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# INTRODUCTION

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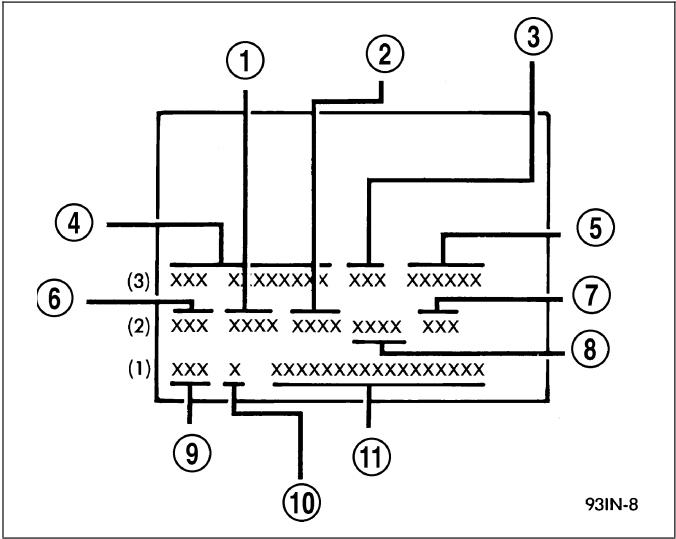
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### BODY CODE PLATE

#### DESCRIPTION

#### LOCATION AND DECODING

The Body Code Plate is located in the engine compartment on the front right side shock tower mounting front panel.



### BODY CODE PLATE LINE 3

There are seven lines of information on the body code plate. Lines 4, 5, 6, and 7 are not used to define service information. Information reads from left to right, starting with line 3 in the center of the plate to line 1 at the bottom of the plate.

#### DIGITS 1, 2, AND 3

Paint procedure

#### DIGIT 4

Open Space

#### DIGITS 5 THROUGH 7

Primary Paint

#### DIGIT 8 AND 9

Open Space

#### DIGITS 10 THROUGH 12

Secondary Paint

#### DIGIT 13 AND 14

Open Space

#### DIGITS 15 THROUGH 18

Interior Trim Code

#### DIGIT 19

Open Space

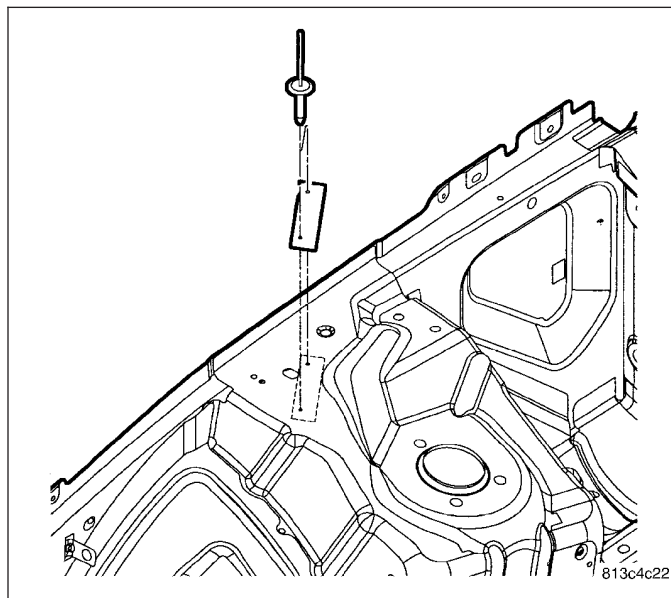
#### DIGITS 20, 21, AND 22

Engine Code

- EER = 2.7 L, Six Cylinder, 24 Valve, DOHC, Gasoline, Aluminum Block (MPI)
- EGG = 3.5 L, Six Cylinder, 24 Valve, SOHC, High Output, Gasoline, Aluminum Block (MPI)
- EZB = 5.7 L, V-8 Cylinder, HEMI, Multi-Displacement, Gasoline,

#### DIGIT 23

Open Space



**BODY CODE PLATE – LINE 2****DIGITS 1 THROUGH 12**

Vehicle Order Number

**DIGITS 13, THROUGH 15**

Vinyl Roof Code

**DIGITS 16 AND 17**

Open space

**DIGITS 18 AND 19**

Vehicle Shell Line

- LX

**DIGITS 20**

Carline

- C = Chrysler
- D = Dodge

**DIGIT 21**

Price Class

- E = Economy
- H = High Line
- L = Low Line
- M = Medium
- P = Premium
- S = Sport
- X = Special

**DIGITS 22 AND 23**

Body Type

- 48 = Four Door Sedan Tall
- 49 = Hatchback Tall

**BODY CODE PLATE LINE 1****DIGITS 1, 2, AND 3**

Transaxle Codes

- DG6 = 4-Speed Electronic Automatic Transaxle
- DGJ = 5-Speed Automatic Transaxle

**DIGIT 4**

Open Space

**DIGIT 5**

Market Code

- C = Canada
- B = International
- M = Mexico
- U = United States

**DIGIT 6**

Open Space

**DIGITS 7 THROUGH 23**

Vehicle Identification Number

- (Refer to VEHICLE DATA/VEHICLE INFORMATION/VEHICLE IDENTIFICATION NUMBER - DESCRIPTION) for proper breakdown of VIN code.

**IF TWO BODY CODE PLATES ARE REQUIRED**

The last code shown on either plate will be followed by END. When two plates are required, the last code space on the first plate will indicate (CTD)

When a second plate is required, the first four spaces of each line will not be used due to overlap of the plates.

# FASTENER IDENTIFICATION

## DESCRIPTION

### Bolt Markings and Torque - Metric

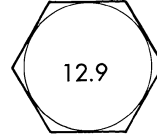
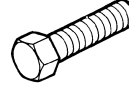
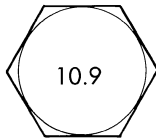
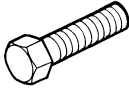
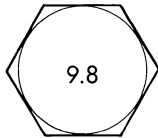
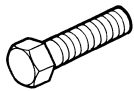
Commercial Steel Class

9.8

10.9

12.9

Bolt Head Markings



Body Size	Torque					Torque				Torque			
	Cast Iron		Aluminum		Cast Iron		Aluminum		Cast Iron		Aluminum		
	Diam. mm	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
6	9	5	7	4	14	9	11	7	14	9	11	7	
7	14	9	11	7	18	14	14	11	23	18	18	14	
8	25	18	18	14	32	23	25	18	36	27	28	21	
10	40	30	30	25	60	45	45	35	70	50	55	40	
12	70	55	55	40	105	75	80	60	125	95	100	75	
14	115	85	90	65	160	120	125	95	195	145	150	110	
16	180	130	140	100	240	175	190	135	290	210	220	165	
18	230	170	180	135	320	240	250	185	400	290	310	230	

### Bolt Markings and Torque Values - U.S. Customary

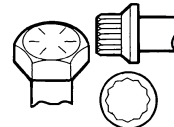
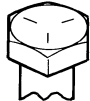
SAE Grade Number

5

8

Bolt Head Markings

These are all SAE Grade 5 (3) line






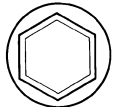




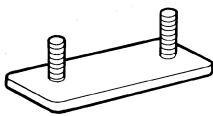

Bolt Torque - Grade 5 Bolt

Bolt Torque - Grade 8 Bolt

Body Size	Cast Iron		Aluminum		Cast Iron		Aluminum	
	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
1/4 - 20	9	7	8	6	15	11	12	9
- 28	12	9	9	7	18	13	14	10
5/16 - 18	20	15	16	12	30	22	24	18
- 24	23	17	19	14	33	24	25	19
3/8 - 16	40	30	25	20	55	40	40	30
- 24	40	30	35	25	60	45	45	35
7/16 - 14	60	45	45	35	90	65	65	50
- 20	65	50	55	40	95	70	75	55
1/2 - 13	95	70	75	55	130	95	100	75
- 20	100	75	80	60	150	110	120	90
9/16 - 12	135	100	110	80	190	140	150	110
- 18	150	110	115	85	210	155	170	125
5/8 - 11	180	135	150	110	255	190	205	150
- 18	210	155	160	120	290	215	230	170
3/4 - 10	325	240	255	190	460	340	365	270
- 16	365	270	285	210	515	380	410	300
7/8 - 9	490	360	380	280	745	550	600	440
- 14	530	390	420	310	825	610	660	490
1 - 8	720	530	570	420	1100	820	890	660
- 14	800	590	650	480	1200	890	960	710

The SAE bolt strength grades range from grade 2 to grade 8. The higher the grade number, the greater the bolt strength. Identification is determined by the line marks on the top of each bolt head. The actual bolt strength grade corresponds to the number of line marks plus 2. The most commonly used metric bolt strength classes are 9.8 and 10.9. The metric strength class identification number is imprinted on the head of the bolt. The higher the class number, the greater the bolt strength. Some metric nuts are imprinted with a single-digit strength class on the nut face. Refer to the Fastener Identification and Fastener Strength Charts.

# HOW TO DETERMINE BOLT STRENGTH

	Mark	Class		Mark	Class
Hexagon head bolt	<div>  <p>Bolt head No.</p> <p>4 — 4T</p> <p>5 — 5T</p> <p>6 — 6T</p> <p>7 — 7T</p> <p>8 — 8T</p> <p>9 — 9T</p> <p>10 — 10T</p> <p>11 — 11T</p> </div>		Stud bolt	<div>  <p>No mark</p> <p>4T</p> </div>	
	<div>  <p>No mark</p> <p>4T</p> </div>				
Hexagon flange bolt w/washer hexagon bolt	<div>  <p>No mark</p> <p>4T</p> </div>		Welded bolt	<div>  <p>Grooved</p> <p>6T</p> </div>	
Hexagon head bolt	<div>  <p>Two protruding lines</p> <p>5T</p> </div>				
Hexagon flange bolt w/washer hexagon bolt	<div>  <p>Two protruding lines</p> <p>6T</p> </div>		Welded bolt		
Hexagon head bolt	<div>  <p>Three protruding lines</p> <p>7T</p> </div>			<div>  <p>4T</p> </div>	
Hexagon head bolt	<div>  <p>Four protruding lines</p> <p>8T</p> </div>				



## FASTENER USAGE

### DESCRIPTION

### FASTENER USAGE

**WARNING: USE OF AN INCORRECT FASTENER MAY RESULT IN COMPONENT DAMAGE OR PERSONAL INJURY.**

Fasteners and torque specifications references in this Service Manual are identified in metric and SAE format.

























During any maintenance or repair procedures, it is important to salvage all fasteners (nuts, bolts, etc.) for reassembly. If the fastener is not salvageable, a fastener of equivalent specification must be used.

### THREADED HOLE REPAIR

Most stripped threaded holes can be repaired using a Helicoil®. Follow the vehicle or Helicoil® recommendations for application and repair procedures.

## INTERNATIONAL SYMBOLS

### DESCRIPTION

 1	 2	 3	 4	 5	 6
 7	 8	 9	 10	 11	 12
 13	 14	 15	 16	 17	 18
 19	 20	 21	 22	 23	 24

80be4788

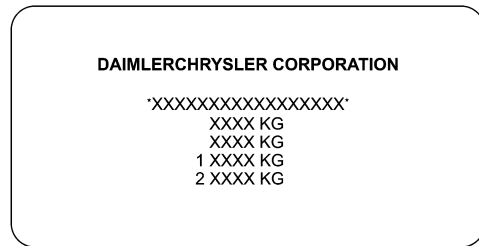
The graphic symbols illustrated in the following International Control and Display Symbols Chart are used to identify various instrument controls. The symbols correspond to the controls and displays that are located on the instrument panel.

## MANUFACTURE PLATE

### DESCRIPTION

The Manufacturer Plate is located in the engine compartment on the passenger side rear corner of the hood. The plate contains five lines of information:

1. Vehicle Identification Number (VIN)
2. Gross Vehicle Mass (GVM)
3. Gross Train Mass (GTM)
4. Gross Front Axle Rating (GFAR)
5. Gross Rear Axle Rating (GRAR)



80bf3788

## METRIC SYSTEM

## DESCRIPTION

in-lbs to N•m

N•m to in-lbs

in- lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m
2	.2260	42	4.7453	82	9.2646	122	13.7839	162	18.3032	.2	1.7702	4.2	37.1747	8.2	72.5792	12.2	107.9837
4	.4519	44	4.9713	84	9.4906	124	14.0099	164	18.5292	.4	3.5404	4.4	38.9449	8.4	74.3494	12.4	109.7539
6	.6779	46	5.1972	86	9.7165	126	14.2359	166	18.7552	.6	5.3107	4.6	40.7152	8.6	76.1197	12.6	111.5242
8	.9039	48	5.4232	88	9.9425	128	14.4618	168	18.9811	.8	7.0809	4.8	42.4854	8.8	77.8899	12.8	113.2944
10	1.1298	50	5.6492	90	10.1685	130	14.6878	170	19.2071	1	8.8511	5	44.2556	9	79.6601	13	115.0646
12	1.3558	52	5.8751	92	10.3944	132	14.9138	172	19.4331	1.2	10.6213	5.2	46.0258	9.2	81.4303	13.2	116.8348
14	1.5818	54	6.1011	94	10.6204	134	15.1397	174	19.6590	1.4	12.3916	5.4	47.7961	9.4	83.2006	13.4	118.6051
16	1.8077	56	6.3270	96	10.8464	136	15.3657	176	19.8850	1.6	14.1618	5.6	49.5663	9.6	84.9708	13.6	120.3753
18	2.0337	58	6.5530	98	11.0723	138	15.5917	178	20.1110	1.8	15.9320	5.8	51.3365	9.8	86.7410	13.8	122.1455
20	2.2597	60	6.7790	100	11.2983	140	15.8176	180	20.3369	2	17.7022	6	53.1067	10	88.5112	14	123.9157
22	2.4856	62	7.0049	102	11.5243	142	16.0436	182	20.5629	2.2	19.4725	6.2	54.8770	10.2	90.2815	14.2	125.6860
24	2.7116	64	7.2309	104	11.7502	144	16.2696	184	20.7889	2.4	21.2427	6.4	56.6472	10.4	92.0517	14.4	127.4562
26	2.9376	66	7.4569	106	11.9762	146	16.4955	186	21.0148	2.6	23.0129	6.6	58.4174	10.6	93.8219	14.6	129.2264
28	3.1635	68	7.6828	108	12.2022	148	16.7215	188	21.2408	2.8	24.7831	6.8	60.1876	10.8	95.5921	14.8	130.9966
30	3.3895	70	7.9088	110	12.4281	150	16.9475	190	21.4668	3	26.5534	7	61.9579	11	97.3624	15	132.7669
32	3.6155	72	8.1348	112	12.6541	152	17.1734	192	21.6927	3.2	28.3236	7.2	63.7281	11.2	99.1326	15.2	134.5371
34	3.8414	74	8.3607	114	12.8801	154	17.3994	194	21.9187	3.4	30.0938	7.4	65.4983	11.4	100.9028	15.4	136.3073
36	4.0674	76	8.5867	116	13.1060	156	17.6253	196	22.1447	3.6	31.8640	7.6	67.2685	11.6	102.6730	15.6	138.0775
38	4.2934	78	8.8127	118	13.3320	158	17.8513	198	22.3706	3.8	33.6342	7.8	69.0388	11.8	104.4433	15.8	139.8478
40	4.5193	80	9.0386	120	13.5580	160	18.0773	200	22.5966	4	35.4045	8	70.8090	12	106.2135	16	141.6180

ft-lbs to N•m

N•m to ft-lbs

ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m
1	1.3558	21	28.4722	41	55.5885	61	82.7049	81	109.8212	1	.7376	21	15.9888	41	30.2400	61	44.9913
2	2.7116	22	29.8280	42	56.9444	62	84.0607	82	111.1770	2	1.4751	22	16.2264	42	30.9776	62	45.7289
3	4.0675	23	31.1838	43	58.3002	63	85.4165	83	112.5328	3	2.2127	23	16.9639	43	31.7152	63	46.4664
4	5.4233	24	32.5396	44	59.6560	64	86.7723	84	113.8884	4	2.9502	24	17.7015	44	32.4527	64	47.2040
5	6.7791	25	33.8954	45	61.0118	65	88.1281	85	115.2446	5	3.6878	25	18.4391	45	33.1903	65	47.9415
6	8.1349	26	35.2513	46	62.3676	66	89.4840	86	116.6004	6	4.4254	26	19.1766	46	33.9279	66	48.6791
7	9.4907	27	36.6071	47	63.7234	67	90.8398	87	117.9562	7	5.1629	27	19.9142	47	34.6654	67	49.4167
8	10.8465	28	37.9629	48	65.0793	68	92.1956	88	119.3120	8	5.9005	28	20.6517	48	35.4030	68	50.1542
9	12.2024	29	39.3187	49	66.4351	69	93.5514	89	120.6678	9	6.6381	29	21.3893	49	36.1405	69	50.8918
10	13.5582	30	40.6745	50	67.7909	70	94.9073	90	122.0236	10	7.3756	30	22.1269	50	36.8781	70	51.6293
11	14.9140	31	42.0304	51	69.1467	71	96.2631	91	123.3794	11	8.1132	31	22.8644	51	37.6157	71	52.3669
12	16.2698	32	43.3862	52	70.5025	72	97.6189	92	124.7352	12	8.8507	32	23.6020	52	38.3532	72	53.1045
13	17.6256	33	44.7420	53	71.8583	73	98.9747	93	126.0910	13	9.5883	33	24.3395	53	39.0908	73	53.8420
14	18.9815	34	46.0978	54	73.2142	74	100.3316	94	127.4468	14	10.3259	34	25.0771	54	39.8284	74	54.5720
15	20.3373	35	47.4536	55	74.5700	75	101.6862	95	128.8026	15	11.0634	35	25.8147	55	40.5659	75	55.3172
16	21.6931	36	48.8094	56	75.9258	76	103.0422	96	130.1586	16	11.8010	36	26.5522	56	41.3035	76	56.0547
17	23.0489	37	50.1653	57	77.2816	77	104.3980	97	131.5144	17	12.5386	37	27.2898	57	42.0410	77	56.7923
18	24.4047	38	51.5211	58	78.6374	78	105.7538	98	132.8702	18	13.2761	38	28.0274	58	42.7786	78	57.5298
19	25.7605	39	52.8769	59	79.9933	79	107.1196	99	134.2260	19	14.0137	39	28.7649	59	43.5162	79	58.2674
20	27.1164	40	54.2327	60	81.3491	80	108.4654	100	135.5820	20	14.7512	40	29.5025	60	44.2537	80	59.0050

in. to mm

mm to in.

in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
.01	.254	.21	5.334	.41	10.414	.61	15.494	.81	20.574	.01	.00039	.21	.00827	.41	.01614	.61	.02402
.02	.508	.22	5.588	.42	10.668	.62	15.748	.82	20.828	.02	.00079	.22	.00866	.42	.01654	.62	.02441
.03	.762	.23	5.842	.43	10.922	.63	16.002	.83	21.082	.03	.00118	.23	.00906	.43	.01693	.63	.02480
.04	1.016	.24	6.096	.44	11.176	.64	16.256	.84	21.336	.04	.00157	.24	.00945	.44	.01732	.64	.02520
.05	1.270	.25	6.350	.45	11.430	.65	16.510	.85	21.590	.05	.00197	.25	.00984	.45	.01772	.65	.02559
.06	1.524	.26	6.604	.46	11.684	.66	16.764	.86	21.844	.06	.00236	.26	.01024	.46	.01811	.66	.02598
.07	1.778	.27	6.858	.47	11.938	.67	17.018	.87	22.098	.07	.00276	.27	.01063	.47	.01850	.67	.02638
.08	2.032	.28	7.112	.48	12.192	.68	17.272	.88	22.352	.08	.00315	.28	.01102	.48	.01890	.68	.02677
.09	2.286	.29	7.366	.49	12.446	.69	17.526	.89	22.606	.09	.00354	.29	.01142	.49	.01929	.69	.02717
.10	2.540	.30	7.620	.50	12.700	.70	17.780	.90	22.860	.10	.00394	.30	.01181	.50	.01969	.70	.02756
.11	2.794	.31	7.874	.51	12.954	.71	18.034	.91	23.114	.11	.00433	.31	.01220	.51	.02008	.71	.02795
.12	3.048	.32	8.128	.52	13.208	.72	18.288	.92	23.368	.12	.00472	.32	.01260	.52	.02047	.72	.02835
.13	3.302	.33	8.382	.53	13.462	.73	18.542	.93	23.622	.13	.00512	.33	.01299	.53	.02087	.73	.02874
.14	3.556	.34	8.636	.54	13.716	.74	18.796	.94	23.876	.14	.00551	.34	.01339	.54	.02126	.74	.02913
.15	3.810	.35	8.890	.55	13.970	.75	19.050	.95	24.130	.15	.00591	.35	.01378	.55	.02165	.75	.02953
.16	4.064	.36	9.144	.56	14.224	.76	19.304	.96	24.384	.16	.00630	.36	.01417	.56	.02205	.76	.02992
.17	4.318	.37	9.398	.57	14.478	.77	19.558	.97	24.638	.17	.00669	.37	.01457	.57	.02244	.77	.03032
.18	4.572	.38	9.652	.58	14.732	.78	19.812	.98	24.892	.18	.00709	.38	.01496	.58	.02283	.78	.03071
.19	4.826	.39	9.906	.59	14.986	.79	20.066	.99	25.146	.19	.00748	.39	.01535	.59	.02323	.79	.03110
.20	5.080	.40	10.160	.60	15.240	.80	20.320	1.00	25.400	.20	.00787	.40	.01575	.60	.02362	.80	.03150

The metric system is based on quantities of one, ten, one hundred, one thousand and one million.  
The following chart will assist in converting metric units to equivalent English and SAE units, or vice versa.

### CONVERSION FORMULAS AND EQUIVALENT VALUES

MULTIPLY	BY	TO GET	MULTIPLY	BY	TO GET
in-lbs	x 0.11298	= Newton Meters (N·m)	N·m	x 8.851	= in-lbs
ft-lbs	x 1.3558	= Newton Meters (N·m)	N·m	x 0.7376	= ft-lbs
Inches Hg (60° F)	x 3.377	= Kilopascals (kPa)	kPa	x 0.2961	= Inches Hg
psi	x 6.895	= Kilopascals (kPa)	kPa	x 0.145	= psi
Inches	x 25.4	= Millimeters (mm)	mm	x 0.03937	= Inches
Feet	x 0.3048	= Meters (M)	M	x 3.281	= Feet
Yards	x 0.9144	= Meters	M	x 1.0936	= Yards
mph	x 1.6093	= Kilometers/Hr. (Km/h)	Km/h	x 0.6214	= mph
Feet/Sec	x 0.3048	= Meters/Sec (M/S)	M/S	x 3.281	= Feet/Sec
mph	x 0.4470	= Meters/Sec (M/S)	M/S	x 2.237	= mph
Kilometers/Hr. (Km/h)	x 0.27778	= Meters/Sec (M/S)	M/S	x 3.600	Kilometers/Hr. (Km/h)

### COMMON METRIC EQUIVALENTS

1 inch = 25 Millimeters	1 Cubic Inch = 16 Cubic Centimeters
1 Foot = 0.3 Meter	1 Cubic Foot = 0.03 Cubic Meter
1 Yard = 0.9 Meter	1 Cubic Yard = 0.8 Cubic Meter
1 Mile = 1.6 Kilometers	

Refer to the Metric Conversion Chart to convert torque values listed in metric Newton- meters (N·m). Also, use the chart to convert between millimeters (mm) and inches (in.).

## TORQUE REFERENCES

### DESCRIPTION

#### SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N•m	kgf-cm	ft-lbf	N•m	kgf-cm	ft-lbf
4T	6	1	5	55	48 in.-lbf	6	60	52 in.-lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	—	—	—
5T	6	1	6.5	65	56 in.-lbf	7.5	75	65 in.-lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	—	—	—
6T	6	1	8	80	69 in.-lbf	9	90	78 in.-lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	—	—	—
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	—	—	—
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

Individual Torque Charts appear within many of the Groups. Refer to the Standard Torque Specifications Chart for torque references not listed in the individual torque charts.

## VECI LABEL

### DESCRIPTION

All vehicles are equipped with a combined VECI label. This label is located in the engine compartment.

The VECI label contains the following:

- Engine family and displacement
- Evaporative family
- Emission control system schematic
- Certification application
- Engine timing specifications (if adjustable)
- Idle speeds (if adjustable)
- Spark plug and gap

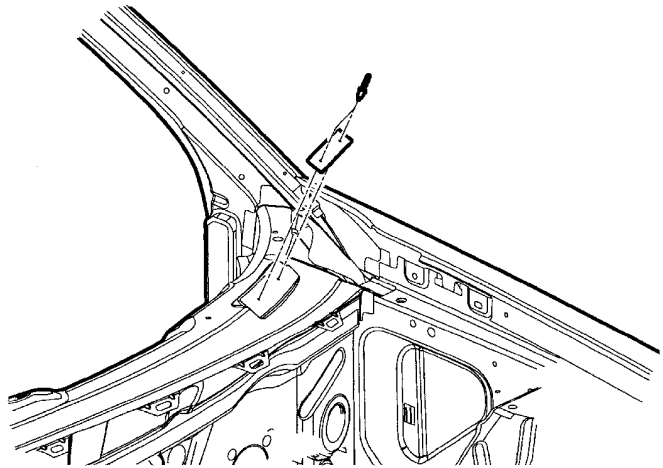
The label also contains an engine vacuum schematic. There are unique labels for vehicles built for sale in the state of California and the country of Canada. Canadian labels are written in both the English and French languages. These labels are permanently attached and cannot be removed without defacing information and destroying label.

## VEHICLE IDENTIFICATION NUMBER

### DESCRIPTION

The Vehicle Identification Number (VIN) plate is attached to the top left side of the instrument panel. The VIN contains 17 characters that provide data concerning the vehicle. Refer to the decoding chart to determine the identification of a vehicle.

To protect the consumer from theft and possible fraud the manufacturer is required to include a Check Digit at the ninth position of the Vehicle Identification Number. The check digit is used by the manufacturer and government agencies to verify the authenticity of the vehicle and official documentation. The formula to use the check digit is not released to the general public.



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## VIN DECODING INFORMATION

POSITION	INTERPRETATION	CODE = DESCRIPTION
1	Country of Origin	1 = Manufactured by DaimlerChrysler Canada Inc.
2	Make	C = Chrysler D = Dodge
3	Vehicle Type	3 = Passenger Car 4 = Multipurpose Passenger Vehicle With Side Airbags 8 = Multipurpose Passenger Vehicle with Side Airbags
4	Restraint System	J = Restraint System Air bags Front Next Generation Multi-Stage Sales Code (CG1) Without Side Air Bags Sales Code (CGS)
	Gross Vehicle Weight Rating	H = 6001-7000 lbs.
5	Vehicle Line	A = 300 / 300C / SRT-8 (RWD) K = 300 (AWD) V = TBD (RWD) Z = TBD (AWD)
6	Series	2 = L Low Line 3 = M Medium 4 = H High Line 5 = P Premium 6 = S Sport 7 = S Special
7	Body Style	3 = LX - 48 8 = LX - 49
8	Engine	R = 2.7L V-6 cyl. DOHC 24 Valve MPI Gasoline G = 3.5L V-6 cyl. High Output 24 Valve MPI Gasoline H = 5.7L V-8 cyl. Gasoline T = 2.7L V-6 cyl. DOHC 24 Valve MPI Gasoline V = 3.5L V-6 cyl. High Output 24 Valve MPI Gasoline 2 = 5.7L V-8 cyl. HEMI Multiple Displacement Gasoline
9	Check Digit	0 through 9 or X
10	Model Year	5 = 2005
11	Assembly Plant	H = Brampton Assembly
12 Through 17	Vehicle Build Sequence	Six Digit Number Assigned By Assembly Plant

## VEHICLE CERTIFICATION LABEL

### DESCRIPTION

A vehicle certification label is attached to every DaimlerChrysler Corporation vehicle. The label certifies that the vehicle conforms to all applicable Federal Motor Vehicle Standards. The label also lists:

- Month and year of vehicle manufacture.
- Gross Vehicle Weight Rating (GVWR). The gross front and rear axle weight ratings (GAWR's) are based on a minimum rim size and maximum cold tire inflation pressure.
- Vehicle Identification Number (VIN).
- Type of vehicle.
- Type of rear wheels.
- Bar code.
- Month, Day and Hour (MDH) of final assembly.
- Paint and Trim codes.
- Country of origin.

The label is located on the driver-side door shut-face.

MFD BY	DAIMLER CHRYSLER CORPORATION	DATE OF MFR	1-96 C	GVWR	2268 KG (05000 LB)		
GAWR FRONT	1203 KG (2650 LB)	WITH TIRES	P195/75R14	RIMS AT	14 X 5.5	COLD	380 KPA(35 PSI)
GAWR REAR	1225 KG (2700 LB)	WITH TIRES	P195/75R14	RIMS AT	14 X 5.5	COLD	380 KPA(35 PSI)

THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

VIN: XXXXXXXXXXXXXXXX TYPE: SINGLE X DUAL



MDH: 010615 021 PAINT:POP VEHICLE MADE IN CANADA TRIM:C5C3 4848505

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# LUBRICATION & MAINTENANCE

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## FLUID TYPES

### DESCRIPTION

### ENGINE OIL AND LUBRICANTS

**WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA.**

When service is required, DaimlerChrysler Corporation recommends that only Mopar® brand parts, lubricants and chemicals be used. Mopar® provides the best engineered products for servicing DaimlerChrysler Corporation vehicles.

Only lubricants bearing designations defined by the following organization should be used.

- Society of Automotive Engineers (SAE)
- American Petroleum Institute (API)
- National Lubricating Grease Institute (NLGI)

## API SERVICE GRADE CERTIFIED

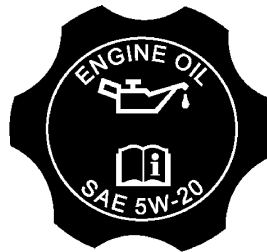
Use an engine oil that is API Certified. Mopar® provides engine oils, meeting Material Standard MS-6395, that meet or exceed this requirement.



9400-9

## SAE VISCOSITY

SAE 5W-20 and SAE 5W-30 engine oils are recommended for all operating temperatures. These engine oils improve low temperature starting and vehicle fuel economy. Refer to the engine oil filler cap for the recommended engine oil viscosity for each vehicle. An SAE viscosity grade is used to specify the viscosity of engine oil. Use only engine oils with multiple viscosities such as 5W-20 or 5W-30. These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range. Select an engine oil that is best suited to your particular temperature range and variation.



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## ENERGY CONSERVING OIL

An Energy Conserving type oil is recommended for gasoline engines. The designation of ENERGY CONSERVING is located on the label of an engine oil container.

## CONTAINER IDENTIFICATION

Standard engine oil identification notations have been adopted to aid in the proper selection of engine oil. The identifying notations are located on the front label of engine oil plastic bottles and the top of engine oil cans.

This symbol means that the oil has been certified by the American Petroleum Institute (API). DaimlerChrysler only recommend API Certified engine oils that meet the requirements of Material Standard MS-6395. Use Mopar® or an equivalent oil meeting the specification MS-6395.

## SYNTHETIC ENGINE OILS

There are a number of engine oils being promoted as either synthetic or semi-synthetic. If you chose to use such a product, use **only** those oils that meet the American Petroleum Institute (API) and SAE viscosity standard. Follow the service schedule that describes your driving type.



9400-9

## ENGINE OIL ADDITIVES/SUPPLEMENTS

The manufacturer **does not recommend** the addition of any engine oil additives/supplements to the specified engine oil. Engine oil additives/supplements should not be used to enhance engine oil performance. Engine oil additives/supplements should not be used to extend engine oil change intervals. No additive is known to be safe for engine durability and can degrade emission components. Additives can contain undesirable materials that harm the long term durability of engines by:

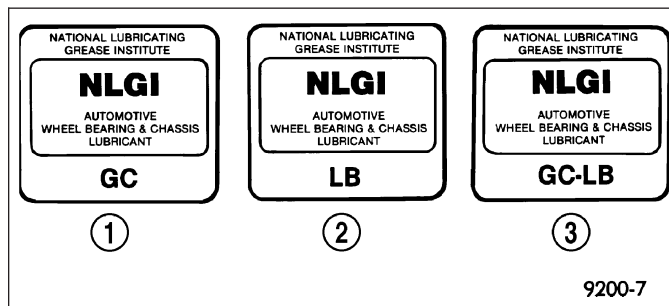
- Doubling the level of Phosphorus in the engine oil. The ILSAC (International Lubricant Standard Approval Committee) GF-2 and GF-3 standards require that engine oil contain no more than 0.10% Phosphorus to protect the vehicles emissions performance. Addition of engine oil additives/supplements can poison, from the added sulfur and phosphorus, catalysts and hinder efforts to guarantee emissions performance to 80,000 miles.
- Altering the viscosity characteristics of the engine oil so that it no longer meets the requirements of the specified viscosity grade.
- Creating potential for an undesirable additive compatibility interaction in the engine crankcase. Generally it is not desirable to mix additive packages from different suppliers in the crankcase; there have been reports of low temperature engine failures caused by additive package incompatibility with such mixtures.

## GEAR LUBRICANTS

SAE ratings also apply to multigrade gear lubricants. In addition, API classification defines the lubricants usage. Such as API GL-5 and SAE 75W-90.

## LUBRICANTS AND GREASES

Lubricating grease is rated for quality and usage by the NLGI. All approved products have the NLGI symbol on the label. At the bottom NLGI symbol is the usage and quality identification letters. Wheel bearing lubricant is identified by the letter "G". Chassis lubricant is identified by the latter "L". The letter following the usage letter indicates the quality of the lubricant. The following symbols indicate the highest quality.



## SPECIALIZED LUBRICANTS AND OILS

Some maintenance or repair procedures may require the use of specialized lubricants or oils. Consult the appropriate sections in this manual for the correct application of these lubricants.

## DESCRIPTION - AXLE

**Note:** DaimlerChrysler recommends the use of Mopar® lubricants. Fluid additives are not required for these axles.

### REAR AXLE

- 198 RII - Mopar® Synthetic Gear & Axle Lubricant 75W-140
- 210 RII - Mopar® Synthetic Gear & Axle Lubricant 75W-140

## AUTOMATIC TRANSMISSION FLUID

**Note:** Refer to Service Procedures in this group for fluid level checking procedures.

Mopar® ATF +4, Automatic Transmission Fluid is the recommended fluid for DaimlerChrysler automatic transmissions.

**Dexron II fluid IS NOT recommended. Clutch chatter can result from the use of improper fluid.**

Mopar® ATF +4, Automatic Transmission Fluid when new is red in color. The ATF is dyed red so it can be identified from other fluids used in the vehicle such as engine oil or antifreeze. The red color is not permanent and is not an indicator of fluid condition. As the vehicle is driven, the ATF will begin to look darker in color and may eventually become brown. **This is normal.** ATF+4 also has a unique odor that may change with age. Consequently, odor and color cannot be used to indicate the fluid condition or the need for a fluid change.

## FLUID ADDITIVES

DaimlerChrysler strongly recommends against the addition of any fluids to the transmission, other than those automatic transmission fluids listed above. Exceptions to this policy are the use of special dyes to aid in detecting fluid leaks.

Various “special” additives and supplements exist that claim to improve shift feel and/or quality. These additives and others also claim to improve converter clutch operation and inhibit overheating, oxidation, varnish, and sludge. These claims have not been supported to the satisfaction of DaimlerChrysler and these additives **must not be used**. The use of transmission “sealers” should also be avoided, since they may adversely affect the integrity of transmission seals.

## OPERATION

### AUTOMATIC TRANSMISSION FLUID

The automatic transmission fluid is selected based upon several qualities. The fluid must provide a high level of protection for the internal components by providing a lubricating film between adjacent metal components. The fluid must also be thermally stable so that it can maintain a consistent viscosity through a large temperature range. If the viscosity stays constant through the temperature range of operation, transmission operation and shift feel will remain consistent. Transmission fluid must also be a good conductor of heat. The fluid must absorb heat from the internal transmission components and transfer that heat to the transmission case.

## FLUID CAPACITIES

### SPECIFICATIONS - FLUID CAPACITIES

DESCRIPTION	SPECIFICATION
Fuel Tank - V6 Engine	68 L (18 gal.)
Fuel Tank - V8 Engine	72 L (19 gal.)
Engine Oil*	5.7 L (6.0 qts.)
Engine Oil* - 5.7L	6.6 L (7.0 qts.)
Cooling System - 2.7L **	10.0 L (10.5 qts.)
Cooling System - 3.5L **	10.5 L (11.0 qts.)
*(includes filter)	
**(includes heater and coolant recovery bottle filled to MAX level)	
AUTOMATIC TRANSMISSION	
Service Fill - NAG1	5.0 L (10.6 pts.)
O-haul Fill - NAG1	7.7 L (16.3 pts.)
Service Fill - 42RLE	3.8L (4.0 qts)
O-haul Fill - 42RLE	8.3L (17.6 pts)
Dry fill capacity Depending on type and size of internal cooler, length and inside diameter of cooler lines, or use of an auxiliary cooler, these figures may vary. (Refer to 21 - TRANSMISSION/AUTOMATIC/FLUID - STANDARD PROCEDURE)	
AXLE - REAR	
198 MM RII Axle	1.4L (1.5 qts.)
210 MM RII Axle	1.6L (1.7 qts.)

## FLUID FILL/CHECK LOCATIONS

### DESCRIPTION

The fluid check/fill points and lubrication locations are located in each applicable Sections.

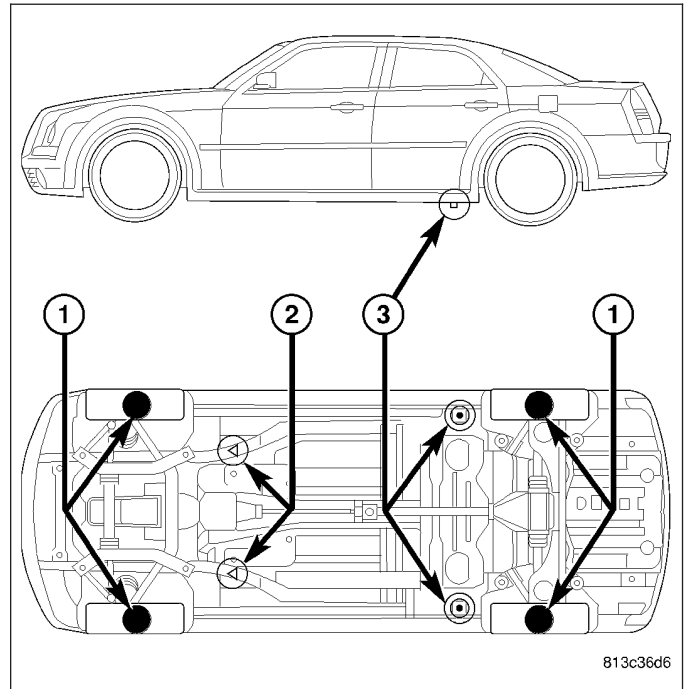
## HOISTING

### STANDARD PROCEDURE - HOISTING

Refer to Owner's Manual provided with vehicle for proper emergency jacking procedures.

**WARNING: THE HOISTING AND JACK LIFTING POINTS PROVIDED ARE FOR A COMPLETE VEHICLE. WHEN THE ENGINE OR REAR SUSPENSION IS REMOVED FROM A VEHICLE, THE CENTER OF GRAVITY IS ALTERED MAKING SOME HOISTING CONDITIONS UNSTABLE. PROPERLY SUPPORT OR SECURE VEHICLE TO HOISTING DEVICE WHEN THESE CONDITIONS EXIST.**

**CAUTION: Do not position hoisting device on any suspension component, including the front or rear suspension crossmembers. Do not hoist on the front and rear bumpers, the lower liftgate crossmember, the lower radiator crossmember, or the front engine mount.**









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- 1 - DRIVE ON LIFT
- 2 - SAE HOISTING SYMBOLS
- 2 - FRAME CONTACT LIFT (SINGLE POST)
- 2 - CHASSIS LIFT (DUAL LIFT)
- 2 - OUTBOARD LIFT (DUEL LIFT)
- 2 - FLOOR JACK
- 3 - HOISTING PADS
- 3 - FRAME CONTACT LIFT (SINGLE POST)
- 3 - CHASSIS LIFT (DUAL LIFT)
- 3 - OUTBOARD LIFT (DUEL LIFT)
- 3 - FLOOR JACK

## INTERNATIONAL SYMBOLS

### DESCRIPTION

DaimlerChrysler Corporation uses international symbols to identify engine compartment lubricant and fluid inspection and fill locations.

	ENGINE OIL		BRAKE FLUID
	AUTOMATIC TRANSMISSION FLUID		POWER STEERING FLUID
	ENGINE COOLANT		WINDSHIELD WASHER FLUID

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## JUMP STARTING

### STANDARD PROCEDURE

### JUMP STARTING

**WARNING: REVIEW ALL SAFETY PRECAUTIONS AND WARNINGS IN THE BATTERY SYSTEM SECTION OF THE SERVICE MANUAL. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE)** Take care to avoid the radiator cooling fan whenever the hood is raised. It can start anytime the ignition switch is on. You can be hurt by the fan.

- DO NOT JUMP START A FROZEN BATTERY, PERSONAL INJURY CAN RESULT.
- IF EQUIPPED, DO NOT JUMP START WHEN MAINTENANCE FREE BATTERY INDICATOR DOT IS YELLOW OR BRIGHT COLOR.
- DO NOT JUMP START A VEHICLE WHEN THE BATTERY FLUID IS BELOW THE TOP OF LEAD PLATES.
- DO NOT ALLOW JUMPER CABLE CLAMPS TO TOUCH EACH OTHER WHEN CONNECTED TO A BOOSTER SOURCE.
- DO NOT USE OPEN FLAME NEAR BATTERY.
- REMOVE METALLIC JEWELRY WORN ON HANDS OR WRISTS TO AVOID INJURY BY ACCIDENTAL ARCING OF BATTERY CURRENT.
- WHEN USING A HIGH OUTPUT BOOSTING DEVICE, DO NOT ALLOW BATTERY VOLTAGE TO EXCEED 16 VOLTS. REFER TO INSTRUCTIONS PROVIDED WITH DEVICE BEING USED.
- Do not attempt to push or tow your vehicle to get it started. Vehicles equipped with an automatic transmission cannot be started this way. Unburned fuel could enter the catalytic converter and once the engine has started, ignite and damage the converter and vehicle. If the vehicle has a discharged battery, booster cables may be used to obtain a start from another vehicle. This type of start can be dangerous if done improperly, so follow this procedure carefully.
- Battery fluid is a corrosive acid solution; do not allow battery fluid to contact eyes, skin or clothing. Don't lean over battery when attaching clamps or allow the clamps to touch each other. If acid splashes in eyes or on skin, flush contaminated area immediately with large quantities of water.
- A battery generates hydrogen gas which is flammable and explosive. Keep flame or spark away from the vent holes. Do not use a booster battery or any other booster source with an output that exceeds 12 volts.

**FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.**

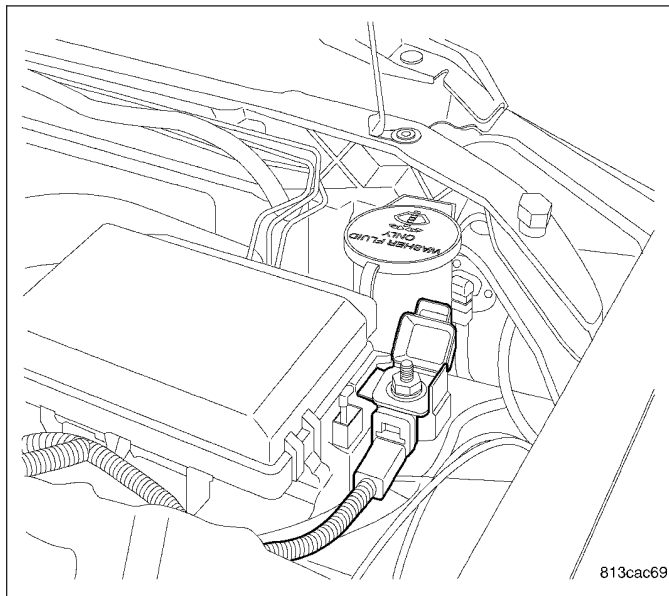
**CAUTION:** When using another vehicle as a booster, do not allow vehicles to touch. Electrical systems can be damaged on either vehicle.

**Note:** The battery is stored under an access cover in the trunk. Remote battery terminals are located in the engine compartment for jump starting.

**Note:** The battery in this vehicle has a vent hose that should not be disconnected and should only be replaced with a battery of the same type (vented).

### TO JUMP START A DISABLED VEHICLE:

- Wear eye protection and remove any metal jewelry such as watch bands or bracelets that might make an inadvertent electrical contact.
- When boost is provided by a battery in another vehicle, park that vehicle within booster cable reach and without letting the vehicles touch. Set the parking brake, place the automatic transmission in PARK and turn the ignition switch to the OFF (or LOCK) position for both vehicles.
- Turn off the heater, radio and all unnecessary electrical loads.
- Connect one end of the jumper cable RED clamp to the remote jump start positive battery post in the engine compartment of the disabled vehicle. Connect the other end of the jumper cable RED clamp to the positive terminal of the booster battery.
- Connect the jumper cable BLACK clamp, first to the negative terminal of the booster battery and then connect the other end of the jumper cable BLACK clamp to a suitable engine ground on the disabled vehicle battery. Make sure you have a good contact on the engine ground.



### DISCONNECT CABLE CLAMPS AS FOLLOWS:

- Disconnect BLACK cable clamp from engine ground on disabled vehicle.
- When using a booster vehicle, disconnect BLACK cable clamp from battery negative terminal. Disconnect RED cable clamp from battery positive terminal.
- Disconnect RED cable clamp from battery positive terminal on disabled vehicle.

## LUBRICATION POINTS

### DESCRIPTION

Lubrication point locations are located in each applicable Sections.

## MAINTENANCE SCHEDULES

### DESCRIPTION

#### DESCRIPTION - SEDAN

There are two maintenance schedules that show the **required** service for your vehicle.

First is Schedule **B**. It is for vehicles that are operated under the conditions that are listed below and at the beginning of the schedule. Change the automatic transmission fluid and filter every 60,000 miles (96 000 km) if the vehicle is usually operated under one or more of the conditions marked with an ◇.

- Day or night temperatures are below 32° F (0° C).
- Stop and go driving.
- Extensive engine idling.



- Driving in dusty conditions.
- Short trips of less than 10 miles (16 km).
- More than 50% of your driving is at sustained high speeds during hot weather, above 90° F (32° C).
- Trailer towing. ◇
- Taxi, police, or delivery service (commercial service). ◇
- Off-road or desert operation.

**Note: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule B of the "Maintenance Schedules" section of this manual.**

**Note: Most vehicles are operated under the conditions listed for Schedule B.**

Second is Schedule **A**. It is for vehicles that are not operated under any of the conditions listed under Schedule B. Use the schedule that best describes your driving conditions. Where time and mileage are listed, follow the interval that occurs first.

**Note: Under no circumstances should oil change intervals exceed 6000 miles (10 000 km) or 6 months whichever comes first.**

**CAUTION: Failure to perform the required maintenance items may result in damage to the vehicle.**

#### ***At Each Stop for Fuel***

- Check the engine oil level about 5 minutes after a fully warmed engine is shut off. Checking the oil level while the vehicle is on level ground will improve the accuracy of the oil level reading. Add oil only when the level is at or below the ADD or MIN mark.
- Check the windshield washer solvent and add if required.

#### ***Once a Month***

- Check tire pressure and look for unusual wear or damage.
- Inspect the battery and clean and tighten the terminals as required.
- Check the fluid levels of coolant reservoir, brake master cylinder, and transmission and add as needed.
- Check all lights and all other electrical items for correct operation.
- Check rubber seals on each side of the radiator for proper fit.

#### ***At Each Oil Change***

- Change the engine oil filter.
- Inspect the exhaust system.
- Inspect the brake hoses.
- Inspect the CV joints and front and rear suspension components.
- Check the automatic transmission fluid level.
- Check the coolant level, hoses, and clamps.

### **SCHEDULE B**

Follow schedule B if you usually operate your vehicle under one or more of the following conditions. Change the automatic transmission fluid and filter every 60,000 miles (96 000 km) if the vehicle is usually operated under one or more of the conditions marked with an ◇.

- Day or night temperatures are below 32° F (0° C).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 10 miles (16.2 km).
- More than 50% of your driving is at sustained high speeds during hot weather, above 90° F (32° C).
- Trailer towing. ◇

- Taxi, police or delivery service (commercial services). ◇
- Off-road or desert operation.
- **If equipped for and operating with E-85 (ethanol) fuel.**

**Note: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule “B” of the “Maintenance Schedules” section of this manual.**

<b>Miles (Kilometers)</b>	<b>3,000 (5 000)</b>	<b>6,000 (10 000)</b>	<b>9,000 (14 000)</b>	<b>12,000 (19 000)</b>	<b>15,000 (24 000)</b>	<b>18,000 (29 000)</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X	X	X		X
Replace the <b>air cleaner filter</b> .*					X	
Inspect the front and rear brake linings and rotors.			X			X
Replace the air conditioning filter.					X	
Rotate the tires.		X		X		X

<b>Miles (Kilometers)</b>	<b>21,000 (34 000)</b>	<b>24,000 (38 000)</b>	<b>27,000 (43 000)</b>	<b>30,000 (48 000)</b>	<b>33,000 (53 000)</b>	<b>36,000 (58 000)</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X	X		X	X
Replace the <b>air cleaner filter</b> .				X		
Replace the <b>spark plugs</b> . 5.7L Engine.				X		
Inspect the front and rear brake linings and rotors.			X			X
Check and replace, if necessary, the <b>PCV valve</b> .*				X		
Replace the air conditioning filter.				X		
Rotate the tires.		X		X		X

<b>Miles (Kilometers)</b>	<b>39,000 (62 000)</b>	<b>42,000 (67 000)</b>	<b>45,000 (72 000)</b>	<b>48,000 (77 000)</b>	<b>51,000 (82 000)</b>	<b>54,000 (86 000)</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X		X	X	X
Replace the <b>air cleaner filter</b> .*			X			
Inspect the front and rear brake linings and rotors.			X			X
Replace the rear axle fluid.				X		

<b>Miles (Kilometers)</b>	<b>39,000 (62 000)</b>	<b>42,000 (67 000)</b>	<b>45,000 (72 000)</b>	<b>48,000 (77 000)</b>	<b>51,000 (82 000)</b>	<b>54,000 (86 000)</b>
Replace the air conditioning filter.			X			
Rotate the tires.		X		X		X

<b>Miles (Kilometers)</b>	<b>57,000 (91 000)</b>	<b>60,000 (96 000)</b>	<b>63,000 (101 000)</b>	<b>66,000 (106 000)</b>	<b>69,000 (110 000)</b>	<b>72,000 (115 000)</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X		X	X	X	X
Replace the <b>air cleaner filter</b> .		X				
Replace the <b>spark plugs</b> . 5.7L Engine.		X				
Inspect the front and rear brake linings and rotors.			X			X
Check and Inspect the accessory drive belt and tensioner. Replace if required.						X
Check and replace, if necessary, the <b>PCV valve</b> .* ‡		X				
Replace the power steering fluid.		X				
Change the automatic transmission fluid and filter.		X				
Replace the air conditioning filter.		X				
Rotate the tires.		X		X		X

<b>Miles (Kilometers)</b>	<b>75,000 (120 000)</b>	<b>78,000 (125 000)</b>	<b>81,000 (130 000)</b>	<b>84,000 (134 000)</b>	<b>87,000 (139 000)</b>	<b>90,000 (144 000)</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*		X	X	X	X	
Replace the <b>air cleaner filter</b> .*	X					
Replace the <b>spark plugs</b> . 5.7L Engine.						X
Replace the <b>air cleaner filter</b> .						X
Inspect the front and rear brake linings and rotors.			X			X
Check and replace, if necessary, the <b>PCV valve</b> .* ‡						X
Replace the air conditioning filter.	X					X
Rotate the tires.		X		X		X

<b>Miles (Kilometers)</b>	<b>93,000 (149 000)</b>	<b>96,000 (154 000)</b>	<b>99,000 (158 000)</b>	<b>100,000 (160 000)</b>	<b>102,000 (163 000)</b>	<b>105,000 (168 000)</b>
Change engine oil and engine oil filter.	X	X	X		X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X	X			
Inspect the <b>air cleaner filter</b> and replace if required.					X	
Replace the <b>air cleaner filter</b> .						X
Inspect the front and rear brake linings and rotors.			X			
Flush and replace the engine coolant.					X	
Replace the <b>engine timing belt</b> (Federal Emissions). 3.5L Engine						X
Replace the <b>engine timing belt</b> (California Emissions). 3.5L Engine						X
Replace the <b>spark plugs</b> . 2.7L, 3.5L Engines.				X		
Check and Inspect the accessory drive belt and tensioner. Replace if required.					X	
Change the rear axle fluid.		X				
Replace the air conditioning filter.						X
Rotate the tires.		X			X	

\* This maintenance is recommended by the manufacture to the owner but is not required to maintain the emissions warranty.

‡ This maintenance is not required if previously replaced.

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

## SCHEDULE A

<b>Miles (Kilometers) [Months]</b>	<b>6,000 (10 000) [6]</b>	<b>12,000 (19 000) [12]</b>	<b>18,000 (29 000) [18]</b>	<b>24,000 (38 000) [24]</b>	<b>30,000 (48 000) [30]</b>	<b>36,000 (58 000) [36]</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X	X	X		X
Replace the <b>air cleaner filter</b> .					X	
Replace the <b>spark plugs</b> . 5.7L Engine.					X	
Inspect the front and rear brake linings and rotors.			X			X
Replace the air conditioning filter.		X		X		X

<b>Miles</b> <b>(Kilometers)</b> <b>[Months]</b>	<b>6,000</b> <b>(10 000)</b> <b>[6]</b>	<b>12,000</b> <b>(19 000)</b> <b>[12]</b>	<b>18,000</b> <b>(29 000)</b> <b>[18]</b>	<b>24,000</b> <b>(38 000)</b> <b>[24]</b>	<b>30,000</b> <b>(48 000)</b> <b>[30]</b>	<b>36,000</b> <b>(58 000)</b> <b>[36]</b>
Rotate the tires.	X	X	X	X	X	X

<b>Miles</b> <b>(Kilometers)</b> <b>[Months]</b>	<b>42,000</b> <b>(67 000)</b> <b>[42]</b>	<b>48,000</b> <b>(77 000)</b> <b>[48]</b>	<b>54,000</b> <b>(86 000)</b> <b>[54]</b>	<b>60,000</b> <b>(96 000)</b> <b>[60]</b>	<b>66,000</b> <b>(106 000)</b> <b>[66]</b>	<b>72,000</b> <b>(115 000)</b> <b>[72]</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X	X		X	X
Replace the <b>air cleaner filter</b> .				X		
Inspect the front and rear brake linings and rotors.			X			X
Replace the <b>spark plugs</b> . 5.7L Engine.				X		
Check and Inspect the accessory drive belt and tensioner. Replace if required.						X
Flush and replace engine coolant at 60 months or 102,000 miles.				X		
Check and replace, if necessary, the <b>PCV valve</b> . *				X		
Replace the air conditioning filter.		X		X		X
Rotate the tires.	X	X	X	X	X	X

<b>Miles</b> <b>(Kilometers)</b> <b>[Months]</b>	<b>78,000</b> <b>(125 000)</b> <b>[78]</b>	<b>84,000</b> <b>(134 000)</b> <b>[84]</b>	<b>90,000</b> <b>(144 000)</b> <b>[90]</b>	<b>96,000</b> <b>(154 000)</b> <b>[96]</b>	<b>100,000</b> <b>(160 000)</b> <b>[100]</b>	<b>102,000</b> <b>(163 000)</b> <b>[102]</b>
Change engine oil and engine oil filter.	X	X	X	X		X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X		X		X
Replace the <b>air cleaner filter</b> .			X			
Inspect the front and rear brake linings and rotors.			X			
Check and Inspect the accessory drive belt and tensioner. Replace if required.						X
Replace the <b>spark plugs</b> . 2.7L, 3.5L Engines.					X	
Replace the <b>spark plugs</b> . 5.7L Engine.			X			
Check and replace, if necessary, the <b>PCV valve</b> .*‡			X			

Miles (Kilometers) [Months]	78,000 (125 000) [78]	84,000 (134 000) [84]	90,000 (144 000) [90]	96,000 (154 000) [96]	100,000 (160 000)	102,000 (163 000) [102]
Replace the <b>engine timing belt</b> (Federal Emissions equipped vehicles only). 3.5L Engine						X
Replace the <b>engine timing belt</b> (California Emissions equipped vehicles only). 3.5L Engine						X
Flush and replace the engine coolant at 60 months or 102,000 miles.						X
Replace the air conditioning filter.		X		X		
Rotate the tires.	X	X	X	X		X

\* This maintenance is recommended by the manufacture to the owner but is not required to maintain the emissions warranty.

‡ This maintenance is not required if previously replaced.

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

**WARNING: You can be badly injured working on or around a motor vehicle. Do only that service work for which you have the knowledge and the right equipment. If you have any doubt about your ability to perform a service job, take your vehicle to a competent mechanic.**

## DESCRIPTION - WAGON

There are two maintenance schedules that show the **required** service for your vehicle.

First is Schedule **B**. It is for vehicles that are operated under the conditions that are listed below and at the beginning of the schedule. Change the automatic transmission fluid and filter every 60,000 miles (96 000 km) if the vehicle is usually operated under one or more of the conditions marked with an ◇.

- Day or night temperatures are below 32° F (0° C).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 10 miles (16 km).
- More than 50% of your driving is at sustained high speeds during hot weather, above 90° F (32° C).
- Trailer towing. ◇
- Taxi, police, or delivery service (commercial service). ◇
- Off-road or desert operation.

**Note: If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule B of the "Maintenance Schedules" section of this manual.**

**Note: Most vehicles are operated under the conditions listed for Schedule B.**

Second is Schedule **A**. It is for vehicles that are not operated under any of the conditions listed under Schedule B. Use the schedule that best describes your driving conditions. Where time and mileage are listed, follow the interval that occurs first.

**Note:** Under no circumstances should oil change intervals exceed 6000 miles (10 000 km) or 6 months whichever comes first.

**CAUTION:** Failure to perform the required maintenance items may result in damage to the vehicle.

#### ***At Each Stop for Fuel***

- Check the engine oil level about 5 minutes after a fully warmed engine is shut off. Checking the oil level while the vehicle is on level ground will improve the accuracy of the oil level reading. Add oil only when the level is at or below the ADD or MIN mark.
- Check the windshield washer solvent and add if required.

#### ***Once a Month***

- Check tire pressure and look for unusual wear or damage.
- Inspect the battery and clean and tighten the terminals as required.
- Check the fluid levels of coolant reservoir, brake master cylinder, and transmission and add as needed.
- Check all lights and all other electrical items for correct operation.
- Check rubber seals on each side of the radiator for proper fit.

#### ***At Each Oil Change***

- Change the engine oil filter.
- Inspect the exhaust system.
- Inspect the brake hoses.
- Inspect the CV joints and front and rear suspension components.
- Check the automatic transmission fluid level.
- Check the coolant level, hoses, and clamps.

### **SCHEDULE B**

Follow schedule B if you usually operate your vehicle under one or more of the following conditions. Change the automatic transmission fluid and filter every 60,000 miles (96 000 km) if the vehicle is usually operated under one or more of the conditions marked with an ◇.

- Day or night temperatures are below 32° F (0° C).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 10 miles (16.2 km).
- More than 50% of your driving is at sustained high speeds during hot weather, above 90° F (32° C).
- Trailer towing. ◇
- Taxi, police or delivery service (commercial services). ◇
- Off-road or desert operation.
- **If equipped for and operating with E-85 (ethanol) fuel.**

**Note:** If ANY of these apply to you then change your engine oil every 3,000 miles (5 000 km) or 3 months, whichever comes first and follow schedule B of the "Maintenance Schedules" section of this manual.

<b>Miles (Kilometers)</b>	<b>3,000 (5 000)</b>	<b>6,000 (10 000)</b>	<b>9,000 (14 000)</b>	<b>12,000 (19 000)</b>	<b>15,000 (24 000)</b>	<b>18,000 (29 000)</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X	X	X		X
Replace the <b>air cleaner filter</b> .*					X	

<b>Miles (Kilometers)</b>	<b>3,000 (5 000)</b>	<b>6,000 (10 000)</b>	<b>9,000 (14 000)</b>	<b>12,000 (19 000)</b>	<b>15,000 (24 000)</b>	<b>18,000 (29 000)</b>
Inspect the front and rear brake linings and rotors.			X			X
Replace the air conditioning filter.					X	
Rotate the tires.		X		X		X

<b>Miles (Kilometers)</b>	<b>21,000 (34 000)</b>	<b>24,000 (38 000)</b>	<b>27,000 (43 000)</b>	<b>30,000 (48 000)</b>	<b>33,000 (53 000)</b>	<b>36,000 (58 000)</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X	X		X	X
Replace the <b>air cleaner filter</b> .				X		
Replace the <b>spark plugs</b> . 5.7L Engine.				X		
Inspect the front and rear brake linings and rotors.			X			X
Check and replace, if necessary, the <b>PCV valve</b> .*				X		
Replace the air conditioning filter.				X		
Rotate the tires.		X		X		X

<b>Miles (Kilometers)</b>	<b>39,000 (62 000)</b>	<b>42,000 (67 000)</b>	<b>45,000 (72 000)</b>	<b>48,000 (77 000)</b>	<b>51,000 (82 000)</b>	<b>54,000 (86 000)</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X		X	X	X
Replace the <b>air cleaner filter</b> .*			X			
Inspect the front and rear brake linings and rotors.			X			X
Replace the rear axle fluid.				X		
Replace the air conditioning filter.			X			
Rotate the tires.		X		X		X
Change the Front Differential Fluid - All Wheel Drive (AWD) only				X		
Change the Transfer Case Fluid - All Wheel Drive (AWD) only				X		



<b>Miles (Kilometers)</b>	<b>57,000 (91 000)</b>	<b>60,000 (96 000)</b>	<b>63,000 (101 000)</b>	<b>66,000 (106 000)</b>	<b>69,000 (110 000)</b>	<b>72,000 (115 000)</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X		X	X	X	X
Replace the <b>air cleaner filter</b> .		X				
Replace the <b>spark plugs</b> . 5.7L Engine.		X				
Inspect the front and rear brake linings and rotors.			X			X
Check and Inspect the accessory drive belt and tensioner. Replace if required.						X
Check and replace, if necessary, the <b>PCV valve</b> .* ‡		X				
Replace the power steering fluid.		X				
Change the automatic transmission fluid and filter.		X				
Replace the air conditioning filter.		X				
Rotate the tires.		X		X		X

<b>Miles (Kilometers)</b>	<b>75,000 (120 000)</b>	<b>78,000 (125 000)</b>	<b>81,000 (130 000)</b>	<b>84,000 (134 000)</b>	<b>87,000 (139 000)</b>	<b>90,000 (144 000)</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*		X	X	X	X	
Replace the <b>air cleaner filter</b> .*	X					
Replace the <b>spark plugs</b> . 5.7L Engine.						X
Replace the <b>air cleaner filter</b> .						X
Inspect the front and rear brake linings and rotors.			X			X
Check and replace, if necessary, the <b>PCV valve</b> .* ‡						X
Replace the air conditioning filter.	X					X
Rotate the tires.		X		X		X

<b>Miles (Kilometers)</b>	<b>93,000 (149 000)</b>	<b>96,000 (154 000)</b>	<b>99,000 (158 000)</b>	<b>100,000 (160 000)</b>	<b>102,000 (163 000)</b>	<b>105,000 (168 000)</b>
Change engine oil and engine oil filter.	X	X	X		X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X	X			

<b>Miles (Kilometers)</b>	<b>93,000 (149 000)</b>	<b>96,000 (154 000)</b>	<b>99,000 (158 000)</b>	<b>100,000 (160 000)</b>	<b>102,000 (163 000)</b>	<b>105,000 (168 000)</b>
Inspect the <b>air cleaner filter</b> and replace if required.					X	
Replace the <b>air cleaner filter</b> .						X
Inspect the front and rear brake linings and rotors.			X			
Flush and replace the engine coolant.					X	
Replace the <b>engine timing belt</b> (Federal Emissions). 3.5L Engine						X
Replace the <b>engine timing belt</b> (California Emissions). 3.5L Engine						X
Replace the <b>spark plugs</b> . 2.7L, 3.5L Engines.				X		
Check and Inspect the accessory drive belt and tensioner. Replace if required.					X	
Change the rear axle fluid.		X				
Replace the air conditioning filter.						X
Rotate the tires.		X			X	
Change the Front Differential Fluid - All Wheel Drive (AWD) only		X				
Change the Transfer Case Fluid - All Wheel Drive (AWD) only		X				

\* This maintenance is recommended by the manufacture to the owner but is not required to maintain the emissions warranty.

‡ This maintenance is not required if previously replaced.

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

## SCHEDULE A

<b>Miles (Kilometers) [Months]</b>	<b>6,000 (10 000) [6]</b>	<b>12,000 (19 000) [12]</b>	<b>18,000 (29 000) [18]</b>	<b>24,000 (38 000) [24]</b>	<b>30,000 (48 000) [30]</b>	<b>36,000 (58 000) [36]</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X	X	X		X
Replace the <b>air cleaner filter</b> .					X	
Replace the <b>spark plugs</b> . 5.7L Engine.					X	
Inspect the front and rear brake linings and rotors.			X			X

<b>Miles (Kilometers) [Months]</b>	<b>6,000 (10 000) [6]</b>	<b>12,000 (19 000) [12]</b>	<b>18,000 (29 000) [18]</b>	<b>24,000 (38 000) [24]</b>	<b>30,000 (48 000) [30]</b>	<b>36,000 (58 000) [36]</b>
Replace the air conditioning filter.		X		X		X
Rotate the tires.	X	X	X	X	X	X

<b>Miles (Kilometers) [Months]</b>	<b>42,000 (67 000) [42]</b>	<b>48,000 (77 000) [48]</b>	<b>54,000 (86 000) [54]</b>	<b>60,000 (96 000) [60]</b>	<b>66,000 (106 000) [66]</b>	<b>72,000 (115 000) [72]</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X	X		X	X
Replace the <b>air cleaner filter</b> .				X		
Inspect the front and rear brake linings and rotors.			X			X
Replace the <b>spark plugs</b> . 5.7L Engine.				X		
Check and Inspect the accessory drive belt and tensioner. Replace if required.						X
Flush and replace engine coolant at 60 months or 102,000 miles.				X		
Check and replace, if necessary, the <b>PCV valve</b> . *				X		
Replace the air conditioning filter.		X		X		X
Rotate the tires.	X	X	X	X	X	X

<b>Miles (Kilometers) [Months]</b>	<b>78,000 (125 000) [78]</b>	<b>84,000 (134 000) [84]</b>	<b>90,000 (144 000) [90]</b>	<b>96,000 (154 000) [96]</b>	<b>100,000 (160 000) [100]</b>	<b>102,000 (163 000) [102]</b>
Change engine oil and engine oil filter.	X	X	X	X		X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X		X		X
Replace the <b>air cleaner filter</b> .			X			
Inspect the front and rear brake linings and rotors.			X			
Check and Inspect the accessory drive belt and tensioner. Replace if required.						X
Replace the <b>spark plugs</b> . 2.7L, 3.5L Engines.					X	
Replace the <b>spark plugs</b> . 5.7L Engine.			X			

Miles (Kilometers) [Months]	78,000 (125 000) [78]	84,000 (134 000) [84]	90,000 (144 000) [90]	96,000 (154 000) [96]	100,000 (160 000)	102,000 (163 000) [102]
Check and replace, if necessary, the <b>PCV valve</b> .*‡			X			
Replace the <b>engine timing belt</b> (Federal Emissions equipped vehicles only). 3.5L Engine						X
Replace the <b>engine timing belt</b> (California Emissions equipped vehicles only). 3.5L Engine						X
Flush and replace the engine coolant at 60 months or 102,000 miles.						X
Replace the air conditioning filter.		X		X		
Rotate the tires.	X	X	X	X		X

\* This maintenance is recommended by the manufacture to the owner but is not required to maintain the emissions warranty.

‡ This maintenance is not required if previously replaced.

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

**WARNING: You can be badly injured working on or around a motor vehicle. Do only that service work for which you have the knowledge and the right equipment. If you have any doubt about your ability to perform a service job, take your vehicle to a competent mechanic.**

## DESCRIPTION - EXPORT

There are two maintenance schedules that show the **required** service for your vehicle.

First is Schedule **A**. It is for vehicles that are not operated under any of the conditions listed under Schedule B.

**Note: Most vehicles are operated under the conditions listed for Schedule B.**

Second is Schedule **B**. It is for vehicles that are operated under the conditions that are listed below and at the beginning of the schedule. Change the automatic transmission fluid and filter every 96 000 km (60,000 miles) if the vehicle is usually operated under one or more of the conditions marked with an ◇.

- Day or night temperatures are below 0° C (32° F).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.
- Short trips of less than 16 km (10 miles).
- More than 50% of your driving is at sustained high speeds during hot weather, above 32° C (90° F ).
- Trailer towing. ◇
- Taxi, police, or delivery service (commercial service). ◇
- Off-road or desert operation.
- If equipped for and operating with E-85 (ethanol) fuel.

**Note: If ANY of these apply to you then change your engine oil every 5 000 km (3,000 miles) or 3 months, whichever comes first and follow schedule “B” of the “Maintenance Schedules” section of this manual.**

Use the schedule that best describes your driving conditions. Where time and mileage are listed, follow the interval that occurs first.

**CAUTION:** Failure to perform the required maintenance items may result in damage to the vehicle.

#### ***At Each Stop for Fuel***

- Check the engine oil level about 5 minutes after a fully warmed engine is shut off. Checking the oil level while the vehicle is on level ground will improve the accuracy of the oil level reading. Add oil only when the level is at or below the ADD or MIN mark.
- Check the windshield washer solvent and add if required.

#### ***Once a Month***

- Check tire pressure and look for unusual wear or damage.
- Inspect the battery and clean and tighten the terminals as required.
- Check the fluid levels of coolant reservoir, brake master cylinder, and transmission and add as needed.
- Check all lights and all other electrical items for correct operation.
- Check rubber seals on each side of the radiator for proper fit.

#### ***At Each Oil Change***

- Change the engine oil filter.
- Inspect the exhaust system.
- Inspect the brake hoses.
- Inspect the CV joints and front and rear suspension components.
- Check the automatic transmission fluid level.
- Check the coolant level, hoses, and clamps.

**Note:** If ANY of these apply to you then change your engine oil every 5 000 km (3,000 miles) or 3 months, whichever comes first and follow schedule B of the "Maintenance Schedules" section of this manual.

If none of these apply to you, then change your engine oil at every interval shown on schedule "A" of the "Maintenance Schedules" section of this manual.

**Note:** Under no circumstances should oil change intervals exceed 10 000 km (6000 miles) or 6 months whichever comes first.

### **SCHEDULE A**

Kilometers (Miles) [Months]	12 000 (7,500) [6]	24 000 (15,000) [12]	36 000 (22,500) [18]	48 000 (30,000) [24]	60 000 (37,500) [30]	72 000 (45,000) [36]
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X	X	X		X
Replace the <b>air cleaner filter</b> .				X		
Replace the <b>spark plugs</b> .5.7L Engines				X		
Inspect the front and rear brake linings and rotors.			X			X
Replace the air conditioning filter.		X		X		X
Rotate the tires.	X	X	X	X	X	X

<b>Kilometers (Miles) [Months]</b>	<b>84 000 (52,500) [42]</b>	<b>96 000 (60, 000) [48]</b>	<b>108 000 (67,500) [54]</b>	<b>120 000 (75,000) [60]</b>	<b>132 000 (82,500) [66]</b>	<b>140 000 (90,000) [72]</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X		X	X	X	X
Replace the <b>air cleaner filter</b> .		X				
Inspect the front and rear brake linings and rotors.		X				X
Replace the <b>spark plugs</b> . 5.7L Engines		X				X
Check and Inspect the accessory drive belt and tensioner. Replace if required.						X
Flush and replace engine coolant at 60 months or 160,000 km.		X				
Check and replace, if necessary, the <b>PCV valve</b> . *		X				X
Replace the air conditioning filter.		X		X		X
Rotate the tires.	X	X	X	X	X	X

<b>Kilometers (Miles) [Months]</b>	<b>156 000 (97,500) [78]</b>	<b>160 000 (100,000) [84]</b>	<b>168 000 (105,000) [84]</b>
Change engine oil and engine oil filter.	X		X
Inspect the <b>air cleaner filter</b> and replace if required.*	X		X
Replace the <b>spark plugs</b> . 2.7L, 3.5L Engines.		X	
Check and Inspect the accessory drive belt and tensioner. Replace if required.			X
Flush and replace the engine coolant at 60 months or 160,000 km.		X	
Replace the air conditioning filter.			X
Rotate the tires.	X		X

\* This maintenance is recommended by the manufacture to the owner but is not required to maintain the emissions warranty.

‡ This maintenance is not required if previously replaced.

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

## SCHEDULE B

Follow schedule B if you usually operate your vehicle under one or more of the following conditions.

Change the automatic transmission fluid and filter every 96 000 km (60,000 miles) if the vehicle is usually operated under one or more of the conditions marked with an ◇.

- Day or night temperatures are below 0° C (32° F).
- Stop and go driving.
- Extensive engine idling.
- Driving in dusty conditions.

- Short trips of less than 16.2 km (10 miles).
- More than 50% of your driving is at sustained high speeds during hot weather, above 32° C (90° F).
- Trailer towing. ◇
- Taxi, police or delivery service (commercial services). ◇
- Off-road or desert operation.
- **If equipped for and operating with E-85 (ethanol) fuel.**

Kilometers (Miles)	5 000 (3,000)	10 000 (6,000)	14 000 (9,000)	19 000 (12,000)	24 000 (15,000)	29 000 (18,000)
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X	X	X		X
Replace the <b>air cleaner filter</b> . *					X	
Inspect the front and rear brake linings and rotors.			X			X
Replace the air conditioning filter.					X	
Rotate the tires.		X		X		X

Kilometers (Miles)	34 000 (21,000)	38 000 (24,000)	43 000 (27,000)	48 000 (30,000)	53 000 (33,000)	58 000 (36,000)
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X	X		X	X
Replace the <b>air cleaner filter</b> .				X		
Replace the <b>spark plugs</b> . 5.7L Engines				X		
Inspect the front and rear brake linings and rotors.			X			X
Check and replace, if necessary, the <b>PCV valve</b> .*				X		
Replace the air conditioning filter.				X		
Rotate the tires.		X		X		X

Kilometers (Miles)	62 000 (39,000)	67 000 (42,000)	72 000 (45,000)	77 000 (48,000)	82 000 (51,000)	86 000 (54,000)
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X		X	X	X
Replace the <b>air cleaner filter</b> .*			X			
Inspect the front and rear brake linings and rotors.			X			X
Replace the rear axle fluid.				X		

<b>Kilometers (Miles)</b>	<b>62 000 (39,000)</b>	<b>67 000 (42,000)</b>	<b>72 000 (45,000)</b>	<b>77 000 (48,000)</b>	<b>82 000 (51,000)</b>	<b>86 000 (54,000)</b>
Replace the air conditioning filter.			X			
Rotate the tires.		X		X		X

<b>Kilometers (Miles)</b>	<b>91 000 (57,000)</b>	<b>96 000 (60,000)</b>	<b>101 000 (63,000)</b>	<b>106 000 (66,000)</b>	<b>110 000 (69,000)</b>	<b>115 000 (72,000)</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X		X	X	X	X
Replace the <b>air cleaner filter</b> .		X				
Replace the <b>spark plugs</b> . 5.7L Engines		X				
Inspect the front and rear brake linings and rotors.			X			X
Check and Inspect the accessory drive belt and tensioner. Replace if required.						X
Check and replace, if necessary, the <b>PCV valve</b> .* ‡		X				
Replace the power steering fluid.		X				
Change the automatic transmission fluid and filter.		X				
Replace the air conditioning filter.		X				
Rotate the tires.		X		X		X

<b>Kilometers (Miles)</b>	<b>120 000 (75,000)</b>	<b>125 000 (78,000)</b>	<b>130 000 (81,000)</b>	<b>134 000 (84,000)</b>	<b>139 000 (87,000)</b>	<b>144 000 (90,000)</b>
Change engine oil and engine oil filter.	X	X	X	X	X	X
Inspect the <b>air cleaner filter</b> and replace if required.*		X	X	X	X	
Replace the <b>air cleaner filter</b> .*	X					
Replace the <b>spark plugs</b> . 5.7L Engines						X
Replace the <b>air cleaner filter</b> .						X
Inspect the front and rear brake linings and rotors.			X			X
Check and replace, if necessary, the <b>PCV valve</b> .* ‡						X
Replace the air conditioning filter.	X					X
Rotate the tires.		X		X		X



Kilometers (Miles)	149 000 (93,000)	154 000 (96,000)	158 000 (99,000)	160 000 (100,000)	163 000 (102,000)	168 000 (105,000)
Change engine oil and engine oil filter.	X	X	X		X	X
Inspect the <b>air cleaner filter</b> and replace if required.*	X	X	X			
Inspect the <b>air cleaner filter</b> and replace if required.					X	
Replace the <b>air cleaner filter</b> .						X
Inspect the front and rear brake linings and rotors.			X			
Replace the <b>spark plugs</b> . 2.7L, 3.5L Engines.				X		
Flush and replace the engine coolant.					X	
Check and Inspect the accessory drive belt and tensioner. Replace if required.					X	
Change the rear axle fluid.		X				
Replace the air conditioning filter.						X
Rotate the tires.		X			X	

\* This maintenance is recommended by the manufacture to the owner but is not required to maintain the emissions warranty.

‡ This maintenance is not required if previously replaced.

Inspection and service should also be performed anytime a malfunction is observed or suspected. Retain all receipts.

#### WARNING:

You can be badly injured working on or around a motor vehicle. Do only that service work for which you have the knowledge and the right equipment. If you have any doubt about your ability to perform a service job, take your vehicle to a competent mechanic.

## PARTS & LUBRICANT RECOMMENDATION

### DESCRIPTION

#### DESCRIPTION - FLUID TYPES

When service is required, DaimlerChrysler Corporation recommends that only Mopar® brand parts, lubricants and chemicals be used. Mopar® provides the best engineered products for servicing DaimlerChrysler Corporation vehicles.

Only lubricants bearing designations defined by the following organization should be used to service a Chrysler Corporation vehicle.

- Society of Automotive Engineers (SAE)
- American Petroleum Institute (API)
- National Lubricating Grease Institute (NLGI)

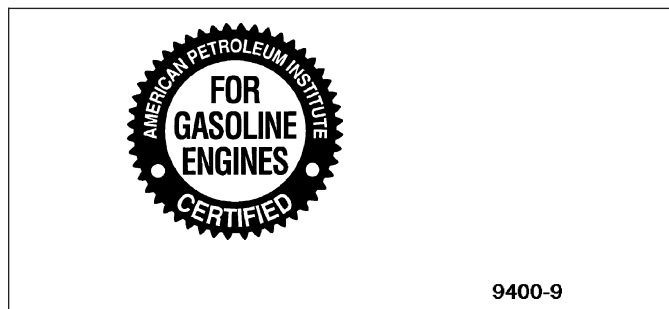
#### SAE VISCOSITY RATING

An SAE viscosity grade is used to specify the viscosity of engine oil. These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range. Example SAE 5W-30 = multigrade engine oil.

DaimlerChrysler Corporation only recommends multigrade engine oils.

## API QUALITY CLASSIFICATION

This symbol on the front of an oil container means that the oil has been certified by the American Petroleum Institute (API) to meet all the lubrication requirements specified by DaimlerChrysler Corporation.

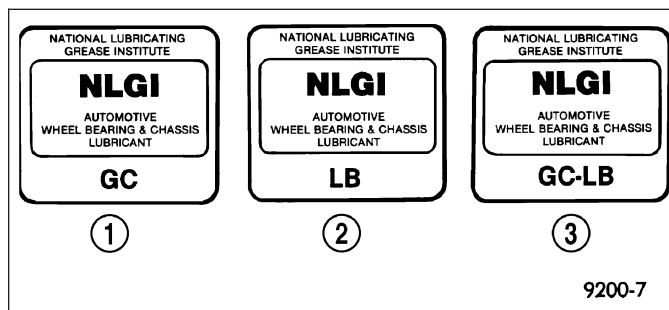


## GEAR LUBRICANTS

SAE ratings also apply to multigrade gear lubricants. In addition, API classification defines the lubricants usage. Such as API GL-5 and SAE 75W-90.

## LUBRICANTS AND GREASES

Lubricating grease is rated for quality and usage by the NLGI. All approved products have the NLGI symbol on the label. At the bottom NLGI symbol is the usage and quality identification letters. Wheel bearing lubricant is identified by the letter "G". Chassis lubricant is identified by the latter "L". The letter following the usage letter indicates the quality of the lubricant. The following symbols indicate the highest quality.



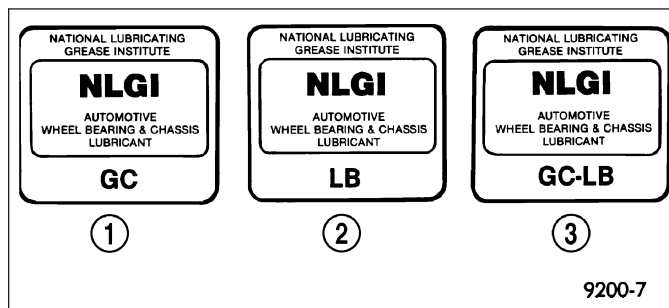
## SPECIALIZED LUBRICANTS AND OILS

Some maintenance or repair procedures may require the use of specialized lubricants or oils. Consult the appropriate sections in this manual for the correct application of these lubricants.

## LUBRICANT RECOMMENDATIONS

### LUBRICANTS AND GREASEES

Lubricating grease is rated for quality and usage by the NLGI. All approved products have the NLGI symbol on the label. At the bottom NLGI symbol is the usage and quality identification letters. Wheel bearing lubricant is identified by the letter "G". Chassis lubricant is identified by the latter "L". The letter following the usage letter indicates the quality of the lubricant. The following symbols indicate the highest quality.



## SPECIALIZED LUBRICANTS AND OILS

Some maintenance or repair procedures may require the use of specialized lubricants or oils. Consult the appropriate sections in this manual for the correct application of these lubricants.

## Chassis

Component	Fluid, Lubricant, or Genuine Part
Steering Gear & Linkage, Ball Joints, Prop Shafts & Yokes, Wheel Bearings	Mopar® Multi-Purpose Lubricant NLGI Grade 2 EP, GC-LB

## Body

Component	Fluid, Lubricant, and Genuine Part
Hinges:	
Door & Hood	Mopar® Engine Oil
Swing Gate	Mopar® Multi-Purpose Lube NLGI Grade 2 EP, GC-LB
Latches: Door, Hood/Safety Catch, Swing Gate	Mopar® Multi-Purpose Lube NLGI Grade 2 EP, GC-LB
Seat Regulator & Track	Mopar® Multi-Purpose Lube NLGI Grade 2 EP, GC-LB
Lock Cylinders	Mopar® Lock Cylinder Lube

## TOWING

### STANDARD PROCEDURE - TOWING

#### WARNINGS AND CAUTIONS

**WARNING: DO NOT ALLOW TOWING ATTACHMENT DEVICES TO CONTACT THE FUEL TANK OR LINES, FUEL LEAK CAN RESULT.**

**DO NOT LIFT OR TOW VEHICLE BY FRONT OR REAR BUMPER.**

**DO NOT GO UNDER A LIFTED VEHICLE IF NOT SUPPORTED PROPERLY ON SAFETY STANDS.**

**DO NOT ALLOW PASSENGERS TO RIDE IN A TOWED VEHICLE.**

**USE A SAFETY CHAIN THAT IS INDEPENDENT FROM THE TOWING ATTACHMENT DEVICE.**

**CAUTION: Do not damage brake lines, exhaust system, shock absorbers, sway bars, or any other under vehicle components when attaching towing device to vehicle.**

**Do not secure vehicle to towing device by the use of front or rear suspension or steering components.**

**Remove or secure loose or protruding objects from a damaged vehicle before towing.**

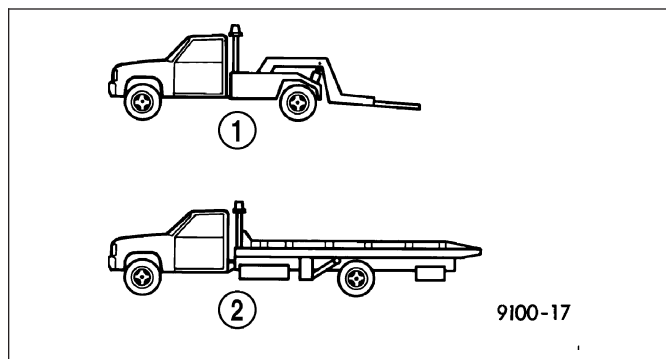
**Refer to state and local rules and regulations before towing a vehicle.**

**Do not allow weight of towed vehicle to bear on lower fascia, air dams, or spoilers.**

#### RECOMMENDED TOWING EQUIPMENT

- FWD vehicles, use of a flat bed towing device or a wheel lift is recommended.
- AWD vehicles, a flat bed towing device is recommended.

When using a wheel lift towing device, be sure the disabled vehicle has at least 100 mm (4 in.) ground clearance. If minimum ground clearance cannot be reached, use a towing dolly. If a flat bed device is used, the approach angle should not exceed 15 degrees.



**CAUTION:**

- Do not attempt to tow this vehicle from the front with sling type towing equipment. Damage to the front fascia and air dams will result.
- The only approved method of towing is with a flat bed truck.
- Do not tow the vehicle from the rear. Damage to the rear sheet metal, liftgate and fascia will occur.
- Do not push or tow this vehicle with another vehicle as damage to the bumper fascia and transmission may result.

**GROUND CLEARANCE**

**CAUTION:** If vehicle is towed with wheels removed, install lug nuts to retain brake drums or rotors.

A towed vehicle should be raised until the lifted wheels are a minimum 100 mm (4 in.) from the ground. Be sure there is at least 100 mm (4 in.) clearance between the tail pipe and the ground. If necessary, remove the wheels from the front end of the vehicle and lower the front end closer to the ground, to increase the ground clearance at the rear of the vehicle. Install lug nuts on wheel attaching studs to retain brake rotors.

**LOCKED VEHICLE TOWING**

When a locked vehicle must be towed with the front wheels on the ground, use a towing dolly or flat bed hauler.

**FLAT BED TOWING TIE DOWNS**

**CAUTION:** Do not tie vehicle down by attaching chains or cables to suspension components or engine mounts, damage to vehicle can result.

The vehicle can be tied to a flat bed device using the pair of front transportation slots on the bottom surface of the rails, behind the front wheels. The rear transportation slots are on the bottom of the left bumper extension and in the bracket extending inboard of the right bumper extension.

**TOWING – FRONT WHEEL DRIVE**

Your vehicle may be towed under the following conditions: The gear selector must be in NEUTRAL, the distance to be traveled must not exceed 100 miles (160 km), and the towing speed must not exceed 44 mph (72 km/h). Exceeding these towing limits may cause a transmission gear train failure. If the transmission is not operative, or if the vehicle is to be towed more than 100 miles (160 km), the vehicle must be towed with the front wheels off the ground.

**TOWING – ALL WHEEL DRIVE**

Your vehicle may be towed under the following conditions: The gear selector must be in NEUTRAL, the distance to be traveled must not exceed 100 miles (160 km), the towing speed must not exceed 44 mph (72 km/h), and both front and rear wheels must be on the ground. If your vehicle must be towed farther or at a higher rate of speed, it must be transported on a flat bed truck.

**ALL TRANSMISSIONS**

- Do not attempt to tow this vehicle from the front with sling type towing equipment. Damage to the front fascia will result.
- The only approved method of towing is with a flat bed truck.
- Do not tow the vehicle from the rear. Damage to the rear sheet metal, liftgate and fascia will occur.
- Do not push or tow this vehicle with another vehicle as damage to the bumper fascia and transmission may result.

If it is necessary to use the accessories while being towed (wipers, defrosters, etc.), the key must be in the ON position, not the ACCESSORY position. Make certain the transmission remains in NEUTRAL.

## WITHOUT THE IGNITION KEY

Special care must be taken when the vehicle is towed with the ignition in the LOCK position. The only approved method of towing with out the ignition key is with a flat bed truck. Proper towing equipment is necessary to prevent damage to the vehicle.

## TOWING THIS VEHICLE BEHIND ANOTHER VEHICLE (Flat towing with all four wheels on the ground)

Flat towing of vehicles equipped with an automatic transmission, is only permitted within the limitations described in this section.

### FLAT TOWING WITH TOW BAR

- Four speed electronic automatic transaxle vehicles can be flat towed at speeds not to exceed 72 km/h (44 mph) for not more than 160 km (100 miles). The steering column must be unlocked and gear selector in neutral.
- AWD models should not be flat towed. For additional information, refer to **RECOMMENDED TOWING EQUIPMENT** in this section.

## TOWING THIS VEHICLE BEHIND ANOTHER VEHICLE WITH A TOW DOLLEY

The manufacture **does not recommend** that you tow an All-Wheel Drive (AWD) or front wheel drive vehicle on a tow dolly. Vehicle damage may occur.

# SUSPENSION

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### SUSPENSION

#### STANDARD PROCEDURE

#### LUBRICATION

There are no serviceable lubrication points on the front or rear suspension. The ball joints are sealed-for-life and require no maintenance.

FRONT

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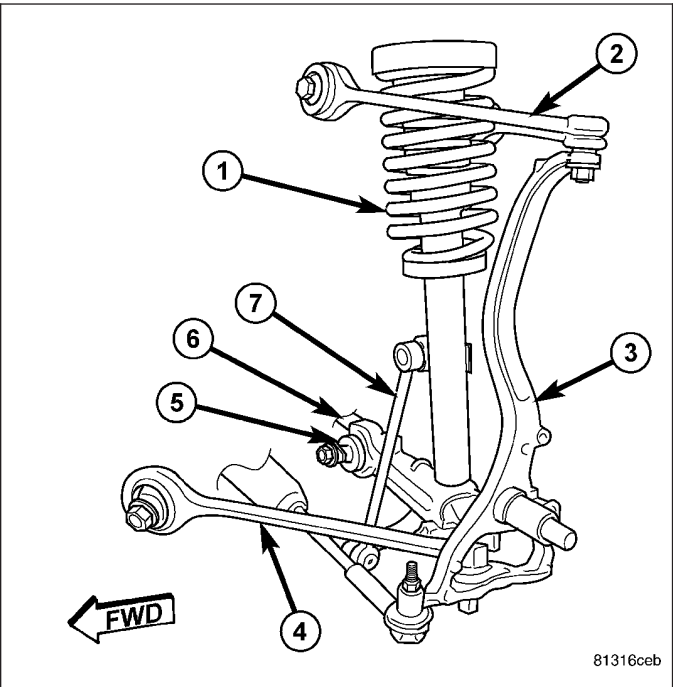
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FRONT

DESCRIPTION

The front suspension is a long and short arm design. Each side of the front suspension includes the following components:

- Hub And Bearing (not shown)
- Knuckle (3)
- Lower Control Arm (5)
- Shock Assembly (1)
- Stabilizer Bar (6) and Link (7)
- Tension Strut (4)
- Upper Control Arm (2)



## SPECIFICATIONS

### FRONT SUSPENSION FASTENER TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
ENGINE CRADLE MOUNTING BOLTS	185	136	—
SPINDLE HUB NUT	250	184	—
KNUCKLE DUST SHIELD SCREWS	10	7	89
LOWER CONTROL ARM CRADLE NUT	176	130	—
LOWER CONTROL ARM BALL JOINT NUT	68 + 90° TURN	50 + 90° TURN	—
TENSION STRUT CRADLE NUT	176	130	—
TENSION STRUT BALL JOINT NUT	68 + 90° TURN	50 + 90° TURN	—
SHOCK ABSORBER LOWER MOUNTING BOLT	174	128	—
SHOCK ABSORBER UPPER MOUNTING NUTS	27	20	239
SHOCK ABSORBER SHAFT NUT	95	70	—
STABILIZER BAR LINK SHOCK NUT	146	108	—
STABILIZER BAR LINK NUT	146	108	—
STABILIZER BAR ISOLATOR RETAINER BOLTS	60	44	—
STABILIZER BAR HEAT SHIELD SCREWS	7	5	62
UPPER CONTROL ARM BALL JOINT NUT	47 + 90° TURN	35 + 90° TURN	—
UPPER CONTROL ARM BODY NUTS	75	55	—
OUTER TIE ROD BALL JOINT NUT	85	63	—
TIE ROD JAM NUT	75	55	—

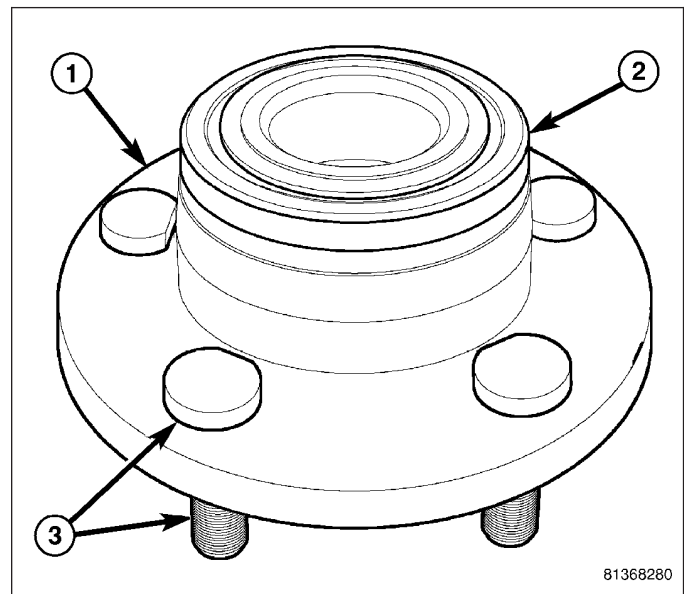
## HUB / BEARING

### DESCRIPTION

The front wheel bearing and wheel hub of this vehicle are a one piece sealed unit or hub and bearing unit type assembly. The hub and bearing (1) is mounted to the center of the spindle using a retaining nut. It has five wheel mounting studs (3) on the hub flange.

The wheel mounting studs used to mount the tire and wheel to the vehicle are the only replaceable components of the hub and bearing. Otherwise, the hub and bearing is serviced only as a complete assembly.

If a vehicle is equipped with antilock brakes, the tone wheel (2) for the wheel speed sensor is pressed onto the hub and bearing.





## DIAGNOSIS AND TESTING

### HUB AND BEARING

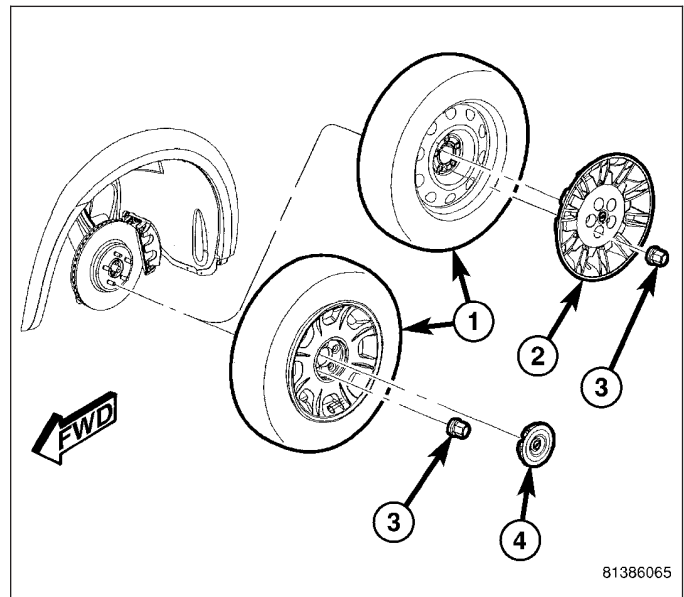
**Note:** The hub and bearing is designed for the life of the vehicle and should require no maintenance.

With wheel and brake rotor removed, rotate flanged outer ring of hub. Excessive roughness, lateral play or resistance to rotation may indicate dirt intrusion or bearing failure. If the rear wheel bearings exhibit these conditions during inspection, the hub and bearing assembly should be replaced.

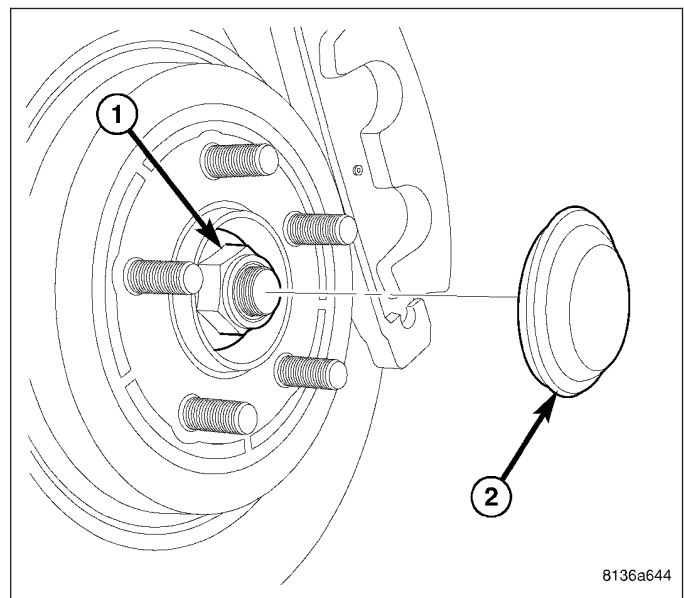
Damaged bearing seals and resulting excessive grease loss may also require bearing replacement. Moderate grease loss from bearing is considered normal and should not require replacement of the hub and bearing assembly.

### REMOVAL

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove wheel mounting nuts (3), then tire and wheel assembly (1).
3. Access and remove front brake rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - REMOVAL)

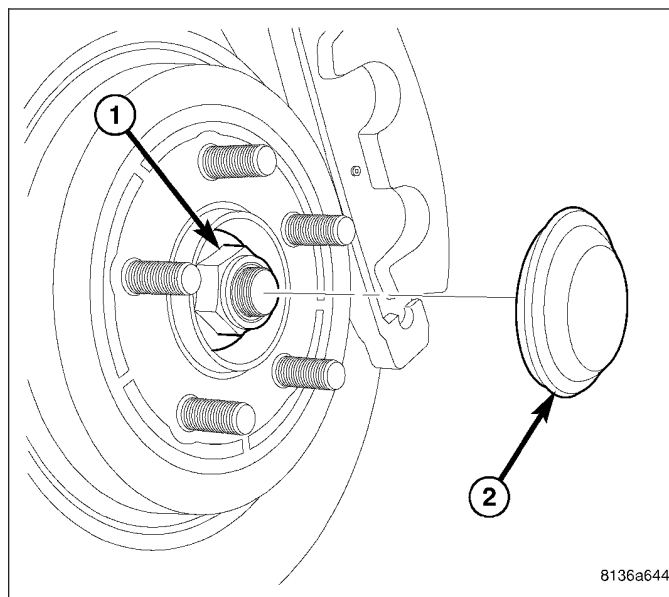


4. Remove dust cap (2).
5. Remove hub nut (1).
6. Slide hub and bearing off knuckle spindle.

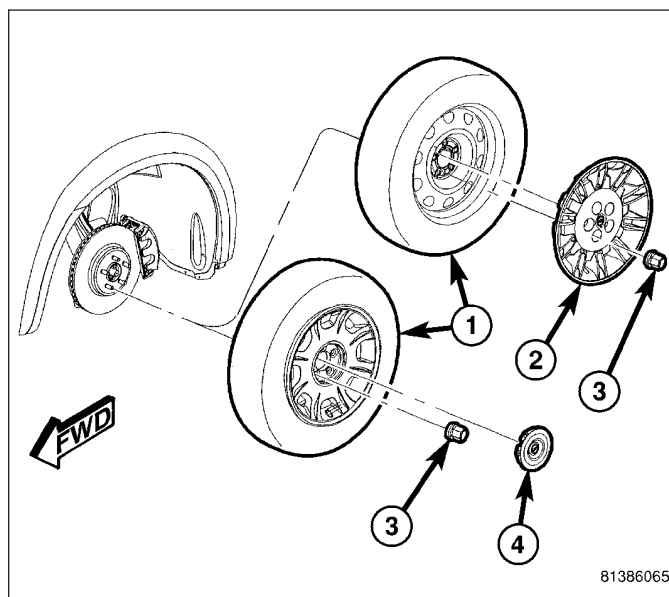


## INSTALLATION

1. Slide hub and bearing onto knuckle spindle.
2. Install hub nut (1) on end of spindle. Tighten hub nut to 250 N·m (184 ft. lbs.) torque.
3. Install brake rotor, then disc brake caliper and adapter assembly. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - INSTALLATION)
4. Install dust cap (2) on hub and bearing.



5. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque.
6. Lower vehicle.
7. Pump brake pedal several times to ensure vehicle has a firm brake pedal before moving vehicle.
8. Check and adjust brake fluid level as necessary.

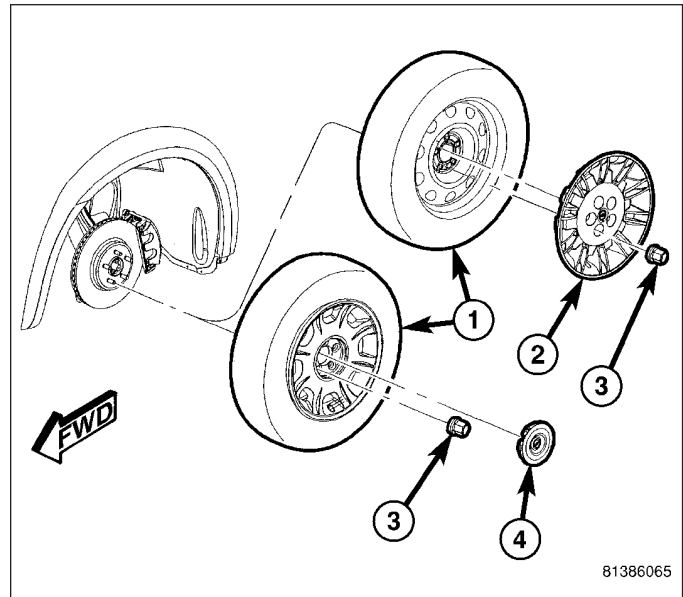


## KNUCKLE

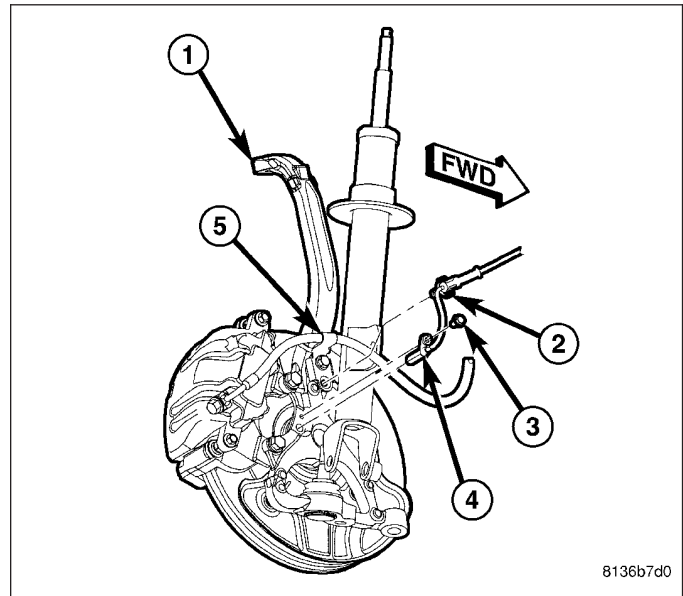
### REMOVAL

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

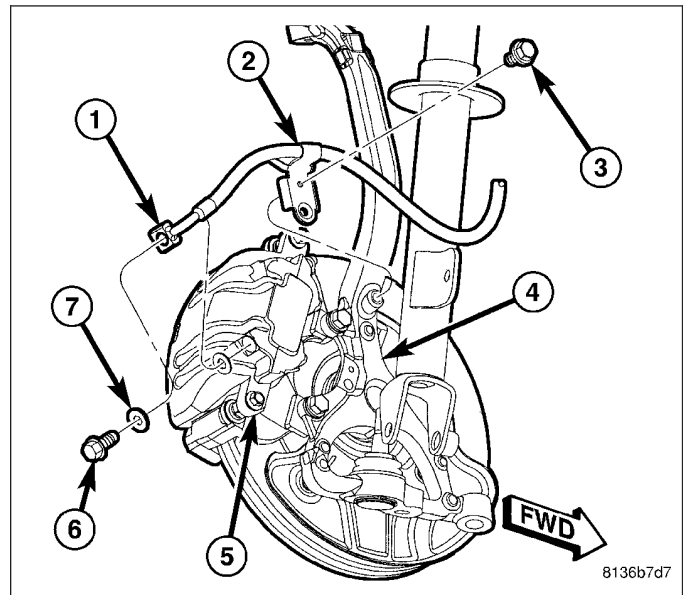
2. Remove wheel mounting nuts (3), then tire and wheel assembly (1).



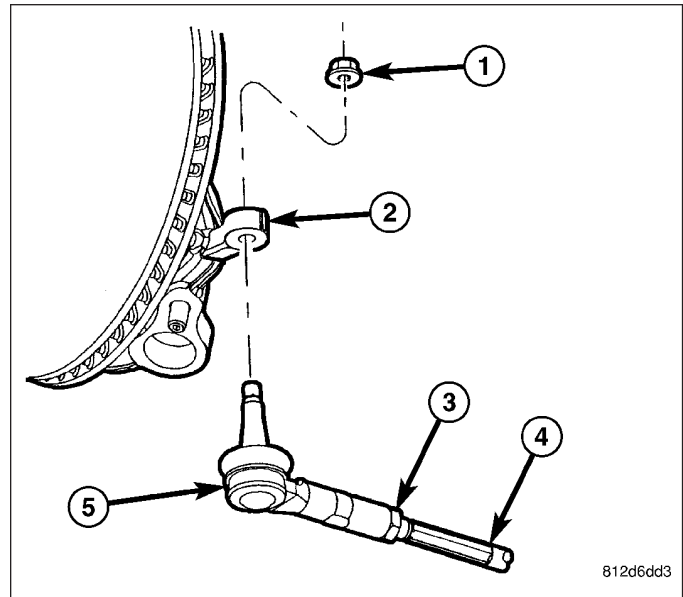
3. Remove screw (3) fastening wheel speed sensor to knuckle (1). Pull sensor head (4) out of knuckle.
4. Remove wheel speed sensor cable routing clip (2) from brake flex hose routing bracket (5).



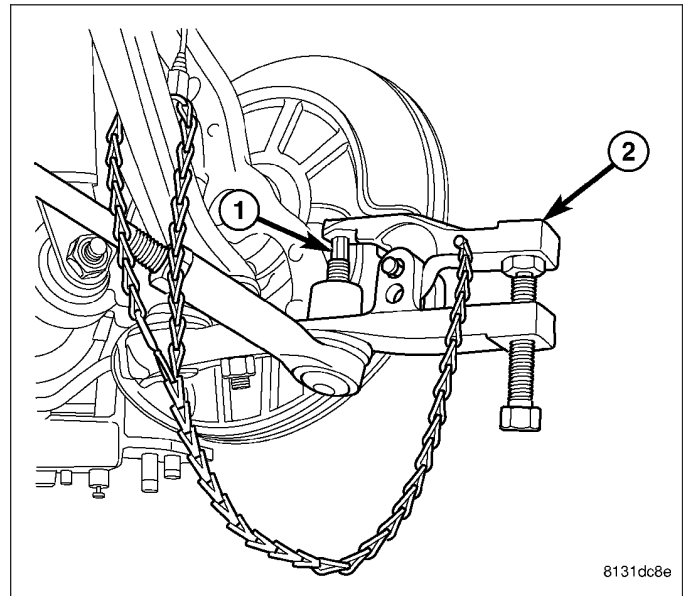
5. Remove screw (3) fastening brake flex hose routing bracket (2) to knuckle (4).
6. Access and remove front brake rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - REMOVAL)



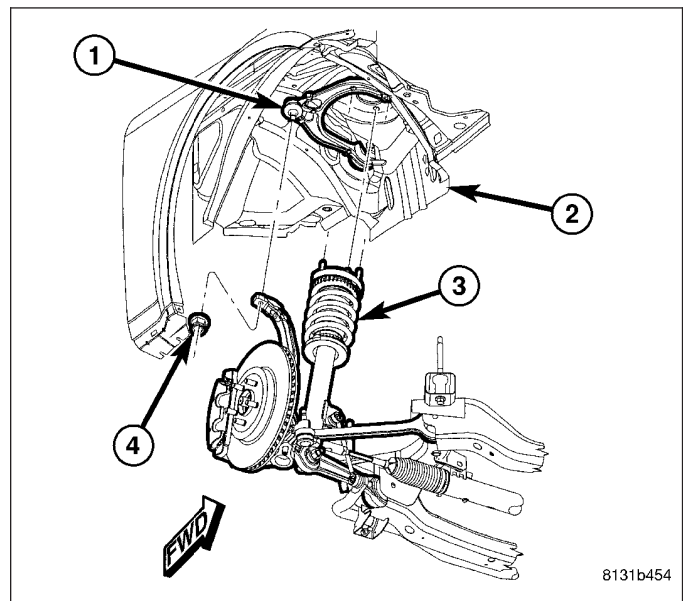
7. Remove nut (1) from outer tie rod end stud.



8. Using Puller (2), Special Tool 9360, separate tie rod stud (1) from knuckle.

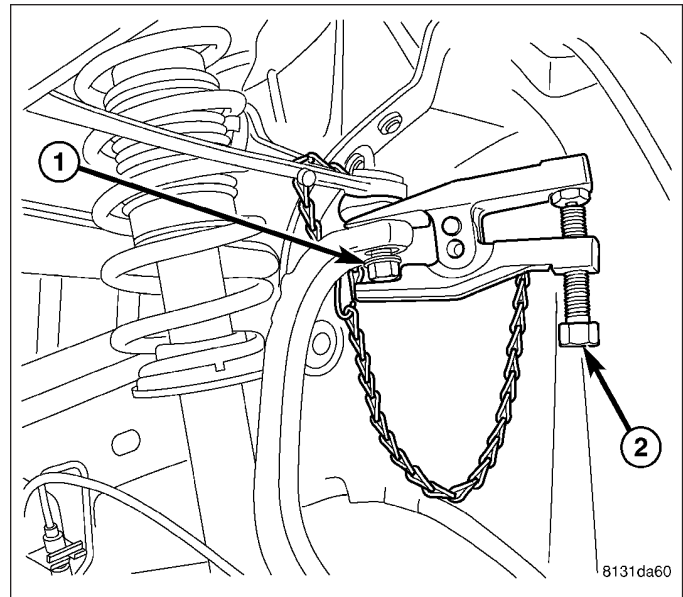


9. Loosen nut (4) attaching upper ball joint stud (1) to knuckle. Back nut off until nut is even with end of stud. **Keeping nut on at this location will help keep end of stud from distorting while using Puller in next step.**

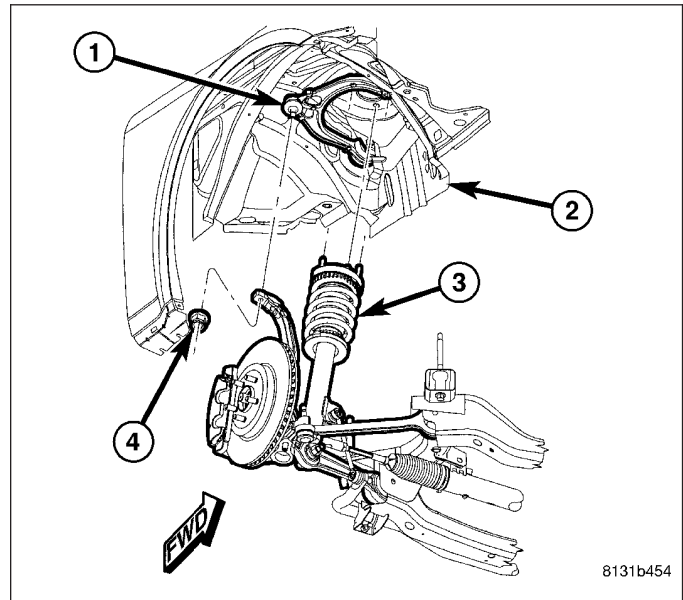


**CAUTION:** In following step, use care not to damage ball joint seal boot while sliding Puller, Special Tool 9360, into place past seal boot.

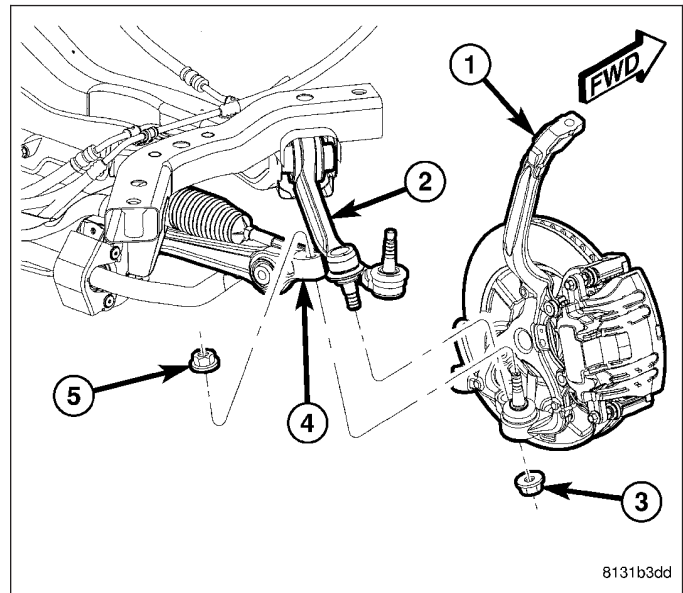
10. Using Puller (2), Special Tool 9360, separate upper ball joint stud (1) from knuckle.



11. Remove nut (4) from end of upper ball joint stud (1).

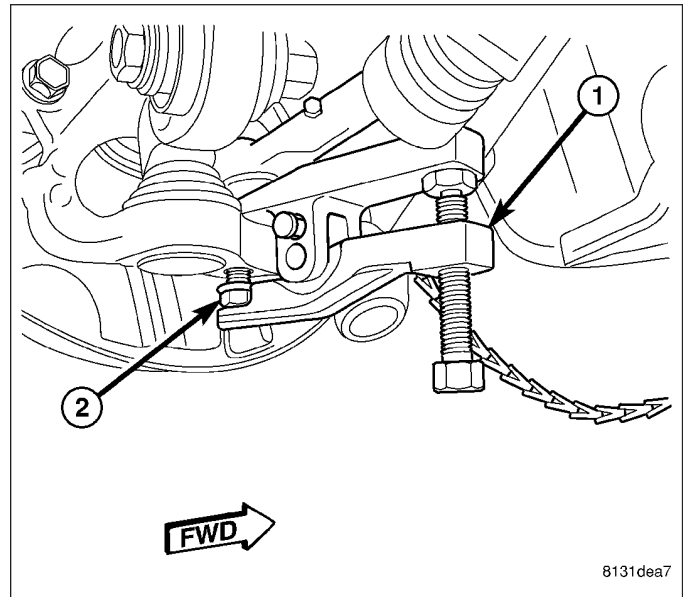


12. Loosen nut (3) attaching tension strut (2) ball joint stud to knuckle. Back nut off until nut is even with end of stud. **Keeping nut on at this location will help keep end of stud from distorting while using Puller in next step.**

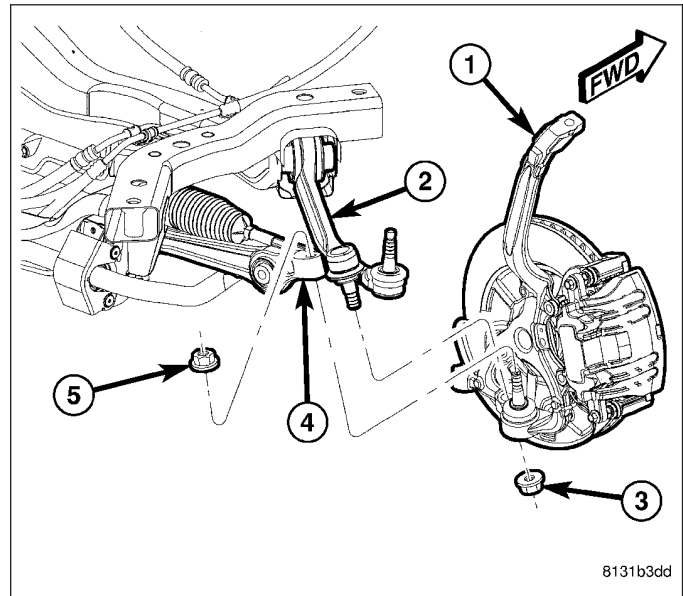


**CAUTION:** In following step, use care not to damage ball joint seal boot while sliding Puller, Special Tool 9360, into place past seal boot.

13. Using Puller (1), Special Tool 9360, separate tension strut ball joint stud (2) from knuckle.

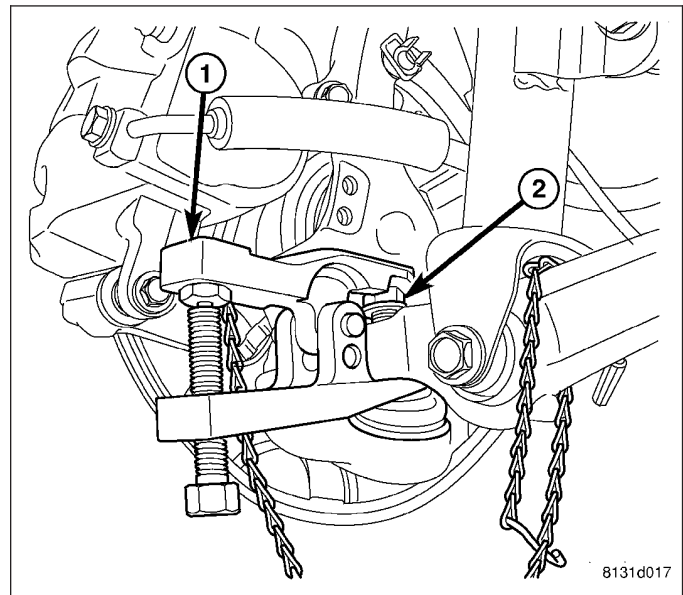


14. Remove nut (3) from end of tension strut (2) ball joint stud.
15. Loosen nut (5) attaching ball joint stud to lower control arm (4). Back nut off until nut is even with end of stud. **Keeping nut on at this location will help keep end of stud from distorting while using Puller in next step.**

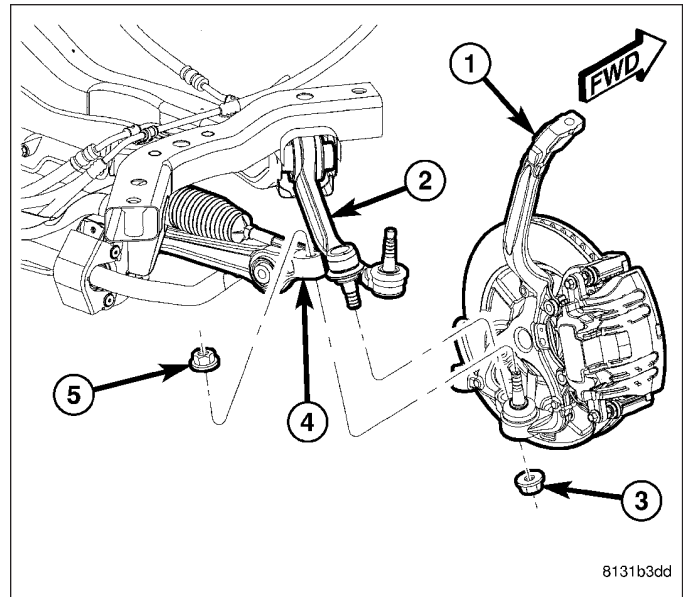


**CAUTION:** In following step, use care not to damage ball joint seal boot while sliding Puller, Special Tool 9360, into place past seal boot.

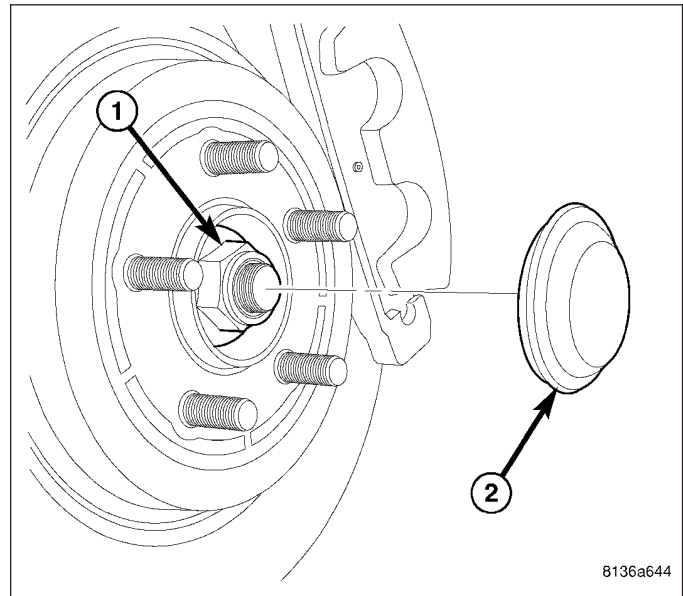
16. Using Puller (1), Special Tool 9360, separate ball joint stud (2) from lower control arm.



17. Remove nut (5) from end of ball joint stud attaching lower control arm to knuckle.
18. Remove knuckle from vehicle.



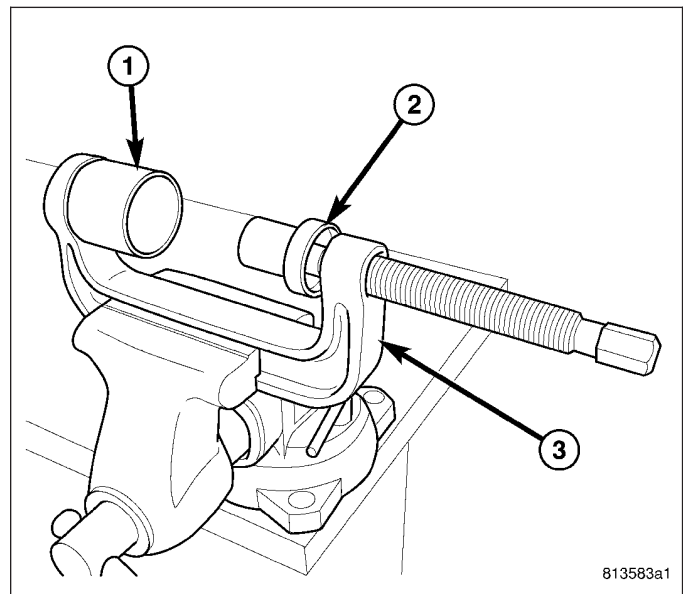
19. If hub and bearing needs to be removed, perform the following:
  - a. Remove dust cap (2).
  - b. Remove hub nut (1).
  - c. Slide hub and bearing off knuckle spindle.
20. If shield needs to be removed from knuckle, remove 3 mounting screws, then shield.



## DISASSEMBLY - BALL JOINT

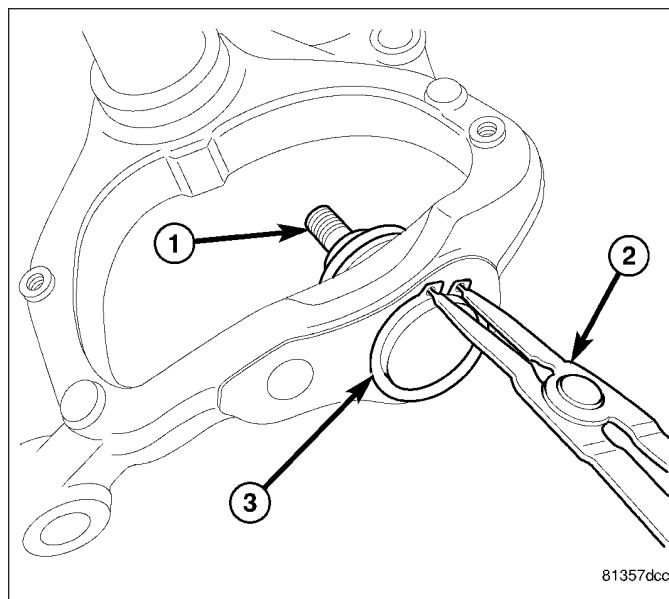
**Note:** To perform this procedure it works best to mount Press (3), Special Tool C-4212F, in a vise and hold the component in your hands.

1. Place Receiver (1), Special Tool 9320-5, into cup area of Press (3), Special Tool C-4212F, as shown and tighten set screw.
2. Place Remover (2), Special Tool 9320-3, onto end of screw-drive of Press (3), Special Tool C-4212F, as shown.

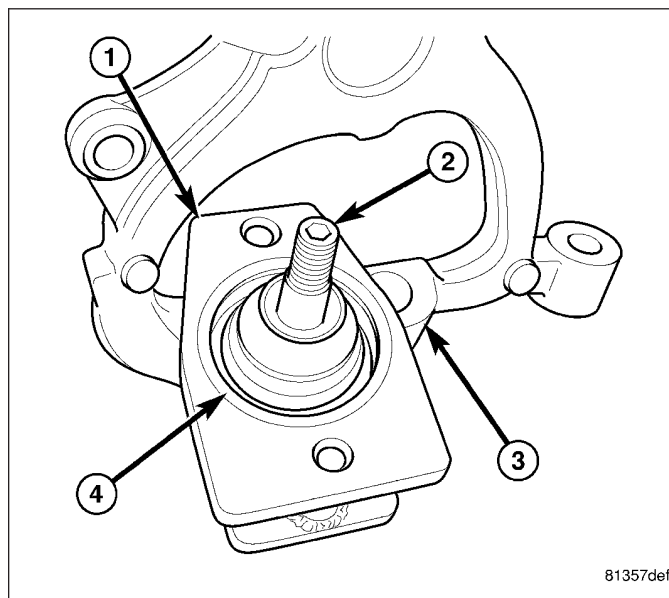




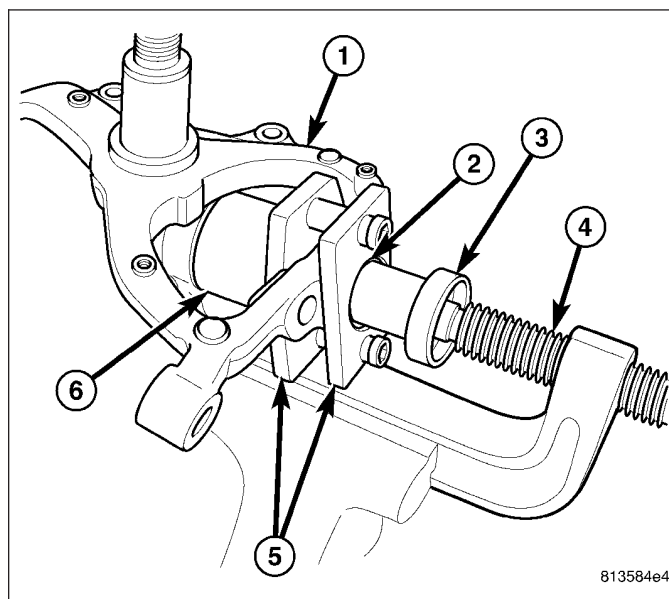
3. Using a pair of snap-ring pliers (2), remove snap-ring (3) from bottom of ball joint (1).



4. Install halves of Support Clamp (1), Special Tool 9320-1, over ball joint (2) and around knuckle surface (3) as shown. Install and snug Support Clamp (1) screws from underside.

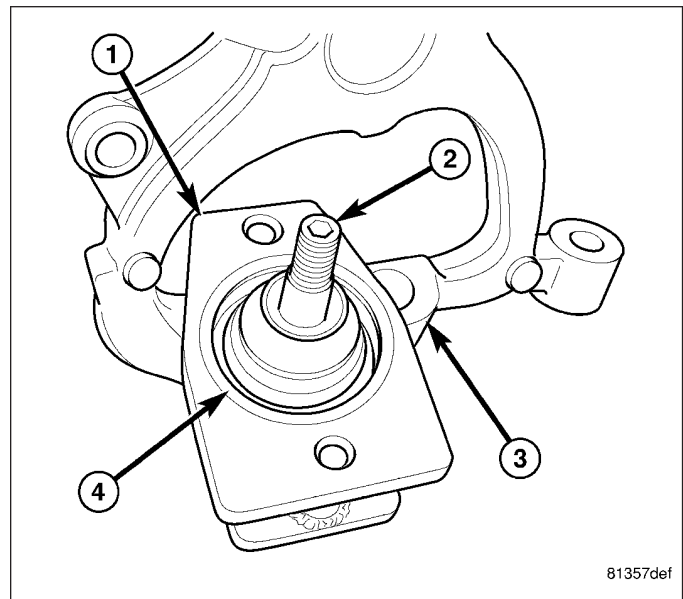


5. Position knuckle (1) over tools guiding top of ball joint inside of Receiver (6), then hand tighten Press screw-drive (4) until Remover (3) comes into contact with bottom of ball joint (2).

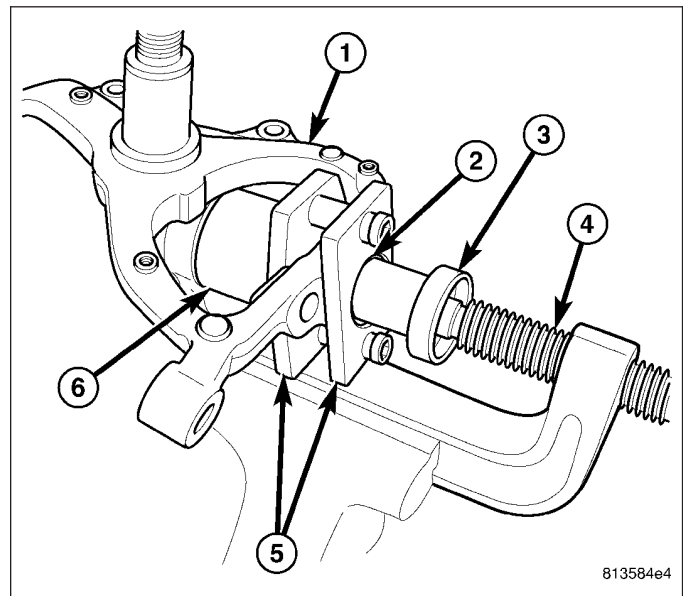




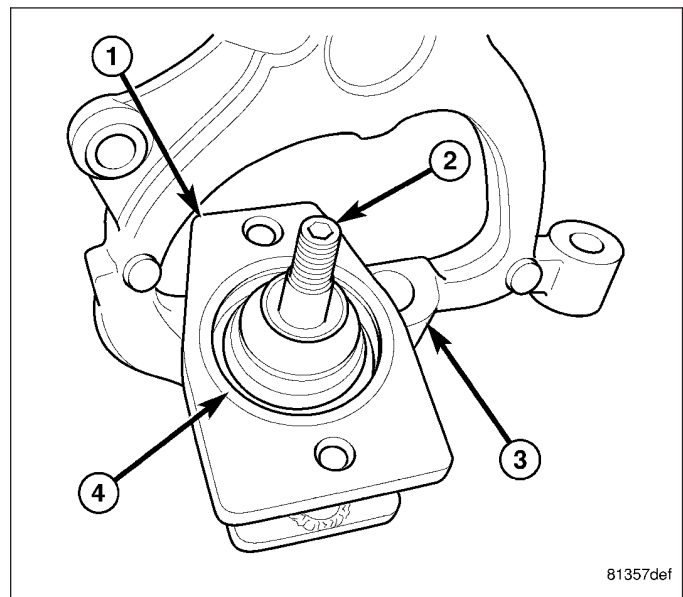
**Note:** When positioning knuckle over tools, make sure Receiver, Special Tool 9320-5, sets into recessed area (4) of Support Clamp, Special Tool 9320-1.



6. Tighten Press screw-drive (4) forcing ball joint out of knuckle (1) and into Receiver (6).
7. Loosen screw-drive (4) and remove knuckle (1) from Press. Remove ball joint from Receiver (6).



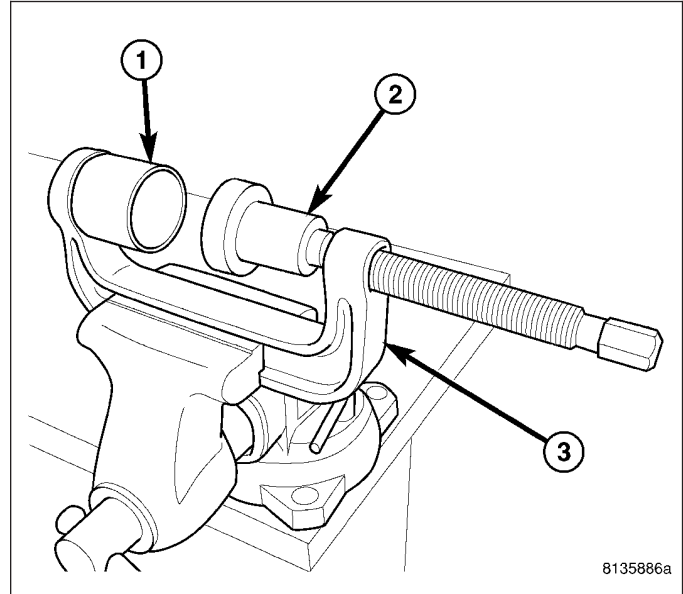
8. Remove Support Clamp (1) from knuckle (3).



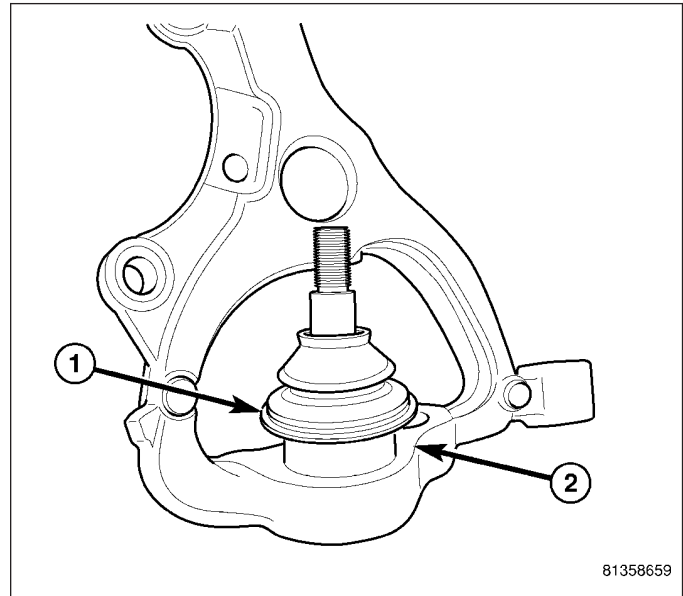
## ASSEMBLY - BALL JOINT

**Note:** To perform this procedure it works best to mount Press (3), Special Tool C-4212F, in a vise and hold the component in your hands.

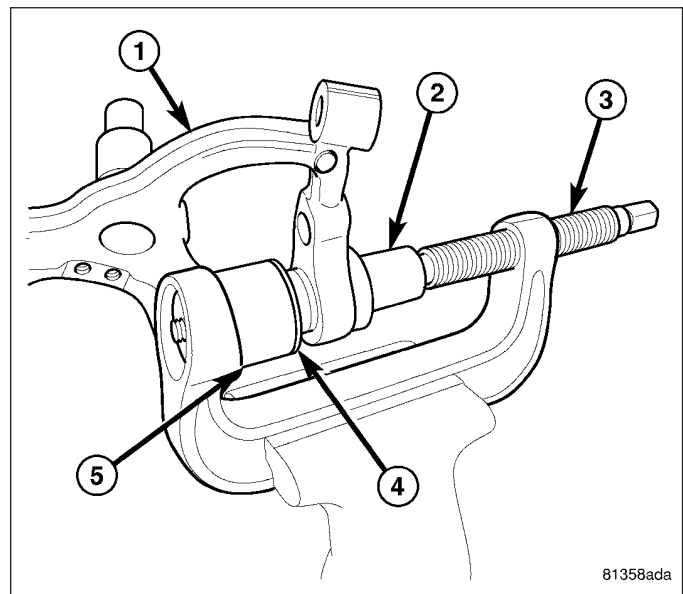
1. Place Installer (1), Special Tool 9320-4, into cup area of Press (3), Special Tool C-4212F, as shown and tighten set screw.
2. Place Remover (2), Special Tool 9320-3, onto end of screw-drive of Press (3), Special Tool C-4212F, as shown. **Note: This is the reverse of how Remover is installed on screw-drive for removal.**



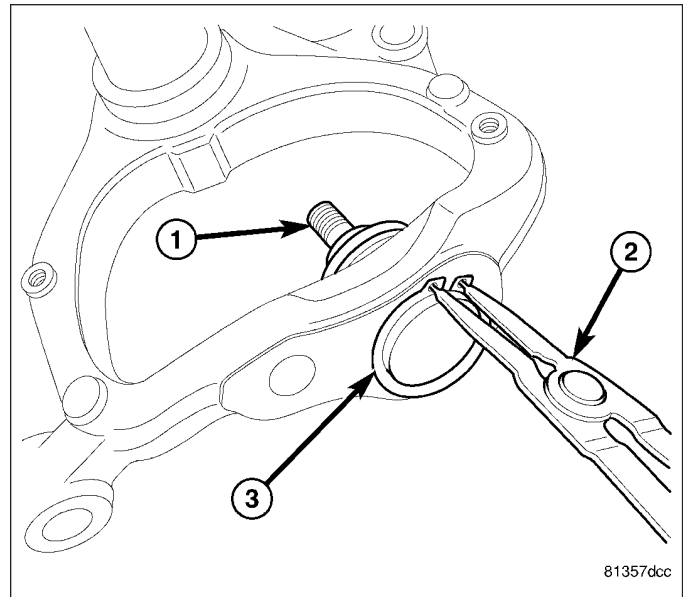
3. Start NEW ball joint (1) into bore of knuckle (2).



4. Position knuckle (1) over tools guiding top of ball joint inside of Installer (5) until outside flange of ball joint (4) comes into contact with Installer, then hand tighten Press screw-drive (3) until Remover (2) comes into contact with bottom of knuckle (1).
5. Using hand tools, tighten screw-drive (3), pressing ball joint into knuckle until flange (4) comes to a stop against the knuckle.
6. Loosen screw-drive and remove knuckle from Press.

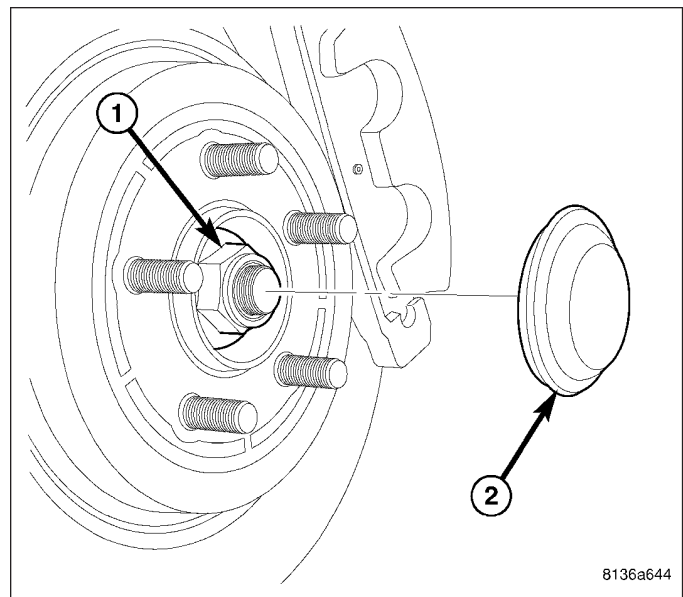


7. Install snap-ring (3) into groove on bottom of ball joint.
8. Inspect ball joint for proper fit. Make sure seal boot is uniform and wire rings are in place.



## INSTALLATION

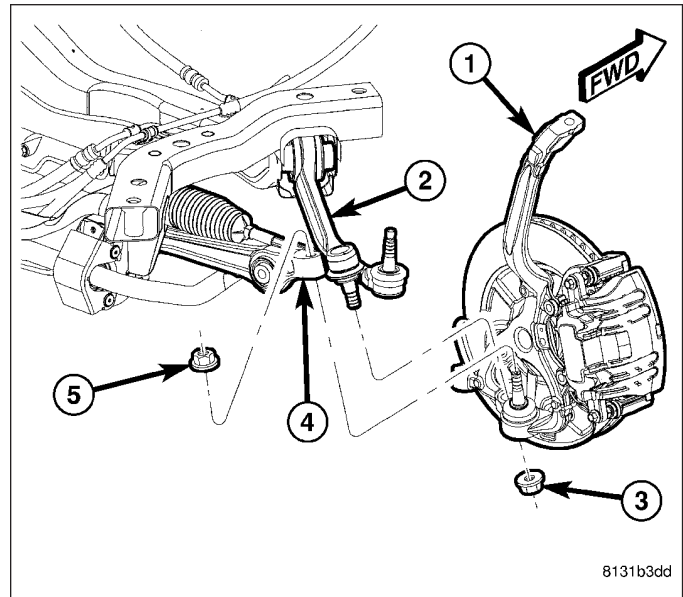
1. If shield needs to be installed on knuckle, place shield in place and attach to knuckle using 3 screws. Tighten screws to 10 N·m (89 in. lbs.) torque.
2. If hub and bearing needs to be installed on knuckle, perform the following:
  - a. Slide hub and bearing onto knuckle spindle.
  - b. Install hub nut (1) on end of spindle. Tighten hub nut to 250 N·m (184 ft. lbs.) torque.
  - c. Install dust cap (2).



3. Place knuckle (1) over lower ball joint studs on vehicle and loosely install NEW nuts by hand.

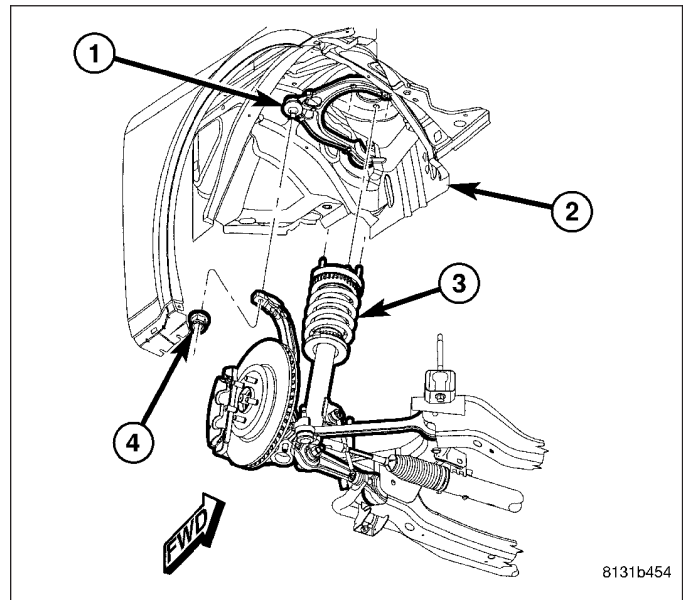
**CAUTION:** It is important to tighten nuts as described in following steps to avoid damaging ball stud joints.

4. Completely install NEW nut (5) on ball joint stud attaching lower control arm (4) to knuckle (1). Tighten nut by holding ball joint stud with a hex wrench while turning nut with a wrench. Tighten nut using crow foot wrench on torque wrench to 68 N·m + 90° turn (50 ft. lbs. + 90° turn) torque.
5. Completely install NEW nut (3) on ball joint stud attaching tension strut (2) to knuckle (1). Tighten nut by holding ball joint stud with a hex wrench while turning nut with a wrench. Tighten nut using crow foot wrench on torque wrench to 68 N·m + 90° turn (50 ft. lbs. + 90° turn) torque.



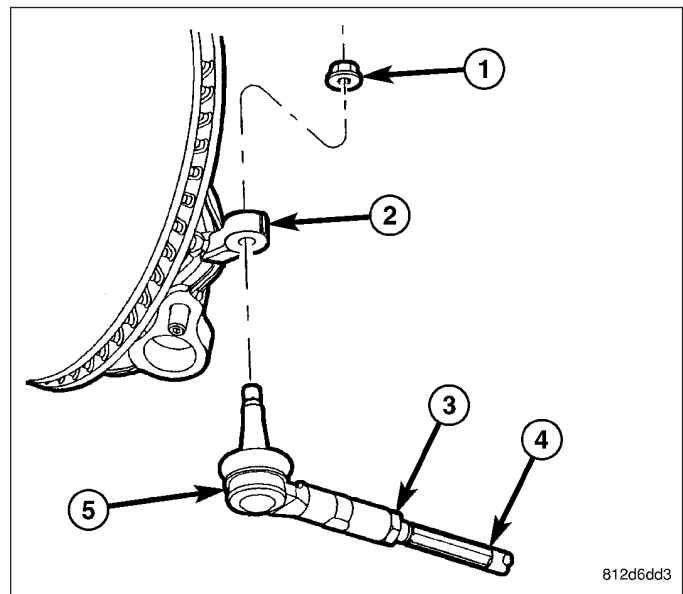
**CAUTION:** It is important to tighten nut as described in following step to avoid damaging ball stud joint.

6. Place upper ball joint stud (1) through hole in top of knuckle and install nut (4). Tighten nut by holding ball joint stud with a hex wrench while turning nut with a wrench. Tighten nut using crow foot wrench on torque wrench to 47 N·m + 90° turn (35 ft. lbs. + 90° turn) torque.

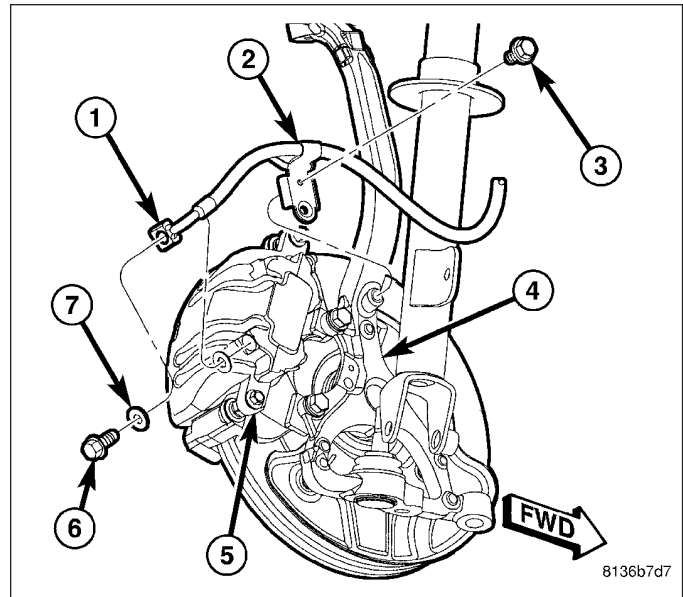


**CAUTION:** It is important to tighten nut as described in following step to avoid damaging ball stud joint.

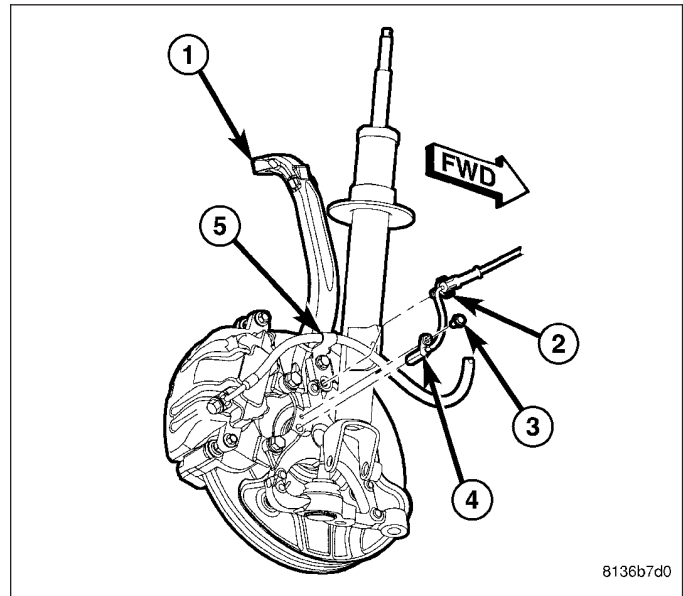
7. Place outer tie rod stud through hole in knuckle (2) and install nut (1). Tighten nut by holding stud with a wrench while turning nut with another wrench. Tighten nut using crow foot wrench on torque wrench to 85 N·m (63 ft. lbs.) torque.
8. Install brake rotor, then disc brake caliper and adapter assembly. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - INSTALLATION)



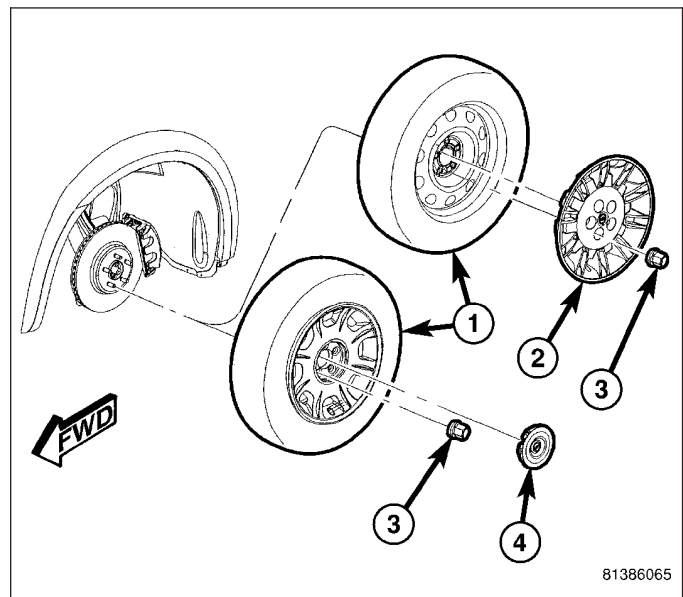
9. Install screw (3) fastening brake flex hose routing bracket (2) to knuckle (4). Tighten screw to 12 N·m (106 in. lbs.) torque.



10. Install wheel speed sensor head (4) into knuckle and install mounting screw (3). Tighten screw to 11 N·m (95 in. lbs.) torque.
11. Attach wheel speed sensor cable and routing clip (2) to brake flex hose routing bracket (5).



12. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque.
13. Lower vehicle.
14. Pump brake pedal several times to ensure vehicle has a firm brake pedal before moving vehicle.
15. Check and adjust brake fluid level as necessary.
16. Perform wheel alignment. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)



## BALL JOINT - LOWER

### DESCRIPTION

There are two lower ball joints on the RWD version of this vehicle. One in for the lower control arm and the other for the tension strut. The ball joint for the lower control arm is pressed into the knuckle and the ball joint for the tension strut is part of the tension strut. The ball joints are both “sealed for life” components and cannot be maintenance lubricated. These ball joints are lubricated for life at the time of assembly. **No attempt should be made to ever add any lubrication to these ball joints.**

The ball joint for the lower control arm is a ball joint and seal boot cartridge type and can be replaced as a separate component of the knuckle. The boot cannot be serviced separately. To service this ball joint, (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - DISASSEMBLY).

Neither the ball joint, not the seal boot for the tension strut can be serviced as a separate component. They entire tension strut must be replaced if either are damaged.

The ball joint connection to the lower control arm and the ball joint connection at the knuckle is achieved by an interference fit created by the tapered stud of the ball joint and a tapered hole in the steering knuckle. The ball joint stud is retained in the steering knuckle using a locking nut.

### DIAGNOSIS AND TESTING

#### LOWER BALL JOINT

1. Raise vehicle on a drive-on hoist.

**Note: If a drive-on hoist is not available, use wooden blocks with jack stands to support the lower control arm in the ball joint area. Place the jack stands appropriately and lower the hoist placing weight on the lower control arm. The lower control arms should now be supporting the vehicle weight.**

2. Using a jack, lift the front end off the hoist and position a wooden block underneath lower control arm supporting that corner of the vehicles weight.
3. Remove tire and wheel assembly. (Refer to 22 - TIRES/WHEELS - REMOVAL)
4. If checking ball joint for lower control arm – Attach a dial indicator to base of lower control arm, then align dial indicator's contact pointer with direction of stud axis and touch machined flat on knuckle near ball joint. Zero dial indicator.
5. If checking ball joint for tension strut – Attach a dial indicator to base of tension strut, then align dial indicator's contact pointer with direction of stud axis and touch machined flat on knuckle near ball joint. Zero dial indicator.

**Note: Use care when applying the load to the knuckle so as to not damage components of suspension.**

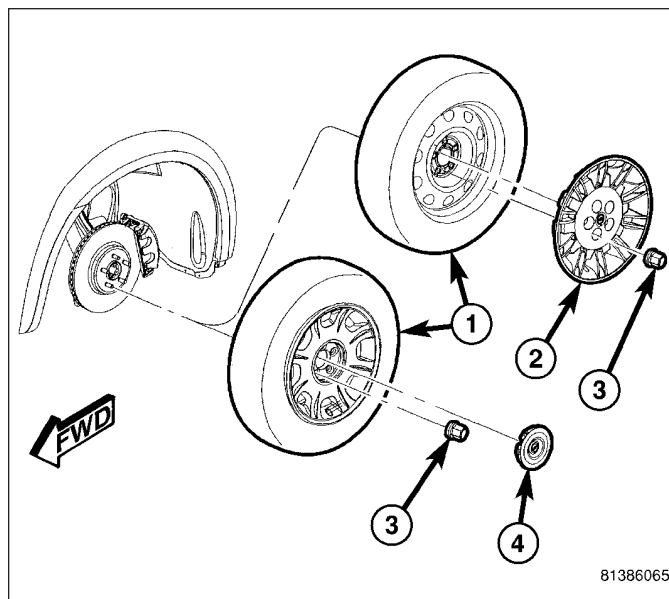
6. Insert a pry bar and rest it against bottom of lower control arm or tension strut (depending on which is being tested) and use lever principle to push knuckle downward until dial indicator no longer moves.
7. Record any ball joint movement. If movement in the lower control arm exceeds 1.5 mm (.059 in.), the ball joint is faulty.
8. If the ball joint for the lower control arm needs replaced, it can be serviced separately. (Refer to 2 - SUSPENSION/FRONT/KNUCKLE - DISASSEMBLY)
9. If the tension strut ball joint needs replaced, the entire tension strut needs to be replaced. (Refer to 2 - SUSPENSION/FRONT/TENSION STRUT - REMOVAL)

## ARM - LOWER CONTROL

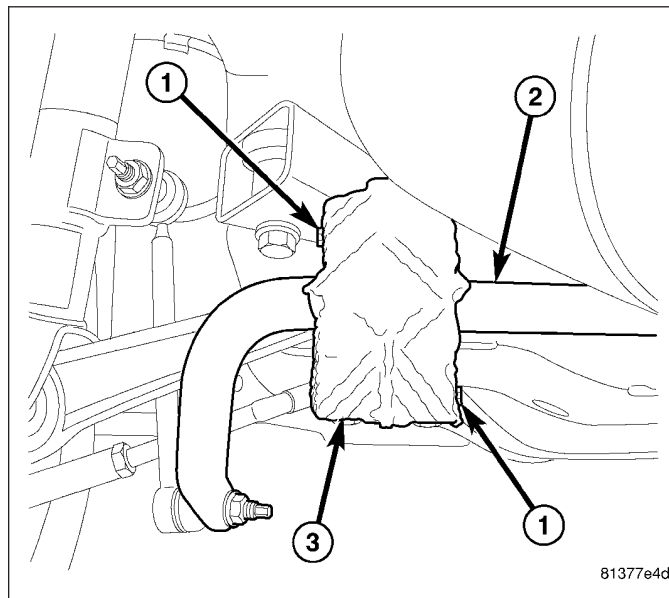
### REMOVAL

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

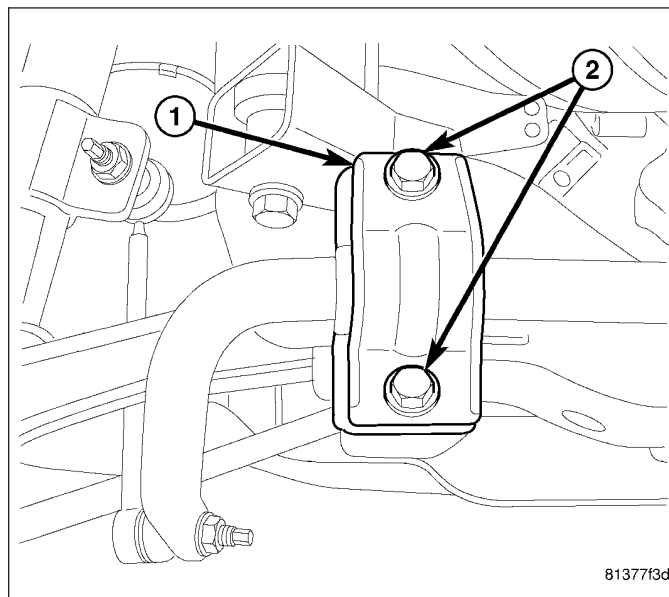
2. Remove wheel mounting nuts (3), then tire and wheel assembly (1).
3. Remove belly pan. (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL)



4. Remove screws (1) fastening stabilizer bar heat shield (3) on side of control arm repair.

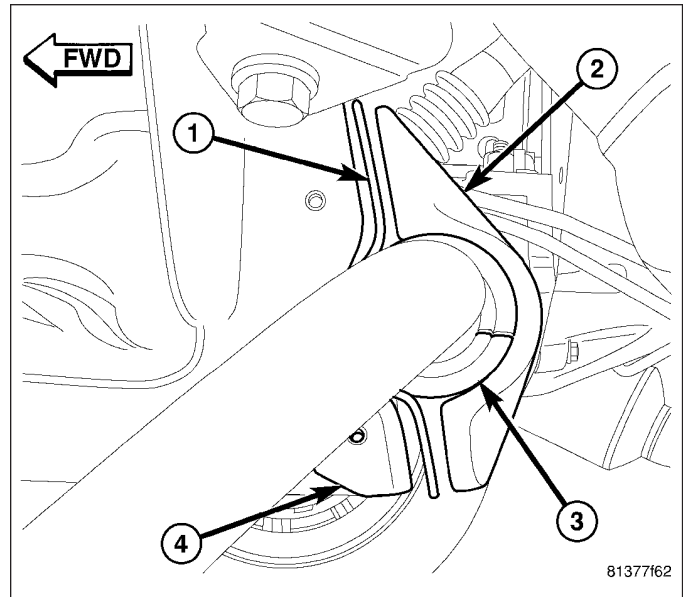


5. Remove bolts (2) fastening stabilizer bar bushing retainer (1) in place on side of control arm repair.

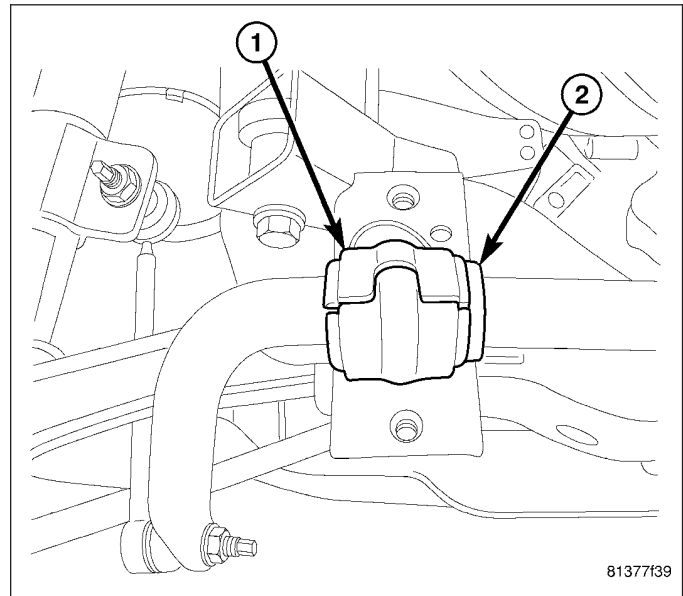




6. Remove retainer halves (1)(2) from around stabilizer bar bushing (3).

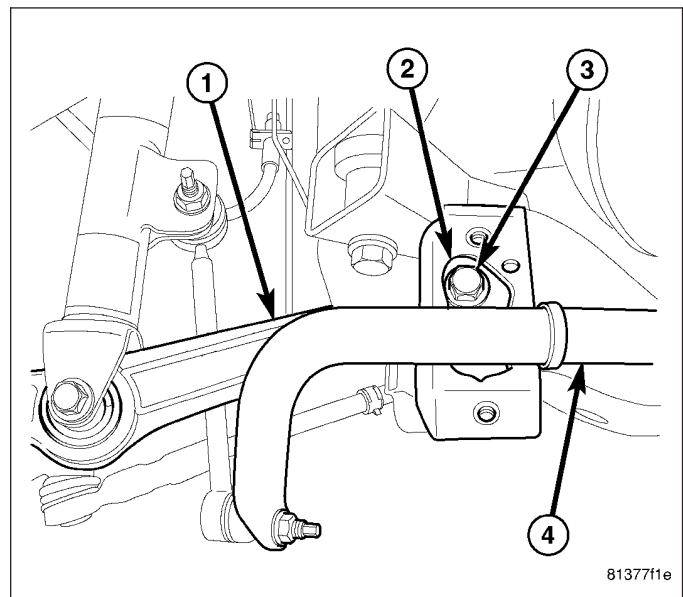


7. Utilizing slit, remove bushing (1) from stabilizer bar (2).



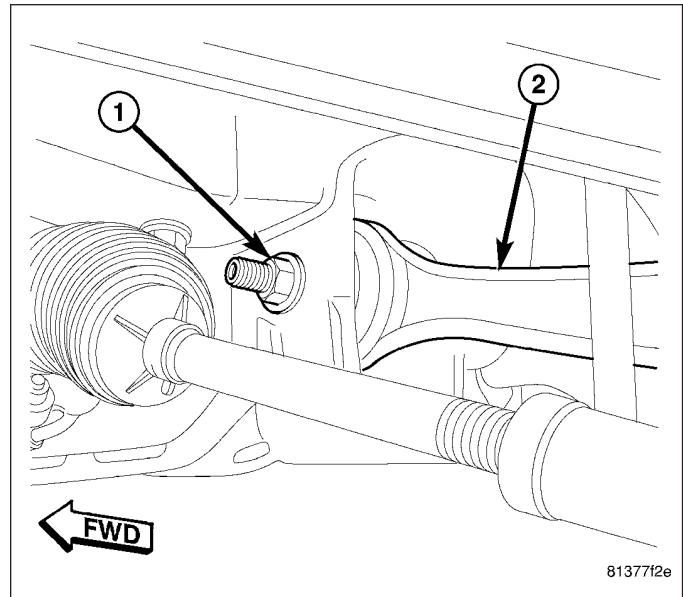
**Note:** In the following step, the lower control arm cradle bolt (3) is accessed through the opening (2) created by removal of the bushing from the stabilizer bar (4).

**CAUTION:** If the lower control arm bolt at the engine cradle has a torx head, it is a special wheel alignment adjustment bolt and the bolt head must not be rotated in the vehicle or damage to the bolt and control arm bushing will result. While holding the bolt in place with a wrench, remove the nut, then slide the bolt out of the bushing and cradle taking note of bolt positioning in lower control arm bushing for reassembly purposes. The bolt needs to be installed in the same position as removed to make sure wheel camber and caster return to adjusted position.

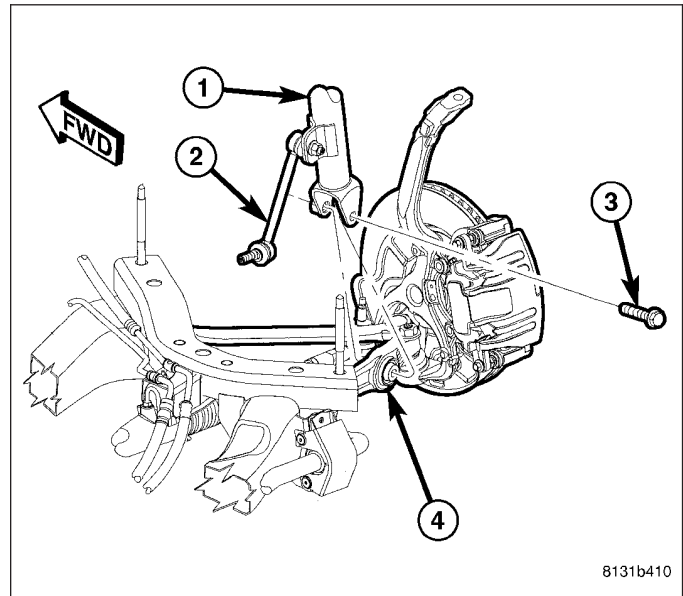




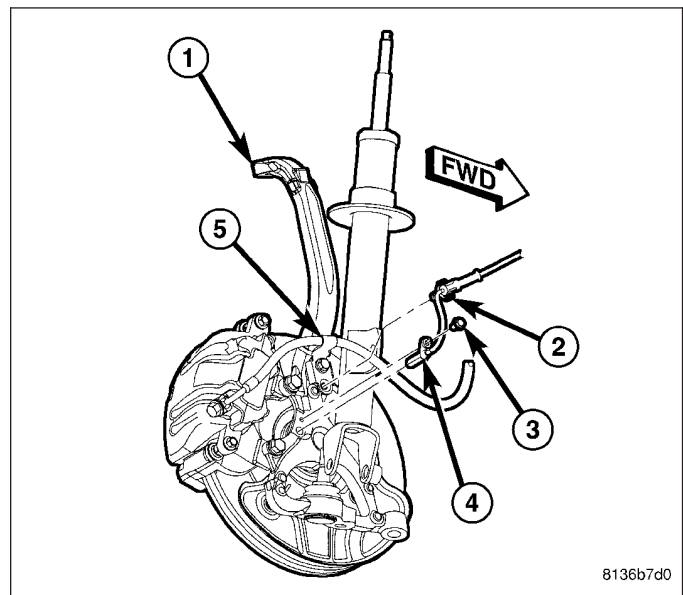
8. Remove bolt and nut (1) securing lower control arm (2) to engine cradle. If the bolt has a torx head (see above note), remove the bolt and nut by holding the bolt in place with a wrench, removing the nut, then sliding the bolt out of the bushing and cradle while taking note of bolt positioning in lower control arm bushing for reassembly purposes.



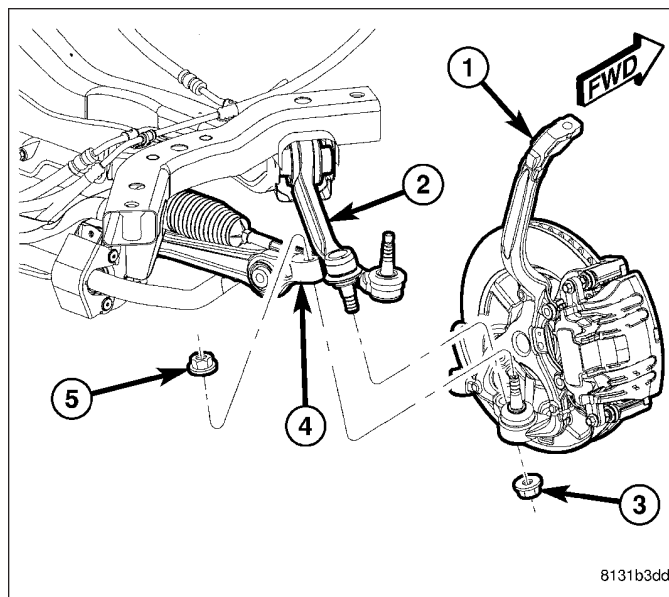
9. Remove bolt (3) securing shock assembly (1) to lower control arm (4).



10. Remove screw (3) fastening wheel speed sensor to knuckle (1). Pull sensor head (4) out of knuckle.
11. Remove wheel speed sensor cable routing clip (2) from brake flex hose routing bracket (5).

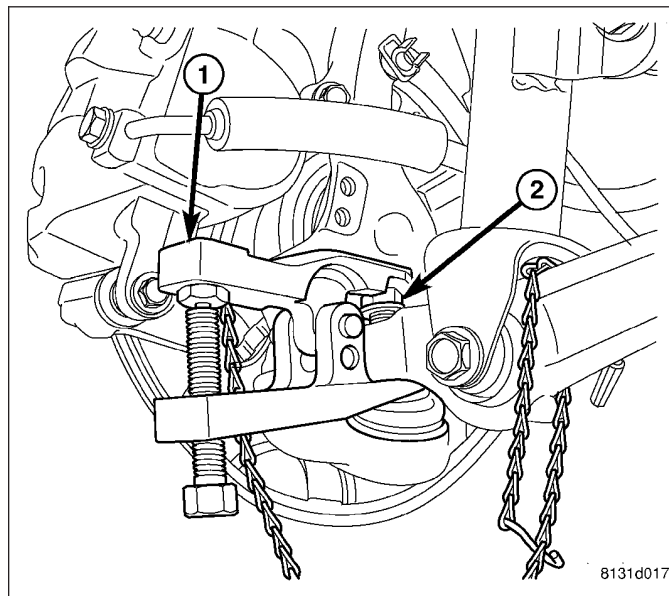


12. Loosen nut (5) attaching ball joint stud to lower control arm (4). Back nut off until nut is even with end of stud. **Keeping nut on at this location will help keep end of stud from distorting while using Puller in next step.**

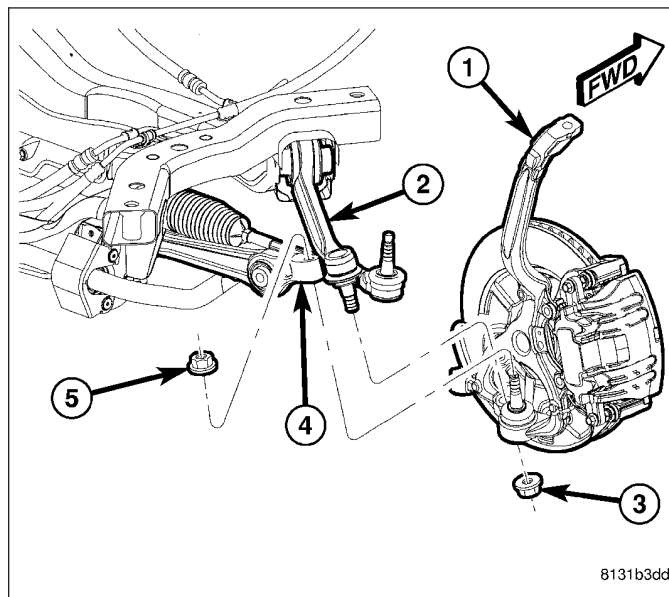


**CAUTION:** In following step, use care not to damage ball joint seal boot while sliding Puller, Special Tool 9360, into place past seal boot.

13. Using Puller (1), Special Tool 9360, separate ball joint stud (2) from lower control arm.



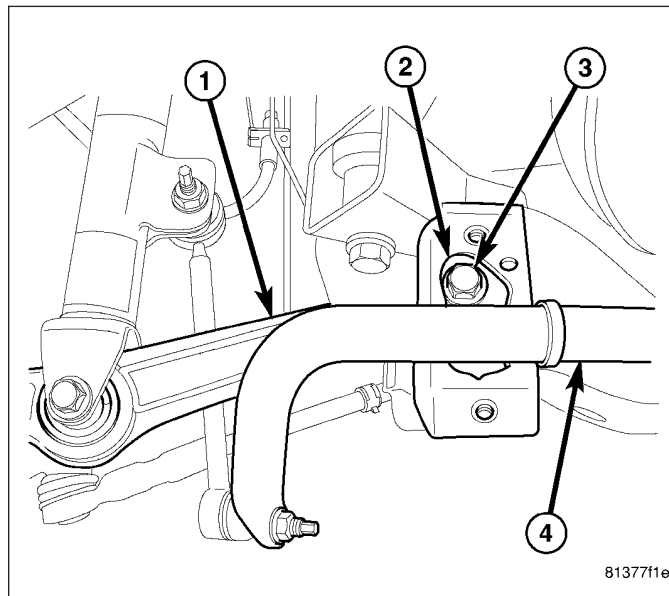
14. Remove nut (5) from end of ball joint stud attaching lower control arm to knuckle.
15. Pry knuckle downward and slide ball joint stud out of lower control arm. Position knuckle outward, away from lower control arm.
16. Slide lower control arm out of engine cradle and remove from vehicle.



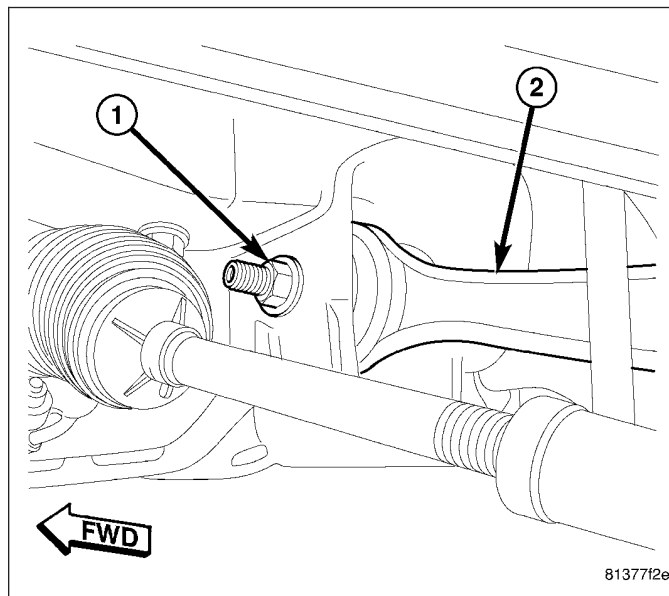
## INSTALLATION

**Note:** If installing a lower control arm engine cradle bolt that is a wheel alignment adjustment bolt (length-wise grooved shaft), make sure to install it in the same position which it was in upon removal. For more details on installation of this special bolt, (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

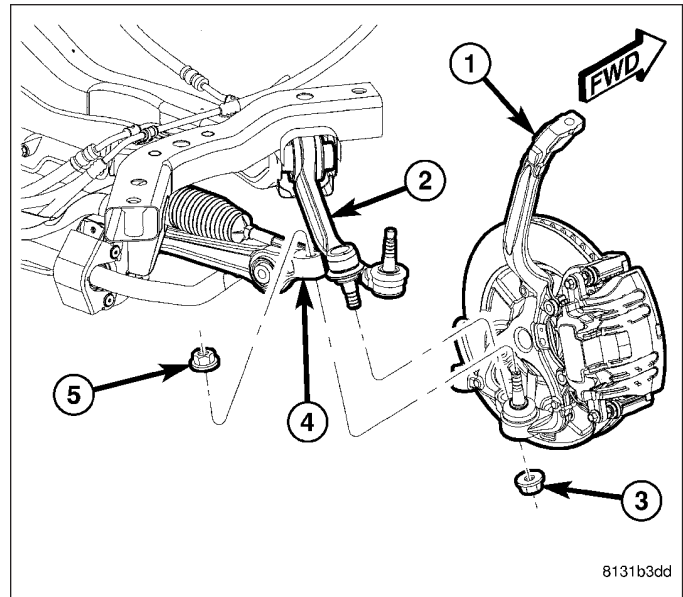
1. Slide lower control arm (4) into position in engine cradle and install mounting bolt from rear.



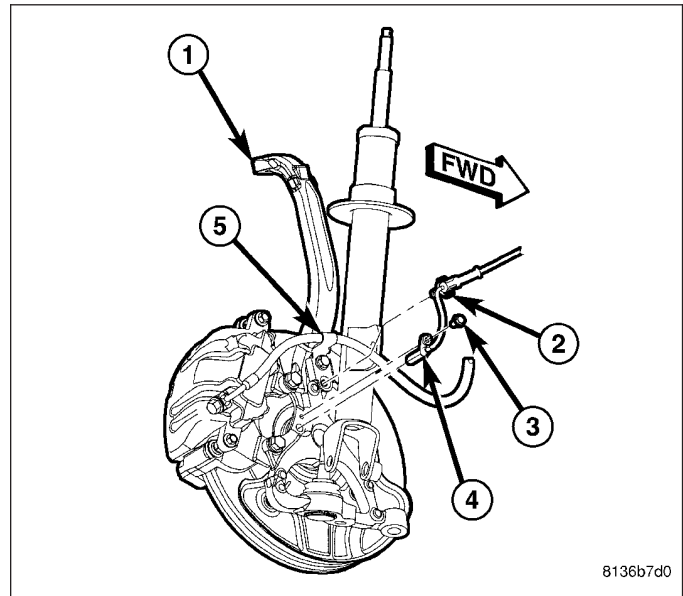
2. Install nut (1) on lower control arm cradle bolt, but **do not tighten at this time.**



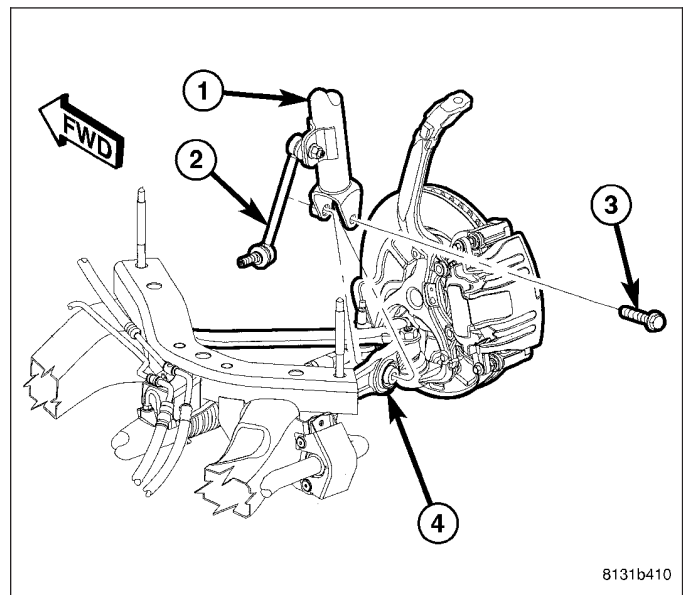
3. Pull knuckle (1) downward and position lower control arm (4) over ball joint stud. Release knuckle, guiding stud into lower control arm. Install NEW nut (5) on ball joint stud attaching lower control arm (4) to knuckle (1). Tighten nut by holding ball joint stud with a hex wrench while turning nut with a wrench. Tighten nut using crow foot wrench on torque wrench to 68 N·m + 90° turn (50 ft. lbs. + 90° turn) torque.



4. Install wheel speed sensor head (4) into knuckle and install mounting screw (3). Tighten screw to 11 N·m (95 in. lbs.) torque.
5. Attach wheel speed sensor cable and routing clip (2) to brake flex hose routing bracket (5).



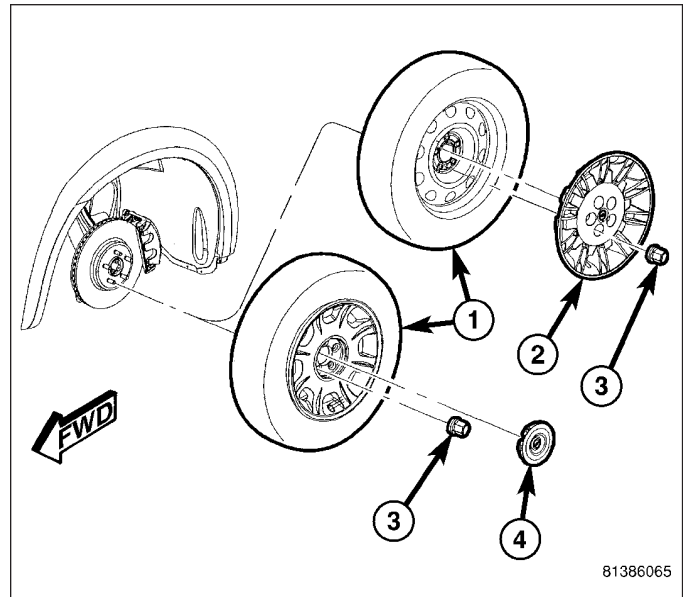
6. Install lower shock mounting bolt (3) attaching shock assembly (1) to lower control arm (4). **Do not tighten bolt at this time.**



7. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque.
8. Lower vehicle.

**CAUTION:** Because stabilizer bar is disconnected at cradle it is important to use extra care while moving vehicle to alignment rack/drive-on lift.

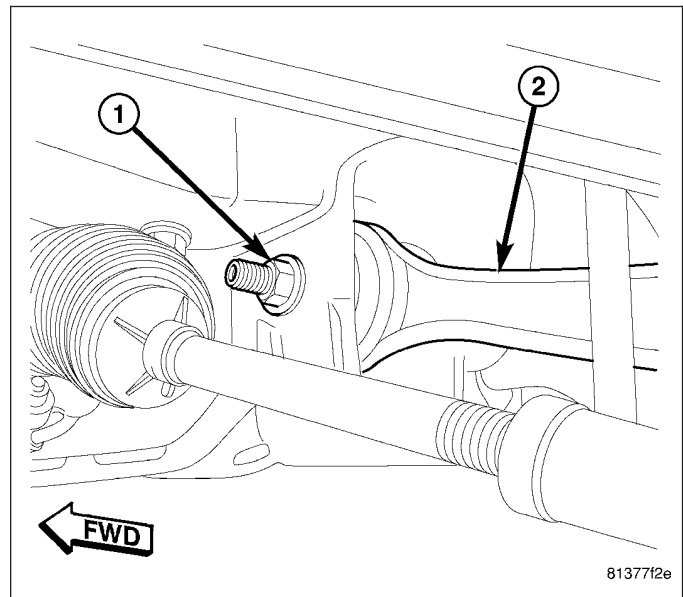
9. Position vehicle on an alignment rack/drive-on lift.
10. Tighten lower shock mounting bolt (3) to 174 N·m (128 ft. lbs.) torque.



11. Perform wheel alignment. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

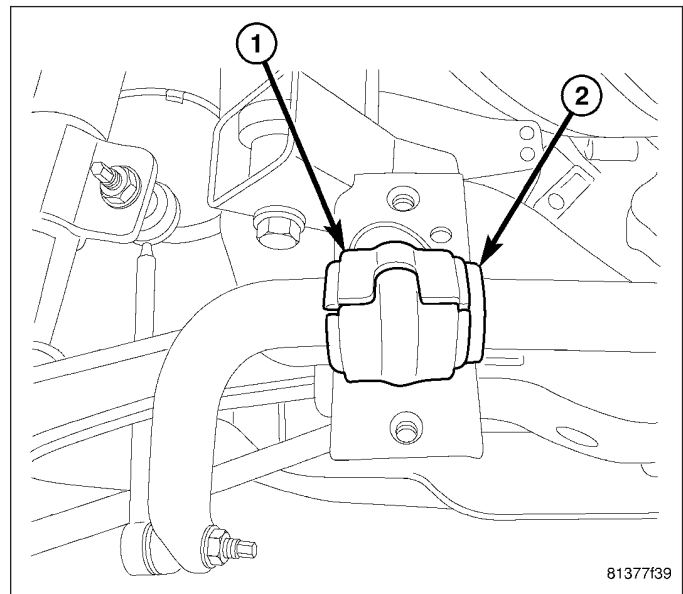
**CAUTION:** If the control arm engine cradle bolt is a wheel alignment adjustment bolt (lengthwise grooved shaft), be sure to only tighten the nut. Do not rotate the bolt or damage to the bushing will occur.

12. Once camber is found to be within specifications, using a crowfoot wrench, tighten lower control arm cradle bolt nut (1) to 176 N·m (130 ft. lbs.) torque while holding the bolt stationary.

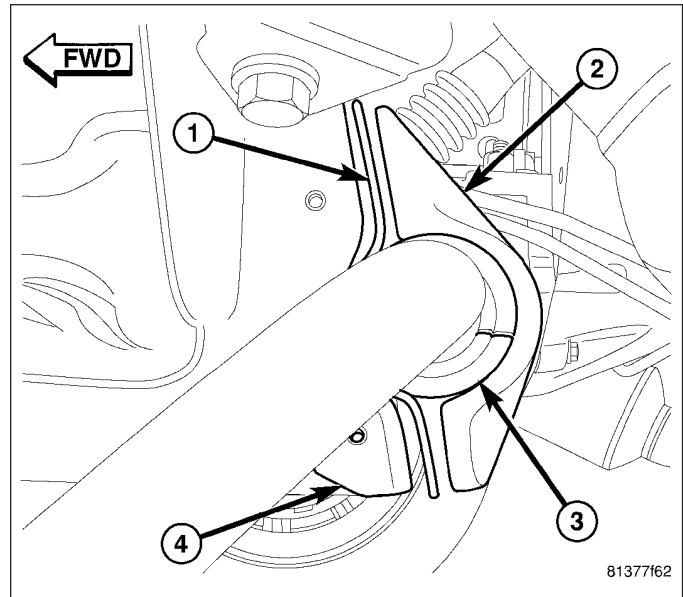


**CAUTION:** Because of stabilizer bushing outer shape, it is very important to install bushings in position discussed in following step.

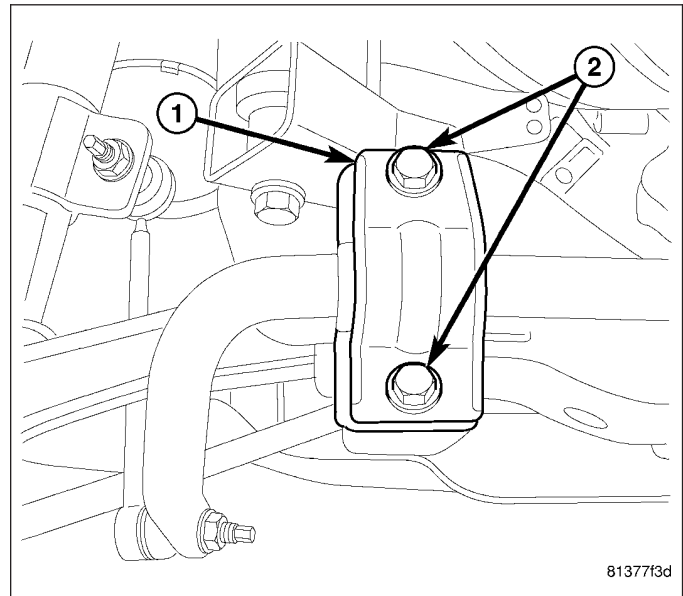
13. Utilizing slit in bushing, install stabilizer bar bushing (1) against locating collar on stabilizer bar (2) as shown. Make sure slit in bushing is positioned toward rear of vehicle.



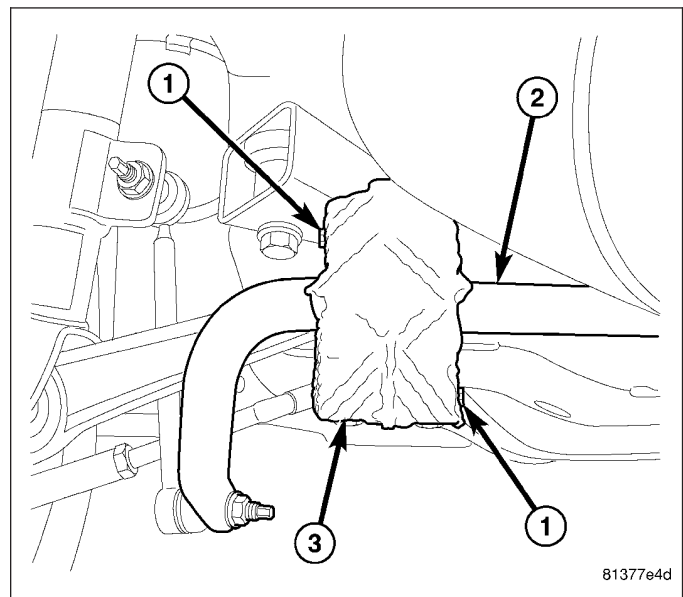
14. Install stabilizer bar bushing retainer halves (1)(2) around bushing (3).



15. Install bolts (2) securing stabilizer bar bushing retainer halves (2) to cradle. Tighten bolts (2) to 60 N·m (44 ft. lbs.) torque.



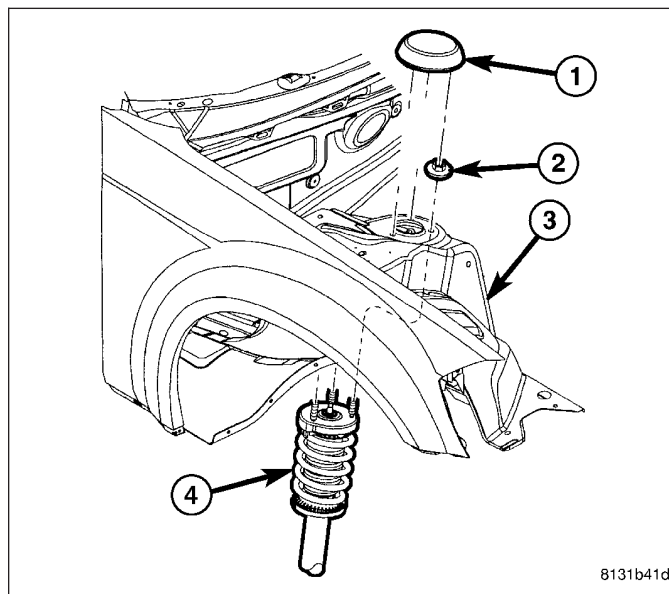
16. Install stabilizer bar heat shield (3) over stabilizer bar bushing retainer. Install mounting screws (1).
17. Install belly pan. (Refer to 23 - BODY/EXTERIOR/ BELLY PAN - REMOVAL)



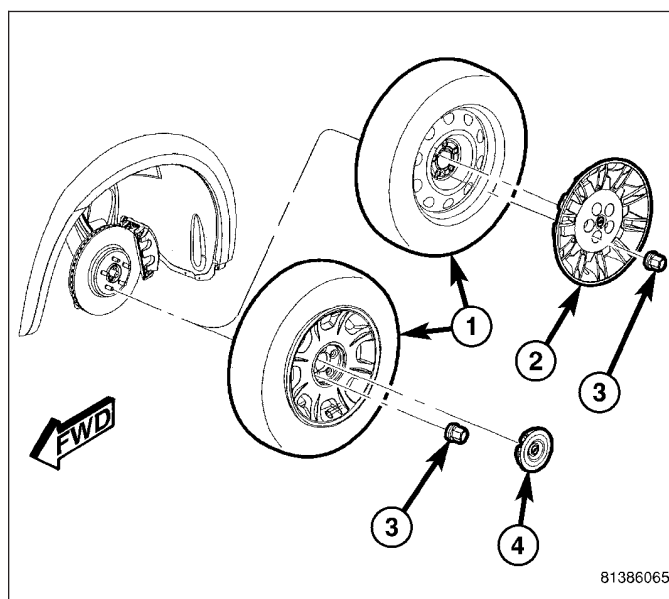
## SHOCK ASSEMBLY

### REMOVAL

1. Remove front shock tower cap (1) from top of shock assembly (4).
2. Remove three nuts (2) fastening shock assembly (4) to shock tower (3).
3. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

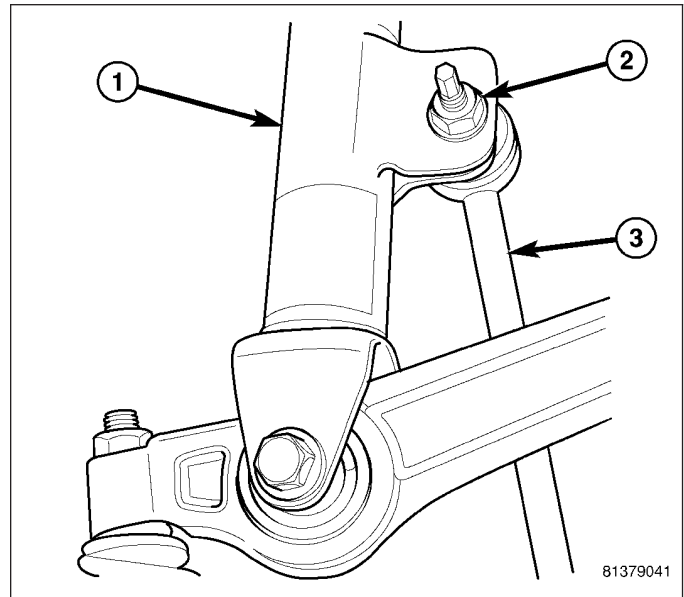


4. Remove wheel mounting nuts (3), then tire and wheel assembly (1).

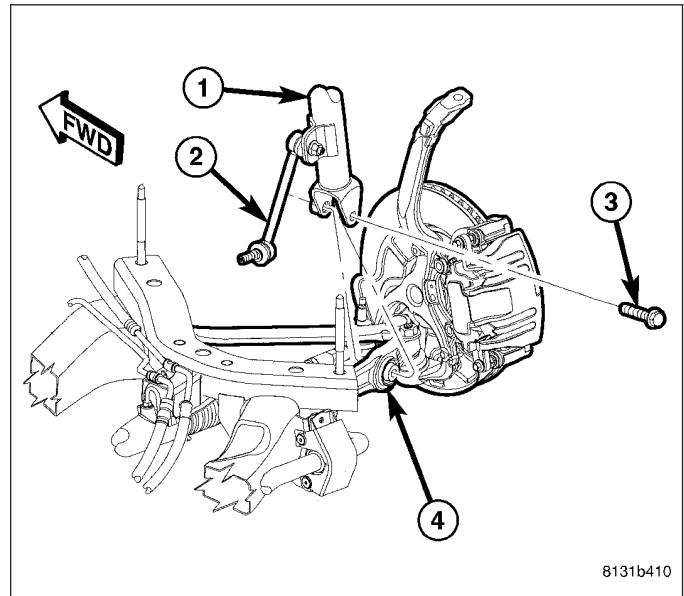




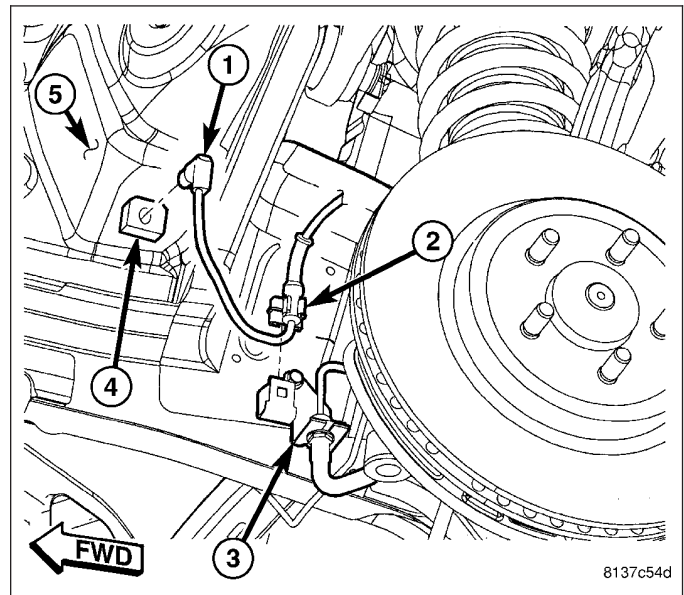
5. Remove nut (2) fastening stabilizer link (3) to shock assembly (1). Slide link ball joint stem from shock assembly.



6. Remove bolt (3) securing shock assembly (1) to lower control arm (4).

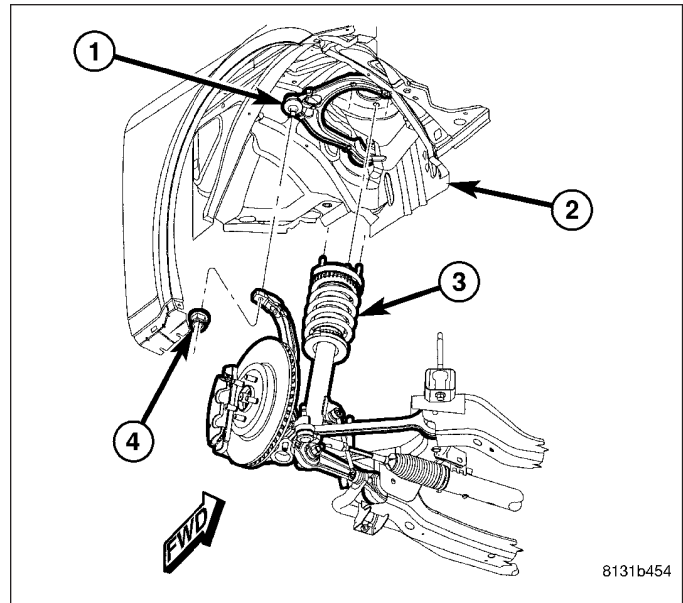


7. Disconnect wheel speed sensor cable routing clip (2) at brake tube bracket (3).



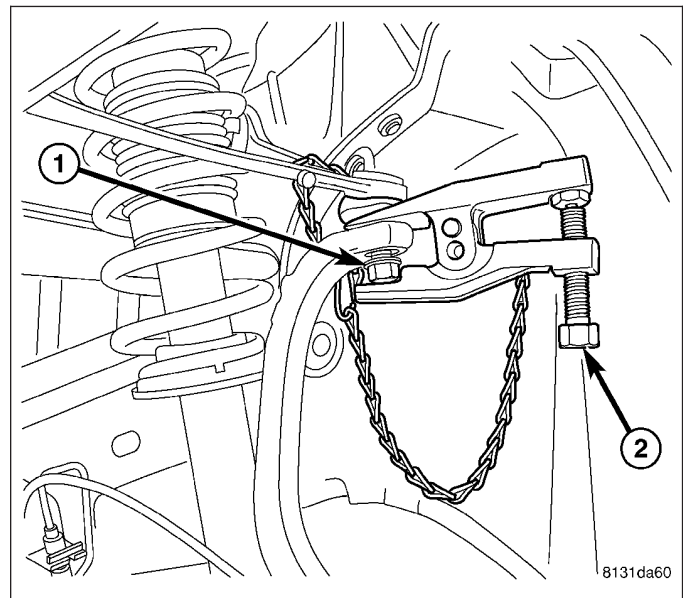


8. Loosen nut (4) attaching upper ball joint stud (1) to knuckle. Back nut off until nut is even with end of stud. **Keeping nut on at this location will help keep end of stud from distorting while using Puller in next step.**

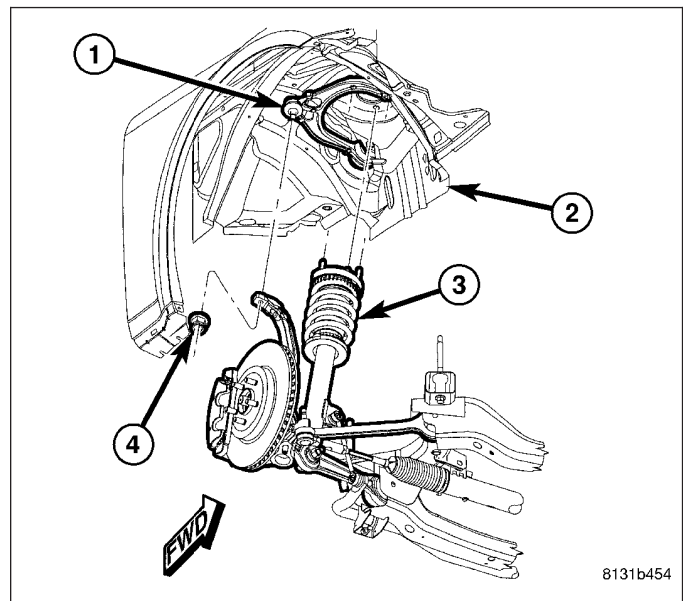


**CAUTION:** In following step, use care not to damage ball joint seal boot while sliding Puller, Special Tool 9360, into place past seal boot.

9. Using Puller (2), Special Tool 9360, separate upper ball joint stud (1) from knuckle.



10. Remove nut (4) from end of upper ball joint stud (1).
11. Tip top of knuckle outward using care not to over-extend bake flex hose.
12. Remove shock assembly from vehicle.



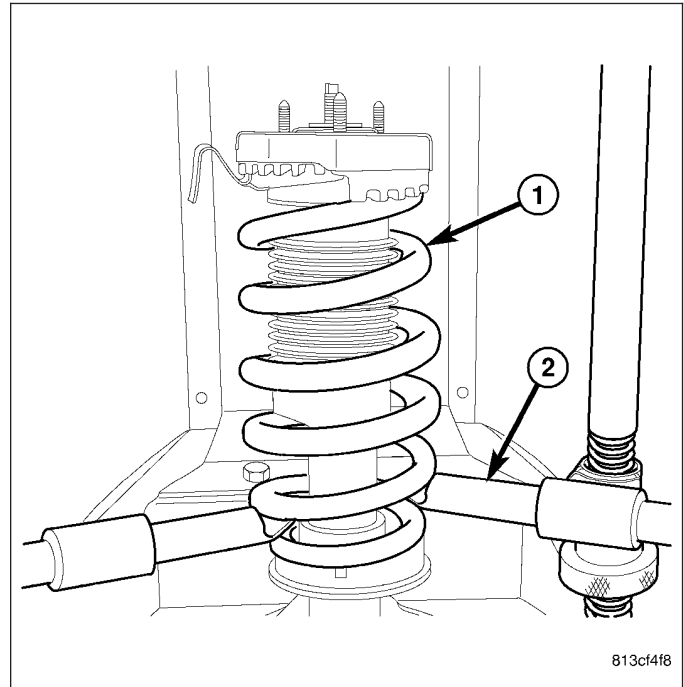
## DISASSEMBLY

The shock assembly must be removed from vehicle for it to be disassembled and assembled.

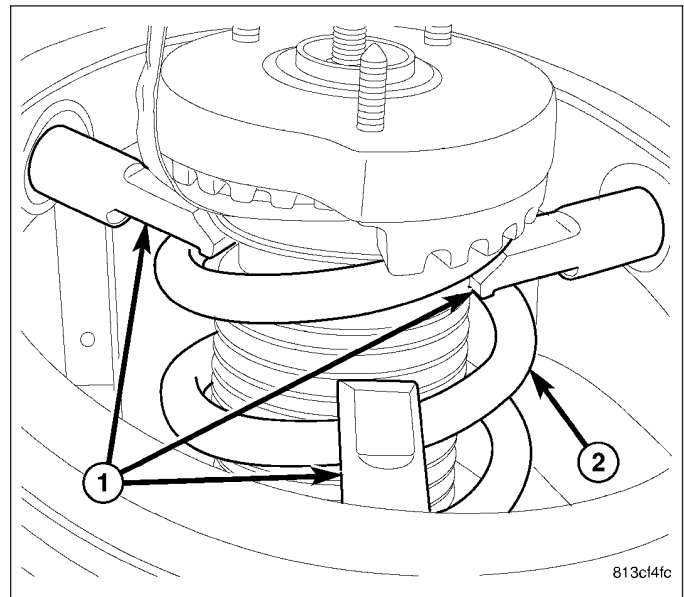
For shock assembly disassembly and assembly, use of shock Spring Compressor, Pentastar Service Equipment (PSE) tool W-7200, or equivalent, is recommended to compress coil spring. Follow manufacturer's instructions closely.

**WARNING: Do not remove shock shaft nut before coil spring is compressed. Coil spring is held under pressure and must be compressed, removing spring tension from upper and lower mounts, before shock removal.**

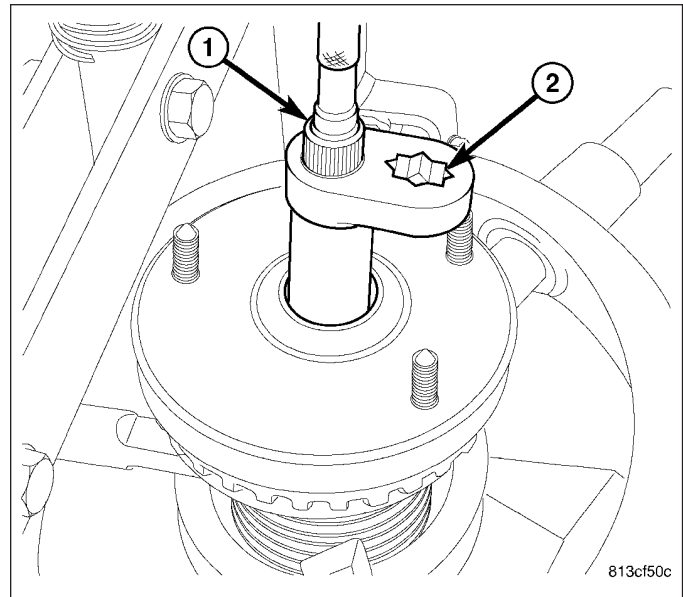
1. Position shock assembly coil spring (1) on hooks (2) of Compressor following manufacturers instructions. Install clamp securing shock to lower spring coil.



2. Position Compressor upper hooks (1) on upper coil spring (2) following manufacturers instructions. To ease installation, rotate shock as necessary positioning shock in compressor so that upper spring coil ends (step in upper mount) at straight outward position from Compressor.
3. Compress coil spring until all spring tension is removed from upper mount.



4. Position Wrench (2), Special Tool 9362, on shock shaft retaining nut. Next, insert 8 mm socket through Wrench onto hex located on end of shock shaft. While holding shock shaft from turning, remove nut from shock shaft using Wrench.
5. Remove clamp from bottom of coil spring and remove shock and lower isolator out through bottom of coil spring.

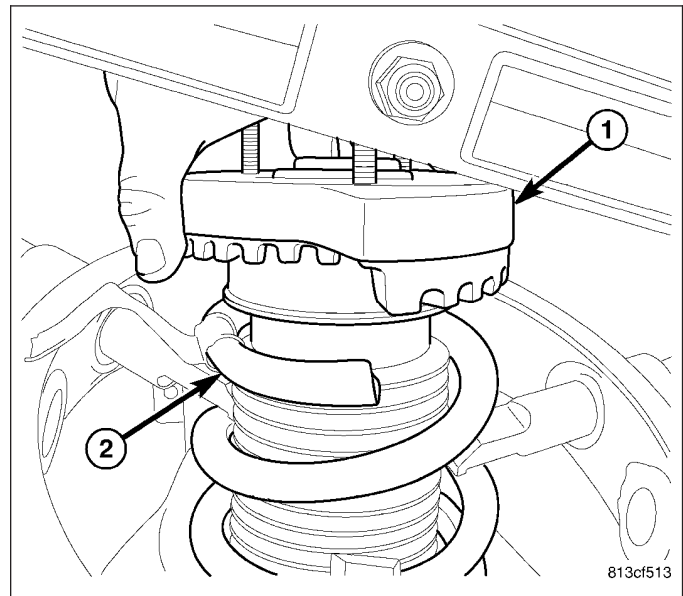


**Note:** If upper mount or coil spring needs to be serviced, proceed with next step, otherwise, proceed with step 8.

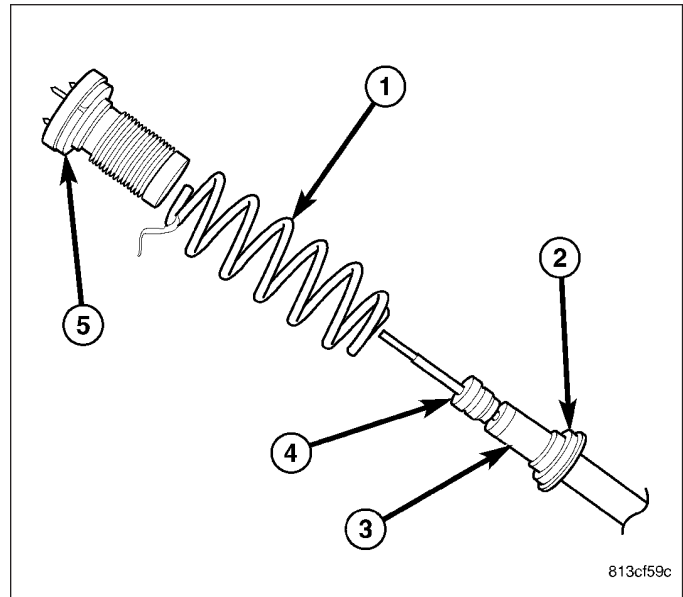
6. Remove upper mount (1) from shock shaft and coil spring.

**Note:** Prior to removing spring from compressor, note location of lower spring coil end in relationship to compressor to ease assembly of components later.

7. Back off Compressor drive, releasing tension from coil spring. Push back compressor upper hooks and remove coil spring from Compressor.



8. Remove jounce bumper (4) from shock shaft by pulling straight up and off.
9. Remove lower isolator (2) from shock body by pulling straight up and off shock shaft.
10. Inspect shock assembly components for following and replace as necessary:
  - Inspect shock (3) for any condition of shaft binding over full stroke of shaft.
  - Inspect upper mount (5) for cracks and distortion and its retaining studs for any sign of damage.
  - Inspect upper spring isolator (5) for severe deterioration.
  - Inspect lower spring isolator (2) for severe deterioration.
  - Inspect dust shield for tears and deterioration.
  - Inspect coil spring (1) for cracks in the coating and corrosion.
  - Inspect jounce bumper (4) for cracks and signs of deterioration.



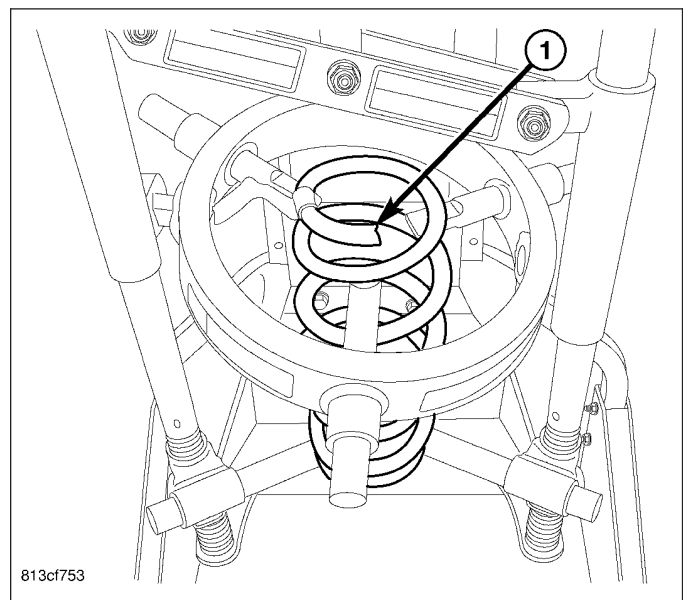
## ASSEMBLY

**CAUTION:** Use care not to damage coil spring coating during spring assembly. Damage to coating will jeopardize its corrosion protection.

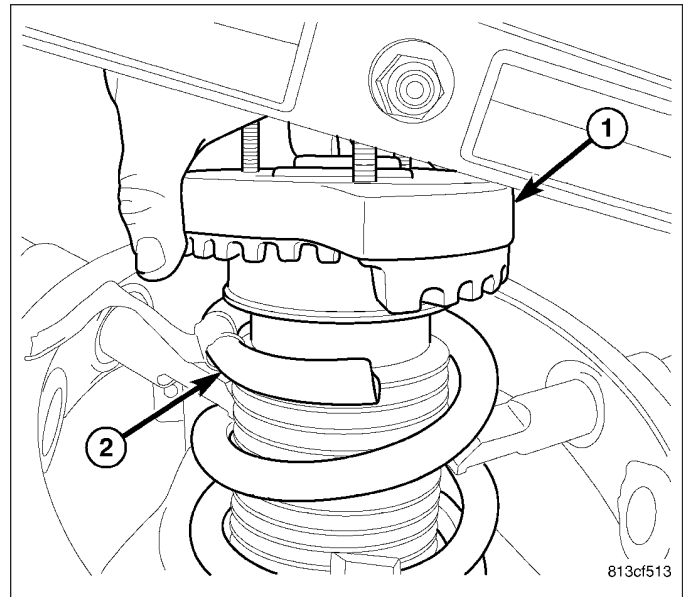
**Note:** Left and right springs must not be interchanged.

**Note:** If coil spring has been removed from spring compressor, proceed with next step, otherwise, proceed with step 4.

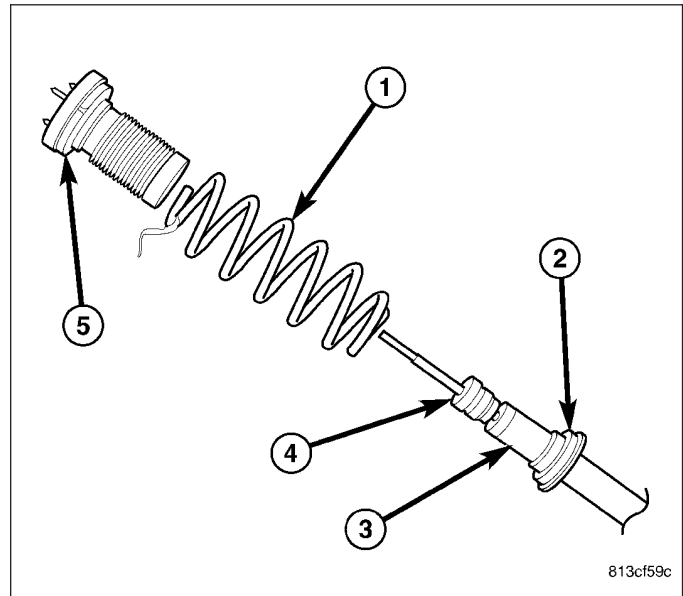
1. Place coil spring (**part number tag end upward**) in compressor lower hooks following manufacturers instructions. To ease shock reassembly, rotate coil spring around until upper coil (1) ends at straight outward position from Compressor. Proper orientation of spring to upper mount (once installed) is necessary.
2. Position compressor upper hooks over coil spring following manufacturers instructions.
3. Compress coil spring far enough to allow shock installation.



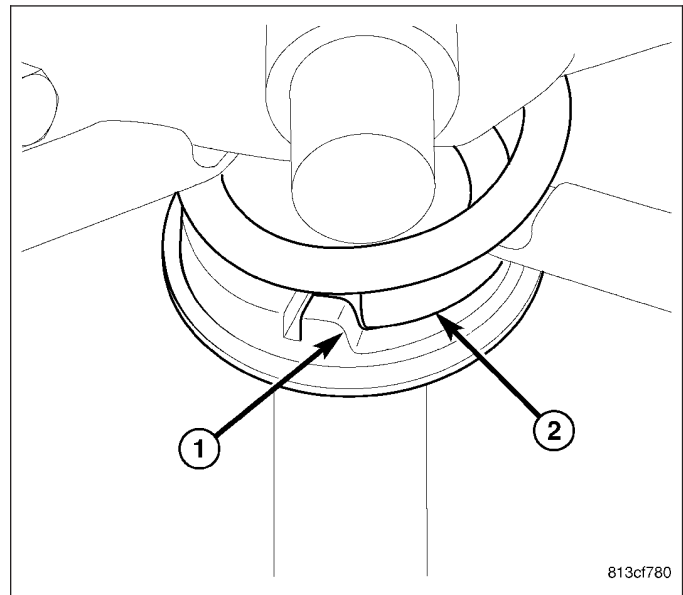
4. If separated, install upper mount (1) onto coil spring (2). Match step in upper isolator to end of spring coil.



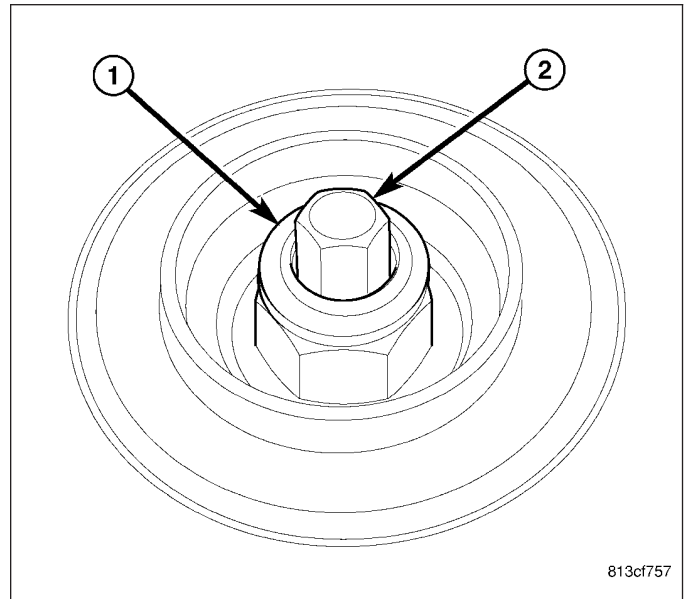
5. Install lower spring isolator (2) on shock body (3).  
6. Install jounce bumper (4) on shock shaft, small end first.



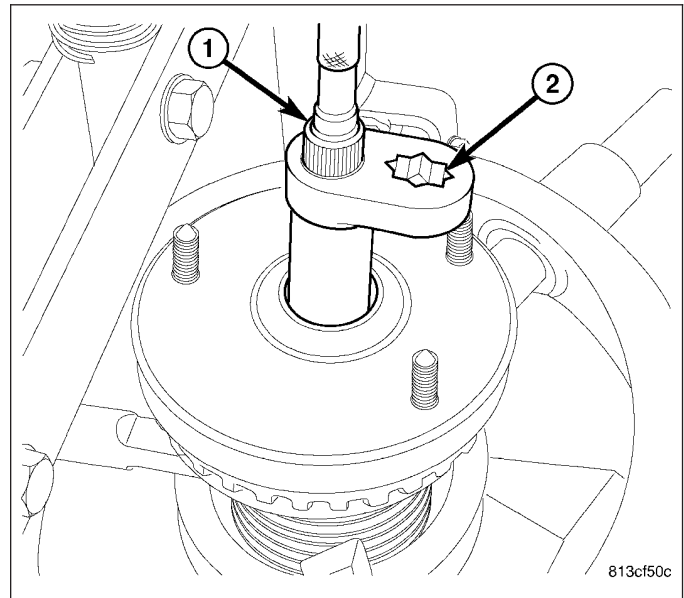
7. Install shock through bottom of coil spring until lower spring isolator (on shock) contacts lower end of coil spring. Match step built into isolator (1) to lower coil end (2). Once in this position, stabilizer bar bracket, or clevis key on AWD models, should point straight inward toward Compressor body. If not, rotate isolator on shock body until alignment is achieved when isolator is correctly positioned with lower spring coil.  
8. Install clamp to hold shock and coil spring together.



9. Install retaining nut (1) on shock shaft (2) as far as possible by hand. Make sure nut is installed far enough for 8 mm socket to grasp hex (2) on end of shaft for tightening.



10. Install Wrench (on end of a torque wrench), Special Tool 9362, on shock shaft retaining nut. Next, insert 8 mm socket through Wrench onto hex located on end of shock shaft. While holding shock shaft from turning, tighten nut using Wrench to 90 N·m (66 ft. lbs.) torque.
11. Slowly release tension from coil spring by backing off Compressor drive fully. As tension is relieved, make sure shock components are properly in place.
12. Remove clamp from lower end of coil spring and shock. Push back spring compressor upper and lower hooks, then remove shock assembly from spring compressor.
13. Install shock assembly on vehicle. (Refer to 2 - SUSPENSION/FRONT/SHOCK - INSTALLATION)

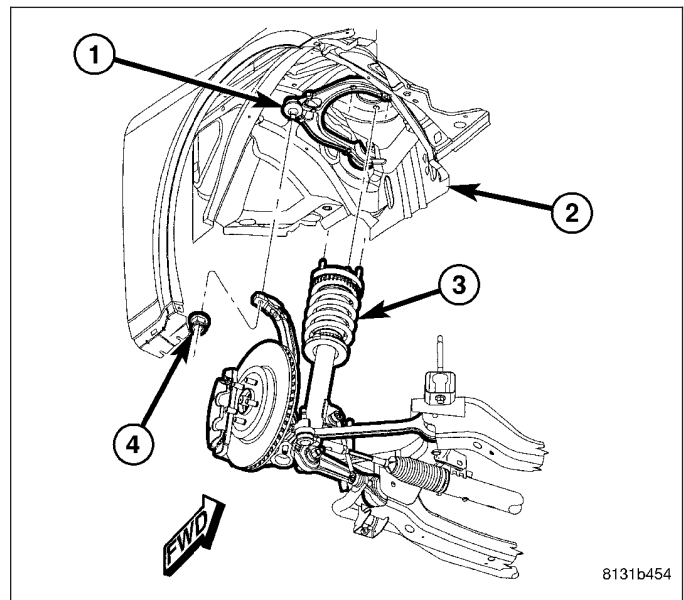


## INSTALLATION

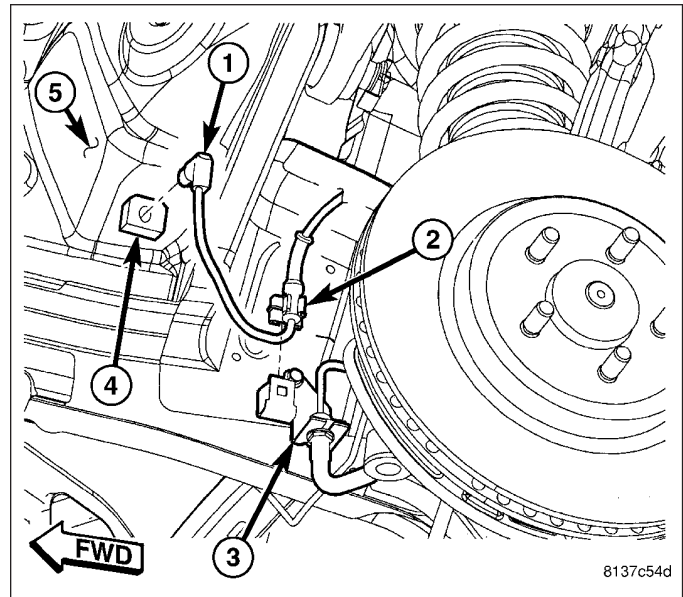
1. Place shock assembly into front suspension using reverse direction in which it was removed.

**CAUTION:** It is important to tighten nut as described in following step to avoid damaging ball stud joint.

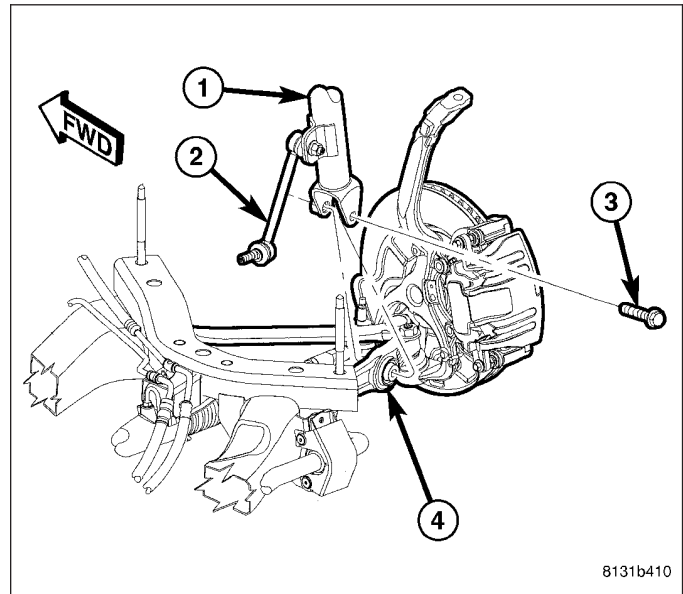
2. Place upper ball joint stud (1) through hole in top of knuckle and install nut (4). Tighten nut by holding ball joint stud with a hex wrench while turning nut with a wrench. Tighten nut using crow foot wrench on torque wrench to 47 N·m + 90° turn (35 ft. lbs. + 90° turn) torque.



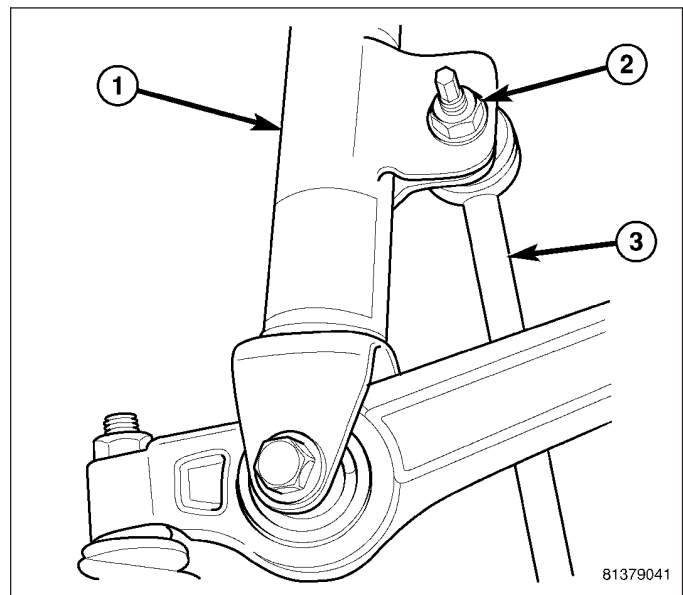
3. Connect wheel speed sensor cable routing clip (2) at brake tube bracket (3).



4. Install lower shock mounting bolt (3) attaching shock assembly (1) to lower control arm (4). **Do not tighten bolt at this time.**



5. Slide stabilizer link (3) ball joint stem into shock assembly from front. Install nut fastening link (3) to shock assembly (1). Tighten nut by holding ball joint stud while turning nut. Tighten nut using crow foot wrench on torque wrench to 146 N·m (108 ft. lbs.) torque.

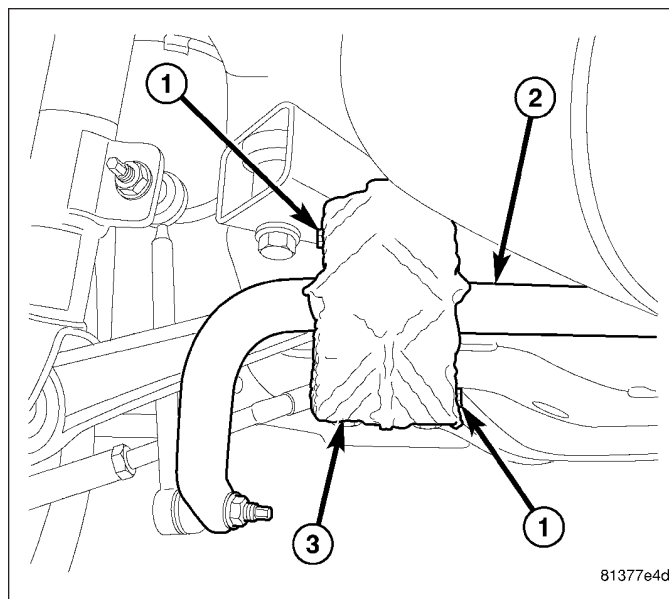




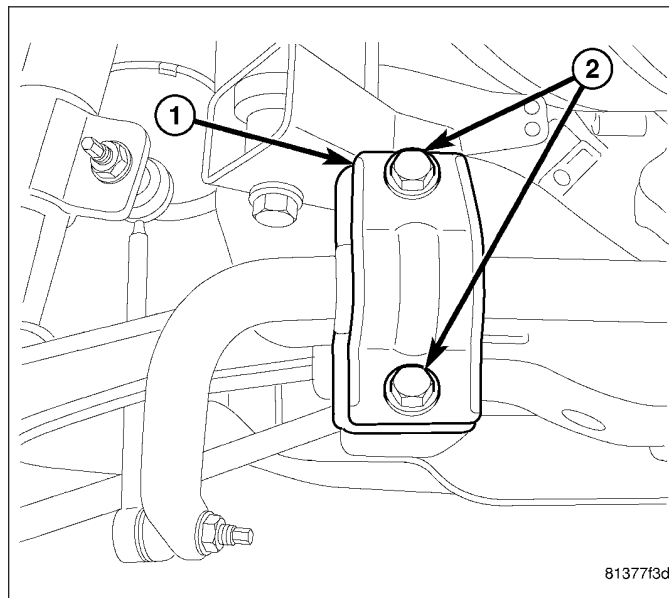




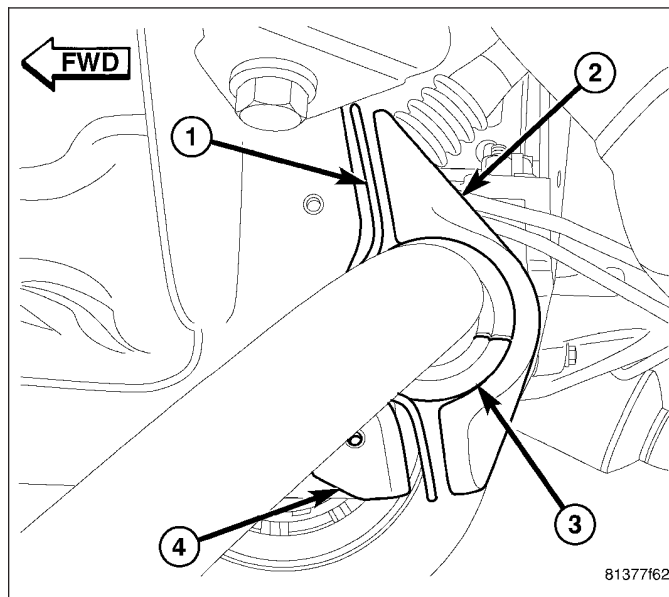
3. On each side of vehicle, remove screws (1) fastening stabilizer bar heat shield (3). Remove heat shield.



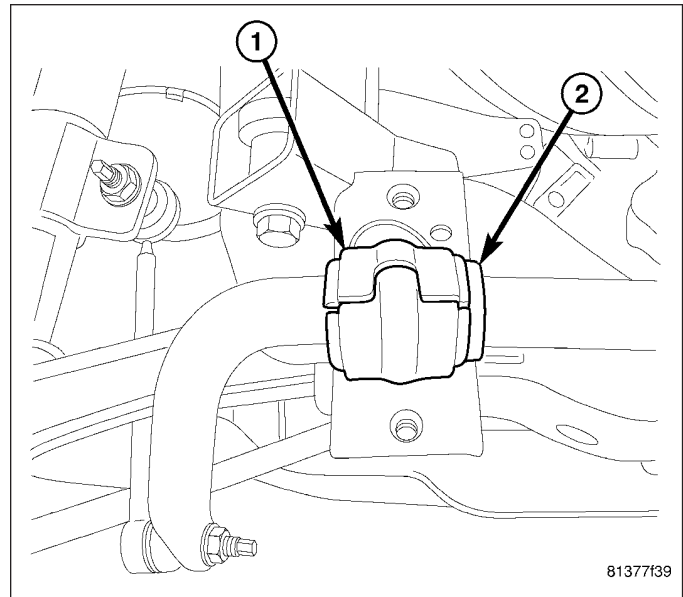
4. On each side of vehicle, remove bolts (2) fastening stabilizer bar isolator retainer (1) in place.



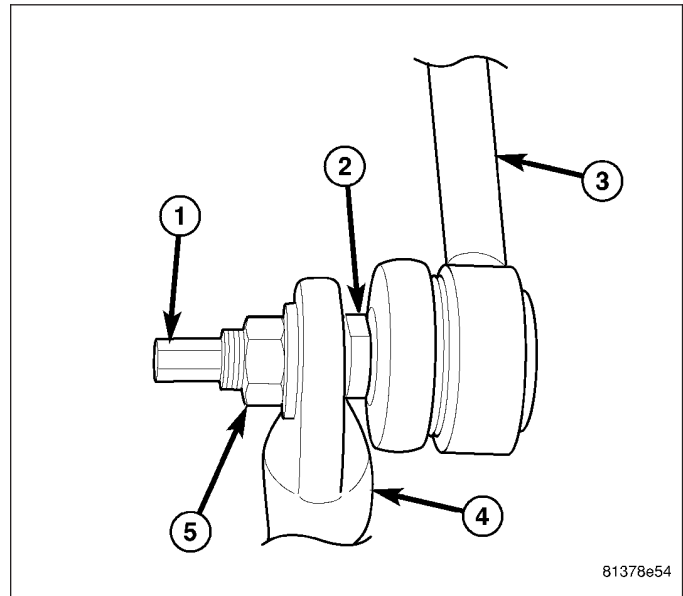
5. On each side of vehicle, remove retainer halves (1)(2) from around stabilizer bar isolator (3).



6. Utilizing slit, remove each isolator (1) from stabilizer bar (2).



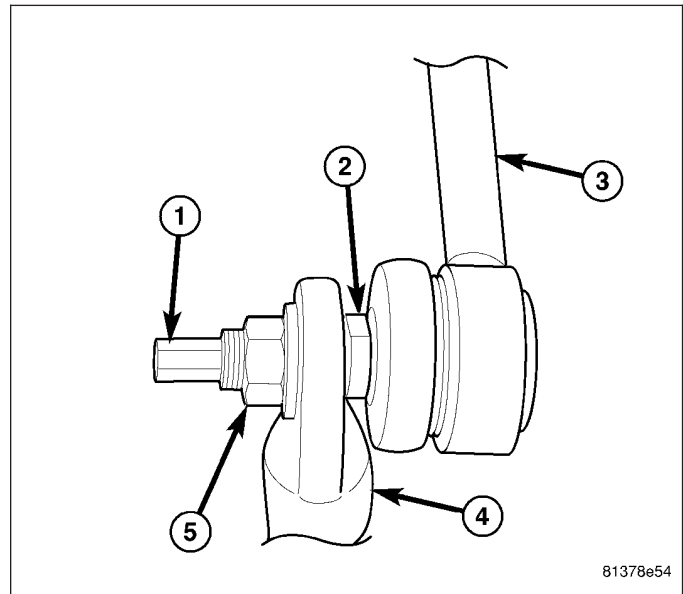
7. On each side of vehicle, remove nut (5) fastening stabilizer link (3) to stabilizer bar (4). Slide link ball joint stem (1) from bar, then remove bar from vehicle.



## INSTALLATION

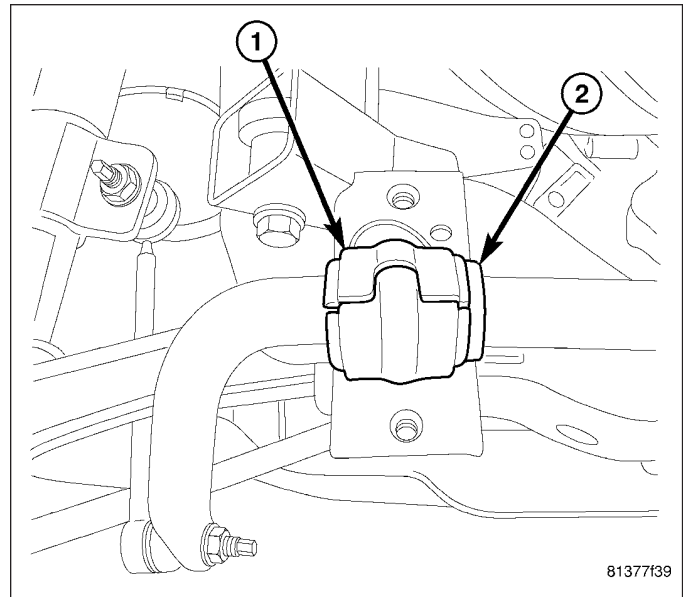
**Note:** When attaching stabilizer link to stabilizer bar, make sure link ball joint stem is pointed inboard toward engine cradle.

1. On each side of vehicle, raise stabilizer bar (4) to stabilizer link (3) and slide link ball joint stem (1) through mounting hole in bar. Loosely install nut (5) at this time.

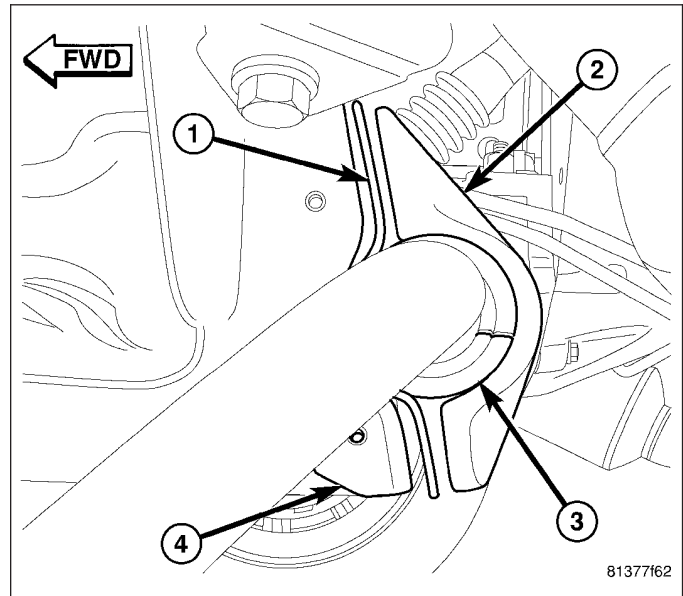


**CAUTION:** Because of stabilizer isolator outer shape, it is very important to install isolators in position discussed in following step.

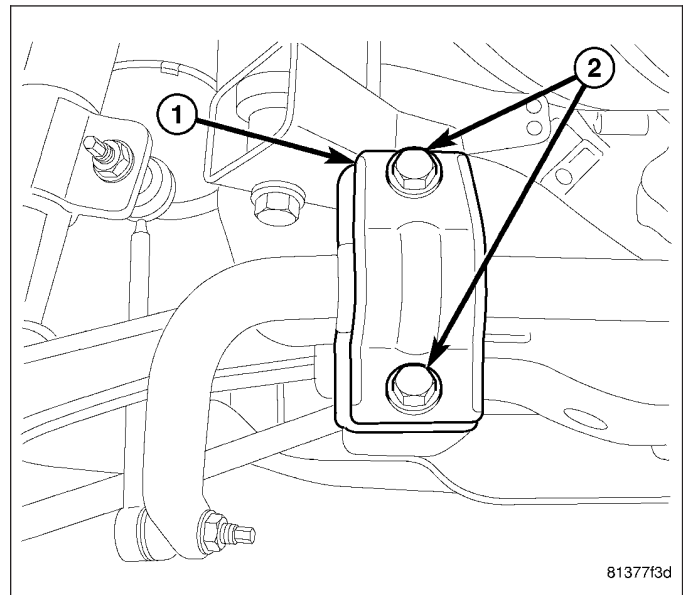
2. Utilizing slit in isolator, install each stabilizer bar isolator (1) on bar resting against locating collar (2) as shown. Make sure slit in isolator is positioned toward rear of vehicle.



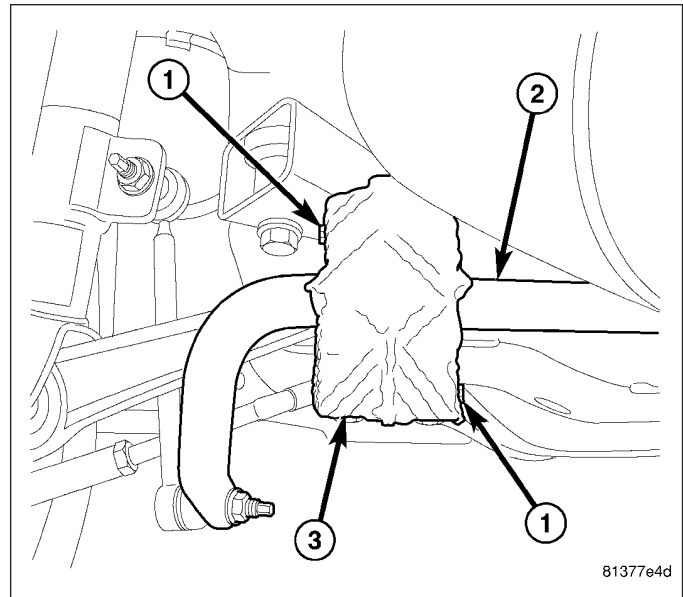
3. On each side of vehicle, install stabilizer bar isolator retainer halves (1)(2) around isolator (3).



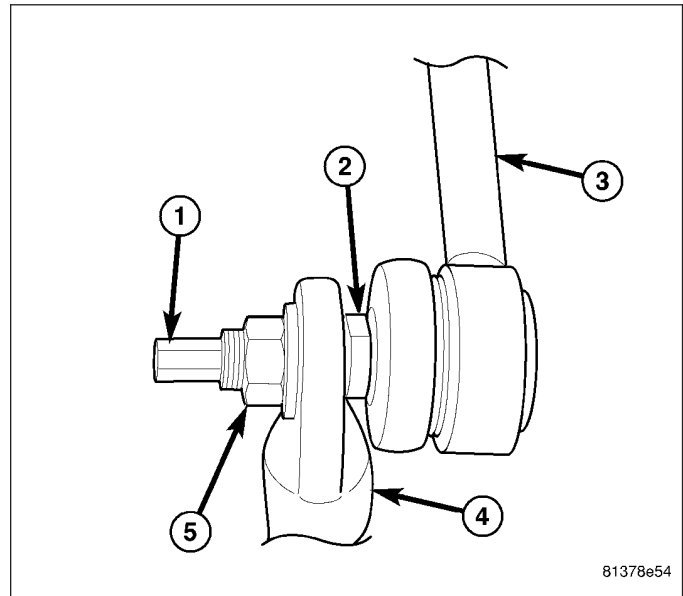
4. On each side of vehicle, install bolts (2) securing stabilizer bar isolator retainer halves (2) to cradle. Tighten bolts (2) to 60 N·m (44 ft. lbs.) torque.



5. On each side of vehicle, install stabilizer bar heat shield (3) over stabilizer bar isolator retainer. Install mounting screws (1).



6. While holding stem from rotating at hex (1) or flat (2) tighten stabilizer link nuts at each end of stabilizer bar (4) to 146 N·m (108 ft. lbs.) torque.



7. Install belly pan. (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL)  
8. Lower vehicle.

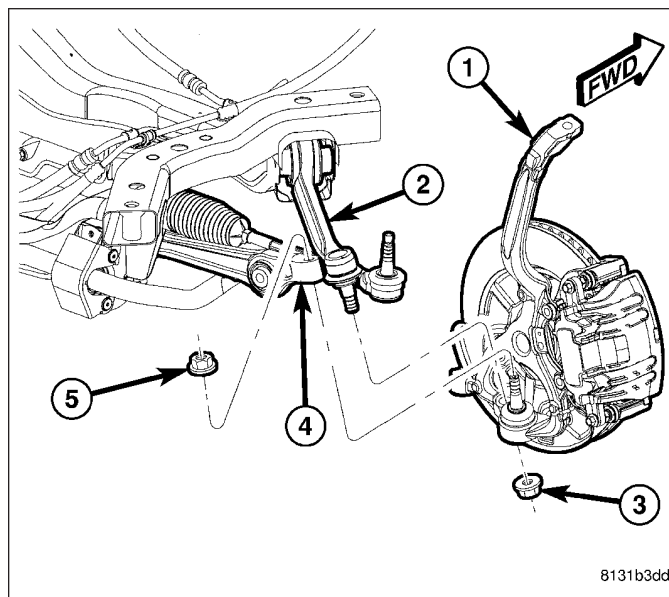
## STRUT - TENSION

### REMOVAL

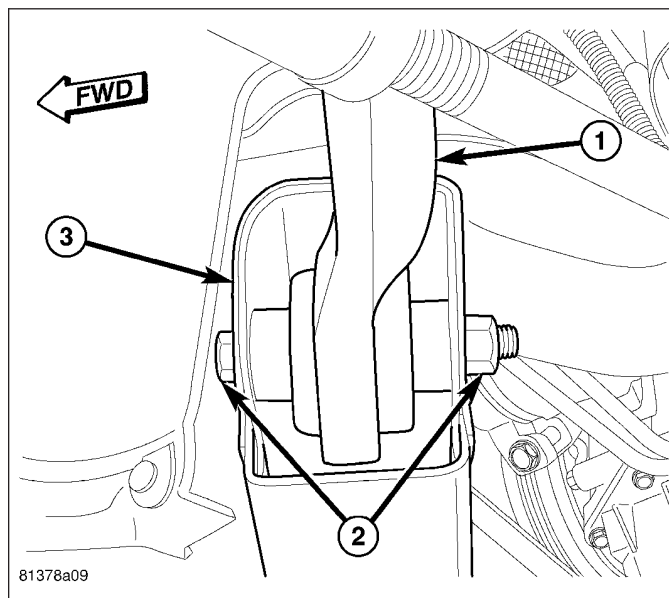
1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)



6. Remove nut (3) from end of tension strut (2) ball joint stud.
7. Rotate knuckle outward and push ball joint upward, out of knuckle.



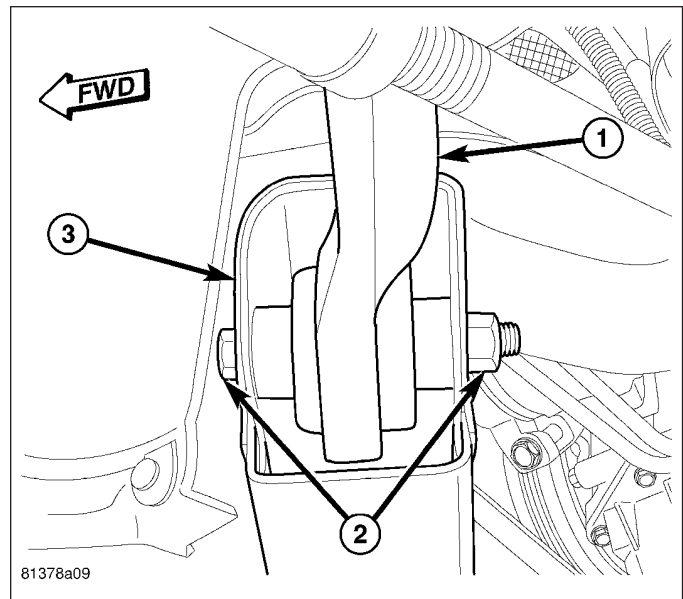
8. Remove nut and bolt (2) securing tension strut (1) to engine cradle (3).
9. Slide tension strut out of cradle bracket and remove from vehicle.



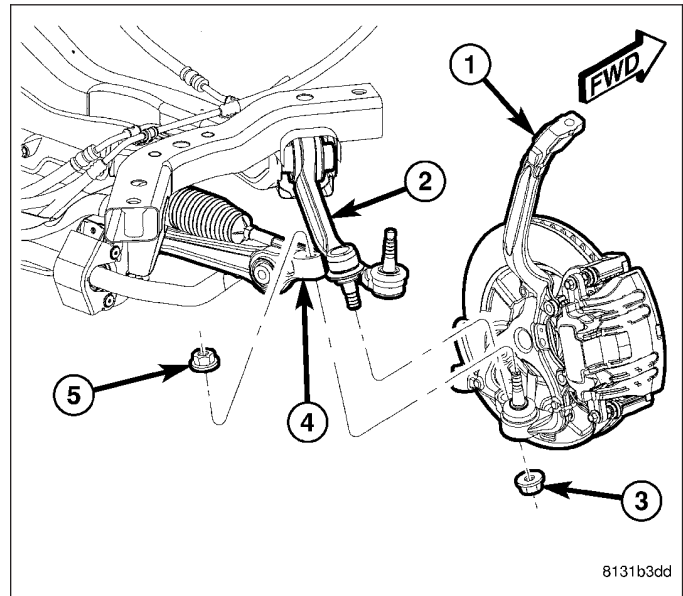
## INSTALLATION

**Note:** If installing a tension strut engine cradle bolt that is a wheel alignment adjustment bolt (lengthwise grooved shaft), make sure to install it in the same position which it was in upon removal. For more details on installation of this special bolt, (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).

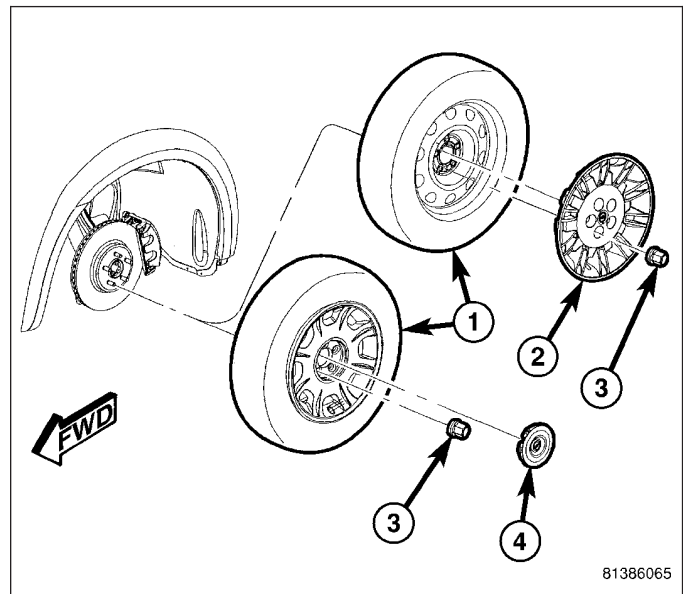
1. Slide bushing end of tension strut (1) into cradle bracket (3).
2. Install mounting bolt (2) from front through cradle and bushing.
3. Install nut (2), but **do not tighten at this time**.



4. Insert tension strut (2) ball joint stud downward, into knuckle hole.
5. Completely install NEW nut (3) on ball joint stud attaching tension strut (2) to knuckle (1). Tighten nut by holding ball joint stud with a hex wrench while turning nut with a wrench. Tighten nut using crow foot wrench on torque wrench to 68 N·m + 90° turn (50 ft. lbs. + 90° turn) torque.



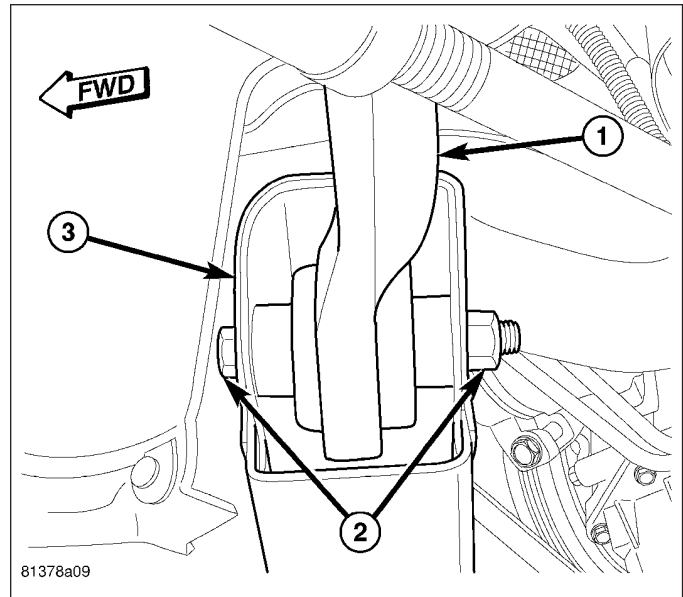
6. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque.
7. Lower vehicle.
8. Position vehicle on an alignment rack/drive-on lift.



9. Perform wheel alignment. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

**CAUTION:** If the tension strut engine cradle bolt is a wheel alignment adjustment bolt (lengthwise grooved shaft), be sure to only tighten the nut. Do not rotate the bolt or damage to the bushing will occur.

10. Once alignment is found to be within specifications, using a crowfoot wrench, tighten tension strut cradle bolt nut (2) to 176 N·m (130 ft. lbs.) torque while holding the bolt stationary.



11. Install belly pan. (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL)

## BALL JOINT - UPPER

### DESCRIPTION

The upper ball joint is pressed into the upper control arm. The ball joint is a “sealed for life” component and cannot be maintenance lubricated. This ball joint is lubricated for life at the time of assembly. **No attempt should be made to ever add any lubrication to this ball joint.**

Neither the upper ball joint, nor the seal boot can be serviced as a separate component. The entire upper control arm must be replaced if either are damaged.

The ball joint connection at the knuckle is achieved by an interference fit created by the tapered stud of the ball joint and a tapered hole in the steering knuckle. The ball joint stud is retained in the steering knuckle using a locking nut.

### DIAGNOSIS AND TESTING

#### UPPER BALL JOINT

1. Raise vehicle on a drive-on hoist.

**Note:** If a drive-on hoist is not available, use wooden blocks with jack stands to support the lower control arm in the ball joint area. Place the jack stands appropriately and lower the hoist placing weight on the lower control arm. The lower control arms should now be supporting the vehicle weight.

2. Using a jack, lift the front end off the hoist and position a wooden block underneath lower control arm supporting that corner of the vehicles weight.
3. Remove tire and wheel assembly. (Refer to 22 - TIRES/WHEELS - REMOVAL)
4. Attach a dial indicator to body of upper control arm, then align dial indicator's contact pointer with direction of stud axis and touch machined flat on end of knuckle near ball joint. Zero dial indicator.

**Note:** Use care when applying the load to the knuckle so as to not damage components of suspension.

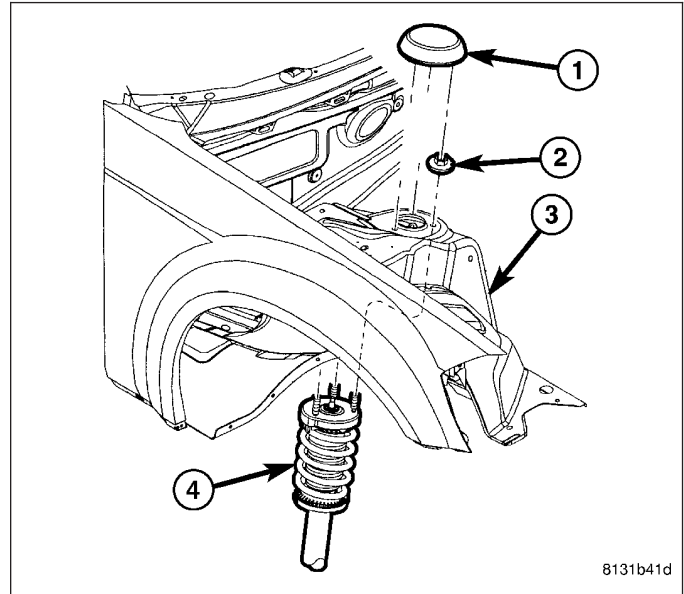
5. Insert a pry bar and rest it against top of upper control arm and use lever principle to push arm downward until dial indicator no longer moves.
6. Record any ball joint movement. If movement in the control arm exceeds 1.5 mm (.059 in.), the ball joint is faulty.
7. If the ball joint needs replaced, the entire upper control arm needs to be replaced. (Refer to 2 - SUSPENSION/FRONT/UPPER CONTROL ARM - REMOVAL)



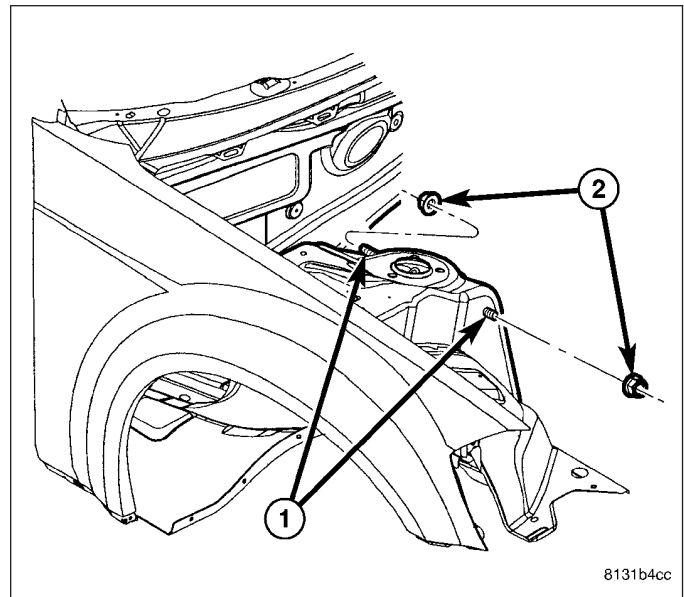
## ARM - UPPER CONTROL

### REMOVAL

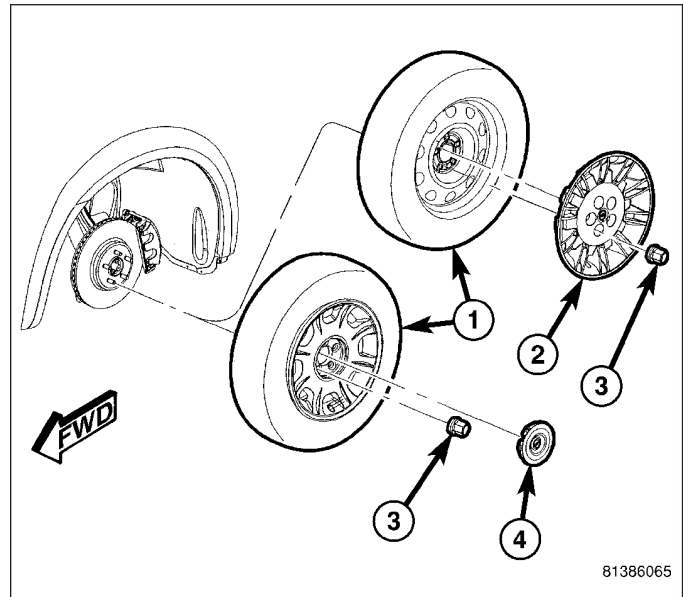
1. If removing left upper control arm, remove and reposition coolant recovery container. (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - REMOVAL)
2. If removing right upper control arm, remove IPM from mount and reposition. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/INTEGRATED POWER MODULE - REMOVAL)
3. Remove front shock tower cap (1) from top of shock assembly (4).
4. Remove three nuts (2) fastening shock assembly (4) to shock tower (3).



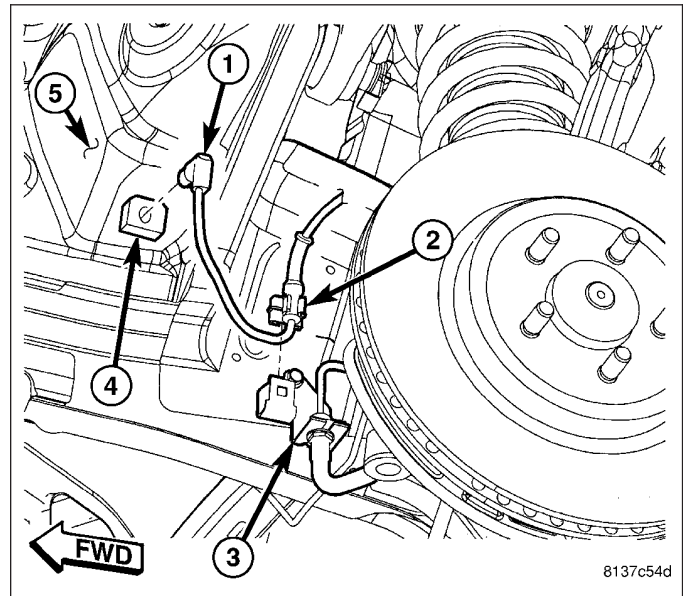
5. remove nuts (2) from upper control arm mounting bolts (1).
6. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)



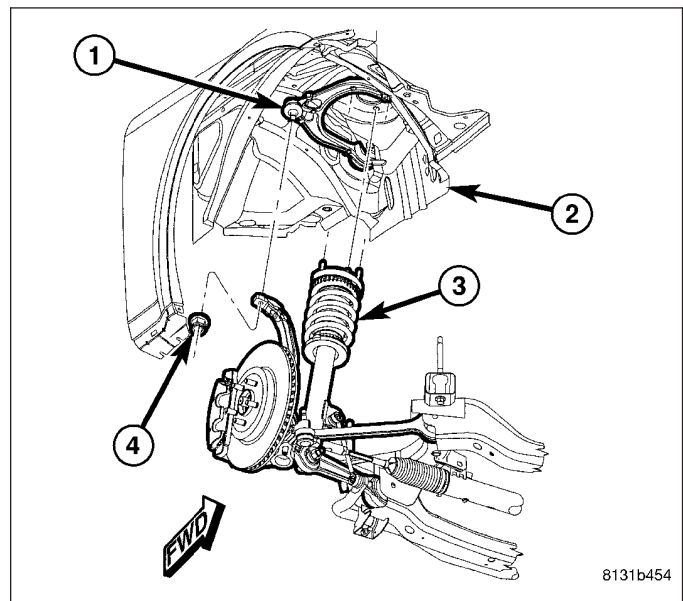
7. Remove wheel mounting nuts (3), then tire and wheel assembly (1).



8. Disconnect wheel speed sensor cable routing clip (2) at brake tube bracket (3).

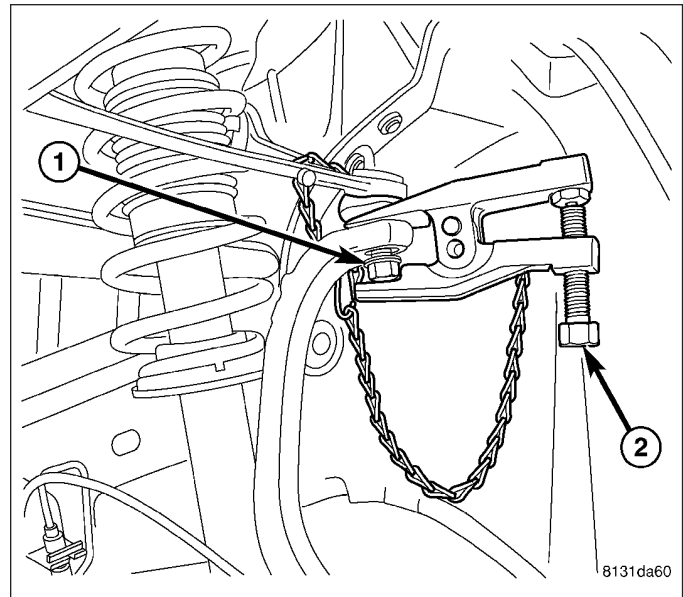


9. Loosen nut (4) attaching upper ball joint stud (1) to knuckle. Back nut off until nut is even with end of stud. **Keeping nut on at this location will help keep end of stud from distorting while using Puller in next step.**

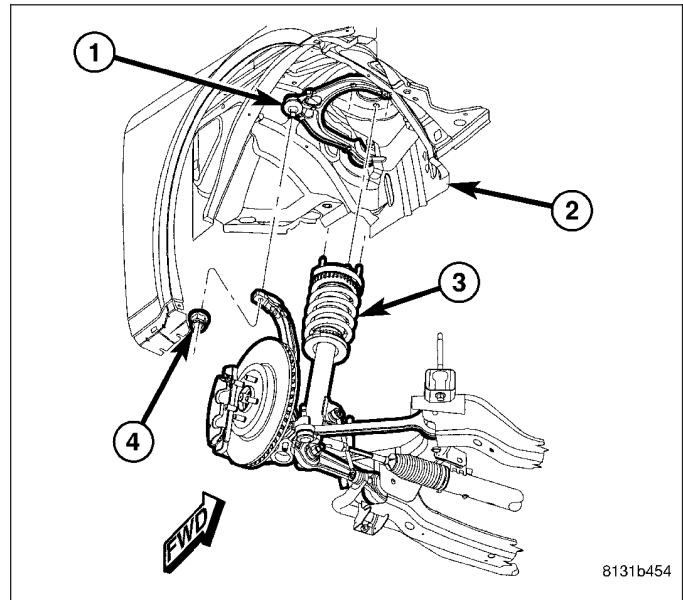


**CAUTION:** In following step, use care not to damage ball joint seal boot while sliding Puller, Special Tool 9360, into place past seal boot.

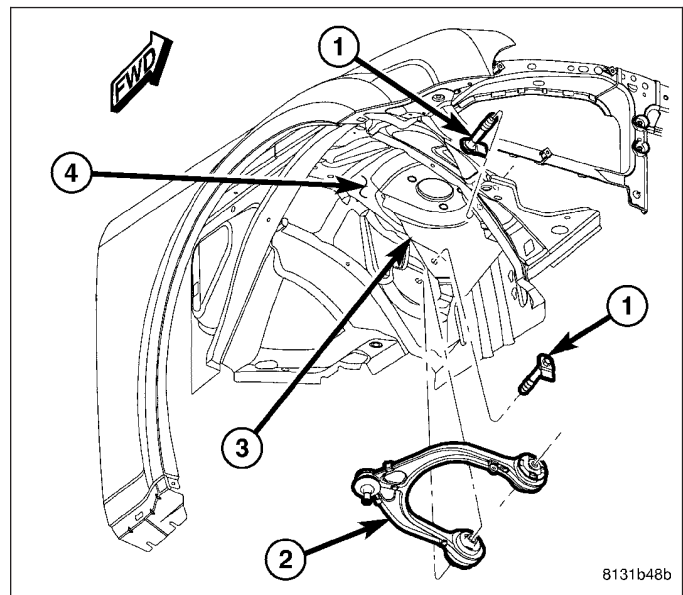
10. Using Puller (2), Special Tool 9360, separate upper ball joint stud (1) from knuckle.



11. Remove nut (4) from end of upper ball joint stud (1).
12. Pull shock assembly (3) downward until studs clear shock tower (2), then pull it outward allowing access to upper control arm mounting bolts.

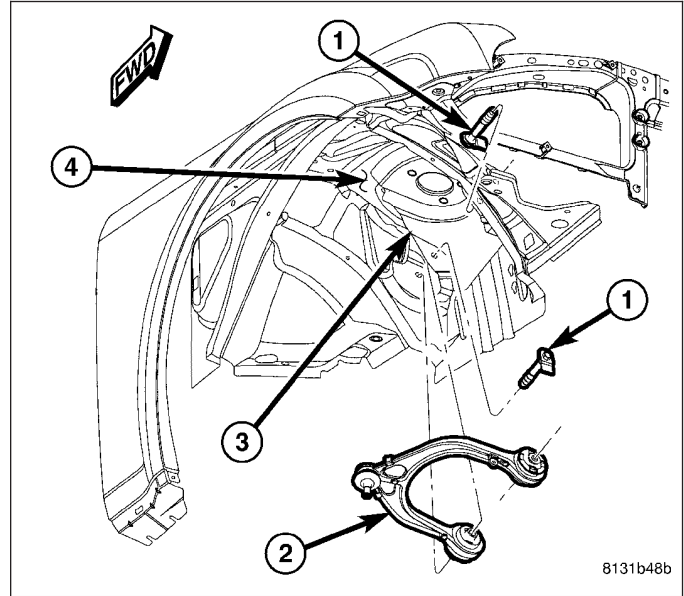


13. Remove upper control arm mounting (flag) bolts (1).
14. Remove upper control arm (2) from bracket (3) in shock tower (4).

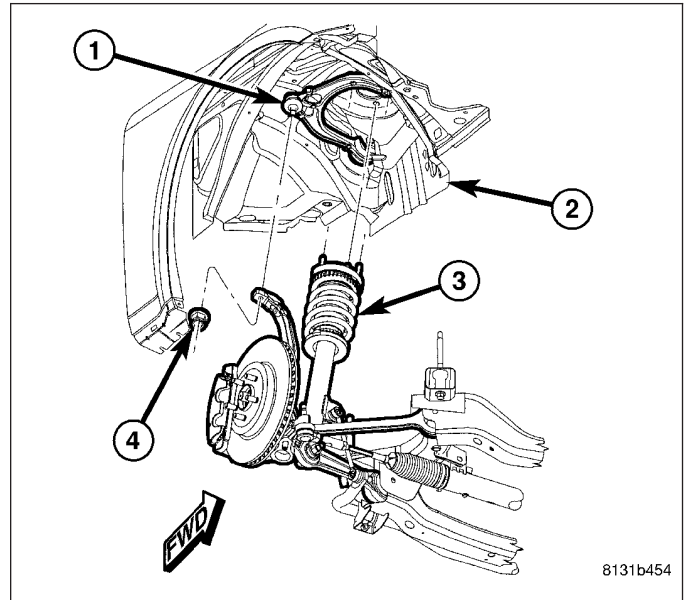


## INSTALLATION

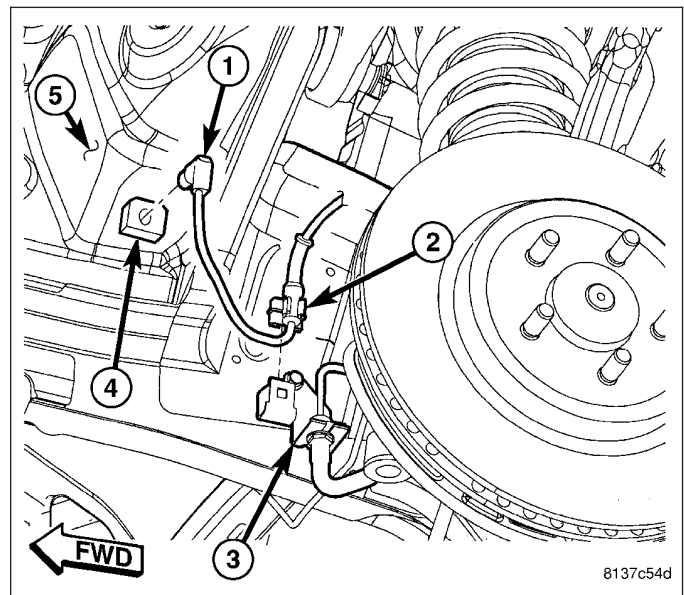
1. Slide upper control arm (2) into bracket (3) located in shock tower (4).
2. Install upper control arm mounting (flag) bolts (1) through bracket, arm and tower. Position flags on bolt heads outward, toward wheel opening.



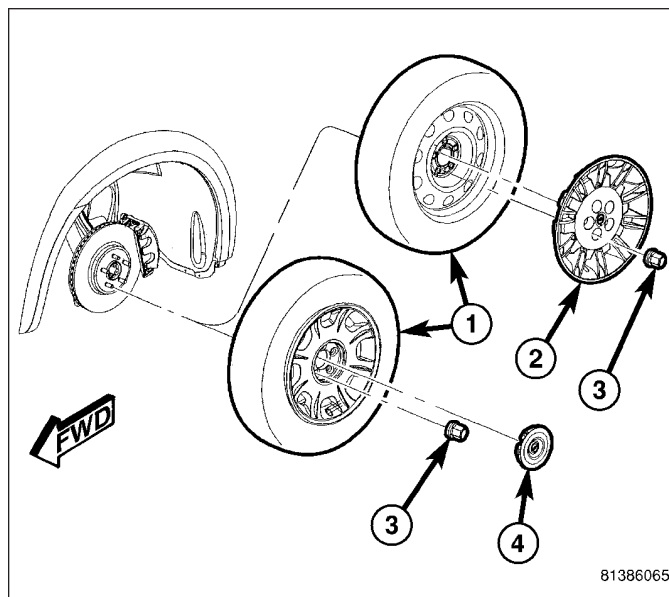
3. Move shock assembly (3) allowing studs to be inserted through shock tower (2) mounting holes.
4. Place upper ball joint stud (1) through hole in top of knuckle and install nut (4). Tighten nut by holding ball joint stud with a hex wrench while turning nut with a wrench. Tighten nut using crow foot wrench on torque wrench to 47 N·m + 90° turn (35 ft. lbs. + 90° turn) torque.



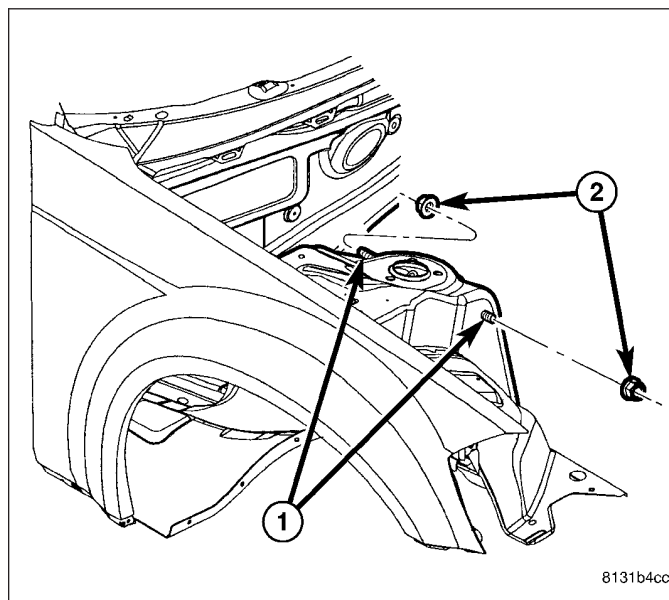
5. Connect wheel speed sensor cable routing clip (2) at brake tube bracket (3).



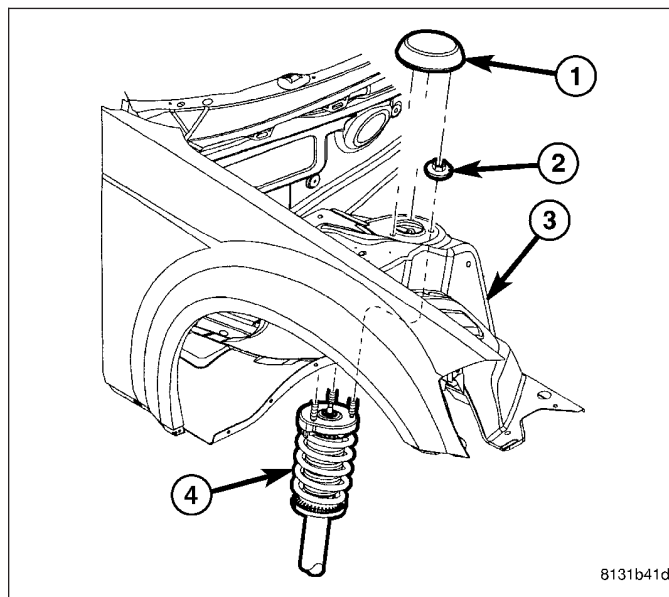
6. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque.
7. Lower vehicle to curb position.



8. Install nuts (2) on upper control arm body mounting bolts (1). Tighten nuts to 75 N·m (55 ft. lbs.) torque.



9. Install three nuts (2) fastening shock assembly (4) to shock tower (3). Tighten nuts to 27 N·m (20 ft. lbs.) torque.
10. Align shock tower cap (1) with shock mounting nuts (2) and snap into place.



11. If installing left upper control arm, install coolant recovery container. (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - INSTALLATION)
12. If installing right upper control arm, install IPM. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/INTEGRATED POWER MODULE - INSTALLATION)

REAR

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REAR

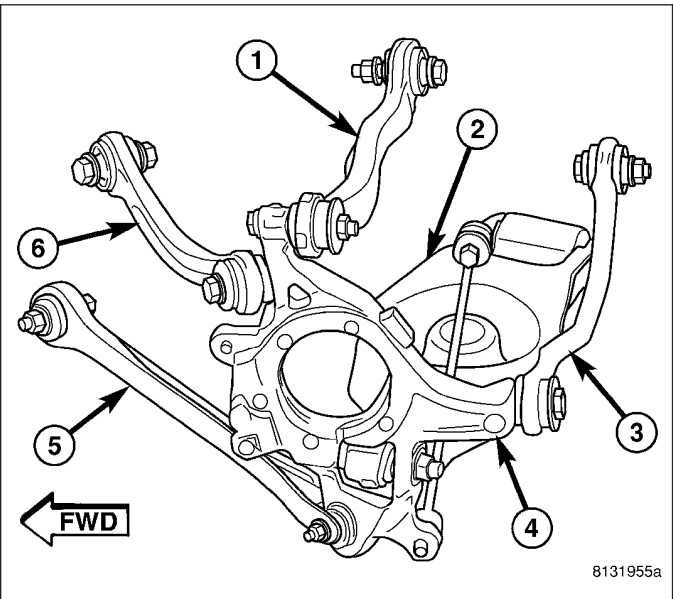
DESCRIPTION

This vehicle utilizes a five-link rear suspension including the following major components:

- Camber Link (1)
- Compression Link (5)
- Spring Link (2)
- Tension Link (6)
- Toe Link (3)
- Coil Spring
- Crossmember
- Hub And Bearing
- Knuckle (4)
- Shock Absorber
- Stabilizer Bar

The knuckle, camber link, compression link and tension link are **aluminum** castings. Extra care needs to be taken when servicing these components.

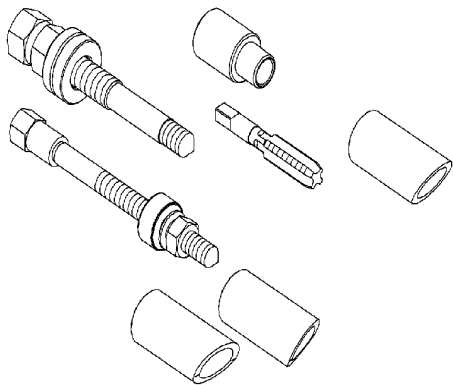
Service Procedures for the crossmember can be found in Frame And Bumpers. (Refer to 13 - FRAME & BUMPERS/FRAME/REAR CROSSMEMBER - REMOVAL)



**SPECIFICATIONS****REAR SUSPENSION FASTENER TORQUE**

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Brake Caliper Adapter Knuckle Bolts	119	88	—
Camber Link Crossmember Bolt	85	63	—
Camber Link Knuckle Bolt	98	72	—
Compression Link Crossmember Bolt	85	63	—
Compression Link Knuckle Bolt	81	60	—
Crossmember Mounting Bolts	180	133	—
Hub And Bearing Mounting Bolts	68	50	—
Hub Nut	213	157	—
Parking Brake Cable Knuckle Bolt	8	—	71
Shock Absorber Mounting Bolts - Upper	52	38	—
Shock Absorber Mounting Bolt Nut - Lower	72	53	—
Spring Link Crossmember Bolt	108	80	—
Spring Link Knuckle Nut	138	102	—
Stabilizer Bar Isolator Retainer Bolts	61	45	—
Stabilizer Link Nuts	61	45	—
Tension Link Crossmember Bolt	85	63	—
Tension Link Knuckle Bolt	98	72	—
Toe Link Crossmember Nut	108	80	—
Toe Link Knuckle Bolt	81	60	—



**SPECIAL TOOLS****REAR SUSPENSION**

***Remover/Installer, Sleeve 9361***

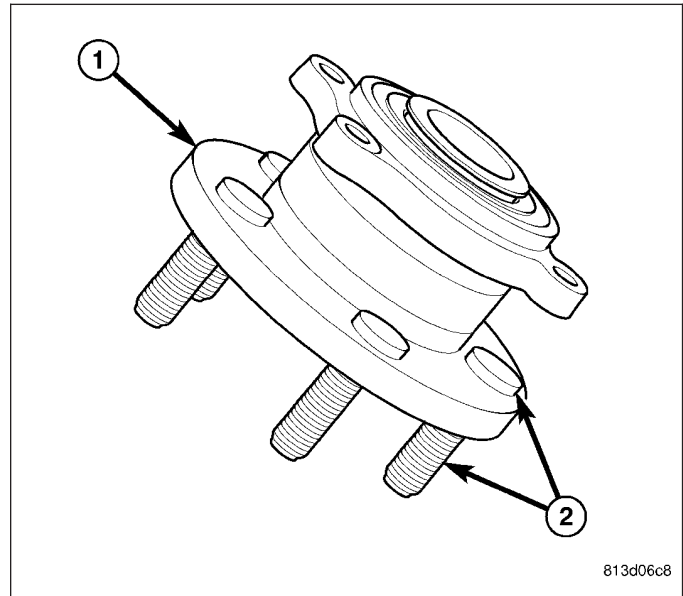
## HUB / BEARING

### DESCRIPTION

The rear wheel bearing and wheel hub of this vehicle are a one piece sealed unit or hub and bearing unit type assembly. The hub and bearing (1) is mounted to the center of the knuckle using 4 bolts. It has five wheel mounting studs (2) on the hub flange.

The center of the hub and bearing is splined to match the axle half shaft.

The wheel mounting studs used to mount the tire and wheel to the vehicle are the only replaceable components of the hub and bearing. Otherwise, the hub and bearing is serviced only as a complete assembly.



### DIAGNOSIS AND TESTING

#### HUB AND BEARING

**Note:** The hub and bearing is designed for the life of the vehicle and should require no maintenance.

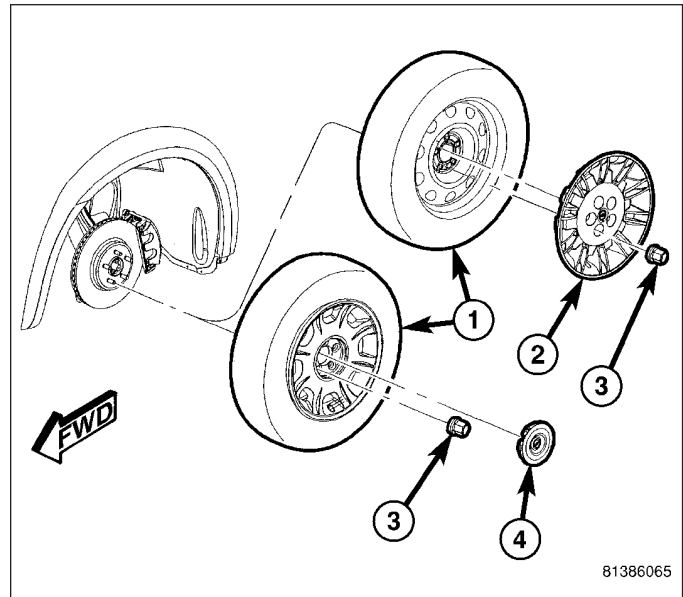
With wheel and brake rotor removed, rotate flanged outer ring of hub. Excessive roughness, lateral play or resistance to rotation may indicate dirt intrusion or bearing failure. If the rear wheel bearings exhibit these conditions during inspection, the hub and bearing assembly should be replaced.

Damaged bearing seals and resulting excessive grease loss may also require bearing replacement. Moderate grease loss from bearing is considered normal and should not require replacement of the hub and bearing assembly.

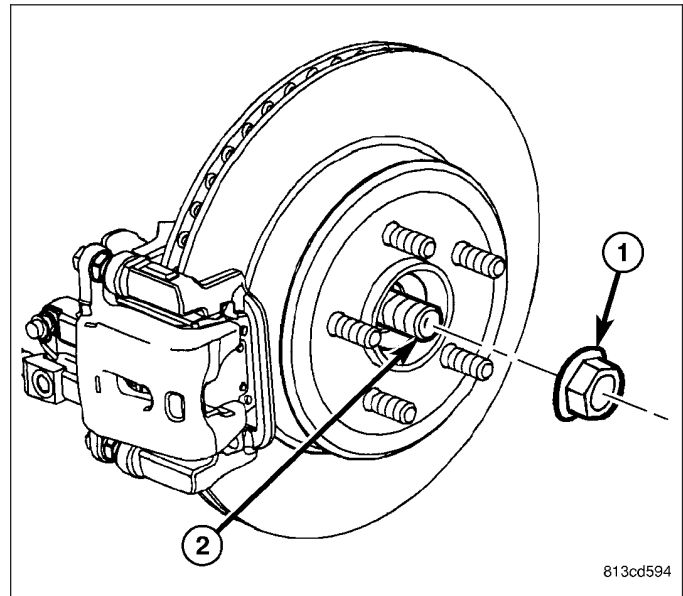
### REMOVAL

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

2. Remove wheel mounting nuts (3), then tire and wheel assembly (1).

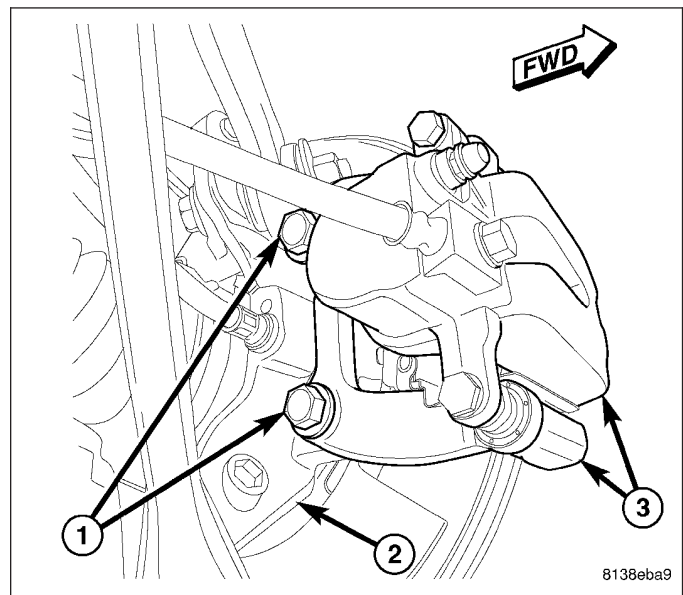


3. While a helper applies brakes to keep hub from rotating, remove hub nut (1) from the half shaft (2).

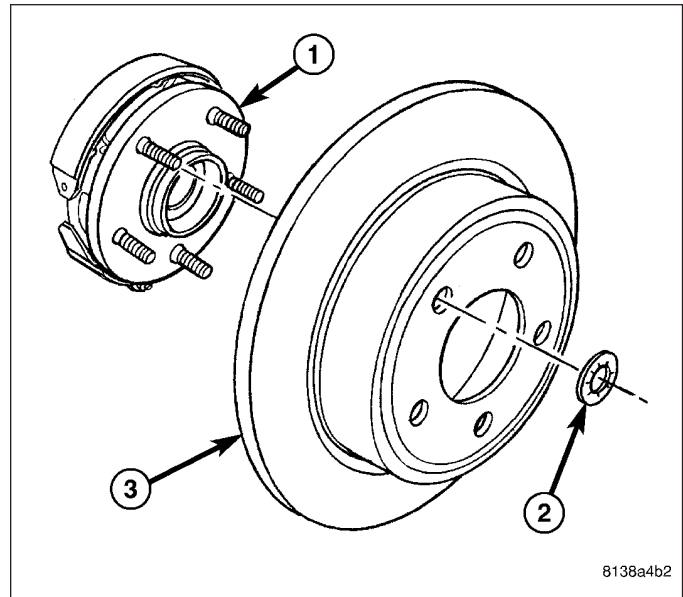


**Note:** In some cases, it may be necessary to retract caliper piston in its bore a small amount in order to provide sufficient clearance between shoes and rotor to easily remove caliper from knuckle. This can usually be accomplished before guide pin bolts are removed, by grasping rear of caliper and pulling outward working with guide pins, thus retracting piston. Never push on piston directly as it may get damaged.

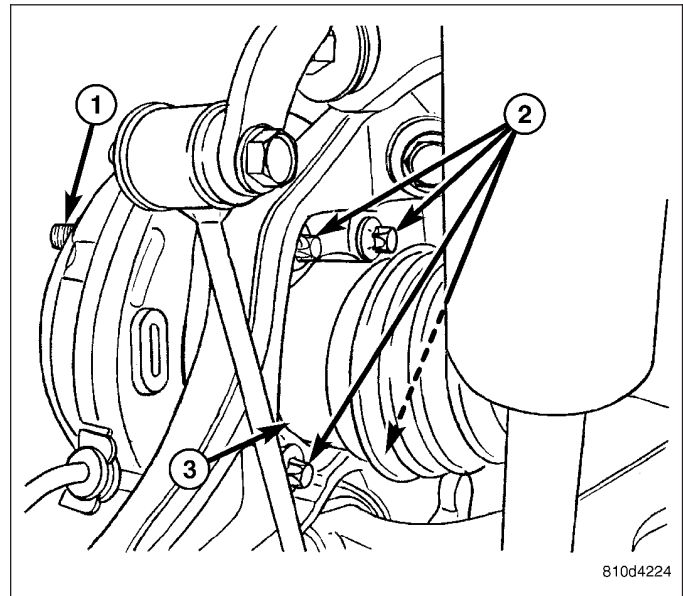
4. Remove two bolts (1) securing disc brake caliper adapter (3) to knuckle (2).
5. Remove disc brake caliper and adapter (3) from knuckle as an assembly. Hang assembly out of way using wire or a bungee cord. Use care not to overextend brake hose when doing this.



6. Remove any clips (2) retaining brake rotor (3) to wheel mounting studs.
7. Slide brake rotor (3) off hub and bearing (1).



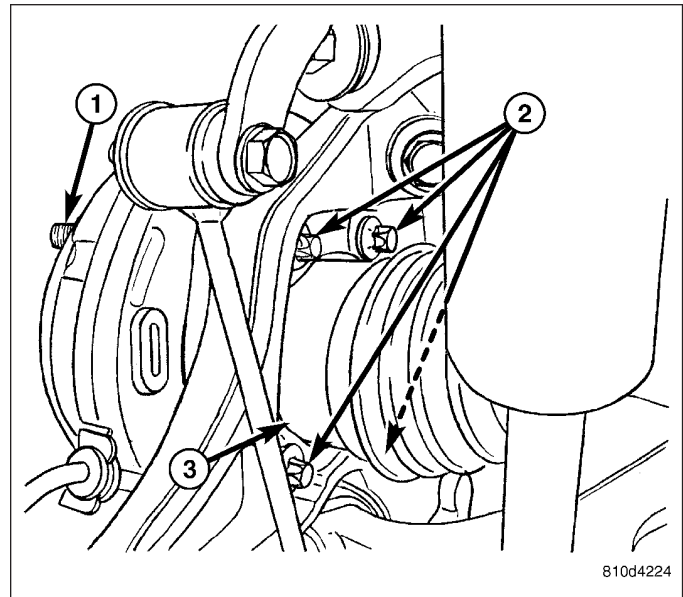
8. Loosen each hub and bearing mounting bolt (2) a turn or two at a time while pulling outward on hub and bearing to avoid bolt contact with half shaft outer joint. Once removed from threads in hub and bearing (but not knuckle), allow bolts to stay in and protrude through knuckle and brake support plate to keep brake support plate in place when hub and bearing is removed.
9. Slide hub and bearing off knuckle and half shaft.



## INSTALLATION

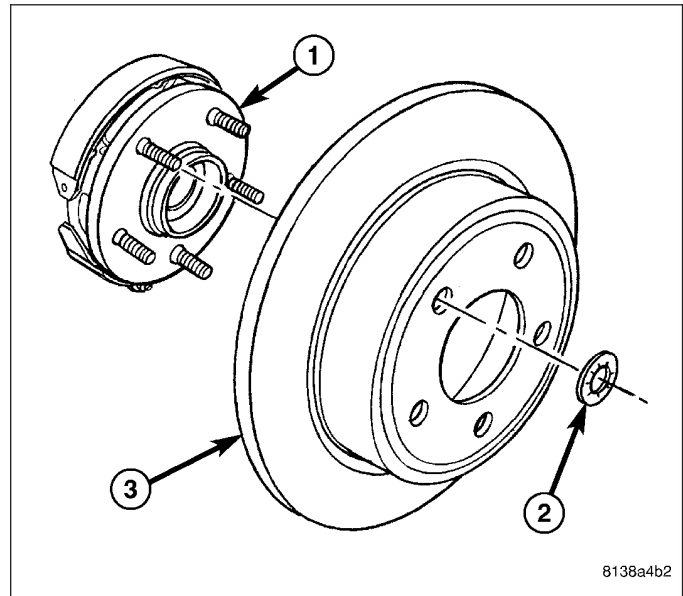
1. Position hub and bearing bolts through rear of knuckle and parking brake support just enough to hold support in place as hub and bearing is installed.
2. Slide hub and bearing onto half shaft. Place hub and bearing through brake support, onto knuckle, lining up mounting bolt holes with bolts.

3. Install four bolts (2) fastening hub and bearing in place. Tighten mounting bolts to 68 N·m (50 ft. lbs.) torque.

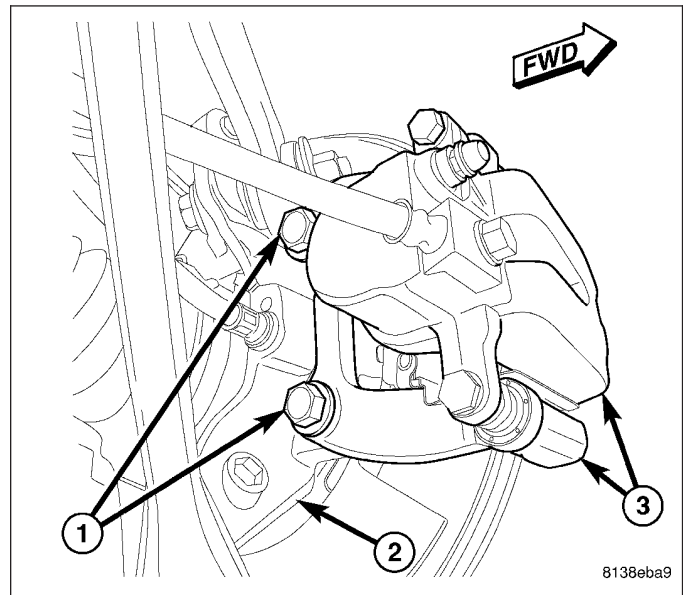


**Note: Inspect disc brake pads and parking brake shoes before brake rotor installation. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSPECTION)**

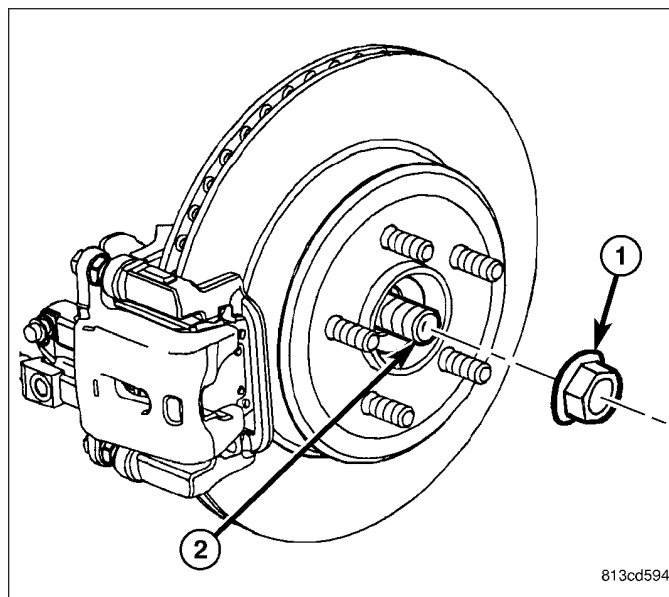
4. Install brake rotor (3) over wheel mounting studs and onto hub (1).



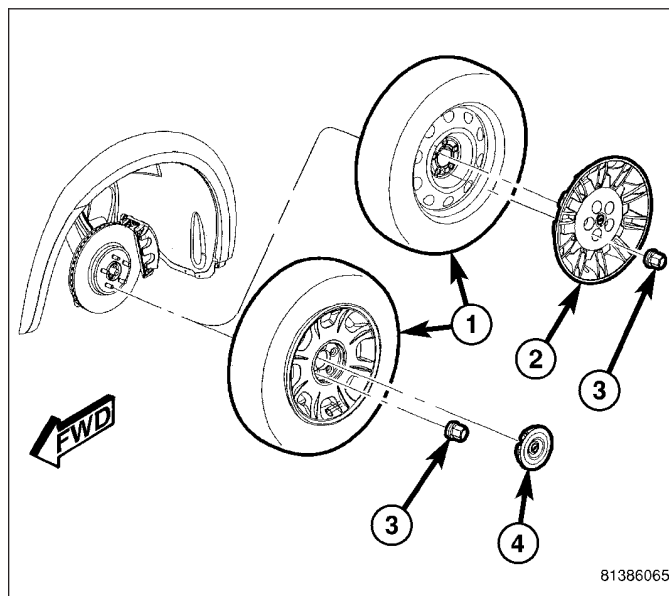
5. Install disc brake caliper and adapter assembly (3) over brake rotor.
6. Install mounting bolts (1) securing caliper adapter (3) to knuckle (2). Tighten bolts to 95 N·m (70 ft. lbs.) torque.



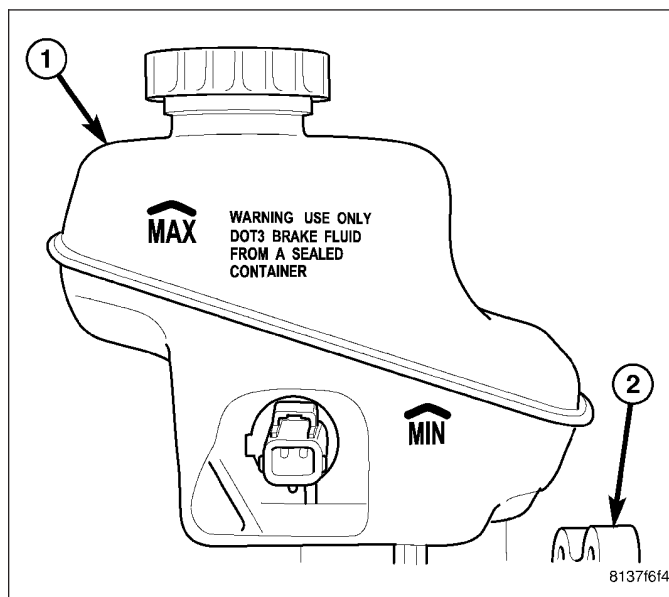
7. Install hub nut (1) on end of half shaft (2). While a helper applies brakes to keep hub from turning, tighten hub nut to 213 N·m (157 ft. lbs.) torque.
8. Verify proper adjustment of the parking brake shoes and adjust as necessary. (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENT)



9. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque.
10. Lower vehicle.
11. Pump brake pedal several times to ensure vehicle has a firm brake pedal before moving vehicle.



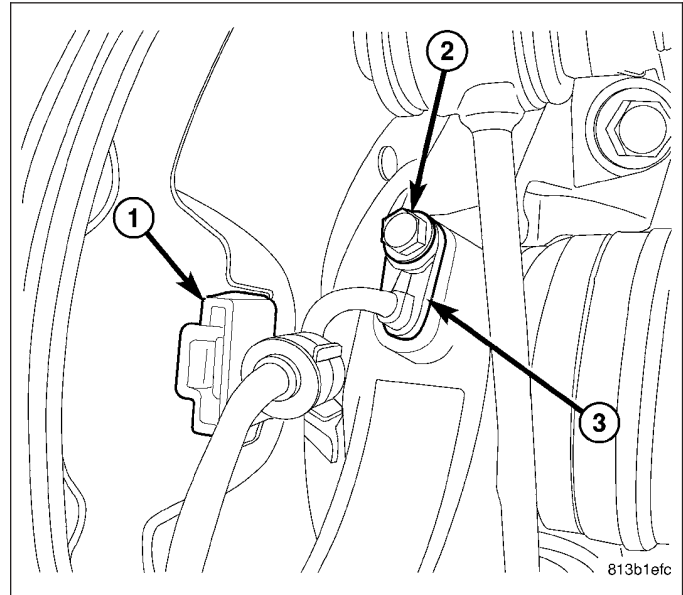
12. Check and adjust brake fluid level in reservoir (1) as necessary.
13. Road test vehicle and make several stops to wear off any foreign material on brakes and to seat brake pads.



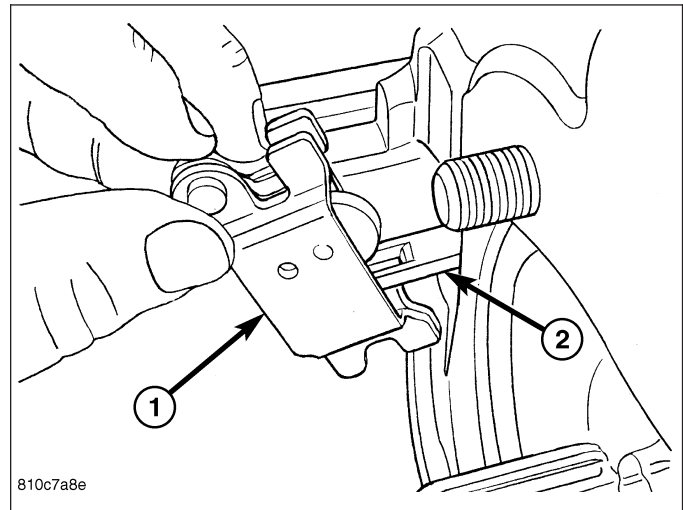
## KNUCKLE

### REMOVAL

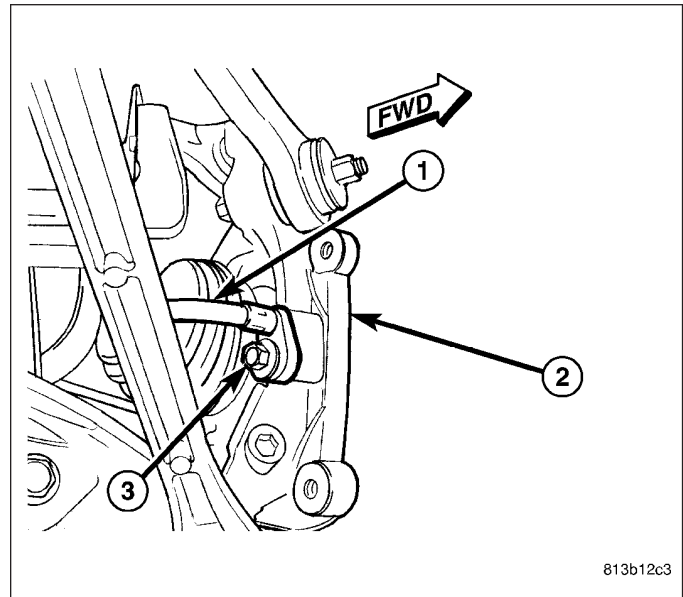
1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Unclip wheel speed sensor cable at rear brake rotor shield (1).
3. Remove screw (2) fastening sensor head (3) to rear knuckle.
4. Remove wheel speed sensor head from knuckle.
5. Access and remove rear hub and bearing. (Refer to 2 - SUSPENSION/REAR/HUB / BEARING - REMOVAL)
6. Remove parking brake shoes. (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - REMOVAL)



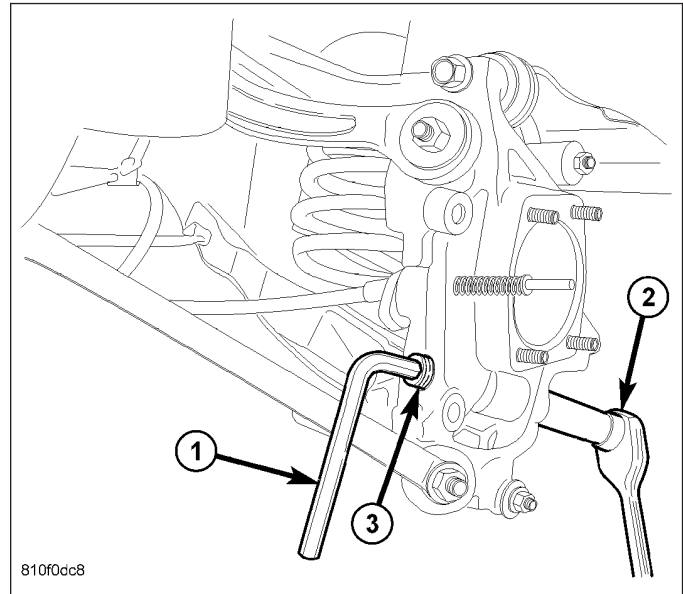
7. If not removed, remove parking brake shoe actuator lever (1) from end of cable (2).
8. Remove shoe support from knuckle.



9. Remove parking brake cable bolt (3) at knuckle (2) and pull cable (1) out of knuckle.
10. Position under-hoist utility jack or jack stand under spring link. Raise jack head to contact spring link at shock mount secure in place.

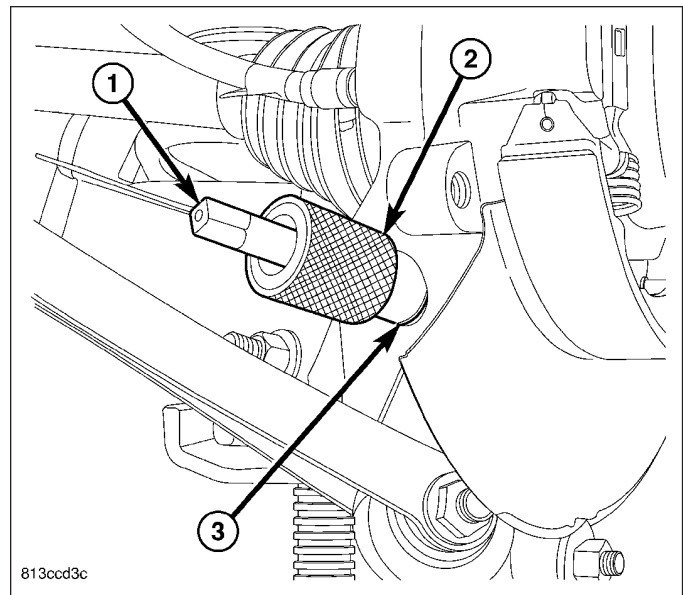


11. Remove spring link-to-knuckle nut and bolt (3).



**CAUTION:** It is important to use Guide (2) , Special Tool 9361-2, when tapping sleeve in knuckle to help keep Tap (1) , Special Tool 9361-1, straight during use or damage to Tap may occur.

12. Place Guide 9361-2 (2) against sleeve (3) in knuckle to keep Tap 9361-1 (1) straight. Using Tap with an appropriate handle, cut threads approximately halfway through bushing (or about six complete threads). **It is important to back tap out, clean out burrs and lubricate Tap often during process.**





**Note:** Prior to using Special Tool 9361, lubricate Bolt (1) threads to provide ease of use and promote tool longevity.

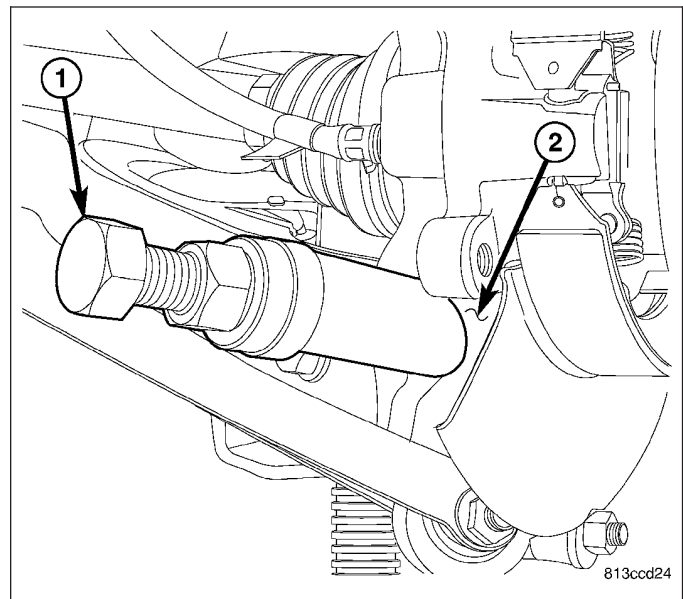
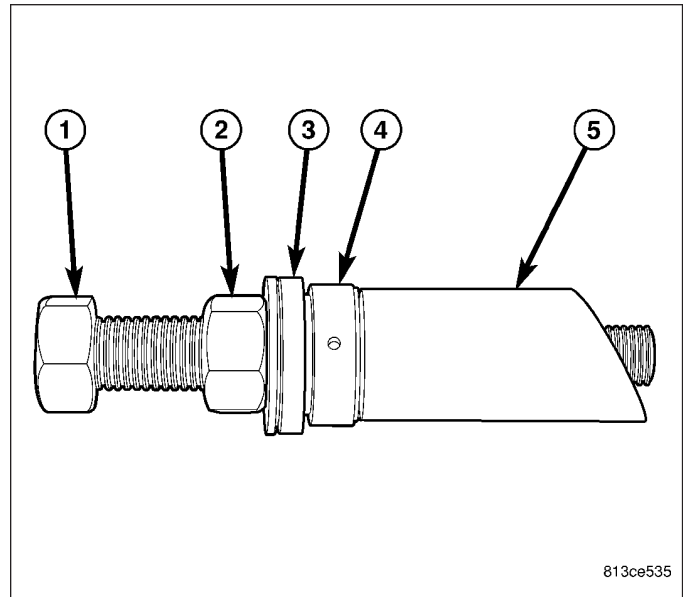
13. Assemble Remover, Special Tool 9361, as shown.

- Bolt 9361-3
- Nut
- Spherical Washer
- Thrust Bearing
- Sleeve 9361-4 (RWD)
- Sleeve 9361-5 (AWD – Left Side)
- Sleeve 9361-6 (AWD – Right Side)

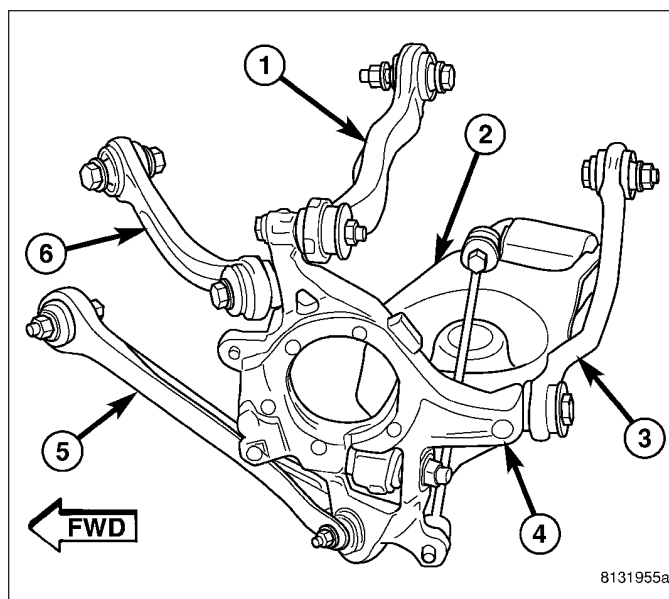
**Note:** When installing Thrust bearing on Remover, be sure to place hardened side against nut.

**Note:** It is important to use appropriate Sleeve on Remover to provide proper Tool-to-Knuckle contact. RWD sleeve can be used on either side while AWD knuckles require specific left or right side Sleeves.

14. Thread Remover Bolt 9361-3 (1) into tapped knuckle sleeve.
15. Rotate Nut down, matching Sleeve angled end with angled face of knuckle.
16. Continue to rotate Nut until knuckle sleeve is removed from knuckle. **Discard knuckle sleeve; replace it with new upon installation.**

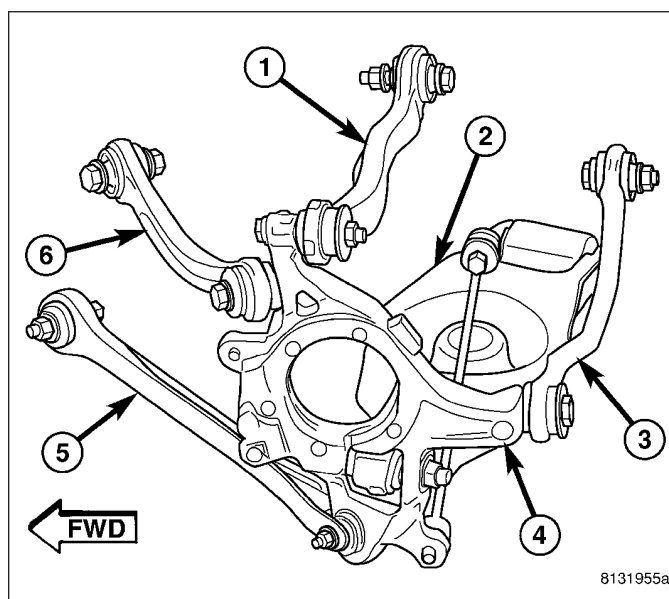


17. Remove bolt and nut fastening compression link (5) to knuckle (4).
18. Remove bolt fastening toe link (3) to knuckle (4).
19. Remove nut and bolt fastening stabilizer link to knuckle (4).
20. Remove nut and bolt fastening tension link (6) to knuckle (4).
21. Remove nut and bolt fastening camber link (1) to knuckle (4).
22. Remove knuckle (4).
23. Remove hub mounting bolts from knuckle.



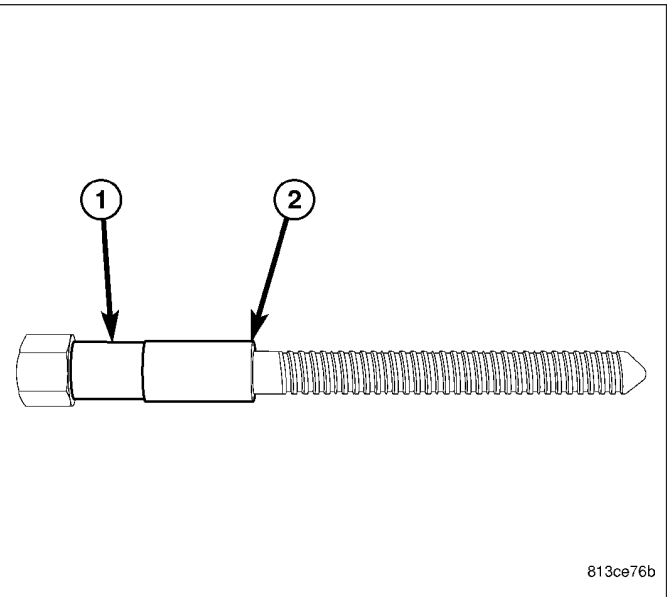
## INSTALLATION

1. Install four hub mounting bolts through knuckle from inboard side allowing ends to protrude from opposite side.
2. Install bolt and nut fastening camber link (1) to knuckle (4) as shown. **Do not tighten bolt at this time.**
3. Install bolt and nut fastening tension link (6) to knuckle (4) as shown. **Do not tighten bolt at this time.**
4. Install bolt and nut fastening stabilizer link to knuckle (4). **Do not tighten bolt at this time.**
5. Install bolt fastening toe link (3) to knuckle (4). **Do not tighten bolt at this time.**
6. Install bolt and nut fastening compression link (5) to knuckle (4). **Do not tighten bolt at this time.**

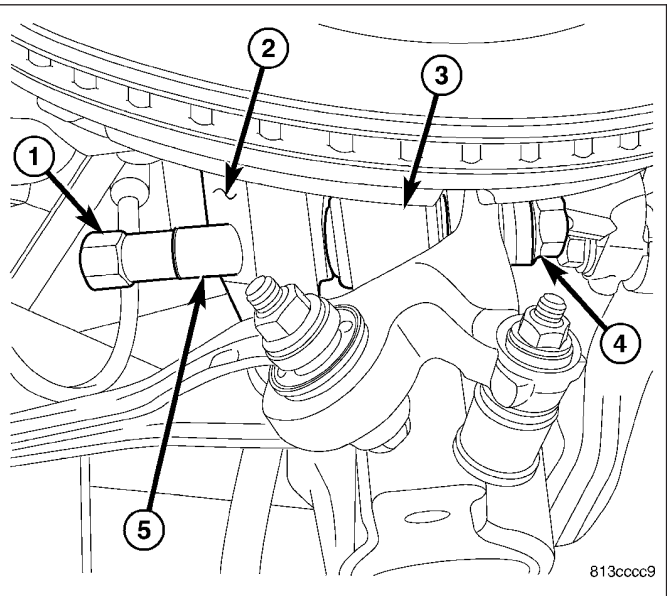


**Note:** Prior to using Special Tool 9361, lubricate bolt (1) threads to provide ease of use and promote tool longevity.

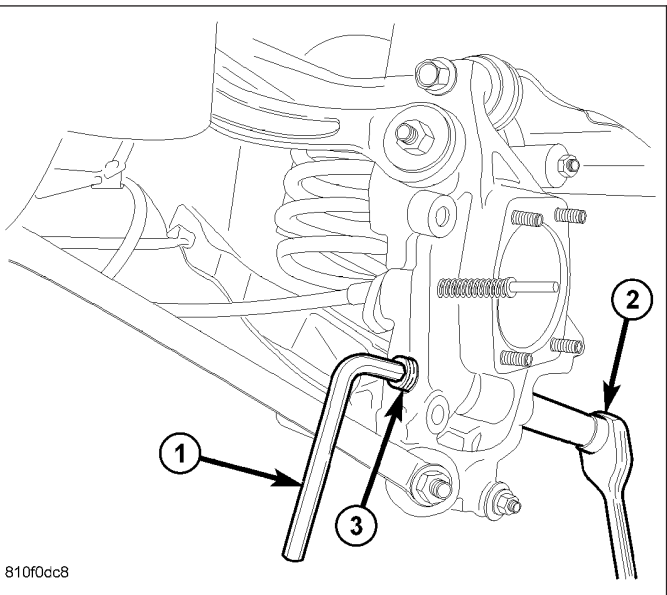
7. Place NEW knuckle sleeve (2) onto Installer Bolt 9361-7 (1), and slide it up to Bolt's head.



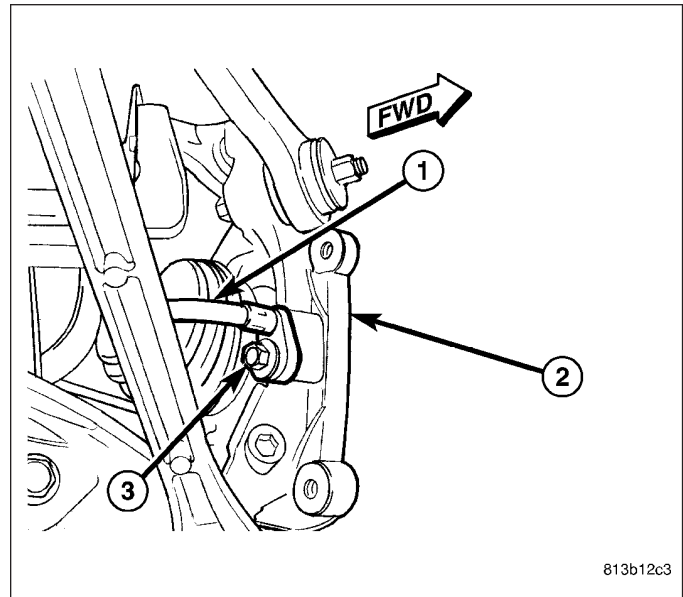
8. Slide Bolt 9361-7 (1) with sleeve (5) through knuckle (2) and spring link ball joint (3) starting from knuckle forward end.
9. Install thrust bearing and nut (4) on end of Bolt.
10. While holding Bolt head (1) stationary, rotate Nut (4) (using hand tools) installing sleeve in knuckle. Install sleeve until Nut stops turning. **Do not over-tighten Nut.**
11. Remove special tool.



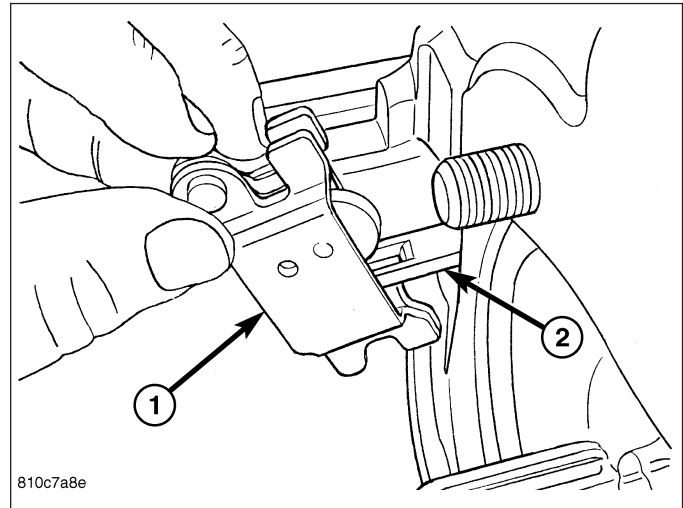
12. Install spring link-to-knuckle bolt and nut as shown. While holding bolt head stationary, tighten nut to 138 N·m (102 ft. lbs.) torque.
13. Remove under-hoist utility jack or jack stand from under spring link.



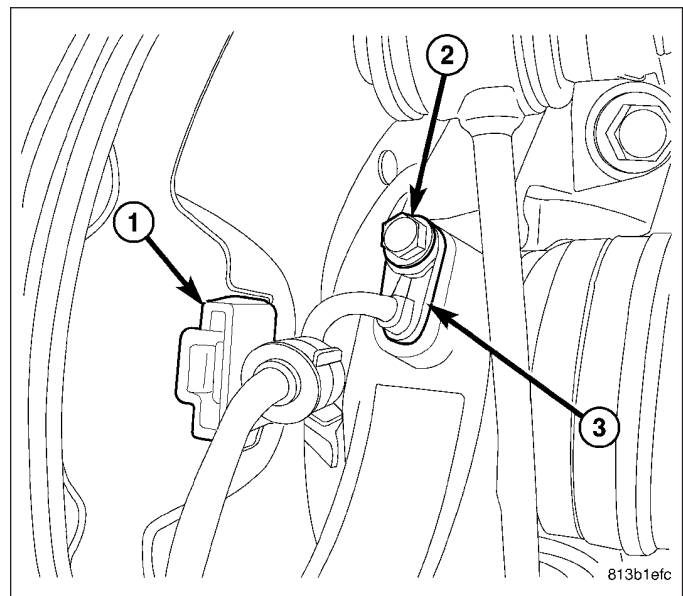
14. Insert end of cable (1) through rear knuckle (2) and install mounting screw (3). Tighten screw to 8 N·m (71 in. lbs.) torque.
15. Install parking brake shoe support over hub and bearing mounting screws and onto face of knuckle.



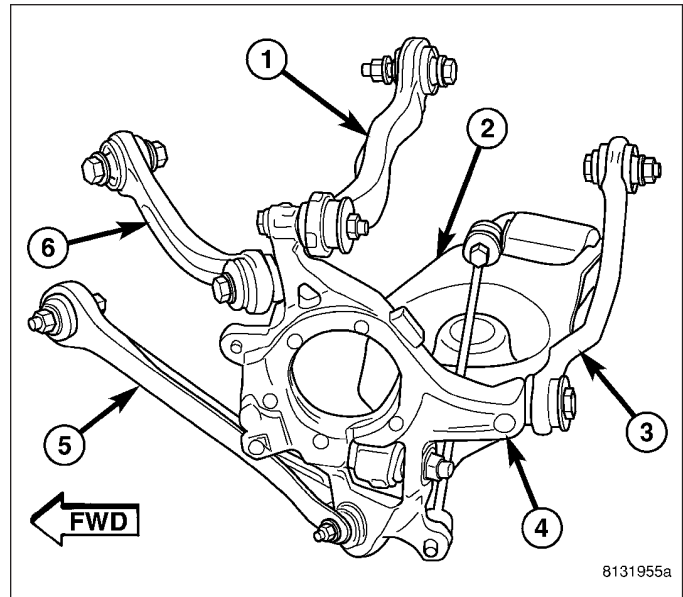
16. Install shoe actuator lever (1) on end of parking brake cable (2). Make sure actuator lever is positioned with word "UP" facing outward.
17. Install parking brake shoes as well as all components necessary to access them. (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - INSTALLATION)



18. Install hub and bearing as well as all components necessary to access it. (Refer to 2 - SUSPENSION/REAR/HUB / BEARING - INSTALLATION)
19. Insert wheel speed sensor head (3) into mounting hole in rear of knuckle.
20. Install screw (2) fastening sensor head (3) to rear knuckle. Tighten Screw to 11 N·m (97 in. lbs.) torque.
21. Install sensor cable at rear brake rotor shield (1).
22. Lower vehicle.
23. Adjust parking brake shoes as necessary. (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENTS)
24. Position vehicle on alignment rack/drive-on hoist. Raise vehicle as necessary to access mounting bolts.



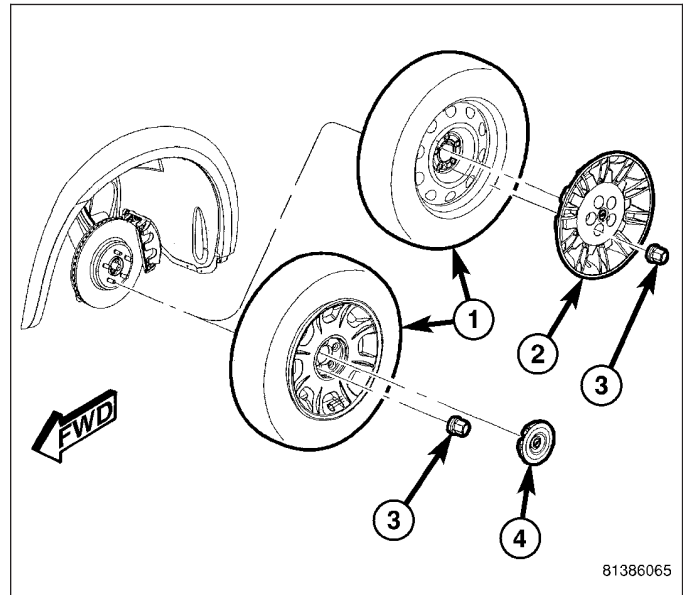
25. Tighten fasteners at knuckle (vehicle at curb height) as follows:
- Camber Link (1) – 98 N·m (72 ft. lbs.) torque.
  - Compression Link (5) – 81 N·m (60 ft. lbs.) torque.
  - Stabilizer Link – 61 N·m (45 ft. lbs.) torque.
  - Tension Link (6) – 98 N·m (72 ft. lbs.) torque.
  - Toe Link (3) – 81 N·m (60 ft. lbs.) torque.
26. Perform wheel alignment. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)



## CAMBER LINK

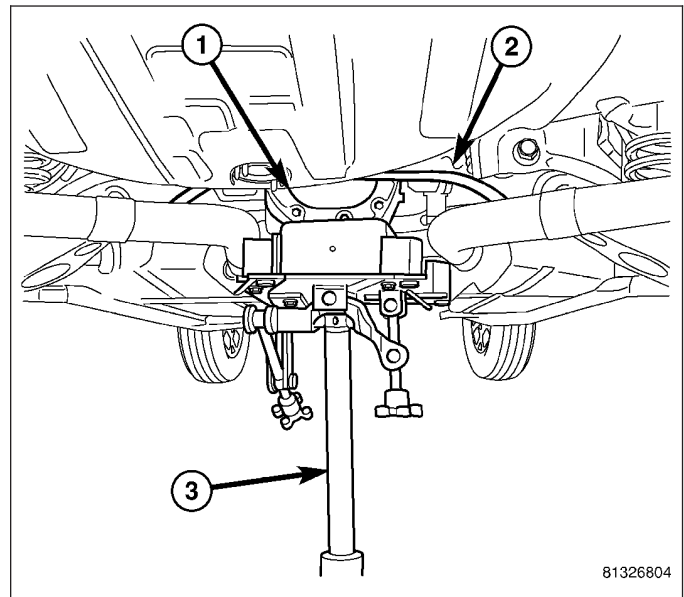
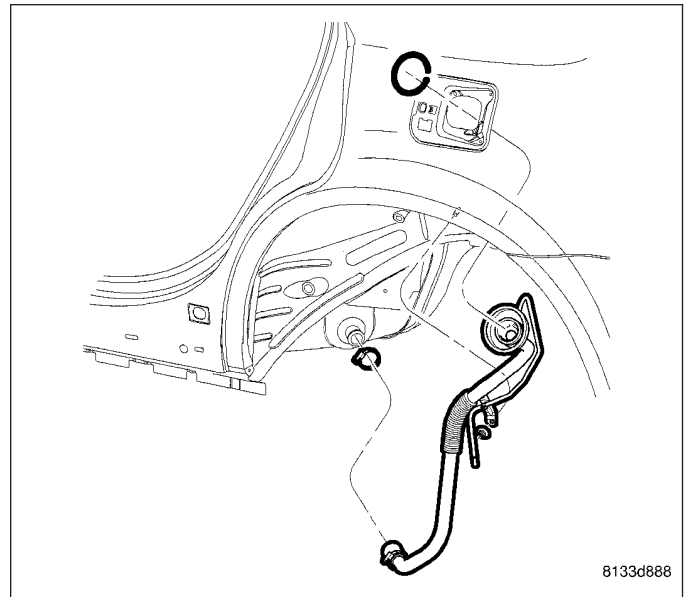
### REMOVAL

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. On both sides of vehicle, remove wheel mounting nuts (3), then rear tire and wheel assembly (1).

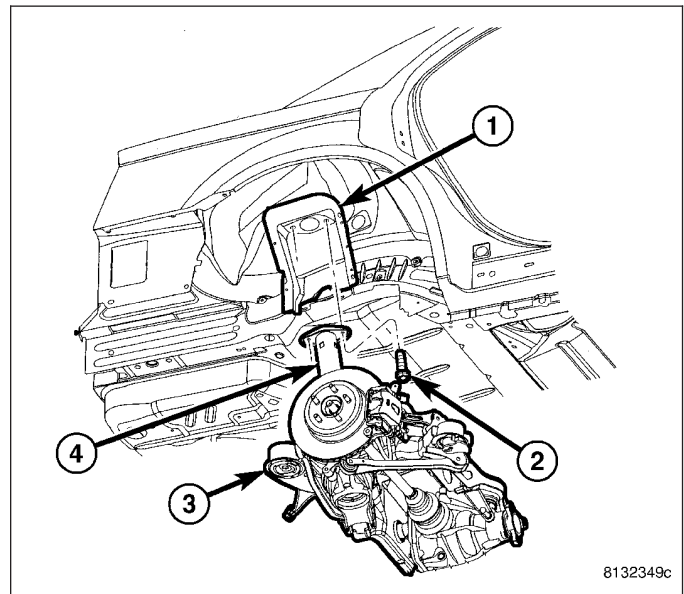


**WARNING: Before opening fuel system, review all Warnings and Cautions.**

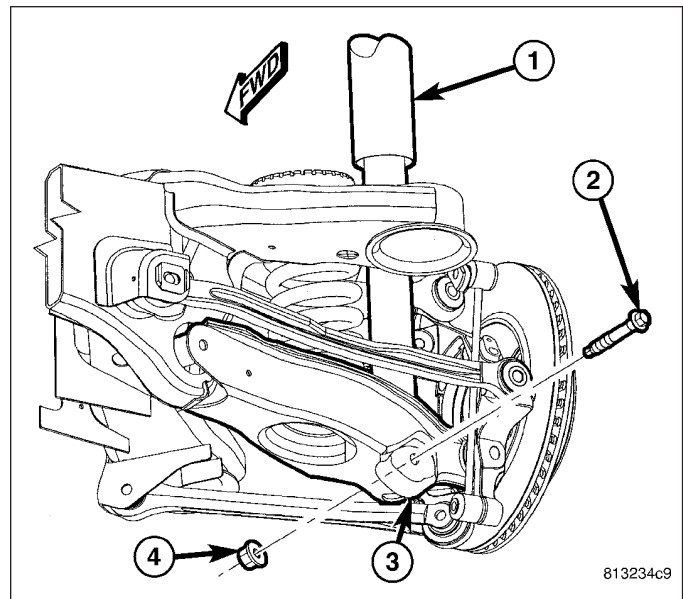
3. If servicing left side, remove fuel filler tube. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK FILLER TUBE - REMOVAL)
4. Position an extra pair of jack stands under and support forward end of engine cradle to help stabilize vehicle during rear suspension removal/installation.
5. Perform following if vehicle is equipped with dual-exhaust or are servicing right side on vehicle with single exhaust.
  - a. Position under-hoist utility jack or stand several inches below exhaust at muffler.
  - b. Disconnect exhaust isolators at muffler and resonators hangers.
  - c. Lower exhaust down to rest upon top of jack or stand placed below muffler.
6. Position under-hoist utility jack or transmission jack (3) under center of rear axle differential (1). Raise jack head to contact differential and secure in place. **When securing crossmember to jack, be sure not to secure stabilizer bar.**



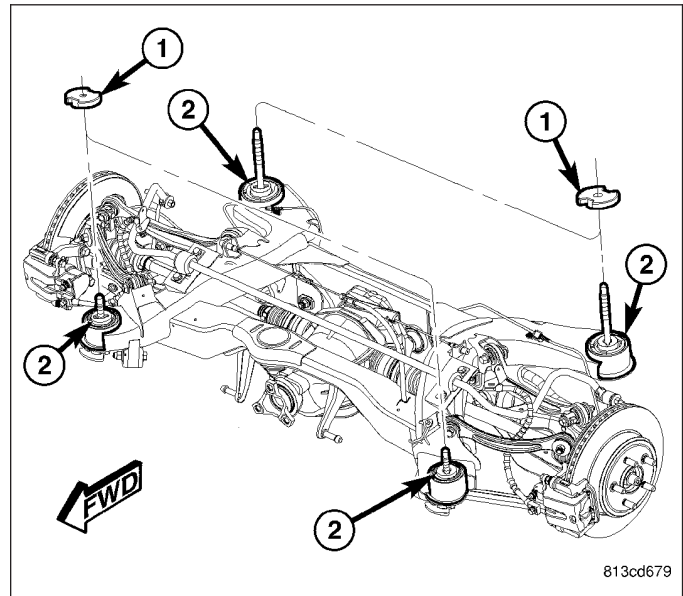
7. Remove shock absorber (1) upper mounting screws (2).



8. Remove shock absorber (1) lower mounting bolt (2) and nut (4).



**Note:** If equipped with AWD, when removing crossmember mounting bolts in following step, be sure to not to misplace spacers (1) between crossmember mounts (2) and body.

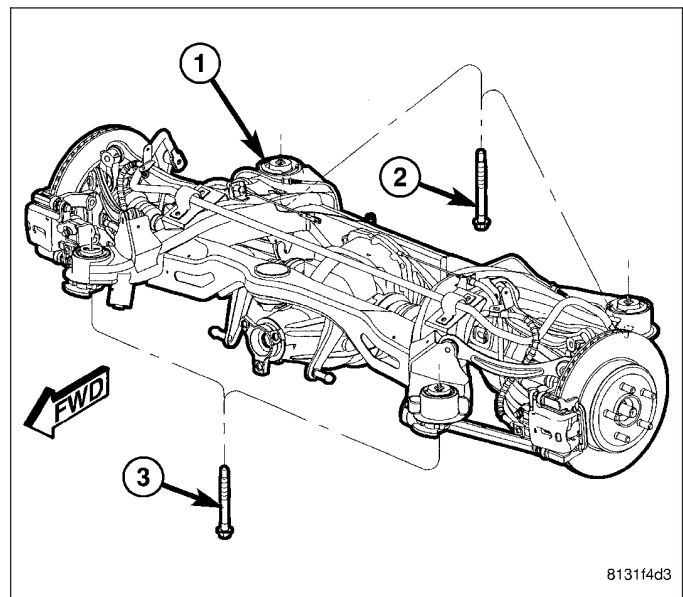


**CAUTION:** When removing crossmember mounting bolts (2 and 3) it is important NOT to loosen or remove crossmember mounting bolts on opposite side of vehicle. Doing so will require rear wheel alignment following reinstallation to ensure proper thrust angle.

9. Remove both front and rear crossmember mounting bolts (2 and 3) on repair-side of vehicle.

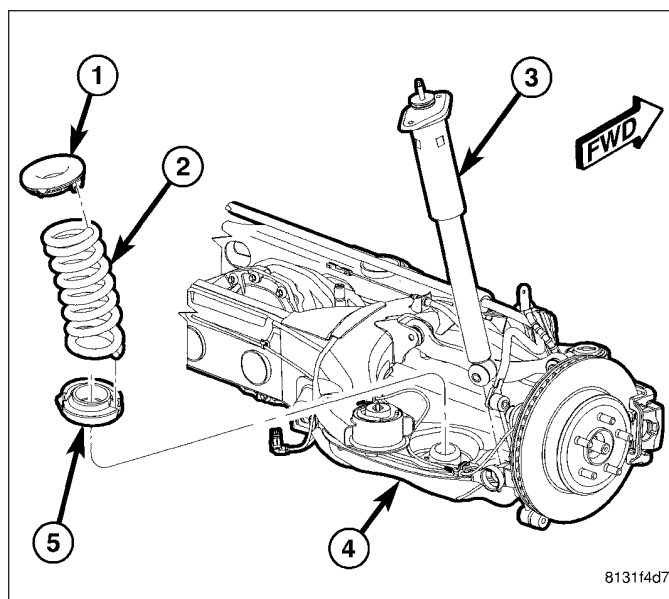
**CAUTION:** To avoid damaging other components of vehicle, do not lower crossmember (1) any further than necessary to remove shock absorber.

10. **Slowly** lower jack allowing repair-side of crossmember to drop. **Do not lower jack at a fast rate.** Lower jack just enough to allow top of shock absorber to clear body flange.



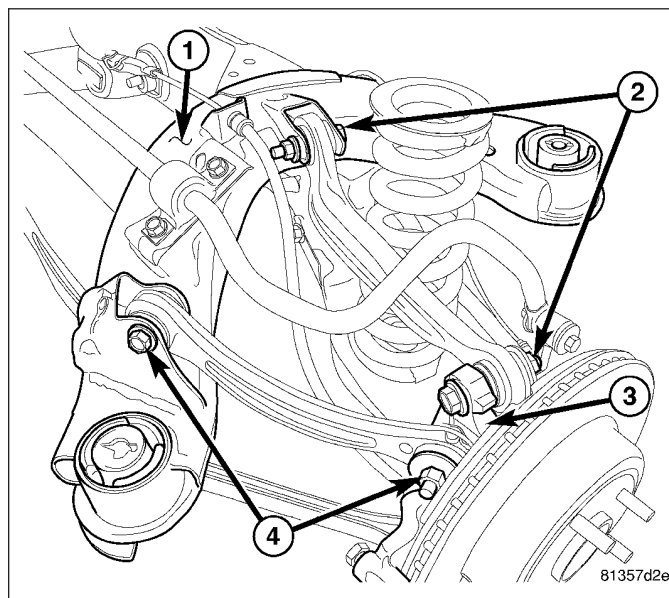


11. Remove shock absorber (3) by tipping top outward and lifting lower end out of pocket in spring link (4).



**Note:** Do not lower repair-side of crossmember any further than necessary to gain access to link mounting bolts at crossmember.

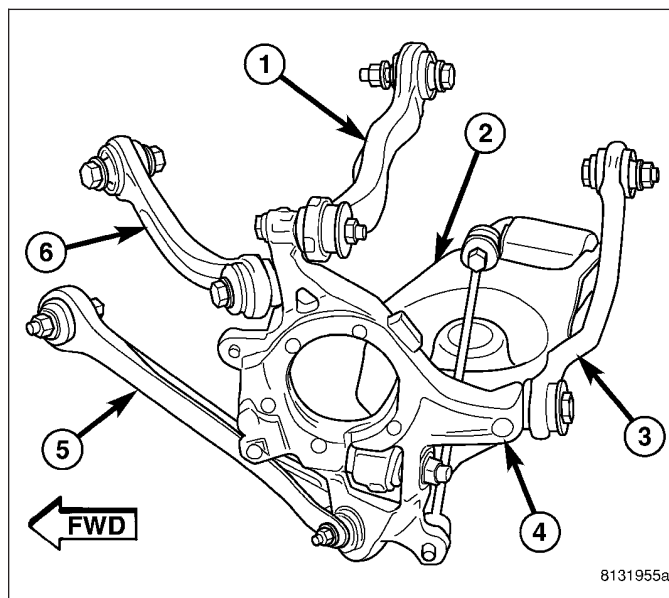
12. Remove nut and bolt (2) mounting link to knuckle (3).
13. Remove nut and bolt (2) mounting link to crossmember (1).
14. Remove link.



## INSTALLATION

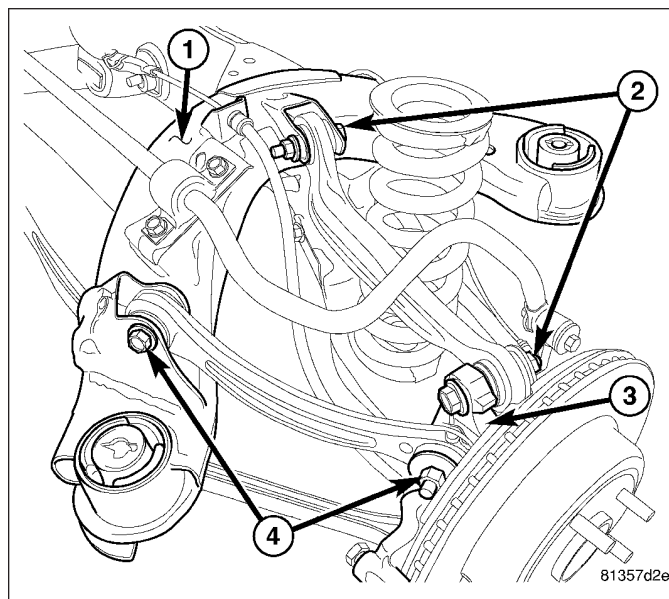
**Note:** When installing link (1), ensure following to avoid mis-installation:

- Heavier, thicker end goes toward crossmember.
- Fore-or-aft bow faces forward (curves around coil spring).
- Up-or-down bow faces downward.

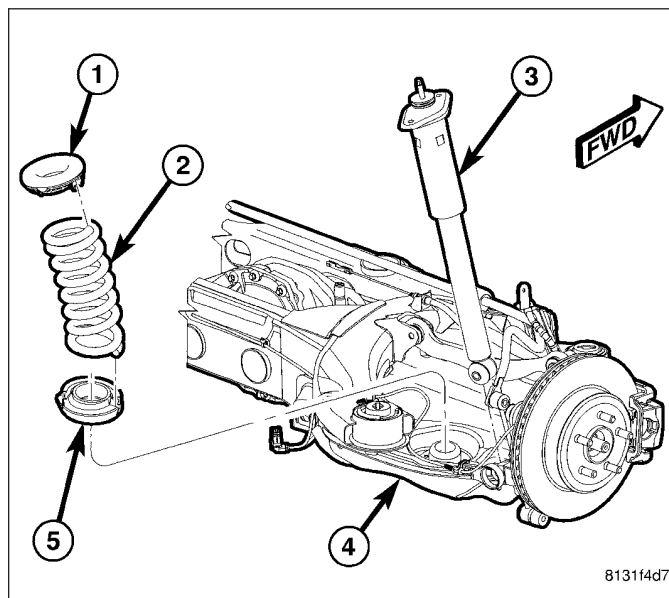




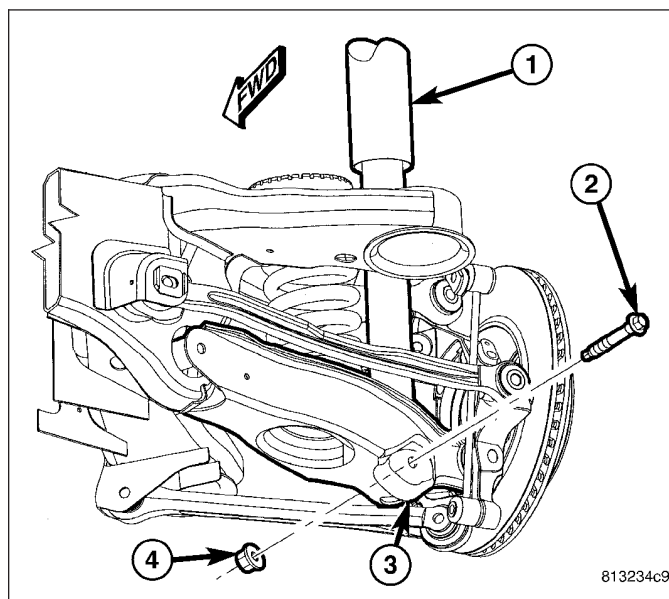
1. Place link in bracket on crossmember (1). Install bolt and nut (2) at crossmember (1) as shown. **Do not tighten bolt at this time.**
2. Install bolt and nut (2) mounting link to knuckle (3) as shown. **Do not tighten bolt at this time.**



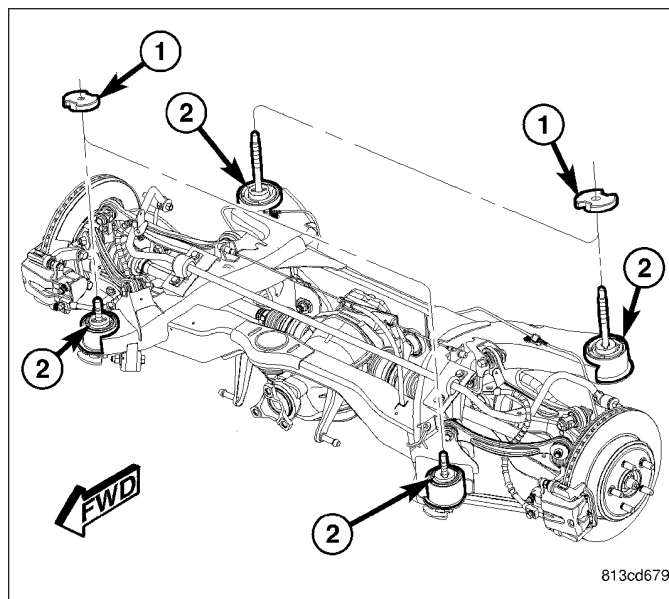
3. Install shock absorber (3) by setting lower end into pocket in spring link (4), then tipping top inward until aligned with upper mounting holes.



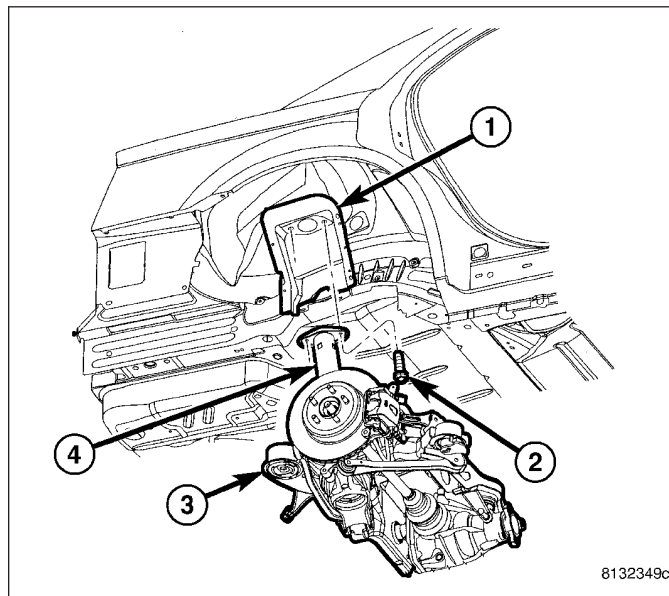
4. Install lower shock mounting bolt and nut. **Do not tighten at this time.**



5. If vehicle is equipped with AWD, make sure spacers (1) on top of crossmember mount bushings (2) on side of repair are in position.

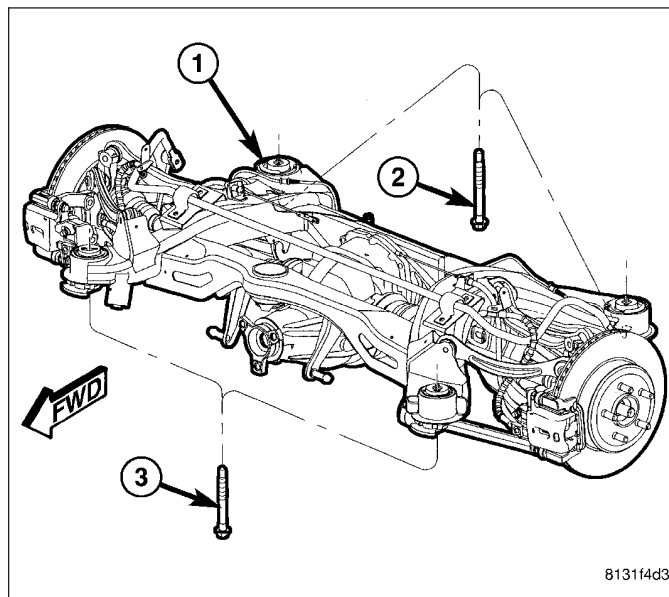


6. Carefully raise jack, guiding coil spring and upper end of shock absorber (4) into mounted positions.
7. Install shock absorber upper mounting screws (2). Tighten upper mounting screws to 52 N·m (38 ft. lbs.) torque.

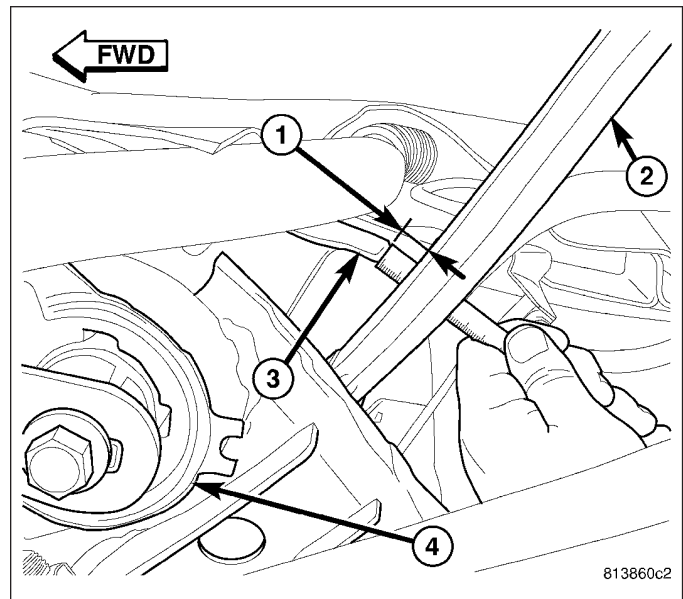


**Note:** Rear crossmember mounting bolts (2) are longer than front mounting bolts (3). Do not interchange mounting bolts.

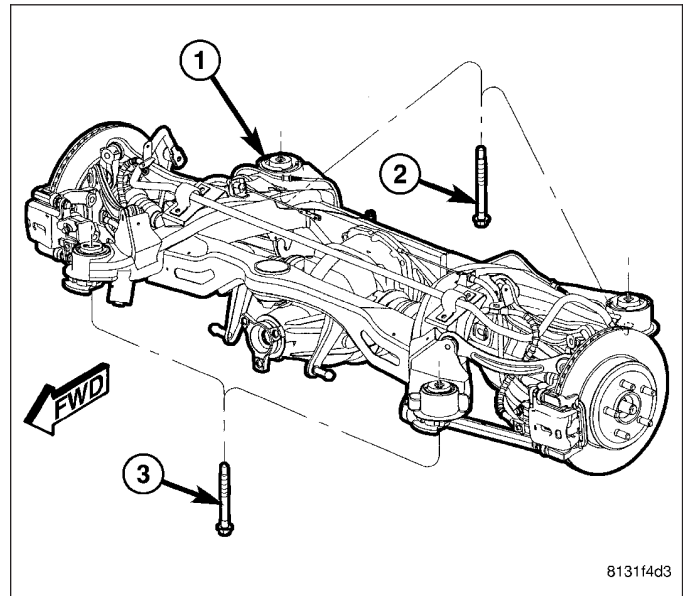
8. Install crossmember mounting bolts (2 and 3). Snug, but do not fully tighten bolts at this time.



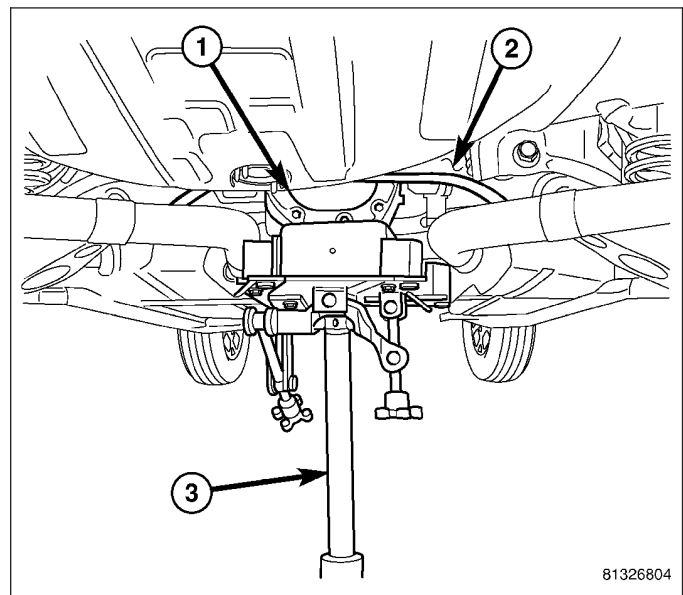
9. Measure distance (1) between from tension link (2) to body weld flange (3) directly in front of it, just outboard of front mount bushing (4). **This distance must be at least 12 mm to allow proper clearance for suspension movement.** If distance is less than 12 mm, shift that side of rear crossmember directly rearward until distance is 12 mm or greater. To do so, loosen 3 mounting bolts slightly, leaving one on opposite side of shift snugged to pivot off of. Shift crossmember rearward and snug loosened bolts. Measure opposite side to be sure it also maintains minimum 12 mm distance.



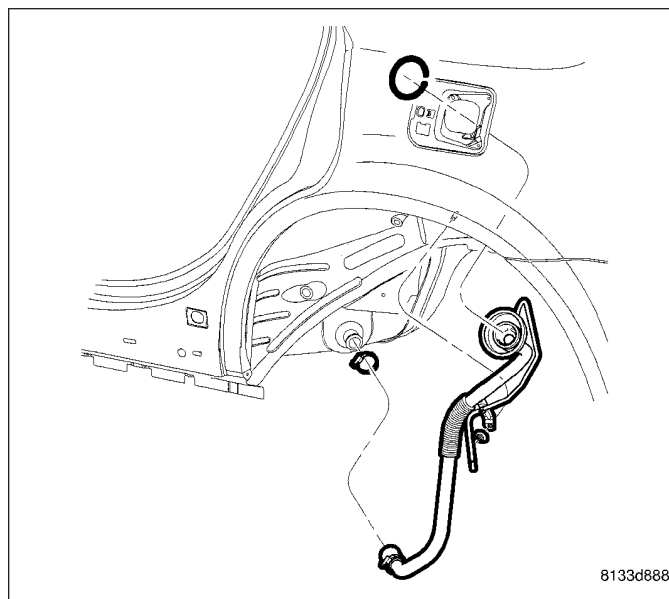
10. Tighten all crossmember mounting bolts (2 and 3) to 180 N·m (133 ft. lbs.) torque.



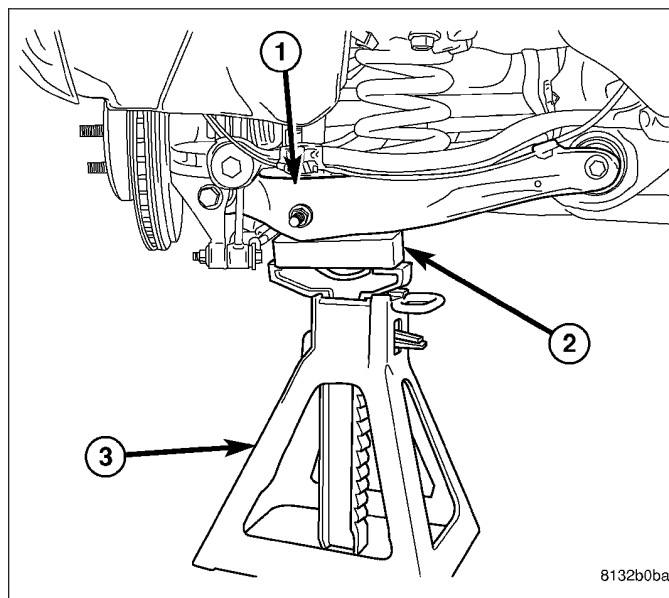
11. Remove jack (3) from under rear axle differential.  
12. If previously lowered, raise rear exhaust back to mounted position and connect exhaust isolators at muffler and resonators hangers. Remove jack or stand below exhaust muffler.



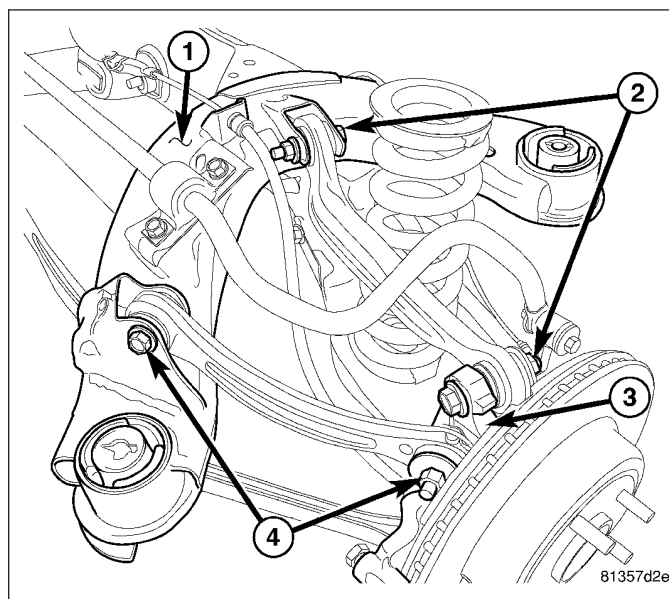
13. If removed, install fuel filler tube. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK FILLER TUBE - INSTALLATION)



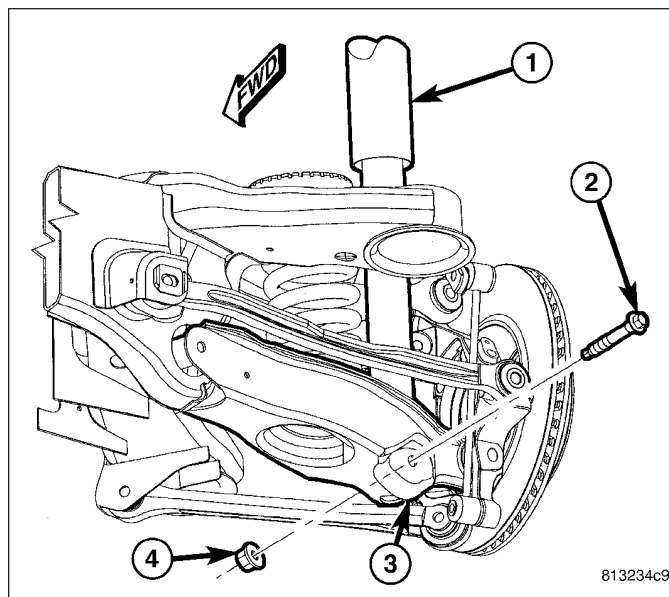
14. Lower vehicle until front tires contact floor but rear is still suspended. Place jack stands under each rear suspension spring link. Place an appropriate wooden block between stand and link to avoid damaging spring link, then lower vehicle until full vehicle weight is supported by suspension.



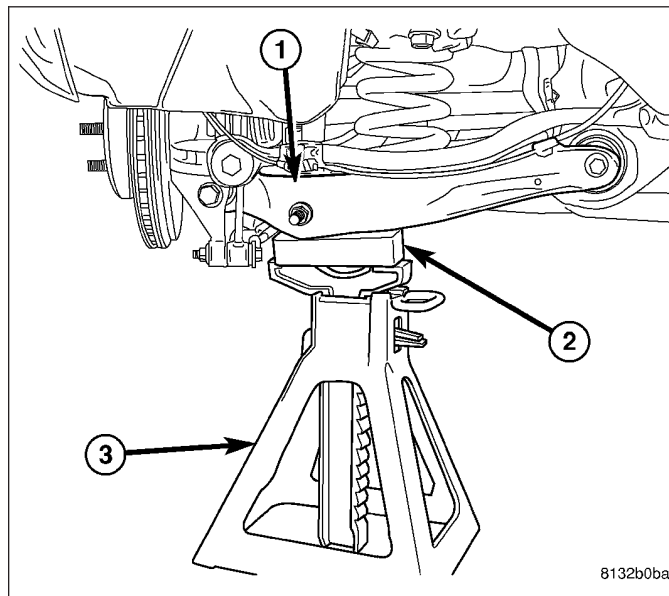
15. Tighten camber link fasteners (2) to:
- Bolt at crossmember – 85 N·m (63 ft. lbs.) torque.
  - Bolt nut at knuckle – 98 N·m (72 ft. lbs.) torque.



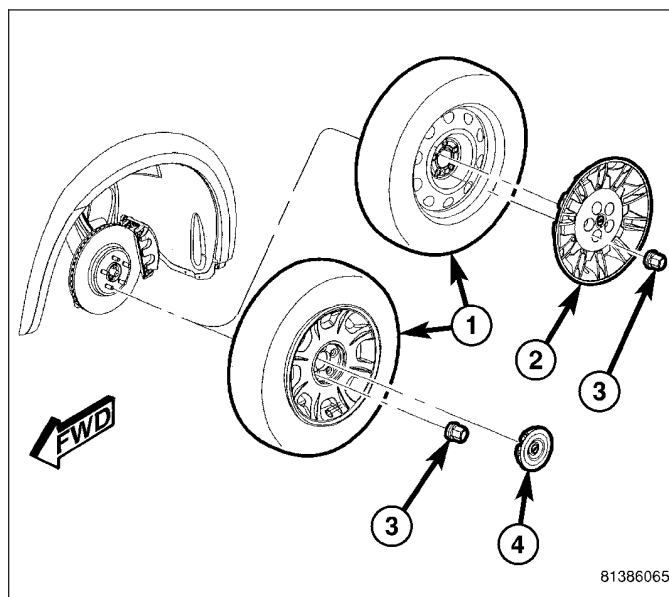
16. Tighten shock absorber lower mounting bolt nut (4) to 72 N·m (53 ft. lbs.) torque.



17. Raise vehicle and remove jack stands (3).



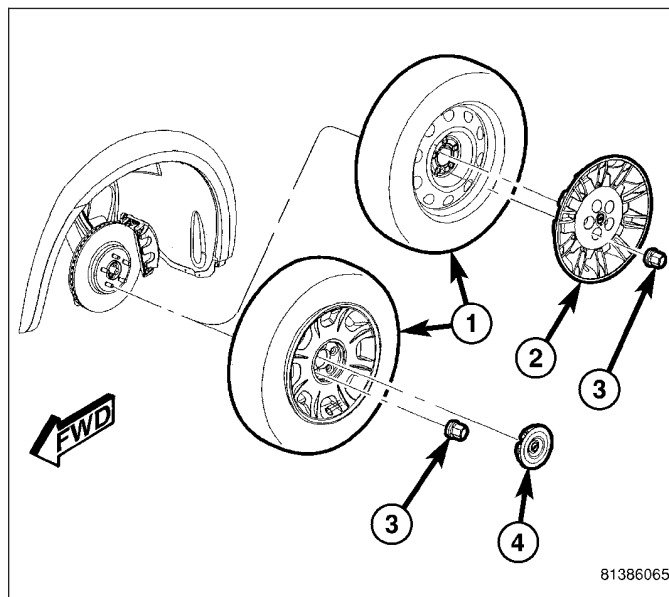
18. Install tire and wheel assemblies (1). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
19. Lower vehicle.
20. Perform wheel alignment. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)



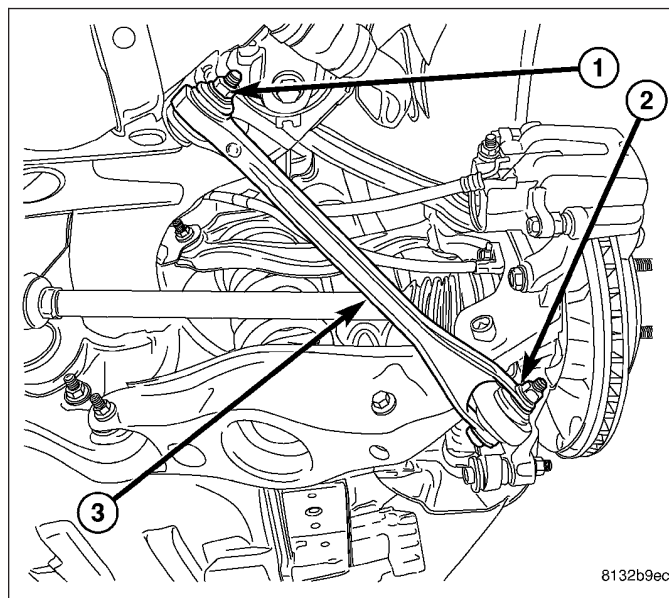
## COMPRESSION LINK

### REMOVAL

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove wheel mounting nuts (3), then rear tire and wheel assembly (1).



3. Remove bolt and nut (2) mounting link (3) at knuckle.
4. Remove bolt and nut (1) mounting link (3) at cross-member.
5. Remove link (3).

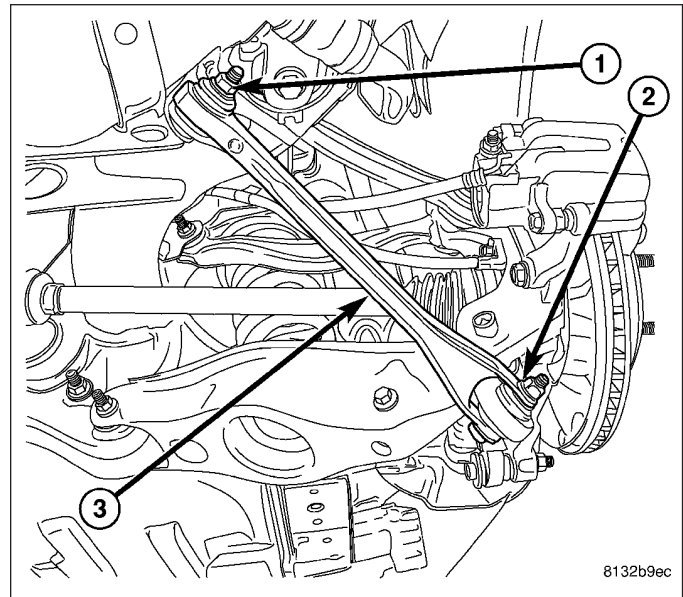


### INSTALLATION

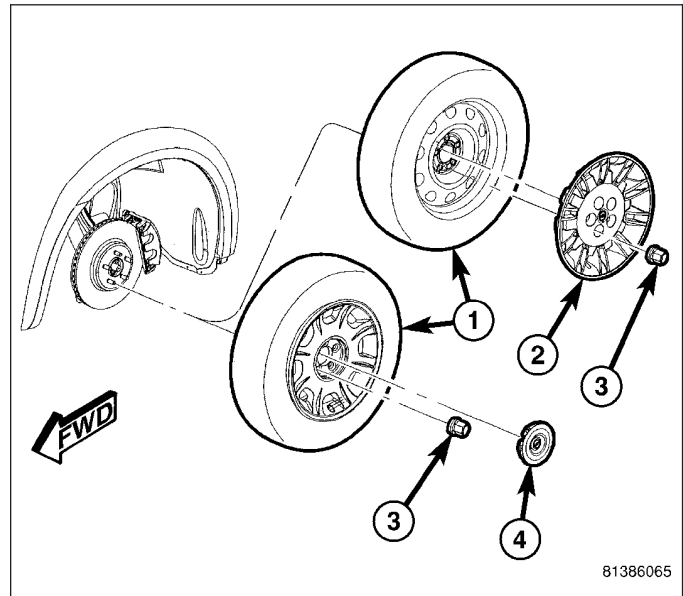
**Note:** Although the compression link is different end-to-end, there is no top and bottom.



1. Position link and install bolt and nut (1) mounting link (3) at crossmember. **Do not tighten bolt at this time.**
2. Install bolt and nut (2) mounting link (3) at knuckle. **Do not tighten bolt at this time.**



3. Install tire and wheel assembly (1). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
4. Lower vehicle.
5. Position vehicle on alignment rack/drive-on lift. Raise vehicle as necessary to access link fasteners.
6. Tighten compression link fasteners to:
  - Bolt at crossmember – 85 N·m (63 ft. lbs.) torque.
  - Bolt at knuckle – 81 N·m (60 ft. lbs.) torque.
7. Perform wheel alignment. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

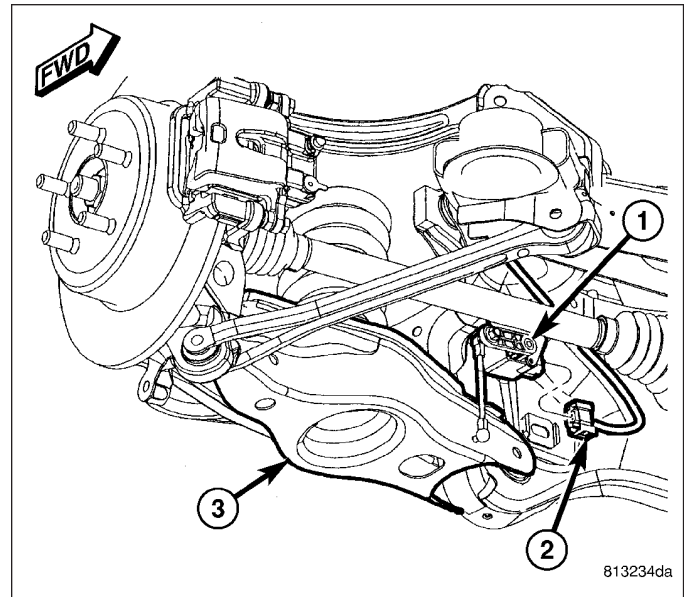


## SPRING LINK

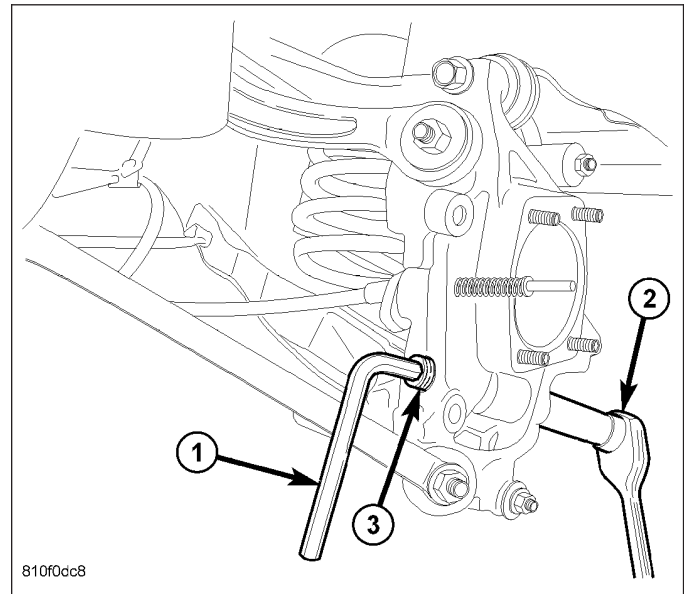
### REMOVAL

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Access and remove rear spring. (Refer to 2 - SUSPENSION/REAR/SPRING - REMOVAL)

3. Export Only – If servicing right spring link, disconnect headlamp leveling sensor (1) link at spring link (3).

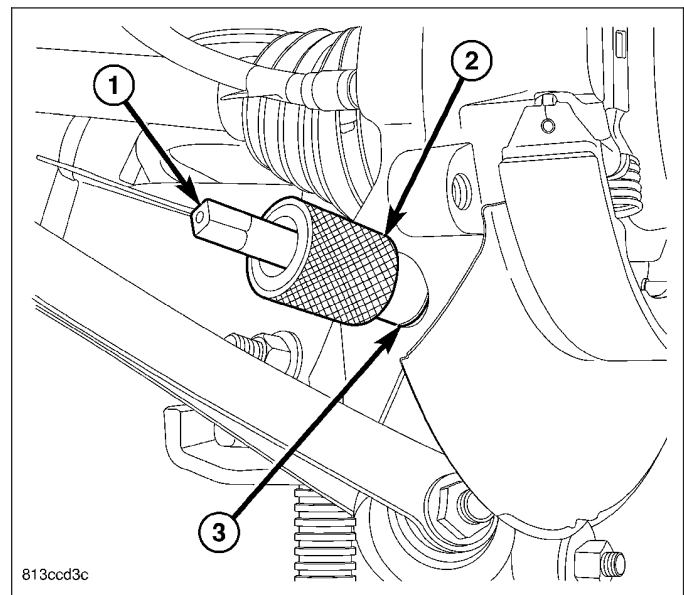


4. Remove spring link-to-knuckle nut and bolt (3).



**CAUTION:** It important to use Guide (2) , Special Tool 9361-2, when tapping sleeve in knuckle to help keep Tap (1) , Special Tool 9361-1, straight during use or damage to Tap may occur.

5. Place Guide 9361-2 (2) against sleeve (3) in knuckle to keep Tap 9361-1 (1) straight. Using Tap with an appropriate handle, cut threads approximately halfway through bushing (or about six complete threads). **It is important to back tap out, clean out burrs and lubricate Tap often during process.**





**Note:** Prior to using Special Tool 9361, lubricate Bolt (1) threads to provide ease of use and promote tool longevity.

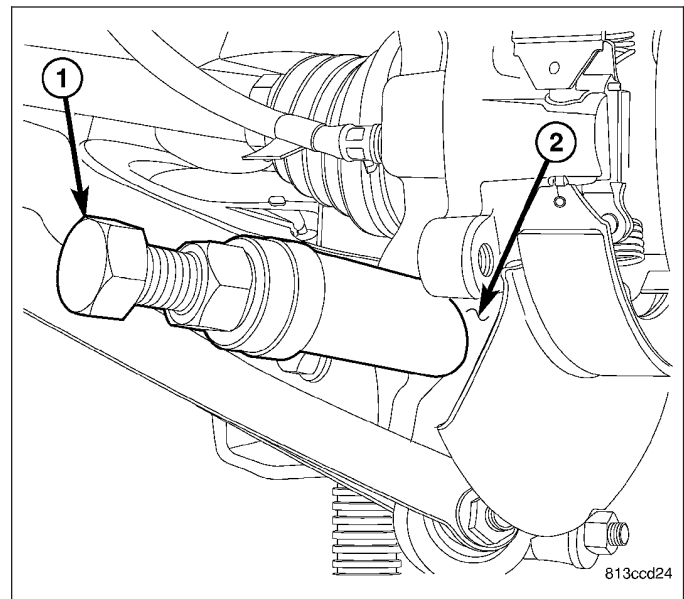
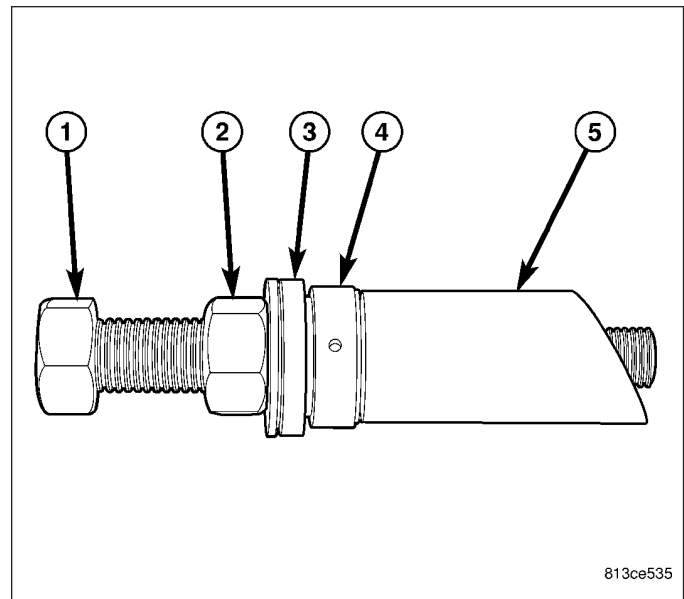
6. Assemble Remover, Special Tool 9361, as shown.

- Bolt 9361-3
- Nut
- Spherical Washer
- Thrust Bearing
- Sleeve 9361-4 (RWD)
- Sleeve 9361-5 (AWD – Left Side)
- Sleeve 9361-6 (AWD – Right Side)

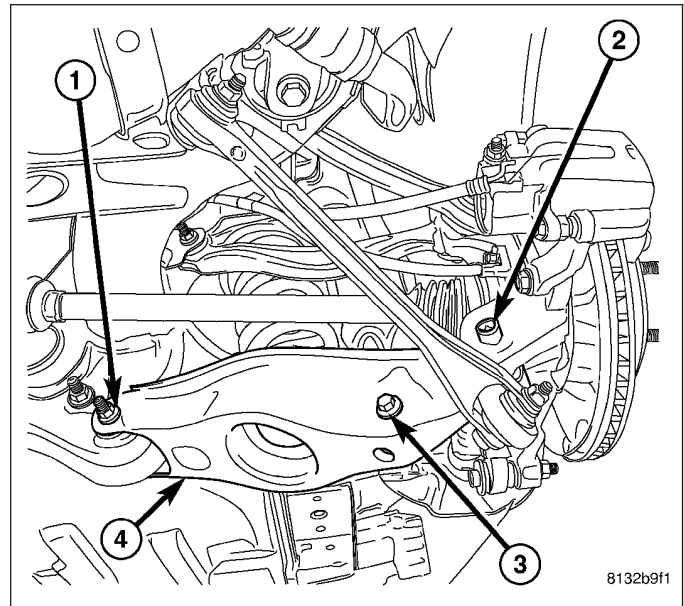
**Note:** When installing Thrust bearing on Remover, be sure to place hardened side against nut.

**Note:** It is important to use appropriate Sleeve on Remover to provide proper Tool-to-Knuckle contact. RWD sleeve can be used on either side while AWD knuckles require specific left or right side Sleeves.

7. Thread Remover Bolt 9361-3 (1) into tapped knuckle sleeve.
8. Rotate Nut down, matching Sleeve angled end with angled face of knuckle.
9. Continue to rotate Nut until knuckle sleeve is removed from knuckle. **Discard knuckle sleeve; replace it with new upon installation.**

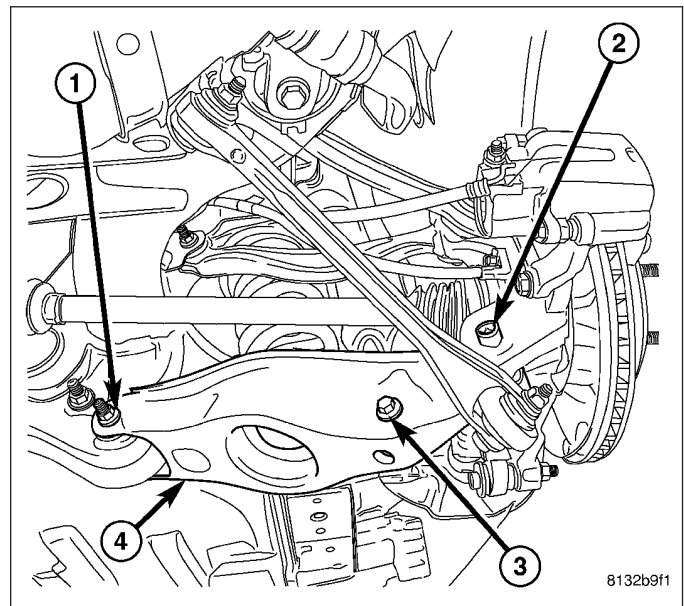


10. Remove bolt and nut (1) fastening spring link (4) to crossmember.
11. Remove spring link (4).



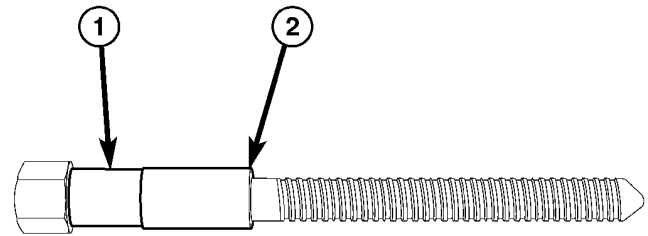
## INSTALLATION

1. Guide ball joint end of spring link (4) into mounting pocket of knuckle, then swing opposite end up to bushing in crossmember and install bolt and nut (1) fastening spring link (4) to crossmember. **Do not tighten bolt at this time.**



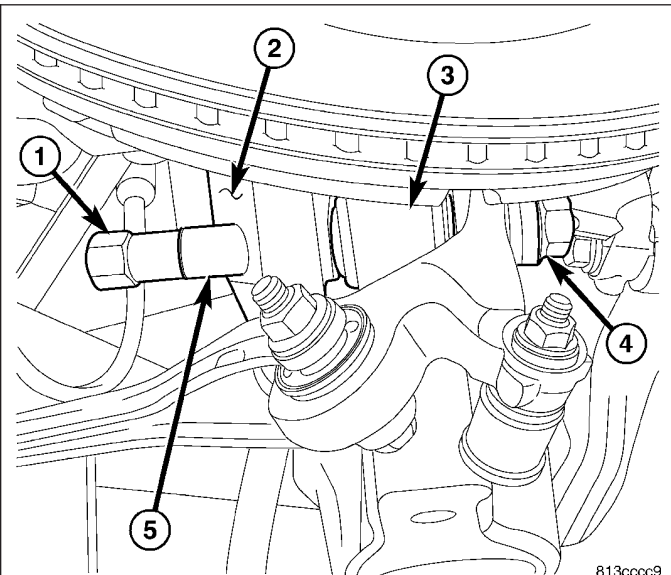
**Note:** Prior to using Special Tool 9361, lubricate bolt (1) threads to provide ease of use and promote tool longevity.

2. Place NEW knuckle sleeve (2) onto Installer Bolt 9361-7 (1), and slide it up to Bolt's head.



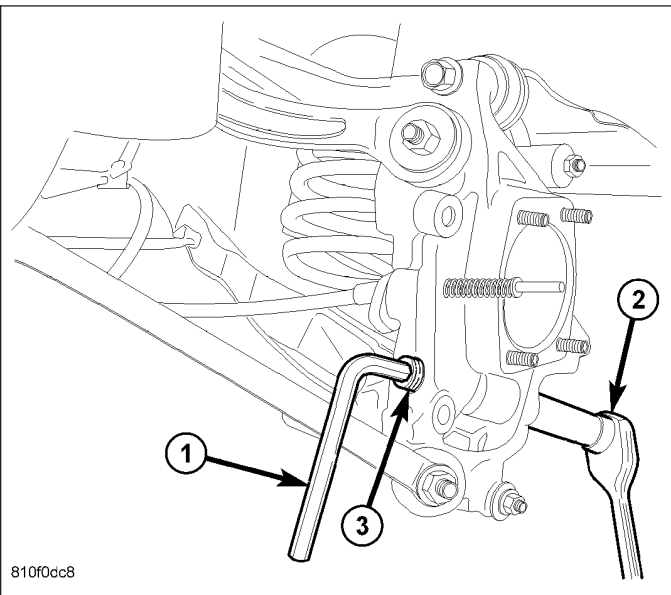
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3. Slide Bolt 9361-7 (1) with sleeve (5) through knuckle (2) and spring link ball joint (3) starting from knuckle forward end.
4. Install thrust bearing and nut (4) on end of Bolt.
5. While holding Bolt head (1) stationary, rotate Nut (4) (using hand tools) installing sleeve in knuckle. Install sleeve until Nut stops turning. **Do not over-tighten Nut.**
6. Remove special tool.



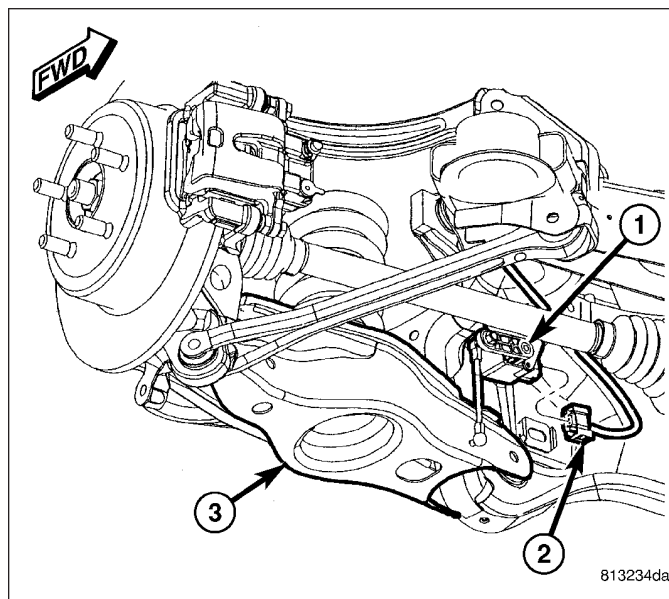
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7. Install spring link-to-knuckle bolt and nut (3) as shown. While holding bolt head stationary, tighten nut to 138 N·m (102 ft. lbs.) torque.



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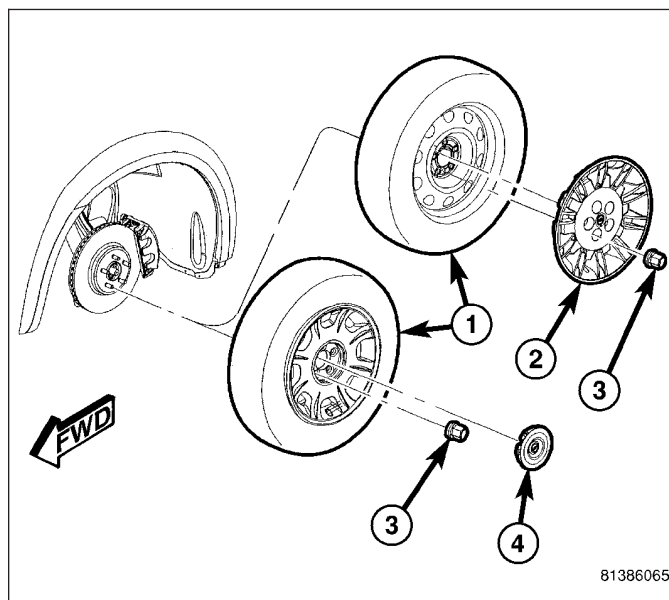
8. Export Only – If servicing right spring link, connect headlamp leveling sensor (1) link at spring link (3).
9. Install rear spring as well as all components necessary to access it. (Refer to 2 - SUSPENSION/REAR/HUB / BEARING - INSTALLATION)
10. Lower vehicle.
11. Position vehicle on alignment rack/drive-on lift. Raise vehicle as necessary to access mounting bolt.
12. Tighten spring link bolt at crossmember to 108 N·m (80 ft. lbs.) torque.
13. Perform wheel alignment. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)



## TENSION LINK

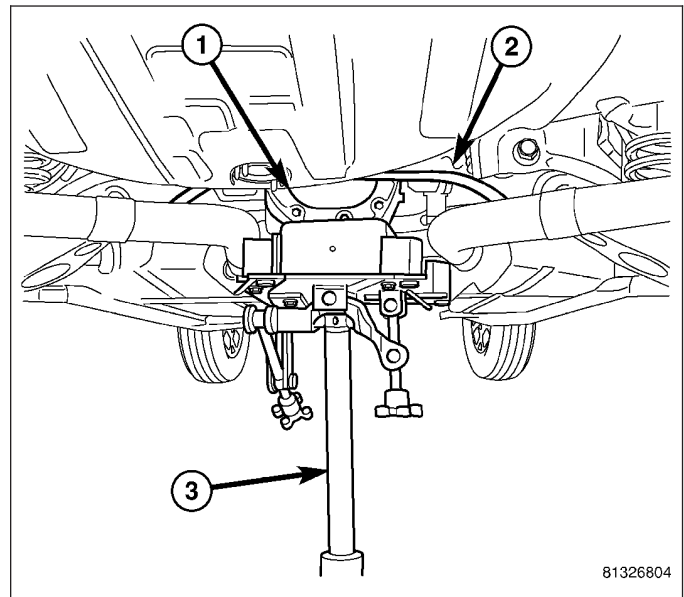
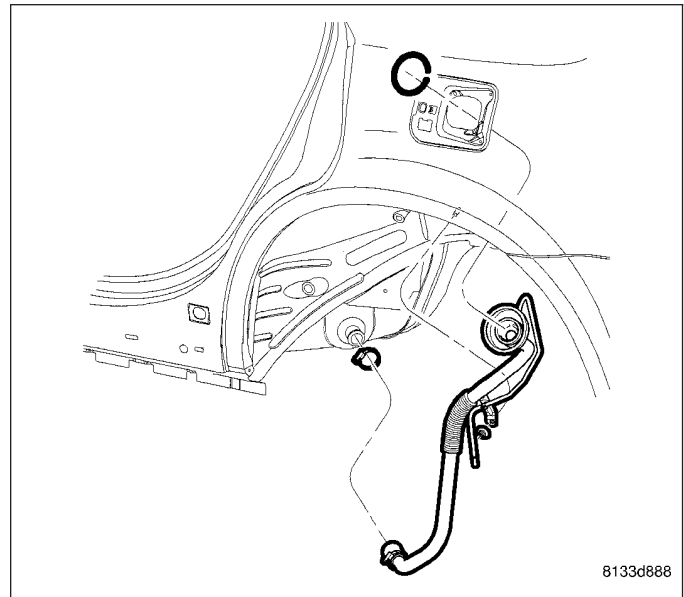
### REMOVAL

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. On both sides of vehicle, remove wheel mounting nuts (3), then rear tire and wheel assembly (1).

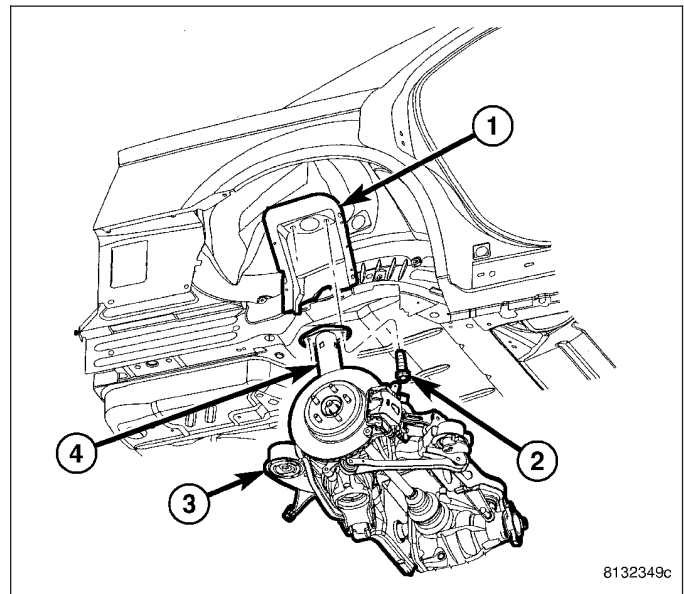


**WARNING:** Before opening fuel system, review all Warnings and Cautions.

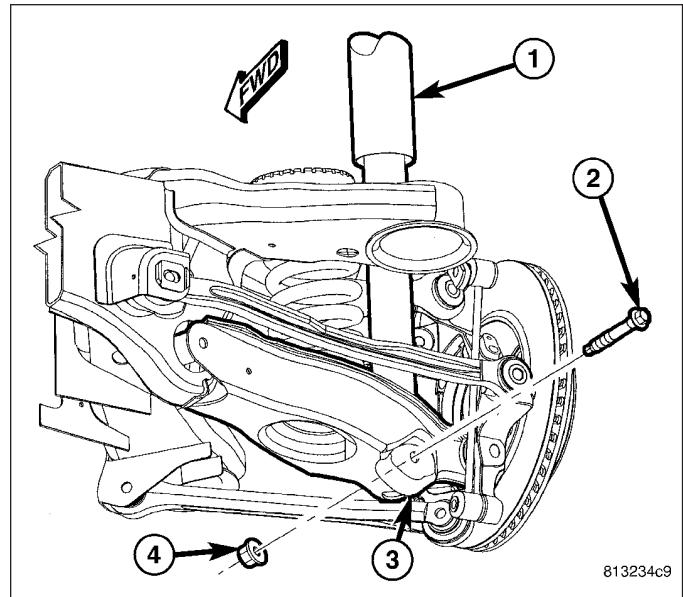
3. If servicing left side, remove fuel filler tube. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK FILLER TUBE - REMOVAL)
4. Position an extra pair of jack stands under and support forward end of engine cradle to help stabilize vehicle during rear suspension removal/installation.
5. Perform following if vehicle is equipped with dual-exhaust or are servicing right side on vehicle with single exhaust.
  - a. Position under-hoist utility jack or stand several inches below exhaust at muffler.
  - b. Disconnect exhaust isolators at muffler and resonators hangers.
  - c. Lower exhaust down to rest upon top of jack or stand placed below muffler.
6. Position under-hoist utility jack or transmission jack (3) under center of rear axle differential (1). Raise jack head to contact differential and secure in place. **When securing crossmember to jack, be sure not to secure stabilizer bar.**



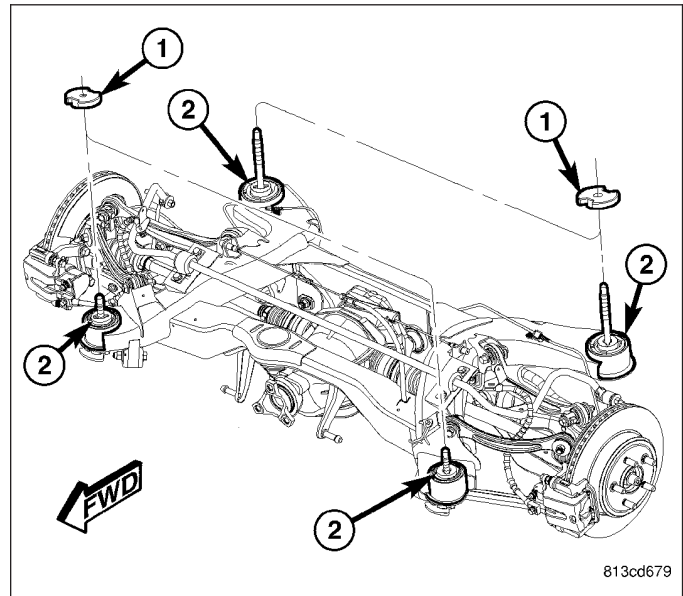
7. Remove shock absorber (1) upper mounting screws (2).



8. Remove shock absorber (1) lower mounting bolt (2) and nut (4).



**Note:** If equipped with AWD, when removing crossmember mounting bolts in following step, be sure to not to misplace spacers (1) between crossmember mounts (2) and body.

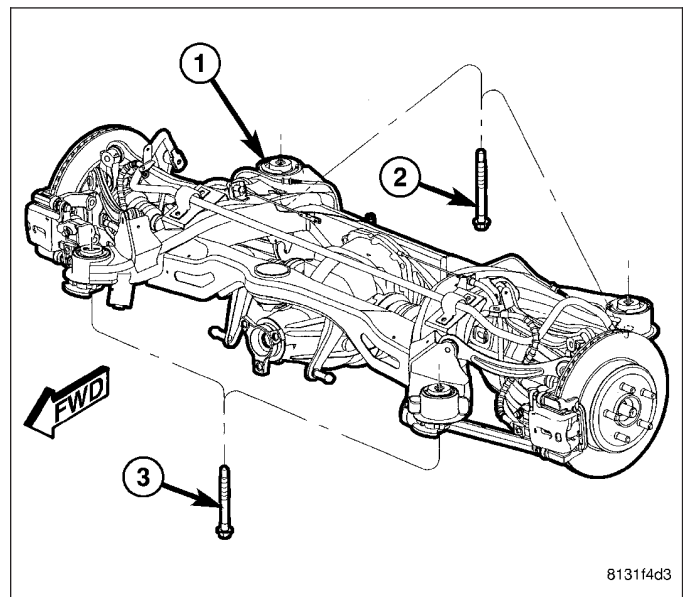


**CAUTION:** When removing crossmember mounting bolts (2 and 3) it is important NOT to loosen or remove crossmember mounting bolts on opposite side of vehicle. Doing so will require rear wheel alignment following reinstallation to ensure proper thrust angle.

9. Remove both front and rear crossmember mounting bolts (2 and 3) on repair-side of vehicle.

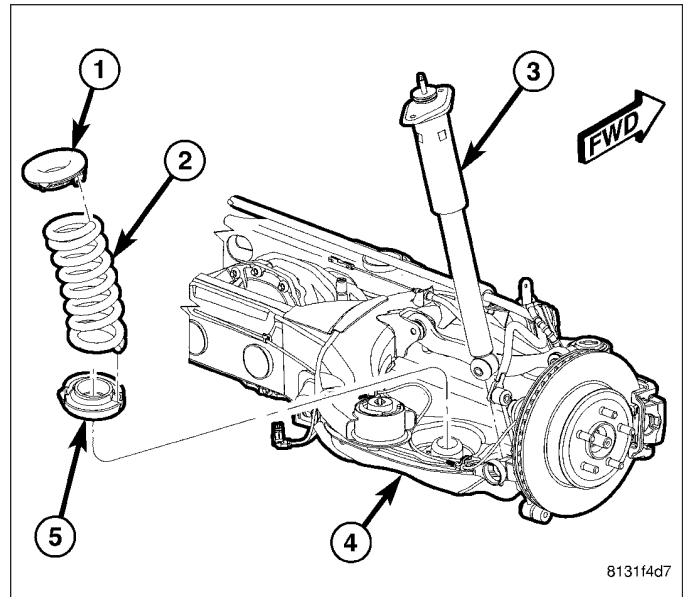
**CAUTION:** To avoid damaging other components of vehicle, do not lower crossmember (1) any further than necessary to remove shock absorber.

10. **Slowly** lower jack allowing repair-side of crossmember to drop. **Do not lower jack at a fast rate.** Lower jack just enough to allow top of shock absorber to clear body flange.



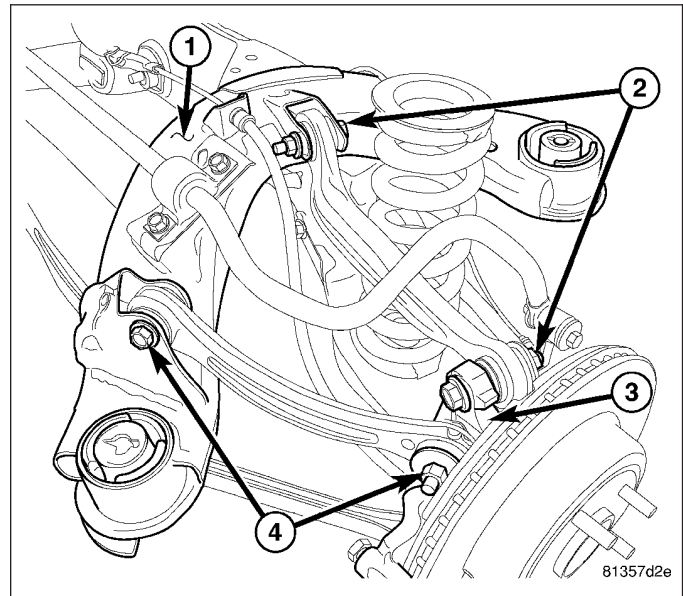


11. Remove shock absorber (3) by tipping top outward and lifting lower end out of pocket in spring link (4).



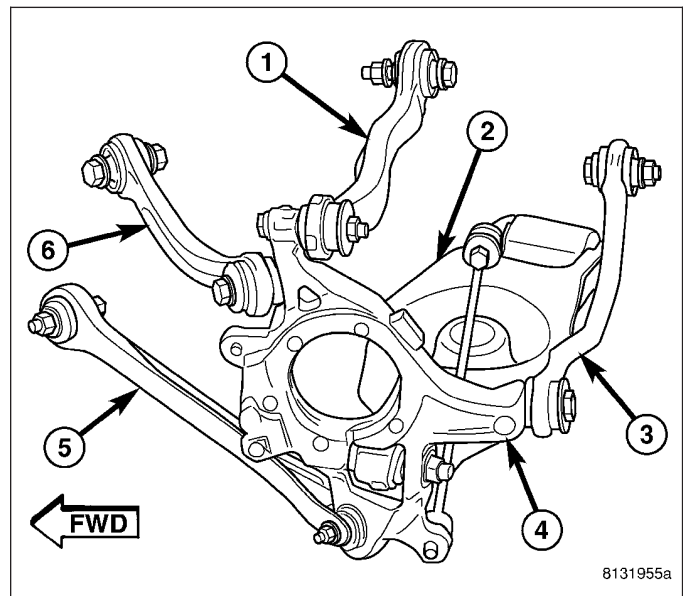
**Note:** Do not lower repair-side of crossmember any further than necessary to gain access to link mounting bolts at crossmember.

12. Remove nut and bolt (4) mounting link to knuckle (3).  
 13. Remove nut and bolt (4) mounting link to crossmember (1).  
 14. Remove link.

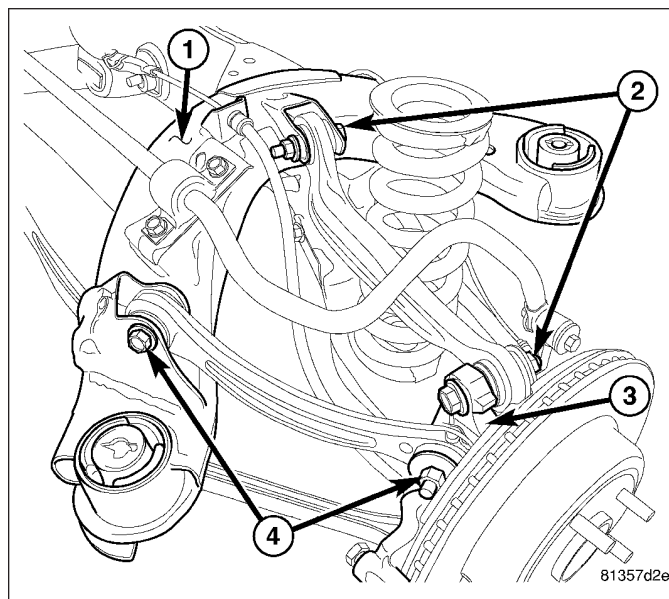


## INSTALLATION

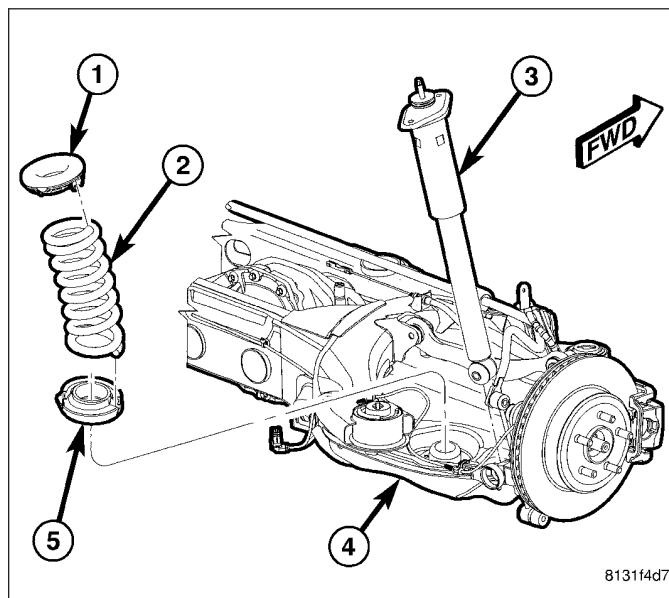
**Note:** When installing tension link, although link (6) is same end-to-end, make sure that center bow is facing downward.



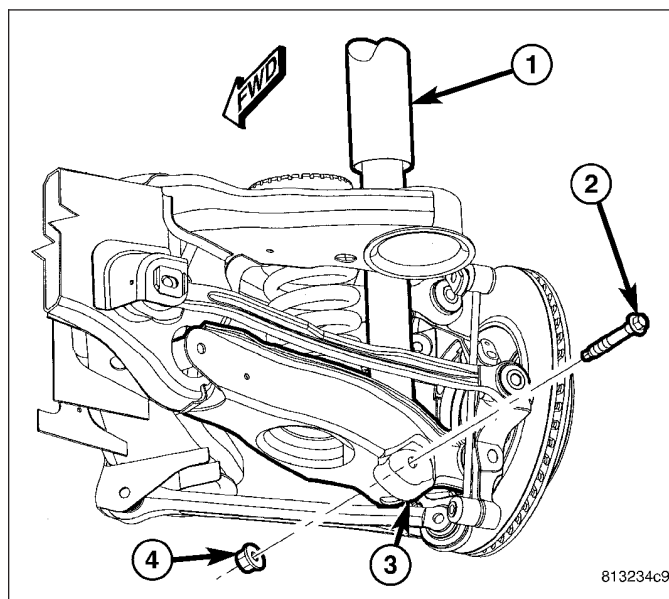
1. Place link in bracket on crossmember (1). Install bolt and nut (4) at crossmember (1) as shown. **Do not tighten bolt at this time.**
2. Install bolt and nut (4) mounting link to knuckle (3) as shown. **Do not tighten bolt at this time.**



3. Install shock absorber (3) by setting lower end into pocket in spring link (4), then tipping top inward until aligned with upper mounting holes.

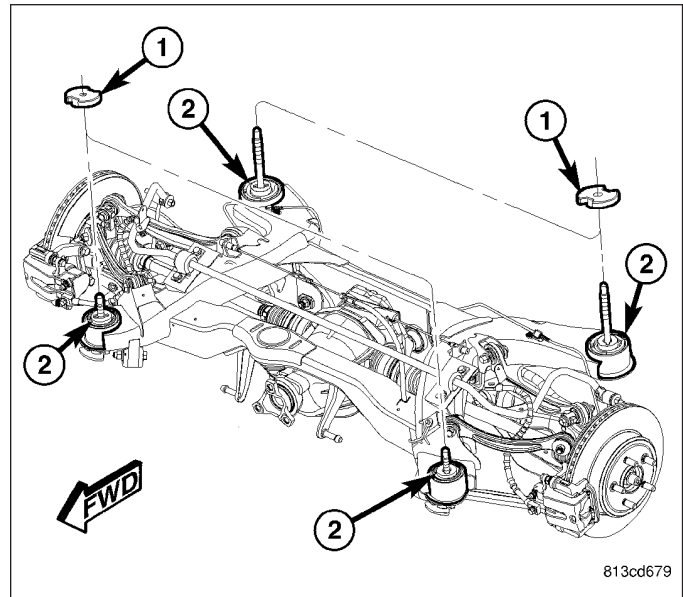


4. Install lower shock mounting bolt and nut. **Do not tighten at this time.**

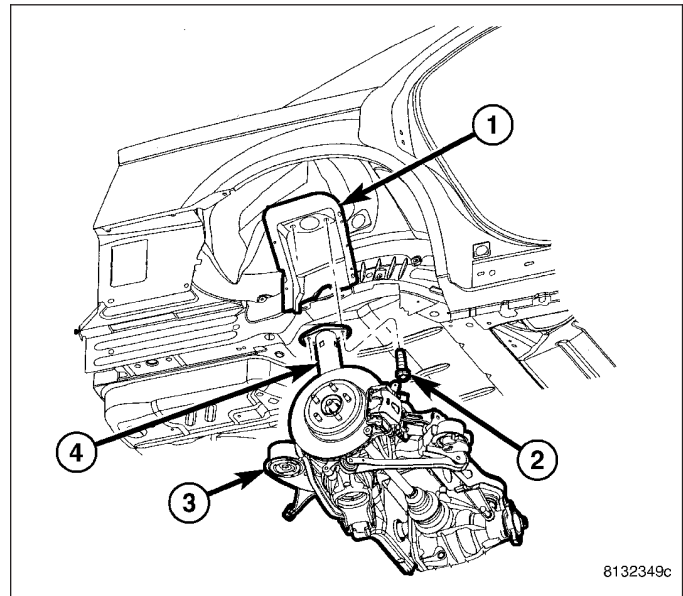




5. If vehicle is equipped with AWD, make sure spacers (1) on top of crossmember mount bushings (2) on side of repair are in position.

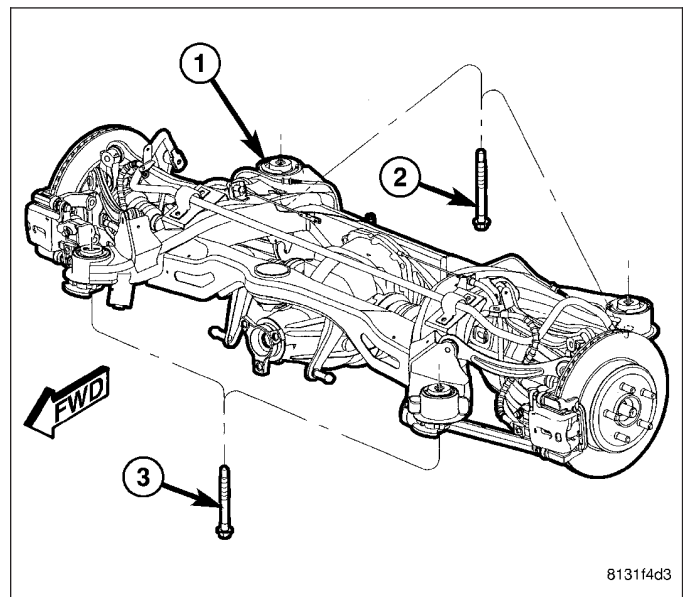


6. Carefully raise jack, guiding coil spring and upper end of shock absorber (4) into mounted positions.
7. Install shock absorber upper mounting screws (2). Tighten upper mounting screws to 52 N·m (38 ft. lbs.) torque.

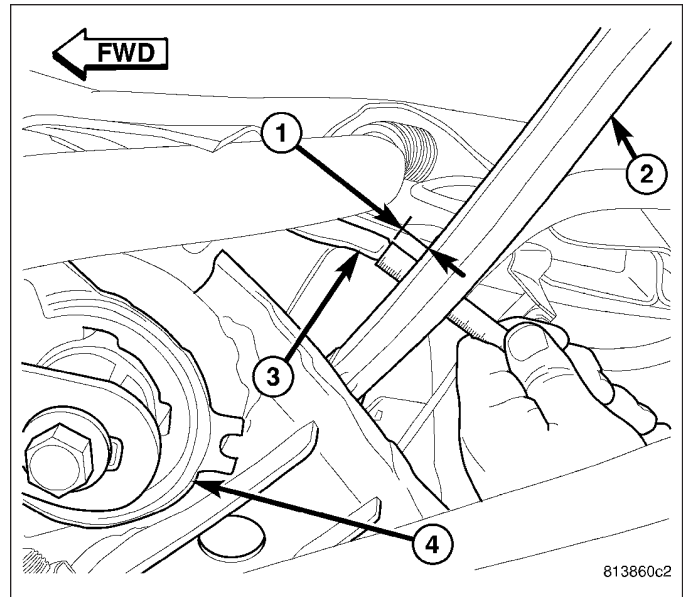


**Note:** Rear crossmember mounting bolts (2) are longer than front mounting bolts (3). Do not interchange mounting bolts.

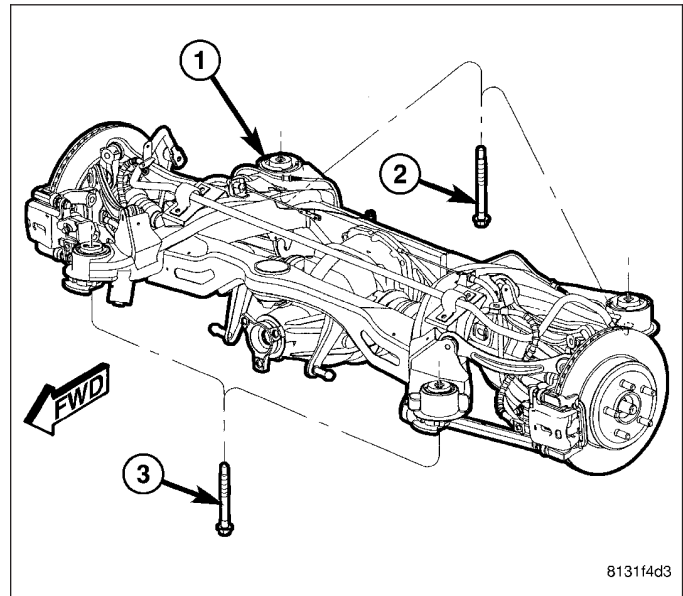
8. Install crossmember mounting bolts (2 and 3). Snug, but do not fully tighten bolts at this time.



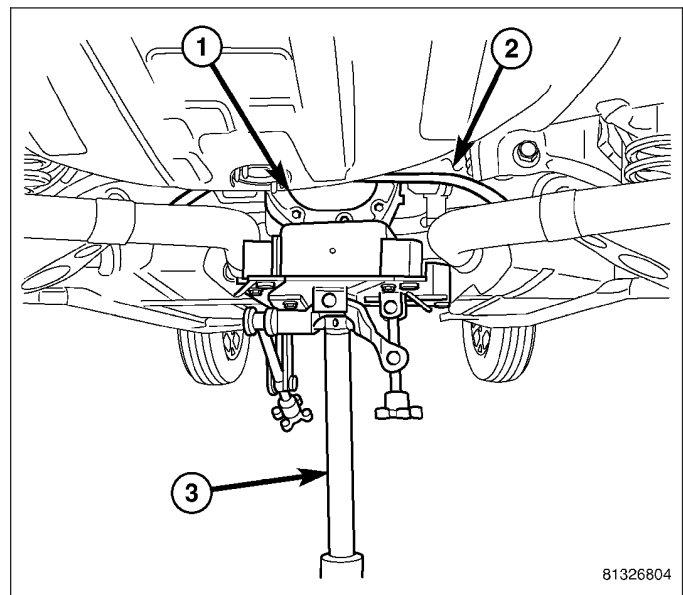
9. Measure distance (1) between from tension link (2) to body weld flange (3) directly in front of it, just outboard of front mount bushing (4). **This distance must be at least 12 mm to allow proper clearance for suspension movement.** If distance is less than 12 mm, shift that side of rear crossmember directly rearward until distance is 12 mm or greater. To do so, loosen 3 mounting bolts slightly, leaving one on opposite side of shift snugged to pivot off of. Shift crossmember rearward and snug loosened bolts. Measure opposite side to be sure it also maintains minimum 12 mm distance.



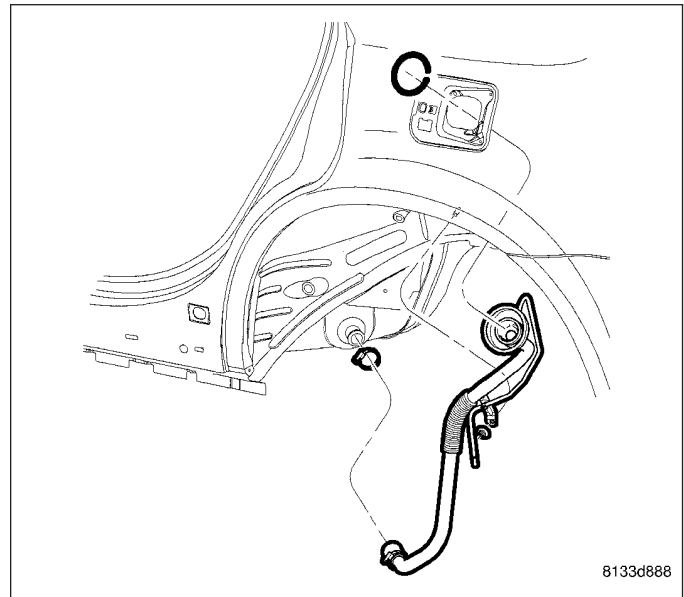
10. Tighten all crossmember mounting bolts (2 and 3) to 180 N·m (133 ft. lbs.) torque.



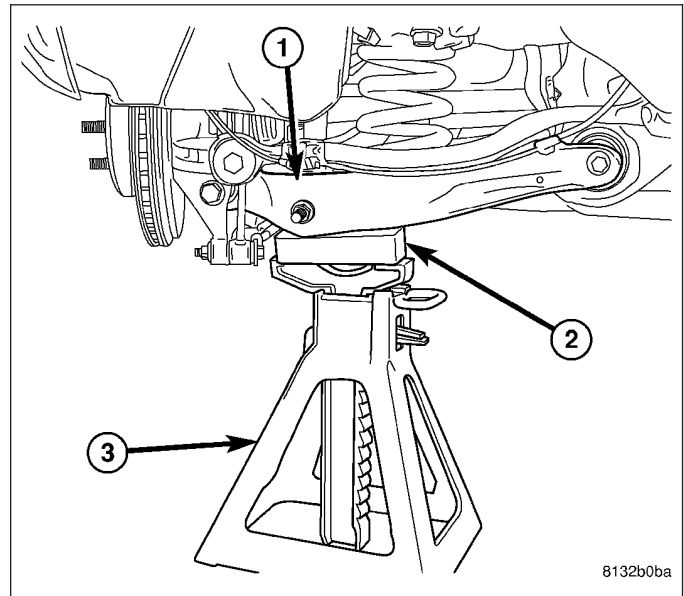
11. Remove jack (3) from under rear axle differential.  
 12. If previously lowered, raise rear exhaust back to mounted position and connect exhaust isolators at muffler and resonators hangers. Remove jack or stand below exhaust muffler.



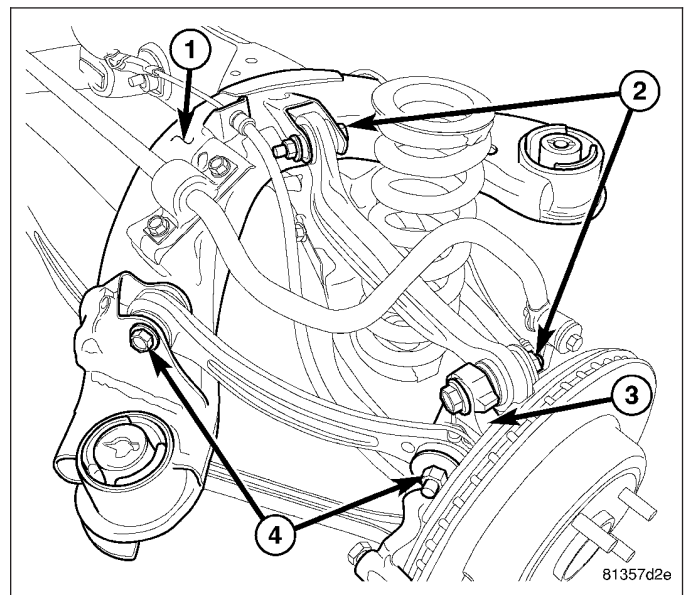
13. If removed, install fuel filler tube. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK FILLER TUBE - INSTALLATION)



14. Lower vehicle until front tires contact floor but rear is still suspended. Place jack stands under each rear suspension spring link. Place an appropriate wooden block between stand and link to avoid damaging spring link, then lower vehicle until full vehicle weight is supported by suspension.



15. Tighten tension link fasteners (4) to:
- Bolt nut at crossmember – 85 N·m (63 ft. lbs.) torque.
  - Bolt at knuckle – 98 N·m (72 ft. lbs.) torque.



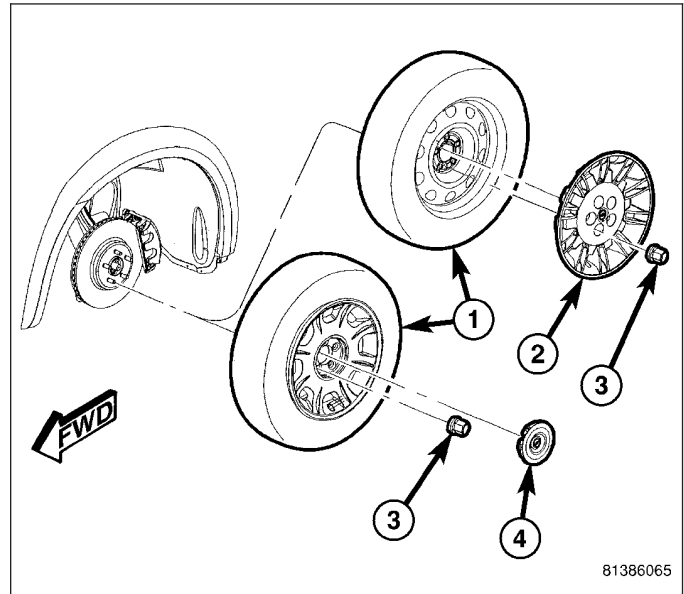


## TOE LINK

### REMOVAL

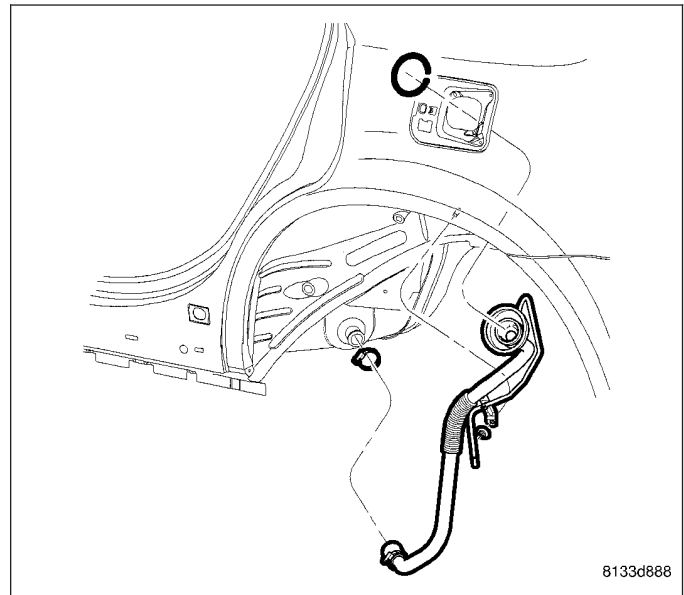
#### LEFT LINK

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. On both sides of vehicle, remove wheel mounting nuts (3), then rear tire and wheel assembly (1).

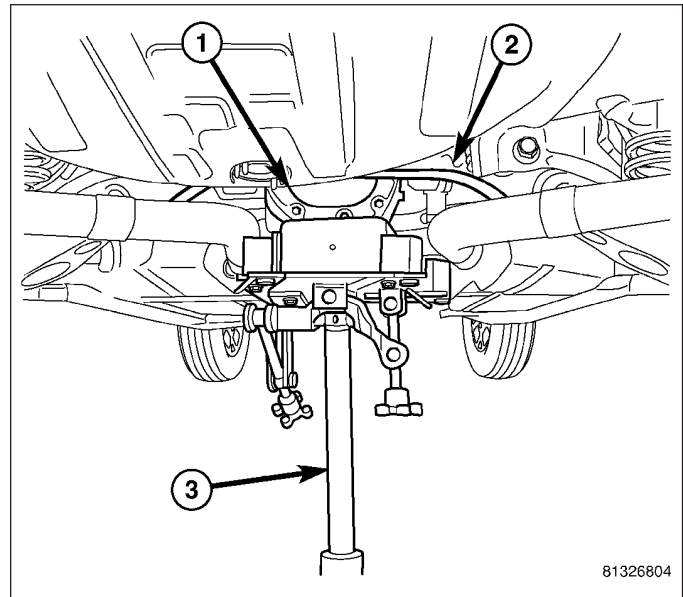


**WARNING:** Before opening fuel system, review all Warnings and Cautions.

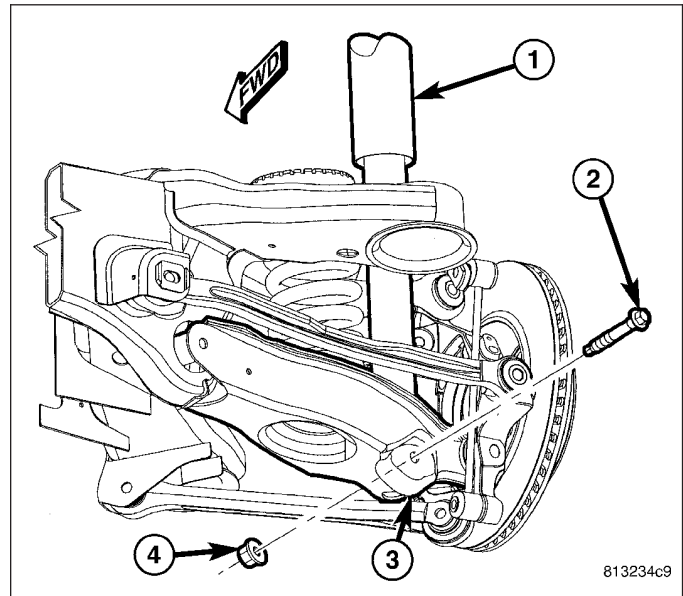
3. Remove fuel filler tube. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK FILLER TUBE - REMOVAL)
4. Position an extra pair of jack stands under and support forward end of engine cradle to help stabilize vehicle during rear suspension removal/installation.
5. Perform following if vehicle is equipped with dual-exhaust.
  - a. Position under-hoist utility jack or stand several inches below exhaust at muffler.
  - b. Disconnect exhaust isolators at muffler and resonators hangers.
  - c. Lower exhaust down to rest upon top of jack or stand placed below muffler.



6. Position under-hoist utility jack or transmission jack (3) under center of rear axle differential (1). Raise jack head to contact differential and secure in place.



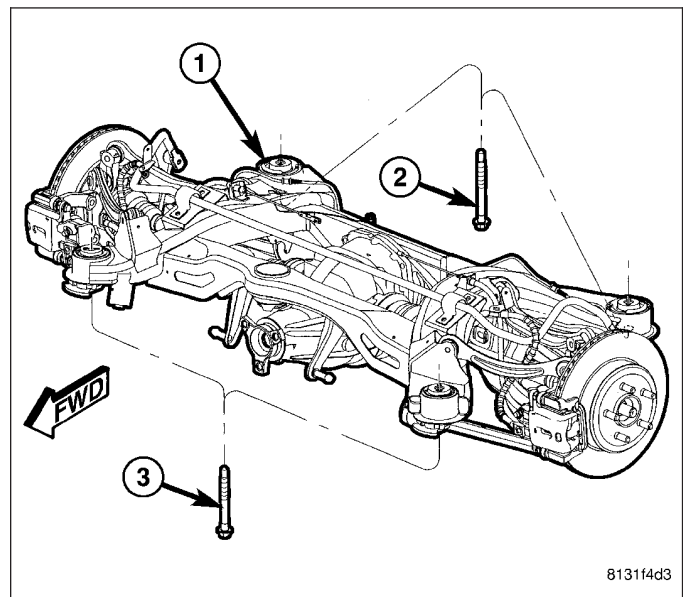
7. Remove shock absorber (1) lower mounting bolt (2) and nut (4).



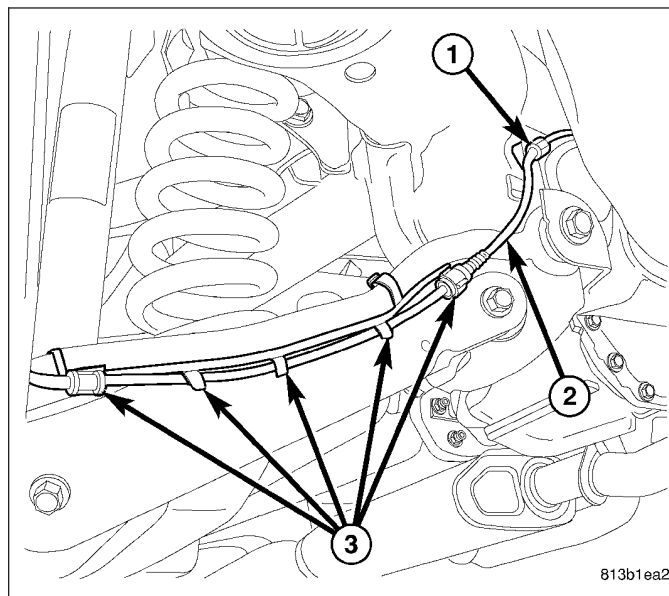
**CAUTION:** When removing crossmember mounting bolts (2 and 3) it is important NOT to loosen or remove crossmember mounting bolts on opposite side of vehicle. Doing so will require rear wheel alignment following reinstallation to ensure proper thrust angle.

8. Remove both front and rear crossmember mounting bolts (2 and 3) on repair-side of vehicle. If equipped with AWD, be sure to not to misplace spacers between crossmember mounts and body.

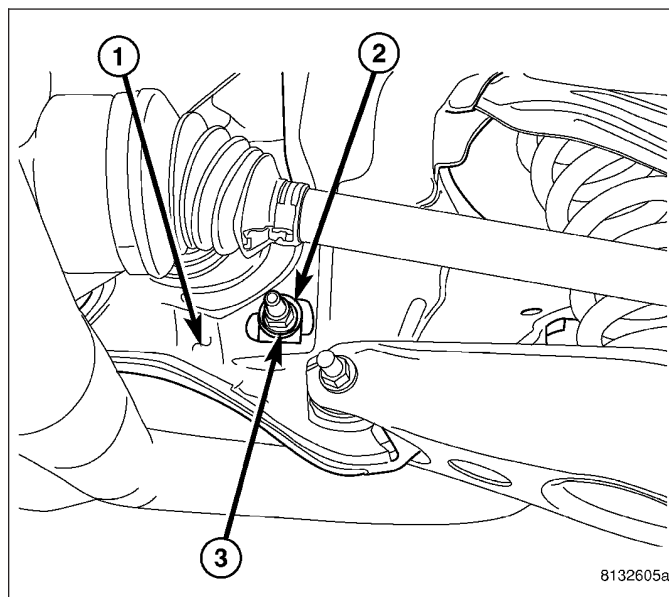
**CAUTION:** To avoid damaging other components of vehicle, do not lower crossmember (1) any further than necessary to remove shock absorber.



9. **Slowly** lower jack allowing repair-side of crossmember to drop. **Do not lower jack at a fast rate.** Lower jack just enough to allow toe link mounting bolt at crossmember.
10. If equipped, remove wheel speed sensor cable (2) from toe link.

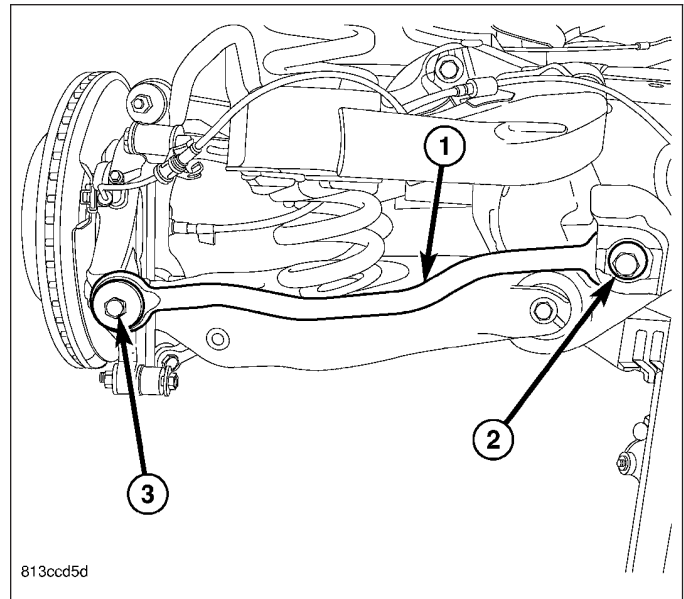


11. While holding toe adjustment cam bolt from rotating, remove nut (3) securing toe link at crossmember (1).



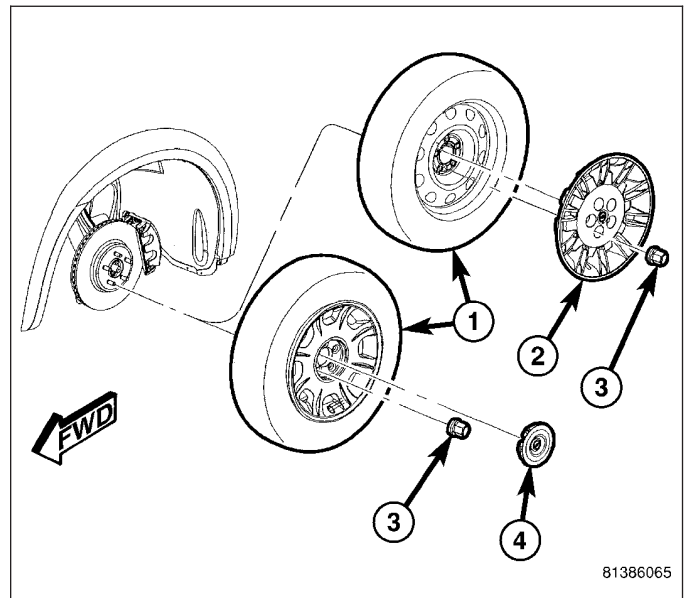


12. Slide cam bolt (2) rearward out of crossmember and link (1).
13. Remove mounting bolt (3) and nut at knuckle.
14. Remove toe link (1).



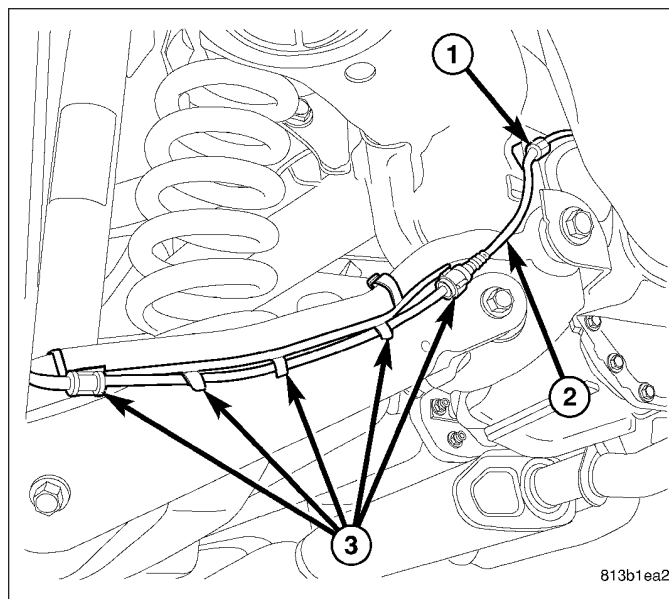
## RIGHT LINK

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove wheel mounting nuts (3), then rear tire and wheel assembly (1).

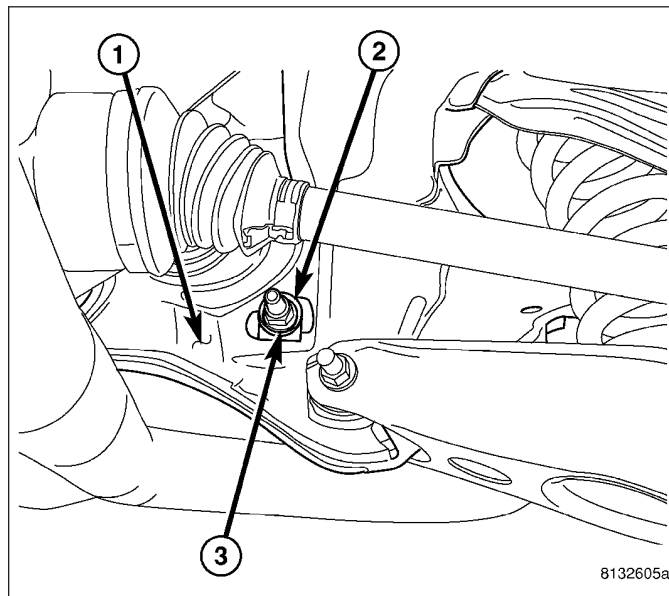




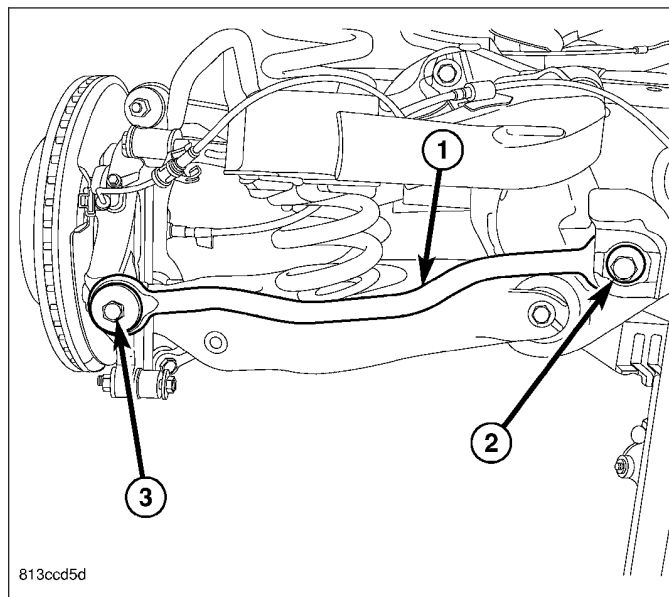
3. If equipped, remove wheel speed sensor cable (2) from toe link.



4. While holding toe adjustment cam bolt from rotating, remove nut (3) securing toe link at crossmember (1).



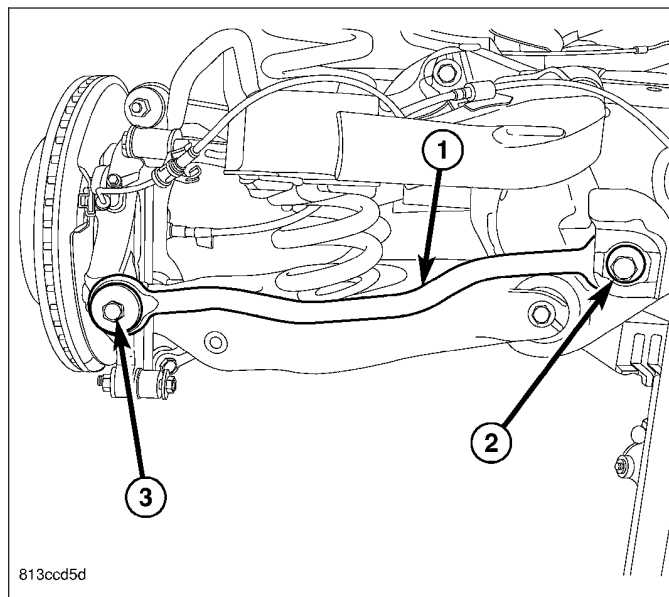
5. Slide cam bolt (2) rearward out of crossmember and link (1).
6. Remove mounting bolt (3) and nut at knuckle.
7. Remove toe link (1).



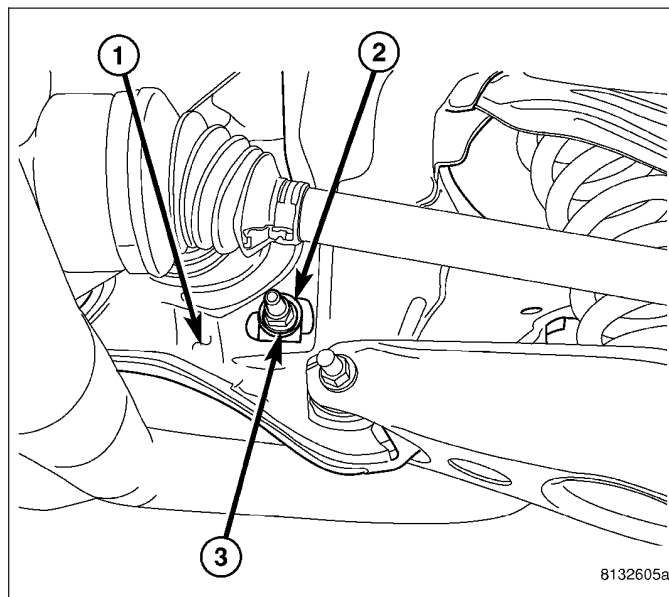
## INSTALLATION

### LEFT LINK

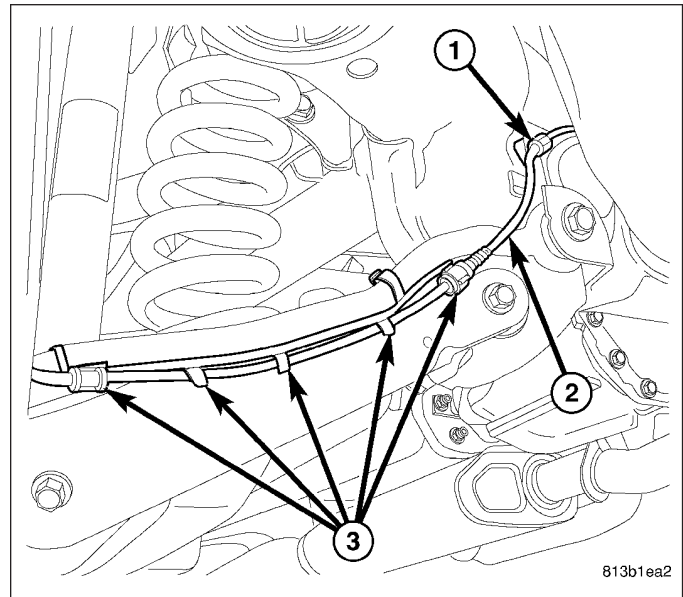
1. Slide crossmember end of toe link (1) into box bracket on crossmember. Slide cam bolt (2) through bracket and link from rear.
2. Install bolt (3) and nut securing link to knuckle. **Do not tighten bolt at this time.**



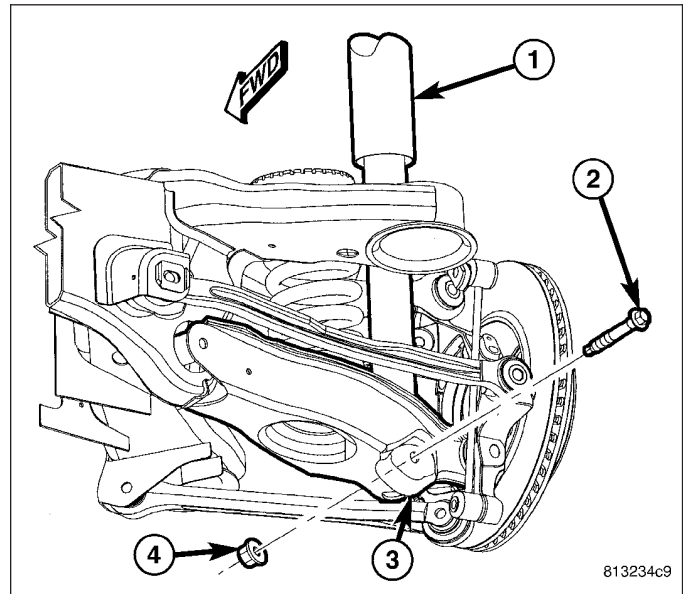
3. While holding toe adjustment cam bolt from rotating (cam facing upward), Install cam washer (2) and nut (3) securing toe link at crossmember (1). **Do not tighten nut at this time.**



4. If equipped, Attach wheel speed sensor cable (2) to toe link.

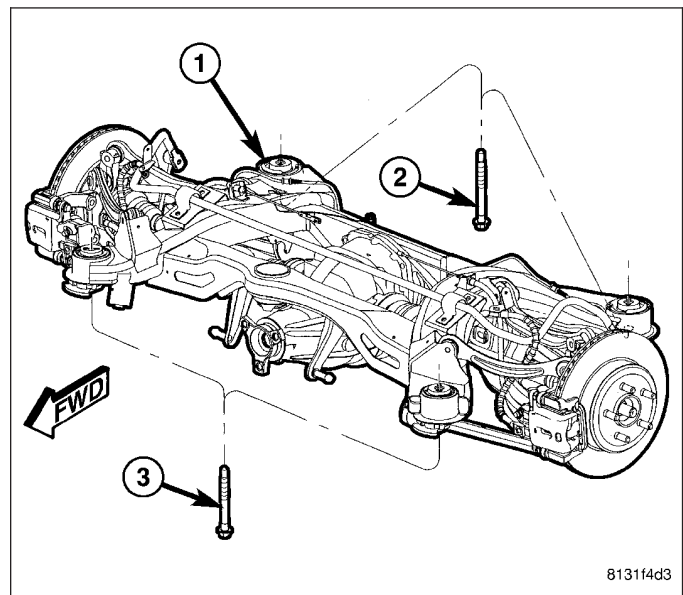


5. Carefully raise jack, guiding coil spring and lower end of shock absorber (4) into mounted positions.
6. When lower shock mounting bolt holes line up install bolt (2) and nut (4). **Do not tighten at this time.**

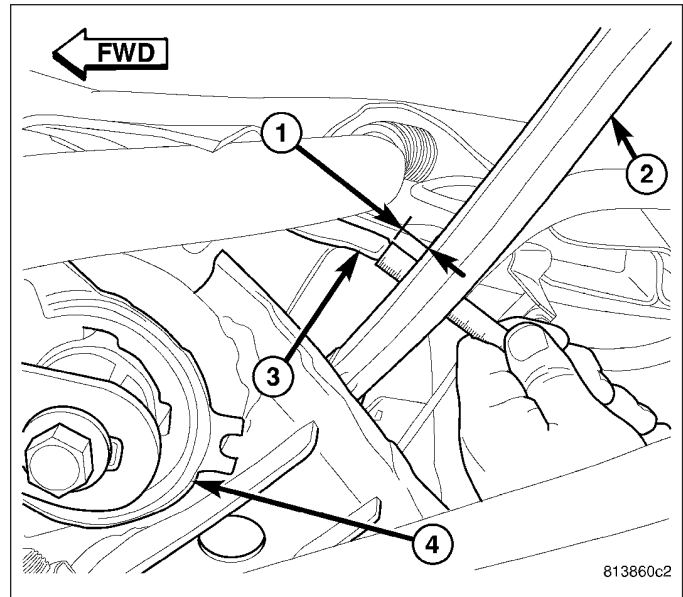


**Note:** Rear crossmember mounting bolts (2) are longer than front mounting bolts (3). Do not interchange mounting bolts.

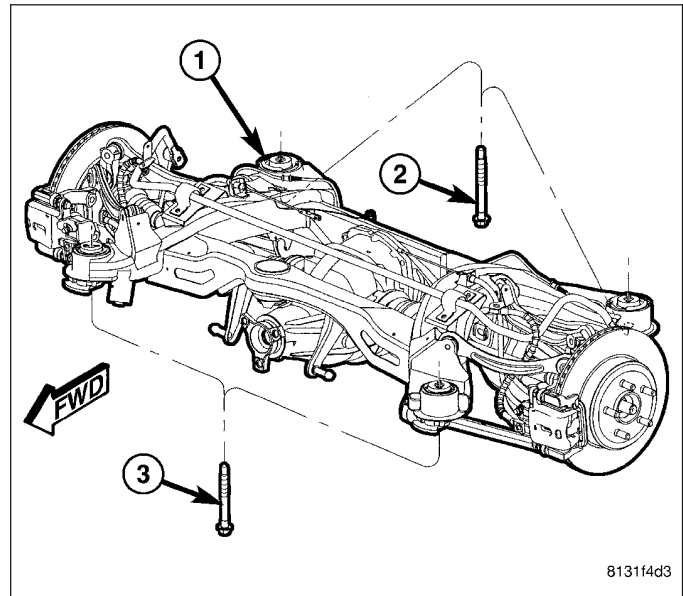
7. Continue to raise crossmember in not already in mounted position, then install crossmember mounting bolts (2 and 3). **Snug, but do not fully tighten bolts at this time.**



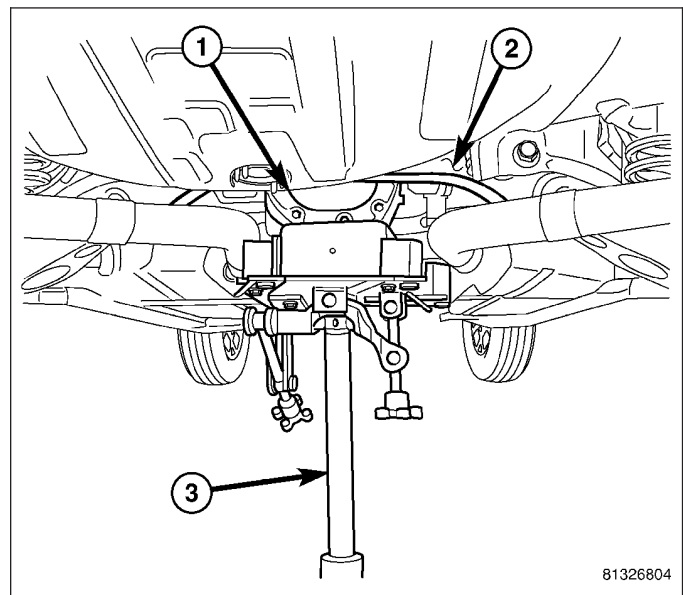
8. Measure distance (1) between from tension link (2) to body weld flange (3) directly in front of it, just outboard of front mount bushing (4). **This distance must be at least 12 mm to allow proper clearance for suspension movement.** If distance is less than 12 mm, shift that side of rear crossmember directly rearward until distance is 12 mm or greater. To do so, loosen 3 mounting bolts slightly, leaving one on opposite side of shift snugged to pivot off of. Shift crossmember rearward and snug loosened bolts. Measure opposite side to be sure it also maintains minimum 12 mm distance.



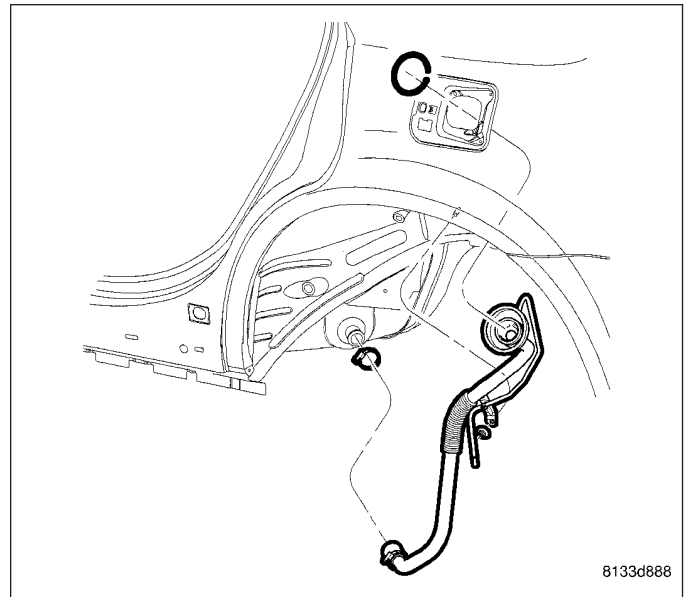
9. Tighten all crossmember mounting bolts (2 and 3) to 180 N·m (133 ft. lbs.) torque.



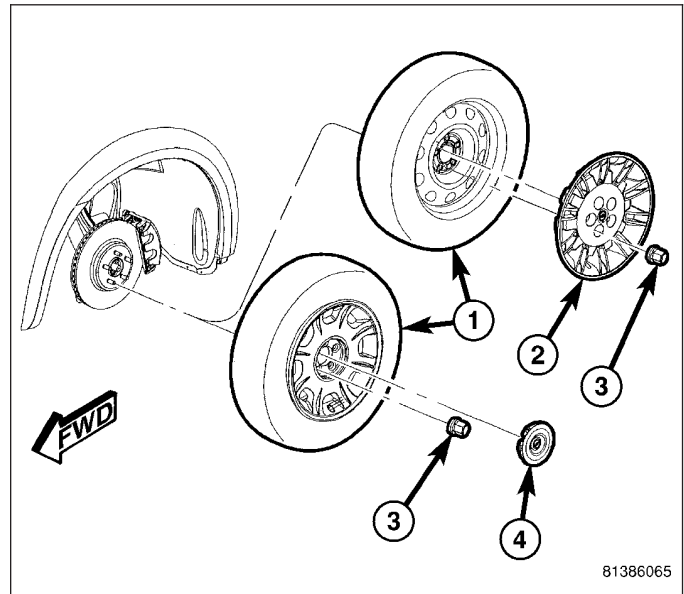
10. Remove jack (3) from under rear axle differential.  
 11. If previously lowered, raise rear exhaust back to mounted position and connect exhaust isolators at muffler and resonators hangers. Remove jack or stand below exhaust muffler.



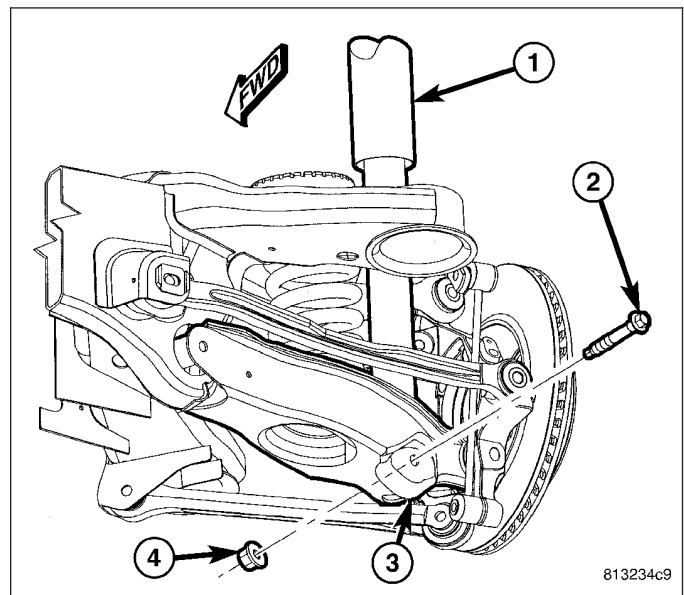
12. Install fuel filler tube. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK FILLER TUBE - INSTALLATION)



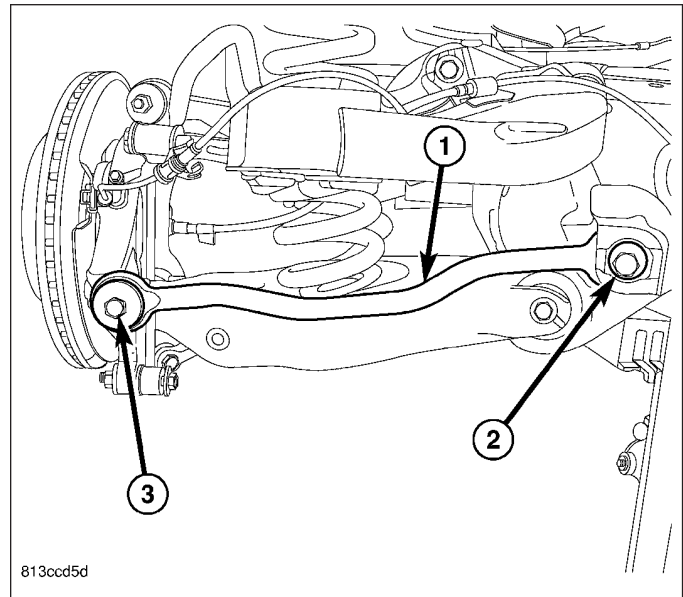
13. Install tire and wheel assemblies (1). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
14. Lower vehicle.
15. Position vehicle on alignment rack/drive-on lift. Raise vehicle as necessary to access mounting bolts.



16. Tighten shock absorber lower mounting bolt nut (4) to 72 N·m (53 ft. lbs.) torque.

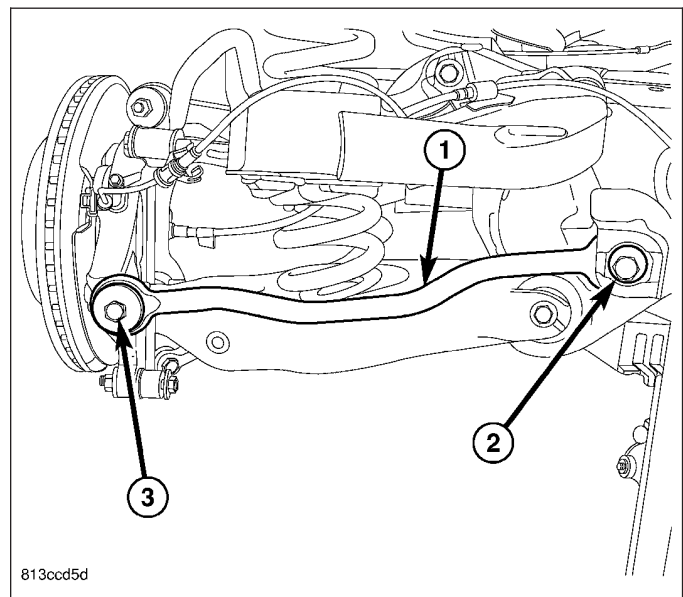


17. Tighten toe link (1) fasteners to:
  - Nut at crossmember – 108 N·m (80 ft. lbs.) torque (This nut may be tightened after rear wheel alignment toe is set. Do not tighten from bolt head end.)
  - Bolt at knuckle – 81 N·m (60 ft. lbs.) torque.
18. Perform wheel alignment. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

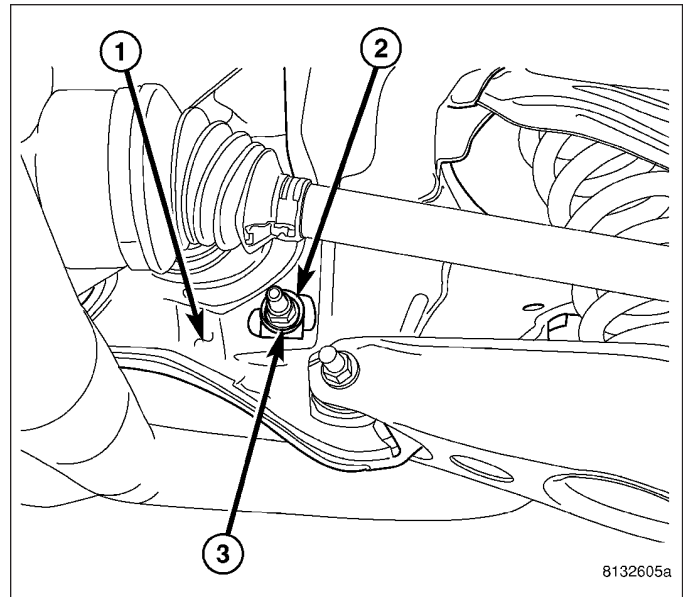


## RIGHT LINK

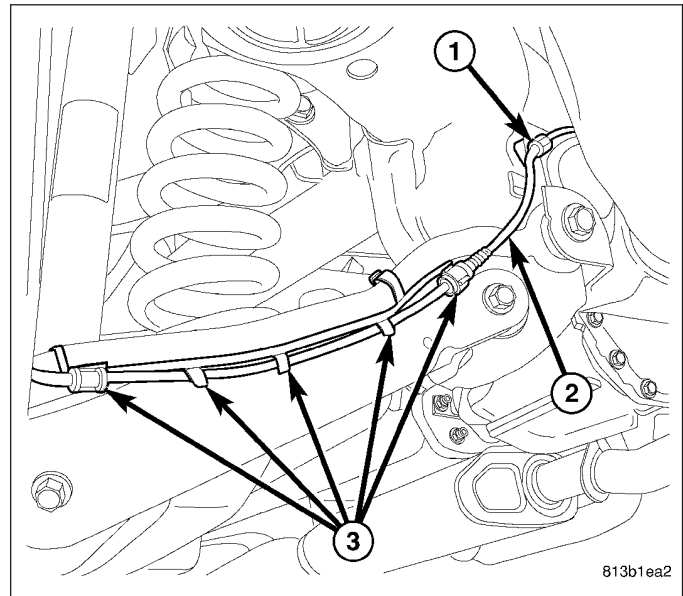
1. Slide crossmember end of toe link (1) into box bracket on crossmember. Slide cam bolt (2) through bracket and link from rear of vehicle.
2. Install bolt (3) and nut securing link to knuckle. **Do not tighten bolt at this time.**



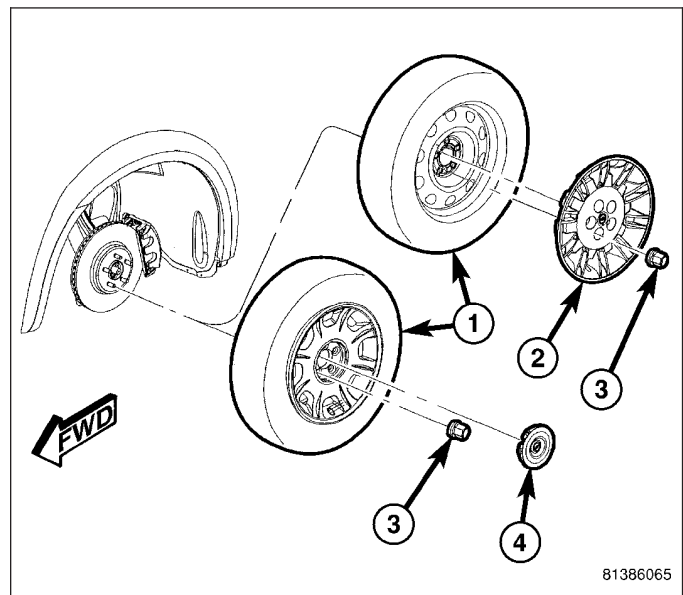
3. While holding toe adjustment cam bolt from rotating (cam facing upward), Install cam washer (2) and nut (3) securing toe link at crossmember (1). **Do not tighten nut at this time.**



4. If equipped, Attach wheel speed sensor cable (2) to toe link.
5. Raise rear exhaust back to mounted position and connect exhaust isolators at muffler and resonators hangers. Remove jack or stand below exhaust muffler.

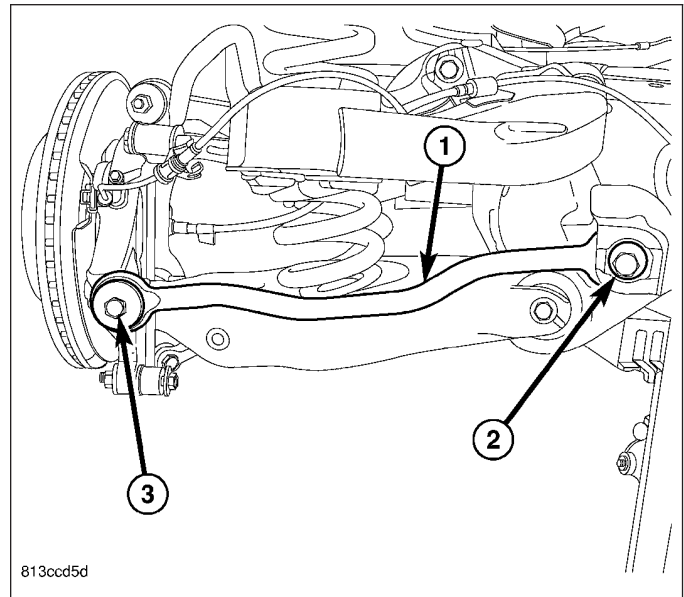


6. Install tire and wheel assembly (1). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
7. Lower vehicle.
8. Position vehicle on alignment rack/drive-on lift. Raise vehicle as necessary to access mounting bolts.





9. Tighten toe link (1) fasteners to:
  - Nut at crossmember – 108 N·m (80 ft. lbs.) torque (This nut may be tightened after rear wheel alignment toe is set. Do not tighten from bolt head end.)
  - Bolt at knuckle – 81 N·m (60 ft. lbs.) torque.
10. Perform wheel alignment. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

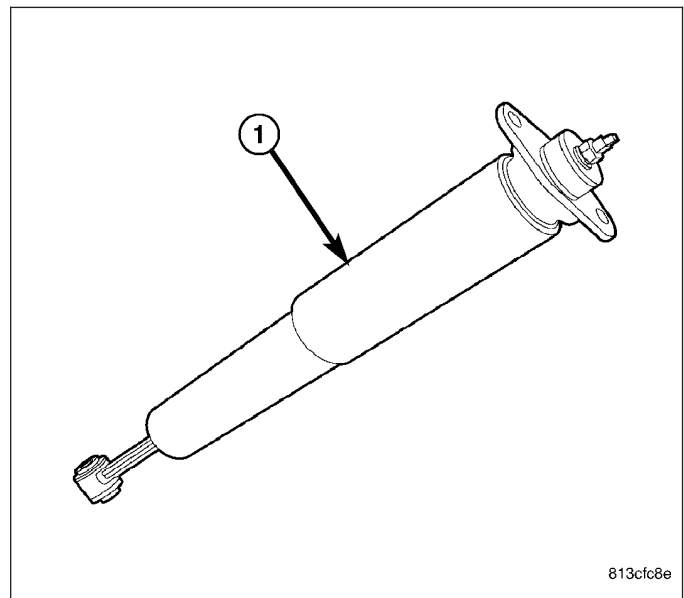


## SHOCK ABSORBER

### DESCRIPTION

This vehicle is available with either standard gas-charged shock absorbers or Nivomat™ load-leveling shock absorbers for the rear suspension. Depending on options, the load-leveling shock absorbers may either be standard or optional equipment.

On the exterior, the load-leveling shock absorbers (1) are larger in diameter than the standard shock absorbers. Each load-leveling shock absorber is a self-leveling, self-contained vehicle leveling system and shock absorber combined. It does not require any external compressor, hoses, or height leveling sensors. When cargo or passengers are added, the load-leveling shock absorbers use normal ride motions during driving, even on smooth roads, to raise the rear of the vehicle automatically to the unloaded (or curb) height. When the load is removed, the vehicle maintains this rear ride height.



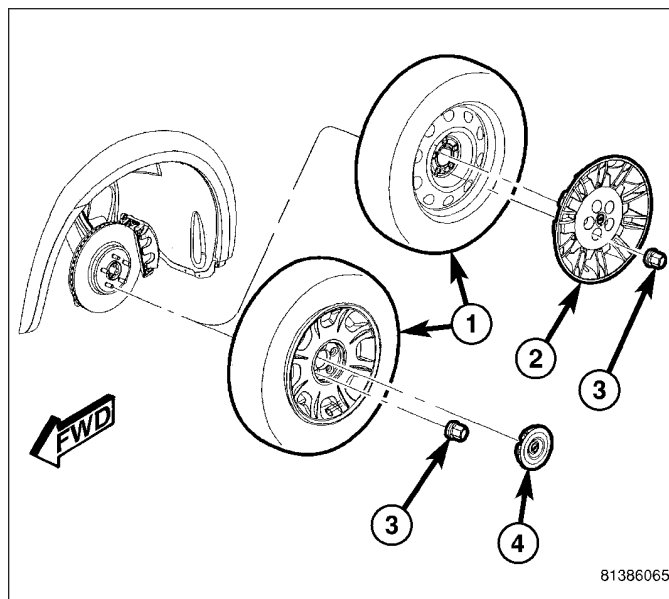
### REMOVAL

#### STANDARD

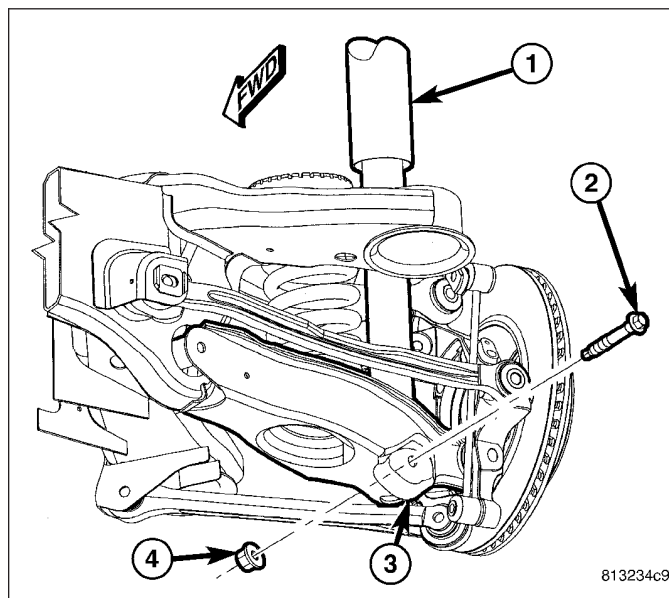
1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)



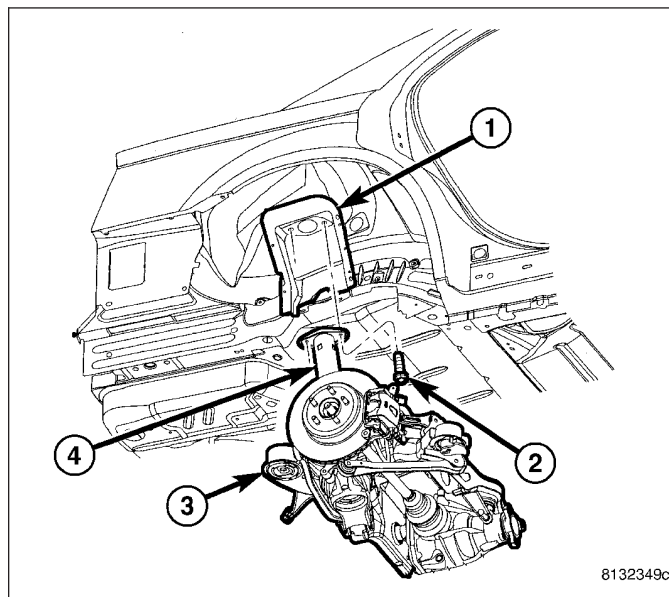
2. Remove wheel mounting nuts (3), then tire and wheel assembly (1).



3. Remove shock absorber (1) lower mounting bolt (2) and nut (4).

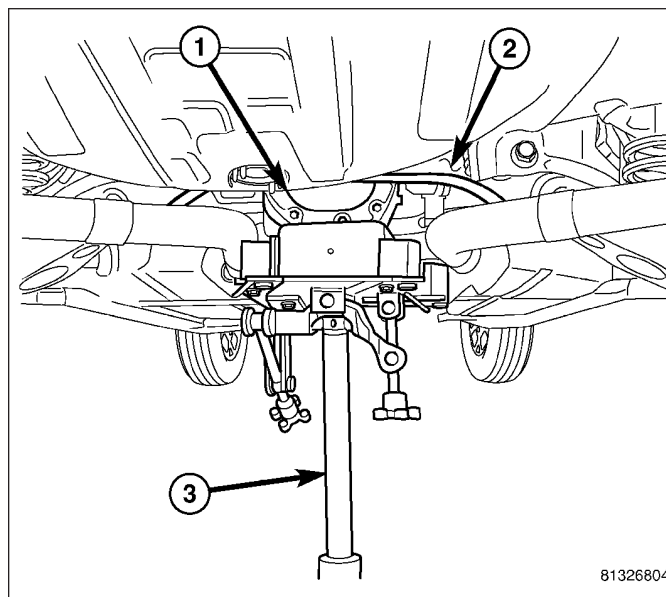


4. Remove shock absorber (1) upper mounting bolts (2).
5. Remove shock absorber (4).

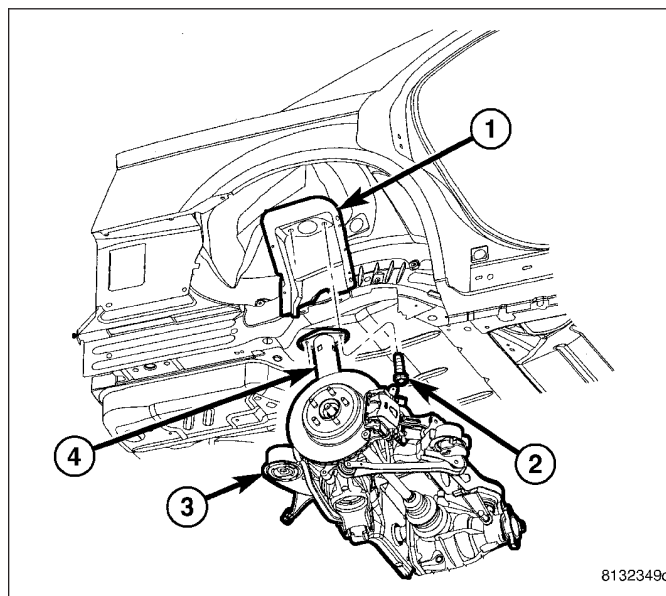




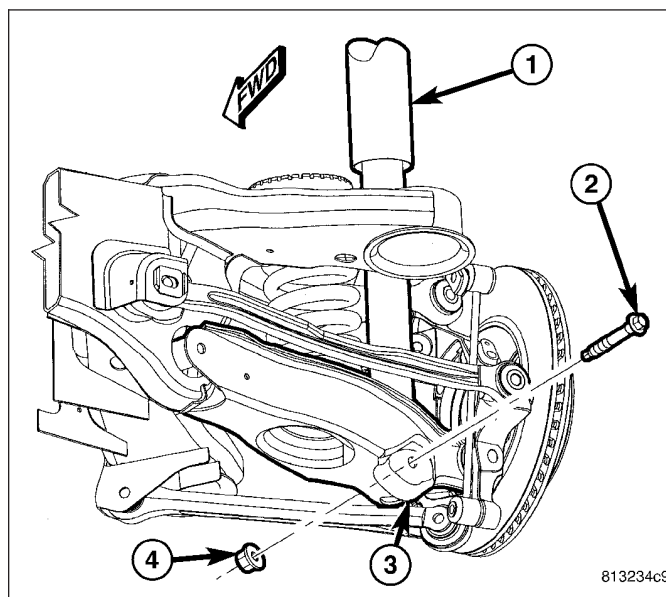
6. Position under-hoist utility jack or transmission jack (3) under center of rear axle differential (1). Raise jack head to contact differential and secure in place. **When securing crossmember to jack, be sure not to secure stabilizer bar.**



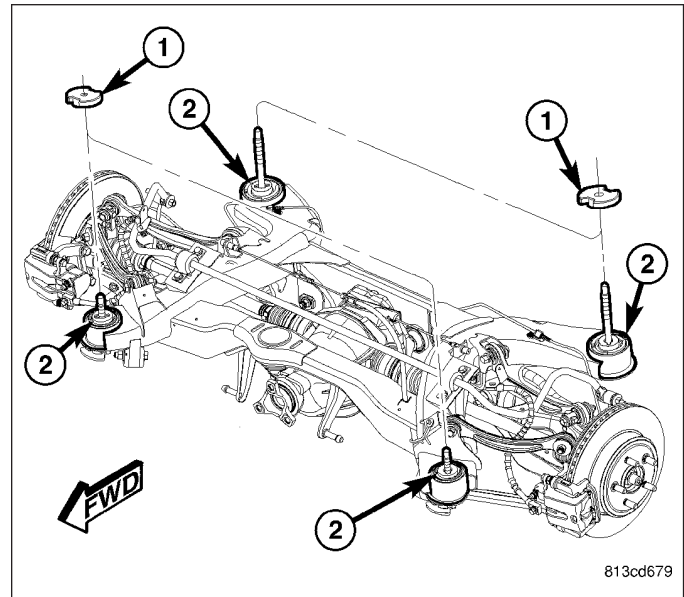
7. Remove shock absorber (1) upper mounting screws (2).



8. Remove shock absorber (1) lower mounting bolt (2) and nut (4).



**Note:** If equipped with AWD, when removing crossmember mounting bolts in following step, be sure to not to misplace spacers (1) between crossmember mounts (2) and body.

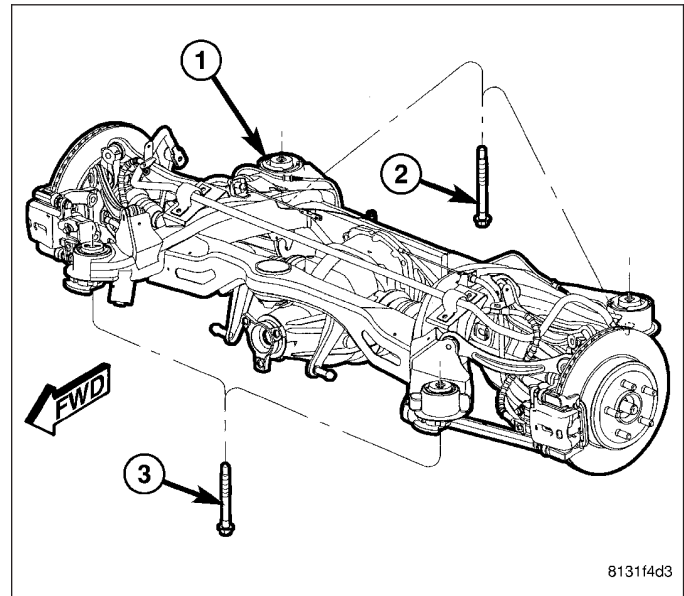


**CAUTION:** When removing crossmember mounting bolts (2 and 3) it is important NOT to loosen or remove crossmember mounting bolts on opposite side of vehicle. Doing so will require rear wheel alignment following reinstallation to ensure proper thrust angle.

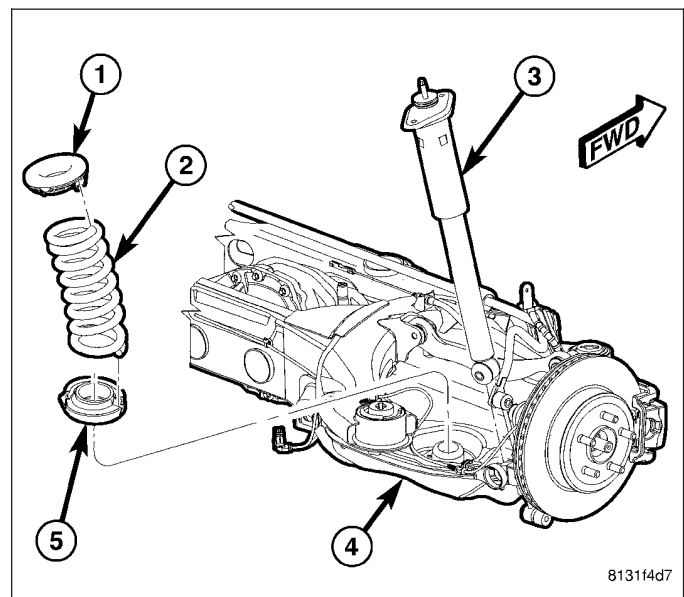
9. Remove both front and rear crossmember mounting bolts (2 and 3) on repair-side of vehicle.

**CAUTION:** To avoid damaging other components of vehicle, do not lower crossmember (1) any further than necessary to remove shock absorber.

10. **Slowly** lower jack allowing repair-side of crossmember to drop. **Do not lower jack at a fast rate.** Lower jack just enough to allow top of shock absorber to clear body flange.



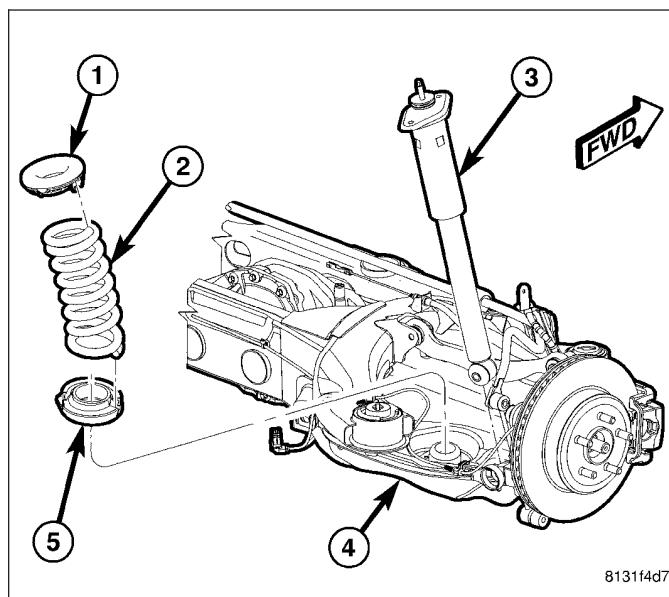
11. Remove shock absorber (3) by tipping top outward and lifting lower end out of pocket in spring link (4).



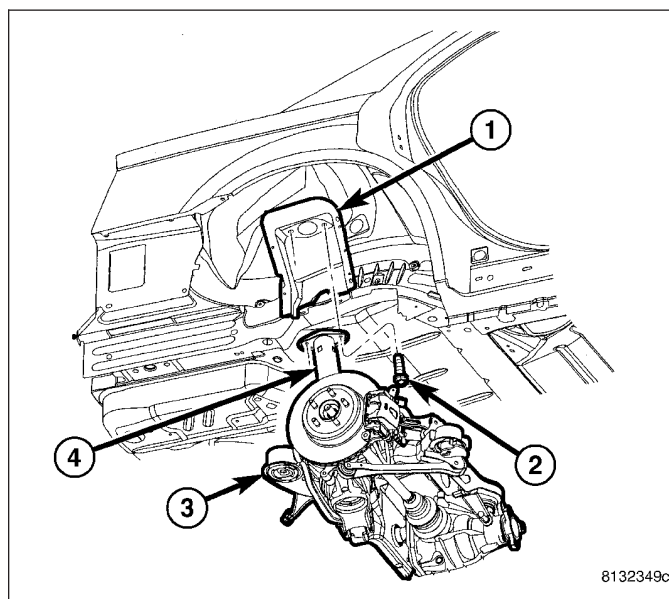
## INSTALLATION

### STANDARD

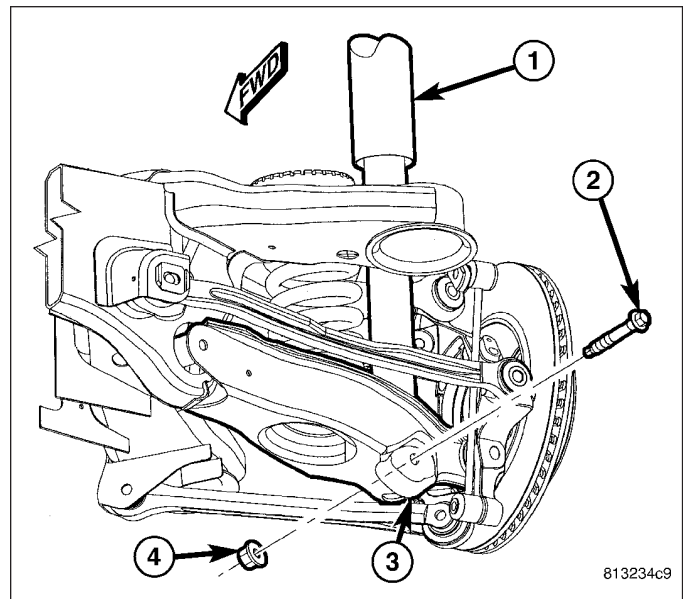
1. Insert lower end of shock absorber (3) into well of spring link (4).



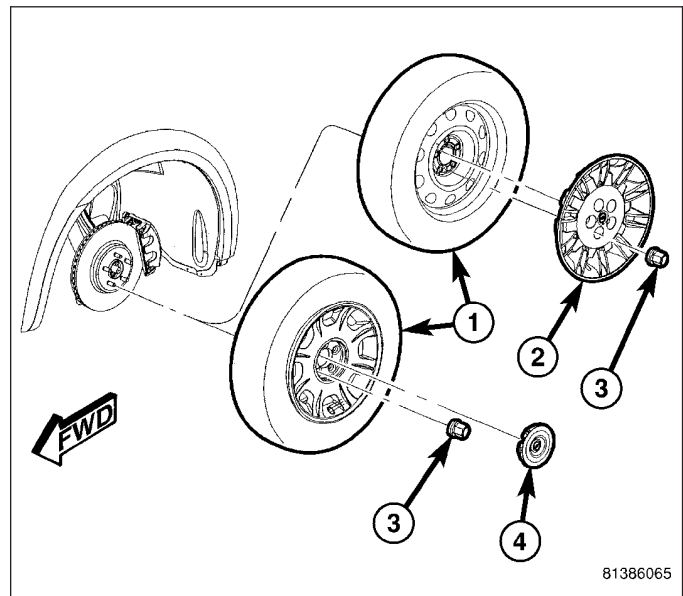
2. Raise upper end of shock absorber (4) up into mounted position on body (1) and install upper mounting screws (2). Tighten upper mounting screws to 52 N·m (38 ft. lbs.) torque.



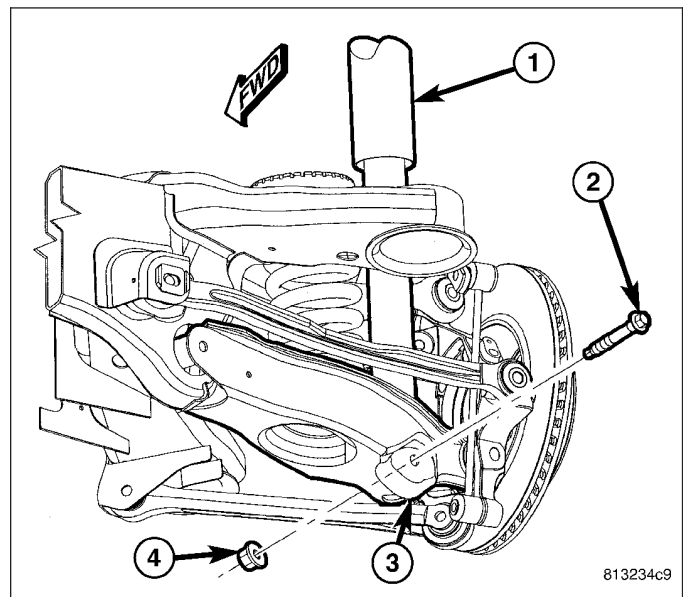
3. Install lower shock mounting bolt (2) and nut (4).  
**Do not tighten at this time.**



4. Install tire and wheel assembly (1). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
5. Lower vehicle.
6. Position vehicle on alignment rack/drive-on hoist. Raise vehicle as necessary to access lower mounting bolt.

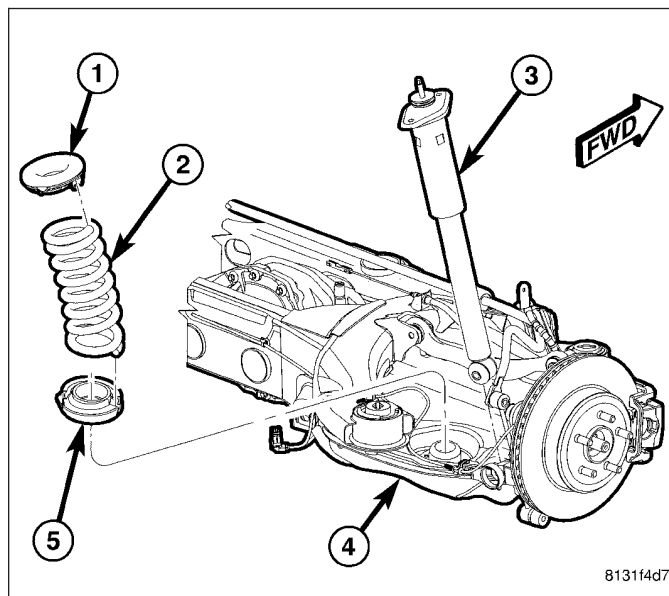


7. Tighten shock absorber lower mounting bolt nut (4) to 72 N·m (53 ft. lbs.) torque.

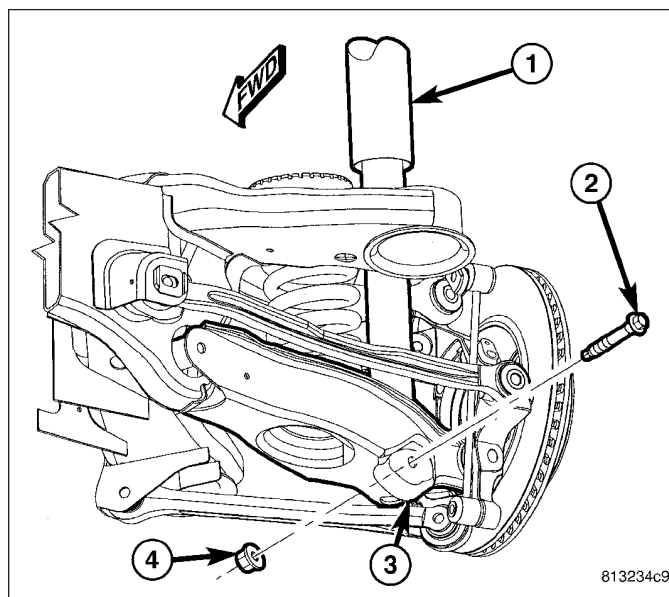


## LOAD-LEVELING

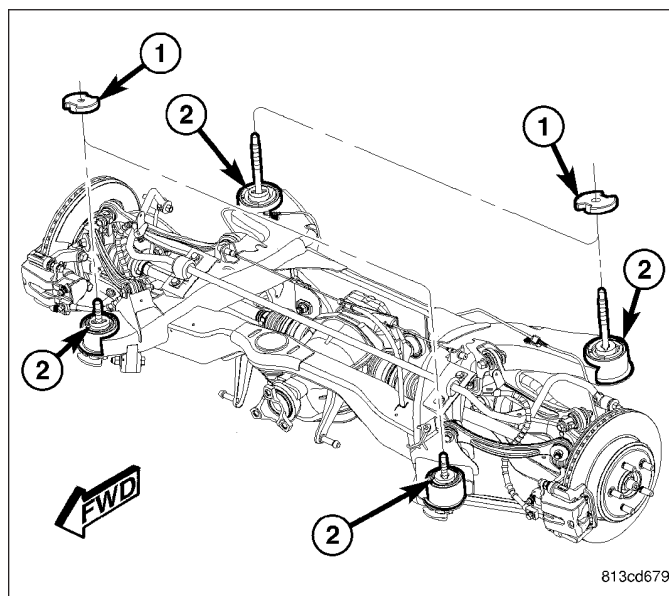
1. Install shock absorber (3) by setting lower end into pocket in spring link (4), then tipping top inward until aligned with upper mounting holes.



2. Install lower shock mounting bolt and nut. **Do not tighten at this time.**

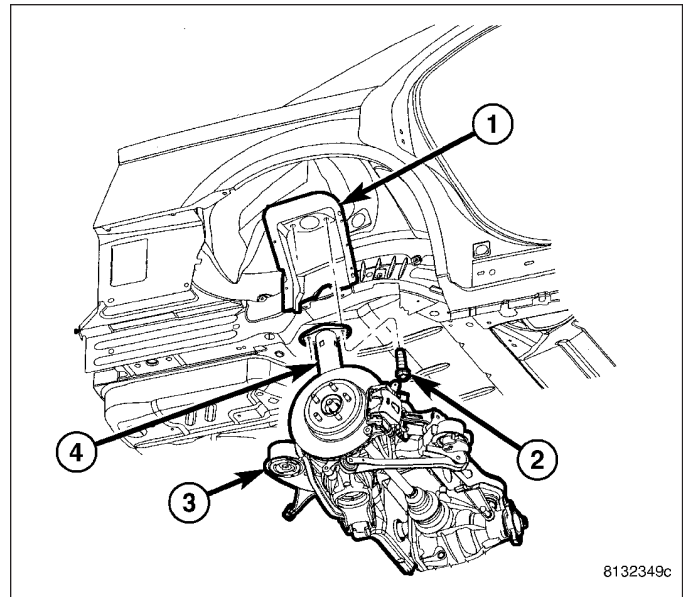


3. If vehicle is equipped with AWD, make sure spacers (1) on top of crossmember mount bushings (2) on side of repair are in position.



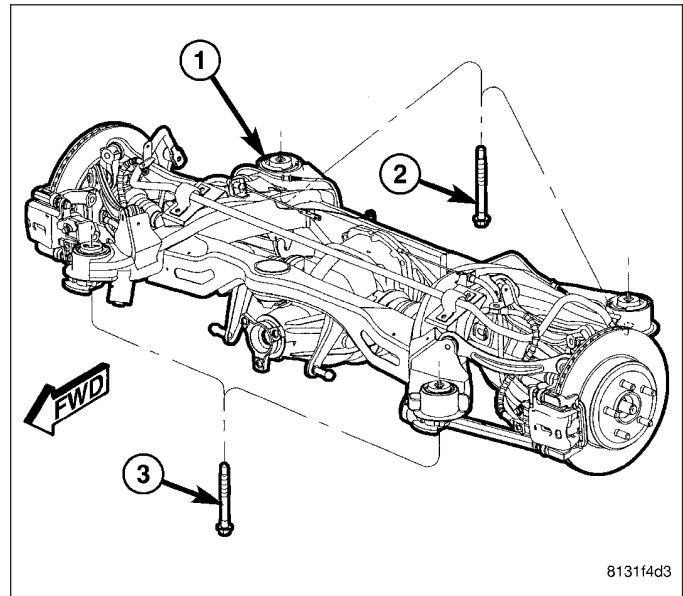


4. Carefully raise jack, guiding coil spring and upper end of shock absorber (4) into mounted positions.
5. Install shock absorber upper mounting screws (2). Tighten upper mounting screws to 52 N·m (38 ft. lbs.) torque.

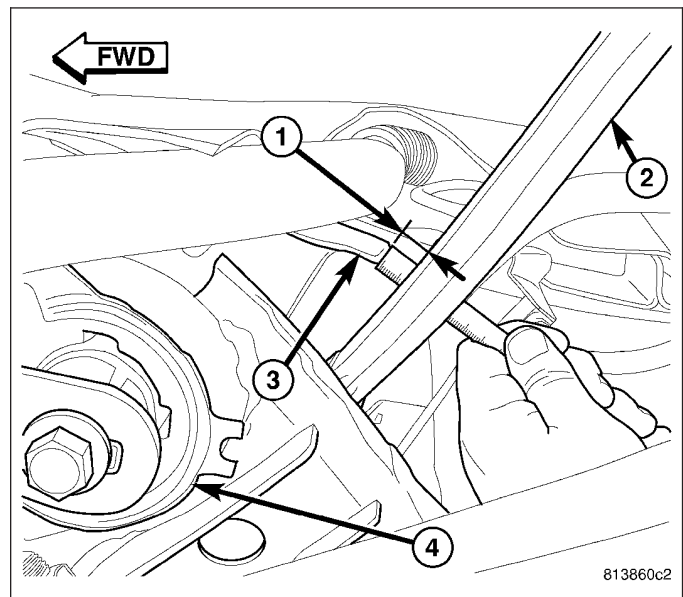


**Note: Rear crossmember mounting bolts (2) are longer than front mounting bolts (3). Do not interchange mounting bolts.**

6. Install crossmember mounting bolts (2 and 3). Snug, but do not fully tighten bolts at this time.

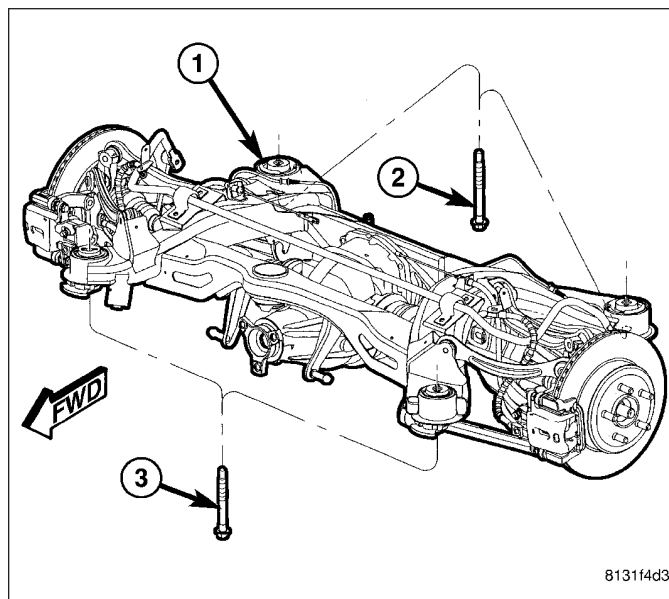


7. Measure distance (1) between from tension link (2) to body weld flange (3) directly in front of it, just outboard of front mount bushing (4). **This distance must be at least 12 mm to allow proper clearance for suspension movement.** If distance is less than 12 mm, shift that side of rear crossmember directly rearward until distance is 12 mm or greater. To do so, loosen 3 mounting bolts slightly, leaving one on opposite side of shift snugged to pivot off of. Shift crossmember rearward and snug loosened bolts. Measure opposite side to be sure it also maintains minimum 12 mm distance.

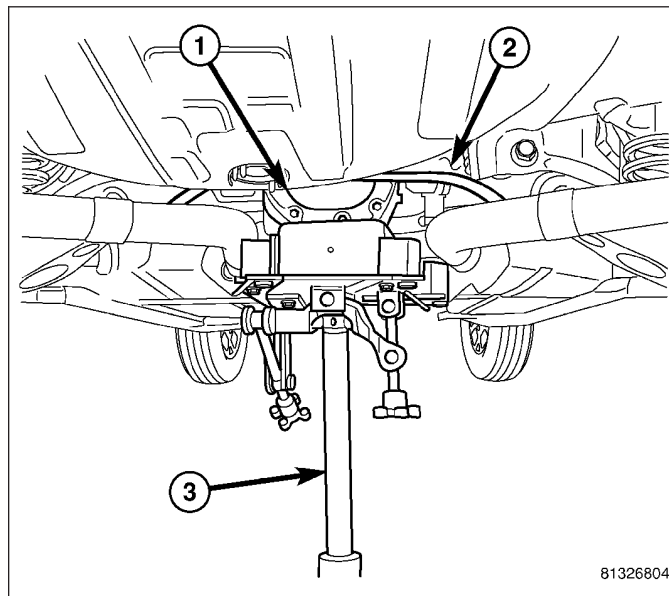




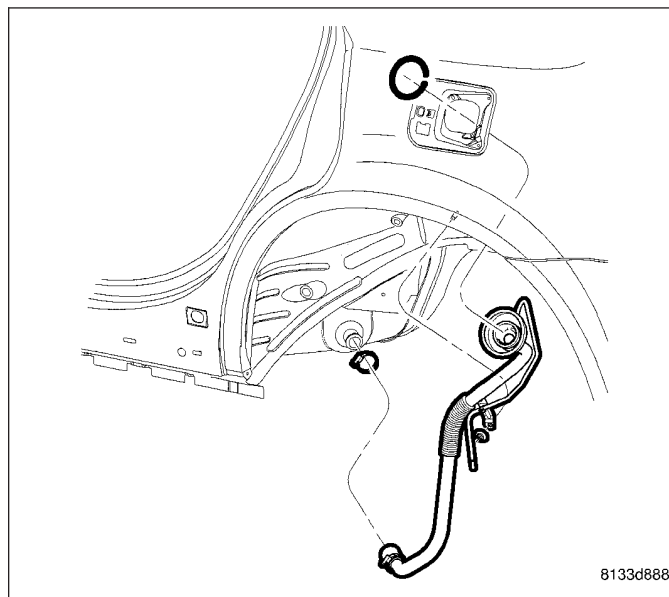
8. Tighten all crossmember mounting bolts (2 and 3) to 180 N·m (133 ft. lbs.) torque.



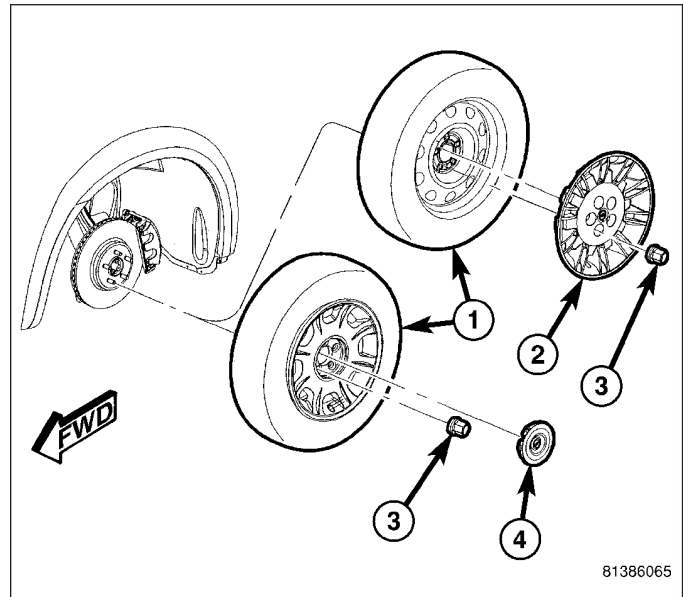
9. Remove jack (3) from under rear axle differential.  
10. If previously lowered, raise rear exhaust back to mounted position and connect exhaust isolators at muffler and resonators hangers. Remove jack or stand below exhaust muffler.



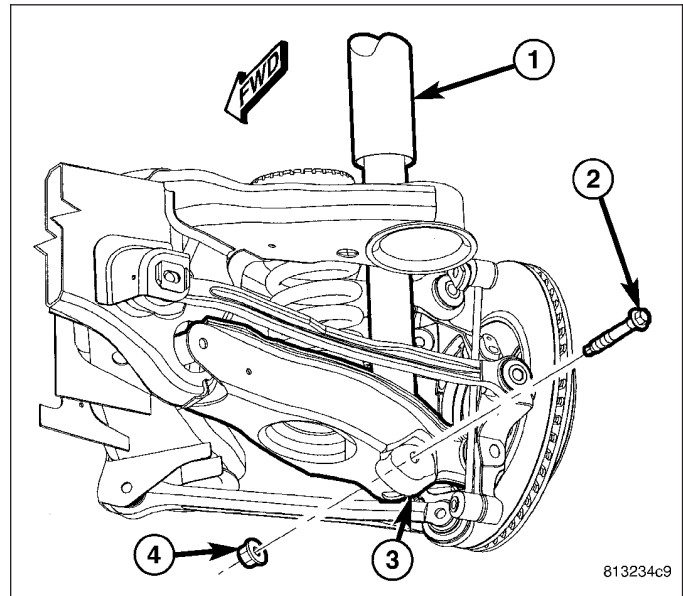
11. If removed, install fuel filler tube. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK FILLER TUBE - INSTALLATION)



12. Install tire and wheel assemblies (1). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
13. Lower vehicle.
14. Position vehicle on alignment rack/drive-on lift. Raise lift as necessary to access lower mounting bolt.



15. Tighten shock absorber lower mounting bolt nut (4) to 72 N·m (53 ft. lbs.) torque.

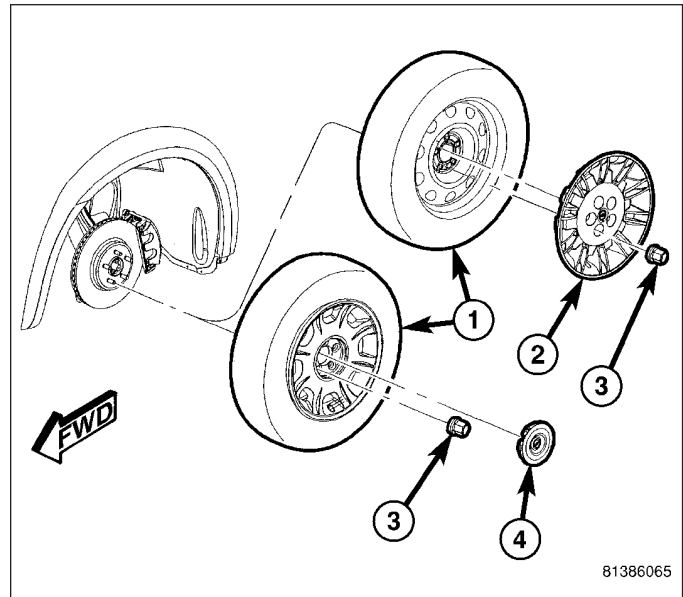


## SPRING

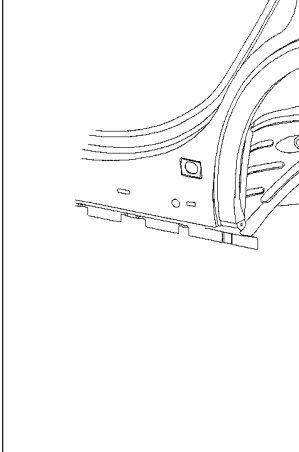
### REMOVAL

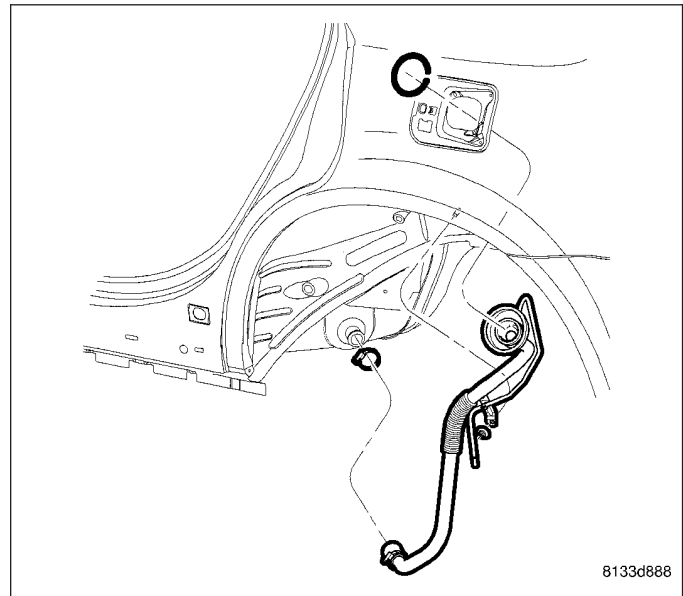
1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

2. On both sides of vehicle, remove wheel mounting nuts (3), then rear tire and wheel assembly (1).

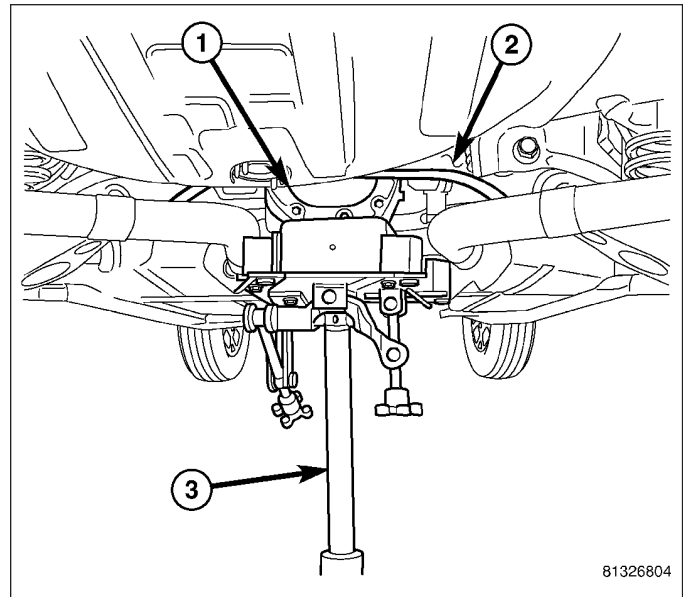


**WARNING:** Before opening fuel system, review all Warnings and Cautions.

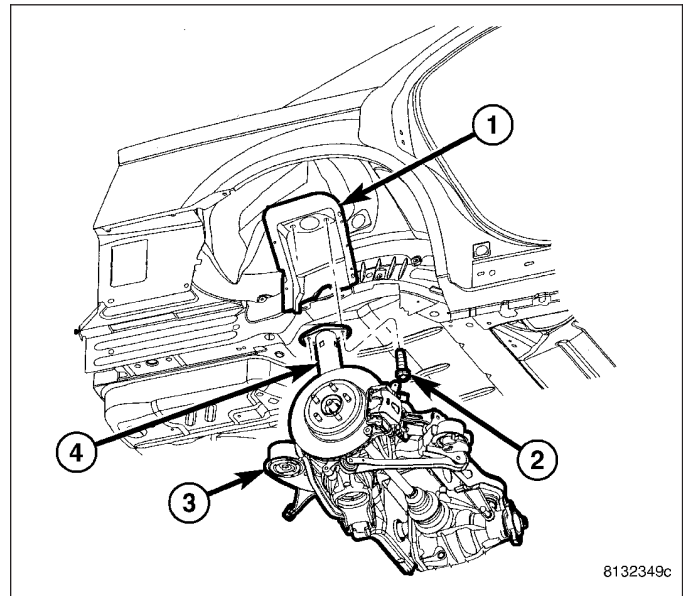
3. If servicing left side shock absorber, remove fuel filler tube. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK FILLER TUBE - REMOVAL)
  4. Position an extra pair of jack stands under and support forward end of engine cradle to help stabilize vehicle during rear suspension removal/installation.
  5. Perform following if vehicle is equipped with dual-exhaust or are servicing right side on vehicle with single exhaust.
    - a. Position under-hoist utility jack or stand several inches below exhaust at muffler.
    - b. Disconnect exhaust isolators at muffler and resonators hangers.
    - c. Lower exhaust down to rest upon top of jack or stand placed below muffler.
- 
- The diagram shows the rear three-quarter view of a vehicle's chassis. It highlights the engine cradle, which is supported by jack stands. The exhaust system, including the muffler and resonators, is shown with isolators at the hangers. The diagram illustrates the location where a jack or stand should be placed under the exhaust at the muffler for removal or installation.



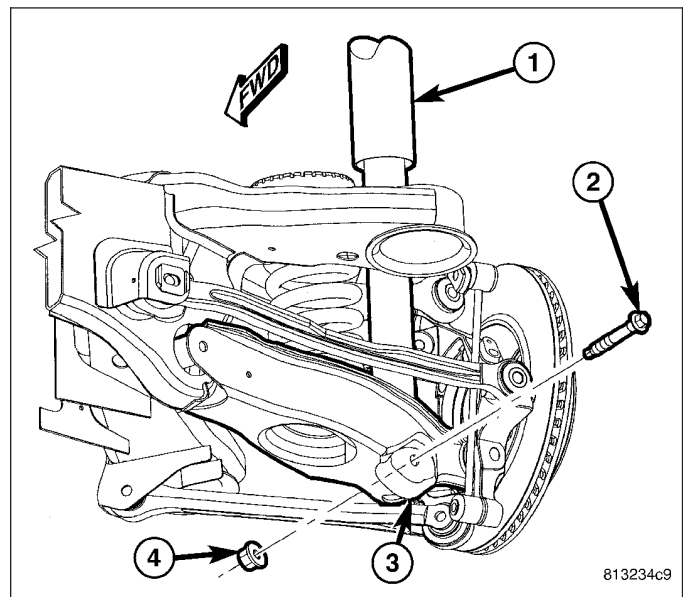
6. Position under-hoist utility jack or transmission jack (3) under center of rear axle differential (1). Raise jack head to contact differential and secure in place. **When securing crossmember to jack, be sure not to secure stabilizer bar.**



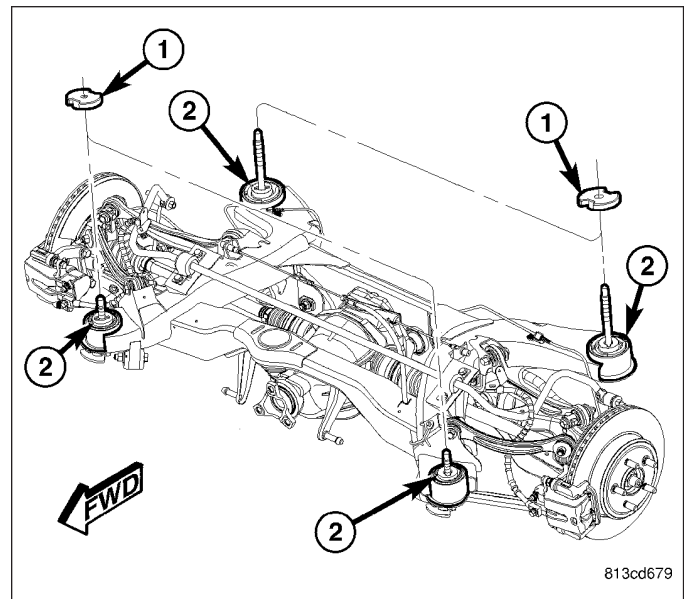
7. Remove shock absorber (1) upper mounting screws (2).



8. Remove shock absorber (1) lower mounting bolt (2) and nut (4).



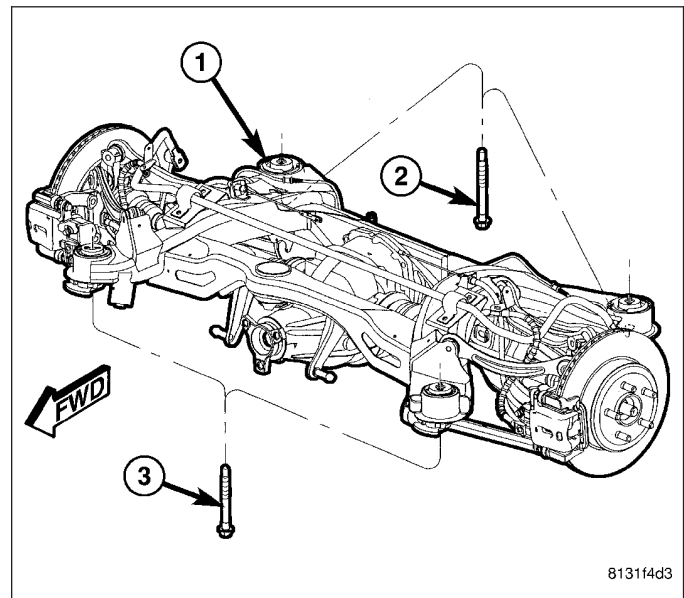
**Note:** If equipped with AWD, when removing crossmember mounting bolts in following step, be sure to not to misplace spacers (1) between crossmember mounts (2) and body.



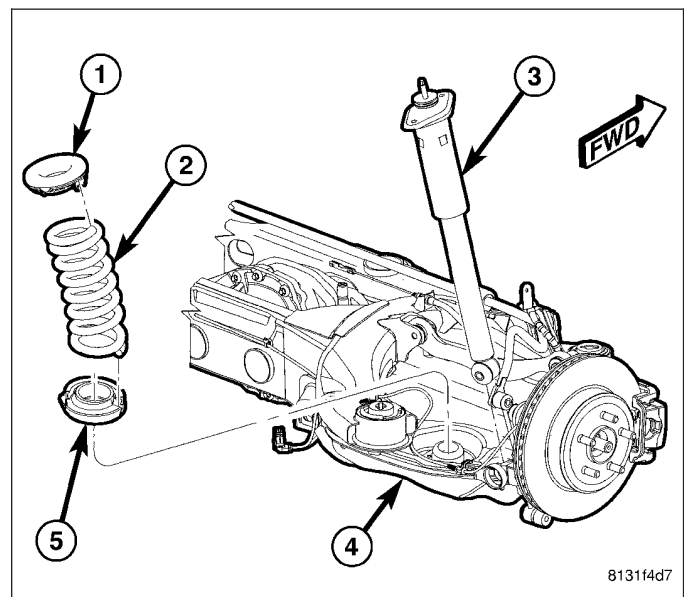
**CAUTION:** When removing crossmember mounting bolts (2 and 3) it is important NOT to loosen or remove crossmember mounting bolts on opposite side of vehicle. Doing so will require rear wheel alignment following reinstallation to ensure proper thrust angle.

9. Remove both front and rear crossmember mounting bolts (2 and 3) on repair-side of vehicle.

**CAUTION:** To avoid damaging other components of vehicle, do not lower crossmember (1) any further than necessary to remove shock absorber.



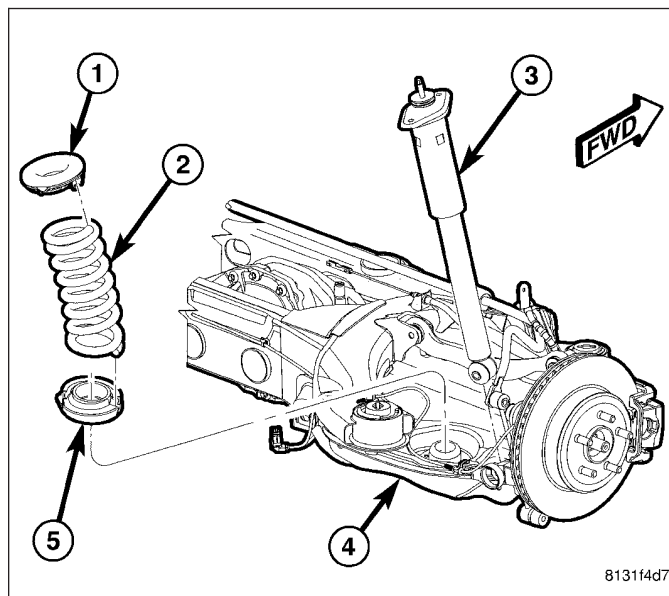
10. **Slowly** lower jack allowing repair-side of crossmember to drop. **Do not lower jack at a fast rate.** Lower jack just enough to allow top of shock absorber to clear body flange.
11. Remove shock absorber (3) by tipping top outward and lifting lower end out of pocket in spring link (4).
12. Disconnect brake hose at bracket mounted to body to allow to avoid overextending hose, damaging it, during following step.
13. Slowly lower jack until crossmember is low enough to remove coil spring. **Do not lower jack any further than necessary to remove spring.**
14. Remove coil spring and isolators (1, 2 and 5).



## INSTALLATION

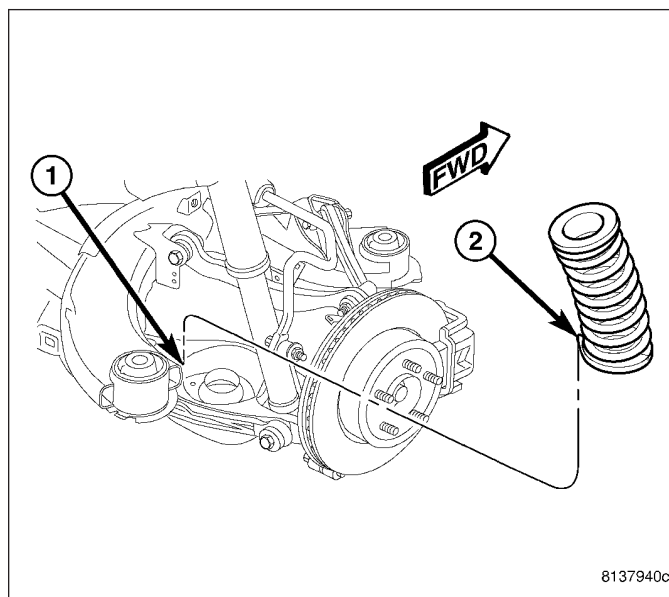
**Note:** Rear coil springs are interchangeable.

1. Install upper (1) and lower (5) isolators on coil spring (2).

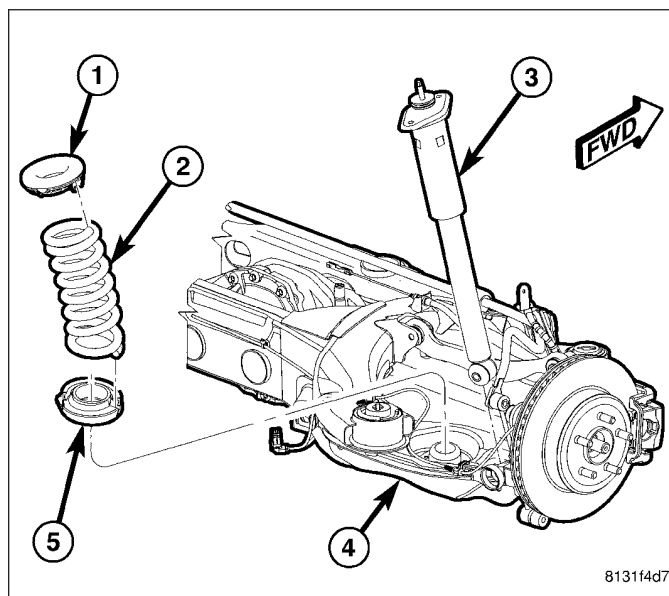


**Note:** Before installing coil spring, make sure isolators (1 and 5) are completely installed on ends of spring.

2. Install coil spring with isolators into spring pocket of spring link (1) fitting lower isolator (2) to shape of pocket, then align top of spring with body mount.

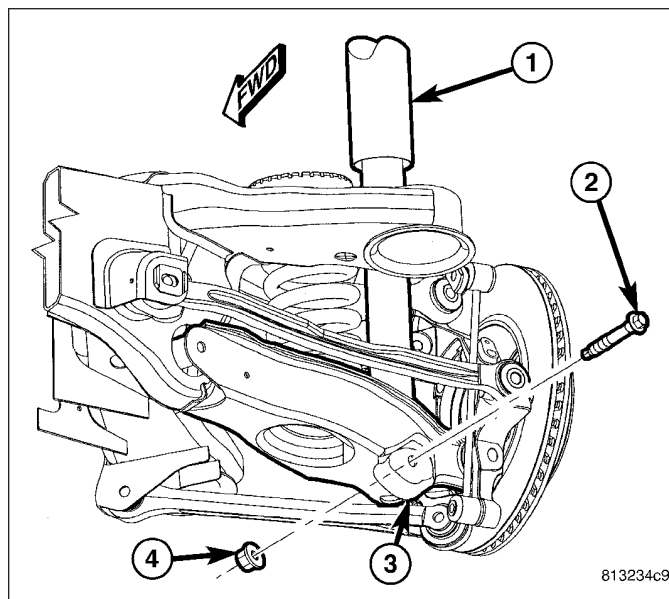


3. Install shock absorber (3) by setting lower end into pocket in spring link (4), then tipping top inward until aligned with upper mounting holes.

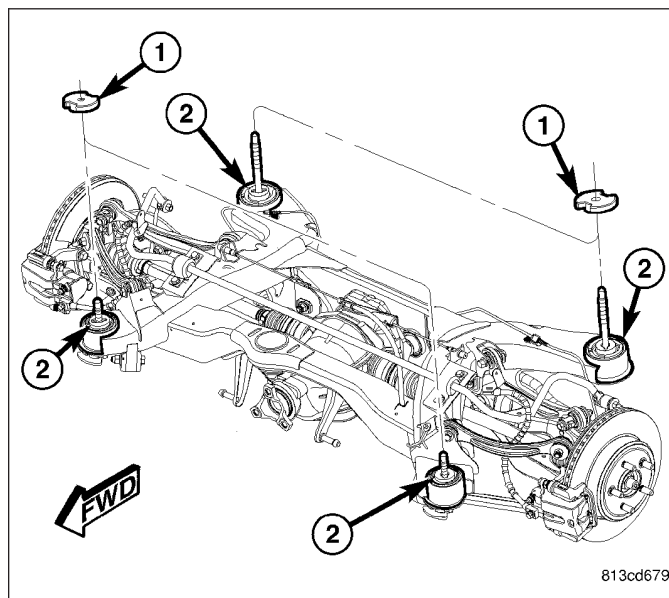




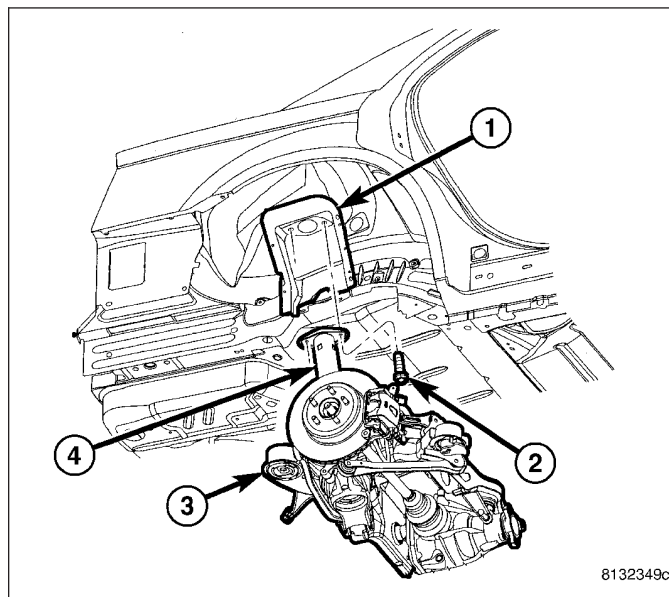
4. Install lower shock mounting bolt and nut. **Do not tighten at this time.**



5. If vehicle is equipped with AWD, make sure spacers (1) on top of crossmember mount bushings (2) on side of repair are in position.

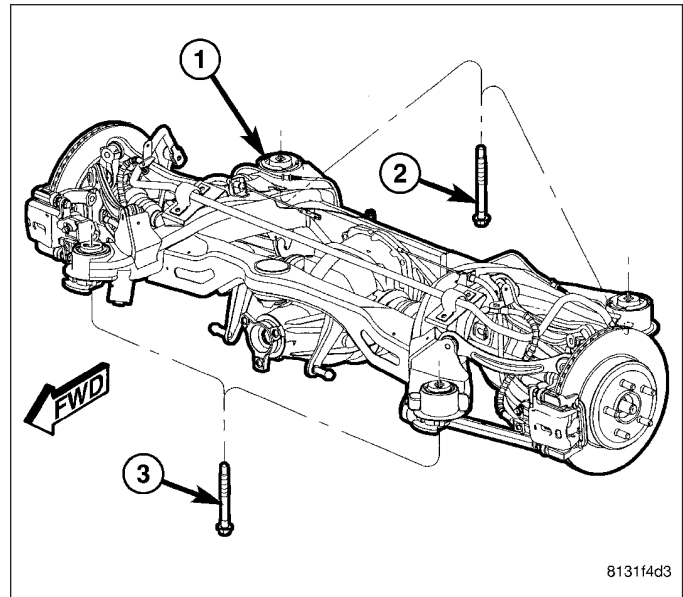


6. Carefully raise jack, guiding coil spring and upper end of shock absorber (4) into mounted positions.
7. Install shock absorber upper mounting screws (2). Tighten upper mounting screws to 52 N·m (38 ft. lbs.) torque.

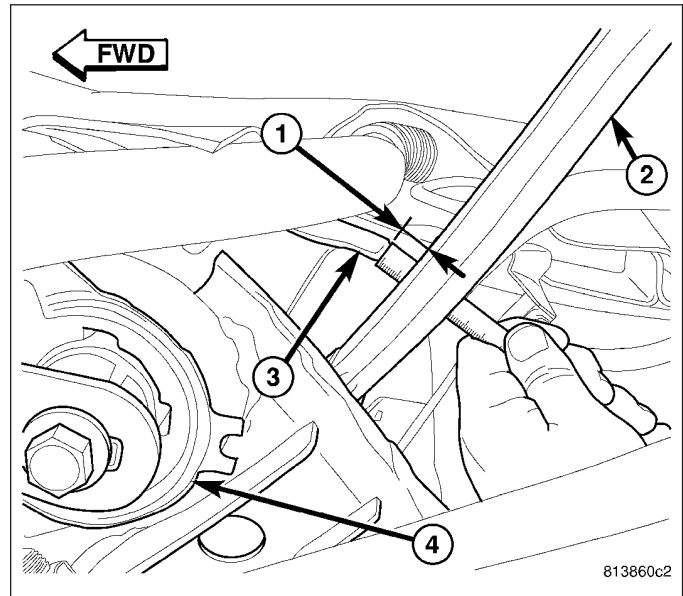


**Note:** Rear crossmember mounting bolts (2) are longer than front mounting bolts (3). Do not interchange mounting bolts.

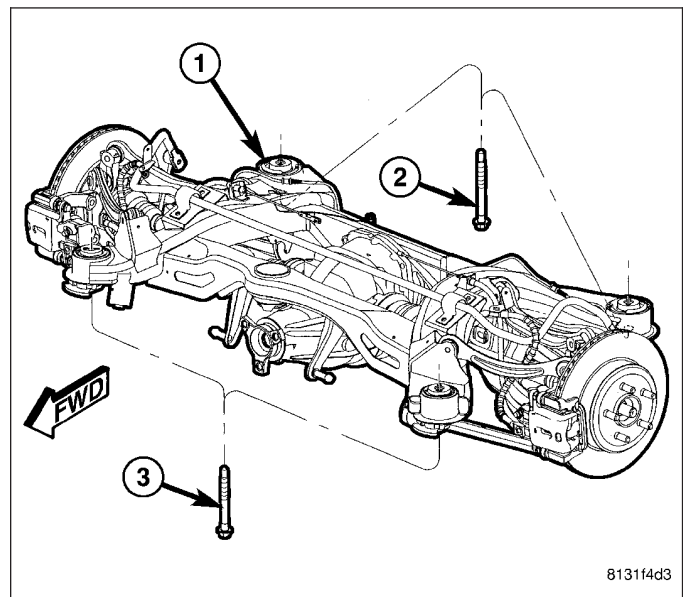
8. Install crossmember mounting bolts (2 and 3).  
**Snug, but do not fully tighten bolts at this time.**



9. Measure distance (1) between front tension link (2) to body weld flange (3) directly in front of it, just outboard of front mount bushing (4). **This distance must be at least 12 mm to allow proper clearance for suspension movement.** If distance is less than 12 mm, shift that side of rear crossmember directly rearward until distance is 12 mm or greater. To do so, loosen 3 mounting bolts slightly, leaving one on opposite side of shift snugged to pivot off of. Shift crossmember rearward and snug loosened bolts. Measure opposite side to be sure it also maintains minimum 12 mm distance.

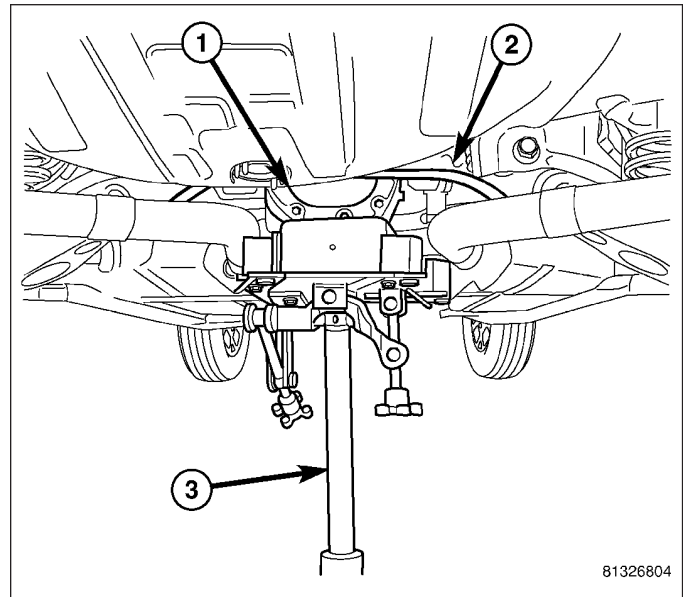


10. Tighten all crossmember mounting bolts (2 and 3) to 180 N·m (133 ft. lbs.) torque.

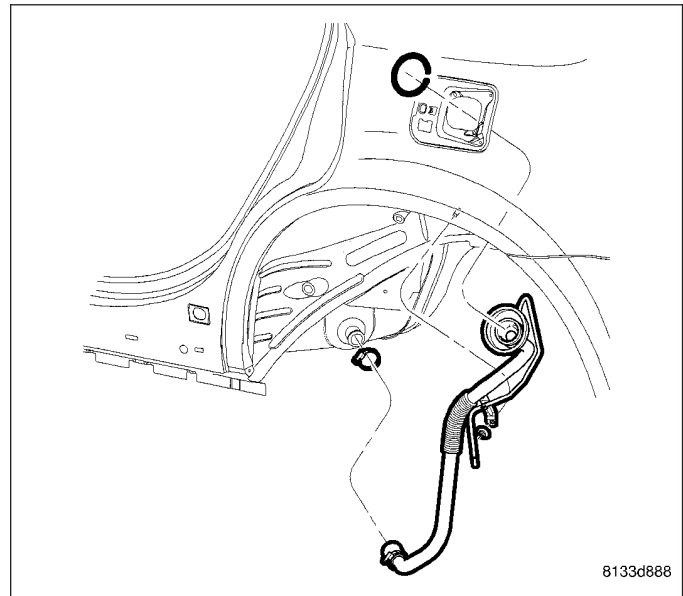




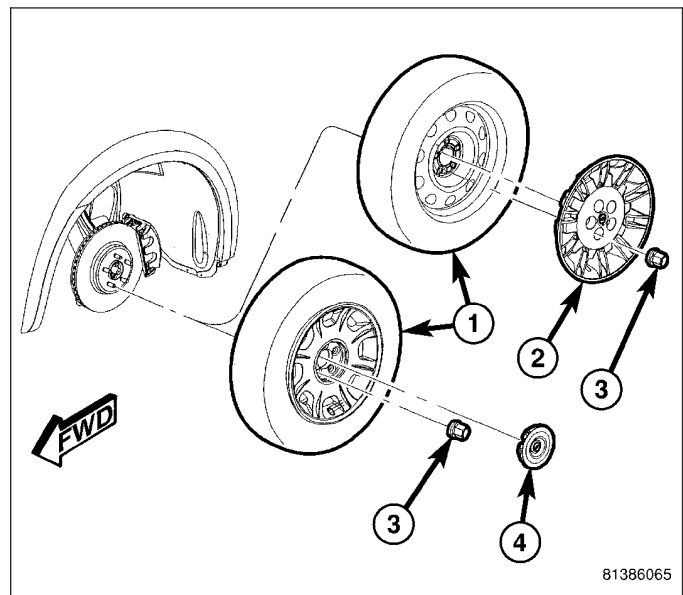
11. Remove jack (3) from under rear axle differential.
12. If previously lowered, raise rear exhaust back to mounted position and connect exhaust isolators at muffler and resonators hangers. Remove jack or stand below exhaust muffler.



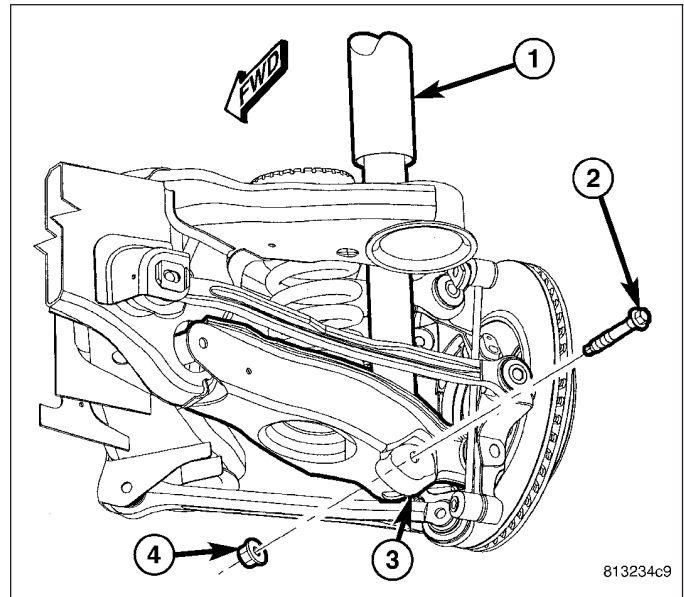
13. Install fuel filler tube. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK FILLER TUBE - INSTALLATION)



14. Install tire and wheel assemblies (1). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
15. Lower vehicle.
16. Position vehicle on alignment rack/drive-on lift. Raise lift as necessary to access lower mounting bolt.



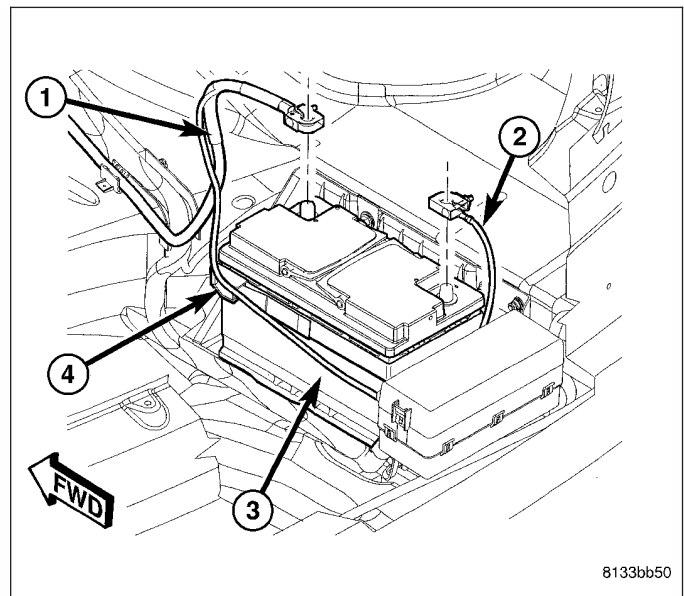
17. Tighten shock absorber lower mounting bolt nut (4) to 72 N·m (53 ft. lbs.) torque.



## BAR - STABILIZER

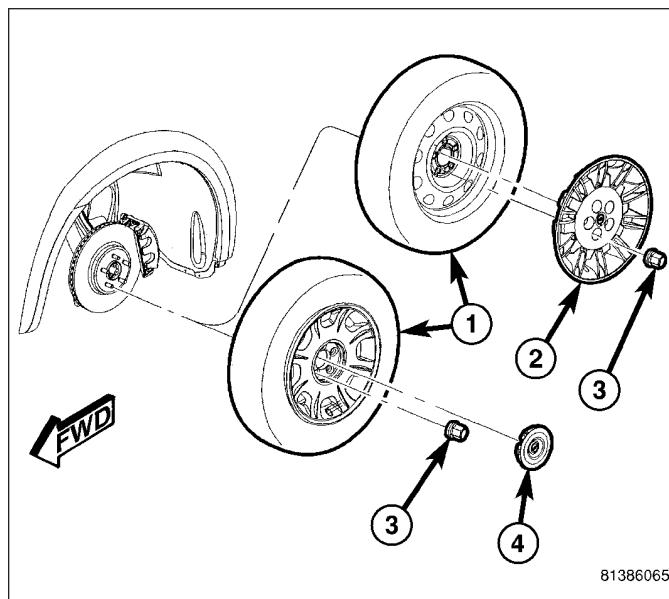
### REMOVAL

1. Disconnect and isolate battery negative cable (2) from battery post.

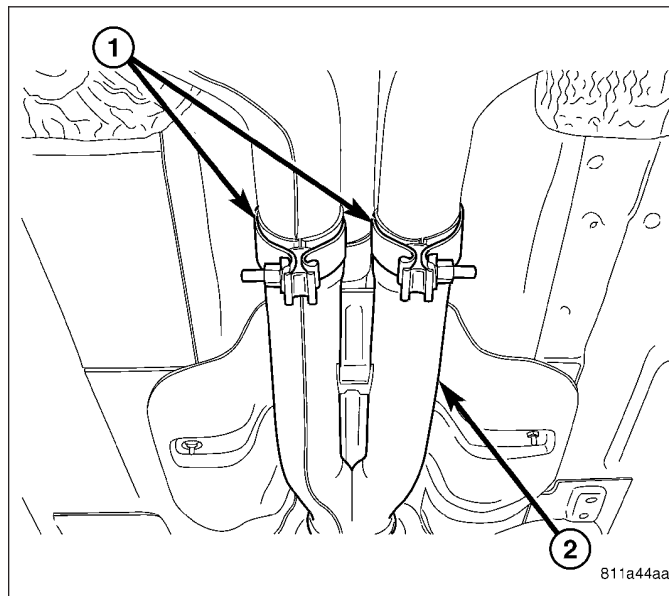


2. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

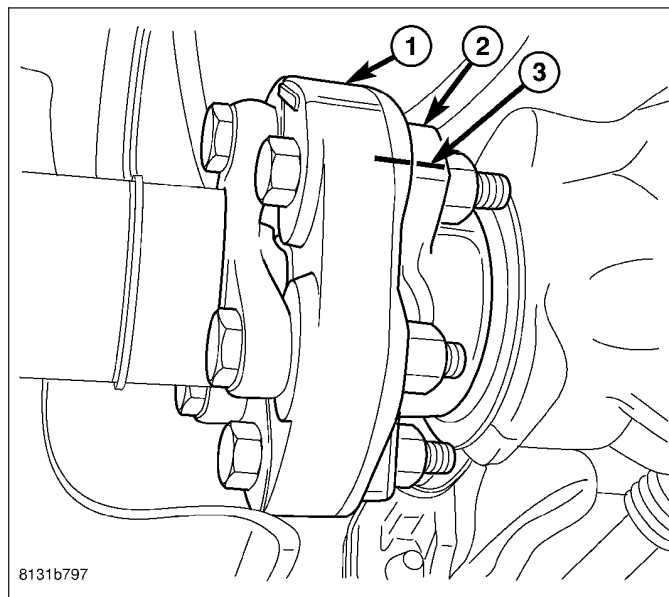
3. On each side of vehicle rear, remove wheel mounting nuts (3), then tire and wheel assembly (1).



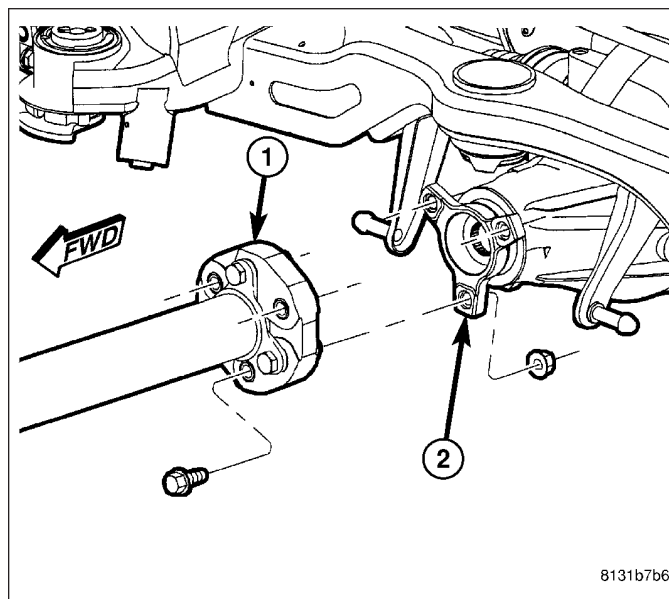
4. Remove rear exhaust system (2) (dual-outlet exhaust shown in figure). (Refer to 11 - EXHAUST SYSTEM - REMOVAL)



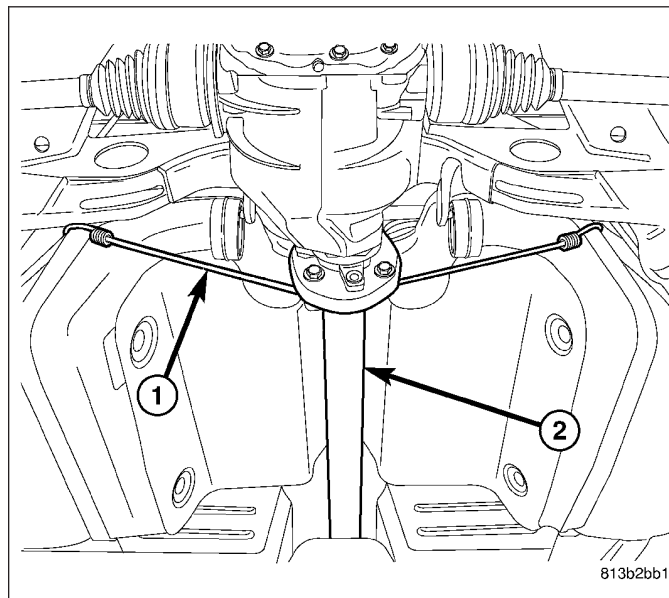
5. Apply alignment index marks (3) to the propeller shaft rubber coupler (1) and axle flange (2).



6. Remove three propeller shaft coupler-to-axle flange bolts and nuts.

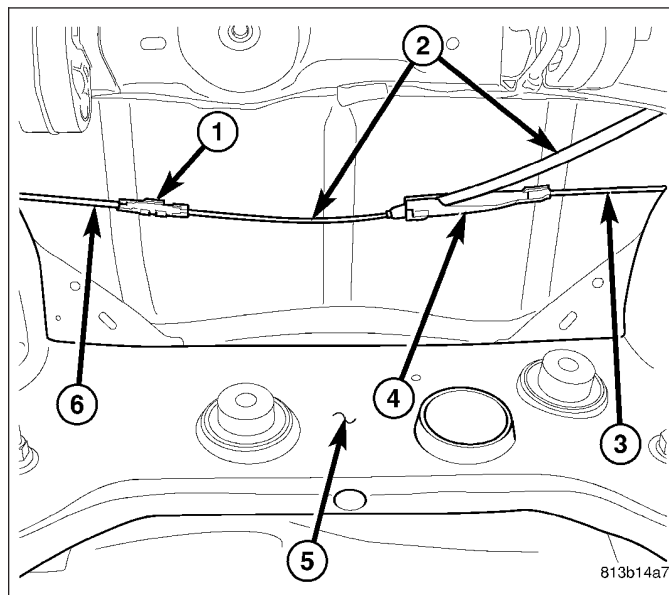


7. Support propeller shaft (2) using a bungee cord (1). Attach ends of cord to fuel tank straps as shown.



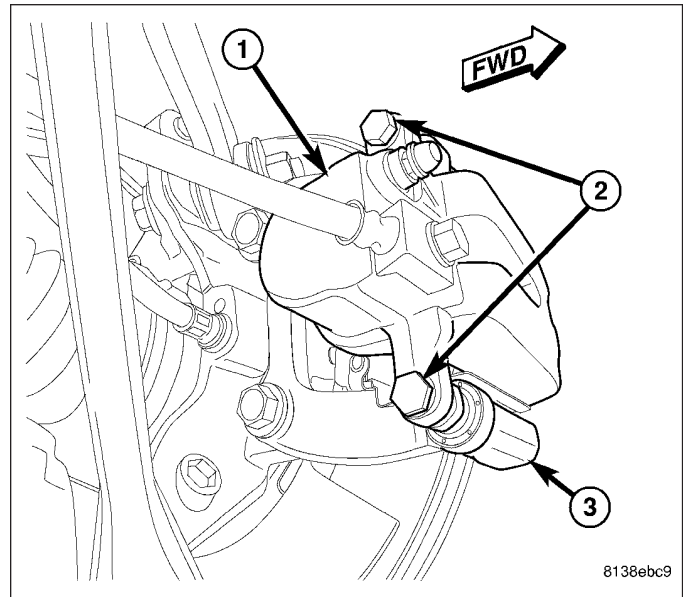
**Note:** Due to short travel and low spring tension, it is not necessary to lock-out parking brake lever to service parking brake components.

8. Disconnect front parking brake cable (2) at connector (1) to right rear parking brake cable.
9. Remove front parking brake cable (2) from equalizer (4).

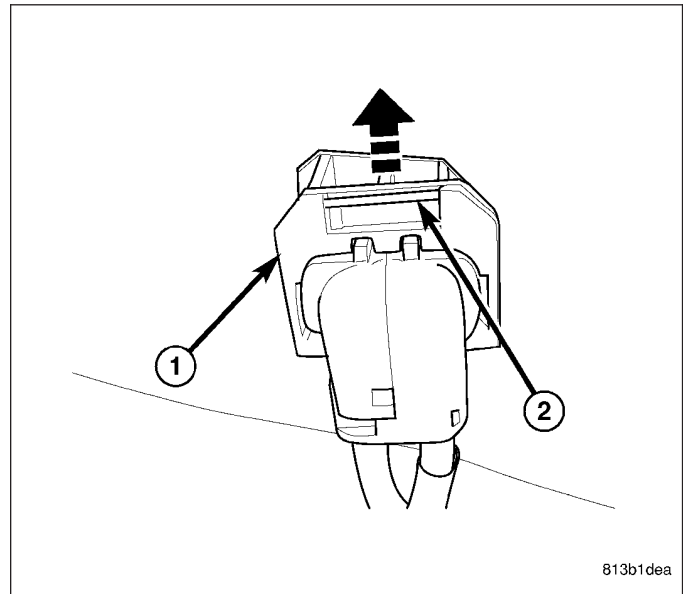


## 10. On each rear disc brake:

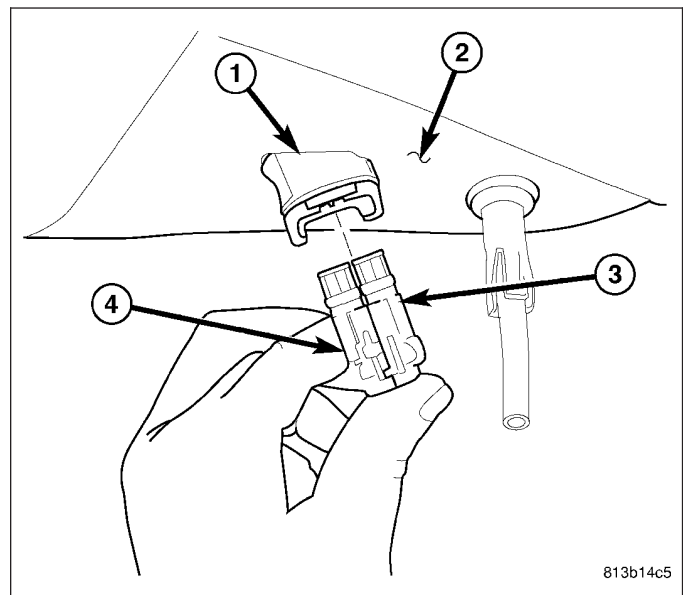
- While holding guide pins from turning, remove disc brake caliper guide pin bolts (2).
- Remove brake caliper (1) from brake adapter (3) and pads.
- Guide brake caliper up through suspension, following brake hose path. Support caliper above rear suspension using with bungee cord or wire to keep caliper from overextending brake hose when crossmember is lowered.



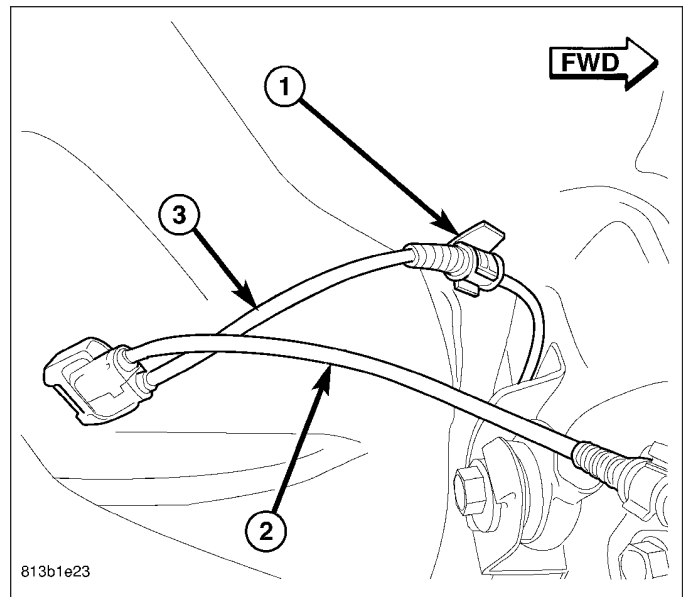
**Note:** To remove wheel speed sensor connector from body wiring harness connector, move retaining clip (2) and pull sensor connector outward.



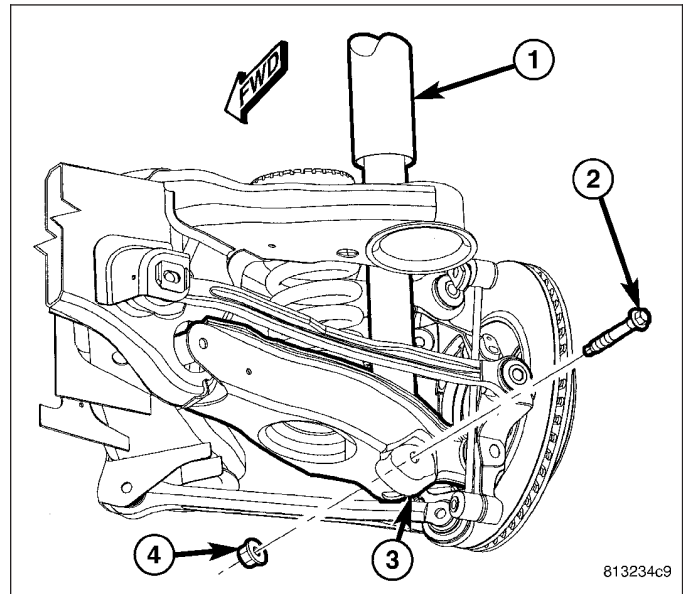
- Remove wheel speed sensor connectors (3 and 4) from body wiring harness connector (1) located in luggage compartment floor pan (2).



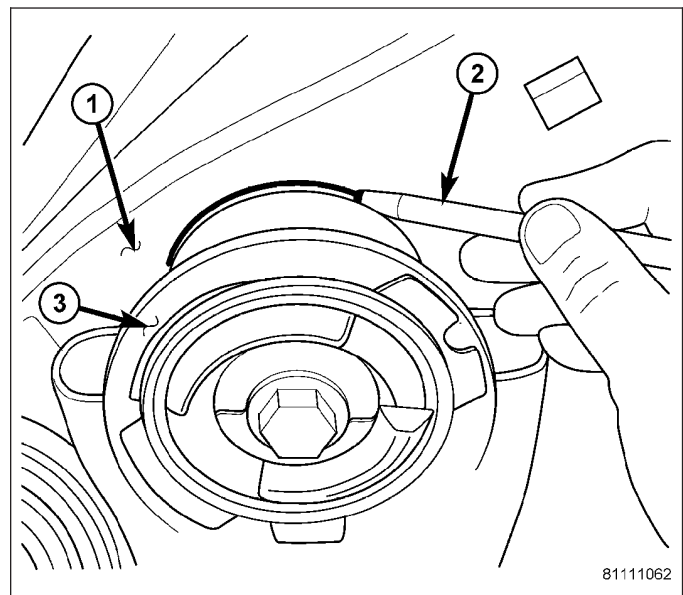
12. Unclip left wheel speed sensor cable (3) from routing clip (1) near body connector.



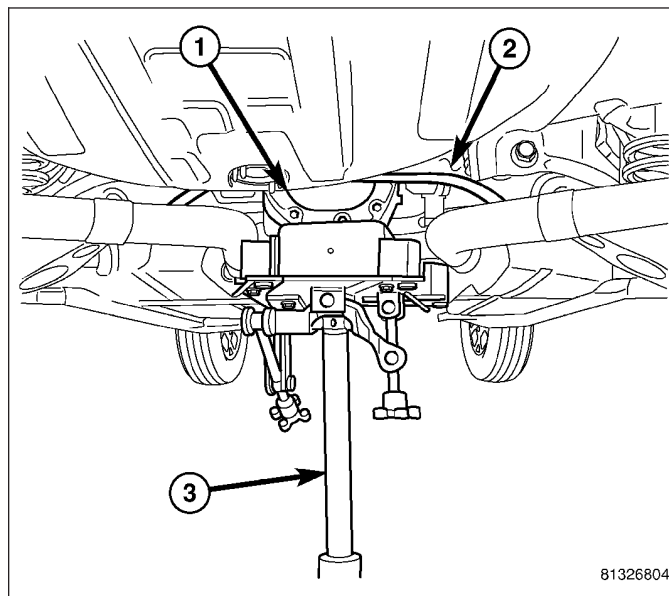
13. On each side of vehicle, remove shock absorber (1) lower mounting bolt (2) and nut (4).



14. Carefully mark location of rear crossmember on body at all four mount (bushing) locations using a marker or crayon. **Do not use a scratch awl to mark location.**

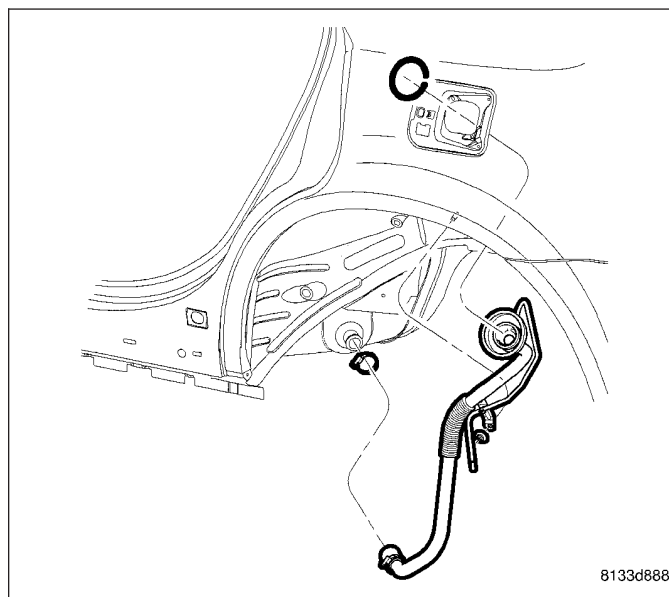


15. Position an extra pair of jack stands under and support forward end of engine cradle to help stabilize vehicle during rear suspension removal/installation.
16. Position under-hoist utility jack or transmission jack (3) under center of rear axle differential (1). Raise jack head to contact differential and secure in place. **When securing crossmember to jack, be sure not to secure stabilizer bar.**

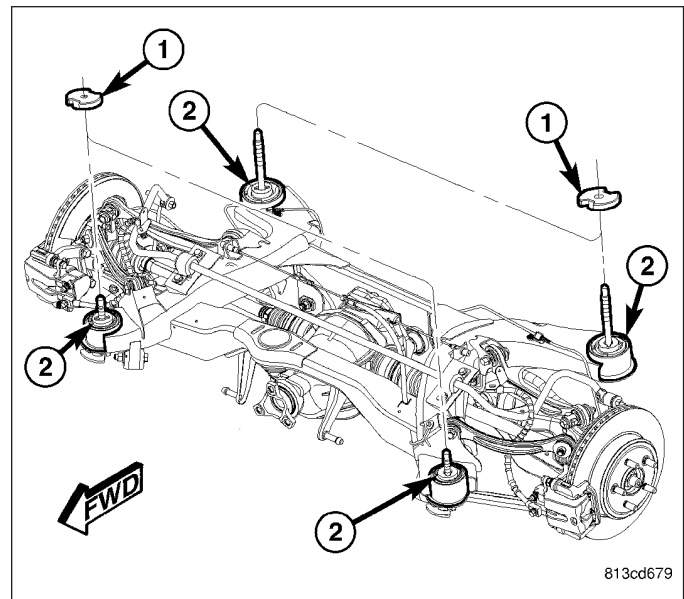


**WARNING:** Before opening fuel system, review all Warnings and Cautions.

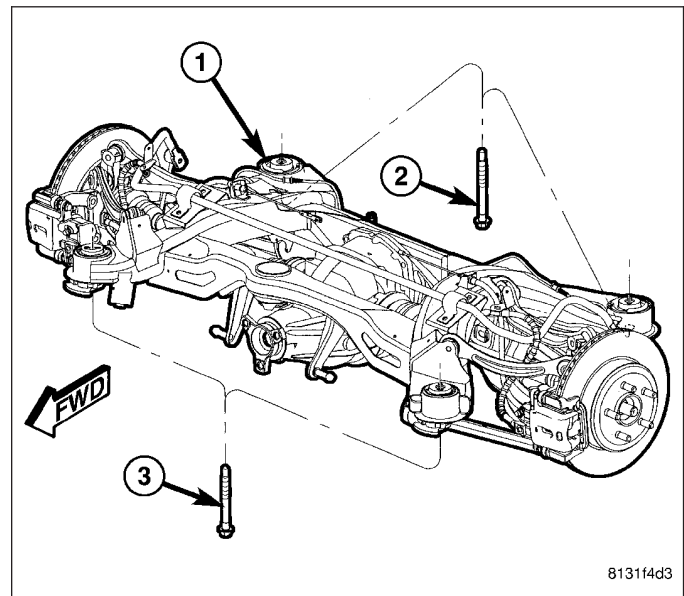
17. Remove fuel filler tube. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK FILLER TUBE - REMOVAL)



**Note:** If equipped with AWD, when removing crossmember mounting bolts in following step, be sure to not to misplace spacers (1) between crossmember mounts (2) and body.



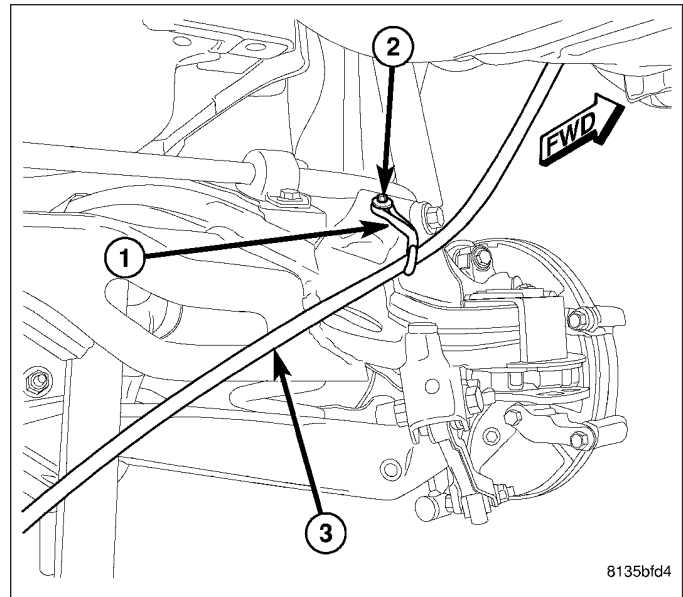
18. Remove both front (3) and both rear (2) mounting bolts fastening crossmember (1) in place.



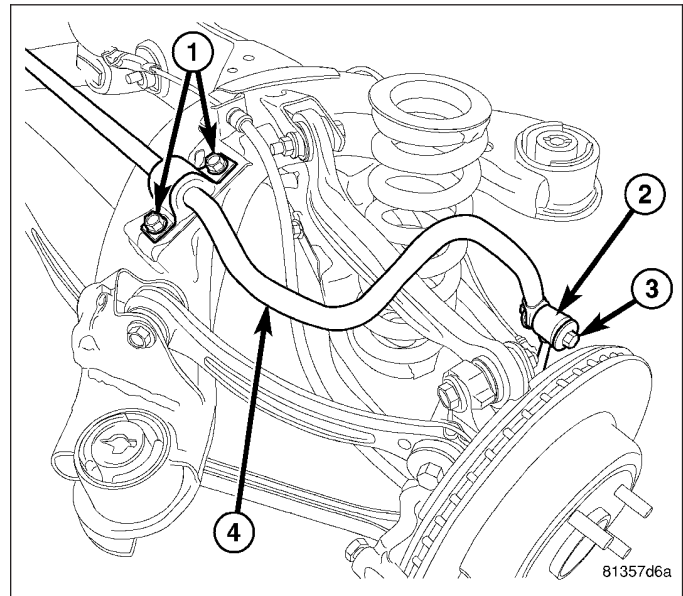
19. **Slowly** lower crossmember using jack. **Do not lower jack at a fast rate.** Lower just enough to allow propeller shaft removal from rear axle differential. **Do not lower jack any further than necessary.** Slide propeller shaft out of rear axle differential and allow bungee cord previously installed to support.



20. **Slowly** lower crossmember several inches.
21. Remove screw (2) fastening front parking brake cable routing bracket (2) to rear crossmember.
22. Continue to lower jack until crossmember is at a comfortable working level to access stabilizer bar fasteners.

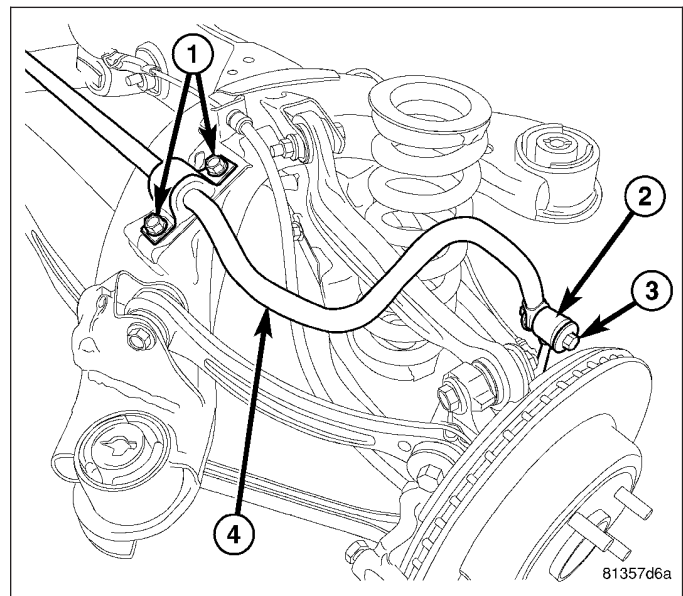


23. On each end, remove bolt (3) and nut fastening stabilizer bar (4) to stabilizer link (2).
24. Remove bolts (1) fastening each stabilizer bar isolator retainer to crossmember.
25. Remove stabilizer bar (4) with isolators and retainers.
26. Remove retainers from isolators.
27. Remove isolators from stabilizer bar utilizing slits in bushings.

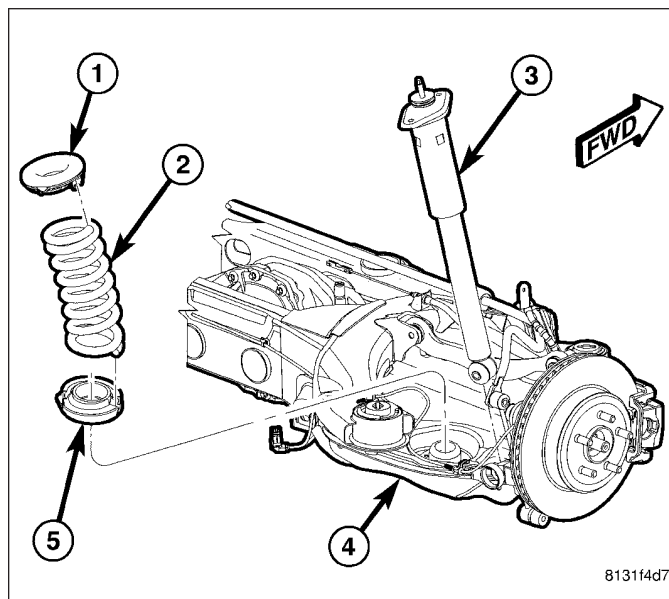


## INSTALLATION

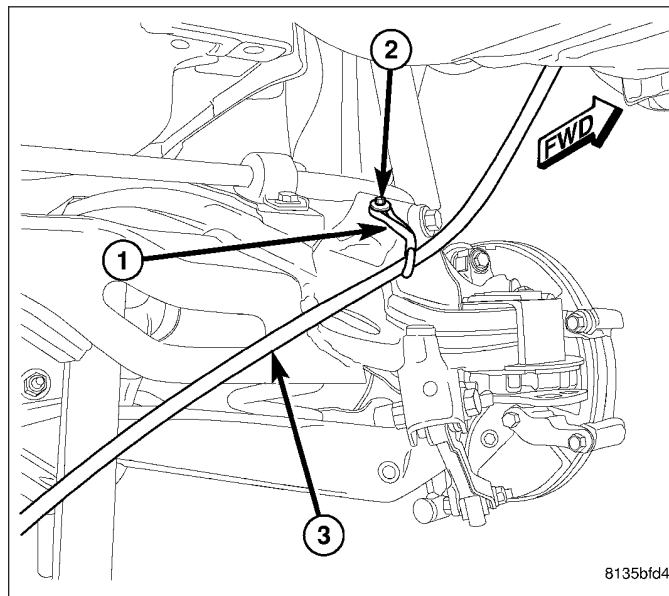
1. Install isolators on stabilizer bar utilizing slits in bushings. Install each isolator so its slit faces forward and flat side is positioned toward crossmember once installed.
2. Install retainers on isolators.
3. Install stabilizer bar (4) with isolators and retainers on crossmember.
4. Install isolator retainer mounting bolts (1). **Do not tighten at this time.**
5. Install bolt (3) and nut fastening stabilizer bar ends to each stabilizer links (2). **Do not tighten at this time.**
6. Tighten isolator retainer mounting bolts (1) to 61 N·m (45 ft. lbs.) torque.



7. Remove coil springs (2) with isolators (1 and 5) from spring links (4).



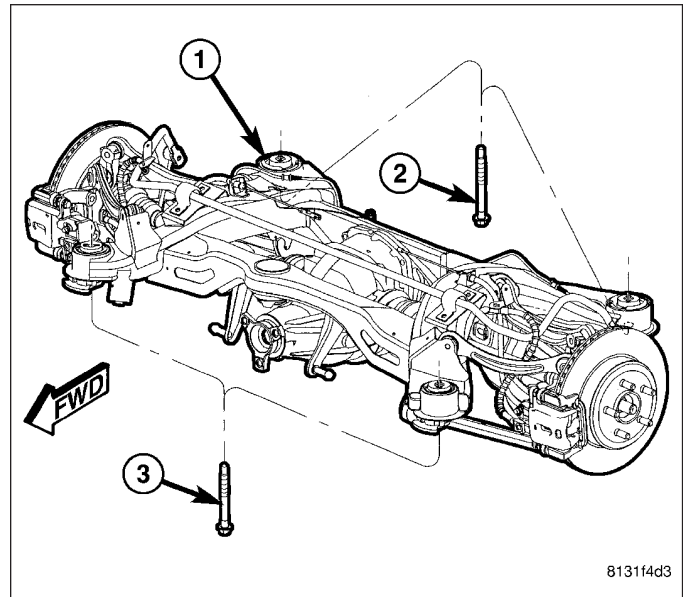
8. Raise crossmember using jack until there is about 10 inches clearance to the to body mounting points.
9. Install screw (2) fastening front parking brake cable routing bracket (1) to rear crossmember.



10. Raise crossmember to body mounting points. As crossmember is raised, slide propeller shaft onto rear axle differential flange and align shocks with pockets in spring links.

**Note:** There are four crossmember mounting bolts. Rear mounting bolts (2) are longer than front mounting bolts (3). Do not interchange mounting bolts.

11. Continue to raise crossmember (1) with jack until crossmember mounting bolts (2 and 3) can be installed. Install left side crossmember mounting bolts, but not the right side bolts. It is not necessary to tighten bolts at this point.

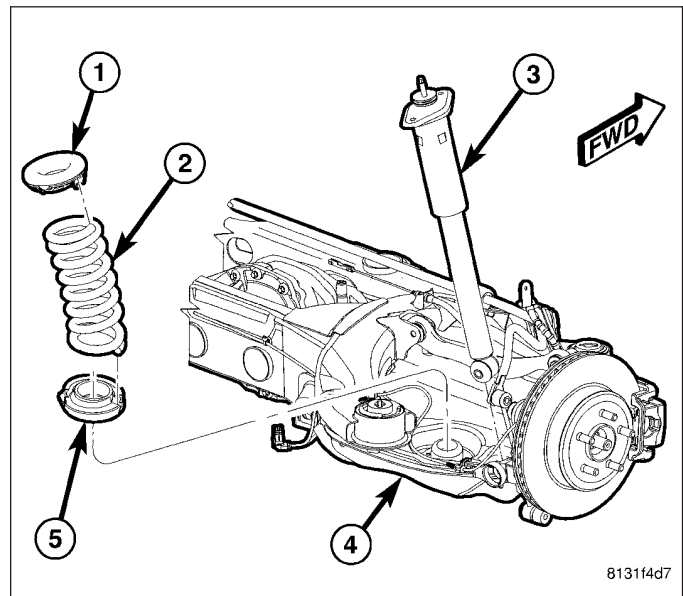


**CAUTION:** To avoid damaging other components of vehicle, do not lower crossmember any further than necessary to install coil spring (2).

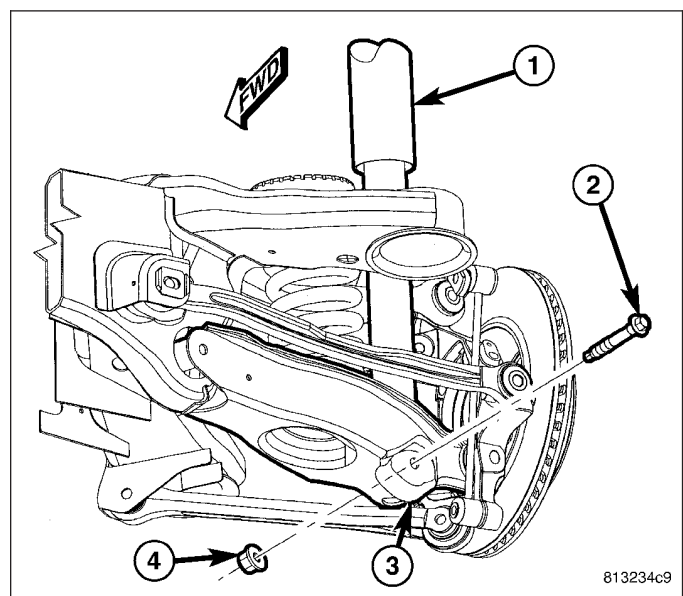
12. **Slowly** lower jack allowing right side of crossmember to drop. **Do not lower jack at a fast rate.** Lower jack just enough to allow spring (2) installation. **Do not lower jack any further than necessary.**

**Note:** Before installing coil spring, make sure isolators (1 and 5) are completely installed on ends of spring.

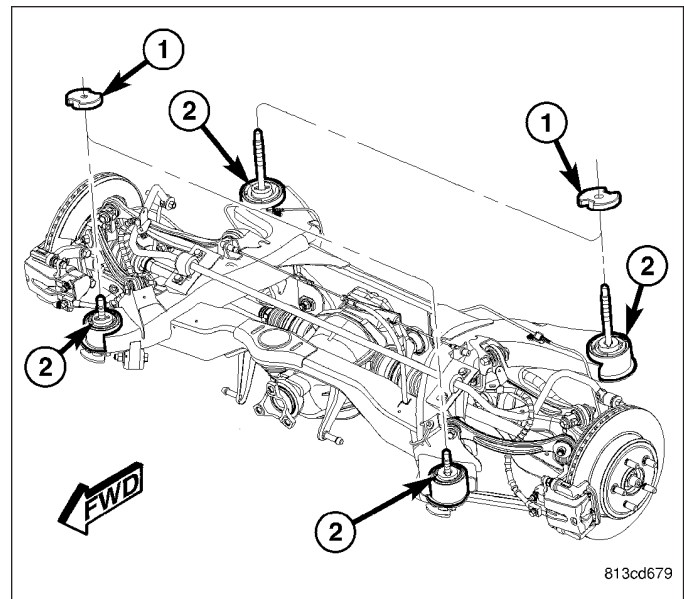
13. Install coil spring (2) with isolators into spring pocket of spring link fitting the lower isolator to the shape of the pocket, then align top of spring with body mount.



14. Carefully raise jack, guiding coil spring and lower end of shock absorber (1) into mounted positions. Once shock absorber (1) lower mounting hole lines up with hole in spring link (3), stop jacking.
15. Install lower shock mounting bolt (2) and nut (4). **Do not tighten at this time.**

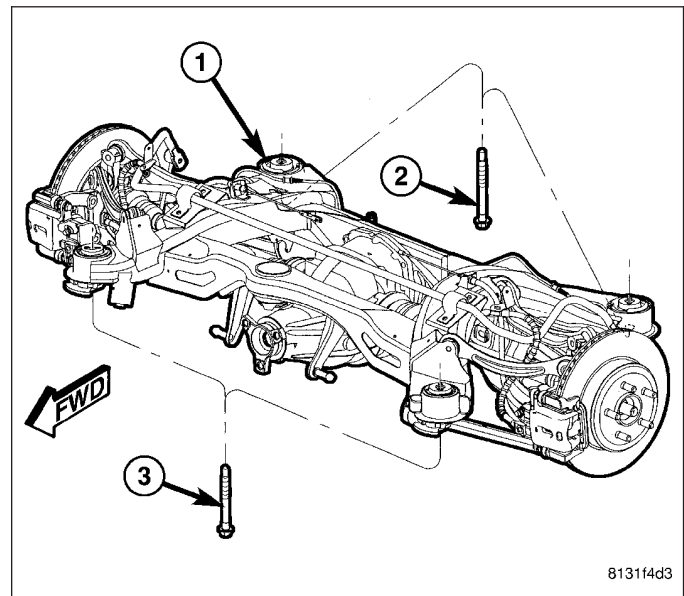


16. If vehicle is equipped with AWD, insert spacers (1) on top of right crossmember mount bushings (2) before crossmember is raised into place.



**Note:** There are four crossmember mounting bolts. Rear mounting bolts (2) are longer than front mounting bolts (3). Do not interchange mounting bolts.

17. Raise right side of crossmember (1) into mounted position. Install right side crossmember mounting bolts (2 and 3). **Snug, but do not fully tighten bolts at this time.**
18. Remove both front and rear crossmember mounting bolts (2 and 3) on **left** side of vehicle.

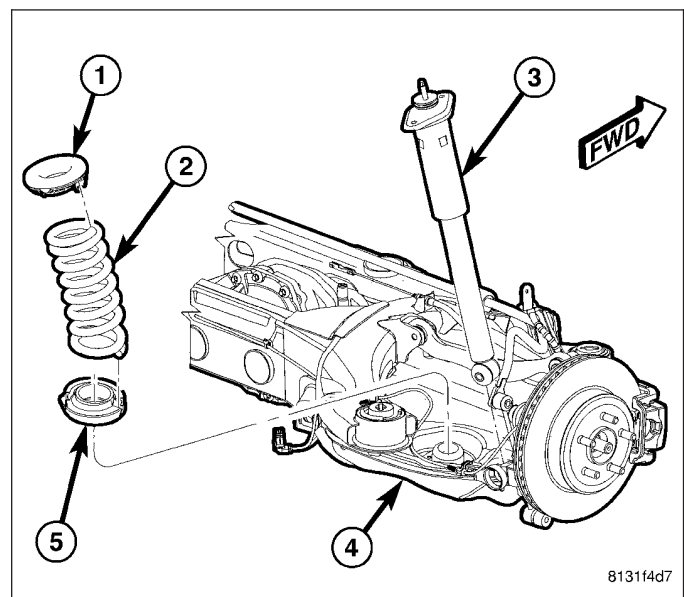


**CAUTION:** To avoid damaging other components of vehicle, do not lower crossmember any further than necessary to install coil spring (2).

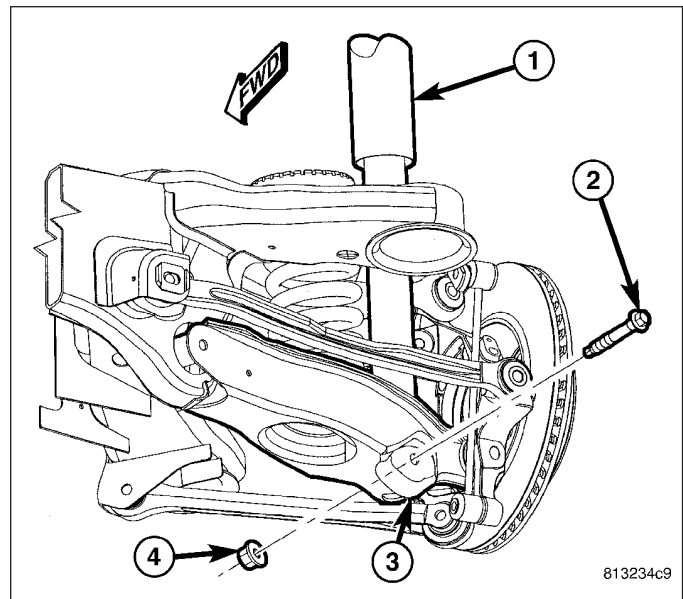
19. **Slowly** lower jack allowing left side of crossmember to drop. **Do not lower jack at a fast rate.** Lower jack just enough to allow spring (2) installation. **Do not lower jack any further than necessary.**

**Note:** Before installing coil spring, make sure isolators (1 and 5) are completely installed on ends of spring.

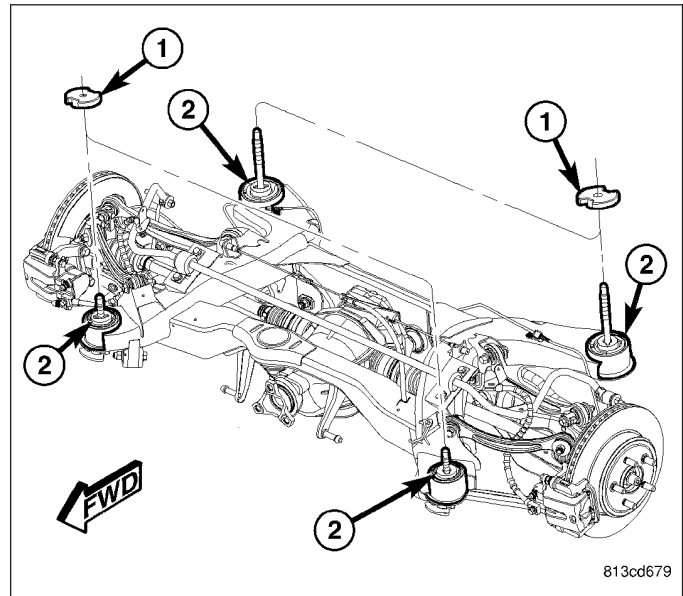
20. Install coil spring (2) with isolators into spring pocket of spring link fitting the lower isolator to the shape of the pocket, then align top of spring with body mount.



21. Carefully raise jack, guiding coil spring and lower end of shock absorber (1) into mounted positions. Once shock absorber (1) lower mounting hole lines up with hole in spring link (3), stop jacking.
22. Install lower shock mounting bolt (2) and nut (4). **Do not tighten at this time.**

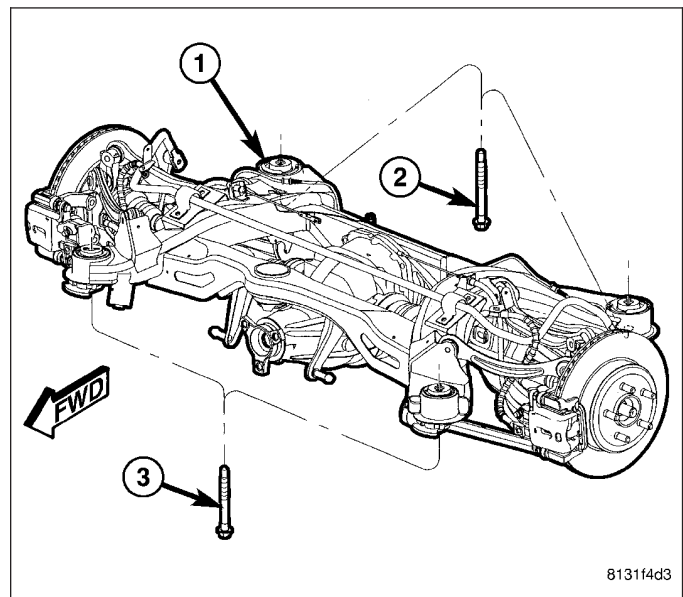


23. If vehicle is equipped with AWD, insert spacers (1) on top of left crossmember mount bushings (2) before crossmember is raised into place.



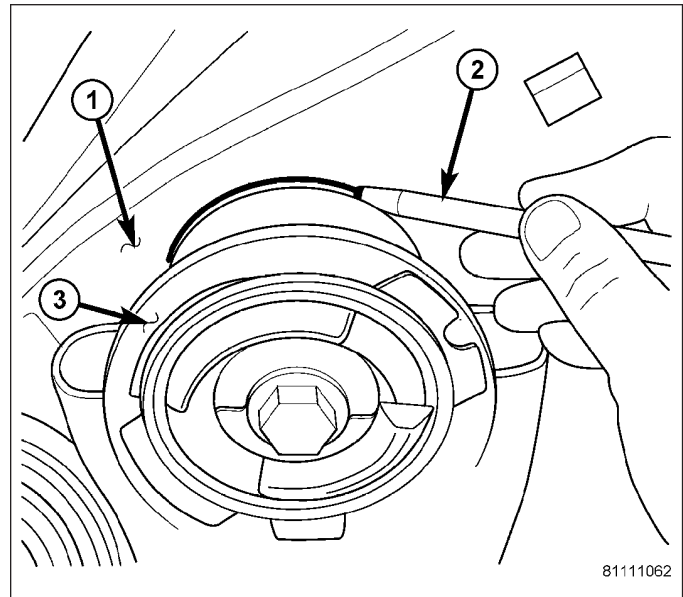
**Note:** There are four crossmember mounting bolts. Rear mounting bolts (2) are longer than front mounting bolts (3). Do not interchange mounting bolts.

24. Raise left side of crossmember (1) into mounted position. Install left side crossmember mounting bolts (2 and 3). **Snug, but do not fully tighten bolts at this time.**

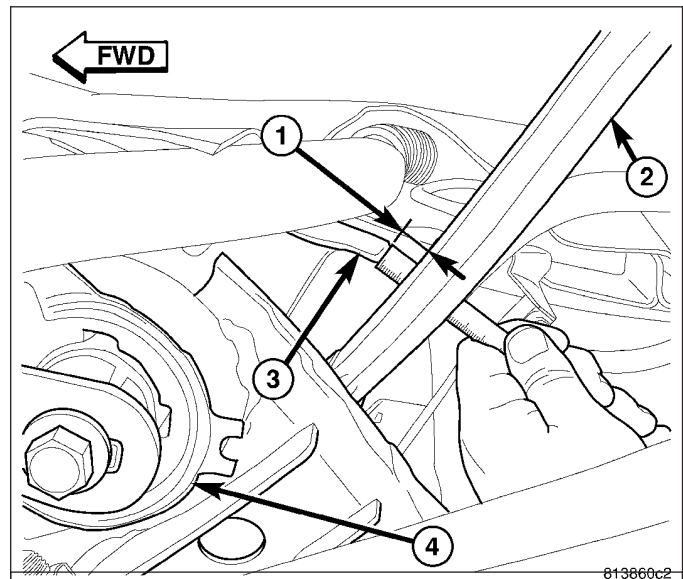




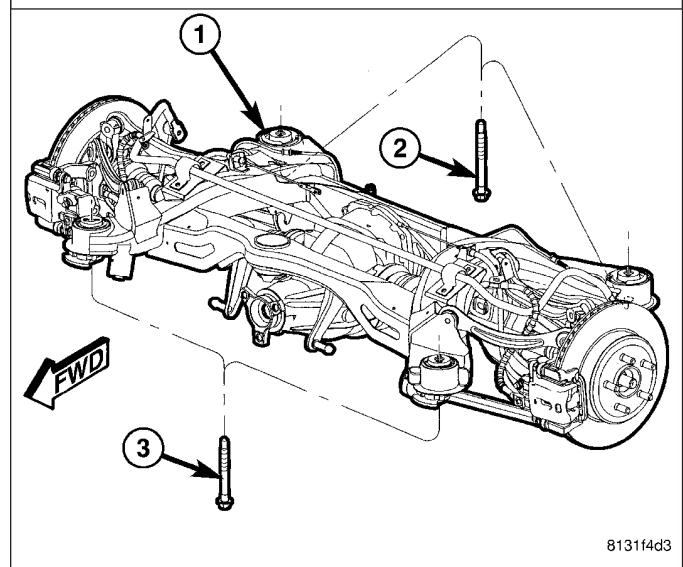
25. Shift crossmember as necessary to line up mounts (3) with location marks drawn on body (1) before removal.



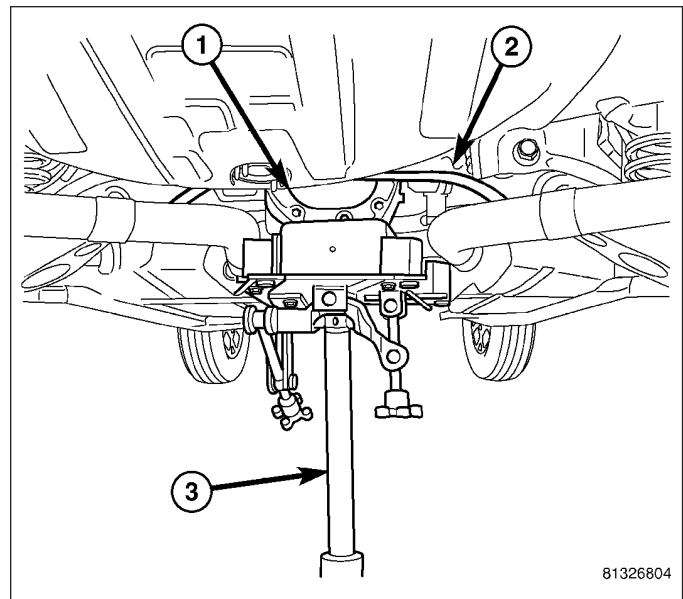
26. Once mounts are lined up with location marks, on both sides of vehicle, measure distance (1) between the tension link (2) and weld flange (3) on body directly in front of it, just outboard of the front mount bushing (4). **This distance must be at least 12 mm to allow proper clearance for suspension movement.** If distance is less than 12 mm on either side of vehicle, shift that side of rear crossmember directly rearward until distance is 12 mm or greater. To do so, loosen 3 mounting bolts slightly, leaving one on opposite side of shift snugged to pivot off of. Shift crossmember rearward and snug loosened bolts. Remeasure opposite side to be sure it still maintains minimum 12 mm distance.



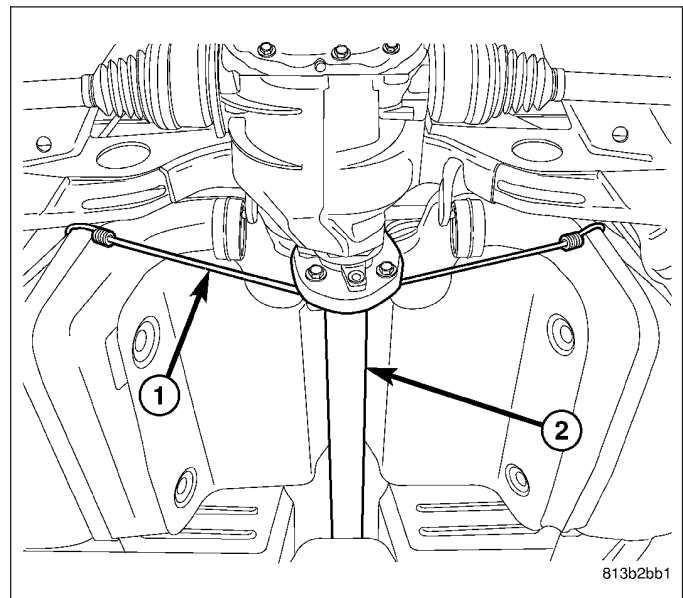
27. Tighten all four crossmember mounting bolts (2 and 3) to 180 N·m (133 ft. lbs.) torque.



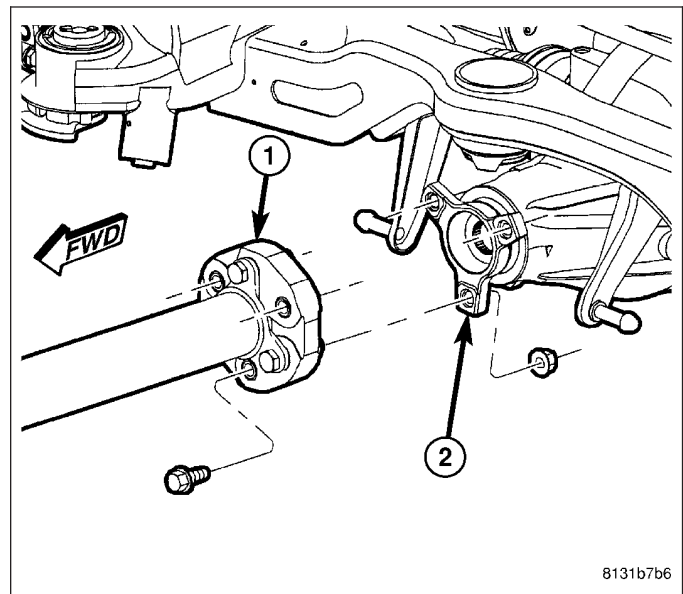
28. Remove jack (3) from under rear axle differential.



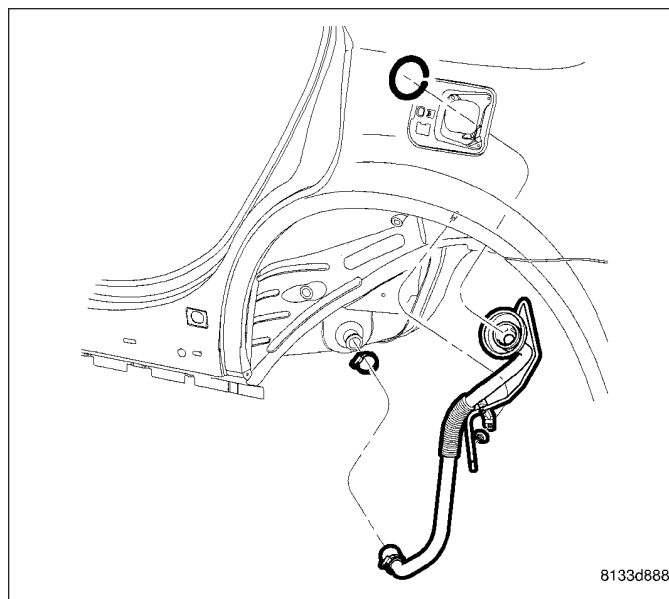
29. Remove bungee cord (1) supporting propeller shaft (2).



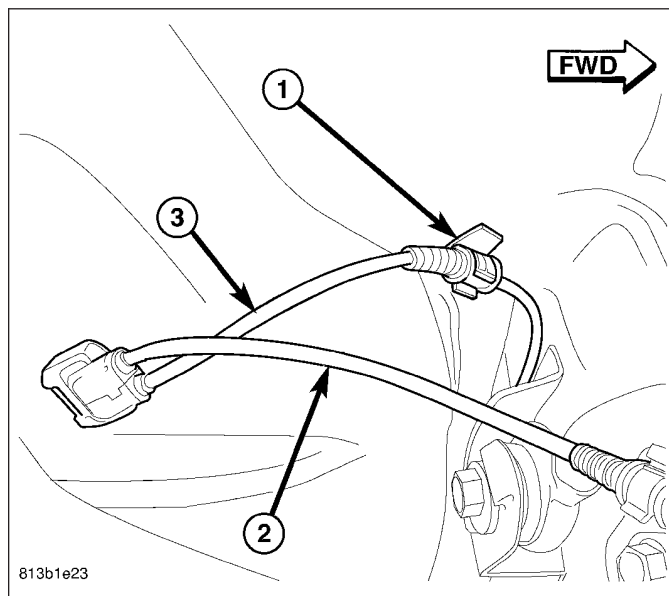
30. Align propeller shaft index marks (3) placed upon removal. Install propeller shaft rear coupler-to-axle flange bolts and nuts by hand. Tighten propeller shaft rear coupler-to-axle flange bolts to 81 N·m (60 ft. lbs.) torque.



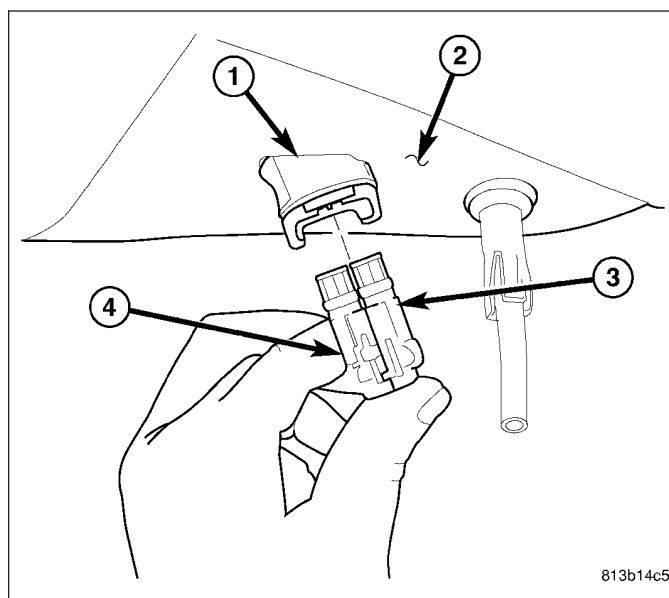
31. Install fuel filler tube. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK FILLER TUBE - INSTALLATION)



32. Clip left rear wheel speed sensor cable (3) to routing clip (1) near body connector.



33. Match left rear wheel speed sensor connector (4) to right sensor connector (3) to make one connector.
34. Insert speed sensor connectors (3 and 4) into body wiring harness connector (1) located in luggage compartment floor pan (2). When installing connector, make sure retaining clip on body connector is properly in place and sensor connector cannot be pulled out.



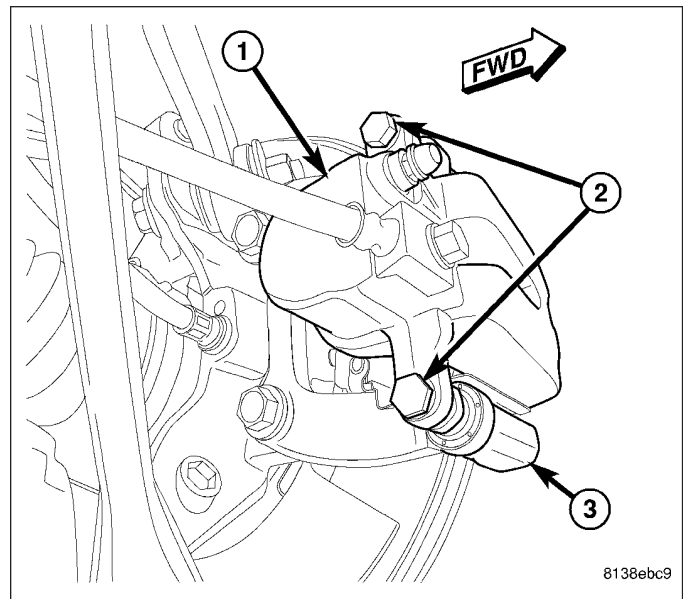


35. On each rear disc brake:

- Push caliper guide pins into caliper adapter to clear caliper mounting bosses when installing.
- Guide caliper and brake hose down through rear suspension, then slide caliper over brake pads and onto caliper adapter (3).

**CAUTION:** Extreme caution should be taken not to cross-thread caliper guide pin bolts (2) when they are installed.

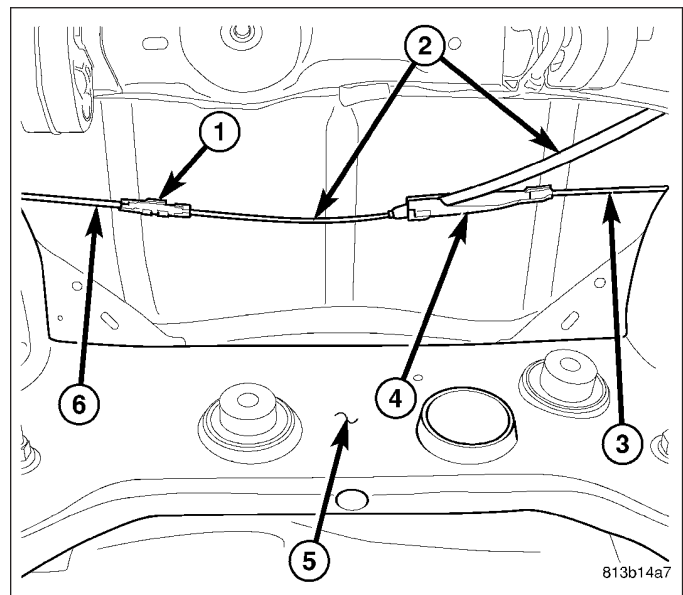
- Align caliper mounting holes with guide pins, then install guide pin bolts (2). While holding guide pins from turning, tighten bolts to 60 N·m (44 ft. lbs.) torque.
- Make sure brake hose is properly routed and will not come in contact with suspension components.



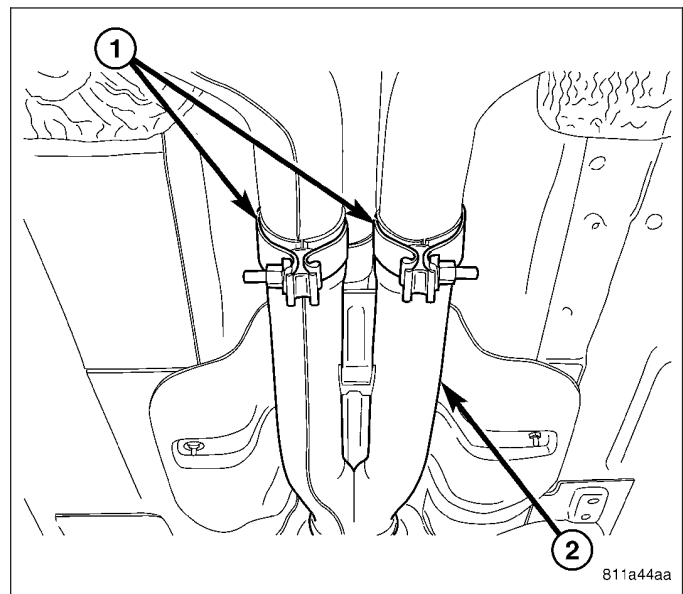
36. Route parking brake cable above rear crossmember, then slide cable (2) through equalizer (4) above rear differential.

**Note:** Due to short travel and low spring tension, it is not necessary to lock-out parking brake lever to service parking brake components.

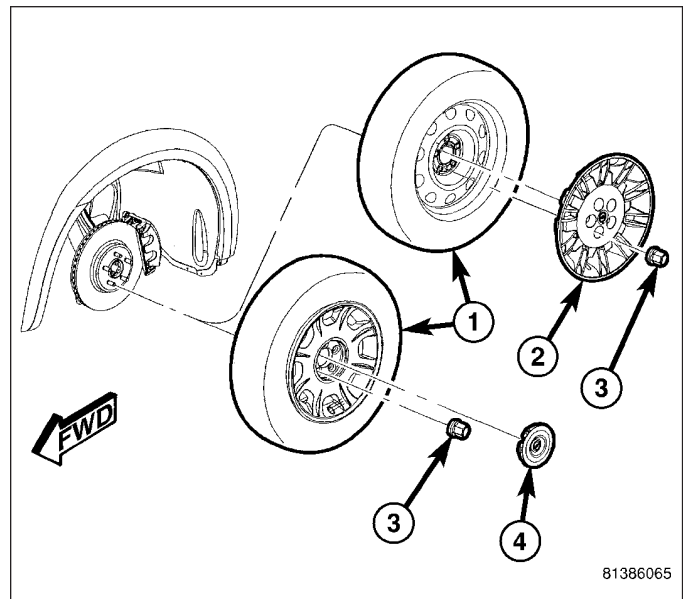
37. Connect front parking brake cable (2) at connector (1) to right rear parking brake cable (6).



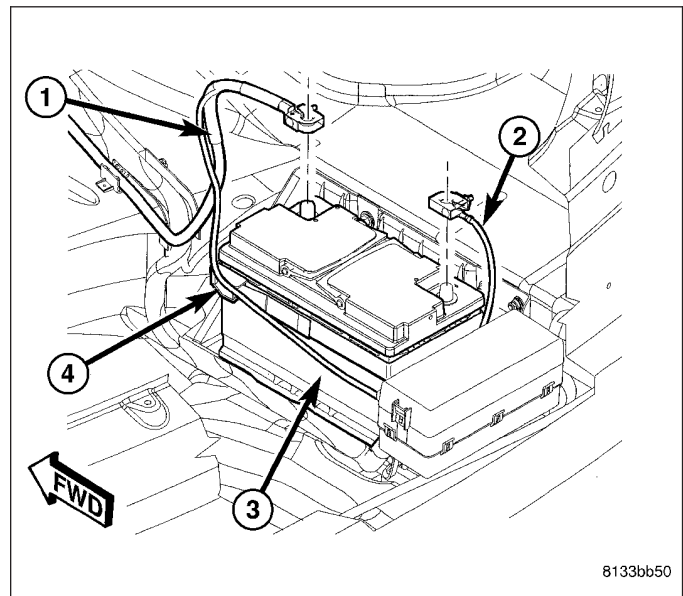
38. Install rear exhaust system (2) (dual-outlet exhaust shown in figure). (Refer to 11 - EXHAUST SYSTEM - INSTALLATION)



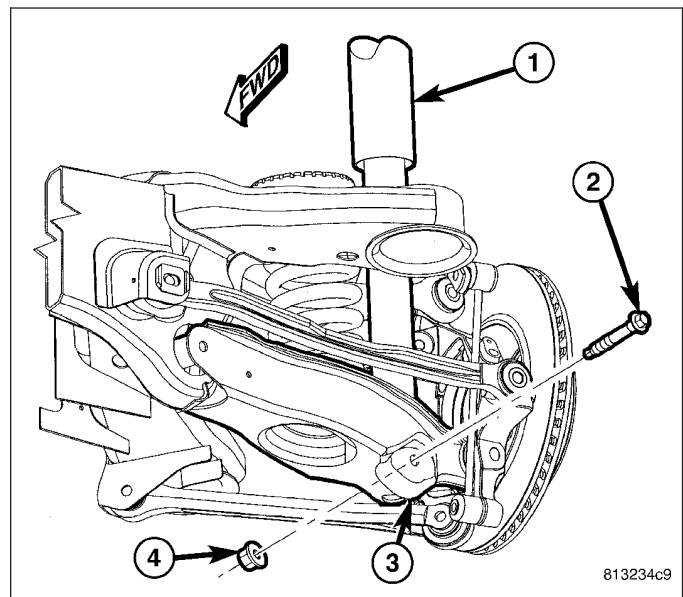
39. Install tire and wheel assemblies (1). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
40. Lower vehicle until rear wheels are just above floor level.
41. Apply parking brake lever. Release lever, then reapply.
42. Check to make sure rear wheels will not rotate with lever applied.
43. Lower vehicle.



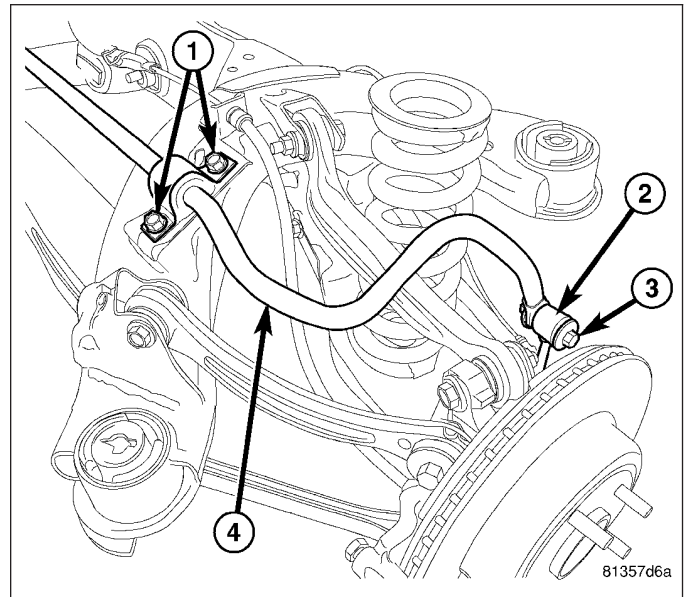
44. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)
45. Position vehicle on alignment rack/drive-on hoist. Raise vehicle as necessary to access mounting bolts.



46. Tighten shock absorber lower mounting bolt nuts (4) to 72 N·m (53 ft. lbs.) torque.



47. Tighten stabilizer link fasteners (3) to 61 N·m (45 ft. lbs.) torque.
48. Perform wheel alignment. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)



# WHEEL ALIGNMENT

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## WHEEL ALIGNMENT

### DESCRIPTION

Vehicle wheel alignment is the positioning of all interrelated front and rear suspension angles. These angles affect the handling and steering of the vehicle when it is in motion. Proper wheel alignment is essential for efficient steering, good directional stability, and proper tire wear.

The method of checking a vehicle's front and rear wheel alignment varies depending on the manufacturer and type of equipment used. The manufacturer's instructions should always be followed to ensure accuracy of the alignment, except when DaimlerChrysler Corporation's wheel alignment specifications differ.

On this vehicle, the suspension angles that can be adjusted are as follows:

#### FRONT:

- Camber (with cradle shift/service adjustment bolt package)
- Caster (with cradle shift/service adjustment bolt package)
- Toe

#### REAR:

- Toe

Check the wheel alignment and make all wheel alignment adjustments with the vehicle standing at its proper curb height specification. Curb height is the normal riding height of the vehicle. It is measured from a certain point on the vehicle to the ground or a designated area while the vehicle is sitting on a flat, level surface. Refer to Curb Height Measurement in this section for additional information.

Typical wheel alignment angles and measurements are described in the following paragraphs.

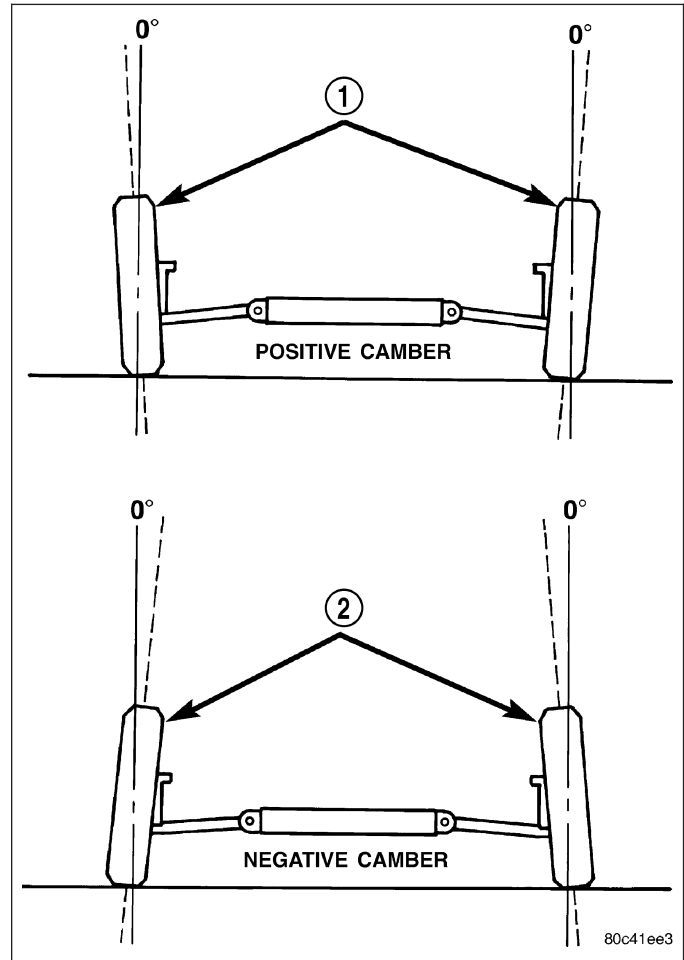
## CAMBER

Camber is the inward or outward tilt of the top of the tire and wheel assembly. Inward tilt (2) is negative camber. Outward tilt (1) is positive camber. Camber is measured in degrees of angle relative to a true vertical line. Camber is a tire wearing angle.

- Excessive negative camber will cause tread wear at the inside of the tire.
- Excessive positive camber will cause tread wear on the outside of the tire.

## CROSS CAMBER

Cross camber is the difference between left and right camber. To achieve the cross camber reading, subtract the right side camber reading from the left. For example, if the left camber is  $+0.3^\circ$  and the right camber is  $0.0^\circ$ , the cross camber would be  $+0.3^\circ$ .



## CASTER

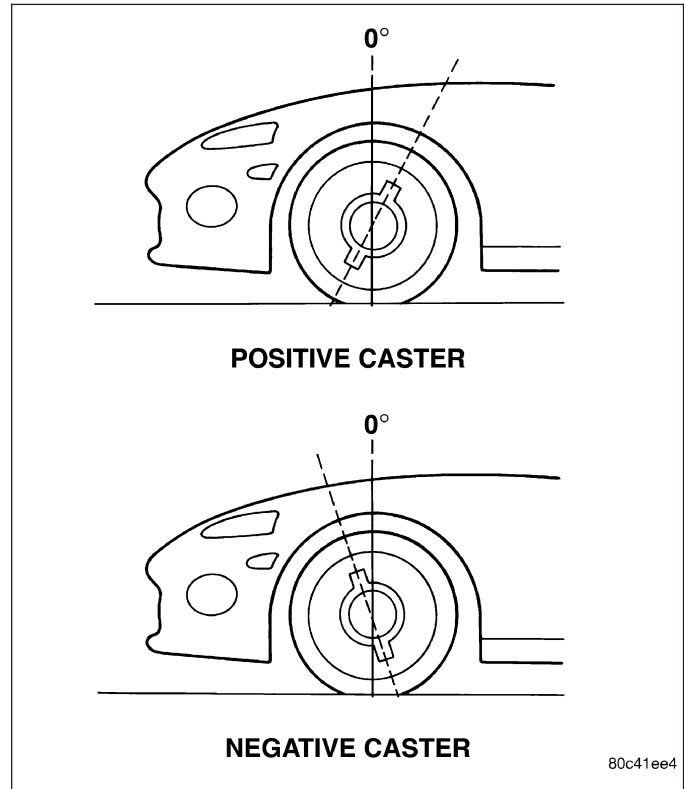
Caster is the forward or rearward tilt of the steering knuckle in reference to the position of the upper and lower ball joints. Caster is measured in degrees of angle relative to a true vertical center line. This line is viewed from the side of the tire and wheel assembly.

- Forward tilt (upper ball joint ahead of lower) results in a negative caster angle.
- Rearward tilt (upper ball joint trailing lower) results in a positive caster angle.

Although caster does not affect tire wear, a caster imbalance between the two front wheels may cause the vehicle to lead to the side with the least positive caster.

## CROSS CASTER

Cross caster is the difference between left and right caster.



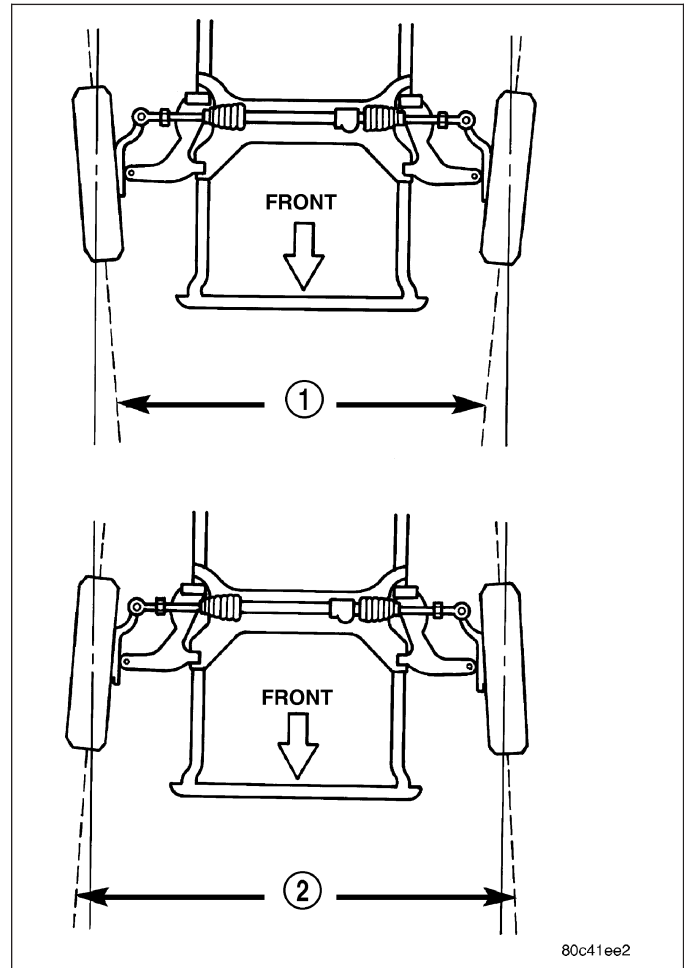
## TOE

Toe is the inward or outward angle of the wheels as viewed from above the vehicle.

- Toe-in (1) is produced when the front edges of the wheels on the same axle are closer together than the rear edges.
- Toe-out (2) is produced when the front edges of the wheels on the same axle are farther apart than the rear edges.

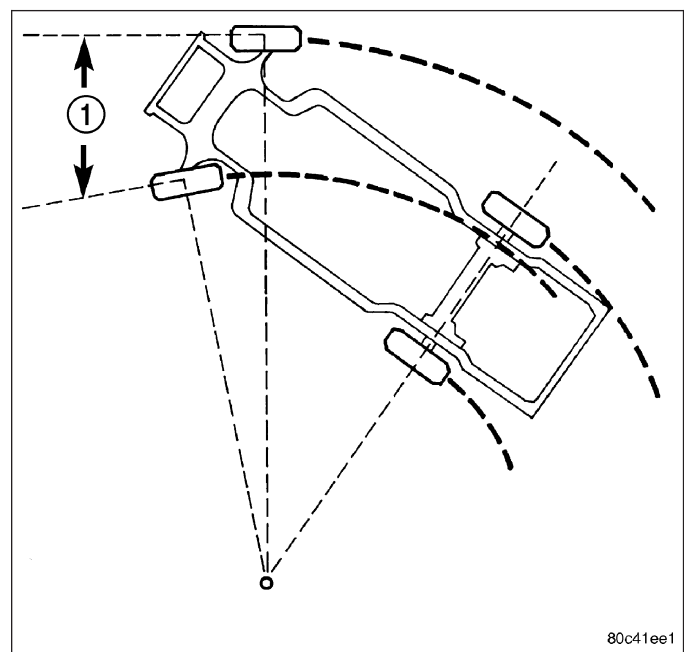
Toe-in and toe-out can occur at the front wheels and the rear wheels.

Toe is measured in degrees or inches. The measurement identifies the amount that the front of the wheels point inward (toe-in) or outward (toe-out). Toe is measured at the spindle height. Zero toe means the front and rear edges of the wheels on the same axle are equally distant.



## TOE-OUT ON TURNS

Toe-out on turns is the relative positioning of the front wheels while steering through a turn. This compensates for each front wheel's turning radius. As the vehicle encounters a turn, the outboard wheel must travel in a larger radius circle than the inboard wheel. The steering system is designed to make each wheel follow its particular radius circle. To accomplish this, the front wheels must progressively toe outward as the steering is turned from center. This eliminates tire scrubbing and undue tire wear when steering a vehicle through a turn.



## DYNAMIC TOE PATTERN

Dynamic toe pattern is the inward and outward toe movement of the front and rear tires through the suspension's jounce and rebound travel. As the vehicle's suspension moves up and down, the toe pattern varies. Toe pattern is critical in controlling the directional stability of the vehicle while in motion. Front and rear dynamic toe pattern is preset by the factory at the time the vehicle is assembled.

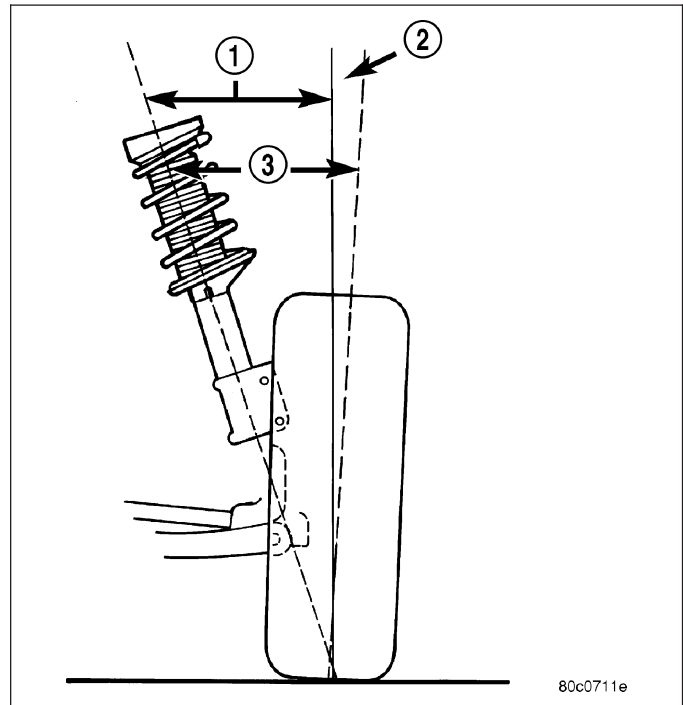
It is not necessary to check or adjust front or rear dynamic toe pattern when doing a normal wheel alignment. The only time dynamic toe pattern needs to be checked or adjusted is if the frame of the vehicle has been damaged.

## STEERING AXIS INCLINATION (S. A. I.)

Steering axis inclination is the angle between a true vertical line starting at the center of the tire at the road contact point and a line drawn through the center of the upper ball joint (or strut) and the lower ball joint (1). S.A.I. is built into the vehicle and is not an adjustable angle. If S.A.I. is not within specifications, a bent or damaged suspension component may be the cause.

## INCLUDED ANGLE (I. A.)

Included angle (3) is the sum of the S.A.I. angle (1) plus or minus the camber angle (2), depending on whether or not the wheel has positive or negative camber. If camber is positive (2), add the camber angle to the S.A.I. angle. If camber is negative, subtract the camber angle from the S.A.I. angle. Included angle is not adjustable, but can be used to diagnose a frame misalignment or bent suspension component (spindle, strut).

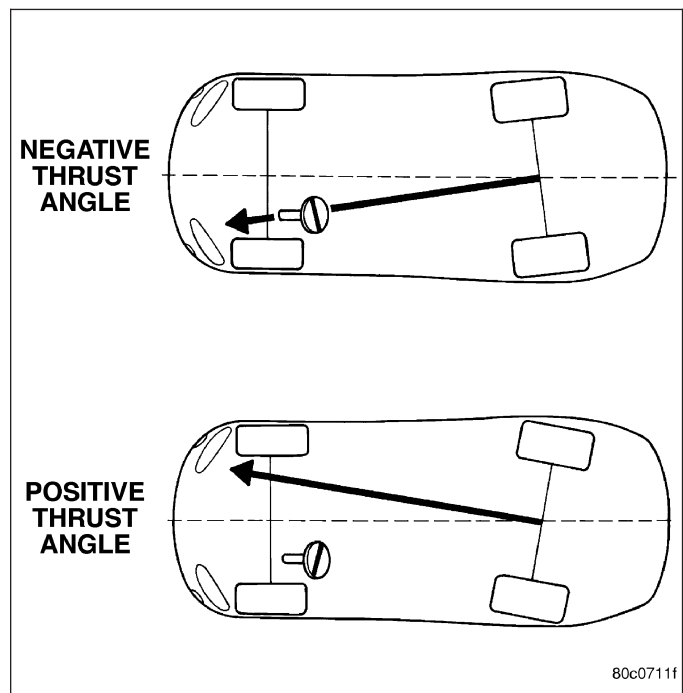


## THRUST ANGLE

Thrust angle is the averaged direction the rear wheels are pointing in relation to the vehicle's center line. The presence of negative or positive thrust angle causes the rear tires to track improperly to the left or right of the front tires (dog tracking).

- Negative thrust angle means the rear tires are tracking to the left of the front tires.
- Positive thrust angle means the rear tires are tracking to the right of the front tires.

Improper tracking can cause undue tire wear, a lead or pull and a crooked steering wheel. Excessive thrust angle can usually be corrected by adjusting the rear wheel toe so that each wheel has one-half of the total toe measurement.





**DIAGNOSIS AND TESTING****SUSPENSION AND STEERING**

CONDITION	POSSIBLE CAUSES	CORRECTION
Front End Whine On Turns	<ol style="list-style-type: none"> <li>1. Defective wheel bearing</li> <li>2. Incorrect wheel alignment</li> <li>3. Worn tires</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace wheel bearing</li> <li>2. Check and reset wheel alignment</li> <li>3. Replace tires</li> </ol>
Front End Growl Or Grinding On Turns	<ol style="list-style-type: none"> <li>1. Defective wheel bearing</li> <li>2. Engine mount grounding</li> <li>3. AWD - Worn or broken C/V joint</li> <li>4. Loose wheel lug nuts</li> <li>5. Incorrect wheel alignment</li> <li>6. Worn tires</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace wheel bearing</li> <li>2. Check for motor mount hitting frame rail and reposition engine as required</li> <li>3. Replace C/V joint</li> <li>4. Verify wheel lug nut torque</li> <li>5. Check and reset wheel alignment</li> <li>6. Replace tires</li> </ol>
Front End Clunk Or Snap On Turns	<ol style="list-style-type: none"> <li>1. Loose lug nuts</li> <li>2. Worn or loose tie rod</li> <li>3. Worn or loose ball joint</li> <li>4. Worn/loose control arm bushing</li> <li>5. Loose control arm fasteners</li> <li>6. Loose stabilizer bar</li> <li>7. Loose crossmember bolts</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten wheel lug nuts to specifications</li> <li>2. Tighten or replace tie rod end</li> <li>3. Tighten or replace ball joint</li> <li>4. Replace control arm or bushing</li> <li>5. Tighten control arm fasteners to specified torque</li> <li>6. Tighten stabilizer bar fasteners to specified torque</li> <li>7. Tighten crossmember bolts to specified torque</li> </ol>
Front End Whine With Vehicle Going Straight At A Constant Speed	<ol style="list-style-type: none"> <li>1. Defective wheel bearing</li> <li>2. Incorrect wheel alignment</li> <li>3. Worn tires</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace hub and bearing assembly</li> <li>2. Check and reset wheel alignment</li> <li>3. Replace tires</li> </ol>
Front End Growl Or Grinding With Vehicle Going Straight At A Constant Speed	<ol style="list-style-type: none"> <li>1. Engine mount grounding</li> </ol>	<ol style="list-style-type: none"> <li>1. Reposition engine/mount as required</li> </ol>
Front End Clunk When Accelerating Or Decelerating	<ol style="list-style-type: none"> <li>1. Worn or broken engine mount</li> <li>2. Loose lug nuts</li> <li>3. Worn or loose ball joint</li> <li>4. Worn or loose control arm bushing</li> <li>5. Loose control arm fasteners</li> <li>6. Loose crossmember bolts</li> <li>7. Worn tie rod end</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace engine mount</li> <li>2. Tighten wheel lug nuts to specified torque</li> <li>3. Replace ball joint/control arm</li> <li>4. Replace control arm or bushing</li> <li>5. Tighten fasteners to specified torque</li> <li>6. Tighten crossmember bolts to specified torque</li> <li>7. Replace tie rod end</li> </ol>

CONDITION	POSSIBLE CAUSES	CORRECTION
Road Wander	<ol style="list-style-type: none"> <li>1. Incorrect tire pressure</li> <li>2. Incorrect front or rear wheel toe</li> <li>3. Worn wheel bearing</li> <li>4. Worn control arm bushings</li> <li>5. Excessive friction in steering gear</li> <li>6. Excessive friction in steering shaft coupler</li> </ol>	<ol style="list-style-type: none"> <li>1. Inflate tires to recommended pressure</li> <li>2. Check and reset wheel toe</li> <li>3. Replace hub and bearing</li> <li>4. Replace control arm or bushing</li> <li>5. Replace steering gear</li> <li>6. Replace steering intermediate shaft/coupler</li> </ol>
Lateral Pull	<ol style="list-style-type: none"> <li>1. Unequal tire pressure</li> <li>2. Radial tire lead</li> <li>3. Incorrect front wheel camber</li> <li>4. Power steering gear imbalance</li> <li>5. Wheel braking</li> </ol>	<ol style="list-style-type: none"> <li>1. Inflate all tires to recommended pressure</li> <li>2. Perform lead correction procedure</li> <li>3. Check and reset front wheel camber</li> <li>4. Replace power steering gear</li> <li>5. Correct braking condition causing lateral pull</li> </ol>
Excessive Steering Free Play	<ol style="list-style-type: none"> <li>1. Incorrect Steering Gear Adjustment</li> <li>2. Worn or loose tie rod ends</li> <li>3. Loose steering gear mounting bolts</li> <li>4. Loose or worn steering shaft coupler</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace Steering Gear</li> <li>2. Replace tie rod ends</li> <li>3. Tighten steering gear mounting bolts to specified torque</li> <li>4. Replace steering intermediate shaft/coupler</li> </ol>
Excessive Steering Effort	<ol style="list-style-type: none"> <li>1. Low tire pressure</li> <li>2. Lack of lubricant in steering gear</li> <li>3. Low power steering fluid level</li> <li>4. Loose drive belt</li> <li>5. Lack of lubricant in ball joints</li> <li>6. Steering gear malfunction</li> <li>7. Lack of lubricant in steering shaft coupler</li> </ol>	<ol style="list-style-type: none"> <li>1. Inflate all tires to recommended pressure</li> <li>2. Replace steering gear</li> <li>3. Fill power steering fluid reservoir to correct level. Bleed as necessary</li> <li>4. Replace adjuster or drive belt</li> <li>5. Replace ball joints</li> <li>6. Replace steering gear</li> <li>7. Replace steering intermediate shaft/coupler</li> </ol>

## VEHICLE LEAD/PULL

To assure correct diagnosis, it is important to follow the steps outlined below in the order shown. Road test the vehicle before and after each step to verify that the lead condition has been corrected. When evaluating a vehicle, always drive the same road in both directions to get a feel for the effect of road crown and cross wind. A neutral vehicle will exhibit a small amount of drift on both right and left crowned roads (normal crown sensitivity). A vehicle with pronounced lead/pull may have one or more of the following conditions:

1. **UNEQUAL TIRE PRESSURE.** Adjust tire pressure to the pressure stated on door placard. Make sure the tire pressure is equal on all four tires and evaluate the car. Also verify that the tire size and type are correct and match each other. If the car still has a lead condition go to step (2).
2. **TIRE CONICITY.** Excessive tire conicity is one of the more frequent causes of vehicle lead. Cross-switch the front tires and evaluate the car. If the car still leads in the same direction or gets worse, return the front tires to their original position, then go to step (3).
3. **SUSPENSION ALIGNMENT.** Check and record the wheel alignment settings. Non-symmetrical front caster or camber can sometimes cause a lead condition or can be used to fix a lead condition. Adjust the wheel alignment as necessary to preferred settings (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE). If the car still leads, go to step (4).

4. **STEERING GEAR VALVE IMBALANCE.** Steering gear valve imbalance can sometimes cause a vehicle lead. Although there is no quick test or measurement that can be performed to verify a good or bad steering gear valve, generally the steering efforts will feel much lighter in the lead direction and heavier in the opposite direction with an unbalanced valve. Replace the steering gear only as a "last resort" to solve the problem. To replace the steering gear, (Refer to 19 - STEERING/GEAR - REMOVAL).

## STANDARD PROCEDURE

### WHEEL ALIGNMENT

#### PRE-WHEEL ALIGNMENT INSPECTION

Before any attempt is made to change or correct the wheel alignment, the following inspection and necessary corrections must be made to ensure proper alignment.

1. Verify that the fuel tank is full of fuel. If the tank is not full, the reduction in weight will affect the curb height of the vehicle and the alignment angles.
2. The vehicle's passenger and luggage compartments should be free of any load that is not factory equipment.
3. Check the tires on the vehicle. All tires must be the same size and in good condition with approximately the same amount of tread wear. Inflate all the tires to the recommended air pressure.
4. Check the wheel and tire assemblies for excessive radial runout.
5. Inspect lower ball joints and all steering linkage for looseness, binding, wear or damage. Repair as necessary.
6. Check suspension fasteners for proper torque and tighten as necessary.
7. Inspect all suspension component rubber bushings for signs of wear or deterioration. Replace any faulty bushings or components before aligning the vehicle.
8. Check the vehicle's curb height to verify it is within specifications. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE - CURB HEIGHT MEASUREMENT)

#### WHEEL ALIGNMENT SETUP

1. Position the vehicle on an alignment rack.
2. Install all required alignment equipment on the vehicle per the alignment equipment manufacturer's instructions. On this vehicle, a four-wheel alignment is recommended.

**Note:** Prior to reading the vehicle's alignment readouts, the front and rear of vehicle should be jounced (suspension compressed/released). Induce jounce (rear first, then front) by grasping the center of the bumper and jouncing each end of vehicle an equal number of times. The bumper should always be released when vehicle is at the bottom of the jounce cycle.

3. Read the vehicle's current front and rear alignment settings. Compare the vehicle's current alignment settings to the vehicle specifications for camber, caster and toe-in. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - SPECIFICATIONS)
4. If front camber and caster are not within specifications, proceed to CAMBER AND CASTER below. If caster and camber are within specifications, proceed to TOE which can be found following CAMBER AND CASTER. Rear camber and caster are not adjustable. If found not to be within specifications, reinspect for damaged suspension or body components and replace as necessary. If rear toe is not within specifications, adjust rear toe before proceeding to adjust front toe.

#### CAMBER AND CASTER

Camber and caster settings on this vehicle are determined at the time the vehicle is designed, by the location of the vehicle's suspension components. This is referred to as NET BUILD. The result is no required adjustment of camber and caster after the vehicle is built or when servicing the suspension components. Thus, when performing a wheel alignment, caster and camber are not normally considered adjustable angles. Camber and caster should be checked to ensure they meet vehicle specifications.

If individual front camber or caster is found not to meet alignment specifications, each can be adjusted by shifting the engine cradle if cross-camber and cross-caster are within specifications, or by using an available service adjustment bolt package. Always try to shift the cradle first **(if camber and caster are off slightly)** to correct the mis-

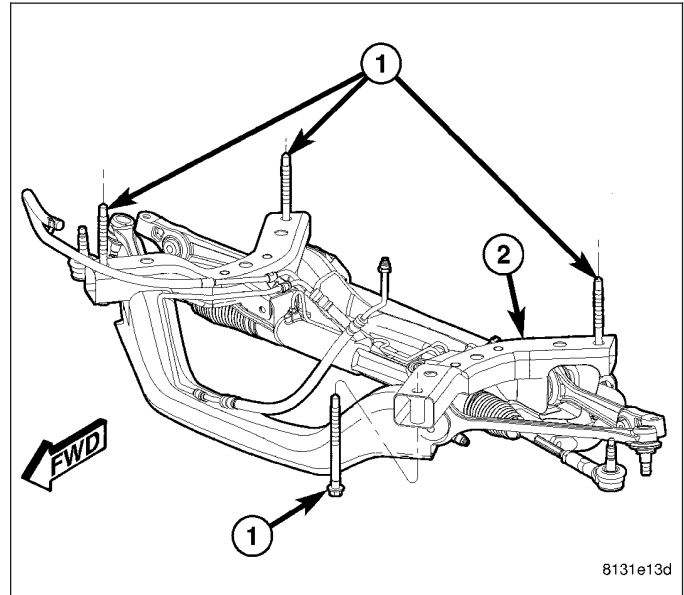
alignment before installing an adjustment bolt package. If an adjustment bolt package installation is necessary, inspect the suspension components for any signs of damage or bending first.

**CAUTION:** Do not attempt to adjust the vehicles wheel alignment by heating, bending or by performing any other modification to the vehicle's front suspension components or body.

### ADJUSTMENT BY SHIFTING CRADLE

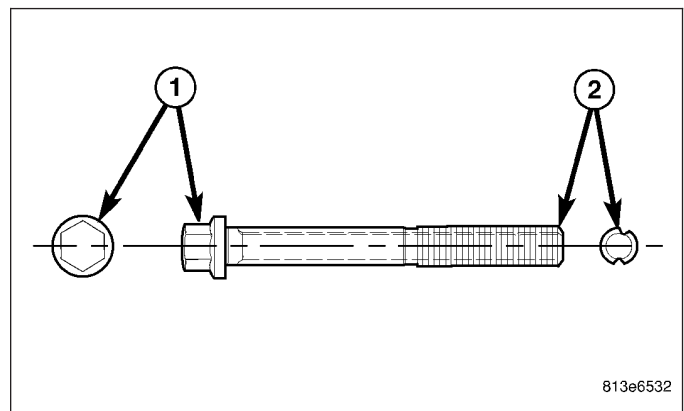
**CAUTION:** Always use care when shifting cradle to avoid damaging other components on the vehicle.

1. Loosen the four bolts (1) fastening the engine cradle (2) to the frame just enough to allow movement of the cradle.
2. Shift cradle as necessary to bring camber or caster into specifications. When shifting cradle, use care not to move other angles (camber or caster) that are within specifications, out of specifications.
3. Tighten the four bolts (1) fastening the engine cradle (2) to the frame to specifications.
4. Jounce the rear, then front of the vehicle an equal amount of times.
5. Measure camber and caster. If camber and caster are within specifications, proceed to TOE. If camber or caster cannot be brought into specifications, perform the ADJUSTMENT BOLT PACKAGE INSTALLATION below.



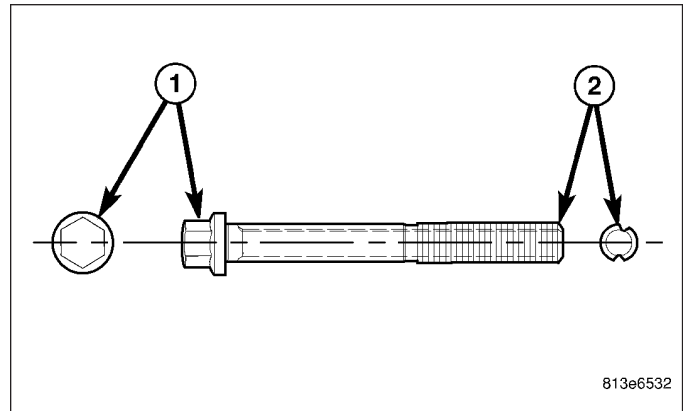
### ADJUSTMENT BOLT PACKAGE INSTALLATION - RWD

The adjustment bolt package contains 2 special bolts (1). These bolts can be identified by the offset grooves cut into the thread section (2). These bolts are designed to replace the inboard mounting bolts of the lower control arm and tension strut. Each bolt allows approximately 0.3 degrees of movement. To adjust camber only, use both bolts, one at the tension strut and the other at the lower control arm. To adjust caster only, use one bolt at the tension strut only.



1. Raise the vehicle by the frame until the tires are not supporting the weight of the vehicle.
2. Remove the belly pan as necessary. (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL)
3. Lower control arm bolt only:
  - a. Remove the screws fastening the heat shields covering the stabilizer bar bushing retainers to the cradle. Remove the heat shields.
  - b. Remove the four bolts (two each) fastening the stabilizer bar bushing retainers to the cradle.
  - c. Swing the stabilizer bar rearward and down out of the way of the control arm mounting bolts.

**CAUTION:** Wheel alignment adjustment bolts have offset grooves cut into the length of the bolt (2). If removing or installing lower control arm or tension strut mounting bolts that have these grooves, **DO NOT ROTATE THE BOLT**. To remove the bolt, hold the bolt head stationary and rotate the nut, then slide the bolt straight out of the bushing. This is necessary to avoid damaging the bat wings in the bushing inner metal or cradle.



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4. Hold the head of the control arm or tension strut mounting bolt stationary and remove the nut. Slide the bolt straight out of the bushing and discard.

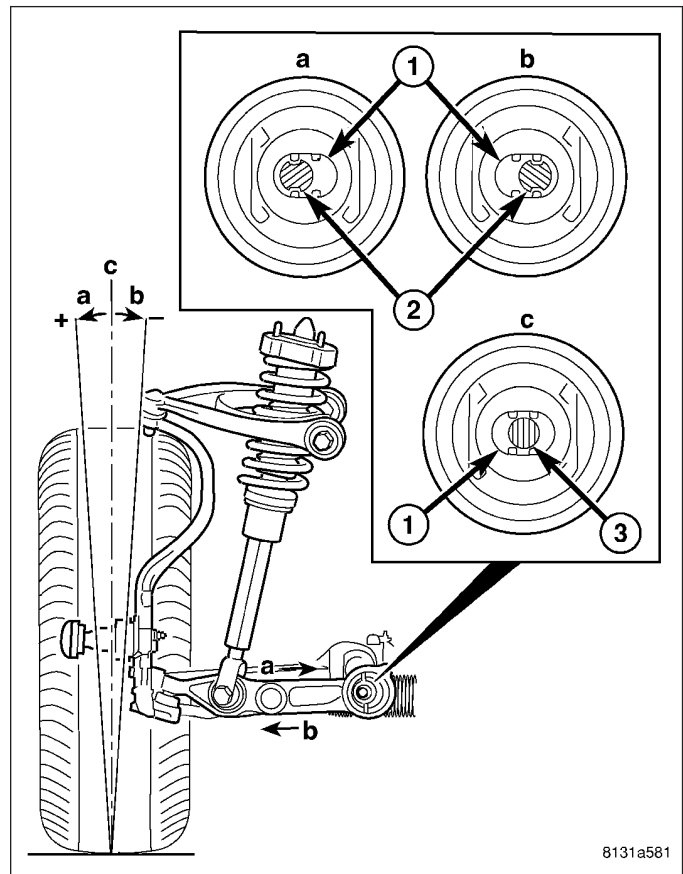
**CAUTION:** When installing an adjustment bolt, be sure to install it in the correct direction. Lower control arm bolts must be installed from the rear-forward to avoid contact with the stabilizer bar upon installation. Tension strut bolts must be installed from the front-rearward.

**Note:** The grooves on the adjustment bolts are off-center forcing the bolt to be installed in one of two ways depending on whether more positive or negative camber or caster is necessary. The Bolts must be rotated 180° to achieve either more positive or negative camber or caster. **DO NOT** force the adjustment bolt.

**Note:** The original (non-grooved) mounting bolt (3) lies through the center of the hole (1), between the “bat wings” (c).

5. Camber Adjustment – The adjustment bolts are designed to work in conjunction with “bat wing” holes that are formed into the inner metal of the lower control arm bushing (1) allowing for lower control arm movement approximately 0.3° in either direction.

- To achieve more positive camber, refer to (a) in the figure. Move the control arm or tension strut in the desired direction, then insert the adjustment bolt (2) with a washer installed through the round hole in engine cradle and bat wing hole (1) in the bushing inner metal.
- To achieve more negative camber, refer to (b) in the figure. Move the control arm or tension strut in the desired direction, then insert the adjustment bolt (2) with a washer installed through the round hole in engine cradle and bat wing hole (1) in the bushing inner metal.

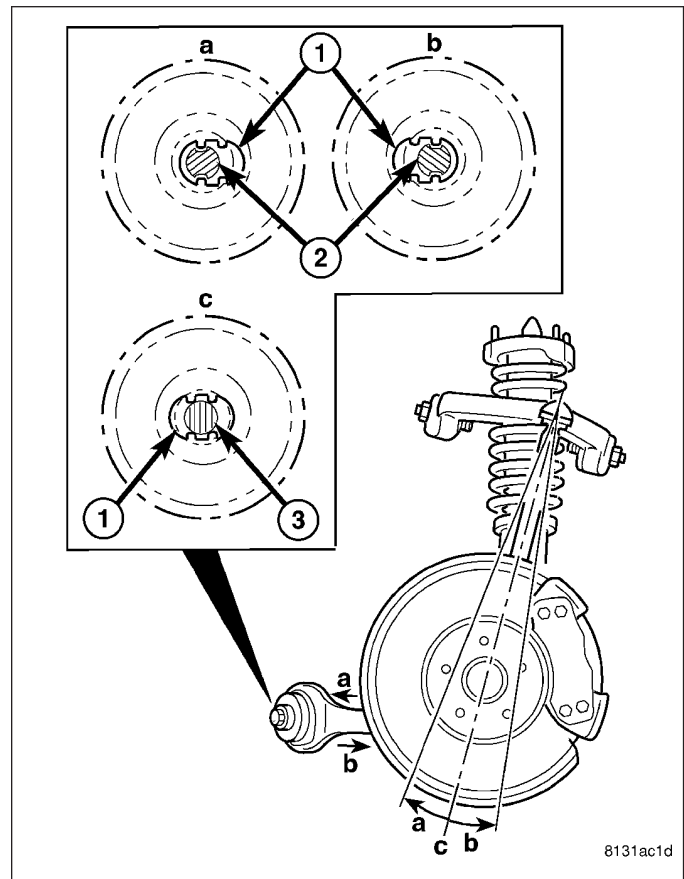


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**Note:** The original (non-grooved) mounting bolt (3) lies through the center of the hole (1), between the “bat wings” (c).

6. Caster Adjustment – The adjustment bolts are designed to work in conjunction with “bat wings” that are formed into the engine cradle (1) allowing for tension strut movement approximately 0.3° in either direction.

- To achieve more positive caster, refer to (a) in the figure. Move the tension strut in the desired direction, then insert the adjustment bolt (2) with a washer installed through the bat wing hole in engine cradle (1) and round hole in the bushing inner metal.
- To achieve more negative caster, refer to (b) in the figure. Move the tension strut in the desired direction, then insert the adjustment bolt (2) with a washer installed through the bat wing hole in engine cradle (1) and round hole in the bushing inner metal.



7. Start a NEW nut (and a washer on RWD vehicles) on the end of the mounting bolt by hand, then while holding the head of the bolt stationary, install the nut. **Do not tighten the nut at this time.**
8. Lower the vehicle to curb position. Jounce the rear, then the front of the vehicle an equal amount of times.
9. Using a crowsfoot wrench, tighten the adjustment bolt **nut** to 176 N·m (130 ft. lbs.) torque while holding the bolt stationary.
10. Reinstall the stabilizer bar and heat shields.
11. Measure camber and caster. If camber and caster are not within specifications, inspect the suspension components for any signs of damage or bending. If camber and caster (and cross-camber and cross-caster) are within specifications, proceed with TOE to check and adjust toe.
12. Install the belly pan. (Refer to 23 - BODY/EXTERIOR/BELLY PAN - INSTALLATION)



## TOE

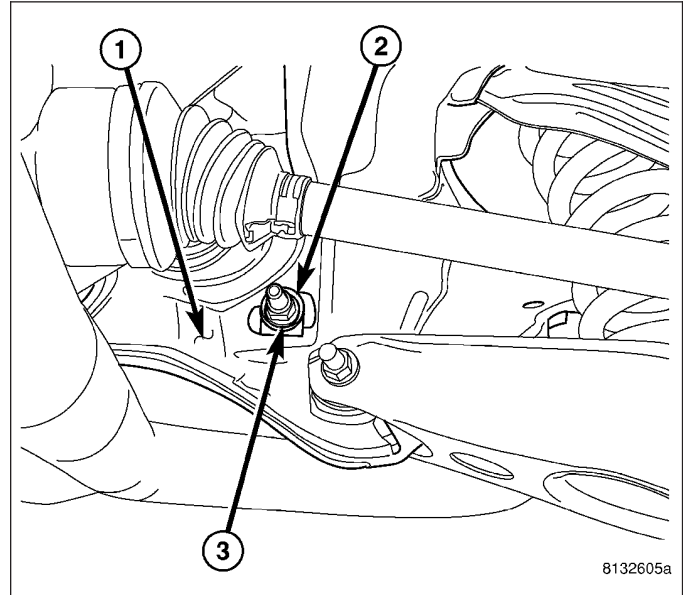
1. Center the steering wheel and lock in place using a steering wheel clamp.

**Note:** When performing the toe adjustment procedure, set rear toe to specifications before setting front toe.

## REAR TOE

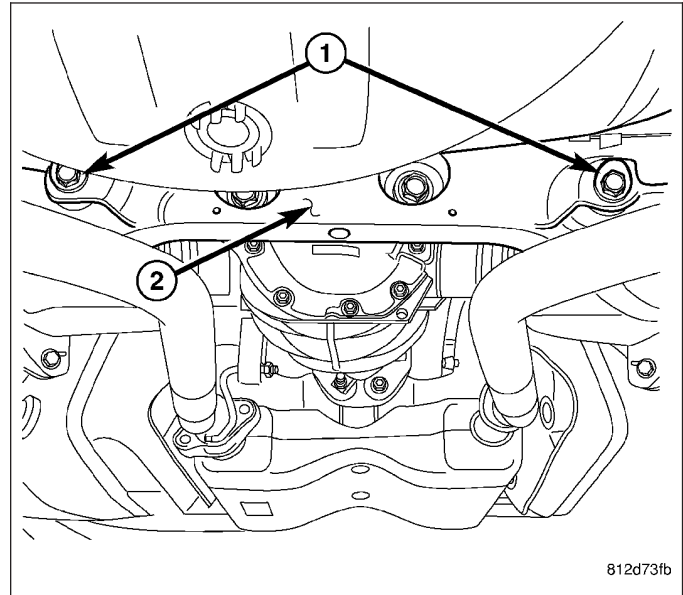
**Note:** Perform the following procedure to each side of the vehicle as necessary.

1. Loosen the cam bolt nut securing the toe link to the rear crossmember (front of rear crossmember) just enough to rotate the cam bolt (1).



**Note:** When adjusting rear toe, the eccentric lobes on the toe adjustment cam bolts and washers are not to be facing downward. The lobes should only be facing upward or up to 90° to one side or the other from the 12 O'clock position.

2. Rotate the cam bolt head on the opposite side (rear) of the crossmember in either direction until the preferred specification is obtained. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - SPECIFICATIONS)
3. While holding the cam bolt (1) from turning, tighten the cam bolt nut to specifications.
4. Adjust rear toe on opposite side of vehicle using above procedure as necessary.



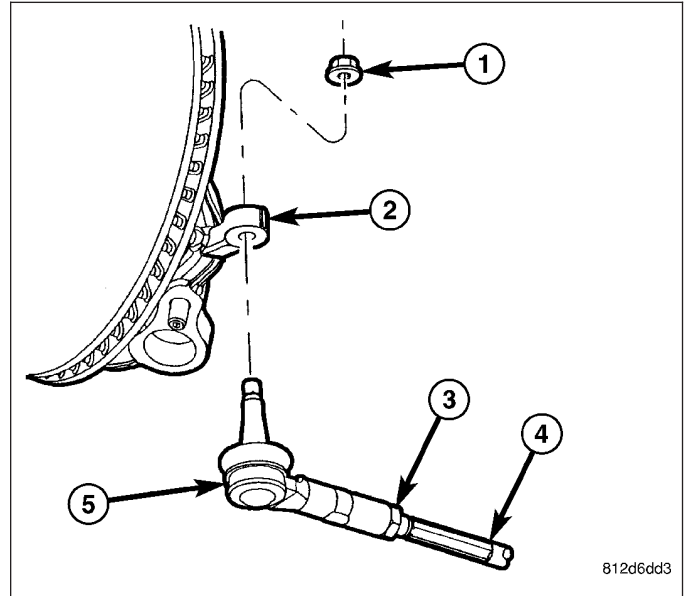
5. Once rear toe is set, proceed to FRONT TOE to set the vehicle's front toe.

## FRONT TOE

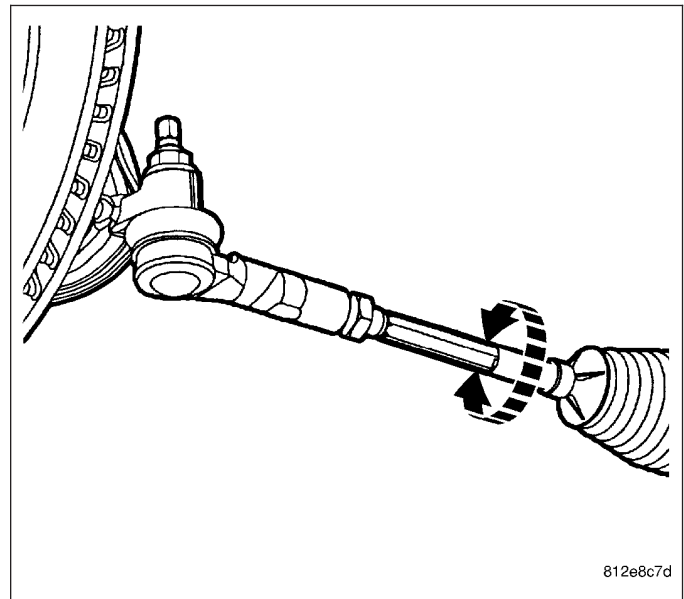
**Note:** Perform the following procedure to each side of the vehicle as necessary.

**CAUTION:** Do not twist inner tie rod-to-steering gear boots during front wheel Toe adjustment. Remove boot clamps at the inner tie rods and make sure boots moves freely on inner tie rod.

1. Loosen the jam nut (3) at the inner-to-outer tie rod (4-5) connection.

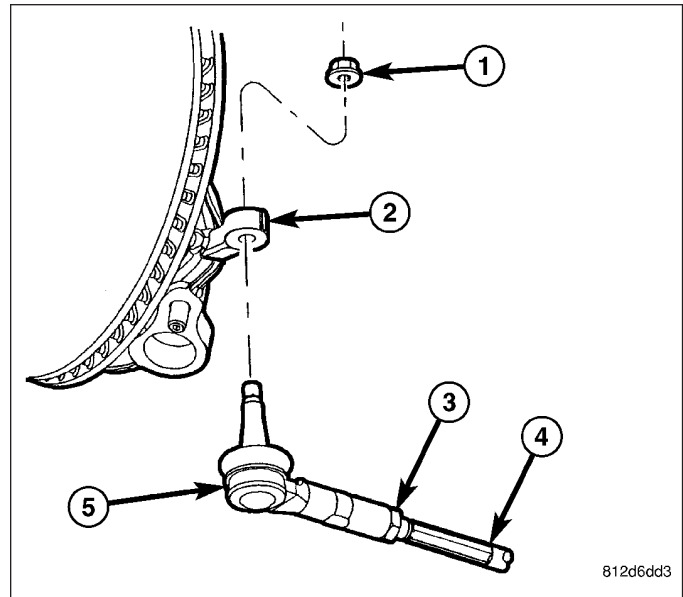


2. Grasp inner tie rod at hex and rotate as necessary to adjust front toe to preferred toe specification. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - SPECIFICATIONS)





3. Tighten tie rod jam nut (3) to 75 N·m (55 ft. lbs.) torque using care not to lose adjustment.
4. Make sure inner tie rod-to-steering gear boot is not twisted, then reinstall boot clamp at inner tie rod.
5. Adjust front toe on opposite side of vehicle using above procedure as necessary.



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2. Remove steering wheel clamp.
3. Remove alignment equipment.
4. Road test vehicle to verify steering wheel is straight and vehicle does not wander or pull.

## CURB HEIGHT MEASUREMENT

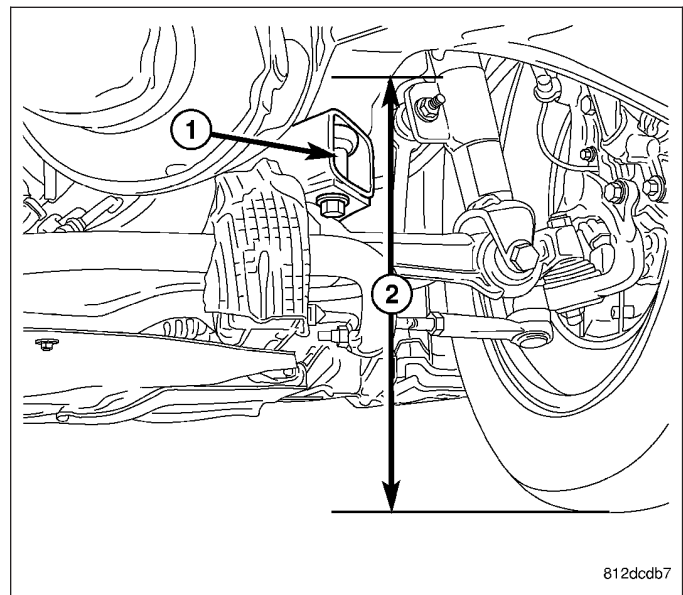
The wheel alignment is to be checked and all alignment adjustments made with the vehicle at its required curb height specification.

Vehicle height is to be checked with the vehicle on a flat, level surface, preferably a vehicle alignment rack. The tires are to be inflated to the recommended pressure. All tires are to be the same size as standard equipment. Vehicle height is checked with the fuel tank full of fuel, and no passenger or luggage compartment load.

Vehicle height is not adjustable. If the measurement is not within specifications, inspect the vehicle for bent or weak suspension components. Compare the parts tag on the suspect coil spring(s) to the parts book and the vehicle sales code, checking for a match. Once removed from the vehicle, compare the coil spring height to a correct new or known good coil spring. The heights should vary if the suspect spring is weak.

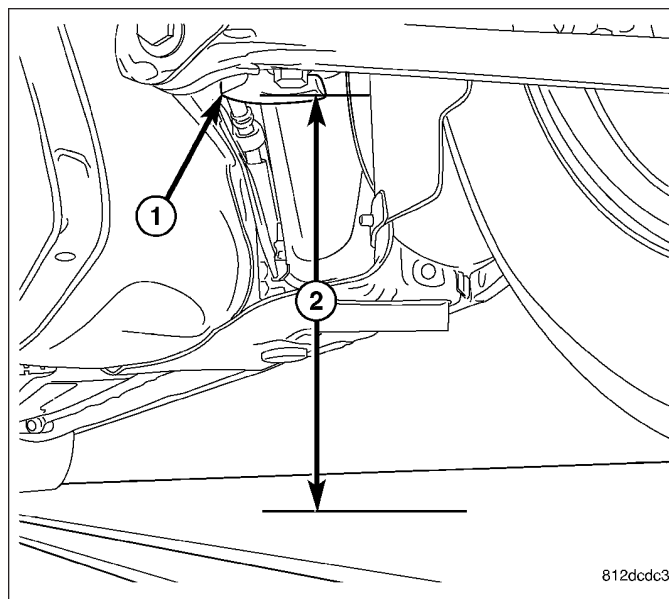
**Note: When measuring, the maximum left-to-right differential is not to exceed 12.5 mm (0.5 in.).**

1. Front – On each side of the vehicle, measure the distance (2) from the frame rail just behind the engine cradle rear mount (1) to the floor or alignment rack/lift runway surface. It may be necessary to measure to the bottom of a straight edge, placed from lift runway to runway, to get an accurate measurement.



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2. Rear – On each side of the vehicle, measure the distance (2) from the travel limiter (1) attached to the front rear crossmember mount bushing to the floor or alignment rack/lift runway surface. It may be necessary to measure to the bottom of a straight edge, placed from lift runway to runway, to get an accurate measurement.



3. Compare the measurements to the specifications listed in the following Curb Height Specifications chart.

#### CURB HEIGHT SPECIFICATIONS

WHEEL DIAMETER	FRONT	REAR
AWD	353 mm $\pm$ 10 mm 13.90 in. $\pm$ 0.39 in	307 mm $\pm$ 10 mm 12.09 in. $\pm$ 0.39 in.
RWD	328 mm $\pm$ 10 mm 12.91 in. $\pm$ 0.39 in	296 mm $\pm$ 10 mm 11.65 in. $\pm$ 0.39 in.

## SPECIFICATIONS

### WHEEL ALIGNMENT

**Note:** All specifications are given in degrees.

**Note:** All wheel alignments are to be set at curb height. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

#### REAR WHEEL DRIVE

FRONT WHEEL ALIGNMENT	PREFERRED SETTING	ACCEPTABLE RANGE
CAMBER - LEFT	−0.00°	−0.50° to +0.50°
CAMBER - RIGHT	−0.10°	−0.60° to +0.40°
Cross-Camber (Maximum side-to-side difference)	0.10°	1.00°
CASTER - LEFT	+11.10°	+9.00° to +12.10°
CASTER - RIGHT	+11.10°	+9.50° to +12.10°
Cross-Caster (Maximum side-to-side difference)	0.00°	2.00°
TOTAL TOE**	+0.20°	0.00° to +0.40°
Maximum side-to-side difference	0.00°	0.06°
REAR WHEEL ALIGNMENT	PREFERRED SETTING	ACCEPTABLE RANGE
CAMBER*	−0.55°	−1.05° to −0.05°
Cross-Camber (Maximum side-to-side difference)	0.00°	1.00°
TOTAL TOE**	0.20°	−0.10° to +0.50°
THRUST ANGLE	0.0°	−0.15° to +0.15°
Notes:		
* For reference only. These are non-adjustable angles.		
** TOTAL TOE is the sum of both left and right wheel toe settings. TOTAL TOE must be equally split between each front wheel to ensure the steering wheel is centered after setting toe. Positive toe is toe-in and negative toe is toe-out		

# DIFFERENTIAL & DRIVELINE

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## PROPELLER SHAFT

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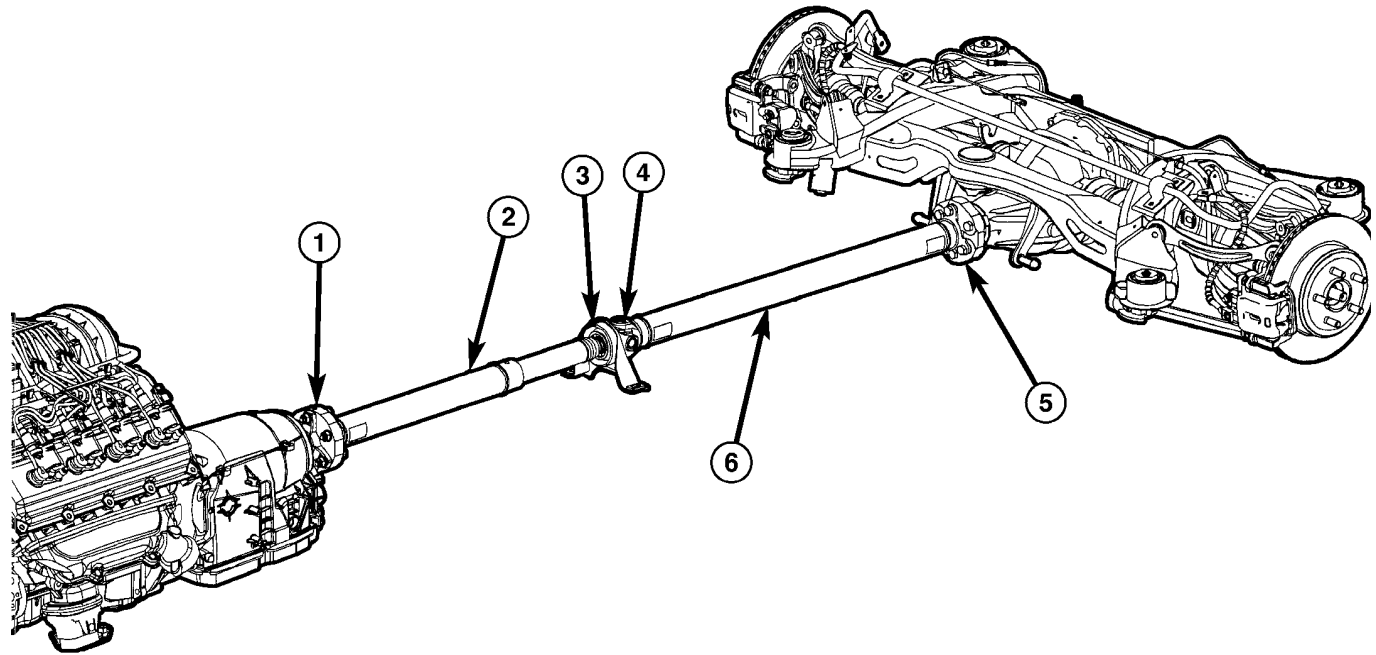
## PROPELLER SHAFT

### DESCRIPTION

**WARNING:** Due to propeller shaft imbalance concerns, propeller shaft service is limited to center support bearing and coupler replacement only. The rear segment single-cardan universal joint is not serviceable.

RWD Models utilize a “two-piece” propeller shaft design to transmit torque to the rear axle assembly. This two-piece design consists of:

- Front and rear shaft segments
- Center support bearing/bracket assembly
- Single-Cardan u-joint at rear segment/bearing interface
- Rubber couplers at transmission and rear axle flanges
- Fore-mounted vibration damper (V6 Models)



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*Propeller Shaft Assembly (V8 System Shown)*

- 1 - FRONT COUPLER
- 2 - FRONT SEGMENT
- 3 - BEARING/BACKET ASSEMBLY
- 4 - SINGLE-CARDAN U-JOINT
- 5 - REAR COUPLER
- 6 - REAR SEGMENT

The front shaft segment is designed with a collapsing feature, consisting of two concentric tubes secured by shear pins. This feature allows the tubes to telescope up to 200 mm (8 in.) during certain impacts.

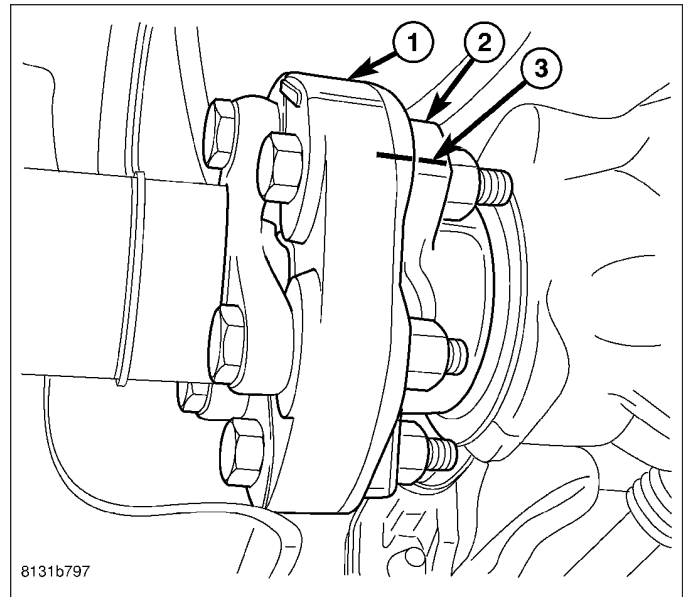
The flexible rubber couplers at the transmission and axle flanges absorb vibration. The low-travel Single-Cardan universal joint permits the minimal axial and angular variations that occur with independent rear suspension.

Additionally, models equipped with the V6 engine utilize a vibration damper which is designed to absorb and isolate driveline vibrations and harmonics. This damper is mounted to the front segment, sandwiched between the coupler and propeller shaft.

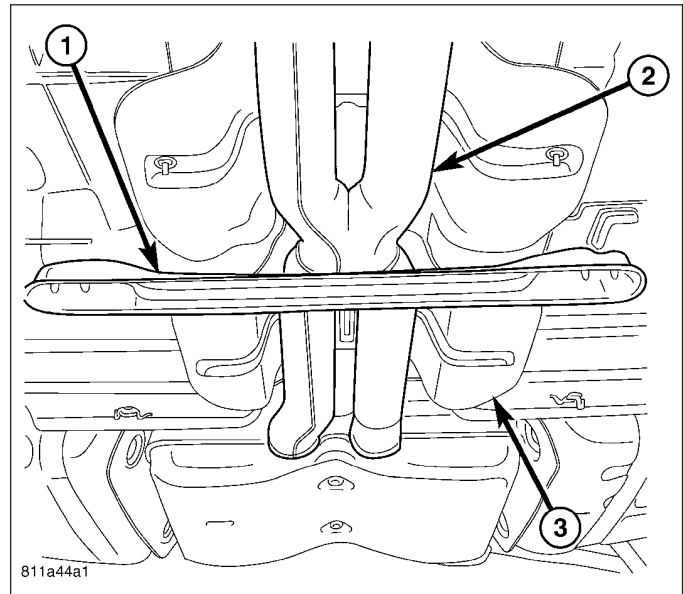
## REMOVAL

**CAUTION:** Propeller shaft removal is a two-man operation. Never allow propeller shaft to hang from the center bearing, or while only connected to the transmission or rear axle flanges. A helper is required. If a propeller shaft section is hung unsupported, damage may occur to the shaft, coupler, and/or center bearing from over-angulation. This may result in driveline vibrations and/or component failure.

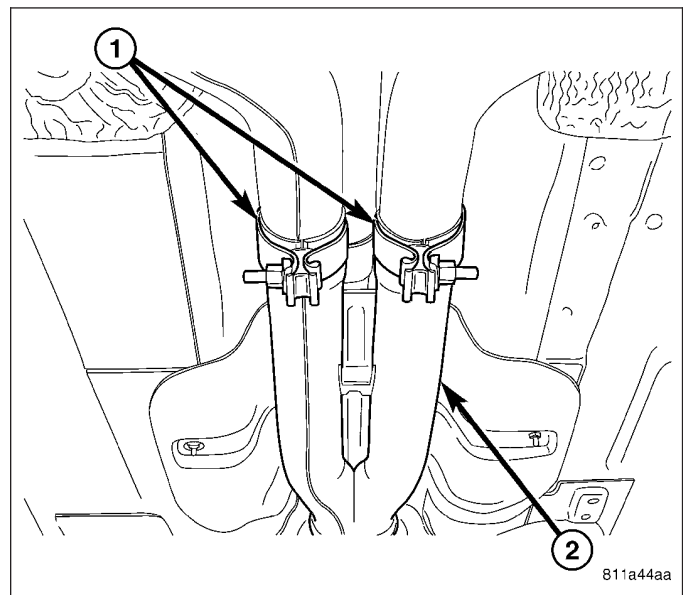
1. With vehicle in neutral, position on hoist.
2. Apply alignment index marks (3) on the transmission and axle flanges (2) and rubber couplers (1).



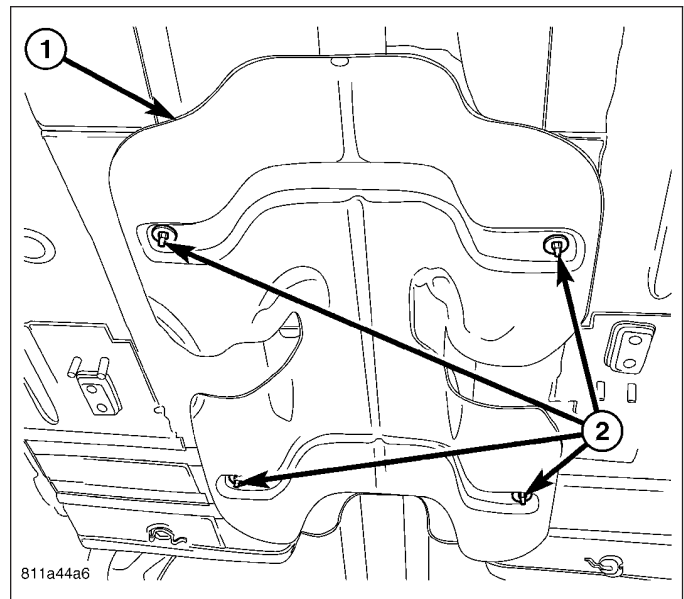
3. Remove crossmember (1).



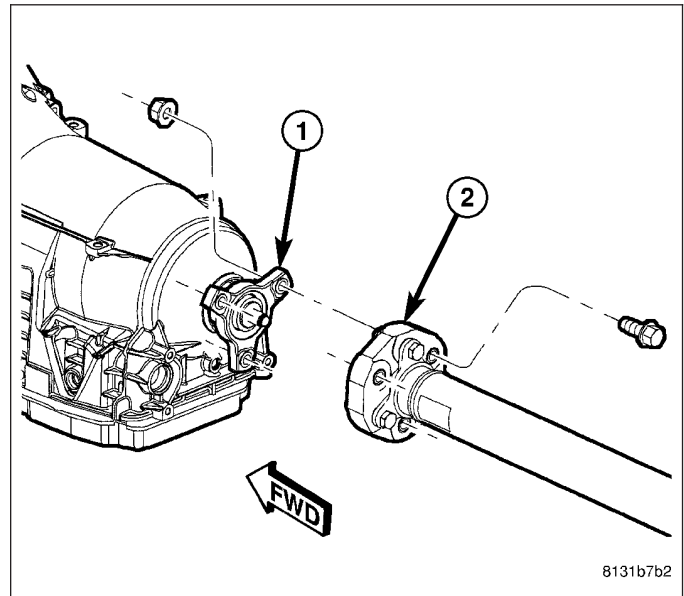
4. Remove rear exhaust system (2).



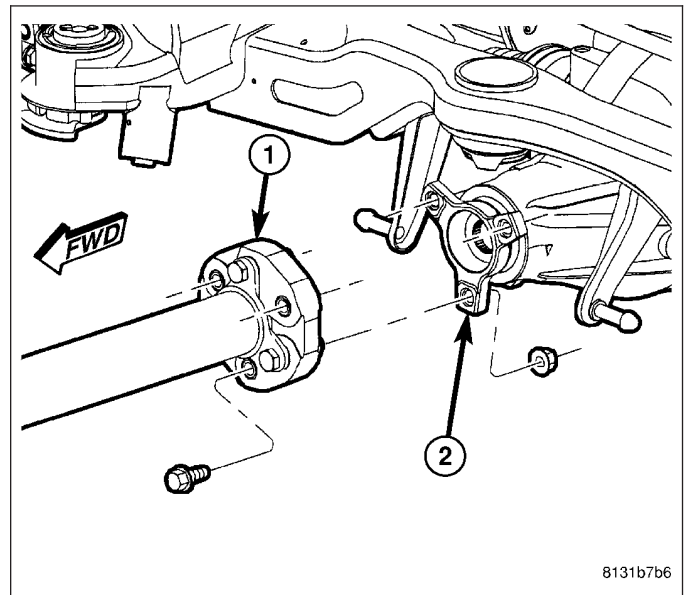
5. Remove heat shield (1).



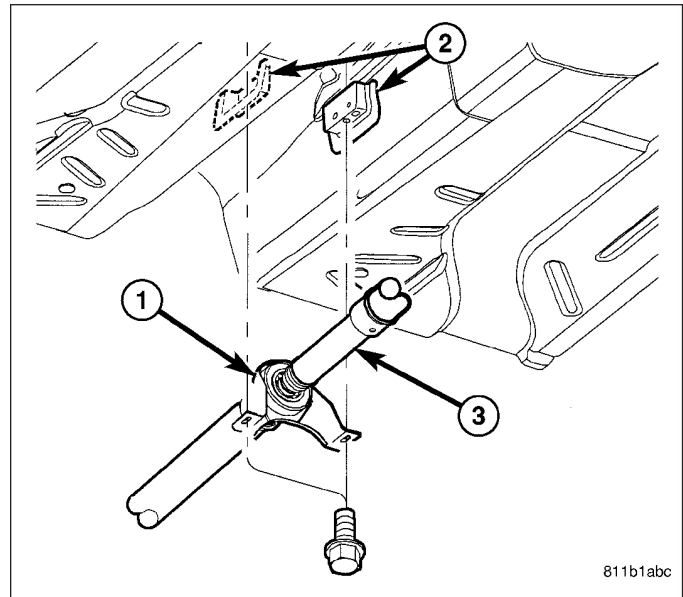
6. Remove propeller shaft front coupler-to-flange bolts.



7. Remove propeller shaft rear coupler-to-flange bolts.

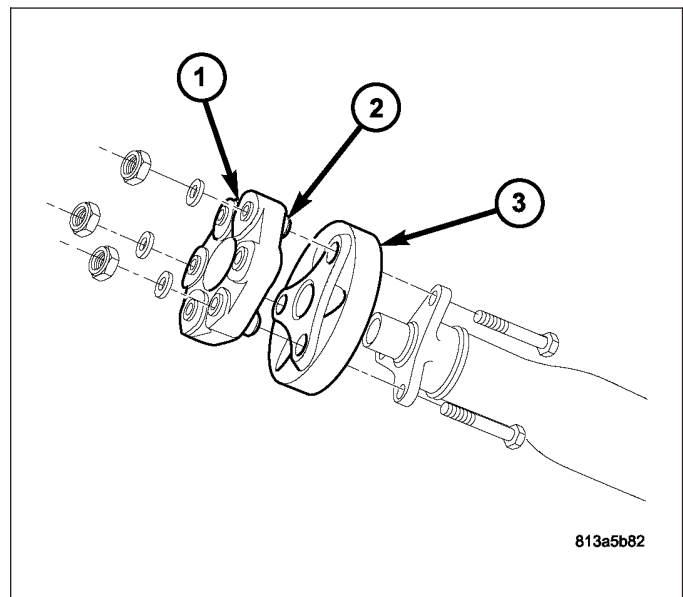


8. Remove center bearing (1) mounting bolts.
9. With the aid of a helper, remove propeller shaft assembly.



## COUPLER/DAMPER SERVICE

1. Remove three coupler-to-propeller shaft bolt/nuts.
2. Separate coupler (1) and damper (3) (if equipped) from propeller shaft. Note orientation and direction of components. It is imperative that they are properly reinstalled.



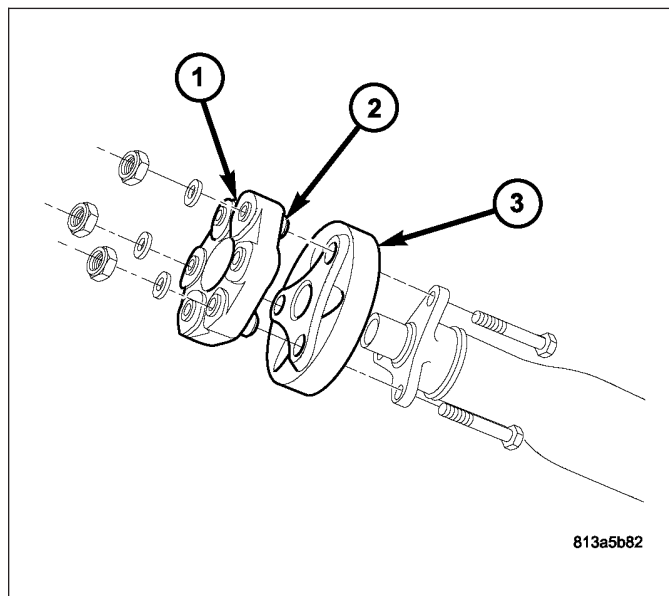
## INSTALLATION

**CAUTION:** Propeller shaft installation is a two-man operation. Never allow propeller shaft to hang from the center bearing, or while only connected to the transmission or rear axle flanges. A helper is required. If a propeller shaft section is hung unsupported, damage may occur to the shaft, coupler, and/or center bearing from over-angulation. This may result in driveline vibrations and/or component failure.

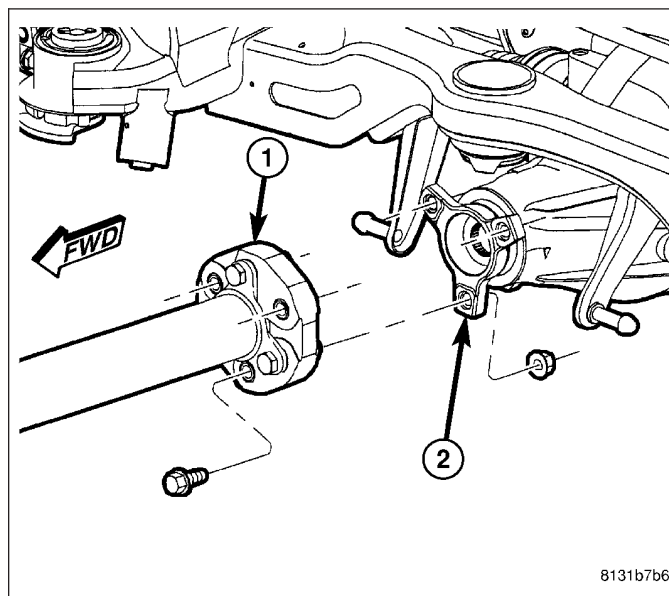


**COUPLER/DAMPER SERVICE**

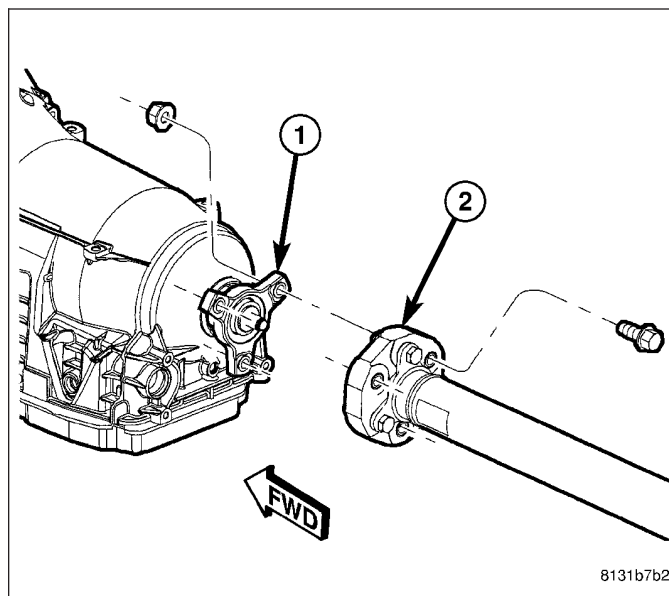
1. If coupler and/or damper (V6 Models) were removed, align index marks and reinstall. **Make sure protruding sleeve (2) is properly seated into propshaft or damper counterbores.**
2. Install three bolts with washers and nuts and torque to 81 N·m (60 ft. lbs.) torque.



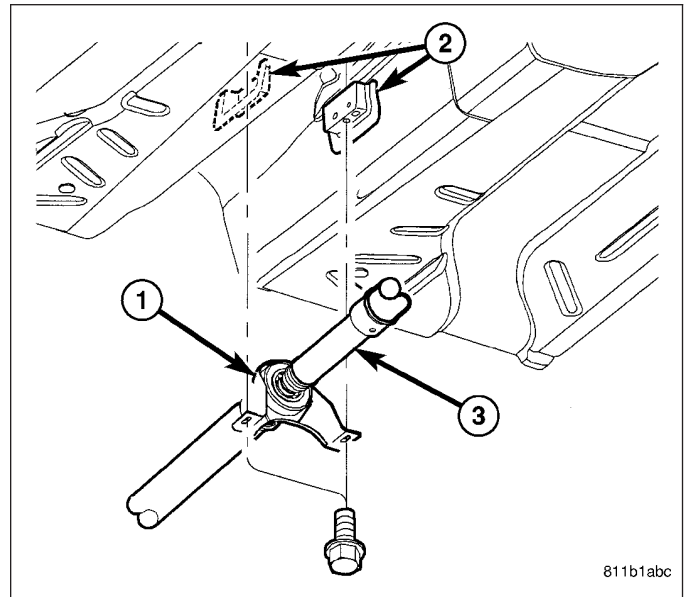
1. Obtain helper and install propeller shaft into position at axle. Align index marks (3) placed upon removal. Install propeller shaft rear coupler-to-axle flange bolt/nuts by hand. Do not torque at this time.



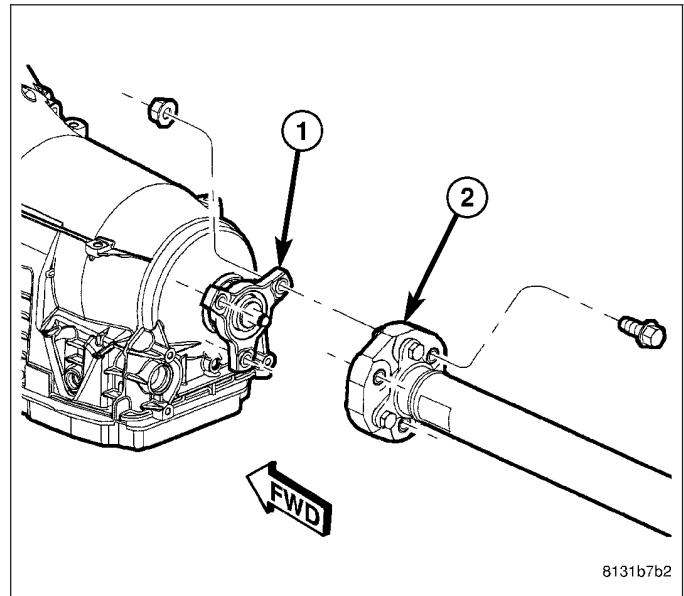
2. Install propeller shaft into position at transmission flange. Align index marks placed upon removal. Install propeller shaft front coupler-to-transmission flange bolt/nuts by hand. Do not torque at this time.



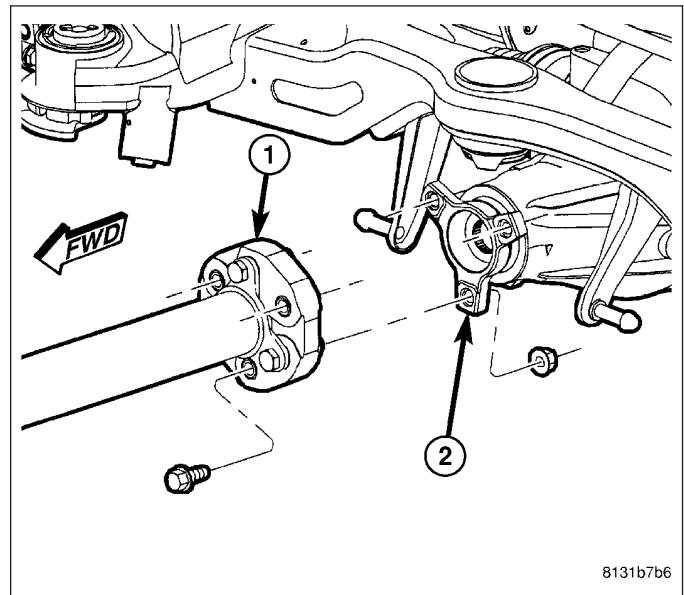
3. Loosely install center bearing-to-body bolts. Do not torque at this time.



4. Torque propeller shaft front coupler-to-transmission flange bolt/nuts to 58 N·m (43 ft. lbs.)

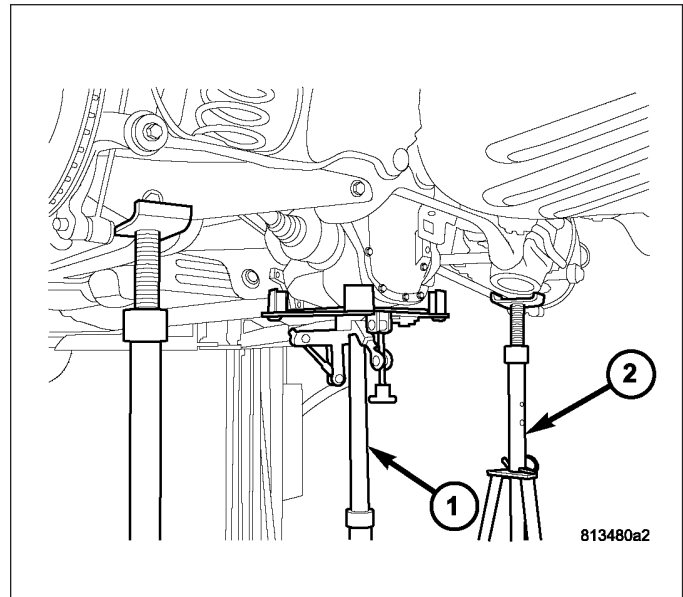


5. Torque propeller shaft rear coupler-to-axle flange bolt/nuts to 58 N·m (43 ft. lbs.)

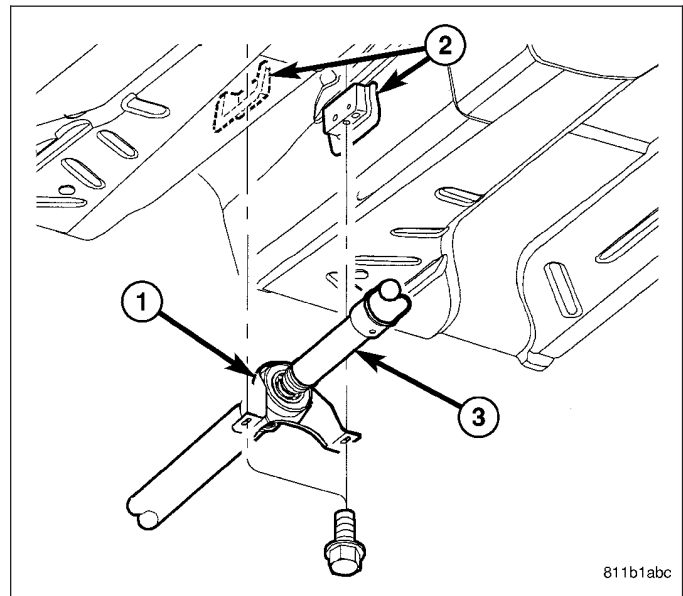


**Note:** Note: It is necessary to compress rear suspension to ride height before securing center bearing to body. Failure to compress suspension may result in objectionable noise and premature bearing wear.

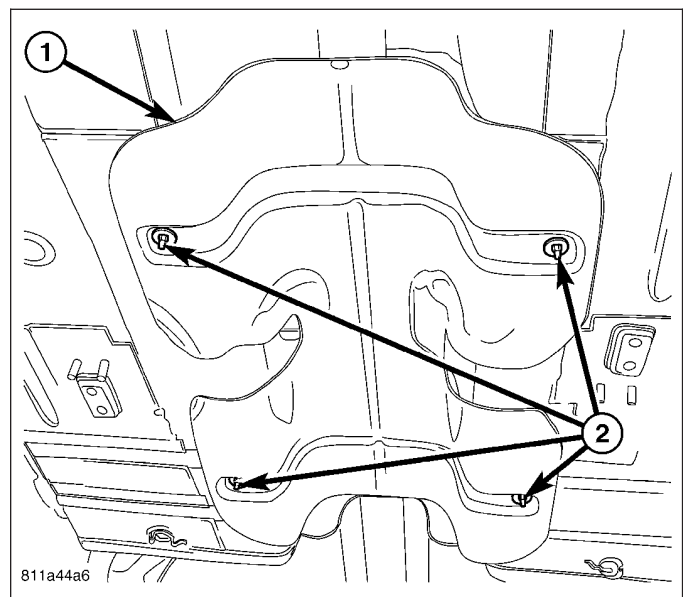
6. Compress rear suspension with suitable jack stands (1).



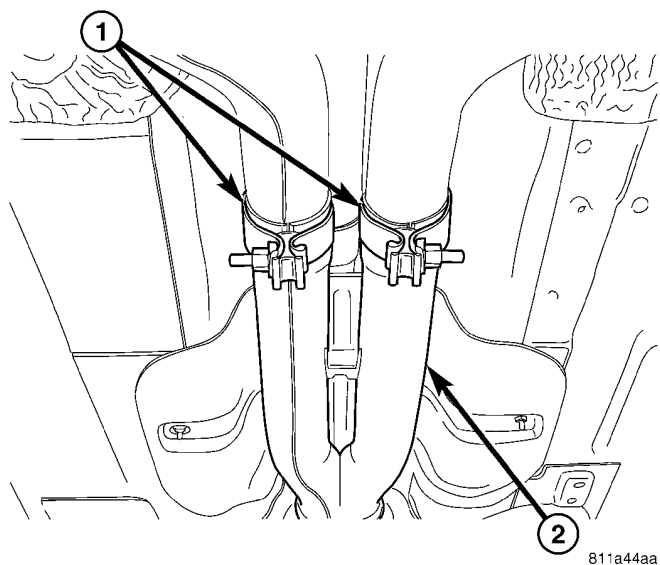
7. Torque center bearing-to-body bolts to 31 N·m (23 ft. lbs.).



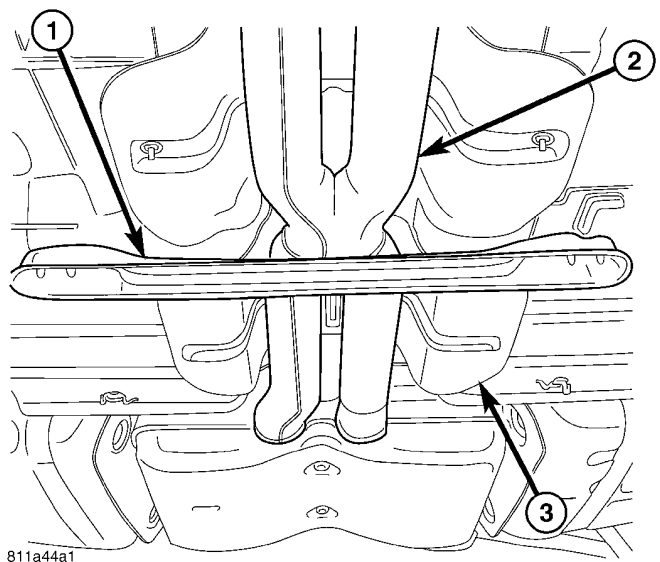
8. Install heat shield (1).



9. Install rear exhaust system (2)



10. Install crossmember (1).

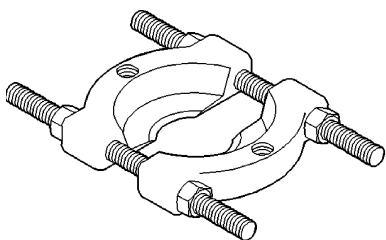


## SPECIFICATIONS – PROPELLER SHAFT

### TORQUE SPECIFICATIONS

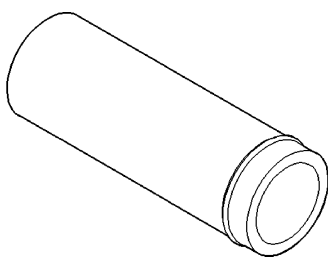
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
BOLT/NUT - SHAFT COUPLER-TO-TRANSMISSION	58	43	—
BOLT/NUT - SHAFT COUPLER-TO-AXLE ASSEMBLY	58	43	—
BOLT/NUT - COUPLER/DAMPER-TO-PROPELLER SHAFT	65	48	—
BOLT - CENTER BEARING-TO-BODY	31	23	—

## SPECIAL TOOLS – PROPELLER SHAFT



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***Bearing Splitter, 1130***



***Installer C-4735-1***

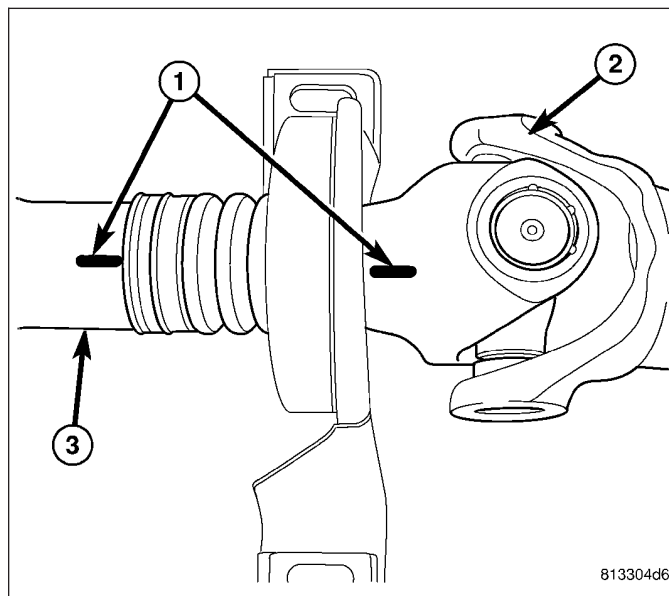
## CENTER BEARING

### REMOVAL

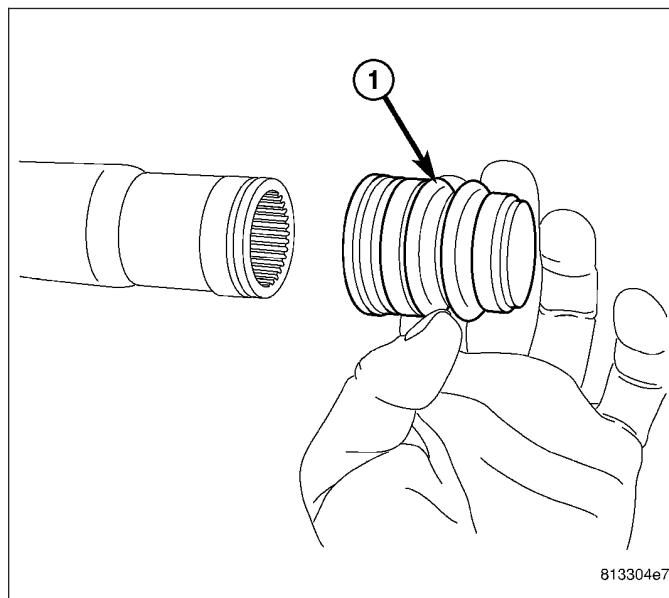
1. Remove propeller shaft from vehicle.

**Note:** To address propeller shaft imbalance concerns, the propeller shaft spline interface has a “skip-tooth” design allowing only one possible assembly orientation. Install reference marks only to aid in assembly.

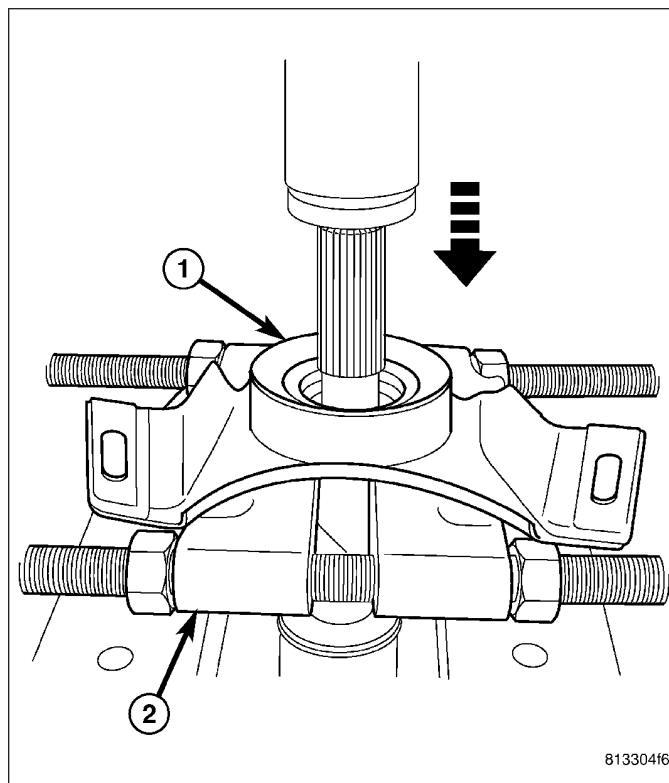
2. Mark front and rear shaft segments (2,3) with installation reference marks (1).



3. Separate propeller shaft front and rear segments at bearing and remove boot (1)

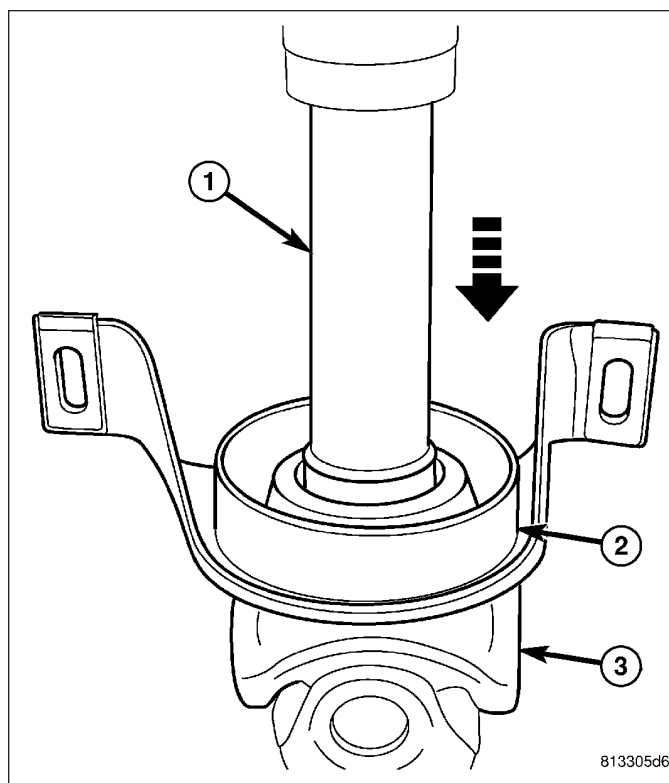


4. Press center bearing (1) off of rear shaft segment using arbor press and Bearing Splitter 1130 (2).

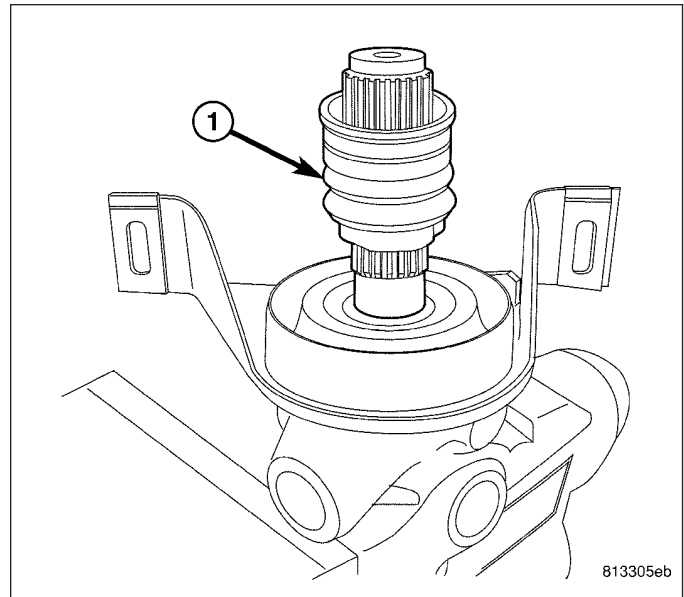


## INSTALLATION

1. Install propeller shaft rear segment into press, supported on joint yoke (3).
2. Install bearing assembly as shown (2).
3. Using Tool C-4735-1 (1), press bearing assembly (2) onto shaft.

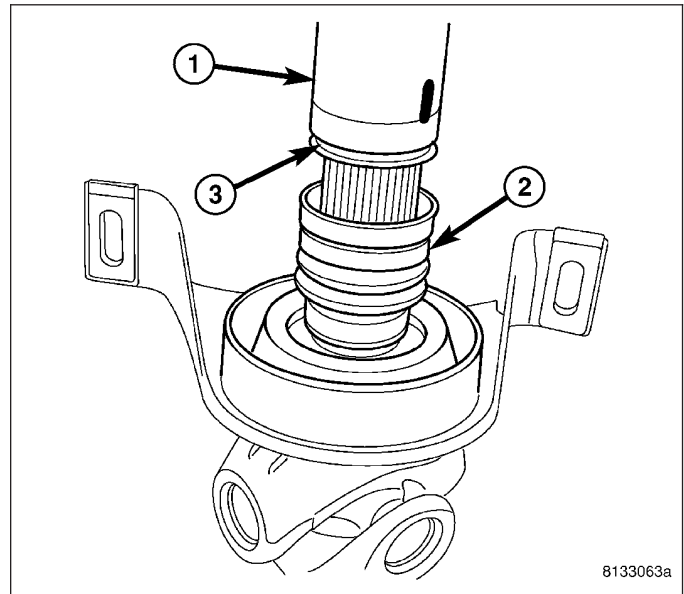


4. Remove propeller shaft from press.
5. Install boot (1) to rear shaft segment.



**Note:** To address propeller shaft imbalance concerns, the propeller shaft spline interface has a “skip-tooth” design allowing only one possible assembly orientation.

6. Align index marks placed upon disassembly and install front segment (1) to rear segment.
7. Install boot (2) to front segment, seating boot into groove (3).
8. Install propeller shaft into vehicle.





## HALF SHAFT - REAR

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## HALF SHAFT - REAR

### DESCRIPTION

The inner joints of both half shaft assemblies are cross-groove joints. The outer joints of both assemblies are Rzeppa Joints. The cross-groove joints are true constant velocity (CV) joint assemblies, which allow for the changes in half shaft length through the jounce and rebound travel of the rear suspension.

The inner cross-groove joint of both half shafts is splined into the rear differential assembly and retained by a snap ring. The outer CV joint has a stub shaft that is splined into the wheel hub and retained by a steel hub nut.

### DIAGNOSIS AND TESTING - HALF SHAFT

#### VEHICLE INSPECTION

1. Check for grease in the vicinity of the inboard cross-groove joint and outboard CV joint; this is a sign of inner or outer joint seal boot or seal boot clamp damage.

#### NOISE AND/OR VIBRATION IN TURNS

A clicking noise and/or a vibration in turns could be caused by one of the following conditions:

- Damaged outer CV or inner cross-groove joint seal boot or seal boot clamps. This will result in the loss and/or contamination of the joint grease, resulting in inadequate lubrication of the joint.
- Noise may also be caused by another component of the vehicle coming in contact with the half shafts.

#### CLUNKING NOISE DURING ACCELERATION

This noise may be a result of one of the following conditions:

- A torn seal boot on the inner or outer joint of the half shaft assembly.
- A loose or missing clamp on the inner or outer joint of the half shaft assembly.
- A damaged or worn half shaft CV joint.

#### SHUDDER OR VIBRATION DURING ACCELERATION

This problem could be a result of:

- A worn or damaged half shaft inner cross-groove joint.
- Improper wheel alignment. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)

#### VIBRATION AT HIGHWAY SPEEDS

This problem could be a result of:

- Foreign material (mud, etc.) packed on the backside of the wheel(s).
- Out of balance tires or wheels. (Refer to 22 - TIRES/WHEELS - STANDARD PROCEDURE)
- Improper tire and/or wheel runout. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

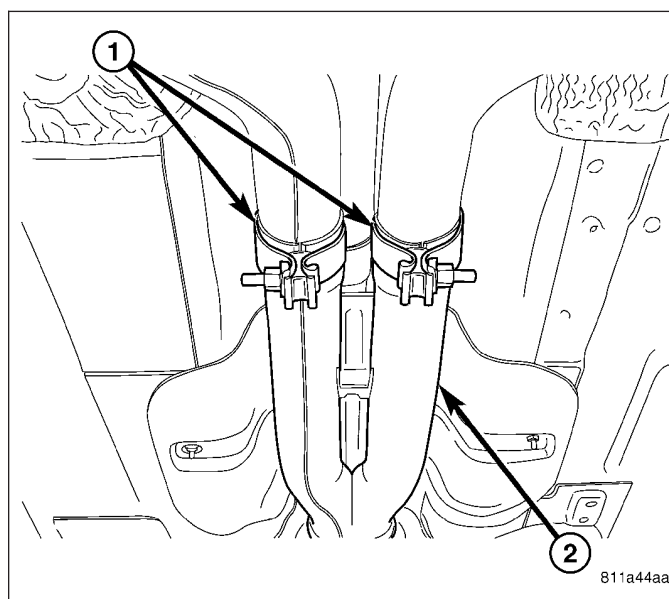
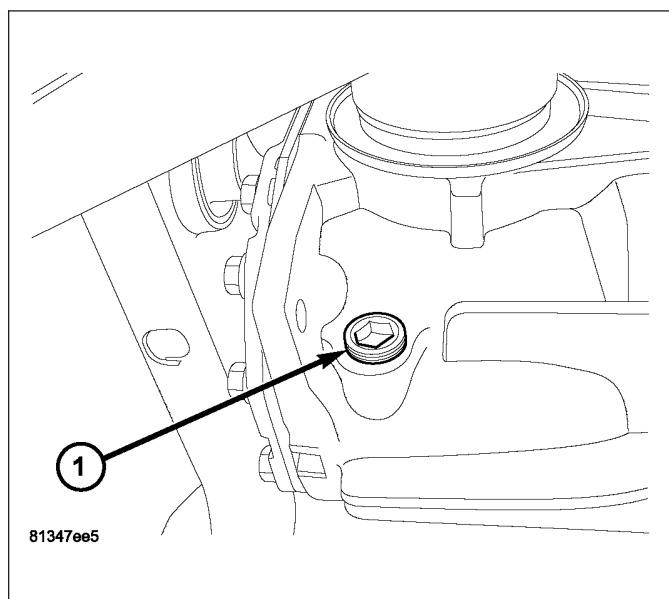
## REMOVAL

**Note:** This procedure requires the compression of the rear suspension to ride height. A drive-on hoist should be used. If a drive-on hoist is not used, screw-style under-hoist jack stands are required to compress the rear suspension, facilitating rear halfshaft removal.

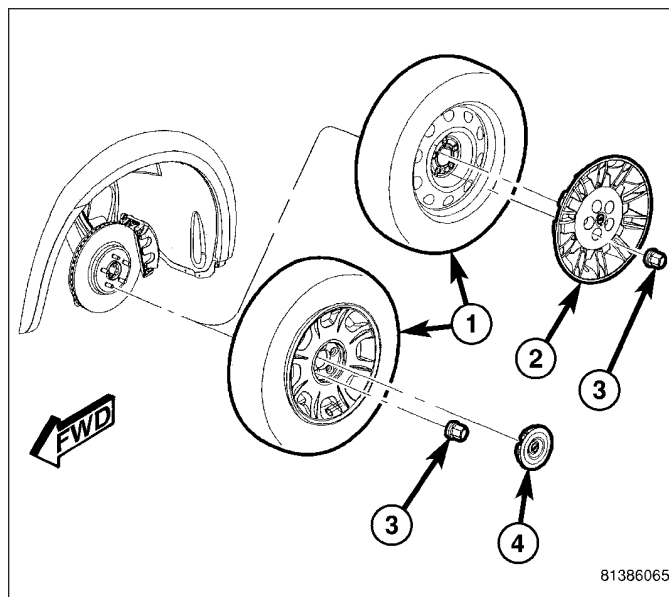
**Note:** Halfshaft inner and outer boots are not serviceable separately. Boot replacement requires entire shaft assembly replacement.

**CAUTION:** Never grasp halfshaft assembly by the inner or outer boots. Doing so may cause the boot to pucker or crease, reducing the service life of the boot and joint. Avoid over angulating or stroking the C/V joints when handling the halfshaft.

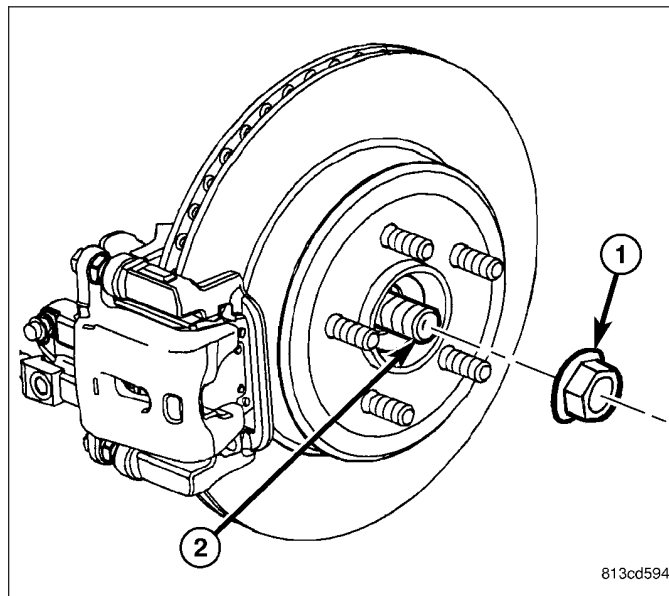
1. With vehicle in neutral, position and raise vehicle on hoist.
2. Using 14mm hex, remove axle drain plug (1) and drain rear axle fluid into container suitable for fluid reuse.
3. Install drain plug (1) and torque to:
  - 198 Axle: 60 N·m (44 ft. lbs.)
  - 210 Axle: 50 N·m (37 ft. lbs.)
4. Remove rear exhaust system (2) on V8-equipped models.



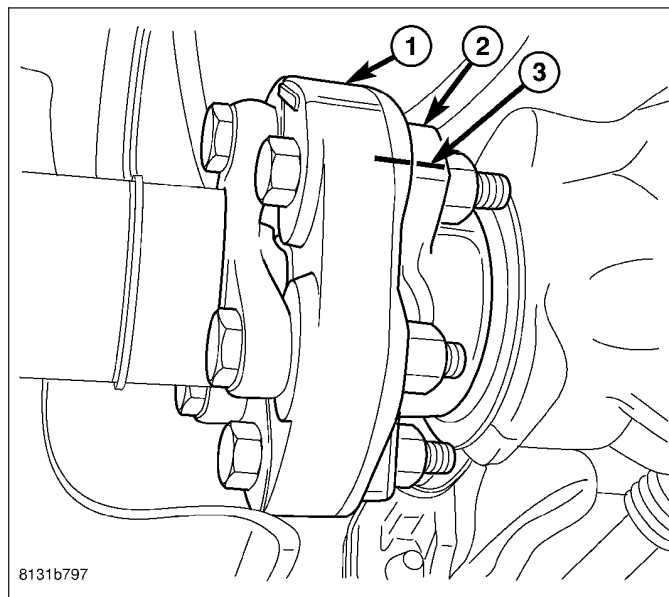
5. Remove wheel/tire assembly (1) from sides that shaft is to be removed.



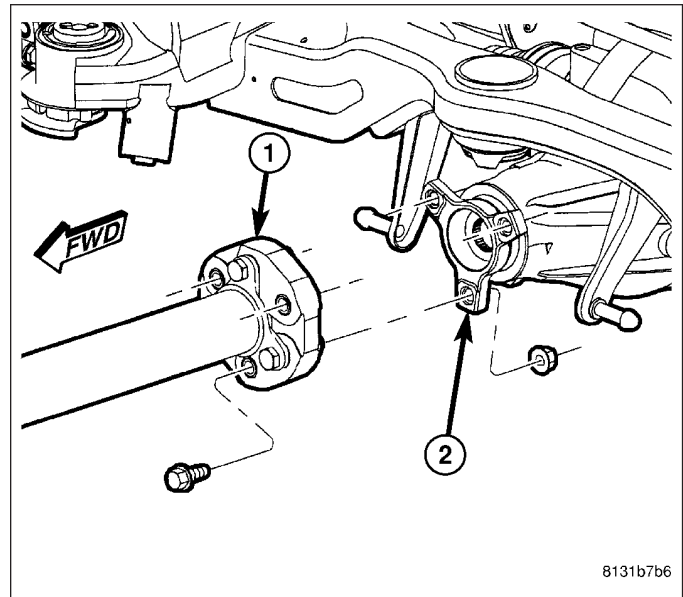
6. Remove wheel hub nut. (1)



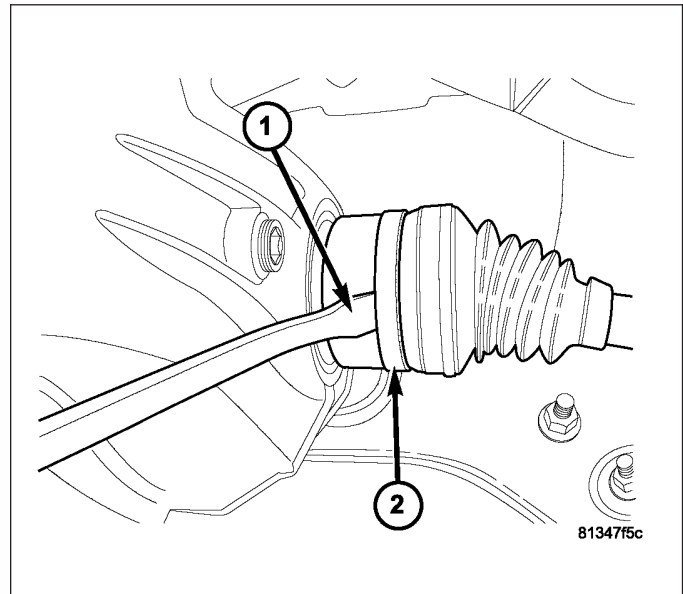
7. Apply alignment index marks (3) to the propeller shaft rubber coupler (1) and axle flange (2).



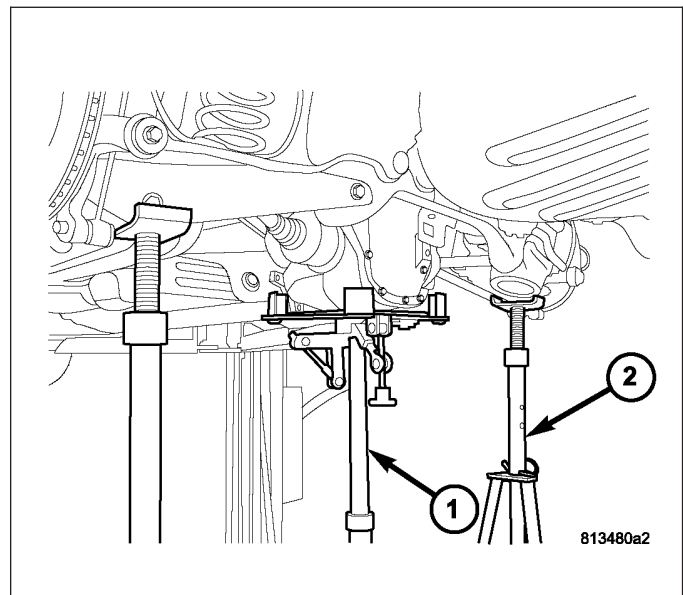
8. Remove three (3) propeller shaft coupler-to-axle flange bolt/nuts.



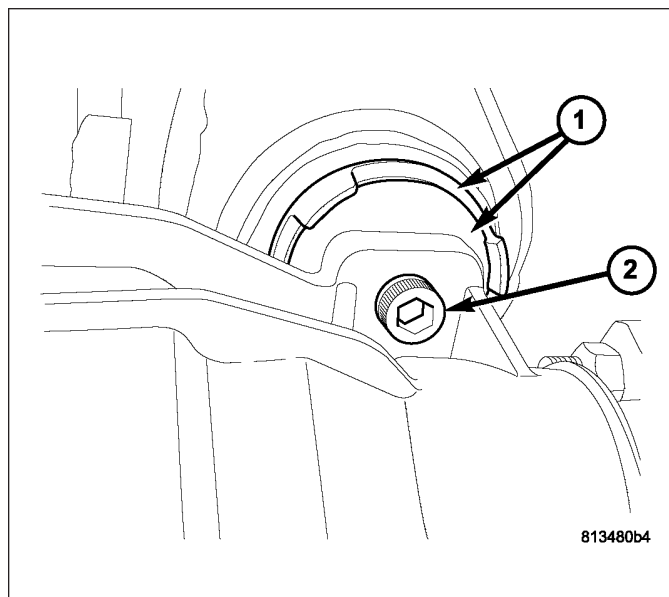
9. Using suitable screwdriver (1), partially disengage halfshaft(s) (2) from axle assembly.



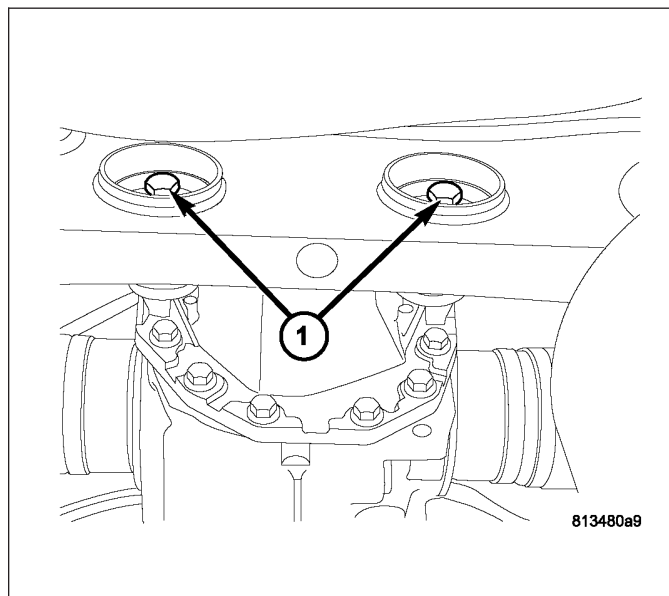
10. If a drive-on hoist is used, position transmission jack(1) to rear axle assembly. If a drive-on hoist is not used, compress rear suspension using screw-style under-hoist jack stands (2), then position transmission jack to rear axle assembly.



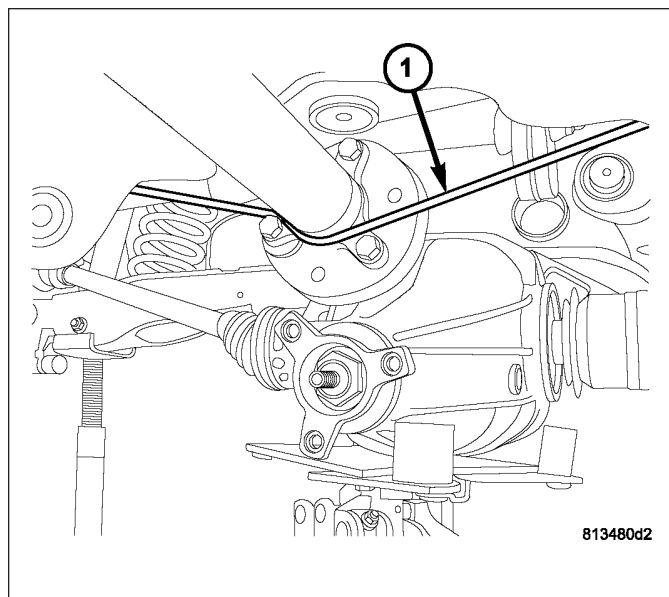
11. Remove rear axle forward mount isolator (1) bolt/nut (2).



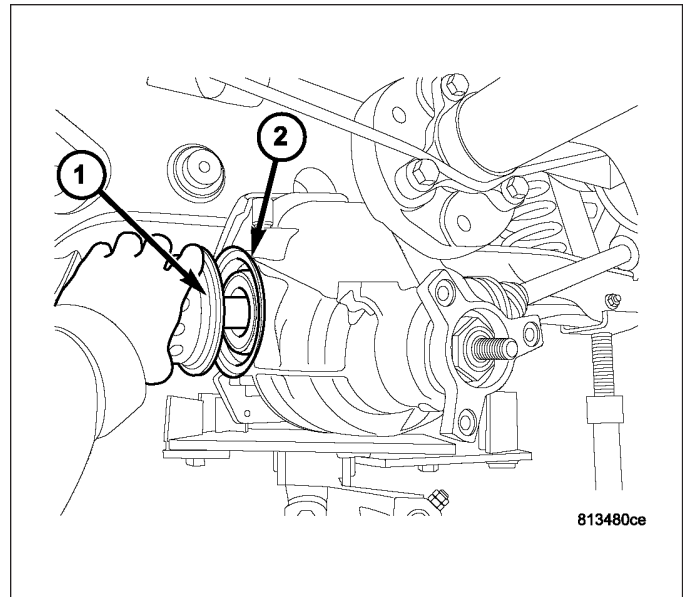
12. Remove two rear axle-to-crossmember bolts (1).



13. Carefully lower rear axle. While lowering axle, separate propeller shaft from axle and support with suitable rope or wire (1).



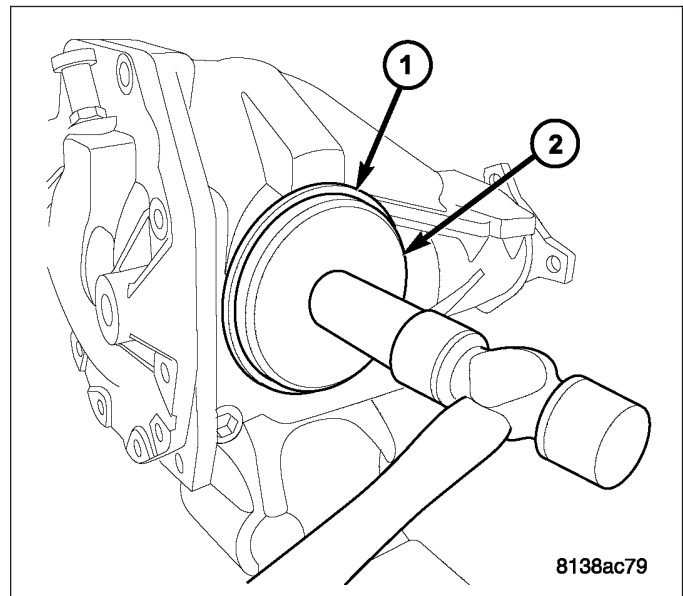
14. Lower axle just enough to remove halfshafts one at a time. Shift axle assembly in one direction, compressing one halfshaft while removing the other (1). Use caution to protect axle seal and journal.
15. Remove halfshaft from hub. Repeat on other side if necessary.



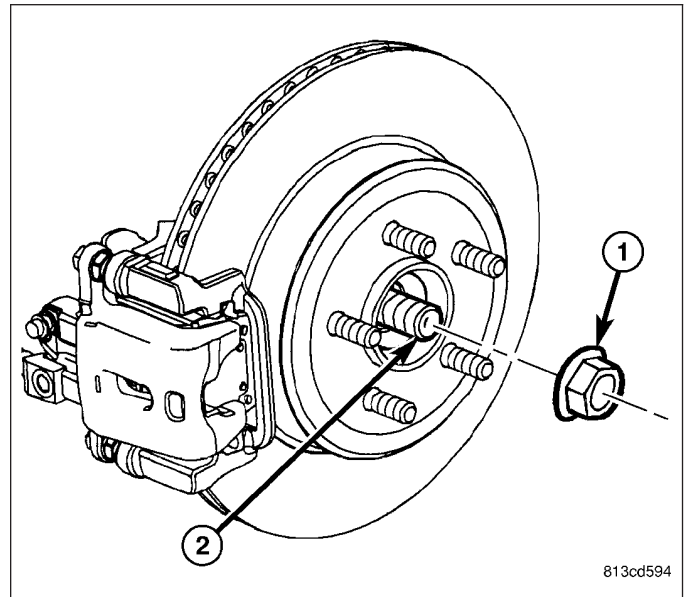
16. Remove axle seals using suitable screwdriver.

## INSTALLATION

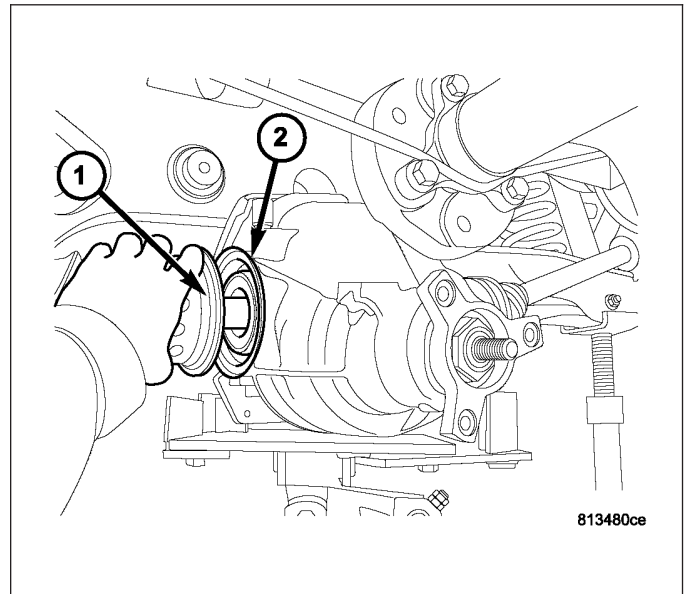
1. Install new axle seal(s) (1) using Tool 9223 (2).



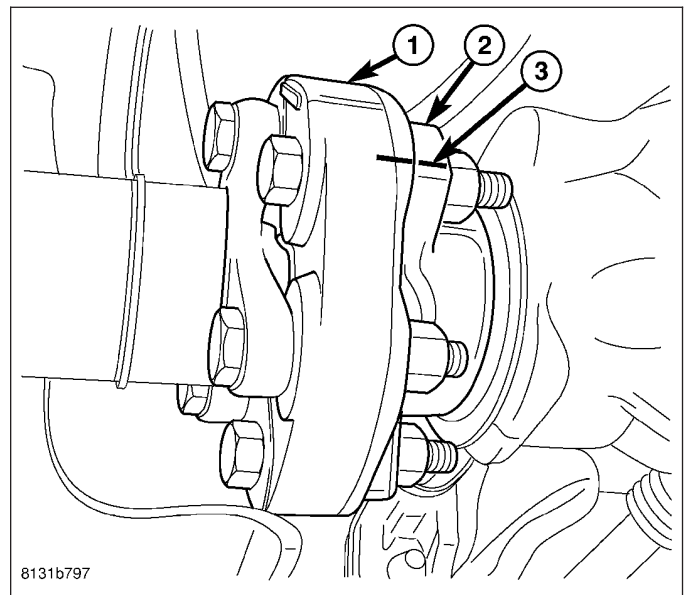
2. Install halfshaft (2) to wheel hub/knuckle assembly and start hub nut (1) by hand.



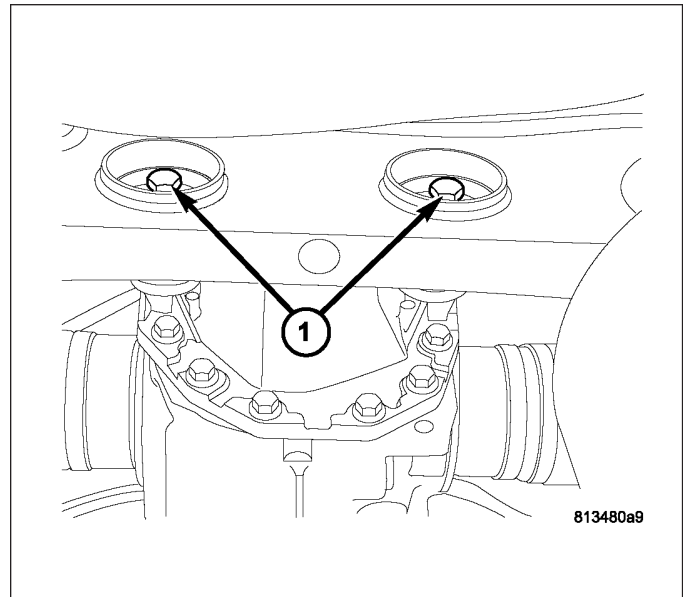
3. Using new circlip(s), install halfshaft (1) to rear axle assembly. Use care not to damage axle seals(2). Verify proper installation by pulling outward on joint by hand.



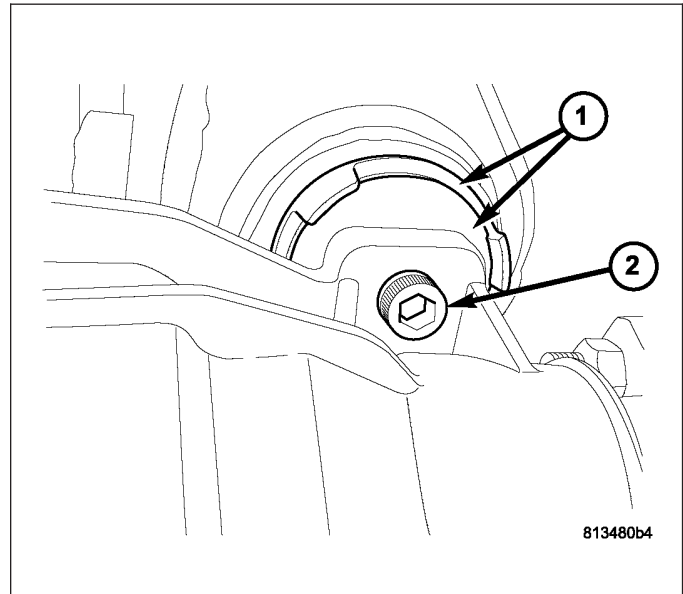
4. Raise rear axle assembly into position. Align propeller shaft index marks (3) and start propeller shaft coupler-to-axle bolt/nuts by hand.



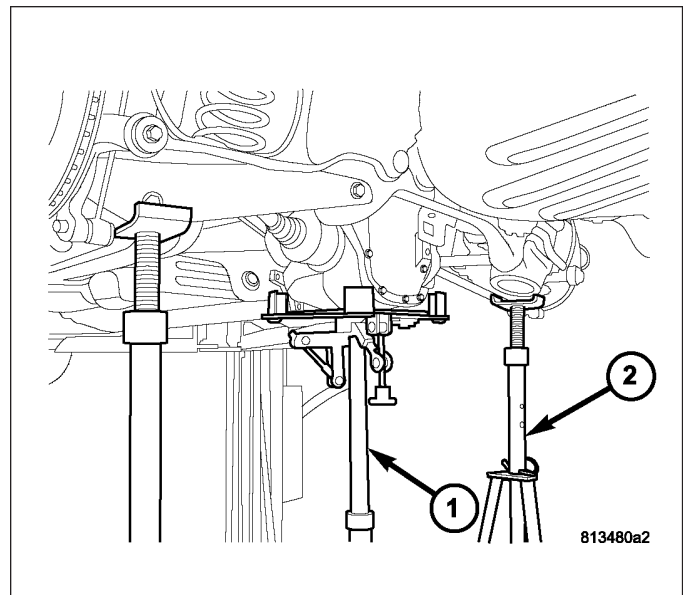
5. Install two rear axle-to-crossmember bolts (1) and torque to 220 N·m (162 ft. lbs.).



6. Install rear axle front mount isolator (1) as shown and torque bolt/nut to 65 N·m (48 ft. lbs.).

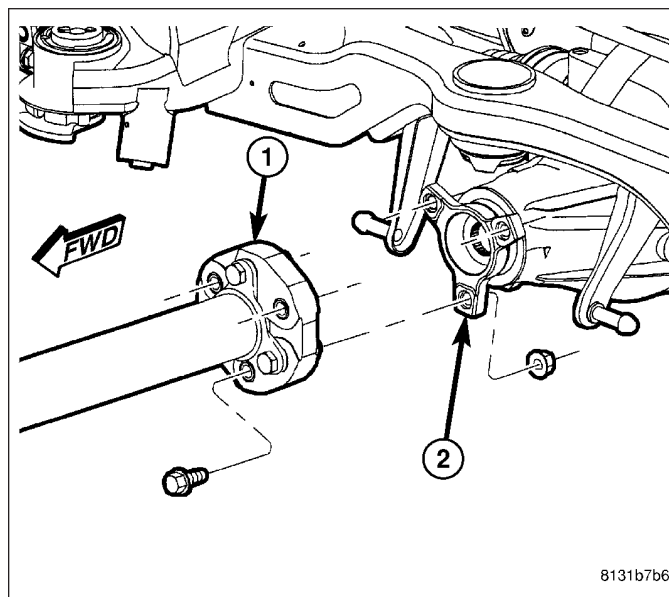


7. Again verify halfshaft inner joints are fully engaged to axle assembly.  
8. Remove transmission jack (1).  
9. If used, remove screw-type under-hoist jack stands (2).

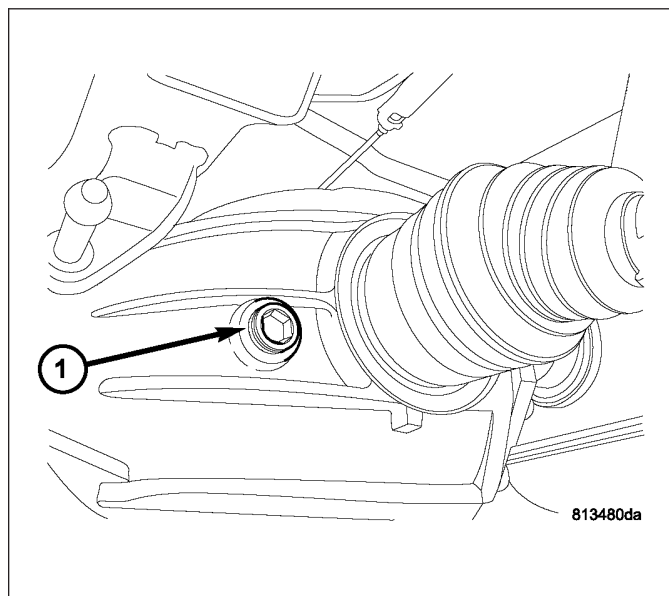




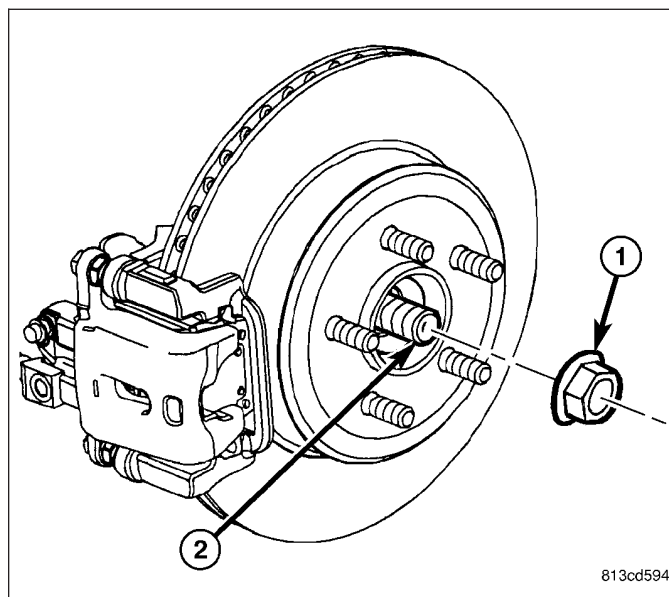
10. Torque propeller shaft coupler-to-axle flange bolt/nuts to 58 N·m (43 ft. lbs.).



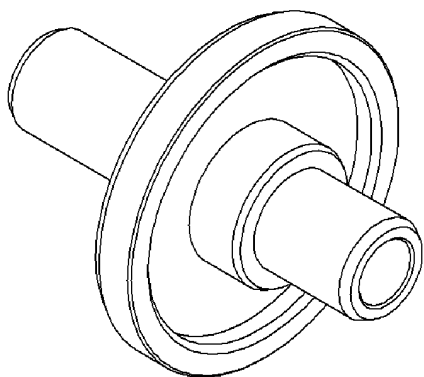
11. Using a 14mm hex, remove rear axle fill plug (1). Fill axle with 1.4L (1.5 qts.) of Mopar® 75W-140 Synthetic Gear & Axle Lubricant. Install fill plug and torque to 60 N·m (44 ft. lbs.).



12. Lower vehicle. Torque halfshaft hub nut (1) to 213 N·m (157 ft. lbs.). Install wheel center cap.





**SPECIAL TOOLS**

*Installer, 9223*

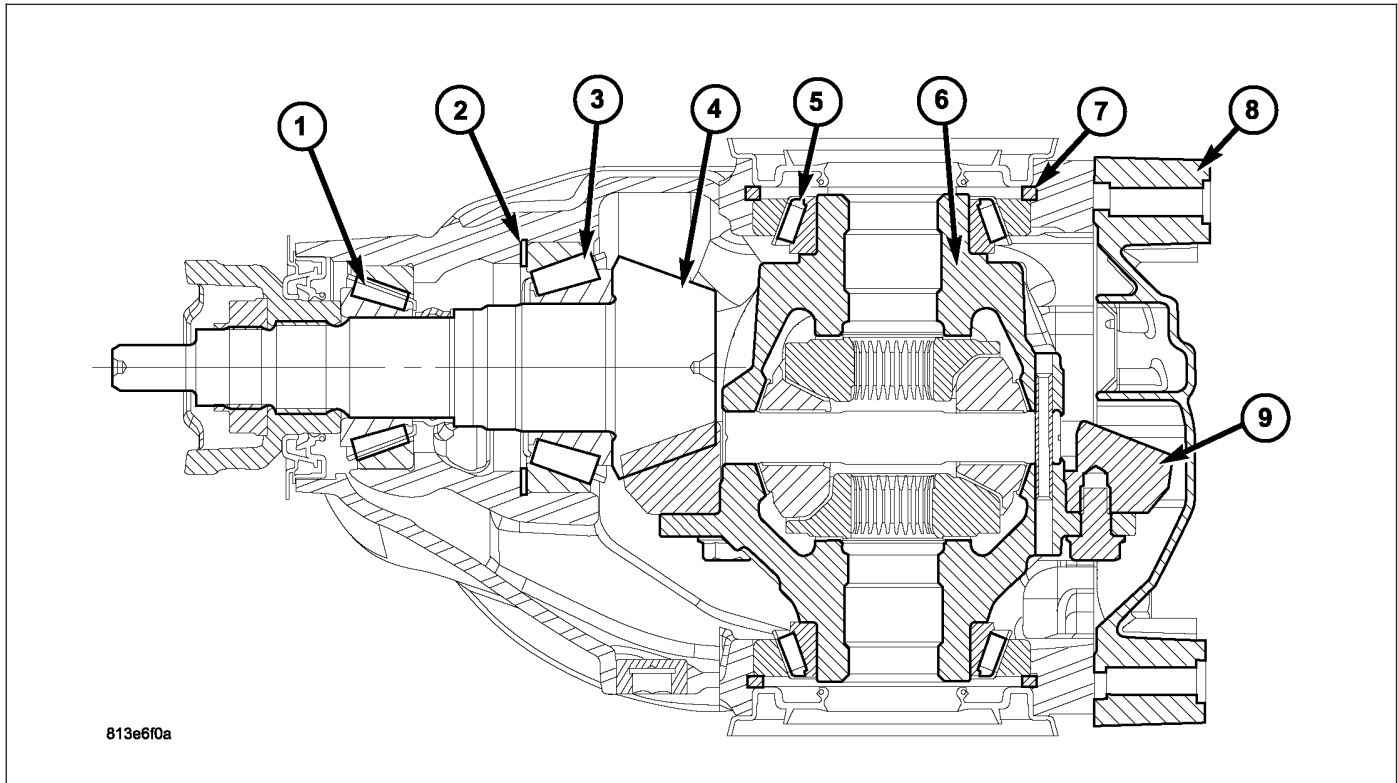
## REAR AXLE - 198R11

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## REAR AXLE - 198RII

### DESCRIPTION



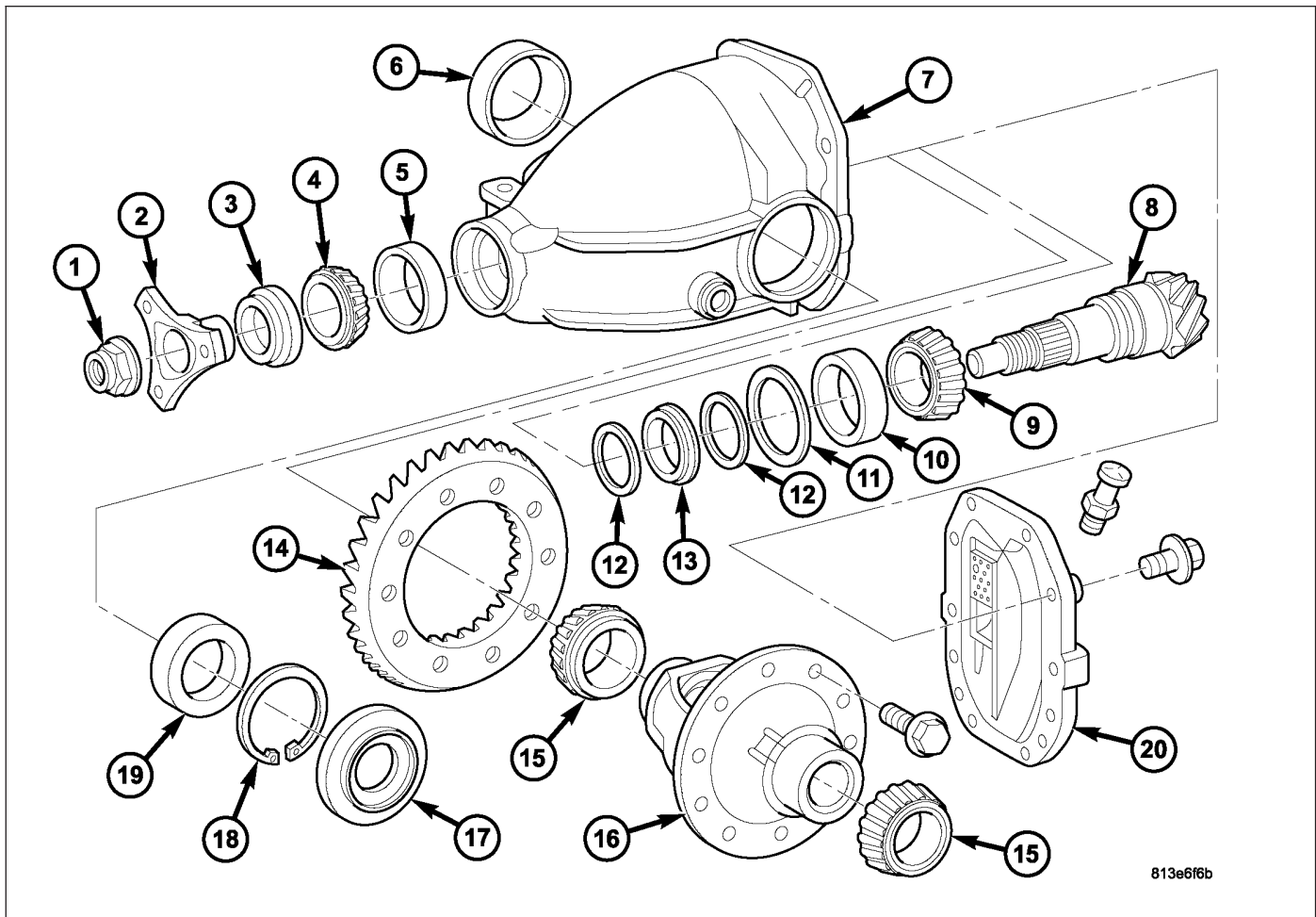
**198/210 MM RII Axle Section View**

- 1 - BEARING, PINION TAIL
- 2 - SHIM, PINION DEPTH
- 3 - BEARING, PINION HEAD
- 4 - GEAR/SHAFT, PINION
- 5 - BEARING, DIFFERENTIAL SIDE

- 6 - DIFFERENTIAL
- 7 - RING, SNAP
- 8 - COVER, AXLE
- 9 - GEAR, RING

The 198 MM RII (Rear-Independent-Iron) axle is an independent assembly with a cast iron housing and differential. The 198 MM RII uses an open differential which is supported by two tapered roller bearings located on either side of the case. Differential bearing preload and ring gear backlash are controlled with select snap-rings located on the outside of the differential bearing cups. Pinion height is set with a select shim located under the rear pinion bearing cup.

The 198 axle is available only in V6 engine-equipped models in three available gear ratios: 3.08, 3.64 & 3.90:1.



**198/210 Axle Components**

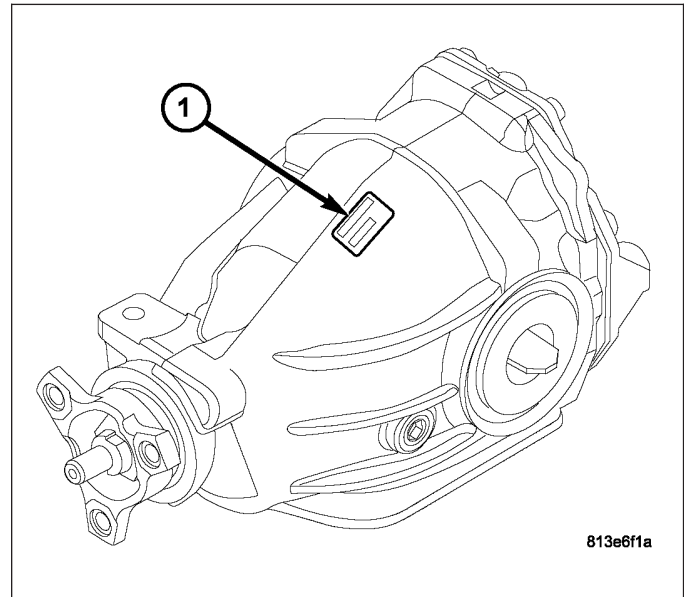
- |                                    |                                      |
|------------------------------------|--------------------------------------|
| 1 - NUT, PINION FLANGE             | 11 - SHIM, PINION DEPTH              |
| 2 - FLANGE, PINION                 | 12 - WASHER (2)                      |
| 3 - SEAL, PINION                   | 13 - SPACER, COLLAPSIBLE             |
| 4 - CONE, PINION TAIL BEARING      | 14 - GEAR, RING                      |
| 5 - CUP, PINION TAIL BEARING       | 15 - CONE, DIFFERENTIAL SIDE BEARING |
| 6 - CUP, DIFFERENTIAL SIDE BEARING | 16 - DIFFERENTIAL                    |
| 7 - HOUSING, AXLE                  | 17 - SEAL, AXLE                      |
| 8 - GEAR/SHAFT, PINION             | 18 - RING, SNAP                      |
| 9 - CONE, PINION HEAD BEARING      | 19 - CUP, DIFFERENTIAL SIDE BEARING  |
| 10 - CUP, PINION HEAD BEARING      | 20 - COVER, AXLE HOUSING             |

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## AXLE IDENTIFICATION

The 198 MM axle utilizes a barcoded label (1) which is adhered to the top of the axle housing as shown. The following information is found on the identification label:

- Traceability Code (Plant Use)
- Axle Part Number
- Axle Gear Ratio



**198 Axle Identification Label**

## DIAGNOSIS AND TESTING

### GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, incorrect pinion depth, tooth contact, worn/damaged gears, or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion shaft can also cause a snapping or a knocking noise.

### BEARING NOISE

The differential and pinion bearings can produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Wheel hub bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

## LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint or by worn side-gear thrust washers. A worn pinion shaft bore will also cause low speed knock.

## VIBRATION

Vibration at the rear of the vehicle is usually caused by a:

- Damaged propeller shaft.
- Missing propeller shaft balance weight(s).
- Worn or out-of-balance wheels.
- Loose wheel lug nuts.
- Worn U-joints or CV joints.
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent halfshaft(s).

Check for loose or damaged front-end components or engine/transmission mounts. These components can contribute to what appears to be a rearend vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

## DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear, can be caused by:

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U-joints or CV joints.
- Worn or broken axle mount isolators.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.



## DIAGNOSTIC CHART

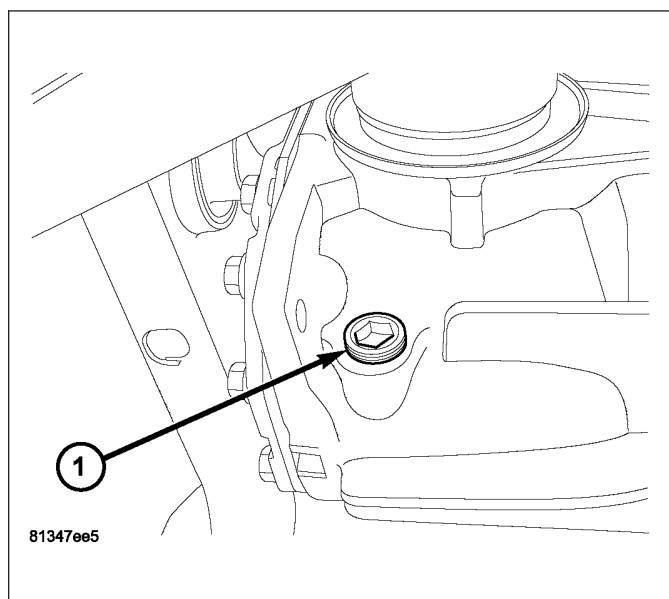
CONDITION	POSSIBLE CAUSE	CORRECTION
Wheel Noise	<ol style="list-style-type: none"> <li>1. Wheel loose.</li> <li>2. Faulty, brinelled wheel bearing.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten loose nuts.</li> <li>2. Replace bearing.</li> </ol>
Differential Cracked	<ol style="list-style-type: none"> <li>1. Improper differential side bearing preload.</li> <li>2. Excessive ring gear backlash.</li> <li>3. Vehicle overloaded.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace case and inspect gears and bearings for further damage. Set differential bearing preload properly.</li> <li>2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly.</li> <li>3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight.</li> </ol>
Differential Gears Scored	<ol style="list-style-type: none"> <li>1. Insufficient lubrication.</li> <li>2. Improper grade of lubricant.</li> <li>3. Excessive spinning of one wheel/tire.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace scored gears. Fill differential with the correct fluid type and quantity.</li> <li>2. Replace scored gears. Fill differential with the proper fluid type and quantity.</li> <li>3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.</li> </ol>
Loss Of Lubricant	<ol style="list-style-type: none"> <li>1. Lubricant level too high.</li> <li>2. Worn axle shaft seals.</li> <li>3. Cracked axle housing.</li> <li>4. Worn pinion seal.</li> <li>5. Worn/scored pinion flange journal.</li> <li>6. Axle cover not properly sealed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Drain lubricant to the correct level.</li> <li>2. Replace seals.</li> <li>3. Repair as necessary.</li> <li>4. Replace seal.</li> <li>5. Replace pinion flange and seal.</li> <li>6. Remove, clean, and re-seal cover.</li> </ol>
Axle Overheating	<ol style="list-style-type: none"> <li>1. Lubricant level low.</li> <li>2. Improper grade of lubricant.</li> <li>3. Bearing preload too high.</li> <li>4. Insufficient ring gear backlash.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill differential to correct level.</li> <li>2. Fill differential with the correct fluid type and quantity.</li> <li>3. Readjust bearing pre-load.</li> <li>4. Re-adjust ring gear backlash.</li> </ol>
Gear Teeth Broke	<ol style="list-style-type: none"> <li>1. Overloading.</li> <li>2. Ice-spotted pavement.</li> <li>3. Improper adjustments.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace gears. Examine other gears and bearings for possible damage.</li> <li>2. Replace gears and examine remaining parts for damage.</li> <li>3. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.</li> </ol>

CONDITION	POSSIBLE CAUSE	CORRECTION
Axle Noise	<ol style="list-style-type: none"> <li>1. Insufficient lubricant.</li> <li>2. Improper ring gear and pinion adjustment.</li> <li>3. Unmatched ring gear and pinion.</li> <li>4. Worn teeth on ring gear and/or pinion.</li> <li>5. Loose pinion bearings.</li> <li>6. Loose differential bearings.</li> <li>7. Misaligned or sprung ring gear.</li> <li>8. Housing not machined properly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill axle with the correct fluid type and quantity.</li> <li>2. Check ring gear and pinion contact pattern. Adjust backlash or pinion depth.</li> <li>3. Replace gears with a matched ring gear and pinion.</li> <li>4. Replace ring gear and pinion.</li> <li>5. Adjust pinion bearing pre-load.</li> <li>6. Adjust differential bearing preload.</li> <li>7. Measure ring gear run-out. Replace components as necessary.</li> <li>8. Replace housing.</li> </ol>

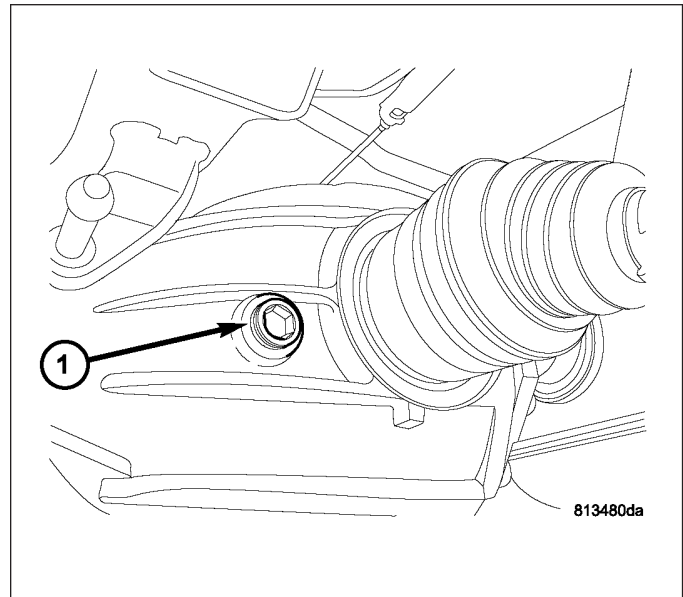
## STANDARD PROCEDURE - FLUID DRAIN AND FILL

**Note:** Note: The fluid required for use in this axle is Mopar® Synthetic Gear and Axle Lubricant 75W-140.

1. Drive the vehicle until the differential lubricant is at the normal operating temperature.
2. With vehicle in neutral, position and raise vehicle on hoist.
3. Remove rear axle drain plug and drain lubricant completely from the axle.
4. Install drain plug and tighten to 60 N·m (44 ft lbs).



5. Remove fill plug (1) and fill rear axle with 1.4 L (1.5 qts.) Mopar® Synthetic Gear & Axle Lubricant 75W-140.
6. Install fill plug and tighten to 60 N·m (44 ft lbs).

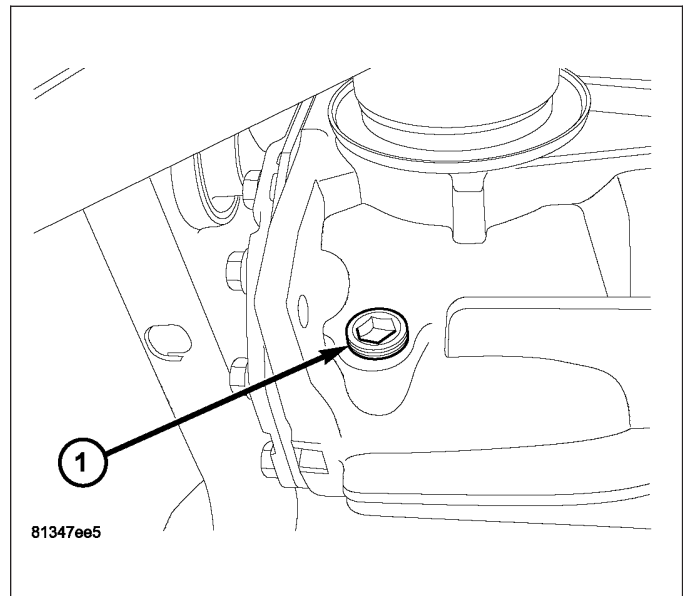


## REMOVAL

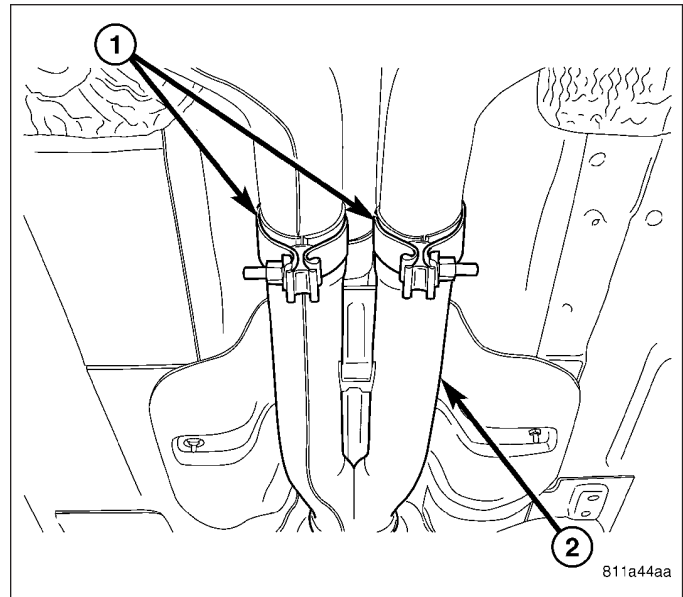
**Note:** This procedure requires the compression of the rear suspension to ride height. A drive-on hoist should be used. If a drive-on hoist is not used, screw-style under-hoist jack stands are required to compress the rear suspension, facilitating rear halfshaft removal.

**CAUTION:** Never grasp halfshaft assembly by the inner or outer boots. Doing so may cause the boot to pucker or crease, reducing the service life of the boot and joint. Avoid over angulating or stroking the C/V joints when handling the halfshaft.

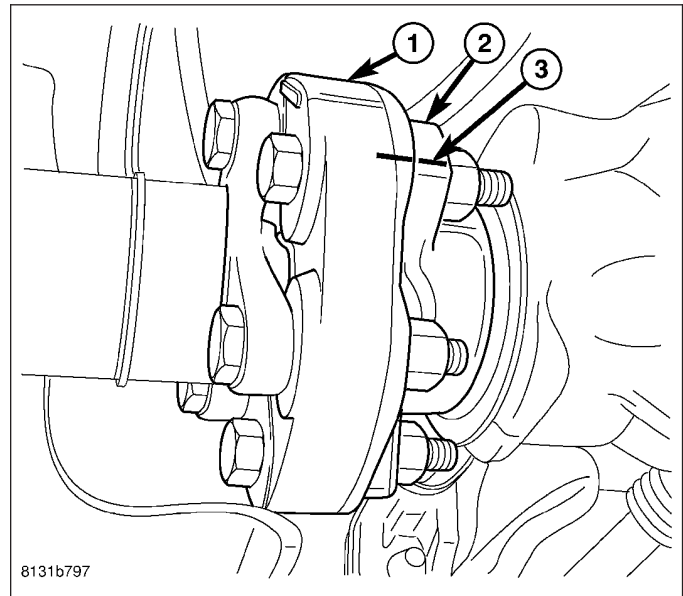
1. With vehicle in neutral, position and raise vehicle on hoist.
2. Using 14mm hex, remove axle drain plug (1) and drain rear axle fluid into container suitable for fluid reuse.
3. Install drain plug (1) and torque to 50 N·m (37 ft. lbs.) torque.



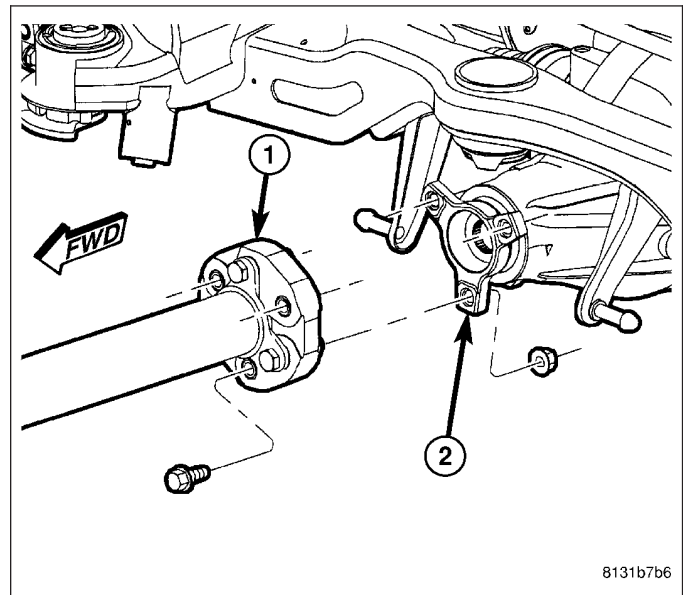
4. Remove rear exhaust system (2) on dual-outlet exhaust models.



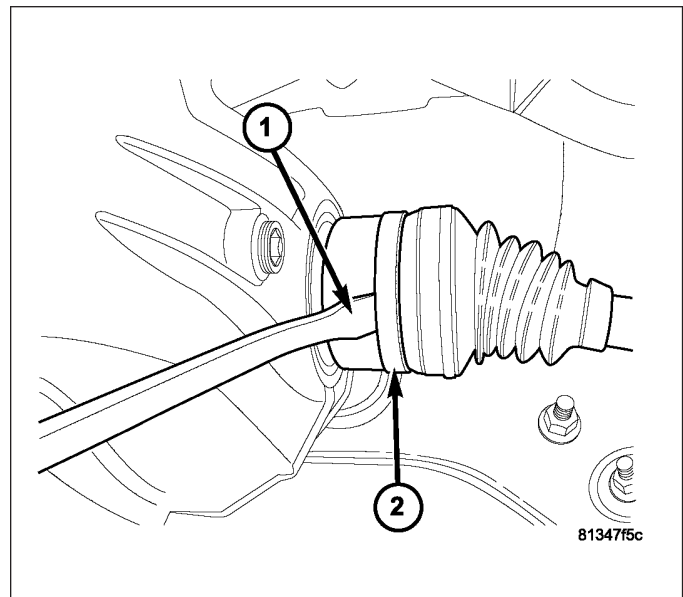
5. Apply alignment index marks (3) to the propeller shaft rubber coupler (1) and axle flange (2).



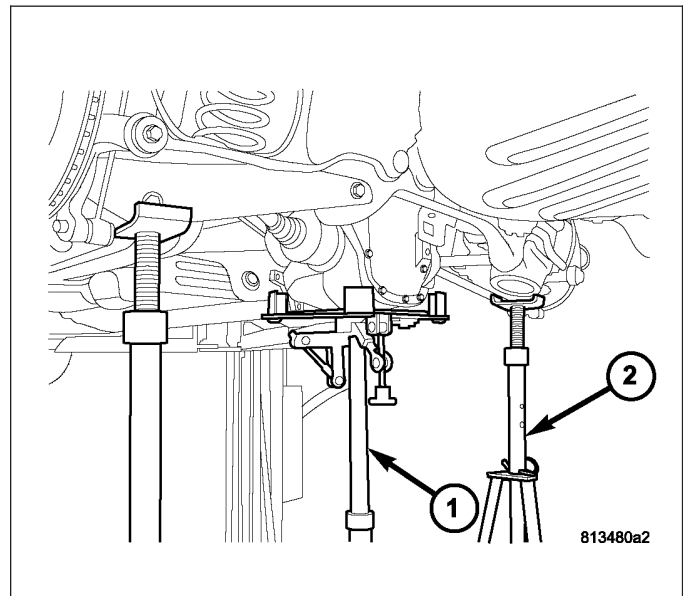
6. Remove three (3) propeller shaft coupler-to-axle flange bolt/nuts.



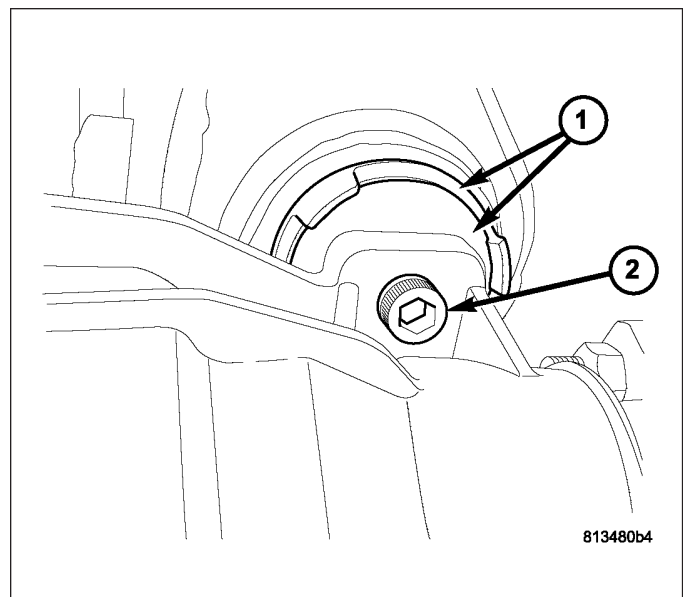
7. Using suitable screwdriver (1), partially disengage halfshaft(s) (2) from axle assembly.



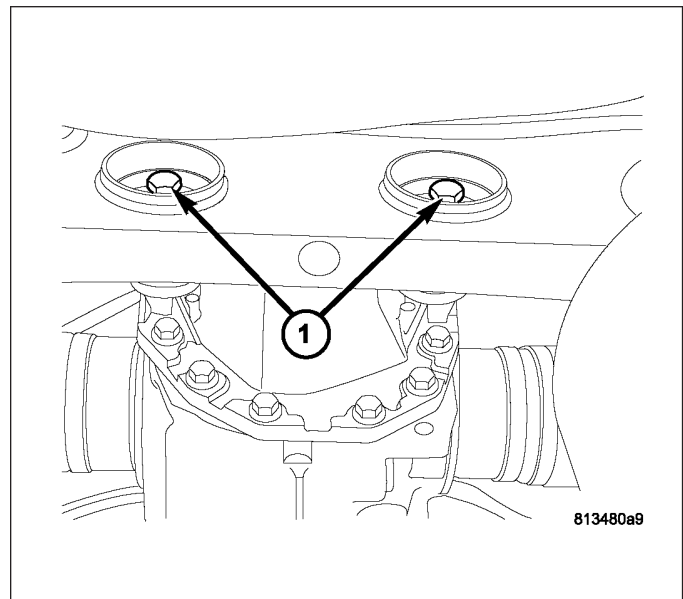
8. If a drive-on hoist is used, position transmission jack(1) to rear axle assembly. If a drive-on hoist is not used, compress rear suspension using screw-style under-hoist jack stands (2), then position transmission jack to rear axle assembly.



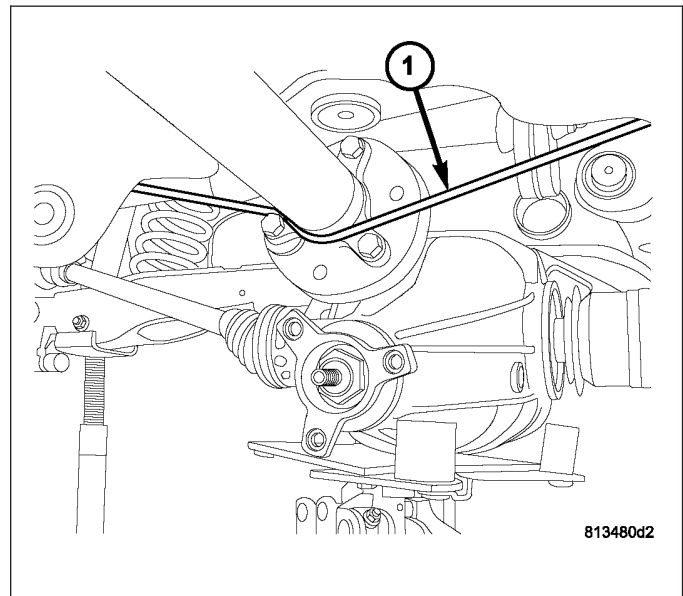
9. Remove rear axle forward mount isolator (1) bolt/nut (2).



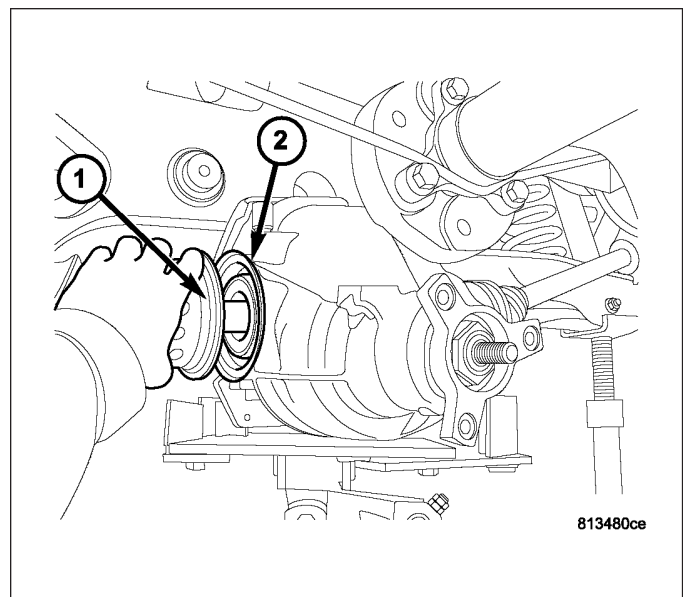
10. Remove two rear axle-to-crossmember bolts (1).



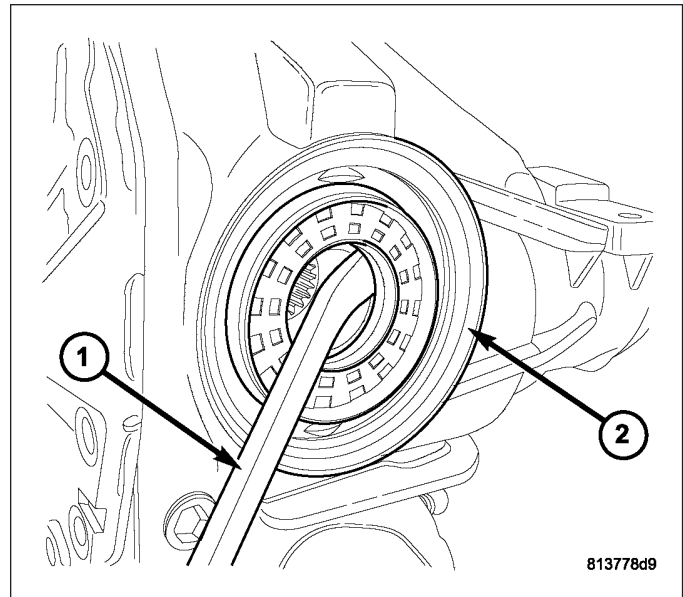
11. Carefully lower rear axle. While lowering axle, separate propeller shaft from axle and support with suitable rope or wire (1).



12. Lower axle just enough to remove both halfshafts one at a time. Shift axle assembly in one direction, compressing one halfshaft while removing the other (1). Use caution to protect axle seal and journal.

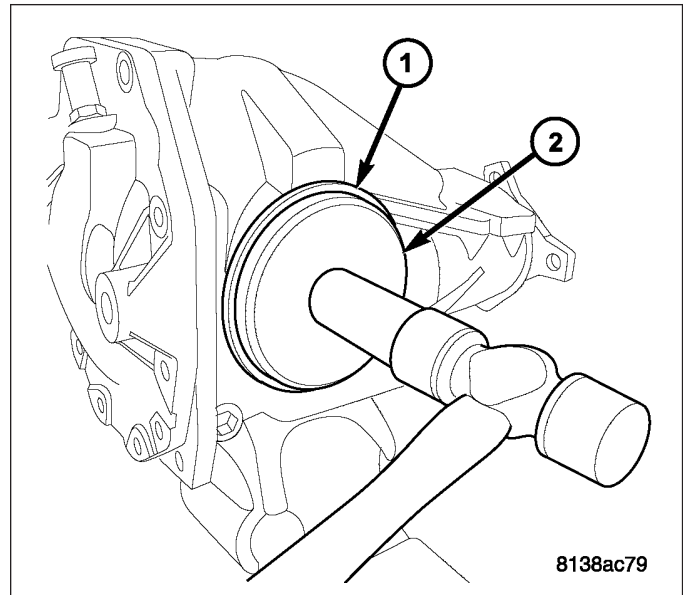


13. Remove axle assembly from vehicle and transfer to bench.
14. Using suitable screwdriver, remove axle seals and discard.

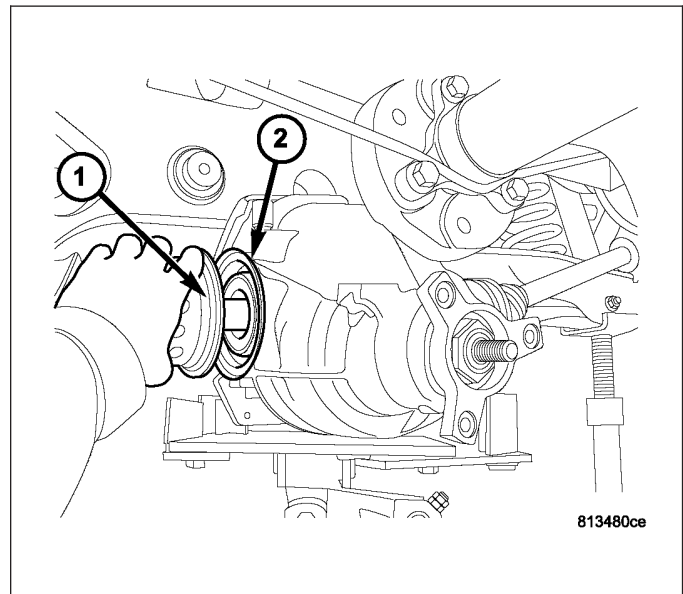


## INSTALLATION

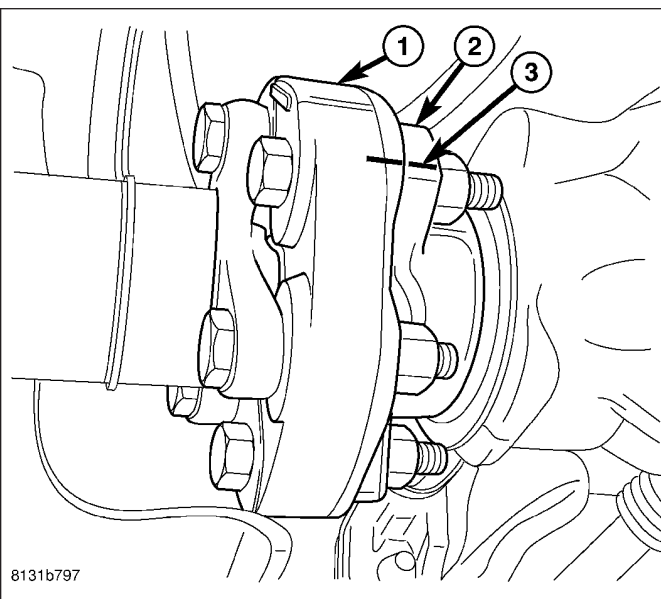
1. Install new axle seal(s) (1) using Tool 9223 (2).



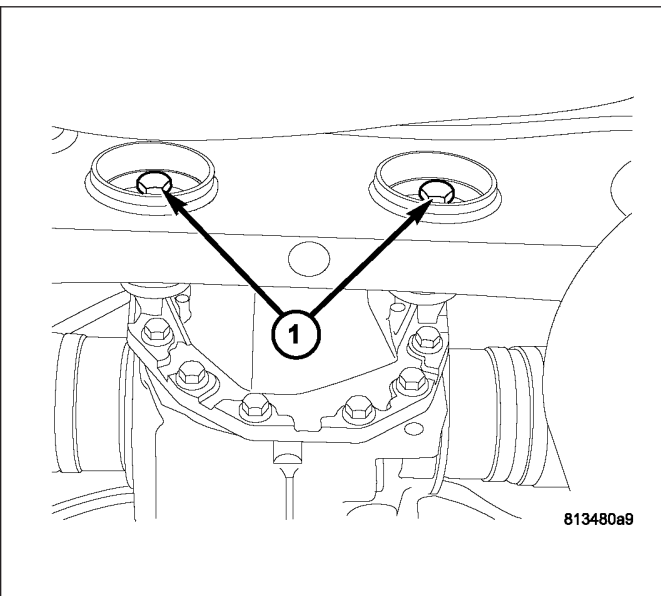
2. Using new circlip(s), install halfshaft (1) to rear axle assembly. Use care not to damage axle seals(2). Verify proper installation by pulling outward on joint by hand.



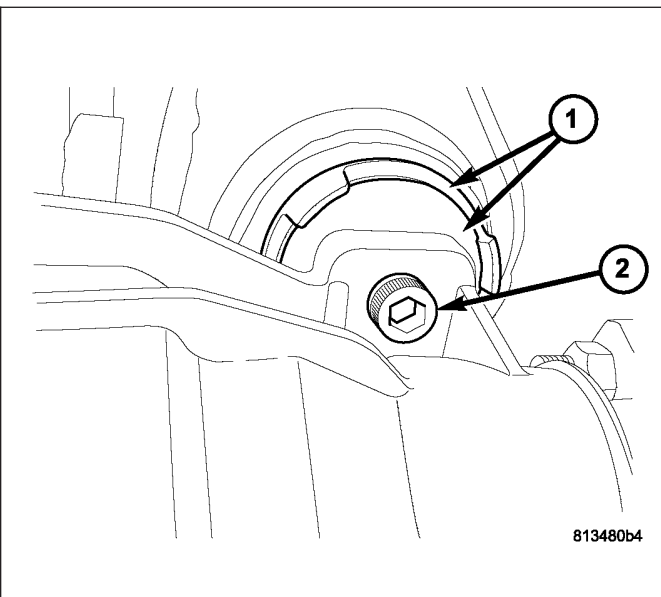
3. Raise rear axle assembly into position. Align propeller shaft index marks (3) and start propeller shaft coupler-to-axle bolt/nuts by hand.



4. Install two rear axle-to-crossmember bolts (1) and torque to 220 N·m (162 ft. lbs.).

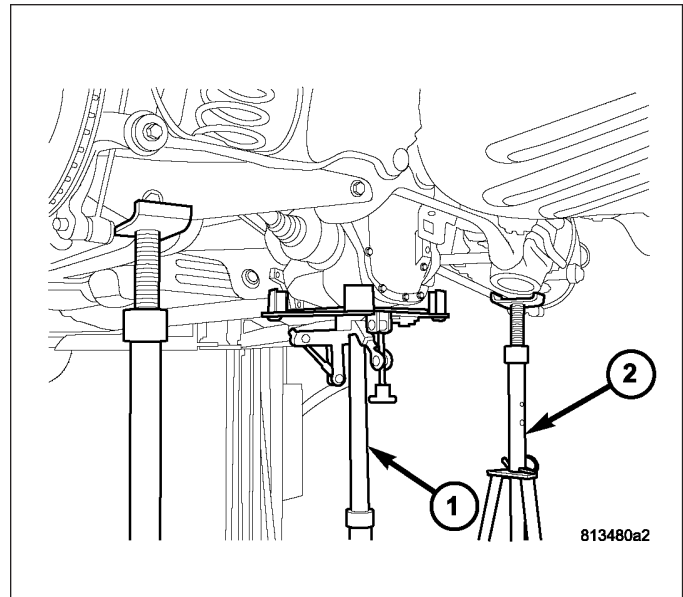


5. Install rear axle front mount isolator (1) as shown and torque bolt/nut to 65 N·m (48 ft. lbs.).

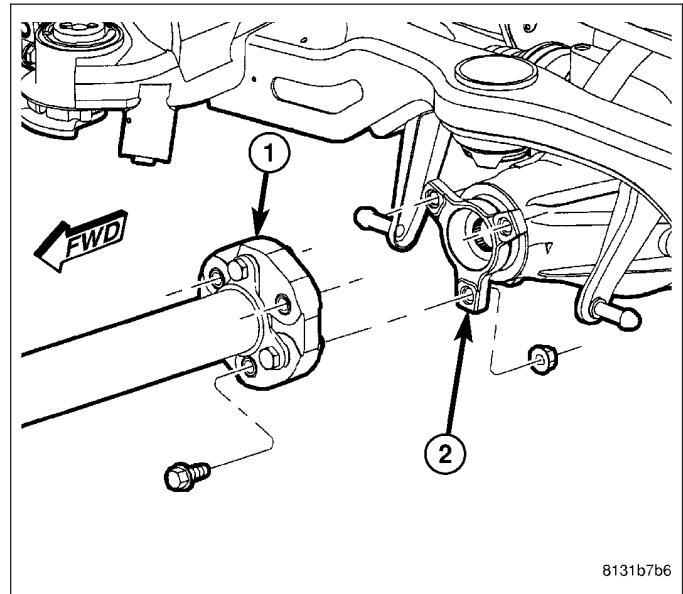




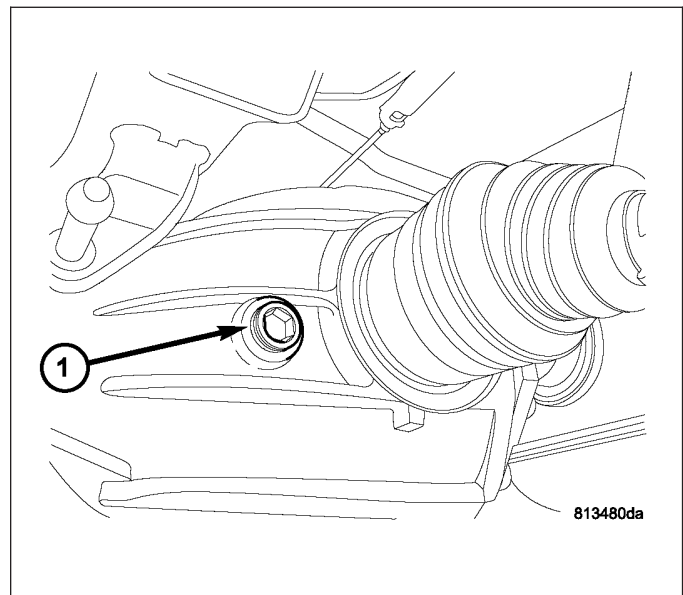
6. Again verify halfshaft inner joints are fully engaged to axle assembly.
7. Remove transmission jack (1).
8. If used, remove screw-type under-hoist jack stands (2).



9. Torque propeller shaft coupler-to-axle flange bolt/nuts to 58 N·m (43 ft. lbs.).



10. Using a 14mm hex, remove rear axle fill plug (1). Fill axle with 1.4L (1.5 qts.) of Mopar® 75W-140 Synthetic Gear & Axle Lubricant. Install fill plug and torque to 60 N·m (44 ft. lbs.).

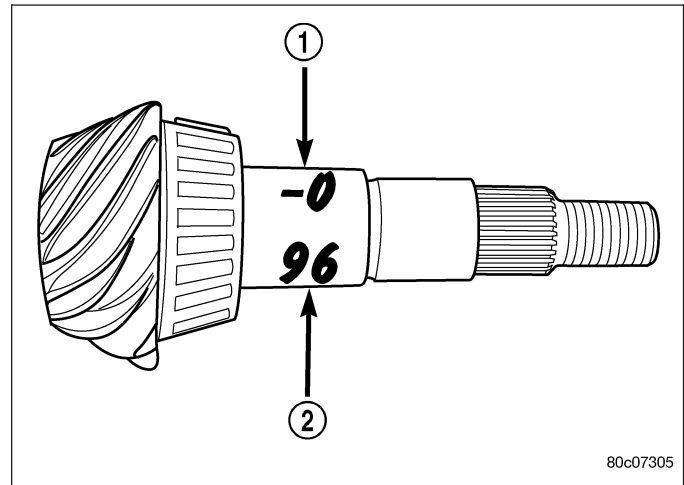


## ADJUSTMENTS

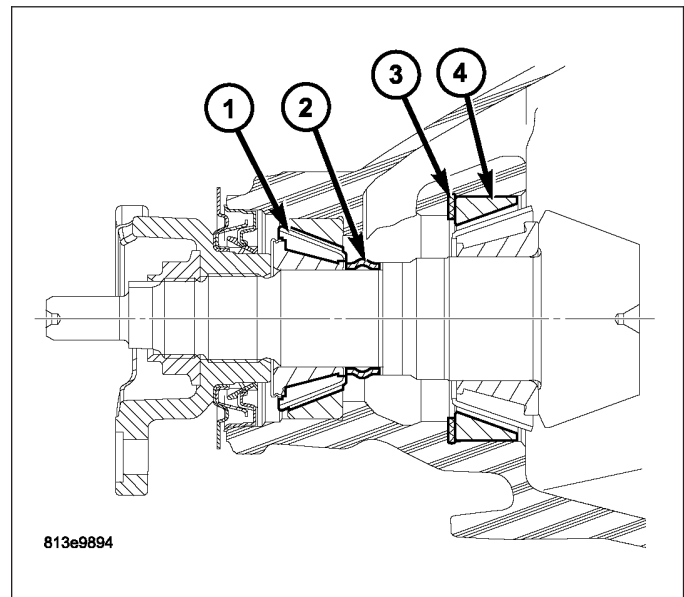
### ADJUSTMENT - PINION DEPTH

#### PINION DEPTH VARIANCE

Ring gear and pinion are supplied as matched sets. Identifying numbers for the ring gear and pinion are painted onto the pinion gear shaft and the side of the ring gear. A plus (+) number, minus (–) number or zero (0) along with the gear set sequence number (01 to 99) is on each gear. The pinion depth variance (1) is the amount the depth varies from the standard depth setting of a pinion marked with a (0). The remaining numbers (2) are the sequence number of the gear set. The standard depth provides the best gear tooth contact pattern.



Compensation for pinion depth variance is achieved with select shims (3). The shims are sandwiched between the pinion head bearing cup (4) and axle housing.



If installing a new gear, note the depth variance number of the original and replacement pinion. Add or subtract this number from the original depth shim to compensate for the difference in the depth variances. The numbers represent deviation from the standard in microns. If the number is negative, subtract that value to the required thickness of the depth shims. If the number is positive, subtract that value from the thickness of the depth shim.

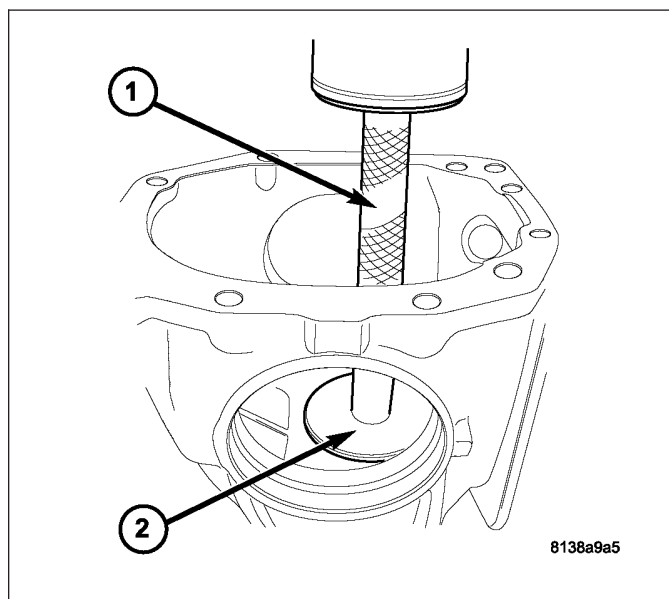
**PINION GEAR DEPTH VARIANCE**

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	-4	-3	-2	-1	0	+1	+2	+3	+4
<b>+4</b>	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
<b>+3</b>	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001
<b>+2</b>	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002
<b>+1</b>	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003
<b>0</b>	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004
<b>-1</b>	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005
<b>-2</b>	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006
<b>-3</b>	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007
<b>-4</b>	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007	-0.008

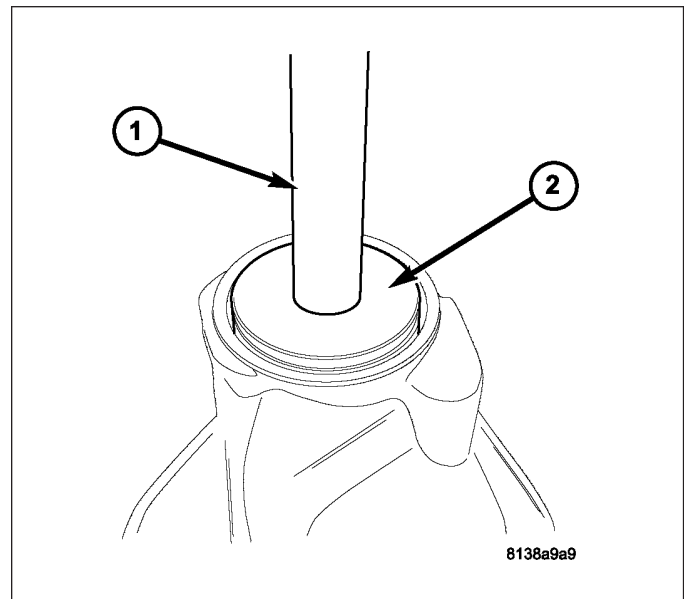
**PINION DEPTH MEASUREMENT**

Pinion depth measurement is taken with the pinion head and tail bearing cups pressed into the axle housing without the shim.

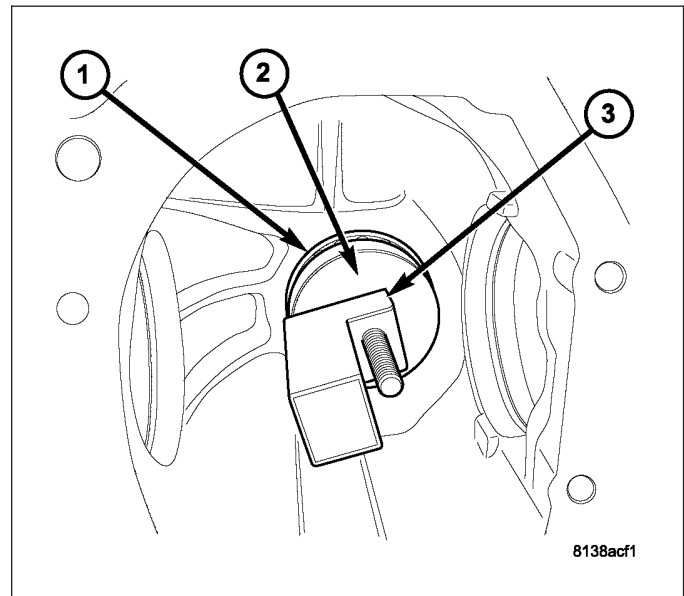
1. Press pinion head bearing cup into housing using Tools C-4171 (1) and C-4310 (2).



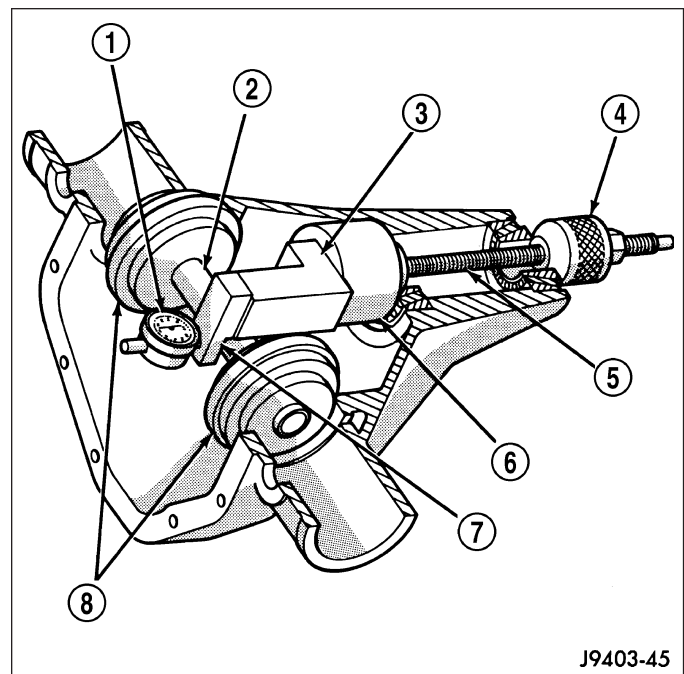
2. Press pinion tail bearing cup into housing using Tools C-4171 (1) and D-146 (2).



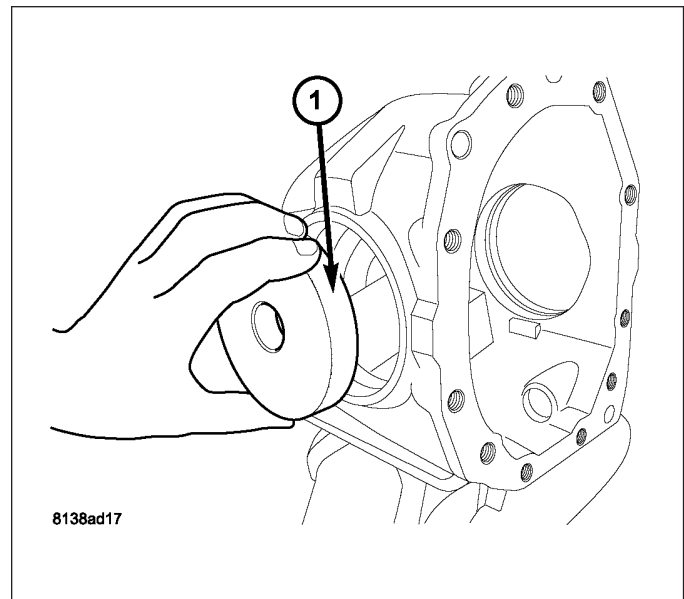
3. Install Pinion Height Block 6739 (3), Pinion Gage Block 9227 (2), and pinion head bearing cone (1) onto Screw 6741. Install assembly into axle housing and through bearing cups.



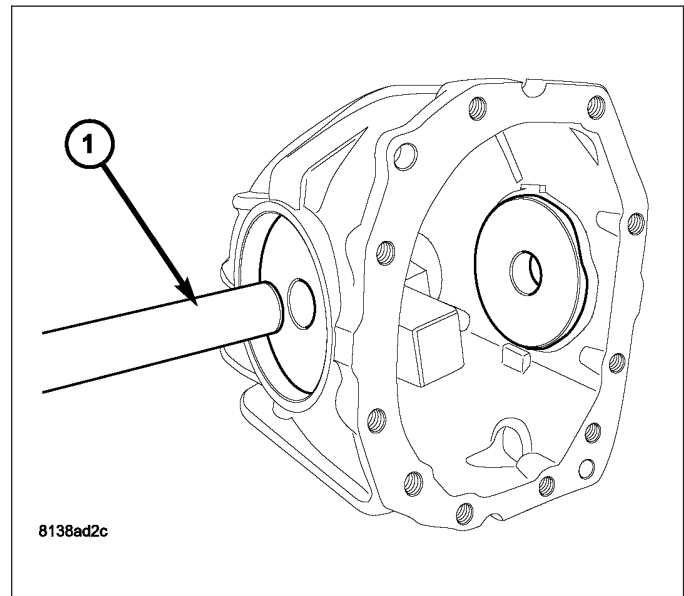
4. Install pinion tail bearing and Cone 6740 (4). Tighten Cone 6740 by hand until 3.4 N·m (30 in. lbs.) of rotating torque is measured at Screw 6741 (5).



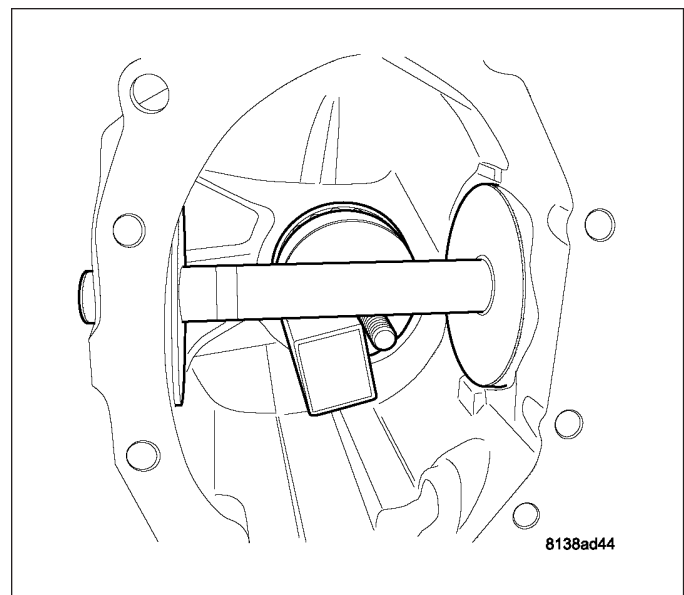
5. Install Arbor Discs 9228 (1).



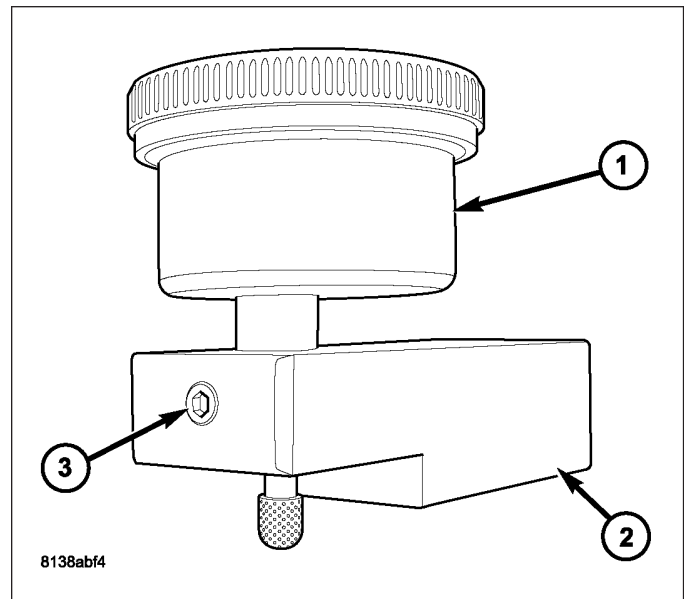
6. Install Arbor Bar D-115-3 (1).



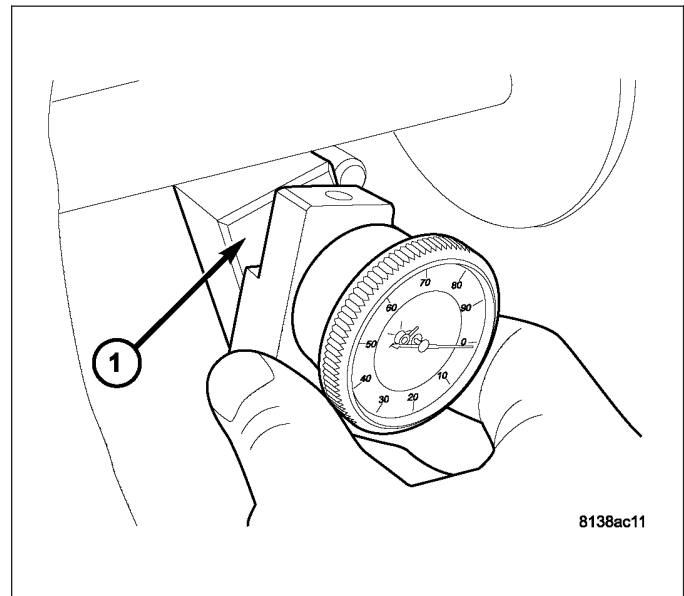
7. Verify pinion depth setup is as shown.



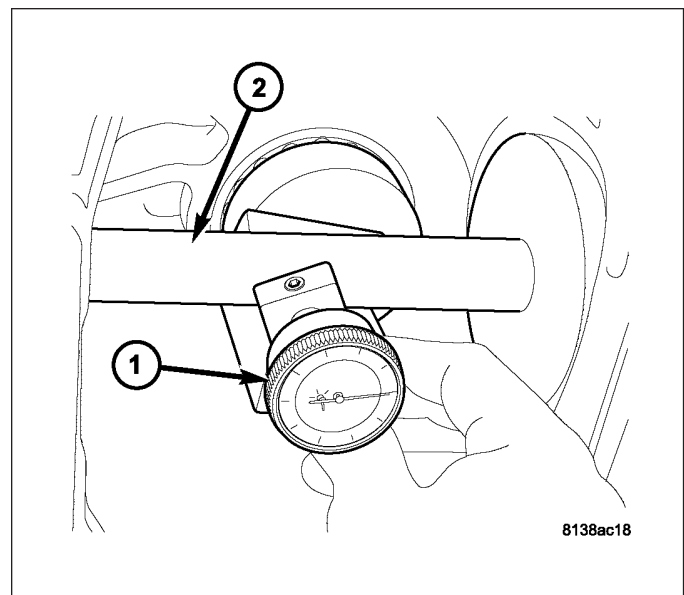
8. Install Dial Indicator 9524 (1) to Scooter Block D-115-2A (2). Secure with set-screw (3).



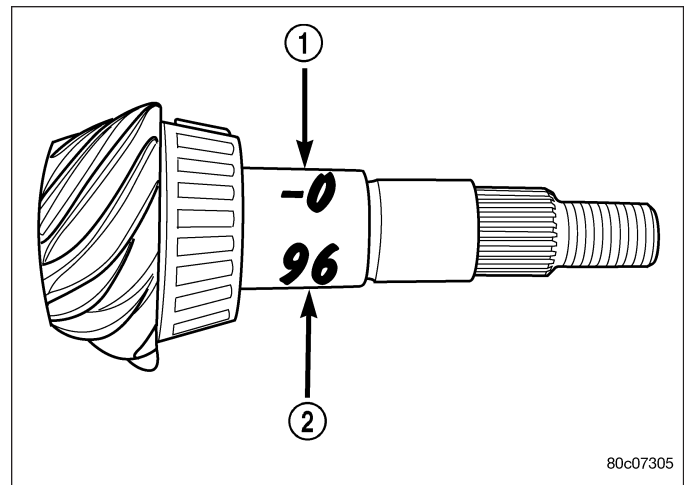
9. Install Indicator/Block assembly to top of Height Block 6739 (1). Zero indicator on top surface.



10. Slide indicator probe off of height block and onto Arbor Bar D-115-3 (2). As indicator contacts Arbor Bar (2), indicator needle will rotate clockwise. Continue moving indicator probe to the crest of the arbor bar and record the highest reading.



11. Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number (1) written on the side of the pinion shaft. For example, if the depth variance is  $-1$ , subtract 0.025mm (0.001 in.) from dial indicator reading.



## ADJUSTMENT - SIDE BEARING PRELOAD AND RING GEAR BACKLASH

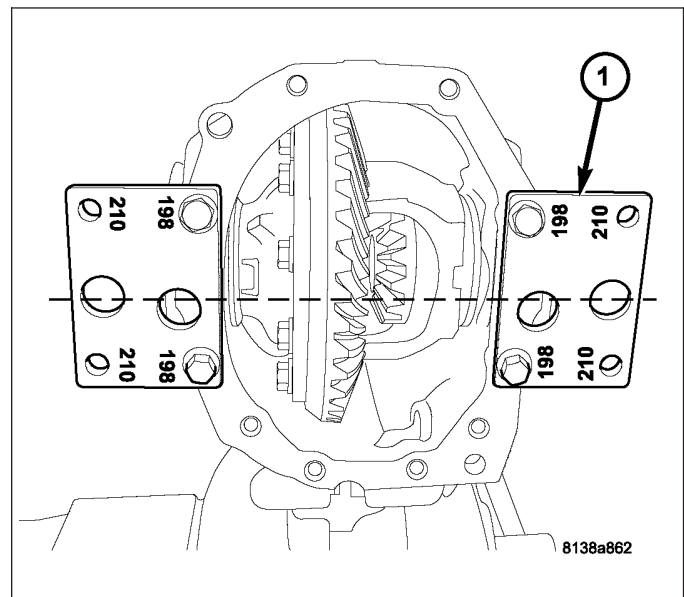
### DIFFERENTIAL SIDE BEARING PRELOAD MEASUREMENT/CORRECTION

Differential side bearing preload should be measured and adjusted after the following scenarios:

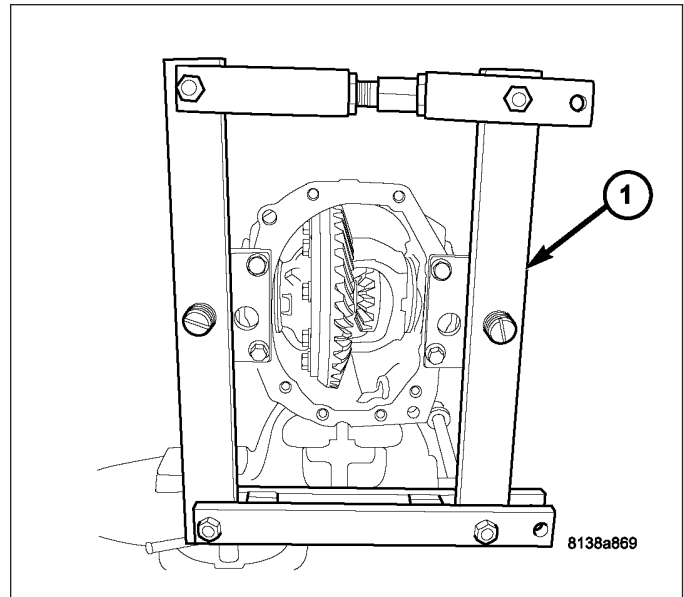
- Differential case replacement
- Differential side bearing replacement
- Axle housing replacement
- Loss or replacement of side bearing snap rings

If none of these situations apply, refer to Adjustment — Ring Gear Backlash

1. Install Spreader Adapter Plates 9226 (1) as shown

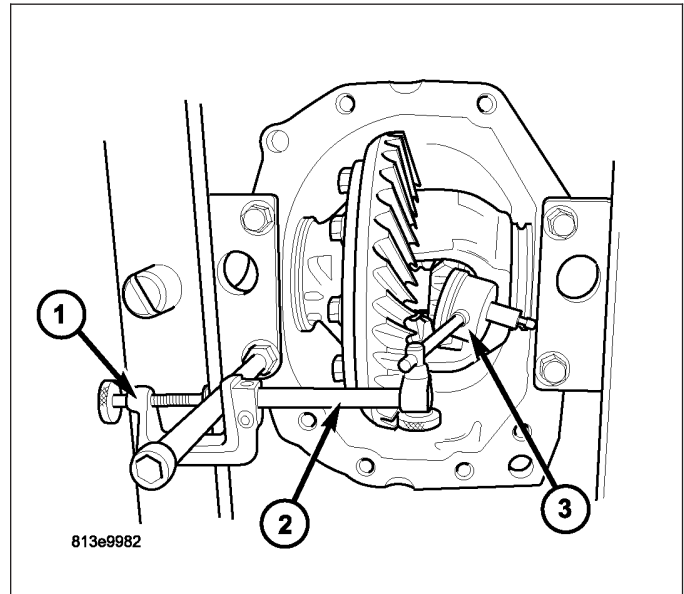


2. Mount axle housing to Spreader W-129-B (1).

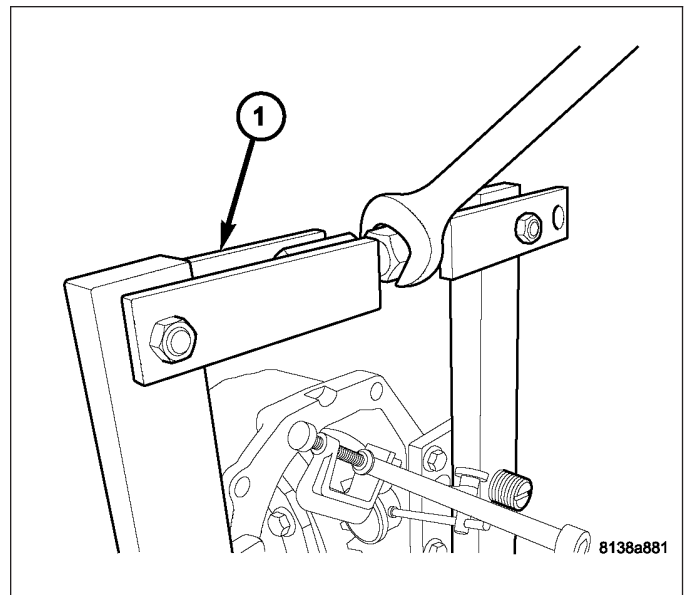


3. Set up Dial Indicator Set C-3339-A as shown to measure axle housing spread:

- a. Clamp SP-5426 (1)
- b. Post SP-5425-B (2)
- c. Metric Dial Indicator 9524 (3)

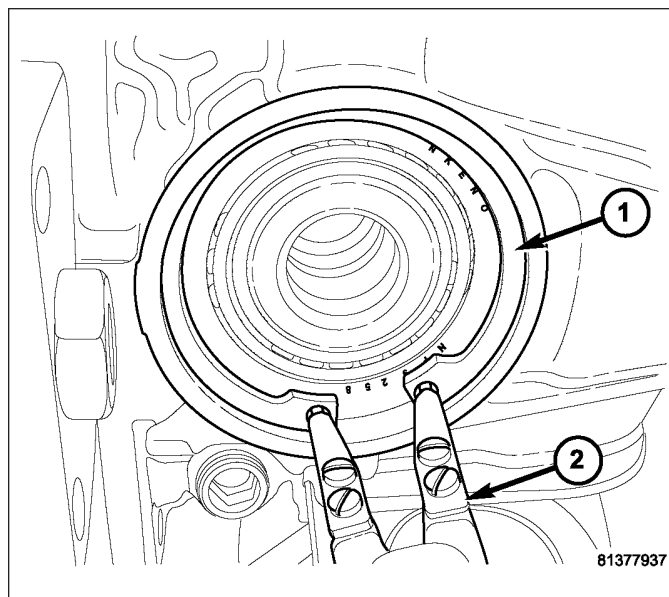


4. If differential side bearing cups and snap rings are removed at this point, skip to Step 8. Otherwise, expand spreader to spread axle housing no more than 0.30 mm (0.012 in.).

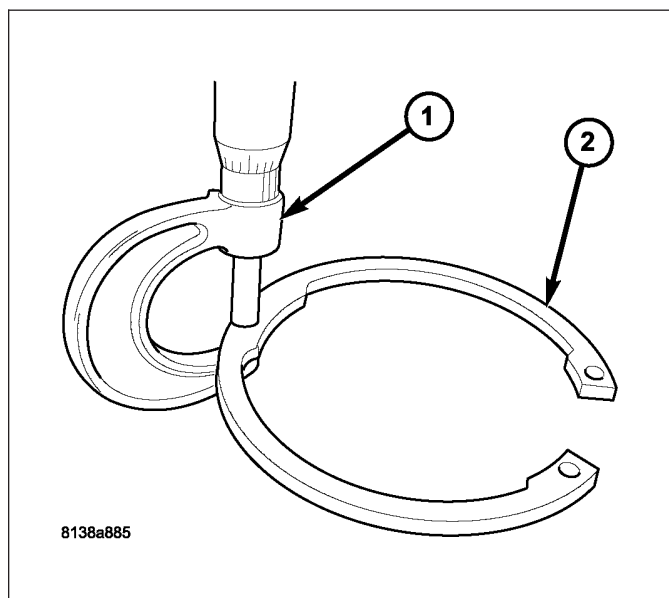




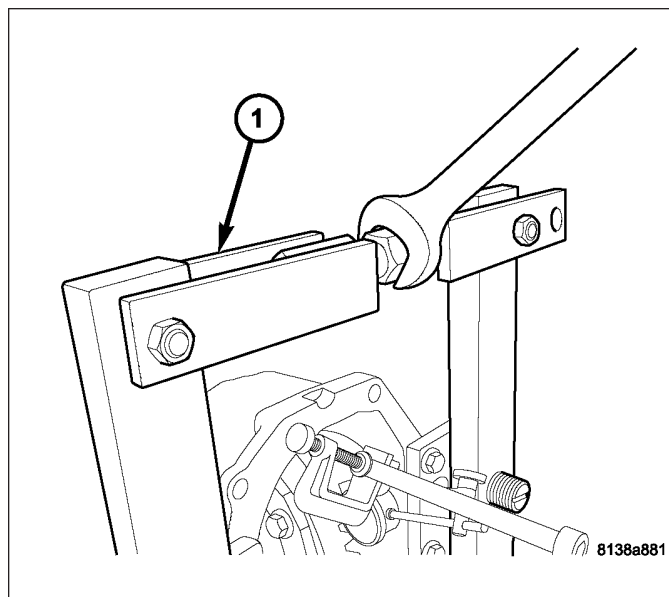
5. Remove both differential side bearing snap rings (1). Tag snap ring to ensure replacement to original position.



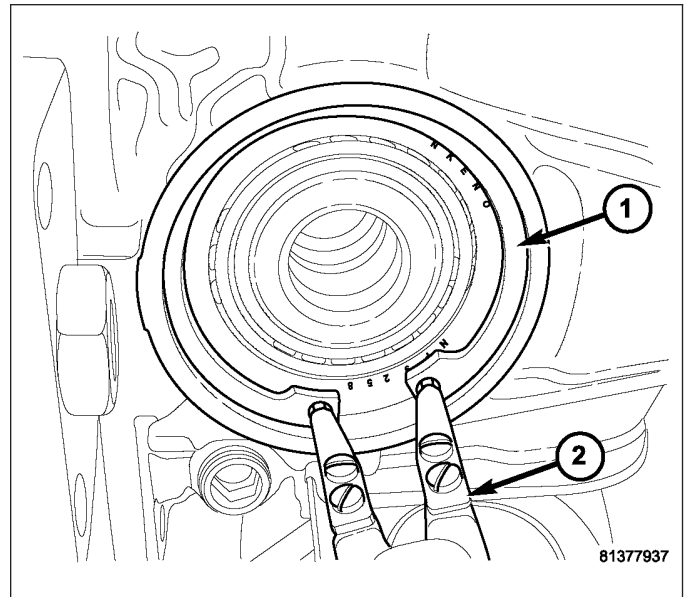
6. Measure and record snap ring (2) thickness for later use.



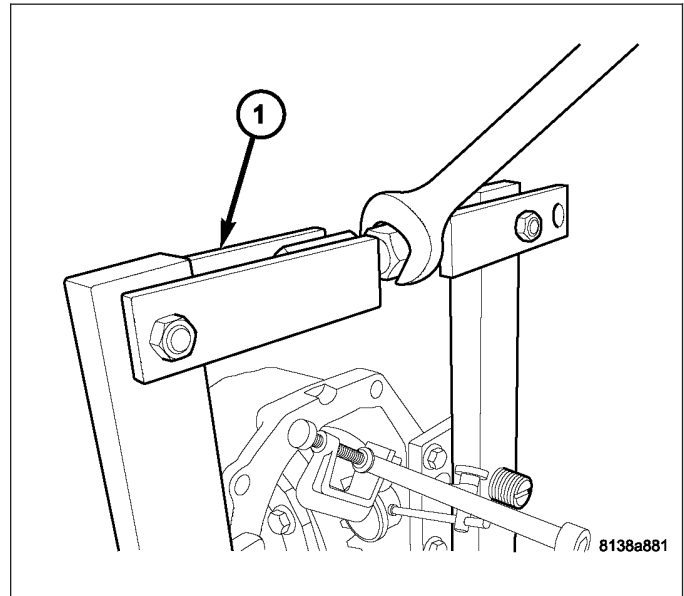
7. Relax spreader (1) to relieve tension on axle housing.



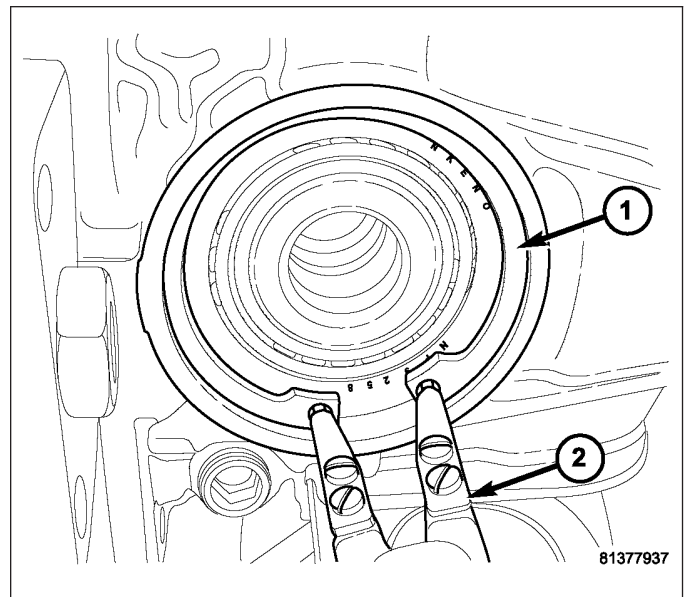
8. Install right (pinion) side bearing cup and snap ring (1).



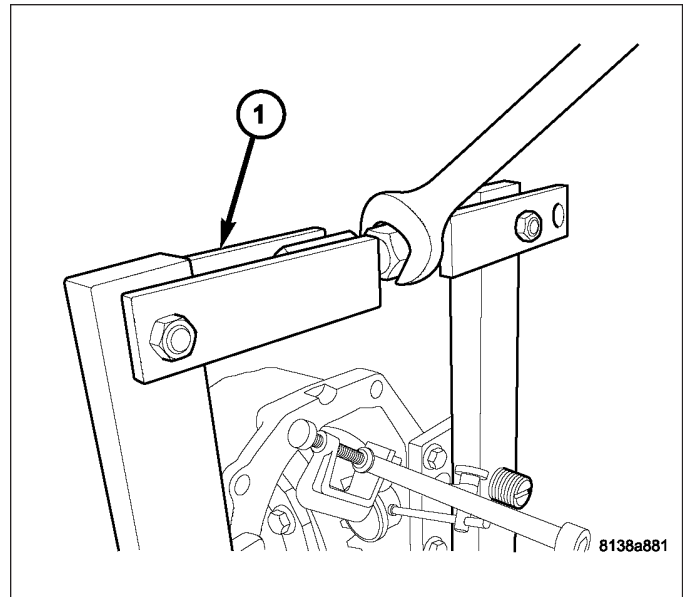
9. Zero dial indicator.
10. Expand spreader (1) to spread axle housing no more than 0.30 mm (0.012 in.).



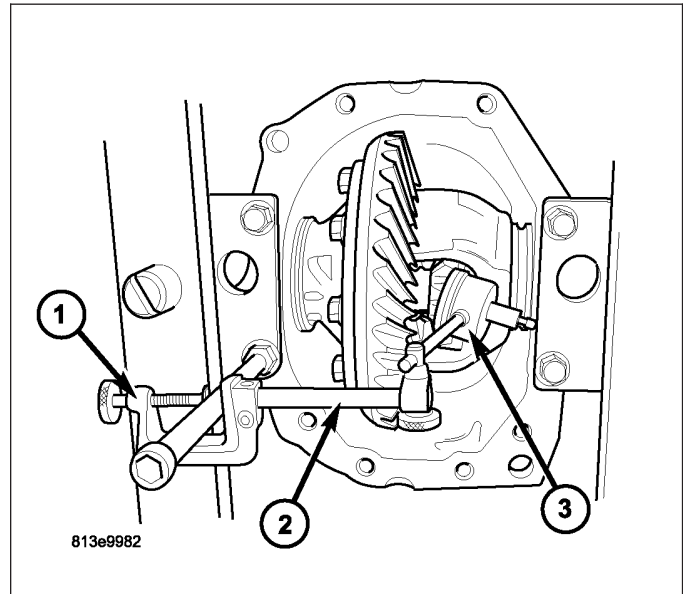
11. Install left (ring gear) side bearing cup and snap ring (1).



12. Relax spreader (1) to relieve tension on axle housing.



13. Measurement showing on indicator is the axle housing retained spread. Proper differential side bearing preload is achieved with an axle housing retained spread of 0.18-0.23 mm (0.007-0.009 in.).
14. If retained spread is less than 0.18 mm (0.007 in.), increase snap ring thickness at each side in equal increments.
15. If retained spread is greater than 0.23 mm (0.009 in.), decrease snap ring thickness at each side in equal increments.



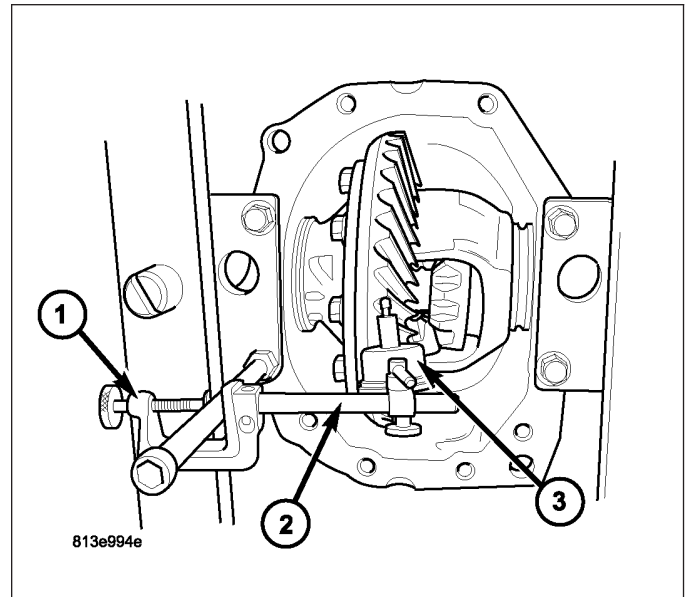
## RING GEAR BACKLASH MEASUREMENT/CORRECTION

Differential Ring Gear Backlash should be measured and adjusted after the following scenarios:

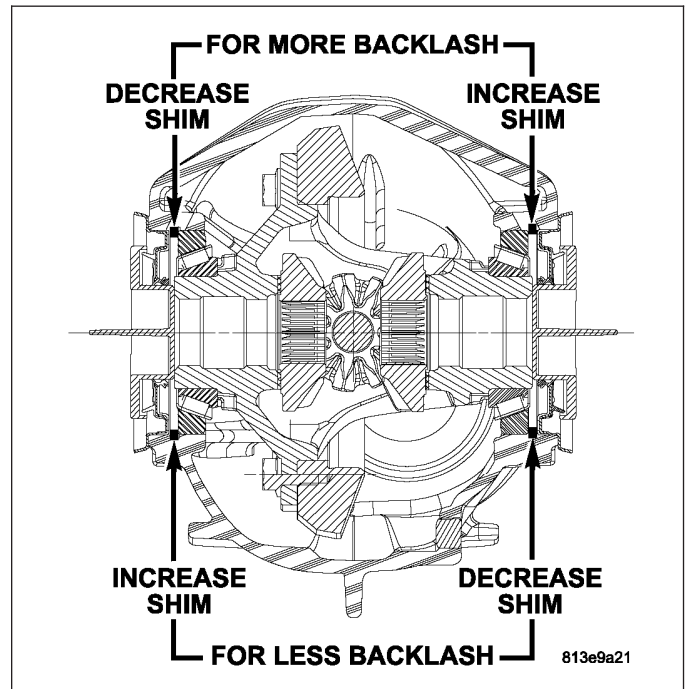
1. Ring and pinion gear replacement
2. Pinion head bearing replacement
3. Pinion depth (shim) adjustment
4. Differential case replacement
5. Differential side bearing replacement
6. Axle housing replacement

**Note:** If Spreader W-129-B is installed, make sure tension on axle housing is relieved.

7. Set up Dial Indicator Set C-3339-A as shown to measure ring gear backlash:
  - a. Clamp SP-5426 (1)
  - b. Post SP-5425-B (2)
  - c. Metric Dial Indicator 9524 (3)
8. Rotate ring gear one direction to take up clearance to pinion. Verify indicator tip is in contact with ring gear and zero indicator. Rotate ring gear back and forth and record measurement. Ring gear backlash should be 0.13-0.18 mm (0.005-0.007 in.). Verify back lash measurement in four (4) positions.



9. If backlash measurement is less than 0.13 mm (0.005 in.), it is necessary to decrease the snap ring thickness on the ring gear (left) side, and increase the thickness on the pinion (right) side.
10. If backlash measurement is greater than 0.18 mm (0.007 in.), it is necessary to increase the snap ring thickness on the ring gear (right) side, and decrease the thickness on the pinion (left) side.

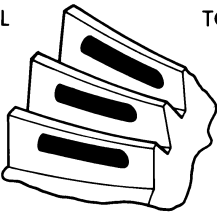
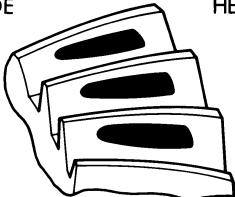

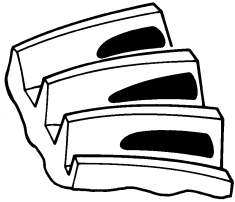
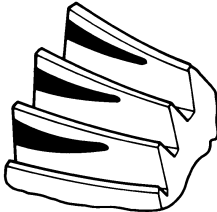
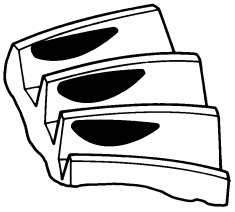
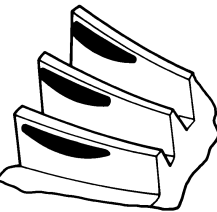
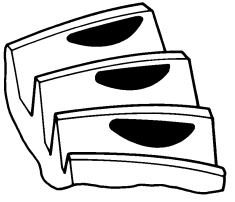
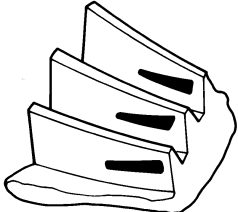
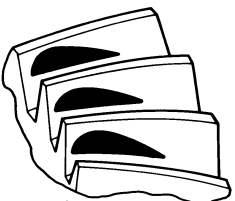


## GEAR CONTACT PATTERN

The ring gear and pinion teeth contact patterns will show if the pinion depth is correct in the housing. It will also show if the ring gear backlash has been adjusted correctly. The backlash can be adjusted within specifications to achieve desired tooth contact patterns.

1. Apply a thin coat of hydrated ferric oxide or equivalent to the drive and coast side of the ring gear teeth.
2. Wrap, twist, and hold a shop towel around the pinion yoke to increase the turning resistance of the pinion. This will provide a more distinct contact pattern.
3. With a boxed end wrench on a ring gear bolt, rotate the differential case one complete revolution in both directions while a load is being applied from shop towel.

The areas on the ring gear teeth with the greatest degree of contact against the pinion teeth will squeegee the compound to the areas with the least amount of contact. Note and compare patterns on the ring gear teeth to Gear Tooth Contact Patterns chart and adjust pinion depth and gear backlash as necessary.

<p>DRIVE SIDE OF RING GEAR TEETH</p> <p>HEEL                      TOE</p> 	<p>COAST SIDE OF RING GEAR TEETH</p> <p>TOE                      HEEL</p> 	<p>DESIRABLE CONTACT PATTERN. PATTERN SHOULD BE CENTERED ON THE DRIVE SIDE OF TOOTH. PATTERN SHOULD BE CENTERED ON THE COAST SIDE OF TOOTH, BUT MAY BE SLIGHTLY TOWARD THE TOE. THERE SHOULD ALWAYS BE SOME CLEARANCE BETWEEN CONTACT PATTERN AND TOP OF THE TOOTH.</p>
		<p>RING GEAR BACKLASH CORRECT. <b>THINNER</b> PINION GEAR DEPTH SHIM REQUIRED.</p>
		<p>RING GEAR BACKLASH CORRECT. <b>THICKER</b> PINION GEAR DEPTH SHIM REQUIRED.</p>
		<p>PINION GEAR DEPTH SHIM CORRECT. <b>DECREASE</b> RING GEAR BACKLASH.</p>
		<p>PINION GEAR DEPTH SHIM CORRECT. <b>INCREASE</b> RING GEAR BACKLASH.</p>

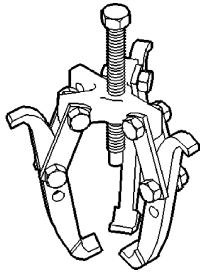
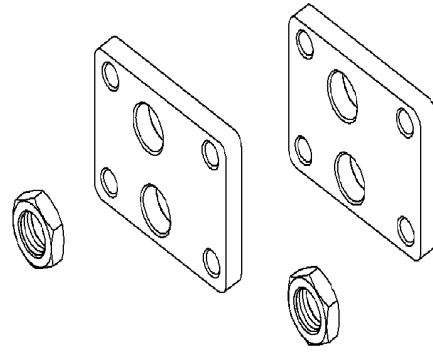
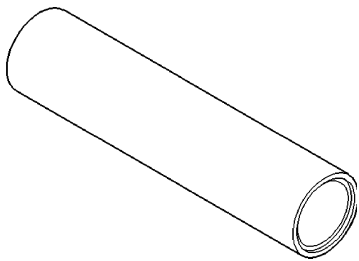
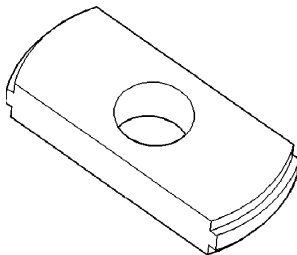
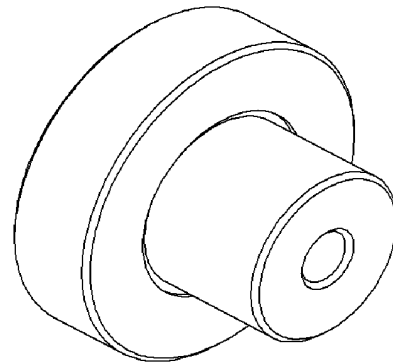
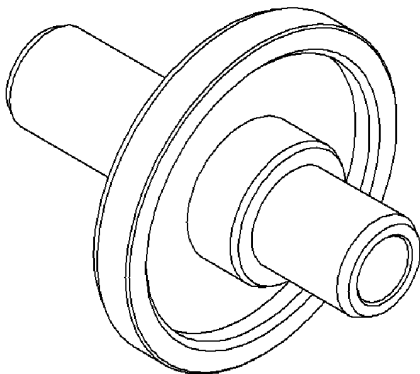
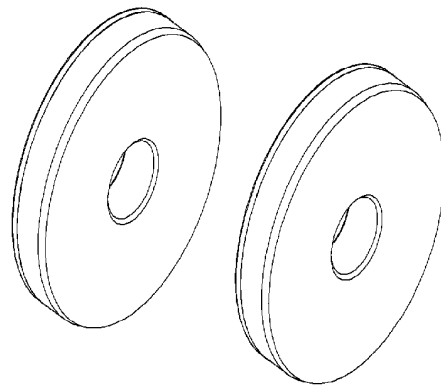
J9003-24

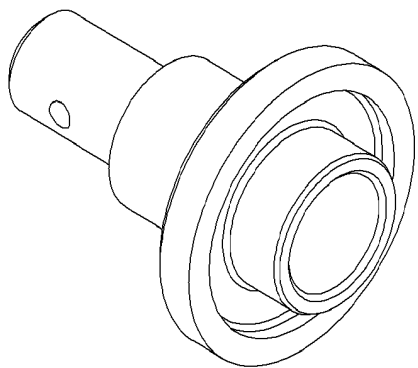
**SPECIFICATIONS - 198 RII AXLE****SPECIFICATIONS**

DESCRIPTION	SPECIFICATION
Axle Ratios	3.08, 3.64, 3.90
Ring Gear Diameter	198 mm (7.8 in.)
Ring Gear Backlash	0.13-0.18 mm (0.005-0.007 in.)
Side Bearing Preload	6-8000 N
Axle Housing Retained Spread	0.18 mm to 0.23 mm (0.007 in. to 0.009 in.)
Select Snap Ring Size	3.60-4.50mm (0.14-0.17 in.) In 0.02mm (0.0007 in.) increments
Select Pinion Shim Size	1.40-2.50mm (0.05-0.10 in.) In 0.01mm (0.0004 in.) increments
Pinion Torque To Rotate	2.25N·m (20 in. lbs.)
Total Torque To Rotate (Approx.)	3.38N·m (30 in. lbs.)

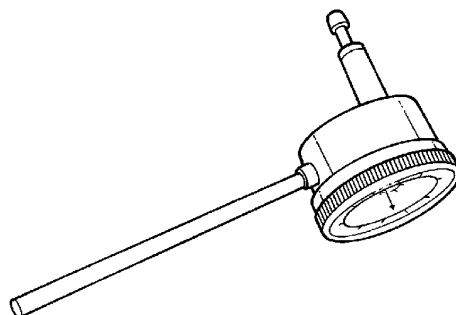
**TORQUE SPECIFICATIONS**

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Plug, Rear Axle Drain/Fill	60	44	—
Bolt, Differential Cover	30 +45°	22 + 45°	—
Bolt, Ring Gear-to-Differential Case	85	63	—
Bolt, Axle Housing-to-Crossmember	220	162	—
Bolt/Nut, Axle Front Mount Isolator	65	48	—

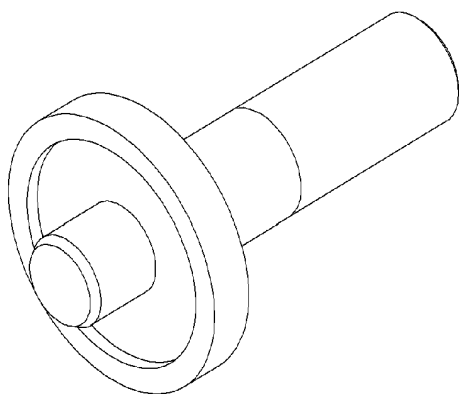
**SPECIAL TOOLS - 198 R11 AXLE*****Puller, 1026******Spreader Adapters, 9226******Installer, 6448A******Remover, 9084******Pinion Height Gage, 9227******Installer, 9223******Arbor Discs, 9228***



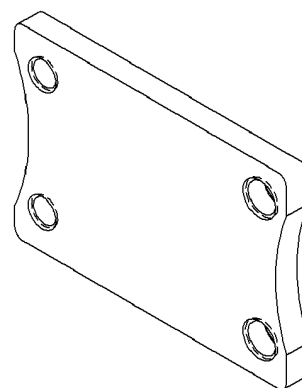
***Installer, 9231A***



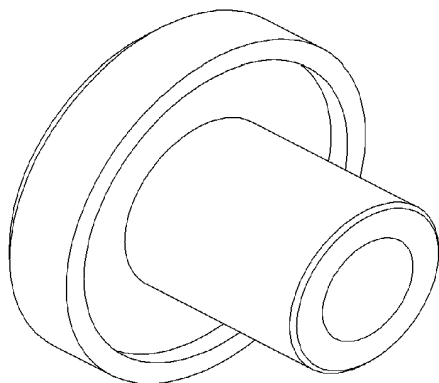
***Dial Indicator, 9524***



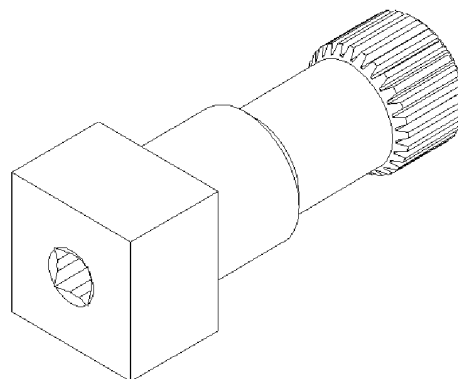
***Removal/Installation Arbor, 9522***



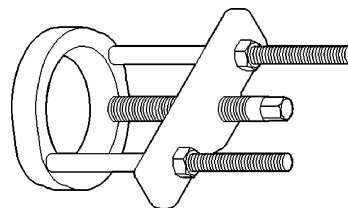
***Mounting Plate, 9630***



***Installer, 9523***

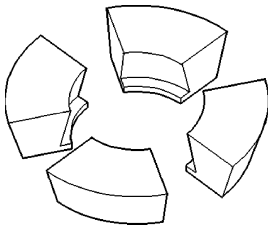


***Fixture, 9631***

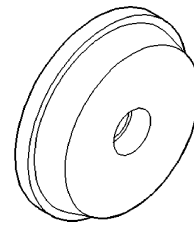


***Puller Press, C-293-PA***

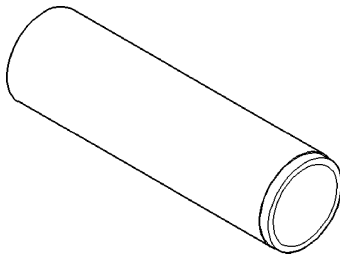




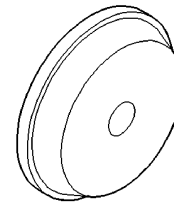
**Adapters, C-293-37**



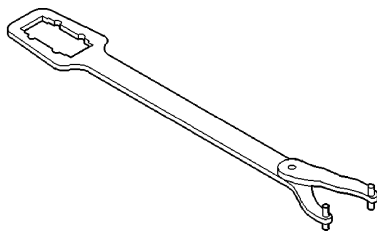
**Installer, C-4310**



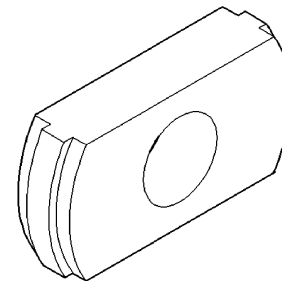
**Installer, C-3095-A**



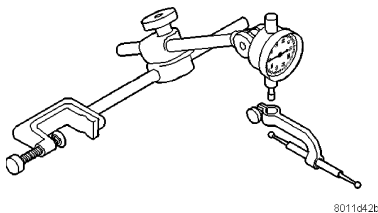
**Installer, D-146**



**Flange Wrench, C-3281**

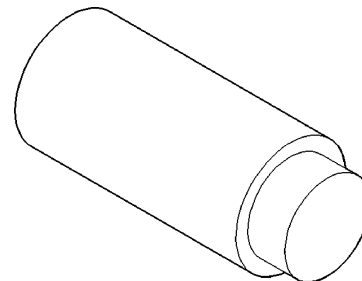


**Remover, D-149**

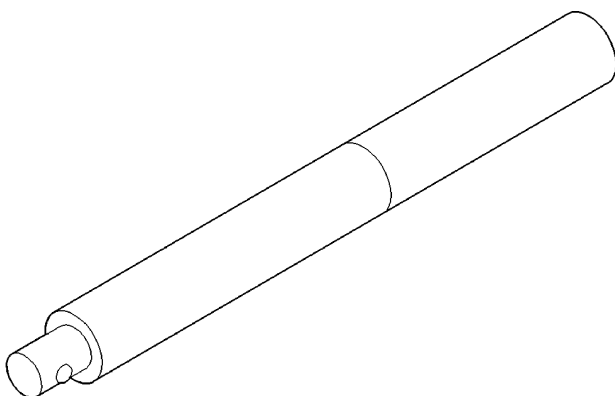


9011042b

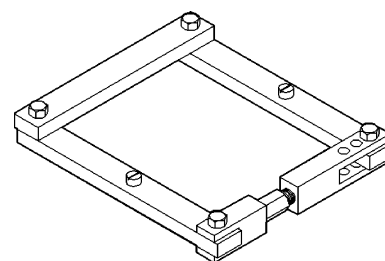
**Dial Indicator Set, C-3339-A**



**Adapter, SP-3289**



**Handle, C-4171**

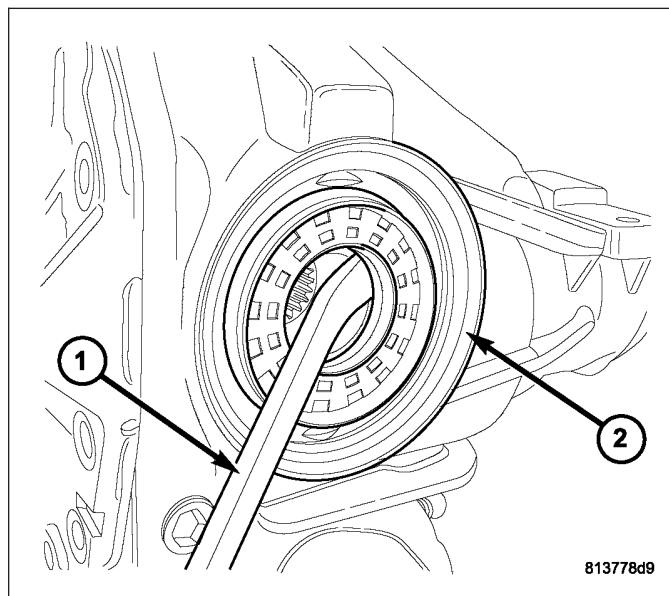


**Spreader, W-129-B**

## AXLE SHAFT SEALS

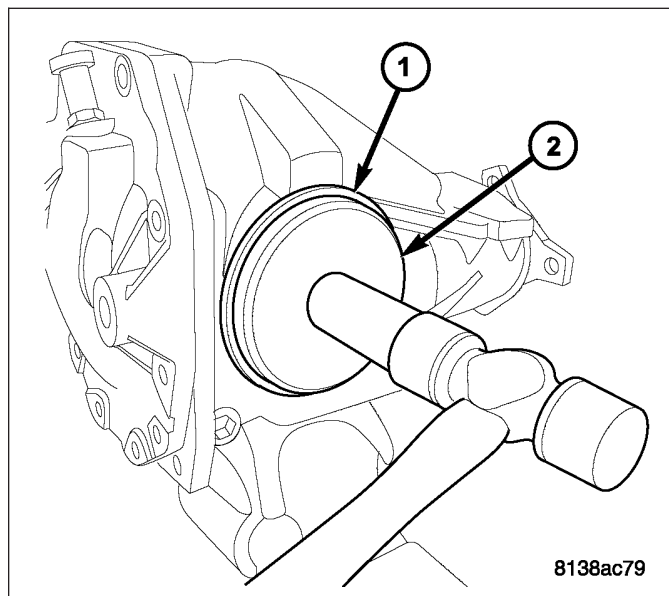
### REMOVAL

1. Remove halfshaft(s). (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)
2. Using suitable screwdriver (1), remove axle shaft seal (2).
3. Visually inspect halfshaft seal journal for damage (excessive seal groove, nicks, scratches, etc. Replace halfshaft if necessary.

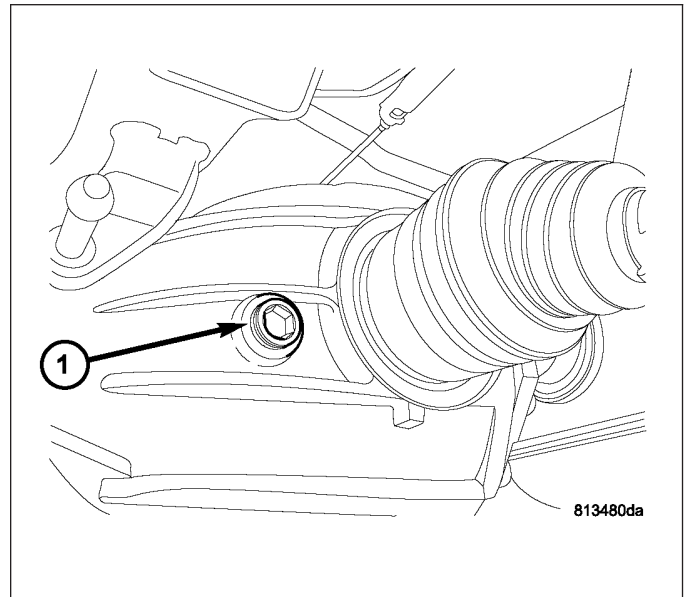


### INSTALLATION

1. Using Tool 9223 (2), install **NEW** axle shaft seal (1). Lubricate the inside diameter with Mopar® Gear and Axle Lubricant 75W-140 to protect seal during halfshaft installation.
2. Install halfshaft(s). (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION)



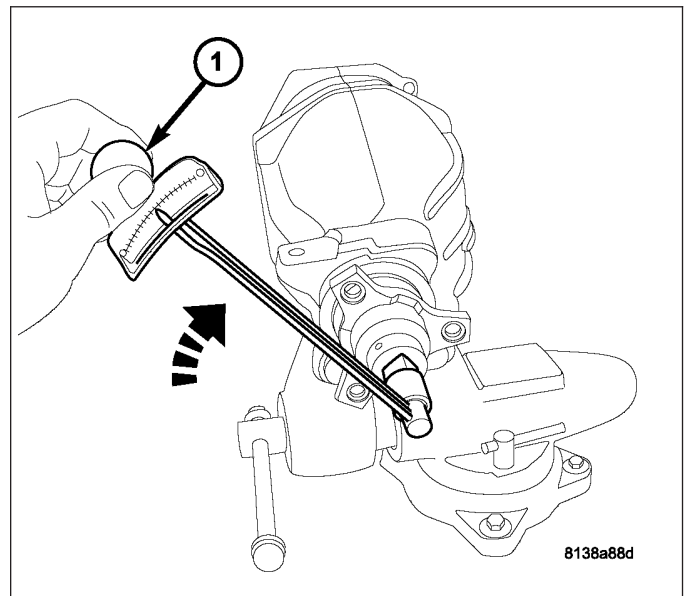
3. Remove fill plug (1) to check and adjust rear axle fluid level. Top off axle with Mopar® Gear and Axle Lubricant 75W-140. Reinstall fill plug torque to 60 N·m (44 ft. lbs.) torque.



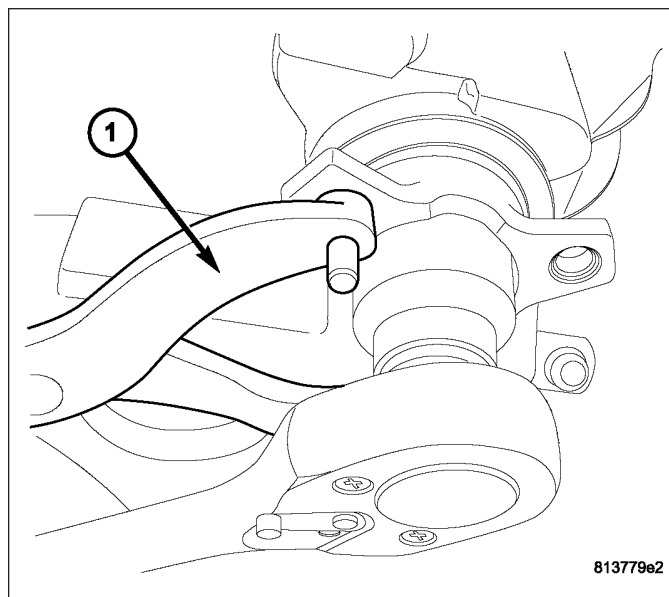
## PINION SEAL

### REMOVAL

1. Remove rear axle assembly from vehicle. Refer to Rear Axle Removal.
2. Measure axle assembly rotating torque and record measurement for reuse on assembly.

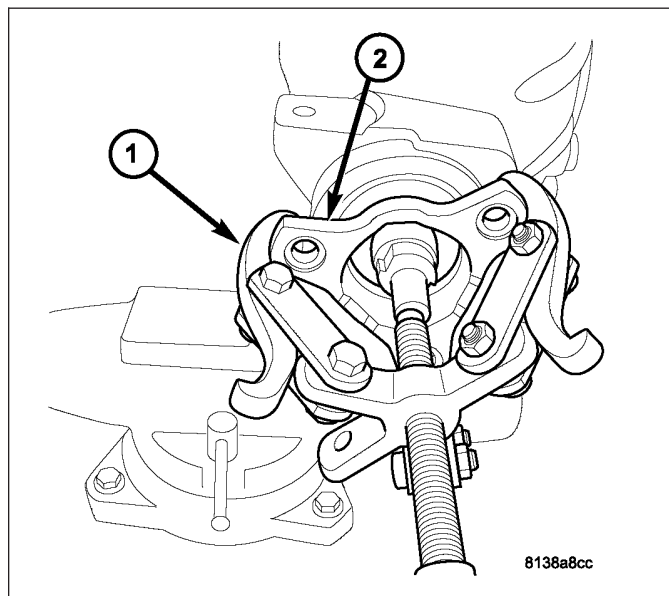


3. Using flange holder C-3281(1) and 41mm socket, remove pinion flange nut and discard.

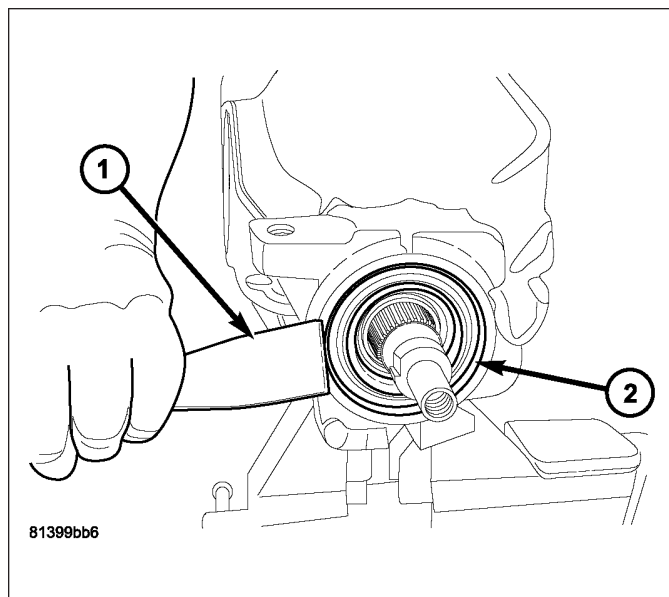


**Note:** Due to axle imbalance concerns, it is necessary to make sure pinion flange-to-shaft orientation is maintained. If alignment marks are not visible, apply appropriate marks before removing pinion flange.

4. Using puller 1026 (1), remove pinion flange (2) from pinion shaft.

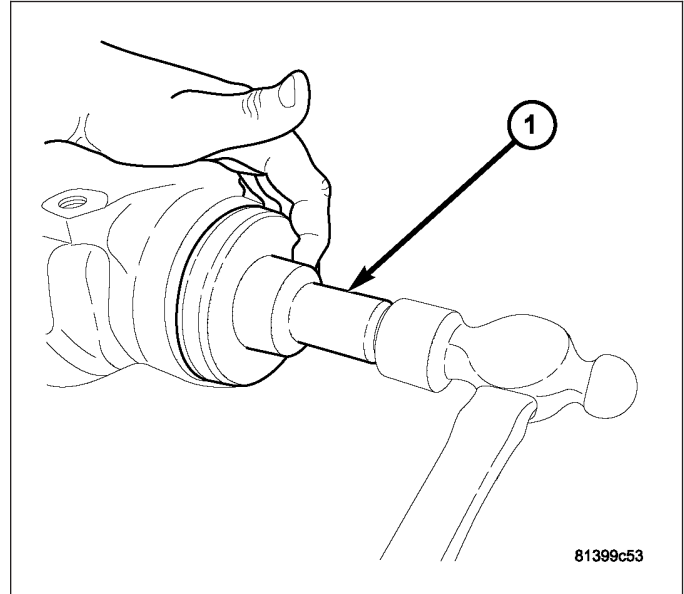


5. Using suitable tool (1), remove pinion seal (2) and discard.

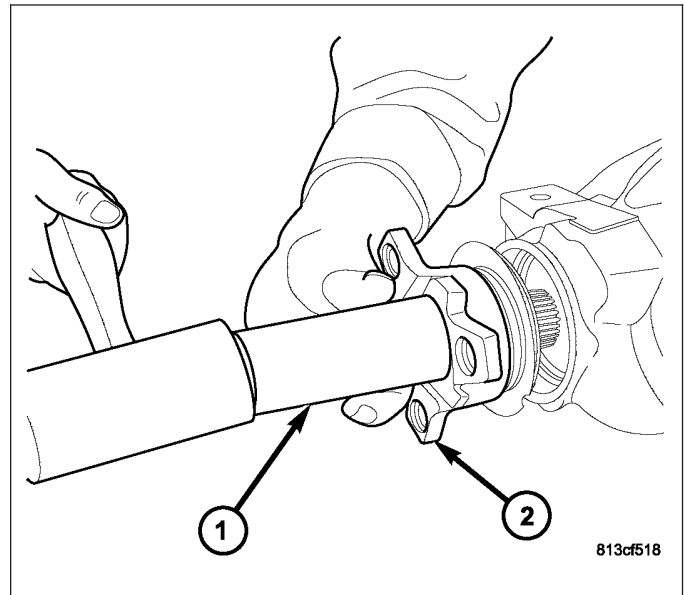


## INSTALLATION

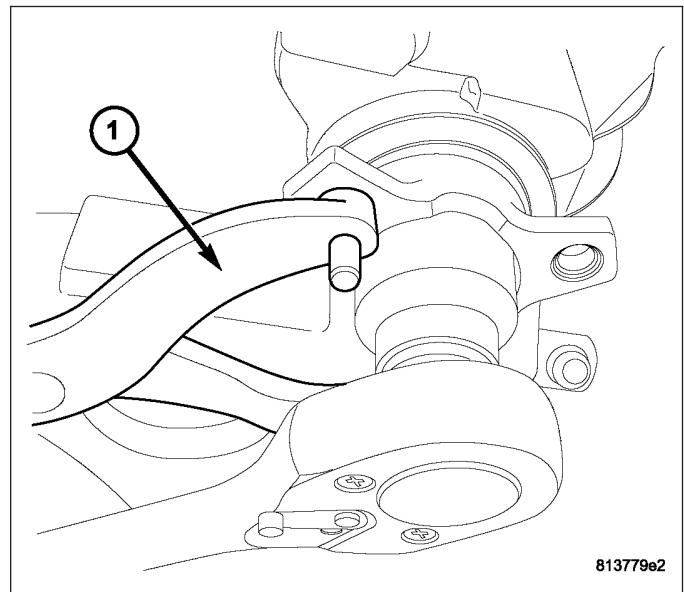
1. Apply light coating of gear lubricant to the lip of the pinion seal.
2. Using Tool 9231A (1), install pinion seal until tool bottoms on carrier.



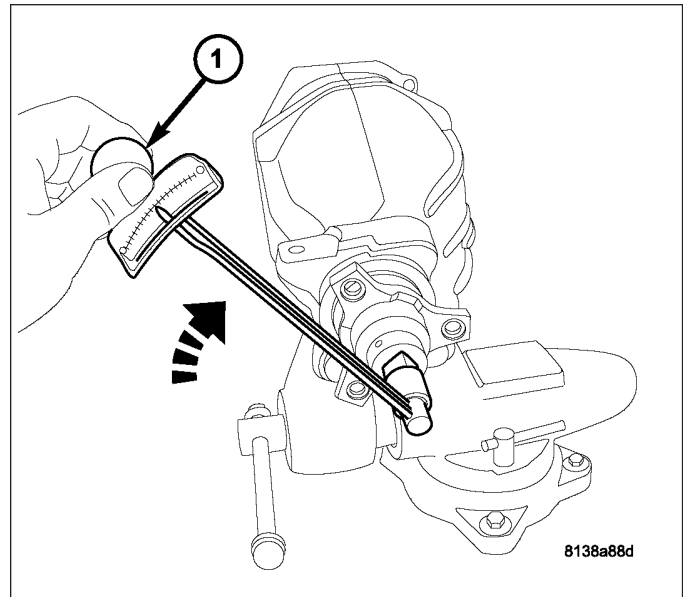
3. Install pinion flange into position. Align index marks to maintain assembly balance.
4. Using Installer 6448A (1), lightly tap on pinion flange (2) until adequate pinion shaft threads are exposed.



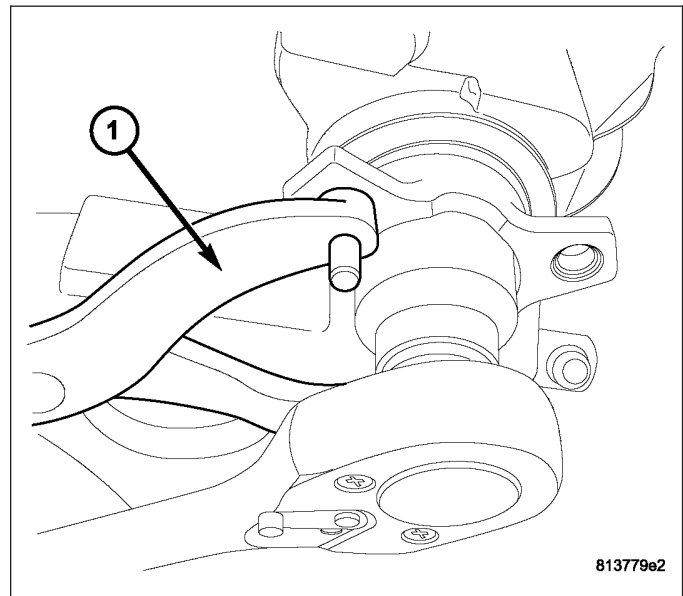
5. Install **new** pinion flange nut. Using flange holder tool C-3281(1) and 41mm socket, torque nut to 136 N·m (100 ft. lbs.).



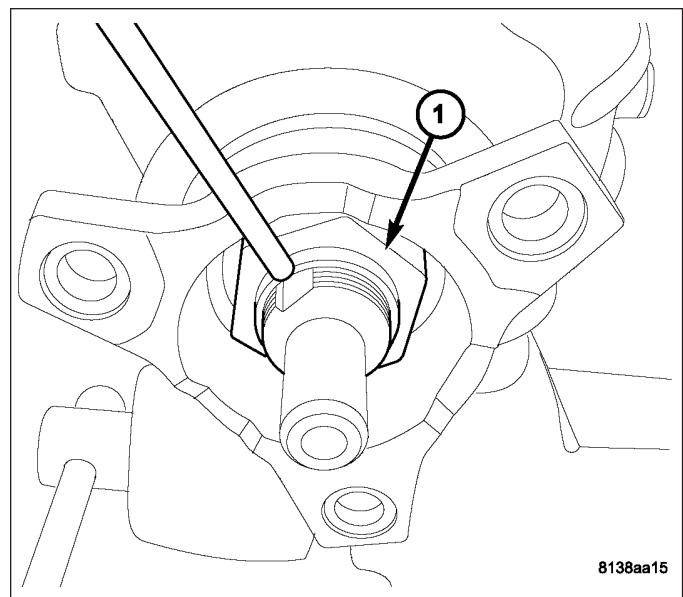
6. Measure assembly turning torque. Axle assembly rotating torque must be should be equal to the reading recorded upon seal/flange removal.



7. If rotating torque is low, increase pinion flange nut torque in 7 N·m (5 ft. lbs.) increments. Repeat until proper rotating torque is received.



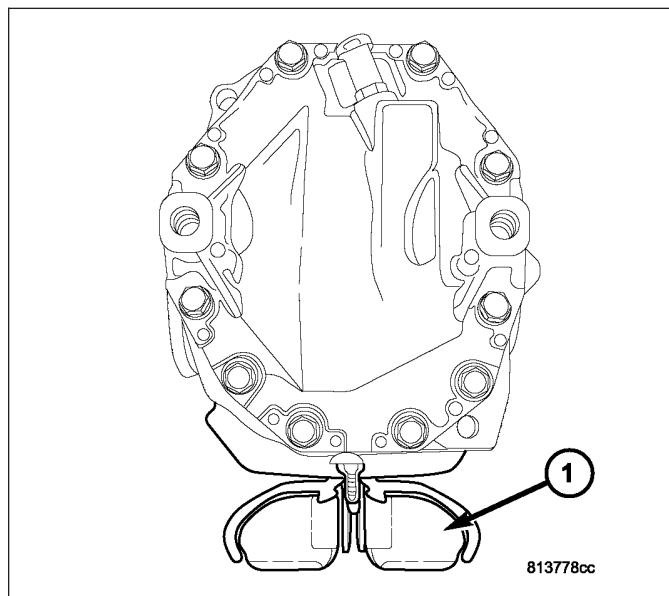
8. Stake pinion flange nut (1) as shown.  
9. Install rear axle assembly. Refer to Rear Axle Installation.



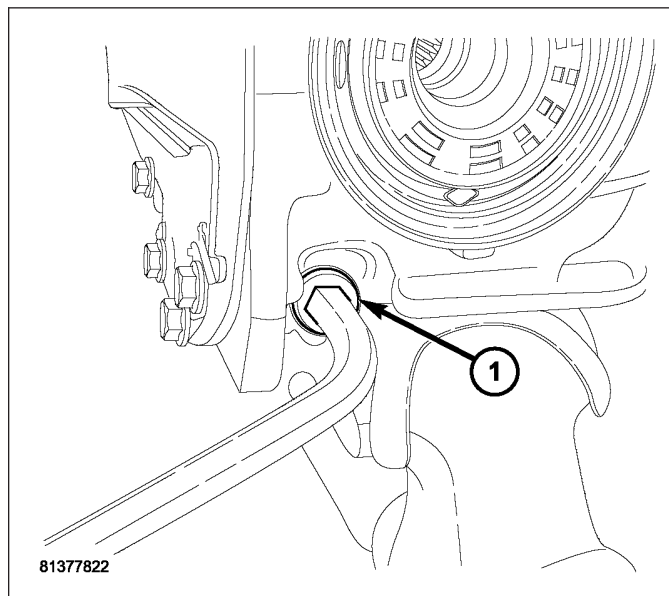
## DIFFERENTIAL

### REMOVAL

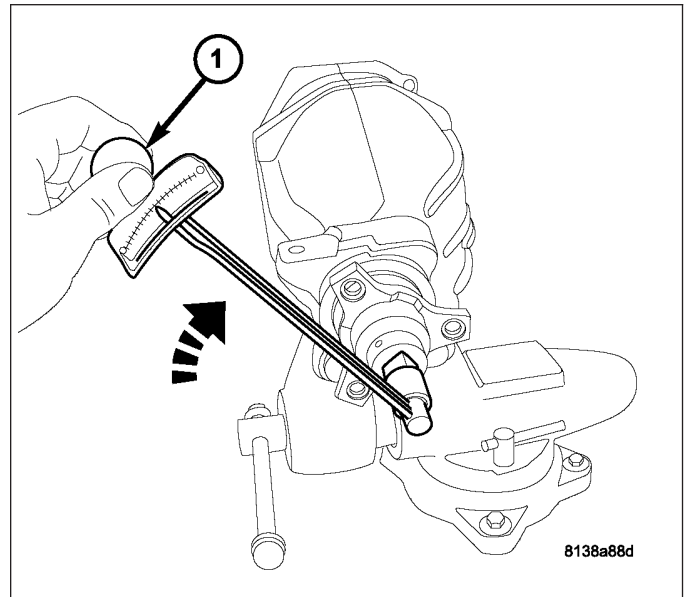
1. Clamp rear axle assembly into bench vise (1).



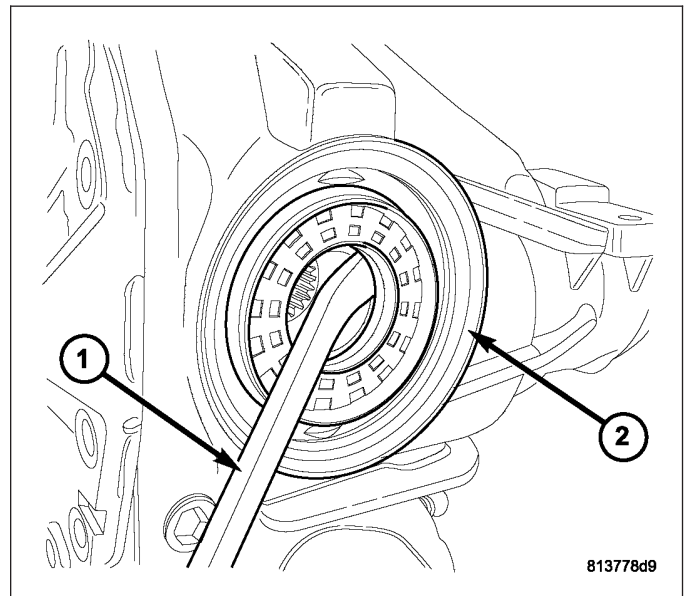
2. Remove drain plug (1) and drain fluid into container suitable for reuse.
3. Install drain plug and torque to 60 N·m (44 ft. lbs.).



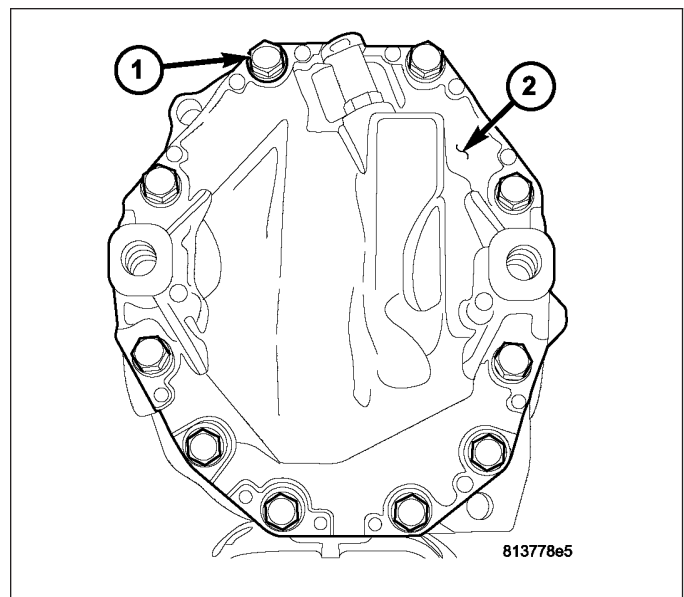
4. Using suitable torque wrench (1), measure and record rear axle assembly total turning torque.



5. Using suitable screwdriver (1), remove both axle seals (2).

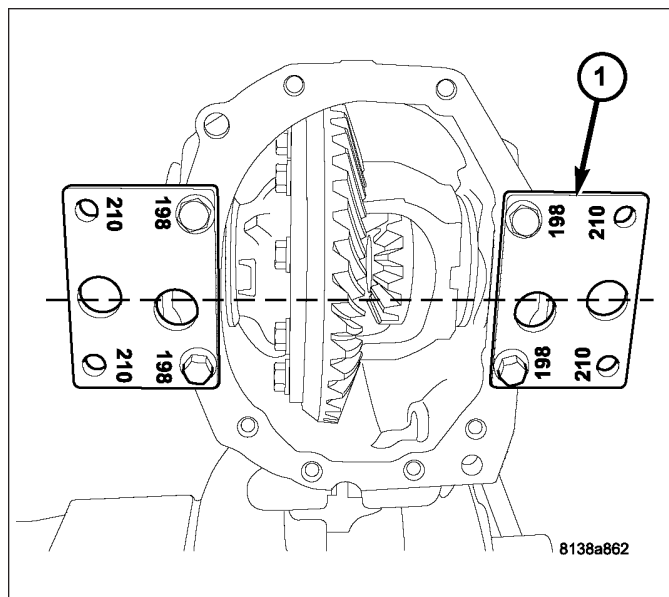


6. Remove twelve axle cover-to-housing bolts (1) and remove cover (2).

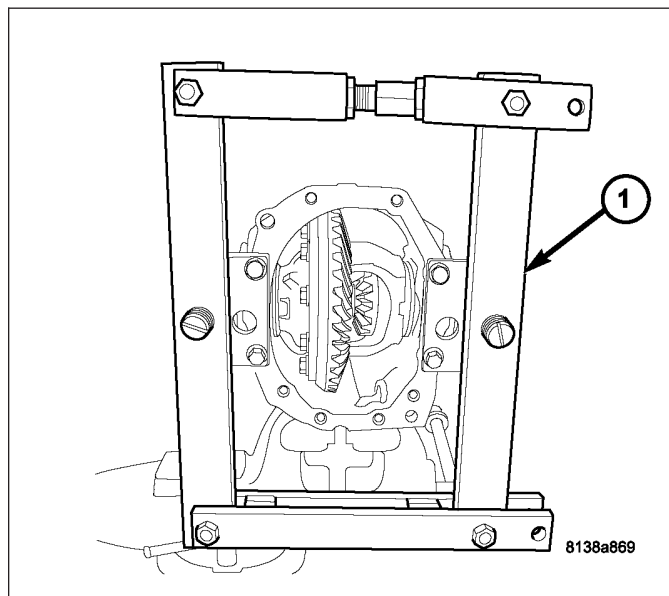




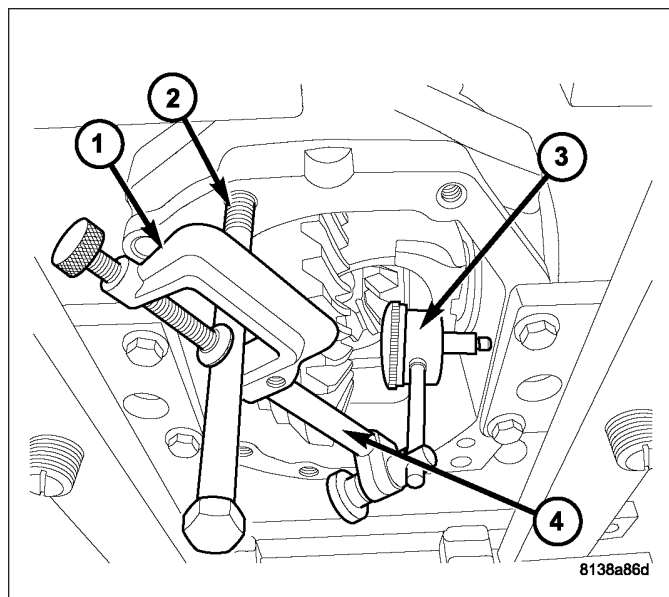
7. Install spreader adapters (1), Tool 9226, as shown. Adapters contain two hole patterns and are labeled accordingly.



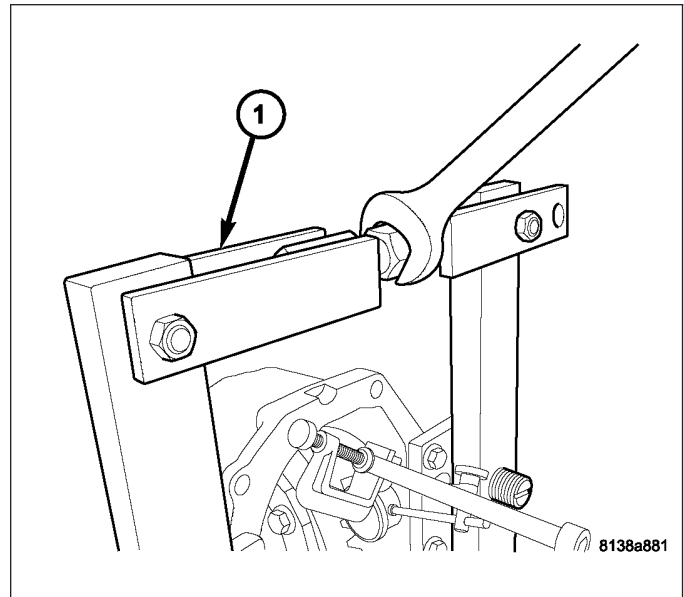
8. Install spreader, Tool W-129-B (1), as shown.



9. Set up Dial Indicator Set C-3339-A to measure housing spread as shown.
- Clamp SP-5426 (1)
  - Post SP-5425-B (2)
  - Metric Dial Indicator 9524 (3)

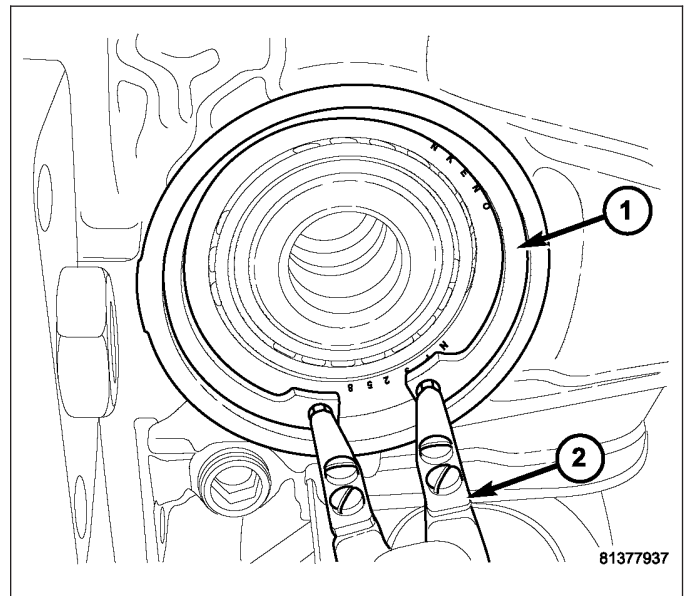


10. Spread axle housing no more than 0.30 mm (0.012 in.).

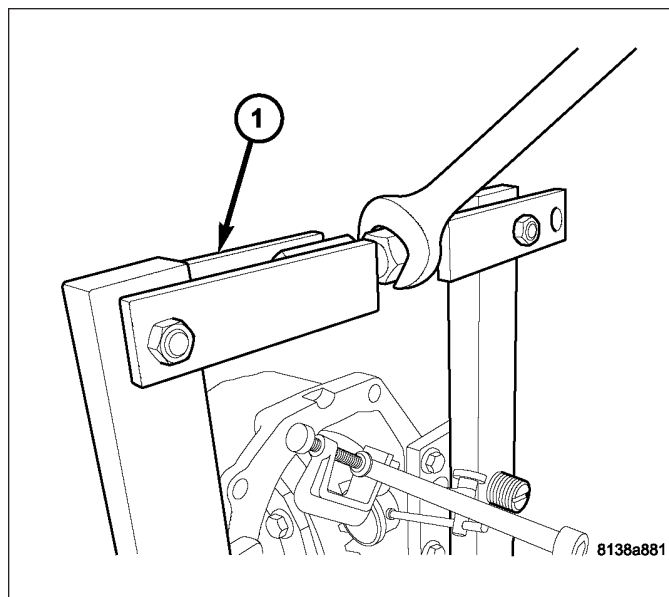


**Note:** The differential side bearing snap rings are select-fit, and control ring gear backlash and differential side bearing preload. It is important to return original snap rings to their original position.

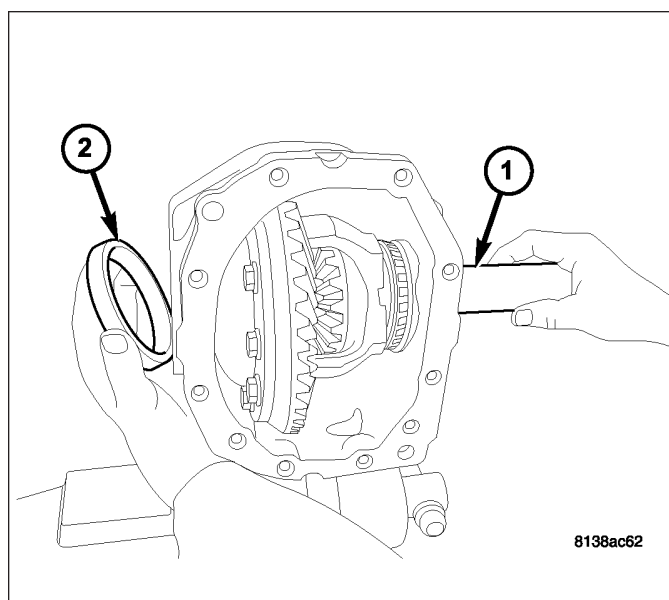
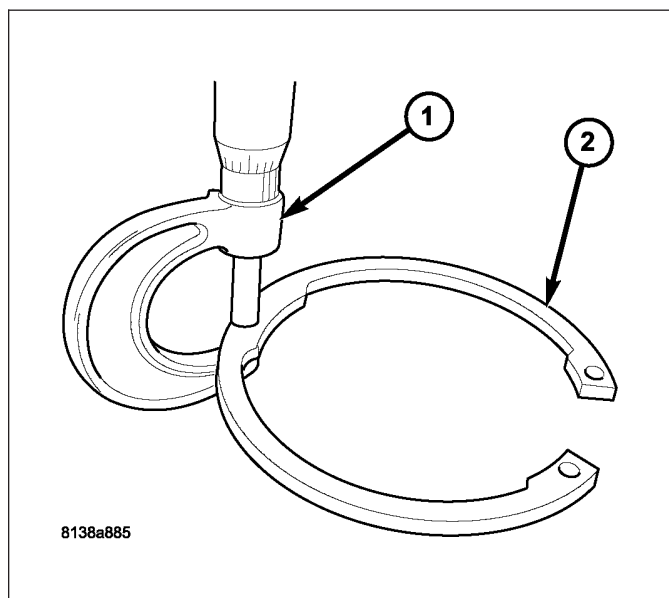
11. Using suitable snap ring pliers (2), compress and remove differential side bearing snap rings (1). Identify and tag for proper reuse.



12. Back off W-129-B spreader (1) to relax tension on housing.
13. Measure snap ring thickness and record for future use.

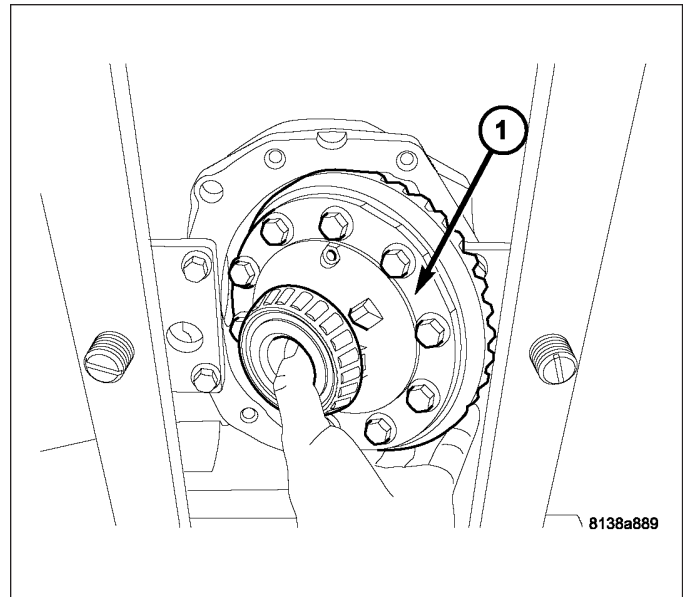


14. Install Tool 9522 (1) into one side of housing and push inward to release differential side bearing cup (2) from opposite side. Repeat for other bearing.



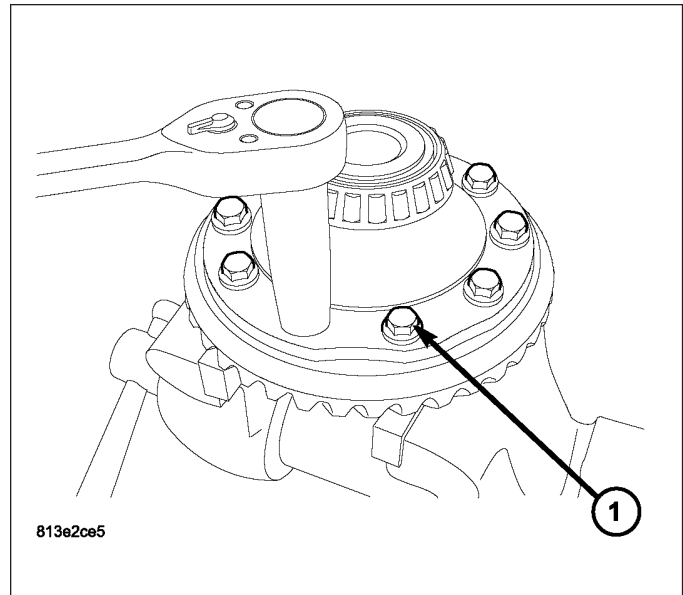
15. Remove differential assembly from axle housing.

**Note:** Note: If difficulty removing differential is encountered due to interference with W-129-B spreader and adapter plates, remove spreader and adapter plates to facilitate removal.

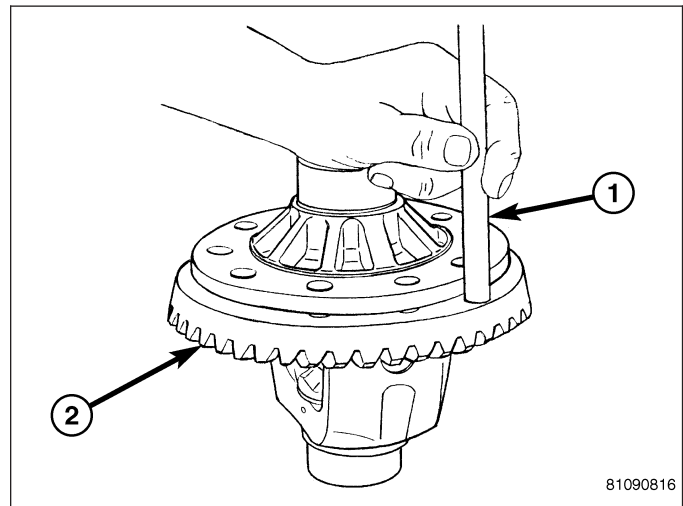


## DISASSEMBLY

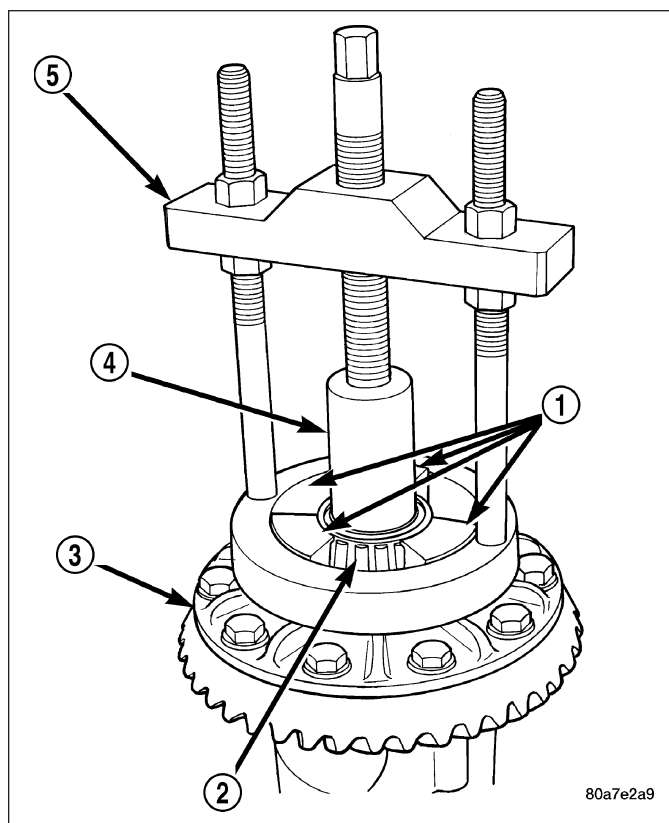
1. Remove differential ring gear-to-case bolts (1).



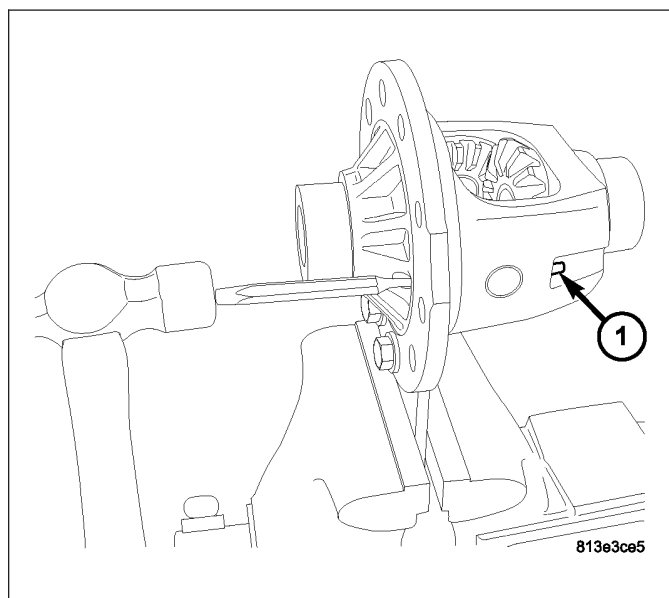
2. Using brass drift (1), remove ring gear (2).



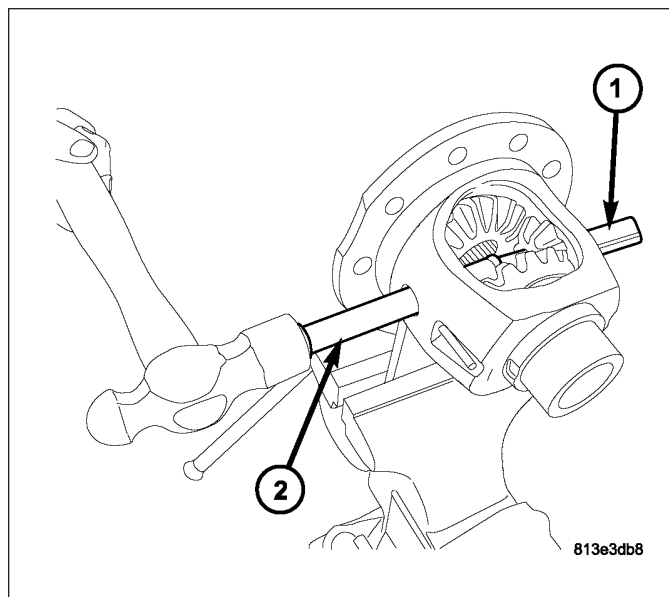
3. Remove bearings (2) from the differential case (3) with Puller/Press C-293-PA (5), Adapters C-293-37 (1) and Plug SP-3289 (4).



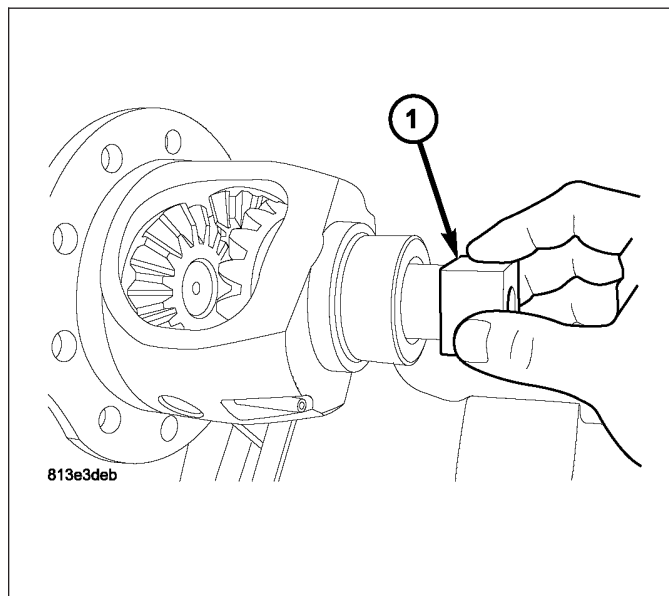
4. Drive out pinion shaft-to-case roll pin using hammer and suitable punch.



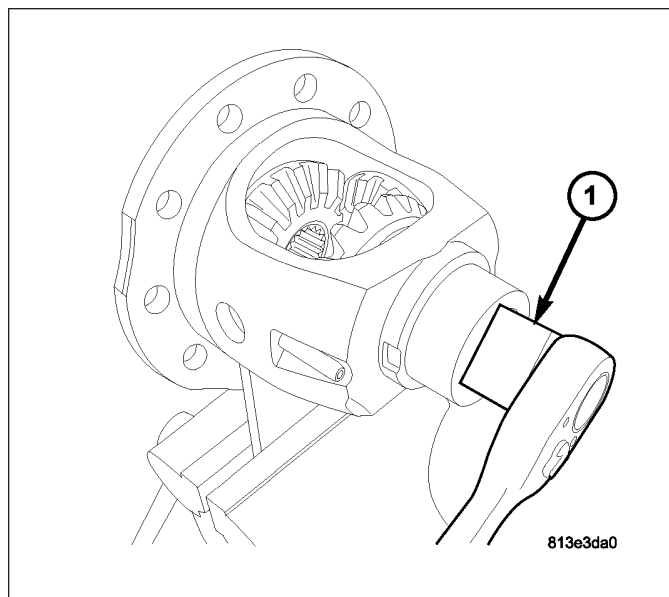
5. Using brass drift (2), drive out pinion shaft (1).



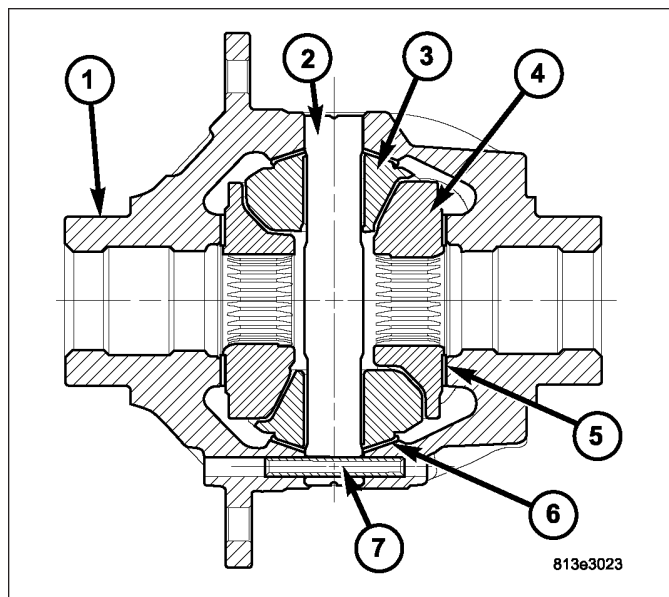
6. Install Tool 9631 (1) into differential side gear.



7. Rotate Tool 9631 (1) to gain access to and remove pinion gears and thrust washers.

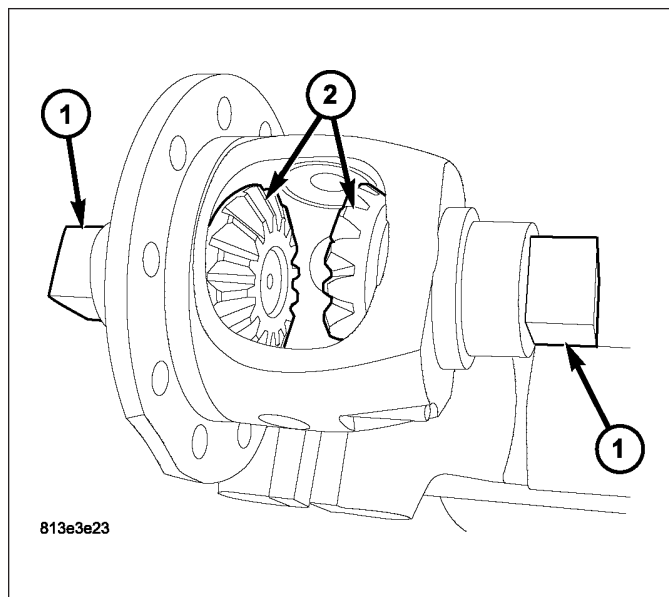


8. Remove differential side gears (4) and thrust washers (5).

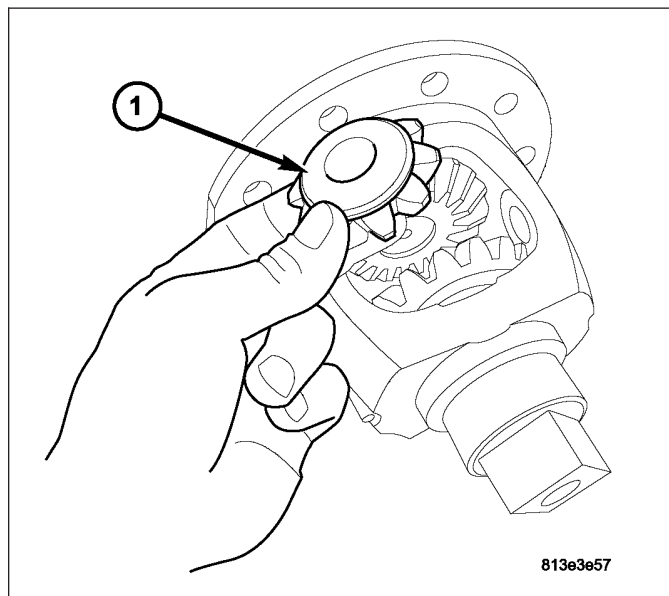


## ASSEMBLY

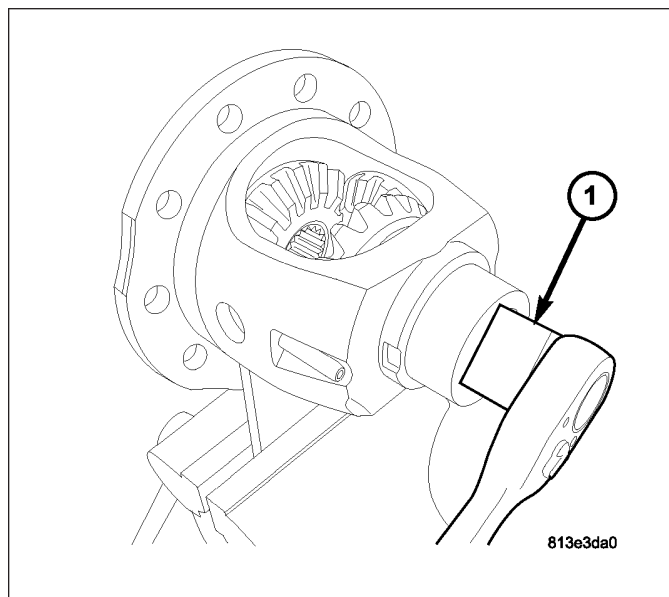
1. Lubricate all differential components with hypoid gear lubricant.
2. Install differential side gears (2) and thrust washers to Tools 9631 (1) as shown in illustration.



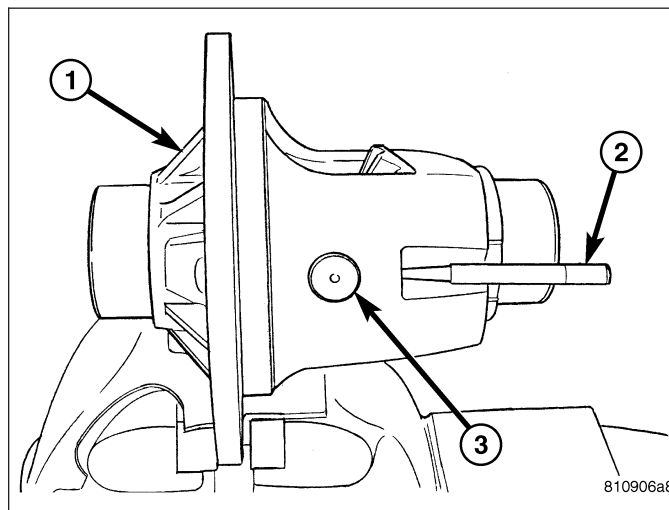
3. Install differential pinion gears (1) and thrust washers into position across from each other.



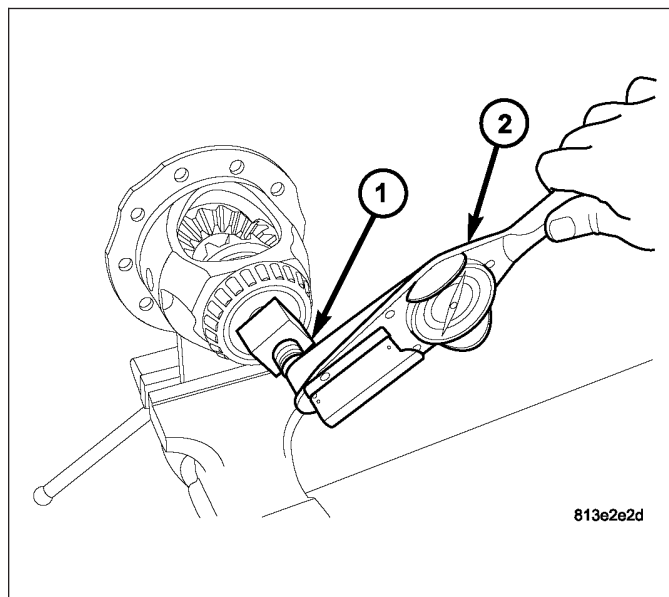
4. Rotate pinion gears into place using Tool 9631 and line up gear centers with pinion shaft bore.



5. Using a brass hammer, drive pinion shaft (3) into differential case (1), making sure to line up roll pin bores.
6. Using suitable punch (2), drive new roll pin into position.



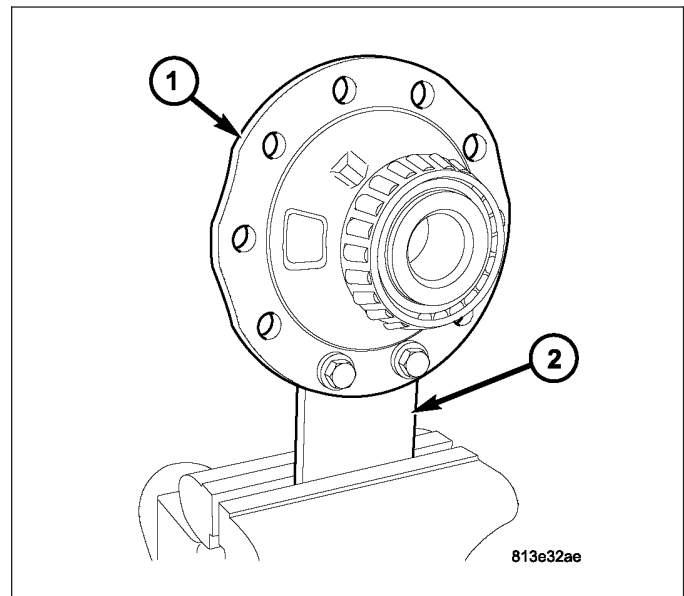
7. Measure differential gear rotating torque as shown. Differential gear rotating torque should be 5-30 N·m (44-266 in. lbs.) Rotating torque is adjusted using select side gear thrust washers. Refer to the following chart.



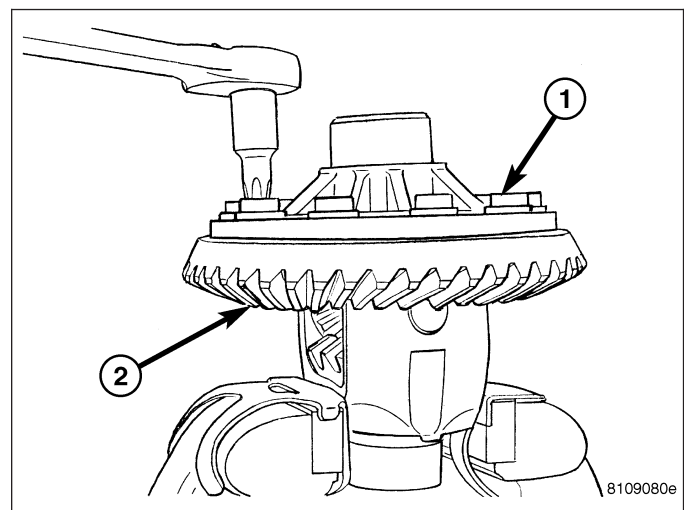


Available Side Gear Thrust Washer Thicknesses	
	1.25 mm (0.049 in.)
	1.30 mm (0.051 in.)
	1.35 mm (0.053 in.)
	1.40 mm (0.055 in.)
	1.45 mm (0.057 in.)
	1.50 mm (0.059 in.)
	1.55 mm (0.061 in.)
	1.60 mm (0.063 in.)
	1.65 mm (0.065 in.)

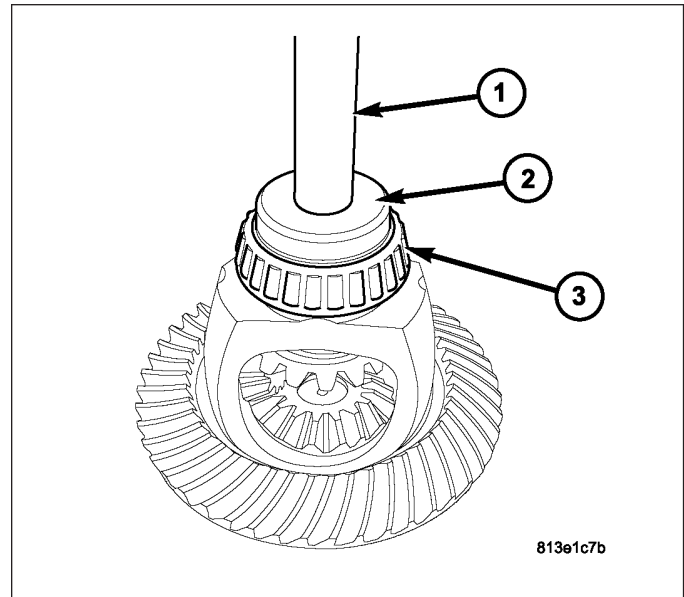
8. Remove differential case from Tool 9630 (2).



9. Install ring gear to case. Lightly tap ring gear into position to facilitate starting of bolts.
10. Install **new** ring gear-to-case bolts and torque to 85 N·m (63 ft. lbs.).



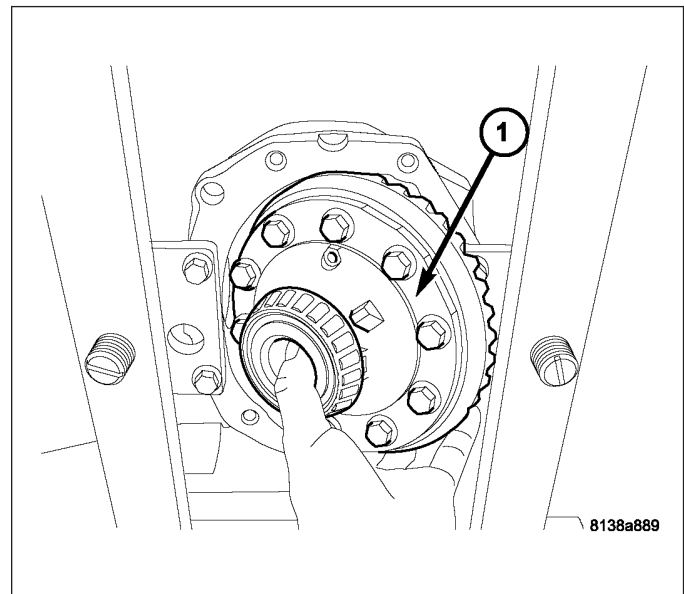
11. Using Tool 9523 (2) and Handle C-4171 (1), press **new** differential side bearings (3) onto differential case.



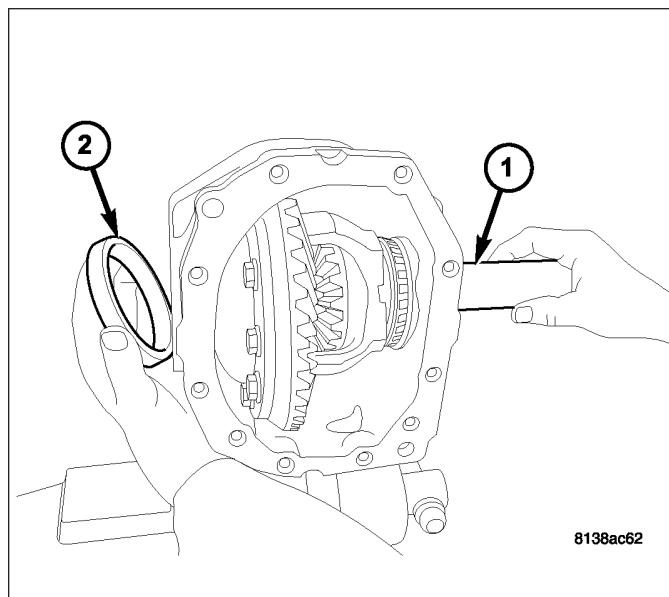
## INSTALLATION

**Note:** If replacement differential side bearings or differential case are being installed, it is necessary to measure and adjust Differential Side Bearing Preload and Gear Backlash. Refer to Adjustments — Differential Side Bearing Preload and Gear Backlash to determine proper snap ring selection.

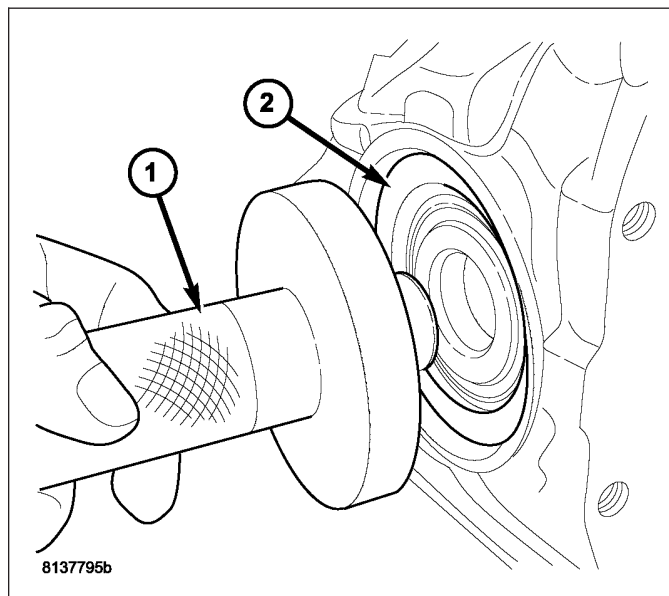
1. Install differential assembly (1) into axle housing.



2. Install differential side bearing cups (2).

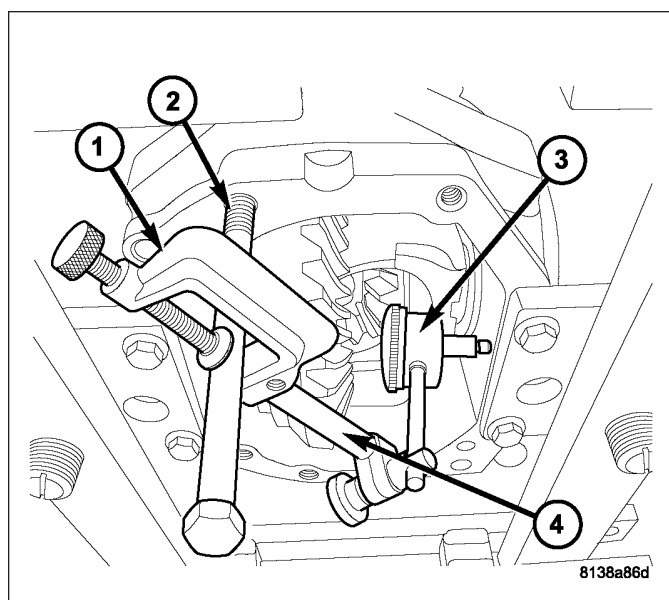


3. Use Tool 9522 (1) to aid in seating side bearing cups (2).

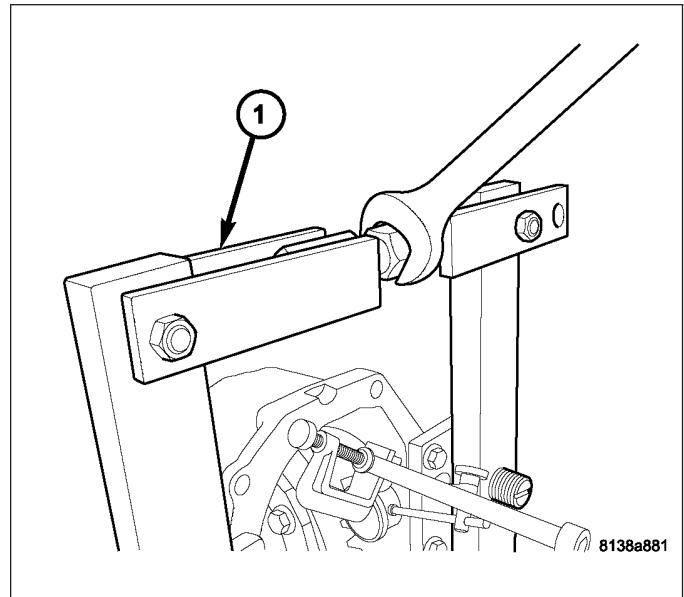


4. Set up Dial Indicator Set C-3339-A to measure housing spread as shown:

- Clamp SP-5426 (1)
- Post SP-5425-B (2)
- Metric Dial Indicator 9524 (3)

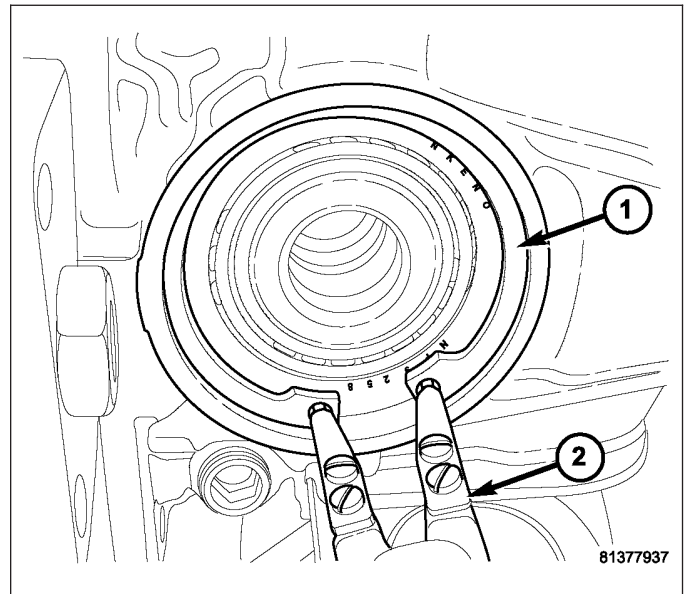


5. Expand spreader W-129-B (1) to spread axle housing no more than 0.30 mm (0.012 in.).

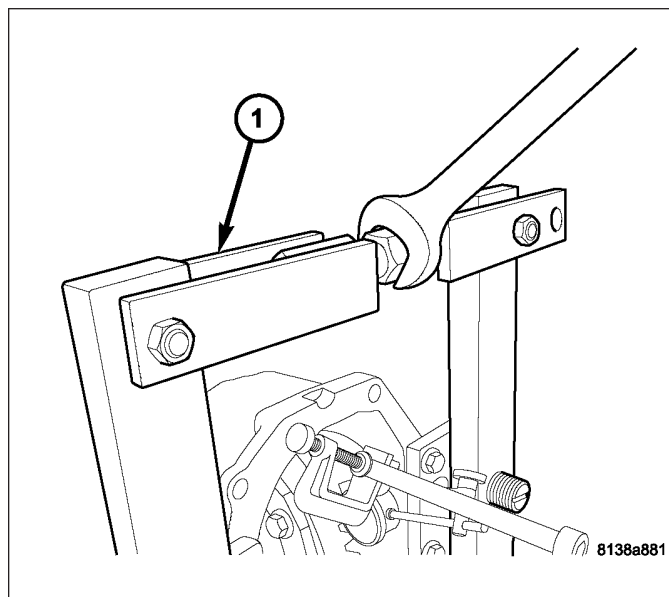


**Note:** The differential side bearing snap rings are select-fit, and control ring gear backlash and differential side bearing preload. It is necessary to return snap rings to their original position. If replacement differential side bearings or differential case are being installed, refer to Adjustments — Differential Side Bearing Preload and Gear Backlash to determine proper snap ring selection.

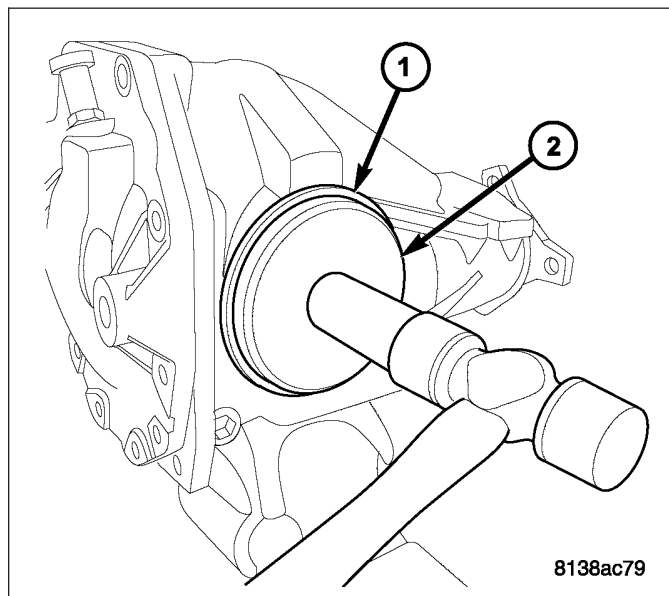
6. Using suitable snap ring pliers (2), install differential side bearing snap rings (1).



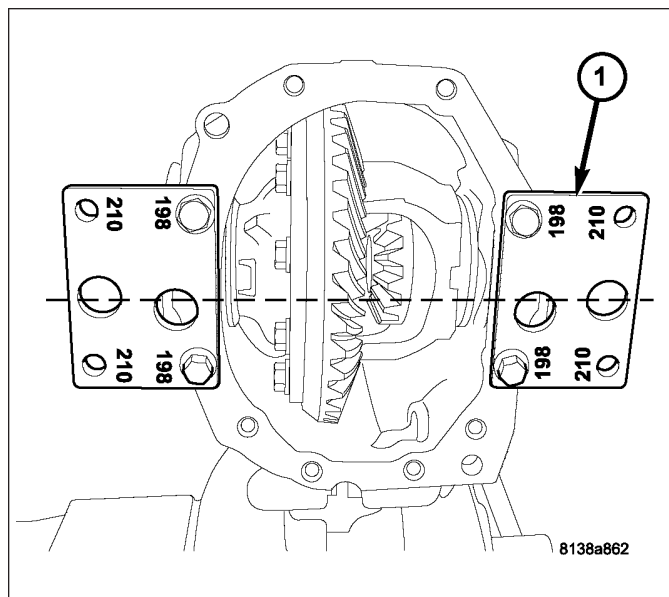
7. Back off W-129-B spreader (1) to relax tension on housing.



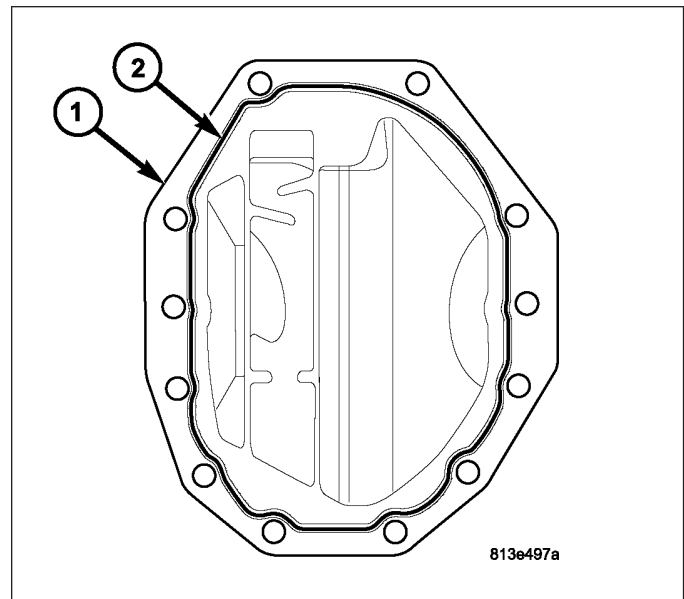
8. Install axle seals (1) using Tool 9223 (2).



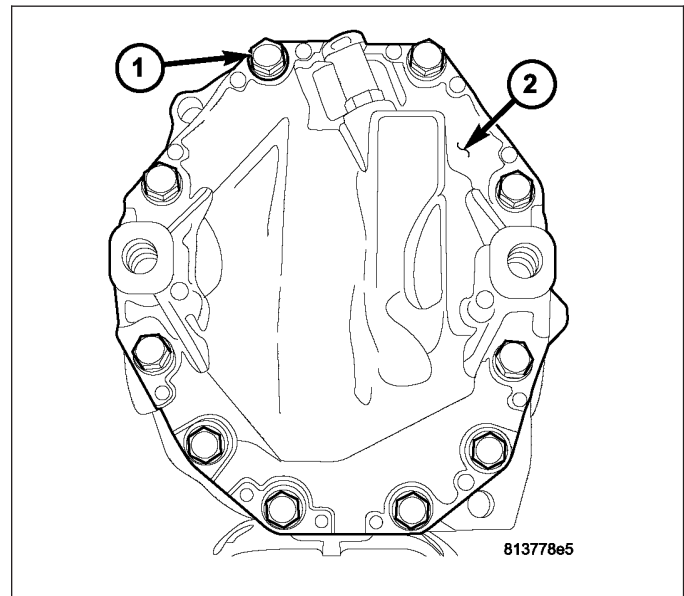
9. Remove spreader W-129-B and adapter plates 9226 (1).



10. Apply 4mm (0.157 in.) bead (2) of Mopar® Axle RTV to axle housing cover (1) as shown.



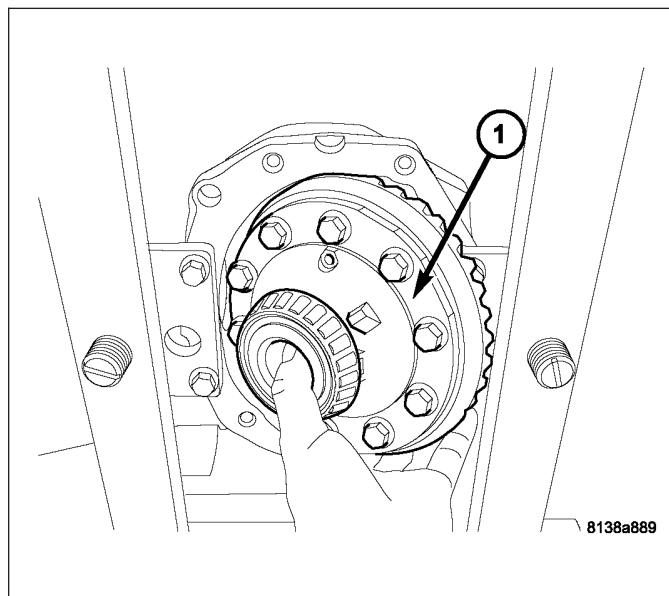
11. Install cover to axle housing. Install and torque cover-to-housing bolts to 30 N·m (22 ft. lbs.) + 90°.



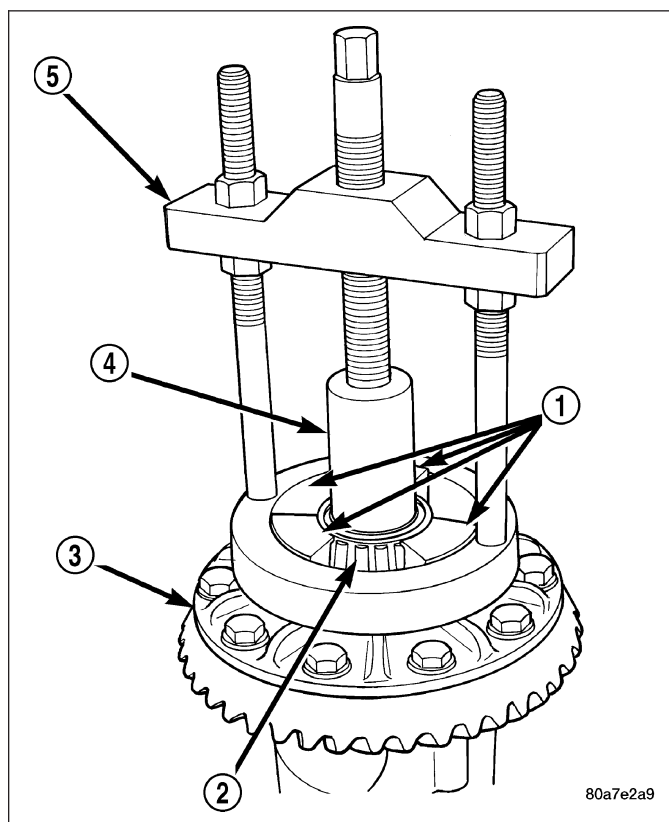
## DIFFERENTIAL CASE BEARINGS

### REMOVAL

1. Remove differential assembly from axle. Refer to Differential Removal.

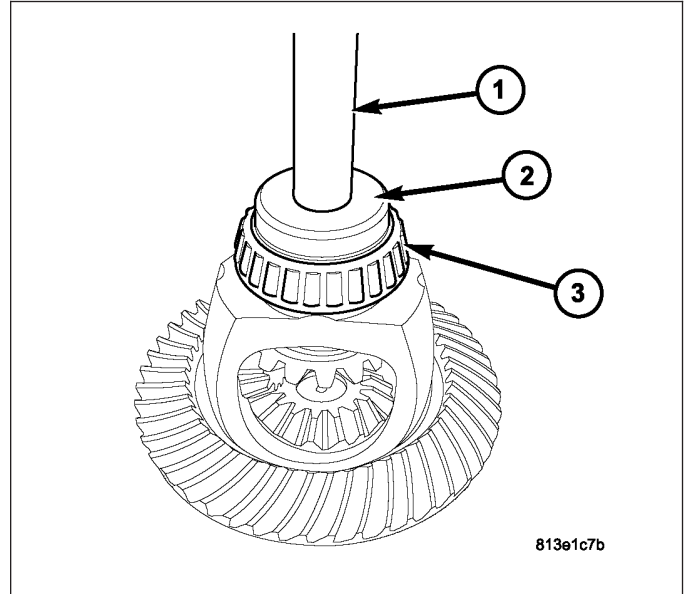


2. Remove bearings (2) from the differential case (3) with Puller/Press C-293-PA (5), Adapters C-293-37 (1) and Plug SP-3289 (4).

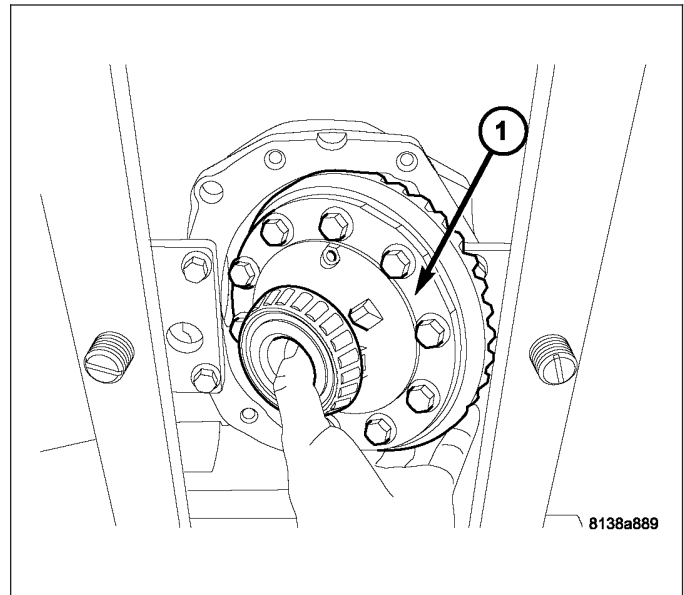


## INSTALLATION

1. Using Tool 9523 and Handle C-4171, press differential side bearings onto differential case.



2. Install differential and reassemble axle assembly.

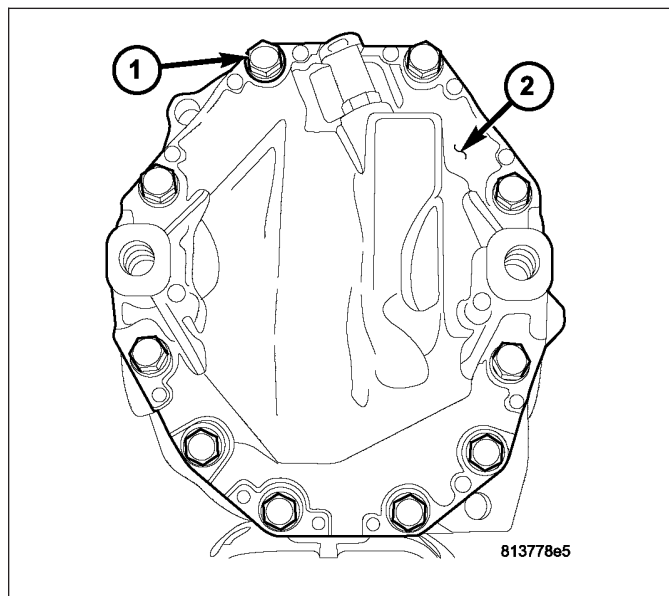




## DIFFERENTIAL COVER

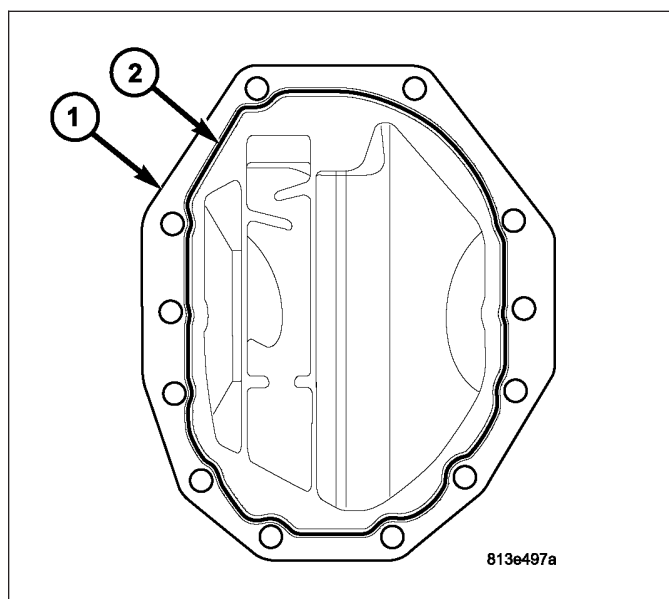
### REMOVAL

1. Remove axle assembly from vehicle.(Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 198MM - REMOVAL)
2. Remove axle housing cover bolts (1).
3. Using suitable screwdriver, remove axle housing cover (1).

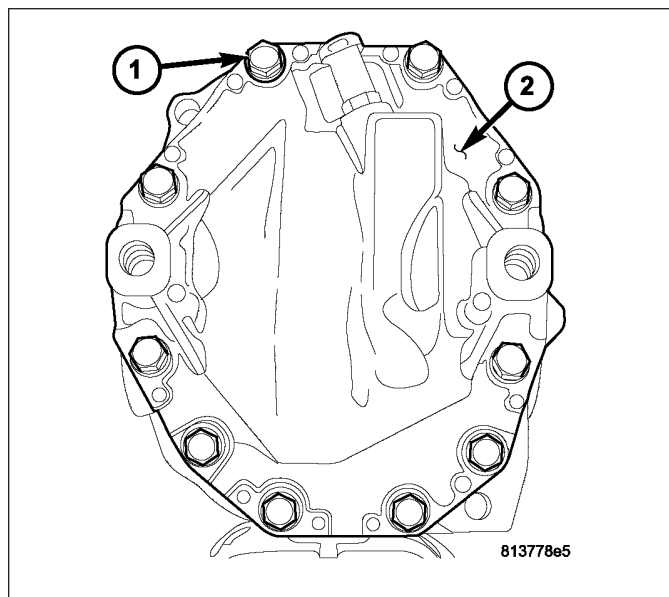


### INSTALLATION

1. After thoroughly cleaning axle housing cover (1), apply a 4 mm (0.157 in.) bead (2) of Mopar® Axle RTV as shown.



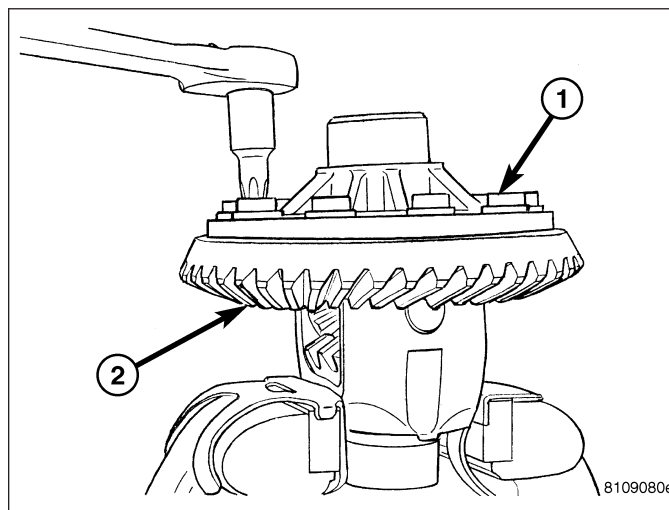
2. Immediately install cover (2) to axle housing. Install and torque axle housing cover bolts (1) to 30 N·m (22 ft. lbs.) + 45°.
3. Install axle assembly to vehicle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 198MM - INSTALLATION)



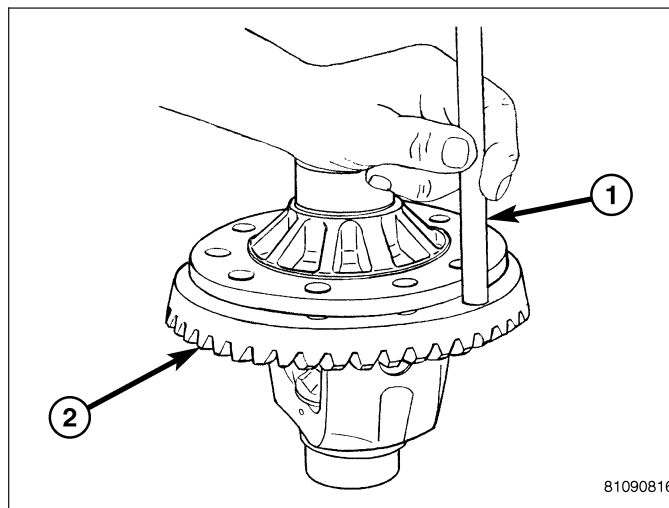
## PINION GEAR/RING GEAR

### REMOVAL

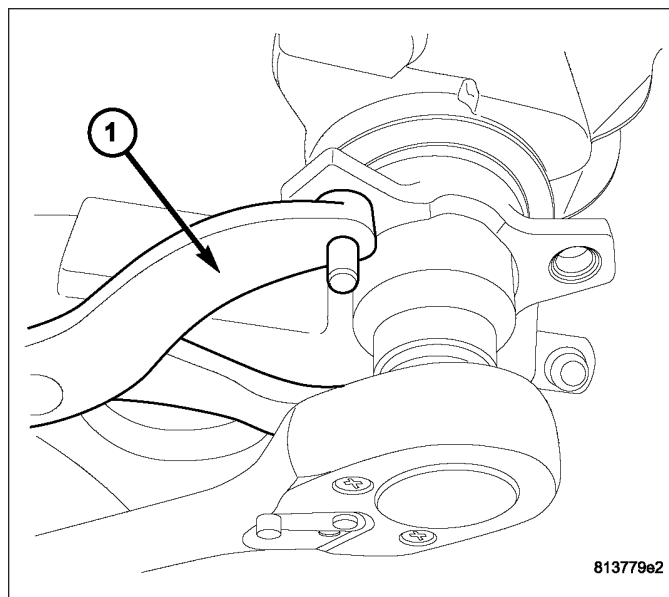
1. Remove differential assembly. (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 198MM/ DIFFERENTIAL - REMOVAL)
2. Place differential case in a soft-jawed vise and remove ring gear-to-case bolts.



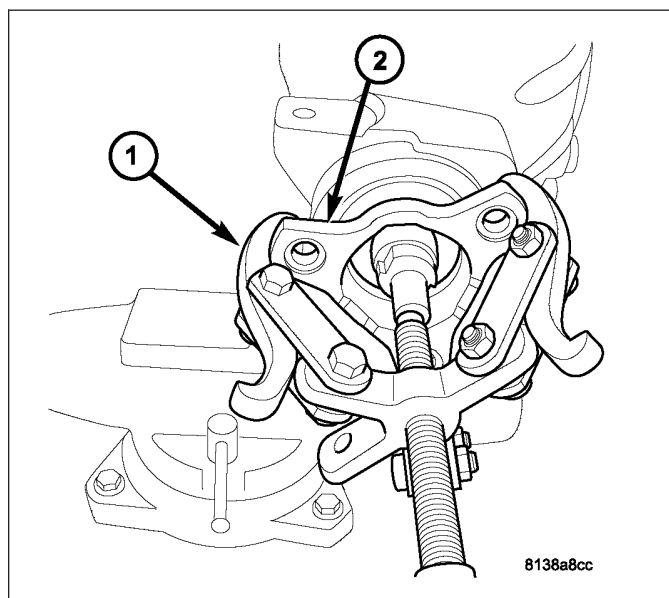
3. Remove ring gear from differential case with a brass drift and hammer.



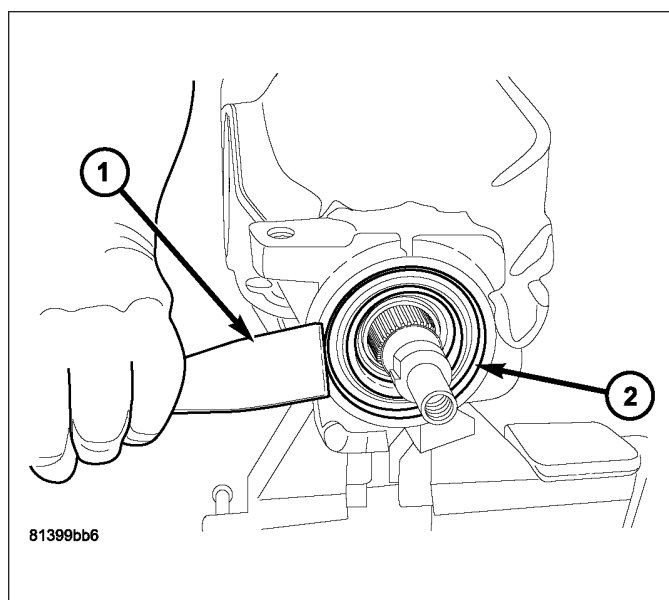
4. Using 41mm socket and flange wrench Tool C-3281 (1), remove pinion nut and discard.



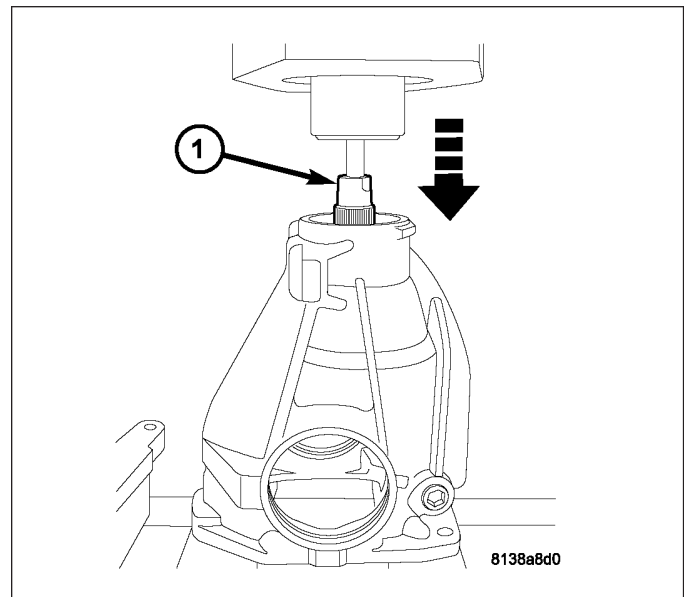
5. Using puller Tool 1026 (1), remove pinion flange (2).



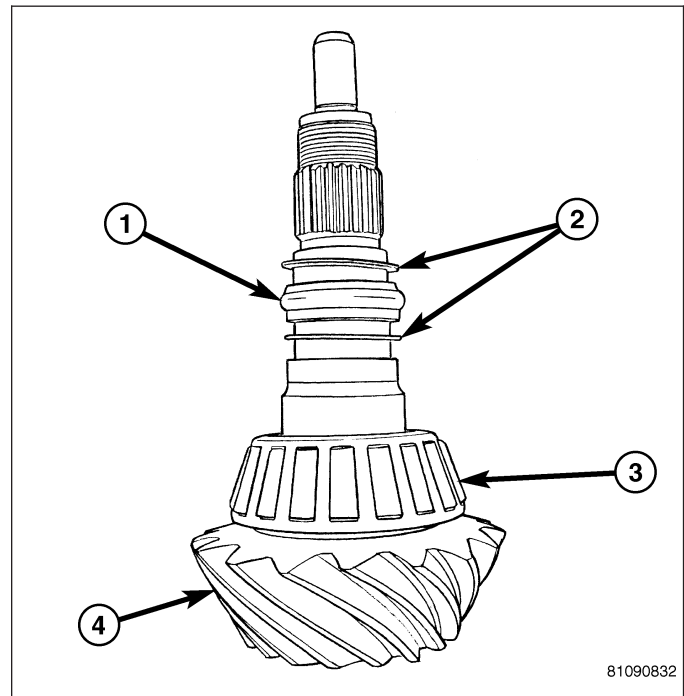
6. Using a suitable screwdriver, remove and discard the pinion seal.
7. Remove pinion tail bearing cone.



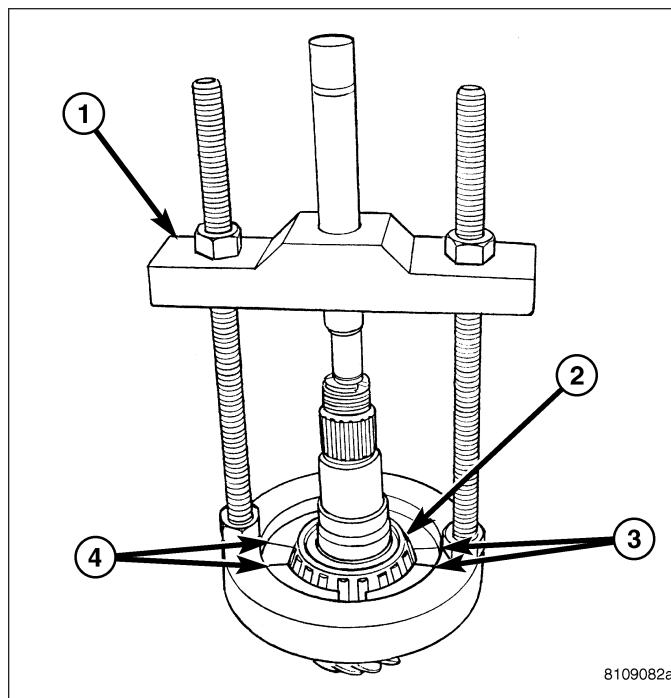
8. Move axle housing to press and press out pinion shaft (1) as shown.



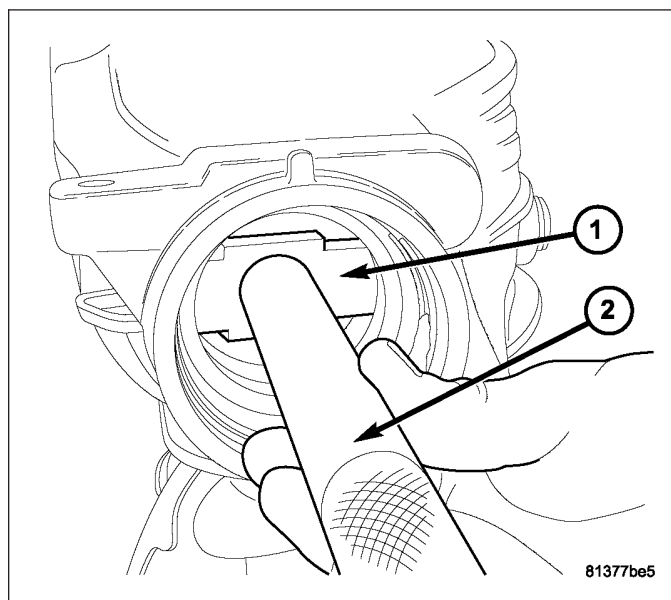
9. Remove collapsible spacer (1) and washers (2). Discard collapsible spacer.



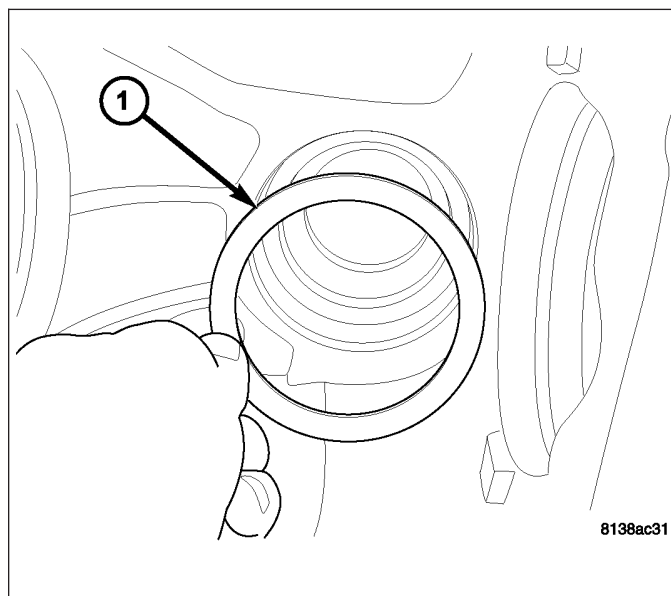
10. Remove pinion head bearing (2) with Puller C-293-PA (1) and Adapters C-293-37 (3,4).



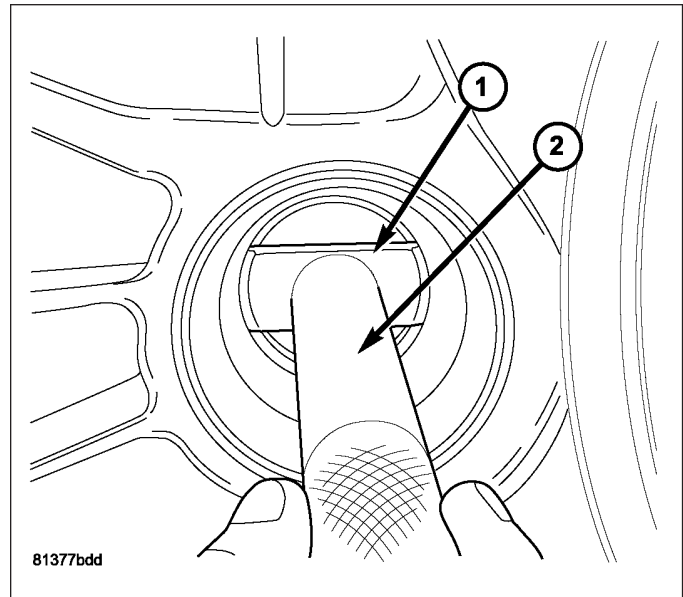
11. Using driver handle C-4171(2) and remover Tool 9084 (1), drive out pinion head bearing cup.



12. Remove pinion head shim. Measure and record shim thickness.

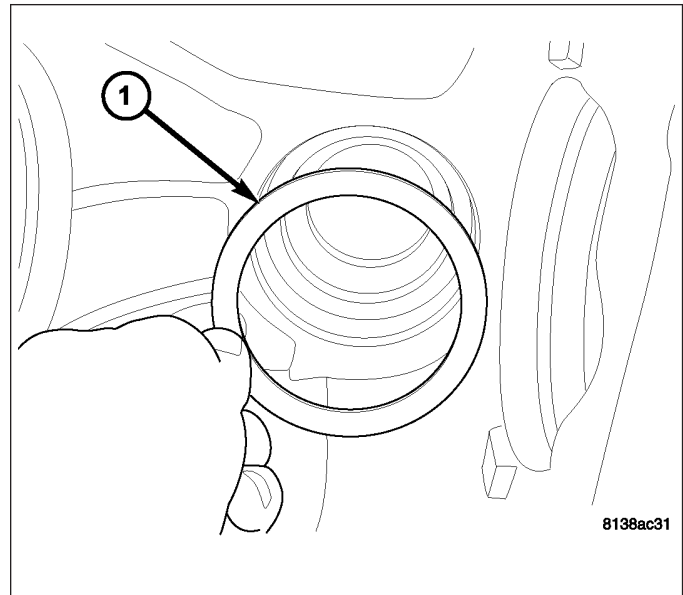


13. Using driver handle C-4171 (2) and remover Tool D-149 (1), drive out pinion tail bearing cup.

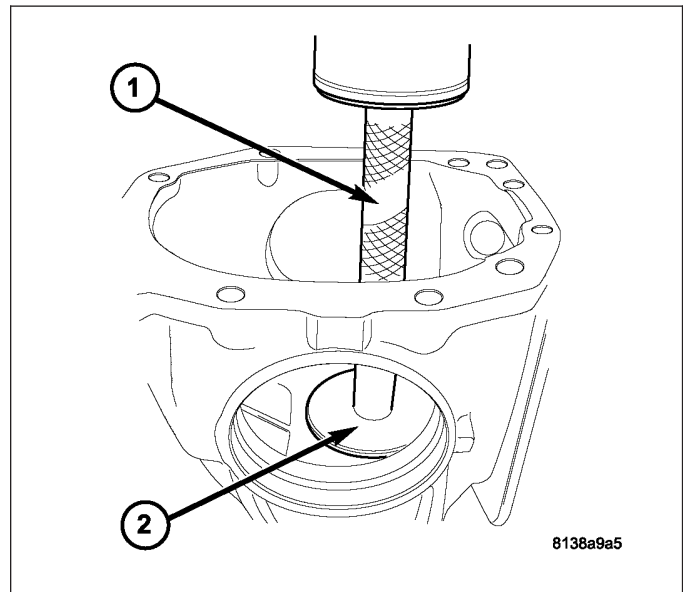


## INSTALLATION

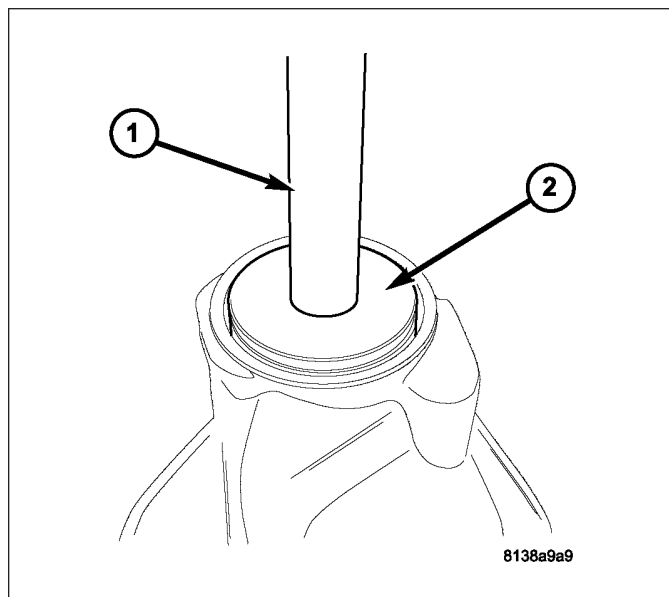
1. Install selected pinion depth shim (1) into housing.



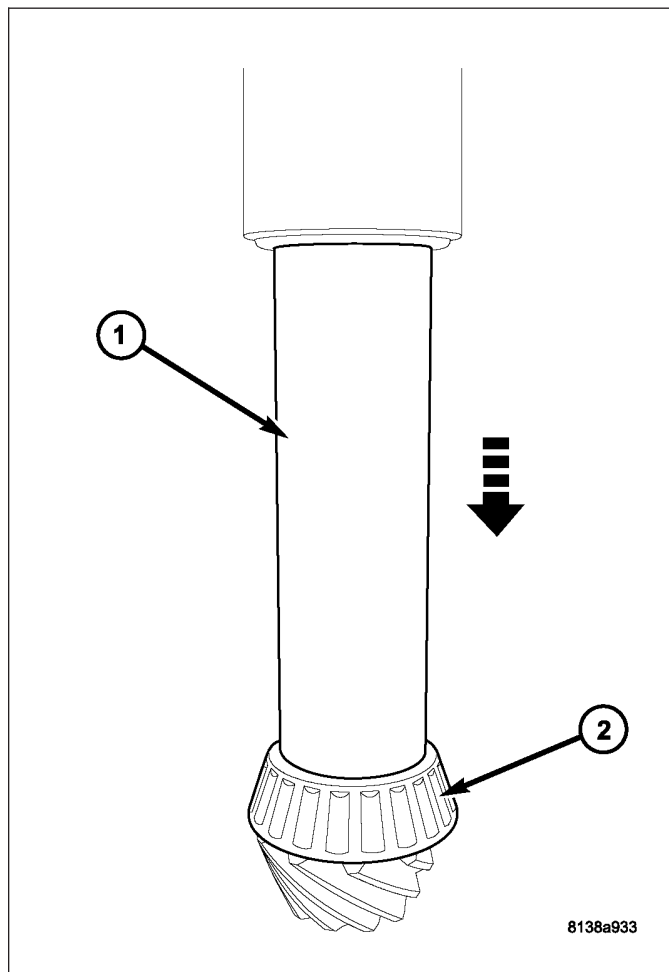
2. Press pinion head bearing cup into housing using Tools C-4171 (1) and C-4310 (2).



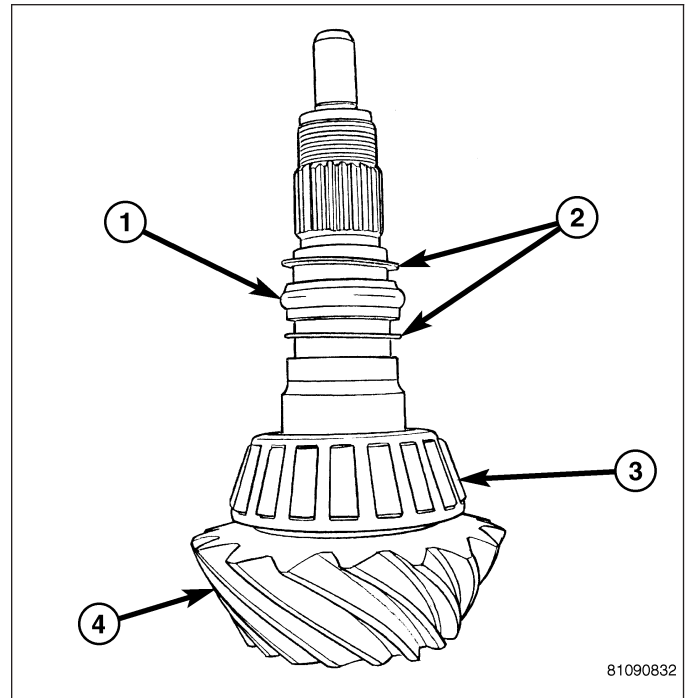
3. Press pinion tail bearing cup into housing using Tools C-4171 (1) and D-146 (2).



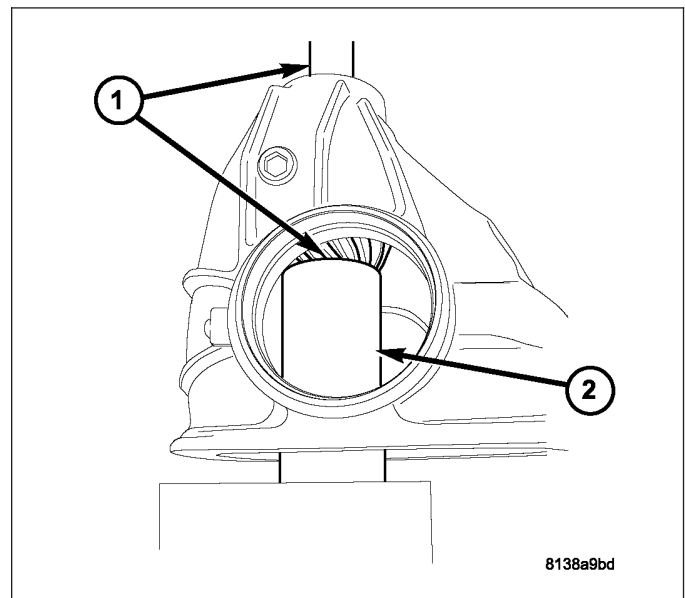
4. Press **new** pinion head bearing (2) onto pinion shaft using Tool C-3095-A (1).



5. Install washers (2) and **new** collapsible spacer (1) to pinion shaft.

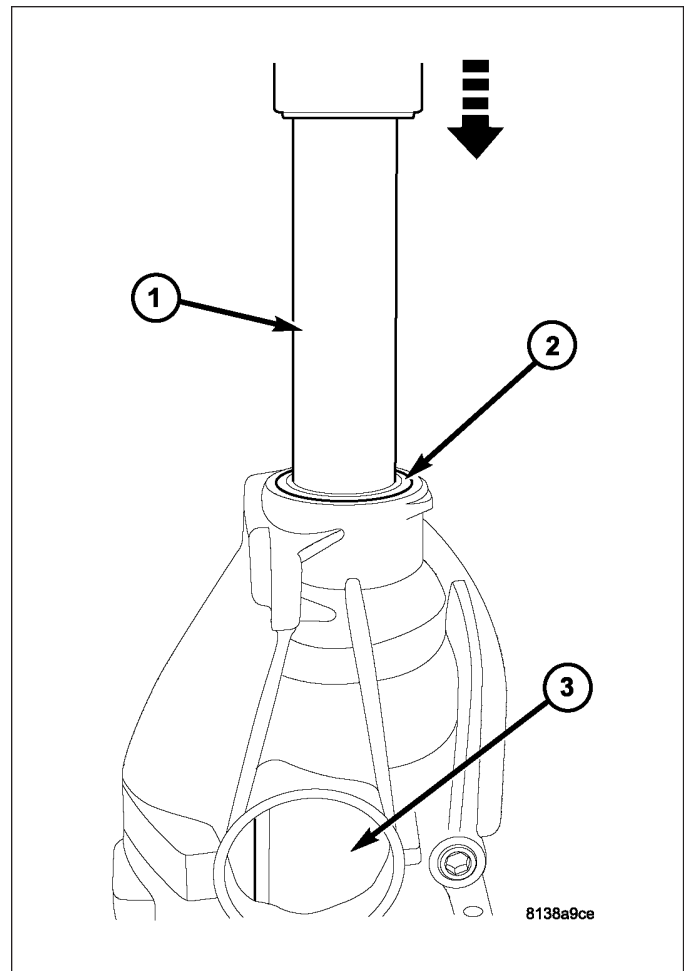


6. Install pinion shaft (1) into housing and support on press table atop Tool 8255 (2). **Ensure pinion gear face is centered atop Tool 8255.**

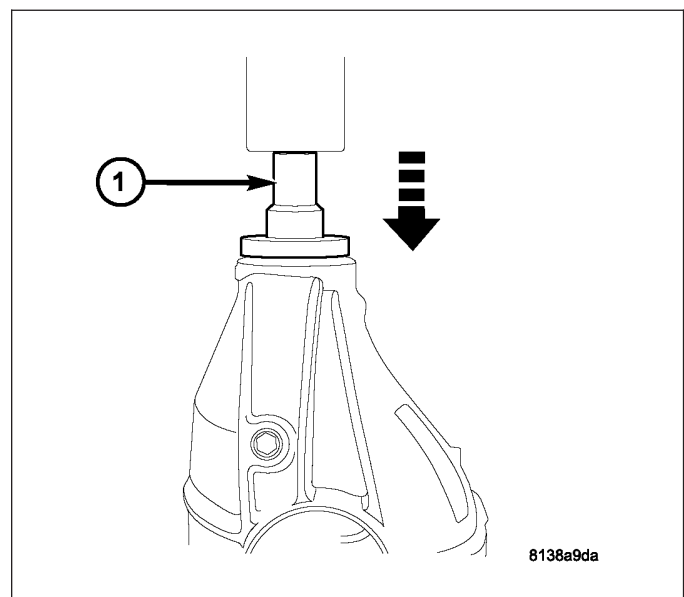




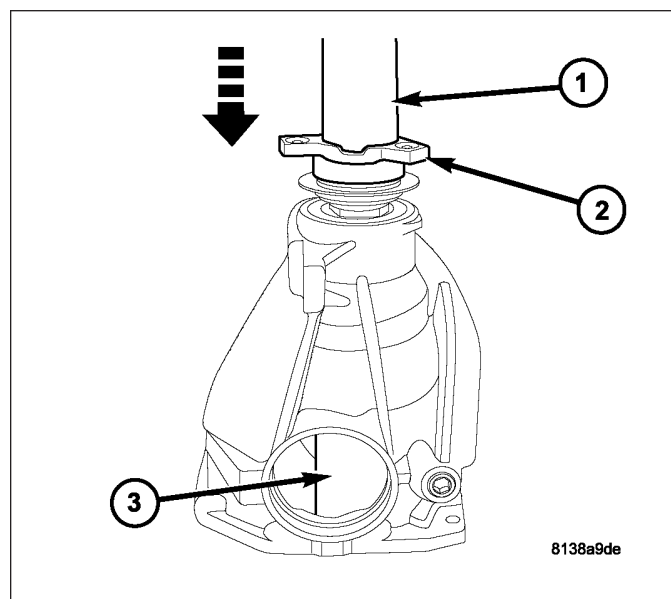
7. Using Tool C-3095-A (1), press on **new** pinion tail bearing (2).



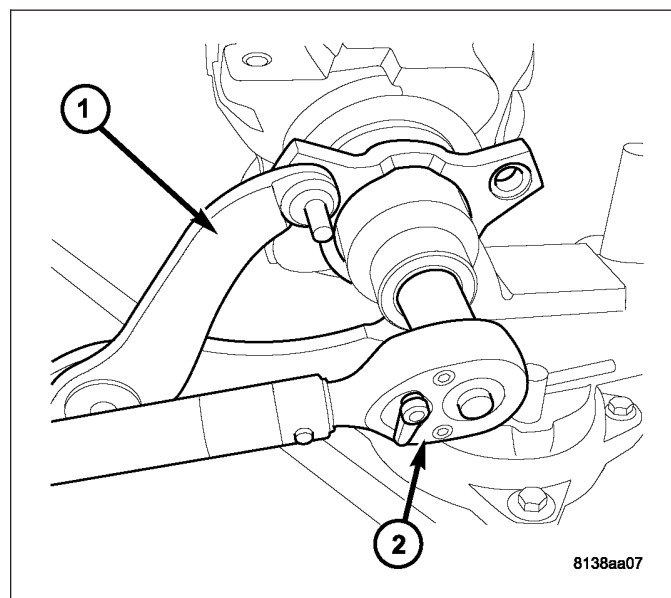
8. Install new pinion seal into position.  
9. Press pinion seal into housing using Tool 9231A (1).



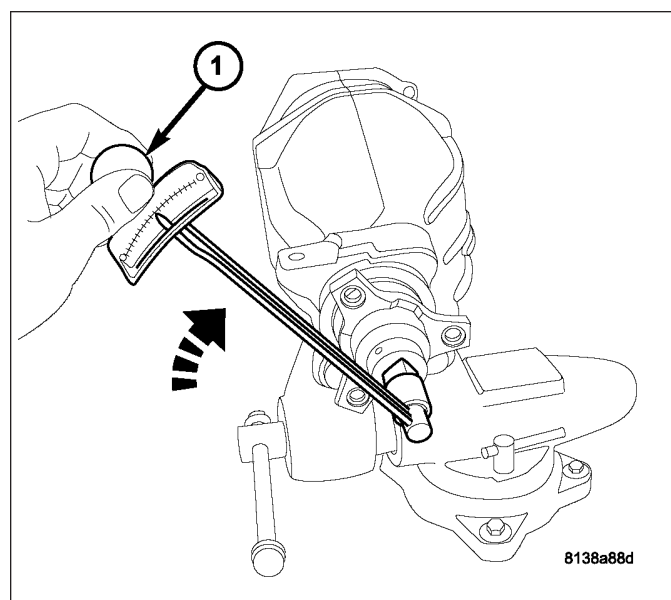
10. Lightly lubricate pinion flange seal with axle lubricant for flange installation.
11. Align index marks and press pinion flange (2) on using Tool C-3095-A (1).



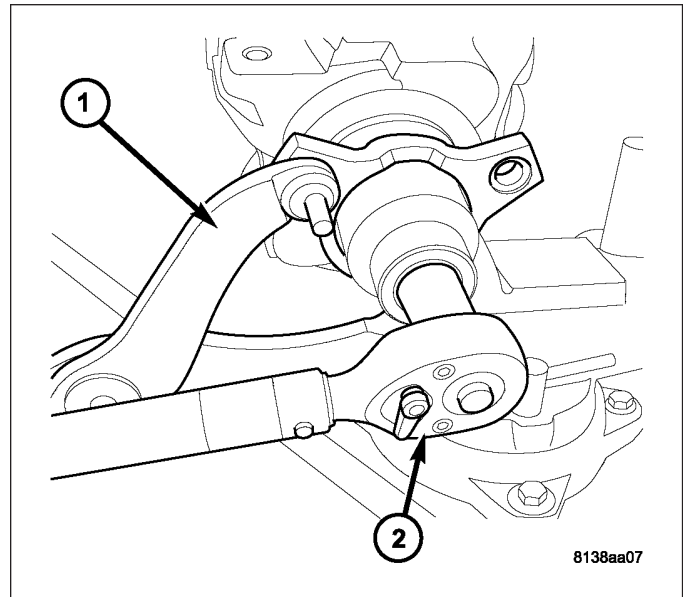
12. Install new pinion flange nut by hand.
13. Hold pinion flange with Tool C-3281 (1). Using a deep 41 mm socket, tighten pinion flange nut to an initial torque of 203 N·m (150 ft. lbs.).



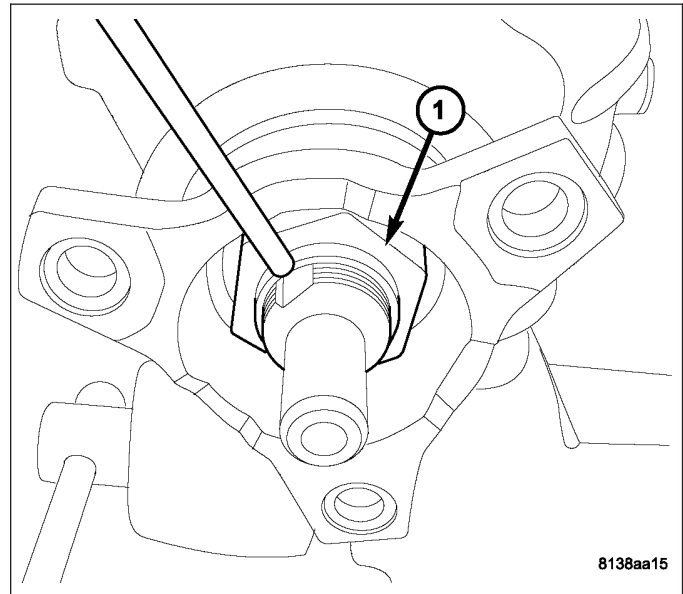
14. Rotate pinion flange to ensure bearing is properly seated.
15. Measure pinion rotating torque using suitable torque wrench (1). **Pinion rotating torque should be 215-245 N. cm (19-22 in. lbs.).**
16. If pinion rotating torque exceeds the specified range, the pinion shaft must be removed and the crush sleeve replaced.



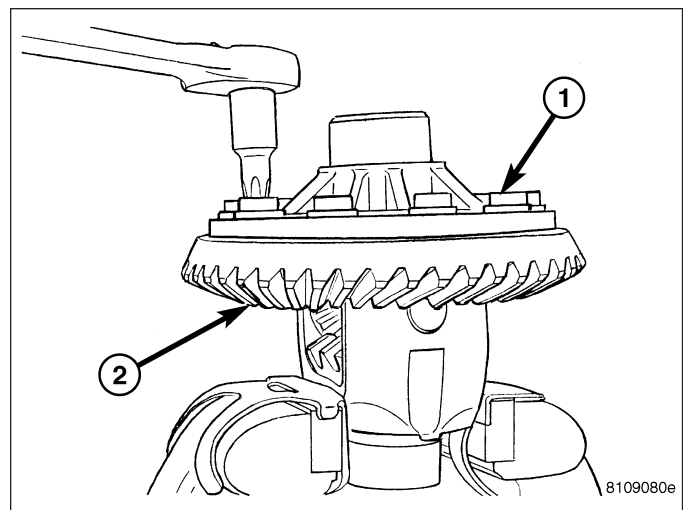
17. If pinion rotating torque is below the specified range, increase nut torque by 7 N·m (5 ft. lbs.) increments and recheck turning torque until rotating torque is within range.



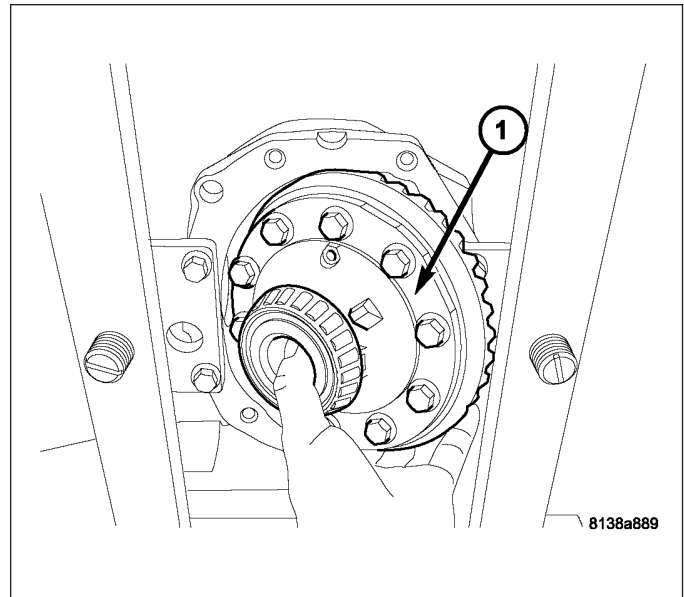
18. Stake pinion flange nut (1) using hammer and suitable punch.



19. Install ring gear to differential case. Loosely install **new** ring-gear-to-differential case bolts.
20. Torque all ring gear-to-case bolts to 85 N·m (64 ft. lbs.)



21. Install differential and reassemble axle assembly.  
(Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR  
AXLE - 198MM/DIFFERENTIAL - INSTALLATION)



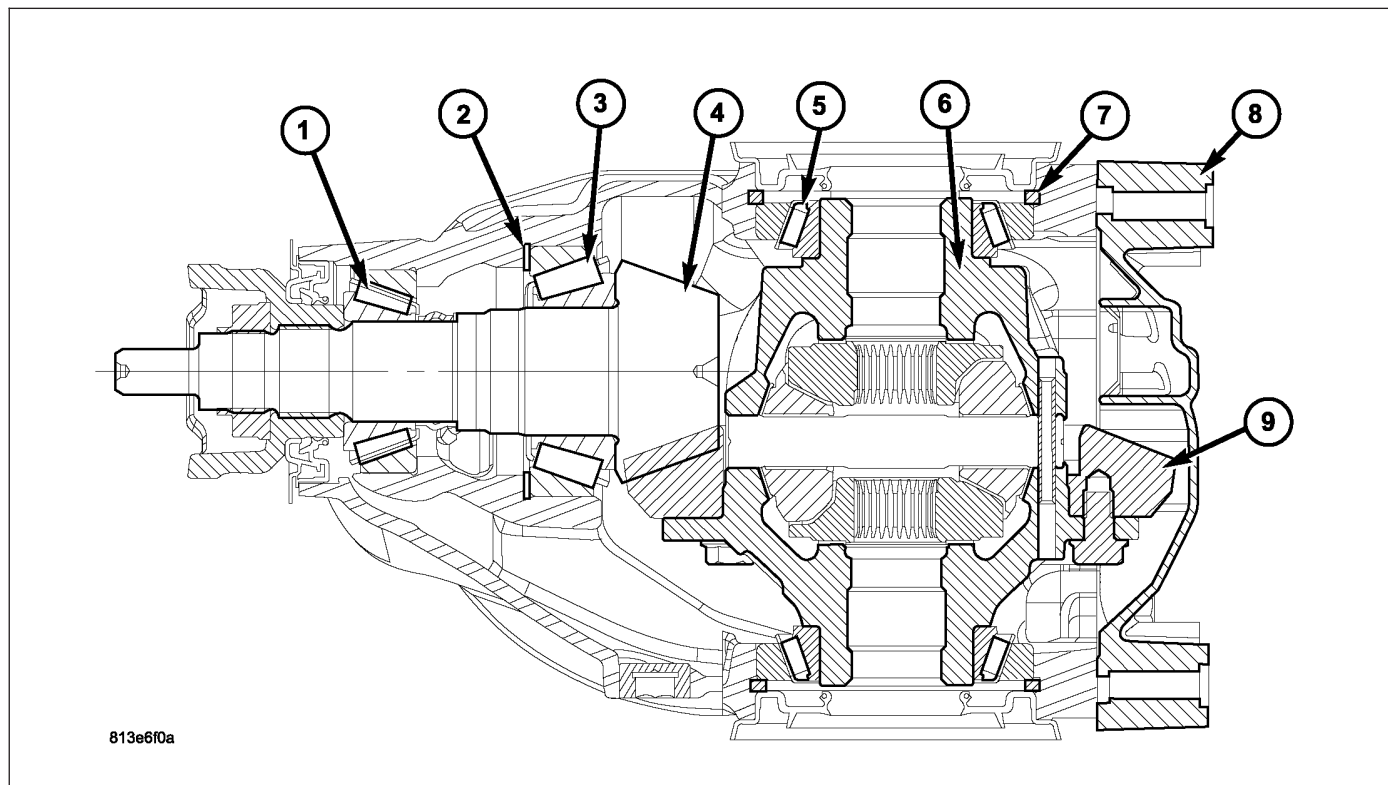
## REAR AXLE - 210R11

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## REAR AXLE - 210RII

### DESCRIPTION



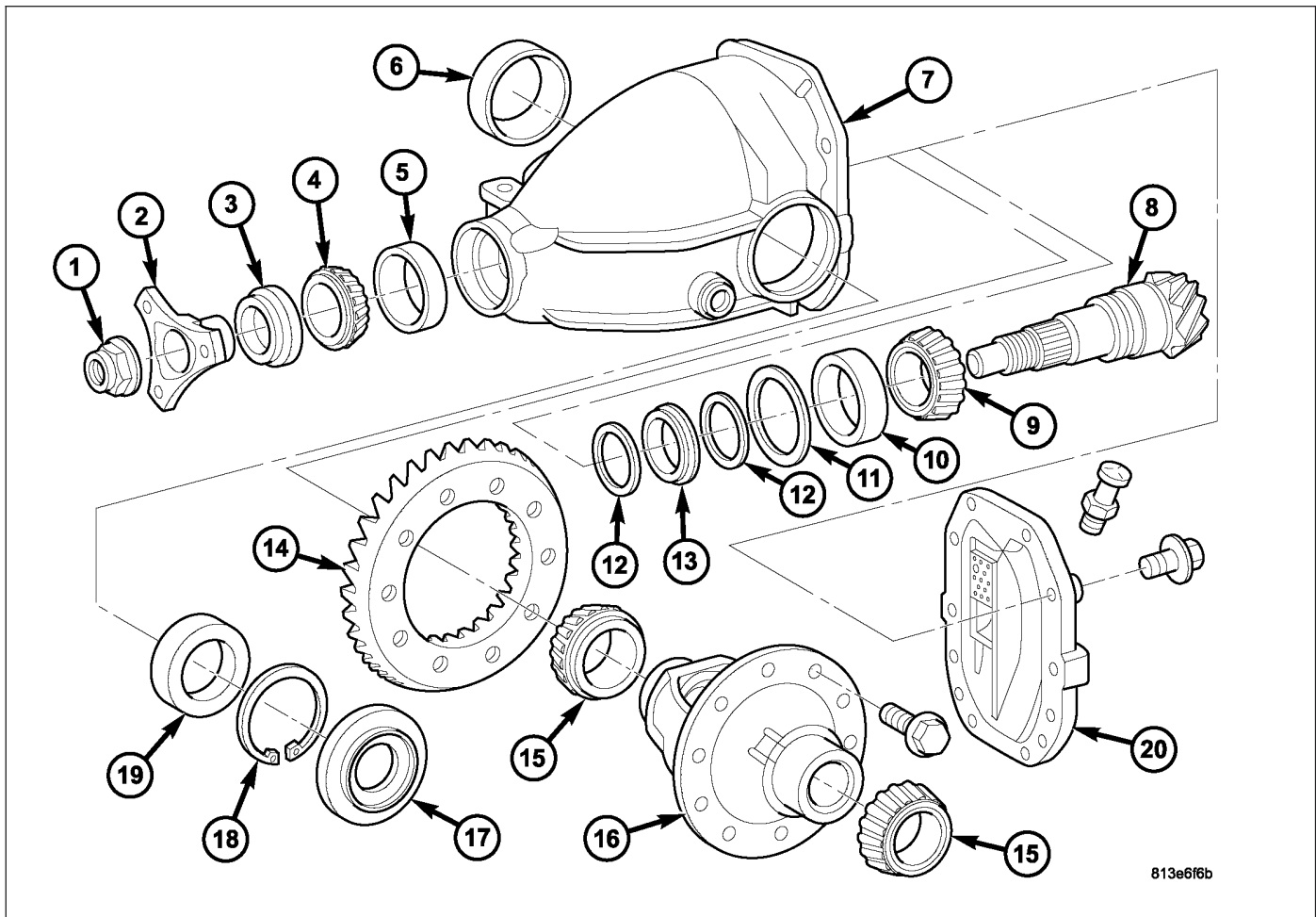
**198/210 MM RII Axle Section View**

- 1 - BEARING, PINION TAIL
- 2 - SHIM, PINION DEPTH
- 3 - BEARING, PINION HEAD
- 4 - GEAR/SHAFT, PINION
- 5 - BEARING, DIFFERENTIAL SIDE

- 6 - DIFFERENTIAL
- 7 - RING, SNAP
- 8 - COVER, AXLE
- 9 - GEAR, RING

The 210 MM RII (Rear-Independent-Iron) axle is an independent assembly with a cast iron housing and differential. The 210 MM RII uses an open differential which is supported by two tapered roller bearings located on either side of the case. Differential bearing preload and ring gear backlash are controlled with select snap-rings located on the outside of the differential bearing cups. Pinion height is set with a select shim located under the rear pinion bearing cup.

The 210 MM axle is available only in V8 engine-equipped models with a 2.82:1 gear ratio.

**198/210 MM Axle Components**

- |                                    |                                      |
|------------------------------------|--------------------------------------|
| 1 - NUT, PINION FLANGE             | 11 - SHIM, PINION DEPTH              |
| 2 - FLANGE, PINION                 | 12 - WASHER (2)                      |
| 3 - SEAL, PINION                   | 13 - SPACER, COLLAPSIBLE             |
| 4 - CONE, PINION TAIL BEARING      | 14 - GEAR, RING                      |
| 5 - CUP, PINION TAIL BEARING       | 15 - CONE, DIFFERENTIAL SIDE BEARING |
| 6 - CUP, DIFFERENTIAL SIDE BEARING | 16 - DIFFERENTIAL                    |
| 7 - HOUSING, AXLE                  | 17 - SEAL, AXLE                      |
| 8 - GEAR/SHAFT, PINION             | 18 - RING, SNAP                      |
| 9 - CONE, PINION HEAD BEARING      | 19 - CUP, DIFFERENTIAL SIDE BEARING  |
| 10 - CUP, PINION HEAD BEARING      | 20 - COVER, AXLE HOUSING             |

## AXLE IDENTIFICATION

The 210 MM axle utilizes a barcoded label which is adhered to the top of the axle housing as shown. The following information is found on the identification label:

- Traceability Code (Plant Use)
- Axle Part Number
- Axle Gear Ratio

## DIAGNOSIS AND TESTING

### GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, incorrect pinion depth, tooth contact, worn/damaged gears, or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion shaft can also cause a snapping or a knocking noise.

### BEARING NOISE

The differential and pinion bearings can produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Wheel hub bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

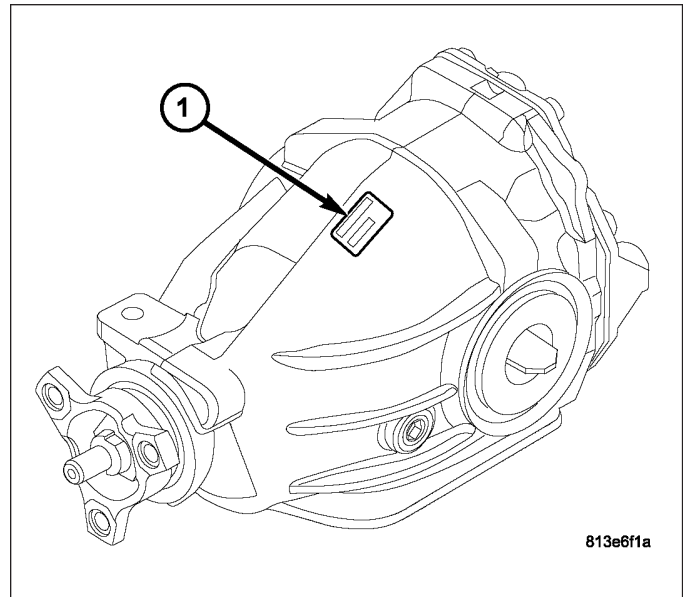
### LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint or by worn side-gear thrust washers. A worn pinion shaft bore will also cause low speed knock.

### VIBRATION

Vibration at the rear of the vehicle is usually caused by a:

- Damaged propeller shaft.
- Missing propeller shaft balance weight(s).
- Worn or out-of-balance wheels.
- Loose wheel lug nuts.
- Worn U-joints or CV joints.
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent halfshaft(s).



**210 MM Axle Identification Tag**



Check for loose or damaged front-end components or engine/transmission mounts. These components can contribute to what appears to be a rearend vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

## DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear, can be caused by:

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U-joints or CV joints.
- Worn or broken axle mount isolators.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

## DIAGNOSTIC CHART

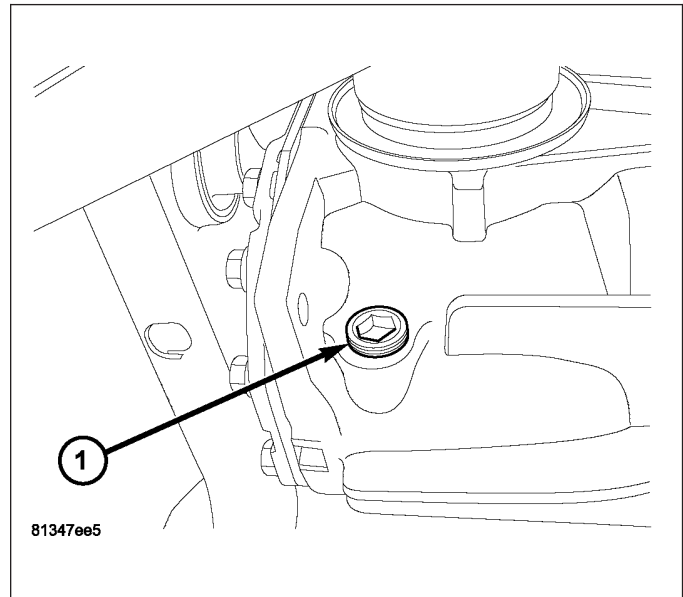
CONDITION	POSSIBLE CAUSE	CORRECTION
Wheel Noise	<ol style="list-style-type: none"> <li>1. Wheel loose.</li> <li>2. Faulty, brinelled wheel bearing.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten loose nuts.</li> <li>2. Replace bearing.</li> </ol>
Differential Cracked	<ol style="list-style-type: none"> <li>1. Improper differential side bearing preload.</li> <li>2. Excessive ring gear backlash.</li> <li>3. Vehicle overloaded.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace case and inspect gears and bearings for further damage. Set differential bearing preload properly.</li> <li>2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly.</li> <li>3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight.</li> </ol>
Differential Gears Scored	<ol style="list-style-type: none"> <li>1. Insufficient lubrication.</li> <li>2. Improper grade of lubricant.</li> <li>3. Excessive spinning of one wheel/tire.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace scored gears. Fill differential with the correct fluid type and quantity.</li> <li>2. Replace scored gears. Fill differential with the proper fluid type and quantity.</li> <li>3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.</li> </ol>

CONDITION	POSSIBLE CAUSE	CORRECTION
Loss Of Lubricant	<ol style="list-style-type: none"> <li>1. Lubricant level too high.</li> <li>2. Worn axle shaft seals.</li> <li>3. Cracked axle housing.</li> <li>4. Worn pinion seal.</li> <li>5. Worn/scored pinion flange journal.</li> <li>6. Axle cover not properly sealed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Drain lubricant to the correct level.</li> <li>2. Replace seals.</li> <li>3. Repair as necessary.</li> <li>4. Replace seal.</li> <li>5. Replace pinion flange and seal.</li> <li>6. Remove, clean, and re-seal cover.</li> </ol>
Axle Overheating	<ol style="list-style-type: none"> <li>1. Lubricant level low.</li> <li>2. Improper grade of lubricant.</li> <li>3. Bearing preload too high.</li> <li>4. Insufficient ring gear backlash.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill differential to correct level.</li> <li>2. Fill differential with the correct fluid type and quantity.</li> <li>3. Readjust bearing pre-load.</li> <li>4. Re-adjust ring gear backlash.</li> </ol>
Gear Teeth Broke	<ol style="list-style-type: none"> <li>1. Overloading.</li> <li>2. Ice-spotted pavement.</li> <li>3. Improper adjustments.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace gears. Examine other gears and bearings for possible damage.</li> <li>2. Replace gears and examine remaining parts for damage.</li> <li>3. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.</li> </ol>
Axle Noise	<ol style="list-style-type: none"> <li>1. Insufficient lubricant.</li> <li>2. Improper ring gear and pinion adjustment.</li> <li>3. Unmatched ring gear and pinion.</li> <li>4. Worn teeth on ring gear and/or pinion.</li> <li>5. Loose pinion bearings.</li> <li>6. Loose differential bearings.</li> <li>7. Misaligned or sprung ring gear.</li> <li>8. Housing not machined properly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill axle with the correct fluid type and quantity.</li> <li>2. Check ring gear and pinion contact pattern. Adjust backlash or pinion depth.</li> <li>3. Replace gears with a matched ring gear and pinion.</li> <li>4. Replace ring gear and pinion.</li> <li>5. Adjust pinion bearing pre-load.</li> <li>6. Adjust differential bearing preload.</li> <li>7. Measure ring gear run-out. Replace components as necessary.</li> <li>8. Replace housing.</li> </ol>

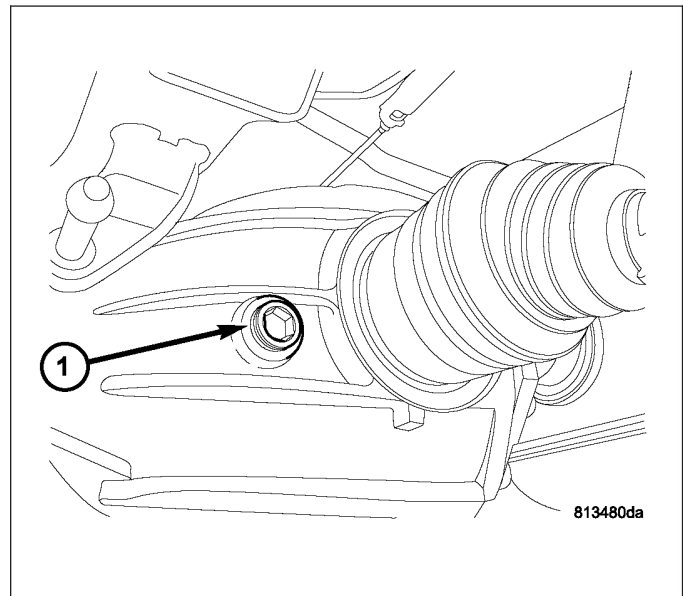
## STANDARD PROCEDURE - FLUID DRAIN AND FILL

**Note:** The fluid required for use in this axle is Mopar® Synthetic Gear and Axle Lubricant 75W-140.

1. Drive the vehicle until the differential lubricant is at the normal operating temperature.
2. With vehicle in neutral, position and raise vehicle on hoist.
3. Remove rear axle drain plug (1) and drain lubricant completely from the axle.
4. Install drain plug and tighten to 50 N·m (37 ft lbs).



5. Remove fill plug (1) and fill rear axle with 1.6 L (1.7 qts.) Mopar® Synthetic Gear & Axle Lubricant 75W-140.
6. Install fill plug and tighten to 50 N·m (37 ft lbs).



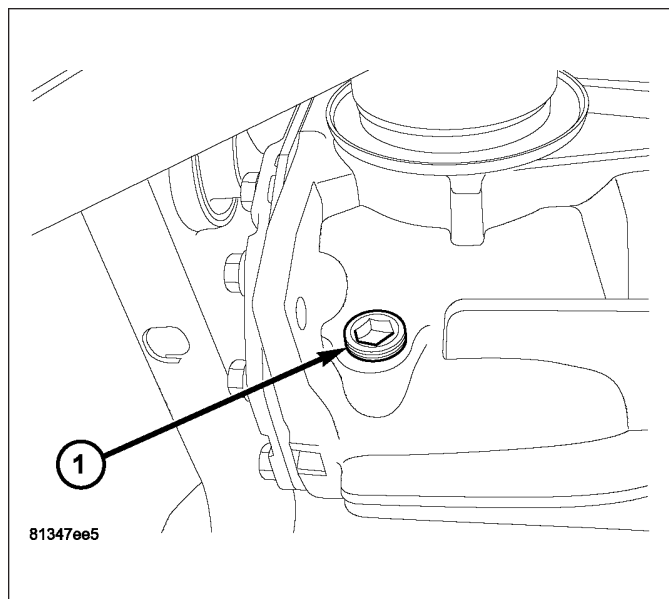
7.

## REMOVAL

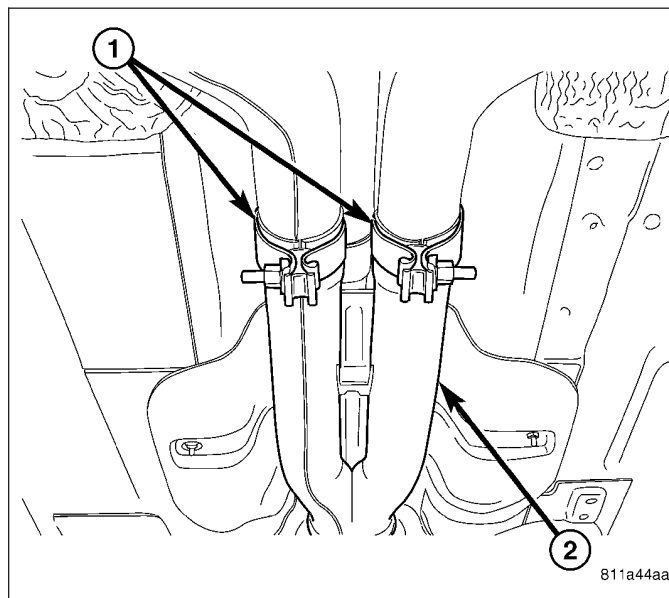
**Note:** This procedure requires the compression of the rear suspension to ride height. A drive-on hoist should be used. If a drive-on hoist is not used, screw-style under-hoist jack stands are required to compress the rear suspension, facilitating rear halfshaft removal.

**CAUTION:** Never grasp halfshaft assembly by the inner or outer boots. Doing so may cause the boot to pucker or crease, reducing the service life of the boot and joint. Avoid over angulating or stroking the C/V joints when handling the halfshaft.

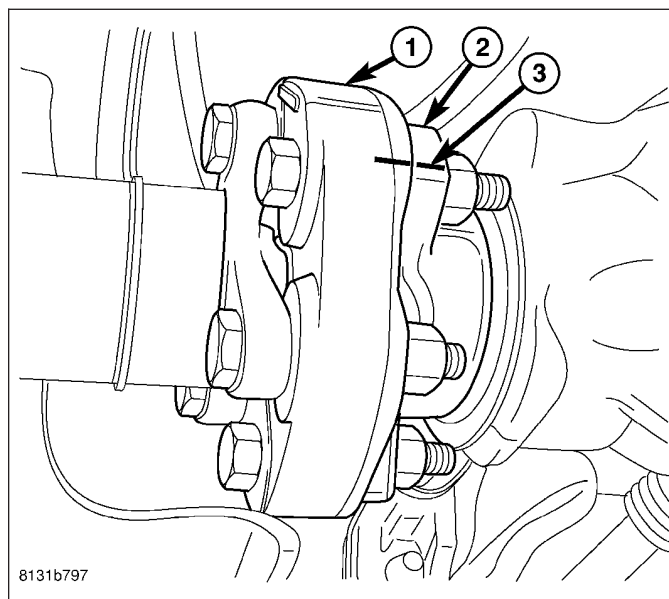
1. With vehicle in neutral, position and raise vehicle on hoist.
2. Using 14mm hex, remove axle drain plug (1) and drain rear axle fluid into container suitable for fluid reuse.
3. Install drain plug (1) and torque to 50 N·m (37 ft. lbs.) torque.



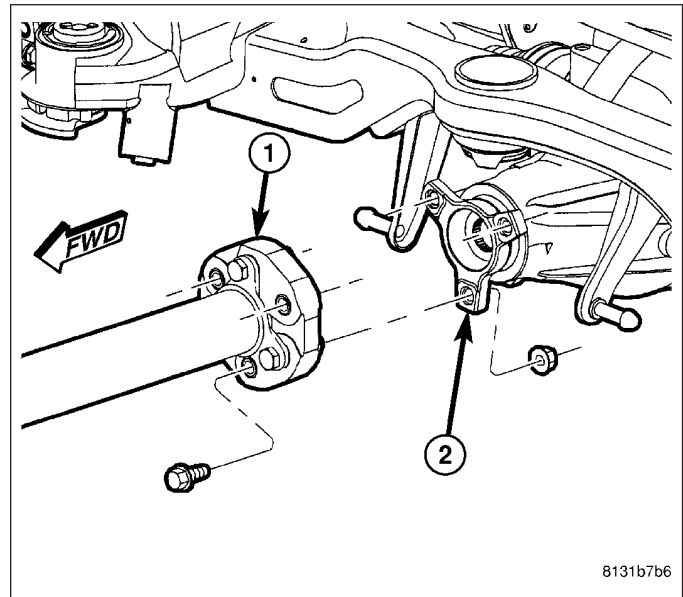
4. Remove rear exhaust system (2) on dual-outlet exhaust models.



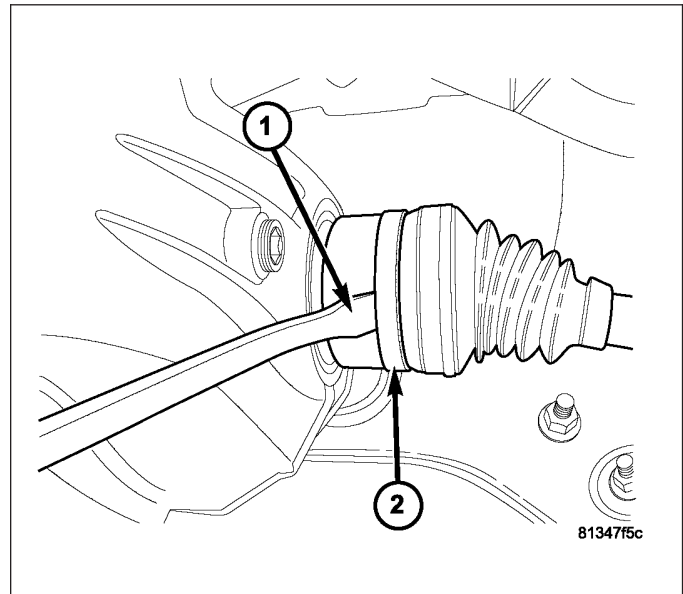
5. Apply alignment index marks (3) to the propeller shaft rubber coupler (1) and axle flange (2).



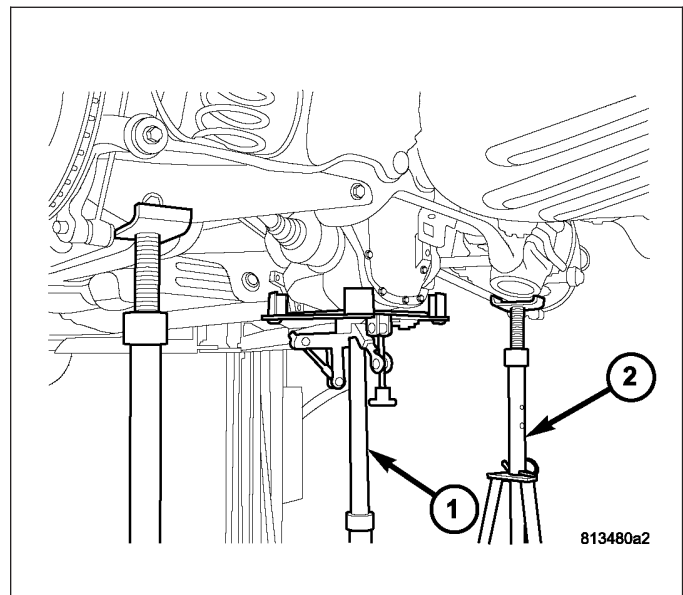
6. Remove three (3) propeller shaft coupler-to-axle flange bolt/nuts.



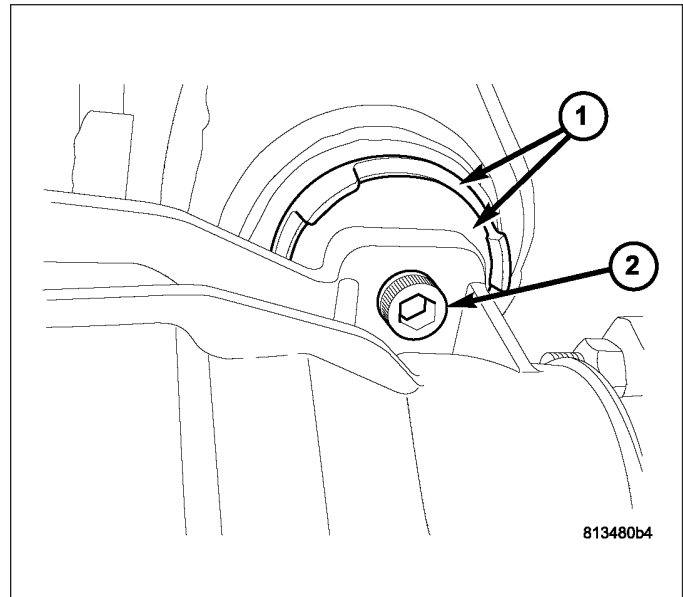
7. Using suitable screwdriver (1), partially disengage halfshaft(s) (2) from axle assembly.



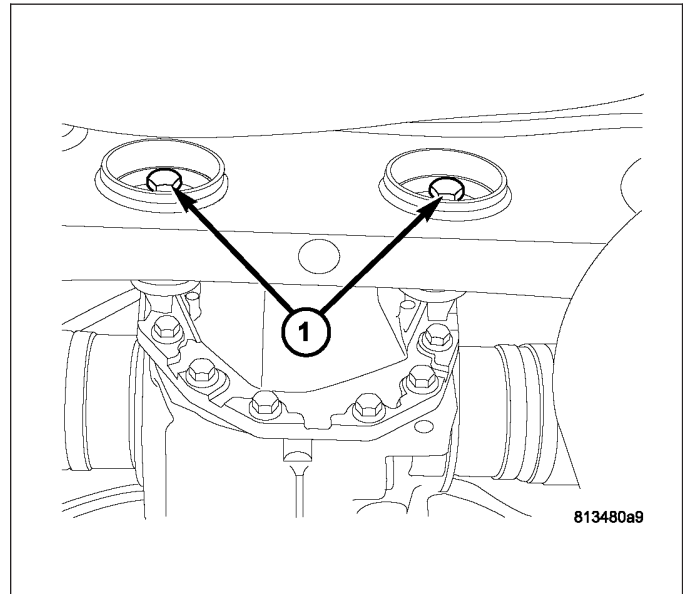
8. If a drive-on hoist is used, position transmission jack(1) to rear axle assembly. If a drive-on hoist is not used, compress rear suspension using screw-style under-hoist jack stands (2), then position transmission jack to rear axle assembly.



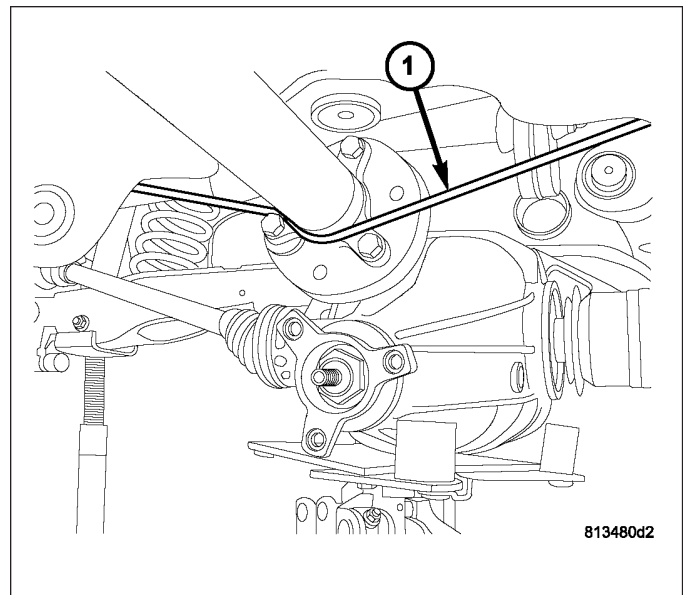
9. Remove rear axle forward mount isolator (1) bolt/nut (2).



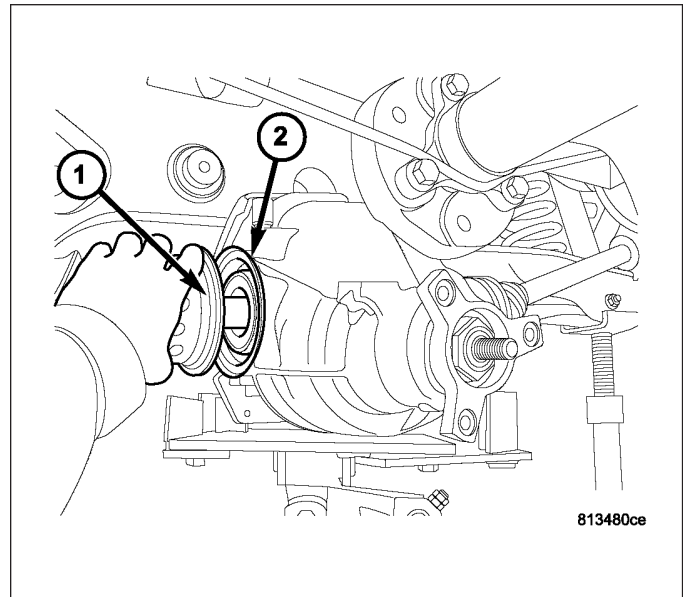
10. Remove two rear axle-to-crossmember bolts (1).



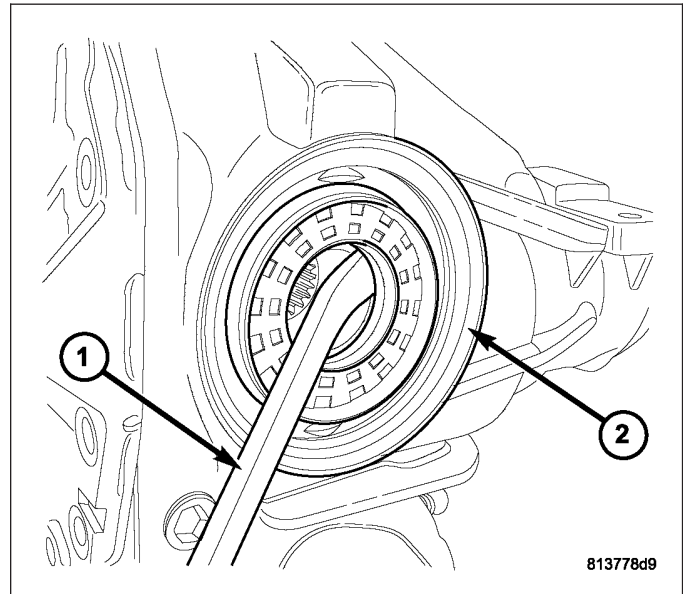
11. Carefully lower rear axle. While lowering axle, separate propeller shaft from axle and support with suitable rope or wire (1).



12. Lower axle just enough to remove both halfshafts one at a time. Shift axle assembly in one direction, compressing one halfshaft while removing the other (1). Use caution to protect axle seal and journal.

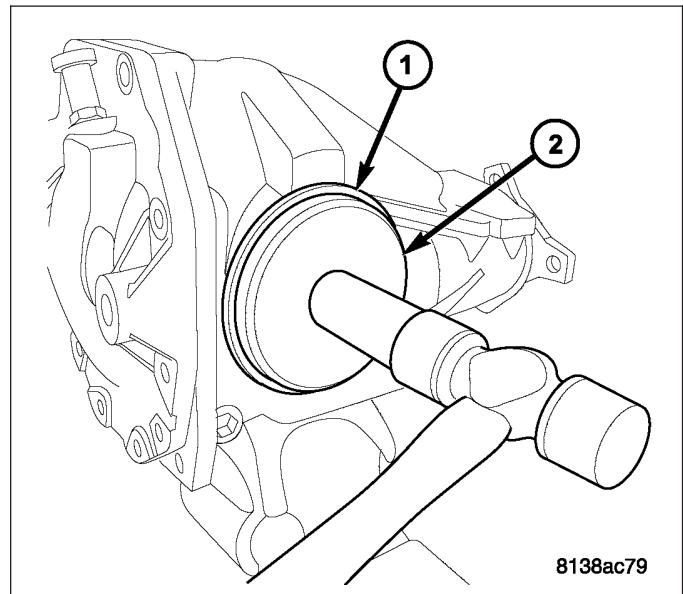


13. Remove axle assembly from vehicle and transfer to bench.
14. Using suitable screwdriver, remove axle seals and discard.

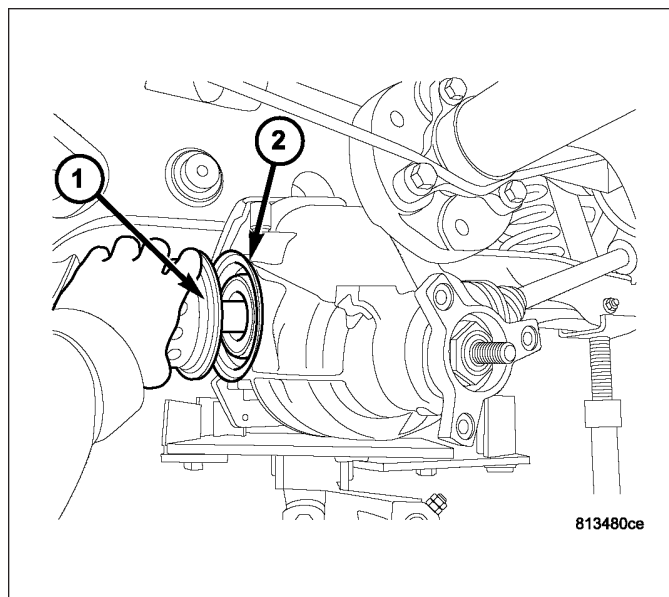


## INSTALLATION

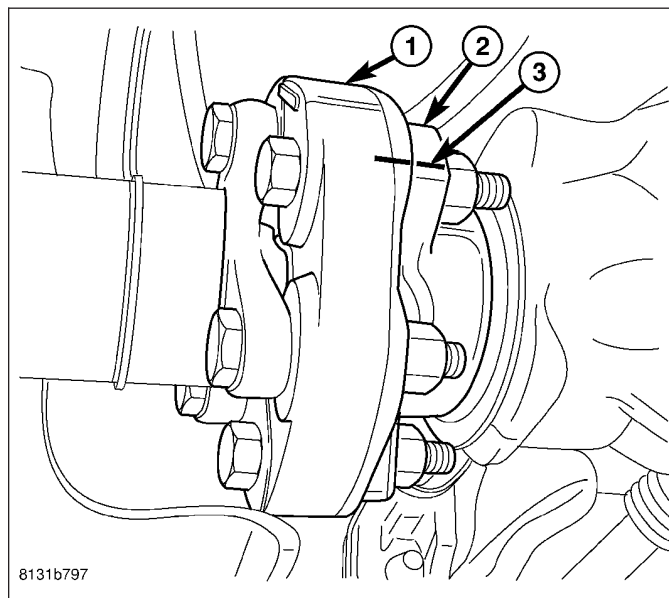
1. Install new axle seal(s) (1) using Tool 9223 (2).



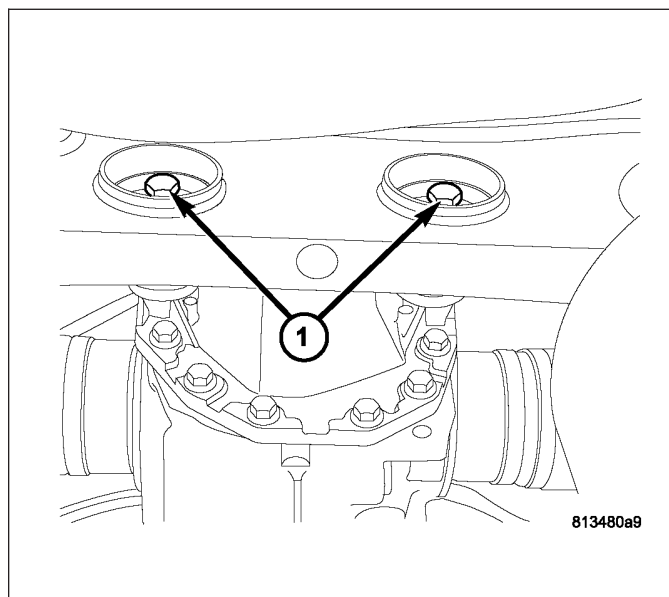
2. Using new circlip(s), install halfshaft (1) to rear axle assembly. Use care not to damage axle seals(2). Verify proper installation by pulling outward on joint by hand.



3. Raise rear axle assembly into position. Align propeller shaft index marks (3) and start propeller shaft coupler-to-axle bolt/nuts by hand.

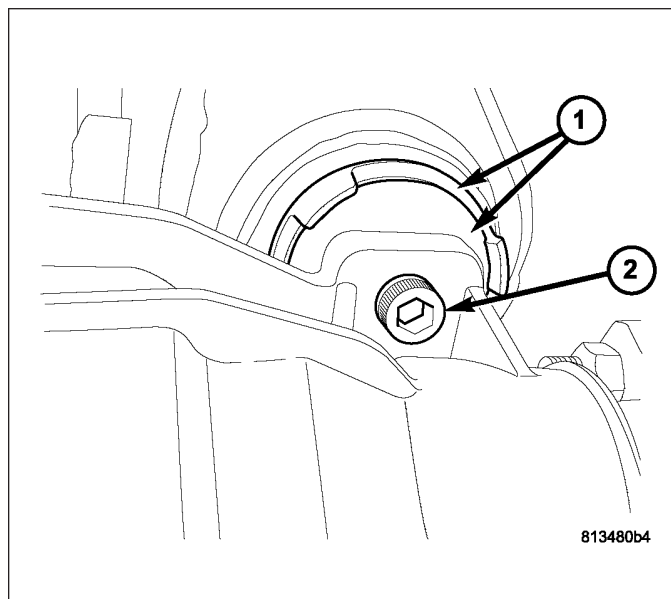


4. Install two rear axle-to-crossmember bolts (1) and torque to 220 N·m (162 ft. lbs.).

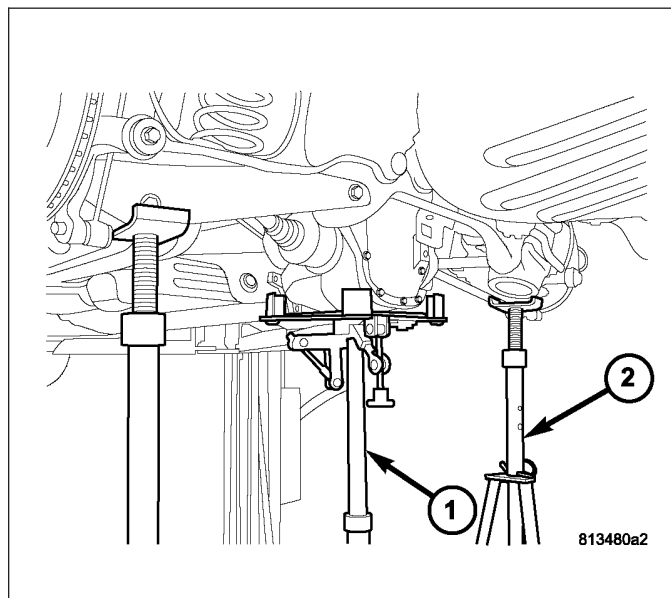




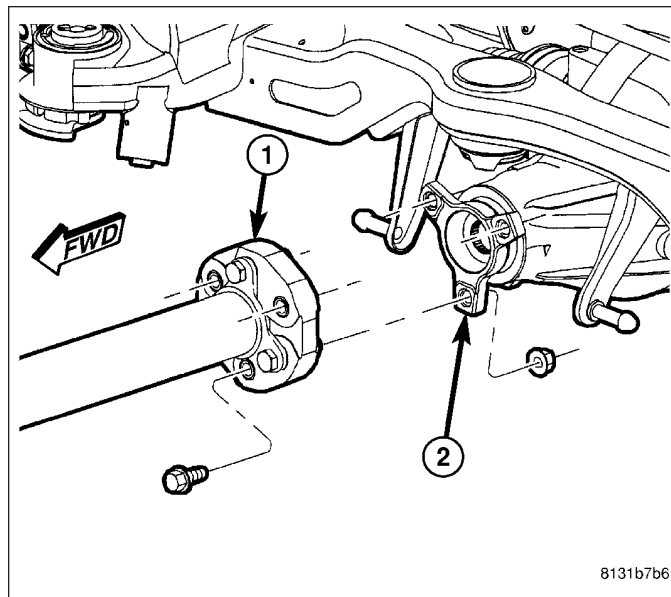
5. Install rear axle front mount isolator (1) as shown and torque bolt/nut to 65 N·m (48 ft. lbs.).



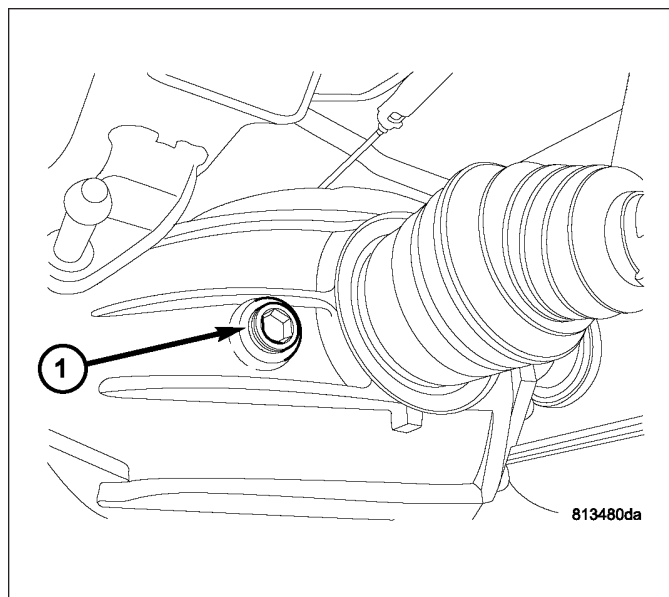
6. Again verify halfshaft inner joints are fully engaged to axle assembly.  
7. Remove transmission jack (1).  
8. If used, remove screw-type under-hoist jack stands (2).



9. Torque propeller shaft coupler-to-axle flange bolt/nuts to 58 N·m (43 ft. lbs.).



10. Using a 14mm hex, remove rear axle fill plug (1). Fill axle with 1.6L (1.7 qts.) of Mopar® 75W-140 Synthetic Gear & Axle Lubricant. Install fill plug and torque to 50 N·m (37 ft. lbs.).

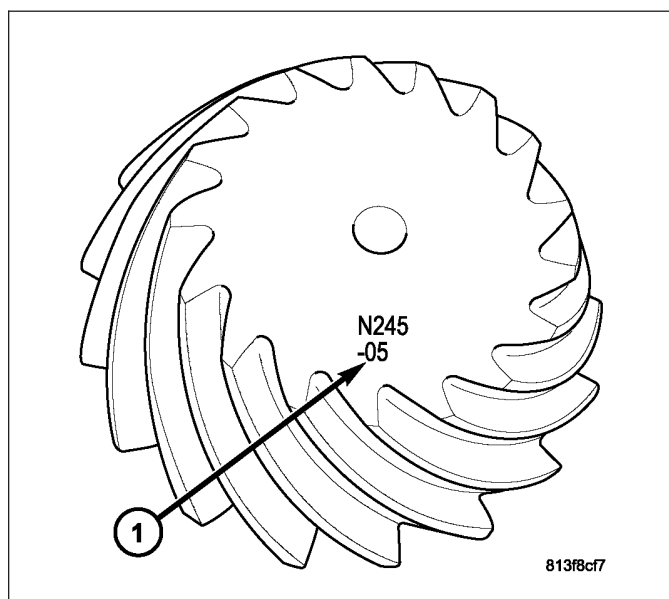


## ADJUSTMENTS

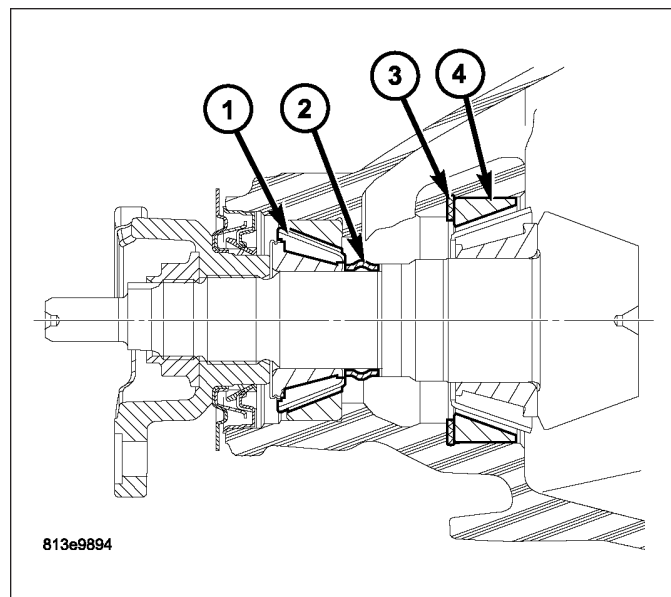
### ADJUSTMENT - PINION DEPTH MEASUREMENT

#### PINION DEPTH VARIANCE

Ring gear and pinion are supplied as matched sets. Identifying numbers for the ring gear and pinion are etched into the pinion gear face. A plus (+) number, minus (–) number or zero (0) along with the gear set sequence number (01 to 99) is on each gear. The pinion depth variance (1) is the amount the depth varies from the standard depth setting of a pinion marked with a zero. The remaining numbers are the sequence number of the gear set. The standard depth provides the best gear tooth contact pattern.



Compensation for pinion depth variance is achieved with select shims. The shims (3) are sandwiched between the pinion head bearing cup and axle housing.



**Pinion Depth Shim and Collapsible Washer**

If installing a new gear, note the depth variance number of the original and replacement pinion. Add or subtract this number from the original depth shim to compensate for the difference in the depth variances. The numbers represent deviation from the standard in microns. If the number is negative, subtract that value to the required thickness of the depth shims. If the number is positive, subtract that value from the thickness of the depth shim.

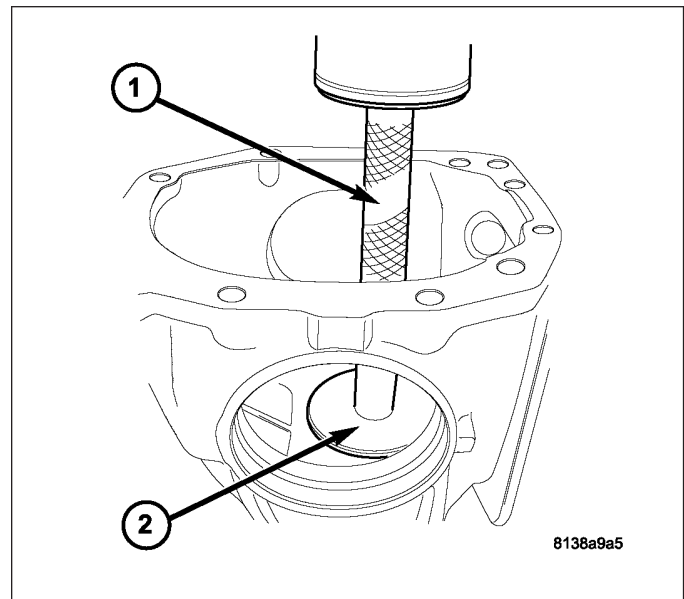
#### PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	-04	-03	-02	-01	00	+01	+02	+03	+04
<b>+04</b>	-0.08	-0.07	-0.06	-0.05	-0.04	-0.03	-0.02	-0.01	0
<b>+03</b>	-0.07	-0.06	-0.05	-0.04	-0.03	-0.02	-0.01	0	+0.01
<b>+02</b>	-0.06	-0.05	-0.04	-0.03	-0.02	-0.01	0	+0.01	+0.02
<b>+01</b>	-0.05	-0.04	-0.03	-0.02	-0.01	0	+0.01	+0.02	+0.03
<b>00</b>	-0.04	-0.03	-0.02	-0.01	0	+0.01	+0.02	+0.03	+0.04
<b>-01</b>	-0.03	-0.02	-0.01	0	+0.01	+0.02	+0.03	+0.04	+0.05
<b>-02</b>	-0.02	-0.01	0	+0.01	+0.02	+0.03	+0.04	+0.05	+0.06
<b>-03</b>	-0.01	0	+0.01	+0.02	+0.03	+0.04	+0.05	+0.06	+0.07
<b>-04</b>	0	+0.01	+0.02	+0.03	+0.04	+0.05	+0.06	+0.07	+0.08

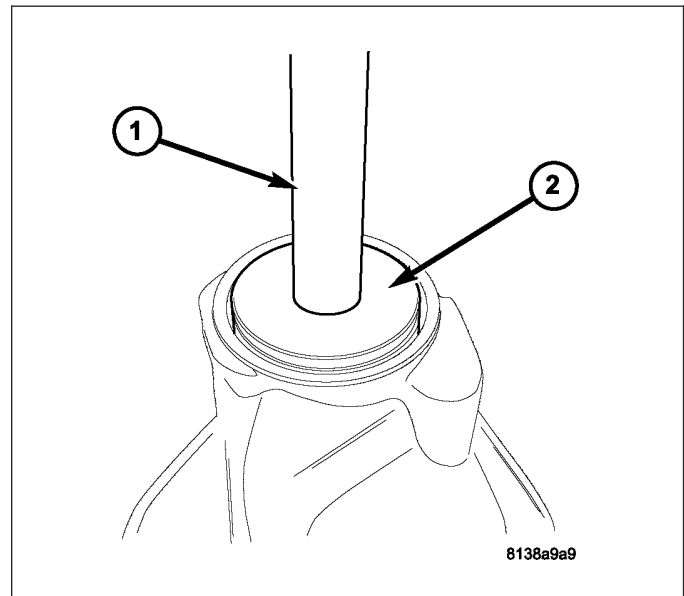
#### PINION DEPTH MEASUREMENT

Pinion depth measurement is taken with the pinion head and tail bearing cups pressed into the axle housing without the shim.

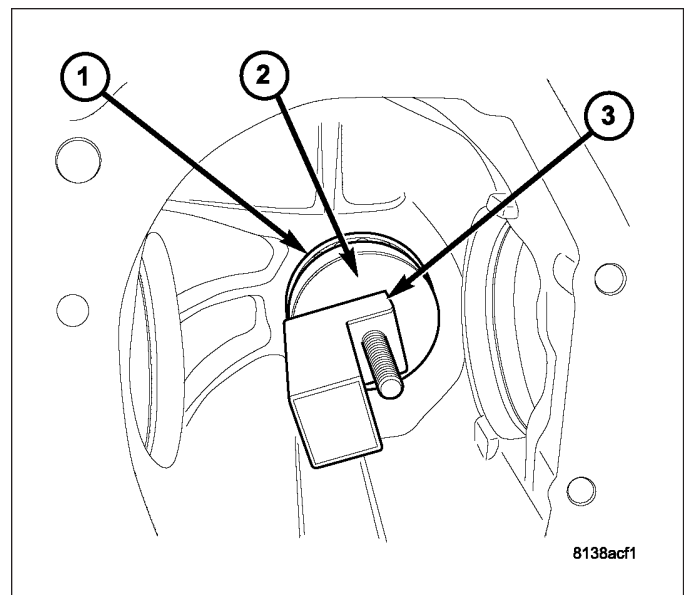
1. Press pinion head bearing cup into housing using Tools C-4171 (1) and C-4310 (2).



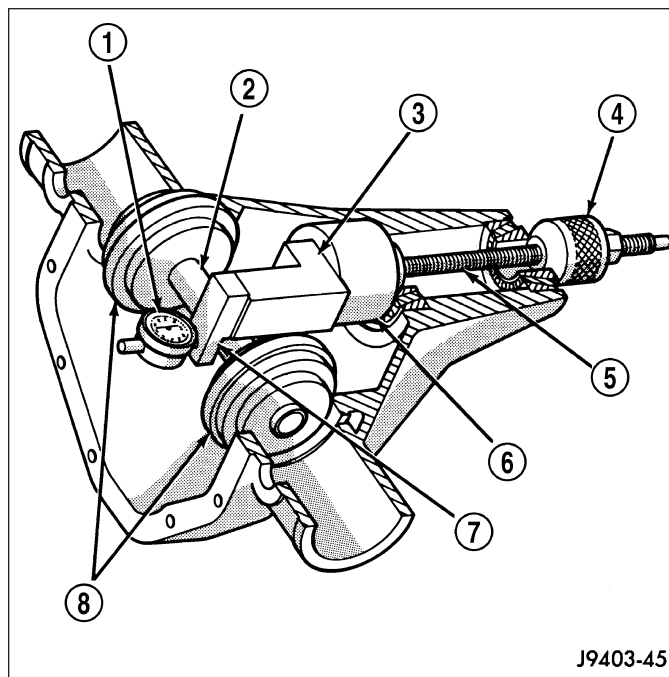
2. Press pinion tail bearing cup into housing using Tools C-4171 (1) and D-146 (2).



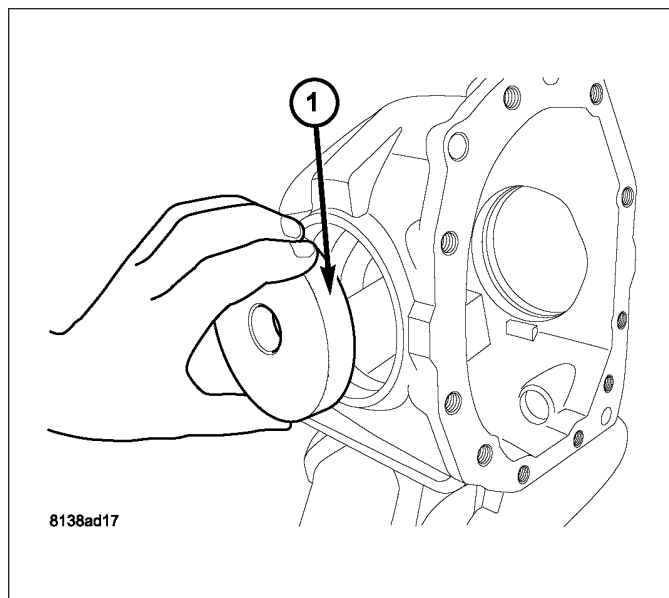
3. Install Pinion Height Block 6739 (3), Pinion Gage Block 9085 (2), and pinion head bearing cone (1) onto Screw 6741. Install assembly into axle housing and through bearing cups.



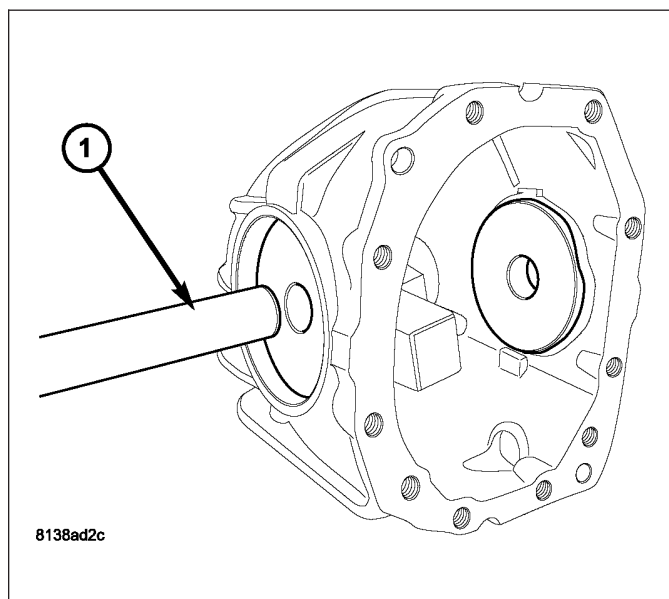
4. Install pinion tail bearing and Cone 6740 (4). Tighten Cone 6740 by hand until 3.4 N·m (30 in. lbs.) of rotating torque is measured at Screw 6741 (5).



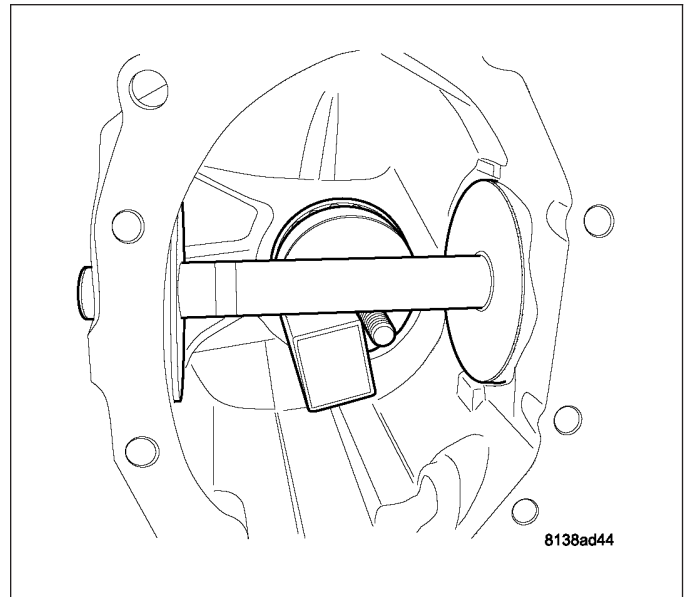
5. Install Arbor Discs 9083 (1).



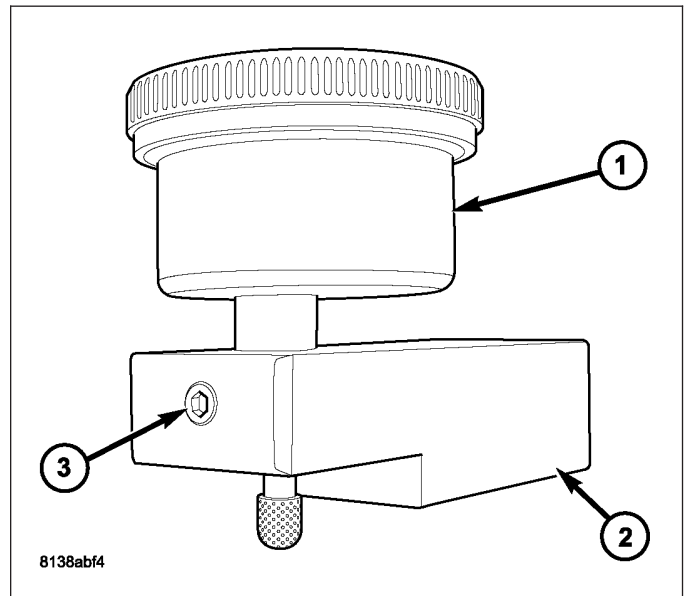
6. Install Arbor Bar D-115-3 (1).



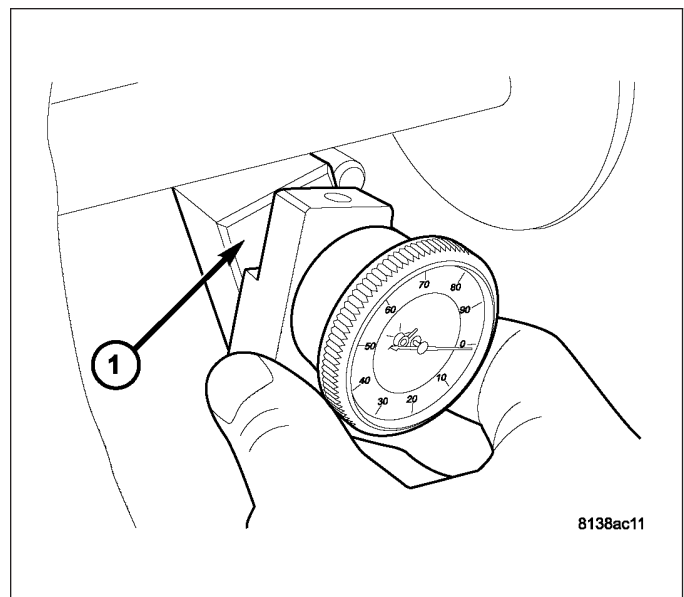
7. Verify pinion depth setup is as shown.



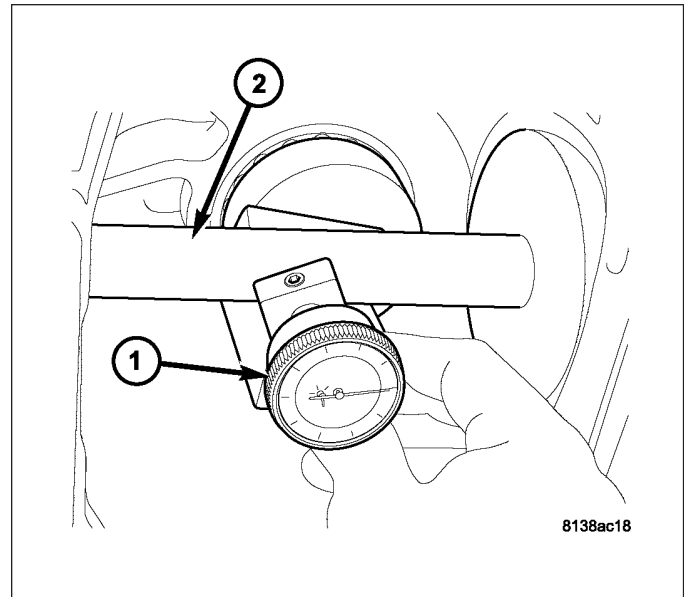
8. Install Dial Indicator 9524 (1) to Scooter Block D-115-2A (2). Secure with set-screw (3).



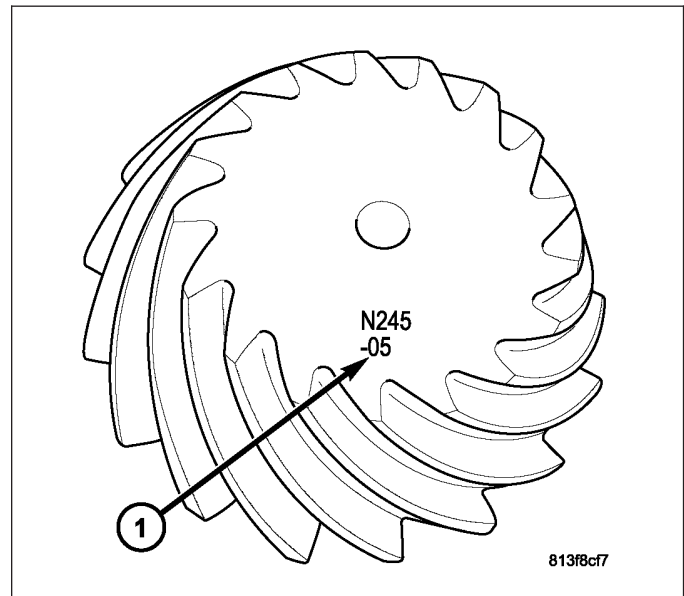
9. Install Indicator/Block assembly to top of Height Block 6739 (1). Zero indicator on top surface.



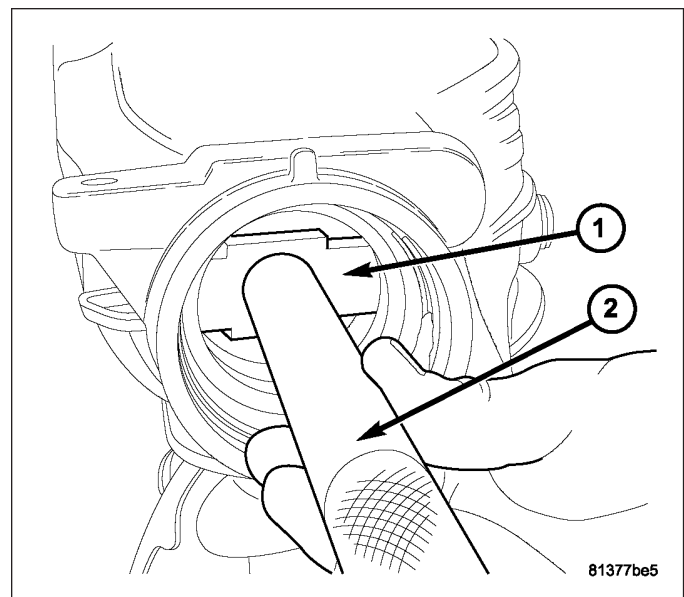
10. Slide indicator probe off of height block and onto Arbor Bar D-115-3 (2). As indicator contacts Arbor Bar (2), indicator needle will rotate clockwise. Continue moving indicator probe to the crest of the arbor bar and record the highest reading.



11. Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number etched into the pinion face (1). For example, if the depth variance is  $-01$ , subtract 0.01mm (0.0004 in.) from dial indicator reading.



12. Using Tool C-4171 (2) and Remover 9084 (1), drive out pinion head bearing cup and insert specified shim.



## ADJUSTMENT — SIDE BEARING PRELOAD AND RING GEAR BACKLASH

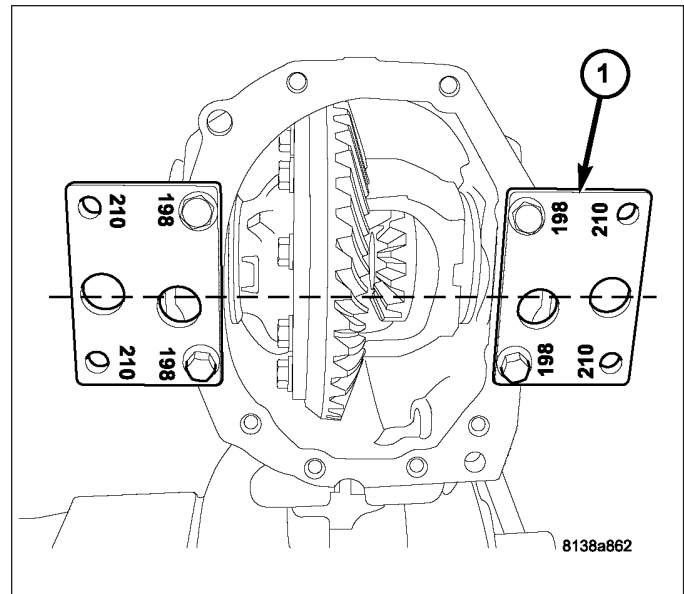
### DIFFERENTIAL SIDE BEARING PRELOAD MEASUREMENT/CORRECTION

Differential side bearing preload should be measured and adjusted after the following scenarios:

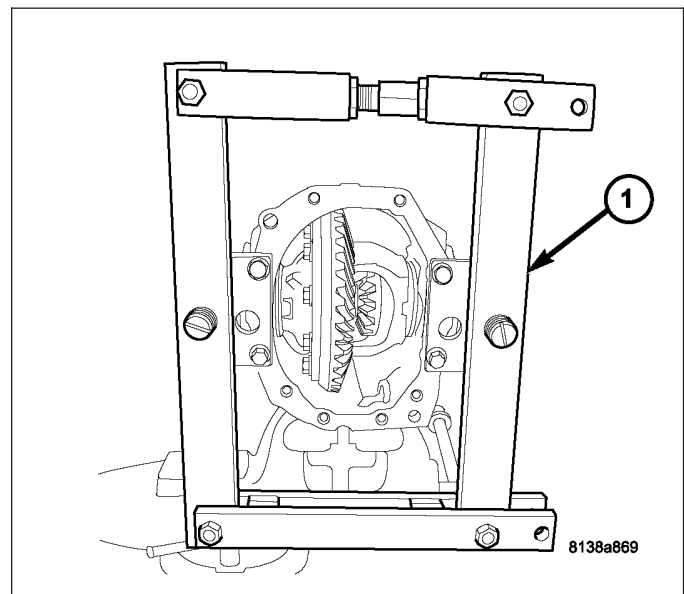
- Differential case replacement
- Differential side bearing replacement
- Axle housing replacement
- Loss or replacement of side bearing snap rings

If none of these situations apply, refer to Adjustment — Ring Gear Backlash

1. Install Spreader Adapter Plates 9226 (1).



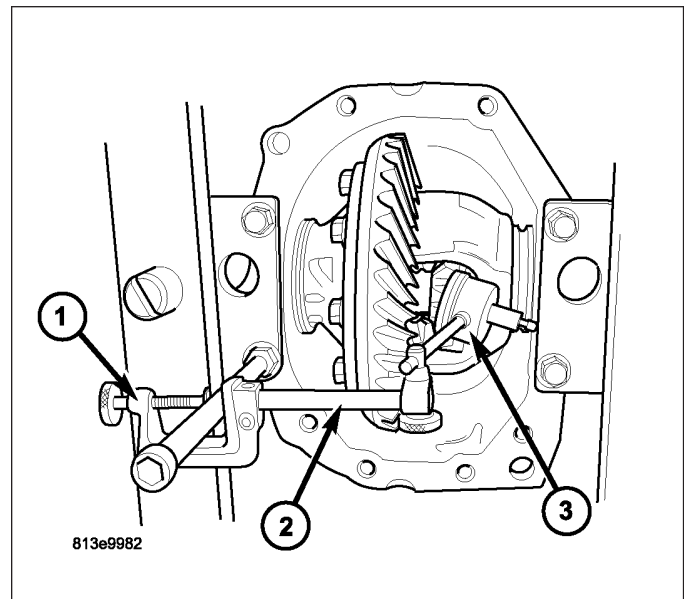
2. Mount axle housing to Spreader W-129-B (1)



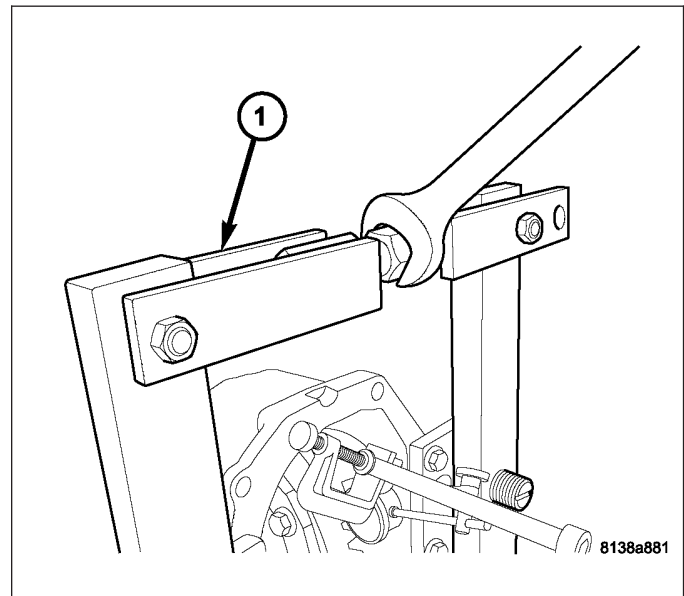


3. Set up Dial Indicator Set C-3339-A as shown to measure axle housing spread:

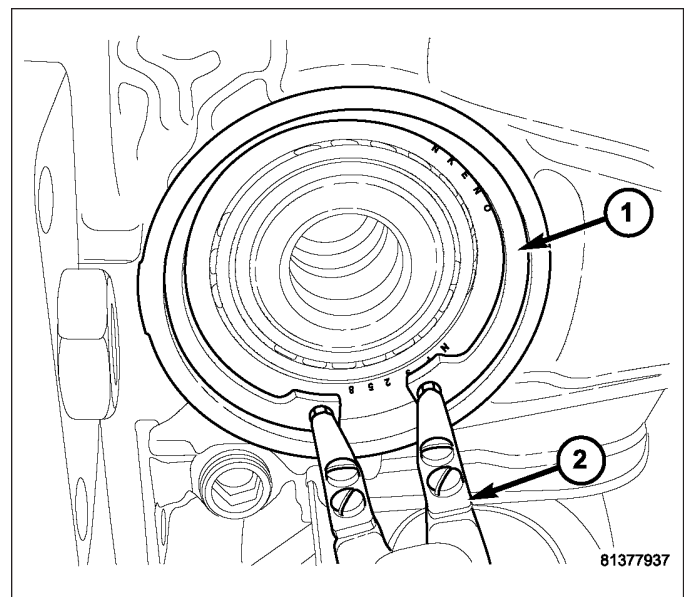
- a. Clamp SP-5426 (1)
- b. Post SP-5425-B (2)
- c. Metric Dial Indicator 9524 (3)



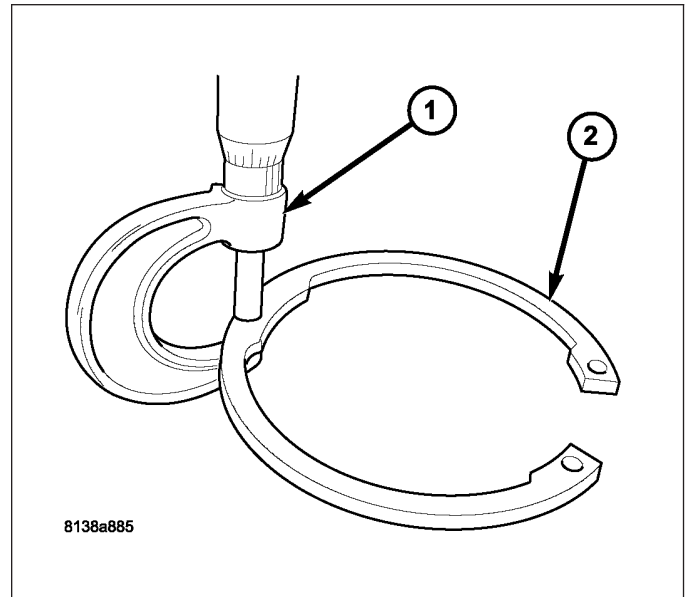
4. If differential side bearing cups and snap rings are already removed at this point, skip to Step 8. Otherwise, expand spreader (1) to spread axle housing no more than 0.30 mm (0.012 in.).



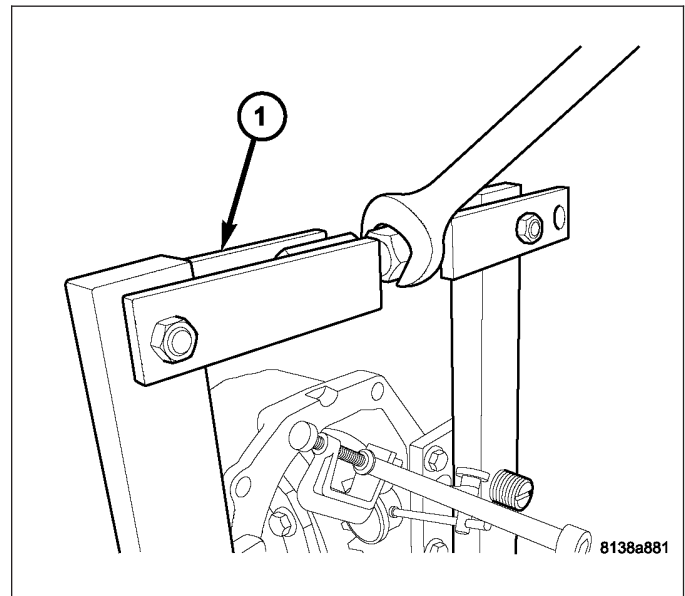
5. Remove both differential side bearing snap rings (1). Tag snap ring to ensure replacement to original position.



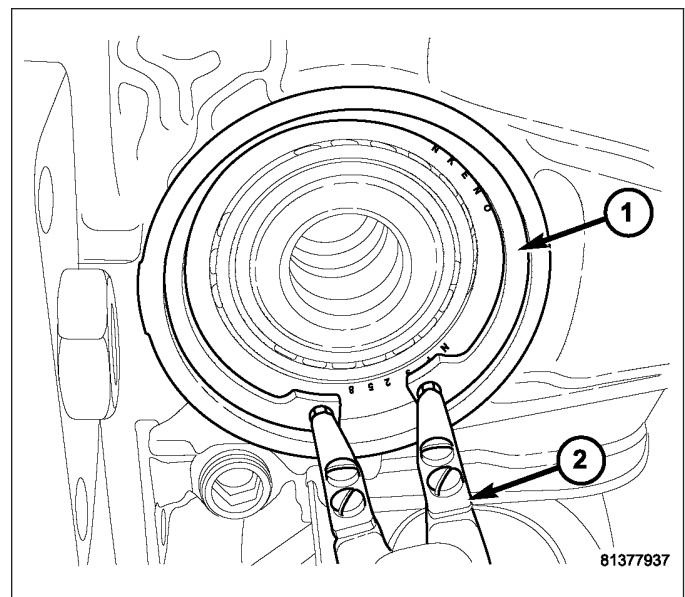
6. Measure and record snap ring (2) thickness for later use.



7. Relax spreader (1) to relieve tension on axle housing.

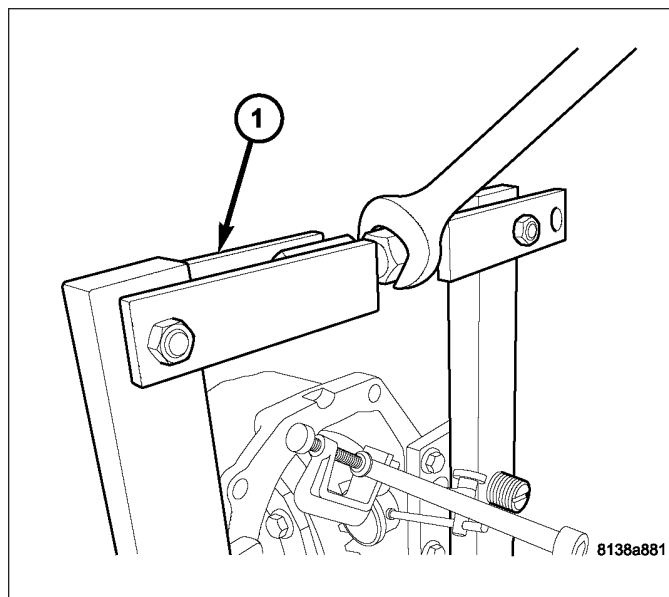


8. Install right (pinion) side bearing cup and snap ring (1).

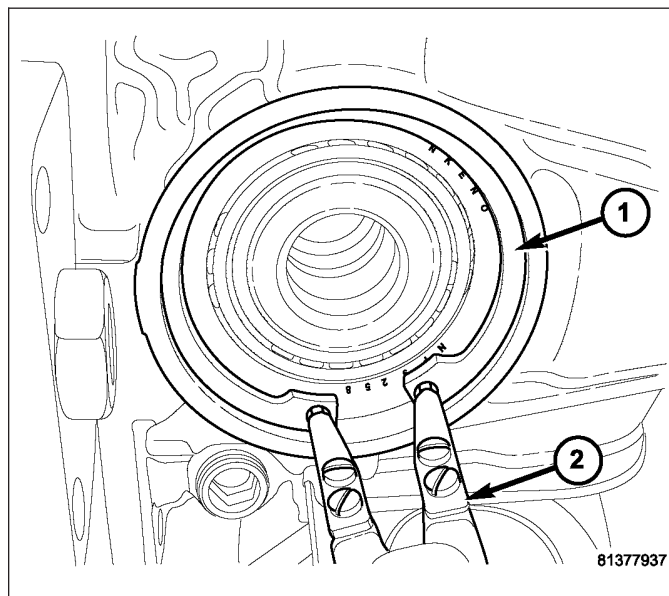


9. Zero dial indicator.

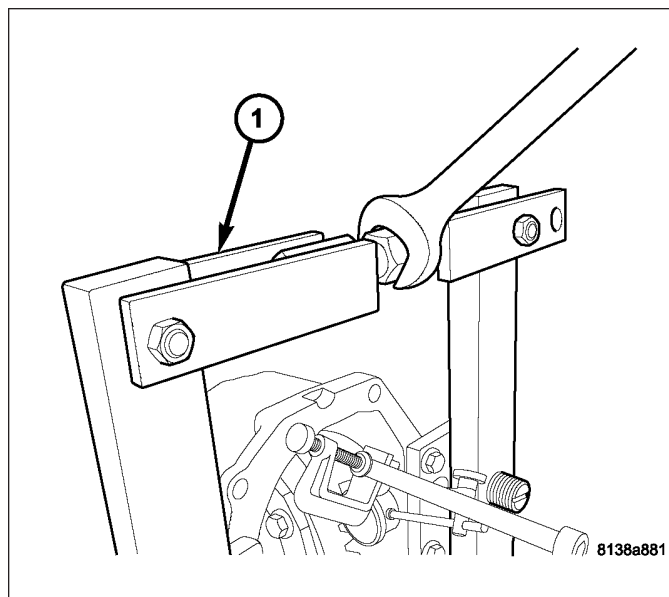
10. Expand spreader (1) to spread axle housing no more than 0.30 mm (0.012 in.).



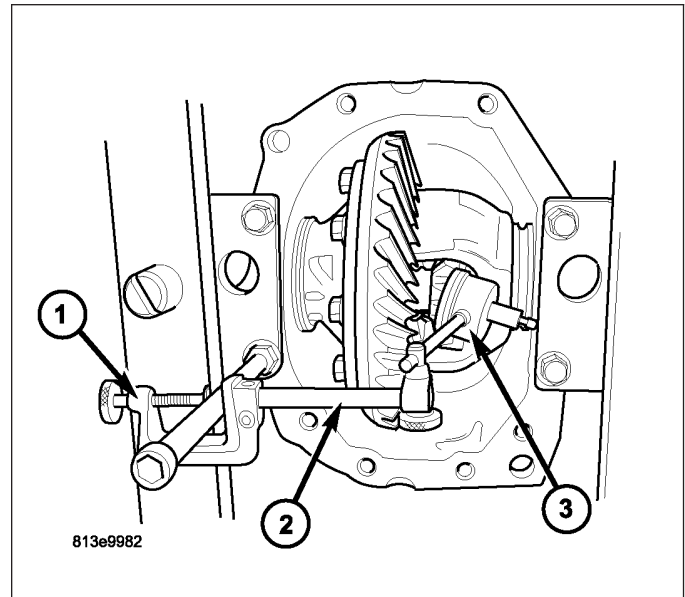
11. Install left (ring gear) side bearing cup and snap ring (1).



12. Relax spreader (1) to relieve tension on axle housing.



13. Measurement showing on indicator (3) is the axle housing retained spread. Proper differential side bearing preload is achieved with an axle housing retained spread of 0.11-0.17 mm (0.004-0.007 in.).
14. If retained spread is less than 0.11 mm (0.004 in.), increase snap ring thickness at each side in equal increments.
15. If retained spread is greater than 0.17 mm (0.007 in.), decrease snap ring thickness at each side in equal increments.



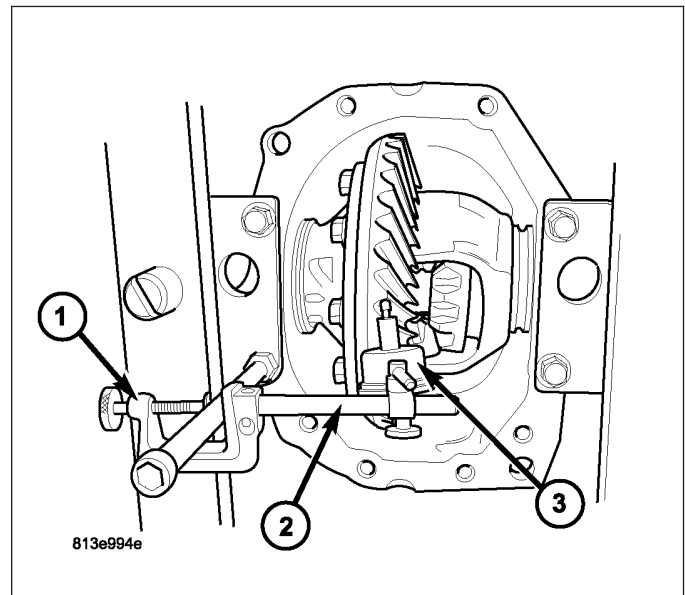
## RING GEAR BACKLASH MEASUREMENT/CORRECTION

Differential Ring Gear Backlash should be measured and adjusted after the following scenarios:

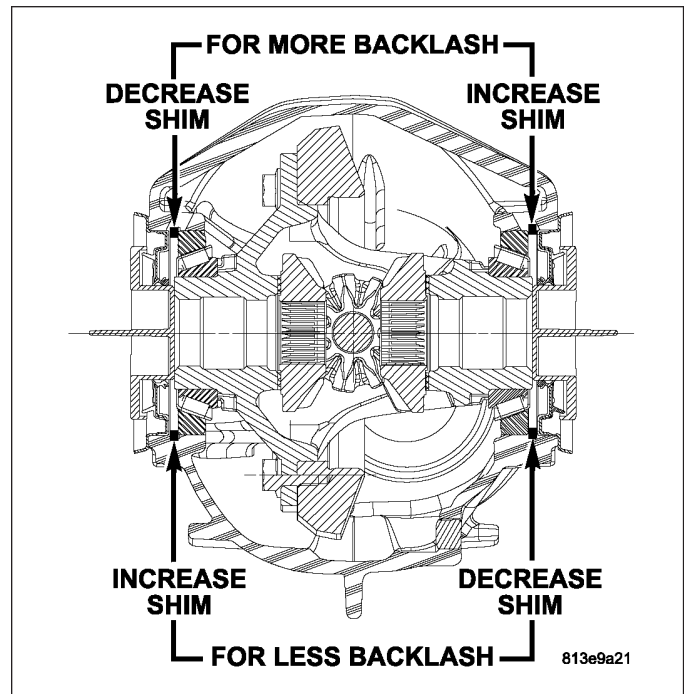
1. Ring and pinion gear replacement
2. Pinion head bearing replacement
3. Pinion depth (shim) adjustment
4. Differential case replacement
5. Differential side bearing replacement
6. Axle housing replacement

**Note: If Spreader W-129-B is installed, make sure tension on axle housing is relieved.**

7. Set up Dial Indicator Set C-3339-A as shown to measure ring gear backlash:
  - a. Clamp SP-5426 (1)
  - b. Post SP-5425-B (2)
  - c. Metric Dial Indicator 9524 (3)
8. Rotate ring gear one direction to take up clearance to pinion. Verify indicator tip is in contact with ring gear and zero indicator. Rotate ring gear back and forth and record measurement. Ring gear backlash should be 0.10-0.16 mm (0.004-0.006 in.). Verify back lash measurement in four (4) positions.



9. If backlash measurement is less than 0.10 mm (0.004 in.), it is necessary to decrease the snap ring thickness on the ring gear (left) side, and increase the thickness on the pinion (right) side.
10. If backlash measurement is greater than 0.16 mm (0.006 in.), it is necessary to increase the snap ring thickness on the ring gear (right) side, and decrease the thickness on the pinion (left) side.

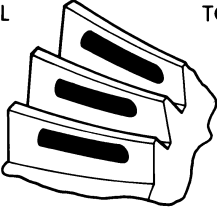
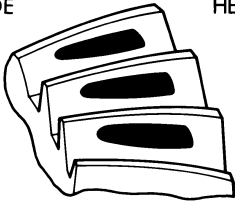

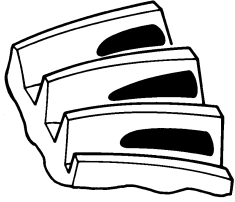

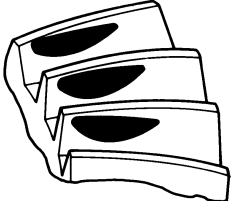
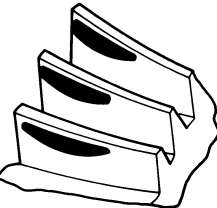
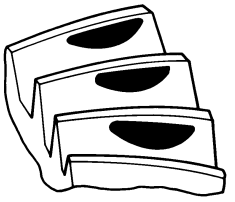
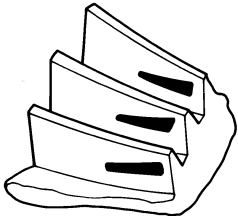
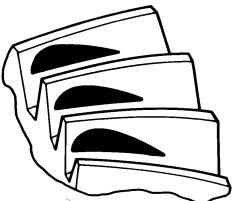


## GEAR CONTACT PATTERN

The ring gear and pinion teeth contact patterns will show if the pinion depth is correct in the housing. It will also show if the ring gear backlash has been adjusted correctly. The backlash can be adjusted within specifications to achieve desired tooth contact patterns.

1. Apply a thin coat of hydrated ferric oxide or equivalent to the drive and coast side of the ring gear teeth.
2. Wrap, twist, and hold a shop towel around the pinion yoke to increase the turning resistance of the pinion. This will provide a more distinct contact pattern.
3. With a boxed end wrench on a ring gear bolt, rotate the differential case one complete revolution in both directions while a load is being applied from shop towel.

The areas on the ring gear teeth with the greatest degree of contact against the pinion teeth will squeegee the compound to the areas with the least amount of contact. Note and compare patterns on the ring gear teeth to Gear Tooth Contact Patterns chart and adjust pinion depth and gear backlash as necessary.

<p>DRIVE SIDE OF RING GEAR TEETH</p> <p>HEEL                      TOE</p> 	<p>COAST SIDE OF RING GEAR TEETH</p> <p>TOE                      HEEL</p> 	<p>DESIRABLE CONTACT PATTERN. PATTERN SHOULD BE CENTERED ON THE DRIVE SIDE OF TOOTH. PATTERN SHOULD BE CENTERED ON THE COAST SIDE OF TOOTH, BUT MAY BE SLIGHTLY TOWARD THE TOE. THERE SHOULD ALWAYS BE SOME CLEARANCE BETWEEN CONTACT PATTERN AND TOP OF THE TOOTH.</p>
		<p>RING GEAR BACKLASH CORRECT. <b>THINNER</b> PINION GEAR DEPTH SHIM REQUIRED.</p>
		<p>RING GEAR BACKLASH CORRECT. <b>THICKER</b> PINION GEAR DEPTH SHIM REQUIRED.</p>
		<p>PINION GEAR DEPTH SHIM CORRECT. <b>DECREASE</b> RING GEAR BACKLASH.</p>
		<p>PINION GEAR DEPTH SHIM CORRECT. <b>INCREASE</b> RING GEAR BACKLASH.</p>

J9003-24

## GEAR TOOTH CONTACT PATTERNS

## SPECIFICATIONS - 210 MM R11 AXLE

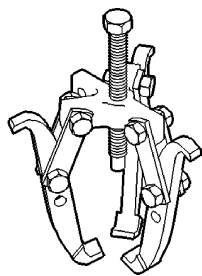
### SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Axle Ratios	2.82
Ring Gear Diameter	210 mm (8.3 in.)
Ring Gear Backlash	0.10-0.16 mm (0.004-0.006 in.)
Side Bearing Preload	6-8000 N
Axle Housing Retained Spread	0.11 mm to 0.17 mm (0.004 in. to 0.007 in.)
Select Snap Ring Size	3.60-4.50mm (0.14-0.17 in.) In 0.02mm (0.0007 in.) increments
Select Pinion Shim Size	1.40-2.50mm (0.05-0.10 in.) In 0.01mm (0.0004 in.) increments
Pinion Torque To Rotate	2.25N·m (20 in. lbs.)
Total Torque To Rotate (Approx.)	3.38N·m (30 in. lbs.)

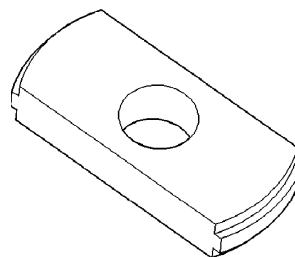
### TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Plug, Rear Axle Drain/Fill	50	37	—
Bolt, Differential Cover	50	37	—
Bolt, Ring Gear-to-Differential Case	85	63	—
Bolt, Axle Housing-to-Crossmember	220	162	—
Bolt/Nut, Axle Front Mount Isolator	65	48	—

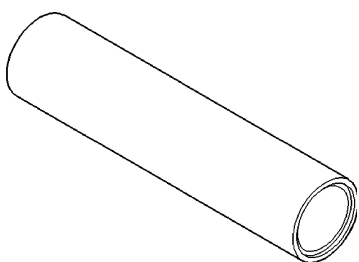
## SPECIAL TOOLS - 210 RII AXLE



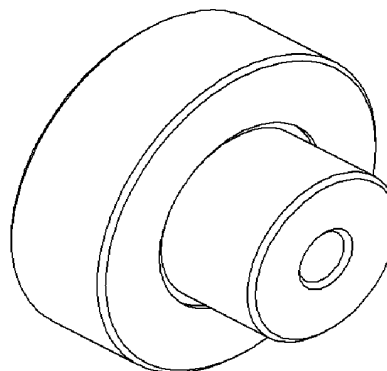
***Puller 1026***



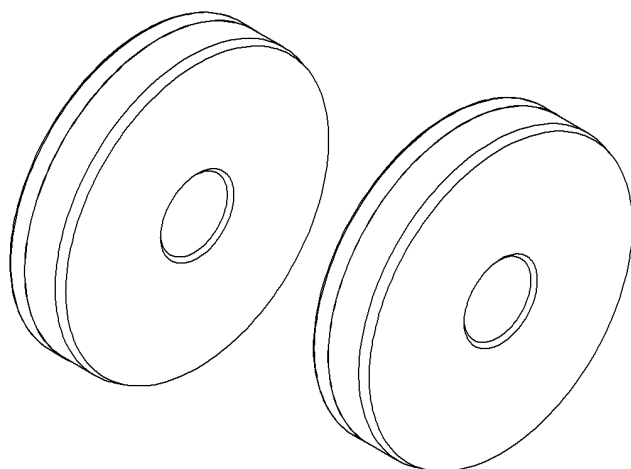
***Remover, 9084***



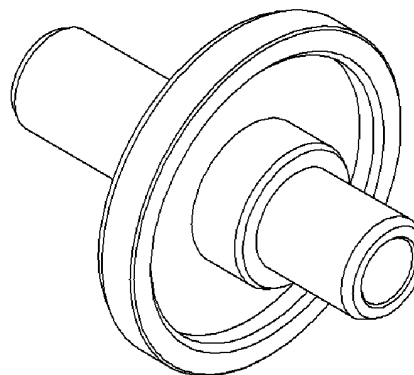
***Installer, 6448A***



***Pinion Height Gage, 9085***

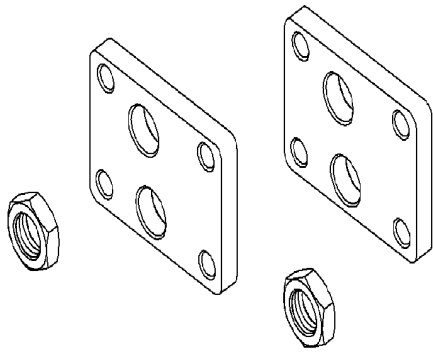


***Arbor Discs, 9083***

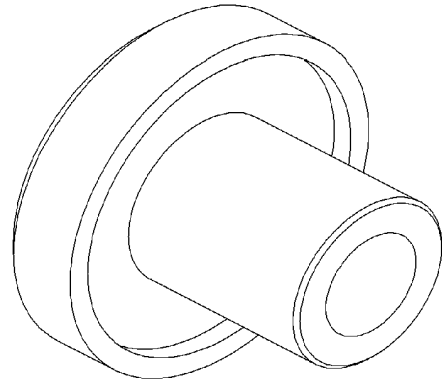


***Installer, 9223***

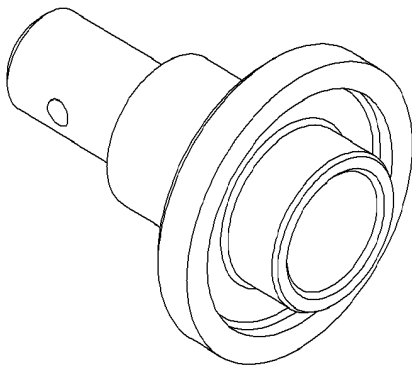




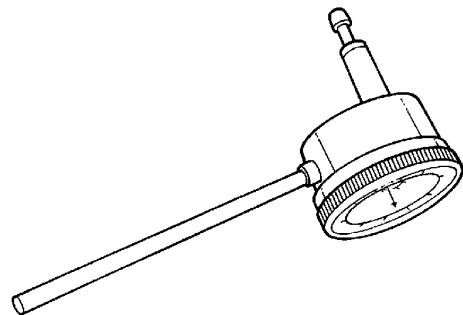
**Spreader Adapters, 9226**



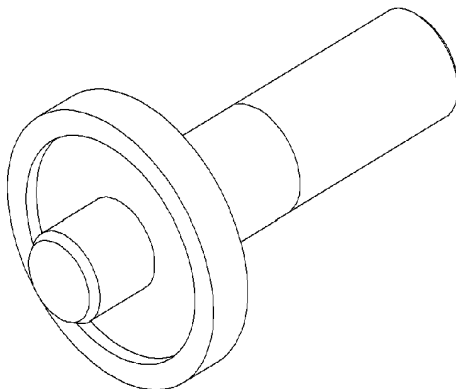
**Installer, 9523**



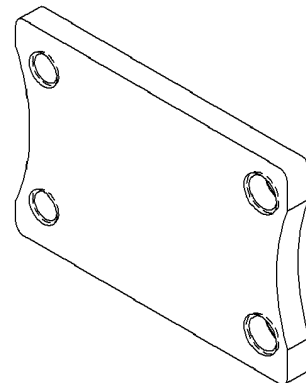
**Installer, 9231**



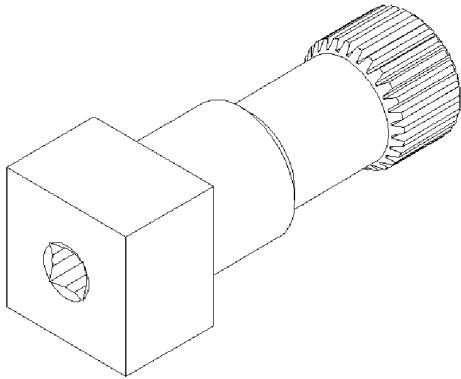
**Dial Indicator, 9524**



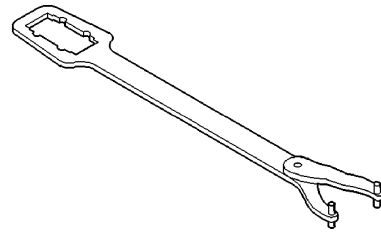
**Removal/Installation Arbor, 9522**



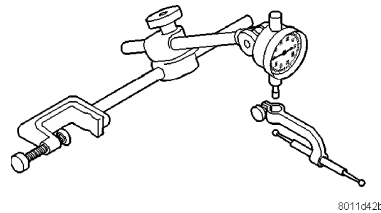
**Mounting Plate, 9630**



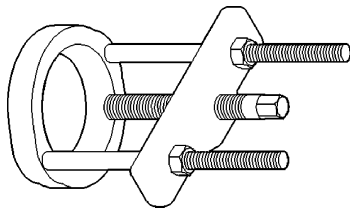
**Fixture, 9631**



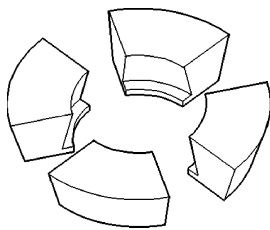
**Flange Wrench, C-3281**



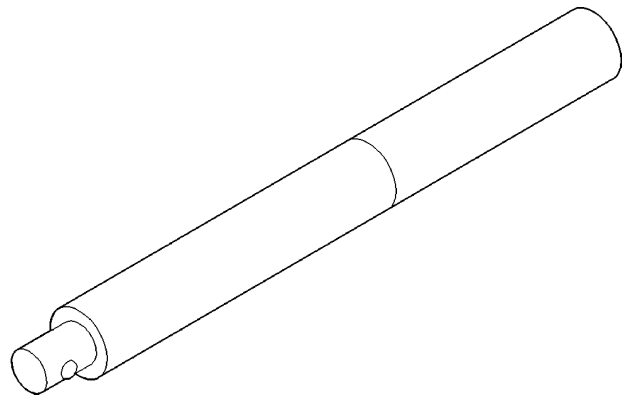
**Dial Indicator Set, C-3339-A**



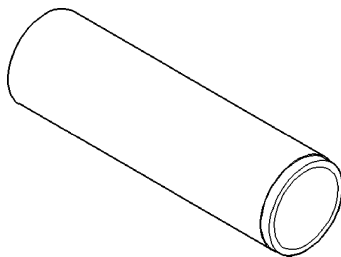
**Puller Press, C-293-PA**



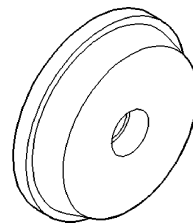
**Adapters, C-293-37**



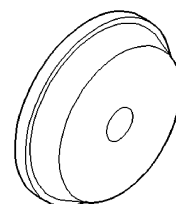
**Handle, C-4171**



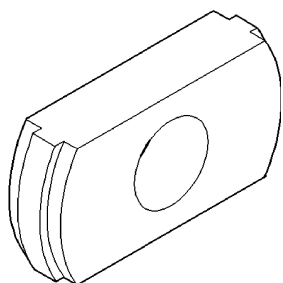
**Installer, C-3095-A**



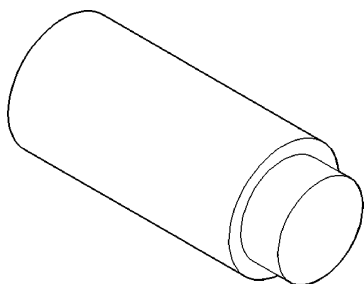
**Installer, C-4310**



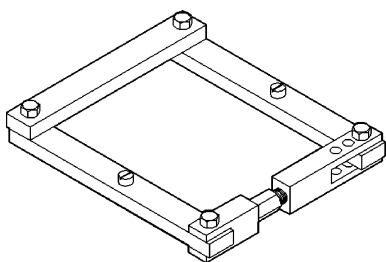
**Installer, D-146**



***Remover, D-149***



***Adapter, SP-3289***

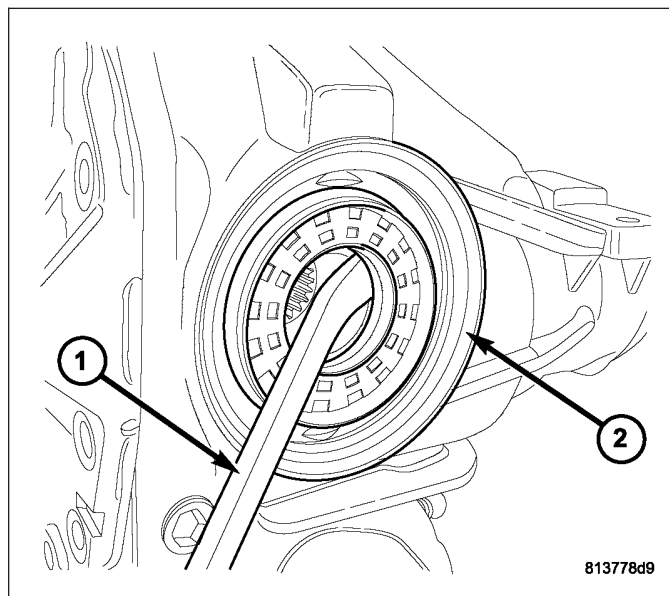


***Spreader, W-129-B***

## AXLE SHAFT SEALS

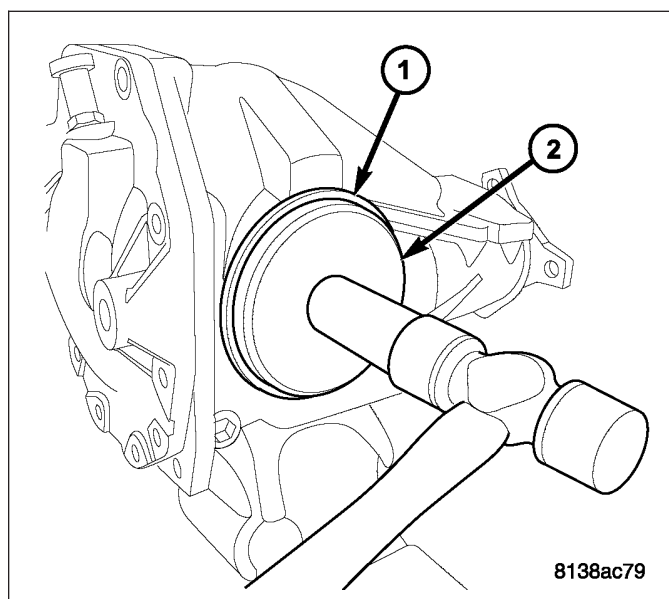
### REMOVAL

1. Remove halfshaft(s). (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - REMOVAL)
2. Using suitable screwdriver (1), remove axle shaft seal (2).
3. Visually inspect halfshaft seal journal for damage (excessive seal groove, nicks, scratches, etc. Replace halfshaft if necessary.

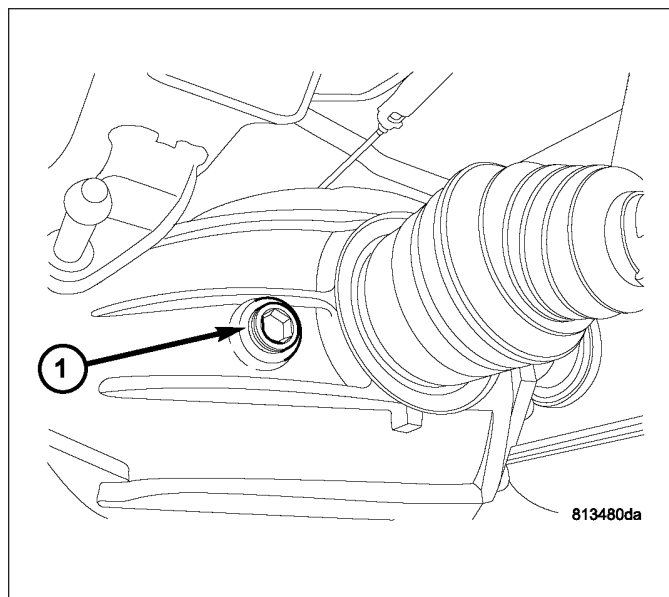


### INSTALLATION

1. Using Tool 9223 (2), install **NEW** axle shaft seal (1). Lubricate the inside diameter with Mopar® Gear and Axle Lubricant 75W-140 to protect seal during halfshaft installation.
2. Install halfshaft(s). (Refer to 3 - DIFFERENTIAL & DRIVELINE/HALF SHAFT - INSTALLATION)



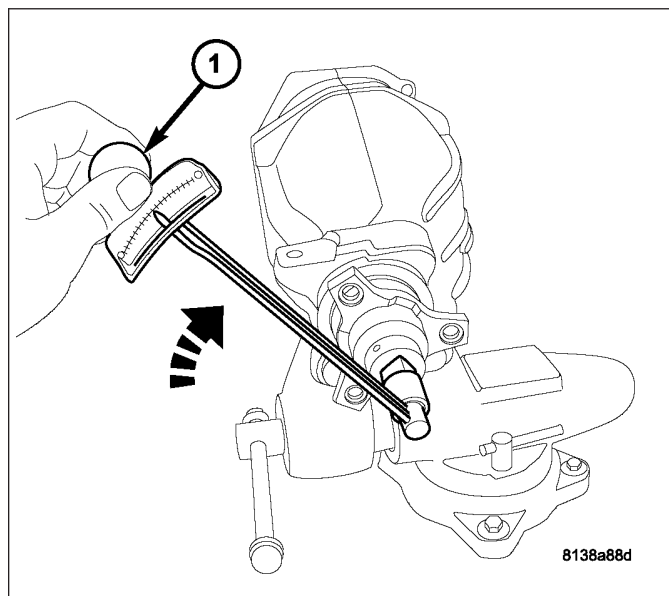
3. Remove fill plug (1) to check and adjust rear axle fluid level. Top off axle with Mopar® Gear and Axle Lubricant 75W-140. Reinstall fill plug and torque to 50 N·m (37 ft. lbs.) torque.



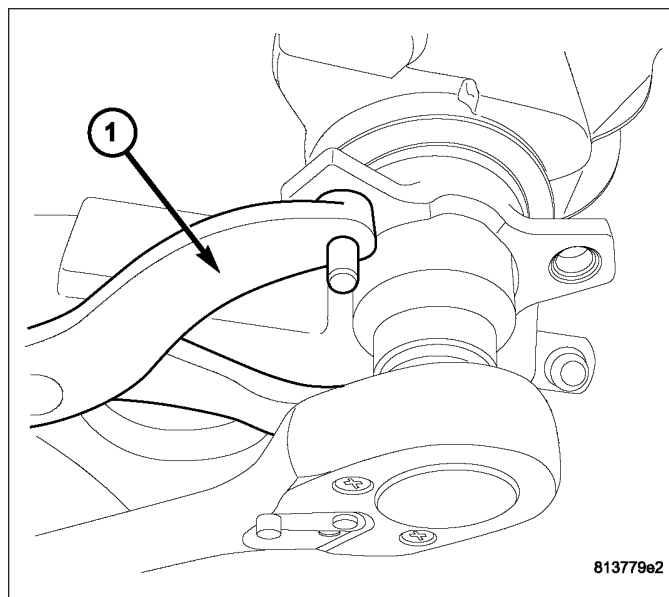
## PINION SEAL/FLANGE

### REMOVAL

1. Remove rear axle assembly from vehicle. Refer to Rear Axle Removal.
2. Measure axle assembly rotating torque and record measurement for reuse on assembly.

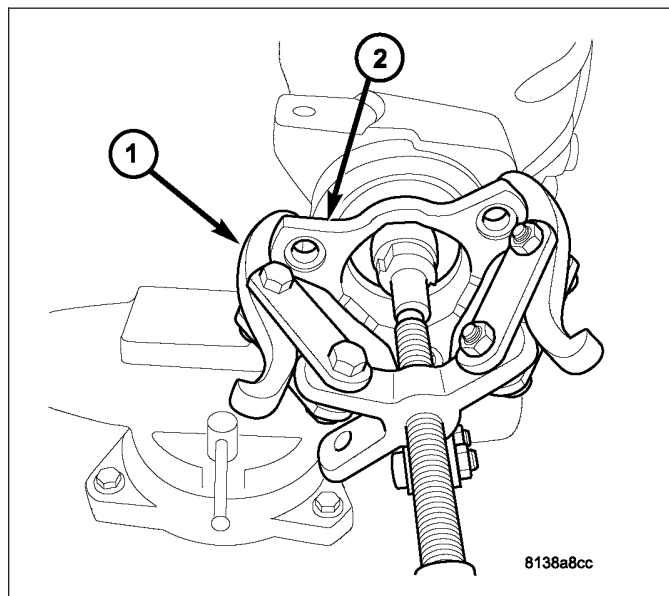


3. Using flange holder C-3281(1) and 41mm socket, remove pinion flange nut and discard.

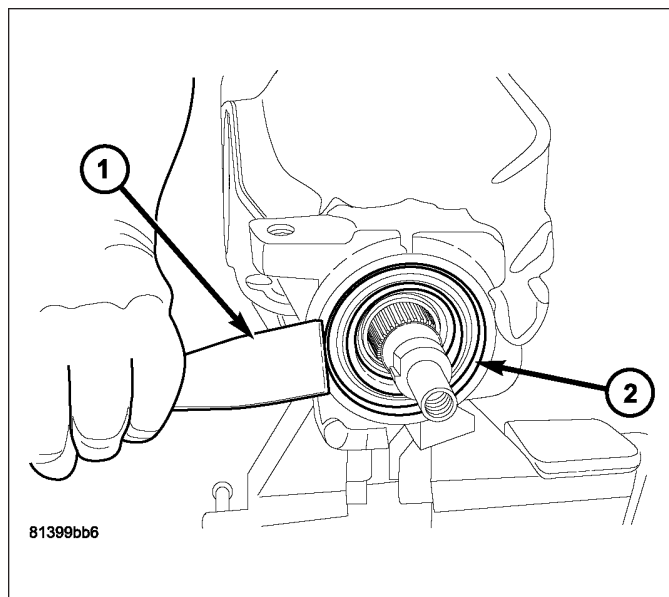


**Note:** Due to axle imbalance concerns, it is necessary to make sure pinion flange-to-shaft orientation is maintained. If alignment marks are not visible, apply appropriate marks before removing pinion flange.

4. Using puller 1026 (1), remove pinion flange (2) from pinion shaft.

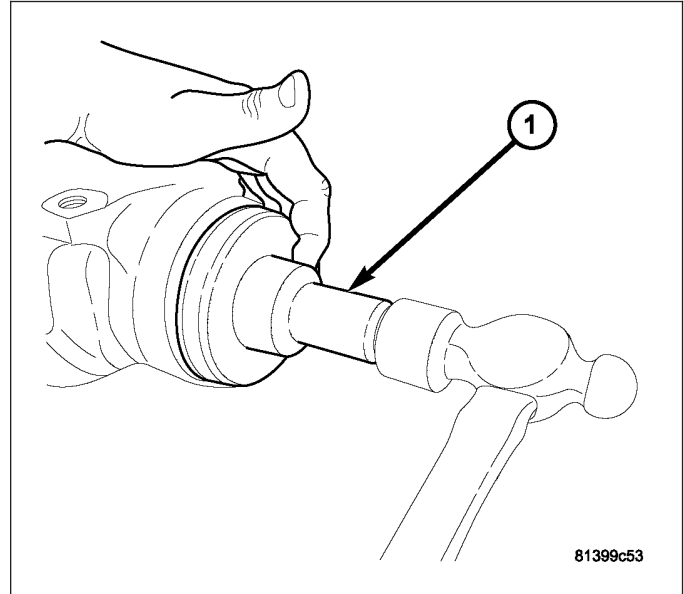


5. Using suitable tool (1), remove pinion seal (2) and discard.

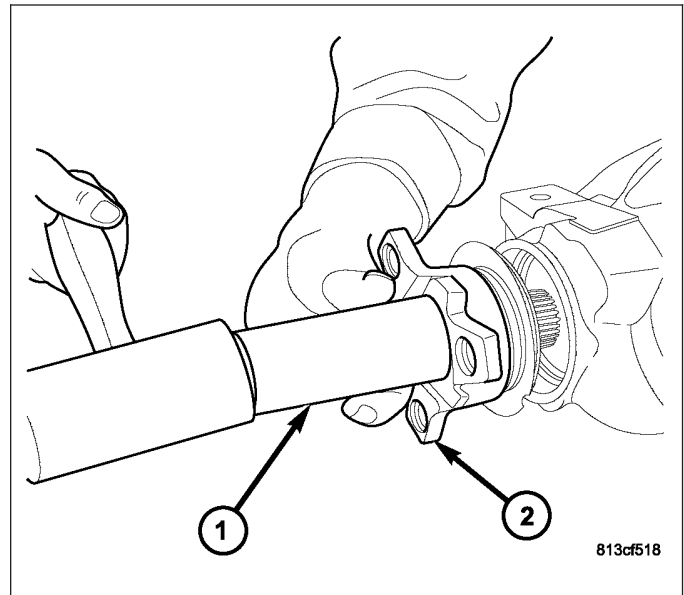


## INSTALLATION

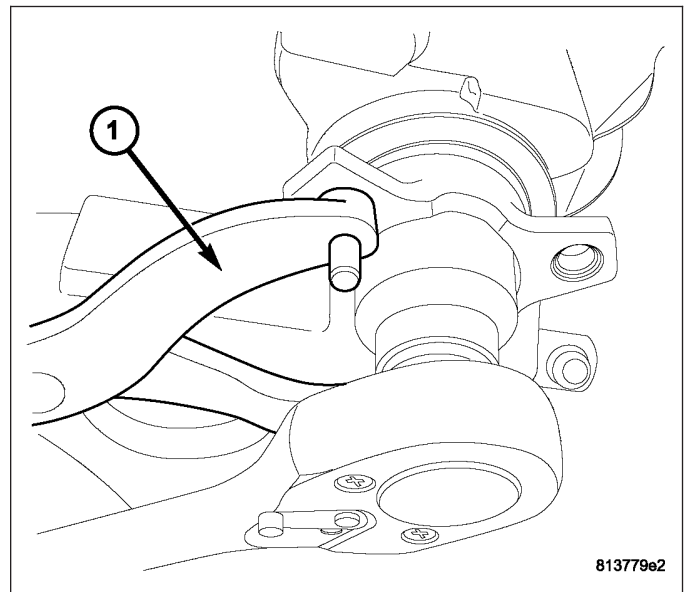
1. Apply light coating of gear lubricant to the lip of the pinion seal.
2. Using Tool 9231A (1), install pinion seal until tool bottoms on carrier.



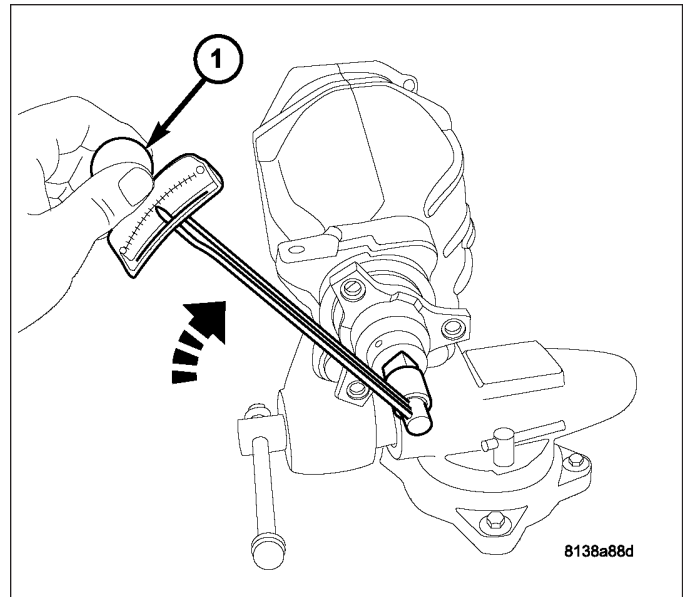
3. Install pinion flange into position. Align index marks to maintain assembly balance.
4. Using Installer 6448A (1), lightly tap on pinion flange (2) until adequate pinion shaft threads are exposed.



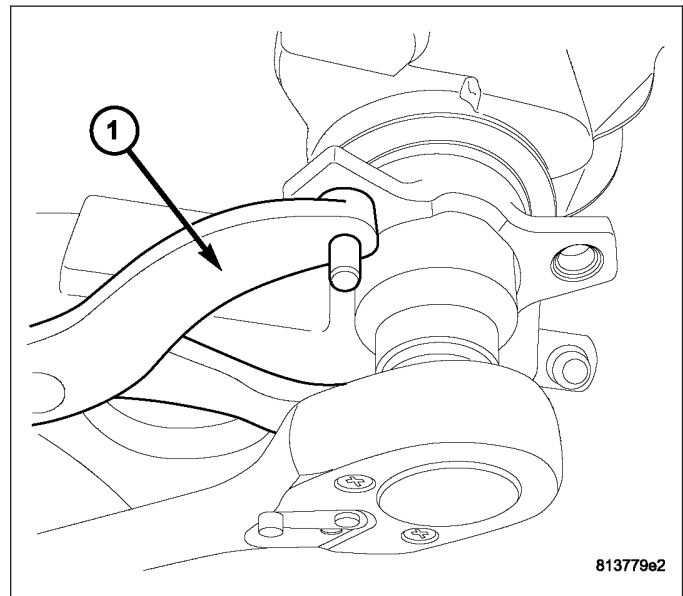
5. Install **new** pinion flange nut. Using flange holder tool C-3281(1) and 41mm socket, torque nut to 136 N·m (100 ft. lbs.).



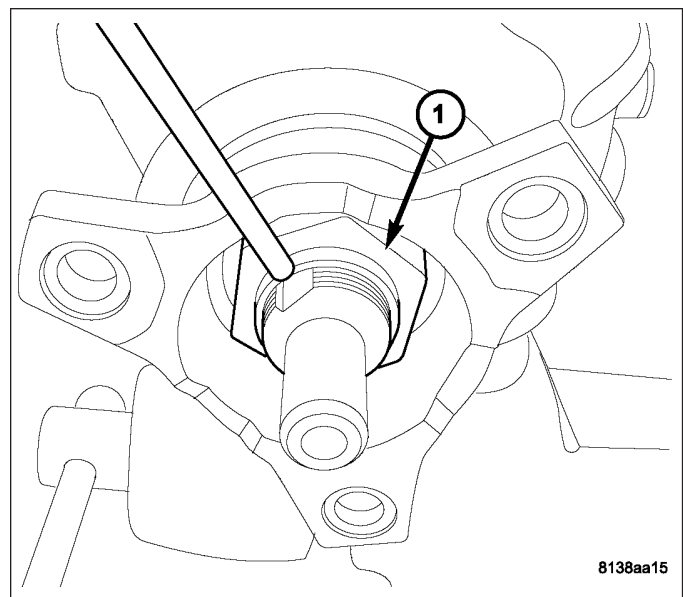
6. Measure assembly turning torque. Axle assembly rotating torque must be should be equal to the reading recorded upon seal/flange removal.



7. If rotating torque is low, increase pinion flange nut torque in 7 N·m (5 ft. lbs.) increments. Repeat until proper rotating torque is received.



8. Stake pinion flange nut (1) as shown.  
9. Install rear axle assembly. Refer to Rear Axle Installation.

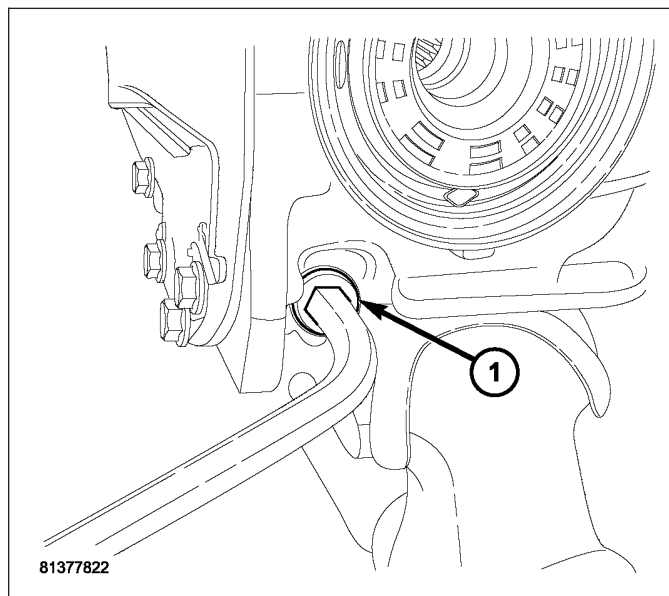




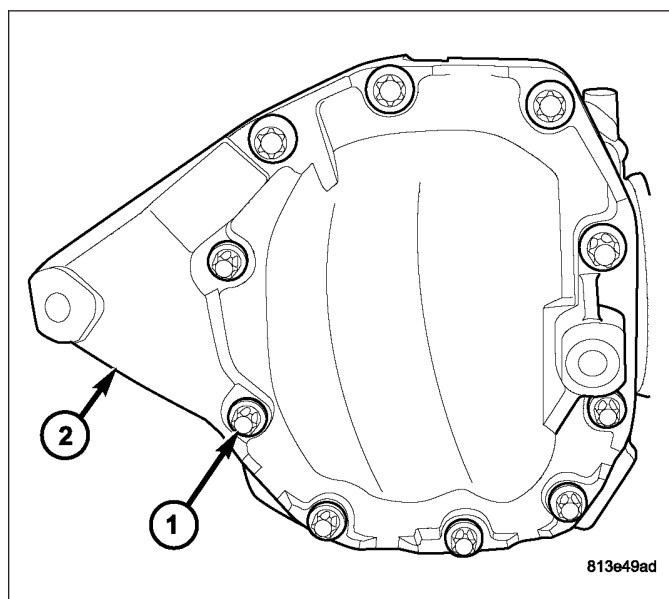
## DIFFERENTIAL

### REMOVAL

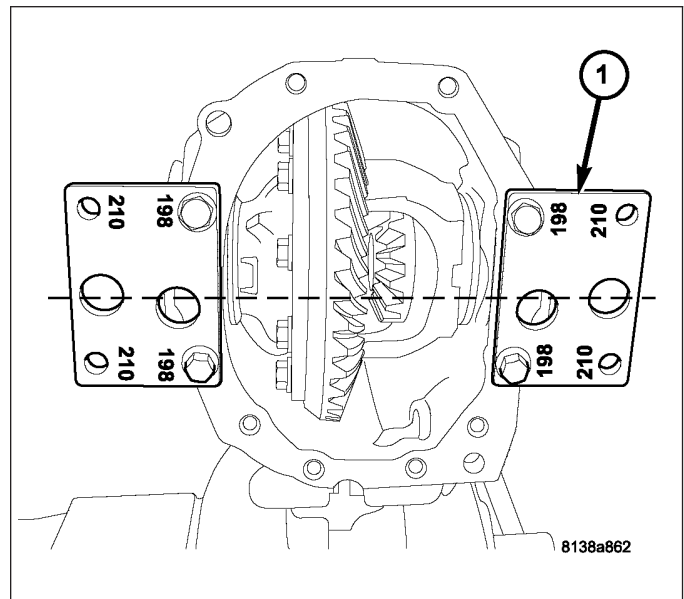
1. Remove drain plug (1) and drain fluid into container suitable for reuse.
2. Install drain plug and torque to 50 N·m (37 ft. lbs.).



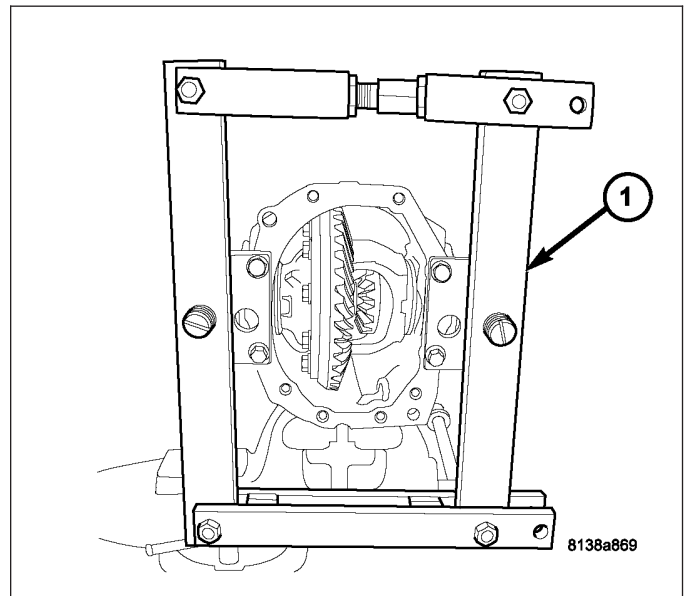
3. Remove twelve axle cover-to-housing bolts (1) and remove cover (2) with a suitable screwdriver.



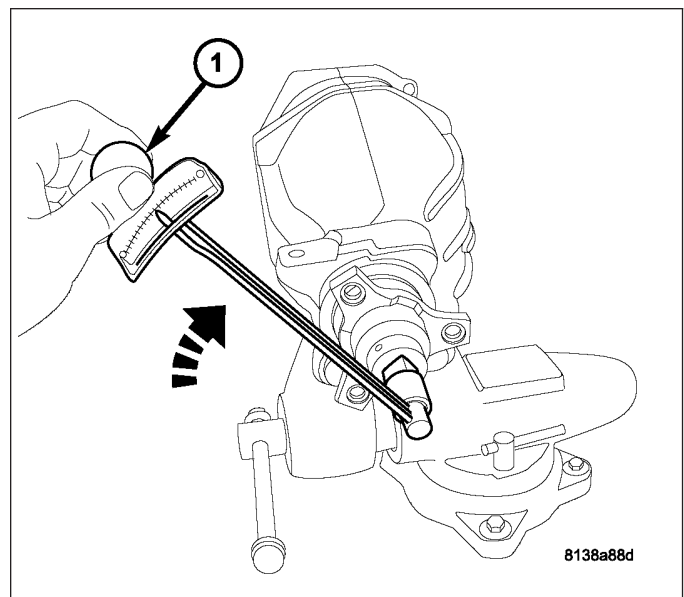
4. Install spreader adapters (1), Tool 9226, as shown. Adapters contain two hole patterns and are labeled accordingly.



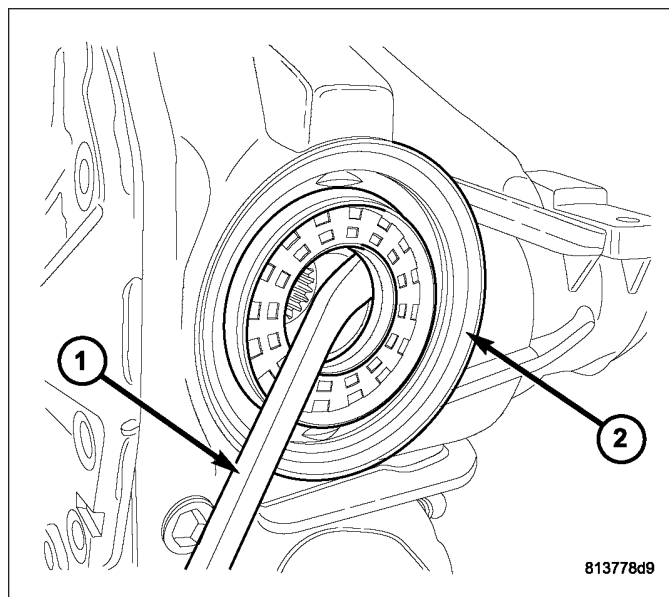
5. Mount spreader Tool W-129-B (1) into bench vise. Install axle assembly to spreader and



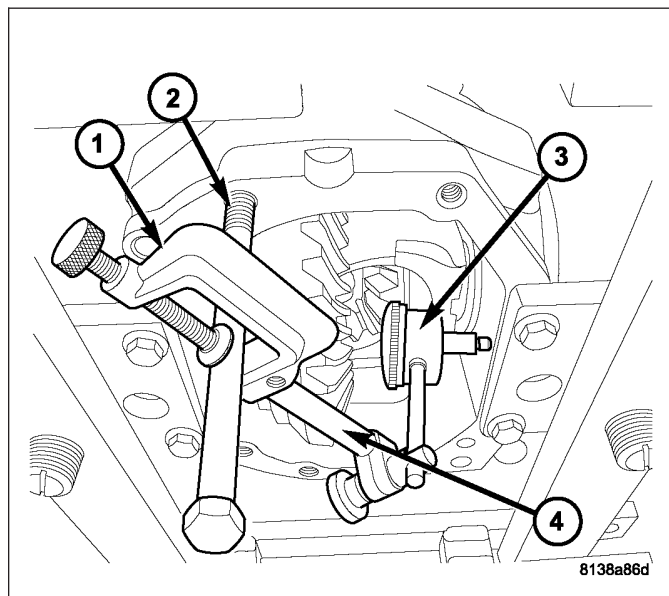
6. Using suitable torque wrench (1), measure and record rear axle assembly total turning torque.



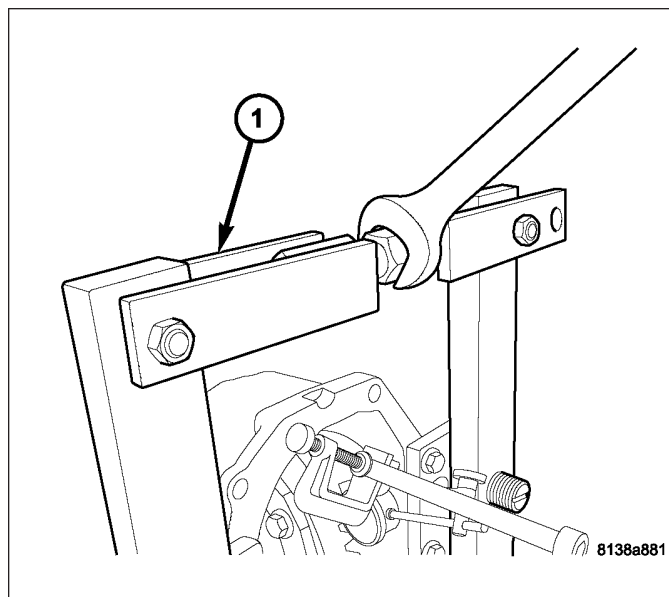
7. Using suitable screwdriver (1), remove both axle seals (2).



8. Set up dial indicator C-3339-A to measure housing spread as shown.

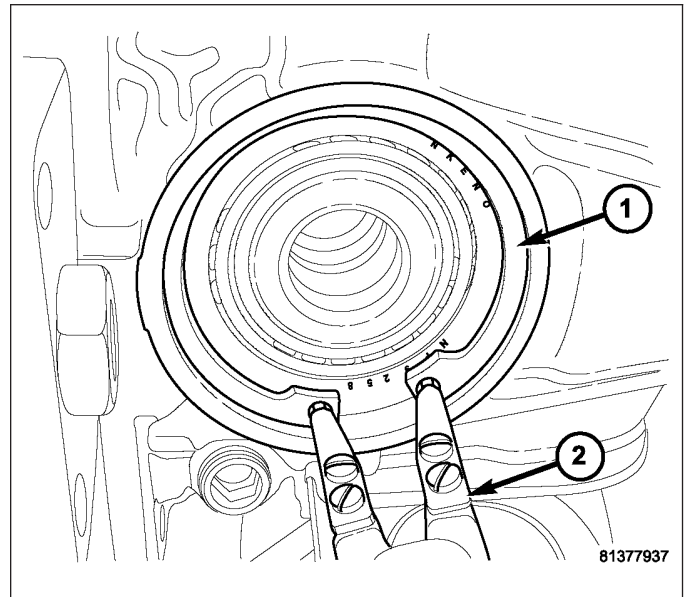


9. Spread axle housing no more than 0.30 mm (0.012 in.).

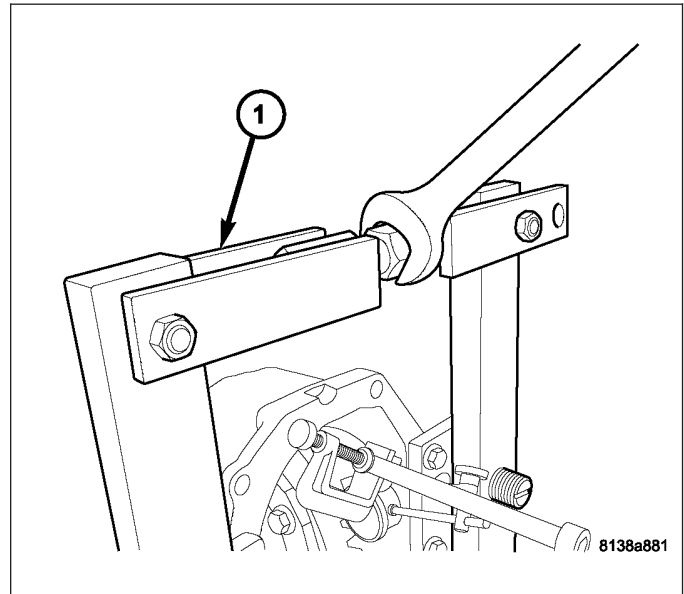


**Note:** The differential side bearing snap rings are select-fit, and control ring gear backlash and differential side bearing preload. It is important to return original snap rings to their original position.

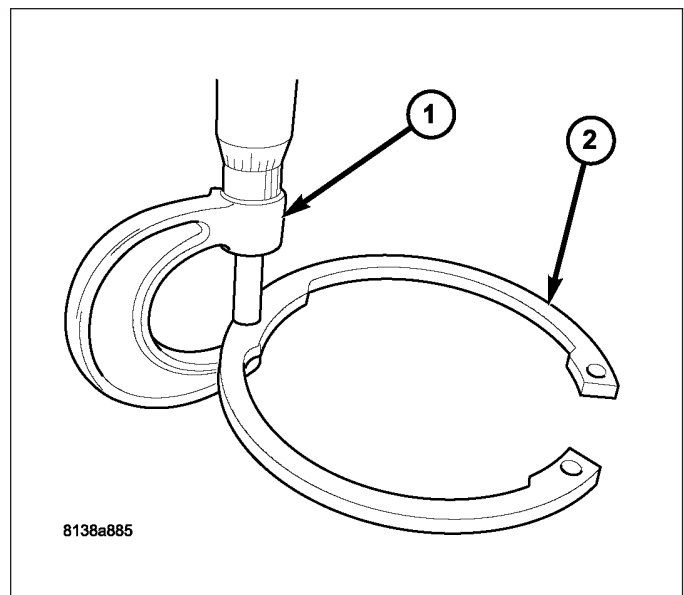
10. Using suitable snap ring pliers (2), compress and remove differential side bearing snap rings (1). Identify and tag for proper reuse.



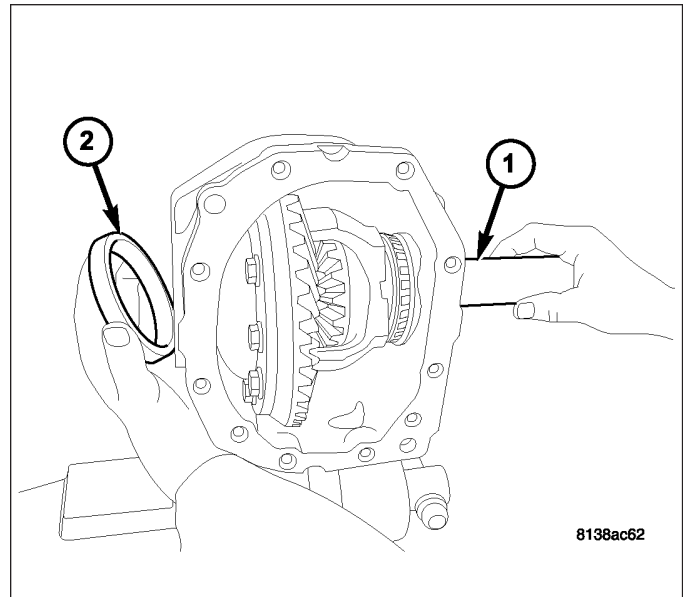
11. Back off W-129-B spreader (1) to relax tension on housing.



12. Measure snap ring thickness and record for future use.

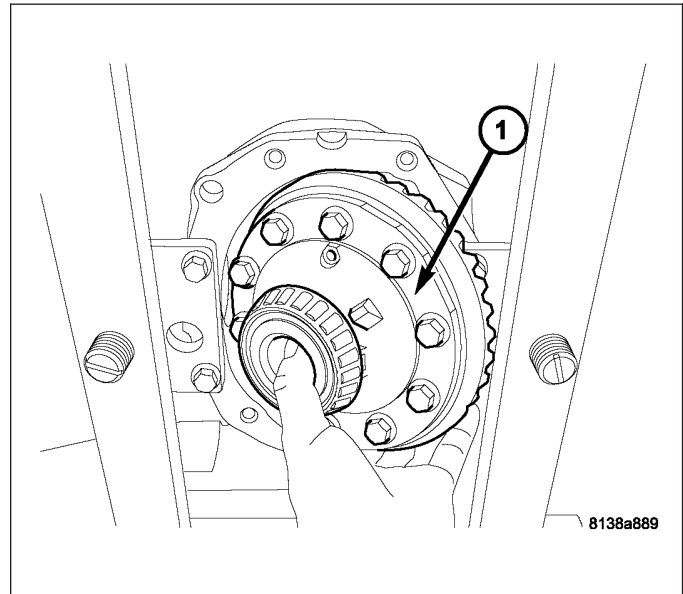


13. Install Tool 9522 (1) into one side of housing and push inward to release differential side bearing cup (2) from opposite side. Repeat for other bearing.



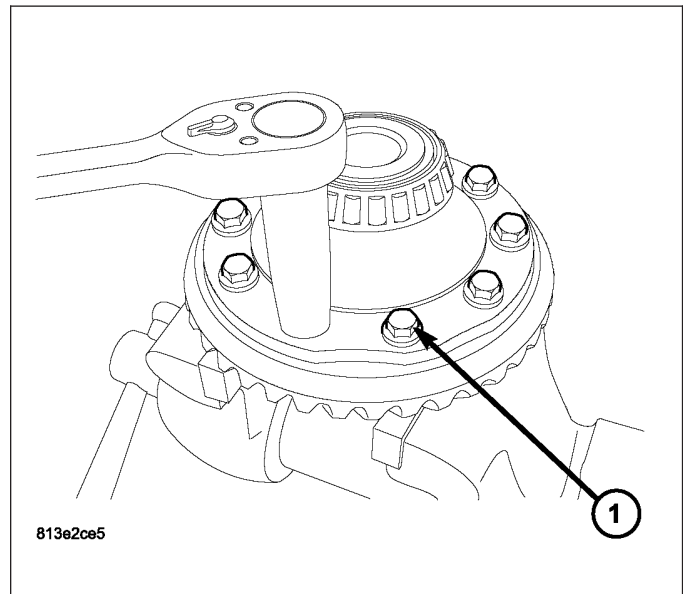
14. Remove differential assembly from axle housing.

**Note:** Note: If difficulty removing differential is encountered due to interference with W-129-B spreader and adapter plates, remove axle from spreader and adapter plates from axle to facilitate removal.

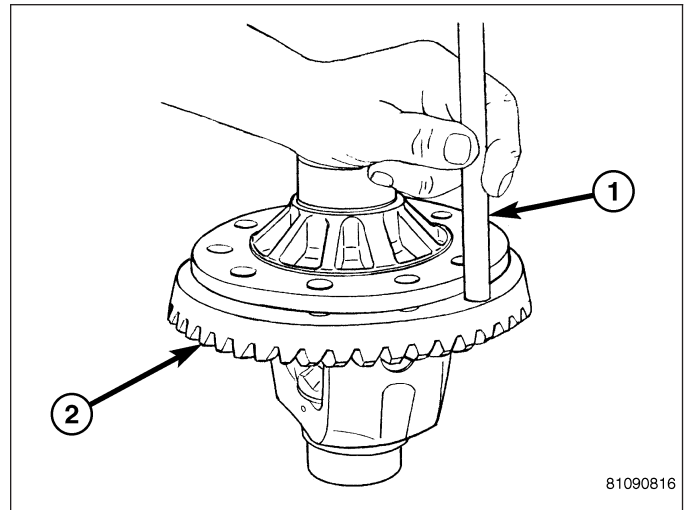


## DISASSEMBLY

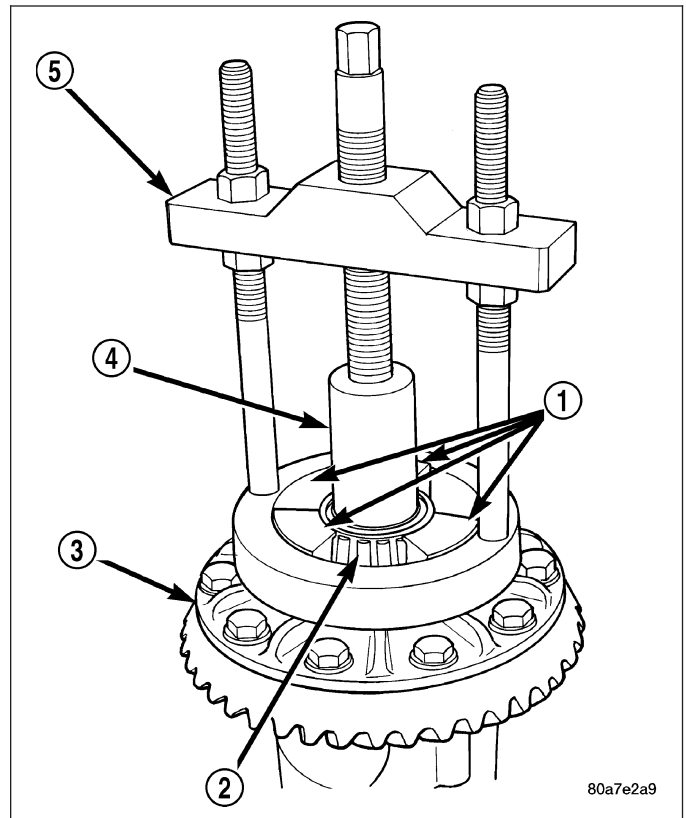
1. Remove differential ring gear-to-case bolts (1).



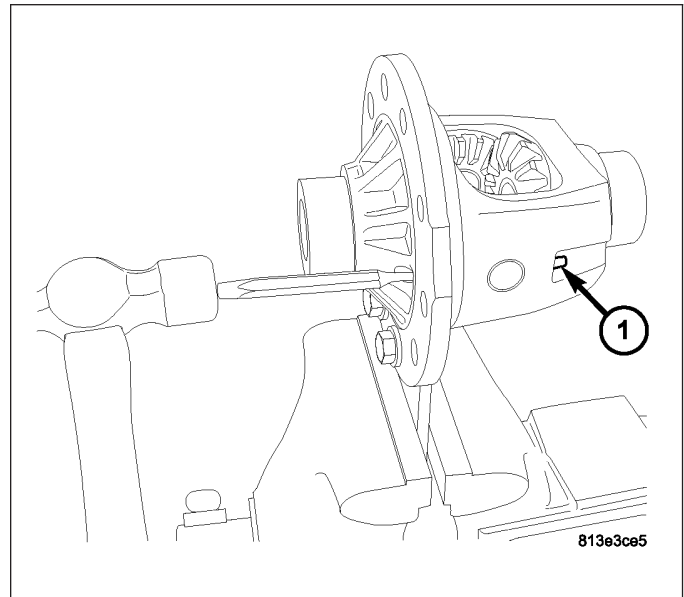
2. Using brass drift (1), remove ring gear (2).



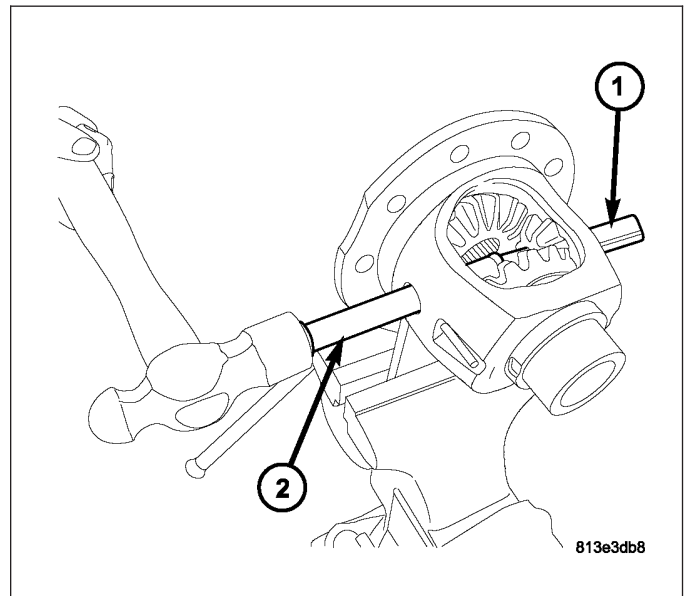
3. Remove bearings (2) from the differential case (3) with Puller/Press C-293-PA (5), Adapters C-293-37 (1) and Plug SP-3289 (4).



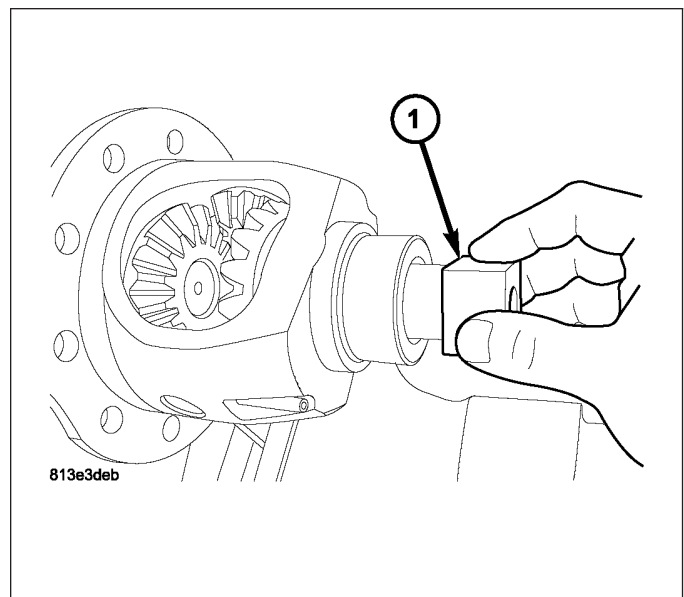
4. Drive out pinion shaft-to-case roll pin using hammer and suitable punch.



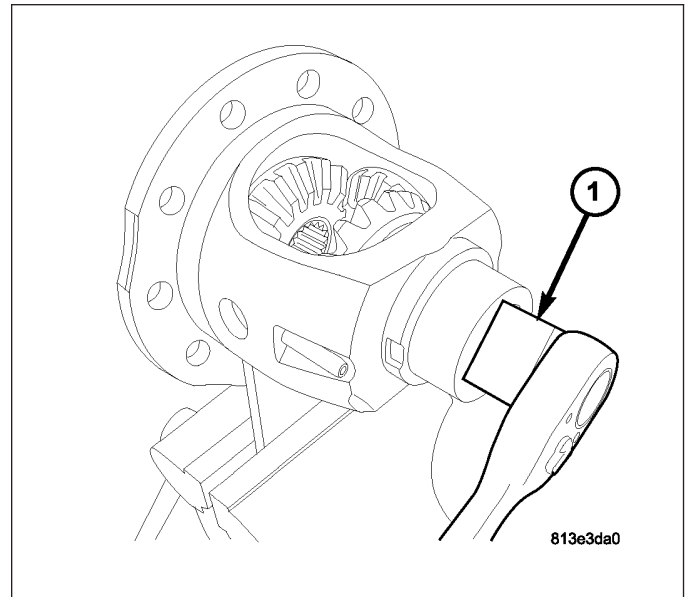
5. Using brass drift (2), drive out pinion shaft (1).



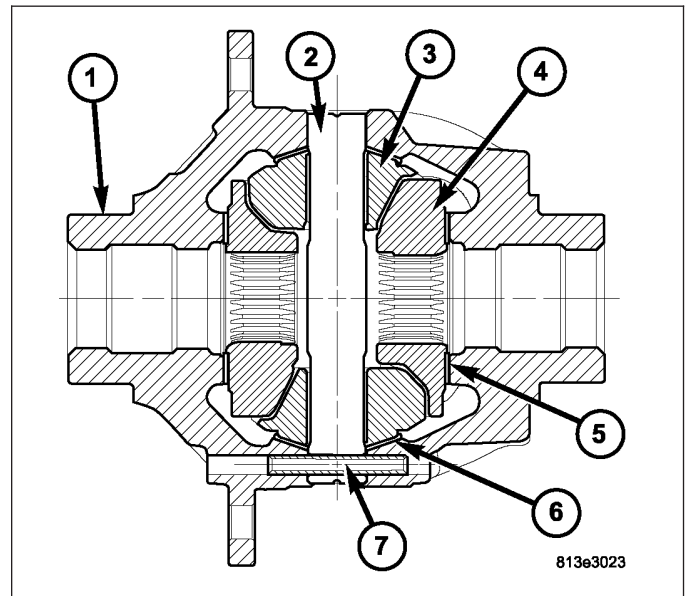
6. Install Tool 9631 (1) into differential side gear.



7. Rotate Tool 9631 (1) to gain access to and remove pinion gears and thrust washers.

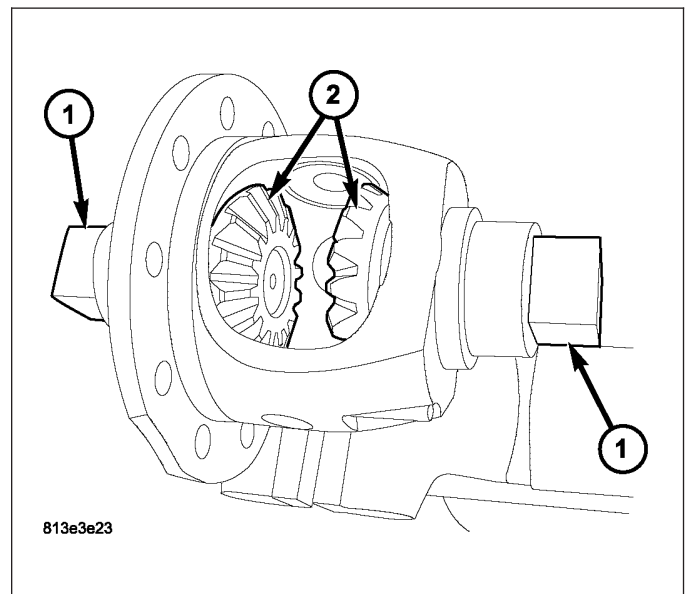


8. Remove differential side gears (4) and thrust washers (5).



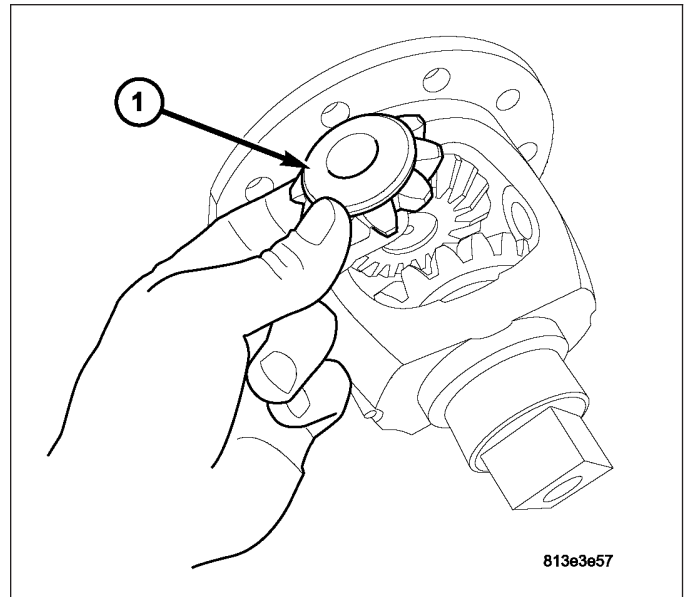
## ASSEMBLY

1. Lubricate all differential components with hypoid gear lubricant.
2. Install differential side gears (2) and thrust washers to Tools 9631 (1) as shown in illustration.

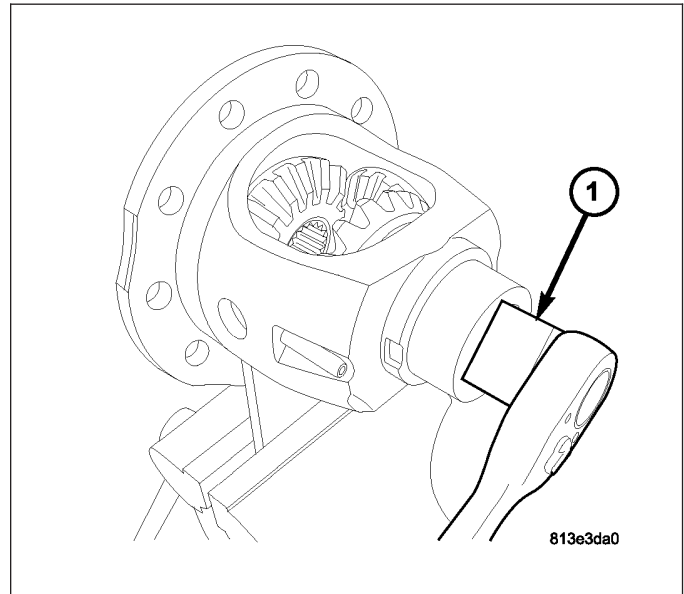




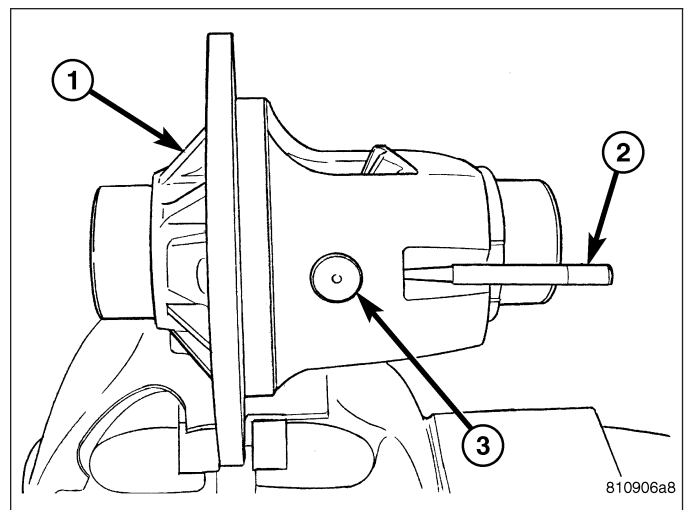
3. Install differential pinion gears (1) and thrust washers into position across from each other.



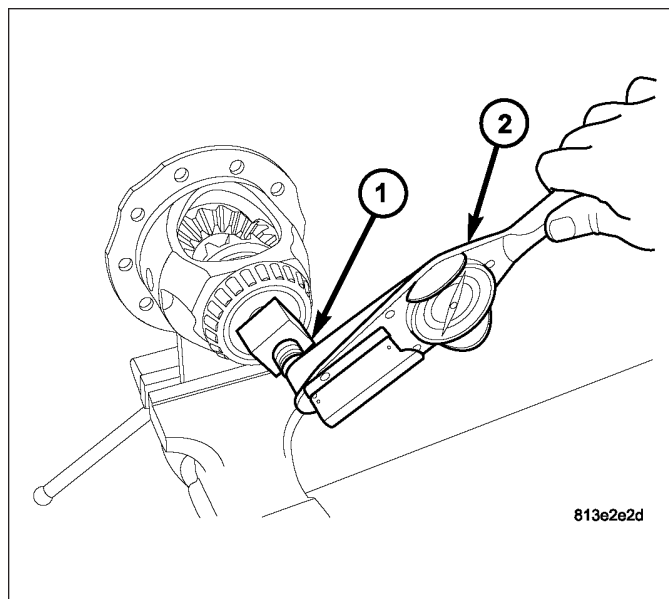
4. Rotate pinion gears into place using Tool 9631 and line up gear centers with pinion shaft bore.



5. Using a brass hammer, drive pinion shaft (3) into differential case (1), making sure to line up roll pin bores.
6. Using suitable punch (2), drive new roll pin into position.



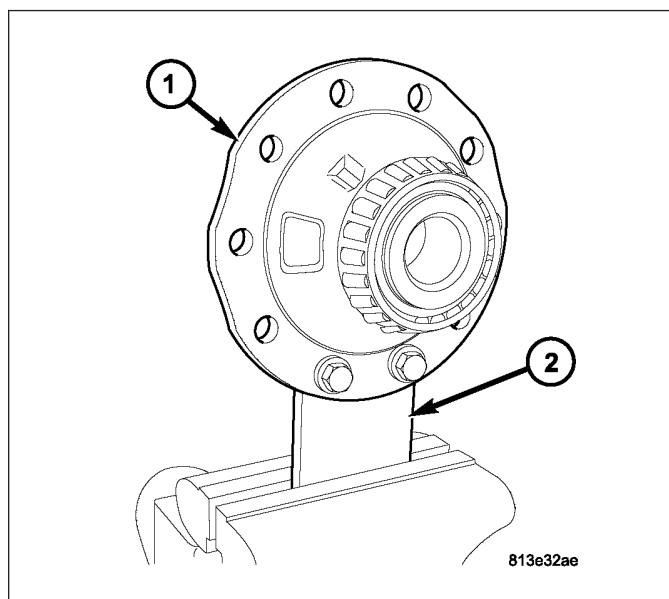
7. Measure differential gear rotating torque as shown. Differential gear rotating torque should be 5-30 N·m (44-266 in. lbs.) Rotating torque is adjusted using select side gear thrust washers. Refer to the following chart.



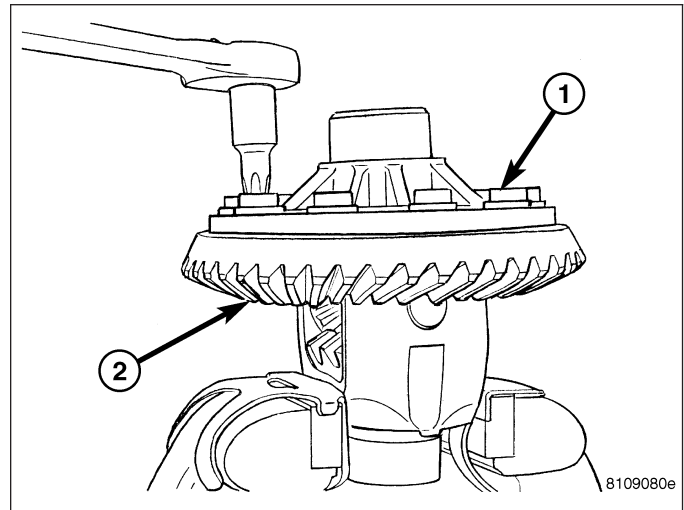
**Available Side Gear Thrust Washer Thicknesses**

1.25 mm (0.049 in.)
1.30 mm (0.051 in.)
1.35 mm (0.053 in.)
1.40 mm (0.055 in.)
1.45 mm (0.057 in.)
1.50 mm (0.059 in.)
1.55 mm (0.061 in.)
1.60 mm (0.063 in.)
1.65 mm (0.065 in.)

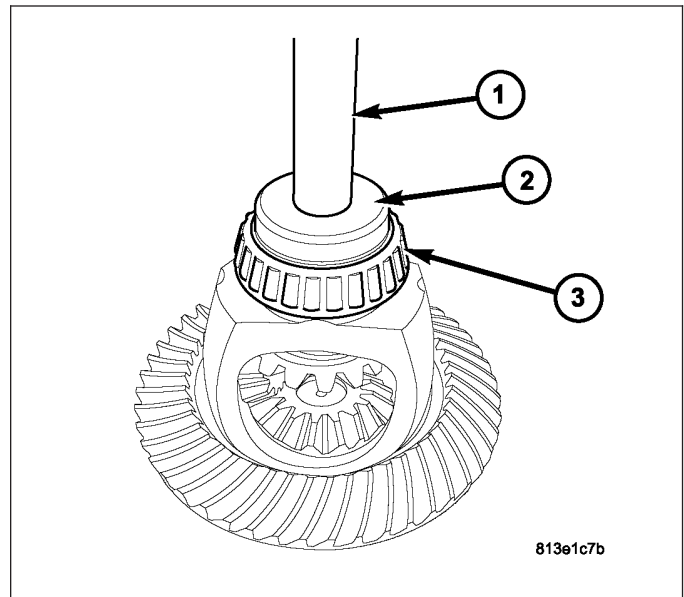
8. Remove differential case from Tool 9630 (2).



- '9. Install ring gear to case. Lightly tap ring gear into position to facilitate starting of bolts.
10. Install **new** ring gear-to-case bolts and torque to 85 N·m (63 ft. lbs.).



11. Using Tool 9523 (2) and Handle C-4171 (1), press **new** differential side bearings (3) onto differential case.

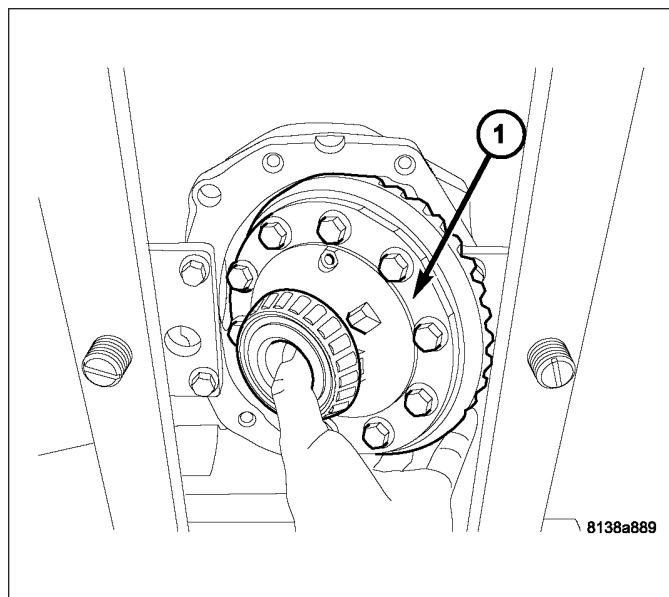


## INSTALLATION

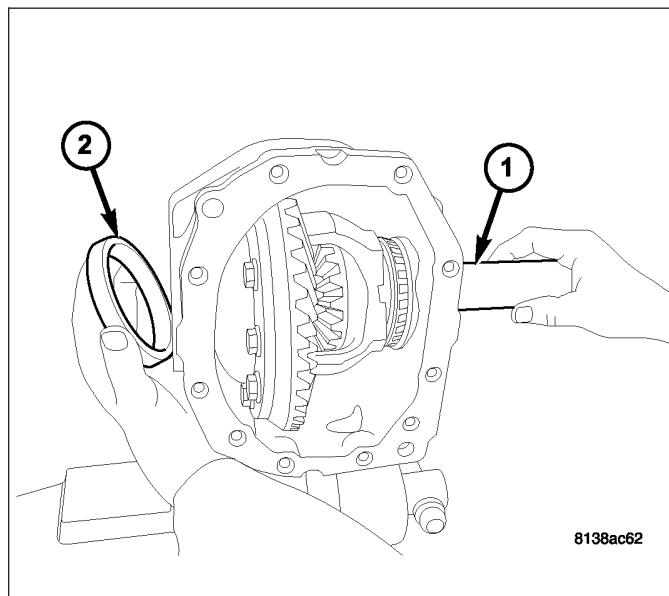
**Note:** If replacement differential side bearings or differential case are being installed, it is necessary to measure and adjust Differential Side Bearing Preload and Gear Backlash. Refer to Adjustments — Differential Side Bearing Preload and Gear Backlash to determine proper snap ring selection.

1. Install differential assembly (1) into axle housing.

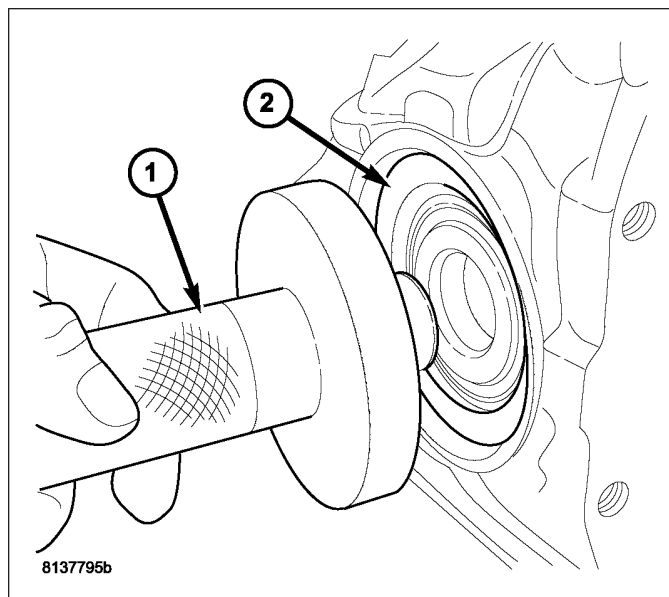
**Note:** If difficulty installing differential is encountered due to interference with spreader and plates, remove axle housing from spreader, plates from housing, and install differential. Return assembly to the spreader.



2. Install differential side bearing cups (2). Use tool 9522 (1) to aid in differential alignment.

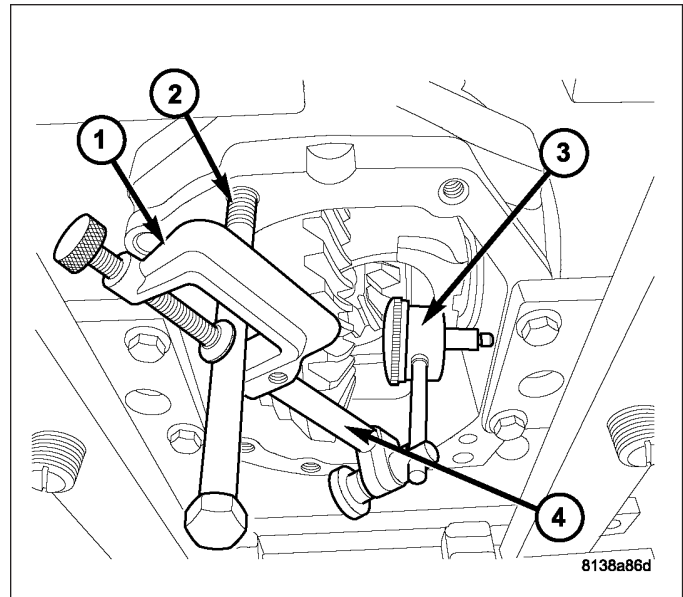


3. Use Tool 9522 (1) to aid in seating side bearing cups (2).

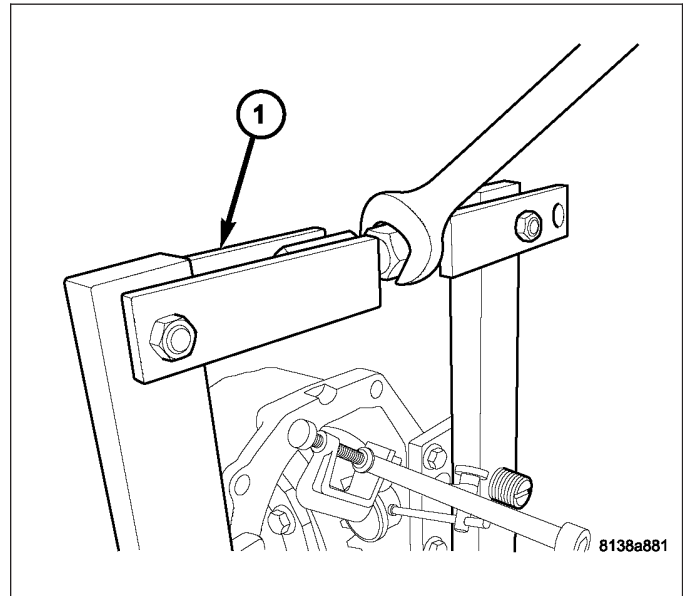


4. Set up Dial Indicator Set C-3339-A to measure housing spread as shown:

- a. Clamp SP-5426 (1)
- b. Post SP-5425-B (2)
- c. Metric Dial Indicator 9524 (3)

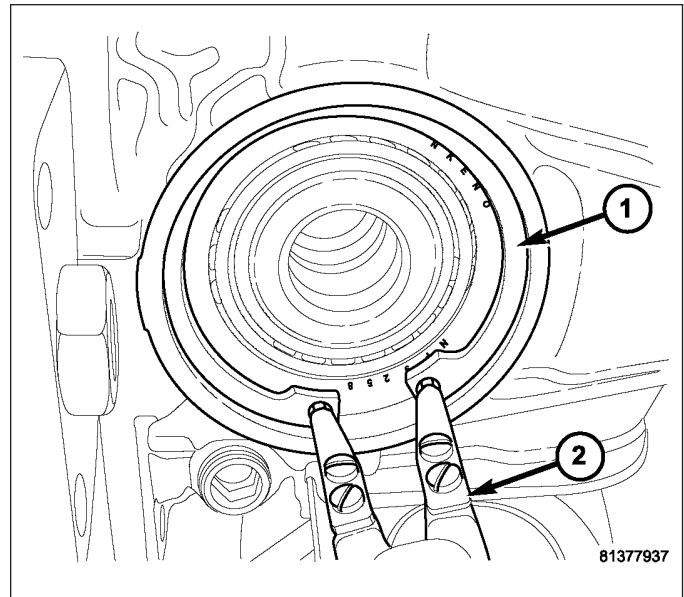


5. Expand spreader W-129-B (1) to spread axle housing no more than 0.30 mm (0.012 in.).

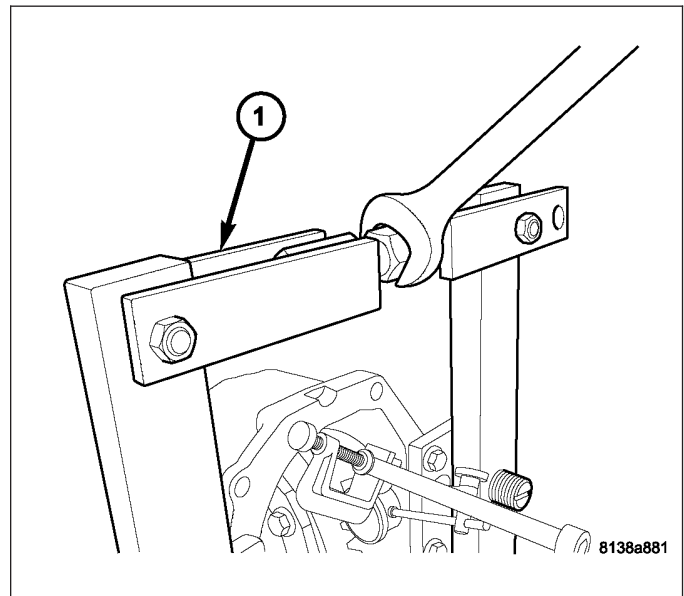


**Note:** The differential side bearing snap rings are select-fit, and control ring gear backlash and differential side bearing preload. It is necessary to return snap rings to their original position. If replacement differential side bearings, differential case, or axle housing are being installed, refer to Adjustments — Differential Side Bearing Preload and Gear Backlash to determine proper snap ring selection.

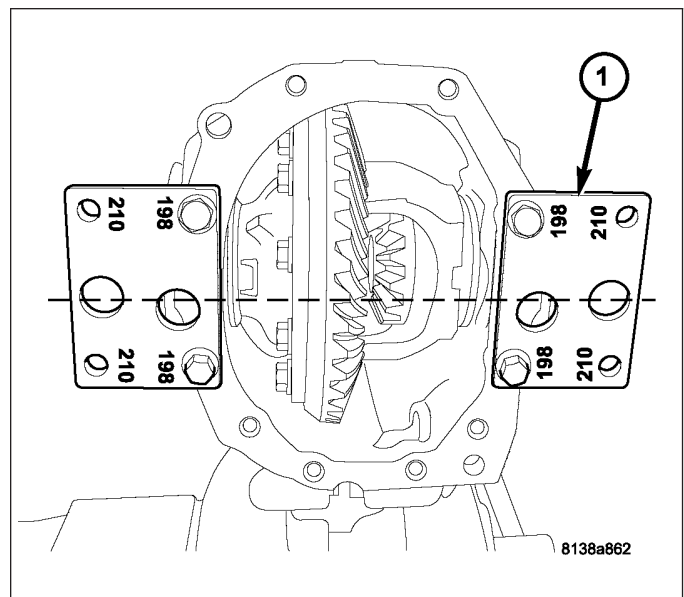
6. Using suitable snap ring pliers (2), install differential side bearing snap rings (1).



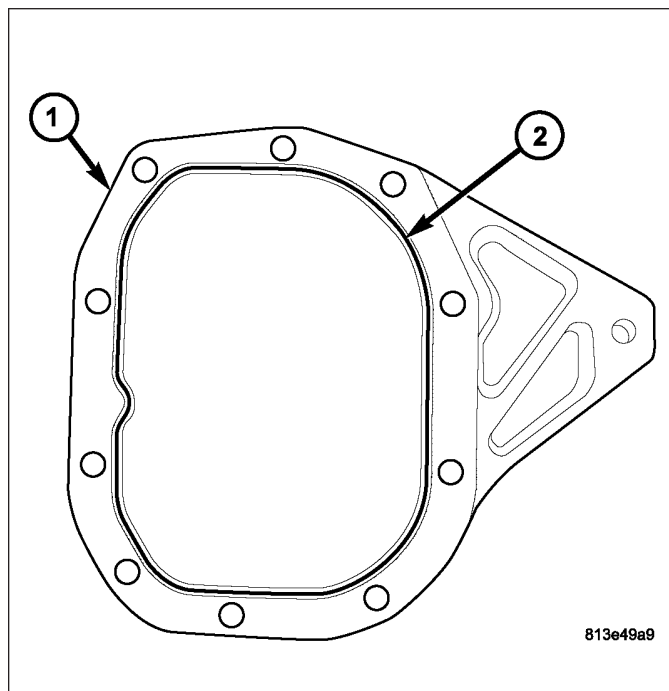
7. Back off W-129-B spreader (1) to relax tension on housing.



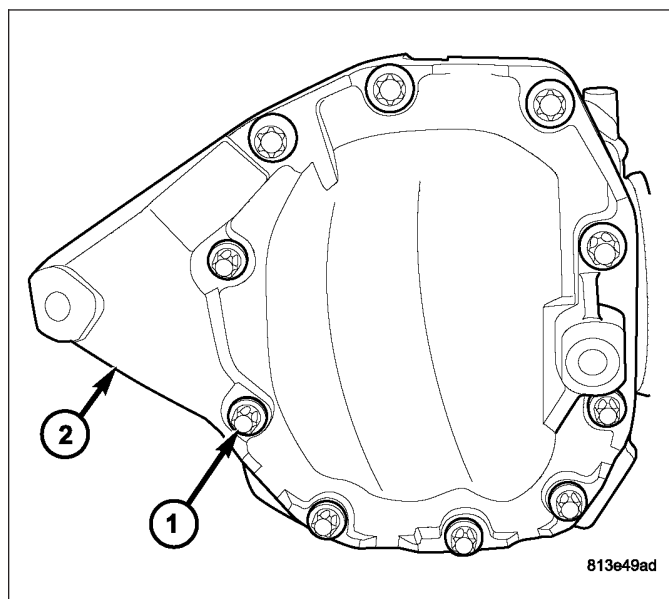
8. Remove axle assembly from spreader. Remove plates (1).



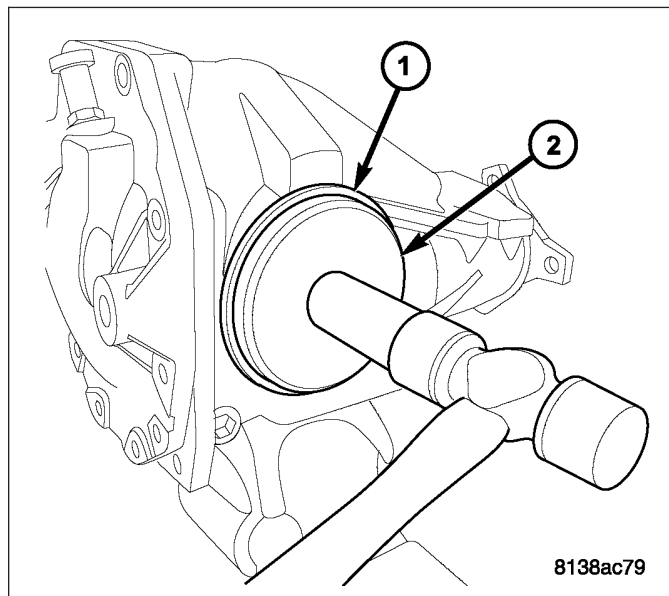
9. Apply 4mm (0.157 in.) bead (2) of Mopar® Axle RTV to axle housing cover (1) as shown.



10. Install cover (2) to axle housing. Install and torque cover-to-housing bolts (1) to 30 N·m (22 ft. lbs.) + 90°.



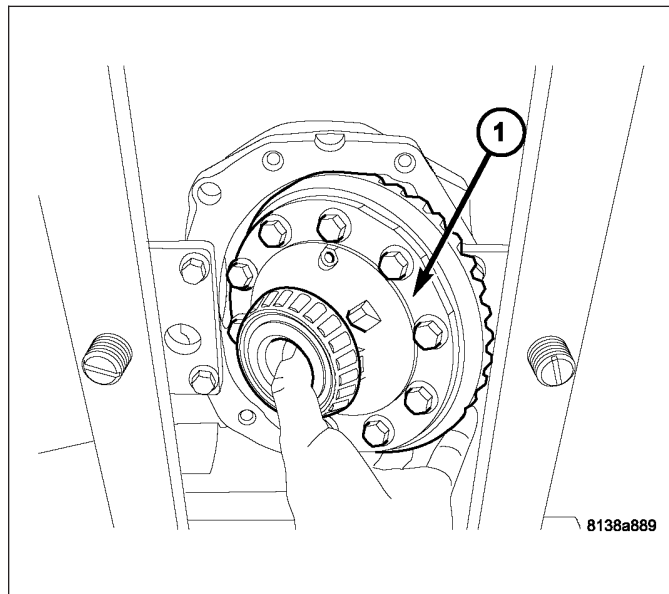
11. Install axle seals (1) using Tool 9223 (2).



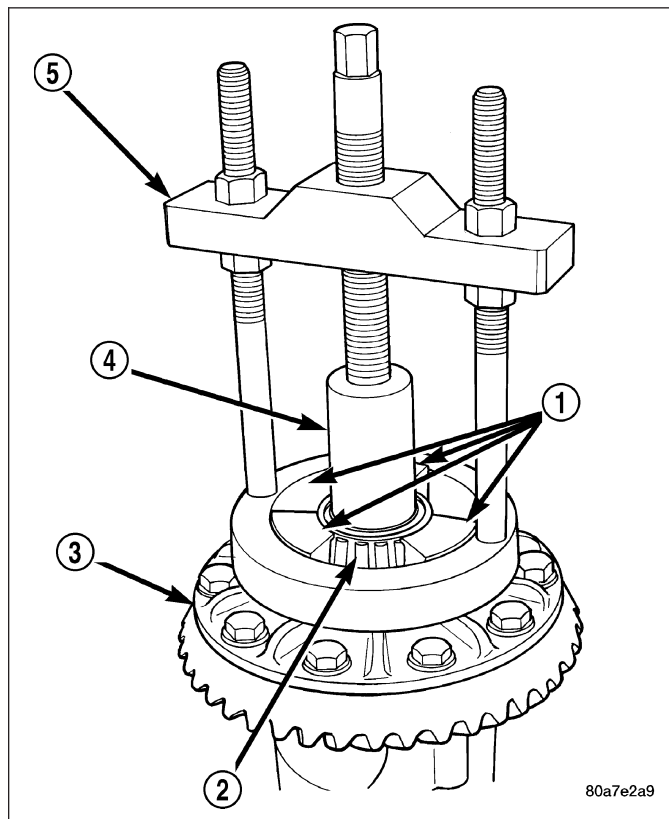
## DIFFERENTIAL CASE BEARINGS

### REMOVAL

1. Remove differential assembly from axle. Refer to Differential Removal.



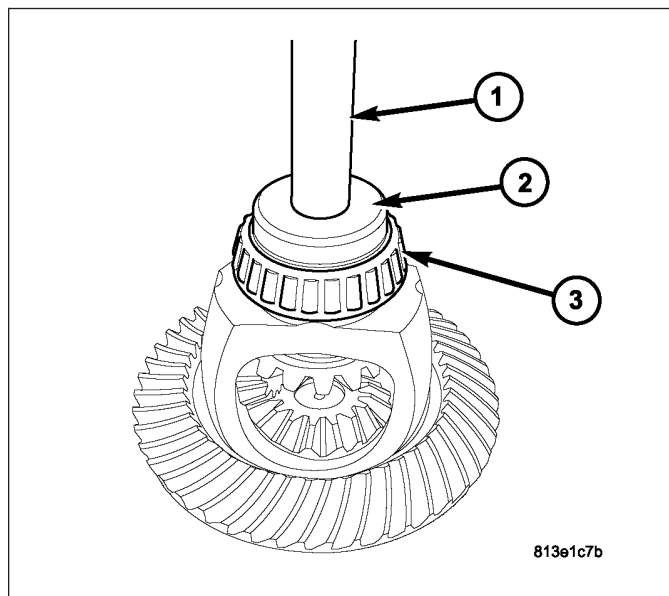
2. Remove bearings (2) from the differential case (3) with Puller/Press C-293-PA (5), Adapters C-293-37 (1) and Plug SP-3289 (4).



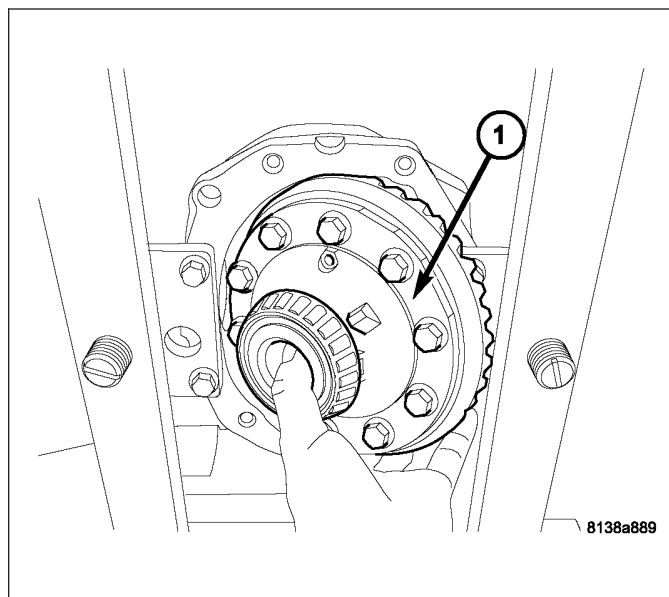


## INSTALLATION

1. Using Tool 9523 and Handle C-4171, press differential side bearings onto differential case.



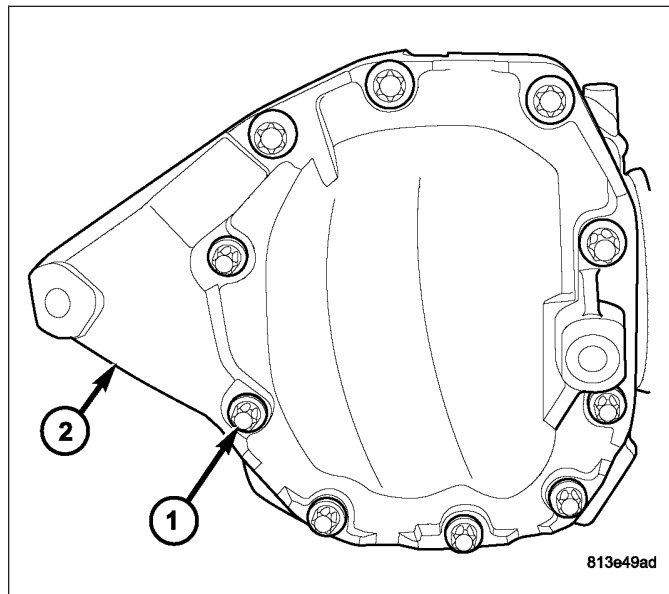
2. Install differential and reassemble axle assembly.



## DIFFERENTIAL COVER

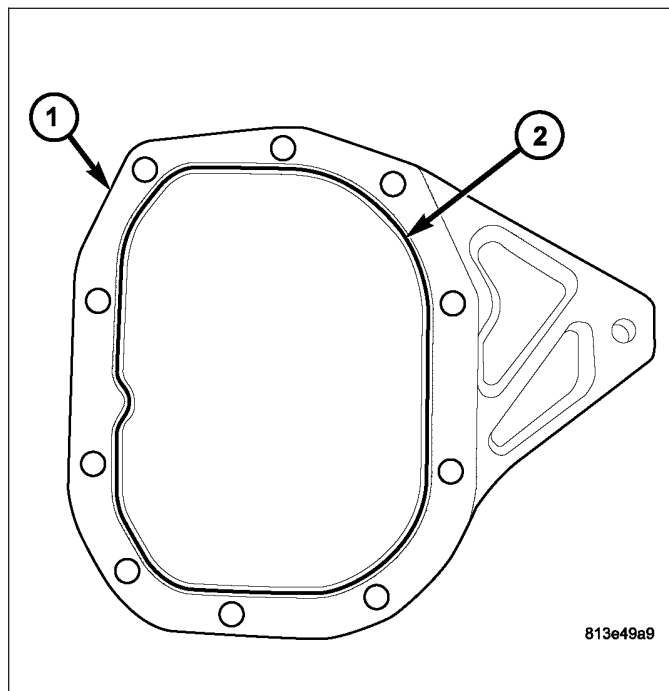
### REMOVAL

1. Remove axle assembly from vehicle.(Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 210MM - REMOVAL)
2. Remove axle housing cover bolts (1). Using suitable screwdriver, pry cover (2) from housing.

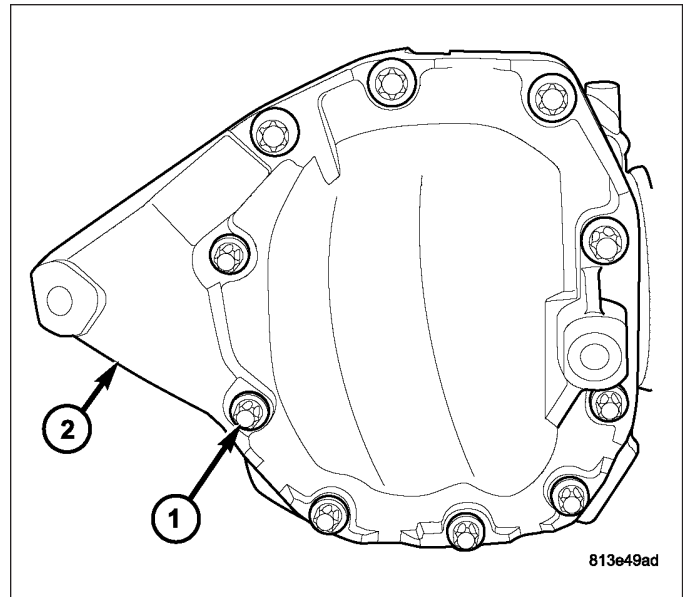


### INSTALLATION

1. Thoroughly clean cover and install a 4 mm (0.157 in.) bead of Mopar® AXLE RTV (2) as shown.



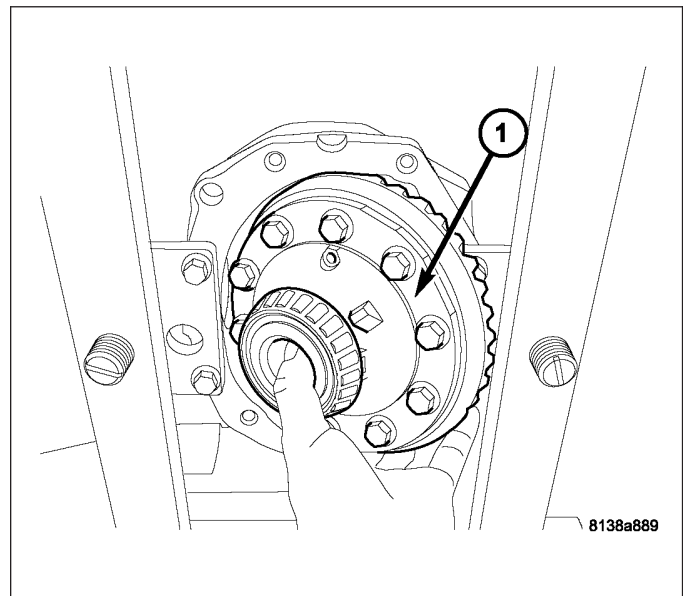
2. Immediately install cover. Install and torque bolts (1) to 50 N·m (37 ft. lbs.).
3. Install axle assembly to vehicle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 210MM - INSTALLATION)



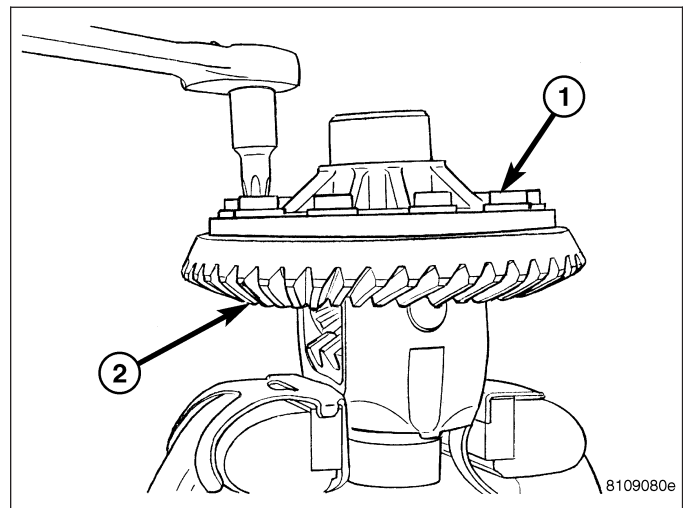
## PINION GEAR/RING GEAR

### REMOVAL

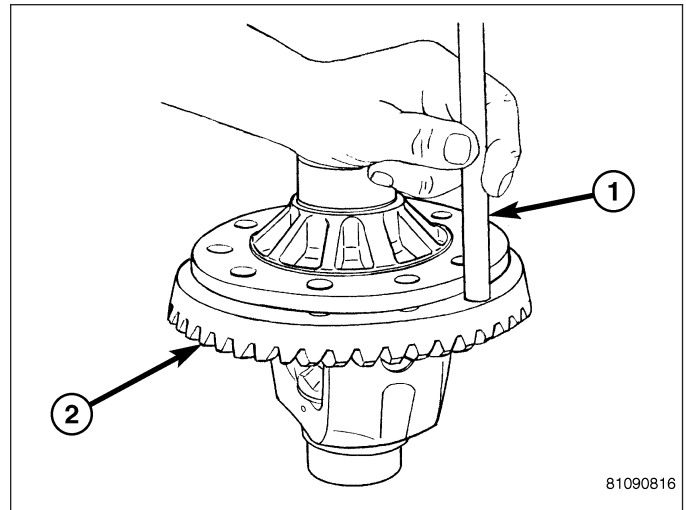
1. Remove differential assembly. (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 210MM/DIFFERENTIAL - REMOVAL)



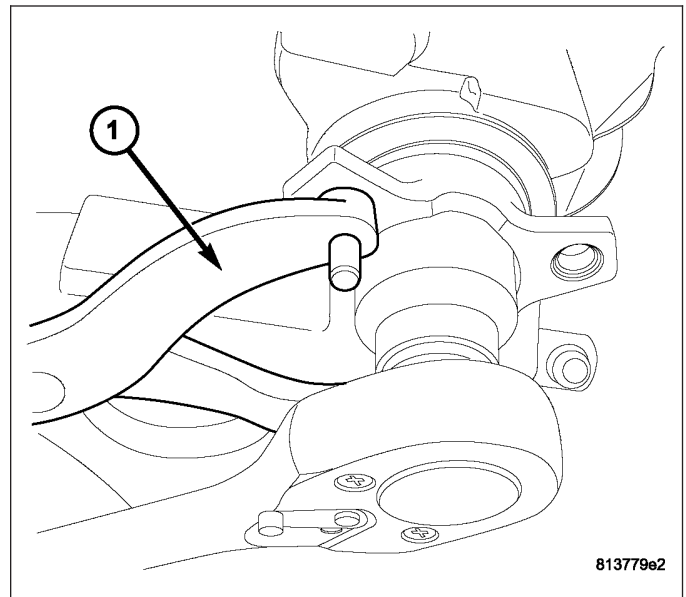
2. Place differential case in a soft-jawvied vise and remove ring gear-to-case bolts (1).



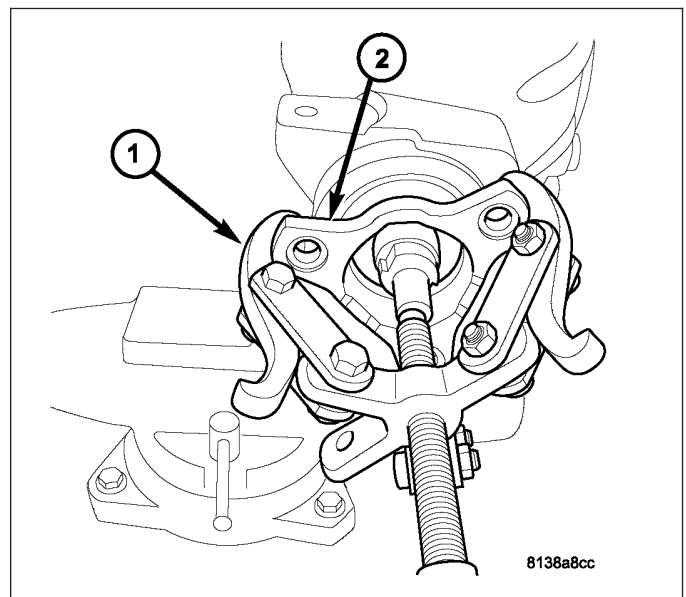
3. Remove ring gear from differential case with a brass drift (1) and hammer.



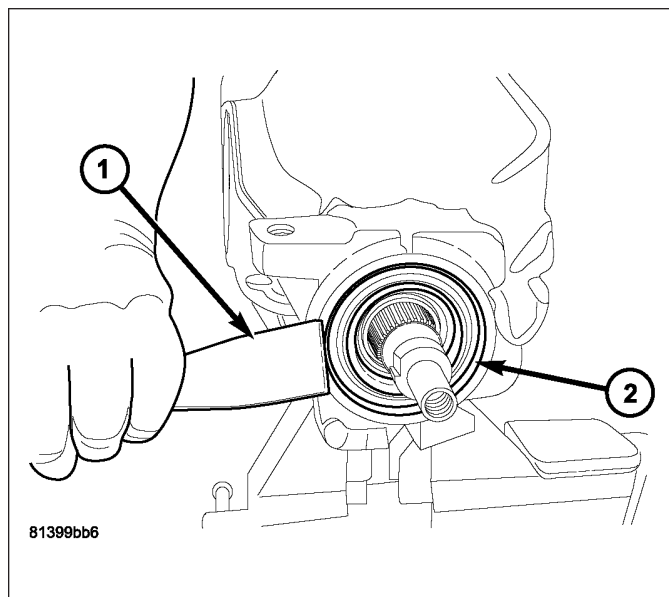
4. Using 41mm socket and flange wrench Tool C-3281 (1), remove pinion nut and discard.



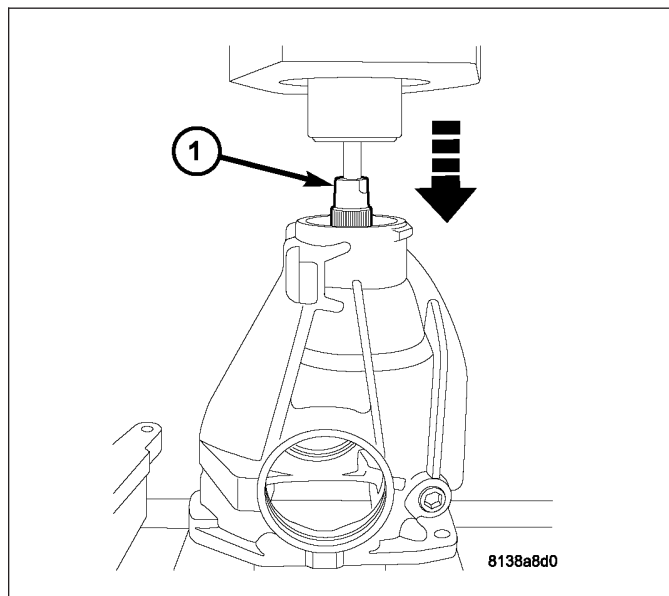
5. Using puller Tool 1026 (1), remove pinion flange (2).



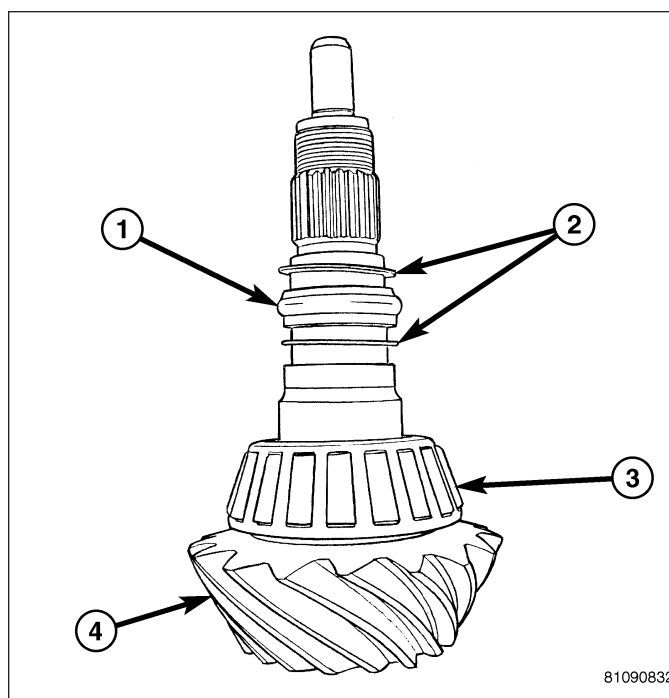
6. Using a suitable screwdriver, remove and discard the pinion seal.
7. Remove pinion tail bearing cone.



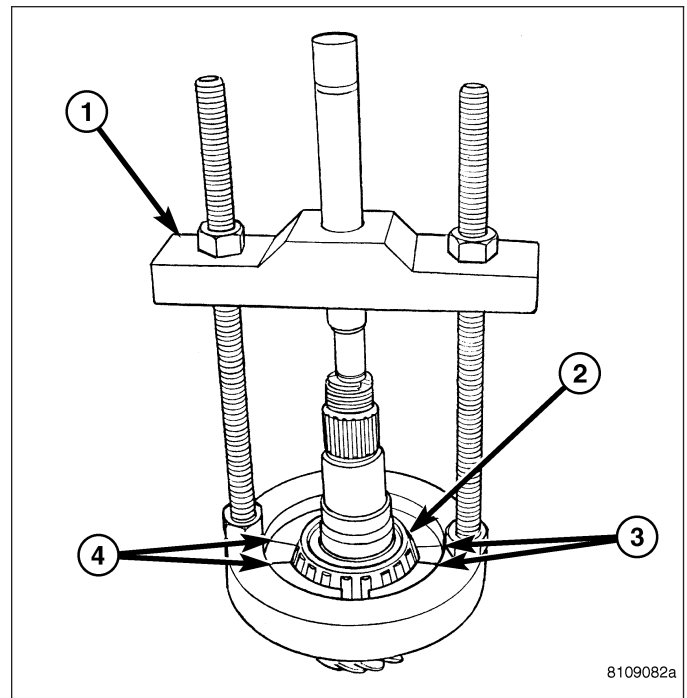
8. Move axle housing to press and press out pinion shaft (1) as shown.



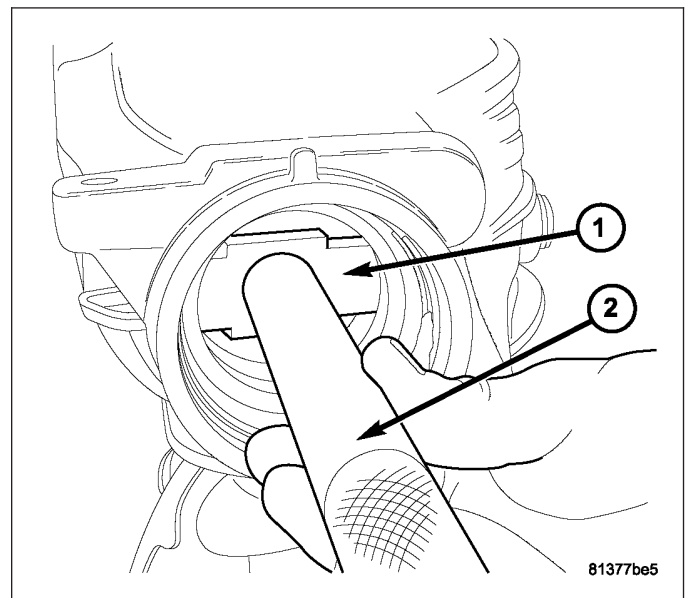
9. Remove collapsible spacer (1) and washers (2). Discard collapsible spacer.



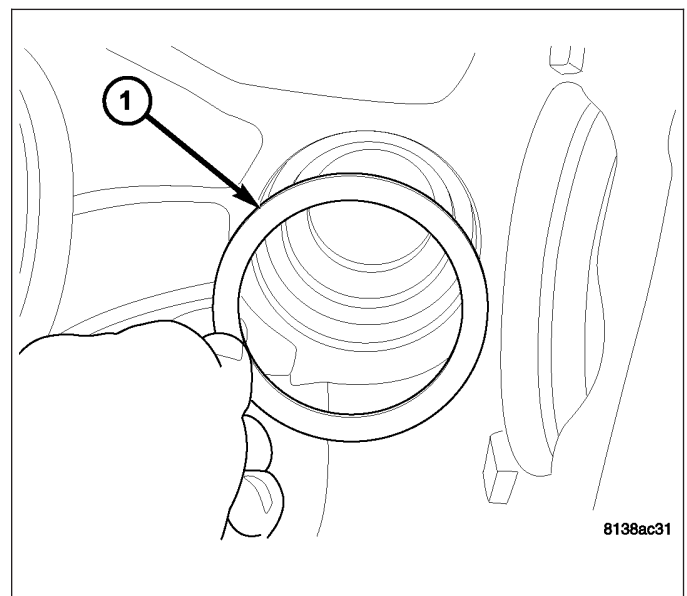
10. Remove pinion head bearing (2) with Puller C-293-PA (1) and Adapters C-293-37 (3,4).



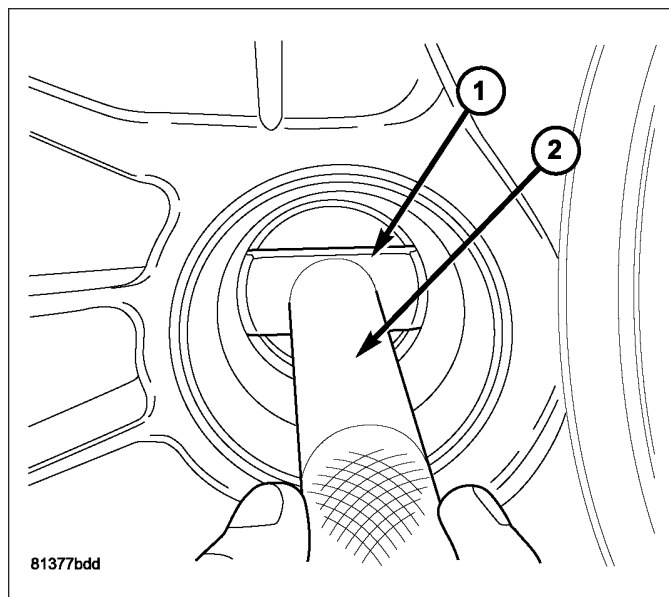
11. Using driver handle C-4171(2) and remover Tool 9084 (1), drive out pinion head bearing cup.



12. Remove pinion head shim. Measure and record shim thickness.

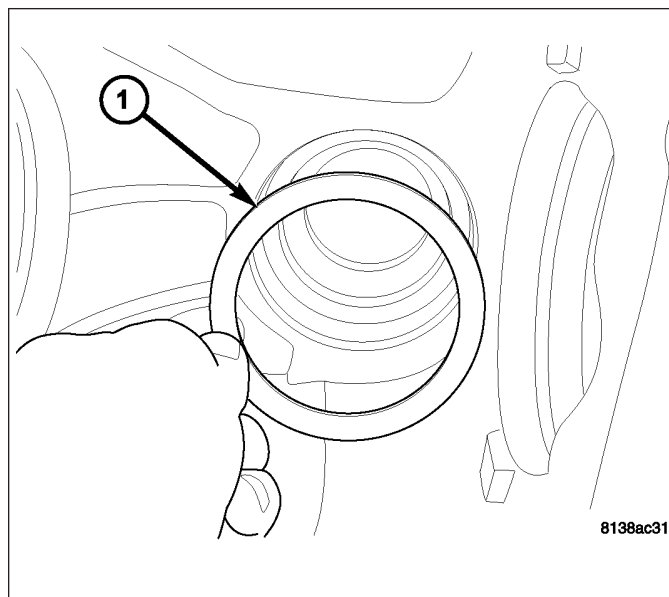


13. Using driver handle C-4171 (2) and remover Tool D-149 (1), drive out pinion tail bearing cup.

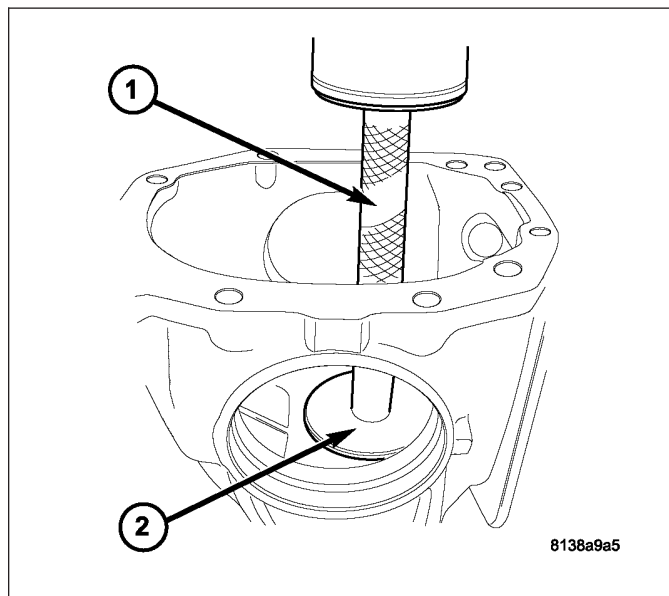


## INSTALLATION

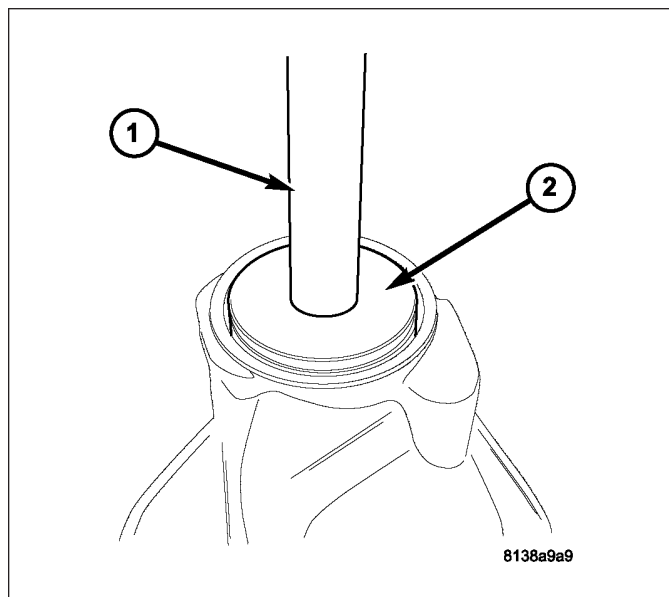
1. Install selected pinion depth shim into housing.



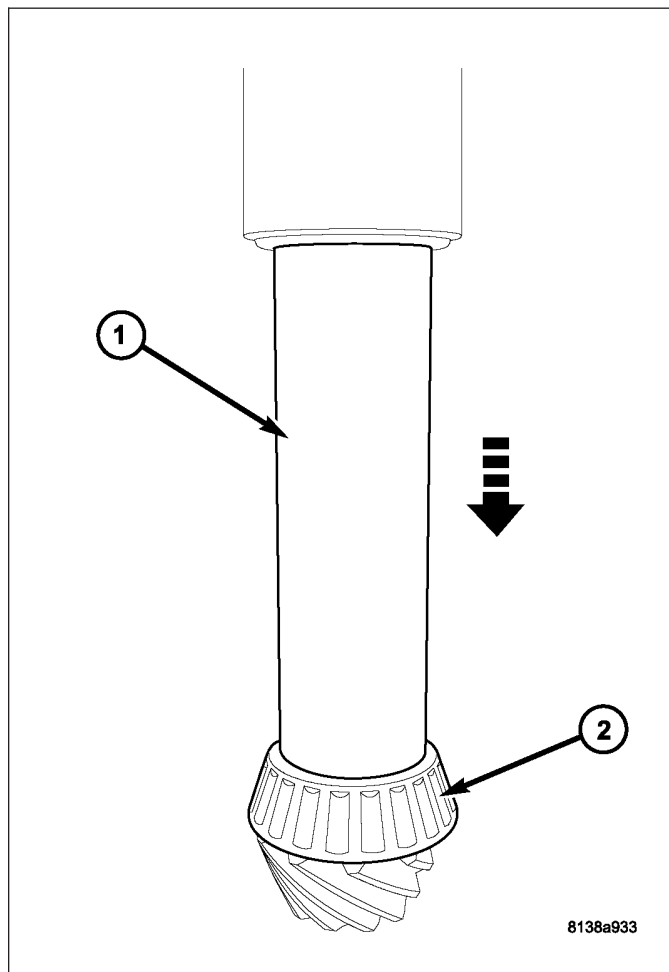
2. Press pinion head bearing cup into housing using Tools C-4171 (1) and C-4310 (2).



3. Press pinion tail bearing cup into housing using Tools C-4171 (1) and D-146 (2).

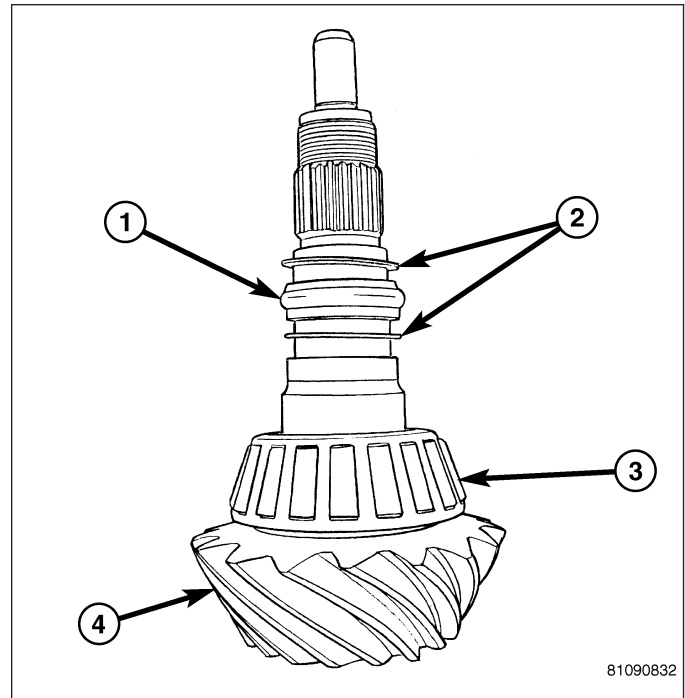


4. Press **new** pinion head bearing (2) onto pinion shaft using Tool C-3095-A (1).

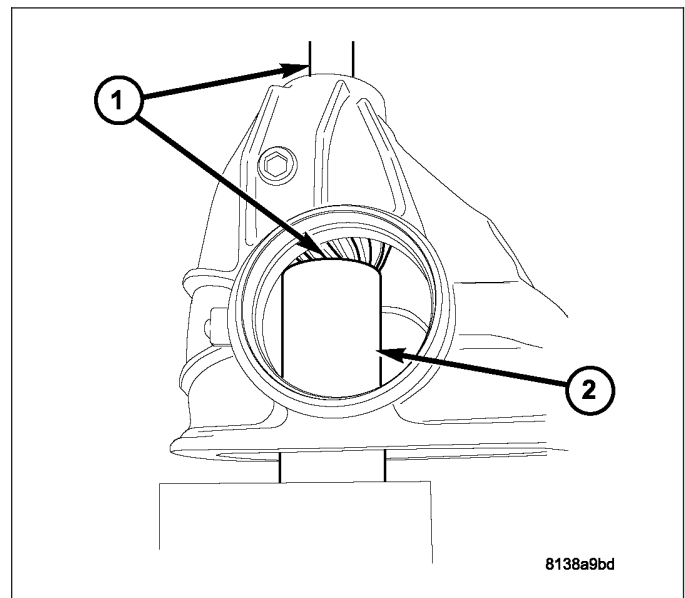




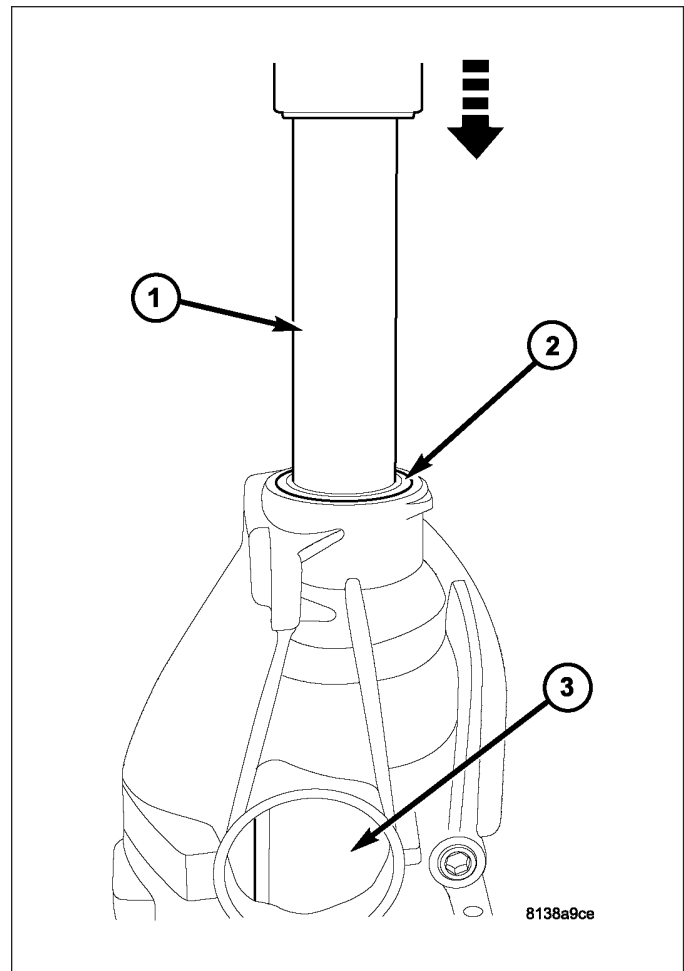
5. Install washers (2) and **new** collapsible spacer (1) to pinion shaft.



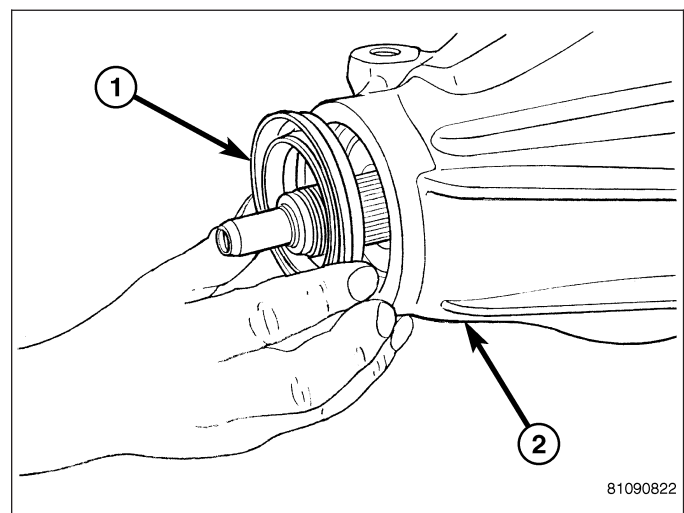
6. Install pinion shaft (1) into housing and support on press table atop Tool 8255 (2). **Ensure pinion gear face is centered atop Tool 8255.**



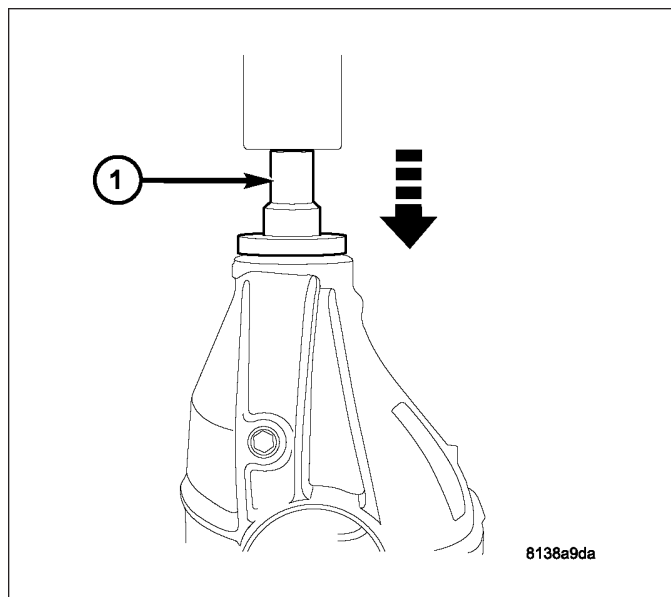
7. Using Tool C-3095-A (1), press on **new** pinion tail bearing (2).



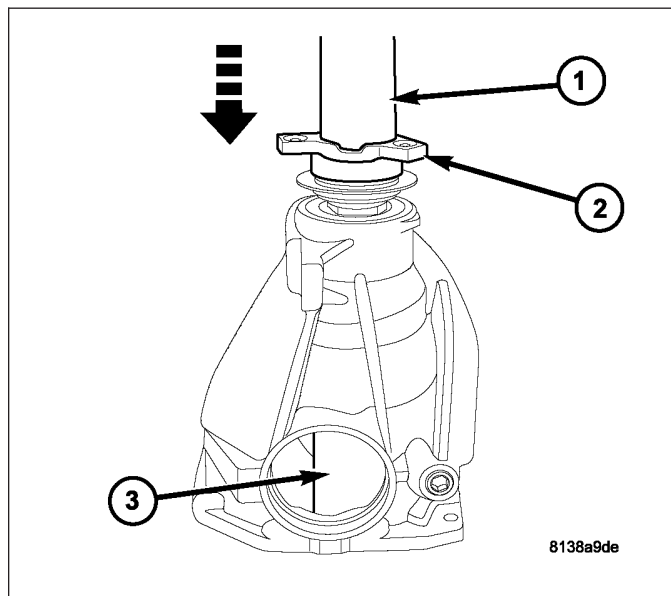
8. Install new pinion seal (1) into position.



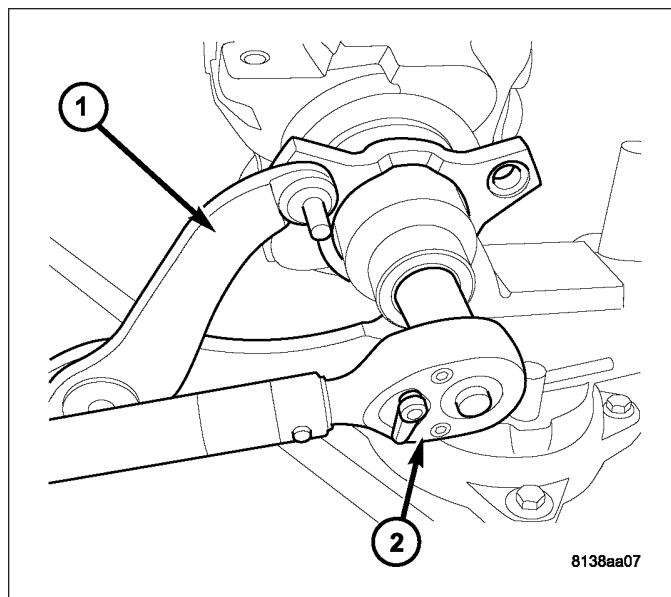
9. Press pinion seal into housing using Tool 9231A (1).



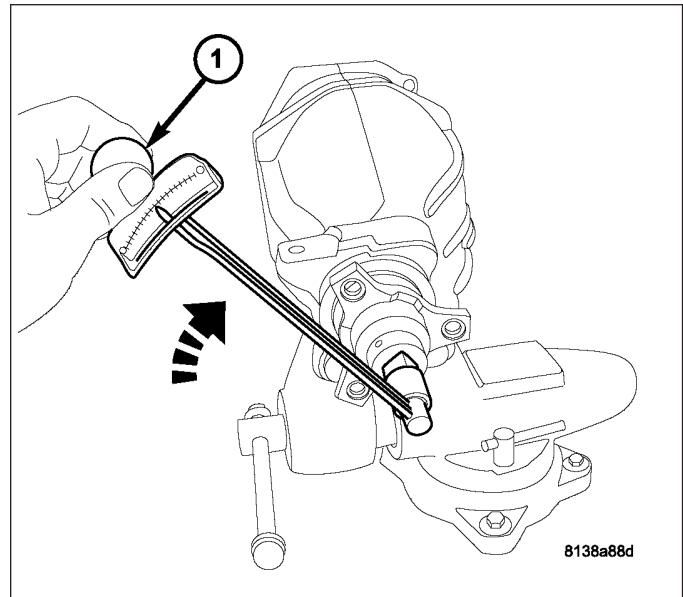
10. Lightly lubricate pinion flange seal with axle lubricant for flange installation.
11. Align index marks and press pinion flange (2) on using Tool C-3095-A (1).



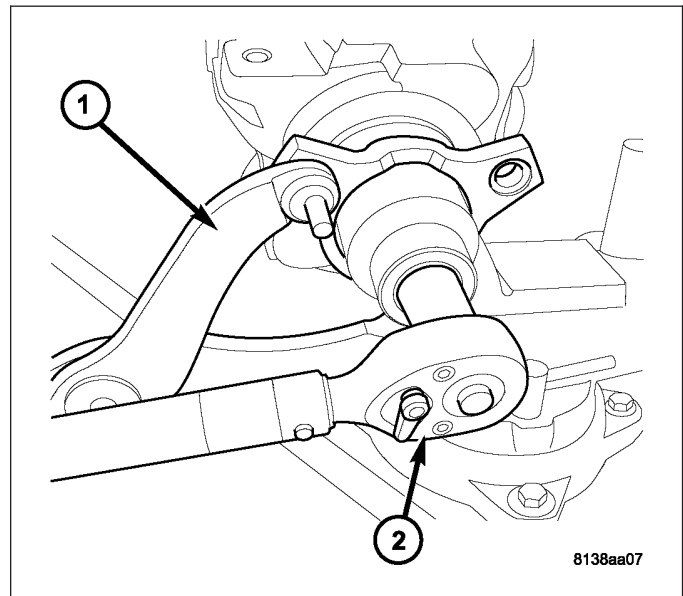
12. Install new pinion flange nut by hand.
13. Hold pinion flange with Tool C-3281 (1). Using a deep 41 mm socket, tighten pinion flange nut to an initial torque of 203 N·m (150 ft. lbs.).



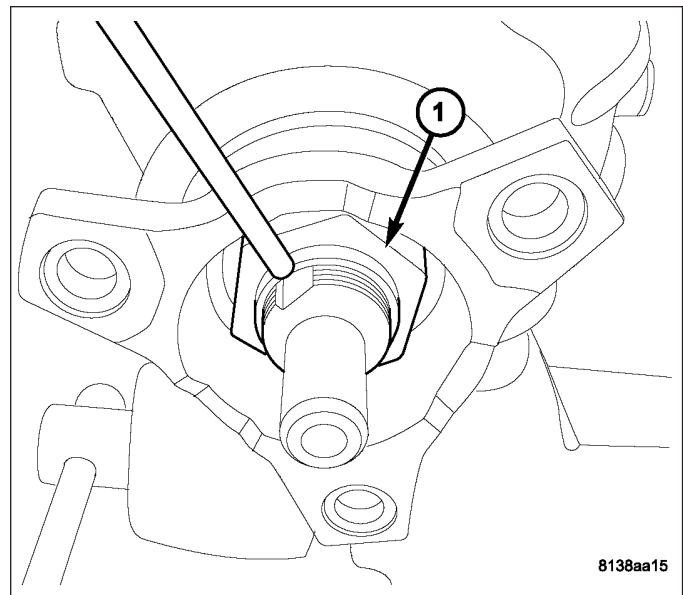
14. Rotate pinion flange to ensure bearing is properly seated.
15. Measure pinion rotating torque using suitable torque wrench (1). **Pinion rotating torque should be 215-245 N. cm (19-22 in. lbs.).**
16. If pinion rotating torque exceeds the specified range, the pinion shaft must be removed and the crush sleeve replaced.



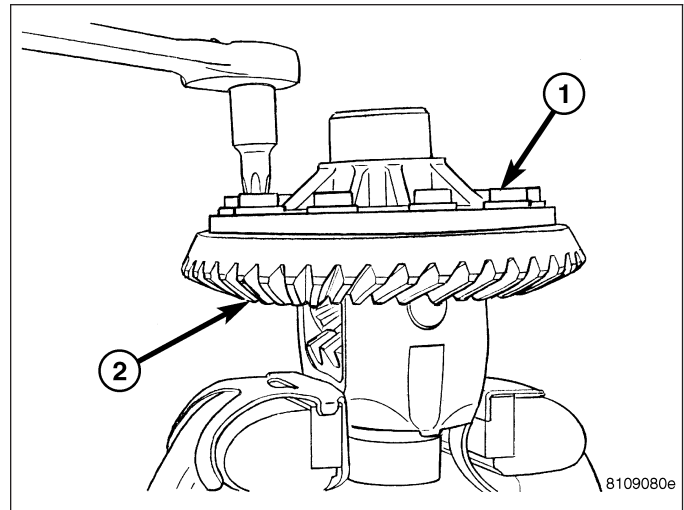
17. If pinion rotating torque is below the specified range, increase nut torque by 7 N·m (5 ft. lbs.) increments and recheck turning torque until rotating torque is within range.



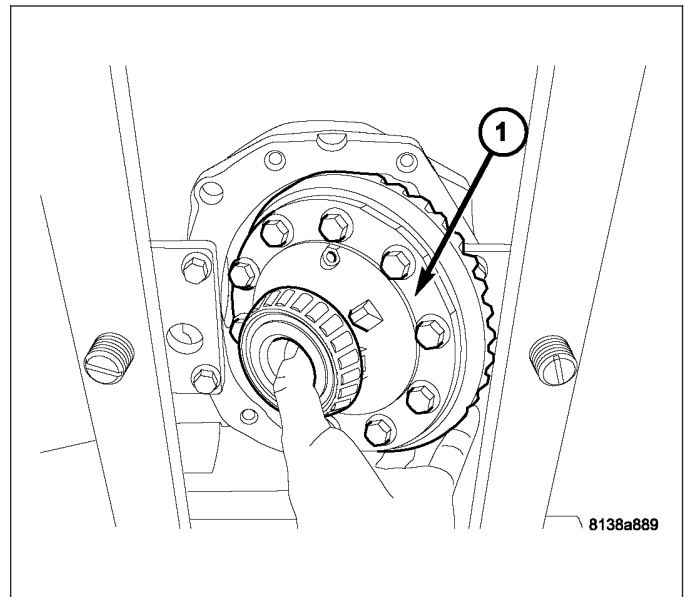
18. Stake pinion flange nut (1) using hammer and suitable punch.



19. Install ring gear to differential case. Loosely install **new** ring-gear-to-differential case bolts.
20. Torque all ring gear-to-case bolts to 85 N·m (64 ft. lbs.)



21. Install differential and reassemble axle assembly. (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 210MM/DIFFERENTIAL - INSTALLATION)



# BRAKES

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## BRAKES - BASE

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## BRAKES - BASE

### DESCRIPTION - BASE BRAKES

The base brake system consists of the following components:

- Brake pedal
- Master cylinder
- Power brake booster
- Brake tubes and hoses
- Proportioning valves (2) (non-ABS only)
- Disc brakes (front and rear)
- Brake lamp switch
- Brake fluid level sensor
- Parking brake

All brakes are power assist type through the use of a vacuum operated power brake booster.

The hydraulic brake system is front/rear split on both the non-antilock and antilock braking systems. This means the front brakes are on one hydraulic circuit from the master cylinder and the rear brakes are on the other.

Front disc brakes control the braking of the front wheels; rear braking is controlled by rear disc brakes.

Vehicles equipped with the optional antilock brake system (ABS) (with and without traction control) use a system designated Mk 25. This system shares most base brake hardware used on vehicles without ABS. An Electronic Stability Program (ESP) is also available. All components differing from the base brake hardware are described in detail in the Antilock Brake System section.

The parking brake on this vehicle is pedal-operated.

For more information on the description of any individual base brake component, refer to that component elsewhere in this section. For information on the brake lamp switch, (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - DESCRIPTION)

## WARNING

**WARNING:** Dust and dirt accumulating on brake parts during normal use may contain asbestos fibers from production or aftermarket brake linings. Breathing excessive concentrations of asbestos fibers can cause serious bodily harm. Exercise care when servicing brake parts. Do not sand or grind brake lining unless equipment used is designed to contain the dust residue. Do not clean brake parts with compressed air or by dry brushing. Cleaning should be done by dampening the brake components with a fine mist of water, then wiping the brake components clean with a dampened cloth. Dispose of cloth and all residue containing asbestos fibers in an impermeable container with the appropriate label. Follow practices prescribed by the Occupational Safety And Health Administration (OSHA) and the Environmental Protection Agency (EPA) for the handling, processing, and disposing of dust or debris that may contain asbestos fibers.

## CAUTION

**CAUTION:** Use only Mopar® brake fluid or an equivalent from a tightly sealed container. Brake fluid must conform to DOT 3 specifications. Do not use petroleum-based fluid because seal damage in the brake system will result.

**CAUTION:** Brake fluid will damage painted surfaces. If brake fluid is spilled on any painted surfaces, wash it off immediately with water.

**CAUTION:** Never use gasoline, kerosene, alcohol, motor oil, transmission fluid, or any fluid containing mineral oil to clean system components. These fluids damage rubber cups and seals.

**CAUTION:** During service procedures, grease or any other foreign material must be kept off the caliper assembly, brake linings, brake rotor and external surfaces of the hub.

**CAUTION:** Disc brake calipers are made of aluminum. They are anodized and appear black in color. When handling the calipers or brake rotors, be careful to avoid damaging them, and avoid scratching or nicking the brake pad lining.

**CAUTION:** Anytime the battery has been disconnected and is reconnected it is important that this be performed properly. The vehicle may be equipped with systems that require special calibration processes. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)

## STANDARD PROCEDURE

### BASE BRAKE BLEEDING

**CAUTION:** Before removing the master cylinder cover, wipe it clean to prevent dirt and other foreign matter from dropping into the master cylinder.

**CAUTION:** Use only Mopar® brake fluid or an equivalent from a fresh, tightly sealed container. Brake fluid must conform to DOT 3 specifications.

**Note:** For bleeding the antilock brake hydraulic system, (Refer to 5 - BRAKES - STANDARD PROCEDURE)

**Note:** Do not pump the brake pedal at any time while having a bleeder screw open during the bleeding process. This will only increase the amount of air in the system and make additional bleeding necessary.

**Note:** Do not allow the master cylinder reservoir to run out of brake fluid while bleeding the system. An empty reservoir will allow additional air into the brake system. Check the fluid level frequently and add fluid as needed.



The following wheel circuit sequence for bleeding the brake hydraulic system should be used to ensure adequate removal of all trapped air from the brake hydraulic system.

- Right rear wheel
- Left rear wheel
- Right front wheel
- Left front wheel

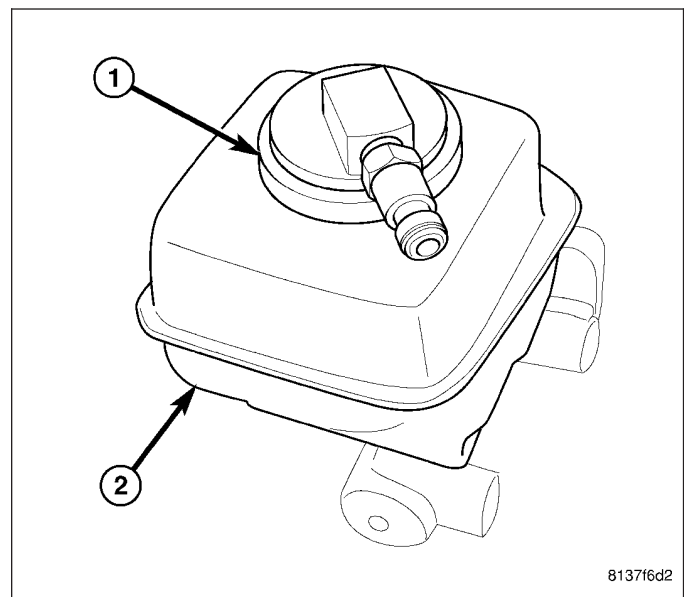
**Note: Pressure bleeding is recommended to bleed this brake system to ensure all air is removed from system. Manual bleeding may also be used, but additional time is needed to remove all air from system.**

The base brake system can be bled using the pressure method or the manual method. Both methods are presented in this text.

## PRESSURE BLEEDING METHOD

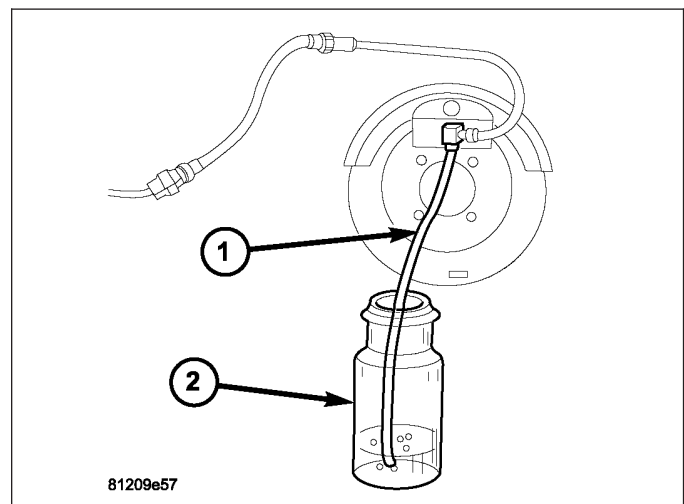
**Note: Follow pressure bleeder manufacturer's instructions for use of pressure bleeding equipment.**

1. Remove filler cap from the top of fluid reservoir (2) on master cylinder.
2. Install Adapter (1), Special Tool 6921, in the caps place on the reservoir (2).
3. Attach Bleeder Tank, Special Tool C-3496-B, or equivalent, to Adapter 6921 (1). Pressurize the system following the pressure bleeder manufacturer's instructions.



4. If installed, remove rubber dust caps from all four bleeder screws on calipers.
5. Starting at the first wheel circuit as listed earlier, attach a clear hose (1) to the bleeder screw at that wheel's brake caliper and feed the other end of the hose into a clear jar (2) containing enough fresh brake fluid to submerge the end of the hose.

**CAUTION: Open the bleeder screw at least one full turn when instructed. Some air may be trapped in the brake lines or valves far upstream, as far as ten feet or more from the bleeder screw. If the bleeder screw is not opened sufficiently, fluid flow is restricted causing a slow, weak fluid discharge. This will NOT get all the air out. Therefore, it is essential to open the bleeder screw at least one full turn to allow a fast, large volume discharge of brake fluid.**



6. Open bleeder screw at least one full turn or more to obtain an adequate flow of brake fluid.
7. After 4 to 8 ounces of brake fluid has been bled through the brake hydraulic circuit, and an air-free flow (no bubbles) is maintained in the clear plastic hose (1) and jar (2), close the bleeder screw.

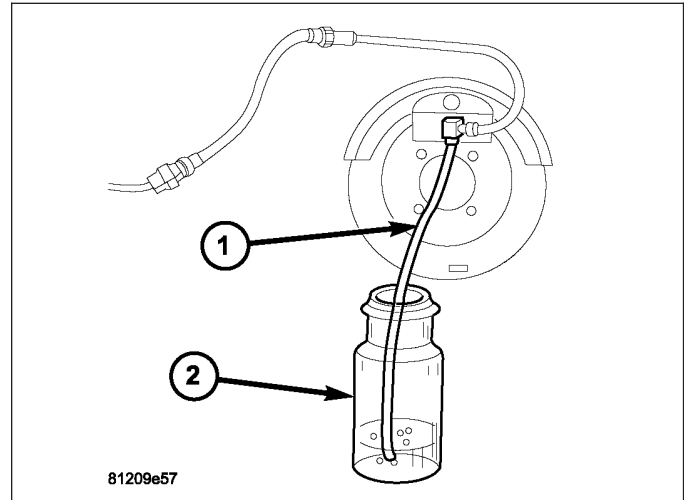
8. Bleed the remaining wheel circuits in the same manner until all air is removed from the brake hydraulic system.
9. Check brake pedal travel. If pedal travel is excessive or has not improved, some air may still be trapped in the hydraulic system. Rebleed the brake system as necessary.
10. If equipped with antilock brakes, the hydraulic control unit may need to be bled, then rebleed base brakes. (Refer to 5 - BRAKES - STANDARD PROCEDURE)
11. Reinstall all 4 bleeder screw dust caps.
12. Test drive vehicle to ensure brakes are operating properly and pedal feel is correct.

## MANUAL BLEEDING METHOD

**Note:** To bleed the base brake system manually, an assistants help is required.

1. Remove rubber duct caps from all 4 bleeder screws.
2. Attach a clear hose (1) to the bleeder screw at one wheel and feed the other end of the hose into a clear jar (2) containing fresh brake fluid.
3. Have an assistant pump the brake pedal three or four times and hold it down before the bleeder screw is opened.

**CAUTION:** Open the bleeder screw at least one full turn when instructed. Some air may be trapped in the brake lines or valves far upstream, as far as ten feet or more from the bleeder screw. If the bleeder screw is not opened sufficiently, fluid flow is restricted causing a slow, weak fluid discharge. This will NOT get all the air out. Therefore, it is essential to open the bleeder screw at least one full turn to allow a fast, large volume discharge of brake fluid.



4. While the pedal is being held down, open the bleeder screw at least 1 full turn. When the bleeder screw opens the brake pedal will drop all the way to the floor. Continue to hold the pedal all the way down.
5. Once the brake pedal has dropped, close the bleeder screw. The pedal can then be released.
6. Repeat steps One through Five until all trapped air is removed from that wheel circuit (usually four or five times). This should pass a sufficient amount of fluid to expel all the trapped air from the brakes hydraulic system. Be sure to monitor brake fluid level in master cylinder fluid reservoir making sure it stays at a proper level. This will ensure air does not reenter brake hydraulic system through master cylinder.

**Note:** Monitor the brake fluid level in the fluid reservoir periodically to make sure it does not go too low. This will ensure that air does not reenter the brake hydraulic system.

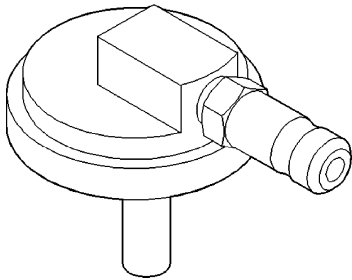
7. Bleed the remaining wheel circuits in the same manner until all air is removed from the brake hydraulic system.
8. Check brake pedal travel. If pedal travel is excessive or has not improved, some air may still be trapped in the hydraulic system. Rebleed the brake system as necessary.
9. If equipped with antilock brakes, the hydraulic control unit may need to be bled, then rebleed base brakes. (Refer to 5 - BRAKES - STANDARD PROCEDURE)
10. Reinstall all 4 bleeder screw dust caps.
11. Test drive vehicle to ensure brakes are operating properly and pedal feel is correct.

**SPECIFICATIONS****BRAKE FASTENER TORQUE**

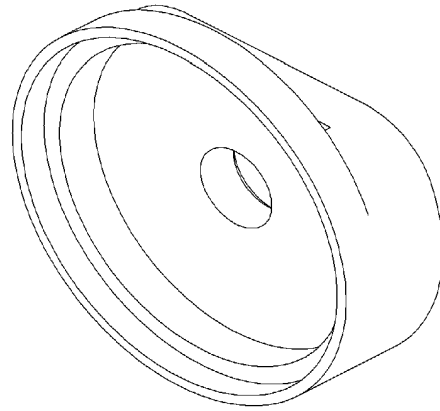
DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
ABS ICU Mounting Bolts To Bracket	11	8	97
ABS ABM-To-HCU Mounting Screws	2	—	17
ABS Wheel Speed Sensor Head Mounting Screw - Front	11	8	97
ABS Wheel Speed Sensor Head Mounting Screw - Rear	11	8	97
Adjustable Pedal Position Sensor Mounting Screws	7.5	66	—
Brake Pedal Mounting Nuts	25	18	221
Brake Tube Nuts	14	10	124
Brake Hose-to-Front knuckle Bracket Screw	11	8	97
Brake Hose Caliper Banjo Bolt	43	32	—
Disc Brake Caliper Adapter Mounting Bolts - Front	95	70	—
Disc Brake Caliper Adapter Mounting Bolts - Rear	95	70	—
Disc Brake Caliper Guide Pin Bolts - Front	60	44	—
Disc Brake Caliper Guide Pin Bolts - Rear	60	44	—
Disc Brake Caliper Bleeder Screw	11	8	97
Master Cylinder Mounting Nuts	25	19	225
Power Brake Booster Mounting Nuts	25	18	221
Parking Brake Cable Knuckle Mounting Screw	8	6	71
Parking Brake Lever (Pedal) Mounting Bolt And Nuts	26	19	230
Wheel Mounting (Lug) Nuts	150	110	—

## SPECIAL TOOLS

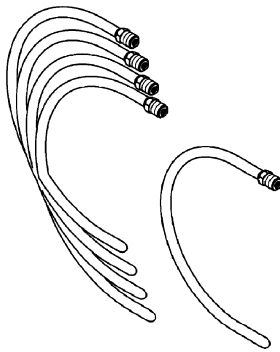
### BASE BRAKE SYSTEM



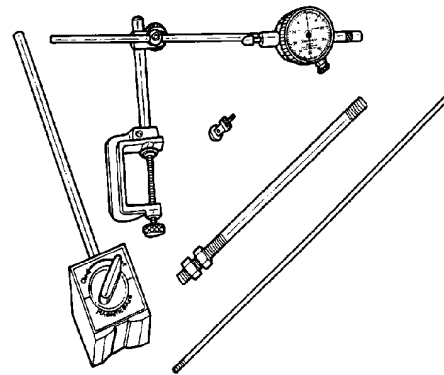
*Adapter, Master Cylinder Pressure Bleed Cap 6921*



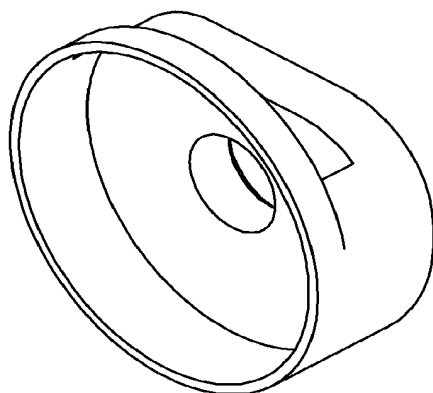
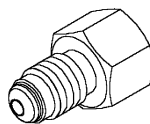
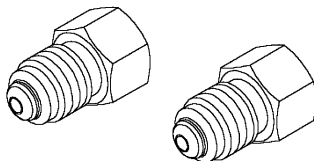
*Installer, Dust Boot 9315*



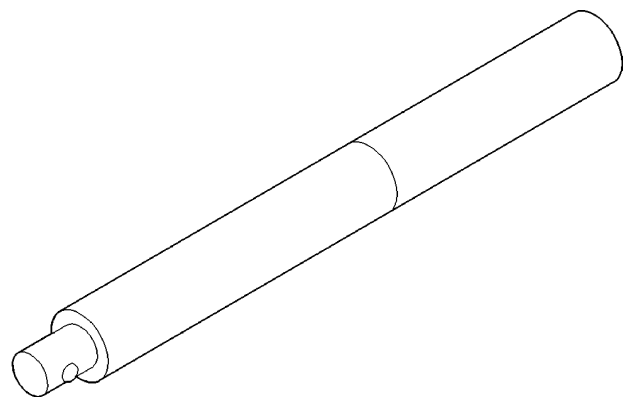
*Adapters, Bleeder Tubes 8822*



*Dial Indicator C-3339A*



*Installer, Dust Boot 9314*



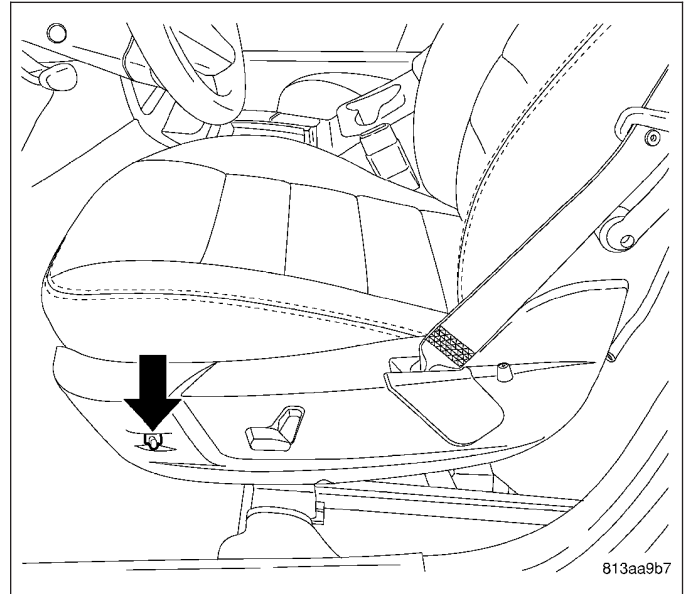
*Handle, Universal C-4171*

## SWITCH-ADJUSTABLE PEDALS

### DESCRIPTION

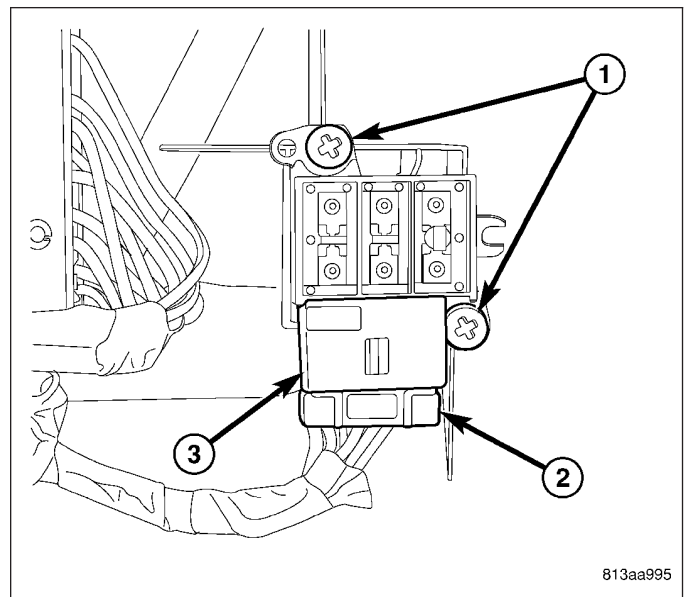
The adjustable pedals switch is located on the left side trim of the driver's seat cushion. Fore and Aft movement of the paddle-type switch allows front-to-rear travel of the adjustable pedals, up to approximately 76 mm (3 inches) total movement. Pushing the paddle forward moves the peddles away from the driver and vice-versa. Movement stops when the switch is released.

The switch actuates the electric motor-driven adjustable pedals mechanism through the memory seat module (MSM). MSM logic prevents pedal adjustment while the speed control is set and when the transmission is in Reverse.



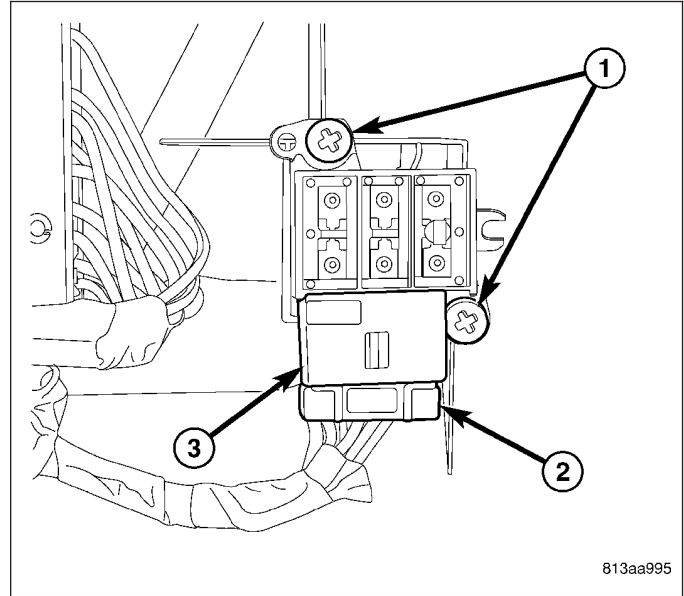
### REMOVAL

1. Move driver's seat to full-forward, full-upward position.
2. Disconnect battery negative cable from battery post and isolate.
3. Remove seat belt shield from driver's seat cushion left side trim.
4. Remove three screws fastening seat cushion side trim in place.
5. Lift side trim from seat and utilizing slack in seat belt, turn trim over.
6. Disconnect wiring connector (2) from adjustable pedals switch (3).
7. Remove two mounting screws (1) and remove switch (3).



## INSTALLATION

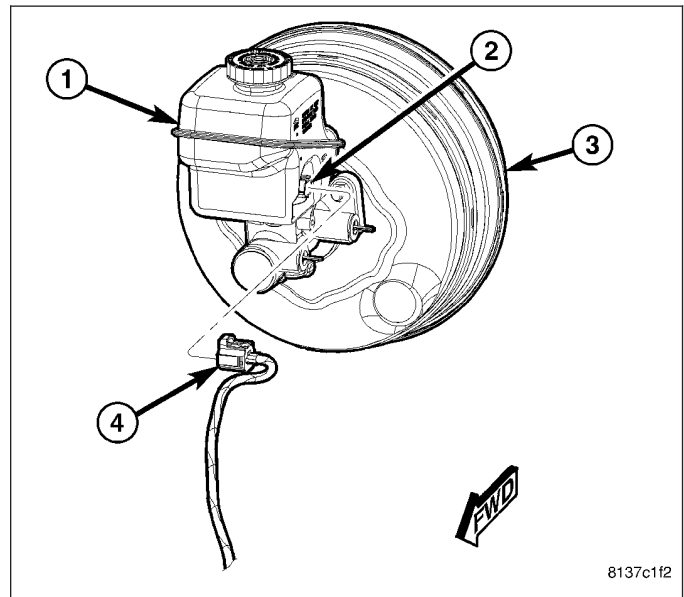
1. Position switch (3) connector-side-down on the inside of the driver's seat cushion side trim.
2. Install two screws (1) fastening switch in place.
3. Connect wiring connector (2) to adjustable pedals switch (3).
4. Position side trim on driver's seat cushion left side and install three screws fastening side trim in place.
5. Install seat belt shield on driver's seat cushion left side trim.
6. Connect negative battery cable to battery post. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)
7. Check operation of adjustable pedals.
8. If vehicle is equipped with memory seats, the system will need to be initialized. Refer to appropriate diagnostic information.



## SENSOR - BRAKE FLUID LEVEL

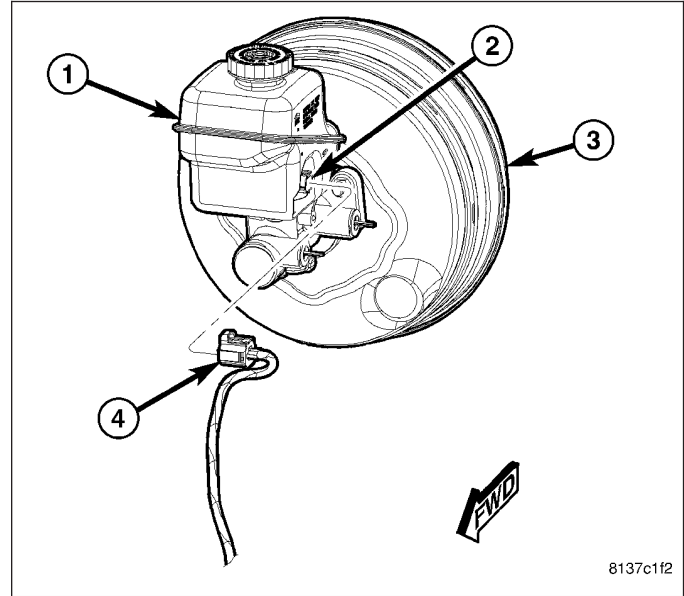
### REMOVAL

The brake fluid level sensor (2) is an integral part of the master cylinder fluid reservoir (1). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/FLUID RESERVOIR - REMOVAL)



## INSTALLATION

The brake fluid level sensor (2) is an integral part of the master cylinder fluid reservoir (1). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/FLUID RESERVOIR - INSTALLATION)

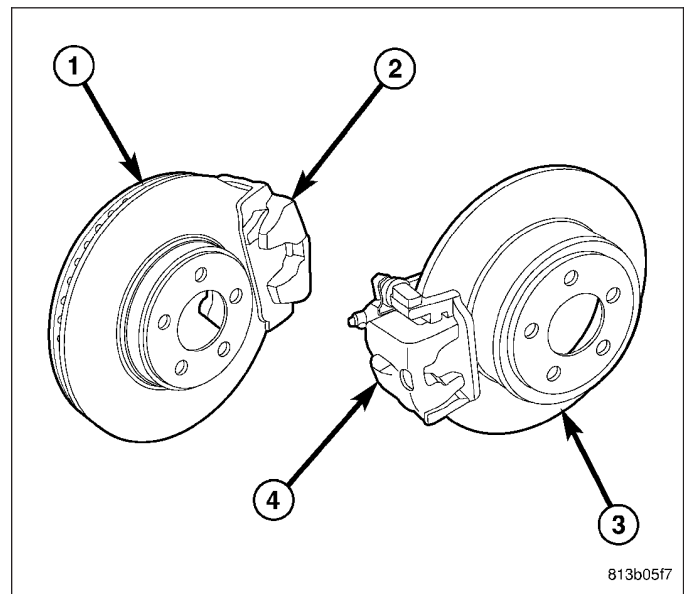


## HYDRAULIC/MECHANICAL

### DESCRIPTION - DISC BRAKES

Four-wheel disc brakes are standard on this vehicle. There are two four-wheel disc brake systems available, a standard and a premium. The standard disc brake system is referred to as "Seventeen-Inch." The premium disc brake system is referred to as "Eighteen-Inch."

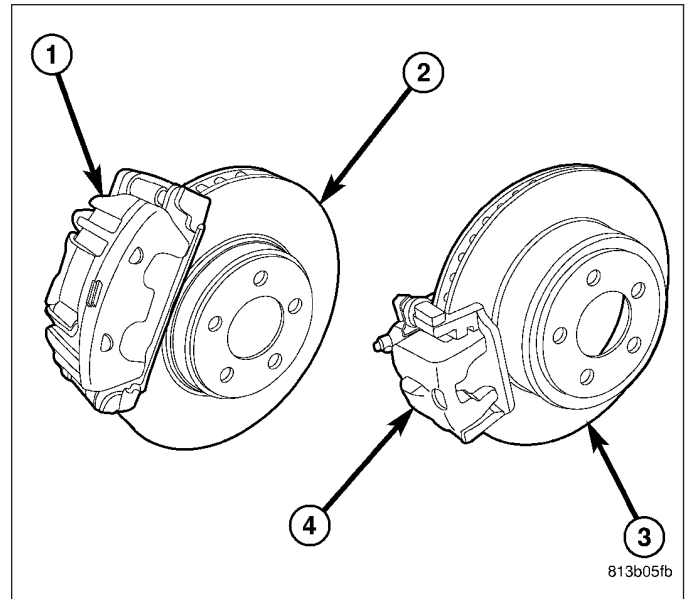
"Seventeen-inch" four-wheel disc brakes (so called because they are designed to fit inside 17-inch wheels) are standard on rear-wheel drive models with V6 engines. They feature single-piston aluminum calipers (2) and vented rotors (1) in the front and single-piston aluminum calipers (4) with solid rotors (3) in the rear.



“Eighteen-inch” four-wheel disc brakes (so called because they are designed to fit inside 18-inch wheels) are standard on Chrysler 300 Hemi C and all international models, and optional on other models. They feature twin-piston aluminum calipers (1) and vented rotors (2) in the front and single-piston aluminum calipers (4) with vented rotors (3) in the rear. Although the rear calipers appear the same as the 17-inch system, the rear calipers used with this system feature a wider jaw to compensate for the wider, vented brake rotors used.

The calipers with the “18-inch” system, which are readily visible through the aluminum wheels, have a gray anodized coating for corrosion protection and long-term neat appearance.

Although the caliper used is the same, rear-wheel drive models mount the front caliper to the front of the knuckle while all-wheel drive models mount the front caliper to the rear of the knuckle.



All calipers are aluminum construction and are the low-drag type. All calipers are anodized, giving them an off-black appearance. New-technology caliper construction allows minimal drag of the pads on the discs with low clearance to the rotors to maintain maximum pedal feel and responsiveness.

Phenolic pistons are used in all calipers. The pistons have stainless steel caps for protection against damage due to contact with the brake pads.

All brake rotors are fully coated with Geomet™, a water-soluble, environmental friendly corrosion preventive. Both the friction surfaces and the vents are coated. During initial brake applications of a new rotor, the brake pads scrub the coating off the friction surfaces, ensuring that the remainder will be rust free. Coating the vents also ensures that there will not be a loss of heat capacity over time.



## PADS - FRONT BRAKE

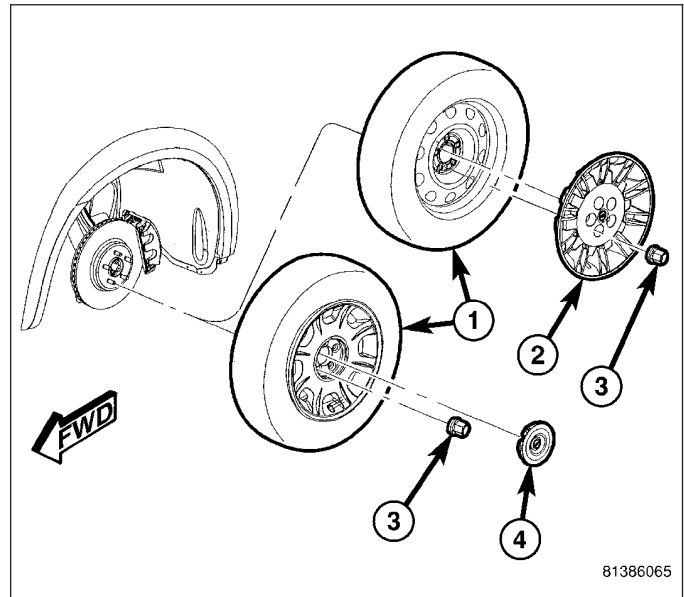
### REMOVAL

**Note:** Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

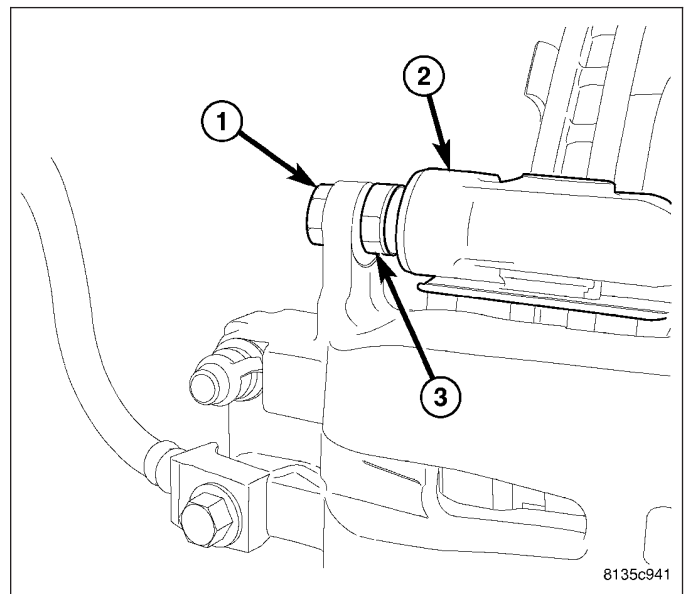
**Note:** Perform steps 2 through 6 on each side of the vehicle.

2. Remove wheel mounting nuts (3), then tire and wheel assembly (1).

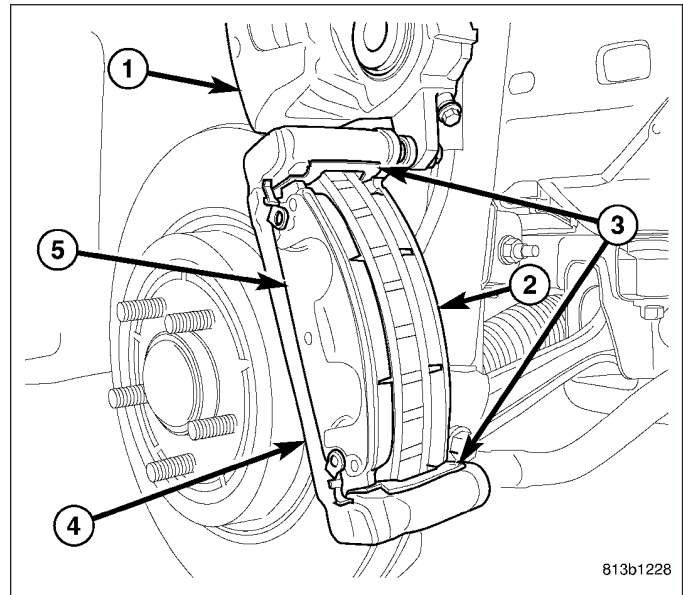


**Note:** In some cases, it may be necessary to retract caliper piston in its bore a small amount in order to provide sufficient clearance between shoes and rotor to easily remove caliper from knuckle. This can usually be accomplished before guide pin bolts are removed by grasping rear of caliper and pulling outward working with guide pins, thus retracting piston. Never push on piston directly as it may get damaged.

3. Remove Lower caliper guide pin bolt. To do so, hold the guide pin (3) stationary while turning bolt (1).



4. Rotate caliper upward (1), exposing brake pads (2 and 5). **Use care not to overextend brake hose when doing this or damage may occur.**
5. Remove inboard (2) and outboard (5) brake pads from caliper adapter (4).
6. If necessary, remove anti-rattle clips (3) from upper and lower abutments of adapter (4).



## CLEANING

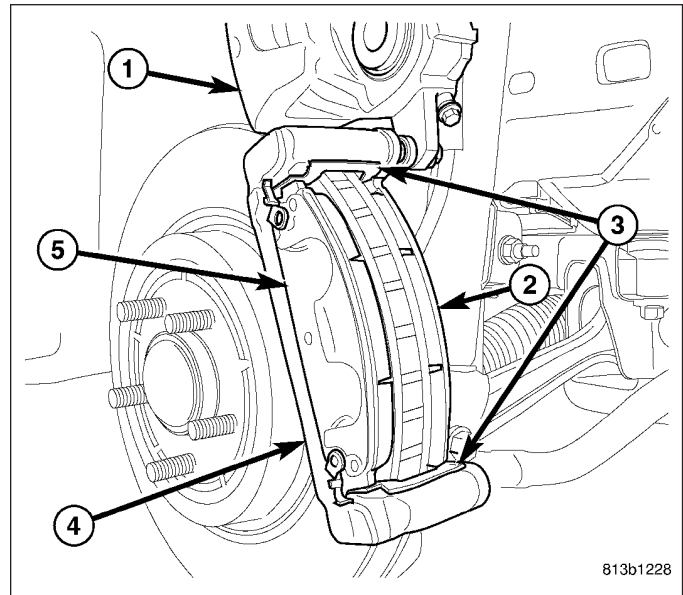
**WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM PRODUCTION OR AFTERMARKET BRAKE LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT SAND OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. CLEANING SHOULD BE DONE BY DAMPENING THE BRAKE COMPONENTS WITH A FINE MIST OF WATER, THEN WIPING THE BRAKE COMPONENTS CLEAN WITH A DAMPENED CLOTH. DISPOSE OF CLOTH AND ALL RESIDUE CONTAINING ASBESTOS FIBERS IN AN IMPERMEABLE CONTAINER WITH THE APPROPRIATE LABEL. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) FOR THE HANDLING, PROCESSING, AND DISPOSING OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.**

## INSTALLATION

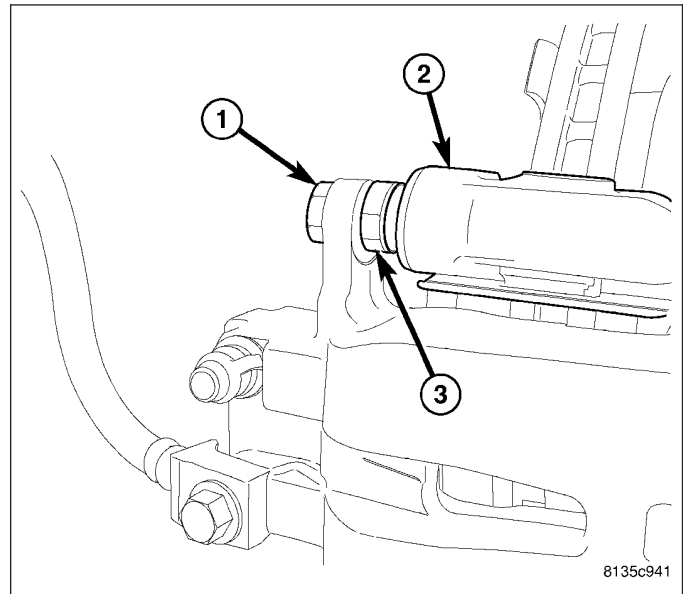
**Note: Perform steps 1 through 7 on each side of the vehicle.**

1. Completely retract caliper piston(s) back into bore(s) of caliper. To do so:
  - a. Remove fluid reservoir cap.
  - b. Use hand pressure or a C-clamp may be used to retract piston, first placing a wood block over piston(s) before installing C-clamp to avoid damaging piston(s).
  - c. Install fluid reservoir cap.

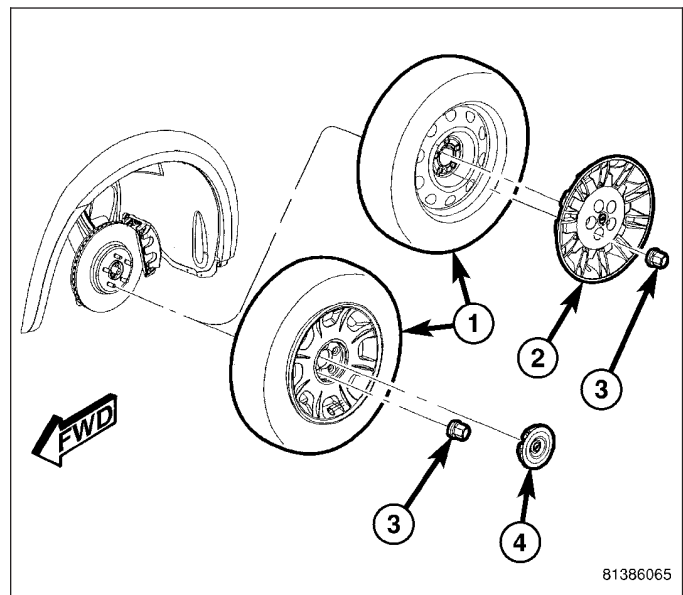
2. If removed, attach anti-rattle clips (3) to upper and lower abutments of adapter (4).
3. Install NEW inboard (2) and outboard (5) brake pads on caliper adapter (4). NEW Inboard and outboard pads are interchangeable.
4. Push caliper guide pins into caliper adapter to clear caliper mounting bosses when installing.
5. Rotate caliper downward, aligning upper mounting boss with lower guide pin.



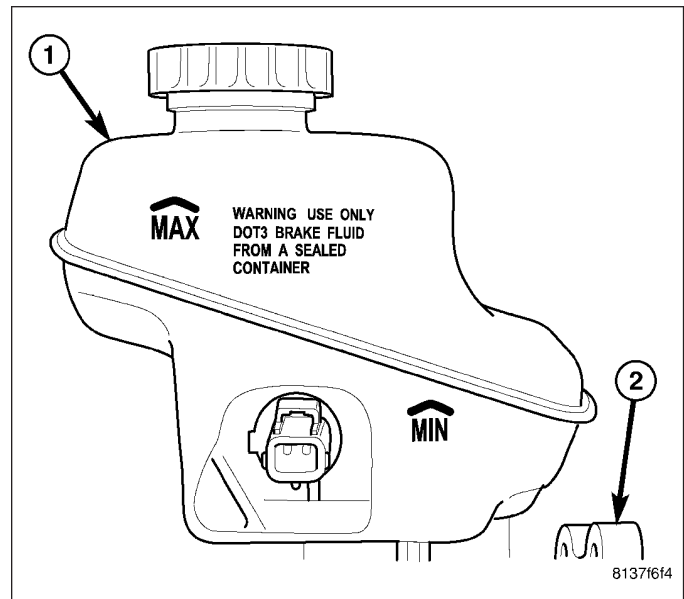
6. Install Upper caliper guide pin bolt (1). While holding guide pin (3) stationary tighten bolt to 60 N·m (44 ft. lbs.) torque.



7. Install tire and wheel assembly (1). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
8. Lower vehicle.
9. Pump brake pedal several times to set pads to caliper and brake rotor.



10. Check and adjust brake fluid level in reservoir (1).  
(Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/FLUID - STANDARD PROCEDURE)
11. Road test vehicle making several stops to wear off any foreign material on brakes and to seat brake shoes.



## PADS - REAR BRAKE

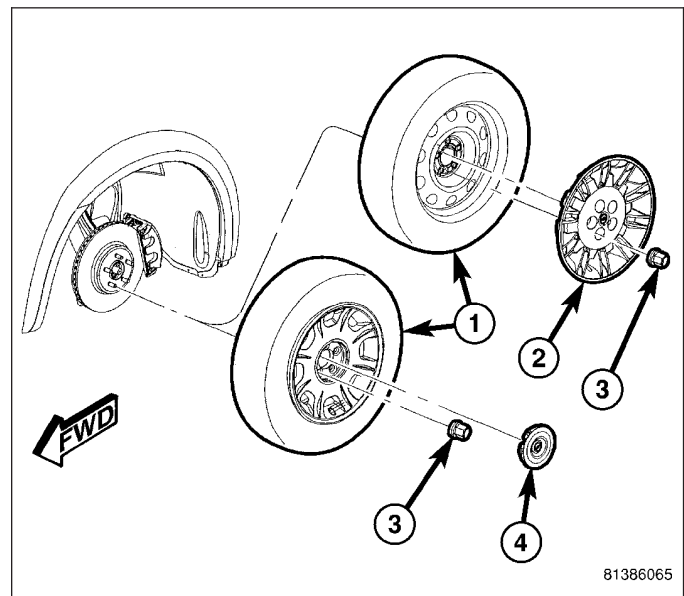
### REMOVAL

**Note:** Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

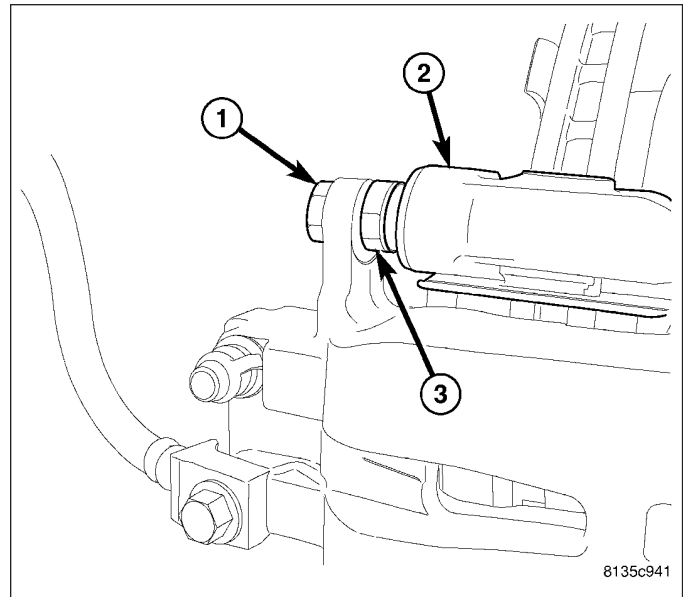
**Note:** Perform steps 2 through 6 on each side of the vehicle.

2. Remove wheel mounting nuts (3), then tire and wheel assembly (1).

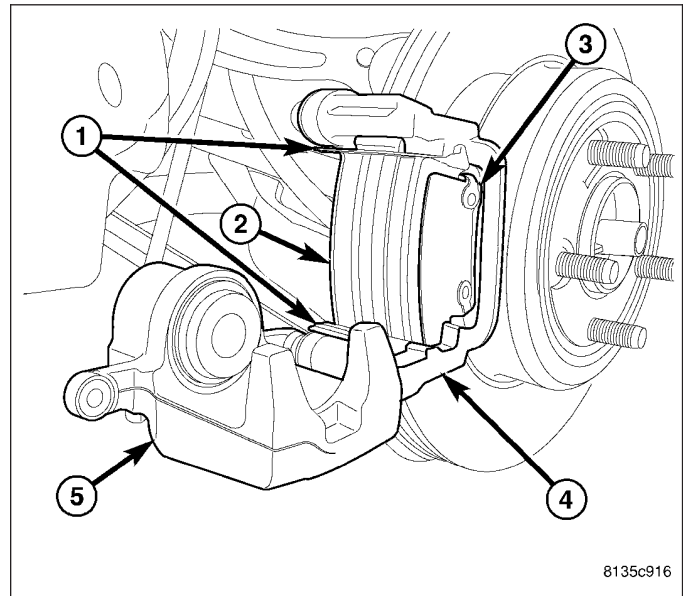


**Note:** In some cases, it may be necessary to retract caliper piston in its bore a small amount in order to provide sufficient clearance between shoes and rotor to easily remove caliper from knuckle. This can usually be accomplished before guide pin bolts are removed by grasping rear of caliper and pulling outward working with guide pins, thus retracting piston. Never push on piston directly as it may get damaged.

3. Remove Upper caliper guide pin bolt (1). To do so, hold the guide pin (3) stationary while turning bolt.



4. Rotate caliper downward (5), exposing brake pads (2 and 3). **Use care not to overextend brake hose when doing this or damage may occur.**
5. Remove inboard (2) and outboard (3) brake pads from caliper adapter (4).
6. If necessary, remove anti-rattle clips (1) from upper and lower abutments of adapter (4).



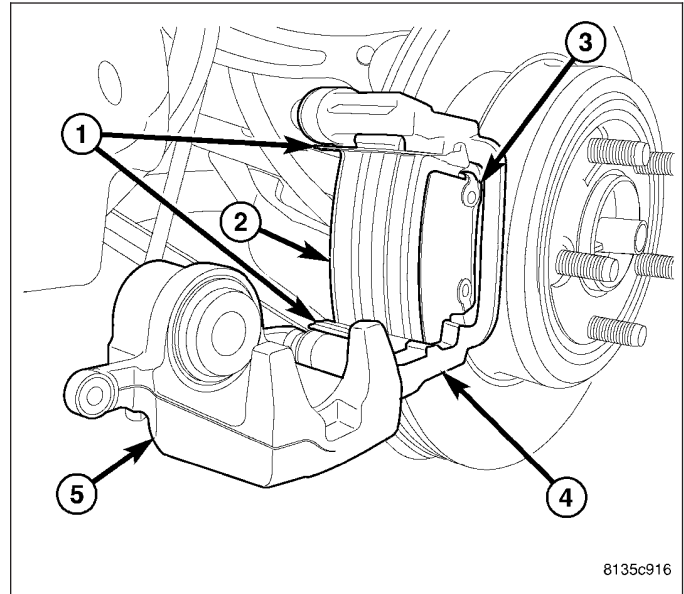
## CLEANING

**WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM PRODUCTION OR AFTERMARKET BRAKE LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT SAND OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. CLEANING SHOULD BE DONE BY DAMPENING THE BRAKE COMPONENTS WITH A FINE MIST OF WATER, THEN WIPING THE BRAKE COMPONENTS CLEAN WITH A DAMPENED CLOTH. DISPOSE OF CLOTH AND ALL RESIDUE CONTAINING ASBESTOS FIBERS IN AN IMPERMEABLE CONTAINER WITH THE APPROPRIATE LABEL. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) FOR THE HANDLING, PROCESSING, AND DISPOSING OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.**

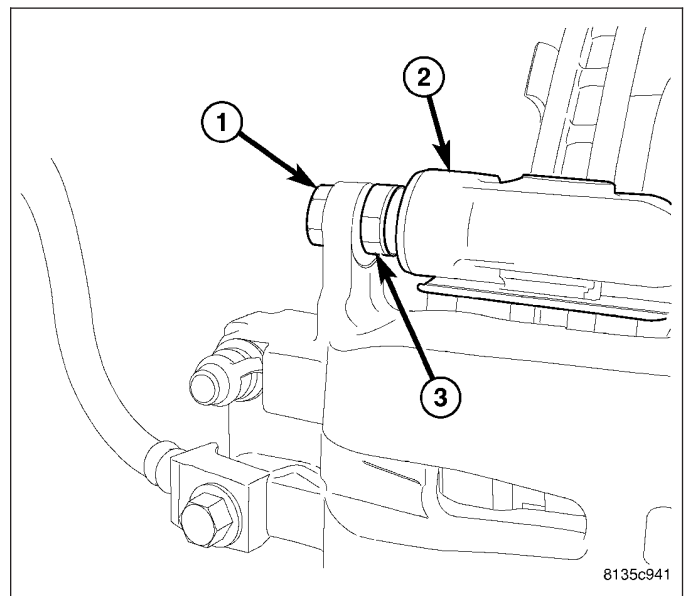
## INSTALLATION

**Note:** Perform steps 1 through 7 on each side of the vehicle.

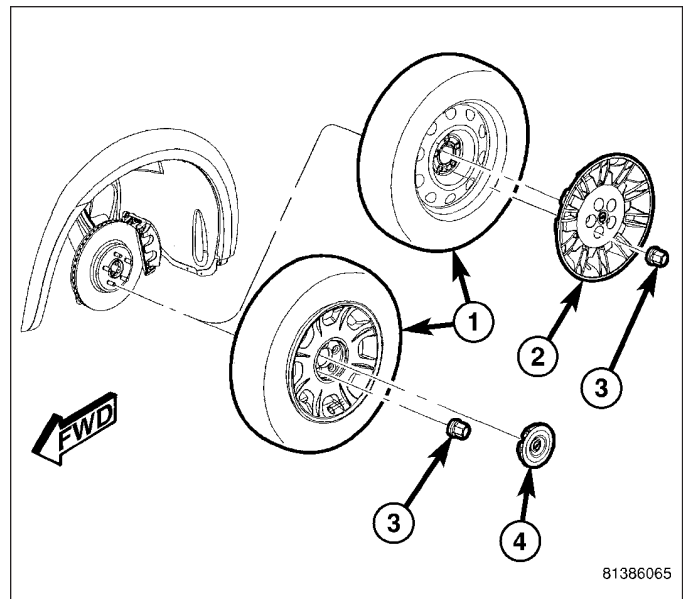
1. Completely retract caliper piston back into bore of caliper. To do so:
  - a. Remove fluid reservoir cap.
  - b. Use hand pressure or a C-clamp may be used to retract piston, first placing a wood block over piston before installing C-clamp to avoid damaging piston.
  - c. Install fluid reservoir cap.
2. If removed, attach anti-rattle clips (1) to upper and lower abutments of adapter (4).
3. Install NEW inboard (2) and outboard (3) brake pads on caliper adapter (4). NEW Inboard and outboard pads are interchangeable.
4. Push caliper guide pins into caliper adapter to clear caliper mounting bosses when installing.
5. Rotate caliper upward, aligning upper mounting boss with upper guide pin.



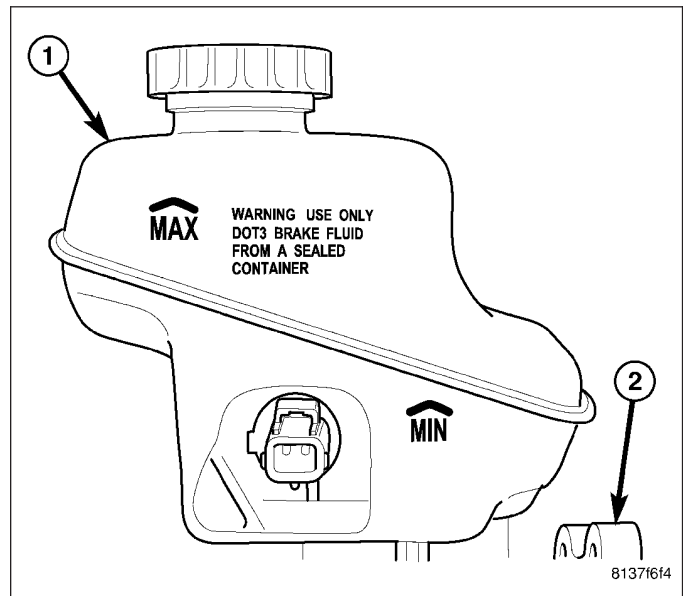
6. Install Upper caliper guide pin bolt (1). While holding guide pin (3) stationary tighten bolt to 60 N-m (44 ft. lbs.) torque.



7. Install tire and wheel assembly (1). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
8. Lower vehicle.
9. Pump brake pedal several times to set pads to caliper and brake rotor.



10. Check and adjust brake fluid level in reservoir (1). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/FLUID - STANDARD PROCEDURE)
11. Road test vehicle making several stops to wear off any foreign material on brakes and to seat brake shoes.

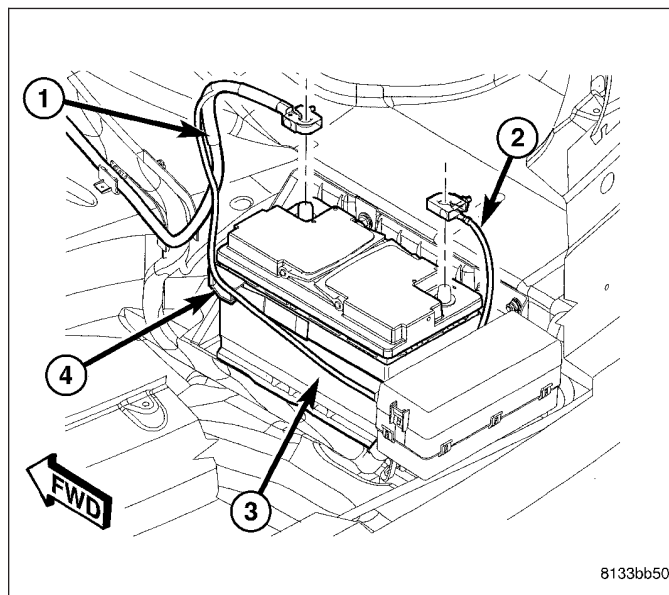


## CALIPER - FRONT SINGLE PISTON DISC BRAKE

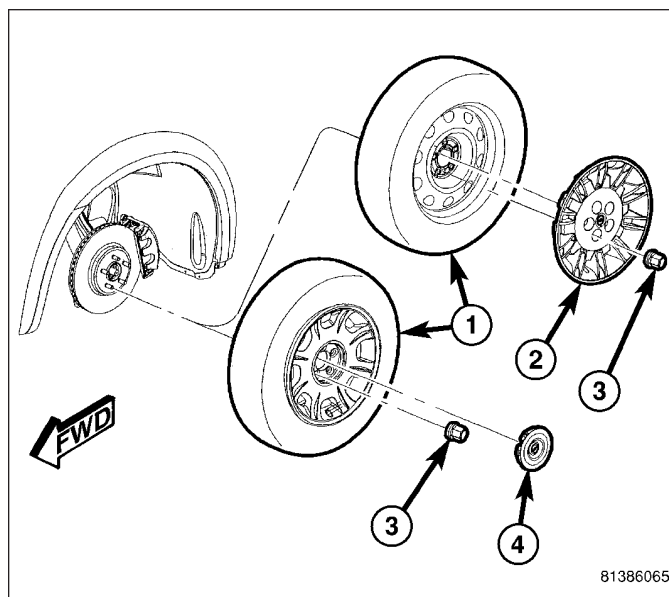
### REMOVAL

**Note:** Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

1. Disconnect and isolate battery negative cable (2) from battery post.
2. Using a brake pedal holding tool, depress brake pedal past its first inch of travel and hold it in this position. Holding pedal in this position will isolate master cylinder from hydraulic brake system and will not allow brake fluid to drain out of brake fluid reservoir while brake lines are open.
3. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

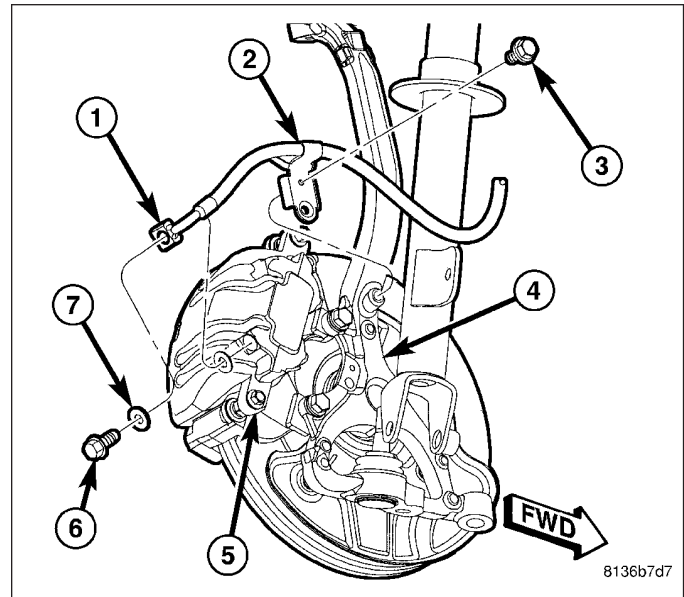


4. Remove wheel mounting nuts (3), then tire and wheel assembly (1).

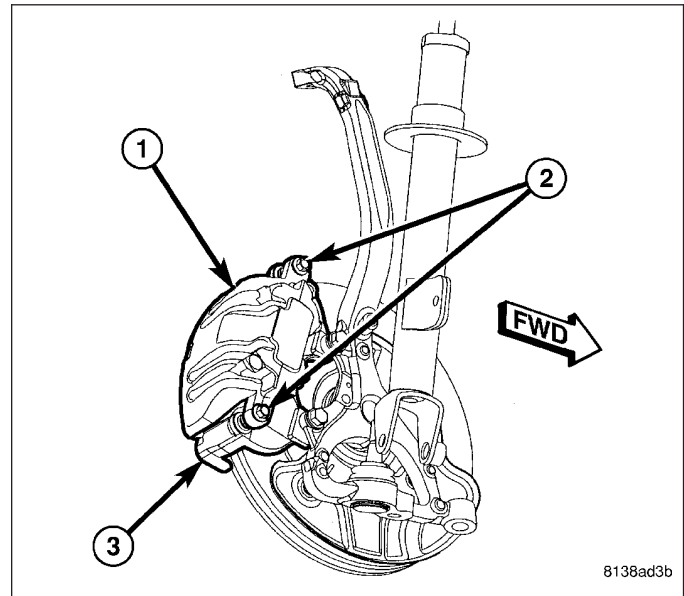




5. Remove banjo bolt (6) connecting flexible brake hose (1) to caliper (5). There are two sealing washers (7) (one on each side of hose fitting) that will come off when bolt is removed. Discard these washers; install NEW washers on installation.



6. While holding guide pins from turning, remove caliper guide pin bolts (2).
7. Remove brake caliper (1) from brake adapter (3) and pads.



## DISASSEMBLY

**Note:** Before disassembling brake caliper, clean and inspect it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - CLEANING)(Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - INSPECTION)

**WARNING:** Under no condition should high pressure air ever be used to remove a piston from a caliper bore. Personal injury could result from such a practice.

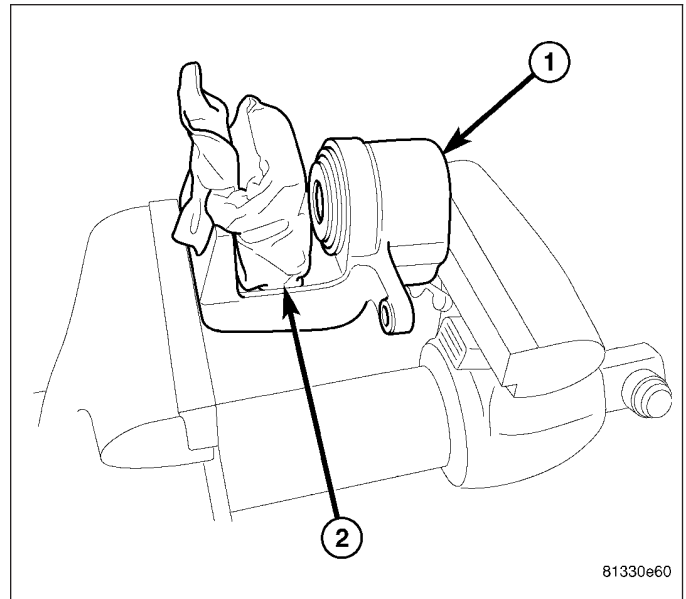
**CAUTION:** Do not use excessive force when clamping caliper in vise. Excessive vise pressure will cause bore distortion.

1. Drain brake fluid from caliper.

2. Mount caliper in a vise equipped with protective jaws.
3. Place a wooden block (2) (padded with approximately one-inch thickness of shop towels) in front of caliper (1) piston as shown. Padded block should be sized to allow piston to push out of bore far enough to be removed by hand after being loosened by air pressure, yet large enough to keep piston from coming completely out. This will cushion and protect caliper piston during removal.

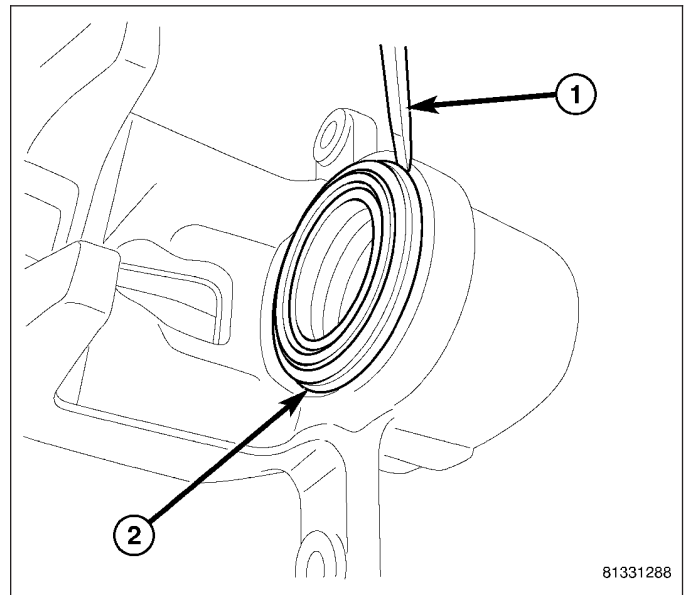
**WARNING: Do not place face or hands near caliper and piston if using compressed air pressure to remove piston. Do not use high pressure.**

4. Apply low pressure compressed air to caliper fluid inlet in **short spurts** to ease piston out of bore.
5. Remove piston from caliper (1).



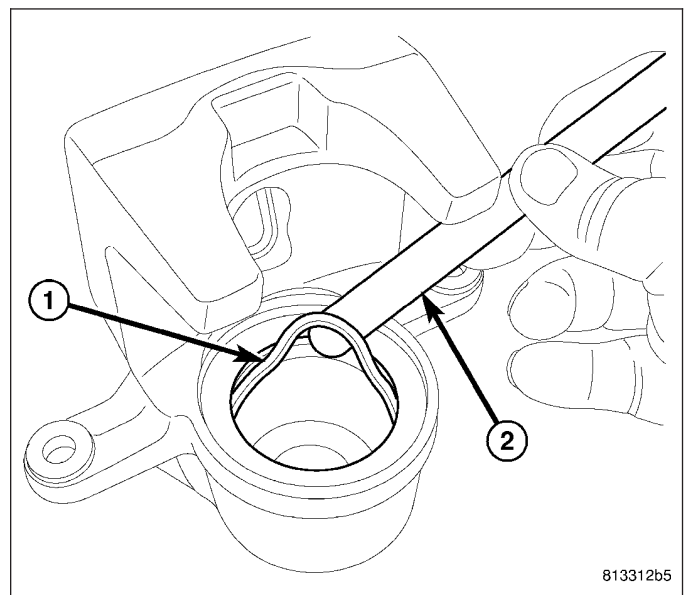
**CAUTION: When working on disc brake caliper, always use care and suitable tools to avoid damaging the aluminum housing.**

6. Using a suitable tool (1), carefully remove dust boot (2) and discard it.



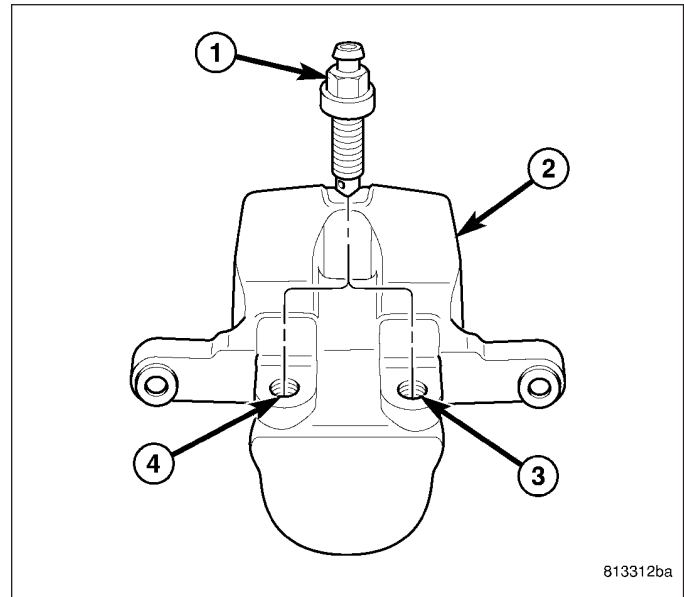
**CAUTION: Do not use a screw driver or other metal tool for seal removal. Using such tools can scratch bore or leave burrs on seal groove edges.**

7. Using a soft tool such as a plastic trim stick (2), work piston seal (1) out of its groove in caliper piston bore. Discard used seal.



8. Remove caliper bleeder screw (1) from caliper housing (2).
9. Clean piston bore and drilled passage ways with alcohol or a suitable solvent. Wipe it dry using only a lint-free cloth.
10. Inspect both piston and bore for scoring or pitting.

**Note:** It is not recommended to hone caliper bore. The anodized coating would be compromised.



## CLEANING

**WARNING:** DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM PRODUCTION OR AFTERMARKET BRAKE LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT SAND OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. CLEANING SHOULD BE DONE BY DAMPENING THE BRAKE COMPONENTS WITH A FINE MIST OF WATER, THEN WIPING THE BRAKE COMPONENTS CLEAN WITH A DAMPENED CLOTH. DISPOSE OF CLOTH AND ALL RESIDUE CONTAINING ASBESTOS FIBERS IN AN IMPERMEABLE CONTAINER WITH THE APPROPRIATE LABEL. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) FOR THE HANDLING, PROCESSING, AND DISPOSING OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.

To clean or flush the internal passages of the brake caliper, use fresh brake fluid or Mopar® Non-Chlorinated Brake Parts Cleaner. Never use gasoline, kerosene, alcohol, oil, transmission fluid or any fluid containing mineral oil to clean the caliper. These fluids will damage rubber cups and seals.

## INSPECTION

Inspect the disc brake caliper for the following:

- Cracked or damaged housing
- Brake fluid leaks in and around boot area
- Ruptures, brittleness or damage to the piston dust boot

If caliper fails inspection, disassemble and recondition caliper, replacing the seals and dust boots or replace caliper.

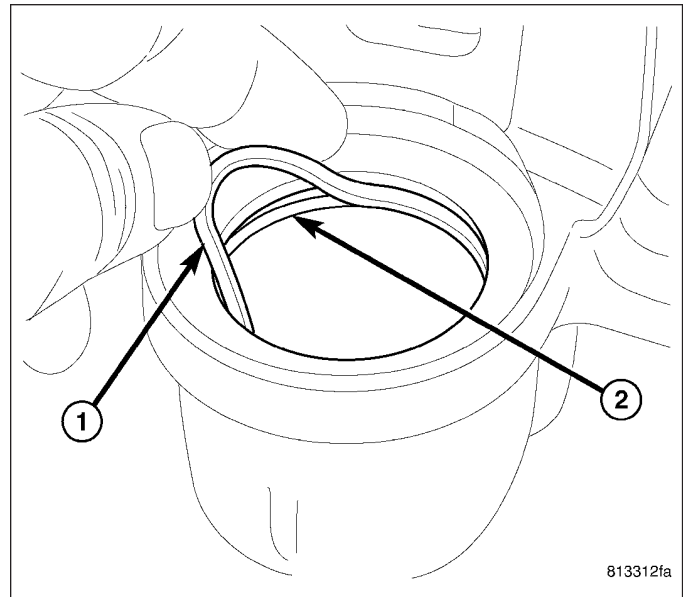
## ASSEMBLY

**CAUTION:** Dirt, oil, and solvents can damage caliper seals. Ensure assembly area is clean and dry.

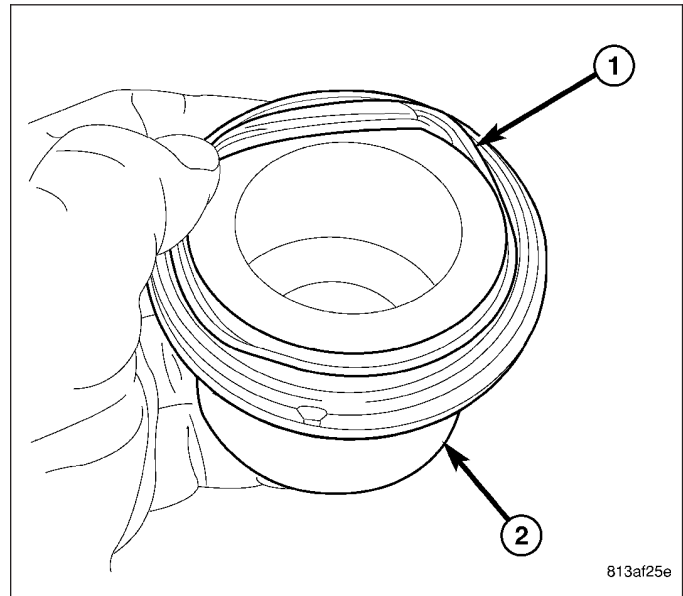
**Note:** Always use new, clean Mopar® DOT 3 Motor Vehicle Brake Fluid or equivalent when assembling brake caliper.

**Note:** Never use used or old piston seals or boots for reassembly.

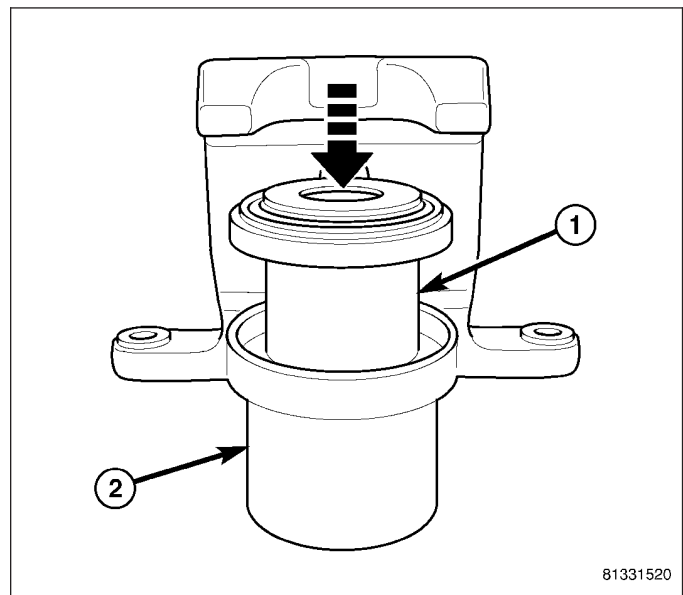
1. Lubricate caliper piston, piston seal (1) and piston bore (2) with clean, fresh brake fluid.
2. Install NEW piston seal (1) in groove of caliper bore (2). Seal should be started at one area of groove and gently worked around and into the groove using only your clean fingers to seat it.



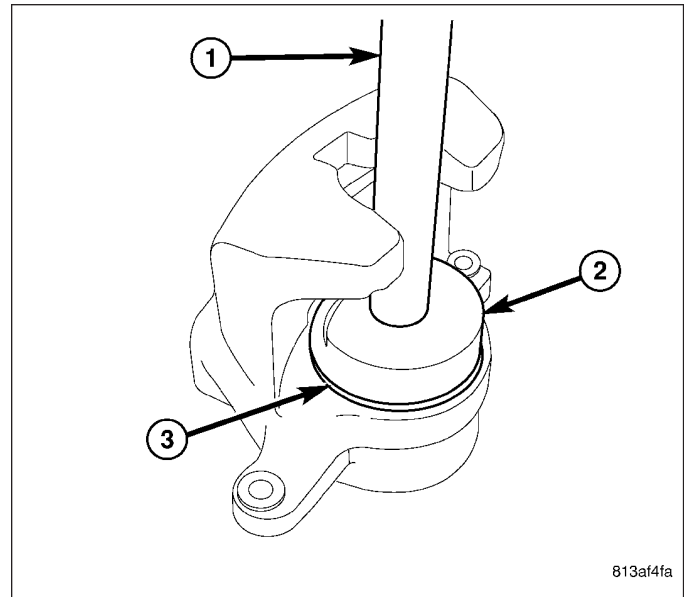
3. Install NEW dust boot (1) on piston (2) and work boot lip into groove at top of piston. Stretch boot downward, straightening boot folds, then move boot back upward as necessary until folds snap uniformly into place.



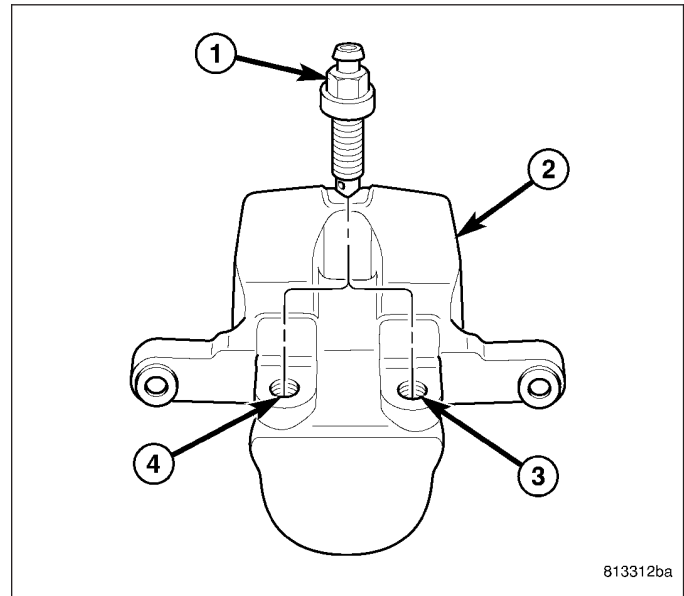
4. Install piston (1) into caliper piston (2) bore, pressing piston down to bottom of bore using hand-pressure. Using a piece of wood or wooden hammer handle may also suffice as long as piston and boot damage can be avoided. **The dust boot will not seat at this time. Refer to following step.**



5. Seat dust boot (3) in caliper counterbore using Installer (2), Special Tool 9315, with Handle (1), Special Tool C-4171. Install dust boot until it bottoms. Do not over-seat dust boot or damage will occur.



6. Install bleeder screw in correct threaded hole. Caliper housing is not side-specific, so it is important to install bleeder screw in threaded hole that will be uppermost once caliper is installed on vehicle. Tighten bleeder screw to 15 N·m (125 in. lbs.) torque.
7. Install caliper on vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - INSTALLATION)



## INSTALLATION

**CAUTION:** Always inspect brake pads before installing disc brake caliper and replace as necessary. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSPECTION)

1. Completely retract caliper piston back into bore of caliper. Use hand pressure or a C-clamp may be used to retract piston, first placing a wood block over piston before installing C-clamp to avoid damaging piston.

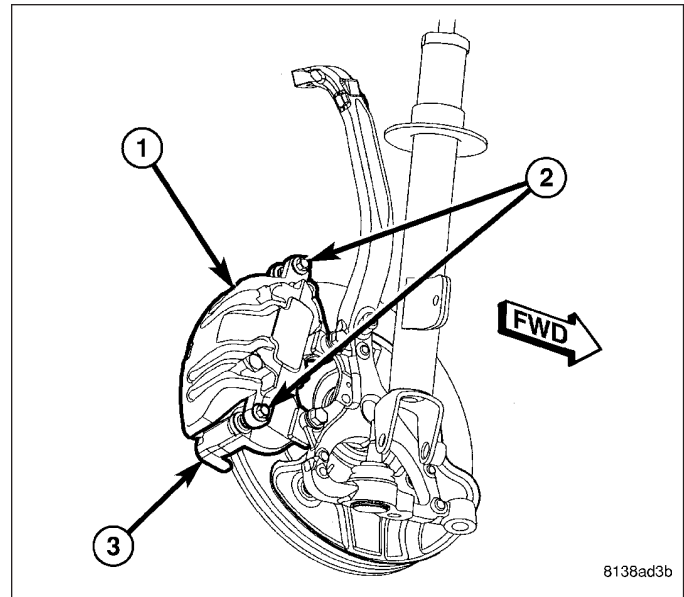
**CAUTION:** Use care when installing caliper onto disc brake adapter to avoid damaging boots on caliper guide pins.

2. Push caliper guide pins into caliper adapter to clear caliper mounting bosses when installing.

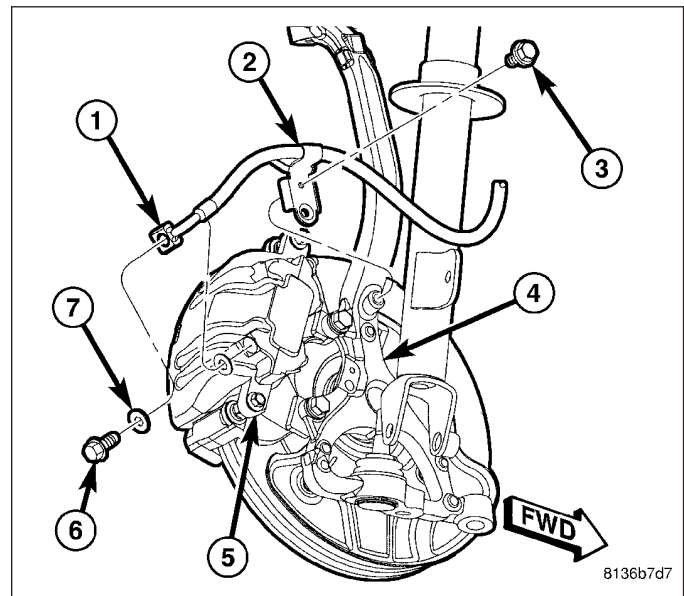
3. Slide caliper over brake pads and onto caliper adapter (3).

**CAUTION:** Extreme caution should be taken not to crossthread caliper guide pin bolts (2) when they are installed.

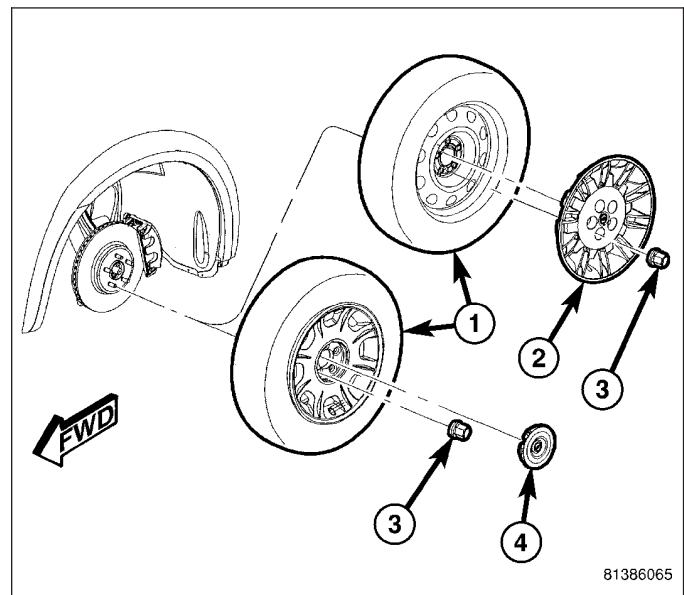
4. Align caliper mounting holes with guide pins, then install guide pin bolts (2). While holding guide pins from turning, tighten bolts to 60 N·m (44 ft. lbs.) torque.



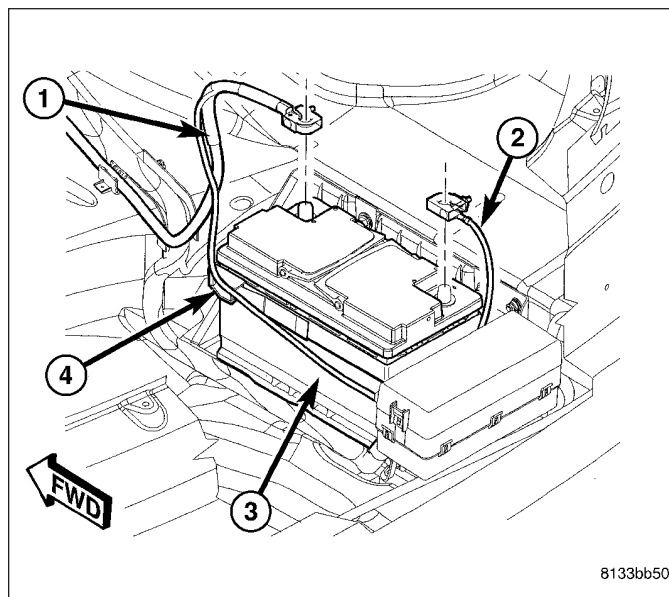
5. Install banjo bolt (6) attaching brake hose (1) to caliper (5). Install NEW washers (7) on each side of hose fitting as banjo bolt is placed through fitting. Thread banjo bolt into caliper and tighten to 43 N·m (32 ft. lbs.) torque.



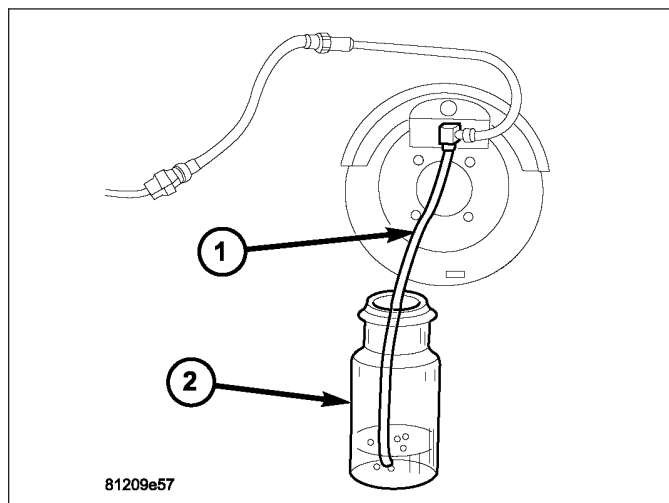
6. Install tire and wheel assembly (1). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
7. Lower vehicle.
8. Remove brake pedal holding tool.



9. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)



10. Bleed (1) base brake hydraulic system as necessary. (Refer to 5 - BRAKES - STANDARD PROCEDURE)
11. Road test vehicle making several stops to wear off any foreign material on brakes and to seat brake shoes.



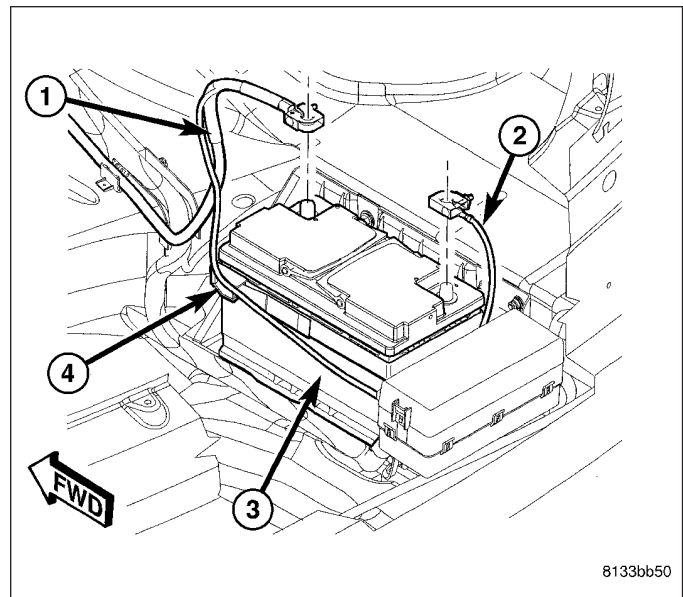
## CALIPER - FRONT TWIN PISTON DISC BRAKE

### REMOVAL

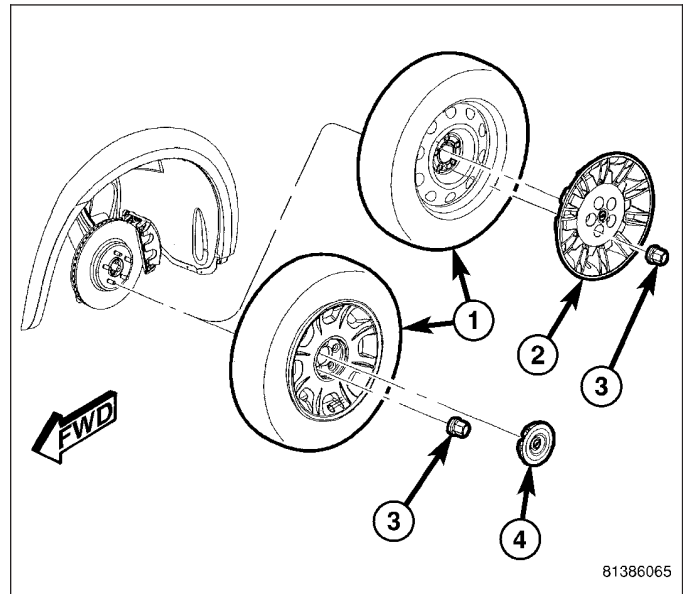
**Note:** Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).



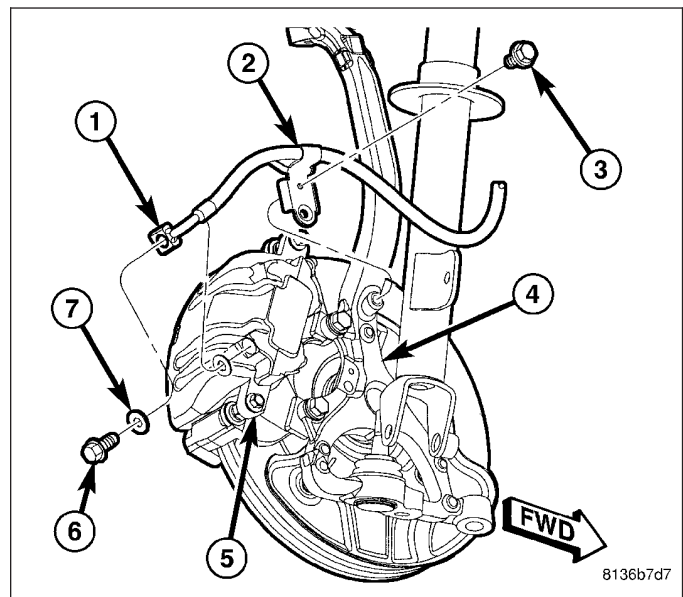
1. Disconnect and isolate battery negative cable (2) from battery post.
2. Using a brake pedal holding tool, depress brake pedal past its first inch of travel and hold it in this position. Holding pedal in this position will isolate master cylinder from hydraulic brake system and will not allow brake fluid to drain out of brake fluid reservoir while brake lines are open.
3. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)



4. Remove wheel mounting nuts (3), then tire and wheel assembly (1).

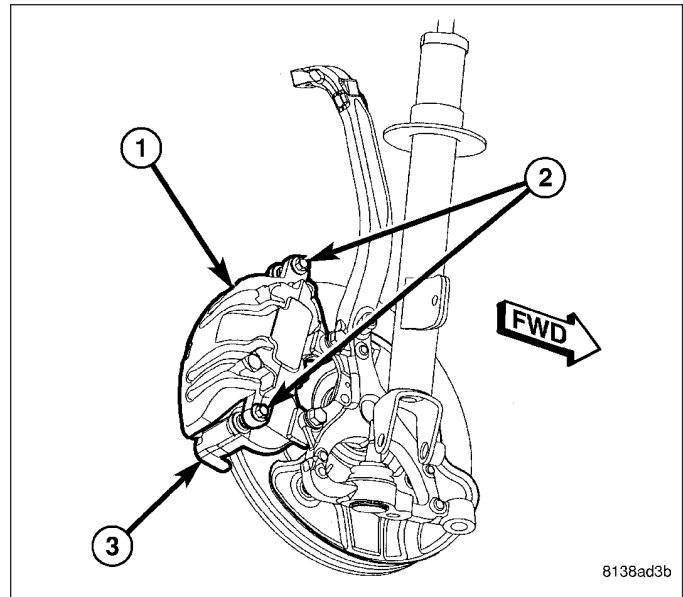


5. Remove banjo bolt (6) connecting flexible brake hose (1) to caliper (5). There are two sealing washers (7) (one on each side of hose fitting) that will come off when bolt is removed. Discard these washers; install NEW washers on installation.





6. While holding guide pins from turning, remove caliper guide pin bolts (2).
7. Remove brake caliper (1) from brake adapter (3) and pads.



## DISASSEMBLY

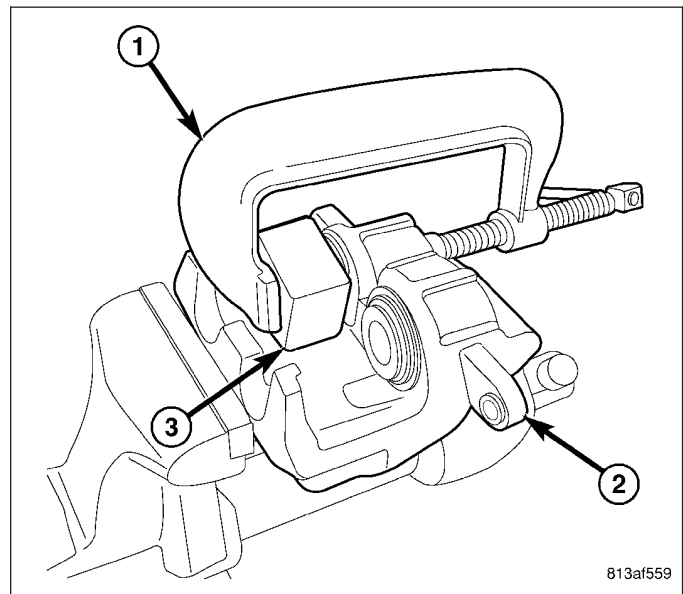
**Note:** Before disassembling the brake caliper, clean and inspect it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - CLEANING)(Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - INSPECTION)

**WARNING:** Under no condition should high pressure air ever be used to remove a piston from a caliper bore. Personal injury could result from such practice.

1. Drain brake fluid from caliper.

**CAUTION:** Do not use excessive force when clamping caliper (2) in vise. Caliper housing is made of aluminum. Excessive vise pressure will cause bore distortion.

2. Mount caliper (2) in vise equipped with protective jaws.
3. C-clamp (1) a block of wood (3) over one piston.



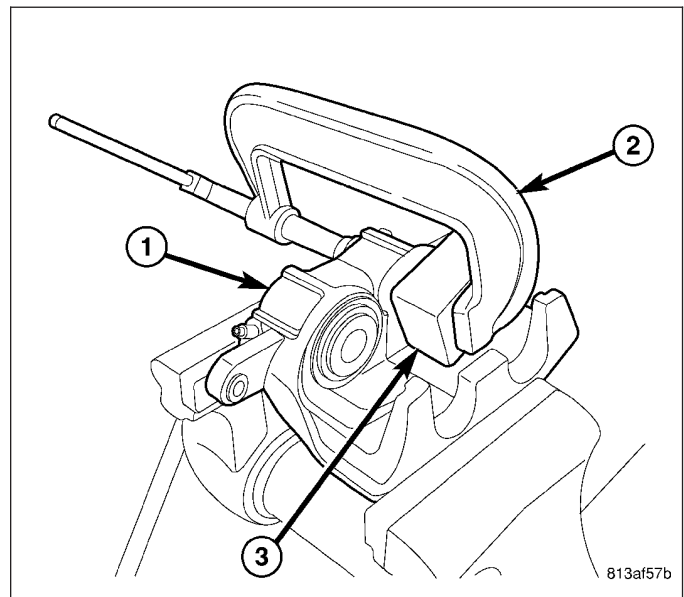
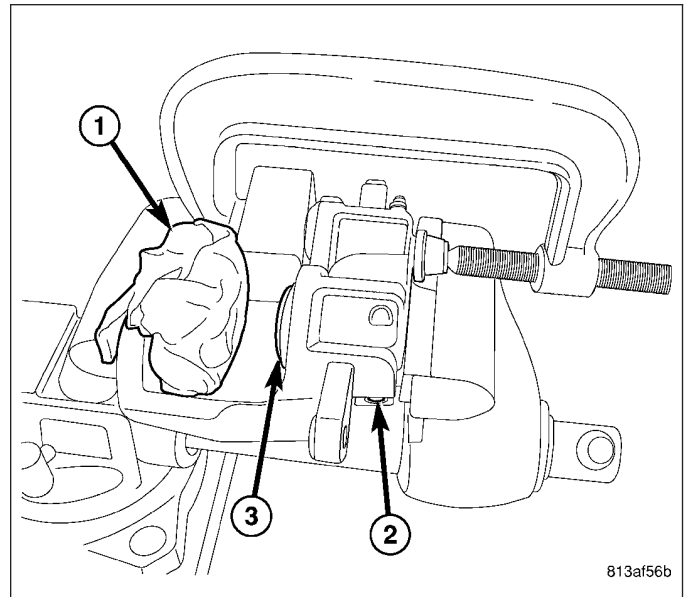
4. Take another block of wood and pad it with one-inch thickness of shop towels. Padded block should be sized to allow piston to push out of bore far enough to be removed by hand after being loosened by air pressure, yet large enough to keep piston from coming completely out.
5. Place the padded block of wood (1) in outboard shoe side of caliper (2) in front of exposed piston (3). This will cushion and protect caliper piston during removal.

**WARNING:** Do not place face or hands near caliper and piston if using compressed air to remove piston. Do not use high pressure.

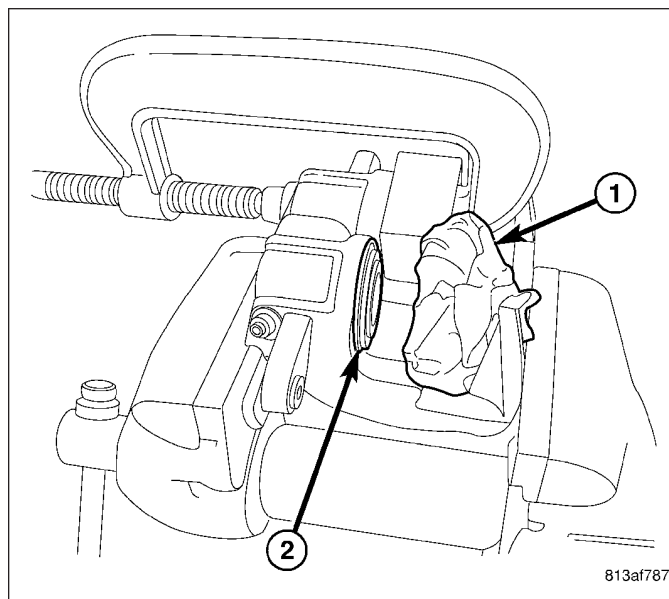
**WARNING:** Never attempt to catch piston as it leaves bore. This could result in personal injury.

**CAUTION:** Do not blow piston out of bore with sustained air pressure. This could result in a cracked piston. Use only short spurts of air.

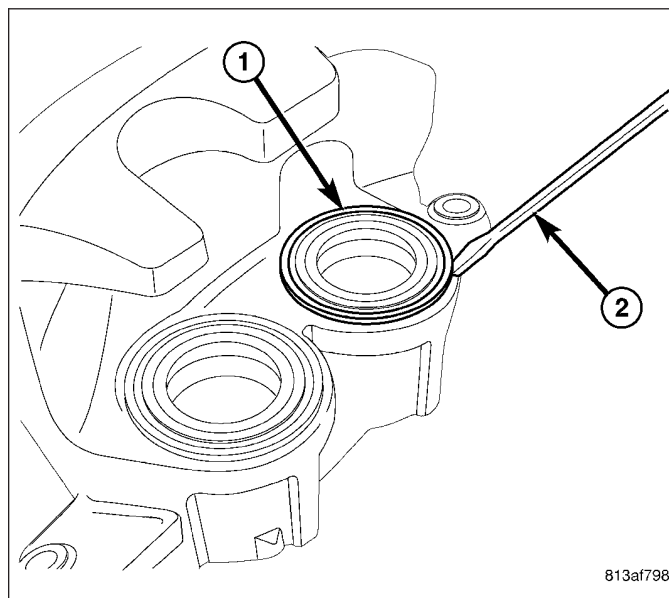
6. Apply **short spurts of low pressure air** with a rubber tipped blow gun through caliper brake hose port. Use only enough air pressure to ease piston out of bore.
7. Remove piston from caliper (2).
8. Remove C-clamp and block of wood.
9. C-clamp (1) the block of wood (3) over dust boot of first piston removed. This will seal empty piston bore.



10. Move padded piece of wood (1) in front of piston (2) yet to be removed.
11. Remove second piston using same procedure with **short spurts of low pressure air**.
12. Remove C-clamp and block of wood from caliper.

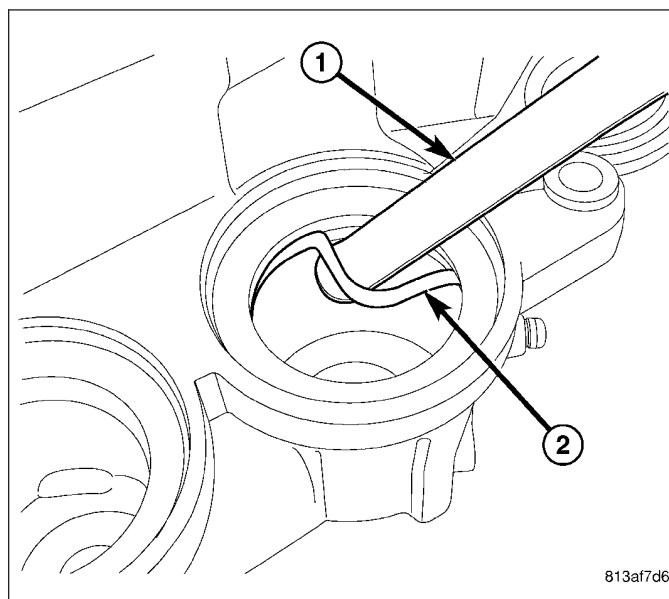


13. Remove piston dust boots (1) (over each bore) with an appropriate pry tool (2). **Use care not to damage aluminum housing.**



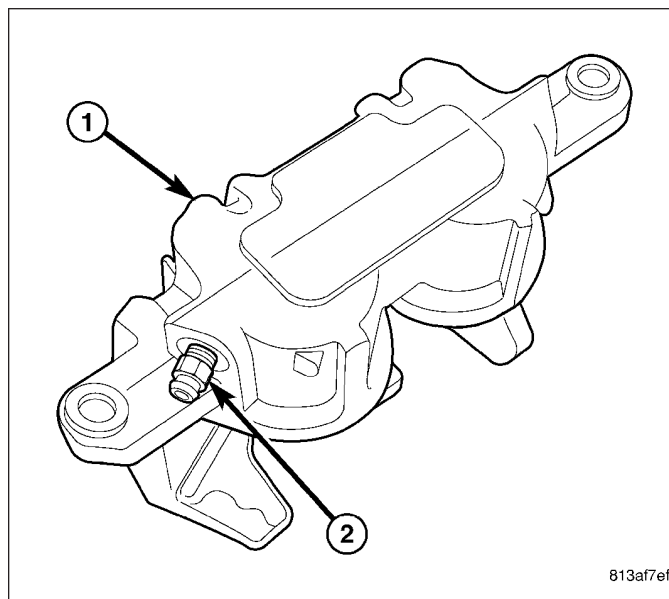
**CAUTION:** Use an appropriate tool (1) to remove piston seals (2) to avoid scratching piston bore. Do not use a screwdriver or other metal tool to remove seals.

14. Using a soft tool such as a plastic trim stick (1), remove piston seals (2) from caliper bores.



15. Remove caliper bleeder screw (2) from caliper housing (1).
16. Clean piston bore and drilled passage ways with alcohol or a suitable solvent. Wipe it dry using only a lint-free cloth.
17. Inspect both piston and bore for scoring or pitting.

**Note: It is not recommended to hone caliper bore. The anodized coating would be compromised.**



## CLEANING

**WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM PRODUCTION OR AFTERMARKET BRAKE LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT SAND OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. CLEANING SHOULD BE DONE BY DAMPENING THE BRAKE COMPONENTS WITH A FINE MIST OF WATER, THEN WIPING THE BRAKE COMPONENTS CLEAN WITH A DAMPENED CLOTH. DISPOSE OF CLOTH AND ALL RESIDUE CONTAINING ASBESTOS FIBERS IN AN IMPERMEABLE CONTAINER WITH THE APPROPRIATE LABEL. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) FOR THE HANDLING, PROCESSING, AND DISPOSING OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.**

To clean or flush the internal passages of the brake caliper, use fresh brake fluid or Mopar® Non-Chlorinated Brake Parts Cleaner. Never use gasoline, kerosene, alcohol, oil, transmission fluid or any fluid containing mineral oil to clean the caliper. These fluids will damage rubber cups and seals.

## INSPECTION

Inspect the disc brake caliper for the following:

- Cracked or damaged housing
- Brake fluid leaks in and around boot area
- Ruptures, brittleness or damage to the piston dust boot

If caliper fails inspection, disassemble and recondition caliper, replacing the seals and dust boots or replace caliper.

## ASSEMBLY

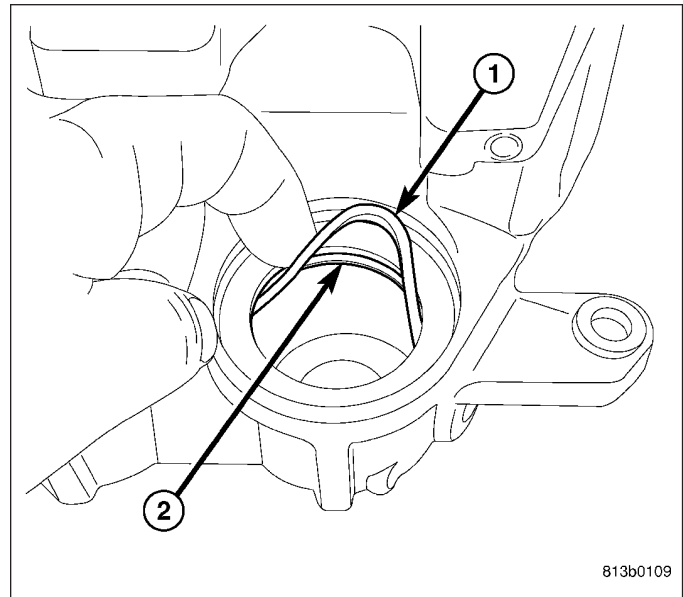
**CAUTION: Dirt, oil, and solvents can damage caliper seals. Ensure assembly area is clean and dry.**

**Note: Always use new, clean Mopar® DOT 3 Motor Vehicle Brake Fluid when assembling brake caliper.**

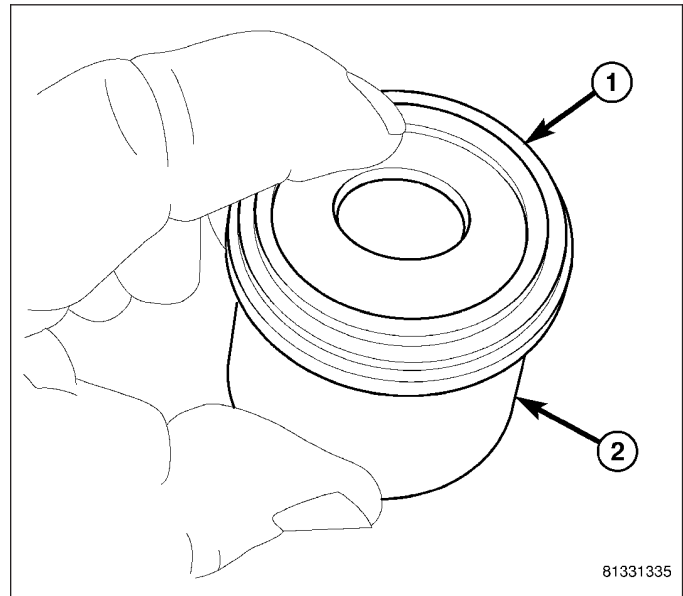
**Note: Never use old or used piston seals or boots for assembly.**

1. Lubricate caliper pistons, piston seals (1) and piston bores (2) with clean, fresh brake fluid.
2. Install NEW piston seal (1) into groove of each caliper piston bore (2).

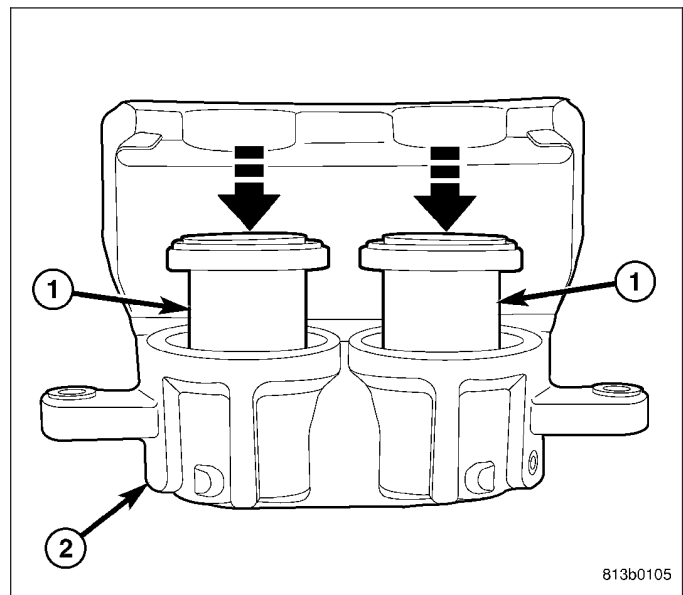
**Note: Make sure seal is fully seated and not twisted in groove.**



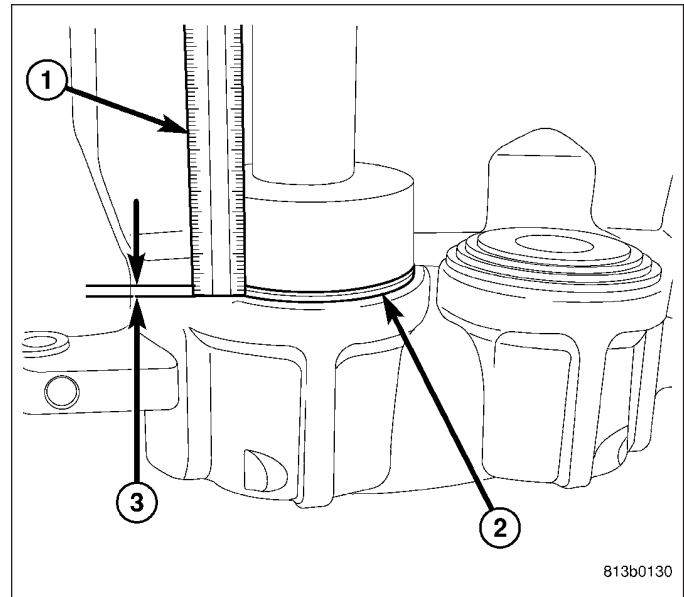
3. Install NEW boot (1) on each piston (2) and work boot lip into groove at top of piston. Stretch boot rearward straightening boot folds, then move boot forward as necessary until folds snap uniformly into place.



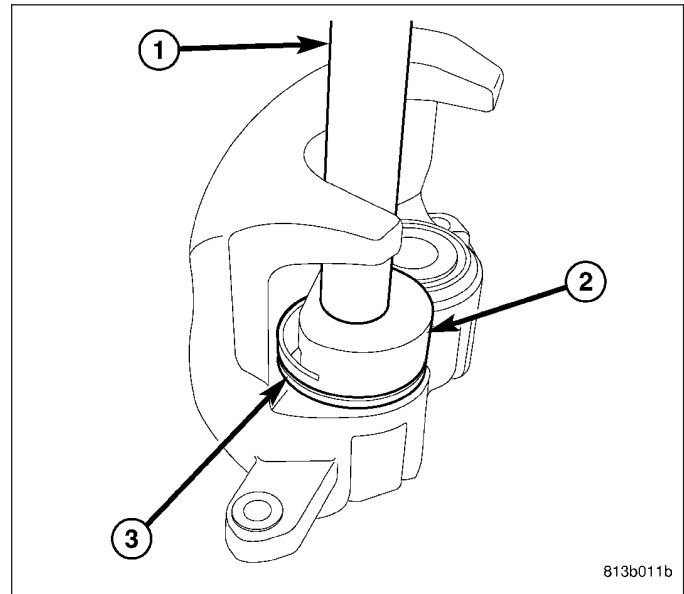
4. Install each piston (1), one at a time, into its caliper piston (2) bore, pressing piston down to bottom of bore using hand-pressure. Using a piece of wood or wooden hammer handle may also suffice as long as piston and boot damage is avoided.



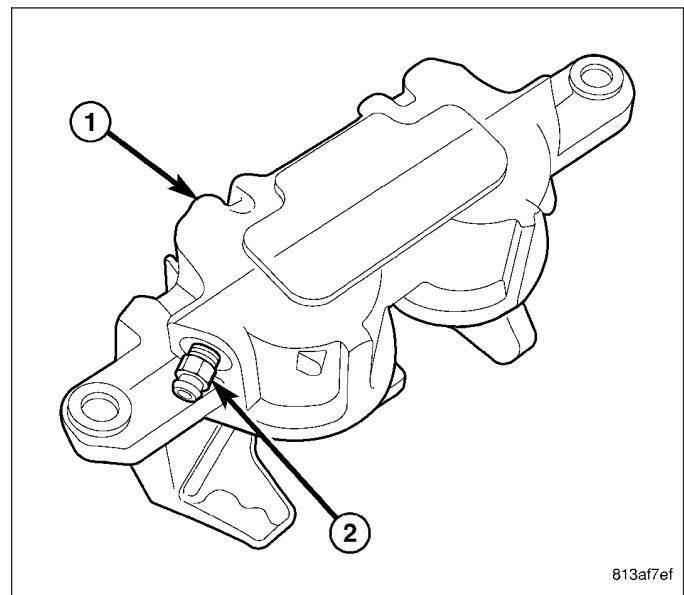
**CAUTION:** When seating dust boots in following step, use care not to over-install boots or damage will occur. Each boot (2) will bottom in the counterbore before the top of the boot reaches the surface of the caliper. The boot will bottom with approximately 2 mm (1/16 inch) (3) of boot still showing above caliper housing.



5. Seat dust boots (3) in caliper counterbores using Installer (2), Special Tool 9315, with Handle (1), Special Tool C-4171. Install each dust boot until it bottoms. Do not over-seat dust boot or damage will occur.



6. Install caliper bleeder screw (2) in caliper housing (1). Tighten bleeder screw to 15 N·m (125 in. lbs.) torque.
7. Install caliper on vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - INSTALLATION)



## INSTALLATION

**CAUTION:** Always inspect brake pads before installing disc brake caliper and replace as necessary. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSPECTION)

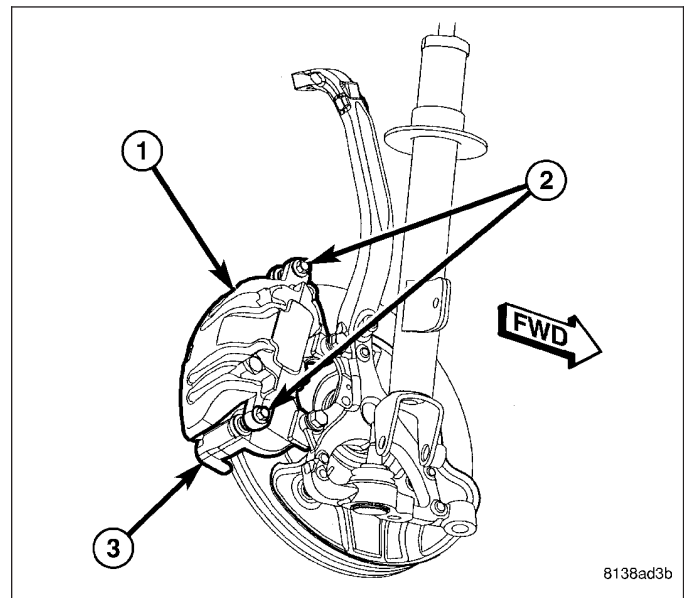
1. Completely retract caliper pistons back into bores of caliper. Use hand pressure or a C-clamp may also be used to retract pistons, first placing a wood block over piston before installing C-clamp to avoid damaging piston.

**CAUTION:** Use care when installing caliper onto disc brake adapter to avoid damaging boots on caliper guide pins.

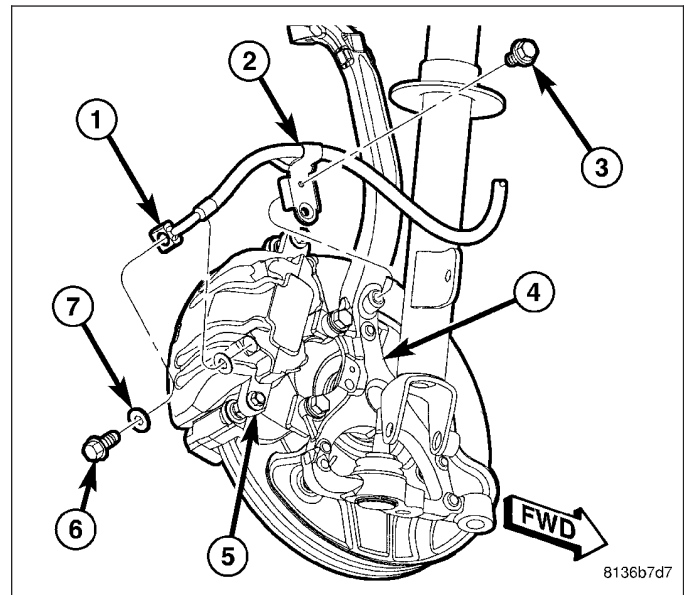
2. Push caliper guide pins into caliper adapter to clear caliper mounting bosses when installing.
3. Slide caliper over brake pads and onto caliper adapter (3).

**CAUTION:** Extreme caution should be taken not to crosstread caliper guide pin bolts (2) when they are installed.

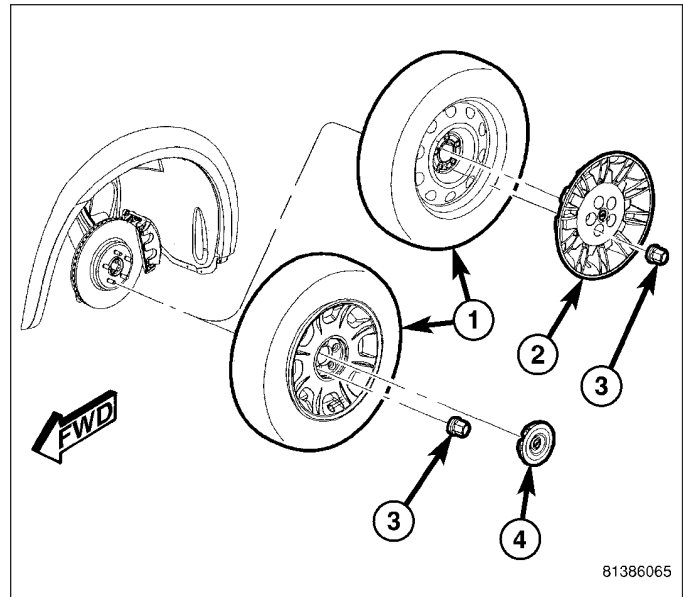
4. Align caliper mounting holes with guide pins, then install guide pin bolts (2). While holding guide pins from turning, tighten bolts to 60 N·m (44 ft. lbs.) torque.



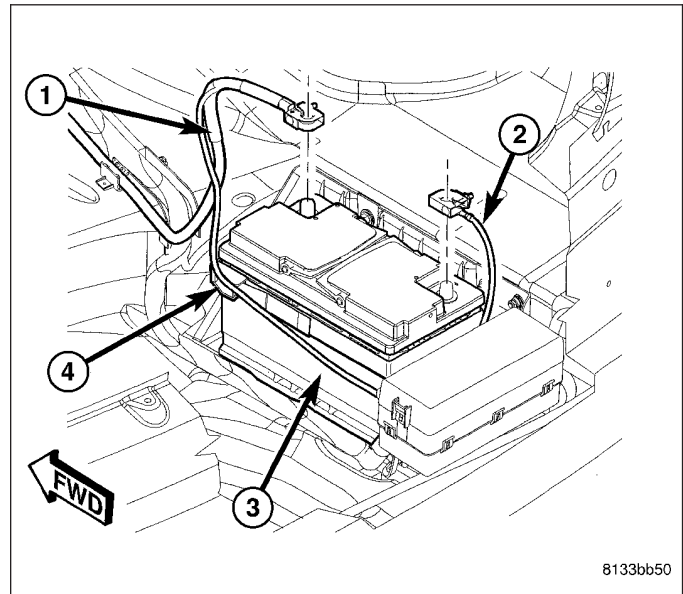
5. Install banjo bolt (6) attaching brake hose (1) to caliper (5). Install NEW washers (7) on each side of hose fitting as banjo bolt is placed through fitting. Thread banjo bolt into caliper and tighten to 43 N·m (32 ft. lbs.) torque.



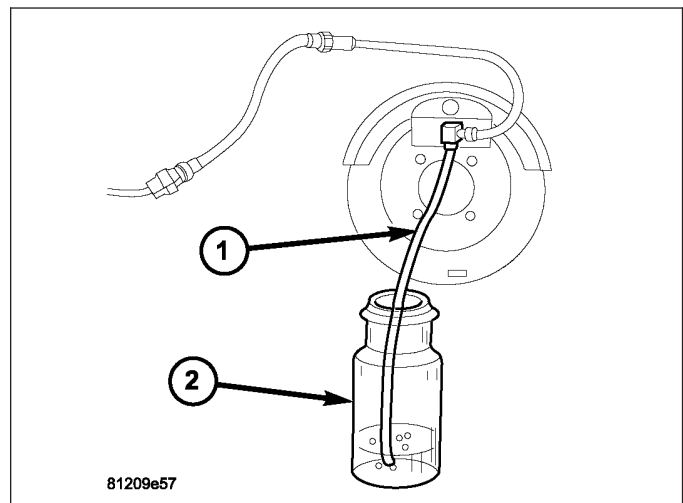
6. Install tire and wheel assembly (1). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
7. Lower vehicle.
8. Remove brake pedal holding tool.



9. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)



10. Bleed (1) base brake hydraulic system as necessary. (Refer to 5 - BRAKES - STANDARD PROCEDURE)
11. Road test vehicle making several stops to wear off any foreign material on brakes and to seat brake shoes.



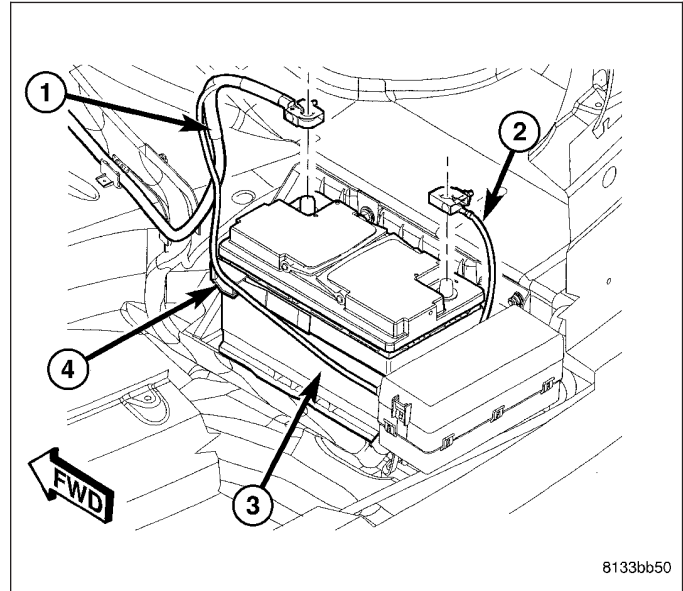


## CALIPER - REAR DISC BRAKE

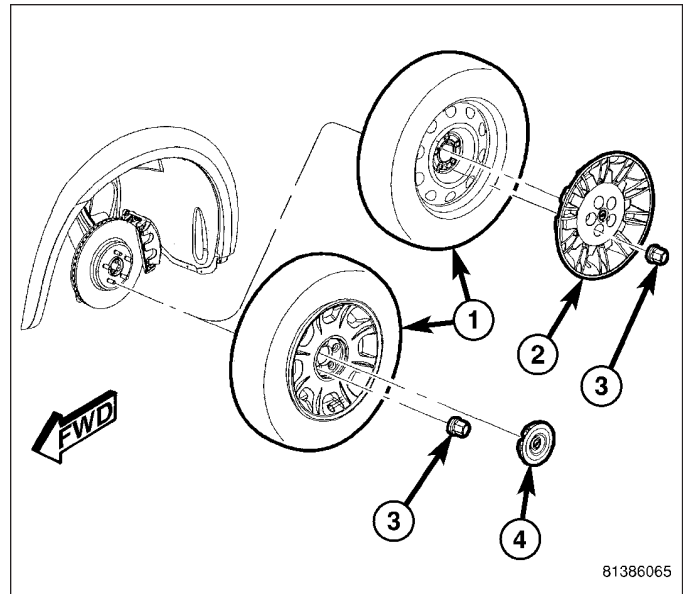
### REMOVAL

**Note:** Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

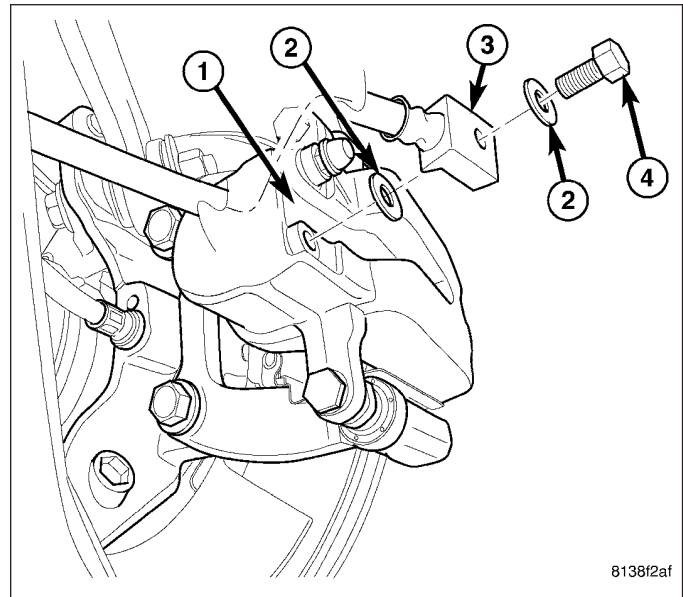
1. Disconnect and isolate battery negative cable (2) from battery post.
2. Using a brake pedal holding tool, depress brake pedal past its first inch of travel and hold it in this position. Holding pedal in this position will isolate master cylinder from hydraulic brake system and will not allow brake fluid to drain out of brake fluid reservoir while brake lines are open.
3. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)



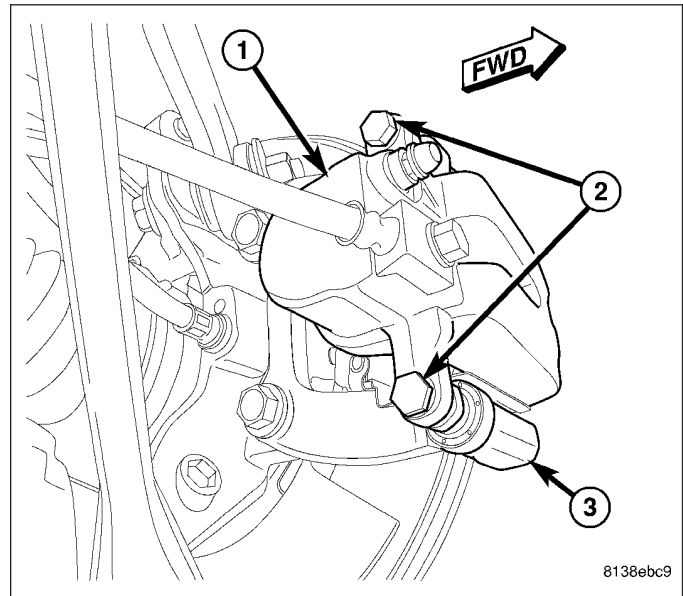
4. Remove wheel mounting nuts (3), then tire and wheel assembly (1).



5. Remove banjo bolt (4) connecting flexible brake hose (3) to caliper (1). There are two sealing washers (2) (one on each side of hose fitting) that will come off when bolt is removed. Discard these washers; install NEW washers on installation.



6. While holding guide pins from turning, remove caliper guide pin bolts (2).
7. Remove brake caliper (1) from brake adapter (3) and pads.



## DISASSEMBLY

**Note:** Before disassembling brake caliper, clean and inspect it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - CLEANING)(Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - INSPECTION)

**WARNING:** Under no condition should high pressure air ever be used to remove a piston from a caliper bore. Personal injury could result from such a practice.

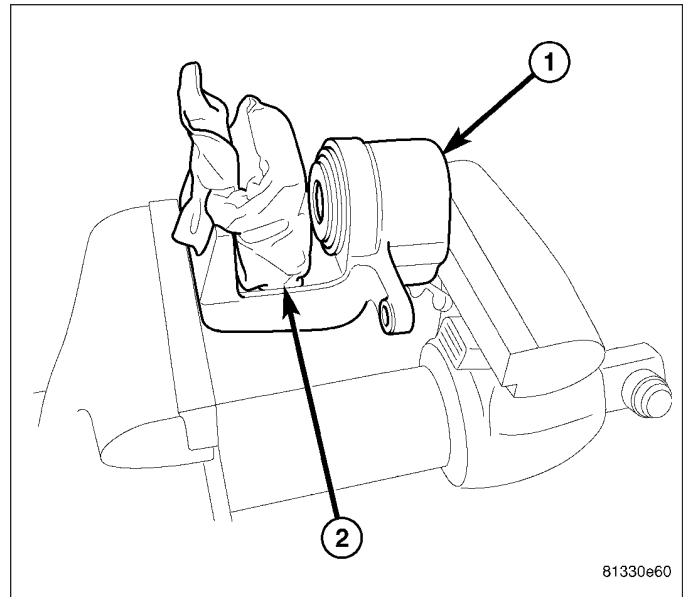
**CAUTION:** Do not use excessive force when clamping caliper in vise. Excessive vise pressure will cause bore distortion.

1. Drain brake fluid from caliper.

2. Mount caliper in a vise equipped with protective jaws.
3. Place a wooden block (2) (padded with approximately one-inch thickness of shop towels) in front of caliper (1) piston as shown. Padded block should be sized to allow piston to push out of bore far enough to be removed by hand after being loosened by air pressure, yet large enough to keep piston from coming completely out. This will cushion and protect caliper piston during removal.

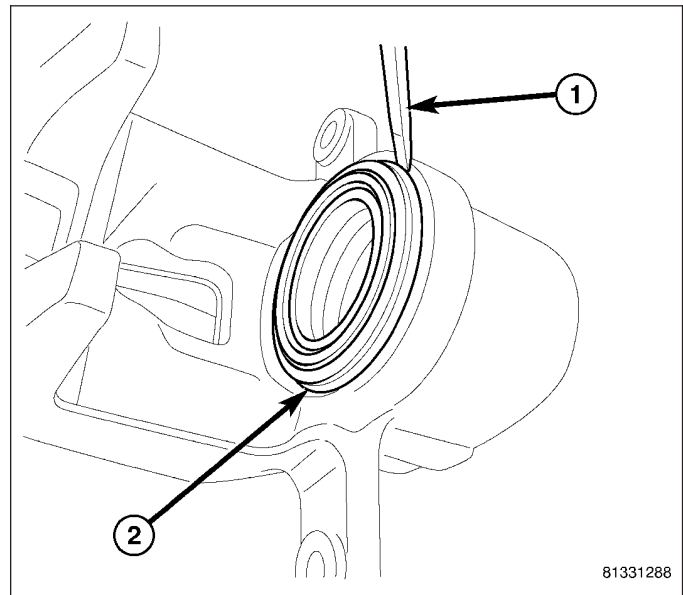
**WARNING:** Do not place face or hands near caliper and piston if using compressed air pressure to remove piston. Do not use high pressure.

4. Apply low pressure compressed air to caliper fluid inlet in **short spurts** to ease piston out of bore.
5. Remove piston from caliper (1).



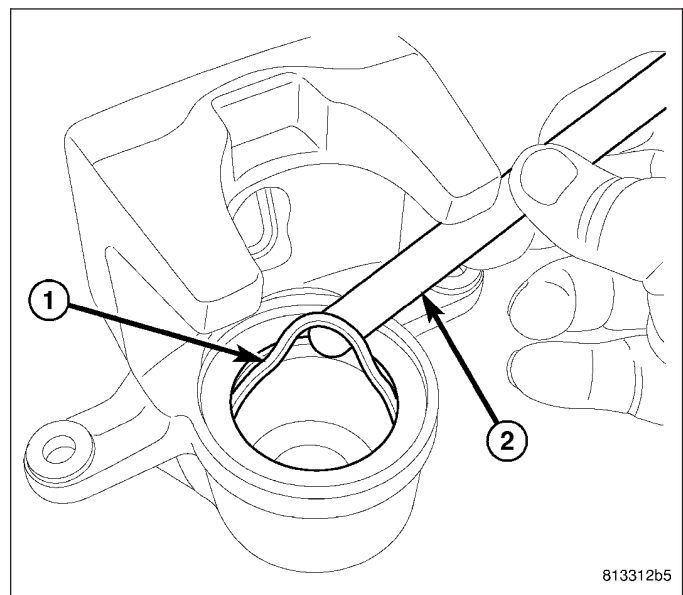
**CAUTION:** When working on disc brake caliper, always use care and suitable tools to avoid damaging the aluminum housing.

6. Using a suitable tool (1), carefully remove dust boot (2) and discard it.



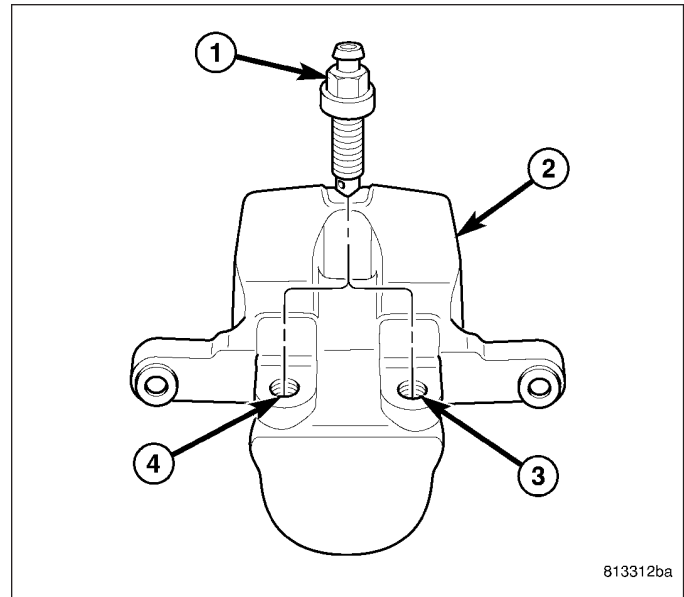
**CAUTION:** Do not use a screw driver or other metal tool for seal removal. Using such tools can scratch bore or leave burrs on seal groove edges.

7. Using a soft tool such as a plastic trim stick (2), work piston seal (1) out of its groove in caliper piston bore. Discard used seal.



8. Remove caliper bleeder screw (1) from caliper housing (2).
9. Clean piston bore and drilled passage ways with alcohol or a suitable solvent. Wipe it dry using only a lint-free cloth.
10. Inspect both piston and bore for scoring or pitting.

**Note:** It is not recommended to hone caliper bore. The anodized coating would be compromised.



## CLEANING

**WARNING:** DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM PRODUCTION OR AFTERMARKET BRAKE LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT SAND OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. CLEANING SHOULD BE DONE BY DAMPENING THE BRAKE COMPONENTS WITH A FINE MIST OF WATER, THEN WIPING THE BRAKE COMPONENTS CLEAN WITH A DAMPENED CLOTH. DISPOSE OF CLOTH AND ALL RESIDUE CONTAINING ASBESTOS FIBERS IN AN IMPERMEABLE CONTAINER WITH THE APPROPRIATE LABEL. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA) FOR THE HANDLING, PROCESSING, AND DISPOSING OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.

To clean or flush the internal passages of the brake caliper, use fresh brake fluid or Mopar® Non-Chlorinated Brake Parts Cleaner. Never use gasoline, kerosene, alcohol, oil, transmission fluid or any fluid containing mineral oil to clean the caliper. These fluids will damage rubber cups and seals.

## INSPECTION

Inspect the disc brake caliper for the following:

- Cracked or damaged housing
- Brake fluid leaks in and around boot area
- Ruptures, brittleness or damage to the piston dust boot

If caliper fails inspection, disassemble and recondition caliper, replacing the seals and dust boots or replace caliper.

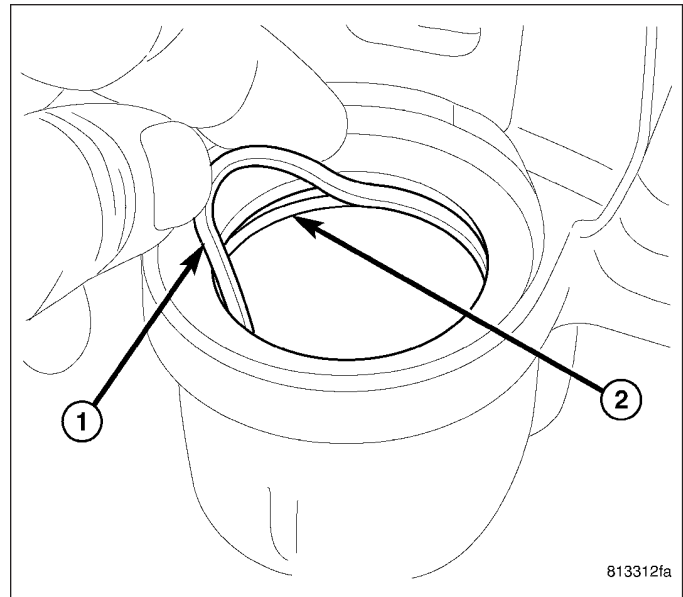
## ASSEMBLY

**CAUTION:** Dirt, oil, and solvents can damage caliper seals. Ensure assembly area is clean and dry.

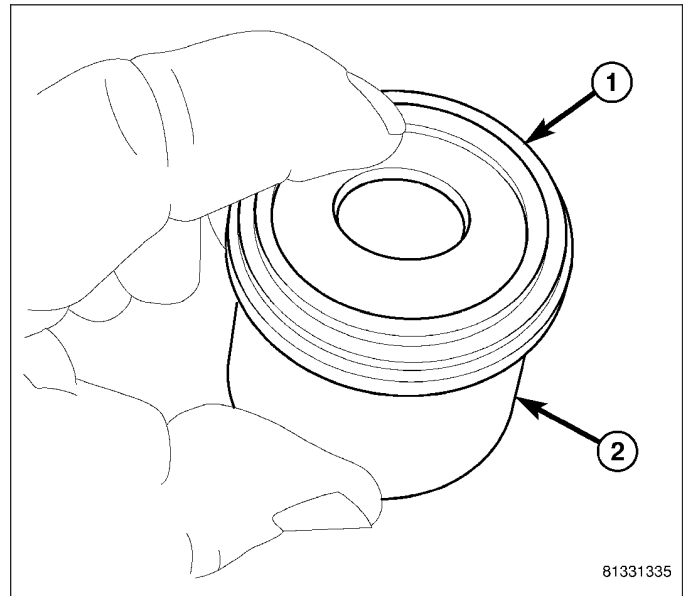
**Note:** Always use new, clean Mopar® DOT 3 Motor Vehicle Brake Fluid or equivalent when assembling brake caliper.

**Note:** Never use used or old piston seals or boots for reassembly.

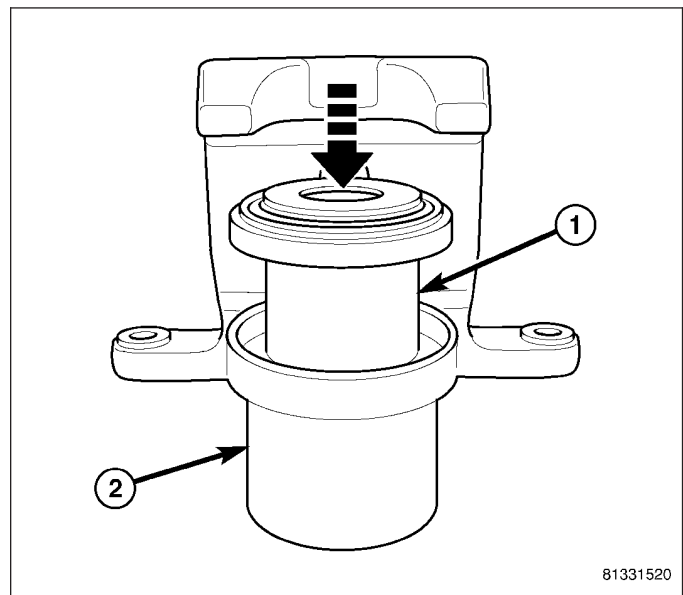
1. Lubricate caliper piston, piston seal (1) and piston bore (2) with clean, fresh brake fluid.
2. Install NEW piston seal (1) in groove of caliper bore (2). Seal should be started at one area of groove and gently worked around and into the groove using only your clean fingers to seat it.



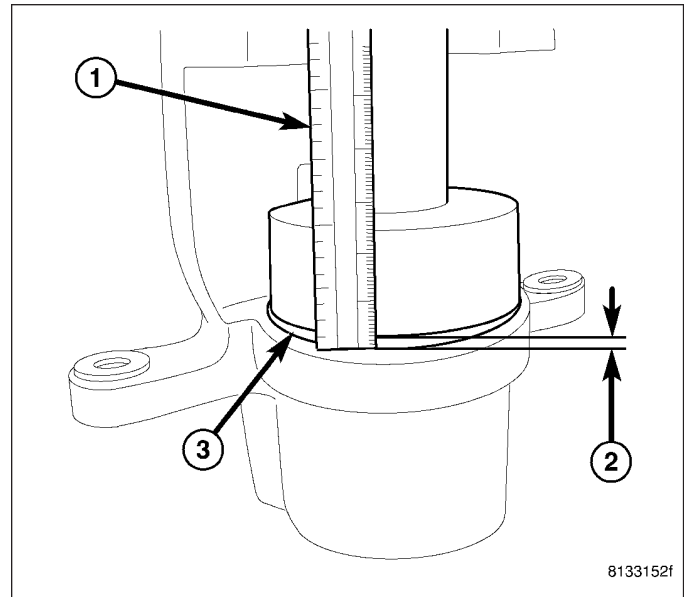
3. Install NEW dust boot (1) on piston (2) and work boot lip into groove at top of piston. Stretch boot downward, straightening boot folds, then move boot back upward as necessary until folds snap uniformly into place.



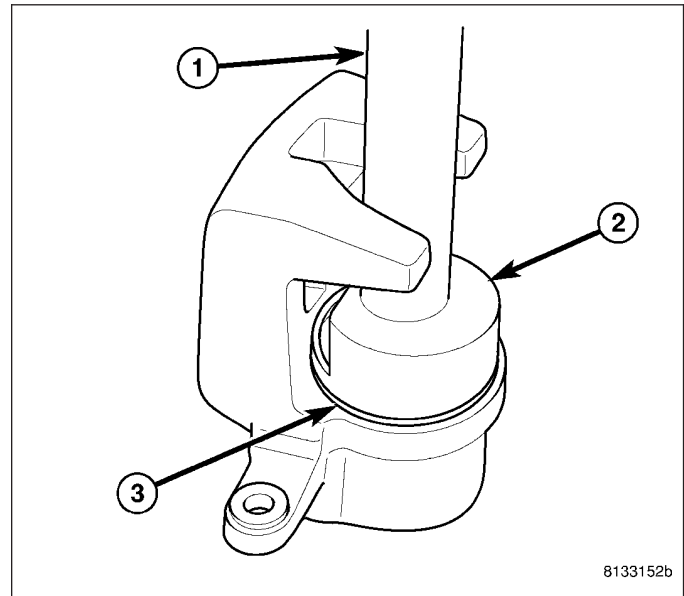
4. Install piston (1) into caliper piston (2) bore, pressing piston down to bottom of bore using hand-pressure. Using a piece of wood or wooden hammer handle may also suffice as long as piston and boot damage can be avoided.



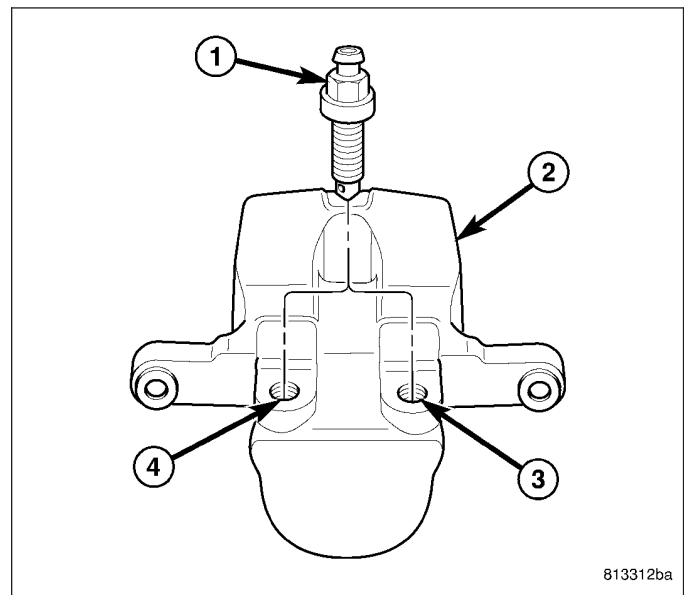
**CAUTION:** When installing dust boot in following step, use care not to over-install boot or damage will occur. The boot (3) will bottom in the counterbore before the top of the boot reaches the surface of the caliper. The boot will bottom with approximately 2 mm (1/16 inch) (2) of boot still showing above caliper housing.



5. Seat dust boot (3) in caliper counterbore using Installer, Special Tool 9314, with Handle, Special Tool C-4171. Install dust boot until it bottoms. Do not over-seat dust boot or damage will occur.



6. Install bleeder screw in correct threaded hole. Caliper housing is not side-specific, so it is important to install bleeder screw in threaded hole that will be uppermost once caliper is installed on vehicle. Tighten bleeder screw to 15 N·m (125 in. lbs.) torque.
7. Install caliper on vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - INSTALLATION)



## INSTALLATION

**CAUTION:** Always inspect brake pads before installing disc brake caliper and replace as necessary. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSPECTION)

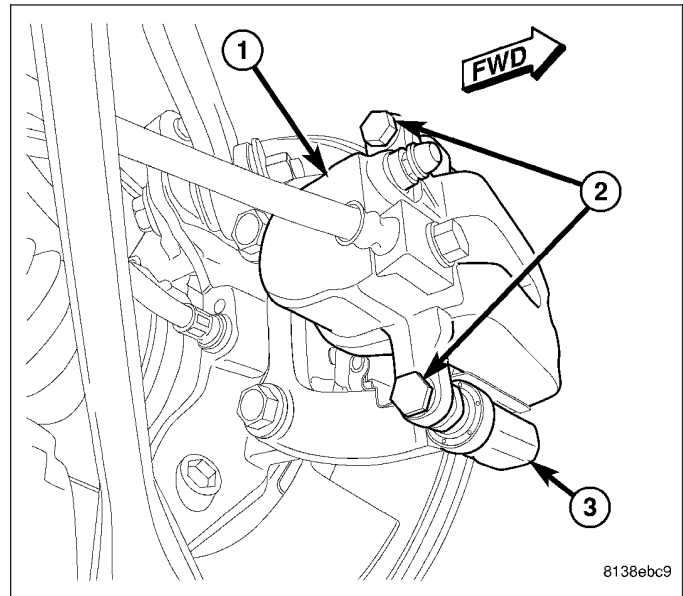
1. Completely retract caliper piston back into bore of caliper. Use hand pressure or a C-clamp may be used to retract piston, first placing a wood block over piston before installing C-clamp to avoid damaging piston.

**CAUTION:** Use care when installing caliper onto disc brake adapter to avoid damaging boots on caliper guide pins.

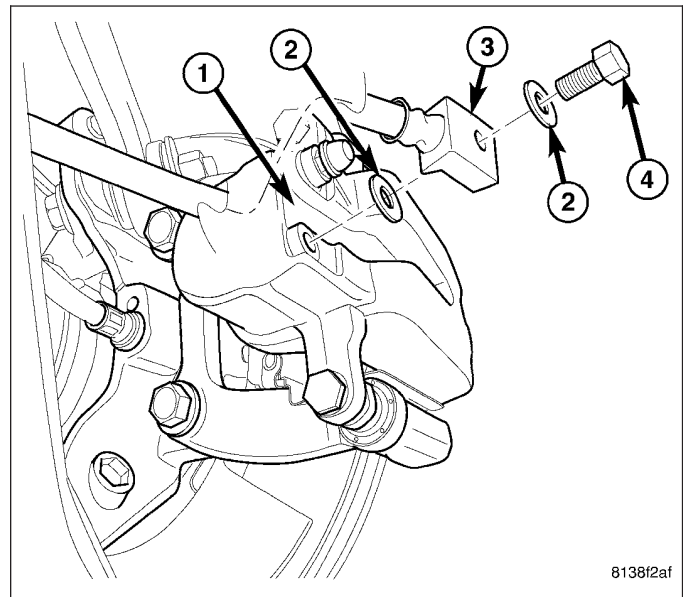
2. Push caliper guide pins into caliper adapter to clear caliper mounting bosses when installing.
3. Slide caliper over brake pads and onto caliper adapter (3).

**CAUTION:** Extreme caution should be taken not to crosstread caliper guide pin bolts (2) when they are installed.

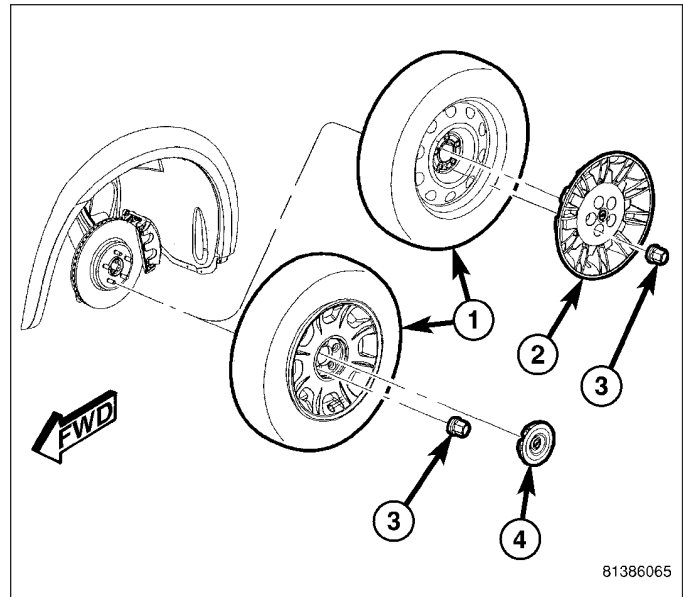
4. Align caliper mounting holes with guide pins, then install guide pin bolts (2). While holding guide pins from turning, tighten bolts to 60 N·m (44 ft. lbs.) torque.



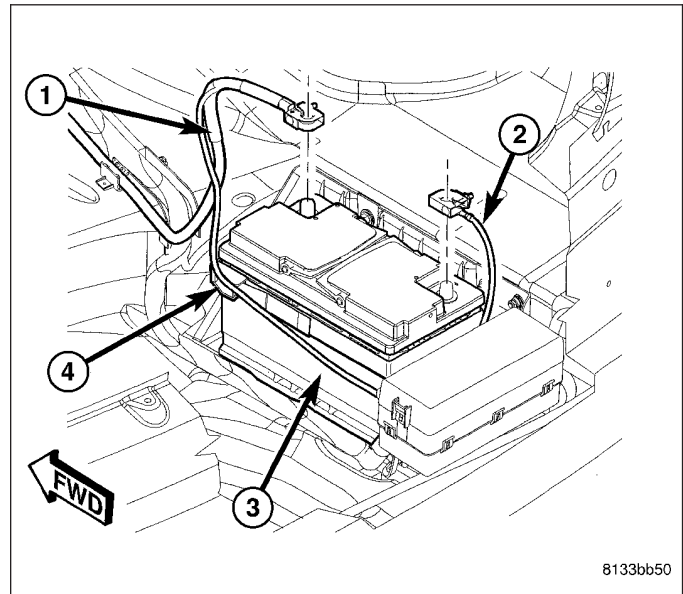
5. Install banjo bolt (4) attaching brake hose (3) to caliper (1). Install NEW washers (2) on each side of hose fitting as banjo bolt is placed through fitting. Thread banjo bolt into caliper and tighten to 43 N·m (32 ft. lbs.) torque.



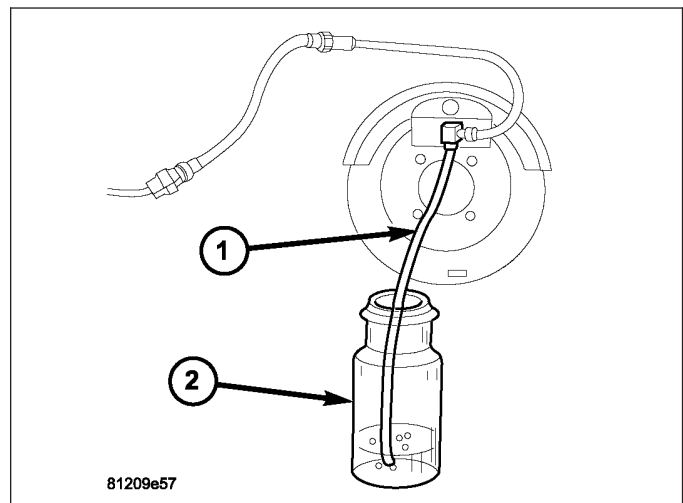
6. Install tire and wheel assembly (1). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
7. Lower vehicle.
8. Remove brake pedal holding tool.



9. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)



10. Bleed (1) base brake hydraulic system as necessary. (Refer to 5 - BRAKES - STANDARD PROCEDURE)
11. Road test vehicle making several stops to wear off any foreign material on brakes and to seat brake shoes.





## FLUID

### DIAGNOSIS AND TESTING

#### BRAKE FLUID CONTAMINATION

Indications of fluid contamination are swollen or deteriorated rubber parts.

Swollen rubber parts indicate the presence of petroleum in the brake fluid.

To test for contamination, put a small amount of drained brake fluid in clear glass jar. If fluid separates into layers, there is mineral oil or other fluid contamination of the brake fluid.

If brake fluid is contaminated, drain and thoroughly flush system. Replace master cylinder, proportioning valve, caliper seals, wheel cylinder seals, Antilock Brake hydraulic unit and all hydraulic fluid hoses.

### STANDARD PROCEDURE

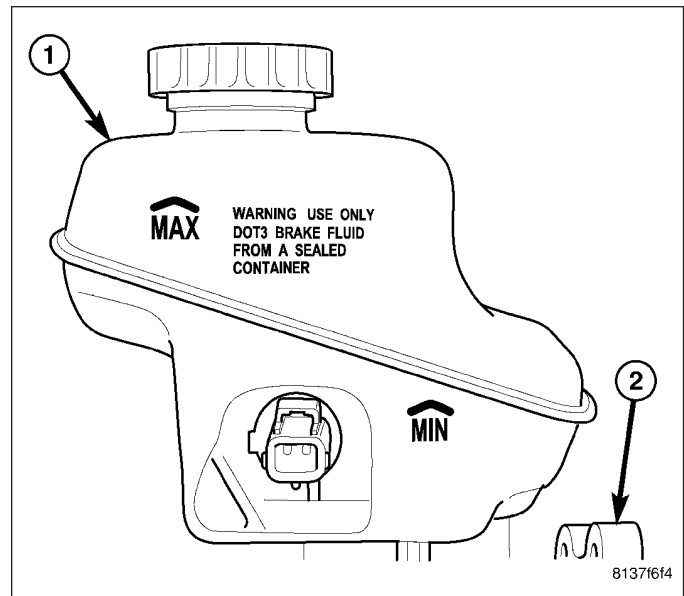
#### BRAKE FLUID LEVEL CHECKING

Check master cylinder reservoir fluid level a minimum of twice annually.

Fluid reservoirs (1) are marked with the words MAX and MIN to indicate proper brake fluid fill level of the master cylinder.

If necessary, add brake fluid to bring the level to the bottom of the MAX mark on the side of the master cylinder fluid reservoir (1).

Use only Mopar® brake fluid or equivalent from a sealed container. Brake fluid must conform to DOT 3 specifications (DOT 4 or DOT 4+ are acceptable, but do not last as long.).



**DO NOT** use brake fluid with a lower boiling point, as brake failure could result during prolonged hard braking.

Use only brake fluid that was stored in a tightly-sealed container.

**DO NOT** use petroleum-based fluid because seal damage will result. Petroleum based fluids would be items such as engine oil, transmission fluid, power steering fluid etc.

### SPECIFICATIONS

#### BRAKE FLUID

The brake fluid used in this vehicle must conform to DOT 3 specifications and SAE J1703 standards. No other type of brake fluid is recommended or approved for usage in the vehicle brake system. DOT 4 and DOT 4+ are acceptable brake fluids, but do not last as long. They must be changed approximately every two years. Use only Mopar® Brake Fluid or equivalent from a tightly sealed container.

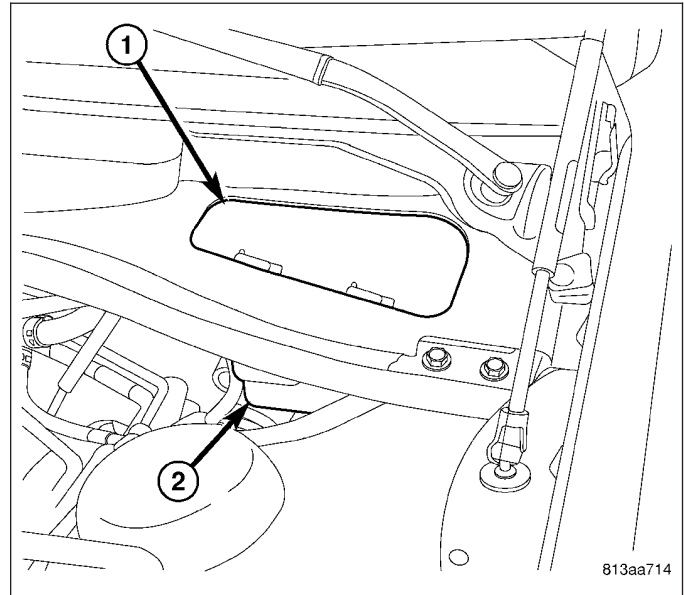
**CAUTION:** Never use reclaimed brake fluid or fluid from an container which has been left open. An open container of brake fluid will absorb moisture from the air and contaminate the fluid.

**CAUTION:** Never use any type of a petroleum-based fluid in the brake hydraulic system. Use of such type fluids will result in seal damage of the vehicle brake hydraulic system causing a failure of the vehicle brake system. Petroleum based fluids would be items such as engine oil, transmission fluid, power steering fluid, etc.

## RESERVOIR - MASTER CYLINDER FLUID

### REMOVAL

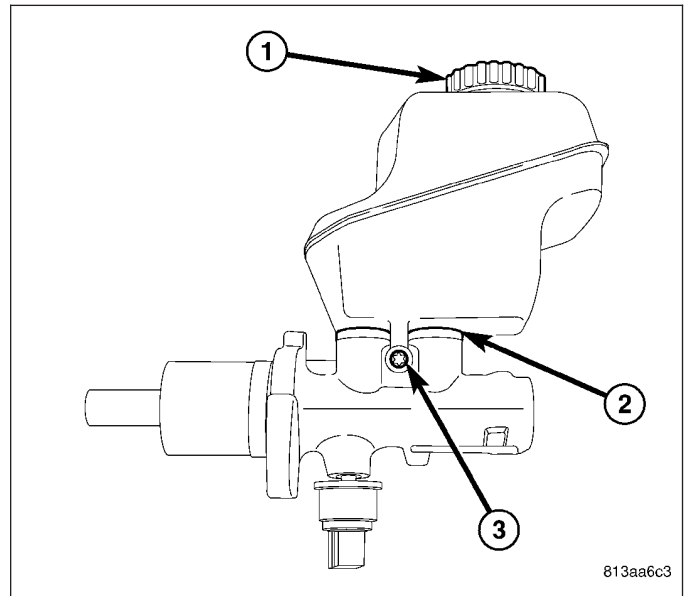
1. Remove access panel (1) in cowl area to expose master cylinder (2).
2. Thoroughly clean all surfaces of brake fluid reservoir and master cylinder. Use only Mopar® Brake Parts Cleaner or equivalent.



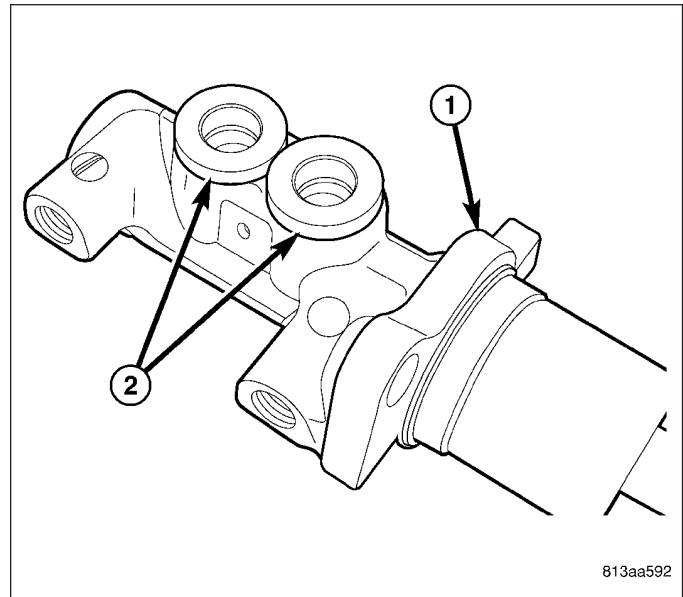
3. Remove brake fluid reservoir cap (1). Using a clean syringe or equivalent type tool, empty as much brake fluid as possible from the reservoir.

**CAUTION:** When removing fluid reservoir from the master cylinder, do not pry off using any type of tool. This can damage the fluid reservoir or master cylinder housing.

4. Remove screw (3) fastening fluid reservoir to master cylinder housing.
5. Rock the brake fluid reservoir side-to-side while pulling up to remove it from seal grommets in master cylinder housing.

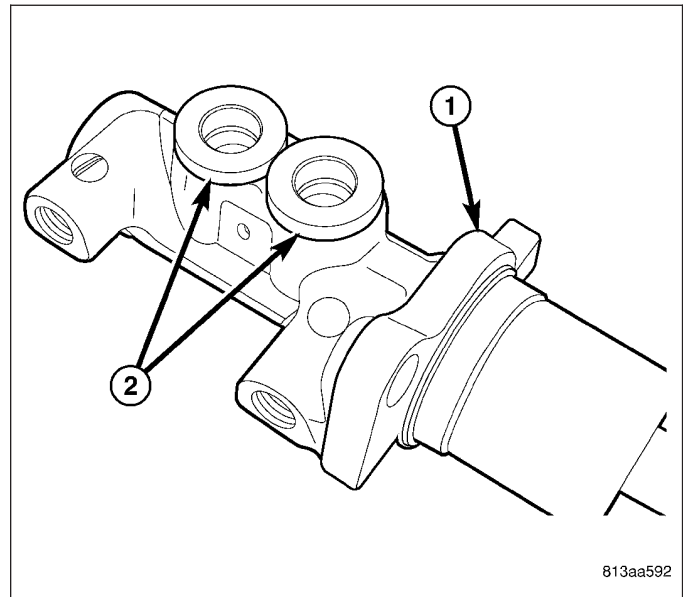


6. Remove two brake fluid reservoir seal grommets (2) from master cylinder housing (1).

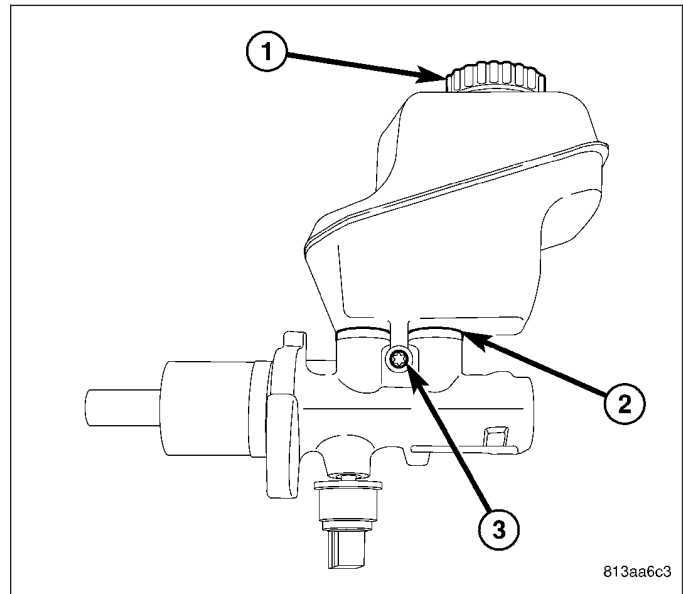


## INSTALLATION

1. Install NEW brake fluid reservoir sealing grommets (2) in master cylinder housing (1).



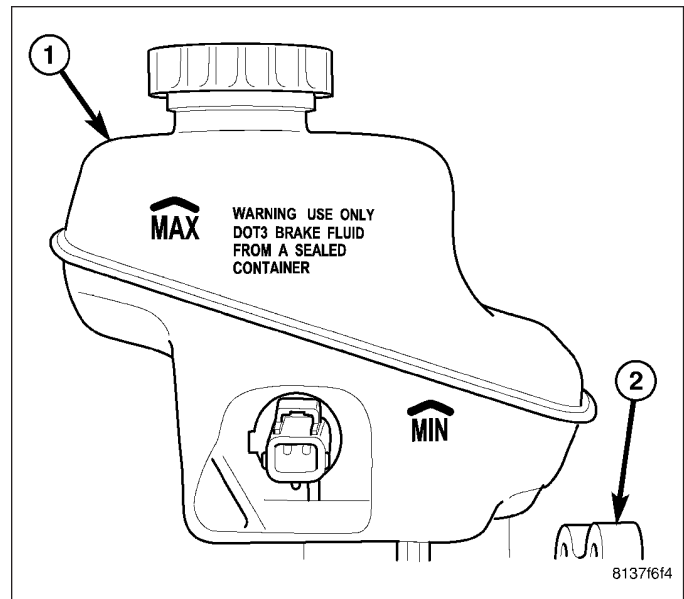
2. Lubricate reservoir mounting area with fresh clean brake fluid. Place reservoir in position over sealing grommets. Seat reservoir into sealing grommets using a rocking motion while firmly pressing down on fluid reservoir. Once installed, make sure fluid reservoir is touching the top of both sealing grommets (2) or reservoir is not properly installed.
3. Install fluid reservoir mounting screw (3). Tighten screw to 28 N-m (250 in. lbs.) torque.



4. Fill master cylinder fluid reservoir (1) with clean, fresh Mopar® Brake Fluid or equivalent.
5. Install access panel in cowl area.

**WARNING:** Be certain a firm brake pedal is achieved prior to attempting vehicle operation. If a firm brake pedal cannot be achieved, bleed entire brake hydraulic system and check for leaks. (refer to 5 - brakes - standard procedure)

6. Road test vehicle to ensure proper operation of brakes.



## JUNCTION BLOCK

### DESCRIPTION

A junction block is used on vehicles that are not equipped with antilock brakes (ABS) allowing use of the same brake tubes on all applications. The junction block is located in the engine compartment, in front of the right wheel well. The junction block mounts in the same location as the ABS integrated control unit (ICU) does on vehicles with ABS.

It has six threaded ports to which the brake tubes connect. Two are for the brake tubes coming from the master cylinder. The remaining four ports are for the brake tubes going to each wheel brake assembly.

The junction block contains two proportioning valves. The proportioning valves are not serviced separately from the junction block. For more information on proportioning valves, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/PROPORTIONING VALVE - DESCRIPTION)

### OPERATION

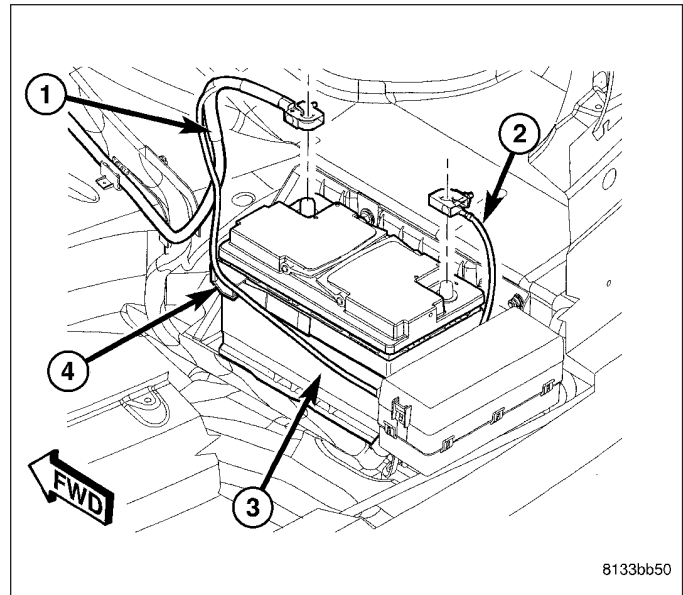
The junction block distributes the brake fluid coming from the master cylinder primary and secondary ports to the four brake tubes leading to the wheel brakes. Since the junction block mounts in the same location as the ABS integrated control unit (ICU), it allows for the common use of brake tubes on the vehicle whether it is equipped with or without ABS.

The junction block includes rear brake proportioning valves. Placed in the fluid flow passages leading to the rear brake tube ports, they balance front-to-rear braking. (Refer to 5 - BRAKES - BASE/HYDRAULIC/MECHANICAL/PROPORTIONING VALVE - OPERATION)

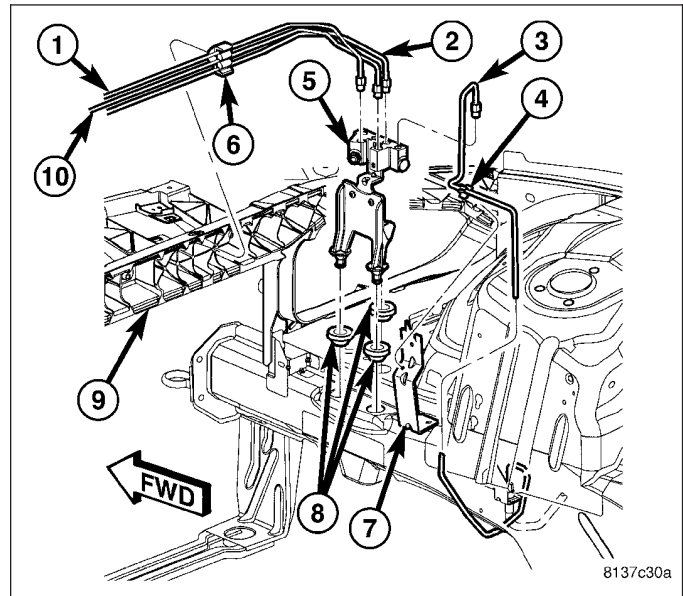
### REMOVAL

**Note:** Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

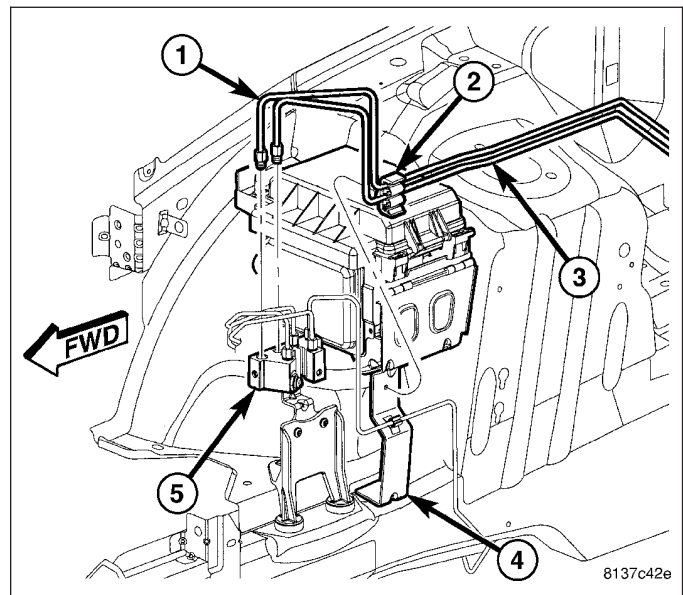
1. Disconnect and isolate battery negative cable (2) from battery post.
2. Using a brake pedal holding tool, depress brake pedal past its first inch of travel and hold it in this position. Holding pedal in this position will isolate master cylinder from hydraulic brake system and will not allow brake fluid to drain out of brake fluid reservoir while brake lines are open.



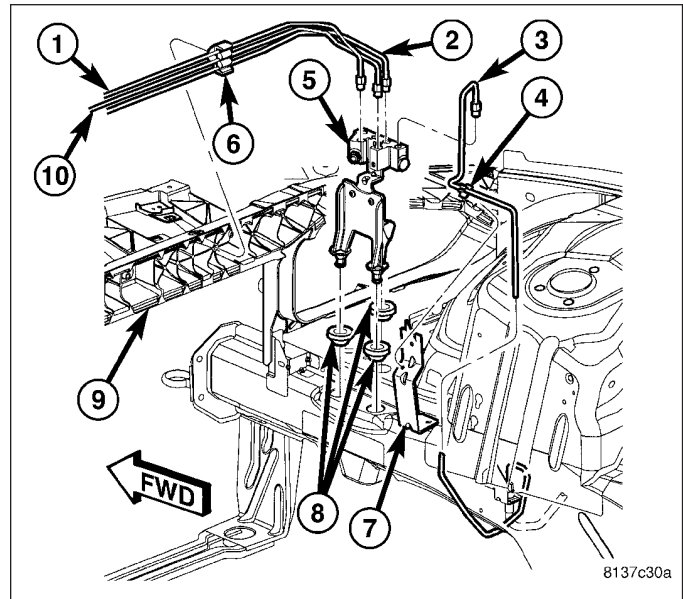
3. Remove brake tubes (1, 2, 3 and 10) at junction block (5).



4. Remove remaining brake tubes (1 and 3) at junction block (5).

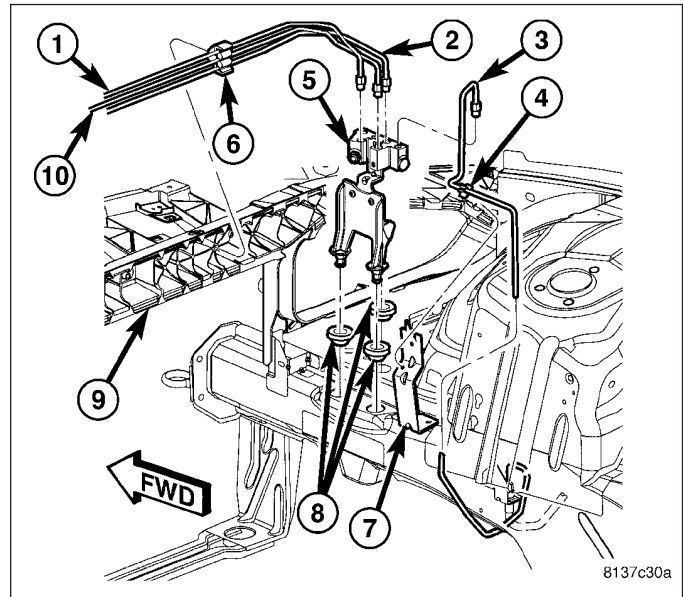


5. Pull up on junction block (5) and remove from mounting grommets (8).

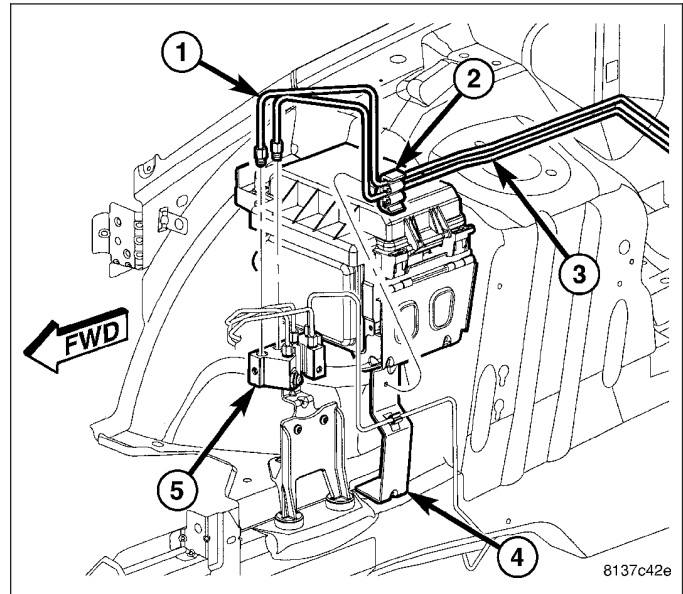


## INSTALLATION

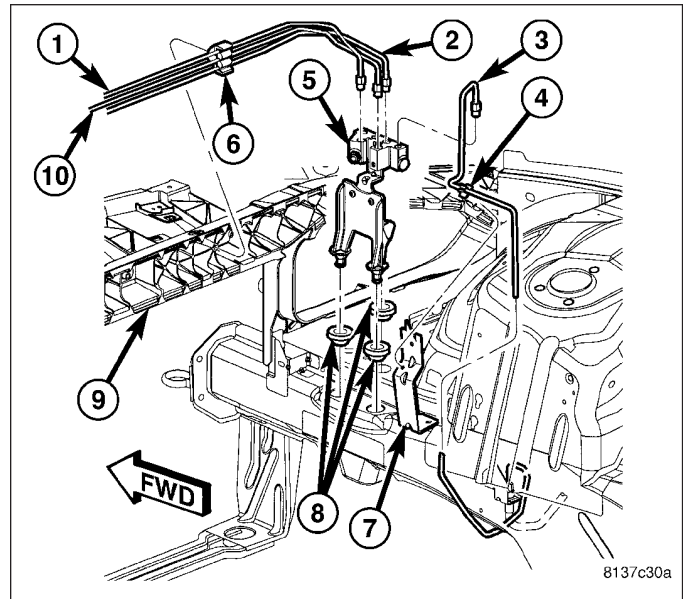
1. Install junction block (5), pushing mounting bracket down into mounting grommets (8) located in body of vehicle.



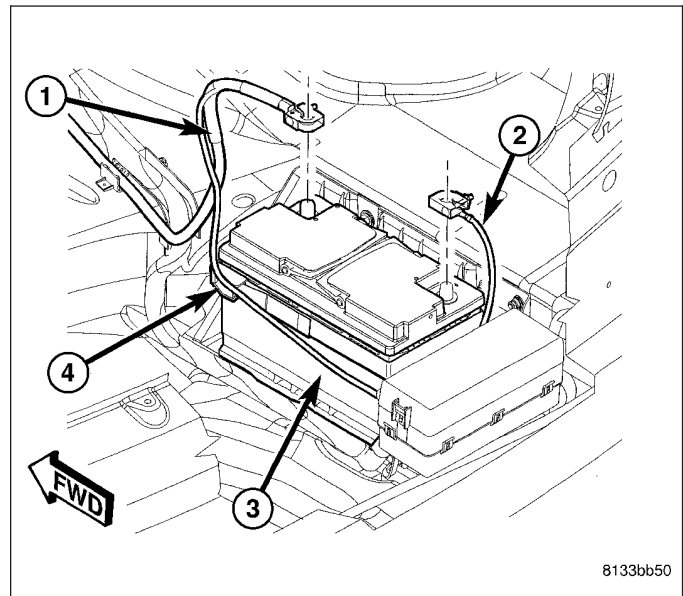
2. Install brake tubes to rear (1 and 3) at hydraulic control unit. Tighten tube nuts to 14 N·m (124 in. lbs.) torque.



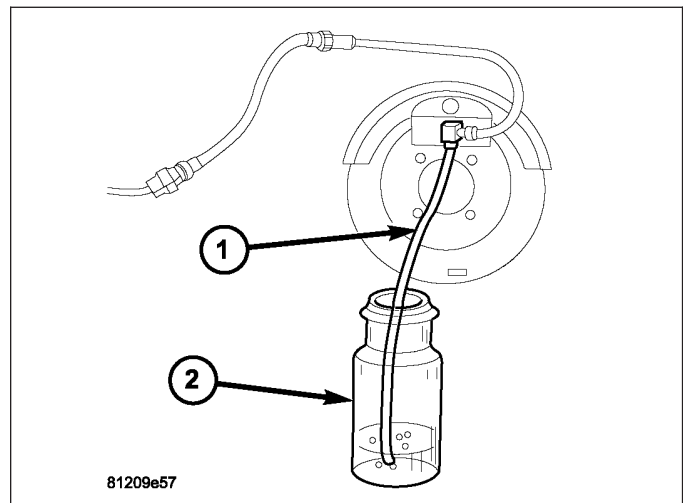
3. Install brake tubes (1, 2, 3 and 10) at junction block (5). Tighten tube nuts to 14 N·m (124 in. lbs.) torque.
4. Remove brake pedal holding tool.



5. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)



6. Fill and bleed (1) base brake hydraulic system. (Refer to 5 - BRAKES - STANDARD PROCEDURE)
7. Road test vehicle to verify proper operation of brakes.





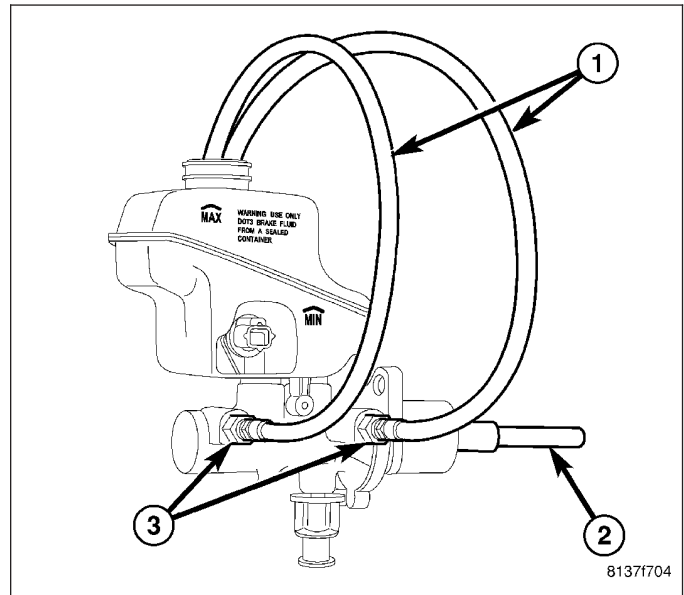
## MASTER CYLINDER

### STANDARD PROCEDURE

### MASTER CYLINDER BLEEDING

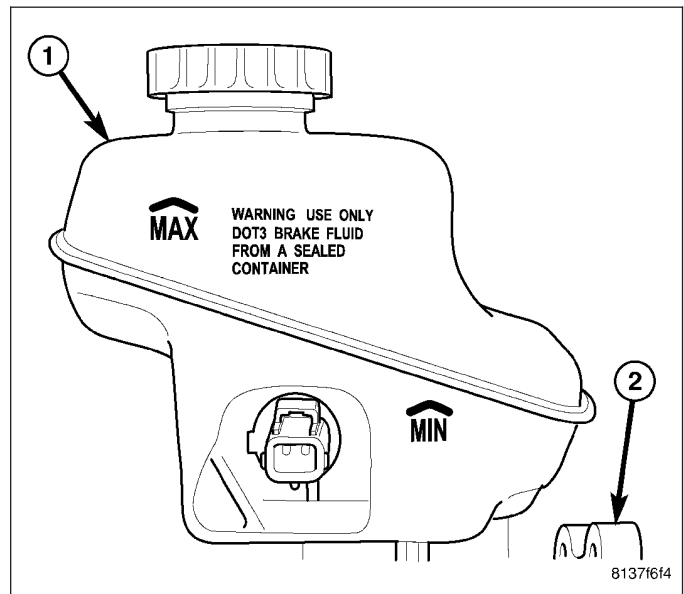
**CAUTION:** When clamping master cylinder in vise, only clamp master cylinder by its mounting flange. Do not clamp master cylinder piston rod, reservoir, seal or body.

1. Clamp master cylinder in a vise.
2. Attach special tools for bleeding master cylinder in the following fashion:
  - a. Thread one Adapter (3), Special Tool 8822-2, in each outlet port. Tighten Adapters to 14 N·m (124 in. lbs.) torque.
  - b. Thread a Bleeder Tube (1), Special Tool 8358-1, into each Adapter. Tighten each tube to 14 N·m (124 in. lbs.) torque. Flex each bleeder tube and place open end into mouth of fluid reservoir as far down as possible.



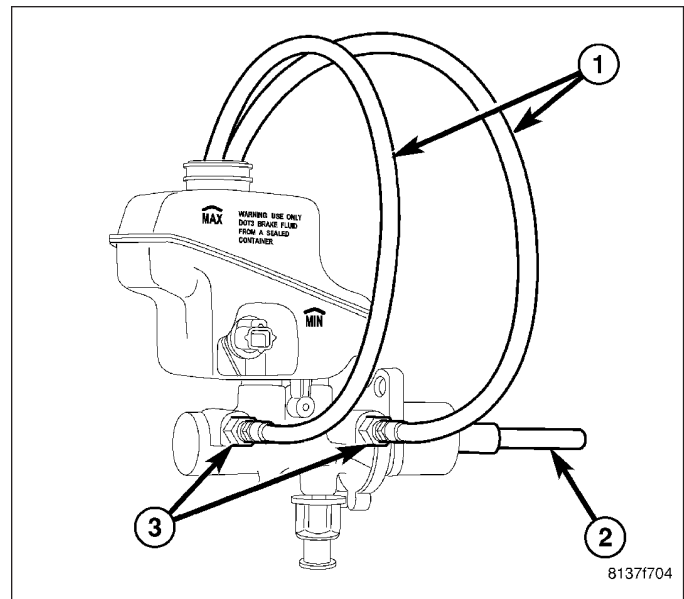
**Note:** Make sure open ends of bleeder tubes stay below surface of brake fluid once reservoir is filled to proper level.

3. Fill brake fluid reservoir (1) to the MAX level with Mopar® brake fluid or equivalent conforming to DOT 3 (DOT 4 and DOT 4+ are acceptable) specifications. Make sure fluid level is above tips of bleeder tubes in reservoir to ensure no air is ingested during bleeding.





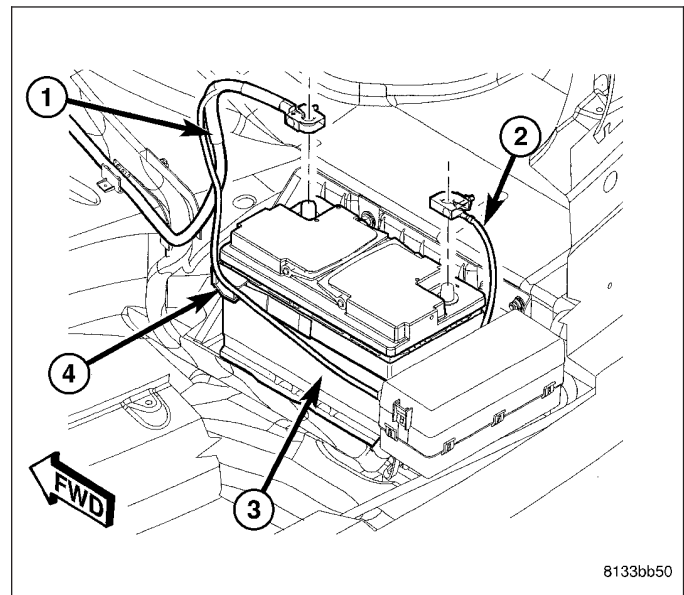
4. Using a wooden dowel as a pushrod (2), slowly depress master cylinder pistons, then release pressure, allowing pistons to return to released position. Repeat several times until all air bubbles are expelled. Make sure fluid level stays above tips of bleeder tubes in reservoir while bleeding.
5. Remove bleeder tubes (1) and adapters (3) from master cylinder outlet ports, then plug outlet ports and install fill cap on reservoir.
6. Remove master cylinder from vise.
7. Install master cylinder on vehicle. (Refer to 5 - BRAKES - BASE/HYDRAULIC/MECHANICAL/ MASTER CYLINDER - INSTALLATION)



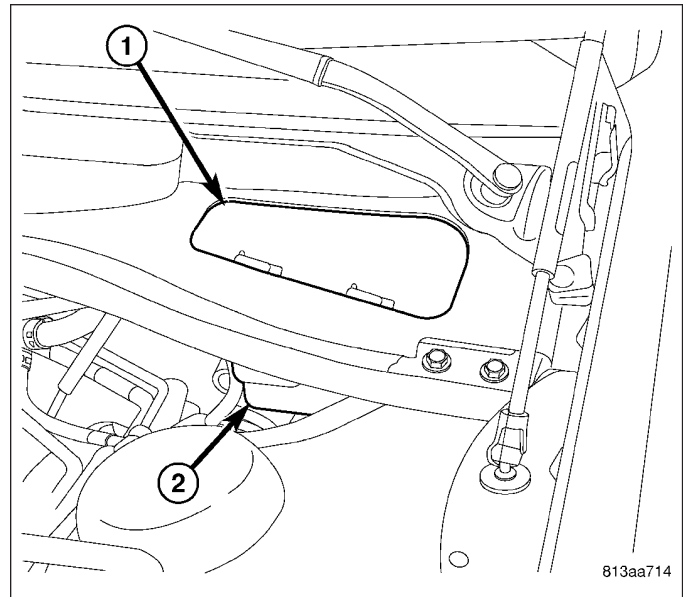
## REMOVAL

**CAUTION:** Vacuum in power brake booster must be pumped down (removed) before removing master cylinder from power brake booster. This is necessary to prevent power brake booster from sucking in any contamination as master cylinder is removed. This can be done simply by pumping brake pedal, with vehicle's engine not running, until a firm feeling brake pedal is achieved.

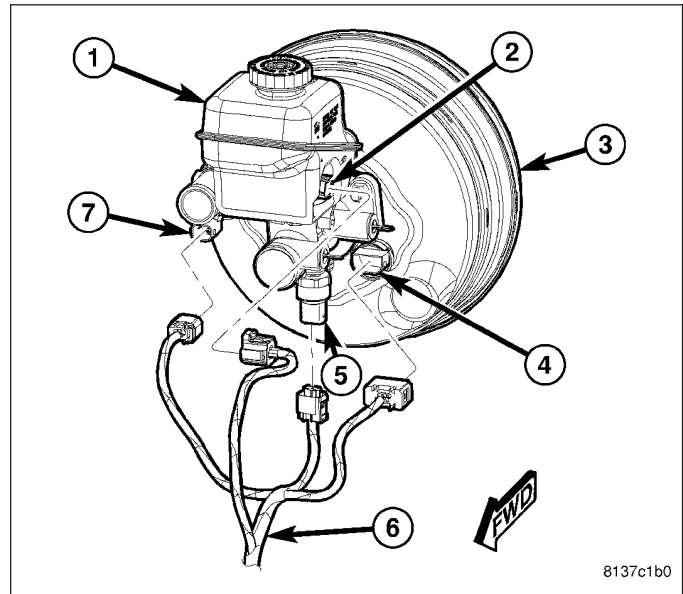
1. With engine not running, pump brake pedal until a firm pedal is achieved (4-5 strokes).
2. Disconnect and isolate battery negative cable (2) from battery post.



3. Remove access panel (1) in cowl area to expose master cylinder (2).
4. Thoroughly clean all surfaces of brake fluid reservoir and master cylinder. Use only Mopar® Brake Parts Cleaner or equivalent.



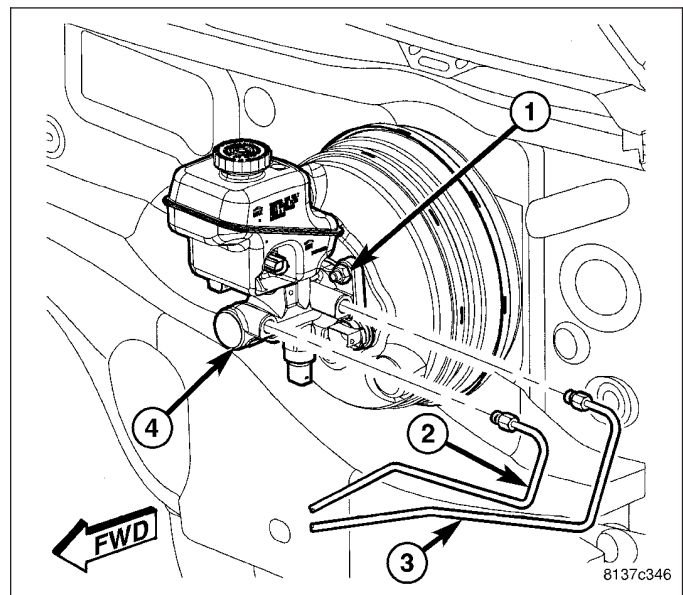
5. Disconnect wiring harness (6) connector from brake fluid level sensor (2) in master cylinder brake fluid reservoir (1).
6. If equipped with Electronic Stability Program, disconnect wiring harness (6) connector from pressure switch (5).



7. Disconnect primary (3) and secondary (2) brake tubes from master cylinder (4). Install sealing plugs in open brake tube outlet ports.

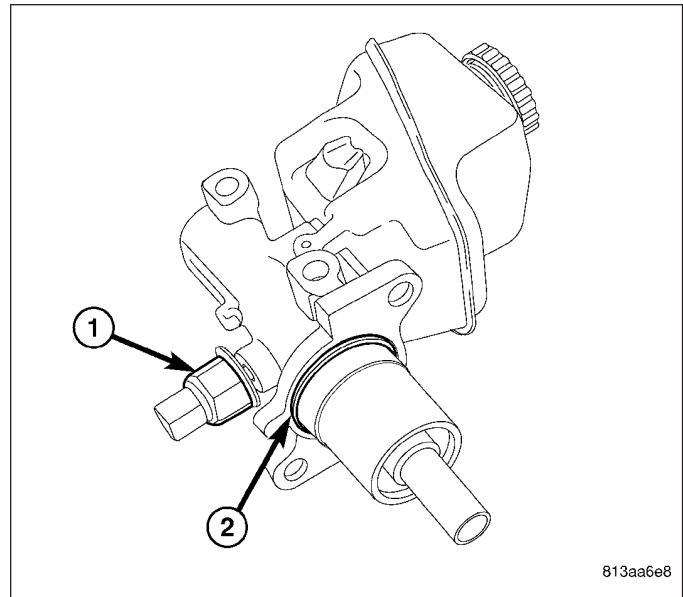
**CAUTION:** Before removing master cylinder from power brake vacuum booster, master cylinder and vacuum booster must be thoroughly cleaned. This must be done to prevent dirt particles from falling into power brake vacuum booster. Use only Mopar® Brake Parts Cleaner or equivalent.

8. Remove two nuts (1) attaching master cylinder to power brake booster.
9. Slide master cylinder straight out of power brake booster.



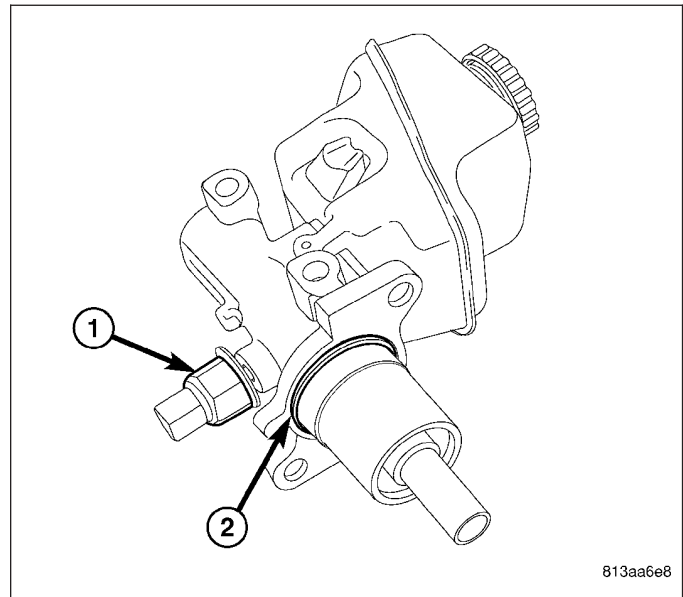
**CAUTION:** Seal on rear of master cylinder (2) is used to allow vacuum ability in power brake vacuum booster. Vacuum seal on master cylinder **MUST** be replaced whenever master cylinder is removed from power brake vacuum booster.

10. Remove vacuum seal located on mounting flange of master cylinder (2). Vacuum seal is removed by **carefully** pulling it off rear of master cylinder. **Do not attempt to pry seal off master cylinder by inserting a sharp tool between seal and master cylinder casting. Damage can occur.**



## DISASSEMBLY

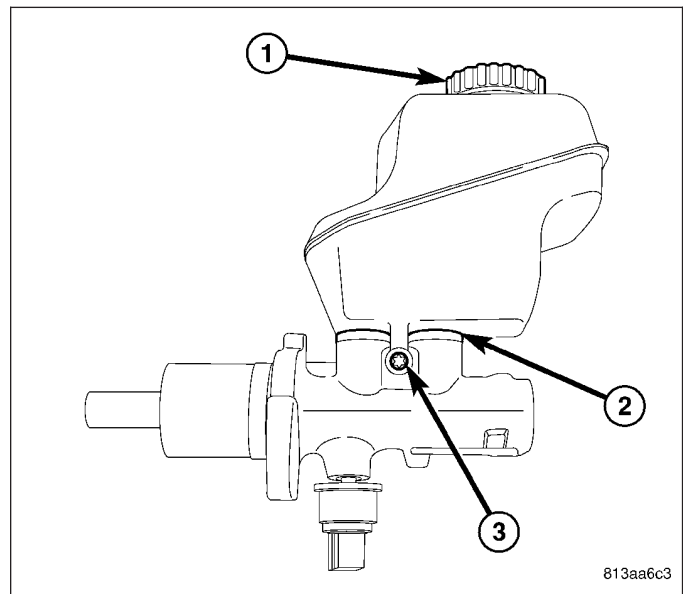
1. Clean master cylinder housing and brake fluid reservoir. Use only Mopar® Brake Parts Cleaner or equivalent.
2. If equipped with Electronic Stability Program, remove pressure switch on bottom of master cylinder (1).



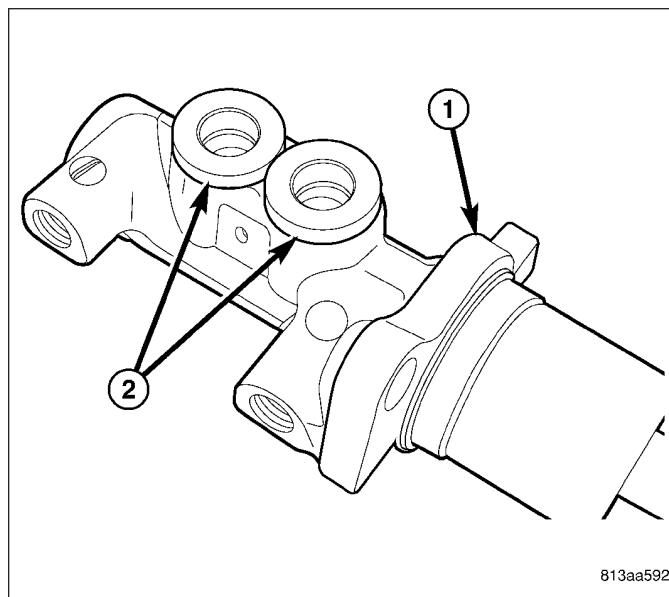
3. Remove brake fluid reservoir cap (1). Using a syringe or equivalent type tool, empty as much brake fluid as possible from the reservoir.

**CAUTION:** When removing fluid reservoir from the master cylinder, do not pry off using any type of tool. This can damage the fluid reservoir or master cylinder housing.

4. Remove screw (3) fastening fluid reservoir to master cylinder housing.
5. Rock the brake fluid reservoir side-to-side while pulling up to remove it from seal grommets in master cylinder housing.

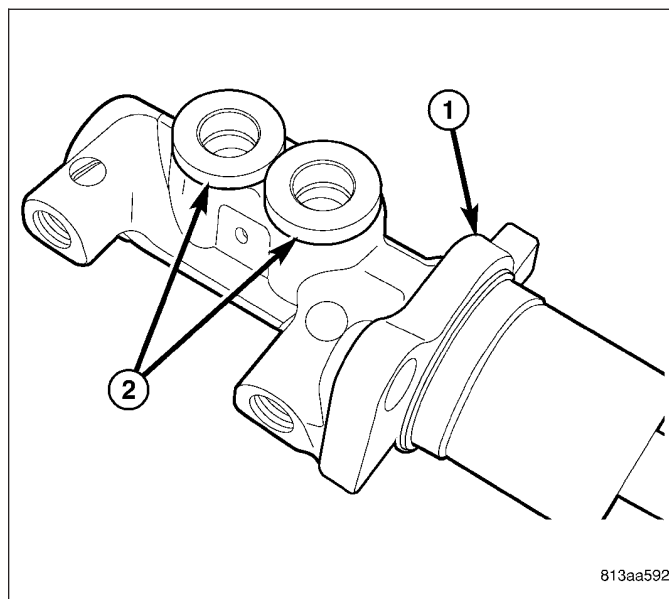


6. Remove two brake fluid reservoir seal grommets (2) from master cylinder housing (1).

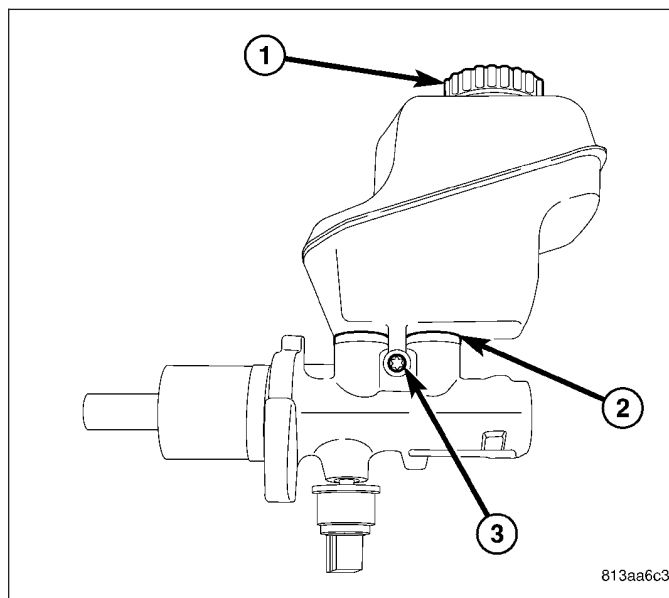


## ASSEMBLY

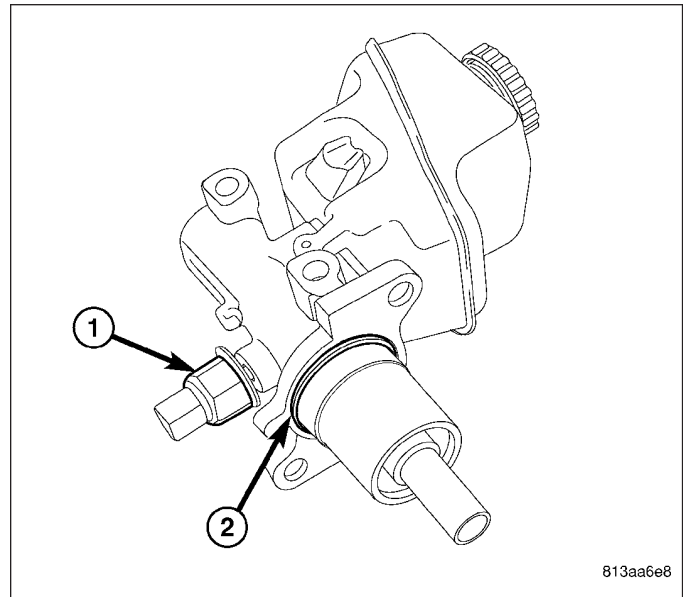
1. Install NEW brake fluid reservoir sealing grommets (2) in master cylinder housing (1).



2. Lubricate reservoir mounting area with fresh clean brake fluid. Place reservoir in position over sealing grommets. Seat reservoir into sealing grommets using a rocking motion while firmly pressing down on fluid reservoir. Once installed, make sure fluid reservoir is touching the top of both sealing grommets (2) or reservoir is not properly installed.
3. Install fluid reservoir mounting screw (3). Tighten screw to 28 N-m (250 in. lbs.) torque.



4. If equipped with Electronic Stability Program, install pressure switch (1) on bottom of master cylinder. Tighten switch to 28 N·m (250 in. lbs.) torque.
5. Thoroughly bleed master cylinder before installing it on vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - STANDARD PROCEDURE)
6. Install master cylinder on power brake booster. Upon installation, vacuum seal (2) on rear of master cylinder must be replaced. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - INSTALLATION)

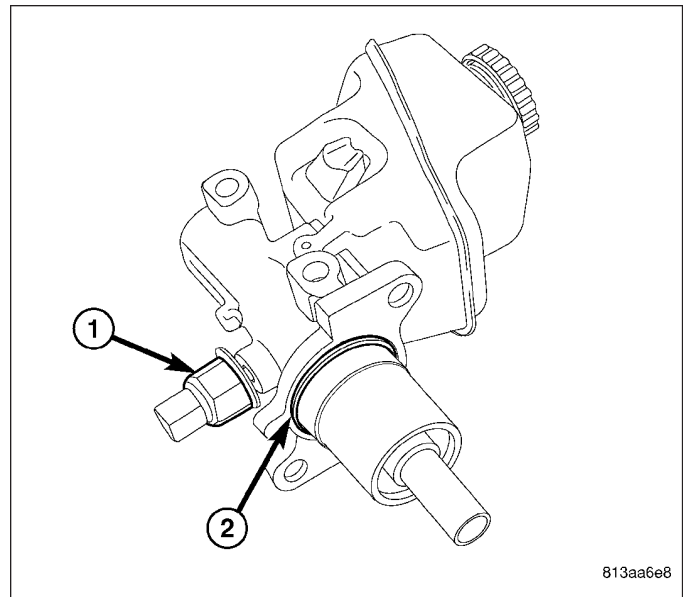


## INSTALLATION

1. Thoroughly bleed master cylinder before installing it on vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - STANDARD PROCEDURE)

**CAUTION:** When replacing master cylinder on vehicle, a **NEW** vacuum seal (2) **MUST** be installed on master cylinder.

2. Install **NEW** vacuum seal (2) on rear of master cylinder making sure seal fits squarely in mounting groove.



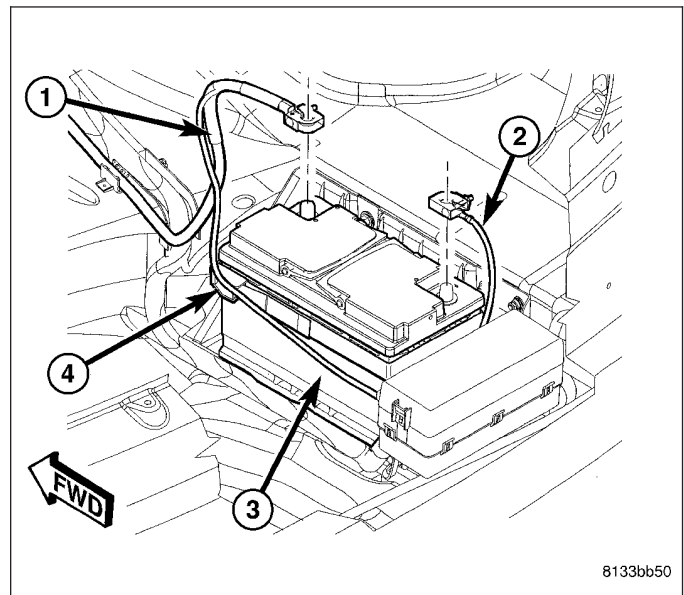
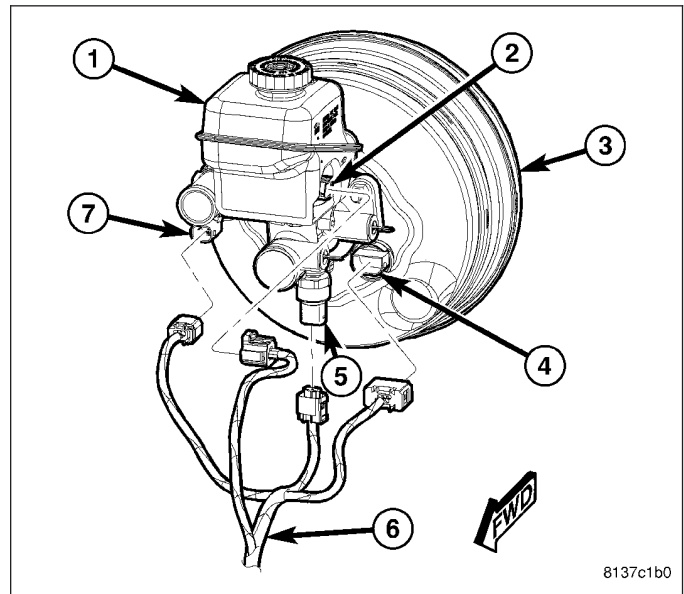
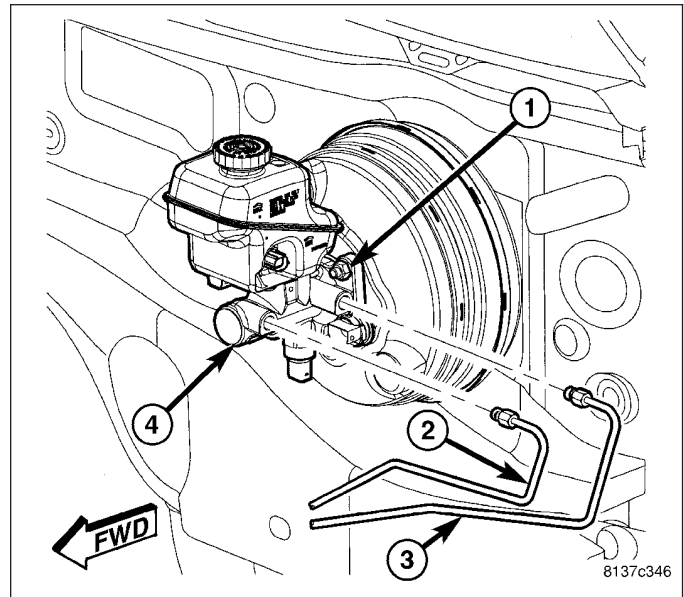
3. Position master cylinder (4) on studs of power brake booster, aligning booster push rod with master cylinder piston.
4. Install two master cylinder mounting nuts (1). Tighten both mounting nuts to 25 N·m (225 in. lbs.) torque.

**CAUTION:** When tightening primary and secondary brake tube nuts at master cylinder, be sure brake tubes do not contact any other components within vehicle and that there is slack in flexible sections of tubes. This is required due to movement between ABS ICU and master cylinder while vehicle is in motion.

5. Thread primary (3) and secondary (2) brake tubes into master cylinder primary and secondary ports. Tighten tube nuts to 14 N·m (124 in. lbs.) torque.

6. If equipped with Electronic Stability Program, connect wiring harness (6) connector to pressure switch (5).
7. Connect wiring harness (6) connector to brake fluid level switch (2) mounted in brake fluid reservoir (1).

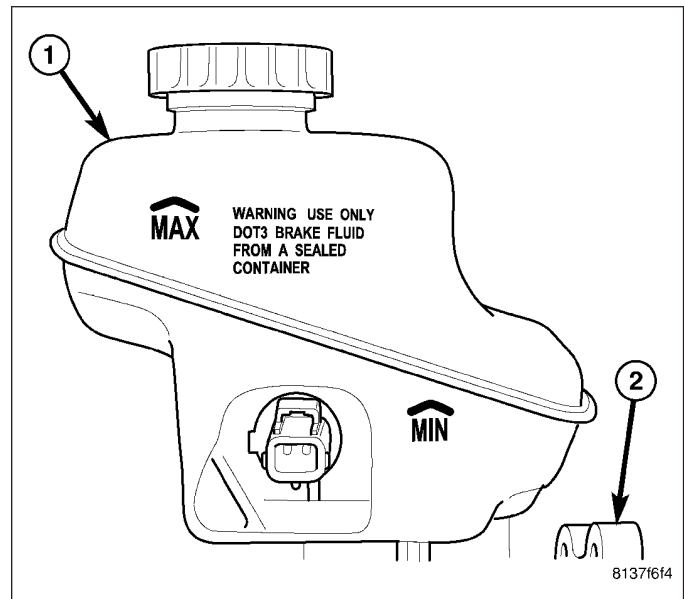
8. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)



9. Fill master cylinder fluid reservoir (1) with clean, fresh Mopar® Brake Fluid or equivalent.
10. Install access panel in cowl area.

**WARNING: BE CERTAIN A FIRM BRAKE PEDAL IS ACHIEVED PRIOR TO ATTEMPTING VEHICLE OPERATION. IF A FIRM BRAKE PEDAL CANNOT BE ACHIEVED, BLEED ENTIRE BRAKE HYDRAULIC SYSTEM AND CHECK FOR LEAKS. (Refer to 5 - BRAKES - STANDARD PROCEDURE)**

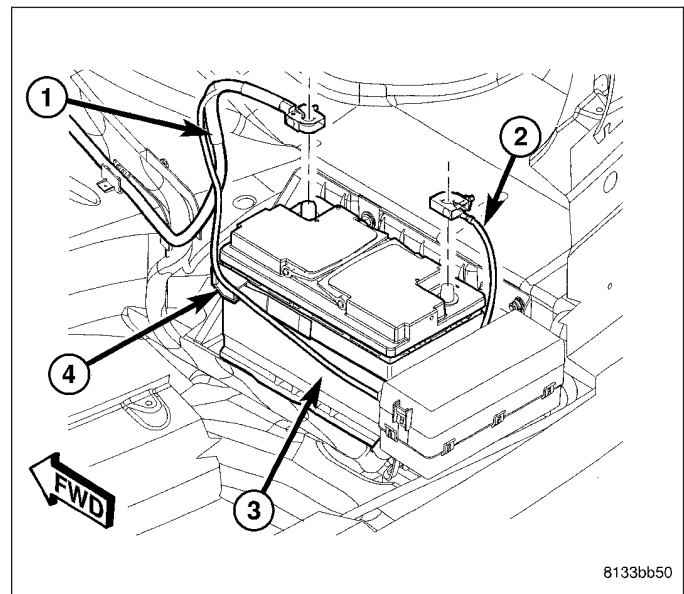
11. Road test vehicle to ensure proper operation of brakes.



## PEDAL

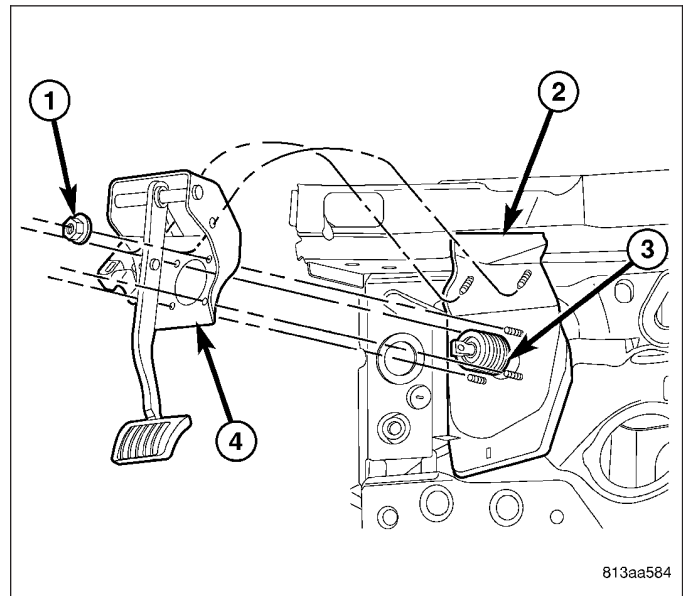
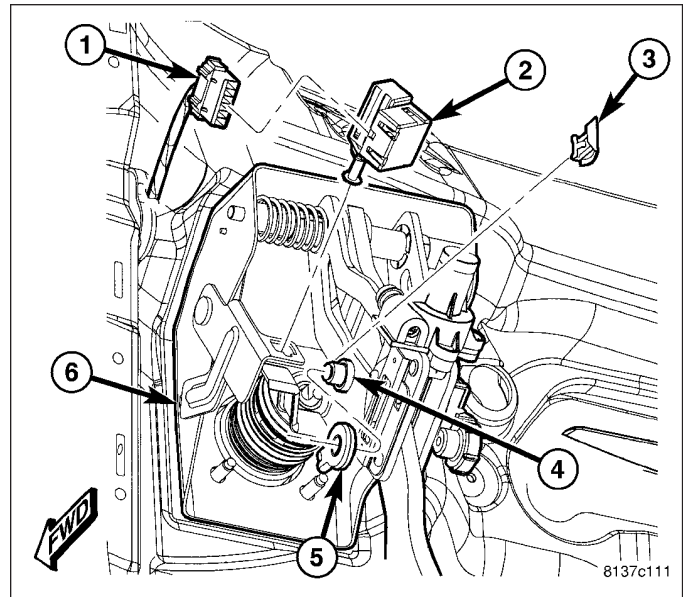
### REMOVAL

1. Disconnect and isolate battery negative cable (2) from battery post.





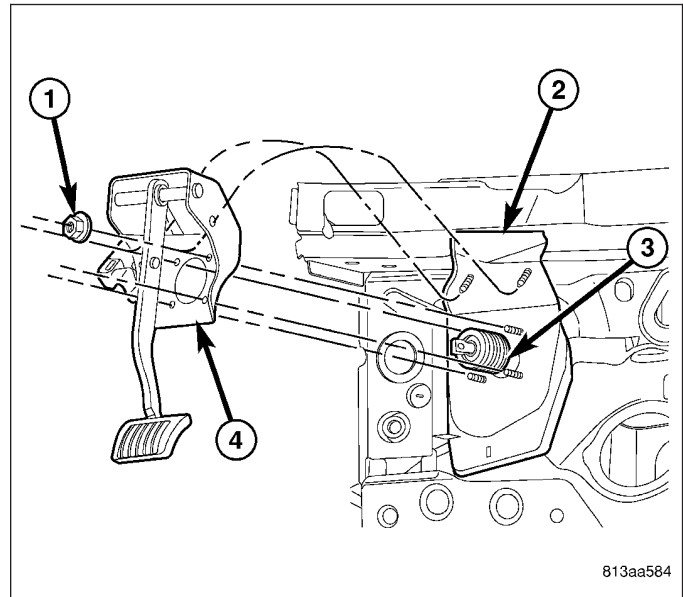
2. Remove brake lamp switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - REMOVAL)
3. Remove booster push rod from pin on brake pedal. To do so:
  - a. Position small screwdriver between center tang on power brake booster brake pedal pin retaining clip (3).
  - b. Rotate screwdriver enough to allow retaining clip center tang to pass over end of brake pedal pin, then slide retaining clip off brake pedal pin.
  - c. **Discard retaining clip (3). It is not to be reused. Install NEW retaining clip when assembling.**
4. Slide booster push rod (5) off brake pedal pin (4).
5. Remove four power brake booster (3) mounting nuts (1).
6. Remove two nuts (1) fastening pedal bracket to upper dash panel (2).
7. Push power brake booster (3) forward into engine compartment as far as possible by hand. Do not force it.
8. Remove brake pedal (4).



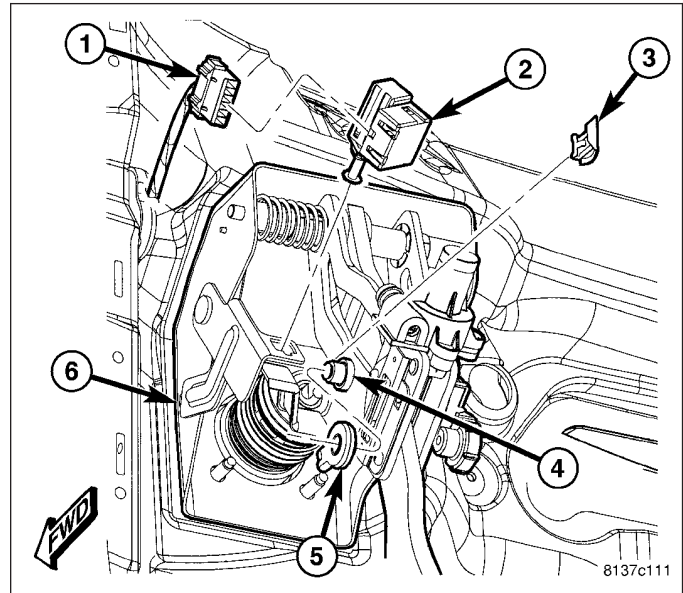


## INSTALLATION

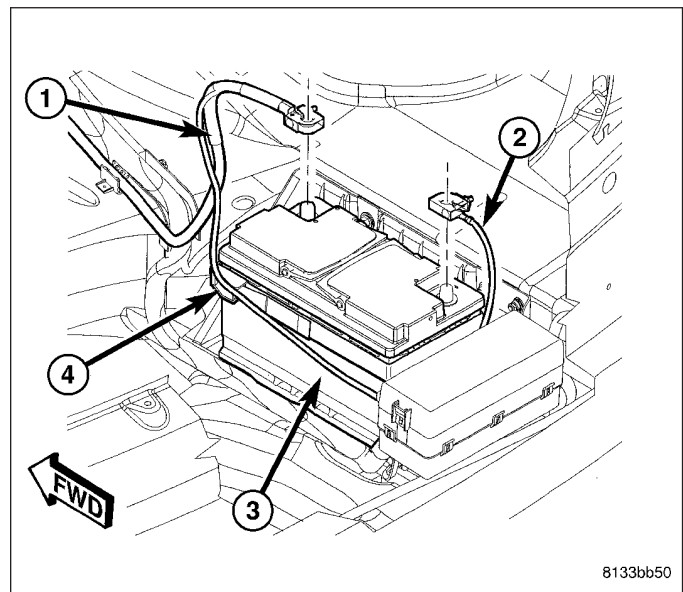
1. Install adjustable brake pedal assembly (4) under instrument panel and slide over booster push rod.
2. From engine compartment side, push power brake booster (3) mounting studs back through dash panel (2) and brake pedal bracket.
3. Install two upper mounting nuts (1) fastening pedal bracket to upper dash panel (2). **Do not tighten at this time.**
4. Install four power brake booster mounting nuts (1). Tighten nuts to 25 N·m (19 ft. lbs.) torque.
5. Tighten two upper mounting nuts (1) to 25 N·m (19 ft. lbs.) torque.



6. Slide booster push rod (5) onto brake pedal pin (4). Install NEW retaining clip (3) securing push rod to brake pedal.
7. Install and adjust NEW brake lamp switch (2). (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - INSTALLATION)



8. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)
9. Road test vehicle testing operation of brakes.



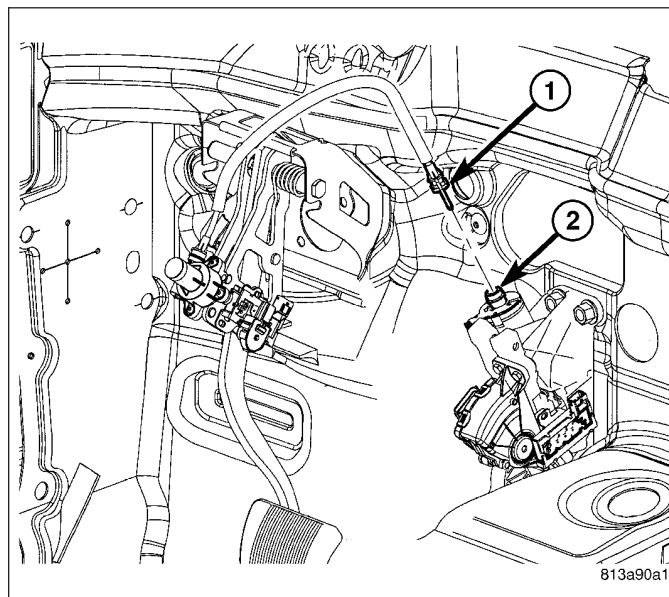
## PEDAL - ADJUSTABLE BRAKE

### STANDARD PROCEDURE

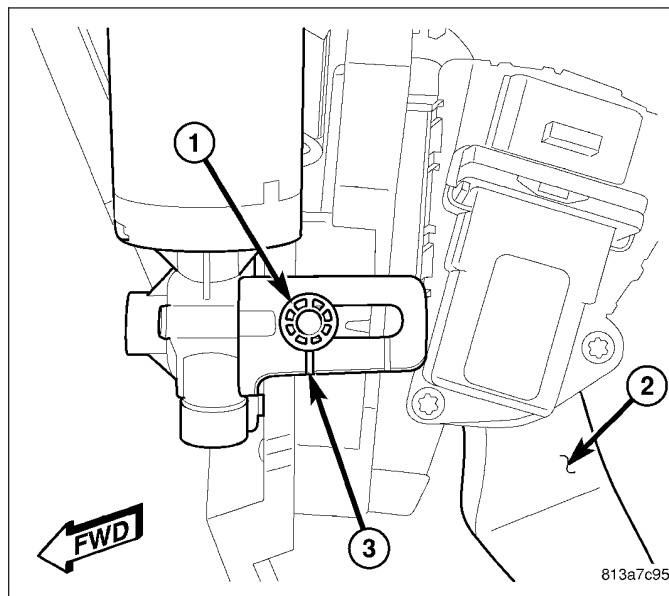
### ADJUSTABLE PEDALS SYCHRONIZATION

**Note:** Although the pedals can be synchronized at either the full-forward or full-rearward positions (both pedals must be in the same position), it is recommended to do so with the pedals positioned in the full-forward position due to service part positioning from the factory.

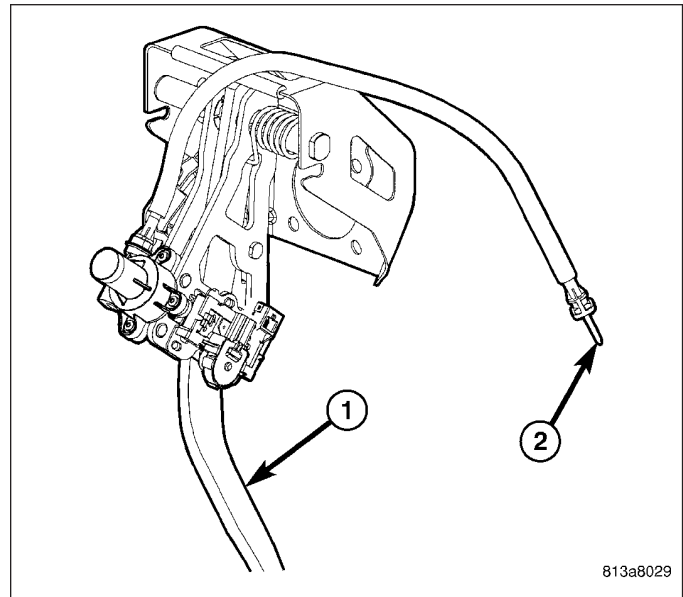
1. Disconnect the adjuster cable (1) running between the accelerator pedal module and the brake pedal assembly at the adjuster motor (2).



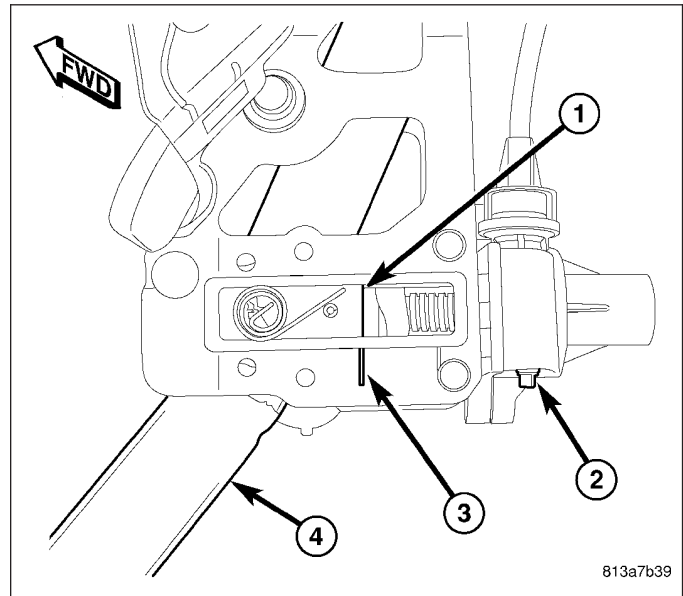
2. Using the switch, position the accelerator pedal (2) in the full-forward position. The pin on the pedal (1) will line up with the adjustment line (2) at this point.



3. Using a drill motor, or other suitable device, rotate the adjuster cable strand (2) from the accelerator pedal end to position the brake pedal (1) toward the full-forward position.



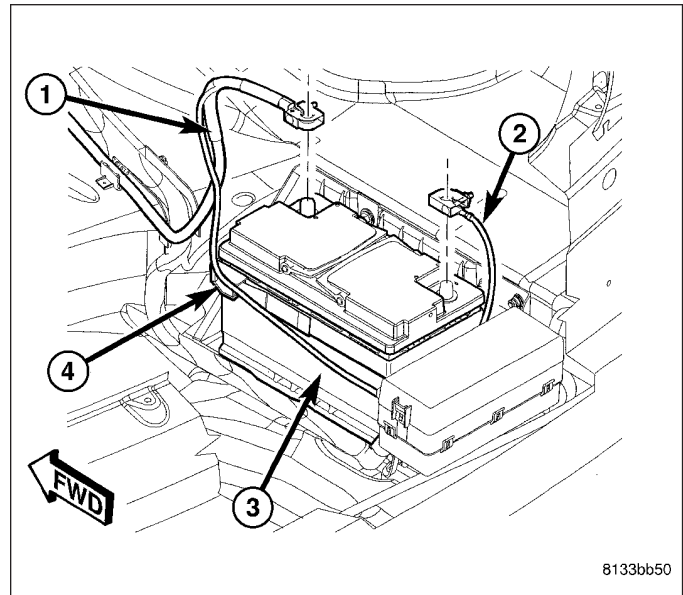
4. Rotate the adjuster cable strand until the brake pedal (4) gear drive block (1) lines up with the full-forward adjustment line (3) as shown. If fine adjustments are necessary, turn the adjustment knob (2) by hand to line up the components.
5. Reconnect the adjuster cable to the adjuster motor. If the cable resists connection, turn the adjustment knob (2) by hand until the cable drops into place.
6. Verify proper operation of the adjustable pedals.



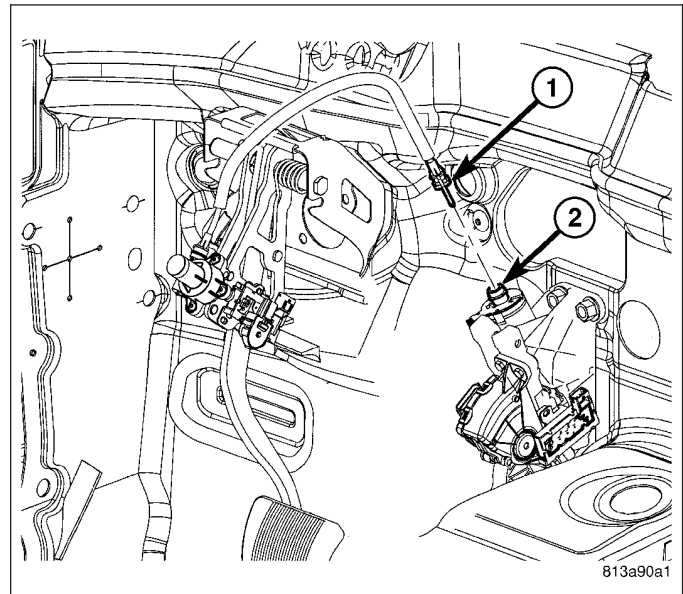
## REMOVAL

1. Move driver's seat to full rearward position.

2. Disconnect and isolate battery negative cable (2) from battery post.



3. Disconnect adjuster cable (1) at accelerator adjuster motor (2).

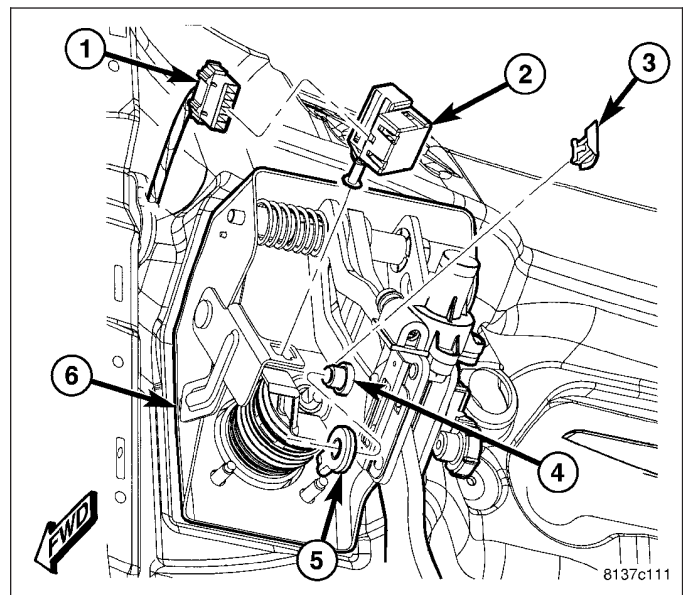


4. Remove brake lamp switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - REMOVAL)

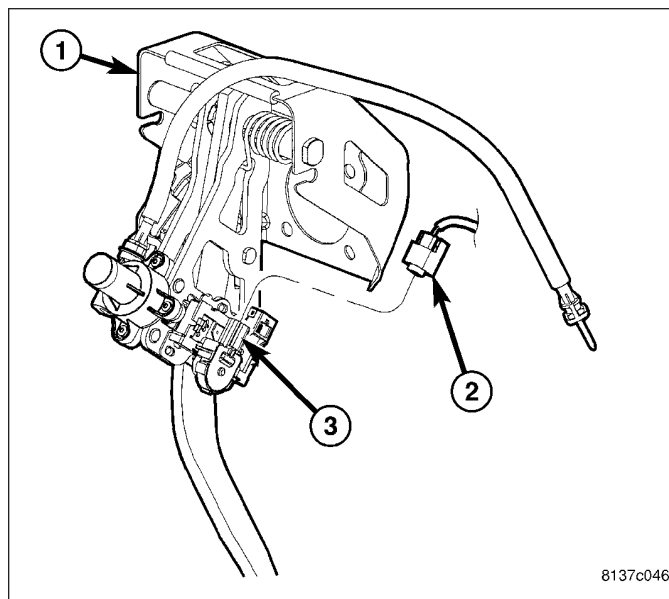
5. Remove booster push rod from pin on brake pedal. To do so:

- a. Position small screwdriver between center tang on power brake booster brake pedal pin retaining clip (3).
- b. Rotate screwdriver enough to allow retaining clip center tang to pass over end of brake pedal pin, then slide retaining clip off brake pedal pin.
- c. **Discard retaining clip (3). It is not to be reused. Install NEW retaining clip when assembling.**

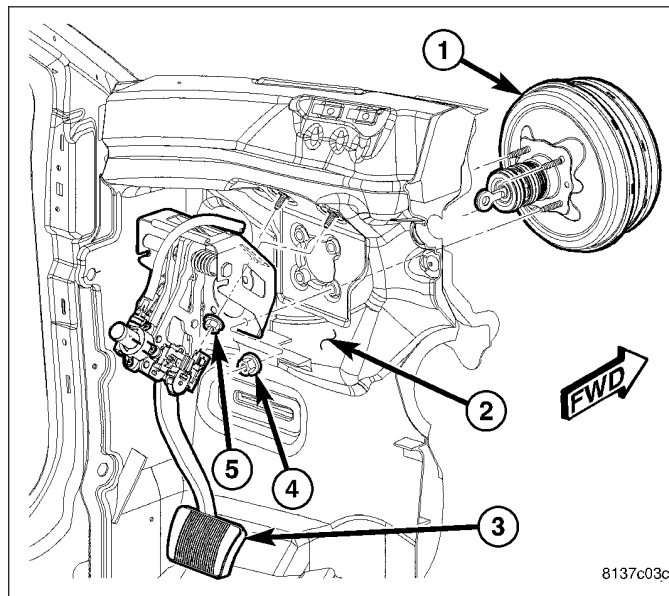
6. Slide booster push rod (5) off brake pedal pin (4).



7. Disconnect wiring connector (2) at brake pedal position sensor (3).



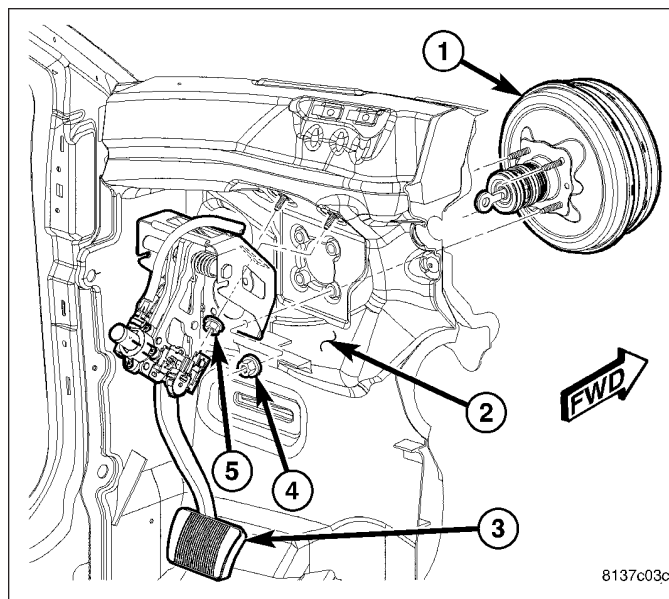
8. Remove four power brake booster mounting nuts (4).
9. Remove two nuts (5) fastening pedal bracket to upper dash panel (2).
10. Push power brake booster (1) forward into engine compartment as far as possible by hand. Do not force it.
11. Remove adjustable brake pedal assembly (3).
12. Remove adjuster cable at brake pedal gear drive.



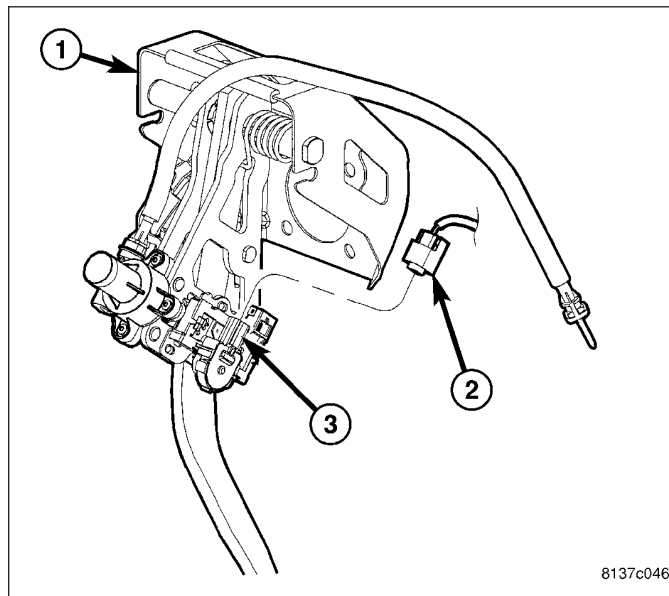
## INSTALLATION

1. Attach cable to brake pedal gear drive.

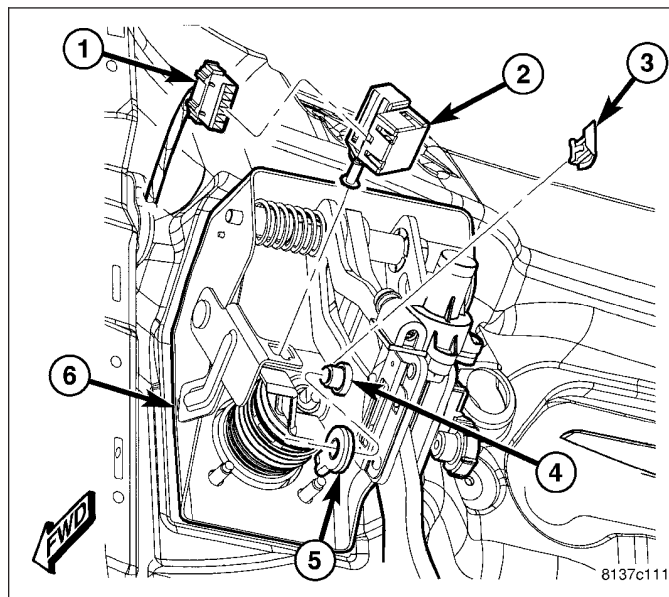
2. Install adjustable brake pedal assembly (3) under instrument panel and slide over booster push rod.
3. From engine compartment side, push power brake booster (1) mounting studs back through dash panel (2) and brake pedal bracket.
4. Install two nuts (5) fastening pedal bracket to upper dash panel (2). **Do not tighten at this time.**
5. Install four power brake booster mounting nuts (4). Tighten nuts to 25 N·m (19 ft. lbs.) torque.
6. Tighten two upper mounting nuts (5) to 25 N·m (19 ft. lbs.) torque.



7. Connect wiring connector (2) at brake pedal position sensor (3).

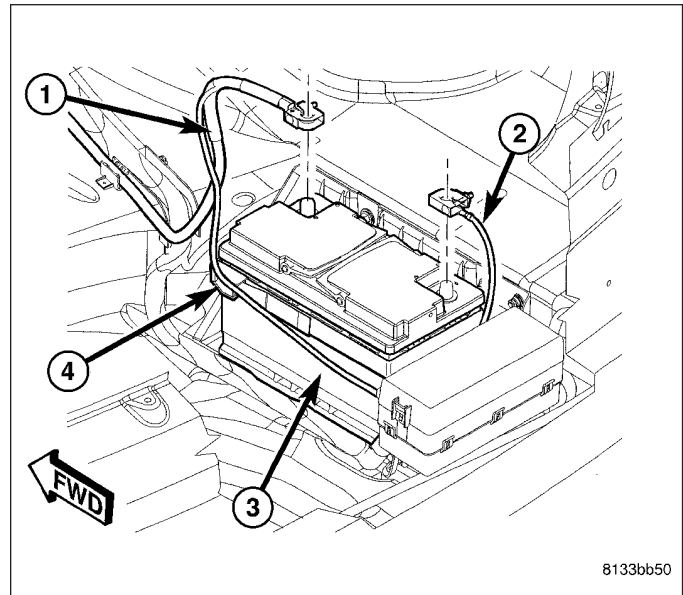


8. Slide booster push rod (5) onto brake pedal pin (4). Install NEW retaining clip (3) securing push rod to brake pedal.
9. Install and adjust NEW brake lamp switch (2). (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - INSTALLATION)

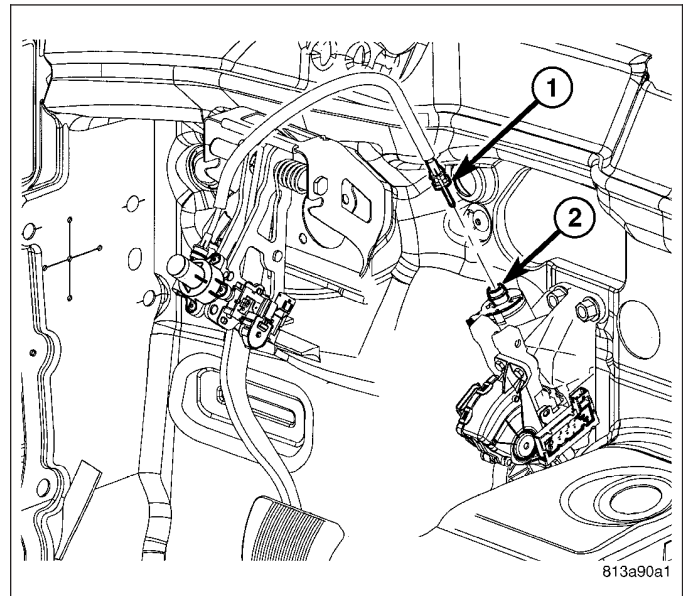




10. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)



11. Synchronize brake pedal to accelerator pedal, then connect adjuster cable (1) to adjuster motor (2). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/PEDAL - STANDARD PROCEDURE)
12. If vehicle is equipped with memory seats, the system will need to be initialized. Refer to appropriate diagnostic information.
13. Test operation of adjustable pedals.
14. Road test vehicle testing operation of brakes and accelerator.

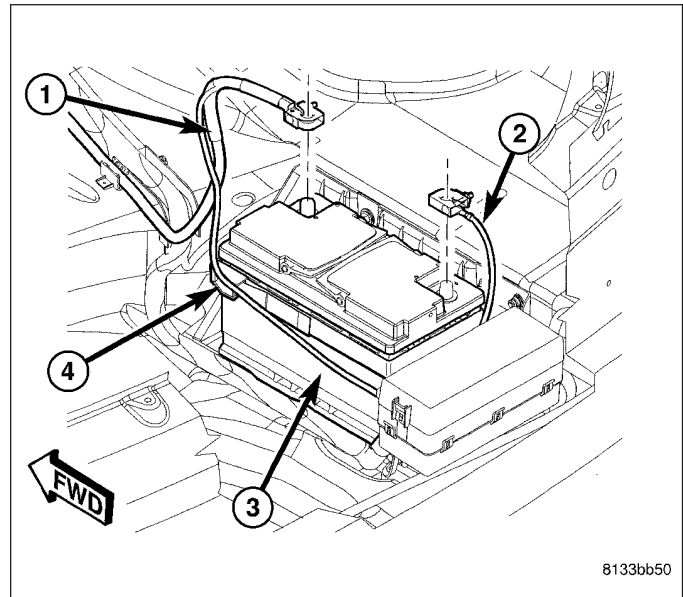


## BOOSTER - POWER BRAKE

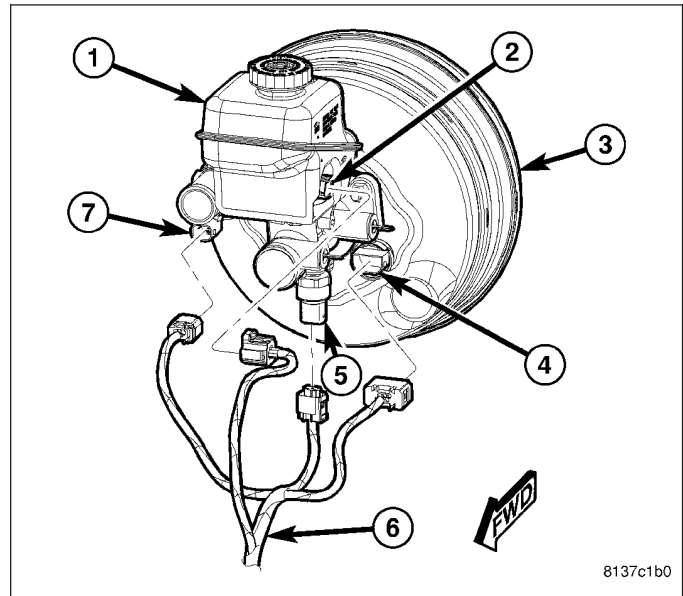
### REMOVAL

1. Move driver's seat to full rearward position.

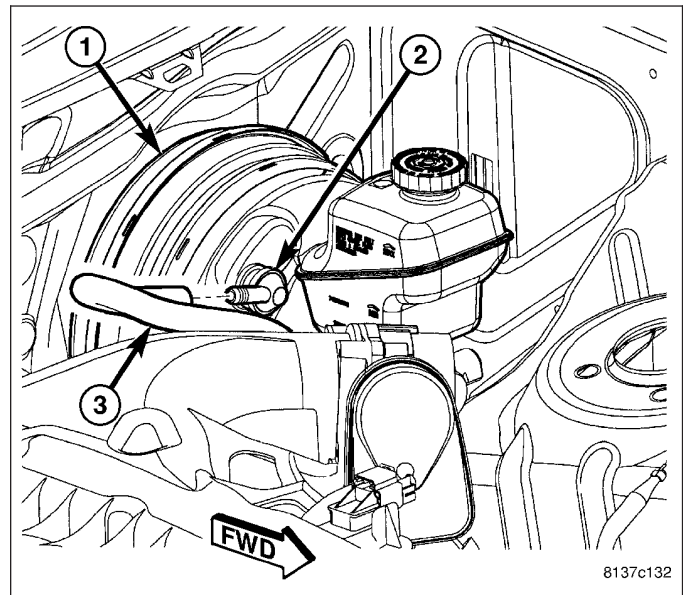
2. Disconnect and isolate battery negative cable (2) from battery post.
3. Remove master cylinder. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - REMOVAL)



4. If equipped with Electronic Stability Program (ESP), disconnect wiring harness (6) connector at pedal travel sensor (7) on power brake booster (3).
5. If equipped with ESP, disconnect wiring harness (6) connector at active brake booster solenoid (4).



6. Disconnect vacuum hose (3) from check valve (2) on face of booster (1). **Do not remove check valve from booster.**





7. Remove brake lamp switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - REMOVAL)

8. Remove booster push rod from pin on brake pedal. To do so:

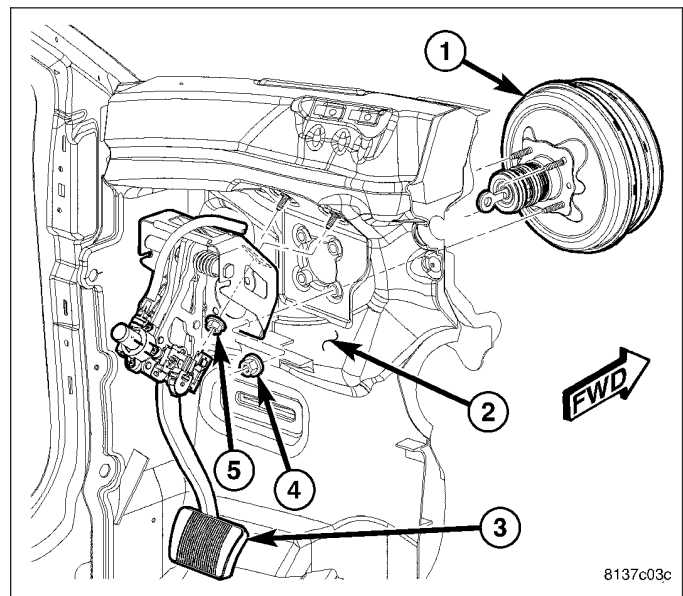
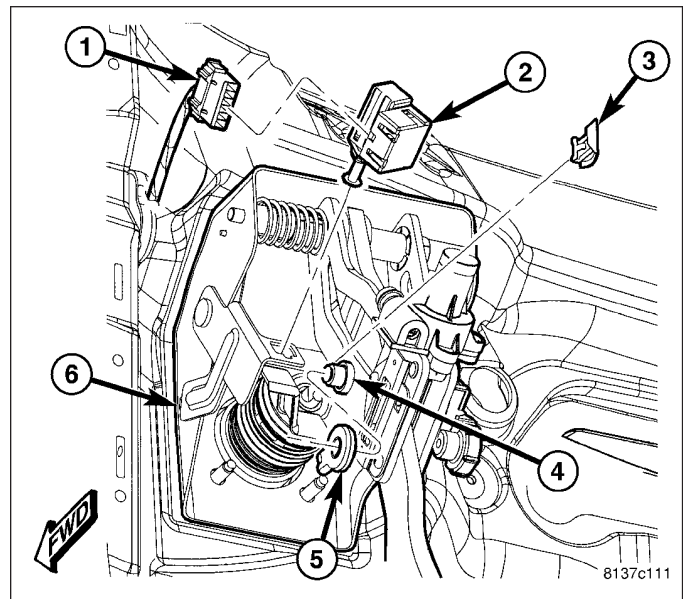
- Position small screwdriver between center tang on power brake booster brake pedal pin retaining clip (3).
- Rotate screwdriver enough to allow retaining clip center tang to pass over end of brake pedal pin, then slide retaining clip off brake pedal pin.
- Discard retaining clip (3). It is not to be reused. Install NEW retaining clip when assembling.**

9. Slide booster push rod (5) off brake pedal pin (4).

10. Remove four power brake booster mounting nuts (4).

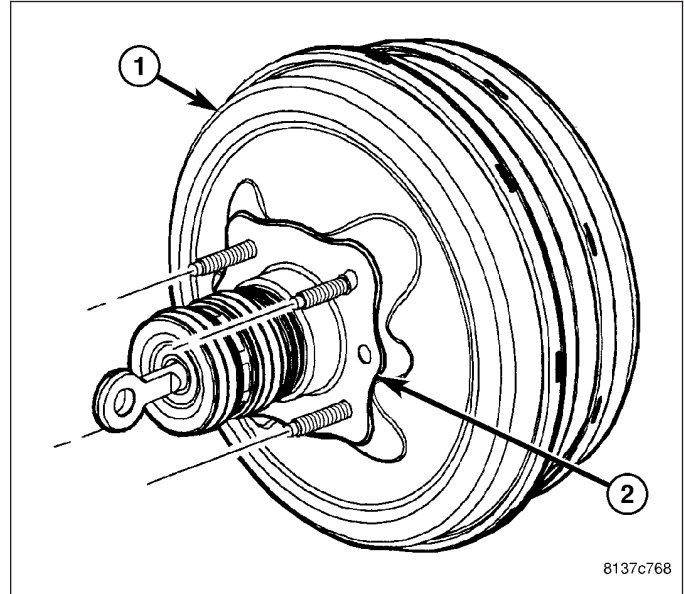
11. Remove windshield wiper module. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - REMOVAL)

12. Slide power brake booster forward out of dash panel and remove through opening between cross-brace and windshield.

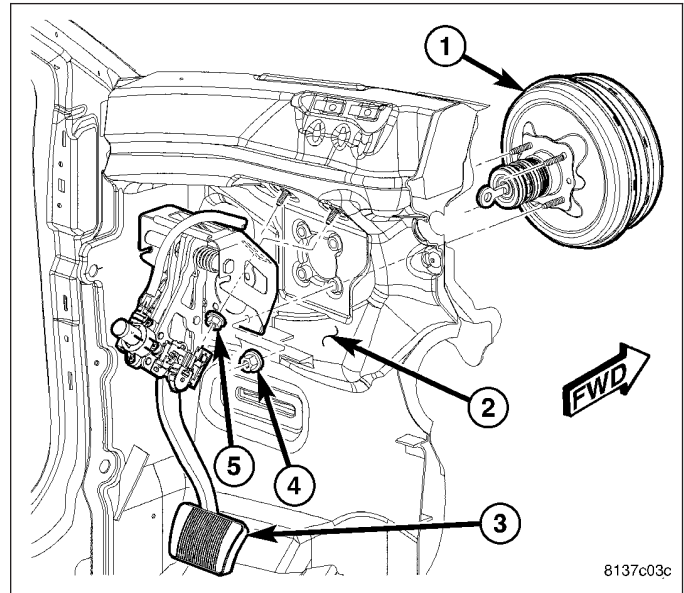


## INSTALLATION

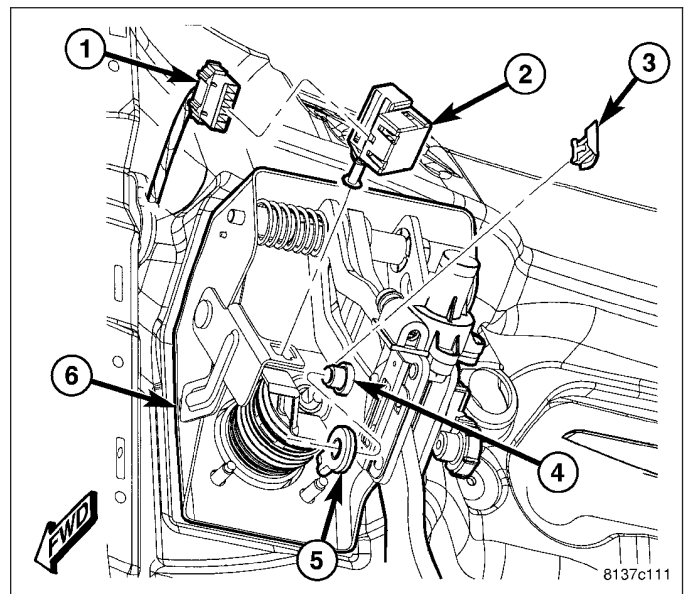
**Note:** Before installing booster, make sure there is a **NEW** booster seal (2) placed over push rod and mounting studs on rear of booster (1).



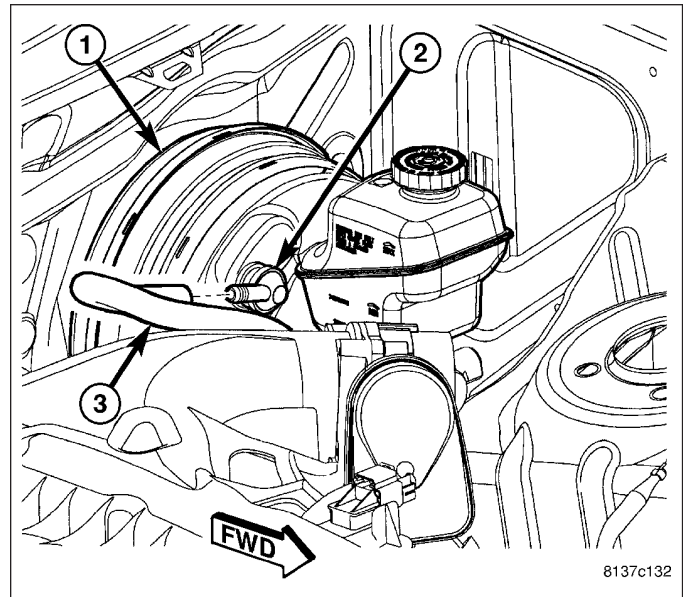
1. Install power brake booster through opening between cross-brace and windshield. Guide booster (1) push rod and mounting studs through dash panel (2).
2. Install four power brake booster mounting nuts (4). Tighten nuts to 25 N·m (19 ft. lbs.) torque.



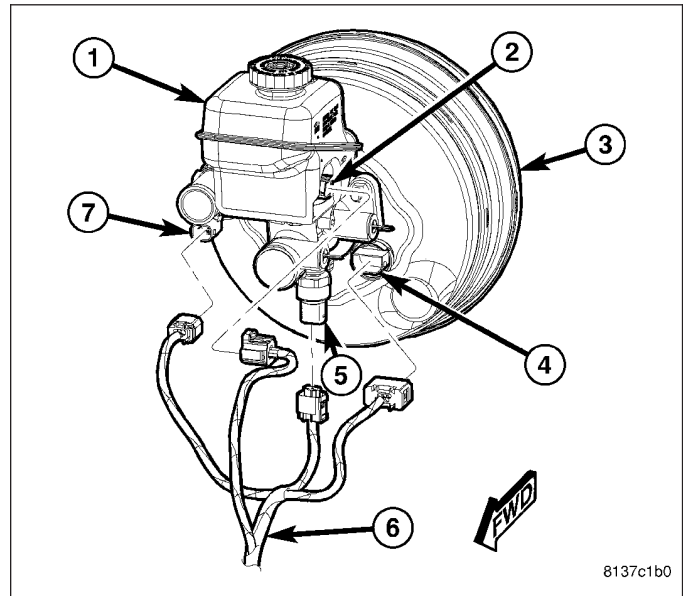
3. Slide booster push rod (5) onto brake pedal pin (4). Install NEW retaining clip (3) securing push rod to brake pedal.
4. Install and adjust NEW brake lamp switch (2). (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - INSTALLATION)



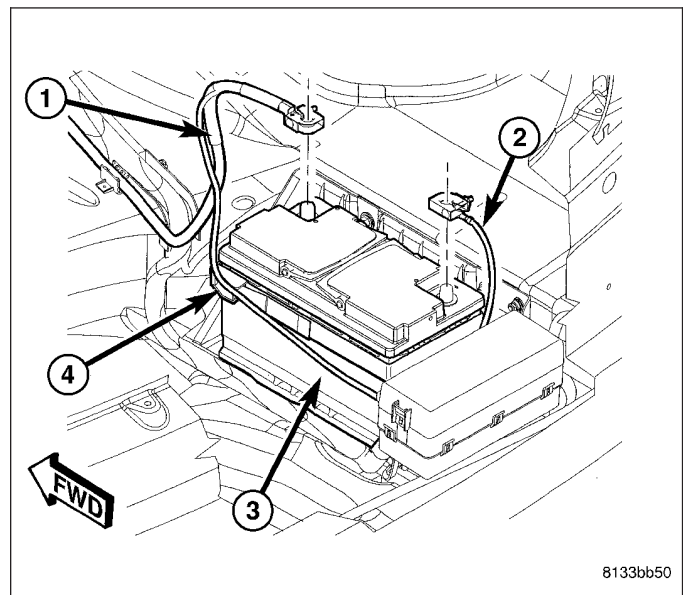
5. Connect vacuum hose (3) to check valve (2) on face of booster (1). **Do not remove check valve from booster.**



6. If equipped with Electronic Stability Program (ESP), connect wiring harness (6) connector at pedal travel sensor (7) on power brake booster (3).
7. If equipped with ESP, connect wiring harness (6) connector at active brake booster solenoid (4).
8. Install master cylinder (1). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - INSTALLATION)
9. Install windshield wiper module and components removed to access. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - INSTALLATION)



10. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)
11. Road test vehicle to ensure proper operation of brakes.



## VALVE - PROPORTIONING

### DESCRIPTION

Two proportioning valves are used on each vehicle without antilock brakes. One valve is used for each rear brake hydraulic circuit. The proportioning valves that are located in the junction block (Refer to 5 - BRAKES - BASE/HYDRAULIC/MECHANICAL/JUNCTION BLOCK - DESCRIPTION). The valves are not serviceable and must be replaced as part of the junction block.

### OPERATION

Proportioning valves balance front to rear braking by controlling (at a given ratio) brake hydraulic pressure to the rear brakes above a preset level (split point). On light pedal applications equal brake pressure is transmitted to both the front and rear brakes. On heavier pedal applications, through the use of proportioning valves, the pressure transmitted to the rear will be lower than the front brakes. This prevents premature rear wheel skid.

## ROTOR

### DIAGNOSIS AND TESTING

#### BRAKE ROTOR

Any servicing of the rotor requires extreme care to maintain the rotor within service tolerances to ensure proper brake action.

Excessive runout or wobble in a rotor can increase pedal travel due to piston knock-back. This increases guide pin sleeve wear due to the tendency of the caliper to follow the rotor wobble.

When diagnosing a brake noise or pulsation, the machined disc braking surface should be inspected.

#### BRAKING SURFACE INSPECTION

Light braking surface scoring and wear is acceptable. If heavy scoring or warping is evident, the rotor must be refaced or replaced. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - STANDARD PROCEDURE).

Excessive wear and scoring of the rotor can cause improper lining contact on the rotor's braking surface. If the ridges on the rotor are not removed before new brake shoes are installed, improper wear of the shoes will result.

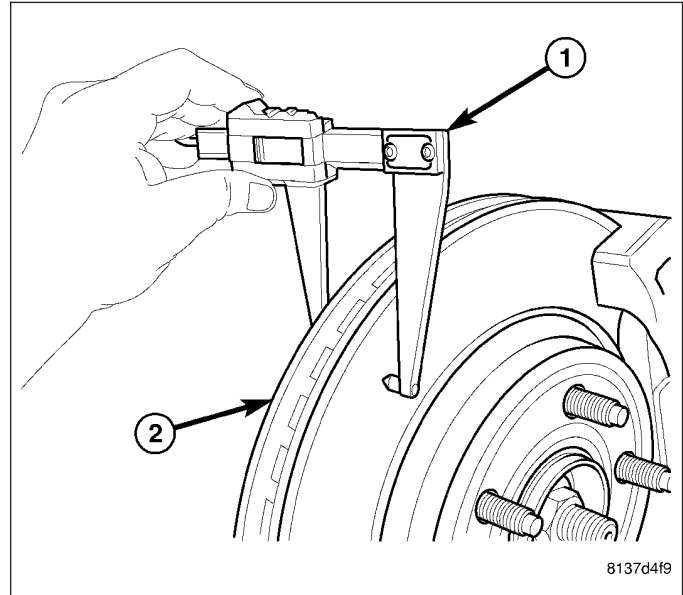
If a vehicle has not been driven for a period of time, the rotor's braking surface will rust in the areas not covered by the brake shoes at that time. Once the vehicle is driven, noise and chatter from the disc brakes can result when the brakes are applied.

Some discoloration or wear of the rotor surface is normal and does not require resurfacing when linings are replaced. If cracks or burned spots are evident, the rotor must be replaced.

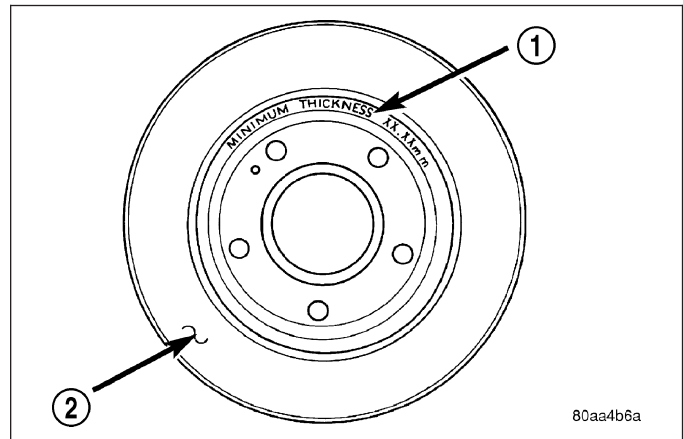
## ROTOR MINIMUM THICKNESS

Measure rotor thickness (1) at the center of the brake shoe contact surface. Replace the rotor if it is worn below minimum thickness or if machining the rotor will cause its thickness to fall below specifications.

**CAUTION:** Do not machine the rotor if it will cause the rotor to fall below minimum thickness.



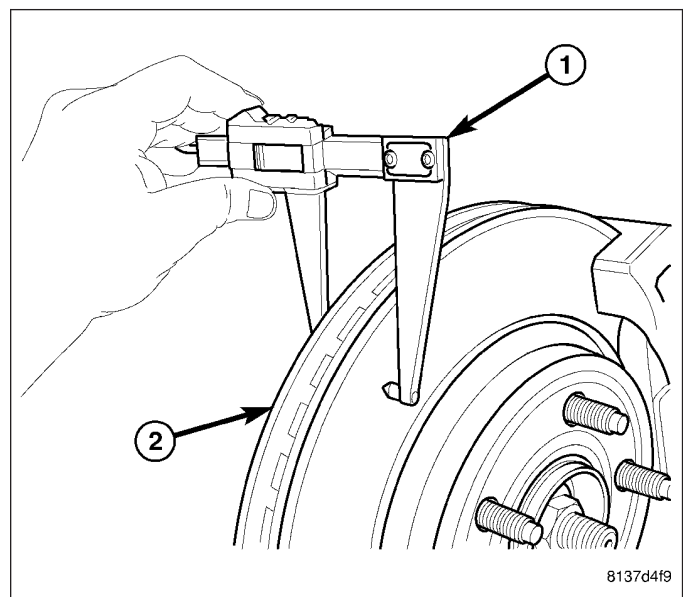
Minimum thickness specifications (1) are cast on the rotor's unmachined surface (2). Limits can also be found in this component's specification table. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)



## ROTOR THICKNESS VARIATION

Thickness variation in a rotor's braking surface can result in pedal pulsation, chatter and surge. This can also be caused by excessive runout in the rotor or the hub.

Rotor thickness variation measurements should be made in conjunction with measuring runout. Measure thickness of the brake rotor (2) at 12 equal points around the rotor braking surface with a micrometer (1) at a radius approximately 25 mm (1 inch) from edge of rotor. If thickness measurements vary beyond the specification listed in the specification table (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS), the rotor should be refaced or replaced. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - STANDARD PROCEDURE).



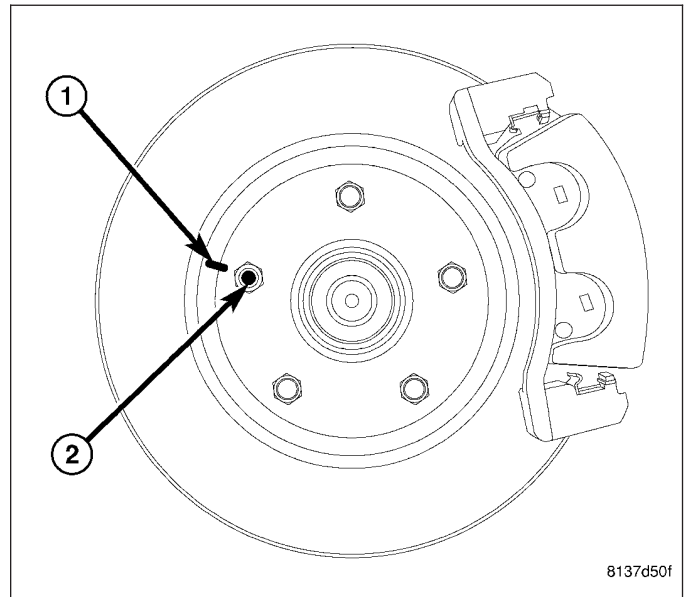
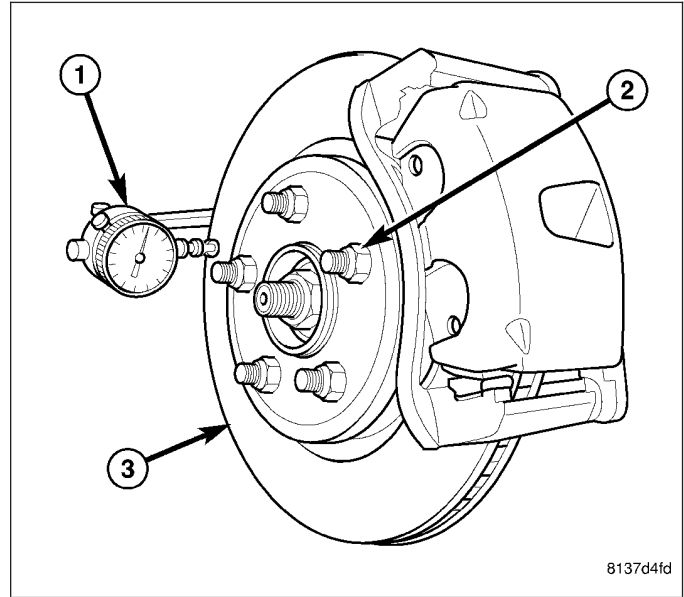
## ROTOR RUNOUT

On-vehicle rotor runout is the combination of the individual runout of the hub face and the runout of the brake rotor (hub runout can be measured separately). To measure rotor runout on the vehicle:

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove tire and wheel assembly. (Refer to 22 - TIRES/WHEELS - REMOVAL)
3. Install standard wheel mounting nuts, flat side to rotor, on all studs (2). Progressively tighten nuts to 150 N·m (110 ft. lbs.) torque.
4. Mount Dial Indicator (1), Special Tool C-3339A, with Wheel, Special Tool 25w, or equivalent, to knuckle. Position Dial Indicator Wheel to contact rotor braking surface approximately ten millimeters from outer edge of rotor (3).
5. Slowly rotate brake rotor checking lateral runout, marking the low and high spots. Record these measurements.
6. Check and record runout of opposite side of rotor in same fashion, marking the low and high spots.
7. Compare runout measurement to specifications. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)

If runout is in excess of specifications, check the lateral runout of the hub face. Before removing the rotor from the hub, place a chalk mark across both the rotor (1) and the one wheel stud (2) closest to where the high runout measurement was taken. This way, the original mounting spot of the rotor on the hub is indexed.

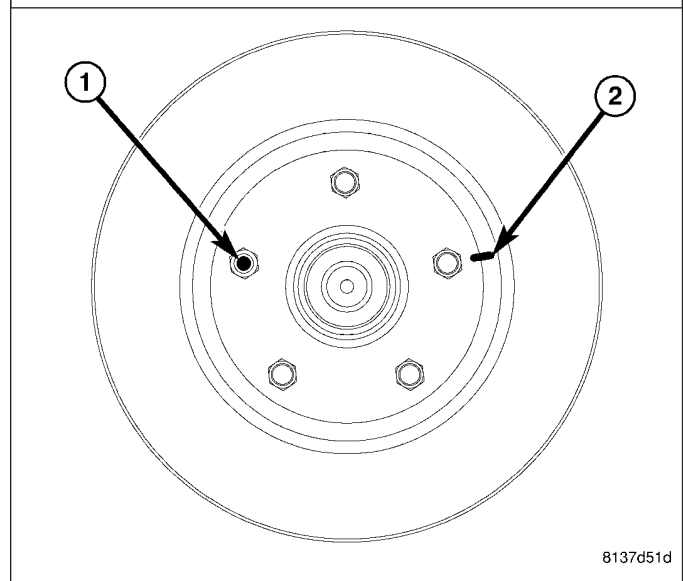
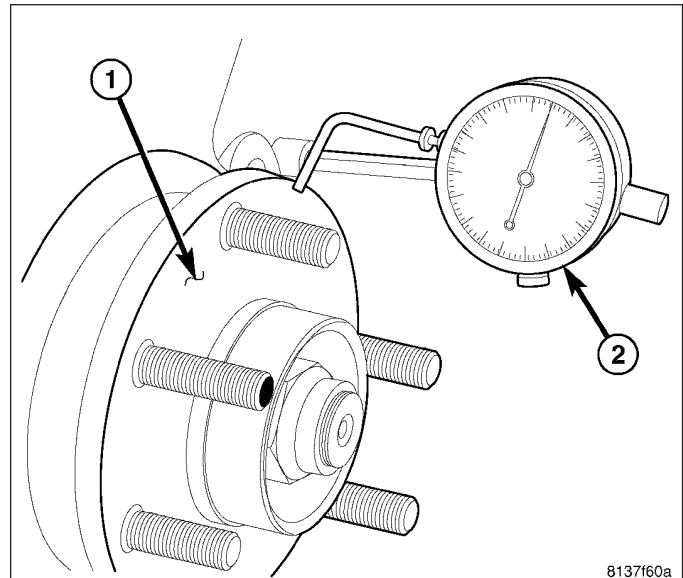
8. Remove the rotor from the hub. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL)



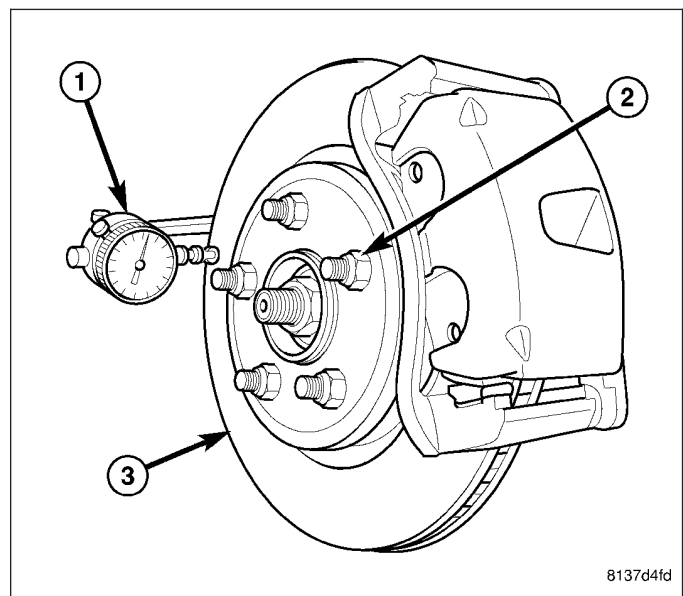


**Note:** Before measuring hub runout, clean the hub face surface with an appropriate cleaner. This provides a clean surface to get an accurate indicator reading.

9. Mount Dial Indicator (2), Special Tool C-3339A, to the knuckle. Position Dial Indicator stem so it contacts hub face (1) near outer diameter. Care must be taken to position stem outside of stud circle, but inside of chamfer on the hub rim.
10. Slowly rotate hub measuring runout. Hub runout should not exceed 0.01 mm (0.0004 inch). If runout exceeds this specification, the hub must be replaced. (Refer to 2 - SUSPENSION/Front/HUB / BEARING - REMOVAL)(Refer to 2 - SUSPENSION/REAR/HUB / BEARING - REMOVAL)
11. If hub runout does not exceed this specification, install original rotor back on hub, aligning chalk mark on rotor (2) with a wheel mounting stud, two studs apart from original stud (1).



12. Install standard wheel mounting nuts, flat side to rotor, on all studs (2). Progressively tighten nuts to 150 N·m (110 ft. lbs.) torque.
13. Mount Dial Indicator (1) and remeasure runout on both sides of the brake rotor as explained in earlier steps to see if runout is now within specifications. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)
14. If runout is still not within specifications, reface or replace brake rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - STANDARD PROCEDURE)



## STANDARD PROCEDURE

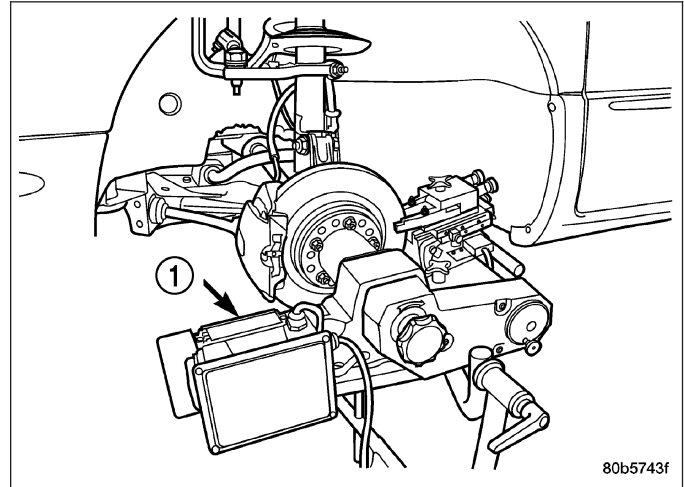
### BRAKE ROTOR MACHINING

**Note:** Refacing the rotor is not required each time the brake pads are replaced, only when the need is foreseen.

Any servicing of the rotor requires extreme care to maintain the rotor within service tolerances to ensure proper brake action.

If the rotor surface is deeply scored or warped, or there is a complaint of brake roughness or brake pedal pulsation, the rotor should be refaced using a hub-mounted on-car brake lathe (1), or replaced.

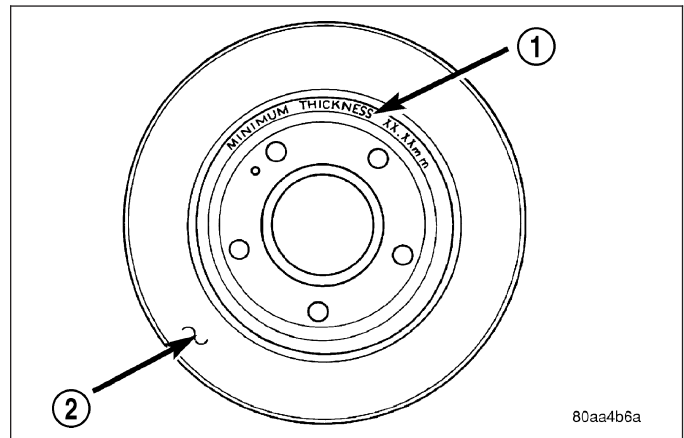
The use of a hub-mounted on-car brake lathe (1) is highly recommended to eliminate the possibility of excessive runout. It trues the brake rotor to the vehicle's hub and bearing.



**Note:** All brake rotors (2) have markings for minimum allowable thickness cast on an unmachined surface of the rotor (1) or stamped into the hat section. Minimum thickness specifications can also be found in this component's specification table. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)

Minimum allowable thickness is the minimum thickness which the brake rotor machined surface may be cut to.

**CAUTION:** Do not machine the rotor if it will cause the rotor to fall below minimum thickness.



Before lathe installation, verify the brake rotor face and the hub adapters are free of any chips, rust, or contamination.

When mounting and using the brake lathe, strict attention to the brake lathe manufacturer's operating instructions is required.

Machine both sides of the brake rotor at the same time. Cutting both sides at the same time minimizes the possibility of a tapered or uneven cut.

When refacing a rotor, the required TIR (Total Indicator Reading) and thickness variation limits **MUST BE MAINTAINED**. Extreme care in the operation of rotor turning equipment is required. Specifications for brake rotor machining can be found in this section's specification table. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - SPECIFICATIONS)

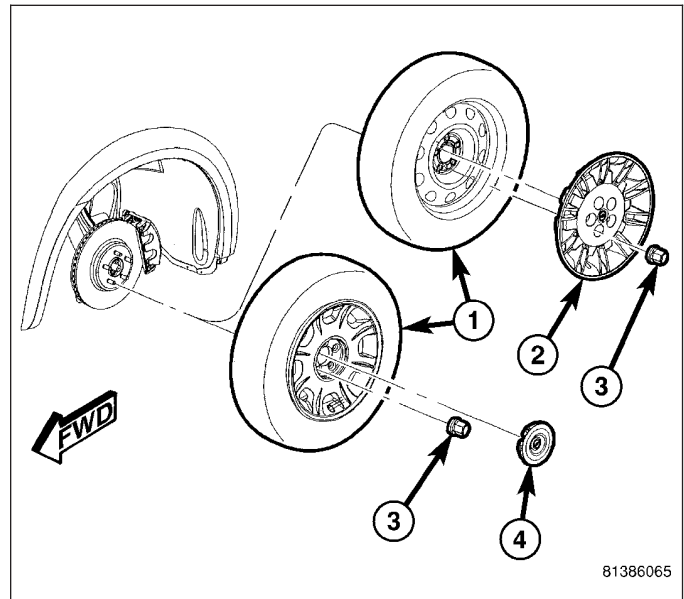


## REMOVAL

### FRONT

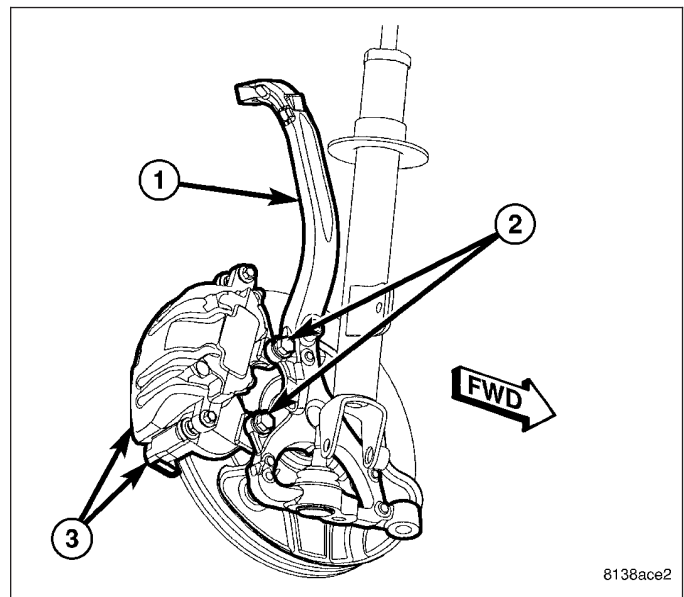
**Note:** Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove wheel mounting nuts(3), then tire and wheel assembly (1).

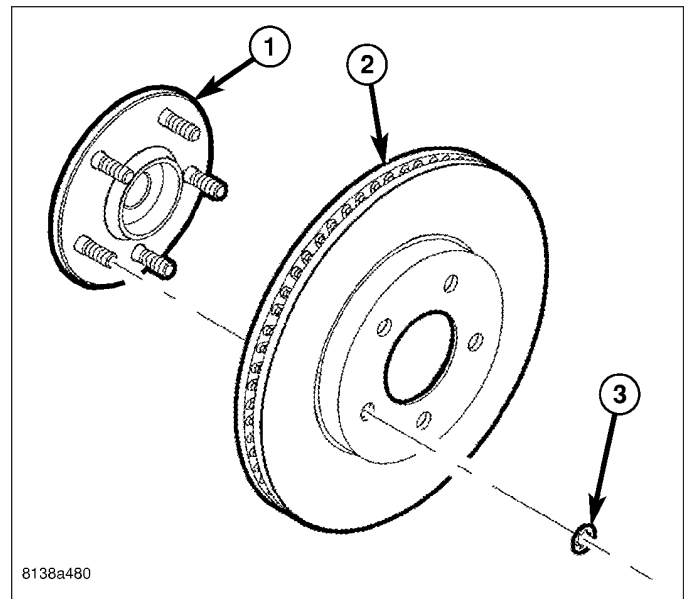


**Note:** In some cases, it may be necessary to retract caliper piston in its bore a small amount in order to provide sufficient clearance between shoes and rotor to easily remove caliper from knuckle. This can usually be accomplished before mounting bolts are removed, by grasping rear of caliper and pulling outward working with guide pins, thus retracting piston. Never push on piston directly as it may get damaged.

3. Remove two bolts (2) securing disc brake caliper adapter (3) to knuckle (1).
4. Remove disc brake caliper and adapter (3) from knuckle as an assembly. Hang assembly out of way using wire or a bungee cord. Use care not to overextend brake hose when doing this.



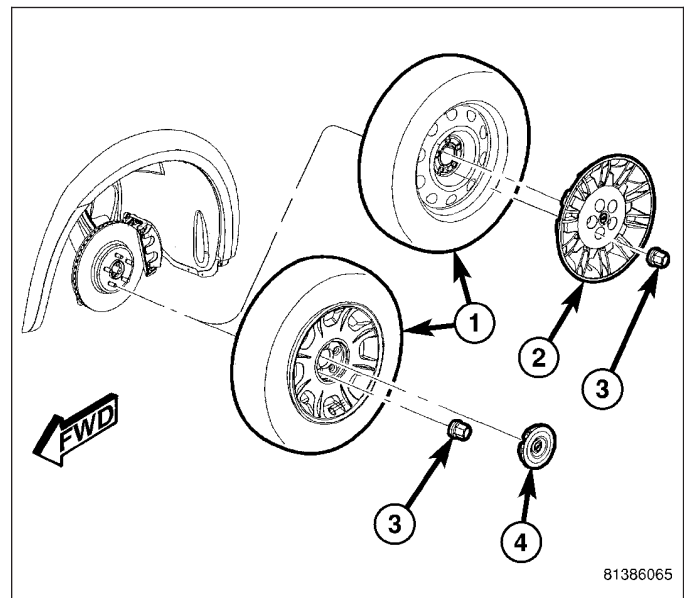
5. Remove any clips (3) retaining brake rotor (2) to wheel studs.
6. Slide brake rotor (2) off hub and bearing (1).



## REAR

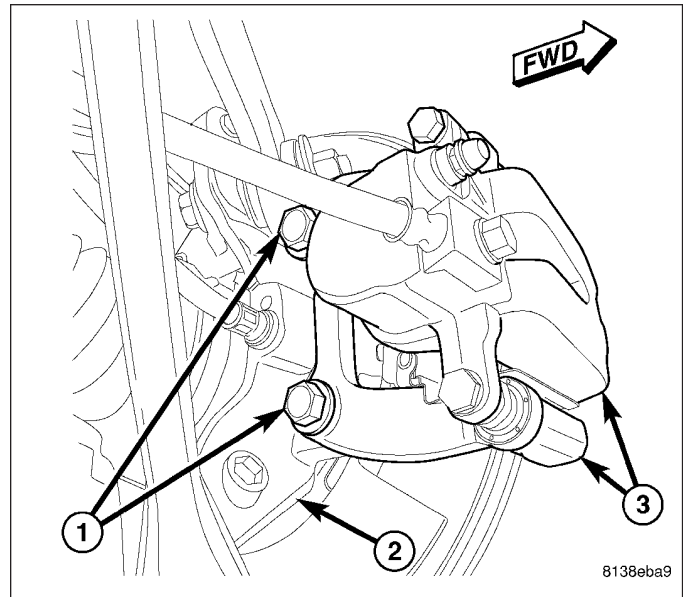
**Note:** Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove wheel mounting nuts (3), then tire and wheel assembly (1).

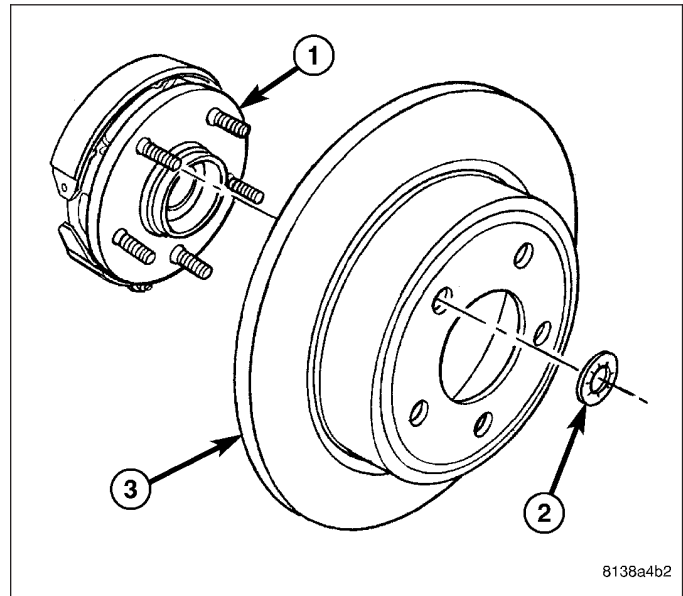


**Note:** In some cases, it may be necessary to retract caliper piston in its bore a small amount in order to provide sufficient clearance between shoes and rotor to easily remove caliper from knuckle. This can usually be accomplished before guide pin bolts are removed, by grasping rear of caliper and pulling outward working with guide pins, thus retracting piston. Never push on piston directly as it may get damaged.

3. Remove two bolts (1) securing disc brake caliper adapter (3) to knuckle (2).
4. Remove disc brake caliper and adapter (3) from knuckle as an assembly. Hang assembly out of way using wire or a bungee cord. Use care not to overextend brake hose when doing this.



5. Remove any clips (2) retaining brake rotor (3) to wheel mounting studs.
6. Slide brake rotor (3) off hub and bearing (1).

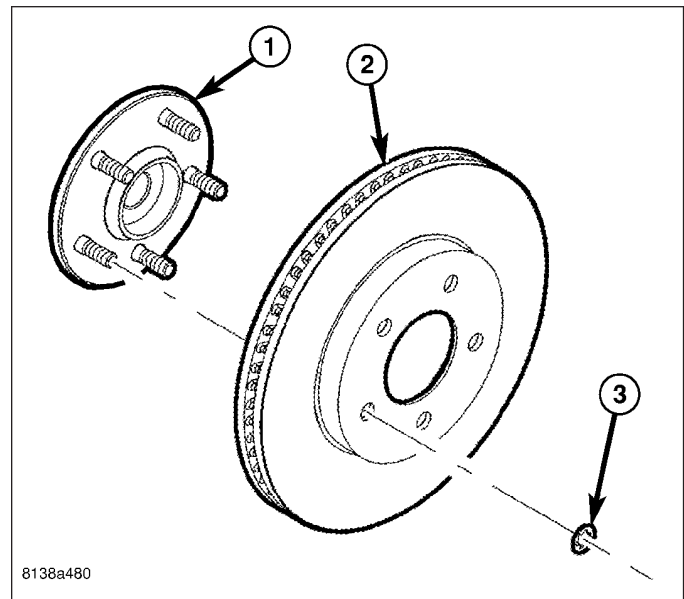


## INSTALLATION

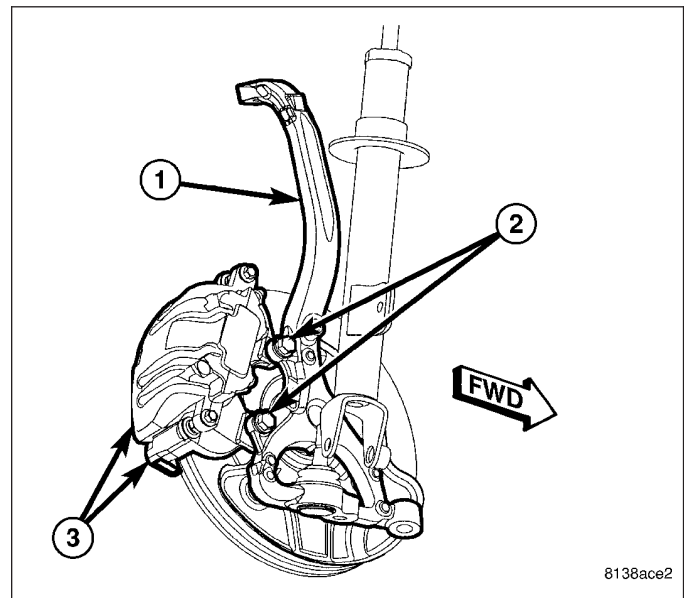
### FRONT

**Note:** Inspect brake shoes (pads) before installation. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ BRAKE PADS/SHOES - INSPECTION)

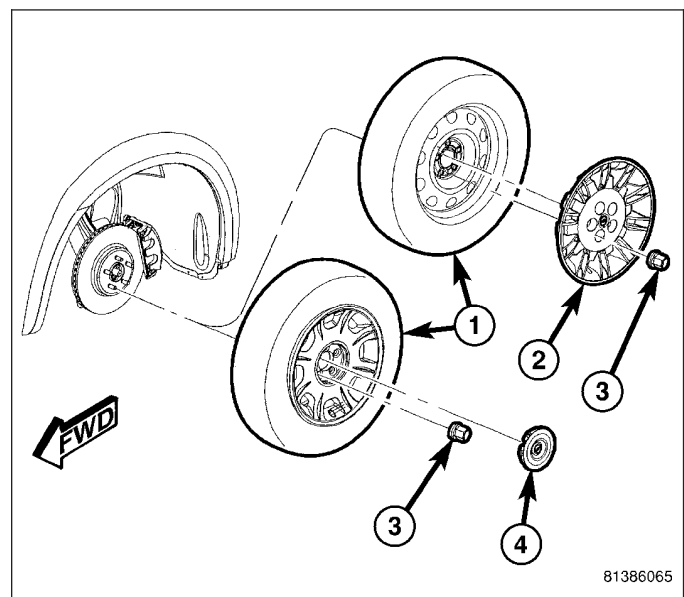
1. Clean hub face (1) to remove any dirt or corrosion where rotor mounts.
2. Install brake rotor (2) over studs on hub and bearing.



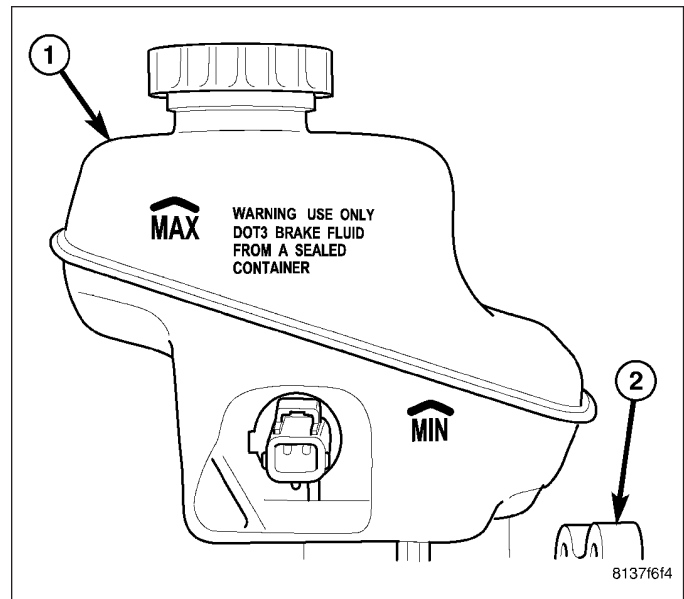
3. Install disc brake caliper and adapter assembly (3) over brake rotor.
4. Install mounting bolts (2) securing caliper adapter (3) to knuckle (1). Tighten bolts to 169 N·m (125 ft. lbs.) torque.



5. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque.
6. Lower vehicle.
7. Pump brake pedal several times to ensure vehicle has a firm brake pedal before moving vehicle.



8. Check and adjust brake fluid level in reservoir (1) as necessary.

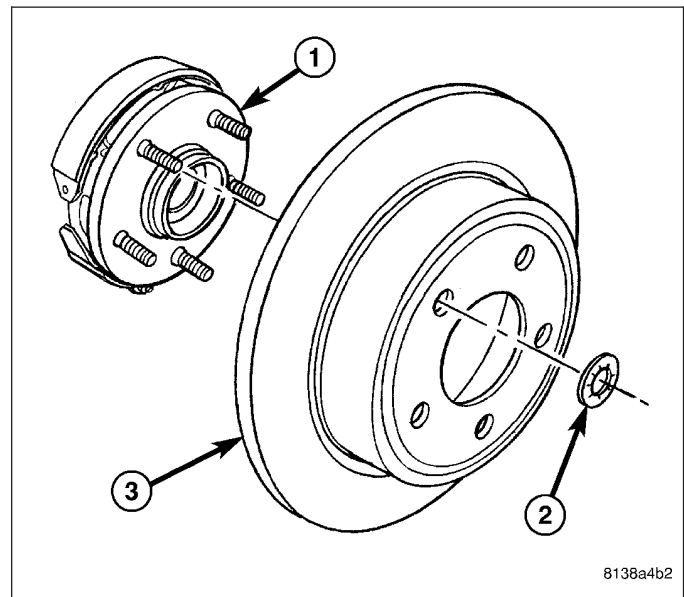


9. Road test vehicle and make several stops to wear off any foreign material on brakes and to seat brake shoes.

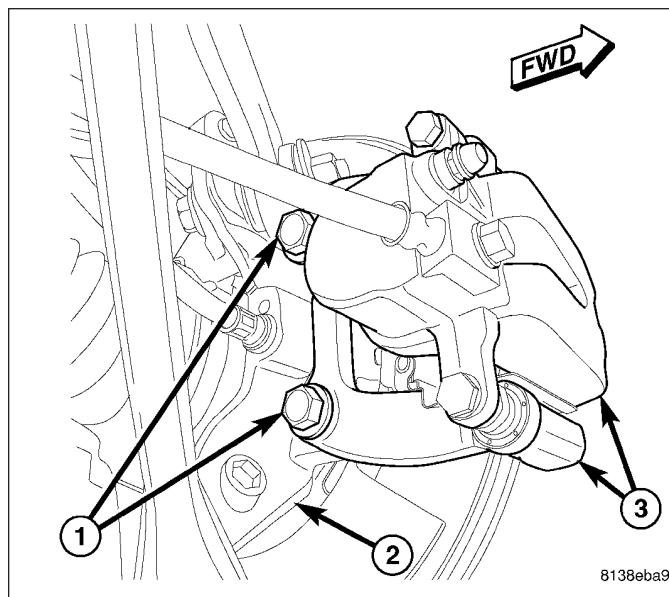
## REAR

**Note: Inspect disc brake shoes and parking brake shoes before installation. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSPECTION)**

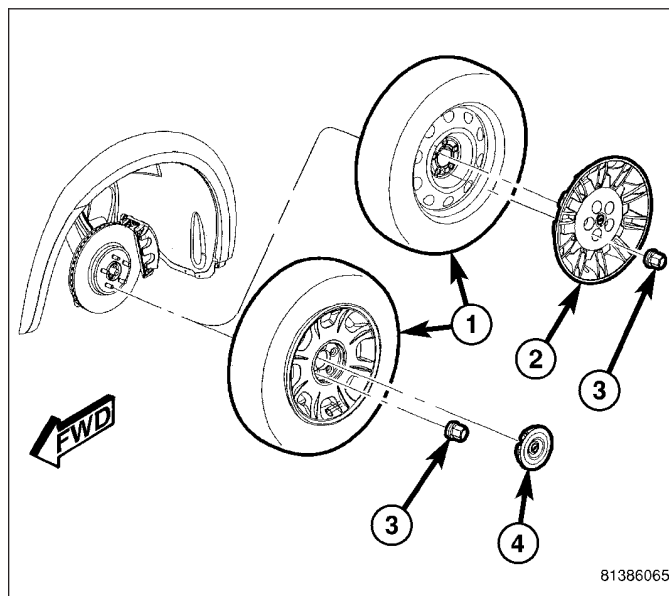
1. Clean hub face to remove any dirt or corrosion where brake rotor mounts (1).
2. Install brake rotor (3) over wheel mounting studs and onto hub (1).



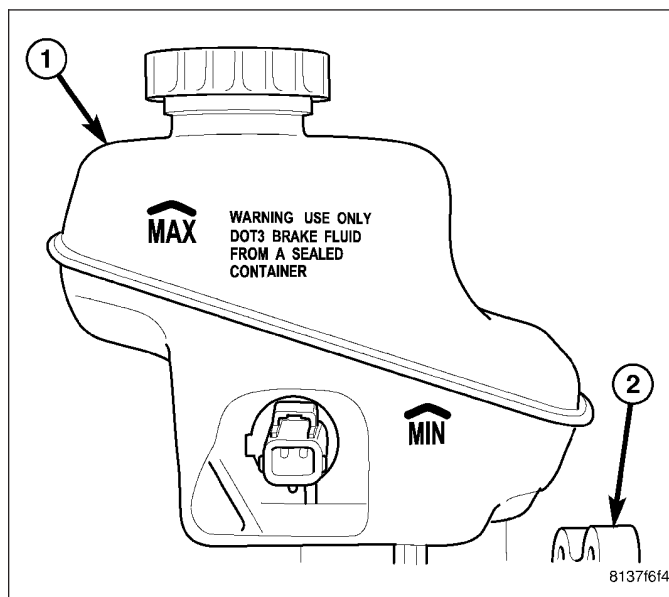
3. Install disc brake caliper and adapter assembly (3) over brake rotor.
4. Install mounting bolts (1) securing caliper adapter (3) to knuckle (2). Tighten bolts to 169 N·m (125 ft. lbs.) torque.



5. Install tire and wheel assembly (1) (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque.
6. Lower vehicle.
7. Pump brake pedal several times to ensure vehicle has a firm brake pedal before moving vehicle.



8. Check and adjust brake fluid level in reservoir (1) as necessary.
9. Road test vehicle and make several stops to wear off any foreign material on brakes and to seat brake shoes.



## SPECIFICATIONS

### BRAKE ROTOR

**Note:** When refacing a rotor, the required TIR (Total Indicator Reading) and thickness variation limits **MUST BE MAINTAINED**. Extreme care in the operation of rotor turning (machining) equipment is required.

#### LIMITS/SPECIFICATIONS - 17 INCH BRAKES (BASE)

Brake Rotor	Rotor Thickness	Minimum Rotor Thickness	Rotor Thickness Variation	Rotor Runout *
Front	27.87-28.13 mm 1.097-1.107 in.	26.5 mm 1.040 in.	0.010 mm 0.0004 in.	0.035 mm 0.0014 in.
Rear	9.87-10.13 mm 0.389-0.399 in.	8.5 mm 0.335 in.	0.010 mm 0.0004 in.	0.035 mm 0.0014 in.
* TIR Total Indicator Reading (Measured On Vehicle)				

#### LIMITS/SPECIFICATIONS - 18 INCH BRAKES (PREMIUM)

Brake Rotor	Rotor Thickness	Minimum Rotor Thickness	Rotor Thickness Variation	Rotor Runout *
Front	27.87-28.13 mm 1.097-1.107 in.	26.5 mm 1.040 in.	0.010 mm 0.0004 in.	0.035 mm 0.0014 in.
Rear	21.87-22.13 mm 0.861-0.871 in.	20.5 mm 0.807 in.	0.010 mm 0.0004 in.	0.035 mm 0.0014 in.
* TIR Total Indicator Reading (Measured On Vehicle)				

## TUBES/HOSES

### DESCRIPTION

The brake tubes are steel with a corrosion-resistant nylon coating applied to the external surfaces.

The flex hoses used at each wheel brake are made of reinforced rubber with fittings at each end. The fitting at each brake caliper is the banjo-type and requires a special banjo bolt and copper washers.

### INSPECTION

Brake tubing should be inspected periodically for evidence of physical damage or contact with moving or hot components.

Flexible rubber hose is used at both the front and rear wheel brakes. Inspection of the flexible brake hoses should be performed whenever the brake system is serviced and every 7,500 miles or 12 months, whichever comes first. Inspect hydraulic brake hoses for surface cracking, scuffing, or worn spots. If the fabric casing of the hose becomes exposed due to cracks or abrasions in the hose cover, the hose should be replaced immediately. Eventual deterioration of the hose can take place with possible burst failure. Faulty installation can cause twisting, resulting in wheel, tire, or chassis interference.

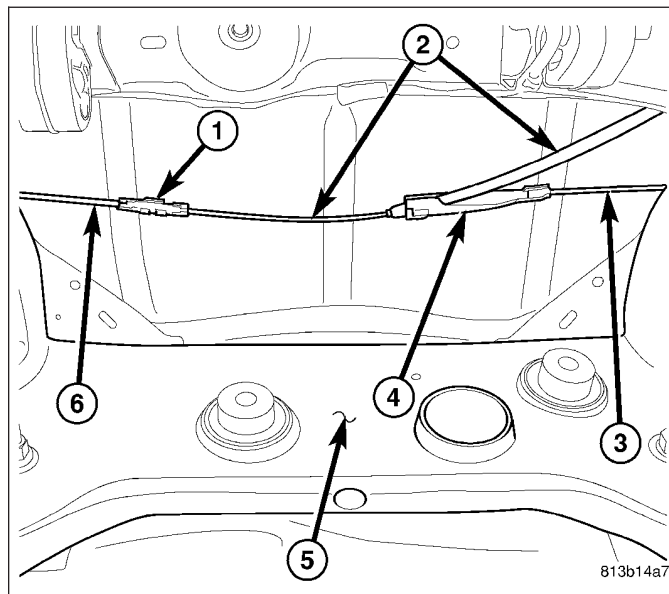
## CABLE - PARKING BRAKE FRONT REMOVAL

**Note:** Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

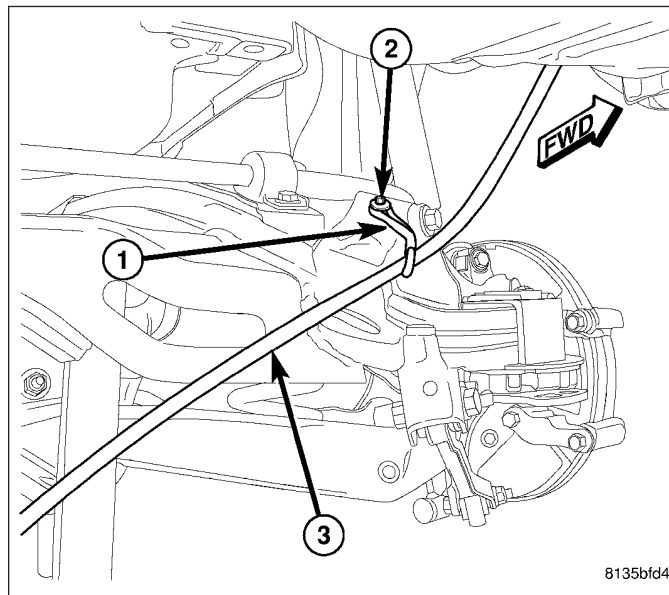
1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

**Note:** Due to short travel and low spring tension, it is not necessary to lock-out parking brake lever to service parking brake components.

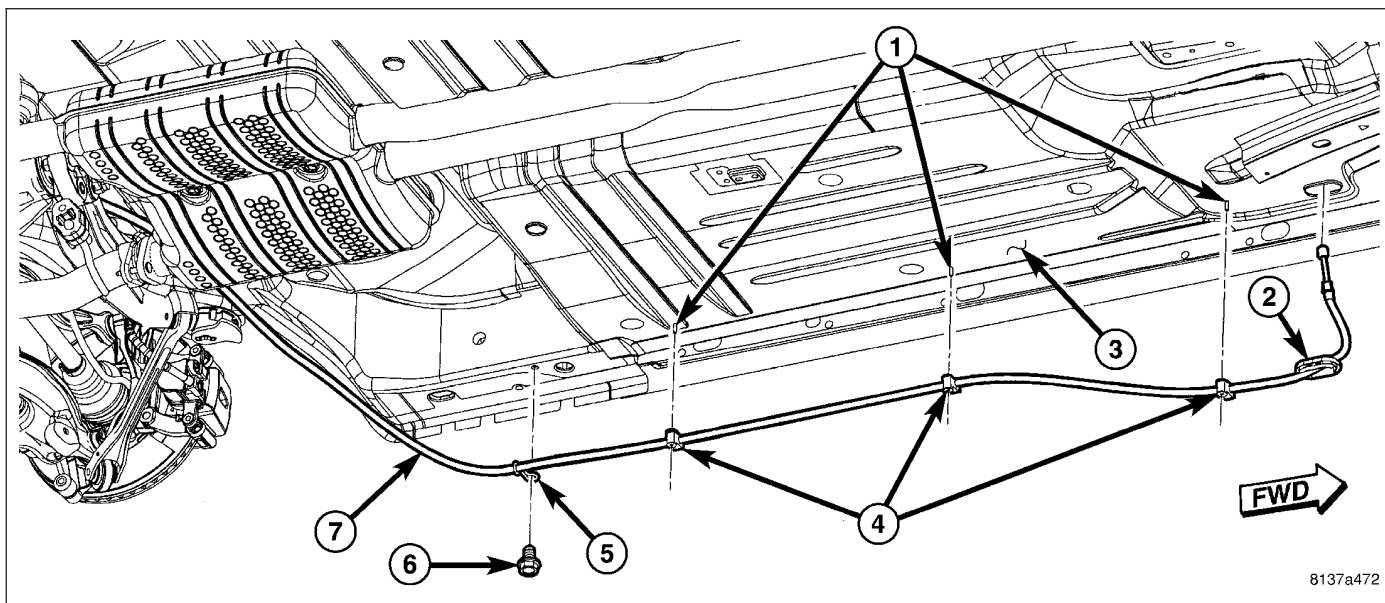
2. Disconnect front parking brake cable (2) at connector (1) to right rear parking brake cable.
3. Remove front cable from equalizer (4).



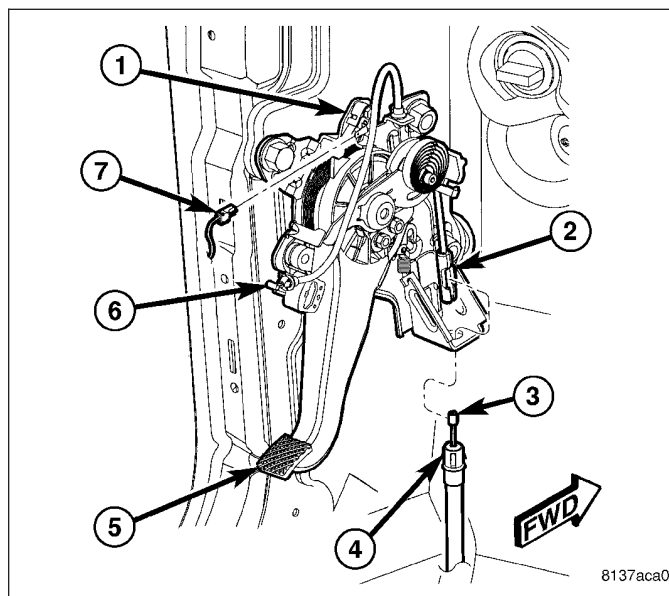
4. Remove screw (2) fastening cable routing bracket (1) to rear crossmember.



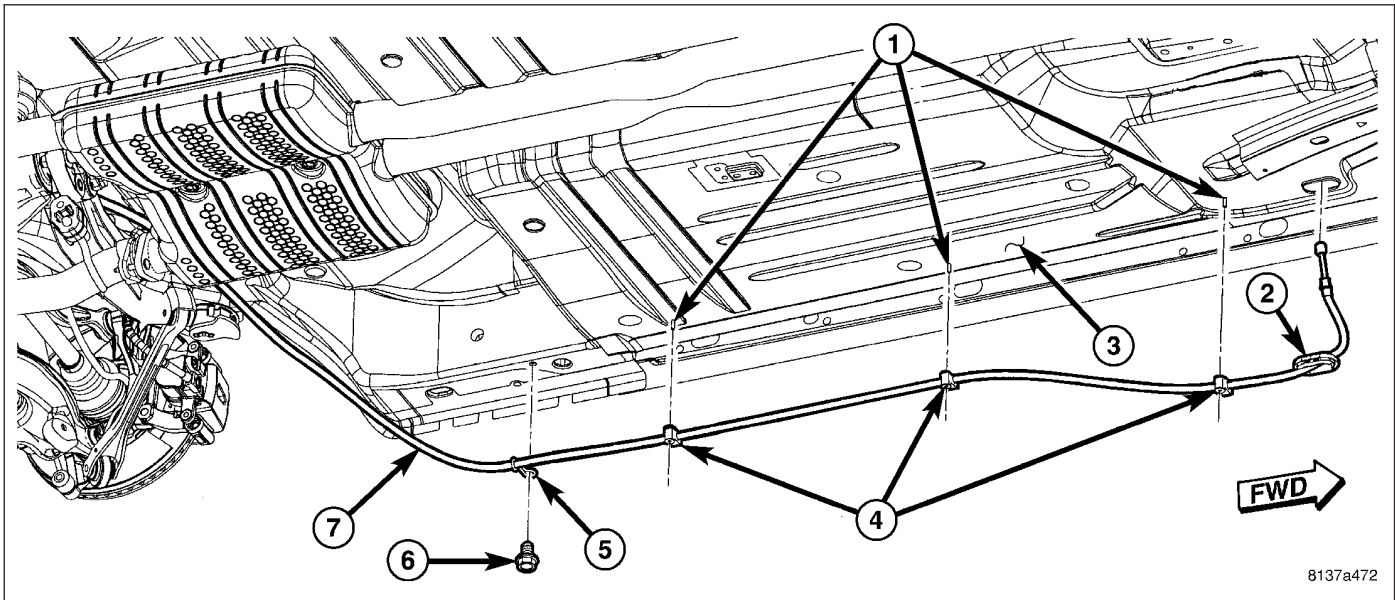
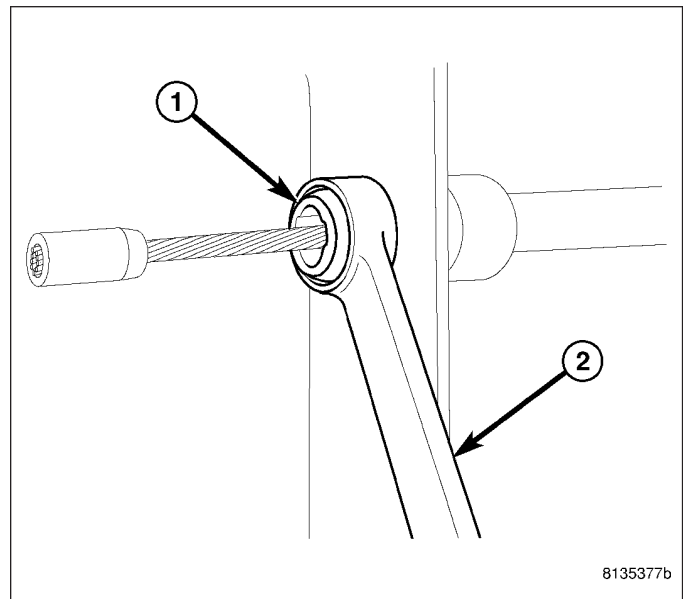




5. Remove screw (6) and routing clip (4) nuts fastening cable (7) to underside of body (3).
6. Lower vehicle.
7. Remove driver door opening sill scuff plate and cowl side trim.
8. Remove clip and roll back carpet away from front cable.
9. Disconnect front parking brake cable strand (3) at lever connector (2).

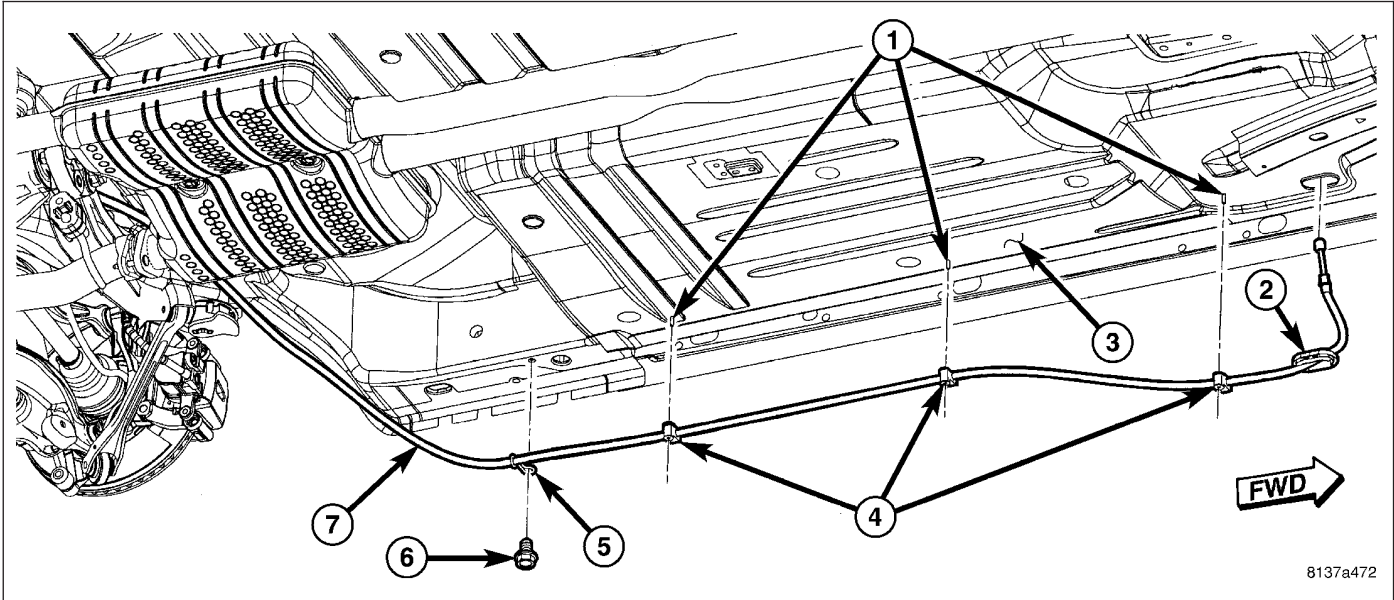


10. Place 13 mm 12-point box wrench (2) over cable retainer (1) at lever bracket as shown to collapse retainer fingers. Pull cable from bracket.

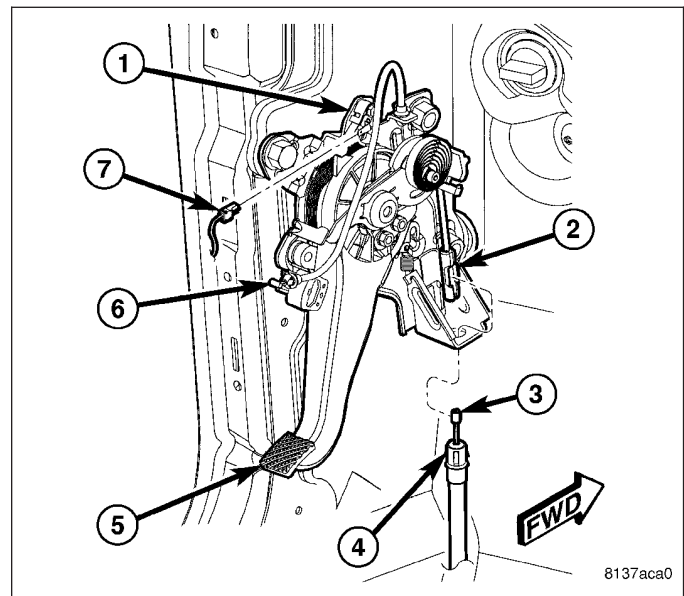


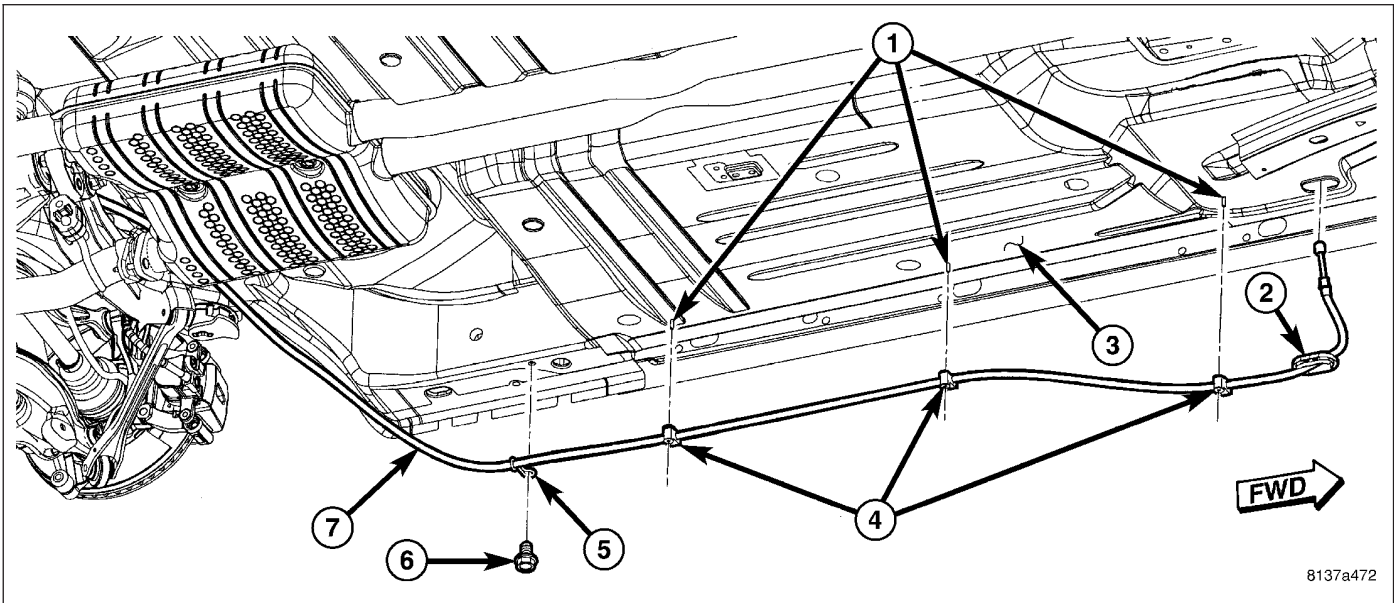
11. Remove parking brake cable grommet (2) from floor pan (3).  
12. Remove parking brake cable (7) through hole in floor pan.

## INSTALLATION



1. Guide parking brake cable (7) down through hole in floor pan.
2. Install parking brake cable grommet (2) in hole of floor pan (3).
3. Guide cable end (3) up through lever bracket and press cable housing retainer (7) into bracket allowing retainer fingers to lock cable in place.
4. Connect front parking brake cable strand (3) at lever connector (2).
5. Lay carpet back into place and install retaining clip.
6. Install driver door opening sill scuff plate and cowl side trim.
7. Raise and support vehicle.





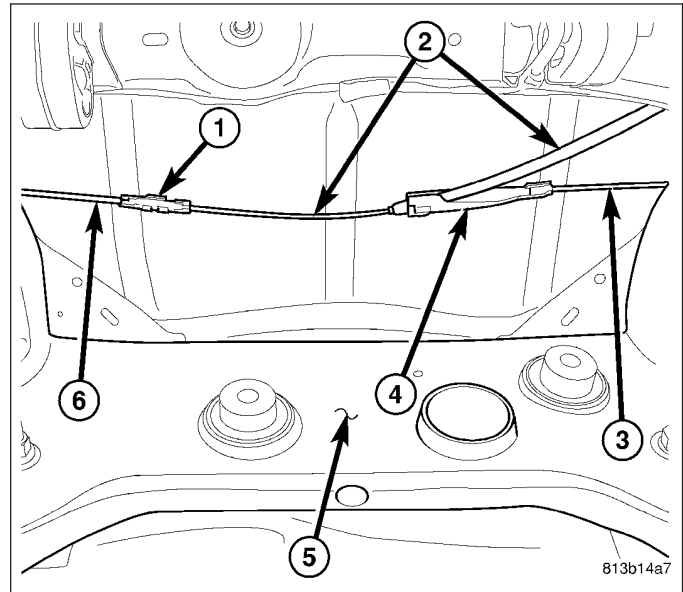
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8. Install screw (6) and routing clip (4) nuts fastening cable (7) to underside of body (3).

9. Route cable above rear crossmember, then slide cable (2) through equalizer (4) above rear differential.

**Note:** Due to short travel and low spring tension, it is not necessary to lock-out parking brake lever to service parking brake components.

10. Connect front parking brake cable (2) at connector (1) to right rear parking brake cable (6).



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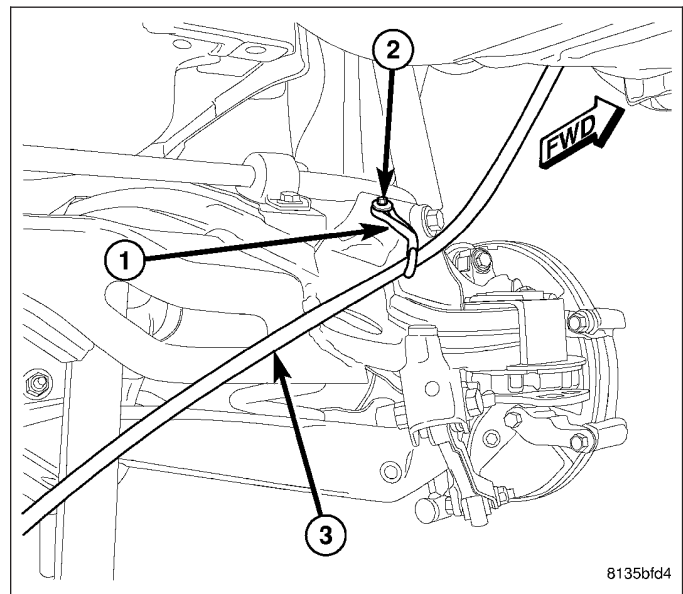
11. Install screw (2) fastening cable routing bracket (1) to rear crossmember.

12. Lower vehicle until rear wheels are just above floor level.

13. Apply parking brake lever. Release lever, then reapply.

14. Check to make sure rear wheels will not rotate with lever applied.

15. Lower vehicle.



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## CABLE - PARKING BRAKE REAR

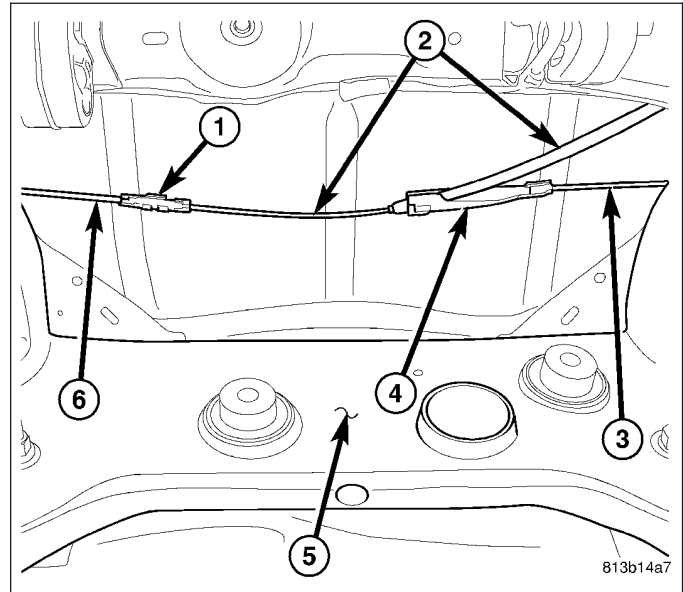
### REMOVAL

**Note:** Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

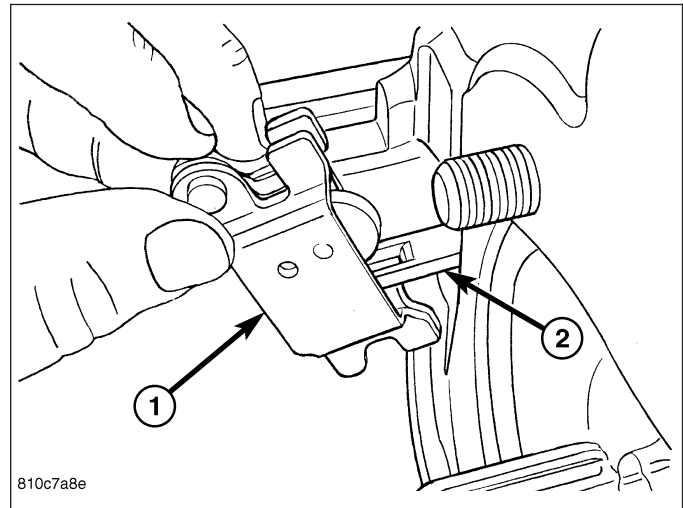
1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

**Note:** Due to short travel and low spring tension, it is not necessary to lock-out parking brake lever to service parking brake components.

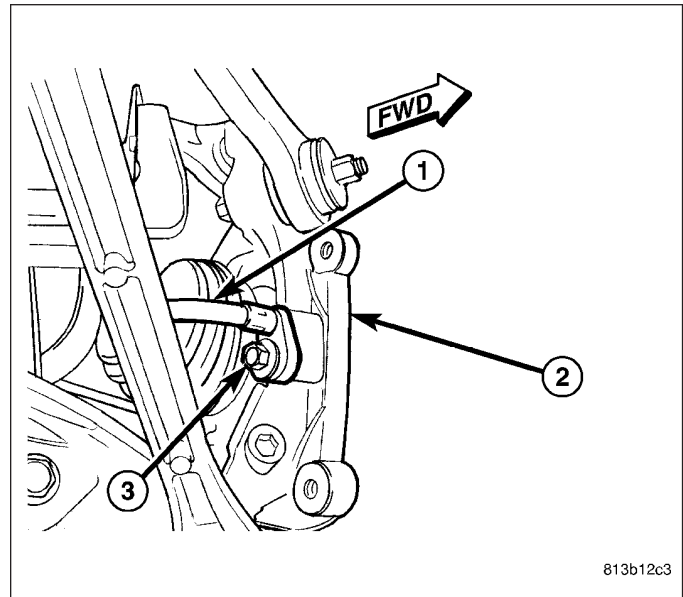
2. If removing left rear parking brake cable, disconnect cable (3) at equalizer (4) above rear cross-member (5).
3. If removing right rear parking brake cable, disconnect cable (6) at connector (1) above rear cross-member (5).
4. Remove parking brake shoes on side of cable service. (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - REMOVAL)



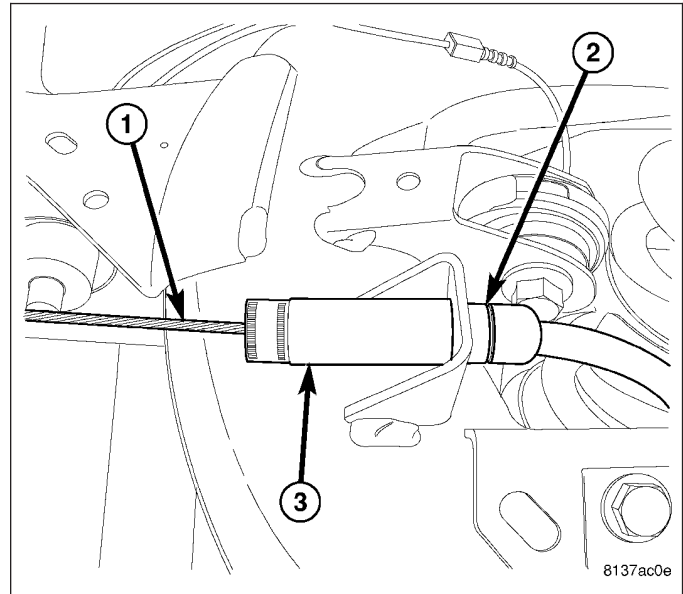
5. Remove shoe actuator lever (1) from end of cable (2) and support.



6. Remove screw (3) fastening cable (1) to knuckle (2). Remove cable from knuckle.



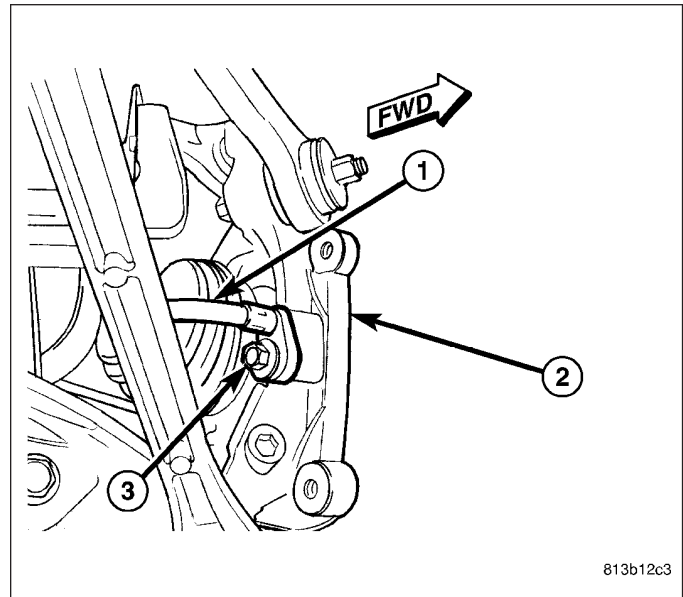
7. Place 14 mm 12-point deep well socket (3) over cable strand (1) onto cable retainer at crossmember bracket as shown to collapse retainer fingers. It may be necessary to wiggle the socket around somewhat to collapse fingers. With socket in place, pull cable (2) from bracket.
8. Remove cable.



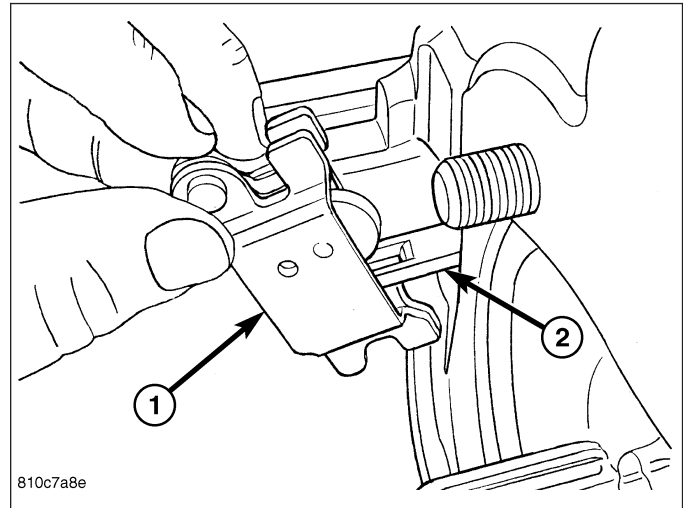
## INSTALLATION

1. Route Rear parking brake cable through rear suspension.
2. Guide cable end through crossmember bracket and press cable housing retainer into bracket allowing retainer fingers to lock cable in place.

3. Insert opposite end of cable (1) through rear knuckle (2) and install mounting screw (3). Tighten screw to 8 N·m (71 in. lbs.) torque.

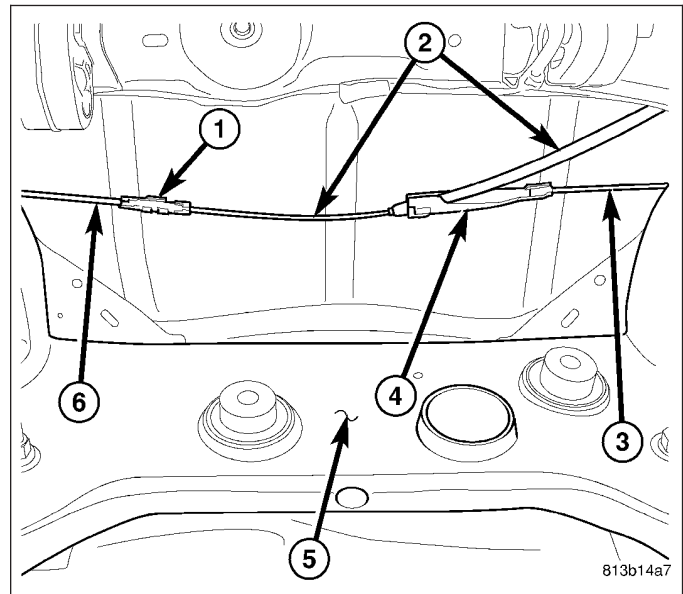


4. Install shoe actuator lever (1) on end of parking brake cable (2). Make sure actuator lever is positioned with word "UP" facing outward.
5. Install parking brake shoes as well as all components necessary to access them. (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - INSTALLATION)



**Note:** Due to short travel and low spring tension, it is not necessary to lock out parking brake lever to service parking brake components.

6. If installing left rear parking brake cable, connect cable (3) at equalizer (4) above rear crossmember (5).
7. If installing right rear parking brake cable, connect cable (6) at connector (1) above rear crossmember (5).



8. Lower vehicle until rear wheels are just above floor level.
9. Apply parking brake lever. Release lever, then reapply.
10. Check to make sure rear wheels will not rotate with lever applied.



11. Lower vehicle.
12. Adjust parking brake shoes as necessary. (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENT)

## LEVER - PARKING BRAKE

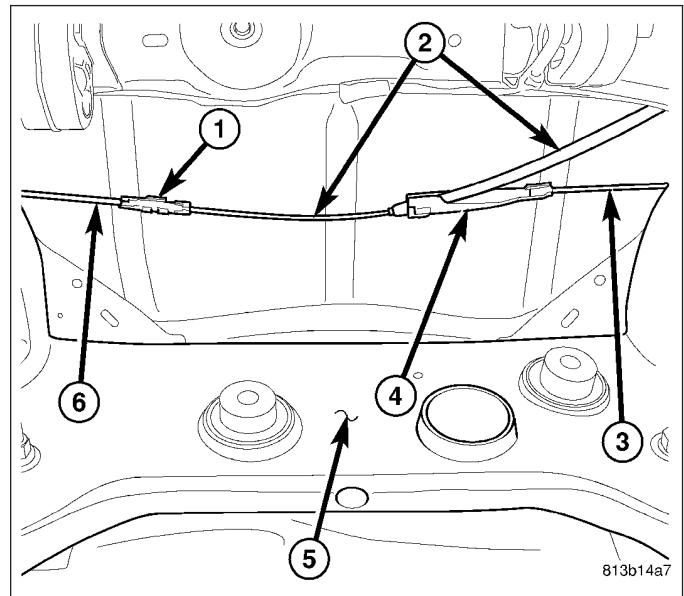
### REMOVAL

**Note:** Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

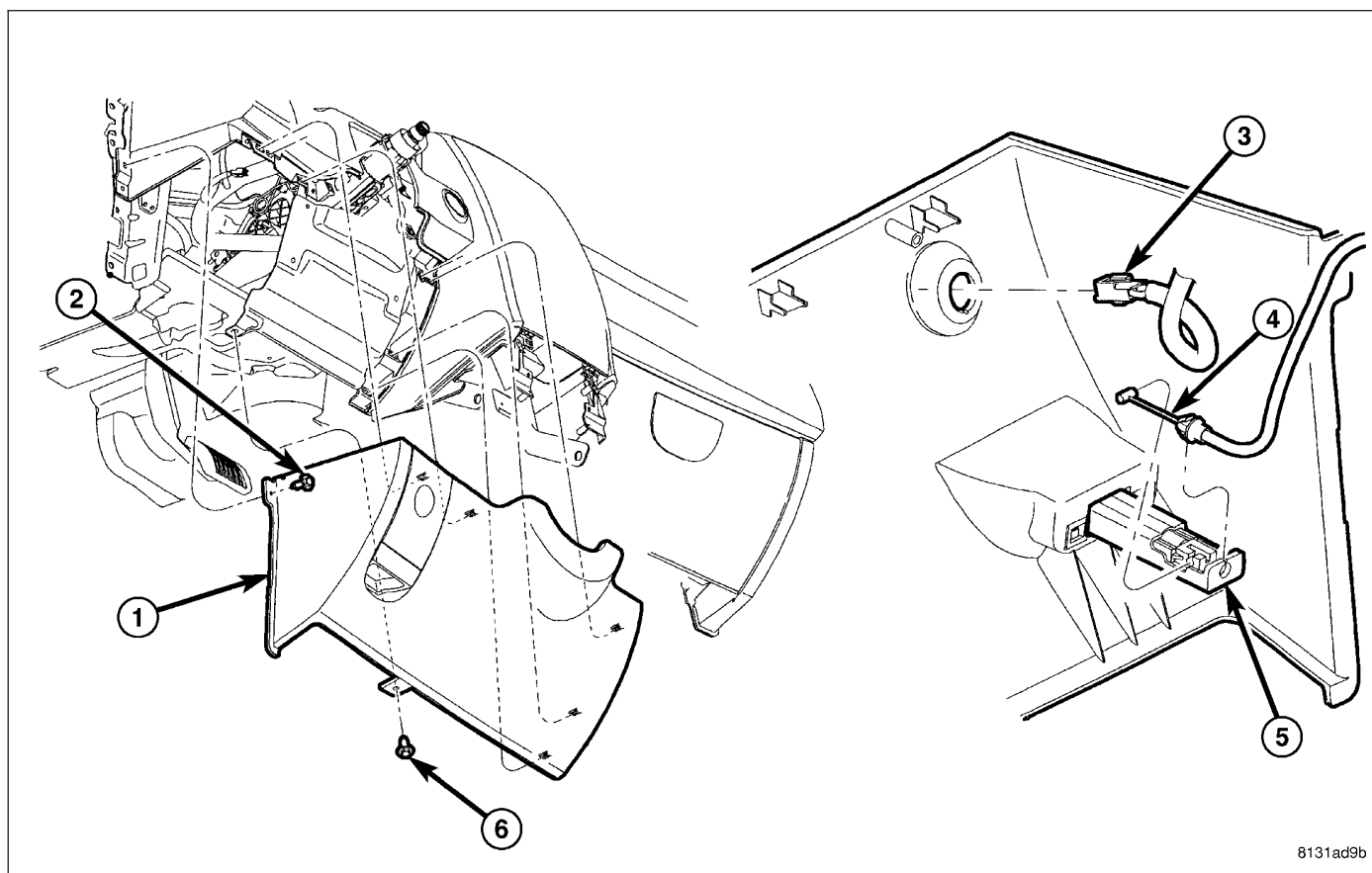
1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

**Note:** Due to short travel and low spring tension, it is not necessary to lock-out parking brake lever to service parking brake components.

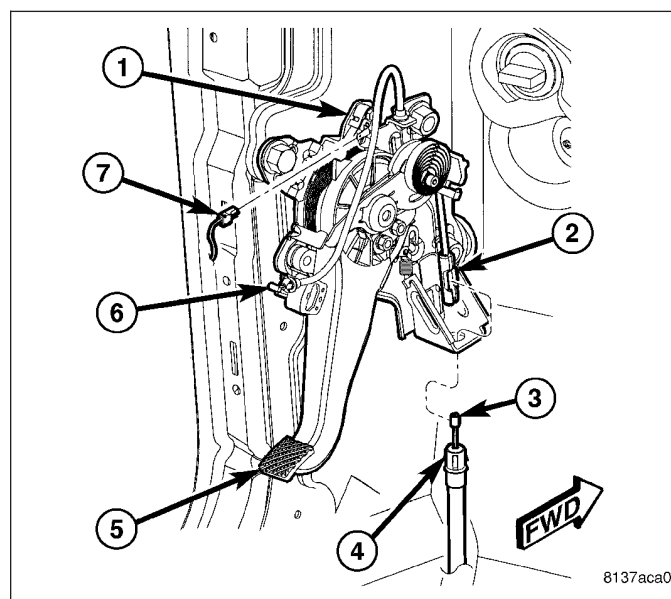
2. Disconnect front parking brake cable (2) at connector (1) to right rear parking brake cable.
3. Lower vehicle.



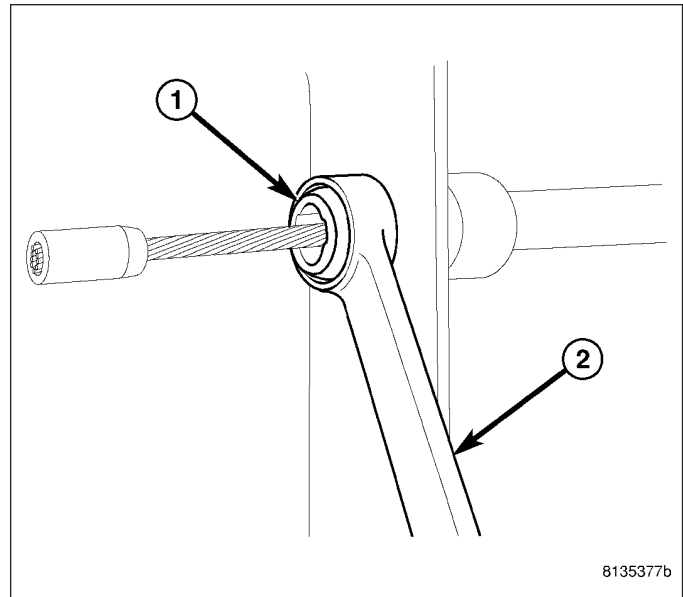




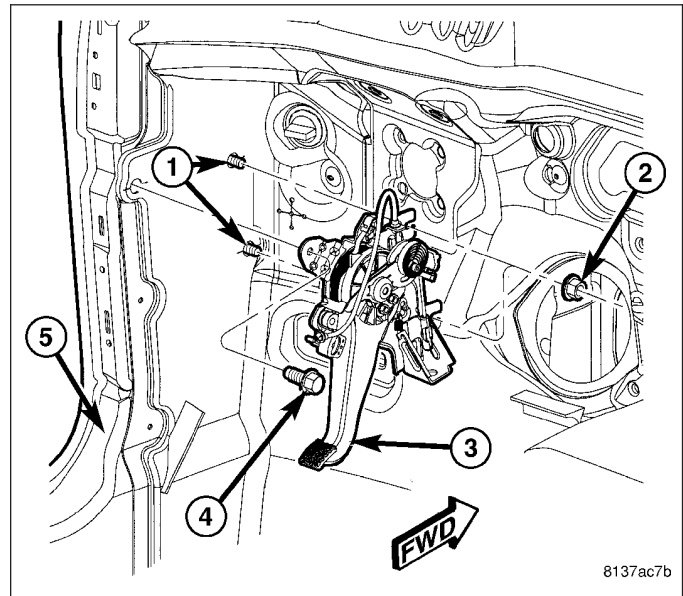
4. Remove fasteners (6) securing steering column opening cover (1) in place.
5. Disconnect wiring connector (3) at decklid release switch.
6. Disconnect parking brake release cable (4) at lever (5) and remove steering column opening cover (1).
7. Disconnect wiring connector (7) at parking brake switch (1).
8. Disconnect front parking brake cable strand (3) at lever connector (2).



9. Place 13 mm 12-point box wrench (2) over cable retainer (1) at lever bracket as shown to collapse retainer fingers. Pull cable from bracket.

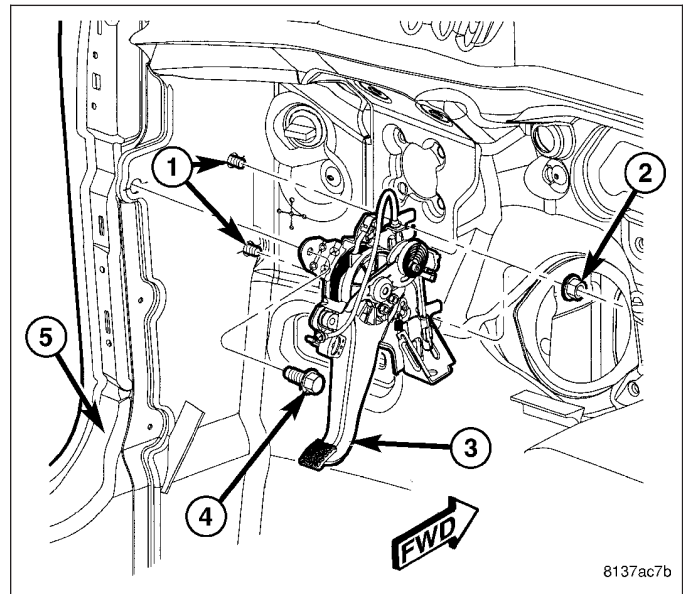


10. Remove bolt (4) and two nuts (2) mounting parking brake lever (3) to body (5).  
11. Remove parking brake lever (3).

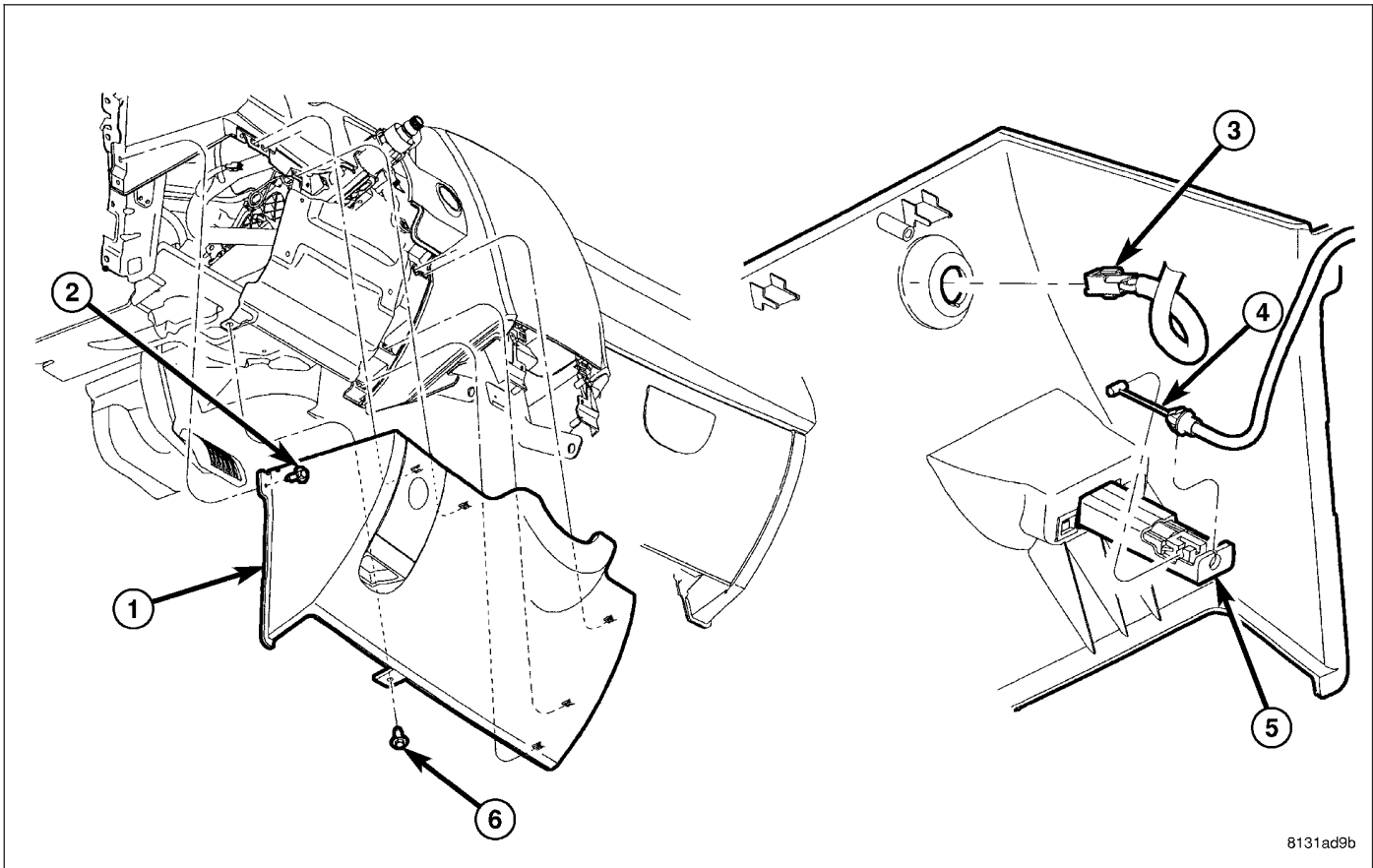
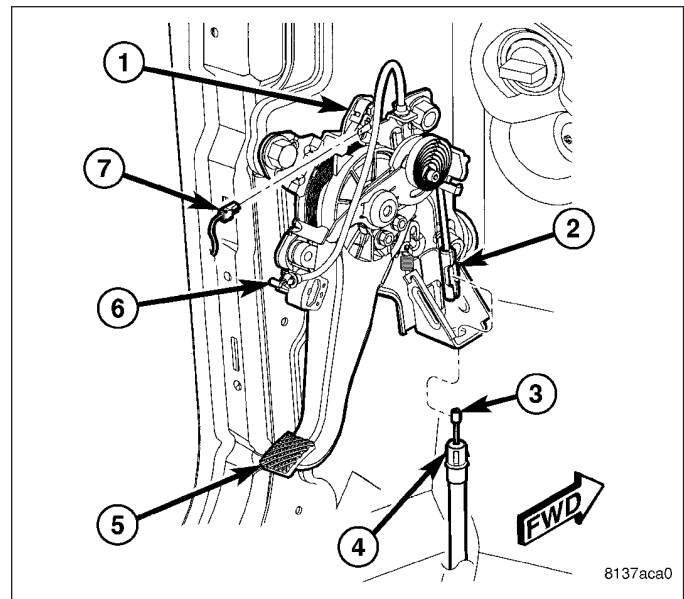


## INSTALLATION

1. Install parking brake lever (3) over mounting studs (1).  
2. Install bolt (4) and two nuts (2) mounting parking brake lever to body (5). Tighten bolt and nuts to 26 N·m (19 ft. lbs.) torque.



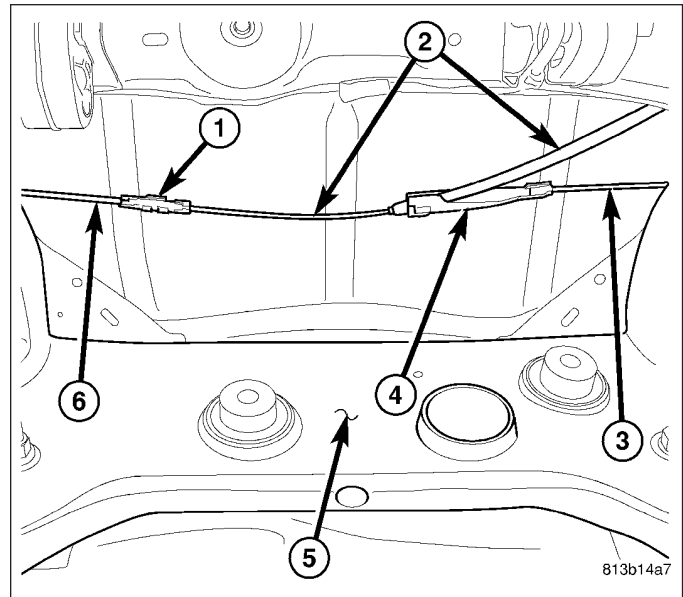
3. Connect wiring connector (7) at parking brake switch (1).
4. Guide cable end (3) up through lever bracket and press cable housing retainer (7) into bracket allowing retainer fingers to lock cable in place.
5. Connect front parking brake cable strand (3) at lever connector (2).
6. If installing new lever, remove pin locking out automatic tensioning spring.



7. Connect parking brake release cable (4) at handle (5) in steering column opening cover (1).
8. Connect wiring connector (3) at decklid release switch.
9. Position steering column opening cover (1) and install fasteners (6) securing it in place.
10. Raise and support vehicle.

**Note:** Due to short travel and low spring tension, it is not necessary to lock-out parking brake lever to service parking brake components.

11. Connect front parking brake cable (2) at connector (1) to right rear parking brake cable (6).
12. Lower vehicle until rear wheels are just above floor level.
13. Apply parking brake lever. Release lever to test release cable and handle. Reapply lever. While doing this, check to make sure the red indicator lamp in the cluster turns on and off properly.
14. Check to make sure rear wheels will not rotate with lever applied.
15. Lower vehicle.

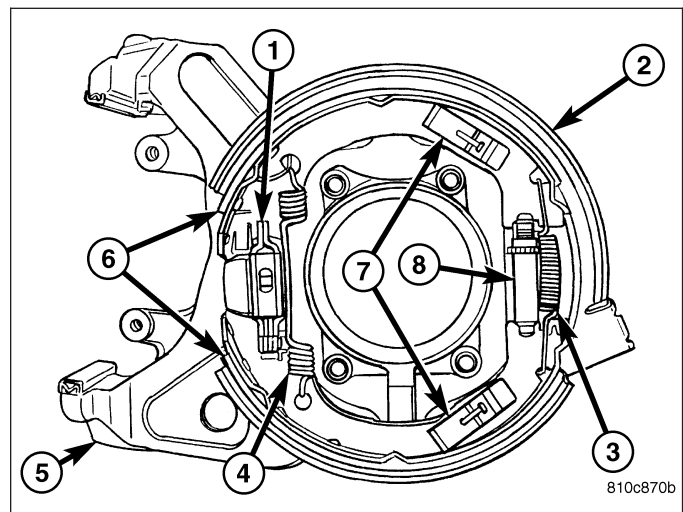


## SHOE AND LINING - PARKING BRAKE

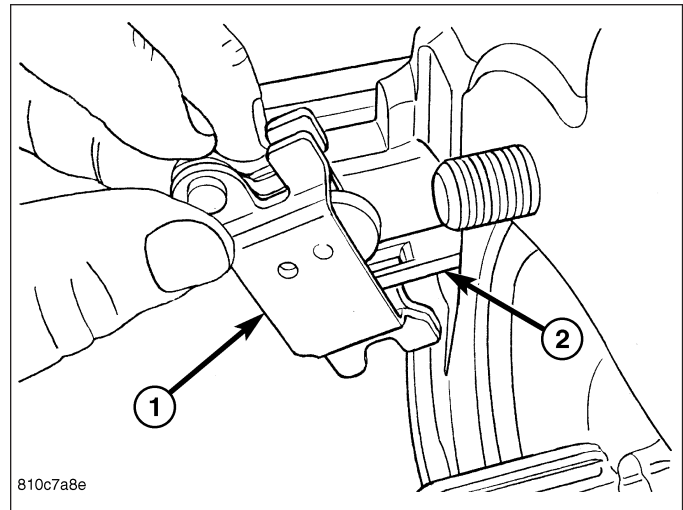
### REMOVAL

**Note:** The following procedure may be used to remove shoes on either side of the vehicle.

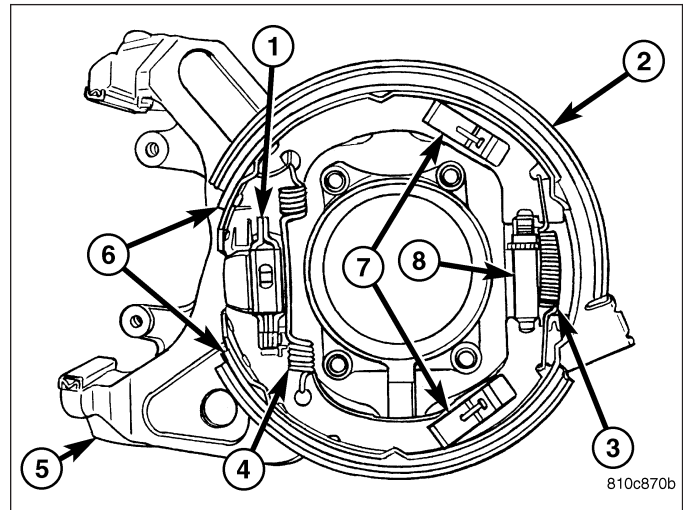
1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Access and remove rear hub and bearing. (Refer to 2 - SUSPENSION/REAR/HUB / BEARING - REMOVAL)
3. Completely back off parking brake shoe adjustment (8).
4. Remove parking brake shoe adjuster spring (3).
5. Remove shoe adjuster (8).
6. Remove upper brake shoe hold-down clip and pin (7).
7. Remove upper shoe (6) from return spring (4) and shoe actuator lever (1).
8. Remove return spring (4) from lower shoe (6).



9. Remove shoe actuator lever (1) from end of cable (2).



10. Remove lower brake shoe hold-down clip and pin (7).
11. Remove lower shoe (6).
12. Inspect springs, adjuster, lever and aluminum shoe anchor pin for wear or damage. Replace as necessary.

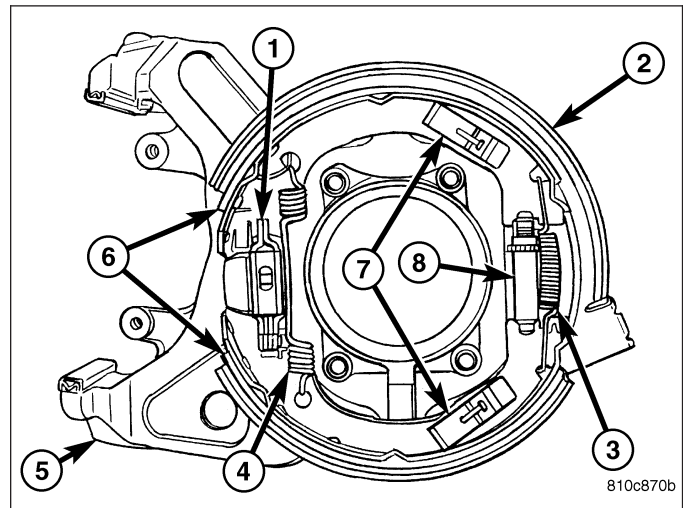


## INSTALLATION

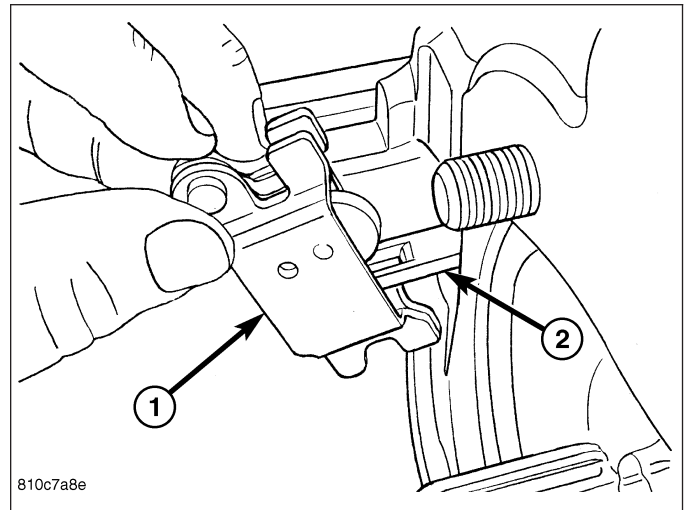
**Note:** The following procedure may be used to install shoes on either side of the vehicle.

**Note:** Inspect springs, adjuster, lever and aluminum shoe anchor pin for wear or damage prior to installation. Replace as necessary.

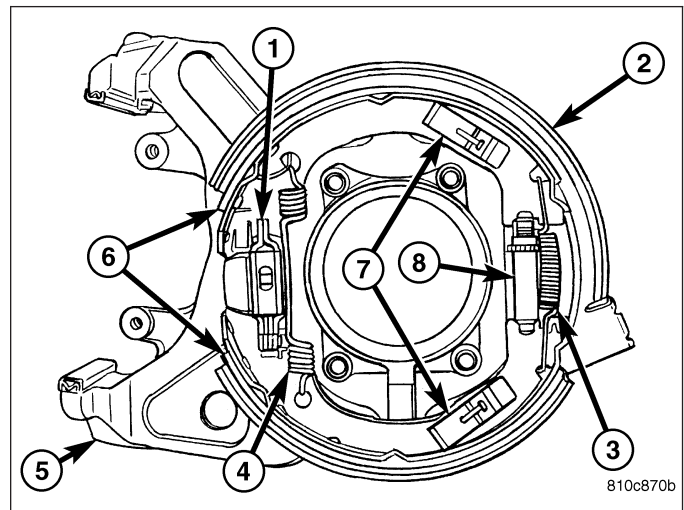
1. Install lower brake shoe hold-down pin (7) through rear of support (2).
2. Install lower shoe (6) against support plate (2).
3. Install lower brake shoe hold-down clip (7).



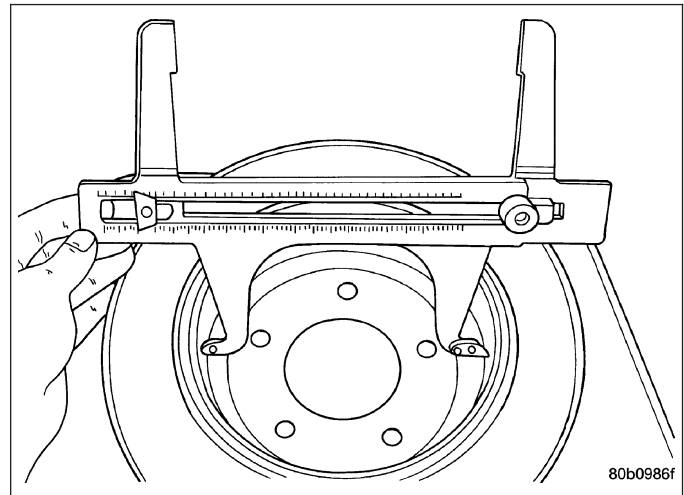
4. Install shoe actuator lever (1) on end of parking brake cable (2). Make sure actuator lever is positioned with word "UP" facing outward.



5. Install return spring (4) to lower shoe (6).
6. Install upper shoe (6) against support plate and onto shoe actuator lever.
7. Install upper brake shoe hold-down pin (7) through rear of support and upper shoe.
8. Install upper brake shoe hold-down clip (7).
9. Attach return spring (4) to upper shoe (6).
10. Install shoe adjuster (8). Place end of adjuster with star wheel upward.
11. Install parking brake shoe adjuster spring (3).

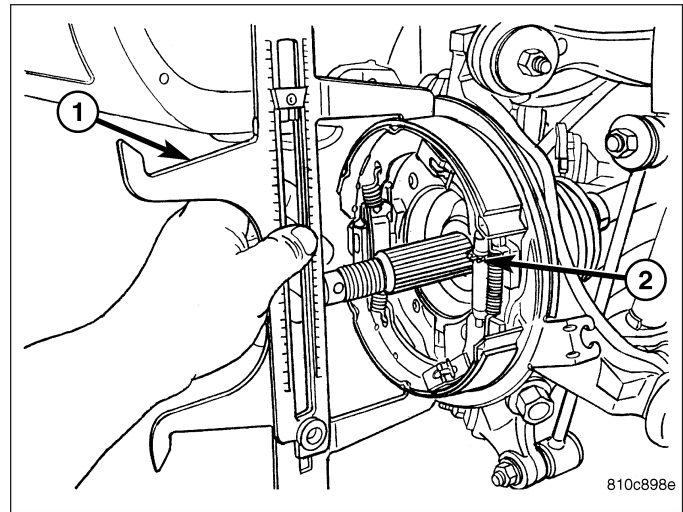


12. Using Brake Shoe Gauge, Special Tool C-3919, or equivalent, measure inside diameter of parking brake drum portion of rotor. Set gauge.





13. Place Gauge (1) over parking brake shoes at widest point.
14. Using adjuster star wheel (2), adjust parking brake shoes until linings on both park brake shoes just touch jaws on gauge. This will give a good preliminary adjustment of parking brake shoes, before a final adjustment is made at end of this procedure.
15. Install hub and bearing with wheel speed sensor as well as all components necessary to access it. (Refer to 2 - SUSPENSION/REAR/HUB / BEARING - INSTALLATION)
16. Lower vehicle.
17. Perform final adjustment of parking brake shoes. (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENT)



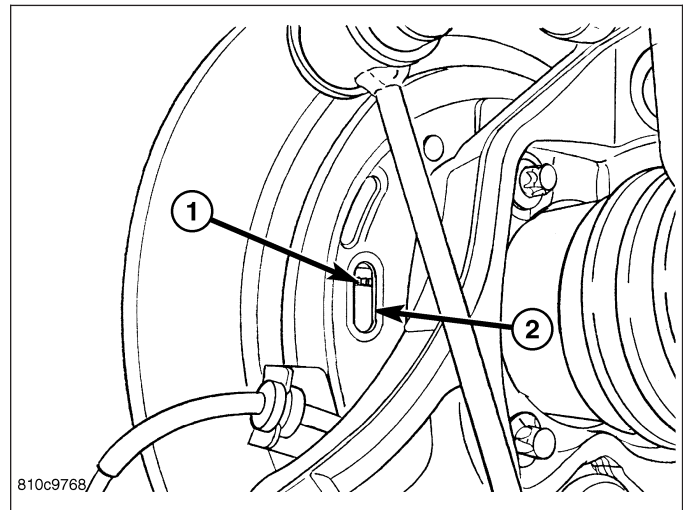
## ADJUSTMENTS

### PARKING BRAKE SHOE ADJUSTMENT

1. Place parking brake lever in "full released" position.
2. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
3. Remove plug in parking brake shoe support to access adjuster star-wheel (1).

**Note:** Through the access hole (2), rotate the adjuster star wheel (1) in the following direction to expand the shoes outward against the drum.

- Left brake – Rotate star-wheel toward rear of vehicle.
  - Right brake – Rotate star-wheel toward front of vehicle.
4. Using an appropriate tool, turn adjuster star wheel (1) until wheel will not rotate (dead lock).
  5. Back off adjuster six detents (teeth).
  6. Rotate wheel, checking for light drag. If drag is too heavy, continue to back off adjuster one detent at a time until light drag is present. **Do not back off star-wheel more than 17 detents from wheel lock.**



7. Install access plug.
8. Adjust opposite wheel parking brake shoes using same method.
9. Lower vehicle.
10. Apply and release parking brake lever once to ensure proper operation of parking brakes.

## BRAKES - ABS ELECTRICAL DIAGNOSTICS

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## BRAKES - ABS ELECTRICAL DIAGNOSTICS

### DIAGNOSIS AND TESTING

## APS-INTERMITTENT CONDITION

For the Adjustable Pedals System circuit diagrams.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

### Diagnostic Test

1.

**Note:** The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

1. Refer to any Technical Service Bulletins (TSBs) that may apply.
2. Review the scan tool information. If possible, try to duplicate the conditions under which the DTC set.
3. Turn the ignition off.
4. Visually inspect the related wire harness. Disconnect all the related harness connectors. Look for any chafed, pierced, pinched, partially broken wires and broken, bent, pushed out, or corroded terminals.
5. Perform a voltage drop test on the related circuits between the suspected faulty component and the Memory Seat Module.
6. Inspect and clean all grounds that are related to the most current DTC.
7. If numerous trouble codes were set, use a wiring schematic and look for any common ground or supply circuits.
8. Monitor with the scan tool and wiggle the related wire harness to try to interrupt the actuation.
9. Use the scan tool to perform a System Test if one applies to failing component.
10. A co-pilot, data recorder, and/or lab scope should be used to help diagnose intermittent conditions.

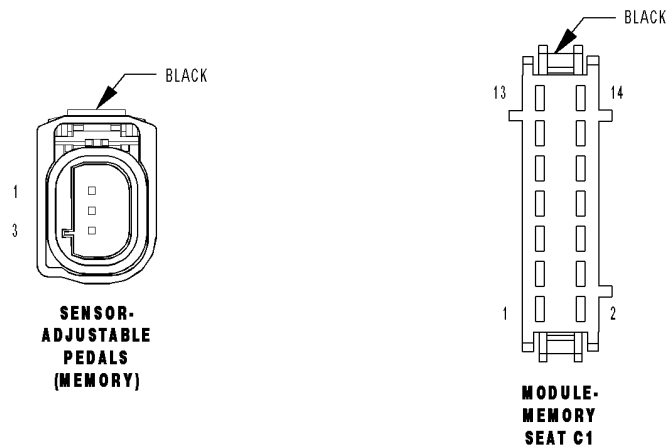
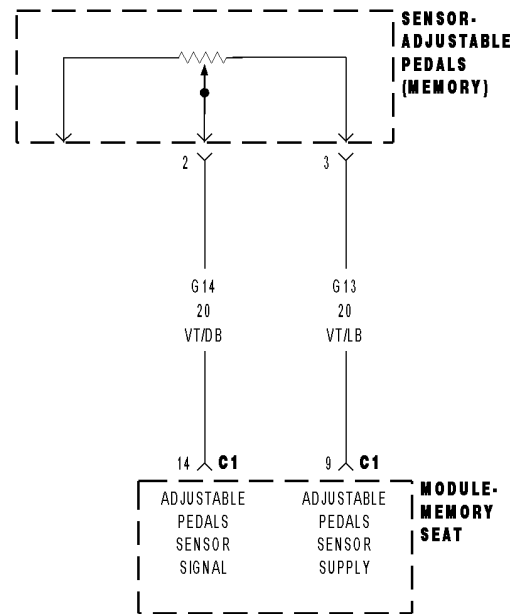
#### Were any problems found during the above inspections?

**Yes** >> Perform the necessary repairs.  
Perform APS VERIFICATION TEST VER - 1.

**No** >> Test Complete.

---

## B1D56-ADJUSTABLE PEDAL SENSOR CIRCUIT LOW



**B1D56-ADJUSTABLE PEDAL SENSOR CIRCUIT LOW (CONTINUED)**

For the Adjustable Pedal System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
The Adjustable Pedal Motor is in active operation.
- **Set Condition:**  
The Memory Seat Module detects a low signal circuit voltage that is not within voltage specification from the Adjustable Pedal Sensor.

Possible Causes
CONNECTOR/TERMINAL DAMAGE (G13) ADJUSTABLE PEDALS SENSOR SUPPLY CIRCUIT SHORTED TO GROUND, OR OPEN (G14) ADJUSTABLE PEDALS SENSOR SIGNAL CIRCUIT SHORTED TO GROUND, OR OPEN ADJUSTABLE PEDALS SENSOR - INTERNAL FAULT MEMORY SEAT MODULE - INTERNAL FAULT

**Diagnostic Test****1. CHECK FOR DTC B1D56-ADJUSTABLE PEDAL SENSOR CIRCUIT LOW**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

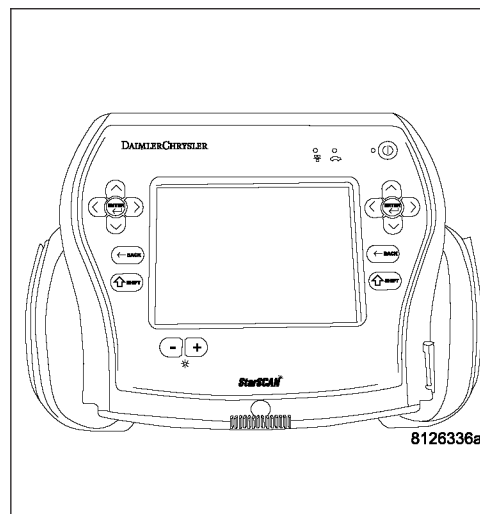
Cycle the Adjustable Pedals Switch forward and rearward.

With the scan tool, read DTC's

**Does the scan tool display: B1D56-ADJUSTABLE PEDAL SENSOR CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform APS VERIFICATION TEST - VER 1.



**B1D56-ADJUSTABLE PEDAL SENSOR CIRCUIT LOW (CONTINUED)****2. CHECK CONNECTOR/TERMINAL FOR DAMAGE**

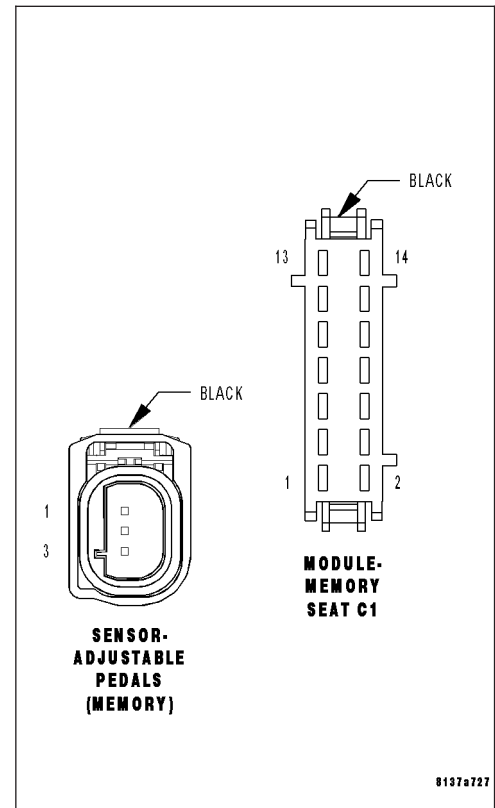
**Note:** Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

Inspect the Memory Seat Module harness connector, Adjustable Pedals Sensor, and Adjustable Pedals Sensor harness connector.

**Is the Adjustable Pedals Sensor or any of the connectors/terminals damaged?**

- Yes** >> Repair as necessary.  
Perform APS VERIFICATION TEST - VER 1.
- No** >> Go To 3

**3. CHECK (G13) ADJUSTABLE PEDALS SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

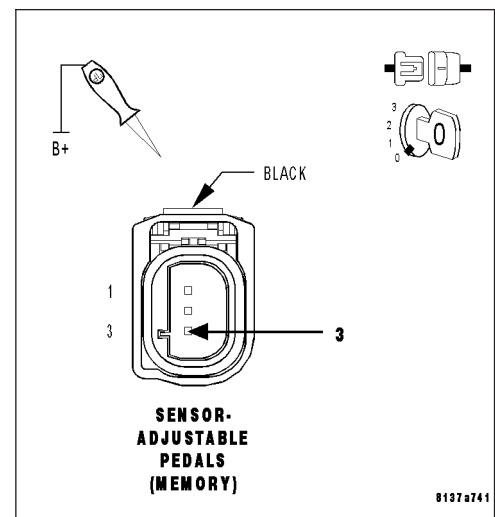
Disconnect the Memory Seat Module harness connector.

Disconnect the Adjustable Pedals Sensor harness connector.

Using a 12-volt test light connected to 12-volts, probe the (G13) Adjustable Pedals Sensor Supply circuit.

**Does the test light illuminate brightly?**

- Yes** >> Repair the (G13) Adjustable Pedals Sensor Supply circuit for a short to ground.  
Perform APS VERIFICATION TEST - VER 1.
- No** >> Go To 4



**B1D56-ADJUSTABLE PEDAL SENSOR CIRCUIT LOW (CONTINUED)****4. CHECK (G13) ADJUSTABLE PEDALS SENSOR SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Memory Seat Module harness connector.

Disconnect the Adjustable Pedals Sensor harness connector.

Connect a jumper wire between the (G13) Adjustable Pedals Sensor Supply circuit and ground.

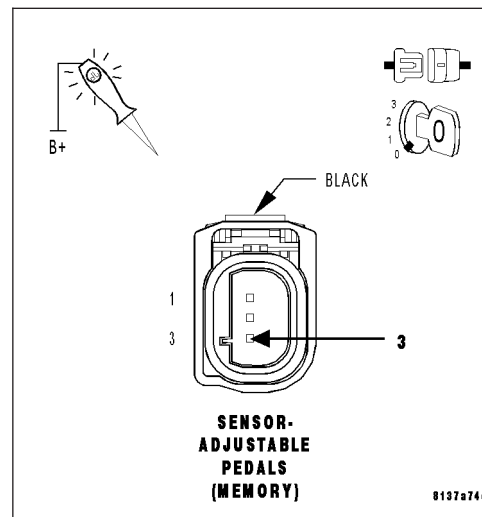
Using a 12-volt test light connected to 12-volts, probe the (G13) Adjustable Pedals Sensor Supply circuit.

**Does the test light illuminate brightly**

**Yes** >> Go To 5

**No** >> Repair the (G13) Adjustable Pedals Sensor Supply circuit for an open.

Perform APS VERIFICATION TEST - VER 1.

**5. CHECK (G14) ADJUSTABLE PEDALS SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Memory Seat Module harness connector.

Disconnect the Adjustable Pedals Sensor harness connector.

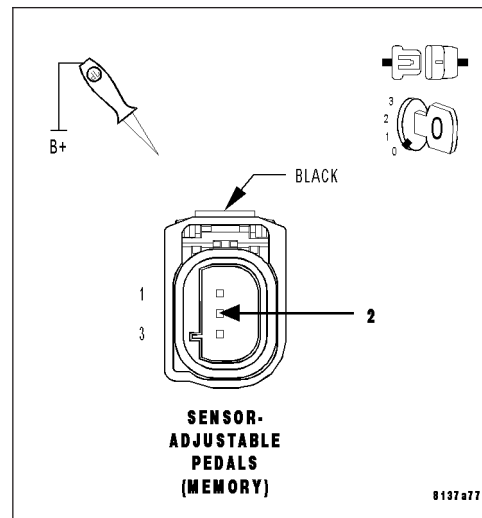
Using a 12-volt test light connected to 12-volts, probe the (G14) Adjustable Pedals Sensor Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (G14) Adjustable Pedals Sensor Signal circuit for a short to ground.

Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**B1D56-ADJUSTABLE PEDAL SENSOR CIRCUIT LOW (CONTINUED)****6. CHECK (G14) ADJUSTABLE PEDALS SENSOR SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Memory Seat Module harness connector.

Disconnect the Adjustable Pedals Sensor harness connector.

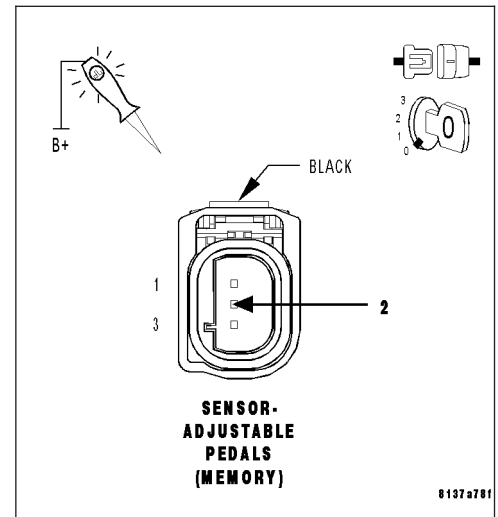
Connect a jumper wire between the (G14) Adjustable Pedals Sensor Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (G14) Adjustable Pedals Sensor Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 7

**No** >> Repair the (G14) Adjustable Pedals Sensor Signal circuit for an open.  
Perform APS VERIFICATION TEST - VER 1.

**7. CHECK (G13) ADJUSTABLE PEDALS SENSOR SUPPLY CIRCUIT VOLTAGE**

Turn the ignition off.

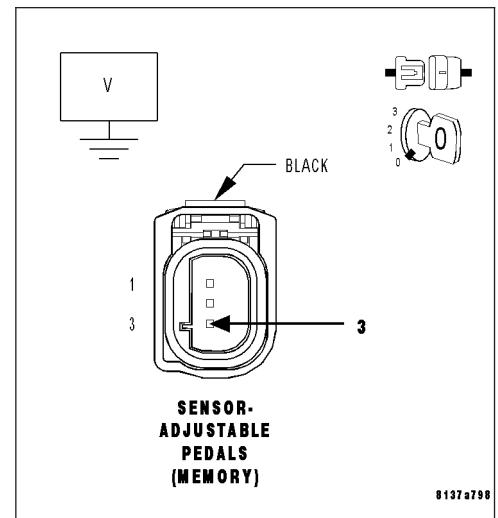
Disconnect the Adjustable Pedals Sensor harness connector.

Measure the voltage between the (G13) Adjustable Pedals Sensor Supply circuit and ground.

**Is the voltage between 4.0 and 5.0 volts?**

**Yes** >> Go To 8

**No** >> Replace and reprogram the Memory Seat Module in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.



**B1D56-ADJUSTABLE PEDAL SENSOR CIRCUIT LOW (CONTINUED)****8. CHECK (G14) ADJUSTABLE PEDALS SENSOR SIGNAL CIRCUIT VOLTAGE**

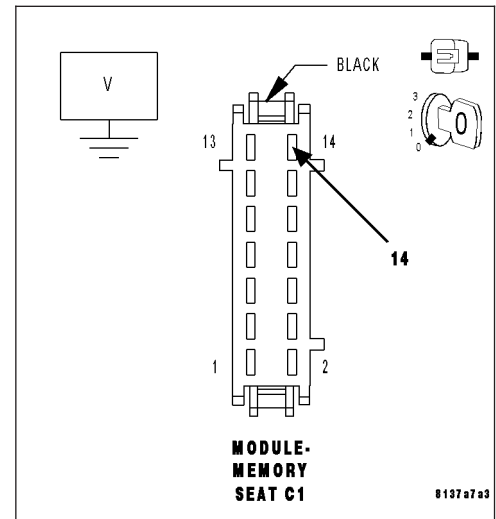
Turn the ignition off.

Reconnect all connectors.

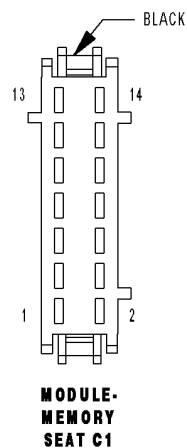
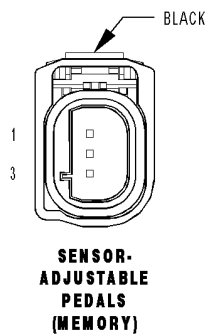
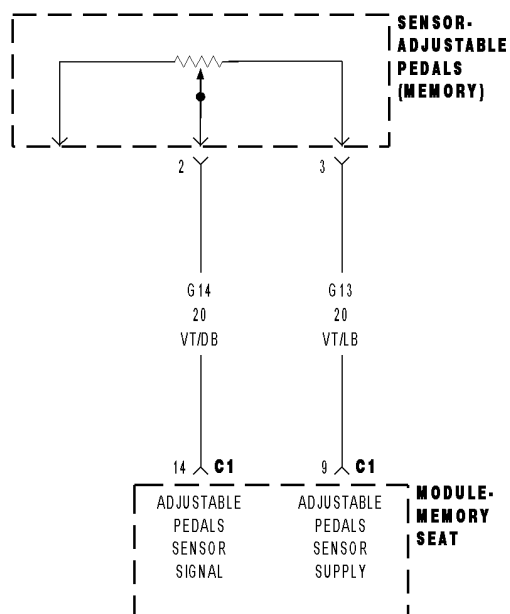
Measure the voltage of the (G14) Adjustable Pedals Sensor Signal circuit in the Memory Seat Module harness connector.

**Is the voltage above 0.5 volts?**

- Yes** >> Replace and reprogram the Memory Seat Module in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.
- No** >> Replace the Adjustable Pedals Sensor in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.





**B1D57-ADJUSTABLE PEDAL SENSOR CIRCUIT HIGH**

**B1D57-ADJUSTABLE PEDAL SENSOR CIRCUIT HIGH (CONTINUED)**

For the Adjustable Pedal System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
The Adjustable Pedal Motor is in active operation.
- **Set Condition:**  
The Memory Seat Module detects a high signal circuit voltage that is not within voltage specification from the Adjustable Pedal Sensor.

Possible Causes
CONNECTOR/TERMINAL DAMAGE (G13) ADJUSTABLE PEDALS SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE (G14) ADJUSTABLE PEDALS SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE ADJUSTABLE PEDALS SENSOR - INTERNAL FAULT MEMORY SEAT MODULE - INTERNAL FAULT

**Diagnostic Test****1. CHECK FOR DTC B1D57-ADJUSTABLE PEDAL SENSOR CIRCUIT HIGH**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

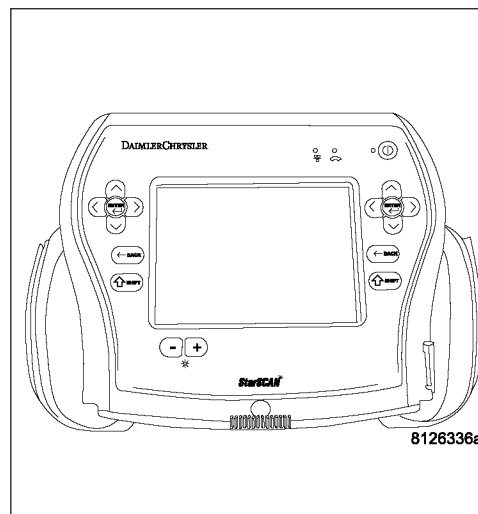
Cycle the Adjustable Pedals Switch forward and rearward.

With the scan tool, read DTC's

**Does the scan tool display: B1D57-ADJUSTABLE PEDAL SENSOR CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform APS VERIFICATION TEST - VER 1.



**B1D57-ADJUSTABLE PEDAL SENSOR CIRCUIT HIGH (CONTINUED)****2. CHECK CONNECTOR/TERMINAL FOR DAMAGE**

**Note:** Check all terminals for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

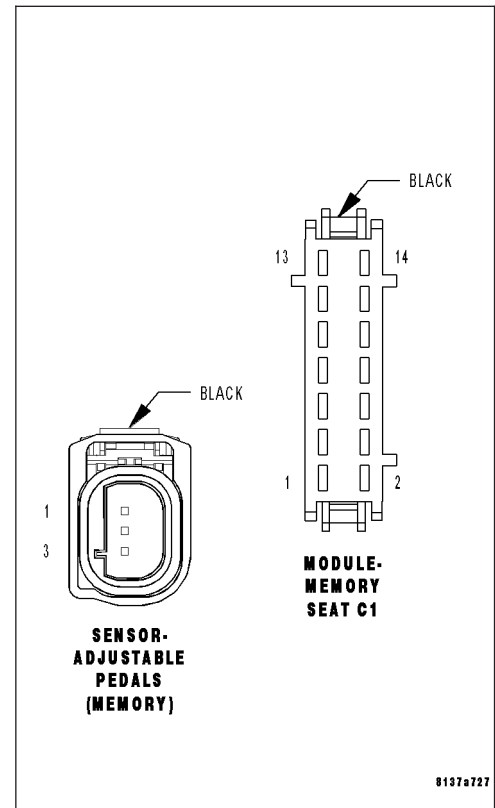
Inspect the Memory Seat Module harness connector, Adjustable Pedals Sensor, and Adjustable Pedals Sensor harness connector.

**Is the Adjustable Pedals Sensor or any of the connectors/terminals damaged?**

**Yes** >> Repair as necessary.

Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK (G13) ADJUSTABLE PEDALS SENSOR SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Memory Seat Module harness connector.

Turn the ignition on.

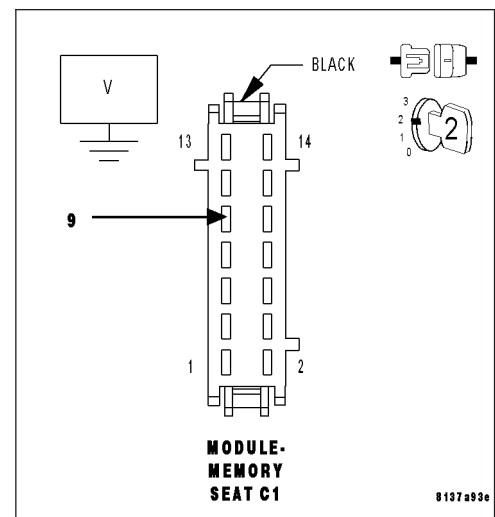
Measure the voltage between the (G13) Adjustable Pedals Sensor Supply circuit and ground.

**Is the voltage above 5.0 volts?**

**Yes** >> Repair the (G13) Adjustable Pedals Sensor Supply circuit for a short to voltage.

Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 4



**B1D57-ADJUSTABLE PEDAL SENSOR CIRCUIT HIGH (CONTINUED)****4. CHECK (G14) ADJUSTABLE PEDALS SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Memory Seat Module harness connector.

Turn the ignition on.

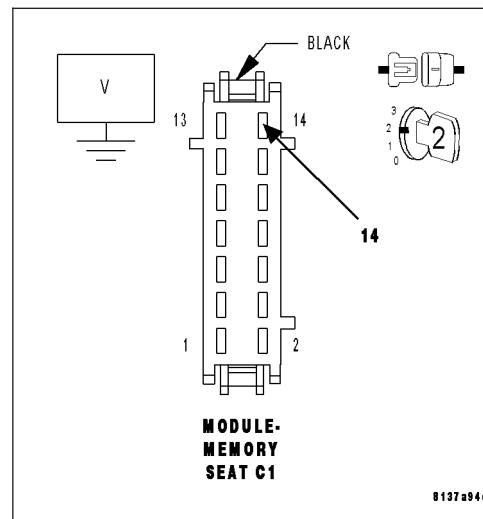
Measure the voltage between the (G14) Adjustable Pedals Sensor Signal circuit and ground.

**Is the voltage above 5.0 volts?**

**Yes** >> Repair the (G14) Adjustable Pedals Sensor Signal circuit for a short to voltage.

Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK (G14) ADJUSTABLE PEDALS SENSOR SIGNAL CIRCUIT VOLTAGE**

Turn the ignition off.

Reconnect all connectors.

Measure the voltage of the (G14) Adjustable Pedals Sensor Signal circuit in the Memory Seat Module harness connector.

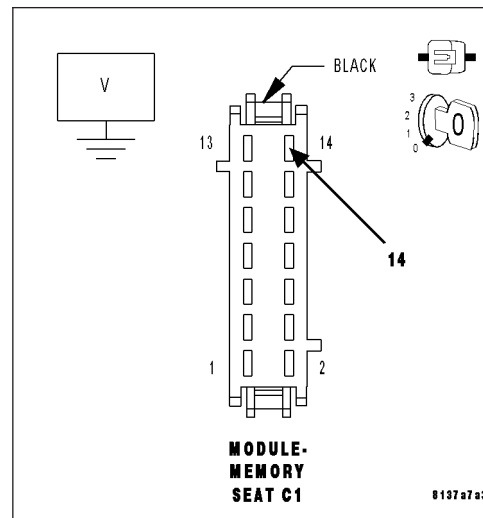
**Is the voltage below 4.0 volts?**

**Yes** >> Replace and reprogram the Memory Seat Module in accordance with the Service Information.

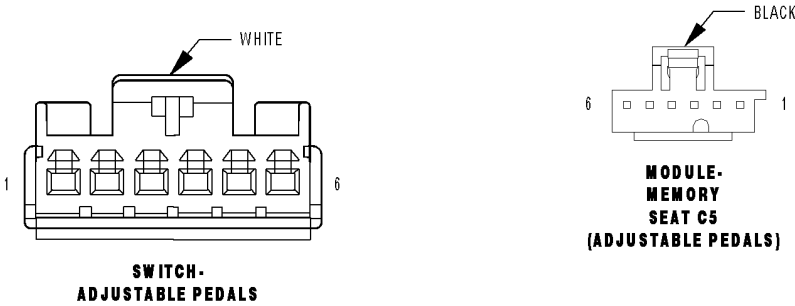
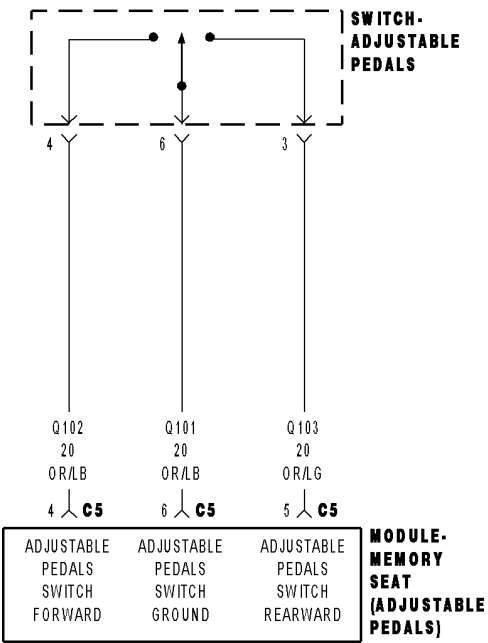
Perform APS VERIFICATION TEST - VER 1.

**No** >> Replace the Adjustable Pedals Sensor in accordance with the Service Information.

Perform APS VERIFICATION TEST - VER 1.



B1D5B-ADJUSTABLE PEDAL SWITCH CIRCUIT PERFORMANCE



**B1D5B-ADJUSTABLE PEDAL SWITCH CIRCUIT PERFORMANCE (CONTINUED)**

For the Adjustable Pedal System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The Adjustable Pedals Switch is in active operation.

- **Set Condition:**

The Memory Seat Module detects an activation of both pedal switches at the same time.

Possible Causes
CONNECTOR/TERMINAL DAMAGE
(Q103) ADJUSTABLE PEDALS SWITCH REARWARD CIRCUIT SHORTED TO GROUND
(Q102) ADJUSTABLE PEDALS SWITCH FORWARD CIRCUIT SHORTED TO GROUND
(Q103) ADJUSTABLE PEDALS SWITCH REARWARD CIRCUIT AND (Q102) ADJUSTABLE PEDALS SWITCH FORWARD CIRCUIT SHORTED TOGETHER
ADJUSTABLE PEDALS SWITCH - INTERNAL FAULT
MEMORY SEAT MODULE - INTERNAL FAULT

## Diagnostic Test

### 1. CHECK FOR DTC B1D5B-ADJUSTABLE PEDAL SWITCH CIRCUIT PERFORMANCE

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

Cycle the Adjustable Pedals Switch forward and rearward.

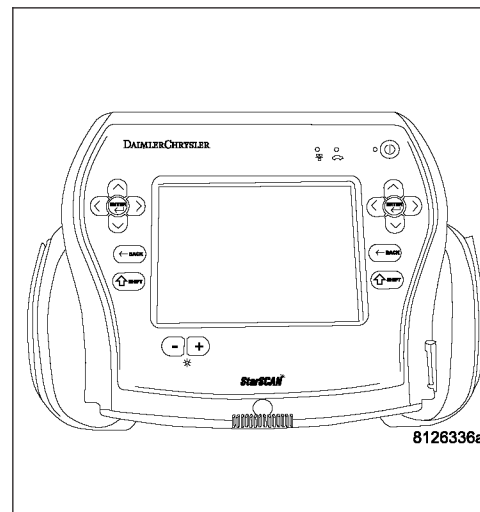
With the scan tool, read DTC's

**Does the scan tool display: B1D5B-ADJUSTABLE PEDAL SWITCH CIRCUIT PERFORMANCE?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.

Perform APS VERIFICATION TEST - VER 1.



**B1D5B-ADJUSTABLE PEDAL SWITCH CIRCUIT PERFORMANCE (CONTINUED)****2. CHECK CONNECTOR/TERMINAL FOR DAMAGE**

**Note:** Check all terminals for broken, bent, pushed out, or corroded terminals.

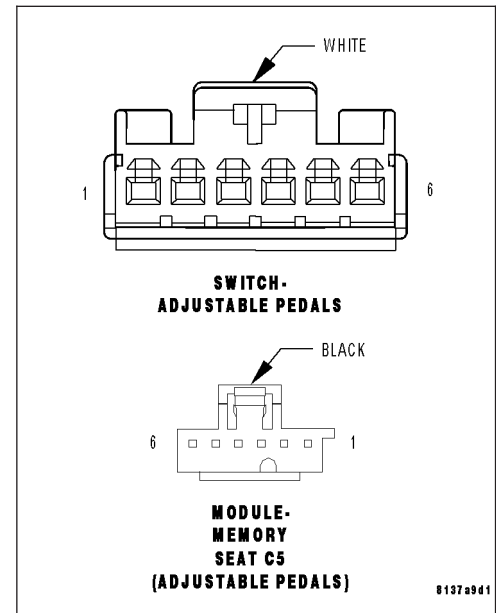
Turn the ignition off.

Inspect the Memory Seat Module harness connector, Adjustable Pedals Switch, and Adjustable Pedals Switch harness connector.

**Is the Adjustable Pedals Switch or any of the connectors/terminals damaged?**

**Yes** >> Repair as necessary.  
Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK (Q103) ADJUSTABLE PEDALS SWITCH REARWARD CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Memory Seat Module harness connector.

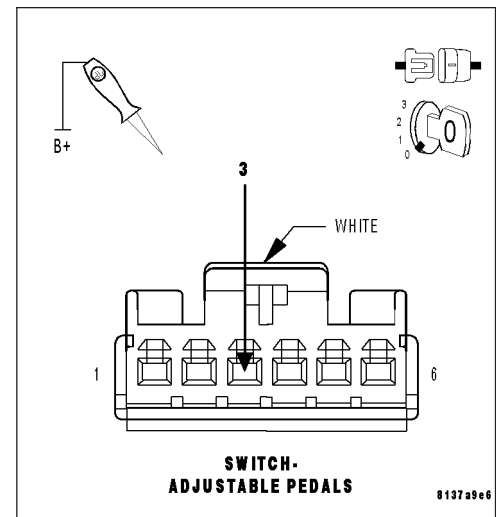
Disconnect the Adjustable Pedals Switch harness connector.

Using a 12-volt test light connected to 12-volts, probe the (Q103) Adjustable Pedals Switch Rearward circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (Q103) Adjustable Pedals Switch Rearward circuit for a short to ground.  
Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 4



**B1D5B-ADJUSTABLE PEDAL SWITCH CIRCUIT PERFORMANCE (CONTINUED)****4. CHECK (Q102) ADJUSTABLE PEDALS SWITCH FORWARD CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Memory Seat Module harness connector.

Disconnect the Adjustable Pedals Switch harness connector.

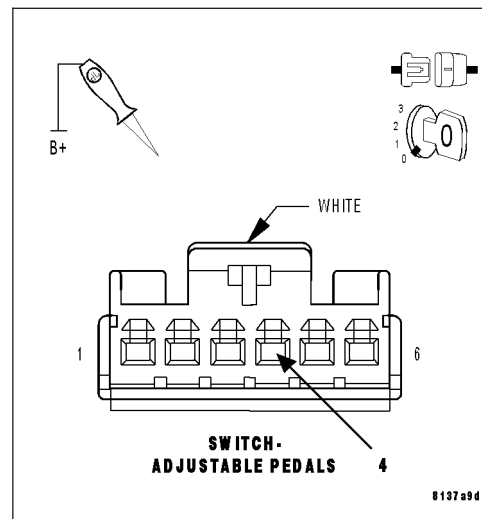
Using a 12-volt test light connected to 12-volts, probe the (Q102) Adjustable Pedals Switch Forward circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (Q102) Adjustable Pedals Switch Forward circuit for a short to ground.

Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK (Q103) ADJUSTABLE PEDALS SWITCH REARWARD CIRCUIT AND (Q102) ADJUSTABLE PEDALS SWITCH FORWARD CIRCUIT FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Memory Seat Module harness connector.

Disconnect the Adjustable Pedals Switch harness connector.

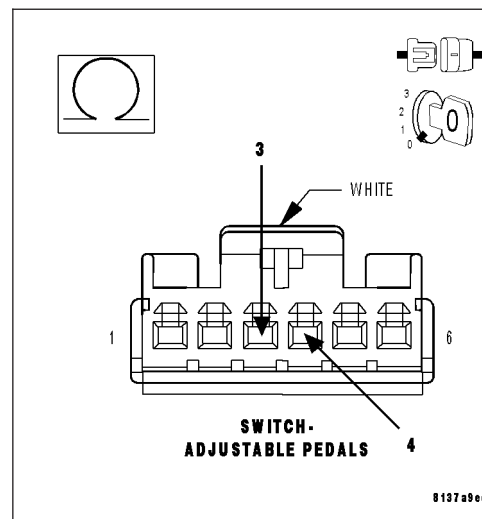
Measure the resistance between the (Q103) Adjustable Pedals Switch Rearward circuit and (Q102) Adjustable Pedals Switch Forward circuit.

**Is the resistance above 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the (Q103) Adjustable Pedals Switch Rearward circuit and (Q102) Adjustable Pedals Switch Forward circuit for a short together.

Perform APS VERIFICATION TEST - VER 1.





**B1D5B-ADJUSTABLE PEDAL SWITCH CIRCUIT PERFORMANCE (CONTINUED)****6. CHECK ADJUSTABLE PEDALS SWITCH SHORTED**

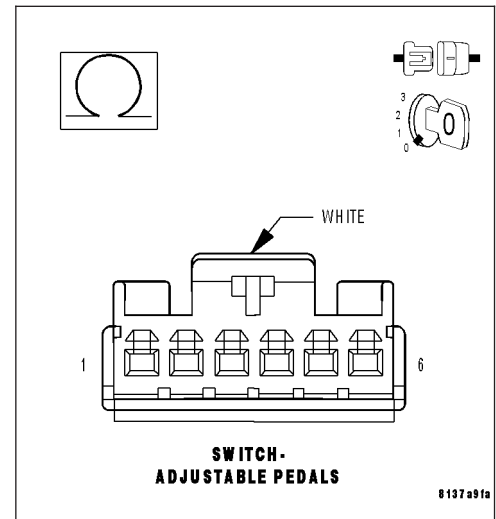
Turn the ignition off.

Disconnect the Adjustable Pedals Switch harness connector.

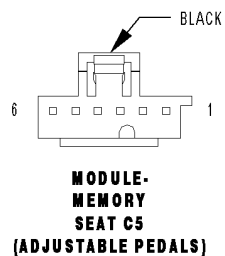
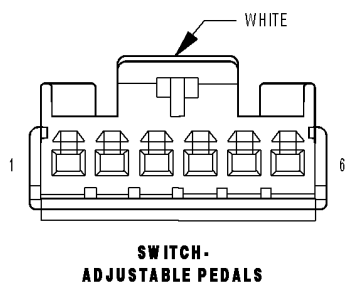
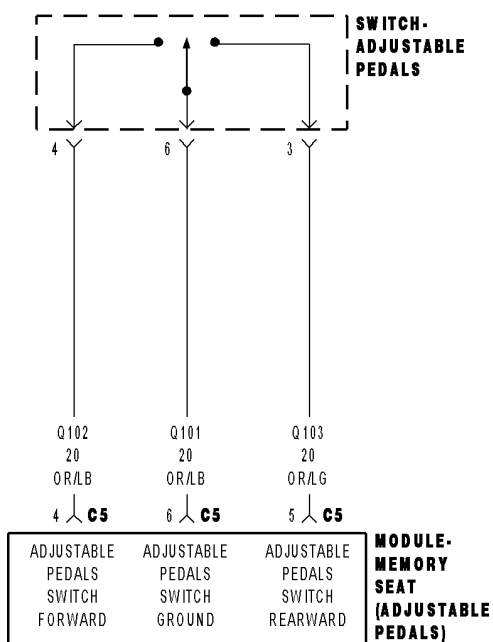
Measure the resistance between the (Q103) Adjustable Pedals Switch Rearward and (Q102) Adjustable Pedals Switch Forward terminals at the Adjustable Pedals Switch.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace and reprogram the Memory Seat Module in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.
- No** >> Replace the Adjustable Pedals Switch in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.



## B1D5C-ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK FORWARD



**B1D5C–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK FORWARD (CONTINUED)**

For the Adjustable Pedal System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
The Adjustable Pedals Switch is in active operation.
- **Set Condition:**  
The Memory Seat Module detects that the Adjustable Pedals Switch has been activated for a time period of more than 50 seconds.

Possible Causes
CONNECTOR/TERMINAL DAMAGE (Q102) ADJUSTABLE PEDALS SWITCH FORWARD CIRCUIT SHORTED TO GROUND ADJUSTABLE PEDALS SWITCH - INTERNAL FAULT MEMORY SEAT MODULE - INTERNAL FAULT

**Diagnostic Test**

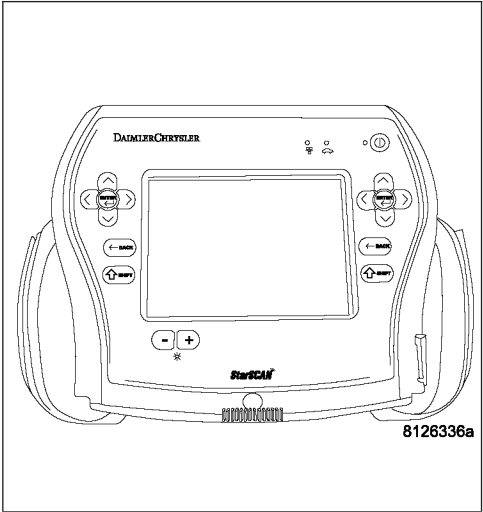
**1. CHECK FOR DTC B1D5C–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK FORWARD**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.  
With the scan tool, record and erase DTC's.  
Cycle the ignition switch from off to on.  
Cycle the Adjustable Pedals Switch forward and rearward.  
With the scan tool, read DTC's

**Does the scan tool display: B1D5C–ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK FORWARD?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform APS VERIFICATION TEST - VER 1.



**B1D5C-ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK FORWARD (CONTINUED)****2. CHECK CONNECTOR/TERMINAL FOR DAMAGE**

**Note:** Check all terminals for broken, bent, pushed out, or corroded terminals.

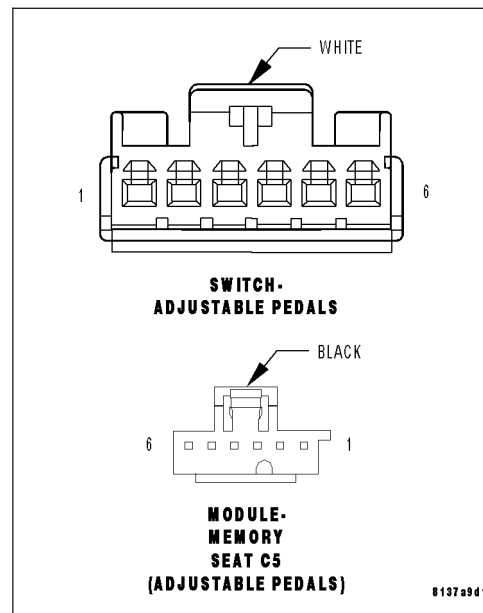
Turn the ignition off.

Inspect the Memory Seat Module harness connector, Adjustable Pedals Switch, and Adjustable Pedals Switch harness connector.

**Is the Adjustable Pedals Switch or any of the connectors/terminals damaged?**

**Yes** >> Repair as necessary.  
Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK (Q102) ADJUSTABLE PEDALS SWITCH FORWARD CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Memory Seat Module harness connector.

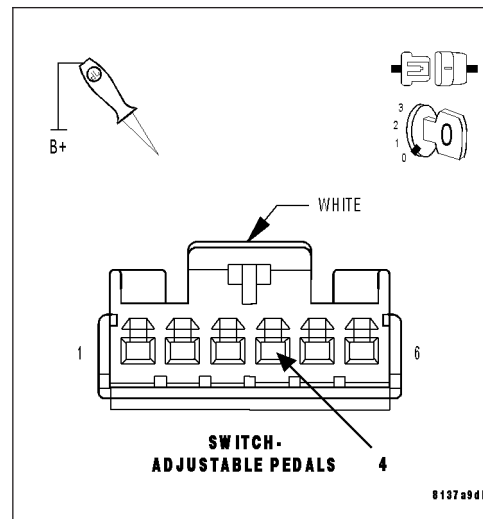
Disconnect the Adjustable Pedals Switch harness connector.

Using a 12-volt test light connected to 12-volts, probe the (Q102) Adjustable Pedals Switch Forward circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (Q102) Adjustable Pedals Switch Forward circuit for a short to ground.  
Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 4



**B1D5C-ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK FORWARD (CONTINUED)****4. CHECK ADJUSTABLE PEDALS SWITCH SHORTED**

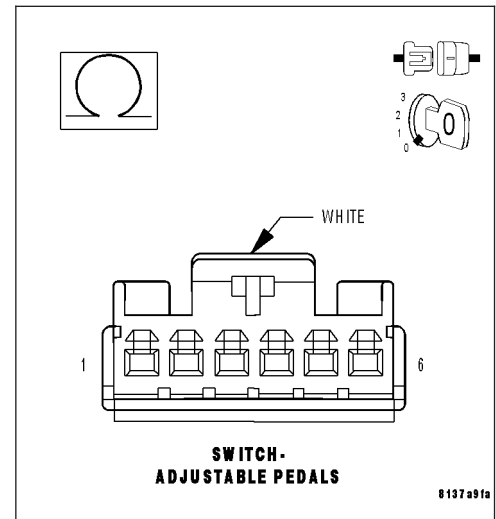
Turn the ignition off.

Disconnect the Adjustable Pedals Switch harness connector.

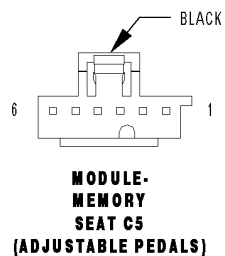
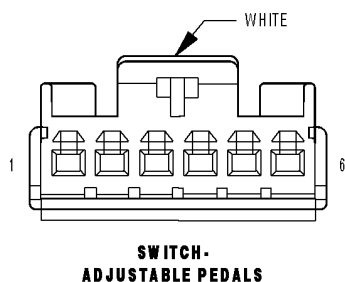
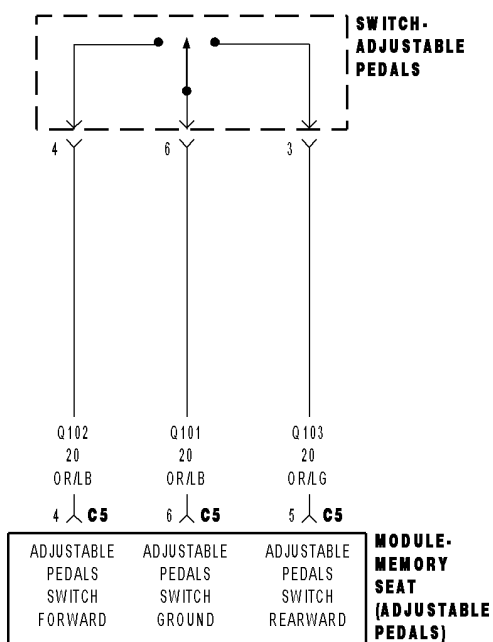
Measure the resistance between the (Q103) Adjustable Pedals Switch Rearward and (Q102) Adjustable Pedals Switch Forward terminals at the Adjustable Pedals Switch.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace and reprogram the Memory Seat Module in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.
- No** >> Replace the Adjustable Pedals Switch in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.



## B1D5D-ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK REARWARD



**B1D5D-ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK REARWARD (CONTINUED)**

For the Adjustable Pedal System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
The Adjustable Pedals Switch is in active operation.
- **Set Condition:**  
The Memory Seat Module detects that the Adjustable Pedals Switch has been activated for a time period of more than 50 seconds.

Possible Causes
CONNECTOR/TERMINAL DAMAGE (Q103) ADJUSTABLE PEDALS SWITCH FORWARD CIRCUIT SHORTED TO GROUND ADJUSTABLE PEDALS SWITCH - INTERNAL FAULT MEMORY SEAT MODULE - INTERNAL FAULT

**Diagnostic Test**

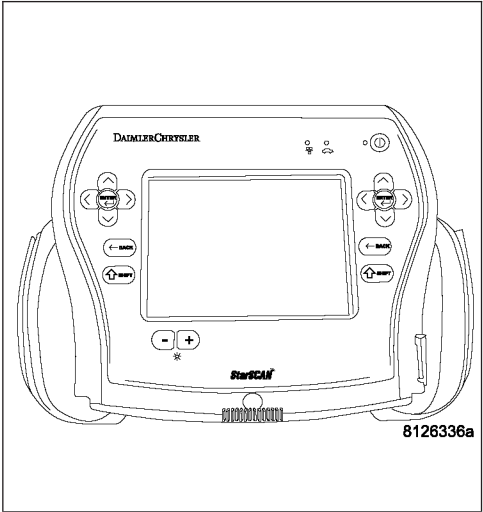
**1. CHECK FOR DTC B1D5D-ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK REARWARD**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.  
With the scan tool, record and erase DTC's.  
Cycle the ignition switch from off to on.  
Cycle the Adjustable Pedals Switch forward and rearward.  
With the scan tool, read DTC's

**Does the scan tool display: B1D5D-ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK REARWARD?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform APS VERIFICATION TEST - VER 1.



**B1D5D-ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK REARWARD (CONTINUED)****2. CHECK CONNECTOR/TERMINAL FOR DAMAGE**

**Note:** Check all terminals for broken, bent, pushed out, or corroded terminals.

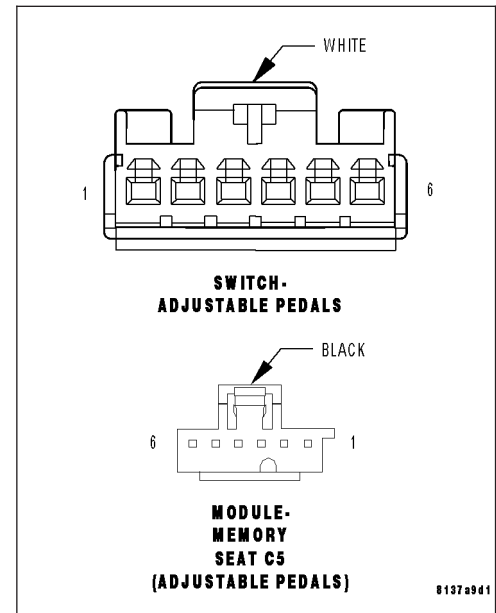
Turn the ignition off.

Inspect the Memory Seat Module harness connector, Adjustable Pedals Switch, and Adjustable Pedals Switch harness connector.

**Is the Adjustable Pedals Switch or any of the connectors/terminals damaged?**

**Yes** >> Repair as necessary.  
Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK (Q103) ADJUSTABLE PEDALS SWITCH REARWARD CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Memory Seat Module harness connector.

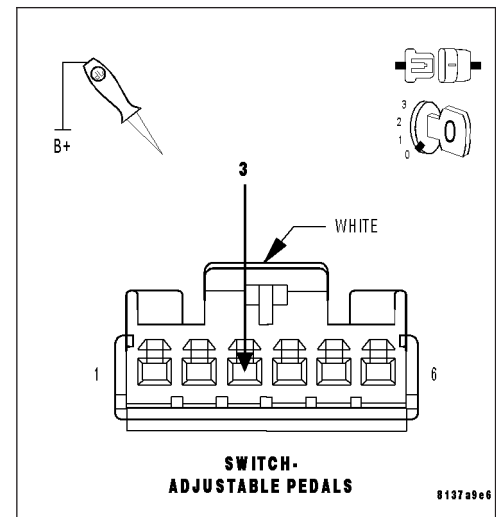
Disconnect the Adjustable Pedals Switch harness connector.

Using a 12-volt test light connected to 12-volts, probe the (Q103) Adjustable Pedals Switch Rearward circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (Q103) Adjustable Pedals Switch Rearward circuit for a short to ground.  
Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 4





**B1D5D-ADJUSTABLE PEDAL SWITCH CIRCUIT STUCK REARWARD (CONTINUED)****4. CHECK ADJUSTABLE PEDALS SWITCH SHORTED**

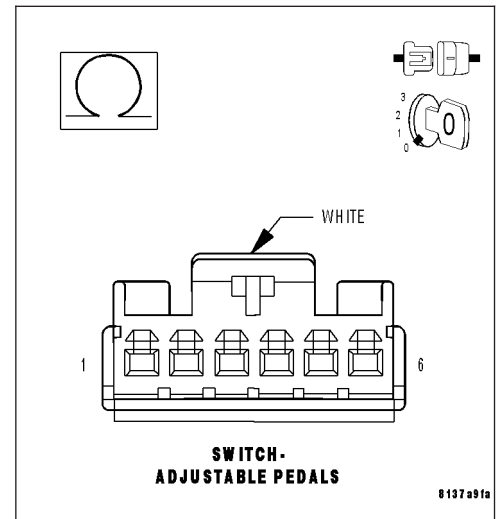
Turn the ignition off.

Disconnect the Adjustable Pedals Switch harness connector.

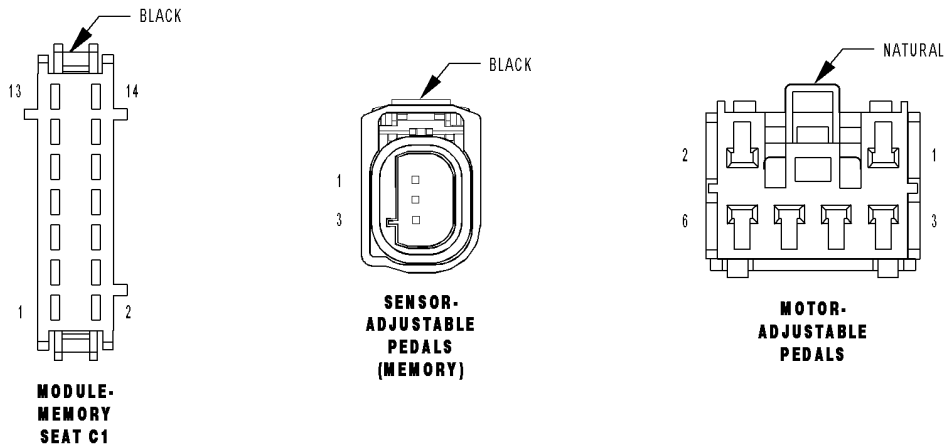
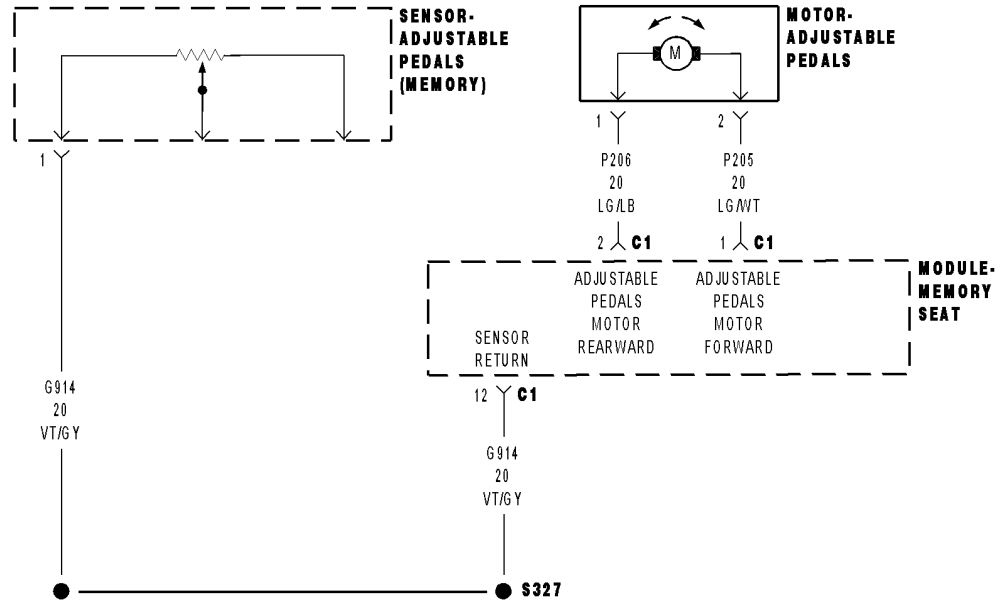
Measure the resistance between the (Q103) Adjustable Pedals Switch Rearward and (Q102) Adjustable Pedals Switch Forward terminals at the Adjustable Pedals Switch.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace and reprogram the Memory Seat Module in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.
- No** >> Replace the Adjustable Pedals Switch in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.



## B1D67-ADJUSTABLE PEDAL CONTROL CIRCUIT PERFORMANCE



**B1D67-ADJUSTABLE PEDAL CONTROL CIRCUIT PERFORMANCE (CONTINUED)**

For the Adjustable Pedal System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
The Adjustable Pedals Motor is in active operation.
- **Set Condition:**  
The Memory Seat Module detects that the Adjustable Pedals Motor has been activated for a time period and has not spun with three motor direction commands.

Possible Causes
CONNECTOR/TERMINAL DAMAGE MECHANICAL FAILURE IN THE ADJUSTABLE PEDALS (P205) ADJUSTABLE PEDALS MOTOR FORWARD CIRCUIT OPEN (P206) ADJUSTABLE PEDALS MOTOR REARWARD CIRCUIT OPEN (G914) RETURN CIRCUIT OPEN ADJUSTABLE PEDALS MOTOR - INTERNAL FAULT MEMORY SEAT MODULE - INTERNAL FAULT

**Diagnostic Test**

**1. CHECK FOR DTC B1D67-ADJUSTABLE PEDAL CONTROL CIRCUIT PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, record and erase DTC's.

Cycle the ignition switch from off to on.

Cycle and hold the Adjustable Pedals Switch forward, rearward, and forward at two second intervals.

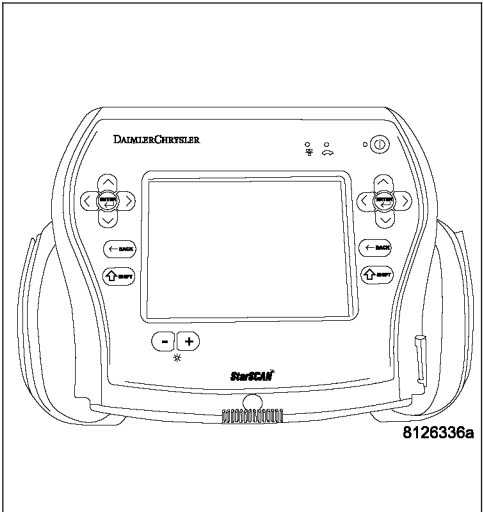
With the scan tool, read DTC's

**Does the scan tool display: B1D67-ADJUSTABLE PEDAL CONTROL CIRCUIT PERFORMANCE?**

- Yes

>> Go To 2
- No

>> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform APS VERIFICATION TEST - VER 1.



**B1D67-ADJUSTABLE PEDAL CONTROL CIRCUIT PERFORMANCE (CONTINUED)****2. CHECK CONNECTOR/TERMINAL FOR DAMAGE**

**Note:** Check all terminals for broken, bent, pushed out, or corroded terminals.

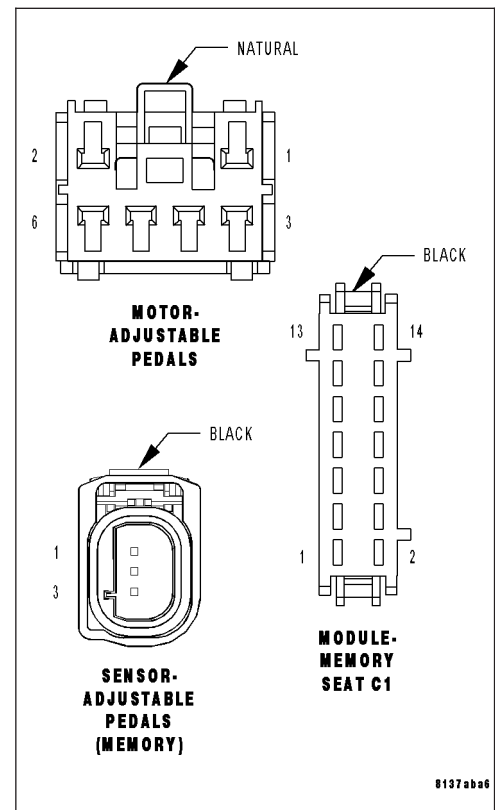
Turn the ignition off.

Inspect the Memory Seat Module harness connector, Adjustable Pedals Motor, and Adjustable Pedals Motor harness connector.

**Is the Adjustable Pedals Motor or any of the connectors/terminals damaged?**

**Yes** >> Repair as necessary.  
Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK ADJUSTABLE PEDALS ASSEMBLY FOR MECHANICAL DAMAGE**

Turn the ignition off.

Inspect the Adjustable Pedals Assembly for any physical damage.

**Note:** Check for any conditions that would cause the motor to stall or be stuck.

**Is the Adjustable Pedals Assembly damaged or broken?**

**Yes** >> Replace the Adjustable Pedals Assembly in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 4

**B1D67-ADJUSTABLE PEDAL CONTROL CIRCUIT PERFORMANCE (CONTINUED)****4. CHECK (P205) ADJUSTABLE PEDALS MOTOR FORWARD CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Memory Seat Module harness connector.

Disconnect the Adjustable Pedals Motor harness connector.

Connect a jumper wire between the (P205) Adjustable Pedals Motor Forward circuit and ground.

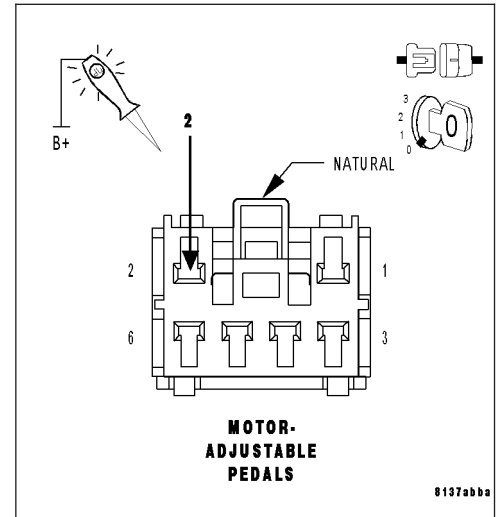
Using a 12-volt test light connected to 12-volts, probe the (P205) Adjustable Pedals Motor Forward circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 5

**No** >> Repair the (P205) Adjustable Pedals Motor Forward circuit for an open.

Perform APS VERIFICATION TEST - VER 1.

**5. CHECK (P206) ADJUSTABLE PEDALS MOTOR REARWARD CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Memory Seat Module harness connector.

Disconnect the Adjustable Pedals Motor harness connector.

Connect a jumper wire between the (P206) Adjustable Pedals Motor Rearward circuit and ground.

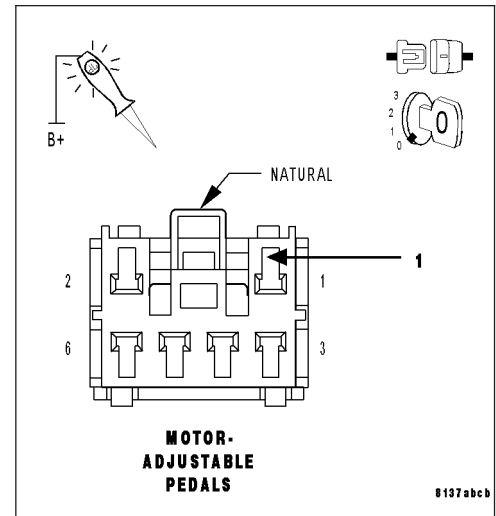
Using a 12-volt test light connected to 12-volts, probe the (P206) Adjustable Pedals Motor Rearward circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 6

**No** >> Repair the (P206) Adjustable Pedals Motor Rearward circuit for an open.

Perform APS VERIFICATION TEST - VER 1.



**B1D67-ADJUSTABLE PEDAL CONTROL CIRCUIT PERFORMANCE (CONTINUED)****6. CHECK (G914) SENSOR RETURN CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Memory Seat Module harness connector.

Disconnect the Adjustable Pedals Sensor harness connector.

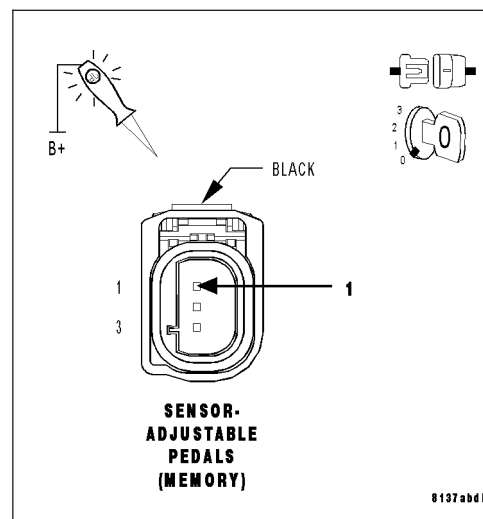
Connect a jumper wire between the (G914) Sensor Return circuit and ground.

Using a 12-volt test light connected to 12-volts, probe the (G914) Sensor Return circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To

**No** >> Repair the (G914) Sensor Return circuit for an open.  
Perform APS VERIFICATION TEST - VER 1.

**7. CHECK ADJUSTABLE PEDALS MOTOR**

Turn the ignition off.

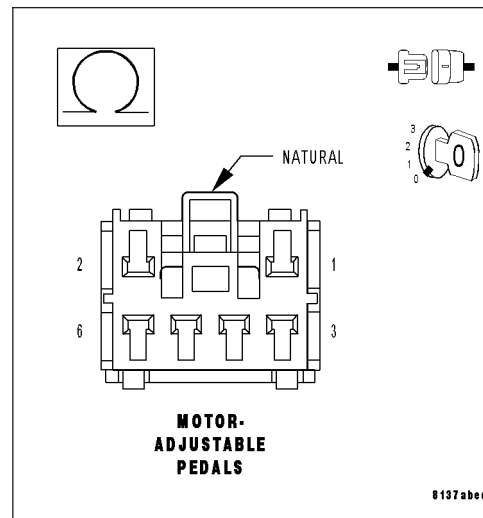
Disconnect the Adjustable Pedals Motor harness connector.

Measure the resistance between the (P205) Adjustable Pedals Motor Forward and (P206) Adjustable Pedals Motor Rearward terminals at the Adjustable Pedals Motor.

**Is the resistance below 100.0 ohms?**

**Yes** >> Replace and reprogram the Memory Seat Module in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.

**No** >> Replace the Adjustable Pedals Motor in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.



## APS VERIFICATION TEST – VER 1

### Diagnostic Test

1.

1. Ensure all accessories are turned off and the battery is fully charged.
2. Connect all previously disconnected components and connectors.
3. If the Memory Seat Module was replaced, reprogram the the Adjustable Pedals hard stop.
4. Start with the Adjustable Pedals going forward.
5. When the Adjustable Pedals reach full travel, continue to apply the Adjustable Pedals Switch for 10 seconds to learn the hard stop.
6. Repeat this step in both travel directions.
7. Verify that the Adjustable Pedals System is disabled with the vehicle in reverse.
8. Verify that the Adjustable Pedals System is disabled when the speed control is activated.
9. Ensure that the ignition is on, and with the scan tool, erase all Diagnostic Trouble Codes from All modules.
10. Fully operate the Adjustable Pedals System.
11. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the scan tool, read DTC's from all modules.
12. If any Diagnostic Trouble Codes are present, return to symptom list and trouble shoot new or recurring symptom.
13. Again, with the scan tool read DTC's. If any DTC's are present, return to Symptom list.
14. If there are no Diagnostic Trouble Codes (DTC's) present, and the customer's concern can no longer be duplicated, the repair is complete.

**Are any DTC's present or is the original concern still present?**

**Yes**    >> Repair is not complete, refer to appropriate symptom.

**No**     >> Repair is complete.

---

## ABS-INTERMITTENT CONDITION

For the Anti-Lock Brake TCS/ESP circuit diagrams.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

### Diagnostic Test

1.

**Note:** The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

1. Refer to any Technical Service Bulletins (TSBs) that may apply.
2. Review the scan tool Freeze Frame information. If possible, try to duplicate the conditions under which the DTC set.
3. Turn the ignition off.
4. Visually inspect the related wire harness. Disconnect all the related harness connectors. Look for any chafed, pierced, pinched, partially broken wires and broken, bent, pushed out, or corroded terminals.
5. Perform a voltage drop test on the related circuits between the suspected faulty component and the Anti-Lock Brake Module.
6. Inspect and clean all PCM, ABS, engine, and chassis grounds that are related to the most current DTC.
7. If numerous trouble codes were set, use a wire schematic and look for any common ground or supply circuits
8. For any Relay DTCs, actuate the Relay with the scan tool and wiggle the related wire harness to try to interrupt the actuation.
9. Use the scan tool to perform a System Test if one applies to failing component.
10. A co-pilot, data recorder, and/or lab scope should be used to help diagnose intermittent conditions.

#### Were any problems found during the above inspections?

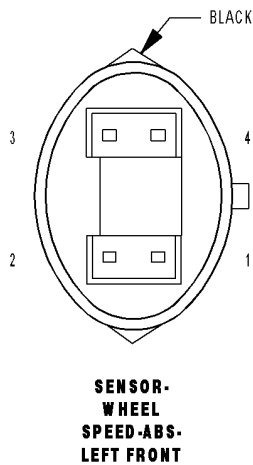
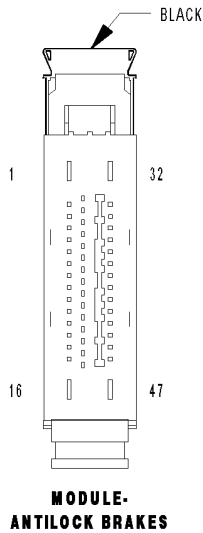
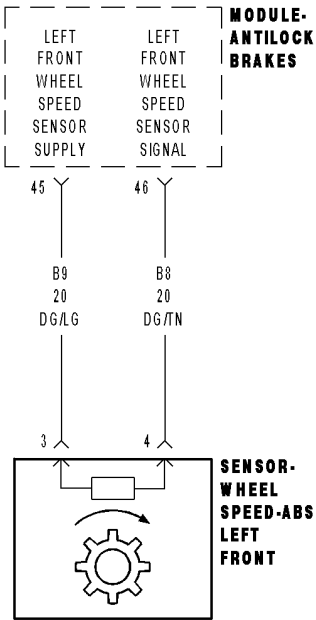
**Yes** >> Perform the necessary repairs.  
Perform ABS VERIFICATION TEST VER - 1.

**No** >> Test Complete.

---



C100A-LEFT FRONT WHEEL SPEED SENSOR CIRCUIT



**C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Left Front Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
TERMINAL/CONNECTOR/TONE WHEEL DAMAGE (B8) LEFT FRONT WSS SIGNAL CIRCUIT AND (B9) LEFT FRONT WSS SUPPLY CIRCUIT SHORTED TOGETHER (B9) LEFT FRONT WSS SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B8) LEFT FRONT WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN LEFT FRONT WSS ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

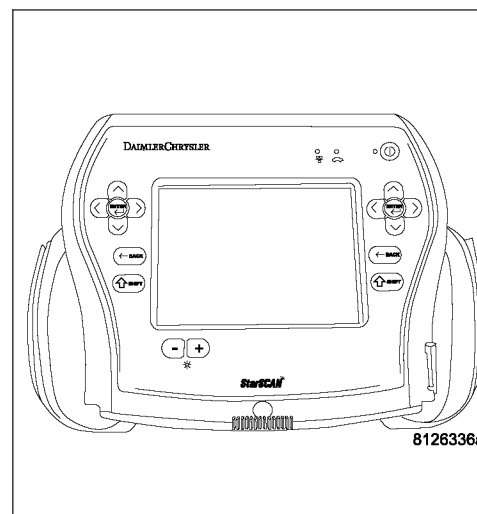
Cycle the ignition switch from off to on.

With the scan tool, read and record DTC's

**Does the scan tool display: C100A–LEFT FRONT WHEEL SPEED SENSOR CIRCUIT?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C100A-LEFT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

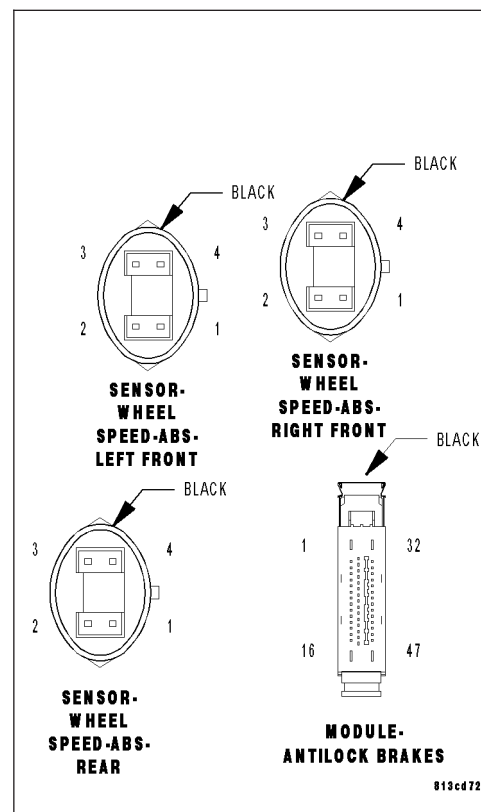
**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

Visually inspect the Anti-Lock Brake Module harness connector, Left Front WSS, Left Front WSS harness connector, and Left Front WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (B8) LEFT FRONT WSS SIGNAL AND THE (B9) LEFT FRONT WSS SUPPLY CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

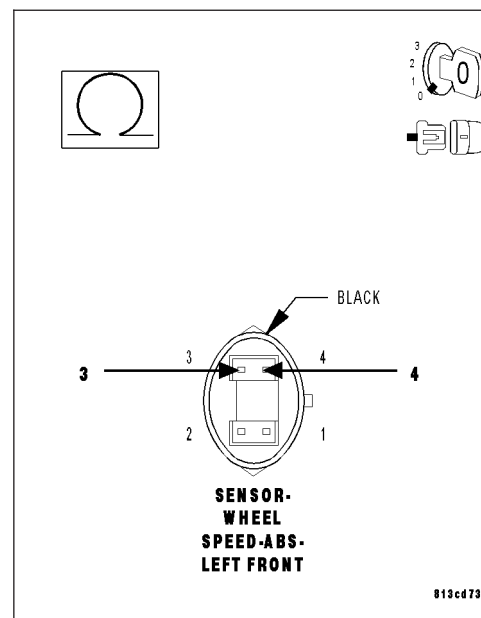
Disconnect the Left Front WSS harness connector.

Measure the resistance between the (B8) Left Front WSS Signal and the (B9) Left Front WSS Supply circuits at the Left Front WSS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (B8) Left Front WSS Signal and the (B9) Left Front WSS Supply circuits for a short together.  
Perform ABS VERIFICATION TEST - VER 1.



**C100A-LEFT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****4. CHECK THE VOLTAGE ON THE (B9) LEFT FRONT WSS SUPPLY CIRCUIT**

Turn the ignition off.

Reconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

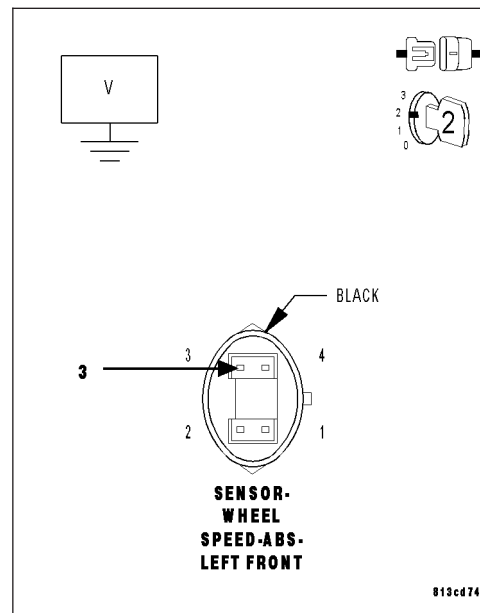
Turn the ignition on.

Measure the voltage of the (B9) Left Front WSS Supply circuit in the Left Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 8

**No** >> Go To 5

**5. CHECK THE (B9) LEFT FRONT WSS SUPPLY CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

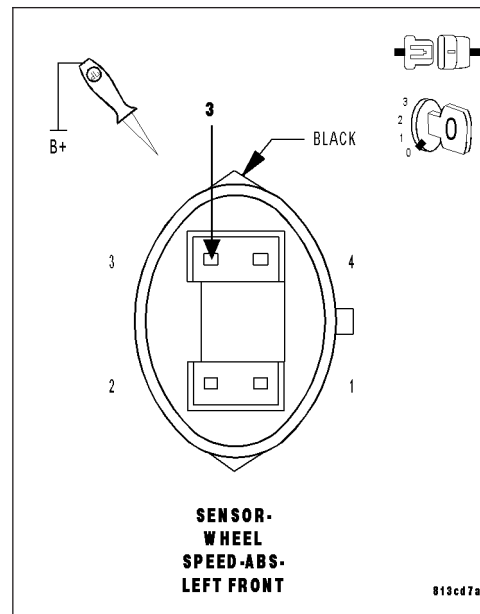
Using a 12-volt test light connected to 12-volts, check the (B9) Left Front WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B9) Left Front WSS Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C100A-LEFT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****6. CHECK THE (B9) LEFT FRONT WSS SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

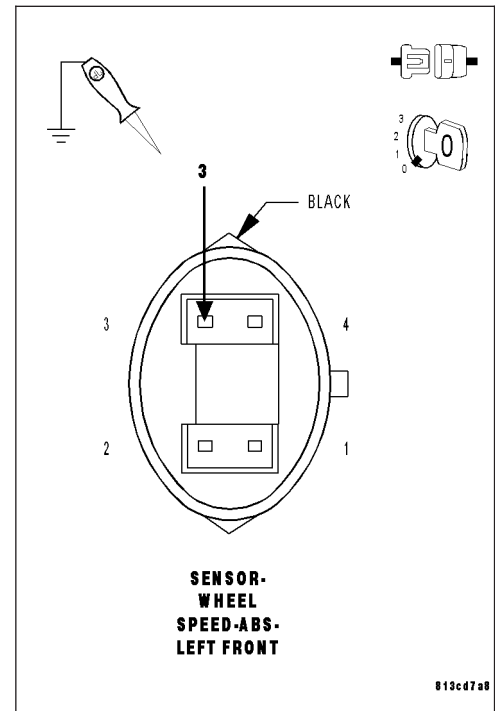
Using a 12-volt test light connected to ground, check the (B9) Left Front WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B9) Left Front WSS Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B9) LEFT FRONT WSS SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

Connect a jumper wire between the (B9) Left Front WSS Supply circuit and ground.

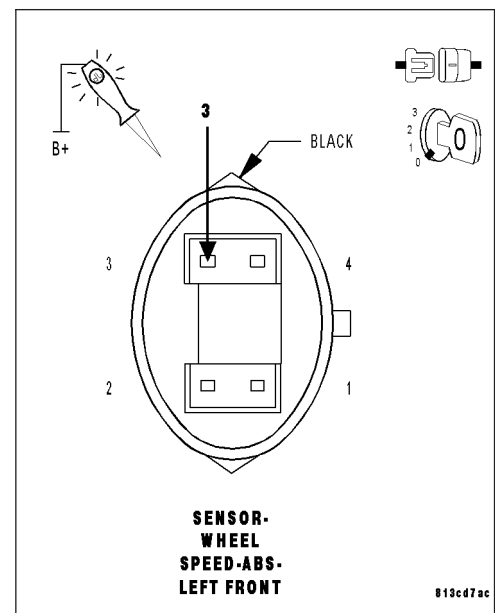
Using a 12-volt test light connected to 12-volts, check the (B9) Left Front WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B9) Left Front WSS Supply circuit for an open. Perform ABS VERIFICATION TEST - VER 1.



**C100A-LEFT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****8. CHECK THE (B9) LEFT FRONT WSS SUPPLY AND THE (B8) LEFT FRONT WSS SIGNAL VOLTAGE**

Turn the ignition off.

Disconnect the Left Front WSS harness connector.

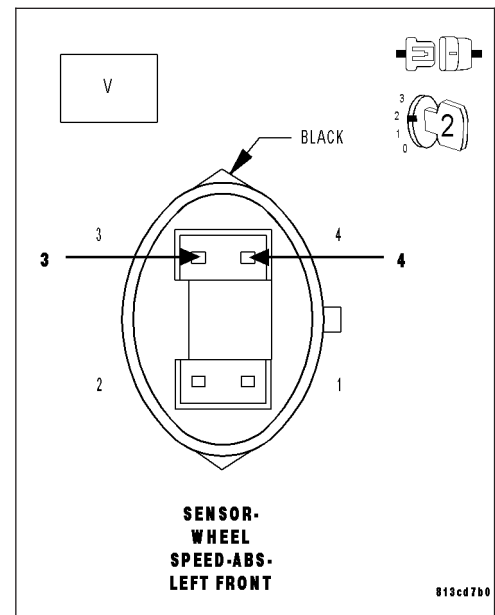
Turn the ignition on.

Measure the voltage between the (B9) Left Front WSS Supply and (B8) Left Front WSS Signal circuits at the Left Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 12

**No** >> Go To 9

**9. CHECK THE (B8) LEFT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

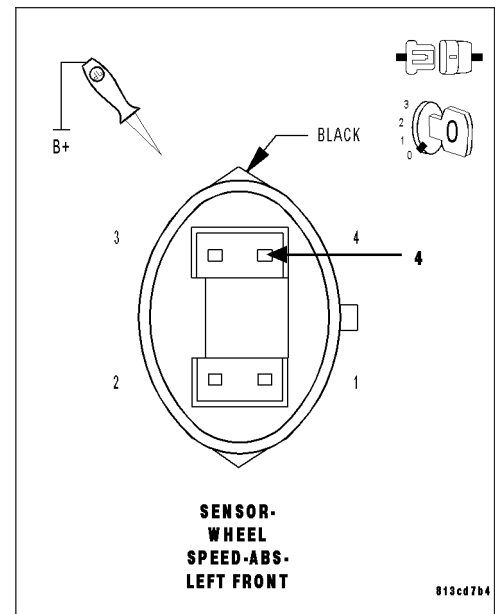
Using a 12-volt test light connected to 12-volts, check the (B8) Left Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B8) Left Front WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C100A-LEFT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****10. CHECK THE (B8) LEFT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

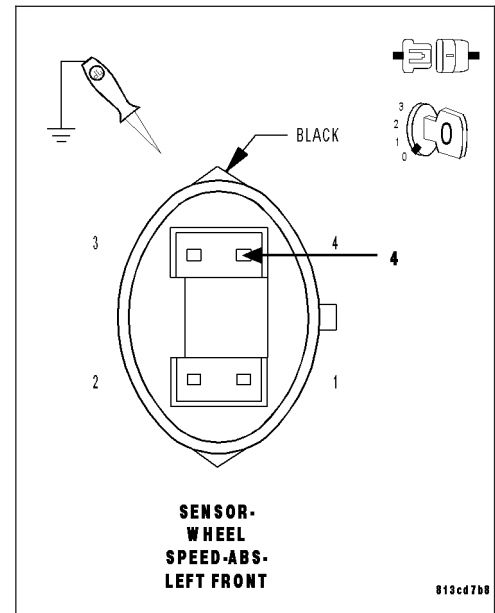
Using a 12-volt test light connected to ground, check the (B8) Left Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B8) Left Front WSS Signal circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (B8) LEFT FRONT WSS SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

Connect a jumper wire between the (B8) Left Front WSS Signal circuit and ground.

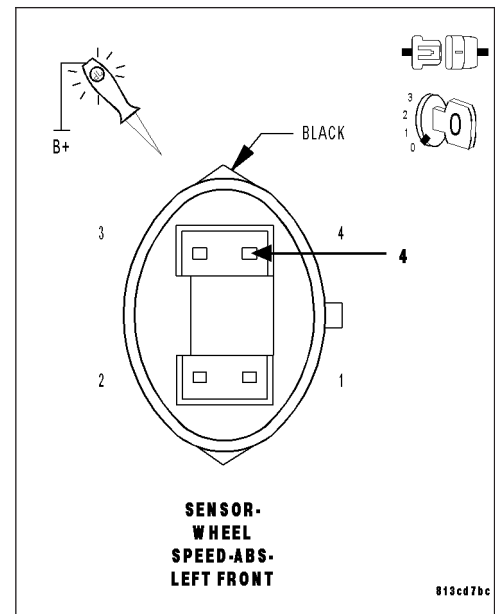
Using a 12-volt test light connected to 12-volts, check the (B8) Left Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B8) Left Front WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



**C100A-LEFT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****12. CHECK THE (B8) LEFT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

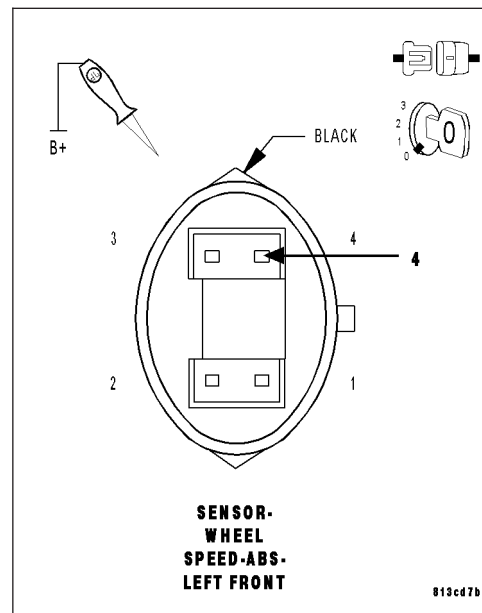
Using a 12-volt test light connected to 12-volts, check the (B8) Left Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B8) Left Front WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B8) LEFT FRONT WSS SIGNAL VOLTAGE AT THE LEFT FRONT WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

While back probing, measure between the (B8) Left Front WSS Signal circuit and chassis ground at the Left Front WSS harness connector.

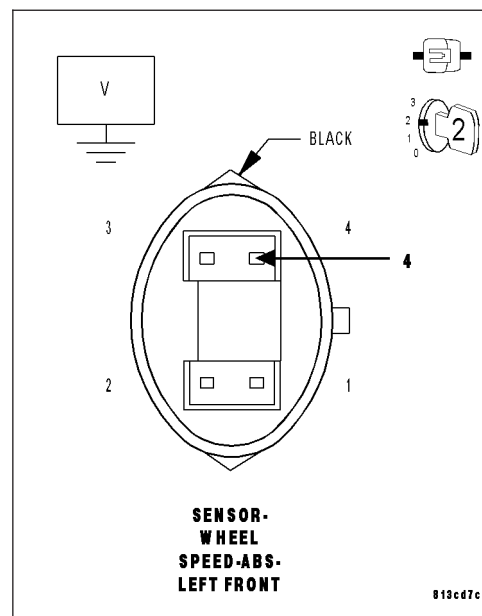
Slowly rotate the wheel by hand.

**Did the (B8) Left Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 14

**No** >> Replace the Left Front WSS in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.





**C100A-LEFT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****14. CHECK THE (B8) LEFT FRONT WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

Turn the ignition on.

While back probing, measure between the (B8) Left Front WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

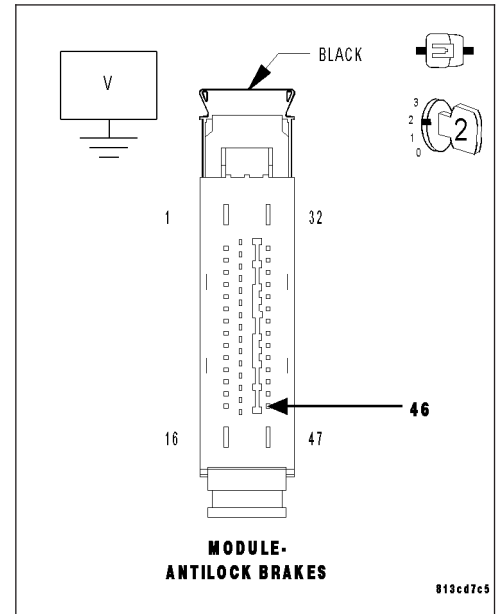
Slowly rotate the wheel by hand.

**Did the (B8) Left Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

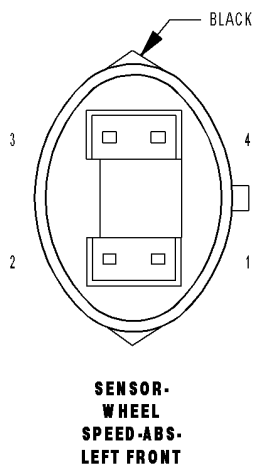
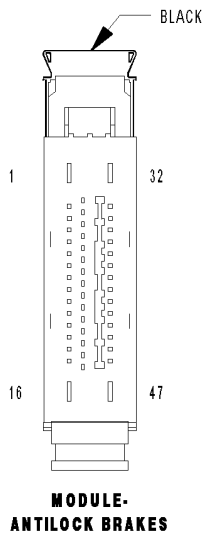
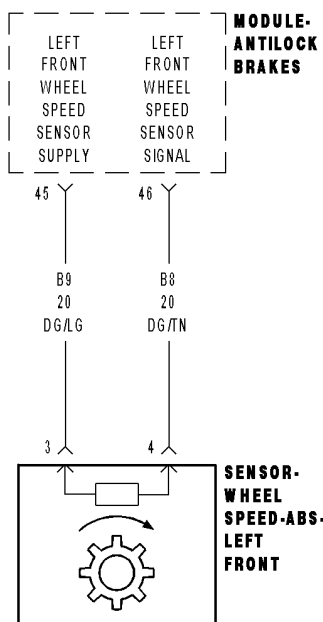
**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B8) Left Front WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



## C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE



C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Left Front Wheel Speed Signal circuit indicates continuously too high or too low wheel speed.

Possible Causes
TERMINAL/CONNECTOR/TONE WHEEL DAMAGE (B8) LEFT FRONT WSS SIGNAL CIRCUIT AND (B9) LEFT FRONT WSS SUPPLY CIRCUIT SHORTED TOGETHER (B9) LEFT FRONT WSS SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B8) LEFT FRONT WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN LEFT FRONT WSS ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR A DTC C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE

**Note:** This DTC must be active for the results of this test to be valid.

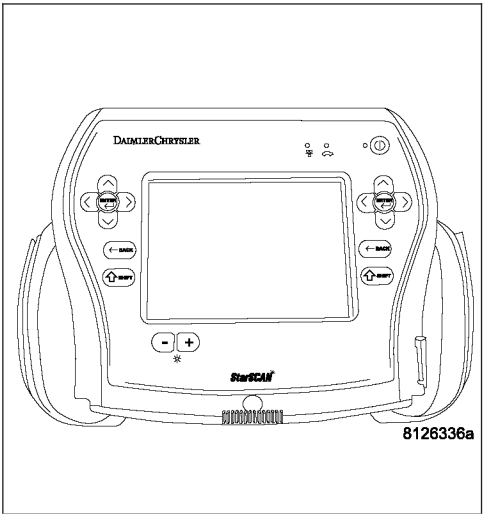
- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.

**CAUTION:** Ensure braking capability is available before road testing.

- Drive the vehicle over 25 km/h (15 mph).
- Park the vehicle and cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's

**Does the scan tool display: C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

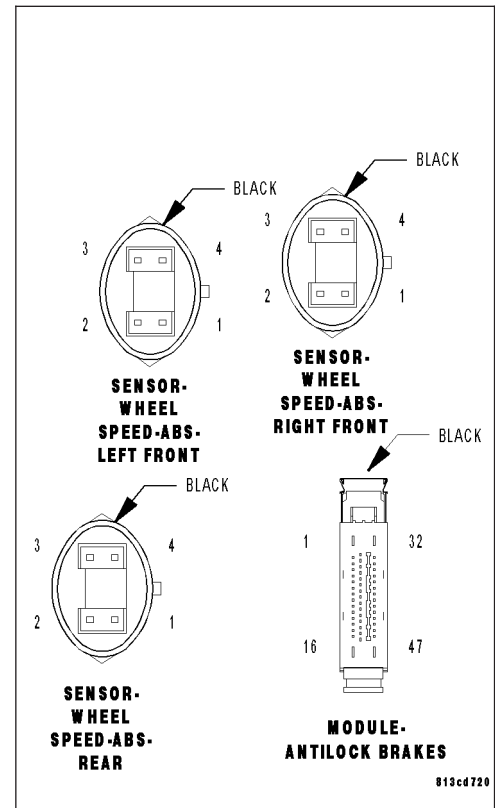
**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

Visually inspect the Anti-Lock Brake Module harness connector, Left Front WSS, Left Front WSS harness connector, and Left Front WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (B8) LEFT FRONT WSS SIGNAL AND THE (B9) LEFT FRONT WSS SUPPLY CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

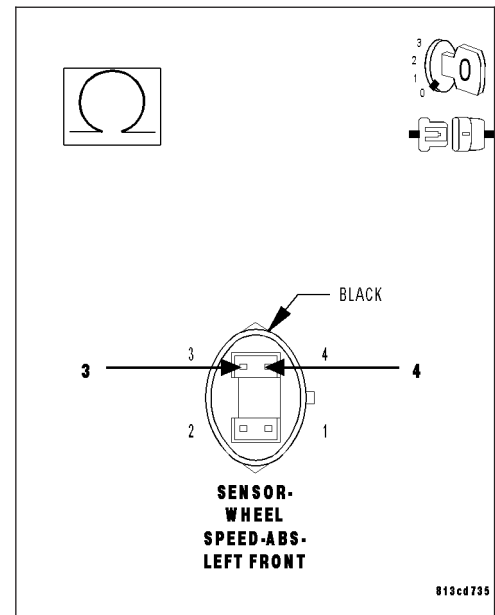
Disconnect the Left Front WSS harness connector.

Measure the resistance between the (B8) Left Front WSS Signal and the (B9) Left Front WSS Supply circuits at the Left Front WSS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (B8) Left Front WSS Signal and the (B9) Left Front WSS Supply circuits for a short together.  
Perform ABS VERIFICATION TEST - VER 1.



**C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****4. CHECK THE VOLTAGE ON THE (B9) LEFT FRONT WSS SUPPLY CIRCUIT**

Turn the ignition off.

Reconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

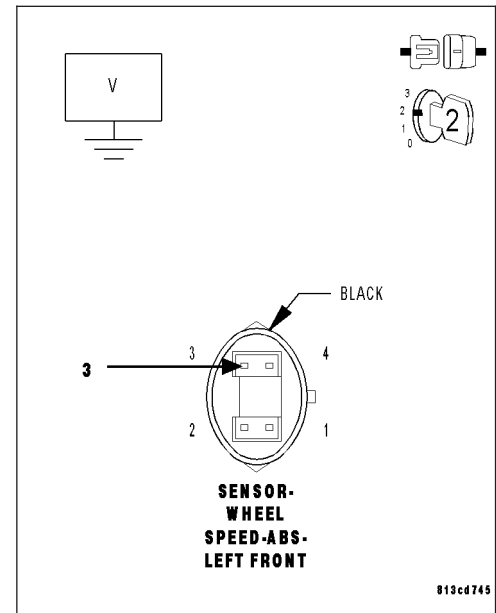
Turn the ignition on.

Measure the voltage of the (B9) Left Front WSS Supply circuit in the Left Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 8

**No** >> Go To 5

**5. CHECK THE (B9) LEFT FRONT WSS SUPPLY CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

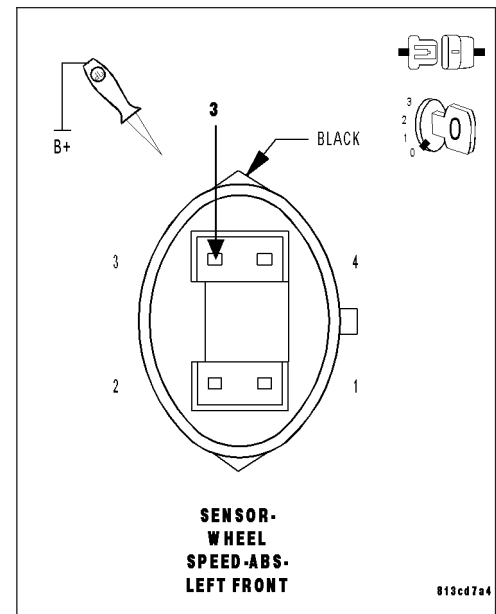
Using a 12-volt test light connected to 12-volts, check the (B9) Left Front WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B9) Left Front WSS Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****6. CHECK THE (B9) LEFT FRONT WSS SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

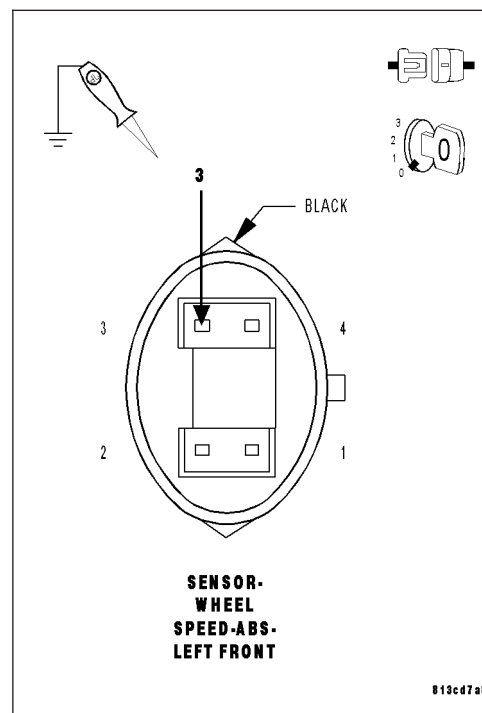
Using a 12-volt test light connected to ground, check the (B9) Left Front WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B9) Left Front WSS Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B9) LEFT FRONT WSS SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

Connect a jumper wire between the (B9) Left Front WSS Supply circuit and ground.

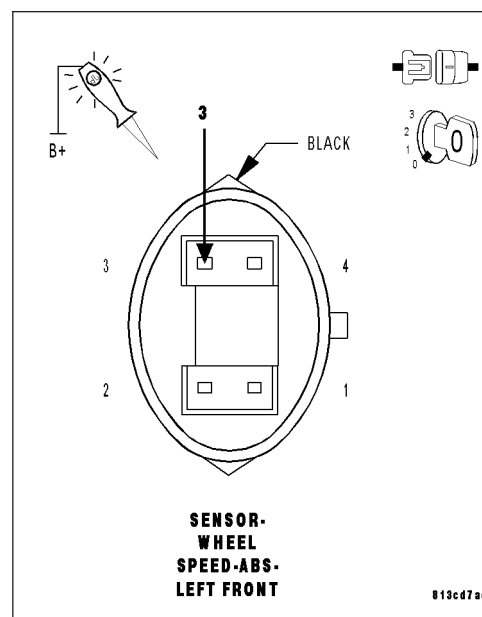
Using a 12-volt test light connected to 12-volts, check the (B9) Left Front WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B9) Left Front WSS Supply circuit for an open. Perform ABS VERIFICATION TEST - VER 1.



**C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****8. CHECK THE (B9) LEFT FRONT WSS SUPPLY AND THE (B8) LEFT FRONT WSS SIGNAL VOLTAGE**

Turn the ignition off.

Disconnect the Left Front WSS harness connector.

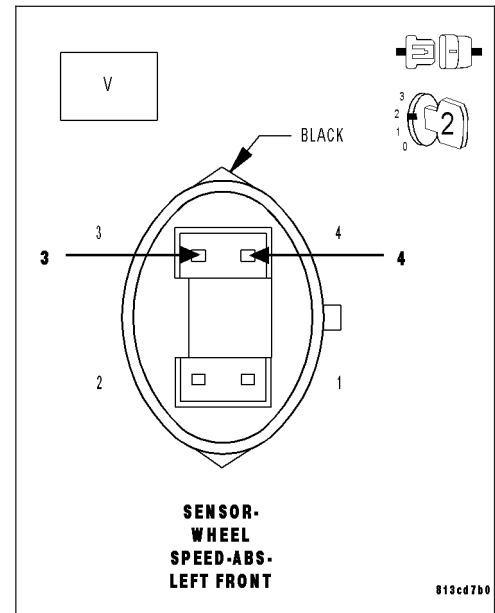
Turn the ignition on.

Measure the voltage between the (B9) Left Front WSS Supply and (B8) Left Front WSS Signal circuits at the Left Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 12

**No** >> Go To 9

**9. CHECK THE (B8) LEFT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

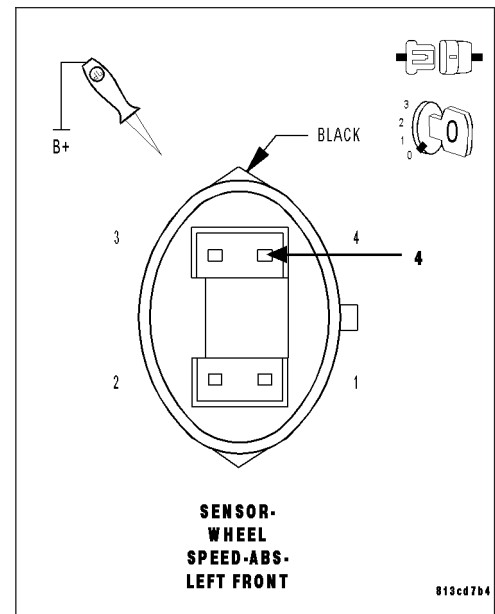
Using a 12-volt test light connected to 12-volts, check the (B8) Left Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B8) Left Front WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****10. CHECK THE (B8) LEFT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

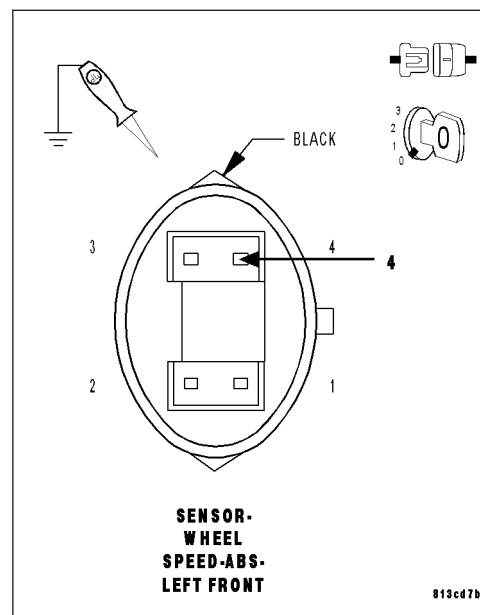
Using a 12-volt test light connected to ground, check the (B8) Left Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B8) Left Front WSS Signal circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (B8) LEFT FRONT WSS SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

Connect a jumper wire between the (B8) Left Front WSS Signal circuit and ground.

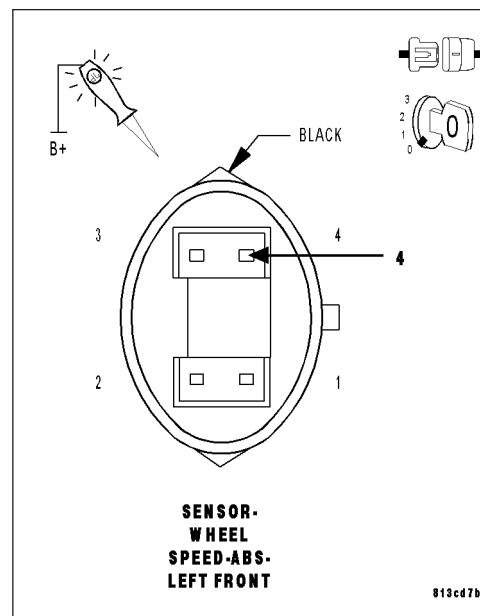
Using a 12-volt test light connected to 12-volts, check the (B8) Left Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B8) Left Front WSS Signal circuit for an open. Perform ABS VERIFICATION TEST - VER 1.





**C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****12. CHECK THE (B8) LEFT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Front WSS harness connector.

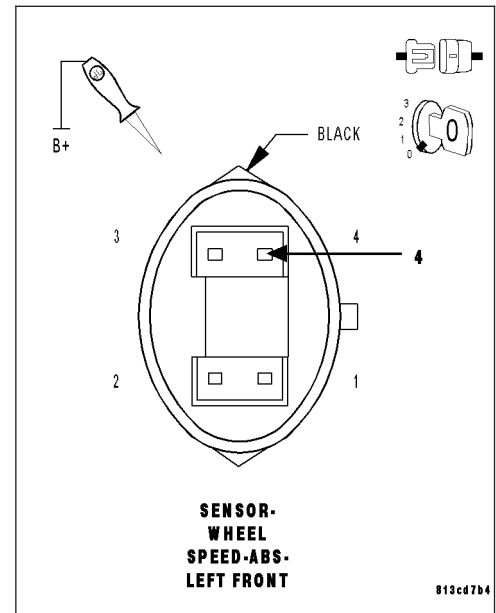
Using a 12-volt test light connected to 12-volts, check the (B8) Left Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B8) Left Front WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B8) LEFT FRONT WSS SIGNAL VOLTAGE AT THE LEFT FRONT WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

While back probing, measure between the (B8) Left Front WSS Signal circuit and chassis ground at the Left Front WSS harness connector.

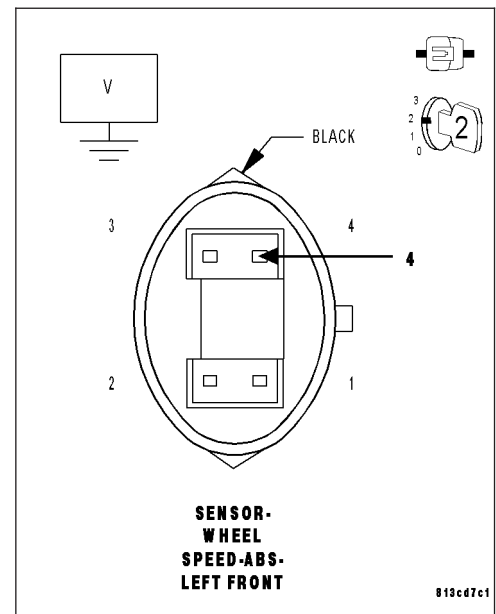
Slowly rotate the wheel by hand.

**Did the (B8) Left Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 14

**No** >> Replace the Left Front WSS in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.



**C1011-LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****14. CHECK THE (B8) LEFT FRONT WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

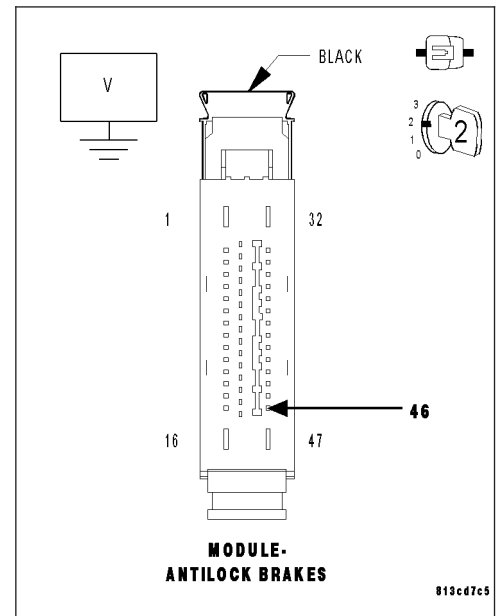
Turn the ignition on.

While back probing, measure between the (B8) Left Front WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

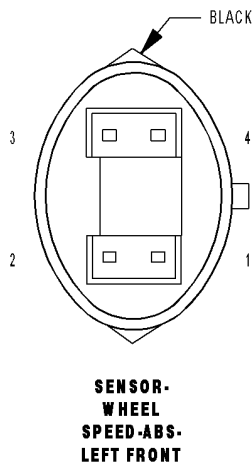
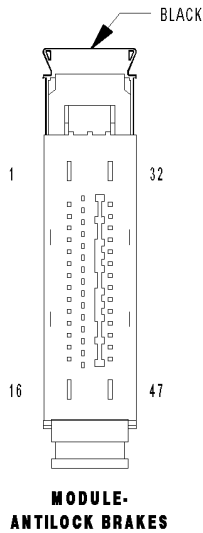
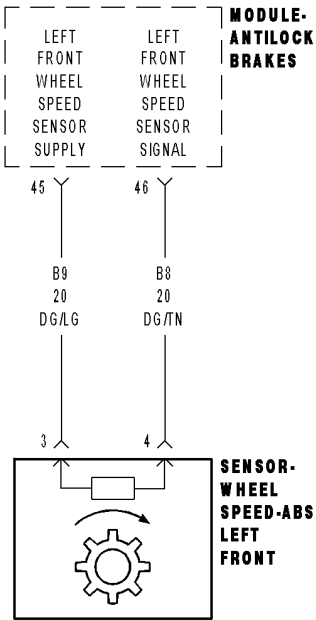
Slowly rotate the wheel by hand.

**Did the (B8) Left Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B8) Left Front WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



C1014-LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE



**C1014-LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Left Front Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS/TONE WHEEL DAMAGE (B8) LEFT FRONT WSS SIGNAL CIRCUIT OPEN LEFT FRONT WSS ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C1014-LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

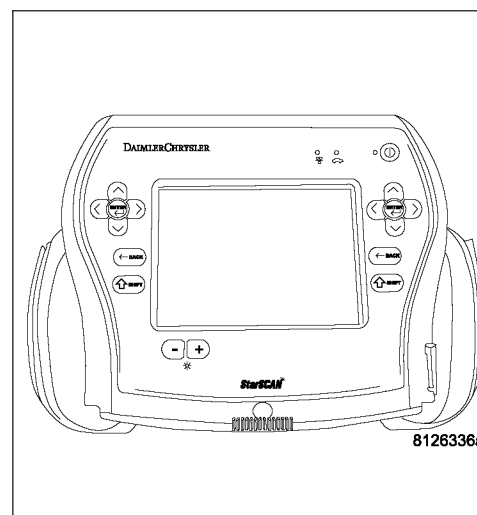
**CAUTION:** Ensure brake capability is available before road testing.

Have an assistant test drive the vehicle in a straight line to 40 Km/h (25 mph) while monitoring all the WSS speeds with the scan tool.

**Did the LF WSS speed differ by 8 Km/h (5 mph) or show NO speed?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C1014-LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

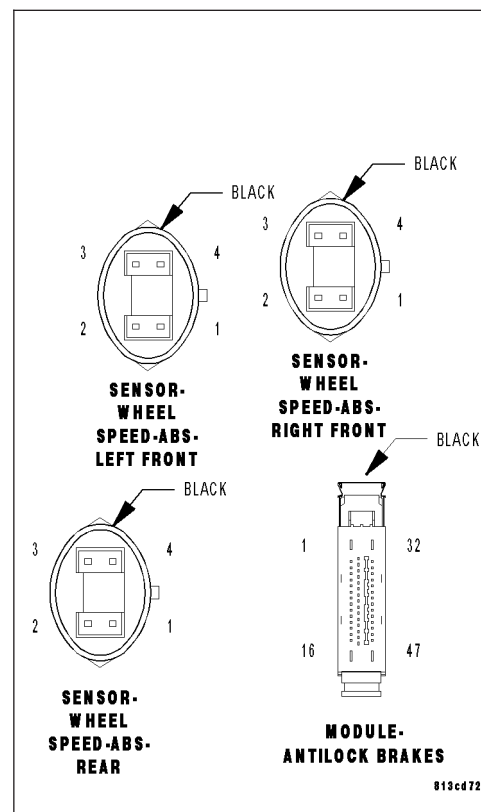
**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

Visually inspect the Anti-Lock Brake Module harness connector, Left Front WSS, Left Front WSS harness connector, and Left Front WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE BETWEEN (B9) LEFT FRONT WSS SUPPLY CIRCUIT AND THE (B8) LEFT FRONT WSS SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the Left Front WSS harness connector.

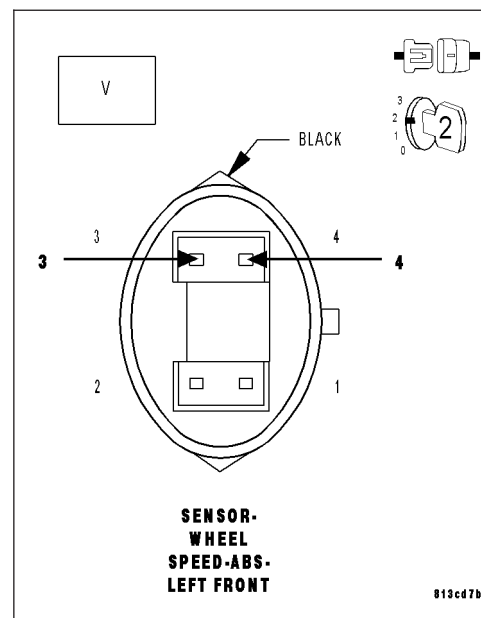
Turn the ignition on.

Measure the voltage between the (B9) Left Front WSS Supply and (B8) Left Front WSS Signal circuits at the Left Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 4

**No** >> Refer to DTC-C100A LEFT FRONT WHEEL SPEED SENSOR CIRCUIT for the diagnostic repair procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C1014-LEFT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)****4. CHECK THE (B8) LEFT FRONT WSS SIGNAL VOLTAGE AT THE LEFT FRONT WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

While back probing, measure between the (B8) Left Front WSS Signal circuit and chassis ground at the Left Front WSS harness connector.

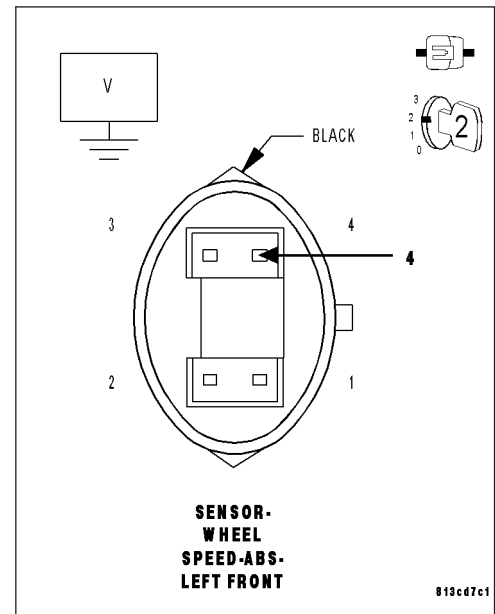
Slowly rotate the wheel by hand.

**Did the (B8) Left Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 5

**No** >> Replace the Left Front WSS in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**5. CHECK THE (B8) LEFT FRONT WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

Turn the ignition on.

While back probing, measure between the (B8) Left Front WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

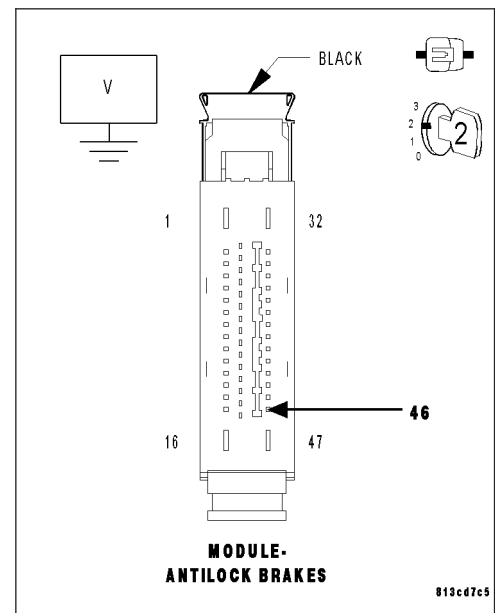
Slowly rotate the wheel by hand.

**Did the (B8) Left Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

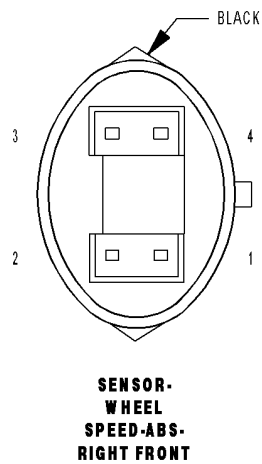
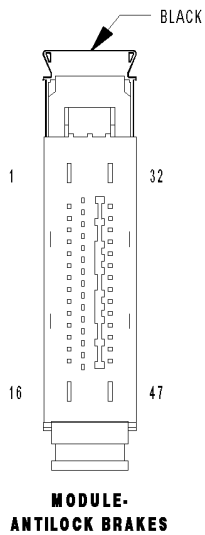
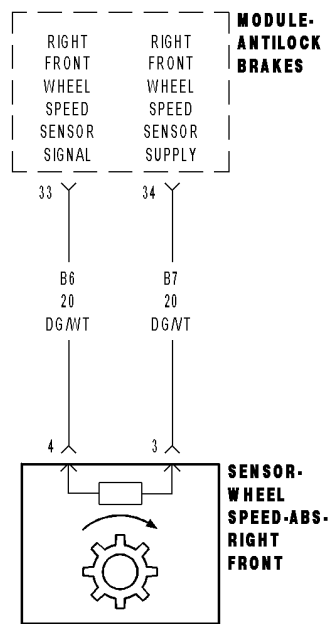
**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B8) Left Front WSS Signal circuit for an open. Perform ABS VERIFICATION TEST - VER 1.



C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT



**C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Right Front Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
TERMINAL/CONNECTOR/TONE WHEEL DAMAGE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT AND (B7) RIGHT FRONT WSS SUPPLY CIRCUIT SHORTED TOGETHER (B7) RIGHT FRONT WSS SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B6) RIGHT FRONT WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN RIGHT FRONT WSS ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

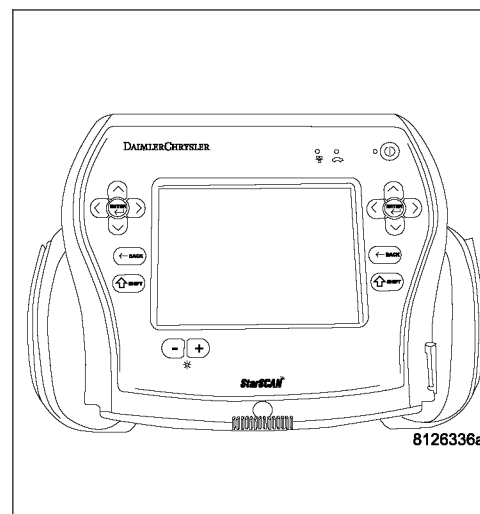
Cycle the ignition switch from off to on.

With the scan tool, read and record DTC's

**Does the scan tool display: C1015–RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.





**C1015-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

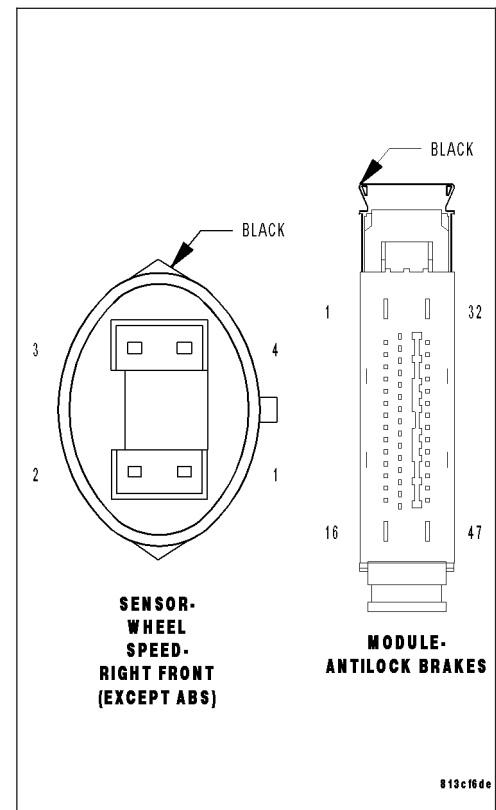
Visually inspect the Anti-Lock Brake Module harness connector, Right Front WSS, Right Front WSS harness connector, and Right Front WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (B6) RIGHT FRONT WSS SIGNAL AND THE (B7) RIGHT FRONT WSS SUPPLY CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

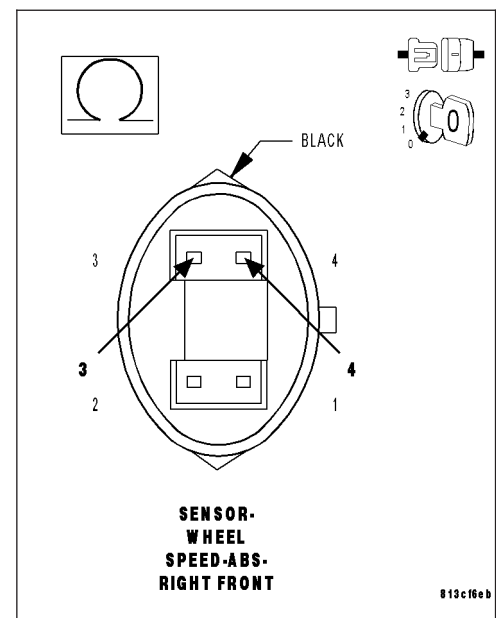
Disconnect the Right Front WSS harness connector.

Measure the resistance between the (B6) Right Front WSS Signal and the (B7) Right Front WSS Supply circuits at the Right Front WSS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (B6) Right Front WSS Signal and the (B7) Right Front WSS Supply circuits for a short together. Perform ABS VERIFICATION TEST - VER 1.



**C1015-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****4. CHECK THE VOLTAGE ON THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT**

Turn the ignition off.

Reconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

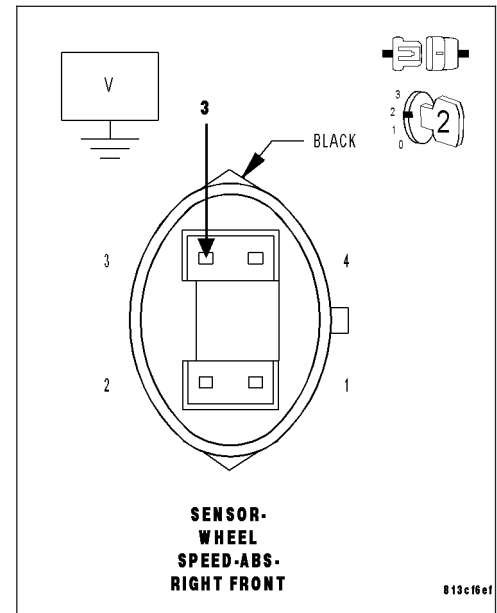
Turn the ignition on.

Measure the voltage of the (B7) Right Front WSS Supply circuit in the Right Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 8

**No** >> Go To 5

**5. CHECK THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

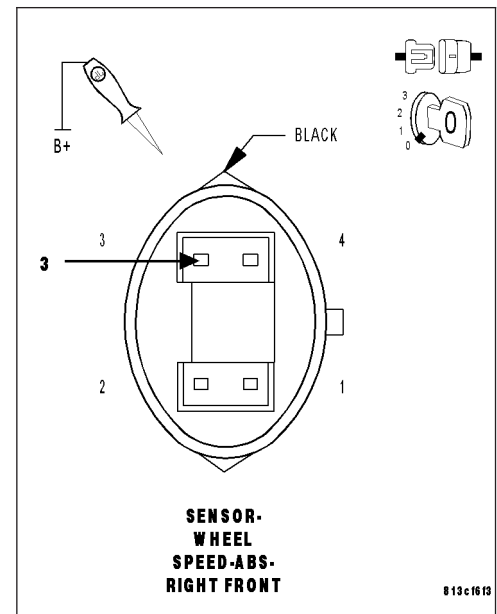
Using a 12-volt test light connected to 12-volts, check the (B7) Right Front WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B7) Right Front WSS Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C1015-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****6. CHECK THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

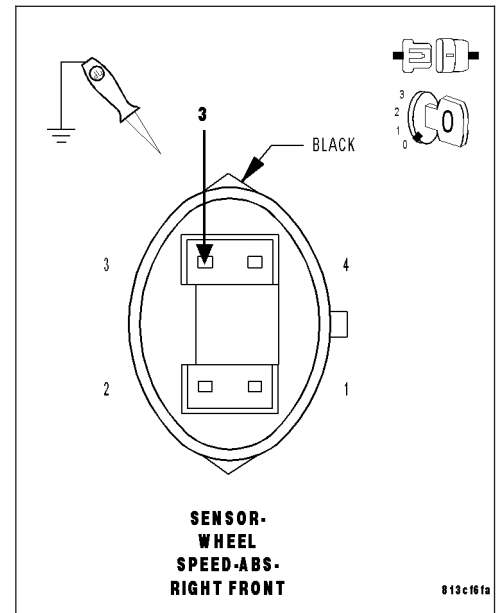
Using a 12-volt test light connected to ground, check the (B7) Right Front WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B7) Right Front WSS Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

Connect a jumper wire between the (B7) Right Front WSS Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B7) Right Front WSS Supply circuit.

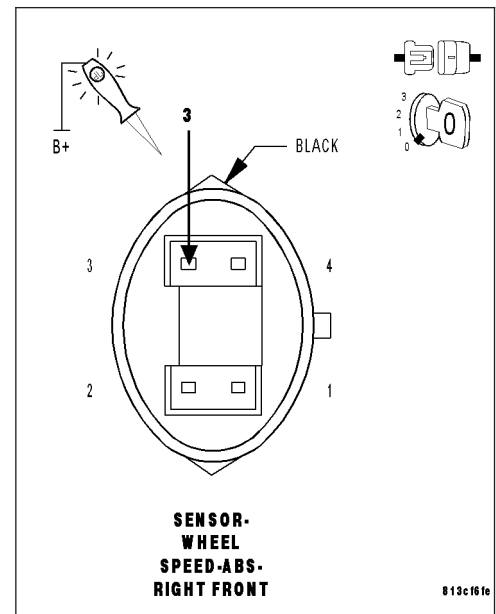
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B7) Right Front WSS Supply circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C1015-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****8. CHECK THE (B7) RIGHT FRONT WSS SUPPLY AND THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE**

Turn the ignition off.

Disconnect the Right Front WSS harness connector.

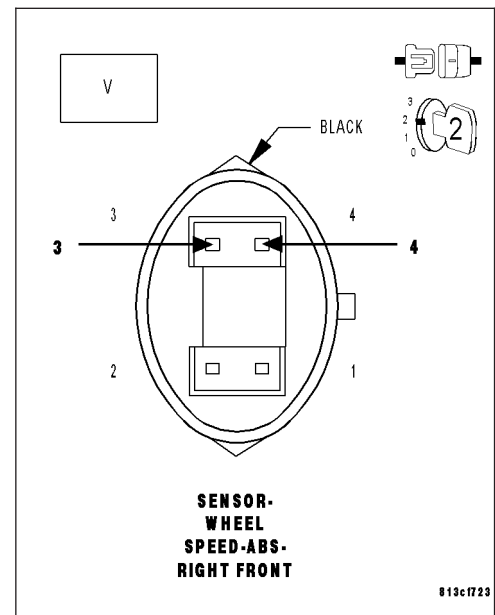
Turn the ignition on.

Measure the voltage between the (B7) Right Front WSS Supply and (B6) Right Front WSS Signal circuits at the Right Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 12

**No** >> Go To 9

**9. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

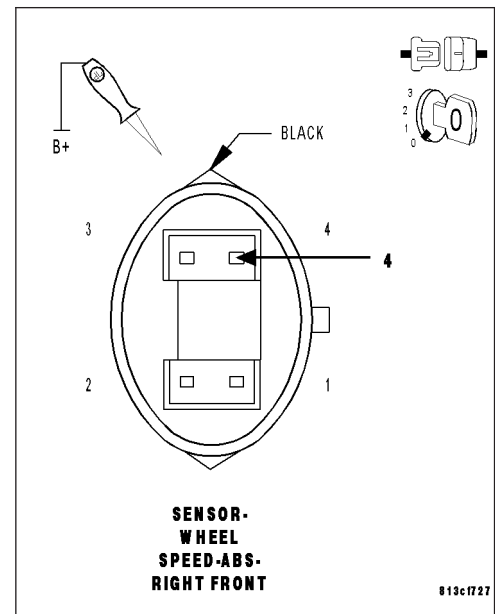
Using a 12-volt test light connected to 12-volts, check the (B6) Right Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B6) Right Front WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C1015-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****10. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

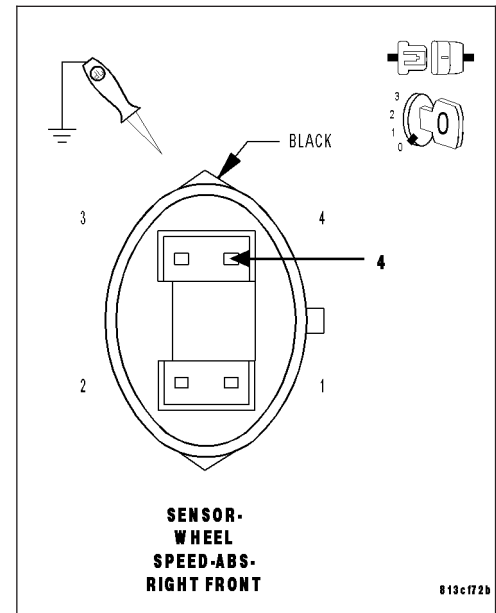
Using a 12-volt test light connected to ground, check the (B6) Right Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B6) Right Front WSS Signal circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

Connect a jumper wire between the (B6) Right Front WSS Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B6) Right Front WSS Signal circuit.

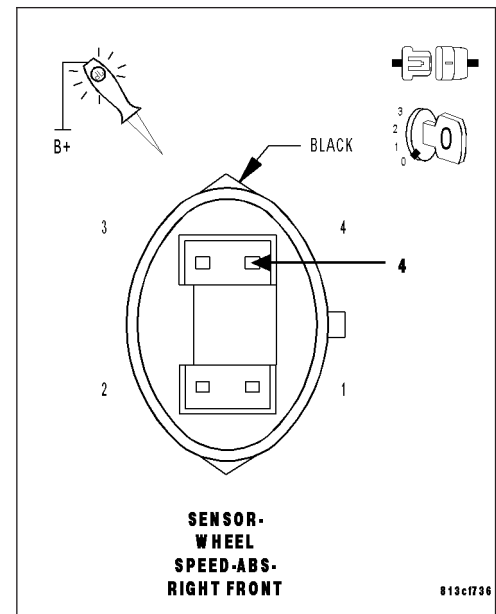
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B6) Right Front WSS Signal circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C1015-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****12. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

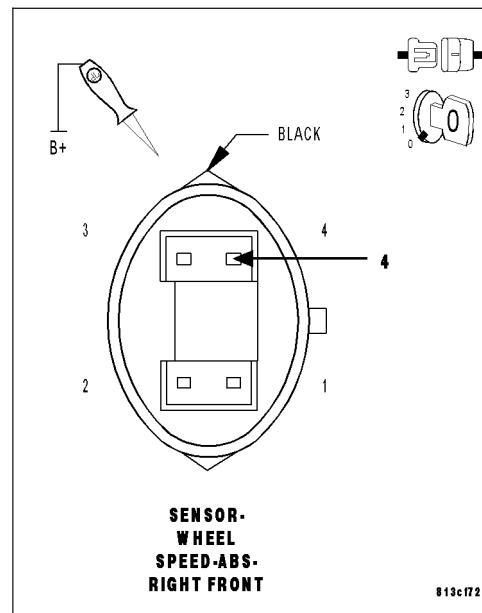
Using a 12-volt test light connected to 12-volts, check the (B6) Right Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B6) Right Front WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE AT THE RIGHT FRONT WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

While back probing, measure between the (B6) Right Front WSS Signal circuit and chassis ground at the Right Front WSS harness connector.

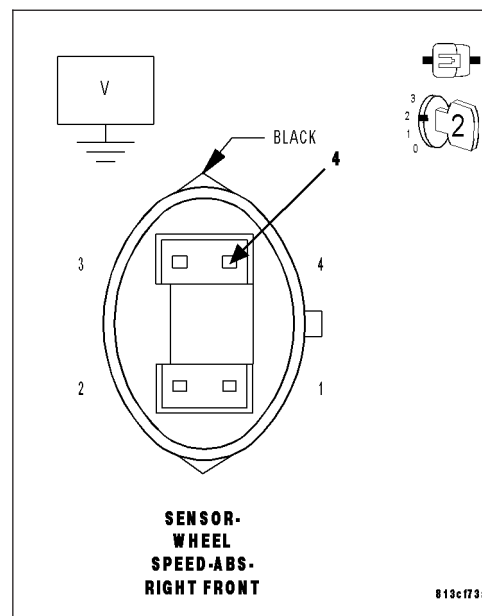
Slowly rotate the wheel by hand.

**Did the (B6) Right Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 14

**No** >> Replace the Right Front WSS in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.



**C1015-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****14. CHECK THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

Turn the ignition on.

While back probing, measure between the (B6) Right Front WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

Slowly rotate the wheel by hand.

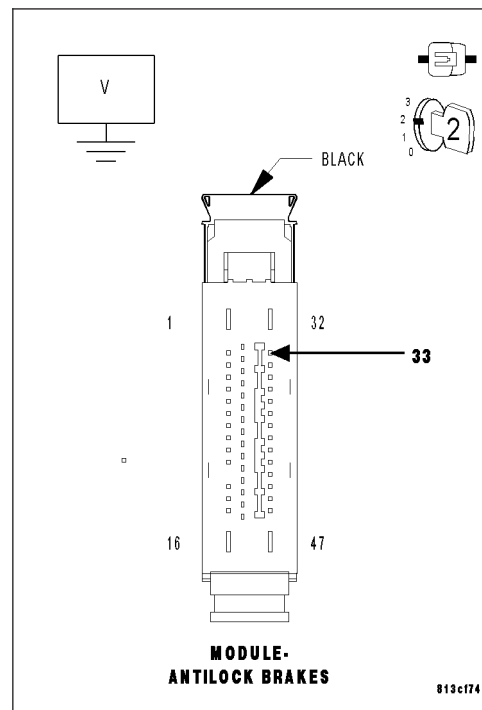
**Did the (B6) Right Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

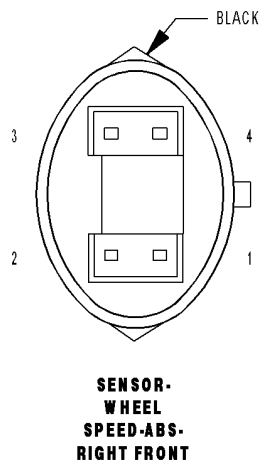
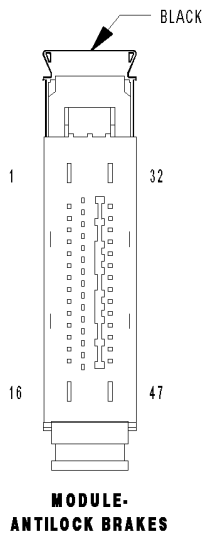
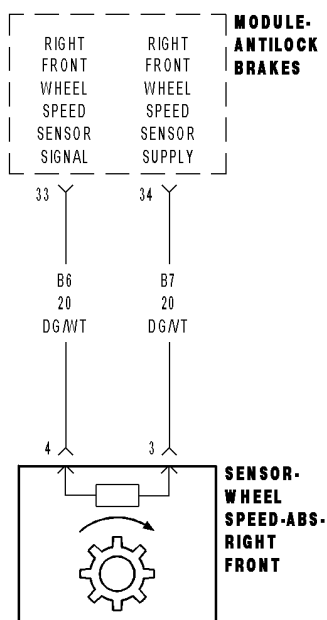
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B6) Right Front WSS Signal circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



## C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE





**C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Right Front Wheel Speed Signal circuit indicates continuously too high or too low wheel speed.

Possible Causes
TERMINAL/CONNECTOR/TONE WHEEL DAMAGE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT AND (B7) RIGHT FRONT WSS SUPPLY CIRCUIT SHORTED TOGETHER (B7) RIGHT FRONT WSS SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B6) RIGHT FRONT WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN RIGHT FRONT WSS ANTI-LOCK BRAKE MODULE

**Diagnostic Test**

**1. CHECK FOR A DTC C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

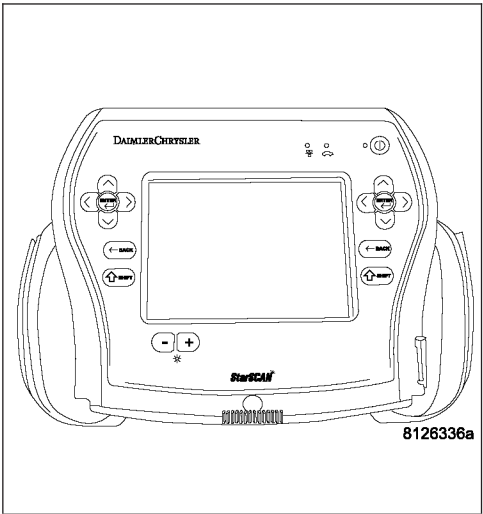
- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.

**CAUTION:** Ensure braking capability is available before road testing.

- Drive the vehicle over 25 Km/h (15 mph).
- Park the vehicle and cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's

**Does the scan tool display: C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

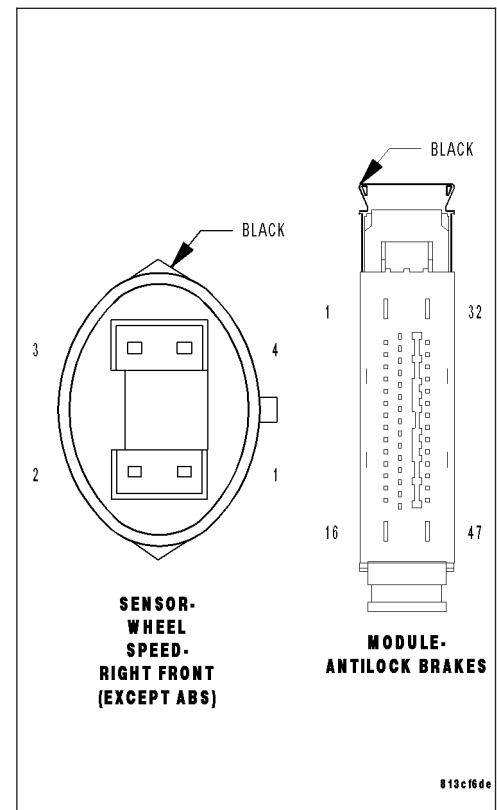
**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

Visually inspect the Anti-Lock Brake Module harness connector, Right Front WSS, Right Front WSS harness connector, and Right Front WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (B6) RIGHT FRONT WSS SIGNAL AND THE (B7) RIGHT FRONT WSS SUPPLY CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

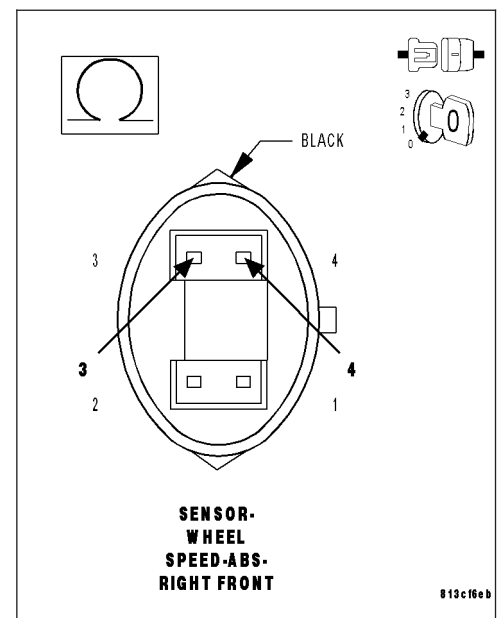
Disconnect the Right Front WSS harness connector.

Measure the resistance between the (B6) Right Front WSS Signal and the (B7) Right Front WSS Supply circuits at the Right Front WSS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (B6) Right Front WSS Signal and the (B7) Right Front WSS Supply circuits for a short together.  
Perform ABS VERIFICATION TEST - VER 1.



**C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****4. CHECK THE VOLTAGE ON THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT**

Turn the ignition off.

Reconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

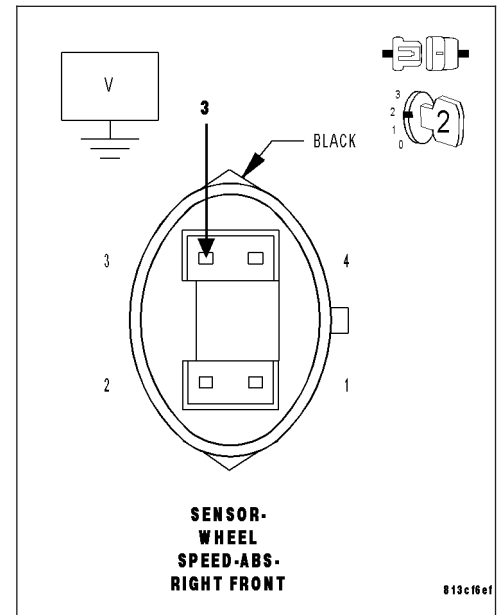
Turn the ignition on.

Measure the voltage of the (B7) Right Front WSS Supply circuit in the Right Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 8

**No** >> Go To 5

**5. CHECK THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

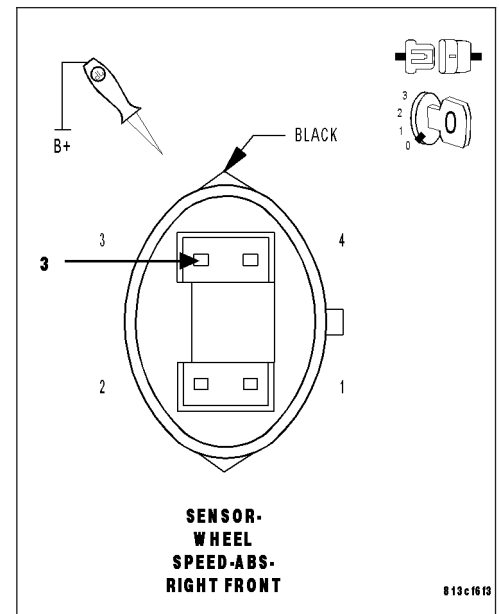
Using a 12-volt test light connected to 12-volts, check the (B7) Right Front WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B7) Right Front WSS Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****6. CHECK THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

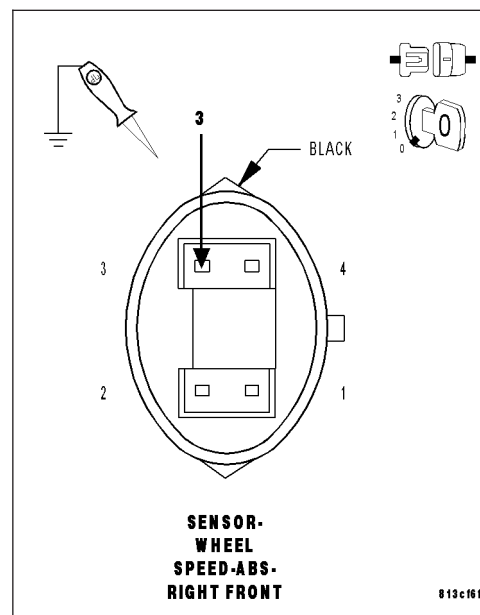
Using a 12-volt test light connected to ground, check the (B7) Right Front WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B7) Right Front WSS Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

Connect a jumper wire between the (B7) Right Front WSS Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B7) Right Front WSS Supply circuit.

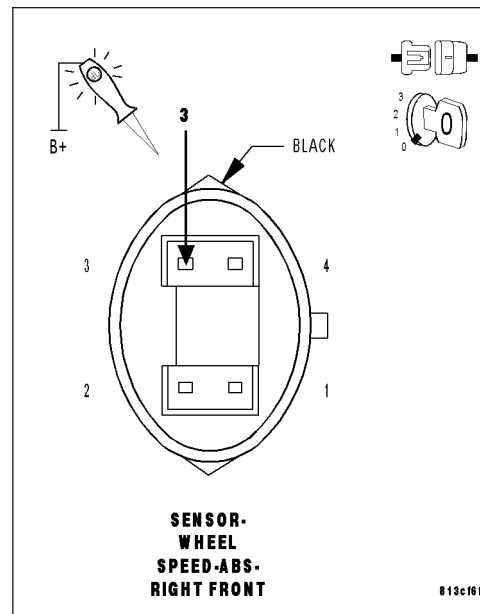
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B7) Right Front WSS Supply circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****8. CHECK THE (B7) RIGHT FRONT WSS SUPPLY AND THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE**

Turn the ignition off.

Disconnect the Right Front WSS harness connector.

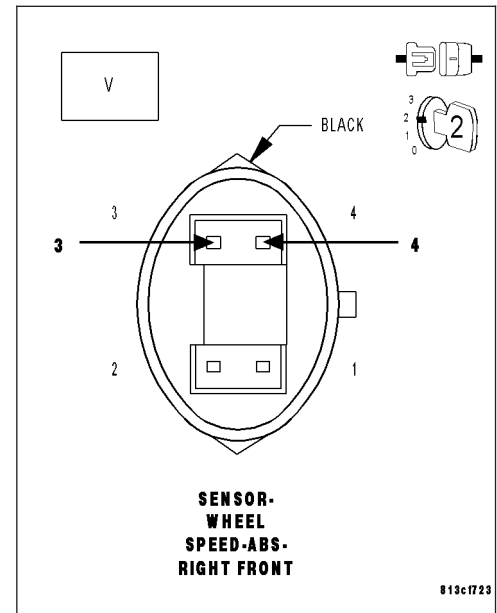
Turn the ignition on.

Measure the voltage between the (B7) Right Front WSS Supply and (B6) Right Front WSS Signal circuits at the Right Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 12

**No** >> Go To 9

**9. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

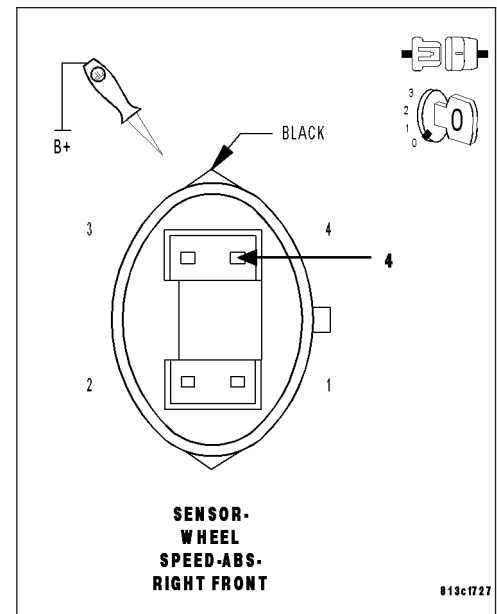
Using a 12-volt test light connected to 12-volts, check the (B6) Right Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B6) Right Front WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****10. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

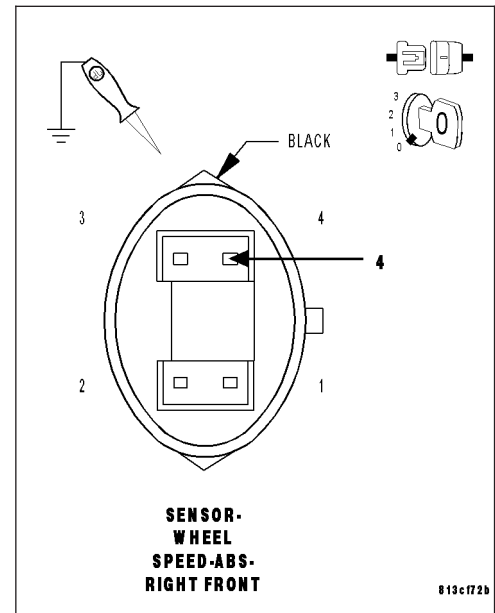
Using a 12-volt test light connected to ground, check the (B6) Right Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B6) Right Front WSS Signal circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

Connect a jumper wire between the (B6) Right Front WSS Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B6) Right Front WSS Signal circuit.

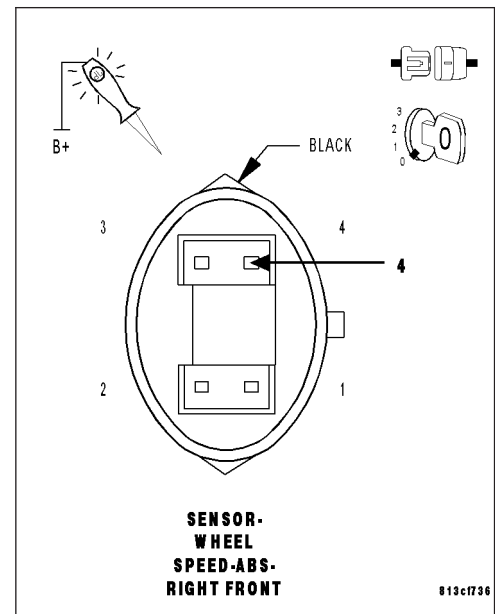
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B6) Right Front WSS Signal circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****12. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Front WSS harness connector.

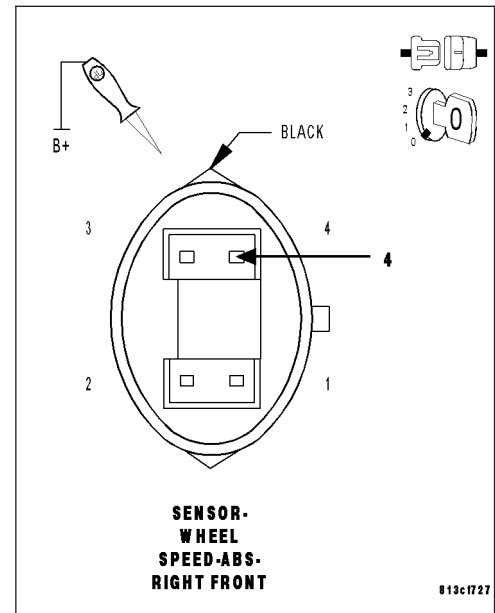
Using a 12-volt test light connected to 12-volts, check the (B6) Right Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B6) Right Front WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE AT THE RIGHT FRONT WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

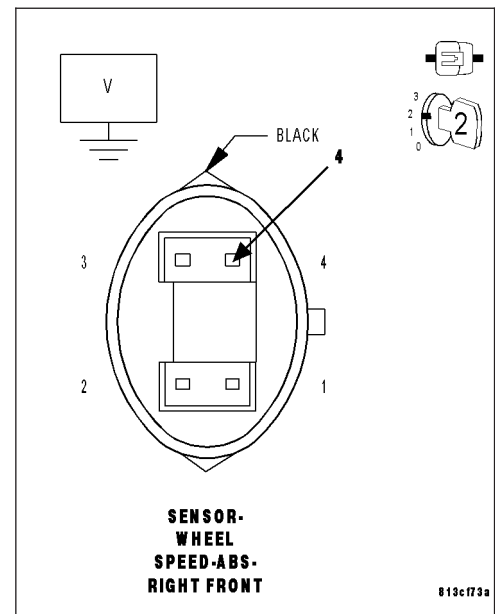
While back probing, measure between the (B6) Right Front WSS Signal circuit and chassis ground at the Right Front WSS harness connector.

Slowly rotate the wheel by hand.

**Did the (B6) Right Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 14

**No** >> Replace the Right Front WSS in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



**C101C-RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****14. CHECK THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

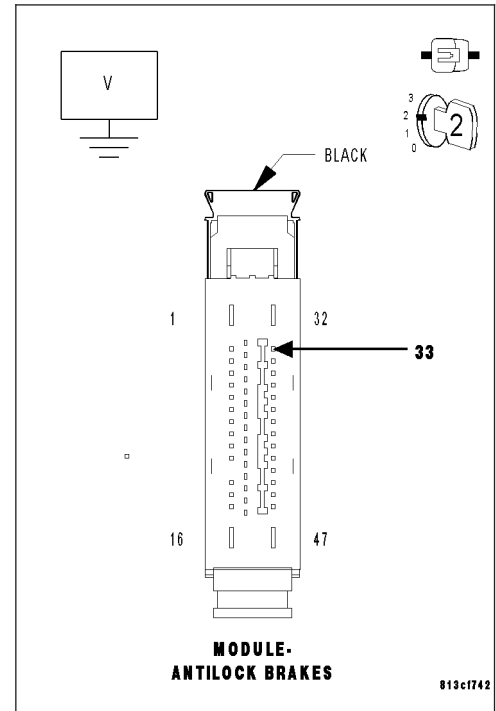
Turn the ignition on.

While back probing, measure between the (B6) Right Front WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

Slowly rotate the wheel by hand.

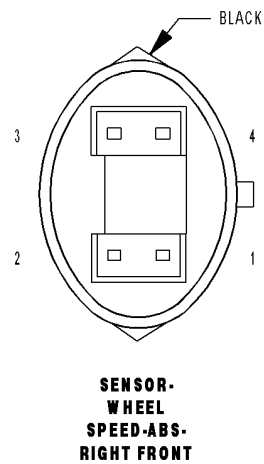
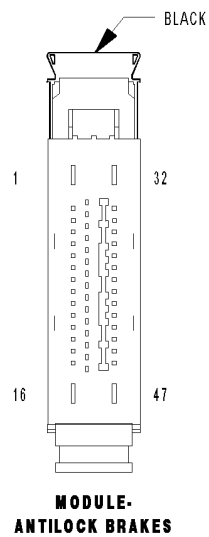
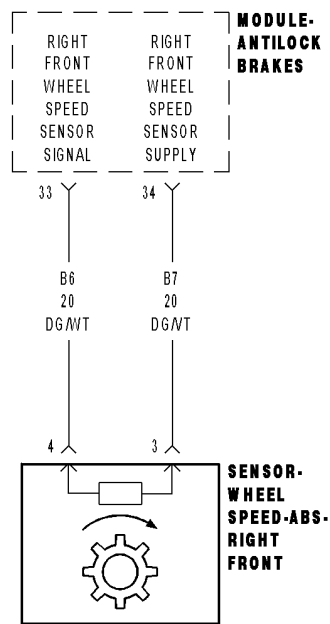
**Did the (B6) Right Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B6) Right Front WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.





C101F-RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE



**C101F-RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Right Front Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS/TONE WHEEL DAMAGE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT OPEN RIGHT FRONT WSS ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C101F-RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

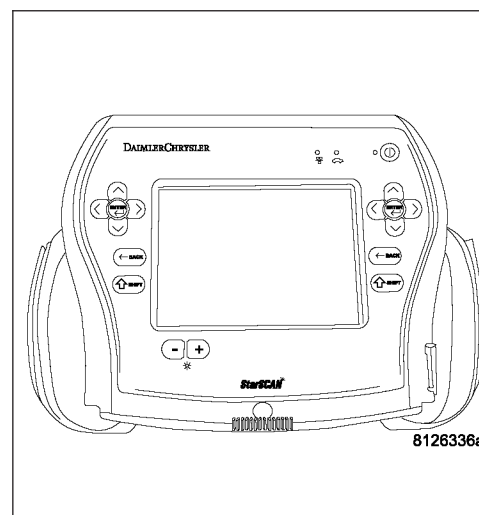
**CAUTION:** Ensure brake capability is available before road testing.

Have an assistant test drive the vehicle in a straight line to 40 Km/h (25 mph) while monitoring all the WSS speeds with the scan tool.

**Did the RF WSS speed differ by 8 Km/h (5 mph) or show NO speed?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C101F-RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

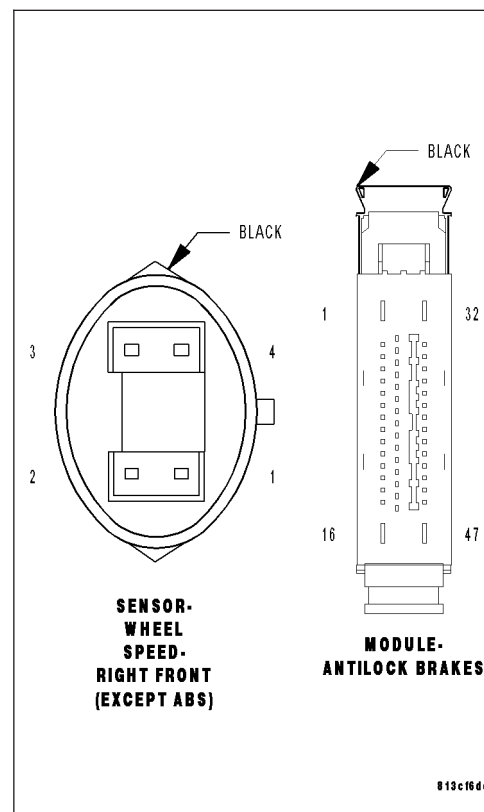
Visually inspect the Anti-Lock Brake Module harness connector, Right Front WSS, Right Front WSS harness connector, and Right Front WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE BETWEEN (B7) RIGHT FRONT WSS SUPPLY CIRCUIT AND THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the Right Front WSS harness connector.

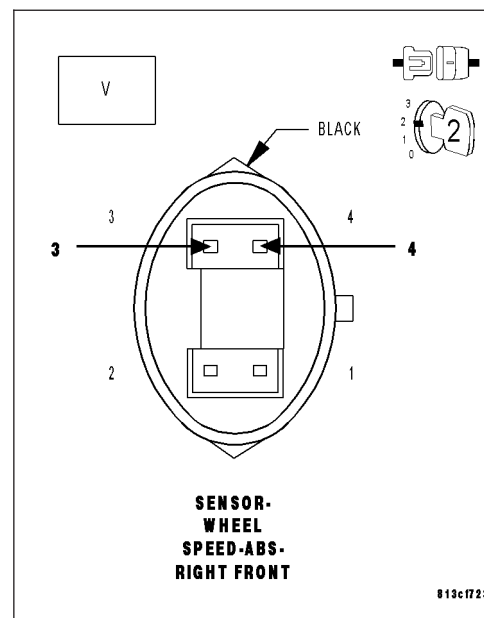
Turn the ignition on.

Measure the voltage between the (B7) Right Front WSS Supply and (B6) Right Front WSS Signal circuits at the Right Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 4

**No** >> Refer to DTC-C1015 RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT for the diagnostic repair procedure. Perform ABS VERIFICATION TEST - VER 1.



**C101F-RIGHT FRONT WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)****4. CHECK THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE AT THE RIGHT FRONT WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

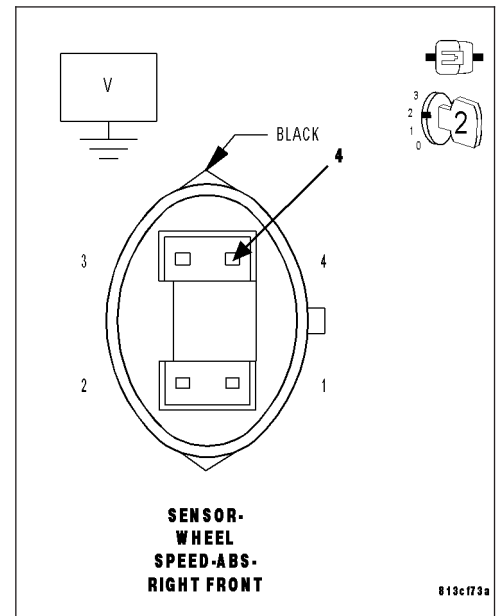
While back probing, measure between the (B6) Right Front WSS Signal circuit and chassis ground at the Right Front WSS harness connector.

Slowly rotate the wheel by hand.

**Did the (B6) Right Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 5

**No** >> Replace the Right Front WSS in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**5. CHECK THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

Turn the ignition on.

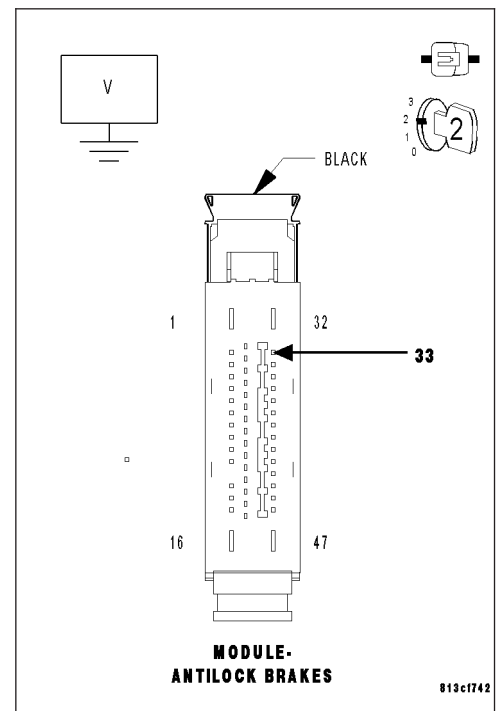
While back probing, measure between the (B6) Right Front WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

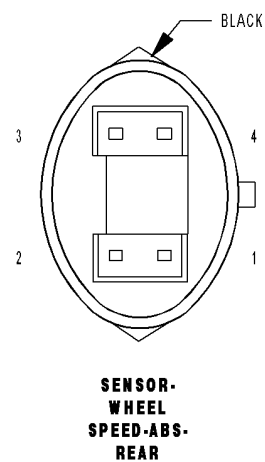
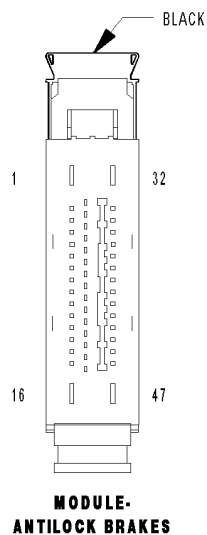
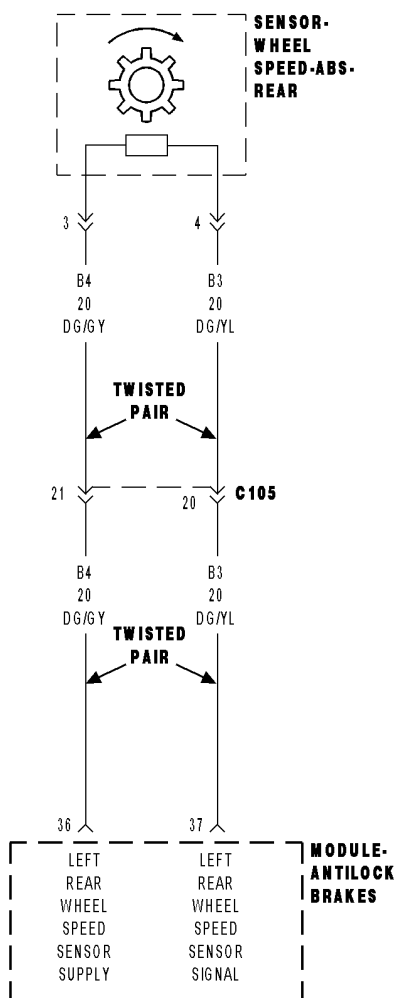
Slowly rotate the wheel by hand.

**Did the (B6) Right Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B6) Right Front WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



**C1020-LEFT REAR WHEEL SPEED SENSOR CIRCUIT**

**C1020-LEFT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Left Rear Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
TERMINAL/CONNECTOR/TONE WHEEL DAMAGE (B3) LEFT REAR WSS SIGNAL CIRCUIT AND (B4) LEFT REAR WSS SUPPLY CIRCUIT SHORTED TOGETHER (B4) LEFT REAR WSS SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B3) LEFT REAR WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN LEFT REAR WSS ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C1020-LEFT REAR WHEEL SPEED SENSOR CIRCUIT**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

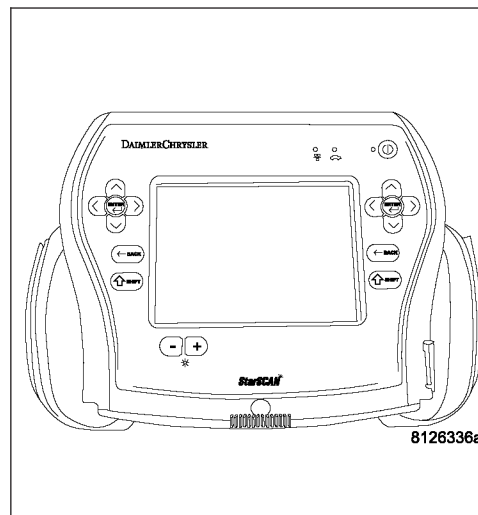
Cycle the ignition switch from off to on.

With the scan tool, read and record DTC's

**Does the scan tool display: C1020-LEFT REAR WHEEL SPEED SENSOR CIRCUIT?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C1020-LEFT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

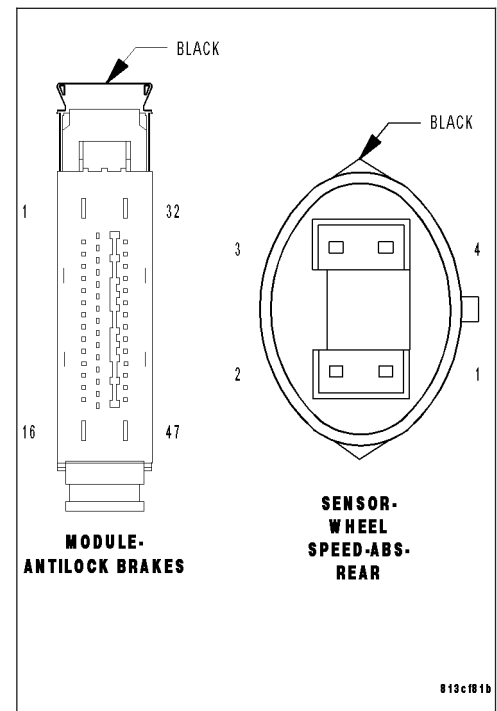
Visually inspect the Anti-Lock Brake Module harness connector, Left Rear WSS, Left Rear WSS harness connector, and Left Rear WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (B3) LEFT REAR WSS SIGNAL AND THE (B4) LEFT REAR WSS SUPPLY CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

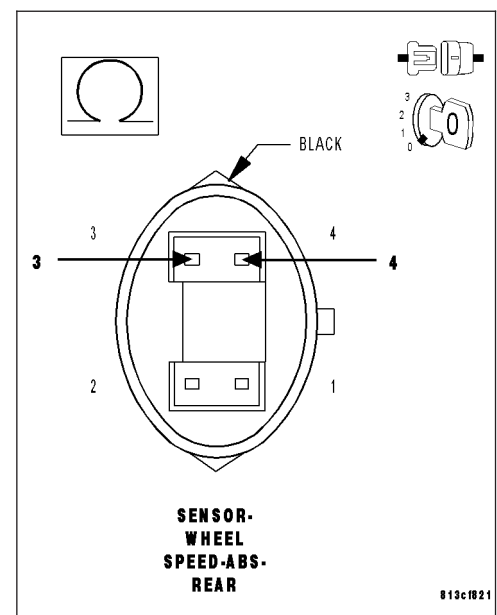
Disconnect the Left Rear WSS harness connector.

Measure the resistance between the (B3) Left Rear WSS Signal and the (B4) Left Rear WSS Supply circuits at the Left Rear WSS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (B3) Left Rear WSS Signal and the (B4) Left Rear WSS Supply circuits for a short together. Perform ABS VERIFICATION TEST - VER 1.



**C1020-LEFT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****4. CHECK THE VOLTAGE ON THE (B4) LEFT REAR WSS SUPPLY CIRCUIT**

Turn the ignition off.

Reconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

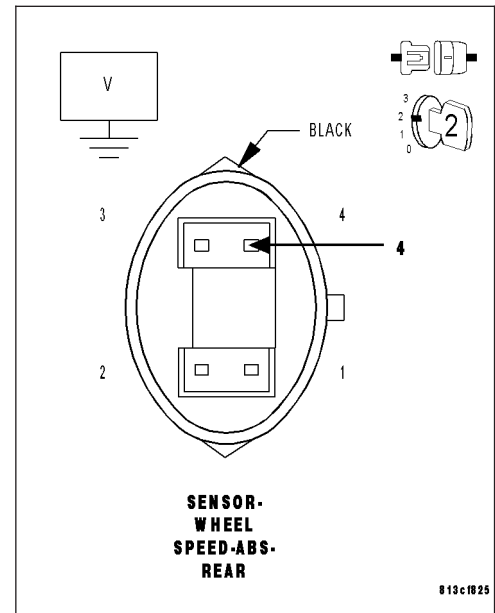
Turn the ignition on.

Measure the voltage of the (B4) Left Rear WSS Supply circuit in the Left Rear WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 8

**No** >> Go To 5

**5. CHECK THE (B4) LEFT REAR WSS SUPPLY CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

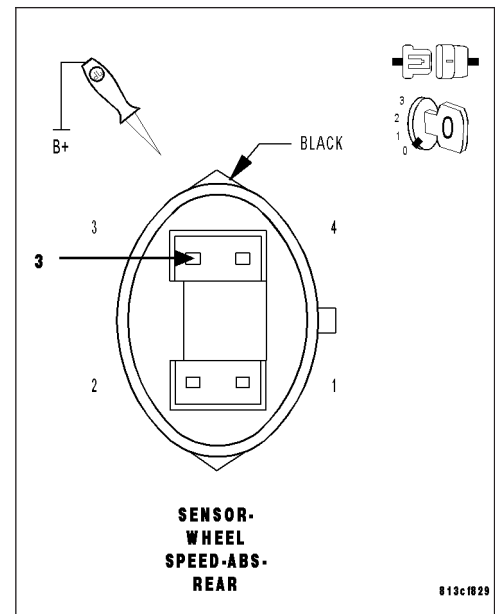
Using a 12-volt test light connected to 12-volts, check the (B4) Left Rear WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B4) Left Rear WSS Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6





**C1020-LEFT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****6. CHECK THE (B4) LEFT REAR WSS SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

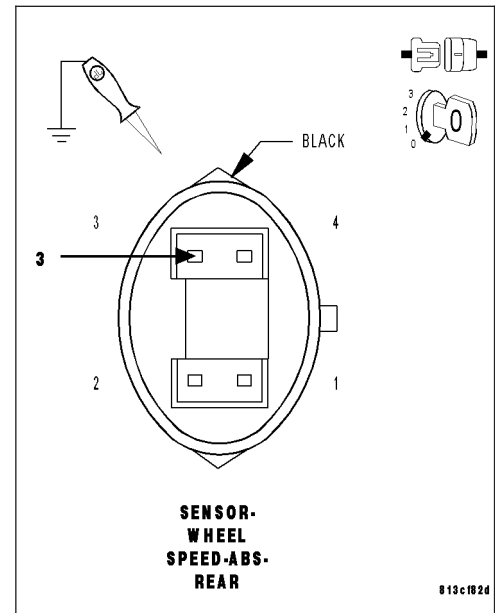
Using a 12-volt test light connected to ground, check the (B4) Left Rear WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B4) Left Rear WSS Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B4) LEFT REAR WSS SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

Connect a jumper wire between the (B4) Left Rear WSS Supply circuit and ground.

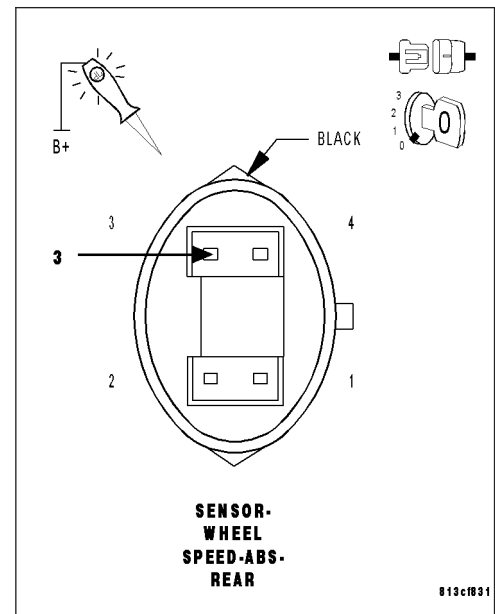
Using a 12-volt test light connected to 12-volts, check the (B4) Left Rear WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B4) Left Rear WSS Supply circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



**C1020-LEFT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****8. CHECK THE (B4) LEFT REAR WSS SUPPLY AND THE (B3) LEFT REAR WSS SIGNAL VOLTAGE**

Turn the ignition off.

Disconnect the Left Rear WSS harness connector.

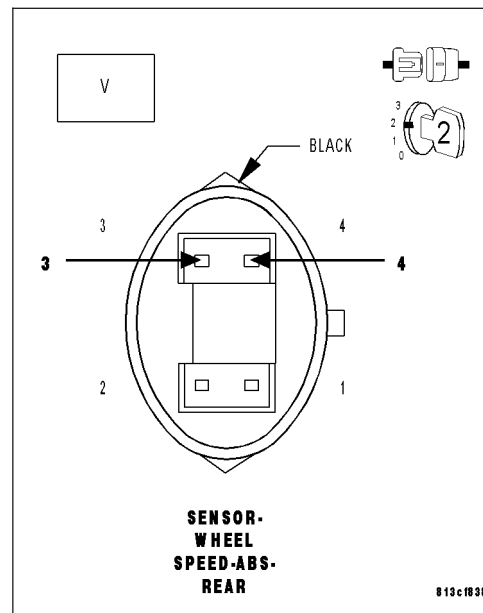
Turn the ignition on.

Measure the voltage between the (B4) Left Rear WSS Supply and (B3) Left Rear WSS Signal circuits at the Left Rear WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 12

**No** >> Go To 9

**9. CHECK THE (B3) LEFT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

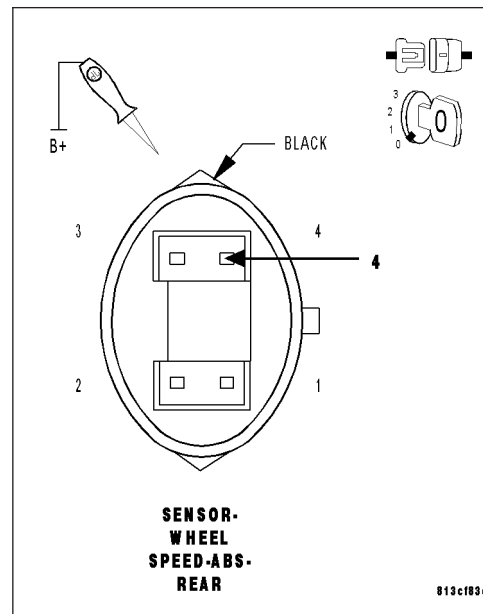
Using a 12-volt test light connected to 12-volts, check the (B3) Left Rear WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B3) Left Rear WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C1020-LEFT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****10. CHECK THE (B3) LEFT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

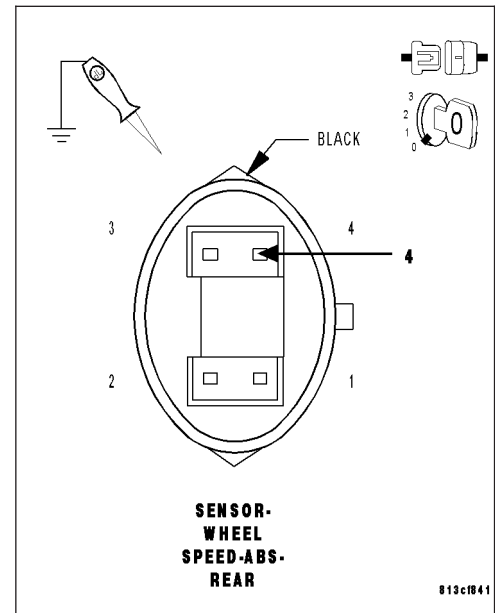
Using a 12-volt test light connected to ground, check the (B3) Left Rear WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B3) Left Rear WSS Signal circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (B3) LEFT REAR WSS SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

Connect a jumper wire between the (B3) Left Rear WSS Signal circuit and ground.

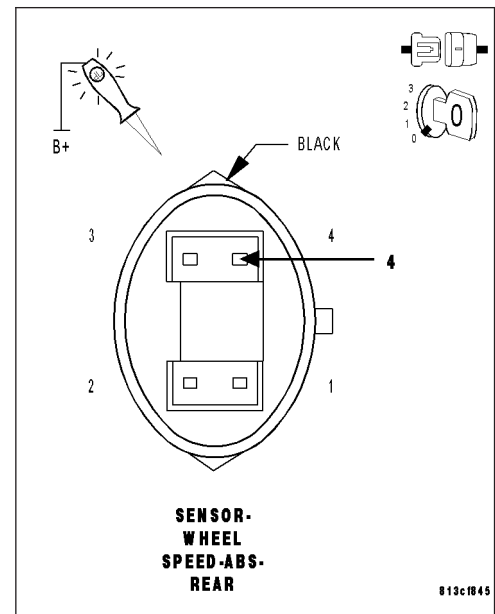
Using a 12-volt test light connected to 12-volts, check the (B3) Left Rear WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B3) Left Rear WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



**C1020-LEFT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****12. CHECK THE (B3) LEFT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

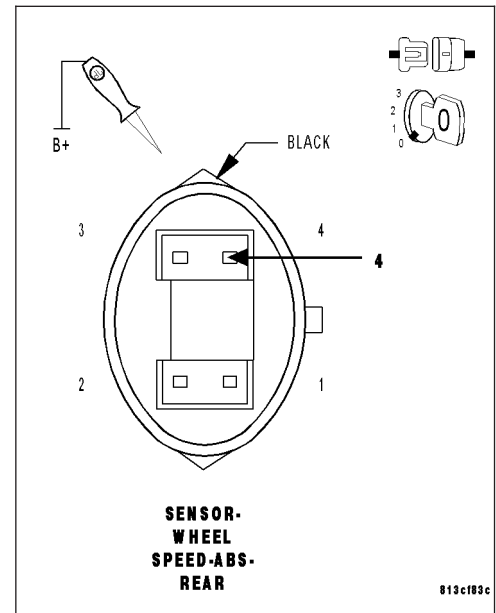
Using a 12-volt test light connected to 12-volts, check the (B3) Left Rear WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B3) Left Rear WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B3) LEFT REAR WSS SIGNAL VOLTAGE AT THE LEFT REAR WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

While back probing, measure between the (B3) Left Rear WSS Signal circuit and chassis ground at the Left Rear WSS harness connector.

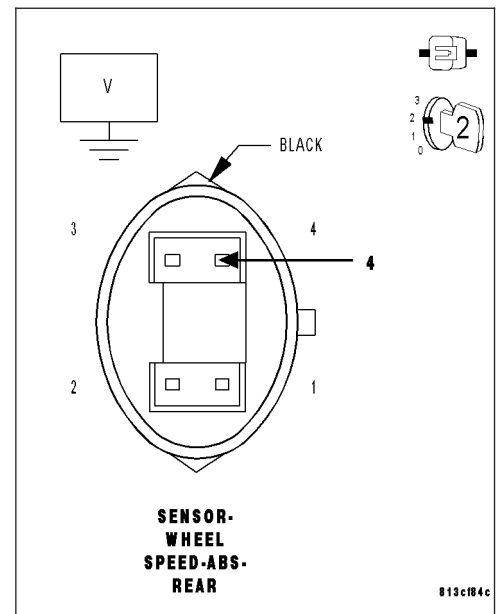
Slowly rotate the wheel by hand.

**Did the (B3) Left Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 14

**No** >> Replace the Left Rear WSS in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.



**C1020-LEFT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****14. CHECK THE (B3) LEFT REAR WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

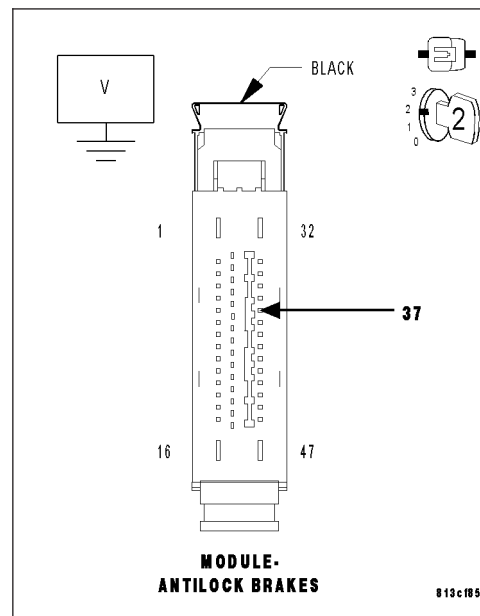
Turn the ignition on.

While back probing, measure between the (B3) Left Rear WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

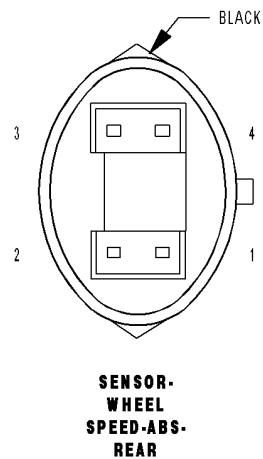
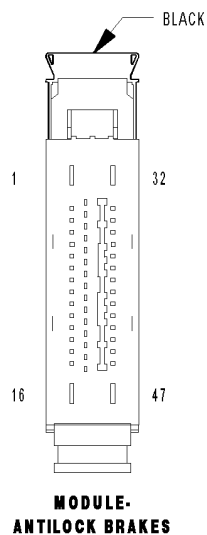
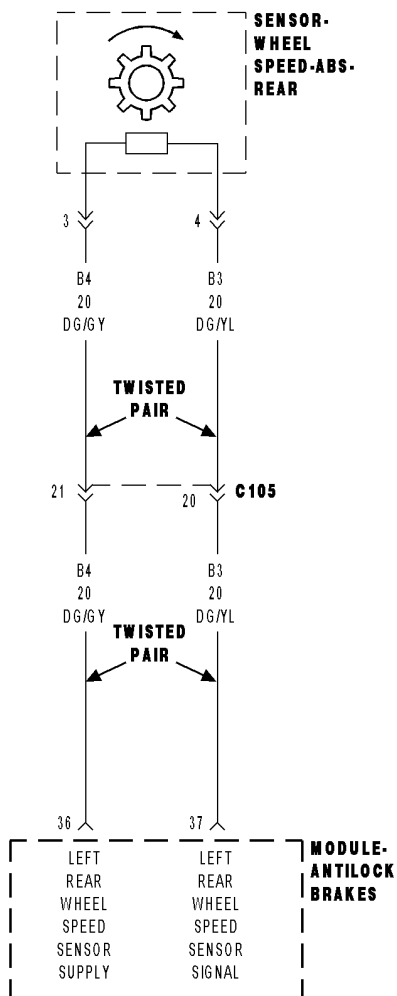
Slowly rotate the wheel by hand.

**Did the (B3) Left Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B3) Left Rear WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



## C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE



C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Left Rear Wheel Speed Signal circuit indicates continuously too high or too low wheel speed.

Possible Causes
TERMINAL/CONNECTOR/TONE WHEEL DAMAGE (B3) LEFT REAR WSS SIGNAL CIRCUIT AND (B4) LEFT REAR WSS SUPPLY CIRCUIT SHORTED TOGETHER (B4) LEFT REAR WSS SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B3) LEFT REAR WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN LEFT REAR WSS ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR A DTC C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE

**Note:** This DTC must be active for the results of this test to be valid.

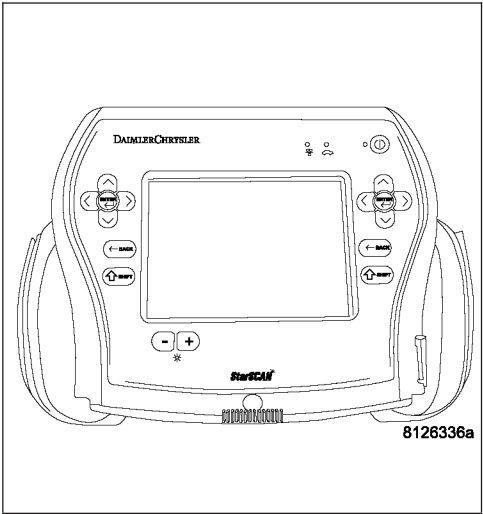
- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.

**CAUTION:** Ensure braking capability is available before road testing.

- Drive the vehicle over 25 Km/h (15 mph).
- Park the vehicle and cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's

**Does the scan tool display: C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

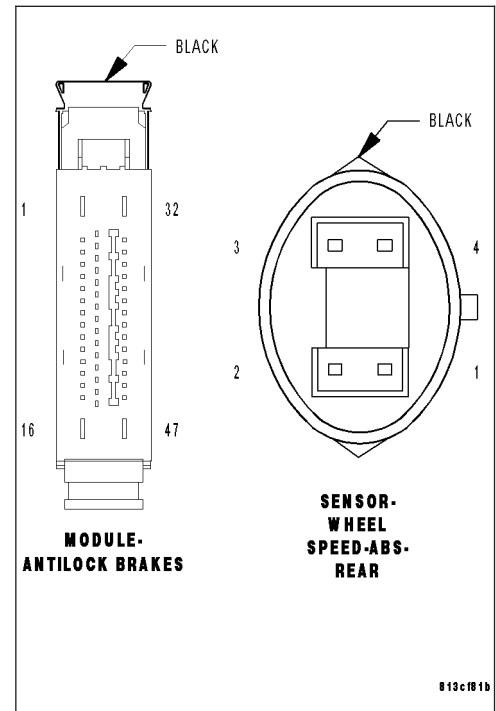
**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

Visually inspect the Anti-Lock Brake Module harness connector, Left Rear WSS, Left Rear WSS harness connector, and Left Rear WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (B3) LEFT REAR WSS SIGNAL AND THE (B4) LEFT REAR WSS SUPPLY CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

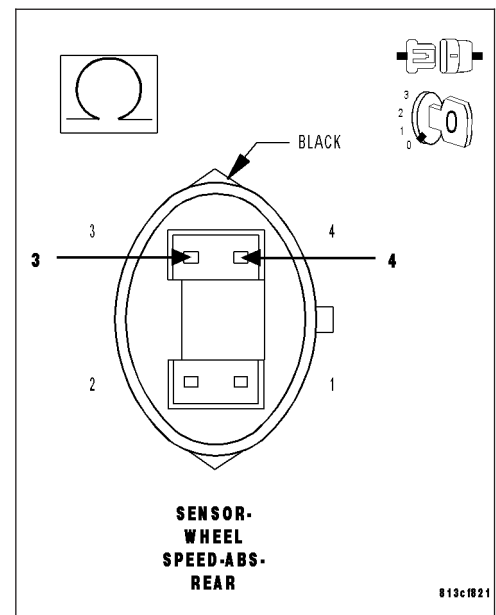
Disconnect the Left Rear WSS harness connector.

Measure the resistance between the (B3) Left Rear WSS Signal and the (B4) Left Rear WSS Supply circuits at the Left Rear WSS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (B3) Left Rear WSS Signal and the (B4) Left Rear WSS Supply circuits for a short together.  
Perform ABS VERIFICATION TEST - VER 1.





**C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****4. CHECK THE VOLTAGE ON THE (B4) LEFT REAR WSS SUPPLY CIRCUIT**

Turn the ignition off.

Reconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

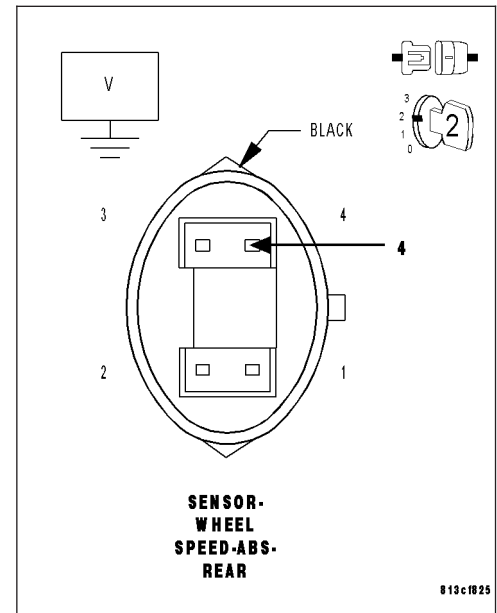
Turn the ignition on.

Measure the voltage of the (B4) Left Rear WSS Supply circuit in the Left Rear WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 8

**No** >> Go To 5

**5. CHECK THE (B4) LEFT REAR WSS SUPPLY CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

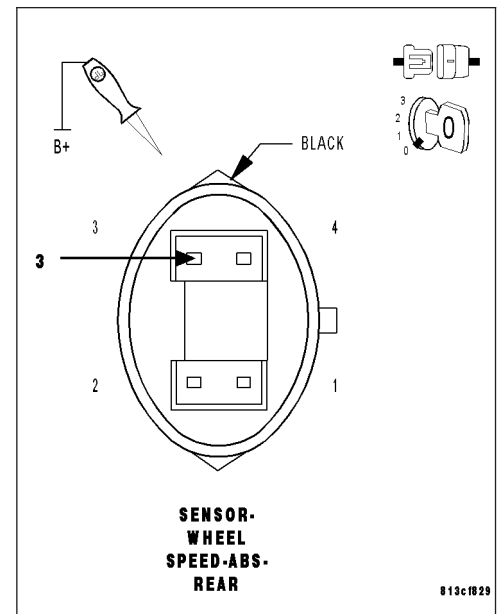
Using a 12-volt test light connected to 12-volts, check the (B4) Left Rear WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B4) Left Rear WSS Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****6. CHECK THE (B4) LEFT REAR WSS SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

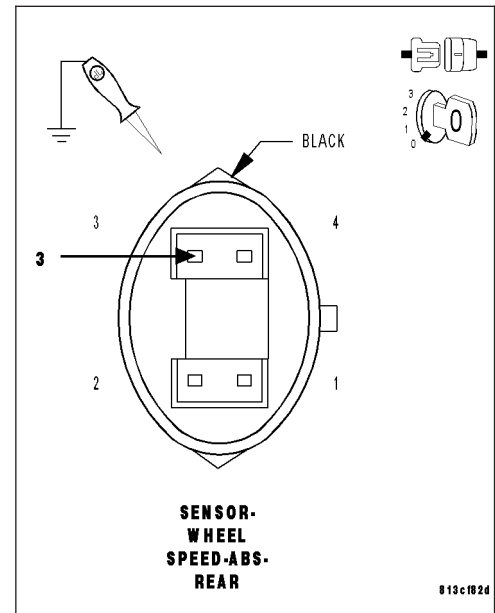
Using a 12-volt test light connected to ground, check the (B4) Left Rear WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B4) Left Rear WSS Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B4) LEFT REAR WSS SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

Connect a jumper wire between the (B4) Left Rear WSS Supply circuit and ground.

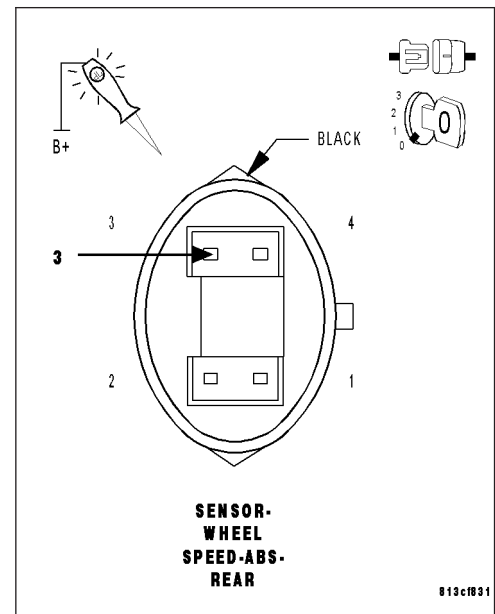
Using a 12-volt test light connected to 12-volts, check the (B4) Left Rear WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B4) Left Rear WSS Supply circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



**C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****8. CHECK THE (B4) LEFT REAR WSS SUPPLY AND THE (B3) LEFT REAR WSS SIGNAL VOLTAGE**

Turn the ignition off.

Disconnect the Left Rear WSS harness connector.

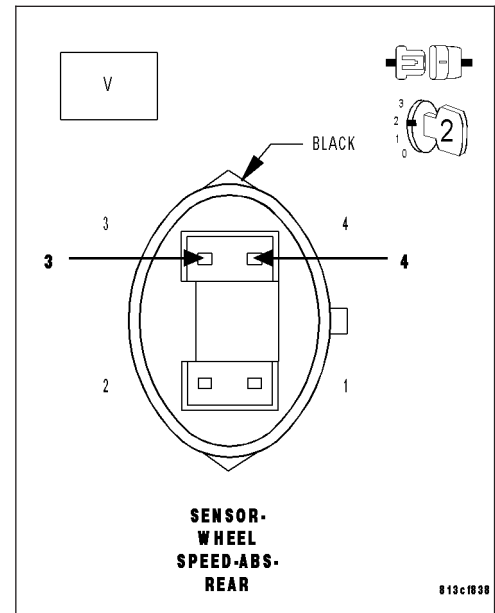
Turn the ignition on.

Measure the voltage between the (B4) Left Rear WSS Supply and (B3) Left Rear WSS Signal circuits at the Left Rear WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 12

**No** >> Go To 9

**9. CHECK THE (B3) LEFT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

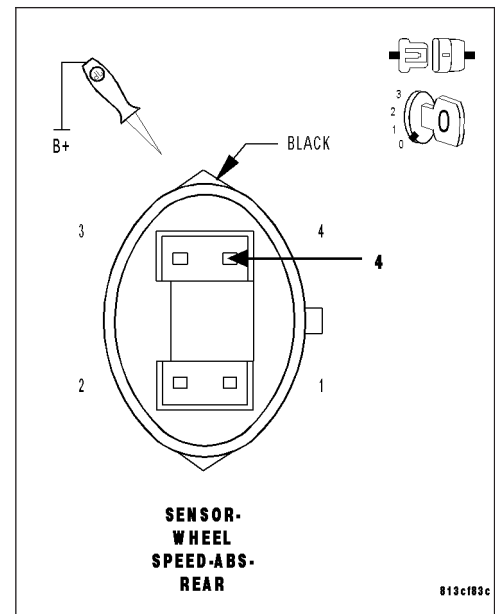
Using a 12-volt test light connected to 12-volts, check the (B3) Left Rear WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B3) Left Rear WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****10. CHECK THE (B3) LEFT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

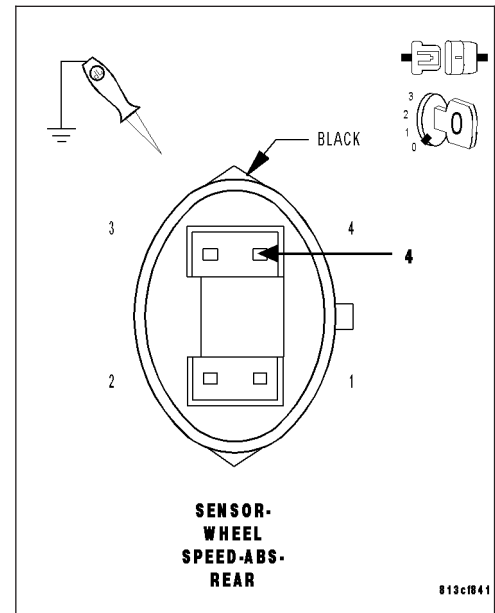
Using a 12-volt test light connected to ground, check the (B3) Left Rear WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B3) Left Rear WSS Signal circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (B3) LEFT REAR WSS SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

Connect a jumper wire between the (B3) Left Rear WSS Signal circuit and ground.

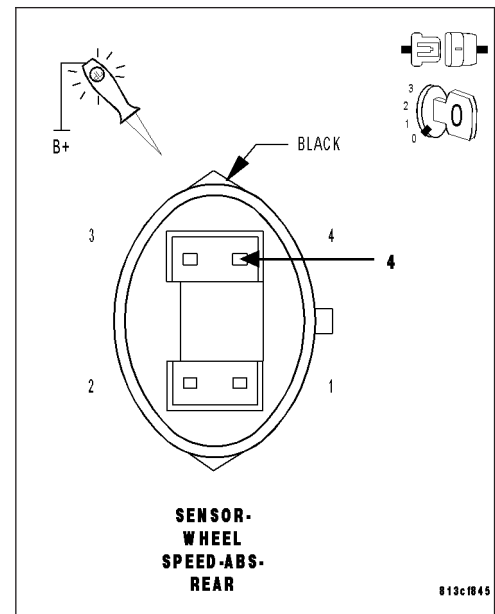
Using a 12-volt test light connected to 12-volts, check the (B3) Left Rear WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B3) Left Rear WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



**C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****12. CHECK THE (B3) LEFT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Left Rear WSS harness connector.

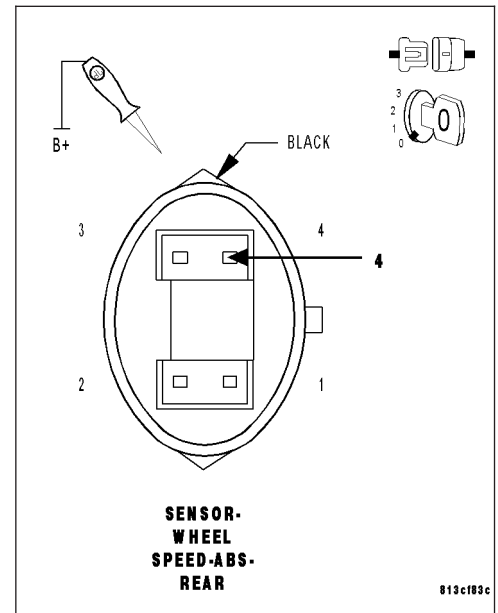
Using a 12-volt test light connected to 12-volts, check the (B3) Left Rear WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B3) Left Rear WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B3) LEFT REAR WSS SIGNAL VOLTAGE AT THE LEFT REAR WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

While back probing, measure between the (B3) Left Rear WSS Signal circuit and chassis ground at the Left Rear WSS harness connector.

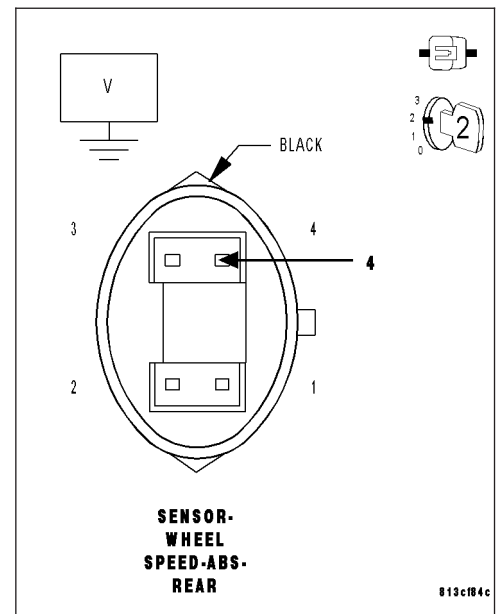
Slowly rotate the wheel by hand.

**Did the (B3) Left Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 14

**No** >> Replace the Left Rear WSS in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.



**C1027-LEFT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****14. CHECK THE (B3) LEFT REAR WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

Turn the ignition on.

While back probing, measure between the (B3) Left Rear WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

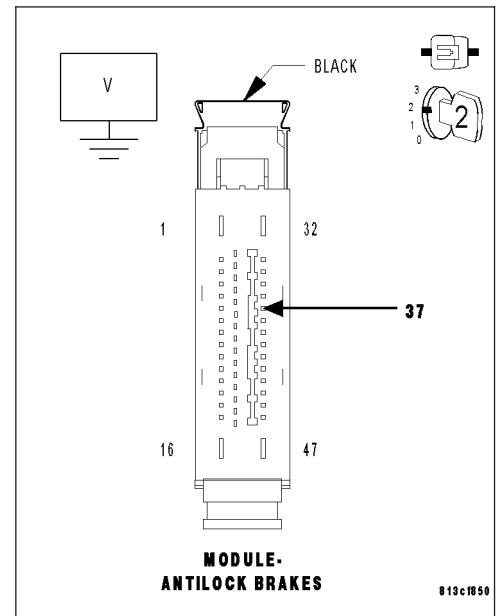
Slowly rotate the wheel by hand.

**Did the (B3) Left Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

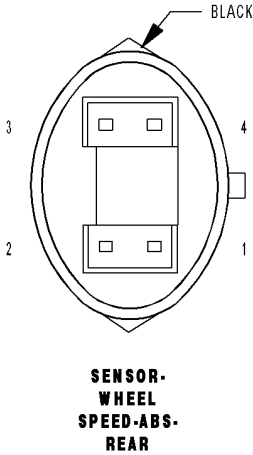
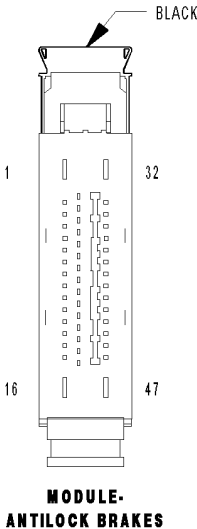
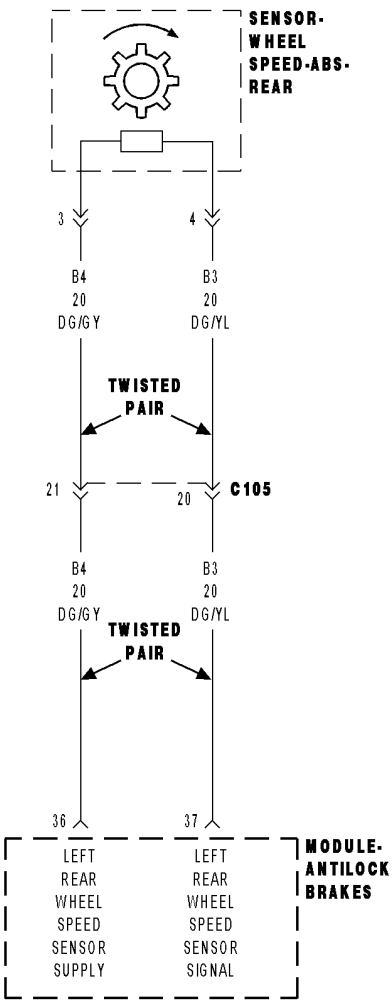
**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B3) Left Rear WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



C102A-LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE



**C102A-LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Left Rear Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS/TONE WHEEL DAMAGE (B3) LEFT REAR WSS SIGNAL CIRCUIT OPEN LEFT REAR WSS ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C102A-LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

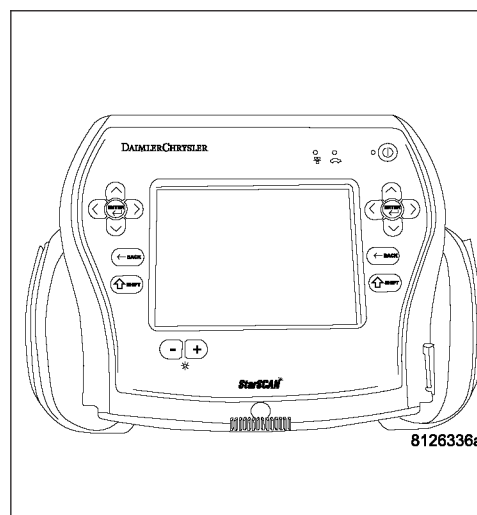
**CAUTION:** Ensure brake capability is available before road testing.

Have an assistant test drive the vehicle in a straight line to 40 Km/h (25 mph) while monitoring all the WSS speeds with the scan tool.

**Did the LR WSS speed differ by 8 Km/h (5 mph) or show NO speed?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.





**C102A-LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

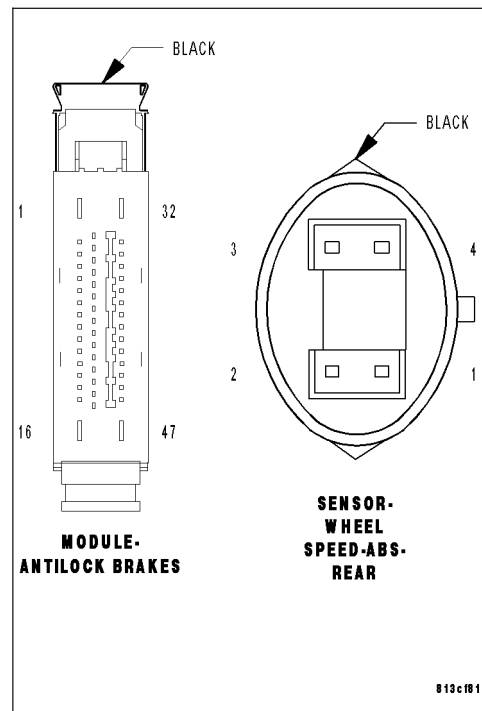
**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

Visually inspect the Anti-Lock Brake Module harness connector, Left Rear WSS, Left Rear WSS harness connector, and Left Rear WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE BETWEEN (B4) LEFT REAR WSS SUPPLY CIRCUIT AND THE (B3) LEFT REAR WSS SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the Left Rear WSS harness connector.

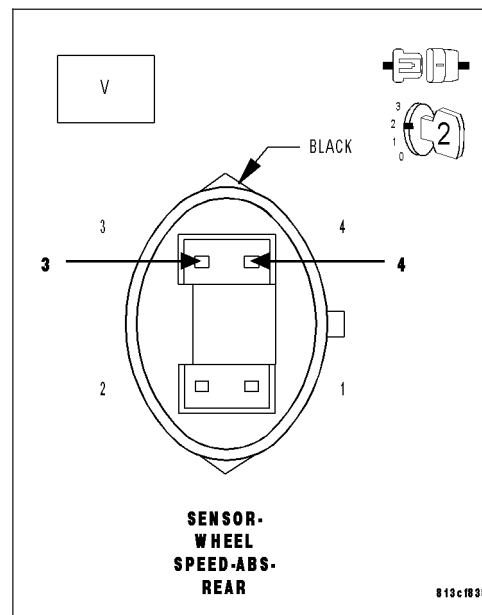
Turn the ignition on.

Measure the voltage between the (B4) Left Rear WSS Supply and (B3) Left Rear WSS Signal circuits at the Left Rear WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 4

**No** >> Refer to DTC-C1020 LEFT REAR WHEEL SPEED SENSOR CIRCUIT for the diagnostic repair procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C102A-LEFT REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)****4. CHECK THE (B3) LEFT REAR WSS SIGNAL VOLTAGE AT THE LEFT REAR WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

While back probing, measure between the (B3) Left Rear WSS Signal circuit and chassis ground at the Left Rear WSS harness connector.

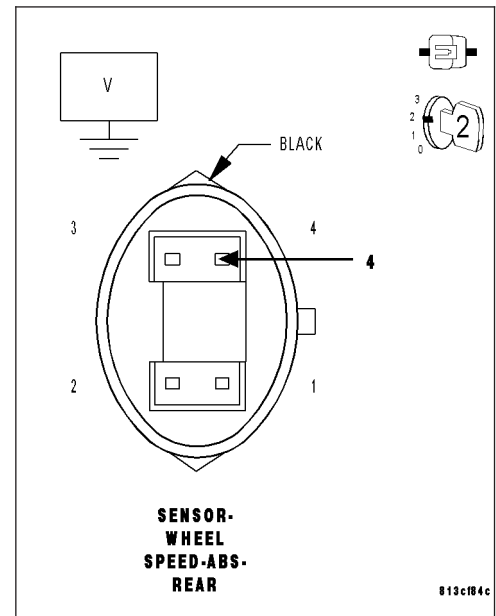
Slowly rotate the wheel by hand.

**Did the (B3) Left Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 5

**No** >> Replace the Left Rear WSS in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**5. CHECK THE (B3) LEFT REAR WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

Turn the ignition on.

While back probing, measure between the (B3) Left Rear WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

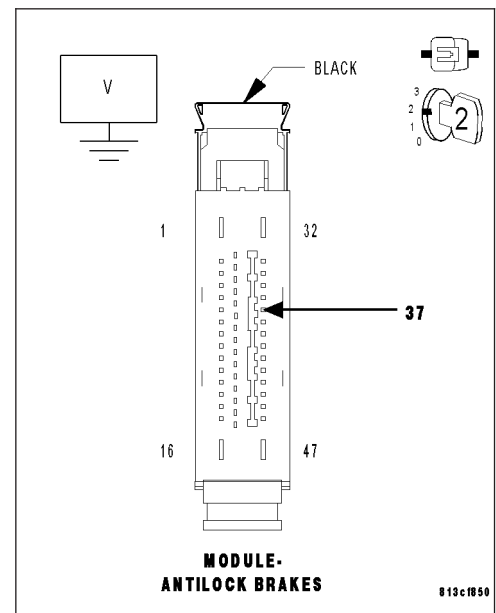
Slowly rotate the wheel by hand.

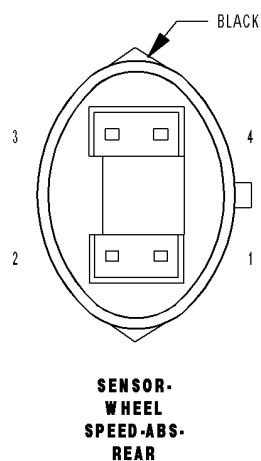
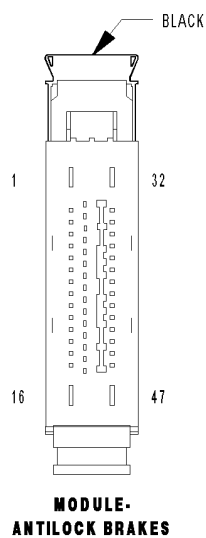
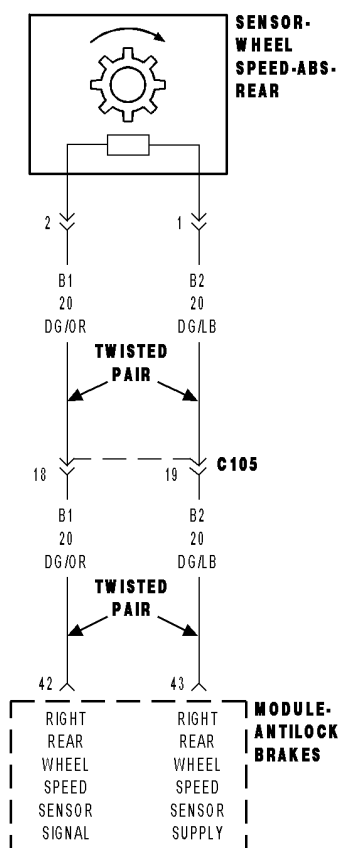
**Did the (B3) Left Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B3) Left Rear WSS Signal circuit for an open. Perform ABS VERIFICATION TEST - VER 1.



**C102B-RIGHT REAR WHEEL SPEED SENSOR CIRCUIT**

**C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Right Rear Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
TERMINAL/CONNECTOR/TONE WHEEL DAMAGE (B1) RIGHT REAR WSS SIGNAL CIRCUIT AND (B2) RIGHT REAR WSS SUPPLY CIRCUIT SHORTED TOGETHER (B2) RIGHT REAR WSS SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B1) RIGHT REAR WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN RIGHT REAR WSS ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

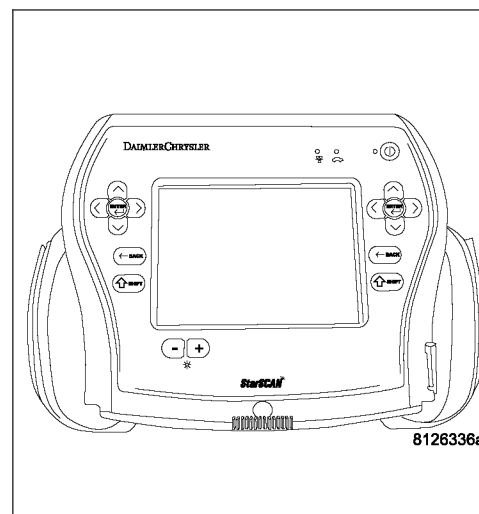
Cycle the ignition switch from off to on.

With the scan tool, read and record DTC's

**Does the scan tool display: C102B–RIGHT REAR WHEEL SPEED SENSOR CIRCUIT?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C102B-RIGHT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

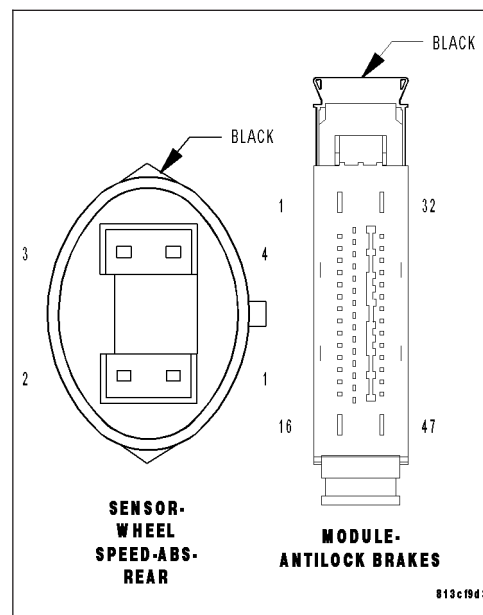
Visually inspect the Anti-Lock Brake Module harness connector, Right Rear WSS, Right Rear WSS harness connector, and Right Rear WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (B1) RIGHT REAR WSS SIGNAL AND THE (B2) RIGHT REAR WSS SUPPLY CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

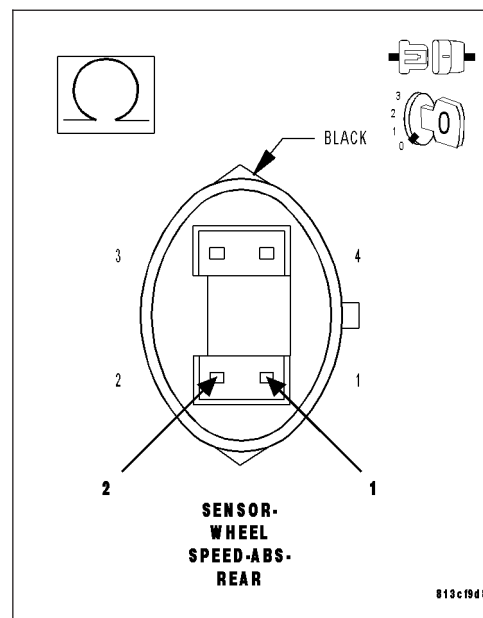
Disconnect the Right Rear WSS harness connector.

Measure the resistance between the (B1) Right Rear WSS Signal and the (B2) Right Rear WSS Supply circuits at the Right Rear WSS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (B1) Right Rear WSS Signal and the (B2) Right Rear WSS Supply circuits for a short together. Perform ABS VERIFICATION TEST - VER 1.



## C102B—RIGHT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)

#### 4. CHECK THE VOLTAGE ON THE (B2) RIGHT REAR WSS SUPPLY CIRCUIT

Turn the ignition off.

Reconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

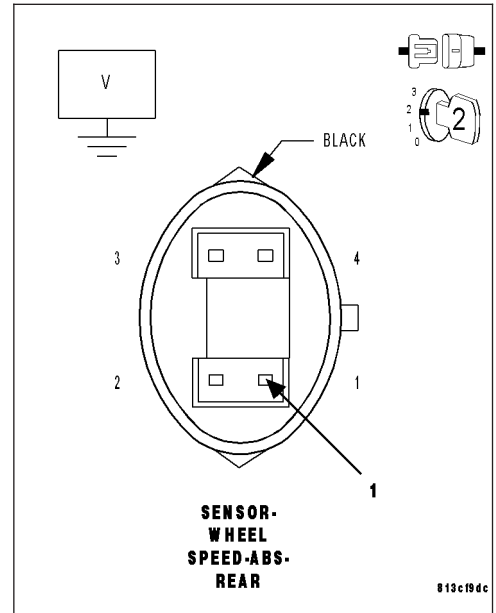
Turn the ignition on.

Measure the voltage of the (B2) Right Rear WSS Supply circuit in the Right Rear WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 8

**No** >> Go To 5



## 5. CHECK THE (B2) RIGHT REAR WSS SUPPLY CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

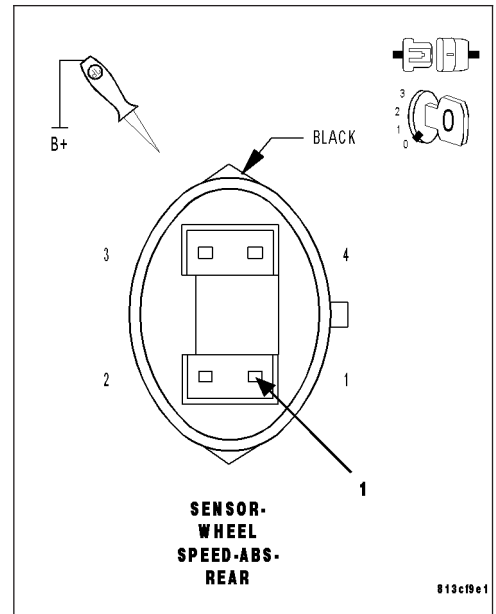
Using a 12-volt test light connected to 12-volts, check the (B2) Right Rear WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B2) Right Rear WSS Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C102B-RIGHT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****6. CHECK THE (B2) RIGHT REAR WSS SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

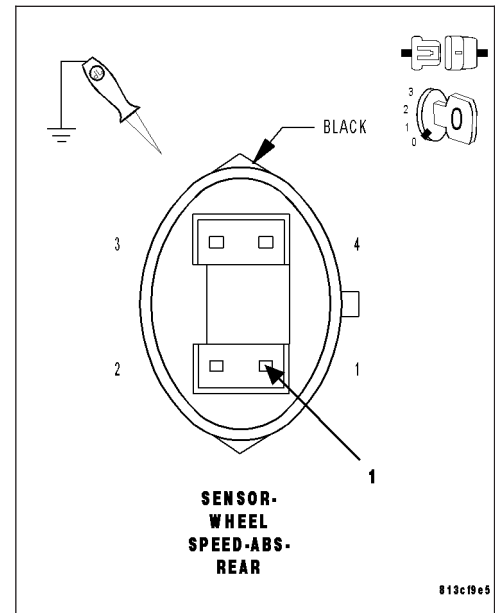
Using a 12-volt test light connected to ground, check the (B2) Right Rear WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B2) Right Rear WSS Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B2) RIGHT REAR WSS SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

Connect a jumper wire between the (B2) Right Rear WSS Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B2) Right Rear WSS Supply circuit.

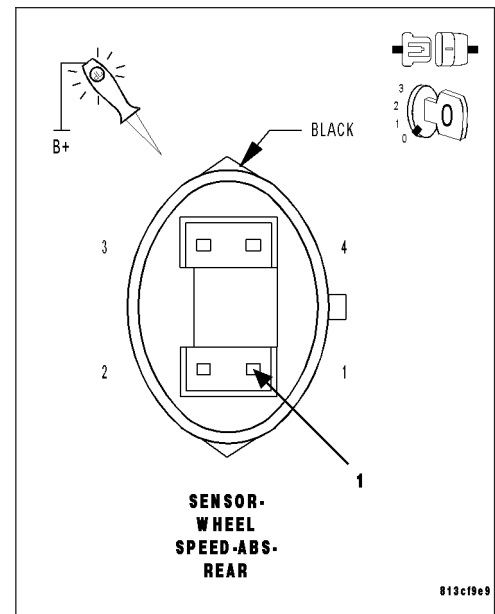
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B2) Right Rear WSS Supply circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C102B-RIGHT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****8. CHECK THE (B2) RIGHT REAR WSS SUPPLY AND THE (B1) RIGHT REAR WSS SIGNAL VOLTAGE**

Turn the ignition off.

Disconnect the Right Rear WSS harness connector.

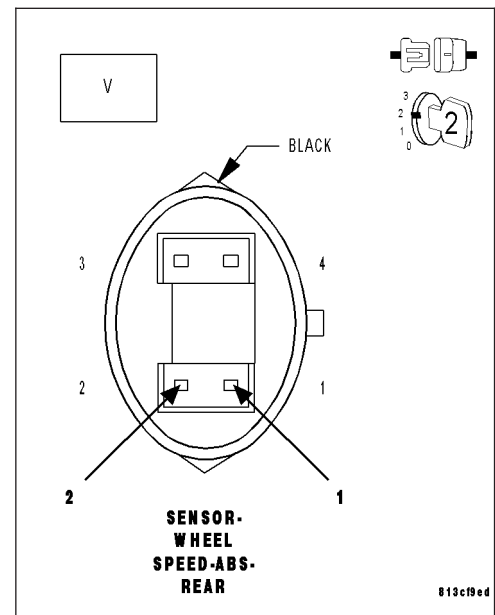
Turn the ignition on.

Measure the voltage between the (B2) Right Rear WSS Supply and (B1) Right Rear WSS Signal circuits at the Right Rear WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 12

**No** >> Go To 9

**9. CHECK THE (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

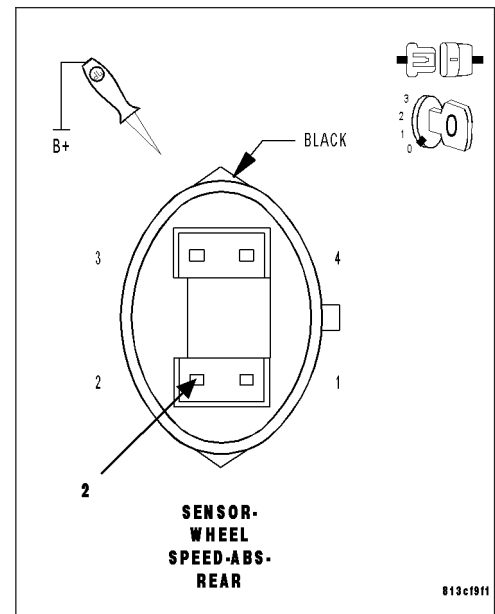
Using a 12-volt test light connected to 12-volts, check the (B1) Right Rear WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B1) Right Rear WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10





**C102B-RIGHT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****10. CHECK THE (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

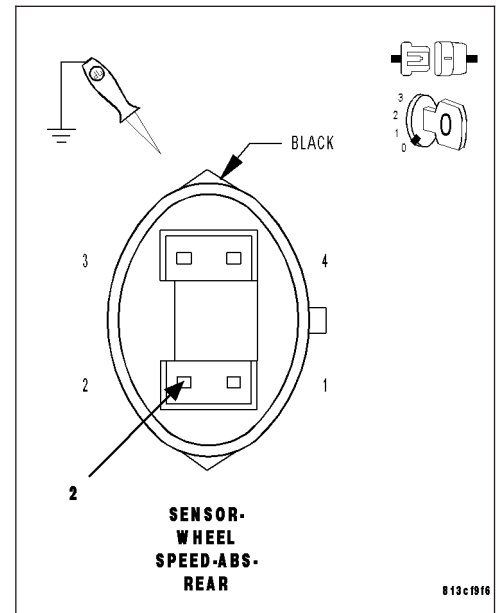
Using a 12-volt test light connected to ground, check the (B1) Right Rear WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B1) Right Rear WSS Signal circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

Connect a jumper wire between the (B1) Right Rear WSS Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B1) Right Rear WSS Signal circuit.

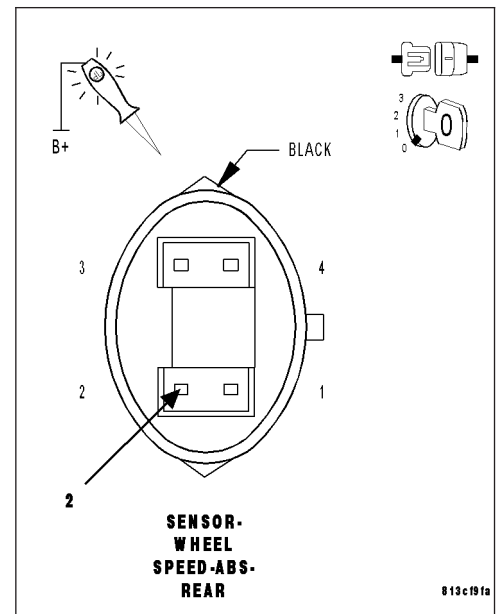
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B1) Right Rear WSS Signal circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C102B-RIGHT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****12. CHECK THE (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

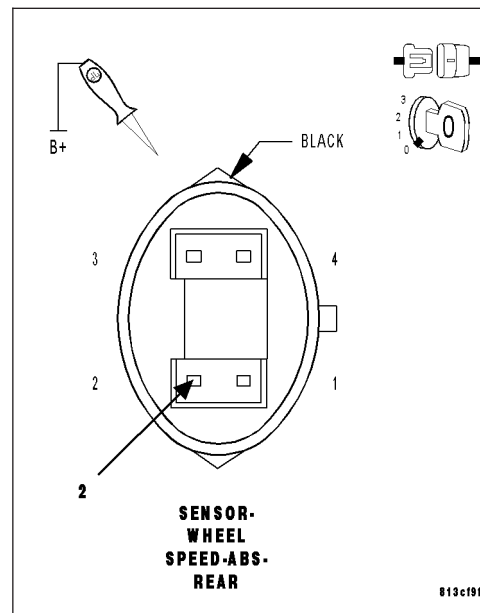
Using a 12-volt test light connected to 12-volts, check the (B1) Right Rear WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B1) Right Rear WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B1) RIGHT REAR WSS SIGNAL VOLTAGE AT THE RIGHT REAR WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

While back probing, measure between the (B1) Right Rear WSS Signal circuit and chassis ground at the Right Rear WSS harness connector.

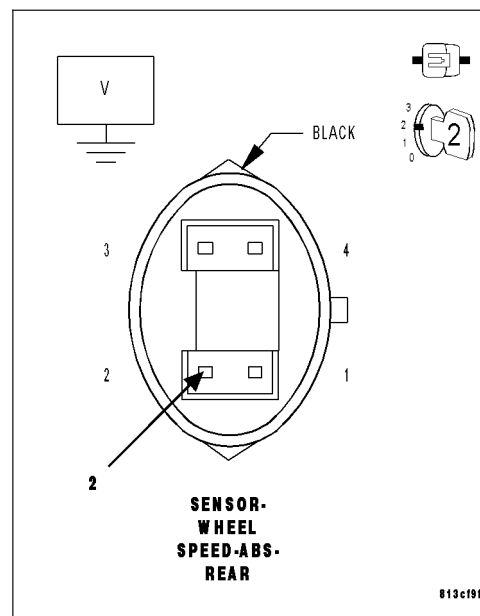
Slowly rotate the wheel by hand.

**Did the (B1) Right Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 14

**No** >> Replace the Right Rear WSS in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.



**C102B-RIGHT REAR WHEEL SPEED SENSOR CIRCUIT (CONTINUED)****14. CHECK THE (B1) RIGHT REAR WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

Turn the ignition on.

While back probing, measure between the (B1) Right Rear WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

Slowly rotate the wheel by hand.

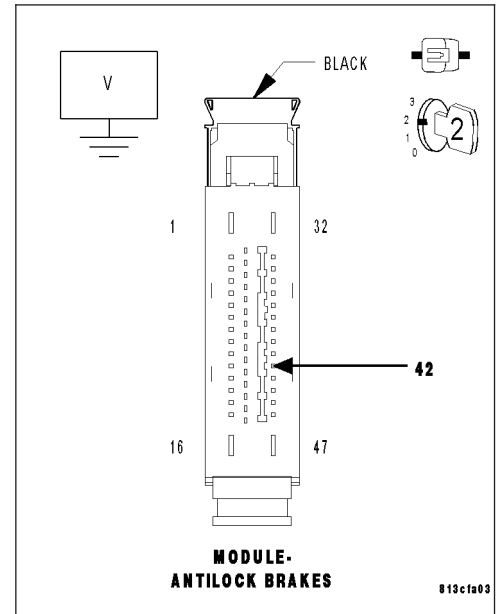
**Did the (B1) Right Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

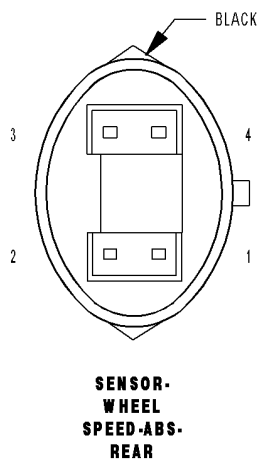
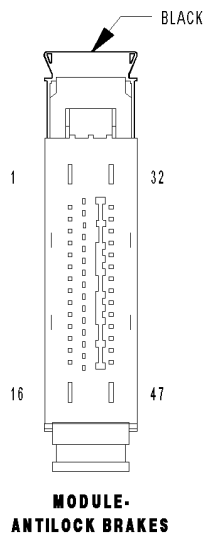
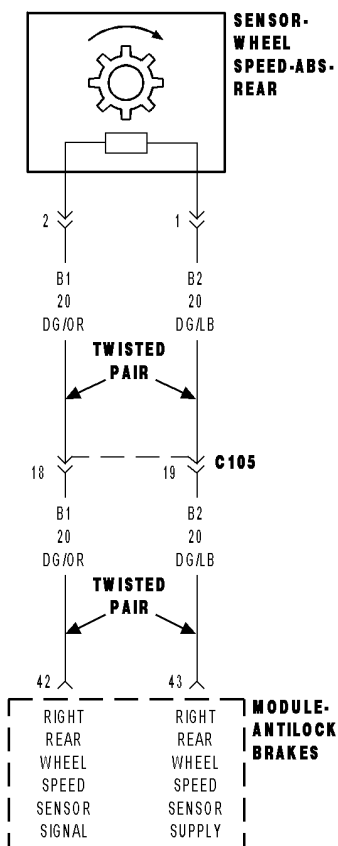
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B1) Right Rear WSS Signal circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



# C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE



**C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Right Rear Wheel Speed Signal circuit indicates continuously too high or too low wheel speed.

Possible Causes
TERMINAL/CONNECTOR/TONE WHEEL DAMAGE (B1) RIGHT REAR WSS SIGNAL CIRCUIT AND (B2) RIGHT REAR WSS SUPPLY CIRCUIT SHORTED TOGETHER (B2) RIGHT REAR WSS SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B1) RIGHT REAR WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN RIGHT REAR WSS ANTI-LOCK BRAKE MODULE

**Diagnostic Test**

**1. CHECK FOR A DTC C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

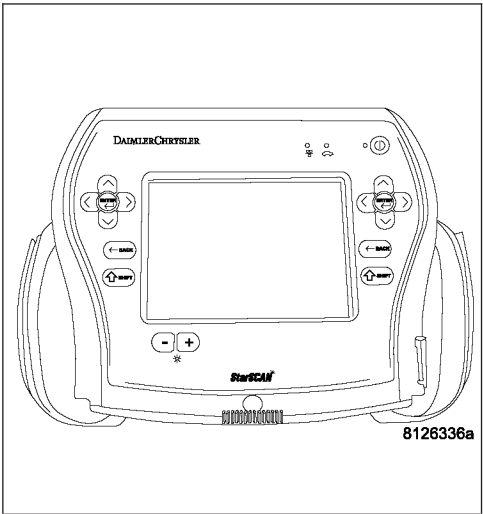
- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.

**CAUTION:** Ensure braking capability is available before road testing.

- Drive the vehicle over 25 Km/h (15 mph).
- Park the vehicle and cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's

**Does the scan tool display: C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



## C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)

## 2. CHECK THE TERMINALS/CONNECTORS/TONE WHEEL FOR DAMAGE

**Note: Check all related wiring for bruised, chafed, pierced, or partially broken wires.**

**Note: Check all related connectors for broken, bent, pushed out, or corroded terminals.**

**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

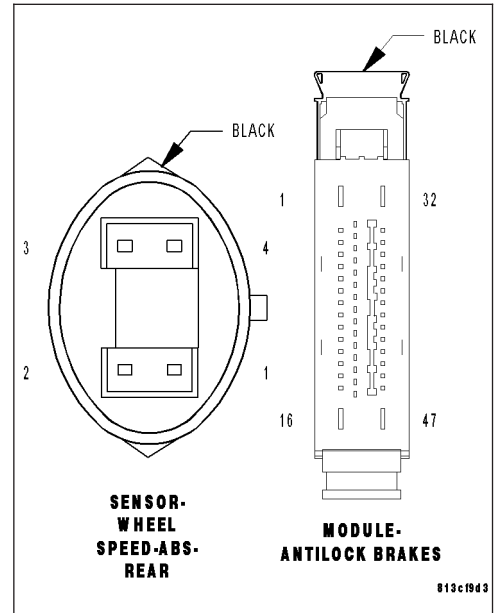
Visually inspect the Anti-Lock Brake Module harness connector, Right Rear WSS, Right Rear WSS harness connector, and Right Rear WSS tone wheel (if applicable) for damage.

### Were any problems found?

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3



### 3. CHECK THE (B1) RIGHT REAR WSS SIGNAL AND THE (B2) RIGHT REAR WSS SUPPLY CIRCUITS FOR A SHORT TOGETHER

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

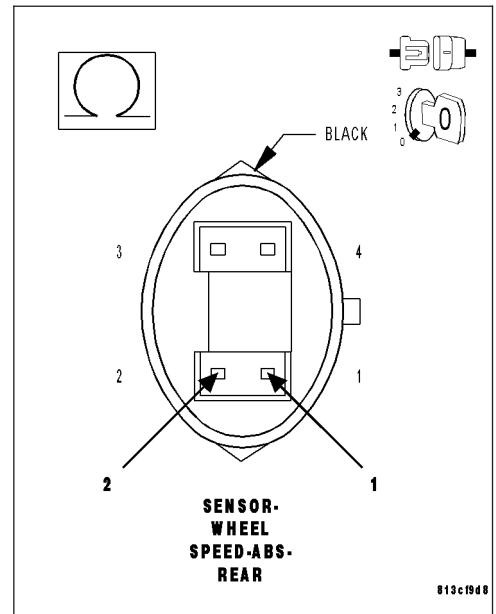
Disconnect the Right Rear WSS harness connector.

Measure the resistance between the (B1) Right Rear WSS Signal and the (B2) Right Rear WSS Supply circuits at the Right Rear WSS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (B1) Right Rear WSS Signal and the (B2) Right Rear WSS Supply circuits for a short together.  
Perform ABS VERIFICATION TEST - VER 1.



**C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****4. CHECK THE VOLTAGE ON THE (B2) RIGHT REAR WSS SUPPLY CIRCUIT**

Turn the ignition off.

Reconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

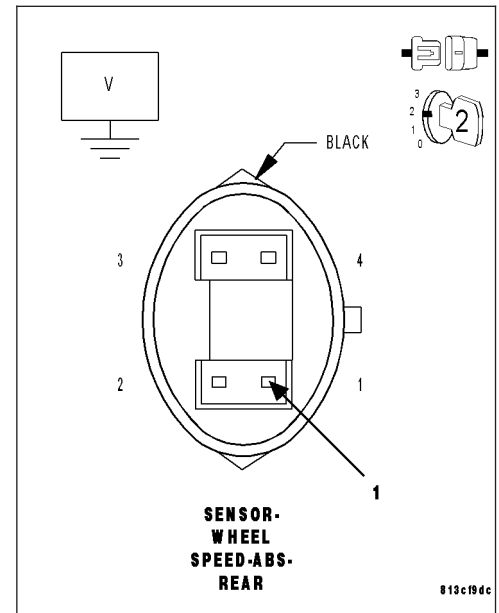
Turn the ignition on.

Measure the voltage of the (B2) Right Rear WSS Supply circuit in the Right Rear WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 8

**No** >> Go To 5

**5. CHECK THE (B2) RIGHT REAR WSS SUPPLY CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

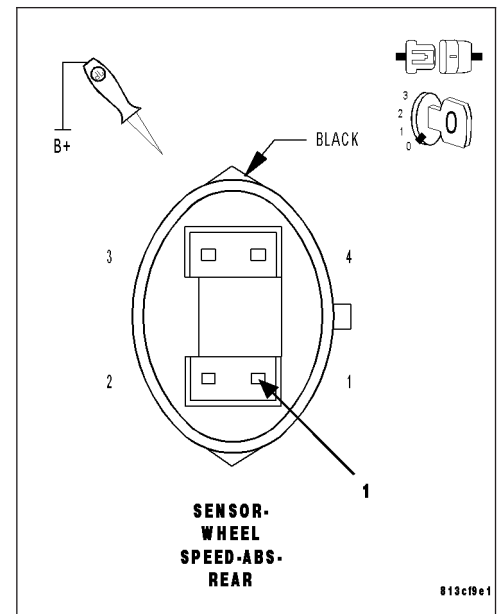
Disconnect the Right Rear WSS harness connector.

Using a 12-volt test light connected to 12-volts, check the (B2) Right Rear WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B2) Right Rear WSS Supply circuit for a short to ground.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****6. CHECK THE (B2) RIGHT REAR WSS SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

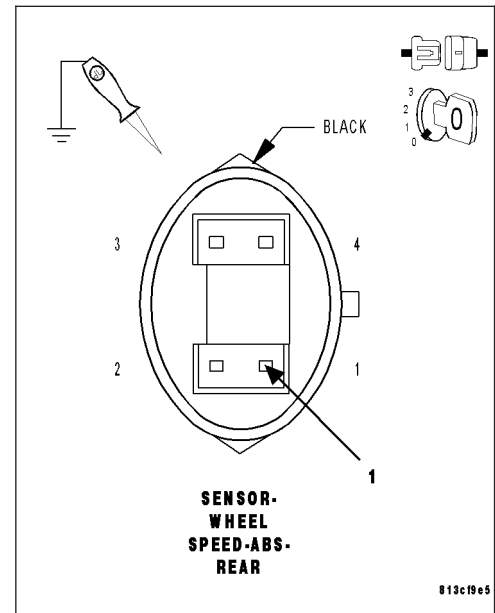
Using a 12-volt test light connected to ground, check the (B2) Right Rear WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B2) Right Rear WSS Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B2) RIGHT REAR WSS SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

Connect a jumper wire between the (B2) Right Rear WSS Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B2) Right Rear WSS Supply circuit.

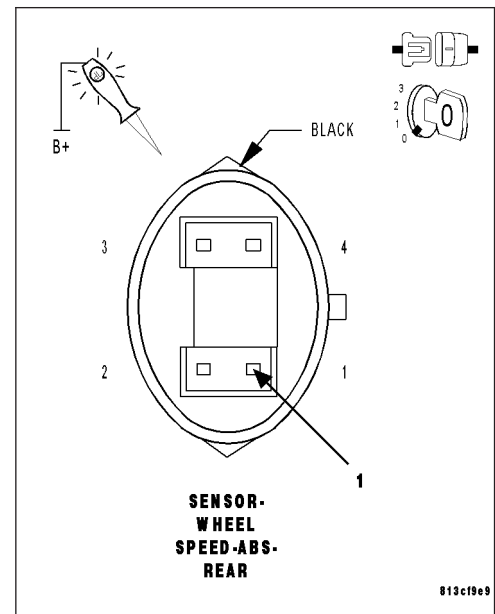
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B2) Right Rear WSS Supply circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.





**C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****8. CHECK THE (B2) RIGHT REAR WSS SUPPLY AND THE (B1) RIGHT REAR WSS SIGNAL VOLTAGE**

Turn the ignition off.

Disconnect the Right Rear WSS harness connector.

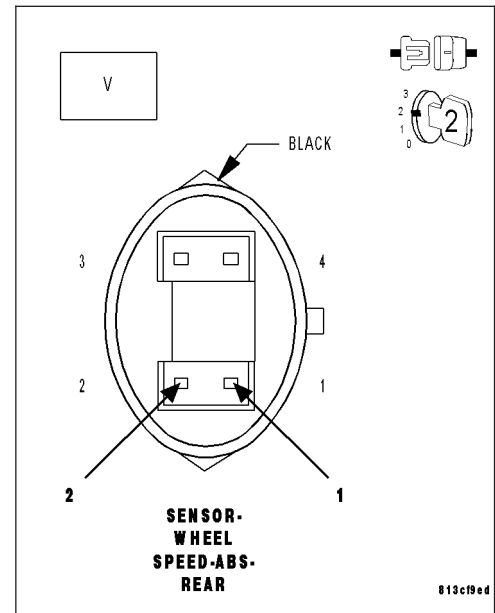
Turn the ignition on.

Measure the voltage between the (B2) Right Rear WSS Supply and (B1) Right Rear WSS Signal circuits at the Right Rear WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 12

**No** >> Go To 9

**9. CHECK THE (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

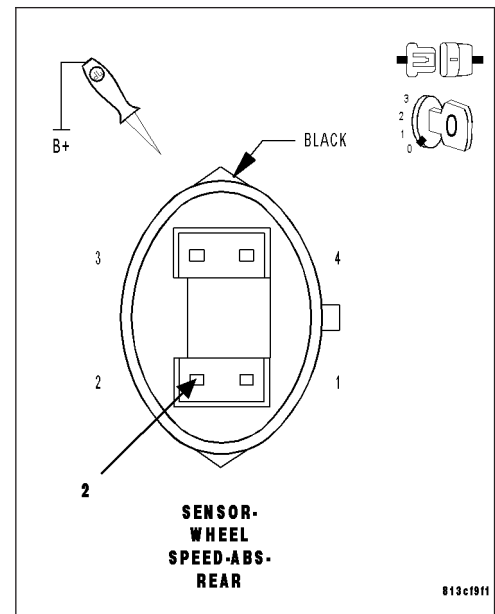
Disconnect the Right Rear WSS harness connector.

Using a 12-volt test light connected to 12-volts, check the (B1) Right Rear WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B1) Right Rear WSS Signal circuit for a short to ground.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****10. CHECK THE (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

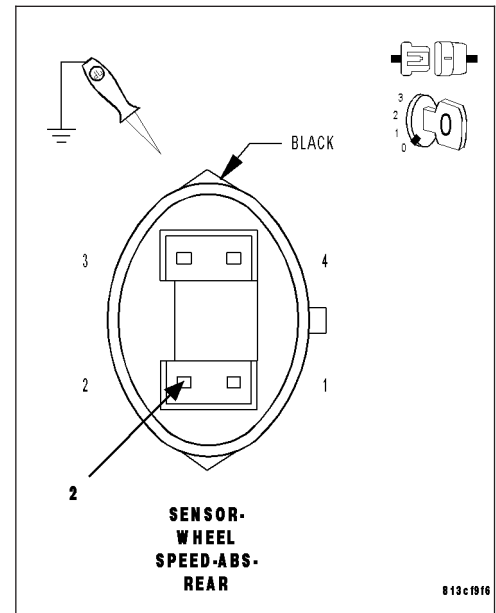
Using a 12-volt test light connected to ground, check the (B1) Right Rear WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B1) Right Rear WSS Signal circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

Connect a jumper wire between the (B1) Right Rear WSS Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B1) Right Rear WSS Signal circuit.

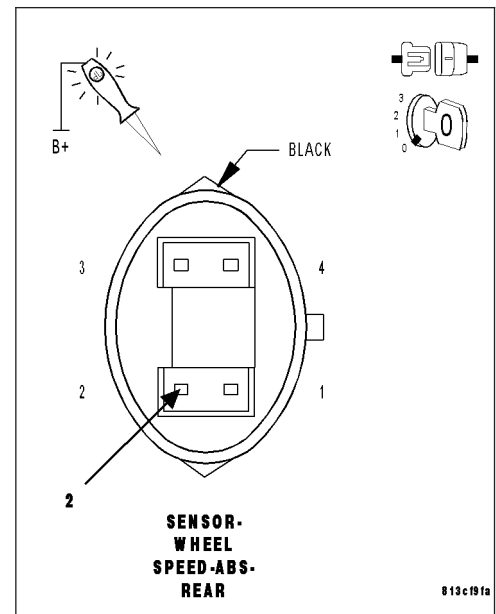
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B1) Right Rear WSS Signal circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****12. CHECK THE (B1) RIGHT REAR WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Right Rear WSS harness connector.

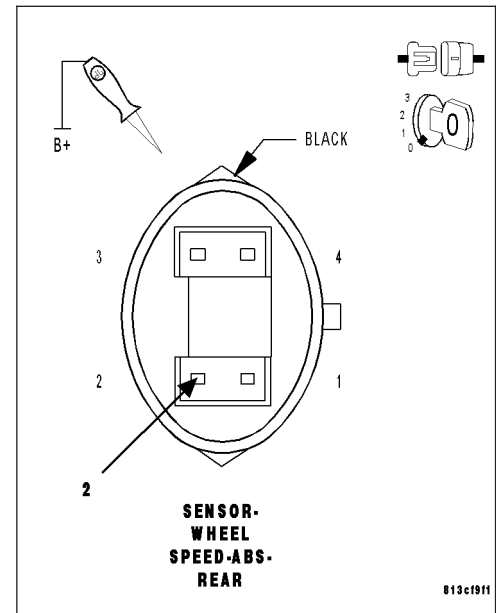
Using a 12-volt test light connected to 12-volts, check the (B1) Right Rear WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B1) Right Rear WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B1) RIGHT REAR WSS SIGNAL VOLTAGE AT THE RIGHT REAR WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

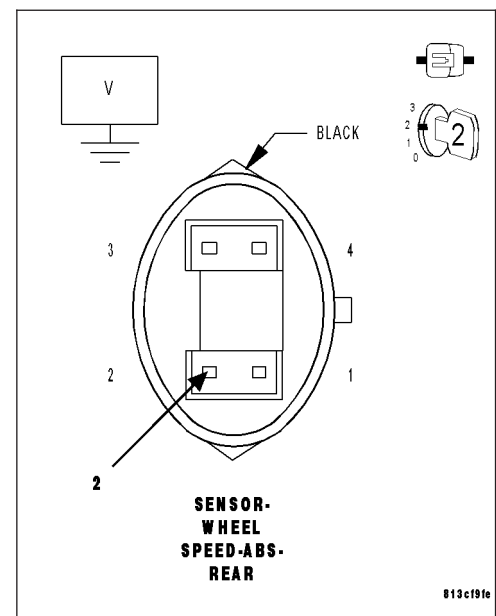
While back probing, measure between the (B1) Right Rear WSS Signal circuit and chassis ground at the Right Rear WSS harness connector.

Slowly rotate the wheel by hand.

**Did the (B1) Right Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 14

**No** >> Replace the Right Rear WSS in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



**C1032-RIGHT REAR WHEEL SPEED SENSOR SIGNAL ERRATIC PERFORMANCE (CONTINUED)****14. CHECK THE (B1) RIGHT REAR WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

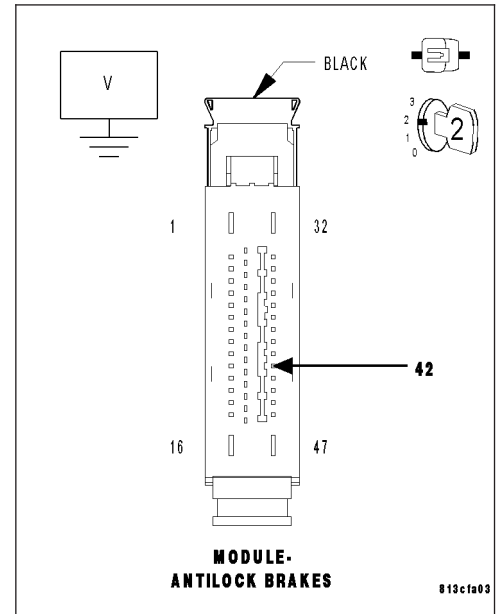
Turn the ignition on.

While back probing, measure between the (B1) Right Rear WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

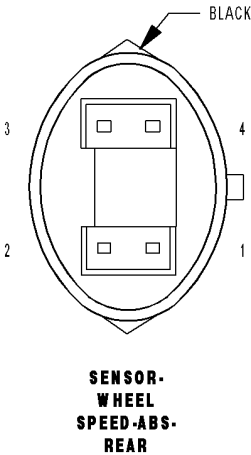
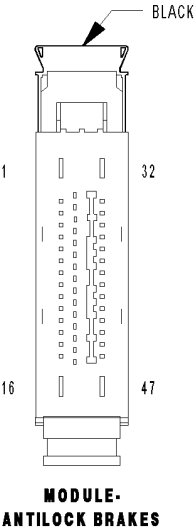
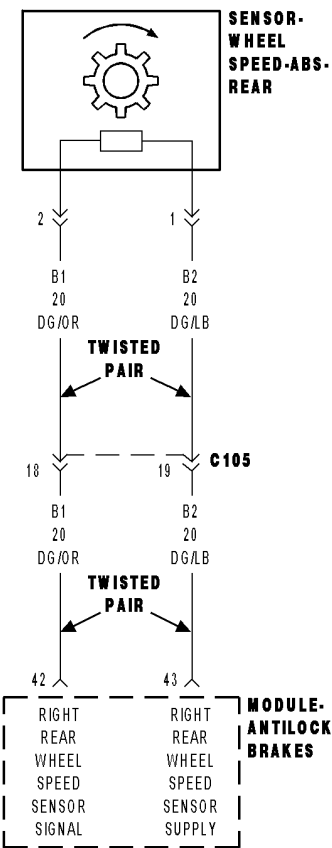
Slowly rotate the wheel by hand.

**Did the (B1) Right Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B1) Right Rear WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



C1035-RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE



**C1035-RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Right Rear Wheel Speed Sensor circuit fails the diagnostic test.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS/TONE WHEEL DAMAGE (B1) RIGHT REAR WSS SIGNAL CIRCUIT OPEN RIGHT REAR WSS ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C1035-RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

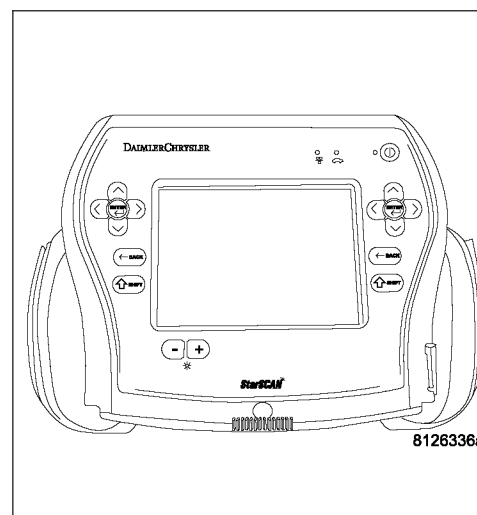
**CAUTION:** Ensure brake capability is available before road testing.

Have an assistant test drive the vehicle in a straight line to 40 Km/h (25 mph) while monitoring all the WSS speeds with the scan tool.

**Did the RR WSS speed differ by 8 Km/h (5 mph) or show NO speed?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C1035-RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

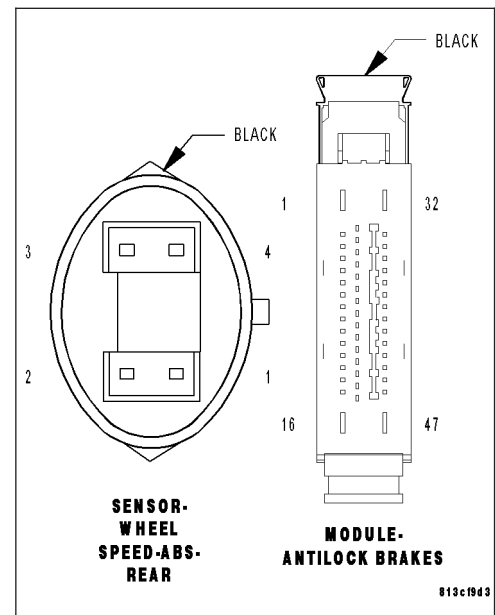
Visually inspect the Anti-Lock Brake Module harness connector, Right Rear WSS, Right Rear WSS harness connector, and Right Rear WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE BETWEEN (B2) RIGHT REAR WSS SUPPLY CIRCUIT AND THE (B1) RIGHT REAR WSS SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the Right Rear WSS harness connector.

Turn the ignition on.

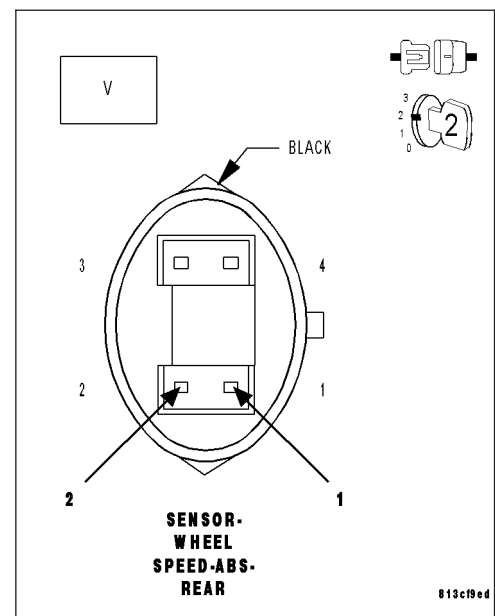
Measure the voltage between the (B2) Right Rear WSS Supply and (B1) Right Rear WSS Signal circuits at the Right Rear WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 4

**No** >> Refer to DTC-C102B RIGHT REAR WHEEL SPEED SENSOR CIRCUIT for the diagnostic repair procedure.

Perform ABS VERIFICATION TEST - VER 1.



**C1035-RIGHT REAR WHEEL SPEED COMPARATIVE PERFORMANCE (CONTINUED)****4. CHECK THE (B1) RIGHT REAR WSS SIGNAL VOLTAGE AT THE RIGHT REAR WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

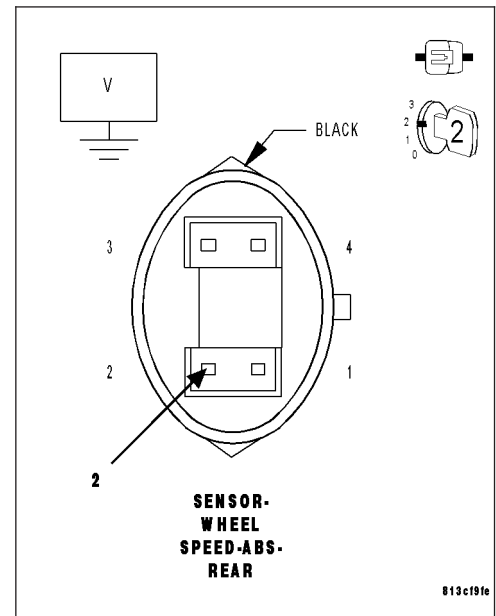
While back probing, measure between the (B1) Right Rear WSS Signal circuit and chassis ground at the Right Rear WSS harness connector.

Slowly rotate the wheel by hand.

**Did the (B1) Right Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 5

**No** >> Replace the Right Rear WSS in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**5. CHECK THE (B1) RIGHT REAR WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

Turn the ignition on.

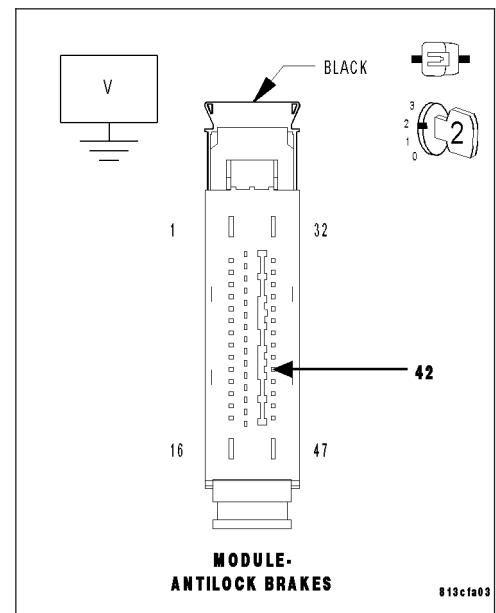
While back probing, measure between the (B1) Right Rear WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

Slowly rotate the wheel by hand.

**Did the (B1) Right Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

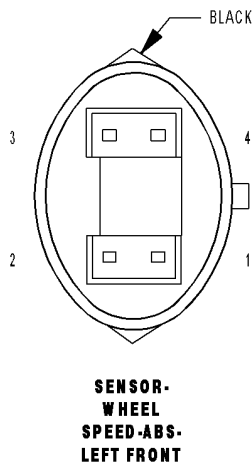
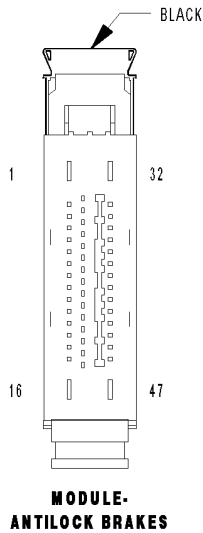
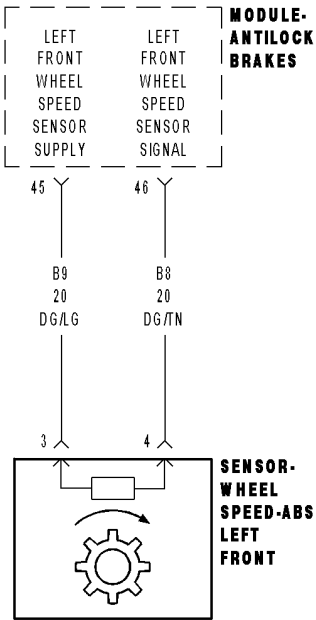
**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B1) Right Rear WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.





C1041-LEFT FRONT TONE WHEEL PERFORMANCE



**C1041-LEFT FRONT TONE WHEEL PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects periodic drops of a WSS signal.

Possible Causes
LEFT FRONT TONE WHEEL

**Diagnostic Test****1. CHECK FOR A DTC C1041-LEFT FRONT TONE WHEEL PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

**CAUTION:** Ensure brake capability is available before road testing.

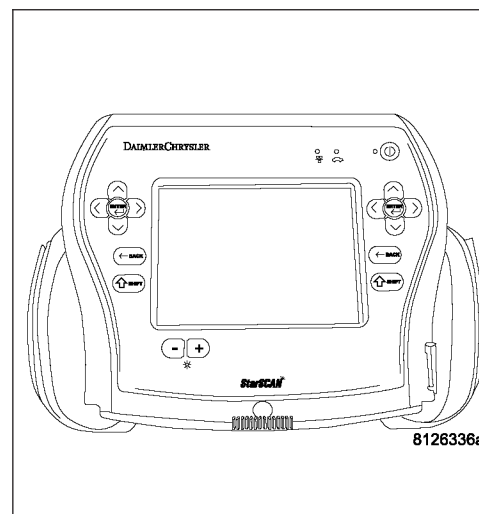
Test drive the vehicle in a straight line to 40 Km/h (25 mph).

With the scan tool, read and record DTC's.

**Does the scan tool display: C1041-LEFT FRONT TONE WHEEL PERFORMANCE?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.

**2. CHECK THE LEFT FRONT TONE WHEEL FOR DAMAGE**

**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked.

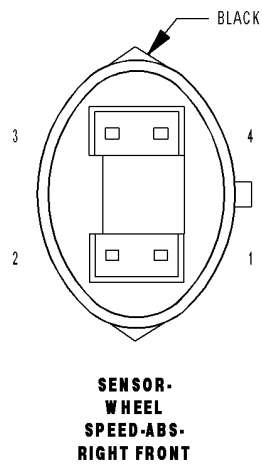
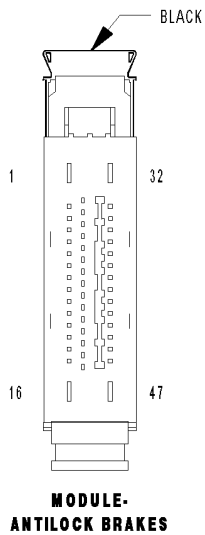
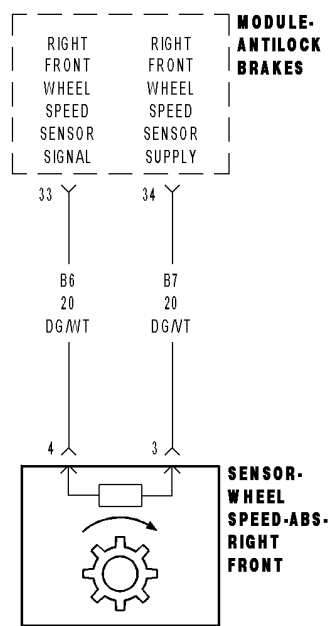
Check the Left Front Tone Wheel for damage.

**Were any problems found?**

**Yes** >> Replace the Left Front Tone Wheel in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Test Complete.

C1042-RIGHT FRONT TONE WHEEL PERFORMANCE



**C1042-RIGHT FRONT TONE WHEEL PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects periodic drops of a WSS signal.

Possible Causes
RIGHT FRONT TONE WHEEL

**Diagnostic Test****1. CHECK FOR A DTC C1042-RIGHT FRONT TONE WHEEL PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

**CAUTION:** Ensure brake capability is available before road testing.

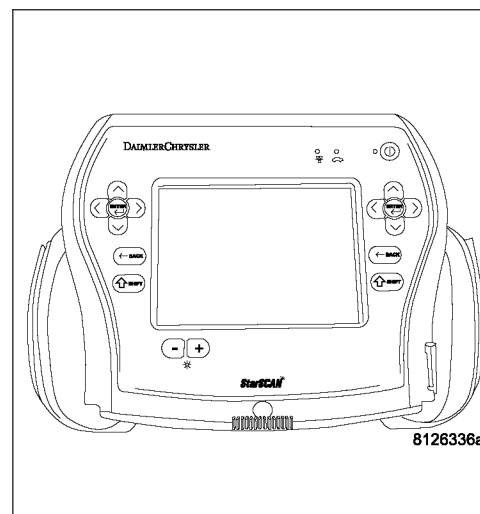
Test drive the vehicle in a straight line to 40 Km/h (25 mph).

With the scan tool, read and record DTC's.

**Does the scan tool display: C1042-RIGHT FRONT TONE WHEEL PERFORMANCE?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.

**2. CHECK THE RIGHT FRONT TONE WHEEL FOR DAMAGE**

**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked.

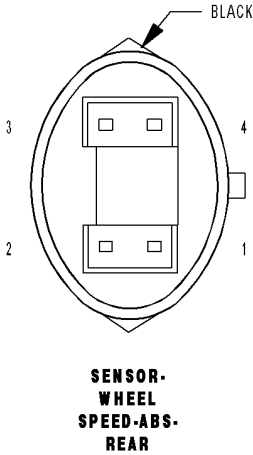
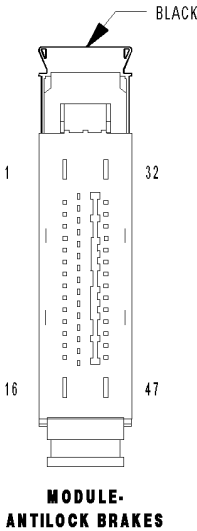
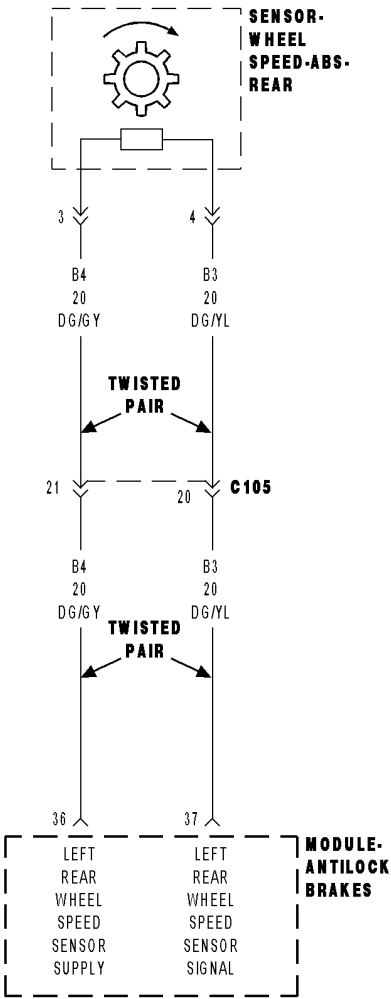
Check the Right Front Tone Wheel for damage.

**Were any problems found?**

**Yes** >> Replace the Right Front Tone Wheel in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Test Complete.

C1043-LEFT REAR TONE WHEEL PERFORMANCE



**C1043-LEFT REAR TONE WHEEL PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects periodic drops of a WSS signal.

Possible Causes
LEFT REAR TONE WHEEL

**Diagnostic Test****1. CHECK FOR A DTC C1043-LEFT REAR TONE WHEEL PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

**CAUTION:** Ensure brake capability is available before road testing.

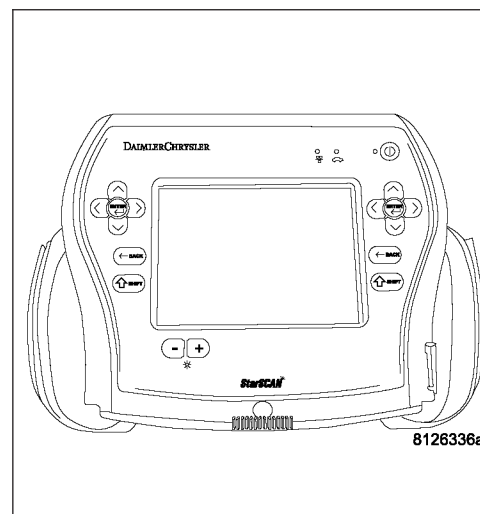
Test drive the vehicle in a straight line to 40 Km/h (25 mph).

With the scan tool, read and record DTC's.

**Does the scan tool display: C1043-LEFT REAR TONE WHEEL PERFORMANCE?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.

**2. CHECK THE LEFT REAR TONE WHEEL FOR DAMAGE**

**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked.

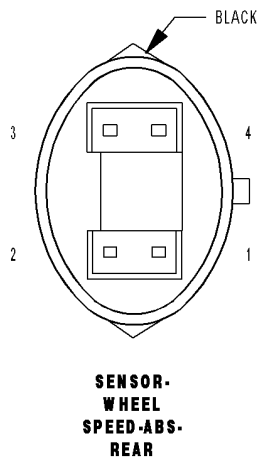
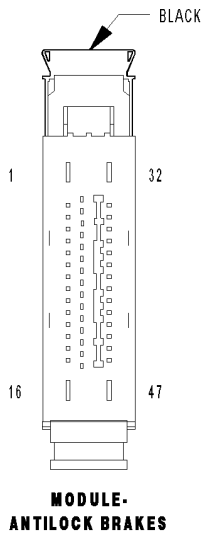
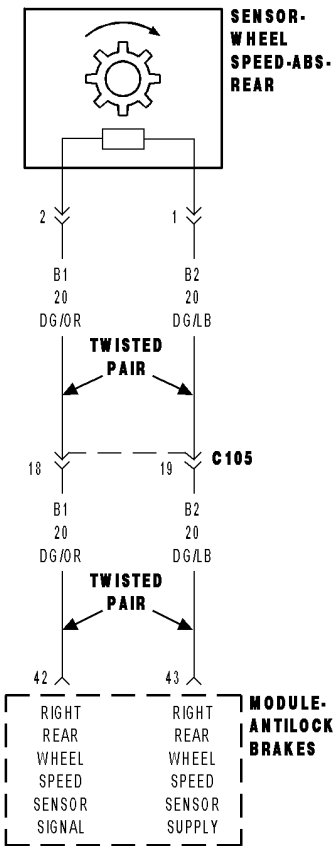
Check the Left Rear Tone Wheel for damage.

**Were any problems found?**

**Yes** >> Replace the Left Rear Tone Wheel in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Test Complete.

C1044-RIGHT REAR TONE WHEEL PERFORMANCE



**C1044-RIGHT REAR TONE WHEEL PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects periodic drops of a WSS signal.

Possible Causes
RIGHT REAR TONE WHEEL

**Diagnostic Test****1. CHECK FOR A DTC C1044-RIGHT REAR TONE WHEEL PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

**CAUTION:** Ensure brake capability is available before road testing.

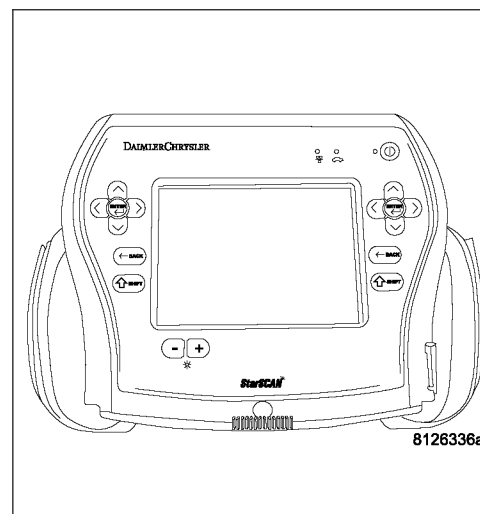
Test drive the vehicle in a straight line to 40 Km/h (25 mph).

With the scan tool, read and record DTC's.

**Does the scan tool display: C1044-RIGHT REAR TONE WHEEL PERFORMANCE?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.

**2. CHECK THE RIGHT REAR TONE WHEEL FOR DAMAGE**

**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked.

Check the Right Rear Tone Wheel for damage.

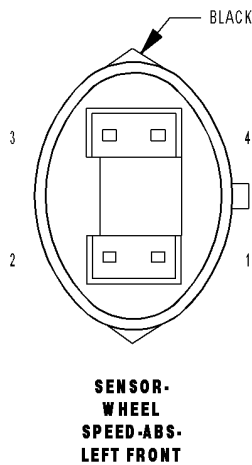
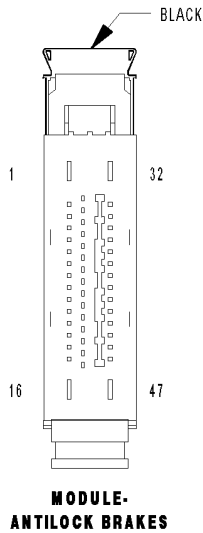
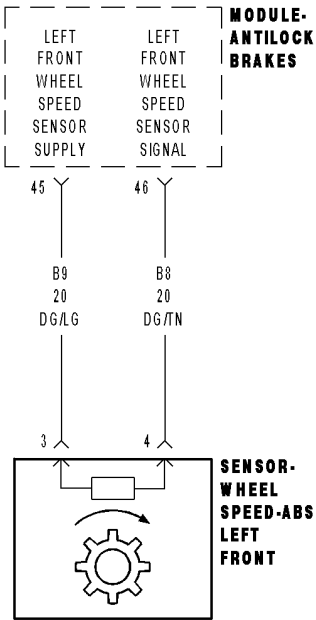
**Were any problems found?**

**Yes** >> Replace the Right Rear Tone Wheel in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Test Complete.



C1046-LEFT FRONT WHEEL PRESSURE PHASE MONITORING



**C1046-LEFT FRONT WHEEL PRESSURE PHASE MONITORING (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects a pressure reduction phase and the following pressure hold phase is too long.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS/TONE WHEEL DAMAGE (B8) LEFT FRONT WSS SIGNAL CIRCUIT OPEN LEFT FRONT WSS ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C1046-LEFT FRONT WHEEL PRESSURE PHASE MONITORING**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

**CAUTION:** Ensure brake capability is available before road testing.

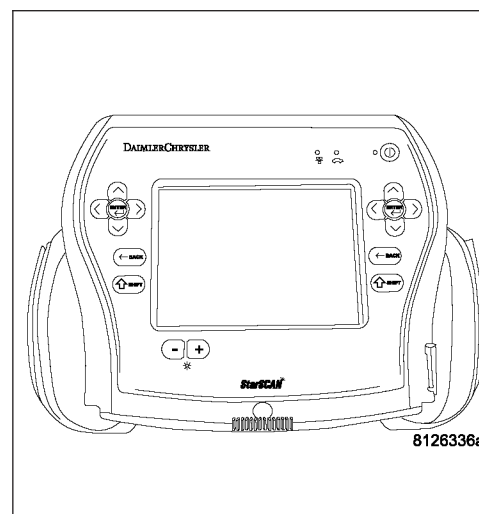
Have an assistant test drive the vehicle in a straight line to 40 Km/h (25 mph) while monitoring all the WSS speeds with the scan tool.

**Did the LF WSS speed differ by 8 Km/h (5 mph) or show NO speed?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.

Perform ABS VERIFICATION TEST - VER 1.



**C1046-LEFT FRONT WHEEL PRESSURE PHASE MONITORING (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

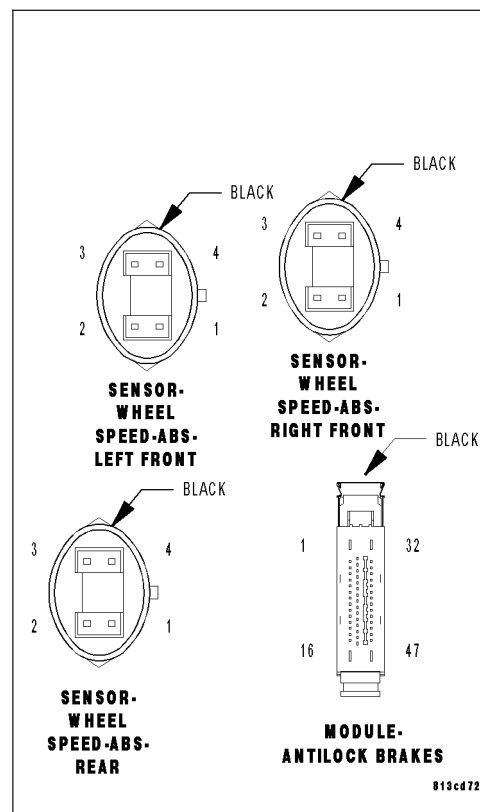
**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

Visually inspect the Anti-Lock Brake Module harness connector, Left Front WSS, Left Front WSS harness connector, and Left Front WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE BETWEEN (B9) LEFT FRONT WSS SUPPLY CIRCUIT AND THE (B8) LEFT FRONT WSS SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the Left Front WSS harness connector.

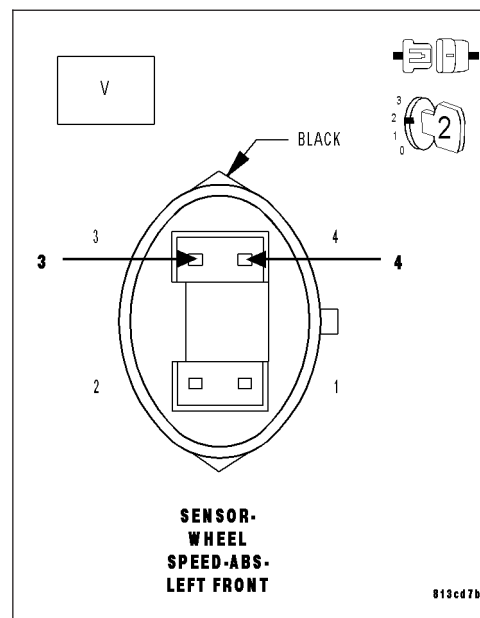
Turn the ignition on.

Measure the voltage between the (B9) Left Front WSS Supply and (B8) Left Front WSS Signal circuits at the Left Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 4

**No** >> Refer to DTC-C100A LEFT FRONT WHEEL SPEED SENSOR CIRCUIT for the diagnostic repair procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C1046-LEFT FRONT WHEEL PRESSURE PHASE MONITORING (CONTINUED)****4. CHECK THE (B8) LEFT FRONT WSS SIGNAL VOLTAGE AT THE LEFT FRONT WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

While back probing, measure between the (B8) Left Front WSS Signal circuit and chassis ground at the Left Front WSS harness connector.

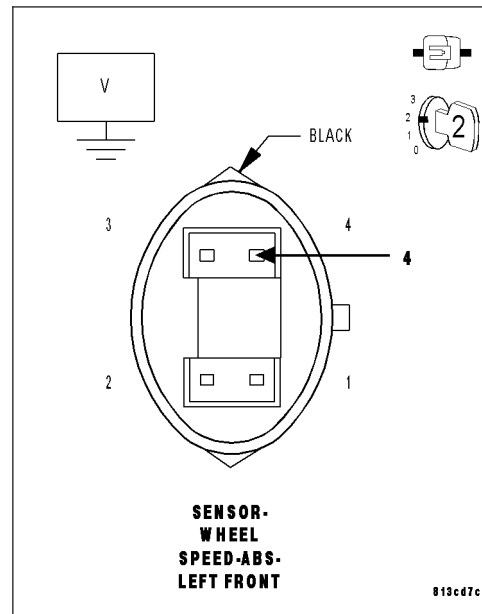
Slowly rotate the wheel by hand.

**Did the (B8) Left Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 5

**No** >> Replace the Left Front WSS in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**5. CHECK THE (B8) LEFT FRONT WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

Turn the ignition on.

While back probing, measure between the (B8) Left Front WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

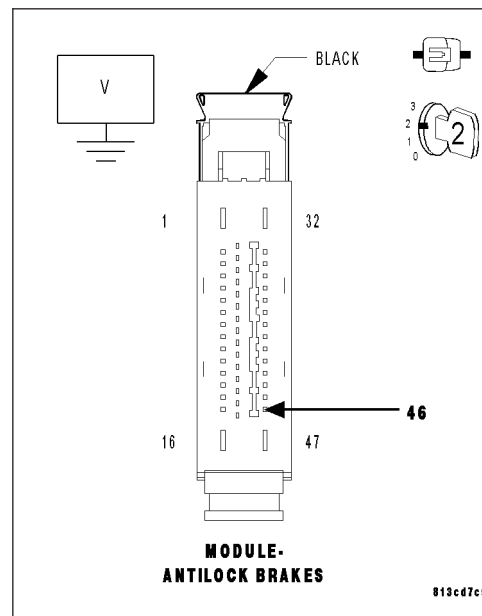
Slowly rotate the wheel by hand.

**Did the (B8) Left Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

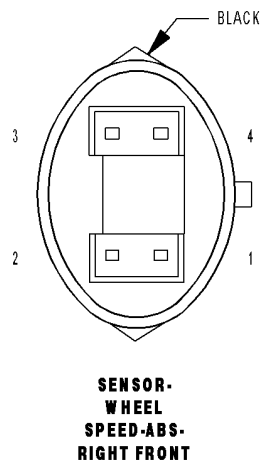
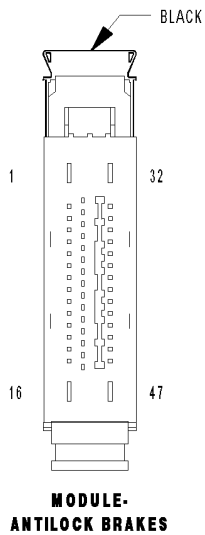
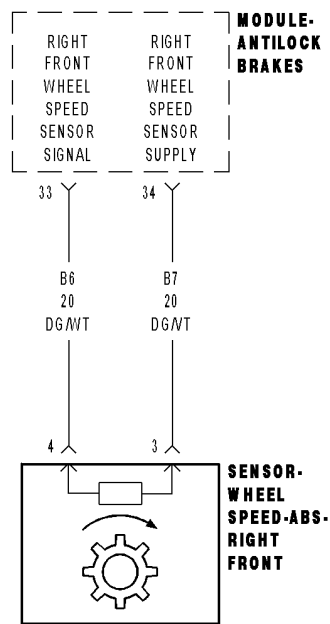
**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B8) Left Front WSS Signal circuit for an open. Perform ABS VERIFICATION TEST - VER 1.



C1047-RIGHT FRONT WHEEL PRESSURE PHASE MONITORING



**C1047-RIGHT FRONT WHEEL PRESSURE PHASE MONITORING (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects a pressure reduction phase and the following pressure hold phase is too long.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS/TONE WHEEL DAMAGE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT OPEN RIGHT FRONT WSS ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C1047-RIGHT FRONT WHEEL PRESSURE PHASE MONITORING**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

**CAUTION:** Ensure brake capability is available before road testing.

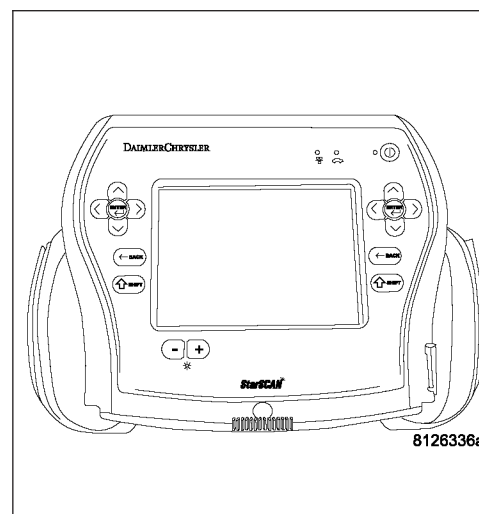
Have an assistant test drive the vehicle in a straight line to 40 Km/h (25 mph) while monitoring all the WSS speeds with the scan tool.

**Did the RF WSS speed differ by 8 Km/h (5 mph) or show NO speed?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.

Perform ABS VERIFICATION TEST - VER 1.



**C1047-RIGHT FRONT WHEEL PRESSURE PHASE MONITORING (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

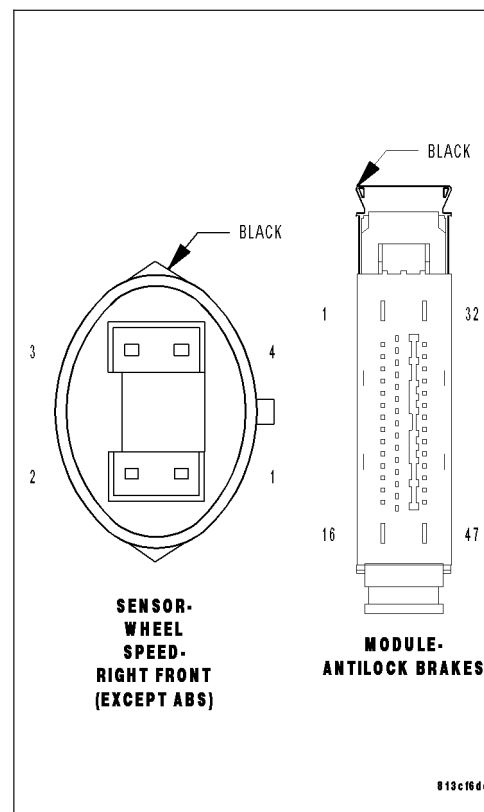
Visually inspect the Anti-Lock Brake Module harness connector, Right Front WSS, Right Front WSS harness connector, and Right Front WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE BETWEEN (B7) RIGHT FRONT WSS SUPPLY CIRCUIT AND THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the Right Front WSS harness connector.

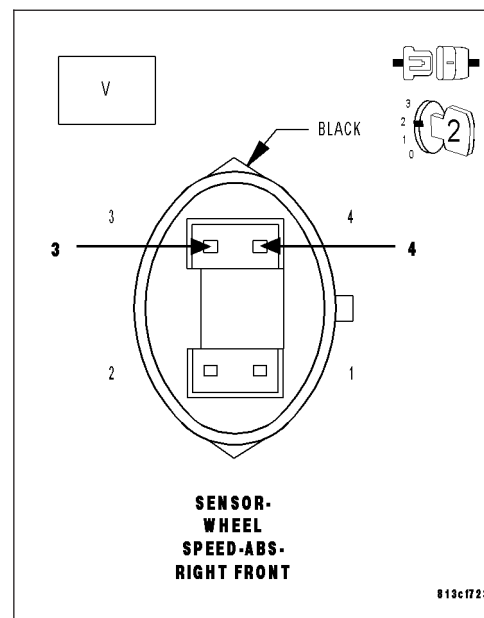
Turn the ignition on.

Measure the voltage between the (B7) Right Front WSS Supply and (B6) Right Front WSS Signal circuits at the Right Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 4

**No** >> Refer to DTC-C1015 RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT for the diagnostic repair procedure. Perform ABS VERIFICATION TEST - VER 1.



**C1047-RIGHT FRONT WHEEL PRESSURE PHASE MONITORING (CONTINUED)****4. CHECK THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE AT THE RIGHT FRONT WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

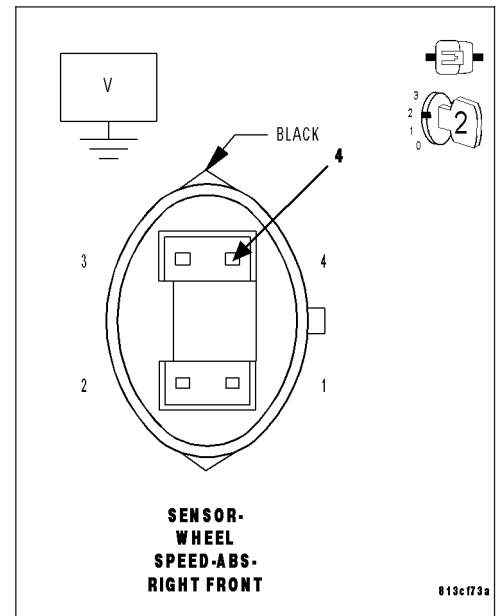
While back probing, measure between the (B6) Right Front WSS Signal circuit and chassis ground at the Right Front WSS harness connector.

Slowly rotate the wheel by hand.

**Did the (B6) Right Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 5

**No** >> Replace the Right Front WSS in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**5. CHECK THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

Turn the ignition on.

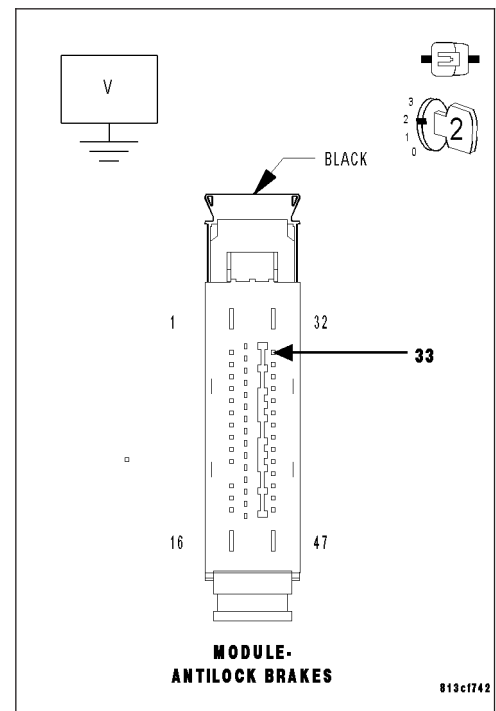
While back probing, measure between the (B6) Right Front WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

Slowly rotate the wheel by hand.

**Did the (B6) Right Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

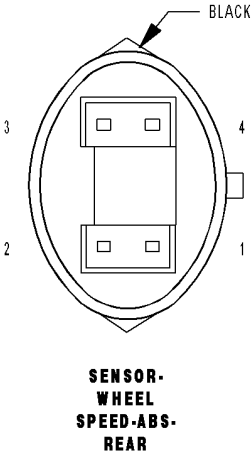
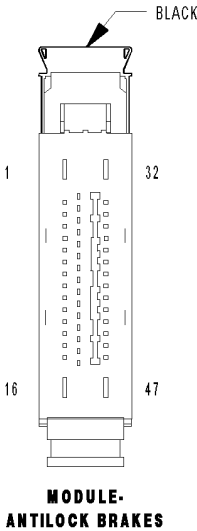
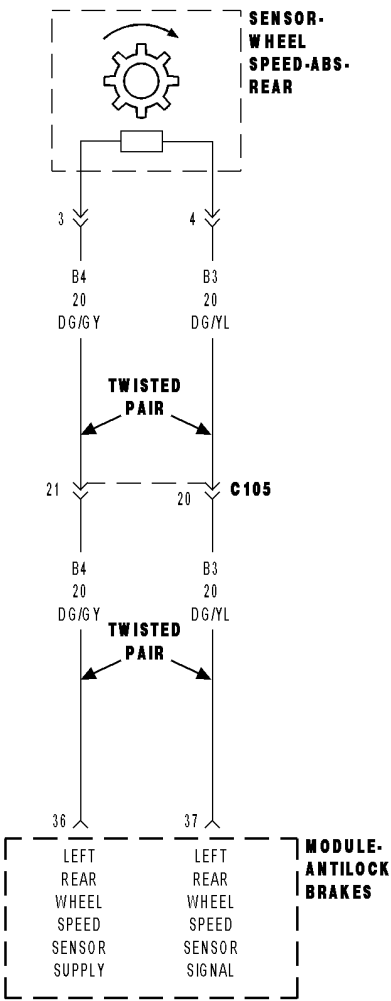
**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B6) Right Front WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.





C1048-LEFT REAR WHEEL PRESSURE PHASE MONITORING



**C1048-LEFT REAR WHEEL PRESSURE PHASE MONITORING (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects a pressure reduction phase and the following pressure hold phase is too long.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS/TONE WHEEL DAMAGE (B3) LEFT REAR WSS SIGNAL CIRCUIT OPEN LEFT REAR WSS ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C1048-LEFT REAR WHEEL PRESSURE PHASE MONITORING**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

**CAUTION:** Ensure brake capability is available before road testing.

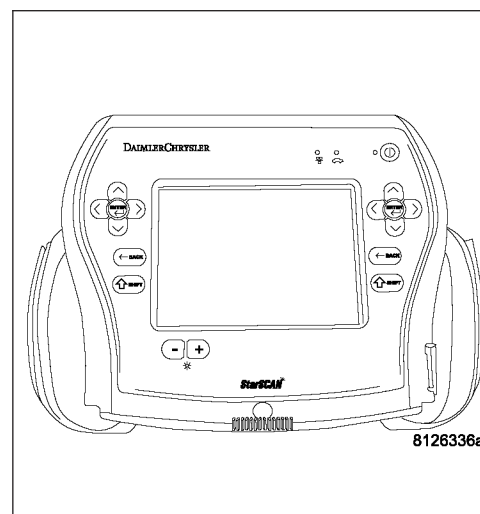
Have an assistant test drive the vehicle in a straight line to 40 Km/h (25 mph) while monitoring all the WSS speeds with the scan tool.

**Did the LR WSS speed differ by 8 Km/h (5 mph) or show NO speed?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.

Perform ABS VERIFICATION TEST - VER 1.



**C1048-LEFT REAR WHEEL PRESSURE PHASE MONITORING (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

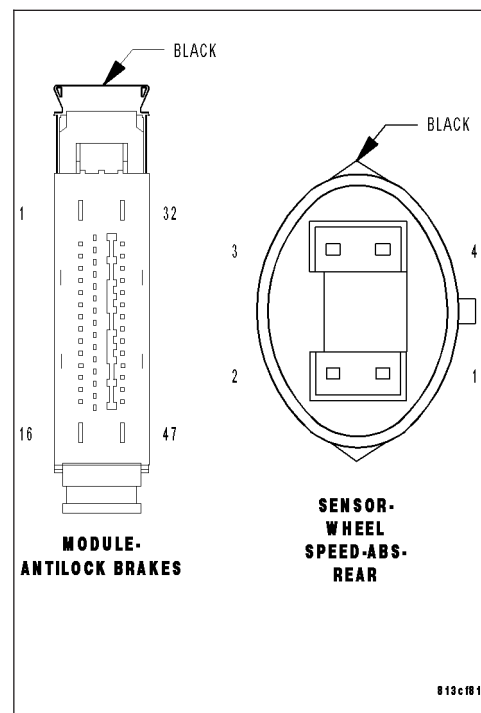
Visually inspect the Anti-Lock Brake Module harness connector, Left Rear WSS, Left Rear WSS harness connector, and Left Rear WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE BETWEEN (B4) LEFT REAR WSS SUPPLY CIRCUIT AND THE (B3) LEFT REAR WSS SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the Left Rear WSS harness connector.

Turn the ignition on.

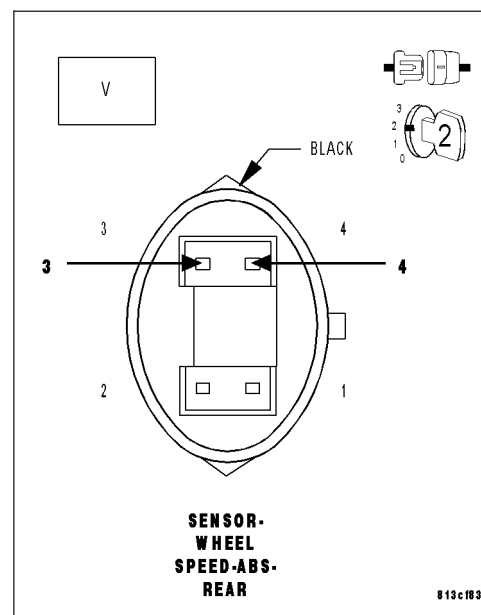
Measure the voltage between the (B4) Left Rear WSS Supply and (B3) Left Rear WSS Signal circuits at the Left Rear WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 4

**No** >> Refer to DTC-C1020 LEFT REAR WHEEL SPEED SENSOR CIRCUIT for the diagnostic repair procedure.

Perform ABS VERIFICATION TEST - VER 1.



**C1048-LEFT REAR WHEEL PRESSURE PHASE MONITORING (CONTINUED)****4. CHECK THE (B3) LEFT REAR WSS SIGNAL VOLTAGE AT THE LEFT REAR WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

While back probing, measure between the (B3) Left Rear WSS Signal circuit and chassis ground at the Left Rear WSS harness connector.

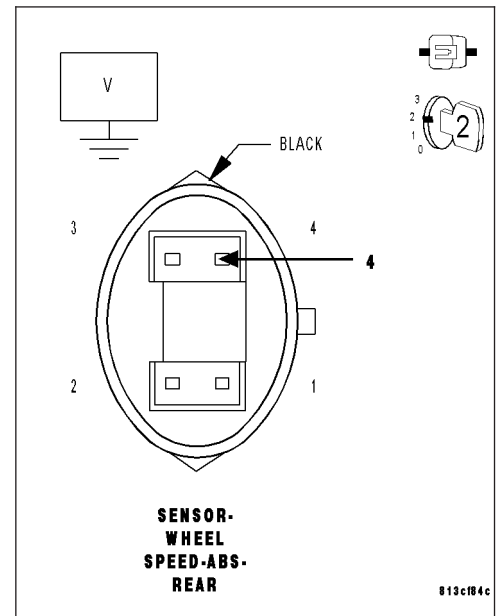
Slowly rotate the wheel by hand.

**Did the (B3) Left Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 5

**No** >> Replace the Left Rear WSS in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**5. CHECK THE (B3) LEFT REAR WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

Turn the ignition on.

While back probing, measure between the (B3) Left Rear WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

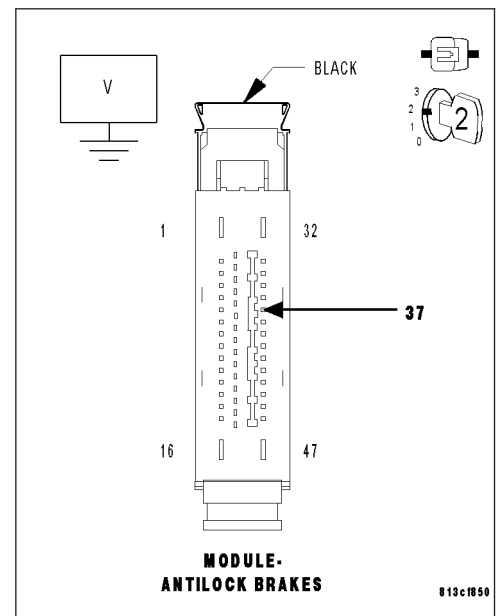
Slowly rotate the wheel by hand.

**Did the (B3) Left Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

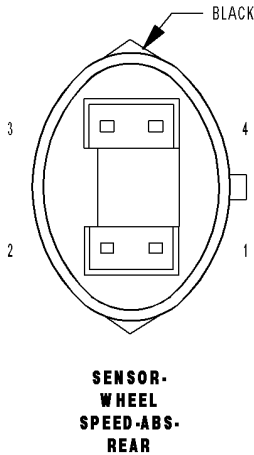
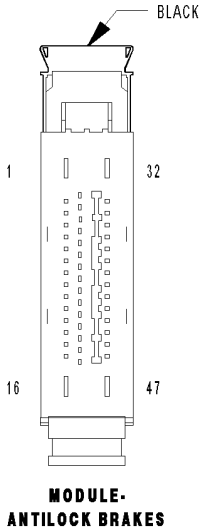
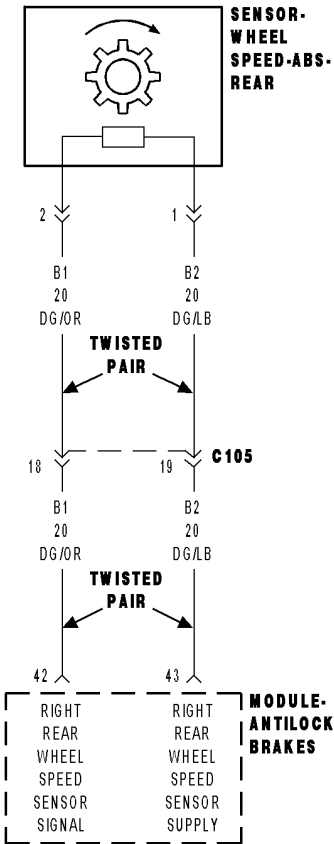
**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B3) Left Rear WSS Signal circuit for an open. Perform ABS VERIFICATION TEST - VER 1.



C1049-RIGHT REAR WHEEL PRESSURE PHASE MONITORING



**C1049-RIGHT REAR WHEEL PRESSURE PHASE MONITORING (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects a pressure reduction phase and the following pressure hold phase is too long.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS/TONE WHEEL DAMAGE (B1) RIGHT REAR WSS SIGNAL CIRCUIT OPEN RIGHT REAR WSS ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C1049-RIGHT REAR WHEEL PRESSURE PHASE MONITORING**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

**CAUTION:** Ensure brake capability is available before road testing.

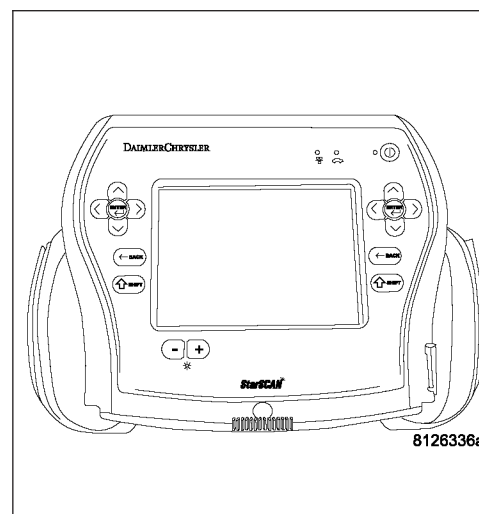
Have an assistant test drive the vehicle in a straight line to 40 Km/h (25 mph) while monitoring all the WSS speeds with the scan tool.

**Did the RR WSS speed differ by 8 Km/h (5 mph) or show NO speed?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.

Perform ABS VERIFICATION TEST - VER 1.



**C1049-RIGHT REAR WHEEL PRESSURE PHASE MONITORING (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

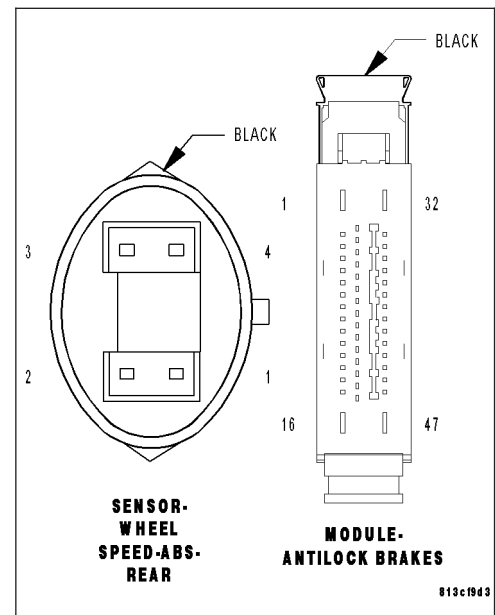
Visually inspect the Anti-Lock Brake Module harness connector, Right Rear WSS, Right Rear WSS harness connector, and Right Rear WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE BETWEEN (B2) RIGHT REAR WSS SUPPLY CIRCUIT AND THE (B1) RIGHT REAR WSS SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the Right Rear WSS harness connector.

Turn the ignition on.

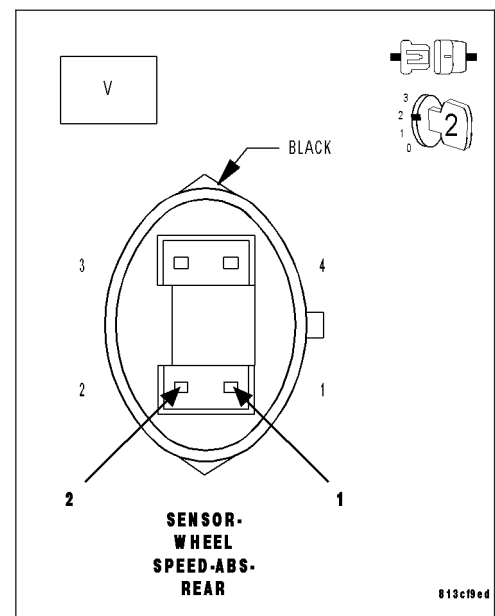
Measure the voltage between the (B2) Right Rear WSS Supply and (B1) Right Rear WSS Signal circuits at the Right Rear WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 4

**No** >> Refer to DTC-C102B RIGHT REAR WHEEL SPEED SENSOR CIRCUIT for the diagnostic repair procedure.

Perform ABS VERIFICATION TEST - VER 1.



**C1049-RIGHT REAR WHEEL PRESSURE PHASE MONITORING (CONTINUED)****4. CHECK THE (B1) RIGHT REAR WSS SIGNAL VOLTAGE AT THE RIGHT REAR WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

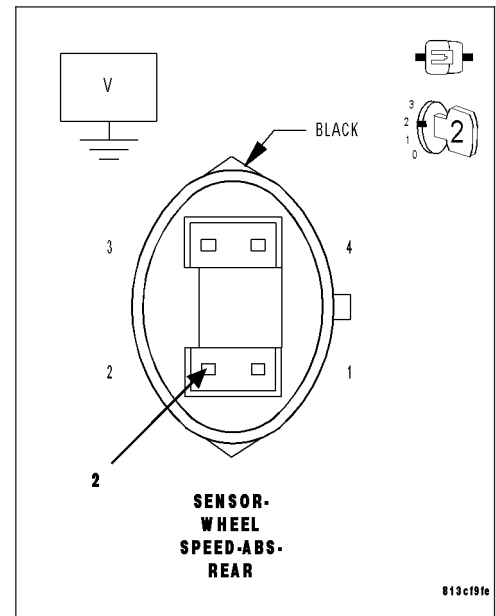
While back probing, measure between the (B1) Right Rear WSS Signal circuit and chassis ground at the Right Rear WSS harness connector.

Slowly rotate the wheel by hand.

**Did the (B1) Right Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 5

**No** >> Replace the Right Rear WSS in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**5. CHECK THE (B1) RIGHT REAR WSS SIGNAL VOLTAGE AT THE ANTI-LOCK BRAKE MODULE HARNESS CONNECTOR**

Turn the ignition off.

Turn the ignition on.

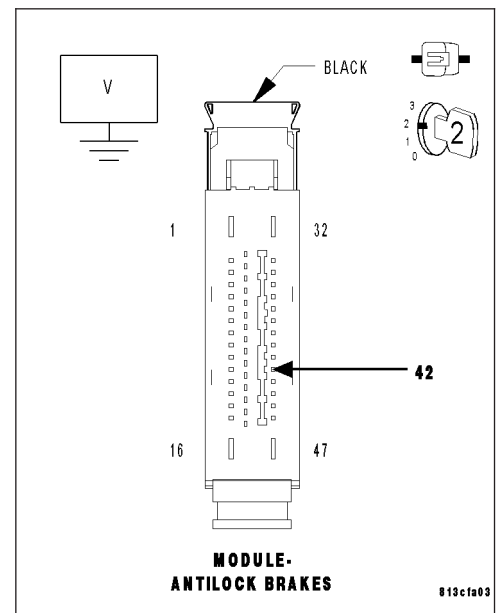
While back probing, measure between the (B1) Right Rear WSS Signal circuit and chassis ground at the Anti-Lock Brake Module harness connector.

Slowly rotate the wheel by hand.

**Did the (B1) Right Rear WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

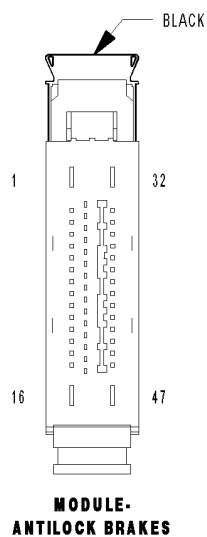
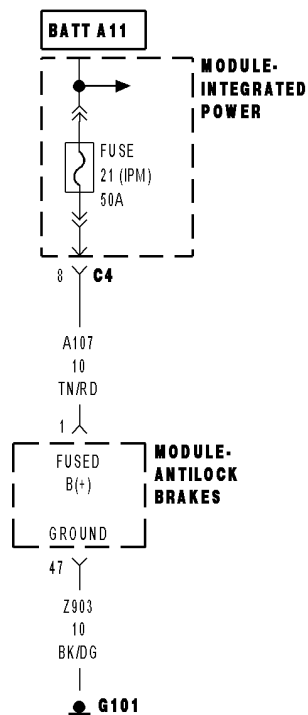
**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B1) Right Rear WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.





## C1073-ABS PUMP MOTOR CONTROL CIRCUIT



**C1073-ABS PUMP MOTOR CONTROL CIRCUIT (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates the ABS Pump Motor circuit fails the diagnostic test.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE ABS PUMP MOTOR FUSE OPEN (A107) FUSED B(+) CIRCUIT SHORTED TO GROUND OR OPEN (Z903) GROUND CIRCUIT OPEN ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK THE ABS PUMP MOTOR FOR CONTINUOUS OPERATION**

Cycle the ignition from off to on.

Monitor the ABS Pump Motor for continuous operation.

**Is the ABS Pump Motor running continuously?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 2

**2. CHECK FOR A DTC C1073-ABS PUMP MOTOR CONTROL CIRCUIT**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

**CAUTION:** Ensure braking capability is available before road testing.

Drive the vehicle over 40 Km/h (25 mph).

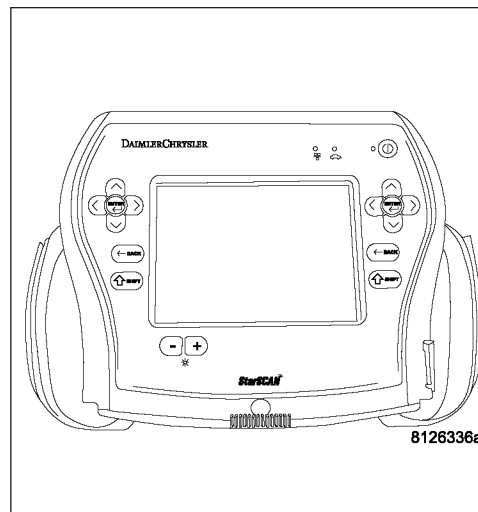
Park the vehicle and cycle the ignition switch from off to on.

With the scan tool, read and record DTC's

**Does the scan tool display: C1073-ABS PUMP MOTOR CONTROL CIRCUIT?**

**Yes** >> Go To 3

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C1073-ABS PUMP MOTOR CONTROL CIRCUIT (CONTINUED)****3. CHECK ABS PUMP OPERATION WITH SCAN TOOL**

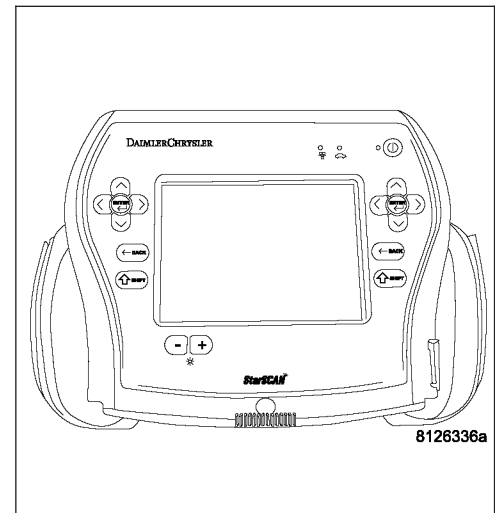
Cycle the ignition from off to on.

With the scan tool, actuate the ABS Pump Motor.

**Did the ABS Pump Motor operate?**

**Yes** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.

**No** >> Go To 4

**4. CHECK THE ABS PUMP MOTOR FUSE FOR AN OPEN**

Turn the ignition off.

Remove and visually inspect the ABS Pump Motor fuse.

**Is the ABS Pump Motor fuse open?**

**Yes** >> Go To 5

**No** >> Go To 6

**5. CHECK THE (A107) FUSED B(+) FOR A SHORT TO GROUND**

Turn the ignition off.

Visually inspect the (A107) Fused B(+) circuit in the wiring harness.

Look for any signs of intermittent short to ground.

**Is the wiring harness OK?**

**Yes** >> Go To 6

**No** >> Repair the (A107) Fused B(+) circuit for a short to ground.  
Perform ABS VERIFICATION TEST - VER 1.

**C1073-ABS PUMP MOTOR CONTROL CIRCUIT (CONTINUED)****6. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

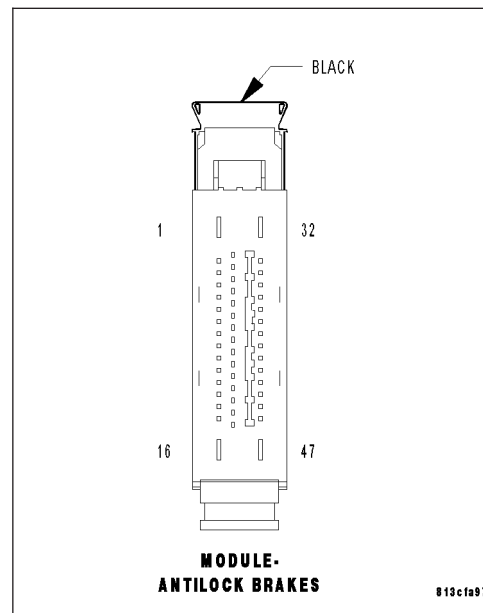
Visually inspect the Anti-Lock Brake Module harness connector and (A107) Fused B(+) circuit in the wiring harness for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE VOLTAGE ON THE (A107) FUSED B(+) CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

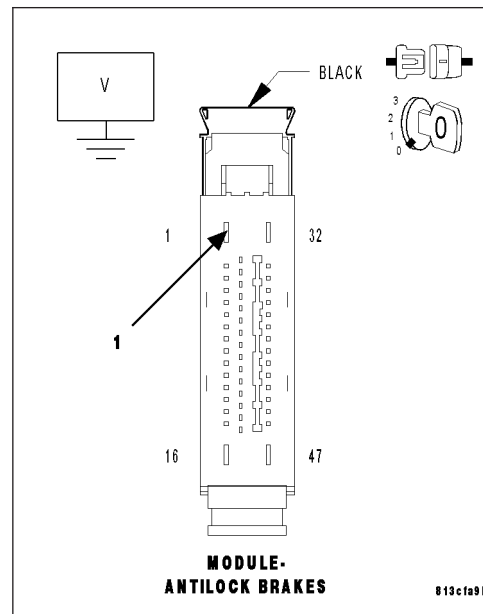
Measure the voltage of the (A107) Fused B(+) circuit in the Anti-Lock Brake Module harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 8

**No** >> Repair the (A107) Fused B(+) circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C1073-ABS PUMP MOTOR CONTROL CIRCUIT (CONTINUED)****8. CHECK THE (Z903) GROUND CIRCUIT FOR AN OPEN**

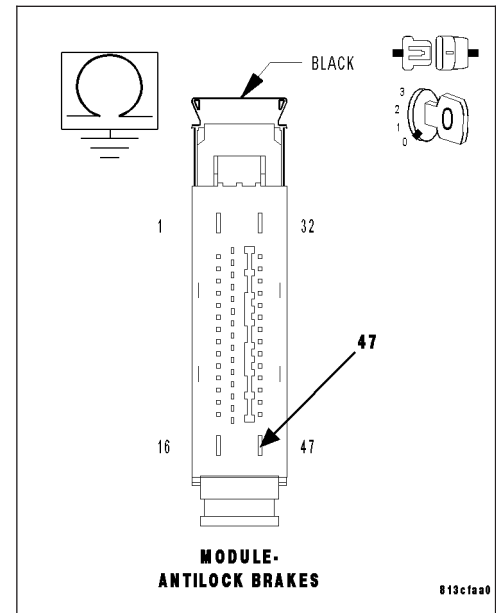
Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

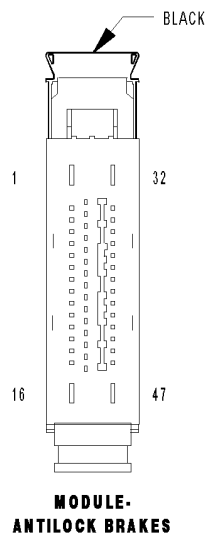
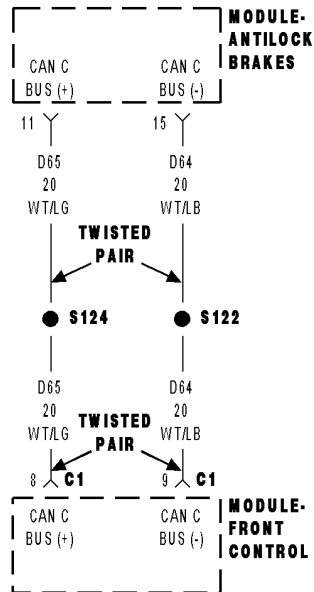
Measure the resistance of the (Z903) Ground circuit between the Anti-Lock Brake Module harness connector and ground

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (Z903) Ground circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



## C1078-TIRE REVOLUTIONS RANGE PERFORMANCE



C1078-TIRE REVOLUTIONS RANGE PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects a comparison between the tire circumference value contained in EEPROM and the tire circumference value received on the CAN Bus.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE (D65) CAN C (+) BUS AND (D64) CAN C (-) BUS CIRCUITS SHORTED TOGETHER (D65) CAN C (+) BUS CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (D64) CAN C (-) BUS CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN ANTI-LOCK BRAKE MODULE

Diagnostic Test

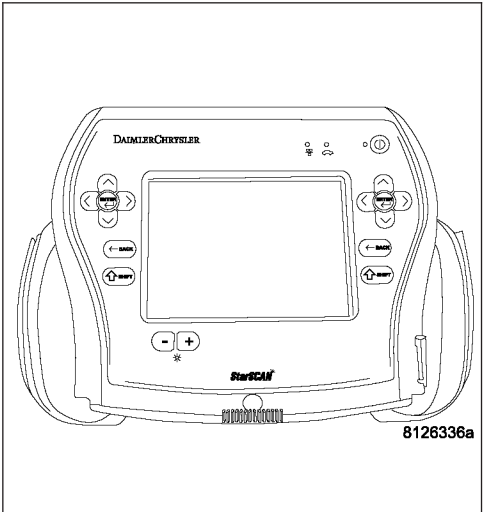
1. CHECK FOR A DTC C1078-TIRE REVOLUTIONS RANGE PERFORMANCE

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's.

**Does the scan tool display: C1078-TIRE REVOLUTIONS RANGE PERFORMANCE?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C1078-TIRE REVOLUTIONS RANGE PERFORMANCE (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

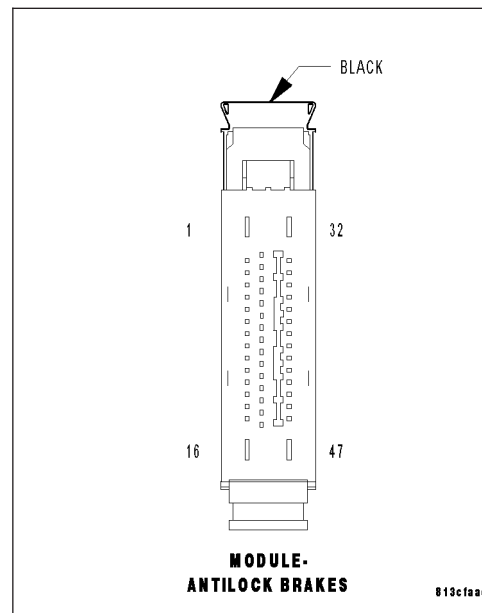
Check all related wiring for bruised, chafed, pierced, or partially broken wires.

Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (D65) CAN C (+) BUS CIRCUIT AND (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TOGETHER**

Turn the ignition off.

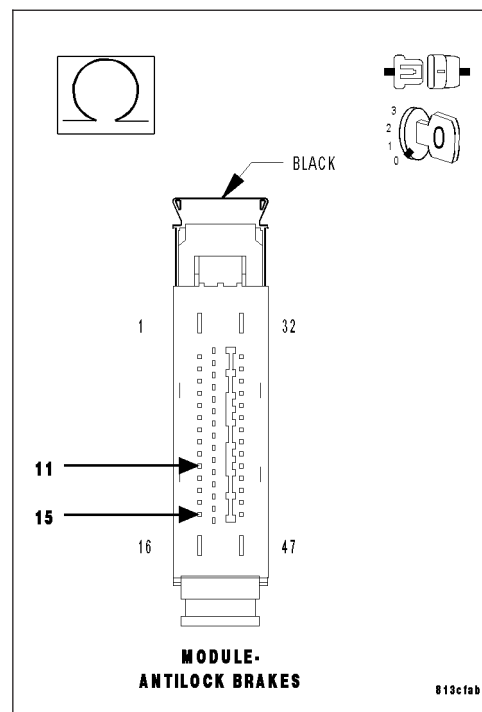
Disconnect the Anti-Lock Brake Module harness connector.

Measure the resistance between the (D65) CAN C (+) BUS circuit and the (D64) CAN C (-) BUS circuit at the Anti-Lock Brake Module harness connector..

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit and the (D64) CAN C (-) BUS circuit for a short together.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 4





**C1078-TIRE REVOLUTIONS RANGE PERFORMANCE (CONTINUED)****4. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Front Control Module harness connector.

Turn the ignition on.

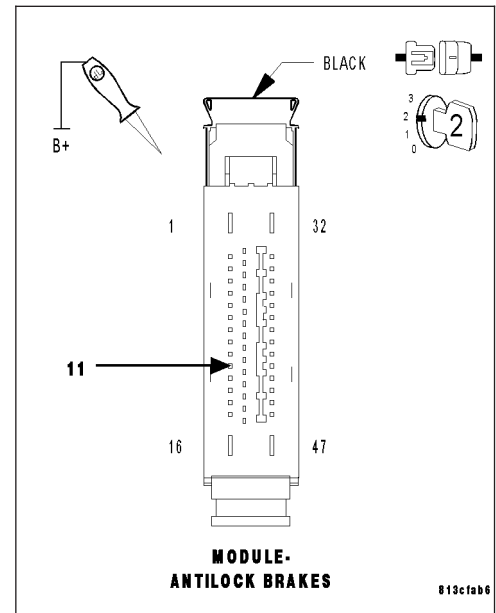
Using a 12-volt test light connected to 12-volts, check the (D65) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Front Control Module harness connector.

Turn the ignition on.

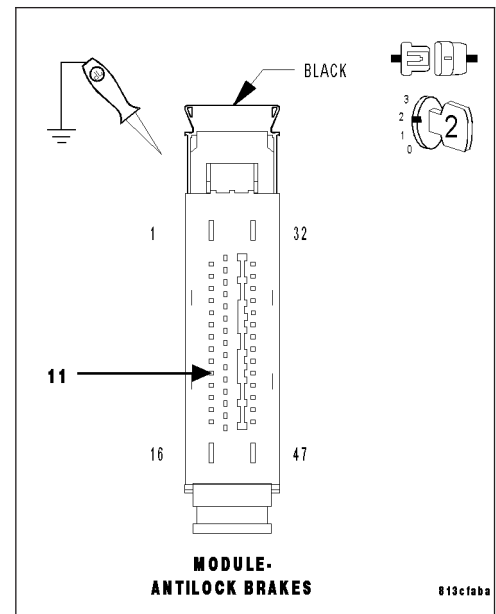
Using a 12-volt test light connected to ground, check the (D65) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C1078-TIRE REVOLUTIONS RANGE PERFORMANCE (CONTINUED)****6. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR AN OPEN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Front Control Module harness connector.

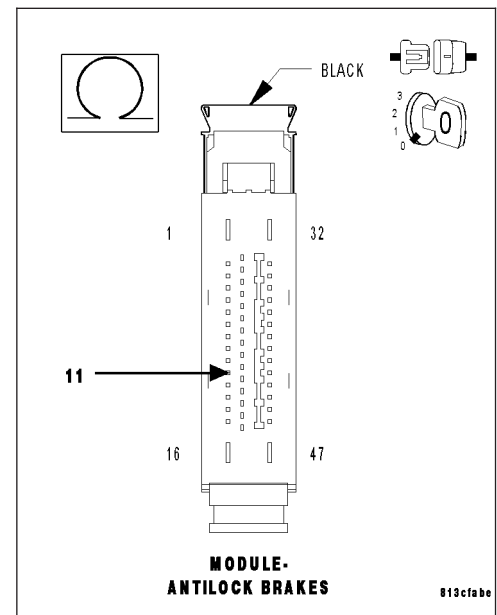
Measure the resistance of the (D65) CAN C (+) Bus circuit between the Anti-lock Brake Module and the Front Control Module.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the (D65) CAN C (+) BUS circuit for an open circuit.

Perform ABS VERIFICATION TEST - VER 1.

**7. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Front Control Module harness connector.

Turn the ignition on.

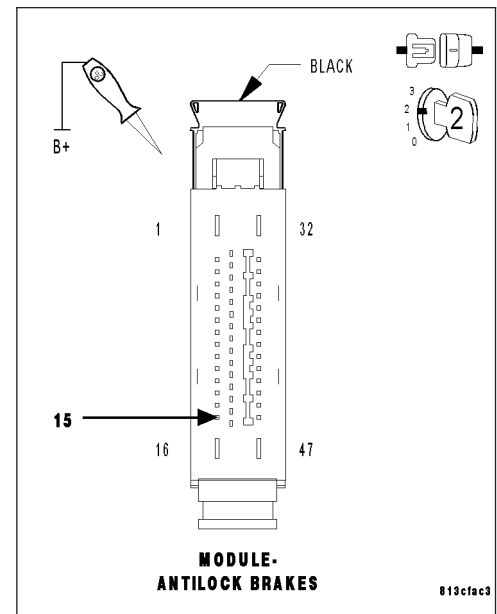
Using a 12-volt test light connected to 12-volts, check the (D64) CAN C (-) BUS circuit.

**Does the test light illuminate brightly**

**Yes** >> Repair the (D64) CAN C (-) BUS circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 8



**C1078-TIRE REVOLUTIONS RANGE PERFORMANCE (CONTINUED)****8. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Front Control Module harness connector.

Turn the ignition on.

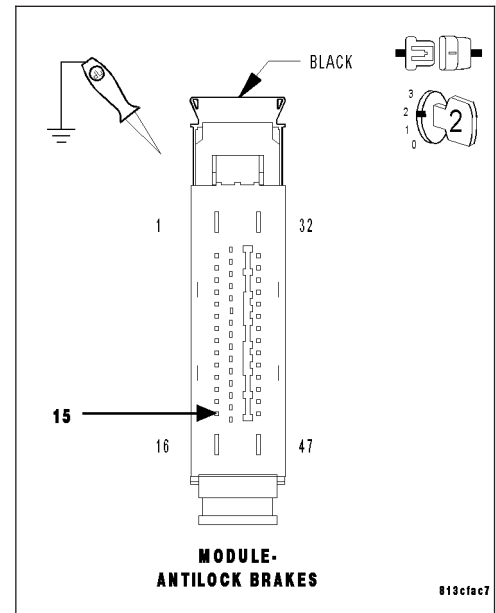
Using a 12-volt test light connected to ground, check the (D64) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D64) CAN C (-) BUS circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR AN OPEN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Front Control Module harness connector.

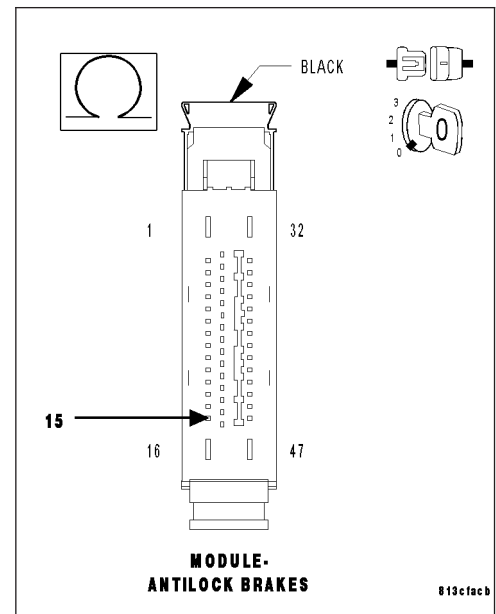
Measure the resistance of the (D64) CAN C (-) Bus circuit between the Anti-lock Brake Module and the Front Control Module.

**Is the resistance below 5.0 ohms?**

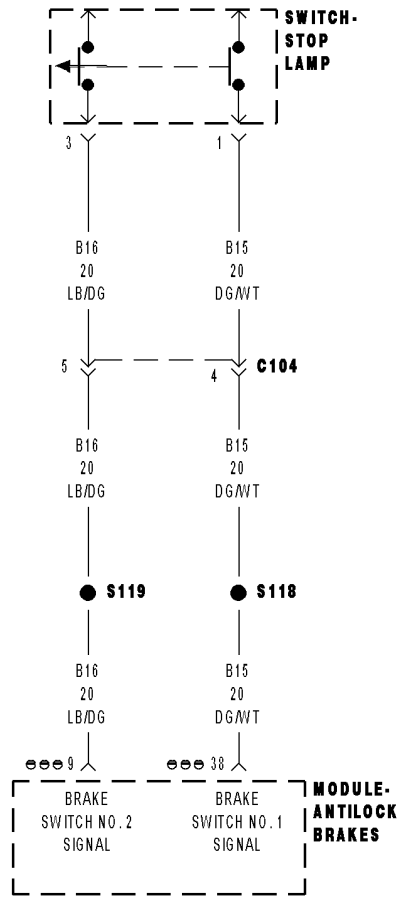
**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service information.

Perform ABS VERIFICATION TEST - VER 1.

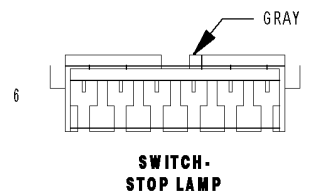
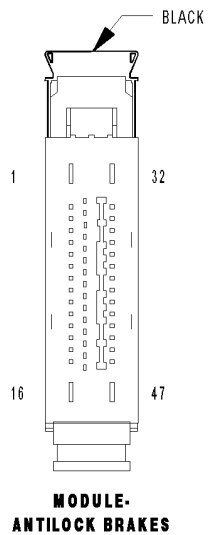
**No** >> Repair the (D64) CAN C (-) BUS circuit for an open circuit. Perform ABS VERIFICATION TEST - VER 1.



# C107C-BRAKE PEDAL SWITCH 1/2 STUCK



TCs



C107C-BRAKE PEDAL SWITCH 1/2 STUCK (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects a mismatch between the two signals of the redundant stop lamp switch.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE STOP LAMP SWITCH (B15) BRAKE SWITCH NO. 1 SIGNAL CIRCUIT OPEN (B16) BRAKE SWITCH NO. 2 SIGNAL CIRCUIT OPEN ANTI-LOCK BRAKE MODULE

Diagnostic Test

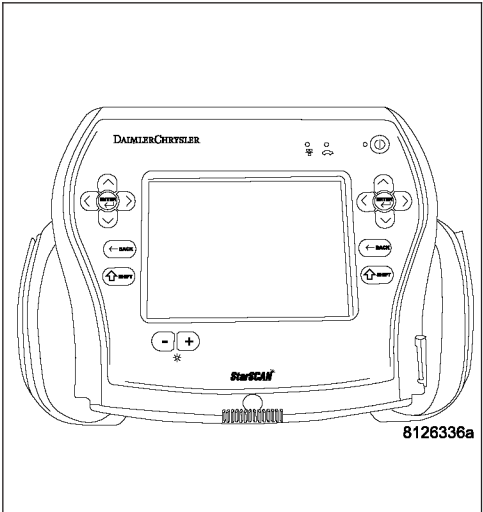
1. CHECK FOR A DTC C107C-BRAKE PEDAL SWITCH 1/2 STUCK

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's.

**Does the scan tool display: C107C-BRAKE PEDAL SWITCH 1/2 STUCK?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C107C-BRAKE PEDAL SWITCH 1/2 STUCK (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

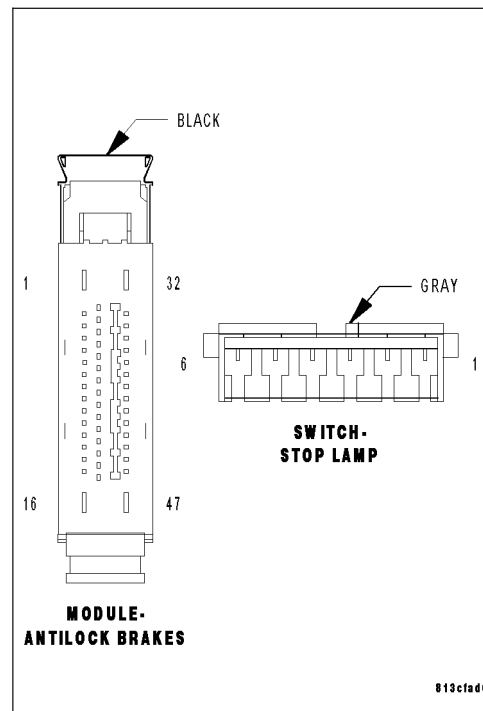
Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (B15) BRAKE SWITCH NO. 1 SIGNAL CIRCUIT WHILE DEPRESSING AND RELEASING BRAKE PEDAL**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Turn the ignition on.

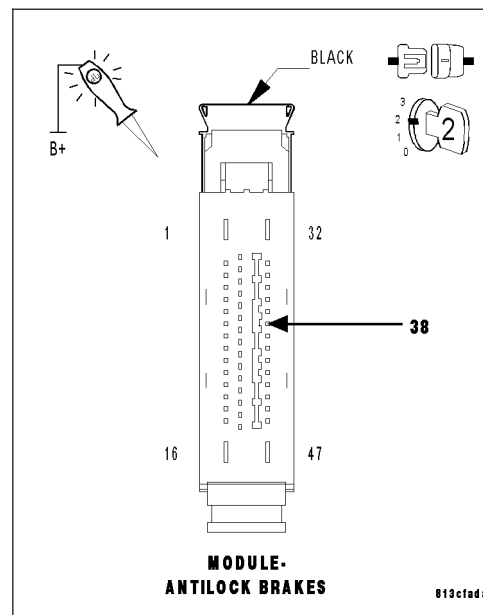
Using a 12-volt test light connected to 12-volts, check the (B15) Brake Switch No. 1 Signal circuit.

Depress and release the brake pedal.

**Does the test light illumination toggle from off to on?**

**Yes** >> Go To 5

**No** >> Go To 4



**C107C-BRAKE PEDAL SWITCH 1/2 STUCK (CONTINUED)****4. CHECK THE (B15) BRAKE SWITCH NO. 1 SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

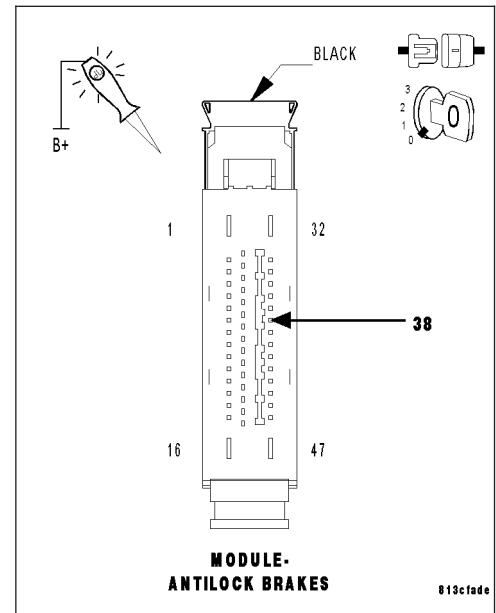
Disconnect the Stop Lamp Switch harness connector.

Connect a jumper wire between the (B15) Brake Switch No. 1 Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B15) Brake Switch No. 1 Signal circuit.

**Does the test light illuminate brightly?**

- Yes** >> Replace the Stop Lamp Switch in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B15) Brake Switch No. 1 Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**5. CHECK THE (B16) BRAKE SWITCH NO. 2 SIGNAL CIRCUIT WHILE DEPRESSING AND RELEASING BRAKE PEDAL**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

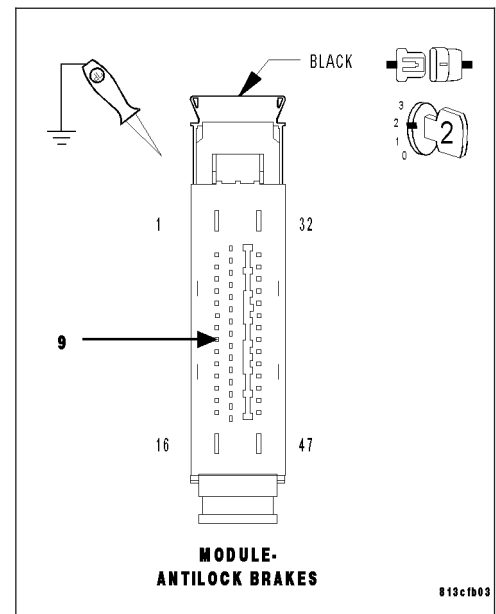
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (B16) Brake Switch No. 2 Signal circuit.

Depress and release the brake pedal.

**Does the test light illumination toggle from off to on?**

- Yes** >> Replace the Stop Lamp Switch in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 6



**C107C-BRAKE PEDAL SWITCH 1/2 STUCK (CONTINUED)****6. CHECK THE (B16) BRAKE SWITCH NO. 2 SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

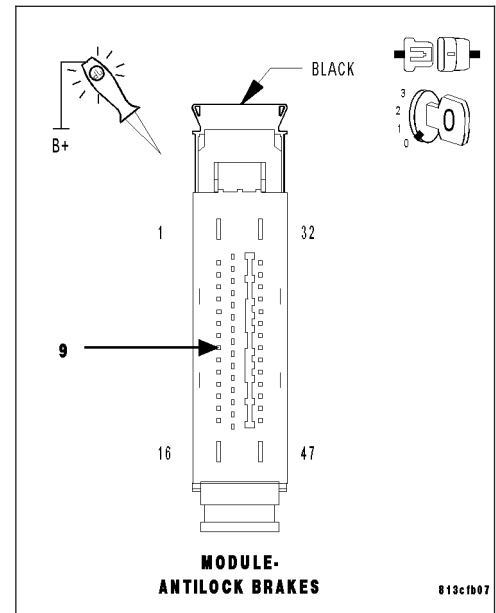
Disconnect the Stop Lamp Switch harness connector.

Connect a jumper wire between the (B16) Brake Switch No. 2 Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B16) Brake Switch No. 2 Signal circuit.

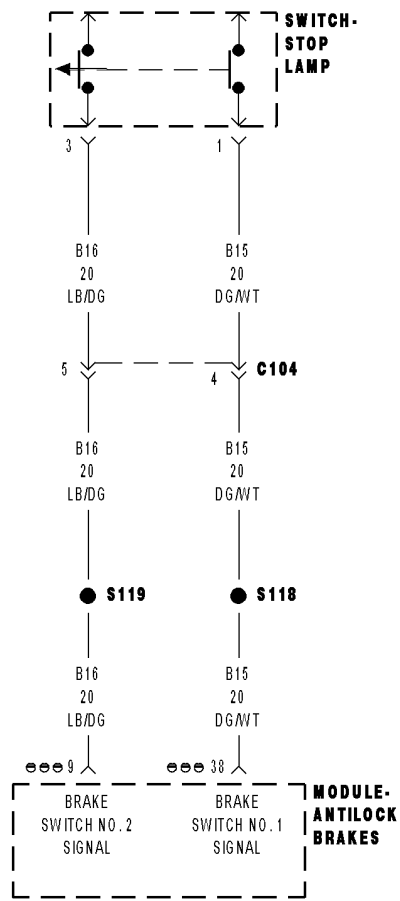
**Does the test light illuminate brightly?**

- Yes** >> Replace the Anti-lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B16) Brake Switch No. 2 Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

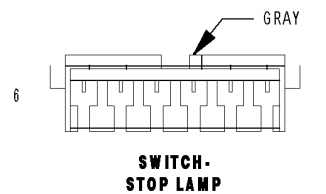
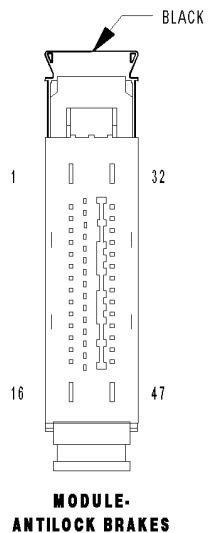




## C107D-BRAKE PEDAL SWITCH 1/2 CORRELATION



TC



**C107D-BRAKE PEDAL SWITCH 1/2 CORRELATION (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects an implausible signal from the Stop Lamp Switch.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE STOP LAMP SWITCH (B15) BRAKE SWITCH NO. 1 SIGNAL CIRCUIT OPEN (B16) BRAKE SWITCH NO. 2 SIGNAL CIRCUIT OPEN ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C107D-BRAKE PEDAL SWITCH 1/2 CORRELATION**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

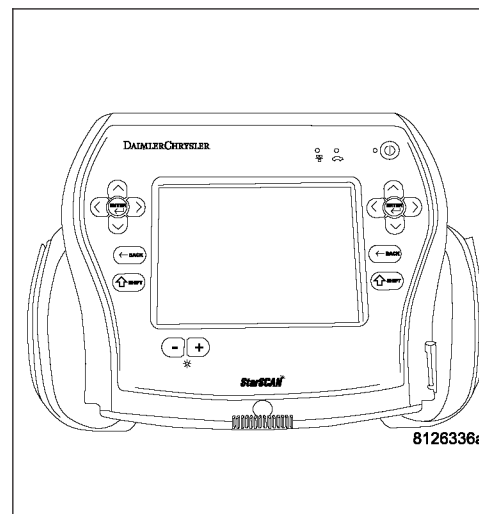
Cycle the ignition switch from off to on.

With the scan tool, read and record DTC's.

**Does the scan tool display: C107D-BRAKE PEDAL SWITCH 1/2 CORRELATION?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C107D-BRAKE PEDAL SWITCH 1/2 CORRELATION (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

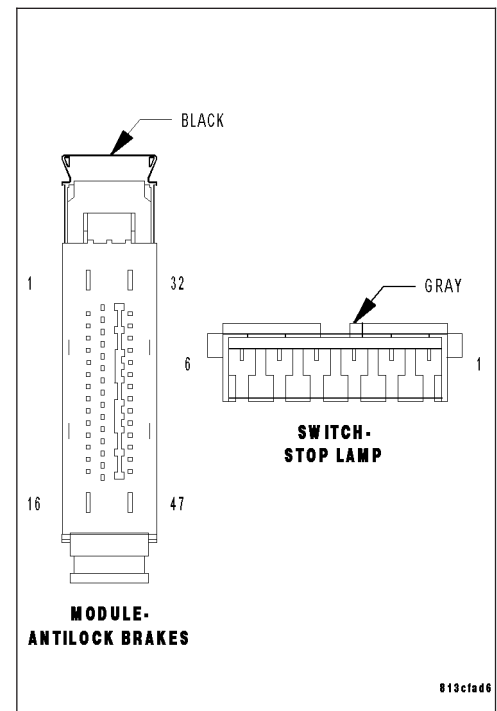
Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (B15) BRAKE SWITCH NO. 1 SIGNAL CIRCUIT WHILE DEPRESSING AND RELEASING BRAKE PEDAL**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Turn the ignition on.

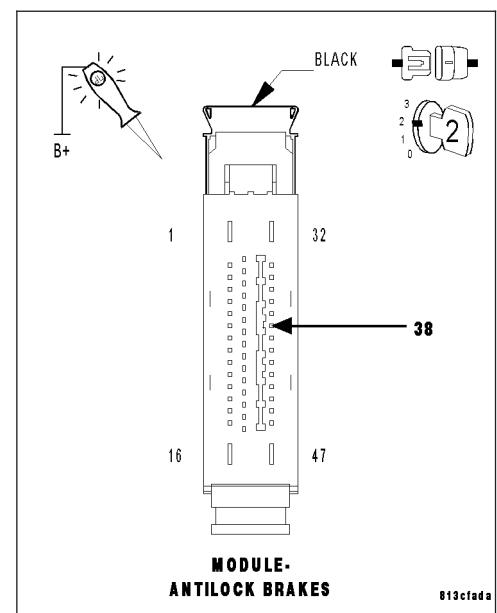
Using a 12-volt test light connected to 12-volts, check the (B15) Brake Switch No. 1 Signal circuit.

Depress and release the brake pedal.

**Does the test light illumination toggle from off to on?**

**Yes** >> Go To 5

**No** >> Go To 4



**C107D-BRAKE PEDAL SWITCH 1/2 CORRELATION (CONTINUED)****4. CHECK THE (B15) BRAKE SWITCH NO. 1 SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Stop Lamp Switch harness connector.

Turn the ignition on.

Connect a jumper wire between the (B15) Brake Switch No. 1 Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B15) Brake Switch No. 1 Signal circuit.

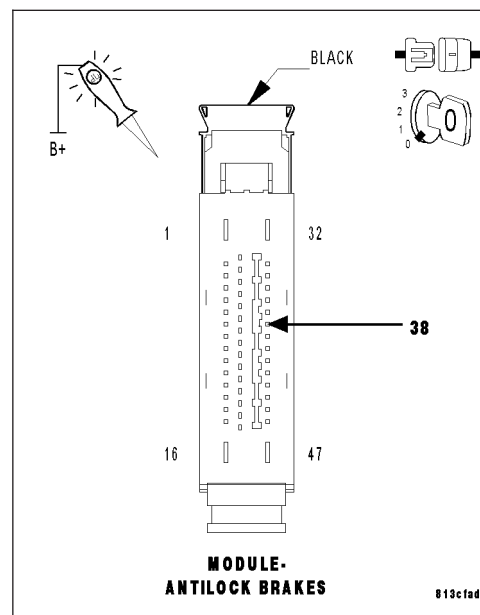
**Does the test light illuminate brightly?**

**Yes** >> Replace the Stop Lamp Switch in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B15) Brake Switch No. 1 Signal circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.

**5. CHECK THE (B16) BRAKE SWITCH NO. 2 SIGNAL CIRCUIT WHILE DEPRESSING AND RELEASING BRAKE PEDAL**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Turn the ignition on.

Using a 12-volt test light connected to ground, check the (B16) Brake Switch No. 2 Signal circuit.

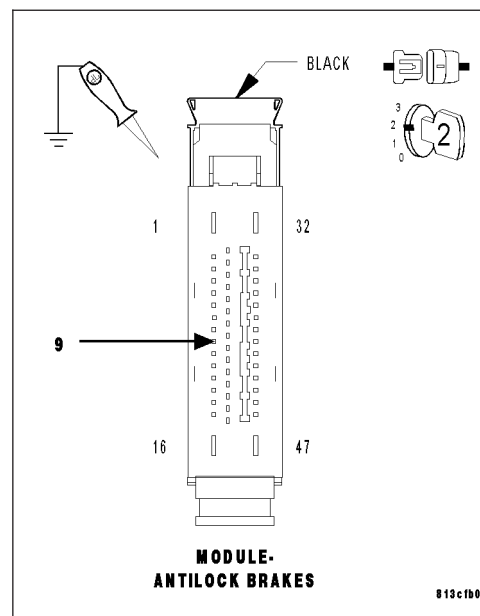
Depress and release the brake pedal.

**Does the test light illumination toggle from off to on?**

**Yes** >> Replace the Stop Lamp Switch in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C107D-BRAKE PEDAL SWITCH 1/2 CORRELATION (CONTINUED)****6. CHECK THE (B16) BRAKE SWITCH NO. 2 SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Stop Lamp Switch harness connector.

Turn the ignition on.

Connect a jumper wire between the (B16) Brake Switch No. 2 Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B16) Brake Switch No. 2 Signal circuit.

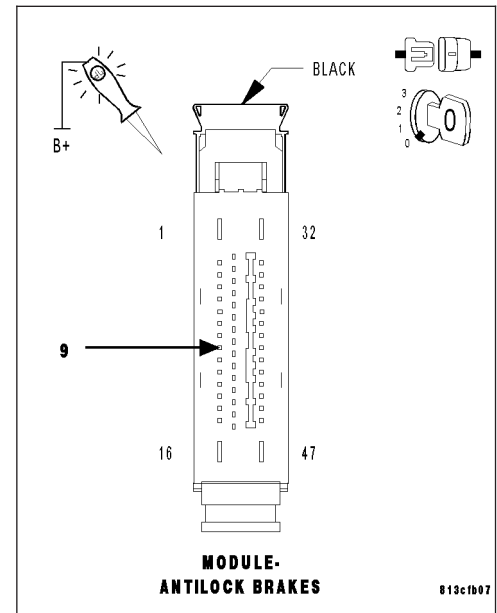
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B16) Brake Switch No. 2 Signal circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.





**C1219-STEERING ANGLE SENSOR ERRATIC PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects a calculated steering wheel angle offset is out of the specified range.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE (A913) FUSED B(+) CIRCUIT OPEN (Z910) GROUND CIRCUIT OPEN (D65) CAN C (+) BUS AND (D64) CAN C (-) BUS CIRCUITS SHORTED TOGETHER (D65) CAN C (+) BUS CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (D64) CAN C (-) BUS CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN STEERING CONTROL MODULE

**Diagnostic Test****1. CHECK FOR A DTC C1219-STEERING ANGLE SENSOR ERRATIC PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

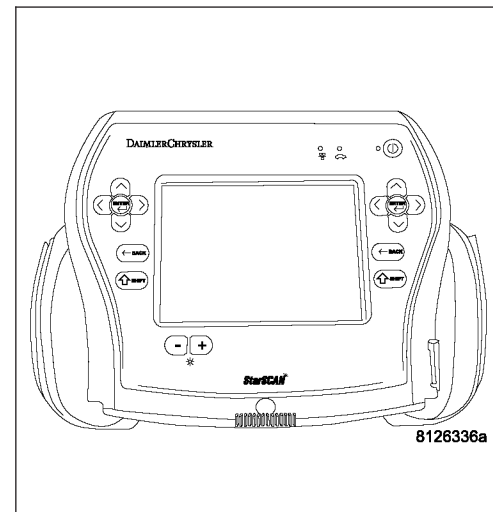
Cycle the ignition switch from off to on.

With the scan tool, read and record DTC's.

**Does the scan tool display: C1219-STEERING ANGLE SENSOR ERRATIC PERFORMANCE?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C1219-STEERING ANGLE SENSOR ERRATIC PERFORMANCE (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check the Steering Angle Sensor installation.

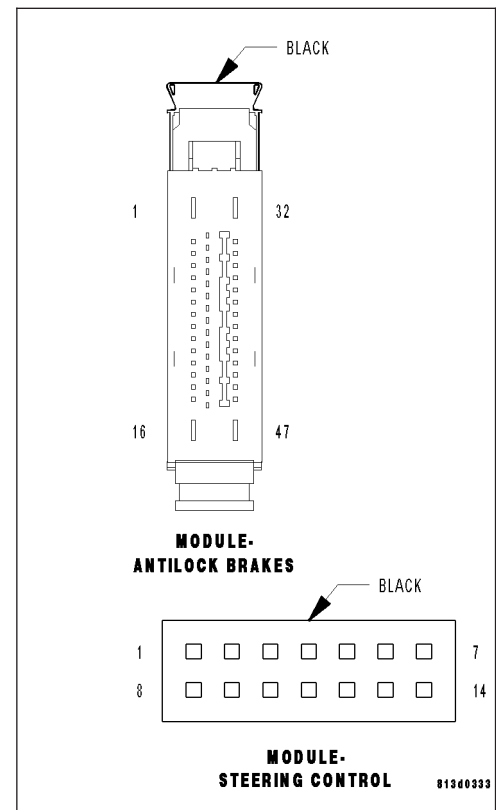
Check all related wiring for bruised, chafed, pierced, or partially broken wires.

Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE ON THE (A913) FUSED B(+) CIRCUIT**

Turn the ignition off.

Disconnect the Steering Control Module harness connector.

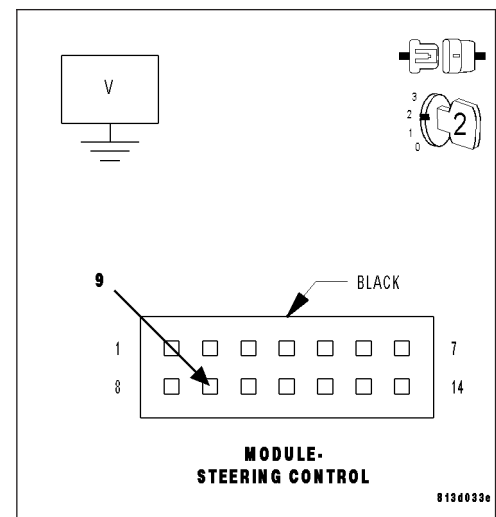
Turn the ignition on.

Measure the voltage of the (A913) Fused B(+) circuit.

**Is the voltage above 10 volts?**

**Yes** >> Go To 4

**No** >> Repair the (A913) Fused B(+) circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.





**C1219-STEERING ANGLE SENSOR ERRATIC PERFORMANCE (CONTINUED)****4. CHECK THE RESISTANCE OF THE (Z910) GROUND CIRCUIT**

Turn the ignition off.

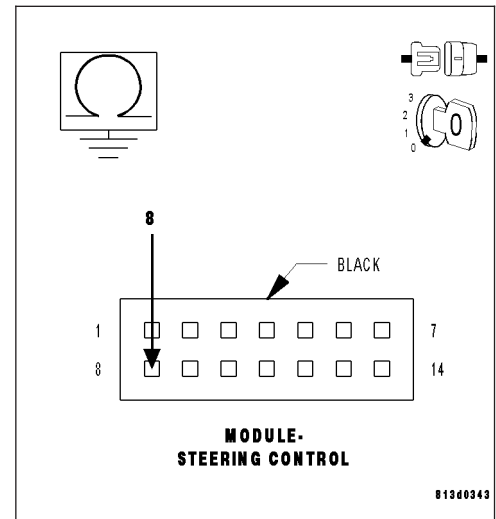
Disconnect the Steering Control Module harness connector.

Measure the resistance between the (Z910) Ground circuit and ground.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the (Z910) Ground circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**5. CHECK THE (D65) CAN C (+) BUS AND (D64) CAN C (-) BUS CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

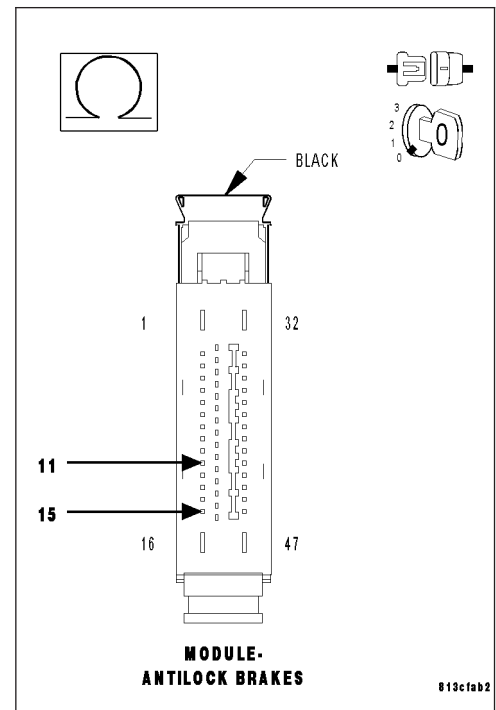
Disconnect the Anti-Lock Brake Module harness connector.

Measure the resistance between the (D65) CAN C (+) BUS circuit and the (D64) CAN C (-) BUS circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (D65) CAN C (+) BUS and the (D64) CAN C (-) BUS circuits for a short together.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C1219-STEERING ANGLE SENSOR ERRATIC PERFORMANCE (CONTINUED)****6. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Steering Control Module harness connector.

Turn the ignition on.

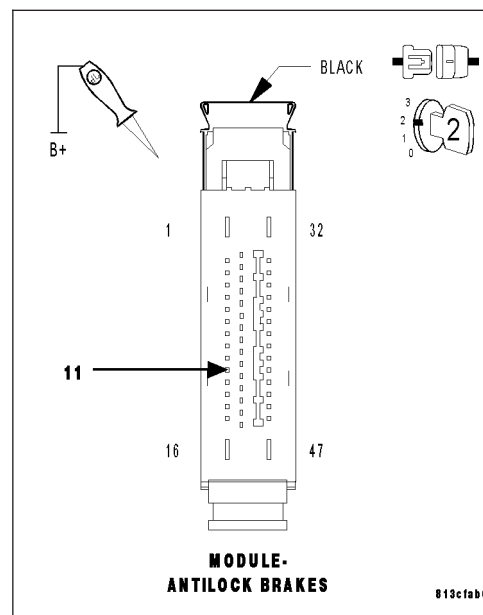
Using a 12-volt test light connected to 12-volts, check the (D65) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Steering Control Module harness connector.

Turn the ignition on.

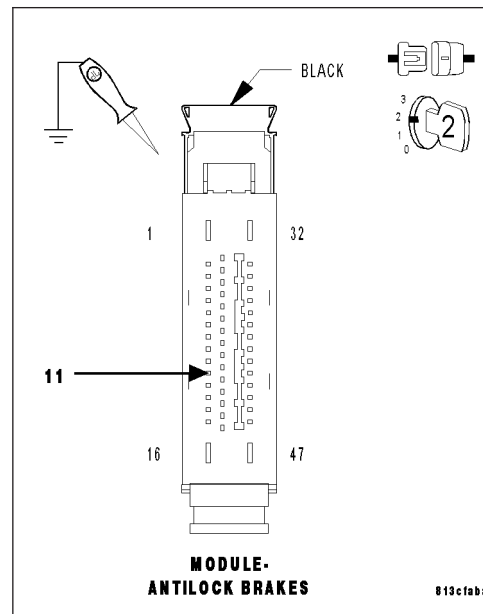
Using a 12-volt test light connected to ground, check the (D65) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 8



**C1219-STEERING ANGLE SENSOR ERRATIC PERFORMANCE (CONTINUED)****8. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR AN OPEN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Steering Control Module harness connector.

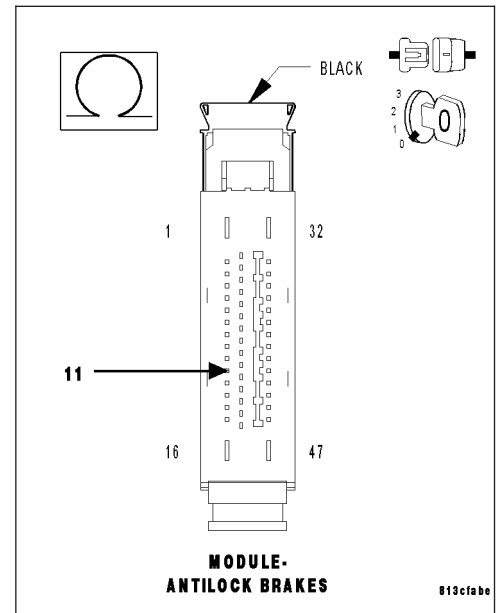
Measure the resistance of the (D65) CAN C (+) Bus circuit between the Anti-lock Brake Module and the Steering Control Module.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the (D65) CAN C (+) BUS circuit for an open circuit.

Perform ABS VERIFICATION TEST - VER 1.

**9. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Steering Control Module harness connector.

Turn the ignition on.

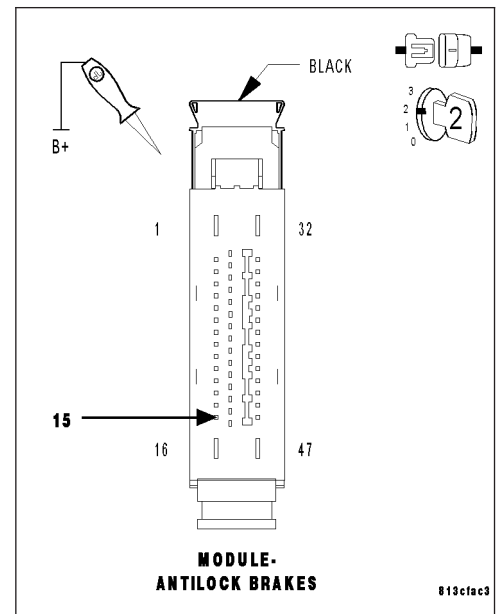
Using a 12-volt test light connected to 12-volts, check the (D64) CAN C (-) BUS circuit.

**Does the test light illuminate brightly**

**Yes** >> Repair the (D64) CAN C (-) BUS circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C1219-STEERING ANGLE SENSOR ERRATIC PERFORMANCE (CONTINUED)****10. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Steering Control Module harness connector.

Turn the ignition on.

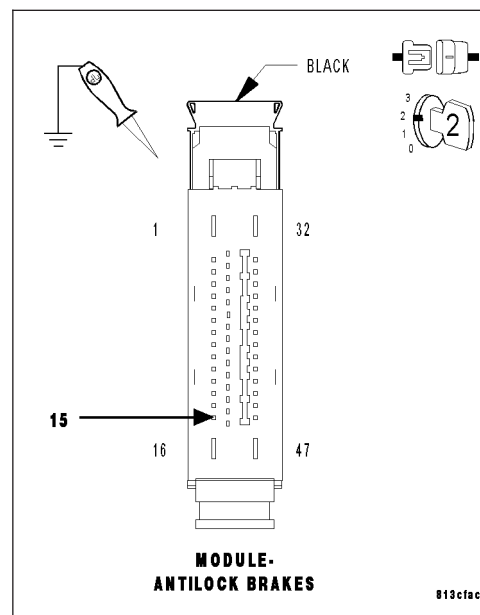
Using a 12-volt test light connected to ground, check the (D64) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D64) CAN C (-) BUS circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR AN OPEN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

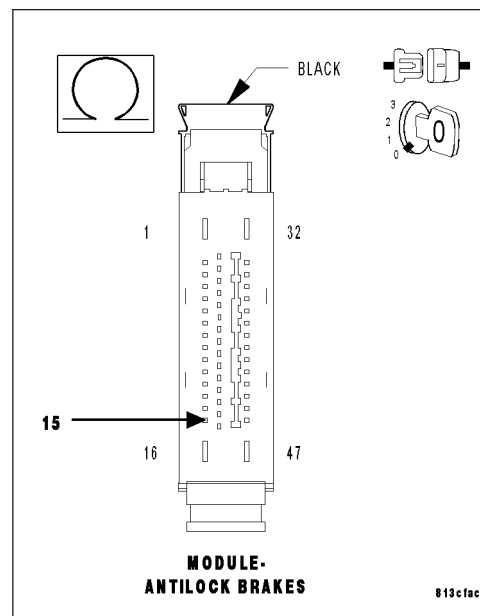
Measure the resistance of the (D64) CAN C (-) Bus circuit between the Anti-lock Brake Module and the Steering Control Module.

**Is the resistance below 5.0 ohms?**

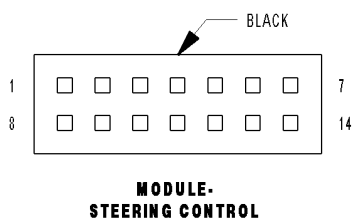
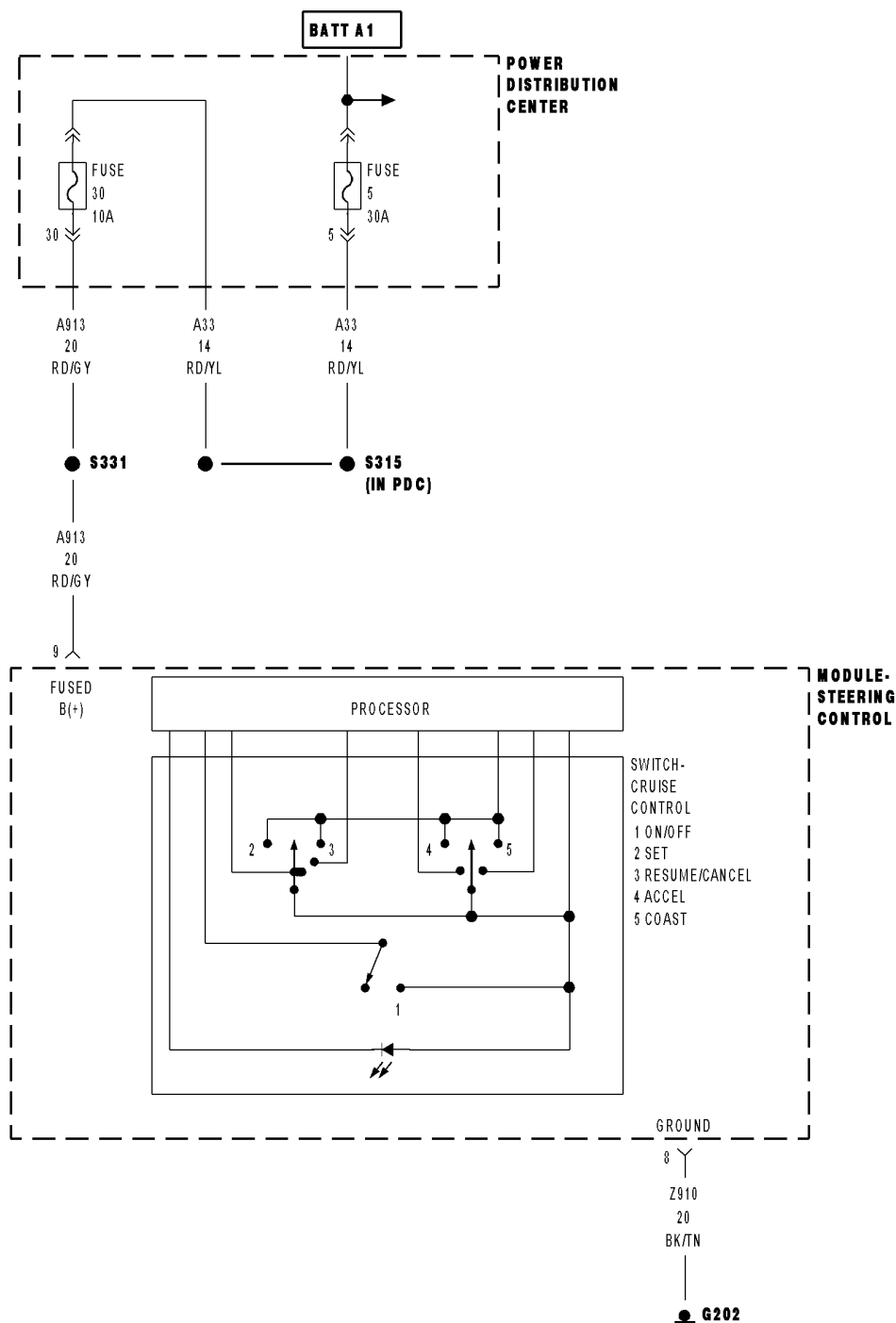
**Yes** >> Replace the Steering Control Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (D64) CAN C (-) BUS circuit for an open circuit. Perform ABS VERIFICATION TEST - VER 1.



## C121A-STEERING ANGLE SENSOR NOT INITIALIZED



**C121A-STEERING ANGLE SENSOR NOT INITIALIZED (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects a low voltage at the Steering Angle Sensor or Steering Angle Sensor failure.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE (A913) FUSED B(+) CIRCUIT OPEN (Z910) GROUND CIRCUIT OPEN STEERING CONTROL MODULE

**Diagnostic Test****1. CHECK FOR A DTC C121A-STEERING ANGLE SENSOR NOT INITIALIZED**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

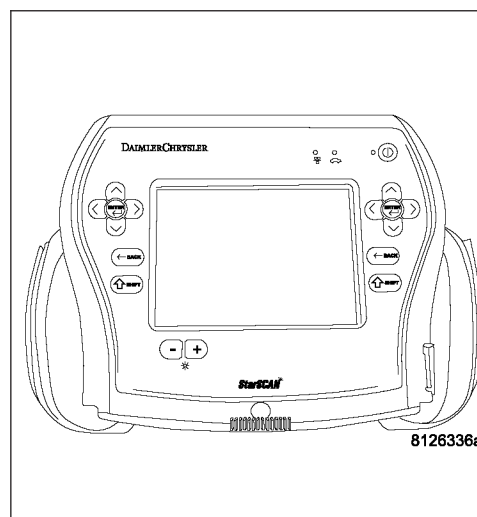
Cycle the ignition switch from off to on.

With the scan tool, read and record DTC's.

**Does the scan tool display: C121A-STEERING ANGLE SENSOR NOT INITIALIZED?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.

**2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check the Steering Angle Sensor installation.

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

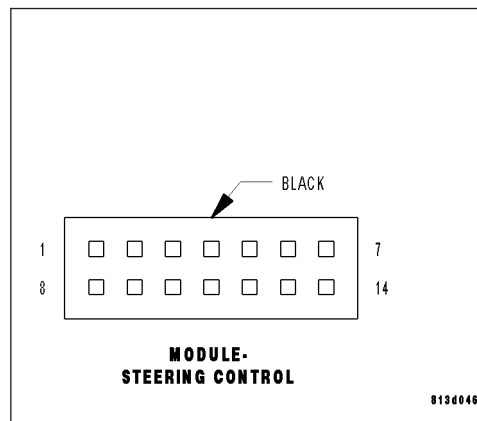
Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3



**C121A-STEERING ANGLE SENSOR NOT INITIALIZED (CONTINUED)****3. CHECK THE VOLTAGE ON THE (A913) FUSED B(+) CIRCUIT**

Turn the ignition off.

Disconnect the Steering Control Module harness connector.

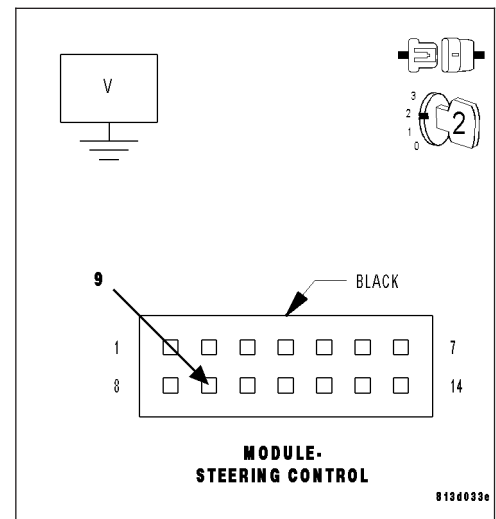
Turn the ignition on.

Measure the voltage of the (A913) Fused B(+) circuit.

**Is the voltage above 10 volts?**

**Yes** >> Go To 4

**No** >> Repair the (A913) Fused B(+) circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**4. CHECK THE RESISTANCE OF THE (Z910) GROUND CIRCUIT**

Turn the ignition off.

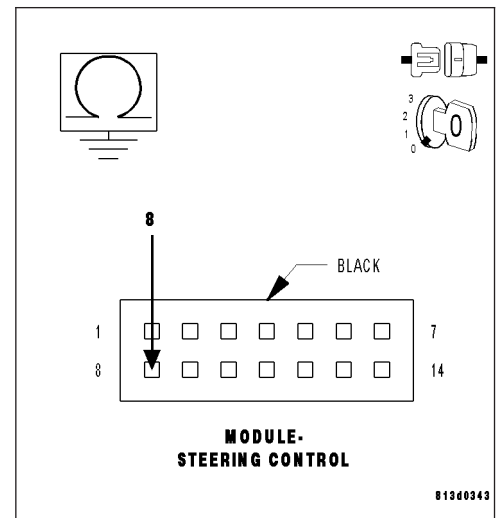
Disconnect the Steering Control Module harness connector.

Measure the resistance between the (Z910) Ground circuit and ground.

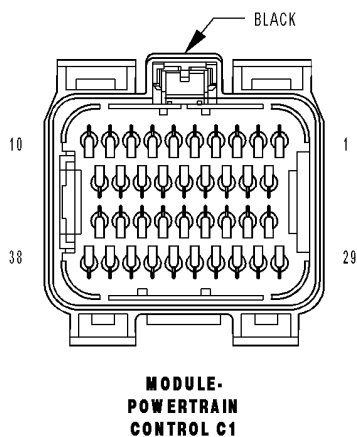
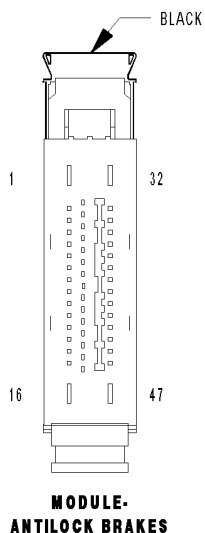
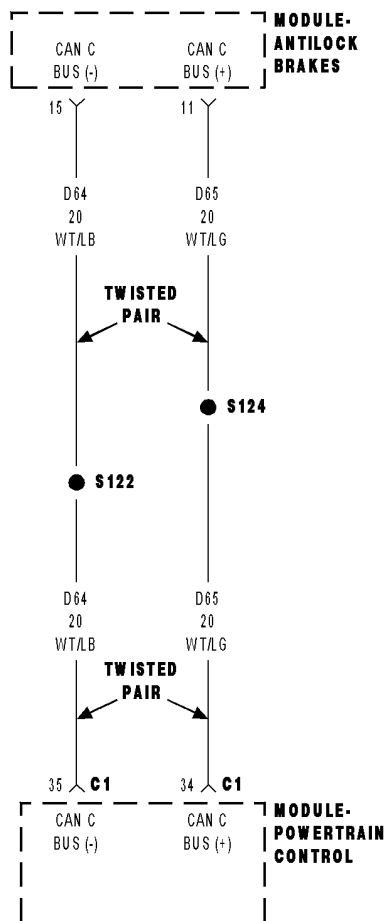
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Steering Control Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (Z910) Ground circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



## C121C-TORQUE REQUEST SIGNAL DENIED





**C121C-TORQUE REQUEST SIGNAL DENIED (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates if engine management relevant for Automatic Yaw Control/Traction Control System control can be accomplished.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE (D65) CAN C (+) BUS AND (D64) CAN C (-) BUS CIRCUITS SHORTED TOGETHER (D65) CAN C (+) BUS CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (D64) CAN C (-) BUS CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN POWERTRAIN CONTROL MODULE

**Diagnostic Test**

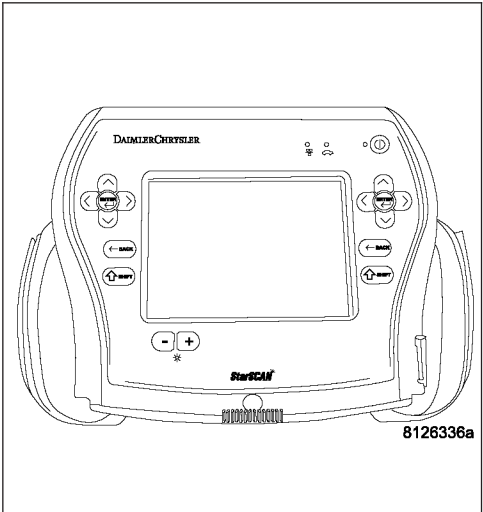
**1. CHECK FOR A DTC C121C-TORQUE REQUEST SIGNAL DENIED**

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's.

**Does the scan tool display: C121C-TORQUE REQUEST SIGNAL DENIED?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C121C-TORQUE REQUEST SIGNAL DENIED (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

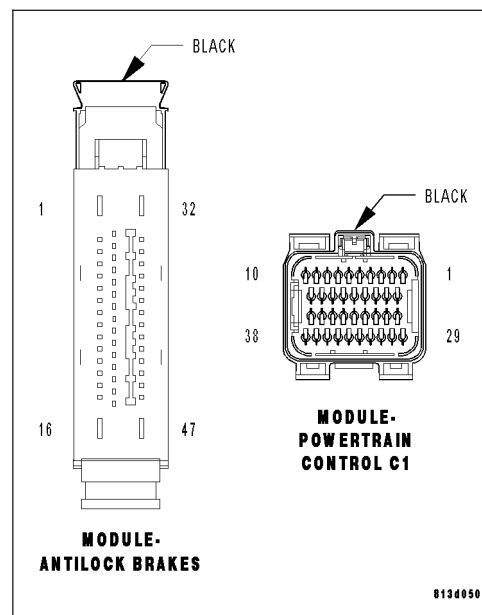
Check all related wiring for bruised, chafed, pierced, or partially broken wires.

Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (D65) CAN C (+) BUS AND (D64) CAN C (-) BUS CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

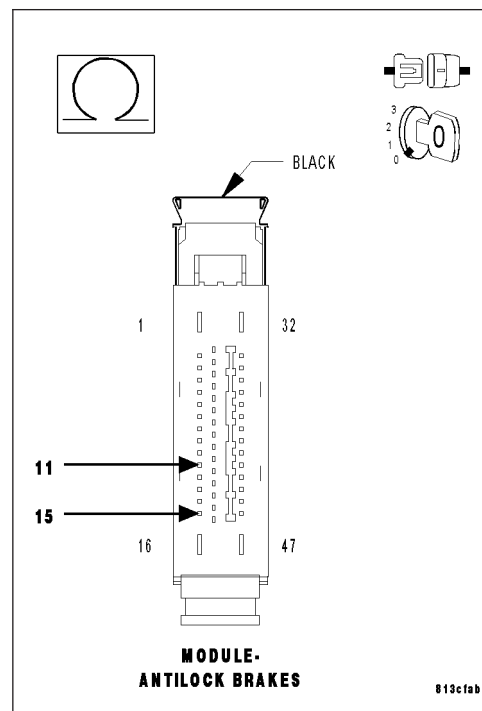
Disconnect the Anti-Lock Brake Module harness connector.

Measure the resistance between the (D65) CAN C (+) BUS circuit and the (D64) CAN C (-) BUS circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (D65) CAN C (+) BUS and the (D64) CAN C (-) BUS circuits for a short together.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 4



**C121C-TORQUE REQUEST SIGNAL DENIED (CONTINUED)****4. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Powertrain Control Module harness connector.

Turn the ignition on.

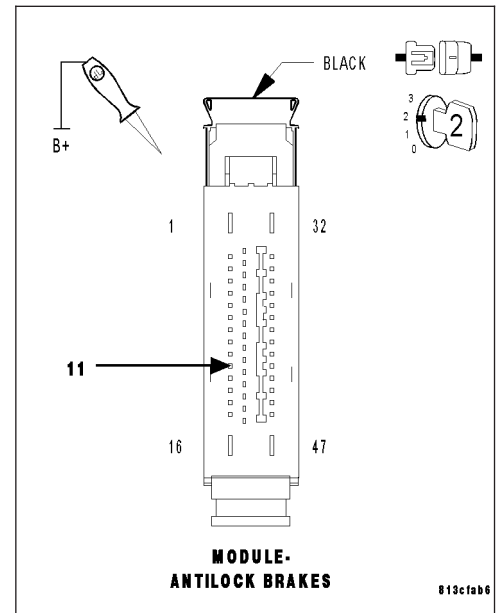
Using a 12-volt test light connected to 12-volts, check the (D65) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Powertrain Control Module harness connector.

Turn the ignition on.

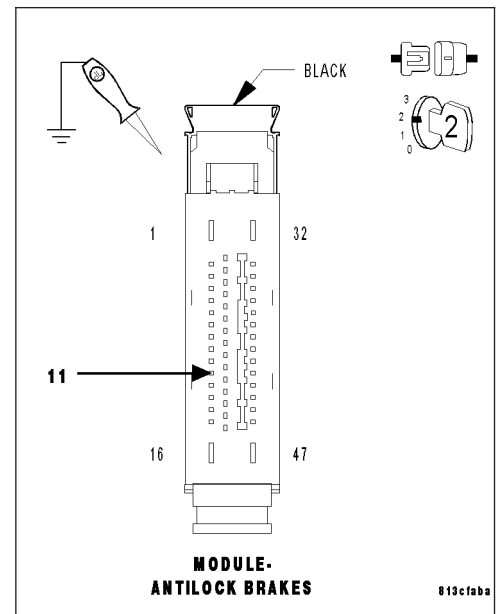
Using a 12-volt test light connected to ground, check the (D65) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C121C-TORQUE REQUEST SIGNAL DENIED (CONTINUED)****6. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR AN OPEN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Powertrain Control Module harness connector.

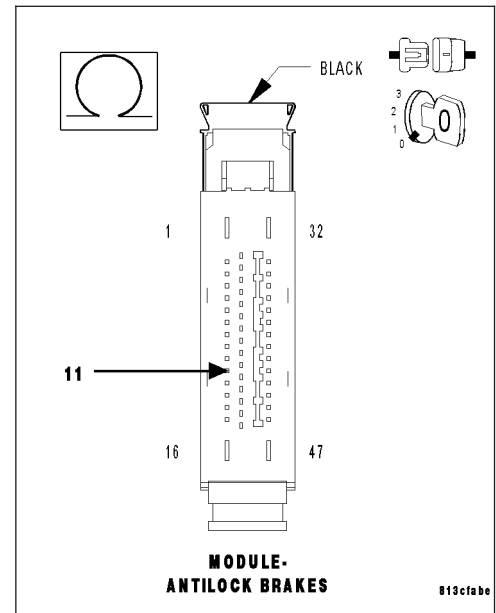
Measure the resistance of the (D65) CAN C (+) Bus circuit between the Anti-lock Brake Module and the Powertrain Control Module.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the (D65) CAN C (+) BUS circuit for an open circuit.

Perform ABS VERIFICATION TEST - VER 1.

**7. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Powertrain Control Module harness connector.

Turn the ignition on.

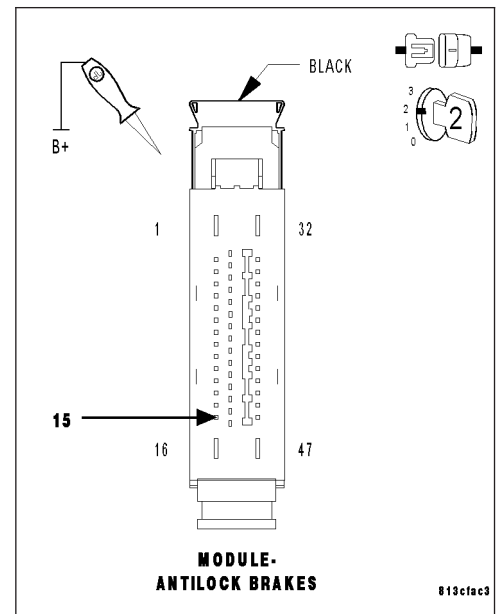
Using a 12-volt test light connected to 12-volts, check the (D64) CAN C (-) BUS circuit.

**Does the test light illuminate brightly**

**Yes** >> Repair the (D64) CAN C (-) BUS circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 8



**C121C-TORQUE REQUEST SIGNAL DENIED (CONTINUED)****8. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Powertrain Control Module harness connector.

Turn the ignition on.

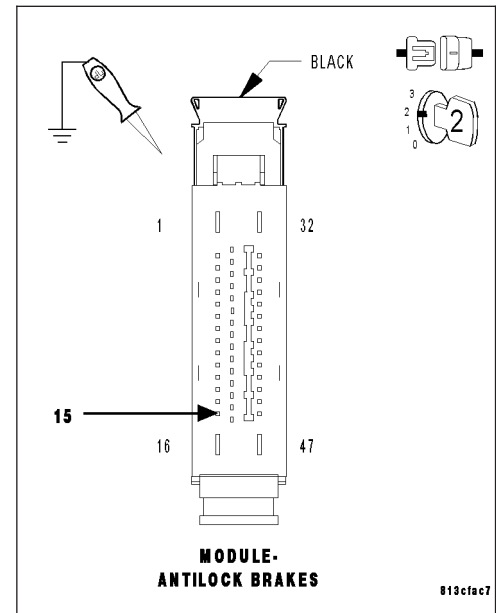
Using a 12-volt test light connected to ground, check the (D64) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D64) CAN C (-) BUS circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR AN OPEN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Powertrain Control Module harness connector.

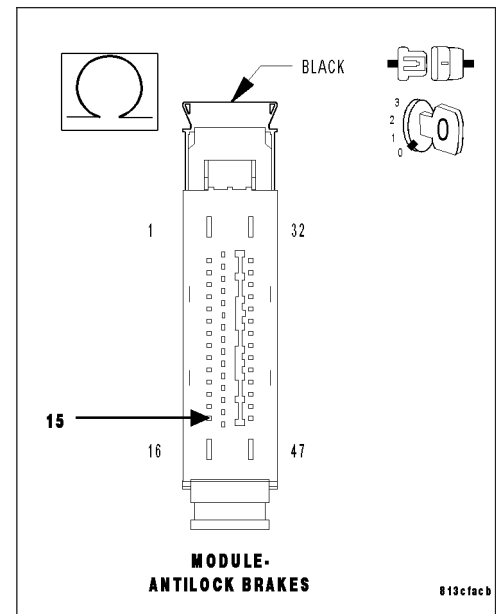
Measure the resistance of the (D64) CAN C (-) Bus circuit between the Anti-lock Brake Module and the Powertrain Control Module.

**Is the resistance below 5.0 ohms?**

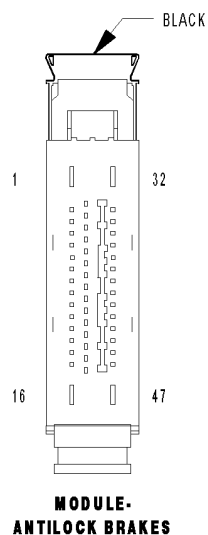
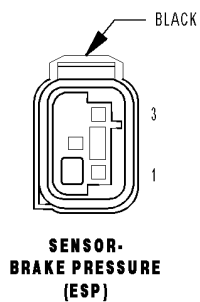
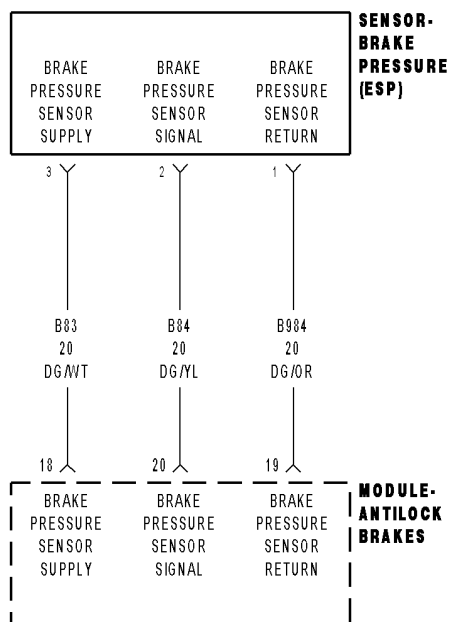
**Yes** >> Replace the Powertrain Control Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (D64) CAN C (-) BUS circuit for an open circuit. Perform ABS VERIFICATION TEST - VER 1.



## C121D-BRAKE PRESSURE SENSOR CIRCUIT



C121D-BRAKE PRESSURE SENSOR CIRCUIT (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates that the Brake Pressure Sensor Signal is out of range.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE AIR IN BRAKE SYSTEM/WORN MECHANICAL COMPONENTS (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN BRAKE PRESSURE SENSOR ANTI-LOCK BRAKE MODULE

Diagnostic Test

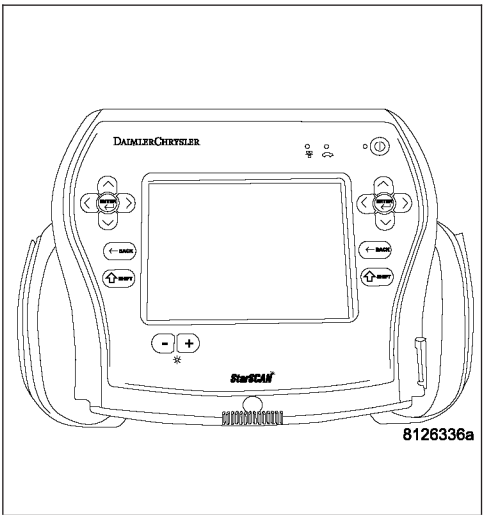
1. CHECK FOR A DTC C121D-BRAKE PRESSURE SENSOR CIRCUIT

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Start the engine.
- Depress and release the brake pedal.
- With the scan tool, read and record DTC's.

**Does the scan tool display: C121D-BRAKE PRESSURE SENSOR CIRCUIT?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



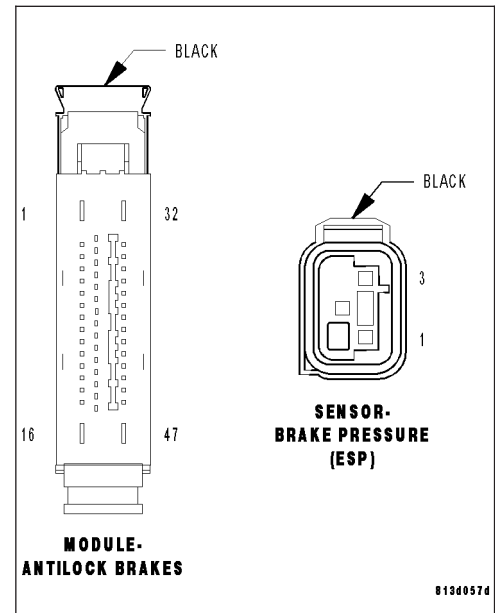
**C121D-BRAKE PRESSURE SENSOR CIRCUIT (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

- Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 3

**3. CHECK FOR AIR IN BRAKE SYSTEM AND WORN MECHANICAL COMPONENTS**

**Note:** Before continuing the brake system must be bled to verify there is no air in the brake system.

**Note:** Visually inspect for worn brake linings, undersized rotors, binding or frozen calipers.

**Was there any air in the brake system or base brake issues found?**

- Yes** >> Repair as needed.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 4

**4. CHECK THE VOLTAGE ON THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

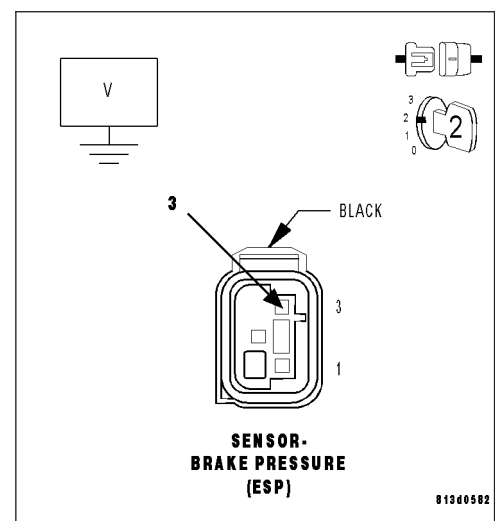
Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (B83) Brake Pressure Sensor Supply circuit.

**Is the voltage above 4 volts?**

- Yes** >> Go To 8
- No** >> Go To 5





**C121D-BRAKE PRESSURE SENSOR CIRCUIT (CONTINUED)****5. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

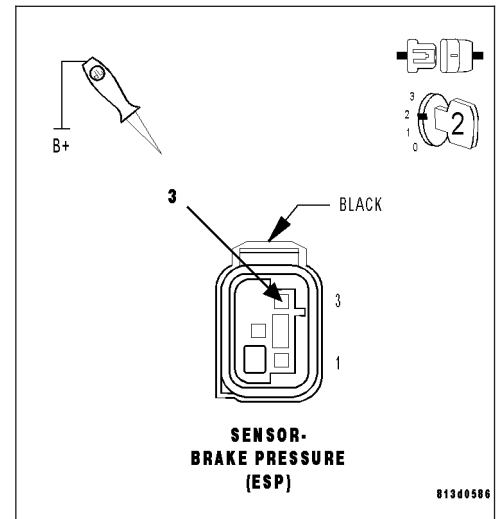
Using a 12-volt test light connected to 12-volts, check the (B83) Brake Pressure Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6

**6. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

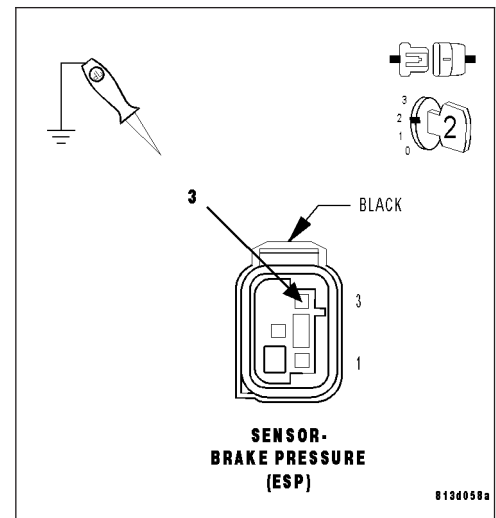
Using a 12-volt test light connected to ground, check the (B83) Brake Pressure Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7



**C121D-BRAKE PRESSURE SENSOR CIRCUIT (CONTINUED)****7. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition off.

Connect a jumper wire between the (B83) Brake Pressure Sensor Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B83) Brake Pressure Sensor Supply circuit.

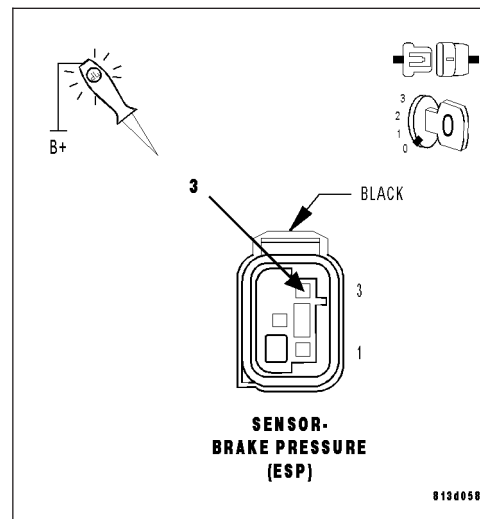
**Does the test light illuminate brightly**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B83) Brake Pressure Sensor Supply circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.

**8. CHECK THE RESISTANCE TO GROUND ON THE (B984) BRAKE PRESSURE RETURN CIRCUIT**

Turn the ignition off.

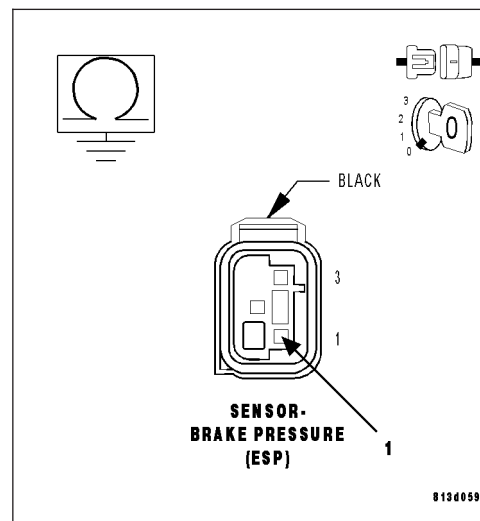
Disconnect the Brake Pressure Sensor harness connector.

Measure the resistance between the (B984) Brake Pressure Return Circuit and ground.

**Is the resistance below 5.0 ohm?**

**Yes** >> Go To 12

**No** >> Go To 9



**C121D-BRAKE PRESSURE SENSOR CIRCUIT (CONTINUED)****9. CHECK THE (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT FOR SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

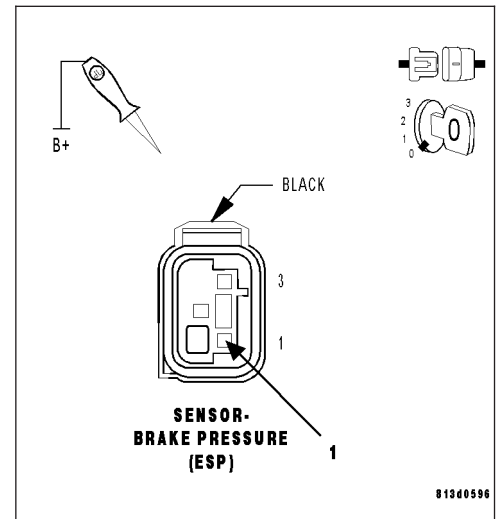
Using a 12-volt test light connected to 12-volts, check the (B984) Brake Pressure Sensor Return circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B984) Brake Pressure Sensor Return circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10

**10. CHECK THE (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT FOR SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

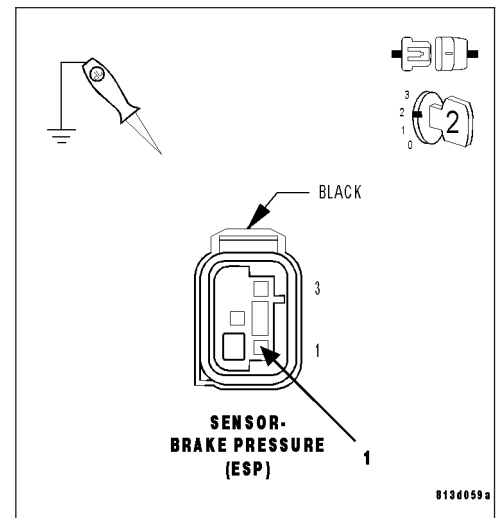
Using a 12-volt test light connected to ground, check the (B984) Brake Pressure Sensor Return circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B984) Brake Pressure Sensor Return circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11



**C121D-BRAKE PRESSURE SENSOR CIRCUIT (CONTINUED)****11. CHECK THE (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition off.

Connect a jumper wire between the (B984) Brake Pressure Sensor Return circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B984) Brake Pressure Sensor Return circuit

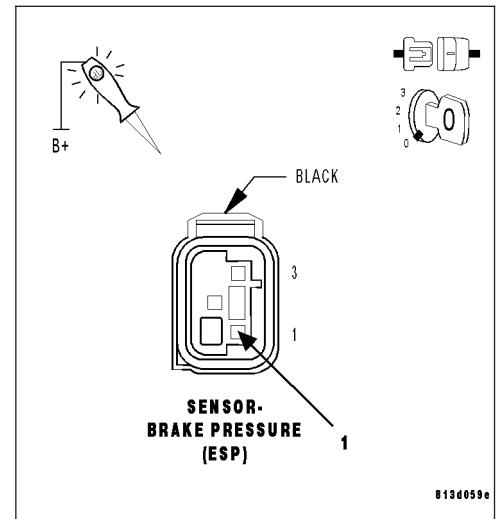
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B984) Brake Pressure Sensor Return circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.

**12. CHECK THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT OUTPUT**

Turn the ignition off.

Reconnect the Anti-Lock Brake Module harness connector.

Reconnect the Brake Pressure Sensor harness connector.

Start the engine.

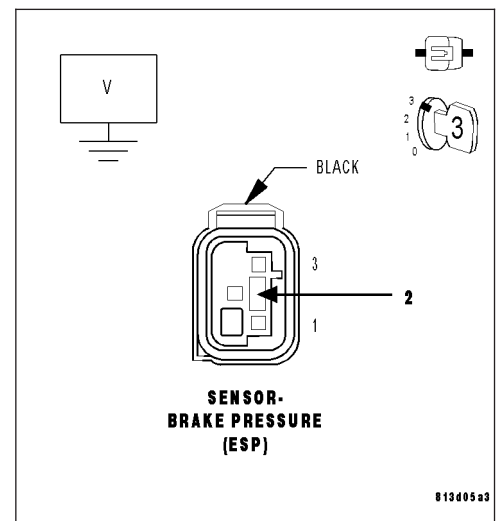
While back probing, measure the voltage of the (B84) Brake Pressure Sensor Signal circuit at the Brake Pressure Sensor harness connector while depressing and releasing the brake pedal.

**Is the voltage between 0.50 volts to 4.55 volts?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13



**C121D-BRAKE PRESSURE SENSOR CIRCUIT (CONTINUED)****13. CHECK THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition off.

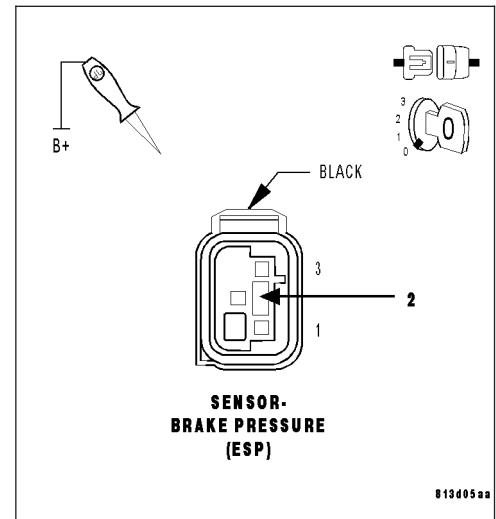
Using a 12-volt test light connected to 12-volts, check the (B84) Brake Pressure Sensor Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B84) Brake Pressure Sensor Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 14

**14. CHECK THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

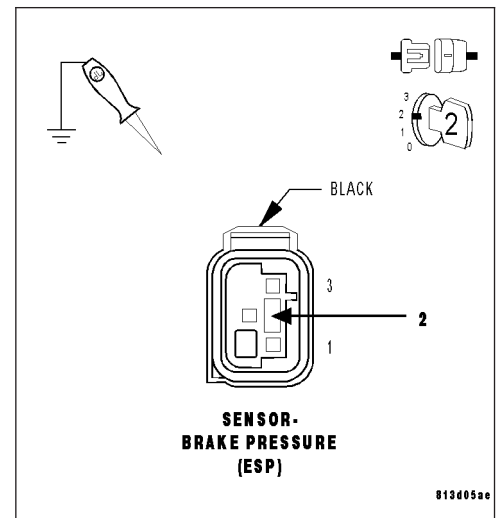
Using a 12-volt test light connected to ground, check the (B84) Brake Pressure Sensor Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B84) Brake Pressure Sensor Signal circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 15



**C121D-BRAKE PRESSURE SENSOR CIRCUIT (CONTINUED)****15. CHECK THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition off.

Connect a jumper wire between the (B84) Brake Pressure Sensor Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B84) Brake Pressure Sensor Signal circuit.

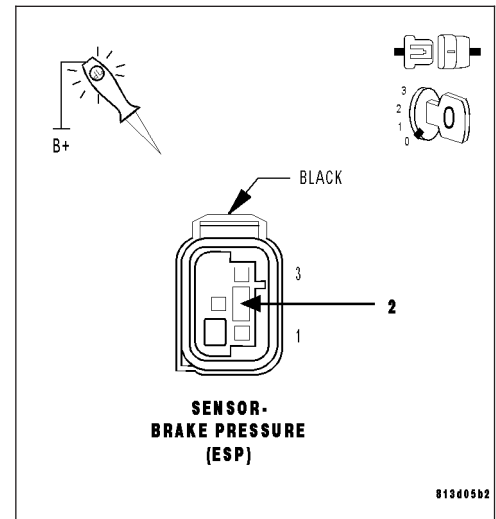
**Does the test light illuminate brightly?**

**Yes** >> Replace the Brake Pressure Sensor in accordance with the Service Information.

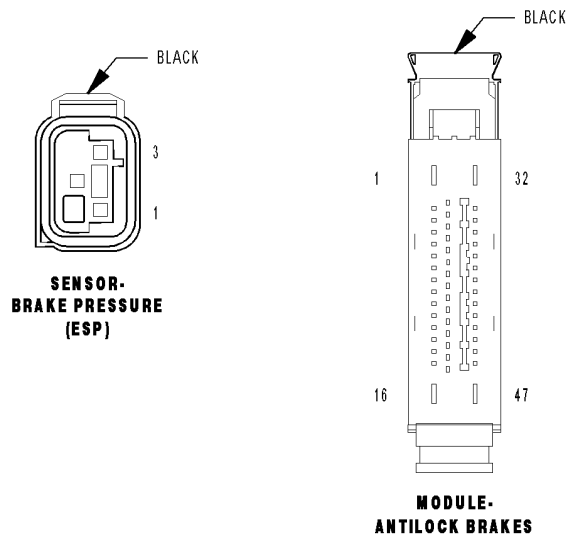
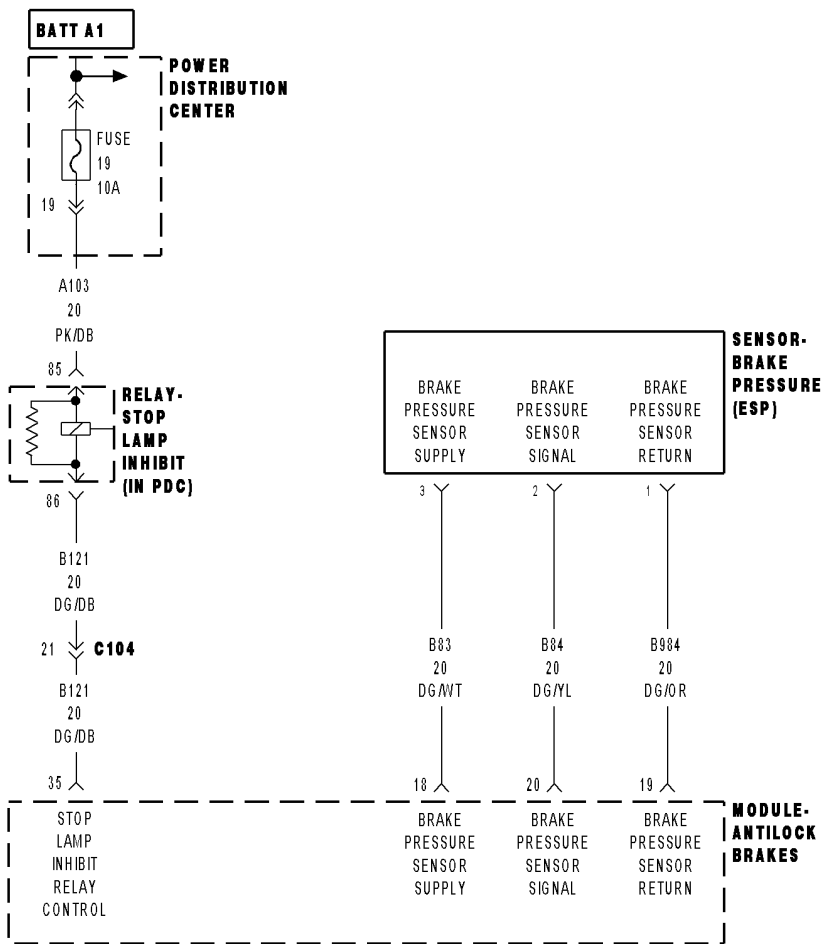
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B137) Brake Pressure Sensor Signal circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE



**C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates that the Brake Pressure Sensor Signal is out of range.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE AIR IN BRAKE SYSTEM/WORN MECHANICAL COMPONENTS (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT OPEN (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT OPEN (B84) BRAKE PRESSURE SENSOR SIGNAL AND (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUITS SHORTED TOGETHER (B84) BRAKE PRESSURE SENSOR SIGNAL AND (B984) BRAKE PRESSURE SENSOR RETURN CIRCUITS SHORTED TOGETHER (B121) STOP LAMP INHIBIT RELAY CONTROL CIRCUIT BRAKE PEDAL TRAVEL SENSOR ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE**

**Note:** If any of the following DTC's are present they must be repaired before continuing.

C122A-BRAKE PEDAL FORCE SWITCH CIRCUIT  
 C122B-BRAKE PEDAL FORCE SWITCH CIRCUIT PERFORMANCE  
 C1227-BRAKE PEDAL TRAVEL SENSOR CIRCUIT PERFORMANCE  
 C1228-BRAKE PEDAL TRAVEL SENSOR CIRCUIT LOW  
 C1229-BRAKE PEDAL TRAVEL SENSOR CIRCUIT HIGH

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Start the engine.

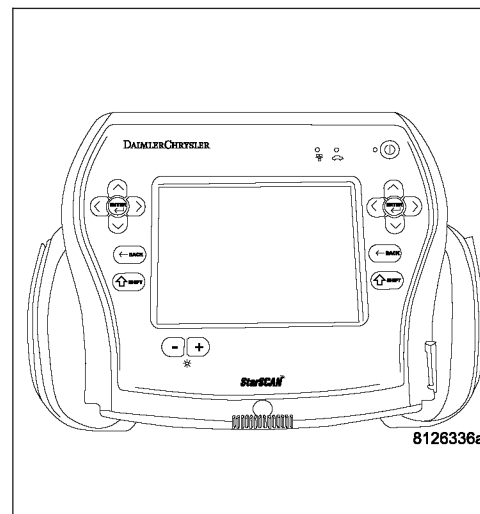
Depress and release the brake pedal.

With the scan tool, read and record DTC's.

**Does the scan tool display: C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
 Perform ABS VERIFICATION TEST - VER 1.





**C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

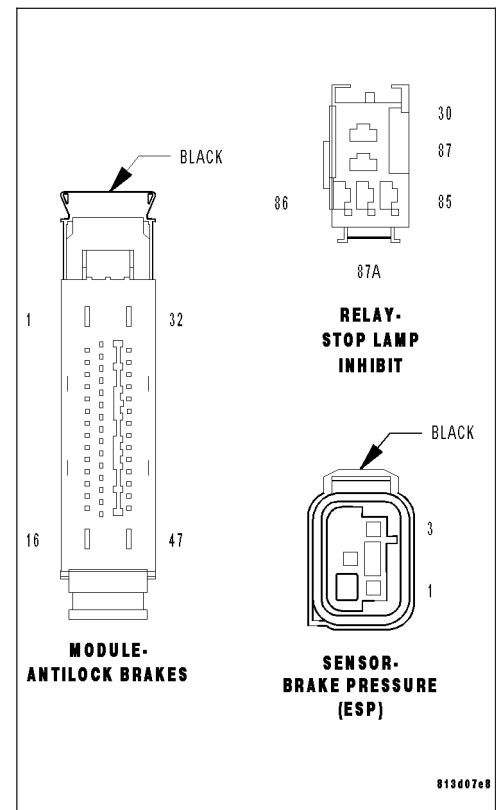
Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK FOR AIR IN BRAKE SYSTEM AND WORN MECHANICAL COMPONENTS**

**Note:** Before continuing the brake system must be bled to verify there is no air in the brake system.

**Note:** Visually inspect for worn brake linings, undersized rotors, binding or frozen calipers.

**Was there any air in the brake system or base brake issues found?**

**Yes** >> Repair as needed.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 4

**C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE (CONTINUED)****4. CHECK THE VOLTAGE ON THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Brake Pressure Sensor harness connector.

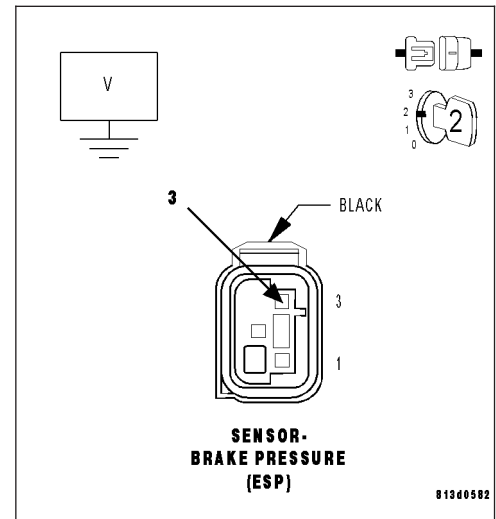
Turn the ignition on.

Measure the voltage of the (B83) Brake Pressure Sensor Supply circuit.

**Is the voltage above 4 volts?**

**Yes** >> Go To 8

**No** >> Go To 5

**5. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

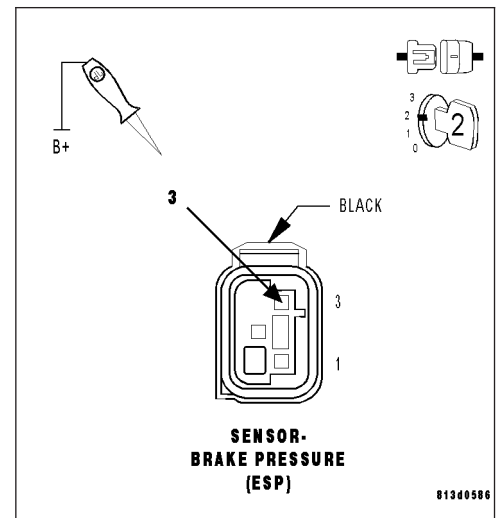
Using a 12-volt test light connected to 12-volts, check the (B83) Brake Pressure Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE (CONTINUED)****6. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

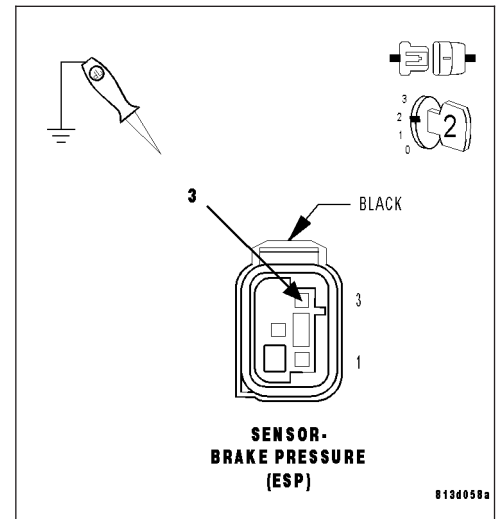
Using a 12-volt test light connected to ground, check the (B83) Brake Pressure Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Connect a jumper wire between the (B83) Brake Pressure Sensor Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B83) Brake Pressure Sensor Supply circuit.

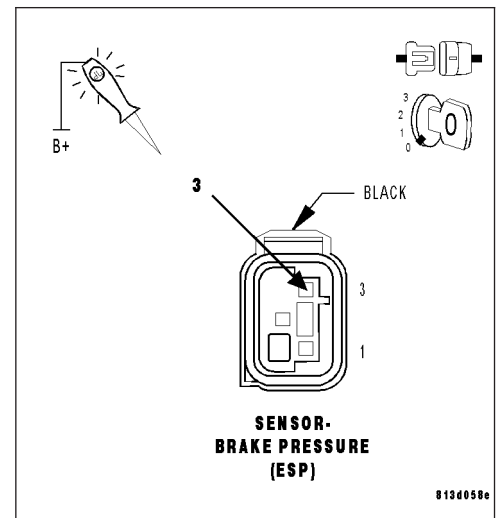
**Does the test light illuminate brightly**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B83) Brake Pressure Sensor Supply circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE (CONTINUED)****8. CHECK THE RESISTANCE TO GROUND ON THE (B984) BRAKE PRESSURE RETURN CIRCUIT**

Turn the ignition off.

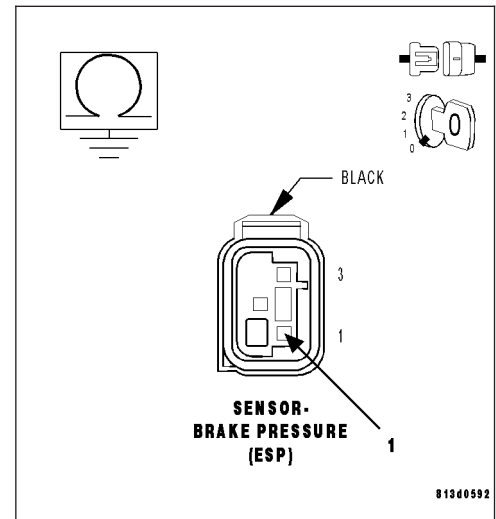
Disconnect the Brake Pressure Sensor harness connector.

Measure the resistance between the (B984) Brake Pressure Return Circuit and ground.

**Is the resistance below 5.0 ohm?**

**Yes** >> Go To 9

**No** >> Repair the (B984) Brake Pressure Return circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**9. CHECK THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT OUTPUT**

Turn the ignition off.

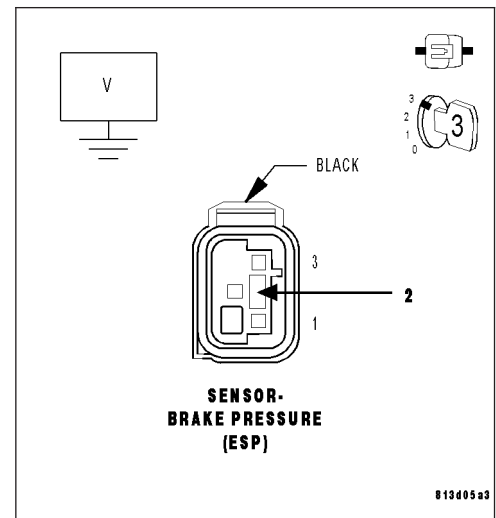
Start the engine.

While back probing, measure the voltage of the (B84) Brake Pressure Sensor Signal circuit at the Brake Pressure Sensor harness connector while depressing and releasing the brake pedal.

**Is the voltage between 0.50 volts to 4.55 volts?**

**Yes** >> Go To 13

**No** >> Go To 10



**C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE (CONTINUED)****10. CHECK THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Connect a jumper wire between the (B84) Brake Pressure Sensor Signal circuit and ground.

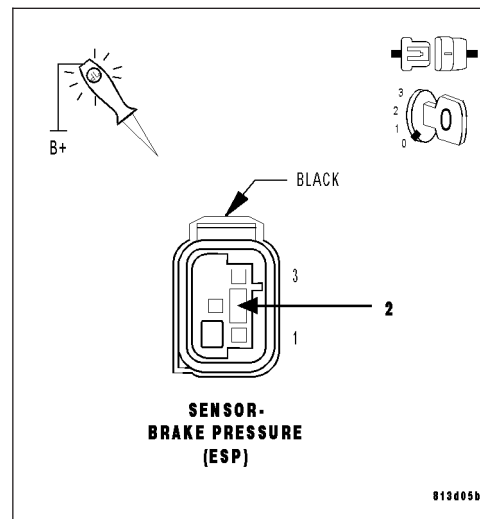
Using a 12-volt test light connected to 12-volts, check the (B84) Brake Pressure Sensor Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 11

**No** >> Repair the (B84) Brake Pressure Sensor Signal circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.

**11. CHECK FOR A SHORT BETWEEN THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT AND THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

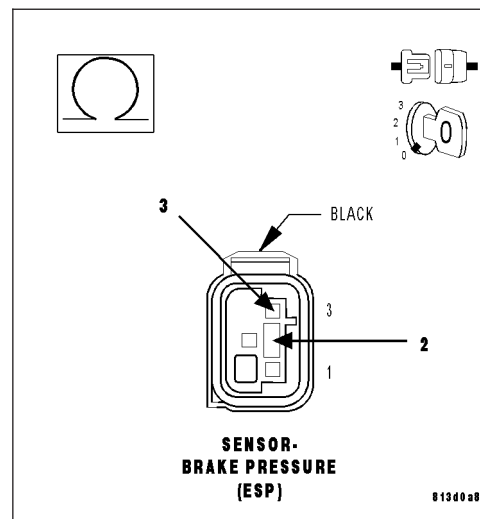
Measure the resistance between the (B84) Brake Pressure Sensor Signal circuit and the (B83) Brake Pressure Sensor Supply circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply and (B84) Brake Pressure Sensor Signal circuits for a short together.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 12



**C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE (CONTINUED)****12. CHECK FOR A SHORT BETWEEN THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT AND THE (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

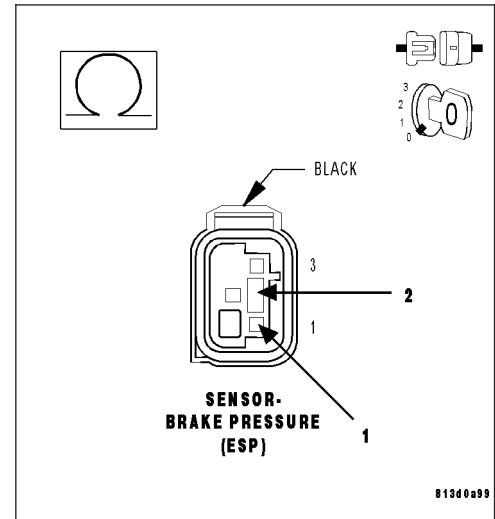
Measure the resistance between the (B84) Brake Pressure Sensor Signal and the (B984) Brake Pressure Sensor Return circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (B84) Brake Pressure Sensor Signal and (B984) Brake Pressure Sensor Return circuits for a short together.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B121) STOP LAMP INHIBIT RELAY CONTROL OPERATION**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Turn the ignition on.

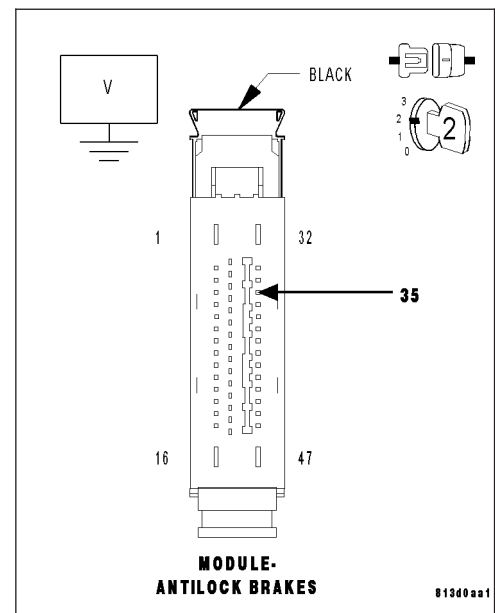
Measure the voltage on the (B121) Stop Lamp Inhibit Relay Control circuit while depressing and releasing the brake pedal.

**Does the voltage toggle from approximately 0 to 12 volts?**

**Yes** >> Go To 14

**No** >> Repair as needed.

Perform ABS VERIFICATION TEST - VER 1.



**C121E-BRAKE PRESSURE SENSOR COMPARATIVE PERFORMANCE (CONTINUED)****14. CHECK THE (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT VOLTAGE OUTPUT**

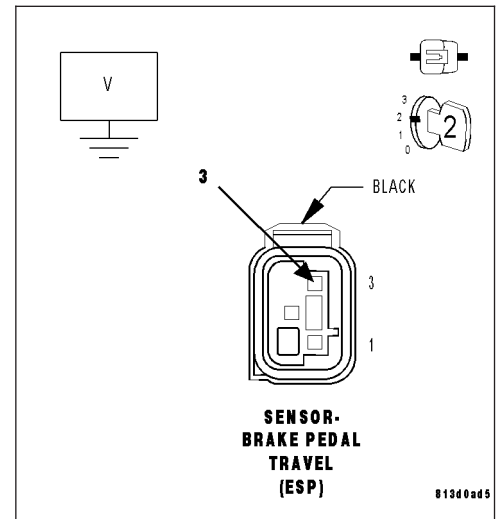
Turn the ignition off.

Turn the ignition on.

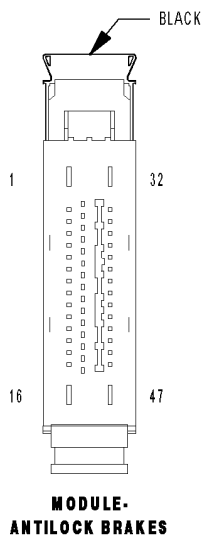
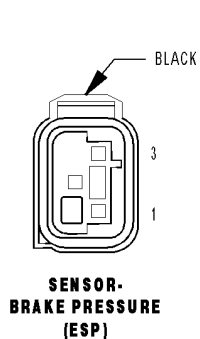
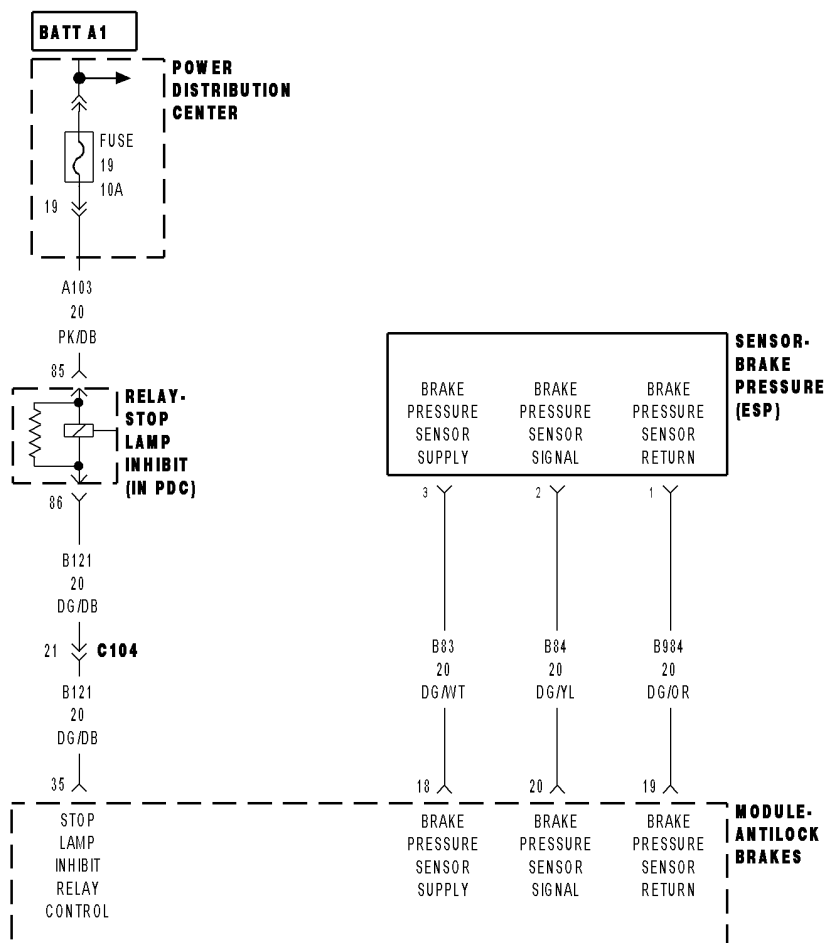
While back probing, measure the voltage of the (B137) Brake Pedal Travel Sensor Signal circuit at the Brake Pedal Travel Sensor harness connector while depressing and releasing the brake pedal.

**Is the voltage between 0.15 volts to 4.85 volts?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Replace the Brake Pedal Travel Sensor in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



# C1221-BRAKE PRESSURE SENSOR/ACCELERATOR PEDAL POSITION SENSOR CORRELATION





**C1221-BRAKE PRESSURE SENSOR/ACCELERATOR PEDAL POSITION SENSOR CORRELATION (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates that the Brake Pressure Sensor Signal is out of range.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE AIR IN BRAKE SYSTEM/WORN MECHANICAL COMPONENTS (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT OPEN (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT OPEN (B84) BRAKE PRESSURE SENSOR SIGNAL AND (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUITS SHORTED TOGETHER (B84) BRAKE PRESSURE SENSOR SIGNAL AND (B984) BRAKE PRESSURE SENSOR RETURN CIRCUITS SHORTED TOGETHER STOP LAMP INHIBIT RELAY CONTROL CIRCUIT BRAKE PEDAL TRAVEL SENSOR ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C1221-BRAKE PRESSURE SENSOR/ACCELERATOR PEDAL POSITION SENSOR CORRELATION**

**Note:** If any of the following DTC's are present they must be repaired before continuing.

C122A-BRAKE PEDAL FORCE SWITCH CIRCUIT  
 C122B-BRAKE PEDAL FORCE SWITCH CIRCUIT PERFORMANCE  
 C1227-BRAKE PEDAL TRAVEL SENSOR CIRCUIT PERFORMANCE  
 C1228-BRAKE PEDAL TRAVEL SENSOR CIRCUIT LOW  
 C1229-BRAKE PEDAL TRAVEL SENSOR CIRCUIT HIGH

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Start the engine.

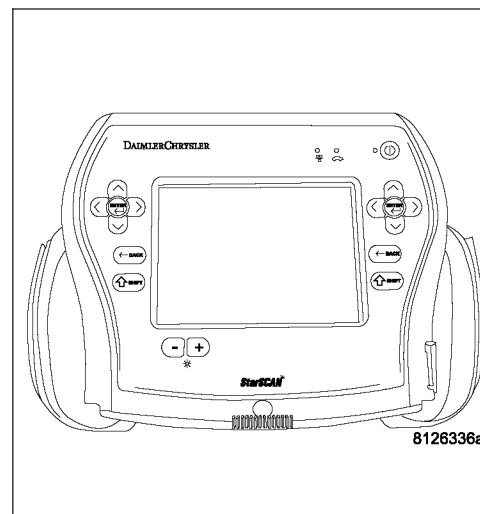
Depress and release the brake pedal.

With the scan tool, read and record DTC's.

**Does the scan tool display: C1221-BRAKE PRESSURE SENSOR/ACCELERATOR PEDAL POSITION SENSOR CORRELATION?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
 Perform ABS VERIFICATION TEST - VER 1.



**C1221-BRAKE PRESSURE SENSOR/ACCELERATOR PEDAL POSITION SENSOR CORRELATION (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

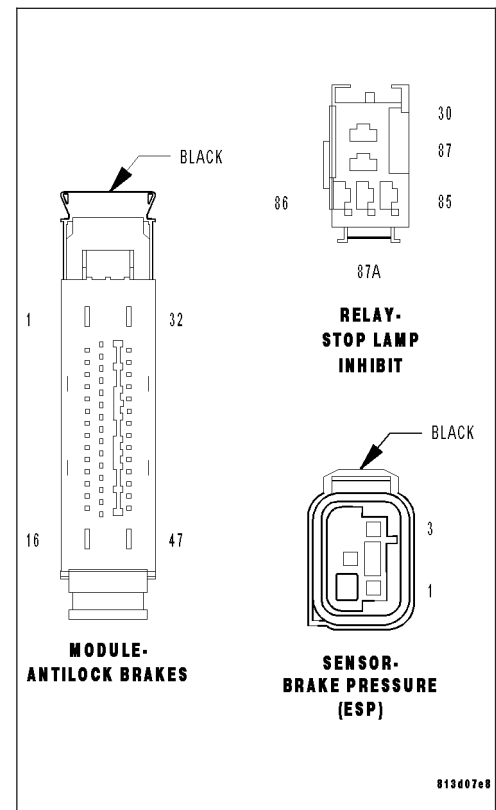
Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK FOR AIR IN BRAKE SYSTEM AND WORN MECHANICAL COMPONENTS**

**Note:** Before continuing the brake system must be bled to verify there is no air in the brake system.

**Note:** Visually inspect for worn brake linings, undersized rotors, binding or frozen calipers.

**Was there any air in the brake system or base brake issues found?**

**Yes** >> Repair as needed.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 4

**C1221-BRAKE PRESSURE SENSOR/ACCELERATOR PEDAL POSITION SENSOR CORRELATION (CONTINUED)****4. CHECK THE VOLTAGE ON THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Brake Pressure Sensor harness connector.

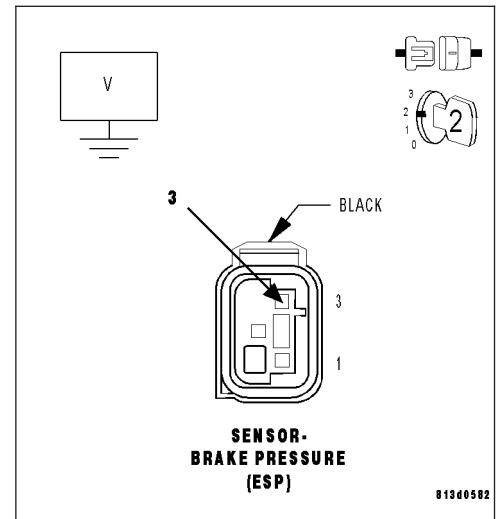
Turn the ignition on.

Measure the voltage of the (B83) Brake Pressure Sensor Supply circuit.

**Is the voltage above 4 volts?**

**Yes** >> Go To 8

**No** >> Go To 5

**5. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

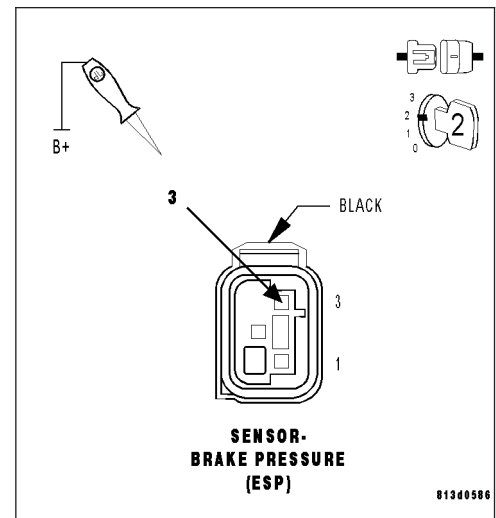
Using a 12-volt test light connected to 12-volts, check the (B83) Brake Pressure Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C1221-BRAKE PRESSURE SENSOR/ACCELERATOR PEDAL POSITION SENSOR CORRELATION (CONTINUED)****6. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

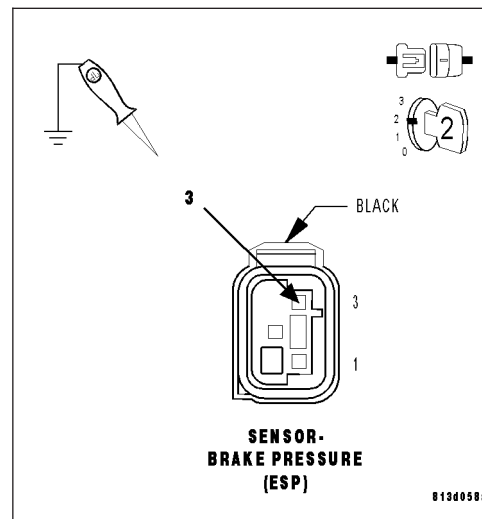
Using a 12-volt test light connected to ground, check the (B83) Brake Pressure Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Connect a jumper wire between the (B83) Brake Pressure Sensor Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B83) Brake Pressure Sensor Supply circuit.

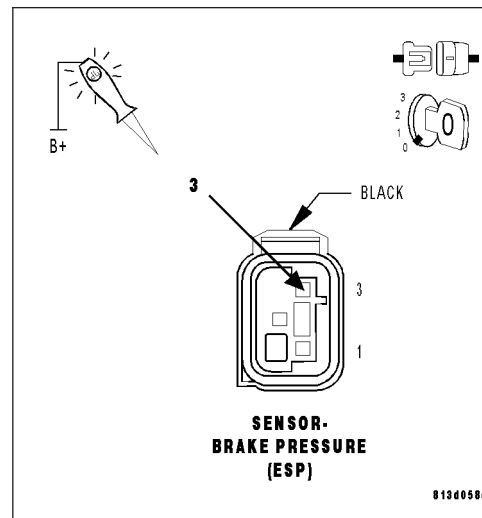
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B83) Brake Pressure Sensor Supply circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C1221-BRAKE PRESSURE SENSOR/ACCELERATOR PEDAL POSITION SENSOR CORRELATION (CONTINUED)****8. CHECK THE RESISTANCE TO GROUND ON THE (B984) BRAKE PRESSURE RETURN CIRCUIT**

Turn the ignition off.

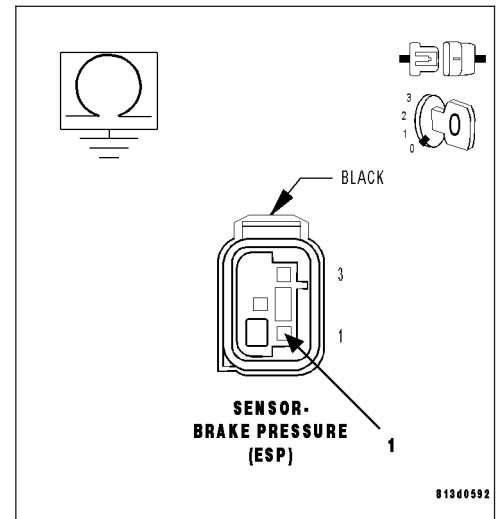
Disconnect the Brake Pressure Sensor harness connector.

Measure the resistance between the (B984) Brake Pressure Return Circuit and ground.

**Is the resistance below 5.0 ohm?**

**Yes** >> Go To 9

**No** >> Repair the (B984) Brake Pressure Return circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**9. CHECK THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT OUTPUT**

Turn the ignition off.

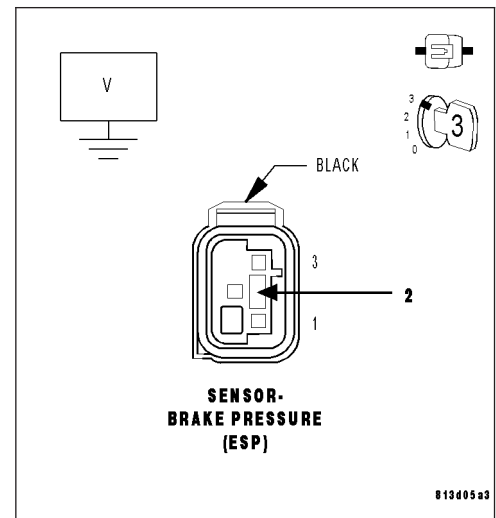
Start the engine.

While back probing, measure the voltage of the (B84) Brake Pressure Sensor Signal circuit at the Brake Pressure Sensor harness connector while depressing and releasing the brake pedal.

**Is the voltage between 0.50 volts to 4.55 volts?**

**Yes** >> Go To 13

**No** >> Go To 10



**C1221-BRAKE PRESSURE SENSOR/ACCELERATOR PEDAL POSITION SENSOR CORRELATION (CONTINUED)****10. CHECK THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Connect a jumper wire between the (B84) Brake Pressure Sensor Signal circuit and ground.

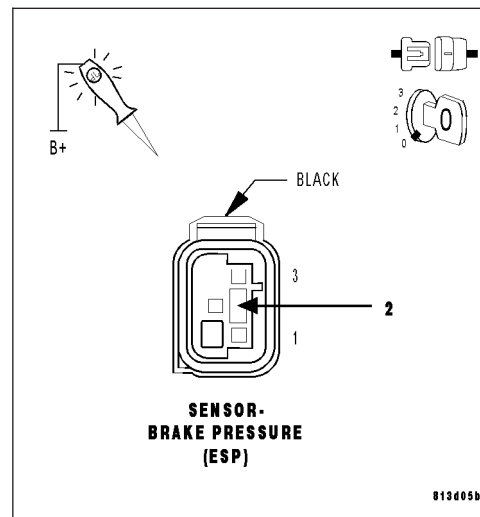
Using a 12-volt test light connected to 12-volts, check the (B84) Brake Pressure Sensor Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 11

**No** >> Repair the (B84) Brake Pressure Sensor Signal circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.

**11. CHECK FOR A SHORT BETWEEN THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT AND THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

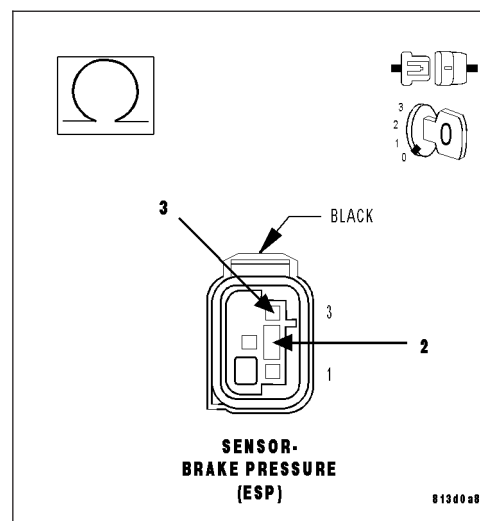
Measure the resistance between the (B84) Brake Pressure Sensor Signal circuit and the (B83) Brake Pressure Sensor Supply circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply and (B84) Brake Pressure Sensor Signal circuits for a short together.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 12



**C1221-BRAKE PRESSURE SENSOR/ACCELERATOR PEDAL POSITION SENSOR CORRELATION (CONTINUED)****12. CHECK FOR A SHORT BETWEEN THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT AND THE (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

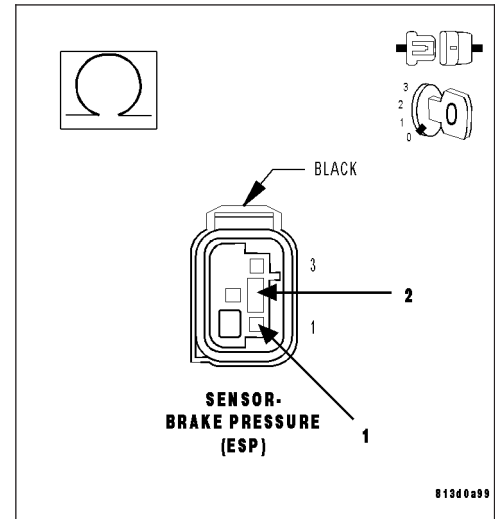
Measure the resistance between the (B84) Brake Pressure Sensor Signal and the (B984) Brake Pressure Sensor Return circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (B84) Brake Pressure Sensor Signal and (B984) Brake Pressure Sensor Return circuits for a short together.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B121) STOP LAMP INHIBIT RELAY CONTROL OPERATION**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Turn the ignition on.

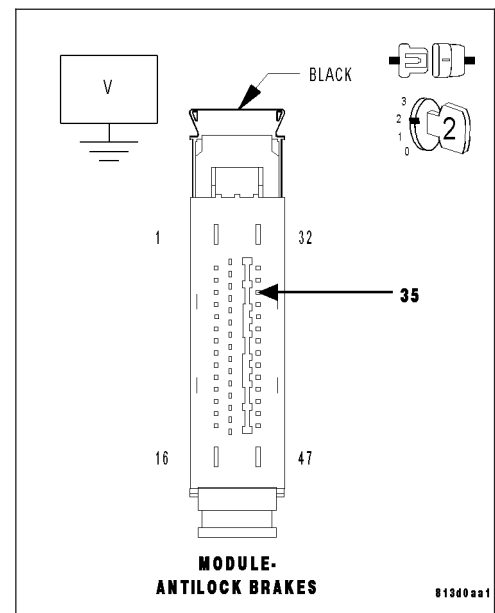
Measure the voltage on the (B121) Stop Lamp Inhibit Relay Control circuit while depressing and releasing the brake pedal.

**Does the voltage toggle from approximately 0 to 12 volts?**

**Yes** >> Go To 14

**No** >> Repair as needed.

Perform ABS VERIFICATION TEST - VER 1.



**C1221-BRAKE PRESSURE SENSOR/ACCELERATOR PEDAL POSITION SENSOR CORRELATION (CONTINUED)****14. CHECK THE (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT VOLTAGE OUTPUT**

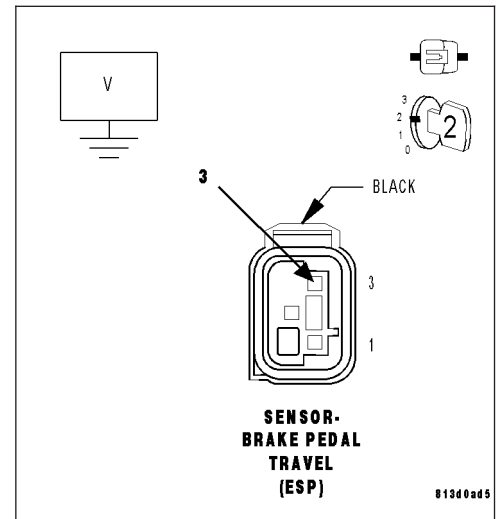
Turn the ignition off.

Turn the ignition on.

While back probing, measure the voltage of the (B137) Brake Pedal Travel Sensor Signal circuit at the Brake Pedal Travel Sensor harness connector while depressing and releasing the brake pedal.

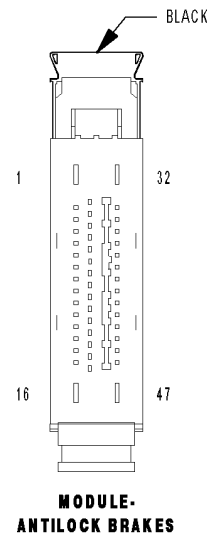
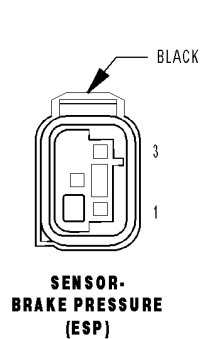
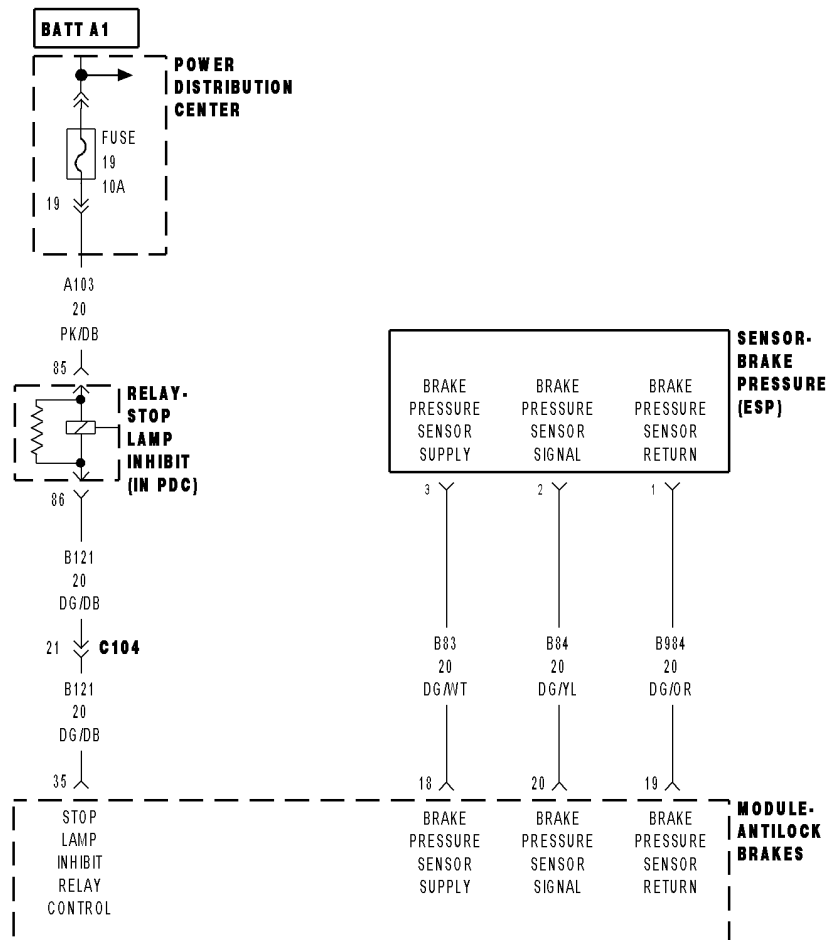
**Is the voltage between 0.15 volts to 4.85 volts?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Replace the Brake Pressure Sensor in accordance with the Service Information  
Perform ABS VERIFICATION TEST - VER 1.





## C1222-BRAKE PEDAL TRAVEL SENSOR/BRAKE PRESSURE SENSOR CORRELATION



**C1222-BRAKE PEDAL TRAVEL SENSOR/BRAKE PRESSURE SENSOR CORRELATION (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates that the Brake Pressure Sensor Signal is not plausible.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE AIR IN BRAKE SYSTEM/WORN MECHANICAL COMPONENTS (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT OPEN (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT OPEN (B84) BRAKE PRESSURE SENSOR SIGNAL AND (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUITS SHORTED TOGETHER (B84) BRAKE PRESSURE SENSOR SIGNAL AND (B984) BRAKE PRESSURE SENSOR RETURN CIRCUITS SHORTED TOGETHER STOP LAMP INHIBIT RELAY CONTROL CIRCUIT BRAKE PEDAL TRAVEL SENSOR ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C1222-BRAKE PEDAL TRAVEL SENSOR/BRAKE PRESSURE SENSOR CORRELATION**

**Note:** If any of the following DTC's are present they must be repaired before continuing.

C1227-BRAKE PEDAL TRAVEL SENSOR CIRCUIT PERFORMANCE

C1228-BRAKE PEDAL TRAVEL SENSOR CIRCUIT LOW

C1229-BRAKE PEDAL TRAVEL SENSOR CIRCUIT HIGH

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Start the engine.

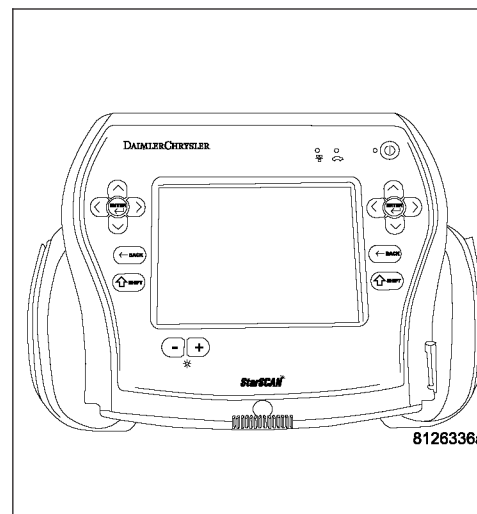
Depress and release the brake pedal.

With the scan tool, read and record DTC's.

**Does the scan tool display: C1222-BRAKE PEDAL TRAVEL SENSOR/BRAKE PRESSURE SENSOR CORRELATION?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C1222-BRAKE PEDAL TRAVEL SENSOR/BRAKE PRESSURE SENSOR CORRELATION (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

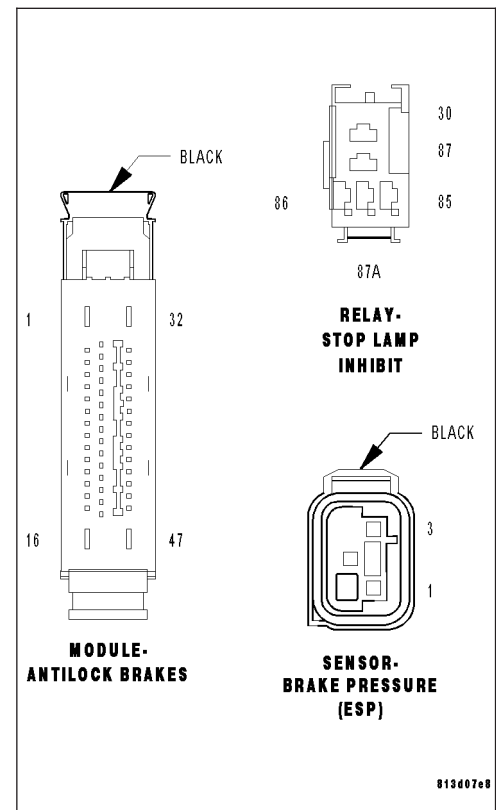
Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK FOR AIR IN BRAKE SYSTEM AND WORN MECHANICAL COMPONENTS**

**Note:** Before continuing the brake system must be bled to verify there is no air in the brake system.

**Note:** Visually inspect for worn brake linings, undersized rotors, binding or frozen calipers.

**Was there any air in the brake system or base brake issues found?**

**Yes** >> Repair as needed.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 4

**C1222-BRAKE PEDAL TRAVEL SENSOR/BRAKE PRESSURE SENSOR CORRELATION (CONTINUED)****4. CHECK THE VOLTAGE ON THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Brake Pressure Sensor harness connector.

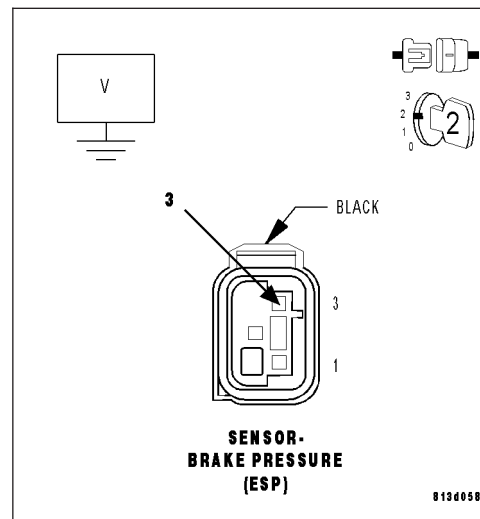
Turn the ignition on.

Measure the voltage of the (B83) Brake Pressure Sensor Supply circuit.

**Is the voltage above 4 volts?**

**Yes** >> Go To 8

**No** >> Go To 5

**5. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

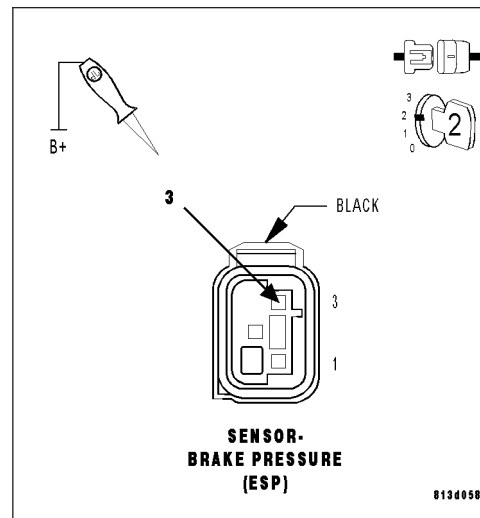
Using a 12-volt test light connected to 12-volts, check the (B83) Brake Pressure Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C1222-BRAKE PEDAL TRAVEL SENSOR/BRAKE PRESSURE SENSOR CORRELATION (CONTINUED)****6. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

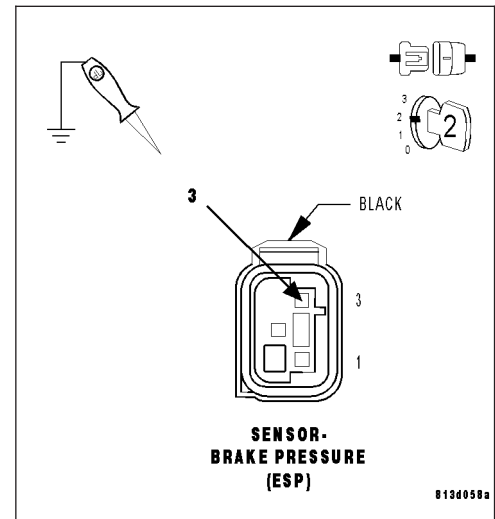
Using a 12-volt test light connected to ground, check the (B83) Brake Pressure Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Connect a jumper wire between the (B83) Brake Pressure Sensor Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B83) Brake Pressure Sensor Supply circuit.

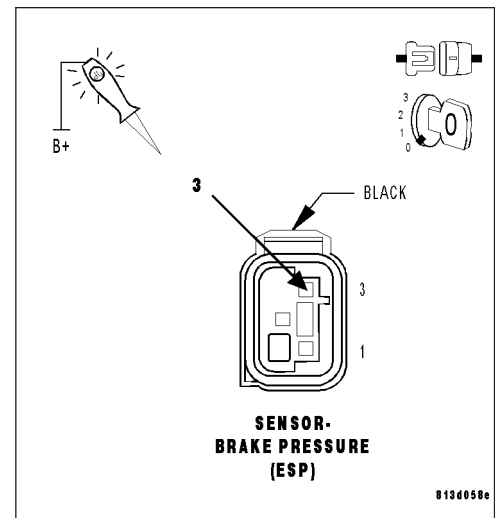
**Does the test light illuminate brightly**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B83) Brake Pressure Sensor Supply circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C1222-BRAKE PEDAL TRAVEL SENSOR/BRAKE PRESSURE SENSOR CORRELATION (CONTINUED)****8. CHECK THE RESISTANCE TO GROUND ON THE (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT**

Turn the ignition off.

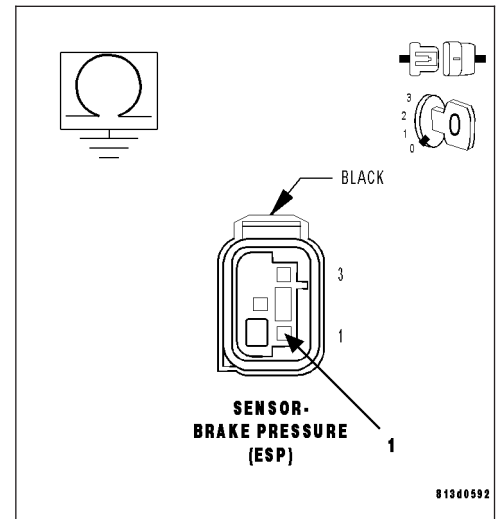
Disconnect the Brake Pressure Sensor harness connector.

Measure the resistance between the (B984) Brake Pressure Sensor Return Circuit and ground.

**Is the resistance below 5.0 ohm?**

**Yes** >> Go To 9

**No** >> Repair the (B984) Brake Pressure Sensor Return circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**9. CHECK THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT OUTPUT**

Turn the ignition off.

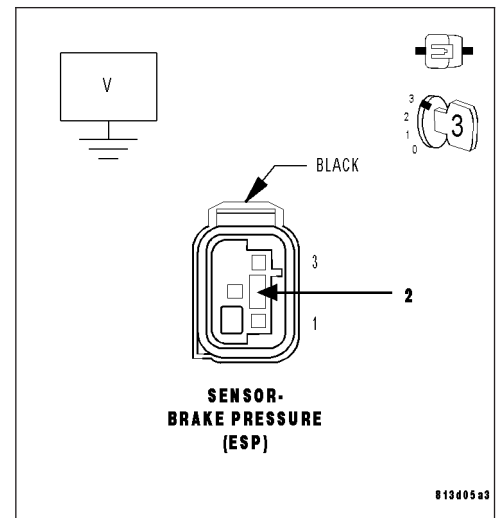
Start the engine.

While back probing, measure the voltage of the (B84) Brake Pressure Sensor Signal circuit at the Brake Pressure Sensor harness connector while depressing and releasing the brake pedal.

**Is the voltage between 0.50 volts to 4.55 volts?**

**Yes** >> Go To 13

**No** >> Go To 10



**C1222-BRAKE PEDAL TRAVEL SENSOR/BRAKE PRESSURE SENSOR CORRELATION (CONTINUED)****10. CHECK THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

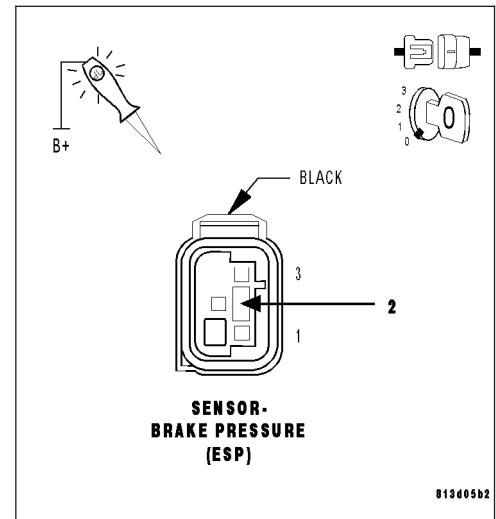
Connect a jumper wire between the (B84) Brake Pressure Sensor Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B84) Brake Pressure Sensor Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 11

**No** >> Repair the (B84) Brake Pressure Sensor Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**11. CHECK FOR A SHORT BETWEEN THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT AND THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

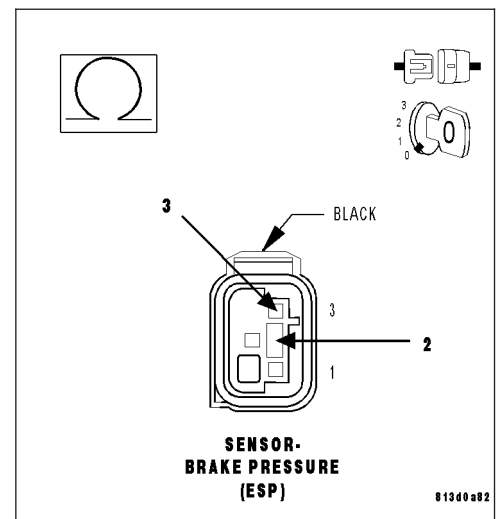
Disconnect the Brake Pressure Sensor harness connector.

Measure the resistance between the (B84) Brake Pressure Sensor Signal circuit and the (B83) Brake Pressure Sensor Supply circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply and (B84) Brake Pressure Sensor Signal circuits for a short together.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 12



**C1222-BRAKE PEDAL TRAVEL SENSOR/BRAKE PRESSURE SENSOR CORRELATION (CONTINUED)****12. CHECK FOR A SHORT BETWEEN THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT AND THE (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

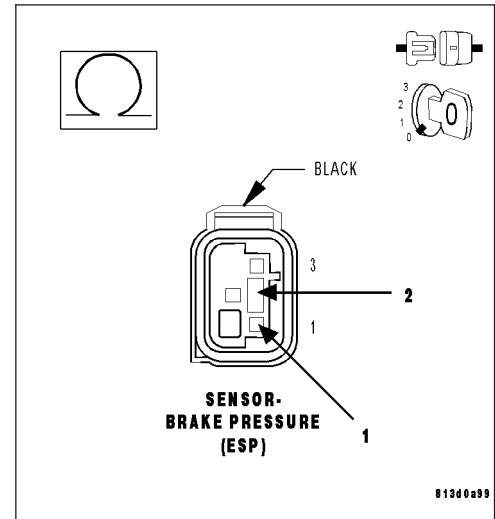
Measure the resistance between the (B84) Brake Pressure Sensor Signal and the (B984) Brake Pressure Sensor Return circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (B84) Brake Pressure Sensor Signal and (B984) Brake Pressure Sensor Return circuits for a short together.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B121) STOP LAMP INHIBIT RELAY CONTROL OPERATION**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Turn the ignition on.

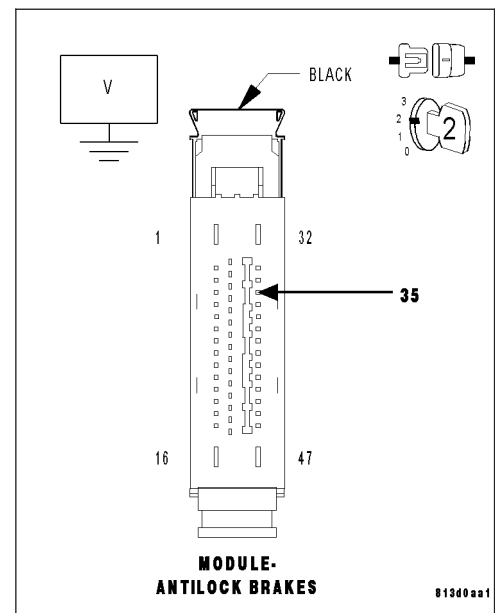
Measure the voltage on the (B121) Stop Lamp Inhibit Relay Control circuit while depressing and releasing the brake pedal.

**Does the voltage toggle from approximately 0 to 12 volts?**

**Yes** >> Go To 14

**No** >> Repair as needed.

Perform ABS VERIFICATION TEST - VER 1.





**C1222-BRAKE PEDAL TRAVEL SENSOR/BRAKE PRESSURE SENSOR CORRELATION (CONTINUED)****14. CHECK THE (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT VOLTAGE OUTPUT**

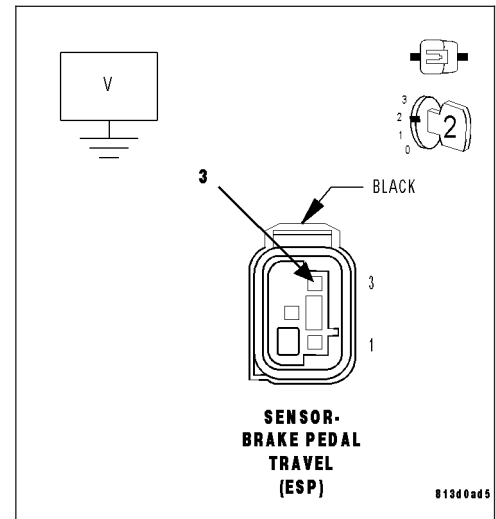
Turn the ignition off.

Turn the ignition on.

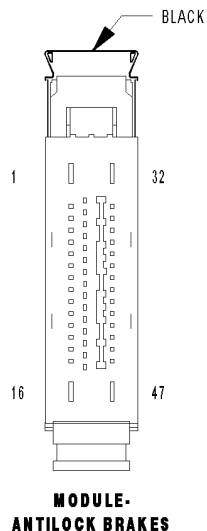
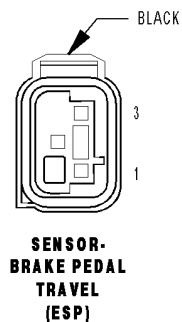
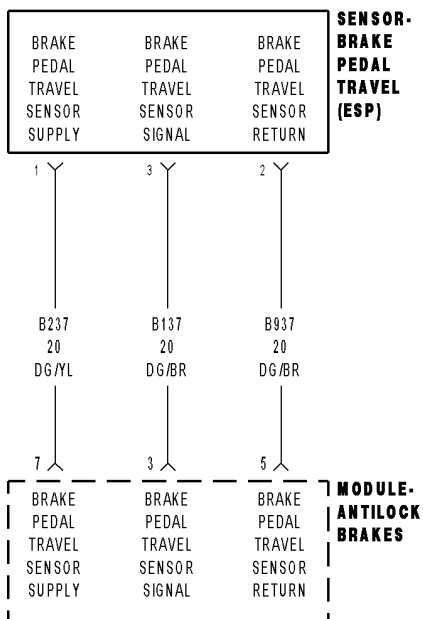
While back probing, measure the voltage of the (B137) Brake Pedal Travel Sensor Signal circuit at the Brake Pedal Travel Sensor harness connector while depressing and releasing the brake pedal.

**Is the voltage between 0.15 volts to 4.85 volts?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Replace the Brake Pedal Travel Sensor in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



## C1227-BRAKE PEDAL TRAVEL SENSOR CIRCUIT PERFORMANCE



**C1227-BRAKE PEDAL TRAVEL SENSOR CIRCUIT PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates that the Brake Pedal Travel Sensor Signal is not plausible.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B937) BRAKE PEDAL TRAVEL SENSOR RETURN CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN BRAKE PEDAL TRAVEL SENSOR ANTI-LOCK BRAKE MODULE

**Diagnostic Test**

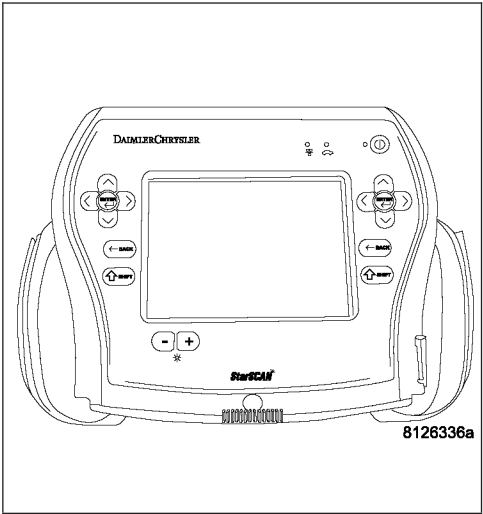
**1. CHECK FOR A DTC C1227-BRAKE PEDAL TRAVEL SENSOR CIRCUIT PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition from off to on.
- With the scan tool, read and record DTC's.

**Does the scan tool display: C1227-BRAKE PEDAL TRAVEL SENSOR CIRCUIT PERFORMANCE?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C1227-BRAKE PEDAL TRAVEL SENSOR CIRCUIT PERFORMANCE (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check the installation of the Brake Pedal Travel Sensor.

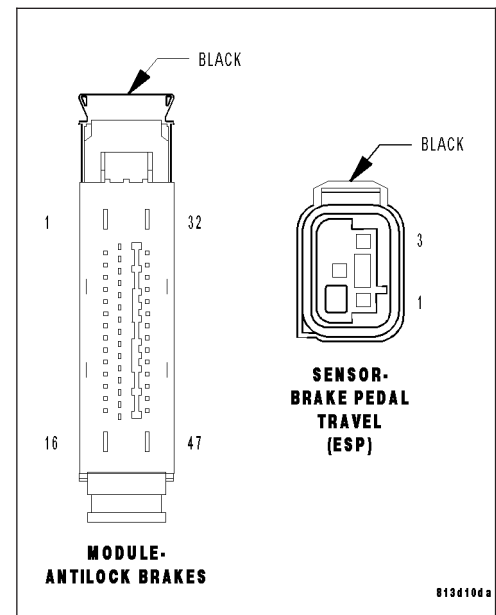
Check all related wiring for bruised, chafed, pierced, or partially broken wires.

Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE ON THE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Brake Pedal Travel Sensor harness connector.

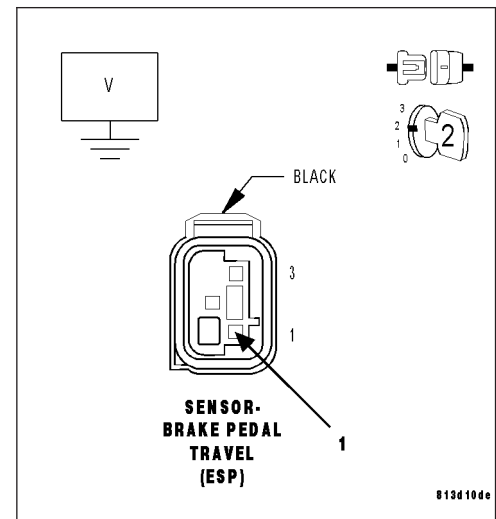
Turn the ignition on.

Measure the voltage of the (B237) Brake Pedal Travel Sensor Supply circuit.

**Is the voltage above 4 volts?**

**Yes** >> Go To 7

**No** >> Go To 4



**C1227-BRAKE PEDAL TRAVEL SENSOR CIRCUIT PERFORMANCE (CONTINUED)****4. CHECK THE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT FOR SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

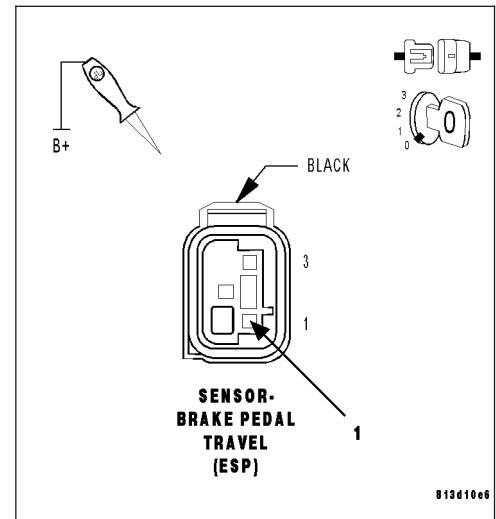
Using a 12-volt test light connected to 12-volts, check the (B237) Brake Pedal Travel Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B237) Brake Pedal Travel Sensor Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT FOR SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

Turn the ignition on.

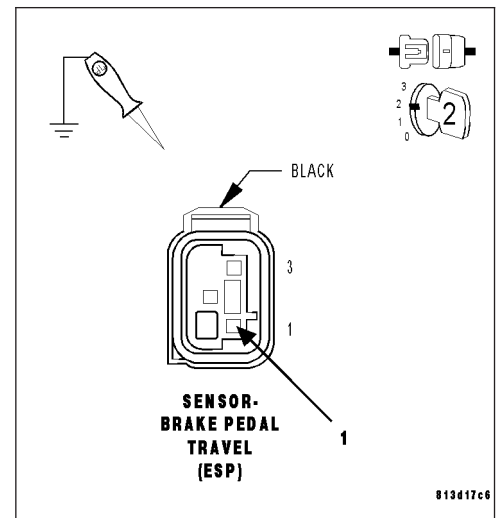
Using a 12-volt test light connected to ground, check the (B237) Brake Pedal Travel Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B237) Brake Pedal Travel Sensor Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C1227-BRAKE PEDAL TRAVEL SENSOR CIRCUIT PERFORMANCE (CONTINUED)****6. CHECK THE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

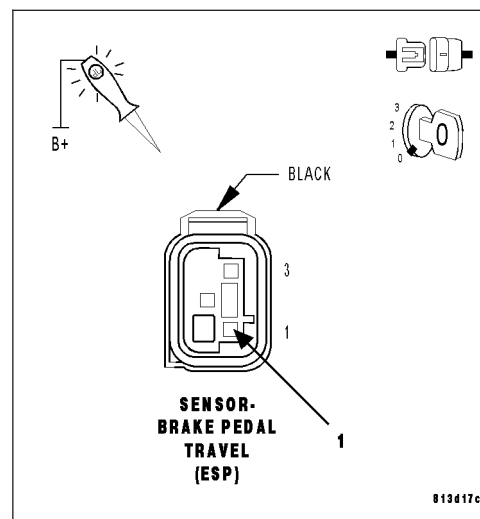
Disconnect the Brake Pedal Travel Sensor harness connector.

Connect a jumper wire between the (B237) Brake Pedal Travel Sensor Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B237) Brake Pedal Travel Sensor Supply circuit

**Does the test light illuminate brightly?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B237) Brake Pedal Travel Sensor Supply circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**7. CHECK THE (B937) BRAKE PEDAL TRAVEL SENSOR RETURN CIRCUIT FOR SHORT TO GROUND**

Turn the ignition off.

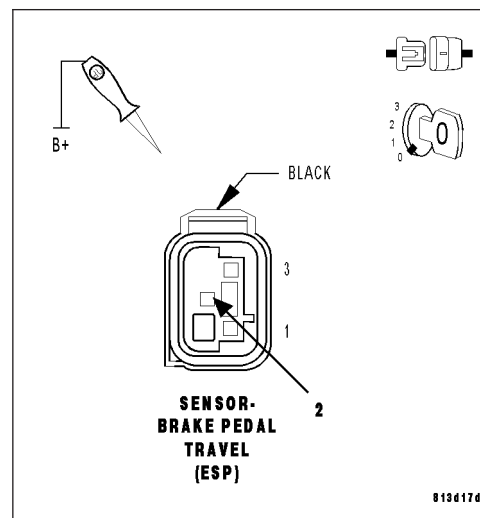
Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

Using a 12-volt test light connected to 12-volts, check the (B937) Brake Pedal Travel Sensor Return circuit.

**Does the test light illuminate brightly**

- Yes** >> Repair the (B937) Brake Pedal Travel Sensor Return circuit for a short to ground.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 8



**C1227-BRAKE PEDAL TRAVEL SENSOR CIRCUIT PERFORMANCE (CONTINUED)****8. CHECK THE (B937) BRAKE PEDAL TRAVEL SENSOR RETURN CIRCUIT FOR SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

Turn the ignition on.

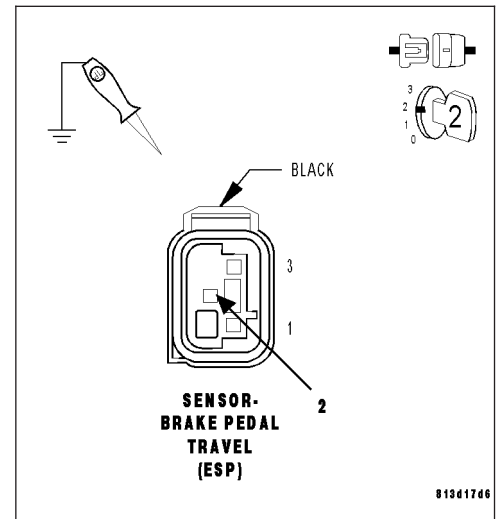
Using a 12-volt test light connected to ground, check the (B937) Brake Pedal Travel Sensor Return circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B937) Brake Pedal Travel Sensor Return circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. CHECK THE (B937) BRAKE PEDAL TRAVEL SENSOR RETURN CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

Connect a jumper wire between the (B937) Brake Pedal Travel Sensor Return circuit and ground.

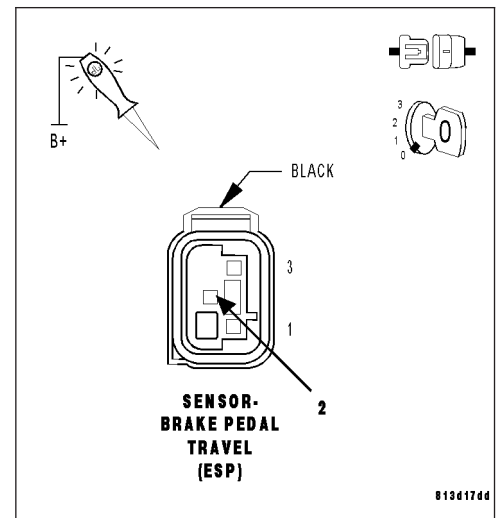
Using a 12-volt test light connected to 12-volts, check the (B937) Brake Pedal Travel Sensor Return circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 10

**No** >> Repair the (B937) Brake Pedal Travel Sensor Return circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C1227-BRAKE PEDAL TRAVEL SENSOR CIRCUIT PERFORMANCE (CONTINUED)****10. CHECK THE (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

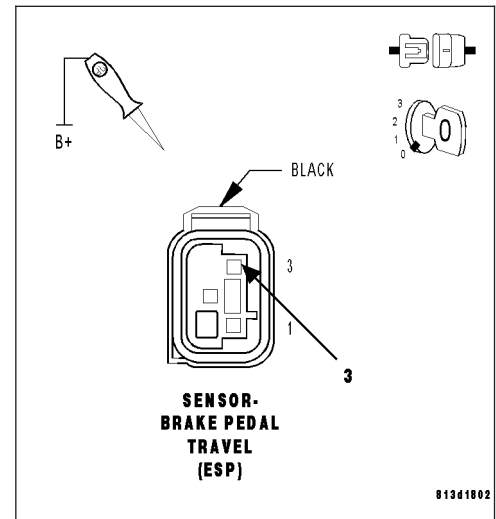
Disconnect the Brake Pedal Travel Sensor harness connector.

Using a 12-volt test light connected to 12-volts, check the (B137) Brake Pedal Travel Sensor Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B137) Brake Booster Travel Position Sensor Signal circuit for a short to ground.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

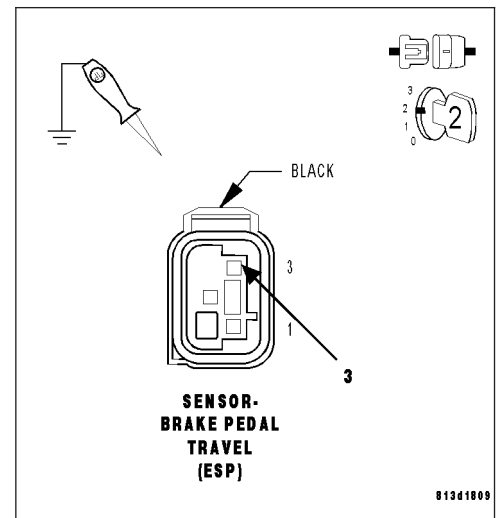
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (B137) Brake Pedal Travel Sensor Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B137) Brake Pedal Travel Sensor Signal circuit for a short to voltage.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 12





**C1227-BRAKE PEDAL TRAVEL SENSOR CIRCUIT PERFORMANCE (CONTINUED)****12. CHECK THE (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

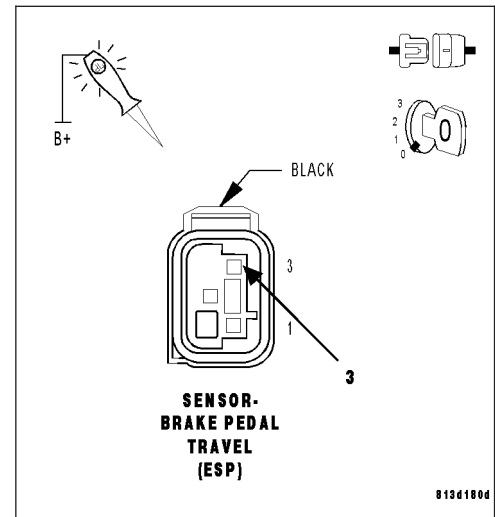
Connect a jumper wire between the (B137) Brake Pedal Travel Sensor Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B137) Brake Pedal Travel Sensor Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 13

**No** >> Repair the (B137) Brake Pedal Travel Sensor Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**13. CHECK THE (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT VOLTAGE OUTPUT**

Turn the ignition off.

Reconnect the Anti-Lock Brake Module harness connector.

Reconnect the Brake Pedal Travel Sensor harness connector.

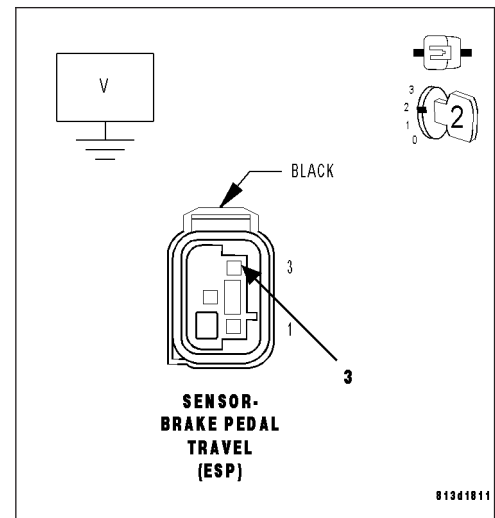
Turn the ignition on.

While back probing, measure the voltage of the (B137) Brake Pedal Travel Sensor Signal circuit at the Brake Pedal Travel Sensor harness connector while depressing and releasing the brake pedal.

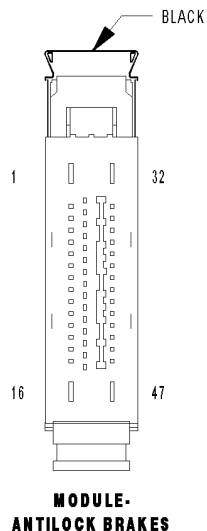
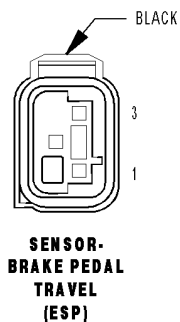
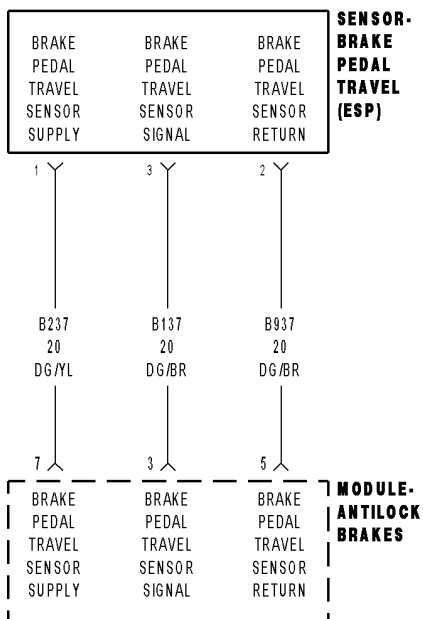
**Is the voltage between 0.15 volts to 4.85 volts?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Replace the Brake Pedal Travel Sensor in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



## C1228-BRAKE PEDAL TRAVEL SENSOR CIRCUIT LOW



C1228-BRAKE PEDAL TRAVEL SENSOR CIRCUIT LOW (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates that the Brake Pedal Travel Sensor Signal is within the low fault area.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B937) BRAKE PEDAL TRAVEL SENSOR RETURN CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN BRAKE PEDAL TRAVEL SENSOR ANTI-LOCK BRAKE MODULE

Diagnostic Test

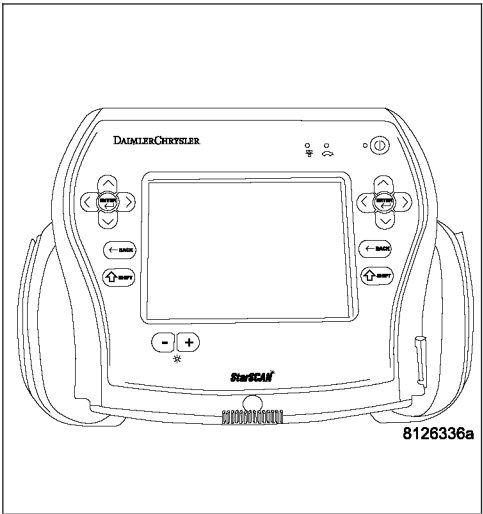
1. CHECK FOR A DTC C1228-BRAKE PEDAL TRAVEL SENSOR CIRCUIT LOW

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition from off to on.
- With the scan tool, read and record DTC's.

**Does the scan tool display: C1228-BRAKE PEDAL TRAVEL SENSOR CIRCUIT LOW?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C1228-BRAKE PEDAL TRAVEL SENSOR CIRCUIT LOW (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check the installation of the Brake Pedal Travel Sensor.

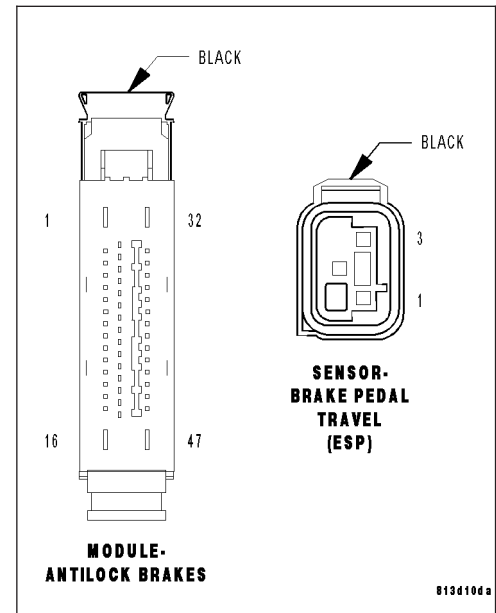
Check all related wiring for bruised, chafed, pierced, or partially broken wires.

Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE ON THE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Brake Pedal Travel Sensor harness connector.

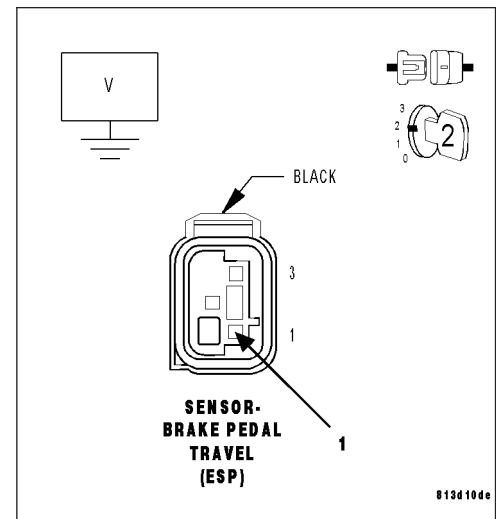
Turn the ignition on.

Measure the voltage of the (B237) Brake Pedal Travel Sensor Supply circuit.

**Is the voltage above 4 volts?**

**Yes** >> Go To 7

**No** >> Go To 4



**C1228-BRAKE PEDAL TRAVEL SENSOR CIRCUIT LOW (CONTINUED)****4. CHECK THE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT FOR SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

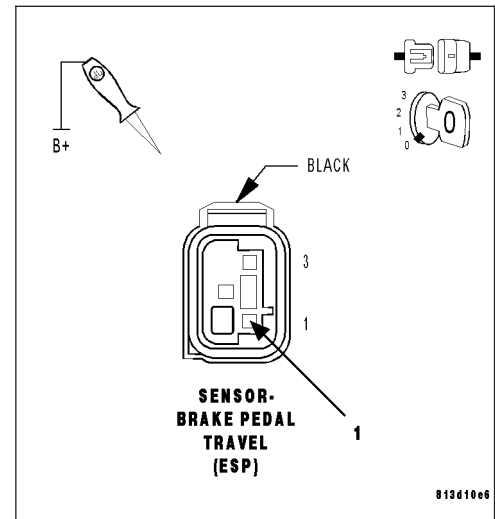
Using a 12-volt test light connected to 12-volts, check the (B237) Brake Pedal Travel Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B237) Brake Pedal Travel Sensor Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT FOR SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

Turn the ignition on.

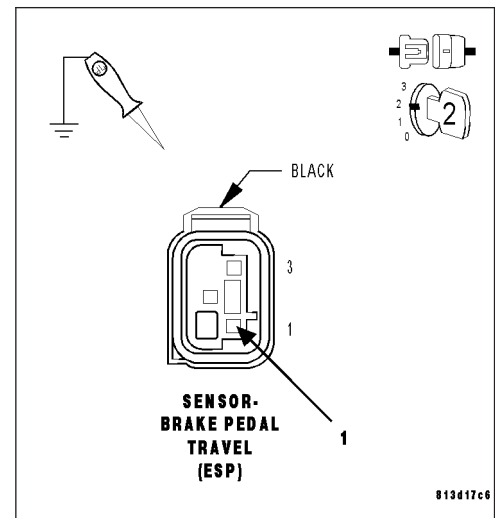
Using a 12-volt test light connected to ground, check the (B237) Brake Pedal Travel Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B237) Brake Pedal Travel Sensor Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C1228-BRAKE PEDAL TRAVEL SENSOR CIRCUIT LOW (CONTINUED)****6. CHECK THE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

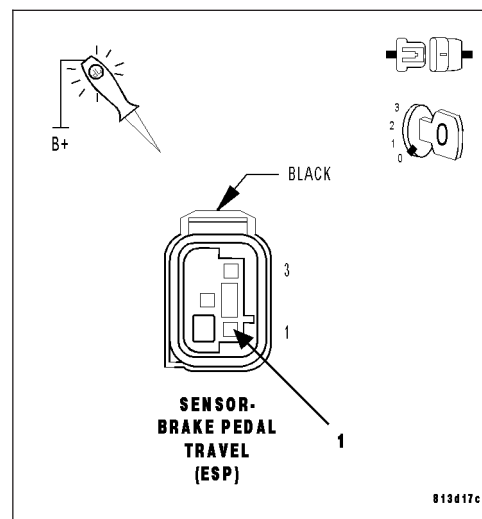
Disconnect the Brake Pedal Travel Sensor harness connector.

Connect a jumper wire between the (B237) Brake Pedal Travel Sensor Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B237) Brake Pedal Travel Sensor Supply circuit

**Does the test light illuminate brightly?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B237) Brake Pedal Travel Sensor Supply circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**7. CHECK THE (B937) BRAKE PEDAL TRAVEL SENSOR RETURN CIRCUIT FOR SHORT TO GROUND**

Turn the ignition off.

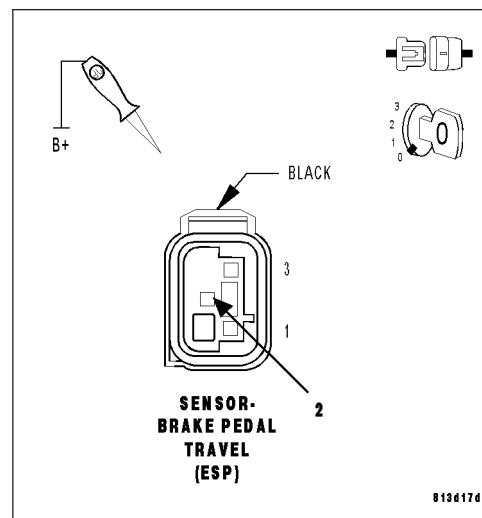
Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

Using a 12-volt test light connected to 12-volts, check the (B937) Brake Pedal Travel Sensor Return circuit.

**Does the test light illuminate brightly**

- Yes** >> Repair the (B937) Brake Pedal Travel Sensor Return circuit for a short to ground.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 8



**C1228-BRAKE PEDAL TRAVEL SENSOR CIRCUIT LOW (CONTINUED)****8. CHECK THE (B937) BRAKE PEDAL TRAVEL SENSOR RETURN CIRCUIT FOR SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

Turn the ignition on.

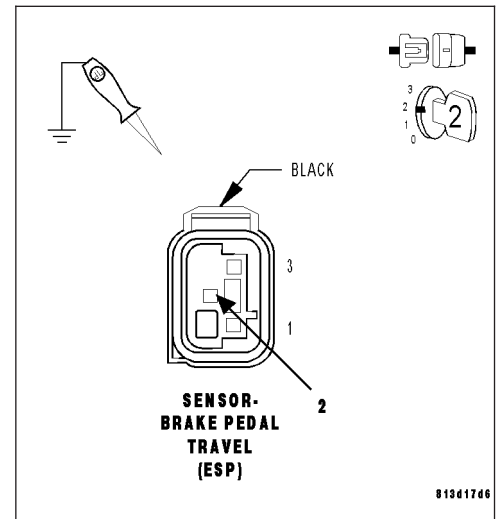
Using a 12-volt test light connected to ground, check the (B937) Brake Pedal Travel Sensor Return circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B937) Brake Pedal Travel Sensor Return circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. CHECK THE (B937) BRAKE PEDAL TRAVEL SENSOR RETURN CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

Connect a jumper wire between the (B937) Brake Pedal Travel Sensor Return circuit and ground.

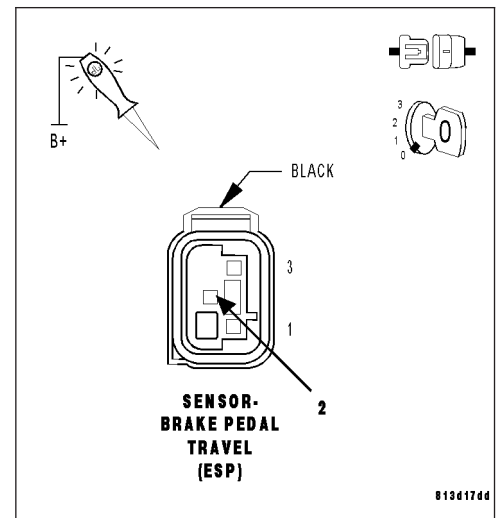
Using a 12-volt test light connected to 12-volts, check the (B937) Brake Pedal Travel Sensor Return circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 10

**No** >> Repair the (B937) Brake Pedal Travel Sensor Return circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C1228-BRAKE PEDAL TRAVEL SENSOR CIRCUIT LOW (CONTINUED)****10. CHECK THE (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

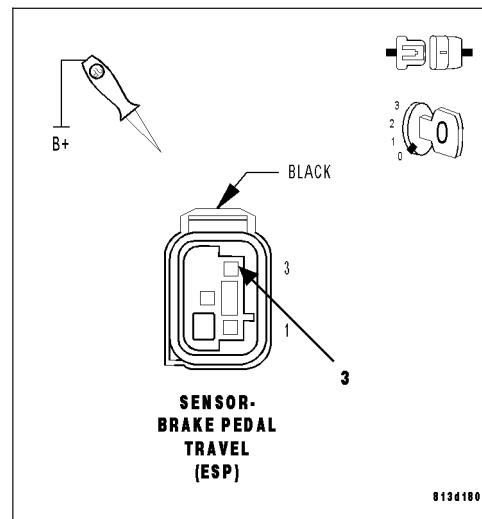
Using a 12-volt test light connected to 12-volts, check the (B137) Brake Pedal Travel Sensor Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B137) Brake Pedal Travel Sensor Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

Turn the ignition on.

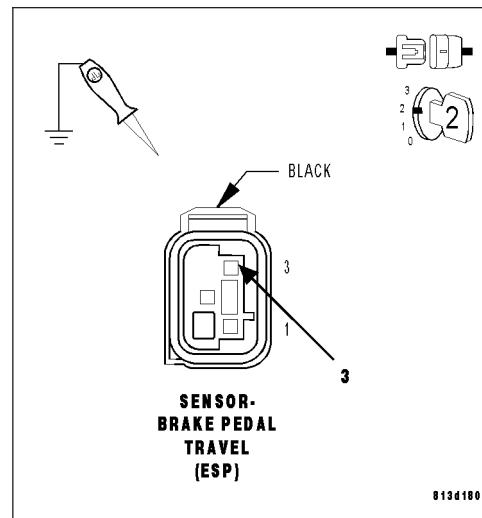
Using a 12-volt test light connected to ground, check the (B137) Brake Pedal Travel Sensor Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B137) Brake Pedal Travel Sensor Signal circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 12





**C1228-BRAKE PEDAL TRAVEL SENSOR CIRCUIT LOW (CONTINUED)****12. CHECK THE (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

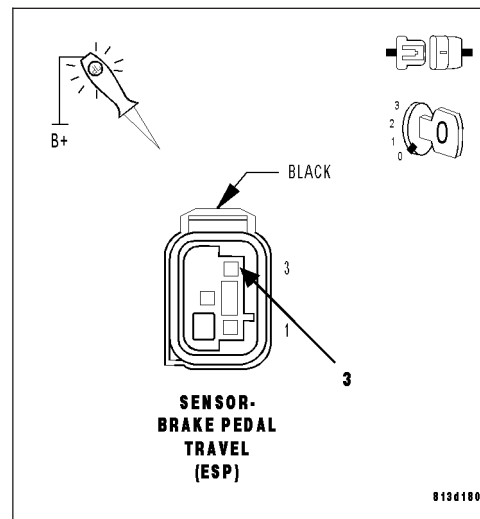
Disconnect the Brake Pedal Travel Sensor harness connector.

Connect a jumper wire between the (B137) Brake Pedal Travel Sensor Signal circuit and ground.

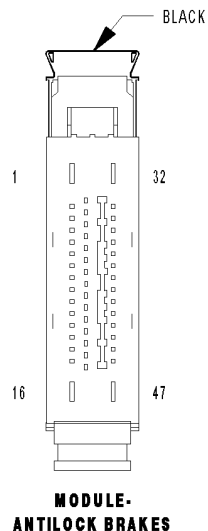
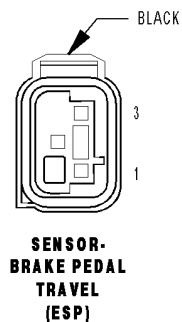
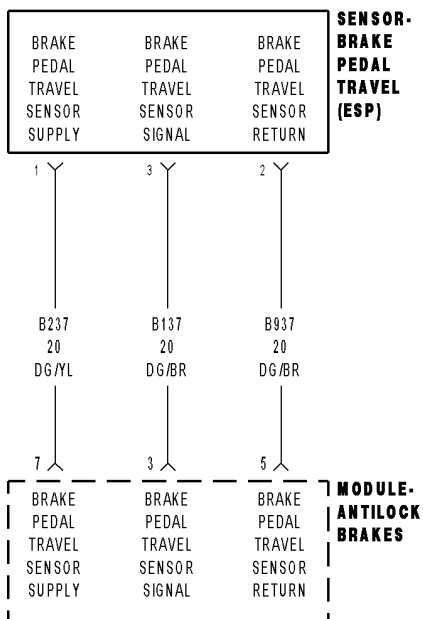
Using a 12-volt test light connected to 12-volts, check the (B137) Brake Pedal Travel Sensor Signal circuit.

**Does the test light illuminate brightly?**

- Yes** >> Replace the Brake Pedal Travel Sensor in accordance with the Service Information  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B137) Brake Pedal Travel Sensor Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



## C1229-BRAKE PEDAL TRAVEL SENSOR CIRCUIT HIGH



C1229-BRAKE PEDAL TRAVEL SENSOR CIRCUIT HIGH (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates that the Brake Pedal Travel Sensor Signal is within the high fault area.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B937) BRAKE PEDAL TRAVEL SENSOR RETURN CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN BRAKE PEDAL TRAVEL SENSOR ANTI-LOCK BRAKE MODULE

Diagnostic Test

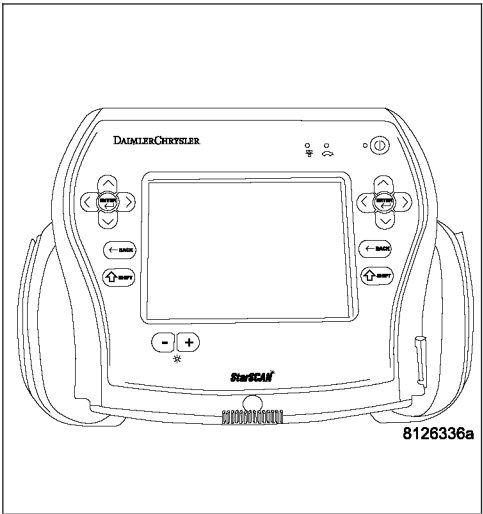
1. CHECK FOR A DTC C1229-BRAKE PEDAL TRAVEL SENSOR CIRCUIT HIGH

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition from off to on.
- With the scan tool, read and record DTC's.

**Does the scan tool display: C1229-BRAKE PEDAL TRAVEL SENSOR CIRCUIT HIGH?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C1229-BRAKE PEDAL TRAVEL SENSOR CIRCUIT HIGH (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check the installation of the Brake Pedal Travel Sensor.

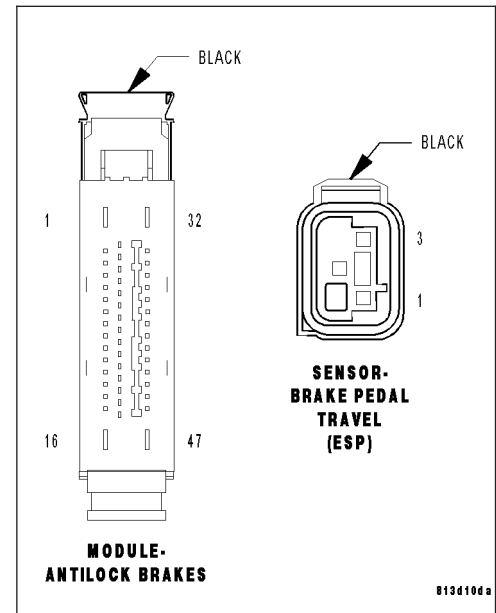
Check all related wiring for bruised, chafed, pierced, or partially broken wires.

Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE ON THE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Brake Pedal Travel Sensor harness connector.

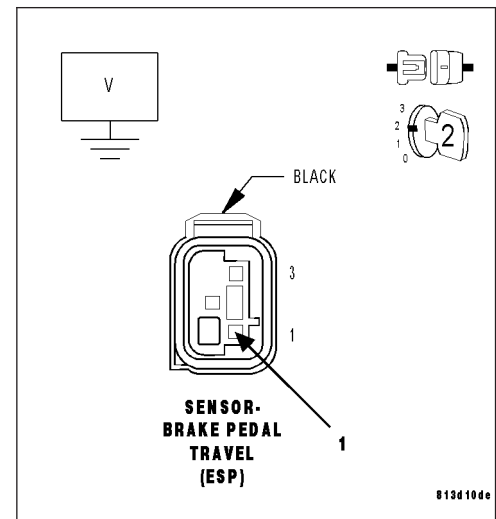
Turn the ignition on.

Measure the voltage of the (B237) Brake Pedal Travel Sensor Supply circuit.

**Is the voltage above 4 volts?**

**Yes** >> Go To 7

**No** >> Go To 4



**C1229-BRAKE PEDAL TRAVEL SENSOR CIRCUIT HIGH (CONTINUED)****4. CHECK THE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT FOR SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

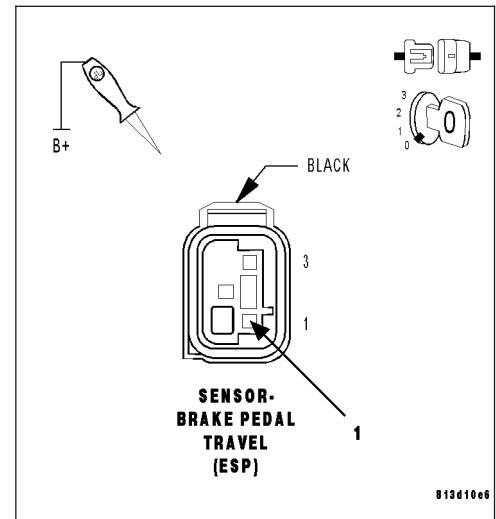
Using a 12-volt test light connected to 12-volts, check the (B237) Brake Pedal Travel Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B237) Brake Pedal Travel Sensor Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT FOR SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

Turn the ignition on.

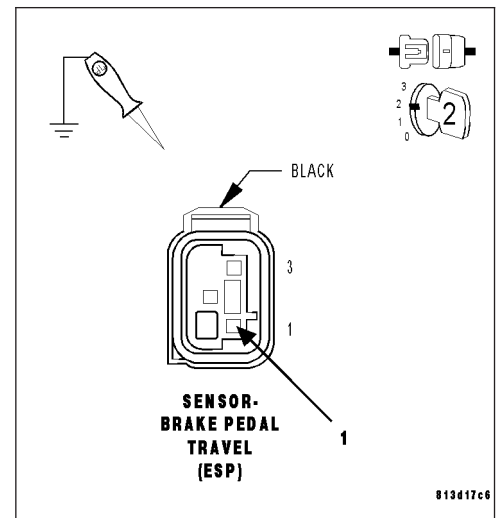
Using a 12-volt test light connected to ground, check the (B237) Brake Pedal Travel Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B237) Brake Pedal Travel Sensor Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C1229-BRAKE PEDAL TRAVEL SENSOR CIRCUIT HIGH (CONTINUED)****6. CHECK THE (B237) BRAKE PEDAL TRAVEL SENSOR SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

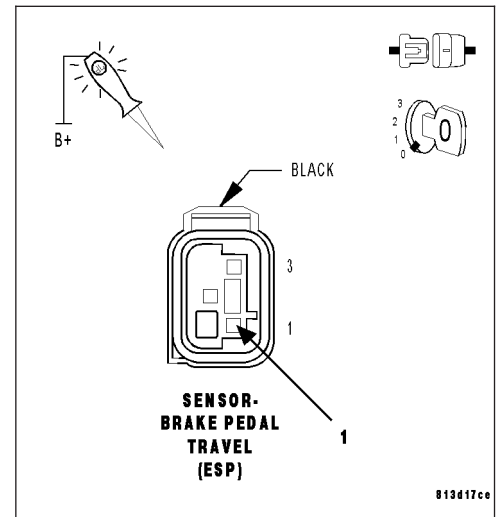
Disconnect the Brake Pedal Travel Sensor harness connector.

Connect a jumper wire between the (B237) Brake Pedal Travel Sensor Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B237) Brake Pedal Travel Sensor Supply circuit

**Does the test light illuminate brightly?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B237) Brake Pedal Travel Sensor Supply circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**7. CHECK THE (B937) BRAKE PEDAL TRAVEL SENSOR RETURN CIRCUIT FOR SHORT TO GROUND**

Turn the ignition off.

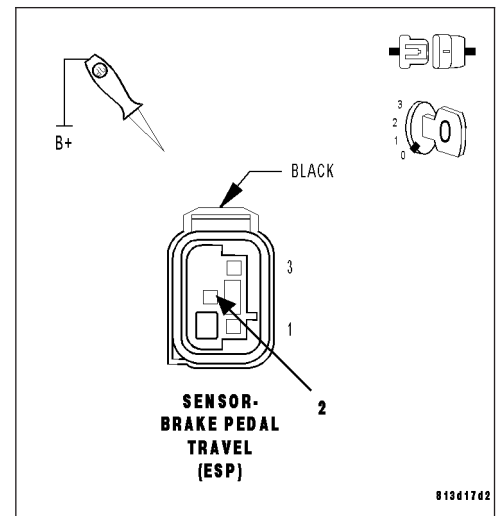
Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

Using a 12-volt test light connected to 12-volts, check the (B937) Brake Pedal Travel Sensor Return circuit.

**Does the test light illuminate brightly**

- Yes** >> Repair the (B937) Brake Pedal Travel Sensor Return circuit for a short to ground.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 8



**C1229-BRAKE PEDAL TRAVEL SENSOR CIRCUIT HIGH (CONTINUED)****8. CHECK THE (B937) BRAKE PEDAL TRAVEL SENSOR RETURN CIRCUIT FOR SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

Turn the ignition on.

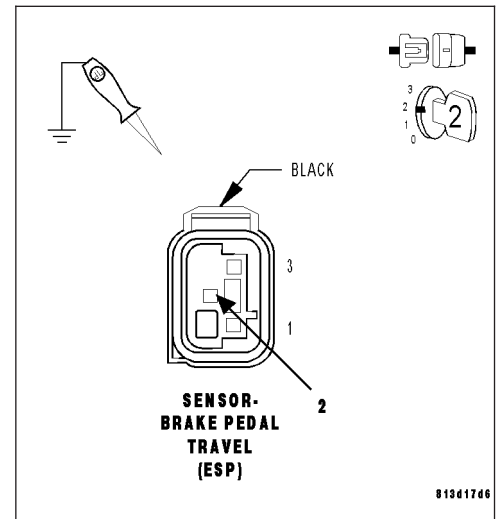
Using a 12-volt test light connected to ground, check the (B937) Brake Pedal Travel Sensor Return circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B937) Brake Pedal Travel Sensor Return circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. CHECK THE (B937) BRAKE PEDAL TRAVEL SENSOR RETURN CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

Connect a jumper wire between the (B937) Brake Pedal Travel Sensor Return circuit and ground.

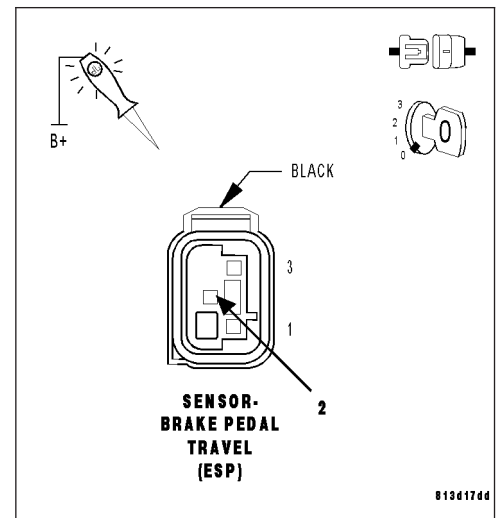
Using a 12-volt test light connected to 12-volts, check the (B937) Brake Pedal Travel Sensor Return circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 10

**No** >> Repair the (B937) Brake Pedal Travel Sensor Return circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C1229-BRAKE PEDAL TRAVEL SENSOR CIRCUIT HIGH (CONTINUED)****10. CHECK THE (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

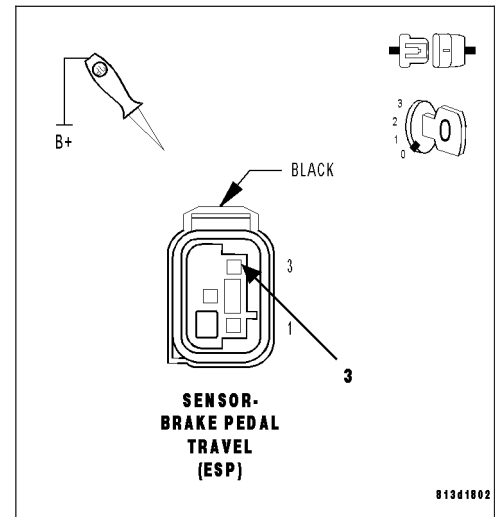
Disconnect the Brake Pedal Travel Sensor harness connector.

Using a 12-volt test light connected to 12-volts, check the (B137) Brake Pedal Travel Sensor Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B137) Brake Booster Travel Position Sensor Signal circuit for a short to ground.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pedal Travel Sensor harness connector.

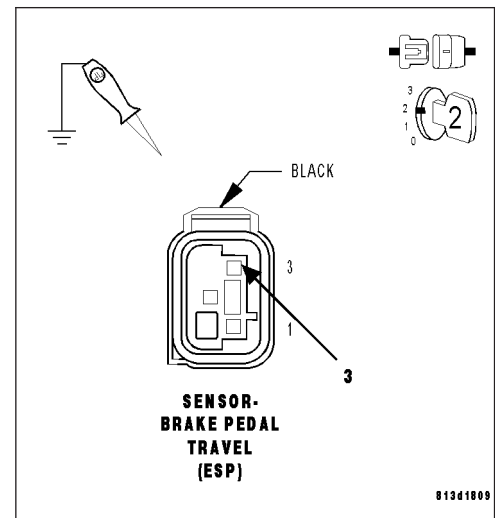
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (B137) Brake Pedal Travel Sensor Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B137) Brake Pedal Travel Sensor Signal circuit for a short to voltage.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 12





**C1229-BRAKE PEDAL TRAVEL SENSOR CIRCUIT HIGH (CONTINUED)****12. CHECK THE (B137) BRAKE PEDAL TRAVEL SENSOR SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

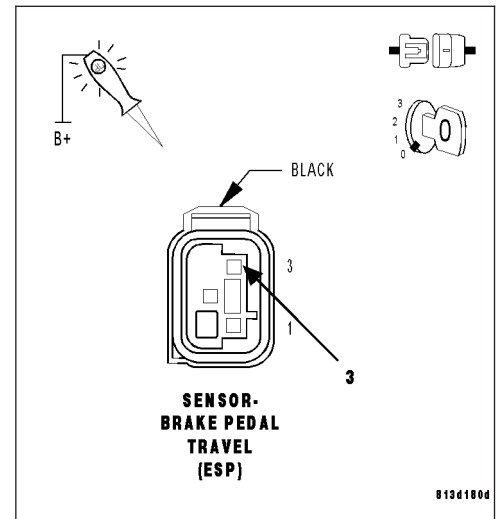
Disconnect the Brake Pedal Travel Sensor harness connector.

Connect a jumper wire between the (B137) Brake Pedal Travel Sensor Signal circuit and ground.

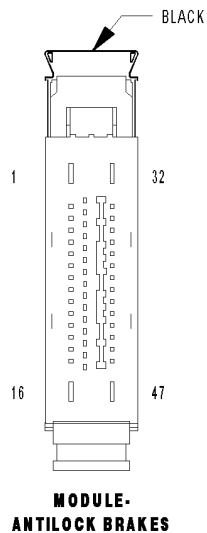
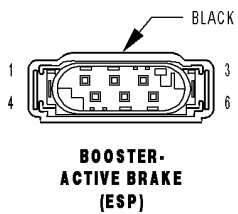
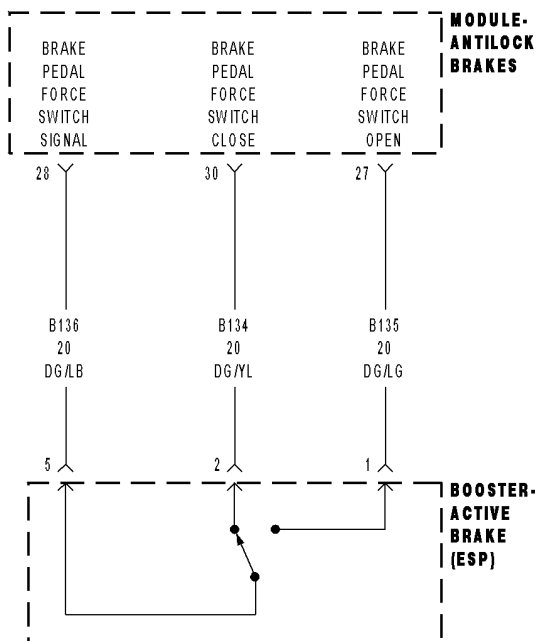
Using a 12-volt test light connected to 12-volts, check the (B137) Brake Pedal Travel Sensor Signal circuit.

**Does the test light illuminate brightly?**

- Yes** >> Replace the Brake Pedal Travel Sensor in accordance with the Service Information  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B137) Brake Pedal Travel Sensor Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



## C122A-BRAKE PEDAL FORCE SWITCH CIRCUIT



C122A-BRAKE PEDAL FORCE SWITCH CIRCUIT (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates that the Brake Pedal Force Switch signals are invalid or not available.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE (B134) BRAKE PEDAL FORCE SWITCH CLOSE CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B135) BRAKE PEDAL FORCE SWITCH OPEN CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B136) BRAKE PEDAL FORCE SWITCH SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN BRAKE PEDAL FORCE SWITCH ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR A DTC C122A-BRAKE PEDAL FORCE SWITCH CIRCUIT

**Note:** This DTC must be active for the results of this test to be valid.

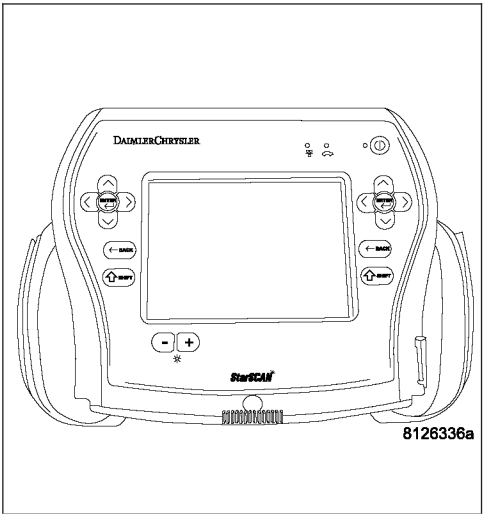
- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.

**CAUTION:** Ensure brake capability is available before road testing.

- Test drive vehicle above 24 k/mh (15 mph).
- With the scan tool, read and record DTC's.

Does the scan tool display: C122A-BRAKE PEDAL FORCE SWITCH CIRCUIT?

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C122A-BRAKE PEDAL FORCE SWITCH CIRCUIT (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

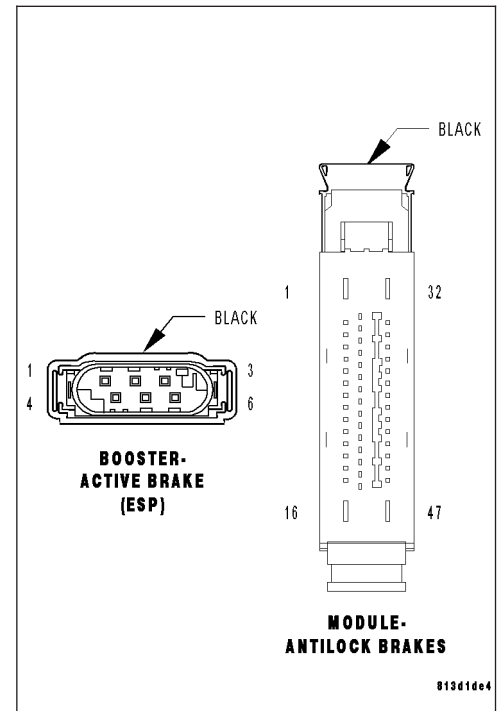
Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE ON THE (B134) BRAKE PEDAL FORCE SWITCH CLOSE CIRCUIT**

Turn the ignition on.

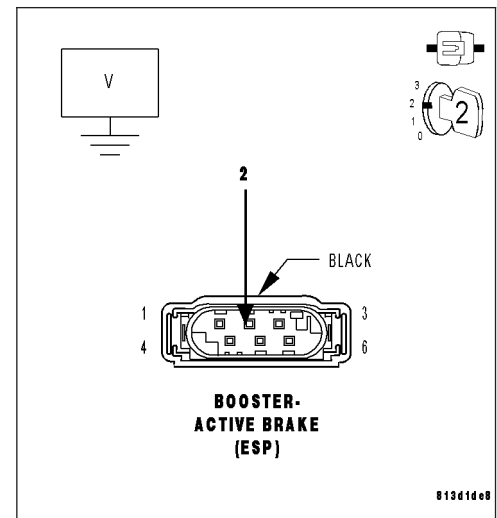
Back probe the (B134) Brake Pedal Force Switch Close circuit at the Active Brake Booster harness connector.

Measure the voltage of the (B134) Brake Pedal Force Switch Close circuit.

**Is the voltage approximately 6 volts?**

**Yes** >> Go To 7

**No** >> Go To 4



**C122A-BRAKE PEDAL FORCE SWITCH CIRCUIT (CONTINUED)****4. CHECK THE (B134) BRAKE PEDAL FORCE SWITCH CLOSE CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

Turn the ignition on.

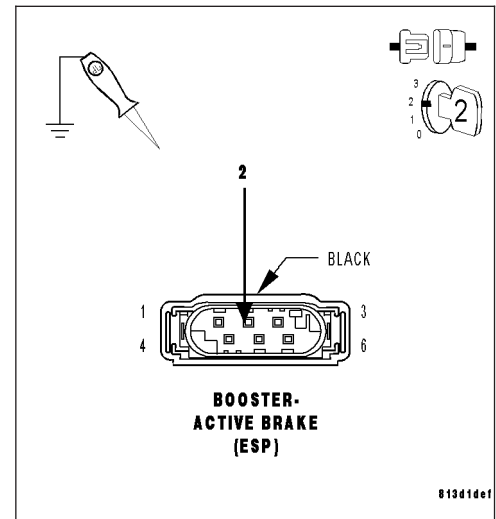
Using a 12-volt test light connected to ground, check the (B134) Brake Pedal Force Switch Close circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B134) Brake Pedal Force Switch Close circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (B134) BRAKE PEDAL FORCE SWITCH CLOSE CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

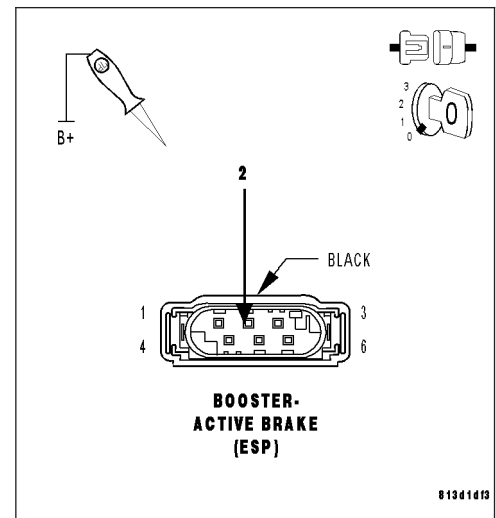
Using a 12-volt test light connected to 12 volts, check the (B134) Brake Pedal Force Switch Close circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B134) Brake Pedal Force Switch Close circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C122A-BRAKE PEDAL FORCE SWITCH CIRCUIT (CONTINUED)****6. CHECK THE (B134) BRAKE PEDAL FORCE SWITCH CLOSE CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

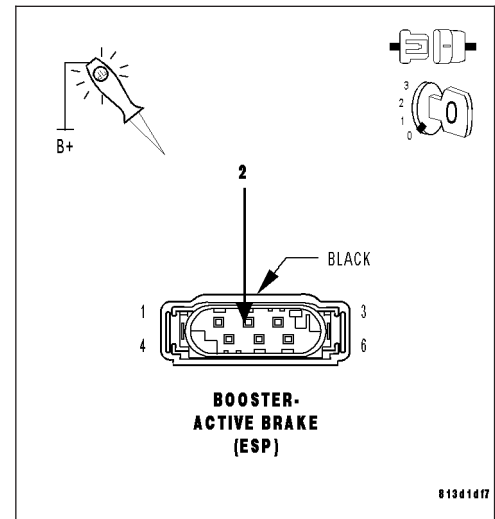
Disconnect the Active Brake Booster harness connector.

Connect a jumper wire between the (B134) Brake Pedal Force Switch Close circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B134) Brake Pedal Force Switch Close circuit.

**Does the test light illuminate brightly?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B134) Brake Pedal Force Switch Close circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**7. CHECK THE VOLTAGE ON THE (B135) BRAKE PEDAL FORCE SWITCH OPEN CIRCUIT**

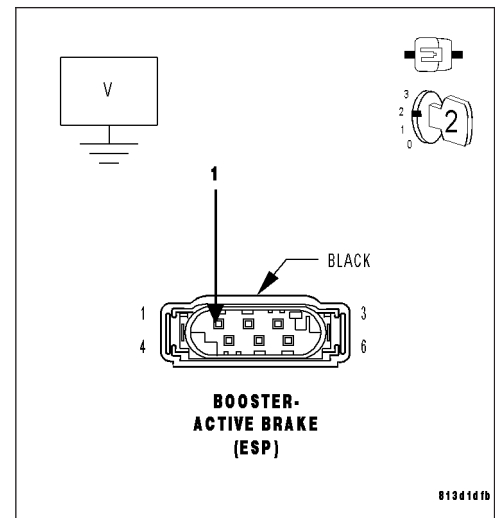
Turn the ignition on.

Back probe the (B135) Brake Pedal Force Switch Open circuit at the Active Brake Booster harness connector.

Measure the voltage of the (B135) Brake Pedal Force Switch Open circuit.

**Is the voltage approximately 12 volts?**

- Yes** >> Go To 11
- No** >> Go To 8



**C122A-BRAKE PEDAL FORCE SWITCH CIRCUIT (CONTINUED)****8. CHECK THE (B135) BRAKE PEDAL FORCE SWITCH OPEN CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

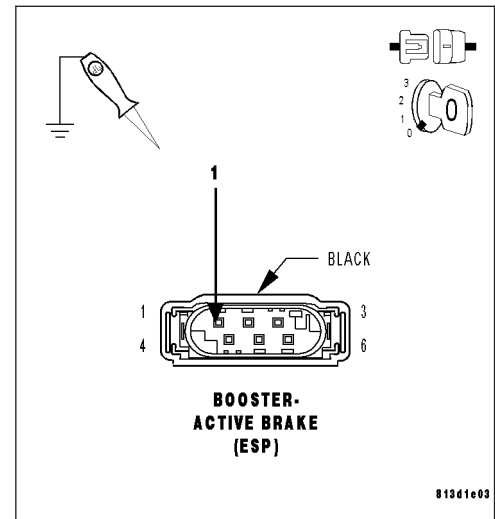
Using a 12-volt test light connected to ground, check the (B135) Brake Pedal Force Switch Open circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B135) Brake Pedal Force Switch Open circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. CHECK THE (B135) BRAKE PEDAL FORCE SWITCH OPEN CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

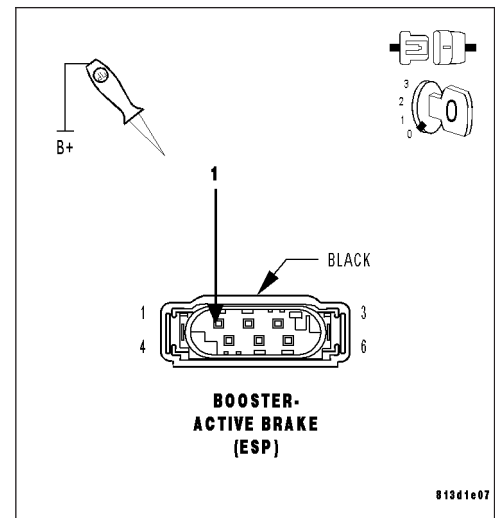
Using a 12-volt test light connected to 12 volts, check the (B135) Brake Pedal Force Switch Open circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B135) Brake Pedal Force Switch Open circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C122A-BRAKE PEDAL FORCE SWITCH CIRCUIT (CONTINUED)****10. CHECK THE (B135) BRAKE PEDAL FORCE SWITCH OPEN CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

Connect a jumper wire between the (B135) Brake Pedal Force Switch Open circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B135) Brake Pedal Force Switch Open circuit.

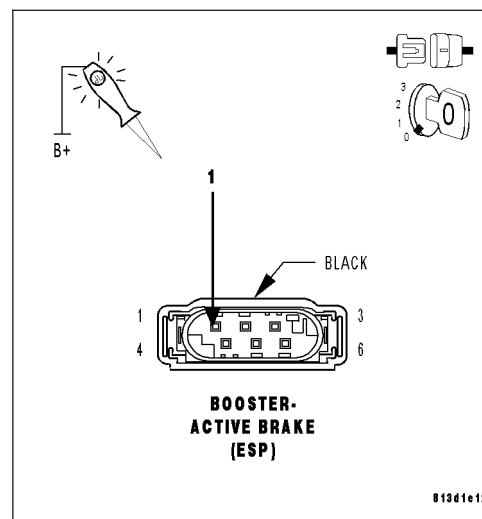
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B135) Brake Pedal Force Switch Open circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.

**11. CHECK THE VOLTAGE ON THE (B136) BRAKE PEDAL FORCE SWITCH SIGNAL CIRCUIT**

Turn the ignition on.

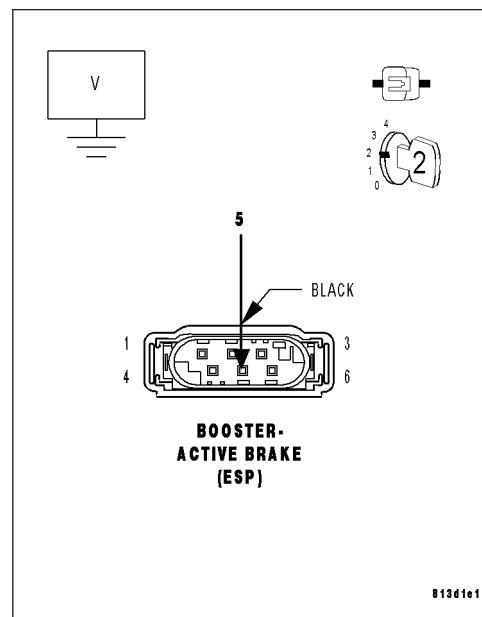
Back probe the (B136) Brake Pedal Force Switch Signal circuit at the Active Brake Booster harness connector.

Measure the voltage of the (B136) Brake Pedal Force Switch Signal circuit.

**Is the voltage approximately 6 volts?**

**Yes** >> Go To 15

**No** >> Go To 12





**C122A-BRAKE PEDAL FORCE SWITCH CIRCUIT (CONTINUED)****12. CHECK THE (B136) BRAKE PEDAL FORCE SWITCH SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

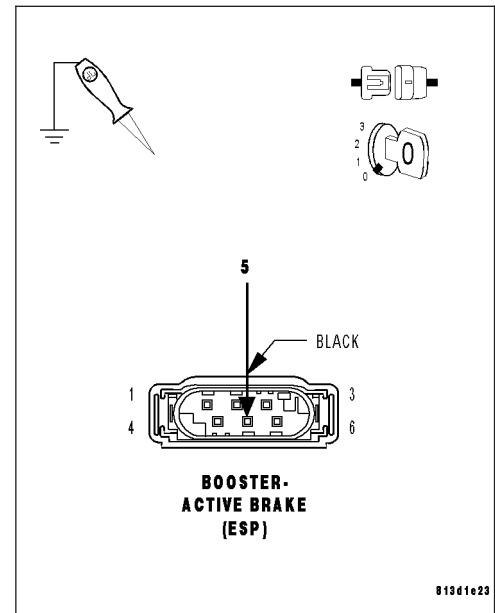
Using a 12-volt test light connected to ground, check the (B136) Brake Pedal Force Switch Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B136) Brake Pedal Force Switch Signal circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B136) BRAKE PEDAL FORCE SWITCH SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

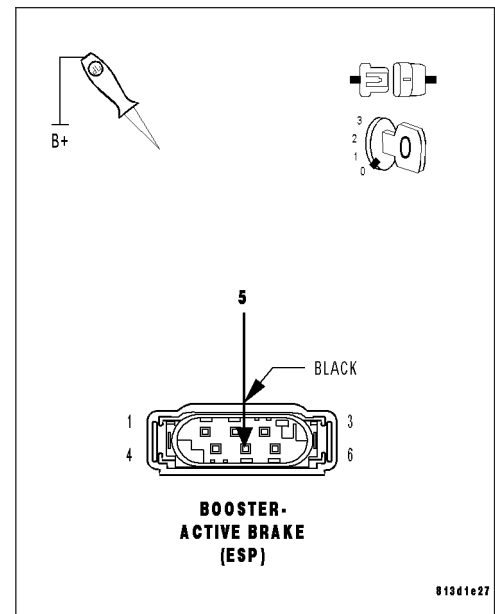
Using a 12-volt test light connected to 12 volts, check the (B136) Brake Pedal Force Switch Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B136) Brake Pedal Force Switch Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 14



**C122A-BRAKE PEDAL FORCE SWITCH CIRCUIT (CONTINUED)****14. CHECK THE (B136) BRAKE PEDAL FORCE SWITCH SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

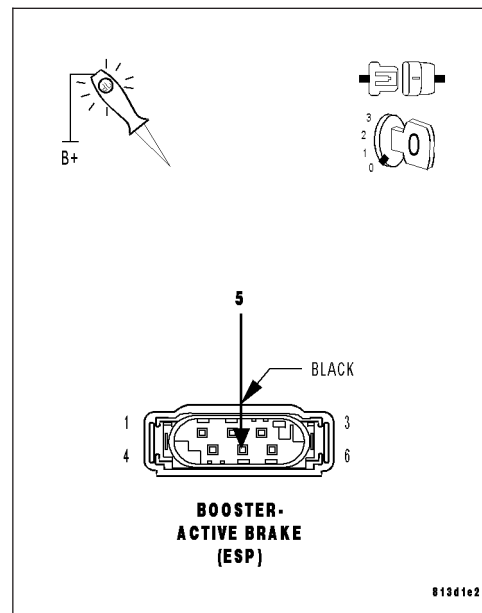
Disconnect the Active Brake Booster harness connector.

Connect a jumper wire between the (B136) Brake Pedal Force Switch Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B136) Brake Pedal Force Switch Signal circuit.

**Does the test light illuminate brightly?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B136) Brake Pedal Force Switch Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1

**15. CHECK THE VOLTAGE ON THE (B134) BRAKE PEDAL FORCE SWITCH CLOSE CIRCUIT**

Turn the ignition on.

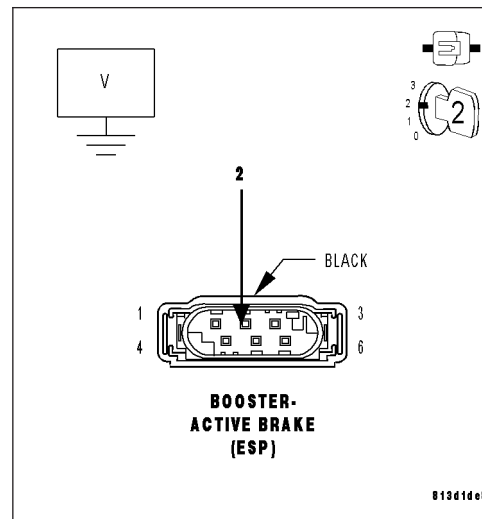
Back probe the (B134) Brake Pedal Force Switch Close circuit at the Active Brake Booster harness connector.

Depress and hold the brake pedal.

Measure the voltage of the (B134) Brake Pedal Force Switch Close circuit.

**Is the voltage approximately 12 volts?**

- Yes** >> Go To 16
- No** >> Replace the Brake Pedal Force Switch in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



**C122A-BRAKE PEDAL FORCE SWITCH CIRCUIT (CONTINUED)****16. CHECK THE VOLTAGE ON THE (B135) BRAKE PEDAL FORCE SWITCH OPEN CIRCUIT**

Turn the ignition on.

Back probe the (B135) Brake Pedal Force Switch Open circuit at the Active Brake Booster harness connector.

Depress and hold the brake pedal.

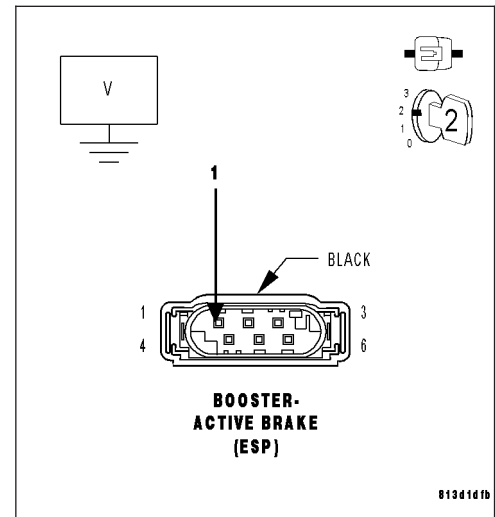
Measure the voltage of the (B135) Brake Pedal Force Switch Open circuit.

**Is the voltage approximately 6 volts?**

**Yes** >> Go To 17

**No** >> Replace the Brake Pedal Force Switch in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**17. CHECK THE VOLTAGE ON THE (B136) BRAKE PEDAL FORCE SWITCH SIGNAL CIRCUIT**

Turn the ignition on.

Back probe the (B136) Brake Pedal Force Switch Signal circuit at the Active Brake Booster harness connector.

Depress and hold the brake pedal.

Measure the voltage of the (B136) Brake Pedal Force Switch Signal circuit.

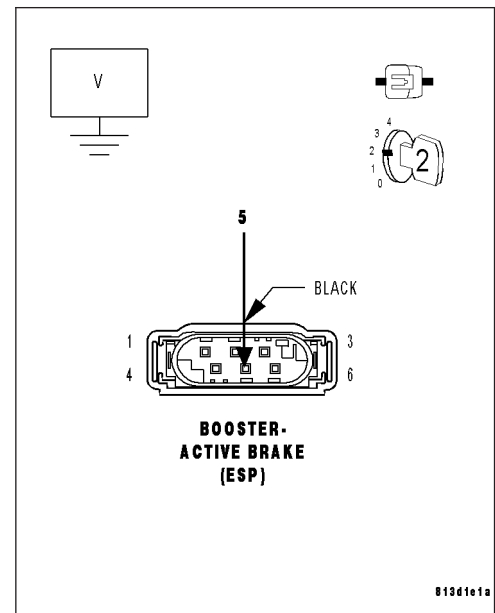
**Is the voltage approximately 6 volts?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

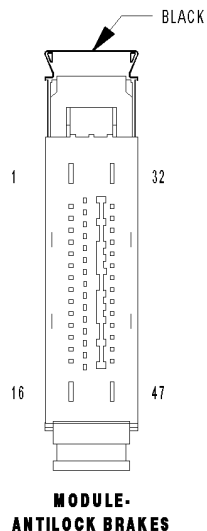
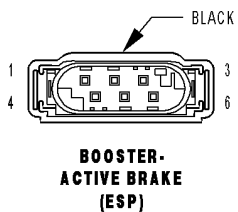
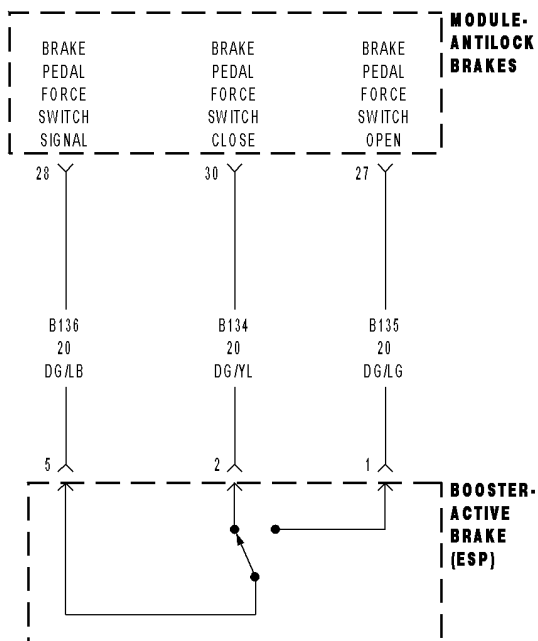
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Replace the Brake Pedal Force Switch in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.



## C122B-BRAKE PEDAL FORCE SWITCH CIRCUIT PERFORMANCE



C122B-BRAKE PEDAL FORCE SWITCH CIRCUIT PERFORMANCE (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates that the Brake Pedal Force Switch signals are implausible.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE (B134) BRAKE PEDAL FORCE SWITCH CLOSE CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B135) BRAKE PEDAL FORCE SWITCH OPEN CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B136) BRAKE PEDAL FORCE SWITCH SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN BRAKE PEDAL FORCE SWITCH ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK FOR A DTC C122B-BRAKE PEDAL FORCE SWITCH CIRCUIT PERFORMANCE

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Fame information.

With the scan tool, erase DTC's.

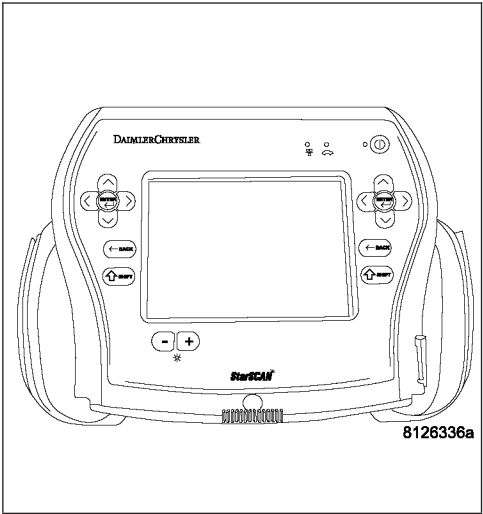
**CAUTION:** Ensure brake capability is available before road testing.

Test drive vehicle above 24 k/mh (15 mph).

With the scan tool, read and record DTC's.

**Does the scan tool display: C122B-BRAKE PEDAL FORCE SWITCH CIRCUIT PERFORMANCE?**

- Yes**
- >> Go To 2
- No**
- >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



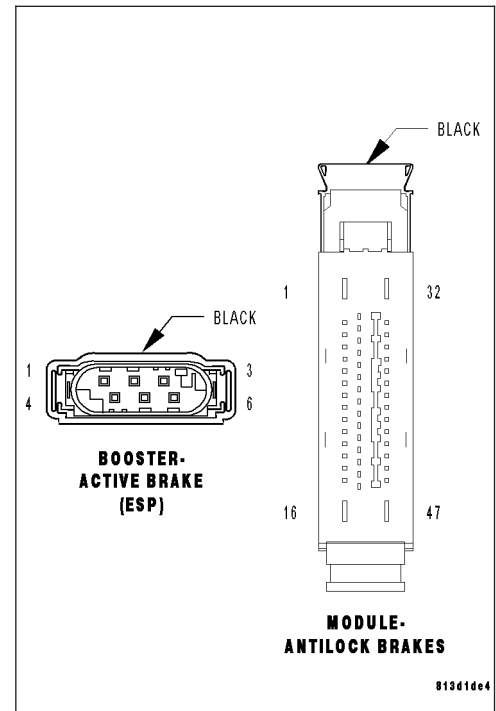
**C122B-BRAKE PEDAL FORCE SWITCH CIRCUIT PERFORMANCE (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

- Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 3

**3. CHECK THE VOLTAGE ON THE (B134) BRAKE PEDAL FORCE SWITCH CLOSE CIRCUIT**

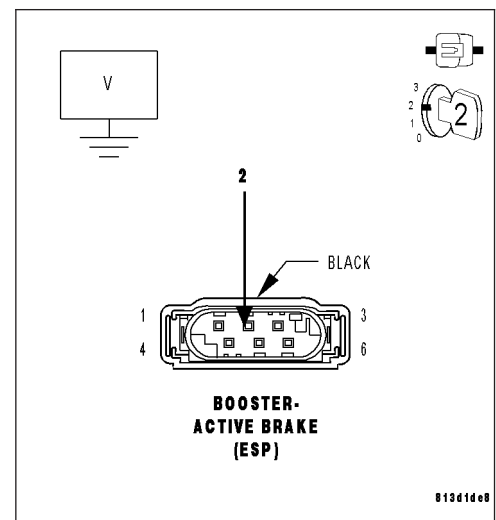
Turn the ignition on.

Back probe the (B134) Brake Pedal Force Switch Close circuit at the Active Brake Booster harness connector.

Measure the voltage of the (B134) Brake Pedal Force Switch Close circuit.

**Is the voltage approximately 6 volts?**

- Yes** >> Go To 7
- No** >> Go To 4



**C122B-BRAKE PEDAL FORCE SWITCH CIRCUIT PERFORMANCE (CONTINUED)****4. CHECK THE (B134) BRAKE PEDAL FORCE SWITCH CLOSE CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

Turn the ignition on.

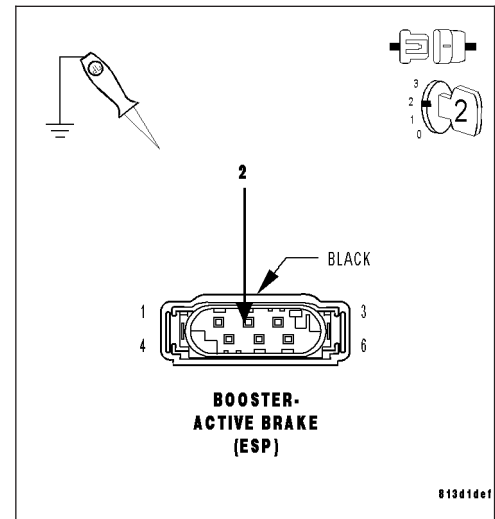
Using a 12-volt test light connected to ground, check the (B134) Brake Pedal Force Switch Close circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B134) Brake Pedal Force Switch Close circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (B134) BRAKE PEDAL FORCE SWITCH CLOSE CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

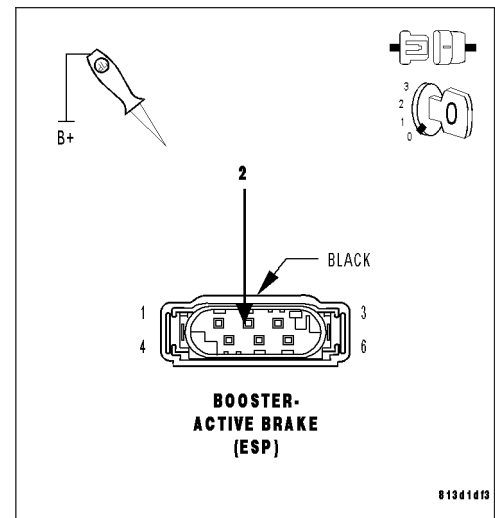
Using a 12-volt test light connected to 12 volts, check the (B134) Brake Pedal Force Switch Close circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B134) Brake Pedal Force Switch Close circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C122B-BRAKE PEDAL FORCE SWITCH CIRCUIT PERFORMANCE (CONTINUED)****6. CHECK THE (B134) BRAKE PEDAL FORCE SWITCH CLOSE CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

Connect a jumper wire between the (B134) Brake Pedal Force Switch Close circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B134) Brake Pedal Force Switch Close circuit.

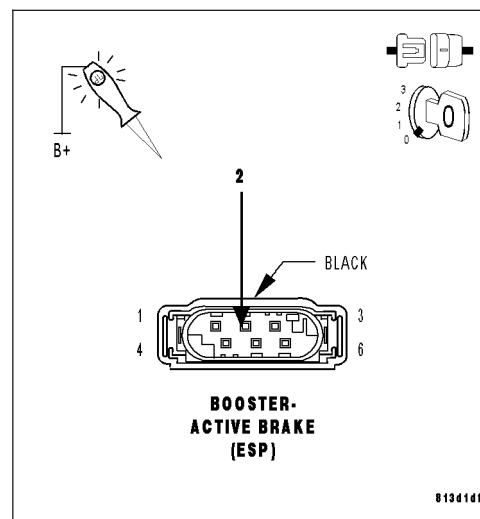
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B134) Brake Pedal Force Switch Close circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.

**7. CHECK THE VOLTAGE ON THE (B135) BRAKE PEDAL FORCE SWITCH OPEN CIRCUIT**

Turn the ignition on.

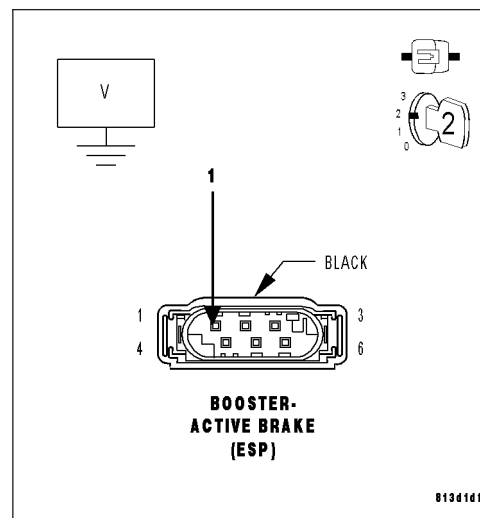
Back probe the (B135) Brake Pedal Force Switch Open circuit at the Active Brake Booster harness connector.

Measure the voltage of the (B135) Brake Pedal Force Switch Open circuit.

**Is the voltage approximately 12 volts?**

**Yes** >> Go To 11

**No** >> Go To 8





**C122B-BRAKE PEDAL FORCE SWITCH CIRCUIT PERFORMANCE (CONTINUED)****8. CHECK THE (B135) BRAKE PEDAL FORCE SWITCH OPEN CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

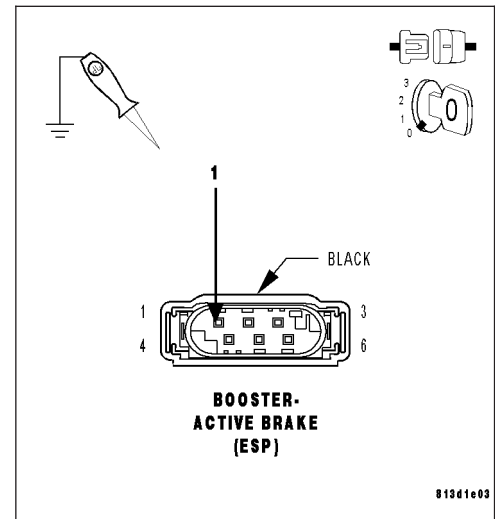
Using a 12-volt test light connected to ground, check the (B135) Brake Pedal Force Switch Open circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B135) Brake Pedal Force Switch Open circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. CHECK THE (B135) BRAKE PEDAL FORCE SWITCH OPEN CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

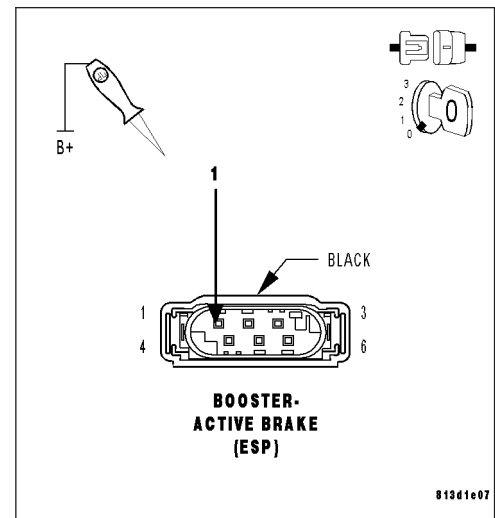
Using a 12-volt test light connected to 12 volts, check the (B135) Brake Pedal Force Switch Open circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B135) Brake Pedal Force Switch Open circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C122B-BRAKE PEDAL FORCE SWITCH CIRCUIT PERFORMANCE (CONTINUED)****10. CHECK THE (B135) BRAKE PEDAL FORCE SWITCH OPEN CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

Connect a jumper wire between the (B135) Brake Pedal Force Switch Open circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B135) Brake Pedal Force Switch Open circuit.

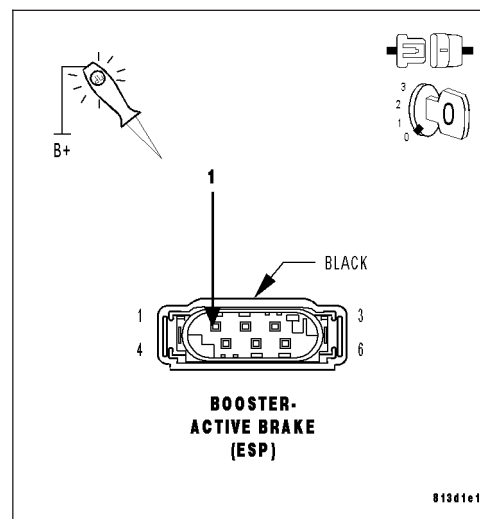
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B135) Brake Pedal Force Switch Open circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.

**11. CHECK THE VOLTAGE ON THE (B136) BRAKE PEDAL FORCE SWITCH SIGNAL CIRCUIT**

Turn the ignition on.

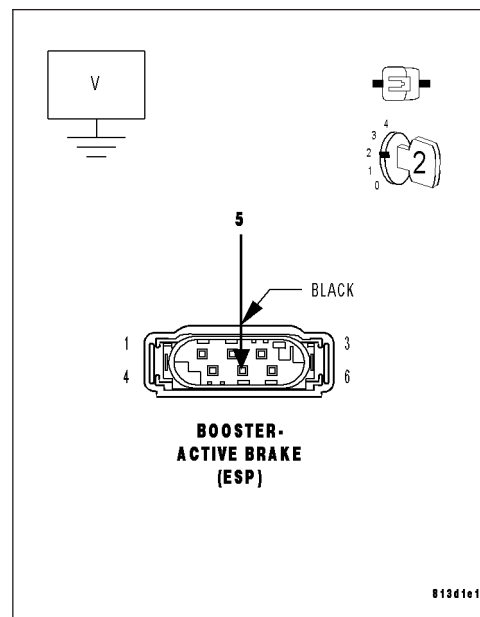
Back probe the (B136) Brake Pedal Force Switch Signal circuit at the Active Brake Booster harness connector.

Measure the voltage of the (B136) Brake Pedal Force Switch Signal circuit.

**Is the voltage approximately 6 volts?**

**Yes** >> Go To 15

**No** >> Go To 12



**C122B-BRAKE PEDAL FORCE SWITCH CIRCUIT PERFORMANCE (CONTINUED)****12. CHECK THE (B136) BRAKE PEDAL FORCE SWITCH SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

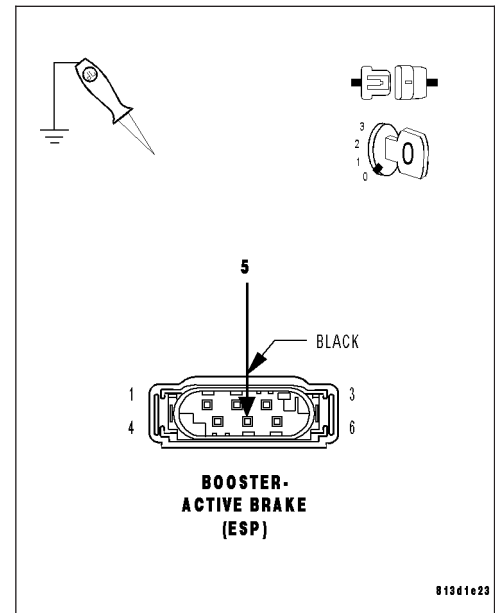
Using a 12-volt test light connected to ground, check the (B136) Brake Pedal Force Switch Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B136) Brake Pedal Force Switch Signal circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B136) BRAKE PEDAL FORCE SWITCH SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Active Brake Booster harness connector.

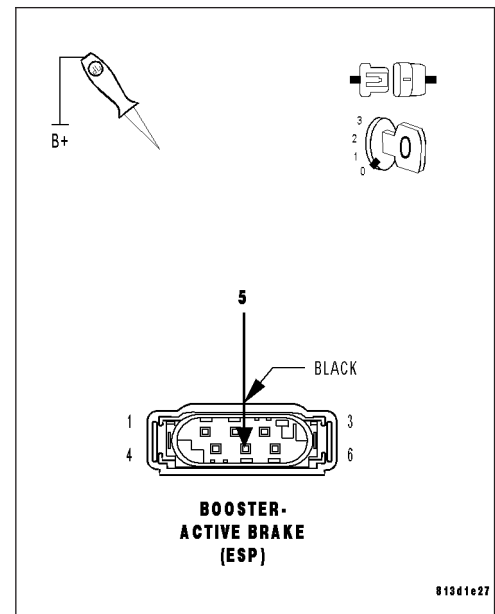
Using a 12-volt test light connected to 12 volts, check the (B136) Brake Pedal Force Switch Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B136) Brake Pedal Force Switch Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 14



**C122B-BRAKE PEDAL FORCE SWITCH CIRCUIT PERFORMANCE (CONTINUED)****14. CHECK THE (B136) BRAKE PEDAL FORCE SWITCH SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

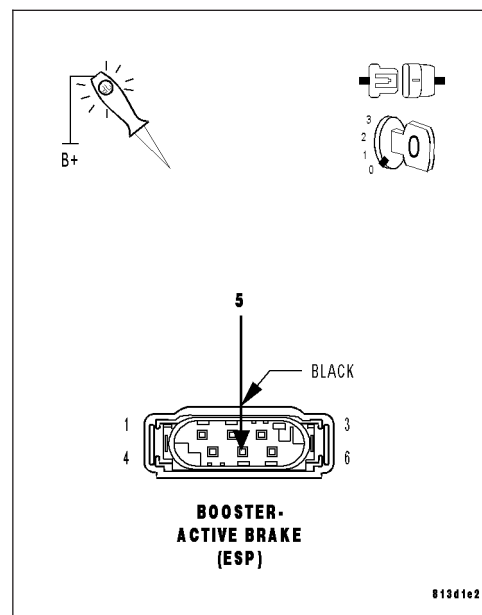
Disconnect the Active Brake Booster harness connector.

Connect a jumper wire between the (B136) Brake Pedal Force Switch Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B136) Brake Pedal Force Switch Signal circuit.

**Does the test light illuminate brightly?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B136) Brake Pedal Force Switch Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1

**15. CHECK THE VOLTAGE ON THE (B134) BRAKE PEDAL FORCE SWITCH CLOSE CIRCUIT**

Turn the ignition on.

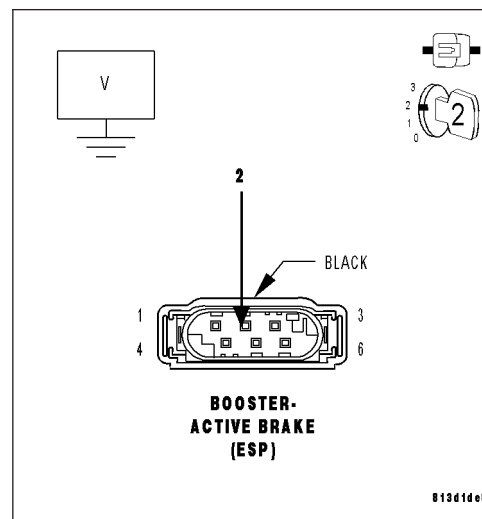
Back probe the (B134) Brake Pedal Force Switch Close circuit at the Active Brake Booster harness connector.

Depress and hold the brake pedal.

Measure the voltage of the (B134) Brake Pedal Force Switch Close circuit.

**Is the voltage approximately 12 volts?**

- Yes** >> Go To 16
- No** >> Replace the Brake Pedal Force Switch in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



**C122B-BRAKE PEDAL FORCE SWITCH CIRCUIT PERFORMANCE (CONTINUED)****16. CHECK THE VOLTAGE ON THE (B135) BRAKE PEDAL FORCE SWITCH OPEN CIRCUIT**

Turn the ignition on.

Back probe the (B135) Brake Pedal Force Switch Open circuit at the Active Brake Booster harness connector.

Depress and hold the brake pedal.

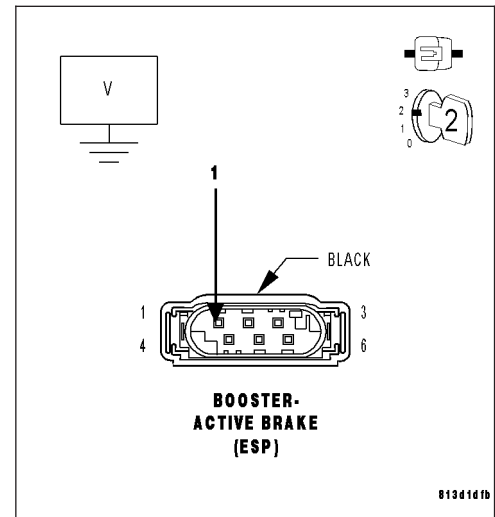
Measure the voltage of the (B135) Brake Pedal Force Switch Open circuit.

**Is the voltage approximately 6 volts?**

**Yes** >> Go To 17

**No** >> Replace the Brake Pedal Force Switch in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**17. CHECK THE VOLTAGE ON THE (B136) BRAKE PEDAL FORCE SWITCH SIGNAL CIRCUIT**

Turn the ignition on.

Back probe the (B136) Brake Pedal Force Switch Signal circuit at the Active Brake Booster harness connector.

Depress and hold the brake pedal.

Measure the voltage of the (B136) Brake Pedal Force Switch Signal circuit.

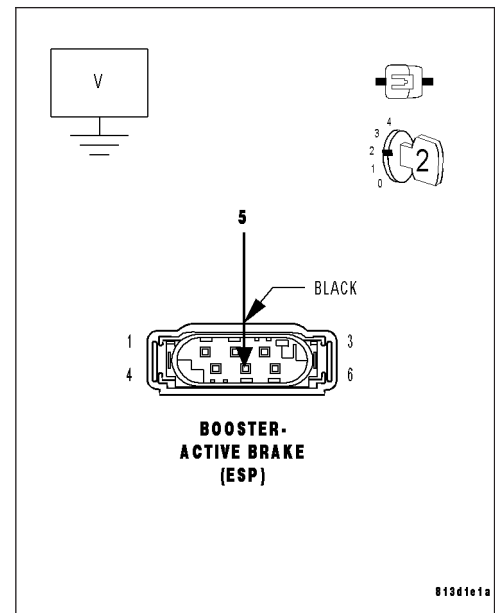
**Is the voltage approximately 6 volts?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

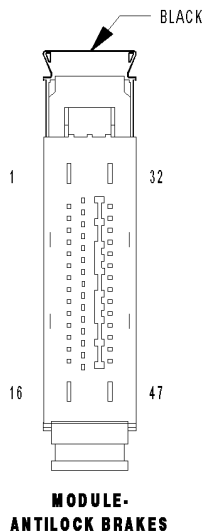
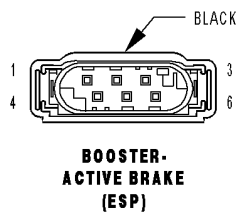
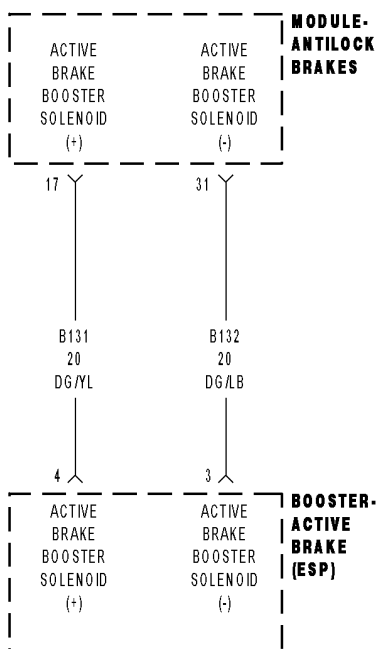
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Replace the Brake Pedal Force Switch in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.



## C122C-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT SUPPLY VOLTAGE



**C122C-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT SUPPLY VOLTAGE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates the Active Brake Booster circuit fails the diagnostic test.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE (B131) ACTIVE BRAKE BOOSTER SOLENOID (+) CIRCUIT AND (B132) ACTIVE BRAKE BOOSTER SOLENOID (-) CIRCUIT SHORTED TO TOGETHER (B131) ACTIVE BRAKE BOOSTER SOLENOID (+) CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN ACTIVE BRAKE BOOSTER SOLENOID ANTI-LOCK BRAKE MODULE

**Diagnostic Test**

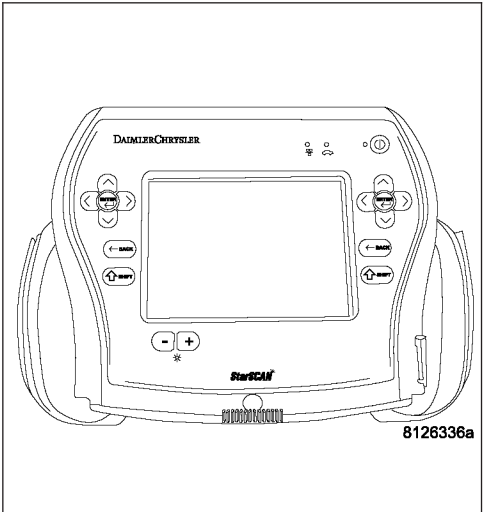
**1. CHECK FOR A DTC C122C-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT SUPPLY VOLTAGE**

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's

**Does the scan tool display: C122C-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT SUPPLY VOLTAGE?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



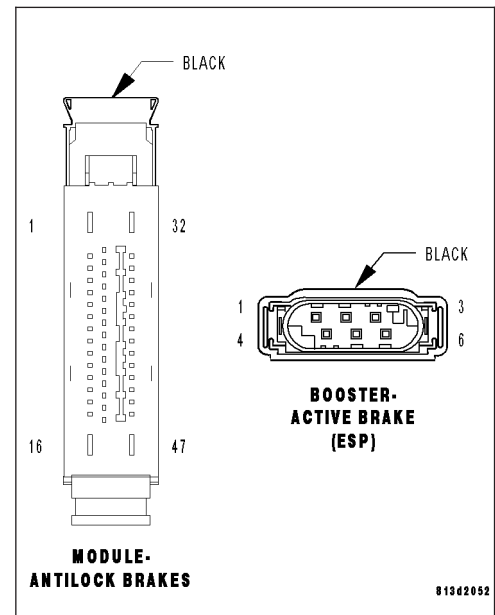
**C122C-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT SUPPLY VOLTAGE (CONTINUED)****2. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

Visually inspect the related wiring harness. Look for any bruised, chafed, pierced, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

- Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 3

**3. CHECK THE RESISTANCE OF THE ACTIVE BRAKE BOOSTER SOLENOID**

Turn the ignition off.

Disconnect the Active Brake Booster harness connector.

Measure the internal resistance of the Active Brake Booster Solenoid.

**Is the resistance between 1 to 2 ohms?**

- Yes** >> Go To 4
- No** >> Replace the Active Brake Booster Solenoid in accordance with the Service information.  
Perform ABS VERIFICATION TEST - VER 1.

**4. CHECK THE VOLTAGE ON THE (B131) ACTIVE BRAKE BOOSTER SOLENOID (+) CIRCUIT**

Turn the ignition off.

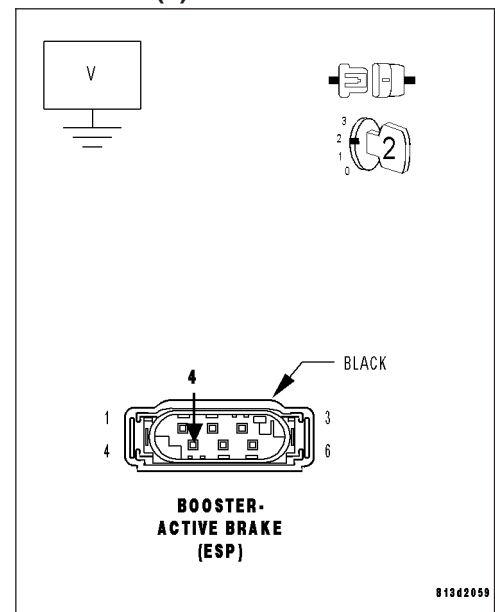
Disconnect the Active Brake Booster harness connector.

Turn the ignition on.

Measure the voltage of the (B131) Active Brake Booster Solenoid (+) circuit in the Active Brake Booster harness connector.

**Is the voltage above 10 volts?**

- Yes** >> Go To 9
- No** >> Go To 5





**C122C-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT SUPPLY VOLTAGE (CONTINUED)****5. CHECK FOR A SHORT BETWEEN THE (B131) ACTIVE BRAKE BOOSTER SOLENOID (+) AND (B132) ACTIVE BRAKE BOOSTER SOLENOID (-) CIRCUITS**

Turn the ignition off.

Disconnect the Active Brake Booster harness connector.

Disconnect the Anti-Lock Brake Module harness connector.

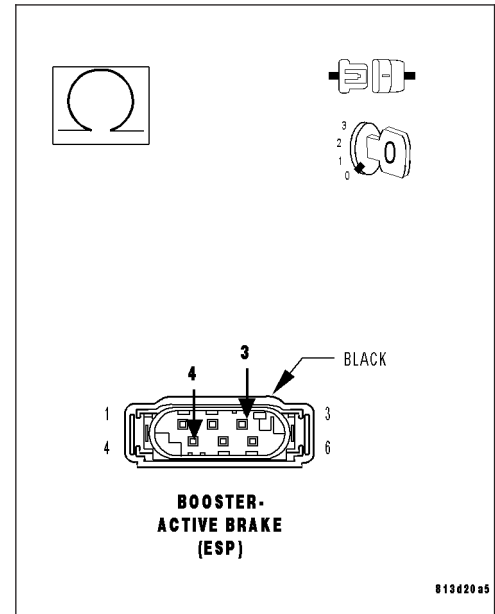
Measure the resistance between the (B131) Active Brake Booster Solenoid (+) circuit and the (B132) Active Brake Booster Solenoid (-) circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (B131) Active Brake Booster Solenoid (+) circuit and the (B132) Active Brake Booster Solenoid (-) circuit for a short together.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6

**6. CHECK THE (B131) ACTIVE BRAKE BOOSTER SOLENOID (+) CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Active Brake Booster harness connector.

Disconnect the Anti-Lock Brake Module harness connector.

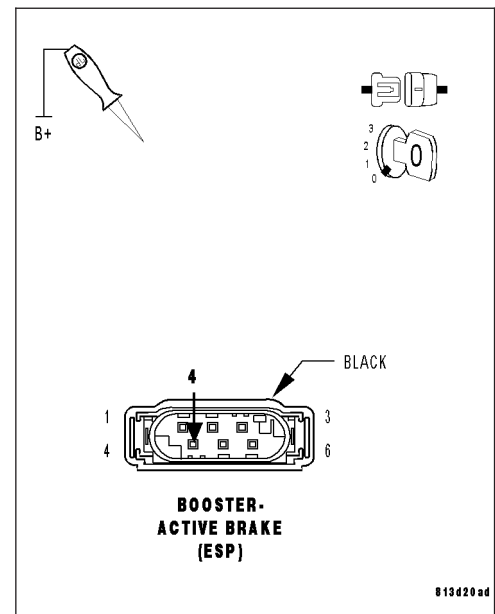
Using a 12-volt test light connected to 12-volts, check the (B131) Active Brake Booster Solenoid (+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B131) Active Brake Booster Solenoid (+) circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7



**C122C-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT SUPPLY VOLTAGE (CONTINUED)****7. CHECK THE (B131) ACTIVE BRAKE BOOSTER SOLENOID (+) CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Active Brake Booster harness connector.

Disconnect the Anti-Lock Brake Module harness connector.

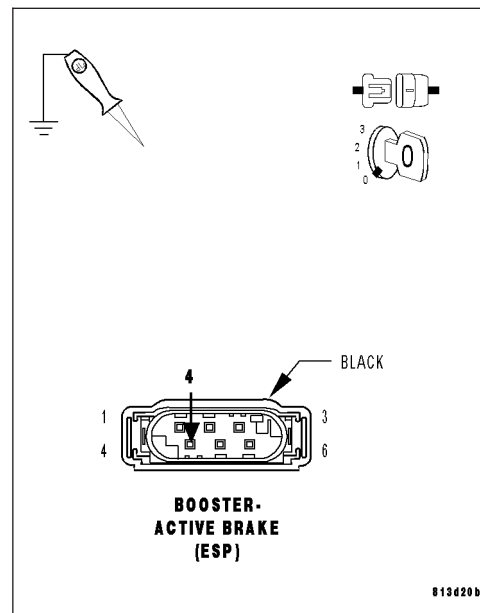
Using a 12-volt test light connected to ground, check the (B131) Active Brake Booster Solenoid (+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B131) Active Brake Booster Solenoid (+) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 8

**8. CHECK THE (B131) ACTIVE BRAKE BOOSTER SOLENOID (+) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Active Brake Booster harness connector.

Disconnect the Anti-Lock Brake Module harness connector.

Connect a jumper wire between the (B131) Active Brake Booster Solenoid (+) circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B131) Active Brake Booster Solenoid (+) circuit.

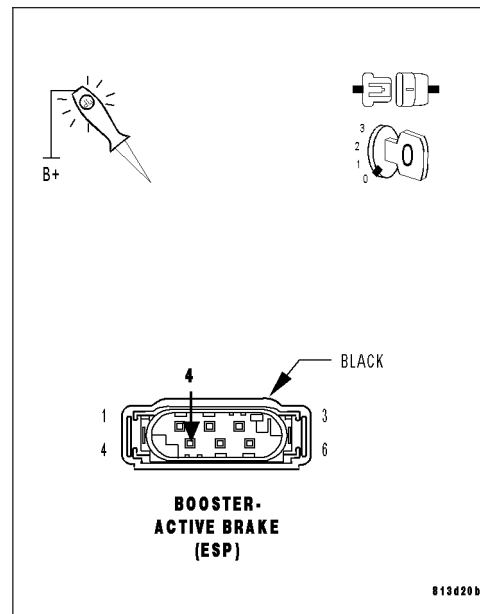
**Does the test light illuminate brightly?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B131) Active Brake Booster Solenoid (+) circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C122C-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT SUPPLY VOLTAGE (CONTINUED)**

**9. CHECK THE ACTIVE BRAKE BOOSTER SOLENOID ACTUATION**

Turn the ignition off.

Reconnect the Active Brake Booster harness connector.

Disconnect the Anti-Lock Brake Module harness connector.

Turn the ignition on.

Connect a jumper wire between the (B132) Active Brake Booster Solenoid (-) and ground at the Anti-Lock Brake Module harness connector.

Connect a jumper wire for several seconds between the (B131) Active Brake Booster Solenoid (+) circuit and a 12 volt supply at the Anti-Lock Brake Module harness connector.

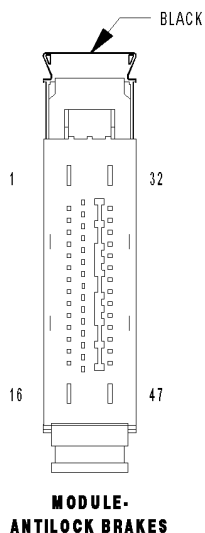
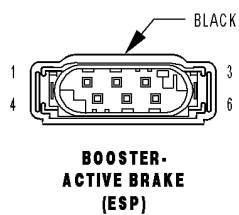
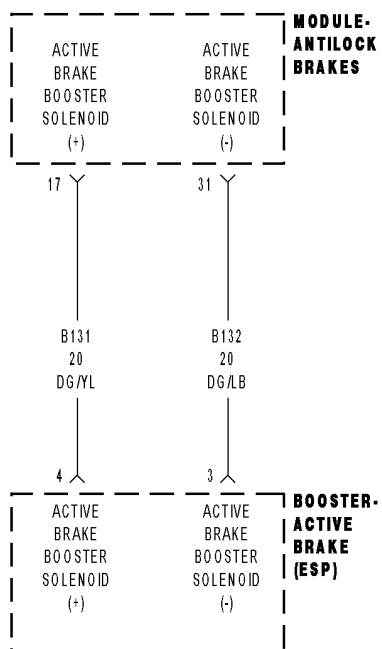
**Is there brake application when the (B131) Active Brake Booster Solenoid (+) circuit is jumped to a 12 volt supply and the (B132) Active Brake Booster Solenoid (-) jumped to ground?**

**Yes**     >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
            Perform ABS VERIFICATION TEST - VER 1.

**No**       >> Replace the Active Brake Booster Solenoid in accordance with the Service Information.  
            Perform ABS VERIFICATION TEST - VER 1.

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## C122D-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT



C122D-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates the Active Brake Booster circuit fails the diagnostic test.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE (B131) ACTIVE BRAKE BOOSTER SOLENOID (+) CIRCUIT AND (B132) ACTIVE BRAKE BOOSTER SOLENOID (-) CIRCUIT SHORTED TO TOGETHER (B132) ACTIVE BRAKE BOOSTER SOLENOID (-) CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN ACTIVE BRAKE BOOSTER SOLENOID ANTI-LOCK BRAKE MODULE

Diagnostic Test

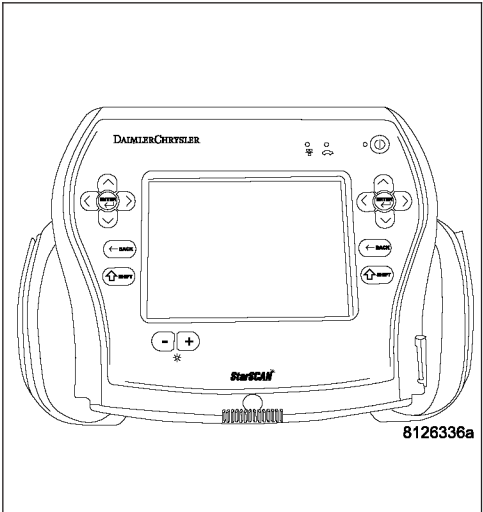
1. CHECK FOR A DTC C122D-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's

**Does the scan tool display: C122D-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C122D-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT (CONTINUED)****2. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

Visually inspect the related wiring harness. Look for any bruised, chafed, pierced, or partially broken wires.

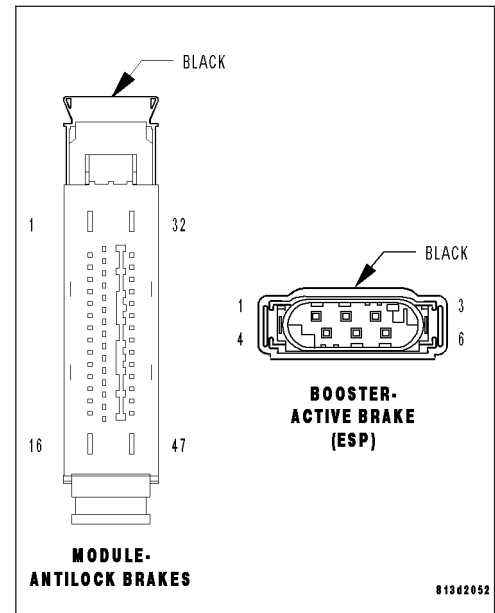
Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE RESISTANCE OF THE ACTIVE BRAKE BOOSTER SOLENOID**

Turn the ignition off.

Disconnect the Active Brake Booster harness connector.

Measure the internal resistance of the Active Brake Booster Solenoid.

**Is the resistance between 1 to 2 ohms?**

**Yes** >> Go To 4

**No** >> Replace the Active Brake Booster Solenoid in accordance with the Service information.

Perform ABS VERIFICATION TEST - VER 1.

**C122D-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT (CONTINUED)****4. CHECK FOR A SHORT BETWEEN THE (B131) ACTIVE BRAKE BOOSTER SOLENOID (+) AND (B132) ACTIVE BRAKE BOOSTER SOLENOID (-) CIRCUITS**

Turn the ignition off.

Disconnect the Active Brake Booster harness connector.

Disconnect the Anti-Lock Brake Module harness connector.

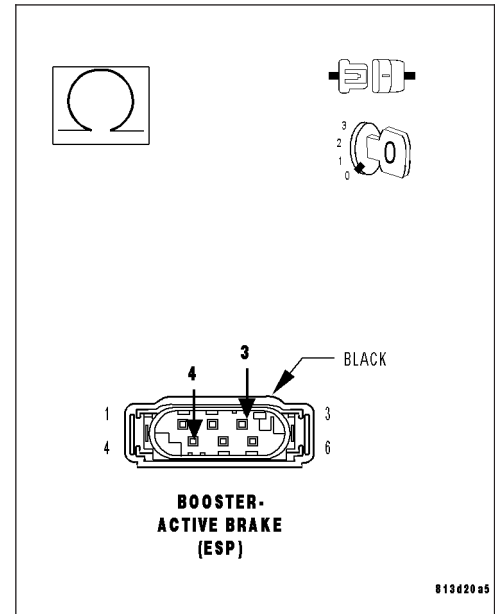
Measure the resistance between the (B131) Active Brake Booster Solenoid (+) circuit and the (B132) Active Brake Booster Solenoid (-) circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (B131) Active Brake Booster Solenoid (+) circuit and the (B132) Active Brake Booster Solenoid (-) circuit for a short together.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (B132) ACTIVE BRAKE BOOSTER SOLENOID (-) CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Active Brake Booster harness connector.

Disconnect the Anti-Lock Brake Module harness connector.

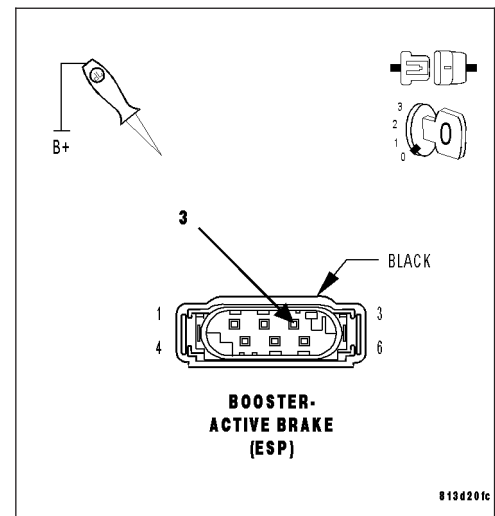
Using a 12-volt test light connected to 12-volts, check the (B132) Active Brake Booster Solenoid (-) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B132) Active Brake Booster Solenoid (-) circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C122D-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT (CONTINUED)****6. CHECK THE (B132) ACTIVE BRAKE BOOSTER SOLENOID (-) CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Active Brake Booster harness connector.

Disconnect the Anti-Lock Brake Module harness connector.

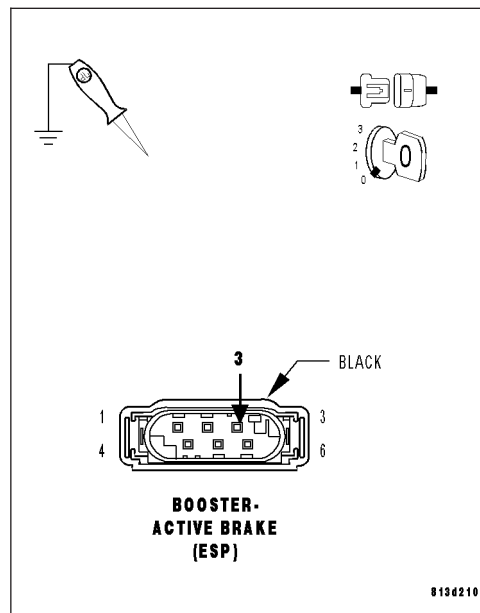
Using a 12-volt test light connected to ground, check the (B132) Active Brake Booster Solenoid (-) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B132) Active Brake Booster Solenoid (-) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B132) ACTIVE BRAKE BOOSTER SOLENOID (-) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Active Brake Booster harness connector.

Disconnect the Anti-Lock Brake Module harness connector.

Connect a jumper wire between the (B132) Active Brake Booster Solenoid (-) circuit and ground.

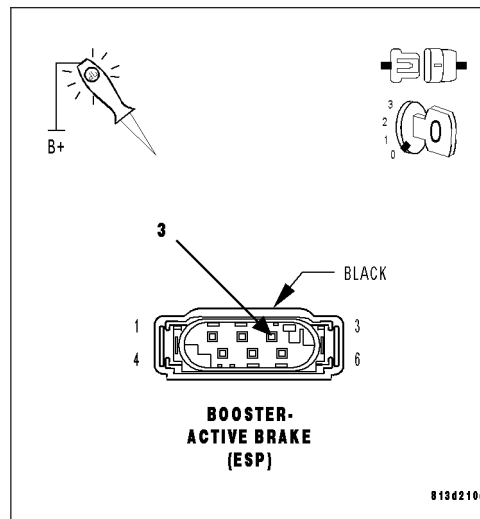
Using a 12-volt test light connected to 12-volts, check the (B132) Active Brake Booster Solenoid (-) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 8

**No** >> Repair the (B132) Active Brake Booster Solenoid (-) circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.





## **C122D-ACTIVE BRAKE BOOSTER CONTROL CIRCUIT (CONTINUED)**

### **8. CHECK THE ACTIVE BRAKE BOOSTER SOLENOID ACTUATION**

Turn the ignition off.

Reconnect the Active Brake Booster harness connector.

Disconnect the Anti-Lock Brake Module harness connector.

Turn the ignition on.

Connect a jumper wire between the (B132) Active Brake Booster Solenoid (-) and ground at the Anti-Lock Brake Module harness connector.

Connect a jumper wire for several seconds between the (B131) Active Brake Booster Solenoid (+) circuit and a 12 volt supply at the Anti-Lock Brake Module harness connector.

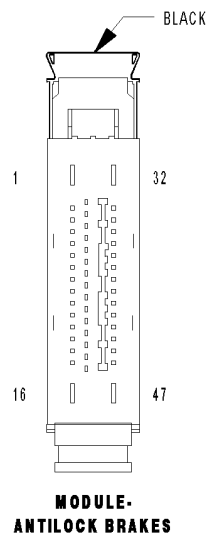
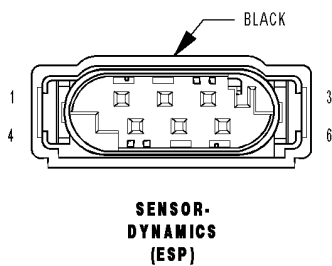
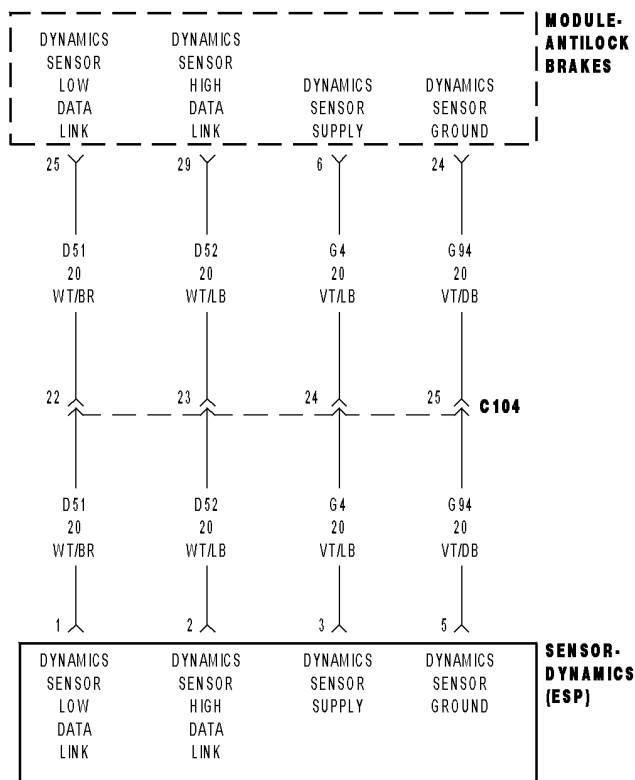
**Is there brake application when the (B131) Active Brake Booster Solenoid (+) circuit is jumped to a 12 volt supply and the (B132) Active Brake Booster Solenoid (-) jumped to ground?**

**Yes**     >> Replace the Active Brake Booster Solenoid in accordance with the Service Information  
            Perform ABS VERIFICATION TEST - VER 1.

**No**       >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
            Perform ABS VERIFICATION TEST - VER 1.

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## C123A-ESP SYSTEM SENSORS CALIBRATION



C123A-ESP SYSTEM SENSORS CALIBRATION (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates the Dynamics Sensor stored calibration values are invalid.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
DYNAMICS SENSOR
ANTI-LOCK BRAKE MODULE

Diagnostic Test

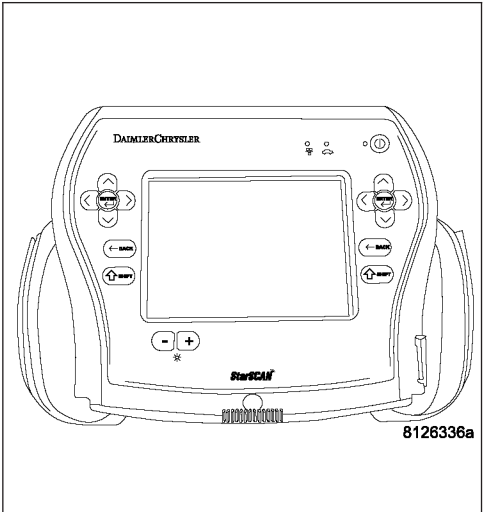
1. CHECK FOR A DTC C123A-ESP SYSTEM SENSORS CALIBRATION

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's

**Does the scan tool display: C123A-ESP SYSTEM SENSORS CALIBRATION?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



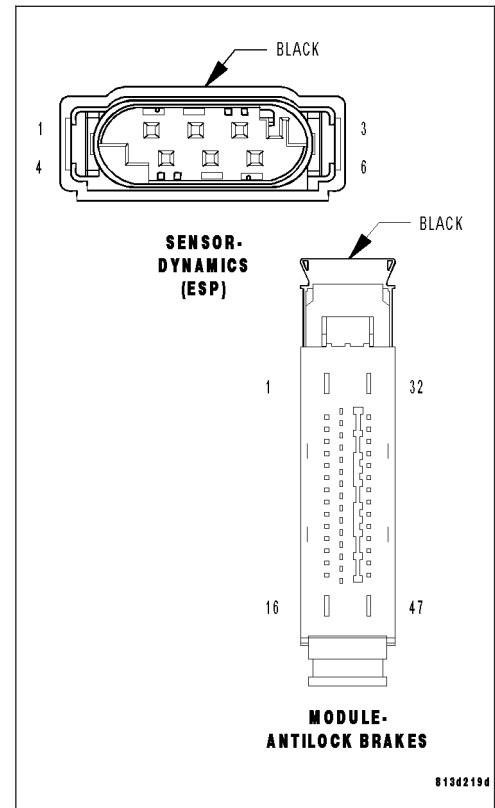
**C123A-ESP SYSTEM SENSORS CALIBRATION (CONTINUED)****2. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

Visually inspect the related wiring harness. Look for any bruised, chafed, pierced, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

- Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 3

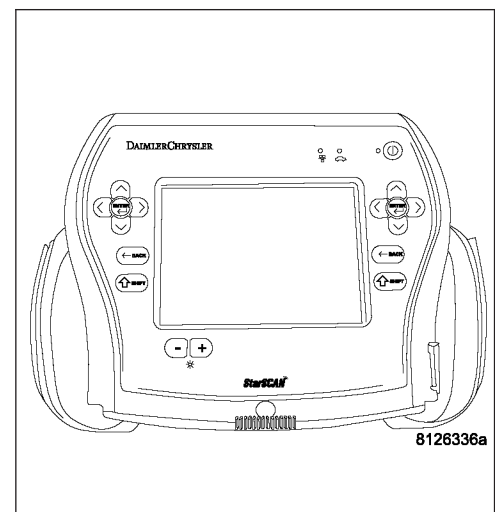
**3. CHECK THE DYNAMICS SENSOR OUTPUT**

**CAUTION:** Ensure brake capability is available before road testing.

Have an assistant test drive the vehicle while monitoring the Dynamics Sensor operation.

**Was the Lateral Sensor output between 0.02 G to 0.16 G and the Yaw Sensor between 1.30° to 5.70°?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Replace the Dynamics Sensor in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



**MODULE-ANTILOCK BRAKES**

DYNAMICS SENSOR LOW DATA LINK	DYNAMICS SENSOR HIGH DATA LINK	DYNAMICS SENSOR SUPPLY	DYNAMICS SENSOR GROUND
25	29	6	24
D51 20 WT/BR	D52 20 WT/LB	G4 20 VT/LB	G94 20 VT/DB
22	23	24	25
D51 20 WT/BR	D52 20 WT/LB	G4 20 VT/LB	G94 20 VT/DB
1	2	3	5

**SENSOR-DYNAMICS (ESP)**

**MODULE-ANTILOCK BRAKES**

BLACK

1 3 4 6

**SENSOR-DYNAMICS (ESP)**

1 32 16 47

**MODULE-ANTILOCK BRAKES**

**C123B-ESP SYSTEM CONTROL TOO LONG (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates Dynamics Sensor failure.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
DYNAMICS SENSOR

**Diagnostic Test****1. CHECK FOR A DTC C123B-ESP SYSTEM CONTROL TOO LONG**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

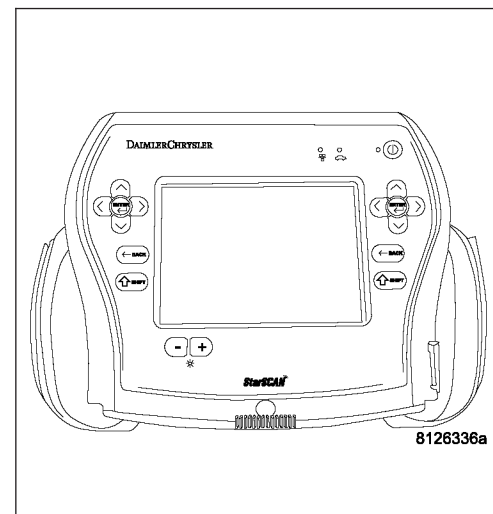
With the scan tool, read and record DTC's

**Does the scan tool display: C123B-ESP SYSTEM CONTROL TOO LONG?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.

Perform ABS VERIFICATION TEST - VER 1.



**C123B-ESP SYSTEM CONTROL TOO LONG (CONTINUED)****2. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

Visually inspect the related wiring harness. Look for any bruised, chafed, pierced, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

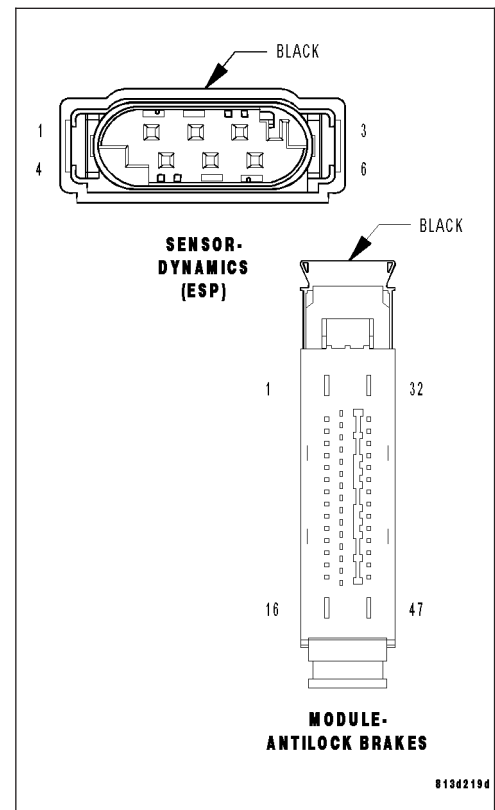
**Were any problems found?**

**Yes** >> Repair as necessary.

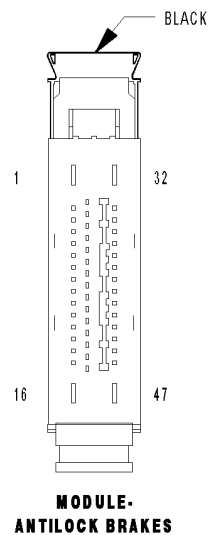
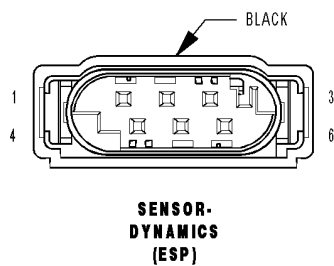
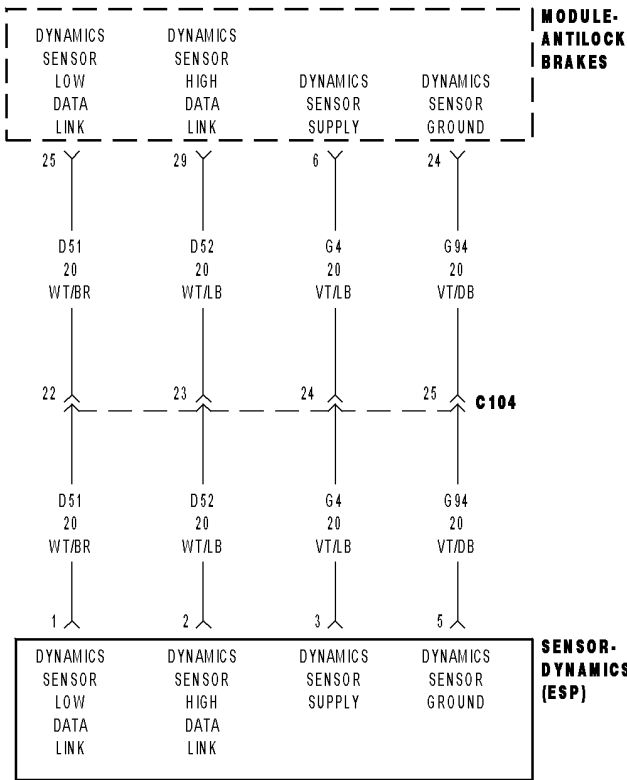
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Replace the Dynamics Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.



C123C-DYNAMICS SENSOR MOUNTING/INSTALLATION PERFORMANCE





**C123C-DYNAMICS SENSOR MOUNTING/INSTALLATION PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates the Dynamics Sensor values are invalid.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE IMPROPERLY INSTALLED DYNAMICS SENSOR (G94) DYNAMICS SENSOR GROUND CIRCUIT OPEN DYNAMICS SENSOR

**Diagnostic Test**

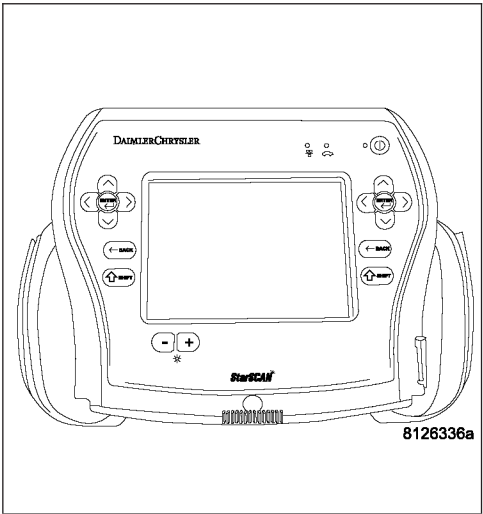
**1. CHECK FOR A DTC C123C-DYNAMICS SENSOR MOUNTING/INSTALLATION PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's

**Does the scan tool display: C123C-DYNAMICS SENSOR MOUNTING/INSTALLATION PERFORMANCE?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



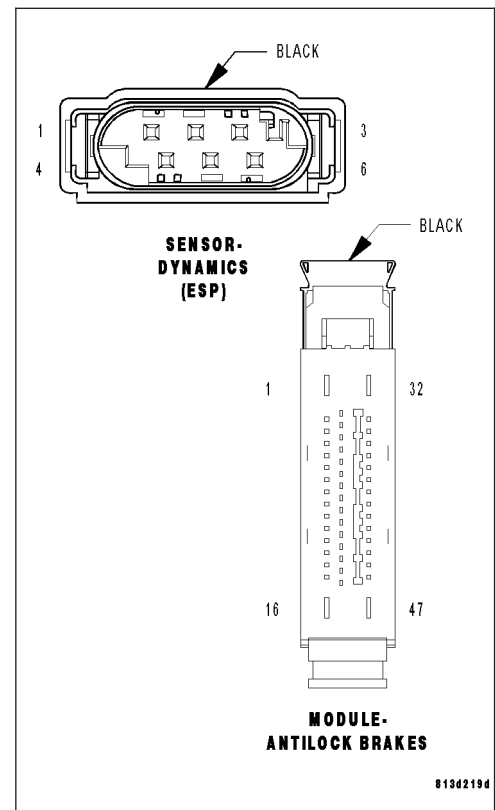
**C123C-DYNAMICS SENSOR MOUNTING/INSTALLATION PERFORMANCE (CONTINUED)****2. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

Visually inspect the related wiring harness. Look for any bruised, chafed, pierced, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

- Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 3

**3. CHECK THE DYNAMICS SENSOR INSTALLATION**

**Note: Dynamics Sensor installation and mounting bolt torque is crucial for proper operation.**

Check the Dynamics Sensor for damaged, modified or bent mounting bracket.

Check the Dynamics Sensor mounting bolts for loose or over tightened mounting bolts.

**Were any problems found?**

- Yes** >> Repair as needed.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 4

**C123C-DYNAMICS SENSOR MOUNTING/INSTALLATION PERFORMANCE (CONTINUED)****4. CHECK THE RESISTANCE BETWEEN THE (G94) DYNAMICS SENSOR GROUND CIRCUIT AND GROUND**

Turn the ignition off.

Disconnect the Dynamics Sensor harness connector.

Measure the resistance between the (G94) Dynamics Sensor Ground circuit and ground.

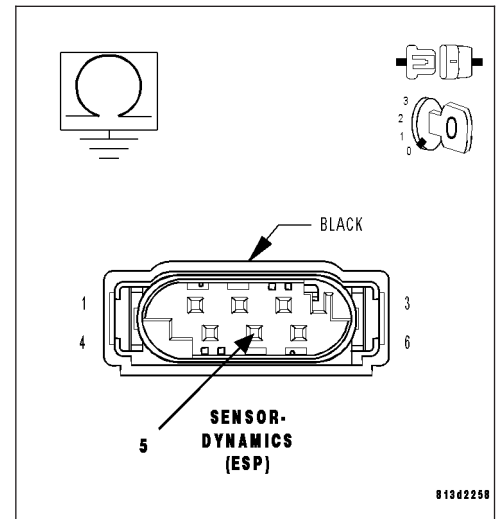
**Is the resistance below 5.0 ohm?**

**Yes** >> Replace the Dynamics Sensor in accordance with the Service Information.

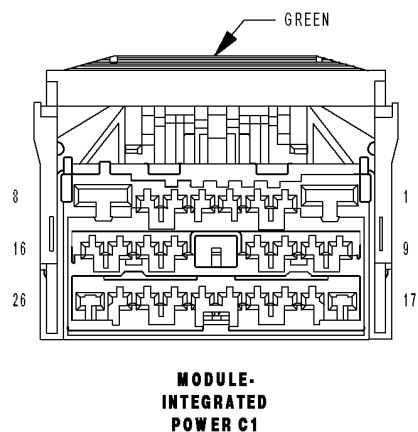
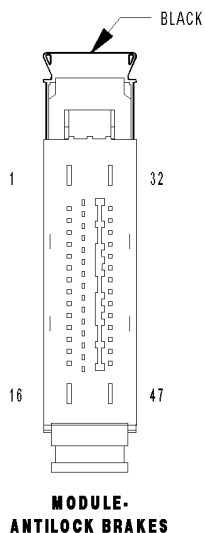
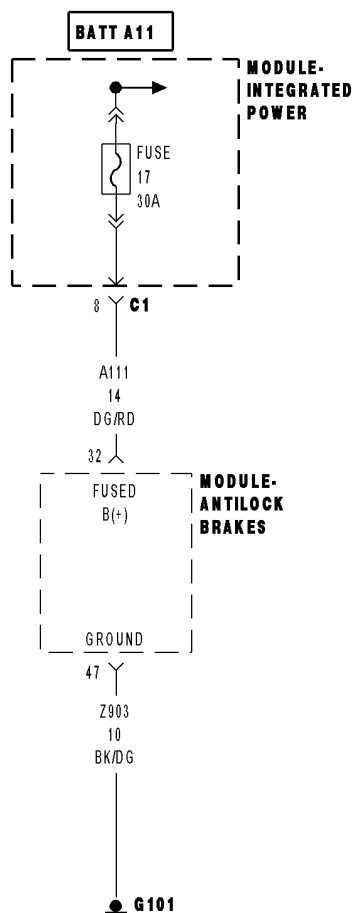
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (G94) Dynamics Sensor Ground circuit for an open circuit.

Perform ABS VERIFICATION TEST - VER 1.



## C2100-BATTERY VOLTAGE LOW



C2100-BATTERY VOLTAGE LOW (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates that voltage is below 7.5 volts.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE
STARTING AND CHARGING CONDITION
(A111) FUSED B(+) CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN
(Z903) GROUND CIRCUIT OPEN
INTEGRATED POWER MODULE
ANTI-LOCK BRAKE MODULE

Diagnostic Test

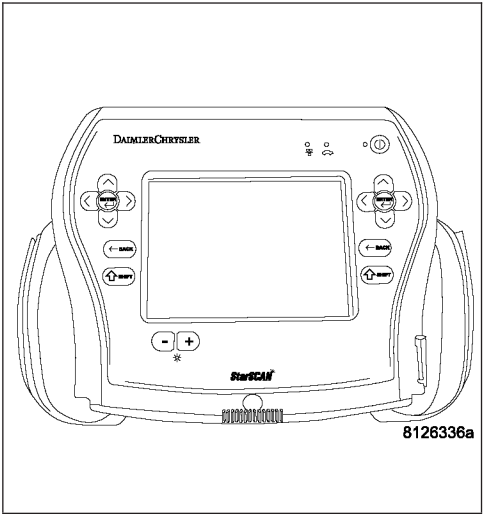
1. CHECK FOR A C2100-BATTERY VOLTAGE LOW

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition from off to on.
- With the scan tool, read and record DTC's.

**Does the scan tool display: C2100-BATTERY VOLTAGE LOW?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



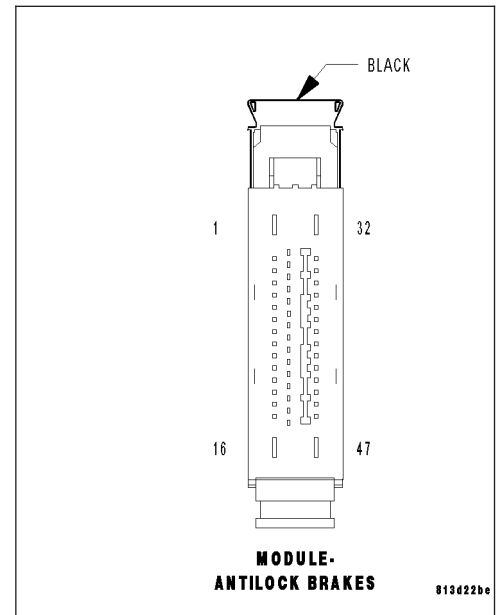
**C2100-BATTERY VOLTAGE LOW (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

- Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 3

**3. CHECK THE BATTERY AND CHARGING SYSTEM**

Turn the ignition off.

Perform a battery and charging system test.

**Note:** Refer to the Service Information for related test(s)/symptom(s).

**Does the battery and charging system pass?**

- Yes** >> Go To 4
- No** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**C2100-BATTERY VOLTAGE LOW (CONTINUED)****4. CHECK THE VOLTAGE ON THE (A111) FUSED B(+) CIRCUIT**

Turn the ignition off.

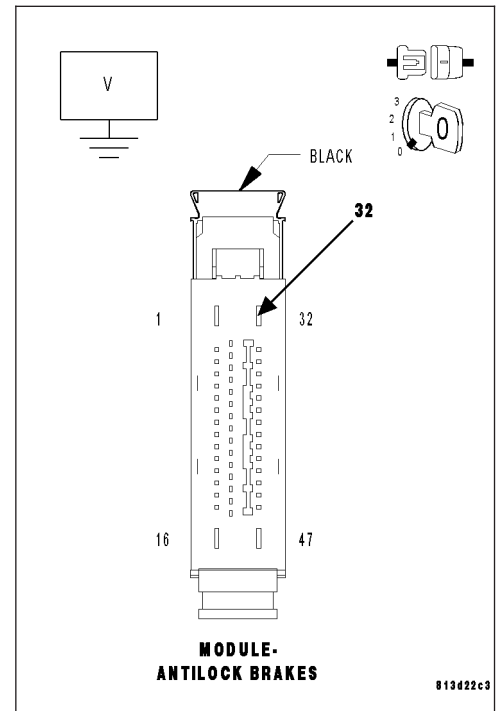
Disconnect the Anti-Lock Brake Module harness connector.

Measure the voltage of the (A111) Fused B(+) circuit.

**Is the voltage below 10 volts?**

**Yes** >> Go To 5

**No** >> Go To 8

**5. CHECK THE (A111) FUSED B(+) CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

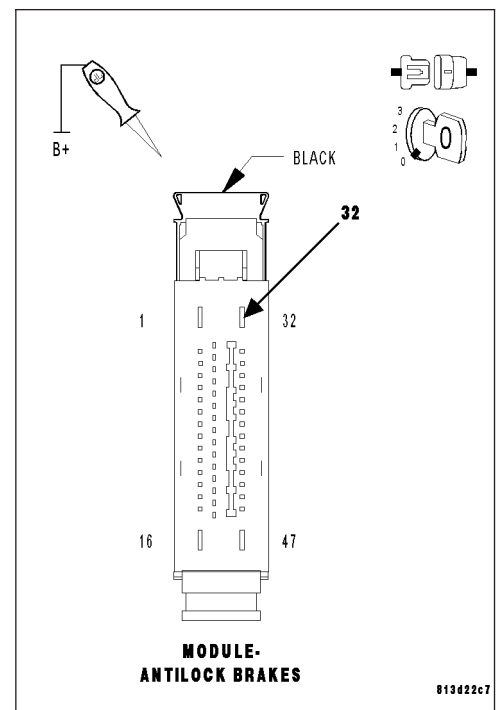
Disconnect the Anti-Lock Brake Module harness connector.

Using a 12-volt test light connected to 12-volts, check the (A111) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (A111) Fused B(+) circuit for a short to ground.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C2100-BATTERY VOLTAGE LOW (CONTINUED)****6. CHECK THE (A111) FUSED B(+) CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

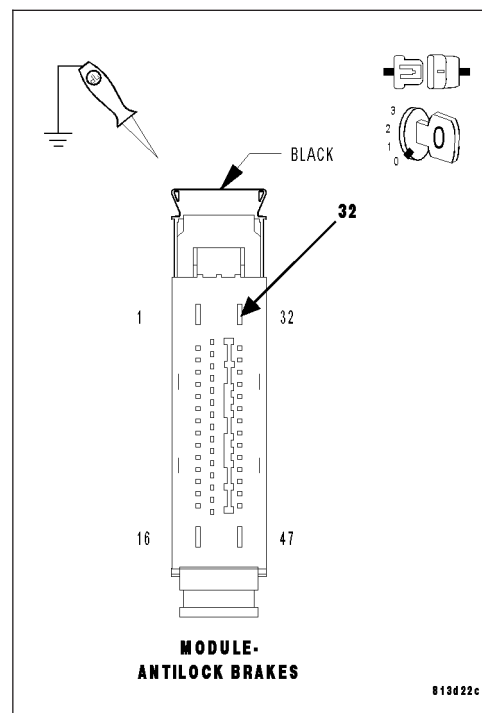
Disconnect the Anti-Lock Brake Module harness connector.

Using a 12-volt test light connected to ground, check the (A111) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (A111) Fused B(+) circuit for a short to voltage.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (A111) FUSED B(+) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Remove the Anti-Lock Brake Module Fused B(+) fuse.

Disconnect the Anti-Lock Brake Module harness connector.

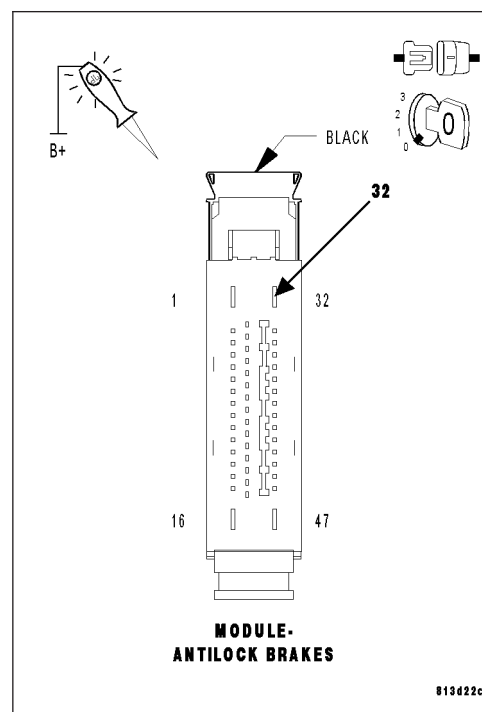
Connect a jumper wire between the (A111) Fused B(+) circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (A111) Fused B(+) circuit.

**Does the test light illuminate brightly**

**Yes** >> Replace the Integrated Power Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (A111) Fused B(+) circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.





**C2100-BATTERY VOLTAGE LOW (CONTINUED)****8. CHECK THE (Z903) GROUND CIRCUIT FOR AN OPEN**

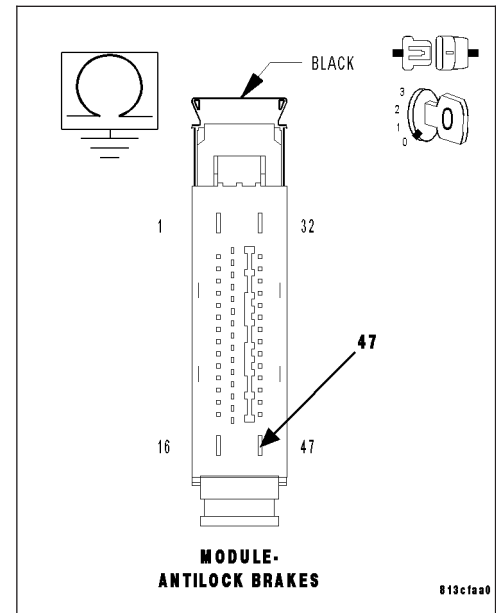
Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

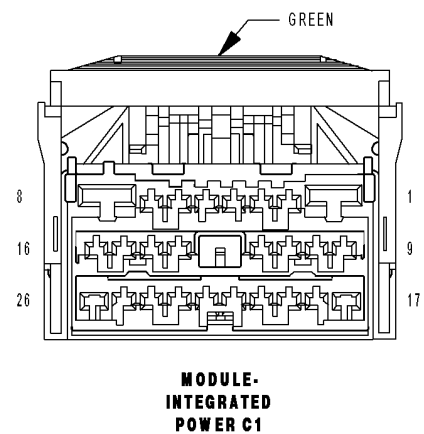
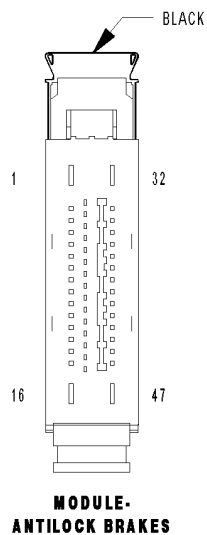
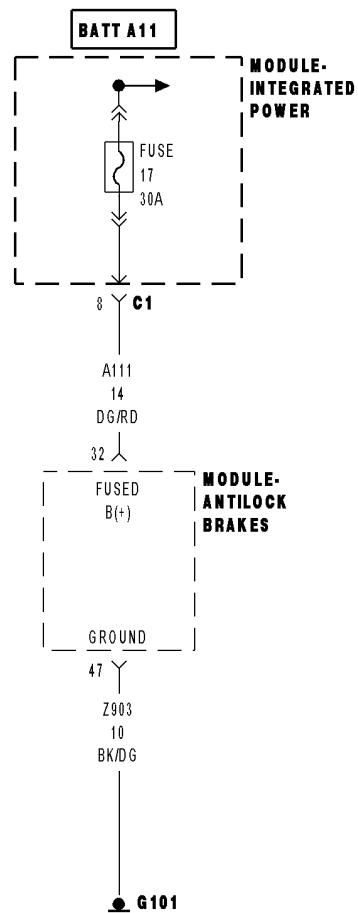
Measure the resistance between the (Z903) Ground circuit and ground.

**Is the resistance below 5.0 ohm?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (Z903) Ground circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



# C2101-BATTERY VOLTAGE HIGH



**C2101-BATTERY VOLTAGE HIGH (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates that voltage is above 17 volts.

Possible Causes
BATTERY CHARGER ON VEHICLE TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE STARTING AND CHARGING CONDITION (Z903) GROUND CIRCUIT OPEN ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A C2101-BATTERY VOLTAGE HIGH**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

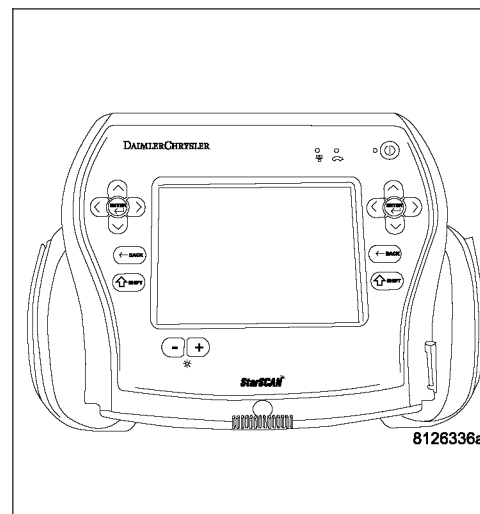
Cycle the ignition from off to on.

With the scan tool, read and record DTC's.

**Does the scan tool display: C2101-BATTERY VOLTAGE HIGH?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.

**2. CHECK FOR BATTERY CHARGER CONNECTED TO VEHICLE**

**Is a battery charger connected to the vehicle?**

**Yes** >> Ensure battery is fully charged.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

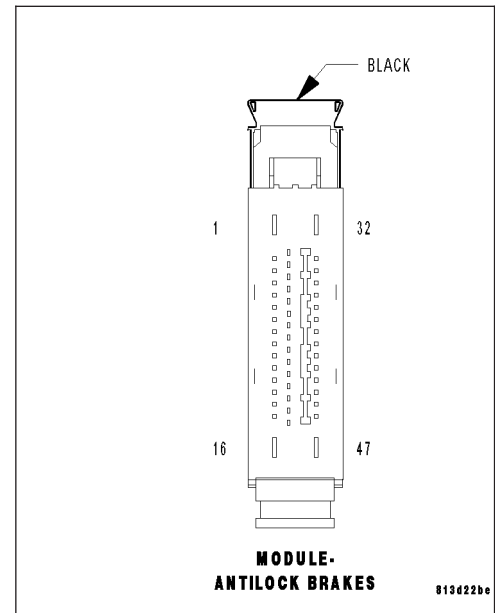
**C2101-BATTERY VOLTAGE HIGH (CONTINUED)****3. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

- Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 4

**4. CHECK THE BATTERY AND CHARGING SYSTEM**

Turn the ignition off.

Perform a battery and charging system test.

**Note:** Refer to the Service Information for related test(s)/symptom(s).

**Does the battery and charging system pass?**

- Yes** >> Go To 5
- No** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**C2101-BATTERY VOLTAGE HIGH (CONTINUED)****5. CHECK THE VOLTAGE ON THE (A111) FUSED B(+) CIRCUIT**

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Start the engine.

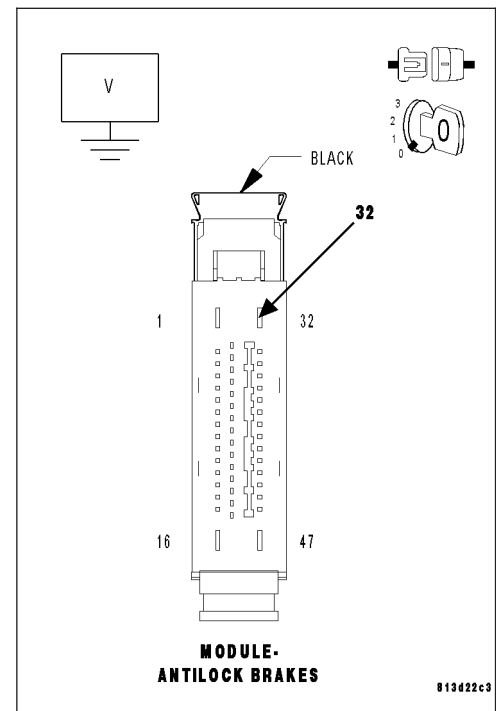
Raise engine speed above 1,800 RPM's.

Measure the voltage of the (A111) Fused B(+) circuit.

**Is the voltage above 17 volts?**

**Yes** >> Refer to the appropriate Service Information for Charging System testing and repair.

**No** >> Go To 6

**6. CHECK THE (Z903) GROUND CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Measure the resistance between the (Z903) Ground circuit and ground.

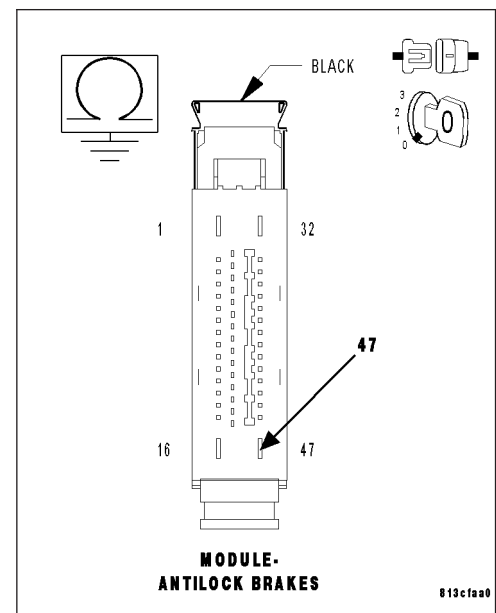
**Is the resistance below 5.0 ohm?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

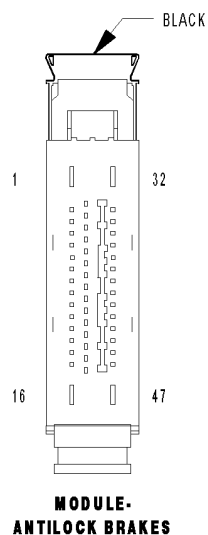
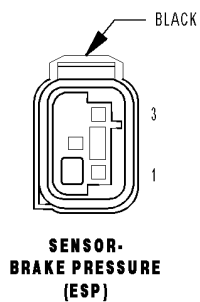
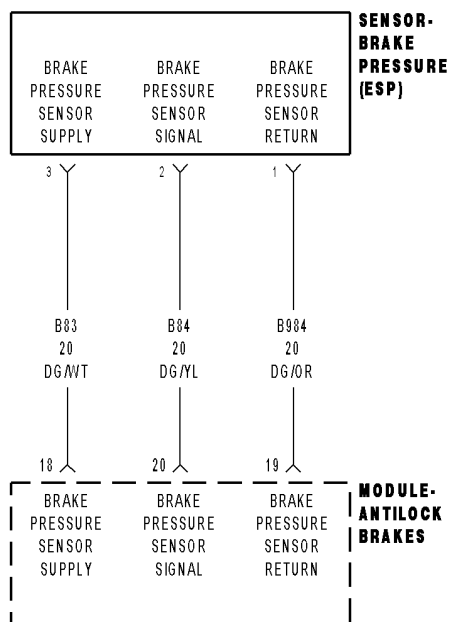
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (Z903) Anti-Lock Brake Module Ground circuit for an open.

Perform ABS VERIFICATION TEST - VER 1



## C2111-SENSOR SUPPLY VOLTAGE CIRCUIT LOW



C2111-SENSOR SUPPLY VOLTAGE CIRCUIT LOW (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates that the Brake Pressure Sensor Signal is within the low fault area.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT AND THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TOGETHER (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT AND THE (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT SHORTED TOGETHER (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN ANTI-LOCK BRAKE MODULE

Diagnostic Test

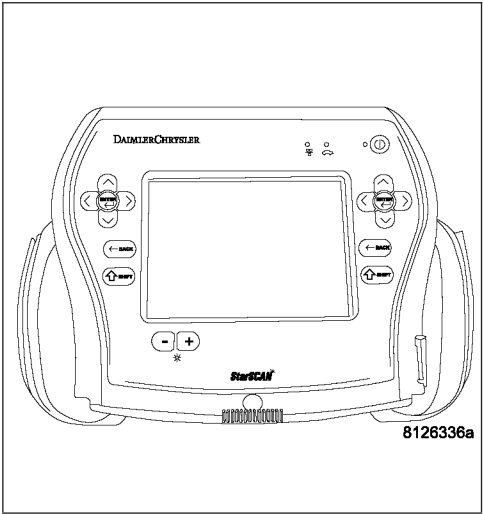
1. CHECK FOR A DTC C2111-SENSOR SUPPLY VOLTAGE CIRCUIT LOW

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition from off to on.
- With the scan tool, read and record DTC's.

**Does the scan tool display: C2111-SENSOR SUPPLY VOLTAGE CIRCUIT LOW?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C2111-SENSOR SUPPLY VOLTAGE CIRCUIT LOW (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

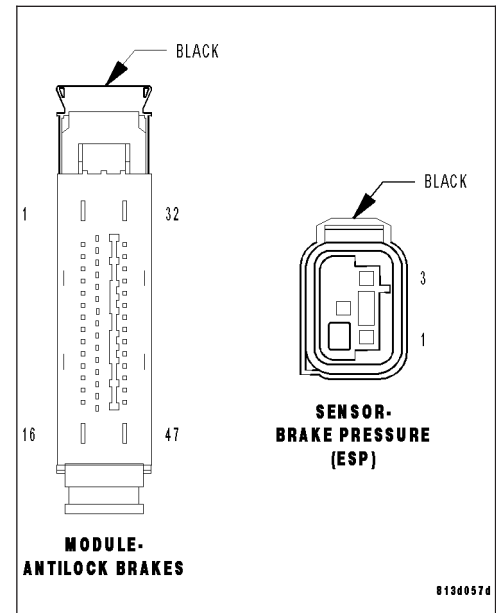
Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE ON THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Brake Pressure Sensor harness connector.

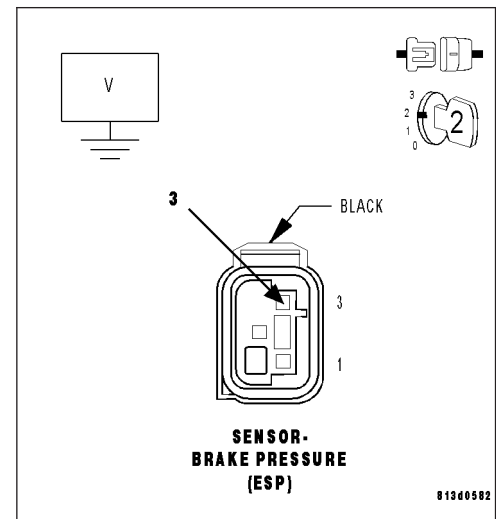
Turn the ignition on.

Measure the voltage of the (B83) Brake Pressure Sensor Supply circuit.

**Is the voltage above 4 volts?**

**Yes** >> Go To 7

**No** >> Go To 4





**C2111-SENSOR SUPPLY VOLTAGE CIRCUIT LOW (CONTINUED)****4. CHECK FOR A SHORT BETWEEN THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT AND THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

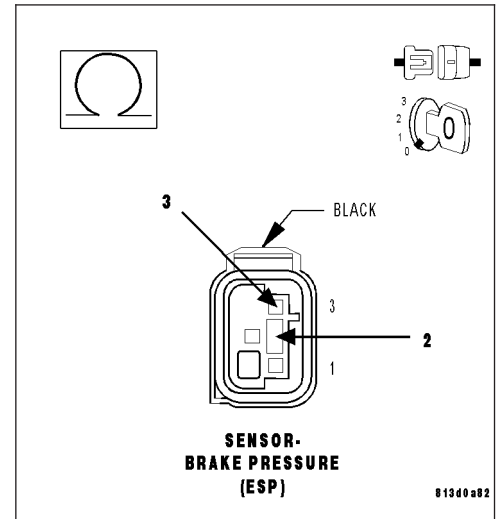
Disconnect the Brake Pressure Sensor harness connector.

Measure the resistance between the (B83) Brake Pressure Sensor Supply and the (B84) Brake Pressure Sensor Signal circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply and (B84) Brake Pressure Sensor Signal circuits for a short together.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK FOR A SHORT BETWEEN THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT AND THE (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

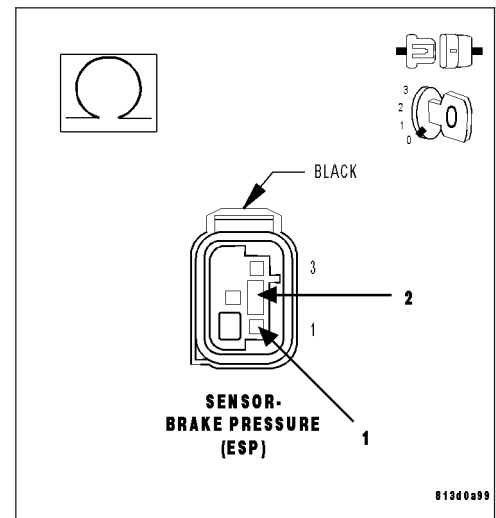
Disconnect the Brake Pressure Sensor harness connector.

Measure the resistance between the (B83) Brake Pressure Sensor Supply and the (B984) Brake Pressure Sensor Return circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply and (B984) Brake Pressure Sensor Return circuits for a short together.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C2111-SENSOR SUPPLY VOLTAGE CIRCUIT LOW (CONTINUED)****6. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

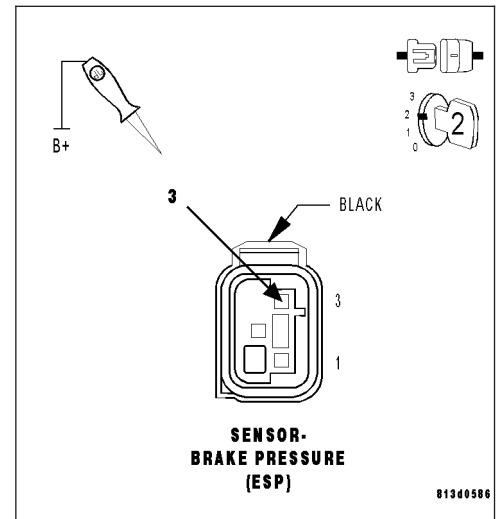
Using a 12-volt test light connected to 12-volts, check the (B83) Brake Pressure Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

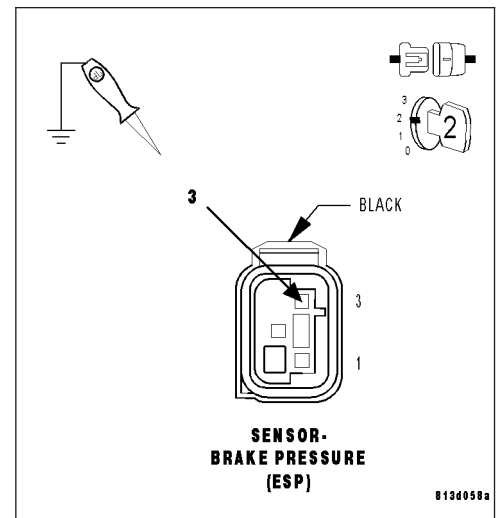
Using a 12-volt test light connected to ground, check the (B83) Brake Pressure Sensor Supply circuit.

**Does the test light illuminate brightly**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 8



**C2111-SENSOR SUPPLY VOLTAGE CIRCUIT LOW (CONTINUED)****8. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

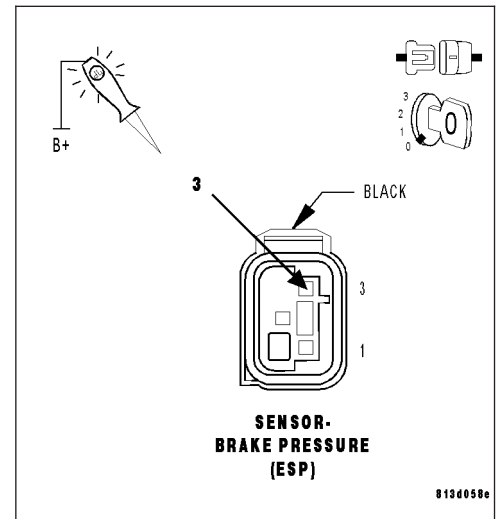
Disconnect the Brake Pressure Sensor harness connector.

Connect a jumper wire between the (B83) Brake Pressure Sensor Supply circuit and ground.

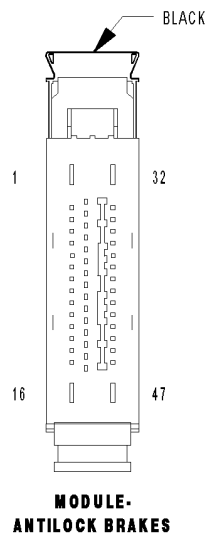
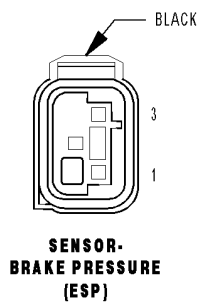
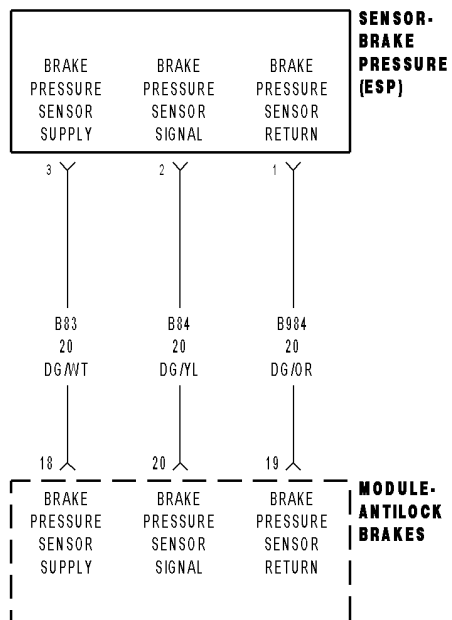
Using a 12-volt test light connected to 12-volts, check the (B83) Brake Pressure Sensor Supply circuit.

**Does the test light illuminate brightly?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B83) Brake Pressure Sensor Supply circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



## C2112-SENSOR SUPPLY VOLTAGE CIRCUIT HIGH



**C2112-SENSOR SUPPLY VOLTAGE CIRCUIT HIGH (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates that the Brake Pressure Sensor Signal is within the high fault area.

Possible Causes
TERMINAL/CONNECTOR/WIRING HARNESS DAMAGE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT AND THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TOGETHER (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT AND THE (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT SHORTED TOGETHER (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE OR GROUND ANTI-LOCK BRAKE MODULE

**Diagnostic Test**

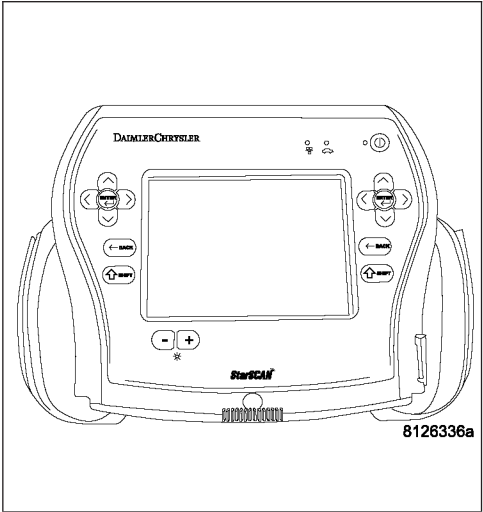
**1. CHECK FOR A DTC C2112-SENSOR SUPPLY VOLTAGE CIRCUIT HIGH**

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition from off to on.
- With the scan tool, read and record DTC's.

**Does the scan tool display: C2112-SENSOR SUPPLY VOLTAGE CIRCUIT HIGH?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



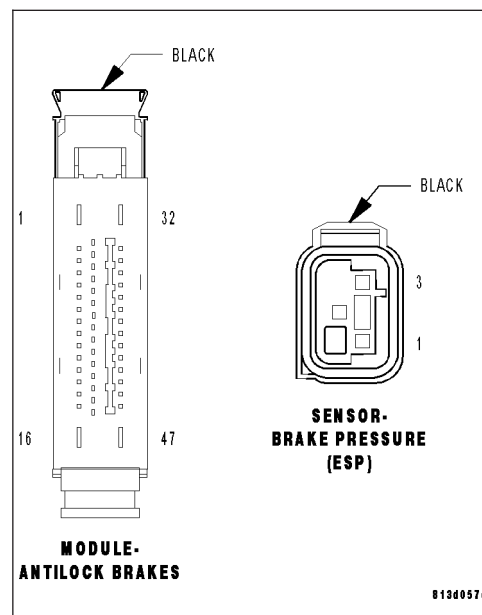
**C2112-SENSOR SUPPLY VOLTAGE CIRCUIT HIGH (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/WIRING HARNESS FOR DAMAGE**

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

- Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 3

**3. CHECK THE VOLTAGE ON THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

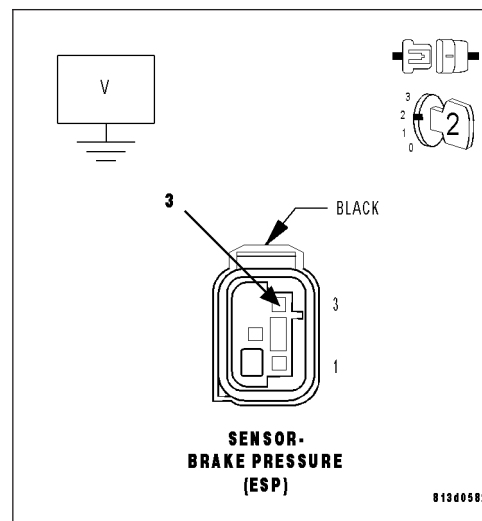
Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (B83) Brake Pressure Sensor Supply circuit.

**Is the voltage above 6 volts?**

- Yes** >> Go To 4
- No** >> Replace the Brake Pressure Sensor in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



**C2112-SENSOR SUPPLY VOLTAGE CIRCUIT HIGH (CONTINUED)****4. CHECK FOR A SHORT BETWEEN THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT AND THE (B84) BRAKE PRESSURE SENSOR SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

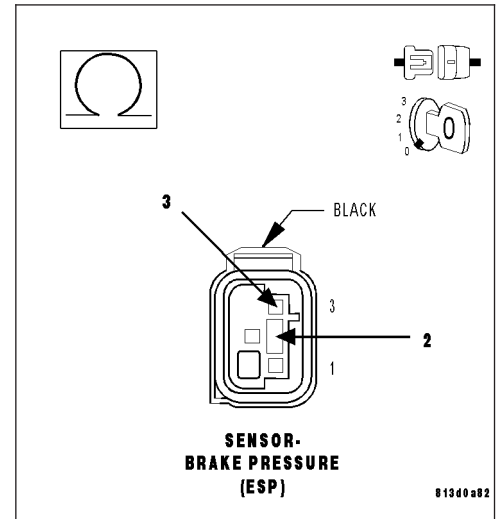
Disconnect the Brake Pressure Sensor harness connector.

Measure the resistance between the (B83) Brake Pressure Sensor Supply and the (B84) Brake Pressure Sensor Signal circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply and (B84) Brake Pressure Sensor Signal circuits for a short together.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK FOR A SHORT BETWEEN THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT AND THE (B984) BRAKE PRESSURE SENSOR RETURN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

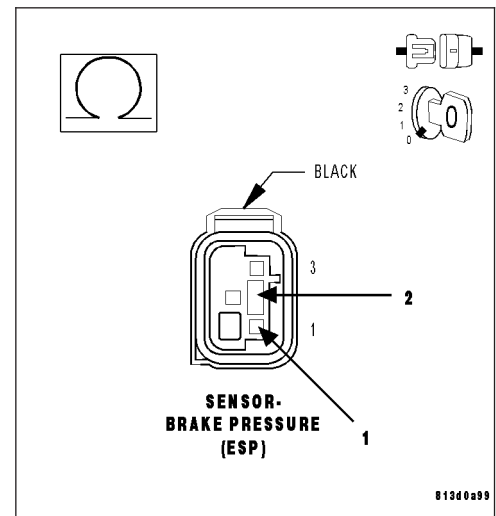
Disconnect the Brake Pressure Sensor harness connector.

Measure the resistance between the (B83) Brake Pressure Sensor Supply and the (B984) Brake Pressure Sensor Return circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply and (B984) Brake Pressure Sensor Return circuits for a short together.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C2112-SENSOR SUPPLY VOLTAGE CIRCUIT HIGH (CONTINUED)****6. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

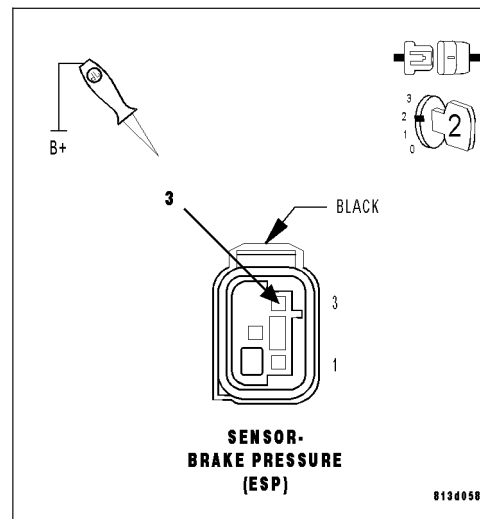
Using a 12-volt test light connected to 12-volts, check the (B83) Brake Pressure Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B83) BRAKE PRESSURE SENSOR SUPPLY CIRCUIT FOR SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Brake Pressure Sensor harness connector.

Turn the ignition on.

Using a 12-volt test light connected to ground, check the (B83) Brake Pressure Sensor Supply circuit.

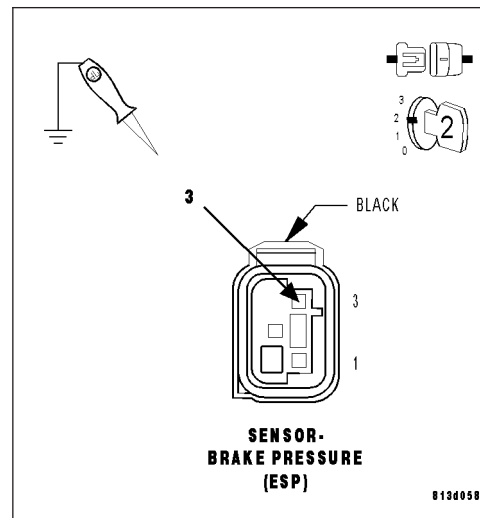
**Does the test light illuminate brightly**

**Yes** >> Repair the (B83) Brake Pressure Sensor Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

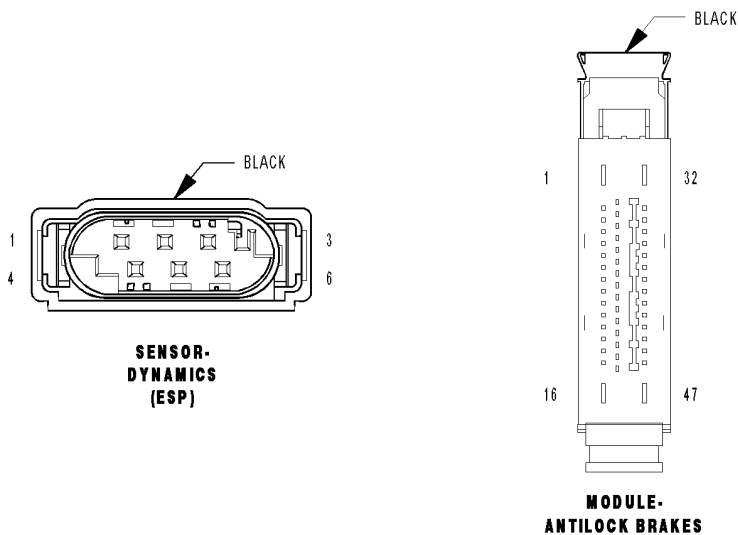
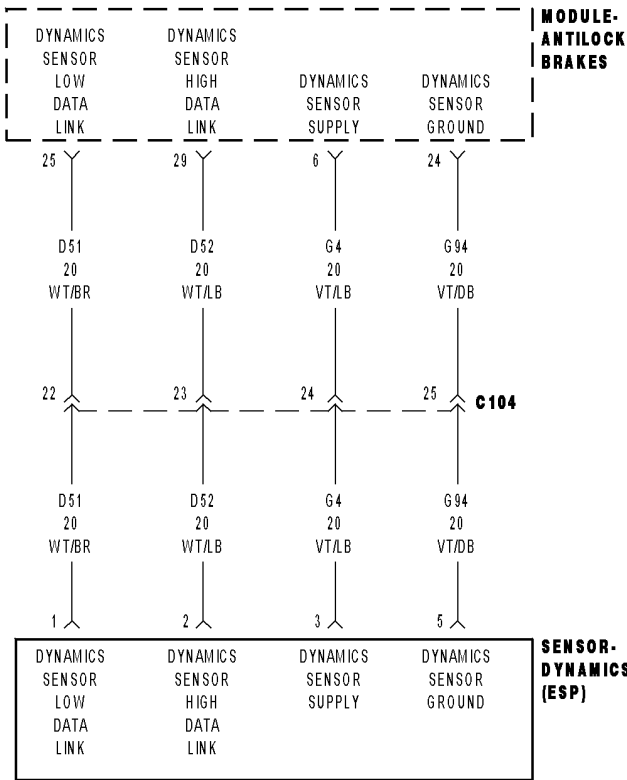
**No** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.





C2114-DYNAMICS SENSOR SUPPLY VOLTAGE LOW



**C2114-DYNAMICS SENSOR SUPPLY VOLTAGE LOW (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates the operating voltage is out of specified range.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE (G4) DYNAMICS SENSOR SUPPLY CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN (G94) DYNAMICS SENSOR GROUND CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN DYNAMICS SENSOR ANTI-LOCK BRAKE MODULE

**1. CHECK FOR A DTC C2114-DYNAMICS SENSOR SUPPLY VOLTAGE LOW**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

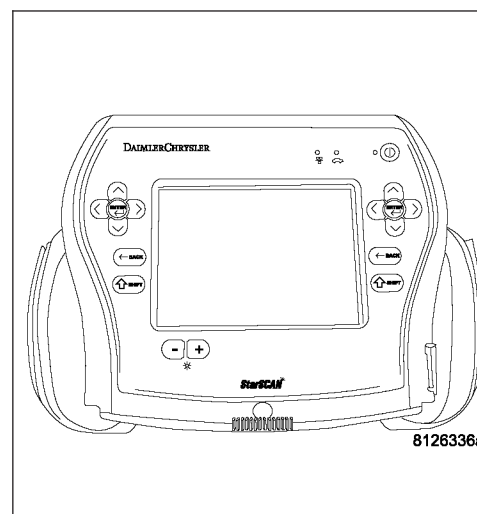
Cycle the ignition from off to on.

With the scan tool, read and record DTC's

**Does the scan tool display: C2114-DYNAMICS SENSOR SUPPLY VOLTAGE LOW?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C2114-DYNAMICS SENSOR SUPPLY VOLTAGE LOW (CONTINUED)****2. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

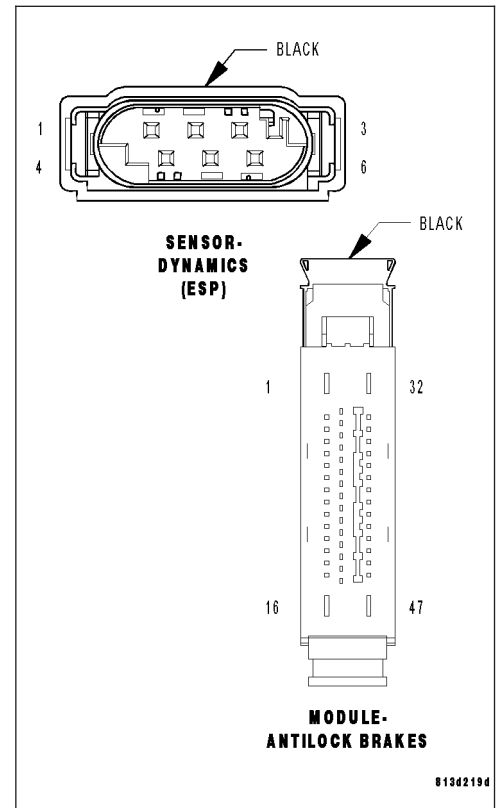
Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE ON THE (G4) DYNAMICS SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

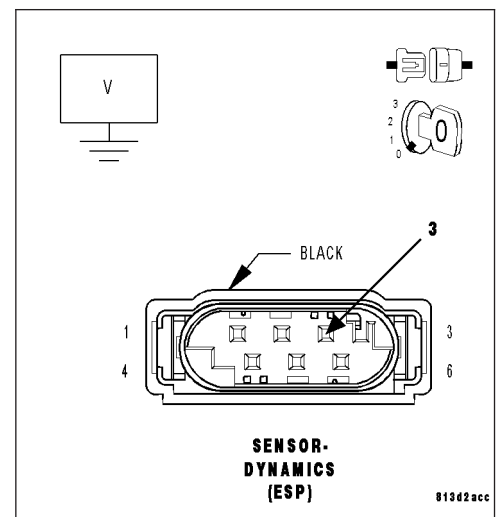
Disconnect the Anti-Lock Brake Module harness connector.

Measure the voltage of the (G4) Dynamics Sensor Supply Circuit.

**Is the voltage above 10 volts?**

**Yes** >> Go To 7

**No** >> Go To 4



**C2114-DYNAMICS SENSOR SUPPLY VOLTAGE LOW (CONTINUED)****4. CHECK THE (G4) DYNAMICS SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

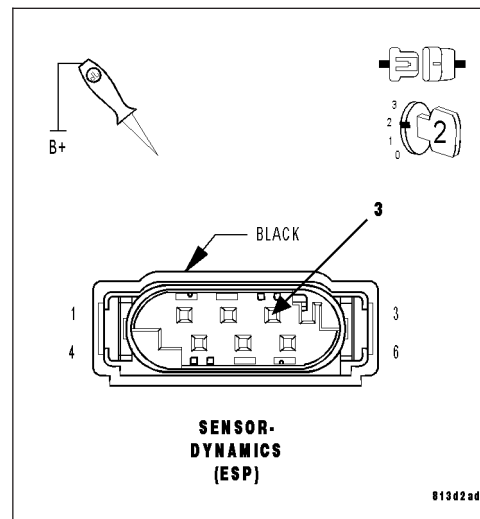
Using a 12-volt test light connected to 12-volts, check the (G4) Dynamics Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (G4) Dynamics Sensor Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (G4) DYNAMICS SENSOR SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

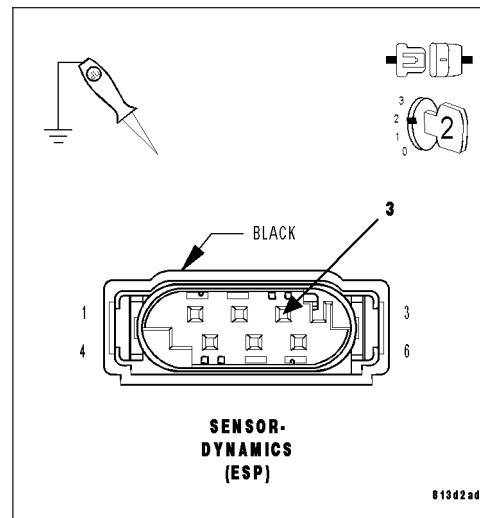
Using a 12-volt test light connected to ground, check the (G4) Dynamics Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (G4) Dynamics Sensor Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C2114-DYNAMICS SENSOR SUPPLY VOLTAGE LOW (CONTINUED)****6. CHECK THE (G4) DYNAMICS SENSOR SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

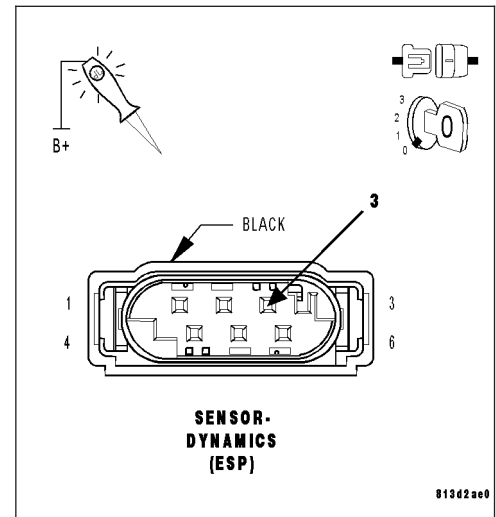
Disconnect the Dynamics Sensor harness connector.

Connect a jumper wire between the (G4) Dynamics Sensor Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (G4) Dynamics Sensor Supply circuit

**Does the test light illuminate brightly?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (G4) Dynamics Sensor Supply circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**7. CHECK THE RESISTANCE BETWEEN THE (G94) DYNAMICS SENSOR GROUND CIRCUIT AND GROUND**

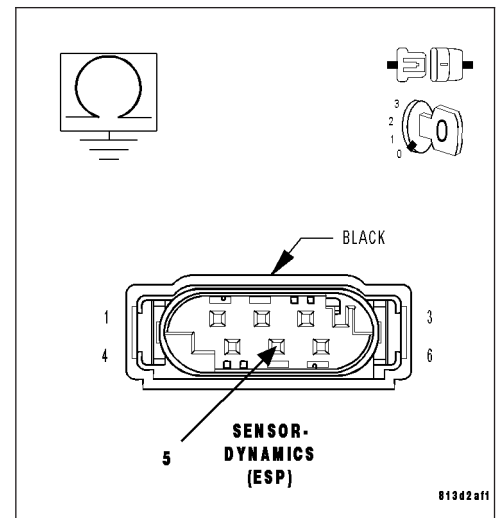
Turn the ignition off.

Disconnect the Dynamics Sensor harness connector.

Measure the resistance between the (G94) Dynamics Sensor Ground Circuit and Ground.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Dynamics Sensor in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 8



**C2114-DYNAMICS SENSOR SUPPLY VOLTAGE LOW (CONTINUED)****8. CHECK THE (G94) DYNAMICS SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

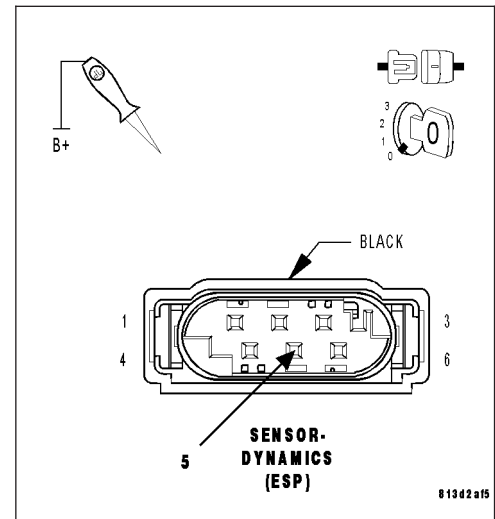
Using a 12-volt test light connected to 12-volts, check the (G94) Dynamics Sensor Ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (G94) Dynamics Sensor Ground circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. CHECK THE (G94) DYNAMICS SENSOR GROUND CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

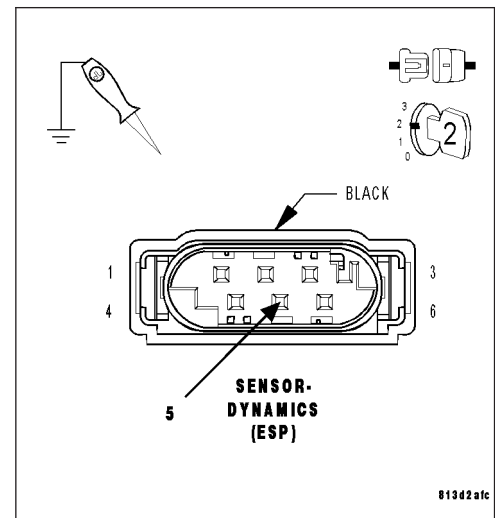
Using a 12-volt test light connected to ground, check the (G94) Dynamics Sensor Ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (G94) Dynamics Sensor Ground circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C2114-DYNAMICS SENSOR SUPPLY VOLTAGE LOW (CONTINUED)****10. CHECK THE (G94) DYNAMICS SENSOR GROUND CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

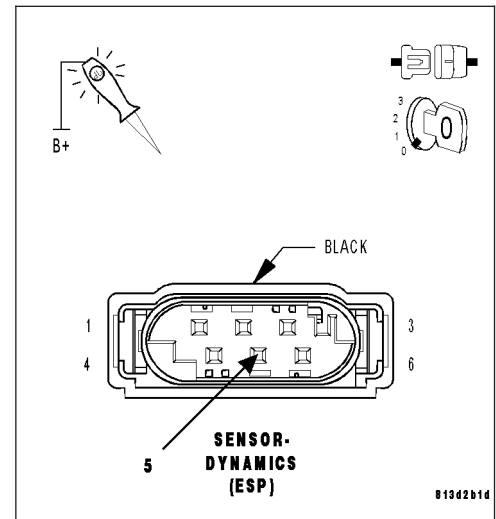
Disconnect the Dynamics Sensor harness connector.

Connect a jumper wire between the (G94) Dynamics Sensor Ground circuit and ground.

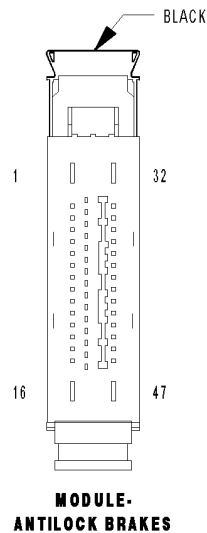
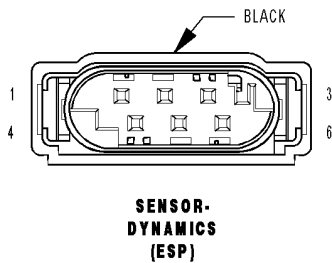
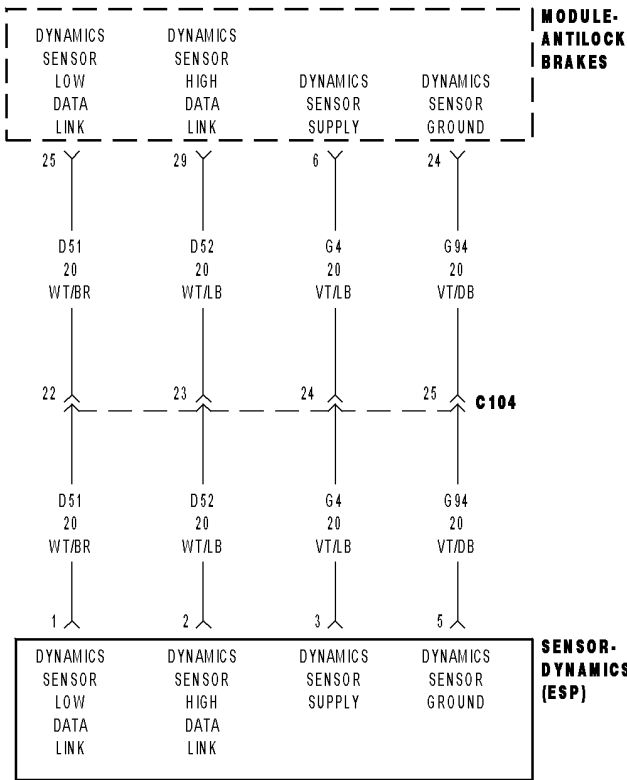
Using a 12-volt test light connected to 12-volts, check the (G94) Dynamics Sensor Ground circuit

**Does the test light illuminate brightly?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (G94) Dynamics Sensor Ground circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



C2115-DYNAMICS SENSOR SUPPLY VOLTAGE HIGH





C2115-DYNAMICS SENSOR SUPPLY VOLTAGE HIGH (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates the operating voltage is out of specified range.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE
CHARGING SYSTEM
(G4) DYNAMICS SENSOR SUPPLY CIRCUIT SHORTED TO GROUND OR VOLTAGE
(G94) DYNAMICS SENSOR GROUND CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN
DYNAMICS SENSOR
ANTI-LOCK BRAKE MODULE

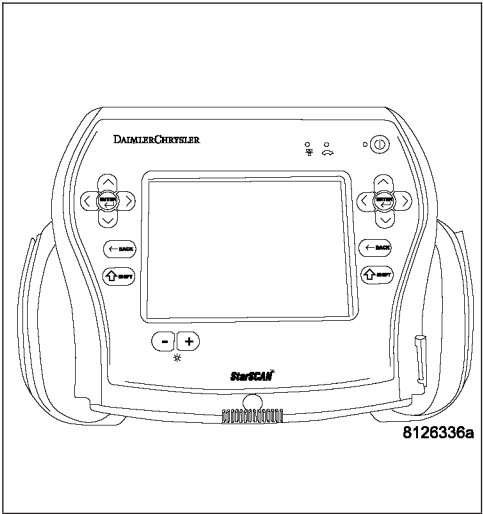
1. CHECK FOR A DTC C2115-DYNAMICS SENSOR SUPPLY VOLTAGE HIGH

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition from off to on.
- With the scan tool, read and record DTC's

**Does the scan tool display: C2115-DYNAMICS SENSOR SUPPLY VOLTAGE HIGH?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C2115-DYNAMICS SENSOR SUPPLY VOLTAGE HIGH (CONTINUED)****2. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

Check all related wiring for bruised, chafed, pierced, or partially broken wires.

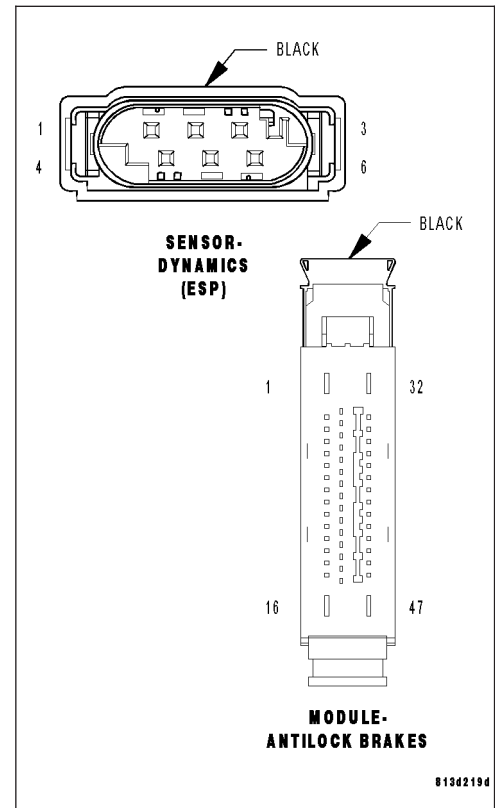
Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE ON THE (G4) DYNAMICS SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

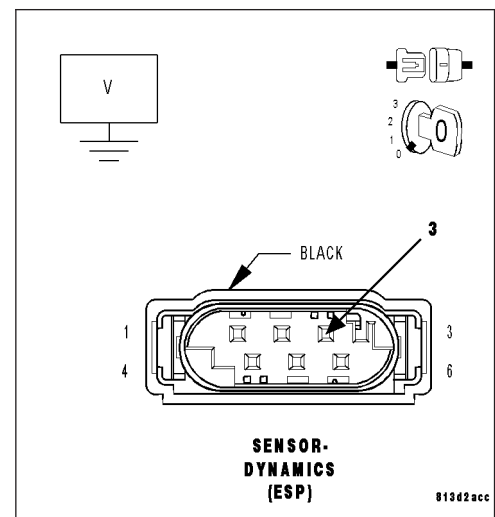
Disconnect the Anti-Lock Brake Module harness connector.

Measure the voltage of the (G4) Dynamics Sensor Supply Circuit.

**Is the voltage above 17 volts?**

**Yes** >> Go To 4

**No** >> Go To 7



**C2115-DYNAMICS SENSOR SUPPLY VOLTAGE HIGH (CONTINUED)****4. CHECK THE VOLTAGE ON THE (A111) FUSED B(+) CIRCUIT**

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Start the engine.

Raise engine speed above 1,800 RPM's.

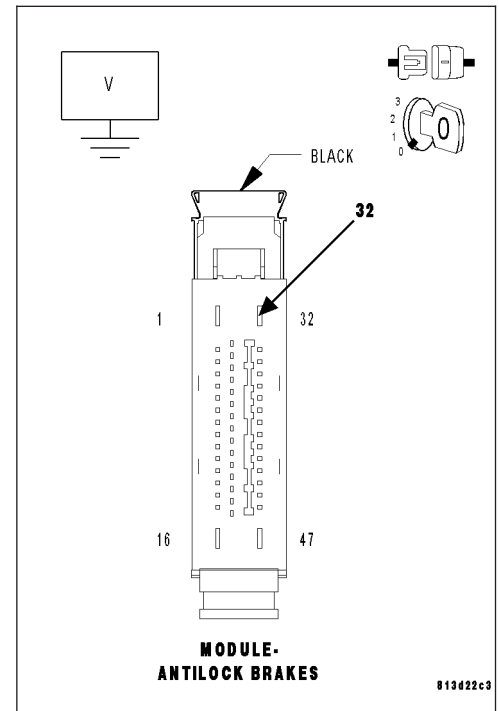
Measure the voltage of the (A111) Fused B(+) circuit.

**Is the voltage above 17 volts?**

**Yes** >> Refer to appropriate Service Information for Charging System testing and repair.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (G4) DYNAMICS SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

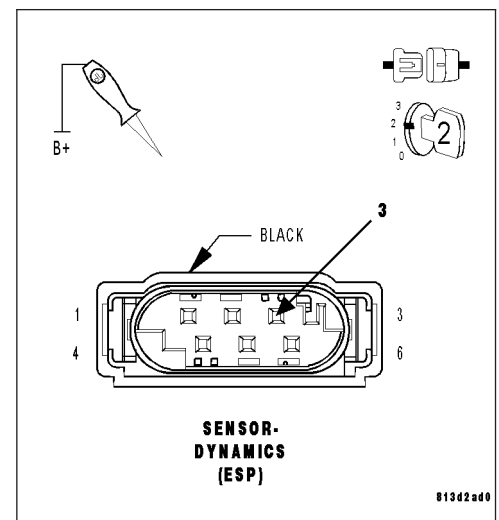
Using a 12-volt test light connected to 12-volts, check the (G4) Dynamic Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (G4) Dynamic Sensor Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C2115-DYNAMICS SENSOR SUPPLY VOLTAGE HIGH (CONTINUED)****6. CHECK THE (G4) DYNAMICS SENSOR SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

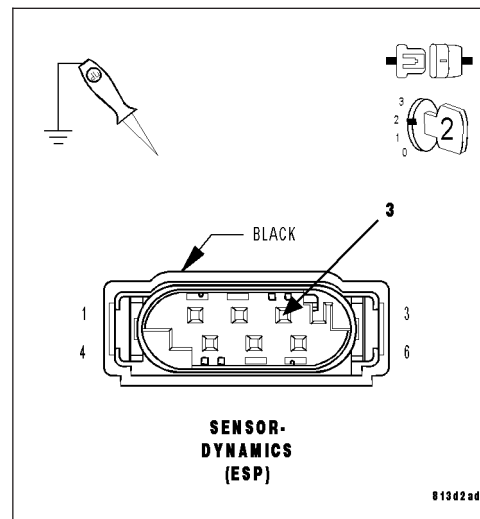
Using a 12-volt test light connected to ground, check the (G4) Dynamics Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (G4) Dynamics Sensor Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE RESISTANCE BETWEEN THE (G94) DYNAMICS SENSOR GROUND CIRCUIT AND GROUND**

Turn the ignition off.

Disconnect the Dynamics Sensor harness connector.

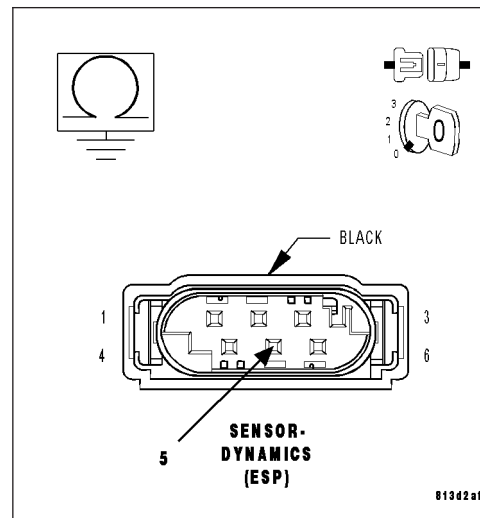
Measure the resistance between the (G94) Dynamics Sensor Ground Circuit and Ground.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Dynamics Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 8



**C2115-DYNAMICS SENSOR SUPPLY VOLTAGE HIGH (CONTINUED)****8. CHECK THE (G94) DYNAMICS SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

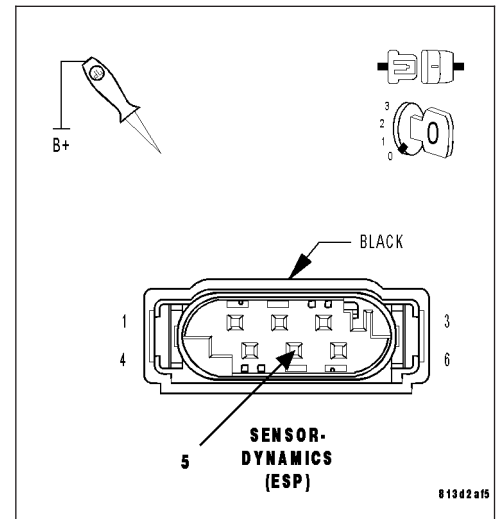
Using a 12-volt test light connected to 12-volts, check the (G94) Dynamics Sensor Ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (G94) Dynamics Sensor Ground circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. CHECK THE (G94) DYNAMICS SENSOR GROUND CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

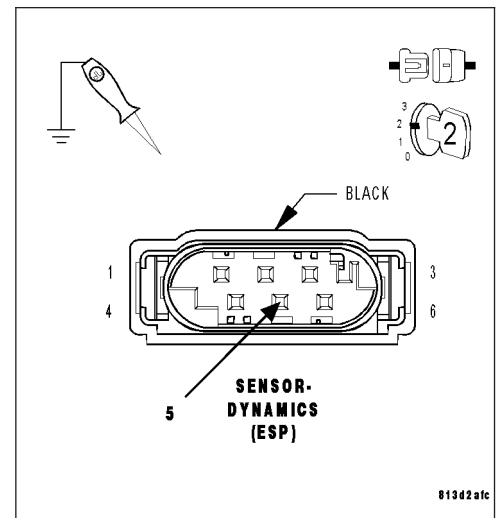
Using a 12-volt test light connected to ground, check the (G94) Dynamics Sensor Ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (G94) Dynamics Sensor Ground circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C2115-DYNAMICS SENSOR SUPPLY VOLTAGE HIGH (CONTINUED)****10. CHECK THE (G94) DYNAMICS SENSOR GROUND CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

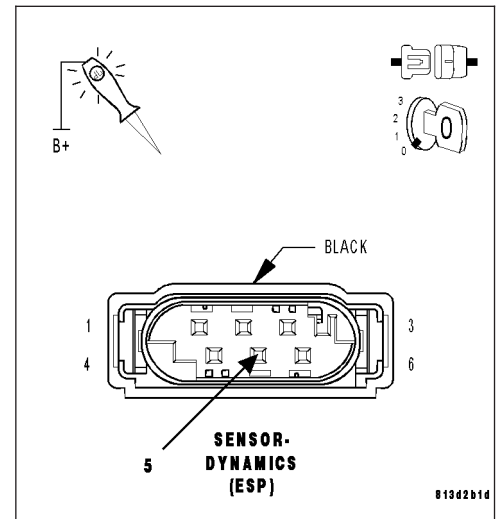
Disconnect the Dynamics Sensor harness connector.

Connect a jumper wire between the (G94) Dynamics Sensor Ground circuit and ground.

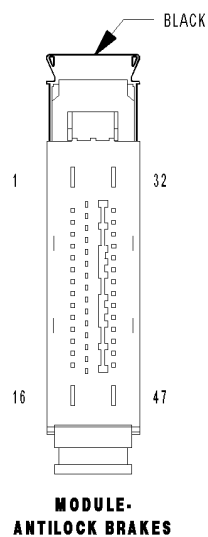
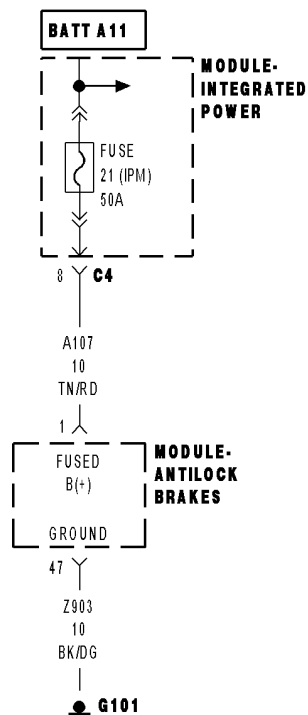
Using a 12-volt test light connected to 12-volts, check the (G94) Dynamics Sensor Ground circuit

**Does the test light illuminate brightly?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (G94) Dynamics Sensor Ground circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



## C2116-ABS PUMP MOTOR SUPPLY LOW VOLTAGE



**C2116-ABS PUMP MOTOR SUPPLY LOW VOLTAGE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module indicates the ABS Pump Motor circuit fails the diagnostic test.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE ABS PUMP MOTOR FUSE OPEN (A107) FUSED B(+) CIRCUIT SHORTED TO GROUND OR OPEN (Z907) GROUND CIRCUIT OPEN ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C2116-ABS PUMP MOTOR SUPPLY LOW VOLTAGE**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

**CAUTION:** Ensure braking capability is available before road testing.

Drive the vehicle over 40 Km/h (25 mph).

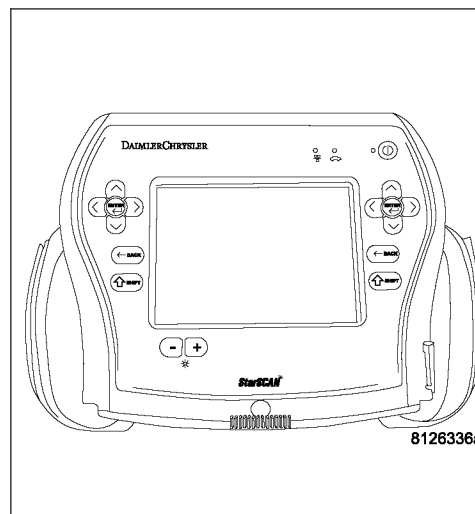
Park the vehicle and cycle the ignition switch from off to on.

With the scan tool, read and record DTC's

**Does the scan tool display: C2116-ABS PUMP MOTOR SUPPLY LOW VOLTAGE?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.





**C2116-ABS PUMP MOTOR SUPPLY LOW VOLTAGE (CONTINUED)****2. CHECK ABS PUMP OPERATION WITH SCAN TOOL**

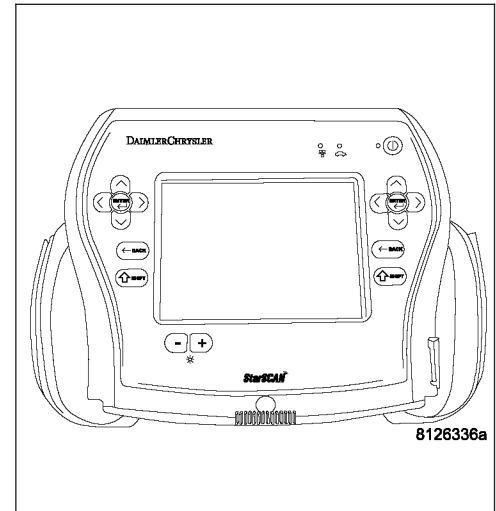
Cycle the ignition from off to on.

With the scan tool, actuate the ABS Pump Motor.

**Did the ABS Pump Motor operate?**

**Yes** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.

**No** >> Go To 3

**3. CHECK THE ABS PUMP MOTOR FUSE FOR AN OPEN**

Turn the ignition off.

Remove and visually inspect the ABS Pump Motor fuse.

**Is the ABS Pump Motor fuse open?**

**Yes** >> Go To 4

**No** >> Go To 5

**4. CHECK THE (A107) FUSED B(+) FOR A SHORT TO GROUND**

Turn the ignition off.

Visually inspect the (A107) Fused B(+) circuit in the wiring harness.

Look for any signs of intermittent short to ground.

**Is the wiring harness OK?**

**Yes** >> Go To 5

**No** >> Repair the (A107) Fused B(+) circuit for a short to ground.  
Perform ABS VERIFICATION TEST - VER 1.

**C2116-ABS PUMP MOTOR SUPPLY LOW VOLTAGE (CONTINUED)****5. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

Turn the ignition off.

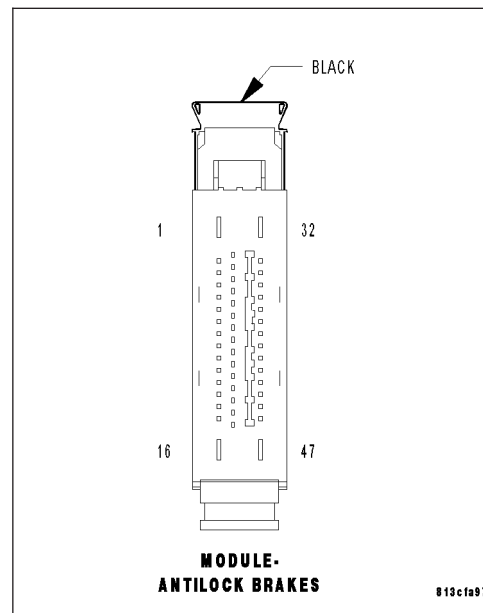
Visually inspect the Anti-Lock Brake Module harness connector and (A107) Fused B(+) circuit in the wiring harness for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6

**6. CHECK THE VOLTAGE ON THE (A107) FUSED B(+) CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

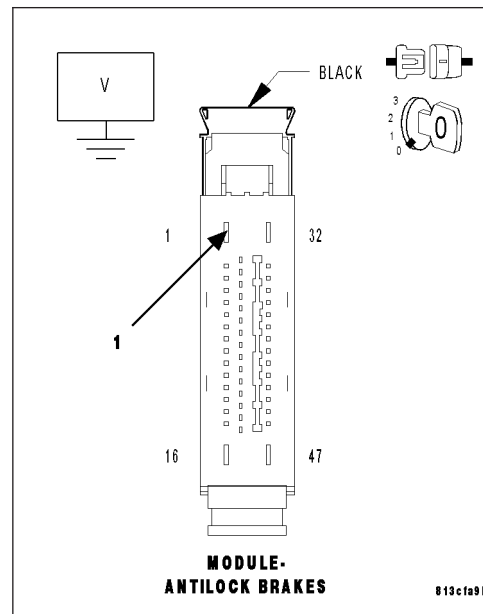
Measure the voltage of the (A107) Fused B(+) circuit in the Anti-Lock Brake Module harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 7

**No** >> Repair the (A107) Fused B(+) circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C2116-ABS PUMP MOTOR SUPPLY LOW VOLTAGE (CONTINUED)****7. CHECK THE (Z903) GROUND CIRCUIT FOR AN OPEN**

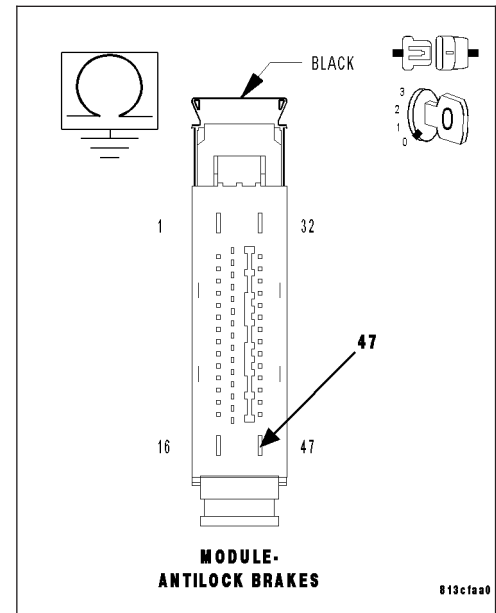
Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

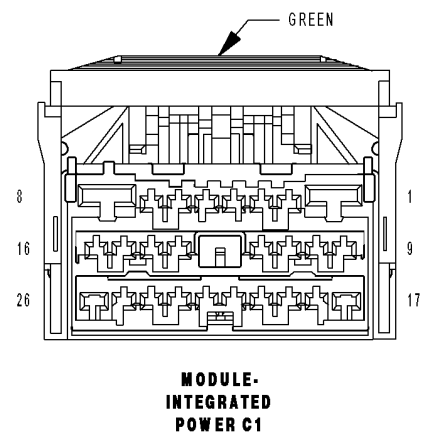
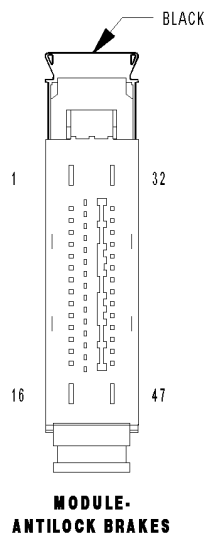
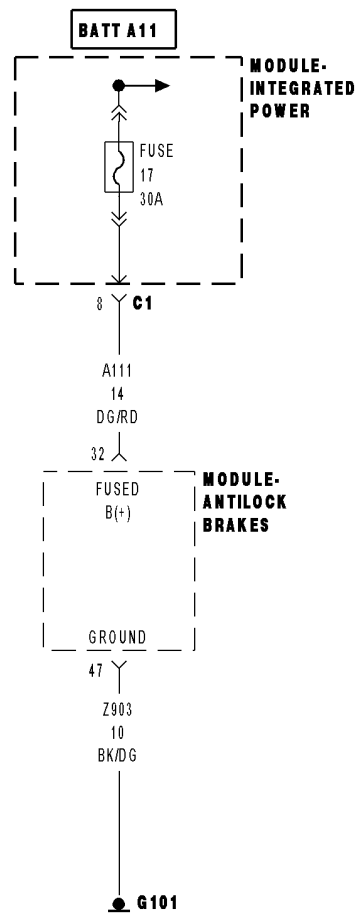
Measure the resistance of the (Z903) Ground circuit between the Anti-Lock Brake Module harness connector and ground

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (Z903) Ground circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



## C2200-ANTI-LOCK BRAKE MODULE INTERNAL



C2200-ANTI-LOCK BRAKE MODULE INTERNAL (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module fails the diagnostic test.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE (A111) FUSED B(+) CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN (Z903) GROUND CIRCUIT OPEN ANTI-LOCK BRAKE MODULE

Diagnostic Test

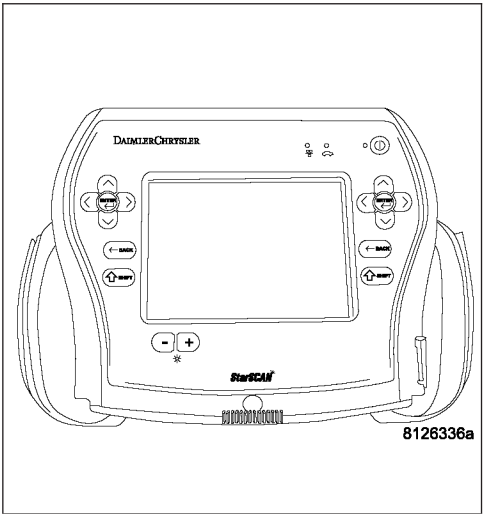
1. CHECK FOR A DTC C2200-ANTI-LOCK BRAKE MODULE INTERNAL

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's

**Does the scan tool display: C2200-ANTI-LOCK BRAKE MODULE INTERNAL?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C2200-ANTI-LOCK BRAKE MODULE INTERNAL (CONTINUED)****2. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

Visually inspect the related wiring harness. Look for any bruised, chafed, pierced, or partially broken wires.

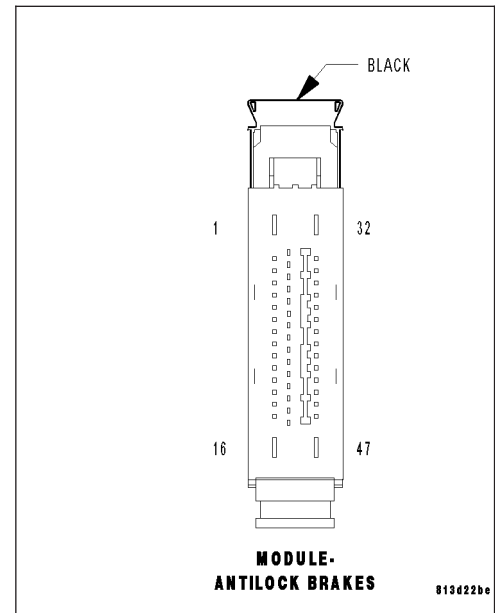
Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE ON THE (A111) FUSED B(+) CIRCUIT**

Turn the ignition off.

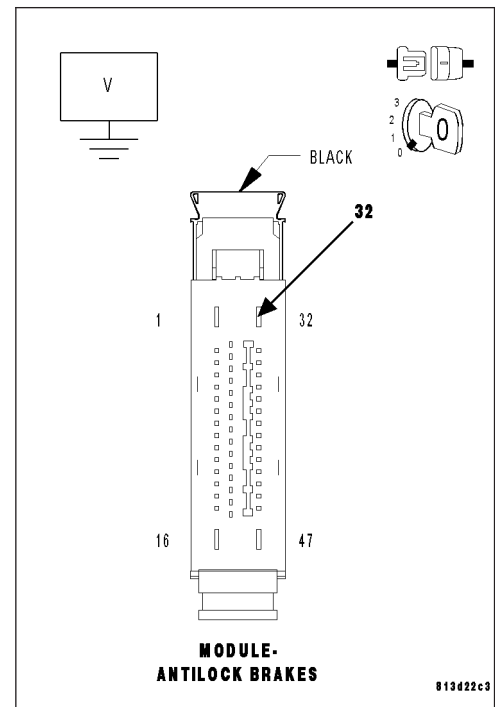
Disconnect the Anti-Lock Brake Module harness connector.

Measure the voltage of the (A111) Fused B(+) circuit in the Anti-Lock Brake Module harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 7

**No** >> Go To 4



**C2200-ANTI-LOCK BRAKE MODULE INTERNAL (CONTINUED)****4. CHECK THE (A111) FUSED B(+) CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

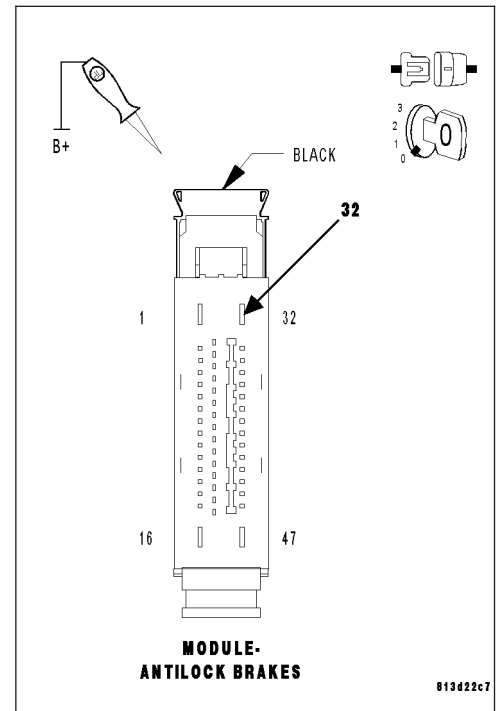
Disconnect the Anti-Lock Brake Module harness connector.

Using a 12-volt test light connected to 12-volts, check the (A111) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (A111) Fused B(+) circuit for a short to ground.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (A111) FUSED B(+) CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

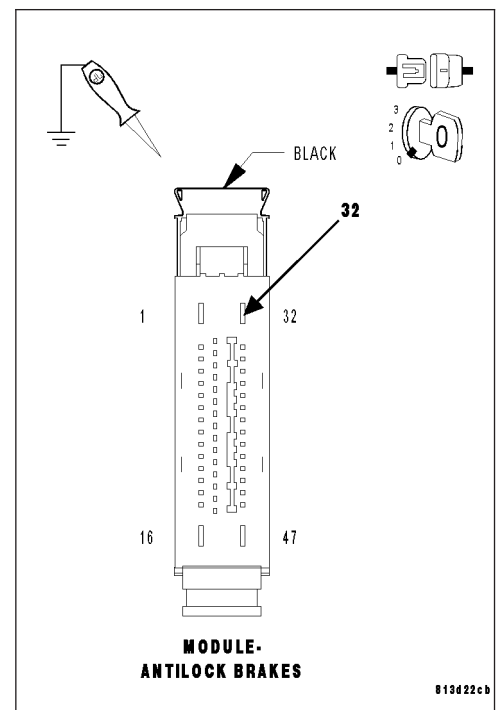
Disconnect the Anti-Lock Brake Module harness connector.

Using a 12-volt test light connected to ground, check the (A111) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (A111) Fused B(+) circuit for a short to voltage.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C2200-ANTI-LOCK BRAKE MODULE INTERNAL (CONTINUED)****6. CHECK THE (A111) FUSED B(+) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Remove the Anti-Lock Brake Module Fused B(+) fuse.

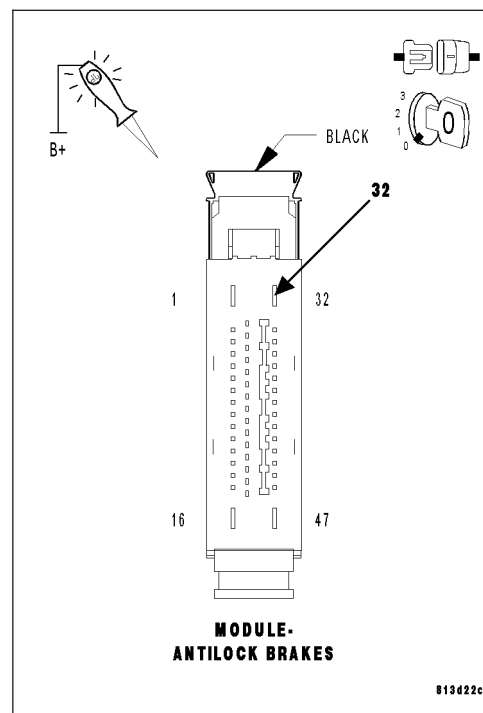
Disconnect the Anti-Lock Brake Module harness connector.

Connect a jumper wire between the (A111) Fused B(+) circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (A111) Fused B(+) circuit.

**Does the test light illuminate brightly?**

- Yes** >> Replace the Integrated Power Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (A111) Fused B(+) circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**7. CHECK THE (Z903) GROUND CIRCUIT FOR AN OPEN**

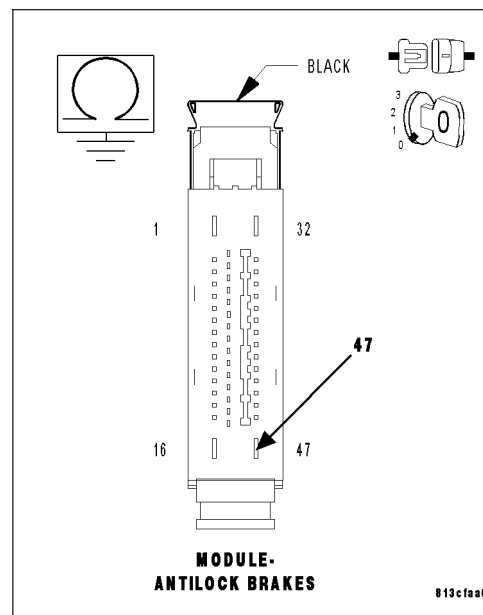
Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Measure the resistance between the (Z903) Ground circuit and ground.

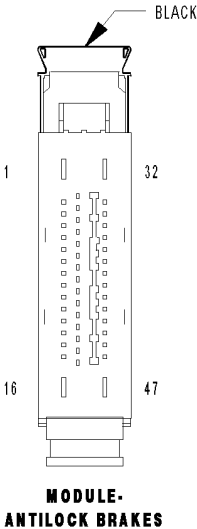
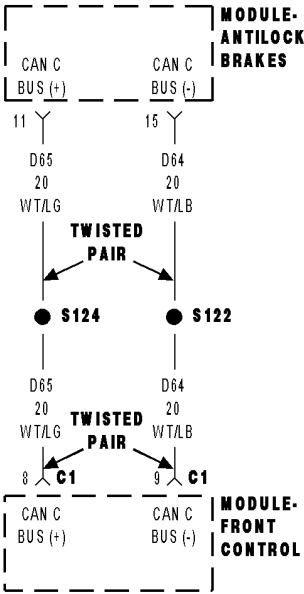
**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (Z903) Ground circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.





C2202-ORIGINAL VIN MISMATCH/MISSING



**C2202-ORIGINAL VIN MISMATCH/MISSING (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module fails the diagnostic test.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE (D65) CAN C (+) BUS CIRCUIT AND (D64) CAN C (-) BUS CIRCUIT SHORTED TOGETHER (D65) CAN C (+) BUS CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN (D64) CAN C (-) BUS CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C2202-ORIGINAL VIN MISMATCH/MISSING**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

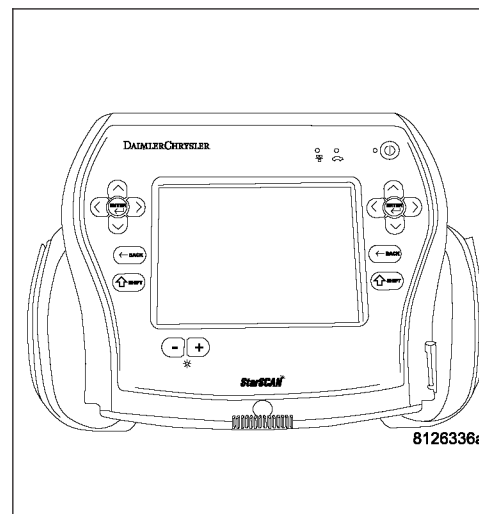
Cycle the ignition switch from off to on.

With the scan tool, read and record DTC's

**Does the scan tool display: C2202-ORIGINAL VIN MISMATCH/MISSING?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C2202-ORIGINAL VIN MISMATCH/MISSING (CONTINUED)****2. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

Visually inspect the related wiring harness. Look for any bruised, chafed, pierced, or partially broken wires.

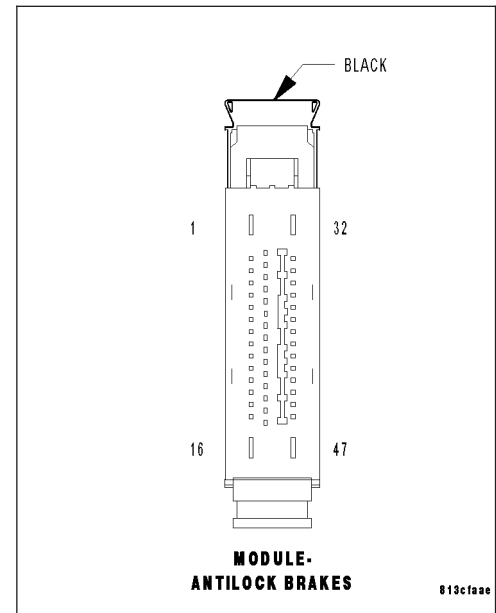
Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (D65) CAN C (+) BUS CIRCUIT AND (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

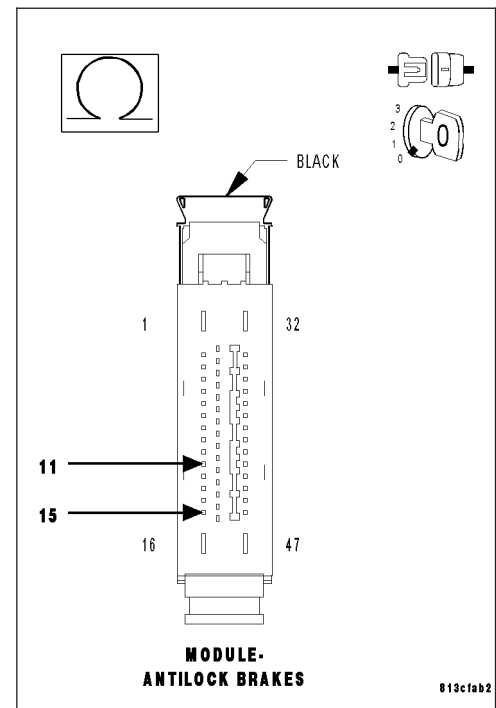
Measure the resistance between the (D65) CAN C (+) BUS circuit and the (D64) CAN C (-) BUS circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit and the (D64) CAN C (-) BUS circuit for a short together.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 4



**C2202-ORIGINAL VIN MISMATCH/MISSING (CONTINUED)****4. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Front Control Module harness connector.

Turn the ignition on.

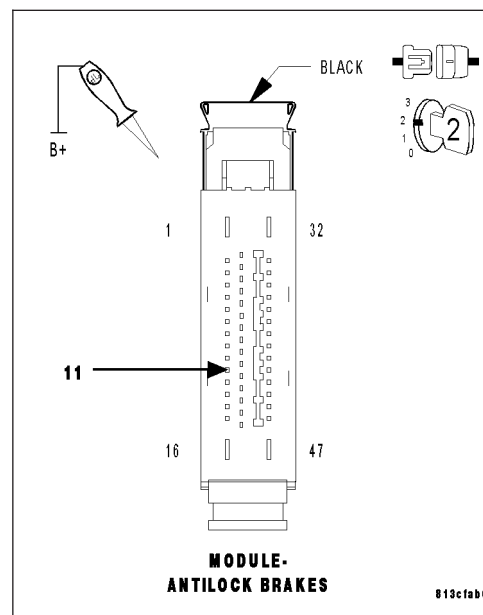
Using a 12-volt test light connected to 12-volts, check the (D65) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Front Control Module harness connector.

Turn the ignition on.

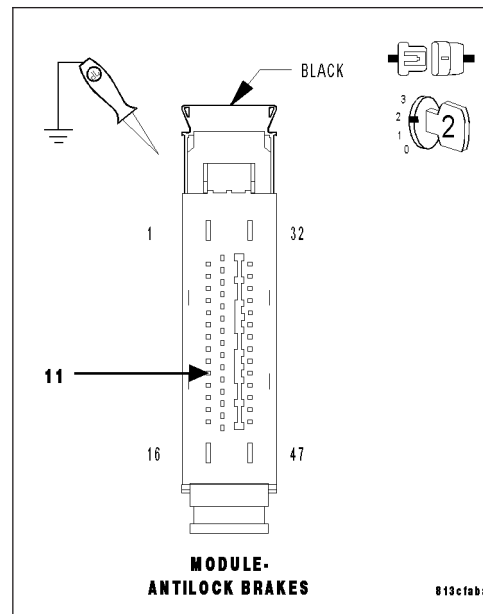
Using a 12-volt test light connected to ground, check the (D65) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C2202-ORIGINAL VIN MISMATCH/MISSING (CONTINUED)****6. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR AN OPEN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Front Control Module harness connector.

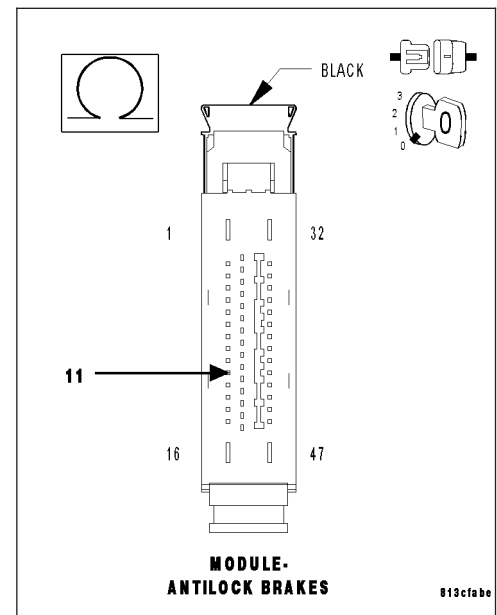
Measure the resistance of the (D65) CAN C (+) Bus circuit between the Anti-lock Brake Module and the Front Control Module.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the (D65) CAN C (+) BUS circuit for an open circuit.

Perform ABS VERIFICATION TEST - VER 1.

**7. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Front Control Module harness connector.

Turn the ignition on.

Using a 12-volt test light connected to 12-volts, check the (D64) CAN C (-) BUS circuit.

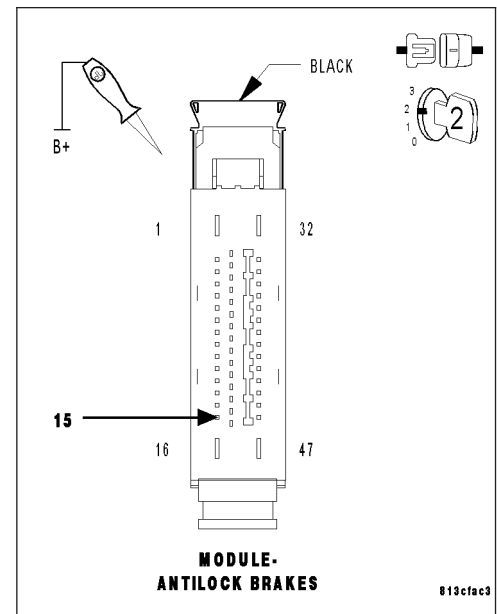
**Does the test light illuminate brightly?**

**Yes** >> Repair the (D64) CAN C (-) BUS circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 8

Perform ABS VERIFICATION TEST - VER 1.



**C2202-ORIGINAL VIN MISMATCH/MISSING (CONTINUED)****8. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Front Control Module harness connector.

Turn the ignition on.

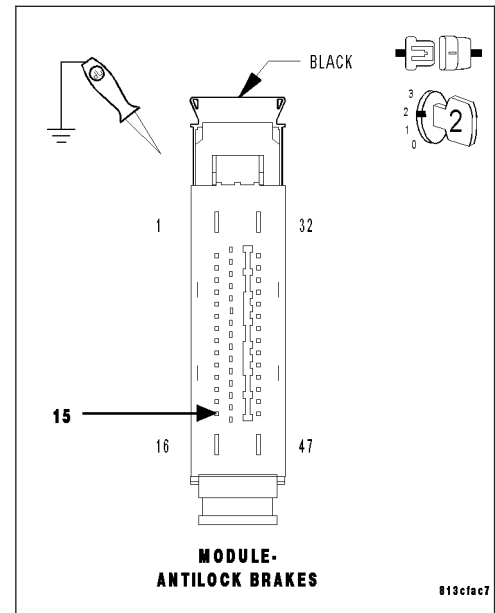
Using a 12-volt test light connected to ground, check the (D64) CAN C (-) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D64) CAN C (-) BUS circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR AN OPEN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Front Control Module harness connector.

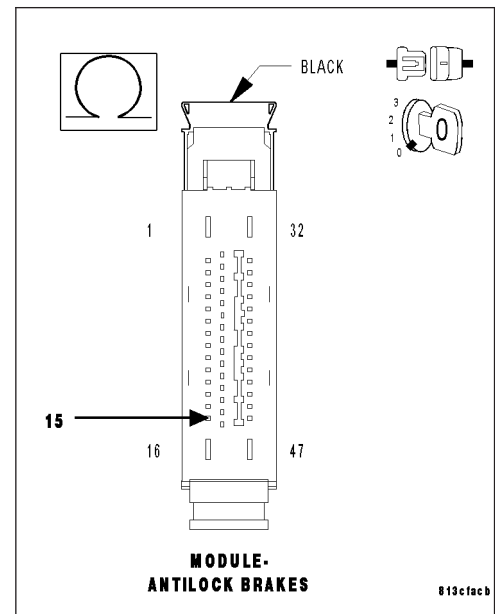
Measure the resistance of the (D64) CAN C (-) Bus circuit between the Anti-lock Brake Module and the Front Control Module.

**Is the resistance below 5.0 ohms?**

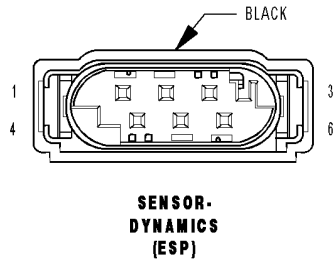
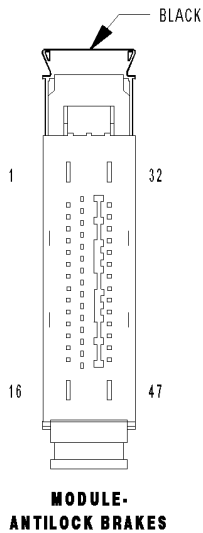
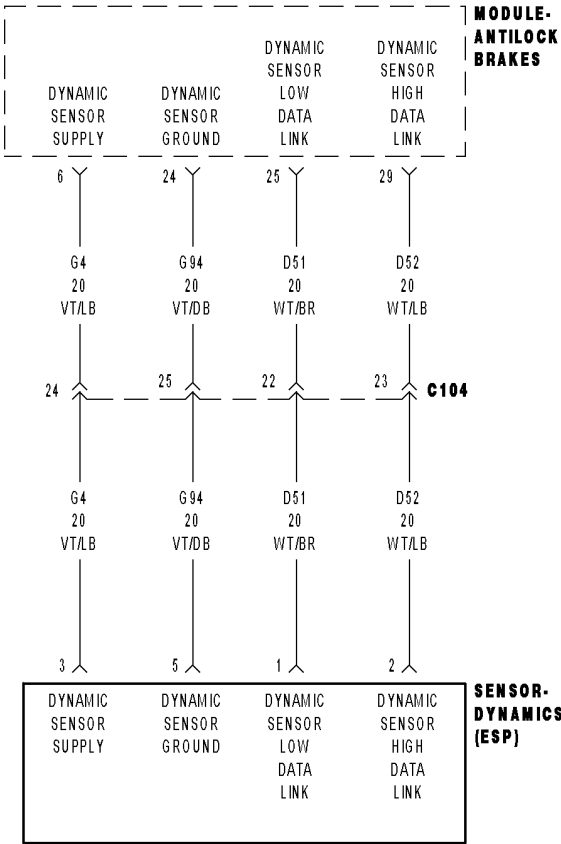
**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (D64) CAN C (-) BUS circuit for an open circuit. Perform ABS VERIFICATION TEST - VER 1.



C2204-DYNAMICS SENSOR INTERNAL



**C2204-DYNAMICS SENSOR INTERNAL (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module fails the diagnostic test.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE (G4) DYNAMICS SENSOR SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (G94) DYNAMICS SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (D52) DYNAMICS SENSOR HIGH DATALINK CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (D51) DYNAMICS SENSOR LOW DATALINK CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN DYNAMICS SENSOR ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK FOR A DTC C2204-DYNAMICS SENSOR INTERNAL**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

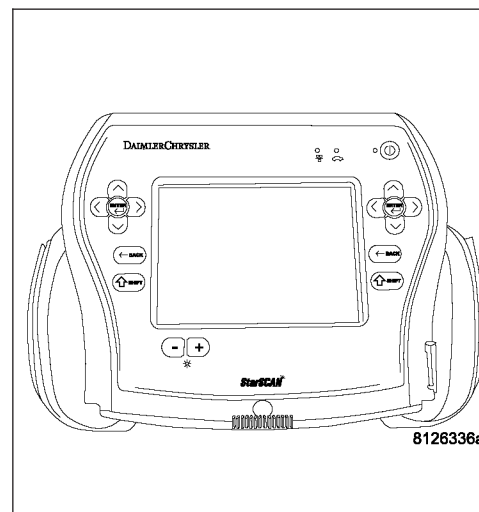
Test drive the vehicle.

With the scan tool, read and record DTC's

**Does the scan tool display: C2204-DYNAMICS SENSOR INTERNAL?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.





**C2204-DYNAMICS SENSOR INTERNAL (CONTINUED)****2. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

Check the Dynamics Sensor installation and torque of the mounting bolts.

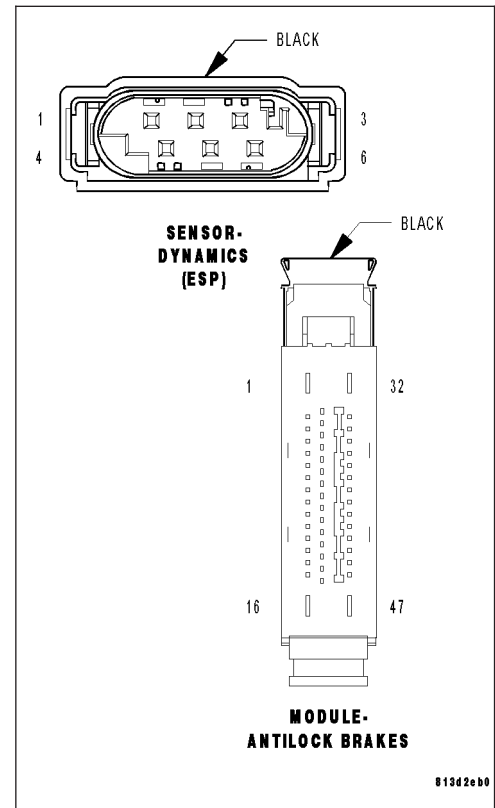
Visually inspect the related wiring harness. Look for any bruised, chafed, pierced, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE VOLTAGE ON THE (G4) DYNAMICS SENSOR SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Dynamics Sensor harness connector.

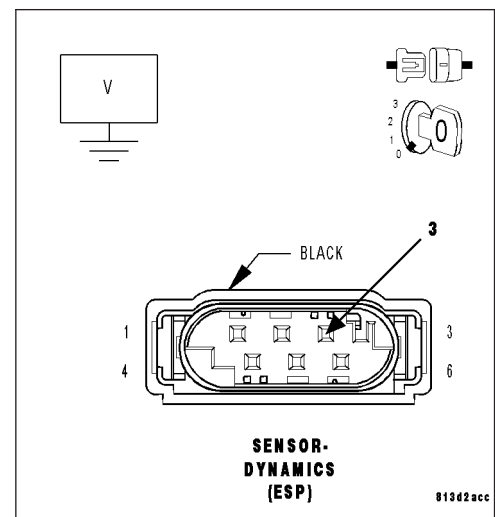
Turn the ignition on.

Measure the voltage of the (G4) Dynamics Sensor Supply Circuit.

**Is the voltage above 10 volts?**

**Yes** >> Go To 7

**No** >> Go To 4



**C2204-DYNAMICS SENSOR INTERNAL (CONTINUED)****4. CHECK THE (G4) DYNAMICS SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

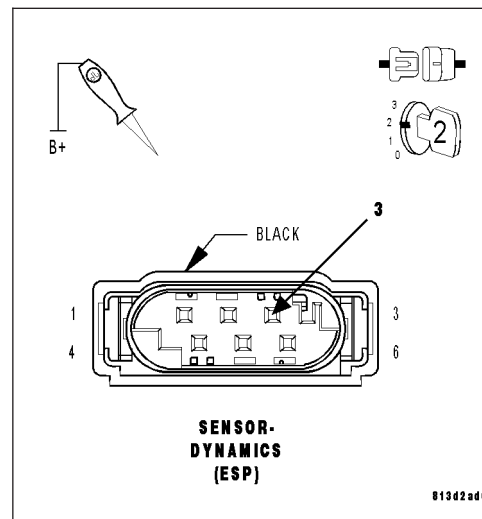
Using a 12-volt test light connected to 12-volts, check the (G4) Dynamics Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (G4) Dynamics Sensor Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (G4) DYNAMICS SENSOR SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

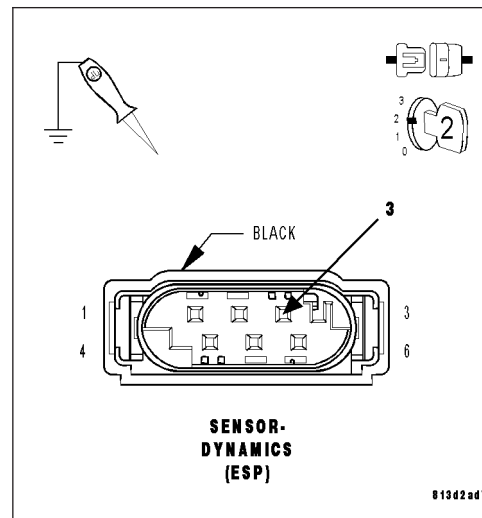
Using a 12-volt test light connected to ground, check the (G4) Dynamics Sensor Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (G4) Dynamics Sensor Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C2204-DYNAMICS SENSOR INTERNAL (CONTINUED)****6. CHECK THE (G4) DYNAMICS SENSOR SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

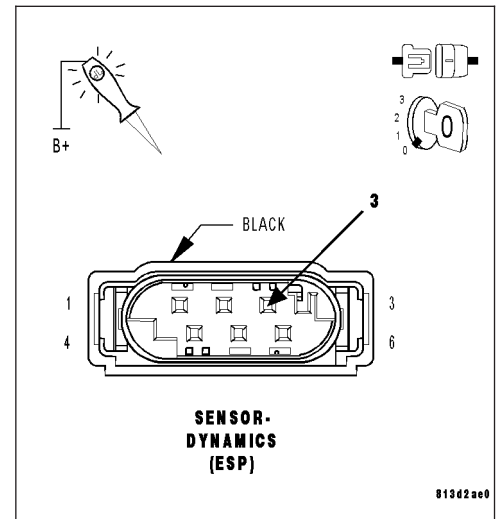
Disconnect the Dynamics Sensor harness connector.

Connect a jumper wire between the (G4) Dynamics Sensor Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (G4) Dynamics Sensor Supply circuit

**Does the test light illuminate brightly?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (G4) Dynamics Sensor Supply circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**7. CHECK THE RESISTANCE BETWEEN THE (G94) DYNAMICS SENSOR GROUND CIRCUIT AND GROUND**

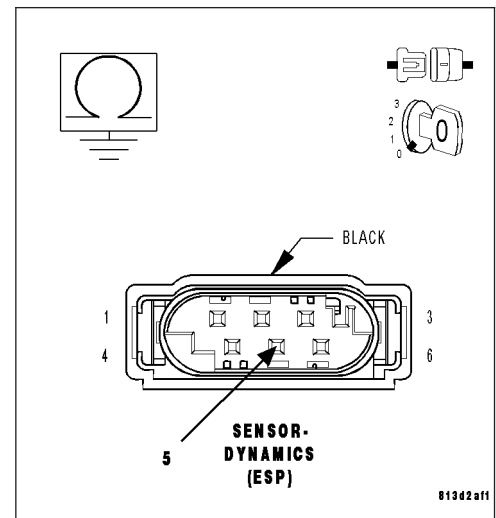
Turn the ignition off.

Disconnect the Dynamics Sensor harness connector.

Measure the resistance between the (G94) Dynamics Sensor Ground Circuit and Ground.

**Is the resistance below 5.0 ohm?**

- Yes** >> Go To 11
- No** >> Go To 8



**C2204-DYNAMICS SENSOR INTERNAL (CONTINUED)****8. CHECK THE (G94) DYNAMICS SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

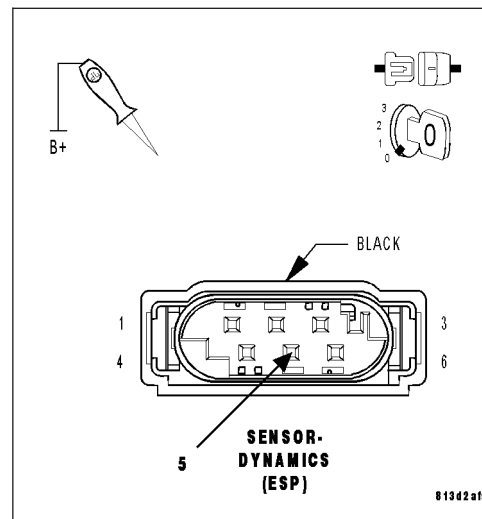
Using a 12-volt test light connected to 12-volts, check the (G94) Dynamics Sensor Ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (G94) Dynamics Sensor Ground circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. CHECK THE (G94) DYNAMICS SENSOR GROUND CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

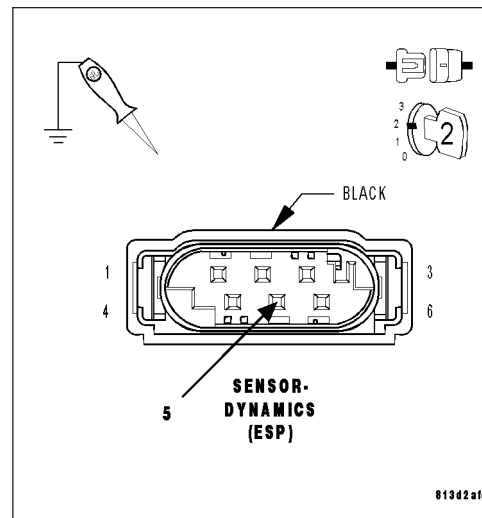
Using a 12-volt test light connected to ground, check the (G94) Dynamics Sensor Ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (G94) Dynamics Sensor Ground circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C2204-DYNAMICS SENSOR INTERNAL (CONTINUED)****10. CHECK THE (G94) DYNAMICS SENSOR GROUND CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

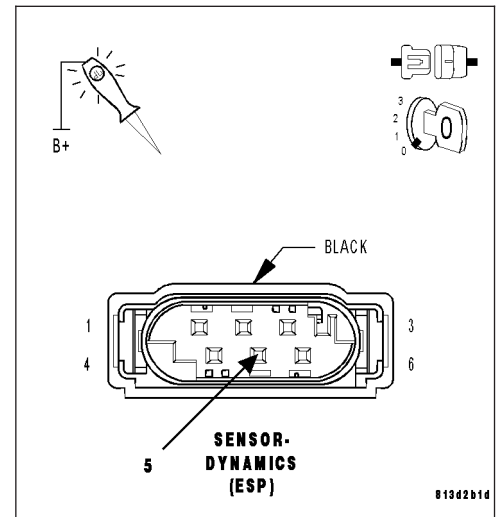
Disconnect the Dynamics Sensor harness connector.

Connect a jumper wire between the (G94) Dynamic Sensor Ground circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (G94) Dynamics Sensor Return circuit

**Does the test light illuminate brightly?**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (G94) Dynamics Sensor Ground circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

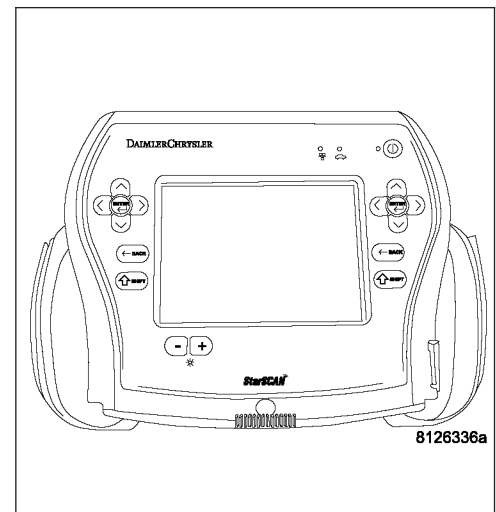
**11. CHECK THE DYNAMICS SENSOR OUTPUT**

**CAUTION:** Ensure brake capability is available before road testing.

Have an assistant test drive the vehicle while monitoring the Dynamics Sensor operation.

**Was the Lateral Sensor output between 0.02 G to 0.16 G and the Yaw Sensor between 1.30° to 5.70°**

- Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 12



**C2204-DYNAMICS SENSOR INTERNAL (CONTINUED)****12. CHECK THE (D52) DYNAMICS SENSOR HIGH DATALINK CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

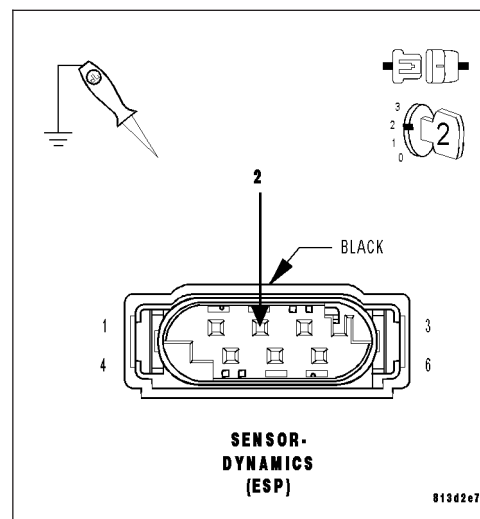
Using a 12-volt test light connected to ground, check the (D52) Dynamics Sensor High Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D52) Dynamics Sensor High Datalink circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (D52) DYNAMICS SENSOR HIGH DATALINK CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

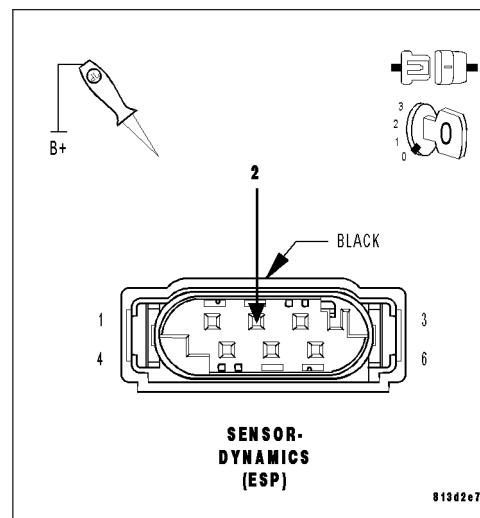
Using a 12-volt test light connected to 12-volts, check the (D52) Dynamics Sensor High Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D52) Dynamics Sensor High Datalink circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 14



**C2204-DYNAMICS SENSOR INTERNAL (CONTINUED)****14. CHECK THE (D52) DYNAMICS SENSOR HIGH DATALINK CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Connect a jumper wire between the (D52) Dynamics Sensor High Datalink circuit and ground.

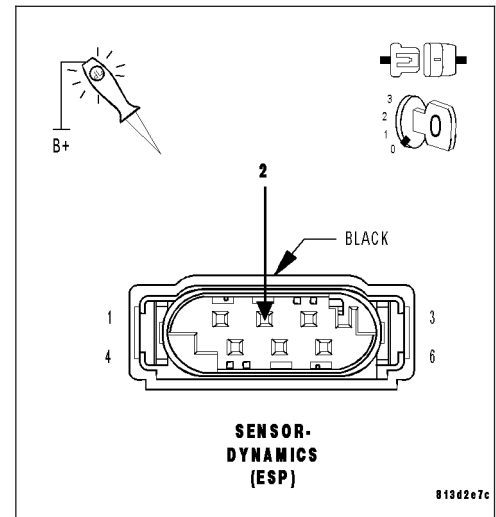
Using a 12-volt test light connected to 12-volts, check the (D52) Dynamics Sensor High Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 15

**No** >> Repair the (D52) Dynamics Sensor High Datalink circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.

**15. CHECK THE (D51) DYNAMICS SENSOR LOW DATALINK CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

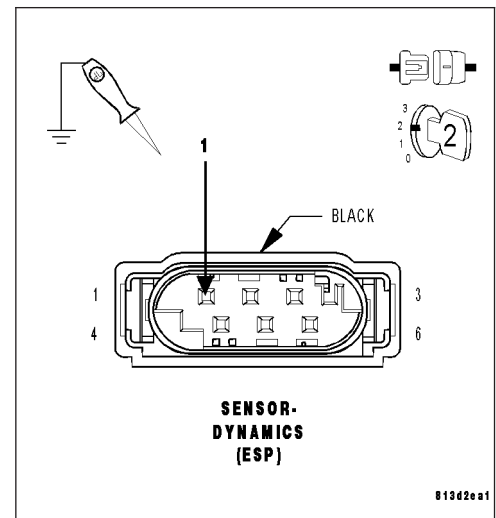
Using a 12-volt test light connected to ground, check the (D51) Dynamics Sensor Low Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D51) Dynamics Sensor Low Datalink circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 16



**C2204-DYNAMICS SENSOR INTERNAL (CONTINUED)****16. CHECK THE (D51) DYNAMICS SENSOR LOW DATALINK CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

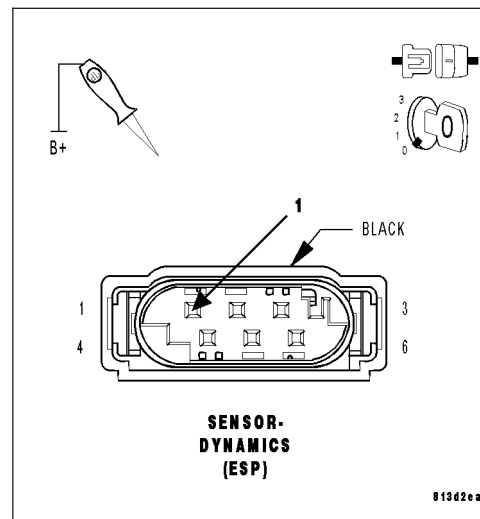
Using a 12-volt test light connected to 12-volts, check the (D51) Dynamics Sensor Low Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D51) Dynamics Sensor Low Datalink circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 17

**17. CHECK THE (D51) DYNAMICS SENSOR LOW DATALINK CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

Connect a jumper wire between the (D51) Dynamics Sensor Low Datalink circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (D51) Dynamics Sensor Low Datalink circuit.

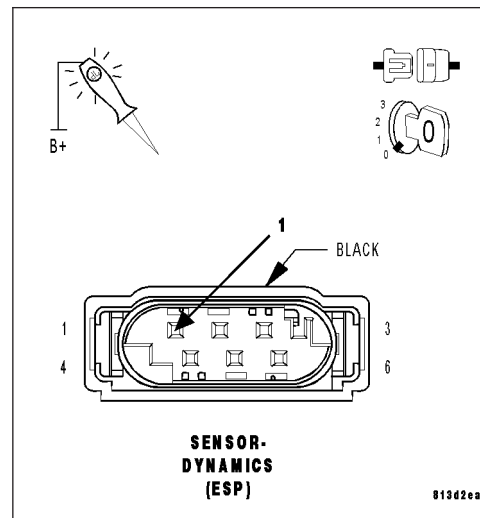
**Does the test light illuminate brightly?**

**Yes** >> Replace the Dynamics Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

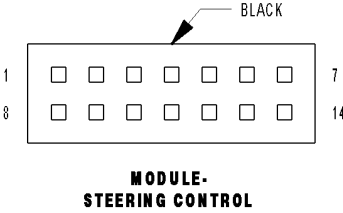
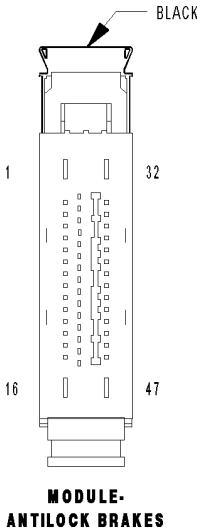
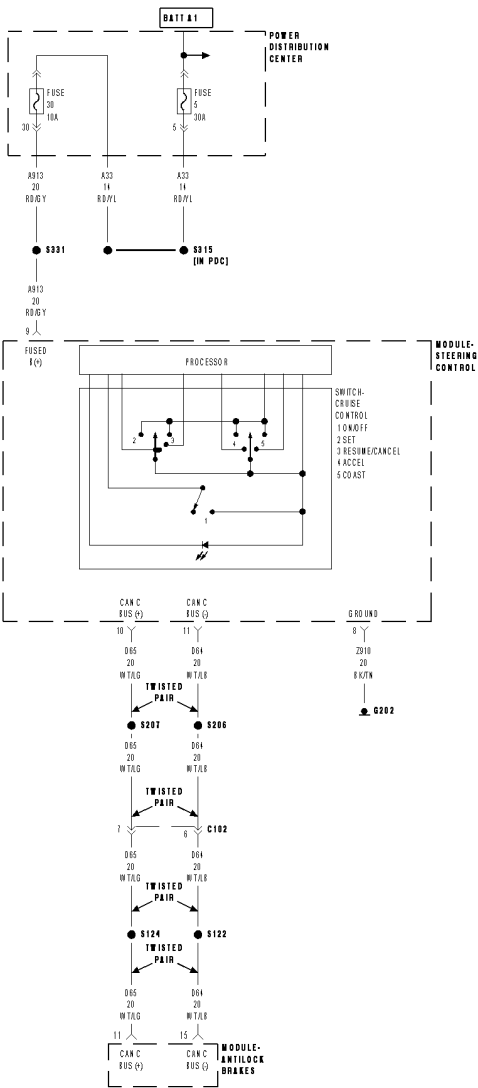
**No** >> Repair the (D51) Dynamics Sensor High Datalink circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.





C2205-STEERING ANGLE SENSOR INTERNAL



**C2205-STEERING ANGLE SENSOR INTERNAL (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects the Steering Angle Sensor has sent the internal failure status.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE (A913) FUSED B(+) CIRCUIT OPEN (Z910) GROUND CIRCUIT OPEN (D65) CAN C (+) BUS CIRCUIT AND (D64) CAN C (-) BUS CIRCUIT SHORTED TOGETHER (D65) CAN C (+) BUS CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN (D64) CAN C (-) BUS CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN STEERING CONTROL MODULE

**Diagnostic Test****1. CHECK FOR A DTC C2205-STEERING ANGLE SENSOR INTERNAL**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

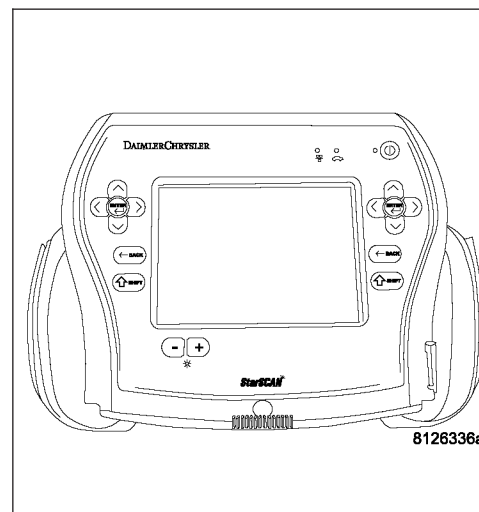
Cycle the ignition switch from off to on.

With the scan tool, read and record DTC's

**Does the scan tool display: C2205-STEERING ANGLE SENSOR INTERNAL?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



**C2205-STEERING ANGLE SENSOR INTERNAL (CONTINUED)****2. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

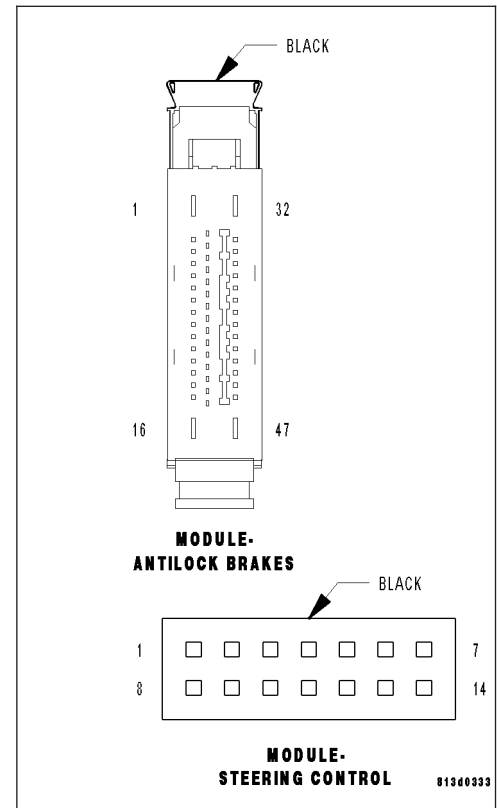
Check the Steering Angle Sensor installation.

Visually inspect the related wiring harness. Look for any bruised, chafed, pierced, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

- Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 3

**3. CHECK THE VOLTAGE OF THE STEERING CONTROL MODULE (A913) FUSED B(+) CIRCUIT**

Turn the ignition off.

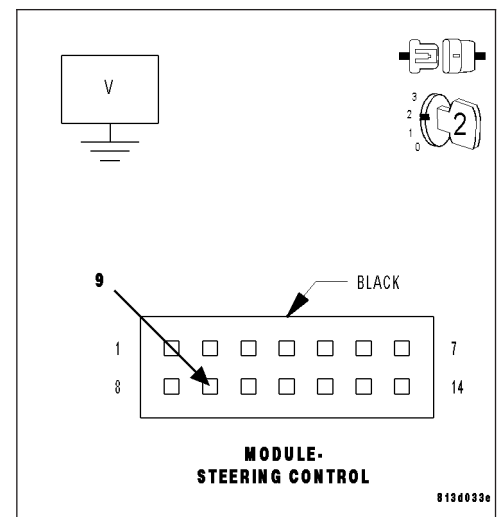
Disconnect the Steering Control Module harness connector.

Turn the ignition on.

Measure the voltage of the (A913) Fused B(+) circuit.

**Is the voltage above 10 volts?**

- Yes** >> Go To 4
- No** >> Repair the (A913) Fused B(+) circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



**C2205-STEERING ANGLE SENSOR INTERNAL (CONTINUED)****4. CHECK THE RESISTANCE OF THE STEERING CONTROL MODULE (Z910) GROUND CIRCUIT**

Turn the ignition off.

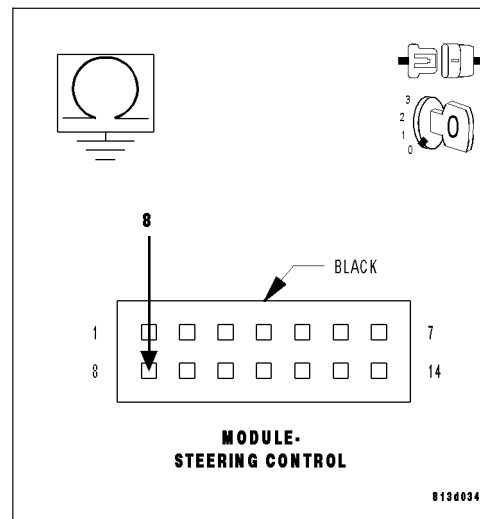
Disconnect the Steering Control Module harness connector.

Measure resistance between the (Z910) Ground circuit and ground.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the (Z910) Ground circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**5. CHECK THE (D65) CAN C (+) BUS CIRCUIT AND (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TOGETHER**

Turn the ignition off.

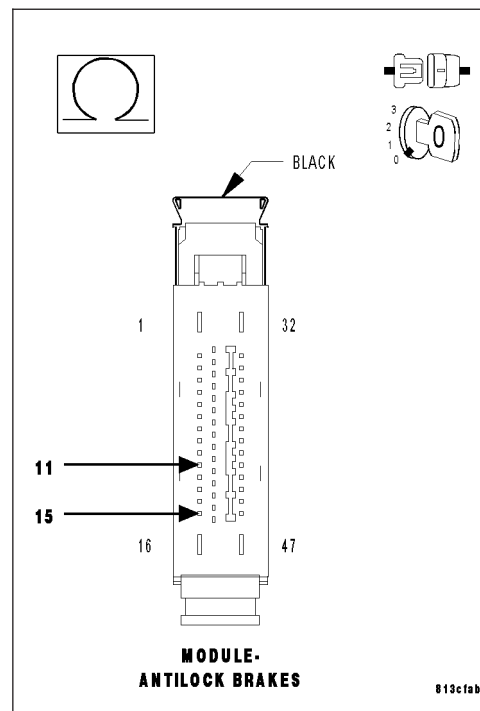
Disconnect the Anti-Lock Brake Module harness connector.

Measure the resistance between the (D65) CAN C (+) BUS circuit and the (D64) CAN C (-) BUS circuit.

**Is the resistance below 150 ohms?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit and the (D64) CAN C (-) BUS circuit for a short together.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C2205-STEERING ANGLE SENSOR INTERNAL (CONTINUED)****6. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Transmission Control Module harness connector.

Turn the ignition on.

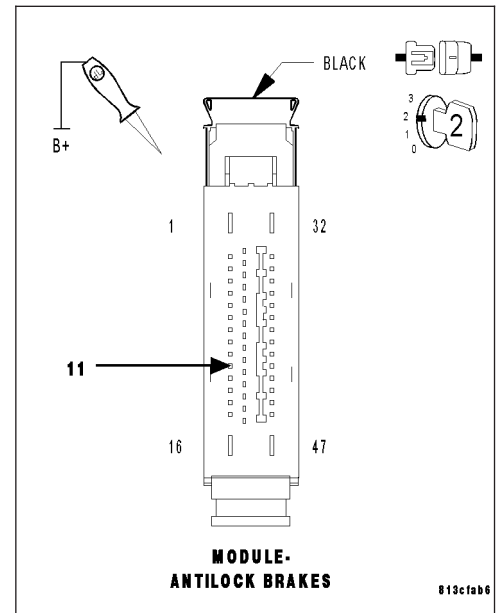
Using a 12-volt test light connected to 12-volts, check the (D65) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Transmission Control Module harness connector.

Turn the ignition on.

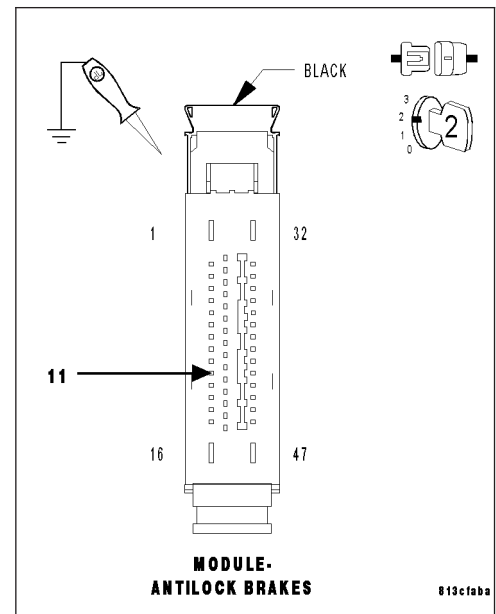
Using a 12-volt test light connected to ground, check the (D65) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 8



**C2205-STEERING ANGLE SENSOR INTERNAL (CONTINUED)****8. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR AN OPEN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Transmission Control Module harness connector.

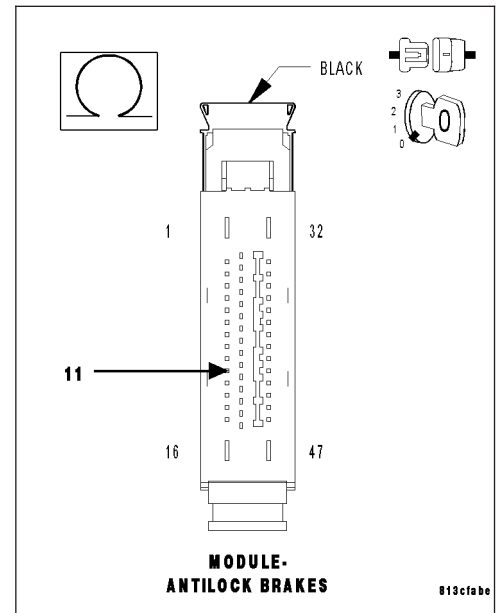
Measure the resistance of the (D65) CAN C (+) Bus circuit between the Anti-lock Brake Module and the Transmission Control Module.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the (D65) CAN C (+) BUS circuit for an open circuit.

Perform ABS VERIFICATION TEST - VER 1.

**9. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Transmission Control Module harness connector.

Turn the ignition on.

Using a 12-volt test light connected to 12-volts, check the (D64) CAN C (-) BUS circuit.

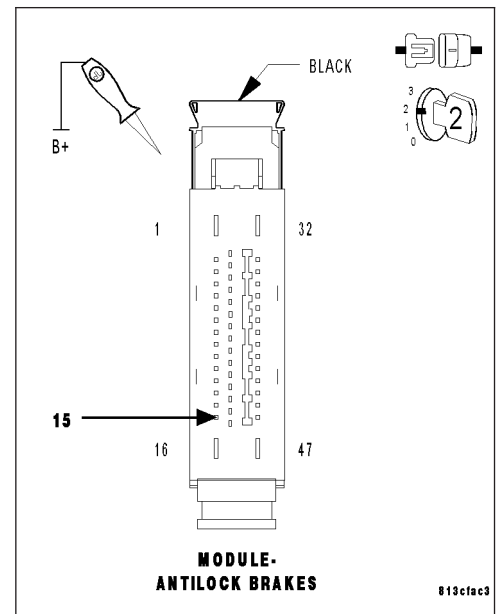
**Does the test light illuminate brightly?**

**Yes** >> Repair the (D64) CAN C (-) BUS circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10

Perform ABS VERIFICATION TEST - VER 1.



**C2205-STEERING ANGLE SENSOR INTERNAL (CONTINUED)****10. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Transmission Control Module harness connector.

Turn the ignition on.

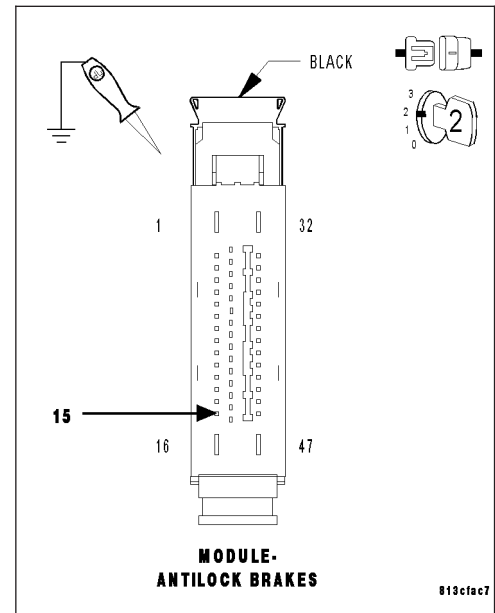
Using a 12-volt test light connected to ground, check the (D64) CAN C (-) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D64) CAN C (-) BUS circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR AN OPEN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Transmission Control Module harness connector.

Measure the resistance of the (D64) CAN C (-) Bus circuit between the Anti-lock Brake Module and the Transmission Control Module.

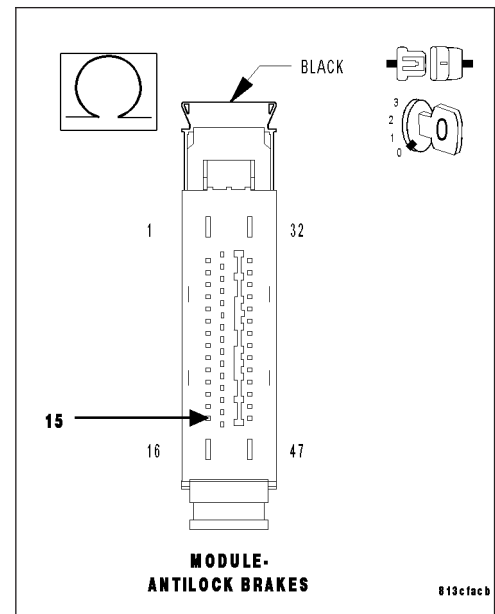
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Steering Control Module in accordance with the Service Information.

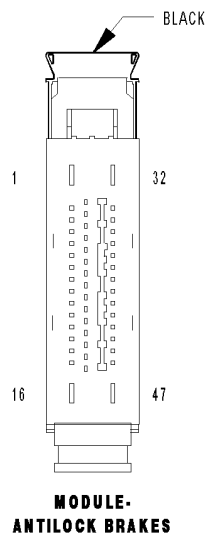
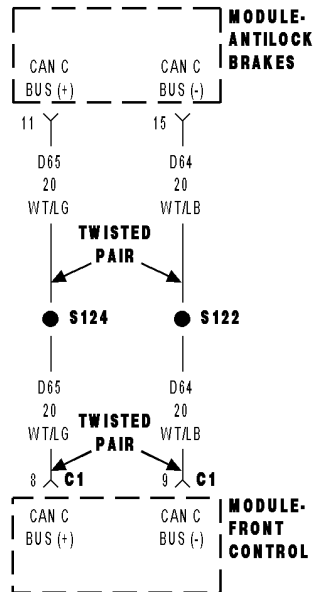
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (D64) CAN C (-) BUS circuit for an open circuit.

Perform ABS VERIFICATION TEST - VER 1.



## C2206-VEHICLE CONFIGURATION MISMATCH





C2206-VEHICLE CONFIGURATION MISMATCH (CONTINUED)

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects the signal from the gateway module relevant for vehicle character-  
istic is missing for a period greater than the specified fault duration.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE (D65) CAN C (+) BUS CIRCUIT AND (D64) CAN C (-) BUS CIRCUIT SHORTED TOGETHER (D65) CAN C (+) BUS CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN (D64) CAN C (-) BUS CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN ANTI-LOCK BRAKE MODULE

Diagnostic Test

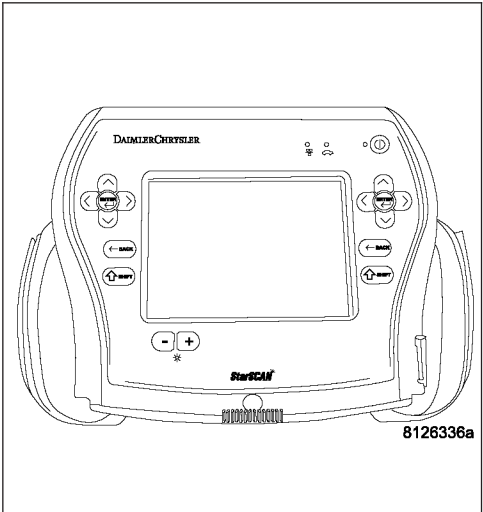
1. CHECK FOR A DTC C2206-VEHICLE CONFIGURATION MISMATCH

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's

**Does the scan tool display: C2206-VEHICLE CONFIGURATION MISMATCH?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.



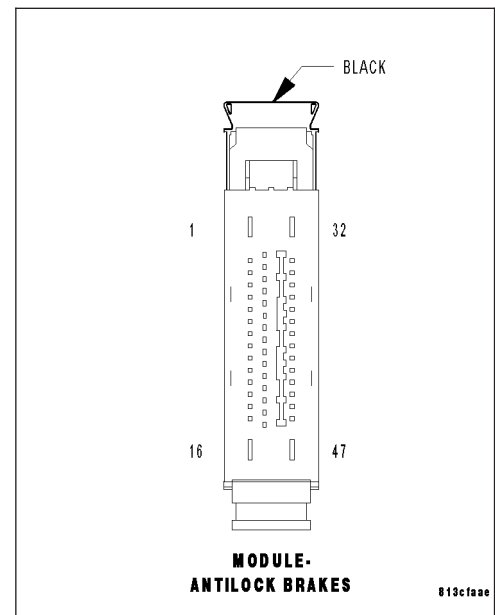
**C2206-VEHICLE CONFIGURATION MISMATCH (CONTINUED)****2. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

Visually inspect the related wiring harness. Look for any bruised, chafed, pierced, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

- Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 3

**3. CHECK THE (D65) CAN C (+) BUS CIRCUIT AND (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TOGETHER**

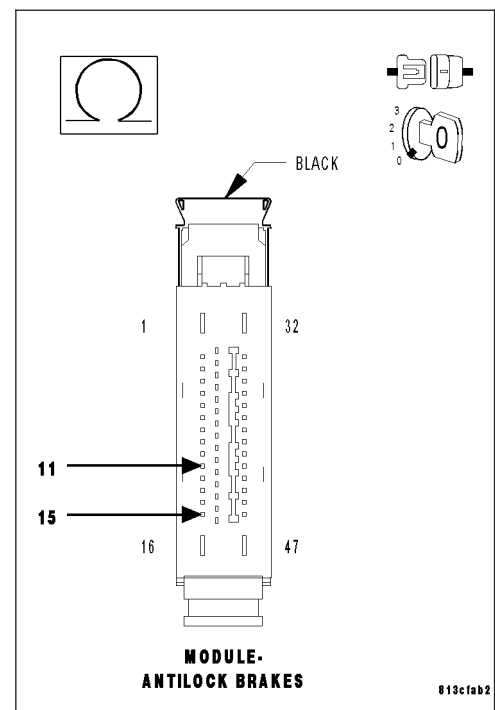
Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Measure the resistance between the (D65) CAN C (+) BUS circuit and the (D64) CAN C (-) BUS circuit.

**Is the resistance below 150 ohms?**

- Yes** >> Repair the (D65) CAN C (+) BUS circuit and the (D64) CAN C (-) BUS circuit for a short together.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Go To 4



**C2206-VEHICLE CONFIGURATION MISMATCH (CONTINUED)****4. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Powertrain Control Module harness connector.

Turn the ignition on.

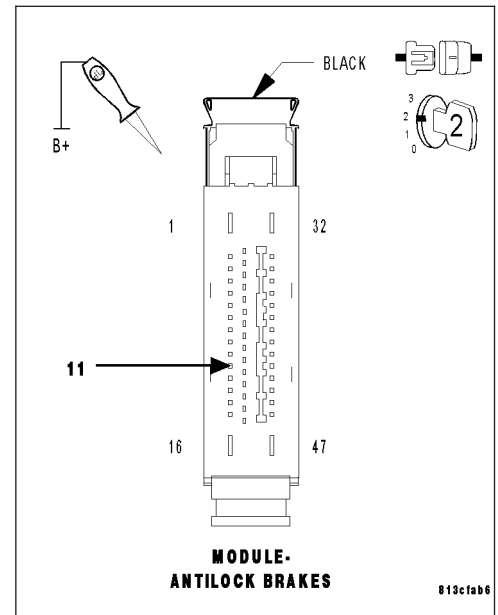
Using a 12-volt test light connected to 12-volts, check the (D65) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Powertrain Control Module harness connector.

Turn the ignition on.

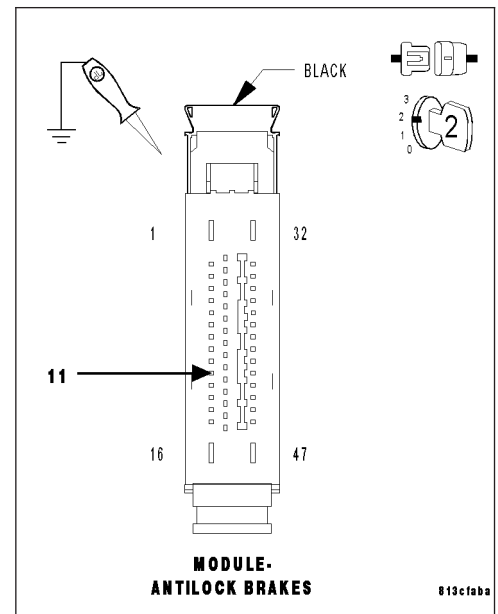
Using a 12-volt test light connected to ground, check the (D65) CAN C (+) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D65) CAN C (+) BUS circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C2206-VEHICLE CONFIGURATION MISMATCH (CONTINUED)****6. CHECK THE (D65) CAN C (+) BUS CIRCUIT FOR AN OPEN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Powertrain Control Module harness connector.

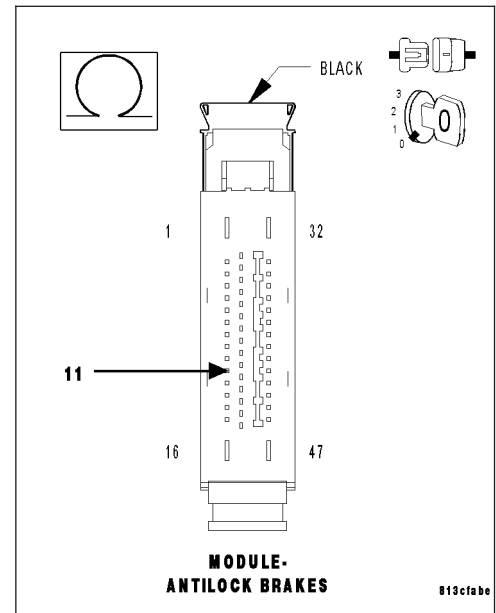
Measure the resistance of the (D65) CAN C (+) Bus circuit between the Anti-lock Brake Module and the Powertrain Control Module.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the (D65) CAN C (+) BUS circuit for an open circuit.

Perform ABS VERIFICATION TEST - VER 1.

**7. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Powertrain Control Module harness connector.

Turn the ignition on.

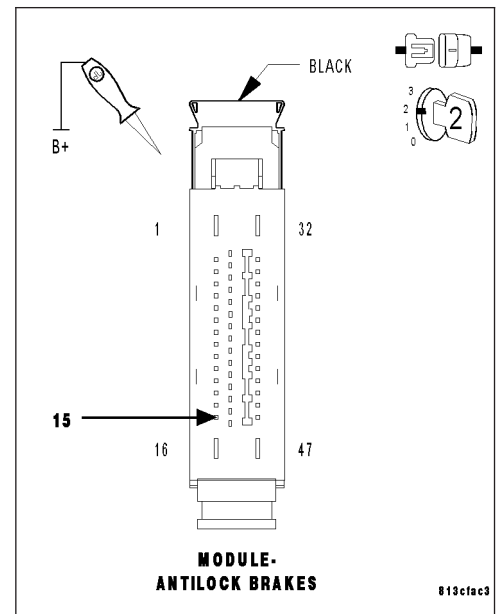
Using a 12-volt test light connected to 12-volts, check the (D64) CAN C (-) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D64) CAN C (-) BUS circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 8



**C2206-VEHICLE CONFIGURATION MISMATCH (CONTINUED)****8. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Powertrain Control Module harness connector.

Turn the ignition on.

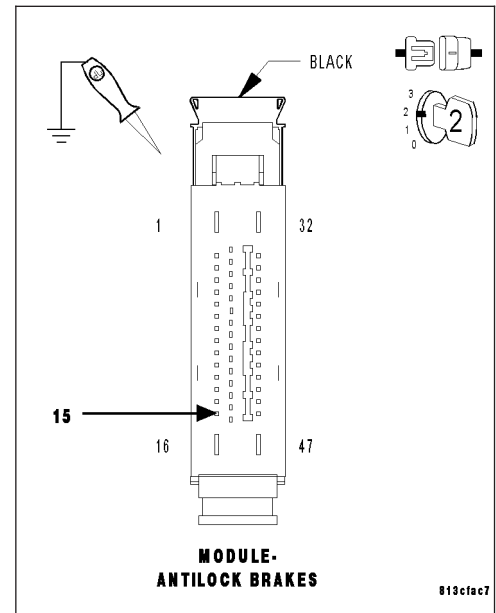
Using a 12-volt test light connected to ground, check the (D64) CAN C (-) BUS circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D64) CAN C (-) BUS circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. CHECK THE (D64) CAN C (-) BUS CIRCUIT FOR AN OPEN CIRCUIT**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Powertrain Control Module harness connector.

Measure the resistance of the (D64) CAN C (-) Bus circuit between the Anti-Lock Brake Module and the Powertrain Control Module.

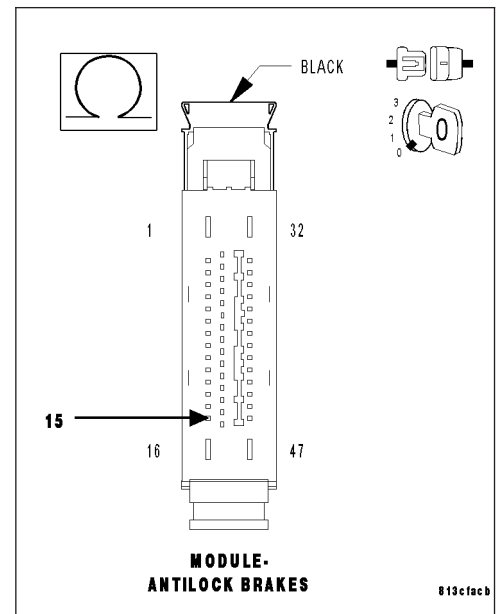
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Anti-Lock Brake Module in accordance with the Service Information.

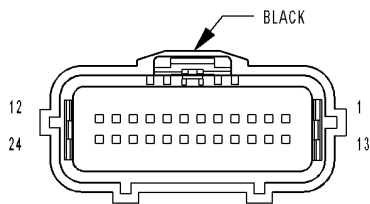
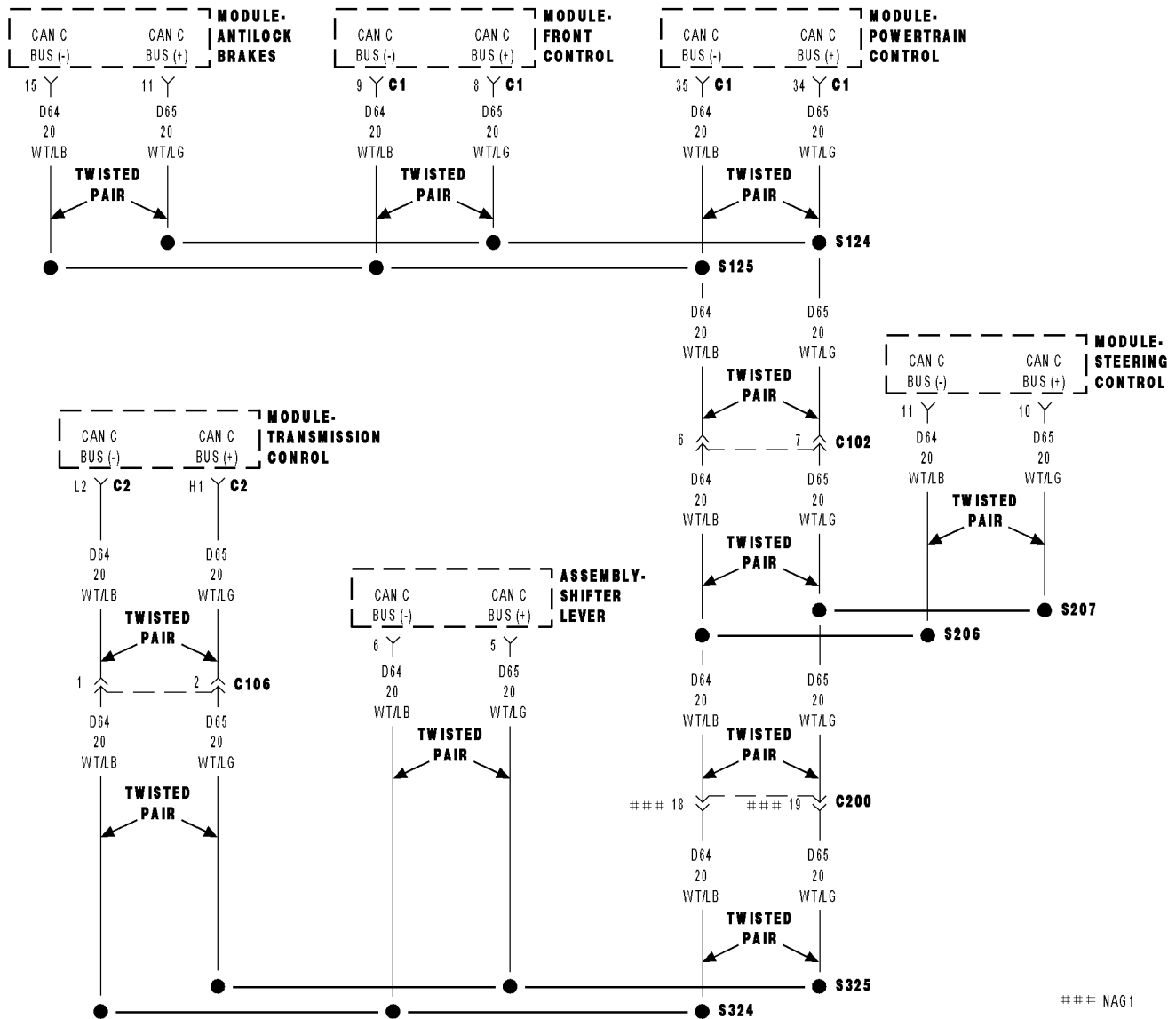
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (D64) CAN C (-) BUS circuit for an open circuit.

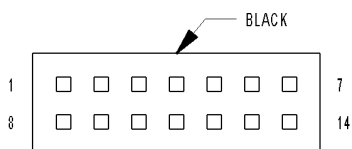
Perform ABS VERIFICATION TEST - VER 1.



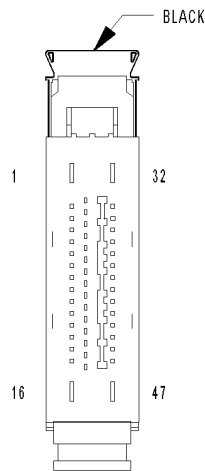
# U0002-CAN C BUS OFF PERFORMANCE



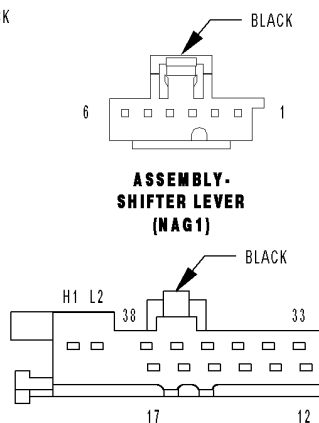
MODULE-FRONT CONTROL C1



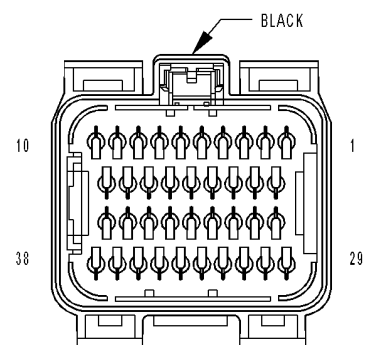
MODULE-STEERING CONTROL



MODULE-ANTILOCK BRAKES



ASSEMBLY-SHIFTER LEVER (NAG1)



MODULE-POWERTRAIN CONTROL C1

**U0002-CAN C BUS OFF PERFORMANCE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The FCM detects a short in either CAN C Bus circuit.

**Possible Causes**

(D65) CAN C BUS (+) CIRCUIT SHORTED TO GROUND  
(D64) CAN C BUS (-) CIRCUIT SHORTED TO GROUND  
(D65) CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE  
(D64) CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE  
(D65) CAN C BUS (+) CIRCUIT SHORTED TO (D64) CAN C BUS (-) CIRCUIT  
ANTILOCK BRAKE MODULE  
POWERTRAIN CONTROL MODULE  
SHIFTER LEVER ASSEMBLY (NAG1 ONLY)  
TRANSMISSION CONTROL MODULE (NAG1 ONLY)  
STEERING CONTROL MODULE  
FRONT CONTROL MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

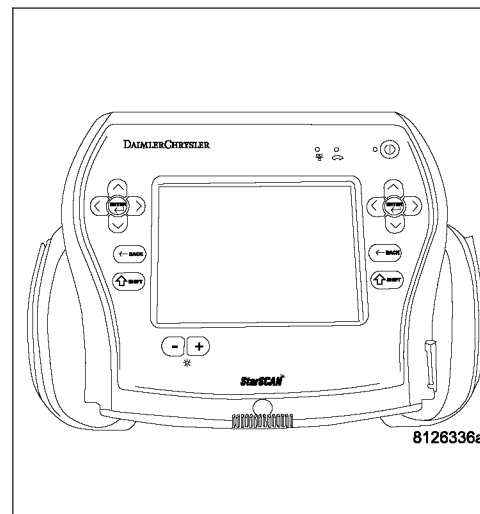
Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U0002-CAN C BUS OFF PERFORMANCE as active?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.



**U0002-CAN C BUS OFF PERFORMANCE (CONTINUED)****2. ANTILOCK BRAKE MODULE — INTERNAL SHORT**

Turn the ignition off.

Disconnect the Antilock Brake Module harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

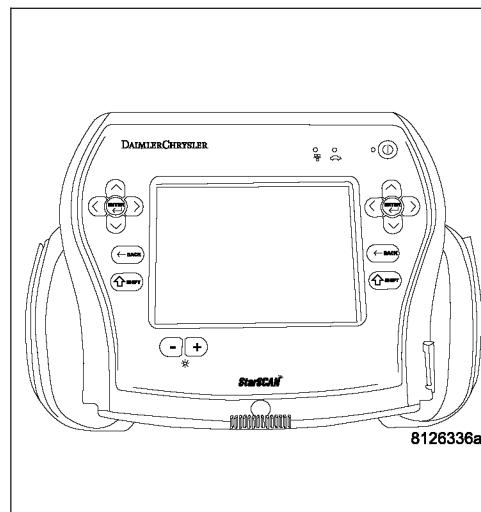
Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U0002-CAN C BUS OFF PERFORMANCE as active?**

**Yes** >> Go To 3

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Antilock Brake Module in accordance with the service information.  
Perform ABS VERIFICATION TEST — VER 1.

**3. POWERTRAIN CONTROL MODULE — INTERNAL SHORT**

Turn the ignition off.

Disconnect the Powertrain Control Module C1 harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

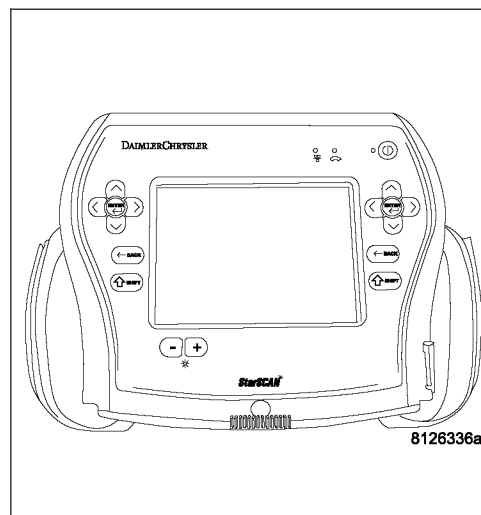
Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U0002-CAN C BUS OFF PERFORMANCE as active?**

**Yes** >> Go To 4

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Powertrain Control Module in accordance with the service information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.





**U0002-CAN C BUS OFF PERFORMANCE (CONTINUED)****4. SHIFTER LEVER ASSEMBLY (NAG1 ONLY)— INTERNAL SHORT**

Turn the ignition off.

**Note:** If the vehicle is not equipped with a NAG1 controller then skip this step.

Disconnect the Shifter Lever Assembly harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

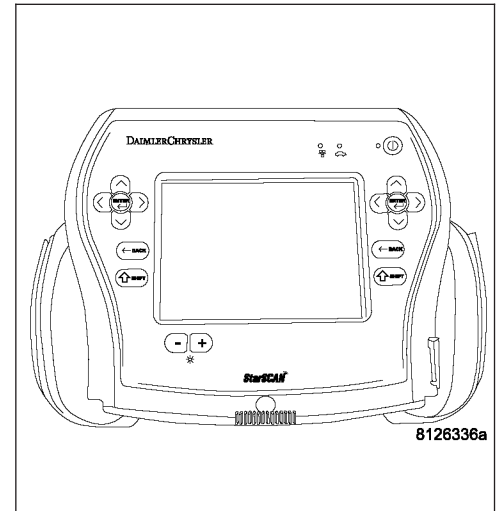
Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U0002-CAN C BUS OFF PERFORMANCE as active?**

**Yes** >> Go To 5

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Shifter Lever Assembly in accordance with the service information.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**5. TRANSMISSION CONTROL MODULE (NAG1 ONLY)— INTERNAL SHORT**

Turn the ignition off.

**Note:** If the vehicle is not equipped with a NAG1 controller then skip this step.

Disconnect the Transmission Control Module C2 harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

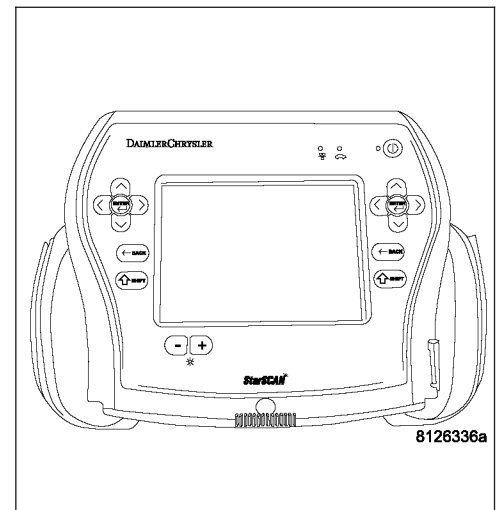
Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U0002-CAN C BUS OFF PERFORMANCE as active?**

**Yes** >> Go To 6

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Transmission Control Module in accordance with the service information.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



**U0002-CAN C BUS OFF PERFORMANCE (CONTINUED)****6. STEERING CONTROL MODULE — INTERNAL SHORT**

Turn the ignition off.

Disconnect the Steering Control Module harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

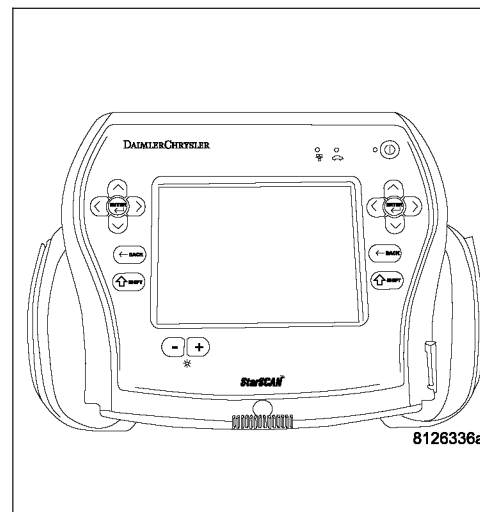
Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U0002-CAN C BUS OFF PERFORMANCE as active?**

**Yes** >> Go To 7

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Steering Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.

**7. (D65) CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE**

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

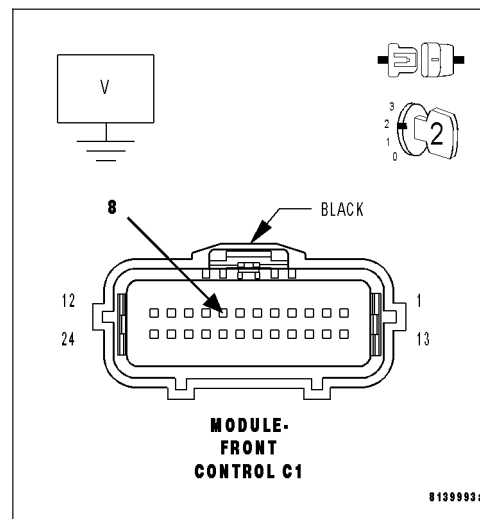
Turn the ignition on.

Measure the voltage between the (D65) CAN C Bus (+) circuit and ground.

**Is there any voltage present?**

**Yes** >> Repair the (D65) CAN C Bus (+) circuit for a short to voltage.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Go To 8



**U0002-CAN C BUS OFF PERFORMANCE (CONTINUED)****8. (D64) CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE**

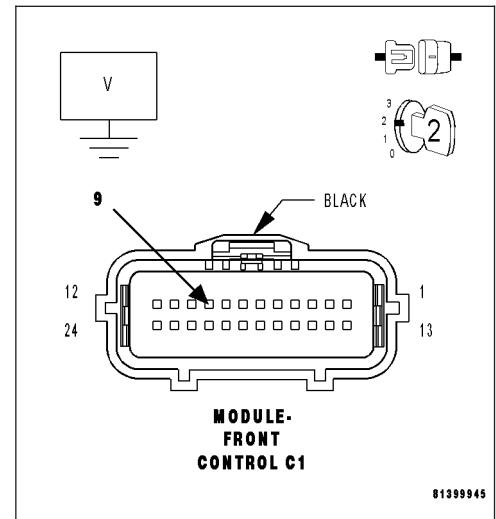
Measure the voltage between the (D64) CAN C Bus (-) circuit and ground.

**Is there any voltage present?**

**Yes** >> Repair the (D64) CAN C Bus (-) circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. (D65) CAN C BUS (+) CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

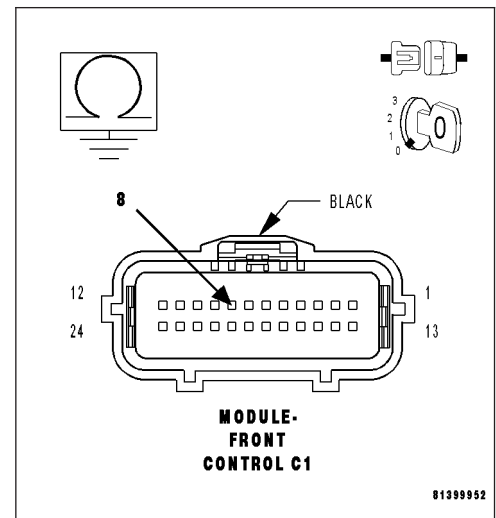
Measure the resistance between ground and the (D65) CAN C Bus (+) circuit.

**Is any resistance present?**

**Yes** >> Repair the (D65) CAN C Bus (+) circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.

**No** >> Go To 10



**U0002-CAN C BUS OFF PERFORMANCE (CONTINUED)****10. (D64) CAN C BUS (-) CIRCUIT SHORTED TO GROUND**

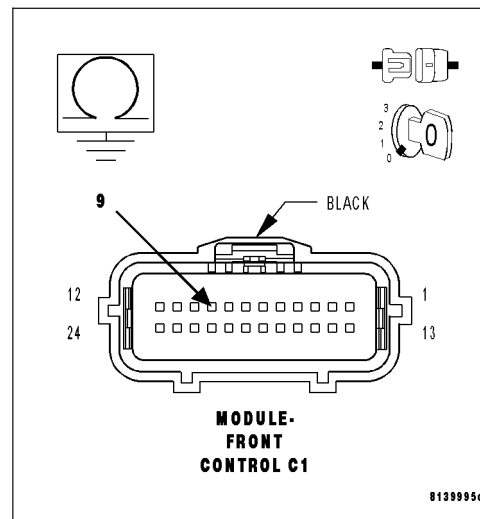
Measure the resistance between ground and the (D64) CAN C Bus (-) circuit.

**Is any resistance present?**

**Yes** >> Repair the (D64) CAN C Bus (-) circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. (D65) CAN C BUS (+) CIRCUIT SHORTED TO (D64) CAN C BUS (-) CIRCUIT**

Measure the resistance between the (D65) CAN C Bus (+) circuit and the (D64) CAN C Bus (-) circuit.

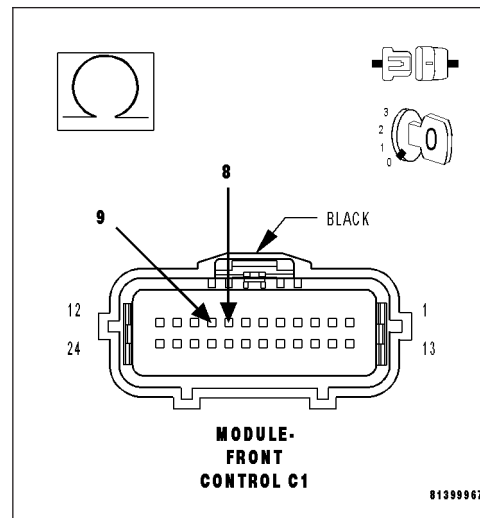
**Is any resistance present?**

**Yes** >> Repair the (D65) CAN C Bus (+) circuit for a short to the (D64) CAN C Bus (-) circuit.

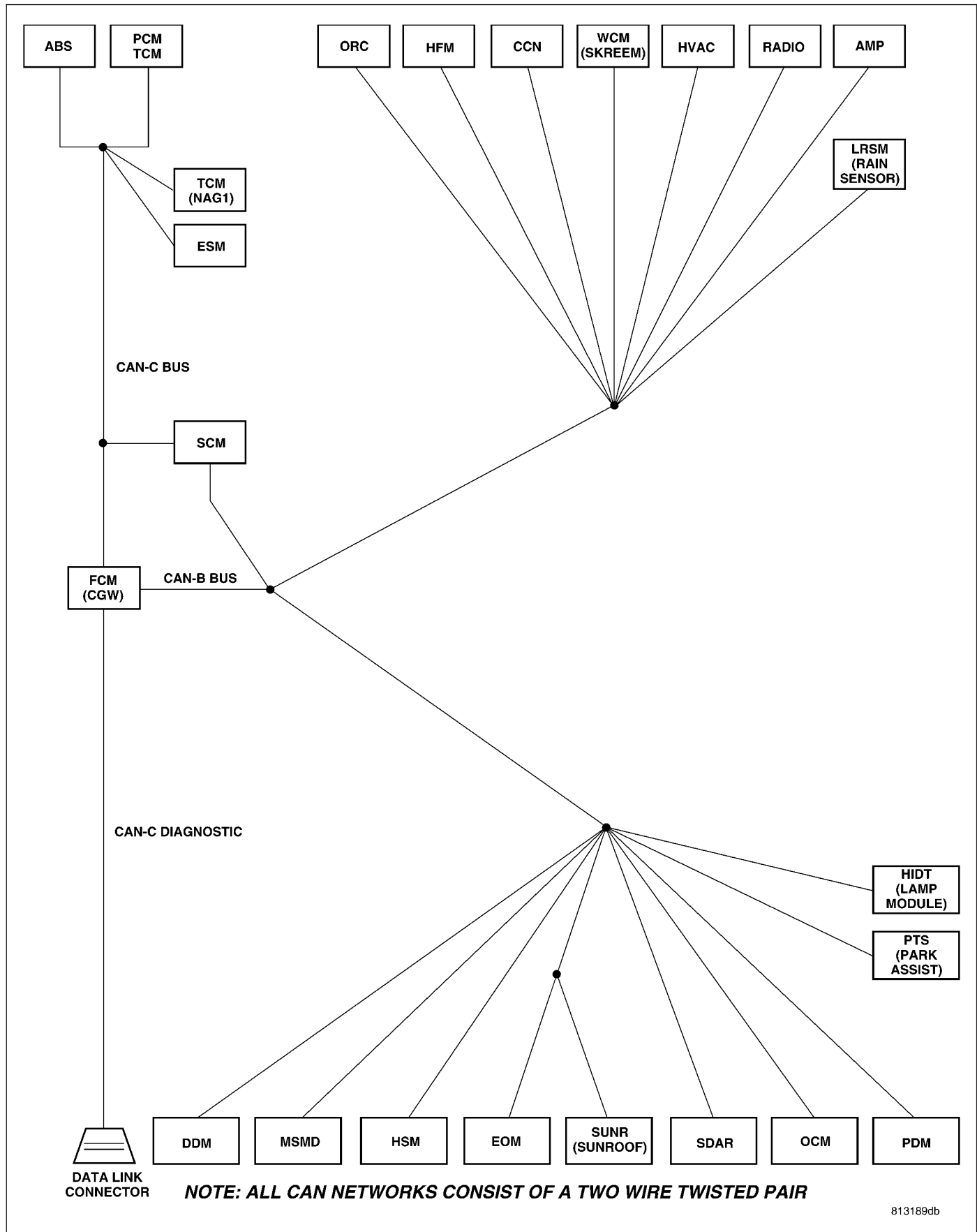
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1.



## U0100-LOST COMMUNICATION WITH ECM/PCM



**U0100-LOST COMMUNICATION WITH ECM/PCM (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the ECM/PCM for approximately 500ms.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
ECM/PCM
ECM/PCM POWER AND GROUND
MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

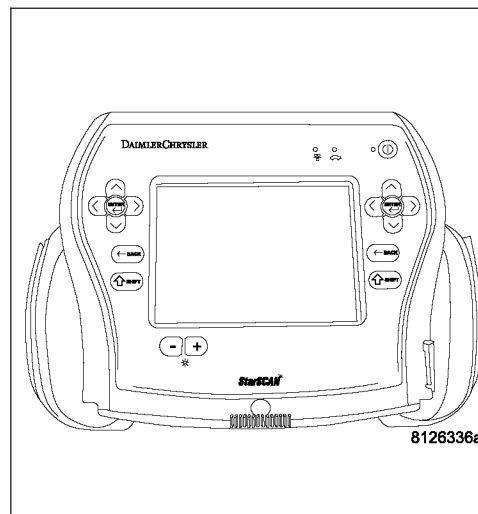
**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.

With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure.  
Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.



**U0100-LOST COMMUNICATION WITH ECM/PCM (CONTINUED)****2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCs**

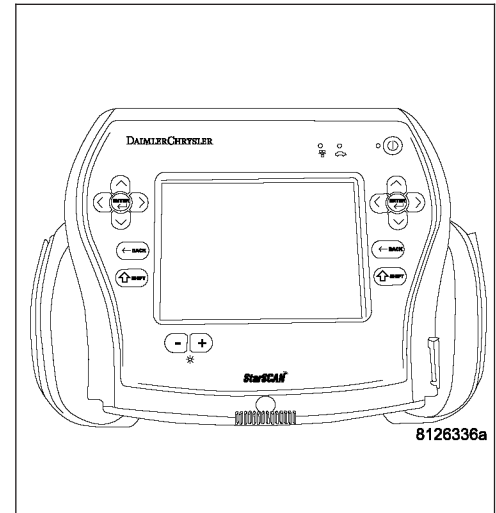
With the scan tool, read all active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

**3. VERIFY THAT THE ECM/PCM IS ACTIVE ON THE BUS**

Turn the ignition on.

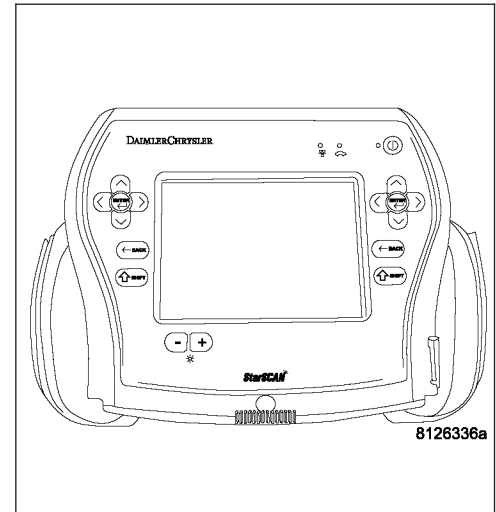
With the scan tool, select Network Diagnostics.

Verify that the ECM/PCM is active on the bus.

**Is the ECM/PCM active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

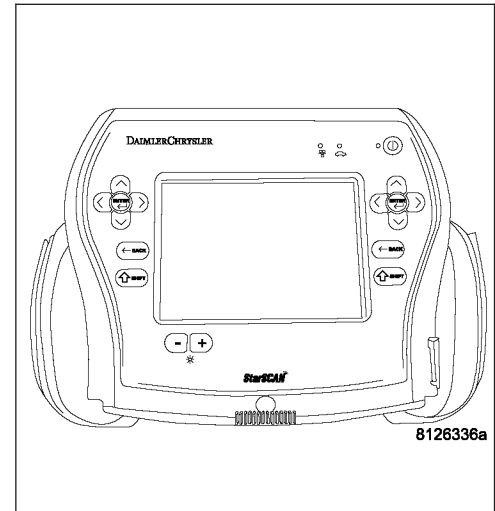


**U0100-LOST COMMUNICATION WITH ECM/PCM (CONTINUED)****4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

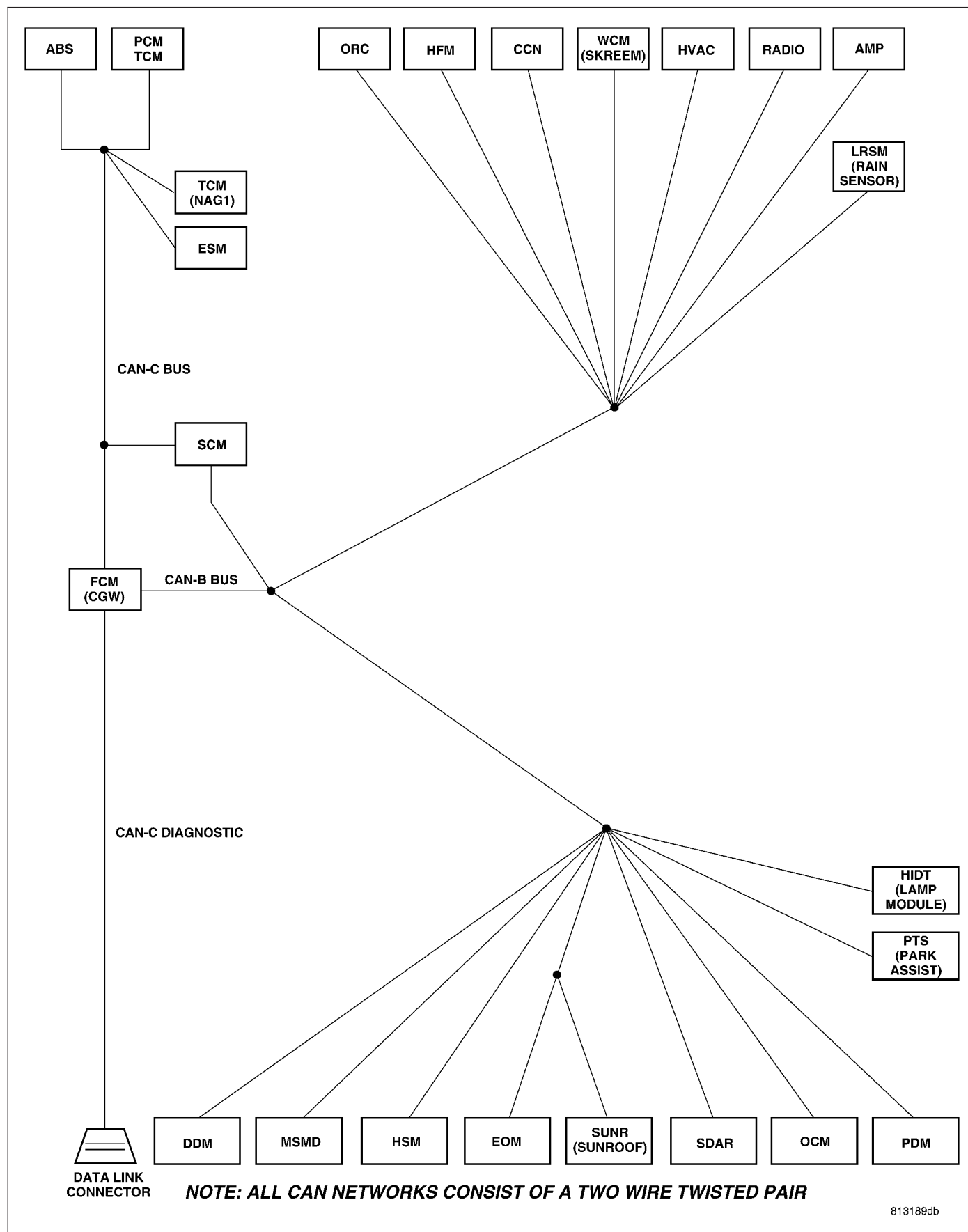
**Is there more than one module with active DTCs “Logged Against” the ECM/PCM?**

- Yes** >> Replace/update the ECM/PCM in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.
- No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.





## U0101-LOST COMMUNICATION WITH TCM



**U0101-LOST COMMUNICATION WITH TCM (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the TCM for approximately 500ms.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
TCM
TCM POWER AND GROUND
MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

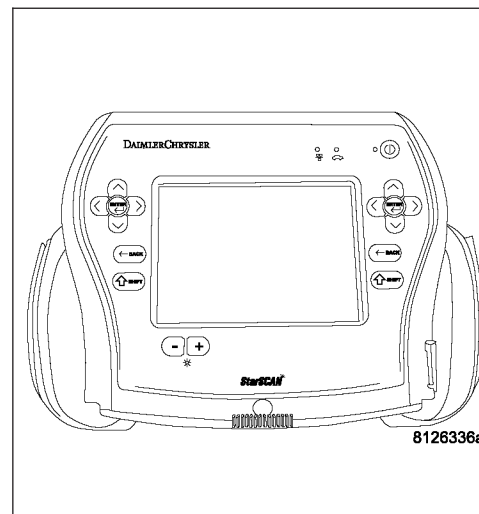
**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.

With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure.  
Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.



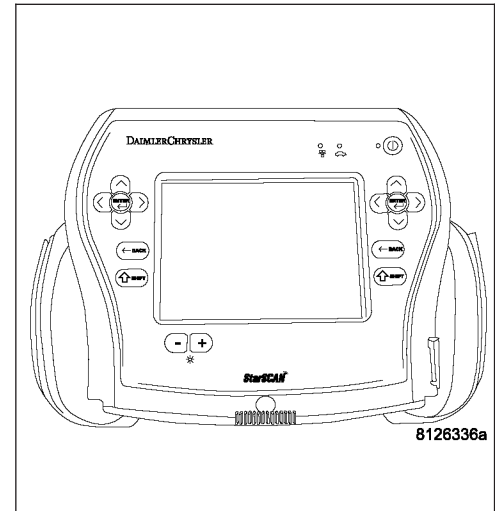
**U0101-LOST COMMUNICATION WITH TCM (CONTINUED)****2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read all active DTCS from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCS.

**Does the scan tool display any active DTCS to the conditions listed above?**

- Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.
- No** >> Go To 3

**3. VERIFY THAT THE TCM IS ACTIVE ON THE BUS**

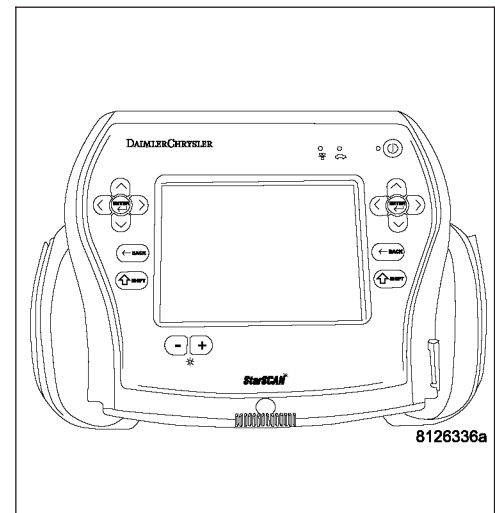
Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the TCM is active on the bus.

**Is the TCM active on the bus?**

- Yes** >> Go To 4
- No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

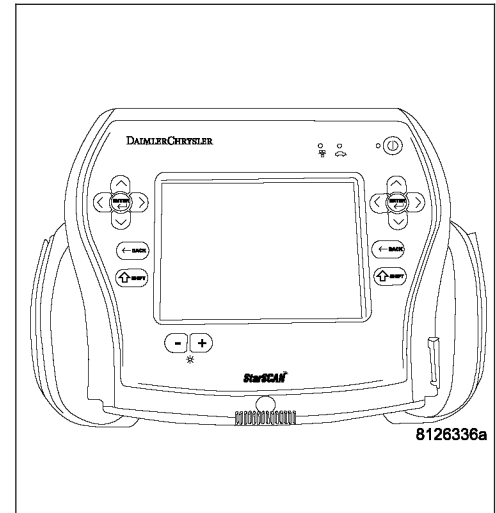


**U0101-LOST COMMUNICATION WITH TCM (CONTINUED)****4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

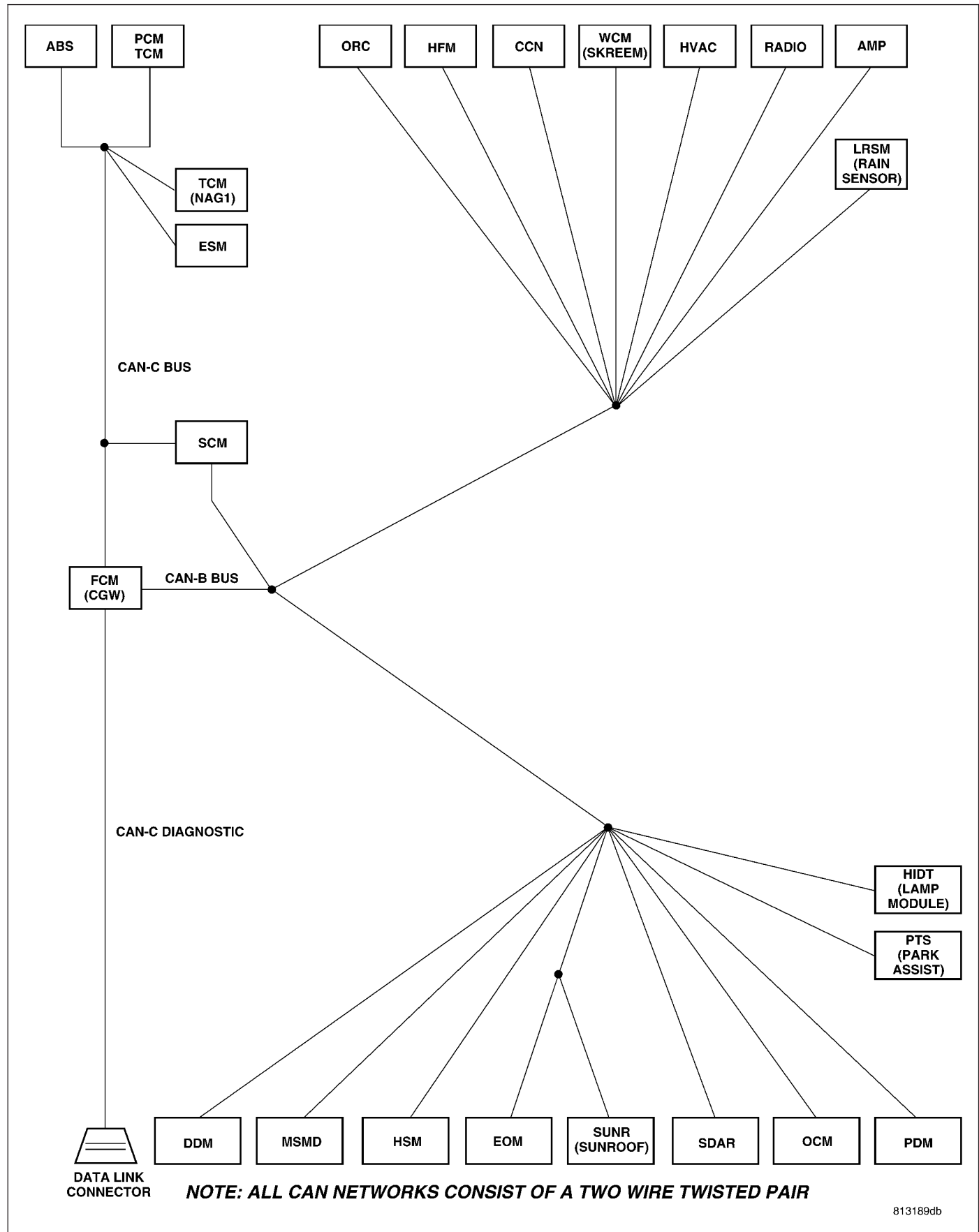
With the scan tool, select Network Diagnostics.

**Is there more than one module with active DTCs “Logged Against” the TCM?**

- Yes** >> Replace/update the TCM in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.
- No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.



## U0125-LOST COMMUNICATION WITH DYNAMICS SENSOR



**U0125-LOST COMMUNICATION WITH DYNAMICS SENSOR (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Dynamics Sensor for approximately 500ms.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY DYNAMICS SENSOR DYNAMICS SENSOR POWER AND GROUND MODULE THAT SET THIS DTC

## Diagnostic Test

### 1. VERIFY DTC IS ACTIVE

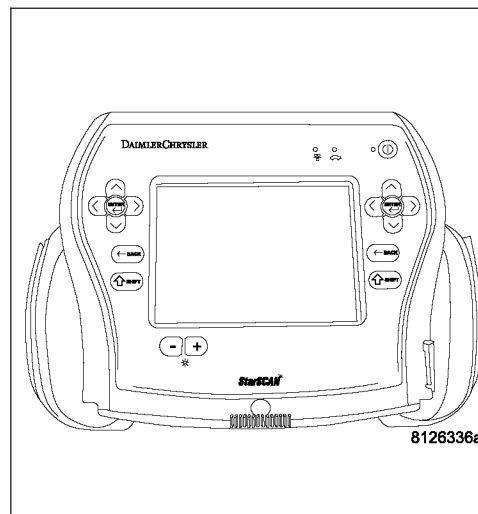
**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.

With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure.  
Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.



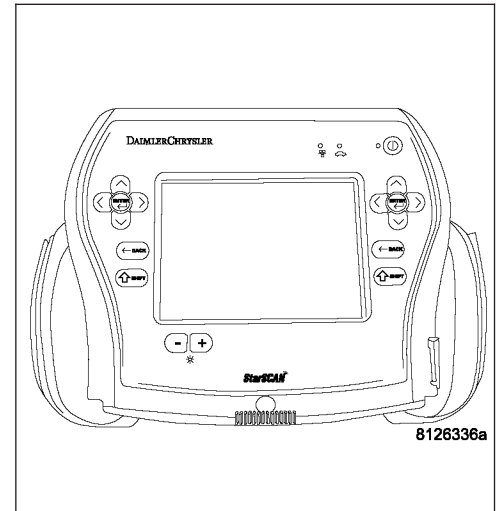
**U0125-LOST COMMUNICATION WITH DYNAMICS SENSOR (CONTINUED)****2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCs**

With the scan tool, read all active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

- Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.
- No** >> Go To 3

**3. VERIFY THAT THE DYANMICS SENSOR IS ACTIVE ON THE BUS**

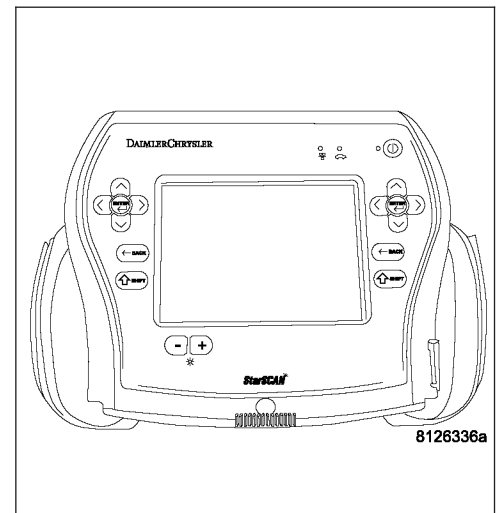
Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the Dynamics Sensor is active on the bus.

**Is the Dynamics Sensor active on the bus?**

- Yes** >> Go To 4
- No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

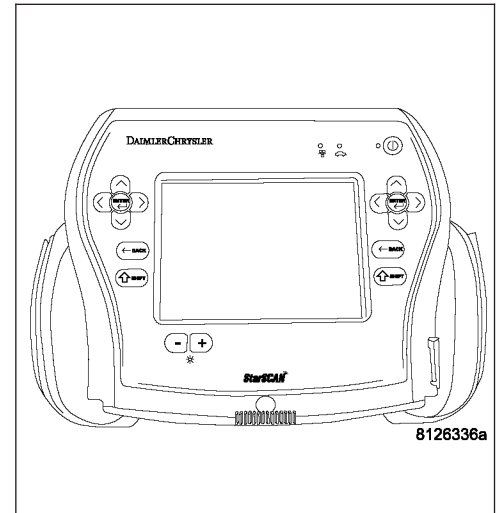


**U0125-LOST COMMUNICATION WITH DYNAMICS SENSOR (CONTINUED)****4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

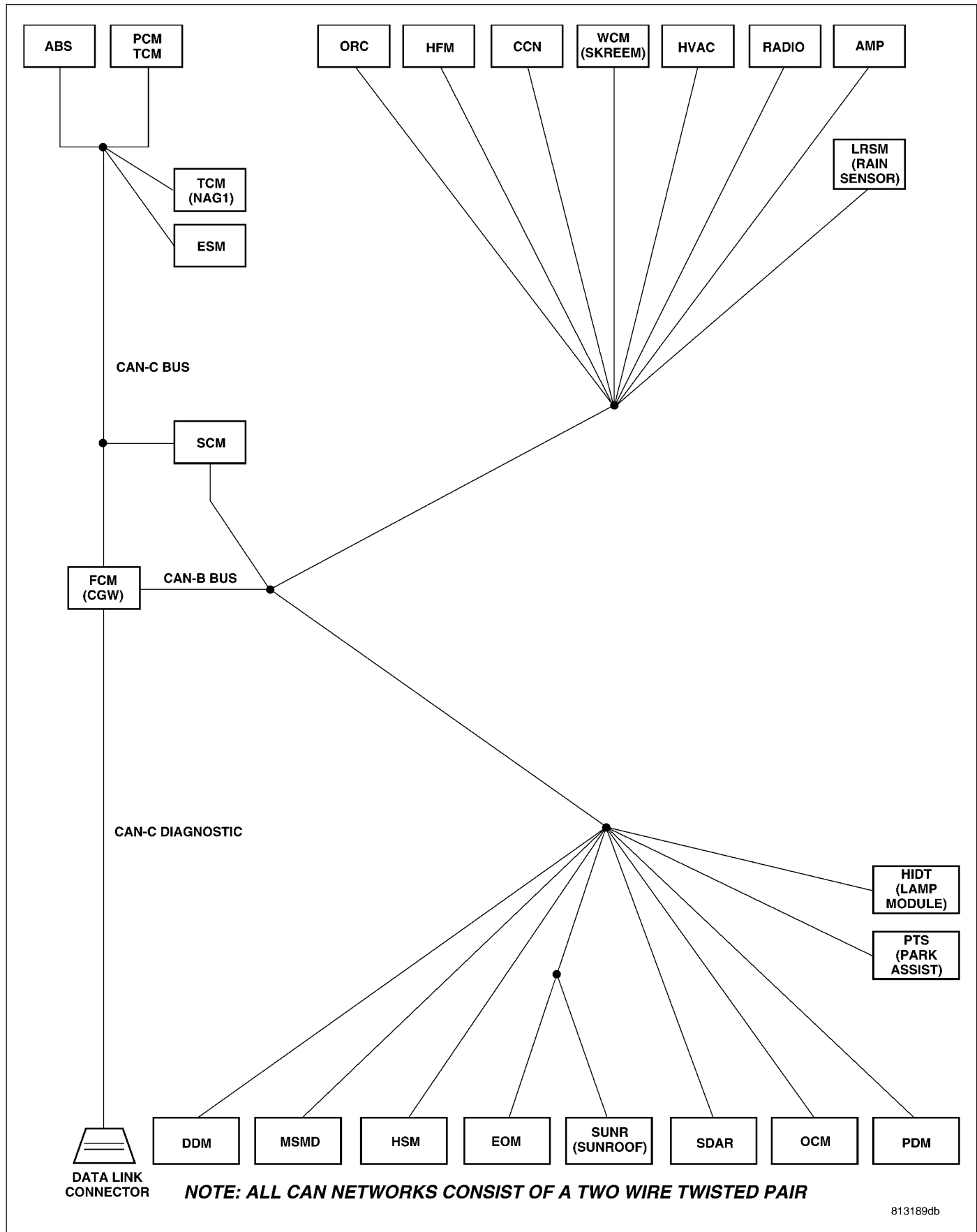
**Is there more than one module with active DTCs “Logged Against” the DYNAMICS SENSOR?**

- Yes** >> Replace/update the Dynamics Sensor in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.
- No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.





## U0126-LOST COMMUNICATION WITH STEERING ANGLE SENSOR



**U0126-LOST COMMUNICATION WITH STEERING ANGLE SENSOR (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Steering Angle Sensor for approximately 500ms.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
STEERING ANGLE SENSOR
STEERING ANGLE SENSOR POWER AND GROUND
MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

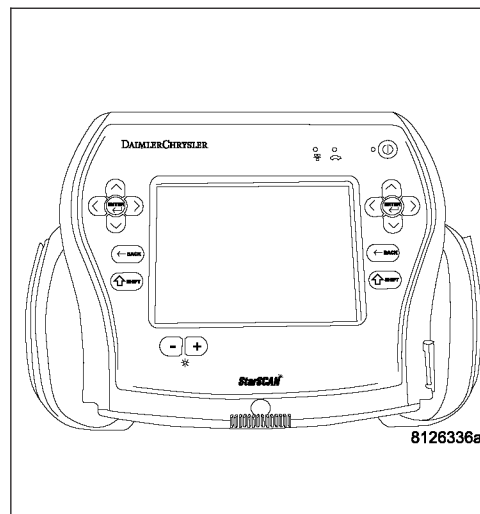
**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.

With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure.  
Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.



**U0126-LOST COMMUNICATION WITH STEERING ANGLE SENSOR (CONTINUED)****2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCs**

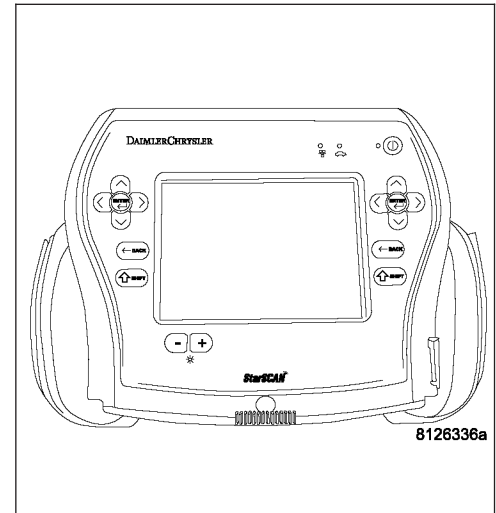
With the scan tool, read all active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

**3. VERIFY THAT THE STEERING ANGLE SENSOR IS ACTIVE ON THE BUS**

Turn the ignition on.

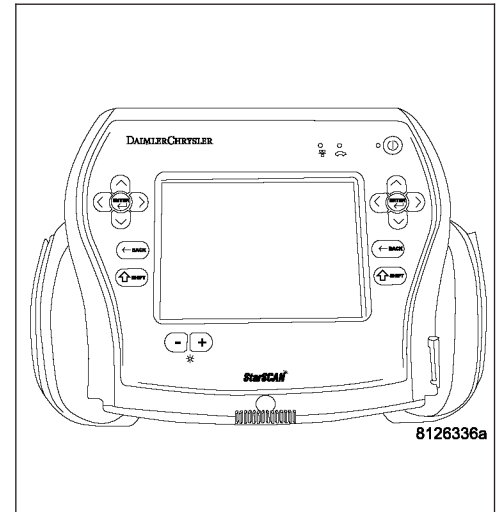
With the scan tool, select Network Diagnostics.

Verify that the Steering Angle Sensor is active on the bus.

**Is the Steering Angle Sensor active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

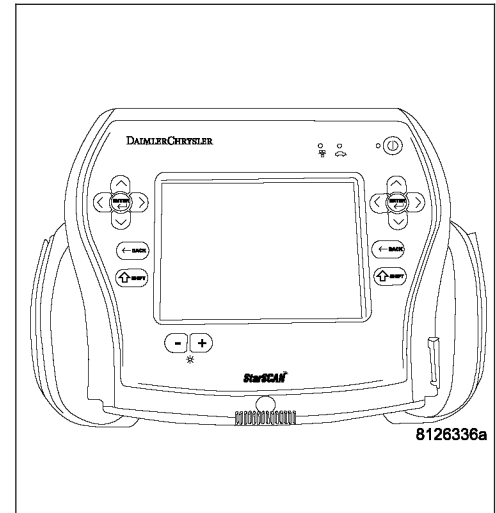


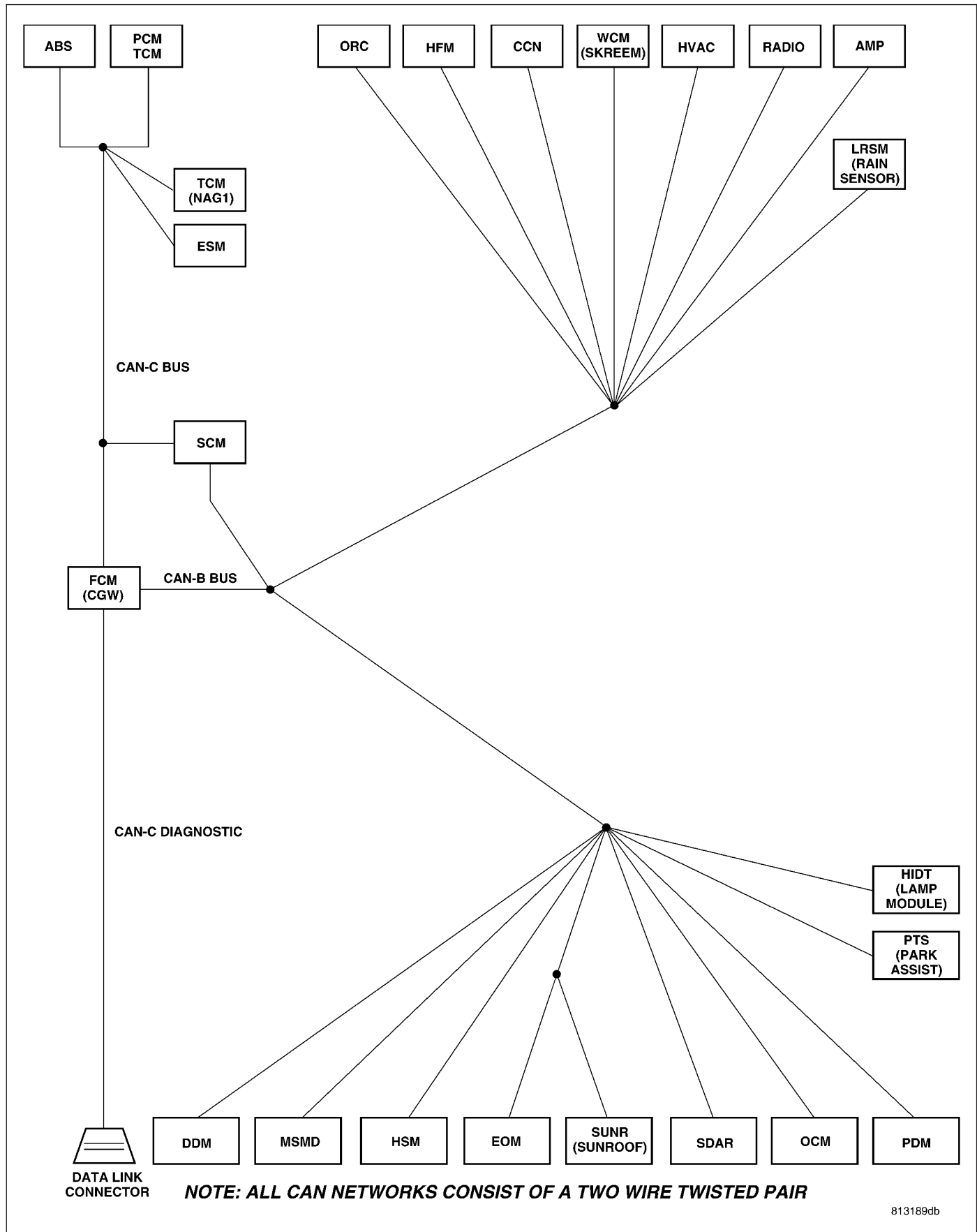
**U0126-LOST COMMUNICATION WITH STEERING ANGLE SENSOR (CONTINUED)****4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

**Is there more than one module with active DTCs “Logged Against” the STEERING ANGLE SENSOR?**

- Yes** >> Replace/update the Steering Angle Sensor in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.
- No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.



**U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE**

**U0141—LOST COMMUNICATION WITH FRONT CONTROL MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Front Control Module for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
FRONT CONTROL MODULE
FRONT CONTROL MODULES POWER AND GROUND
MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

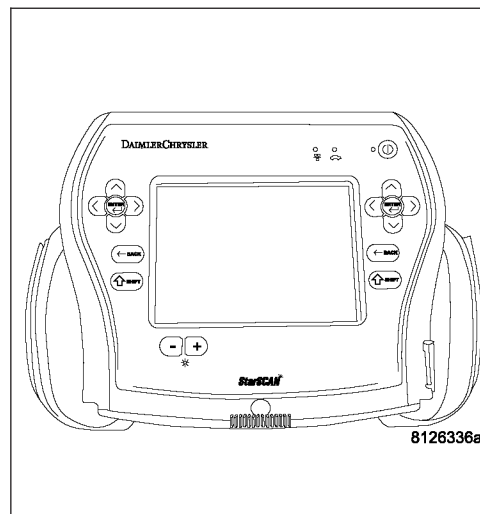
**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.

With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure.  
Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.



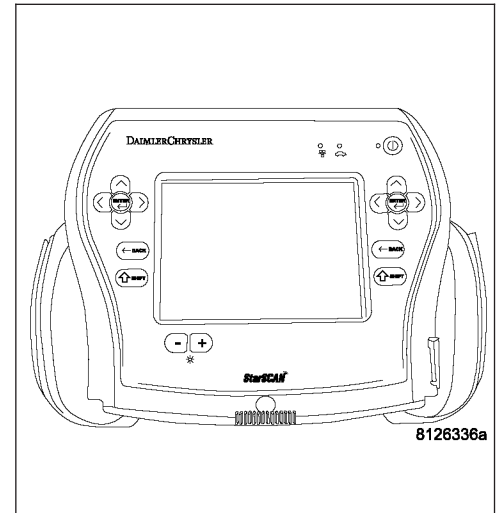
**U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE (CONTINUED)****2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read all active DTCS from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCS.

**Does the scan tool display any active DTCS to the conditions listed above?**

- Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.
- No** >> Go To 3

**3. VERIFY THAT THE FCM IS ACTIVE ON THE BUS**

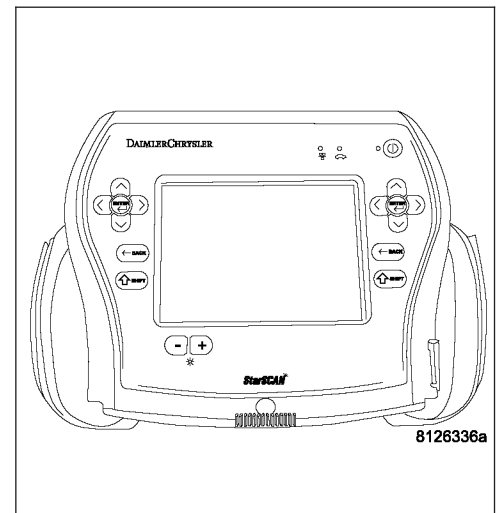
Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the FCM is active on the bus.

**Is the FCM active on the bus?**

- Yes** >> Go To 4
- No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

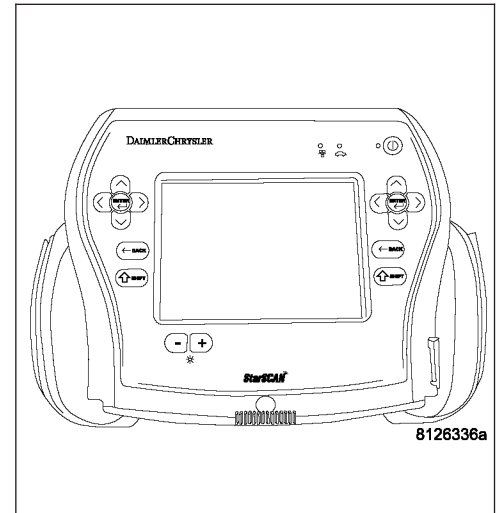


**U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE (CONTINUED)****4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

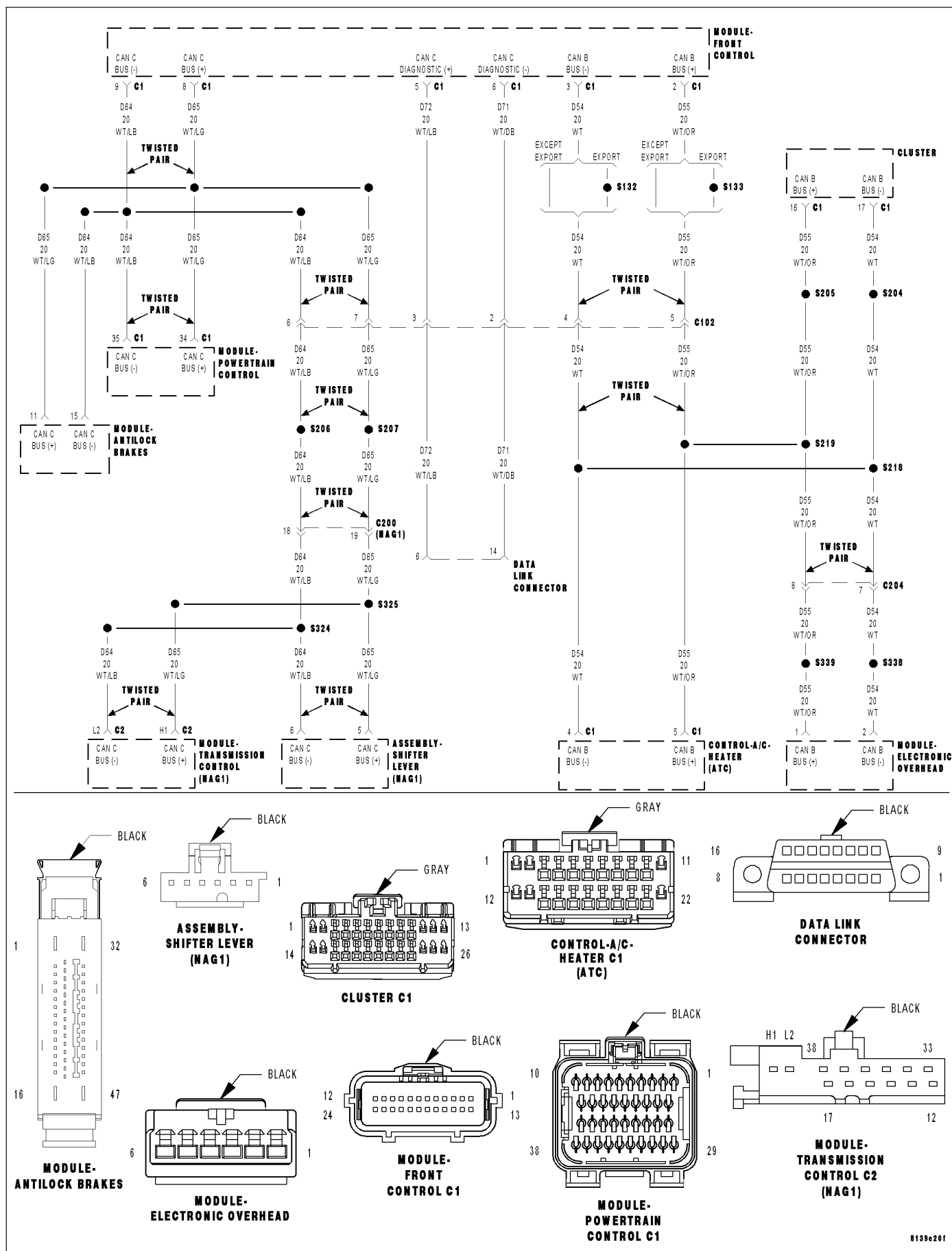
**Is there more than one module with active DTCs “Logged Against” the FCM?**

- Yes** >> Replace/update the Front Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.
- No** >> Replace/update the module that set this DTC in accordance with the service information  
Perform BODY VERIFICATION TEST – VER 1.





## U0401-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM



**U0401-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM (CONTINUED)**

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**

Continuously with the ignition on, one valid CAN message received at least once, and no U0002-CAN C Bus Off Performance DTC present.

- **Set Condition:**

When the Anti-Lock Brake Module detects an incorrect CAN message from the Engine Control Module (ECM).

Possible Causes
FCM CAN BUS DTCS
ENGINE DTCS
ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK IF FCM CAN BUS DTC'S ARE PRESENT**

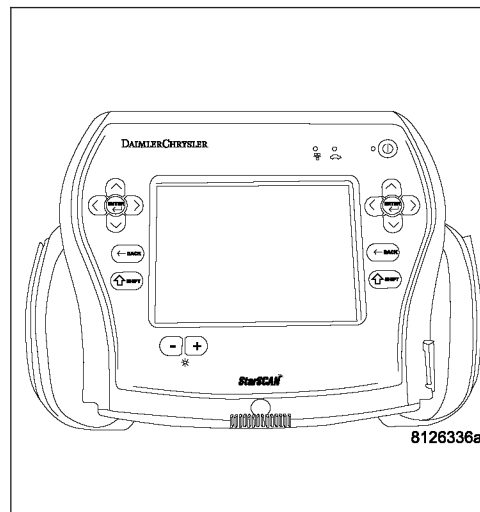
With the scan tool, read FCM DTCs.

**Are there any FCM CAN BUS DTC's present?**

**Yes** >> Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING and diagnose the appropriate symptom.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 2

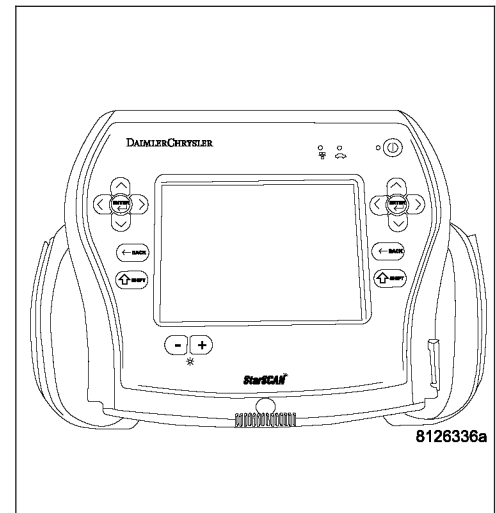


**U0401-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM (CONTINUED)****2. CHECK IF ENGINE DTC'S ARE PRESENT**

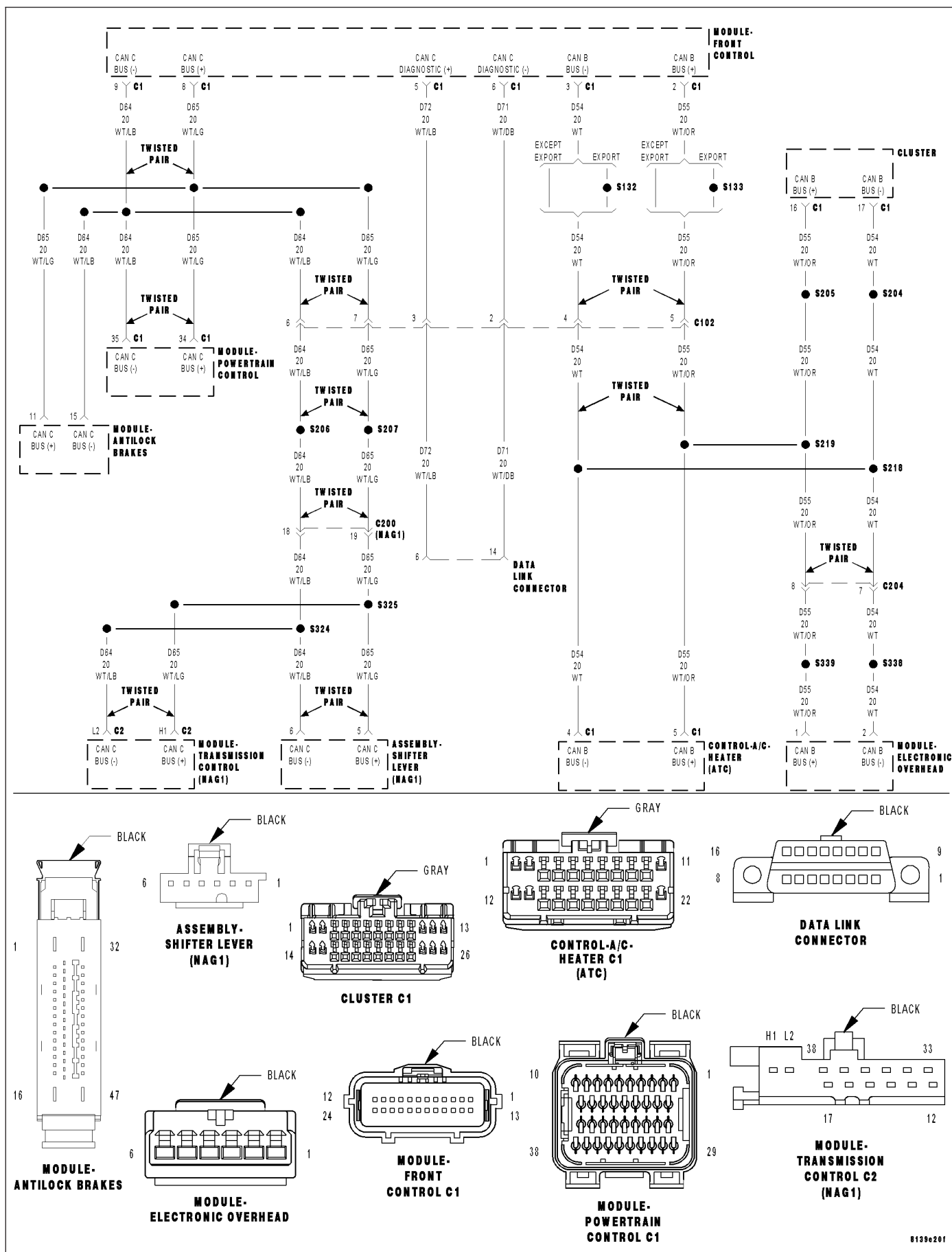
With the scan tool, read Engine DTCs.

**Are there any Engine DTC's present?**

- Yes** >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Anti-Lock Brake Module pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the Anti-Lock Brake Module per the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



# U0402-IMPLAUSIBLE DATA RECEIVED FROM TCM



U0402-IMPLAUSIBLE DATA RECEIVED FROM TCM (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
Continuously with the ignition on, one valid CAN message received at least once, and no U0002-CAN C Bus Off Performance DTC present.
- **Set Condition:**  
When the Anti-Lock Brake Module detects an incorrect CAN message from the Transmission Control Module (TCM).

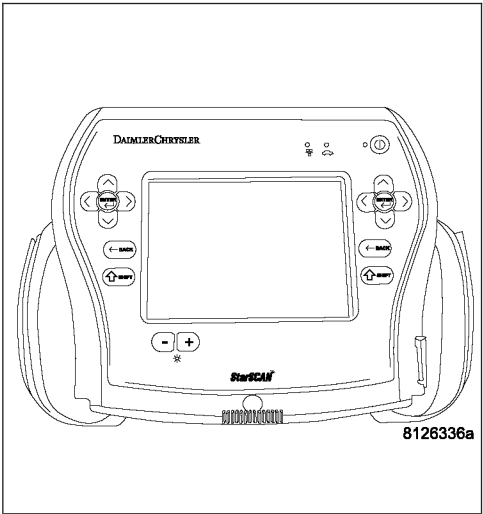
Possible Causes
FCM CAN BUS DTCS TRANSMISSION DTCS ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK IF FCM CAN BUS DTC'S ARE PRESENT

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?**
- Yes**    >> Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING and diagnose the appropriate symptom.  
            Perform ABS VERIFICATION TEST - VER 1.
- No**      >> Go To 2

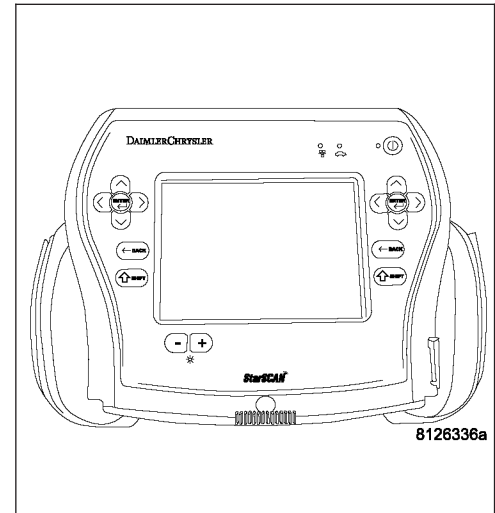


**U0402-IMPLAUSIBLE DATA RECEIVED FROM TCM (CONTINUED)****2. CHECK IF TRANSMISSION DTC'S ARE PRESENT**

With the scan tool, read Transmission DTCs.

**Are there any Transmission DTC's present?**

- Yes** >> Refer to the 21 - TRANSMISSION ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Anti-Lock Brake Module pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the Anti-Lock Brake Module per the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



The diagram illustrates the electrical connection between the **SENSOR-DYNAMICS (ESP)** and the **MODULE-ANTILOCK BRAKES**. The wiring is organized into two main sections, each enclosed in a dashed box.

**Top Section (Module-Antilock Brakes):**

- Left Side:** Labeled "DYNAMICS SENSOR LOW DATA LINK". It features a terminal labeled "25" connected to a wire labeled "D51 20 WT/BR".
- Right Side:** Labeled "DYNAMICS SENSOR HIGH DATA LINK". It features a terminal labeled "29" connected to a wire labeled "D52 20 WT/LB".

**Bottom Section (Sensor-Dynamics (ESP)):**

- Left Side:** Labeled "DYNAMICS SENSOR LOW DATA LINK". It features a terminal labeled "1" connected to a wire labeled "D51 20 WT/BR".
- Right Side:** Labeled "DYNAMICS SENSOR HIGH DATA LINK". It features a terminal labeled "2" connected to a wire labeled "D52 20 WT/LB".

**Central Connection:**

- A horizontal line connects the two sections, labeled "C104".
- On the left side of this line, there is a terminal labeled "22".
- On the right side of this line, there is a terminal labeled "23".

**Physical Views:**

- SENSOR-DYNAMICS (ESP):** A top-down view of the sensor module, showing a rectangular connector with multiple pins. A label "BLACK" points to the top edge of the connector. Pin numbers 1, 3, 4, and 6 are indicated.
- MODULE-ANTILOCK BRAKES:** A side view of the module, showing a vertical connector with multiple pins. A label "BLACK" points to the top edge of the connector. Pin numbers 1, 16, 32, and 47 are indicated.

**U1003-ESP CAN C BUS PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects too many CAN Bus off events.

Possible Causes
WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE (D52) DYNAMICS SENSOR HIGH DATALINK CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN (D51) DYNAMICS SENSOR LOW DATALINK CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN DYNAMICS SENSOR

**Diagnostic Test****1. CHECK FOR A DTC U1003-ESP CAN C BUS PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

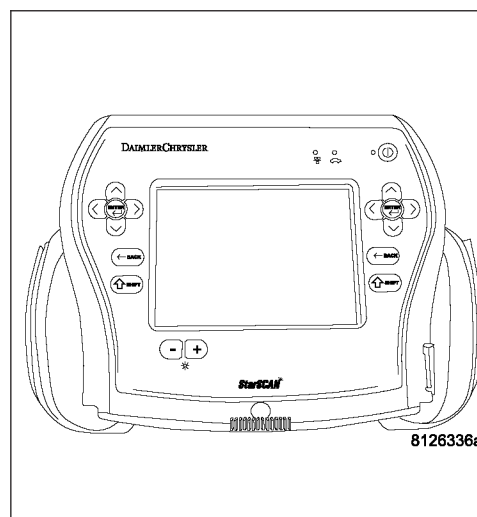
Cycle the ignition switch from off to on.

With the scan tool, read and record DTC's

**Does the scan tool display: U1003-ESP CAN C BUS PERFORMANCE?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.  
Perform ABS VERIFICATION TEST - VER 1.





**U1003-ESP CAN C BUS PERFORMANCE (CONTINUED)****2. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

Check the Dynamic Sensor installation and torque of the mounting bolts.

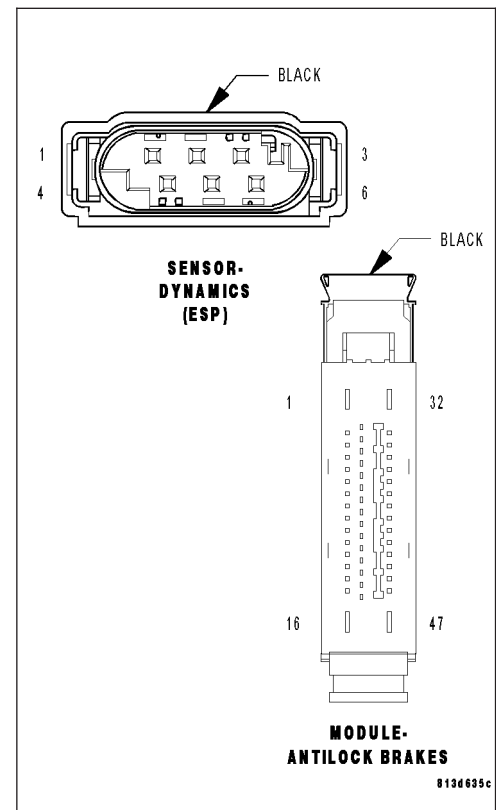
Visually inspect the related wiring harness. Look for any bruised, chafed, pierced, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (D52) DYNAMICS SENSOR HIGH DATALINK CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

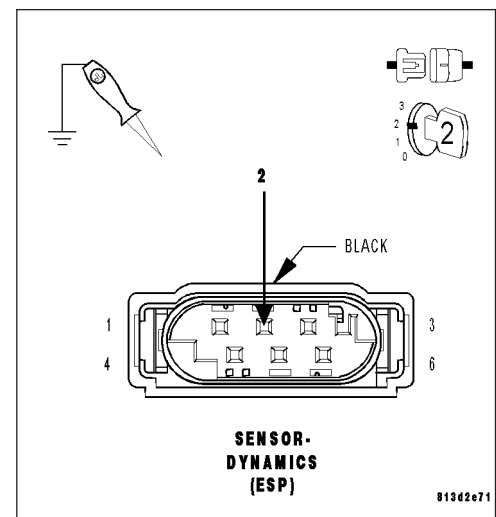
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (D52) Dynamics Sensor High Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D52) Dynamics Sensor High Datalink circuit for a short to voltage.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 4



**U1003-ESP CAN C BUS PERFORMANCE (CONTINUED)****4. CHECK THE (D52) DYNAMICS SENSOR HIGH DATALINK CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

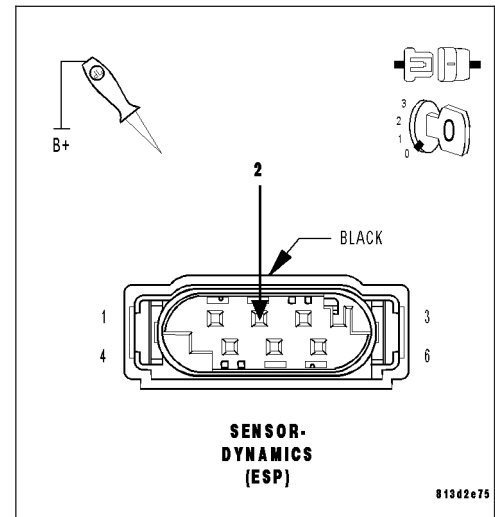
Using a 12-volt test light connected to 12-volts, check the (D52) Dynamics Sensor High Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D52) Dynamics Sensor High Datalink circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (D52) DYNAMICS SENSOR HIGH DATALINK CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Connect a jumper wire between the (D52) Dynamics Sensor High Datalink circuit and ground.

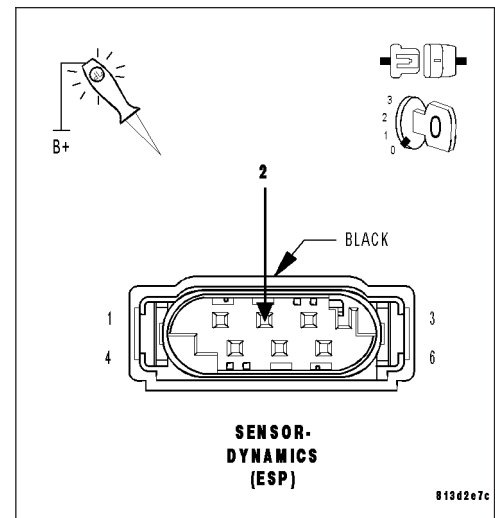
Using a 12-volt test light connected to 12-volts, check the (D52) Dynamics Sensor High Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 6

**No** >> Repair the (D52) Dynamics Sensor High Datalink circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**U1003-ESP CAN C BUS PERFORMANCE (CONTINUED)****6. CHECK THE (D51) DYNAMICS SENSOR LOW DATALINK CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

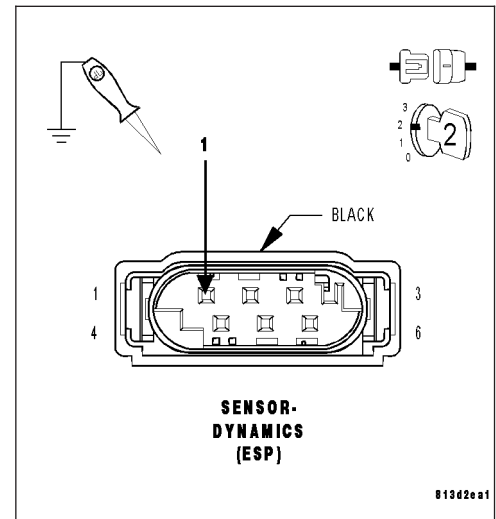
Using a 12-volt test light connected to ground, check the (D51) Dynamics Sensor Low Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D51) Dynamics Sensor Low Datalink circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (D51) DYNAMICS SENSOR LOW DATALINK CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

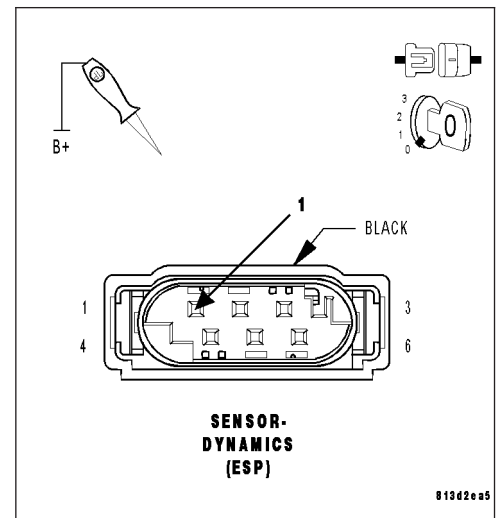
Using a 12-volt test light connected to 12-volts, check the (D51) Dynamics Sensor Low Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D51) Dynamics Sensor Low Datalink circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 8



**U1003-ESP CAN C BUS PERFORMANCE (CONTINUED)****8. CHECK THE (D51) DYNAMICS SENSOR LOW DATALINK CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

Connect a jumper wire between the (D51) Dynamics Sensor Low Datalink circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (D51) Dynamics Sensor Low Datalink circuit.

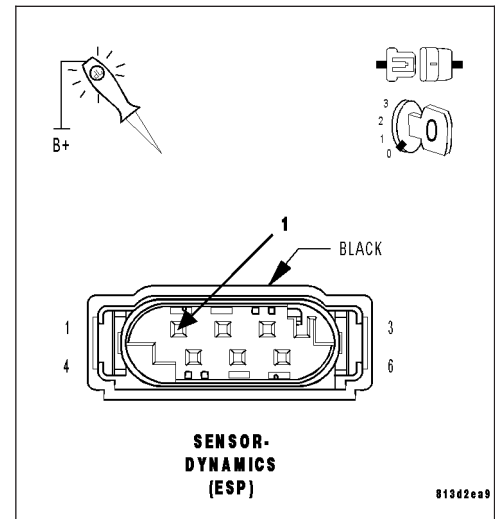
**Does the test light illuminate brightly?**

**Yes** >> Replace the Dynamics Sensor in accordance with the Service Information.

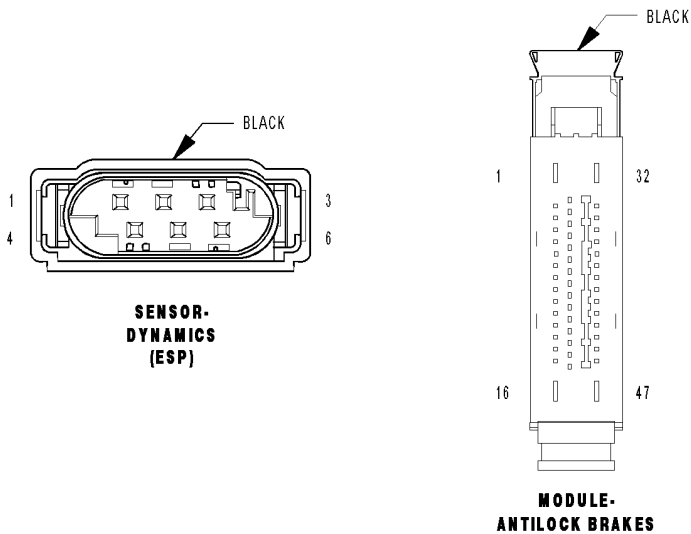
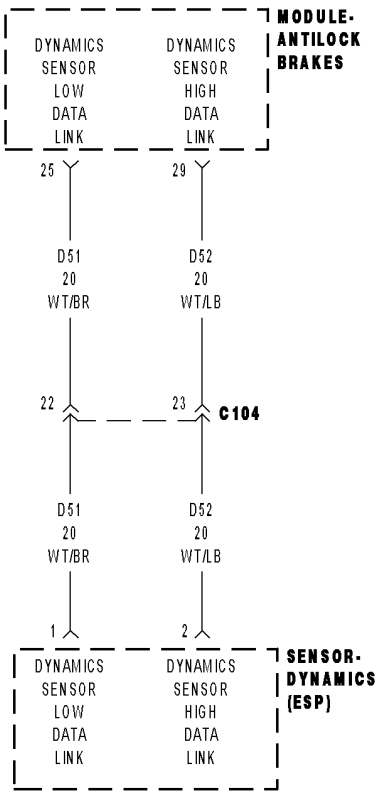
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (D51) Dynamics Sensor Low Datalink circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



U1004-CAN C BUS TRANSMIT PERFORMANCE



**U1004-CAN C BUS TRANSMIT PERFORMANCE (CONTINUED)**

For the Anti-Lock Brake System circuit diagram.(Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects invalid CAN message from the Dynamics Sensor.

Possible Causes
<p>WIRING HARNESS, TERMINAL, CONNECTOR DAMAGE</p> <p>(D52) DYNAMICS SENSOR HIGH DATALINK CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN</p> <p>(D51) DYNAMICS SENSOR LOW DATALINK CIRCUIT SHORTED TO GROUND, VOLTAGE, OR OPEN</p> <p>DYNAMICS SENSOR</p>

**Diagnostic Test****1. CHECK FOR A DTC U1004-CAN C BUS TRANSMIT PERFORMANCE**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

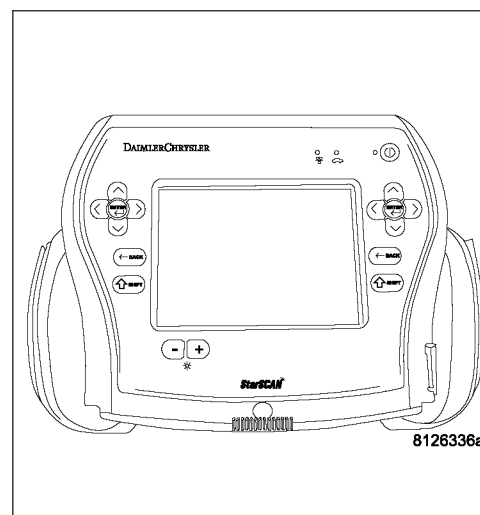
With the scan tool, read and record DTC's

**Does the scan tool display: U1004-CAN C BUS TRANSMIT PERFORMANCE?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION diagnostic procedure.

Perform ABS VERIFICATION TEST - VER 1.



**U1004-CAN C BUS TRANSMIT PERFORMANCE (CONTINUED)****2. CHECK THE WIRING HARNESS, TERMINALS, AND CONNECTORS**

Check the Dynamic Sensor installation and torque of the mounting bolts.

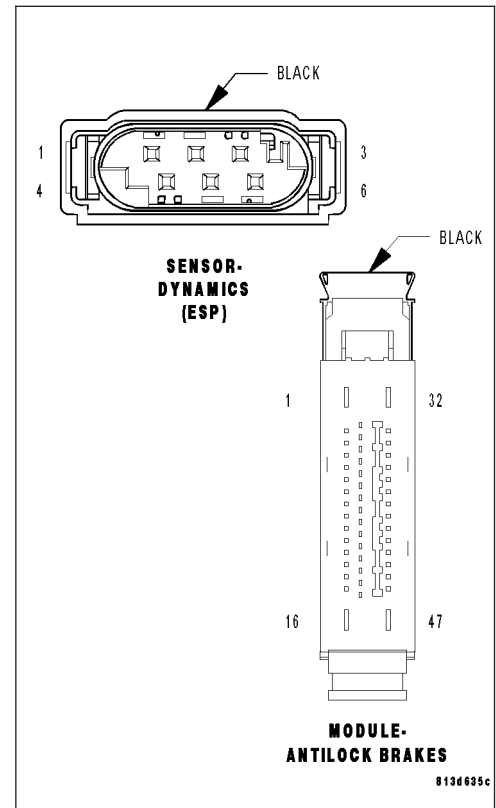
Visually inspect the related wiring harness. Look for any bruised, chafed, pierced, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (D52) DYNAMICS SENSOR HIGH DATALINK CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

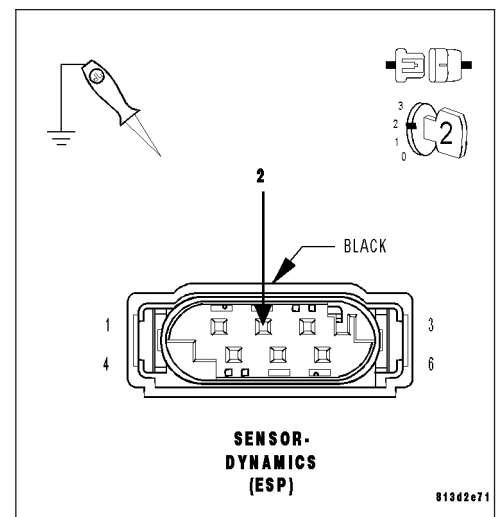
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (D52) Dynamics Sensor High Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D52) Dynamics Sensor High Datalink circuit for a short to voltage.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 4



**U1004-CAN C BUS TRANSMIT PERFORMANCE (CONTINUED)****4. CHECK THE (D52) DYNAMICS SENSOR HIGH DATALINK CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

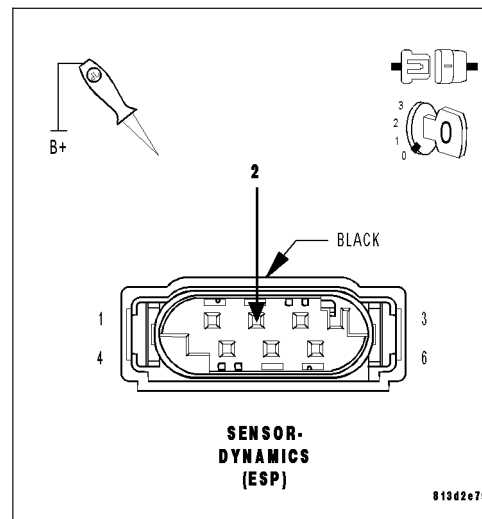
Using a 12-volt test light connected to 12-volts, check the (D52) Dynamics Sensor High Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D52) Dynamics Sensor High Datalink circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (D52) DYNAMICS SENSOR HIGH DATALINK CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Connect a jumper wire between the (D52) Dynamics Sensor High Datalink circuit and ground.

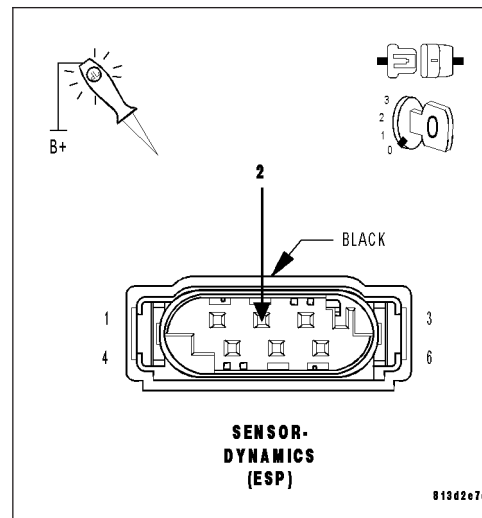
Using a 12-volt test light connected to 12-volts, check the (D52) Dynamics Sensor High Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 6

**No** >> Repair the (D52) Dynamics Sensor High Datalink circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.





**U1004-CAN C BUS TRANSMIT PERFORMANCE (CONTINUED)****6. CHECK THE (D51) DYNAMICS SENSOR LOW DATALINK CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

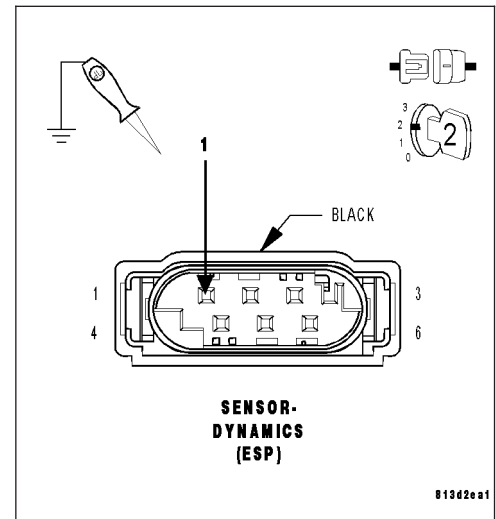
Using a 12-volt test light connected to ground, check the (D51) Dynamics Sensor Low Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D51) Dynamics Sensor Low Datalink circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (D51) DYNAMICS SENSOR LOW DATALINK CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

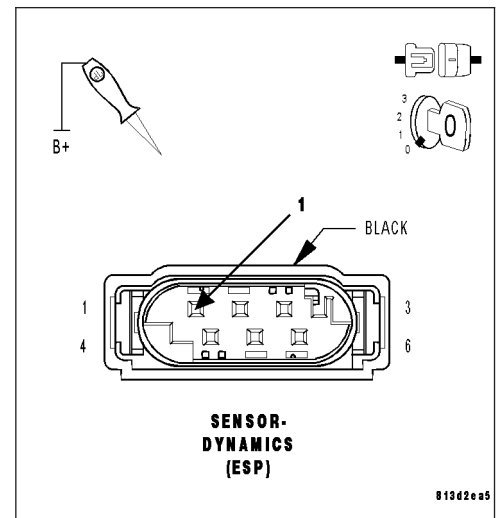
Using a 12-volt test light connected to 12-volts, check the (D51) Dynamics Sensor Low Datalink circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (D51) Dynamics Sensor Low Datalink circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 8



**U1004-CAN C BUS TRANSMIT PERFORMANCE (CONTINUED)****8. CHECK THE (D51) DYNAMICS SENSOR LOW DATALINK CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Anti-Lock Brake Module harness connector.

Disconnect the Dynamics Sensor harness connector.

Turn the ignition on.

Connect a jumper wire between the (D51) Dynamics Sensor Low Datalink circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (D51) Dynamics Sensor Low Datalink circuit.

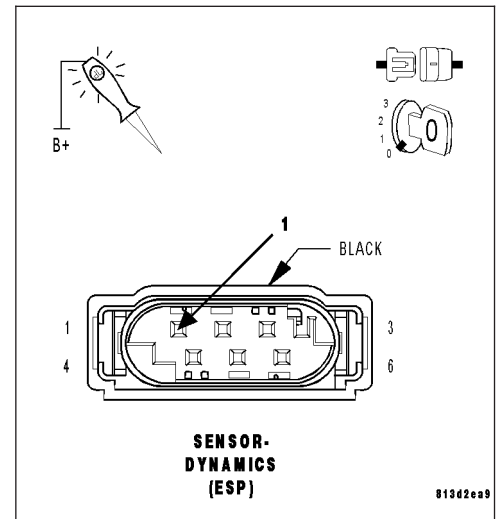
**Does the test light illuminate brightly?**

**Yes** >> Replace the Dynamics Sensor in accordance with the Service Information.

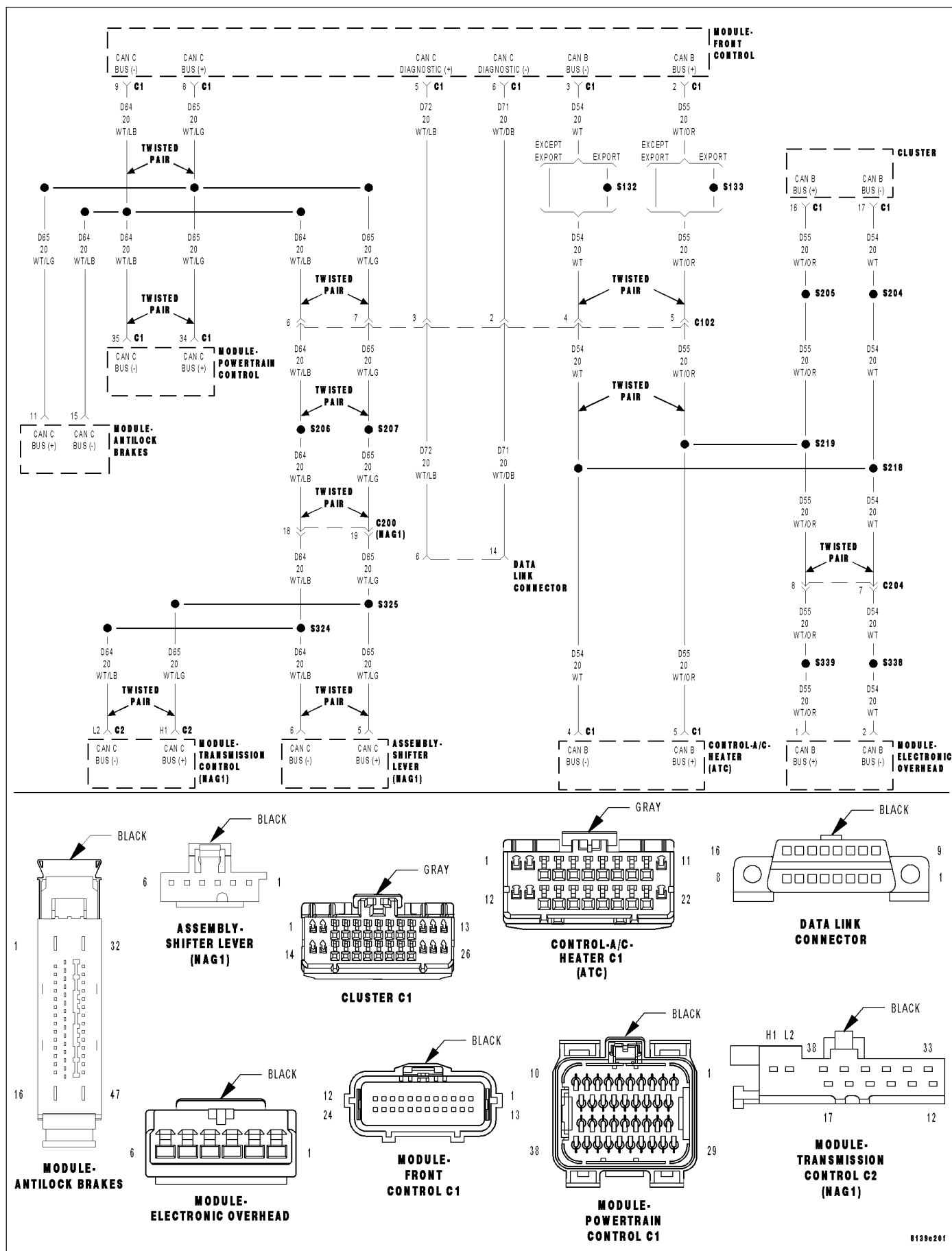
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (D51) Dynamics Sensor Low Datalink circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



## U140E-IMPLAUSIBLE VEHICLE CONFIGURATION DATA RECEIVED



**U140E-IMPLAUSIBLE VEHICLE CONFIGURATION DATA RECEIVED (CONTINUED)**

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects an incorrect CAN messages from the Engine Control Module (ECM).

Possible Causes
FCM CAN BUS DTCS ENGINE DTCS ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK IF FCM CAN BUS DTC'S ARE PRESENT**

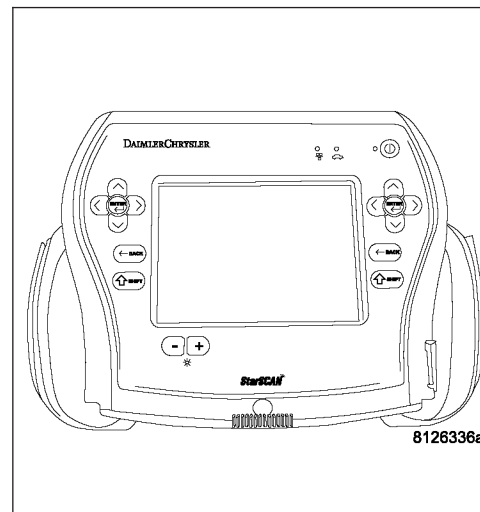
With the scan tool, read FCM DTCs.

**Are there any FCM CAN BUS DTC's present?**

**Yes** >> Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING and diagnose the appropriate symptom.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 2

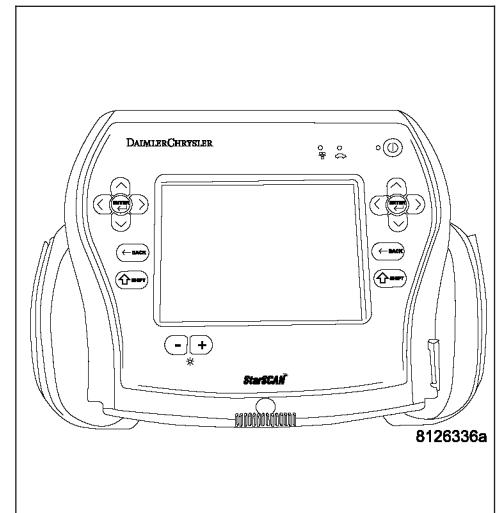


**U140E-IMPLAUSIBLE VEHICLE CONFIGURATION DATA RECEIVED (CONTINUED)****2. CHECK IF ENGINE DTC'S ARE PRESENT**

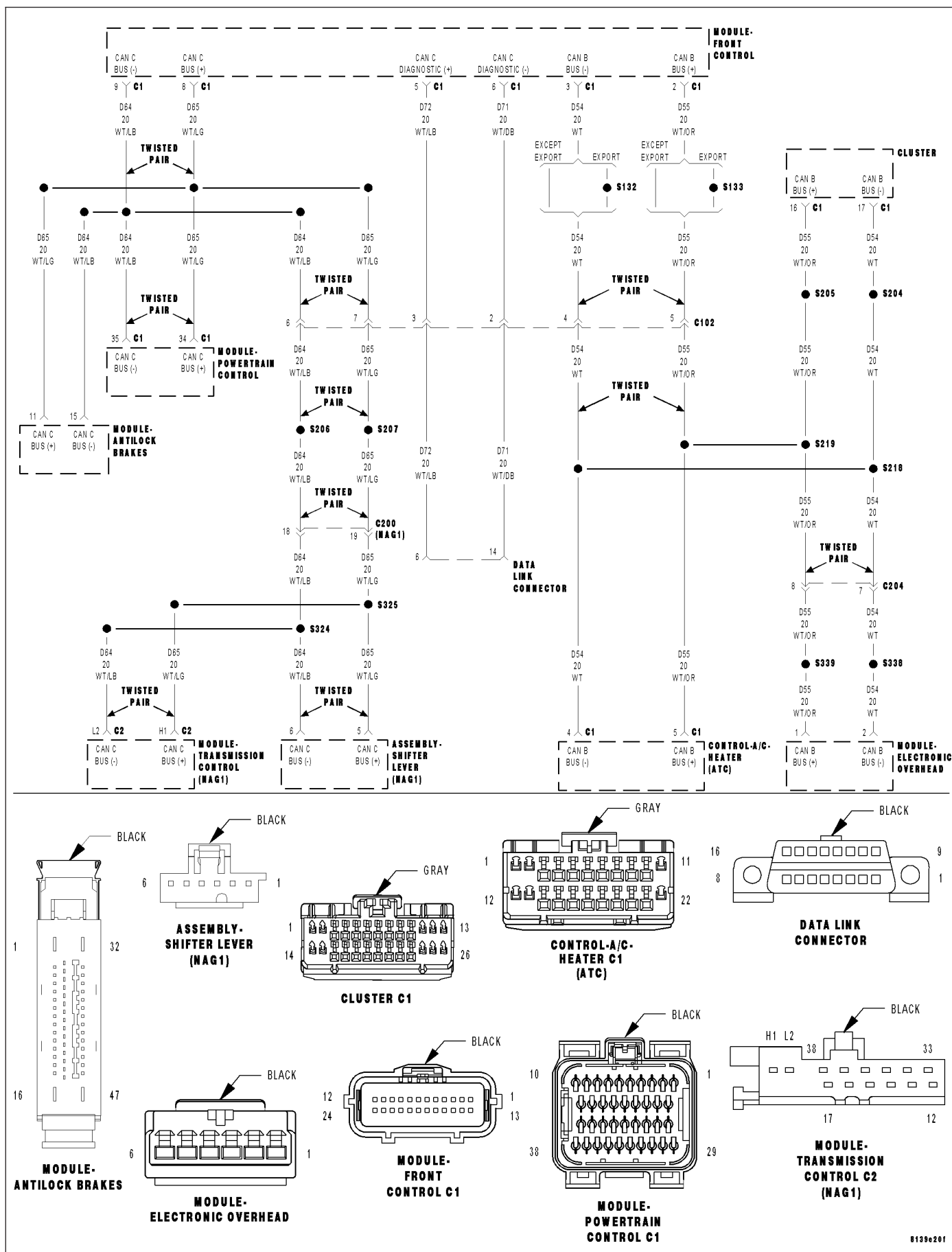
With the scan tool, read Engine DTCs.

**Are there any Engine DTC's present?**

- Yes** >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Anti-Lock Brake Module pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the Anti-Lock Brake Module per the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



# U1501-IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM PCM



U1501-IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM PCM (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects an incorrect CAN message from the Engine Control Module (ECM).

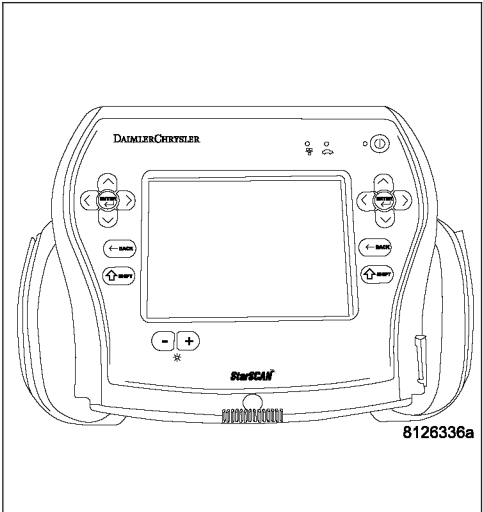
Possible Causes
FCM CAN BUS DTCS ENGINE DTCS ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK IF FCM CAN BUS DTC'S ARE PRESENT

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?**
- Yes**    >> Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING and diagnose the appropriate symptom.  
            Perform ABS VERIFICATION TEST - VER 1.
- No**      >> Go To 2

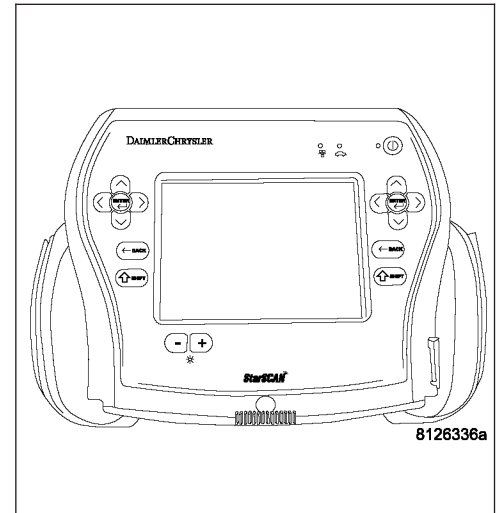


**U1501-IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM PCM (CONTINUED)****2. CHECK IF ENGINE DTC'S ARE PRESENT**

With the scan tool, read Engine DTCs.

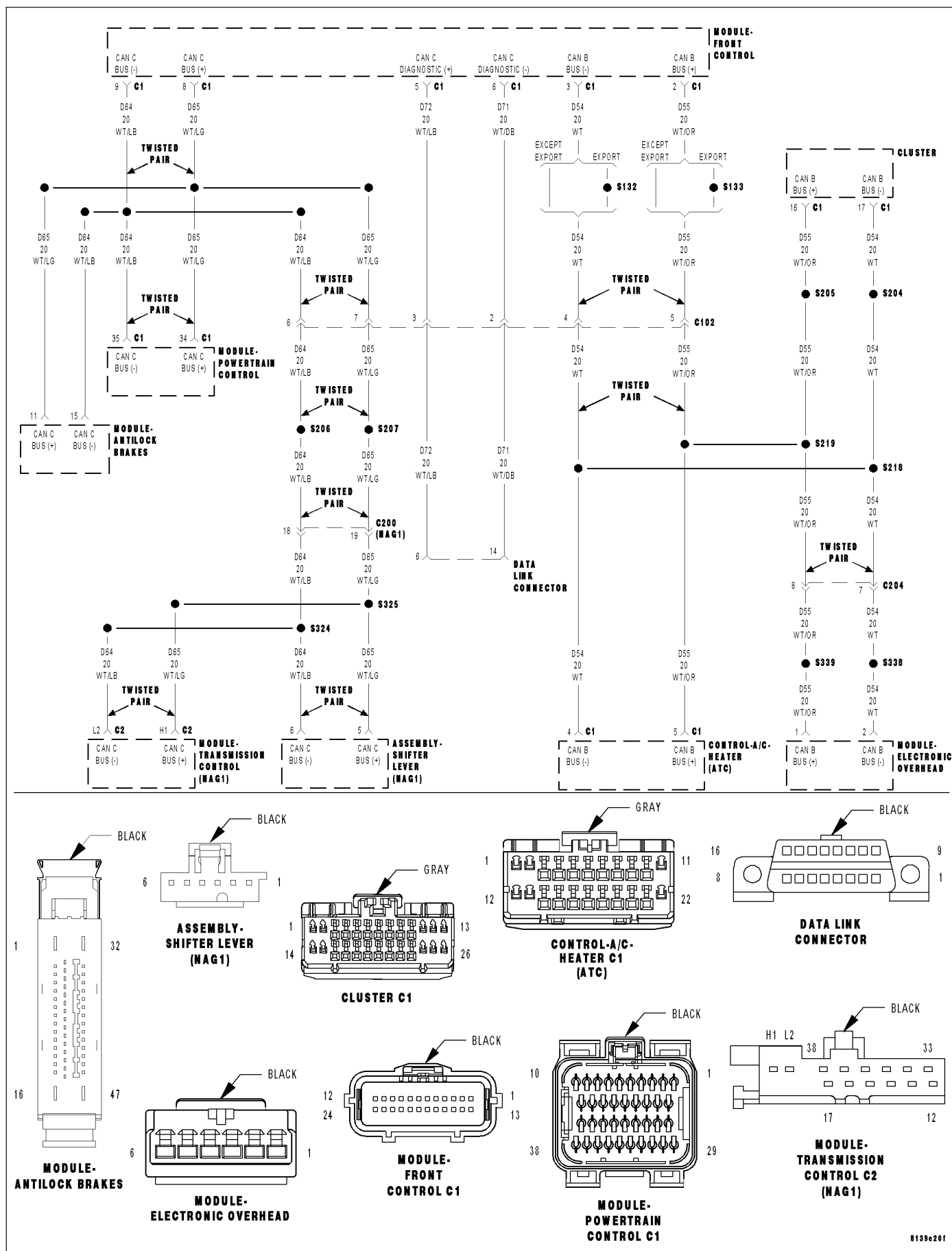
**Are there any Engine DTC's present?**

- Yes** >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Anti-Lock Brake Module pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the Anti-Lock Brake Module per the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.





## U1502-IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM TCM



**U1502-IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM TCM (CONTINUED)**

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects an incorrect CAN message from the Transmission Control Module (TCM).

Possible Causes
FCM CAN BUS DTCS TRANSMISSION DTCS ANTI-LOCK BRAKE MODULE

**Diagnostic Test****1. CHECK IF FCM CAN BUS DTC'S ARE PRESENT**

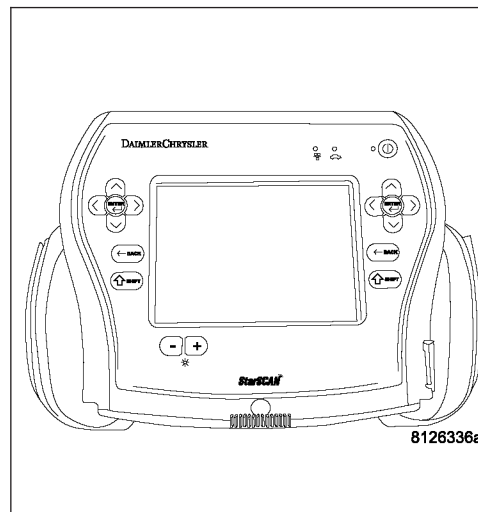
With the scan tool, read FCM DTCs.

**Are there any FCM CAN BUS DTC's present?**

**Yes** >> Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING and diagnose the appropriate symptom.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 2

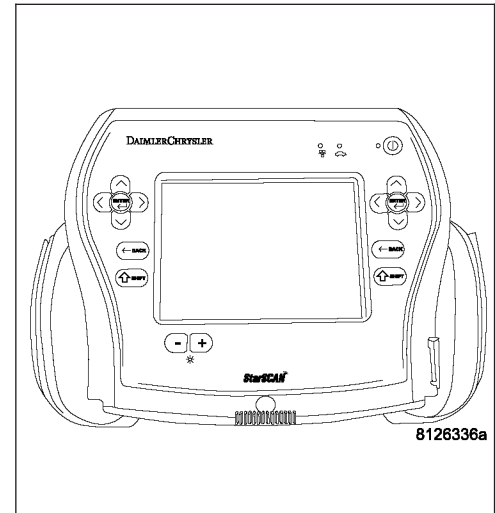


**U1502-IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM TCM (CONTINUED)****2. CHECK IF TRANSMISSION DTC'S ARE PRESENT**

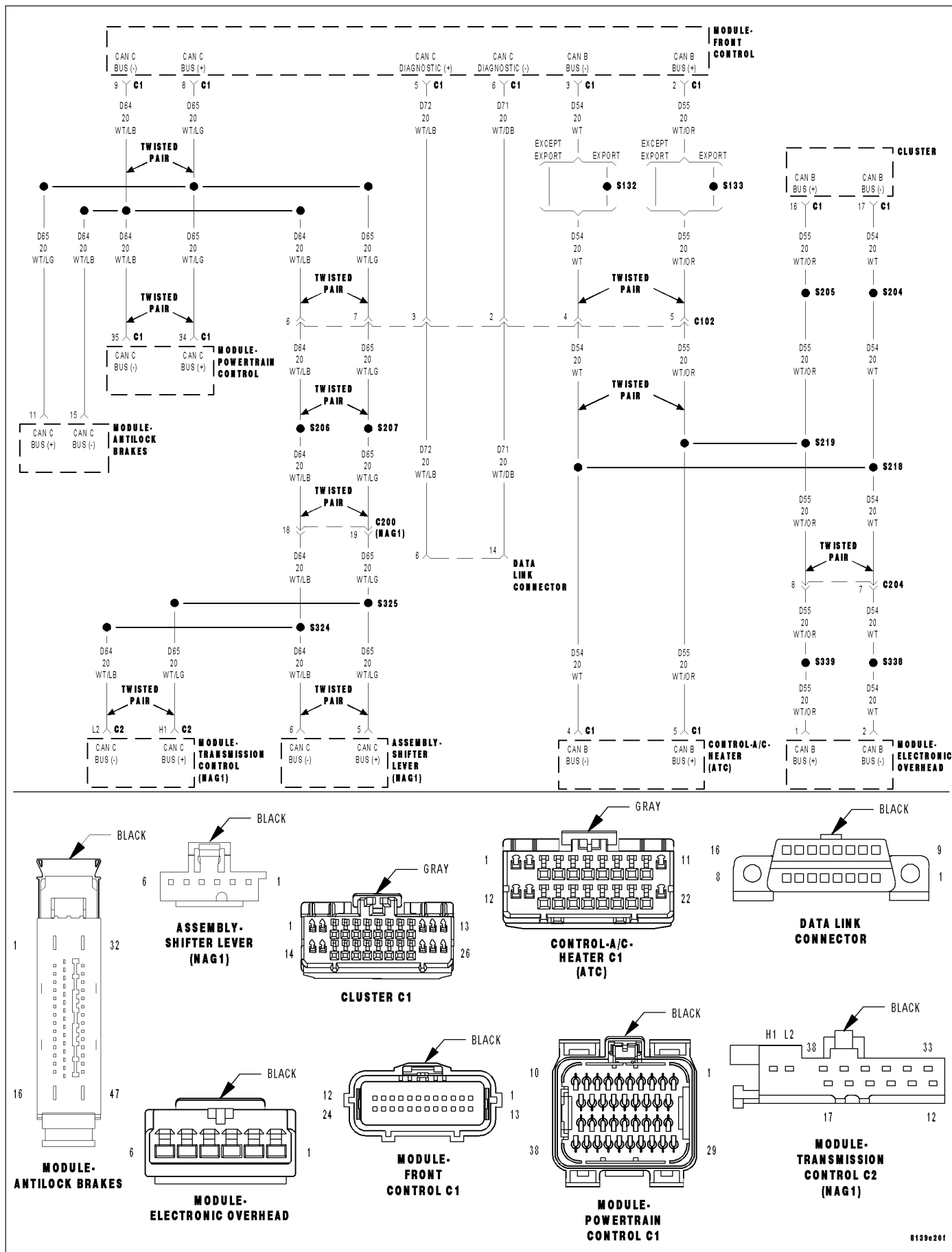
With the scan tool, read Transmission DTCs.

**Are there any Transmission DTC's present?**

- Yes** >> Refer to the 21 - TRANSMISSION ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Anti-Lock Brake Module pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the Anti-Lock Brake Module per the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



# U1503-IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM FCM



U1503-IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM FCM (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects an incorrect CAN message from the Front Control Module (FCM).

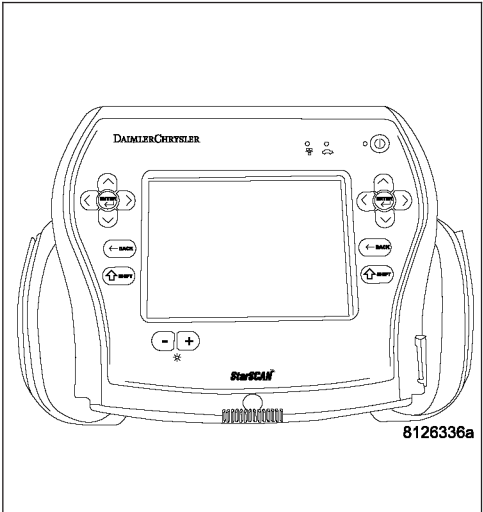
Possible Causes
FCM CAN BUS DTCS
ANTI-LOCK BRAKE MODULE

Diagnostic Test

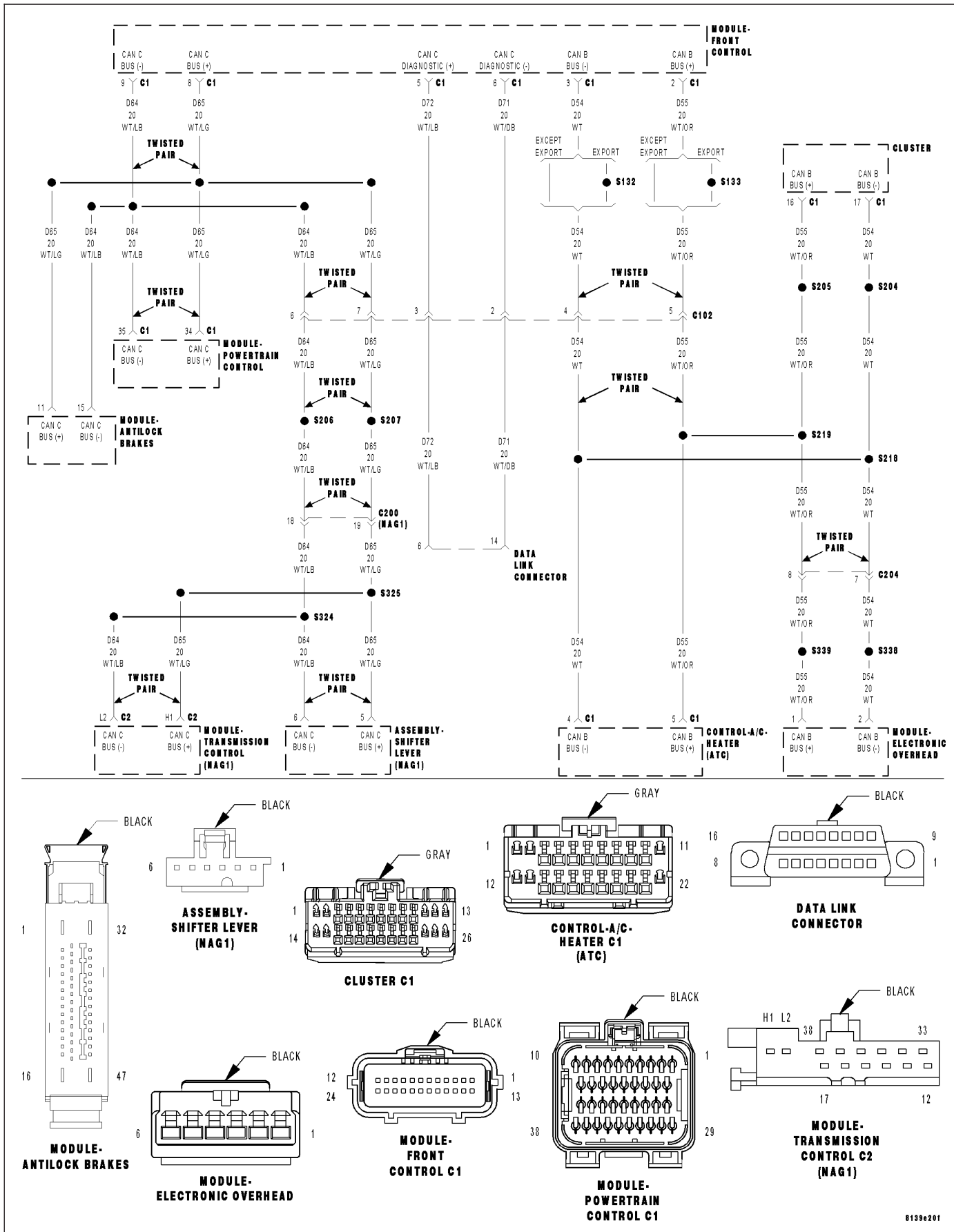
1. CHECK IF FCM CAN BUS DTC'S ARE PRESENT

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?**
- Yes**    >> Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING and diagnose the appropriate symptom.  
Perform ABS VERIFICATION TEST - VER 1.
- No**    >> Using the schematics as a guide, check the Anti-Lock Brake Module pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the Anti-Lock Brake Module per the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



## U1504-IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM STEERING ANGLE SENSOR



U1504-IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM STEERING ANGLE SENSOR (CONTINUED)

For the Anti-Lock Brake System circuit diagram. (Refer to 5 - BRAKES - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
When the Anti-Lock Brake Module detects an incorrect CAN message from the Steering Angle Sensor.

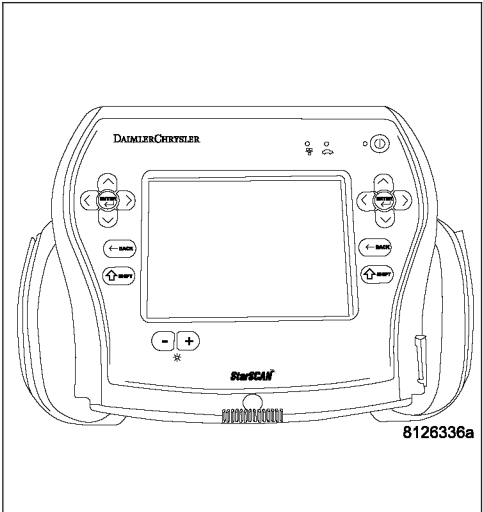
Possible Causes
FCM CAN BUS DTCS STEERING ANGLE SENSOR ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. CHECK IF FCM CAN BUS DTC'S ARE PRESENT

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?**
- Yes**    >> Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING and diagnose the appropriate symptom.  
            Perform ABS VERIFICATION TEST - VER 1.
- No**      >> Go To 2

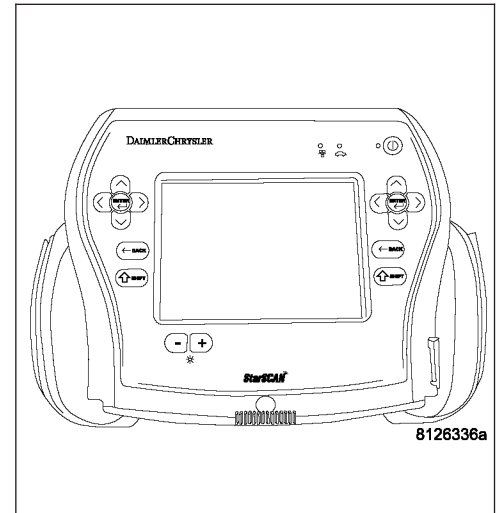


**U1504-IMPLAUSIBLE MESSAGE DATA LENGTH RECEIVED FROM STEERING ANGLE SENSOR (CONTINUED)****2. CHECK IF STEERING ANGLE SENSOR DTC'S ARE PRESENT**

With the scan tool, read Steering Angle Sensor DTCs.

**Are there any STEERING ANGLE SENSOR DTC's present?**

- Yes** >> Refer to the 5 - BRAKE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Anti-Lock Brake Module pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the Anti-Lock Brake Module per the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.





## ABS VERIFICATION TEST — VER 1

### Diagnostic Test

1.

1. Turn the ignition off.
2. Connect all previously disconnected components and connectors.
3. Ensure all accessories are turned off and the battery is fully charged.

**Note:** If the vehicle is equipped with ESP (Electronic Stability Program) the Steering Angle Sensor must be calibrated anytime an ABS component or the battery is disconnected. To calibrate the Steering Angle Sensor, start the engine and center the steering wheel. Turn the steering wheel all the way to the left until it stops, turn the steering wheel all the way to the right until it stops and bring the steering wheel back to center.

4. Ensure that the ignition is on, and with the scan tool, erase all Diagnostic Trouble Codes from All modules. Start the engine and allow it to run for 2 minutes and fully operate the system that was malfunctioning.

**CAUTION:** Ensure braking capability is available before road testing.

5. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the scan tool, read DTC's from all modules.
6. If any Diagnostic Trouble Codes are present, return to symptom list and trouble shoot new or recurring symptom.

**Note:** For Sensor Signal and Pump Motor faults, the CAB must sense all 4 wheels at 25 km/h (15 mph) before it will extinguish the ABS Indicator.

**CAUTION:** Ensure braking capability is available before road testing.

7. If there are no DTC's present after turning ignition on, road test the vehicle for at least 5 minutes. Perform several antilock braking stops.
8. Again, with the scan tool read DTC's. If any DTC's are present, return to Symptom list.
9. If there are no Diagnostic Trouble Codes (DTC's) present, and the customer's concern can no longer be duplicated, the repair is complete.

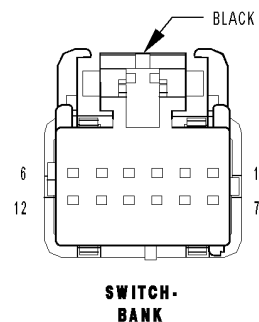
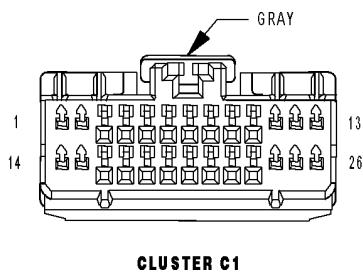
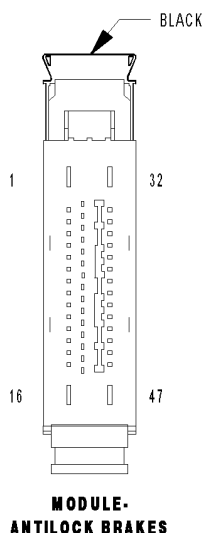
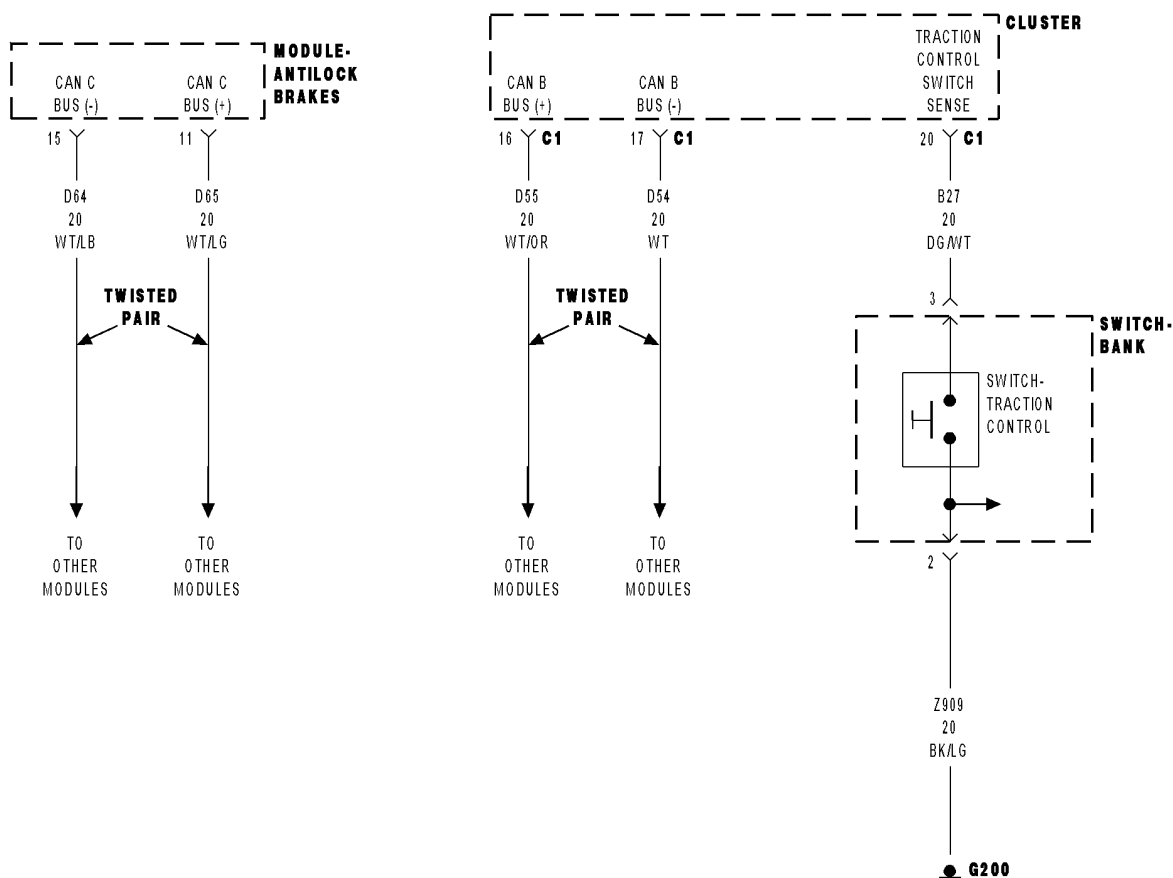
**Are any DTC's present or is the original concern still present?**

**Yes** >> Repair is not complete, refer to appropriate symptom.

**No** >> Repair is complete.

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# C230D-TRAC/ESP OFF SWITCH INPUT CIRCUIT LOW



**C230D-TRAC/ESP OFF SWITCH INPUT CIRCUIT LOW (CONTINUED)**

For the Cluster/CCN circuit diagram. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the CCN indicates that the Trac/ESP Switch is low for 30 seconds.

Possible Causes
STUCK CLOSED TRAC/ESP SWITCH (B27) TRACTION CONTROL SWITCH SENSE CIRCUIT SHORTED TO GROUND INSTRUMENT CLUSTER/CCN

**Diagnostic Test****1. CHECK FOR A DTC C230D-TRAC/ESP OFF SWITCH INPUT CIRCUIT LOW**

**Note:** If any of the following DTC's are present they must be repaired before continuing.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Turn the Trac/ESP Switch ON then OFF.

Wait for 30 seconds.

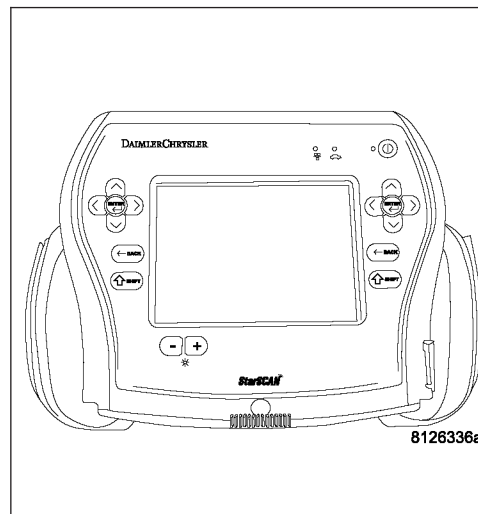
With the scan tool, read and record DTC's.

**Does the scan tool display: C230D-TRAC/ESP OFF SWITCH INPUT CIRCUIT LOW?**

**Yes**    >> Go To 2

**No**    >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform ABS VERIFICATION TEST - VER 1.



**C230D-TRAC/ESP OFF SWITCH INPUT CIRCUIT LOW (CONTINUED)****2. CHECK FOR A STUCK TRAC/ESP SWITCH**

Turn the ignition off.

Disconnect the Trac/ESP Switch harness connector.

Ensure the switch is in the OFF position.

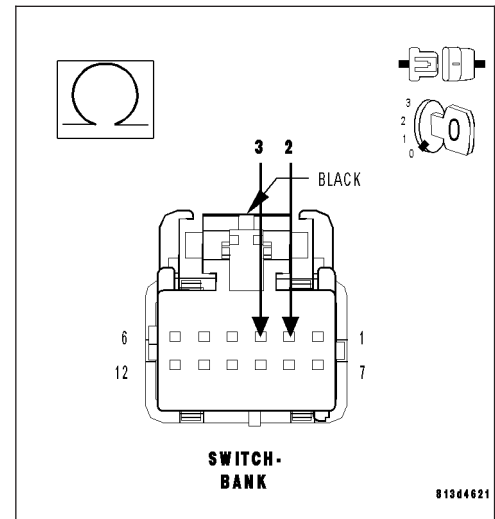
Measure the internal resistance of the Trac/ESP Switch between the (B27) Traction Control Switch Sense circuit and (Z909) Ground circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Trac/ESP switch in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. INSTRUMENT CLUSTER/CCN**

Turn the ignition off.

Disconnect the Trac/ESP Switch harness connector.

Disconnect the Instrument Cluster C1 harness connector.

Measure the resistance of the (B27) Traction Control Switch Sense circuit to ground.

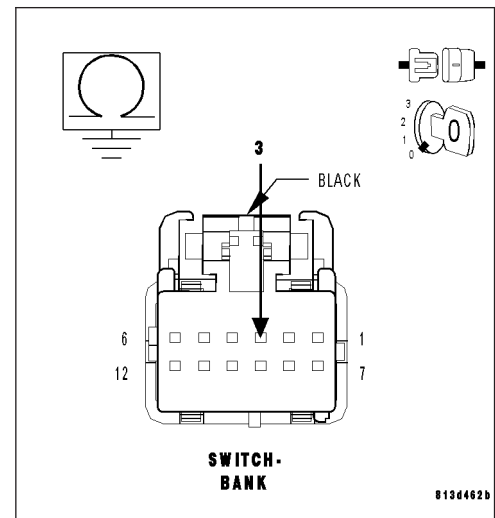
**Is the resistance below 5.0 ohms?**

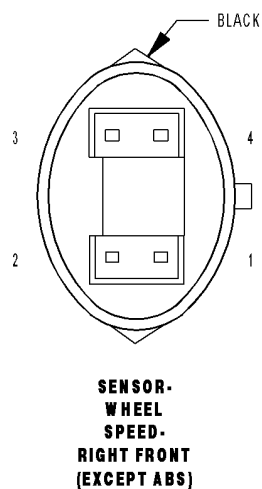
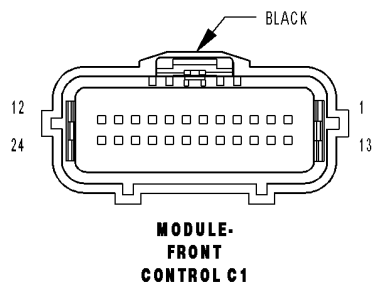
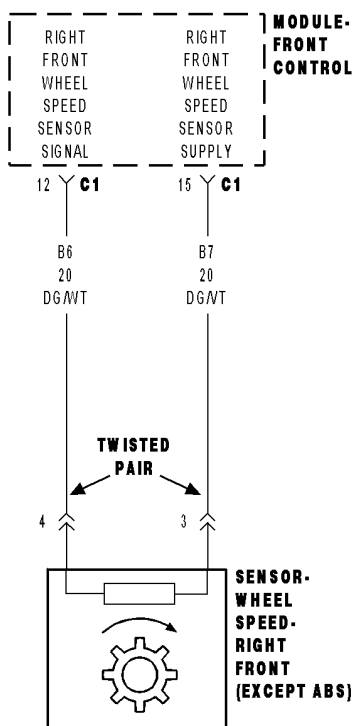
**Yes** >> Repair the (B27) Traction Control Switch Sense circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Replace the Instrument Cluster/CCN in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.



**C1017-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT LOW**

**C1017-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Front Control Module fails the Right Front WSS Signal circuit.

Possible Causes
TERMINAL/CONNECTOR/TONE WHEEL DAMAGE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT AND (B7) RIGHT FRONT WSS SUPPLY CIRCUIT SHORTED TOGETHER (B7) RIGHT FRONT WSS SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B6) RIGHT FRONT WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN RIGHT FRONT WSS FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK FOR A DTC C1017-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT LOW**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

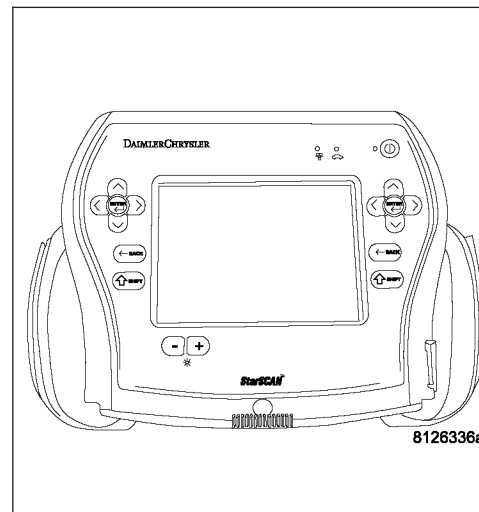
With the scan tool, read and record DTC's

**Does the scan tool display: C1017-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform ABS VERIFICATION TEST - VER 1.



**C1017-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT LOW (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

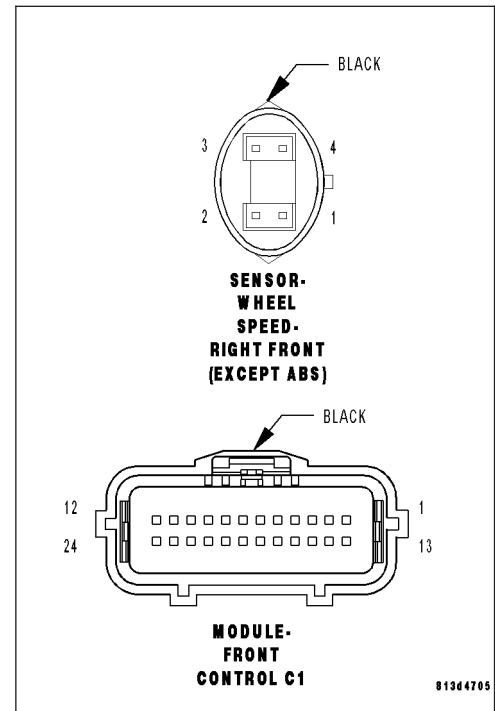
Visually inspect the Front Control Module C1 harness connector, WSS, WSS harness connector, and WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (B6) RIGHT FRONT WSS SIGNAL AND THE (B7) RIGHT FRONT WSS SUPPLY CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

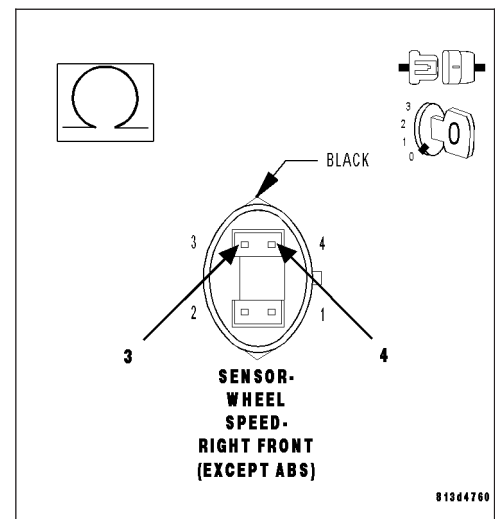
Disconnect the Right Front WSS harness connector.

Measure the resistance between the (B6) Right Front WSS Signal and the (B7) Right Front WSS Supply circuits at the Right Front WSS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (B6) Right Front WSS Signal and the (B7) Right Front WSS Supply circuits for a short together. Perform ABS VERIFICATION TEST - VER 1.



**C1017-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT LOW (CONTINUED)****4. CHECK THE VOLTAGE ON THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT**

Turn the ignition off.

Reconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

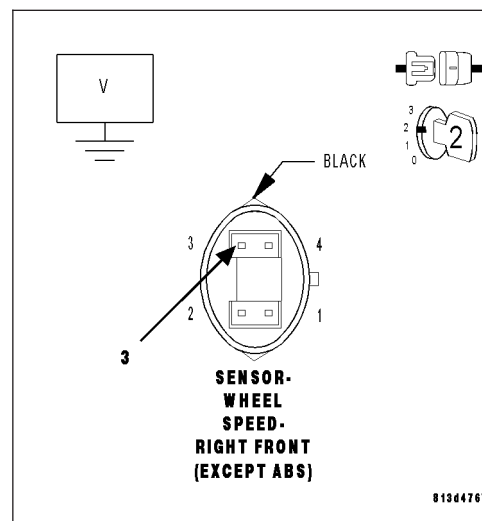
Turn the ignition on.

Measure the voltage of the (B7) Right Front WSS Supply circuit in the Right Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 8

**No** >> Go To 5

**5. CHECK THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

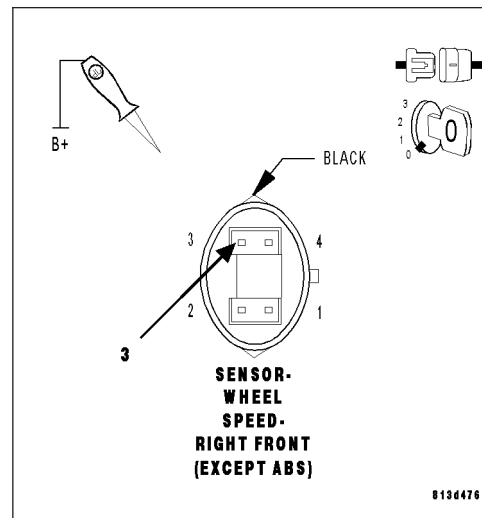
Using a 12-volt test light connected to 12-volts, check the (B7) Right Front WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B7) Right Front WSS Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6





**C1017-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT LOW (CONTINUED)****6. CHECK THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

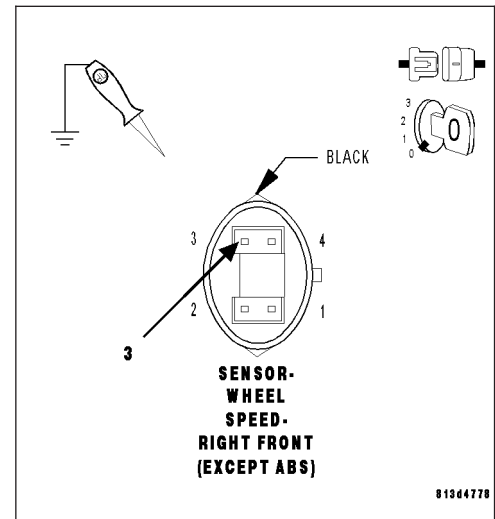
Using a 12-volt test light connected to ground, check the (B7) Right Front WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B7) Right Front WSS Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

Connect a jumper wire between the (B7) Right Front WSS Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B7) Right Front WSS Supply circuit.

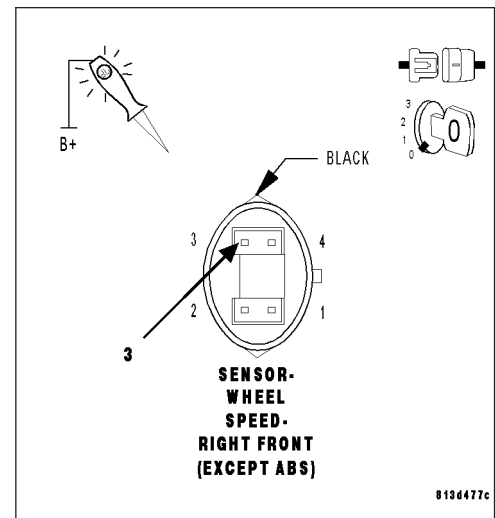
**Does the test light illuminate brightly?**

**Yes** >> Replace the Front Control Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B7) Right Front WSS Supply circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C1017-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT LOW (CONTINUED)****8. CHECK THE (B7) RIGHT FRONT WSS SUPPLY AND THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE**

Turn the ignition off.

Disconnect the Right Front WSS harness connector.

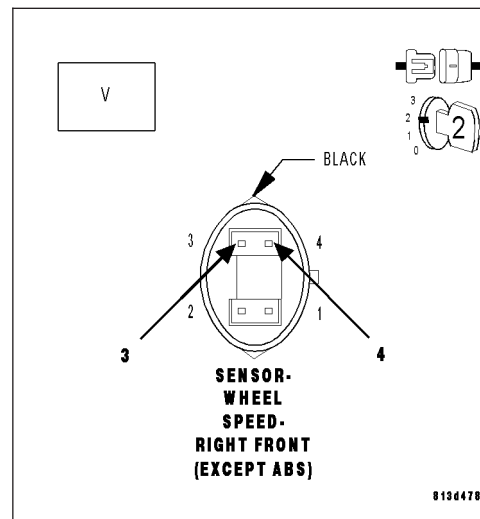
Turn the ignition on.

Measure the voltage between the (B7) Right Front WSS Supply and (B6) Right Front WSS Signal circuits at the Right Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 12

**No** >> Go To 9

**9. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

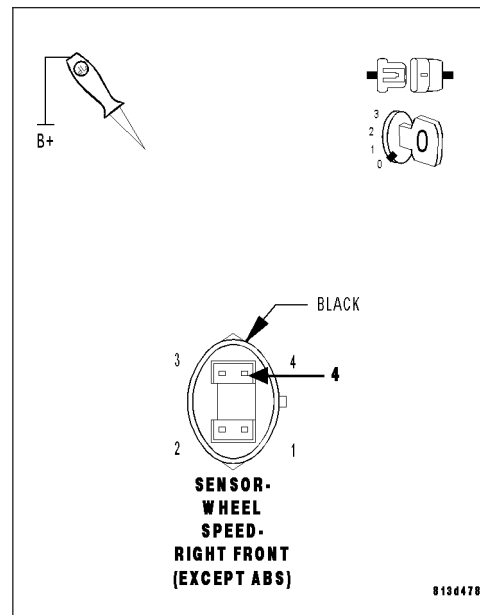
Using a 12-volt test light connected to 12-volts, check the (B6) Right Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B6) Right Front WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C1017-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT LOW (CONTINUED)****10. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

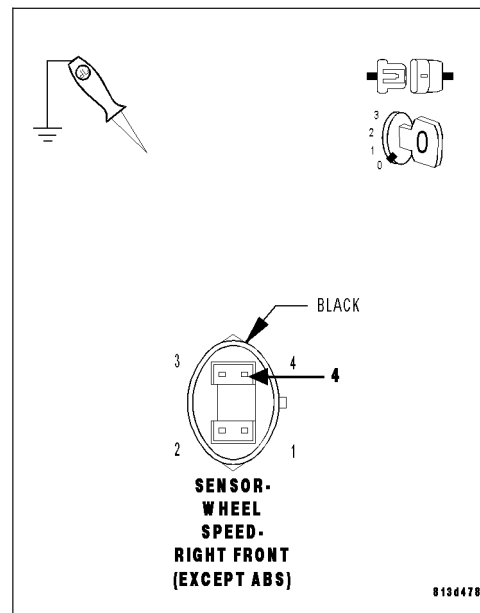
Using a 12-volt test light connected to ground, check the (B6) Right Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B6) Right Front WSS Signal circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

Connect a jumper wire between the (B6) Right Front WSS Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B6) Right Front WSS Signal circuit.

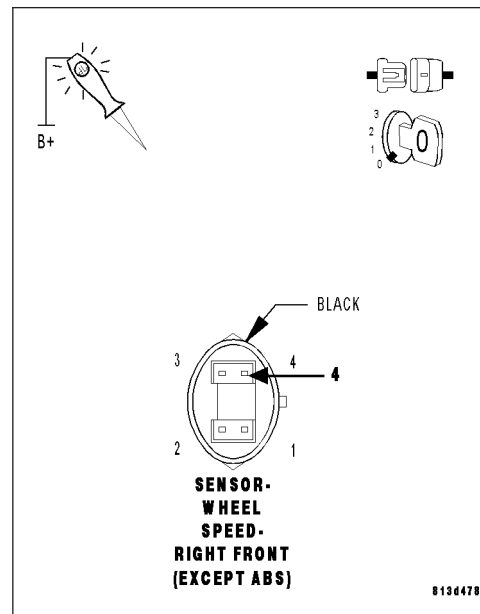
**Does the test light illuminate brightly?**

**Yes** >> Replace the Front Control Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B6) Right Front WSS Signal circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C1017-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT LOW (CONTINUED)****12. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

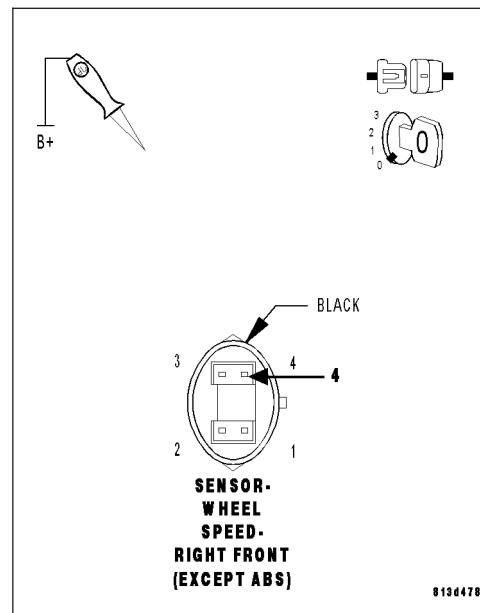
Using a 12-volt test light connected to 12-volts, check the (B6) Right Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B6) Right Front WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE AT THE RIGHT FRONT WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

While back probing, measure between the (B6) Right Front WSS Signal circuit and chassis ground at the Right Front WSS harness connector.

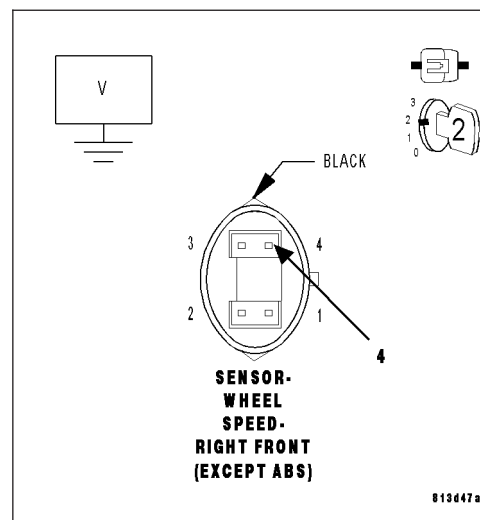
Slowly rotate the wheel by hand.

**Did the (B6) Right Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 14

**No** >> Replace the Right Front WSS in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.



**C1017-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT LOW (CONTINUED)****14. CHECK THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE AT THE FRONT CONTROL MODULE HARNESS CONNECTOR**

Turn the ignition off.

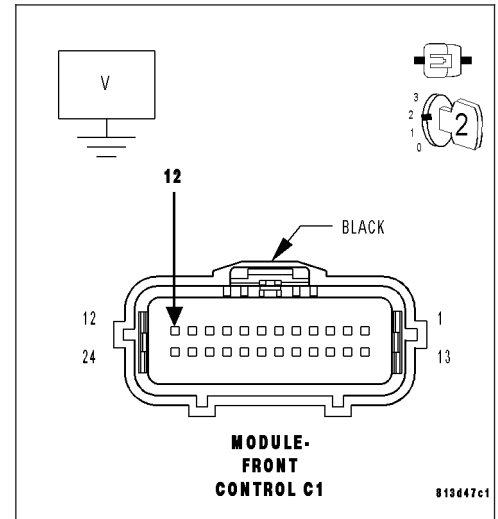
Turn the ignition on.

While back probing, measure between the (B6) Right Front WSS Signal circuit and chassis ground at the Front Control Module harness connector.

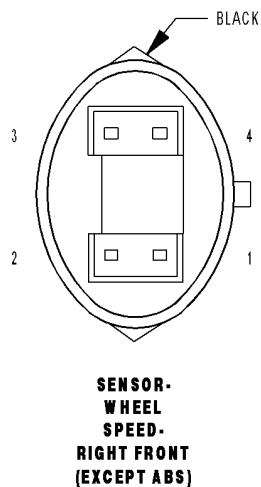
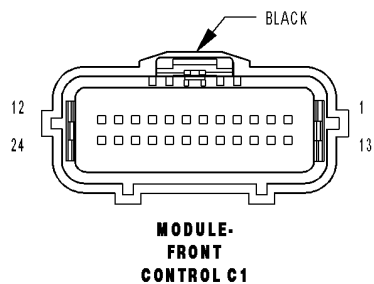
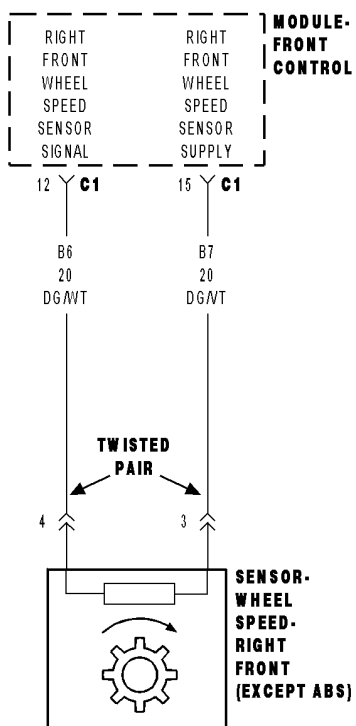
Slowly rotate the wheel by hand.

**Did the (B6) Right Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

- Yes** >> Replace the Front Control Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B6) Right Front WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



## C1018-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT HIGH



C1018-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT HIGH (CONTINUED)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Front Control Module fails the Right Front WSS Signal circuit.

Possible Causes
TERMINAL/CONNECTOR/TONE WHEEL DAMAGE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT AND (B7) RIGHT FRONT WSS SUPPLY CIRCUIT SHORTED TOGETHER (B7) RIGHT FRONT WSS SUPPLY CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN (B6) RIGHT FRONT WSS SIGNAL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN RIGHT FRONT WSS FRONT CONTROL MODULE

Diagnostic Test

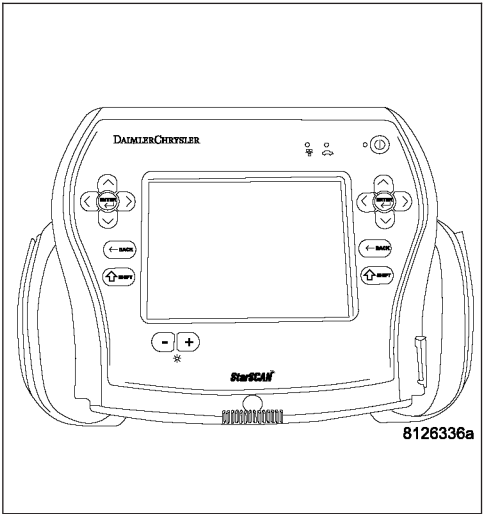
1. CHECK FOR A DTC C1018-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT HIGH

**Note:** This DTC must be active for the results of this test to be valid.

- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's

**Does the scan tool display: C1018-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT HIGH?**

- Yes**    >> Go To 2
- No**    >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform ABS VERIFICATION TEST - VER 1.



**C1018-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT HIGH (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS/TONE WHEEL FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

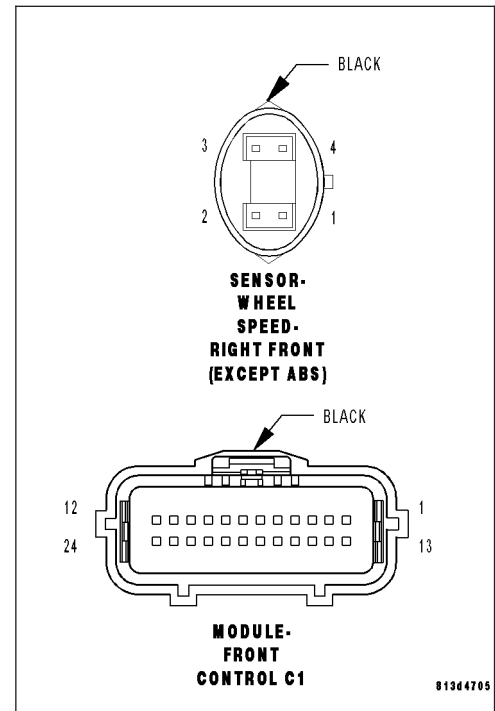
**Note:** Check the tone wheel teeth for missing teeth, cracks, or looseness. Teeth should be perfectly square, not bent, or nicked. Turn the ignition off.

Visually inspect the Front Control Module C1 harness connector, WSS, WSS harness connector, and WSS tone wheel (if applicable) for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (B6) RIGHT FRONT WSS SIGNAL AND THE (B7) RIGHT FRONT WSS SUPPLY CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

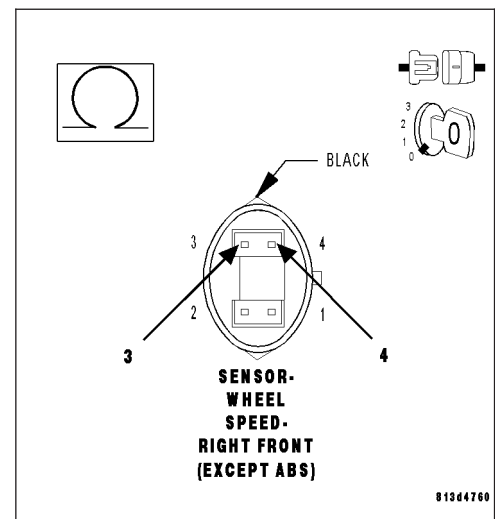
Disconnect the Right Front WSS harness connector.

Measure the resistance between the (B6) Right Front WSS Signal and the (B7) Right Front WSS Supply circuits at the Right Front WSS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (B6) Right Front WSS Signal and the (B7) Right Front WSS Supply circuits for a short together.  
Perform ABS VERIFICATION TEST - VER 1.





**C1018-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT HIGH (CONTINUED)****4. CHECK THE VOLTAGE ON THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT**

Turn the ignition off.

Reconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

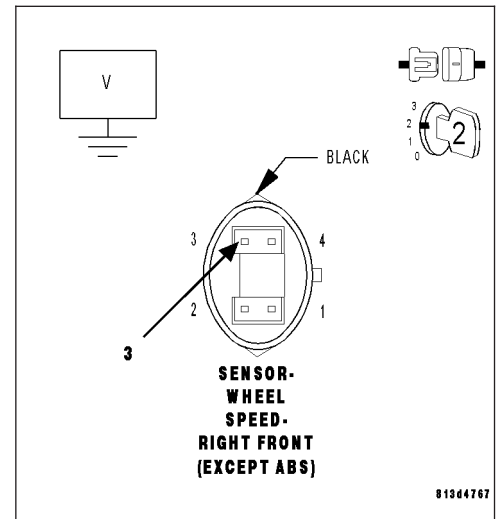
Turn the ignition on.

Measure the voltage of the (B7) Right Front WSS Supply circuit in the Right Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 8

**No** >> Go To 5

**5. CHECK THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

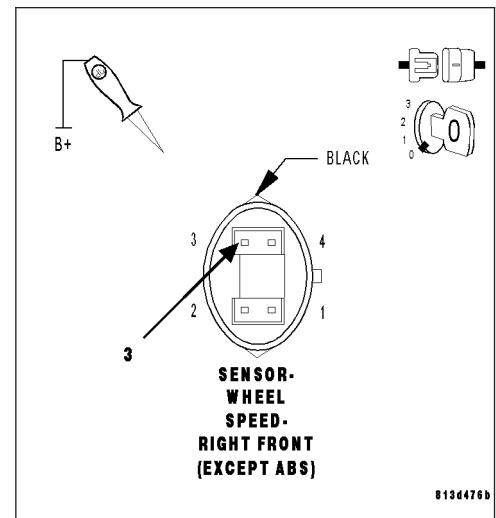
Using a 12-volt test light connected to 12-volts, check the (B7) Right Front WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B7) Right Front WSS Supply circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**C1018-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT HIGH (CONTINUED)****6. CHECK THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

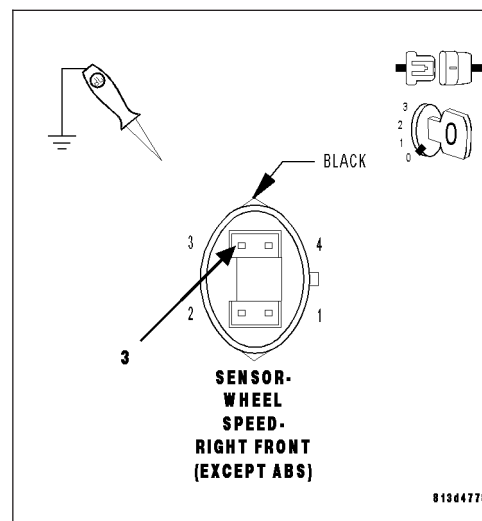
Using a 12-volt test light connected to ground, check the (B7) Right Front WSS Supply circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B7) Right Front WSS Supply circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (B7) RIGHT FRONT WSS SUPPLY CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

Connect a jumper wire between the (B7) Right Front WSS Supply circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B7) Right Front WSS Supply circuit.

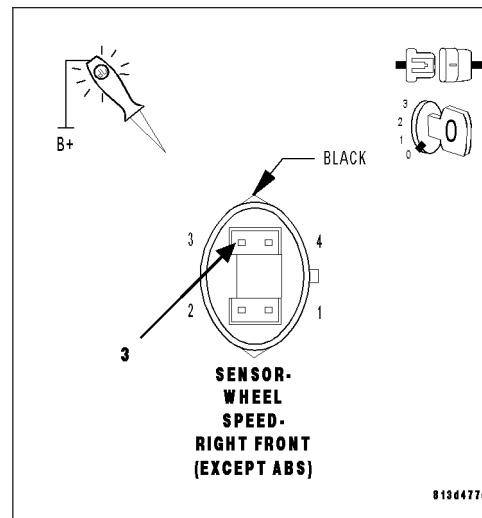
**Does the test light illuminate brightly**

**Yes** >> Replace the Front Control Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B7) Right Front WSS Supply circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C1018-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT HIGH (CONTINUED)****8. CHECK THE (B7) RIGHT FRONT WSS SUPPLY AND THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE**

Turn the ignition off.

Disconnect the Right Front WSS harness connector.

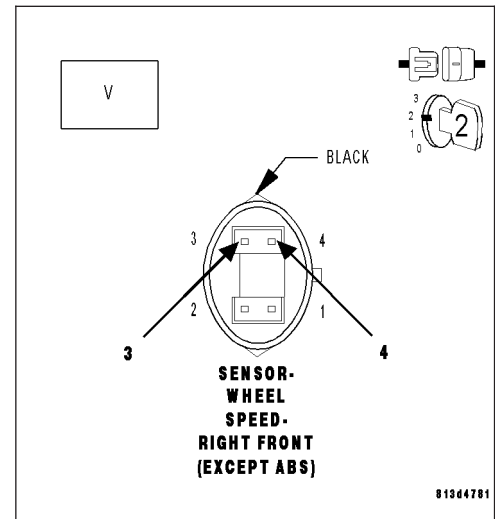
Turn the ignition on.

Measure the voltage between the (B7) Right Front WSS Supply and (B6) Right Front WSS Signal circuits at the Right Front WSS harness connector.

**Is the voltage above 10 volts?**

**Yes** >> Go To 12

**No** >> Go To 9

**9. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

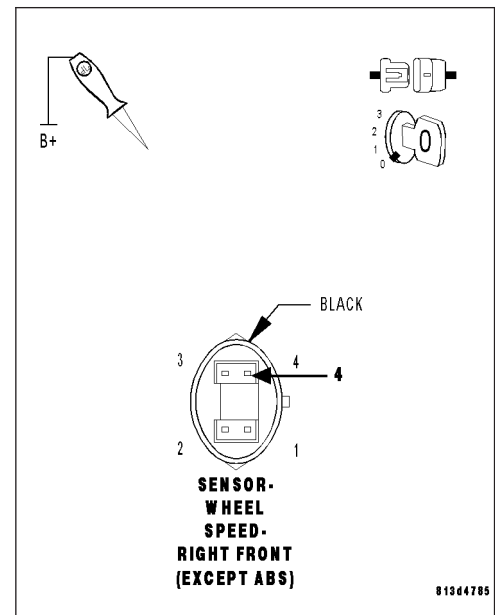
Using a 12-volt test light connected to 12-volts, check the (B6) Right Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B6) Right Front WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 10



**C1018-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT HIGH (CONTINUED)****10. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

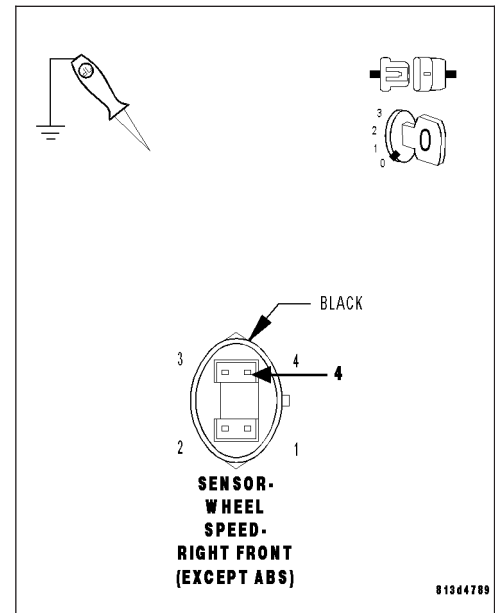
Using a 12-volt test light connected to ground, check the (B6) Right Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B6) Right Front WSS Signal circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

Connect a jumper wire between the (B6) Right Front WSS Signal circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (B6) Right Front WSS Signal circuit.

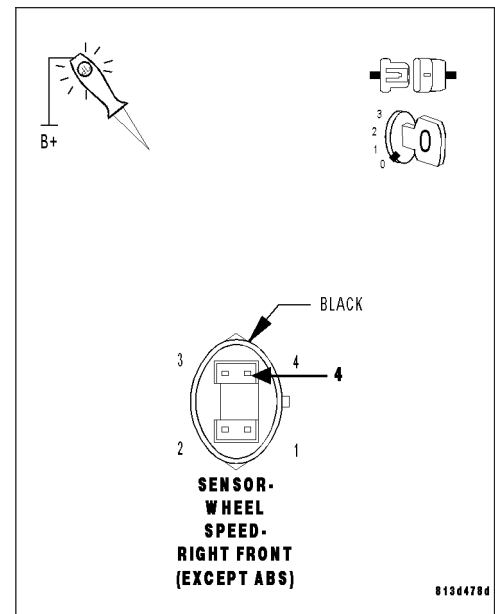
**Does the test light illuminate brightly?**

**Yes** >> Replace the Front Control Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (B6) Right Front WSS Signal circuit for an open.

Perform ABS VERIFICATION TEST - VER 1.



**C1018-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT HIGH (CONTINUED)****12. CHECK THE (B6) RIGHT FRONT WSS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Disconnect the Right Front WSS harness connector.

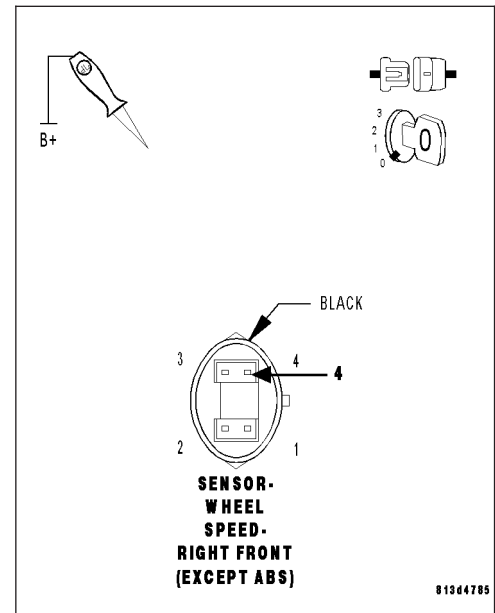
Using a 12-volt test light connected to 12-volts, check the (B6) Right Front WSS Signal circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (B6) Right Front WSS Signal circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. CHECK THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE AT THE RIGHT FRONT WSS HARNESS CONNECTOR**

Turn the ignition off.

Reconnect all connectors.

Turn the ignition on.

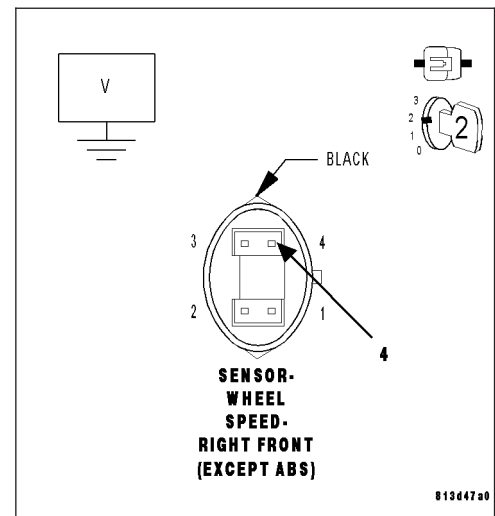
While back probing, measure between the (B6) Right Front WSS Signal circuit and chassis ground at the Right Front WSS harness connector.

Slowly rotate the wheel by hand.

**Did the (B6) Right Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

**Yes** >> Go To 14

**No** >> Replace the Right Front WSS in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.



**C1018-RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT HIGH (CONTINUED)****14. CHECK THE (B6) RIGHT FRONT WSS SIGNAL VOLTAGE AT THE FRONT CONTROL MODULE HARNESS CONNECTOR**

Turn the ignition off.

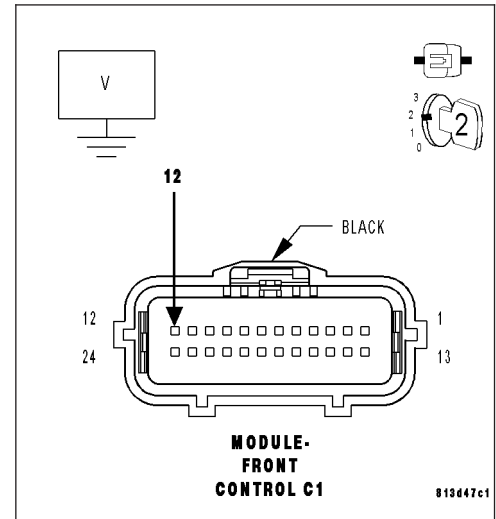
Turn the ignition on.

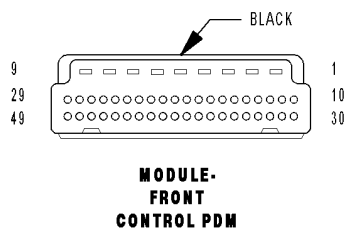
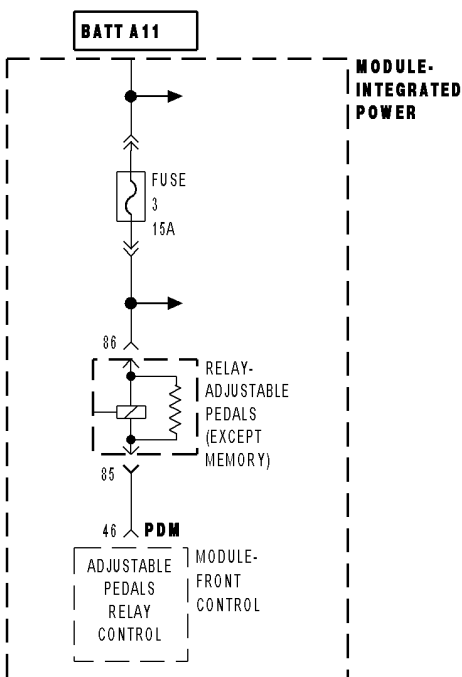
While back probing, measure between the (B6) Right Front WSS Signal circuit and chassis ground at the Front Control Module harness connector.

Slowly rotate the wheel by hand.

**Did the (B6) Right Front WSS Signal circuit voltage toggle between approximately 1.6 to .8 volts?**

- Yes** >> Replace the Front Control Module in accordance with the Service Information.  
Perform ABS VERIFICATION TEST - VER 1.
- No** >> Repair the (B6) Right Front WSS Signal circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



**B1D4F-ADJUSTABLE PEDAL INHIBIT CIRCUIT LOW**

**B1D4F-ADJUSTABLE PEDAL INHIBIT CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Front Control Module fails the Adjustable Pedal Inhibit Relay circuit.

Possible Causes
TERMINAL/CONNECTOR DAMAGE ADJUSTABLE PEDALS RELAY (P201) ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN FRONT CONTROL MODULE INTEGRATED POWER MODULE

**Diagnostic Test****1. CHECK FOR A DTC B1D4F-ADJUSTABLE PEDAL INHIBIT CIRCUIT LOW**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

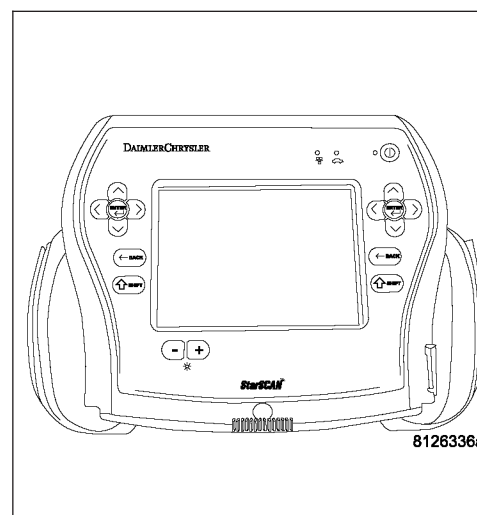
With the scan tool, read and record DTC's

**Does the scan tool display: B1D4F-ADJUSTABLE PEDAL INHIBIT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform APS VERIFICATION TEST - VER 1.





**B1D4F-ADJUSTABLE PEDAL INHIBIT CIRCUIT LOW (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

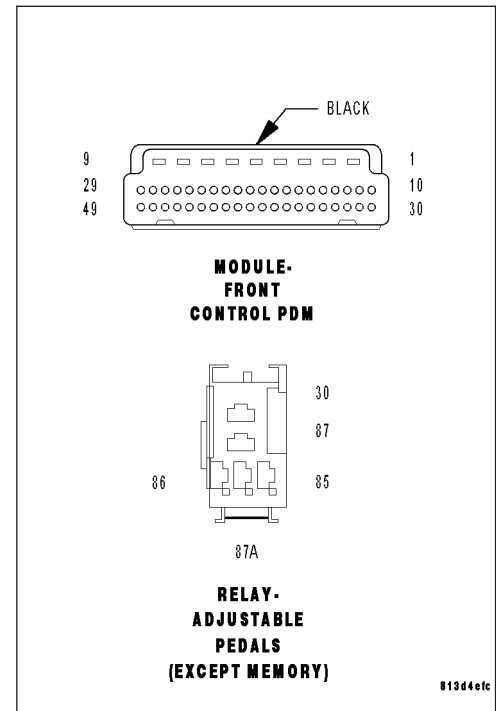
Turn the ignition off.

Visually inspect the wiring for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. SWAP OUT THE ADJUSTABLE PEDALS RELAY**

Turn the ignition off.

Install a substitute relay in place of the Adjustable Pedals Relay.

Turn the ignition on.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

With the scan tool, read and record DTC's

**Does the scan tool display: B1D4F-ADJUSTABLE PEDAL INHIBIT CIRCUIT LOW?**

**Yes** >> Go To 4

**No** >> Replace the Adjustable Pedals Relay in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.

**B1D4F-ADJUSTABLE PEDAL INHIBIT CIRCUIT LOW (CONTINUED)****4. CHECK THE VOLTAGE ON THE FUSED B(+) CIRCUIT FOR THE ADJUSTABLE PEDALS RELAY**

Turn the ignition off.

Remove the Adjustable Pedals Relay from the IPM.

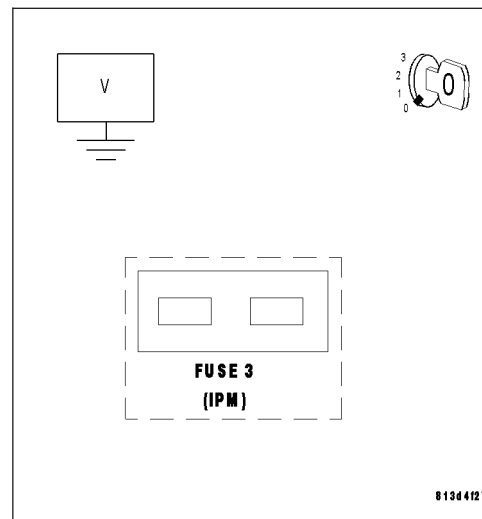
Measure the voltage of the internal Fused B(+) circuit at the IPM.

**Is the voltage above 10 volts?**

**Yes** >> Go To 5

**No** >> Replace the IPM in accordance with the Service Information.

Perform APS VERIFICATION TEST - VER 1.

**5. CHECK THE (P201) ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Remove the Adjustable Pedals Relay from the IPM.

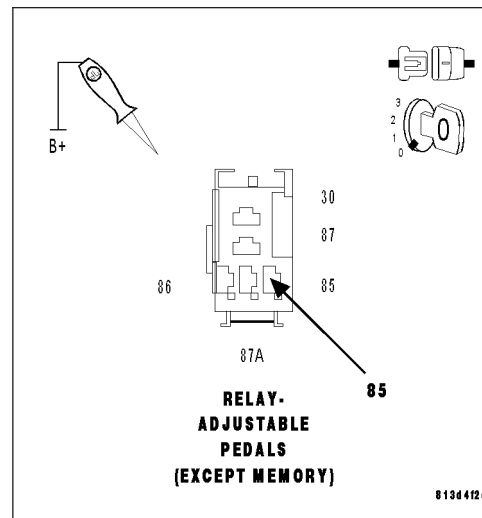
Using a 12-volt test light connected to 12-volts, check the (P201) Adjustable Pedals Relay Control circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (P201) Adjustable Pedals Relay Control circuit for a short to ground.

Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**B1D4F-ADJUSTABLE PEDAL INHIBIT CIRCUIT LOW (CONTINUED)****6. CHECK THE (P201) ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Remove the Adjustable Pedals Relay from the IPM.

Turn the ignition on.

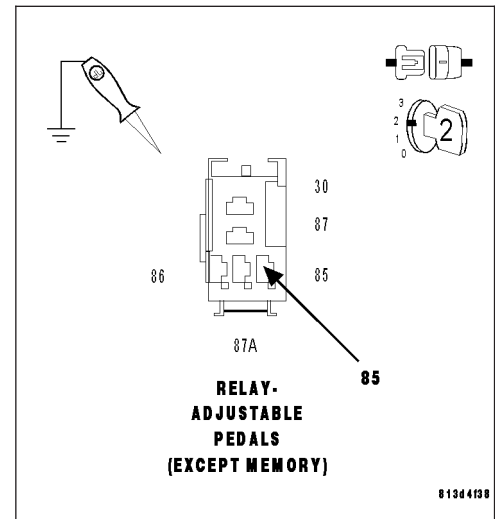
Using a 12-volt test light connected to ground, check the (P201) Adjustable Pedals Relay Control circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (P201) Adjustable Pedals Relay Control circuit for a short to voltage.

Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (P201) ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Remove the Adjustable Pedals Relay from the IPM.

Connect a jumper wire between the (P201) Adjustable Pedals Relay Control circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (P201) Adjustable Pedals Relay Control circuit.

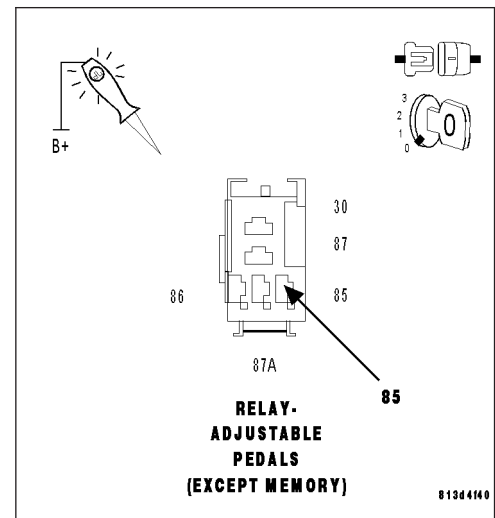
**Does the test light illuminate brightly?**

**Yes** >> Replace the Front Control Module in accordance with the Service Information.

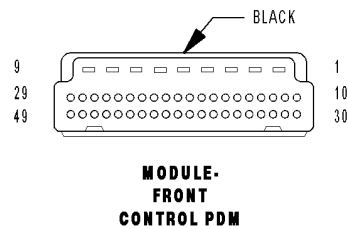
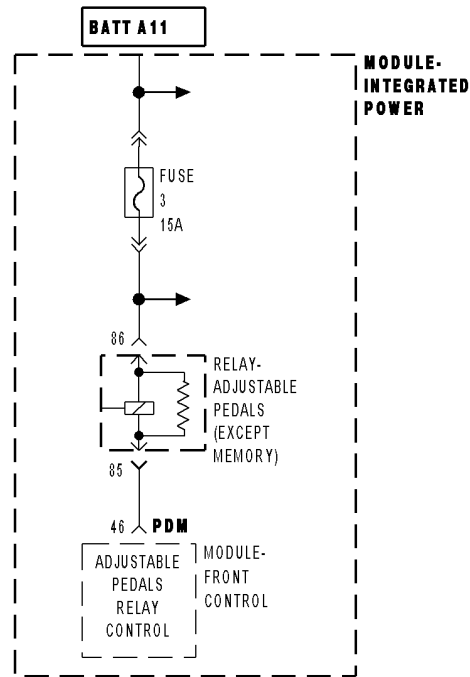
Perform APS VERIFICATION TEST - VER 1.

**No** >> Repair the (P201) Adjustable Pedals Relay Control circuit for an open.

Perform APS VERIFICATION TEST - VER 1.



## B1D50-ADJUSTABLE PEDAL INHIBIT CIRCUIT HIGH



**B1D50-ADJUSTABLE PEDAL INHIBIT CIRCUIT HIGH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Front Control Module fails the Adjustable Pedal Inhibit Relay circuit.

Possible Causes
TERMINAL/CONNECTOR DAMAGE ADJUSTABLE PEDALS RELAY (P201) ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN FRONT CONTROL MODULE INTEGRATED POWER MODULE

**Diagnostic Test**

**1. CHECK FOR A DTC B1D50-ADJUSTABLE PEDAL INHIBIT CIRCUIT HIGH**

**Note:** This DTC must be active for the results of this test to be valid.

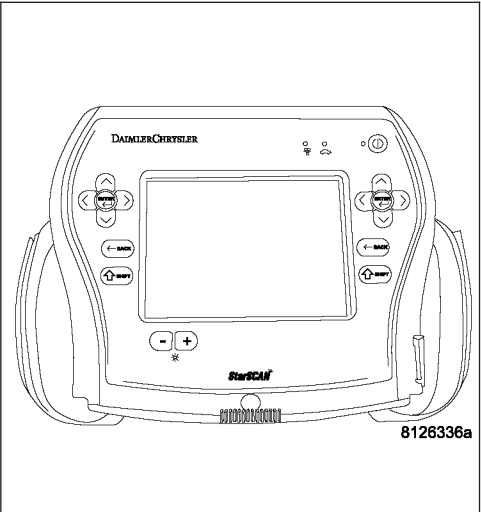
- Turn the ignition on.
- With the scan tool, read and record DTC's.
- With the scan tool, read and record Freeze Fame information.
- With the scan tool, erase DTC's.
- Cycle the ignition switch from off to on.
- With the scan tool, read and record DTC's

**Does the scan tool display: B1D50-ADJUSTABLE PEDAL INHIBIT CIRCUIT HIGH?**

- Yes

>> Go To 2
- No

>> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform APS VERIFICATION TEST - VER 1.



**B1D50-ADJUSTABLE PEDAL INHIBIT CIRCUIT HIGH (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

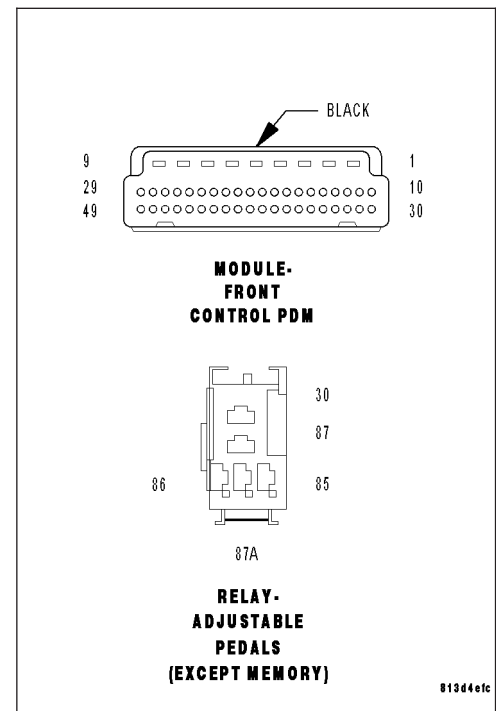
Turn the ignition off.

Visually inspect the wiring for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. SWAP OUT THE ADJUSTABLE PEDALS RELAY**

Turn the ignition off.

Install a substitute relay in place of the Adjustable Pedals Relay.

Turn the ignition on.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

With the scan tool, read and record DTC's

**Does the scan tool display: B1D4F-ADJUSTABLE PEDAL INHIBIT CIRCUIT LOW?**

**Yes** >> Go To 4

**No** >> Replace the Adjustable Pedals Relay in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.

**B1D50-ADJUSTABLE PEDAL INHIBIT CIRCUIT HIGH (CONTINUED)****4. CHECK THE VOLTAGE ON THE FUSED B(+) CIRCUIT FOR THE ADJUSTABLE PEDALS RELAY**

Turn the ignition off.

Remove the Adjustable Pedals Relay from the IPM.

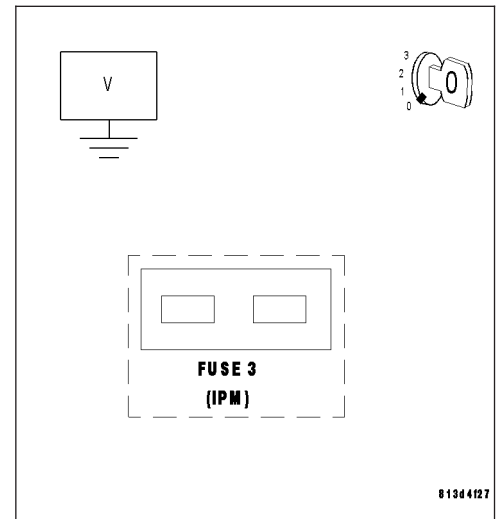
Measure the voltage of the internal Fused B(+) circuit at the IPM.

**Is the voltage above 10 volts?**

**Yes** >> Go To 5

**No** >> Replace the IPM in accordance with the Service Information.

Perform APS VERIFICATION TEST - VER 1.

**5. CHECK THE (P201) ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Remove the Adjustable Pedals Relay from the IPM.

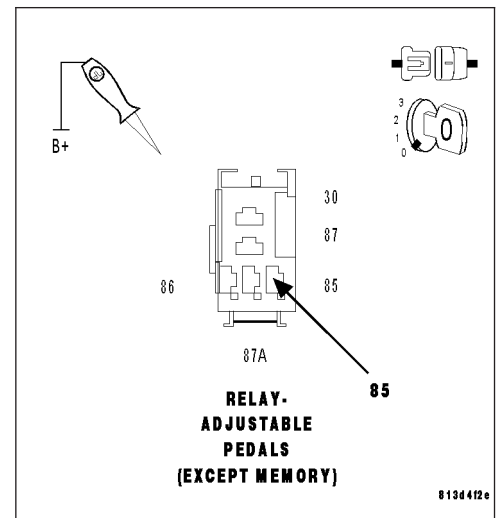
Using a 12-volt test light connected to 12-volts, check the (P201) Adjustable Pedals Relay Control circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (P201) Adjustable Pedals Relay Control circuit for a short to ground.

Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**B1D50-ADJUSTABLE PEDAL INHIBIT CIRCUIT HIGH (CONTINUED)****6. CHECK THE (P201) ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Remove the Adjustable Pedals Relay from the IPM.

Turn the ignition on.

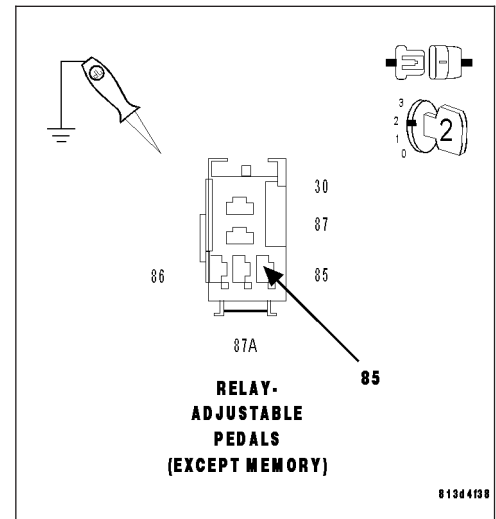
Using a 12-volt test light connected to ground, check the (P201) Adjustable Pedals Relay Control circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (P201) Adjustable Pedals Relay Control circuit for a short to voltage.

Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (P201) ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Remove the Adjustable Pedals Relay from the IPM.

Connect a jumper wire between the (P201) Adjustable Pedals Relay Control circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (P201) Adjustable Pedals Relay Control circuit.

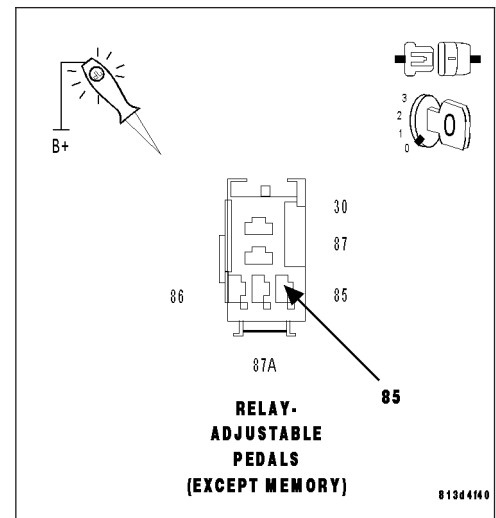
**Does the test light illuminate brightly?**

**Yes** >> Replace the Front Control Module in accordance with the Service Information.

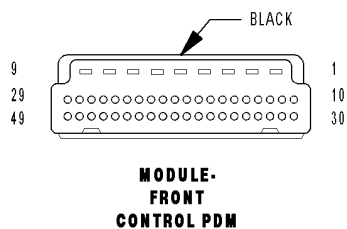
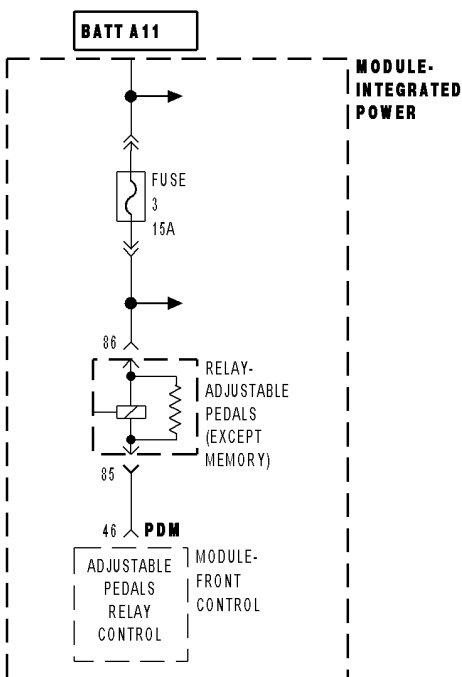
Perform APS VERIFICATION TEST - VER 1.

**No** >> Repair the (P201) Adjustable Pedals Relay Control circuit for an open.

Perform APS VERIFICATION TEST - VER 1.





**B1D51-ADJUSTABLE PEDAL INHIBIT CIRCUIT OPEN**

**B1D51-ADJUSTABLE PEDAL INHIBIT CIRCUIT OPEN (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Front Control Module fails the Adjustable Pedal Inhibit Relay circuit.

Possible Causes
TERMINAL/CONNECTOR DAMAGE ADJUSTABLE PEDALS RELAY (P201) ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE, GROUND, OR OPEN FRONT CONTROL MODULE INTEGRATED POWER MODULE

**Diagnostic Test****1. CHECK FOR A DTC B1D51-ADJUSTABLE PEDAL INHIBIT CIRCUIT OPEN**

**Note:** This DTC must be active for the results of this test to be valid.

Turn the ignition on.

With the scan tool, read and record DTC's.

With the scan tool, read and record Freeze Frame information.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

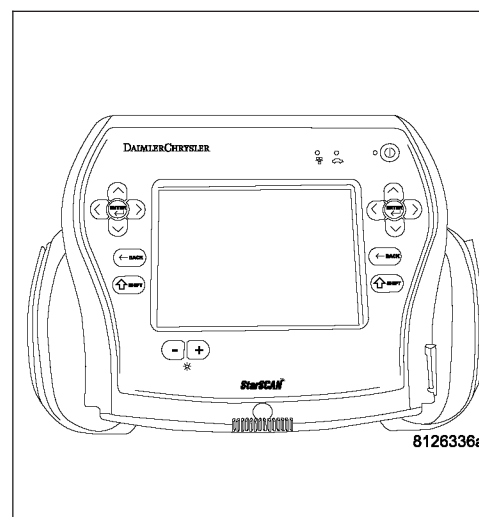
With the scan tool, read and record DTC's

**Does the scan tool display: B1D51-ADJUSTABLE PEDAL INHIBIT CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform APS VERIFICATION TEST - VER 1.



**B1D51-ADJUSTABLE PEDAL INHIBIT CIRCUIT OPEN (CONTINUED)****2. CHECK THE TERMINALS/CONNECTORS FOR DAMAGE**

**Note:** Check all related wiring for bruised, chafed, pierced, or partially broken wires.

**Note:** Check all related connectors for broken, bent, pushed out, or corroded terminals.

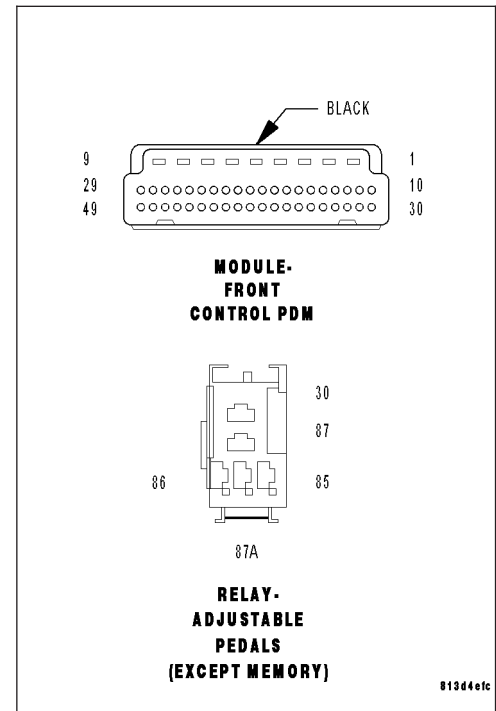
Turn the ignition off.

Visually inspect the wiring for damage.

**Were any problems found?**

**Yes** >> Repair as necessary.  
Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. SWAP OUT THE ADJUSTABLE PEDALS RELAY**

Turn the ignition off.

Install a substitute relay in place of the Adjustable Pedals Relay.

Turn the ignition on.

With the scan tool, erase DTC's.

Cycle the ignition switch from off to on.

With the scan tool, read and record DTC's

**Does the scan tool display: B1D4F-ADJUSTABLE PEDAL INHIBIT CIRCUIT LOW?**

**Yes** >> Go To 4

**No** >> Replace the Adjustable Pedals Relay in accordance with the Service Information.  
Perform APS VERIFICATION TEST - VER 1.

**B1D51-ADJUSTABLE PEDAL INHIBIT CIRCUIT OPEN (CONTINUED)****4. CHECK THE VOLTAGE ON THE FUSED B(+) CIRCUIT FOR THE ADJUSTABLE PEDALS RELAY**

Turn the ignition off.

Remove the Adjustable Pedals Relay from the IPM.

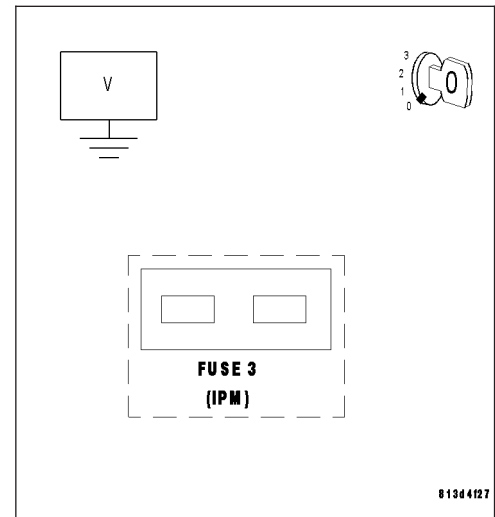
Measure the voltage of the internal Fused B(+) circuit at the IPM.

**Is the voltage above 10 volts?**

**Yes** >> Go To 5

**No** >> Replace the IPM in accordance with the Service Information.

Perform APS VERIFICATION TEST - VER 1.

**5. CHECK THE (P201) ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Remove the Adjustable Pedals Relay from the IPM.

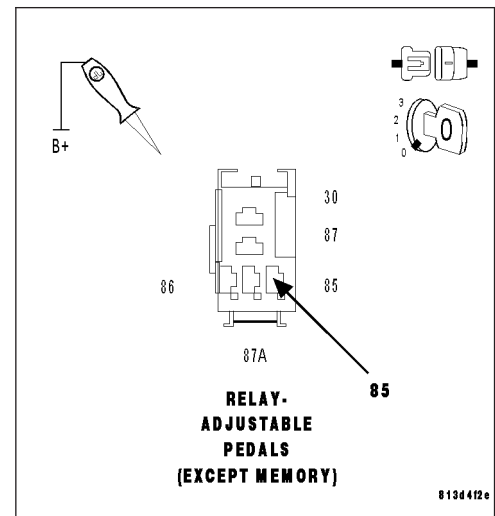
Using a 12-volt test light connected to 12-volts, check the (P201) Adjustable Pedals Relay Control circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (P201) Adjustable Pedals Relay Control circuit for a short to ground.

Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 6



**B1D51-ADJUSTABLE PEDAL INHIBIT CIRCUIT OPEN (CONTINUED)****6. CHECK THE (P201) ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Remove the Adjustable Pedals Relay from the IPM.

Turn the ignition on.

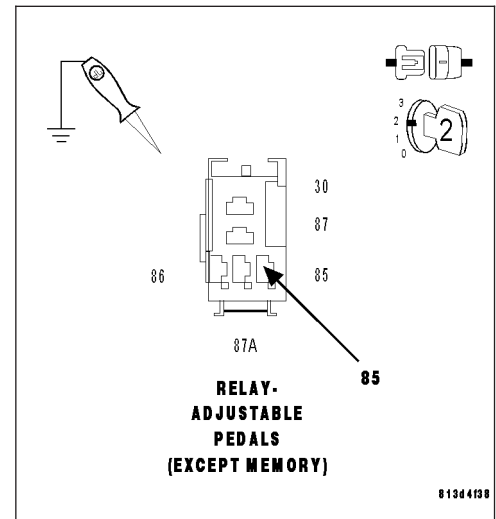
Using a 12-volt test light connected to ground, check the (P201) Adjustable Pedals Relay Control circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (P201) Adjustable Pedals Relay Control circuit for a short to voltage.

Perform APS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (P201) ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Front Control Module harness connector.

Remove the Adjustable Pedals Relay from the IPM.

Connect a jumper wire between the (P201) Adjustable Pedals Relay Control circuit and ground.

Using a 12-volt test light connected to 12-volts, check the (P201) Adjustable Pedals Relay Control circuit.

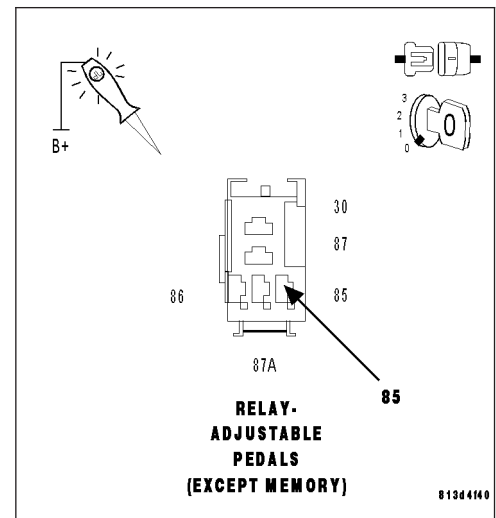
**Does the test light illuminate brightly**

**Yes** >> Replace the Front Control Module in accordance with the Service Information.

Perform APS VERIFICATION TEST - VER 1.

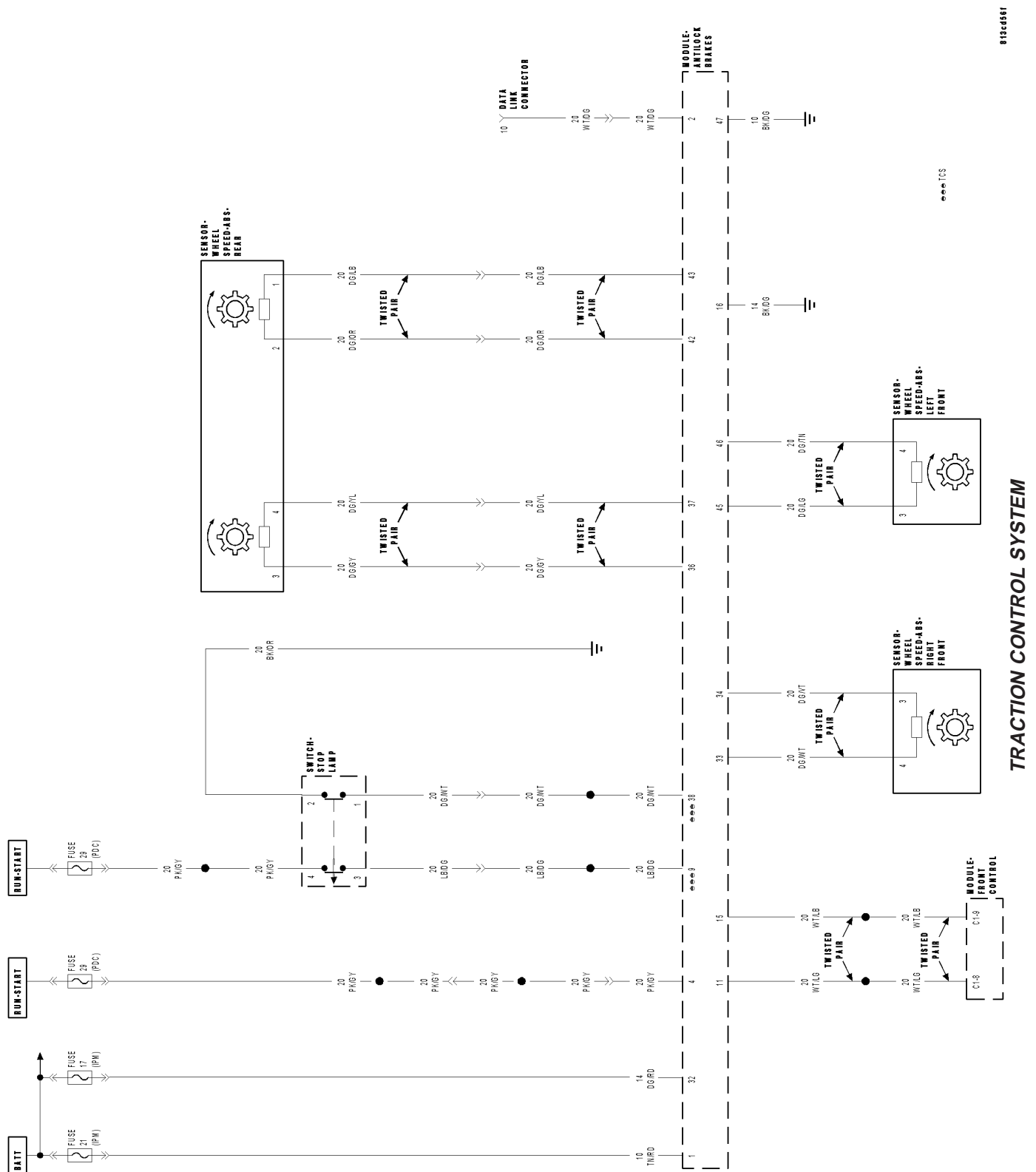
**No** >> Repair the (P201) Adjustable Pedals Relay Control circuit for an open.

Perform APS VERIFICATION TEST - VER 1.

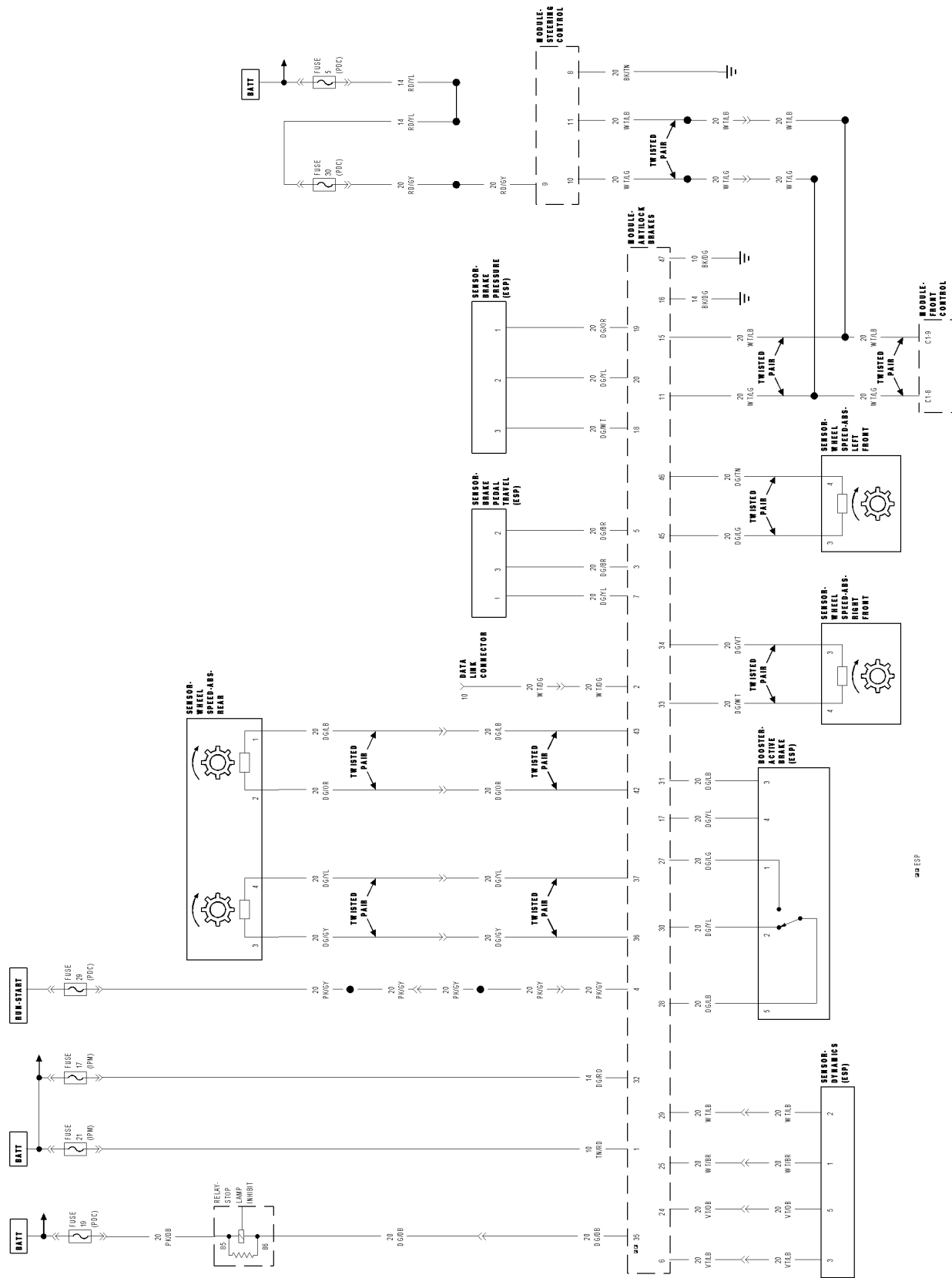


## SCHEMATICS AND DIAGRAMS

## SCHEMATICS AND DIAGRAMS



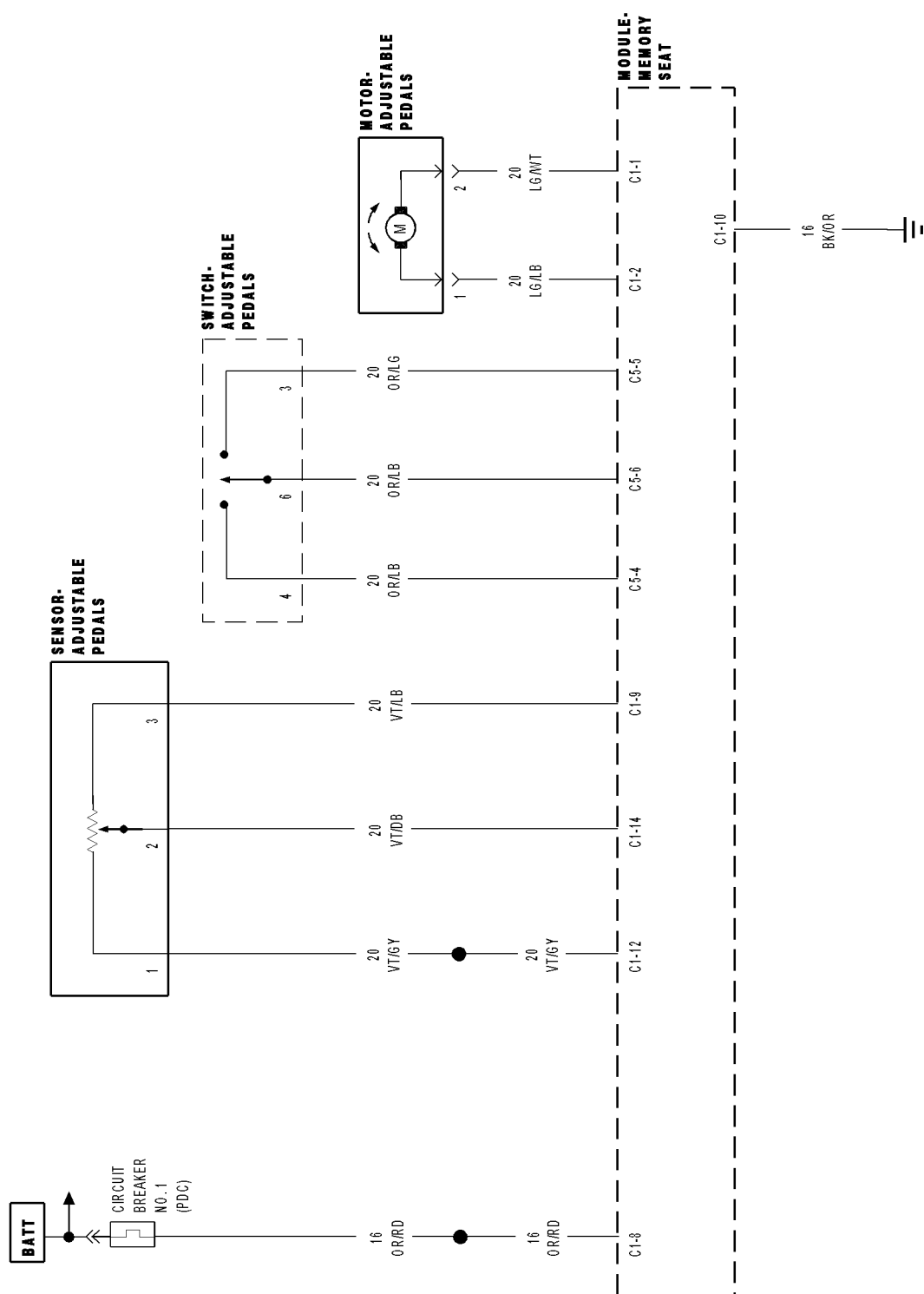
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ELECTRONIC STABILITY PROGRAM

## SCHEMATICS AND DIAGRAMS



813cd581

### ADJUSTABLE PEDALS SYSTEM



## BRAKES - ABS - SERVICE INFORMATION

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## BRAKES - ABS - SERVICE INFORMATION

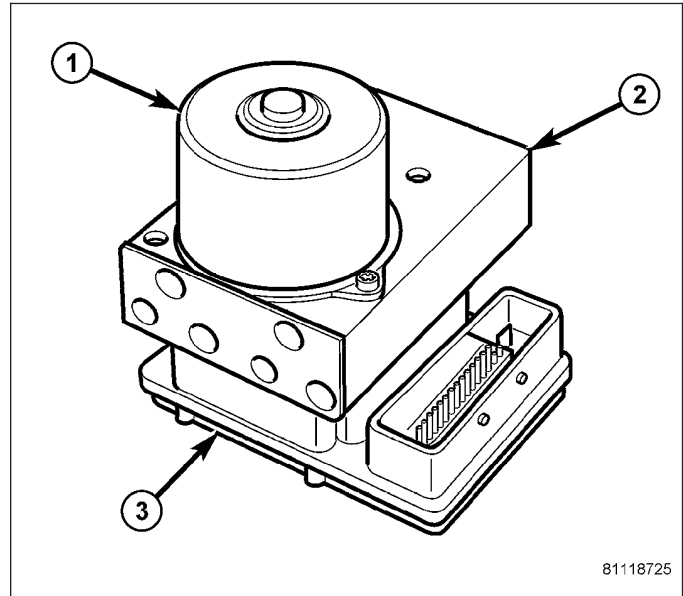
### DESCRIPTION

#### ANTILOCK BRAKE SYSTEM WITH TRACTION CONTROL

This vehicle uses the MK25 Antilock braking system (ABS). This system, a combined ABS and Traction Control system is standard on some vehicles and optional on others.

This antilock brake system uses components of the base brake system, but also features the following components:

- Integrated Control Unit (ICU) - Includes Hydraulic Control Unit (HCU) (2) and Antilock Brake Module (ABM) (3)
- Wheel Speed Sensors (WSS) - Four sensors (one at each wheel)



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### ABS

The purpose of the antilock brake system (ABS) is to prevent wheel lockup under braking conditions on virtually any type of road surface. Antilock braking is desirable because a vehicle that is stopped without locking the wheels retains directional stability and some steering capability. This allows the driver to retain greater control of the vehicle during braking.

#### ALL-SPEED TRACTION CONTROL

The traction control system is an all-speed traction control. All-Speed Traction Control enhances mobility and prevents wheel slip when accelerating on slippery surfaces. Depending on how slippery, an automatically activated Winter Mode feature will select lower transmission up-shift speeds. It also provides a measure of directional stability control. Using the wheel-speed sensors, it can detect excessive yaw and help keep the car on the intended course, as for instance, when accelerating around a curve.

With rear-wheel drive, All-Speed Traction Control is effective up to 85 mph (137 km/h); with AWD, All-Speed Traction Control is effective up to 45 mph (72 km/h), which is common among competitive AWD vehicles with traction control.

### ELECTRONIC STABILITY PROGRAM

ESP® (Electronic Stability Program), which includes a Brake Assist feature, is standard on some models and optional on others. ESP aids the driver in maintaining vehicle directional stability. ESP will do whatever can be done, within the limits of available traction, to keep the car on course.

ESP uses the ABS with Traction Control along with the following components to operate:

- Active Brake Booster
- Brake Pressure Switch
- Dynamics Sensor
- Travel Sensor
- Steering Angle Sensor (SAS)

The Active Brake Booster is part of the Power Brake Booster. The Brake Pressure Switch is mounted to the bottom of the Master Cylinder. The Dynamics Sensor that is mounted under the center console, which is near the center of

gravity of the car for effective sensing. The Travel Sensor is mounted in the Power Brake Booster. The Steering Angle Sensor is located in the steering column.

## **ELECTRONIC VARIABLE BRAKE PROPORTIONING**

Vehicles equipped with ABS use electronic variable brake proportioning (EVBP) to balance front-to-rear braking. The EVBP is used in place of a rear proportioning valve. The EVBP system uses the ABS system to control the slip of the rear wheels in partial braking range. The braking force of the rear wheels is controlled electronically by using the inlet and outlet valves located in the integrated control unit (ICU).

EVBP activation is invisible to the customer since there is no pump motor noise or brake pedal feedback.

## **OPERATION**

### **ANTILOCK BRAKE SYSTEM WITH TRACTION CONTROL**

#### **ABS**

There are a few performance characteristics of the MK25 Antilock Brake System that may at first seem abnormal, but in fact are normal. These characteristics are described below.

#### **NORMAL BRAKING**

Under normal braking conditions, the ABS functions the same as a standard base brake system with a diagonally split master cylinder and conventional vacuum assist.

#### **ABS BRAKING**

ABS operation is available at all vehicle speeds above 3–5 mph. If a wheel locking tendency is detected during a brake application, the brake system enters the ABS mode. During ABS braking, hydraulic pressure in the four wheel circuits is modulated to prevent any wheel from locking. Each wheel circuit is designed with a set of electric solenoids to allow modulation, although for vehicle stability, both rear wheel solenoids receive the same electrical signal. Wheel lockup may be perceived at the very end of an ABS stop and is considered normal.

During an ABS event, the integrated control unit (ICU) regulates hydraulic pressure at all 4 of the vehicle's wheels.

The hydraulic pressure at each front wheel is controlled independently (relative to the amount of slip at each wheel) in order to maximize the braking force generated by the front brakes. The rear wheels are controlled such that the hydraulic pressure at either rear wheel does not exceed that of the highest slip rear wheel in order to maintain vehicle stability.

The system can build and release pressure at each wheel, depending on signals generated by the wheel speed sensors (WSS) at each wheel and received at the Antilock Brake Module (ABM).

#### **NOISE AND BRAKE PEDAL FEEL**

During ABS braking, some brake pedal movement may be felt. In addition, ABS braking will create ticking, popping, or groaning noises heard by the driver. This is normal and is due to pressurized fluid being transferred between the master cylinder and the brakes. If ABS operation occurs during hard braking, some pulsation may be felt in the vehicle body due to fore and aft movement of the suspension as brake pressures are modulated.

At the end of an ABS stop, ABS is turned off when the vehicle is slowed to a speed of 3–4 mph. There may be a slight brake pedal drop anytime that the ABS is deactivated, such as at the end of the stop when the vehicle speed is less than 3 mph or during an ABS stop where ABS is no longer required. These conditions exist when a vehicle is being stopped on a road surface with patches of ice, loose gravel, or sand on it. Also, stopping a vehicle on a bumpy road surface activates ABS because of the wheel hop caused by the bumps.

#### **TIRE NOISE AND MARKS**

Although the ABS system prevents complete wheel lockup, some wheel slip is desired in order to achieve optimum braking performance. Wheel slip is defined as follows: 0 percent slip means the wheel is rolling freely and 100 percent slip means the wheel is fully locked. During brake pressure modulation, wheel slip is allowed to reach up to 25–30 percent. This means that the wheel rolling velocity is 25–30 percent less than that of a free rolling wheel at a given vehicle speed. This slip may result in some tire chirping, depending on the road surface. This sound should not be interpreted as total wheel lockup.

Complete wheel lockup normally leaves black tire marks on dry pavement. The ABS will not leave dark black tire marks since the wheel never reaches a fully locked condition. However, tire marks may be noticeable as light patched marks.

### **START-UP AND DRIVE-OFF CYCLES**

When the ignition is turned on, a popping sound and a slight brake pedal movement may be noticed. The ABS warning lamp will also be on for up to 5 seconds after the ignition is turned on.

When the vehicle is first driven off, a humming may be heard or felt by the driver at approximately 12–25 mph (20–40 km/h). All of these conditions are a normal function of ABS as the system is performing a diagnosis check.

### **PREMATURE ABS CYCLING**

Symptoms of premature ABS cycling include: clicking sounds from the solenoid valves; pump/motor running; and pulsations in the brake pedal. Premature ABS cycling can occur at any braking rate of the vehicle and on any type of road surface. Neither the red BRAKE indicator lamp, nor the amber ABS indicator lamp, illuminate and no fault codes are stored in the CAB.

Premature ABS cycling is a condition that needs to be correctly assessed when diagnosing problems with the antilock brake system. It may be necessary to use a scan tool to detect and verify premature ABS cycling.

Check the following common causes when diagnosing premature ABS cycling: damaged wheel bearings (causing tone wheel issues); damaged wheel bearing housings where wheel speed sensors mount; and loose wheel speed sensor mounting bolts.

After diagnosing the defective component, repair or replace it as required. When the component repair or replacement is completed, test drive the vehicle to verify that premature ABS cycling has been corrected.

### **ALL-SPEED TRACTION CONTROL**

Traction control systems sense impending wheel spin based on a model of the rate of change of wheel speed under normal traction conditions. The All-Speed Traction Control uses signals from the same wheel speed sensors as ABS to determine when to apply the brakes to one or more wheels and when to reduce engine torque output using the electronic throttle control (ETC) to prevent wheel slip during acceleration. Throttle control makes the vehicle less reliant on brake application alone to maintain traction, increasing the operating speed range and more closely modulates speed, resulting in smoother operation. With All-Speed Traction Control reducing engine torque as well as applying the brakes, it is possible to achieve almost seamless torque application at the wheels.

If the wheel slip is severe enough to require throttle intervention, All-Speed Traction Control will reduce engine torque and sometimes upshift the transmission to avoid the condition. In milliseconds, All-Speed Traction Control interrogates the engine control system to determine the current torque output, determines how much the torque output the current conditions will allow, and signals this requirement to the engine control system, which reduces the torque by partially closing the throttle. With execution of the torque reduction, the brake system reduces brake pressure to make the transition smooth, while maintaining forward progress. By reducing engine power, braking effectiveness is maintained and the system can operate throughout the normal vehicle speed range. That is why the system is identified as providing “all-speed” traction control.

With AWD, where front-wheel slip can occur, the degree of throttle intervention is relatively less than with rear-wheel drive. The difference in speed capability and the degree of throttle intervention between rear-wheel drive and all-wheel drive is due to the fact that non-driven front wheels on a rear-wheel drive vehicle give the system an accurate vehicle speed reference on which to base responses. With AWD, the possibility that the front wheels may also be slipping makes appropriate corrective action more difficult to determine, thus limiting the effective speed range. Offsetting this is the fact that loss of traction is less likely with AWD because torque is transmitted through all four wheels to begin with. In actual driving situations on snow or ice, the rear-wheel drive and AWD systems respond in essentially the same way up to the 45 mph (72 km/h) limit of the AWD system.

When severe wheel slippage is detected (as on snow-covered roads), the Winter Mode feature of All-Speed Traction Control causes the transmission to up-shift to higher gears at lower speeds than normal. Once a slippery launch condition is detected, the transmission will remain in Winter Mode for a minimum of three minutes. After that, if the road is providing normal traction, the system returns to providing normal up-shifts.

## ELECTRONIC STABILITY PROGRAM

To determine whether the car is responding properly to cornering commands, ESP uses steering wheel angle, yaw (turning) rate and lateral acceleration sensors (combined into Dynamics Sensor). Using signals from these sensors, in addition to individual wheel speed sensor signals, the system determines appropriate brake and throttle actions. Once initiated, ESP operates much like All-Speed Traction Control, except that the goal is directional stability. If the vehicle yaw response, or rate of turning, is inconsistent with the steering angle and vehicle speed indications, the ESP system applies the brakes and, if necessary closes the throttle, to restore control. This occurs whether the vehicle is turning too rapidly (oversteering) or not rapidly enough (understeering).

ESP notifies the active brake booster electronically of the need for maximum output. A solenoid opens a valve in the booster that immediately applies maximum boost to the master cylinder. A travel sensor in the booster detects the rate and travel of the brake pedal. Above the threshold of an "extreme" brake application, ESP activates the solenoid, thus applying maximum available hydraulic pressure to the brakes. In this type of situation, stopping distance is determined by the ABS system based on available traction, rather than the amount of force that the driver can exert on the brake pedal. This becomes the deciding factor in how quickly the vehicle will stop.

## ELECTRONIC VARIABLE BRAKE PROPORTIONING

Upon entry into EVBP the inlet valve for the rear brake circuit is switched ON so that the fluid supply from the master cylinder is shut off. In order to decrease the rear brake pressure, the outlet valve for the rear brake circuit is pulsed. This allows fluid to enter the low pressure accumulator (LPA) in the Hydraulic Control Unit (HCU) resulting in a drop in fluid pressure to the rear brakes. In order to increase the rear brake pressure, the outlet valve is switched off and the inlet valve is pulsed. This increases the pressure to the rear brakes. This back-and-forth process will continue until the required slip difference is obtained. At the end of EVBP braking (brakes released) the fluid in the LPA drains back to the master cylinder by switching on the outlet valve and draining through the inlet valve check valve. At the same time the inlet valve is switched on in case of another brake application.

The EVBP will remain functional during many ABS fault modes. If both the red BRAKE and amber ABS warning indicators are illuminated, the EVBP may not be functioning.

## STANDARD PROCEDURE

### ANTILOCK BRAKE SYSTEM BLEEDING

The base brake's hydraulic system must be bled anytime air enters the hydraulic system. The ABS must always be bled anytime it is suspected that the HCU has ingested air.

Brake systems with ABS must be bled as two independent braking systems. The non-ABS portion of the brake system with ABS is to be bled the same as any non-ABS system.

The ABS portion of the brake system must be bled separately. Use the following procedure to properly bleed the brake hydraulic system including the ABS.

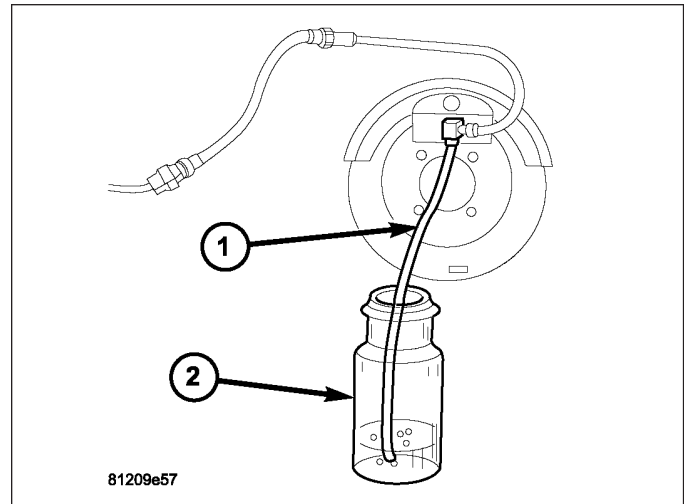
**Note:** During the brake bleeding procedure, be sure the brake fluid level remains close to the FULL level in the master cylinder fluid reservoir. Check the fluid level periodically during the bleeding procedure and add Mopar® DOT 3 brake fluid as required.

### BLEEDING

When bleeding the ABS system, the following bleeding sequence must be followed to insure complete and adequate bleeding.

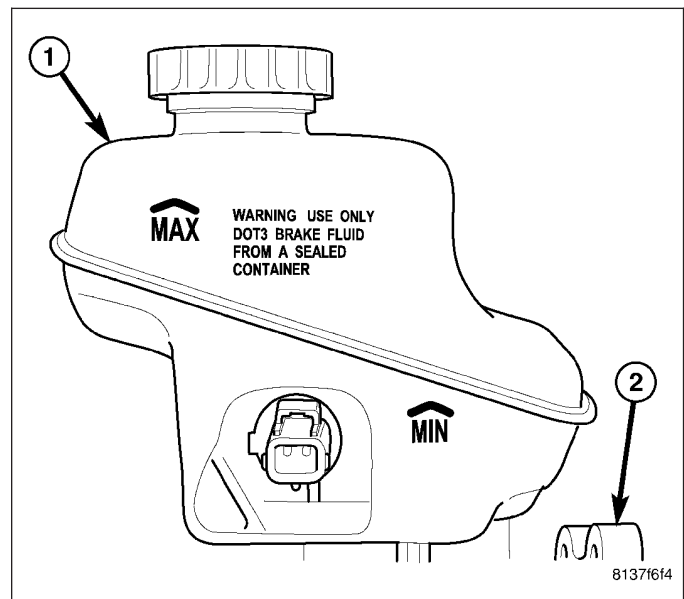
1. Make sure all hydraulic fluid lines are installed and properly torqued.
2. Connect the scan tool to the diagnostics connector. The diagnostic connector is located under the lower steering column cover to the left of the steering column.
3. Using the scan tool, check to make sure the ABM does not have any fault codes stored. If it does, clear them.

**WARNING:** When bleeding the brake system wear safety glasses. A clear bleed tube (1) must be attached to the bleeder screws and submerged in a clear container filled part way with clean brake fluid (2). Direct the flow of brake fluid away from yourself and the painted surfaces of the vehicle. Brake fluid at high pressure may come out of the bleeder screws when opened.



**Note:** Pressure bleeding is recommended to bleed the base brake system to ensure all air is removed from system. Manual bleeding may also be used, but additional time is needed to remove all air from system.

4. Bleed the base brake system. (Refer to 5 - BRAKES - BASE - STANDARD PROCEDURE)
5. Using the scan tool, select ECU VIEW, followed by ABS MISCELLANEOUS FUNCTIONS to access bleeding. Follow the instructions displayed. When finished, disconnect the scan tool and proceed.
6. Bleed the base brake system a second time. Check brake fluid level in the reservoir periodically to prevent emptying, causing air to enter the hydraulic system.
7. Fill the master cylinder fluid reservoir (1) to the MAX level.
8. Test drive the vehicle to be sure the brakes are operating correctly and that the brake pedal does not feel spongy.



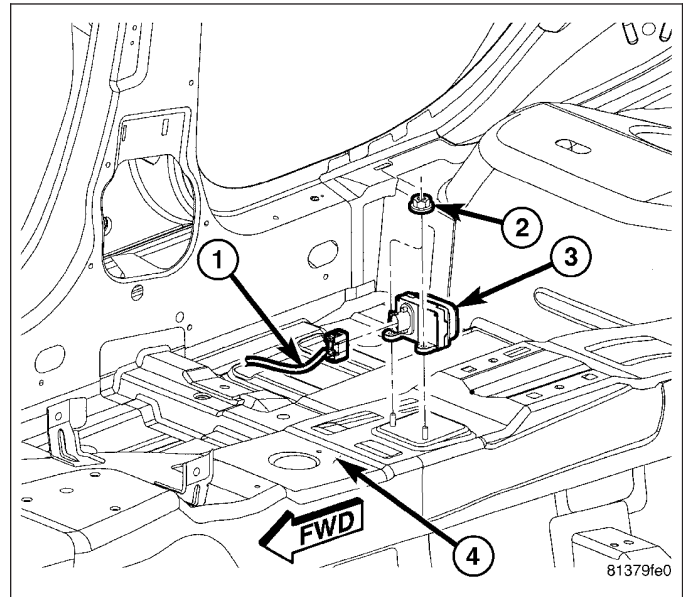


## SENSOR-DYNAMICS

### DESCRIPTION

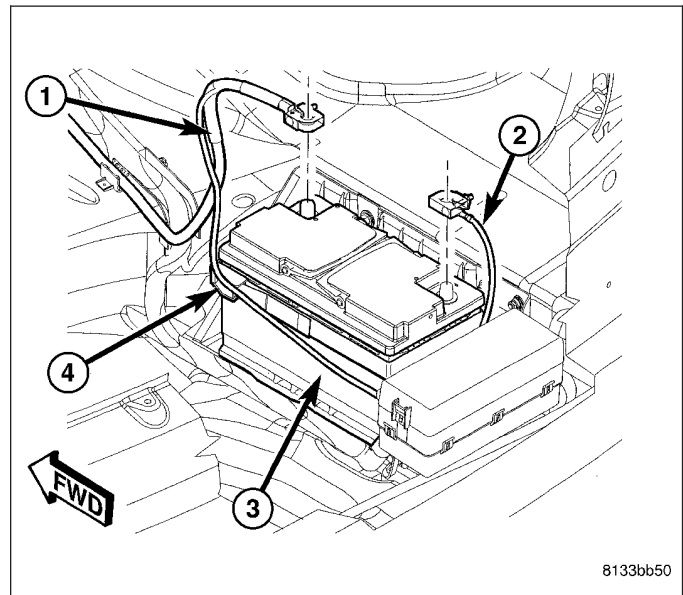
The Yaw Rate and Lateral Acceleration Sensors are housed into one unit known as the Dynamics Sensor. The sensor is used to measure side-to-side (Lateral) motion and vehicle rotational sensing (how fast the vehicle is turning - Yaw).

Yaw and Lateral Acceleration Sensors cannot be serviced separately. The entire Dynamics Sensor must be replaced when necessary.

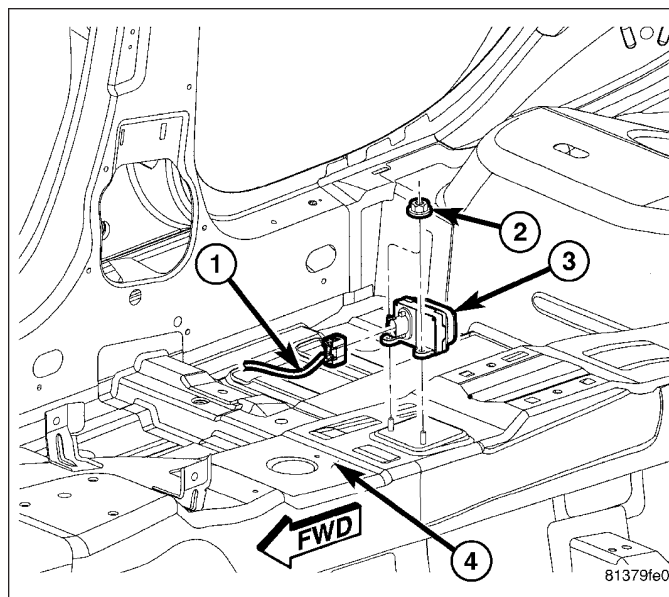


### REMOVAL

1. Disconnect and isolate battery negative cable (2) from battery post.
2. Remove floor console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

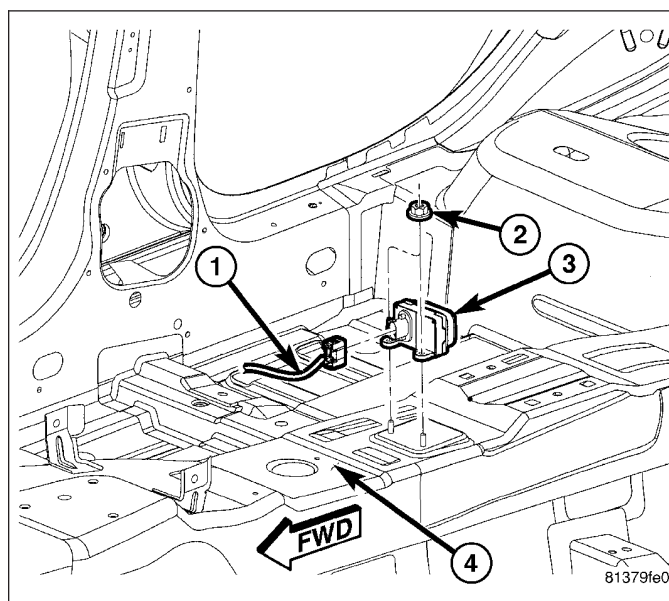


3. Disconnect wiring harness (1) connector at sensor (3).
4. Remove nuts (2) mounting sensor (3) to floor pan tunnel (4).
5. Remove dynamics sensor (3) from vehicle.



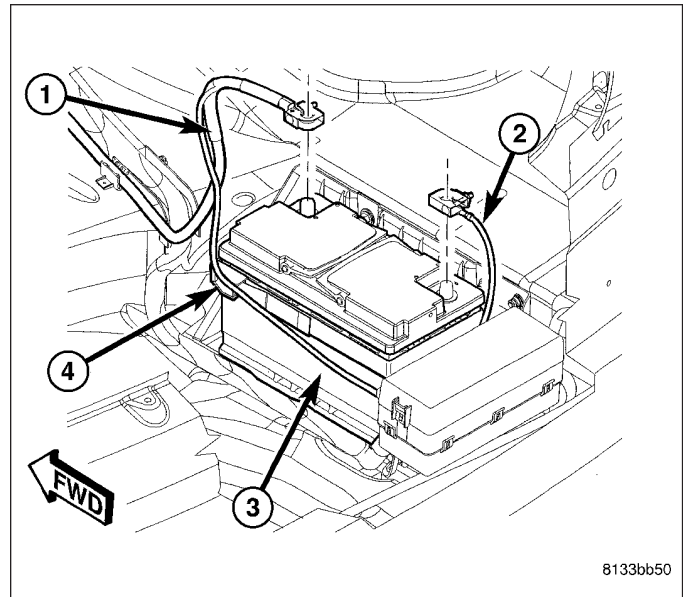
## INSTALLATION

1. Install dynamics sensor (3) over studs mounted to floor pan tunnel (4).
2. Install mounting nuts (2). Tighten nuts to 12 N·m (110 in. lbs.) torque.
3. Connect wiring harness (1) connector to module (3).
4. Install floor console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)



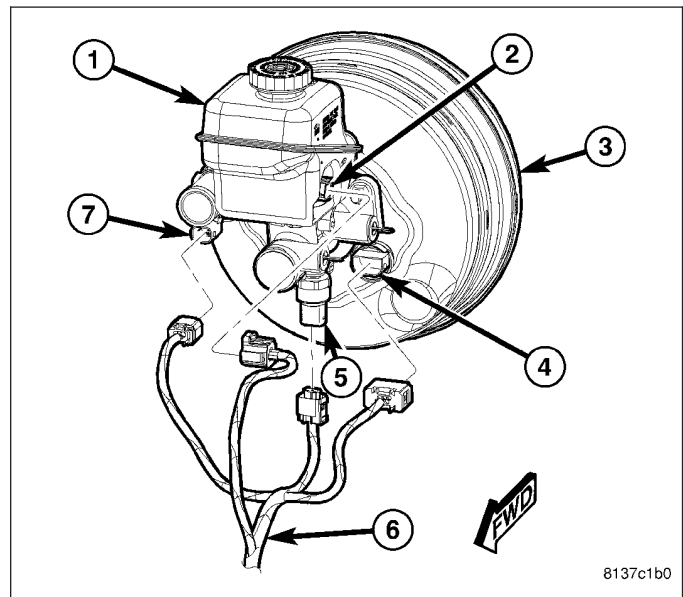


5. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)
6. Perform Verification Test and clear any faults. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

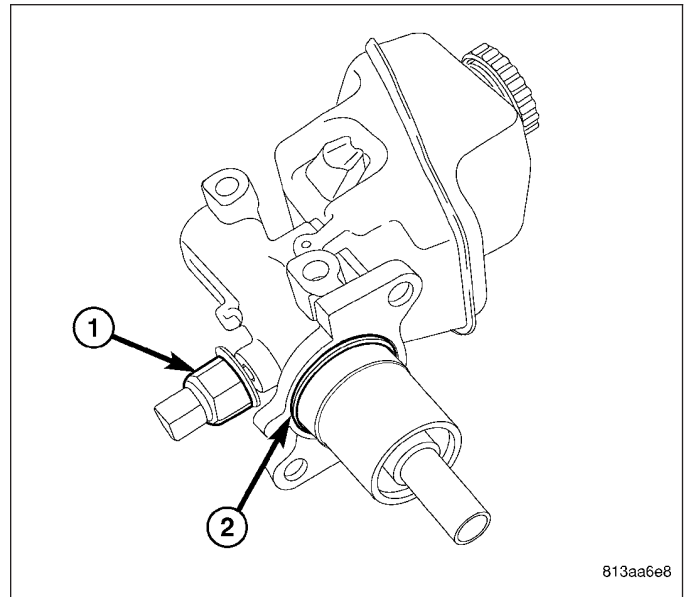


## SENSOR - BRAKE PRESSURE REMOVAL

1. Disconnect wiring harness (6) connector from pressure switch (5).

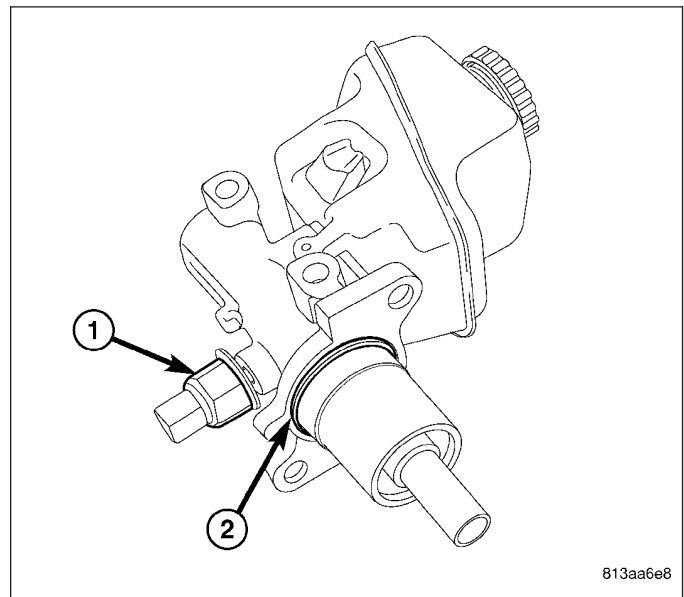


2. Remove pressure switch (1) on bottom of master cylinder.

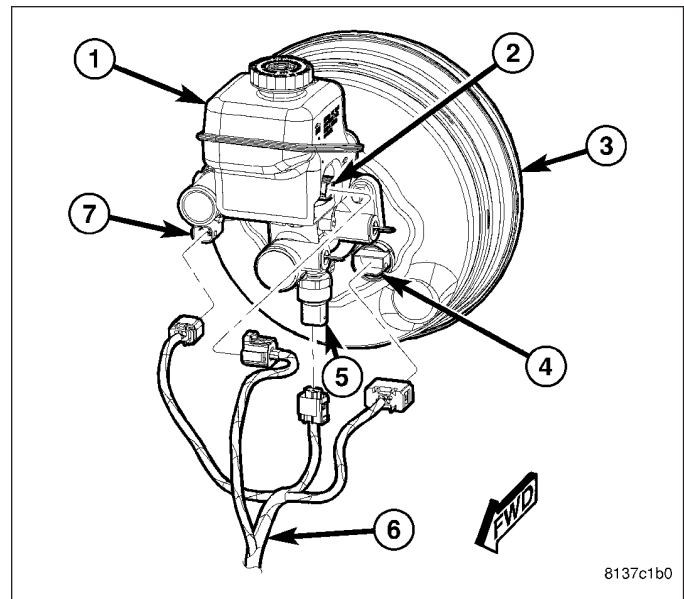


## INSTALLATION

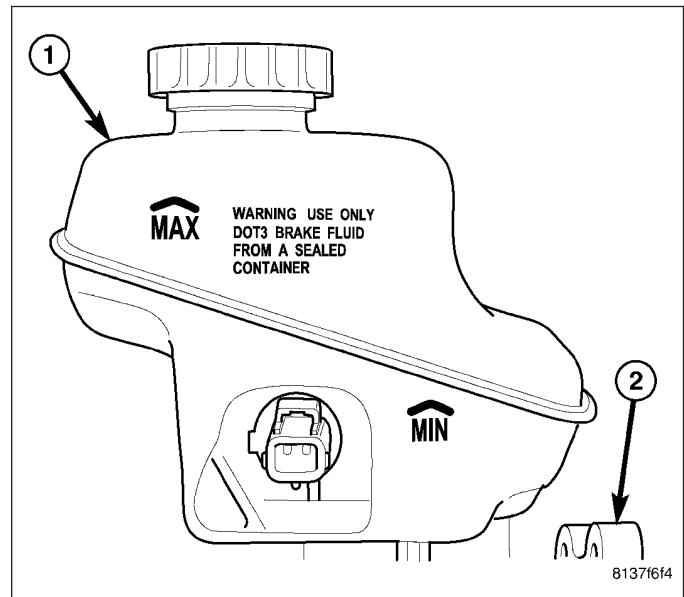
1. Install pressure switch (1) on bottom of master cylinder. Tighten switch to 28 N·m (250 in. lbs.) torque.



2. Connect wiring harness (6) connector to pressure switch (5).



3. Fill master cylinder fluid reservoir (1) with clean, fresh Mopar® Brake Fluid or equivalent.
4. Perform Verification Test and clear any faults. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)



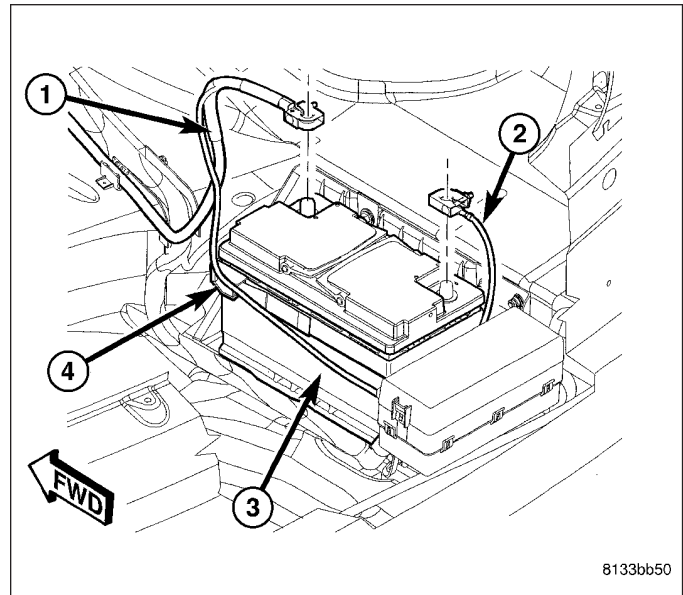
## SENSOR - TRAVEL

### REMOVAL

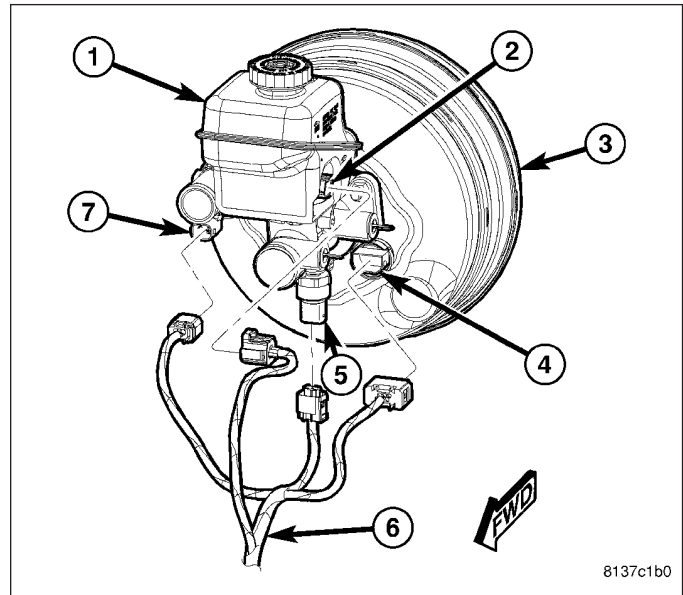
**CAUTION:** Vacuum in power brake booster must be pumped down (removed) before removing master cylinder from power brake booster. This is necessary to prevent power brake booster from sucking in any contamination as master cylinder is removed. This can be done simply by pumping brake pedal, with vehicle's engine not running, until a firm feeling brake pedal is achieved.

1. With engine not running, pump brake pedal until a firm pedal is achieved (4-5 strokes).

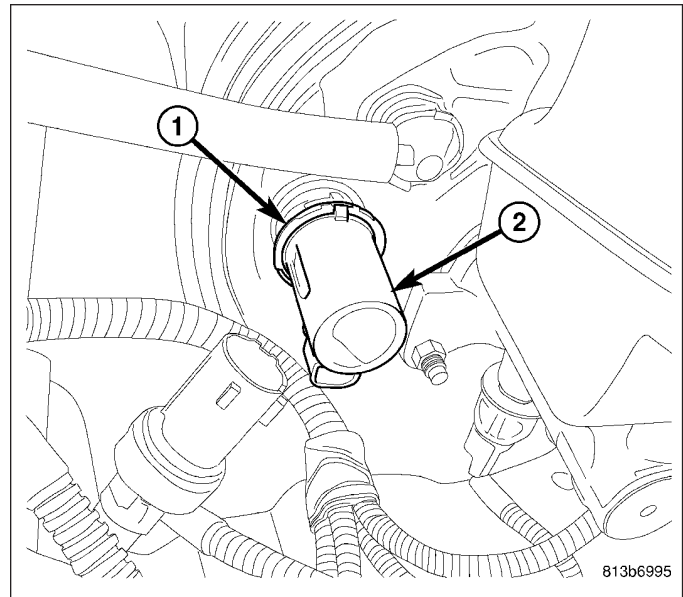
2. Disconnect and isolate battery negative cable (2) from battery post.



3. Disconnect wiring harness (6) connector at pedal travel sensor (7) on power brake booster (3).



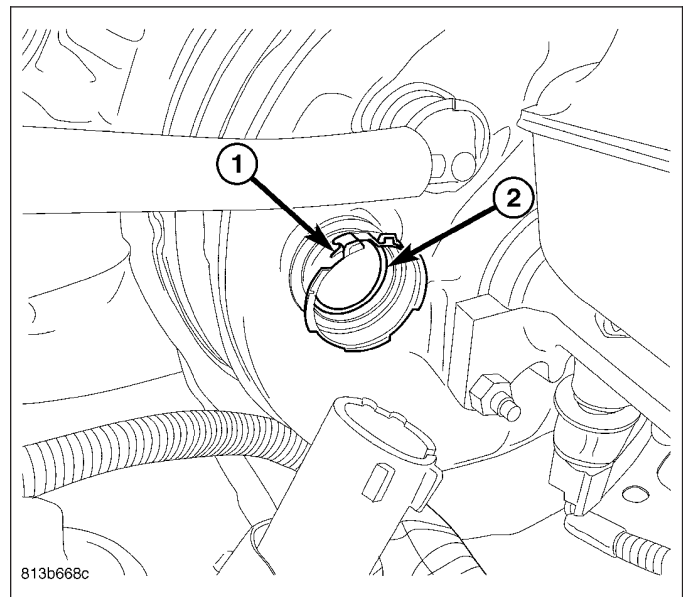
4. Using a small screwdriver, remove sensor retaining ring (1).
5. Pull travel sensor straight out of booster.



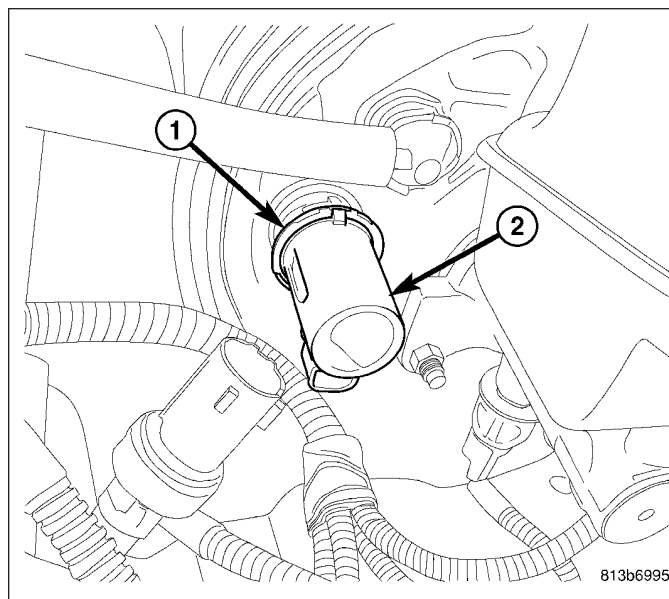
## INSTALLATION

**CAUTION:** Before installing new pedal travel sensor, replace O-ring (2) inside booster opening. Sparingly lubricate NEW O-ring with brake fluid. Use care not to lose O-ring inside booster.

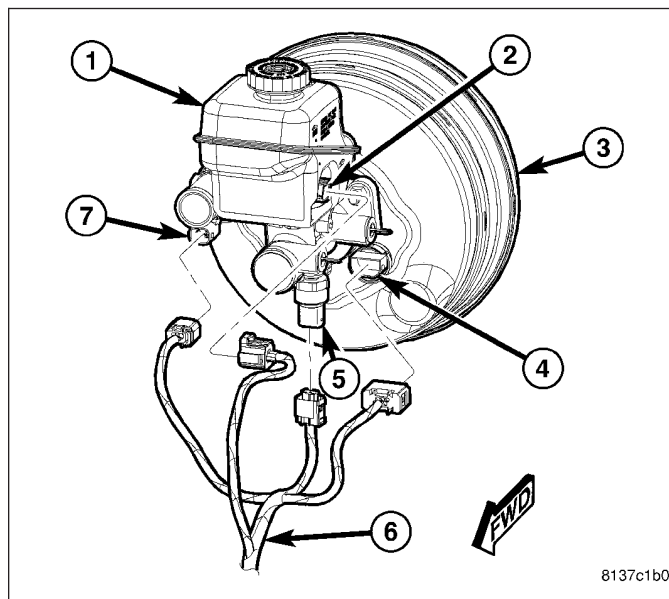
1. Install NEW sensor retaining ring (1) in groove on booster.



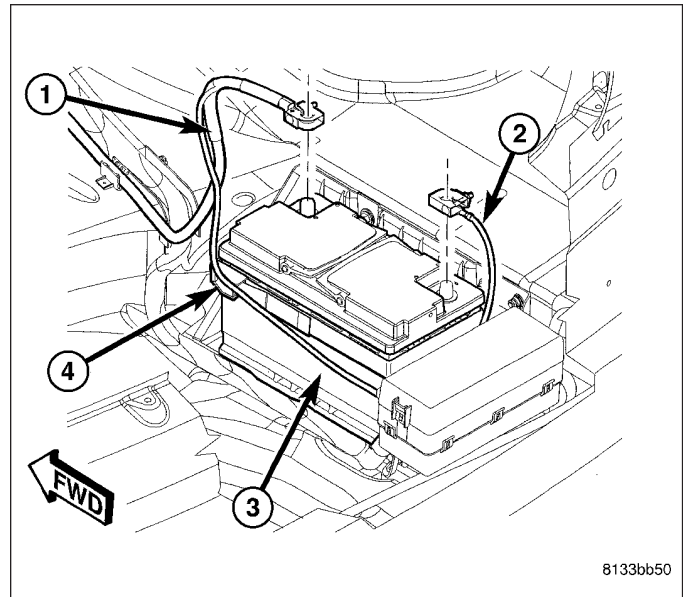
2. Align sensor keyway with notch in top of sensor mount on booster housing, then install pedal travel sensor (2). The sensor will snap into place past the retaining ring (1).



3. Connect wiring harness (6) connector to pedal travel sensor (7).



4. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)



5. Perform Verification Test and clear any faults. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)
6. Start vehicle and check for vacuum leaks around sensor. Correct as necessary.

## SENSOR - STEERING ANGLE

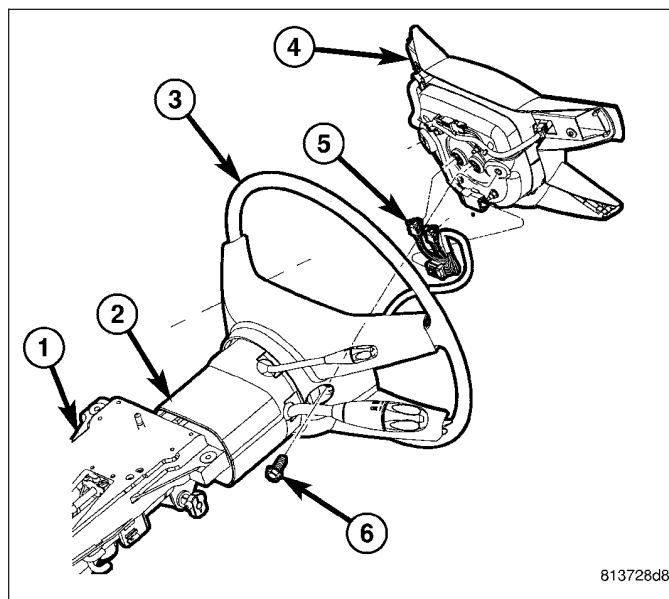
### REMOVAL

**WARNING: BEFORE SERVICING THE STEERING COLUMN THE AIRBAG SYSTEM MUST BE DISARMED. REFER TO ELECTRICAL RESTRAINT SYSTEM FOR SERVICE PROCEDURES. FAILURE TO DO SO MAY RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY.**

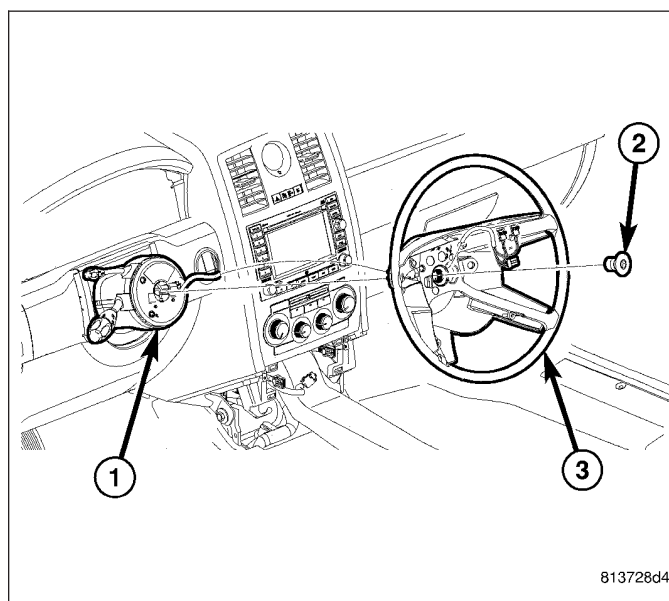
**CAUTION: All fasteners must be torqued to specification to ensure proper operation of the steering column.**

1. Position the front wheels **straight ahead**.
2. Fully extend or pull out adjustable steering column.

3. Disconnect the negative (ground) cable from the battery.
4. Remove the airbag (4), (Refer to 8 - ELECTRICAL/ RESTRAINTS/DRIVER AIRBAG - REMOVAL).

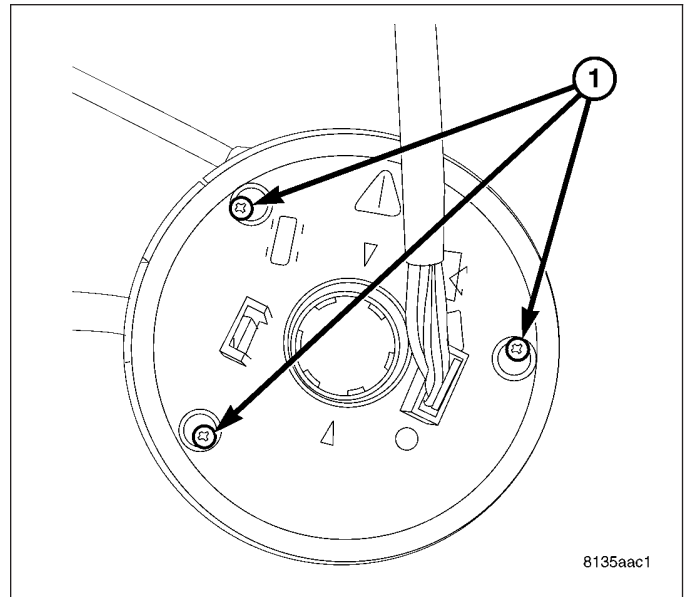


5. Remove the steering wheel allen bolt (2) then remove the steering wheel (3).

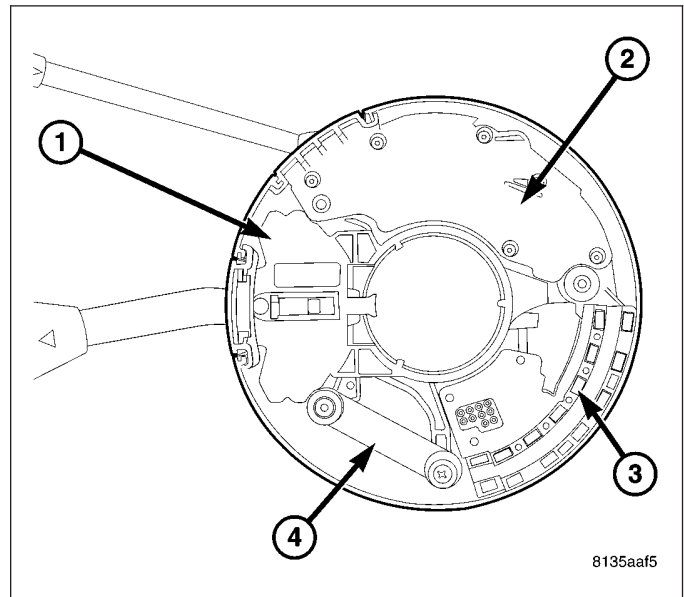




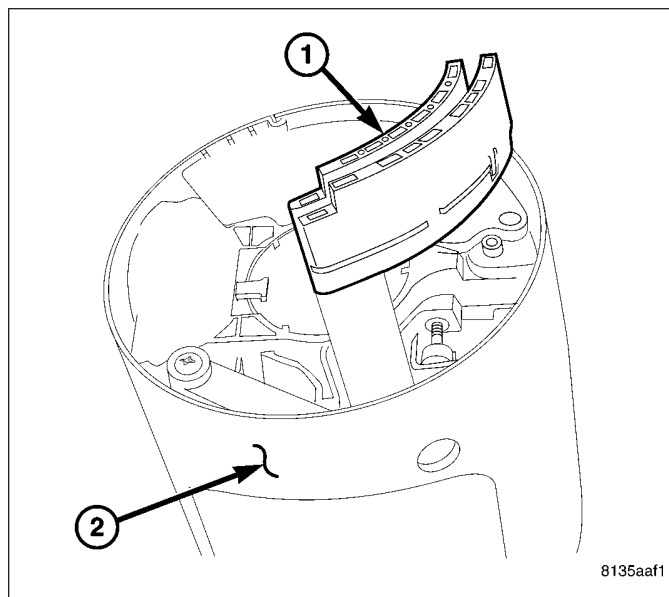
6. Remove the clock spring screws (1), (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).



7. Remove the steering angle sensor (3) screws.

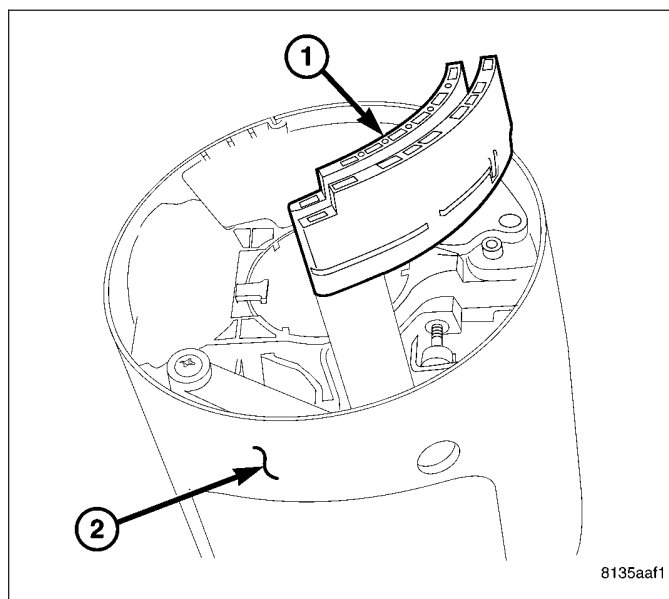


8. Remove the steering angle sensor (1) from the column (2).

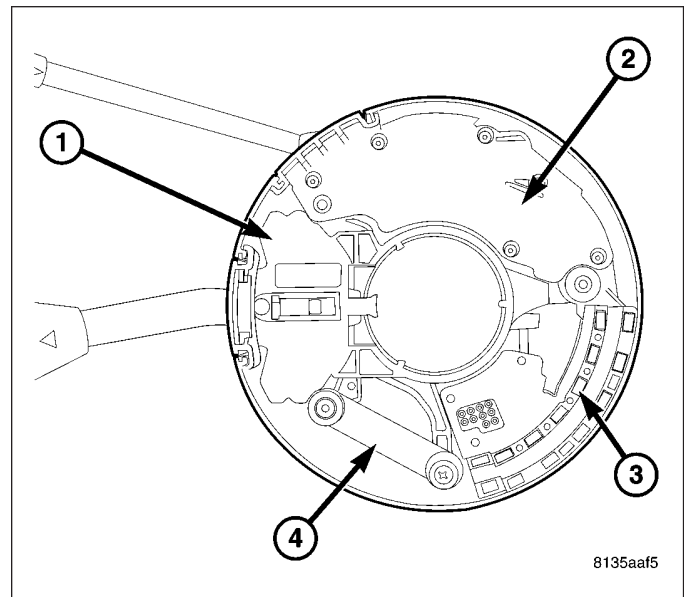


## INSTALLATION

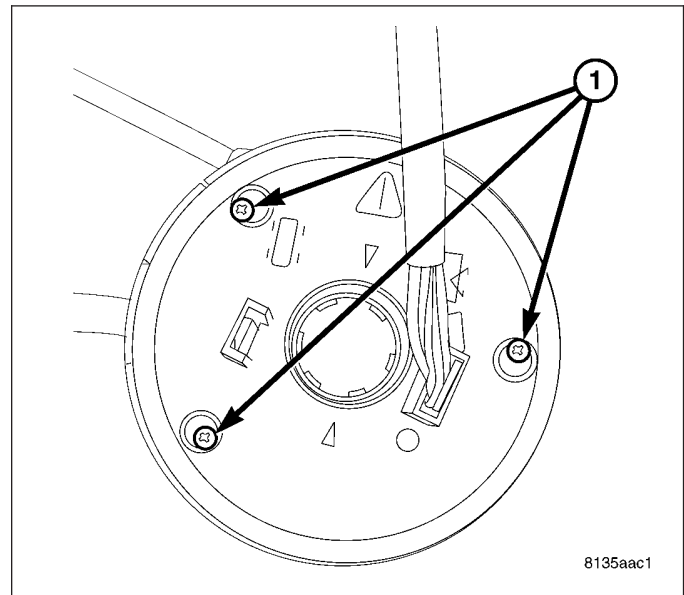
1. Install the steering angle sensor (1) to the SCCM (2).



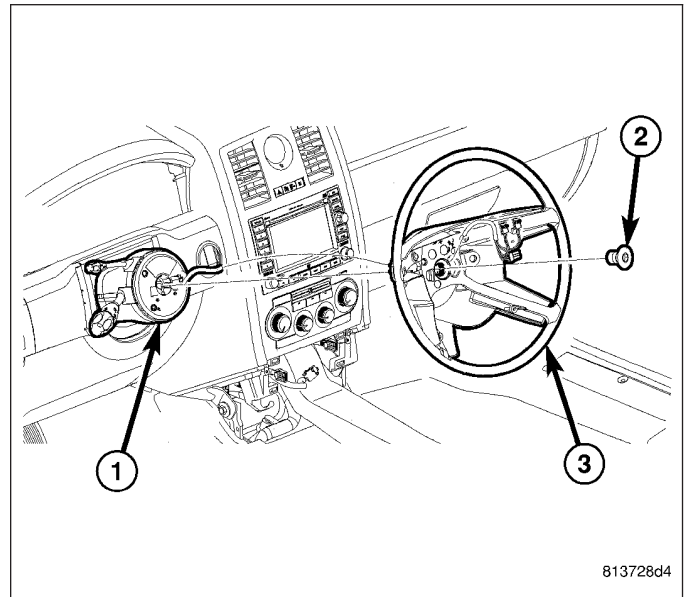
2. Tighten the screws securing the steering angle sensor (3) to the SCCM.



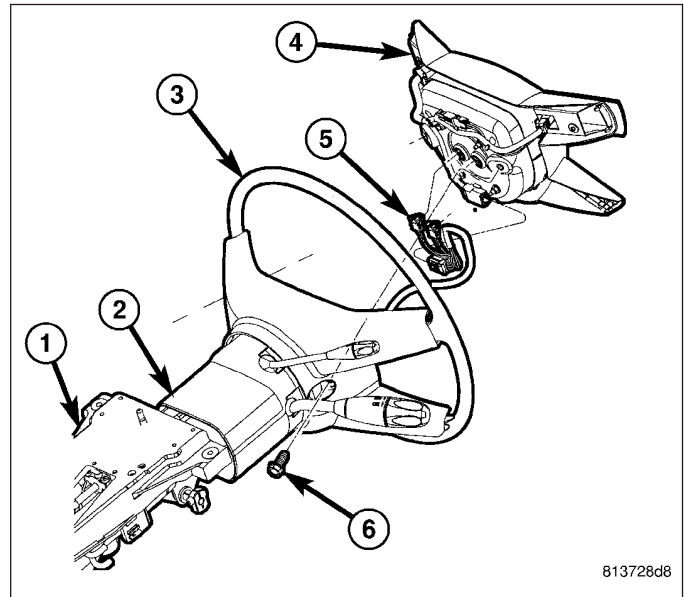
3. Install the clockspring and tighten the screws (1)(Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).



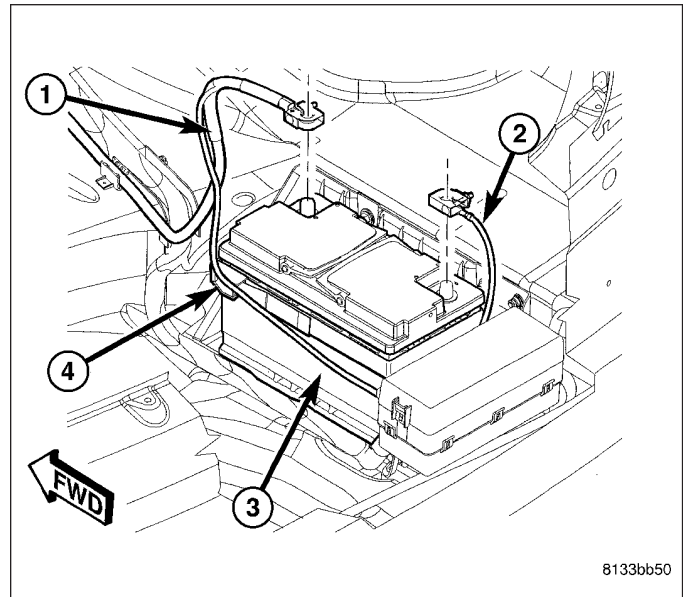
4. Align the spline on the steering wheel hub to shaft.
5. Then install the steering wheel (3) and install a **new** bolt (2). Tighten the bolt to 61 N·m (45 ft. lbs.).



6. Install the airbag (4) (Refer to 8 - ELECTRICAL/ RESTRAINTS/DRIVER AIRBAG - INSTALLATION).



7. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)
8. Perform Verification Test and clear any faults. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)
9. Test the operation of the horn, lights and any other functions that are steering column operated.

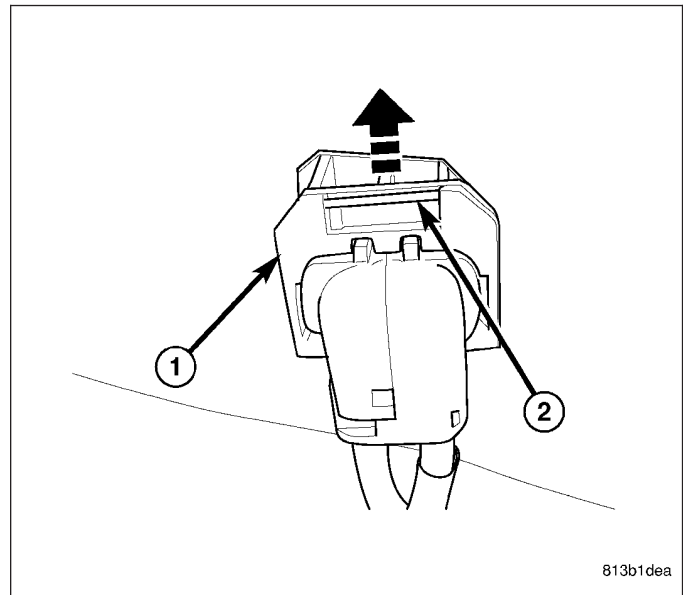


## SENSOR - FRONT WHEEL SPEED

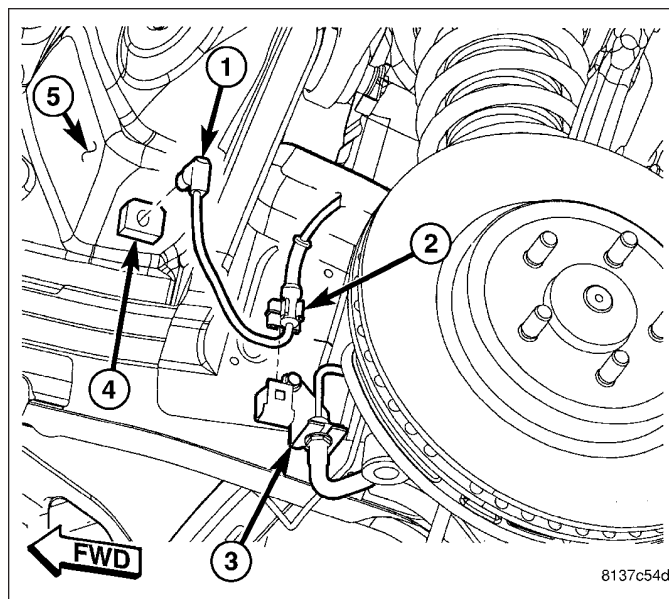
### REMOVAL

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

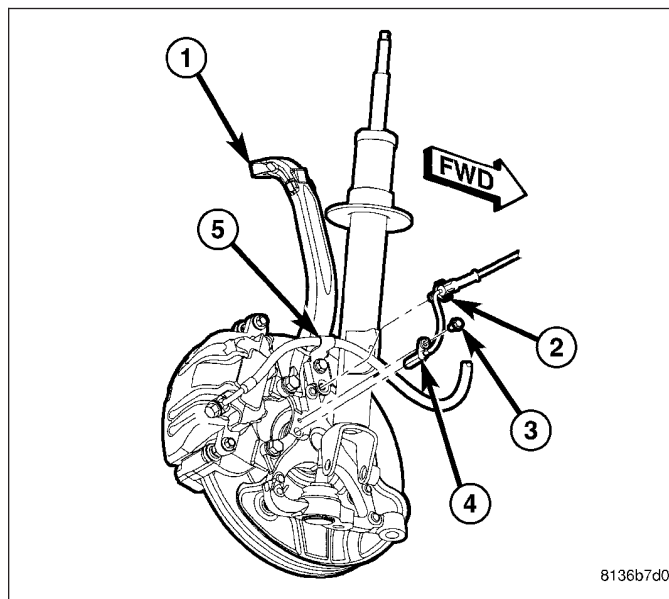
**Note:** To remove sensor connector from body wiring harness connector, move retaining clip (2) and pull sensor connector outward.



2. Remove sensor cable routing clip (2) from brake hose bracket (3).
3. Remove sensor connector (1) from body wiring harness connector (4).

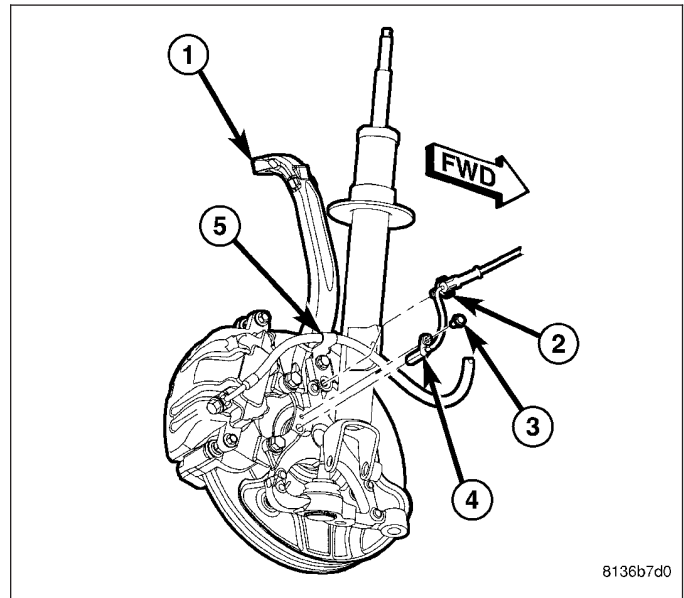


4. Remove screw (3) fastening wheel speed sensor to knuckle (1). Pull sensor head (4) out of knuckle.
5. Remove wheel speed sensor cable routing clip (2) from brake hose routing bracket (5).

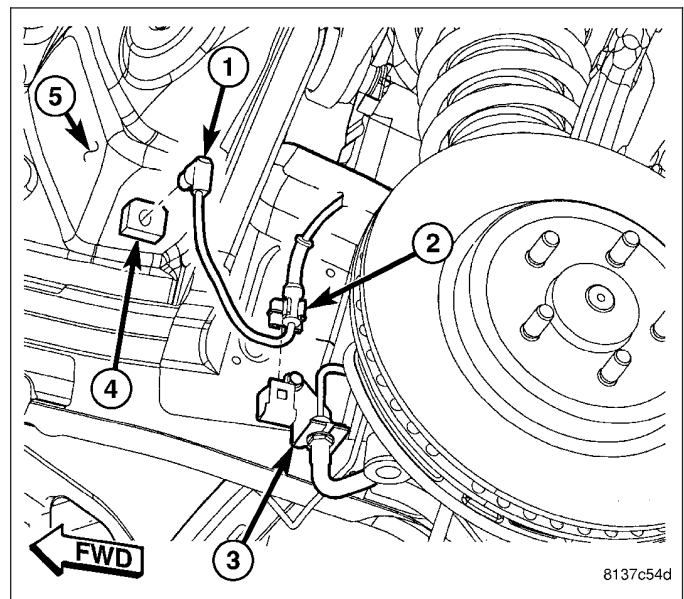


## INSTALLATION

1. Install wheel speed sensor head (4) into knuckle and install mounting screw (3). Tighten screw to 11 N·m (95 in. lbs.) torque.
2. Attach wheel speed sensor cable and routing clip (2) to brake hose routing bracket (5).



3. Attach sensor cable routing clip (2) to brake hose bracket (3).
4. Connect sensor connector (1) to body wiring harness connector (4). When installing connector, make sure retaining clip on body connector is properly in place and sensor connect cannot be pulled out.
5. Lower vehicle.
6. Perform Verification Test and clear any faults. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

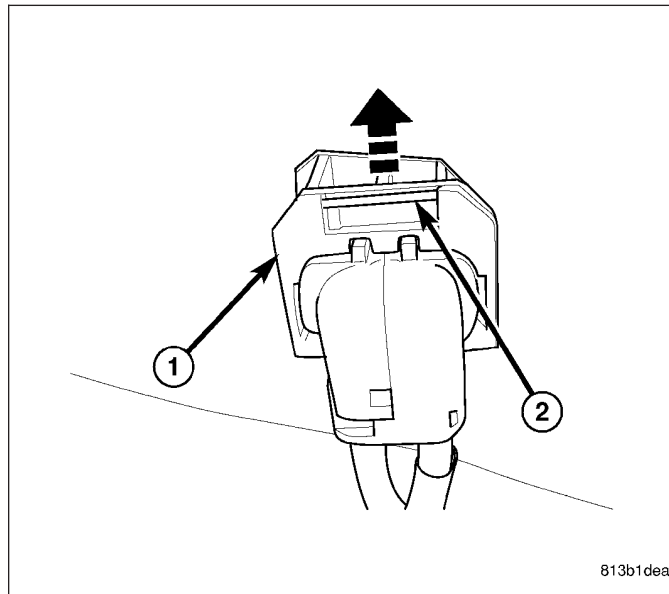


## SENSOR - REAR WHEEL SPEED

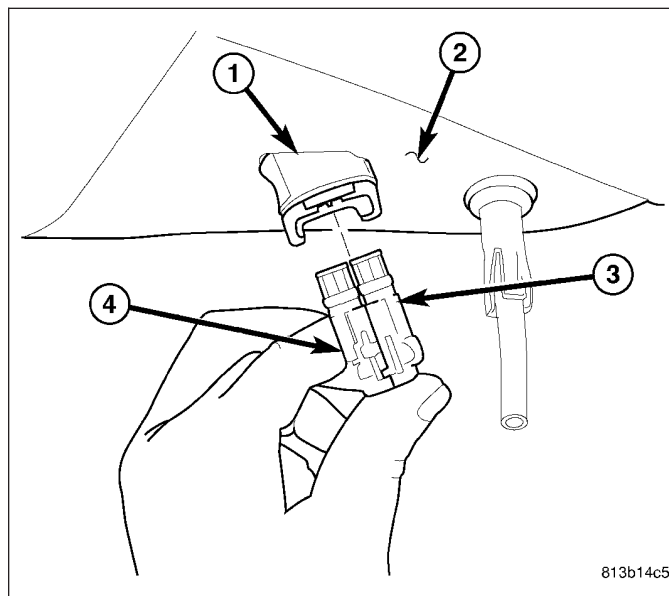
### REMOVAL

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

**Note:** To remove sensor connector from body wiring harness connector, move retaining clip (2) and pull sensor connector outward.

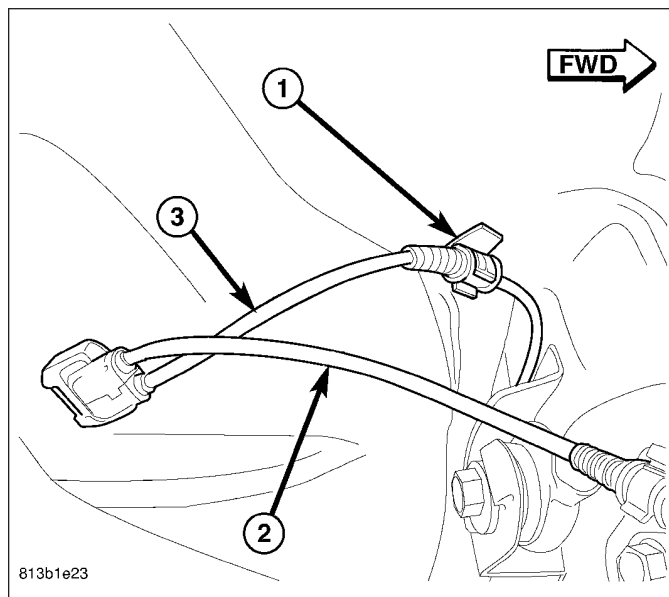


2. Remove sensor connectors (3 and 4) from body wiring harness connector (1) located in luggage compartment floor pan (2).
3. Separate left sensor connector (4) from right sensor connector (3).

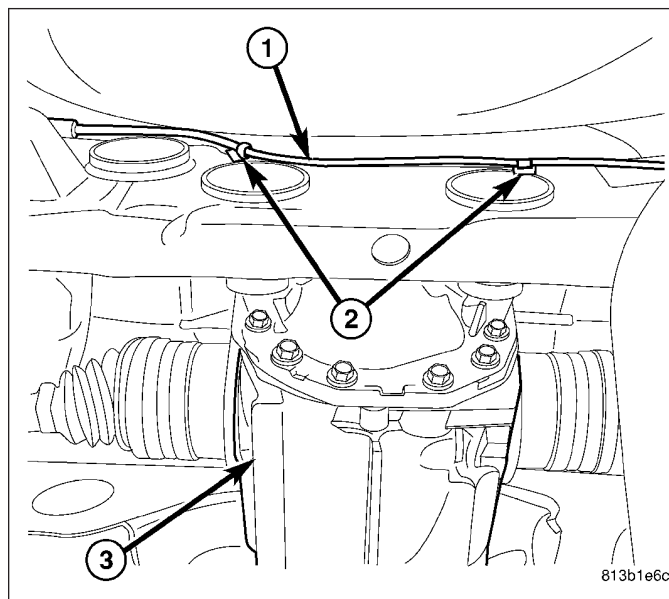




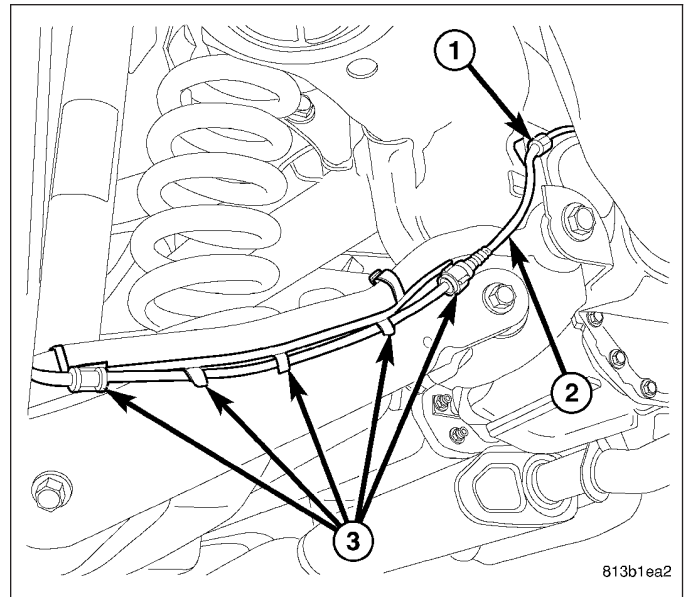
4. If removing left sensor, unclip sensor cable (3) from routing clip near body connector (1).



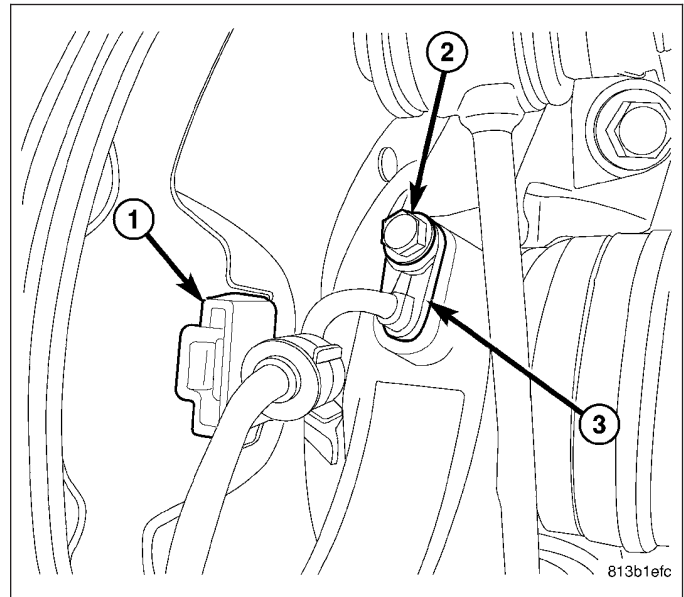
5. If removing left sensor, unclip sensor cable (1) from routing clips (2) along rear of crossmember near rear differential (3).



6. If removing left sensor, unclip sensor cable (2) from routing clip (1) above toe link mount on rear cross-member.
7. Unclip sensor cable (2) from routing clips (3) along toe link.

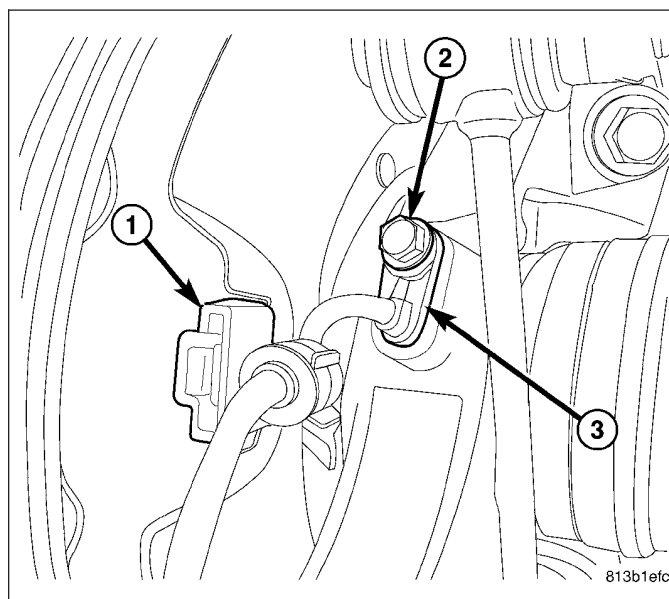


8. Unclip sensor cable at rear brake rotor shield (1).
9. Remove screw (2) fastening sensor head (3) to rear knuckle.
10. Remove wheel speed sensor.

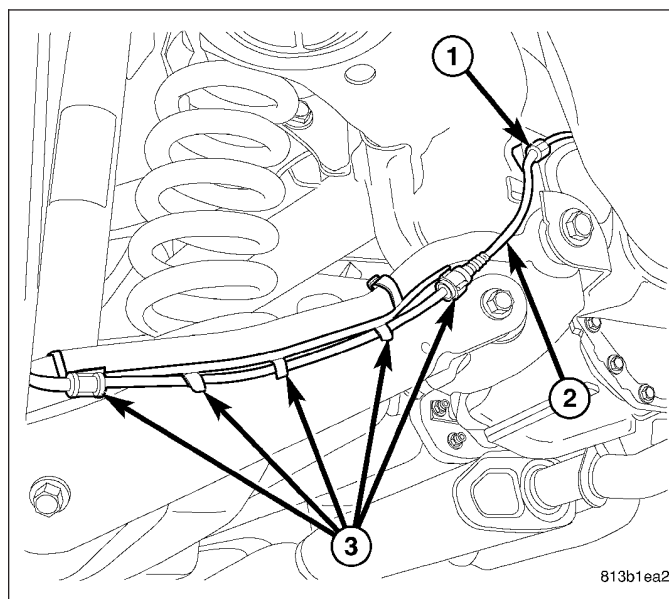


## INSTALLATION

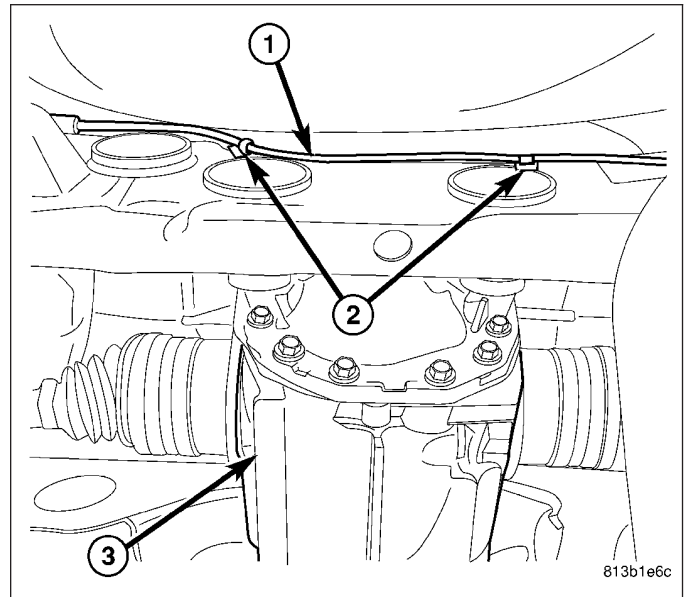
1. Insert wheel speed sensor head (3) into mounting hole in rear of knuckle.
2. Install screw (2) fastening sensor head (3) to rear knuckle. Tighten Screw to 11 N·m (100 in. lbs.) torque.
3. Install sensor cable at rear brake rotor shield (1).



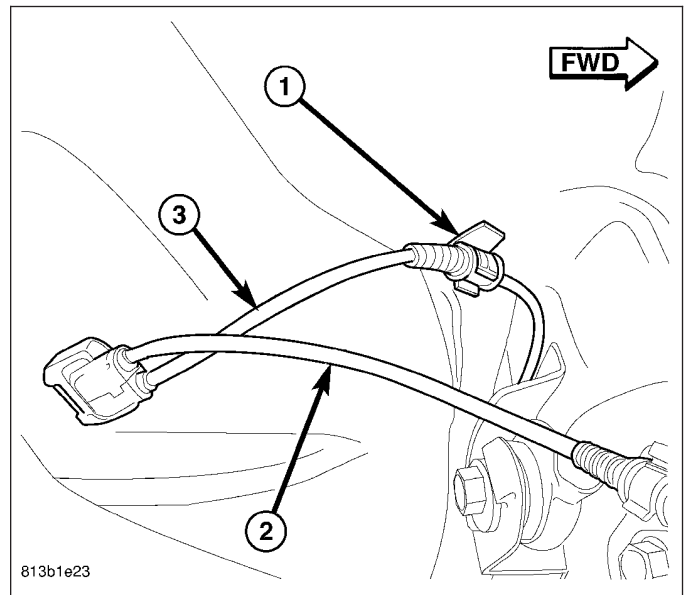
4. Clip sensor cable (2) to routing clips (3) along toe link.
5. If installing left sensor, clip sensor cable (2) to routing clip (1) above toe link mount on rear crossmember.



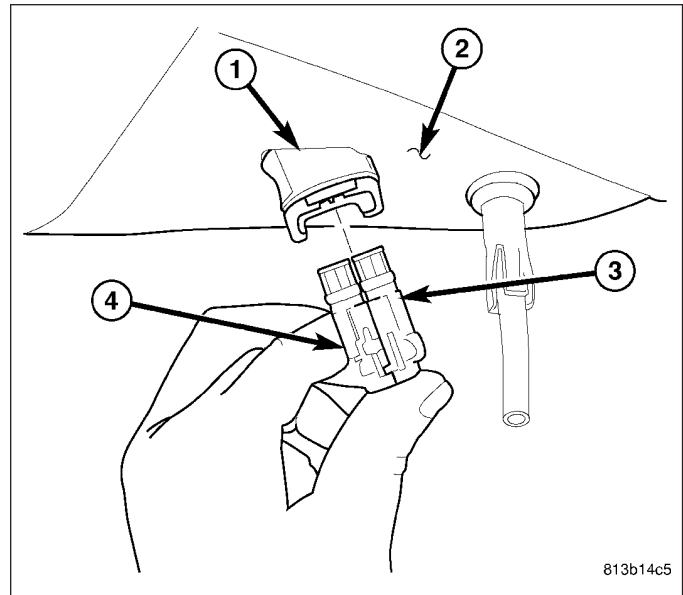
6. If installing left sensor, clip sensor cable (1) to routing clips (2) along rear of crossmember near rear differential (3).



7. If installing left sensor, clip sensor cable (3) to routing clip near body connector (1).



8. Match left sensor connector (4) to right sensor connector (3) to make one connector.
9. Insert sensor connectors (3 and 4) into body wiring harness connector (1) located in luggage compartment floor pan (2). When installing connector, make sure retaining clip on body connector is properly in place and sensor connector cannot be pulled out.

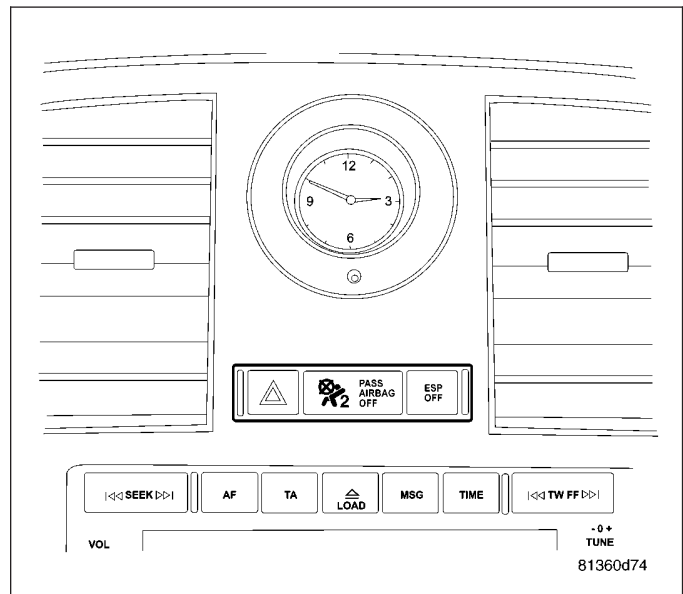


## SWITCH - ESP

### DESCRIPTION

The ESP Off Switch is located in the Instrument Panel Switch Pod in the center of the instrument panel. The ESP Off switch turns the Electronic Stability Program off whenever the switch is depressed. Depressing the switch a second time turns the ESP back on. The switch resets itself each time the ignition is cycled.

The ESP Off switch is serviced as part of the Instrument Panel Switch Pod.



### REMOVAL

The ESP Off switch is serviced as part of the Instrument Panel Switch Pod. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/INSTRUMENT PANEL SWITCH POD - REMOVAL)

### INSTALLATION

The ESP Off switch is serviced as part of the Instrument Panel Switch Pod. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/INSTRUMENT PANEL SWITCH POD - INSTALLATION)

## **SWITCH - TRACTION CONTROL**

### **DESCRIPTION**

The Traction Control Off Switch is located in the Instrument Panel Switch Pod in the center of the instrument panel. The traction control Off switch turns the traction control off whenever the switch is depressed. Depressing the switch a second time turns the traction control back on. The switch resets itself each time the ignition is cycled.

The traction control Off switch is serviced as part of the Instrument Panel Switch Pod.

### **REMOVAL**

The traction control Off switch is serviced as part of the Instrument Panel Switch Pod. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/INSTRUMENT PANEL SWITCH POD - REMOVAL)

### **INSTALLATION**

The traction control Off switch is serviced as part of the Instrument Panel Switch Pod. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/INSTRUMENT PANEL SWITCH POD - INSTALLATION)

## **BOOSTER - ACTIVE BRAKE**

### **DESCRIPTION**

The active brake booster is part of the Electronic Stability Program (ESP). It is serviced as part of the power brake booster. For more information on ESP, (Refer to 5 - BRAKES - DESCRIPTION).

## **HCU (HYDRAULIC CONTROL UNIT)**

### **REMOVAL**

To remove the HCU, the ICU must be removed and disassembled. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - REMOVAL)(Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - DISASSEMBLY)

### **INSTALLATION**

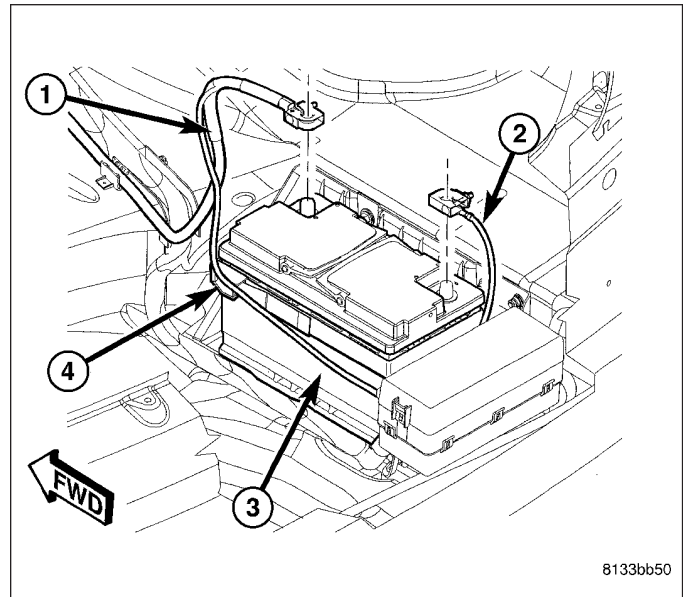
To install the HCU, assemble and install the ICU. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - ASSEMBLY)(Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - INSTALLATION)

## **ICU (INTEGRATED CONTROL UNIT)**

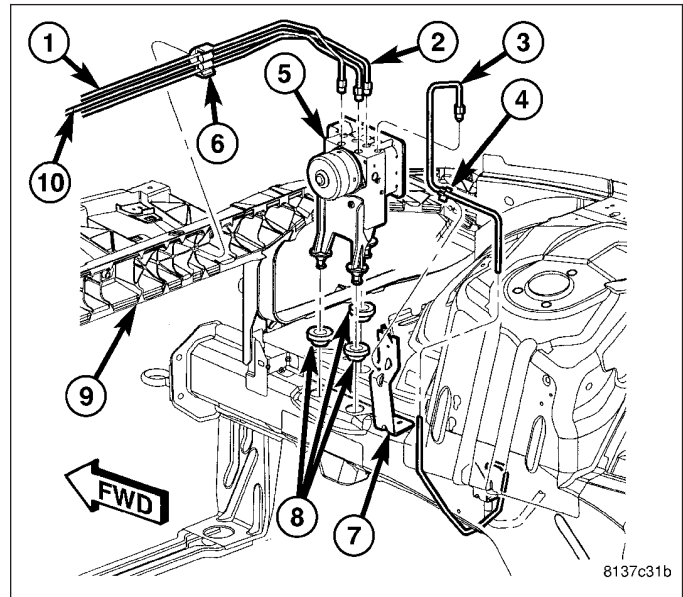
### **REMOVAL**

**Note:** Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

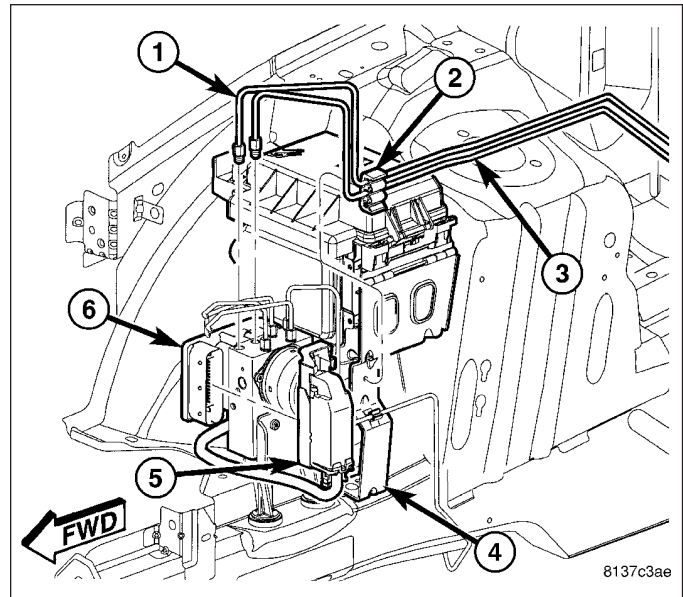
1. Disconnect and isolate battery negative cable (2) from battery post.
2. Using a brake pedal holding tool, depress brake pedal past its first inch of travel and hold it in this position. Holding pedal in this position will isolate master cylinder from hydraulic brake system and will not allow brake fluid to drain out of brake fluid reservoir while brake lines are open.



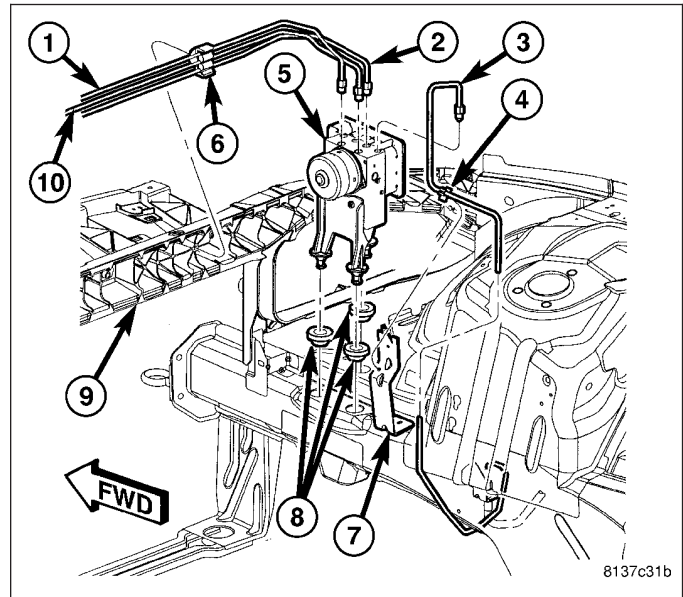
3. Remove brake tubes (1, 2, 3 and 10) at hydraulic control unit (5).



4. Remove remaining brake tubes (1 and 3) at hydraulic control unit.
5. Disconnect 47-way wiring connector (5) at antilock brake module (ABM) (6).



6. Pull up on unit (5) and remove from mounting grommets (8).

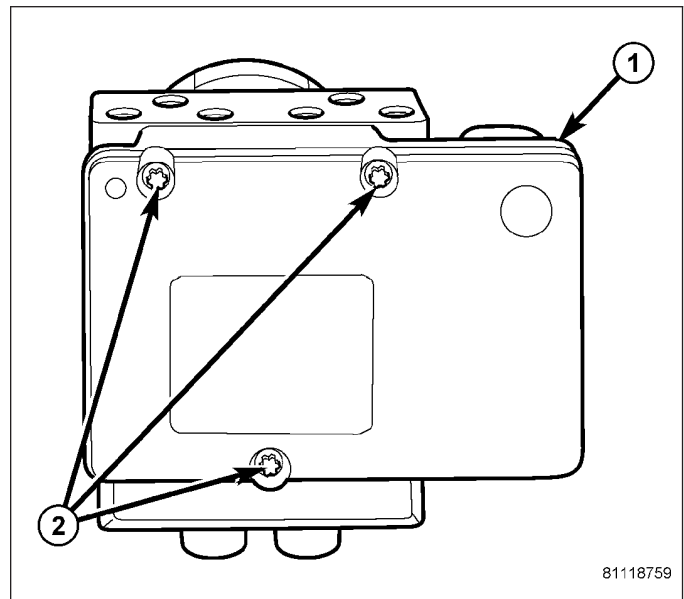


## DISASSEMBLY

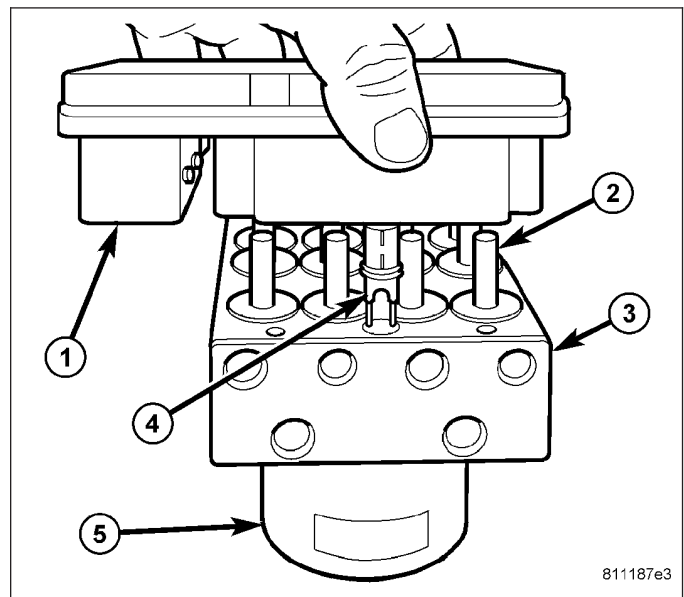
1. Remove two screws attaching mounting bracket to HCU. Remove bracket.



2. Remove three screws (2) attaching ABM (1).

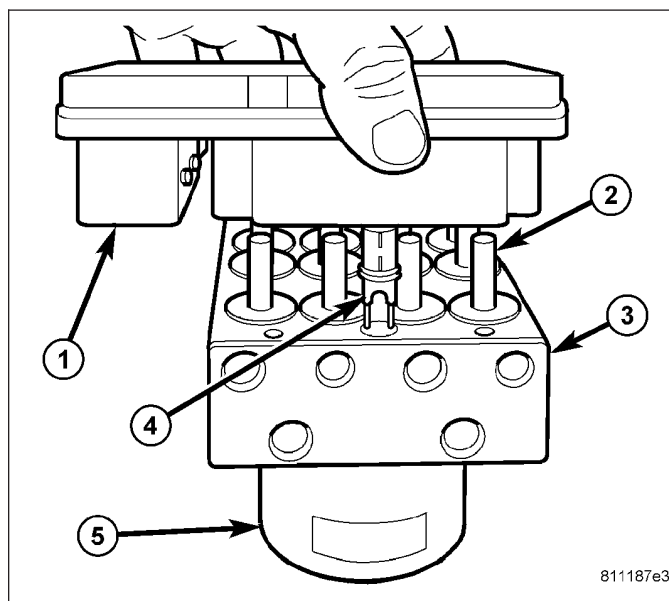


3. Remove ABM (1) from HCU (3).

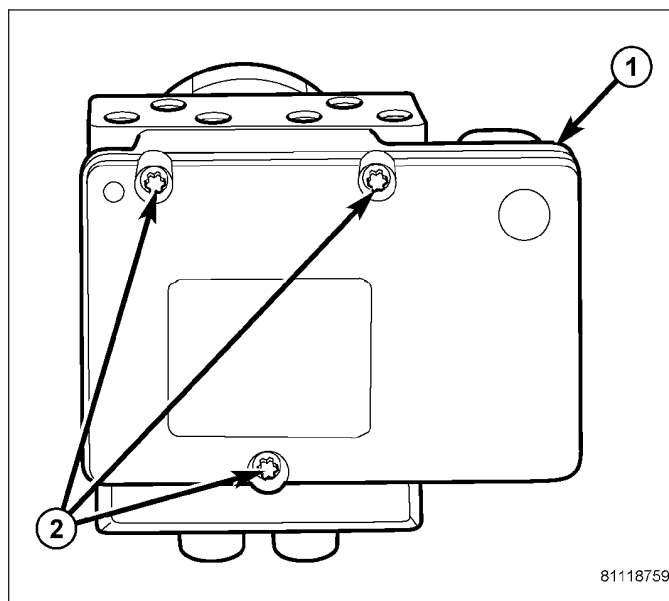


## ASSEMBLY

1. Align ABM solenoids and pump/motor wiring connector (4) with HCU valves (2) and connector passage. Slide ABM (1) onto HCU (3).

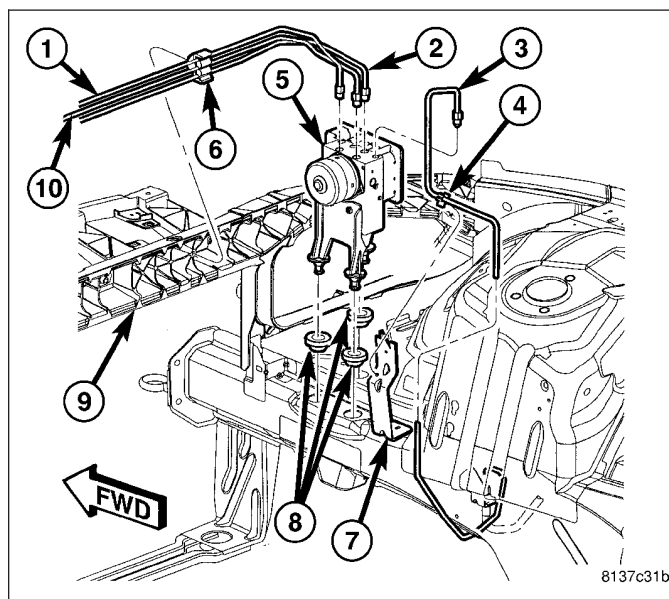


2. Install three screws (2) attaching ABM (1). Tighten screws to 2 N·m (17 in. lbs.) torque.
3. Attach mounting bracket to HCU. Install two mounting bracket attaching screws and tighten to 11 N·m (97 in. lbs.) torque.
4. Install ICU in vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ICU (INTEGRATED CONTROL UNIT) - INSTALLATION)

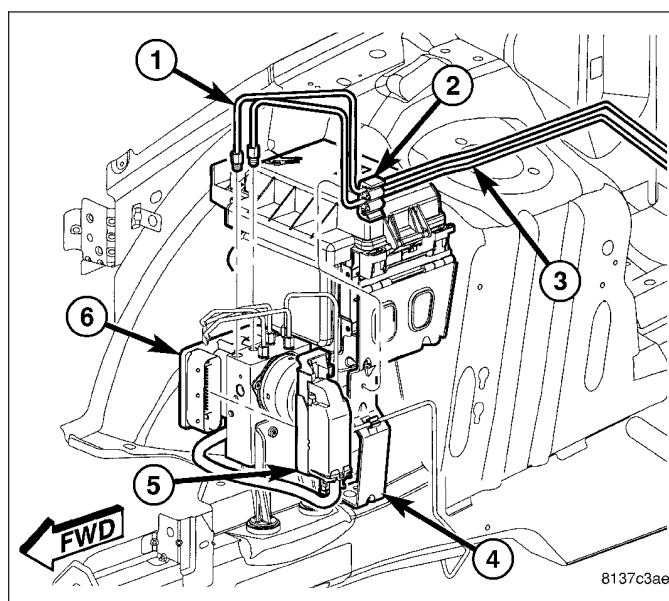


## INSTALLATION

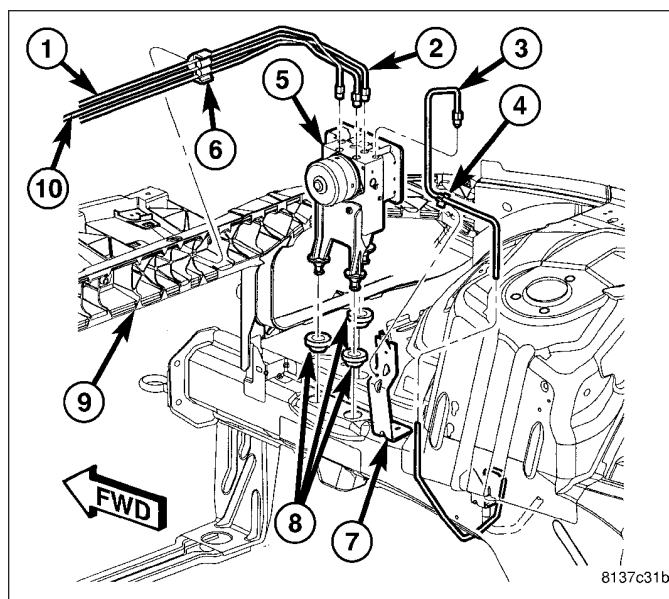
1. Install unit (5), pushing mounting bracket down into mounting grommets (8) located in body of vehicle.



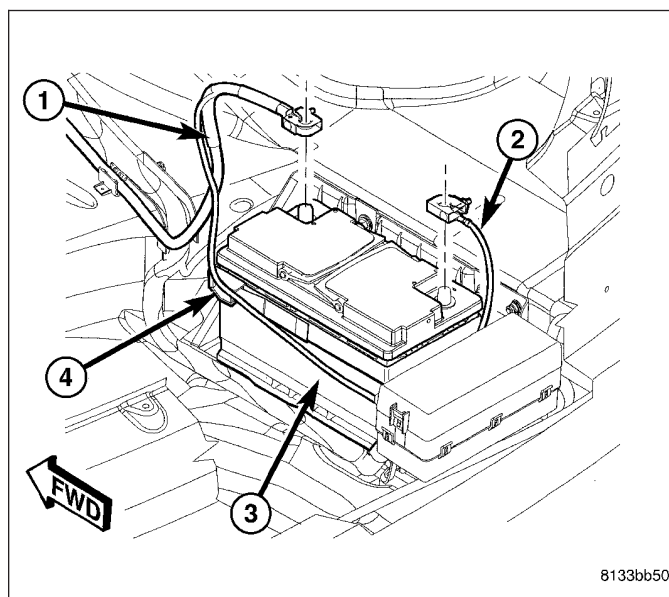
2. Connect 47-way wiring connector (5) at antilock brake module (ABM) (6).
3. Install brake tubes to rear (1 and 3) at hydraulic control unit. Tighten tube nuts to 14 N·m (124 in. lbs.) torque.



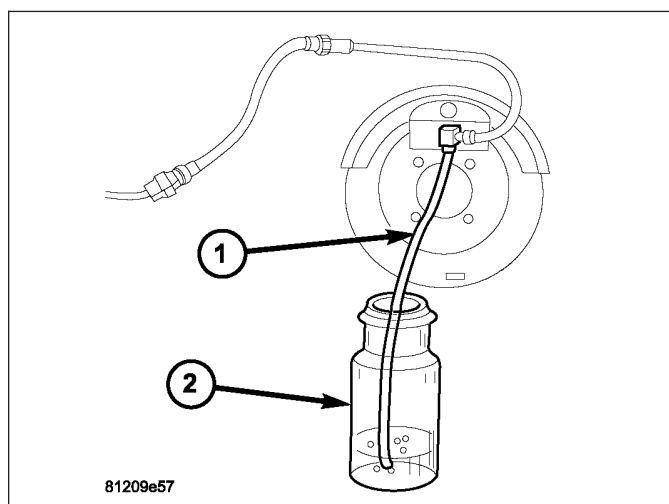
4. Install brake tubes (1, 2, 3 and 10) at hydraulic control unit (5). Tighten tube nuts to 14 N·m (124 in. lbs.) torque.
5. Remove brake pedal holding tool.



6. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)



7. Fill and bleed (1) base brake hydraulic system and ABS. (Refer to 5 - BRAKES - STANDARD PROCEDURE)
8. Perform Verification Test and clear any faults. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)





# COOLING

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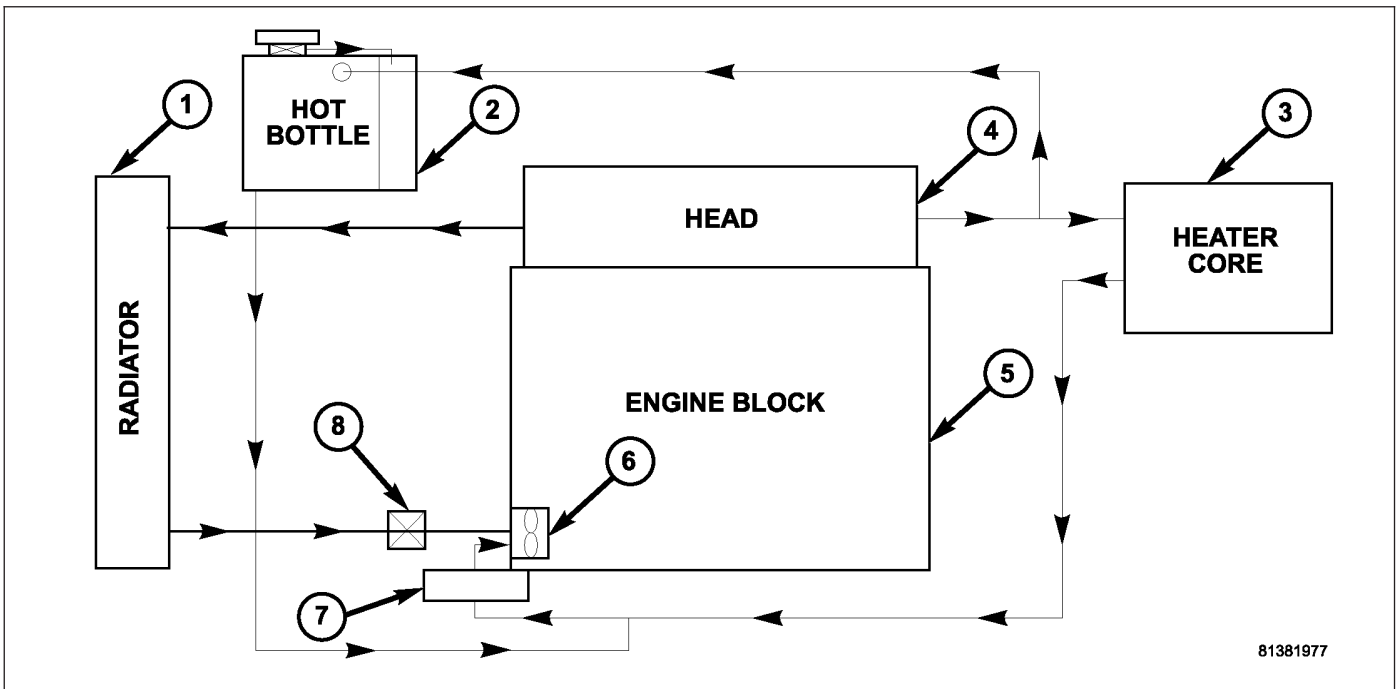
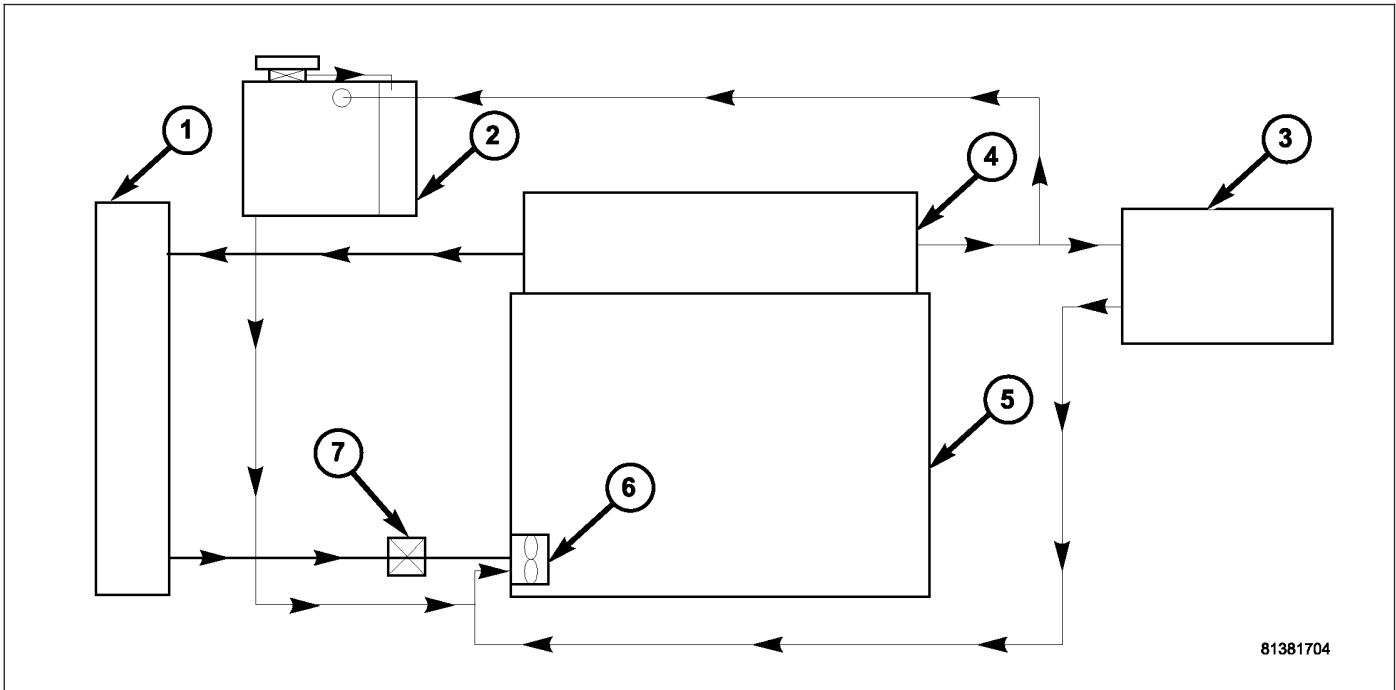
## COOLING

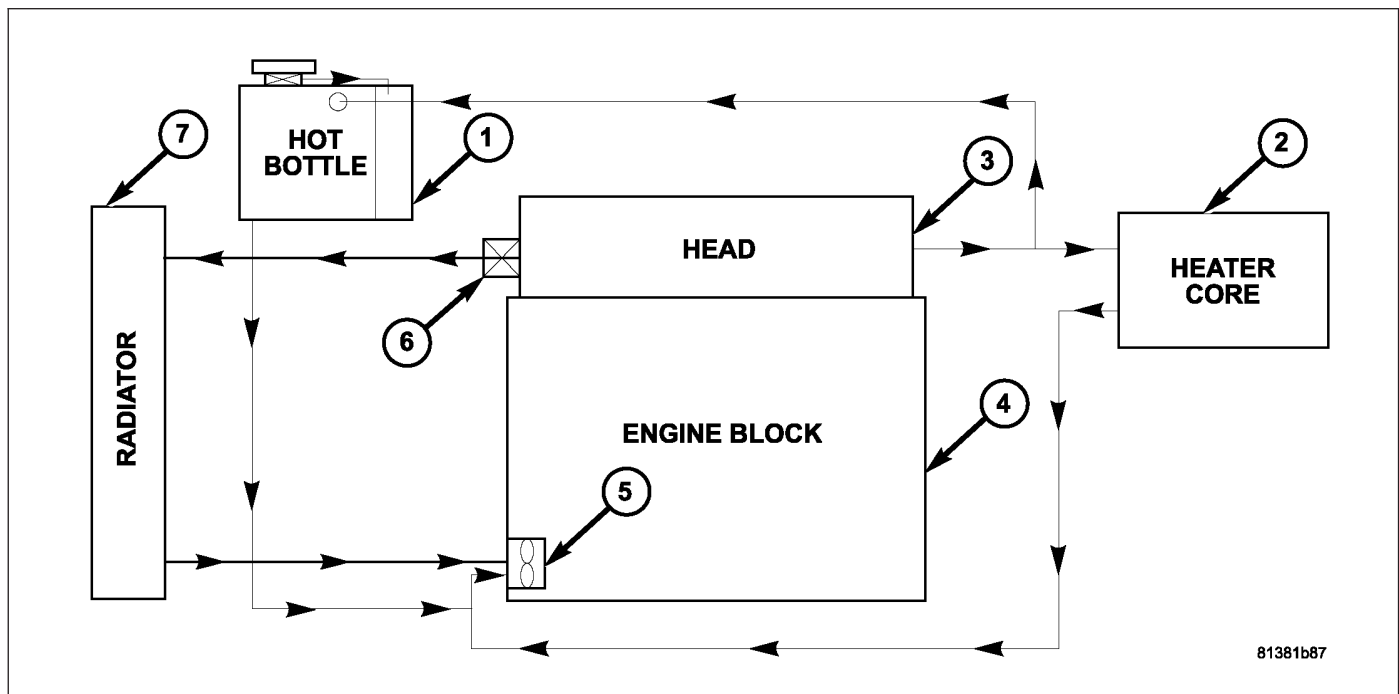
### DESCRIPTION

The cooling system consists of :

- Radiator
- Electric Cooling fan
- Fan shroud
- Radiator pressure cap
- Thermostat
- Coolant reserve/overflow system
- Transmission oil cooler (if equipped with an automatic transmission)
- Coolant
- Water pump
- Hoses and hose clamps

## OPERATION





The cooling system also provides a means of heating the passenger compartment (11) and cooling the automatic transmission fluid (if equipped). The cooling system is pressurized and uses a centrifugal water pump to circulate coolant throughout the system.

## DIAGNOSIS AND TESTING

### ON-BOARD DIAGNOSTICS (OBD)

#### COOLING SYSTEM RELATED DIAGNOSTICS

The powertrain control module (PCM) has been programmed to monitor certain cooling system components:

- If the engine has remained cool for too long a period, such as with a stuck open thermostat, a Diagnostic Trouble Code (DTC) can be set.
- If an open or shorted condition has developed in the relay circuit controlling the electric radiator fan, a Diagnostic Trouble Code (DTC) can be set.

If the problem is sensed in a monitored circuit often enough to indicated an actual problem, a DTC is stored. The DTC will be stored in the PCM memory for eventual display to the service technician. (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION).

#### ACCESSING DIAGNOSTIC TROUBLE CODES

To read DTC's and to obtain cooling system data, (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION).

#### ERASING TROUBLE CODES

After the problem has been repaired, use the scan tool to erase a DTC. Refer to the appropriate Powertrain Diagnostic Procedures service information for operation of the scan tool.

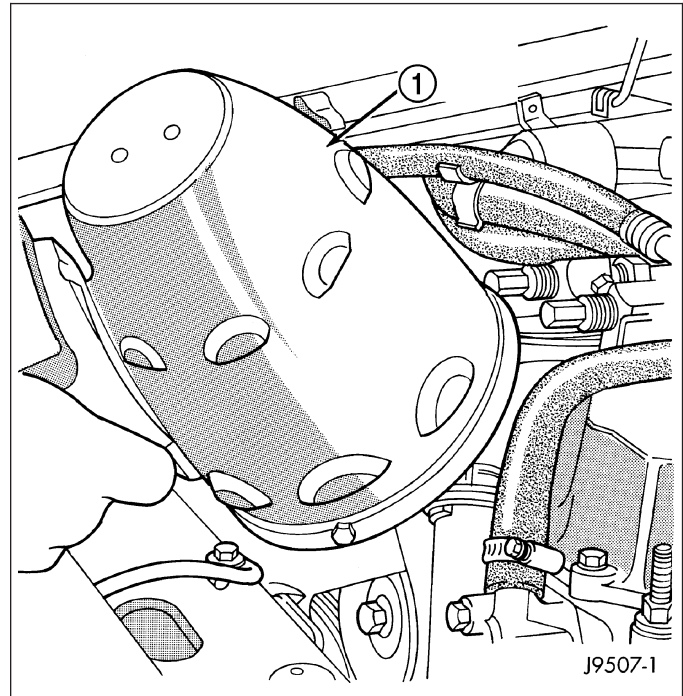


## COOLING SYSTEM - TESTING FOR LEAKS

### ULTRAVIOLET LIGHT METHOD

A leak detection additive is available through the parts department that can be added to cooling system. The additive is highly visible under ultraviolet light (black light) (1). Pour one ounce of additive into cooling system. Place heater control unit in HEAT position. Start and operate engine until the radiator upper hose is warm to touch. Aim the commercially available black light tool at components to be checked. If leaks are present, black light will cause the additive to glow a bright green color.

The black light can be used in conjunction with a pressure tester to determine if any external leaks exist.



### PRESSURE TESTER METHOD

The engine should be at normal operating temperature. Recheck the system cold if the cause of coolant loss is not located during the warm engine examination.

**WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING.**

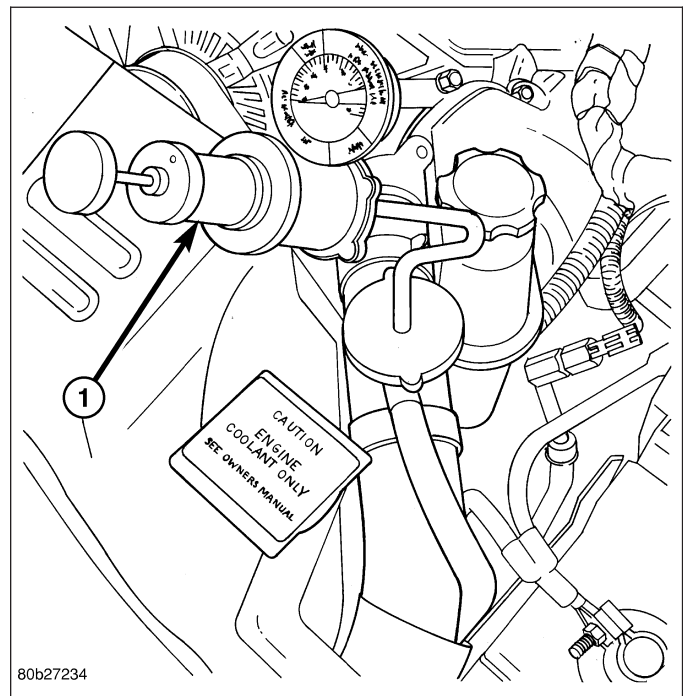
Carefully remove the radiator pressure cap from the filler neck and check coolant level. Push down on cap to disengage it from the stop tabs. Wipe the inside of filler neck and examine the lower inside sealing seat for nicks, cracks, paint, dirt and solder residue. Inspect the radiator-to- reserve/overflow tank hose for internal obstructions. Insert a wire through the hose to be sure it is not obstructed.

Inspect cams on the outside of filler neck. If the cams are damaged, seating of the pressure cap valve and tester seal will be affected.

Attach pressure tester (7700 or an equivalent) (1) to radiator filler neck.

Operate tester pump to apply 124.1 kPa (18 psi) pressure to system. If hoses enlarge excessively or bulge while testing, replace as necessary. Observe the gauge pointer and determine the condition of the cooling system according to the following criteria:

**Holds Steady:** If the pointer remains steady for two minutes, serious coolant leaks are not present in system. However, there could be an internal leak that does not appear with normal system test pressure. If it is certain that coolant is being lost and leaks cannot be detected, inspect for interior leakage or perform Internal Leakage Test. Refer to INTERNAL LEAKAGE INSPECTION .



**Drops Slowly:** Indicates a small leak or seepage is occurring. Examine all connections for seepage or slight leakage with a flashlight. Inspect radiator, hoses, gasket edges and heater. Seal small leak holes with a Sealer Lubricant (or equivalent). Repair leak holes and inspect system again with pressure applied.

**Drops Quickly:** Indicates that serious leakage is occurring. Examine system for external leakage. If leaks are not visible, inspect for internal leakage. Large radiator leak holes should be repaired by a reputable radiator repair shop.

## INTERNAL LEAKAGE INSPECTION

Remove engine oil pan drain plug and drain a small amount of engine oil. If coolant is present in the pan, it will drain first because it is heavier than oil. An alternative method is to operate engine for a short period to churn the oil. After this is done, remove engine dipstick and inspect for water globules. Also inspect the transmission dipstick for water globules and the transmission fluid cooler for leakage.

**WARNING: WITH RADIATOR PRESSURE TESTER TOOL INSTALLED ON RADIATOR, DO NOT ALLOW PRESSURE TO EXCEED 145 KPA (21 PSI). PRESSURE WILL BUILD UP QUICKLY IF A COMBUSTION LEAK IS PRESENT. TO RELEASE PRESSURE, ROCK TESTER FROM SIDE TO SIDE. WHEN REMOVING TESTER, DO NOT TURN TESTER MORE THAN 1/2 TURN IF SYSTEM IS UNDER PRESSURE.**

Operate the engine without the pressure cap on the radiator until the thermostat opens. Attach a Pressure Tester to filler neck. If pressure builds up quickly it indicates a combustion leak exists. This is usually the result of a cylinder head gasket leak or crack in engine. Repair as necessary.

If there is not an immediate pressure increase, pump the Pressure Tester. Do this until indicated pressure is within system range of 124.1 kPa (18 psi). Fluctuation of gauge pointer indicates compression or combustion leakage into cooling system.

Because the vehicle is equipped with a catalytic converter, **do not** remove spark plug cables or short out cylinders to isolate compression leak.

If the needle on the dial of pressure tester does not fluctuate, race engine a few times to check for an abnormal amount of coolant or steam. This would be emitting from exhaust pipe. Coolant or steam from exhaust pipe may indicate a faulty cylinder head gasket, cracked engine cylinder block or cylinder head.

A convenient check for exhaust gas leakage into cooling system is provided by a commercially available Block Leak Check tool. Follow manufacturers instructions when using this product.

## COMBUSTION LEAKAGE TEST - WITHOUT PRESSURE TESTER

DO NOT WASTE reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

**WARNING: DO NOT REMOVE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN RADIATOR DRAINCOCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.**

Drain sufficient coolant to allow thermostat removal (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL) for 2.7L/3.5L engine, (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL) for 5.7L engine. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

Add coolant to radiator to bring level to within 6.3 mm (1/4 in) of the top of the thermostat housing.

**CAUTION: Avoid overheating. Do not operate engine for an excessive period of time. Open draincock immediately after test to eliminate boil over.**

Start engine and accelerate rapidly three times, to approximately 3000 rpm while observing coolant. If internal engine combustion gases are leaking into cooling system, bubbles will appear in coolant. If bubbles do not appear, internal combustion gas leakage is not present.

## PRELIMINARY CHECKS

### ENGINE COOLING SYSTEM OVERHEATING

Establish what driving conditions caused the complaint. Abnormal loads on the cooling system such as the following may be the cause:

- Prolonged idle
- Very high ambient temperature
- Slight tail wind at idle
- Slow traffic
- Traffic jams
- High speed or steep grades

Driving techniques that avoid overheating are:

- Idle with A/C off when temperature gauge is at end of normal range.
- Increasing engine speed for more air flow is recommended.

### TRAILER TOWING:

Consult Trailer Towing section of owners manual. Do not exceed limits.

### RECENT SERVICE OR ACCIDENT REPAIR:

Determine if any recent service has been performed on vehicle that may effect cooling system. This may be:

- Engine adjustments (incorrect timing)
- Slipping engine accessory drive belt(s)
- Brakes (possibly dragging)
- Changed parts. Incorrect water pump or pump rotating in wrong direction due to belt not correctly routed
- Reconditioned radiator or cooling system refilling (possibly under filled or air trapped in system).

**Note: If investigation reveals none of the previous items as a cause for an engine overheating complaint, refer to COOLING SYSTEM DIAGNOSIS CHART BELOW.**

These charts are to be used as a quick-reference only. Refer to COOLING SYSTEM DIAGNOSIS CHART

## COOLING SYSTEM DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS LOW	<ol style="list-style-type: none"><li>1. Has a Diagnostic Trouble Code (DTC) been set indicating a stuck open thermostat?</li><li>2. Is the temperature sending unit connected?</li><li>3. Is the temperature gauge operating OK?</li><li>4. Coolant level low in cold ambient temperatures accompanied with poor heater performance.</li><li>5. Improper operation of internal heater doors or heater controls.</li></ol>	<ol style="list-style-type: none"><li>1. (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION). Replace thermostat if necessary.</li><li>2. Check the temperature sensor connector. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING) . Repair connector if necessary.</li><li>3. Check gauge operation. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/ENGINE TEMPERATURE GAUGE - DESCRIPTION). Repair as necessary.</li><li>4. Check coolant level in the coolant reserve/overflow tank or degas bottle and the radiator. Inspect system for leaks. Repair leaks as necessary. Refer to the Coolant section of the manual text for WARNINGS and CAUTIONS associated with removing the radiator cap.</li><li>5. Inspect heater and repair as necessary. (Refer to 24 - HEATING &amp; AIR CONDITIONING - DIAGNOSIS AND TESTING) .</li></ol>

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS HIGH OR THE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM THE COOLING SYSTEM	<p>1. Trailer is being towed, a steep hill is being climbed, vehicle is operated in slow moving traffic, or engine is being idled with very high ambient (outside) temperatures and the air conditioning is on. Higher altitudes could aggravate these conditions.</p> <p>2. Is the temperature gauge reading correctly?</p> <p>3. Is the temperature warning illuminating unnecessarily?</p> <p>4. Coolant low in coolant reserve/overflow tank and radiator?</p> <p>5. Pressure cap not installed tightly. If cap is loose, boiling point of coolant will be lowered. Also refer to the following Step 6.</p> <p>6. Poor seals at the radiator cap.</p> <p>7. Coolant level low in radiator but not in coolant reserve/overflow tank. This means the radiator is not drawing coolant from the coolant reserve/overflow tank as the engine cools</p> <p>8. Incorrect coolant concentration</p>	<p>1. This may be a temporary condition and repair is not necessary. Turn off the air conditioning and attempt to drive the vehicle without any of the previous conditions. Observe the temperature gauge. The gauge should return to the normal range. If the gauge does not return to the normal range, determine the cause for overheating and repair. Refer to Possible Causes (2-18).</p> <p>2. Check gauge. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Repair as necessary.</p> <p>3. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).</p> <p>4. Check for coolant leaks and repair as necessary. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).</p> <p>5. Tighten cap</p> <p>6. (a) Check condition of cap and cap seals. Refer to Radiator Cap. Replace cap if necessary. (b) Check condition of radiator filler neck or degas bottle. If neck is bent or damaged, replace radiator or degas bottle.</p> <p>7. (a) Check condition of radiator cap and cap seals. Refer to Radiator Cap in this Group. Replace cap if necessary. (b) Check condition of radiator filler neck. If neck is bent or damaged, replace radiator. (c) Check condition of the hose from the radiator to the coolant tank. It should fit tight at both ends without any kinks or tears. Replace hose if necessary. (d) Check coolant reserve/overflow tank and tanks hoses for blockage. Repair as necessary.</p> <p>8. Check coolant. (Refer to LUBRICATION &amp; MAINTENANCE/ FLUID TYPES - DESCRIPTION)</p>

CONDITION	POSSIBLE CAUSES	CORRECTION
	<p>9. Coolant not flowing through system</p> <p>10. Radiator or A/C condenser fins are dirty or clogged.</p> <p>11. Radiator core is corroded or plugged.</p> <p>13. Dragging brakes</p> <p>12. Fuel or ignition system problems.</p> <p>14. Bug screen or cardboard is being, reducing airflow.</p> <p>15. Thermostat partially or completely shut.</p> <p>16. Coolings fan not operating properly.</p> <p>17. Cylinder head gasket leaking.</p> <p>18. Heater core leaking.</p>	<p>9. Check for coolant flow at radiator filler neck with some coolant removed, engine warm and thermostat open. Coolant should be observed flowing through radiator. If flow is not observed, determine area of obstruction and repair as necessary.</p> <p>10. Remove insects and debris. (Refer to 7 - COOLING - STANDARD PROCEDURE).</p> <p>11. Have radiator re-cored or replaced.</p> <p>13. Check and correct as necessary. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)</p> <p>12. Refer to 14 - Fuel System or 8 - Electrical for diagnosis and testing procedures.</p> <p>14. Remove bug screen or cardboard.</p> <p>15. Check thermostat operation and replace as necessary. (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL).</p> <p>16. Check cooling fan drive operation. Refer to appropriate Diagnostic Information.</p> <p>17. Check for cylinder head gasket leaks. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).</p> <p>18. Check heater core for leaks. (Refer to 24 - HEATING &amp; AIR CONDITIONING - DIAGNOSIS AND TESTING). Repair as necessary.</p>

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READING IS INCONSISTANT (FLUCTUATES, CYCLES, OR IS ERRATIC)	<p>1. During cold weather operation, with the heater in the high position, the gauge reading may drop slightly.</p> <p>2. Temperature gauge or engine mounted gauge sensor defective or shorted. Also, corroded or loose wiring in this circuit.</p> <p>3. Gauge reading rises when vehicle is brought to a stop after heavy use (engine still running)</p> <p>4. Gauge reading high after re-starting a warmed up (hot) engine.</p> <p>5. Coolant level low in radiator (air will build up in the cooling system causing the thermostat to open late).</p> <p>6. Cylinder head gasket leaking allowing exhaust gas to enter cooling system causing a thermostat to open late.</p> <p>7. Water pump impeller loose on shaft.</p> <p>8. Loose accessory drive belt. (water pump slipping)</p> <p>9. Air leak on the suction side of the water pump allows air to build up in cooling system causing thermostat to open late.</p>	<p>1. During cold weather operation, with the heater in the high position, the gauge reading may drop slightly.</p> <p>2. Check operation of gauge and repair if necessary. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING).</p> <p>3. A normal condition. No correction is necessary. Gauge should return to normal range after vehicle is driven.</p> <p>4. A normal condition. No correction is necessary. The gauge should return to normal range after a few minutes of engine operation.</p> <p>5. Check and correct coolant leaks. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).</p> <p>6. (a) Check for cylinder head gasket leaks. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING). (b) Check for coolant in the engine oil. Inspect for white steam emitting from the exhaust system. Repair as necessary.</p> <p>7. Check water pump and replace as necessary. (Refer to 7 - COOLING/ENGINE/WATER PUMP - REMOVAL).</p> <p>8.. Check and correct as necessary. (Refer to 7 - COOLING/ ACCESSORY DRIVE/DRIVE BELTS - DIAGNOSIS AND TESTING)</p> <p>9. Locate leak and repair as necessary.</p>
PRESSURE CAP IS BLOWING OFF STEAM AND/OR COOLANT TO COOLANT TANK. TEMPERATURE GAUGE READING MAY BE ABOVE NORMAL BUT NOT HIGH. COOLANT LEVEL MAY BE HIGH IN COOLANT RESERVE/ OVERFLOW TANK	<p>1. Pressure relief valve in radiator cap is defective.</p>	<p>1. Check condition of radiator cap and cap seals. (Refer to 7 - COOLING/ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING). Replace cap as necessary.</p>



CONDITION	POSSIBLE CAUSES	CORRECTION
<p>COOLANT LOSS TO THE GROUND WITHOUT PRESSURE CAP BLOWOFF. GAUGE READING HIGH OR HOT</p> <p>DETONATION OR PRE-IGNITION (NOT CAUSED BY IGNITION SYSTEM). GAUGE MAY OR MAY NOT BE READING HIGH</p>	<p>1. Coolant leaks in radiator, cooling system hoses, water pump or engine.</p> <p>1. Engine overheating.</p> <p>2. Freeze point of coolant not correct. Mixture is too rich or too lean.</p>	<p>1. Pressure test and repair as necessary. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).</p> <p>1. Check reason for overheating and repair as necessary.</p> <p>2. Check coolant concentration. (Refer to LUBRICATION &amp; MAINTENANCE/FLUID TYPES - DESCRIPTION).</p>
HOSE OR HOSES COLLAPSE WHILE ENGINE IS RUNNING	1. Vacuum created in cooling system on engine cool-down is not being relieved through coolant reserve/overflow system.	<p>1. (a) Radiator cap relief valve stuck. (Refer to 7 - COOLING/ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING). Replace if necessary</p> <p>(b) Hose between coolant reserve/overflow tank and radiator is kinked. Repair as necessary.</p> <p>(c) Vent at coolant reserve/overflow tank is plugged. Clean vent and repair as necessary.</p> <p>(d) Reserve/overflow tank is internally blocked or plugged. Check for blockage and repair as necessary.</p>
NOISY COOLING FAN	<p>1. Fan blades loose.</p> <p>2. Fan blades striking a surrounding object.</p> <p>3. Air obstructions at radiator or air conditioning condenser.</p>	<p>1. Replace fan blade assembly (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).</p> <p>2. Locate point of fan blade contact and repair as necessary.</p> <p>3. Remove obstructions and/or clean debris or insects from radiator or A/C condenser.</p>



CONDITION	POSSIBLE CAUSES	CORRECTION
INADEQUATE HEATER PERFORMANCE. THERMOSTAT FAILED IN OPEN POSITION	<ol style="list-style-type: none"> <li>1. Has a Diagnostic trouble Code (DTC) been set?</li> <li>2. Coolant level low</li> <li>3. Obstructions in heater hose/fittings</li> <li>4. Heater hose kinked</li> <li>5. Water pump is not pumping water to/through the heater core. When the engine is fully warmed up, both heater hoses should be hot to the touch. If only one of the hoses is hot, the water pump may not be operating correctly or the heater core may be plugged. Accessory drive belt may be slipping causing poor water pump operation.</li> </ol>	<ol style="list-style-type: none"> <li>1. (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION) for correct procedures and replace thermostat if necessary</li> <li>2. (Refer to 7 - COOLING - STANDARD PROCEDURE).</li> <li>3. Remove heater hoses at both ends and check for obstructions</li> <li>4. Locate kinked area and repair as necessary</li> <li>5. (Refer to 7 - COOLING/ENGINE/WATER PUMP - REMOVAL) for 2.7L engine, (Refer to 7 - COOLING/ENGINE/WATER PUMP - REMOVAL) for 3.5L engine, (Refer to 7 - COOLING/ENGINE/WATER PUMP - REMOVAL) for 5.7L engine. If a slipping belt is detected, (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - DIAGNOSIS AND TESTING). If heater core obstruction is detected, (Refer to 24 - HEATING &amp; AIR CONDITIONING/PLUMBING/HEATER CORE - REMOVAL).</li> </ol>
STEAM IS COMING FROM THE FRONT OF VEHICLE NEAR THE GRILL AREA WHEN WEATHER IS WET, ENGINE IS WARMED UP AND RUNNING, AND VEHICLE IS STATIONARY. TEMPERATURE GAUGE IS IN NORMAL RANGE	<ol style="list-style-type: none"> <li>1. During wet weather, moisture (snow, ice or rain condensation) on the radiator will evaporate when the thermostat opens. This opening allows heated water into the radiator. When the moisture contacts the hot radiator, steam may be emitted. This usually occurs in cold weather with no fan or airflow to blow it away.</li> </ol>	<ol style="list-style-type: none"> <li>1. Occasional steam emitting from this area is normal. No repair is necessary.</li> </ol>
COOLANT COLOR	<ol style="list-style-type: none"> <li>1. Coolant color is not necessarily an indication of adequate corrosion or temperature protection. Do not rely on coolant color for determining condition of coolant.</li> </ol>	<ol style="list-style-type: none"> <li>1. (Refer to LUBRICATION &amp; MAINTENANCE/FLUID TYPES - DESCRIPTION) Adjust coolant mixture as necessary.</li> </ol>
COOLANT LEVEL CHANGES IN COOLANT RESERVE/OVERFLOW TANK. TEMPERATURE GAUGE IS IN NORMAL RANGE	<ol style="list-style-type: none"> <li>1. Level changes are to be expected as coolant volume fluctuates with engine temperature. If the level in the tank was between the FULL and ADD marks at normal operating temperature, the level should return to within that range after operation at elevated temperatures.</li> </ol>	<ol style="list-style-type: none"> <li>1. A normal condition. No repair is necessary.</li> </ol>

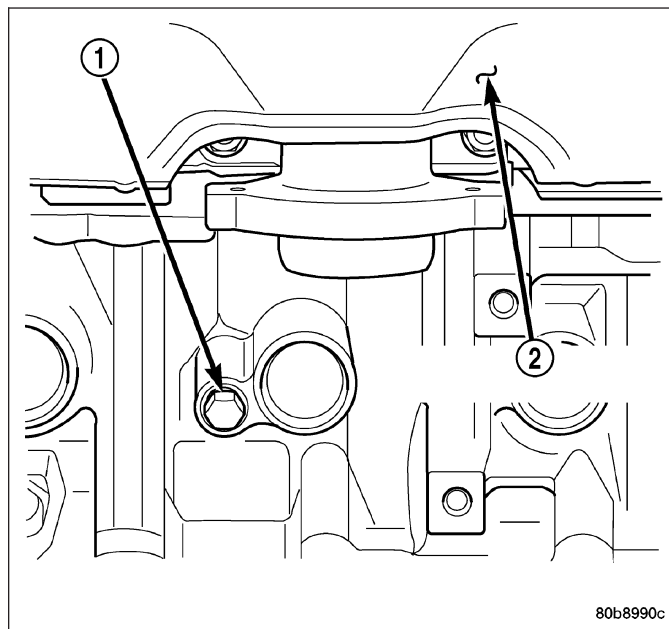
## STANDARD PROCEDURE

### DRAINING COOLING SYSTEM - ALL ENGINES

**WARNING: DO NOT REMOVE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN RADIATOR DRAIN-COCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.**

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

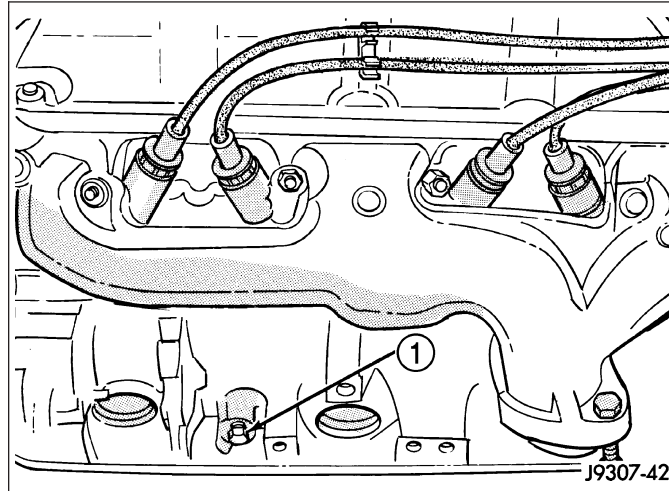
1. Remove radiator pressure cap.
2. Loosen radiator petcock.
3. Remove drain plug (1).



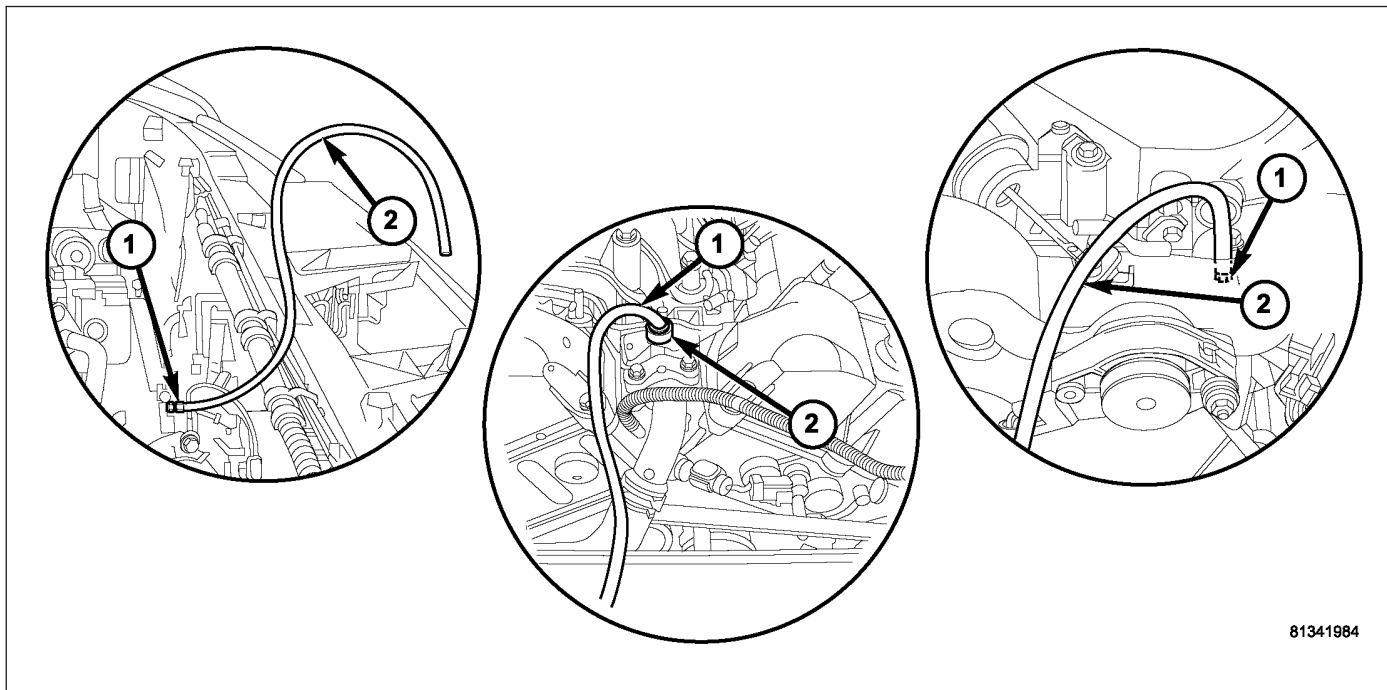
**WARNING: DO NOT REMOVE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN RADIATOR DRAIN-COCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.**

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

4. Remove radiator pressure cap.
5. Loosen radiator petcock.
6. Remove cylinder block drain plugs (1).



## COOLING SYSTEM FILLING



**WARNING:** Make sure engine cooling system is cool before removing pressure cap or any hose. severe personal injury may result from escaping hot coolant. The cooling system is pressurized when hot.

**Note:** Cooling system fill procedure is critical to overall cooling system performance.

1. Close radiator draincock. **Hand tighten only.**
2. Install engine block drain plugs, if removed. Coat the threads with Mopar® Thread Sealant with Teflon.

**WARNING:** When installing drain hose to air bleed valve, route hose away from accessory drive belts, accessory drive pulleys, and electric cooling fan motors.

**Note:** It may be necessary to install a bleed fitting on the 5.7L engine.

3. Attach a 1.5 - 2 m (4 - 6 ft.) long 6.35 mm (1/4 inch.) ID clear hose to bleeder fitting
  - **Bleed Valve Location (2.7L):** Located on the water outlet connector at the front of engine.
  - **Bleed Valve Location (3.5L):** Located on the lower intake manifold, left of center and below the upper intake plenum.
  - **Plug Location (5.7L):** Located on the front of the water outlet housing at the front of engine.
4. Route hose away from the accessory drive belt, drive pulleys and electric cooling fan. Place the other end of hose into a clean container. The hose will prevent coolant from contacting the accessory drive belt when bleeding the system during the refilling operation.

**Note:** It is imperative that the cooling system air bleed valve be opened before any coolant is added to the cooling system. Failure to open the bleed valve first will result in an incomplete fill of the system.

5. 5.7L ENGINE - Install a threaded and barbed fitting into water pump housing.
6. Attach Tool 8195 (1), Filling Aid Funnel to pressure bottle filler neck.
7. Using hose pinch-off pliers, pinch overflow hose (3) that connects between the two chambers of the coolant bottle (2).
8. Open bleed fitting.

**CAUTION:** Do not mix coolants. If coolant is used other than specified, a reduction in corrosion protection will occur.

9. Pour a 50/50 mix of Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula and distilled water into the larger section of Filling Aid Funnel (the smaller section of funnel is to allow air to escape). For system capacity, (Refer to 7 - COOLING - SPECIFICATIONS).
10. Slowly fill the cooling system until a steady stream of coolant flows from the hose attached to the bleed valve.
11. Close the bleed valve and continue filling system to the top of the Tool 8195 (1).
12. Remove pinch-off pliers from overflow hose.
13. Allow the coolant in Filling Funnel to drain into overflow chamber of the pressure bottle.
14. Remove Tool 8195 (1). Install cap on coolant pressure bottle.
15. Remove hose from bleed valve.
16. 5.7L ENGINE - Install fitting into thermostat housing. Coat the threads with Mopar® Thread Sealant with Teflon.
17. Start engine and run at 1500 - 2000 RPM for 30 minutes.

**Note: The engine cooling system will push any remaining air into the coolant bottle within about an hour of normal driving. As a result, a drop in coolant level in the pressure bottle may occur. If the engine cooling system overheats and pushes coolant into the overflow side of the coolant bottle, this coolant will be sucked back into the cooling system ONLY IF THE PRESSURE CAP IS LEFT ON THE BOTTLE. Removing the pressure cap breaks the vacuum path between the two bottle sections and the coolant will not return to cooling system.**

18. Shut off engine allow it to cool down for 30 minutes. This permits coolant to be drawn into the pressure chamber.
19. With engine COLD, observe coolant level in pressure chamber. Coolant level should be within MIN and MAX marks. Adjust coolant level as necessary.

**Note: The coolant bottle has two chambers. Coolant will normally only be in the inboard of the two. The outboard chamber is only to recover coolant in the event of an overheat or after a recent service fill.**

## ADDING ADDITIONAL COOLANT

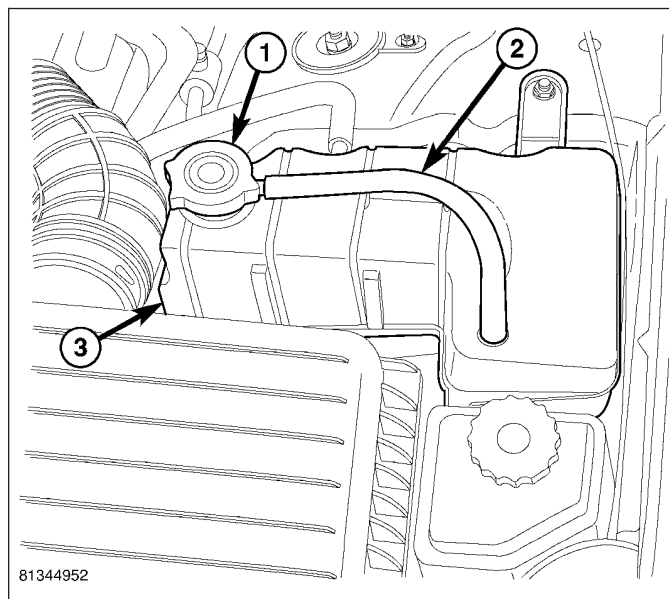
The use of aluminum cylinder blocks, cylinder heads and water pumps requires special corrosion protection. Only Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (glycol base coolant with corrosion inhibitors called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% distilled water to obtain to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

**CAUTION: Do not use coolant additives that are claimed to improve engine cooling.**

## COOLANT LEVEL CHECK

**Note:** Do not remove radiator cap for routine coolant level inspections. The coolant level can be checked at coolant recovery bottle (2).

The coolant reserve/overflow system provides a quick method for determining coolant level. With engine not running, the coolant level should be between ADD and FULL marks (3). If the coolant level is at or below the ADD mark, fill the recovery bottle with a 50/50 mixture of antifreeze and water ONE QUART AT A TIME. Repeat this procedure until the coolant level is at the FULL mark.



## COOLING SYSTEM CLEANING/REVERSE FLUSHING

### CLEANING

Drain cooling system and refill with water. Run engine with radiator cap installed until upper radiator hose is hot. Stop engine and drain water from system. If water is dirty, fill system with water, run engine and drain system. Repeat until water drains clean.

### REVERSE FLUSHING

Reverse flushing of cooling system is the forcing of water through the cooling system. This is done using air pressure in the opposite direction of normal coolant flow. It is usually only necessary with very dirty systems with evidence of partial plugging.

### REVERSE FLUSHING RADIATOR

Disconnect radiator hoses from radiator inlet and outlet. Attach a section of radiator hose to radiator bottom outlet fitting and insert flushing gun. Connect a water supply hose and air supply hose to flushing gun.

**CAUTION:** Internal radiator pressure must not exceed 138 kPa (20 psi) as damage to radiator may result.

Allow radiator to fill with water. When radiator is filled, apply air in short blasts. Allow radiator to refill between blasts. Continue this reverse flushing until clean water flows out through rear of radiator cooling tube passages. Have radiator cleaned more extensively by a radiator repair shop.

### REVERSE FLUSHING ENGINE

Drain cooling system. Remove thermostat housing and thermostat. Install thermostat housing. Disconnect radiator upper hose from radiator and attach flushing gun to hose. Disconnect radiator lower hose from water pump and attach a lead-away hose to water pump inlet fitting.

**CAUTION:** On vehicles equipped with a heater water control valve, be sure heater control valve is closed (heat off). This will prevent coolant flow with scale and other deposits from entering heater core.

Connect water supply hose and air supply hose to flushing gun. Allow engine to fill with water. When engine is filled, apply air in short blasts, allowing system to fill between air blasts. Continue until clean water flows through the lead away hose.

Remove lead away hose, flushing gun, water supply hose and air supply hose. Remove thermostat housing and install thermostat. Install thermostat housing with a replacement gasket. Refer to Thermostat Replacement. Connect radiator hoses. Refill cooling system with correct antifreeze/water mixture. Refer to Refilling the Cooling System.

## CHEMICAL CLEANING

In some instances, use a radiator cleaner (Mopar Radiator Kleen or equivalent) before flushing. This will soften scale and other deposits and aid flushing operation.

**CAUTION: Follow manufacturers instructions when using these products.**

## SPECIFICATIONS

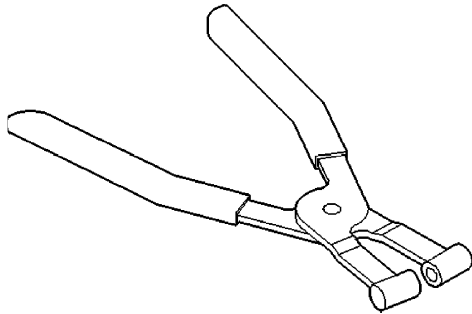
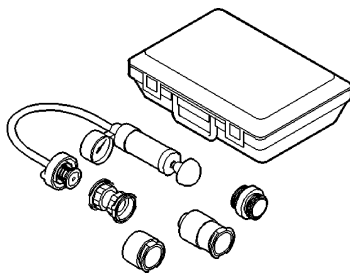
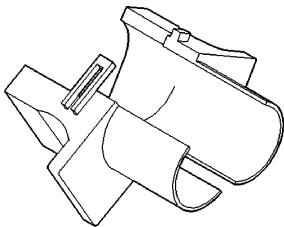
### TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Automatic Belt Tensioner to Block - Bolts	54	40	-
Block Heater - Bolt	2	-	17
Generator/Compressor Mounting Bracket - Bolts - No. 1 and No.2	54	40	-
No. 3	40	30	-
Fan Shroud Mounting - Bolts	6	-	50
Fan Blade to Fan Drive - Bolts	23	17	-
Idler Pulley - Bolt - 5.7L	54	40	-
Idler Pulley - Bolt - 2.7L/3.5L	28	-	250
Radiator to Support - Bolts	23	-	200
Thermostat Housing - Bolts - 2.7L/3.5L	11.8	-	105
Housing - Coolant Outlet	11.8	-	105
Heater Supply Tube	3.4	-	30
Thermostat Housing - Bolts - 5.7L	13	-	112
Transmission Auxiliary Oil Cooler - Bolts	10	-	90
Upper Radiator Closure Panel - Bolts	10	-	90
Water Pump - Bolts - 2.7L/3.5L	11.8	-	105
Water Pump - Bolts - 5.7L	28	20	-

## FILL VOLUMES

### SPECIFICATIONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
2.7L	9	9.5
3.5L	9.75	10.3
5.7L	13.3	14.05

**SPECIAL TOOLS****COOLING*****PLIERS 6094******PRESSURE TESTER 7700******3/8 QUICK RELEASE TOOL***

## ACCESSORY DRIVE

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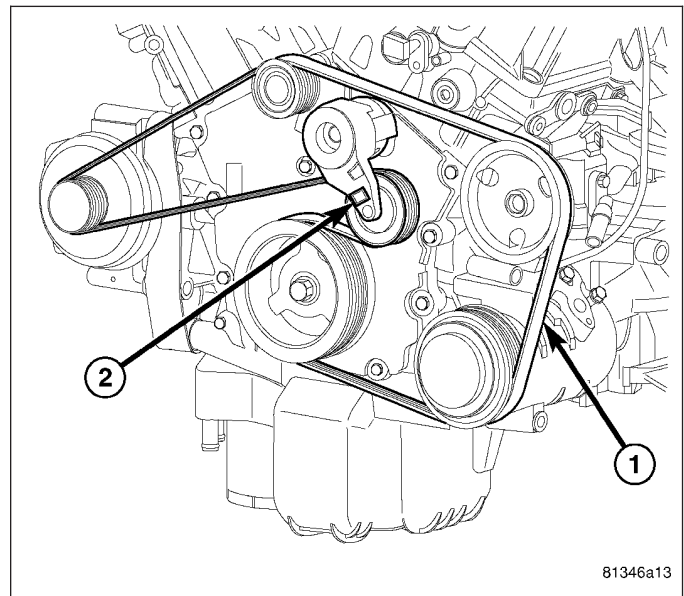
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## TENSIONERS-BELT

### DESCRIPTION

Correct drive belt tension is required to ensure optimum performance of the belt (1) driven engine accessories. If specified tension is not maintained, belt slippage may cause; engine overheating, lack of power steering assist, loss of air conditioning capacity, reduced generator output rate, and greatly reduced belt life.

It is not necessary to adjust belt tension on the 2.7L/ 3.5L or 5.7L engines. These engines are equipped with an automatic belt tensioner (2). The tensioner maintains correct belt tension at all times. Due to use of this belt tensioner (2), do not attempt to use a belt tension gauge on these engines.



### OPERATION

The automatic belt tensioner maintains belt tension by using internal spring pressure, a pivoting arm and pulley to apply force against the drive belt.



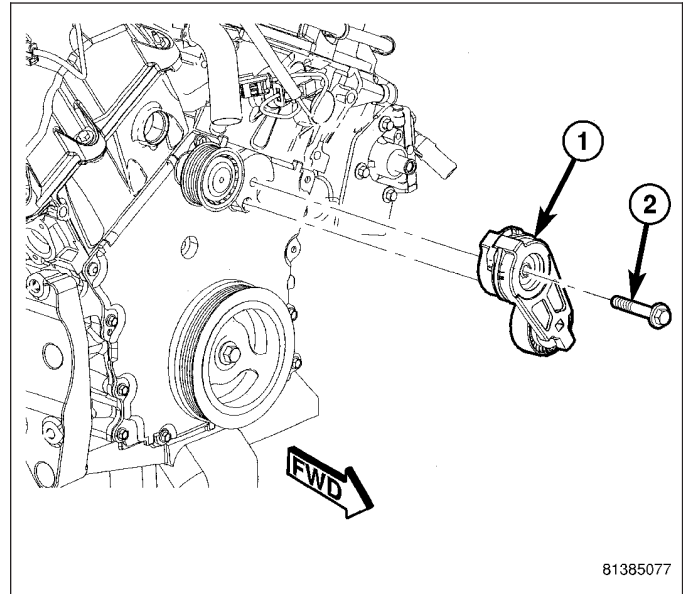
## REMOVAL

### 2.7L ENGINE

On all engines, the tensioner (1) is equipped with an indexing tang on back of tensioner and an indexing stop on tensioner housing. If a new belt is being installed, tang must be within approximately 6 - 8mm (0.24 - 0.32 in.) of indexing stop (i.e. tang is approximately between the two indexing stops). Belt is considered new if it has been used 15 minutes or less.

If the above specification cannot be met, check for:

- The wrong belt being installed (incorrect length/width)
- Worn bearings on an engine accessory (A/C compressor, power steering pump, water pump, idler pulley or generator)
- Belt is not installed in pulley grooves
- A pulley on an engine accessory being loose
- Misalignment of an engine accessory
- Belt incorrectly routed.



**Note:** A used belt should be replaced if tensioner indexing arrow has moved to the minimum tension indicator. Tensioner travel stops at this point.

1. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

**WARNING:** BECAUSE OF HIGH SPRING PRESSURE, DO NOT ATTEMPT TO DISASSEMBLE AUTOMATIC TENSIONER. UNIT IS SERVICED AS AN ASSEMBLY EXCEPT FOR PULLEY ON TENSIONER.

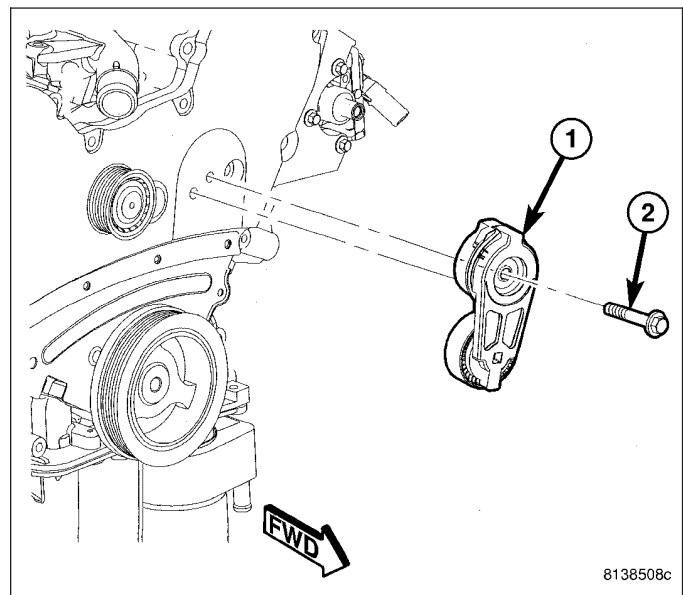
2. Remove tensioner assembly bolt (2).
3. Remove tensioner assembly (1) from mounting bracket.

### 3.5L ENGINE

On all engines, the tensioner (1) is equipped with an indexing tang on back of tensioner and an indexing stop on tensioner housing. If a new belt is being installed, tang must be within approximately 6 - 8mm (0.24 - 0.32 in.) of indexing stop (i.e. tang is approximately between the two indexing stops). Belt is considered new if it has been used 15 minutes or less.

If the above specification cannot be met, check for:

- The wrong belt being installed (incorrect length/width)
- Worn bearings on an engine accessory (A/C compressor, power steering pump, water pump, idler pulley or generator)
- Belt is not installed in pulley grooves
- A pulley on an engine accessory being loose
- Misalignment of an engine accessory
- Belt incorrectly routed.



**Note:** A used belt should be replaced if tensioner indexing arrow has moved to the minimum tension indicator. Tensioner travel stops at this point.

1. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

**WARNING: BECAUSE OF HIGH SPRING PRESSURE, DO NOT ATTEMPT TO DISASSEMBLE AUTOMATIC TENSIONER. UNIT IS SERVICED AS AN ASSEMBLY EXCEPT FOR PULLEY ON TENSIONER.**

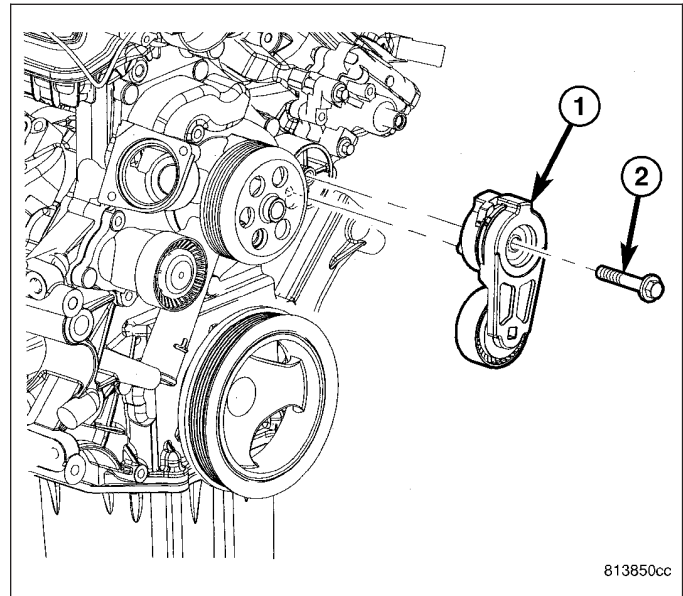
2. Remove tensioner assembly bolt (1).
3. Remove tensioner assembly (2) from mounting bracket.

## 5.7L ENGINE

On all engines, the tensioner (1) is equipped with an indexing tang on back of tensioner and an indexing stop on tensioner housing. If a new belt is being installed, tang must be within approximately 6 - 8mm (0.24 - 0.32 in.) of indexing stop (i.e. tang is approximately between the two indexing stops). Belt is considered new if it has been used 15 minutes or less.

If the above specification cannot be met, check for:

- The wrong belt being installed (incorrect length/width)
- Worn bearings on an engine accessory (A/C compressor, power steering pump, water pump, idler pulley or generator)
- Belt is not installed in pulley grooves
- A pulley on an engine accessory being loose
- Misalignment of an engine accessory
- Belt incorrectly routed.



**Note: A used belt should be replaced if tensioner indexing arrow has moved to the minimum tension indicator. Tensioner travel stops at this point.**

1. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

**WARNING: BECAUSE OF HIGH SPRING PRESSURE, DO NOT ATTEMPT TO DISASSEMBLE AUTOMATIC TENSIONER. UNIT IS SERVICED AS AN ASSEMBLY EXCEPT FOR PULLEY ON TENSIONER.**

2. Remove tensioner assembly bolt (2).
3. Remove tensioner assembly (1) from mounting bracket.

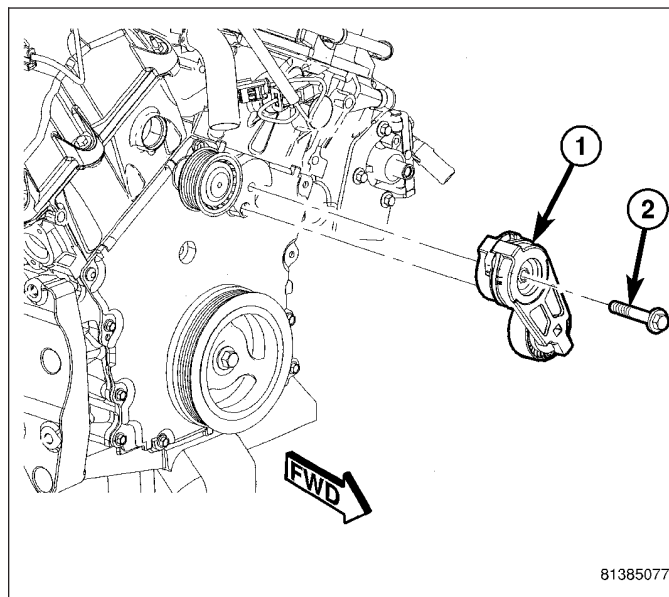
## INSTALLATION

### 2.7L ENGINE

1. Install tensioner bolt (2) to tensioner (1). Tighten bolt to 34 N·m (40 ft. lbs.) torque.
2. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

On all engines, the tensioner (1) is equipped with an indexing tang on back of tensioner and an indexing stop on tensioner housing. If a new belt is being installed, tang must be within approximately 6 - 8mm (0.24 - 0.32 in.) of indexing stop (i.e. tang is approximately between the two indexing stops). Belt is considered new if it has been used 15 minutes or less.

3. Check belt indexing marks.

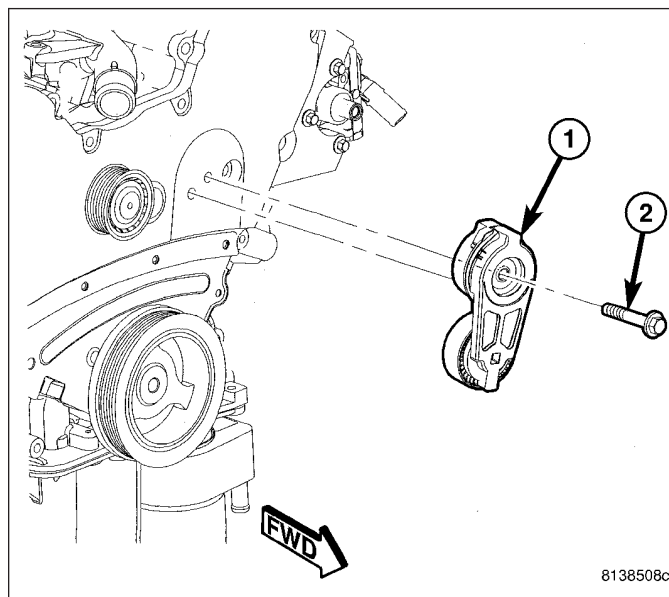


### 3.5L ENGINE

1. Install tensioner bolt (2) to tensioner (1). Tighten bolt to 34 N·m (40 ft. lbs.) torque.
2. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

On all engines, the tensioner (1) is equipped with an indexing tang on back of tensioner and an indexing stop on tensioner housing. If a new belt is being installed, tang must be within approximately 6 - 8mm (0.24 - 0.32 in.) of indexing stop (i.e. tang is approximately between the two indexing stops). Belt is considered new if it has been used 15 minutes or less.

3. Check belt indexing marks.

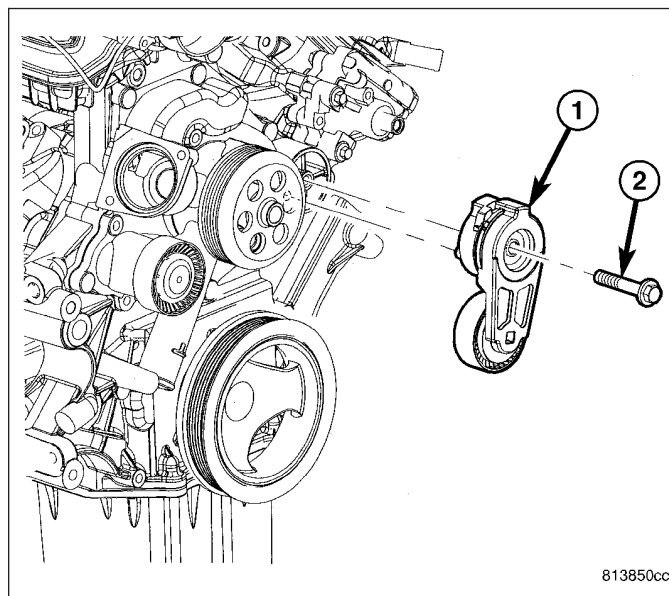


## 5.7L ENGINE

1. Install tensioner bolt (2) to tensioner (1). Tighten bolt to 34 N·m (40 ft. lbs.) torque.
2. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

On all engines, the tensioner (1) is equipped with an indexing tang on back of tensioner and an indexing stop on tensioner housing. If a new belt is being installed, tang must be within approximately 6 - 8mm (0.24 - 0.32 in.) of indexing stop (i.e. tang is approximately between the two indexing stops). Belt is considered new if it has been used 15 minutes or less.

3. Check belt indexing marks.



## BELTS-DRIVE

### DIAGNOSIS AND TESTING

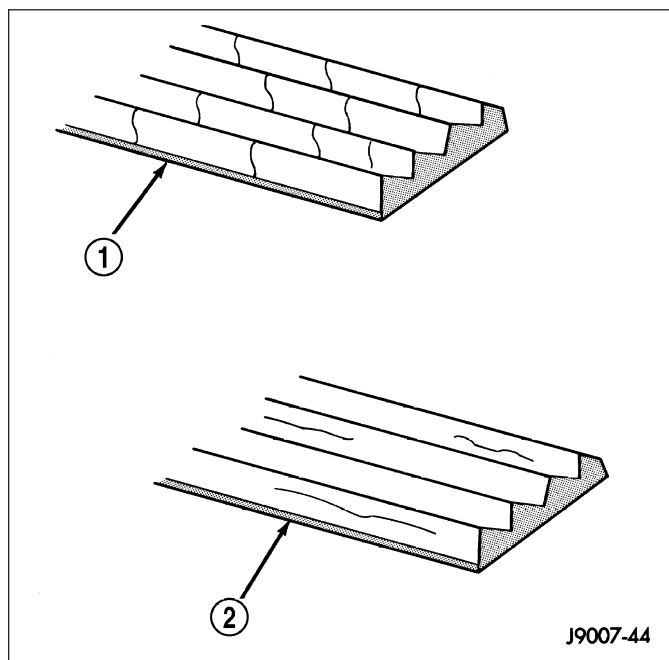
#### ACCESSORY DRIVE BELT

##### VISUAL DIAGNOSIS

When diagnosing serpentine accessory drive belts, small cracks (1) that run across the ribbed surface of the belt from rib to rib, are considered normal. These are not a reason to replace the belt. However, cracks (2) running along a rib (not across) are **not** normal. Any belt with cracks running along a rib must be replaced. Also replace the belt if it has excessive wear, frayed cords, severe glazing or chunking.

Any belt with bumb, surface coming apart, or any other uneven indications along the flat surface of the belt must be remove and inspected and replaced if necessary.

Refer to ACCESSORY DRIVE BELT DIAGNOSIS CHART for further belt diagnosis.



##### NOISE DIAGNOSIS

Noises generated by the accessory drive belt are most noticeable at idle. Before replacing a belt to resolve a noise condition, inspect all of the accessory drive pulleys for alignment, glazing, or excessive end play.

## ACCESSORY DRIVE BELT DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
RIB CHUNKING (One or more ribs has separated from belt body)	<ol style="list-style-type: none"> <li>1. Foreign objects imbedded in pulley grooves.</li> <li>2. Installation damage</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove foreign objects from pulley grooves. Replace belt.</li> <li>2. Replace belt</li> </ol>
RIB OR BELT WEAR	<ol style="list-style-type: none"> <li>1. Pulley misaligned</li> <li>2. Abrasive environment</li> <li>3. Rusted pulley(s)</li> <li>4. Sharp or jagged pulley groove tips</li> <li>5. Belt rubber deteriorated</li> </ol>	<ol style="list-style-type: none"> <li>1. Align pulley(s)</li> <li>2. Clean pulley(s). Replace belt if necessary</li> <li>3. Clean rust from pulley(s)</li> <li>4. Replace pulley. Inspect belt.</li> <li>5. Replace belt</li> </ol>
BELT SLIPS	<ol style="list-style-type: none"> <li>1. Belt slipping because of insufficient tension</li> <li>2. Belt or pulley exposed to substance that has reduced friction (belt dressing, oil, ethylene glycol)</li> <li>3. Driven component bearing failure (seizure)</li> <li>4. Belt glazed or hardened from heat and excessive slippage</li> </ol>	<ol style="list-style-type: none"> <li>1. Inspect/Replace tensioner if necessary</li> <li>2. Replace belt and clean pulleys</li> <li>3. Replace faulty component or bearing</li> <li>4. Replace belt.</li> </ol>
LONGITUDINAL BELT CRACKING	<ol style="list-style-type: none"> <li>1. Belt has mistracked from pulley groove</li> <li>2. Pulley groove tip has worn away rubber to tensile member</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace belt</li> <li>2. Replace belt</li> </ol>
"GROOVE JUMPING" (Belt does not maintain correct position on pulley)	<ol style="list-style-type: none"> <li>1. Incorrect belt tension</li> <li>2. Pulley(s) not within design tolerance</li> <li>3. Foreign object(s) in grooves</li> <li>4. Pulley misalignment</li> <li>5. Belt cordline is broken</li> </ol>	<ol style="list-style-type: none"> <li>1. Inspect/Replace tensioner if necessary</li> <li>2. Replace pulley(s)</li> <li>3. Remove foreign objects from grooves</li> <li>4. Align component</li> <li>5. Replace belt</li> </ol>
BELT BROKEN (Note: Identify and correct problem before new belt is installed)	<ol style="list-style-type: none"> <li>1. Incorrect belt tension</li> <li>2. Tensile member damaged during belt installation</li> <li>3. Severe misalignment</li> <li>4. Bracket, pulley, or bearing failure</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace Inspect/Replace tensioner if necessary</li> <li>2. Replace belt</li> <li>3. Align pulley(s)</li> <li>4. Replace defective component and belt</li> </ol>

CONDITION	POSSIBLE CAUSES	CORRECTION
<b>NOISE</b> (Objectionable squeal, squeak, or rumble is heard or felt while drive belt is in operation)	1. Incorrect belt tension 2. Bearing noise 3. Belt misalignment 4. Belt to pulley mismatch 5. Driven component induced vibration 6. Belt flat surface coming apart	1. Inspect/Replace tensioner if necessary 2. Locate and repair 3. Align belt/pulley(s) 4. Install correct belt 5. Locate defective driven component and repair 6. Replace belt
<b>TENSION SHEETING FABRIC FAILURE</b> (Woven fabric on outside, circumference of belt has cracked or separated from body of belt)	1. Tension sheeting contacting stationary object 2. Excessive heat causing woven fabric to age 3. Tension sheeting splice has fractured	1. Correct rubbing condition 2. Replace belt 3. Replace belt
<b>CORD EDGE FAILURE</b> (Tensile member exposed at edges of belt or separated from belt body)	1. Incorrect belt tension 2. Belt contacting stationary object 3. Pulley(s) out of tolerance 4. Insufficient adhesion between tensile member and rubber matrix	1. Inspect/Replace tensioner if necessary 2. Replace belt 3. Replace pulley 4. Replace belt

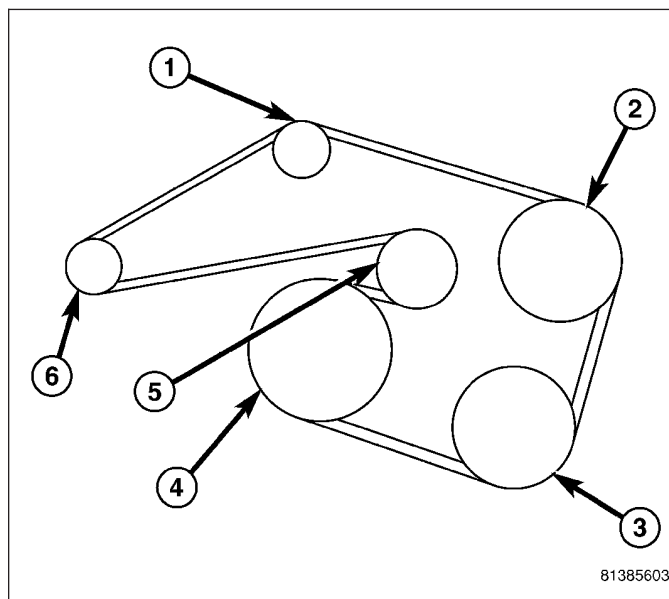
## REMOVAL

### 2.7L ENGINE

**CAUTION: DO NOT LET TENSIONER ARM SNAP BACK TO THE FREEARM POSITION, SEVER DAMAGE MAY OCCUR TO THE TENSIONER.**

Belt tension is not adjustable. Belt adjustment is maintained by an automatic ( spring load ) belt tensioner.

1. Disconnect negative battery cable from battery.
2. Rotate belt tensioner (5) counterclockwise until it contacts it's stop. Remove belt, then slowly rotate the tensioner into the freearm position.

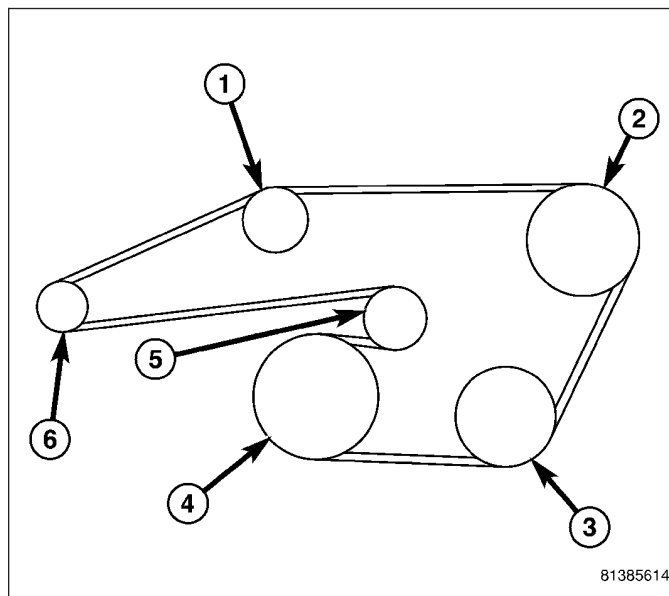


### 3.5L ENGINE

**CAUTION: DO NOT LET TENSIONER ARM SNAP BACK TO THE FREEARM POSITION, SEVER DAM-AGE MAY OCCUR TO THE TENSIONER.**

Belt tension is not adjustable. Belt adjustment is main-  
tained by an automatic ( spring load ) belt tensioner.

1. Disconnect negative battery cable from battery.
2. Rotate belt tensioner (5) counterclockwise until it  
contacts it's stop. Remove belt, then slowly rotate  
the tensioner into the freearm position.

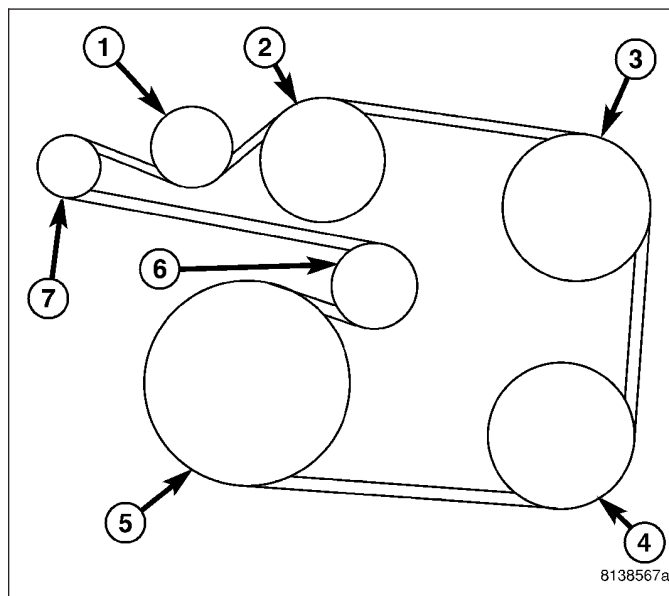


### 5.7L ENGINE

**CAUTION: DO NOT LET TENSIONER ARM SNAP BACK TO THE FREEARM POSITION, SEVER DAM-AGE MAY OCCUR TO THE TENSIONER.**

Belt tension is not adjustable. Belt adjustment is main-  
tained by an automatic ( spring load ) belt tensioner.

1. Disconnect negative battery cable from battery.
2. Rotate belt tensioner (6) counterclockwise until it  
contacts it's stop. Remove belt, then slowly rotate  
the tensioner into the freearm position.





## INSTALLATION

### 2.7L ENGINE

Belt tension is not adjustable. Belt adjustment is maintained by an automatic ( spring load ) belt tensioner.

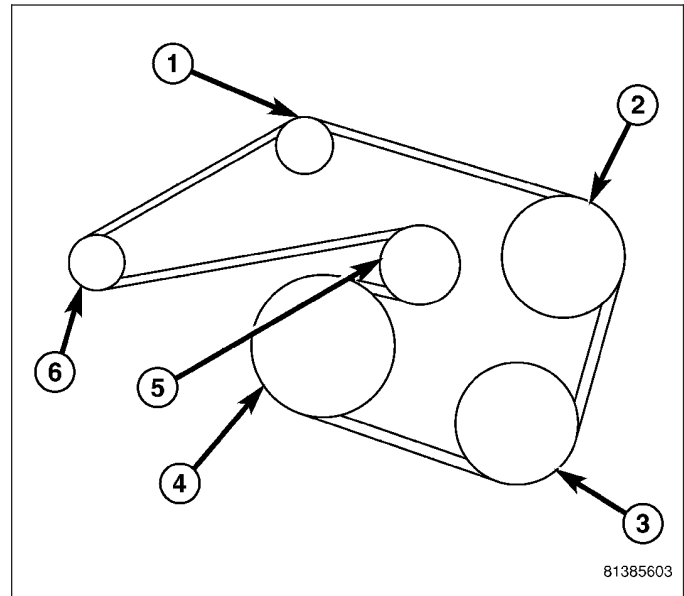
1. Check condition of all pulleys.

**CAUTION:** When installing the serpentine accessory drive belt, the belt **MUST** be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction.

2. Install new belt. Route the belt around all pulleys except the idler pulley. Rotate the tensioner arm until it contacts its stop position. Route the belt around the idler and slowly let the tensioner rotate into the belt. Make sure the belt is seated onto all pulleys.

**ON all engines, the tensioner (5) is equipped with an indexing tang on back of tensioner and an indexing stop on tensioner housing. If a new belt is being installed, tang must be within approximately 6 - 8mm (0.24 - 0.32 in.) of indexing stop (i.e. tang is approximately between the two indexing stops). Belt is considered new if it has been used 15 minutes or less.**

3. With the drive belt installed, inspect the belt wear indicator.



### 3.5L ENGINE

Belt tension is not adjustable. Belt adjustment is maintained by an automatic ( spring load ) belt tensioner.

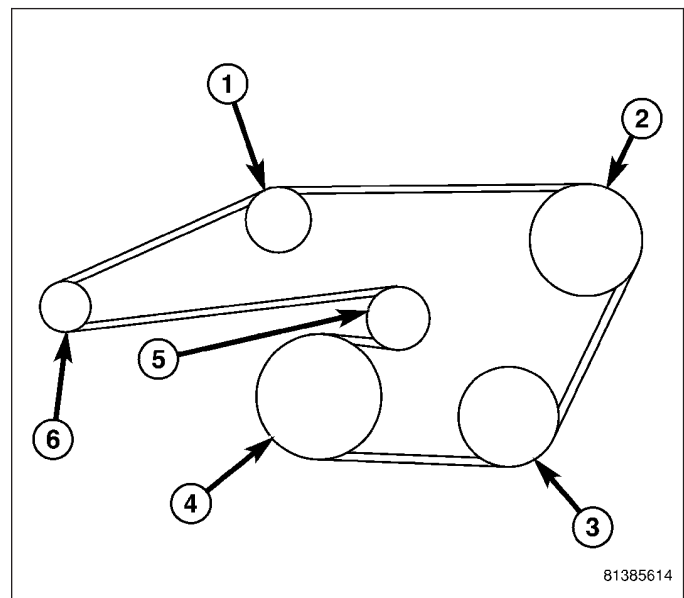
1. Check condition of all pulleys.

**CAUTION:** When installing the serpentine accessory drive belt, the belt **MUST** be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction.

2. Install new belt. Route the belt around all pulleys except the idler pulley. Rotate the tensioner arm until it contacts its stop position. Route the belt around the idler and slowly let the tensioner rotate into the belt. Make sure the belt is seated onto all pulleys.

**ON all engines, the tensioner (5) is equipped with an indexing tang on back of tensioner and an indexing stop on tensioner housing. If a new belt is being installed, tang must be within approximately 6 - 8mm (0.24 - 0.32 in.) of indexing stop (i.e. tang is approximately between the two indexing stops). Belt is considered new if it has been used 15 minutes or less.**

3. With the drive belt installed, inspect the belt wear indicator.





## 5.7L ENGINE

Belt tension is not adjustable. Belt adjustment is maintained by an automatic ( spring load ) belt tensioner.

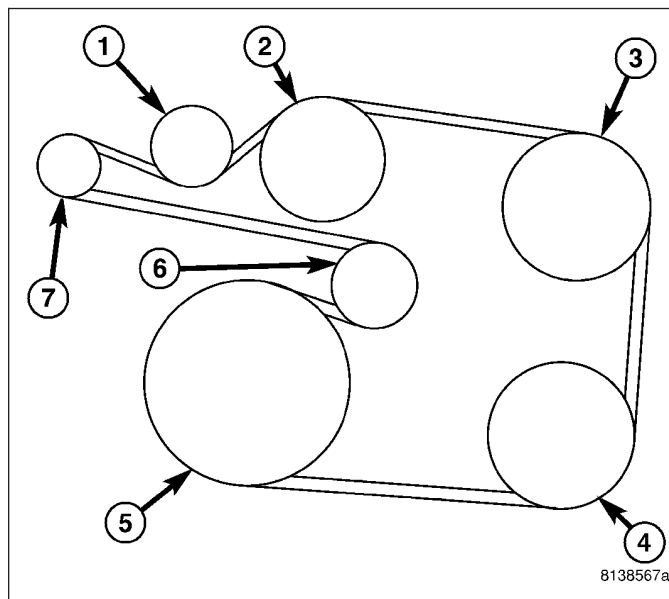
1. Check condition of all pulleys.

**CAUTION:** When installing the serpentine accessory drive belt, the belt **MUST** be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction.

2. Install new belt. Route the belt around all pulleys except the idler pulley. Rotate the tensioner arm until it contacts its stop position. Route the belt around the idler and slowly let the tensioner rotate into the belt. Make sure the belt is seated onto all pulleys.

**ON all engines, the tensioner (6) is equipped with an indexing tang on back of tensioner and an indexing stop on tensioner housing. If a new belt is being installed, tang must be within approximately 6 - 8mm (0.24 - 0.32 in.) of indexing stop (i.e. tang is approximately between the two indexing stops). Belt is considered new if it has been used 15 minutes or less.**

3. With the drive belt installed, inspect the belt wear indicator.

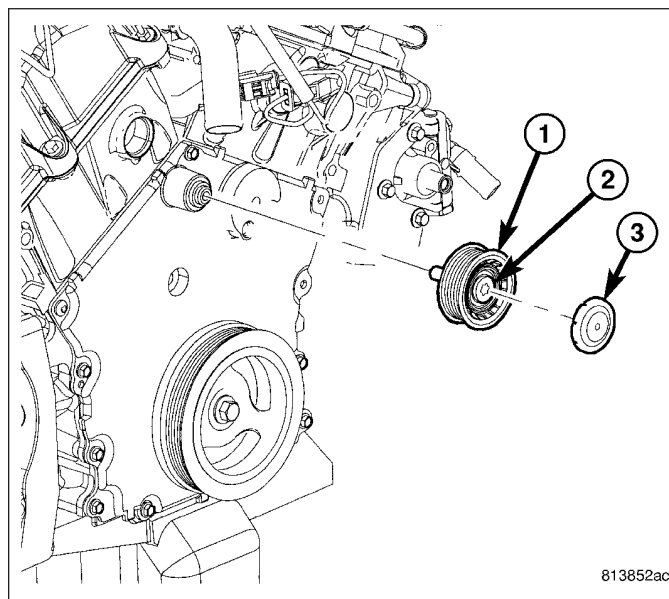


## IDLER PULLEY

### REMOVAL

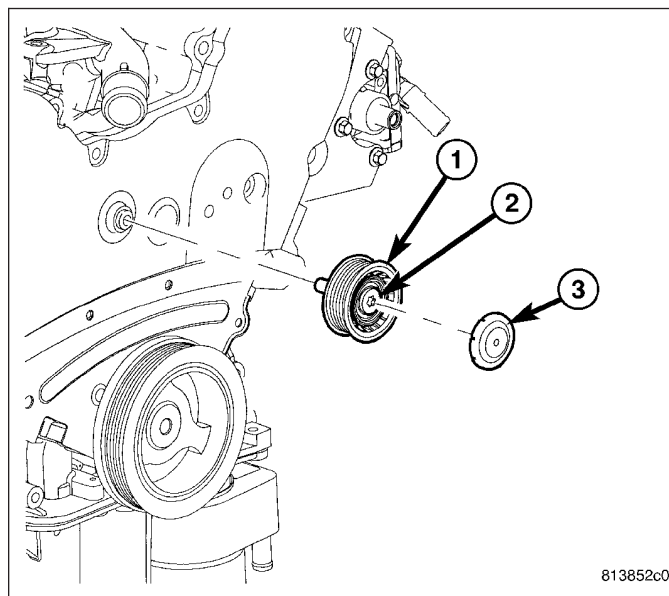
#### 2.7L ENGINE

1. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
2. Remove cover (3).
3. Remove bolt (2) and idler pulley (1).



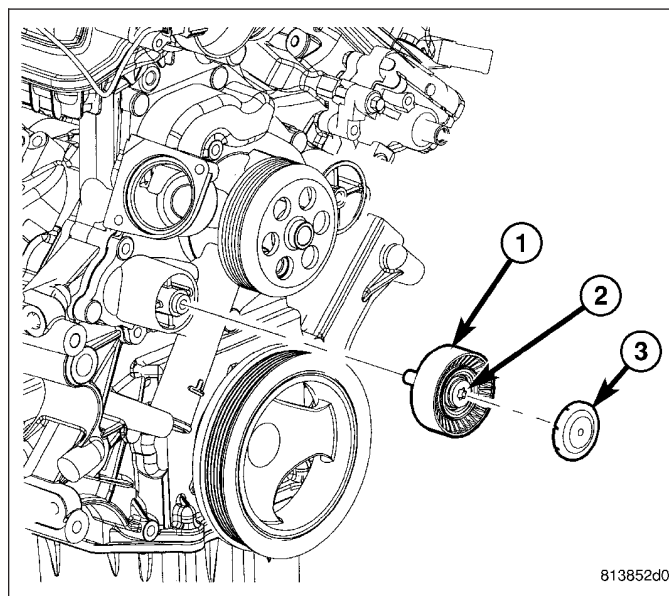
### 3.5L ENGINE

1. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
2. Remove cover (3).
3. Remove bolt (2) and idler pulley (1).



### 5.7L ENGINE

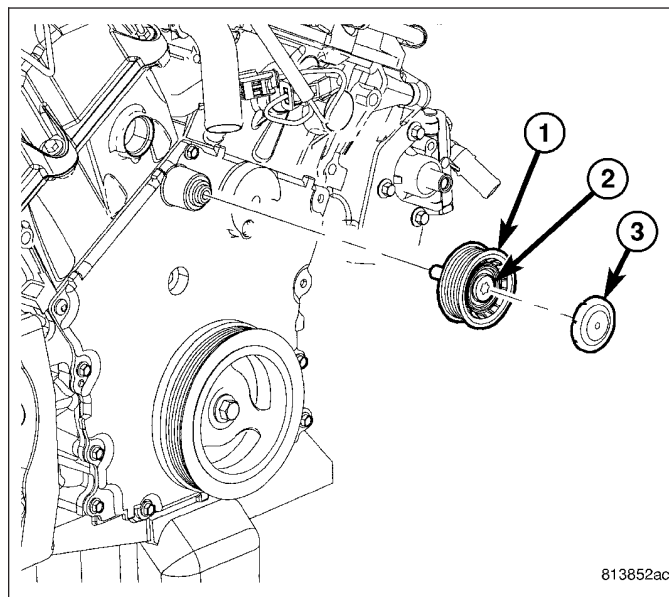
1. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/BELT TENSIONERS - REMOVAL).
2. Remove cover (3).
3. Remove bolt (2) and idler pulley (1).



## INSTALLATION

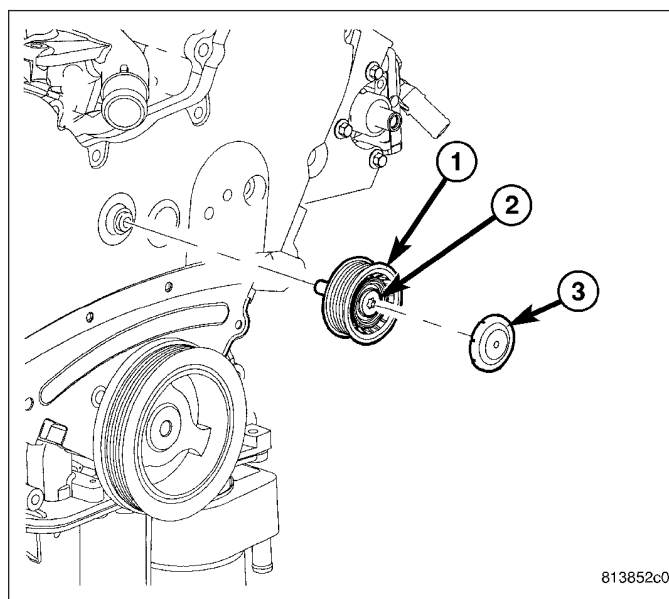
### 2.7L ENGINE

1. Position idler pulley (1).
2. Tighten bolt (2) to 28 N·m (250 in. lbs.).
3. Install cover (3).
4. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION)



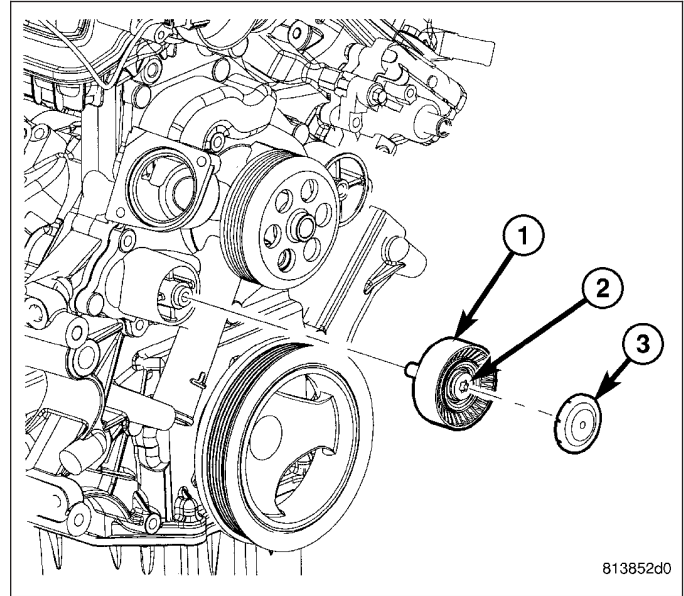
### 3.5L ENGINE

1. Position idler pulley (1).
2. Tighten bolt to (2) 28 N·m (250 in. lbs.).
3. Install cover (3).
4. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).



## 5.7L ENGINE

1. Position idler pulley (1).
2. Tighten bolt (2) to 54 N·m (40 ft. lbs.).
3. Install cover (3).
4. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).



## ENGINE

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## COOLANT

### DESCRIPTION

#### ENGINE COOLANT

##### ETHYLENE-GLYCOL MIXTURES

**CAUTION:** Richer antifreeze mixtures cannot be measured with normal field equipment and can cause problems associated with 100 percent ethylene-glycol.

The use of aluminum cylinder blocks, cylinder heads and water pumps requires special corrosion protection. Only Mopar® Antifreeze/Coolant, 5 year/100,000 Mile Formula (ethylene-glycol base coolant with corrosion inhibitors called HOAT, for Hybrid Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% distilled water to obtain a freeze point of -37°C (-35°F).

The required ethylene-glycol (antifreeze) and water mixture depends upon the climate and vehicle operating conditions. The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. **If percentage is lower than 44 percent, engine parts may be eroded by cavitation, and cooling system components may be severely damaged by corrosion.** Maximum protection against freezing is provided with a 68% antifreeze concentration, which prevents freezing down to -67.7° C (-90° F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because the specific heat of antifreeze is lower than that of water.

Use of 100 percent ethylene-glycol will cause formation of additive deposits in the system, as the corrosion inhibitive additives in ethylene-glycol require the presence of water to dissolve. The deposits act as insulation, causing temperatures to rise to as high as 149° C (300° F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at 22° C (-8° F ).

##### PROPYLENE-GLYCOL MIXTURES

It's overall effective temperature range is smaller than that of ethylene-glycol. The freeze point of 50/50 propylene-glycol and water is -32° C (-26° F). 5° C higher than ethylene-glycol's freeze point. The boiling point (protection against summer boil-over) of propylene-glycol is 125° C (257° F ) at 96.5 kPa (14 psi), compared to 128° C (263° F) for ethylene-glycol. Use of propylene-glycol can result in boil-over or freeze-up on a cooling system designed for ethylene-glycol. Propylene glycol also has poorer heat transfer characteristics than ethylene glycol. This can increase cylinder head temperatures under certain conditions.

Propylene-glycol/ethylene-glycol Mixtures can cause the destabilization of various corrosion inhibitors, causing damage to the various cooling system components. Also, once ethylene-glycol and propylene-glycol based coolants are mixed in the vehicle, conventional methods of determining freeze point will not be accurate. Both the refractive index and specific gravity differ between ethylene glycol and propylene glycol.

#### HOAT COOLANT

**WARNING: ANTIFREEZE IS AN ETHYLENE-GLYCOL BASE COOLANT AND IS HARMFUL IF SWALLOWED OR INHALED. IF SWALLOWED, DRINK TWO GLASSES OF WATER AND INDUCE VOMITING. IF INHALED, MOVE TO FRESH AIR AREA. SEEK MEDICAL ATTENTION IMMEDIATELY. DO NOT STORE IN OPEN OR UNMARKED CONTAINERS. WASH SKIN AND CLOTHING THOROUGHLY AFTER COMING IN CONTACT WITH ETHYLENE-GLYCOL. KEEP OUT OF REACH OF CHILDREN. DISPOSE OF GLYCOL BASE COOLANT PROPERLY, CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA. DO NOT OPEN A COOLING SYSTEM WHEN THE ENGINE IS AT OPERATING TEMPERATURE OR HOT UNDER PRESSURE, PERSONAL INJURY CAN RESULT. AVOID RADIATOR COOLING FAN WHEN ENGINE COMPARTMENT RELATED SERVICE IS PERFORMED, PERSONAL INJURY CAN RESULT.**

**CAUTION:** Use of Propylene-Glycol based coolants is not recommended, as they provide less freeze protection and less corrosion protection.

The cooling system is designed around the coolant. The coolant must accept heat from engine metal, in the cylinder head area near the exhaust valves and engine block. Then coolant carries the heat to the radiator where the tube/fin radiator can transfer the heat to the air.

The use of aluminum cylinder blocks, cylinder heads, and water pumps requires special corrosion protection. Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769), or the equivalent ethylene-glycol base coolant with organic corrosion inhibitors (called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% ethylene-glycol and 50% distilled water to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

**CAUTION: Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769) may not be mixed with any other type of antifreeze. Mixing of coolants other than specified (non-HOAT or other HOAT), may result in engine damage that may not be covered under the new vehicle warranty, and decreased corrosion protection.**

## COOLANT PERFORMANCE

The required ethylene-glycol (antifreeze) and water mixture depends upon climate and vehicle operating conditions. The coolant performance of various mixtures follows:

**Pure Water**-Water can absorb more heat than a mixture of water and ethylene-glycol. This is for purpose of heat transfer only. Water also freezes at a higher temperature and allows corrosion.

**100 percent Ethylene-Glycol**-The corrosion inhibiting additives in ethylene-glycol need the presence of water to dissolve. Without water, additives form deposits in system. These act as insulation causing temperature to rise to as high as 149°C (300°F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at -22°C (-8°F).

**50/50 Ethylene-Glycol and Water**-Is the recommended mixture, it provides protection against freezing to -37°C (-34°F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. If percentage is lower, engine parts may be eroded by cavitation. Maximum protection against freezing is provided with a 68 percent antifreeze concentration, which prevents freezing down to -67.7°C (-90°F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because specific heat of antifreeze is lower than that of water.

**CAUTION: Richer antifreeze mixtures cannot be measured with normal field equipment and can cause problems associated with 100 percent ethylene-glycol.**

## COOLANT SELECTION AND ADDITIVES

The use of aluminum cylinder blocks, cylinder heads and water pumps requires special corrosion protection. Only Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (glycol base coolant with corrosion inhibitors called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% distilled water to obtain to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

**CAUTION: Do not use coolant additives that are claimed to improve engine cooling.**

## OPERATION

Coolant flows through the engine block absorbing the heat from the engine, then flows to the radiator where the cooling fins in the radiator transfers the heat from the coolant to the atmosphere. During cold weather the ethylene-glycol or propylene-glycol coolant prevents water present in the cooling system from freezing within temperatures indicated by mixture ratio of coolant to water.



## DIAGNOSIS AND TESTING

### COOLANT CONCENTRATION TESTING

Coolant concentration should be checked when any additional coolant was added to system or after a coolant drain, flush and refill. The coolant mixture offers optimum engine cooling and protection against corrosion when mixed to a freeze point of  $-37^{\circ}\text{C}$  ( $-34^{\circ}\text{F}$ ) to  $-46^{\circ}\text{C}$  ( $-50^{\circ}\text{F}$ ). The use of a hydrometer or a refractometer can be used to test coolant concentration.

A hydrometer will test the amount of glycol in a mixture by measuring the specific gravity of the mixture. The higher the concentration of ethylene glycol, the larger the number of balls that will float, and higher the freeze protection (up to a maximum of 60% by volume glycol).

A refractometer Tool 8286 (Refer to 7 - COOLING - SPECIAL TOOLS) will test the amount of glycol in a coolant mixture by measuring the amount a beam of light bends as it passes through the fluid.

Some coolant manufactures use other types of glycols into their coolant formulations. Propylene glycol is the most common new coolant. However, propylene glycol based coolants do not provide the same freezing protection and corrosion protection and is not recommended.

**CAUTION: Do not mix types of coolant - corrosion protection will be severely reduced.**

### STANDARD PROCEDURE - COOLANT SERVICE

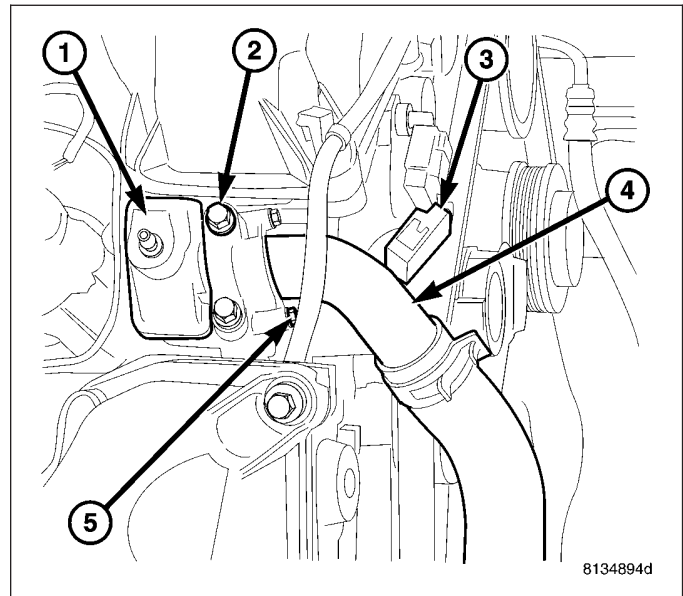
For engine coolant recommended service schedule, (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION).

## HOUSING-COOLANT OUTLET - 2.7L

### REMOVAL

**WARNING: DO NOT REMOVE PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.**

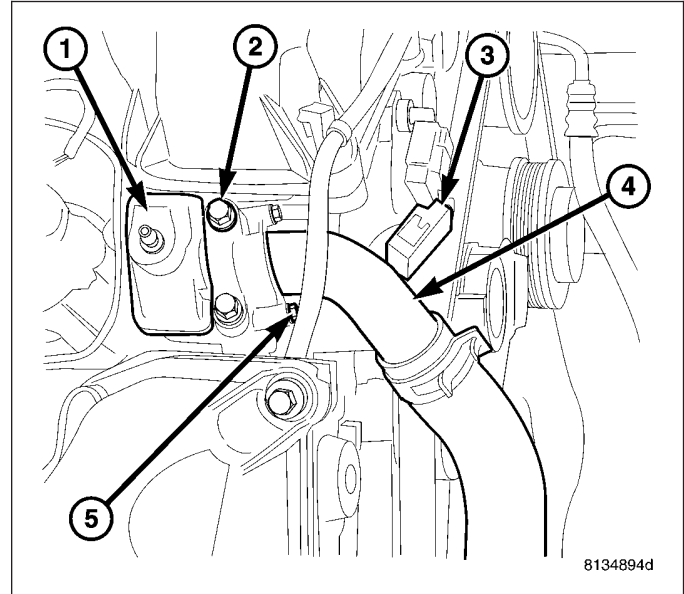
1. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Disconnect engine coolant temperature sensor electrical connector (3).
3. Remove screws (5) attaching heater tube (4) to outlet connector (1).
4. Disengage tube (4) from outlet connector (1) only enough for connector removal.
5. Remove bolts (2) attaching water outlet connector (1).
6. Remove outlet connector (1).





## INSTALLATION

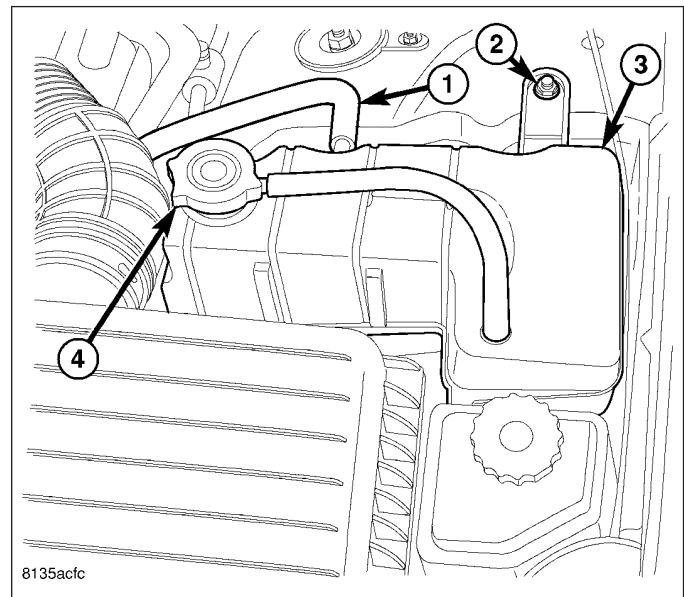
1. Clean sealing surfaces. Inspect gaskets for tears and cuts. Inspect O-ring on heater tube. Replace as necessary.
2. Install outlet connector (1) and mounting bolts (2). Tighten bolts to 12 N·m (105 in. lbs.).
3. Install heater tube (4) to outlet connector (1). Tighten bolts to 3.3 N·m (30 in. lbs.).
4. Connect engine coolant temperature sensor electrical connector (3).
5. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).



## COOLANT RECOVERY CONTAINER

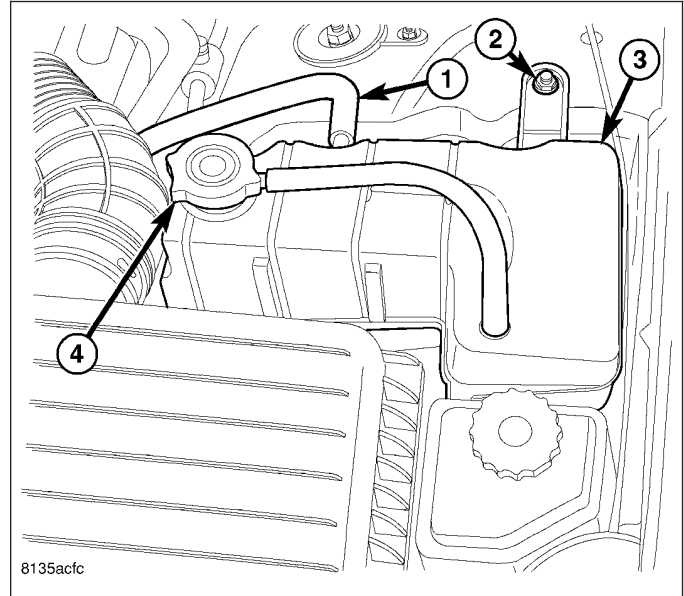
### REMOVAL

1. Remove coolant recovery container pressure cap (3).
2. Remove and plug coolant recovery tube (1).
3. Remove mounting nuts (2).
4. Remove coolant recovery container (3) from vehicle.



## INSTALLATION

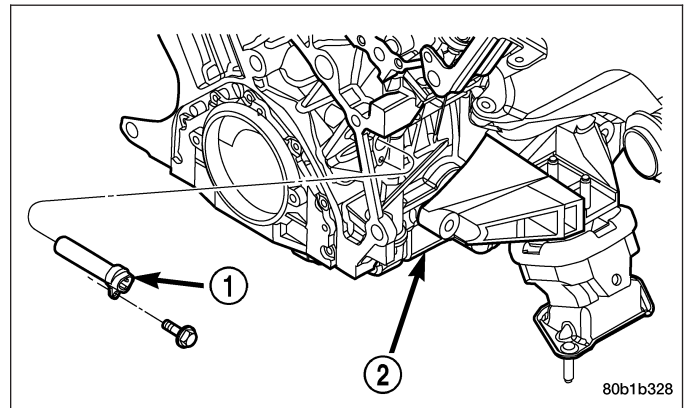
1. Position coolant recovery container (3).
2. Install mounting nuts (2). Tighten to 10 N·m (89 in. lbs.).
3. Install coolant recovery tube (1).
4. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
5. Install coolant recovery container pressure cap (4).



## ENGINE BLOCK HEATER

### DESCRIPTION

The engine block heater(1) is mounted in the cylinder block (2), near the right rear corner. The block heater is a dry cylinder type design and is powered by 110 volt AC. **The power cord must be secured in its retainer clips, and not positioned so it could contact linkages or exhaust manifolds and become damaged.**



### OPERATION

When power is applied (110 volt AC) to the block heater, the heating element transfers heat through the aluminum engine block and into the coolant without directly penetrating the cooling system.

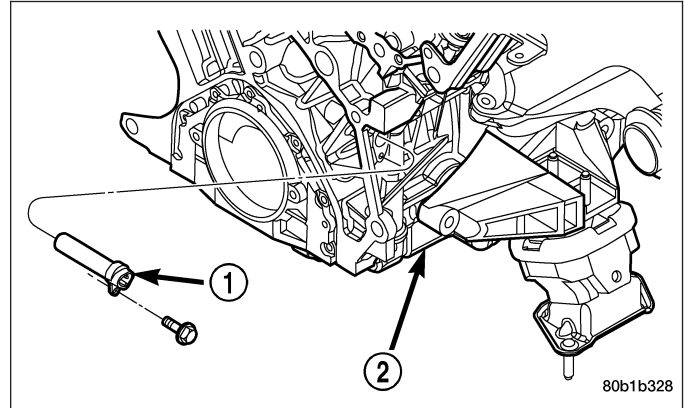
### DIAGNOSIS AND TESTING

#### ENGINE BLOCK HEATER

If unit does not operate, trouble can be in either the power cord or the heater element. Test power cord for continuity with a 110-volt voltmeter or 110-volt test light; test heater element continuity with an ohmmeter or 12-volt test light.

## REMOVAL

1. Raise vehicle on hoist.
2. Detach power cord plug from block heater (1).
3. Remove block heater attaching screw located below heater terminals.
4. Remove block heater from cylinder block (2).

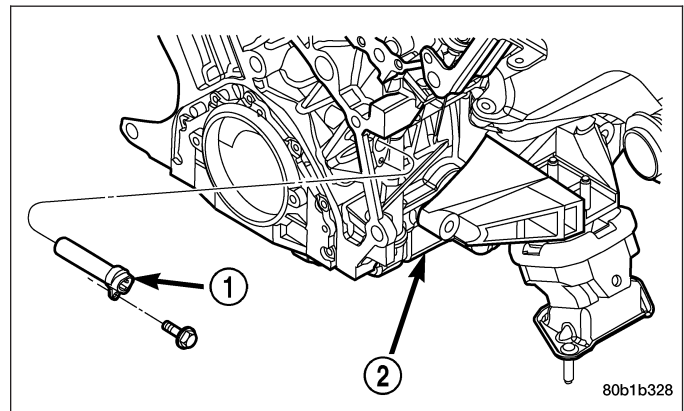


## INSTALLATION

1. Thoroughly clean cylinder block heater cavity.
2. Insert heater assembly (1) into block (2) with mounting hole is located below heater terminals.
3. Install mounting screw and tighten to 12 N·m (105 in. lbs.).
4. Attach power cord to heater.

**CAUTION:** To prevent damage, the power cord must be secured in its retainer clips, and not positioned so it could contact linkages or exhaust manifolds.

5. Lower vehicle.



## ENGINE COOLANT TEMP SENSOR

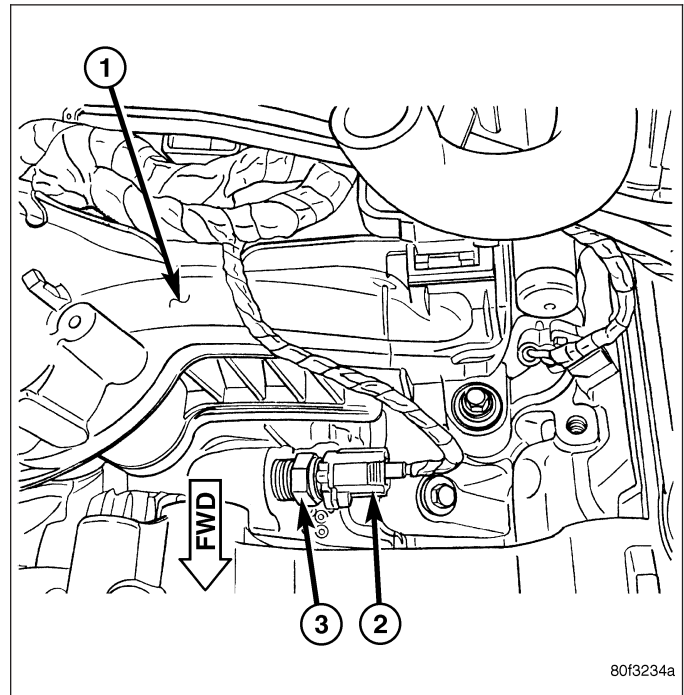
### REMOVAL

#### 5.7L V-8

The Engine Coolant Temperature (ECT) sensor (3) on the 5.7L engine is located under the air conditioning compressor. It is installed into a water jacket at the front of the cylinder block.

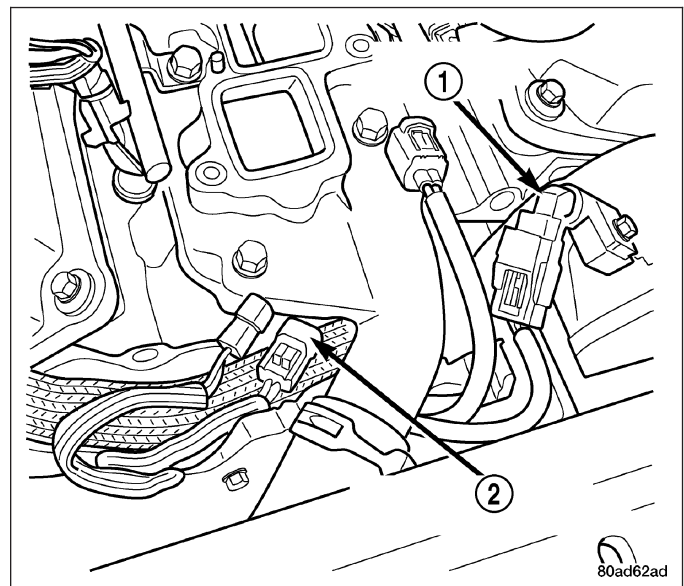
**WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING. COOLING SYSTEM MUST BE PARTIALLY DRAINED BEFORE REMOVING THE COOLANT TEMPERATURE SENSOR.**

1. Partially drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
3. Carefully unbolt air conditioning compressor from front of engine. Do not disconnect any A/C hoses from compressor. Temporarily support compressor to gain access to ECT sensor (3).
4. Disconnect electrical connector (2) from sensor (3).
5. Remove sensor (3) from cylinder block.



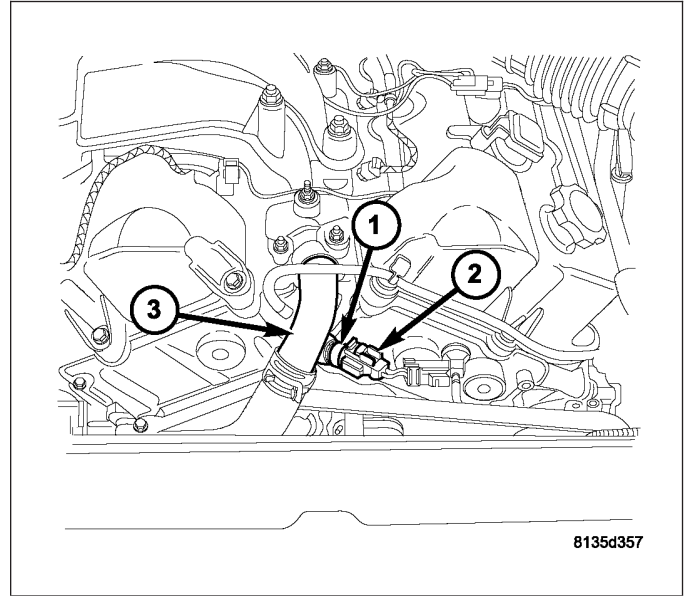
#### 3.5L V6

1. Disconnect negative battery cable.
2. Partially drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. With the engine cold, disconnect coolant sensor electrical connector.
4. Remove sensor (2).



## 2.7L V6

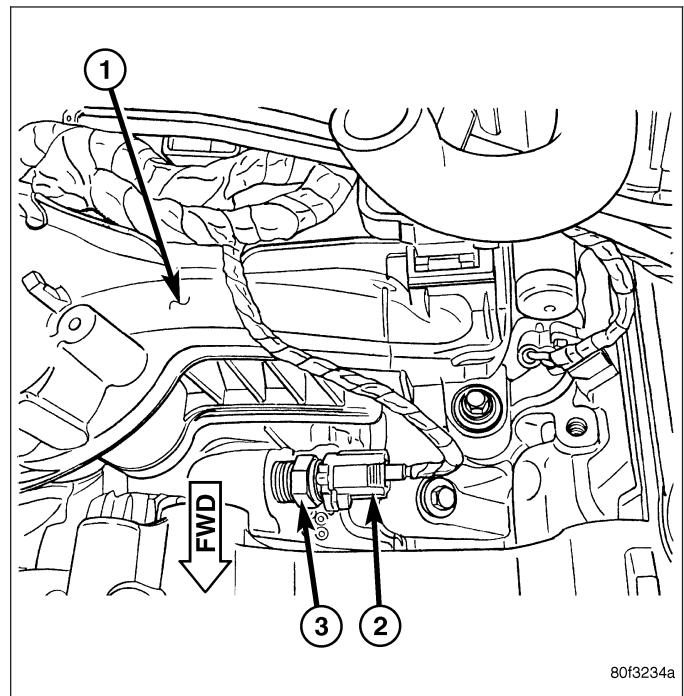
1. Disconnect negative batter cable.
2. Partially drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Disconnect the electrical connector (2).
4. Remove engine coolant sensor (1) from coolant outlet tube (3).



## INSTALLATION

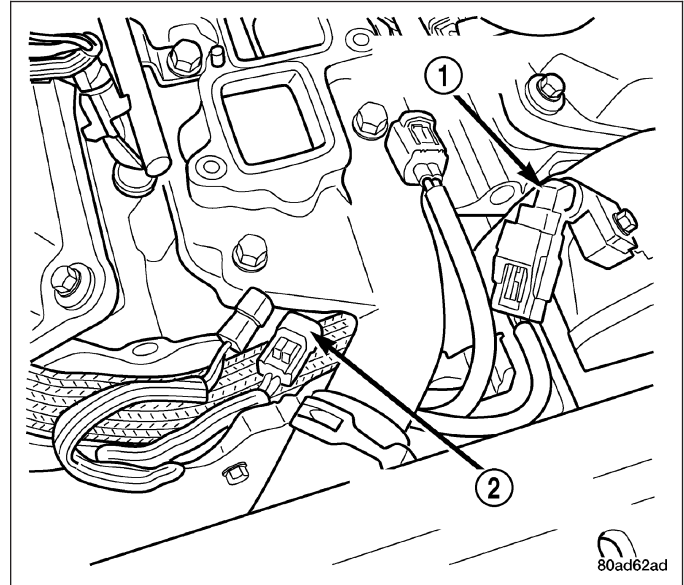
### 5.7L V-8

1. Apply thread sealant to sensor threads.
2. Install ECT sensor (3) to engine.
3. Tighten sensor to 11 N·m (97.3 in. lbs.) torque.
4. Connect electrical connector (2) to ECT sensor (3).
5. Fill the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).



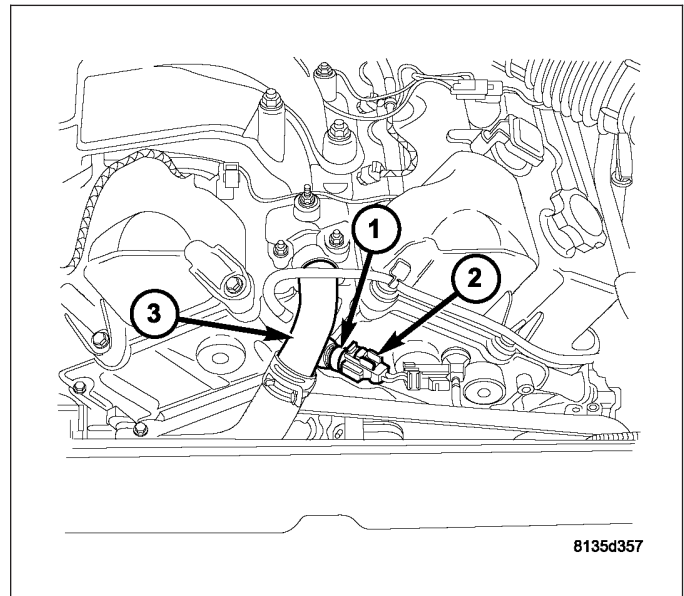
### 3.5L V6

1. Install engine coolant temperature sensor (2).  
Tighten sensor to 28 N·m (20 ft. lbs.) torque.
2. Attach electrical connector to sensor.
3. Connect negative battery cable.



### 2.7L V6

1. Apply thread sealant to sensor threads.
2. Install engine coolant temperature sensor (1) into coolant outlet tube (3).
3. Tighten sensor to 28 N·m (20 ft. lbs.) torque.
4. Connect electrical connector (2) to engine coolant temperature sensor (1).



## ENGINE COOLANT THERMOSTAT

### DESCRIPTION

The engine cooling thermostats are a wax pellet driven, reverse poppet choke type. The thermostats have an air bleed located in the thermostat flange. The air bleed allows internal trapped air during cooling system filling to be released. The thermostat on the 2.7L and 3.5L engines are located on the lower left side of engine, near the front. The thermostat on both engines are on the inlet side of the water pump.

The thermostat on the 5.7L gas powered engine is located beneath the thermostat housing (1) at the front of the intake manifold.

### OPERATION

The engine cooling thermostat is a wax pellet driven, reverse poppet choke type. The thermostat is designed to provide the fastest warm up possible by preventing leakage through it and to guarantee a minimum engine oper-

ating temperature of 88 to 93°C (192 to 199°F). The thermostat also will automatically reach wide open so it will not restrict flow to the radiator as temperature of the coolant rises in hot weather to around 104°C (220°F). Above this temperature the coolant temperature is controlled by the radiator, fan, and ambient temperature, not the thermostat.

The thermostat is operated by a wax filled container (pellet) which is sealed. When heated coolant reaches a pre-determined temperature, the wax expands enough to overcome the closing spring and water pump pressure, which forces the valve to open.

## DIAGNOSIS AND TESTING

### ENGINE COOLANT THERMOSTAT

The thermostat is operated by a wax filled chamber (pellet) which is sealed. When heated coolant reaches a pre-determined temperature the wax pellet expands enough to overcome the closing spring and water pump pressure, which forces the valve to open. Coolant leakage into the pellet will cause a thermostat to fail open. Do not attempt to free up a thermostat with a screwdriver.

Thermostat diagnostics is included in powertrain control module's (PCM) programing for on-board diagnosis. The malfunction indicator light (MIL) will illuminate and a diagnostic trouble code (DTC) will be set when an "open too soon" condition occurs. Do not change a thermostat for lack of heater performance or temperature gauge position, unless a DTC is present. For other probable causes, (Refer to 7 - COOLING - DIAGNOSIS AND TESTING). Thermostat failing shut is the normal long term mode of failure, and normally, only on high mileage vehicles. The temperature gauge will indicate this (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).

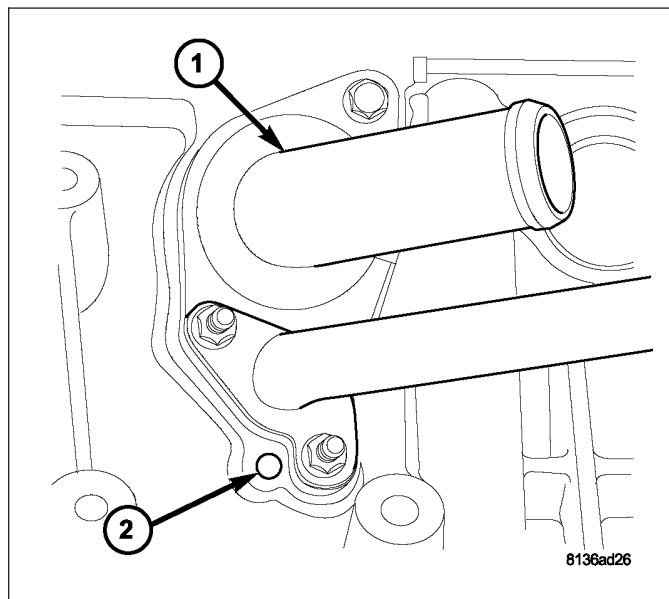
## REMOVAL

### 2.7L ENGINE

1. Disconnect negative cable.

**WARNING: DO NOT REMOVE PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.**

2. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Remove radiator lower hose from thermostat housing (1).
4. Remove nuts
5. Loosen starter bolt at heater tube bracket.
6. Pull heater tube out of thermostat housing and position out of the way.
7. Remove bolt and two studs.





8. Remove thermostat housing (1), O-ring (2) and thermostat (5).
9. Remove thermostat housing bolts (4) and spacer (3).

## REMOVAL

1. Disconnect negative cable.

**WARNING: DO NOT REMOVE PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.**

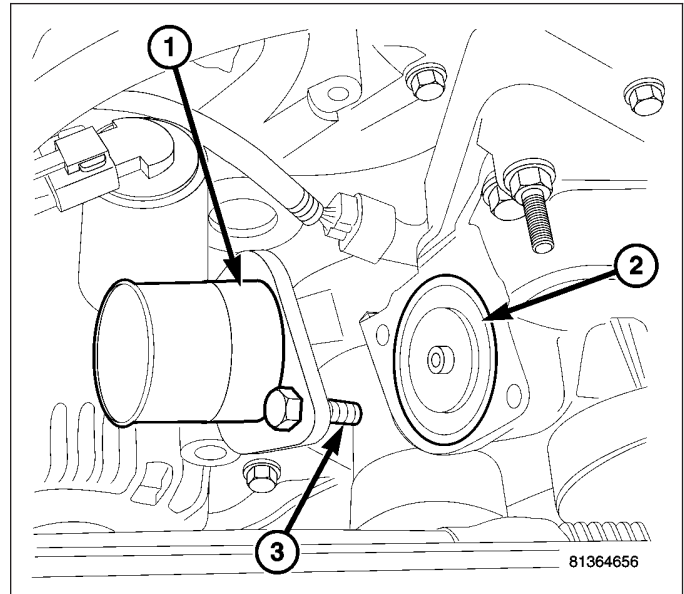
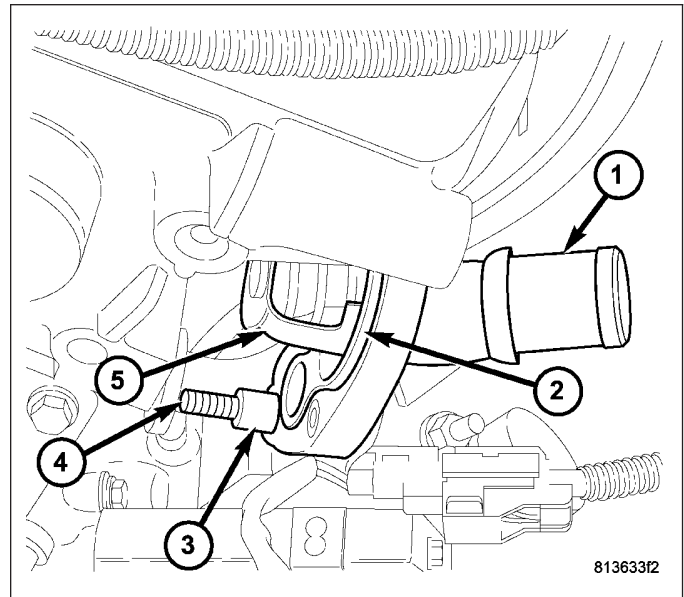
2. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Remove radiator lower hose from thermostat housing (1).
4. Remove bypass hose.
5. Remove bolts.
6. Remove thermostat housing and thermostat..

## 5.7L ENGINE

1. Disconnect negative battery cable at battery.
2. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Remove radiator hose at thermostat housing (1).

**Note: THERMOSTAT O-RING IS PART OF THERMOSTAT (2) AND IS NOT SERVICED SEPERATLY.**

4. Remove thermostat housing mounting bolts (3), thermostat housing (1) and thermostat (2).



## INSTALLATION

### 2.7L ENGINE

1. Clean gasket sealing surfaces.

**Note: Install thermostat with the bleed valve located at the 12 o'clock position.**

2. Install thermostat and gasket into thermostat housing.
3. If removed, install two studs.
4. Install thermostat, thermostat housing (5) and gasket and bolt. Tighten attaching bolts to 12 N·m (105 in. lbs.).
5. Lubricate heater return tube O-ring with coolant.
6. Position heater return tube over two studs. Install nuts. Tighten attaching bolts to 12 N·m (105 in. lbs.).
7. Tighten starter bolt to 54.3 N·m (40 ft. lbs.).



8. Connect the lower radiator hoses to the thermostat housing. Install hose clamps.
9. Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
10. Connect negative cable.

## INSTALLATION

1. Position thermostat and gasket on block.
2. Install thermostat housing and mounting bolts. Tighten attaching bolts to 12 N·m (105 in. lbs.).
3. Install radiator hose.
4. Install bypass hose.
5. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

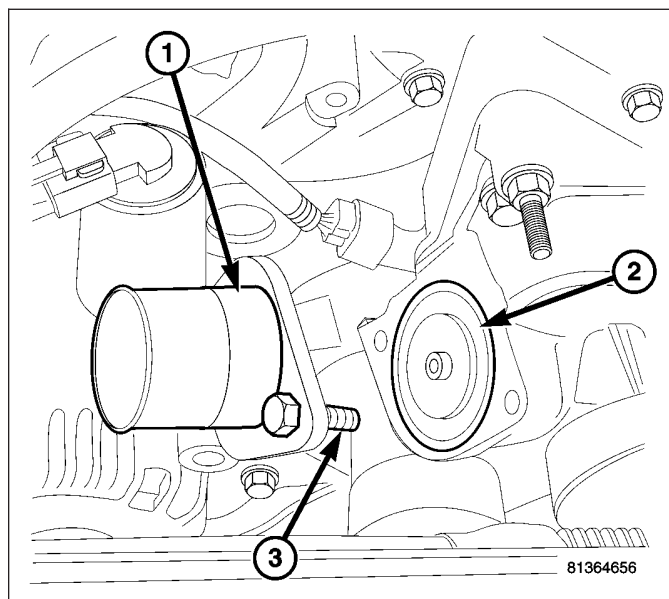
### 5.7L ENGINE

1. Clean mating areas of timing chain cover and thermostat housing (1).

**Note: Install thermostat with the bleed valve located at the 12 o'clock position.**

2. Install thermostat (2) (spring side down) into recessed machined groove on timing chain cover with bleed valve located at the 12 o'clock position.
3. Position thermostat housing (1) on timing chain cover.
4. Install two housing-to-timing chain cover bolts (3). Tighten bolts to 13 N·m (112 in. lbs.) torque.

**CAUTION: Thermostat housing must be tightened evenly and thermostat (2) must be centered into recessed groove in timing chain cover. If not, it may result in a cracked thermostat housing (1), damaged timing chain cover threads or coolant leaks.**



5. Install lower radiator hose on thermostat housing.
6. Lower vehicle.
7. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
8. Connect negative battery cable to battery.
9. Start and warm the engine. Check for leaks.

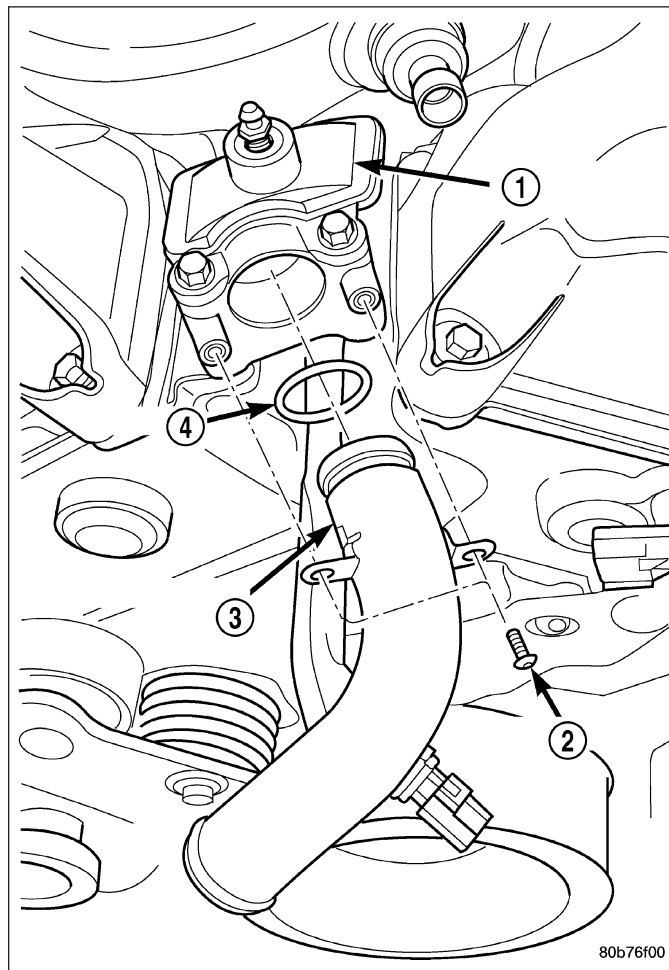
## HEATER SUPPLY TUBE

### REMOVAL

#### 2.7L ENGINE

**WARNING: DO NOT REMOVE PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.**

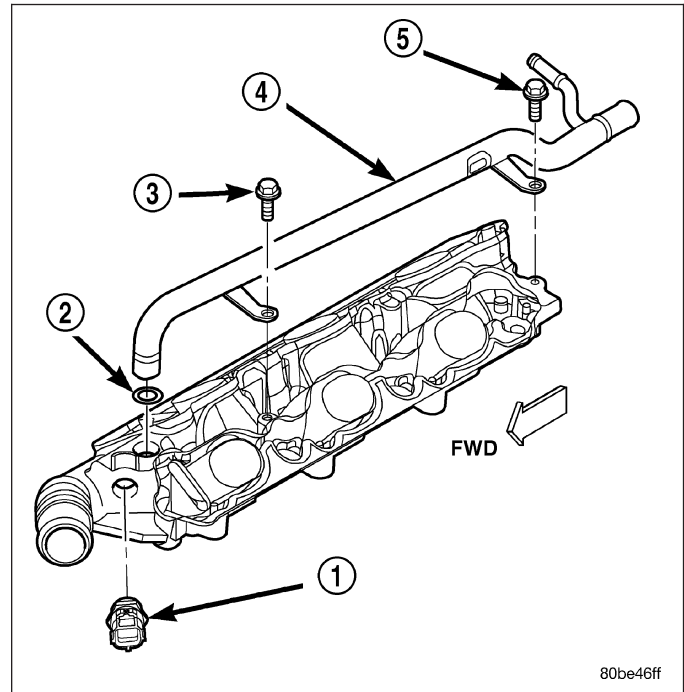
1. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Remove radiator (Refer to 7 - COOLING/ENGINE/ RADIATOR - REMOVAL).
3. Disconnect engine coolant temperature sensor connector.
4. Remove radiator upper hose at tube (3).
5. Remove heater hose from heater tube at rear of engine.
6. Disconnect heater tube from retaining clip at rear of engine.
7. Disconnect electrical connector from coolant temperature sensor.
8. Remove screws (2) attaching heater tube (3) to outlet connector (1).
9. Disengage heater tube (3) from outlet connector (1). To remove heater tube, move forward until the tube (3) clears cylinder heads.



### 3.5L ENGINE

**WARNING: DO NOT REMOVE PRESSURE CAP WITH SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.**

1. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Remove upper and lower intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - UPPER - REMOVAL) and (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - LOWER - REMOVAL).
3. Position lower intake manifold upside down on bench and remove the tube retaining bolt (5).
4. Remove heater supply tube (4) from manifold and discard O-ring (2).



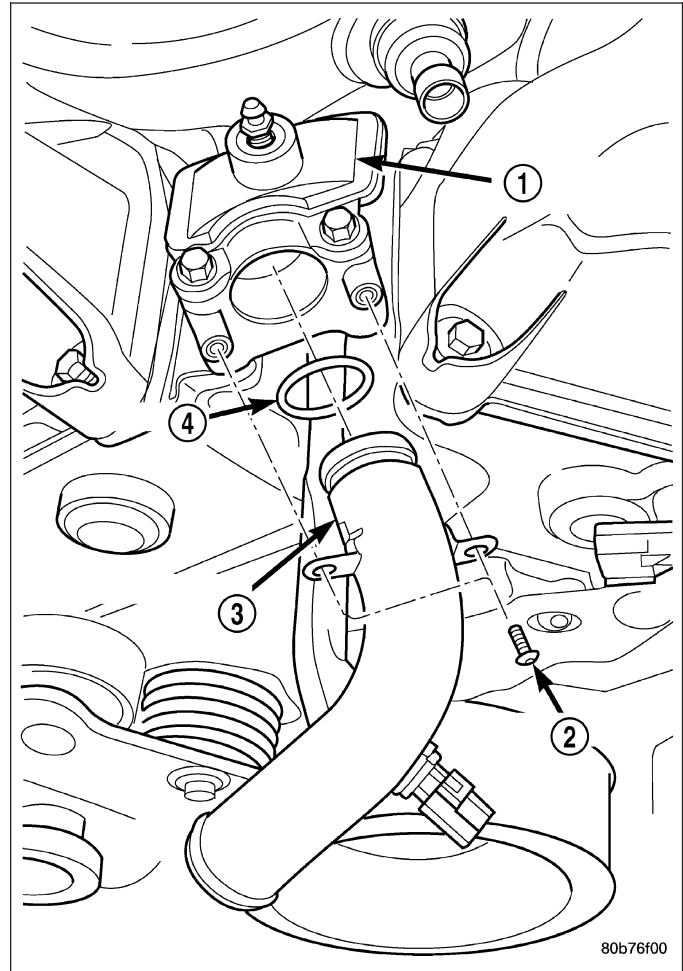
### 5.7L ENGINE

1. Disconnect negative battery cable.
2. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Remove intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
4. Remove heater hoses from heater tubes.
5. Remove heater tube mounting bolts.
6. Remove heater tubes from water pump housing and remove from vehicle.

## INSTALLATION

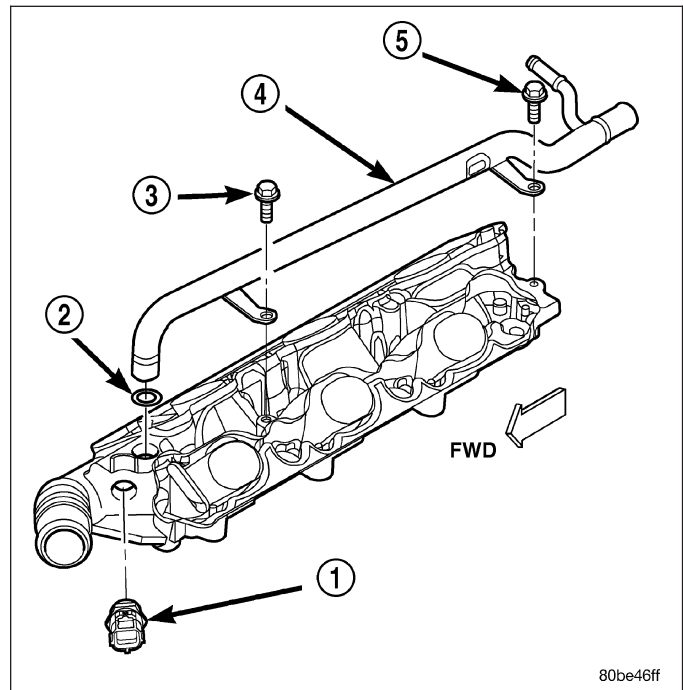
### 2.7L ENGINE

1. Inspect heater tube O-ring (4). Replace as necessary.
2. Lubricate O-ring (4) with a silicone type grease such as Mopar® Dielectric Grease.
3. Install the heater tube (3) by inserting tube in-between cylinder heads. Insert tube into outlet connector (1).
4. Attach heater tube (3) to the retaining clip at rear of engine.
5. Install attaching screws and tighten to 3 N·m (30 in. lbs.).
6. Install radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - INSTALLATION).
7. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
8. Operate engine until it reaches normal operating temperature. Check cooling system for correct fluid levels.



### 3.5L ENGINE

1. Clean heater tube sealing surfaces.
2. Inspect heater tube O-ring (2). Replace as necessary.
3. Lubricate O-ring (2) with a silicone type grease such as Mopar® Dielectric Grease.
4. Install O-ring (2) on heater supply tube (4).
5. Install heater tube (4) on manifold.
6. Install retaining bolts. Tighten bolts to 12 N·m (105 in. lbs.).
7. Install lower and upper intake manifolds (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION - Lower) and (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION - Upper).
8. Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
9. Operate engine until it reaches normal operating temperature. Check cooling system for correct fluid levels.



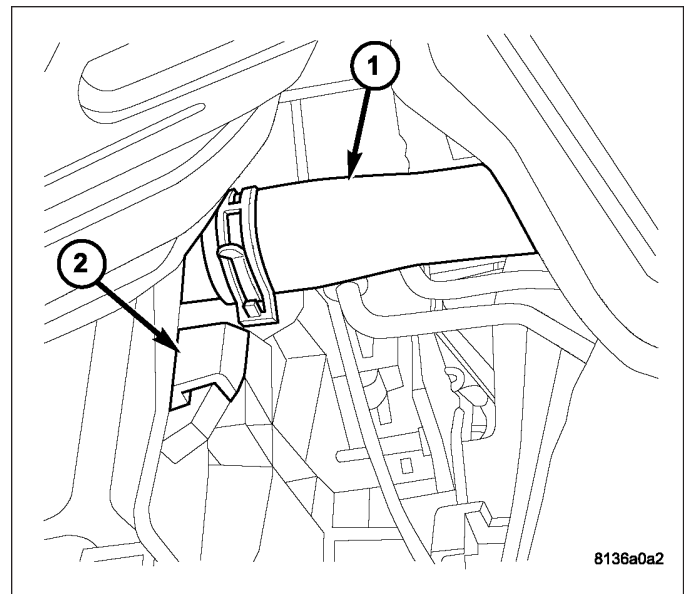
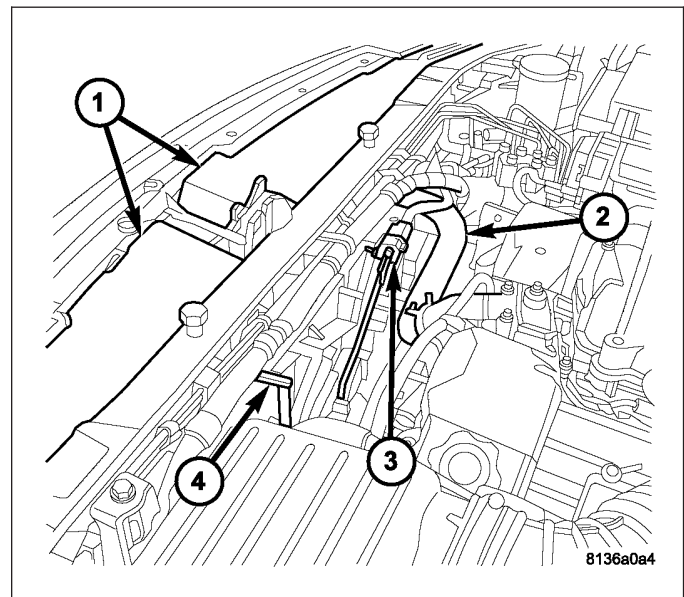
## 5.7L ENGINE

1. Position heater tubes into water pump housing.
2. Install mounting bolts. Tighten bolts to 10 N·m (88 in. lbs.).
3. Install heater hose onto heater tubes.
4. Install intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
5. Connect negative battery cable.
6. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
7. Start vehicle and check for cooling system leaks.

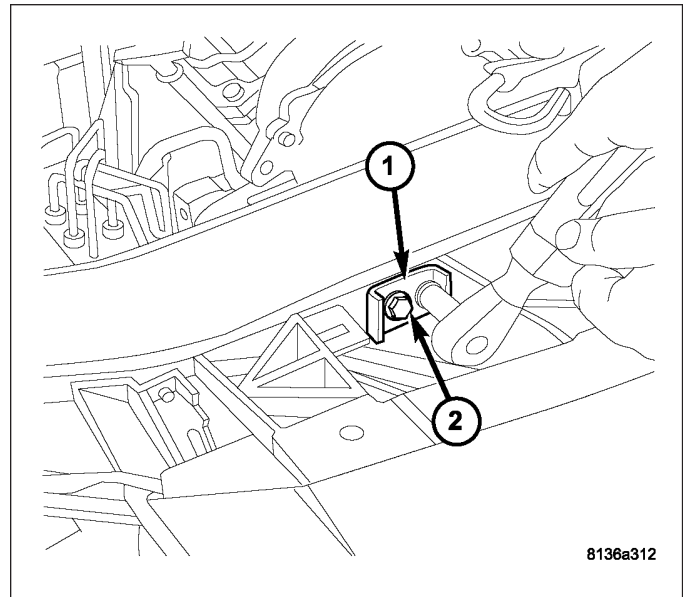
## RADIATOR

### REMOVAL

1. Disconnect negative battery cable.
2. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Remove upper radiator hose (2).
4. Remove upper radiator closure panels (1).
5. Remove radiator fan assembly (4) (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
6. Raise vehicle.
7. Remove lower splash shield.
8. Remove lower radiator hose (1).
9. Remove lower condensor mount bolts.



10. Lower vehicle.
11. Remove upper radiator hose.
12. Remove upper radiator mounting brackets (1) and bolts (2).
13. Remove upper condensor mounting bolts.
14. Separate condensor assembly from radiator.
15. Tilt radiator toward engine and remove radiator from vehicle.



## CLEANING

Clean radiator fins are necessary for good heat transfer. The radiator and air conditioning fins should be cleaned when an accumulation of debris has occurred. With the engine cold, apply cold water and compressed air to the back (engine side) of the radiator to flush the radiator and/or A/C condenser of debris.

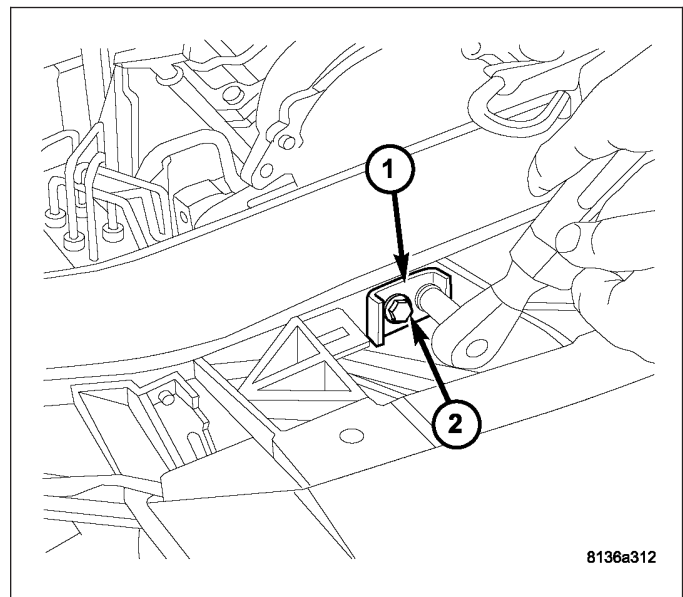
## INSPECTION

Inspect the radiator tanks for cracks, broken or missing fittings also inspect the joint where the tanks seam up to the radiator core for signs of leakage and/or deteriorating seals.

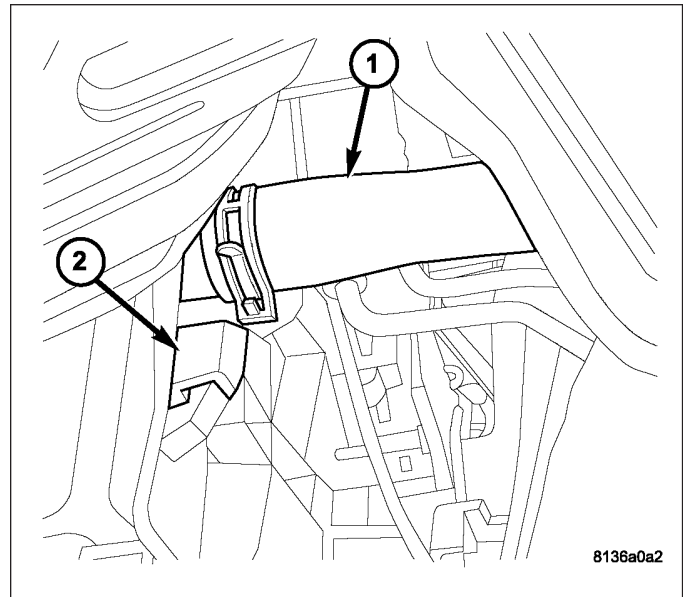
Inspect radiator core for corroded, bent or missing cooling fins. Inspect the core for bent or damaged cooling tubes.

## INSTALLATION

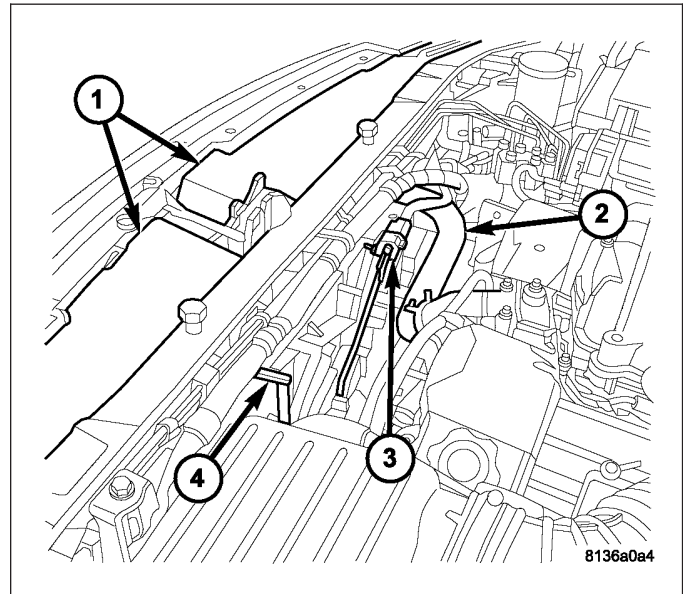
1. Position radiator into engine compartment. Seat the radiator assembly lower rubber isolators into the mounting holes in radiator lower support.
2. Install radiator mounting bracket (1) and bolts (2). Tighten to 5 N·m (45 in. lbs.).
3. Position condensor on radiator and install upper mounting bolts. Tighten bolts to 10 N·m (88 in. lbs.).
4. Raise vehicle.



5. Install lower condensor mounting bolts. Tighten bolts to 10 N·m (88 in. lbs.)
6. Install lower radiator hose (1) and clamp.
7. Lower vehicle.



8. Install the radiator fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
9. Install upper radiator upper hose. Align hose so it does not interfere with the accessory drive belt or engine. Position hose clamp so it will not interfere with the hood.
10. Connect negative cable.
11. Fill cooling system with coolant (Refer to 7 - COOLING - STANDARD PROCEDURE).
12. Operate engine until it reaches normal operating temperature. Check cooling system and automatic transmission for correct fluid levels.

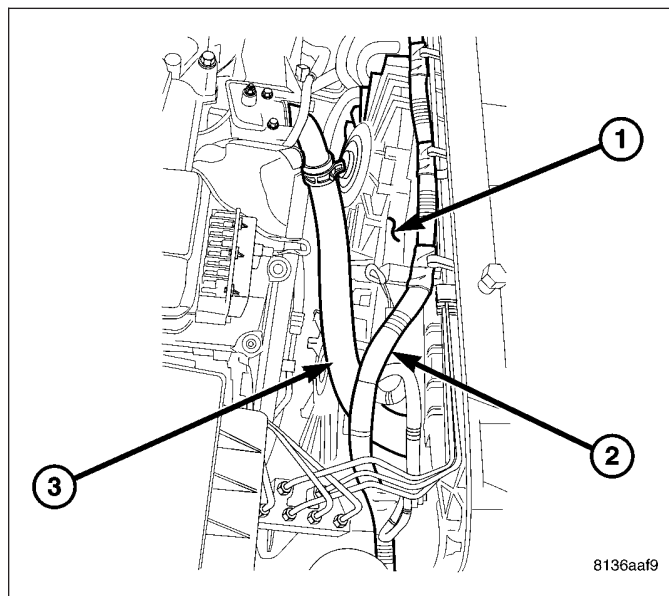




## RADIATOR FAN

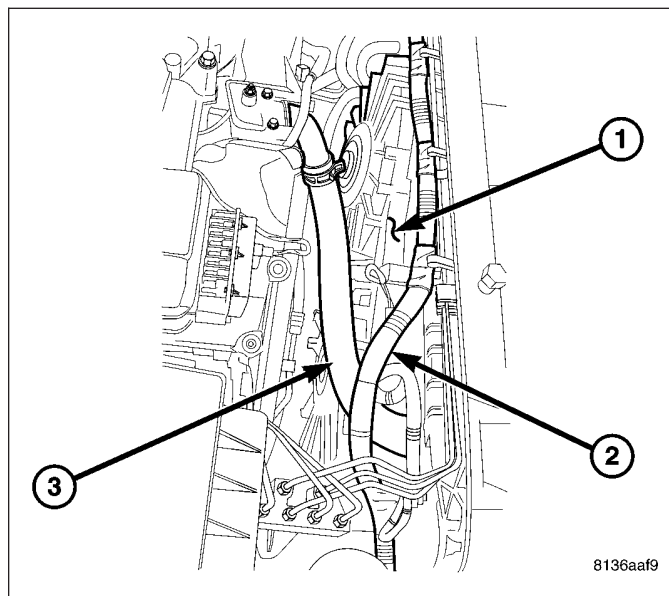
### REMOVAL

1. Disconnect negative battery cable.
2. Partially drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Remove upper radiator hose (3).
4. Disconnect cooling fan electrical connector (2).
5. Remove cooling fan mounting bolts.
6. Remove radiator cooling fan assembly (1) from vehicle.



### INSTALLATION

1. Position radiator cooling fan assembly (1) in vehicle.
2. Install cooling fan mounting bolts. Tighten to 10 N·m (88 in. lbs.).
3. Connect cooling fan electrical connector (2).
4. Install upper radiator hose (3).
5. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
6. Operate engine until it reaches normal operating temperature. Check cooling system and automatic transmission for correct fluid levels.





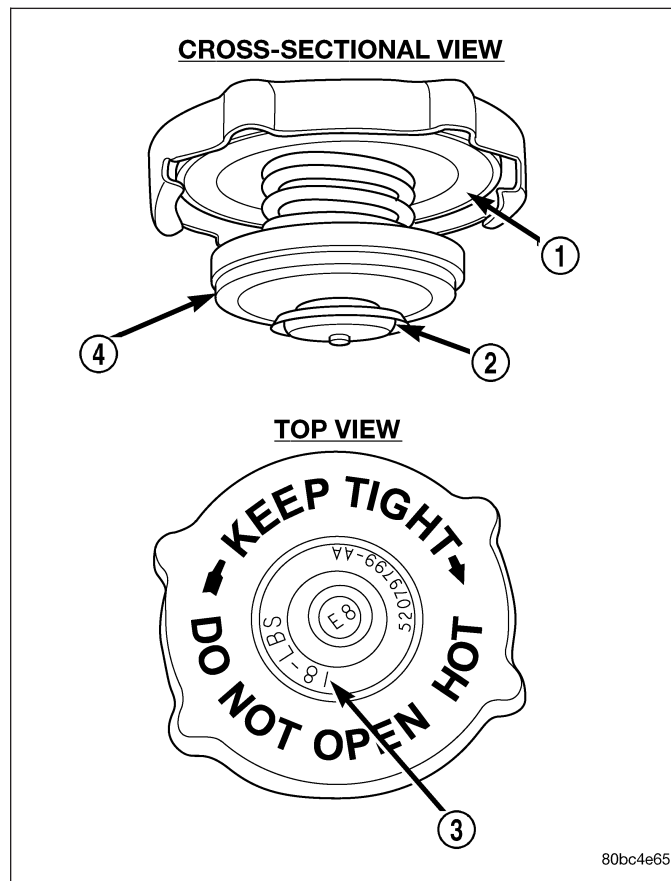
## CAP-RADIATOR PRESSURE

### DESCRIPTION

All cooling systems are equipped with a pressure cap on the radiator. This cap releases pressure at some point within a range of 131-158 kPa (19-23 psi). The pressure relief point (in pounds) is engraved on top of the cap (3).

The cooling system will operate at pressures slightly above atmospheric pressure. This results in a higher coolant boiling point allowing increased radiator cooling capacity. The cap contains a spring-loaded pressure relief valve (4). This valve opens when system pressure reaches the release range of 131-158 kPa (19-23 psi).

A rubber gasket (2) seals the radiator filler neck. This is done to maintain vacuum during coolant cool-down and to prevent leakage when system is under pressure.



### OPERATION

A vent valve in the center of the cap will remain shut as long as the cooling system is pressurized. As the coolant cools, it contracts and creates a vacuum in cooling system. This causes the vacuum valve to open and coolant in reserve/overflow tank to be drawn through connecting hose into radiator. If the vacuum valve is stuck shut, or overflow hose is kinked, radiator hoses will collapse on cool-down.

### DIAGNOSIS AND TESTING

#### RADIATOR CAP-TO-FILLER NECK SEAL

The pressure cap upper gasket (seal) pressure relief can be tested by removing overflow hose from radiator filler neck nipple. Attach hose of pressure tester tool 7700 (or equivalent) to nipple. It will be necessary to disconnect hose from its adapter for filler neck. Pump air into radiator. The pressure cap upper gasket should relieve at 131 kPa (21 psi) and hold pressure at a minimum of 130 kPa (18.8 psi).

**WARNING: THE WARNING WORDS "DO NOT OPEN HOT" ON RADIATOR PRESSURE CAP, ARE A SAFETY PRECAUTION. WHEN HOT, PRESSURE BUILDS UP IN COOLING SYSTEM. TO PREVENT SCALDING OR INJURY, RADIATOR CAP SHOULD NOT BE REMOVED WHILE SYSTEM IS HOT AND/OR UNDER PRESSURE.**

Do not remove radiator cap at any time **except** for the following purposes:

1. Check and adjust antifreeze freeze point.
2. Refill system with new antifreeze.
3. Conducting service procedures.
4. Checking for vacuum leaks.

**WARNING: IF VEHICLE HAS BEEN RUN RECENTLY, WAIT AT LEAST 15 MINUTES BEFORE REMOVING RADIATOR CAP. WITH A RAG, SQUEEZE RADIATOR UPPER HOSE TO CHECK IF SYSTEM IS UNDER PRESSURE. PLACE A RAG OVER CAP AND WITHOUT PUSHING CAP DOWN, ROTATE IT COUNTER-CLOCKWISE TO FIRST STOP. ALLOW FLUID TO ESCAPE THROUGH THE COOLANT RESERVE/OVERFLOW HOSE INTO RESERVE/OVERFLOW TANK. SQUEEZE RADIATOR UPPER HOSE TO DETERMINE WHEN PRESSURE HAS BEEN RELEASED. WHEN COOLANT AND STEAM STOP BEING PUSHED INTO TANK AND SYSTEM PRESSURE DROPS, REMOVE RADIATOR CAP COMPLETELY.**

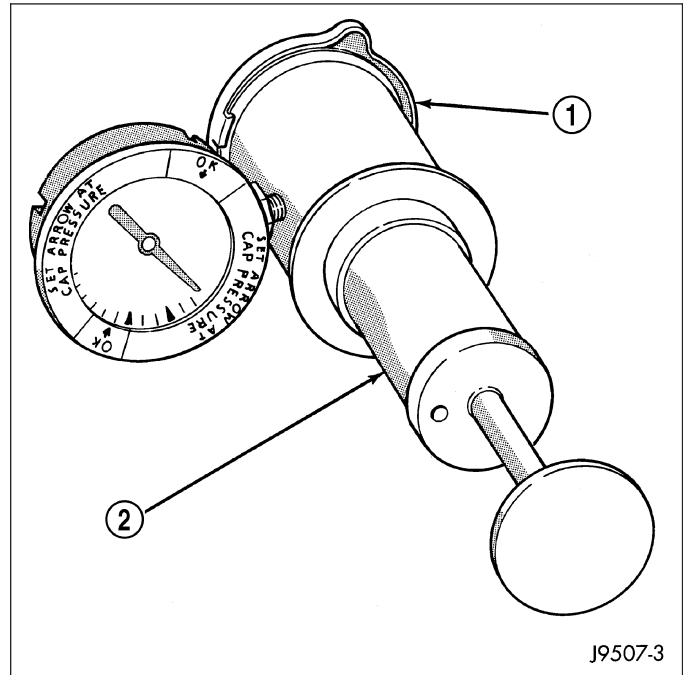
## RADIATOR CAP

Remove cap (1) from radiator. Be sure that sealing surfaces are clean. Moisten rubber gasket with water and install cap (1) on pressure tester 7700 (2) or an equivalent.

Operate tester pump to bring pressure to 138 kPa (20 psi) on gauge. If pressure cap (1) fails to hold pressure of at least 131 kPa (19 psi) replace cap. Refer to the following **CAUTION**.

The pressure cap may test properly while positioned on tool 7700 (or equivalent). It may not hold pressure or vacuum when installed on radiator. If so, inspect radiator filler neck and cap's top gasket for damage. Also inspect for dirt or distortion that may prevent cap from sealing properly.

**CAUTION: Radiator pressure testing tools are very sensitive to small air leaks, which will not cause cooling system problems. A pressure cap that does not have a history of coolant loss should not be replaced just because it leaks slowly when tested with this tool. Add water to tool. Turn tool upside down and recheck pressure cap to confirm that cap needs replacement.**



## CLEANING

Use only a mild soap and water to clean the radiator cap. Using any type solvent may cause damage to the seal in the radiator cap.

## INSPECTION

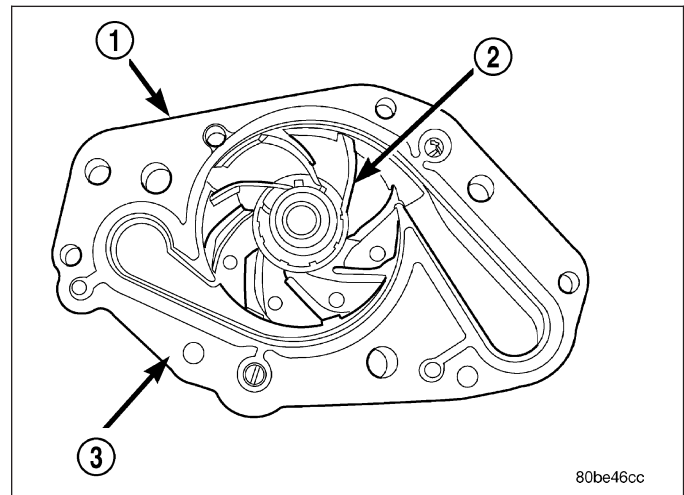
Hold cap at eye level, right side up. The vent valve at bottom of cap should open. If rubber gasket has swollen and prevents vent valve from opening, replace cap.

Hold cap at eye level, upside down. If any light can be seen between vent valve and rubber gasket, replace cap. **Do not use a replacement cap that has a spring to hold vent shut.** A replacement cap must be the type designed for a coolant reserve/overflow system with a completely sealed diaphragm spring and a rubber gasket. This gasket is used to seal to radiator filler neck top surface. Use of proper cap will allow coolant return to radiator.

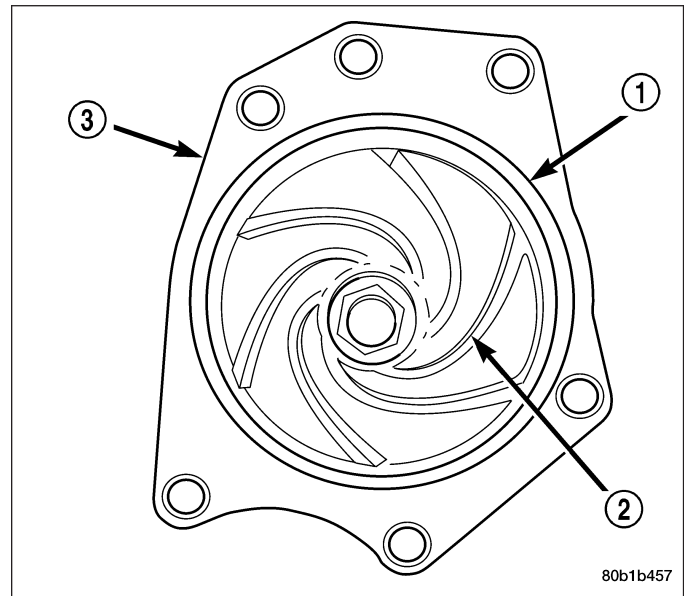
## WATER PUMP

### DESCRIPTION

The 2.7L and 3.5L pump has a die cast aluminum housing and a plastic swept vane impeller. The 2.7L water pump bolts directly to the cylinder block, behind the timing chain cover and is driven by the engine primary timing chain.



The 3.5L water pump bolts directly to the rear timing belt cover using a press-in-place gasket for sealing. The water pump is driven by the engine timing belt.



## REMOVAL

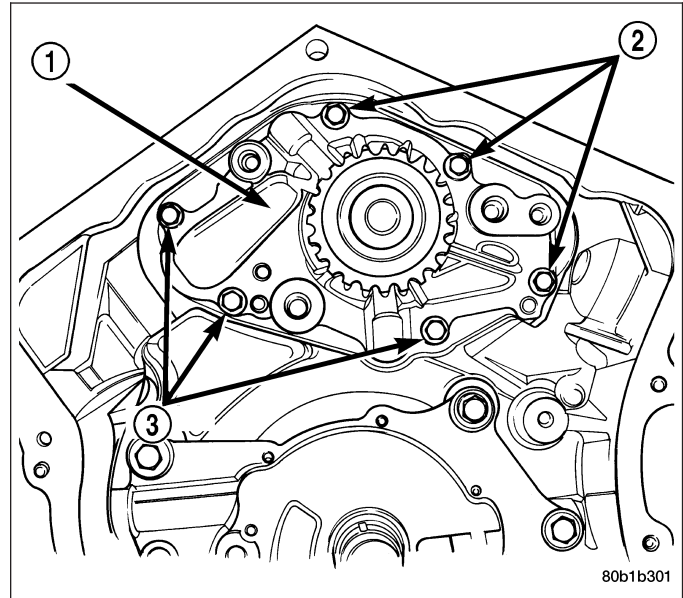
### 2.7L ENGINE

**WARNING: DO NOT REMOVE PRESSURE CAP WITH THE SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM COOLANT CAN RESULT.**

1. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Remove radiator fan assembly (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
3. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

**Note: The water pump is driven by the primary timing chain.**

4. Remove the timing chain and all chain guides (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
5. Remove bolts (2 and 3) attaching water pump (1) to block.
6. Remove water pump (1) and gasket.



### 3.5L ENGINE

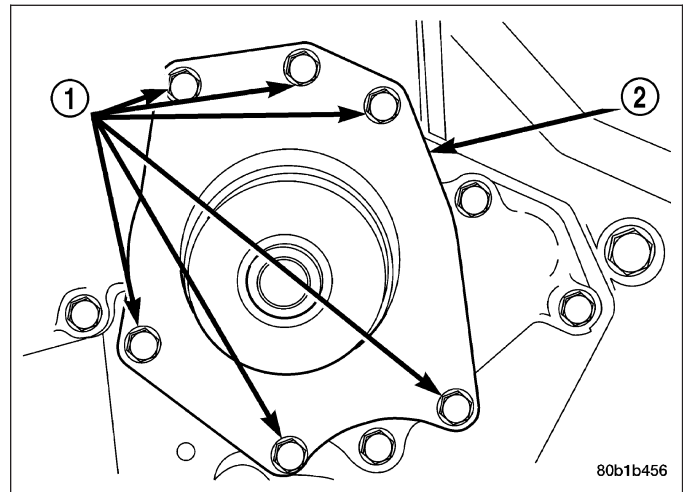
The water pump on all models can be replaced without discharging the air conditioning system.

**WARNING: DO NOT REMOVE PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.**

1. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

**Note: The water pump is driven by the timing belt.**

3. Remove engine timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
4. Remove water pump mounting bolts (1). Note position of longer bolt for proper re-installation.
5. Remove water pump body (1) from engine.

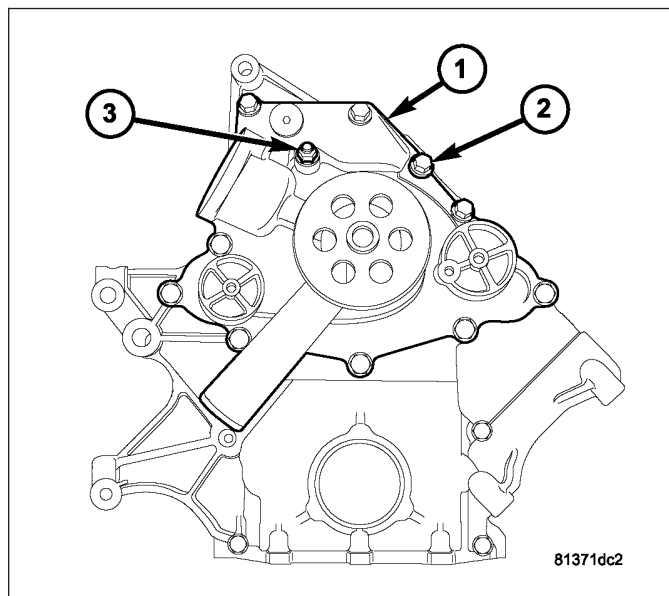


## 5.7L ENGINE

1. Disconnect negative battery cable.
2. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
3. Remove radiator fan assembly (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
4. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL)
5. Remove thermostat (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL)

**Note:** The water pump mounting bolts (2) are different lengths. Note the location of the water pump mounting bolts (2).

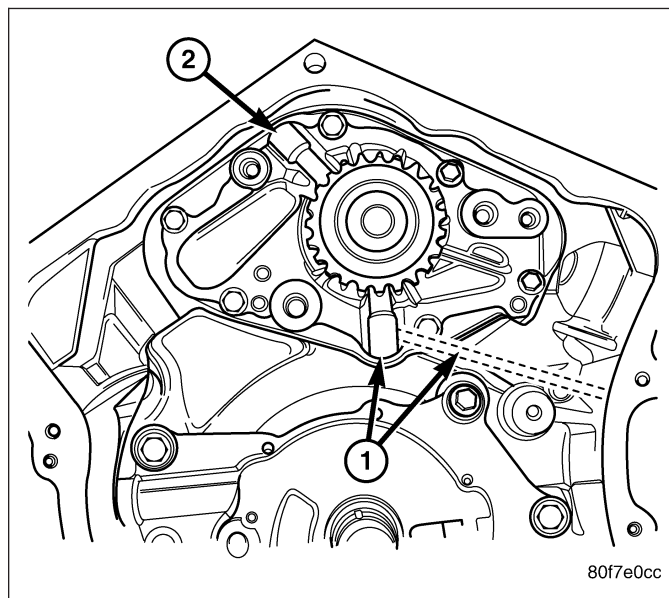
6. Remove water pump mounting bolts (2) and remove water pump (1).



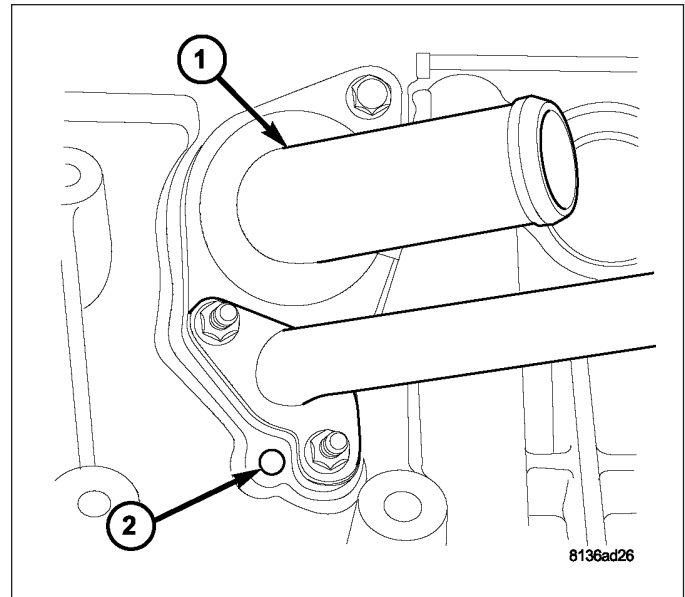
## INSPECTION - 2.7L

Inspect and replace the water pump if it has any of the following defects:

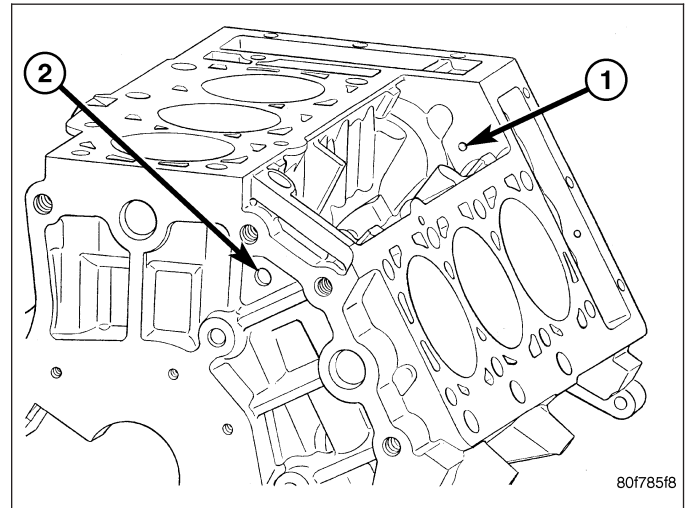
1. Damage or cracks on the pump body.



2. Coolant leaks: If the shaft seal is leaking, this will be evident by traces of thick deposits of dried glycol running down from the pump primary weep passage. A thin black stain below the pump primary weep hole/passagage is considered normal operation.



3. Coolant leaks: If the pump primary weep passage is plugged, coolant may come from the secondary weep passage and collect in the valley of the engine. The coolant will eventually run out the back side of the engine. Leakage from the secondary weep passage may give false indications that core plug(s) may be leaking on the back side of the engine block. If this condition is found, clean the primary weep passage of debris.
4. Impeller rubs inside of cylinder block.
5. Excessively loose or rough turning bearing.

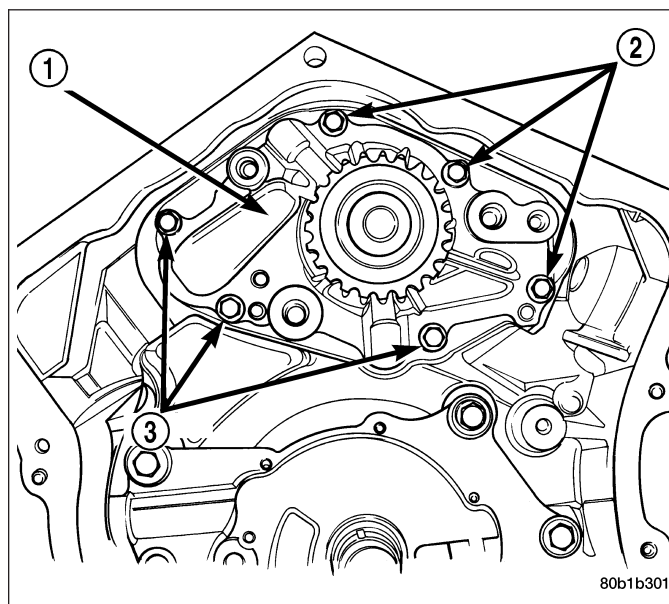


**Note:** It is normal for the water pump to weep a small amount of coolant from the primary weep hole (black stain at weep passage). Do not replace the water pump if this condition exists. Replace the water pump if a heavy deposit or a steady flow of engine coolant is evident from the primary weep passage. This indicates a shaft seal failure and pump must be replaced. Coolant may leak from the secondary weep passage and fill the valley of the engine. If this condition is found, clean the primary weep passage of debris. Be sure to perform a thorough analysis before replacing water pump.

## INSTALLATION

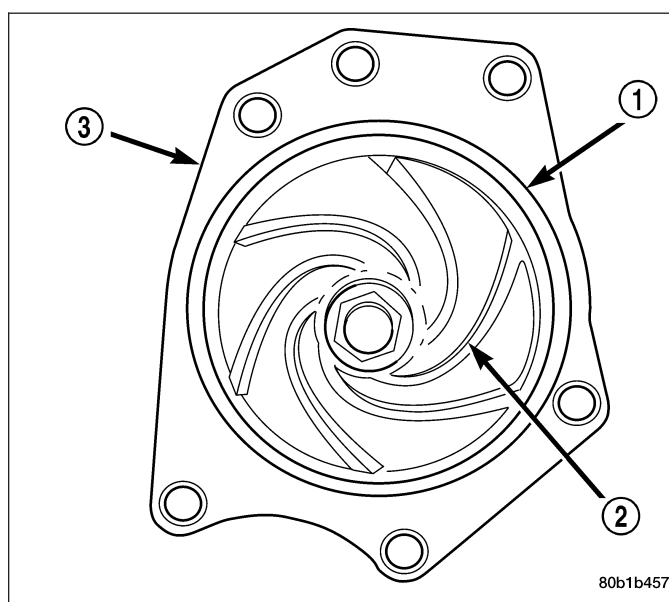
### 2.7L ENGINE

1. Clean all sealing surfaces.
2. Install water pump (1) and gasket. Tighten mounting bolts to 12 N·m (105 in. lbs.).
3. Install timing chain guides and timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
4. Install the accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
5. Install the radiator fan assembly (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
6. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).



### 3.5L ENGINE

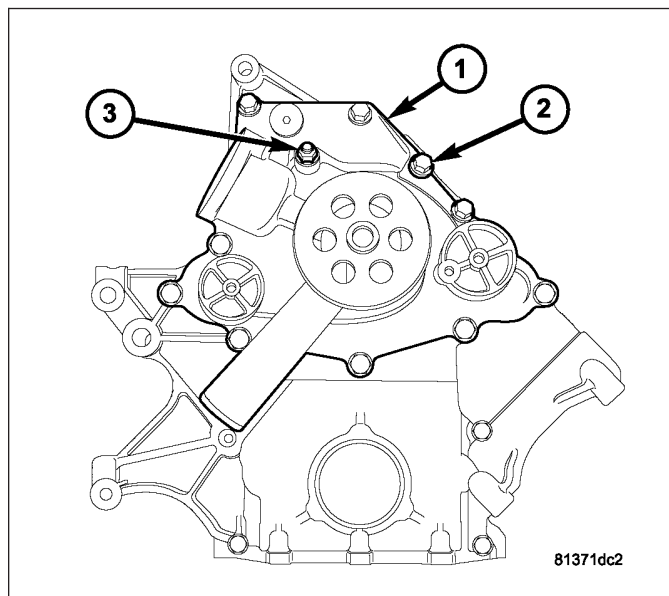
1. Clean all O-ring surfaces on pump and cover.
2. Apply Mopar® Dielectric Grease or the equivalent silicone grease to the O-ring (1) to facilitate assembly. Install new O-ring (1) on water pump body (3).
3. Position water pump (3) to engine.
4. Install mounting bolts. Tighten to 12 N·m (105 in. lbs.).
5. Install timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
6. Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
7. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).





## 5.7L ENGINE

1. Install water pump and mounting bolts (2). Tighten mounting bolts to 28 N·m (20 ft. lbs.).
2. Make sure double ended bolt (3) is in the proper location. Tighten double ended bolt to 28 N·m (20 ft. lbs.).
3. Install thermostat (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - INSTALLATION).
4. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
5. Install the radiator fan assembly (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
6. Connect negative battery cable.
7. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
8. Pressure test cooling system (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).





TRANSMISSION

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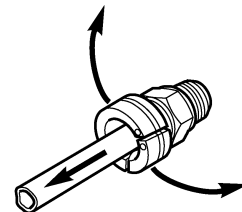
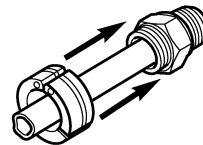
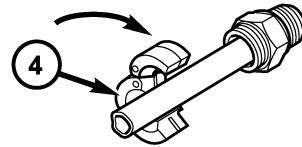
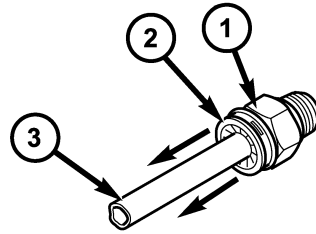
## TRANSMISSION

### STANDARD PROCEDURE

#### TRANSMISSION COOLER LINE QUICK CONNECT FITTING DISASSEMBLY/ ASSEMBLY

##### DISCONNECT

1. Remove dust cap by pulling it straight back off of quick connect fitting.
2. Place disconnect tool Special Tool 8875A onto transmission cooler line with the fingers of the tool facing the quick connect fitting.
3. Slide disconnect tool down the transmission line and engage the fingers of the tool into the retaining clip. When properly engaged in the clip, the tool will fit flush against the quick connect fitting.
4. Rotate the disconnect tool 60° to expand the retaining clip.
5. While holding the disconnect tool against the quick connect fitting, pull back on the transmission cooler line to remove.

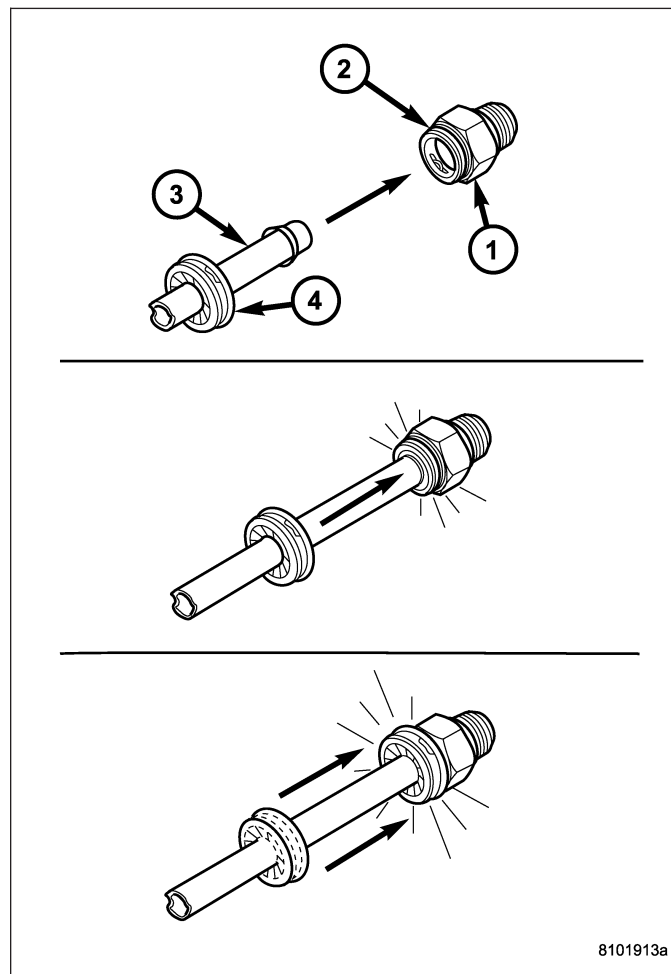


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## CONNECT

1. Align transmission cooler line with quick connect fitting while pushing straight into the fitting.
2. Push in on transmission cooler line until a "click" is heard or felt.
3. Slide dust cap down the transmission cooler line and snap it over the quick connect fitting until it is fully seated and rotates freely. Dust cap will only snap over quick connect fitting when the transmission cooler line is properly installed.

**Note:** If dust cap will not snap into place, repeat assembly step #2.



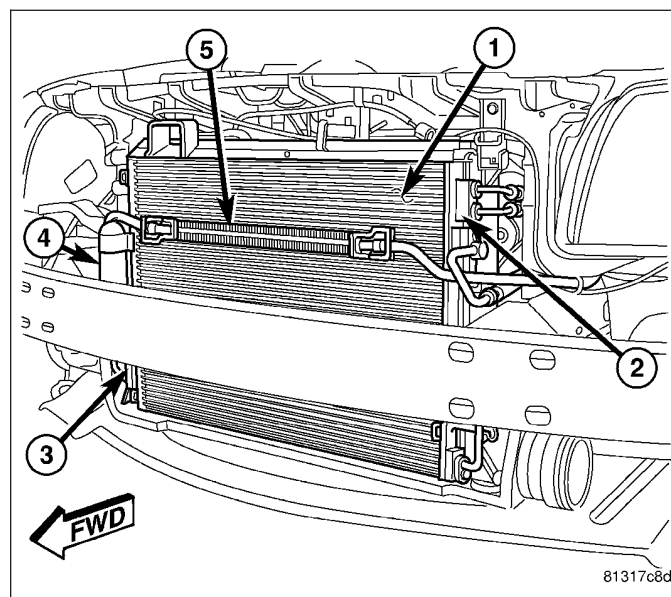
## TRANS COOLER

### DESCRIPTION

The automatic transmission cooler (2) is located in the front of the radiator and behind the front fascia and is combined with the A/C condenser. The transmission cooler is a heat exchanger that allows heat in the transmission fluid to be transferred to the air passing over the cooler fins.

The Transmission oil cooler/A/C condenser assembly is equipped with quick connect fitting for the transmission oil cooler lines, a tapping block (3) for the receiver/drier (4) and mounting provisions for the power steering cooler (5).

The transmission oil cooler/AC condenser is service as an assembly. For removal (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C CONDENSER - REMOVAL) and installation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C CONDENSER - INSTALLATION).



## TRANS COOLER LINES

### REMOVAL

1. Remove upper radiator closure panels
2. Using Tool 8875A, remove transmission cooler lines from transmission cooler (Refer to 7 - COOLING/TRANSMISSION - STANDARD PROCEDURE).
3. Raise vehicle on hoist.
4. Remove front transmission cooler lines from the thermal bypass valve block.
5. Remove rear transmission cooler lines from the thermal bypass valve block
6. Remove the transmission cooler lines from the transmission.

### INSTALLATION

1. Install rear transmission cooler lines at transmission. Tighten fittings to 20 N·m (18 ft. lbs.).
2. Install rear transmission cooler lines to thermal bypass valve. Tighten fittings to 20 N·m (18 ft. lbs.).
3. Install front transmission cooler lines to thermal bypass valve. Tighten fittings to 20 N·m (18 ft. lbs.).
4. Install front transmission cooler lines into transmission cooler (Refer to 7 - COOLING/TRANSMISSION - STANDARD PROCEDURE).
5. Lower vehicle.
6. Check transmission fluid level (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE/FLUID - STANDARD PROCEDURE).



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## AUDIO - ELECTRICAL DIAGNOSTICS

### DIAGNOSIS AND TESTING

## B210D-BATTERY VOLTAGE LOW

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
If the module detects that the battery voltage is less than 9.0 volts for 1 second.

Possible Causes
VEHICLE CHARGING SYSTEM
AMPLIFIER

## Diagnostic Test

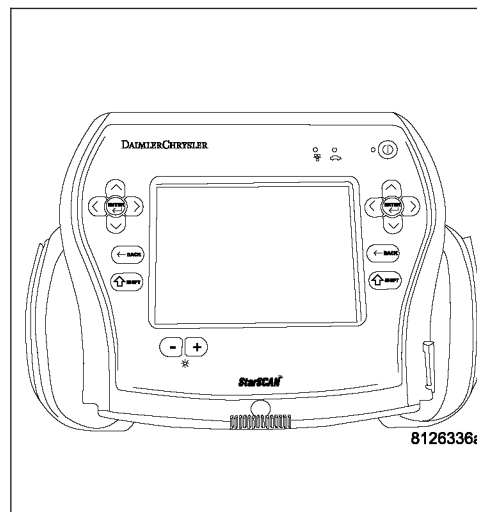
### 1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B210D-BATTERY VOLTAGE LOW?**

- Yes** >> Go To
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



### 2. CHECK THE BATTERY VOLTAGE TO THE AMPLIFIER

With the scan tool in Data Display, read Amplifier battery voltage.

**Is the battery voltage less than 9.0 volts?**

- Yes** >> Go To 3
- No** >> Replace the Amplifier in accordance with the Service Information.  
Perform OCS VERIFICATION TEST - VER 1.

### 3. CHECK FOR CHARGING SYSTEM RELATED DTCs IN THE POWERTRAIN CONTROL MODULE (PCM)

With the scan tool in ECU View, select PCM and check for any Charging System related DTCs.

**Does the scan tool display any Charging System related DTCs?**

- Yes** >> Diagnose and repair the DTCs. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- No** >> Replace the Amplifier in accordance with the Service Information.  
Perform OCS VERIFICATION TEST - VER 1.



B210E-BATTERY VOLTAGE HIGH

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
If the module detects that the battery voltage is greater 16.5 volts for 1 second.

Possible Causes
VEHICLE CHARGING SYSTEM
AMPLIFIER

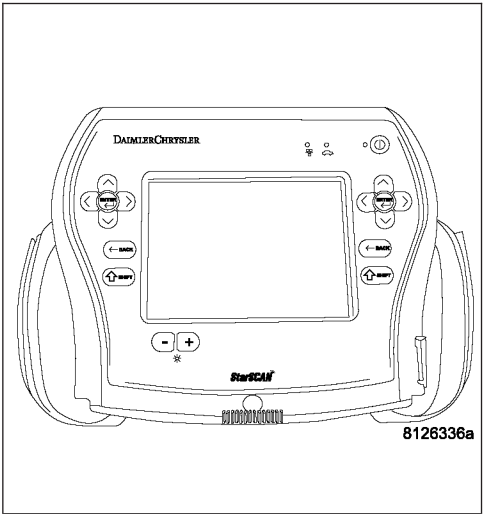
Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

Turn the ignition on, then off, and then on again.  
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B210E-BATTERY VOLTAGE HIGH?

- Yes    >> Go To 2
- No    >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

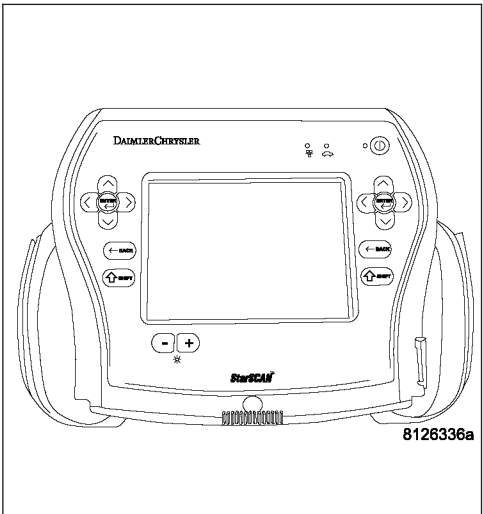


2. CHECK THE BATTERY VOLTAGE TO THE AMPLIFIER

With the scan tool in Data Display, read Amplifier battery voltage.

Is the battery voltage greater than 16.5 volts?

- Yes    >> Go To 3
- No    >> Replace the Amplifier in accordance with the Service Information.  
Perform OCS VERIFICATION TEST - VER 1.

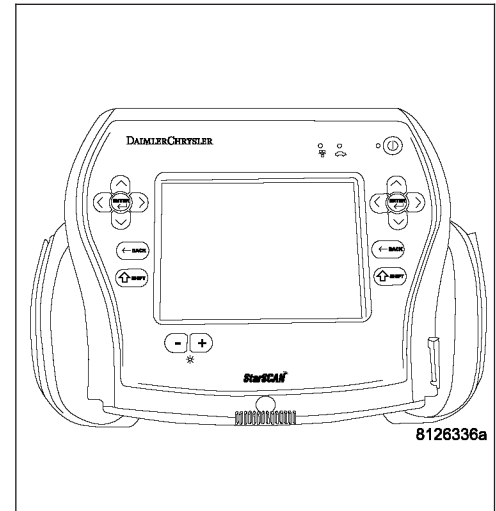


**B210E-BATTERY VOLTAGE HIGH (CONTINUED)****3. CHECK FOR CHARGING SYSTEM RELATED DTCs IN THE POWERTRAIN CONTROL MODULE (PCM)**

With the scan tool in ECU View, select PCM and check for any Charging System related DTCs.

**Does the scan tool display any Charging System related DTCs?**

- Yes** >> Diagnose and repair the DTCs. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- No** >> Replace the Amplifier in accordance with the Service Information.  
Perform OCS VERIFICATION TEST - VER 1.



**B221F-AMPLIFIER INTERNAL**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a software checksum test failure.

Possible Causes
AMPLIFIER

**Diagnostic Test**

**1. REPLACE THE AMPLIFIER**

When this code is set, the Amplifier must be replaced.

**Repair**

Replace the Amplifier in accordance with the Service Information.  
Perform the BODY VERIFICATION TEST-VER 1.

---

**B1488–CABIN EQ MISMATCH PERFORMANCE**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
If the cabin EQ message is incompatible with the EQ's stored in the amplifier for 10 consecutive cycles, then the amplifier will set this DTC.

POSSIBLE CAUSES
NO COMMUNICATION WITH FRONT CONTROL MODULE
ACTIVE FCM DTCs
AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on.

Turn the radio on.

With the scan tool, erase Amplifier DTCs.

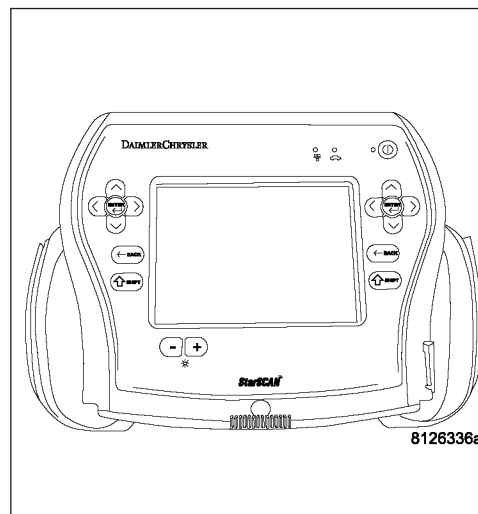
With the scan tool, reset the amplifier.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1488–CABIN EQ MISMATCH PERFORMANCE?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK AMPLIFIER BUSSED INPUTS/OUTPUTS**

With the scan tool in Amplifier Data Display, read the Cabin EQ# settings in the Bussed Inputs and Bussed Outputs Sections.

**Note:** The Cabin EQ# settings in the Inputs/Outputs section should match one another. The Cabin EQ# in the Inputs section is the information that is received from the FCM. The Cabin EQ# in the Outputs section is the information that is stored in the Amplifier's memory.

The Cabin EQ# settings are as follows:

- •\$51: HB Premium 1 (w/o Subwoofer)
- •\$52: HB Premium 2 (with Subwoofer)

**Do the Cabin EQ# settings match one another?**

**Yes** >> Replace the Amplifier in accordance to the service information.  
Perform the BODY VERIFICATION TEST-VER 1.

**No** >> Go To 3

**B1488-CABIN EQ MISMATCH PERFORMANCE (CONTINUED)****3. VERIFY COMMUNICATION WITH FRONT CONTROL MODULE**

With the scan tool in ECU VIEW, read active modules on the bus.

**Does the scan tool show the Front Control Module active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Communication category for the related symptoms.  
Perform the BODY VERIFICATION TEST VER 1.

---

**4. CHECK FRONT CONTROL MODULE FOR ACTIVE DTCs**

With the scan tool, erase FCM DTCs.

Turn the ignition off. Wait approximately 10 seconds.

Turn the ignition on.

With the scan tool, read FCM DTCs.

**Are any active DTCs present?**

**Yes** >> Refer to symptom list for problems related to the Front Control Module.  
Perform the BODY VERIFICATION TEST VER 1.

**No** >> Replace the Front Control Module in accordance with the Service Information.  
Perform the BODY VERIFICATION TEST-VER.1

---

**B1460-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of  $5 \pm 1$  sec.

Possible Causes
AMPLIFIER

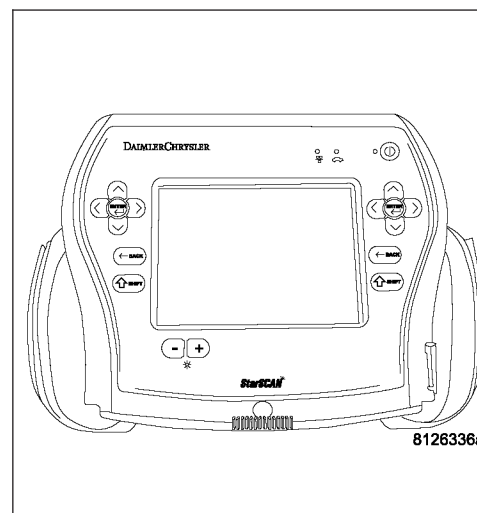
**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

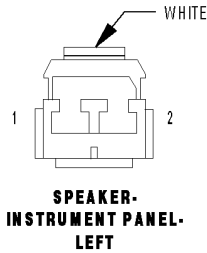
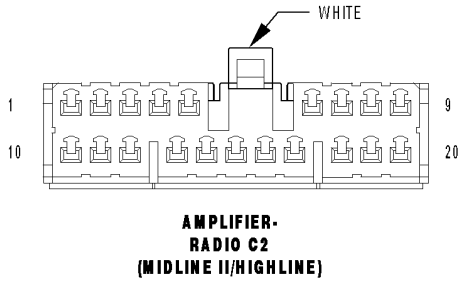
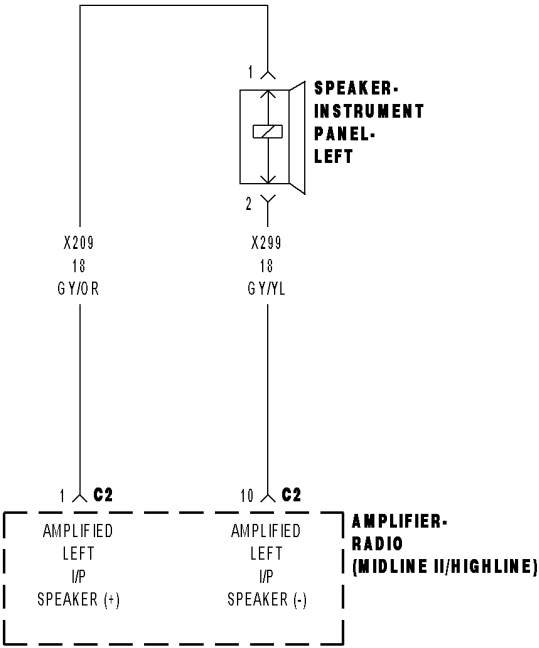
With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1460-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?**

- Yes** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



B1461-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT LOW



**B1461-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X209) AMPLIFIED LEFT FRONT I/P SPEAKER (+) CIRCUIT SHORTED TO GROUND (X299) AMPLIFIED LEFT FRONT I/P SPEAKER (-) CIRCUIT SHORTED TO GROUND LEFT FRONT I/P SPEAKER AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

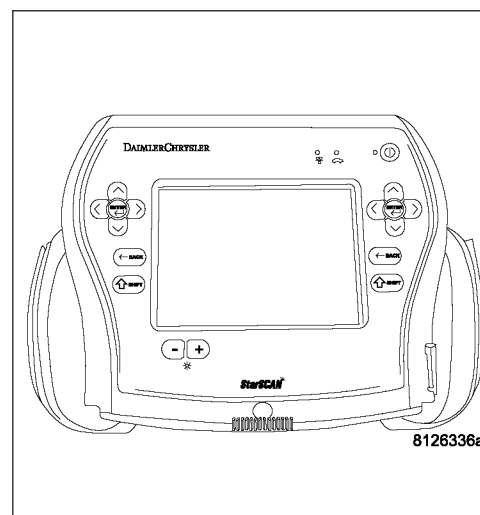
Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1461-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.





**B1461-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)****2. CHECK THE (X209) AMPLIFIED LEFT FRONT I/P SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND**

Disconnect the Amplifier C2 harness connector.

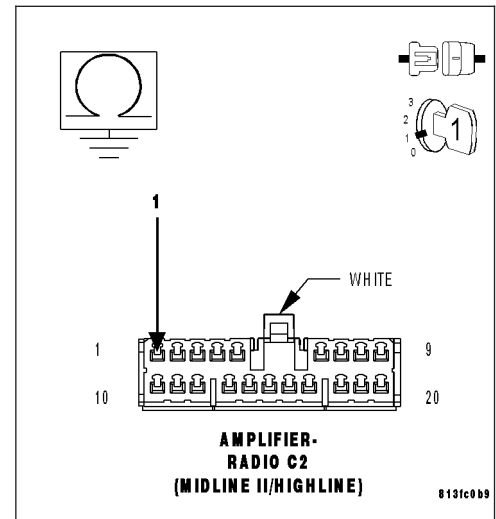
Measure the resistance between ground and the (X209) Amplified Left Front I/P Speaker (+) circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X209) Amplified Left Front I/P Speaker (+) circuit for a short to ground.

Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**3. CHECK THE (X299) AMPLIFIED LEFT FRONT I/P SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND**

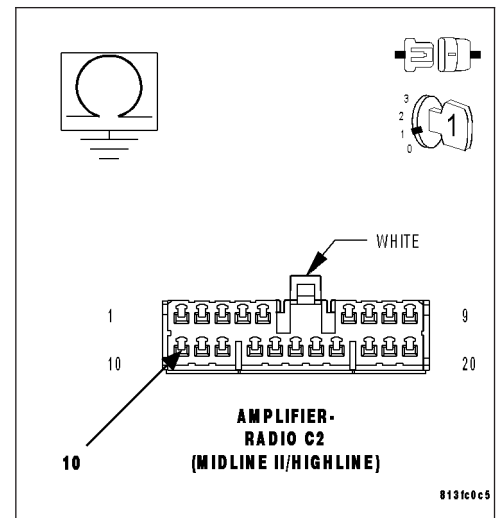
Measure the resistance between ground and the (X299) Amplified Left Front I/P Speaker (-) circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X299) Amplified Left Front I/P Speaker (-) for a short to ground.

Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 4



**B1461-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)****4. CHECK OPERATION OF THE AMPLIFIED LEFT FRONT I/P SPEAKER**

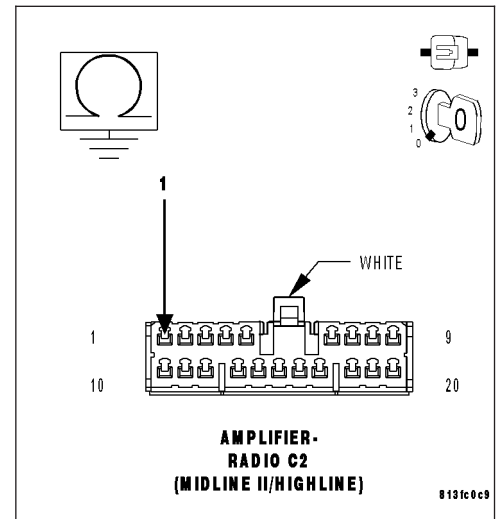
Turn the ignition off.

Reconnect and reinstall the Left Front I/P Speaker.

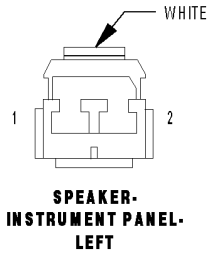
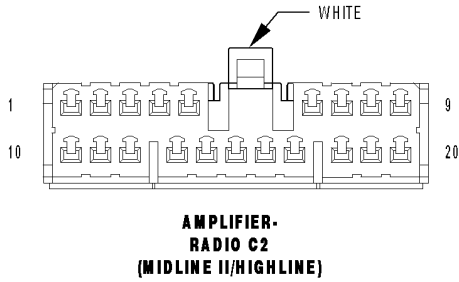
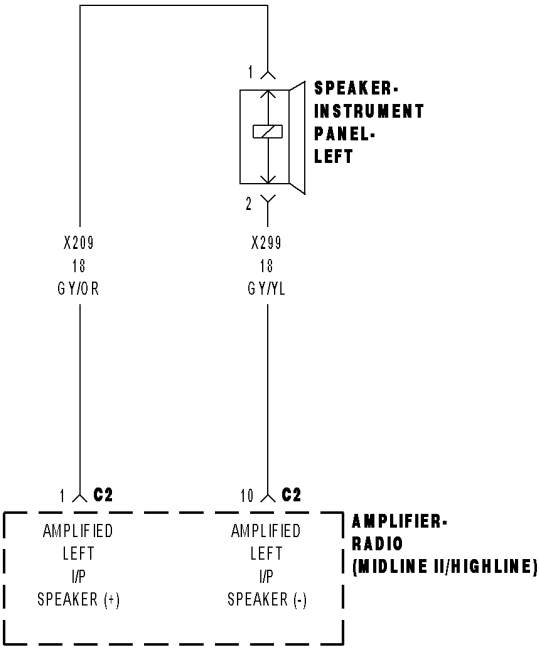
Measure the resistance of the speaker circuit between the Amplifier C2 harness connector and ground.

**Is the resistance below 10K ohms?**

- Yes** >> Replace the Left Front I/P Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.
- No** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.



B1462-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT HIGH



**B1462-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT SHORT TO VOLTAGE (X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT SHORT TO VOLTAGE AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

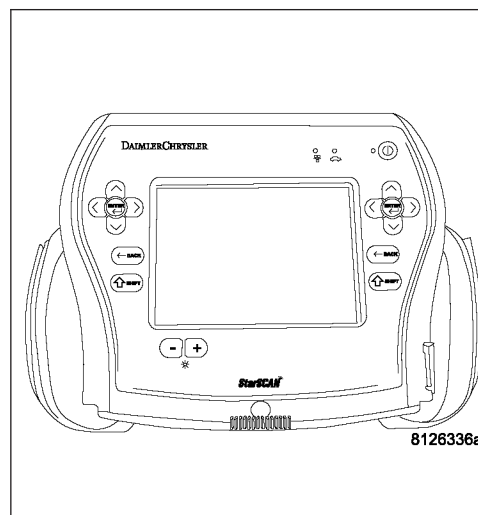
Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1462-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



**B1462-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)****2. CHECK FOR VOLTAGE ON THE (X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT**

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Disconnect the Amplified Left I/P Speaker harness connector.

Turn the ignition on.

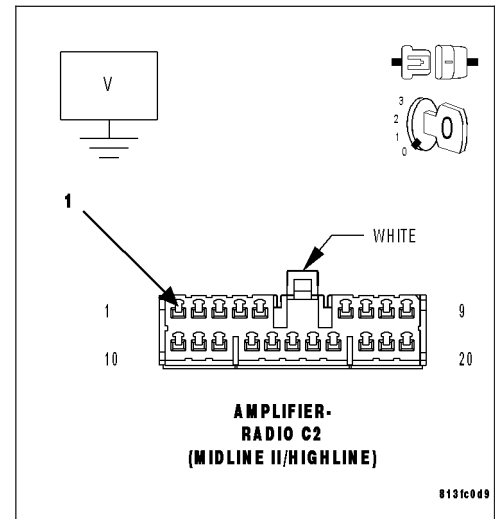
Measure for voltage on the (X209) Amplified Left I/P Speaker (+) circuit.

**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X209) Amplified Left I/P Speaker (+) circuit for a short to voltage.

Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**3. CHECK FOR VOLTAGE ON THE (X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT**

Measure for voltage on the (X299) Amplified Left I/P Speaker (-) circuit.

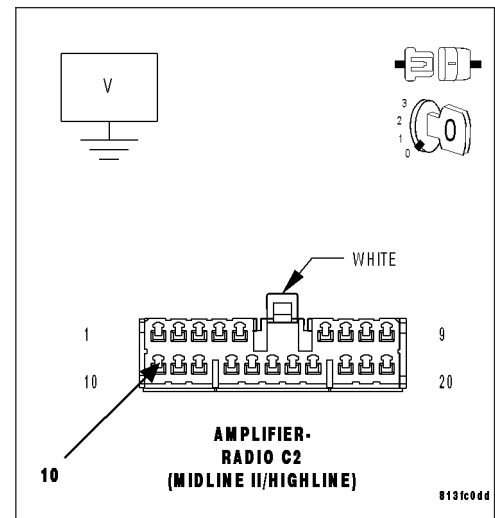
**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X299) Amplified Left I/P Speaker (-) circuit for a short to voltage.

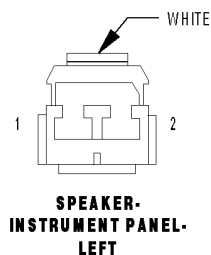
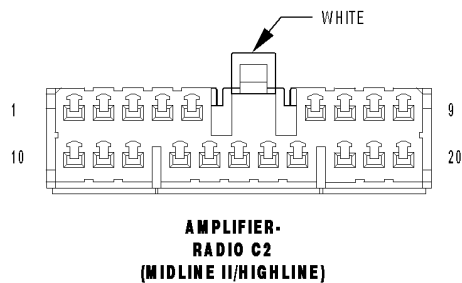
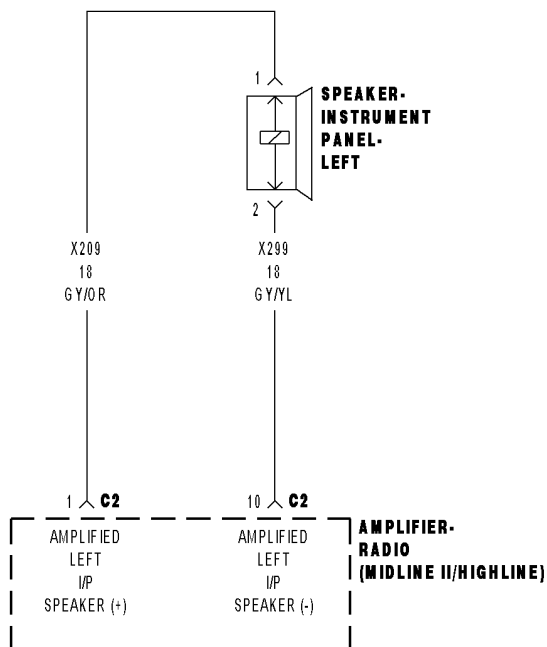
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.



# B1463-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT OPEN



**B1463-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**  
The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT OPEN
(X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT OPEN
LEFT FRONT I/P SPEAKER
AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on.

Turn the radio on.

With the scan tool, erase Amplifier DTCs.

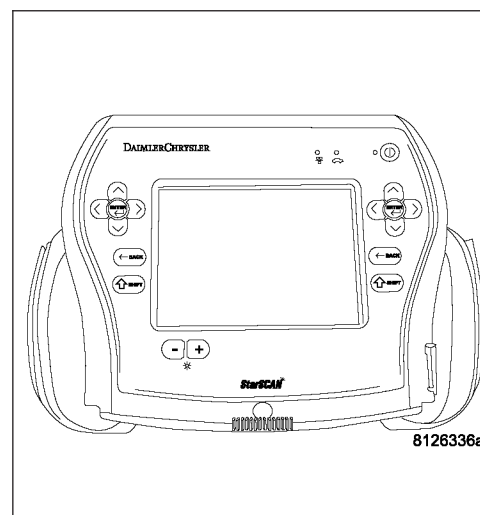
With the scan tool, reset the amplifier.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1463-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



**B1463-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)****2. CHECK THE OPERATION OF THE LEFT FRONT I/P SPEAKER**

Disconnect the Left I/P Speaker harness connector.

Turn the radio on and turn the volume to mid level.

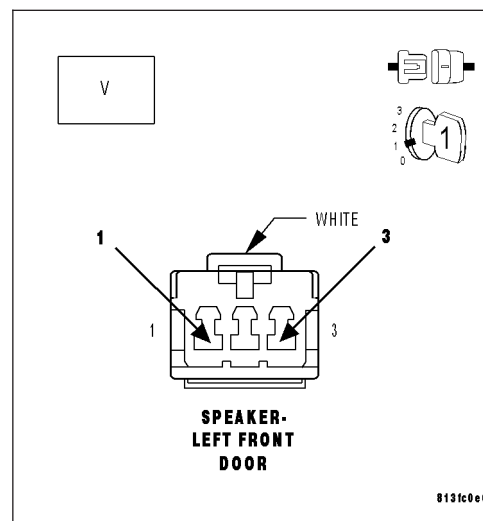
With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Left I/P Speaker circuits in the Amplified Left I/P Speaker harness connector.

**Is the voltage present greater than 1 volt?**

**Yes** >> Replace the Amplified Left I/P Speaker in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**3. CHECK THE (X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

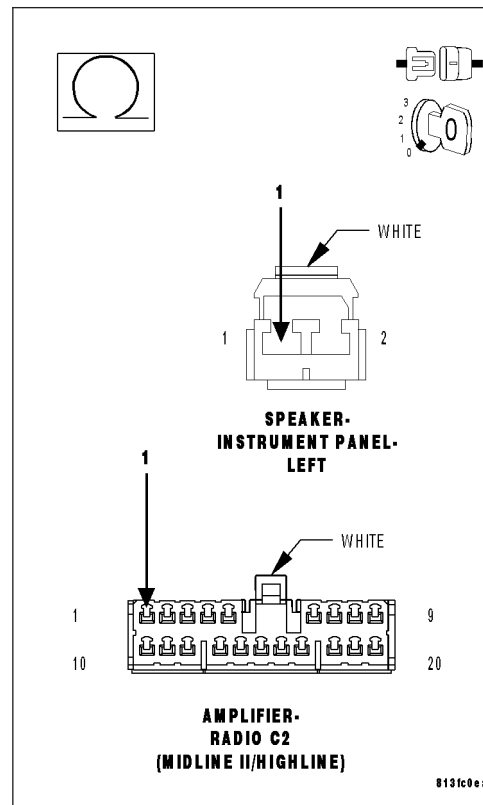
Measure the resistance of the (X209) Amplified Left I/P Speaker (+) circuit between the Amplifier C2 harness connector and the Amplified Left I/P Speaker harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (X209) Amplified Left I/P Speaker (+) circuit for an open.

Perform BODY VERIFICATION TEST VER-1.





**B1463-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)****4. CHECK THE (X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT FOR AN OPEN**

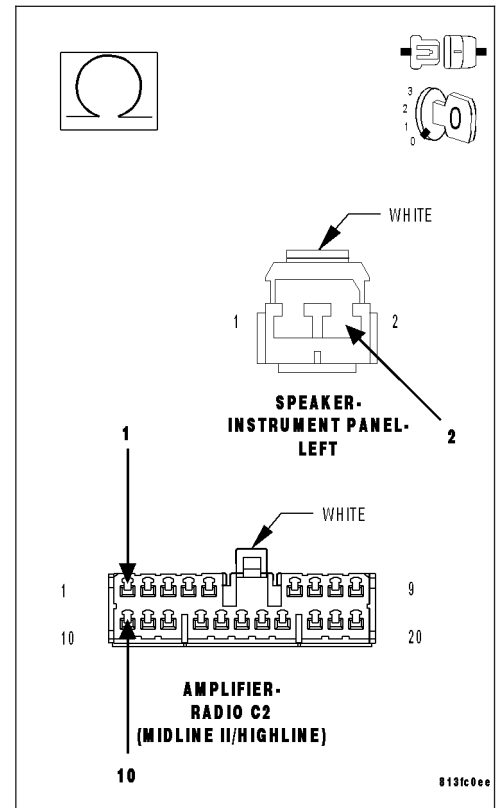
Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

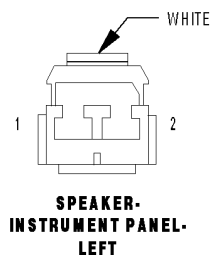
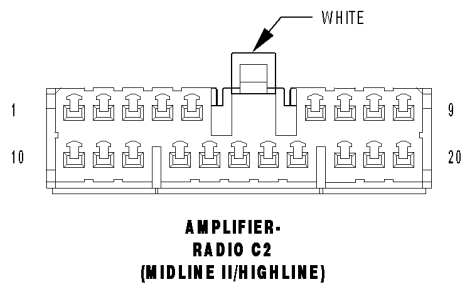
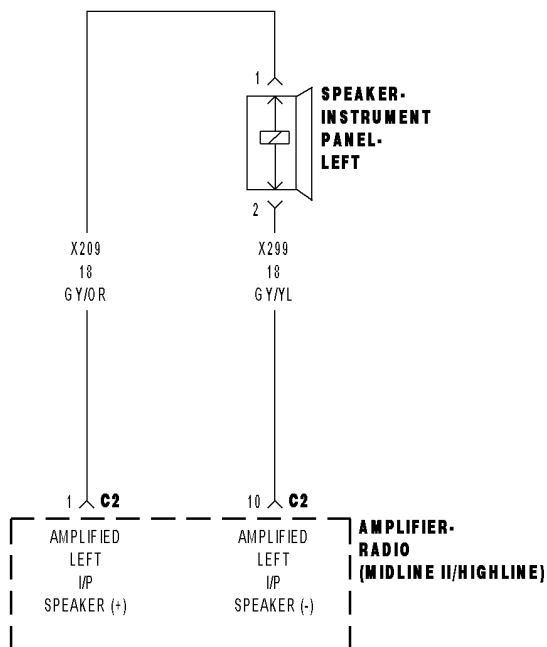
Measure the resistance of the (X299) Amplified Left I/P Speaker (-) circuit between the Amplifier C2 harness connector and the Amplified Left I/P Speaker harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.
- No** >> Repair the (X299) Amplified Left I/P Speaker (-) circuit for an open.  
Perform BODY VERIFICATION TEST VER-1.



## B1464-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER



**B1464-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**  
The amplifier detects that the output circuits are shorted together.

**Possible Causes**

(X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT SHORTED TO THE (X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUIT  
AMPLIFIED LEFT I/P SPEAKER  
AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

With the scan tool, erase Amplifier DTCs.

Turn the radio on.

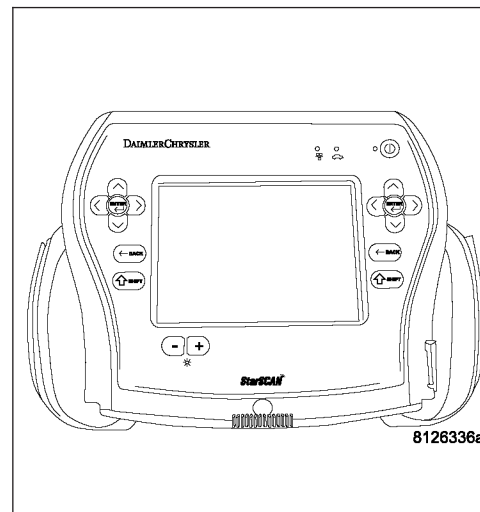
Turn the volume level to 25.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1464-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE OPERATION OF THE AMPLIFIED LEFT I/P SPEAKER**

Disconnect the Amplified Left I/P Speaker.

Measure the resistance of the speaker between the two terminals.

**Is the resistance of the speaker less than 1 ohm?**

**Yes** >> Replace the Amplified Left I/P Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B1464-CHANNEL 1 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)****3. CHECK THE (X209) AMPLIFIED LEFT I/P SPEAKER (+) CIRCUIT, AND THE (X299) AMPLIFIED LEFT I/P SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance between the (X209) Amplified Left I/P Speaker (+) circuit, and the (X299) Amplified Left I/P Speaker (-) circuit.

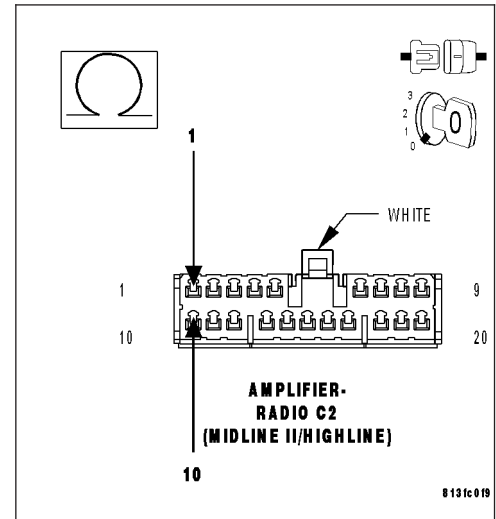
**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X209) Amplified Left I/P Speaker (+) circuit, and the (X299) Amplified Left I/P Speaker (-) circuit for a short together.

Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.



B1465-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

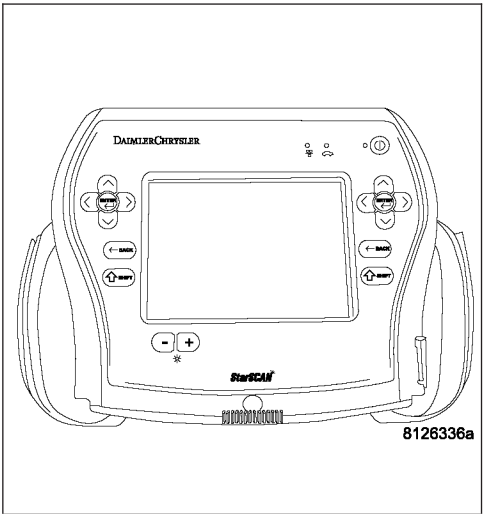
Turn the ignition on, then off, and then on again.  
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1465-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

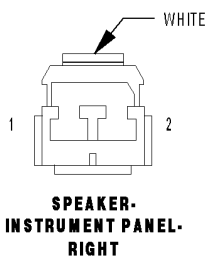
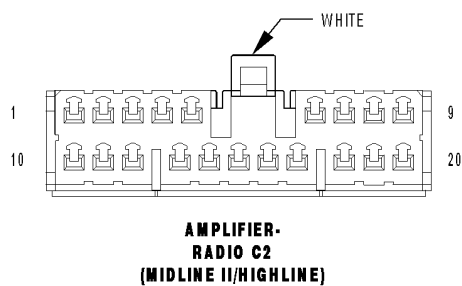
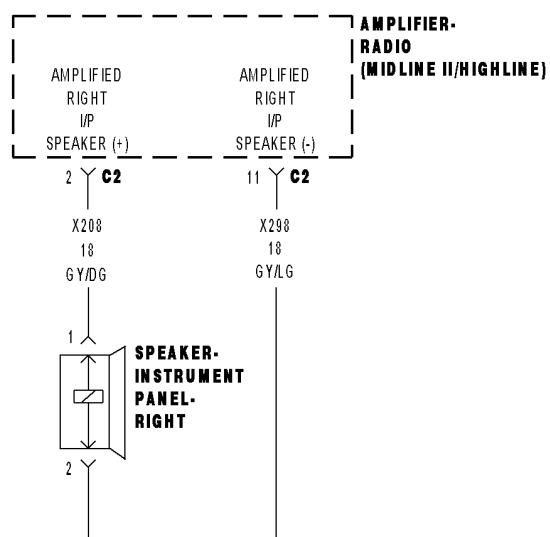
- Yes

>> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.
- No

>> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



## B1466-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT LOW



**B1466-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X208) AMPLIFIED RIGHT FRONT I/P SPEAKER (+) CIRCUIT SHORTED TO GROUND
(X298) AMPLIFIED RIGHT FRONT I/P SPEAKER (-) CIRCUIT SHORTED TO GROUND
RIGHT FRONT I/P SPEAKER
AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

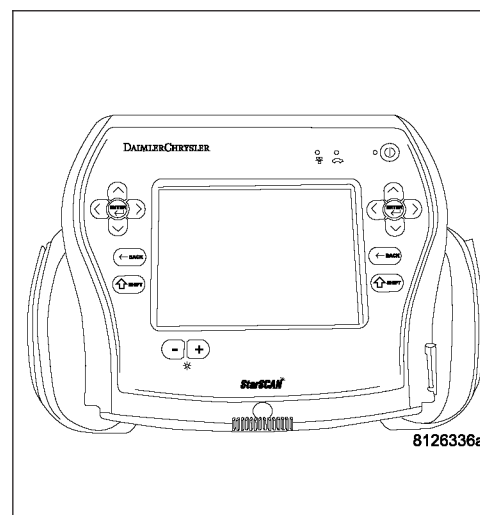
Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1466-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



**B1466-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)****2. CHECK THE (X208) AMPLIFIED RIGHT FRONT I/P SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND**

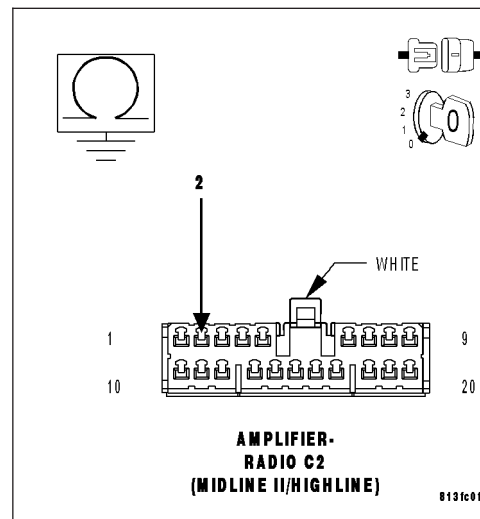
Disconnect the Amplifier C2 harness connector.

Measure the resistance between ground and the (X208) Amplified Right Front I/P Speaker (+) circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X208) Amplified Right Front I/P Speaker (+) circuit for a short to ground.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

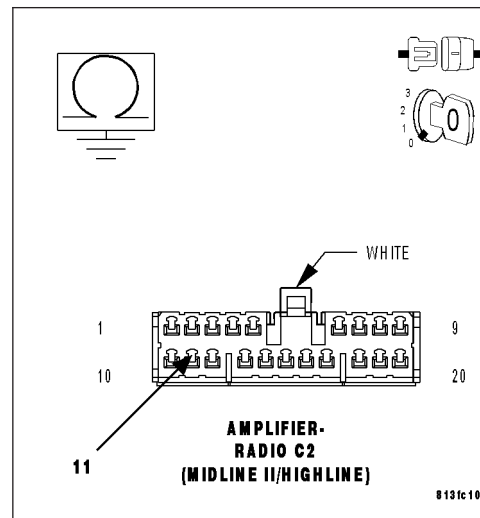
**3. CHECK THE (X298) AMPLIFIED RIGHT FRONT I/P SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (X298) Amplified Right Front I/P Speaker (-) circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X298) Amplified Right Front I/P Speaker (-) for a short to ground.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 4





**B1466-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)****4. CHECK OPERATION OF THE AMPLIFIED RIGHT FRONT I/P SPEAKER**

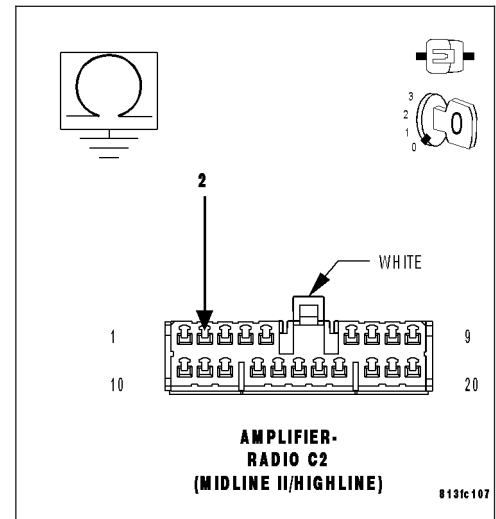
Turn the ignition off.

Reconnect and reinstall the Right Front I/P Speaker.

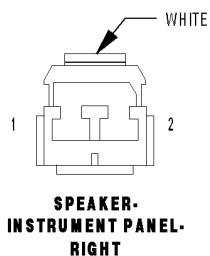
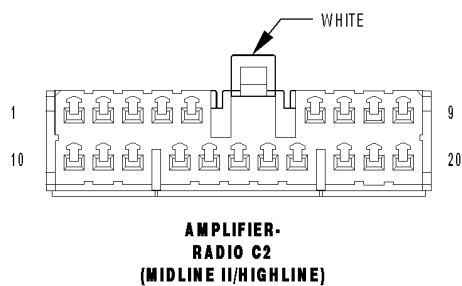
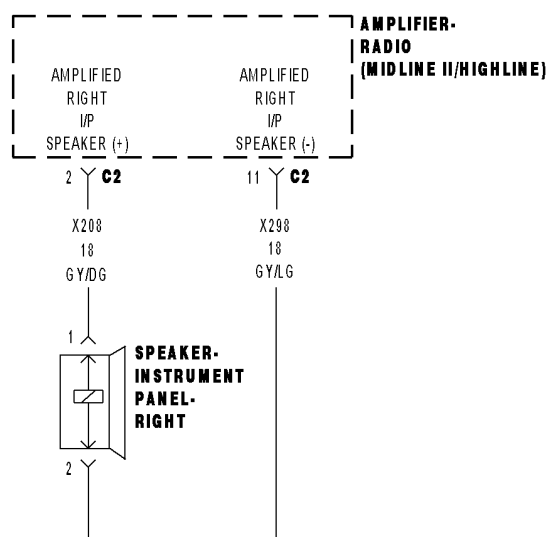
Measure the resistance of the speaker circuit between the Amplifier C2 harness connector and ground..

**Is the resistance below 10K ohms?**

- Yes** >> Replace the Right Front I/P Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.
- No** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.



## B1467-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT HIGH



**B1467-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT SHORT TO VOLTAGE (X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT SHORT TO VOLTAGE AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

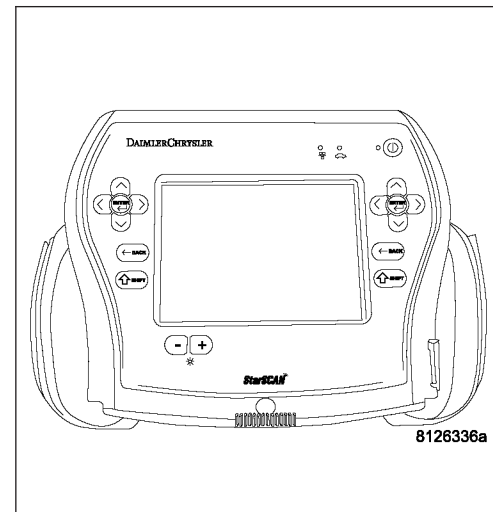
Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1467-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



**B1467-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)****2. CHECK FOR VOLTAGE ON THE (X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT**

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Disconnect the Amplified Right I/P Speaker harness connector.

Turn the ignition on.

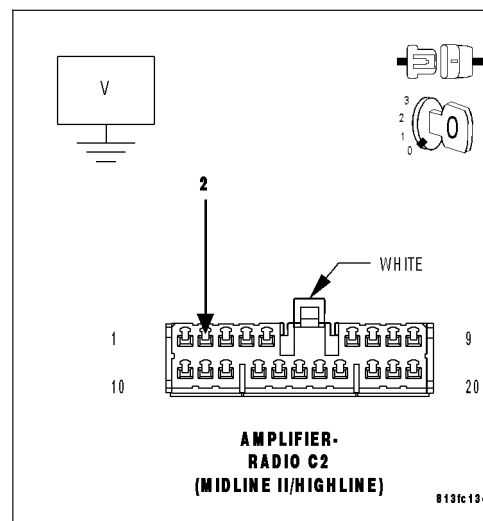
Measure for voltage on the (X208) Amplified Right I/P Speaker (+) circuit.

**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X208) Amplified Right I/P Speaker (+) circuit for a short to voltage.

Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**3. CHECK FOR VOLTAGE ON THE (X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT**

Measure for voltage on the (X298) Amplified Right I/P Speaker (-) circuit.

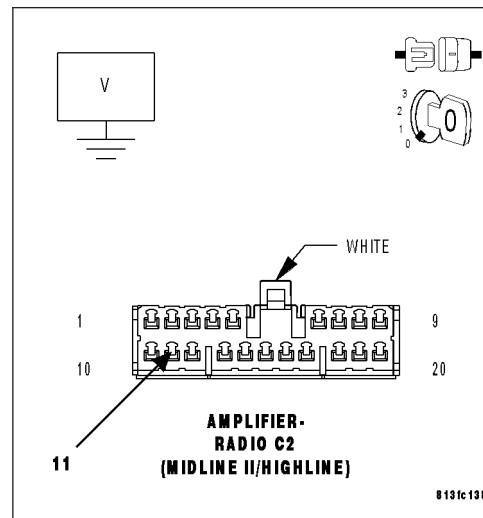
**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X298) Amplified Right I/P Speaker (-) circuit for a short to voltage.

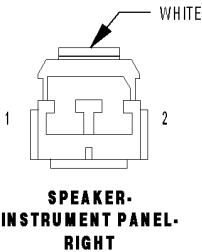
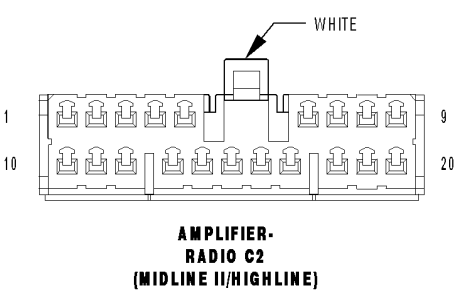
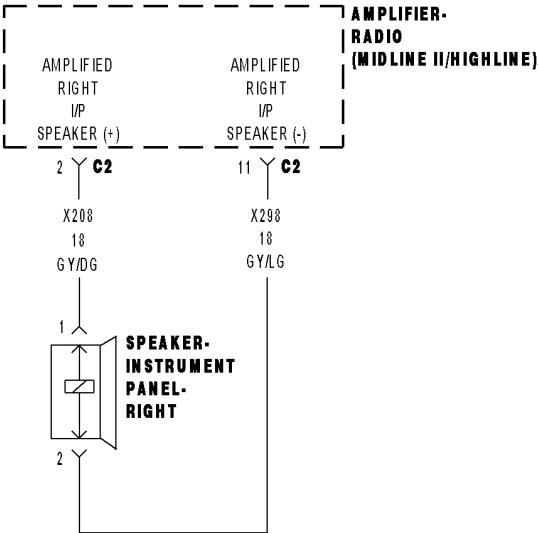
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.



B1468-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT OPEN



**B1468-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**  
The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT OPEN (X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT OPEN RIGHT I/P SPEAKER AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on.

Turn the radio on.

With the scan tool, erase Amplifier DTCs.

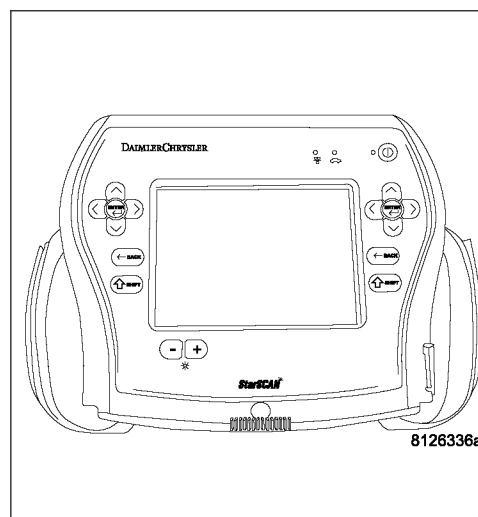
With the scan tool, reset the amplifier.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1468-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



**B1468-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)****2. CHECK THE OPERATION OF THE RIGHT FRONT I/P SPEAKER**

Disconnect the Right I/P Speaker harness connector.

Turn the radio on and turn the volume to mid level.

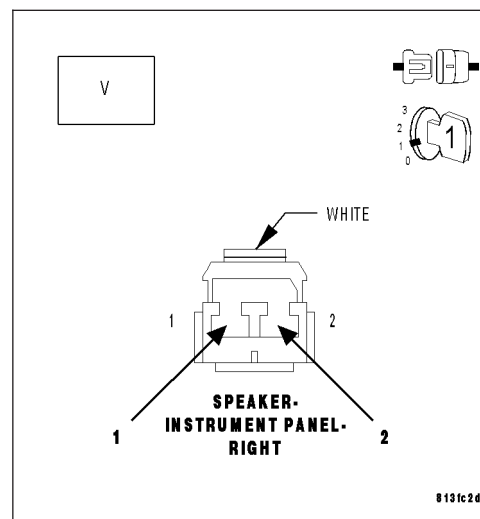
With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Right I/P Speaker circuits in the Amplified Right I/P Speaker harness connector.

**Is the voltage present greater than 1 volt?**

**Yes** >> Replace the Amplified Right I/P Speaker in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**3. CHECK THE (X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

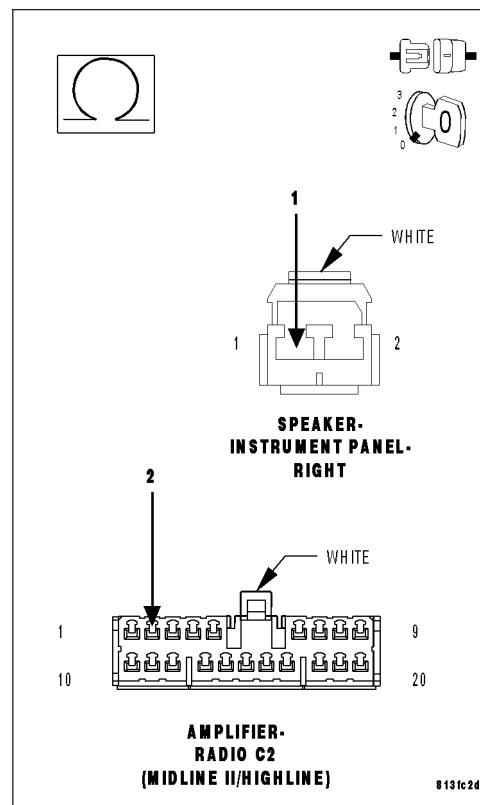
Measure the resistance of the (X208) Amplified Right I/P Speaker (+) circuit between the Amplifier C2 harness connector and the Amplified Right I/P Speaker harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (X208) Amplified Right I/P Speaker (+) circuit for an open.

Perform BODY VERIFICATION TEST VER-1.



**B1468-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)****4. CHECK THE (X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance of the (X298) Amplified Right I/P Speaker (-) circuit between the Amplifier C2 harness connector and the Amplified Right I/P Speaker harness connector.

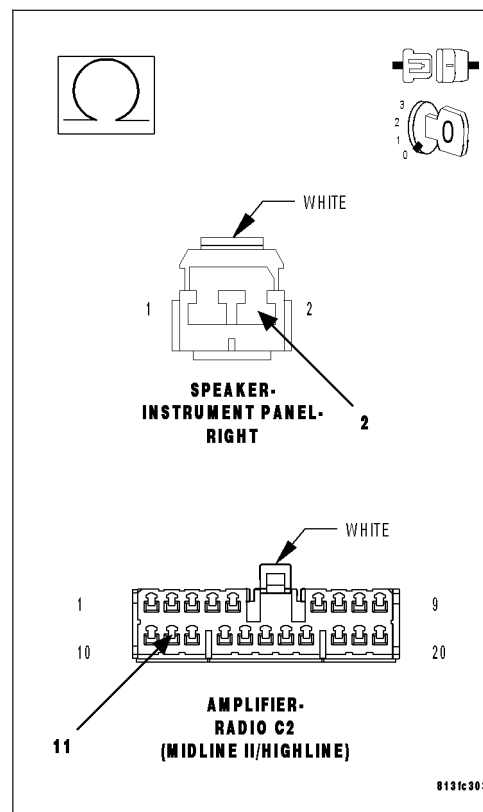
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.

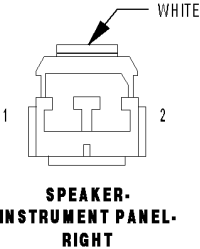
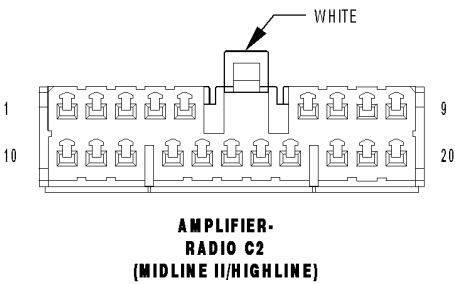
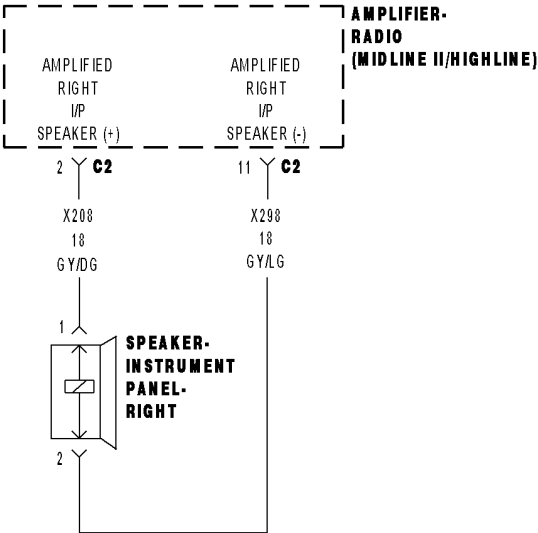
**No** >> Repair the (X298) Amplified Right I/P Speaker (-) circuit for an open.

Perform BODY VERIFICATION TEST VER-1.





B1469-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER



**B1469-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**  
The amplifier detects that the output circuits are shorted together.

Possible Causes
(X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT SHORTED TO THE (X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUIT AMPLIFIED RIGHT I/P SPEAKER AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

With the scan tool, erase Amplifier DTCs.

Turn the radio on.

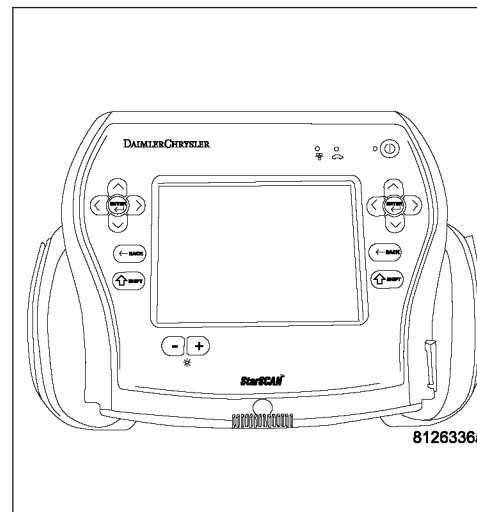
Turn the volume level to 25.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1469-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE OPERATION OF THE AMPLIFIED RIGHT I/P SPEAKER**

Disconnect the Amplified Right I/P Speaker.

Measure the resistance of the speaker between the two terminals.

**Is the resistance of the speaker less than 1 ohm?**

**Yes** >> Replace the Amplified Right I/P Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B1469-CHANNEL 2 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)****3. CHECK THE (X208) AMPLIFIED RIGHT I/P SPEAKER (+) CIRCUIT, AND THE (X298) AMPLIFIED RIGHT I/P SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Amplifier C2 harness connector.

Measure the resistance between the (X208) Amplified Right I/P Speaker (+) circuit, and the (X298) Amplified Right I/P Speaker (-) circuit.

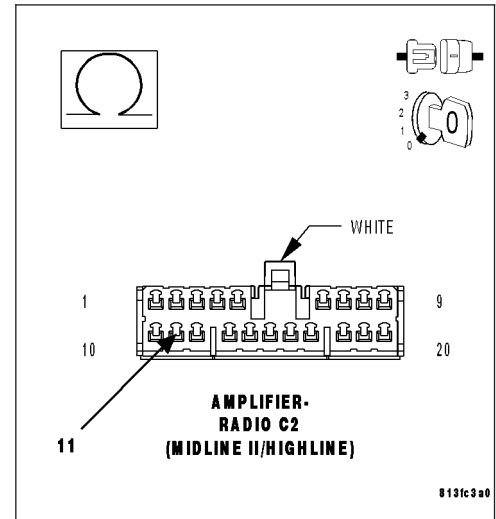
**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X208) Amplified Right I/P Speaker (+) circuit, and the (X298) Amplified Right I/P Speaker (-) circuit for a short together.

Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Amplifier in accordance with the service information.

Perform BODY VERIFICATION TEST VER-1.



**B146A-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of  $5 \pm 1$  sec.

Possible Causes
AMPLIFIER

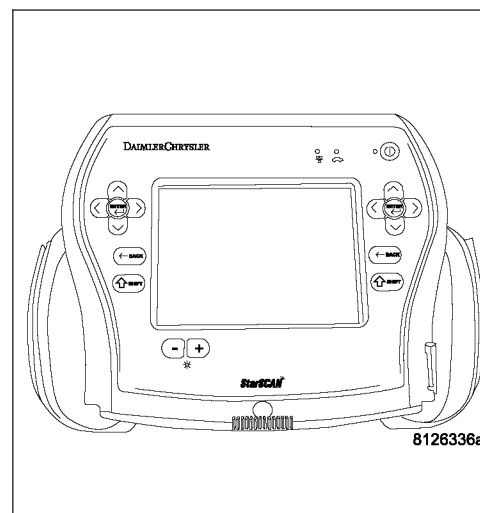
**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

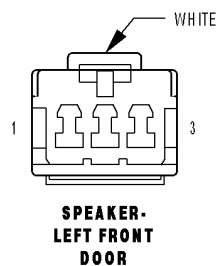
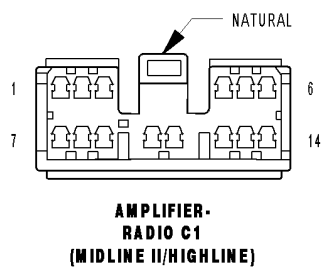
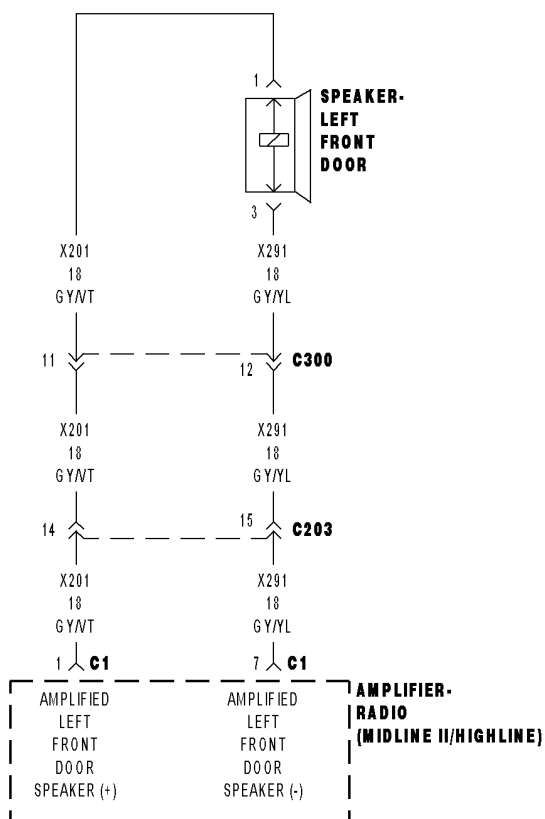
Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B146A-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?**

- Yes** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



**B146B-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT LOW**

**B146B-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X201) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT SHORTED TO GROUND (X291) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT SHORTED TO GROUND LEFT FRONT DOOR SPEAKER AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

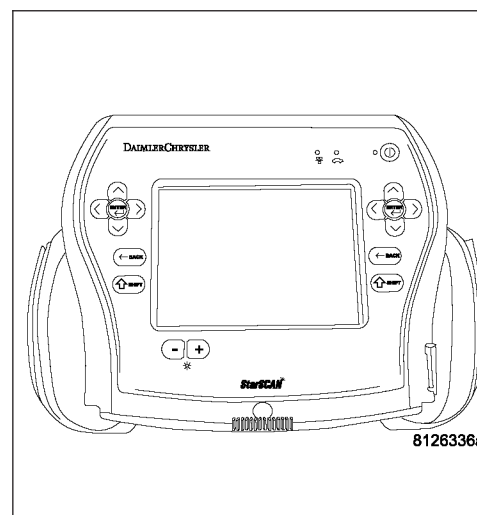
Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B146B-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE (X201) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND**

Disconnect the Amplifier C1 harness connector.

Measure the resistance between ground and the (X201) Amplified Left Front Door Speaker (+) circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X201) Amplified Left Front Door Speaker (+) circuit for a short to ground.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B146B-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)**

**3. CHECK THE (X291) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (X291) Amplified Left Front Door Speaker (-) circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X291) Amplified Left Front Door Speaker (-) for a short to ground.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 4

---

**4. CHECK OPERATION OF THE AMPLIFIED LEFT FRONT DOOR SPEAKER**

Turn the ignition off.

Reconnect and reinstall the Left Front Door Speaker.

Measure the resistance of the speaker circuit between the Amplifier C1 harness connector and ground..

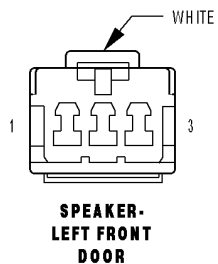
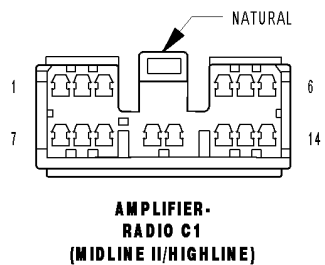
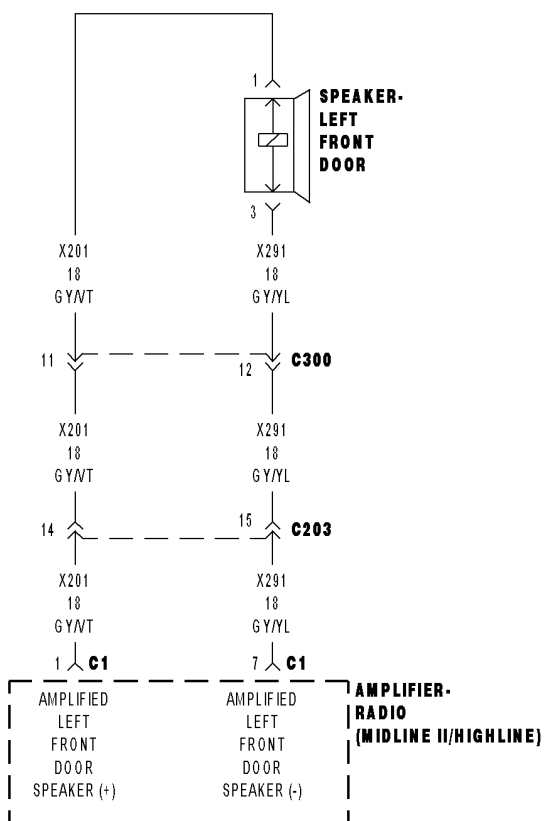
**Is the resistance below 10K ohms?**

**Yes** >> Replace the Left Front Door Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

---

# B146C-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT HIGH





**B146C-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X201) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT SHORT TO VOLTAGE (X291) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT SHORT TO VOLTAGE AMPLIFIER

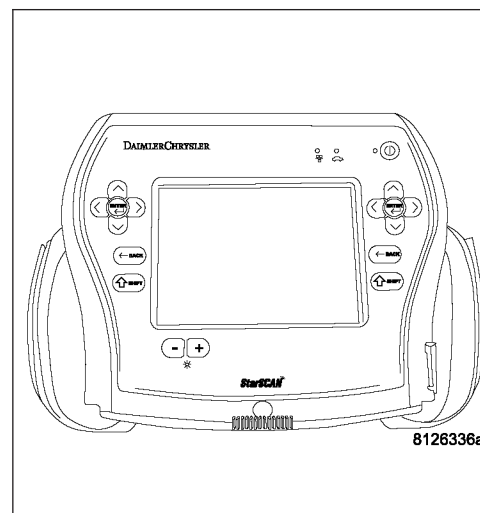
**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B146C-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?**

- Yes** >> Go To 2
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK FOR VOLTAGE ON THE (X201) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Disconnect the Amplified Left Front Door Speaker harness connector.

Turn the ignition on.

Measure for voltage on the (X201) Amplified Left Front Door Speaker (+) circuit.

**Is the voltage above 10.0 volts?**

- Yes** >> Repair the (X201) Amplified Left Front Door Speaker (+) circuit for a short to voltage.  
Perform BODY VERIFICATION TEST VER-1.
- No** >> Go To 3

**B146C-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

**3. CHECK FOR VOLTAGE ON THE (X291) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT**

Measure for voltage on the (X291) Amplified Left Front Door Speaker (-) circuit.

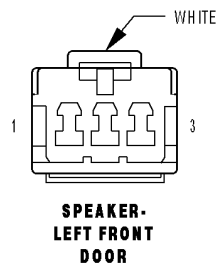
**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X291) Amplified Left Front Door Speaker (-) circuit for a short to voltage.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

---

The diagram illustrates the electrical connection for the left front door speaker. At the bottom, a dashed box represents the 'AMPLIFIER-RADIO (MIDLINE II/HIGHLINE)', containing two columns of terminals. The left column has terminals 1, 14, and 11, all labeled 'X201 18 GY/VT' and 'C1'. The right column has terminals 7, 15, and 12, all labeled 'X291 18 GY/YL' and 'C1'. A solid line connects terminal 1 to terminal 12. Another solid line connects terminal 11 to terminal 14. A dashed line connects terminal 14 to terminal 12. A solid line connects terminal 12 to terminal 15. A solid line connects terminal 15 to terminal 7. A solid line connects terminal 7 to the speaker. The speaker is labeled 'SPEAKER-LEFT FRONT DOOR' and is shown with a switch and a terminal block. The terminal block has terminals 1 and 3, both labeled 'X291 18 GY/YL' and 'C300'. The speaker is connected to terminal 1.



**B146D-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**  
The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X201) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT OPEN
(X291) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT OPEN
LEFT REAR DOOR SPEAKER
AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on.

Turn the radio on.

With the scan tool, erase Amplifier DTCs.

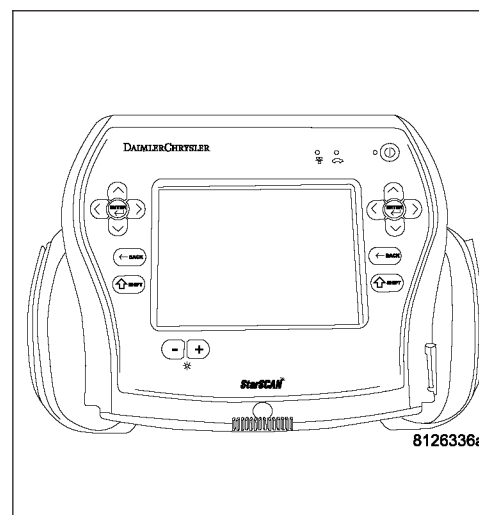
With the scan tool, reset the amplifier.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B146D-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE OPERATION OF THE LEFT REAR DOOR SPEAKER**

Disconnect the Left Rear Door Speaker harness connector.

Turn the radio on and turn the volume to mid level.

With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Left Rear Door Speaker circuits in the Amplified Left Rear Door Speaker harness connector.

**Is the voltage present greater than 1 volt?**

**Yes** >> Replace the Amplified Left Rear Door Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B146D-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)****3. CHECK THE (X201) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X201) Amplified Left Rear Door Speaker (+) circuit between the Amplifier C1 harness connector and the Amplified Left Rear Door Speaker harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (X201) Amplified Left Rear Door Speaker (+) circuit for an open.  
Perform BODY VERIFICATION TEST VER-1.

---

**4. CHECK THE (X291) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X291) Amplified Left Rear Door Speaker (-) circuit between the Amplifier C1 harness connector and the Amplified Left Rear Door Speaker harness connector.

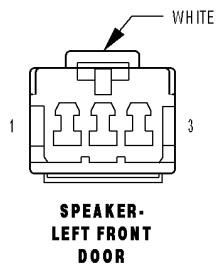
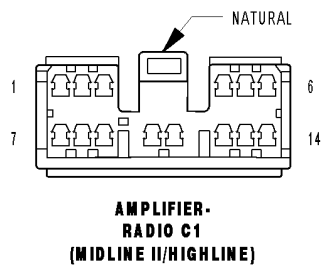
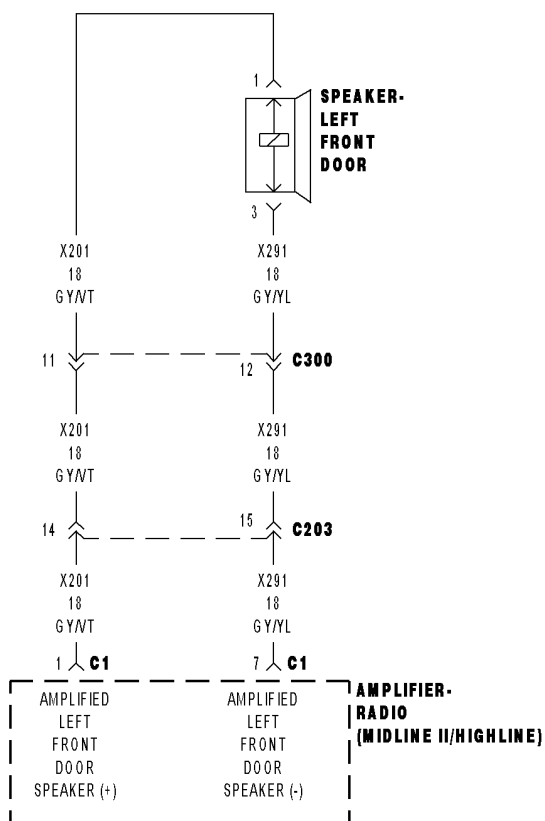
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Repair the (X291) Amplified Left Rear Door Speaker (-) circuit for an open.  
Perform BODY VERIFICATION TEST VER-1.

---

# B146E-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER



**B146E-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**  
The amplifier detects that the output circuits are shorted together.

Possible Causes
(X201) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT SHORTED TO THE (X291) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUIT AMPLIFIED LEFT FRONT DOOR SPEAKER AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

With the scan tool, erase Amplifier DTCs.

Turn the radio on.

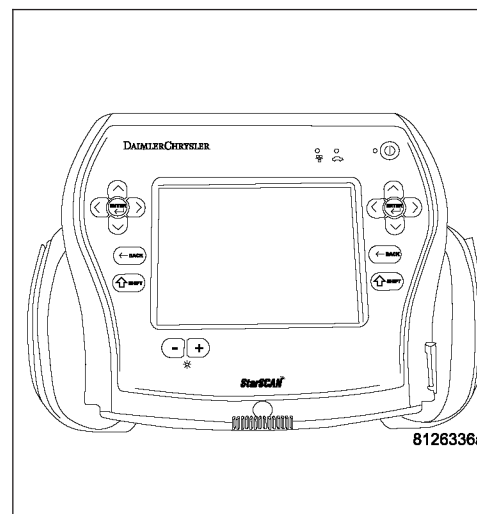
Turn the volume level to 25.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B146E-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE OPERATION OF THE AMPLIFIED LEFT FRONT DOOR SPEAKER**

Disconnect the Amplified Left Front Door Speaker.

Measure the resistance of the speaker between the two terminals.

**Is the resistance of the speaker less than 1 ohm?**

**Yes** >> Replace the Amplified Left Front Door Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B146E-CHANNEL 3 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)****3. CHECK THE (X201) AMPLIFIED LEFT FRONT DOOR SPEAKER (+) CIRCUIT, AND THE (X291) AMPLIFIED LEFT FRONT DOOR SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance between the (X201) Amplified Left Front Door Speaker (+) circuit, and the (X291) Amplified Left Front Door Speaker (-) circuit.

**Is the resistance below 10K ohms?**

- Yes**    >> Repair the (X201) Amplified Left Front Door Speaker (+) circuit, and the (X291) Amplified Left Front Door Speaker (-) circuit for a short together.  
            Perform BODY VERIFICATION TEST VER-1.
- No**      >> Replace the Amplifier in accordance with the service information.  
            Perform BODY VERIFICATION TEST VER-1.
-



B146F-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

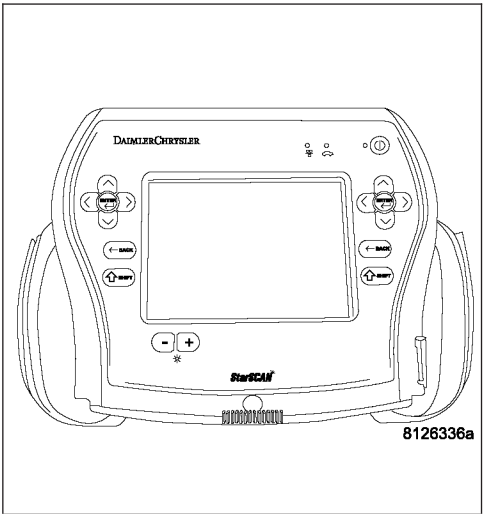
Turn the ignition on, then off, and then on again.  
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B146F-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

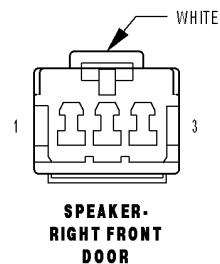
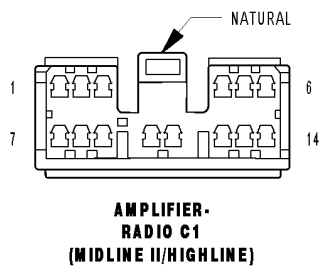
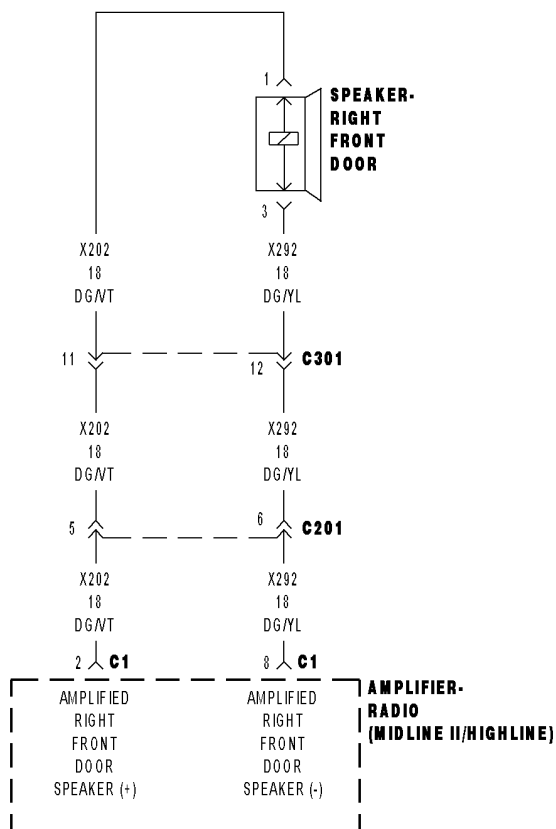
- Yes

>> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.
- No

>> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



# B1470-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT LOW



**B1470-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT SHORTED TO GROUND (X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT SHORTED TO GROUND RIGHT FRONT DOOR SPEAKER AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

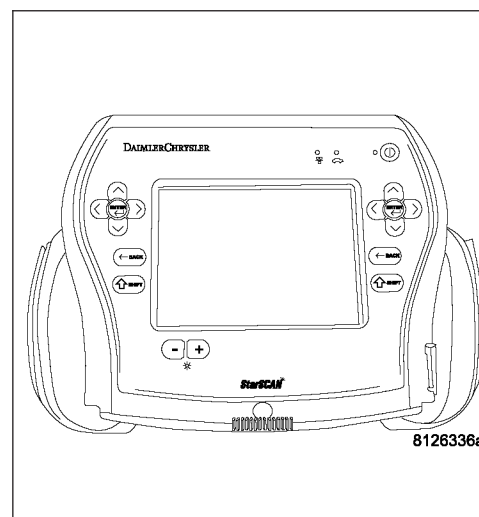
Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1470-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE (X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND**

Disconnect the Amplifier C1 harness connector.

Measure the resistance between ground and the (X202) Amplified Right Front Door Speaker (+) circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X202) Amplified Left Front Door Speaker (+) circuit for a short to ground.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B1470-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)****3. CHECK THE (X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (X292) Amplified Right Front Door Speaker (-) circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X292) Amplified Right Front Door Speaker (-) for a short to ground.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 4

---

**4. CHECK OPERATION OF THE AMPLIFIED RIGHT FRONT DOOR SPEAKER**

Turn the ignition off.

Reconnect and reinstall the Right Front Door Speaker.

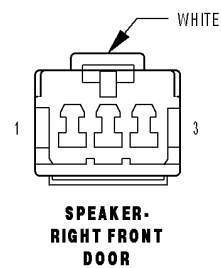
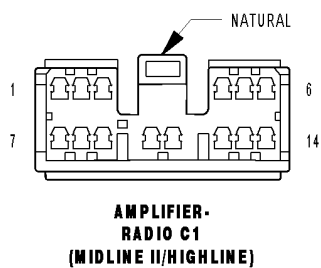
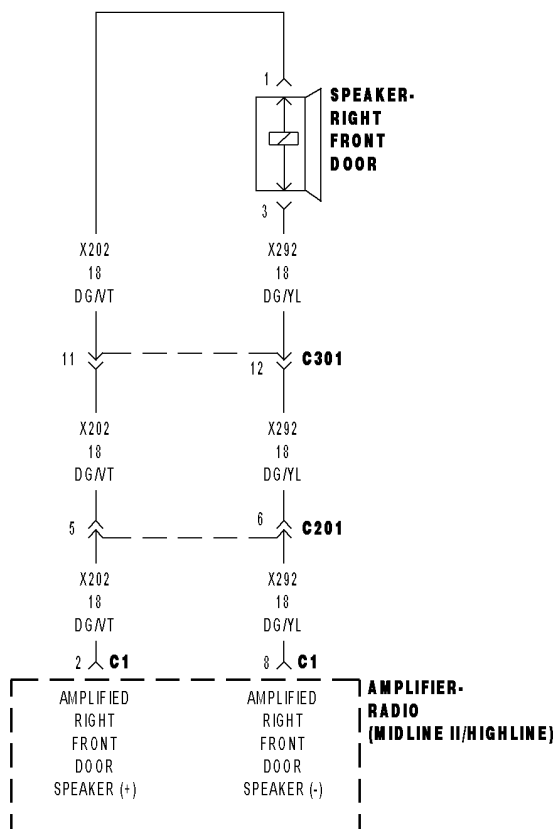
Measure the resistance of the speaker circuit between the Amplifier C1 harness connector and ground..

**Is the resistance below 10K ohms?**

**Yes** >> Replace the Right Front Door Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

---

**B1471-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT HIGH**

**B1471-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT SHORT TO VOLTAGE (X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT SHORT TO VOLTAGE AMPLIFIER

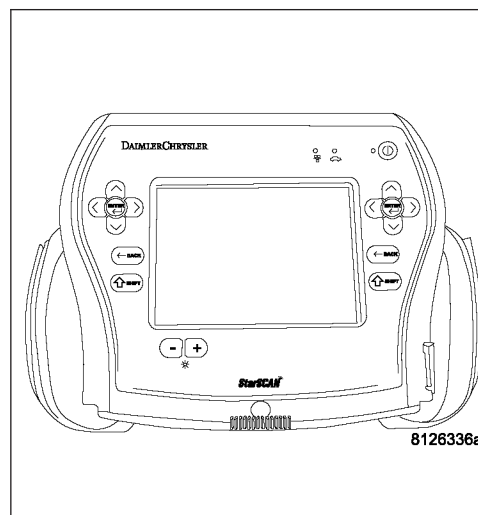
**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1471-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?**

- Yes** >> Go To 2
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK FOR VOLTAGE ON THE (X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Disconnect the Amplified Right Front Door Speaker harness connector.

Turn the ignition on.

Measure for voltage on the (X202) Amplified Right Front Door Speaker (+) circuit.

**Is the voltage above 10.0 volts?**

- Yes** >> Repair the (X202) Amplified Right Front Door Speaker (+) circuit for a short to voltage.  
Perform BODY VERIFICATION TEST VER-1.
- No** >> Go To 3

**B1471-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

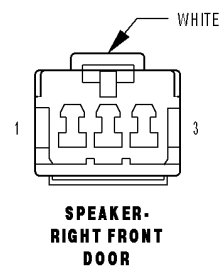
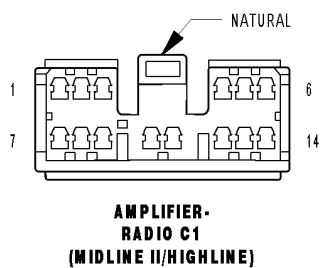
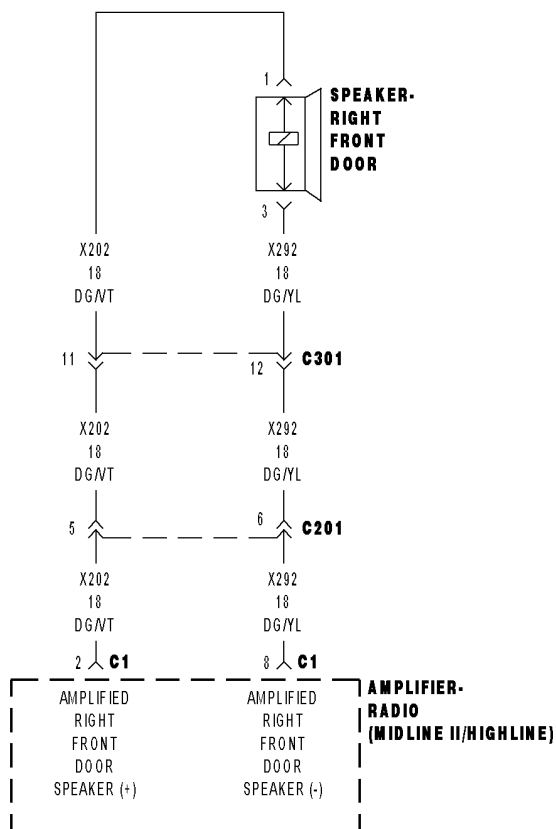
**3. CHECK FOR VOLTAGE ON THE (X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT**

Measure for voltage on the (X292) Amplified Right Front Door Speaker (-) circuit.

**Is the voltage above 10.0 volts?**

- Yes**    >> Repair the (X292) Amplified Right Front Door Speaker (-) circuit for a short to voltage.  
            Perform BODY VERIFICATION TEST VER-1.
- No**      >> Replace the Amplifier in accordance with the service information.  
            Perform BODY VERIFICATION TEST VER-1.
-

# B1472-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT OPEN





**B1472-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**  
The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT OPEN (X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT OPEN RIGHT FRONT DOOR SPEAKER AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on.

Turn the radio on.

With the scan tool, erase Amplifier DTCs.

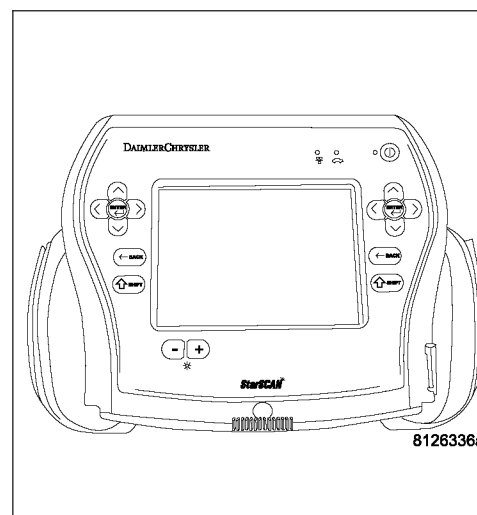
With the scan tool, reset the amplifier.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1472-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE OPERATION OF THE RIGHT FRONT DOOR SPEAKER**

Disconnect the Right Front Door Speaker harness connector.

Turn the radio on and turn the volume to mid level.

With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Right Front Door Speaker circuits in the Amplified Right Front Door Speaker harness connector.

**Is the voltage present greater than 1 volt?**

**Yes** >> Replace the Amplified Right Front Door Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B1472-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)****3. CHECK THE (X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X202) Amplified Right Front Door Speaker (+) circuit between the Amplifier C1 harness connector and the Amplified Right Front Door Speaker harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (X202) Amplified Right Front Door Speaker (+) circuit for an open.  
Perform BODY VERIFICATION TEST VER-1.

---

**4. CHECK THE (X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

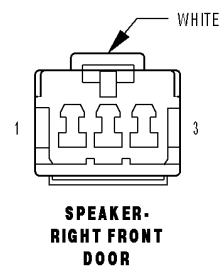
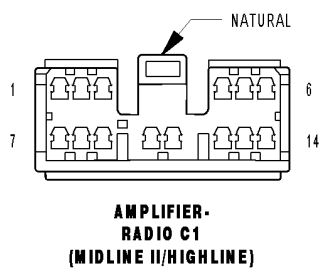
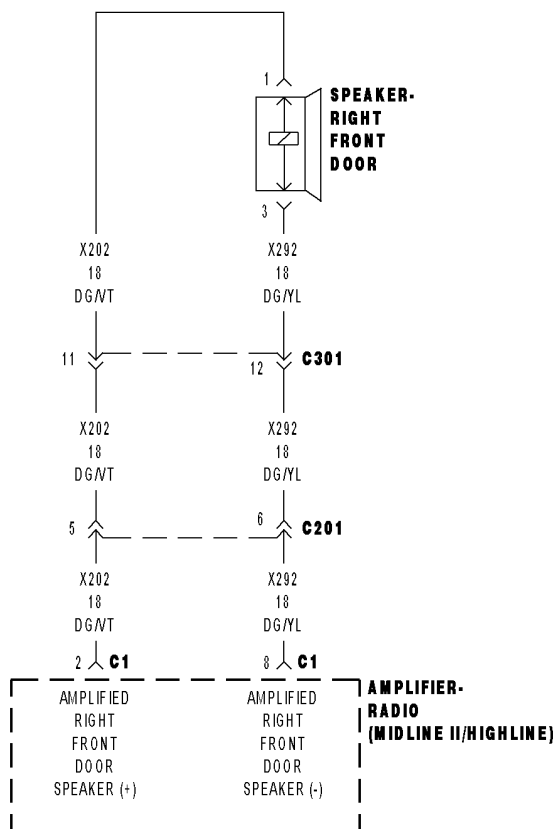
Measure the resistance of the (X292) Amplified Right Front Door Speaker (-) circuit between the Amplifier C1 harness connector and the Amplified Right Front Door Speaker harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Repair the (X292) Amplified Right Front Door Speaker (-) circuit for an open.  
Perform BODY VERIFICATION TEST VER-1.

---

**B1473-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER**

**B1473-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**  
The amplifier detects that the output circuits are shorted together.

Possible Causes
(X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT SHORTED TO THE (X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUIT AMPLIFIED RIGHT FRONT DOOR SPEAKER AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

With the scan tool, erase Amplifier DTCs.

Turn the radio on.

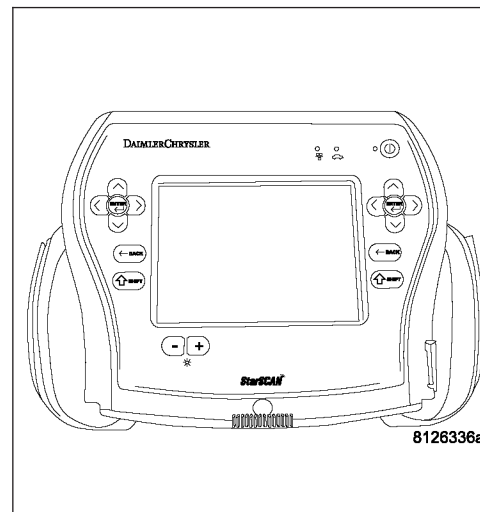
Turn the volume level to 25.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1473-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE OPERATION OF THE AMPLIFIED RIGHT FRONT DOOR SPEAKER**

Disconnect the Amplified Right Front Door Speaker.

Measure the resistance of the speaker between the two terminals.

**Is the resistance of the speaker less than 1 ohm?**

**Yes** >> Replace the Amplified Right Front Door Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B1473-CHANNEL 4 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)****3. CHECK THE (X202) AMPLIFIED RIGHT FRONT DOOR SPEAKER (+) CIRCUIT, AND THE (X292) AMPLIFIED RIGHT FRONT DOOR SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance between the (X202) Amplified Right Front Door Speaker (+) circuit, and the (X292) Amplified Right Front Door Speaker (-) circuit.

**Is the resistance below 10K ohms?**

- Yes**    >> Repair the (X202) Amplified Right Front Door Speaker (+) circuit, and the (X292) Amplified Right Front Door Speaker (-) circuit for a short together.  
            Perform BODY VERIFICATION TEST VER-1.
- No**      >> Replace the Amplifier in accordance with the service information.  
            Perform BODY VERIFICATION TEST VER-1.
-

**B1474-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of  $5 \pm 1$  sec.

Possible Causes
AMPLIFIER

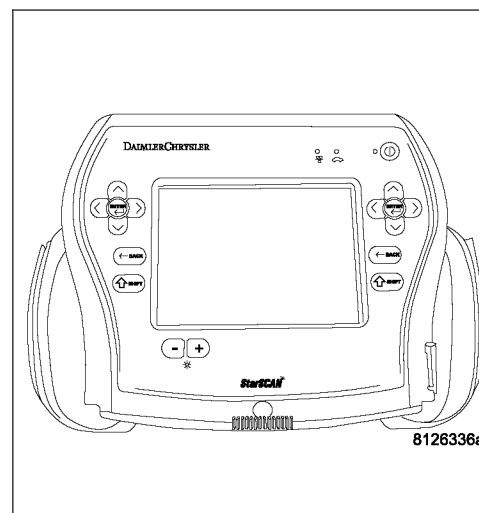
**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

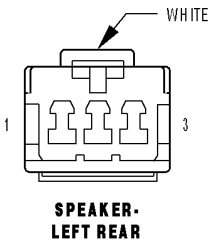
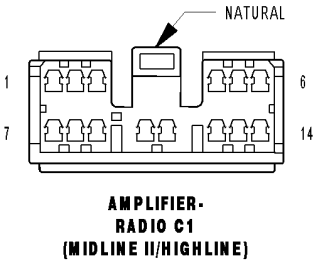
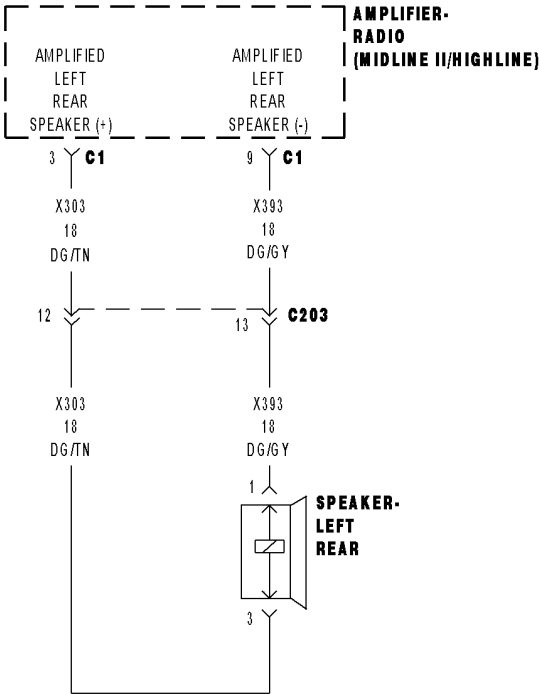
With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1474-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?**

- Yes** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



B1475-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT LOW



**B1475-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X393) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT SHORTED TO GROUND (X303) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT SHORTED TO GROUND LEFT REAR DOOR SPEAKER AMPLIFIER

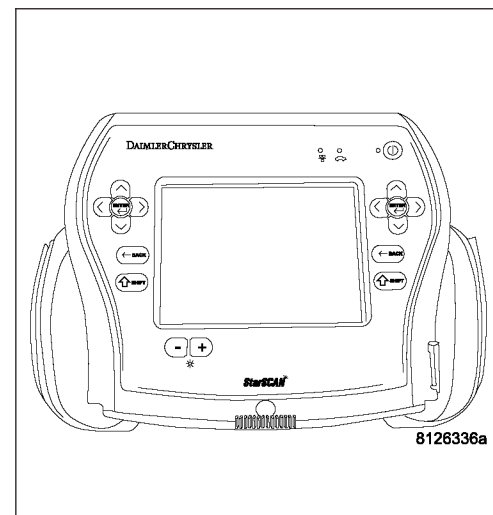
**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1475-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

- Yes** >> Go To 2
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE (X393) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND**

Disconnect the Amplifier C1 harness connector.

Measure the resistance between ground and the (X393) Amplified Left Rear Door Speaker (+) circuit.

**Is the resistance below 10K ohms?**

- Yes** >> Repair the (X393) Amplified Left Rear Door Speaker (+) circuit for a short to ground.  
Perform BODY VERIFICATION TEST VER-1.
- No** >> Go To 3



**B1475-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)****3. CHECK THE (X303) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (X303) Amplified Left Rear Door Speaker (-) circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X303) Amplified Left Rear Door Speaker (-) for a short to ground.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 4

---

**4. CHECK OPERATION OF THE AMPLIFIED LEFT REAR DOOR SPEAKER**

Turn the ignition off.

Reconnect and reinstall the Left Rear Door Speaker.

Measure the resistance of the speaker circuit between the Amplifier C1 harness connector and ground..

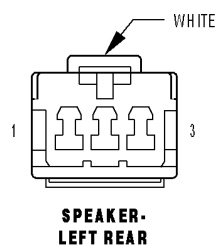
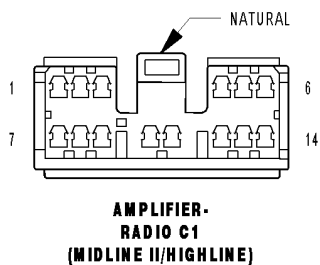
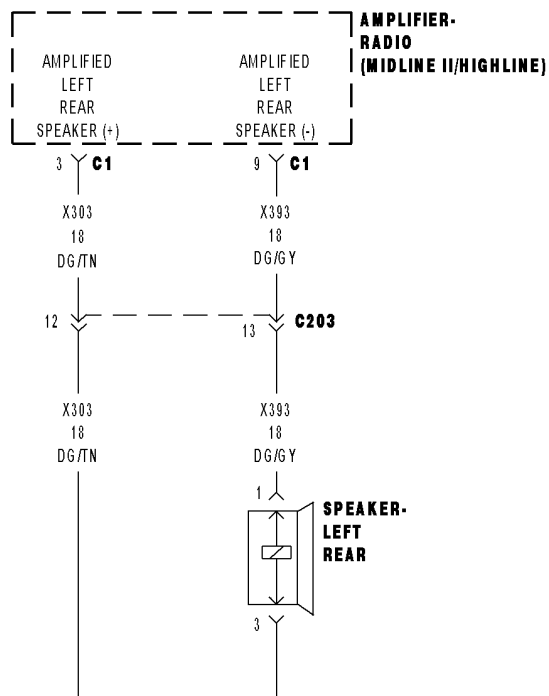
**Is the resistance below 10K ohms?**

**Yes** >> Replace the Left Rear Door Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

---

## B1476-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT HIGH



**B1476-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X393) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT SHORT TO VOLTAGE (X303) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT SHORT TO VOLTAGE AMPLIFIER

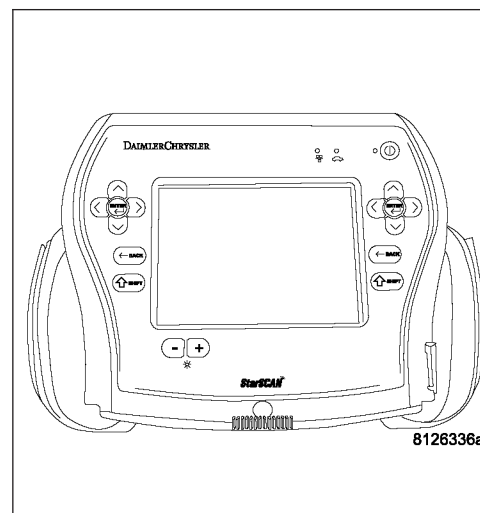
**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1476-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?**

- Yes** >> Go To 2
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK FOR VOLTAGE ON THE (X393) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Disconnect the Amplified Left Rear Door Speaker harness connector.

Turn the ignition on.

Measure for voltage on the (X393) Amplified Left Rear Door Speaker (+) circuit.

**Is the voltage above 10.0 volts?**

- Yes** >> Repair the (X393) Amplified Left Rear Door Speaker (+) circuit for a short to voltage.  
Perform BODY VERIFICATION TEST VER-1.
- No** >> Go To 3

**B1476-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

**3. CHECK FOR VOLTAGE ON THE (X303) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT**

Measure for voltage on the (X303) Amplified Left Rear Door Speaker (-) circuit.

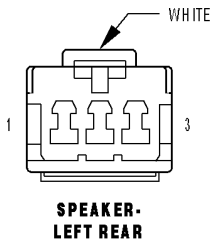
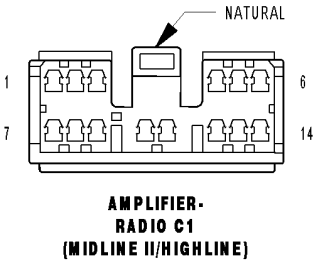
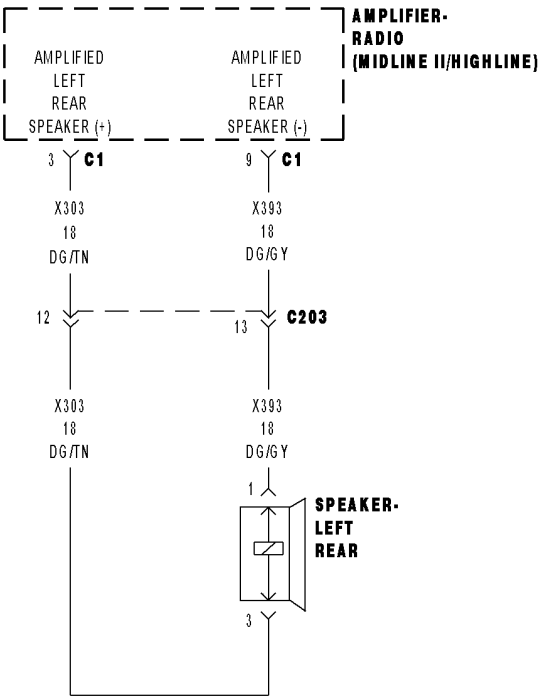
**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X303) Amplified Left Rear Door Speaker (-) circuit for a short to voltage.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

---

B1477-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT OPEN



**B1477-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**  
The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X393) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT OPEN (X303) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT OPEN LEFT REAR DOOR SPEAKER AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on.

Turn the radio on.

With the scan tool, erase Amplifier DTCs.

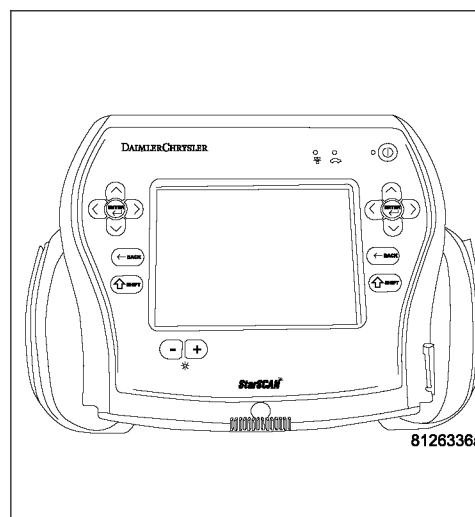
With the scan tool, reset the amplifier.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1477-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE OPERATION OF THE LEFT REAR DOOR SPEAKER**

Disconnect the Left Rear Door Speaker harness connector.

Turn the radio on and turn the volume to mid level.

With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Left Rear Door Speaker circuits in the Amplified Left Rear Door Speaker harness connector.

**Is the voltage present greater than 1 volt?**

**Yes** >> Replace the Amplified Left I/P Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B1477-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)****3. CHECK THE (X393) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X393) Amplified Left Rear Door Speaker (+) circuit between the Amplifier C1 harness connector and the Amplified Left Rear Door Speaker harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (X393) Amplified Left Rear Door Speaker (+) circuit for an open.  
Perform BODY VERIFICATION TEST VER-1.

---

**4. CHECK THE (X303) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X303) Amplified Left Rear Door Speaker (-) circuit between the Amplifier C1 harness connector and the Amplified Left Rear Door Speaker harness connector.

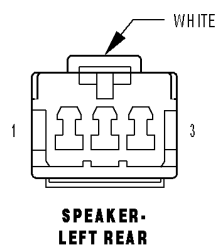
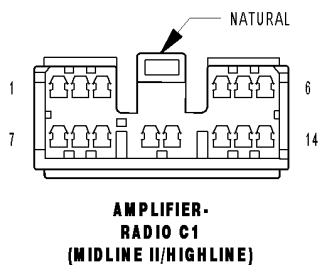
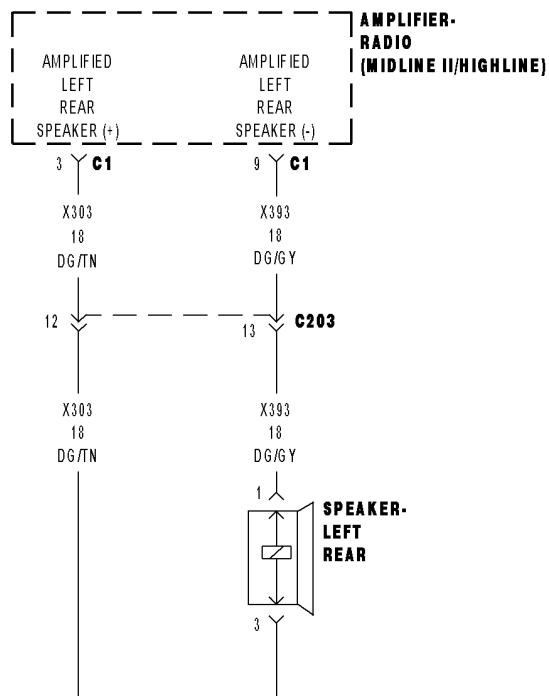
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Repair the (X303) Amplified Left Rear Door Speaker (-) circuit for an open.  
Perform BODY VERIFICATION TEST VER-1.

---

## B1478-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER





**B1478-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**  
The amplifier detects that the output circuits are shorted together.

**Possible Causes**

(X393) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT SHORTED TO THE (X303) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUIT  
AMPLIFIED LEFT REAR DOOR SPEAKER  
AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

With the scan tool, erase Amplifier DTCs.

Turn the radio on.

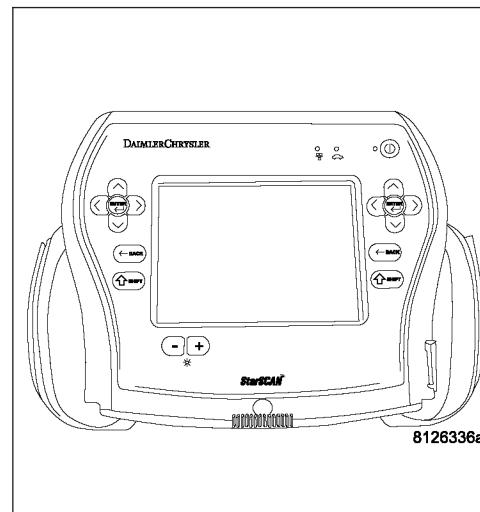
Turn the volume level to 25.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1478-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE OPERATION OF THE AMPLIFIED LEFT REAR DOOR SPEAKER**

Disconnect the Amplified Left Rear Door Speaker.

Measure the resistance of the speaker between the two terminals.

**Is the resistance of the speaker less than 1 ohm?**

**Yes** >> Replace the Amplified Left Rear Door Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B1478-CHANNEL 5 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)****3. CHECK THE (X393) AMPLIFIED LEFT REAR DOOR SPEAKER (+) CIRCUIT, AND THE (X303) AMPLIFIED LEFT REAR DOOR SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance between the (X393) Amplified Left Rear Door Speaker (+) circuit, and the (X303) Amplified Left Rear Door Speaker (-) circuit.

**Is the resistance below 10K ohms?**

- Yes**    >> Repair the (X393) Amplified Left Rear Door Speaker (+) circuit, and the (X303) Amplified Left Rear Door Speaker (-) circuit for a short together.  
            Perform BODY VERIFICATION TEST VER-1.
- No**      >> Replace the Amplifier in accordance with the service information.  
            Perform BODY VERIFICATION TEST VER-1.
-

B1479-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

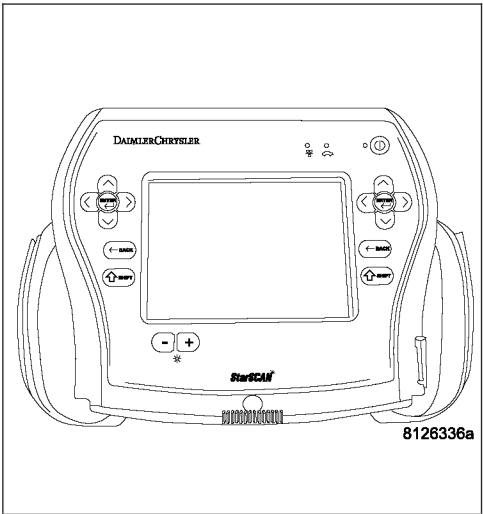
Turn the ignition on, then off, and then on again.  
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1479-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

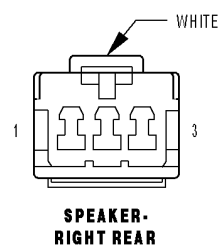
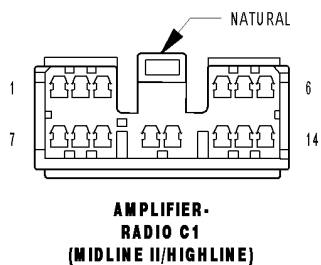
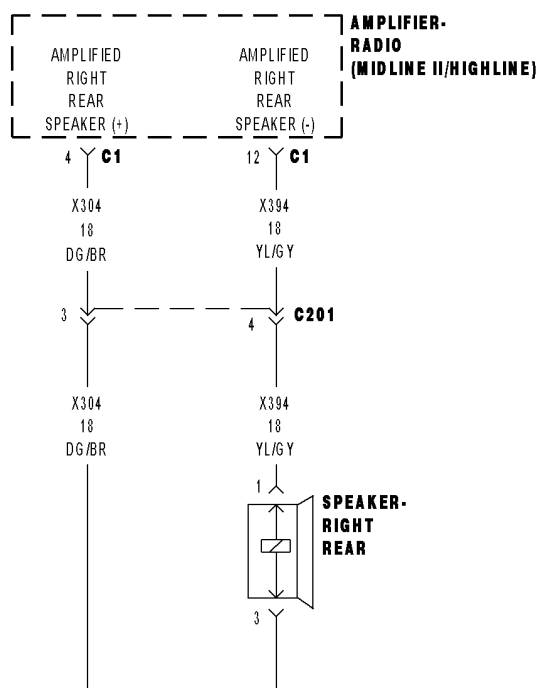
- Yes

>> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.
- No

>> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



# B147A-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT LOW



**B147A-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X304) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT SHORTED TO GROUND (X394) AMPLIFIED RIGHT REAR DOOR SPEAKER (-) CIRCUIT SHORTED TO GROUND RIGHT REAR DOOR SPEAKER AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

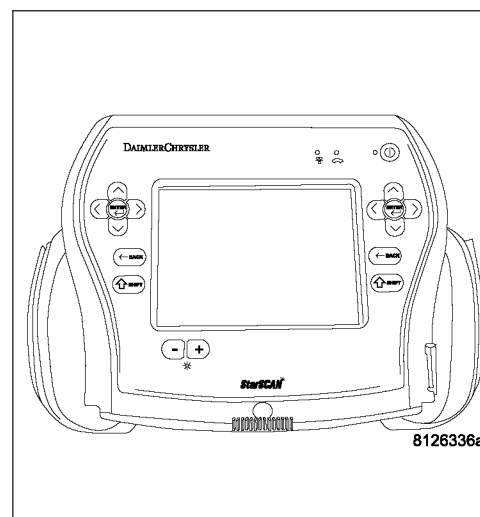
Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B147A-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE (X304) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT FOR A SHORT TO GROUND**

Disconnect the Amplifier C1 harness connector.

Measure the resistance between ground and the (X304) Amplified Right Rear Door Speaker (+) circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X304) Amplified Right Rear Door Speaker (+) circuit for a short to ground.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B147A-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)****3. CHECK THE (X394) AMPLIFIED RIGHT REAR DOOR SPEAKER (-) CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (X394) Amplified Right Rear Door Speaker (-) circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X394) Amplified Right Rear Door Speaker (-) for a short to ground.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 4

---

**4. CHECK OPERATION OF THE AMPLIFIED RIGHT REAR DOOR SPEAKER**

Turn the ignition off.

Reconnect and reinstall the Right Rear Door Speaker.

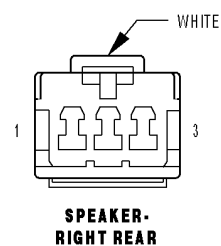
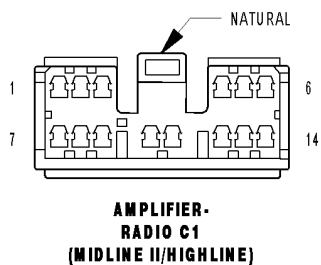
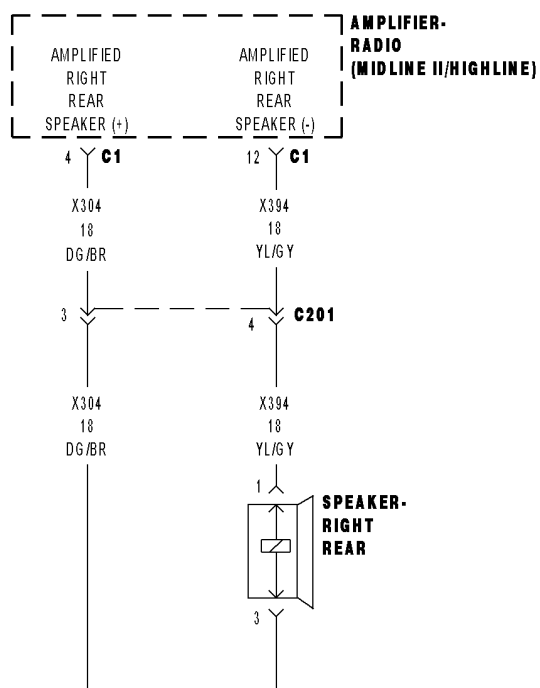
Measure the resistance of the speaker circuit between the Amplifier C1 harness connector and ground..

**Is the resistance below 10K ohms?**

**Yes** >> Replace the Right Rear Door Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

---

**B147B-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT HIGH**

**B147B-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X304) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT SHORT TO VOLTAGE (X394) AMPLIFIED RIGHT REAR DOOR SPEAKER (-) CIRCUIT SHORT TO VOLTAGE AMPLIFIER

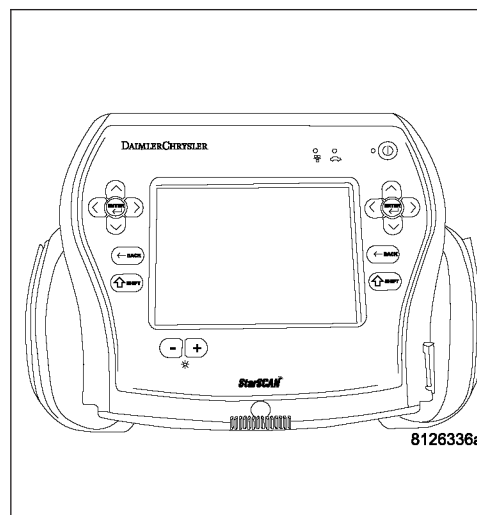
**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B147B-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?**

- Yes** >> Go To 2
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK FOR VOLTAGE ON THE (X304) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Disconnect the Amplified Right Rear Door Speaker harness connector.

Turn the ignition on.

Measure for voltage on the (X304) Amplified Right Rear Door Speaker (+) circuit.

**Is the voltage above 10.0 volts?**

- Yes** >> Repair the (X304) Amplified Right Rear Door Speaker (+) circuit for a short to voltage.  
Perform BODY VERIFICATION TEST VER-1.
- No** >> Go To 3



**B147B-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

**3. CHECK FOR VOLTAGE ON THE (X394) AMPLIFIED RIGHT REAR SPEAKER SPEAKER (-) CIRCUIT**

Measure for voltage on the (X394) Amplified Right Rear Door Speaker (-) circuit.

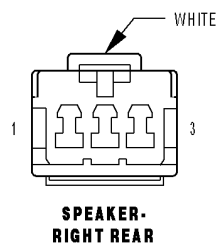
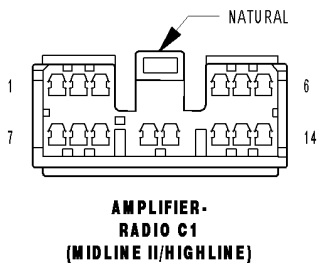
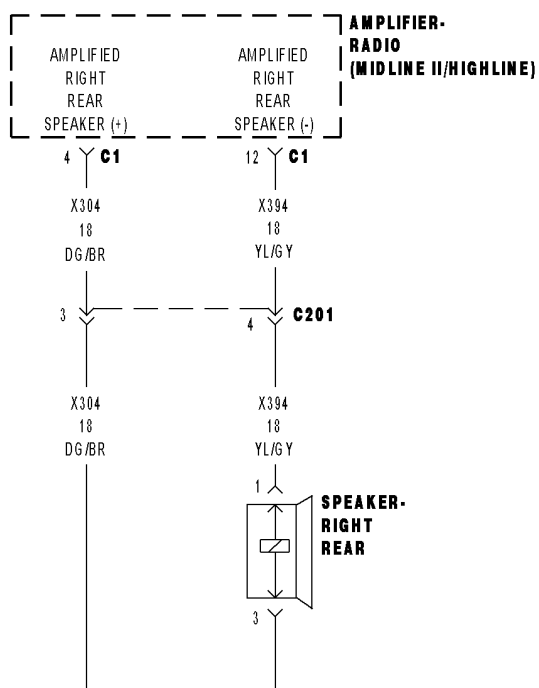
**Is the voltage above 10.0 volts?**

**Yes**    >> Repair the (X394) Amplified Right Rear Door Speaker (-) circuit for a short to voltage.  
             Perform BODY VERIFICATION TEST VER-1.

**No**      >> Replace the Amplifier in accordance with the service information.  
             Perform BODY VERIFICATION TEST VER-1.

---

# B147C-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT OPEN



**B147C-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**  
The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X304) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT OPEN (X394) AMPLIFIED RIGHT REAR DOOR SPEAKER (-) CIRCUIT OPEN RIGHT REAR DOOR SPEAKER AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on.

Turn the radio on.

With the scan tool, erase Amplifier DTCs.

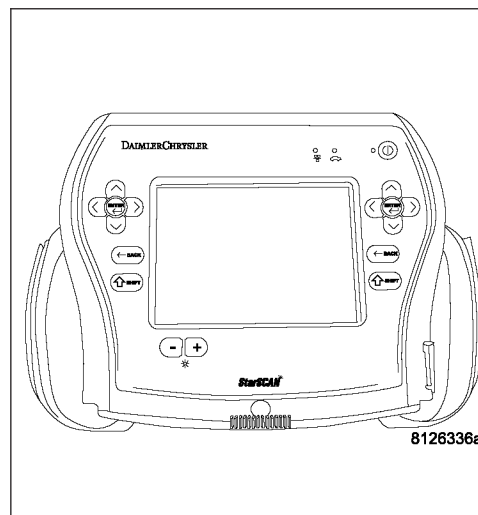
With the scan tool, reset the amplifier.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B147C-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE OPERATION OF THE RIGHT REAR DOOR SPEAKER**

Disconnect the Right Rear Door Speaker harness connector.

Turn the radio on and turn the volume to mid level.

With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Right Rear Door Speaker circuits in the Amplified Right Rear Door Speaker harness connector.

**Is the voltage present greater than 1 volt?**

**Yes** >> Replace the Amplified Right Rear Door Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B147C-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)****3. CHECK THE (X304) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X304) Amplified Right Rear Door Speaker (+) circuit between the Amplifier C1 harness connector and the Amplified Right Rear Door Speaker harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (X304) Amplified Right Rear Door Speaker (+) circuit for an open.  
Perform BODY VERIFICATION TEST VER-1.

---

**4. CHECK THE (X394) AMPLIFIED RIGHT REAR DOOR SPEAKER (-) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X394) Amplified Right Rear Door Speaker (-) circuit between the Amplifier C1 harness connector and the Amplified Right Rear Door Speaker harness connector.

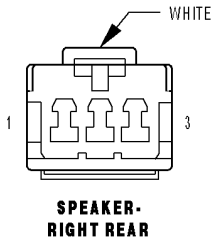
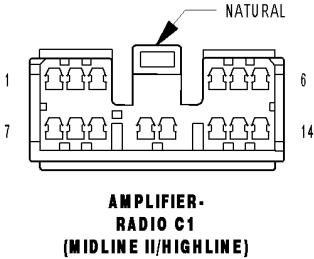
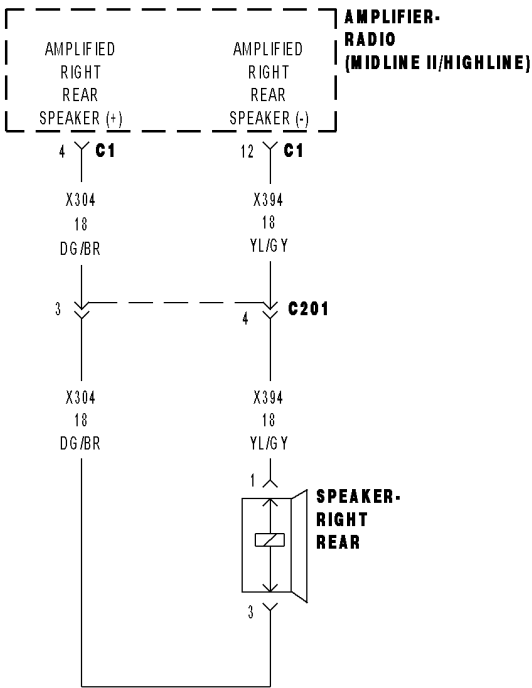
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Repair the (X394) Amplified Right Rear Door Speaker (-) circuit for an open.  
Perform BODY VERIFICATION TEST VER-1.

---

B147D-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER



**B147D-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**  
The amplifier detects that the output circuits are shorted together.

Possible Causes
(X304) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT SHORTED TO THE (X394) AMPLIFIED RIGHT REAR DOOR SPEAKER (-) CIRCUIT
AMPLIFIED RIGHT REAR DOOR SPEAKER
AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

With the scan tool, erase Amplifier DTCs.

Turn the radio on.

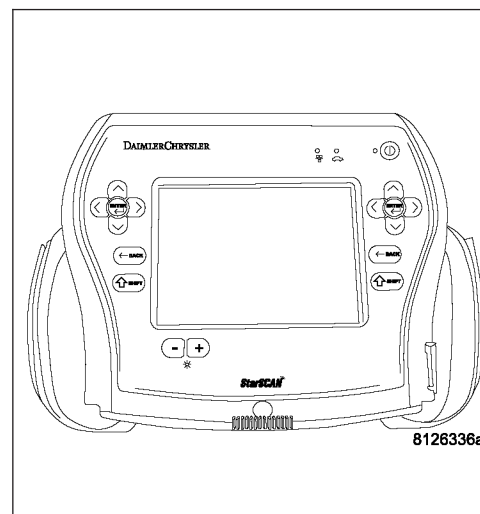
Turn the volume level to 25.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B147D-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE OPERATION OF THE AMPLIFIED RIGHT REAR DOOR SPEAKER**

Disconnect the Amplified Right Rear Door Speaker.

Measure the resistance of the speaker between the two terminals.

**Is the resistance of the speaker less than 1 ohm?**

**Yes** >> Replace the Amplified Right Rear Door Speaker in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B147D-CHANNEL 6 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)**

**3. CHECK THE (X304) AMPLIFIED RIGHT REAR DOOR SPEAKER (+) CIRCUIT, AND THE (X394) AMPLIFIED RIGHT REAR DOOR SPEAKER (-) CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance between the (X304) Amplified Right Rear Door Speaker (+) circuit, and the (X394) Amplified Right Rear Door Speaker (-) circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X304) Amplified Right Rear Door Speaker (+) circuit, and the (X394) Amplified Right Rear Door Speaker (-) circuit for a short together.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

---

**B147E-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of  $5 \pm 1$  sec.

Possible Causes
AMPLIFIER

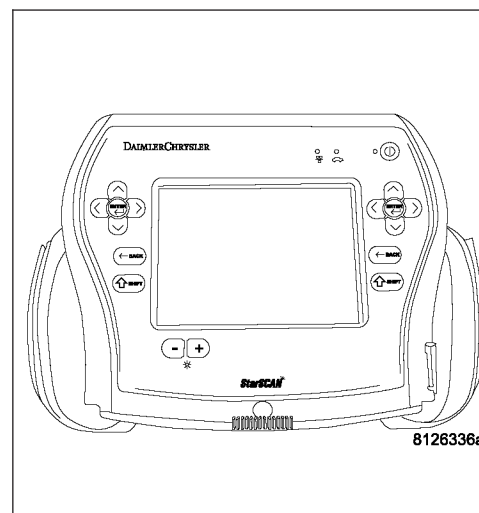
**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

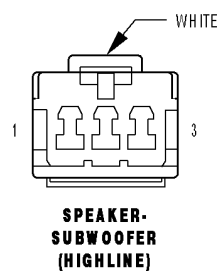
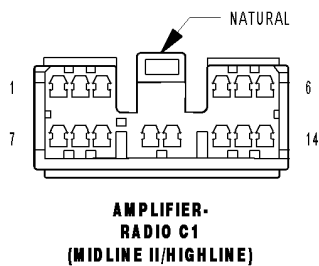
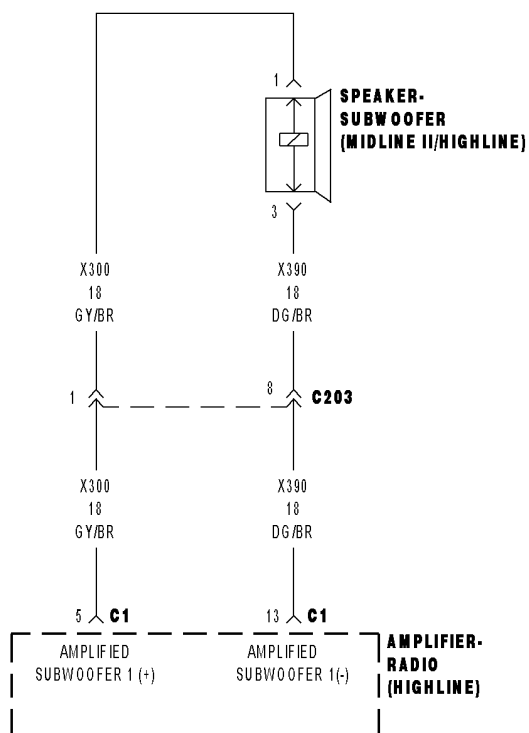
With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B147E-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?**

- Yes** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.





**B147F-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT LOW**

**B147F-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a shorted to ground condition on the speaker output circuit.

Possible Causes
(X300) AMPLIFIED SUBWOOFER 1(+) CIRCUIT SHORTED TO GROUND (X390) AMPLIFIED SUBWOOFER 1 (-) CIRCUIT SHORTED TO GROUND SUBWOOFER AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

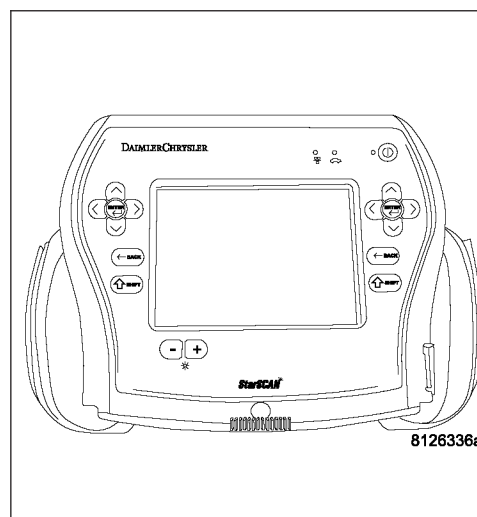
Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B147F-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE (X300) AMPLIFIED SUBWOOFER 1 (+) CIRCUIT FOR A SHORT TO GROUND**

Disconnect the Amplifier C1 harness connector.

Measure the resistance between ground and the (X300) Amplified Subwoofer 1 (+) circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X300) Amplified Subwoofer 1 (+) circuit for a short to ground.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B147F-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)****3. CHECK THE (X390) AMPLIFIED SUBWOOFER 1 (-) CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (X390) Amplified Subwoofer 1 (-) circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X390) Amplified Subwoofer 1 (-) for a short to ground.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 4

---

**4. CHECK OPERATION OF THE AMPLIFIED SUBWOOFER**

Turn the ignition off.

Reconnect the Subwoofer harness connector.

Measure the resistance of the speaker circuit between the Amplifier C1 harness connector and ground..

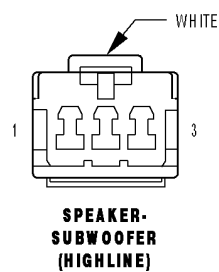
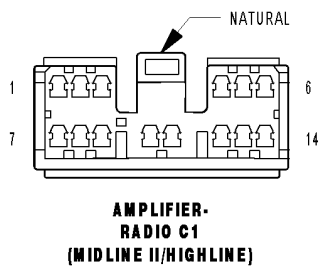
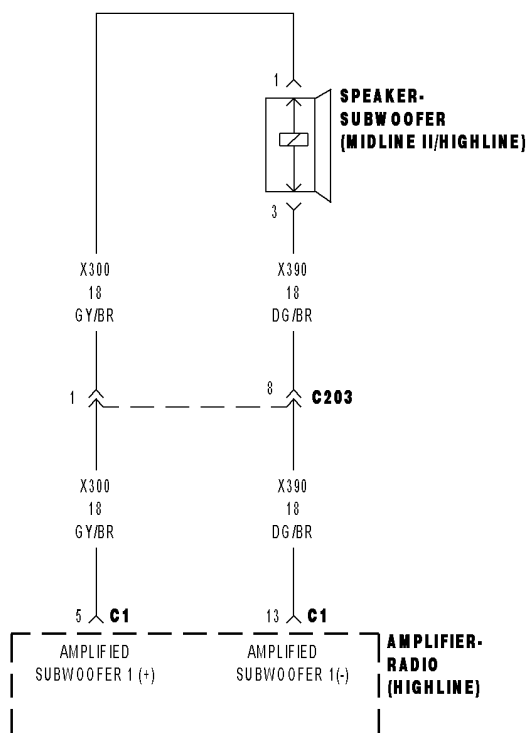
**Is the resistance below 10K ohms?**

**Yes** >> Replace the Subwoofer 1 in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

---

## B1480-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT HIGH



**B1480-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Amplifier detects a short to battery condition on the output circuit.

Possible Causes
(X300) AMPLIFIED SUBWOOFER 1 (+) CIRCUIT SHORT TO VOLTAGE (X390) AMPLIFIED SUBWOOFER 1 (-) CIRCUIT SHORT TO VOLTAGE AMPLIFIER

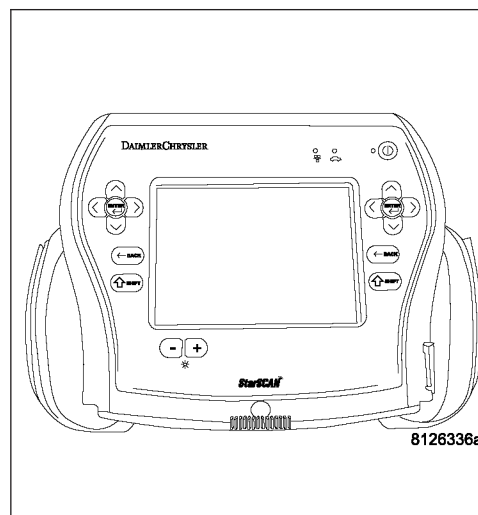
**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1480-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT HIGH?**

- Yes** >> Go To 2
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK FOR VOLTAGE ON THE (X300) AMPLIFIED SUBWOOFER 1 (+) CIRCUIT**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Disconnect the Amplified Subwoofer 1 harness connector.

Turn the ignition on.

Measure for voltage on the (X300) Amplified Subwoofer 1 (+) circuit.

**Is the voltage above 10.0 volts?**

- Yes** >> Repair the (X300) Amplified Subwoofer 1 (+) circuit for a short to voltage.  
Perform BODY VERIFICATION TEST VER-1.
- No** >> Go To 3

**B1480-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

**3. CHECK FOR VOLTAGE ON THE (X390) AMPLIFIED SUBWOOFER 1 (-) CIRCUIT**

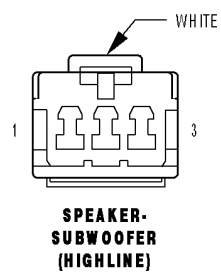
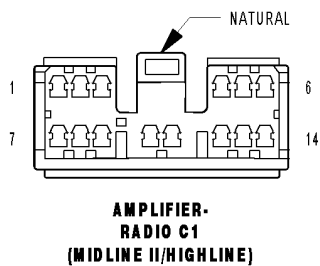
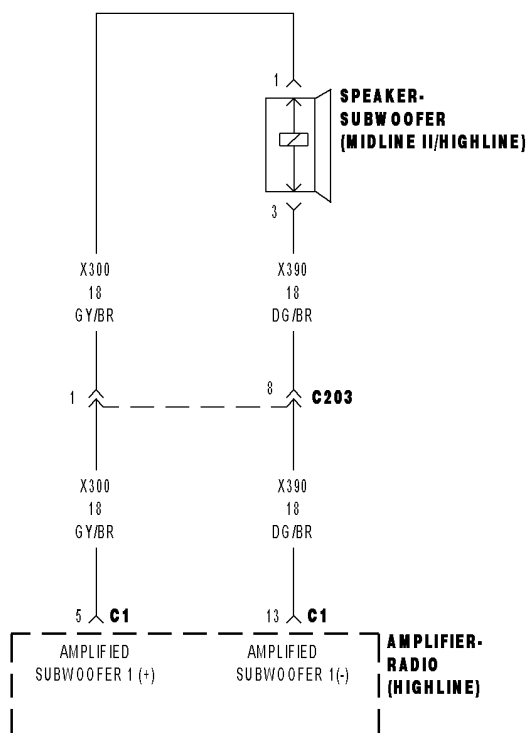
Measure for voltage on the (X390) Amplified Subwoofer 1 (-) circuit.

**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X390) Amplified Subwoofer 1 (-) circuit for a short to voltage.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

---

**B1481-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT OPEN**

**B1481-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Amplifier Bus wake-up. Amplifier reset with scan tool.
- **Set Condition:**  
The Amplifier detects an open condition on the speaker output circuit.

Possible Causes
(X300) AMPLIFIED SUBWOOFER 1 (+) CIRCUIT OPEN (X299) AMPLIFIED SUBWOOFER 1 (-) CIRCUIT OPEN SUBWOOFER AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on.

Turn the radio on.

With the scan tool, erase Amplifier DTCs.

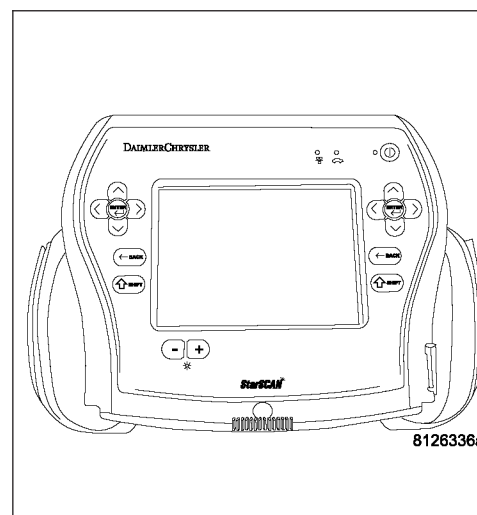
With the scan tool, reset the amplifier.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1481-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE OPERATION OF THE SUBWOOFER**

Disconnect the Subwoofer harness connector.

Turn the radio on and turn the volume to mid level.

With a voltmeter set to read in A/C voltage, measure the voltage of the Amplified Subwoofer 1 circuits in the Amplified Subwoofer harness connector.

**Is the voltage present greater than 1 volt?**

**Yes** >> Replace the Amplified Subwoofer in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3



**B1481-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)****3. CHECK THE (X300) AMPLIFIED SUBWOOFER 1 (+) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X300) Amplified Subwoofer 1 (+) circuit between the Amplifier C1 harness connector and the Amplified Subwoofer harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (X300) Amplified Subwoofer 1 (+) circuit for an open.  
Perform BODY VERIFICATION TEST VER-1.

---

**4. CHECK THE (X390) AMPLIFIED SUBWOOFER 1 (-) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance of the (X390) Amplified Subwoofer 1 (-) circuit between the Amplifier C1 harness connector and the Amplified Subwoofer harness connector.

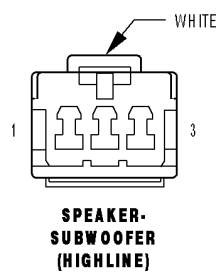
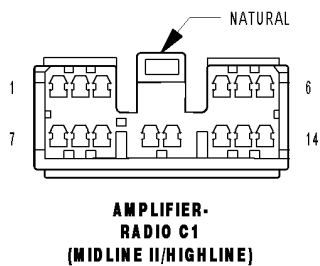
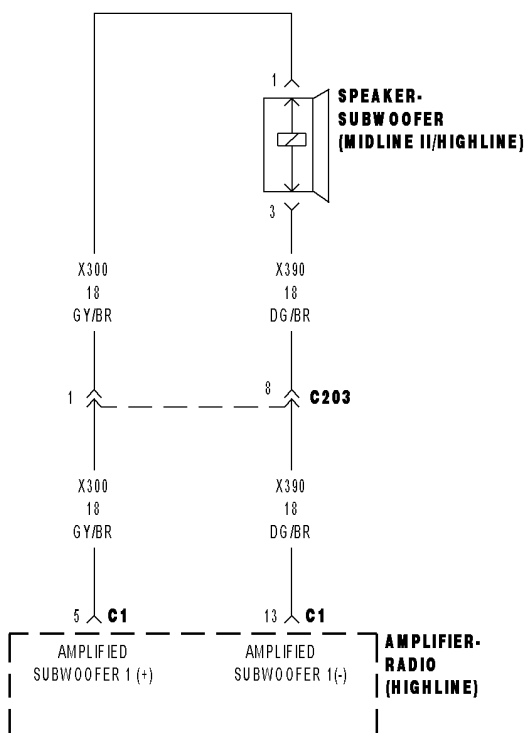
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Repair the (X390) Amplified Subwoofer 1 (-) circuit for an open.  
Perform BODY VERIFICATION TEST VER-1.

---

## B1482-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER



**B1482-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Radio volume at 25 or higher.
- **Set Condition:**  
The amplifier detects that the output circuits are shorted together.

**Possible Causes**

(X300) AMPLIFIED SUBWOOFER 1 (+) CIRCUIT SHORTED TO THE (X390) AMPLIFIED SUBWOOFER 1 (-) CIRCUIT  
AMPLIFIED SUBWOOFER 1  
AMPLIFIER

**Diagnostic Test****1. CHECK FOR AN INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

With the scan tool, erase Amplifier DTCs.

Turn the radio on.

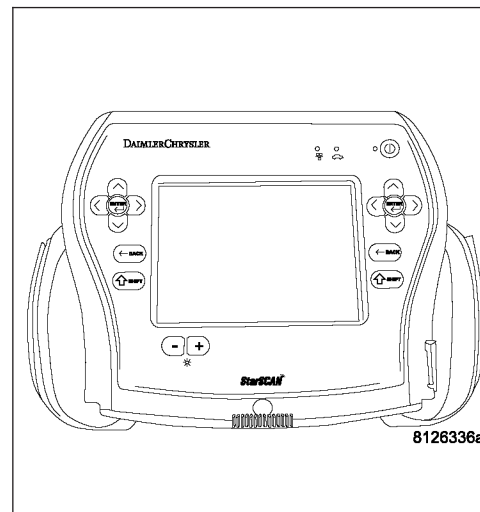
Turn the volume level to 25.

With the scan tool, read Amplifier DTCs.

**Does the scan tool display active: B1482-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.

**2. CHECK THE OPERATION OF THE AMPLIFIED SUBWOOFER 1**

Disconnect the Amplified Subwoofer 1.

Measure the resistance of the speaker between the two terminals.

**Is the resistance of the speaker less than 1 ohm?**

**Yes** >> Replace the Amplified Subwoofer 1 in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

**B1482-CHANNEL 7 AUDIO SPEAKER OUTPUT CIRCUIT SHORTED TOGETHER (CONTINUED)****3. CHECK THE (X300) AMPLIFIED SUBWOOFER 1 (+) CIRCUIT, AND THE (X390) AMPLIFIED SUBWOOFER 1 (-) CIRCUITS FOR A SHORT TOGETHER**

Turn the ignition off.

Disconnect the Amplifier C1 harness connector.

Measure the resistance between the (X300) Amplified Subwoofer 1 (+) circuit, and the (X390) Amplified Subwoofer 1 (-) circuit.

**Is the resistance below 10K ohms?**

- Yes**    >> Repair the (X300) Amplified Subwoofer 1 (+) circuit, and the (X390) Amplified Subwoofer 1 (-) circuit for a short together.  
             Perform BODY VERIFICATION TEST VER-1.
- No**      >> Replace the Amplifier in accordance with the service information.  
             Perform BODY VERIFICATION TEST VER-1.
-

B1483-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
This DTC will set if a DC offset occurs on the output channel, the amplifier shall set a DTC after a maturity rate of 5 ±1 sec.

Possible Causes
AMPLIFIER

Diagnostic Test

1. CHECK FOR AN INTERMITTENT CONDITION

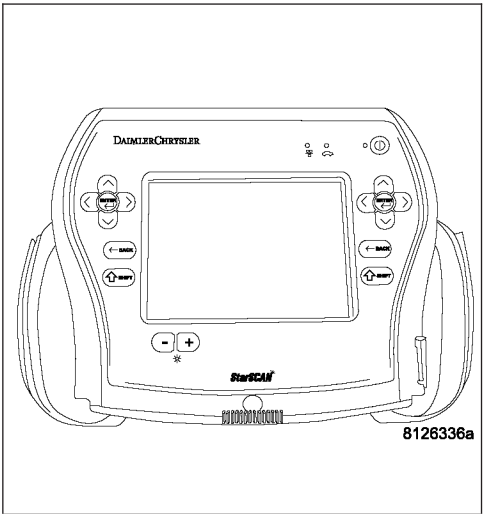
Turn the ignition on, then off, and then on again.  
With the scan tool, read Amplifier DTCs.

Does the scan tool display active: B1483-CHANNEL 8 AUDIO SPEAKER OUTPUT CIRCUIT PERFORMANCE?

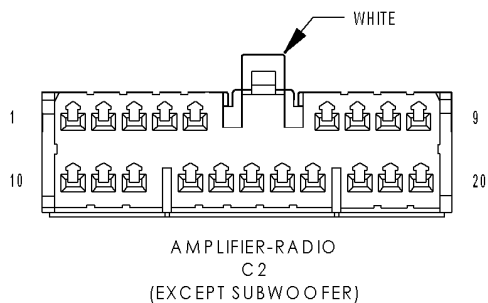
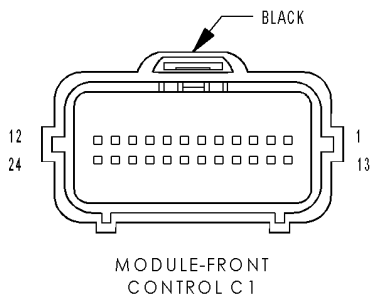
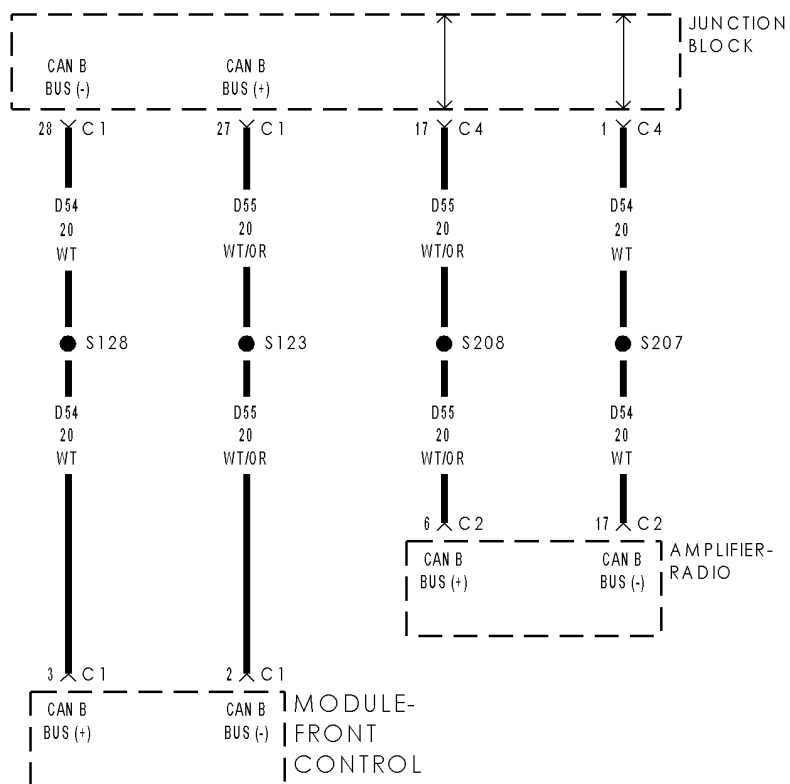
- Yes

>> Replace the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.
- No

>> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



## U0019-CAN B BUS



**U0019–CAN B BUS (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously.
- **Set Condition:**  
Whenever the Can B Bus (+) or B Bus (–) circuit is open, shorted to voltage or shorted to ground, this code will set.

Possible Causes
CAN B BUS DTCs IN FRONT CONTROL MODULE (D54) CAN B BUS (–) CIRCUIT OPEN (D55) CAN B BUS (+) CIRCUIT OPEN AMPLIFIER

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTCs

Cycle the ignition from on to off 3 times.

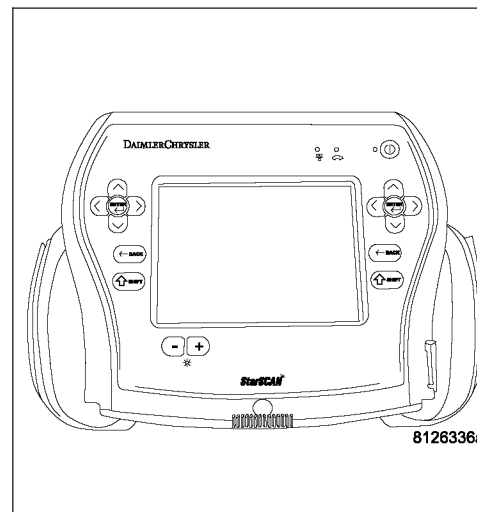
Turn the ignition on.

With the scan tool, read DTCs.

**Does the scan tool display U0019–CAN B BUS CIRCUIT?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.

**2. CHECK FRONT CONTROL MODULE DTCs**

With the scan tool, read Front Control Module DTCs

**Does the scan tool display any CAN B BUS DTCs – ACTIVE?**

**Yes** >> Refer to the symptom list for problems related to Communication in the ELECTRICAL.– ELECTRONIC CONTROL MODULES – ELECTRICAL DIAGNOSES section.

**No** >> Go to 3

**U0019-CAN B BUS (CONTINUED)****3. CAN B BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Amplifier harness connector.

Disconnect the Front Control Module C1 harness connector.

Measure the resistance of the (D55) Can B Bus (+) circuit between the Front Control Module C1 harness connector and the Amplifier harness connector.

**Is the resistance below 2.0 ohms?**

- Yes**    >> Go To 4  
            Perform BODY VERIFICATION TEST - VER 1.
- No**      >> Repair the Can B Bus (+) circuit for an open.  
            Perform BODY VERIFICATION TEST - VER 1.
- 

**4. CAN B BUS (-) CIRCUIT OPEN**

Measure the resistance of the (D54) Can B Bus (-) circuit between the Front Control Module C1 harness connector and the Amplifier harness connector.

**Is the resistance below 2.0 ohms?**

- Yes**    >> Replace the Amplifier in accordance with the service information..  
            Perform BODY VERIFICATION TEST - VER 1.
- No**      >> Repair the Can B Bus (-) circuit for an open.  
            Perform BODY VERIFICATION TEST - VER 1.
-

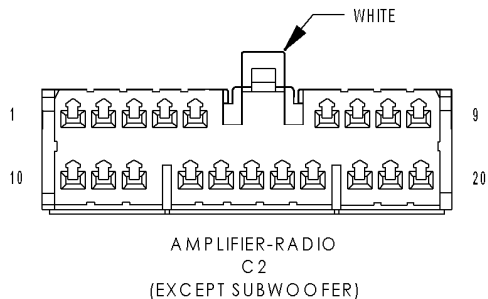
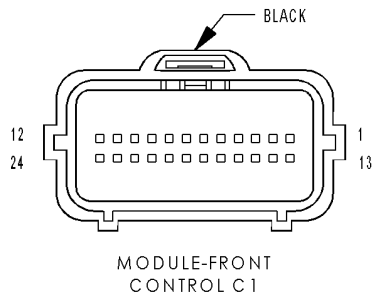
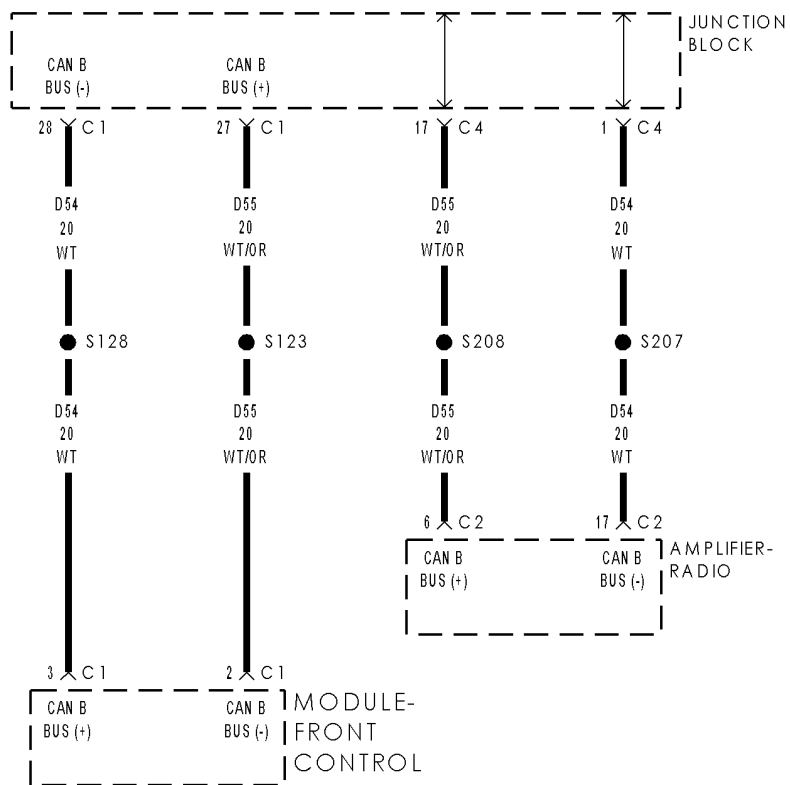


## **U0020-CAN B BUS OFF PERFORMANCE**

For the Amplifier circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)



**U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)**

- **When Monitored:**  
Continuously.
- **Set Condition:**  
Whenever the Can B Bus (+) or B Bus (–) circuit is open, shorted to voltage or shorted to ground, this code will set.

Possible Causes
CAN B BUS DTCs IN FRONT CONTROL MODULE (D54) CAN B BUS (–) CIRCUIT OPEN (D55) CAN B BUS (+) CIRCUIT OPEN AMPLIFIER

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTCs

Cycle the ignition from on to off 3 times.

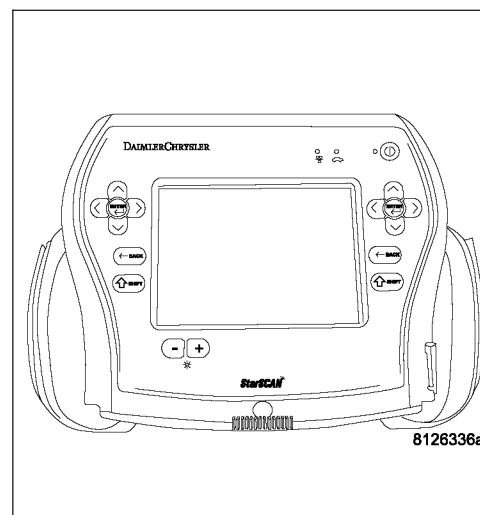
Turn the ignition on.

With the scan tool, read DTCs.

**Does the scan tool display U0020-CAN B BUS OFF PERFORMANCE?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.

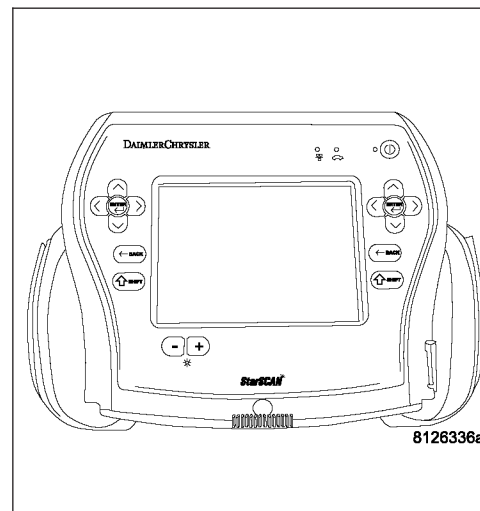
**2. CHECK FRONT CONTROL MODULE DTCs**

With the scan tool, read Front Control Module DTCs

**Does the scan tool display any CAN B BUS DTCs – ACTIVE?**

**Yes** >> Refer to the symptom list for problems related to Communication in the ELECTRICAL– ELECTRONIC CONTROL MODULES – ELECTRICAL DIAGNOSES section.

**No** >> Go to 3



**U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)****3. CAN B BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Amplifier harness connector.

Disconnect the Front Control Module C1 harness connector.

Measure the resistance of the (D55) Can B Bus (+) circuit between the Front Control Module C1 harness connector and the Amplifier harness connector.

**Is the resistance below 2.0 ohms?**

- Yes**    >> Go To 4  
            Perform BODY VERIFICATION TEST - VER 1.
- No**      >> Repair the Can B Bus (+) circuit for an open.  
            Perform BODY VERIFICATION TEST - VER 1.
- 

**4. CAN B BUS (–) CIRCUIT OPEN**

Measure the resistance of the (D54) Can B Bus (–) circuit between the Front Control Module C1 harness connector and the Amplifier harness connector.

**Is the resistance below 2.0 ohms?**

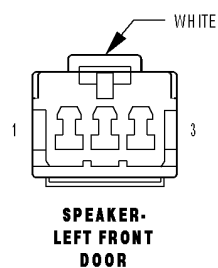
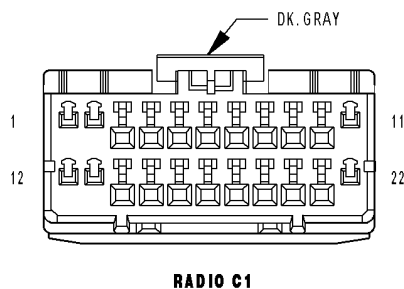
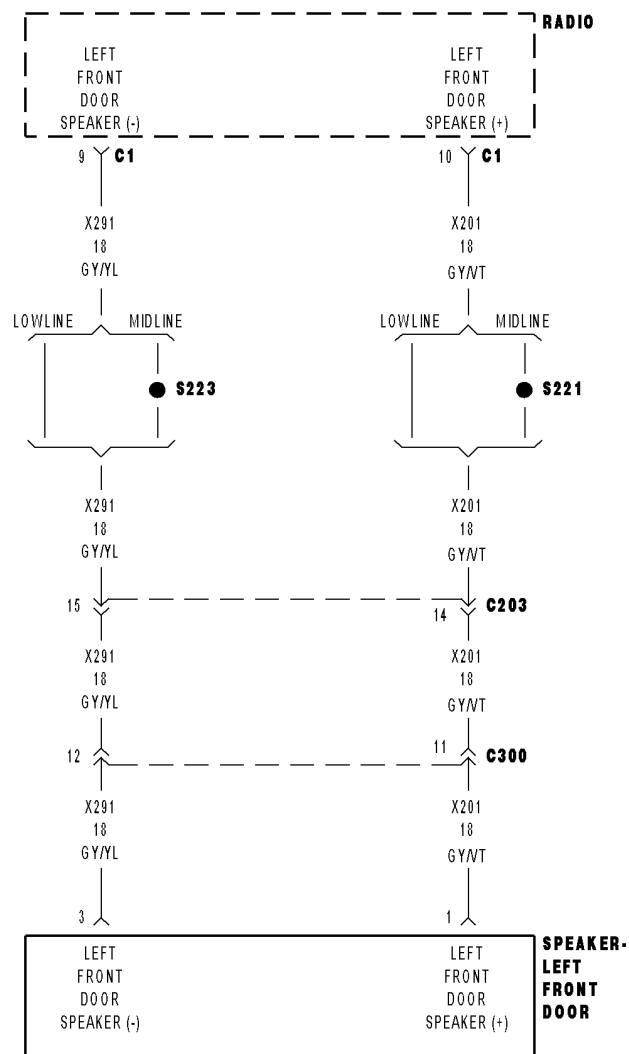
- Yes**    >> Replace the Amplifier in accordance with the service information..  
            Perform BODY VERIFICATION TEST - VER 1.
- No**      >> Repair the Can B Bus (–) circuit for an open.  
            Perform BODY VERIFICATION TEST - VER 1.
-

## **U0141—LOST COMMUNICATION WITH FRONT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## B1401-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW



**B1401-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)**

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is LOW for more than 3 seconds.

Possible Causes
SPEAKER (X201) (X291) LEFT FRONT SPEAKER OUTPUT CIRCUIT

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all Audio DTC's.

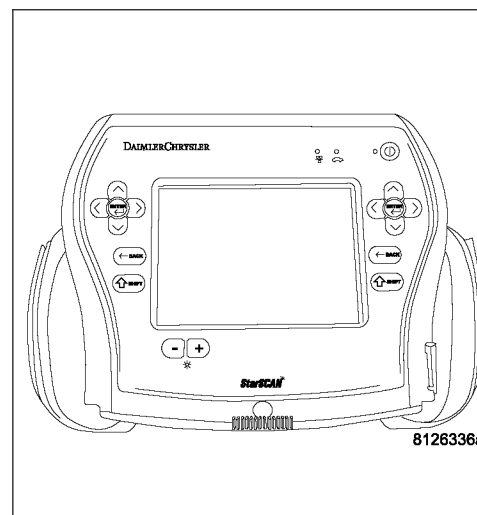
Turn the Radio on.

With the Scan Tool, read the DTC information.

**Does the Scan Tool read: B1401-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST VER 1.

**2. (X201) (X291) SPEAKER OUTPUT CIRCUITS.**

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Front Left Audio Speaker connector.

Measure the resistance between ground and each speaker (X201)(+) and (X291)(-) circuit.

**Is the resistance below 1000.0 ohms for each circuit?**

**Yes** >> Repair the applicable Speaker (+) or (-) Output circuit for a short to ground condition.

**No** >> Go To 3

**B1401-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)**

**3. SPEAKER**

Turn the ignition off.

Disconnect the Front Left Audio Speaker.

Turn the ignition on.

Turn the Radio on.

With the Scan Tool, clear all Audio DTC's.

With the Scan Tool, read the DTC information.

**Does the Scan Tool read: B1401-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

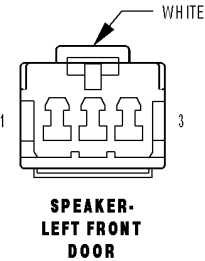
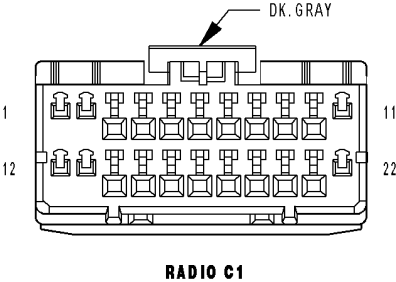
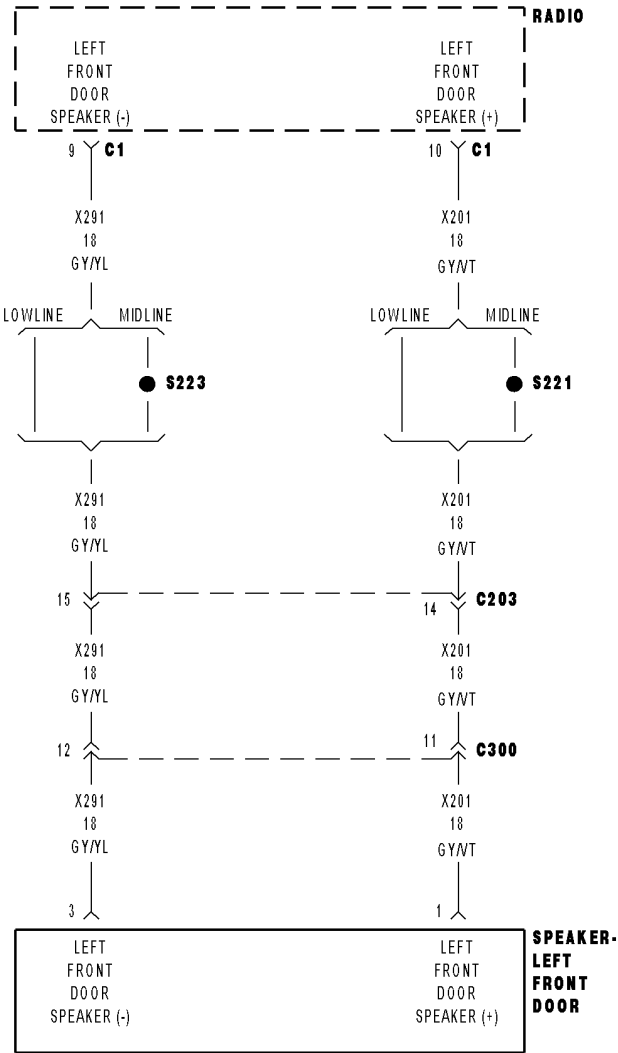
**Yes**     >> Replace the Speaker in accordance with the service information.  
            Perform the BODY VERIFICATION TEST VER 1.

**No**       >> Test Complete.

---



B1402-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH



**B1402-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
SPEAKER (X201) SPEAKER OUTPUT CIRCUIT (+) (X291) SPEAKER OUTPUT CIRCUIT (-)

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

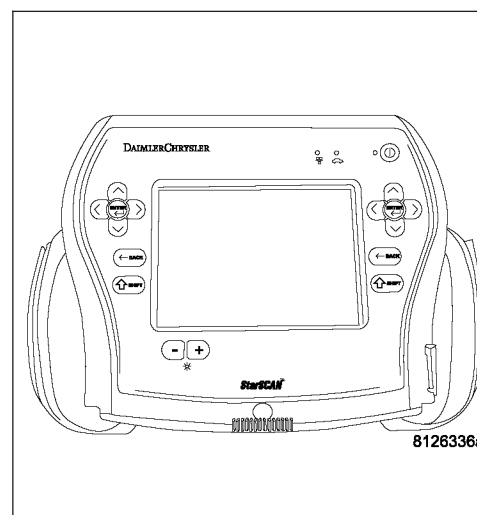
Turn the ignition on, then off, and then on again.

With the scan tool, read Radio DTCs.

**Does the scan tool display active: B1402-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



**B1402-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)****2. CHECK FOR VOLTAGE ON THE (X201) SPEAKER (+) CIRCUIT**

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Left Front Speaker harness connector.

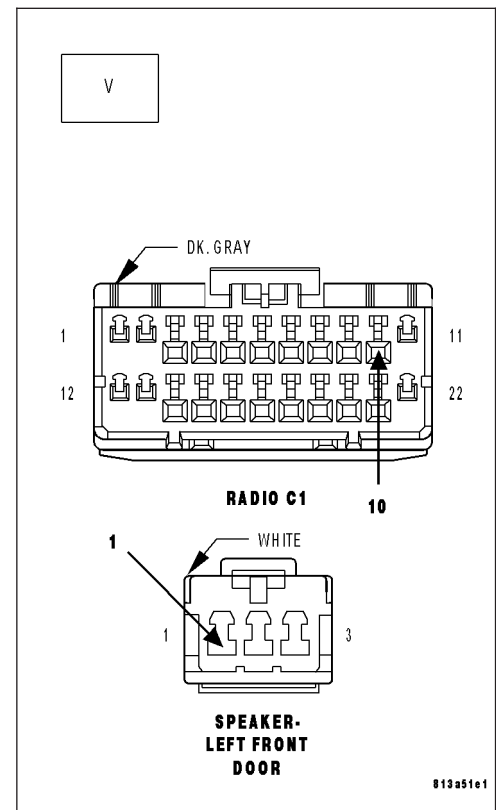
Measure for voltage on the (X201) Speaker (+) circuit.

**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X201) Speaker (+) circuit for a short to voltage.

Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3



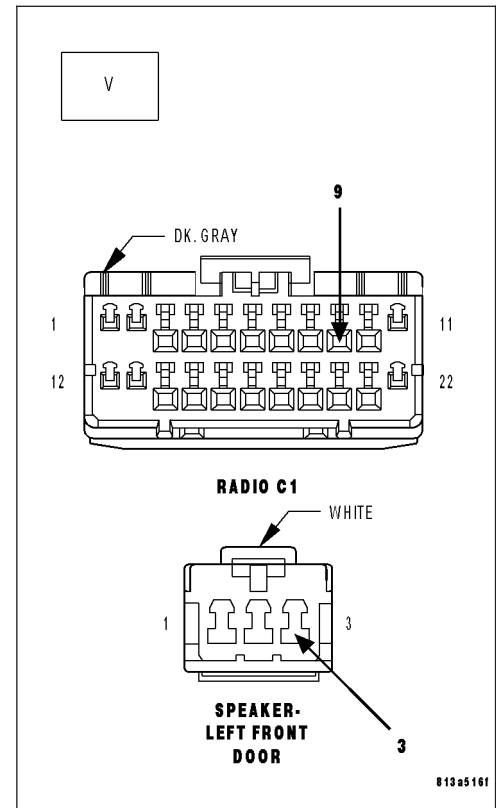
**B1402-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)****3. CHECK FOR VOLTAGE ON THE (X291) SPEAKER (-) CIRCUIT**

Measure for voltage on the (X291) Speaker (-) circuit.

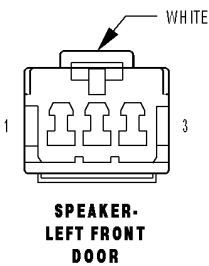
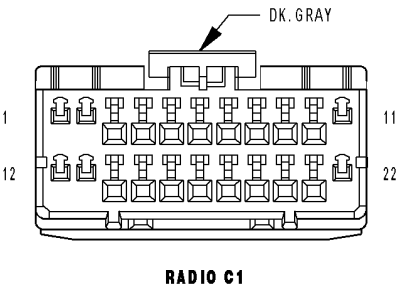
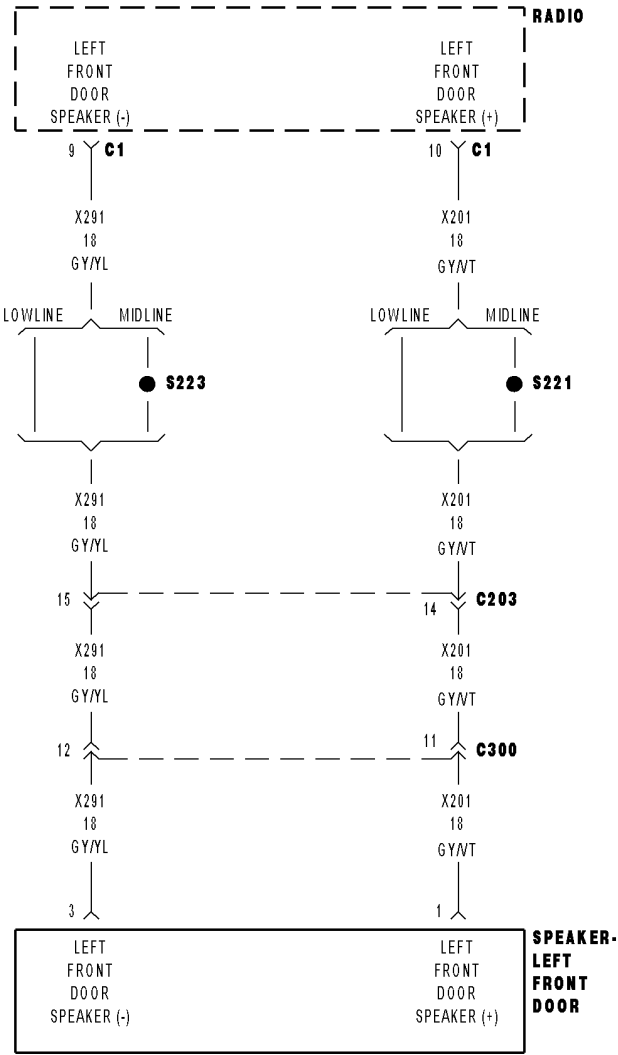
**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X291) Speaker (-) circuit for a short to voltage.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Radio in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.



B1403-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN



**B1403-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)**

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is open for more than 3 seconds. The Radio will not set the fault if the radio confirms an amplifier is on the BUS.

Possible Causes
SPEAKER (X201) (X291) LEFT FRONT SPEAKER OUTPUT CIRCUIT

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all Audio DTC's.

Turn the Radio on.

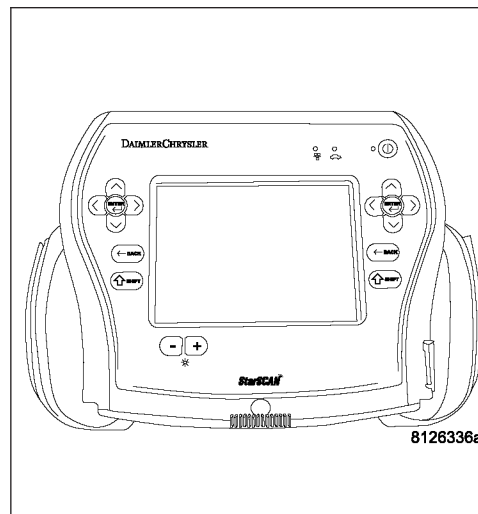
With the Scan Tool, read the DTC information.

**Does the Scan Tool read: B1403-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST VER 1.

**2. (X201) (X291) SPEAKER OUTPUT CIRCUITS.**

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Front Left Audio Speaker connector.

Measure the resistance of each speaker (X201)(+) and (X291)(-) circuit between the Radio and the Speaker.

**Is the resistance below 5.0 ohms for each circuit?**

**Yes** >> Go To 3

**No** >> Repair the applicable Output Speaker circuit for an open condition.  
Perform the BODY VERIFICATION TEST VER 1.

**B1403-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)****3. SPEAKER**

Turn the ignition off.

Disconnect the Front Left Audio Speaker.

Turn the ignition on.

Turn the Radio on.

With the Scan Tool, clear all Audio DTC's.

With the Scan Tool, read the DTC information.

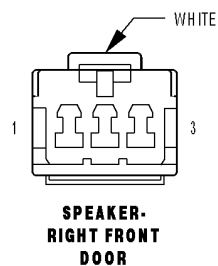
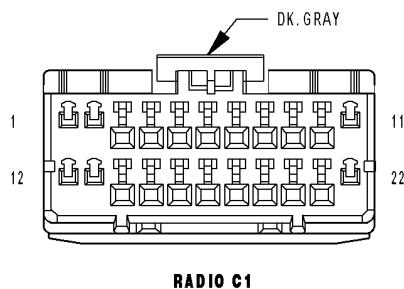
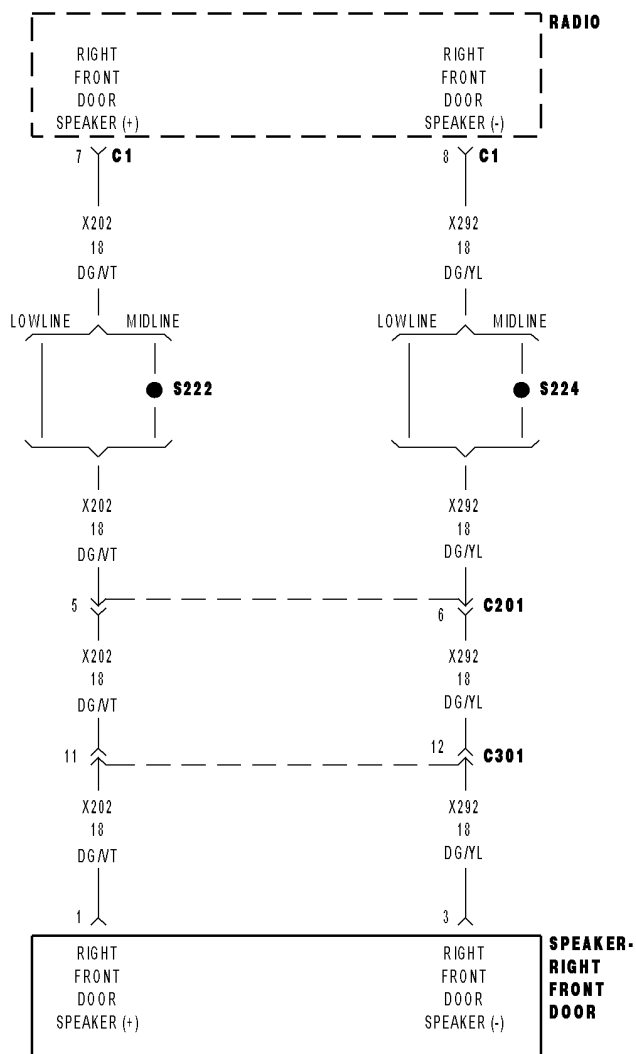
**Does the Scan Tool read: B1403-FRONT LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

**Yes** >> Replace the Speaker in accordance with the service information.  
Perform the BODY VERIFICATION TEST VER 1.

**No** >> Test Complete.

---

## B1405-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW





**B1405-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)**

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is LOW for more than 3 seconds.

Possible Causes
SPEAKER (X202) (X292) RIGHT FRONT SPEAKER OUTPUT CIRCUIT

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all Audio DTC's.

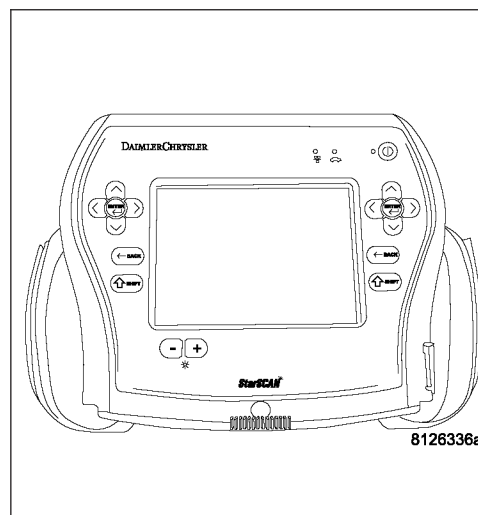
Turn the Radio on.

With the Scan Tool, read the DTC information.

**Does the Scan Tool read: B1405-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST VER 1.

**2. (X202) (X292) SPEAKER OUTPUT CIRCUITS.**

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Front Right Audio Speaker connector.

Measure the resistance between ground and each speaker (X202)(+) and (X292)(-) circuit.

**Is the resistance below 1000.0 ohms for each circuit?**

**Yes** >> Repair the applicable Speaker (+) or (-) Output circuit for a short to ground condition.

**No** >> Go To 3

**B1405-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)****3. SPEAKER**

Turn the ignition off.

Disconnect the Front Right Audio Speaker.

Turn the ignition on.

Turn the Radio on.

With the Scan Tool, clear all Audio DTC's.

With the Scan Tool, read the DTC information.

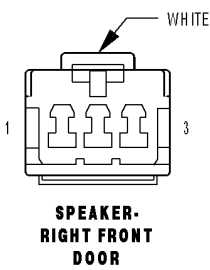
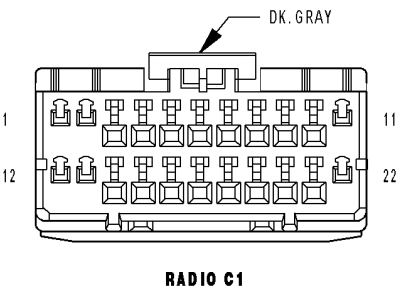
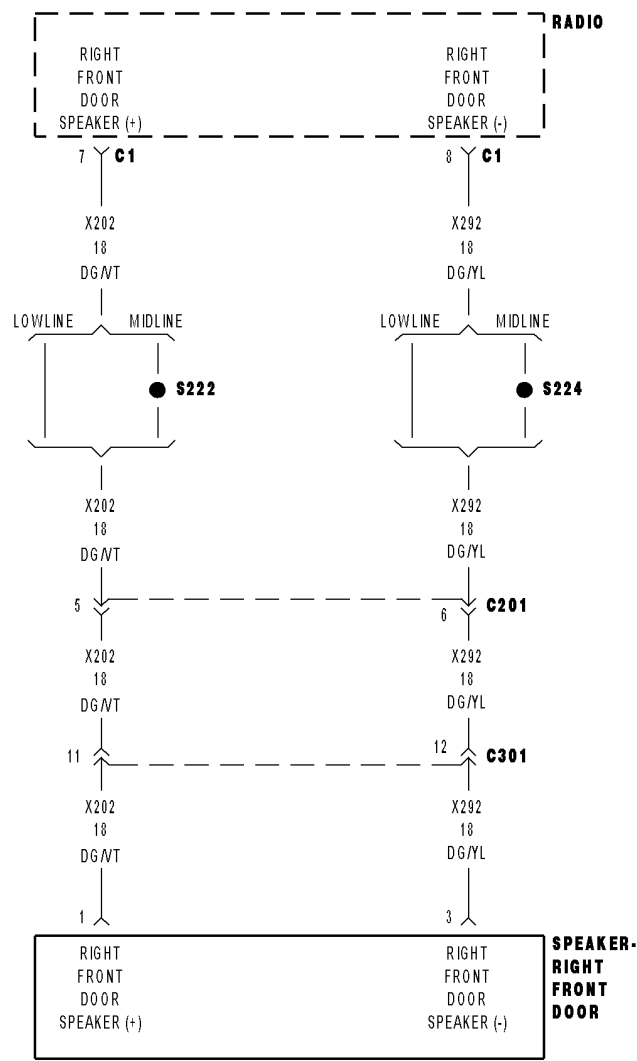
**Does the Scan Tool read: B1405-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

**Yes**    >> Replace the Speaker in accordance with the service information.  
            Perform the BODY VERIFICATION TEST VER 1.

**No**      >> Test Complete.

---

B1406-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH



**B1406-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
SPEAKER (X202) SPEAKER OUTPUT CIRCUIT (+) (X292) SPEAKER OUTPUT CIRCUIT (-)

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

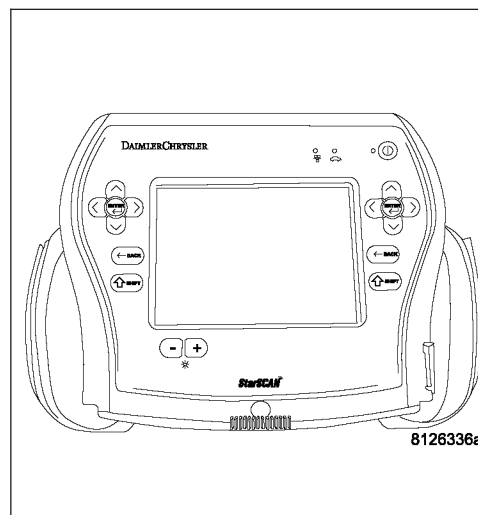
Turn the ignition on, then off, and then on again.

With the scan tool, read Radio DTCs.

**Does the scan tool display active: B1406-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



**B1406-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)****2. CHECK FOR VOLTAGE ON THE (X202) SPEAKER (+) CIRCUIT**

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Right Rear Speaker harness connector.

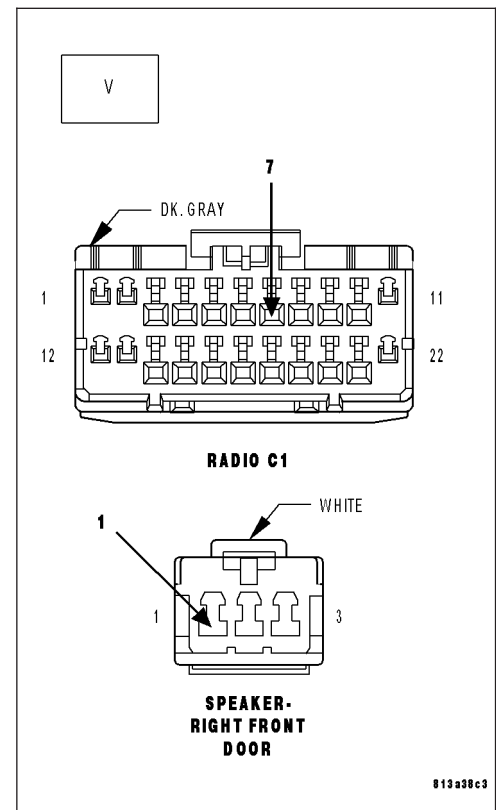
Measure for voltage on the (X202) Speaker (+) circuit.

**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X202) Speaker (+) circuit for a short to voltage.

Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3



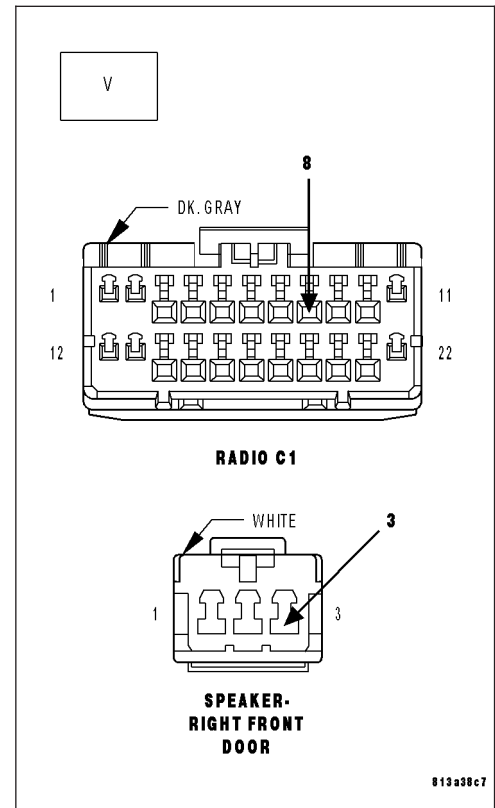
**B1406-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)****3. CHECK FOR VOLTAGE ON THE (X292) SPEAKER (-) CIRCUIT**

Measure for voltage on the (X292) Speaker (-) circuit.

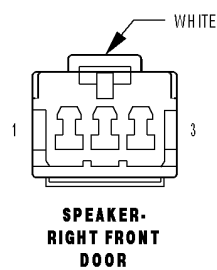
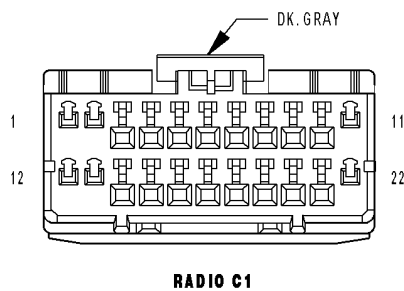
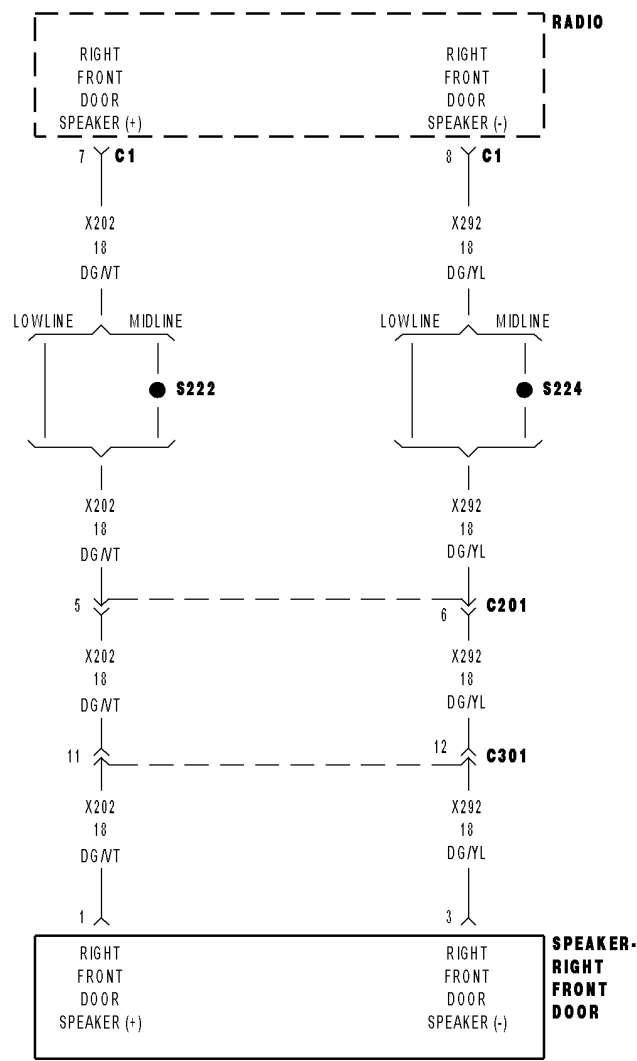
**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X292) Speaker (-) circuit for a short to voltage.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Radio in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.



B1407-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN



**B1407-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)**

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is open for more than 3 seconds. The Radio will not set the fault if the radio confirms an amplifier is on the BUS.

Possible Causes
SPEAKER (X202) (X292) RIGHT FRONT SPEAKER OUTPUT CIRCUIT

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all Audio DTC's.

Turn the Radio on.

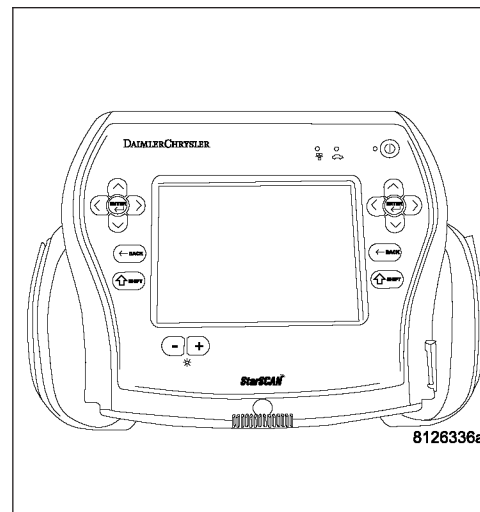
With the Scan Tool, read the DTC information.

**Does the Scan Tool read: B1407-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST VER 1.

**2. (X202) (X292) Speaker Output circuits.**

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Front Right Audio Speaker connector.

Measure the resistance of each speaker (X202)(+) and (X292)(-) circuit between the Radio and the Speaker.

**Is the resistance below 5.0 ohms for each circuit?**

**Yes** >> Go To 3

**No** >> Repair the applicable Output Speaker circuit for an open condition.

Perform the BODY VERIFICATION TEST VER 1.



**B1407-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)****3. Speaker**

Turn the ignition off.

Disconnect the Front Right Audio Speaker.

Turn the ignition on.

Turn the Radio on.

With the Scan Tool, clear all Audio DTC's.

With the Scan Tool, read the DTC information.

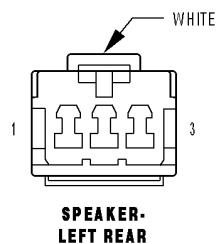
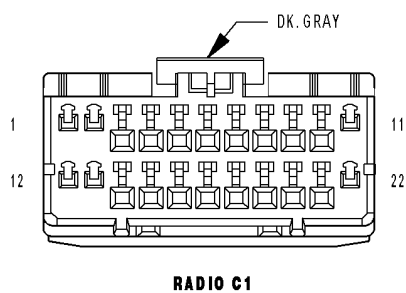
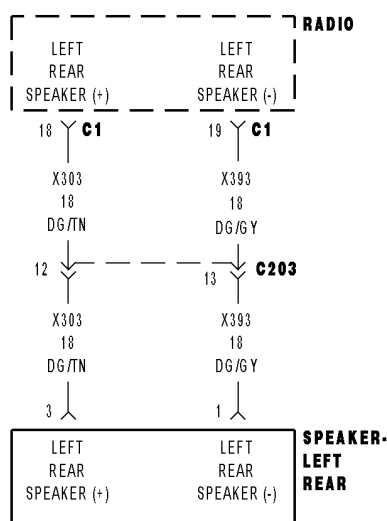
**Does the Scan Tool read: B1407-FRONT RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

**Yes** >> Replace the Speaker in accordance with the service information.  
Perform the BODY VERIFICATION TEST VER 1.

**No** >> Test Complete.

---

## B1409-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW



**B1409-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)**

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is LOW for more than 3 seconds.

Possible Causes
SPEAKER (X303) (X393) LEFT REAR SPEAKER OUTPUT CIRCUIT

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all Audio DTC's.

Turn the Radio on.

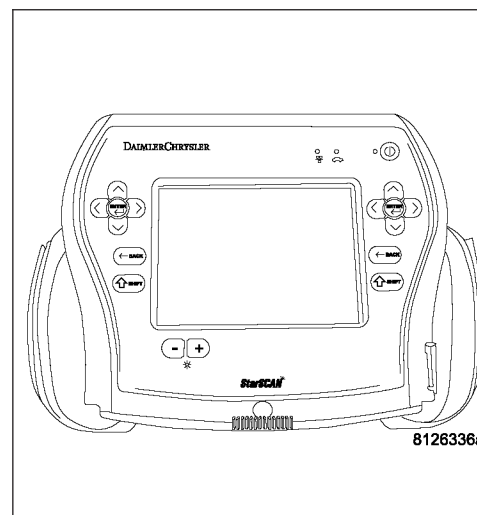
With the Scan Tool, read the DTC information.

**Does the Scan Tool read: B1409-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST VER 1.

**2. (X303) (X393) SPEAKER OUTPUT CIRCUITS.**

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Rear Left Audio Speaker connector.

Measure the resistance between ground and each speaker (X303)(+) and (X393)(-) circuit.

**Is the resistance below 1000.0 ohms for each circuit?**

**Yes** >> Repair the applicable Speaker (+) or (-) Output circuit for a short to ground condition.

**No** >> Go To 3

**B1409-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)****3. SPEAKER**

Turn the ignition off.

Disconnect the Rear Left Audio Speaker.

Turn the ignition on.

Turn the Radio on.

With the Scan Tool, clear all Audio DTC's.

With the Scan Tool, read the DTC information.

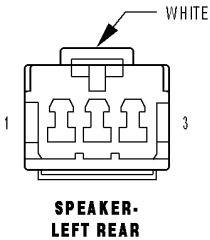
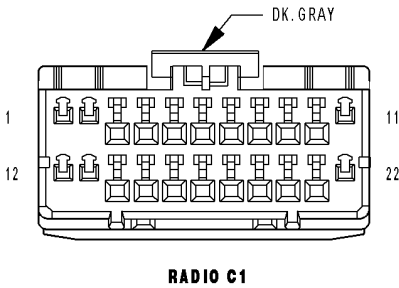
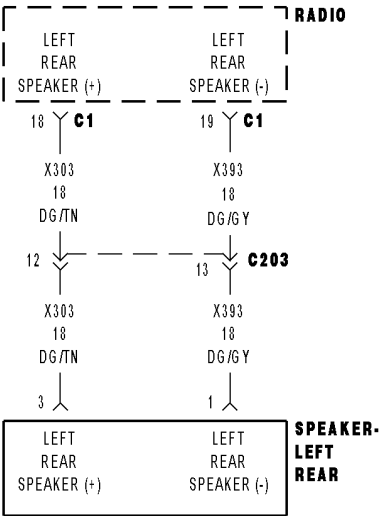
**Does the Scan Tool read: B1409-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

**Yes** >> Replace the Speaker in accordance with the service information.  
Perform the BODY VERIFICATION TEST VER 1.

**No** >> Test Complete.

---

B140A-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH



**B140A-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
SPEAKER (X303) SPEAKER OUTPUT CIRCUIT (+) (X393) SPEAKER OUTPUT CIRCUIT (-)

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

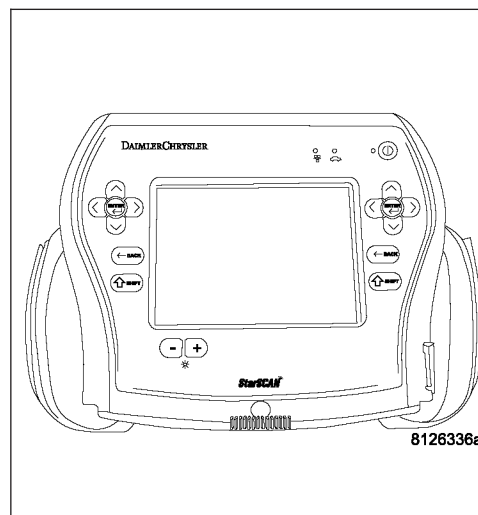
Turn the ignition on, then off, and then on again.

With the scan tool, read Radio DTCs.

**Does the scan tool display active: B140A-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



**B140A-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)****2. CHECK FOR VOLTAGE ON THE (X303) SPEAKER (+) CIRCUIT**

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Left Rear Speaker harness connector.

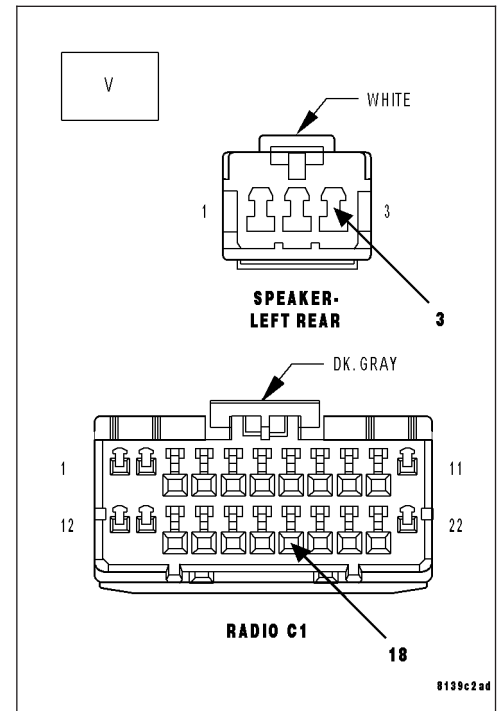
Measure for voltage on the (X303) Speaker (+) circuit.

**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X303) Speaker (+) circuit for a short to voltage.

Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3

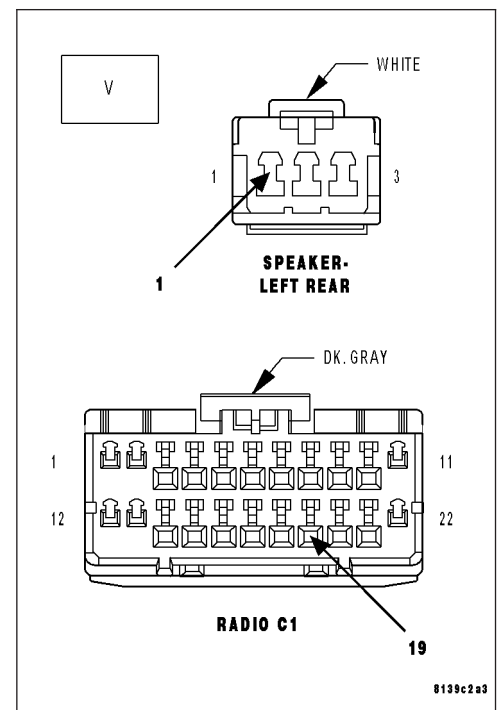
**3. CHECK FOR VOLTAGE ON THE (X393) SPEAKER (-) CIRCUIT**

Measure for voltage on the (X393) Speaker (-) circuit.

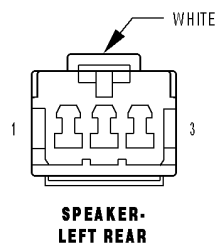
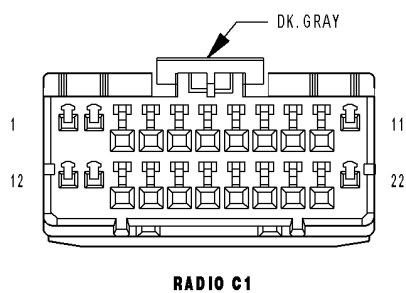
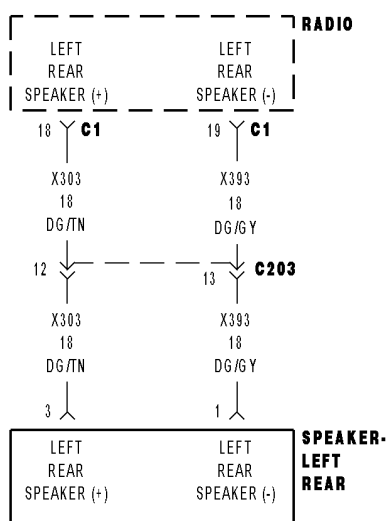
**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X393) Speaker (-) circuit for a short to voltage.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Radio in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.



## B140B-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN





**B140B-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)**

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is open for more than 3 seconds. The Radio will not set the fault if the radio confirms an amplifier is on the BUS.

Possible Causes
SPEAKER (X303) (X393) LEFT REAR SPEAKER OUTPUT CIRCUIT

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. Intermittent Condition**

Turn the ignition on.

With the Scan Tool, clear all Audio DTC's.

Turn the Radio on.

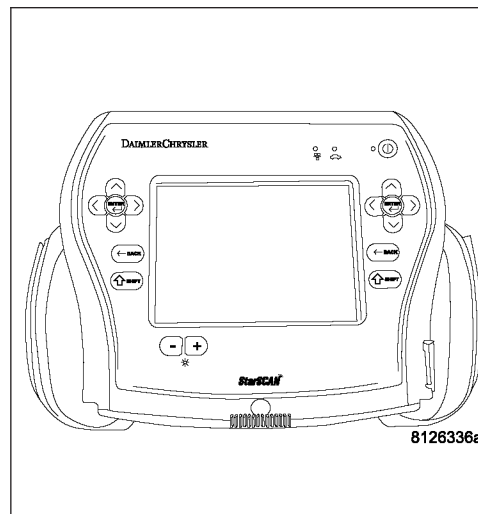
With the Scan Tool, read the DTC information.

**Does the Scan Tool read: B140B-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST VER 1.

**2. (X303) (X393) Speaker Output circuits.**

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Rear Left Audio Speaker connector.

Measure the resistance of each speaker (X303)(+) and (X393)(-) circuit between the Radio and the Speaker.

**Is the resistance below 5.0 ohms for each circuit?**

**Yes** >> Go To 3

**No** >> Repair the applicable Output Speaker circuit for an open condition.

Perform the BODY VERIFICATION TEST VER 1.

**B140B-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)**

**3. Speaker**

Turn the ignition off.

Disconnect the Rear Left Audio Speaker.

Turn the ignition on.

Turn the Radio on.

With the Scan Tool, clear all Audio DTC's.

With the Scan Tool, read the DTC information.

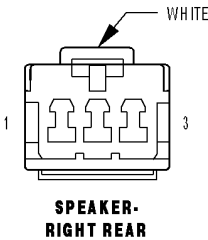
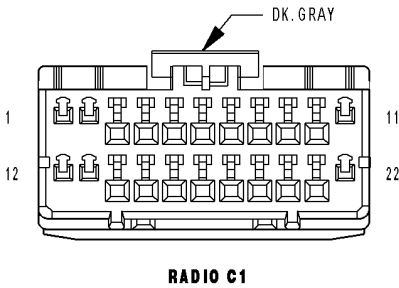
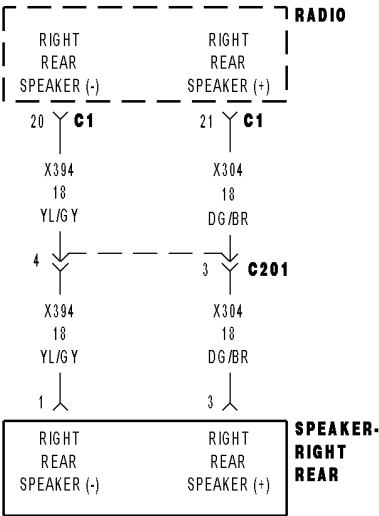
**Does the Scan Tool read: B140B-REAR LEFT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

**Yes** >> Replace the Speaker in accordance with the service information.  
Perform the BODY VERIFICATION TEST VER 1.

**No** >> Test Complete.

---

B140D-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW



**B140D-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)**

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is LOW for more than 3 seconds.

Possible Causes
SPEAKER (X304) (X394) RIGHT REAR SPEAKER OUTPUT CIRCUIT

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. Intermittent Condition**

Turn the ignition on.

With the Scan Tool, clear all Audio DTC's.

Turn the Radio on.

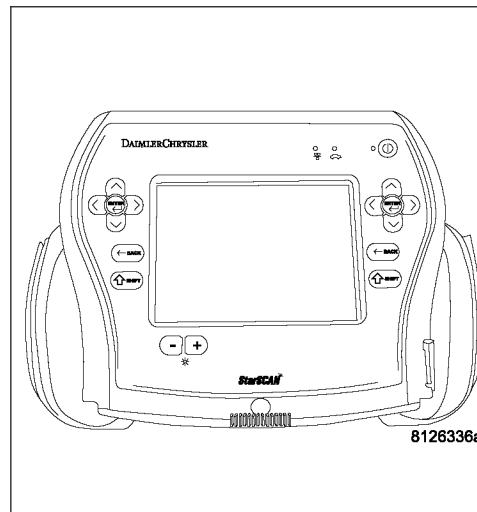
With the Scan Tool, read the DTC information.

**Does the Scan Tool read: B140D-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST VER 1.

**2. (X304) (X394) Speaker Output circuits.**

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Rear Right Audio Speaker connector.

Measure the resistance between ground and each speaker (X304)(+) and (X394)(-) circuit.

**Is the resistance below 1000.0 ohms for each circuit?**

**Yes** >> Repair the applicable Speaker (+) or (-) Output circuit for a short to ground condition.

**No** >> Go To 3

**B140D-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW (CONTINUED)****3. Speaker**

Turn the ignition off.

Disconnect the Rear Right Audio Speaker.

Turn the ignition on.

Turn the Radio on.

With the Scan Tool, clear all Audio DTC's.

With the Scan Tool, read the DTC information.

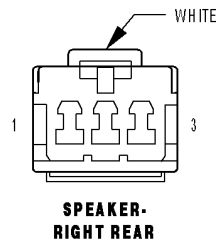
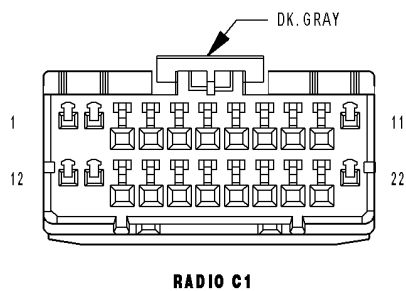
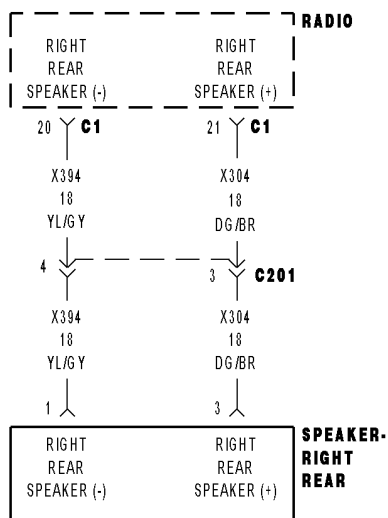
**Does the Scan Tool read: B140D-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT LOW?**

**Yes** >> Replace the Speaker in accordance with the service information.  
Perform the BODY VERIFICATION TEST VER 1.

**No** >> Test Complete.

---

## B140E-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH



**B140E-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)**

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
SPEAKER (X304) SPEAKER OUTPUT CIRCUIT (+) (X394) SPEAKER OUTPUT CIRCUIT (-)

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test**

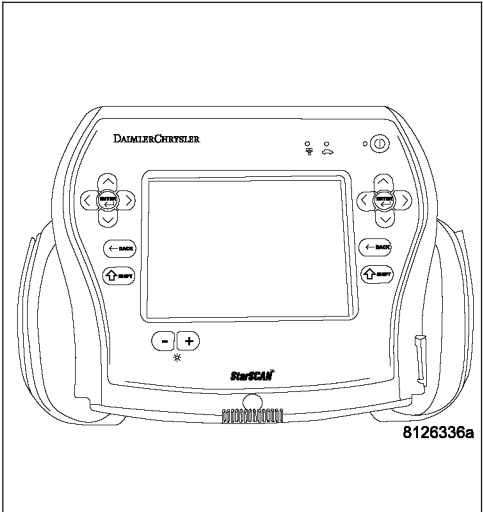
**1. INTERMITTENT CONDITION**

Turn the ignition on, then off, and then on again.

With the scan tool, read Radio DTCs.

**Does the scan tool display active: B140E-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH?**

- Yes**    >> Go To 2
- No**    >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST VER-1.



**B140E-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)****2. CHECK FOR VOLTAGE ON THE (X304) SPEAKER (+) CIRCUIT**

Turn the ignition off.

Disconnect the Radio C1 harness connector.

Disconnect the Right Rear Speaker harness connector.

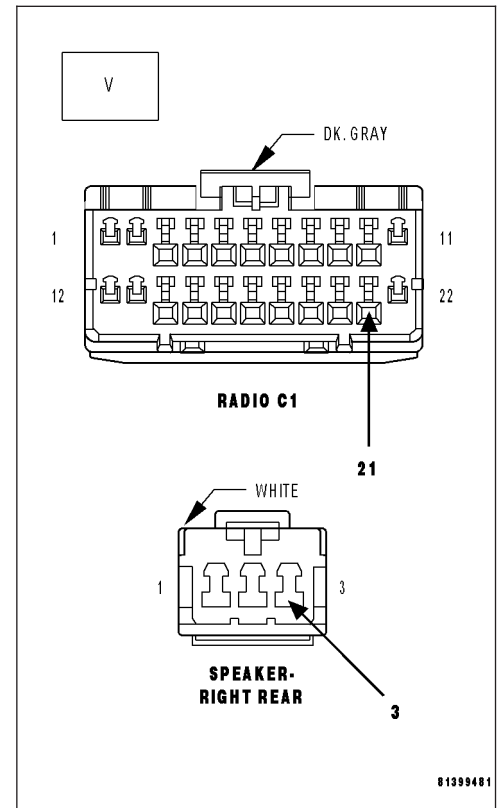
Measure for voltage on the (X304) Speaker (+) circuit.

**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X304) Speaker (+) circuit for a short to voltage.

Perform BODY VERIFICATION TEST VER-1.

**No** >> Go To 3





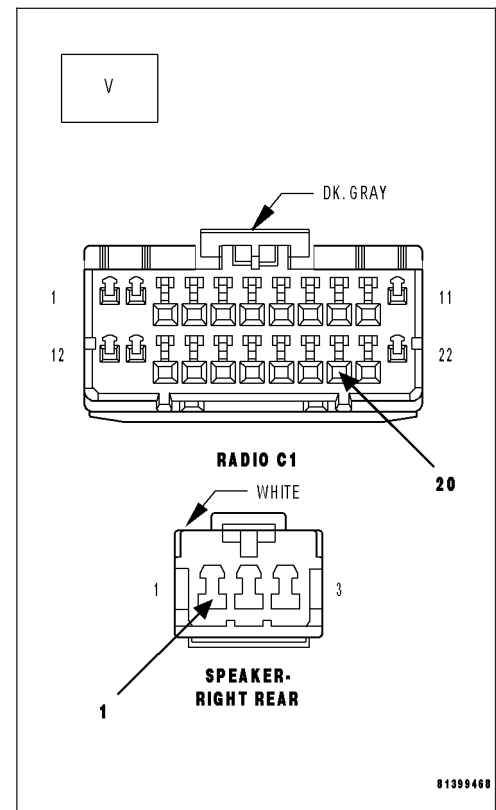
**B140E-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT HIGH (CONTINUED)****3. CHECK FOR VOLTAGE ON THE (X394) SPEAKER (-) CIRCUIT**

Measure for voltage on the (X394) Speaker (-) circuit.

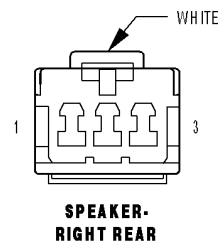
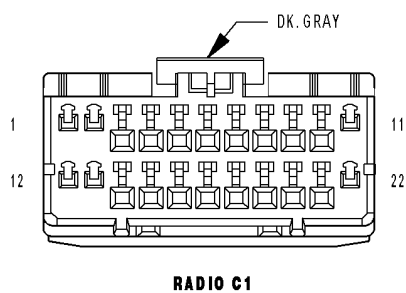
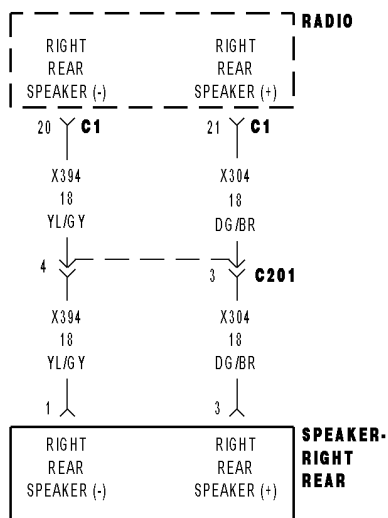
**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (X394) Speaker (-) circuit for a short to voltage.  
Perform BODY VERIFICATION TEST VER-1.

**No** >> Replace the Radio in accordance with the service information.  
Perform BODY VERIFICATION TEST VER-1.



## B140F-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN



**B140F-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)**

For the Audio system circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Radio on.
- **Set Condition:**
- When the Output circuit is open for more than 3 seconds. The Radio will not set the fault if the radio confirms an amplifier is on the BUS.

Possible Causes
SPEAKER (X304) (X394) RIGHT REAR SPEAKER OUTPUT CIRCUIT

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

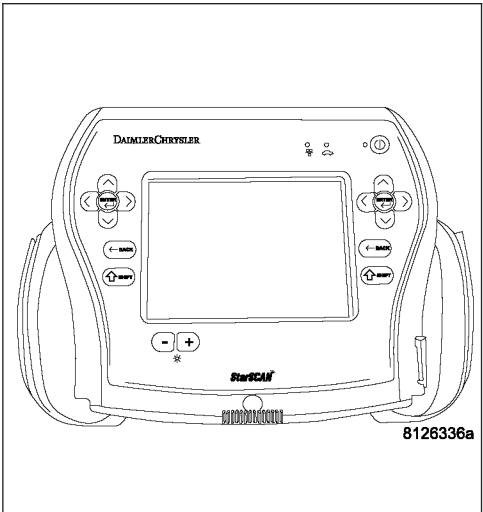
**Diagnostic Test**

**1. Intermittent Condition**

- Turn the ignition on.
- With the Scan Tool, clear all Audio DTC's.
- Turn the Radio on.
- With the Scan Tool, read the DTC information.

**Does the Scan Tool read: B140F-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

- Yes** >> Go To 2
- No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST VER 1.



**2. (X394) (X304) Speaker Output circuits.**

- Turn the ignition off.
- Disconnect the Radio C1 harness connector.
- Disconnect the Rear Right Audio Speaker connector.
- Measure the resistance of each speaker (X304)(+) and (X394)(-) circuit between the Radio and the Speaker.

**Is the resistance below 5.0 ohms for each circuit?**

- Yes** >> Go To 3
- No** >> Repair the applicable Output Speaker circuit for an open condition.  
Perform the BODY VERIFICATION TEST VER 1.

**B140F-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN (CONTINUED)****3. Speaker**

Turn the ignition off.

Disconnect the Rear Right Audio Speaker.

Turn the ignition on.

Turn the Radio on.

With the Scan Tool, clear all Audio DTC's.

With the Scan Tool, read the DTC information.

**Does the Scan Tool read: B140F-REAR RIGHT AUDIO SPEAKER OUTPUT CIRCUIT OPEN?**

**Yes** >> Replace the Speaker in accordance with the service information.  
Perform the BODY VERIFICATION TEST VER 1.

**No** >> Test Complete.

---

B1421-AUDIO CD READ ERROR/INOPERABLE DISC

For the Audio System circuit diagram(Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- Continuously with the ignition on and the radio CD player turned on.
- **Set Condition:**
- The code will set if a CD that is not formatted as a music CD is installed in the radio CD player.

Possible Causes
CD READ FAILURE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. RADIO

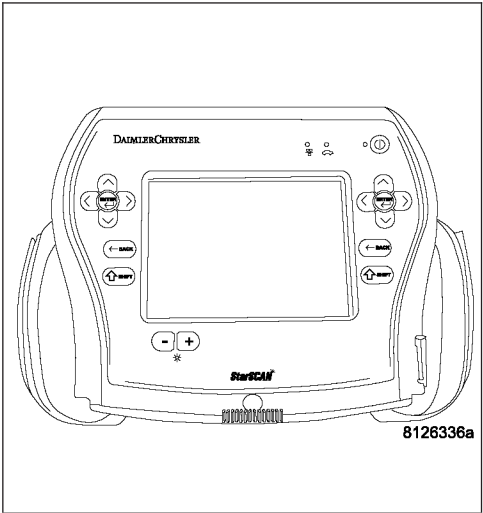
Replace the problem CD with a good, clean,unscratched, music CD.  
Turn the radio CD player on.  
With the Scan Tool, read DTC's.

**Does the Scan Tool display: B1421 Audio CD Read Error/Inoperable Disc?**

- Yes

>> Eject the inoperative CD and replace the CD in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.
- No

>> Test Complete.



**B1422-AUDIO DVD READ ERROR/INOPERABLE DISC**

For the Audio System circuit diagram(Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- Continuously with the ignition on and the DVD player turned on.
- **Set Condition:**
- The code will set if a DVD that is not formatted as a DVD is installed in the DVD player.

Possible Causes
DVD READ FAILURE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. DVD PLAYER**

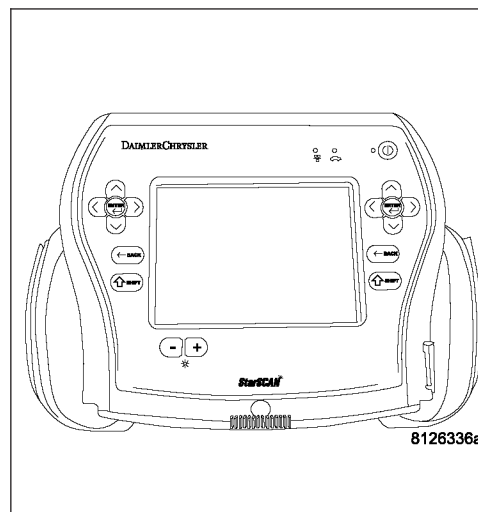
Replace the problem DVD with a good, clean, unscratched DVD.

Turn the DVD player on.

With the Scan Tool, read DTC's.

**Does the Scan Tool display: B1422 Audio DVD Read Error/Inoperable Disc?**

- Yes**    >> Eject the inoperative DVD and replace the DVD in accordance with the service information.  
              Perform the BODY VERIFICATION TEST — VER 1.
- No**     >> Test Complete.



B1429-RADIO DISPLAY HIGH TEMPERATURE

For the Audio System circuit diagram(Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:
- Continuously with the ignition and Navigation Radio on.
- Set Condition:
- The code will set if the temperature inside the display exceeds 158°F

Possible Causes
HIGH TEMPERATURE FAILURE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. VERIFY THAT DTC B1429—RADIO DISPLAY HIGH TEMPERATURE IS ACTIVE.

With the Scan Tool, erase the Audio DTC's.

Start the engine and allow the engine to reach normal operating temperature.

If the vehicle has been in the hot sunlight or extreme cold, move the vehicle indoors and open the doors to allow the inside temperature to stabilize.

The radio display should operate to 158°F.

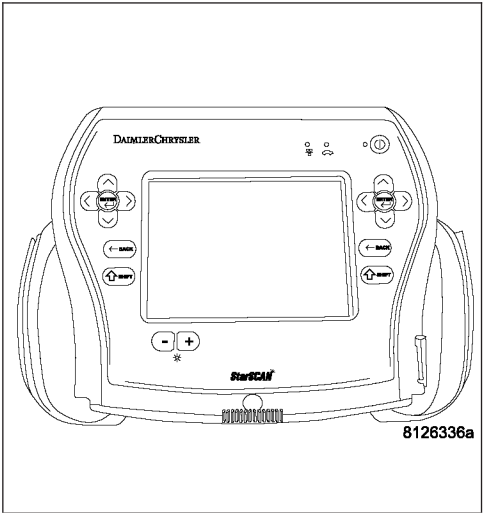
With the Scan Tool, read the DTC's.

Does the Scan Tool display, B1429— Radio Display High Temperature?

- Yes

>> Replace the Radio in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.
- No

>> Test Complete.



**B142A-RADIO UNIT HIGH TEMPERATURE**

For the Audio System circuit diagram(Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:
- Continuously with the ignition and Radio on.
- Set Condition:
- The code will set if the temperature inside the radio is above +65°C ( +145°F )

Possible Causes
HIGH TEMPERATURE FAILURE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. VERIFY THAT DTC B142A—RADIO UNIT HIGH TEMPERATURE IS ACTIVE.**

With the Scan Tool, erase the Audio DTC's.

Start the engine and allow the engine to reach normal operating temperature.

If the vehicle has been in the hot sunlight or extreme cold, move the vehicle indoors and open the doors to allow the inside temperature to stabilize.

The Radio should operate between —23°C and 65°C ( —10°F and +145°F ).

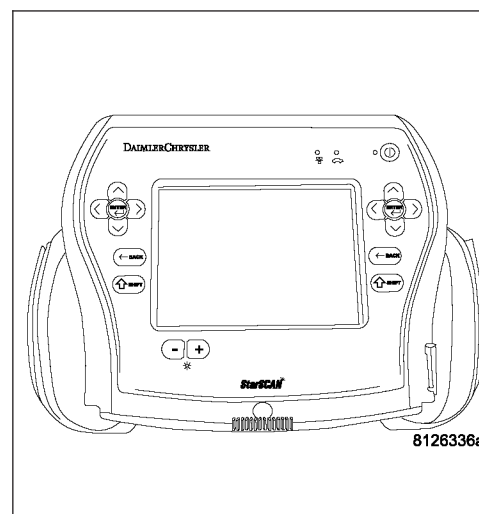
With the Scan Tool, read the DTC's.

**Does the Scan Tool display, B142A— Radio Unit High Temperature?**

**Yes** >> Replace the Radio in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Test Complete.





B142D-AUDIO ANTENNA NOT CONNECTED

For the Audio System circuit diagram(Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the ignition on and the radio in seek mode.
- **Set Condition:**
- With the radio in seek mode for two loops around the band. The radio does not detect an antenna connection or does not receive a radio station signal.

Possible Causes
BAD ANTENNA CONNECTION
RADIO

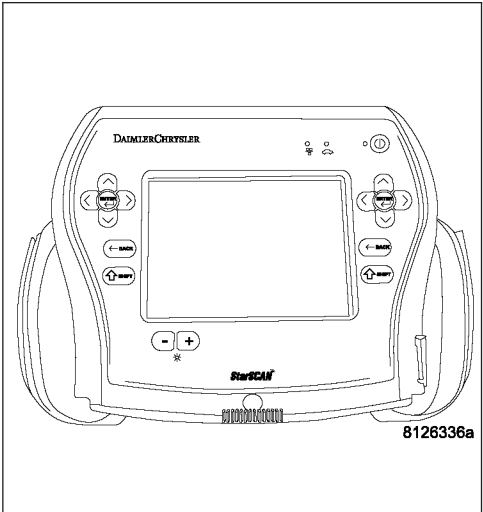
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. Test Antenna

Turn the ignition off.  
Disconnect the Radio Antenna connector.  
Inspect the Radio Antenna connection.

- Was the Antenna connection clean and secure?**
- Yes**    >> Go To 2
- No**     >> Repair the Antenna connection as needed.  
          Perform the BODY VERIFICATION TEST — VER1.



2. ANTENNA

Refer to the Audio System in the service information and test the antenna in accordance with the service procedure.

- Is the Antenna ok?**
- Yes**    >> Go To 3
- No**     >> Repair or replace the Antenna assembly as necessary.  
          Perform the BODY VERIFICATION TEST — VER1.

**B142D-AUDIO ANTENNA NOT CONNECTED (CONTINUED)****3. RADIO**

**Note:** Reconnect all previously disconnected components.

**Note:** Move vehicle outside approximately 30ft from any structure.

Turn the ignition and radio on.

With the Scan Tool, erase the audio DTC's, put the radio in seek up and down mode for 2 loops around the band cycle before proceeding.

With the Scan Tool, read the audio DTC's.

**Did this DTC reset?**

**Yes**    >> Replace the radio in accordance with the service information.  
            Perform the BODY VERIFICATION TEST-VER1.

**No**      >> Test Complete.

---

## B142E-GPS ANTENNA NOT CONNECTED

For the Audio System circuit diagram(Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the ignition on and the radio in navigation mode.
- **Set Condition:**
- With the radio does not detect GPS antenna connection.

Possible Causes
BAD ANTENNA CONNECTION RADIO

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

## Diagnostic Test

### 1. TEST ANTENNA

Turn the ignition off.

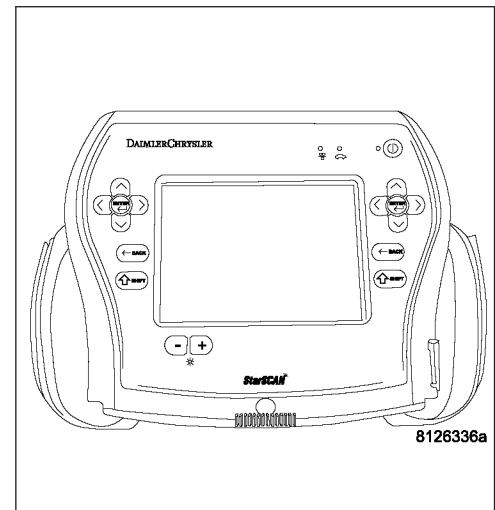
Disconnect the GPS Antenna connector.

Inspect the GPS Antenna connection.

**Was the Antenna connection clean and secure?**

**Yes** >> Go To 2

**No** >> Repair the Antenna connection as needed.  
Perform the BODY VERIFICATION TEST — VER1.



### 2. ANTENNA

Refer to the Audio System in the service information and test the antenna in accordance with the service procedure.

**Is the Antenna ok?**

**Yes** >> Go To 3

**No** >> Repair or replace the Antenna assembly as necessary.  
Perform the BODY VERIFICATION TEST — VER1.

**B142E-GPS ANTENNA NOT CONNECTED (CONTINUED)****3. RADIO**

**Note:** Reconnect all previously disconnected components.

**Note:** Move vehicle outside approximately 30ft from any structure.

Turn the ignition and radio on.

With the Scan Tool, erase the audio DTC's and operate the navigation system.

With the Scan Tool, read the audio DTC's.

**Did this DTC reset?**

**Yes**    >> Replace the radio in accordance with the service information.  
            Perform the BODY VERIFICATION TEST-VER1.

**No**      >> Test Complete.

---

B221E-RADIO INTERNAL

For the Audio System circuit diagram (Refer to 8 - ELECTRICAL/AUDIO - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:
- Continuously with the ignition on and radio turned on.
- Set Condition:
- The code will set if the radio detects a radio internal failure.

Possible Causes
RADIO INTERNAL FAILURE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. Verify DTC B221E-RADIO INTERNAL IS ACTIVE

**Note:** If a DTC is set, erase the DTC and attempt to reset the DTC.  
**If the DTC resets, follow test.**

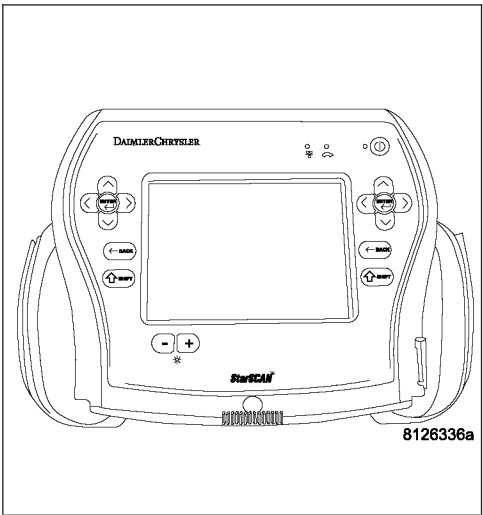
This is an internal radio failure

[View repair](#)

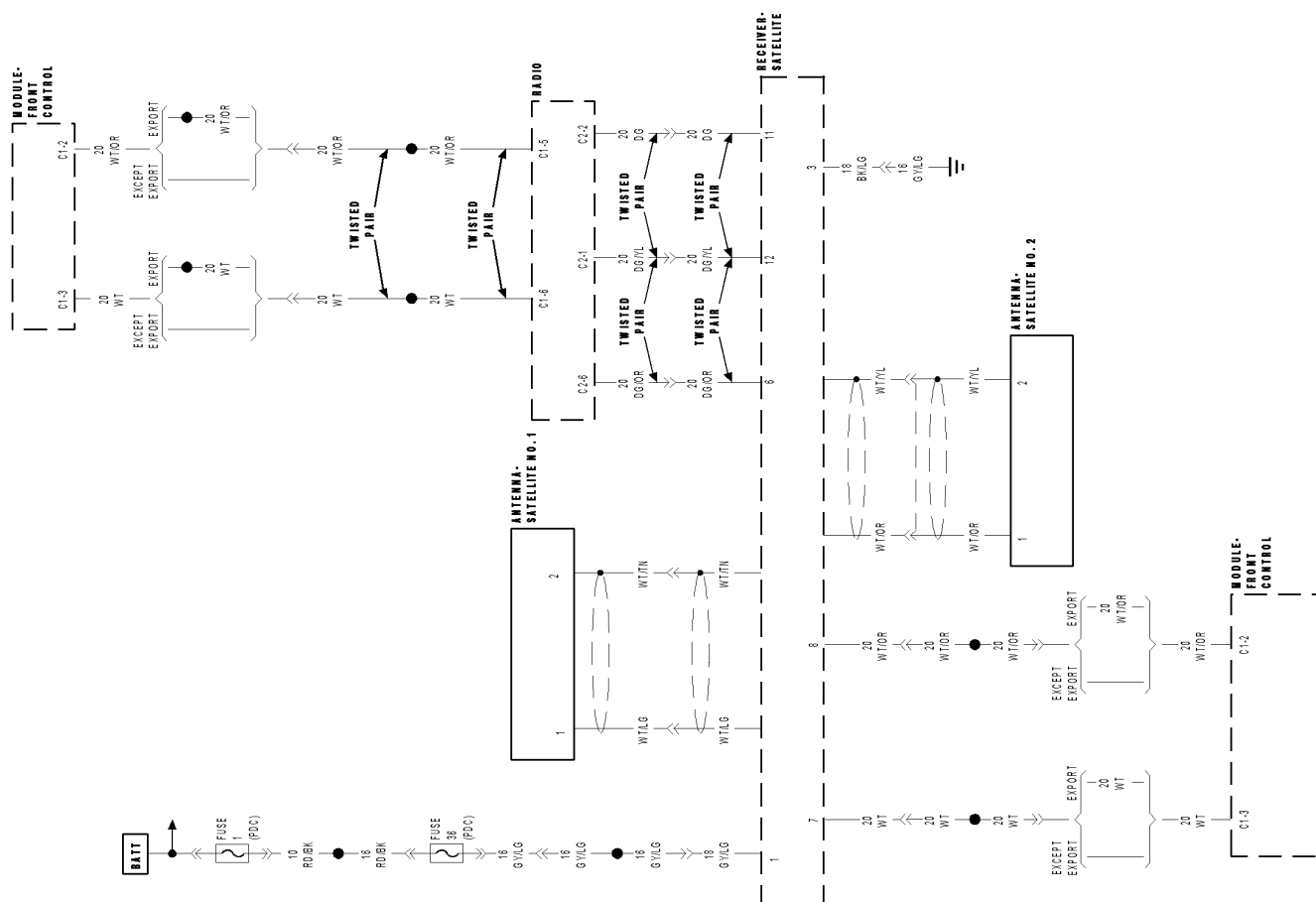
Does the DTC reset and read B221E-Radio Internal?

Repair

- Replace the Radio in accordance with the service information.
- Perform the BODY VERIFICATION TEST — VER 1.

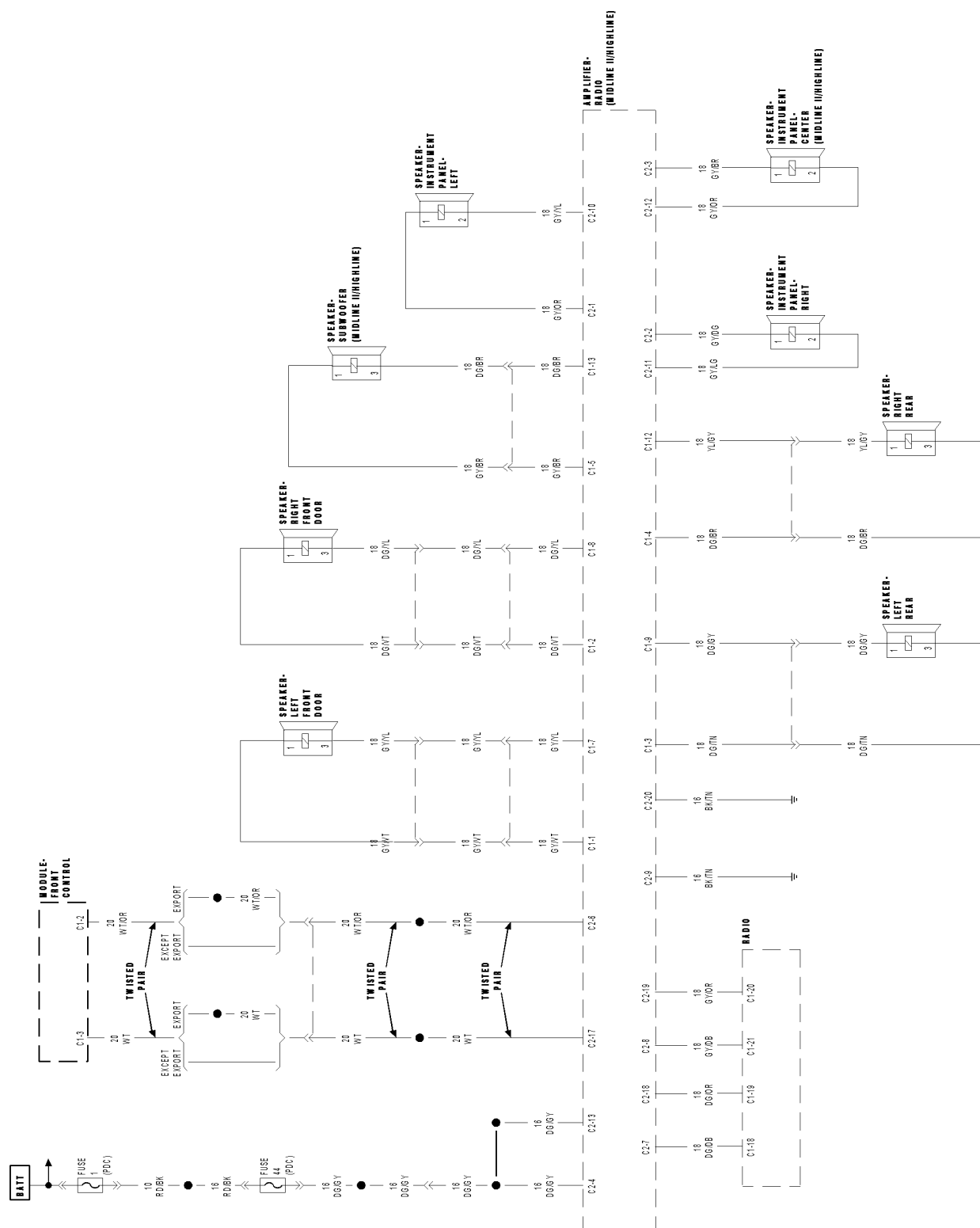


## SCHEMATICS AND DIAGRAMS

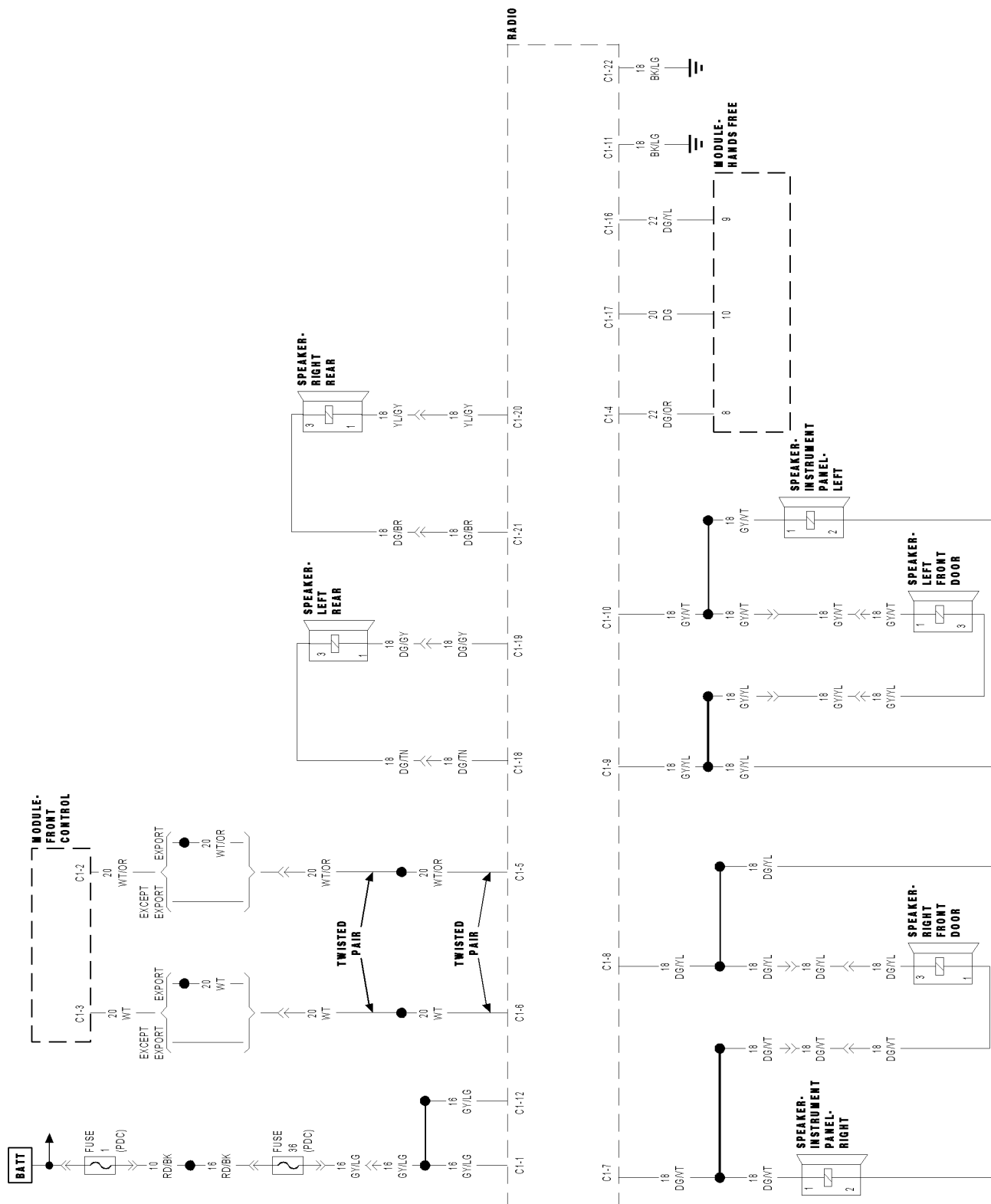


## SATELLITE RADIO

813b50d6



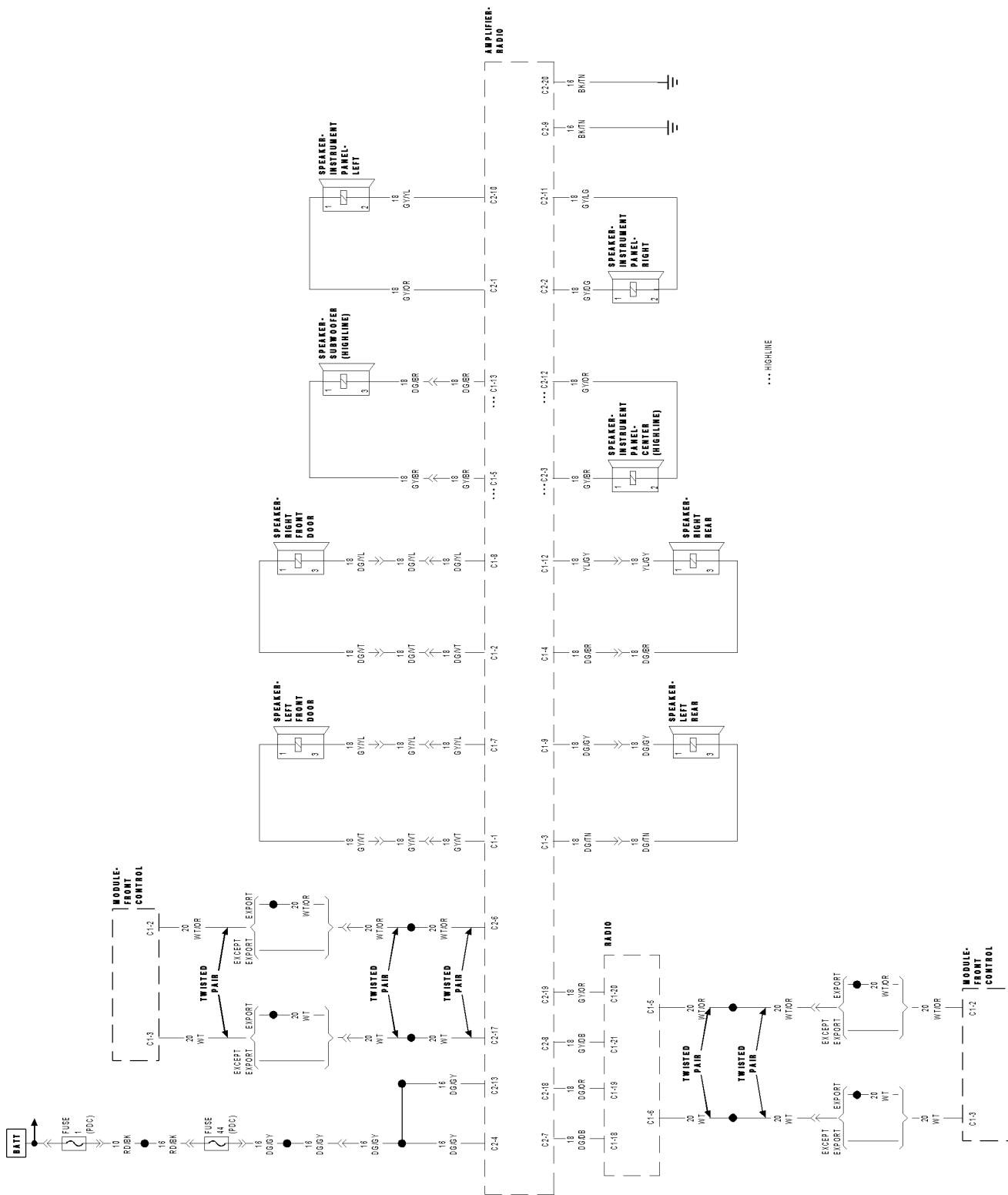
PREMIUM RADIO



BASE RADIO

81356CS





AMPLIFIER

## AUDIO/VIDEO - SERVICE INFORMATION

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## AUDIO/VIDEO - SERVICE INFORMATION

### DESCRIPTION

Several radios are offered. The audio system uses a CAN B bus Ignition ON message so that the system will only operate when the ignition switch is in the RUN or ACCESSORY/ACCESSORY DELAY positions.

The audio system includes the following components:

- Amplifier
- Antenna integral to the rear glass
- Radio noise suppression components
- Radio
- Speakers

Certain functions and features of the audio/video system rely upon resources shared with other electronic modules in the vehicle over the CAN bus network. For diagnosis of the CAN bus network, the use of a scan tool and the proper Diagnostic Procedures information is recommended.

For complete circuit diagrams, refer to the appropriate wiring information.

### DIAGNOSIS AND TESTING - AUDIO/VIDEO

**Any diagnosis of the Audio system should begin with the use of scan tool. For information on the use of the scan tool, refer to the appropriate Diagnostic Service information.**

For complete circuit diagrams, refer to the appropriate wiring information.

**WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

### AUDIO SYSTEM DIAGNOSIS

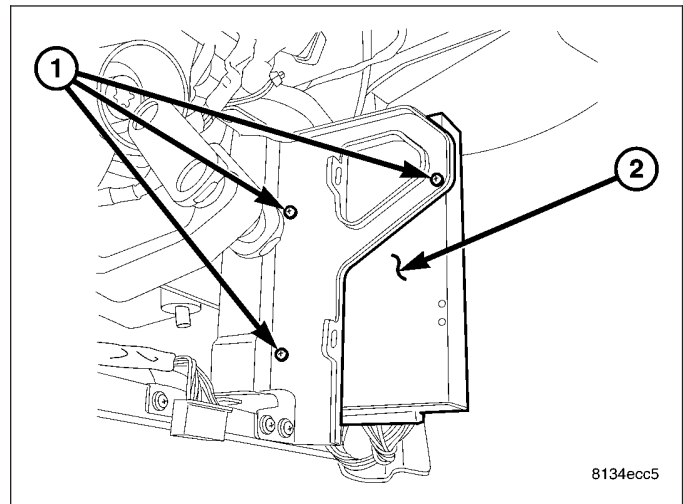
CONDITION	POSSIBLE CAUSE	CORRECTION
NO AUDIO.	1. FUSE INOPERATIVE.	1. CHECK RADIO FUSES IN INTEGRATED POWER MODULE (IPM). REPLACE FUSES, IF REQUIRED.
	2. RADIO CONNECTOR DAMAGED.	2. CHECK FOR LOOSE OR CORRODED RADIO CONNECTOR. REPAIR, IF REQUIRED.
	3. WIRING DAMAGED.	3. CHECK FOR BATTERY VOLTAGE AT RADIO CONNECTOR. REPAIR WIRING, IF REQUIRED.
	4. GROUND DAMAGED.	4. CHECK FOR CONTINUITY BETWEEN RADIO CHASSIS AND A KNOWN GOOD GROUND. THERE SHOULD BE CONTINUITY. REPAIR GROUND, IF REQUIRED.
	5. RADIO INOPERATIVE.	5. EXCHANGE OR REPLACE RADIO, IF REQUIRED.
	6. AMPLIFIER INOPERATIVE.	6. PERFORM DIAGNOSIS ON AMPLIFIER. REPLACE AS NECESSARY.
NO DISPLAY.	1. FUSE INOPERATIVE.	1. CHECK RADIO FUSES. REPLACE FUSES, IF REQUIRED.
	2. RADIO CONNECTOR DAMAGED.	2. CHECK FOR LOOSE OR CORRODED RADIO CONNECTOR. REPAIR, IF REQUIRED.
	3. WIRING DAMAGED.	3. CHECK FOR BATTERY VOLTAGE AT RADIO CONNECTOR. REPAIR WIRING, IF REQUIRED.
	4. GROUND DAMAGED.	4. CHECK FOR CONTINUITY BETWEEN RADIO CHASSIS AND A KNOWN GOOD GROUND. THERE SHOULD BE CONTINUITY. REPAIR GROUND, IF REQUIRED.
	5. RADIO INOPERATIVE.	5. EXCHANGE OR REPLACE RADIO, IF REQUIRED.
NO MEMORY.	1. FUSE INOPERATIVE.	1. CHECK IGNITION-OFF DRAW FUSE. REPLACE FUSE, IF REQUIRED.
	2. RADIO CONNECTOR DAMAGED.	2. CHECK FOR LOOSE OR CORRODED RADIO CONNECTOR. REPAIR, IF REQUIRED.
	3. WIRING DAMAGED.	3. CHECK FOR BATTERY VOLTAGE AT RADIO CONNECTOR. REPAIR WIRING, IF REQUIRED.
	4. GROUND DAMAGED.	4. CHECK FOR CONTINUITY BETWEEN RADIO CHASSIS AND A KNOWN GOOD GROUND. THERE SHOULD BE CONTINUITY. REPAIR GROUND, IF REQUIRED.
	5. RADIO INOPERATIVE.	5. EXCHANGE OR REPLACE RADIO, IF REQUIRED.
POOR RADIO RECEPTION.	1. ANTENNA OR CABLE DAMAGED OR INOPERATIVE.	1. REFER TO ANTENNA DIAGNOSIS. REPAIR OR REPLACE ANTENNA, IF REQUIRED.
	2. GROUND DAMAGED.	2. CHECK FOR CONTINUITY BETWEEN RADIO CHASSIS AND A KNOWN GOOD GROUND. THERE SHOULD BE CONTINUITY. REPAIR GROUND, IF REQUIRED.

CONDITION	POSSIBLE CAUSE	CORRECTION
	3. RADIO INOPERATIVE.	3. EXCHANGE OR REPLACE RADIO, IF REQUIRED.
	4. POOR ANTENNA CONNECTION AT RADIO OR IN LINE.	4. VERIFY PROPER CONNECTION.
SOUND DISTORTION (VIBRATION FROM SPEAKER AREA, BUZZING - HUMMING	1. DOOR TRIM PANEL LOOSE OR MISSING FASTENERS.	1. INSPECT DOOR TRIM PANEL AND CORRECT AS NECESSARY. REPLACE ANY MISSING FASTENERS.
	2. WATER SHIELD LOOSE OR MISALIGNED.	2. INSPECT WATER SHIELD AND ADJUST AS REQUIRED.
	3. ITEMS PLACED IN DOOR TRIM PANEL MAP POCKETS VIBRATING OR MOVING FROM SIDE TO SIDE.	3. REMOVE ITEMS FROM DOOR TRIM PANEL. ENSURE THAT VIBRATION IS NO LONGER PRESENT.
NO/POOR TAPE OPERATION.	1. TAPE DAMAGED.	1. INSERT KNOWN GOOD TAPE AND TEST OPERATION.
	2. FOREIGN OBJECTS BEHIND TAPE DOOR.	2. REMOVE FOREIGN OBJECTS AND TEST OPERATION.
	3. DIRTY CASSETTE TAPE HEAD.	3. CLEAN HEAD WITH MOPAR CASSETTE HEAD CLEANER.
	4. RADIO INOPERATIVE.	4. EXCHANGE OR REPLACE RADIO, IF REQUIRED.
NO COMPACT DISC OPERATION	1. CD DAMAGED.	1. INSERT KNOWN GOOD CD AND TEST OPERATION.
	2. FOREIGN MATERIAL ON CD.	2. CLEAN CD AND TEST OPERATION.
	3. CONDENSATION ON CD OR OPTICS.	3. ALLOW TEMPERATURE OF VEHICLE INTERIOR TO STABILIZE AND TEST OPERATION.
	4. RADIO INOPERATIVE.	4. EXCHANGE OR REPLACE RADIO, IF REQUIRED.

## AMPLIFIER

### DESCRIPTION

The amplifier (2) is available in two ratings: 288 watt (RD7), and 380 watt (RDF). The amplifier is mounted to the left of the steering column under the instrument panel.



### OPERATION

The amplifier receives fused battery current from a fuse in the rear Power Distribution Center (PDC) at all times. The internal circuitry of the amplifier switches the amplifier ON based upon a CAN bus message that is received from the radio receiver whenever the radio is turned on. The amplifier receives the sound signal inputs from the left and right rear outputs of the radio, then sends the amplified speaker outputs for each of those channels to the speakers.

### DIAGNOSIS AND TESTING

#### AMPLIFIER

Any diagnosis of the Audio system should begin with the use of a scan tool and the appropriate Diagnostic Service information.

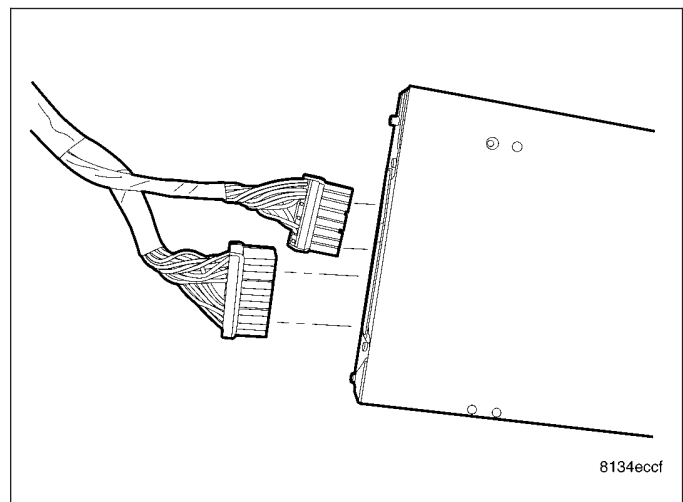
Refer to the appropriate wiring information.

The amplifier unit should be checked if there is no sound output noted from the speakers. For diagnosis of the power amplifier, (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - DIAGNOSIS AND TESTING).

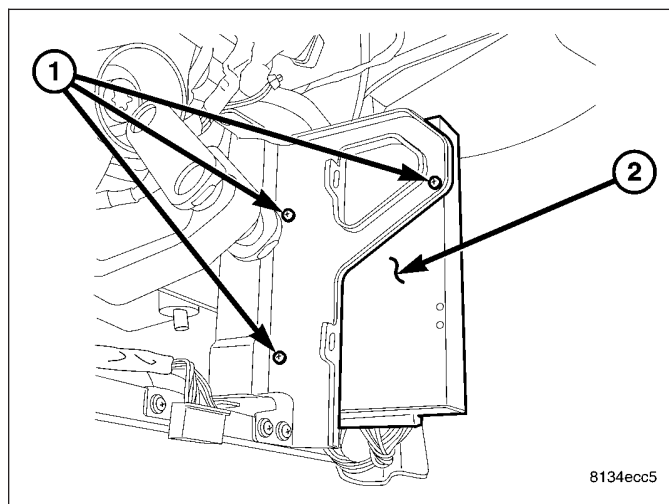
### REMOVAL

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Disconnect and isolate battery negative cable.
2. Remove the instrument panel silencer.



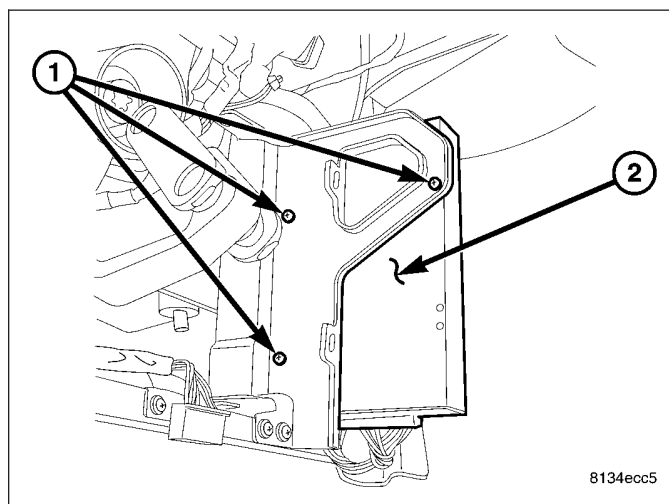
3. Disconnect electrical harness connectors.
4. Remove the mounting fasteners (1).
5. Remove the amplifier (2).



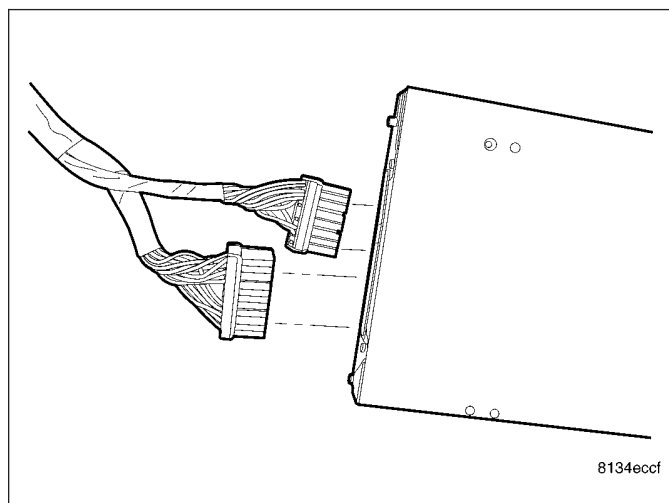
## INSTALLATION

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Position amplifier (2) into place.
2. Install mounting fasteners (1).



3. Connect electrical harness connectors.
4. Install instrument panel silencer.
5. Connect battery negative cable.



## ANTENNA CABLE

### REMOVAL

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Disconnect and isolate battery negative cable.
2. Remove right side cowl trim panel (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - REMOVAL).
3. Disconnect antenna cable from instrument panel antenna cable.
4. Remove right side front and rear door scuff plates (Refer to 23 - BODY/INTERIOR/DOOR SILL SCUFF PLATE - REMOVAL).
5. Remove right side C-pillar trim panel (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).
6. Disconnect antenna cable from antenna module.
7. Move floor carpet aside.
8. Remove antenna cable.

### INSTALLATION

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

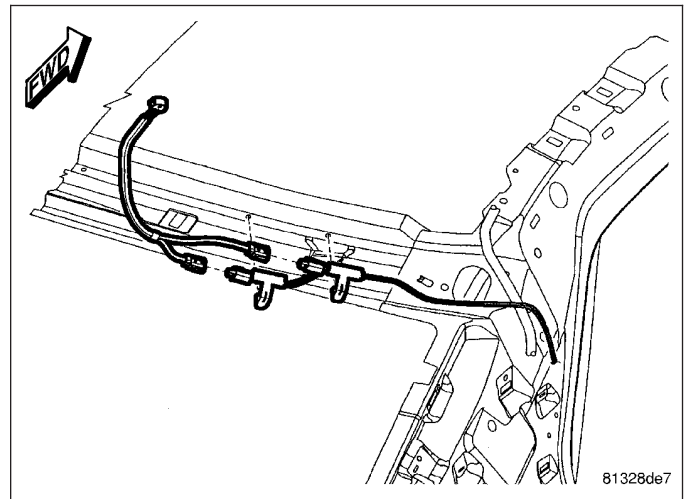
1. Position antenna cable and secure to wire harness.
2. Connect antenna cable to antenna module.
3. Connect antenna cable to instrument panel antenna cable.
4. Install right side C-pillar trim panel (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION).
5. Install right side front and rear door scuff plates (Refer to 23 - BODY/INTERIOR/DOOR SILL SCUFF PLATE - INSTALLATION).
6. Install right side cowl trim panel (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - INSTALLATION).
7. Connect battery negative cable.

## ANTENNA - SATELLITE RADIO

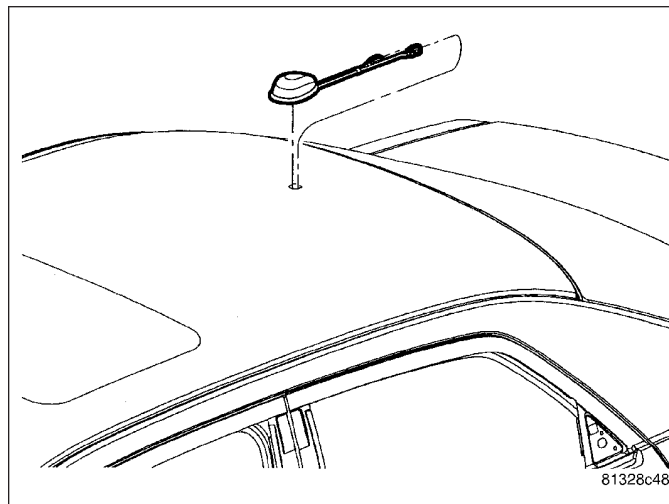
### REMOVAL

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Disconnect and isolate the battery negative cable.
2. Lower the rear portion of the headliner as necessary to access underside of antenna
3. Disconnect the wire harness connectors from the antenna.



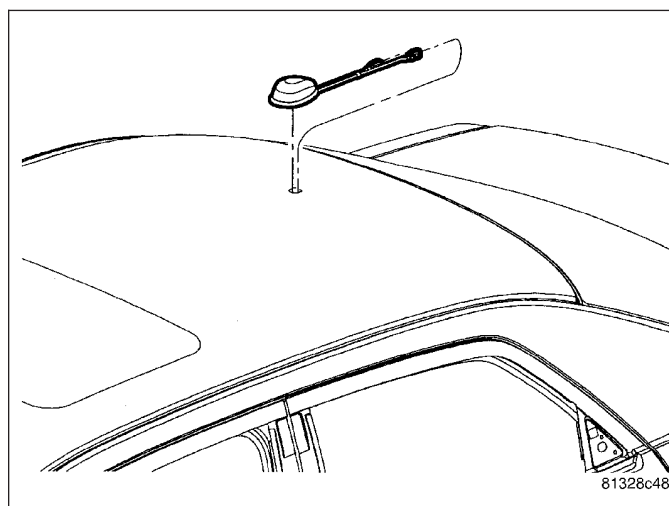
4. From inside the vehicle, and using a flat bladed tool, depress one of the retaining tabs on the antenna. Push up the one side of the antenna connector through the roof panel. Depress the other side of the connector and remove the antenna.



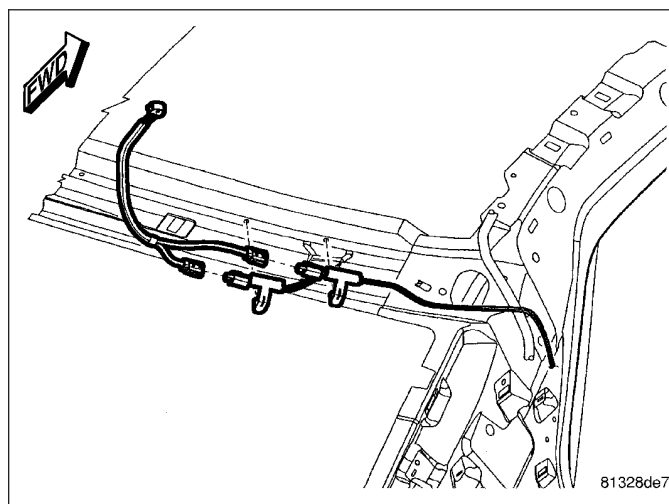
## INSTALLATION

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Insert wire harness through hole in roof panel. Press antenna into position until both retainers engage into position.



2. Connect wire harness connectors to antenna.
3. Install headliner.
4. Connect battery negative cable.





## ANTENNA MODULE

### DESCRIPTION

The antenna module is an electronic circuit component designed to capture and enhance RF (Radio Frequency) signals in both the AM and FM broadcast bands. The antenna module is mounted to the right C-pillar (sedan) or rear liftgate (wagon). The module is grounded through the mounting bracket and fastener. The module has a two wire electrical connector that connects to the integral radio antenna and EBL grid, located on the rear window. There is also an electrical connector for battery voltage and a coax cable connector.

### OPERATION

The antenna module receives both AM and FM radio signals supplied by the rear window integral radio antenna and selectively amplifies them. The amplified signal is then sent through the body length coax cable to the radio input.

### DIAGNOSIS AND TESTING

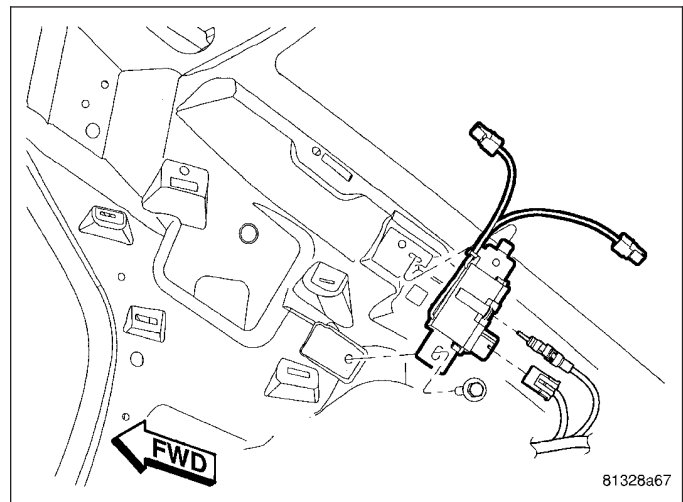
#### ANTENNA MODULE

CONDITION	POSSIBLE CAUSES	CORRECTION
NO AM RECEPTION, WEAK FM RECEPTION	<ol style="list-style-type: none"> <li>1. Antenna module to antenna connector open or disconnected.</li> <li>2. Cable open or disconnected.</li> <li>3. No battery power at antenna module.</li> <li>4. Antenna module disconnected from glass.</li> </ol>	<ol style="list-style-type: none"> <li>1. Repair open, reconnect antenna module connector to glass mounted antenna.</li> <li>2. Replace antenna cable or, reconnect cable.</li> <li>3. Check fuse. if okay, repair open in battery voltage circuit.</li> <li>4. Connect module connector to glass.</li> </ol>
NO AM OR FM RECEPTION	<ol style="list-style-type: none"> <li>1. Coax disconnected at radio.</li> <li>2. Coax shorted to ground.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reconnect coax.</li> <li>2. Repair or Replace coax</li> </ol>
WEAK OR NO AM/FM RECEPTION	<ol style="list-style-type: none"> <li>1. Antenna Module inoperative.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace antenna module.</li> </ol>

### REMOVAL

#### SEDAN

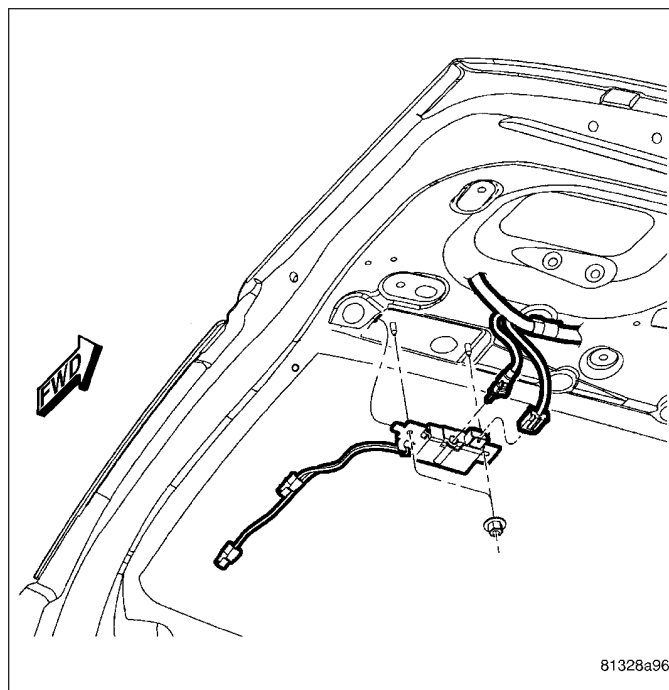
1. Disconnect and isolate the battery negative cable.
2. Remove C-pillar upper trim.
3. Disconnect wire harness connectors and antenna cable.
4. Remove mounting fasteners and antenna module.



## WAGON

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Disconnect and isolate the battery negative cable.
2. Remove the liftgate trim.
3. Disconnect wire harness connectors and antenna cable.
4. Remove mounting fasteners and antenna module.

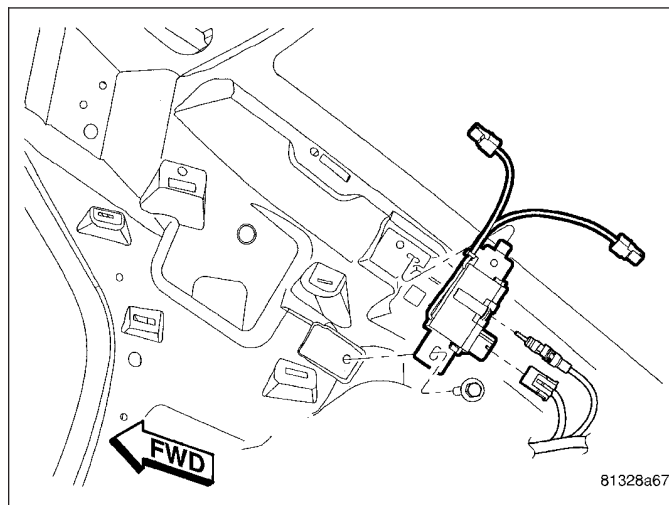


## INSTALLATION

### SEDAN

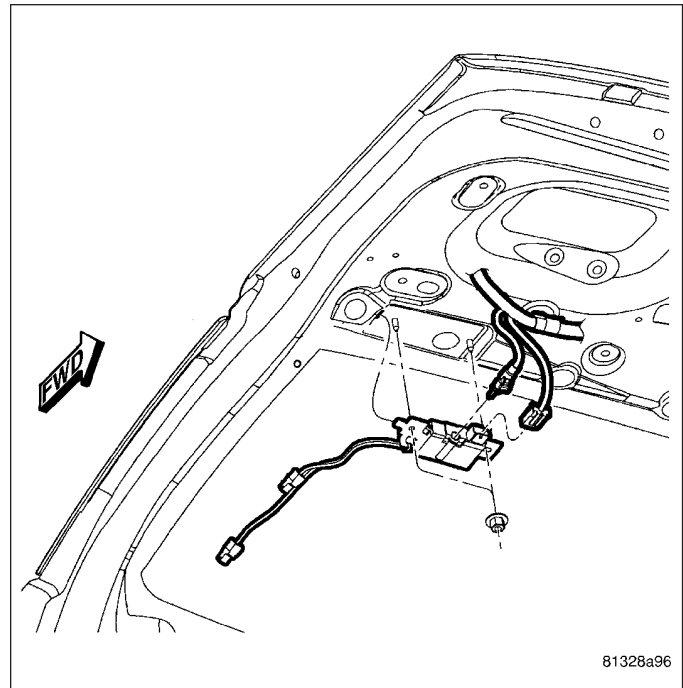
**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Position module into place.
2. Install and tighten mounting fasteners.
3. Connect wire harness connectors and antenna cable to antenna module.
4. Install C-pillar upper trim.
5. Connect battery negative cable.



## WAGON

1. Position module into place.
2. Install and tighten mounting fasteners.
3. Connect wire harness connectors and antenna cable to antenna module.
4. Install the liftgate trim.
5. Connect the battery negative cable.



## REAR GLASS INTEGRAL ANTENNA

### DESCRIPTION

The integral antenna element is bonded to the rear glass and is replaced with the glass assembly only.

### OPERATION

The integral antenna receives radio frequencies and sends them to the antenna module for amplification.

### DIAGNOSIS AND TESTING

#### REAR GLASS INTEGRAL ANTENNA

The antenna grid pattern is located above the EBL grid.

For circuit descriptions and diagrams, refer to the appropriate wiring information. To detect breaks in the integral antenna elements, the following procedure is required:

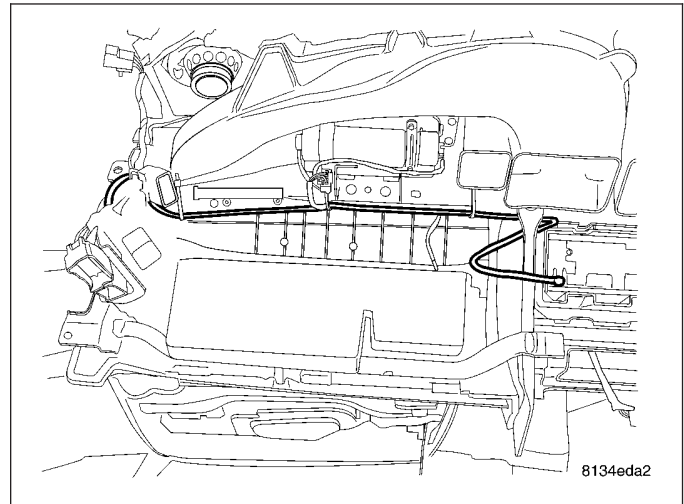
1. Disconnect the antenna module connector from the antenna terminals on the glass.
2. Using an ohmmeter, place a lead on one of the terminals and check each end of the grid pattern connected to this terminal for continuity. If continuity is present, move one lead through the grid in progression starting at the terminal with the other lead on the terminal until continuity is lost. Repeat procedure for the other terminal. A break in the antenna grid can be repaired using a Mopar Rear Window Defogger Repair Kit or equivalent.

## IP ANTENNA CABLE

### REMOVAL

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

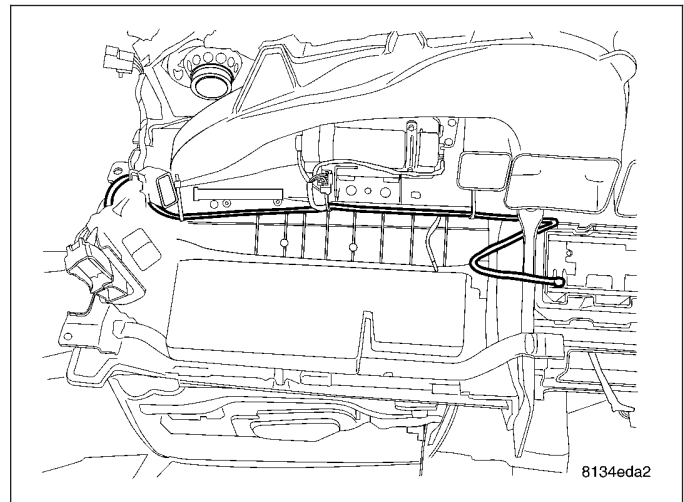
1. Disconnect and isolate the battery negative cable.
2. Remove the radio (Refer to 8 - ELECTRICAL/AUDIO/RADIO - REMOVAL).
3. Remove the glove box (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - REMOVAL).
4. Remove the right side cowl trim (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - REMOVAL).
5. Disconnect antenna cable at right side cowl area.
6. Remove cable from instrument panel.



### INSTALLATION

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Install cable to instrument panel.
2. Connect antenna cable at right side cowl area.
3. Install the right side cowl trim (Refer to 23 - BODY/INTERIOR/COWL TRIM COVER - INSTALLATION).
4. Install the glove box (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - INSTALLATION).
5. Install the radio (Refer to 8 - ELECTRICAL/AUDIO/RADIO - INSTALLATION).
6. Connect the battery negative cable.

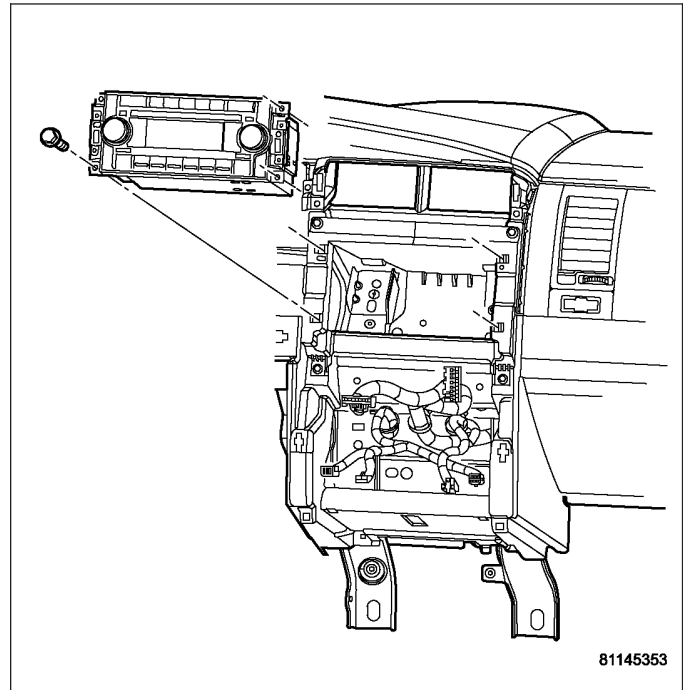


## RADIO

### DESCRIPTION

Available radios include:

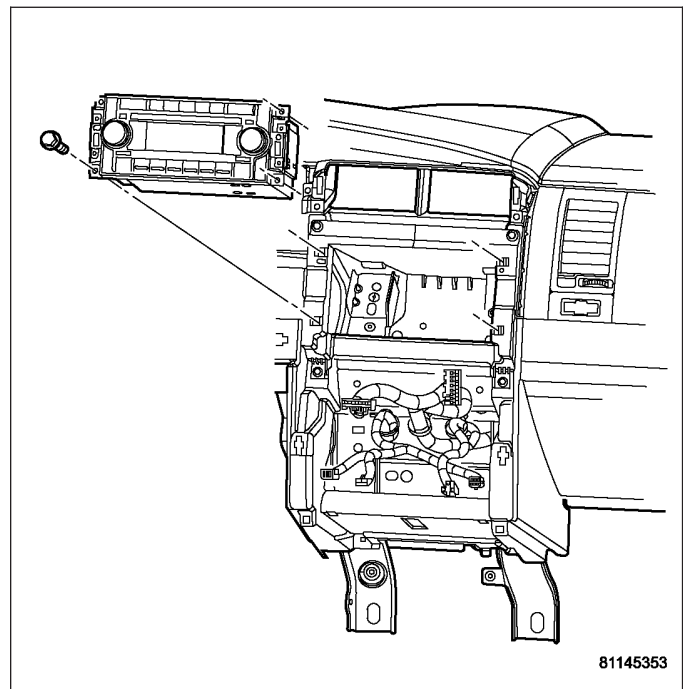
- AM/FM/MP3/6 disc CD with full screen navigation (REC sales code)
- AM/FM/MP3/6 disc CD (RAQ sales code)
- AM/FM/cassette/6 disc CD/MP3 (RAK sales code)
- AM/FM/CD with changer control (REF sales code)
- AM/FM/6 disc CD/RDS (RAR sales code) - export only
- AM/FM/CD/RDS (REG sales code) - export only
- AM/FM with integrated display (REJ sales code) - export only



### REMOVAL

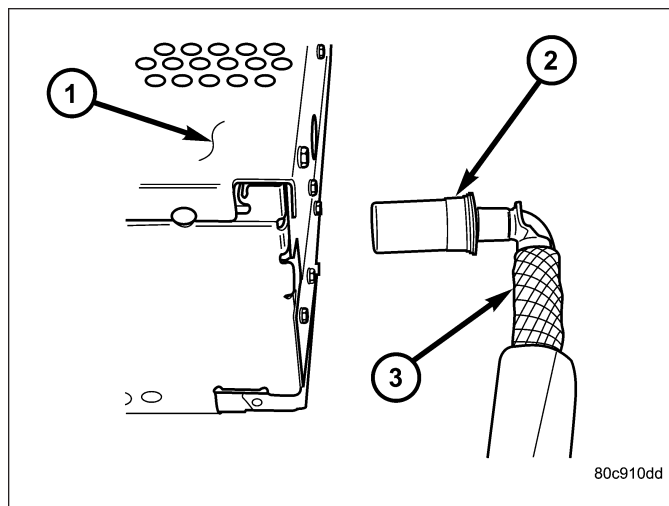
**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Disconnect and isolate the battery negative cable.
2. Remove instrument panel center bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).
3. Remove mounting fasteners.



**CAUTION:** Pulling the antenna cable straight out of the radio without pulling on the locking antenna connector could damage the cable or radio.

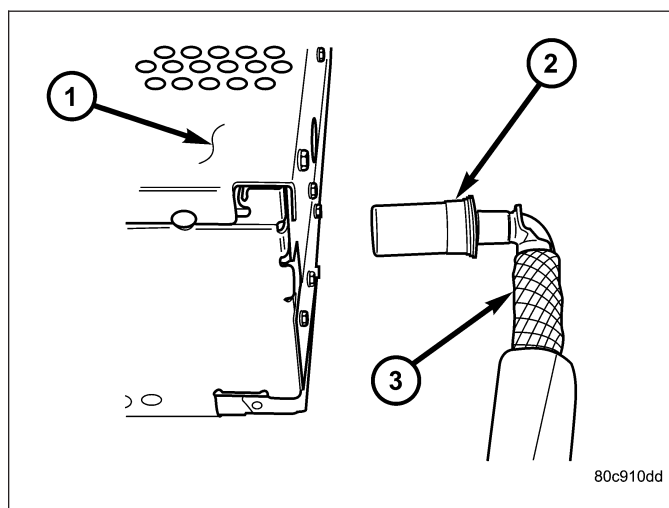
4. Disconnect the antenna cable (3) by pulling the locking antenna connector (2) away from the radio (1).
5. Disconnect the electrical harness connector and remove radio.



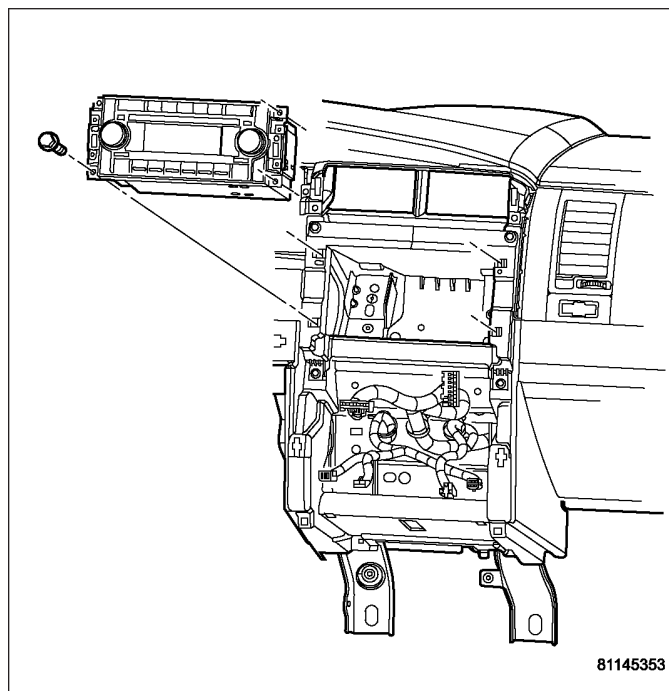
## INSTALLATION

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Connect the electrical harness and antenna cable (3) to radio (1).



2. Position radio and install mounting fasteners.
3. Install instrument panel center bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).
4. Connect battery negative cable.



## RADIO NOISE SUPPRESSION COMPONENTS

### DESCRIPTION

Radio noise suppression devices are installed on this vehicle. Radio Frequency Interference (RFI) and ElectroMagnetic Interference (EMI) can be produced by any on-board or external source of electromagnetic energy. These electromagnetic energy sources can radiate electromagnetic signals through the air, or conduct them through the vehicle electrical system.

When the audio system converts RFI or EMI to an audible acoustic wave form, it is referred to as radio noise. This undesirable radio noise is generally manifested in the form of "buzzing," "hissing," "popping," "clicking," "crackling," and/or "whirring" sounds. In most cases, RFI and EMI radio noise can be suppressed using a combination of vehicle and component grounding, filtering and shielding techniques. This vehicle is equipped with radio noise suppression devices that were designed to minimize exposure to typical sources of RFI and EMI; thereby, minimizing radio noise complaints.

Radio noise suppression is accomplished primarily through circuitry or devices that are integral to the radios, audio power amplifiers and other on-board electrical components such as generators, wiper motors, blower motors, and fuel pumps that have been found to be potential sources of RFI or EMI. External radio noise suppression devices that are used on this vehicle to control RFI or EMI, and can be serviced, include the following:

- **Engine-to-frame ground strap** - This length of braided ground strap has an eyelet terminal connector crimped to each end. One end is secured to the engine cylinder heads. The other is secured to the frame.
- **Resistor-type spark plugs** - This type of spark plug has an internal resistor connected in series between the spark plug terminal and the center electrode to help reduce the production of electromagnetic radiation that can result in radio noise.
- **Exhaust-to-frame ground strap** - This length of braided ground strap has an eyelet terminal connector crimped to each end. One end is secured to the exhaust pipe. The other is secured to the frame.

### OPERATION

There are two common strategies that can be used to suppress Radio Frequency Interference (RFI) and ElectroMagnetic Interference (EMI) radio noise. The first suppression strategy involves preventing the production of RFI and EMI electromagnetic signals at their sources. The second suppression strategy involves preventing the reception of RFI and EMI electromagnetic signals by the audio system components.

The use of braided ground straps in key locations is part of the RFI and EMI prevention strategy. These ground straps ensure adequate ground paths, particularly for high current components such as many of those found in the starting, charging, ignition, engine control and transmission control systems. An insufficient ground path for any of

these high current components may result in radio noise caused by induced voltages created as the high current seeks alternative ground paths through components or circuits intended for use by, or in close proximity to the audio system components or circuits.

Preventing the reception of RFI and EMI is accomplished by ensuring that the audio system components are correctly installed in the vehicle. Loose, corroded or improperly soldered wire harness connections, improperly routed wiring and inadequate audio system component grounding can all contribute to the reception of RFI and EMI. A properly grounded antenna body and radio chassis, as well as a shielded antenna coaxial cable with clean and tight connections will each help reduce the potential for reception of RFI and EMI.

## SWITCH-REMOTE RADIO

### DESCRIPTION

Two rocker-type switches are mounted on the front of the steering wheel spokes.

The left switch controls the following functions:

- AUDIO SYSTEM HOT KEY - Controls mode selection: AM, FM, Tape, CD, Satellite Radio
- FUNCTION SELECT - Controls the radio preset advance or disc change (in audio mode), reset or trip functions and scroll through warning messages, and personal feature selection (only when vehicle is in Park).
- SCROLL - Controls the radio station seek up/down, CD change track, tape change side, satellite radio change channel, trip functions, navigation, system status messages, and personal settings

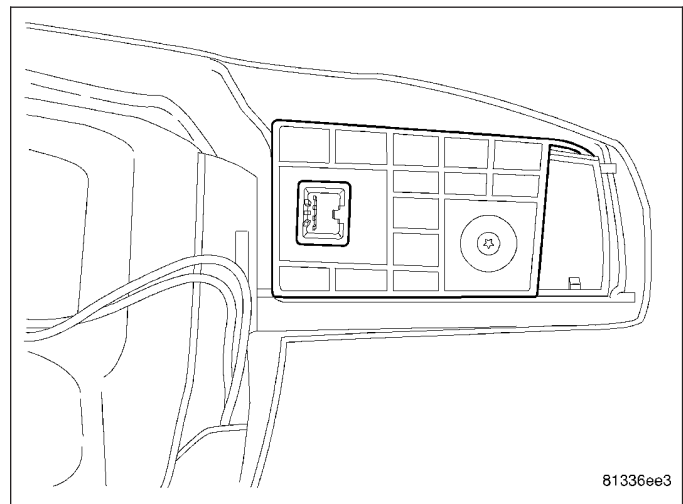
The right switch controls the following:

- AUDIO SYSTEM VOLUME - Controls the system volume level
- C/T - Compass/Temperature hot key
- MENU - Controls trip functions, navigation, system status, personal settings, and telephone

### REMOVAL

**Note: A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).**

1. Disconnect and isolate the battery negative cable.
2. Remove the driver airbag (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).
3. Disconnect electrical connector (s).
4. Remove mounting fastener and switch.

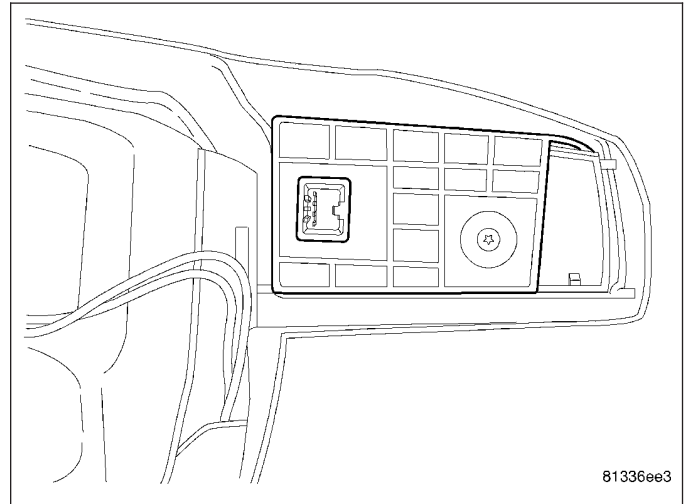




## INSTALLATION

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Position switch into place.
2. Install and tighten mounting fastener.
3. Connect electrical harness connector.
4. Install the driver airbag.
5. Connect the battery negative cable.



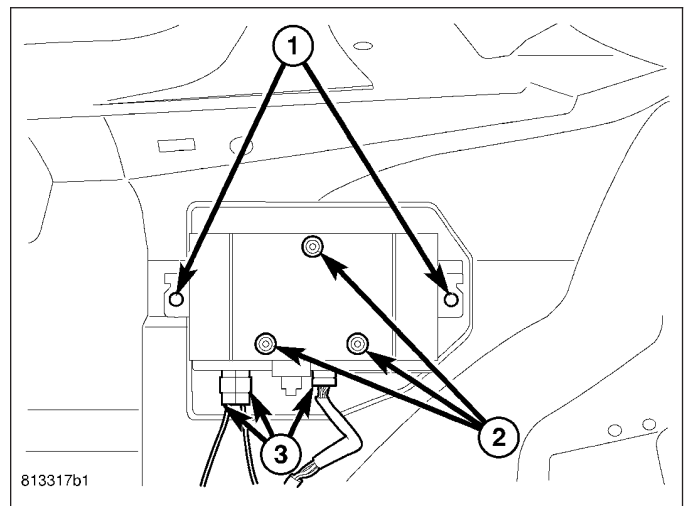
## SATELLITE RECEIVER MODULE

### REMOVAL

#### SEDAN

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

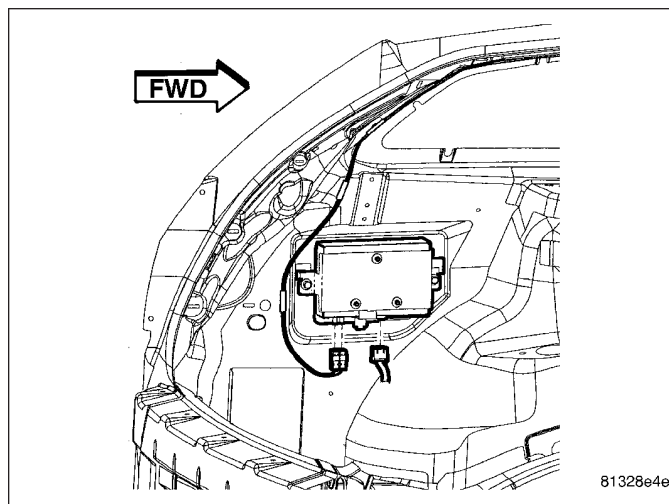
1. Disconnect and isolate the battery negative cable.
2. Remove left side trunk trim.
3. Disconnect electrical harness connector (3).
4. Disconnect antenna harness connectors.
5. Remove mounting bracket fasteners (1).
6. Remove module to mounting bracket fasteners (2).



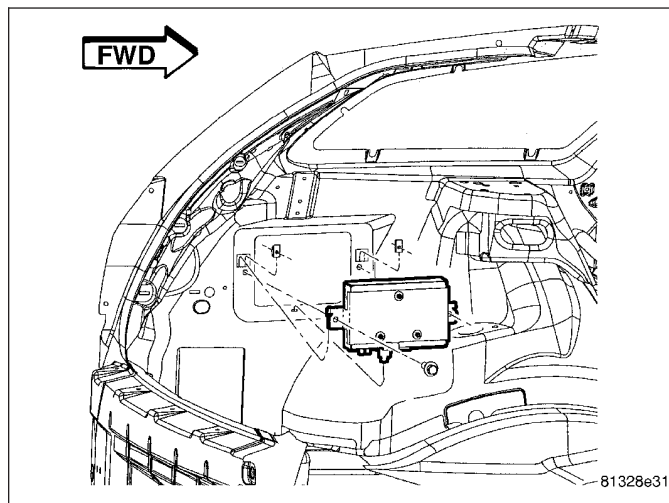
**WAGON**

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

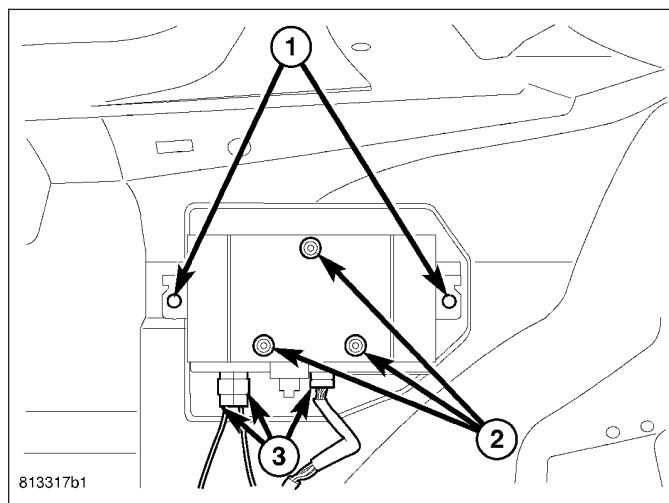
1. Disconnect and isolate the battery negative cable.
2. Remove the left rear quarter trim panel.
3. Disconnect electrical harness connector.
4. Disconnect antenna harness connectors.



5. Remove mounting bracket fasteners



6. Remove module to mounting bracket fasteners (2).

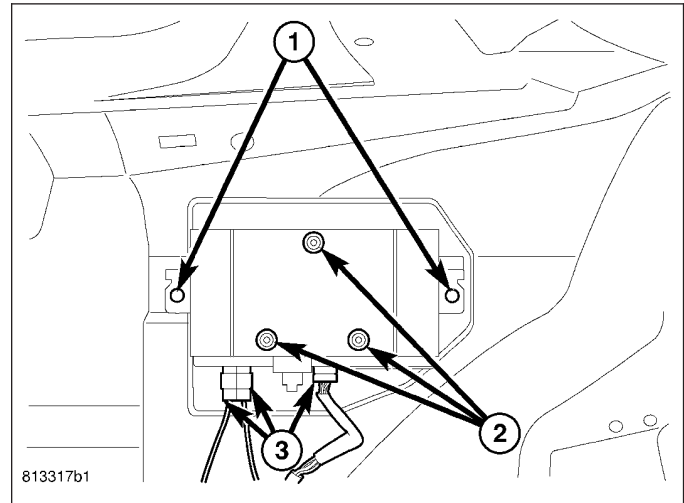


## INSTALLATION

### SEDAN

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

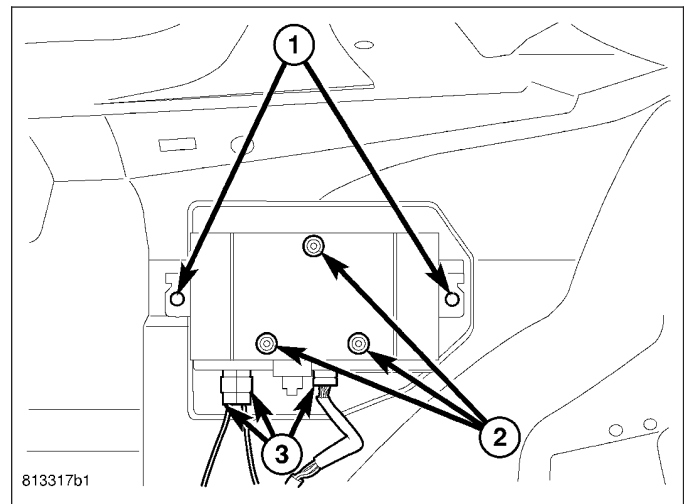
1. Install and tighten module to mounting bracket fasteners (2).
2. Position module into place.
3. Install and tighten mounting bracket fasteners (1).
4. Connect antenna harness connectors.
5. Connect electrical harness connectors (3).
6. Install left side trunk trim.
7. Connect battery negative cable.



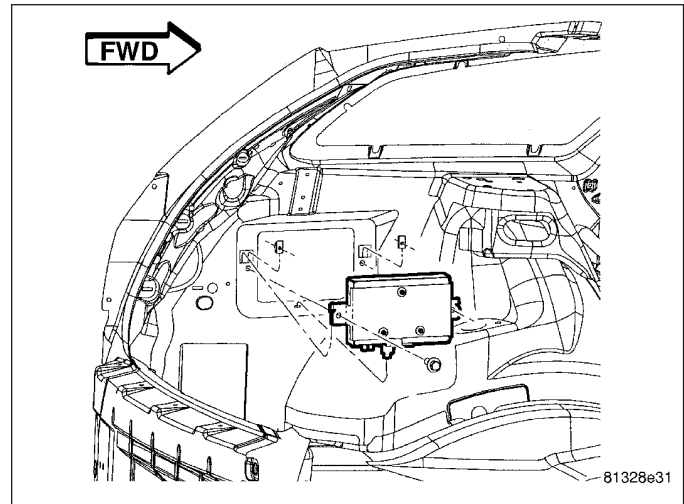
### WAGON

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

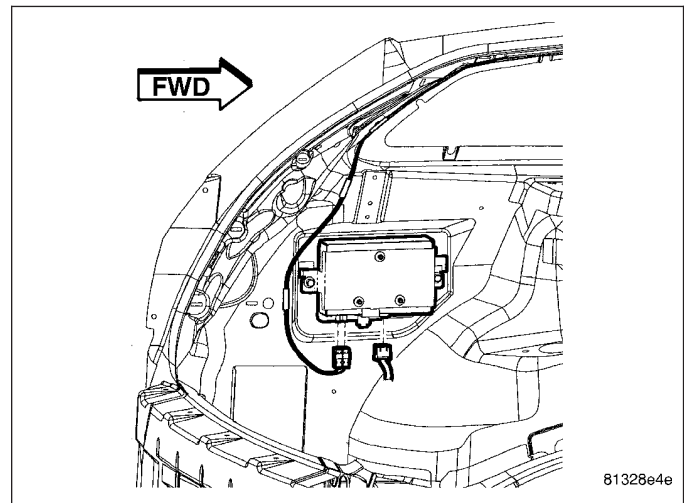
1. Install and tighten module to mounting bracket fasteners (2).
2. Position module into place.



3. Install and tighten mounting bracket fasteners.



4. Connect antenna harness connectors.
5. Connect electrical harness connectors.
6. Install left rear quarter trim panel.
7. Connect battery negative cable.



## SPEAKER

### DESCRIPTION

#### FOUR SPEAKER

The four speaker system includes four speakers in four locations. One 15.2 X 23 centimeter (6 X 9 inch) diameter speaker is located in each front door. There is also one 15.2 X 23 centimeter (6 X 9 inch) diameter speaker located on each side of the rear shelf.

#### SIX SPEAKER

The six speaker system features six speakers in six locations. One 15.2 X 23 centimeter (6 X 9 inch) diameter speaker is located in each front door. One 15.2 X 23 centimeter (6 X 9 inch) diameter speaker located on each side of the rear shelf. Two 8.9 centimeter (3.5 inch) speakers are located on the top portion of the instrument panel.

#### SIX SPEAKER - BOSTON ACOUSTICS

The six speaker system features six speakers in six locations. One 15.2 X 23 centimeter (6 X 9 inch) diameter speaker is located in each front door. One 15.2 X 23 centimeter (6 X 9 inch) diameter speaker located on each side of the rear shelf. Two 8.9 centimeter (3.5 inch) speakers are located on the top portion of the instrument panel. This speaker system also includes an amplifier. The total available power of the speaker system is 288 watts.

## EIGHT SPEAKER - BOSTON ACOUSTICS

The eight speaker system features eight speakers in eight locations. One 16.5 centimeter (6 X 9 inch) diameter speaker is located in each front door. One 15.2 X 23 centimeter (6 X 9 inch) diameter speaker located on each side of the rear shelf. A subwoofer is located on the rear shelf (sedan only) Two 8.9 centimeter (3.5 inch) speakers are located on the top portion of the instrument panel. This speaker system also includes an amplifier. The total available power of the speaker system is 380 watts.

## DIAGNOSIS AND TESTING

### SPEAKER

Any diagnosis of the Audio system should begin with the use of a scan tool and the appropriate Diagnostic Service information.

Refer to the appropriate wiring information.

**WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

**CAUTION: The speaker output of the radio is a "floating ground" system. Do not allow any speaker lead to short to ground, as damage to the radio may result.**

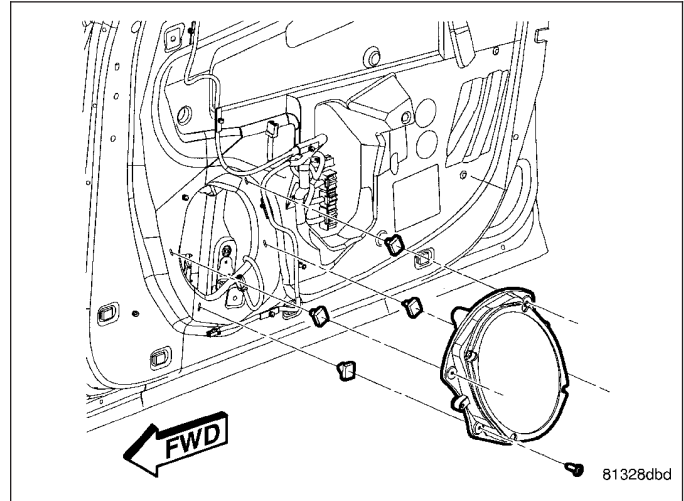
1. If all speakers are inoperative, check the radio fuses in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.
2. Check the amplifier fuse (if equipped) in the junction block. If OK, go to Step 3. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.
3. Turn the ignition switch to the ON position. Turn the radio receiver ON. Adjust the balance and fader control controls to check the performance of each individual speaker. Note the speaker locations that are not performing correctly. Go to Step 4.
4. Turn the radio OFF. Turn the ignition OFF. Disconnect and isolate the battery negative cable. If vehicle is **not** equipped with a amplifier, remove the radio receiver. If the vehicle is equipped with an amplifier, disconnect the wire harness connectors. There are two connectors. The one on the body harness has body speakers only. The other on the instrument panel harness has the instrument panel speakers, battery, ground, and CAN. Go to Step 5.
5. Check both the speaker feed (+) circuit and return (-) circuit cavities for the inoperative speaker at the wire harness connector for continuity to ground. There should be no continuity. If OK, go to Step 6. If not OK, repair the shorted speaker feed (+) and/or return (-) circuit(s) to the speaker as required.
6. Disconnect wire harness connector at the inoperative speaker. Check for continuity between the speaker feed (+) circuit cavities of the radio receiver wire harness connector or if equipped, the amplifier wire harness connector and the speaker wire harness connector. Repeat the check between the speaker return (-) circuit cavities of the radio receiver wire harness connector and the speaker wire harness connector. In each case, there should be continuity. If OK, replace the faulty speaker. If not OK, repair the open speaker feed (+) and/or return (-) circuit(s) as required.

## REMOVAL

### FRONT DOOR SPEAKER

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

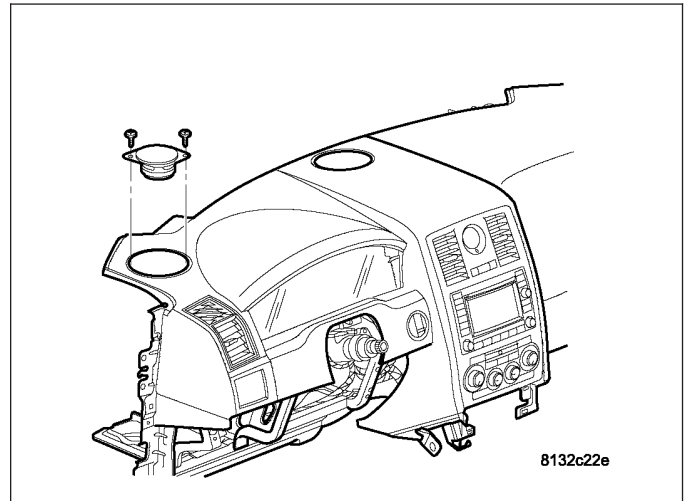
1. Disconnect and isolate the battery negative cable.
2. Remove front door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
3. Remove mounting fasteners.
4. Disconnect electrical harness connector and remove speaker.



### INSTRUMENT PANEL SIDE SPEAKER

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

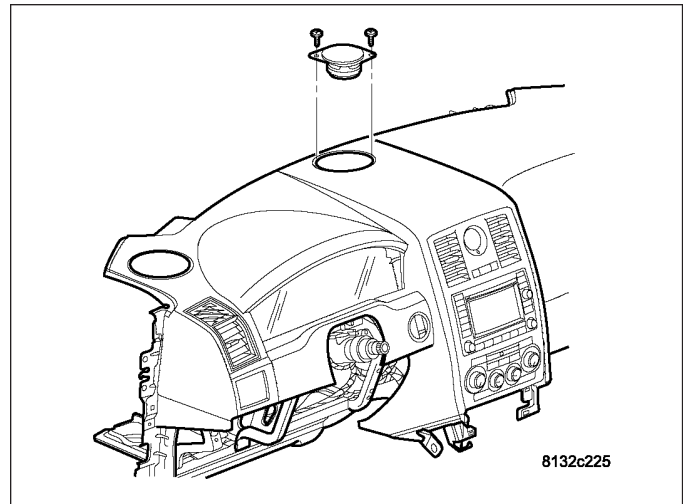
1. Disconnect and isolate the battery negative cable.
2. Remove speaker cover from instrument panel.
3. Remove mounting fasteners.
4. Disconnect electrical harness connector and remove speaker.



## INSTRUMENT PANEL CENTER SPEAKER

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

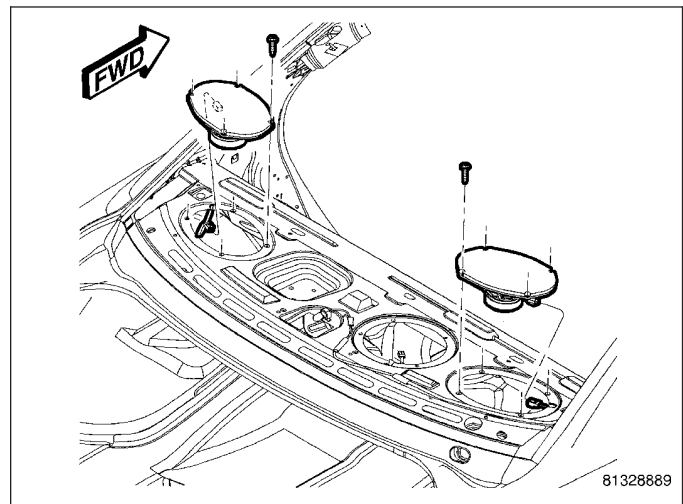
1. Disconnect and isolate the battery negative cable.
2. Remove speaker cover from instrument panel.
3. Remove mounting fasteners.
4. Disconnect electrical harness connector and remove speaker.



## REAR SPEAKER - SEDAN

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

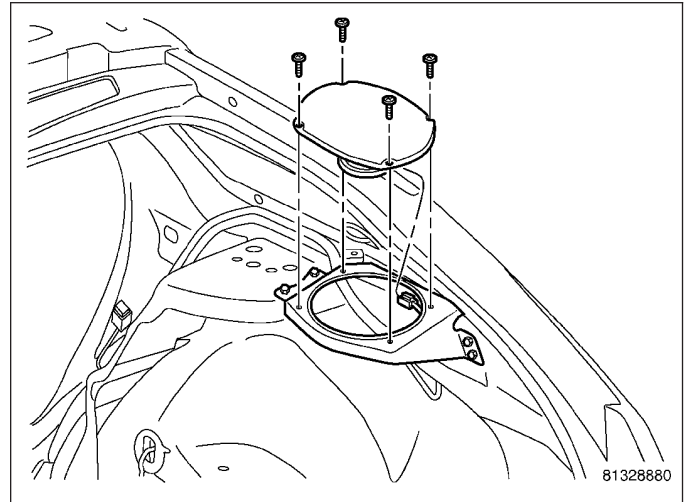
1. Disconnect and isolate the battery negative cable.
2. Remove upper C-pillar trim (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).
3. Remove the lower C-pillar trim (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).
4. Remove the rear shelf trim (Refer to 23 - BODY/INTERIOR/REAR SHELF TRIM PANEL - REMOVAL).
5. Remove the mounting fasteners.
6. Disconnect the electrical harness connector and remove speaker.



## REAR SPEAKER - WAGON

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

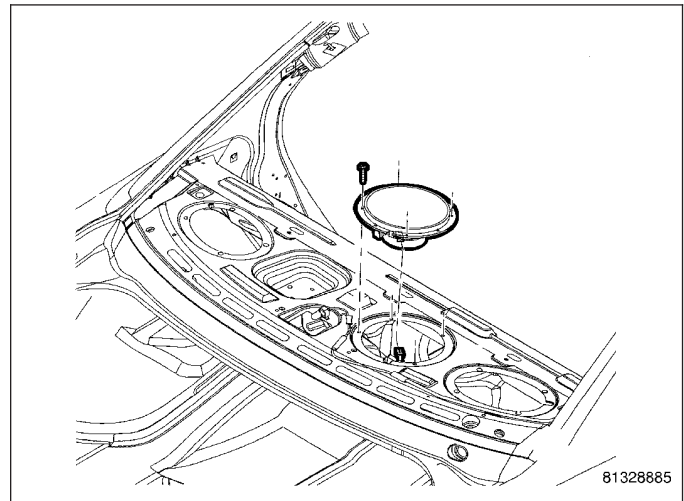
1. Disconnect and isolate the battery negative cable.
2. Remove the quarter trim speaker cover (Refer to 23 - BODY/INTERIOR/SPEAKER BOX TRIM COVER - REMOVAL).
3. Remove the mounting fasteners.
4. Disconnect the electrical harness connector and remove speaker.



## SUBWOOFER

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Disconnect and isolate the battery negative cable.
2. Remove upper C-pillar trim (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).
3. Remove the lower C-pillar trim (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).
4. Remove the rear shelf trim (Refer to 23 - BODY/INTERIOR/REAR SHELF TRIM PANEL - REMOVAL).
5. Remove the mounting fasteners.
6. Disconnect the electrical harness connector and remove subwoofer.



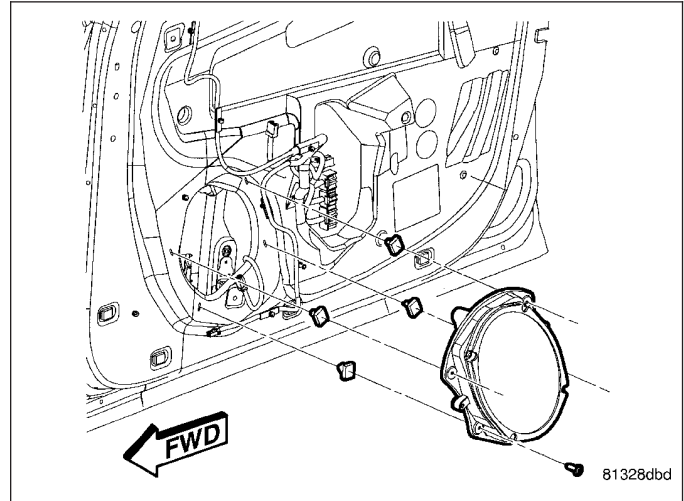


## INSTALLATION

### FRONT DOOR SPEAKER

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

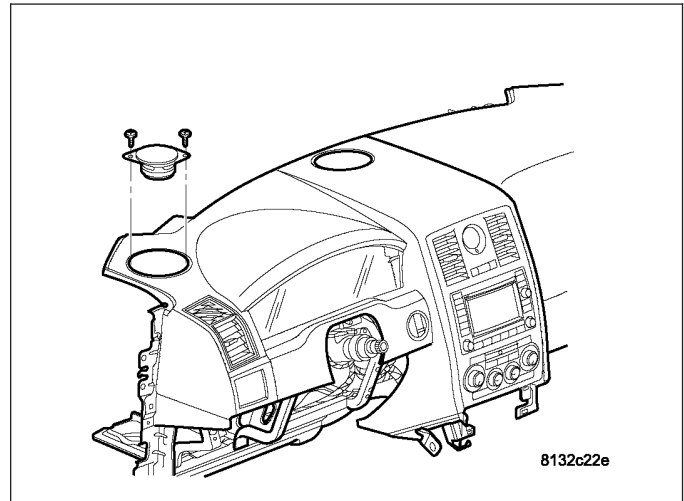
1. Connect electrical harness connector and position speaker.
2. Install and tighten mounting fasteners.
3. Install front door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).
4. Connect battery negative cable.



### INSTRUMENT PANEL SIDE SPEAKER

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

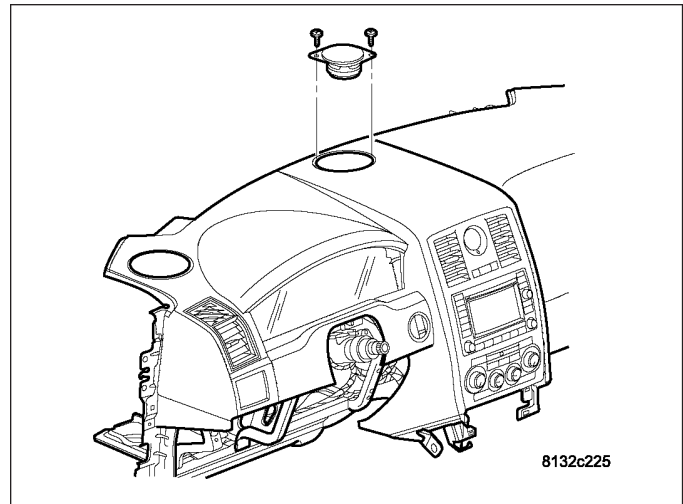
1. Connect electrical harness connector and position speaker.
2. Install and tighten mounting fasteners.
3. Install speaker cover to instrument panel.
4. Connect battery negative cable.



## INSTRUMENT PANEL CENTER SPEAKER

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

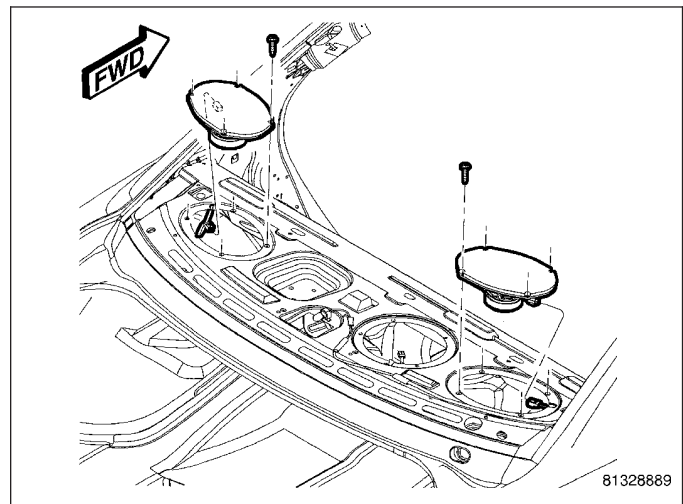
1. Connect electrical harness connector and position speaker.
2. Install and tighten mounting fasteners.
3. Install speaker cover to instrument panel.
4. Connect battery negative cable.



## REAR SPEAKER - SEDAN

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

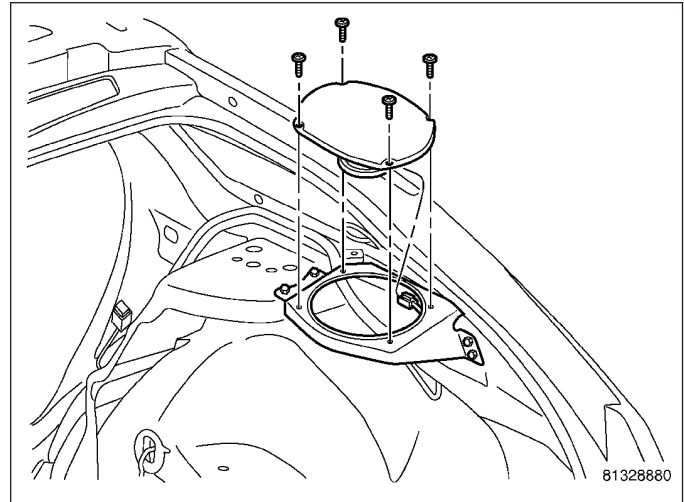
1. Connect electrical harness connector and position speaker.
2. Install and tighten mounting fasteners.
3. Install the rear shelf trim (Refer to 23 - BODY/INTERIOR/REAR SHELF TRIM PANEL - INSTALLATION).
4. Install the lower C-pillar trim (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION).
5. Install the upper C-pillar trim (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION).
6. Connect the battery negative cable.



## REAR SPEAKER - WAGON

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

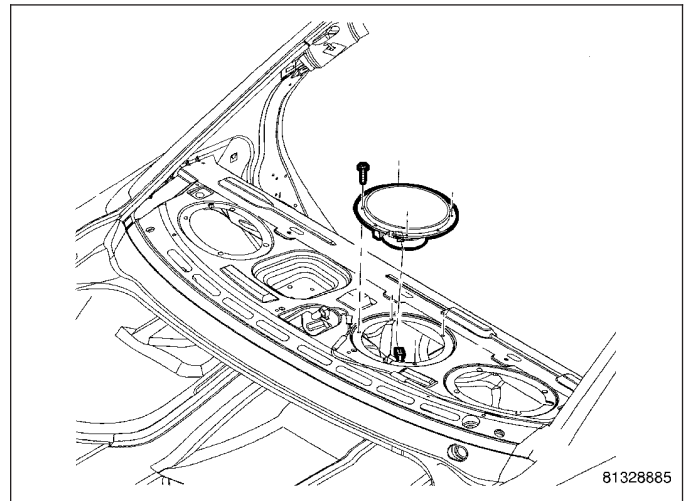
1. Connect electrical harness connector and position speaker.
2. Install and tighten mounting fasteners.
3. Install the speaker grille trim (Refer to 23 - BODY/INTERIOR/SPEAKER BOX TRIM COVER - INSTALLATION).
4. Connect the battery negative cable.



## SUBWOOFER

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Connect electrical harness connector and position subwoofer.
2. Install and tighten mounting fasteners.
3. Install the rear shelf trim (Refer to 23 - BODY/INTERIOR/REAR SHELF TRIM PANEL - INSTALLATION).
4. Install the lower C-pillar trim (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION).
5. Install the upper C-pillar trim (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION).
6. Connect the battery negative cable.



# CHIME/BUZZER

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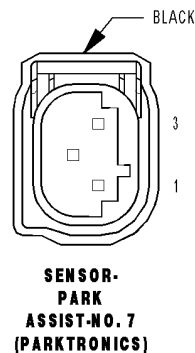
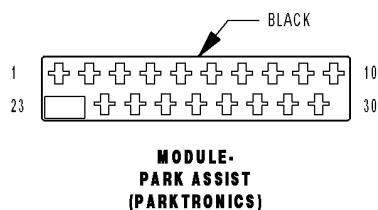
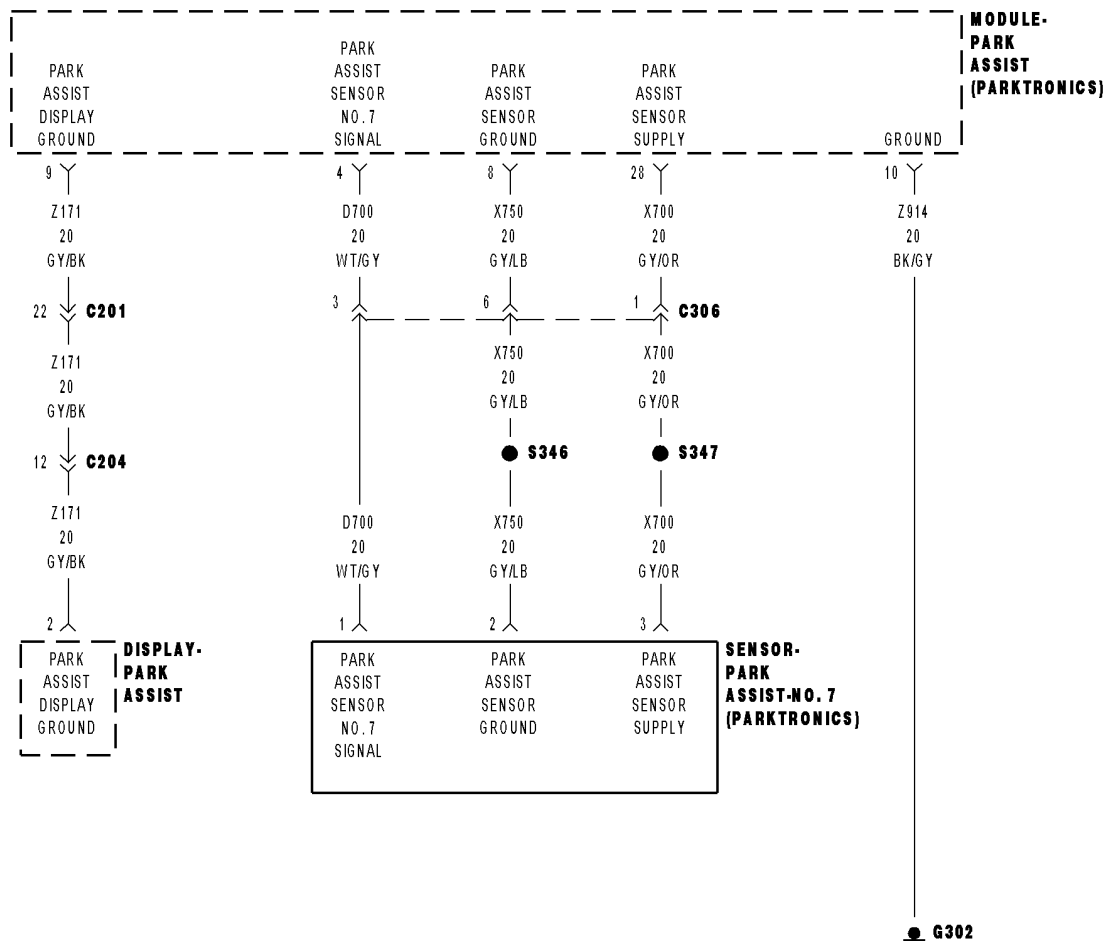
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CHIME/BUZZER - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

## B122C-PTS SENSOR 7 CIRCUIT LOW



**B122C-PTS SENSOR 7 CIRCUIT LOW (CONTINUED)**

For the Park Assist circuit diagram (Refer to 8 - ELECTRICAL/CHIME/BUZZER - SCHEMATIC - ELECTRICAL).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition in Run/Start, and the PRNDL in R, N, or D. (Late build vehicles will disable the Park Assist System in Neutral)
- **Set Condition:**  
Sensor ring down time is too short (700 µsecs).

Possible Causes
(D700) PARK ASSIST SENSOR NO. 7 SIGNAL CIRCUIT SHORTED TO (X750) PARK ASSIST SENSOR GROUND CIRCUIT
(D700) PARK ASSIST SENSOR NO. 7 SIGNAL CIRCUIT SHORTED TO (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT
(D700) PARK ASSIST SENSOR NO. 7 SIGNAL CIRCUIT SHORTED TO (Z914) PARK ASSIST MODULE GROUND CIRCUIT
(D700) PARK ASSIST SENSOR NO. 7 SIGNAL CIRCUIT SHORTED TO GROUND
PARK ASSIST SENSOR NO. 7
PARK ASSIST MODULE

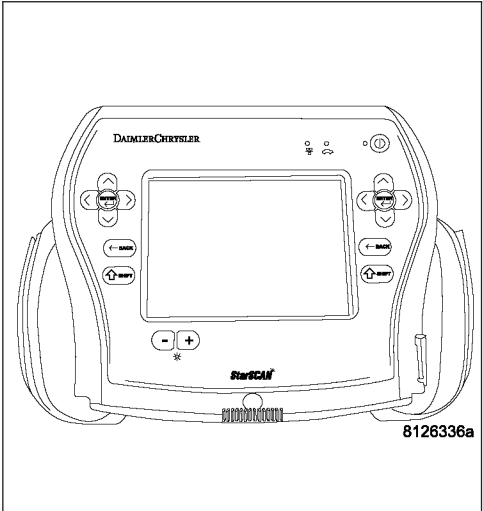
**Diagnostic Test**

**1. CHECK FOR ACTIVE DTC: B122C-PTS SENSOR 7 CIRCUIT LOW**

- Turn the ignition on.
- Apply the vehicle park brake.
- Shift the transmission into reverse.
- With the scan tool, record and erase Park Assist Module DTCs.
- Wait 30 seconds.
- With the scan tool, read Park Assist Module DTCs.

**Is DTC: B122C-PTS SENSOR 7 CIRCUIT LOW active?**

- Yes** >> Go To 2
- No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.
- Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B122C-PTS SENSOR 7 CIRCUIT LOW (CONTINUED)****2. CHECK PARK ASSIST SENSOR NO. 7 FOR A SHORT TO GROUND**

Shift the transmission into park.

With the scan tool, erase DTCs.

Turn the ignition off.

Disconnect Park Assist Sensor No. 7.

Turn the ignition on.

Shift the transmission into reverse.

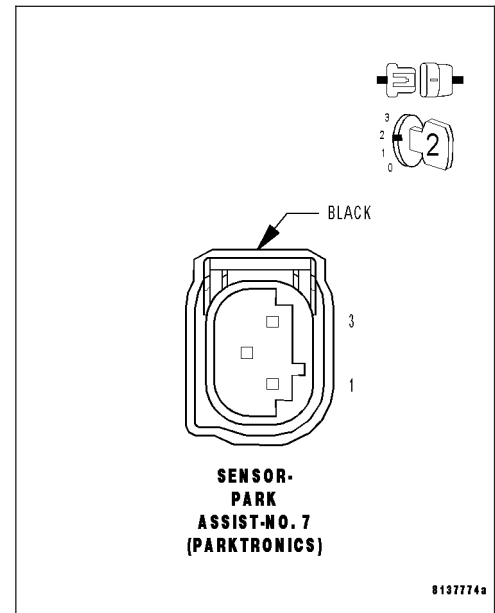
With the scan tool, read Park Assist Module DTCs.

**Does the scan tool display: B122C-PTS SENSOR 7 CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace Park Assist Sensor No. 7 in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**3. CHECK THE (D700) PARK ASSIST SENSOR NO. 7 SIGNAL CIRCUIT FOR A SHORT TO (X750) PARK ASSIST SENSOR GROUND CIRCUIT**

Turn the ignition off.

Disconnect the Park Assist Module harness connector.

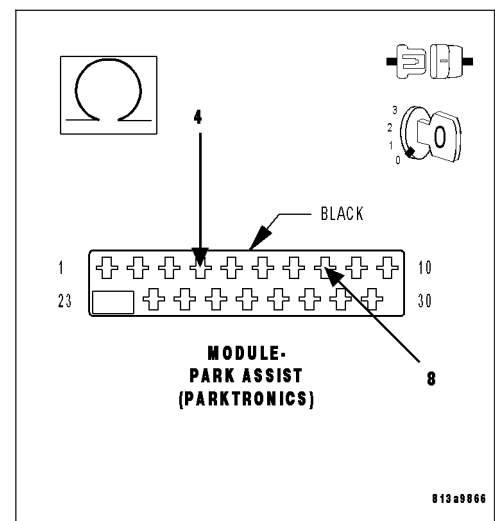
Measure the resistance between the (D700) Park Assist Sensor No. 7 Signal circuit and the (X750) Park Assist Sensor Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D700) Park Assist Sensor No. 7 Signal circuit for a short to the (X750) Park Assist Sensor Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4





**B122C-PTS SENSOR 7 CIRCUIT LOW (CONTINUED)****4. CHECK THE (D700) PARK ASSIST SENSOR NO. 7 SIGNAL CIRCUIT FOR A SHORT TO (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT**

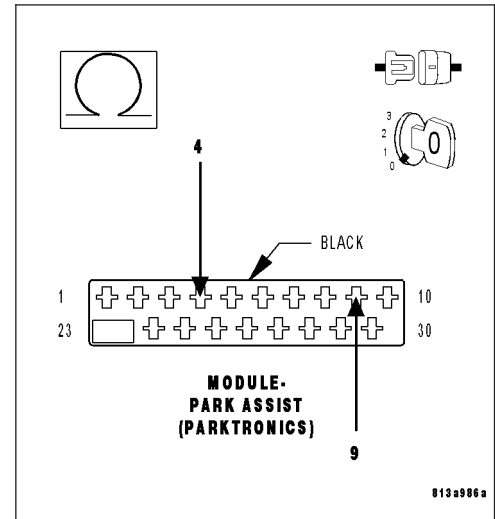
Measure the resistance between the (D700) Park Assist Sensor No. 7 Signal circuit and the (Z171) Park Assist Display Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D700) Park Assist Sensor No. 7 Signal circuit for a short to the (Z171) Park Assist Display Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 5

**5. CHECK THE (D700) PARK ASSIST SENSOR NO. 7 SIGNAL CIRCUIT FOR A SHORT TO (Z914) PARK ASSIST MODULE GROUND CIRCUIT**

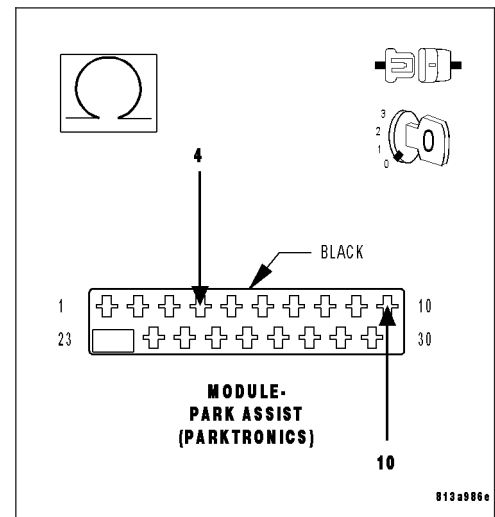
Measure the resistance between the (D700) Park Assist Sensor No. 7 Signal circuit and the (Z914) Park Assist Module Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D700) Park Assist Sensor No. 7 Signal circuit for a short to the (Z914) Park Assist Module Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 6

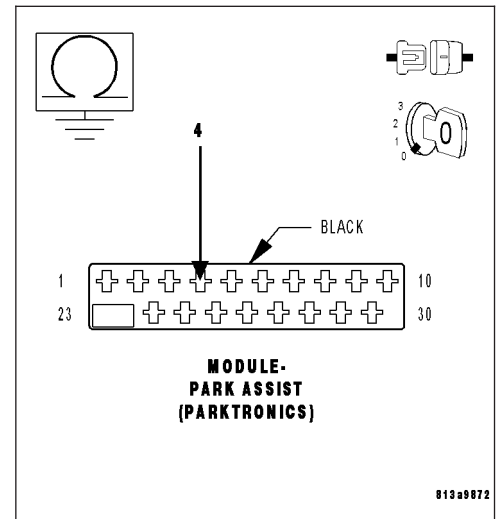


**B122C-PTS SENSOR 7 CIRCUIT LOW (CONTINUED)****6. CHECK THE (D700) PARK ASSIST SENSOR NO. 7 SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (D700) Park Assist Sensor No. 7 Signal circuit.

**Is the resistance below 10K ohms?**

- Yes** >> Repair the (D700) Park Assist Sensor No. 7 Signal circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Replace the Park Assist Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



B122E-PTS SENSOR 7 RING TIME TOO SHORT

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on, transmission in reverse or neutral (Late build vehicles will disable the Park Assist System in Neutral).
- **Set Condition:**  
Sensor ring down time exceeds limit (greater than 1450 µsecs).

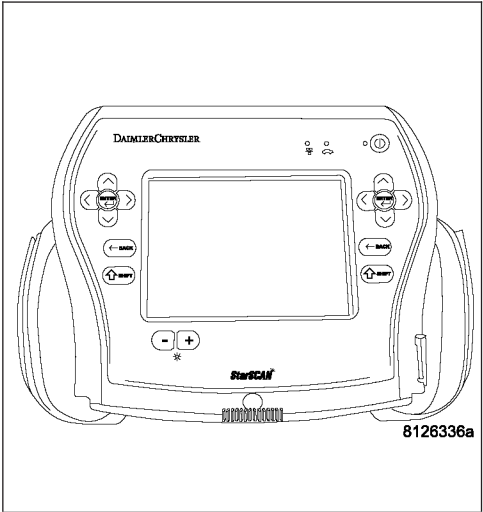
Possible Causes
PARK ASSIST SENSOR NO. 7

Diagnostic Test

1. CHECK FOR ACTIVE DTC: B122E-PTS SENSOR 7 RING TIME TOO SHORT

Turn the ignition on.  
Apply the vehicle park brake.  
Shift the transmission into reverse.  
With the scan tool, record and erase Park Assist Module DTCs.  
Wait 30 seconds.  
With the scan tool, read Park Assist Module DTCs.

- Is DTC: B122E-PTS SENSOR 7 RING TIME TOO SHORT active?
- Yes**    >> Go To 2
- No**    >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



2. REPLACE PARK ASSIST SENSOR NO. 7

View Repair

Repair

Replace Park Assist Sensor No. 7 in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**B122F-PTS SENSOR 7 RING TIME TOO LONG**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, transmission in reverse or neutral (Late build vehicles will disable the Park Assist System in Neutral).
- **Set Condition:**  
Data line stuck at 0.

Possible Causes
PARK ASSIST SENSOR NO. 7

**Diagnostic Test****1. CHECK FOR ACTIVE DTC: B122F-PTS SENSOR 7 RING TIME TOO LONG**

Turn the ignition on.

Apply the vehicle park brake.

Shift the transmission into reverse.

With the scan tool, record and erase Park Assist Module DTCs.

Wait 30 seconds.

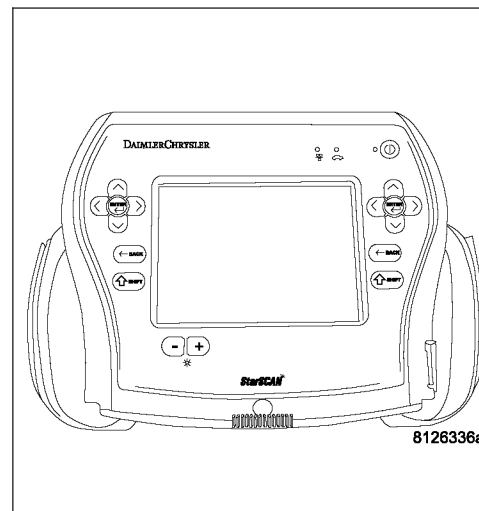
With the scan tool, read Park Assist Module DTCs.

**Is DTC: B122F-PTS SENSOR 7 RING TIME TOO LONG active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**2. REPLACE PARK ASSIST SENSOR NO 7.**

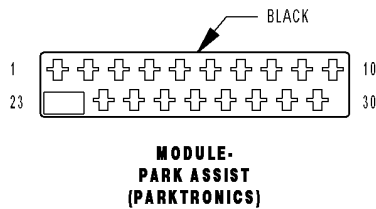
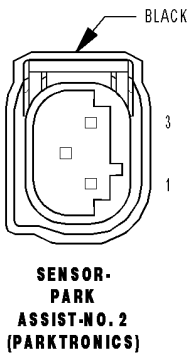
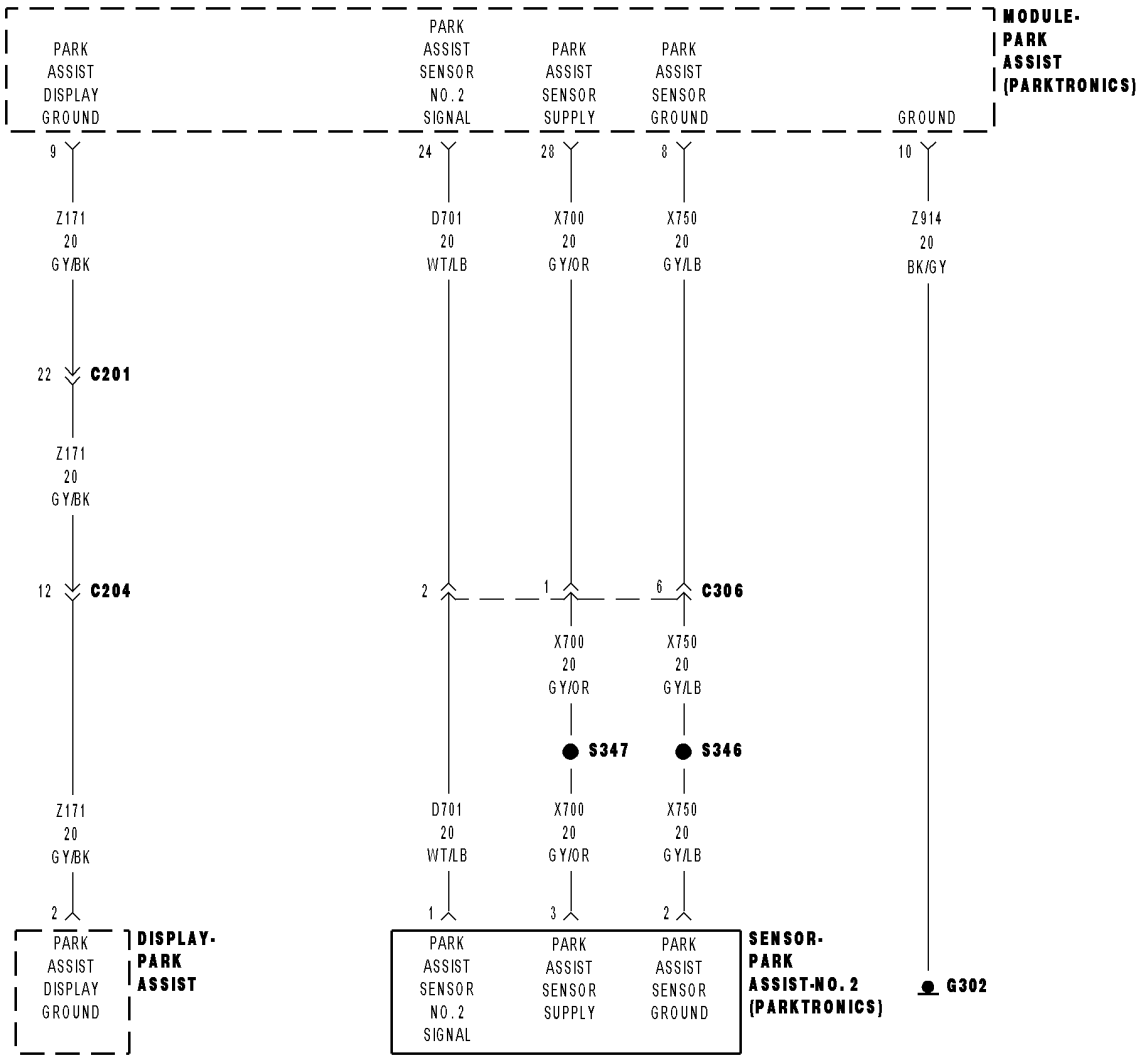
**View Repair**

**Repair**

Replace Park Assist Sensor No. 7 in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

B1231-PTS SENSOR 8 CIRCUIT LOW



**B1231-PTS SENSOR 8 CIRCUIT LOW (CONTINUED)**

For the Park Assist circuit diagram (Refer to 8 - ELECTRICAL/CHIME/BUZZER - SCHEMATIC - ELECTRICAL).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition in Run/Start, and the PRNDL in R, N, or D (Late build vehicles will disable the Park Assist System in Neutral).

- **Set Condition:**

Sensor ring down time is too short (700 µsecs).

Possible Causes
(D701) PARK ASSIST SENSOR NO. 8 SIGNAL CIRCUIT SHORTED TO (X750) PARK ASSIST SENSOR GROUND CIRCUIT
(D701) PARK ASSIST SENSOR NO. 8 SIGNAL CIRCUIT SHORTED TO (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT
(D701) PARK ASSIST SENSOR NO. 8 SIGNAL CIRCUIT SHORTED TO (Z914) PARK ASSIST MODULE GROUND CIRCUIT
(D701) PARK ASSIST SENSOR NO. 8 SIGNAL CIRCUIT SHORTED TO GROUND
PARK ASSIST SENSOR NO. 8
PARK ASSIST MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC: B1231-PTS SENSOR 8 CIRCUIT LOW**

Turn the ignition on.

Apply the vehicle park brake.

Shift the transmission into reverse.

With the scan tool, record and erase Park Assist Module DTCs.

Wait 30 seconds.

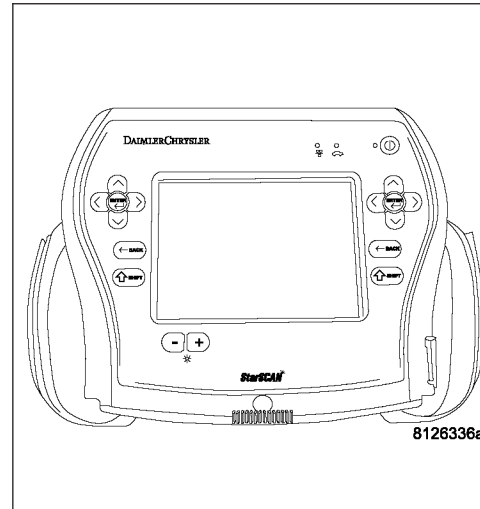
With the scan tool, read Park Assist Module DTCs.

**Is DTC: B1231-PTS SENSOR 8 CIRCUIT LOW active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1231-PTS SENSOR 8 CIRCUIT LOW (CONTINUED)****2. CHECK PARK ASSIST SENSOR NO. 8 FOR A SHORT TO GROUND**

Shift the transmission into park.

With the scan tool, erase DTCs.

Turn the ignition off.

Disconnect Park Assist Sensor No. 8.

Turn the ignition on.

Shift the transmission into reverse.

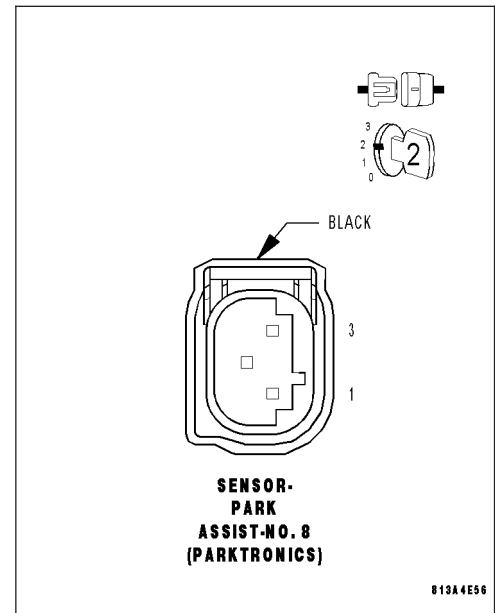
With the scan tool, read Park Assist Module DTCs.

**Does the scan tool display: B1231-PTS SENSOR 8 CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace Park Assist Sensor No. 8 in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**3. CHECK THE (D701) PARK ASSIST SENSOR NO. 8 SIGNAL CIRCUIT FOR A SHORT TO (X750) PARK ASSIST SENSOR GROUND CIRCUIT**

Turn the ignition off.

Disconnect the Park Assist Module harness connector.

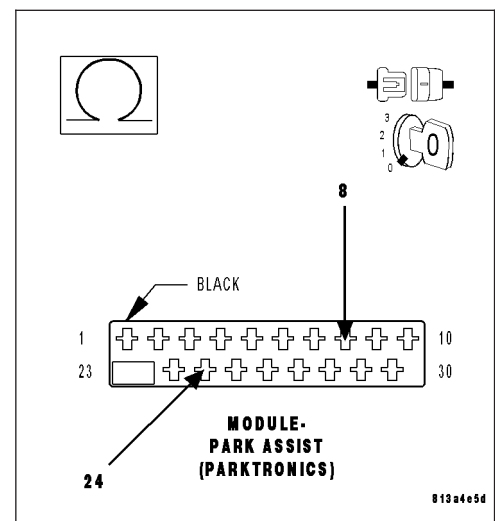
Measure the resistance between the (D701) Park Assist Sensor No. 8 Signal circuit and the (X750) Park Assist Sensor Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D701) Park Assist Sensor No. 8 Signal circuit for a short to the (X750) Park Assist Sensor Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4



**B1231-PTS SENSOR 8 CIRCUIT LOW (CONTINUED)****4. CHECK THE (D701) PARK ASSIST SENSOR NO. 8 SIGNAL CIRCUIT FOR A SHORT TO (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT**

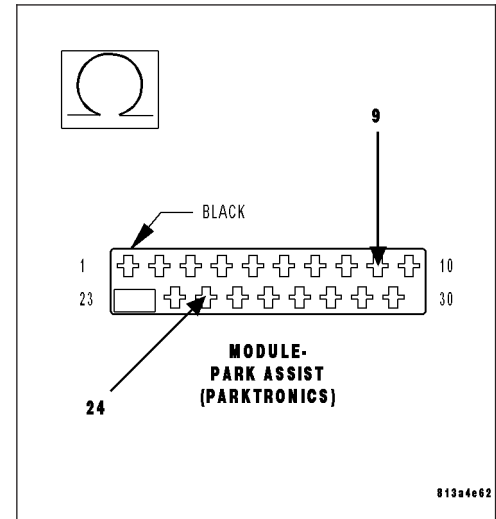
Measure the resistance between the (D701) Park Assist Sensor No. 8 Signal circuit and the (Z171) Park Assist Display Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D701) Park Assist Sensor No. 8 Signal circuit for a short to the (Z171) Park Assist Display Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 5

**5. CHECK THE (D701) PARK ASSIST SENSOR NO. 8 SIGNAL CIRCUIT FOR A SHORT TO (Z914) PARK ASSIST MODULE GROUND CIRCUIT**

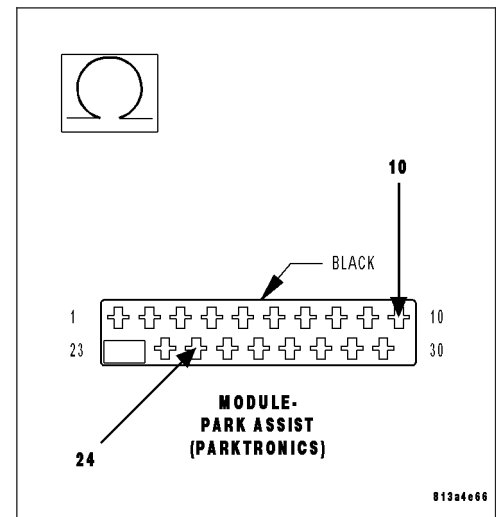
Measure the resistance between the (D701) Park Assist Sensor No. 8 Signal circuit and the (Z914) Park Assist Module Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D701) Park Assist Sensor No. 8 Signal circuit for a short to the (Z914) Park Assist Module Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 6





**B1231-PTS SENSOR 8 CIRCUIT LOW (CONTINUED)****6. CHECK THE (D701) PARK ASSIST SENSOR NO. 8 SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (D701) Park Assist Sensor No. 8 Signal circuit.

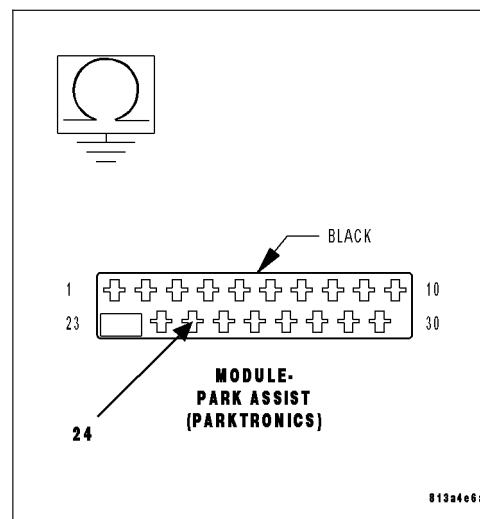
**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D701) Park Assist Sensor No. 8 Signal circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Park Assist Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1233-PTS SENSOR 8 RING TIME TOO SHORT**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, transmission in reverse or neutral (Late build vehicles will disable the Park Assist System in Neutral).
- **Set Condition:**  
Sensor ring down time exceeds limit (greater than 1450 µsecs).

Possible Causes
PARK ASSIST SENSOR NO. 8

**Diagnostic Test****1. CHECK FOR ACTIVE DTC: B1233-PTS SENSOR 8 RING TIME TOO SHORT**

Turn the ignition on.

Apply the vehicle park brake.

Shift the transmission into Reverse.

With the scan tool, record and erase Park Assist Module DTCs.

Wait 30 seconds.

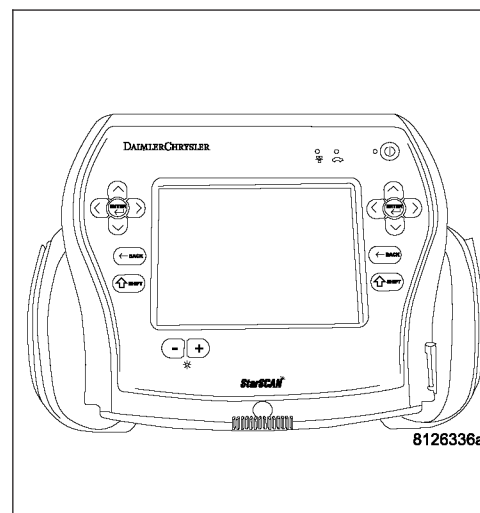
With the scan tool, read Park Assist Module DTCs.

**Is DTC: B1233-PTS SENSOR 8 RING TIME TOO SHORT active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**2. REPLACE PARK ASSIST SENSOR NO. 8**

**View Repair**

**Repair**

Replace Park Assist Sensor No. 8 in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

B1234-PTS SENSOR 8 RING TIME TOO LONG

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on, transmission in reverse or neutral (Late build vehicles will disable the Park Assist System in neutral).
- **Set Condition:**  
Data line stuck at 0.

Possible Causes
PARK ASSIST SENSOR NO. 8

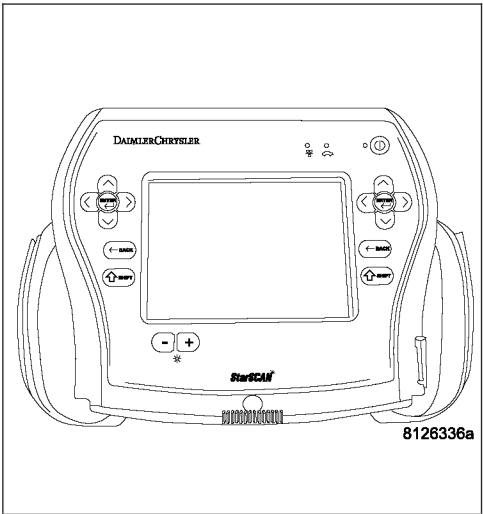
Diagnostic Test

1. CHECK FOR ACTIVE DTC: B1234-PTS SENSOR 8 RING TIME TOO LONG

Turn the ignition on.  
Apply the vehicle park brake.  
Shift the transmission into Reverse.  
With the scan tool, record and erase Park Assist Module DTCs.  
Wait 30 seconds.  
With the scan tool, read Park Assist Module DTCs.

Is DTC: B1234-PTS SENSOR 8 RING TIME TOO LONG active?

- Yes>> Go To 2
- No>> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



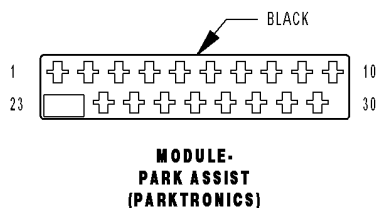
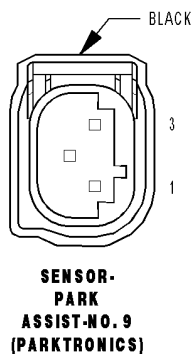
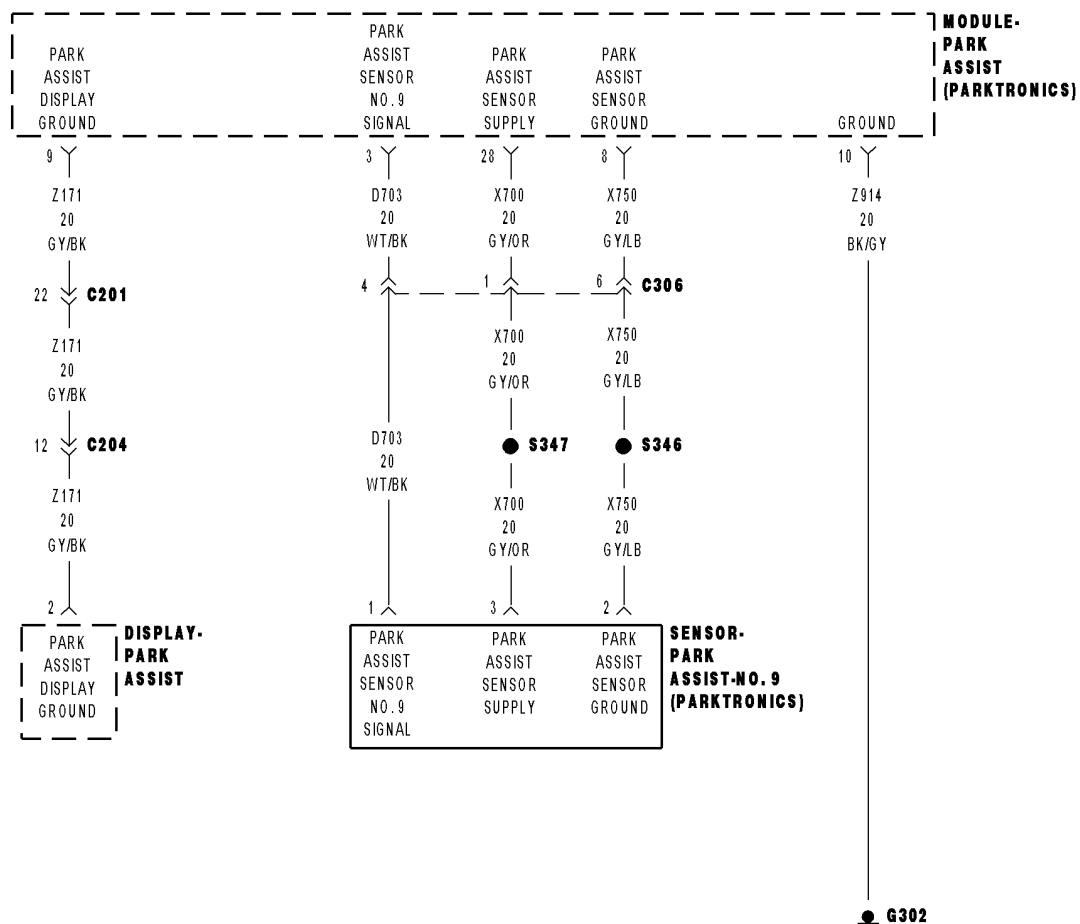
2. REPLACE PARK ASSIST SENSOR NO. 8

View Repair

Repair

Replace Park Assist Sensor No. 8 in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

## B1236-PTS SENSOR 9 CIRCUIT LOW



**B1236-PTS SENSOR 9 CIRCUIT LOW (CONTINUED)**

For the Park Assist circuit diagram (Refer to 8 - ELECTRICAL/CHIME/BUZZER - SCHEMATIC - ELECTRICAL).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition in Run/Start, and the PRNDL in R, N, or D (Late build vehicles will disable the Park Assist System in neutral).

- **Set Condition:**

Sensor ring down time is too short (700 µsecs).

Possible Causes
(D703) PARK ASSIST SENSOR NO. 9 SIGNAL CIRCUIT SHORTED TO (X750) PARK ASSIST SENSOR GROUND CIRCUIT
(D703) PARK ASSIST SENSOR NO. 9 SIGNAL CIRCUIT SHORTED TO (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT
(D703) PARK ASSIST SENSOR NO. 9 SIGNAL CIRCUIT SHORTED TO (Z914) PARK ASSIST MODULE GROUND CIRCUIT
(D703) PARK ASSIST SENSOR NO. 9 SIGNAL CIRCUIT SHORTED TO GROUND
PARK ASSIST SENSOR NO. 9
PARK ASSIST MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC: B1236-PTS SENSOR 9 CIRCUIT LOW**

Turn the ignition on.

Apply the vehicle park brake.

Shift the transmission into reverse.

With the scan tool, record and erase Park Assist Module DTCs.

Wait 30 seconds.

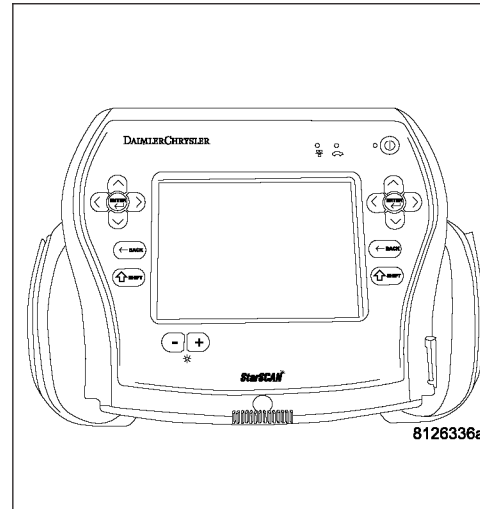
With the scan tool, read Park Assist Module DTCs.

**Is DTC: B1236-PTS SENSOR 9 CIRCUIT LOW active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1236-PTS SENSOR 9 CIRCUIT LOW (CONTINUED)****2. CHECK PARK ASSIST SENSOR NO. 9 FOR A SHORT TO GROUND**

Shift the transmission into park.

With the scan tool, erase DTCs.

Turn the ignition off.

Disconnect Park Assist Sensor No. 9.

Turn the ignition on.

Shift the transmission into reverse.

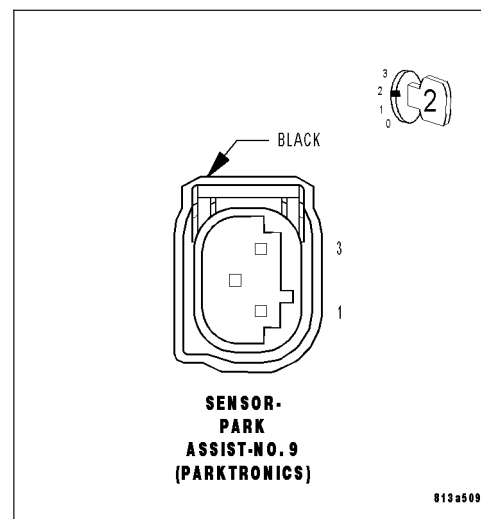
With the scan tool, read Park Assist Module DTCs.

**Does the scan tool display: B1236-PTS SENSOR 9 CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace Park Assist Sensor No. 9 in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**3. CHECK THE (D703) PARK ASSIST SENSOR NO. 9 SIGNAL CIRCUIT FOR A SHORT TO (X750) PARK ASSIST SENSOR GROUND CIRCUIT**

Turn the ignition off.

Disconnect the Park Assist Module harness connector.

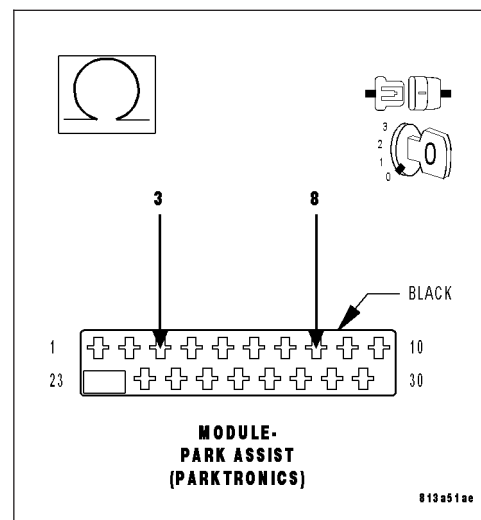
Measure the resistance between the (D703) Park Assist Sensor No. 9 Signal circuit and the (X750) Park Assist Sensor Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D703) Park Assist Sensor No. 9 Signal circuit for a short to the (X750) Park Assist Sensor Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4



**B1236-PTS SENSOR 9 CIRCUIT LOW (CONTINUED)****4. CHECK THE (D703) PARK ASSIST SENSOR NO. 9 SIGNAL CIRCUIT FOR A SHORT TO (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT**

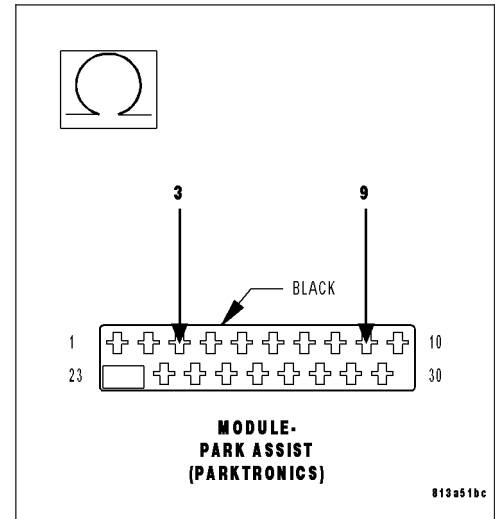
Measure the resistance between the (D703) Park Assist Sensor No. 9 Signal circuit and the (Z171) Park Assist Display Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D703) Park Assist Sensor No. 9 Signal circuit for a short to the (Z171) Park Assist Display Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 5

**5. CHECK THE (D703) PARK ASSIST SENSOR NO. 9 SIGNAL CIRCUIT FOR A SHORT TO (Z914) PARK ASSIST MODULE GROUND CIRCUIT**

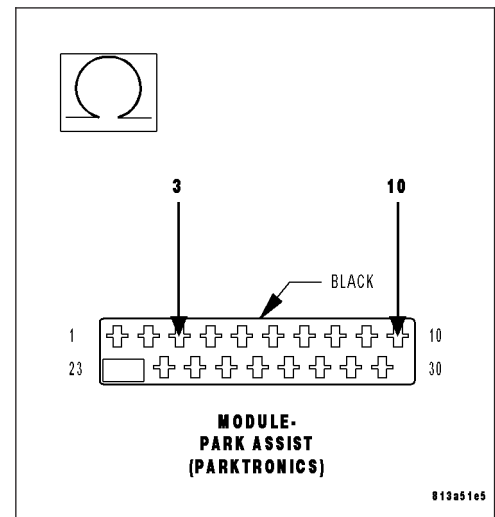
Measure the resistance between the (D703) Park Assist Sensor No. 9 Signal circuit and the (Z914) Park Assist Module Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D703) Park Assist Sensor No. 9 Signal circuit for a short to the (Z914) Park Assist Module Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 6

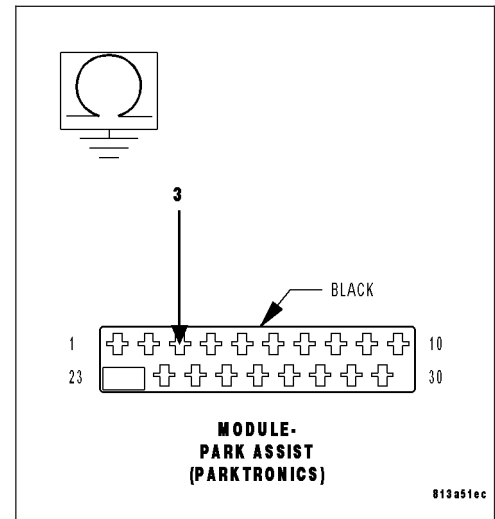


**B1236-PTS SENSOR 9 CIRCUIT LOW (CONTINUED)****6. CHECK THE (D703) PARK ASSIST SENSOR NO. 9 SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (D703) Park Assist Sensor No. 9 Signal circuit.

**Is the resistance below 10K ohms?**

- Yes** >> Repair the (D703) Park Assist Sensor No. 9 Signal circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Replace the Park Assist Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).





B1238-PTS SENSOR 9 RING TIME TOO SHORT

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on, transmission in reverse or neutral (Late build vehicles will disable the Park Assist System in neutral).
- **Set Condition:**  
Sensor ring down time exceeds limit (greater than 1450 µsecs).

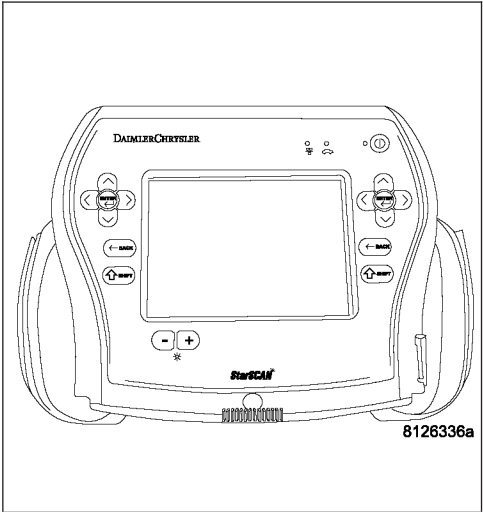
Possible Causes
PARK ASSIST SENSOR NO. 9

Diagnostic Test

1. CHECK FOR ACTIVE DTC: B1238-PTS SENSOR 9 RING TIME TOO SHORT

Turn the ignition on.  
Apply the vehicle park brake.  
Shift the transmission into Reverse.  
With the scan tool, record and erase Park Assist Module DTCs.  
Wait 30 seconds.  
With the scan tool, read Park Assist Module DTCs.

- Is DTC: B1238-PTS SENSOR 9 RING TIME TOO SHORT active?
- Yes** >> Go To 2
- No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



2. REPLACE PARK ASSIST SENSOR NO. 9

View Repair

Repair

Replace Park Assist Sensor No. 9 in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**B1239-PTS SENSOR 9 RING TIME TOO LONG**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, transmission in reverse or neutral (Late build vehicles will disable the Park Assist System in neutral).
- **Set Condition:**  
Data line stuck at 0.

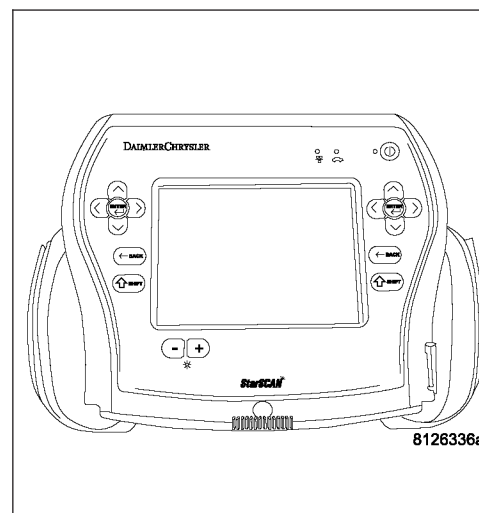
Possible Causes
PARK ASSIST SENSOR NO. 9

**Diagnostic Test****1. CHECK FOR ACTIVE DTC: B1239-PTS SENSOR 9 RING TIME TOO LONG**

Turn the ignition on.  
Apply the vehicle park brake.  
Shift the transmission into Reverse.  
With the scan tool, record and erase Park Assist Module DTCs.  
Wait 30 seconds.  
With the scan tool, read Park Assist Module DTCs.

**Is DTC: B1239-PTS SENSOR 9 RING TIME TOO LONG active?**

- Yes** >> Go To 2
- No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

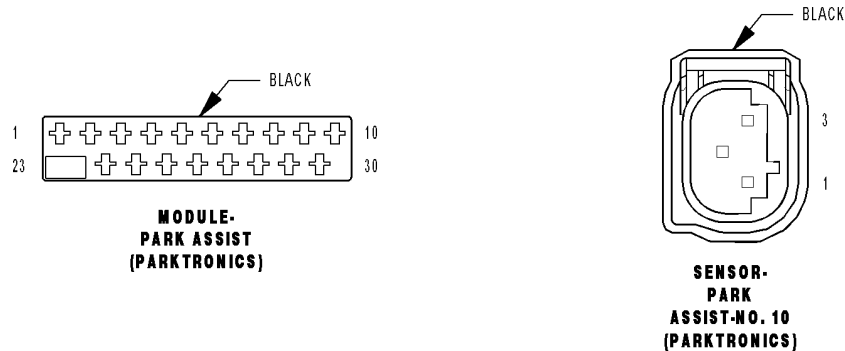
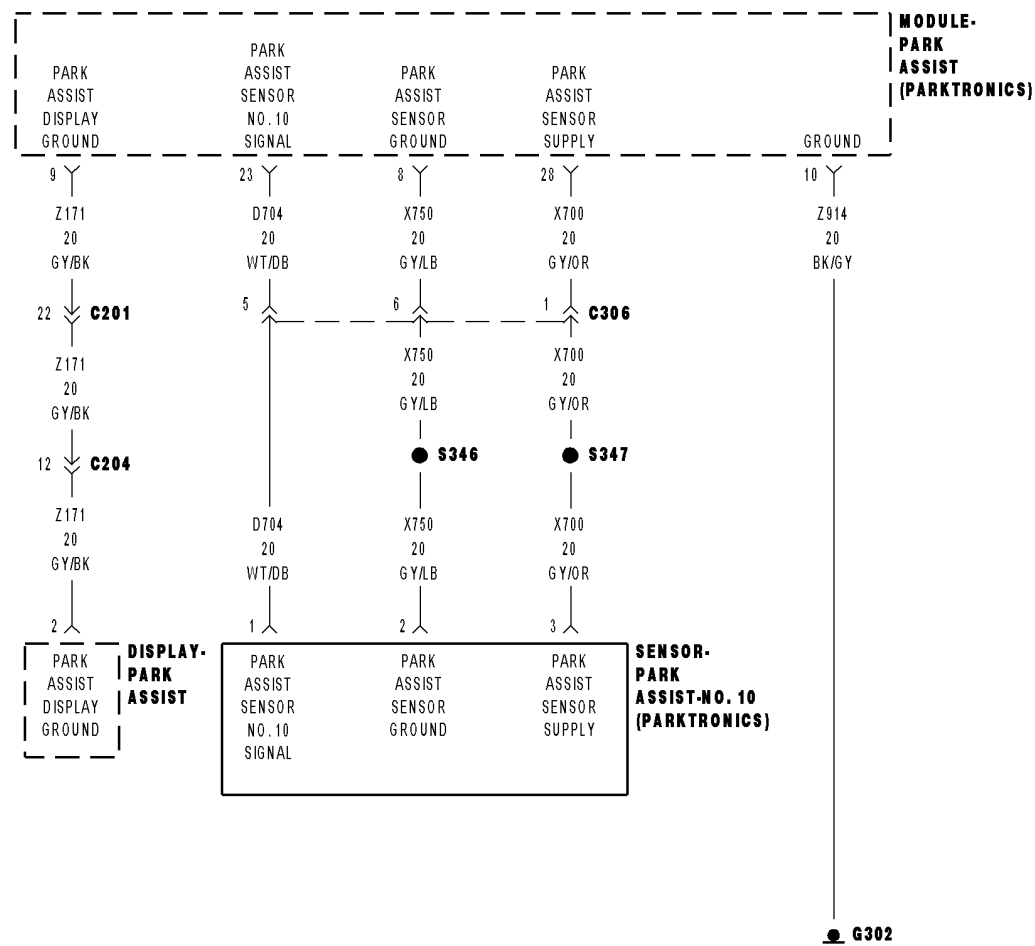
**2. REPLACE PARK ASSIST SENSOR NO. 9**

**View Repair**

**Repair**

Replace Park Assist Sensor No. 9 in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

B123B-PTS SENSOR 10 CIRCUIT LOW



**B123B-PTS SENSOR 10 CIRCUIT LOW (CONTINUED)**

For the Park Assist circuit diagram (Refer to 8 - ELECTRICAL/CHIME/BUZZER - SCHEMATIC - ELECTRICAL).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition in Run/Start, and PRNDL in R, N, or D (Late build vehicles will disable the Park Assist System in neutral).

- **Set Condition:**

Sensor ring down time is too short (700 µsecs).

Possible Causes
(D704) PARK ASSIST SENSOR NO. 10 SIGNAL CIRCUIT SHORTED TO (X750) PARK ASSIST SENSOR GROUND CIRCUIT
(D704) PARK ASSIST SENSOR NO. 10 SIGNAL CIRCUIT SHORTED TO (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT
(D704) PARK ASSIST SENSOR NO. 10 SIGNAL CIRCUIT SHORTED TO (Z914) PARK ASSIST MODULE GROUND CIRCUIT
(D704) PARK ASSIST SENSOR NO. 10 SIGNAL CIRCUIT SHORTED TO GROUND
PARK ASSIST SENSOR NO. 10
PARK ASSIST MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC: B123B-PTS SENSOR 10 CIRCUIT LOW**

Turn the ignition on.

Apply the vehicle park brake.

Shift the transmission into reverse.

With the scan tool, record and erase Park Assist Module DTCs.

Wait 30 seconds.

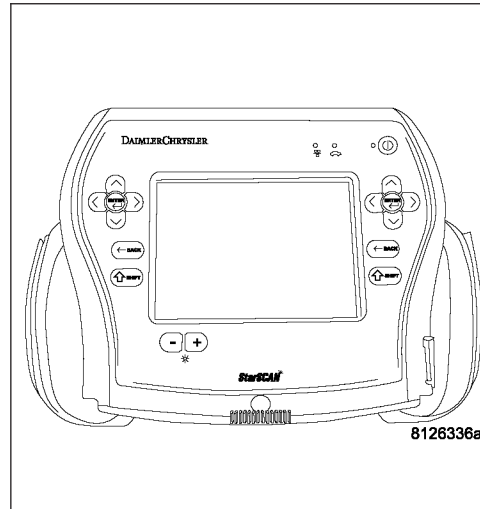
With the scan tool, read Park Assist Module DTCs.

**Is DTC: B123B-PTS SENSOR 10 CIRCUIT LOW active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B123B-PTS SENSOR 10 CIRCUIT LOW (CONTINUED)****2. CHECK PARK ASSIST SENSOR NO. 10 FOR A SHORT TO GROUND**

Shift the transmission into park.

With the scan tool, erase DTCs.

Turn the ignition off.

Disconnect Park Assist Sensor No. 10.

Turn the ignition on.

Shift the transmission into reverse.

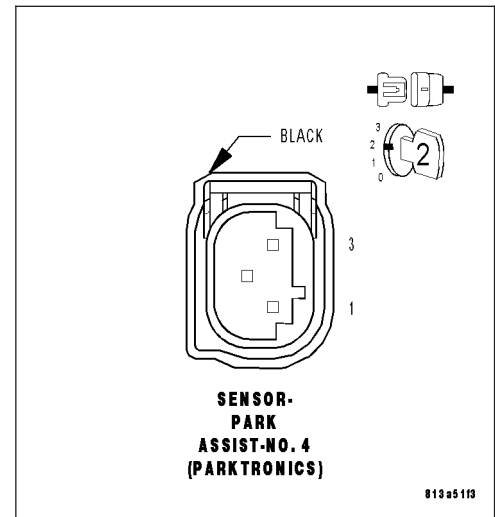
With the scan tool, read Park Assist Module DTCs.

**Does the scan tool display: B123B-PTS SENSOR 10 CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace Park Assist Sensor No. 10 in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**3. CHECK THE (D704) PARK ASSIST SENSOR NO. 10 SIGNAL CIRCUIT FOR A SHORT TO (X750) PARK ASSIST SENSOR GROUND CIRCUIT**

Turn the ignition off.

Disconnect the Park Assist Module harness connector.

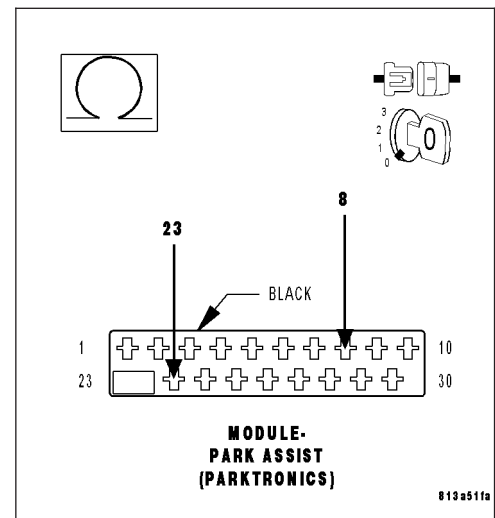
Measure the resistance between the (D704) Park Assist Sensor No. 10 Signal circuit and the (X750) Park Assist Sensor Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D704) Park Assist Sensor No. 10 Signal circuit for a short to the (X750) Park Assist Sensor Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4



**B123B-PTS SENSOR 10 CIRCUIT LOW (CONTINUED)****4. CHECK THE (D704) PARK ASSIST SENSOR NO. 10 SIGNAL CIRCUIT FOR A SHORT TO (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT**

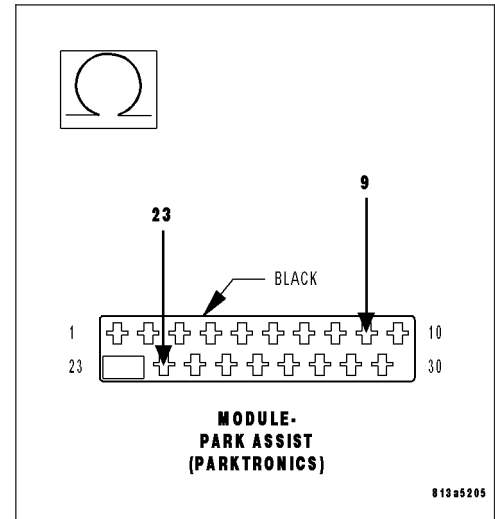
Measure the resistance between the (D704) Park Assist Sensor No. 10 Signal circuit and the (Z171) Park Assist Display Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D704) Park Assist Sensor No. 10 Signal circuit for a short to the (Z171) Park Assist Display Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 5

**5. CHECK THE (D704) PARK ASSIST SENSOR NO. 10 SIGNAL CIRCUIT FOR A SHORT TO (Z914) PARK ASSIST MODULE GROUND CIRCUIT**

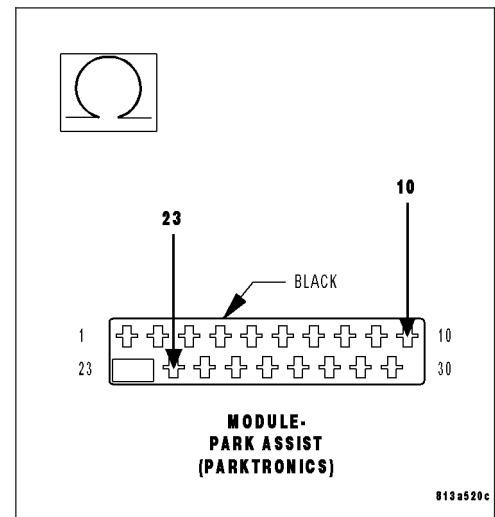
Measure the resistance between the (D704) Park Assist Sensor No. 10 Signal circuit and the (Z914) Park Assist Module Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D704) Park Assist Sensor No. 10 Signal circuit for a short to the (Z914) Park Assist Module Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 6



**B123B-PTS SENSOR 10 CIRCUIT LOW (CONTINUED)****6. CHECK THE (D704) PARK ASSIST SENSOR NO. 10 SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (D704) Park Assist Sensor No. 10 Signal circuit and ground.

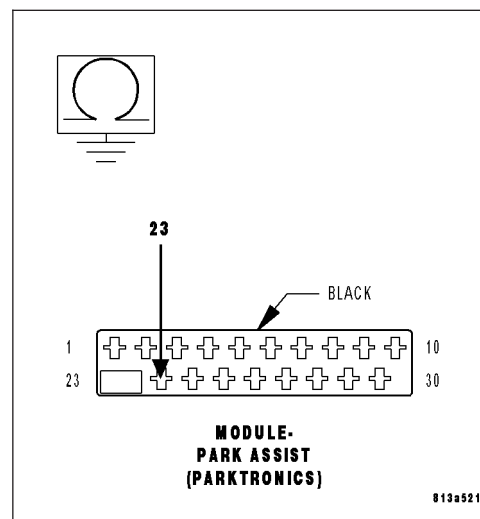
**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D704) Park Assist Sensor No. 10 Signal circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Park Assist Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B123D-PTS SENSOR 10 RING TIME TOO SHORT**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, transmission in reverse or neutral (Late build vehicles will disable the Park Assist System in neutral).
- **Set Condition:**  
Sensor ring down time exceeds limit (greater than 1450 µsecs).

Possible Causes
PARK ASSIST SENSOR NO. 10

**Diagnostic Test****1. CHECK FOR ACTIVE DTC: B123D-PTS SENSOR 10 RING TIME TOO SHORT**

Turn the ignition on.

Apply the vehicle park brake.

Shift the transmission into Reverse.

With the scan tool, record and erase Park Assist Module DTCs.

Wait 30 seconds.

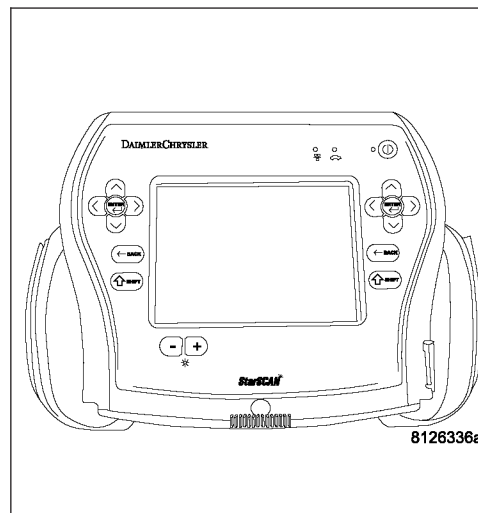
With the scan tool, read Park Assist Module DTCs.

**Is DTC: B123D-PTS SENSOR 10 RING TIME TOO SHORT active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**2. REPLACE THE PARK ASSIST SENSOR NO. 10**

**View Repair**

**Repair**

Replace Park Assist Sensor No. 10 in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



B123E-PTS SENSOR 10 RING TIME TOO LONG

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on, transmission in reverse or neutral (Late build vehicles will disable the Park Assist System in neutral).
- **Set Condition:**  
Data line stuck at 0.

Possible Causes
PARK ASSIST SENSORNO. 10

Diagnostic Test

1. CHECK FOR ACTIVE DTC: B123E-PTS SENSOR 10 RING TIME TOO LONG

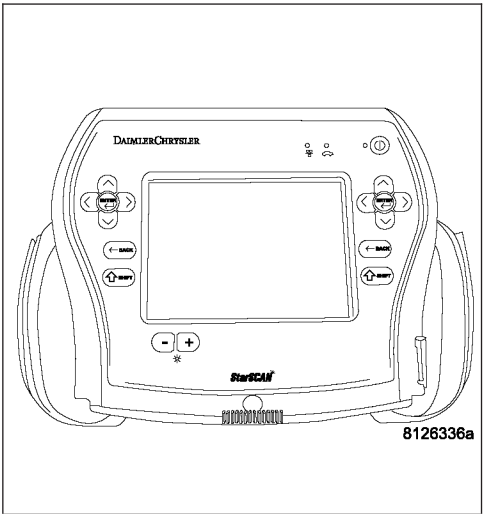
Turn the ignition on.  
Apply the vehicle park brake.  
Shift the transmission into reverse.  
With the scan tool, record and erase Park Assist Module DTCs.  
Wait 30 seconds.  
With the scan tool, read Park Assist Module DTCs.

Is DTC B123E-PTS SENSOR 10 RING TIME TOO LONG active?

- Yes

>> Go To 2
- No

>> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



2. REPLACE PARK ASSIST SENSOR NO. 10

View Repair

Repair

Replace Park Assist Sensor No. 10 in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

## B210D-BATTERY VOLTAGE LOW

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, transmission in reverse or neutral (Late build vehicles will disable the Park Assist System in neutral).
- **Set Condition:**  
Park Assist Module supply voltage less than 9.0 volts.

Possible Causes
VEHICLE CHARGING SYSTEM
PARK ASSIST MODULE

## Diagnostic Test

### 1. CHECK FOR ACTIVE DTC: B210D-BATTERY VOLTAGE LOW

Turn the ignition on.

Apply the vehicle park brake.

Shift the transmission into reverse.

With the scan tool, record and erase Park Assist Module DTCs.

Wait 30 seconds.

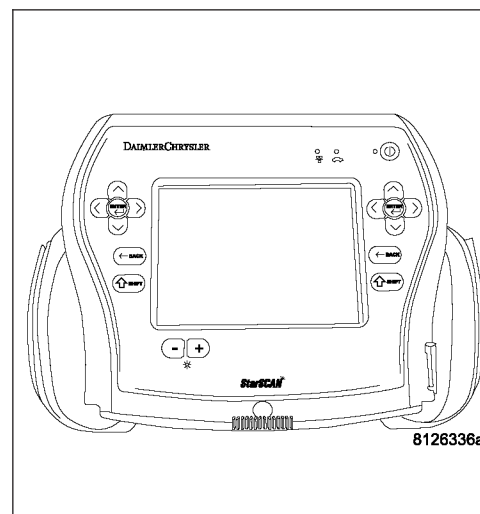
With the scan tool, read Park Assist Module DTCs.

**Is DTC: B210D-BATTERY VOLTAGE LOW active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



### 2. VERIFY OPERATION OF THE VEHICLE CHARGING SYSTEM

**Note:** Troubleshoot any PCM charging/cranking DTCs before proceeding.

**Note:** Ensure the battery is fully charged.

**Are any charging system DTCs present?**

**Yes** >> (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) for the diagnostic test procedures.

**No** >> Replace the Park Assist Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

B210E-BATTERY VOLTAGE HIGH

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on, and the transmission in reverse or neutral (Late build vehicles will disable the Park Assist System in neutral).
- **Set Condition:**  
Park Assist Module supply voltage greater than 16.0 volts.

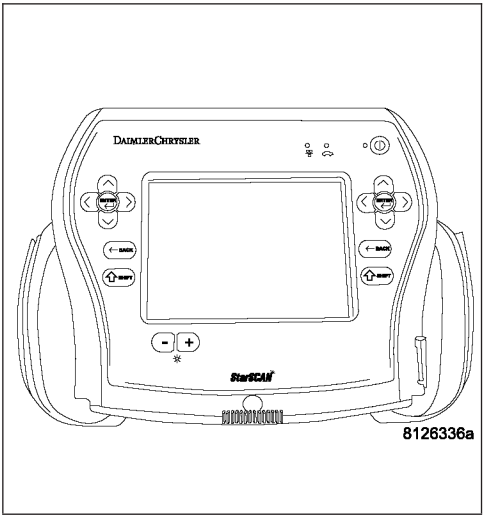
Possible Causes
VEHICLE CHARGING SYSTEM
PARK ASSIST MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTC: B210E-BATTERY VOLTAGE HIGH

Turn the ignition on.  
Apply the vehicle park brake.  
Shift the transmission into reverse.  
With the scan tool, record and erase Park Assist Module DTCs.  
Wait 30 seconds.  
With the scan tool, read Park Assist Module DTCs.

- Is DTC: B210E-BATTERY VOLTAGE HIGH active?**
- Yes**    >> Go To 2
- No**    >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



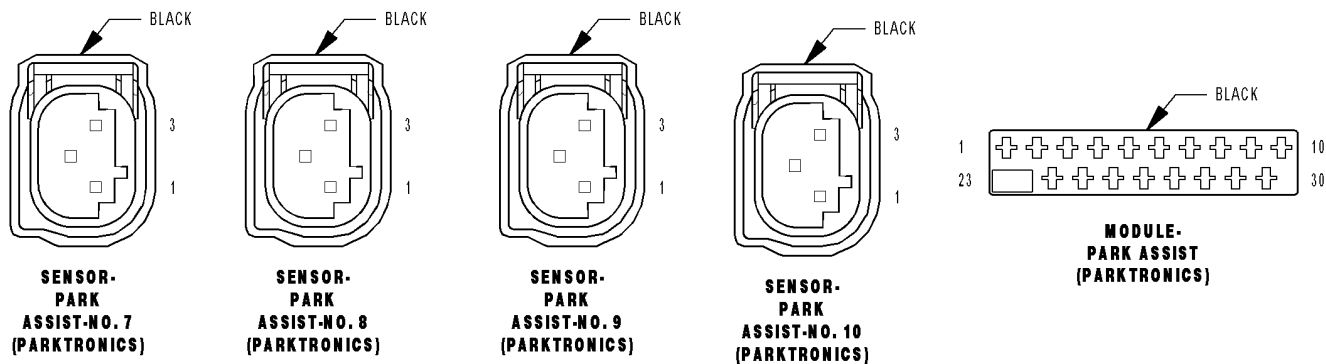
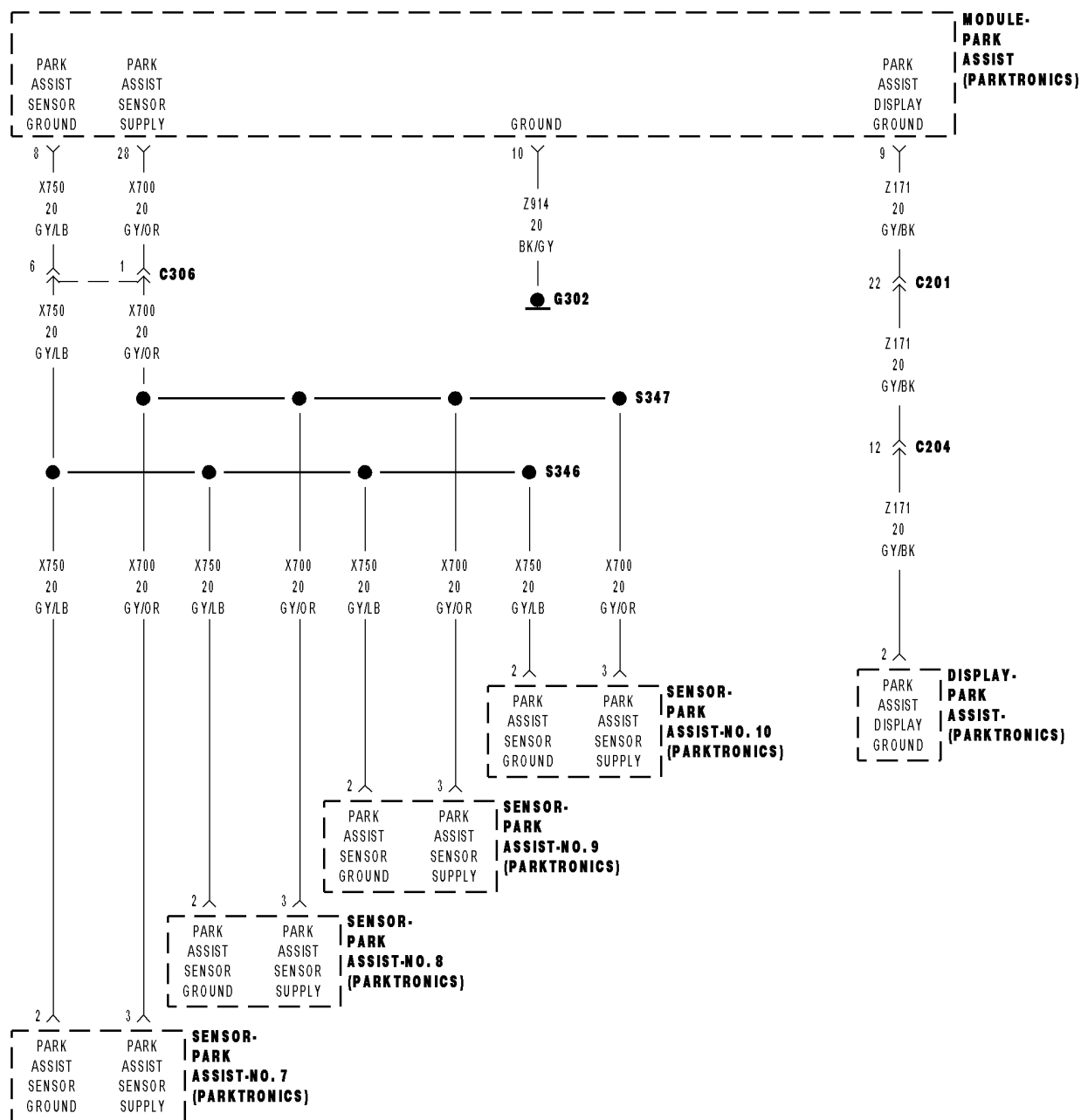
2. VERIFY OPERATION OF THE VEHICLE CHARGING SYSTEM

**Note:** Troubleshoot any PCM charging/cranking DTCs before proceeding.

**Note:** Ensure the battery is fully charged.

- Are any charging system DTCs present?**
- Yes**    >> (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) for the diagnostic test procedures.
- No**    >> Replace the Park Assist Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

# B2126-SENSOR SUPPLY VOLTAGE LOW



**B2126-SENSOR SUPPLY VOLTAGE LOW (CONTINUED)**

For the Park Assist circuit diagram (Refer to 8 - ELECTRICAL/CHIME/BUZZER - SCHEMATIC - ELECTRICAL).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition in Run/Start, and the PRNDL in R, N, or D (Late build vehicles will disable the Park Assist System in neutral).
- **Set Condition:**  
Park assist Sensor supply voltage less than 7.2 volts.

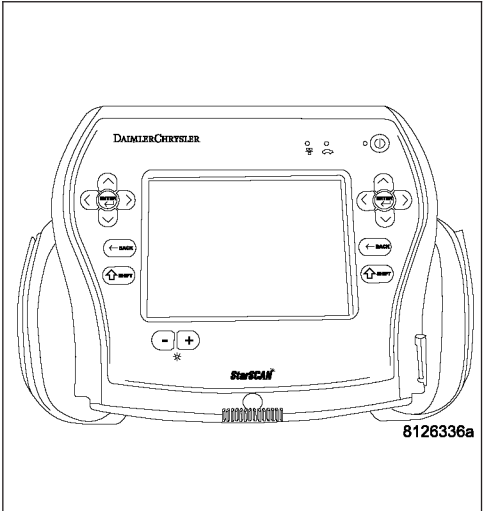
Possible Causes
(X700) PARK ASSIST SENSOR SUPPLY CIRCUIT SHORTED TO (X750) PARK ASSIST SENSOR GROUND CIRCUIT
(X700) PARK ASSIST SENSOR SUPPLY CIRCUIT SHORTED TO (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT
(X700) PARK ASSIST SENSOR SUPPLY CIRCUIT SHORTED TO (Z914) PARK ASSIST MODULE GROUND CIRCUIT
(X700) PARK ASSIST SENSOR SUPPLY CIRCUIT SHORTED TO GROUND
PARK ASSIST SENSOR
PARK ASSIST MODULE

**Diagnostic Test**

**1. CHECK FOR AN ACTIVE DTC**

- Turn the ignition on.
- Apply the park brake.
- Shift the transmission into Reverse.
- With the scan tool, record and erase DTCs.
- Wait 30 seconds.
- With the scan tool, read DTCs.

- Is the DTC active?**
- Yes**    >> Go To 2
- No**     >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.
- Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B2126-SENSOR SUPPLY VOLTAGE LOW (CONTINUED)****2. CHECK EACH PARK ASSIST SENSOR FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect one Park Assist Sensor.

Turn the ignition on.

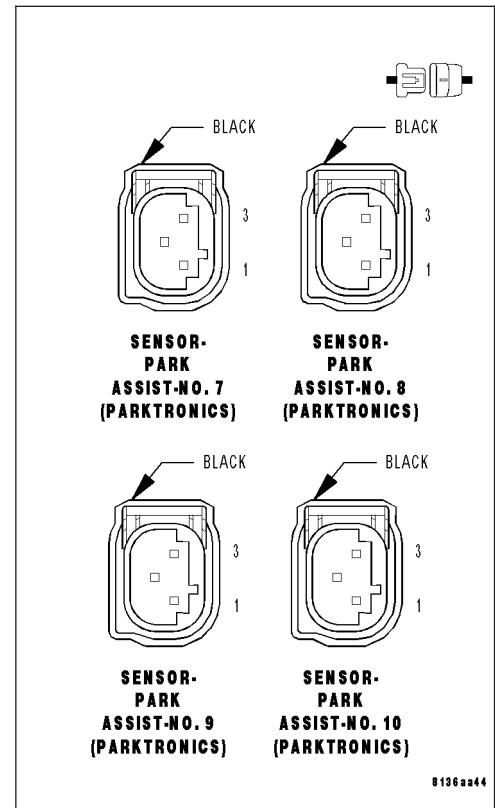
With the scan tool, read Park Assist Module DTCs. If DTC B2126 is still active, repeat this procedure by disconnecting another park assist sensor. However, if DTC B2126 changes from active to stored, or if all four sensors have been disconnected, proceed as follows:

**Is B2126-SENSOR SUPPLY VOLTAGE LOW still active?**

**Yes** >> Go To 3

**No** >> Replace the Park Assist Sensor that caused DTC B2126 to change from active to stored after disconnecting it in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**3. CHECK THE (X700) PARK ASSIST SENSOR SUPPLY CIRCUIT FOR A SHORT TO (X750) PARK ASSIST SENSOR GROUND CIRCUIT**

**Note: Perform this test with all Park Assist Sensors disconnected.**

Turn the ignition off.

Disconnect the Park Assist Module harness connector.

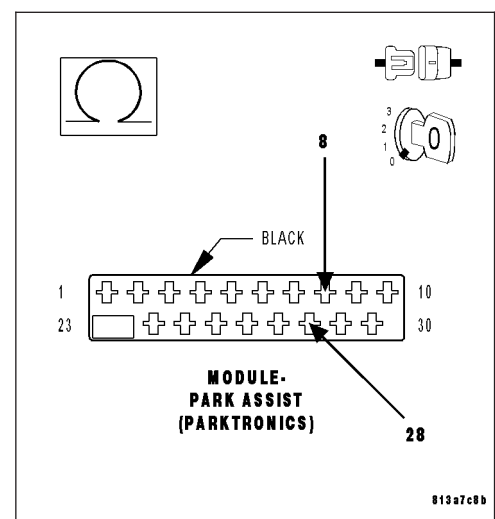
Measure the resistance between the (X700) Park Assist Sensor Supply circuit and the (X750) Park Assist Sensor Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X700) Park Assist Sensor Supply circuit for a short to the (X750) Park Assist Sensor Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4



**B2126-SENSOR SUPPLY VOLTAGE LOW (CONTINUED)****4. CHECK THE (X700) PARK ASSIST SENSOR SUPPLY CIRCUIT FOR A SHORT TO (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT**

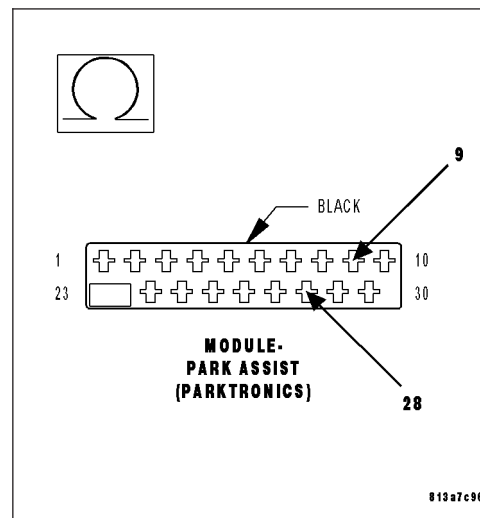
**Note:** Perform this test with all Park Assist Sensors disconnected.

Measure the resistance between the (X700) Park Assist Sensor Supply circuit and the (Z171) Park Assist Display Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X700) Park Assist Sensor Supply circuit for a short to the (Z171) Park Assist Display Ground circuit.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 5

**5. CHECK THE (X700) PARK ASSIST SENSOR SUPPLY CIRCUIT FOR A SHORT TO (Z914) PARK ASSIST MODULE GROUND CIRCUIT**

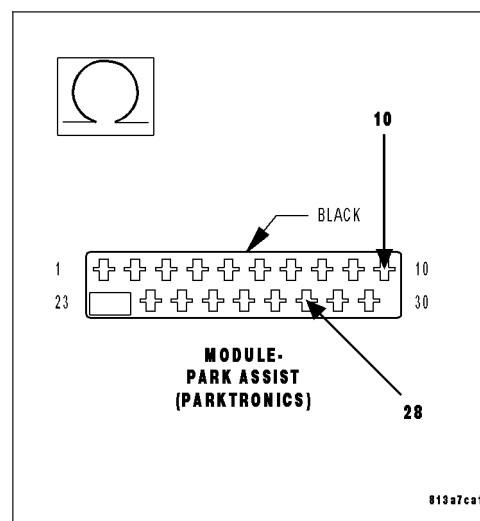
**Note:** Perform this test with all Park Assist Sensors disconnected.

Measure the resistance between the (X700) Park Assist Sensor Supply circuit and the (Z914) Park Assist Module Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X700) Park Assist Sensor Supply circuit for a short to the (Z914) Park Assist Module Ground circuit.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 6



**B2126-SENSOR SUPPLY VOLTAGE LOW (CONTINUED)****6. CHECK THE (X700) PARK ASSIST SENSOR SUPPLY CIRCUIT FOR A SHORT TO GROUND**

**Note:** Perform this test with all Park Assist Sensors disconnected.

Measure the resistance between ground and the (X700) Park Assist Sensor Supply circuit.

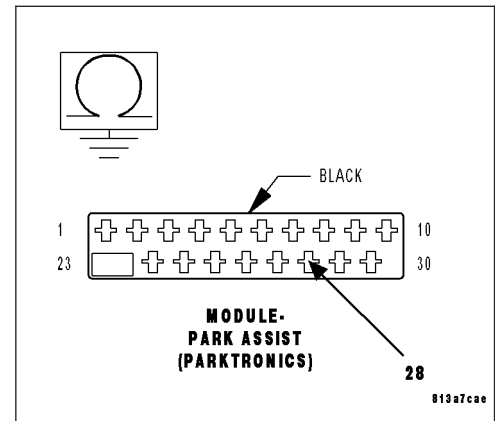
**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X700) Park Assist Sensor Supply circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Park Assist Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).





**Wiring Diagram for PARK ASSIST (PARKTRONICS)**

The diagram shows the electrical connections for the PARK ASSIST system. The main power source is the **MODULE-PARK ASSIST (PARKTRONICS)**, which provides **PARK ASSIST SENSOR GROUND** and **PARK ASSIST SENSOR SUPPLY** to the four sensors. The sensors are connected to the ground line via terminals 8, 28, 10, and 9. The ground line is connected to the **GROUND** terminal. The sensors are connected to the ground line via terminals 2 and 3. The sensors are connected to the ground line via terminals 2 and 3. The sensors are connected to the ground line via terminals 2 and 3. The sensors are connected to the ground line via terminals 2 and 3.

**SENSOR-PARK ASSIST-NO. 7 (PARKTRONICS)**

**SENSOR-PARK ASSIST-NO. 8 (PARKTRONICS)**

**SENSOR-PARK ASSIST-NO. 9 (PARKTRONICS)**

**SENSOR-PARK ASSIST-NO. 10 (PARKTRONICS)**

**MODULE-PARK ASSIST (PARKTRONICS)**

**DISPLAY-PARK ASSIST (PARKTRONICS)**

**Wiring Diagram for PARK ASSIST (PARKTRONICS)**

The diagram shows the electrical connections for the PARK ASSIST system. The main power source is the **MODULE-PARK ASSIST (PARKTRONICS)**, which provides **PARK ASSIST SENSOR GROUND** and **PARK ASSIST SENSOR SUPPLY** to the four sensors. The sensors are connected to the ground line via terminals 8, 28, 10, and 9. The ground line is connected to the **GROUND** terminal. The sensors are connected to the ground line via terminals 2 and 3. The sensors are connected to the ground line via terminals 2 and 3. The sensors are connected to the ground line via terminals 2 and 3. The sensors are connected to the ground line via terminals 2 and 3.

**SENSOR-PARK ASSIST-NO. 7 (PARKTRONICS)**

**SENSOR-PARK ASSIST-NO. 8 (PARKTRONICS)**

**SENSOR-PARK ASSIST-NO. 9 (PARKTRONICS)**

**SENSOR-PARK ASSIST-NO. 10 (PARKTRONICS)**

**MODULE-PARK ASSIST (PARKTRONICS)**

**DISPLAY-PARK ASSIST (PARKTRONICS)**

**B2127-SENSOR SUPPLY VOLTAGE HIGH (CONTINUED)**

For the Park Assist circuit diagram (Refer to 8 - ELECTRICAL/CHIME/BUZZER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition in Run/Start, PRNDL in R, N, or D; vehicle speed less than 40 mph (Late build vehicles will disable the Park Assist System in neutral).

- **Set Condition:**

Park Assist Sensor supply voltage greater than 9.2 volts.

Possible Causes
(X700) PARK ASSIST SENSOR SUPPLY CIRCUIT SHORT TO VOLTAGE
PARK ASSIST MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC: B2127-SENSOR SUPPLY VOLTAGE HIGH**

Turn the ignition on.

Apply the vehicle park brake.

Shift the transmission into Reverse.

With the scan tool, record and erase Park Assist Module DTCs.

Wait 30 seconds.

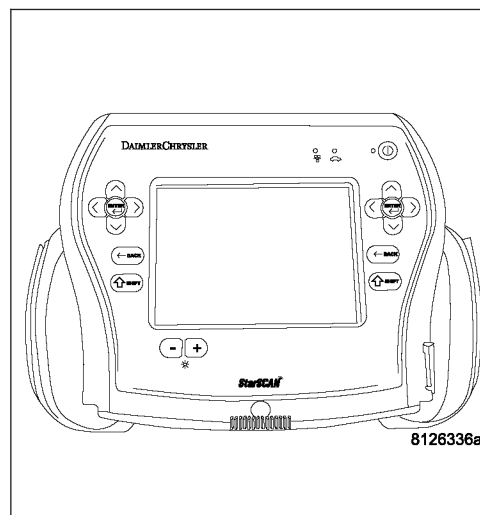
With the scan tool, read Park Assist Module DTCs.

**Is DTC: B2127-SENSOR SUPPLY VOLTAGE HIGH active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**2. CHECK THE (X700) PARK ASSIST SENSOR SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Park Assist Module harness connector.

Turn the ignition on.

Measure the voltage on the (X700) Park Assist Sensor Supply circuit.

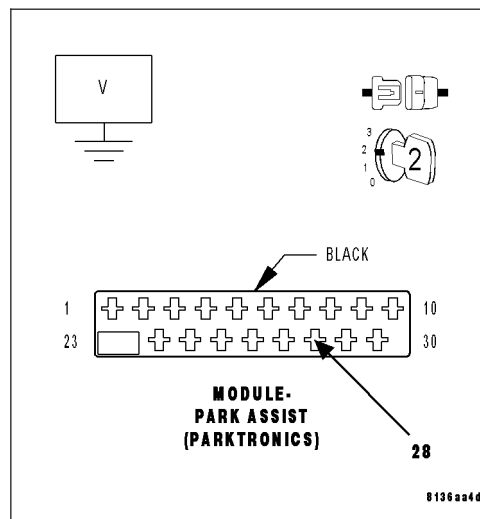
**Is the voltage above 9.2 volts?**

**Yes** >> Repair the (X700) Park Assist Sensor Supply circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Park Assist Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**MODULE-PARK ASSIST (PARKTRONICS)**

**DISP. PARK ASSIST (PARKTRONICS)**

**SENSOR-PARK ASSIST-NO. 10 (PARKTRONICS)**

**SENSOR-PARK ASSIST-NO. 9 (PARKTRONICS)**

**SENSOR-PARK ASSIST-NO. 8 (PARKTRONICS)**

**SENSOR-PARK ASSIST-NO. 7 (PARKTRONICS)**

**Wiring Details:**

- Module-Park Assist (PARKTRONICS) Connections:**
  - PARK ASSIST DISPLAY SUPPLY: 29 (X777, 20, DG/GY) to 21 (X777, 20, DG/GY) to 10 (X777, 20, DG/GY) to 1 (PARK ASSIST DISPLAY SUPPLY)
  - PARK ASSIST DISPLAY GROUND: 9 (Z171, 20, GY/BK) to 22 (Z171, 20, GY/BK) to 12 (Z171, 20, GY/BK) to 2 (PARK ASSIST DISPLAY GROUND)
  - PARK ASSIST DISPLAY SIGNAL: 25 (D777, 20, WT/DG) to 20 (D777, 20, WT/DG) to 9 (D777, 20, WT/DG) to 3 (PARK ASSIST DISPLAY SIGNAL)
- Display-Park Assist (PARKTRONICS) Connections:**
  - PARK ASSIST SENSOR GROUND: 2 (C306) to 6 (X750, 20, GY/LB) to 2 (PARK ASSIST SENSOR GROUND)
  - PARK ASSIST SENSOR GROUND: 2 (G302) to 10 (Z914, 20, BK/GY) to 2 (PARK ASSIST SENSOR GROUND)
  - PARK ASSIST SENSOR GROUND: 2 (S346) to 2 (X750, 20, GY/LB) to 2 (PARK ASSIST SENSOR GROUND)
- Sensor-Park Assist Modules (PARKTRONICS) Connections:**
  - SENSOR-PARK ASSIST-NO. 10: 2 (PARK ASSIST SENSOR GROUND) to 2 (X750, 20, GY/LB) to 2 (PARK ASSIST SENSOR GROUND)
  - SENSOR-PARK ASSIST-NO. 9: 2 (PARK ASSIST SENSOR GROUND) to 2 (X750, 20, GY/LB) to 2 (PARK ASSIST SENSOR GROUND)
  - SENSOR-PARK ASSIST-NO. 8: 2 (PARK ASSIST SENSOR GROUND) to 2 (X750, 20, GY/LB) to 2 (PARK ASSIST SENSOR GROUND)
  - SENSOR-PARK ASSIST-NO. 7: 2 (PARK ASSIST SENSOR GROUND) to 2 (X750, 20, GY/LB) to 2 (PARK ASSIST SENSOR GROUND)

**Physical Layout:**

**DISPLAY-PARK ASSIST (PARKTRONICS)**

**MODULE-PARK ASSIST (PARKTRONICS)**

**Pin Connections:**

- Display-Park Assist (PARKTRONICS):** 1 (PARK ASSIST DISPLAY SUPPLY), 2 (PARK ASSIST DISPLAY GROUND), 3 (PARK ASSIST DISPLAY SIGNAL)
- Module-Park Assist (PARKTRONICS):** 1 (PARK ASSIST DISPLAY SUPPLY), 2 (PARK ASSIST DISPLAY GROUND), 3 (PARK ASSIST DISPLAY SIGNAL), 10 (PARK ASSIST DISPLAY SUPPLY), 20 (PARK ASSIST DISPLAY GROUND), 30 (PARK ASSIST DISPLAY SIGNAL)

**B212A-PTS DISPLAY SUPPLY VOLTAGE LOW (CONTINUED)**

For the Park Assist circuit diagram (Refer to 8 - ELECTRICAL/CHIME/BUZZER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition in Run/Start, PRNDL in R, N, or D; vehicle speed less than 40 mph (Late build vehicles will disable the Park Assist System in neutral).

- **Set Condition:**

Park Assist Sensor Display voltage less than 8.0 volts.

Possible Causes
(X777) PARK ASSIST DISPLAY SUPPLY CIRCUIT SHORT TO GROUND
(X777) PARK ASSIST DISPLAY SUPPLY CIRCUIT SHORT TO (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT
(X777) PARK ASSIST DISPLAY SUPPLY CIRCUIT SHORT TO (Z914) PARK ASSIST MODULE GROUND CIRCUIT
(X777) PARK ASSIST DISPLAY SUPPLY CIRCUIT SHORT TO (X750) PARK ASSIST SENSOR GROUND CIRCUIT
PARK ASSIST DISPLAY
PARK ASSIST MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC: B212A-PTS DISPLAY SUPPLY VOLTAGE LOW**

Turn the ignition on.

Apply the vehicle park brake.

Shift the transmission into Reverse.

With the scan tool, record and erase Park Assist Module DTCs.

Wait 30 seconds.

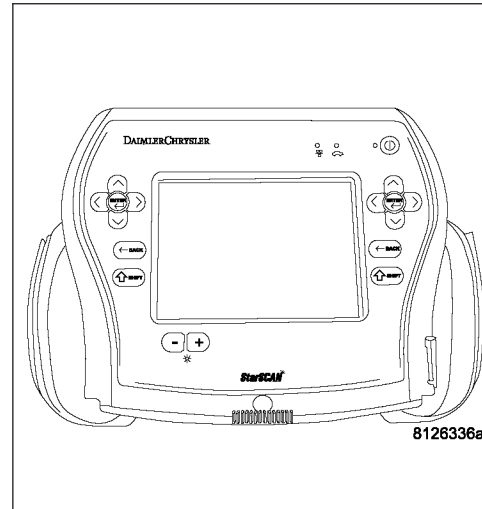
With the scan tool, read Park Assist Module DTCs.

**Is DTC: B212A-PTS DISPLAY SUPPLY VOLTAGE LOW active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B212A-PTS DISPLAY SUPPLY VOLTAGE LOW (CONTINUED)****2. CHECK PARK ASSIST MODULE FOR AN INTERNAL SHORT TO GROUND**

Turn the ignition off.

Disconnect the Park Assist Module harness connector.

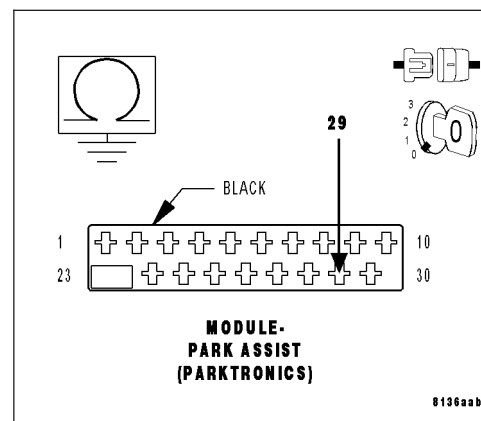
Measure the resistance between ground and the (X777) Park Assist Display Supply circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Go To 3

**No** >> Replace the Park Assist Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**3. CHECK THE (X777) PARK ASSIST DISPLAY SUPPLY CIRCUIT FOR A SHORT TO THE (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT**

Disconnect the Park Assist Display harness connector.

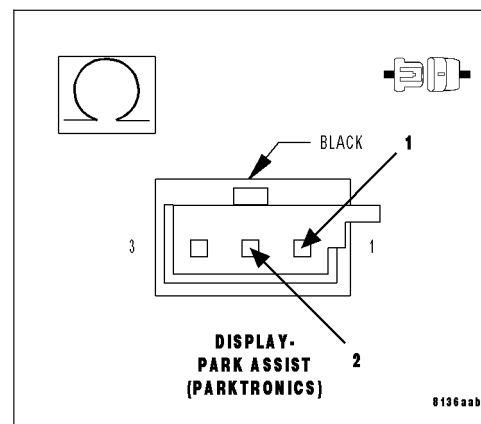
Measure the resistance between the (X777) Park Assist Display Supply circuit and the (Z171) Park Assist Display Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X777) Park Assist Display Supply circuit for a short to the (Z171) Park Assist Display Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4

**4. CHECK THE (X777) PARK ASSIST DISPLAY SUPPLY CIRCUIT FOR A SHORT TO THE (Z914) PARK ASSIST MODULE GROUND CIRCUIT**

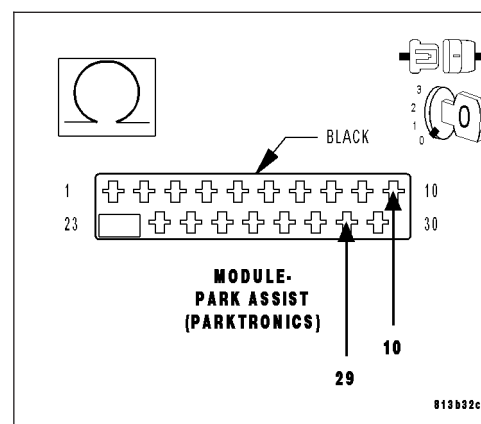
Measure the resistance between the (X777) Park Assist Display Supply circuit and the (Z914) Park Assist Module Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X777) Park Assist Display Supply circuit for a short to the (Z914) Park Assist Module Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 5



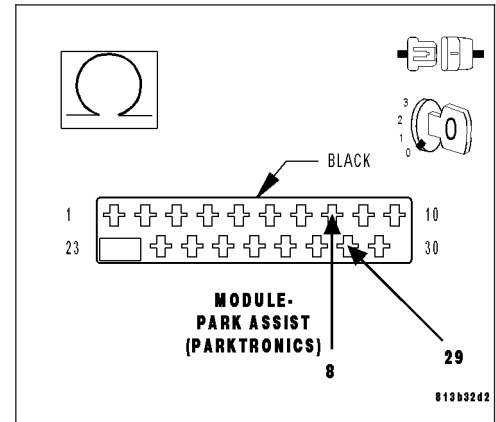
**B212A-PTS DISPLAY SUPPLY VOLTAGE LOW (CONTINUED)****5. CHECK THE (X777) PARK ASSIST DISPLAY SUPPLY CIRCUIT FOR A SHORT TO THE (X750) PARK ASSIST SENSOR GROUND CIRCUIT**

Measure the resistance between the (X777) Park Assist Display Supply circuit and the (X750) Park Assist Sensor Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X777) Park Assist Display Supply circuit for a short to the (X750) Park Assist Sensor Ground circuit.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 6

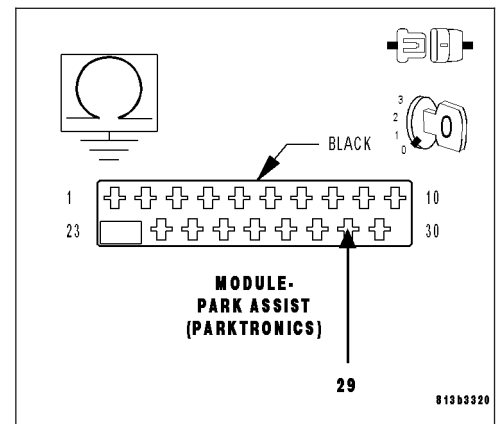
**6. CHECK THE (X777) PARK ASSIST DISPLAY SUPPLY CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (X777) Park Assist Display Supply circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (X777) Park Assist Display Supply circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Park Assist Display in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



B222A-VEHICLE LINE MISMATCH

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
If the Vehicle Line data transmitted on the CAN B bus doesn't correspond with the data stored in the Park Assist Module.

Possible Causes
PARK ASSIST MODULE

Diagnostic Test

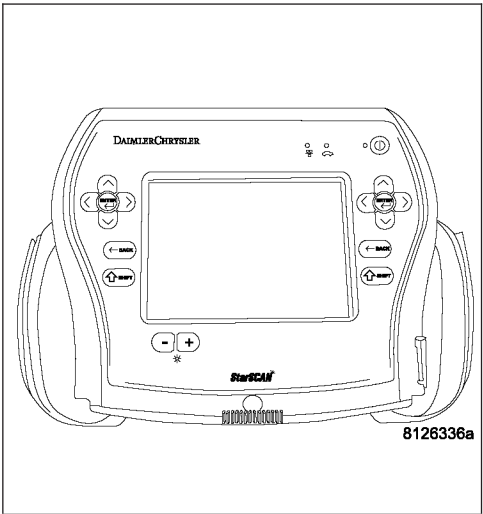
1. CHECK VEHICLE LINE IN THE PCM

With the scan tool, compare the vehicle line that is programmed in to the PCM to the vehicle line of the vehicle.

Does the vehicle line programmed into the PCM match the vehicle?

**Yes** >> Replace the Park Assist Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER 5. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)



**B2232-(PTS) PARKTRONICS INTERNAL**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Park Assist Module detects an internal failure.

Possible Causes
PARK ASSIST MODULE

**Diagnostic Test****1. REPLACE THE PARK ASSIST MODULE**

**View Repair**

**Repair**

Replace the Park Assist Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

---



B2234-(PTS) PARKTRONICS REAR DISPLAY INTERNAL

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition in Run/Start, PRNDL in R, N, or D; vehicle speed less than 40 mph (Late build vehicles will disable the Park Assist System in neutral).
- **Set Condition:**  
The Park Assist Module detects an internal Park Assist Display failure.

Possible Causes
PARK ASSIST DISPLAY

Diagnostic Test

1. REPLACE THE PARK ASSIST DISPLAY

View Repair

Repair

Replace the Park Assist Display in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**U0423-IMPLAUSIBLE DATA RECEIVED FROM CLUSTER/CCN**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Park Assist Module supply voltage between 9–16 volts. Ignition in Run/Start.
- **Set Condition:**  
Ignition status = 7h

Possible Causes
NO COMMUNICATION WITH INSTRUMENT CLUSTER
DTCS STORED OR ACTIVE IN THE INSTRUMENT CLUSTER
ACTIVE DTCS IN THE FCM
PARK ASSIST MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC: U0423-IMPLAUSIBLE DATA RECEIVED FROM CLUSTER/CCN**

Turn the ignition on.

With the scan tool, record and erase Park Assist Module DTCs.

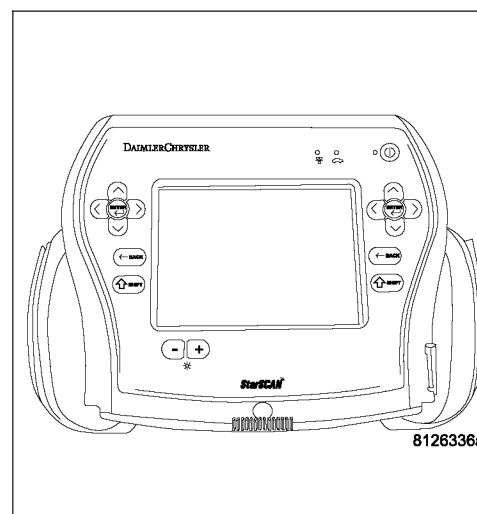
Wait 30 seconds.

With the scan tool, read Park Assist Module DTCs.

**Is DTC: U0423-IMPLAUSIBLE DATA RECEIVED FROM CLUSTER/CCN active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**2. INSTRUMENT CLUSTER IS ACTIVE ON THE CAN B BUS**

With the scan tool, select ECU View.

Verify that the Instrument Cluster is active on the bus.

**Is the Instrument Cluster active on the bus?**

**Yes** >> Go To 3

**No** >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

## U0423-IMPLAUSIBLE DATA RECEIVED FROM CLUSTER/CCN (CONTINUED)

### 3. DTCS STORED OR ACTIVE IN THE INSTRUMENT CLUSTER

Check for Ignition Switch DTCs in the Instrument Cluster.

**Are any DTCs active or stored in the Instrument Cluster?**

**Yes** >> Refer to the appropriate section and perform the diagnostics for the DTCs.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go to 4

---

### 4. ACTIVE DTCS IN THE FCM

With the scan tool, select ECU View and select FCM.

With the scan tool, read active DTCs.

**Are any Communication DTCs active in the FCM Park Assist System?**

**Yes** >> Refer to the appropriate section and perform the diagnostics for the DTCs.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace and program the Park Assist Module in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

---

**U0431-IMPLAUSIBLE DATA RECEIVED FROM FCM**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Park Assist Module supply voltage between 9–16 volts. Ignition in Run/Start.
- **Set Condition:**  
PRNDL = 7h, or vehicle speed greater than 511 km/hr.

Possible Causes
CAN B OPEN OR SHORTED FRONT CONTROL MODULE PARK ASSIST MODULE

**Diagnostic Test****1. U0431-IMPLAUSIBLE DATA RECEIVED FROM FCM**

Turn the ignition on.

With the scan tool, record and erase Park Assist Module DTCs.

Wait 30 seconds.

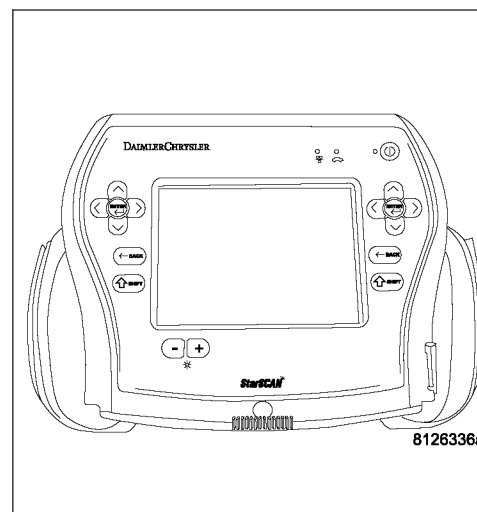
With the scan tool, read Park Assist Module DTCs.

**Is DTC: U0423-IMPLAUSIBLE DATA RECEIVED FROM CLUSTER/CCN active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**2. U0019-NO COMMUNICATION ON THE CAN B BUS CIRCUIT ALSO ACTIVE**

With a scan tool check for DTCs in the FCM.

**Is the U0019-NO COMMUNICATION ON THE CAN B BUS CIRCUIT active at this time?**

**Yes** >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for the U0019-NO COMMUNICATION ON THE CAN B BUS CIRCUIT diagnostic procedures.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace and program the Park Assist Module according to the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

The diagram illustrates the electrical connections for a Park Assist system. At the top, four sensor modules are shown, each with a 'PARK ASSIST SENSOR GROUND' terminal and a 'SENSOR-PARK ASSIST-NO. 1' through '4' terminal. These are connected to a common ground line labeled 'S346'. Below this, a 'MODULE-PARK ASSIST (PARKTRONICS)' is shown with a 'PARK ASSIST SENSOR SIGNAL' terminal connected to the common ground line. The main control module, 'MODULE-PARK ASSIST (PARKTRONICS)', is shown with a 'PARK ASSIST SENSOR SIGNAL' terminal connected to the common ground line. The diagram also shows the wiring for the 'DISPLAY-PARK ASSIST (PARKTRONICS)' module, including its 'PARK ASSIST DISPLAY SUPPLY', 'PARK ASSIST DISPLAY GROUND', and 'PARK ASSIST DISPLAY SIGNAL' terminals. The wiring is color-coded: X750 (20) GY/LB, X777 (20) DG/GY, Z171 (20) GY/BK, D777 (20) WT/DG, Z914 (20) BK/GY, and Z914 (20) BK/GY. The diagram includes a legend for the 'DISPLAY-PARK ASSIST (PARKTRONICS)' module, showing its terminals and their corresponding colors: 1 (BLACK), 2 (GY/BK), 3 (WT/DG), 4 (DG/GY), 5 (GY/BK), 6 (WT/DG), 7 (DG/GY), 8 (GY/BK), 9 (WT/DG), 10 (DG/GY), 11 (GY/BK), 12 (WT/DG), 13 (DG/GY), 14 (GY/BK), 15 (WT/DG), 16 (DG/GY), 17 (GY/BK), 18 (WT/DG), 19 (DG/GY), 20 (GY/BK), 21 (WT/DG), 22 (DG/GY), 23 (GY/BK), 24 (WT/DG), 25 (DG/GY), 26 (GY/BK), 27 (WT/DG), 28 (DG/GY), 29 (GY/BK), 30 (WT/DG).

**U1002-PTS DISPLAY COMMUNICATION CIRCUIT LOW (CONTINUED)**

For the Park Assist circuit diagram (Refer to 8 - ELECTRICAL/CHIME/BUZZER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition in Run/Start, PRNDL in R, N, or D; vehicle speed less than 40 mph (Late build vehicles will disable the Park Assist System in neutral).

- **Set Condition:**

Display data line low.

Possible Causes
(D777) PARK ASSIST DISPLAY SIGNAL CIRCUIT SHORT TO THE (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT
(D777) PARK ASSIST DISPLAY SIGNAL CIRCUIT SHORT TO THE (X750) PARK ASSIST SENSOR GROUND CIRCUIT
(D777) PARK ASSIST DISPLAY SIGNAL CIRCUIT SHORT TO THE (Z914) PARK ASSIST MODULE GROUND CIRCUIT
(D777) PARK ASSIST DISPLAY SIGNAL CIRCUIT SHORT TO GROUND
PARK ASSIST DISPLAY
PARK ASSIST MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC: U1002-PTS DISPLAY COMMUNICATION CIRCUIT LOW**

Turn the ignition on.

Apply the vehicle park brake.

Shift the transmission into reverse.

With the scan tool, record and erase Park Assist Module DTCs.

Wait 30 seconds.

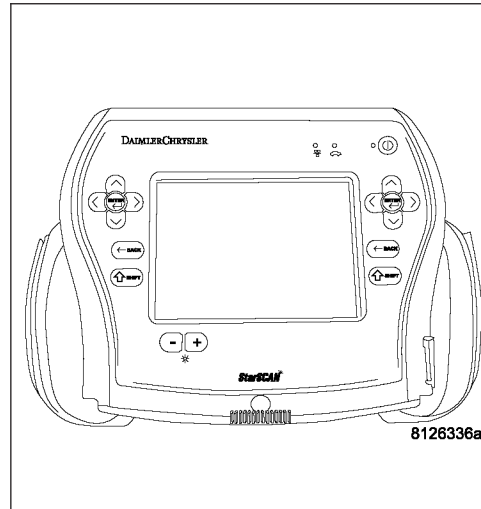
With the scan tool, read Park Assist Module DTCs.

**Is DTC: U1002-PTS DISPLAY COMMUNICATION CIRCUIT LOW active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**U1002-PTS DISPLAY COMMUNICATION CIRCUIT LOW (CONTINUED)****2. CHECK PARK ASSIST MODULE FOR AN INTERNAL SHORT TO GROUND**

Turn the ignition off.

Disconnect the Park Assist Module harness connector.

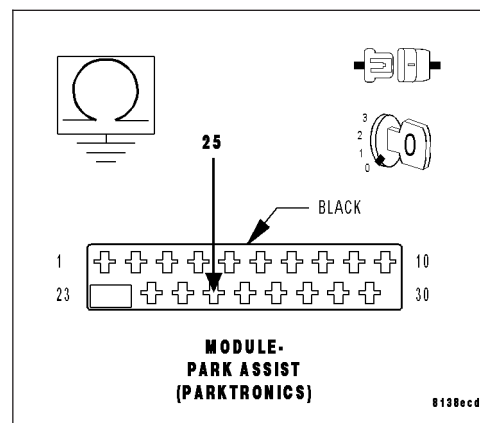
Measure the resistance between ground and the (D777) Park Assist Display Signal circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Go To 3

**No** >> Replace the Park Assist Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**3. CHECK THE (D777) PARK ASSIST DISPLAY SIGNAL CIRCUIT FOR A SHORT TO THE (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT**

Disconnect the Park Assist Display harness connector.

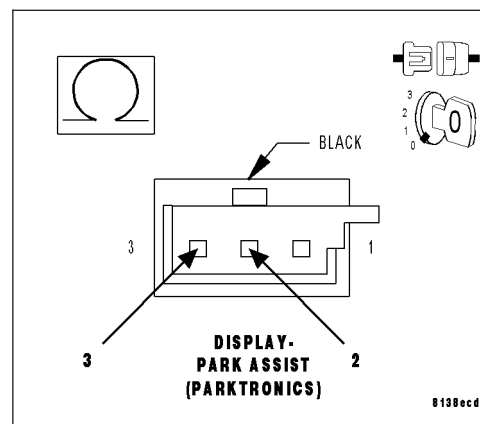
Measure the resistance between the (D777) Park Assist Display Signal circuit and the (Z171) Park Assist Display Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D777) Park Assist Display Signal circuit for a short to the (Z171) Park Assist Display Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4

**4. CHECK THE (D777) PARK ASSIST DISPLAY SIGNAL CIRCUIT FOR A SHORT TO THE (X750) PARK ASSIST SENSOR GROUND CIRCUIT**

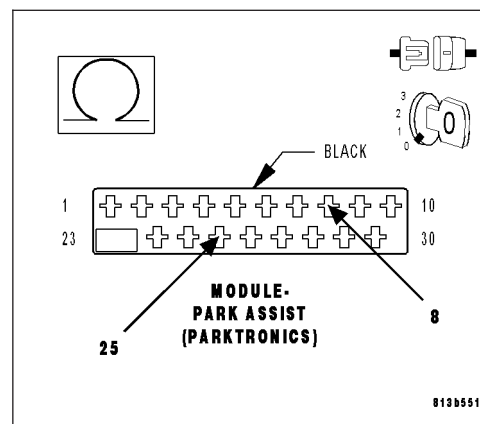
Measure the resistance between the (D777) Park Assist Display Signal circuit and the (X750) Park Assist Sensor Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D777) Park Assist Display Signal circuit for a short to the (X750) Park Assist Sensor Ground circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 5



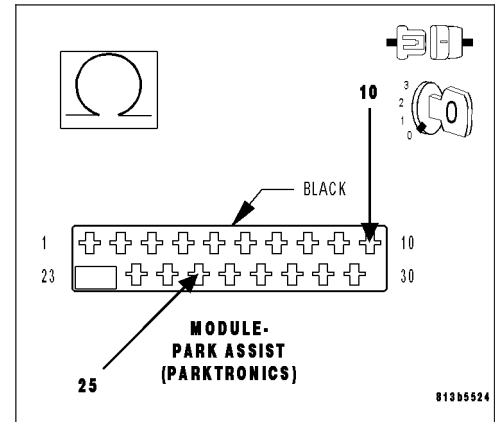
**U1002-PTS DISPLAY COMMUNICATION CIRCUIT LOW (CONTINUED)****5. CHECK THE (D777) PARK ASSIST DISPLAY SIGNAL CIRCUIT FOR A SHORT TO THE (Z914) PARK ASSIST MODULE GROUND CIRCUIT**

Measure the resistance between the (D777) Park Assist Display Signal circuit and the (Z914) Park Assist Module Ground circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (D777) Park Assist Display Signal circuit for a short to the (Z914) Park Assist Module Ground circuit.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 6

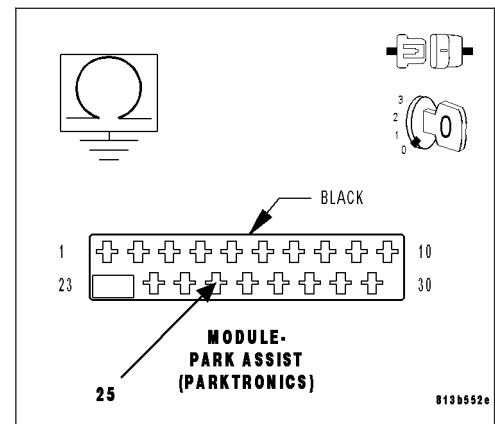
**6. CHECK THE (D777) PARK ASSIST DISPLAY SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (D777) Park Assist Display Signal circuit.

**Is the resistance below 10K ohms?**

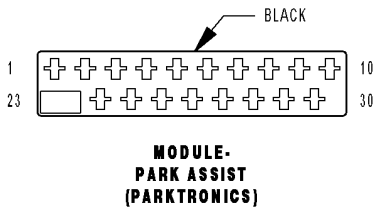
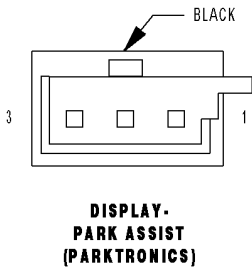
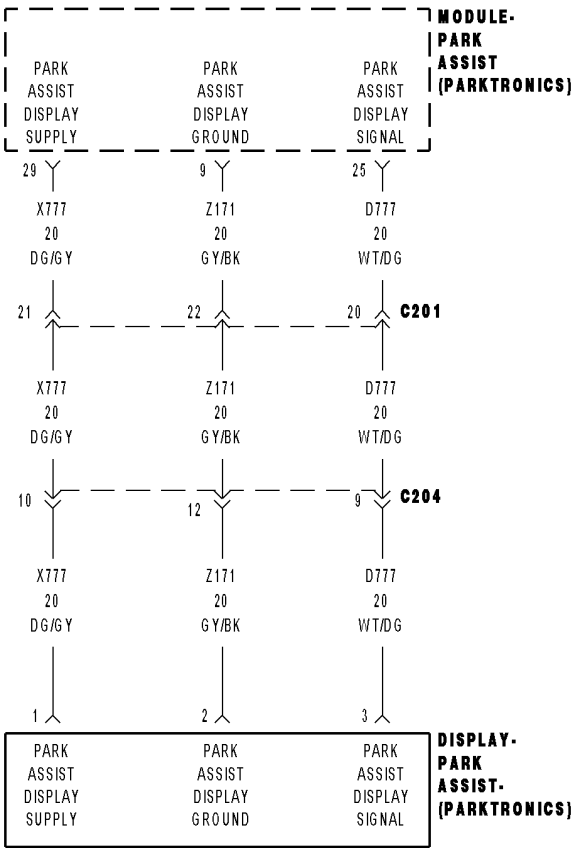
**Yes** >> Repair the (D777) Park Assist Display Signal circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Park Assist Display in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).





U1101-LOST COMMUNICATION WITH PTS DISPLAY



**U1101-LOST COMMUNICATION WITH PTS DISPLAY (CONTINUED)**

For the Park Assist circuit diagram (Refer to 8 - ELECTRICAL/CHIME/BUZZER - SCHEMATIC - ELECTRICAL).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition in Run/Start, PRNDL in R, N, or D; vehicle speed less than 40 mph (Late build vehicles will disable the Park Assist System in neutral).

- **Set Condition:**

Data display line open.

Possible Causes
(D777) PARK ASSIST DISPLAY SIGNAL CIRCUIT OPEN
(X777) PARK ASSIST DISPLAY SUPPLY CIRCUIT OPEN
(Z171) PARK ASSIST DISPLAY GROUND CIRCUIT OPEN
PARK ASSIST DISPLAY
PARK ASSIST MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC: U1101-LOST COMMUNICATION WITH PTS DISPLAY**

Turn the ignition on.

Apply the vehicle park brake.

Shift the transmission into Reverse.

With the scan tool, record and erase Park Assist Module DTCs.

Wait 30 seconds.

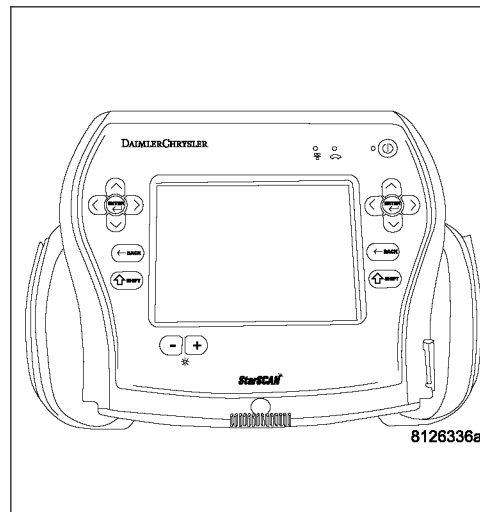
With the scan tool, read Park Assist Module DTCs.

**Is DTC: U1101-LOST COMMUNICATION WITH PTS DISPLAY active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**U1101-LOST COMMUNICATION WITH PTS DISPLAY (CONTINUED)****2. CHECK THE (D777) PARK ASSIST DISPLAY SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Park Assist Module harness connector.

Disconnect the Park Assist Display Module harness connector.

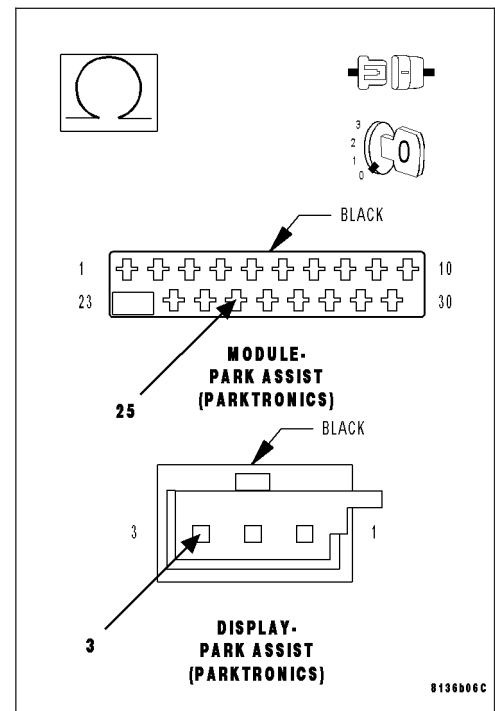
Measure the resistance of the (D777) Park Assist Display Signal circuit between the Park Assist Module harness connector and the Park Assist Display harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (D777) Park Assist Display Signal circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**3. CHECK THE (X777) PARK ASSIST DISPLAY SUPPLY CIRCUIT FOR AN OPEN**

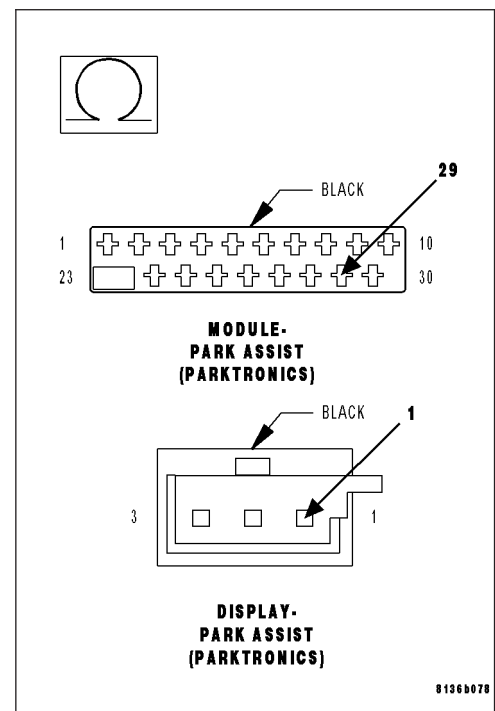
Measure the resistance of the (X777) Park Assist Display Supply circuit between the Park Assist Module harness connector and the Park Assist Display harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (X777) Park Assist Display Supply circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



## U1101-LOST COMMUNICATION WITH PTS DISPLAY (CONTINUED)

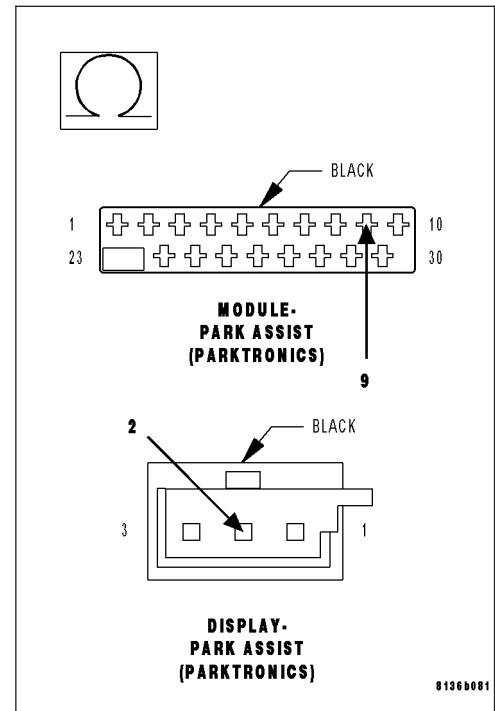
### 4. CHECK THE (Z171) PARK ASSIST DISPLAY GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (Z171) Park Assist Display Ground circuit between the Park Assist Module harness connector and the Park Assist Display harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the (Z171) Park Assist Display Ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



### 5. CHECK THE OPERATION OF THE PARK ASSIST DISPLAY

Replace the Park Assist Display in accordance with the service information.

Reconnect the Park Assist Module harness connector.

Turn the ignition on.

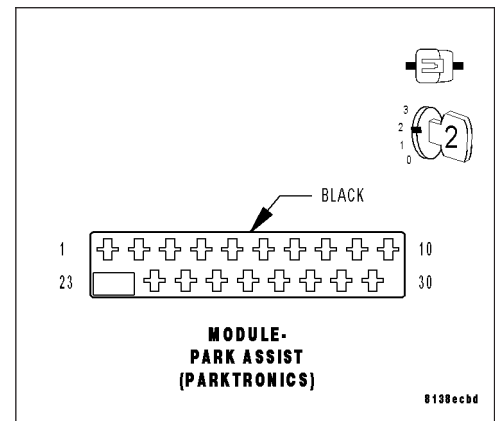
With the scan tool, read DTCs.

**Does the scan tool display U1101-LOST COMMUNICATION WITH PTS DISPLAY?**

**Yes** >> Replace the Park Assist Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Test Complete.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



## U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W.**

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0155-LOST COMMUNICATION WITH CLUSTER/CCN**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0159-LOST COMMUNICATION WITH PARKING ASSIST CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0167-LOST COMMUNICATION WITH INTRUSION TRANSCEIVER CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0169-LOST COMMUNICATION WITH SUNROOF CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0184-LOST COMMUNICATION WITH RADIO**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0195-LOST COMMUNICATION WITH SDARS**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0196-LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0212-LOST COMMUNICATION WITH SCCM-CAN-B**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0231-LOST COMMUNICATION WITH RAIN SENSING MODULE**

For a complete wiring diagram **Refer to Section 8W.**

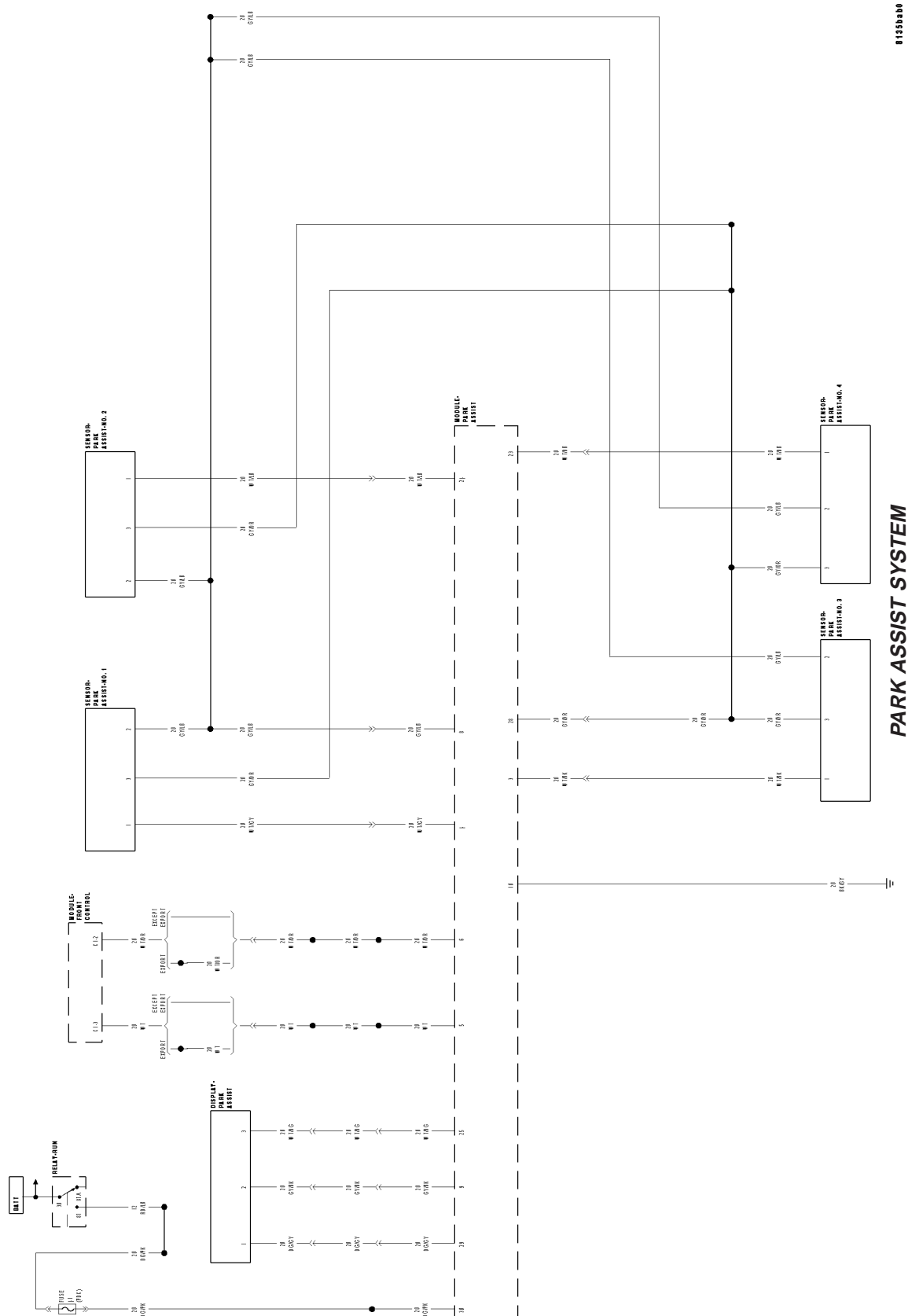
**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0241-LOST COMMUNICATION WITH AUTO HIGHBEAM HEADLAMP CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## SCHEMATICS AND DIAGRAMS





CHIME/BUZZER - SERVICE INFORMATION

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CHIME/BUZZER - SERVICE INFORMATION

DESCRIPTION

CHIME WARNING SYSTEM

The chime warning system uses an electromechanical transducer and an electromechanical relay that are soldered onto the electronic circuit board inside of the ElectroMechanical Instrument Cluster (EMIC) to provide audible indications of various vehicle conditions that may require the attention of the vehicle operator or occupants. The EMIC also includes the hardware and software necessary to serve as the electronic body control module and is sometimes referred to as the Cab Compartment Node or CCN.

The electromechanical transducer generates beep tones and chime tones, while the electromechanical relay generates click tones to emulate the sounds associated with conventional turn signal and hazard warning flasher operation. The microprocessor-based EMIC utilizes electronic chime request messages received from other modules in the vehicle over the Controller Area Network (CAN) data bus along with hard wired inputs to monitor many sensors and switches throughout the vehicle. In response to those inputs, the circuitry and programming of the EMIC allow it to control the audible outputs that are produced through its on-board transducer and relay.

PARK ASSIST SYSTEM

The Park Assist System is an electronic parking aid that alerts the driver to obstacles which are located immediately behind the vehicle. Objects are sensed using ultrasonic sound waves. When an object is detected, the system will give the driver visual and audible warnings. The system is customer programmable through the Electronic Vehicle Information Center (EVIC) but will be enabled from the factory as a default.

The major components of the park assist system are:

- **Park Assist Module** - supplies voltage to the object detection sensors and park assist display. It triggers the sensors, analyzes the echo delay times and calculates obstacle distances. It sends display information to the park assist display, performs system diagnostics, and communicates via the Programmable Communication Interface (PCI) data bus network.
- **Park Assist Sensors** - there are four sensors located in the rear bumper that generate ultrasonic pulses when triggered by the park assist module. The sensors signal the park assist module when reflected ultrasonic pulses are received.
- **Park Assist Display** - there are sixteen Light Emitting Diode (LED) indicators which provide indication of relative distance to obstacles. When the system is engaged and no obstacles are detected, the two outermost yellow LED's are lit at reduced brightness to show the system is working. As the distance to a detected obstacle decreases, more yellow LED's towards the center of the display illuminate.

For diagnosis and testing of the park assist system, use a scan tool and the appropriate body diagnostic information.

## OPERATION

### CHIME WARNING SYSTEM

The chime warning system operates on battery voltage received through a fuse in the Junction Block (JB) on a non-switched fused B(+) circuit so that the system may operate regardless of the ignition switch position. The chime warning system also monitors the ignition switch position so that some chime features are functional only with the ignition switch in the On position, while others are functional regardless of the ignition switch position.

The chime warning system provides an audible indication to the vehicle operator or occupants under the following conditions:

- **Airbag Indicator Warning** - The ElectroMechanical Instrument Cluster (EMIC) transducer will generate one short chime when the ignition switch is in the On position, and an electronic message is received over the Controller Area Network (CAN) data bus from the Occupant Restraint Controller (ORC) requesting "Airbag" indicator illumination. This warning will only occur following completion of the "Airbag" indicator bulb test, and will only occur once during any ignition cycle.
- **Compass Mini-Trip Computer Global Reset** - The EMIC transducer will generate one short chime when the ignition switch is in the On position, and an electronic message is received over the CAN data bus from the optional Compass Mini-Trip Computer (CMTC) requesting that the CMTC average fuel economy, trip odometer and distance to empty data be reset. The CMTC monitors hard wired inputs from the U.S./Metric and Reset button switches to determine the proper reset messages to send to the EMIC.
- **Door Ajar Indicator Warning** - The EMIC transducer will generate one short chime when the ignition switch is in the On position, a hard wired input is received indicating that the status of any door ajar switch has changed, and an electronic message is received over the CAN data bus indicating that the vehicle is moving.
- **Fasten Seat Belt Indicator Warning** - The EMIC transducer will generate repetitive chimes at a slow rate to announce that a hard wired input from the seat belt switch indicates that the driver side front seat belt is not fastened with the ignition switch in the On position. The chime warning system also supports the enhanced seat belt reminder (beltminder) when this feature is enabled.
- **Gate Ajar Indicator Warning** - The EMIC transducer will generate one short chime when the ignition switch is in the On position, a hard wired input is received indicating that the status of the liftgate ajar switch has changed, and an electronic message is received over the CAN data bus indicating that the vehicle is moving.
- **Head/Park Lamps-On Warning** - The EMIC transducer will generate repetitive chimes at a fast rate to indicate that hard wired inputs from the driver door ajar switch, the headlamp switch, and the ignition switch indicate that the exterior lamps are turned On with the driver side front door opened and the ignition switch in the Off position. The chimes will continue to sound until the exterior lamps are turned Off, the driver side front door is closed, or the ignition switch is turned to the On position, whichever occurs first.
- **Key-In-Ignition Warning** - The EMIC transducer will generate repetitive chimes at a fast rate to indicate that hard wired inputs from the driver door ajar switch, the ignition switch, and the key-in ignition switch circuitry of the ignition switch indicate that the key is in the ignition lock cylinder with the driver side front door open and the ignition switch in the Off position. The chimes will continue to sound until the key is removed from the ignition lock cylinder, the driver side front door is closed, or the ignition switch is turned to the On position, whichever occurs first.
- **Low Fuel Indicator Warning** - The EMIC transducer will generate one short chime when the low fuel indicator is illuminated by the instrument cluster circuitry. This chime will only occur once during any ignition cycle.
- **Low Wash Indicator Warning** - The EMIC transducer will generate one short chime when the low washer fluid indicator is illuminated by the instrument cluster circuitry. This chime will only occur once during any ignition cycle.
- **Overspeed Warning** - The EMIC transducer will generate repetitive chimes at a slow rate to indicate that the vehicle speed is over a pre-programmed speed value. The EMIC monitors electronic vehicle speed messages received over the CAN data bus. This feature is only enabled on an EMIC that has been programmed with a Middle East Gulf Coast Country (GCC) country code.
- **Park Brake Reminder** - The EMIC transducer will generate one short chime to announce that the hard wired input from the park brake switch and a vehicle speed message input received over the CAN data bus indicate that the park brake is applied and the vehicle is moving. This chime will repeat each time the input conditions are met.
- **Sentry Key "Customer Learn" Mode Announcement** - The EMIC transducer will generate one short chime to confirm that an electronic "Customer Learn" mode message has been received over the CAN data bus to indicate that the Sentry Key Remote Entry Module (SKREEM) is prepared for programming additional sentry

key transponders. This chime feature is only active on vehicles equipped with the optional Sentry Key system, and sold in a market where "Customer Learn" programming is an allowed feature.

- **Trans Overtemp Indicator Warning** - The EMIC transducer will generate repetitive chimes at a slow rate when the transmission overtemp indicator is illuminated by the instrument cluster for a high or critical transmission fluid temperature condition. This chime will repeat each time the trans overtemp indicator is cycled from Off to On.
- **Turn Signal/Hazard Warning Flasher Emulation** - The EMIC relay will generate repetitive clicks at a slow rate to emulate an electromechanical flasher when the turn signal or hazard warning system are operating. The EMIC relay will generate repetitive clicks at a fast rate to indicate that the right or left turn signal are operating with one or more bulbs inoperative. In either case, the clicks will continue until the turn signal and hazard warning systems are turned off.
- **Turn Signal On Warning** - The EMIC transducer will generate repetitive chimes at a slow rate to indicate that a turn signal has been active continuously for 1.6 kilometers (1 mile) with the vehicle speed greater than 22 kilometers-per-hour (15 miles-per hour). Vehicles built for markets other than the United States and Canada have a revised distance threshold of 4 kilometers for this feature. The chime will continue until the turn signal input becomes inactive or until the vehicle speed message indicates that the speed is less than 22 kilometers-per-hour (15 miles-per-hour), whichever occurs first. The hazard warning flashers will not activate this chime feature.
- **Warning Indicator Announcement** - The EMIC transducer will generate one short chime each time the check gauges indicator is illuminated by the instrument cluster circuitry. The check gauges indicator may be illuminated when any critical engine or transmission systems are operating outside of their normal parameters. The instrument cluster monitors electronic messages received over the CAN data bus to determine when to illuminate the check gauges indicator.

The EMIC provides chime service for all available features in the chime warning system. The EMIC relies upon its internal programming, numerous hard wired inputs, and electronic message inputs received from other modules over the CAN data bus network to provide the chime warning system features. The internal programming of the EMIC determines the priority of each chime request input that is received, as well as the rate and duration of each chime that is to be generated.

The hard wired chime warning system inputs to the EMIC may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the EMIC, the CAN data bus, or the electronic messages received by the EMIC from other modules. The most reliable, efficient and accurate means to diagnose the EMIC, the CAN data bus, or the electronic message inputs used for the chime warning system requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

## PARK ASSIST SYSTEM

The Park Assist System display activates an audible tone that changes from intermittent to continuous as the final two Light Emitting Diodes (LED's) are illuminated on one side or both sides of the display.

The system detection length from the rear of the vehicle is 0.3 meters to 1.5 meters. This area extends around the rear side of the vehicle. The system detection height from the ground is 0.2 meters to about 1.5 meters. The radio mutes when the system activates its audible tone.

When the driver selects Reverse or Neutral the system scans for objects behind the vehicle using four sensors located in the rear bumper. A warning display above the rear window provides both visible and audible warnings indicating the range of the object.

The system is active only when the transmission gear selector is in reverse or neutral for vehicle speeds less than 16 Km/h (10 mph). If the vehicle's Parking/Emergency Brake is applied, the system is deactivated.

The display contains two sets of yellow and red Light Emitting Diode's (LED's) that the driver can see as they look over their shoulder while backing up. Each side of the vehicle has its own warning LED's. The system provides a visual warning by illuminating one or more yellow LED's as the vehicle gets closer to the object. As the vehicle continues to approach the object, one red LED is illuminated and the system emits a series of short beeps. The tone will remain constant and both red LED's are illuminated once the vehicle is within 12 inches (30.5 cm) of the object.

The system can be turned ON or OFF through the Electronic Vehicle Information Center (EVIC) when the vehicle is in PARK. If the park assist system is turned OFF, a single chime will sound and the EVIC will display the following message "REAR PARK ASSIST OFF", when the vehicle is in reverse.

- Ensure that the rear bumper is free of dirt and debris to keep the system operating properly.
- Jackhammers, large trucks, and other vibrations could affect the performance of the system.
- Ensure that the parking brake is not applied.

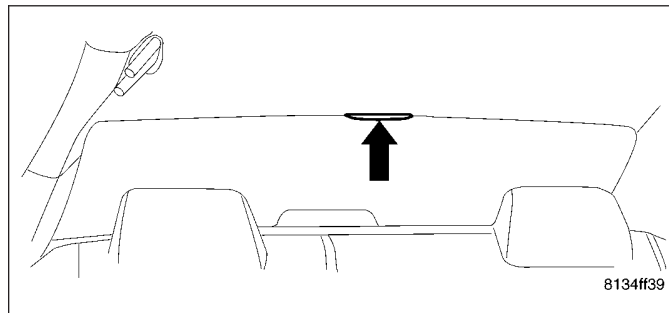
If "Service Park Assist System" appears in the EVIC after making sure the rear bumper is clean, proceed to diagnose the system using a scan tool and the appropriate diagnostic information.

## PARK ASSIST DISPLAY

### DESCRIPTION

The Park Assist Display is located in the rear of vehicle, over the rear window in the headliner. It is a molded plastic unit housing Light Emitting Diodes (LED's) and a chime module. Located in the rear of the vehicle for easy visual reference when the driver is backing up.

The display is used to alert the driver of any obstacles detected in the rear of the vehicle. The chime or audible signal also comes from the display unit.

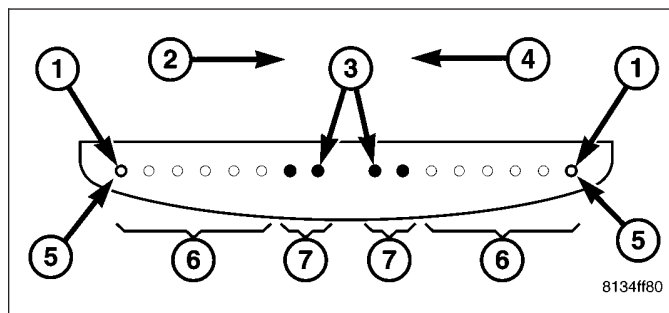


### OPERATION

When the ignition is put in the RUN position, all the Light Emitting Diodes (LED's) will illuminate for approximately one second. This will be interrupted if the system senses an obstacle.

The ready status will be sensed by the outermost two yellow LED's (1) being illuminated. As the obstacle is sensed, the yellow LED's will start illuminating inward (6) until the object is approximately one foot away and then the inner red LED will light (3).

The display is sensitive to which side of the rear of the vehicle that the object is detected. If on the left rear, the left segments will light and the same for the right side of the vehicle.



### CORRELATION OF LED SEGMENTS TO DISTANCE

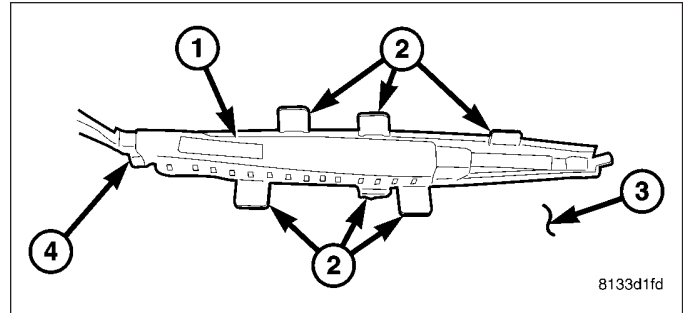
DISPLAY LED	DISTANCE		LED COLOR	AUDIBLE SIGNAL
	REAR CORNERS	REAR CENTER		
1st LED		300 cm (9.8 ft.)	Yellow	None
2nd LED		150 cm (4.9 ft.)	Yellow	None
3rd LED		70 cm (2.2 ft.)	Yellow	None
4th LED	60 cm (1.9 ft.)	60 cm (1.9 ft.)	Yellow	None
5th LED	50 cm (1.6 ft.)	50 cm (1.6 ft.)	Yellow	None
6th LED	40 cm (1.3 ft.)	40 cm (1.3 ft.)	Yellow	None
7th LED	30 cm (12 in.)	30 cm (12 in.)	Red	30 cm (12 in.) Intermittant
8th LED	15 cm (6 in.)	20 cm (8 in.)	Red	20 cm (8 in.) Continuous

There will be an audible tone when the object gets within 30 cm (1 ft.) from the rear of the vehicle.

To diagnose and test the Park Assist System, use a scan tool and the appropriate diagnostic information.

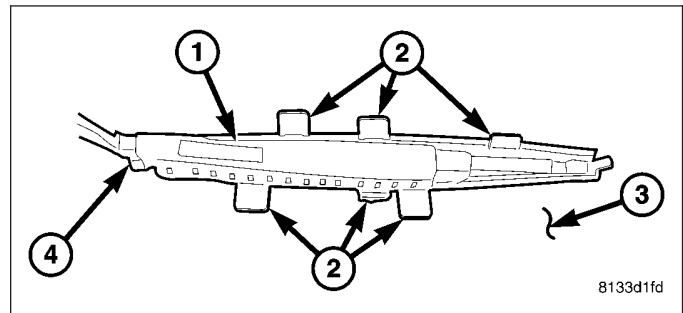
## REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Lower the headliner (3) in the rear of the vehicle in the liftgate opening. Follow the headliner removal procedure for the rear of the headliner (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).
3. Bend the retaining tabs (2) upwards to allow the park assist display (1) to drop out of the headliner (3) opening.
4. Disconnect the display electrical connector (4) and remove display (1) from vehicle.



## INSTALLATION

1. Position the Park Assist Display (1) in headliner (3) opening and connect the display electrical connector (4).
2. Bend the retaining tabs (2) down behind the headliner (3).
3. Raise the headliner in the rear of the vehicle in the liftgate opening (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION).
4. Connect the battery negative cable.



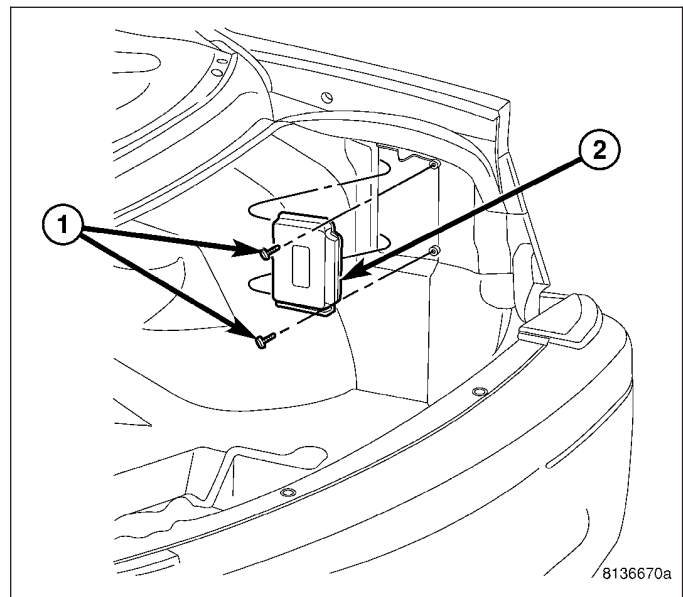
## PARK ASSIST MODULE

### DESCRIPTION

The Park Assist Module (2) is located on the right side of the vehicle, in the trunk compartment, behind the trunk carpet. It has a molded plastic housing which houses internal circuitry and one electrical connector. There are two mounting tabs that affix the module to the right inner quarter trim panel with two screws (1).

The module (2) has a number of functions:

- Supply voltage to the sensors and display.
- Disconnection of the display with bus idle and over voltage Vmax.
- Triggering the sensors.
- Analyze echo delay times and calculate obstacle distances.
- Bi-directional data communication to the display for diagnosis.
- System diagnostics - diagnosis and error handling (sensors, display, module).
- Data exchange over the Controller Area Network (CAN) data bus.





## OPERATION

The system detection length from the rear of the vehicle is 0.3 meters to 1.5 meters. This area extends around the rear side of the vehicle. The system detection height from the ground is 0.2 meters to about 1.5 meters. The radio mutes when the system activates its audible tone.

When the driver selects Reverse or Neutral the system scans for objects behind the vehicle using four sensors located in the rear bumper. Objects can be detected from up to 1.5 meters. A warning display above the rear window provides both visible and audible warnings indicating the range of the object.

The system is active only when the vehicle is in reverse or neutral for vehicle speeds less than 16 Km/h (10 mph). If the vehicle's Parking/Emergency Brake is applied, the system is deactivated.

The display contains two sets of yellow and red Light Emitting Diode's (LED's) that the driver can see as they look over their shoulder while backing up. Each side of the vehicle has its own warning LED's. The system provides a visual warning by illuminating one or more yellow LED's as the vehicle gets closer to the object. As the vehicle continues to approach the object, one red LED is illuminated and the system emits a series of short beeps. The tone will remain constant and both red LED's are illuminated once the vehicle is within 12 inches (30.5 cm) of the object.

The system can be turned ON or OFF through the Electronic Vehicle Information Center (EVIC) when the vehicle is in PARK. If the park assist system is turned OFF, a single chime will sound and the EVIC will display the following message "REAR PARK ASSIST OFF", when the vehicle is in reverse.

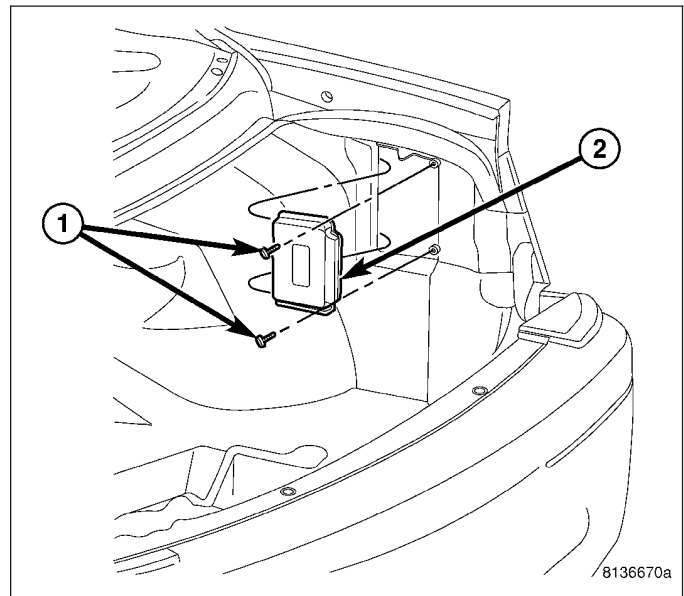
- Ensure that the rear bumper is free of dirt and debris to keep the system operating properly.
- Jackhammers, large trucks, and other vibrations could affect the performance of the system.
- Ensure that the parking brake is not applied.

If "Service Park Assist System" appears in the EVIC after making sure the rear bumper is clean, proceed to diagnose the system using a scan tool and the appropriate diagnostic information.

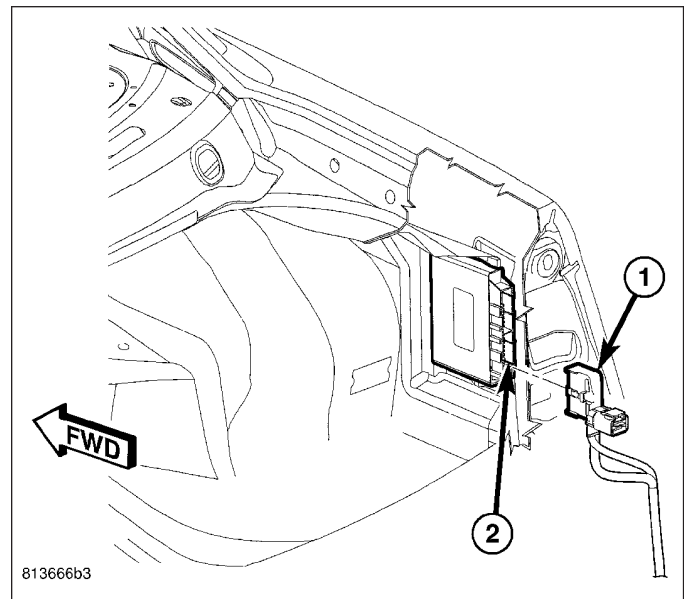
To diagnose the Park Assist Module, use a scan tool and the appropriate body diagnostic information.

## REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Peel back the right inner trunk carpet to expose the Park Assist Module (2).
3. Remove the two attaching screws (1) and separate the module (2) from the vehicle.

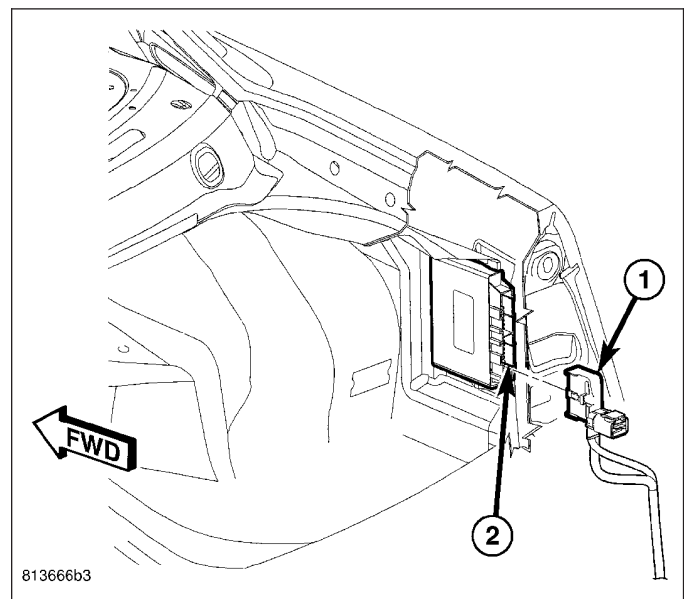


4. Disconnect the Park Assist Module (2) electrical connector (1).

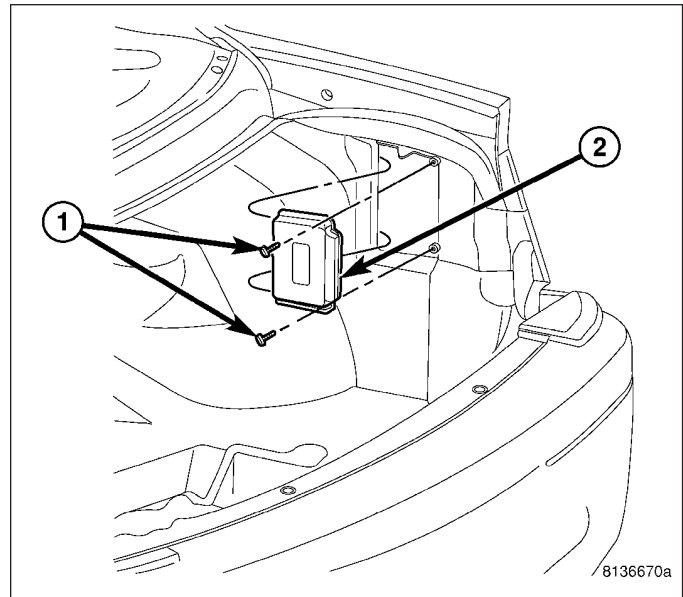


## INSTALLATION

1. Connect the Park Assist Module electrical connector.



2. Position the Park Assist Module (2) and install the two attaching screws (1). Torque screws to 3.5 N·m (30 in. lbs.).
3. Reposition the trunk carpet.
4. Connect the battery negative cable.

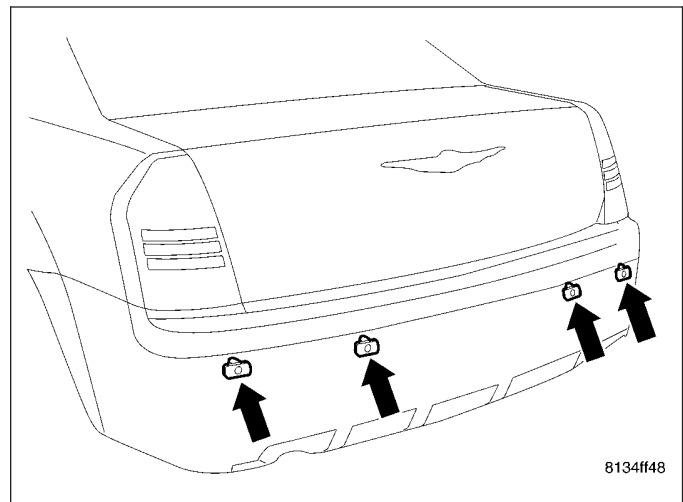


## PARK ASSIST SENSOR

### DESCRIPTION

The Park Assist Sensors are located in the rear bumper fascia mounted equally apart. The sensors generate ultrasonic pulses when triggered by the park assist module when an obstacle is detected. The sensors then signal the module when reflected ultrasonic pulses are received.

The sensors detect objects with an ultrasonic pulse that reflects off the object and then is sent to the module to determine the distance of the object.



### OPERATION

The Park Assist Sensors:

- Generate ultrasonic pulses when triggered by the Park Assist Module.
- Reception/filtering of ultrasonic energy received.
- Signalling the module of received ultrasonic pulses that meet threshold criteria.

The sensors are supplied power by the module. The sensor supply is enabled when the sensor function is necessary.

The sensors detection length from the rear of the vehicle is 0.3 meters to 1.5 meters. This area extends around the rear side of the vehicle. The sensor detection height from the ground is 0.2 meters to about 1.5 meters.

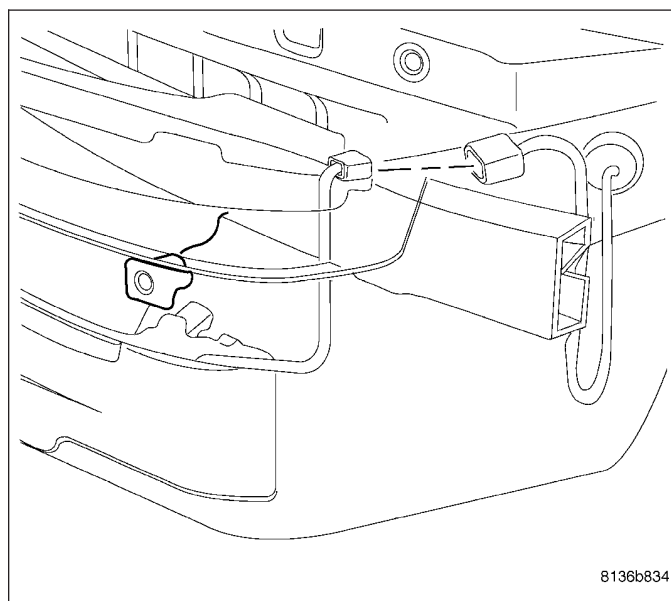
- Ensure that the rear bumper (sensors) is free of dirt and debris to keep the system operating properly.
- Jackhammers, large trucks, and other vibrations could affect the performance of the system.
- Ensure that the parking brake is not applied.

If "Service Park Assist System" appears in the EVIC after making sure the rear bumper is clean, proceed to diagnose the system using a scan tool and the appropriate diagnostic information.



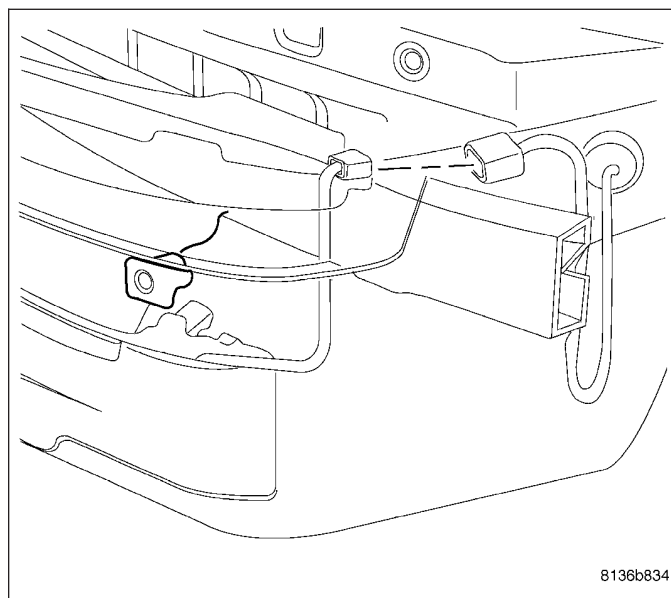
## REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove rear fascia (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR FASCIA - REMOVAL).
3. Unsnap Park Assist Sensor from the retaining housing and remove from fascia.



## INSTALLATION

1. Position the Park Assist Sensor over the retaining housing and firmly snap into housing in rear fascia.
2. Install the rear fascia (Refer to 13 - FRAME & BUMPERS/BUMPERS/REAR FASCIA - INSTALLATION).
3. Connect the battery negative cable.



# CLOCK

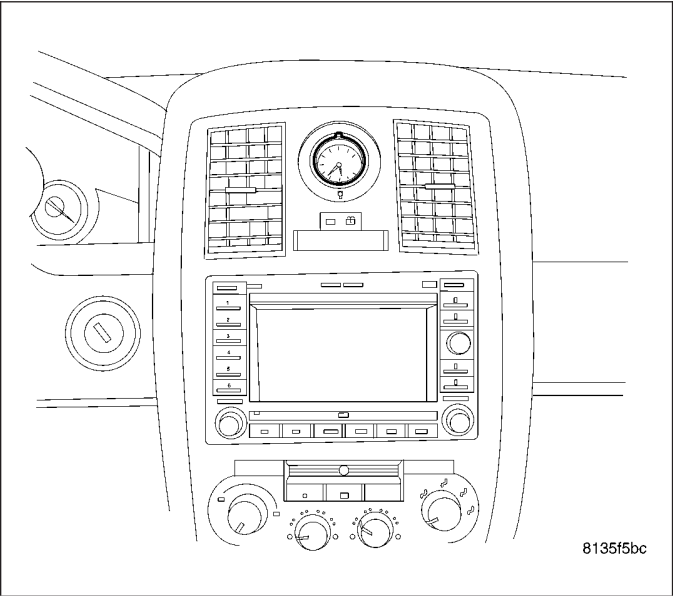
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### CLOCK - SERVICE INFORMATION

#### DESCRIPTION

The analog clock is located in the instrument panel center bezel, between the air distribution outlets. It has one adjustment button for setting and no second hand.



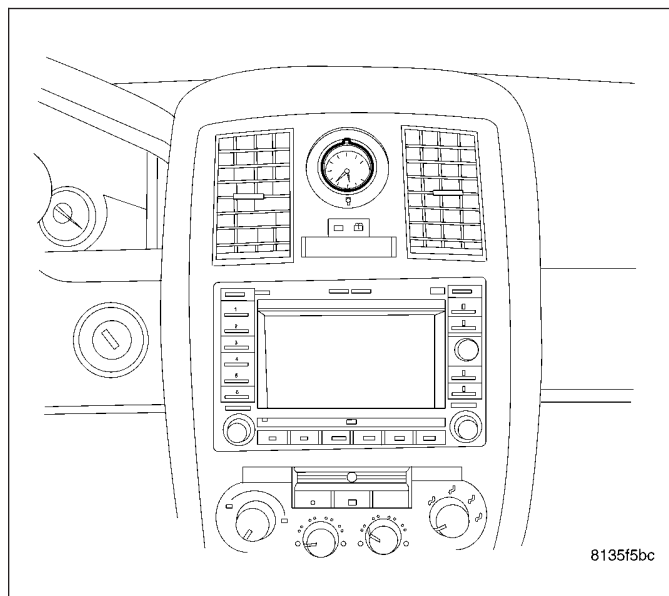
#### OPERATION

The analog clock is fed power through the M1 fuse. when installed, the clock, along with other noncritical options will be functional.

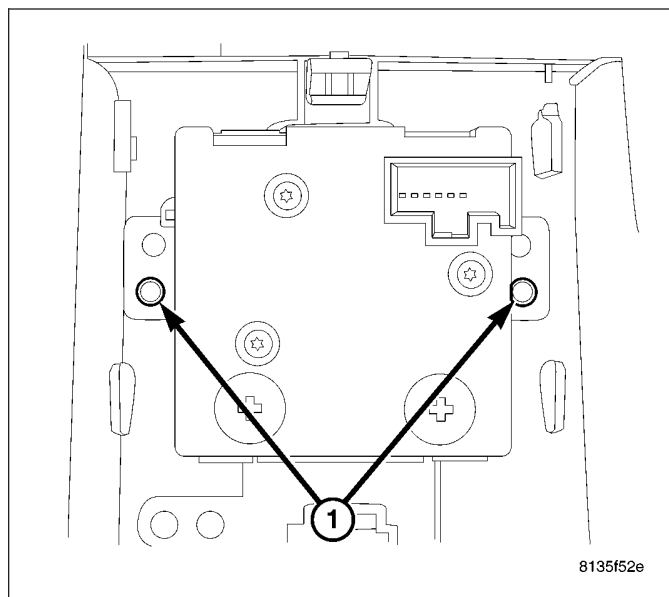
To set the analog clock, press and hold the adjustment button until desired time is reached.

## REMOVAL

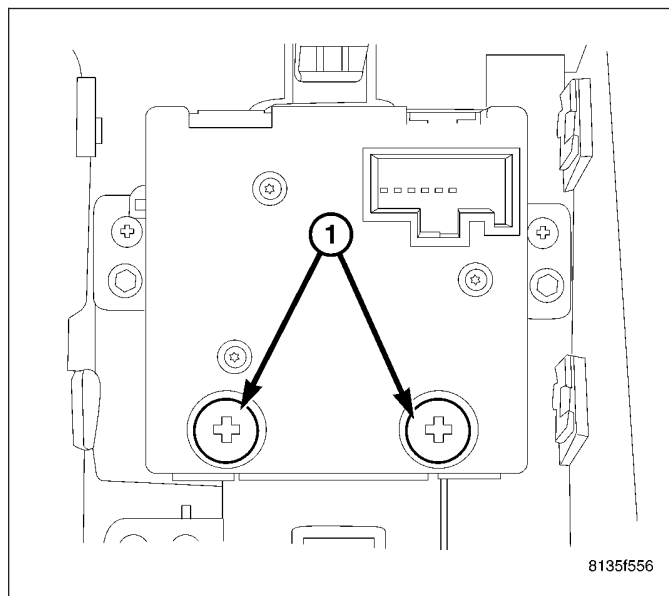
1. Disconnect and isolate the battery negative cable.
2. Remove the Instrument Panel Center Bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).



3. Remove the two retaining screws (1) holding the clock to the rear of the I/P Center Bezel.

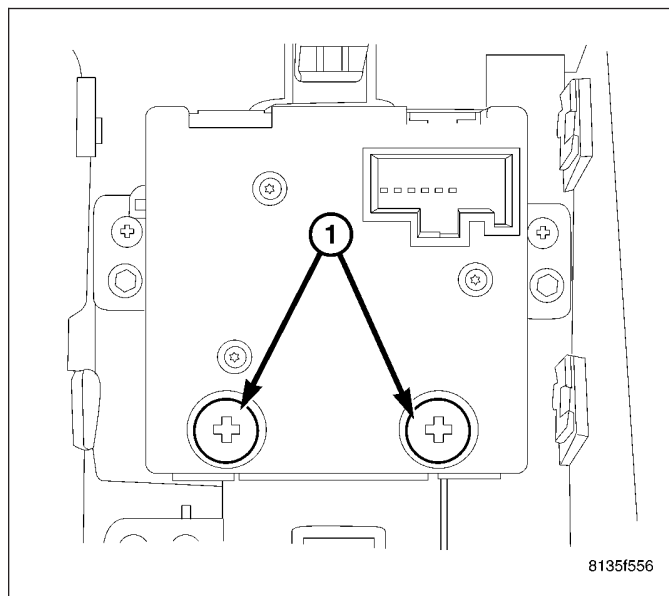


4. To replace the clock illumination lamps (1), turn sockets (1) counterclockwise to remove lamp and socket (1).

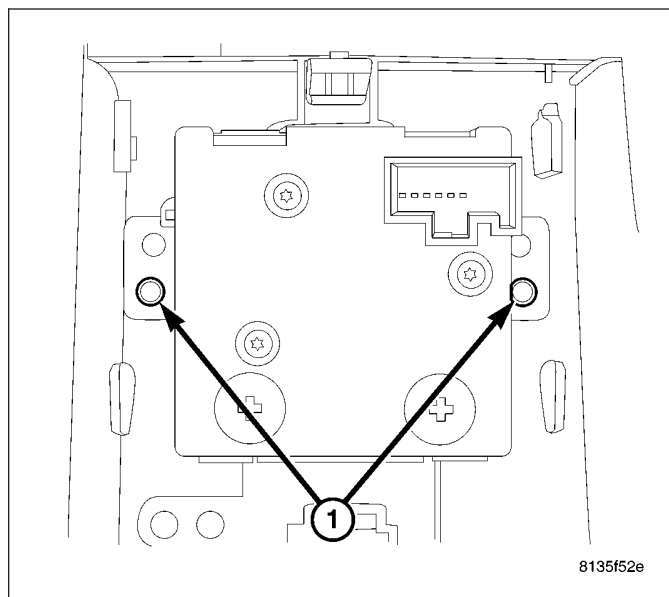


## INSTALLATION

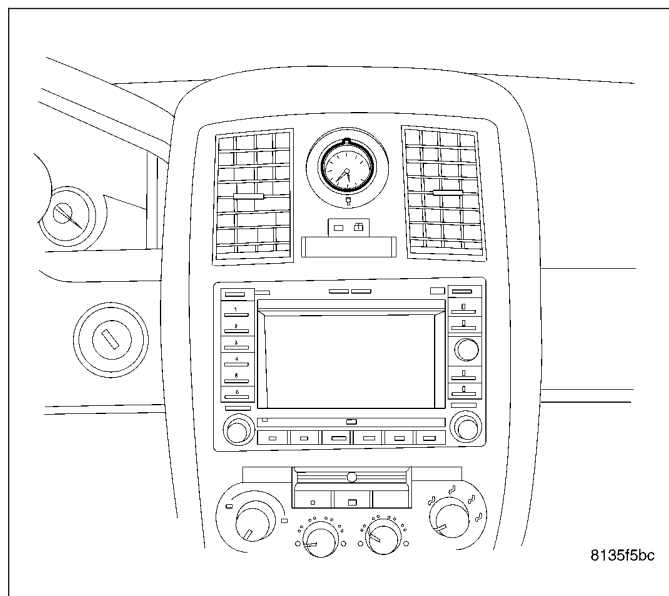
1. Place lamp and sockets (1) into opening and turn clockwise till detent is felt.



2. Place the clock into bezel opening and then install the two retaining screws (1).



3. Install the Instrument Panel Center Bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).
4. Connect the battery negative cable.
5. Adjust clock to proper time.





# ELECTRONIC CONTROL MODULES

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## ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS

### DIAGNOSIS AND TESTING

## B210D-BATTERY VOLTAGE LOW

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
Battery voltage less than 9 volts for approximately 5 to 6 seconds.

Possible Causes
RESISTANCE IN THE BATTERY POSITIVE CIRCUIT RESISTANCE IN THE GENERATOR CASE GROUND GENERATOR OPERATION (K20) GENERATOR FIELD CONTROL CIRCUIT OPEN (K20) GENERATOR FIELD CONTROL CIRCUIT SHORTED TO GROUND GROUND CIRCUIT OPEN PCM

## Diagnostic Test

### 1. CHECK FOR ANY POWERTRAIN CONTROL MODULES DTCS

**Note:** Make sure the Battery is in good condition. Using the Midtronics Battery Tester, test the Battery before continuing.

**Note:** Inspect the vehicle for after market accessories that may exceed the Generator System output.

**Note:** Make sure the generator drive belt is in good operating condition.

**Note:** Inspect the fuses in the IPM. If an open fuse is found, use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.

Turn the ignition on.

With the scan tool, read active PCM DTC's.

**Does the scan tool display any active PCM DTC's?**

**Yes** >> (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**No** >> Check the above conditions that can cause a low voltage condition. Repair as necessary.  
Perform BODY VERIFICATION TEST – VER 1.

---



**B210E-BATTERY VOLTAGE HIGH**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
Battery voltage greater than 16 volts for approximately 5 to 6 seconds.

Possible Causes
(K20) GENERATOR FIELD CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE GENERATOR PCM

**Diagnostic Test****1. CHECK FOR ANY POWERTRAIN CONTROL MODULES DTCS**

**Note:** Make sure the Battery is in good condition. Using the Midtronics Battery Tester, test the Battery before continuing.

**Note:** Inspect the vehicle for after market accessories that may exceed the Generator System output.

**Note:** Make sure the generator drive belt is in good operating condition.

**Note:** Inspect the fuses in the IPM. If an open fuse is found, use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.

Turn the ignition on.

With the scan tool, read active PCM DTC's.

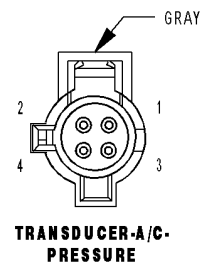
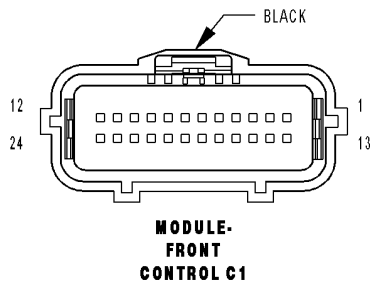
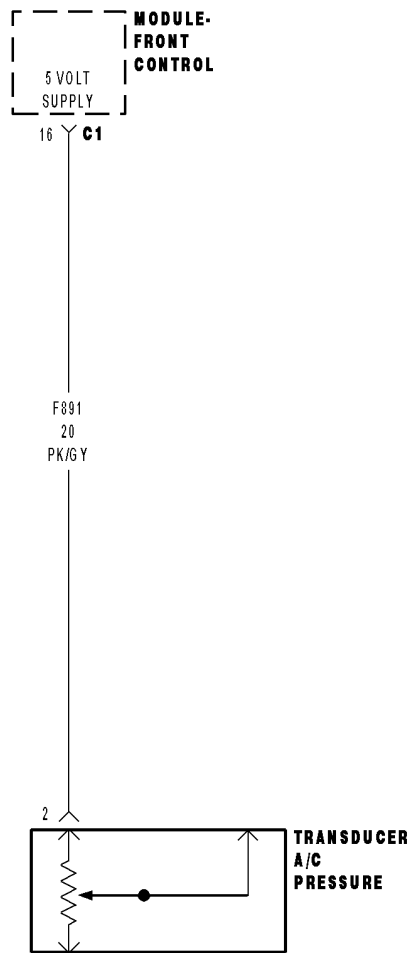
**Does the scan tool display any active PCM DTC's?**

**Yes** >> (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**No** >> Check the above conditions that can cause a high voltage condition. Repair as necessary.  
Perform BODY VERIFICATION TEST – VER 1.

---

## B2112-5 VOLT SUPPLY CIRCUIT LOW



**B2112-5 VOLT SUPPLY CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Front Control Module detects the (F891) 5 volt supply circuit voltage below 4 volts.

Possible Causes
(F891) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND A/C PRESSURE TRANSDUCER FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**2. A/C PRESSURE TRANSDUCER**

Turn the ignition off.

Disconnect the A/C Pressure Transducer harness connector.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 3

**No** >> Replace the A/C Pressure Transducer in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

**B2112-5 VOLT SUPPLY CIRCUIT LOW (CONTINUED)****3. (F891) 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the FCM C1 harness connector.

Measure the resistance between ground and the (F891) 5 Volt Supply circuit.

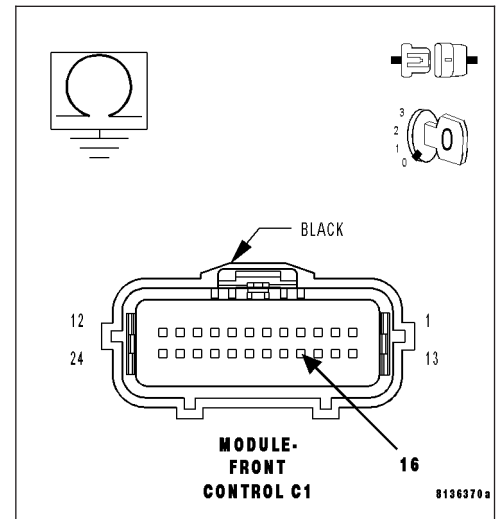
**Is the resistance below 1000.0 ohms?**

**Yes** >> Repair the (F891) 5 Volt Supply circuit for a short to ground.

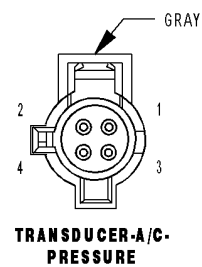
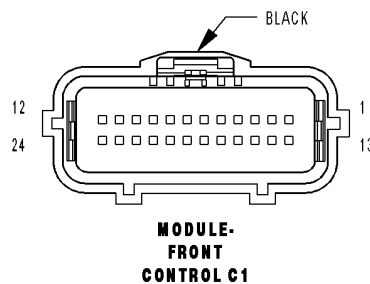
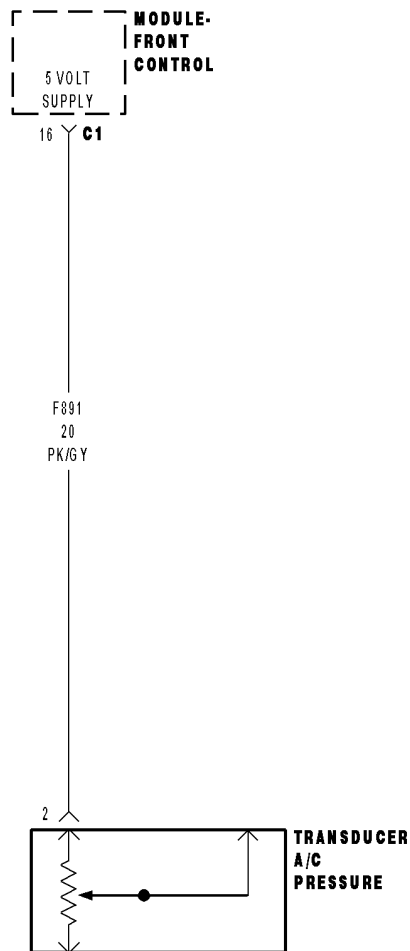
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



## B2113-5 VOLT SUPPLY CIRCUIT HIGH



**B2113-5 VOLT SUPPLY CIRCUIT HIGH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Front Control Module detects the (F891) 5 volt supply circuit voltage above 5.0 volts.

Possible Causes
(F891) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE A/C PRESSURE TRANSDUCER FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**2. A/C PRESSURE TRANSDUCER**

Turn the ignition off.

Disconnect the A/C Pressure Transducer harness connector.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 3

**No** >> Replace the A/C Pressure Transducer in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

**B2113-5 VOLT SUPPLY CIRCUIT HIGH (CONTINUED)****3. (F891) 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE**

Turn the ignition off.

Disconnect the FCM C1 harness connector.

Turn the ignition on.

Measure the voltage of the (F891) 5 Volt Supply circuit.

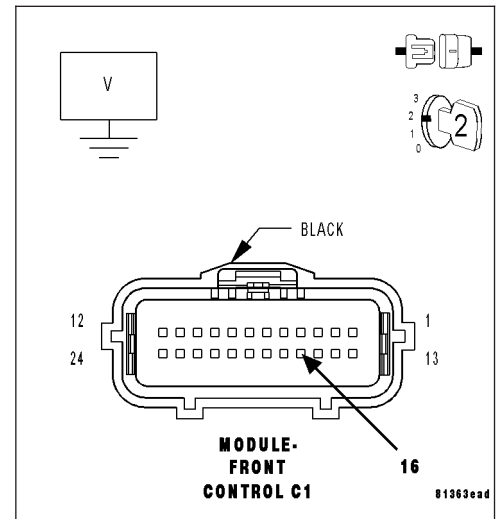
**Is the voltage above 5.5 volts?**

**Yes** >> Repair the (F891) 5 Volt Supply circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**B2206-CURRENT VIN MISSING/MISMATCH**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Front Control Module will receive and monitor the VIN message from the PCM and record the VIN if different from the last VIN.

Possible Causes
INCORRECT VIN PROGRAMMED IN PCM
FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**2. CHECK VIN IN PCM**

With the scan tool compare the VIN that is programmed into the PCM to the VIN on the vehicle.

**Does the VIN programmed into the PCM match the vehicles VIN?**

**Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Program the correct VIN in the PCM and retest.

---



**B2215-FRONT CONTROL MODULE INTERNAL**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously.
- **Set Condition:**  
The Front Control Module detects an internal fault.

Possible Causes
FRONT CONTROL MODULE

**Diagnostic Test**

**1. REPLACE THE FRONT CONTROL MODULE IF DTC IS ACTIVE**

With the scan tool, read the active FCM DTC's.

- Does the scan tool display this DTC as active?**
- Yes**    >> Replace and program the Front Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.
- No**    >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
-

**B222C-VEHICLE CONFIGURATION NOT PROGRAMMED**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Front Control Module is not configured correctly to the vehicle.

Possible Causes
FRONT CONTROL MODULE NOT CONFIGURED CORRECTLY
FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**2. CONFIGURE THE FCM TO THE VEHICLE**

With the scan tool enter program network configuration and program the FCM to the vehicle configuration.

With the scan tool, erase FCM DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

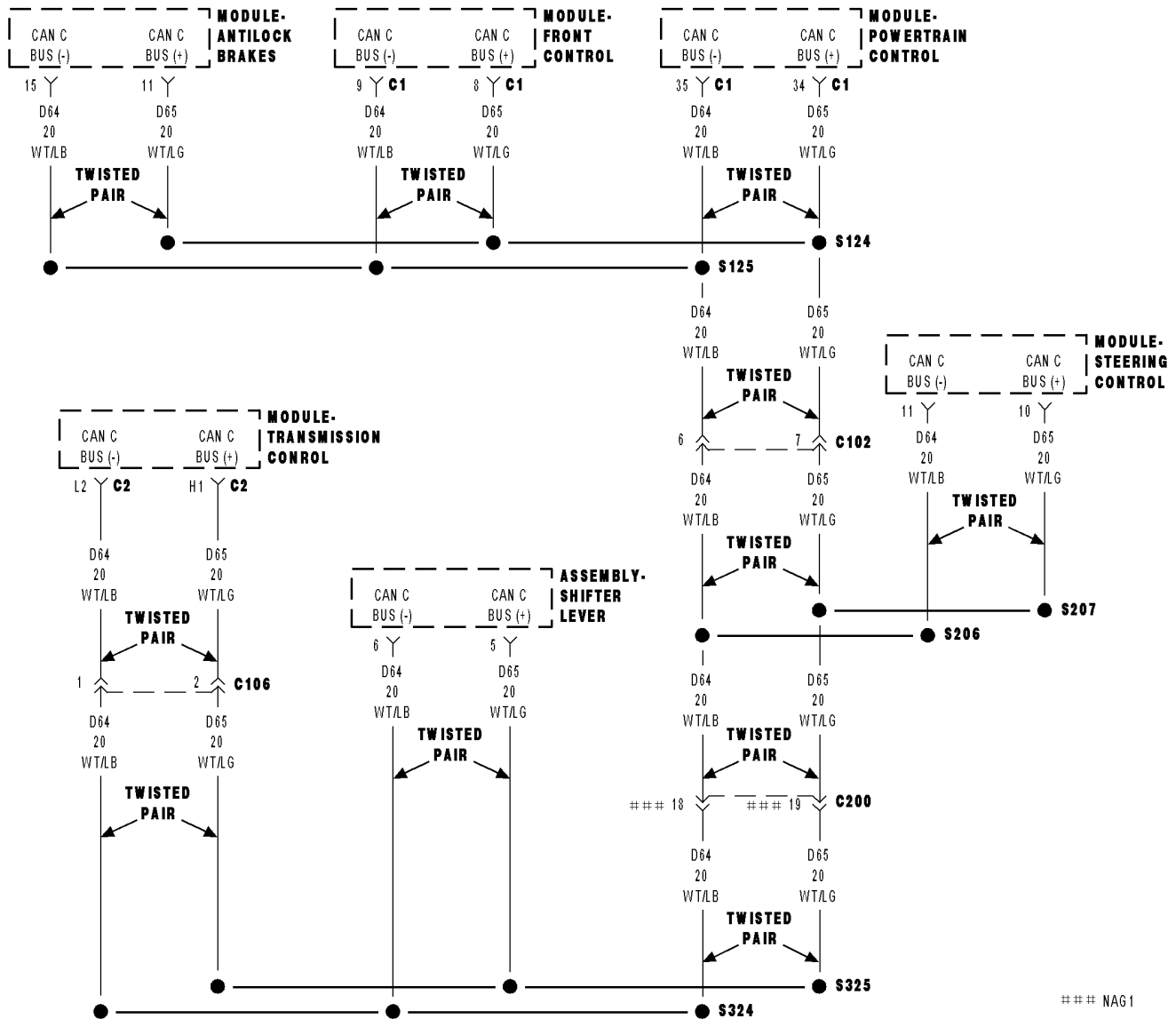
**Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

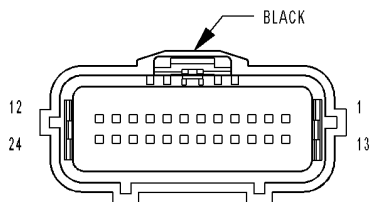
**No** >> Repair is complete.

---

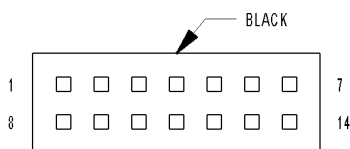
# U0001-CAN C BUS



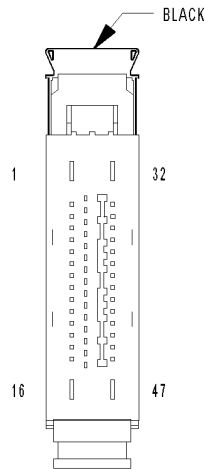
### NAG1



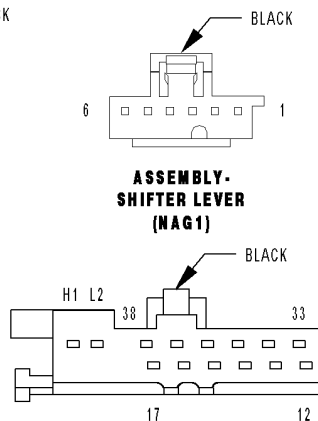
**MODULE-FRONT CONTROL C1**



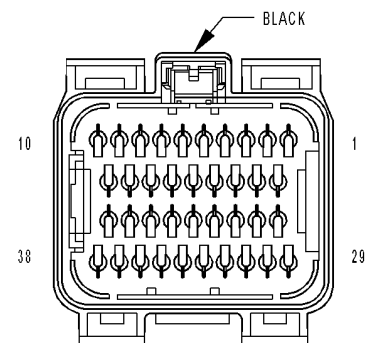
**MODULE-STEERING CONTROL**



**MODULE-ANTILOCK BRAKES**



**ASSEMBLY-SHIFTER LEVER (NAG1)**



**MODULE-POWERTRAIN CONTROL C1**

**U0001-CAN C BUS (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The FCM detects a short in either CAN C Bus circuit.

Possible Causes
(D65) CAN C BUS (+) CIRCUIT SHORTED TO GROUND (D64) CAN C BUS (-) CIRCUIT SHORTED TO GROUND (D65) CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE (D64) CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE (D65) CAN C BUS (+) CIRCUIT SHORTED TO (D64) CAN C BUS (-) CIRCUIT ANTILOCK BRAKE MODULE POWERTRAIN CONTROL MODULE SHIFTER LEVER ASSEMBLY (NAG1 ONLY) TRANSMISSION CONTROL MODULE (NAG1 ONLY) STEERING CONTROL MODULE FRONT CONTROL MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U0001–CAN C BUS as active?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

**U0001-CAN C BUS (CONTINUED)****2. ANTILOCK BRAKE MODULE — INTERNAL SHORT**

Turn the ignition off.

Disconnect the Antilock Brake Module harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U0001–CAN C BUS as active?**

**Yes** >> Go To 3

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Antilock Brake Module in accordance with the service information.  
Perform ABS VERIFICATION TEST — VER 1.

---

**3. POWERTRAIN CONTROL MODULE — INTERNAL SHORT**

Turn the ignition off.

Disconnect the Powertrain Control Module C1 harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U0001–CAN C BUS as active?**

**Yes** >> Go To 4

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Powertrain Control Module in accordance with the service information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

---

**4. SHIFTER LEVER ASSEMBLY (NAG1 ONLY)— INTERNAL SHORT**

Turn the ignition off.

**Note: If the vehicle is not equipped with a NAG1 controller then skip this step.**

Disconnect the Shifter Lever Assembly harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U0001–CAN C BUS as active?**

**Yes** >> Go To 5

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Shifter Lever Assembly in accordance with the service information.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---

**U0001-CAN C BUS (CONTINUED)****5. TRANSMISSION CONTROL MODULE (NAG1 ONLY)— INTERNAL SHORT**

Turn the ignition off.

**Note: If the vehicle is not equipped with a NAG1 controller then skip this step.**

Disconnect the Transmission Control Module C2 harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U0001—CAN C BUS as active?**

**Yes** >> Go To 6

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Transmission Control Module in accordance with the service information.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---

**6. STEERING CONTROL MODULE — INTERNAL SHORT**

Turn the ignition off.

Disconnect the Steering Control Module harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U0001—CAN C BUS as active?**

**Yes** >> Go To 7

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Steering Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.

---

**U0001-CAN C BUS (CONTINUED)****7. (D65) CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE**

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

Turn the ignition on.

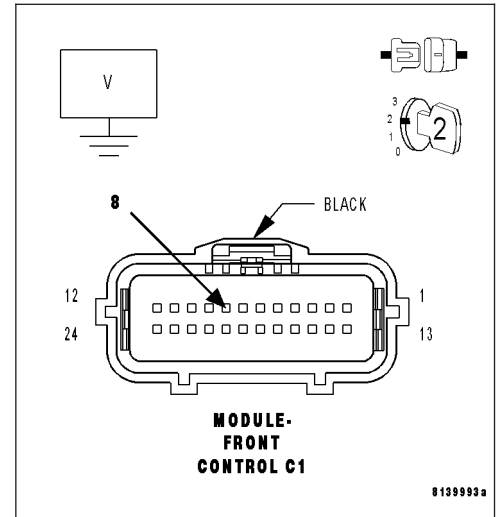
Measure the voltage between the (D65) CAN C Bus (+) circuit and ground.

**Is there any voltage present?**

**Yes** >> Repair the (D65) CAN C Bus (+) circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1.

**No** >> Go To 8

**8. (D64) CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE**

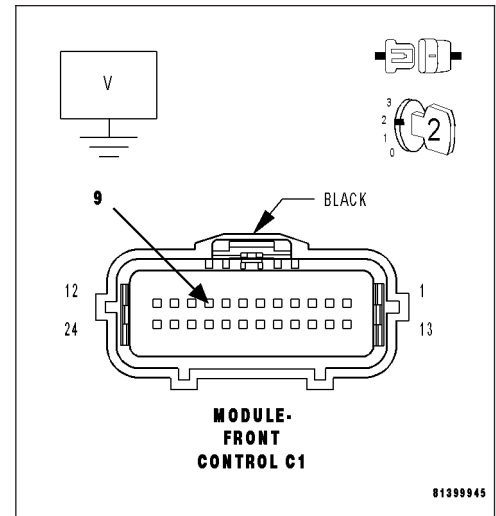
Measure the voltage between the (D64) CAN C Bus (-) circuit and ground.

**Is there any voltage present?**

**Yes** >> Repair the (D64) CAN C Bus (-) circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1.

**No** >> Go To 9



**U0001-CAN C BUS (CONTINUED)****9. (D65) CAN C BUS (+) CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

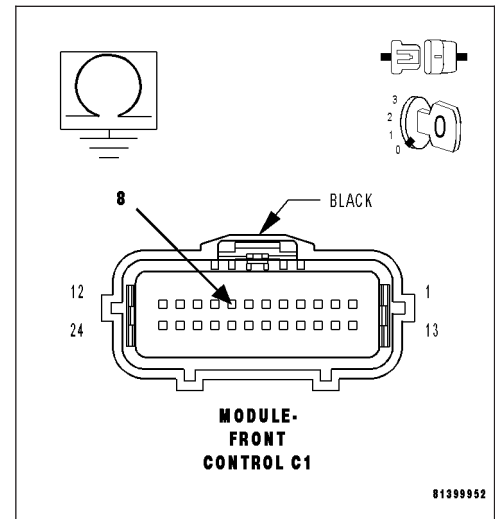
Measure the resistance between ground and the (D65) CAN C Bus (+) circuit.

**Is any resistance present?**

**Yes** >> Repair the (D65) CAN C Bus (+) circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.

**No** >> Go To 10

**10. (D64) CAN C BUS (-) CIRCUIT SHORTED TO GROUND**

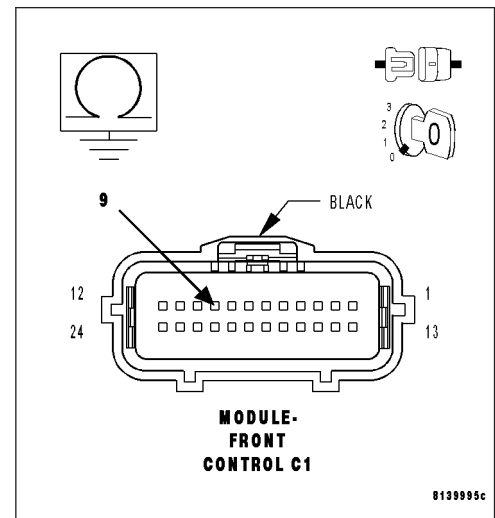
Measure the resistance between ground and the (D64) CAN C Bus (-) circuit.

**Is any resistance present?**

**Yes** >> Repair the (D64) CAN C Bus (-) circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.

**No** >> Go To 11



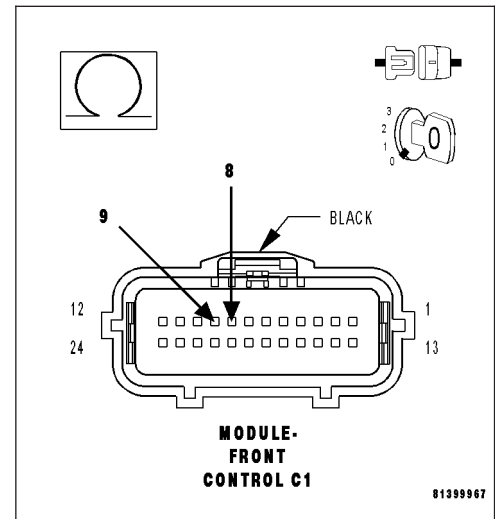


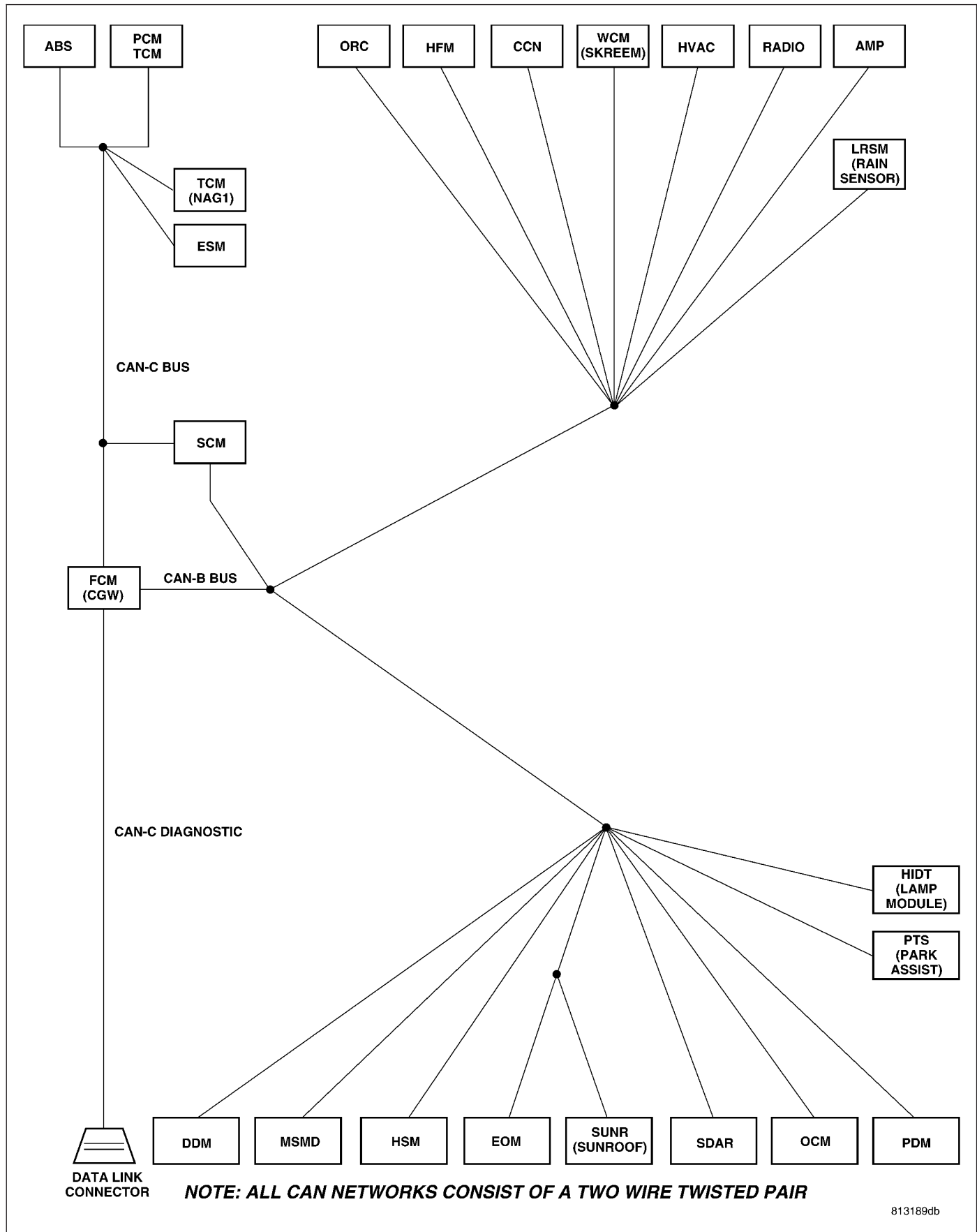
**U0001-CAN C BUS (CONTINUED)****11. (D65) CAN C BUS (+) CIRCUIT SHORTED TO (D64) CAN C BUS (-) CIRCUIT**

Measure the resistance between the (D65) CAN C Bus (+) circuit and the (D64) CAN C Bus (-) circuit.

**Is any resistance present?**

- Yes** >> Repair the (D65) CAN C Bus (+) circuit for a short to the (D64) CAN C Bus (-) circuit.  
Perform BODY VERIFICATION TEST - VER 1.
- No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.



**U0019-CAN B BUS**

**U0019-CAN B BUS (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The FCM detects an open, a short high, a short low or a short together in either of the CAN B Bus circuits.

Possible Causes
(D55) CAN B BUS (+) CIRCUIT SHORTED TO GROUND
(D54) CAN B BUS (-) CIRCUIT SHORTED TO GROUND
(D55) CAN B BUS (+) CIRCUIT SHORTED TO VOLTAGE
(D54) CAN B BUS (-) CIRCUIT SHORTED TO VOLTAGE
(D55) CAN B BUS (+) CIRCUIT SHORTED TO (D54) CAN B BUS (-) CIRCUIT
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
ANY CAN B BUS MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

**2. ANY CAN B BUS MODULE— INTERNAL FAULT**

Turn the ignition off.

With the scan tool, monitor the active FCM DTCs.

While monitoring the scan tool, disconnect each CAN B Bus module one at a time.

**Note: When performing the above step, turn the ignition off (wait one minute) before disconnecting any module. When the module is disconnected turn the ignition on.**

**Note: This is to determine if the fault is internal within a module.**

Check for this DTC to become active after disconnecting each CAN B Bus module the vehicle is equipped with.

**Note: If the DTC becomes stored when a particular CAN B Bus module is disconnected, that module is causing the DTC to set.**

**With all the CAN B Bus modules disconnected did the FCM still set this DTC as active?**

**Yes** >> Go To 3

**No** >> Replace the module that when disconnected the DTC became stored.  
Perform BODY VERIFICATION TEST - VER 1.

---

**U0019-CAN B BUS (CONTINUED)****3. (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

**Note: Ensure each CAN B Bus module is disconnected at this time.**

Turn the ignition on.

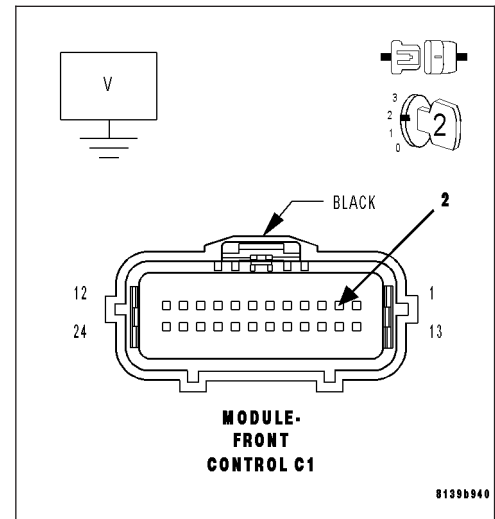
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (D55) CAN B Bus (+) circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1.

**No** >> Go To 4

**4. (D54) CAN B BUS (-) CIRCUIT FOR A SHORT TO VOLTAGE**

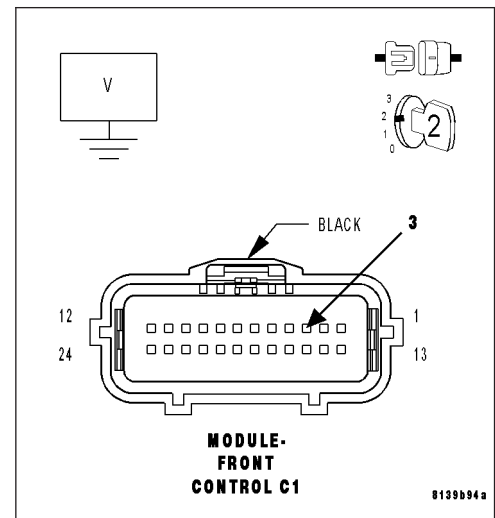
**Note: Ensure each CAN B Bus module is disconnected at this time.**

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (D54) CAN B Bus (-) circuit for a short to voltage.

**No** >> Go To 5



**U0019-CAN B BUS (CONTINUED)****5. (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

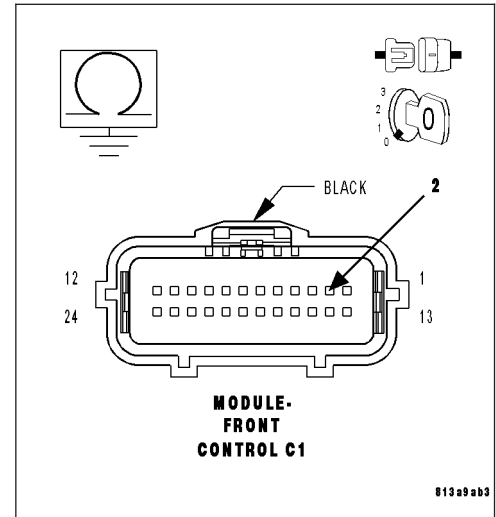
**Note:** Ensure each CAN B Bus module is disconnected at this time.

Measure the resistance between ground and the (D55) CAN B Bus (+) circuit.

**Is the resistance above 1000.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the (D55) CAN B Bus (+) circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.

**6. (D54) CAN B BUS (-) CIRCUIT FOR A SHORT TO GROUND**

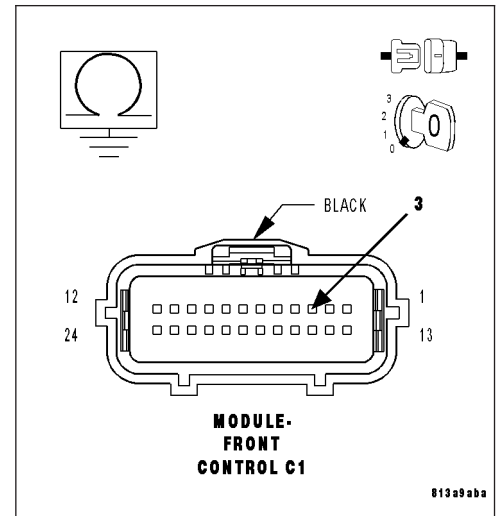
**Note:** Ensure each CAN B Bus module is disconnected at this time.

Measure the resistance between ground and the (D54) CAN B Bus (-) circuit.

**Is the resistance above 1000.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the (D54) CAN B Bus (-) circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.



**U0019-CAN B BUS (CONTINUED)****7. (D55) CAN B BUS (+) CIRCUIT SHORTED TO THE (D54) CAN B BUS (-) CIRCUIT**

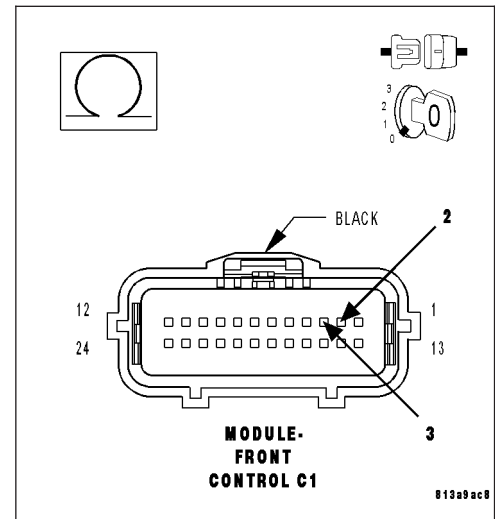
Measure the resistance between the (D55) CAN B Bus (+) circuit and (D54) CAN B Bus (-) circuit.

**Note:** Ensure each CAN B Bus module is disconnected at this time.

**Is any resistance present?**

**Yes** >> Repair the (D55) CAN B Bus (+) circuit for a short to the (D54) CAN B Bus (-) circuit.  
Perform BODY VERIFICATION TEST - VER 1

**No** >> Go To 8

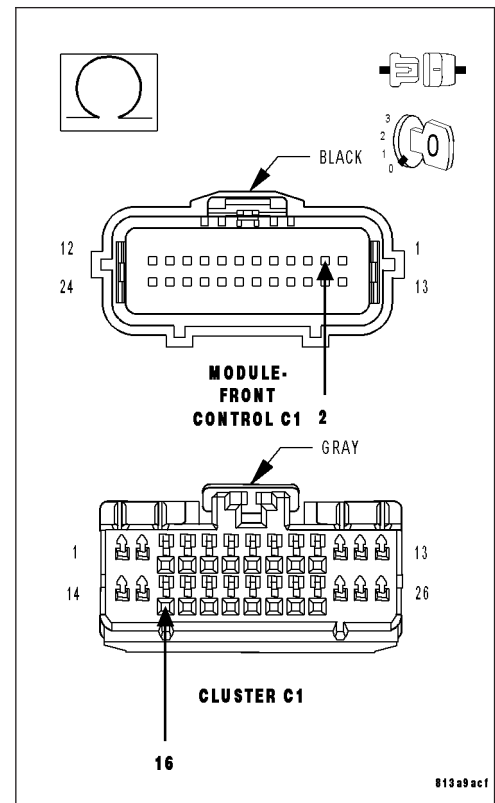
**8. (D55) CAN B BUS (+) CIRCUIT OPEN**

Measure the resistance of the (D55) CAN B Bus (+) circuit between the FCM connector and the Cluster connector.

**Is the resistance above 10.0 ohms?**

**Yes** >> Repair the (D55) CAN B Bus (+) circuit for an open or high resistance.  
Perform BODY VERIFICATION TEST - VER 1

**No** >> Go To 9



## U0019-CAN B BUS (CONTINUED)

## 9. (D54) CAN B BUS (-) CIRCUIT OPEN

Measure the resistance of the (D54) CAN B Bus (-) circuit between the FCM connector and the Cluster connector.

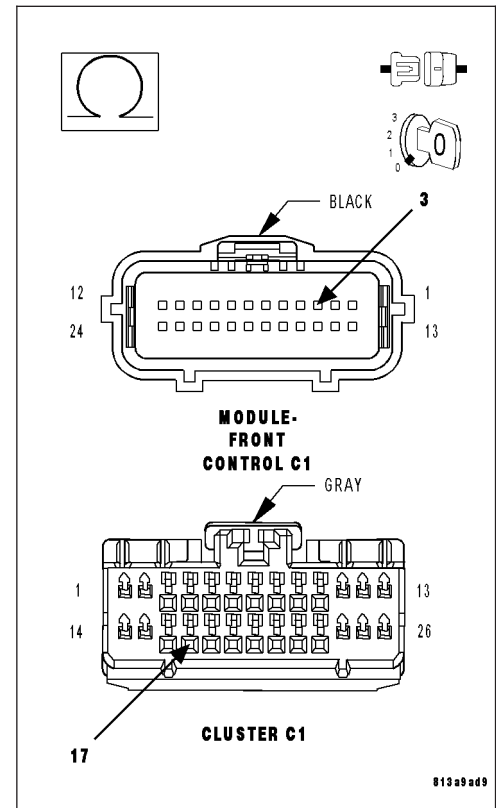
**Is the resistance above 10.0 ohms?**

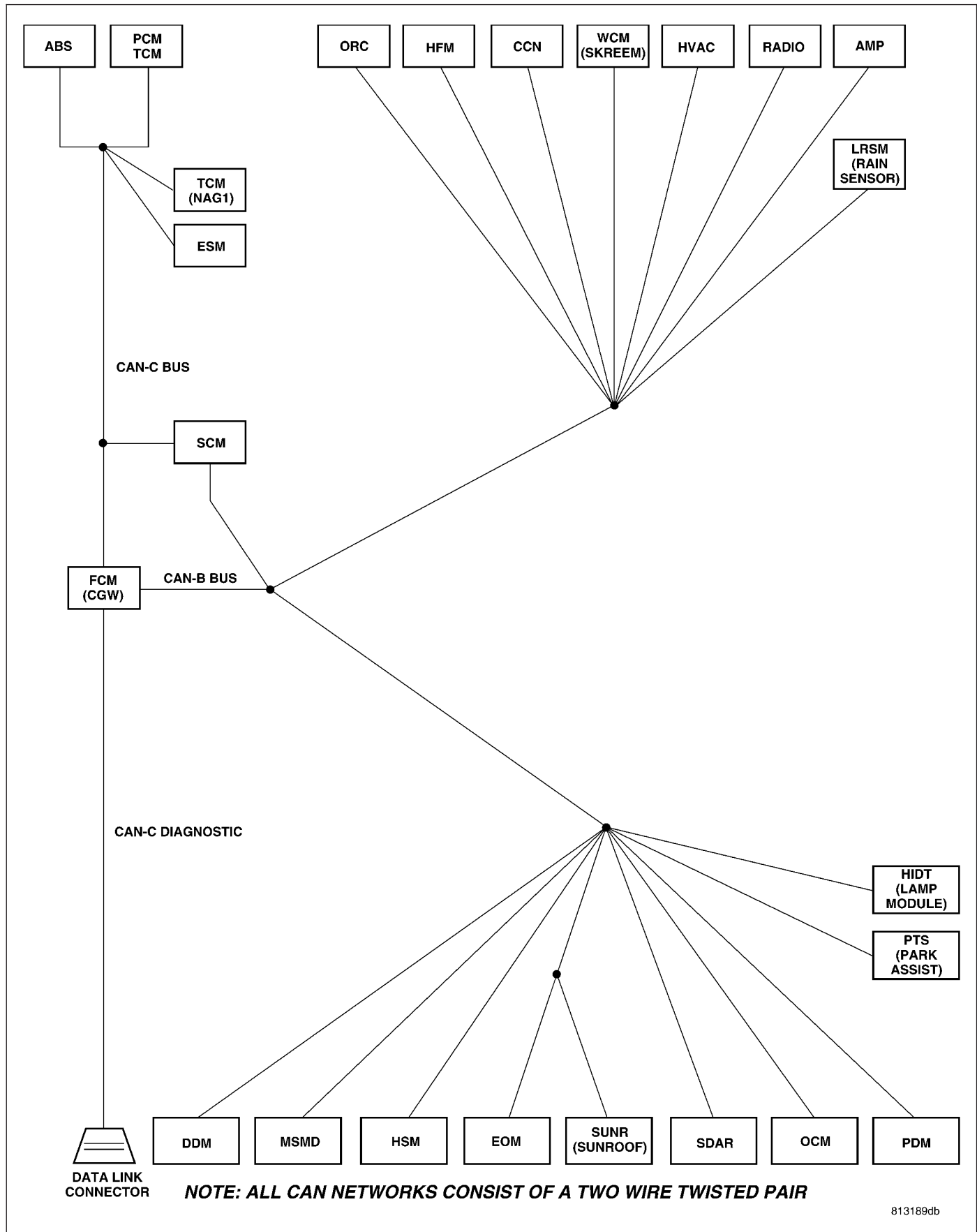
**Yes** >> Repair the (D54) CAN B Bus (-) circuit for an open or high resistance.

Perform BODY VERIFICATION TEST - VER 1

**No** >> Replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1



**U0100-LOST COMMUNICATION WITH ECM/PCM**



**U0100-LOST COMMUNICATION WITH ECM/PCM (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the ECM/PCM for approximately 500ms.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY ECM/PCM ECM/PCM POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read all active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0100-LOST COMMUNICATION WITH ECM/PCM (CONTINUED)****3. VERIFY THAT THE ECM/PCM IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the ECM/PCM is active on the bus.

**Is the ECM/PCM active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

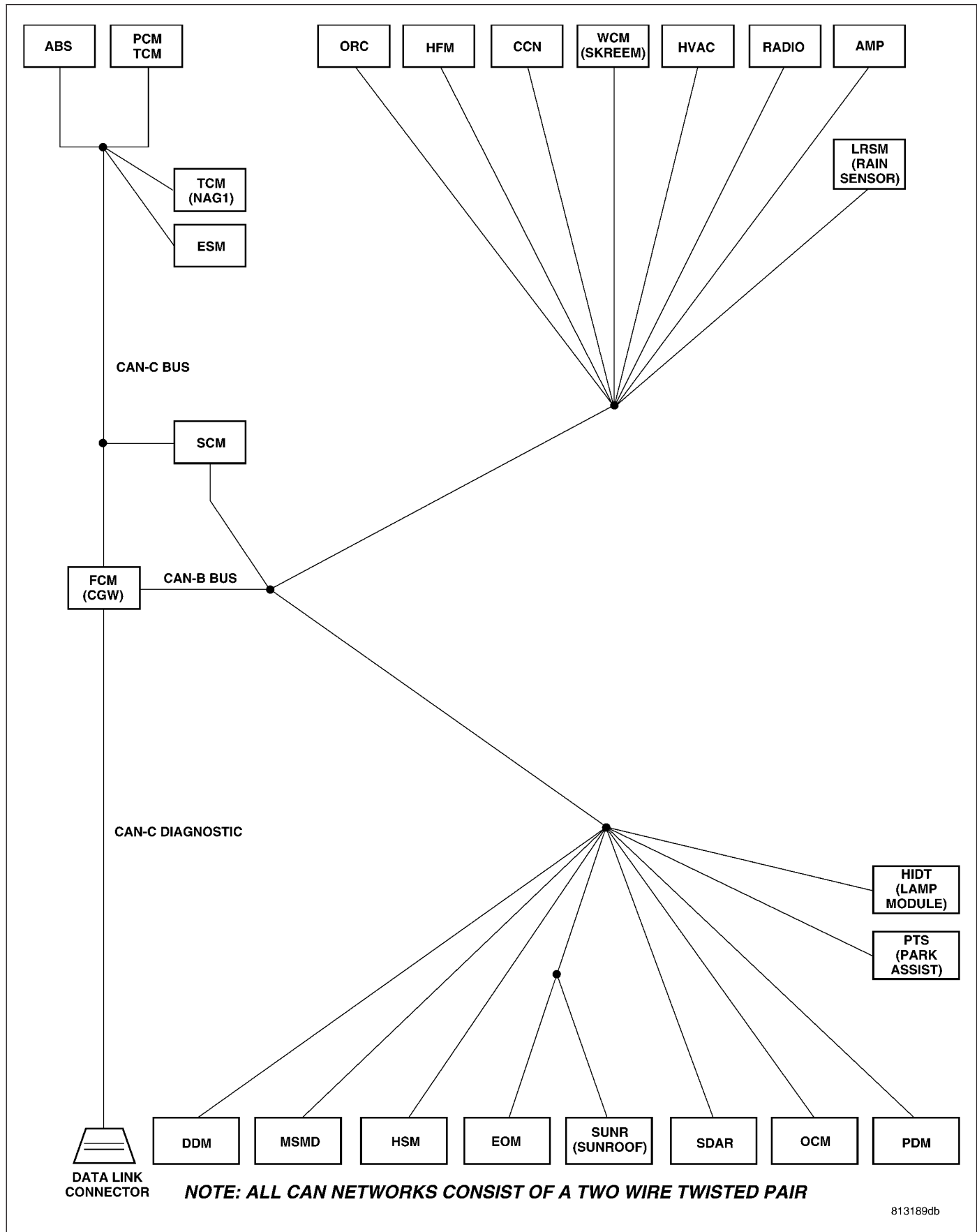
**Is there more than one module with active DTCs “Logged Against” the ECM/PCM?**

**Yes** >> Replace/update the ECM/PCM in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---

## U0101-LOST COMMUNICATION WITH TCM



**U0101-LOST COMMUNICATION WITH TCM (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the TCM for approximately 500ms.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY TCM TCM POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read all active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0101-LOST COMMUNICATION WITH TCM (CONTINUED)****3. VERIFY THAT THE TCM IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the TCM is active on the bus.

**Is the TCM active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

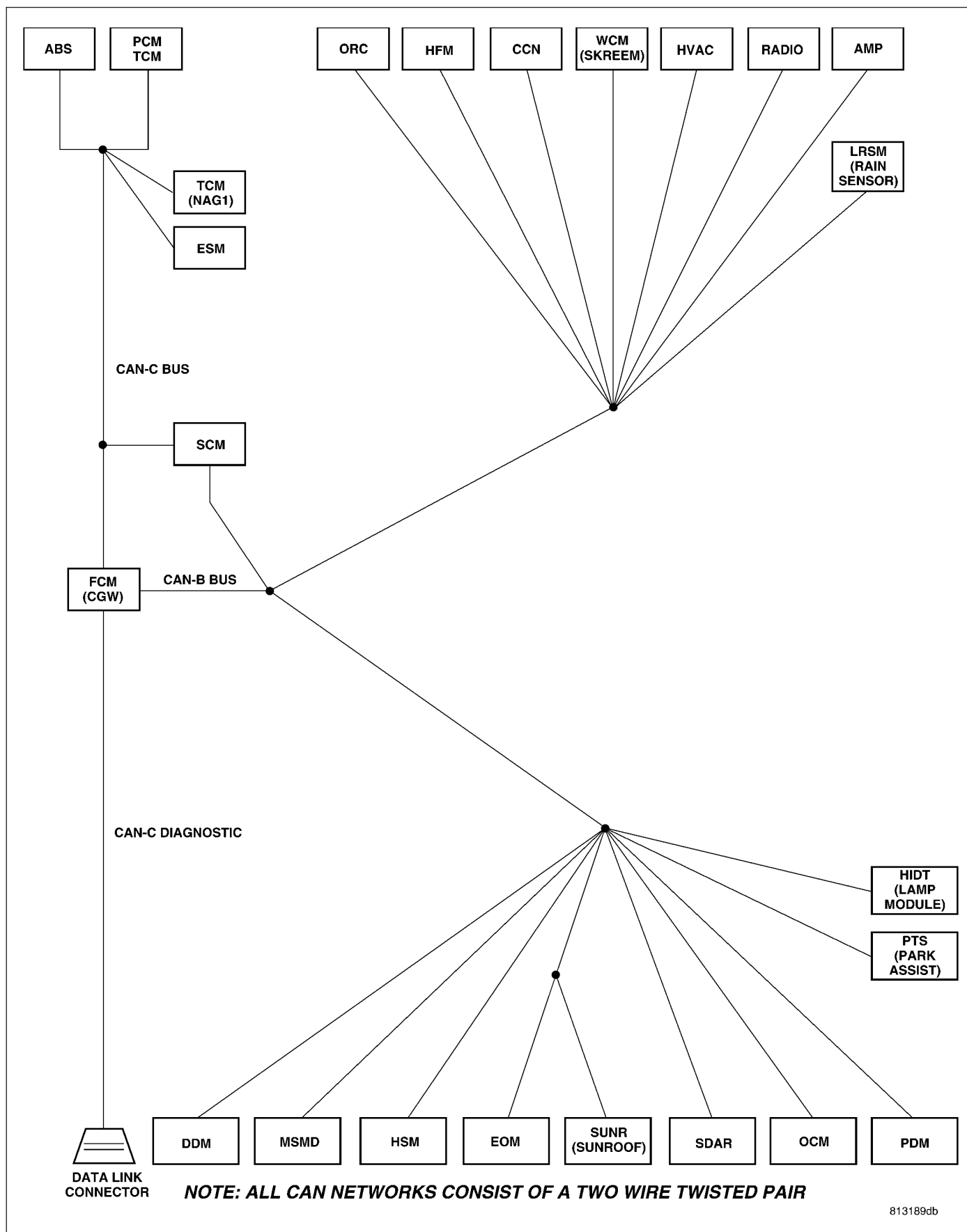
**Is there more than one module with active DTCs “Logged Against” the TCM?**

**Yes** >> Replace/update the TCM in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---

## U0103-LOST COMMUNICATION WITH ELECTRIC GEAR SHIFT MODULE



**U0103-LOST COMMUNICATION WITH ELECTRIC GEAR SHIFT MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Electric Gear Shift Module (shifter lever assembly) for approximately 500ms.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY SHIFTER LEVER ASSEMBLY SHIFTER LEVER ASSEMBLY POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding. With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section. Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read all active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms. Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0103-LOST COMMUNICATION WITH ELECTRIC GEAR SHIFT MODULE (CONTINUED)****3. VERIFY THAT THE SHIFTER LEVER ASSEMBLY IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the Shifter Lever Assembly is active on the bus.

**Is the Shifter Lever Assembly active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

**Is there more than one module with active DTCs “Logged Against” the Shifter Lever Assembly?**

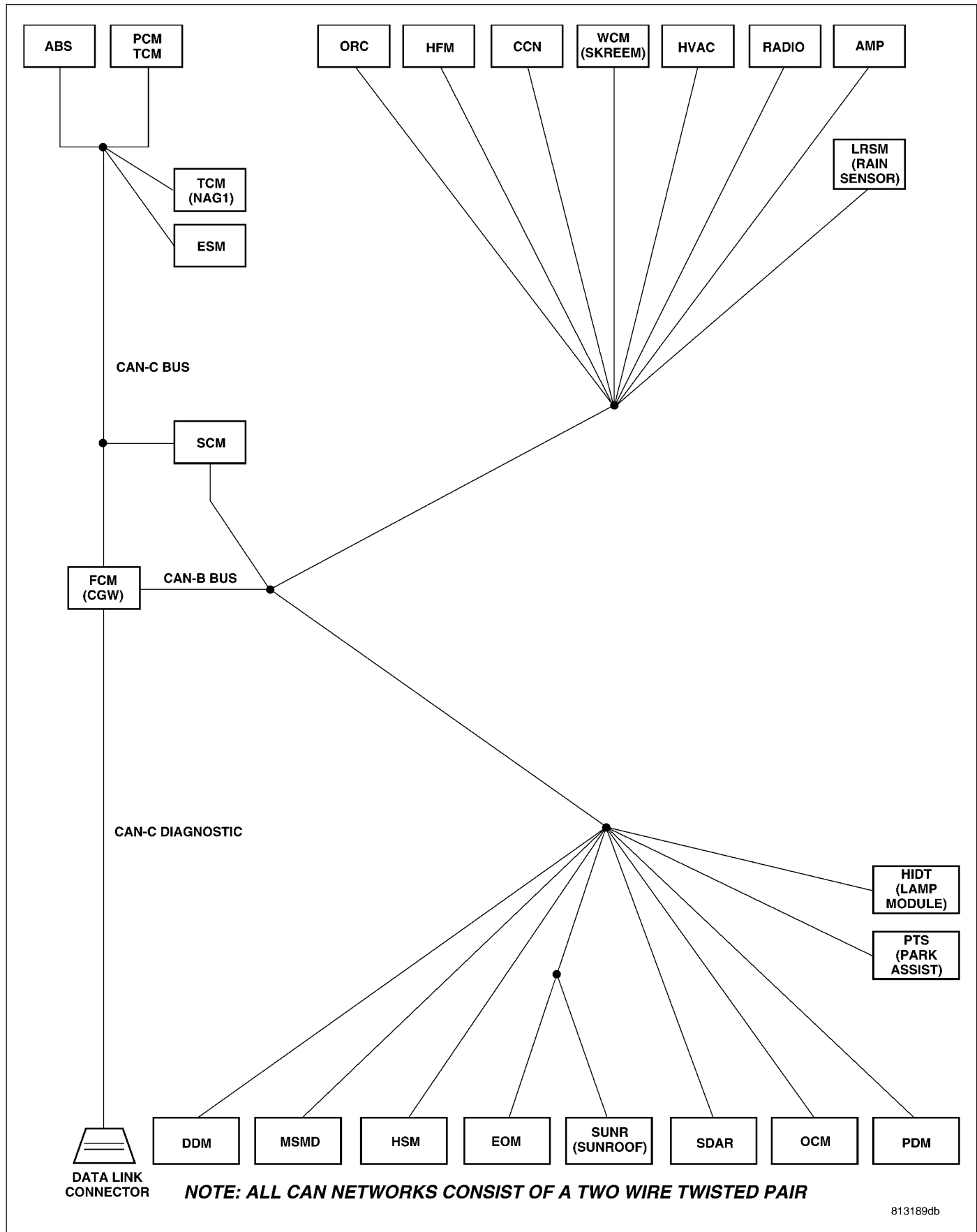
**Yes** >> Replace/update the Shifter Lever Assembly in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---



## U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE



**U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Antilock Brake Module for approximately 500ms.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY ANTILOCK BRAKE MODULE POWER AND GROUND ANTILOCK BRAKE MODULE MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read all active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE (CONTINUED)****3. VERIFY THAT THE ABS IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the ABS is active on the bus.

**Is the ABS active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

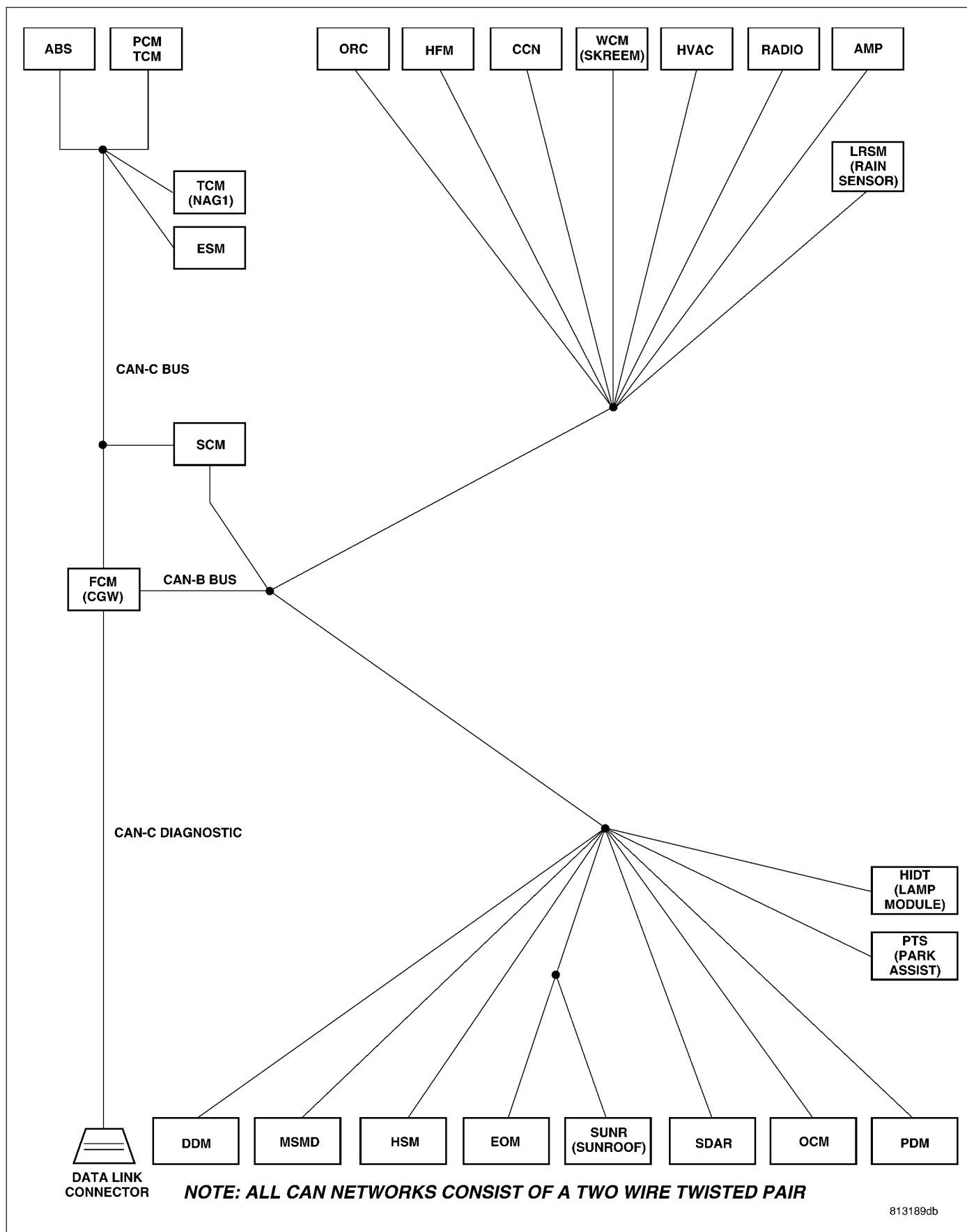
**Is there more than one module with active DTCs “Logged Against” the ABS?**

**Yes** >> Replace/update the Antilock Brake Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information  
Perform BODY VERIFICATION TEST – VER 1.

---

## U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE



**U0141—LOST COMMUNICATION WITH FRONT CONTROL MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Front Control Module for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY FRONT CONTROL MODULE FRONT CONTROL MODULES POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read all active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE (CONTINUED)****3. VERIFY THAT THE FCM IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the FCM is active on the bus.

**Is the FCM active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

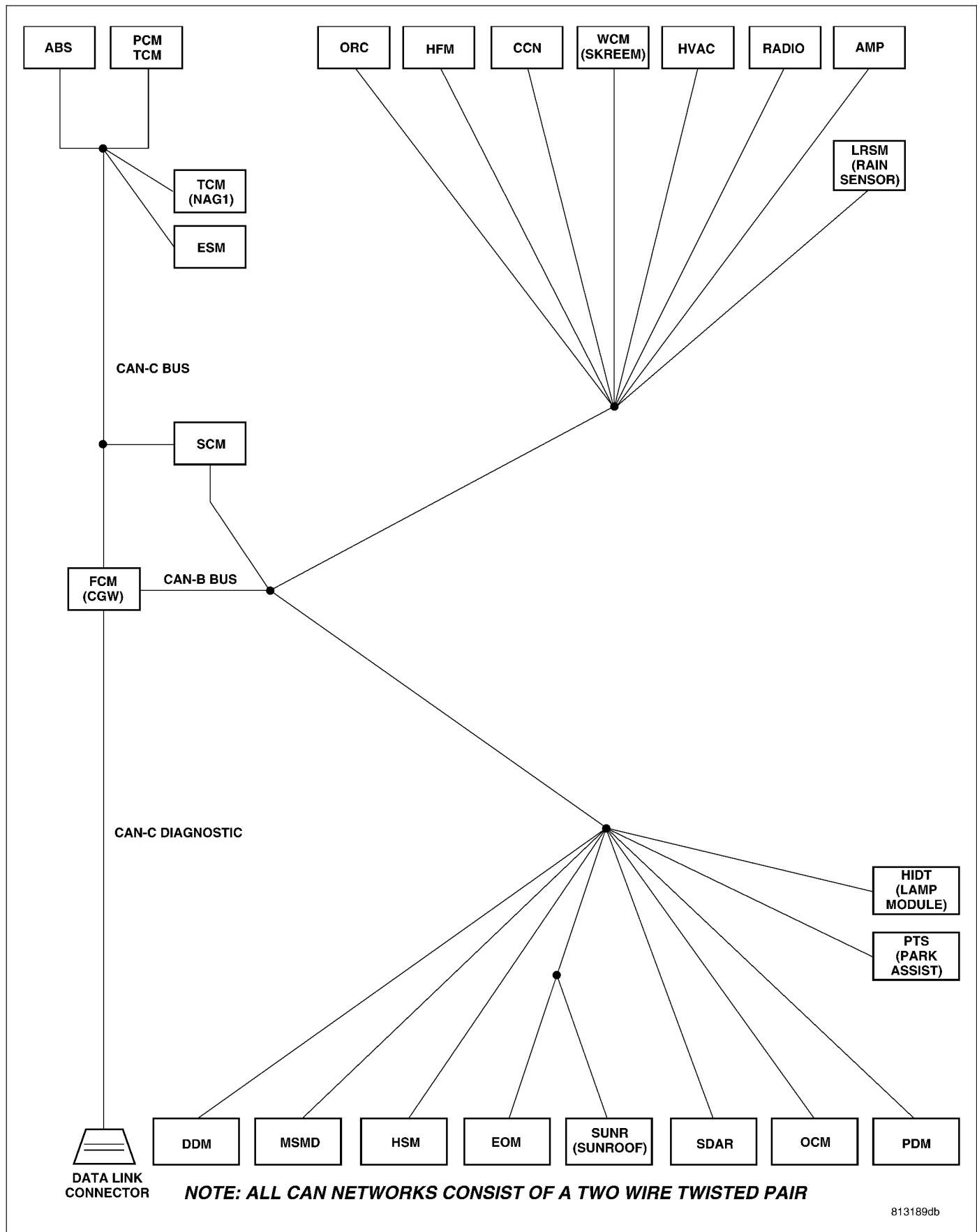
With the scan tool, select Network Diagnostics.

**Is there more than one module with active DTCs “Logged Against” the FCM?**

**Yes** >> Replace/update the Front Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information  
Perform BODY VERIFICATION TEST – VER 1.

---

**U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)**

**U0151—LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC) (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Occupant Restraint Controller for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY OCCUPANT RESTRAINT CONTROLLER OCCUPANT RESTRAINT CONTROLLER POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read all active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---



**U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC) (CONTINUED)****3. VERIFY THAT THE ORC IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the ORC is active on the bus.

**Is the ORC active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

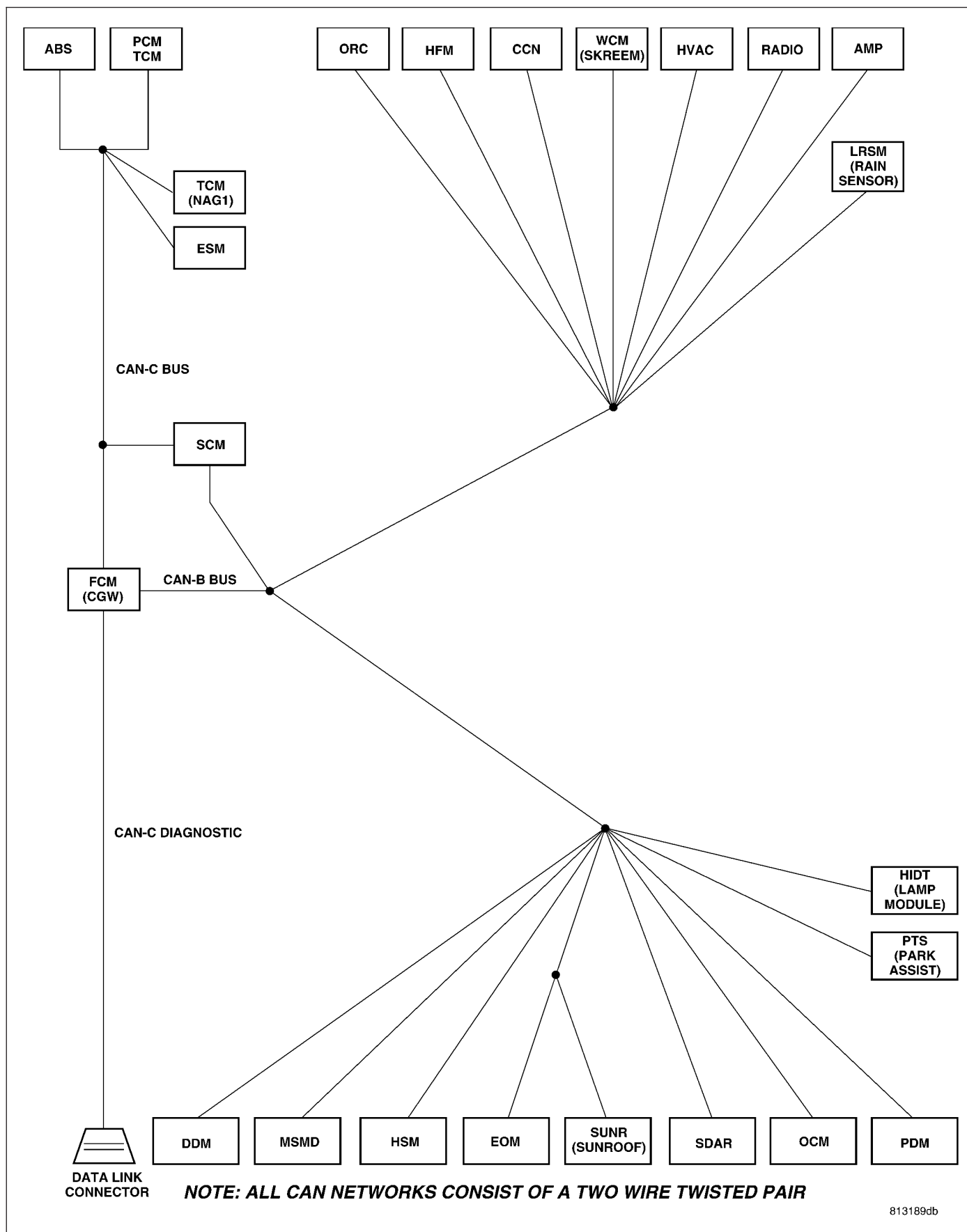
**Is there more than one module with active DTCs “Logged Against” the ORC?**

**Yes** >> Replace/update the Occupant Restraint Controller in accordance with the service information.  
Perform AIRBAG VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information  
Perform BODY VERIFICATION TEST – VER 1.

---

## U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE



**U0154—LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Occupant Classification Module for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY OCCUPANT CLASSIFICATION MODULE OCCUPANT CLASSIFICATION MODULE POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0154—LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE (CONTINUED)****3. VERIFY THAT THE OCM IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the OCM is active on the bus.

**Is the OCM active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

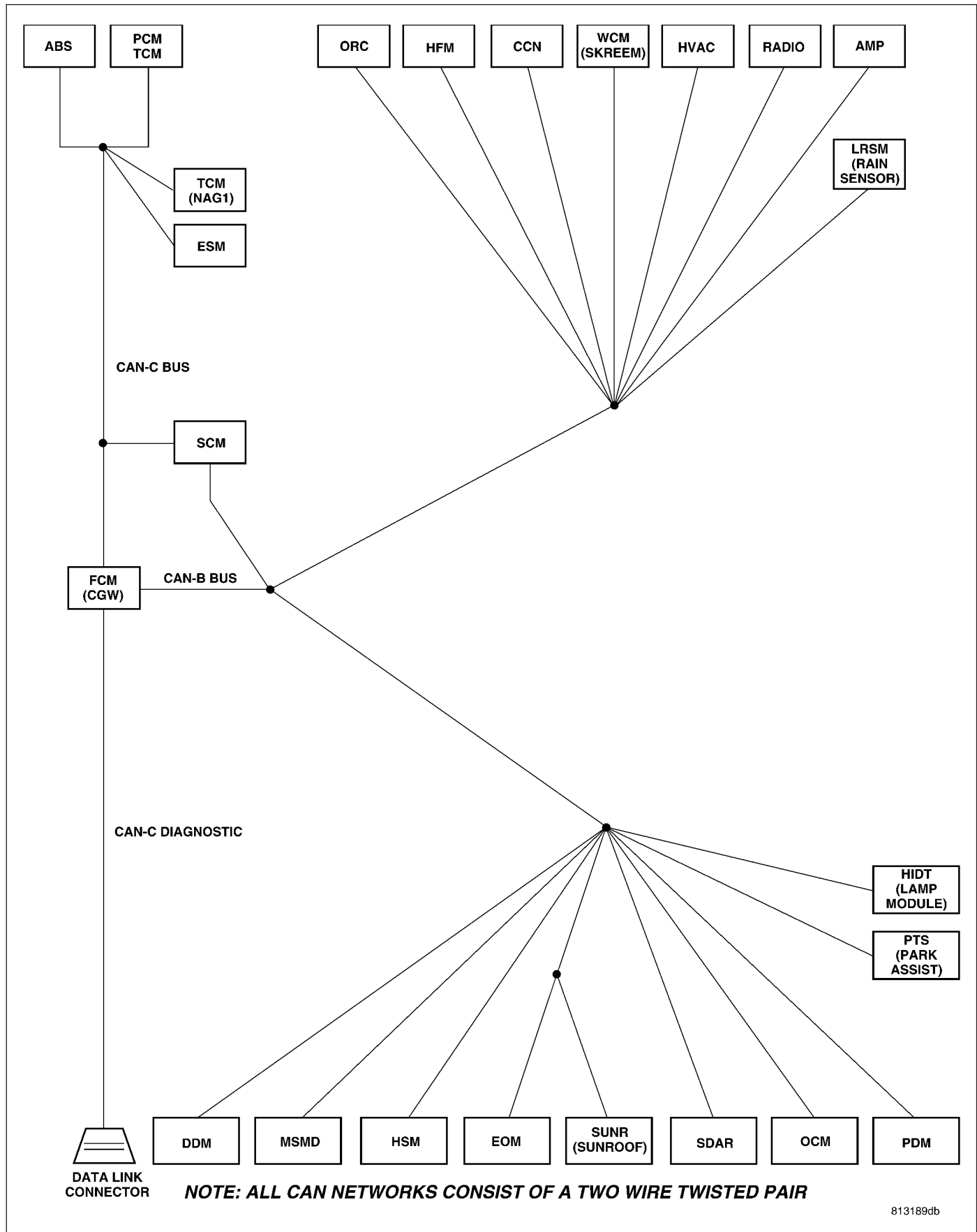
With the scan tool, select Network Diagnostics.

**Is there more than one module with active DTCs “Logged Against” the OCM?**

**Yes** >> Replace/update the Occupant Classification Module in accordance with the service information.  
Perform AIRBAG VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information  
Perform BODY VERIFICATION TEST – VER 1.

---

**U0155-LOST COMMUNICATION WITH CLUSTER/CCN**

**U0155-LOST COMMUNICATION WITH CLUSTER/CCN (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Cluster/CCN for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY CLUSTER/CCN CLUSTER/CCN POWER AND GROUND MODULE THAT SET THE DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0155-LOST COMMUNICATION WITH CLUSTER/CCN (CONTINUED)****3. VERIFY THAT THE CCN IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the CCN is active on the bus.

**Is the CCN active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

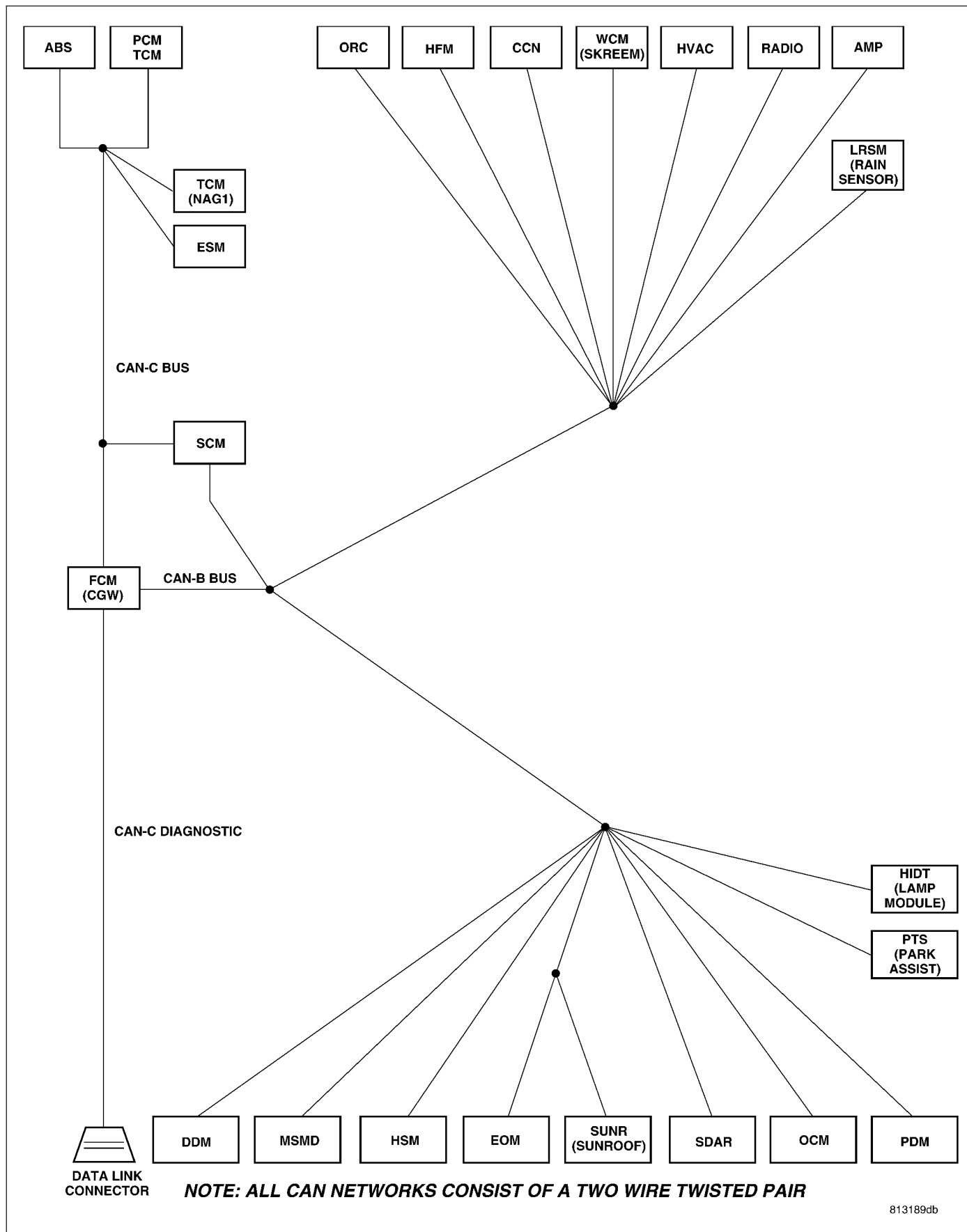
**Is there more than one module with active DTCs “Logged Against” the CCN?**

**Yes** >> Replace/update the Cluster (CCN) in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---

## U0156—LOST COMMUNICATION WITH EOM





**U0156—LOST COMMUNICATION WITH EOM (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Electronic Overhead Module (EOM) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
ELECTRONIC OVERHEAD MODULE POWER OR GROUND
ELECTRONIC OVERHEAD MODULE
MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read all active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0156—LOST COMMUNICATION WITH EOM (CONTINUED)****3. VERIFY THAT THE EOM IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the EOM is active on the bus.

**Is the EOM active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

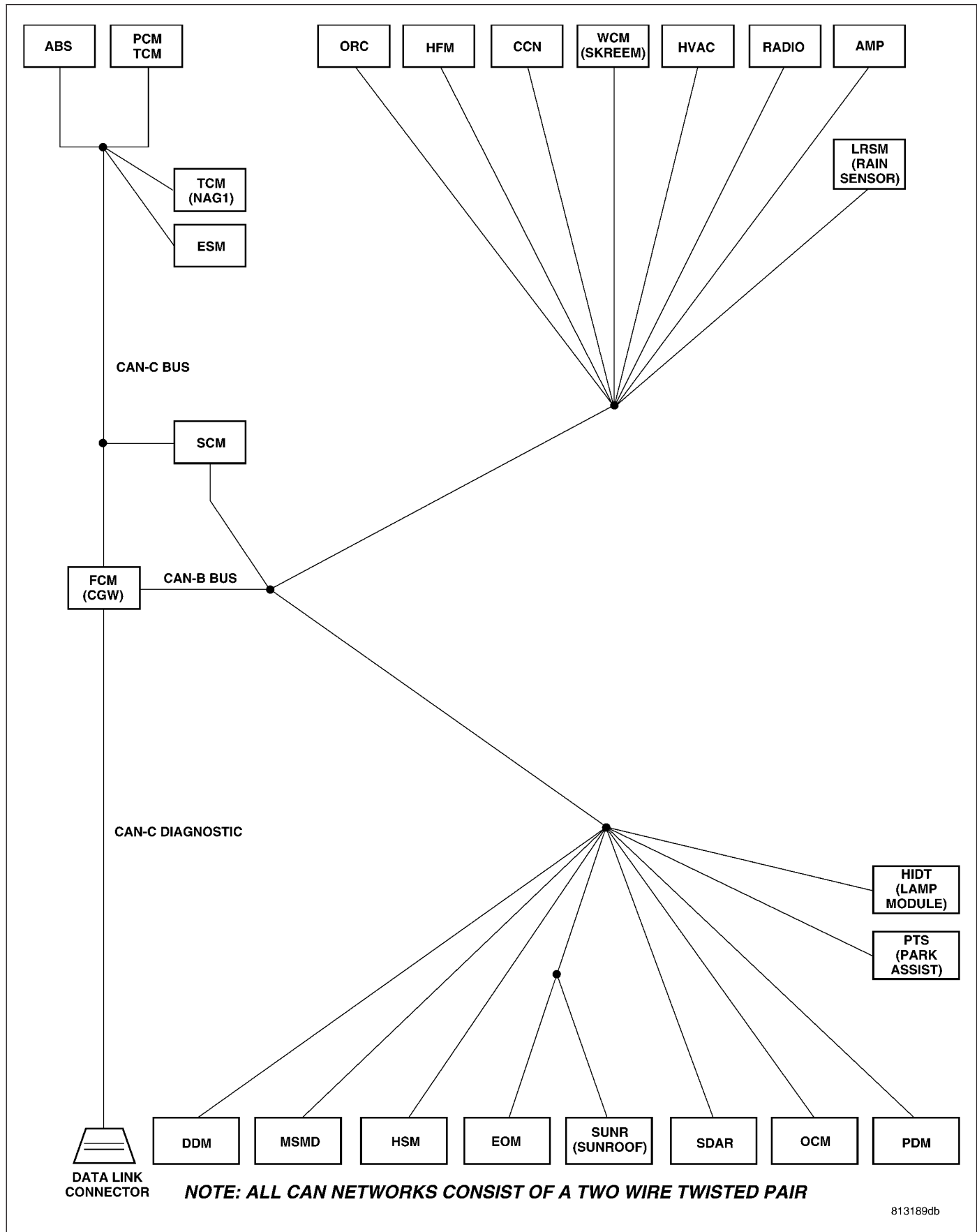
With the scan tool, select Network Diagnostics.

**Is there more than one module with active DTCs “Logged Against” the EOM?**

**Yes** >> Replace/update the Electronic Overhead Module (EOM) in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information  
Perform BODY VERIFICATION TEST – VER 1.

---

**U0159-LOST COMMUNICATION WITH PARK ASSIST CONTROL MODULE**

**U0159-LOST COMMUNICATION WITH PARK ASSIST CONTROL MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Park Assist Module (PTS) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY PARK ASSIST MODULE PARK ASSIST MODULE POWER OR GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read all active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0159-LOST COMMUNICATION WITH PARK ASSIST CONTROL MODULE (CONTINUED)****3. VERIFY THAT THE PTS IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the PTS is active on the bus.

**Is the PTS active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

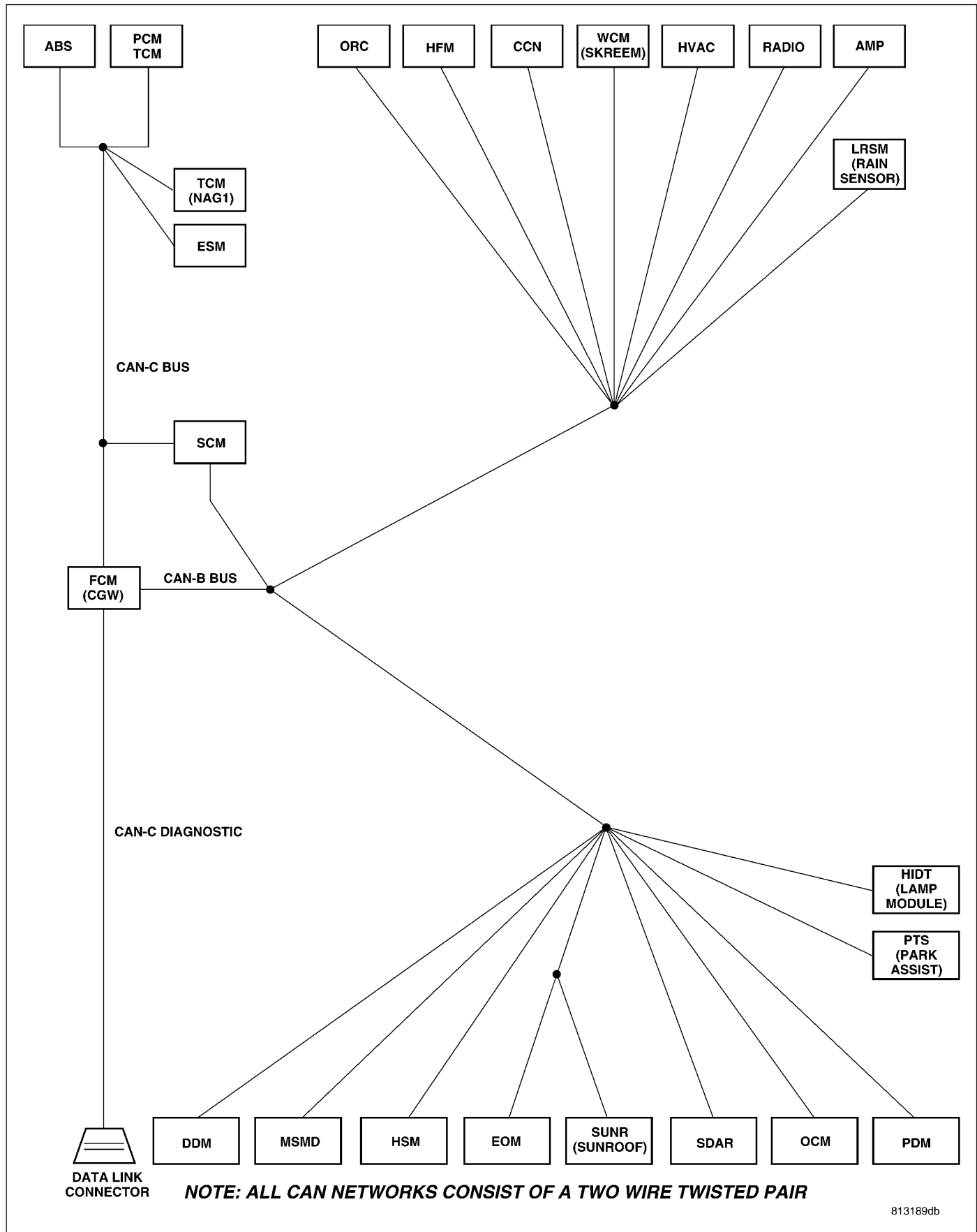
With the scan tool, select Network Diagnostics.

**Is there more than one module with active DTCs “Logged Against” the PTS?**

**Yes** >> Replace/update the Park Assist Module (PTS) in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information  
Perform BODY VERIFICATION TEST – VER 1.

---

**U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE**

**U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the A/C Heater Control (HVAC) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY A/C HEATER CONTROL A/C HEATER CONTROL POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE (CONTINUED)****3. VERIFY THAT THE HVAC IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the HVAC is active on the bus.

**Is the HVAC active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

**Is there more than one module with active DTCs “Logged Against” the HVAC?**

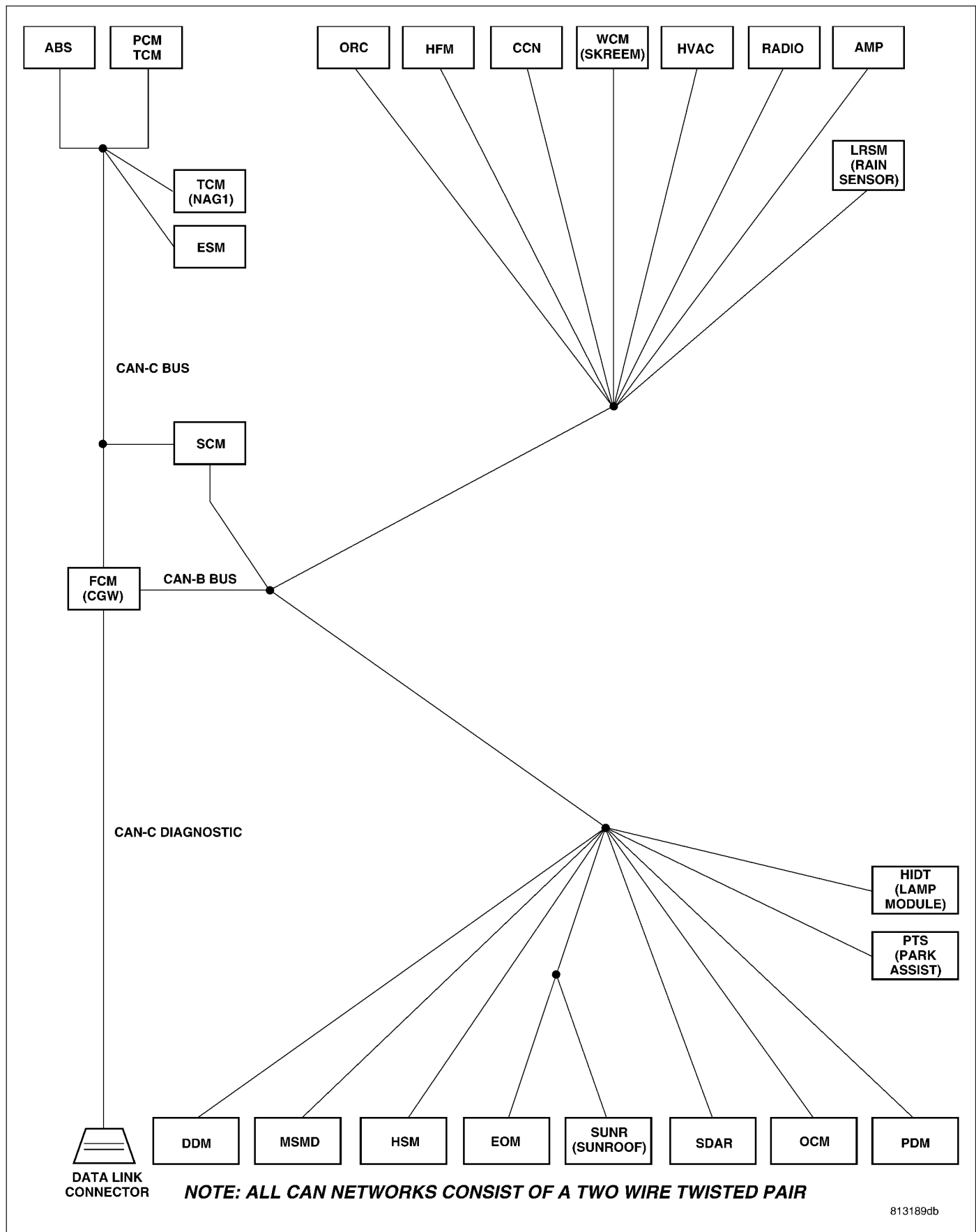
**Yes** >> Replace/update the A/C Heater Control in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set the DTC in accordance with the service information  
Perform BODY VERIFICATION TEST – VER 1.

---



## U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)



**U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM) (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Sentry Key Remote Entry Module (WCM) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
SENTRY KEY REMOTE ENTRY MODULE
SENTRY KEY REMOTE ENTRY MODULE POWER AND GROUND
MODULE THAT SET THIS DTC

## Diagnostic Test

### 1. VERIFY DTC IS ACTIVE

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.

With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

### 2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM) (CONTINUED)****3. VERIFY THAT THE WCM IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the WCM is active on the bus.

**Is the WCM active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

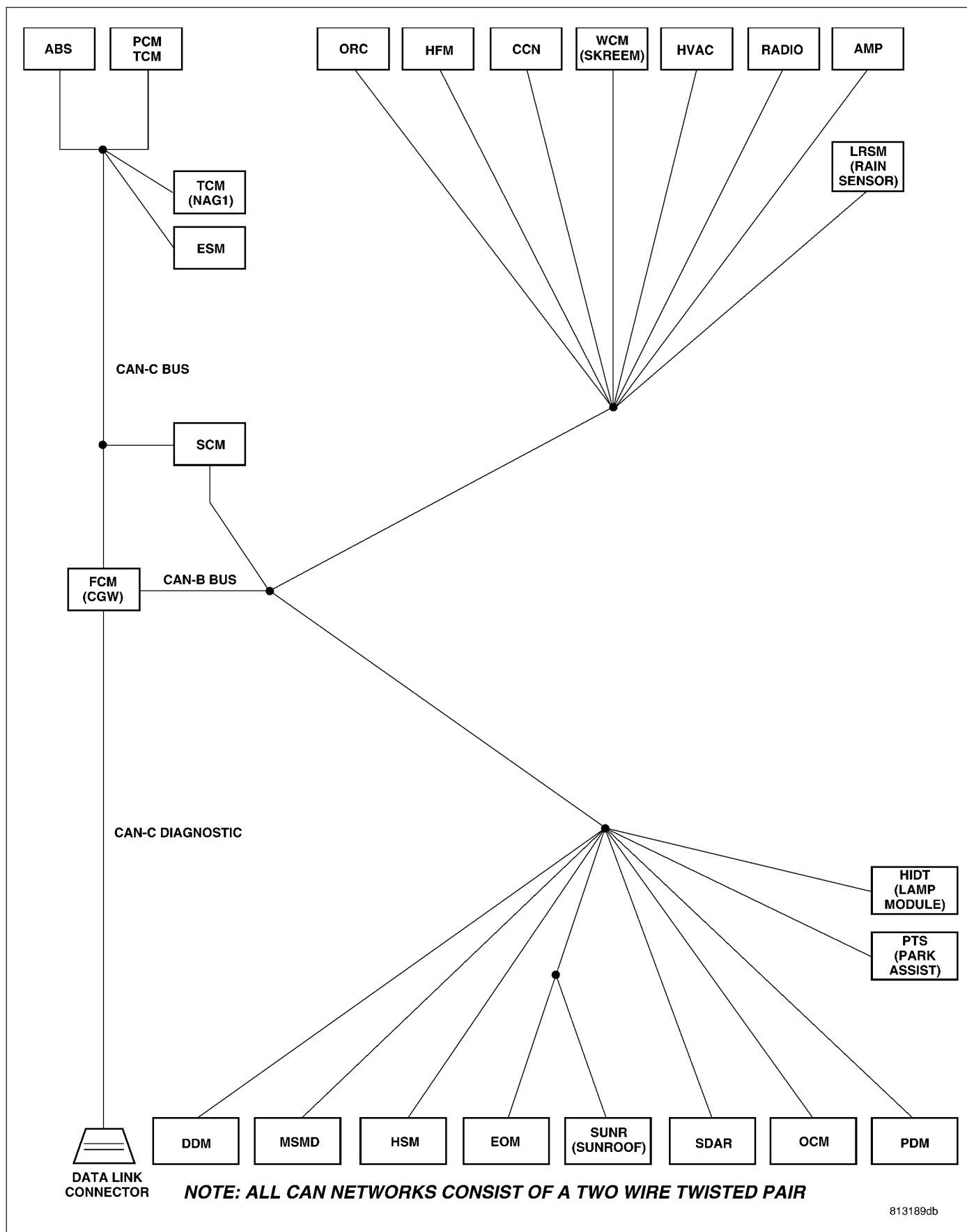
**Is there more than one module with active DTCs “Logged Against” the WCM?**

**Yes** >> Replace/update the Sentry Key Remote Entry Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---

## U0169-LOST COMMUNICATION WITH SUNROOF CONTROL MODULE



**U0169-LOST COMMUNICATION WITH SUNROOF CONTROL MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Sunroof Control Module (SUNR) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY SUNROOF CONTROL MODULE SUNROOF CONTROL MODULE POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0169-LOST COMMUNICATION WITH SUNROOF CONTROL MODULE (CONTINUED)****3. VERIFY THAT THE SUNR IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the SUNR is active on the bus.

**Is the SUNR active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

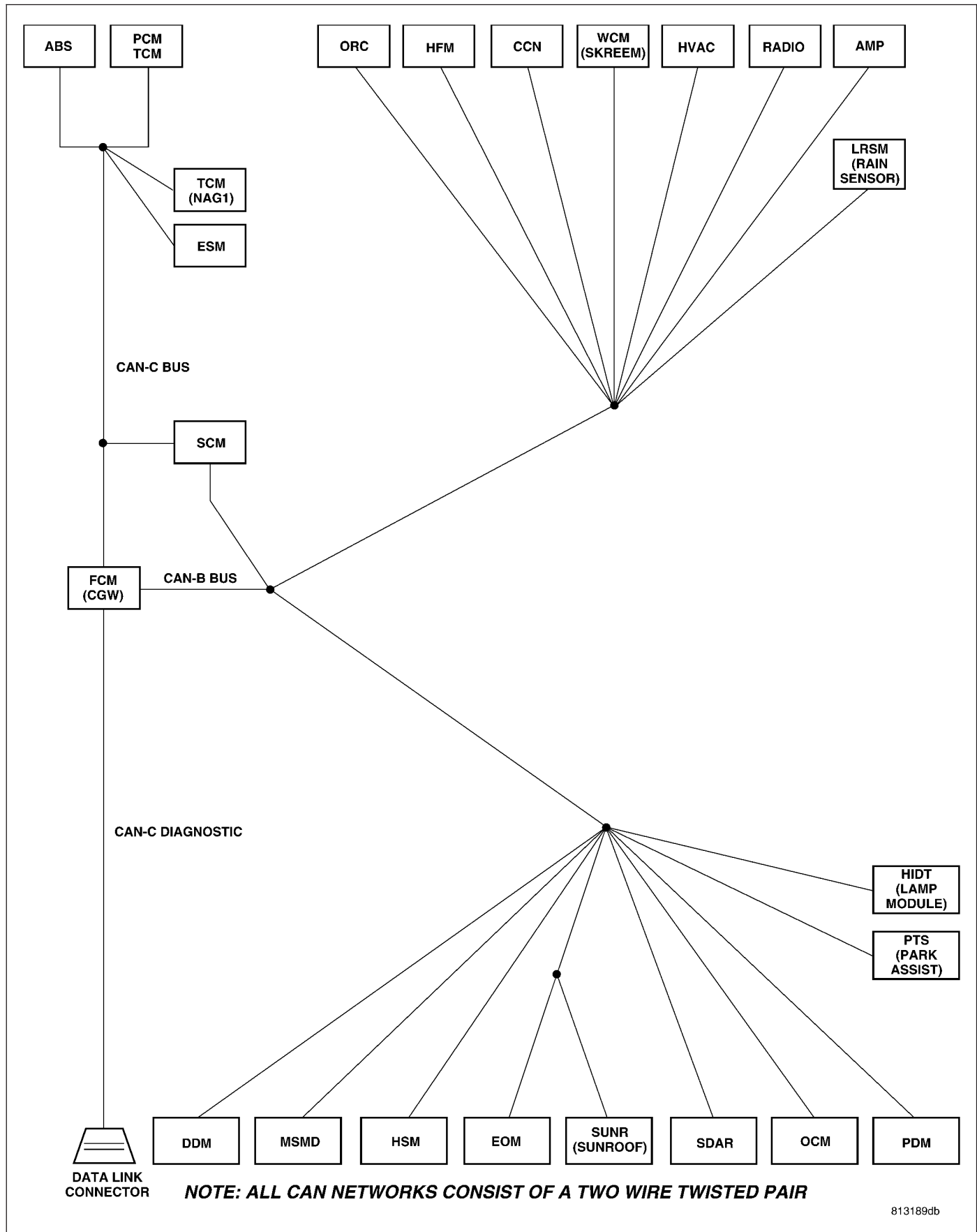
With the scan tool, select Network Diagnostics.

**Is there more than one module with active DTCs “Logged Against” the SUNR?**

**Yes** >> Replace/update the Sunroof Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---

**U0181-LOST COMMUNICATION WITH HEADLAMP LEVELING TRANSLATOR**

**U0181-LOST COMMUNICATION WITH HEADLAMP LEVELING TRANSLATOR (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Headlamp Leveling Module for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY HEADLAMP LEVELING MODULE HEADLAMP LEVELING MODULE POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---



**U0181-LOST COMMUNICATION WITH HEADLAMP LEVELING TRANSLATOR (CONTINUED)****3. VERIFY THAT THE HDT IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the HDT is active on the bus.

**Is the HDT active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

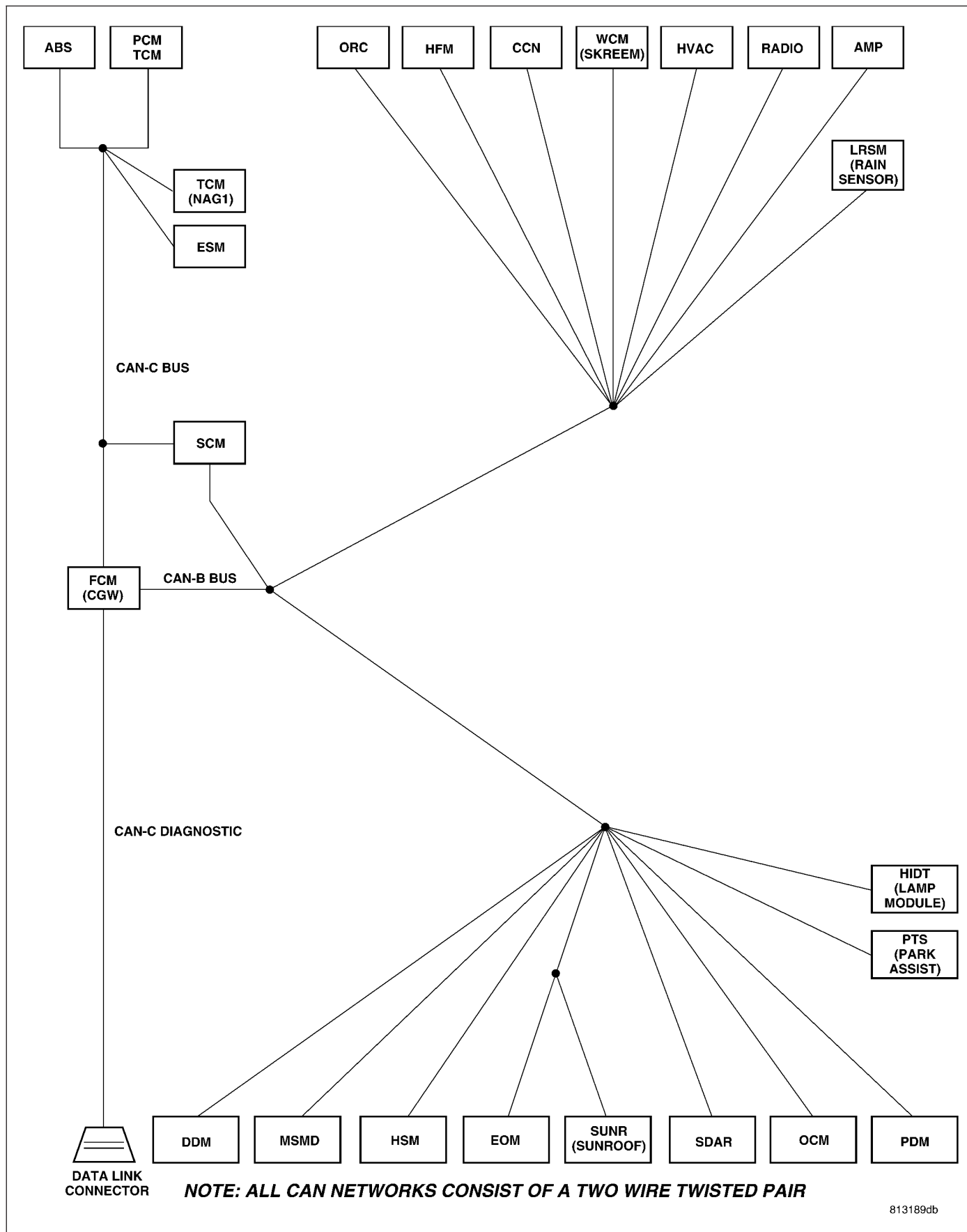
**Is there more than one module with active DTCs “Logged Against” the HDT?**

**Yes** >> Replace/update the Headlamp Leveling Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---

## U0184-LOST COMMUNICATION WITH RADIO



**U0184-LOST COMMUNICATION WITH RADIO (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**

Bus messages not received from the Radio for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY RADIO RADIO POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0184-LOST COMMUNICATION WITH RADIO (CONTINUED)****3. VERIFY THAT THE RADIO IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the Radio is active on the bus.

**Is the Radio active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

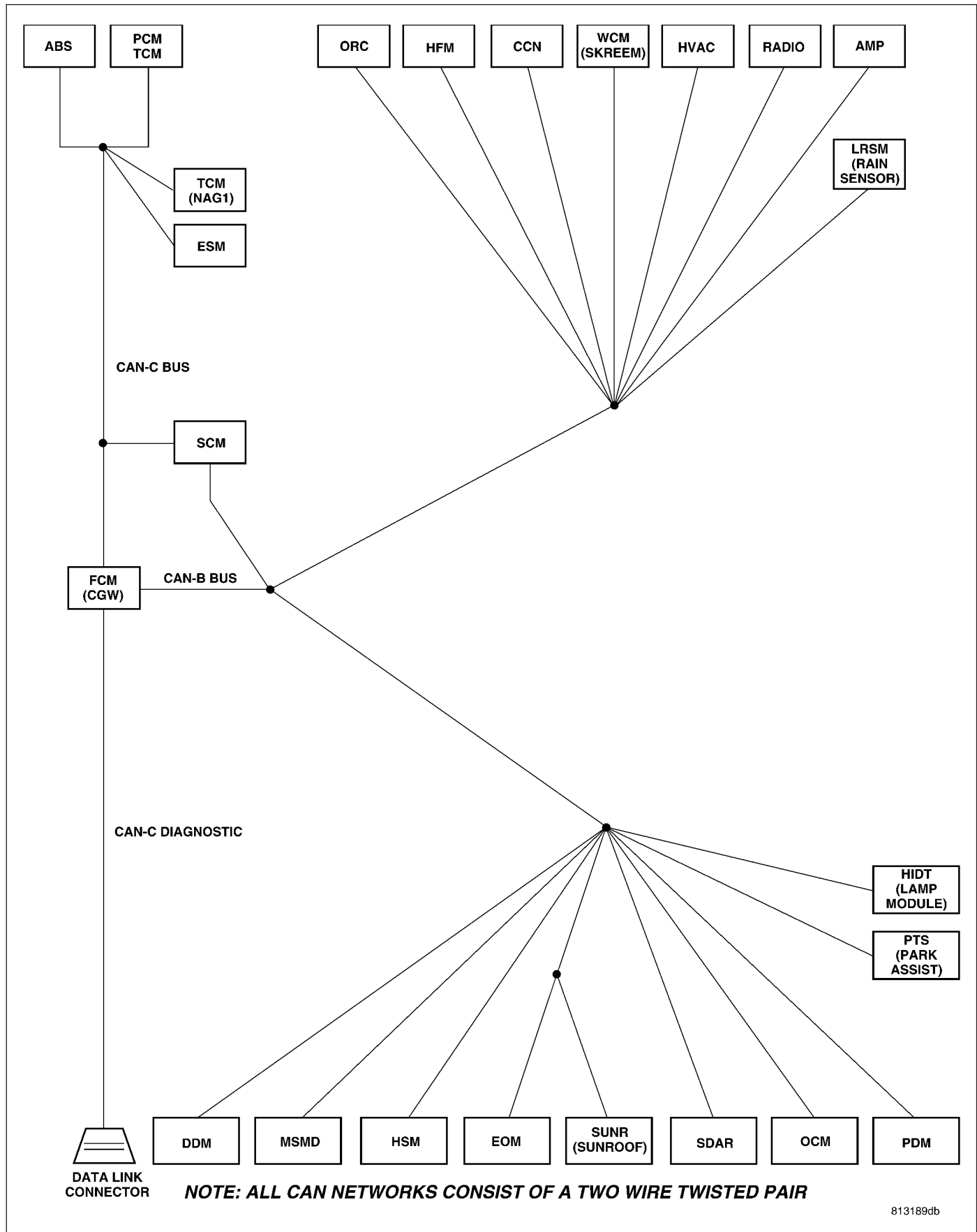
**Is there more than one module with active DTCs “Logged Against” the Radio?**

**Yes** >> Replace/update the Radio in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---

## U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER



**U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the Amplifier for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY AMPLIFIER AMPLIFIER POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER (CONTINUED)****3. VERIFY THAT THE AMPLIFIER IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the Amplifier is active on the bus.

**Is the Amplifier active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

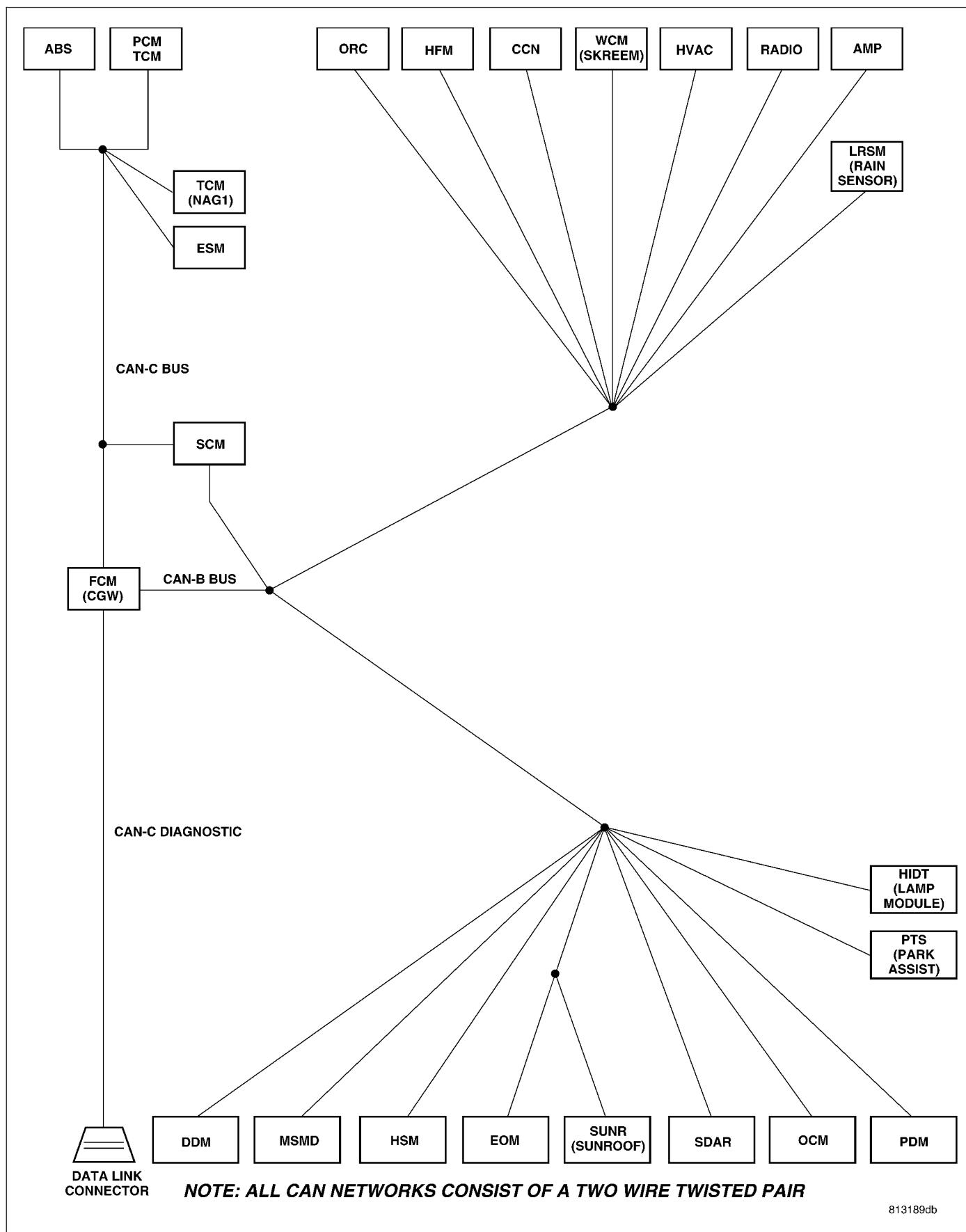
**Is there more than one module with active DTCs “Logged Against” the Amplifier?**

**Yes** >> Replace/update the Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information  
Perform BODY VERIFICATION TEST – VER 1.

---

## U0195-LOST COMMUNICATION WITH SDARS





**U0195-LOST COMMUNICATION WITH SDARS (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**  
Bus messages not received from the Satellite Receiver (SDAR) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY SATELLITE RECEIVER SATELLITE RECEIVER POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0195-LOST COMMUNICATION WITH SDARS (CONTINUED)****3. VERIFY THAT THE SATELLITE RECEIVER IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the SDARS is active on the bus.

**Is the SDARS active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

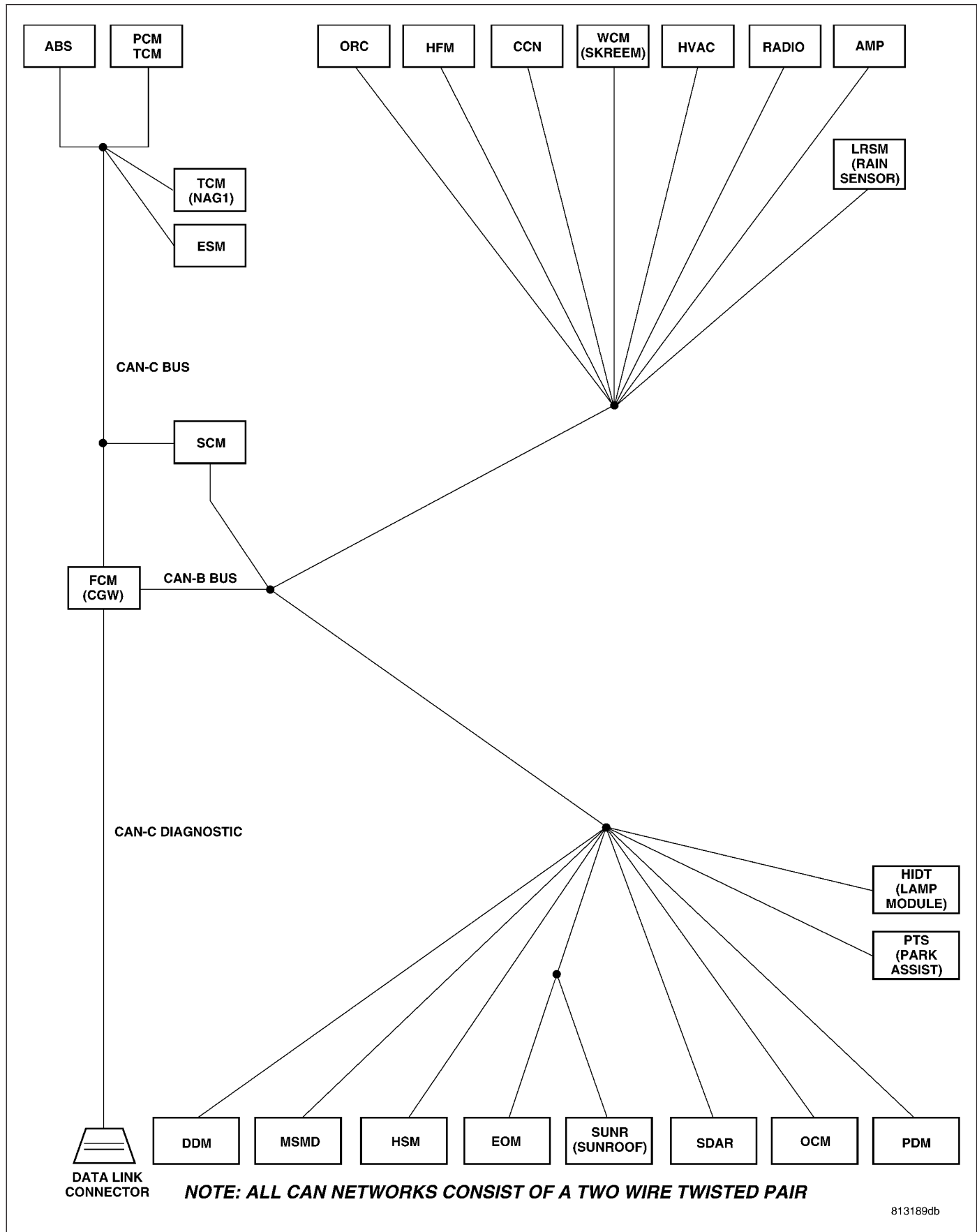
With the scan tool, select Network Diagnostics.

**Is there more than one module with active DTCs “Logged Against” the SDARS?**

**Yes** >> Replace/update the Satellite Receiver in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set the DTC in accordance with the service information  
Perform BODY VERIFICATION TEST – VER 1.

---

**U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE**

**U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the HFM for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY HANDS FREE MODULE HANDS FREE MODULE POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE (CONTINUED)****3. VERIFY THAT THE HFM IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the HFM is active on the bus.

**Is the HFM active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

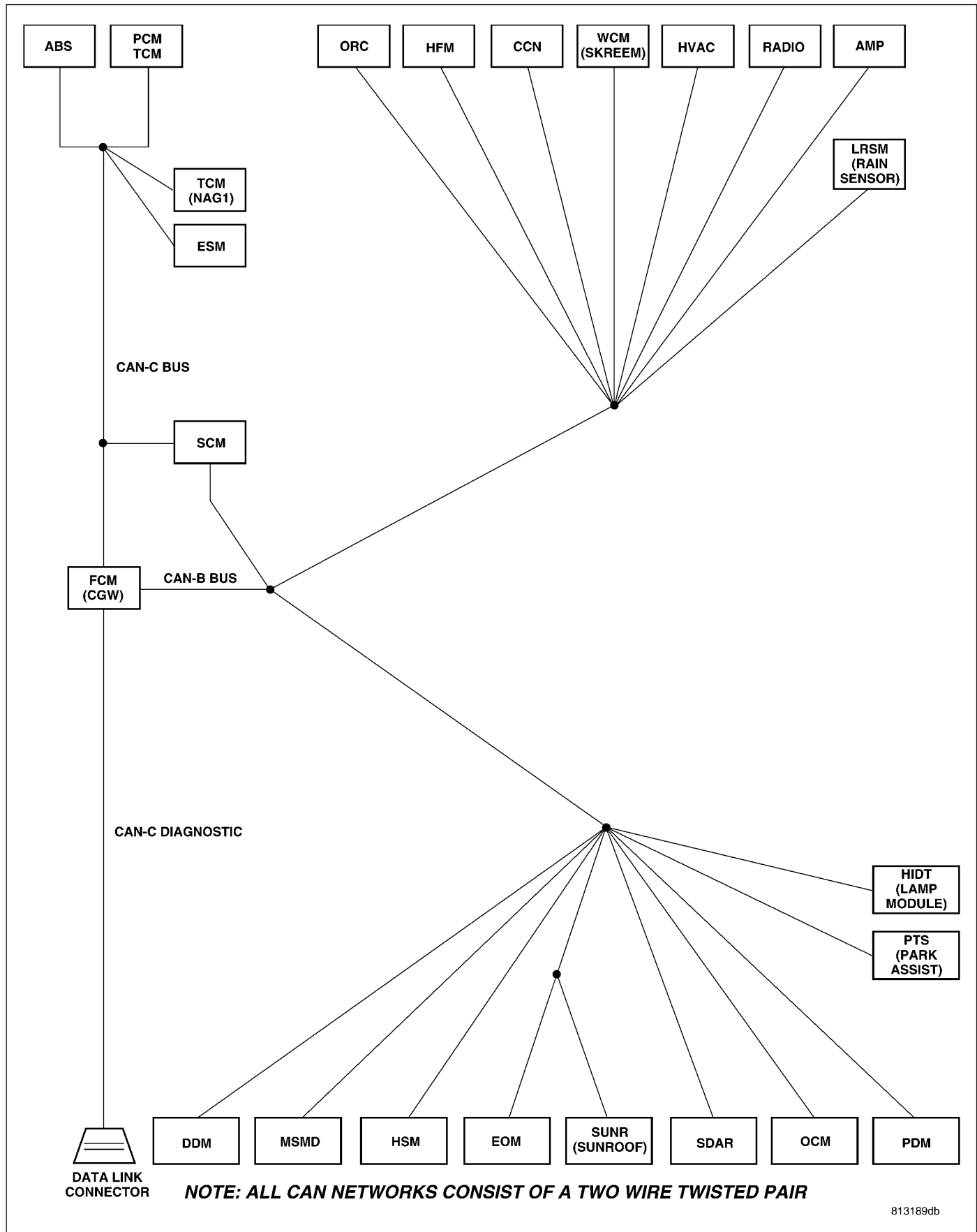
With the scan tool, select Network Diagnostics.

**Is there more than one module with active DTCs “Logged Against” the HFM?**

**Yes** >> Replace/update the Hands Free Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---

**U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE**

**U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**

Bus messages not received from the DDM for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY DRIVER DOOR MODULE DRIVER DOOR MODULE POWER AND GROUND MODULE THAT SET THE DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE (CONTINUED)****3. VERIFY THAT THE DDM IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the DDM is active on the bus.

**Is the DDM active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

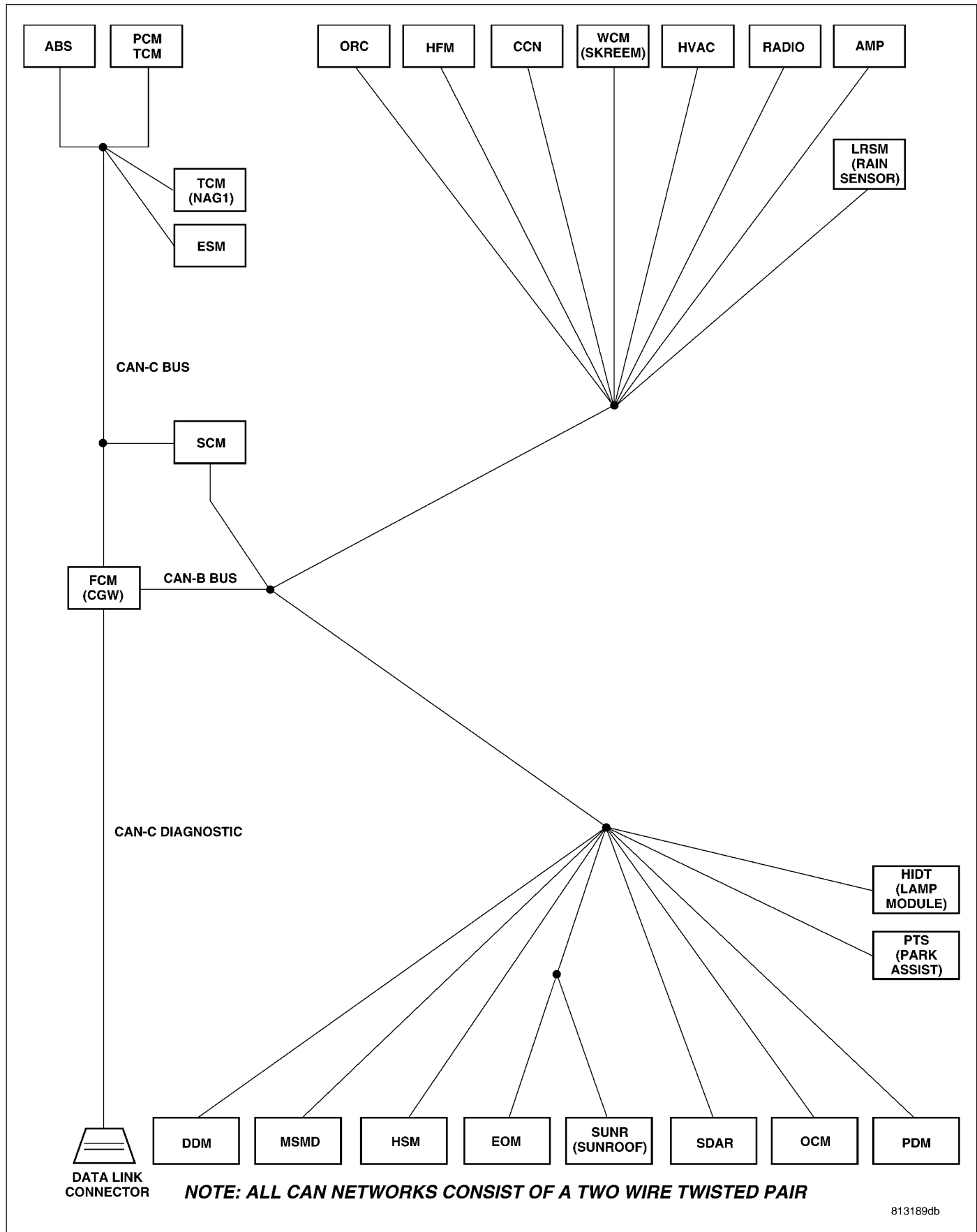
**Is there more than one module with active DTCs “Logged Against” the DDM?**

**Yes** >> Replace/update the Driver Door Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---



**U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE**

**U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**

Bus messages not received from the PDM for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY PASSENGER DOOR MODULE PASSENGER DOOR MODULE POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE (CONTINUED)****3. VERIFY THAT THE PDM IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the PDM is active on the bus.

**Is the PDM active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

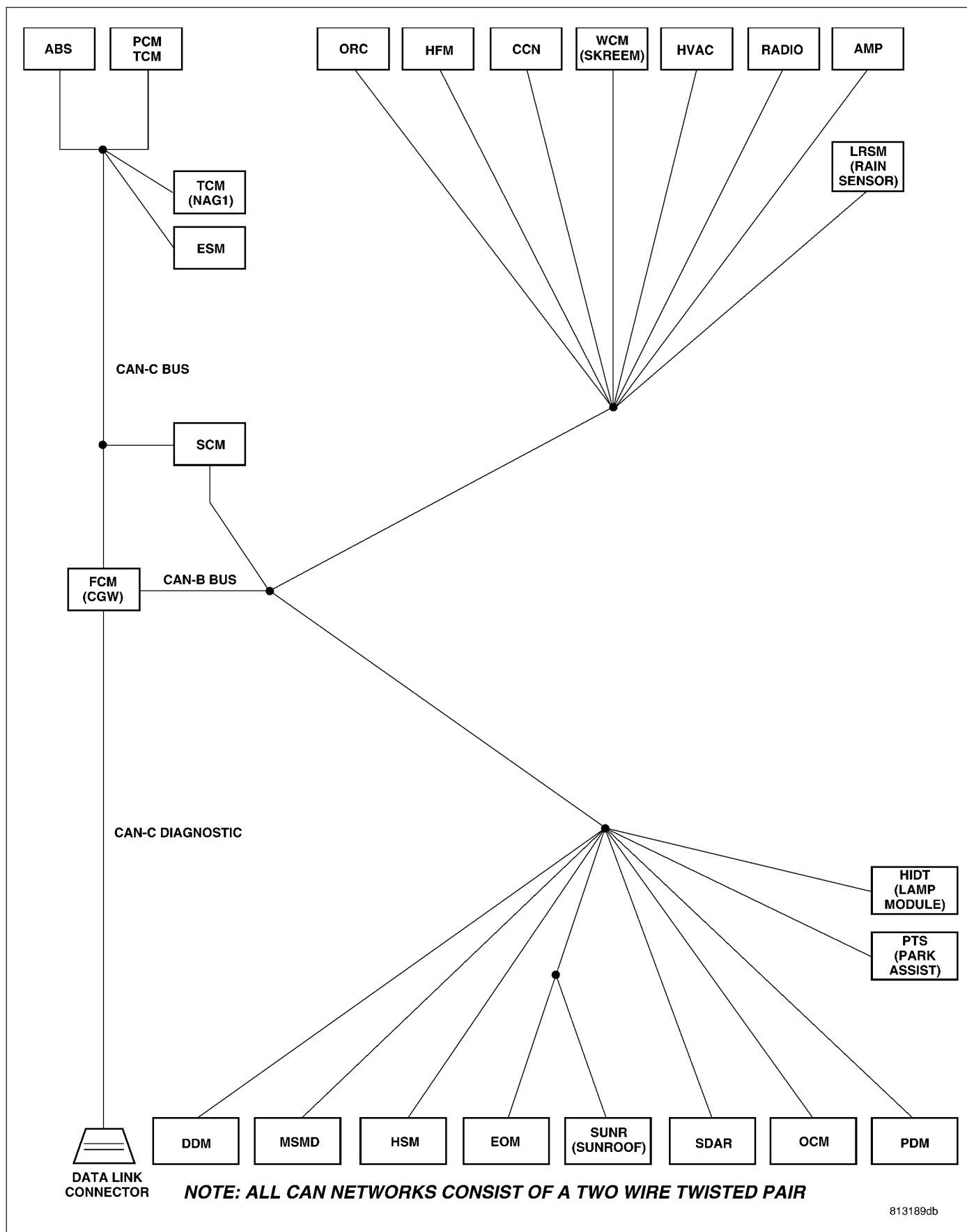
**Is there more than one module with active DTCs “Logged Against” the PDM?**

**Yes** >> Replace/update the Passenger Door Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information  
Perform BODY VERIFICATION TEST – VER 1.

---

## U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE



**U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**

Bus messages not received from the HSM for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY HEATED SEAT MODULE HEATED SEAT MODULE POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE (CONTINUED)****3. VERIFY THAT THE HSM IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the HSM is active on the bus.

**Is the HSM active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

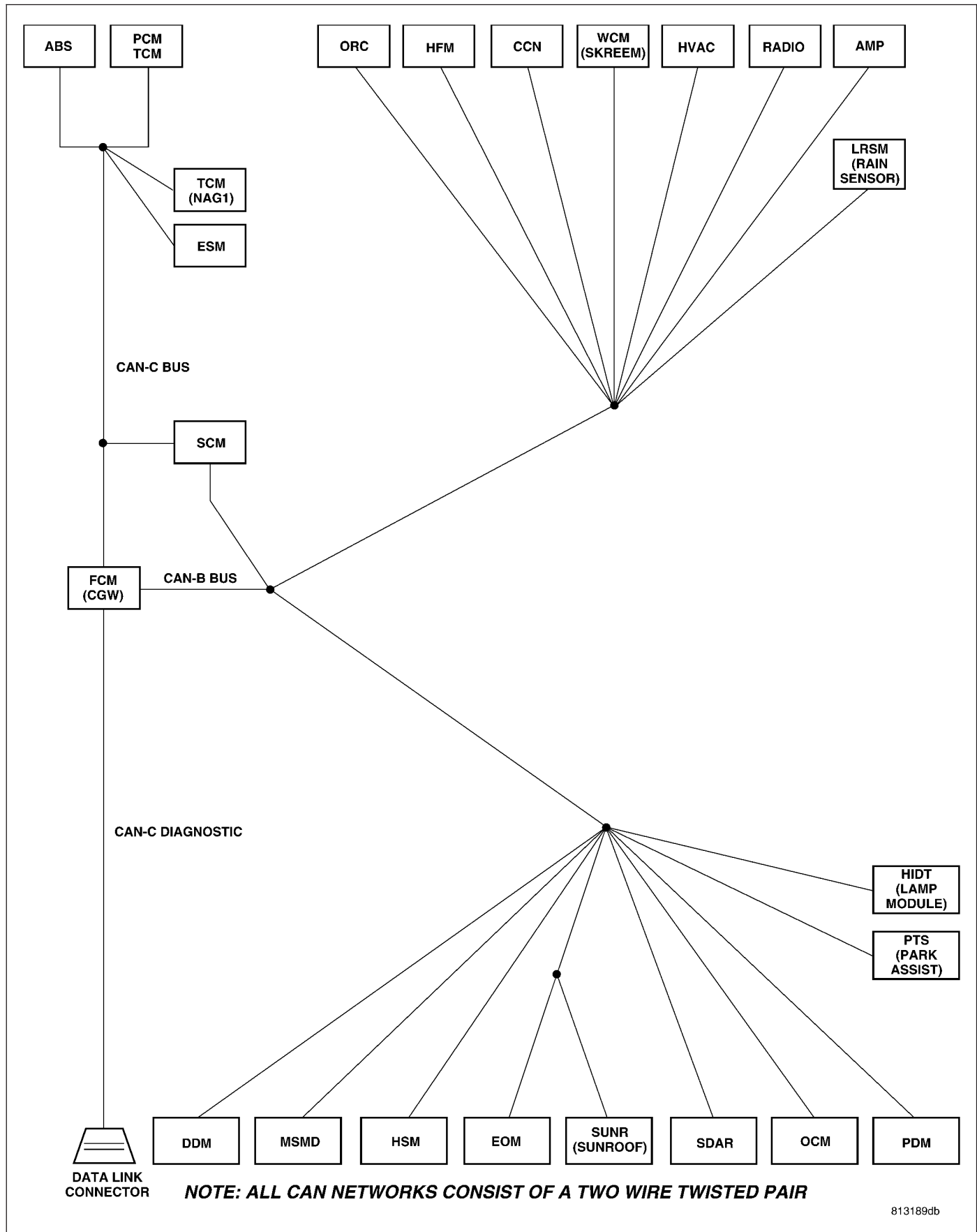
With the scan tool, select Network Diagnostics.

**Is there more than one module with active DTCs “Logged Against” the HSM?**

**Yes** >> Replace/update the Heated Seat Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---

**U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE**

**U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the MSMD for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY MEMORY SEAT MODULE MEMORY SEAT MODULE POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---



**U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE (CONTINUED)****3. VERIFY THAT THE MSMD IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the MSMD is active on the bus.

**Is the MSMD active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

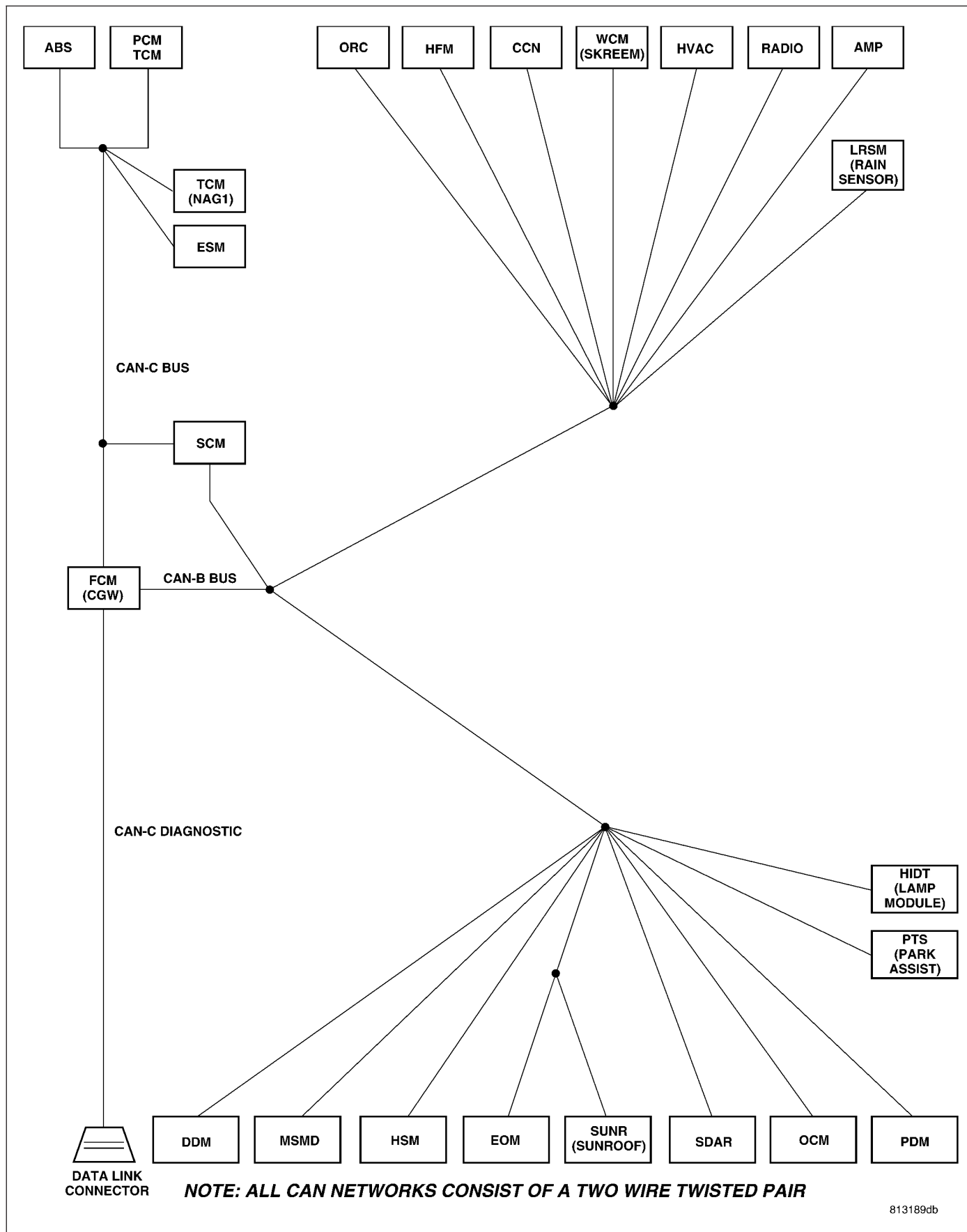
**Is there more than one module with active DTCs “Logged Against” the MSMD?**

**Yes** >> Replace/update the Memory Seat Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---

## U0212-LOST COMMUNICATION WITH SCCM - CAN B



**U0212-LOST COMMUNICATION WITH SCCM - CAN B (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the SCM (CAN B) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY STEERING CONTROL MODULE STEERING CONTROL MODULE POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0212-LOST COMMUNICATION WITH SCCM - CAN B (CONTINUED)****3. VERIFY THAT THE SCM IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the SCM is active on the bus.

**Is the SCM active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

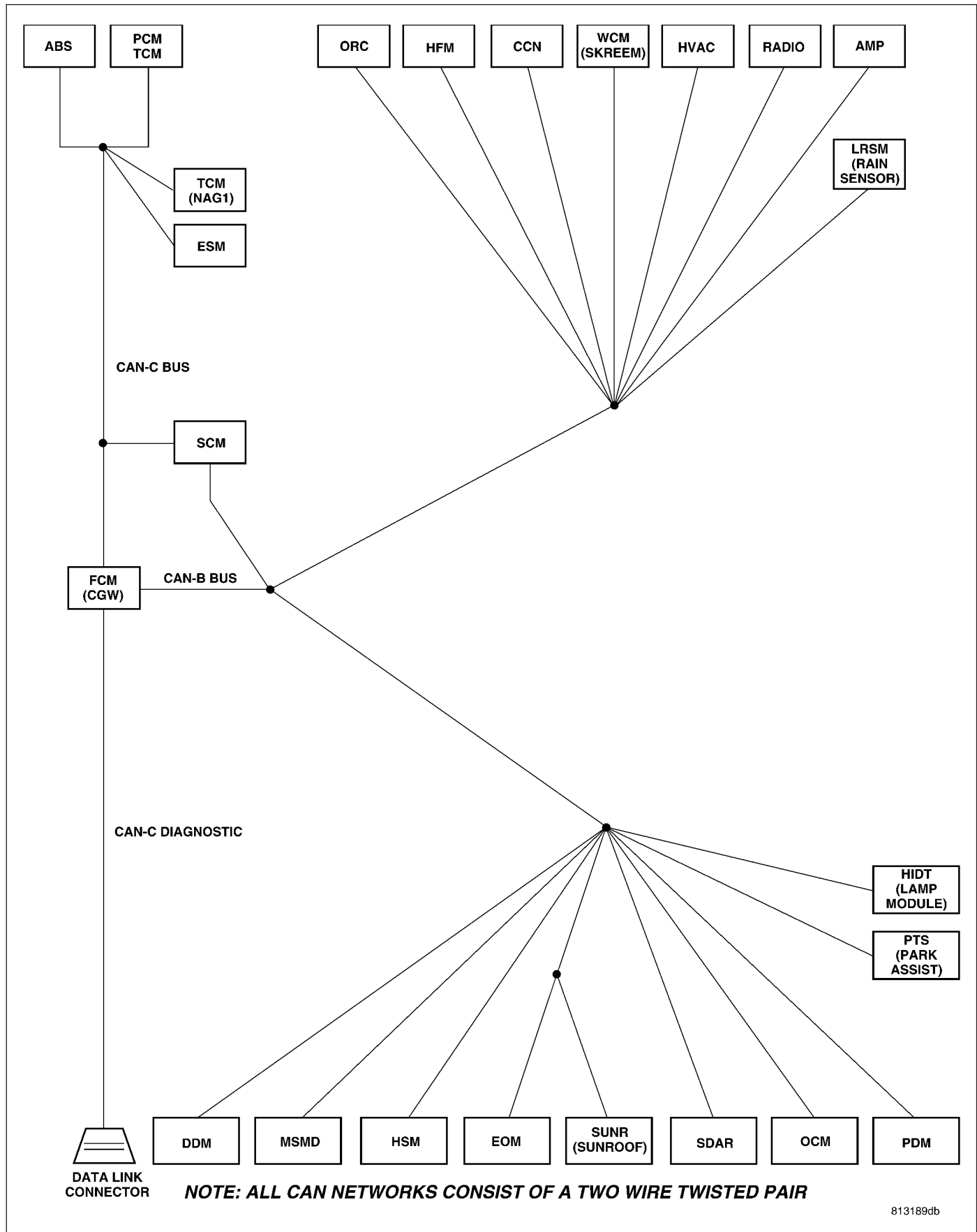
**Is there more than one module with active DTCs “Logged Against” the SCM?**

**Yes** >> Replace/update the Steering Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---

## U0231-LOST COMMUNICATION WITH RAIN SENSING MODULE



**U0231-LOST COMMUNICATION WITH RAIN SENSING MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the rain sensor (LRSM) for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
RAIN SENSOR
RAIN SENSOR POWER AND GROUND
MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U0231-LOST COMMUNICATION WITH RAIN SENSING MODULE (CONTINUED)****3. VERIFY THAT THE LRSM IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the LRSM is active on the bus.

**Is the LRSM active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

With the scan tool, select Network Diagnostics.

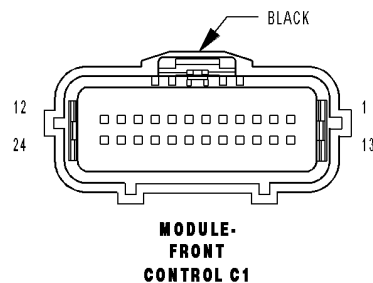
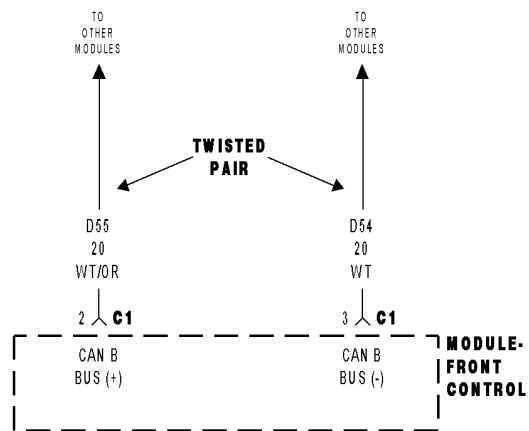
**Is there more than one module with active DTCs “Logged Against” the LRSM?**

**Yes** >> Replace/update the Rain Sensor in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---

## U1105-CAN B SIGNAL MISSING





U1105-CAN B SIGNAL MISSING (CONTINUED)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the CAN B Bus messages are not received within 2 seconds.

Possible Causes
OTHER CAN B BUS DTC's SET IN FRONT CONTROL MODULE (D55) CAN B BUS (+) CIRCUIT OPEN (D54) CAN B BUS (-) CIRCUIT OPEN FRONT CONTROL MODULE

Diagnostic Test

1. CHECK FOR ACTIVE DTCS

With the scan tool, read the active DTC's.  
Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.  
With the scan tool, read the active DTC's.

- Does the scan tool display this DTC as active?
- Yes

>> Go To 2
- No

>> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

2. CHECK FRONT CONTROL MODULE FOR U0019 DTC

With the scan tool, read Front Control Module active DTC's

- Does the scan tool display U0019 CAN B BUS – ACTIVE?
- Yes

>> Refer to the table of contents in this section and perform the U0019 diagnostic procedure.
- No

>> Go To 3

**U1105-CAN B SIGNAL MISSING (CONTINUED)****3. (D55) CAN B BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Front Control Module C1 connector.

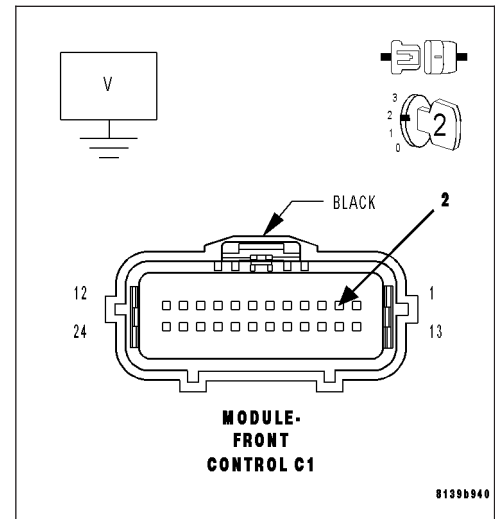
Turn the ignition on.

Measure the voltage of the (D55) CAN B Bus (+) circuit.

**Is any voltage present on this circuit?**

**Yes** >> Go To 4

**No** >> Repair the (D55) CAN B Bus (+) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

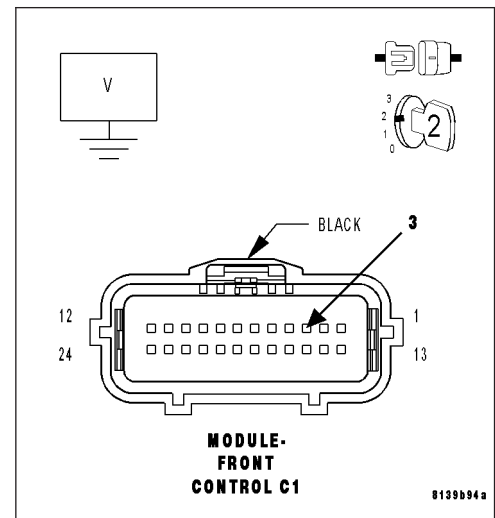
**4. (D54) CAN B BUS (-) CIRCUIT OPEN**

Measure the voltage of the (D54) CAN B Bus (-) circuit.

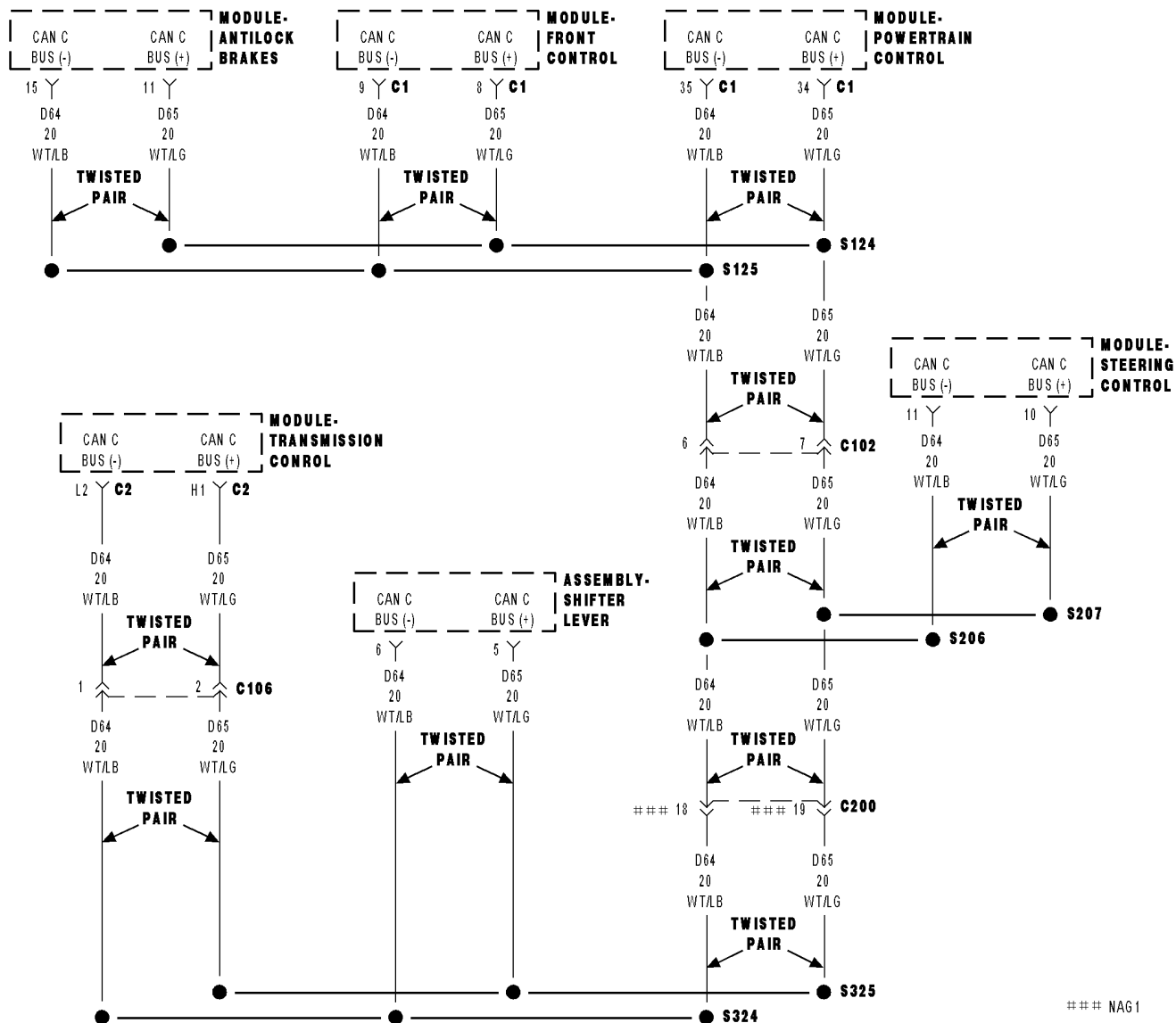
**Is any voltage present on this circuit?**

**Yes** >> Replace the Front Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

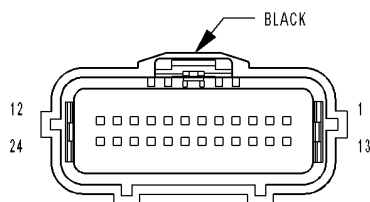
**No** >> Repair the (D54) CAN B Bus (-) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



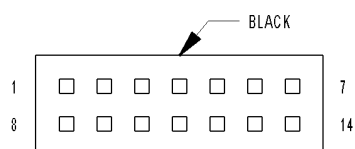
## U1106-CAN C SIGNAL MISSING



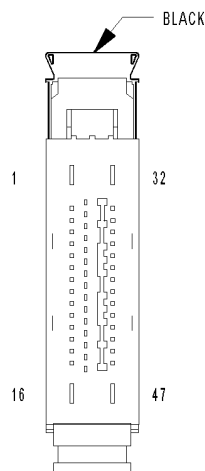
### NAG1



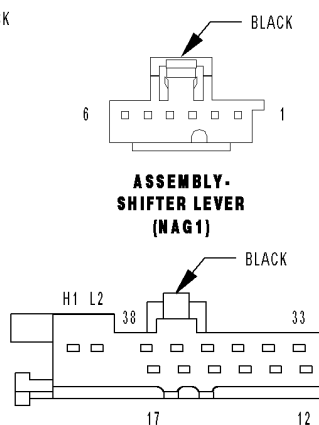
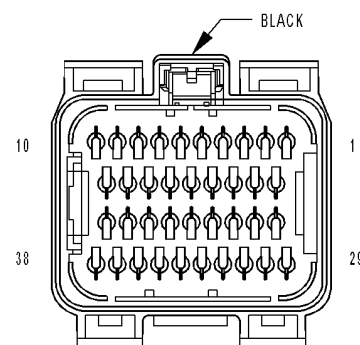
MODULE-FRONT CONTROL C1



MODULE-STEERING CONTROL



MODULE-ANTILOCK BRAKES

ASSEMBLY-SHIFTER LEVER (NAG1)  
MODULE-TRANSMISSION CONTROL C2 (NAG1)

MODULE-POWERTRAIN CONTROL C1

**U1106-CAN C SIGNAL MISSING (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The FCM detects a short in either CAN C Bus circuit.

Possible Causes
(D65) CAN C BUS (+) CIRCUIT SHORTED TO GROUND (D64) CAN C BUS (-) CIRCUIT SHORTED TO GROUND (D65) CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE (D64) CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE (D65) CAN C BUS (+) CIRCUIT SHORTED TO (D64) CAN C BUS (-) CIRCUIT ANTILOCK BRAKE MODULE POWERTRAIN CONTROL MODULE SHIFTER LEVER ASSEMBLY (NAG1 ONLY) TRANSMISSION CONTROL MODULE (NAG1 ONLY) STEERING CONTROL MODULE FRONT CONTROL MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U1106–CAN C SIGNAL MISSING as active?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

**U1106-CAN C SIGNAL MISSING (CONTINUED)****2. ANTILOCK BRAKE MODULE — INTERNAL SHORT**

Turn the ignition off.

Disconnect the Antilock Brake Module harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U1106–CAN C SIGNAL MISSING as active?**

**Yes** >> Go To 3

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Antilock Brake Module in accordance with the service information.  
Perform ABS VERIFICATION TEST — VER 1.

---

**3. POWERTRAIN CONTROL MODULE — INTERNAL SHORT**

Turn the ignition off.

Disconnect the Powertrain Control Module C1 harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U1106–CAN C SIGNAL MISSING as active?**

**Yes** >> Go To 4

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Powertrain Control Module in accordance with the service information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

---

**4. SHIFTER LEVER ASSEMBLY (NAG1 ONLY)— INTERNAL SHORT**

Turn the ignition off.

**Note: If the vehicle is not equipped with a NAG1 controller then skip this step.**

Disconnect the Shifter Lever Assembly harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U1106–CAN C SIGNAL MISSING as active?**

**Yes** >> Go To 5

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Shifter Lever Assembly in accordance with the service information.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---

**U1106-CAN C SIGNAL MISSING (CONTINUED)****5. TRANSMISSION CONTROL MODULE (NAG1 ONLY)— INTERNAL SHORT**

Turn the ignition off.

**Note:** If the vehicle is not equipped with a NAG1 controller then skip this step.

Disconnect the Transmission Control Module C2 harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U1106–CAN C SIGNAL MISSING as active?**

**Yes** >> Go To 6

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Transmission Control Module in accordance with the service information.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**6. STEERING CONTROL MODULE — INTERNAL SHORT**

Turn the ignition off.

Disconnect the Steering Control Module harness connector.

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display U1106–CAN C SIGNAL MISSING as active?**

**Yes** >> Go To 7

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Steering Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.

**7. (D65) CAN C BUS (+) CIRCUIT SHORTED TO VOLTAGE**

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

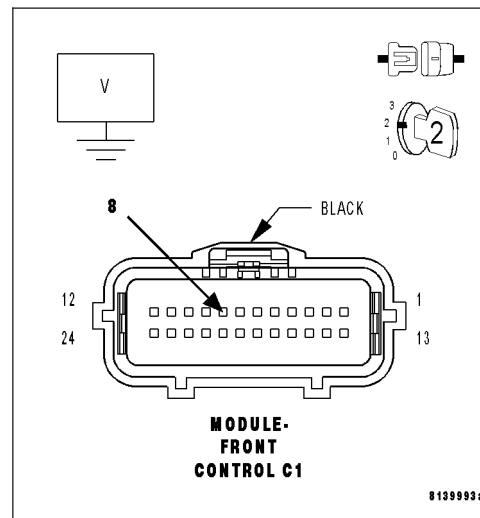
Turn the ignition on.

Measure the voltage between the (D65) CAN C Bus (+) circuit and ground.

**Is there any voltage present?**

**Yes** >> Repair the (D65) CAN C Bus (+) circuit for a short to voltage.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Go To 8



**U1106-CAN C SIGNAL MISSING (CONTINUED)****8. (D64) CAN C BUS (-) CIRCUIT SHORTED TO VOLTAGE**

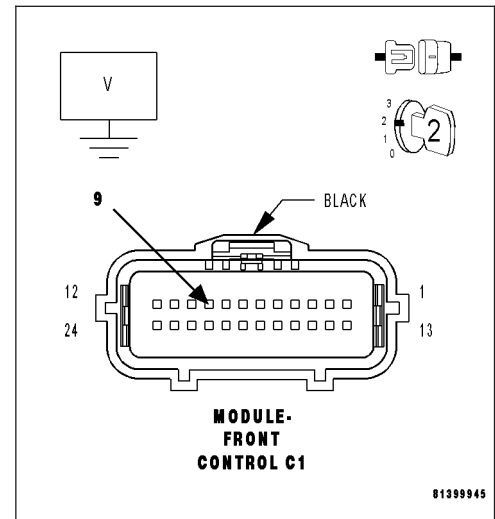
Measure the voltage between the (D64) CAN C Bus (-) circuit and ground.

**Is there any voltage present?**

**Yes** >> Repair the (D64) CAN C Bus (-) circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. (D65) CAN C BUS (+) CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

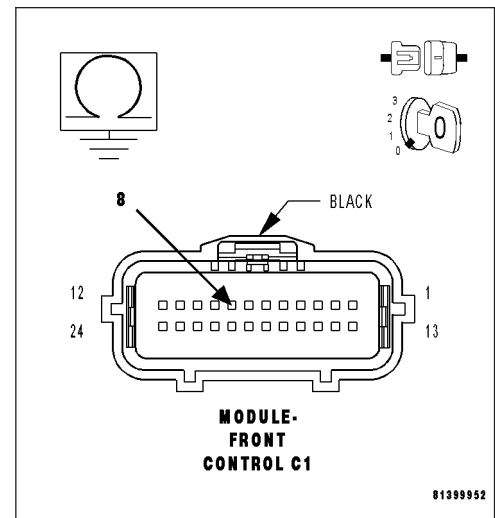
Measure the resistance between ground and the (D65) CAN C Bus (+) circuit.

**Is any resistance present?**

**Yes** >> Repair the (D65) CAN C Bus (+) circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.

**No** >> Go To 10



**U1106-CAN C SIGNAL MISSING (CONTINUED)****10. (D64) CAN C BUS (-) CIRCUIT SHORTED TO GROUND**

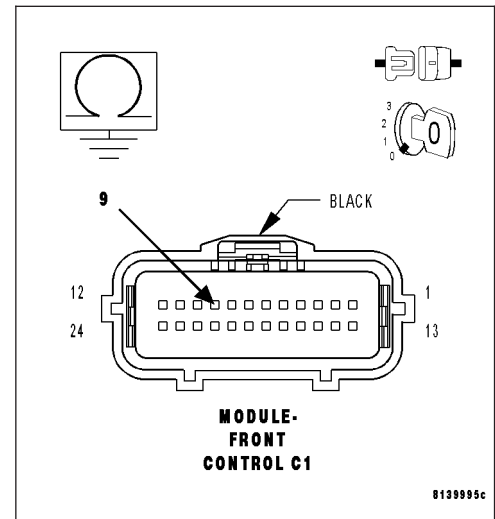
Measure the resistance between ground and the (D64) CAN C Bus (-) circuit.

**Is any resistance present?**

**Yes** >> Repair the (D64) CAN C Bus (-) circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.

**No** >> Go To 11

**11. (D65) CAN C BUS (+) CIRCUIT SHORTED TO (D64) CAN C BUS (-) CIRCUIT**

Measure the resistance between the (D65) CAN C Bus (+) circuit and the (D64) CAN C Bus (-) circuit.

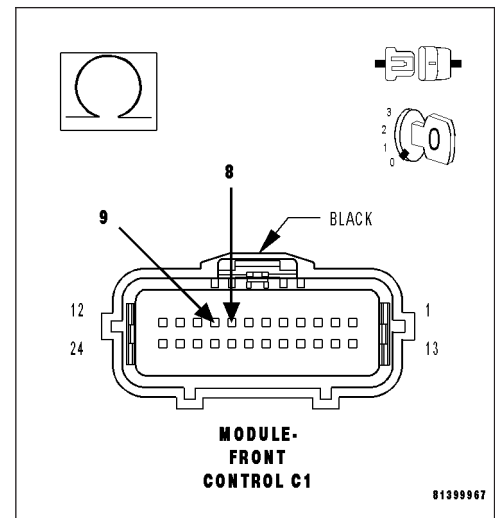
**Is any resistance present?**

**Yes** >> Repair the (D65) CAN C Bus (+) circuit for a short to the (D64) CAN C Bus (-) circuit.

Perform BODY VERIFICATION TEST - VER 1.

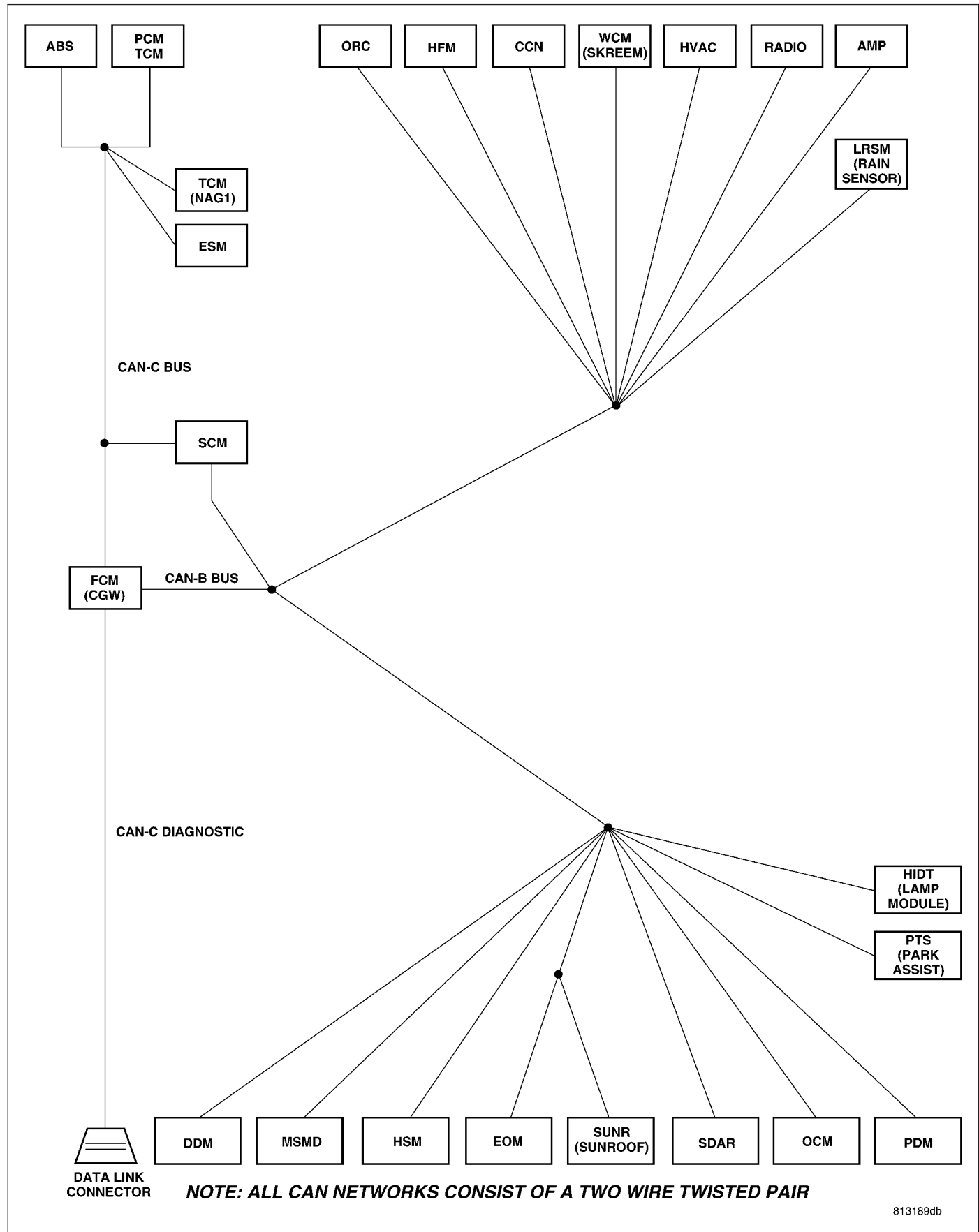
**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1.





## U1107-ECU IN SINGLE-WIRE MODE



**U1107-ECU IN SINGLE-WIRE MODE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The FCM detects an open, a short high, a short low or a short together in either of the CAN B Bus circuits.

Possible Causes
(D55) CAN B BUS (+) CIRCUIT SHORTED TO GROUND
(D54) CAN B BUS (-) CIRCUIT SHORTED TO GROUND
(D55) CAN B BUS (+) CIRCUIT SHORTED TO VOLTAGE
(D54) CAN B BUS (-) CIRCUIT SHORTED TO VOLTAGE
(D55) CAN B BUS (+) CIRCUIT SHORTED TO (D54) CAN B BUS (-) CIRCUIT
(D55) CAN B BUS (+) CIRCUIT OPEN
(D54) CAN B BUS (-) CIRCUIT OPEN
ANY CAN B BUS MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase FCM DTC's.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active FCM DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

**2. ANY CAN B BUS MODULE— INTERNAL FAULT**

Turn the ignition off.

With the scan tool, monitor the active FCM DTCs.

While monitoring the scan tool, disconnect each CAN B Bus module one at a time.

**Note: When performing the above step, turn the ignition off (wait one minute) before disconnecting any module. When the module is disconnected turn the ignition on.**

**Note: This is to determine if the fault is internal within a module.**

Check for this DTC to become active after disconnecting each CAN B Bus module the vehicle is equipped with.

**Note: If the DTC becomes stored when a particular CAN B Bus module is disconnected, that module is causing the DTC to set.**

**With all the CAN B Bus modules disconnected did the FCM still set this DTC as active?**

**Yes** >> Go To 3

**No** >> Replace the module that when disconnected the DTC became stored.  
Perform BODY VERIFICATION TEST - VER 1.

**U1107-ECU IN SINGLE-WIRE MODE (CONTINUED)****3. (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

**Note: Ensure each CAN B Bus module is disconnected at this time.**

Turn the ignition on.

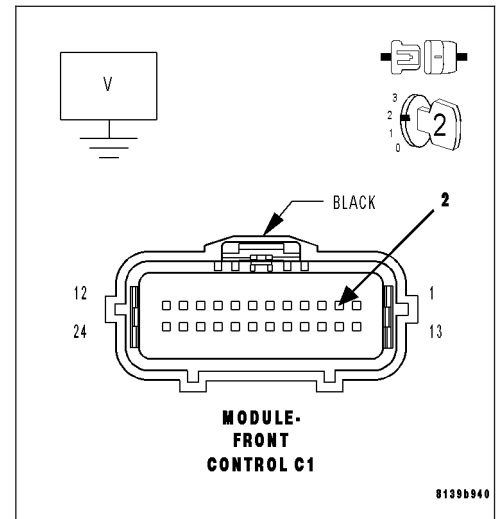
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (D55) CAN B Bus (+) circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1.

**No** >> Go To 4

**4. (D54) CAN B BUS (-) CIRCUIT FOR A SHORT TO VOLTAGE**

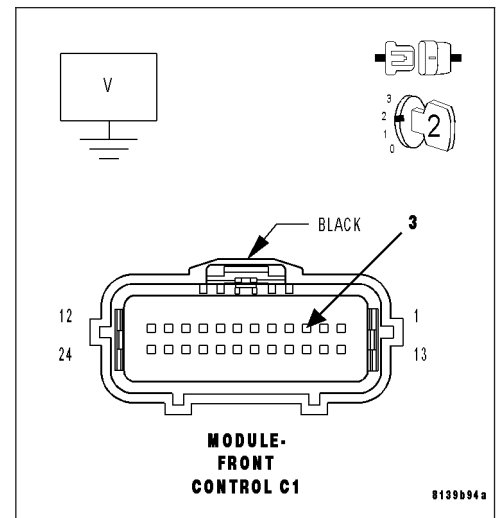
**Note: Ensure each CAN B Bus module is disconnected at this time.**

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (D54) CAN B Bus (-) circuit for a short to voltage.

**No** >> Go To 5



**U1107-ECU IN SINGLE-WIRE MODE (CONTINUED)****5. (D55) CAN B BUS (+) CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

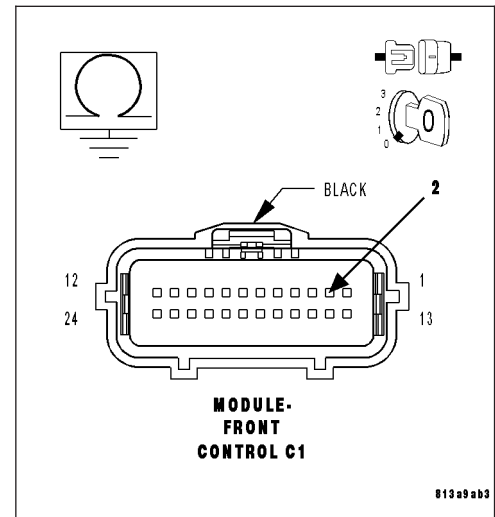
**Note:** Ensure each CAN B Bus module is disconnected at this time.

Measure the resistance between ground and the (D55) CAN B Bus (+) circuit.

**Is the resistance above 1000.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the (D55) CAN B Bus (+) circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.

**6. (D54) CAN B BUS (-) CIRCUIT FOR A SHORT TO GROUND**

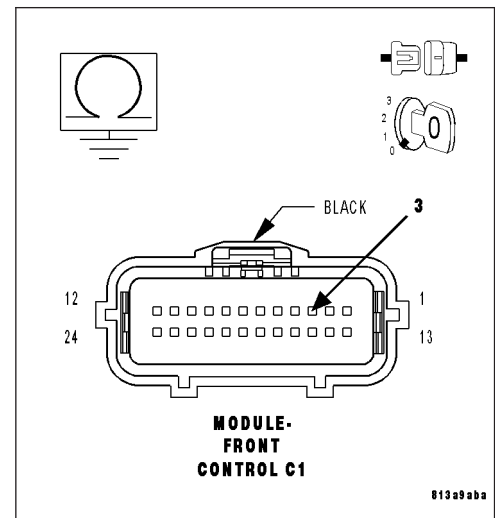
**Note:** Ensure each CAN B Bus module is disconnected at this time.

Measure the resistance between ground and the (D54) CAN B Bus (-) circuit.

**Is the resistance above 1000.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the (D54) CAN B Bus (-) circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.



**U1107-ECU IN SINGLE-WIRE MODE (CONTINUED)****7. (D55) CAN B BUS (+) CIRCUIT SHORTED TO THE (D54) CAN B BUS (-) CIRCUIT**

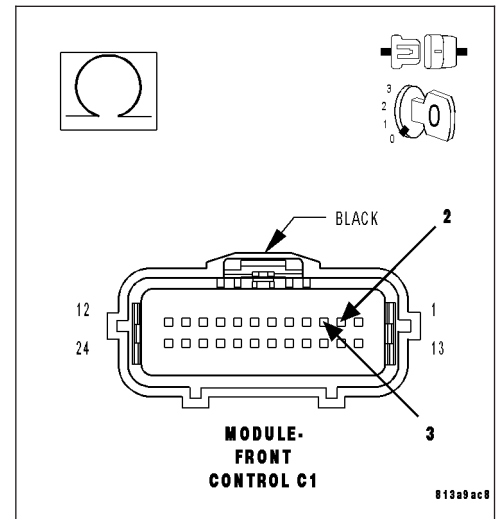
Measure the resistance between the (D55) CAN B Bus (+) circuit and (D54) CAN B Bus (-) circuit.

**Note:** Ensure each CAN B Bus module is disconnected at this time.

**Is any resistance present?**

**Yes** >> Repair the (D55) CAN B Bus (+) circuit for a short to the (D54) CAN B Bus (-) circuit.  
Perform BODY VERIFICATION TEST - VER 1

**No** >> Go To 8

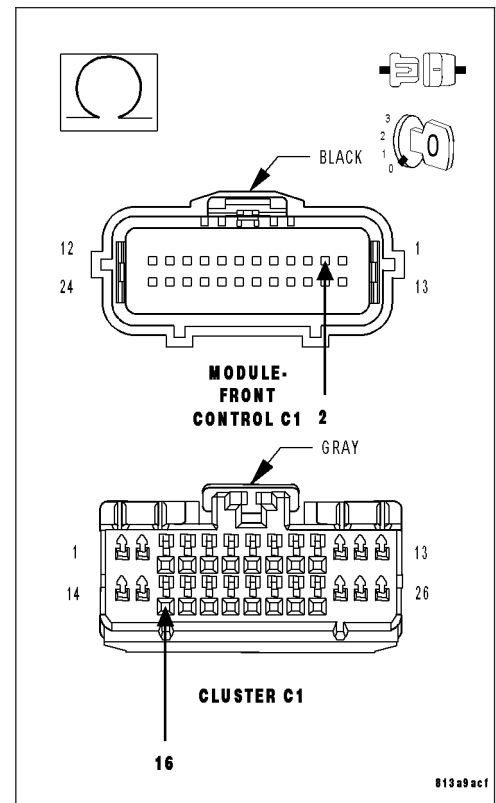
**8. (D55) CAN B BUS (+) CIRCUIT OPEN**

Measure the resistance of the (D55) CAN B Bus (+) circuit between the FCM connector and the Cluster connector.

**Is the resistance above 10.0 ohms?**

**Yes** >> Repair the (D55) CAN B Bus (+) circuit for an open or high resistance.  
Perform BODY VERIFICATION TEST - VER 1

**No** >> Go To 9



**U1107-ECU IN SINGLE-WIRE MODE (CONTINUED)****9. (D54) CAN B BUS (-) CIRCUIT OPEN**

Measure the resistance of the (D54) CAN B Bus (-) circuit between the FCM connector and the Cluster connector.

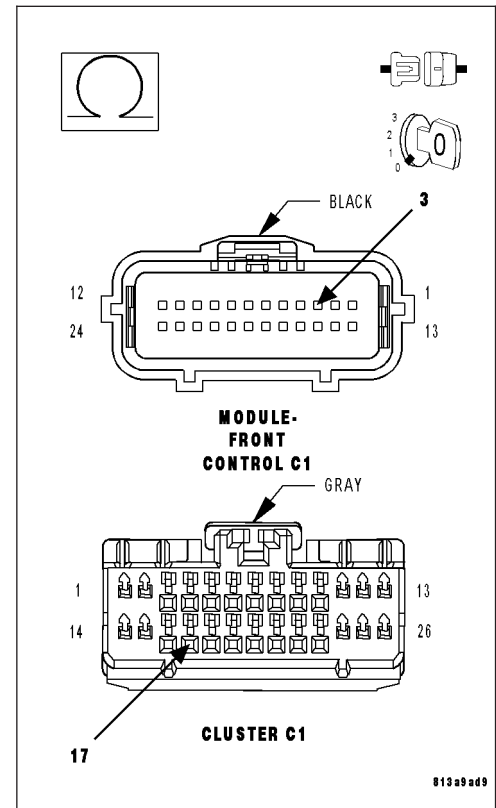
**Is the resistance above 10.0 ohms?**

**Yes** >> Repair the (D54) CAN B Bus (-) circuit for an open or high resistance.

Perform BODY VERIFICATION TEST - VER 1

**No** >> Replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1



**U1108-ADDITIONAL CAN B ECU DETECTED**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously.
- **Set Condition:**  
The Front Control Module detects an additional CAN B module and requires a re-configuration.

Possible Causes
ADDITIONAL MODULE ADDED/REMOVED FROM THE CAN B BUS NETWORK

**Diagnostic Test****1. RECONFIGURE THE FRONT CONTROL MODULE**

Turn the ignition on.

With the scan tool, select network view and press the gateway button. This will list the CAN modules on the vehicle. Read and record the listed modules.

With the scan tool, select FCM, miscellaneous functions then add/remove ECUs.

With the scan tool, add or remove the module that was not configured in the FCM.

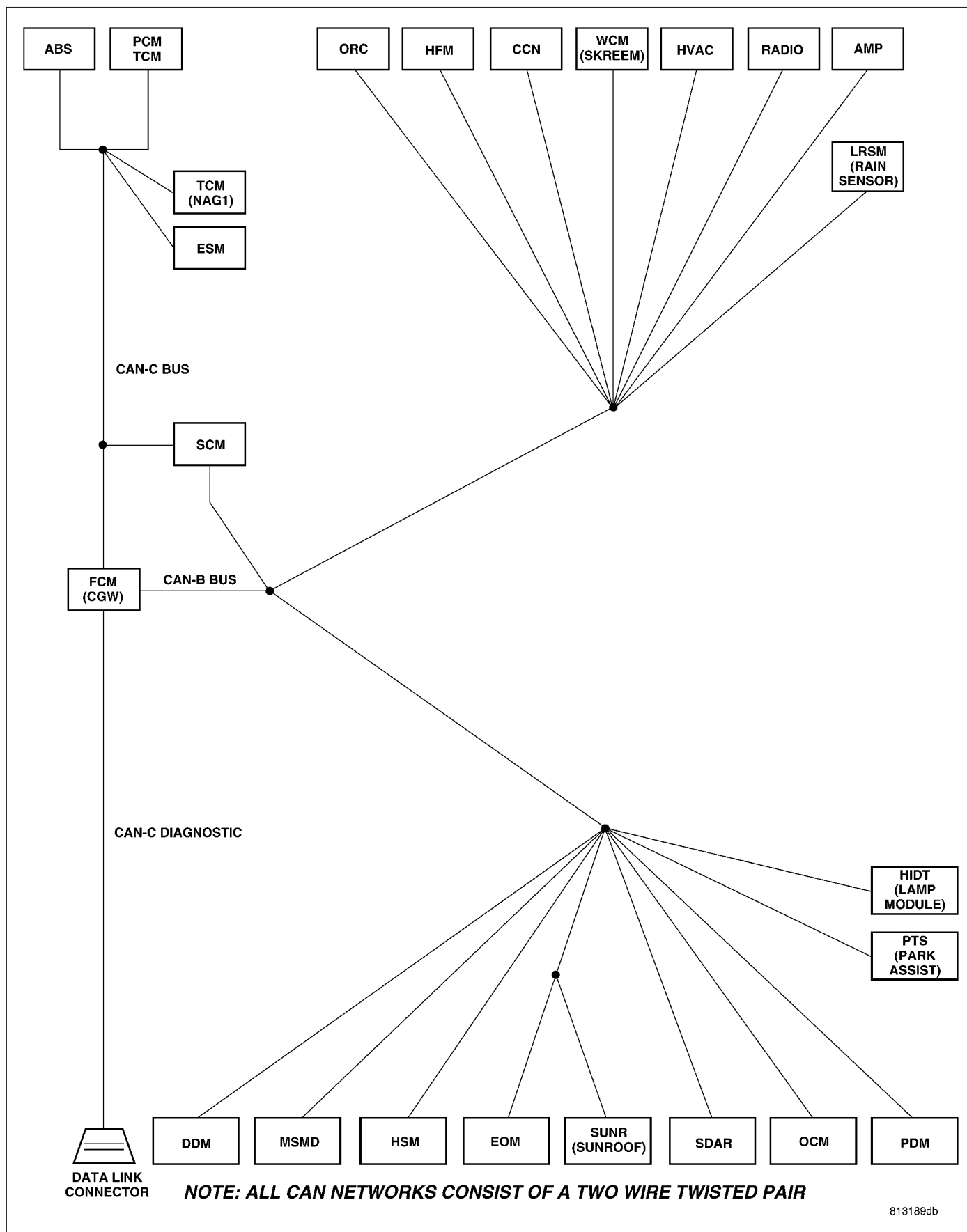
With the scan tool, erase DTC's.

Cycle the ignition from on to off 3 times and read the active FCM DTC's.

**Does the scan tool display this DTC as active?**

- Yes** >> Retest system and attempt to reconfigure the FCM.  
Perform BODY VERIFICATION TEST – VER 1.
- No** >> Repair is complete.  
Perform BODY VERIFICATION TEST – VER 1.
-

## U110A-LOST COMMUNICATION WITH SCCM - CAN C





**U110A-LOST COMMUNICATION WITH SCCM - CAN C (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

- With the ignition on
- Battery voltage between 10 and 16 volts
- IOD fuse installed
- FCM is configured correctly

- **Set Condition:**

Bus messages not received from the SCM (CAN C) for approximately 200ms.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY STEERING CONTROL MODULE STEERING CONTROL MODULE POWER AND GROUND MODULE THAT SET THIS DTC

**Diagnostic Test****1. VERIFY DTC IS ACTIVE**

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read active DTCs.

**Is this DTC active?**

**Yes** >> Go To 2

**No** >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.  
Perform BODY VERIFICATION TEST – VER 1.

---

**2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS**

With the scan tool, read active DTCs from all modules.

**Note:** Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

**Does the scan tool display any active DTCs to the conditions listed above?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents for a complete list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

---

**U110A-LOST COMMUNICATION WITH SCCM - CAN C (CONTINUED)****3. VERIFY THAT THE SCM IS ACTIVE ON THE BUS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

Verify that the SCM is active on the bus.

**Is the SCM active on the bus?**

**Yes** >> Go To 4

**No** >> Refer to the Table of Contents located in this section for a no response test procedure.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS**

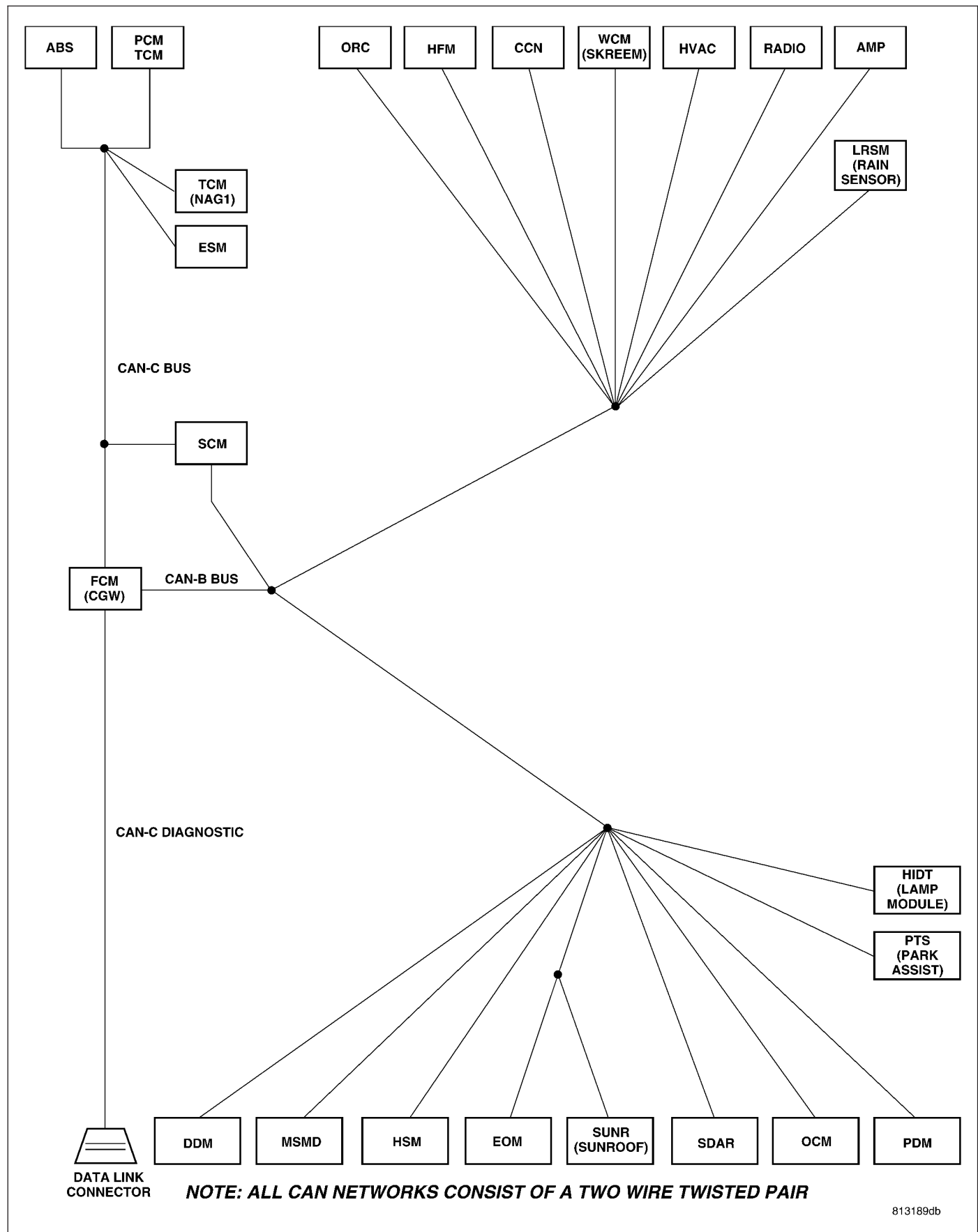
With the scan tool, select Network Diagnostics.

**Is there more than one module with active DTCs “Logged Against” the SCM?**

**Yes** >> Replace/update the Steering Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace/update the module that set this DTC in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.

---

**\*STORED LOST COMMUNICATION DTCS**

**\*STORED LOST COMMUNICATION DTCS (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**  
Bus messages not received for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES FCM NOT CONFIGURED CORRECTLY POWER OR GROUND FROM THE REPORTING MODULE MODULE THAT SET THIS DTC PREVIOUS SERVICE PERFORMED WITHIN THE LAST 100 KEY CYCLES (FUSE/RELAYS REMOVED, WIRING SERVICE, BATTERY DISCONNECT) LOW BATTERY/JUMP START CONDITION IOD FUSE WAS REMOVED DURING SHIPPING CHECK FOR RELATED TSBS

**Diagnostic Test****1. VERIFY DTC IS STORED**

**Note:** Stored faults may indicate a customer perceived intermittent condition.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.  
With the scan tool, read stored DTCs.

**Is this DTC stored?**

**Yes** >> Go To 2

**No** >> Diagnose the active DTC. Refer to the table of contents for a list of the symptoms.  
Perform BODY VERIFICATION TEST – VER 1.

**2. CHECK THE ENVIRONMENTAL DATA**

With the scan tool, read the loss of communication environmental data.

**Does the loss of communication environmental odometer data match up to any of the previous service procedures listed in the possible causes or are there any stored CAN B or C hardware electrical, battery, ignition voltage, VIN missing/mismatch, FCM configuration DTCs present with match environmental data?**

**Yes** >> These DTCs may have been the result of other service procedures performed. Clear DTCs.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

**\*STORED LOST COMMUNICATION DTCS (CONTINUED)****3. VERIFY INTERMITTENT LOST COMMUNICATION DTC-WIRING CONCERNS**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

**Is there more than one ECU with stored DTCS “Logged Against” the module and one or more lost communication DTCS stored in the offending module?**

**Yes** >> Verify if the vehicle was recently in for this type of service. Otherwise, visually inspect the related wiring harness for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals. Repair as necessary.

**No** >> Go To 4

---

**4. VERIFY INTERMITTENT LOST COMMUNICATION DTC-OFFENDING MODULE**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

**Is there more than one ECU with stored DTCS “Logged Against” the module and NO lost communication DTCS stored in the offending module?**

**Yes** >> Check for TSB related to this offending module.

**No** >> Go To 5

---

**5. VERIFY INTERMITTENT LOST COMMUNICATION DTC-REPORTING MODULE**

Turn the ignition on.

With the scan tool, select Network Diagnostics.

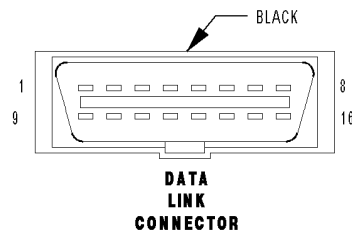
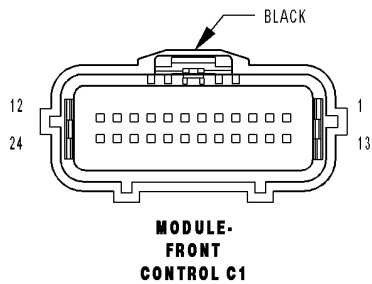
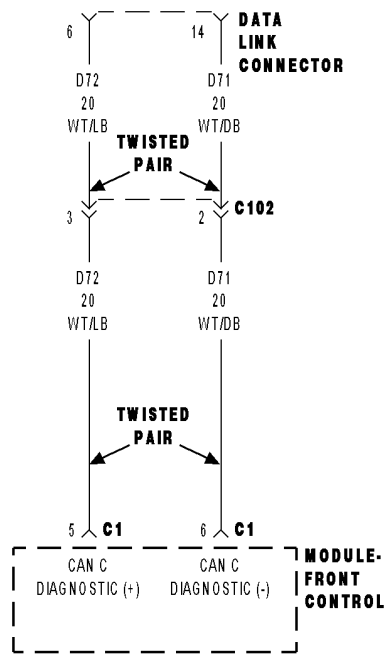
**Is there ONLY ONE ECU with stored DTCS “Logged Against” the module?**

**Yes** >> Check for TSB related to the module that set this DTC.

**No** >> Verify if the vehicle was recently in for this type of service. Otherwise, visually inspect the related wiring harness for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals. Repair as necessary.

---

**\*CAN C DIAGNOSTIC (+) AND/OR CAN C DIAGNOSTIC (-) CIRCUITS HIGH**



**\*CAN C DIAGNOSTIC (+) AND/OR CAN C DIAGNOSTIC (-) CIRCUITS HIGH (CONTINUED)**

For a complete wiring diagram Refer to **Section 8W**.

- **When Monitored:**  
When the scan tool queries the FCM.
- **Set Condition:**  
The scan tool has detected a shorted high condition on either or both CAN C Diagnostic circuits.

Possible Causes
(D72) CAN C DIAGNOSTIC (+) CIRCUIT SHORTED TO VOLTAGE (D71) CAN C DIAGNOSTIC (-) CIRCUIT SHORTED TO VOLTAGE FRONT CONTROL MODULE

**Diagnostic Test**

**1. CHECK THE STATUS OF THE ERROR MESSAGE**

**Note:** Ensure the vehicle being tested is a **CAN BUS VEHICLE**. If not, false error messages may be displayed.

**Note:** Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

**Does the scan tool display this same error message?**

**Yes**    >> Go To 2

**No**    >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

**2. CAN C DIAGNOSTIC CIRCUITS SHORTED TO VOLTAGE**

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

Disconnect the scan tool from the DLC.

Turn the ignition on.

Measure the voltage of the CAN C Diagnostic circuits.

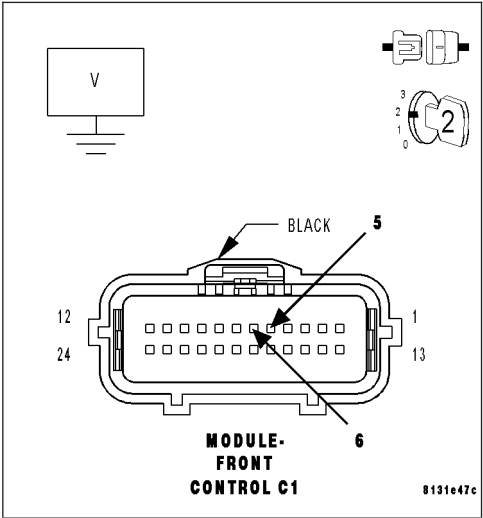
**Is the voltage above 6.0 volts for either circuit?**

**Yes**    >> Repair the CAN C Diagnostic circuits for a short to voltage.

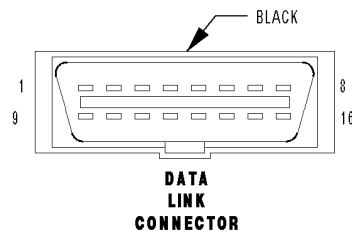
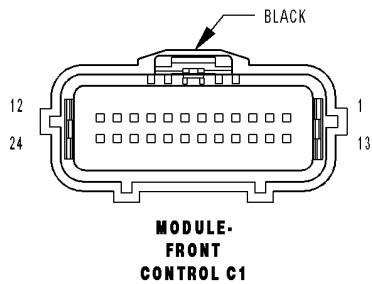
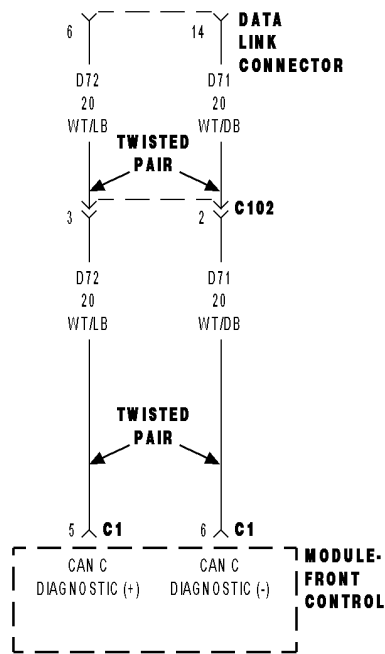
Perform BODY VERIFICATION TEST - VER 1.

**No**    >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1.



**\*CAN C DIAGNOSTIC (+) CIRCUIT LOW**





**\*CAN C DIAGNOSTIC (+) CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram Refer to **Section 8W**.

- **When Monitored:**  
When the scan tool queries the FCM.
- **Set Condition:**  
The scan tool has detected a shorted low condition on the (D72) CAN C Diagnostic (+) circuit.

Possible Causes
(D72) CAN C DIAGNOSTIC (+) CIRCUIT SHORTED TO GROUND FRONT CONTROL MODULE

**Diagnostic Test**

**1. CHECK THE STATUS OF THE ERROR MESSAGE**

**Note:** Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

**Note:** Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

**Does the scan tool display this same error message?**

- Yes**    >> Go To 2
- No**     >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

**2. (D72) CAN C DIAGNOSTIC (+) CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

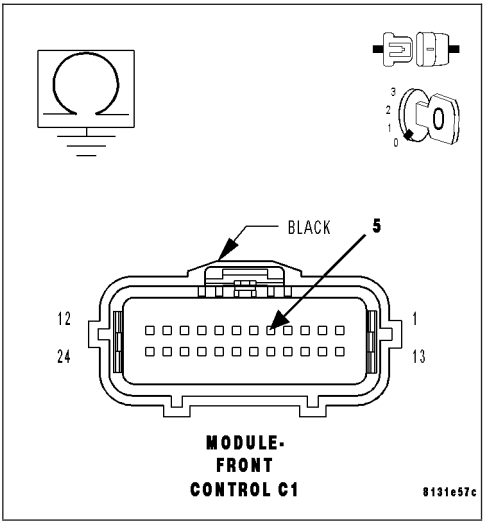
Disconnect the Front Control Module C1 harness connector.

Disconnect the scan tool from the DLC.

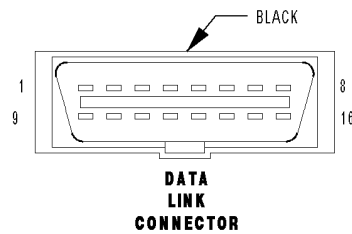
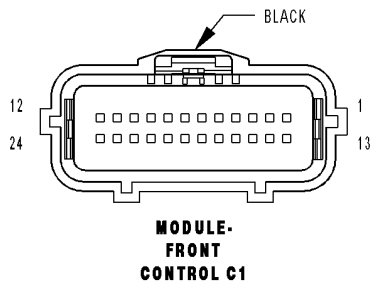
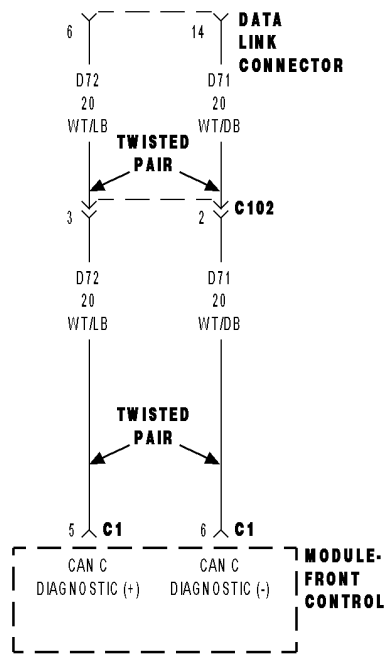
Measure the resistance between ground and the (D72) CAN C Diagnostic (+) circuit.

**Is the resistance below 100.0 ohms?**

- Yes**    >> Repair the (D72) CAN C Diagnostic (+) circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.
- No**     >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.



**\*CAN C DIAGNOSTIC (-) CIRCUIT LOW**



**\*CAN C DIAGNOSTIC (-) CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When the scan tool queries the FCM.
- **Set Condition:**  
The scan tool has detected a shorted low condition on the (D71) CAN C Diagnostic (-) circuit.

Possible Causes
(D71) CAN C DIAGNOSTIC (-) CIRCUIT SHORTED TO GROUND FRONT CONTROL MODULE

**Diagnostic Test**

**1. CHECK THE STATUS OF THE ERROR MESSAGE**

**Note:** Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

**Note:** Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

**Does the scan tool display this same error message?**

- Yes**    >> Go To 2
- No**    >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

**2. (D71) CAN C DIAGNOSTIC (-) CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

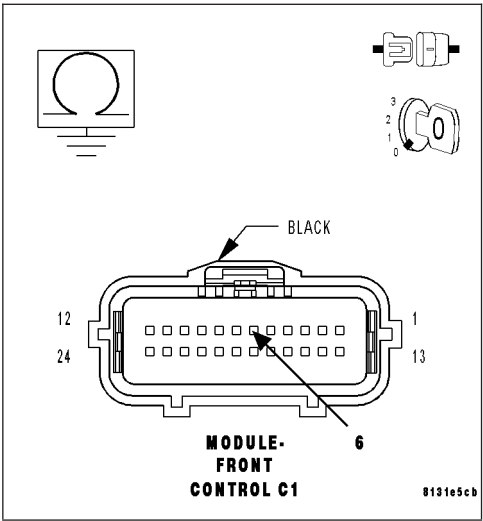
Disconnect the Front Control Module C1 harness connector.

Disconnect the scan tool from the DLC.

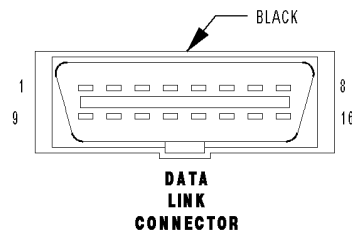
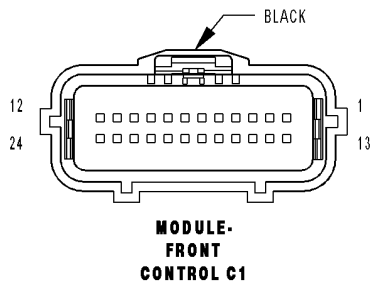
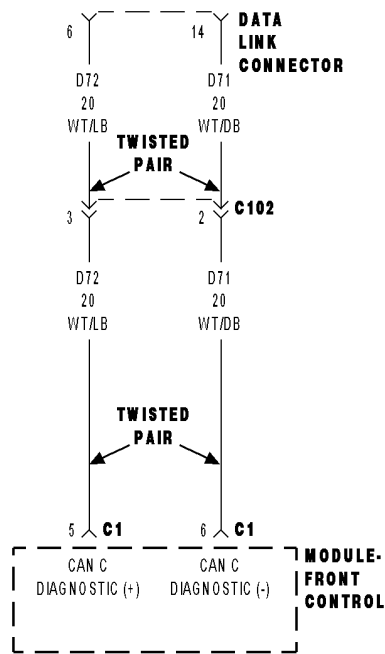
Measure the resistance between ground and the (D71) CAN C Diagnostic (-) circuit.

**Is the resistance below 100.0 ohms?**

- Yes**    >> Repair the (D71) CAN C Diagnostic (-) circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.
- No**    >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.



# \*CAN C DIAGNOSTIC (+) SHORTED TO CAN C DIAGNOSTIC (-)



**\*CAN C DIAGNOSTIC (+) SHORTED TO CAN C DIAGNOSTIC (-) (CONTINUED)**

For a complete wiring diagram Refer to **Section 8W**.

- **When Monitored:**  
When the scan tool queries the FCM.
- **Set Condition:**  
The scan tool has detected a shorted together condition on the CAN C Diagnostic circuits.

Possible Causes
(D72) CAN C DIAGNOSTIC (+) CIRCUIT SHORTED TO (D71) CAN C DIAGNOSTIC (-) CIRCUIT FRONT CONTROL MODULE

**Diagnostic Test**

**1. CHECK THE STATUS OF THE ERROR MESSAGE**

**Note:** Ensure the vehicle being tested is a **CAN BUS VEHICLE**. If not, false error messages may be displayed.

**Note:** Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

**Does the scan tool display this same error message?**

- Yes**    >> Go To 2
- No**    >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

**2. (D72) CAN C DIAGNOSTIC (+) CIRCUIT SHORTED TO (D71) CAN C DIAGNOSTIC (-) CIRCUIT**

Turn the ignition off.

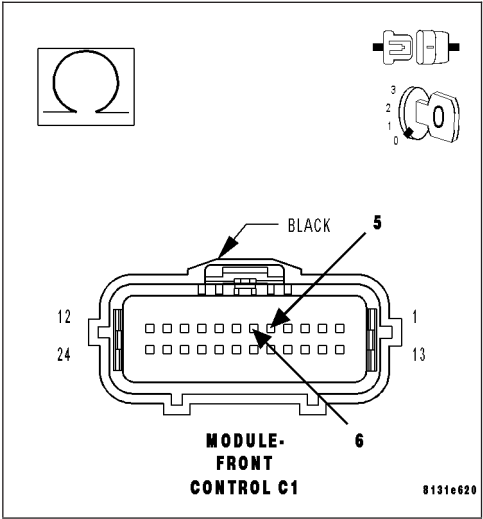
Disconnect the Front Control Module C1 harness connector.

Disconnect the scan tool from the DLC.

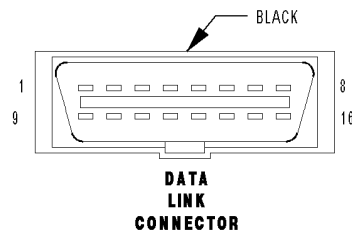
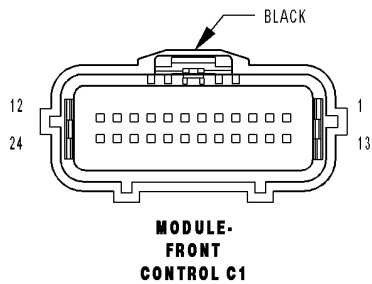
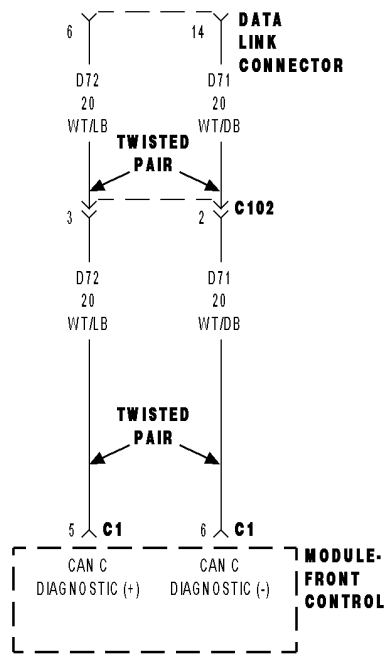
Measure the resistance between the (D72) CAN C Diagnostic (+) circuit and the (D71) CAN C Diagnostic (-) circuit.

**Is the resistance below 100.0 ohms?**

- Yes**    >> Repair the (D72) CAN C Diagnostic (+) circuit for a short to the (D71) CAN C Diagnostic (-) circuit.  
Perform BODY VERIFICATION TEST - VER 1.
- No**    >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.



# \*CAN C DIAGNOSTIC (-) CIRCUIT OPEN



**\*CAN C DIAGNOSTIC (-) CIRCUIT OPEN (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When the scan tool queries the FCM.
- **Set Condition:**  
The scan tool has detected an open condition on the (D71) CAN C Diagnostic (-) circuit.

Possible Causes
(D71) CAN C DIAGNOSTIC (-) CIRCUIT OPEN FRONT CONTROL MODULE

**Diagnostic Test**

**1. CHECK THE STATUS OF THE ERROR MESSAGE**

**Note:** Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

**Note:** Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

**Does the scan tool display this same error message?**

**Yes**     >> Go To 2

**No**     >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

**\*CAN C DIAGNOSTIC (-) CIRCUIT OPEN (CONTINUED)****2. (D71) CAN C DIAGNOSTIC (-) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

Disconnect the scan tool from the DLC.

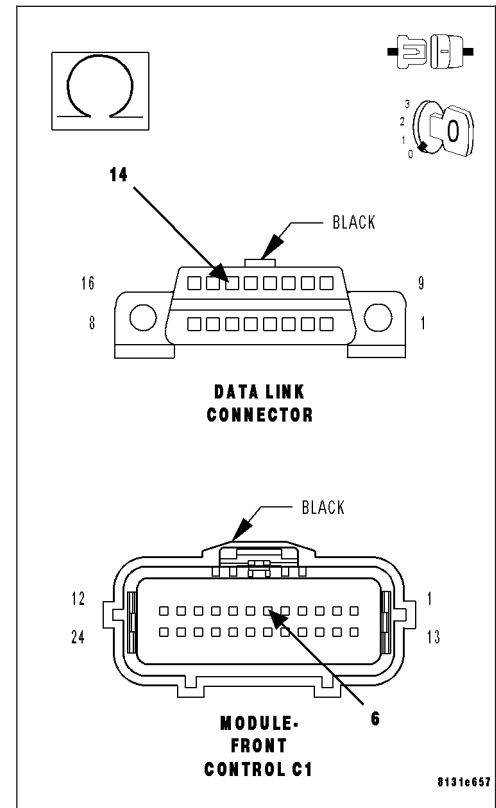
Measure the resistance of the (D71) CAN C Diagnostic (-) circuit between the FCM connector and the DLC.

**Is the resistance below 5.0 ohms?**

**Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.

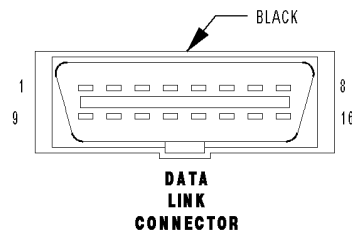
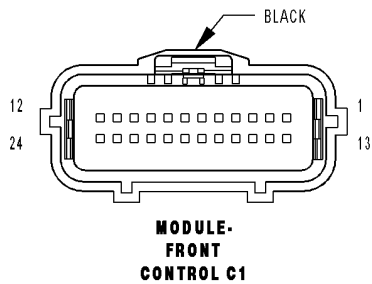
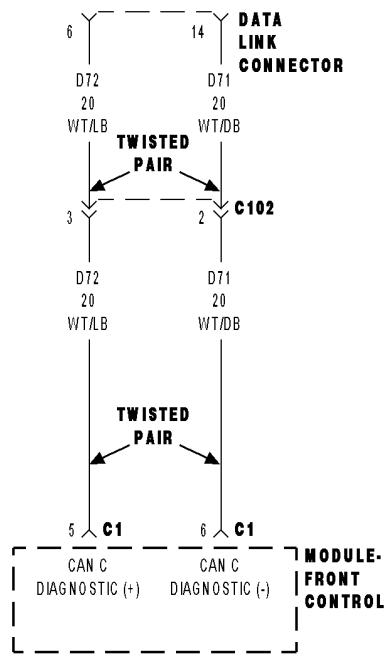
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D71) CAN C Diagnostic (-) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.





# \*CAN C DIAGNOSTIC (+) CIRCUIT OPEN



**\*CAN C DIAGNOSTIC (+) CIRCUIT OPEN (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When the scan tool queries the FCM.
- **Set Condition:**  
The scan tool has detected an open condition on the (D72) CAN C Diagnostic (+) circuit.

Possible Causes
(D72) CAN C DIAGNOSTIC (+) CIRCUIT OPEN FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK THE STATUS OF THE ERROR MESSAGE**

**Note:** Ensure the vehicle being tested is a CAN BUS VEHICLE. If not, false error messages may be displayed.

**Note:** Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

**Does the scan tool display this same error message?**

**Yes** >> Go To 2

**No** >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

**\*CAN C DIAGNOSTIC (+) CIRCUIT OPEN (CONTINUED)****2. (D72) CAN C DIAGNOSTIC (+) CIRCUIT OPEN**

Turn the ignition off.

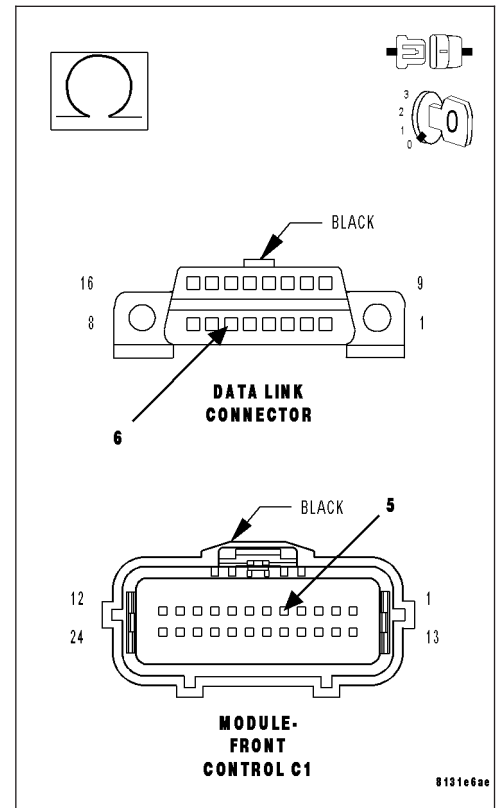
Disconnect the Front Control Module C1 harness connector.

Disconnect the scan tool from the DLC.

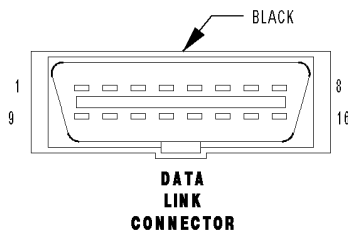
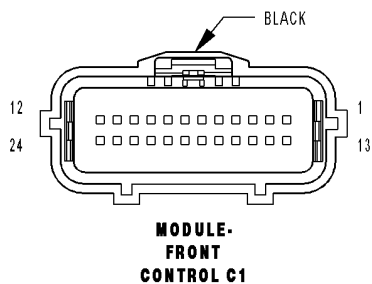
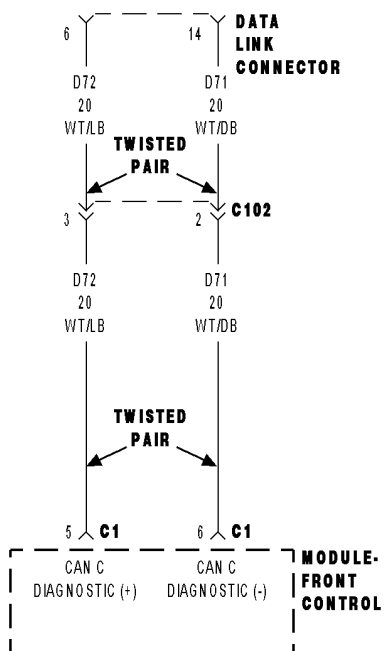
Measure the resistance of the (D72) CAN C Diagnostic (+) circuit between the FCM connector and the DLC.

**Is the resistance below 5.0 ohms?**

- Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.
- No** >> Repair the (D72) CAN C Diagnostic (+) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.



**\*BOTH CAN C DIAGNOSTIC (+) AND CAN C DIAGNOSTIC (-) CIRCUITS OPEN**



**\*BOTH CAN C DIAGNOSTIC (+) AND CAN C DIAGNOSTIC (-) CIRCUITS OPEN (CONTINUED)**

For a complete wiring diagram Refer to **Section 8W**.

- **When Monitored:**  
When the scan tool queries the FCM.
- **Set Condition:**  
The scan tool has detected an open condition on both CAN C Diagnostic circuits.

Possible Causes
(D72) CAN C DIAGNOSTIC (+) CIRCUIT OPEN (D71) CAN C DIAGNOSTIC (-) CIRCUIT OPEN FRONT CONTROL MODULE

**Diagnostic Test**

**1. CHECK THE STATUS OF THE ERROR MESSAGE**

**Note:** Ensure the vehicle being tested is a **CAN BUS VEHICLE**. If not, false error messages may be displayed.

**Note:** Ensure the scan tool is updated to the latest software.

With the scan tool, record the error message.

Disconnect the scan tool from the DLC.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

**Does the scan tool display this same error message?**

**Yes**    >> Go To 2

**No**    >> The conditions that caused this error message to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

---

**\*BOTH CAN C DIAGNOSTIC (+) AND CAN C DIAGNOSTIC (-) CIRCUITS OPEN (CONTINUED)****2. (D72) CAN C DIAGNOSTIC (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Front Control Module C1 harness connector.

Disconnect the scan tool from the DLC.

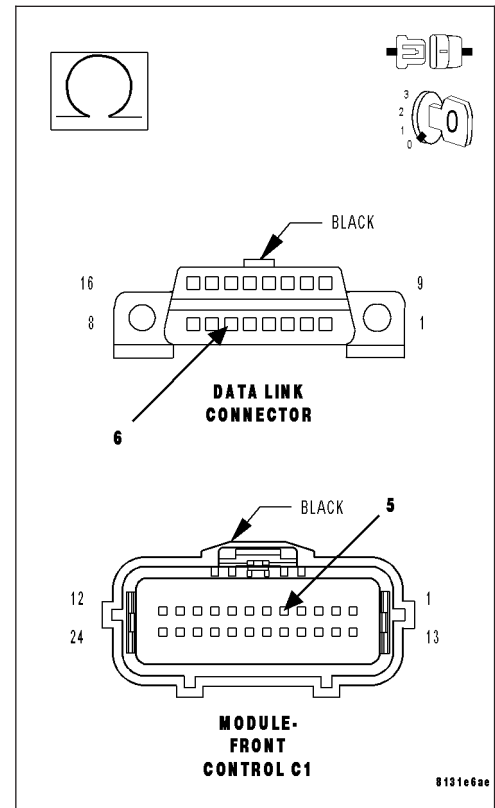
**Note: Check the connectors at both the DLC and the FCM.**

Measure the resistance of the (D72) CAN C Diagnostic (+) circuit between the FCM connector and the DLC.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (D72) CAN C Diagnostic (+) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.

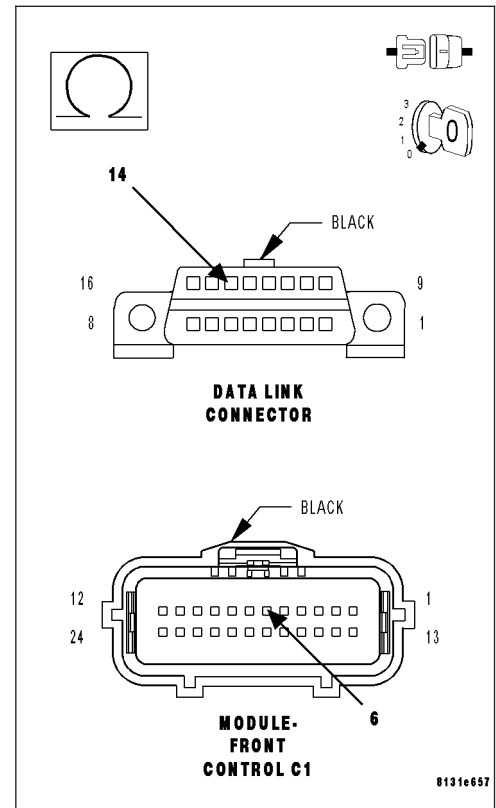


**\*BOTH CAN C DIAGNOSTIC (+) AND CAN C DIAGNOSTIC (-) CIRCUITS OPEN (CONTINUED)****3. (D71) CAN C DIAGNOSTIC (-) CIRCUIT OPEN**

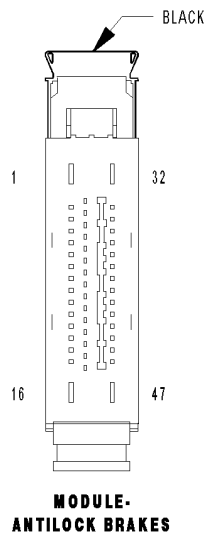
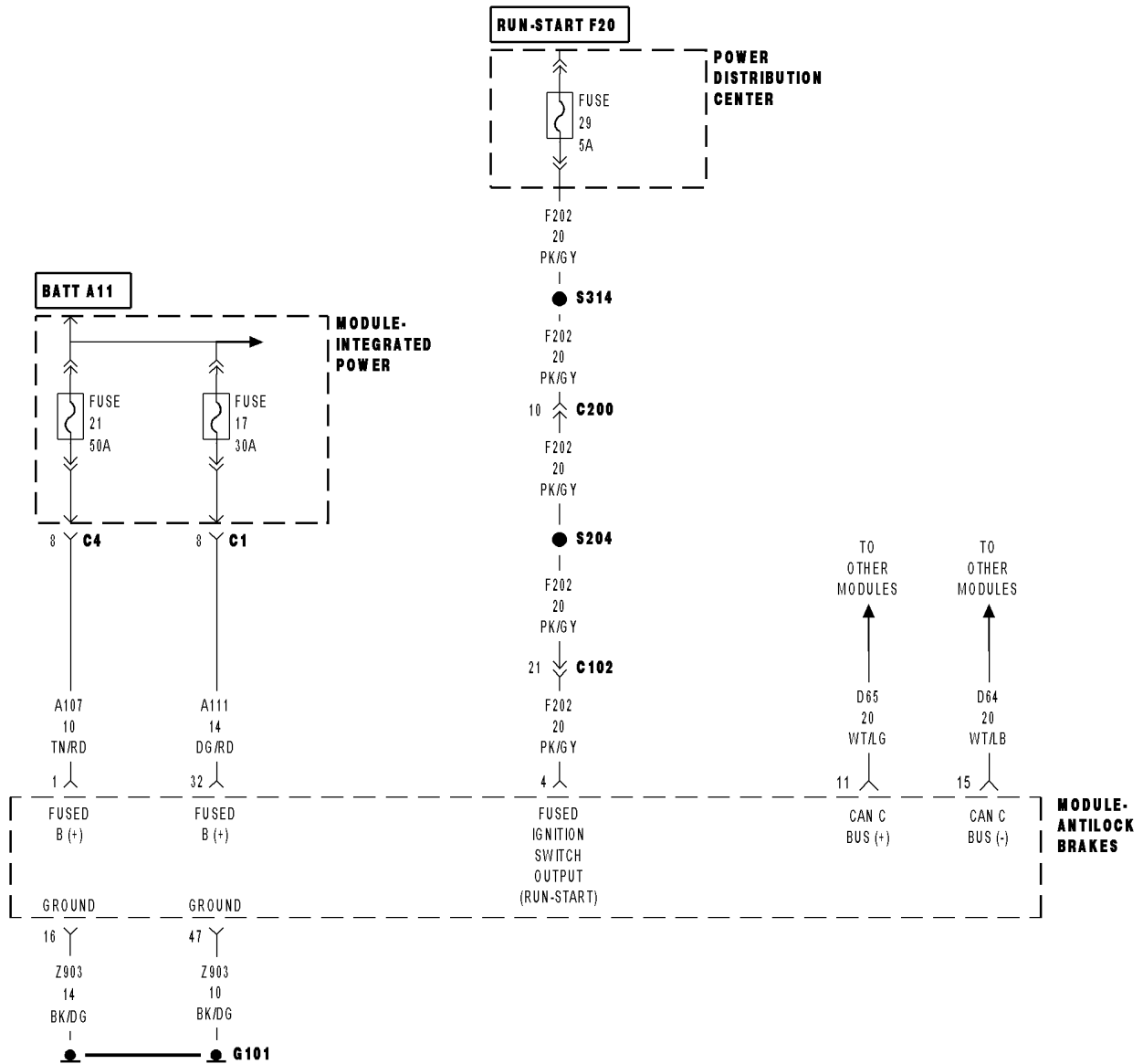
Measure the resistance of the (D71) CAN C Diagnostic (-) circuit between the FCM connector and the DLC.

**Is the resistance below 5.0 ohms?**

- Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Front Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.
- No** >> Repair the (D71) CAN C Diagnostic (-) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.



# \*NO RESPONSE FROM ABS





**\*NO RESPONSE FROM ABS (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

Possible Causes
(A107) (A111) FUSED B(+) CIRCUIT OPEN OR SHORTED (Z903) GROUND CIRCUIT OPEN (F202) FUSED IGNITION SW OUTPUT CIRCUIT OPEN OR SHORTED (D65) CAN C BUS (+) CIRCUIT OPEN (D64) CAN C BUS (-) CIRCUIT OPEN ANTILOCK BRAKE MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Note:** Check the FCM for any active CAN C hardware DTCs, perform DTC before proceeding.

**Does the scan tool display a red X next to the module?**

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

**\*NO RESPONSE FROM ABS (CONTINUED)****2. (A107) (A111) FUSED B(+) CIRCUIT OPEN OR SHORTED**

Turn the ignition off.

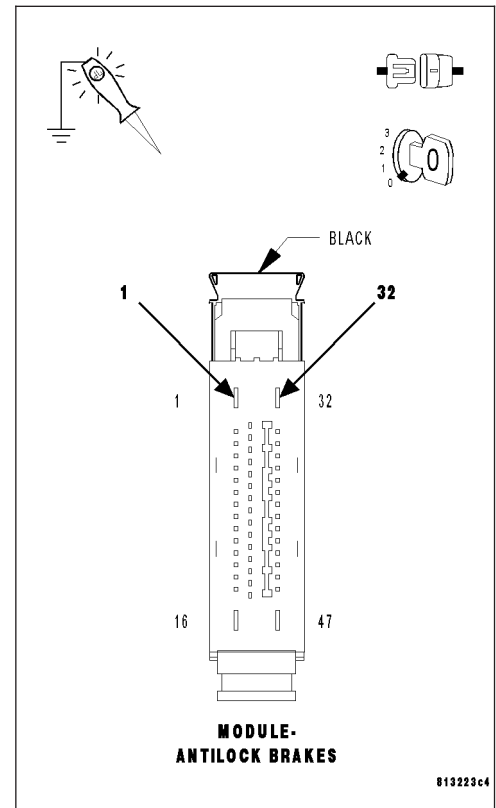
Disconnect the Antilock Brake Module harness connector.

Using a 12-volt test light connected to ground, check each (A107) and (A111) Fused B(+) circuit.

**Does the test light illuminate brightly for each circuit?**

**Yes** >> Go To 3

**No** >> Repair the Fused B(+) circuit for an open or short.  
Perform ABS VERIFICATION TEST - VER 1.



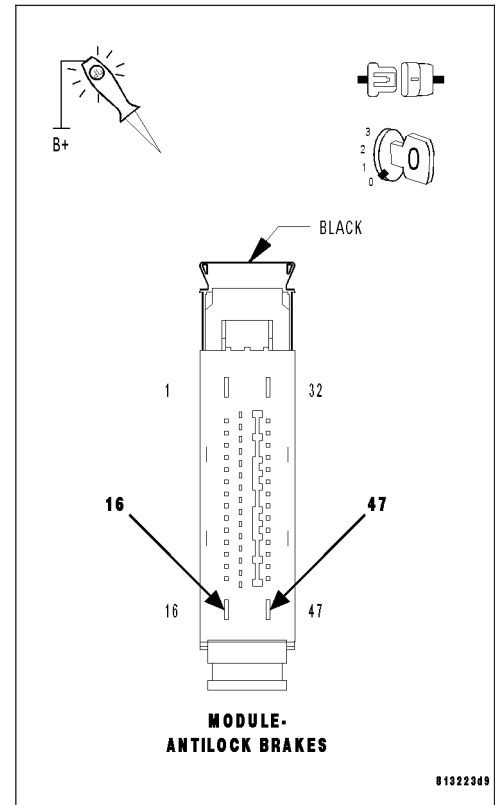
**\*NO RESPONSE FROM ABS (CONTINUED)****3. (Z903) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check the (Z903) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z903) ground circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

**4. (F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED**

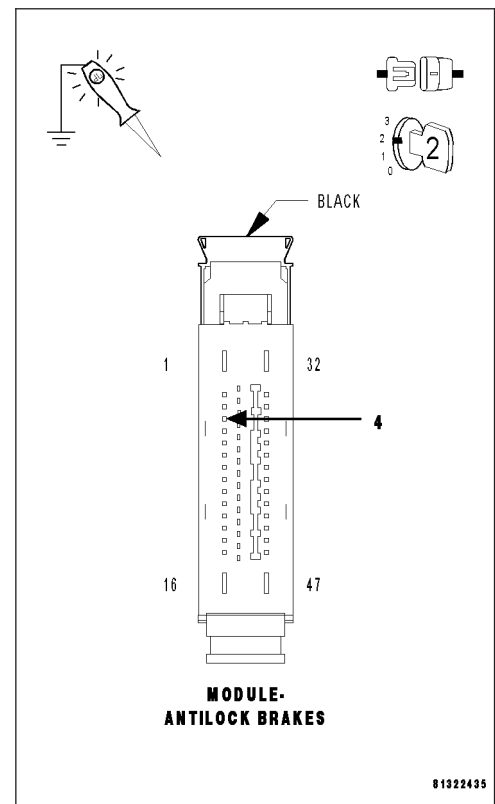
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F202) Fused Ignition Switch Output circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 5

**No** >> Repair the (F202) Fused Ignition Switch Output circuit for an open or short.  
Perform ABS VERIFICATION TEST - VER 1..



**\*NO RESPONSE FROM ABS (CONTINUED)****5. (D65) CAN C BUS (+) CIRCUIT OPEN**

Turn the ignition off.

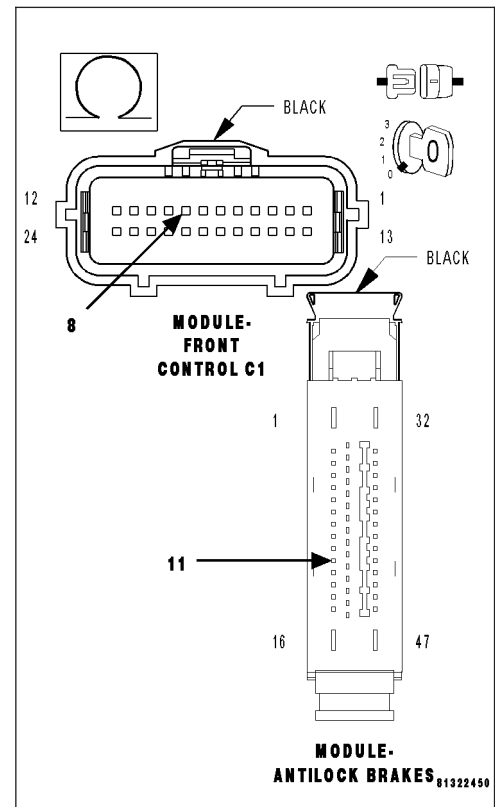
Disconnect the FCM C1 harness connector.

Measure the resistance of the (D65) CAN C Bus (+) circuit between the FCM connector and the Antilock Brake Module connector.

**Is resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the (D65) CAN C Bus (+) circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.

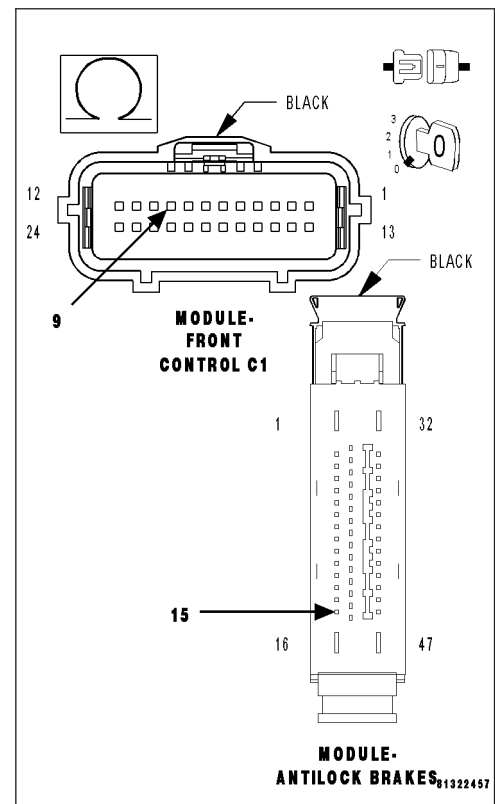
**6. (D64) CAN C BUS (-) CIRCUIT OPEN**

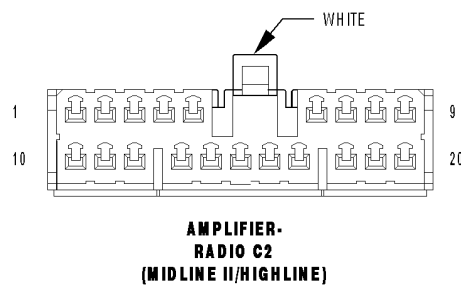
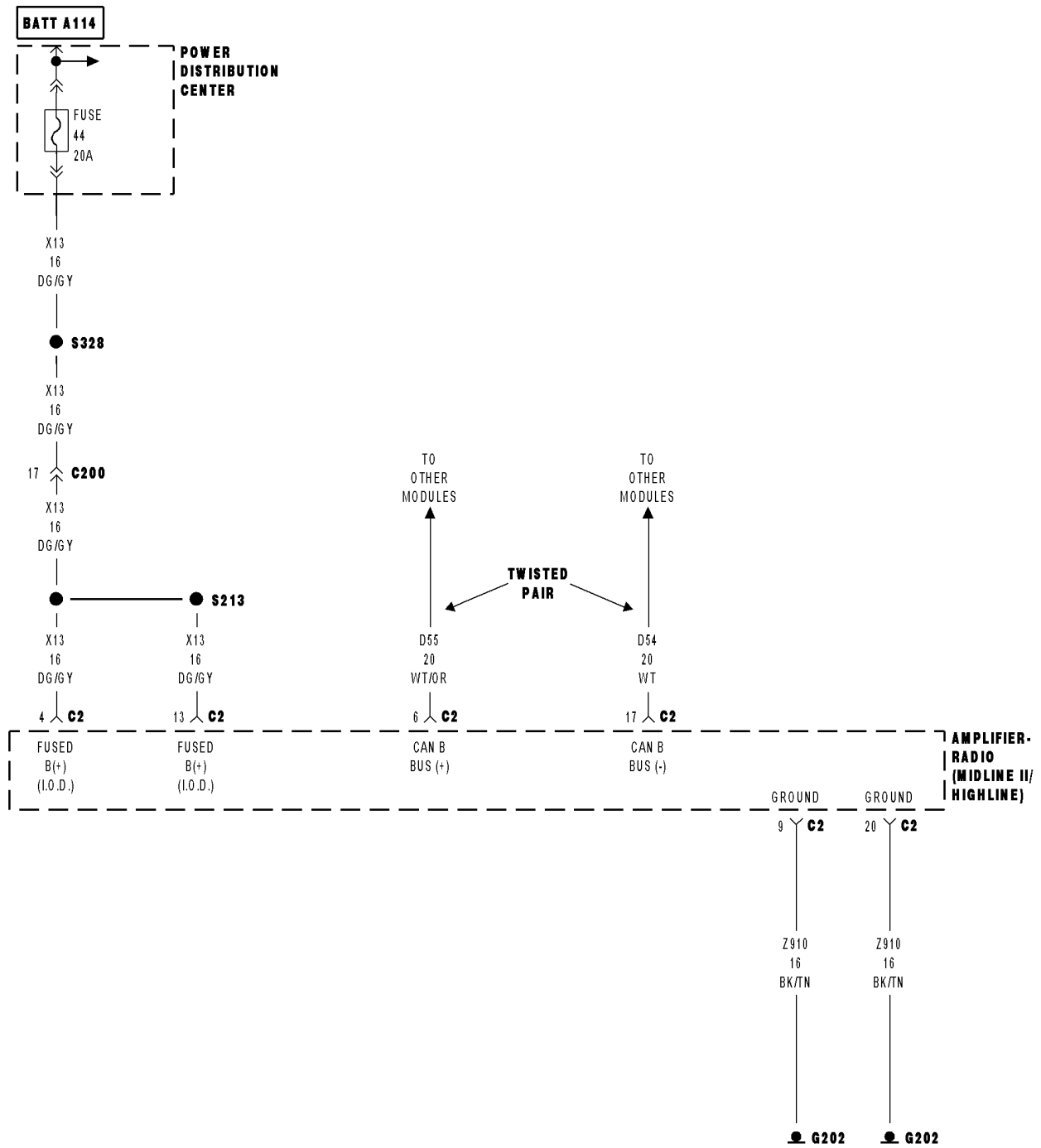
Measure the resistance of the (D64) CAN C Bus (-) circuit between the FCM connector and the Antilock Brake Module connector.

**Is resistance below 5.0 ohms?**

**Yes** >> Replace the Antilock Brake Module in accordance with the service information.  
Perform ABS VERIFICATION TEST - VER 1.

**No** >> Repair the (D64) CAN C Bus (-) circuit for an open.  
Perform ABS VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM AMP**

**\*NO RESPONSE FROM AMP (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

Possible Causes
(X13) FUSED B (+) CIRCUIT OPEN OR SHORTED (Z910) GROUND CIRCUIT OPEN (D55) AND (D54) CAN B BUS CIRCUITS OPEN AMPLIFIER

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Does the scan tool display a red X next to the module?**

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

**2. (X13) FUSED B(+) CIRCUIT OPEN OR SHORTED**

Turn the ignition off.

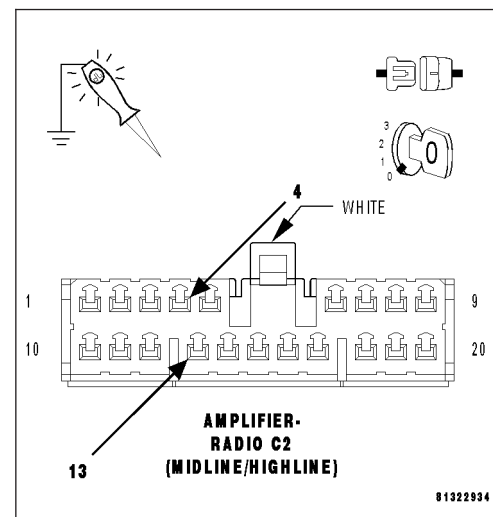
Disconnect the Radio Amplifier C2 harness connector.

Using a 12-volt test light connected to ground, check each (X13) Fused B(+) circuit.

**Does the test light illuminate brightly for each circuit?**

**Yes** >> Go To 3

**No** >> Repair the (X13) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.



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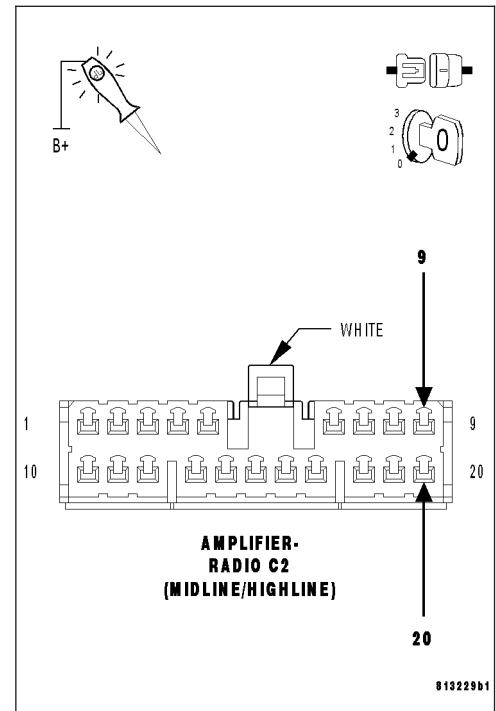
**\*NO RESPONSE FROM AMP (CONTINUED)****3. (Z910) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check each (Z910) ground circuit.

**Does the test light illuminate brightly for each circuit?**

**Yes** >> Go To 4

**No** >> Repair the (Z910) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.

**4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note: One open circuit will not cause this condition.**

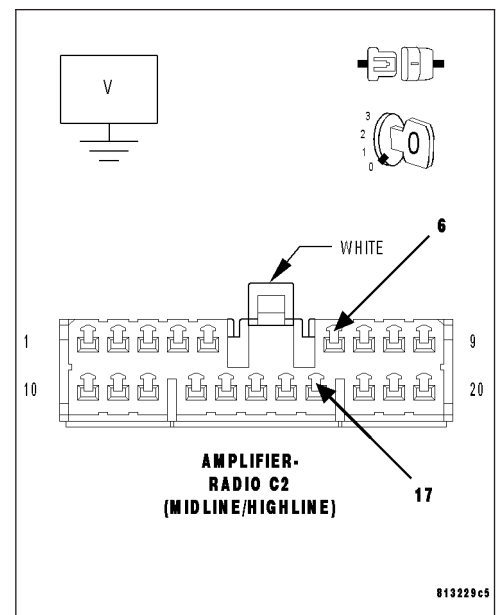
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

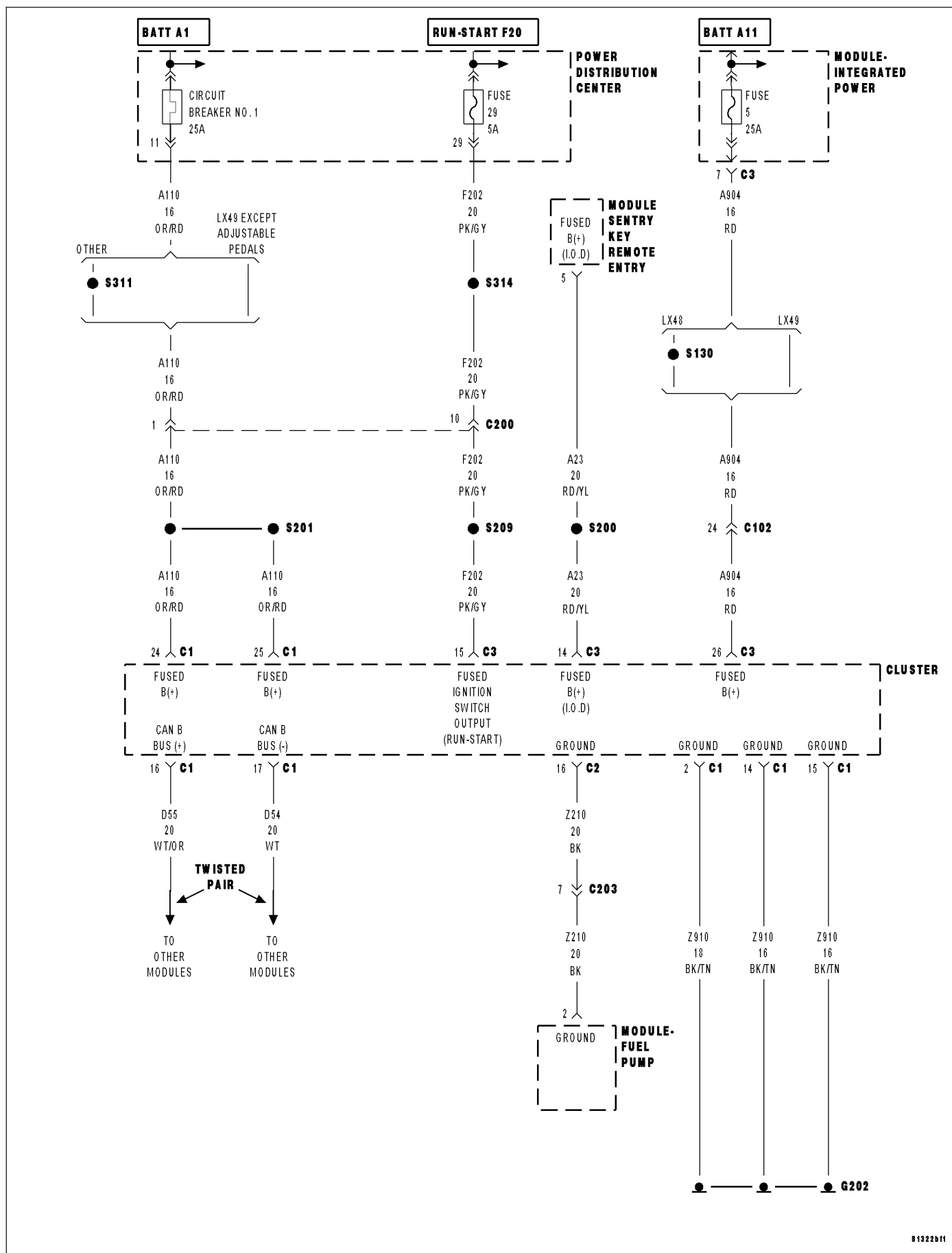
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

**Is there any voltage present on either circuit?**

**Yes** >> Replace the Radio Amplifier in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.  
Perform BODY VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM CCN**



**\*NO RESPONSE FROM CCM (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(A904) (A23) (A110) FUSED B(+) CIRCUITS OPEN OR SHORTED (Z910) (Z210) GROUND CIRCUITS OPEN (F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED (D55) AND (D54) CAN B BUS CIRCUITS OPEN CLUSTER (CCN)

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Does the scan tool display a red X next to the module?**

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

**\*NO RESPONSE FROM CCM (CONTINUED)****2. (A904) (A23) (A110) FUSED B(+) CIRCUITS OPEN OR SHORTED**

Turn the ignition off.

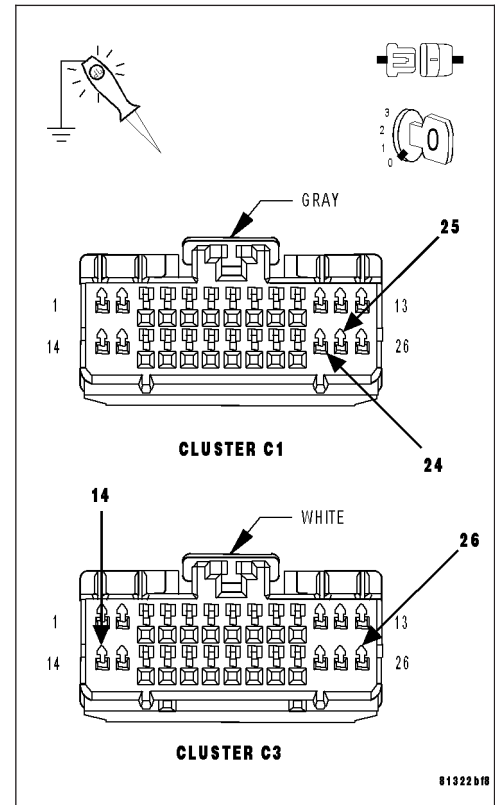
Disconnect the Cluster harness connectors.

Using a 12-volt test light connected to ground, check each (A904) (A23) (A110) Fused B(+) circuit.

**Does the test light illuminate brightly for each circuit?**

**Yes** >> Go To 3

**No** >> Repair the (A904) (A23) (A110) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.

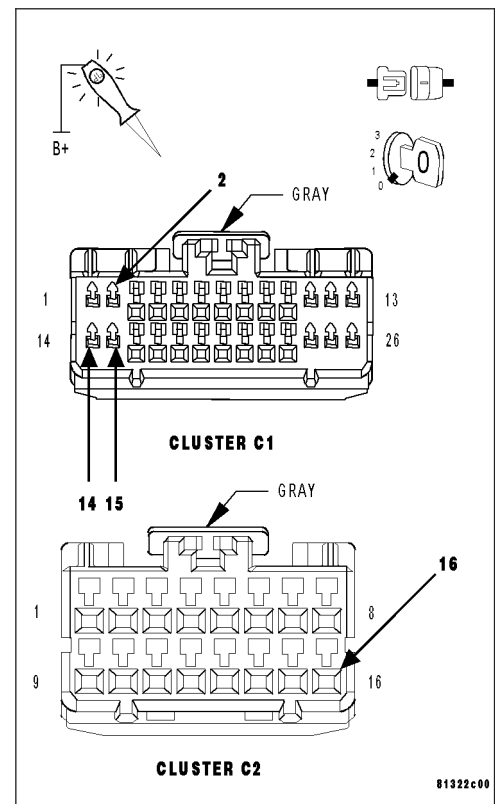
**3. (Z910) (Z210) GROUND CIRCUITS OPEN**

Using a 12-volt test light connected to 12-volts, check each (Z910) (Z210) ground circuit.

**Does the test light illuminate brightly for each circuit?**

**Yes** >> Go To 4

**No** >> Repair the (Z910) (Z210) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM CCM (CONTINUED)****4. (F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED**

Turn the ignition on.

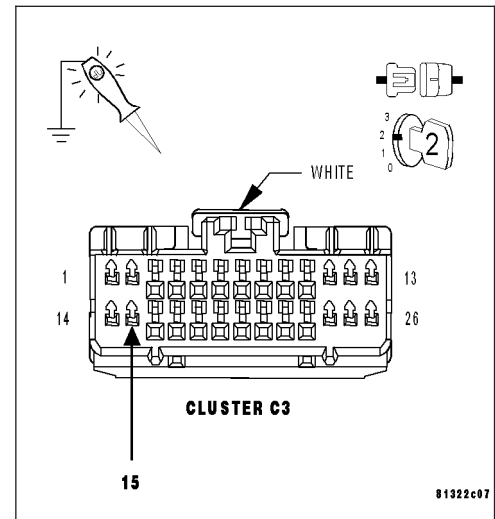
Using a 12-volt test light connected to ground, check the (F202) Fused Ignition Switch Output circuit.

**Does the test light illuminate brightly for each circuit?**

**Yes** >> Go To 5

**No** >> Repair the (F202) Fused Ignition Switch Output circuit for an open or short.

Perform BODY VERIFICATION TEST - VER 1.

**5. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note: One open circuit will not cause this condition.**

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

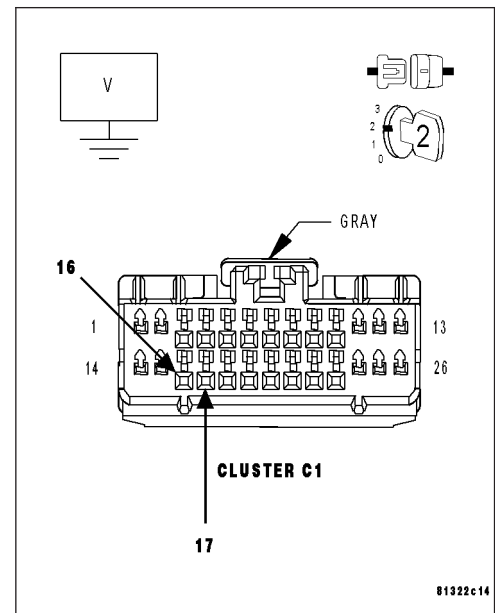
**Is there any voltage present on either circuit?**

**Yes** >> Replace the Cluster in accordance with the service information.

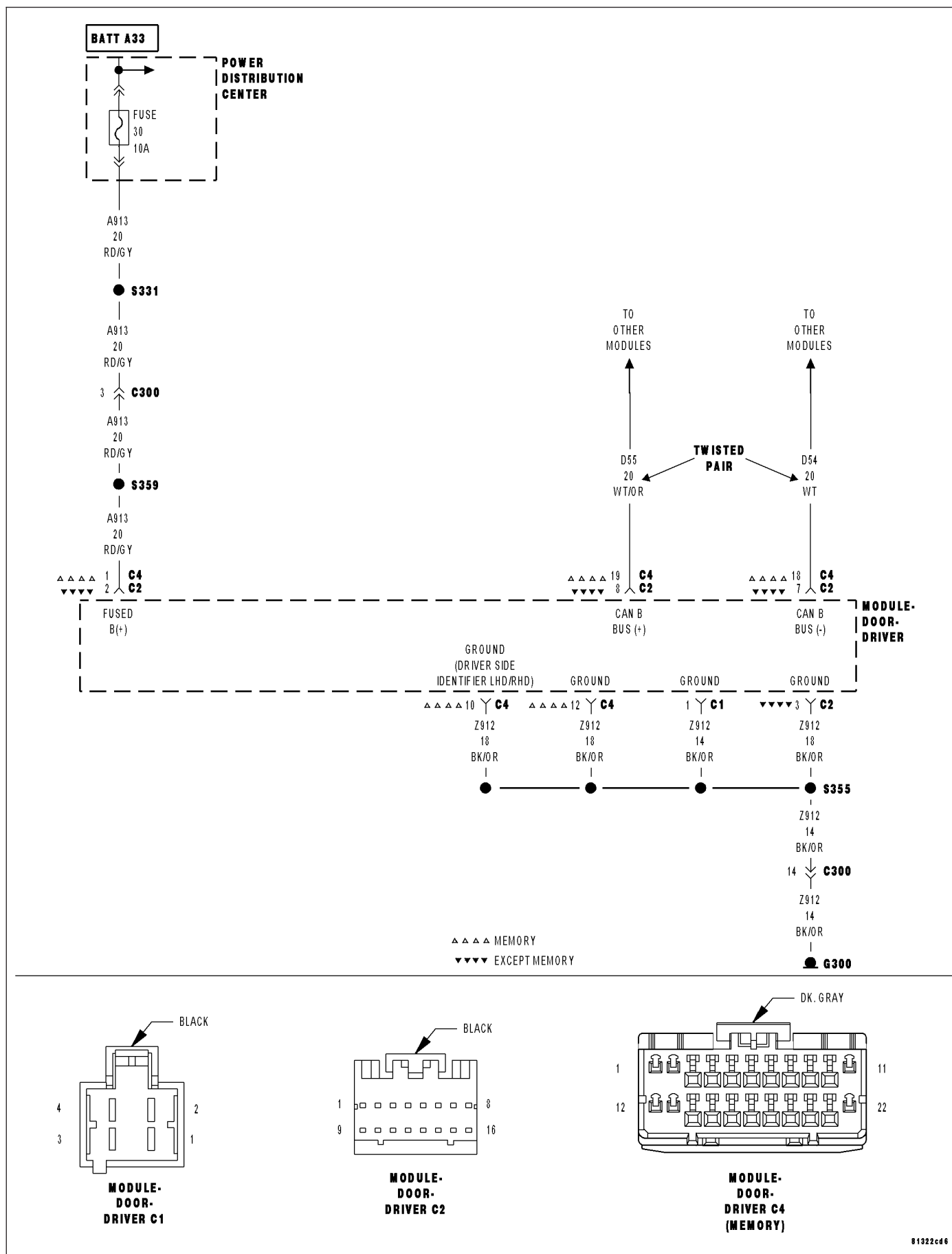
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.

Perform BODY VERIFICATION TEST - VER 1.



# \*NO RESPONSE FROM DDM



**\*NO RESPONSE FROM DDM (CONTINUED)**  
For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(A913) FUSED B (+) CIRCUIT OPEN OR SHORTED (Z912) GROUND CIRCUIT OPEN (D55) AND (D54) CAN B BUS CIRCUITS OPEN DRIVER MEMORY MIRROR MODULE

**Diagnostic Test**

**1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.  
With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

- Yes**    >> Go To 2
- No**      >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

**\*NO RESPONSE FROM DDM (CONTINUED)****2. (A913) FUSED B(+) CIRCUIT OPEN OR SHORTED**

Turn the ignition off.

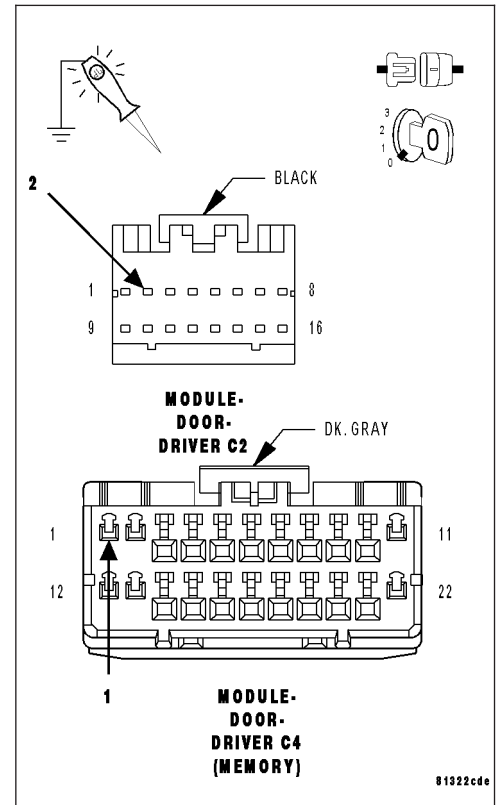
Disconnect the Driver Door Module harness connectors.

Using a 12-volt test light connected to ground, check the (A913) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (A913) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.

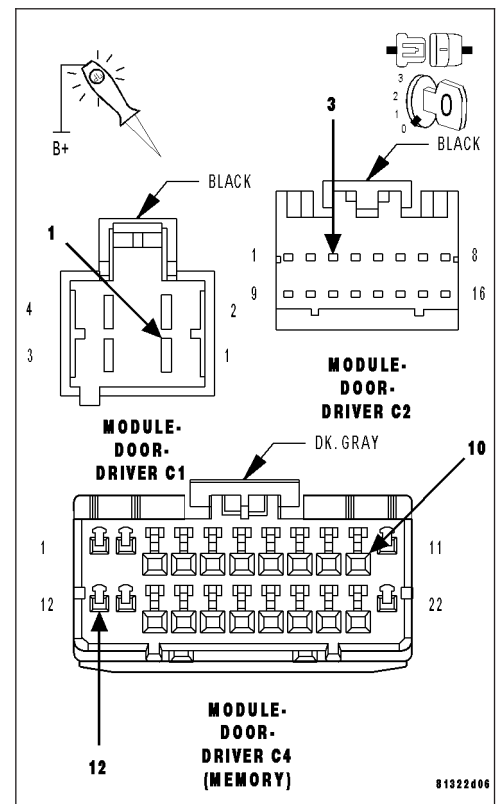
**3. (Z912) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check each (Z912) ground circuit.

**Does the test light illuminate brightly for each circuit?**

**Yes** >> Go To 4

**No** >> Repair the (Z912) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM DDM (CONTINUED)****4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note:** One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

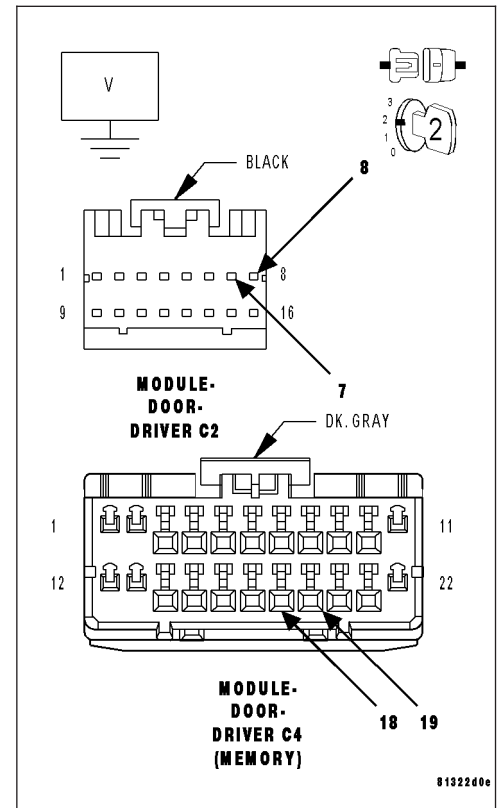
**Is there any voltage present on either circuit?**

**Yes** >> Replace the Driver Door Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1.

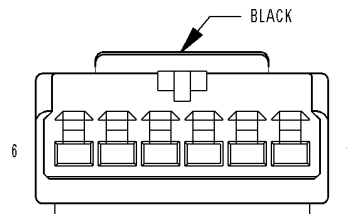
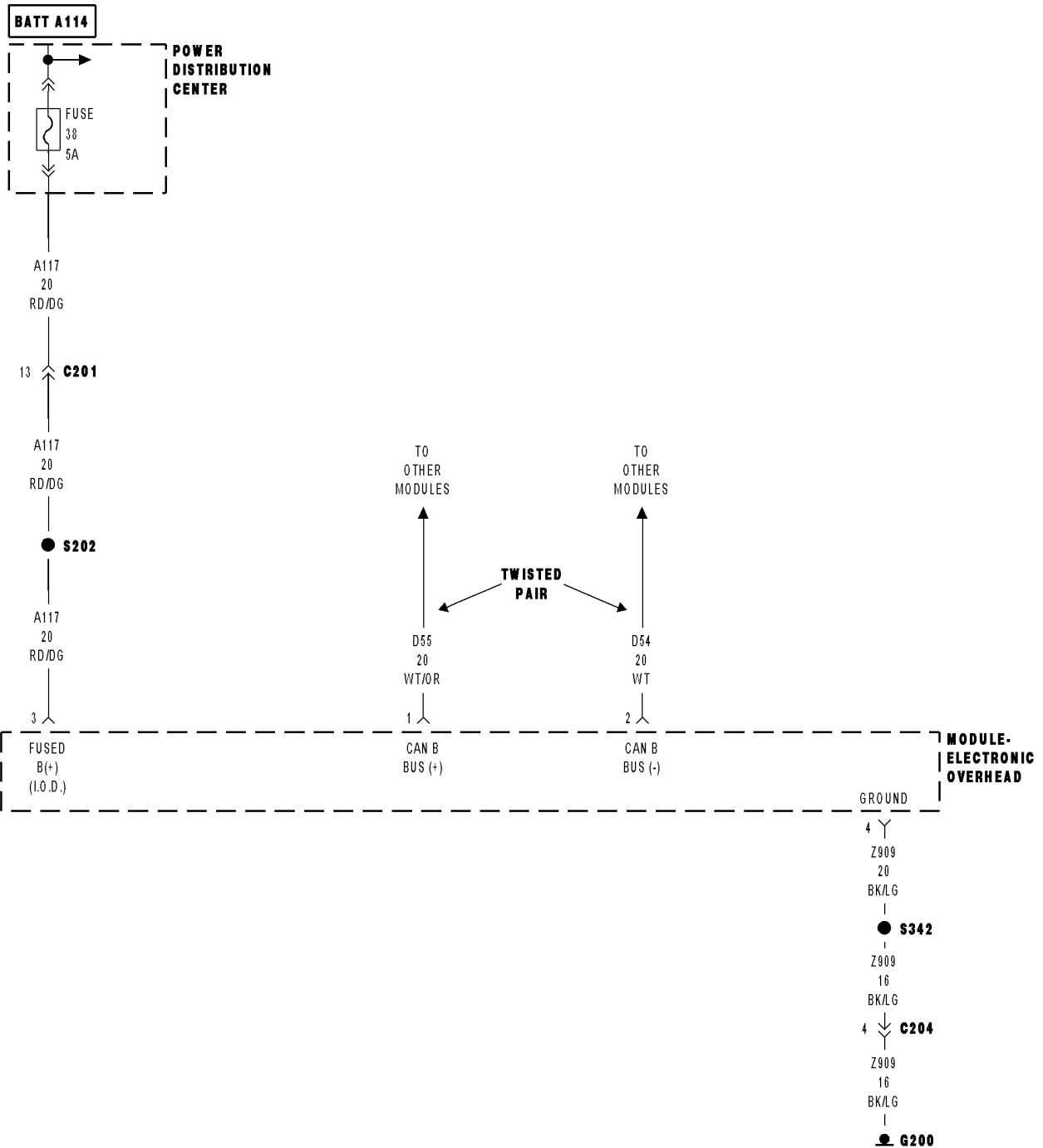
**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.

Perform BODY VERIFICATION TEST - VER 1.



81322d0e

# \*NO RESPONSE FROM EOM





**\*NO RESPONSE FROM EOM (CONTINUED)**  
For a complete wiring diagram Refer to **Section 8W**.

Possible Causes
(A117) FUSED B(+) CIRCUIT OPEN OR SHORTED (Z909) GROUND CIRCUIT OPEN (D55) AND (D54) CAN B BUS CIRCUITS OPEN ELECTRONIC OVERHEAD MODULE

**Diagnostic Test**

**1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.  
With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Does the scan tool display a red X next to the module?**

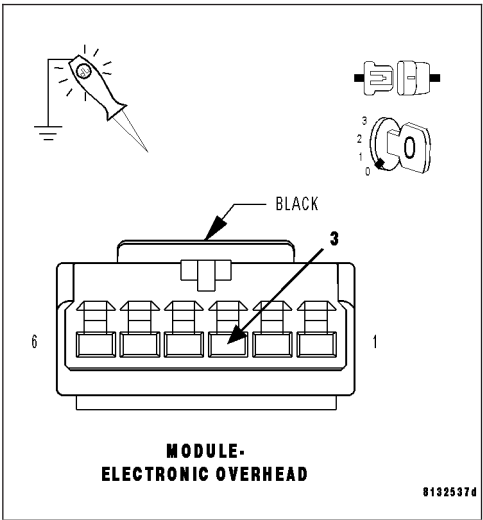
- Yes** >> Go To 2
- No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

**2. (A117) FUSED B(+) CIRCUIT OPEN OR SHORTED**

Turn the ignition off.  
Disconnect the Electronic Overhead Module harness connector.  
Using a 12-volt test light connected to ground, check the (A117) Fused B(+) circuit.

**Does the test light illuminate brightly?**

- Yes** >> Go To 3
- No** >> Repair the (A117) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.



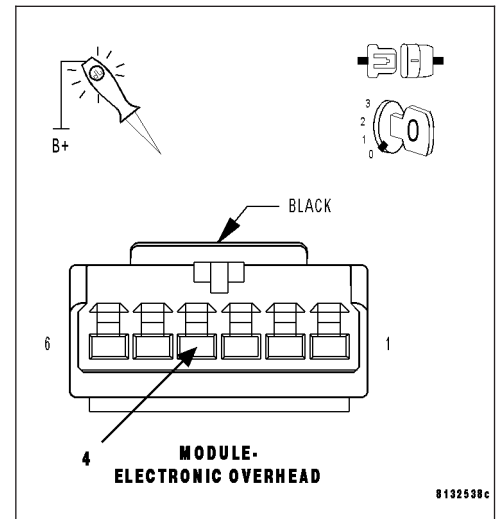
**\*NO RESPONSE FROM EOM (CONTINUED)****3. (Z909) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check the (Z909) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z909) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.

**4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note: One open circuit will not cause this condition.**

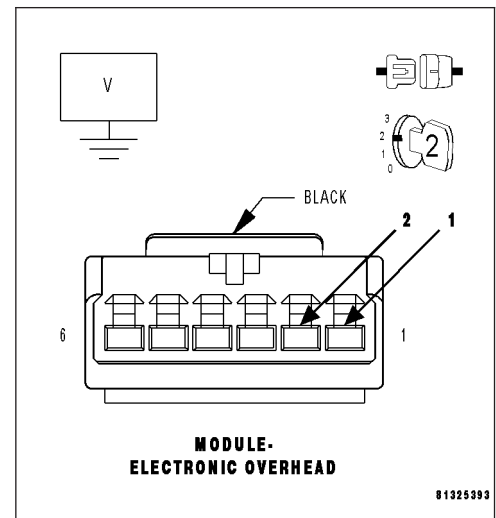
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

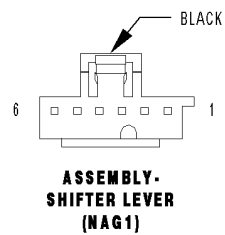
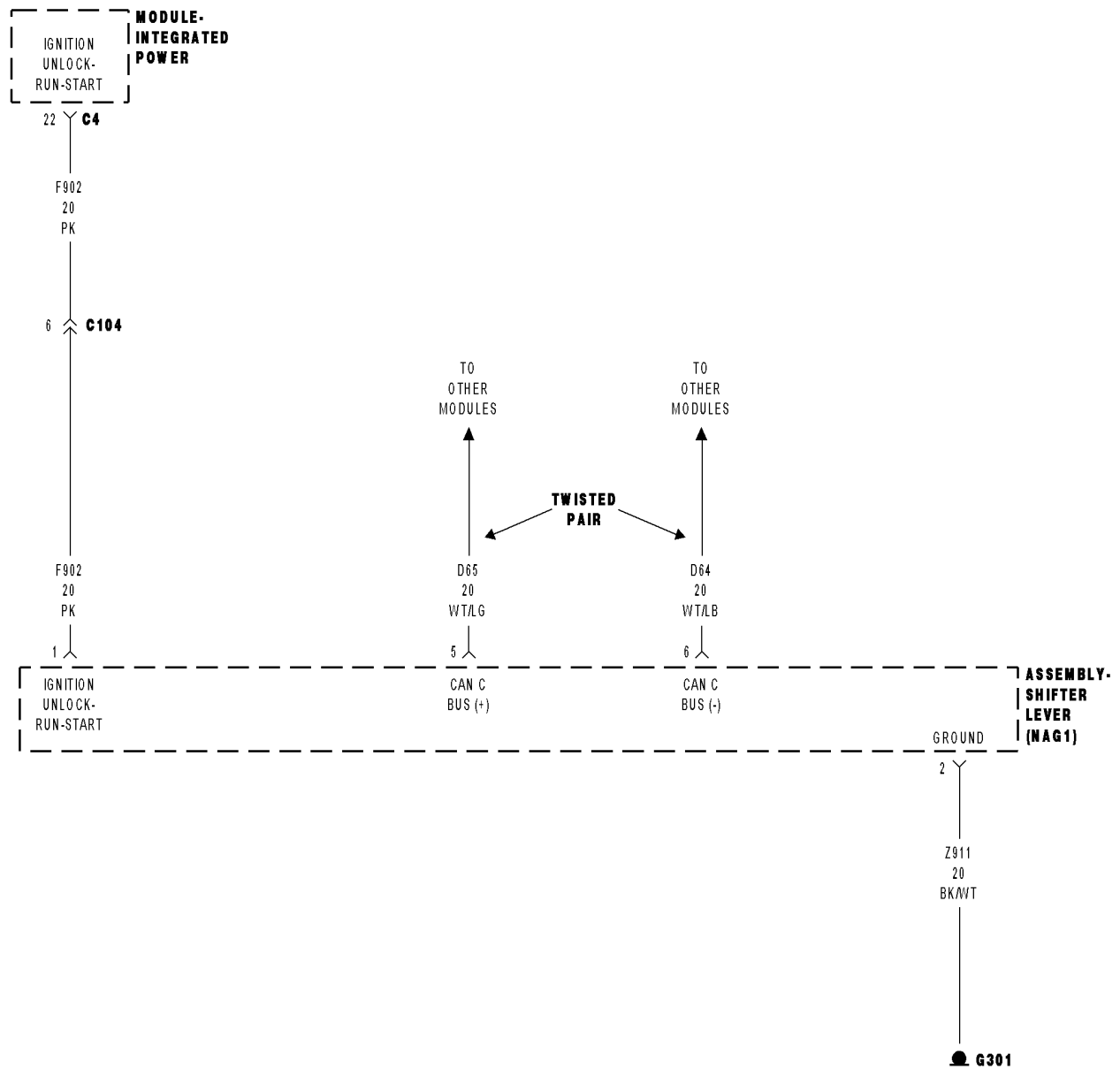
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

**Is there any voltage present on either circuit?**

**Yes** >> Replace the Electronic Overhead Module (EOM) in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.  
Perform BODY VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM ESM (SHIFTER LEVER ASSEMBLY) - NAG1**

**\*NO RESPONSE FROM ESM (SHIFTER LEVER ASSEMBLY) - NAG1 (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

Possible Causes
(Z911) GROUND CIRCUIT OPEN
(F902) IGNITION UNLOCK-RUN-START CIRCUIT OPEN OR SHORTED
(D65) CAN C BUS (+) CIRCUIT OPEN
(D64) CAN C BUS (-) CIRCUIT OPEN
SHIFTER LEVER ASSEMBLY

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Note:** Check the FCM for any active CAN C hardware and any ignition related DTCs, perform DTCs before proceeding.

**Does the scan tool display a red X next to the module?**

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

**2. (Z911) GROUND CIRCUIT OPEN**

Turn the ignition off.

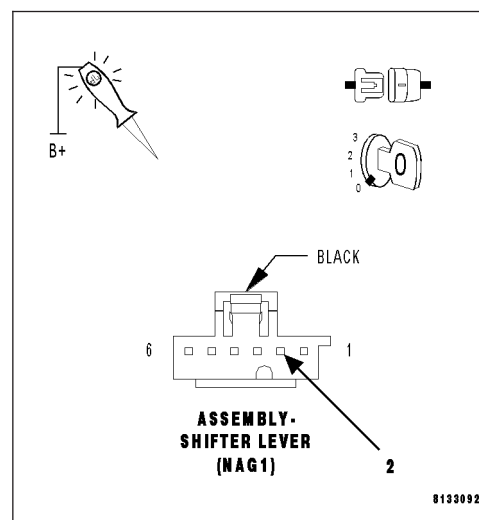
Disconnect the Shifter Lever Assembly harness connector.

Using a 12-volt test light connected to 12-volts, check the (Z911) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (Z911) ground circuit for an open.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM ESM (SHIFTER LEVER ASSEMBLY) - NAG1 (CONTINUED)****3. (F902) IGNITION UNLOCK–RUN–START CIRCUIT OPEN OR SHORTED**

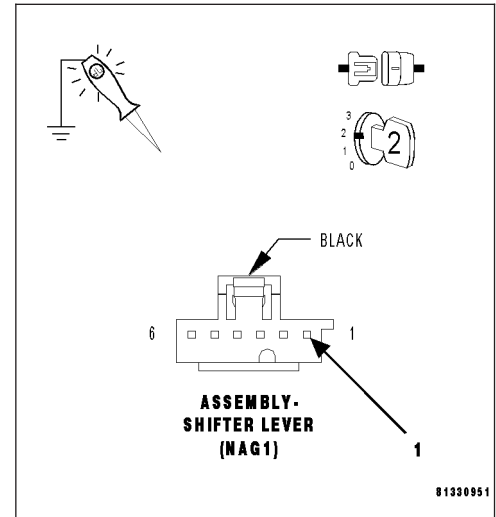
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F902) Ignition Unlock–Run–Start circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (F902) Ignition Unlock–Run–Start circuit for an open or short.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**4. (D65) CAN C BUS (+) CIRCUIT OPEN**

Turn the ignition off.

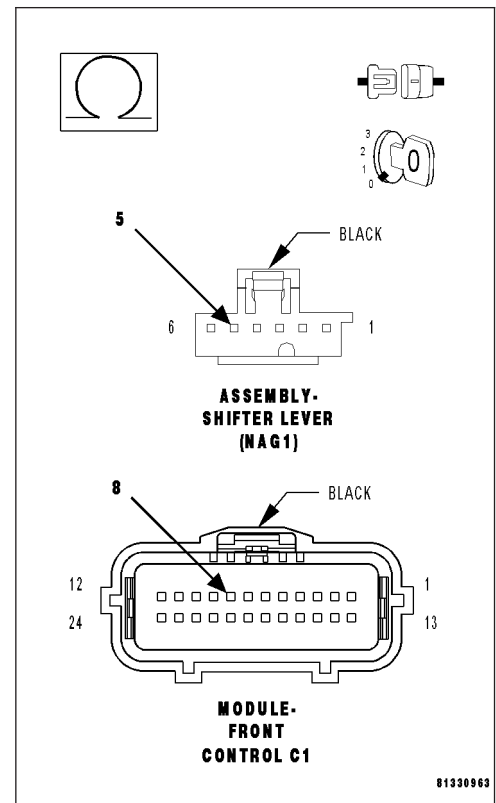
Disconnect the FCM C1 harness connector.

Measure the resistance of the (D65) CAN C Bus (+) circuit between the FCM connector and the Shifter Lever Assembly connector.

**Is resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the (D65) CAN C Bus (+) circuit for an open.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

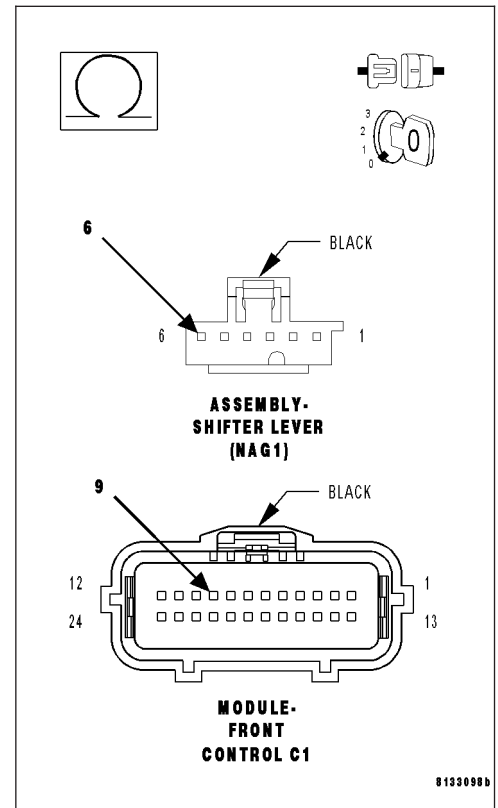


**\*NO RESPONSE FROM ESM (SHIFTER LEVER ASSEMBLY) - NAG1 (CONTINUED)****5. (D64) CAN C BUS (-) CIRCUIT OPEN**

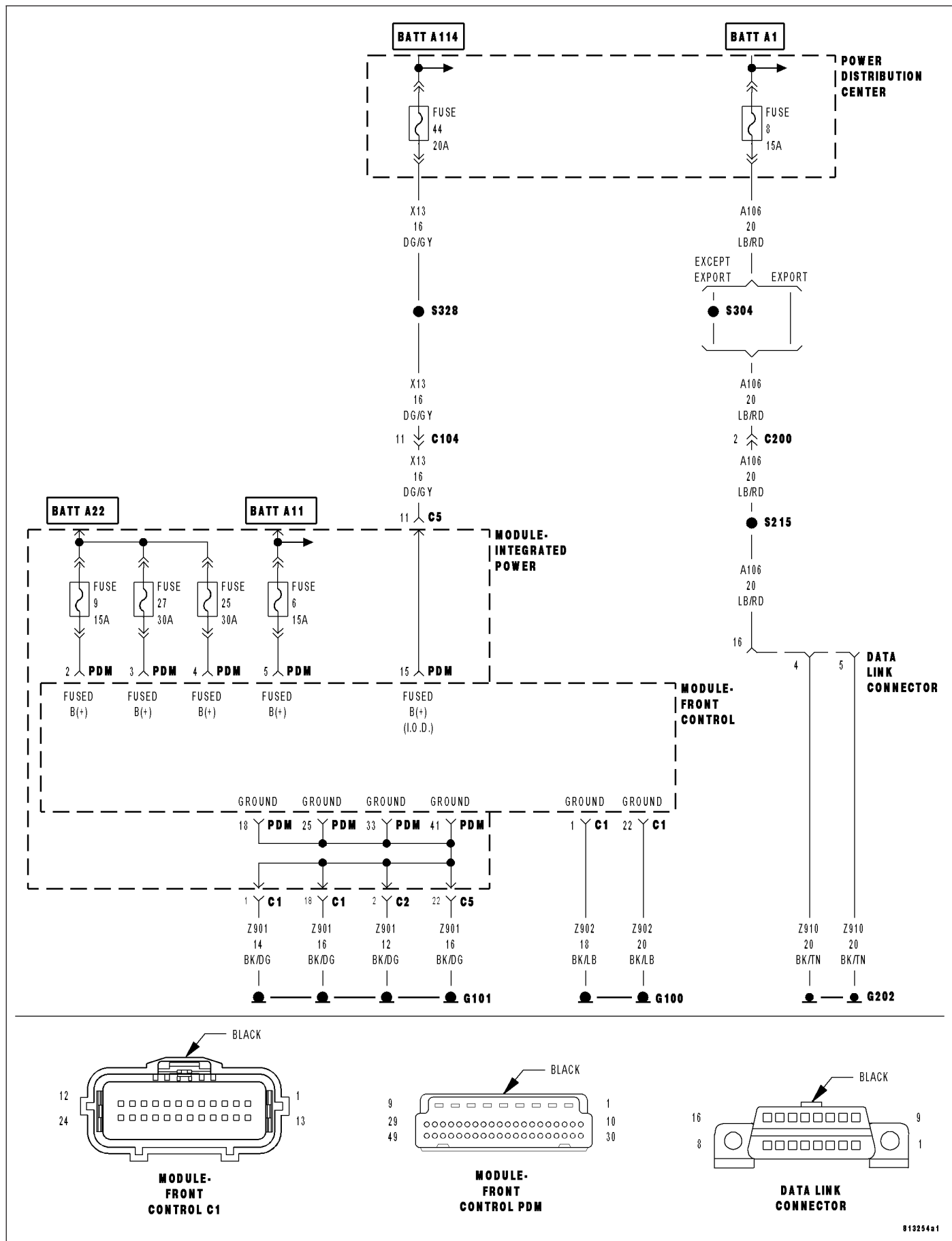
Measure the resistance of the (D64) CAN C Bus (-) circuit between the FCM connector and the Shifter Lever Assembly connector.

**Is resistance below 5.0 ohms?**

- Yes** >> Replace the Shifter Lever Assembly in accordance with the service information.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Repair the (D64) CAN C Bus (-) circuit for an open.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



# \*NO RESPONSE FROM FCM



**\*NO RESPONSE FROM FCM (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

Possible Causes
(A106) FUSED B (+) CIRCUIT OPEN AT DLC (Z910) GROUND CIRCUIT OPEN AT DLC GROUND CIRCUITS OPEN AT FCM FUSED B+ CIRCUITS OPEN AT FCM FRONT CONTROL MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

**Note:** Ensure the scan tool is updated to the latest software.

**Note:** If the scan tool displays any error messages involving the CAN C Diagnostic circuits, diagnose and repair the error message before proceeding. Refer to the Table of Contents.

**Note:** A loss of communication with the FCM can cause the ECU View button on the scan tool to be inoperative (not highlighted).

With the scan tool, attempt to select ECU view.

**Can the scan tool communicate with the FCM?**

**Yes** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

**No** >> Go To 2

**2. (A106) FUSED B(+) CIRCUIT OPEN AT DLC**

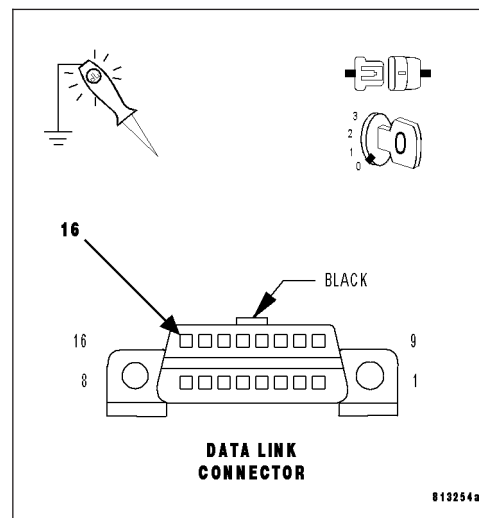
Disconnect the scan tool from the DLC.

Using a 12-volt test light connected to ground, check the (A106) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (A106) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.





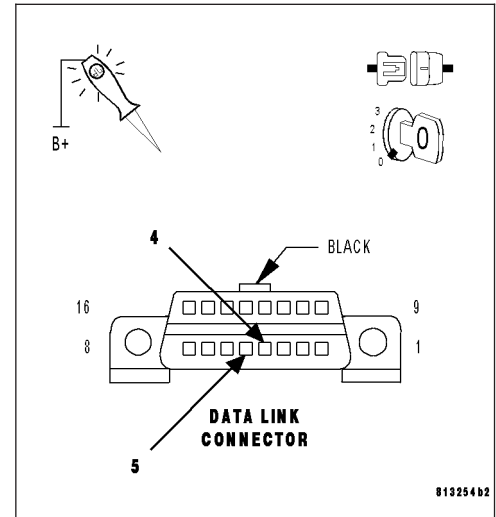
**\*NO RESPONSE FROM FCM (CONTINUED)****3. (Z910) GROUND CIRCUIT OPEN AT DLC**

Using a 12-volt test light connected to 12-volts, check each (Z910) ground circuit.

**Does the test light illuminate brightly for each circuit?**

**Yes** >> Go To 4

**No** >> Repair the (Z910) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.

**4. GROUND CIRCUITS OPEN AT FCM C1 CONNECTOR**

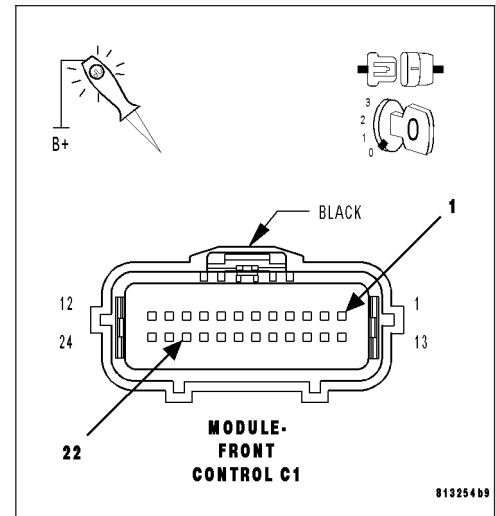
Disconnect the FCM C1 harness connector.

Using a 12-volt test light connected to 12-volts, check each ground circuit.

**Does the test light illuminate brightly for each circuit?**

**Yes** >> Go To 5

**No** >> Repair the ground circuit for an open. Inspect the connector for damage.  
Perform BODY VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM FCM (CONTINUED)****5. GROUND CIRCUITS OPEN AT FCM PDM CONNECTOR**

Remove the FCM from the PDM.

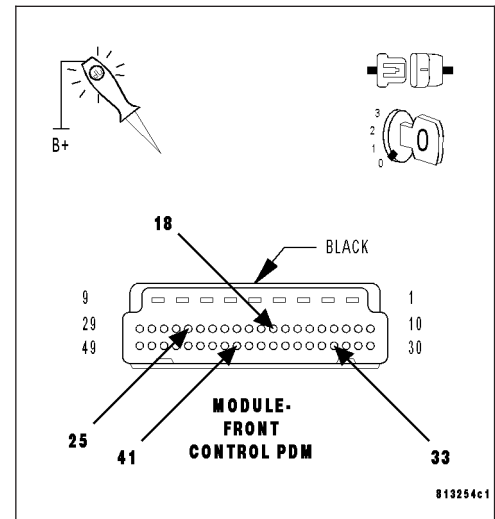
Using a 12-volt test light connected to 12-volts, check each ground circuit.

**Does the test light illuminate brightly for each circuit?**

**Yes** >> Go To 6

**No** >> Repair the ground circuit for an open. Inspect the connector for damage.

Perform BODY VERIFICATION TEST - VER 1.

**6. FUSED B(+) CIRCUITS OPEN AT FCM PDM CONNECTOR**

Using a 12-volt test light connected to ground, check each Fused B(+) circuit.

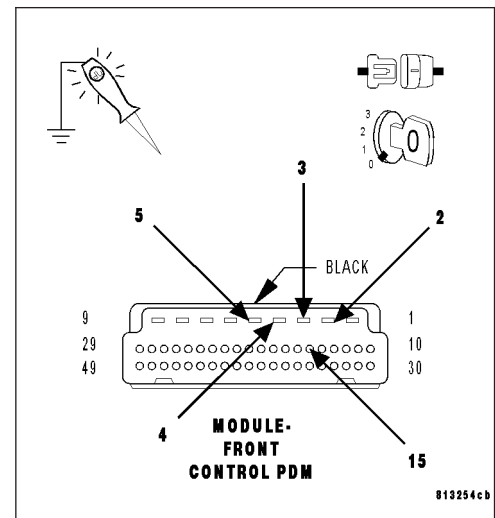
**Does the test light illuminate brightly for each circuit?**

**Yes** >> Replace and program the Front Control Module in accordance with the service information.

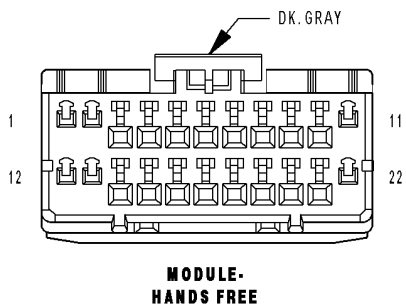
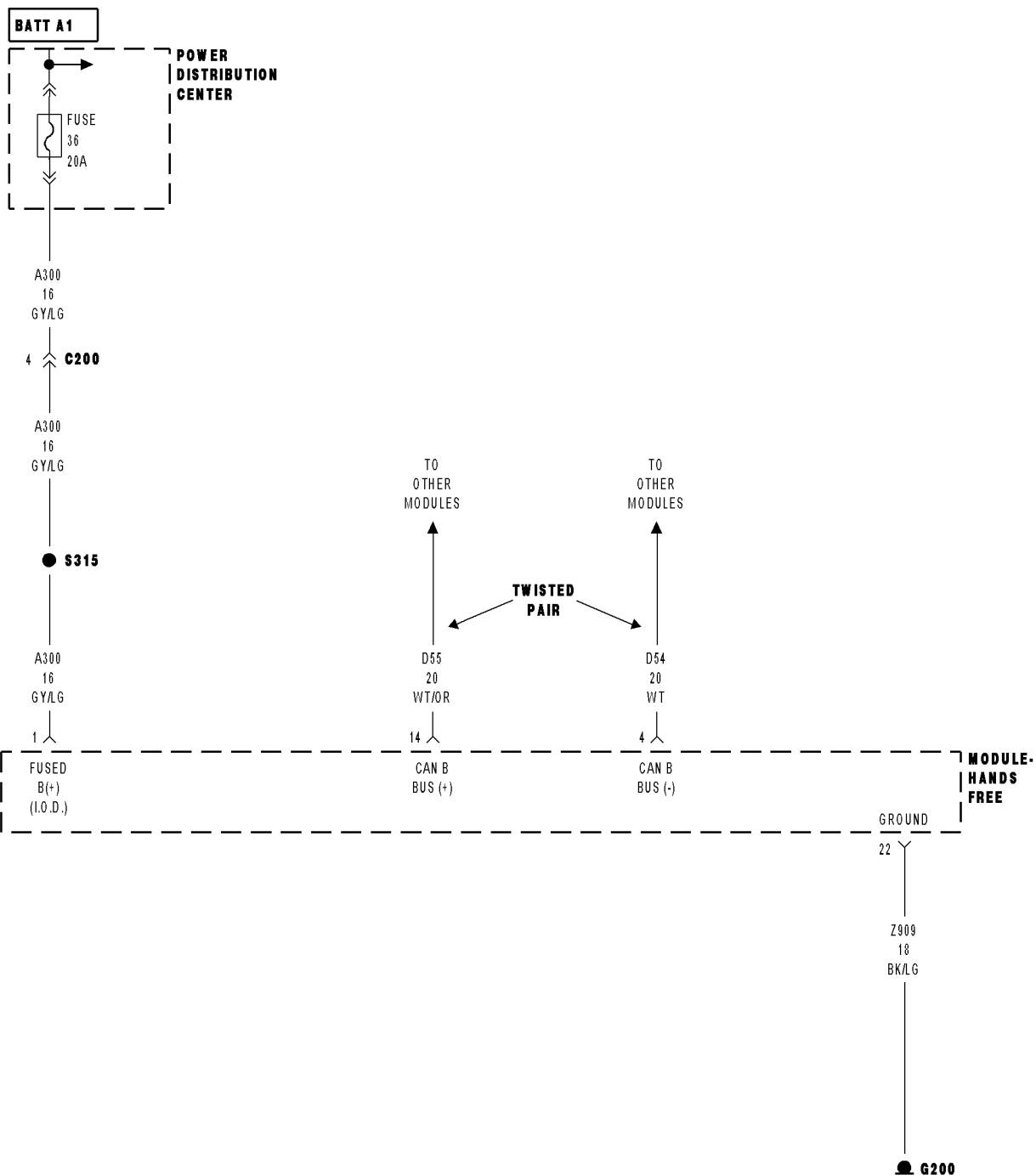
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the Fused B(+) circuit for an open. Inspect the connector for damage.

Perform BODY VERIFICATION TEST - VER 1.



# \*NO RESPONSE FROM HFM



**\*NO RESPONSE FROM HFM (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

Possible Causes
(A300) FUSED B(+) CIRCUIT OPEN OR SHORTED (Z909) GROUND CIRCUIT OPEN (D55) AND (D54) CAN B BUS CIRCUITS OPEN HANDS FREE MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Does the scan tool display a red X next to the module?**

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

**2. (A300) FUSED B(+) CIRCUIT OPEN OR SHORTED**

Turn the ignition off.

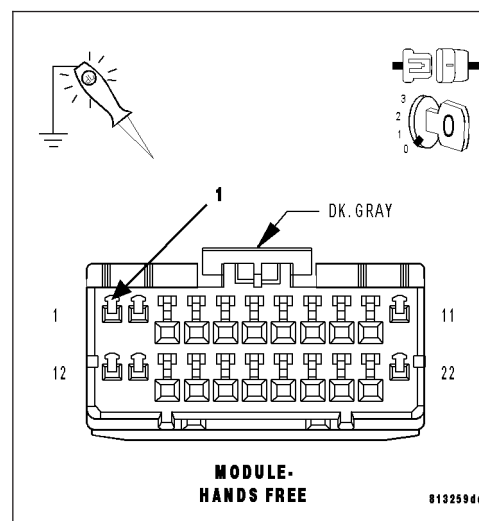
Disconnect the Hands Free Module harness connector.

Using a 12-volt test light connected to ground, check the (A300) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (A300) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.



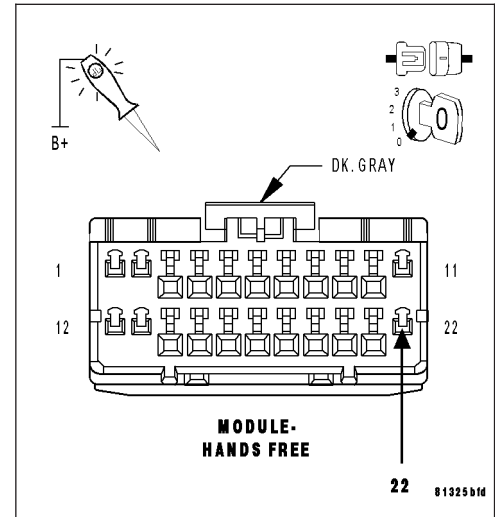
**\*NO RESPONSE FROM HFM (CONTINUED)****3. (Z909) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check the (Z909) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z909) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.

**4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note: One open circuit will not cause this condition.**

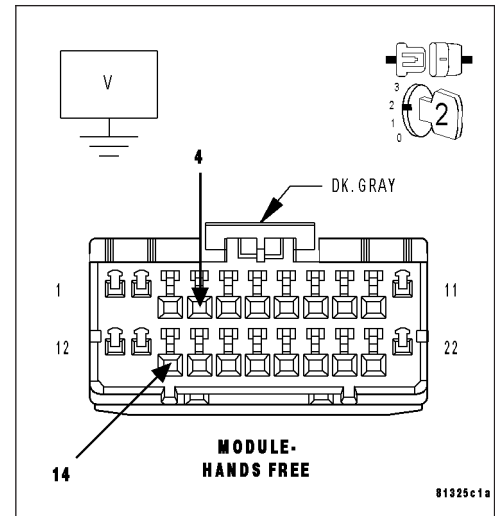
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

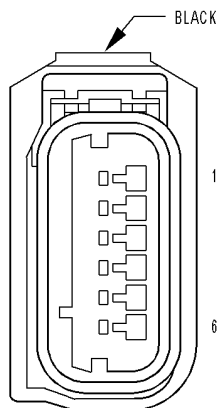
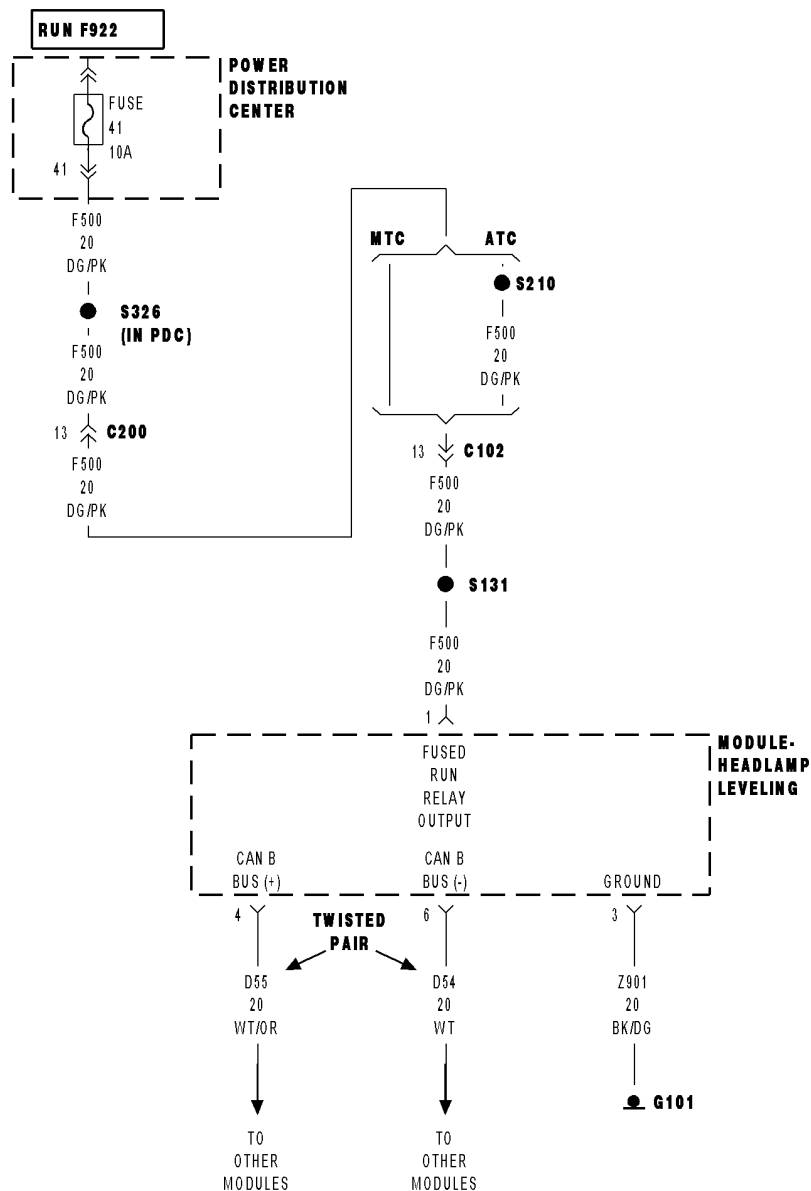
**Is there any voltage present on either circuit?**

**Yes** >> Replace the Hands Free Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.  
Perform BODY VERIFICATION TEST - VER 1.



# **\*NO RESPONSE FROM HEADLAMP LEVELING MODULE**



**MODULE-HEADLAMP LEVELING (EXPORT)**

**\*NO RESPONSE FROM HEADLAMP LEVELING MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(F500) FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR SHORTED (Z901) GROUND CIRCUIT OPEN (D55) AND (D54) CAN B BUS CIRCUITS OPEN HEADLAMP LEVELING MODULE

**Diagnostic Test**

**1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Does the scan tool display a red X next to the module?**

- Yes**    >> Go To 2
- No**    >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

**\*NO RESPONSE FROM HEADLAMP LEVELING MODULE (CONTINUED)****2. (F500) FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR SHORTED**

**Note:** Check the FCM for any ignition related DTCs before proceeding. If set (Refer to 8 - ELECTRICAL/IGNITION CONTROL - DIAGNOSIS AND TESTING).

Turn the ignition off.

Disconnect the Headlamp Leveling Module harness connector.

Turn the ignition on.

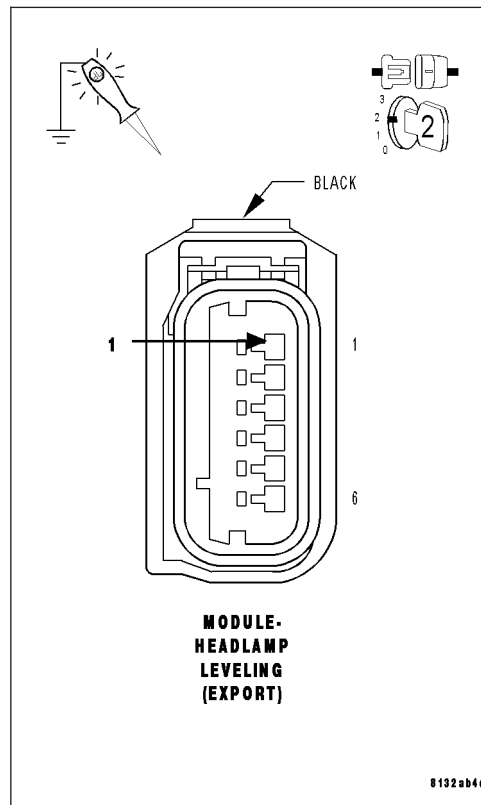
Using a 12-volt test light connected to ground, check the (F500) Fused Run Relay Output circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (F500) Fused Run Relay Output circuit for an open or short.

Perform BODY VERIFICATION TEST - VER 1.

**3. (Z901) GROUND CIRCUIT OPEN**

Turn the ignition off.

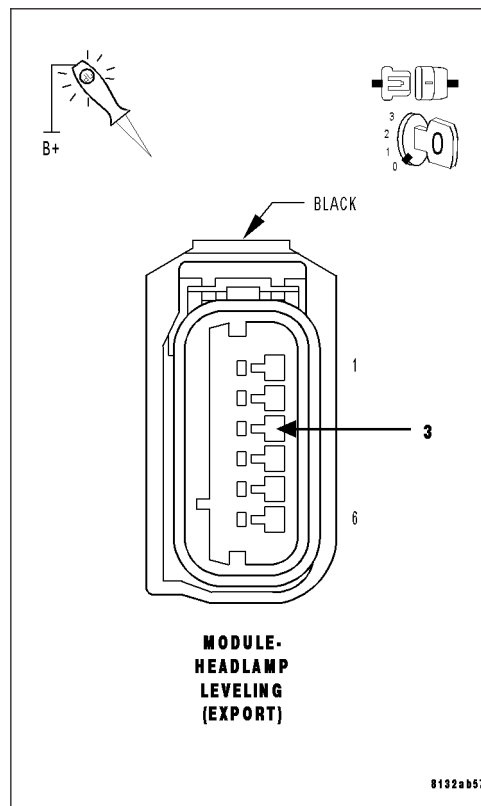
Using a 12-volt test light connected to 12-volts, check the (Z901) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z901) ground circuit for an open.

Perform BODY VERIFICATION TEST - VER 1.





**\*NO RESPONSE FROM HEADLAMP LEVELING MODULE (CONTINUED)****4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note:** One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

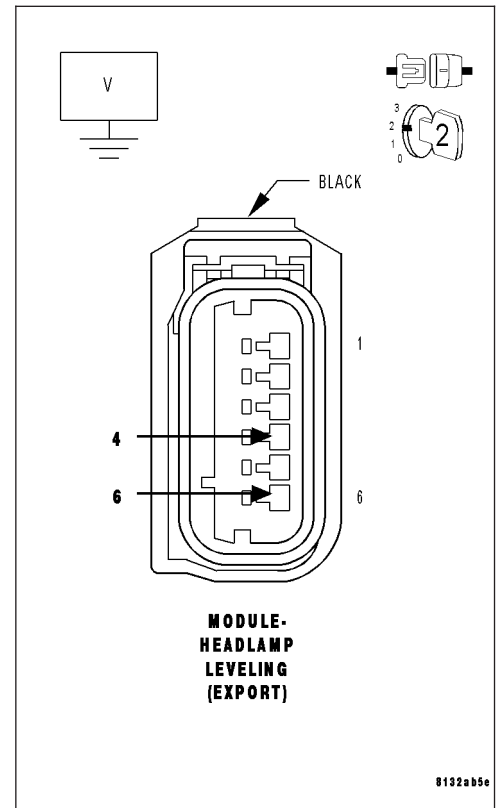
**Is there any voltage present on either circuit?**

**Yes** >> Replace the Headlamp Leveling Module in accordance with the service information.

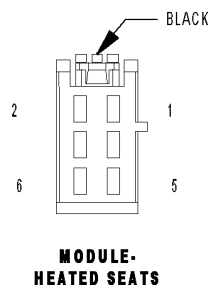
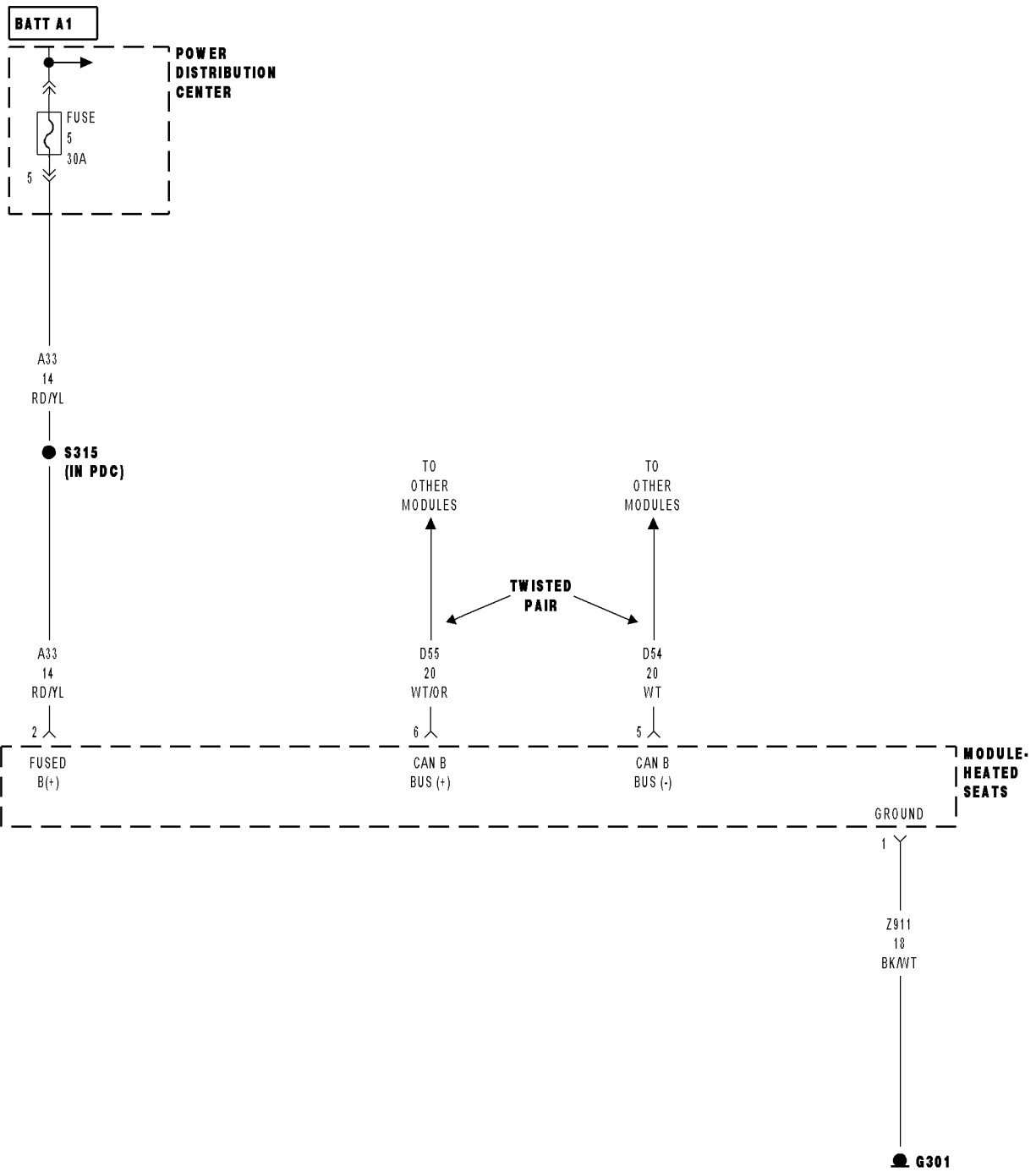
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.

Perform BODY VERIFICATION TEST - VER 1.



# \*NO RESPONSE FROM HSM



**\*NO RESPONSE FROM HSM (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(A33) FUSED B (+) CIRCUIT OPEN OR SHORTED (Z911) GROUND CIRCUIT OPEN (D55) AND (D54) CAN B BUS CIRCUITS OPEN HEATED SEAT MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Does the scan tool display a red X next to the module?**

**Yes**     >> Go To 2

**No**     >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

**\*NO RESPONSE FROM HSM (CONTINUED)****2. (A33) FUSED B(+) CIRCUIT OPEN OR SHORTED**

Turn the ignition off.

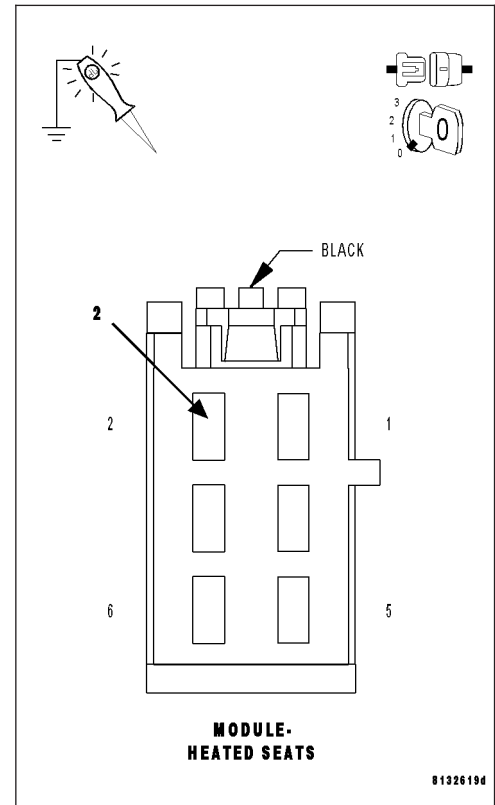
Disconnect the Heated Seat Module harness connector.

Using a 12-volt test light connected to ground, check the (A33) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (A33) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.

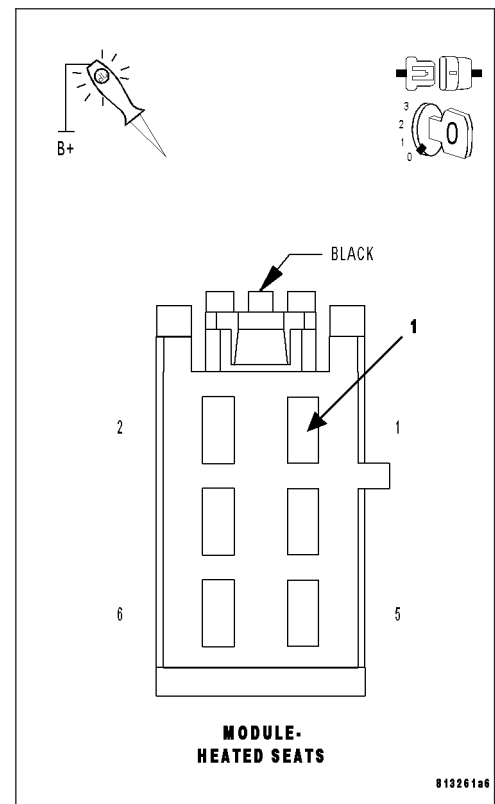
**3. (Z911) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check the (Z911) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z911) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM HSM (CONTINUED)****4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note:** One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

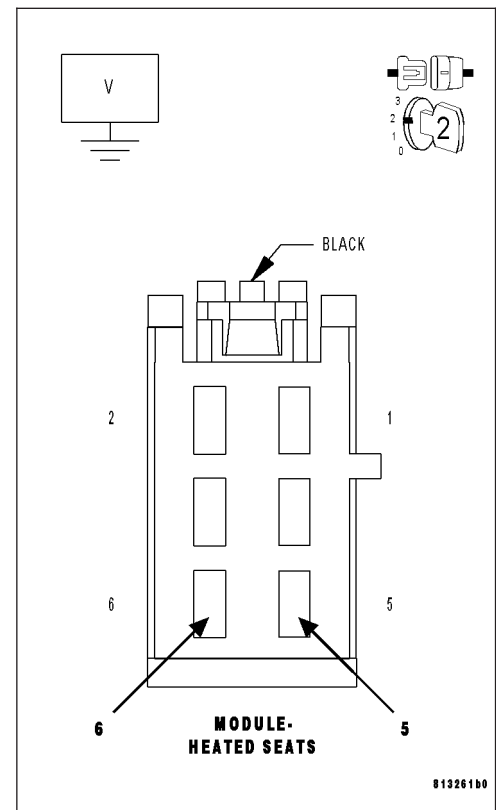
**Is there any voltage present on either circuit?**

**Yes** >> Replace the Heated Seat Module in accordance with the service information.

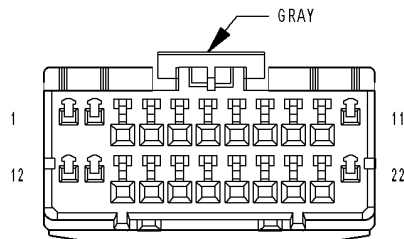
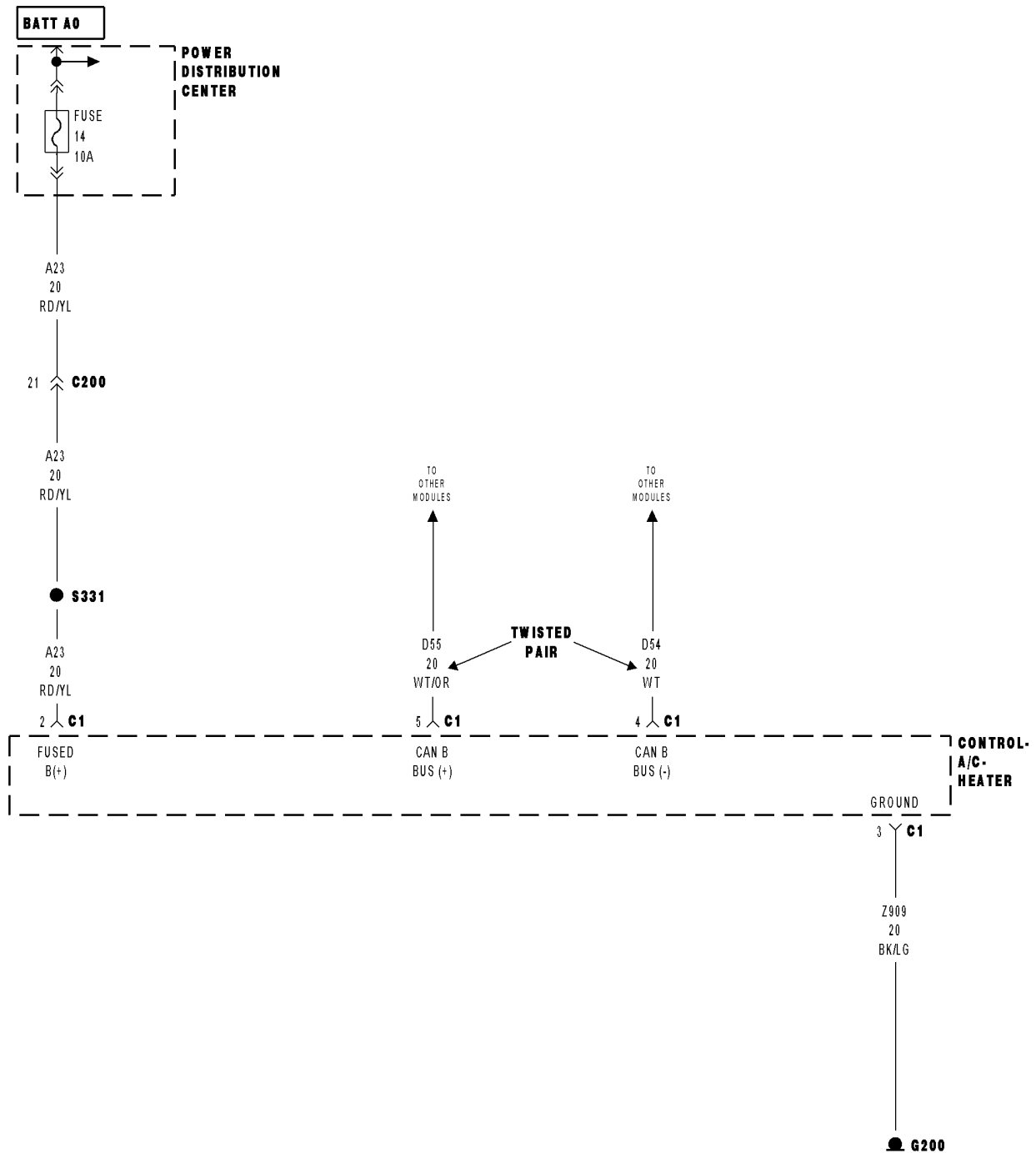
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.

Perform BODY VERIFICATION TEST - VER 1.



# \*NO RESPONSE FROM HVAC (ATC)



**CONTROL-A/C-  
HEATER C1  
(ATC)**

**\*NO RESPONSE FROM HVAC (ATC) (CONTINUED)**

For a complete wiring diagram Refer to **Section 8W**.

Possible Causes
(A23) FUSED B (+) CIRCUIT OPEN OR SHORTED (Z909) GROUND CIRCUIT OPEN (D55) AND (D54) CAN B BUS CIRCUITS OPEN A/C HEATER CONTROL

**Diagnostic Test**

**1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

- Yes**    >> Go To 2
- No**    >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

**2. (A23) FUSED B(+) CIRCUIT OPEN OR SHORTED**

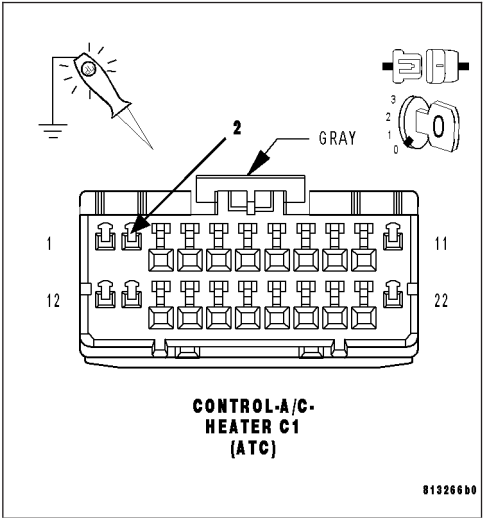
Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Using a 12-volt test light connected to ground, check the (A23) Fused B(+) circuit.

Does the test light illuminate brightly?

- Yes**    >> Go To 3
- No**    >> Repair the (A23) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.



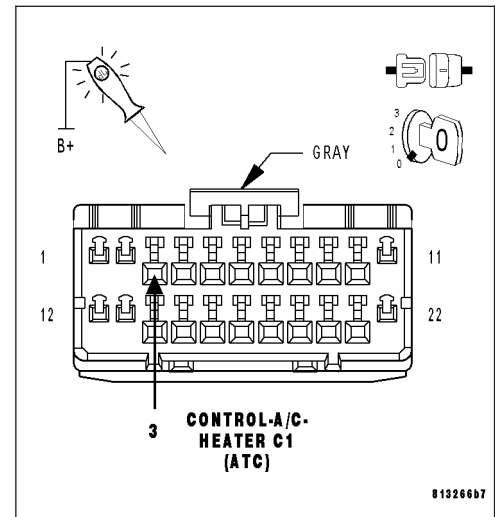
**\*NO RESPONSE FROM HVAC (ATC) (CONTINUED)****3. (Z909) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check the (Z909) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z909) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.

**4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note: One open circuit will not cause this condition.**

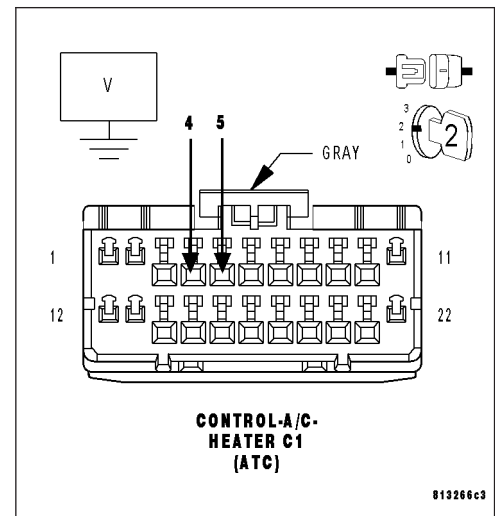
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

**Is there any voltage present on either circuit?**

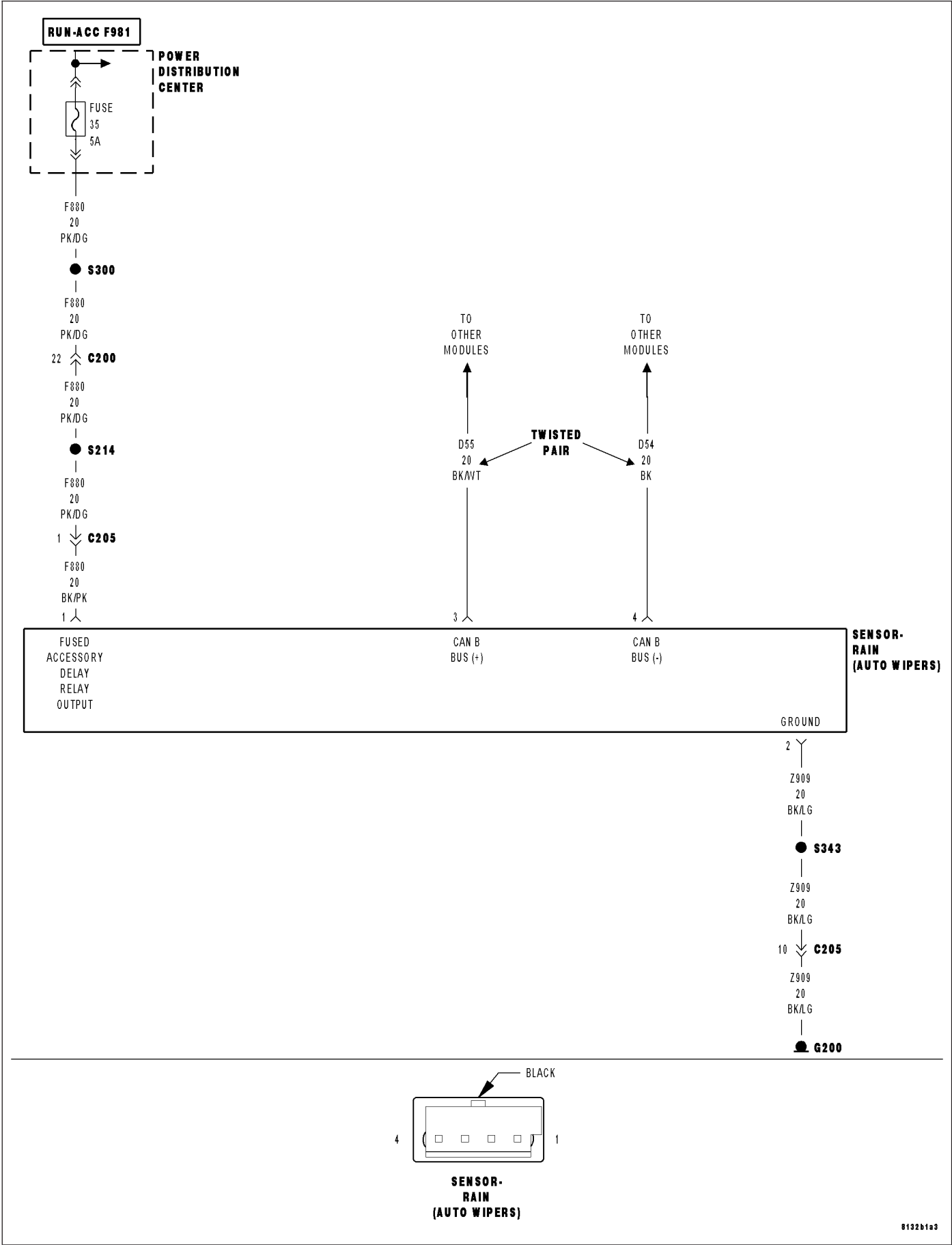
**Yes** >> Replace the A/C Heater Control in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.  
Perform BODY VERIFICATION TEST - VER 1.





\*NO RESPONSE FROM LRSM (RAIN SENSOR)



**\*NO RESPONSE FROM LRSM (RAIN SENSOR) (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

Possible Causes
(F880) FUSED ACCESSORY DELAY RELAY OUTPUT CIRCUIT OPEN OR SHORTED
(Z909) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
RAIN SENSOR

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Does the scan tool display a red X next to the module?**

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

**2. (F880) FUSED ACCESSORY DELAY RELAY OUTPUT CIRCUIT OPEN OR SHORTED**

**Note:** Check the FCM for any ignition related DTCs before proceeding. If set (Refer to 8 - ELECTRICAL/IGNITION CONTROL - DIAGNOSIS AND TESTING).

Turn the ignition off.

Disconnect the Rain Sensor harness connector.

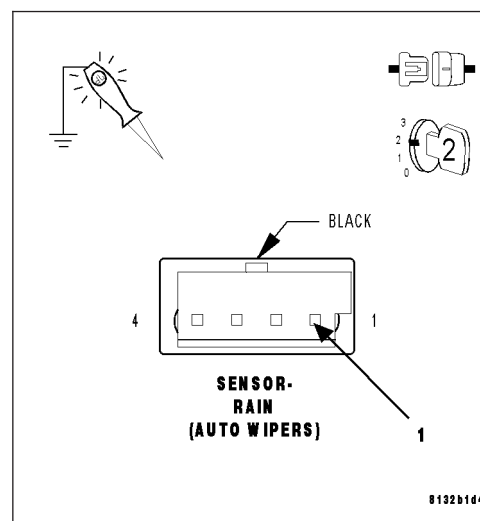
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F880) Fused Accessory Delay Relay Output circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (F880) Fused Accessory Delay Relay Output circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM LRSM (RAIN SENSOR) (CONTINUED)****3. (Z909) GROUND CIRCUIT OPEN**

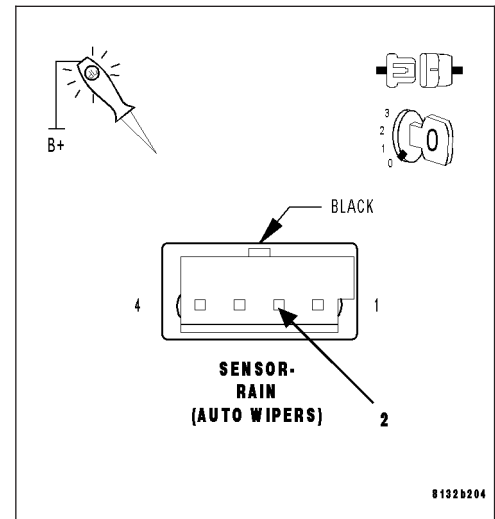
Turn the ignition off.

Using a 12-volt test light connected to 12-volts, check the (Z909) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z909) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.

**4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note: One open circuit will not cause this condition.**

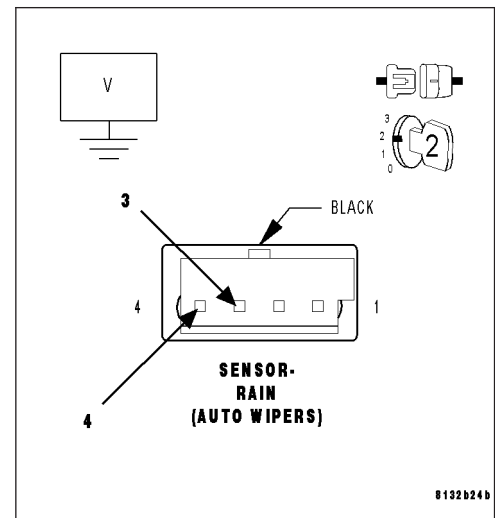
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

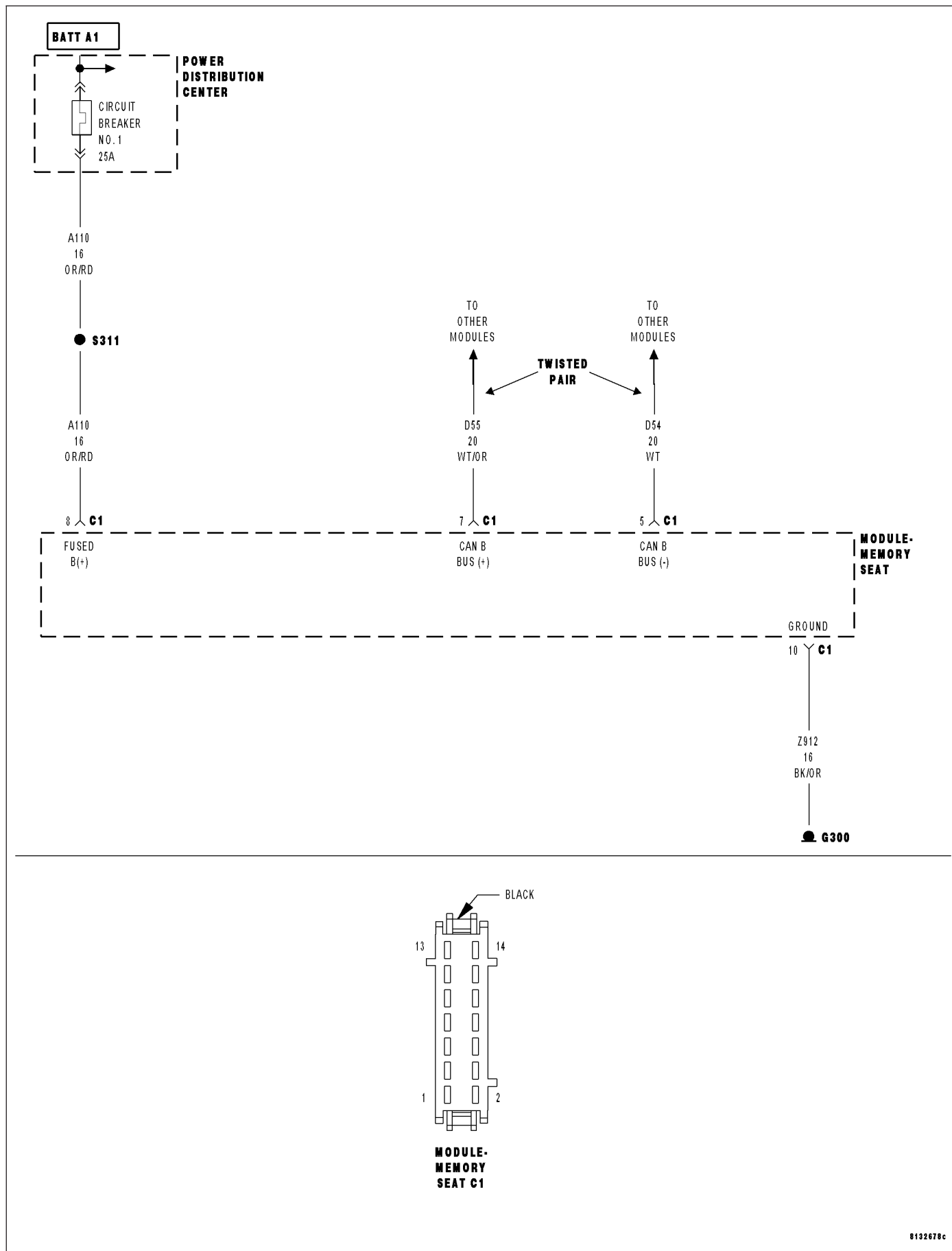
**Is there any voltage present on either circuit?**

**Yes** >> Replace the Rain Sensor in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.  
Perform BODY VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM MSMD**



**\*NO RESPONSE FROM MSMD (CONTINUED)**  
For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(A110) FUSED B (+) CIRCUIT OPEN OR SHORTED (Z912) GROUND CIRCUIT OPEN (D55) AND (D54) CAN B BUS CIRCUITS OPEN MEMORY SEAT MODULE

**Diagnostic Test**

**1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.  
With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Does the scan tool display a red X next to the module?**

- Yes**    >> Go To 2
- No**      >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

**\*NO RESPONSE FROM MSMD (CONTINUED)****2. (A110) FUSED B(+) CIRCUIT OPEN OR SHORTED**

Turn the ignition off.

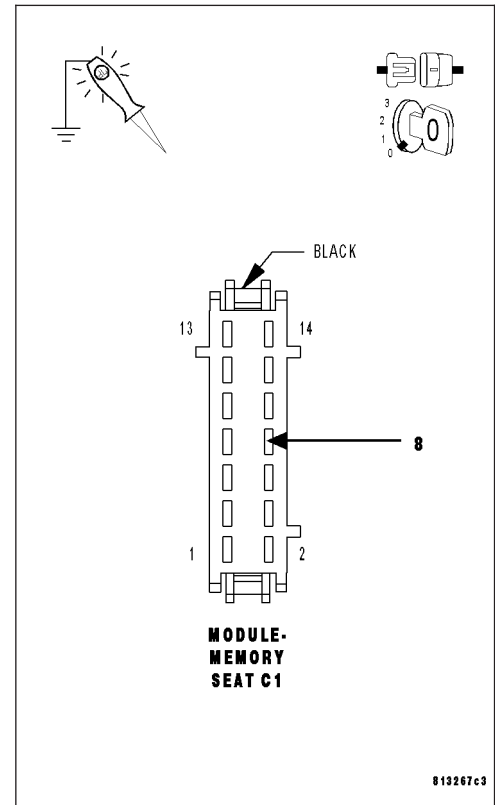
Disconnect the Memory Seat Module C1 harness connector.

Using a 12-volt test light connected to ground, check the (A110) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (A110) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.

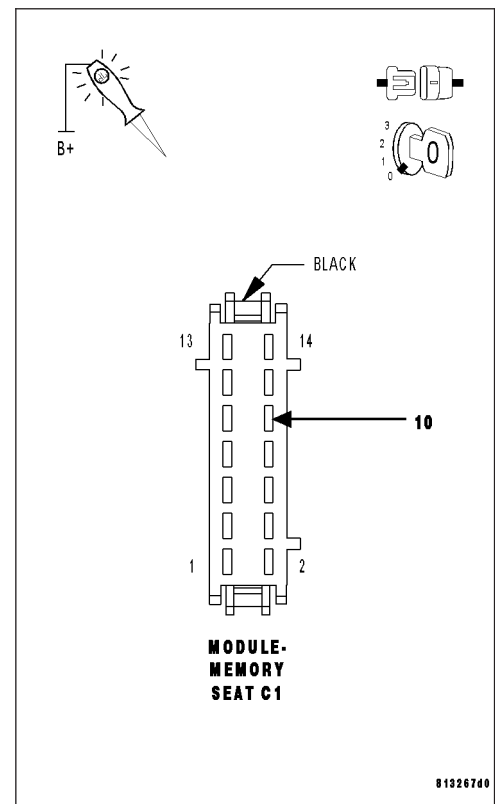
**3. (Z912) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check the (Z912) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z912) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM MSMD (CONTINUED)****4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note:** One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

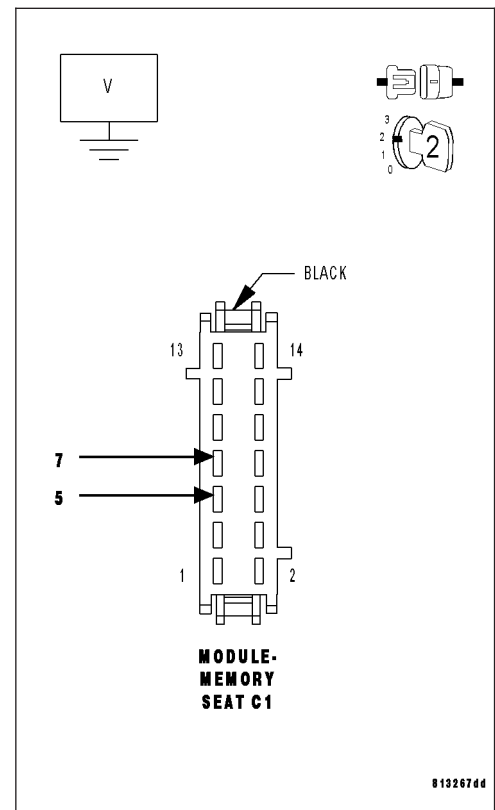
**Is there any voltage present on either circuit?**

**Yes** >> Replace the Memory Seat Module in accordance with the service information.

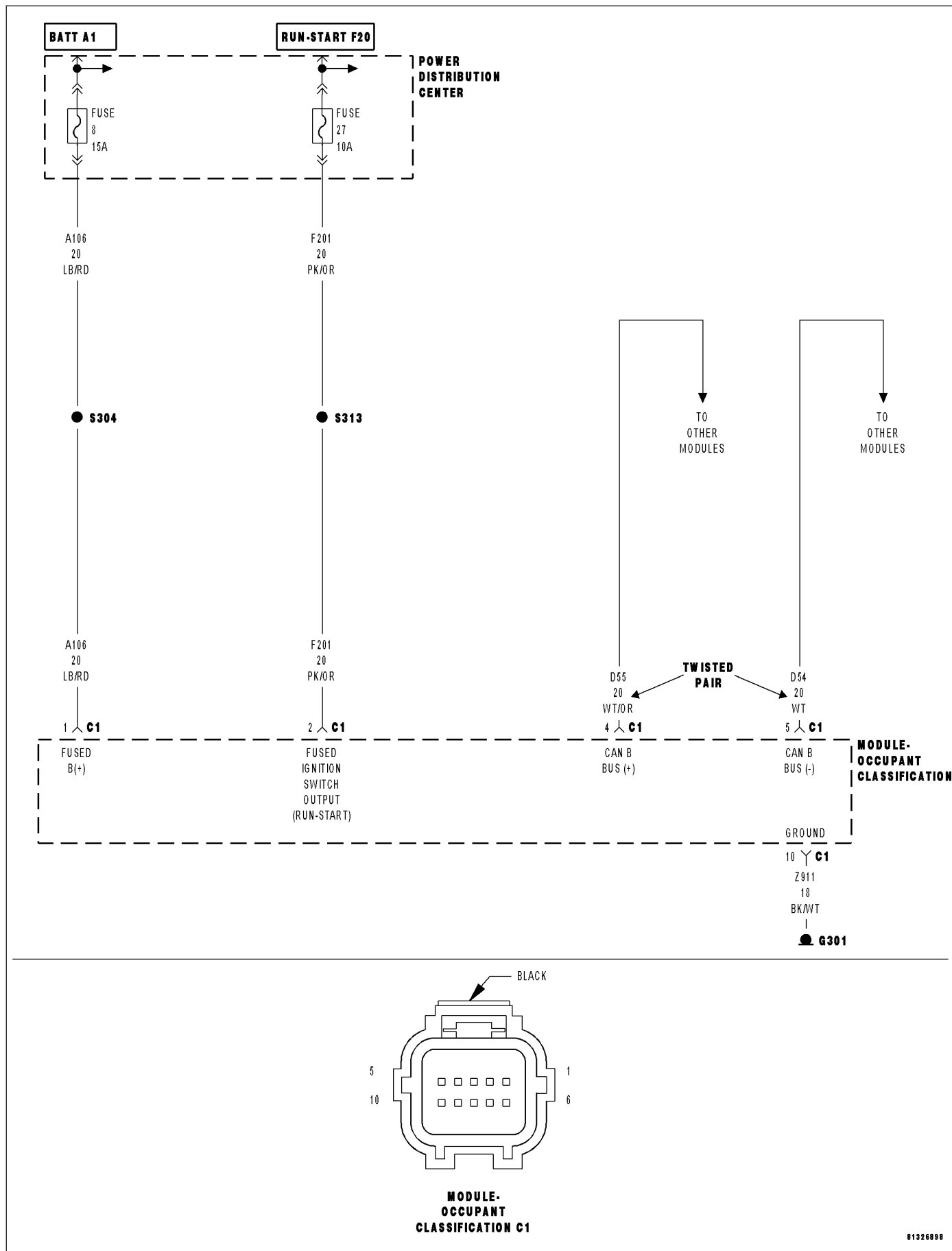
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.

Perform BODY VERIFICATION TEST - VER 1.



# \*NO RESPONSE FROM OCM





**\*NO RESPONSE FROM OCM (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(A106) FUSED B(+) CIRCUIT OPEN OR SHORTED (Z911) GROUND CIRCUIT OPEN (F201) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED (D55) AND (D54) CAN B BUS CIRCUITS OPEN (R263) SEAT POSITION SENSOR VOLTAGE CIRCUIT FOR A SHORT TO GROUND (R701) SEAT WEIGHT SENSOR 5 VOLTS CIRCUIT FOR A SHORT TO GROUND OCCUPANT CLASSIFICATION MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Does the scan tool display a red X next to the module?**

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

**\*NO RESPONSE FROM OCM (CONTINUED)****2. (A106) FUSED B(+) CIRCUIT OPEN OR SHORTED**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Occupant Classification Module C1 harness connector.

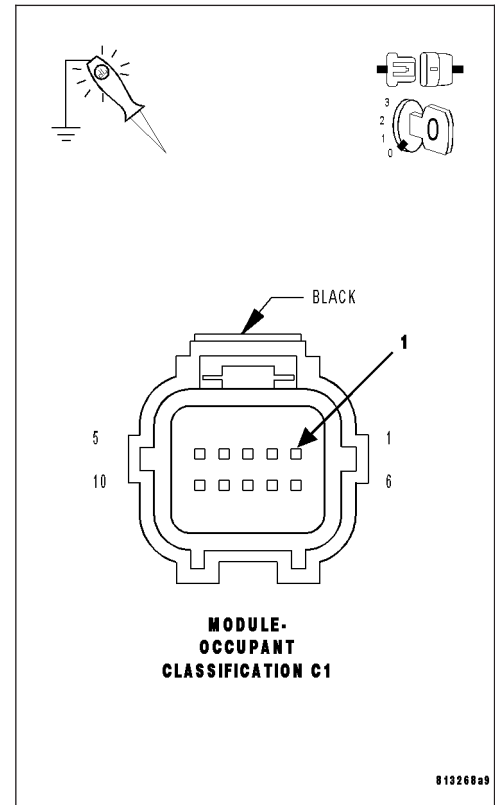
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Using a 12-volt test light connected to ground, check the (A106) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (A106) Fused B(+) circuit for an open or short. Perform the OCS VERIFICATION TEST-VER 1.

**3. (Z911) GROUND CIRCUIT OPEN**

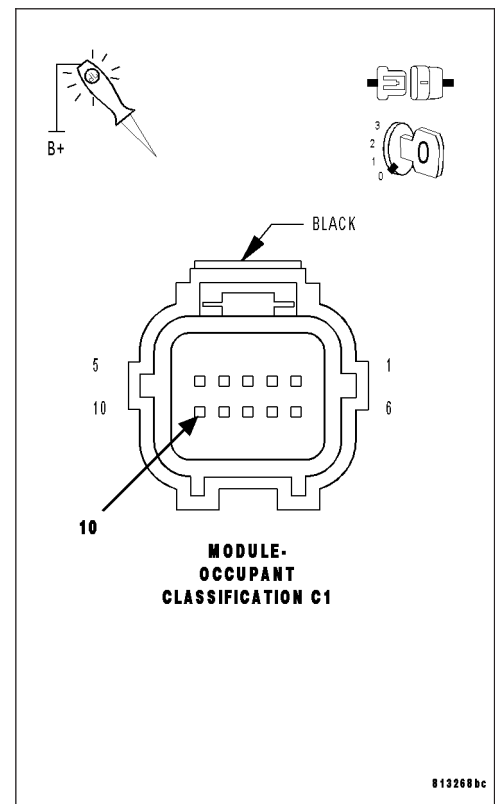
Turn the ignition off.

Using a 12-volt test light connected to 12-volts, check the (Z911) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z911) ground circuit for an open. Perform the OCS VERIFICATION TEST-VER 1.



**\*NO RESPONSE FROM OCM (CONTINUED)****4. (F201) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED**

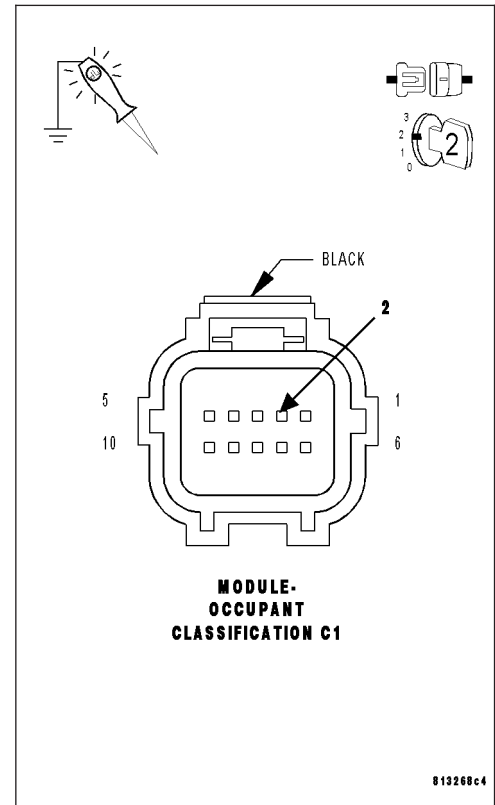
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F201) Fused Ignition Switch Output circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 5

**No** >> Repair the (F201) Fused Ignition Switch Output circuit for an open or short.  
Perform the OCS VERIFICATION TEST-VER 1.

**5. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**WARNING:** If the Occupant Classification Module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

**Note:** One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

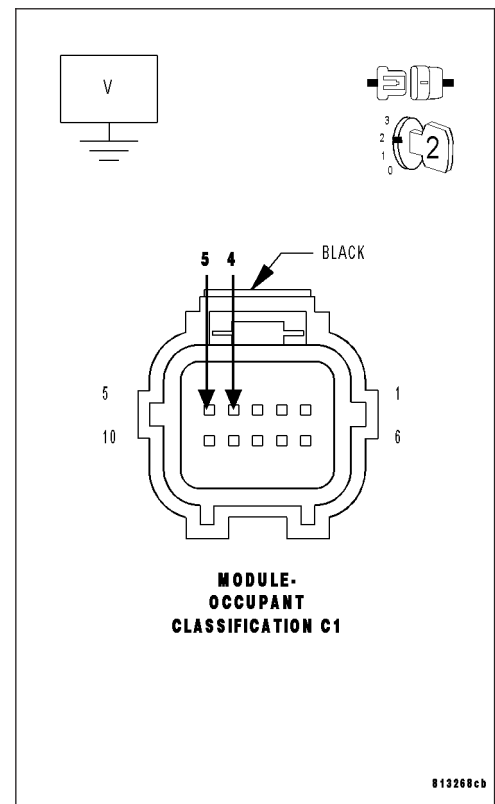
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

**Is there any voltage present on either circuit?**

**Yes** >> Go To 6

Perform the OCS VERIFICATION TEST-VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.  
Perform the OCS VERIFICATION TEST-VER 1.



**\*NO RESPONSE FROM OCM (CONTINUED)****6. CHECK (R263) SEAT POSITION SENSOR VOLTAGE CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Measure the resistance between ground and the (R263) Seat Position Sensor Voltage-Driver circuit.

**Is the resistance below 10k ohms on either circuit?**

**Yes** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the OCM and Driver Seat Position Sensor Harness in accordance with the service information.

Perform the OCS VERIFICATION TEST-VER 1.

**No** >> Go To 7

---

**7. CHECK (R701) SEAT WEIGHT SENSOR 5 VOLTS CIRCUIT FOR A SHORT TO GROUND**

Disconnect the Occupant Classification Module C2 harness connector.

Measure the resistance between ground and the (R701) Seat Weight Sensor 5 volt circuit.

**Is the resistance below 10k ohms on either circuit?**

**Yes** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

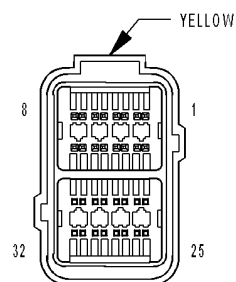
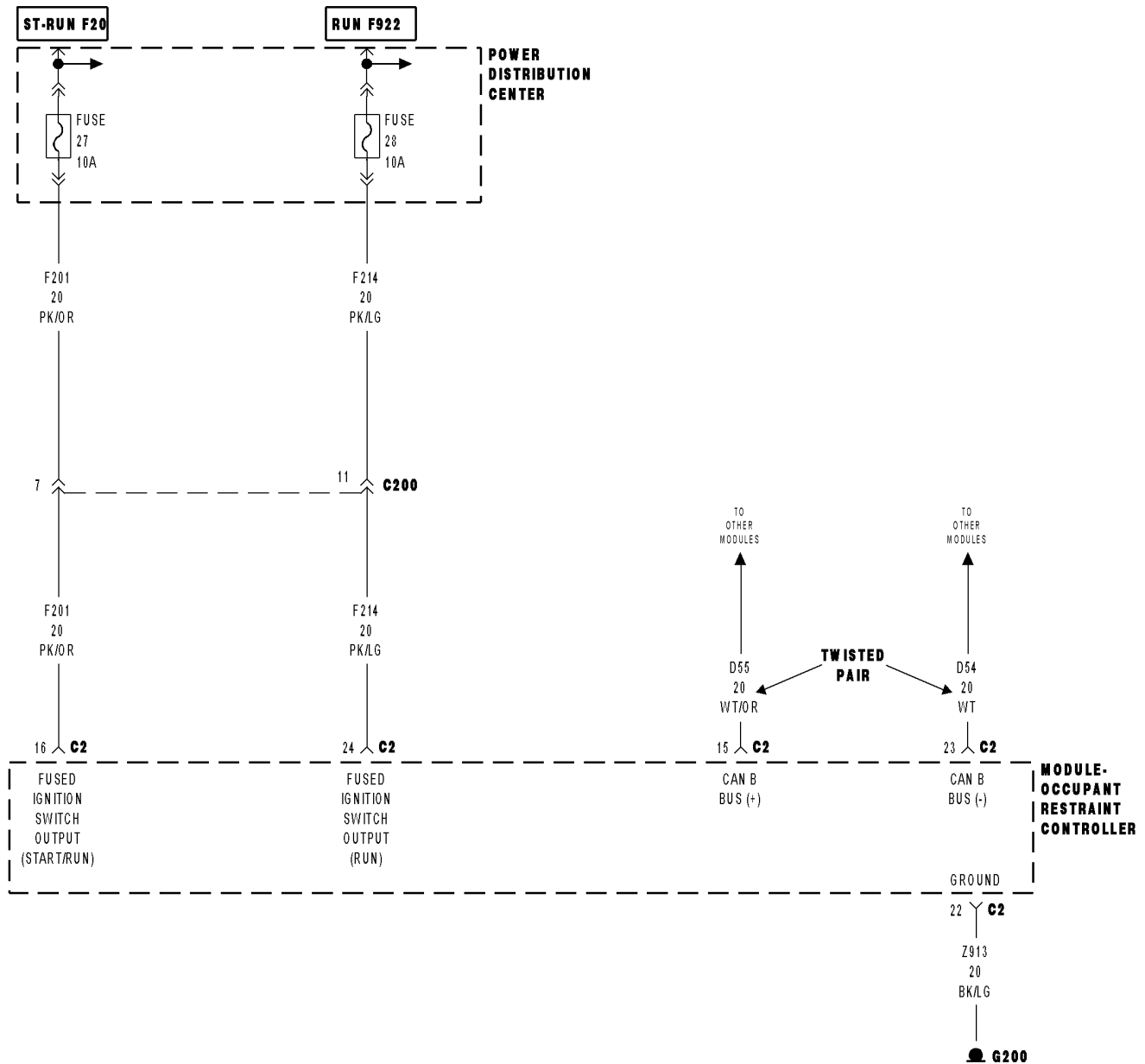
Replace the OCM and Driver Seat Position Sensor Harness in accordance with the service information.

Perform the OCS VERIFICATION TEST-VER 1.

**No** >> Replace the Occupant Classification Module in accordance with the service information.  
Perform the OCS VERIFICATION TEST-VER 1.

---

# \*NO RESPONSE FROM ORC



**MODULE-  
OCCUPANT  
RESTRAINT  
CONTROLLER C2**

**\*NO RESPONSE FROM ORC (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

Possible Causes
(Z913) GROUND CIRCUIT OPEN (F214) FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR SHORTED (F201) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN OR SHORTED (D55) AND (D54) CAN B BUS CIRCUITS OPEN OCCUPANT RESTRAINT CONTROLLER MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

**2. (Z913) GROUND CIRCUIT OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Occupant Restraint Controller Module harness connectors.

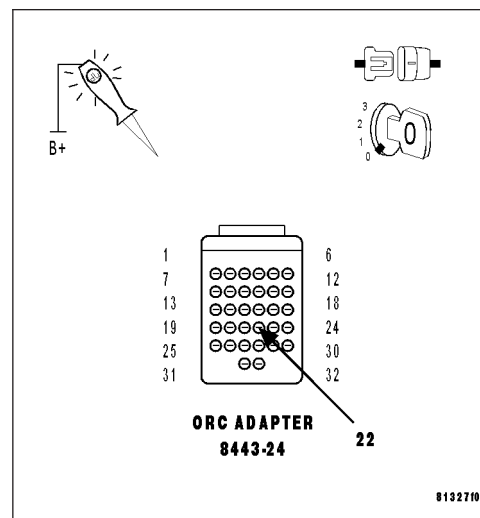
Connect the appropriate Load Tool ACM Adaptor to the ORC connector.

Using a 12-volt test light connected to 12-volts, check the (Z913) ground circuit.

Does the test light illuminate brightly?

**Yes** >> Go To 3

**No** >> Repair the (Z913) ground circuit for an open.  
Perform AIRBAG VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM ORC (CONTINUED)****3. (F214) FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR SHORTED**

**Note:** Check the FCM for any ignition related DTCs before proceeding. If set (Refer to 8 - ELECTRICAL/IGNITION CONTROL - DIAGNOSIS AND TESTING).

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

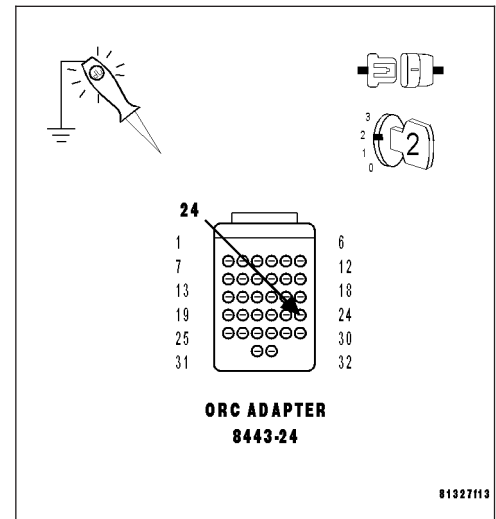
Using a 12-volt test light connected to ground, check the (F214) Fused Run Relay Output circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (F214) Fused Run Relay Output circuit for an open or short.

Perform AIRBAG VERIFICATION TEST - VER 1.

**4. (F201) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN OR SHORTED**

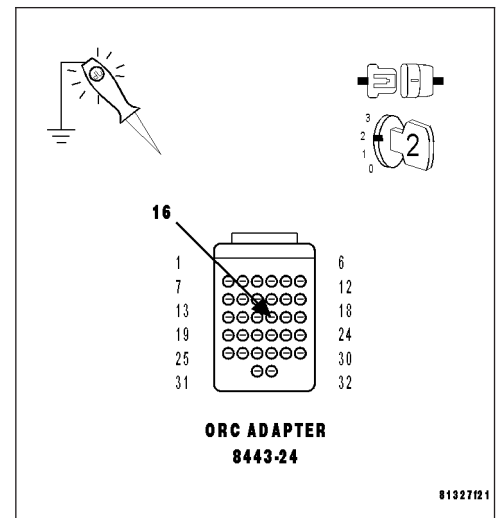
Using a 12-volt test light connected to ground, check the (F201) Fused Ignition Switch Output (RUN/START) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 5

**No** >> Repair the (F201) Fused Ignition Switch Output (RUN/START) circuit for an open or short.

Perform AIRBAG VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM ORC (CONTINUED)****5. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**WARNING:** If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

**Note:** One open circuit will not cause this condition.

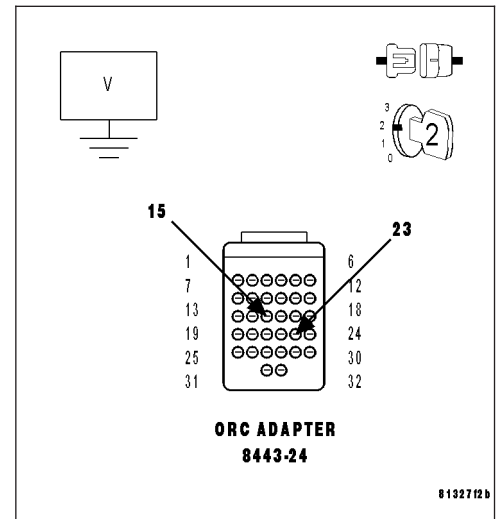
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

**Is there any voltage present on either circuit?**

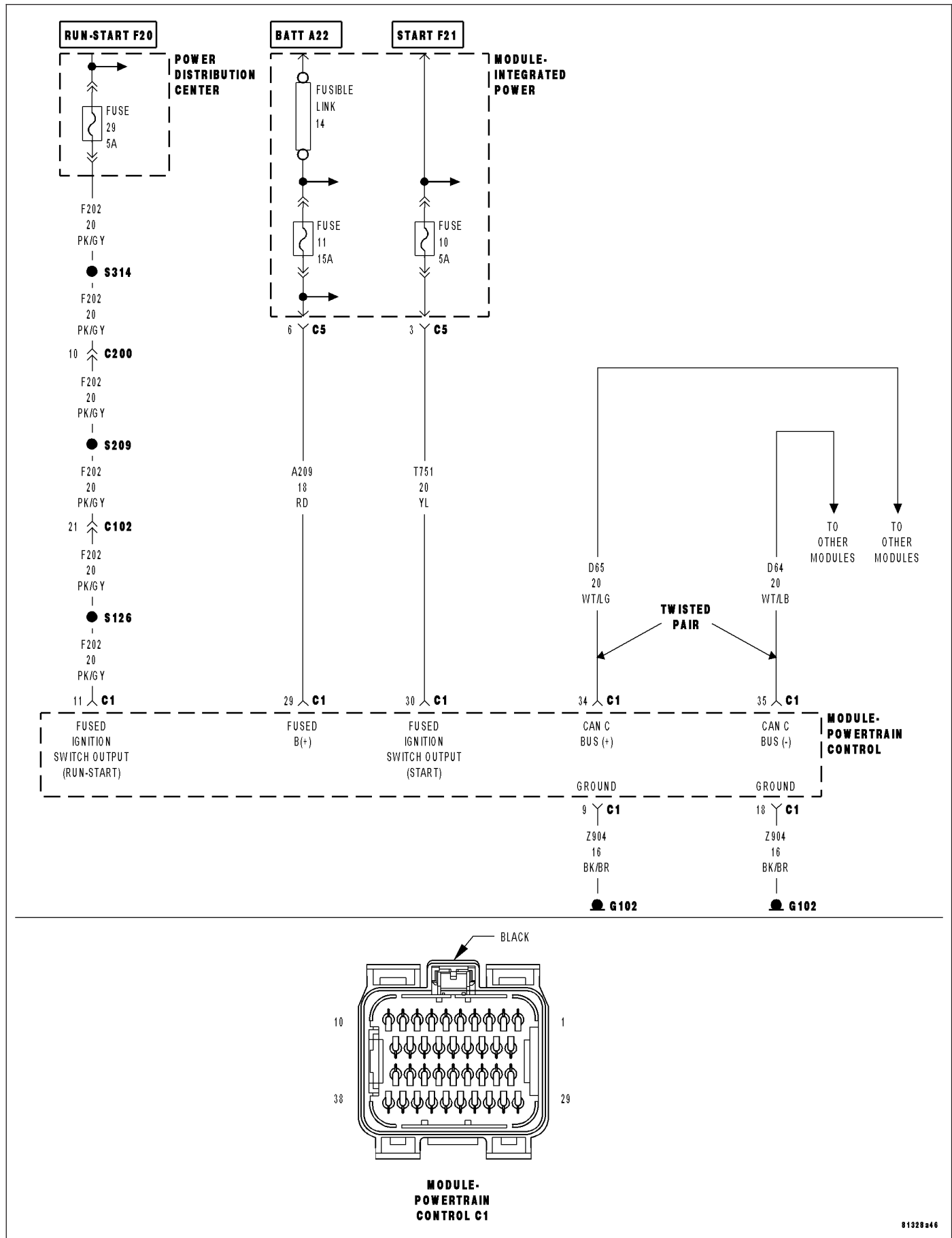
**Yes** >> Replace the Occupant Restraint Controller Module in accordance with the service information.  
Perform AIRBAG VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.  
Perform AIRBAG VERIFICATION TEST - VER 1.





# \*NO RESPONSE FROM PCM



**\*NO RESPONSE FROM PCM (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

Possible Causes
(A209) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z904) GROUND CIRCUIT OPEN
(F202) FUSED IGNITION SW OUTPUT CIRCUIT OPEN OR SHORTED
(D65) CAN C BUS (+) CIRCUIT OPEN
(D64) CAN C BUS (-) CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Note:** Check the FCM for any active CAN C hardware DTCs, perform DTC before proceeding.

**Does the scan tool display a red X next to the module?**

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

**2. (A209) FUSED B(+) CIRCUIT OPEN OR SHORTED**

Turn the ignition off.

Disconnect the PCM C1 harness connector.

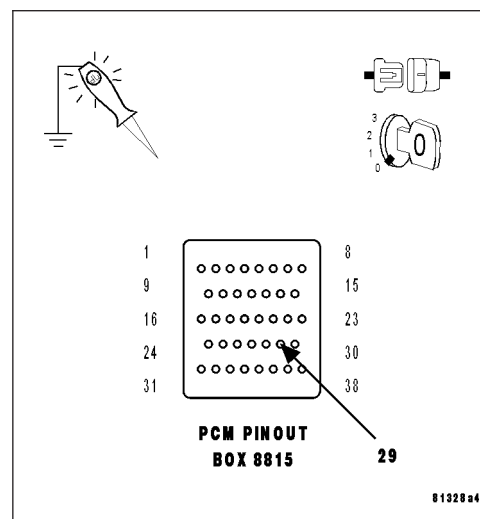
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Using a 12-volt test light connected to ground, check the (A209) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (A209) Fused B(+) circuit for an open or short. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



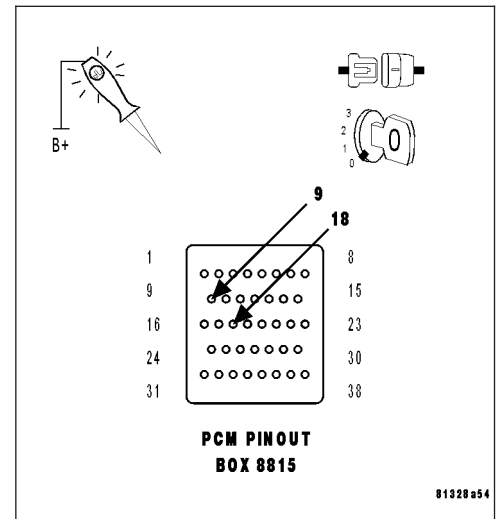
**\*NO RESPONSE FROM PCM (CONTINUED)****3. (Z904) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check each (Z904) ground circuit.

**Does the test light illuminate brightly for each circuit?**

**Yes** >> Go To 4

**No** >> Repair the (Z904) ground circuit for an open.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**4. (F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED**

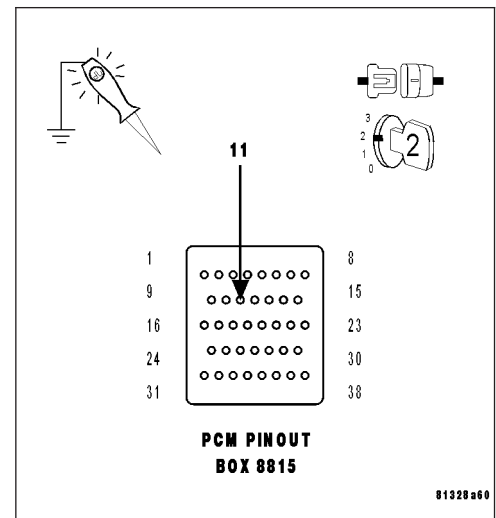
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F202) Fused Ignition Switch Output circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 5

**No** >> Repair the (F202) Fused Ignition Switch Output circuit for an open or short.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



**\*NO RESPONSE FROM PCM (CONTINUED)****5. (D65) CAN C BUS (+) CIRCUIT OPEN**

Turn the ignition off.

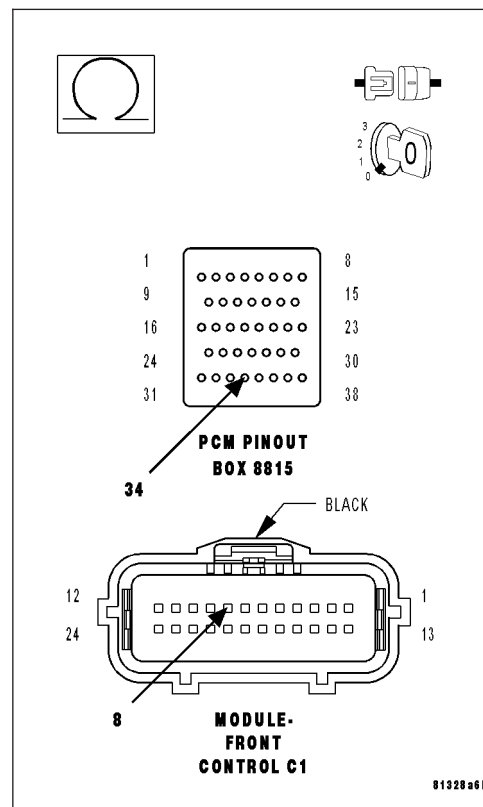
Disconnect the FCM C1 harness connector.

Measure the resistance of the (D65) CAN C Bus (+) circuit between the FCM connector and the appropriate terminal of the special tool #8815.

**Is resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the (D65) CAN C Bus (+) circuit for an open.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

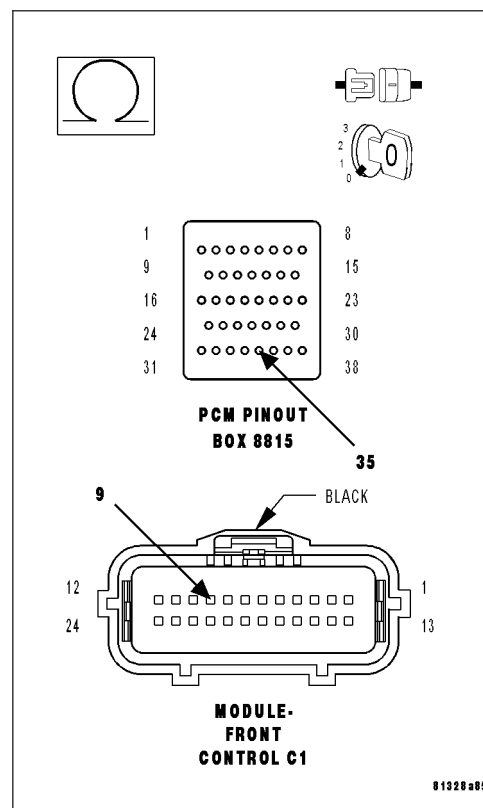
**6. (D64) CAN C BUS (-) CIRCUIT OPEN**

Measure the resistance of the (D64) CAN C Bus (-) circuit between the FCM connector and the appropriate terminal of the special tool #8815.

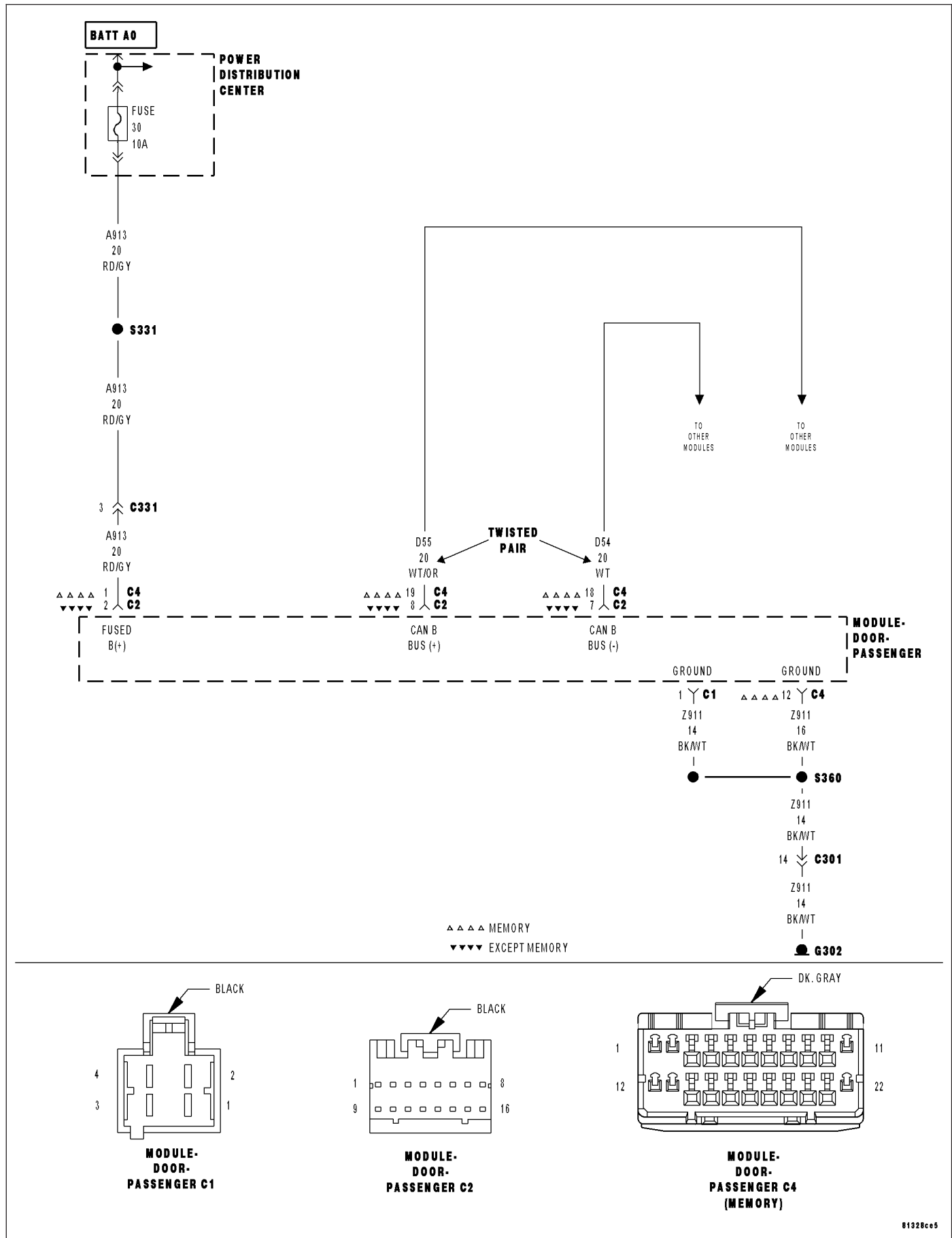
**Is resistance below 5.0 ohms?**

**Yes** >> Replace and program the Powertrain Control Module in accordance with the service information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Repair the (D64) CAN C Bus (-) circuit for an open.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



## \*NO RESPONSE FROM PDM



**\*NO RESPONSE FROM PDM (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(A913) FUSED B (+) CIRCUIT OPEN OR SHORTED (Z911) GROUND CIRCUIT OPEN (D55) AND (D54) CAN B BUS CIRCUITS OPEN PASSENGER DOOR MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Does the scan tool display a red X next to the module?**

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

**\*NO RESPONSE FROM PDM (CONTINUED)****2. (A913) FUSED B(+) CIRCUIT OPEN OR SHORTED**

Turn the ignition off.

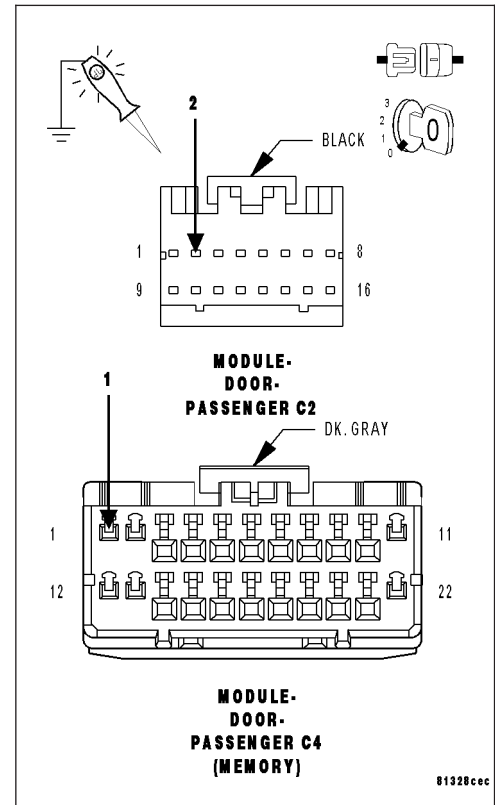
Disconnect the Passenger Door Module harness connectors.

Using a 12-volt test light connected to ground, check the (A913) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (A913) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.

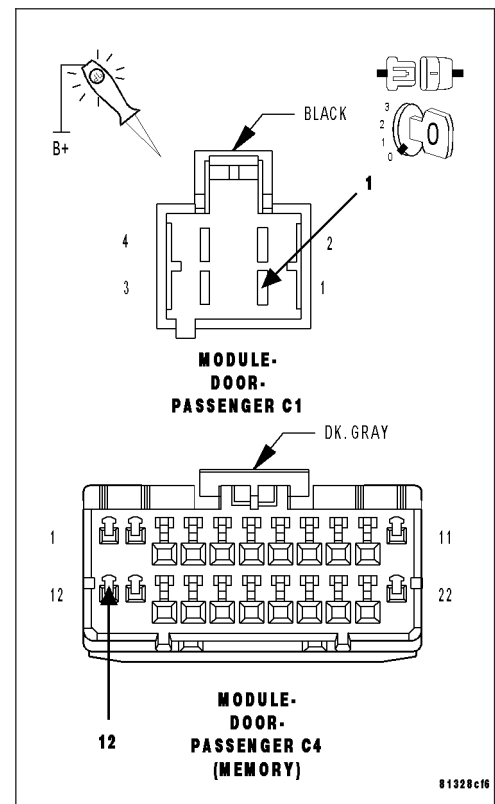
**3. (Z911) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check the (Z911) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z911) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM PDM (CONTINUED)****4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note:** One open circuit will not cause this condition.

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

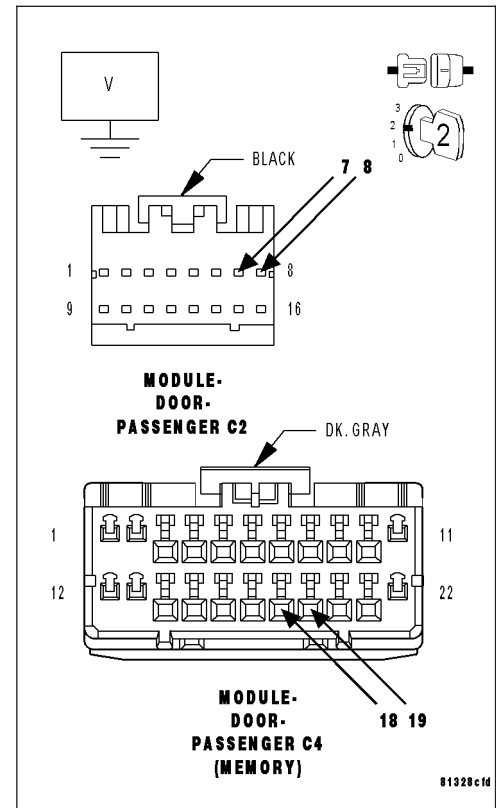
**Is there any voltage present on either circuit?**

**Yes** >> Replace the Passenger Door Module in accordance with the service information.

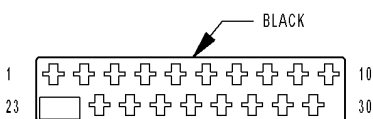
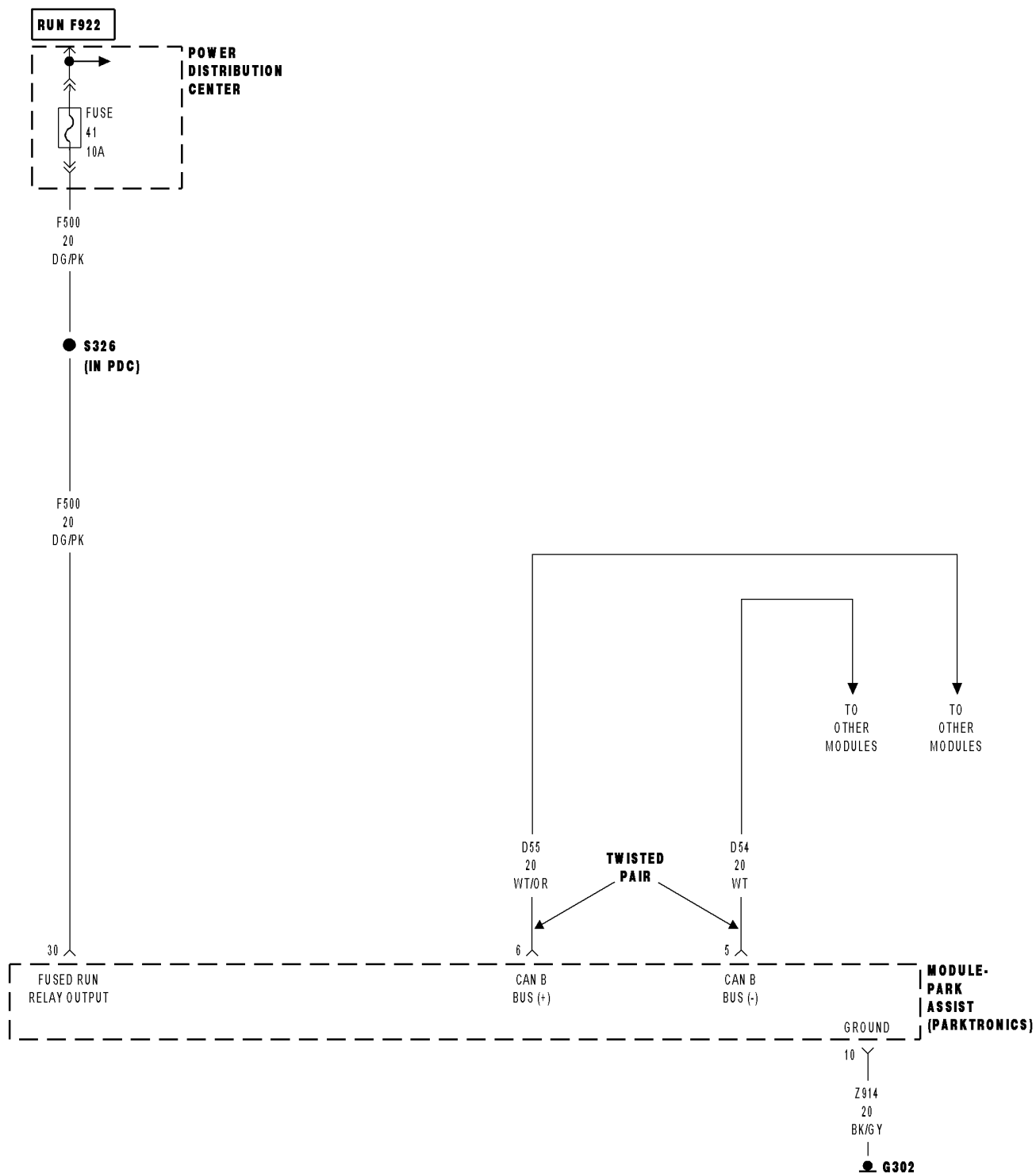
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.

Perform BODY VERIFICATION TEST - VER 1.





**\*NO RESPONSE FROM PTS (PARK ASSIST MODULE)**

# \*NO RESPONSE FROM PTS (PARK ASSIST MODULE) (CONTINUED)

For a complete wiring diagram Refer to Section 8W.

Possible Causes
(F500) FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR SHORTED
(Z914) GROUND CIRCUIT OPEN
(D55) AND (D54) CAN B BUS CIRCUITS OPEN
PARK ASSIST MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

Does the scan tool display a red X next to the module?

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

### 2. (F500) FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR SHORTED

**Note:** Check the FCM for any ignition related DTCs before proceeding. If set (Refer to 8 - ELECTRICAL/IGNITION CONTROL - DIAGNOSIS AND TESTING).

Turn the ignition off.

Disconnect the Park Assist Module harness connector.

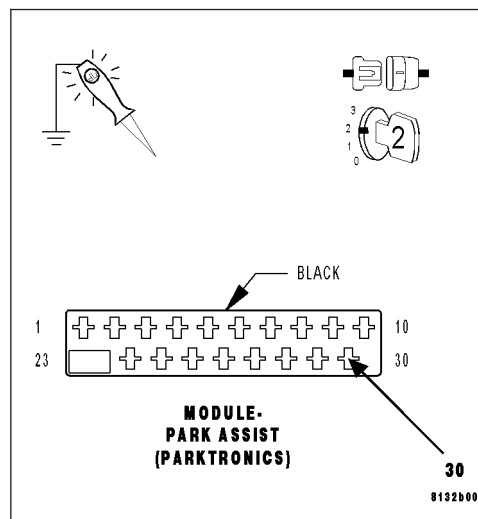
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F500) Fused Run Relay Output circuit.

Does the test light illuminate brightly?

**Yes** >> Go To 3

**No** >> Repair the (F500) Fused Run Relay Output circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM PTS (PARK ASSIST MODULE) (CONTINUED)****3. (Z914) GROUND CIRCUIT OPEN**

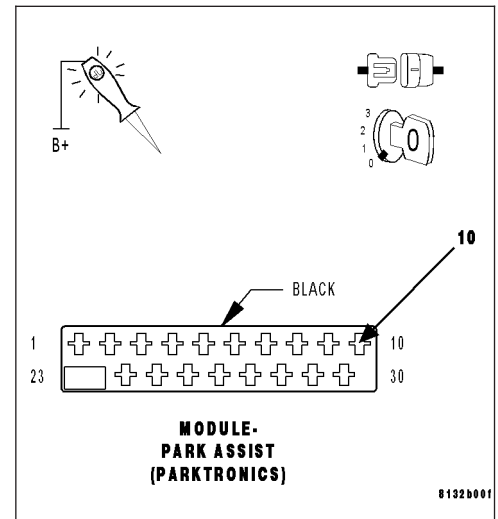
Turn the ignition off.

Using a 12-volt test light connected to 12-volts, check the (Z914) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z914) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.

**4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note: One open circuit will not cause this condition.**

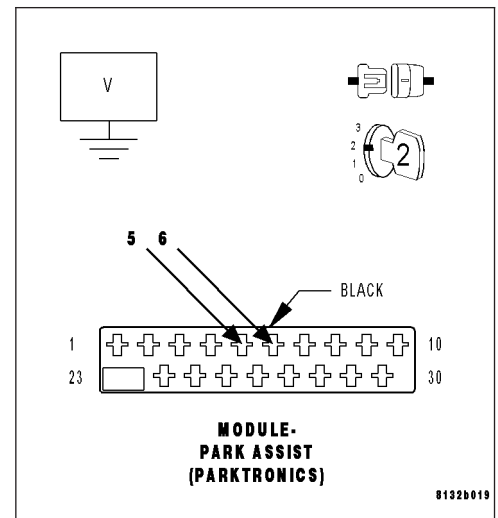
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

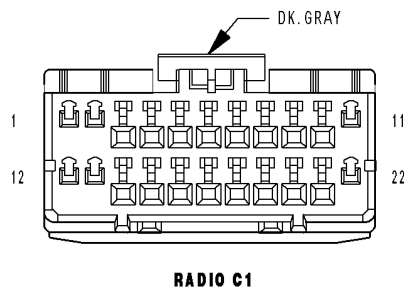
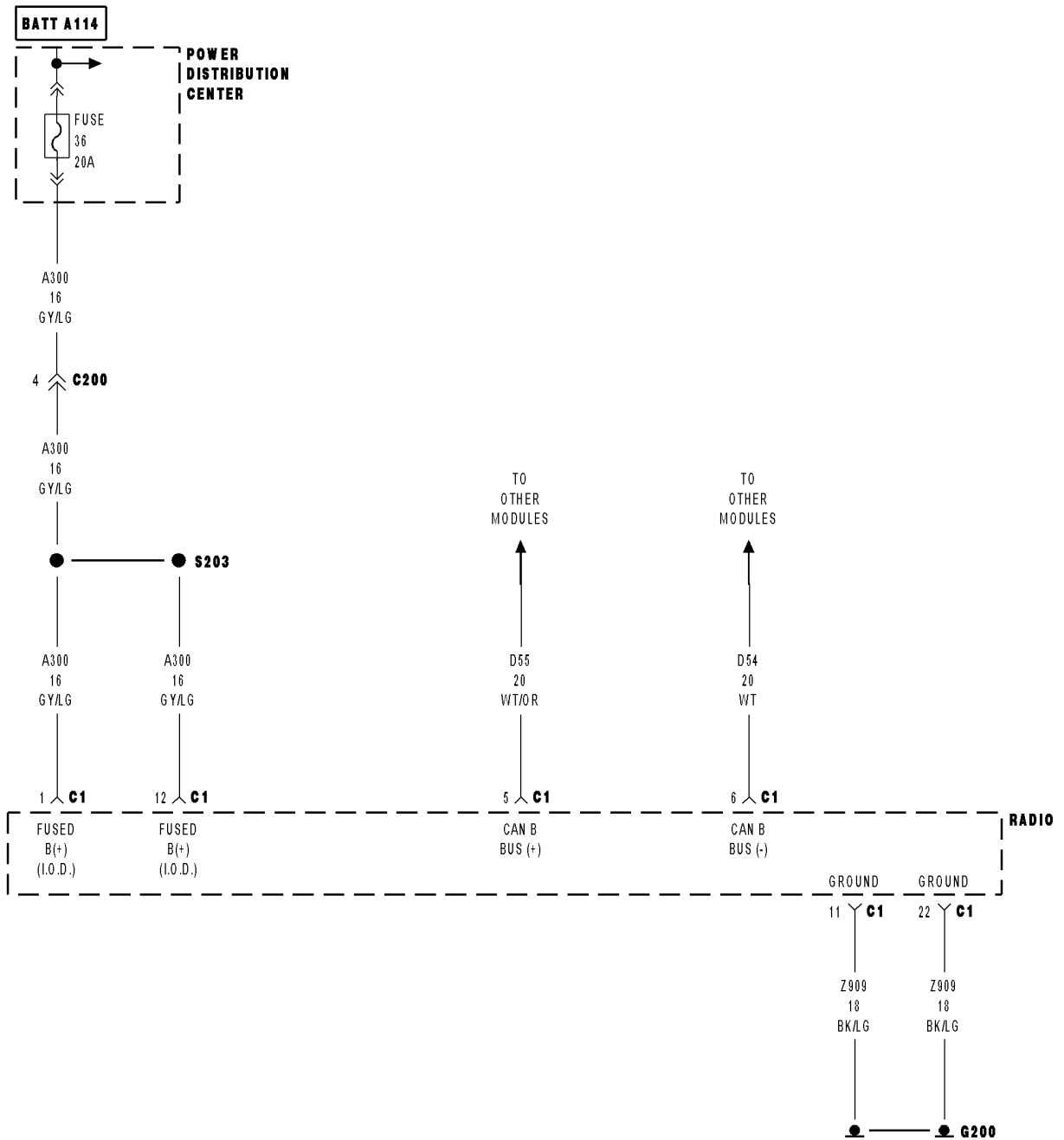
**Is there any voltage present on either circuit?**

**Yes** >> Replace the Park Assist Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.  
Perform BODY VERIFICATION TEST - VER 1.



# \*NO RESPONSE FROM RADIO



**\*NO RESPONSE FROM RADIO (CONTINUED)**

For a complete wiring diagram Refer to **Section 8W**.

Possible Causes
(A300) FUSED B (+) CIRCUIT OPEN OR SHORTED (Z909) GROUND CIRCUIT OPEN (D55) AND (D54) CAN B BUS CIRCUITS OPEN RADIO

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Does the scan tool display a red X next to the module?**

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

**2. (A300) FUSED B(+) CIRCUIT OPEN OR SHORTED**

Turn the ignition off.

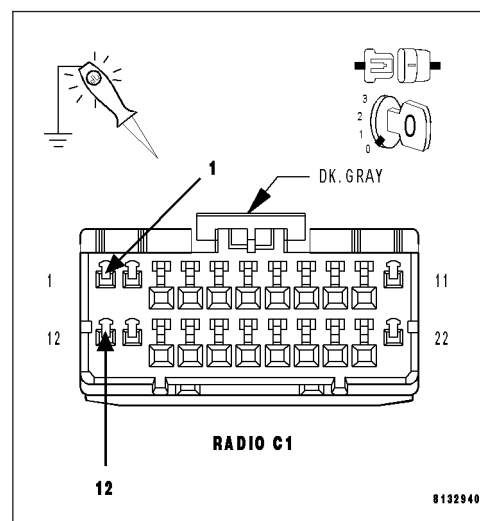
Disconnect the Radio C1 harness connector.

Using a 12-volt test light connected to ground, check each (A300) Fused B(+) circuit.

**Does the test light illuminate brightly for each circuit?**

**Yes** >> Go To 3

**No** >> Repair the (A300) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.



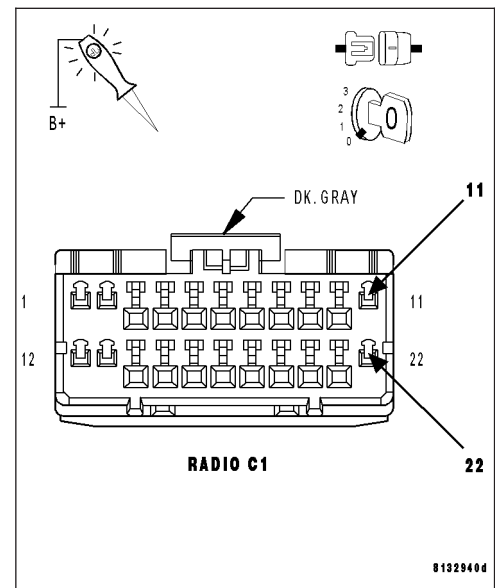
**\*NO RESPONSE FROM RADIO (CONTINUED)****3. (Z909) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check each (Z909) ground circuit.

**Does the test light illuminate brightly for each circuit?**

**Yes** >> Go To 4

**No** >> Repair the (Z909) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.

**4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note: One open circuit will not cause this condition.**

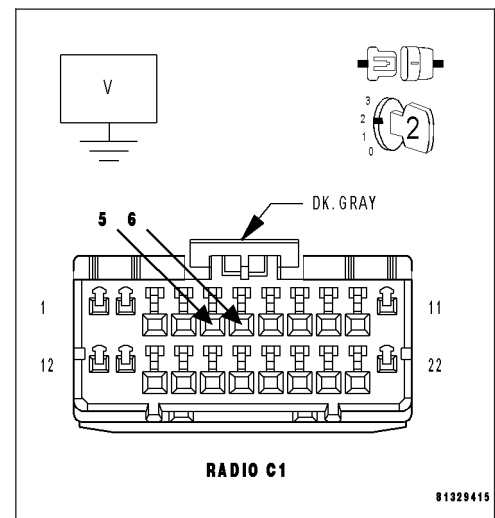
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

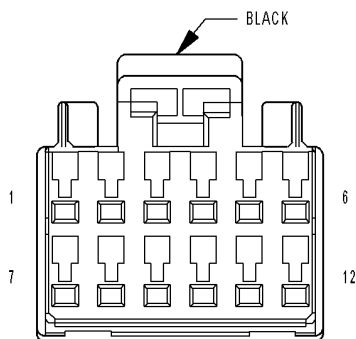
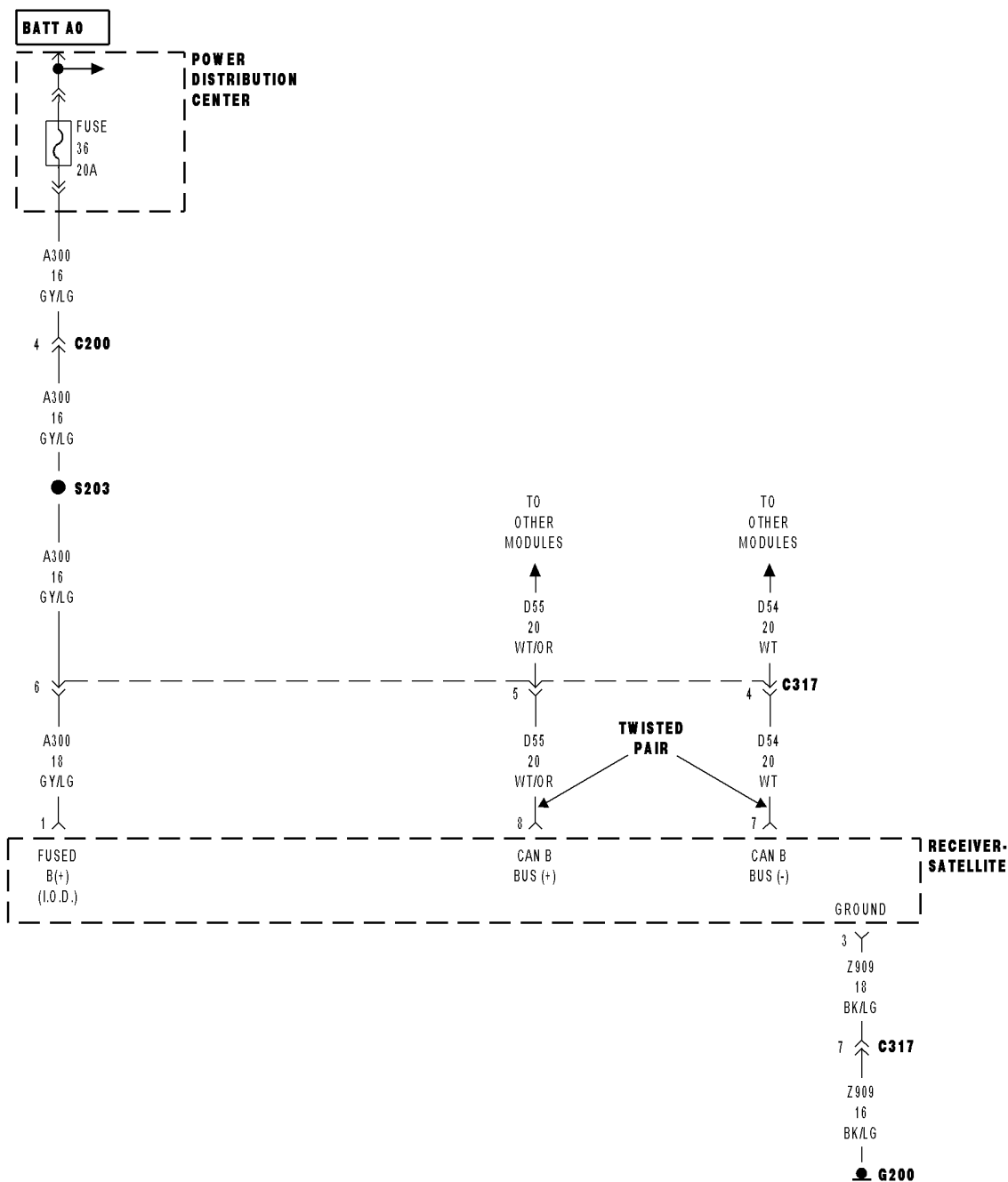
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

**Is there any voltage present on either circuit?**

**Yes** >> Replace the Radio in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.  
Perform BODY VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM SDAR****RECEIVER-SATELLITE**

**\*NO RESPONSE FROM SDAR (CONTINUED)**

For a complete wiring diagram Refer to **Section 8W**.

Possible Causes
(A300) FUSED B (+) CIRCUIT OPEN OR SHORTED (Z909) GROUND CIRCUIT OPEN (D55) AND (D54) CAN B BUS CIRCUITS OPEN SATELLITE RECEIVER

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Does the scan tool display a red X next to the module?**

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

**2. (A300) FUSED B(+) CIRCUIT OPEN OR SHORTED**

Turn the ignition off.

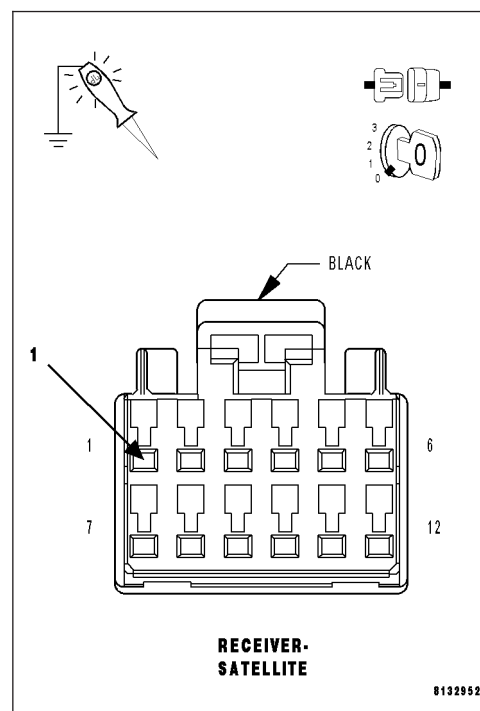
Disconnect the Satellite Receiver harness connector.

Using a 12-volt test light connected to ground, check the (A300) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (A300) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.





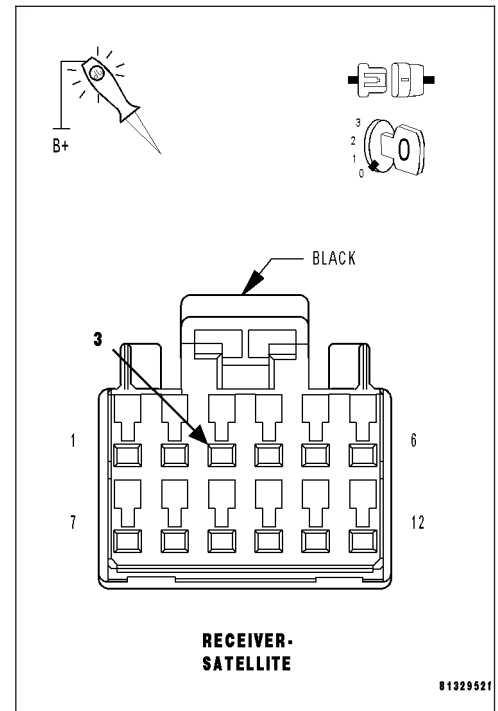
**\*NO RESPONSE FROM SDAR (CONTINUED)****3. (Z909) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check the (Z909) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z909) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.

**4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note: One open circuit will not cause this condition.**

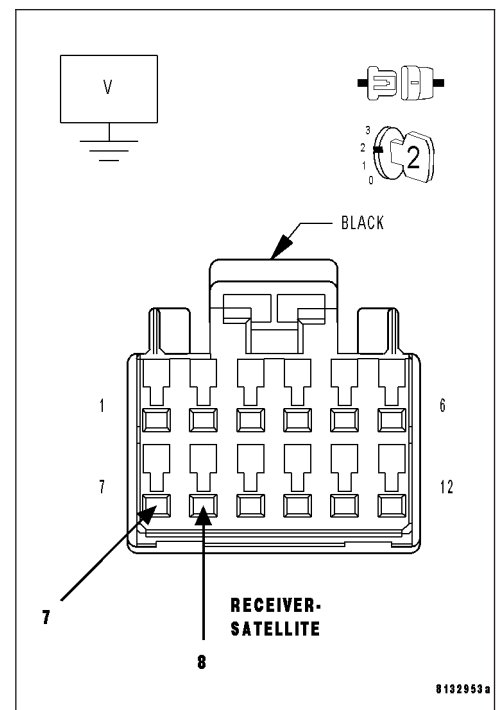
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

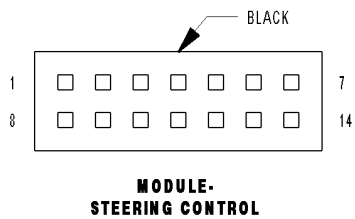
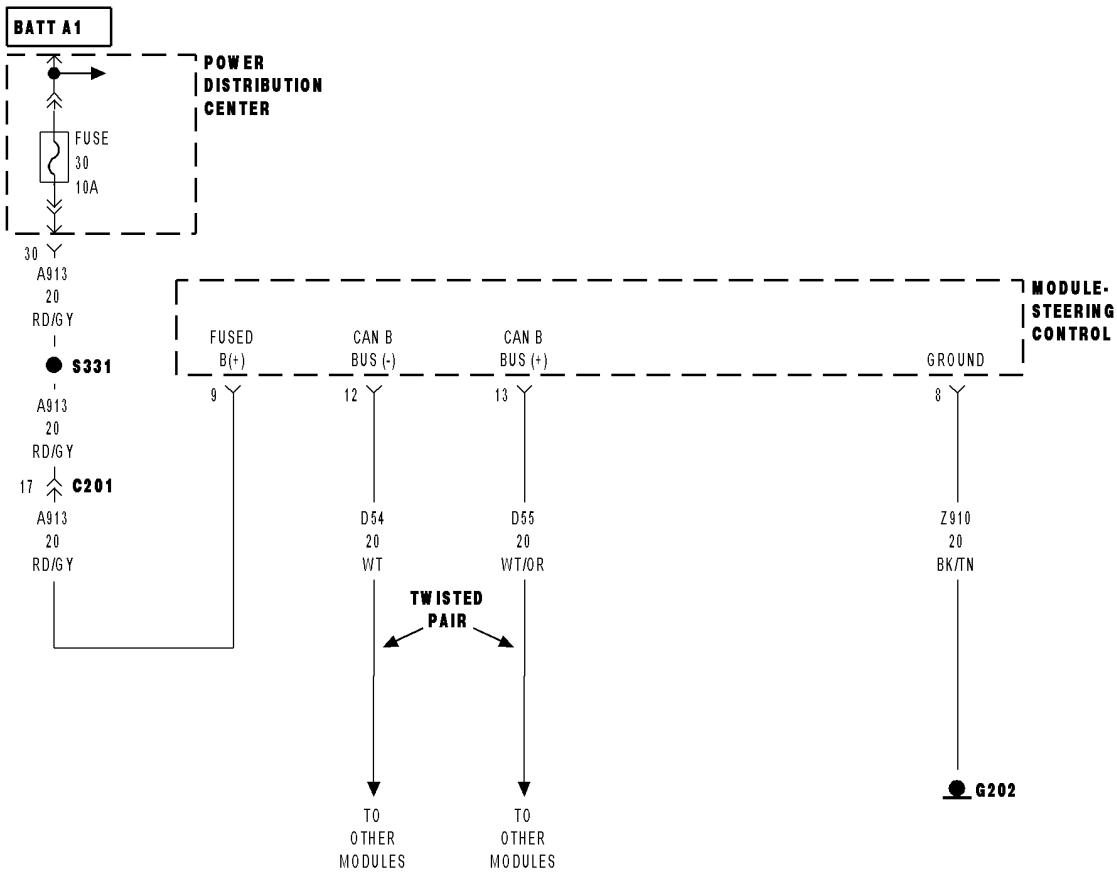
**Is there any voltage present on either circuit?**

**Yes** >> Replace the Satellite Receiver in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.  
Perform BODY VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM SCM**



**\*NO RESPONSE FROM SCM (CONTINUED)**  
For a complete wiring diagram Refer to **Section 8W**.

Possible Causes
(A913) FUSED B(+) CIRCUIT OPEN OR SHORTED (Z910) GROUND CIRCUIT OPEN (D55) AND (D54) CAN B BUS CIRCUITS OPEN STEERING CONTROL MODULE

Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.  
With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

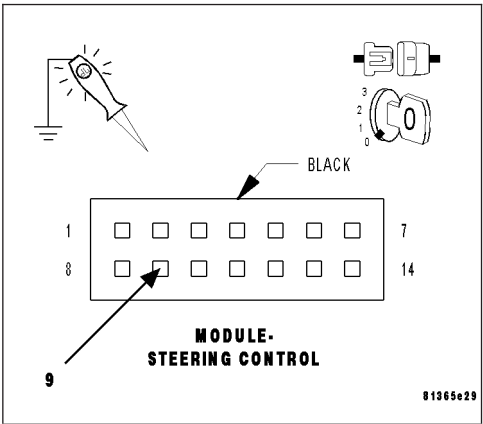
Does the scan tool display a red X next to the module?

- Yes    >> Go To 2
- No    >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

2. (A913) FUSED B(+) CIRCUIT OPEN OR SHORTED

Turn the ignition off.  
Disconnect the Steering Control Module harness connector.  
Using a 12-volt test light connected to ground, check the (A913) Fused B(+) circuit.

- Does the test light illuminate brightly?
- Yes    >> Go To 3
- No    >> Repair the (A913) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



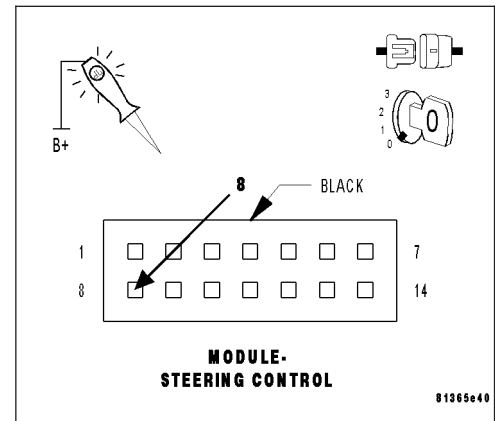
**\*NO RESPONSE FROM SCM (CONTINUED)****3. (Z910) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check the (Z910) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z910) ground circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note: One open circuit will not cause this condition.**

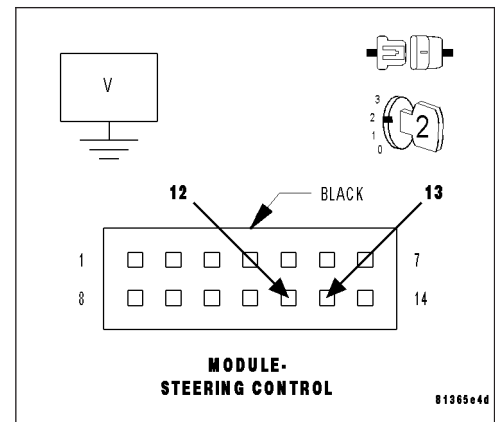
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

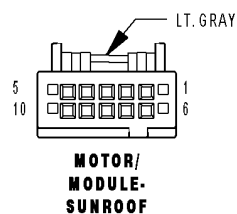
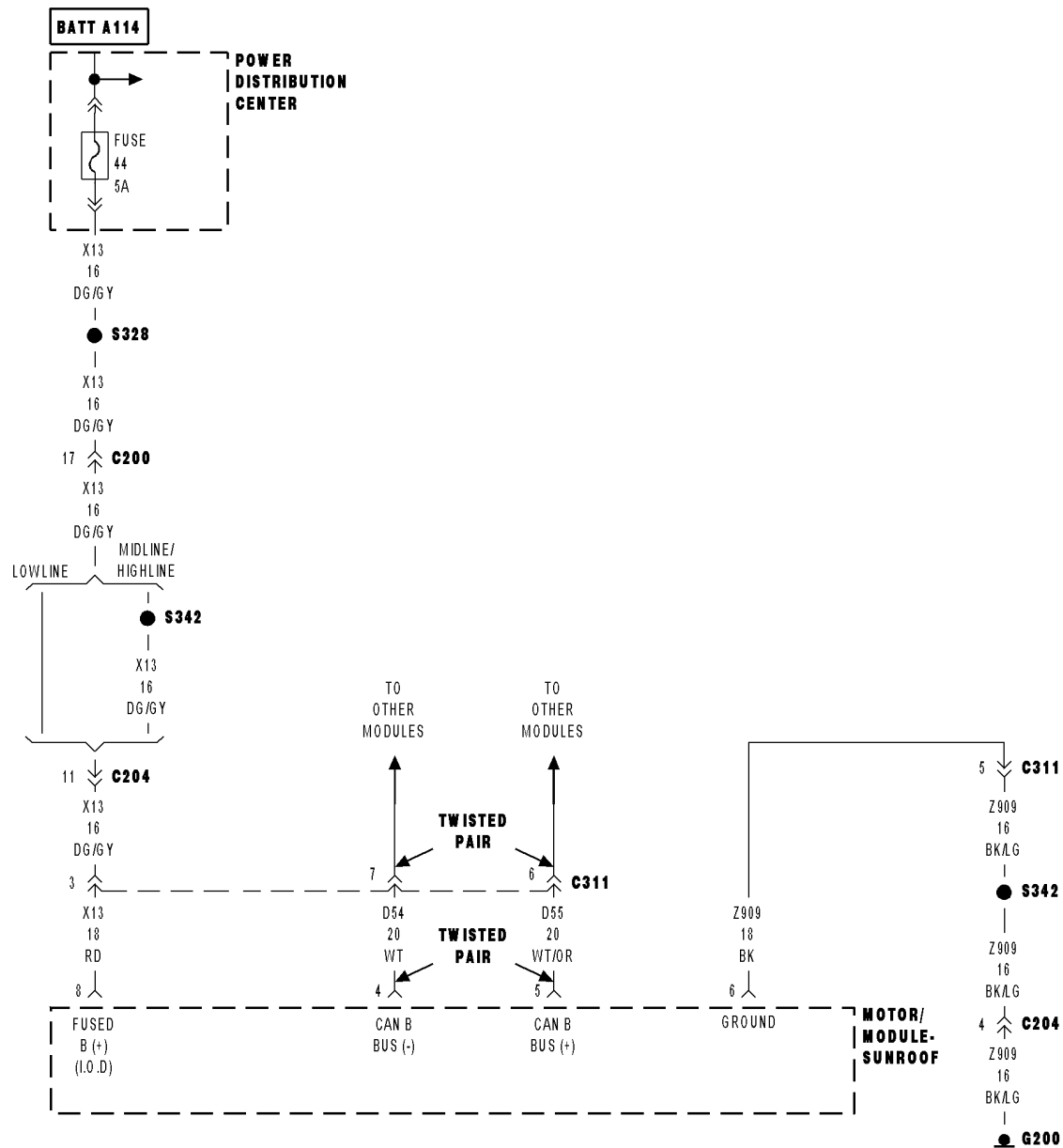
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

**Is there any voltage present on either circuit?**

**Yes** >> Replace the Steering Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**\*NO RESPONSE FROM SUNR (SUNROOF MODULE)**

**\*NO RESPONSE FROM SUNR (SUNROOF MODULE) (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

Possible Causes
(X13) FUSED B (+) CIRCUIT OPEN OR SHORTED (Z909) GROUND CIRCUIT OPEN (D55) AND (D54) CAN B BUS CIRCUITS OPEN SUNROOF MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Does the scan tool display a red X next to the module?**

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

**2. (X13) FUSED B(+) CIRCUIT OPEN OR SHORTED**

Turn the ignition off.

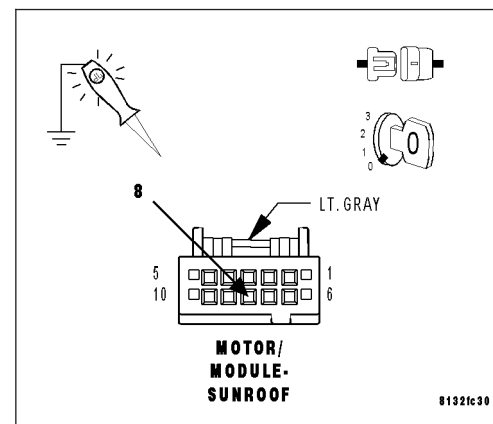
Disconnect the Sunroof Module harness connector.

Using a 12-volt test light connected to ground, check the (X13) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (X13) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.



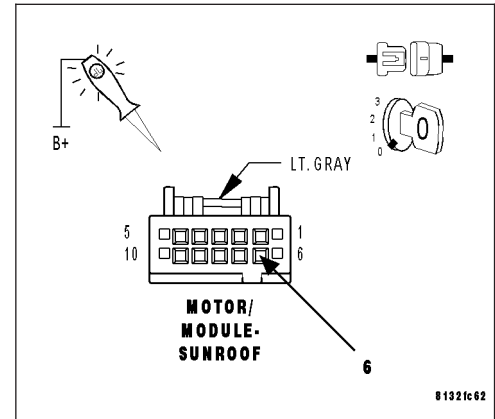
**\*NO RESPONSE FROM SUNR (SUNROOF MODULE) (CONTINUED)****3. (Z909) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check the (Z909) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z909) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.

**4. (D55) AND (D54) CAN B BUS CIRCUITS OPEN**

**Note: One open circuit will not cause this condition.**

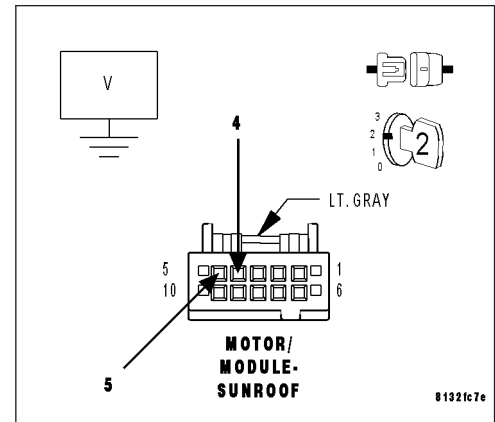
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

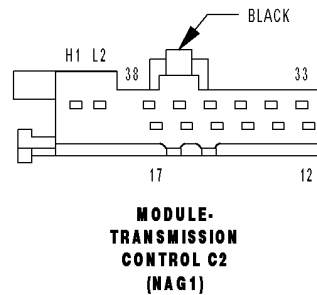
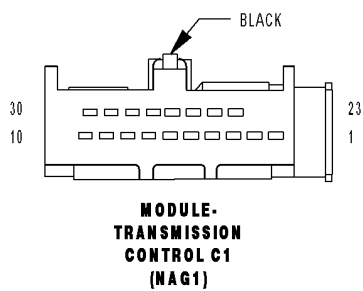
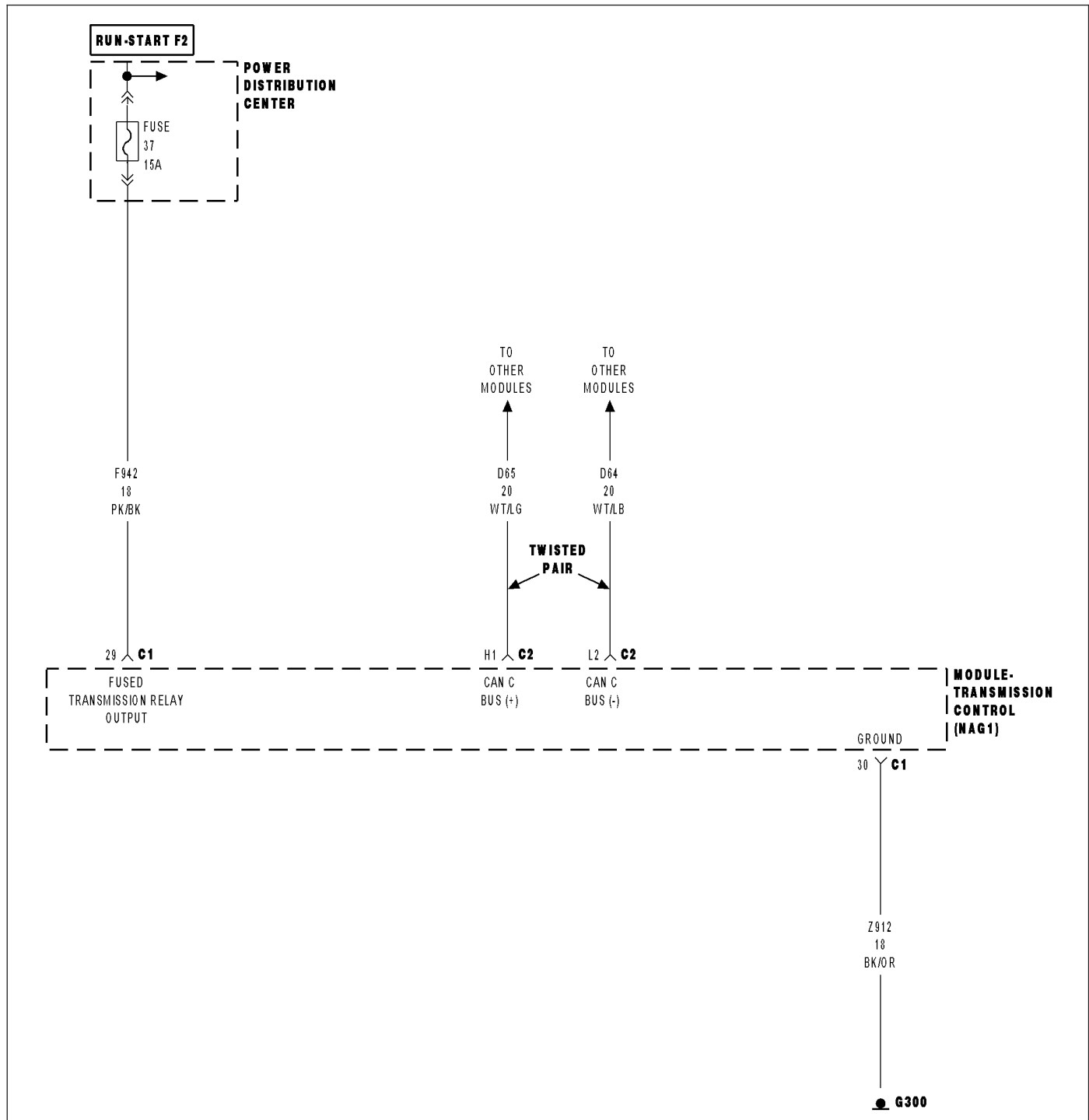
**Is there any voltage present on either circuit?**

**Yes** >> Replace the Sunroof Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.  
Perform BODY VERIFICATION TEST - VER 1.



# \*NO RESPONSE FROM TCM - NAG1





**\*NO RESPONSE FROM TCM - NAG1 (CONTINUED)**

For a complete wiring diagram Refer to **Section 8W**.

Possible Causes
(Z912) GROUND CIRCUIT OPEN (F942) FUSED TRANSMISSION RELAY OUTPUT CIRCUIT OPEN OR SHORT (D65) CAN C BUS (+) CIRCUIT OPEN (D64) CAN C BUS (-) CIRCUIT OPEN TRANSMISSION CONTROL MODULE

**Diagnostic Test**

**1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Note:** Check the FCM for any active CAN C hardware and any ignition related DTCs, perform DTCs before proceeding.

Does the scan tool display a red X next to the module?

- Yes    >> Go To 2
- No    >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

**2. (Z912) GROUND CIRCUIT OPEN**

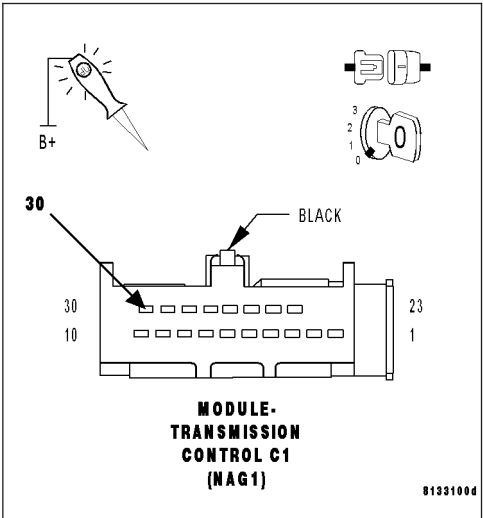
Turn the ignition off.

Disconnect the Transmission Control Module C1 harness connector.

Using a 12-volt test light connected to 12-volts, check the (Z912) ground circuit.

Does the test light illuminate brightly?

- Yes    >> Go To 3
- No    >> Repair the (Z912) ground circuit for an open.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM TCM - NAG1 (CONTINUED)****3. (F942) FUSED TRANSMISSION RELAY OUTPUT CIRCUIT OPEN OR SHORTED**

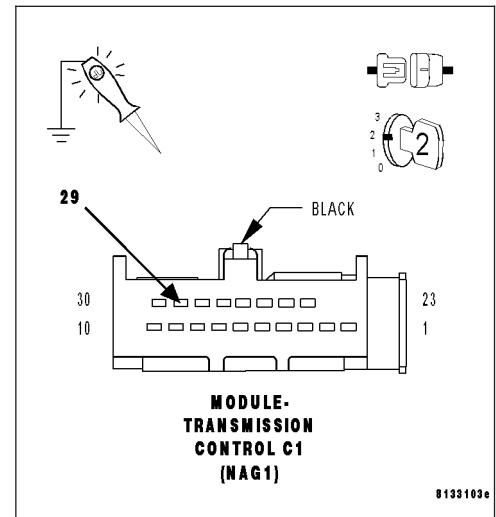
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F942) Fused Transmission Relay Output circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (F942) Fused Transmission Relay Output circuit for an open or short.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**4. (D65) CAN C BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the FCM C1 harness connector.

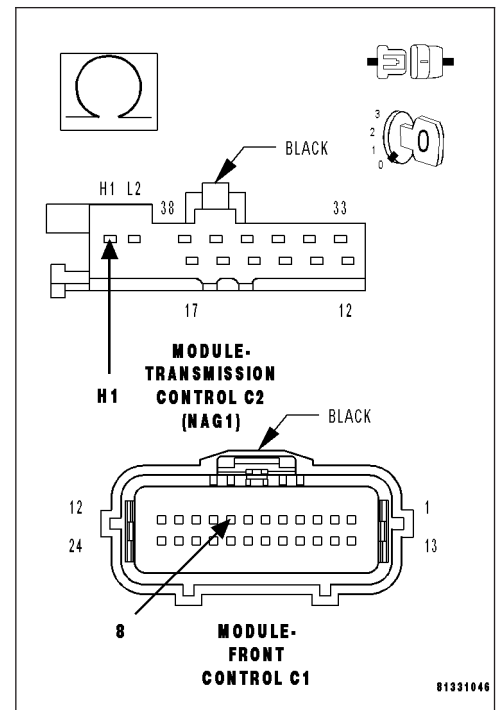
Disconnect the TCM C2 harness connector.

Measure the resistance of the (D65) CAN C Bus (+) circuit between the FCM connector and the TCM connector.

**Is resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the (D65) CAN C Bus (+) circuit for an open.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

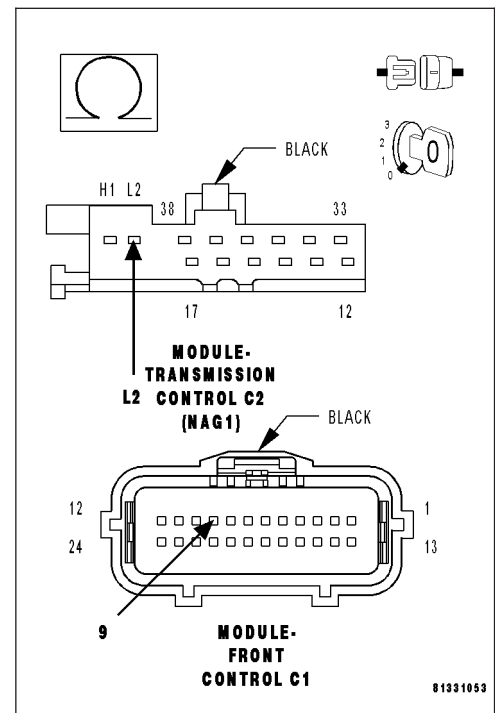


**\*NO RESPONSE FROM TCM - NAG1 (CONTINUED)****5. (D64) CAN C BUS (-) CIRCUIT OPEN**

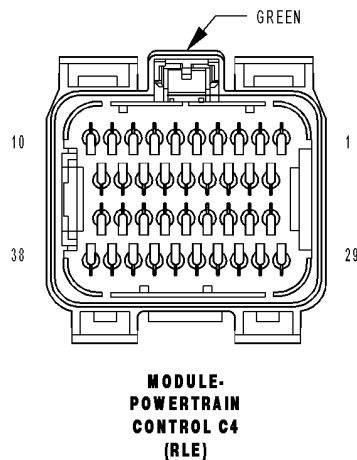
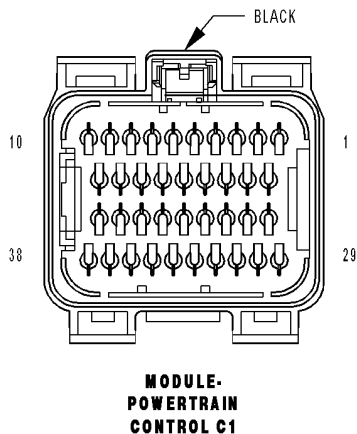
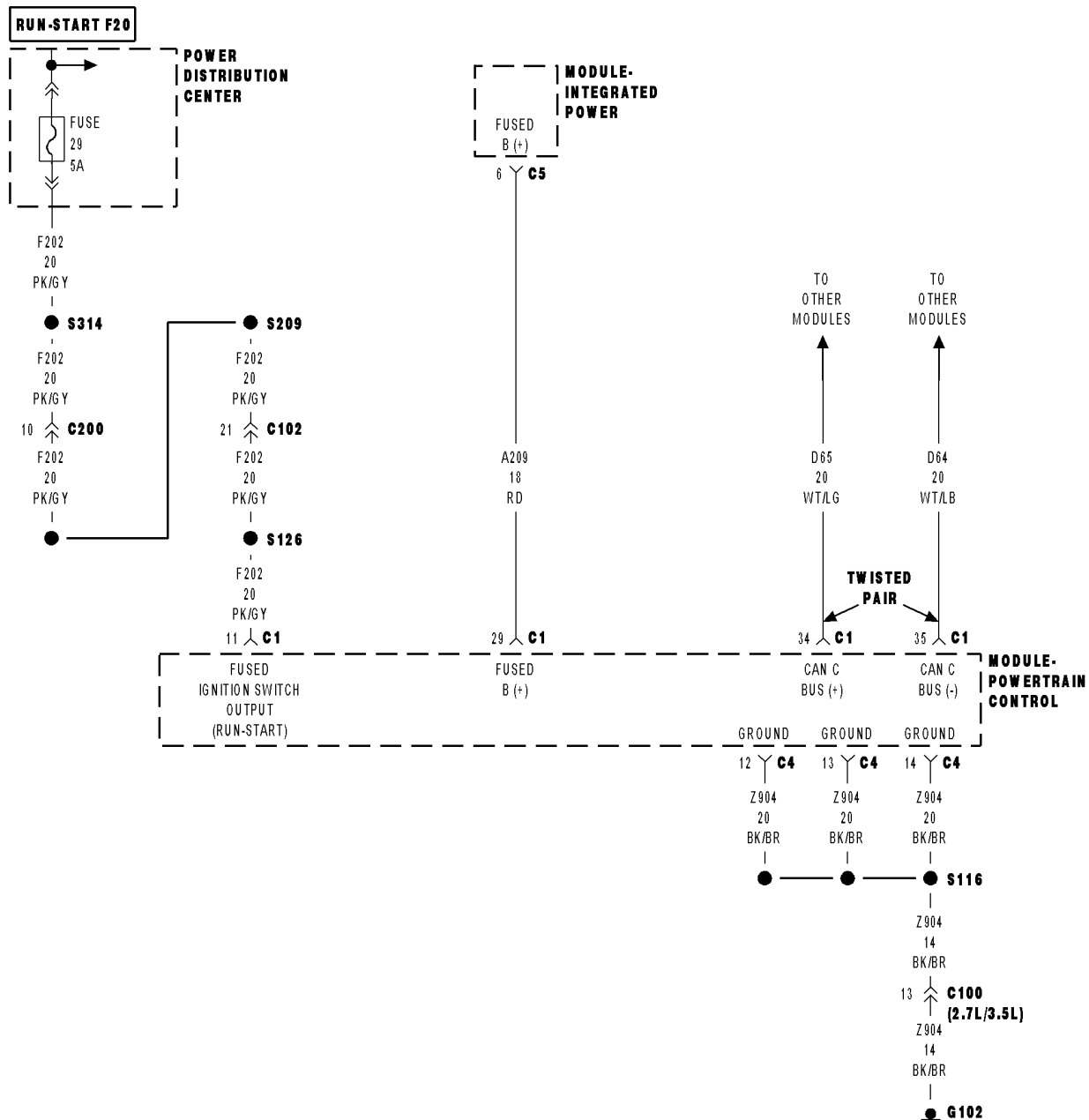
Measure the resistance of the (D64) CAN C Bus (-) circuit between the FCM connector and the TCM connector.

**Is resistance below 5.0 ohms?**

- Yes** >> Replace the Transmission Control Module in accordance with the service information.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Repair the (D64) CAN C Bus (-) circuit for an open.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



# \*NO RESPONSE FROM TCM – NGC



**\*NO RESPONSE FROM TCM – NGC (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(A209) FUSED B(+) CIRCUIT OPEN OR SHORTED
(Z904) GROUND CIRCUIT OPEN
(F202) FUSED IGNITION SW OUTPUT CIRCUIT OPEN OR SHORTED
(D65) CAN C BUS (+) CIRCUIT OPEN
(D64) CAN C BUS (-) CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Note:** Check the FCM for any active CAN C hardware DTCs, perform DTC before proceeding.

**Does the scan tool display a red X next to the module?**

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent , pushed out, and corroded terminals.

---

**2. ATTEMPT TO COMMUNICATE WITH THE PCM**

With the scan tool in ECU view, observe the status of the PCM.

**Does the scan tool display a red X next to the PCM?**

**Yes** >> Refer to the No Response From PCM test procedure. Refer to the table of contents in this section.

**No** >> Go To 3

---

**\*NO RESPONSE FROM TCM – NGC (CONTINUED)****3. (Z904) GROUND CIRCUIT OPEN**

Turn the ignition off.

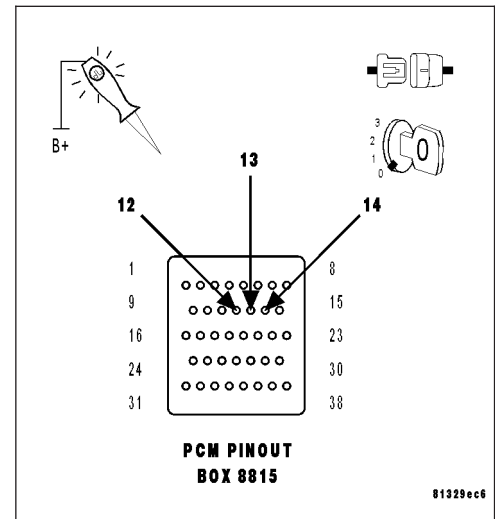
Disconnect the PCM C4 harness connector.

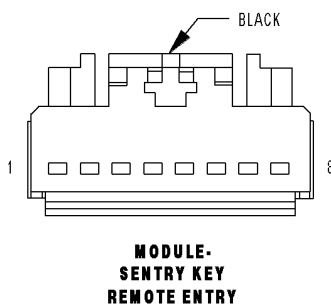
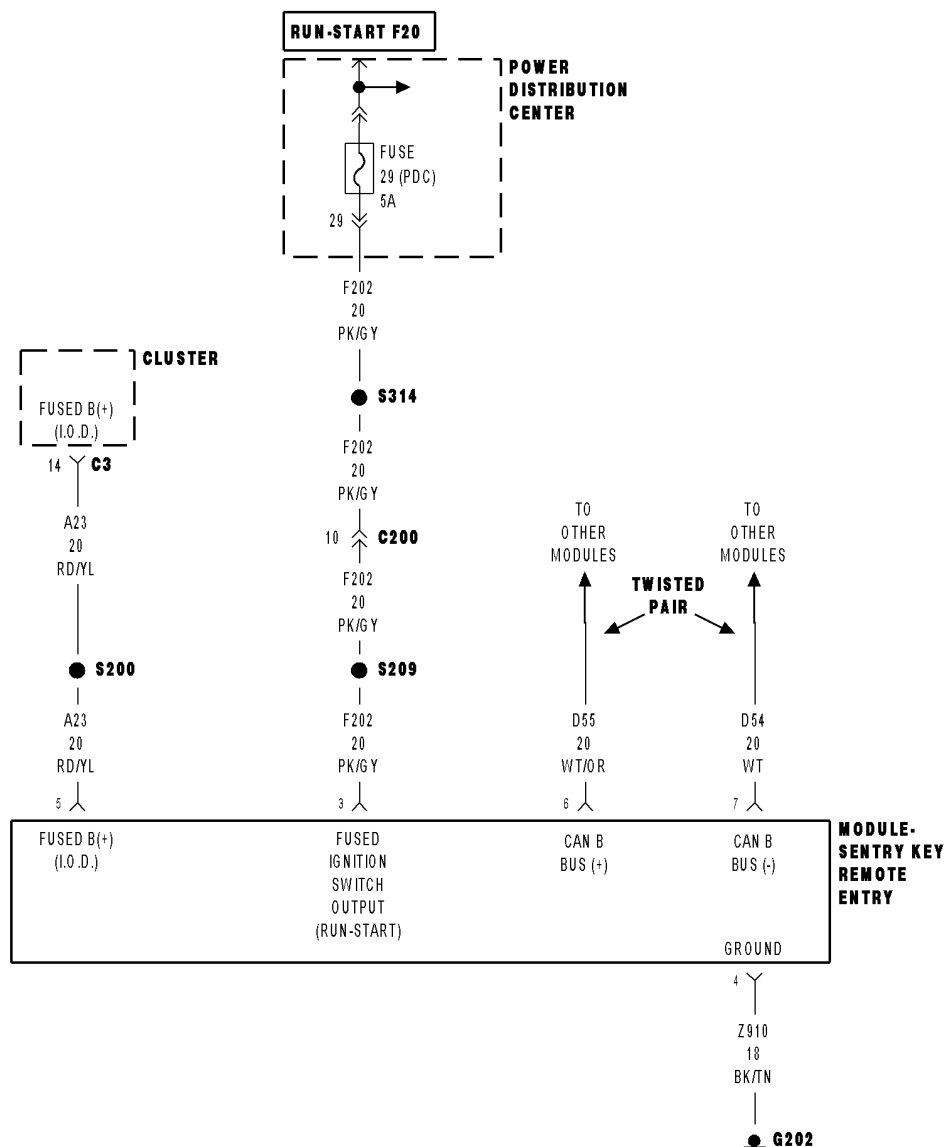
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Using a 12-volt test light connected to 12-volts, check each (Z904) ground circuit.

**Does the test light illuminate brightly for each circuit?**

- Yes** >> Replace and program the Powertrain Control Module in accordance with the service information.
- No** >> Repair the (Z904) ground circuit for an open.  
Perform the appropriate TRANSMISSION VERIFICATION TEST.



**\*NO RESPONSE FROM WCM**

**\*NO RESPONSE FROM WCM (CONTINUED)**

For a complete wiring diagram Refer to **Section 8W**.

Possible Causes
(A23) FUSED B(+) CIRCUIT OPEN OR SHORTED (Z910) GROUND CIRCUIT OPEN (F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED (D55) AND (D54) CAN B BUS CIRCUITS OPEN SENTRY KEY REMOTE ENTRY MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

**Note:** Ensure the IOD fuse is installed and battery voltage is between 10.0 and 16.0 volts.

With the scan tool, select ECU view.

**Note:** A red X will be next to the module that is not communicating, indicating that the module is not active on the Bus network. A green check indicates that the module is active on the Bus network.

**Does the scan tool display a red X next to the module?**

**Yes** >> Go To 2

**No** >> The no response condition is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring for chafed, pierced, pinched, and partially broken wires and the wiring harness connectors for broken, bent, pushed out, and corroded terminals.

**2. (A23) FUSED B(+) CIRCUIT OPEN OR SHORTED**

Turn the ignition off.

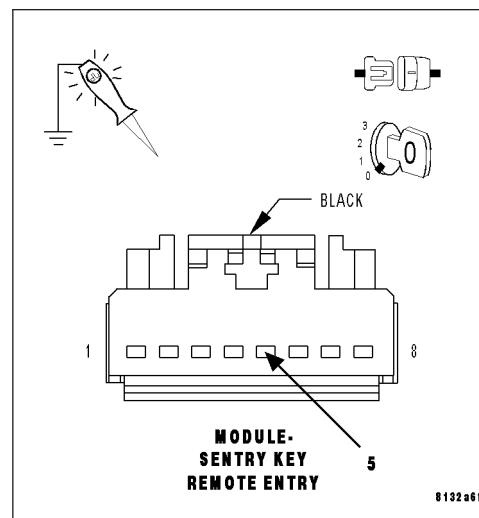
Disconnect the Sentry Key Remote Entry Module harness connector.

Using a 12-volt test light connected to ground, check the (A23) Fused B(+) circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (A23) Fused B(+) circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.





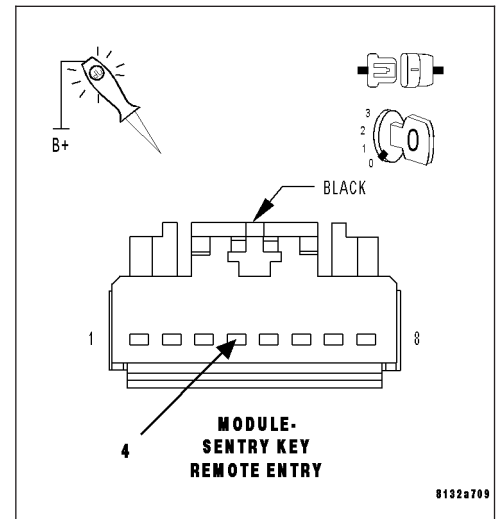
**\*NO RESPONSE FROM WCM (CONTINUED)****3. (Z910) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check the (Z910) ground circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (Z910) ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.

**4. (F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR SHORTED**

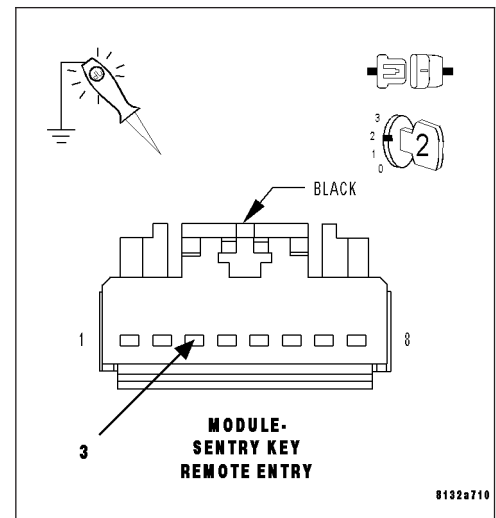
Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F202) Fused Ignition Switch Output circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 5

**No** >> Repair the (F202) Fused Ignition Switch Output circuit for an open or short.  
Perform BODY VERIFICATION TEST - VER 1.



**\*NO RESPONSE FROM WCM (CONTINUED)****5. (D55) AND (D54) CAN B BUS CIRCUITS OPEN****Note: One open circuit will not cause this condition.**

Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

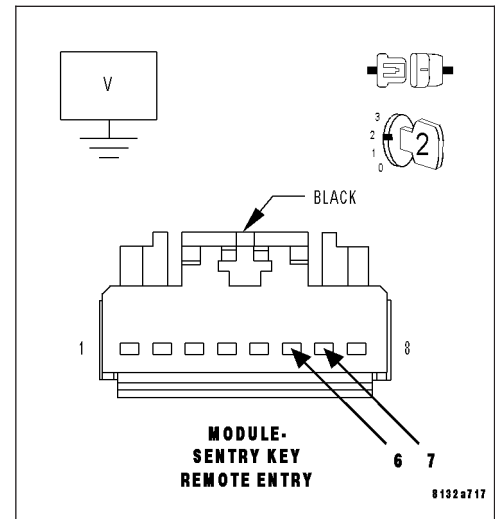
**Is there any voltage present on either circuit?**

**Yes** >> Replace the Sentry Key Remote Entry Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) and (D54) CAN B Bus circuits for an open. Inspect the connector for damage.

Perform BODY VERIFICATION TEST - VER 1.



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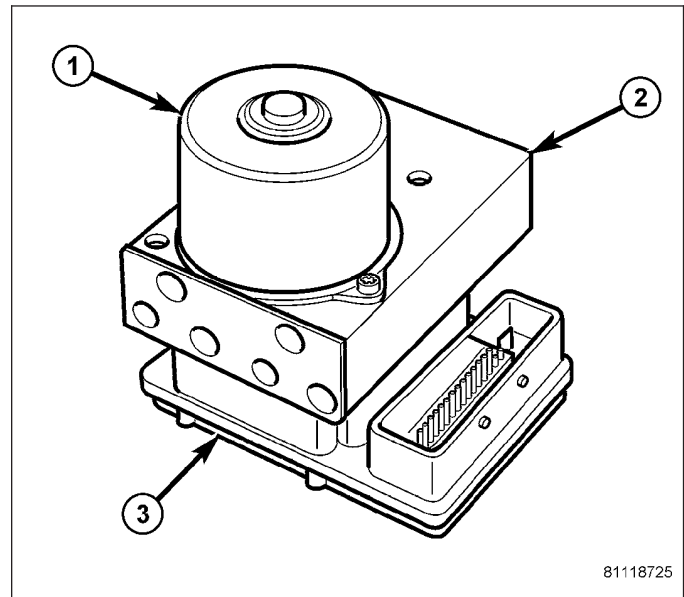
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## MODULE - ANTILOCK BRAKE

### DESCRIPTION

The Antilock Brake Module (ABM) is a microprocessor-based device which monitors the Antilock Brake System (ABS) during normal braking and controls it when the vehicle is in an ABS stop. The ABM also monitors the Electronic Stability Program (ESP) if so equipped. The ABM (3) is mounted to the HCU (2) as part of the Integrated Control Unit (ICU). The ABM uses a 47-way connector on the vehicle wiring harness. The power source for the ABM is through the ignition switch in the RUN or ON position. The ABM is on the CAN-C bus.

The ABM (3) is mounted to the HCU (2) as part of the Integrated Control Unit (ICU). The ABM uses a 47-way connector on the vehicle wiring harness. The power source for the ABM is through the ignition switch in the RUN or ON position. The ABM is on the CAN-C bus.



### OPERATION

The primary functions of the Antilock Brake Module (ABM) are to:

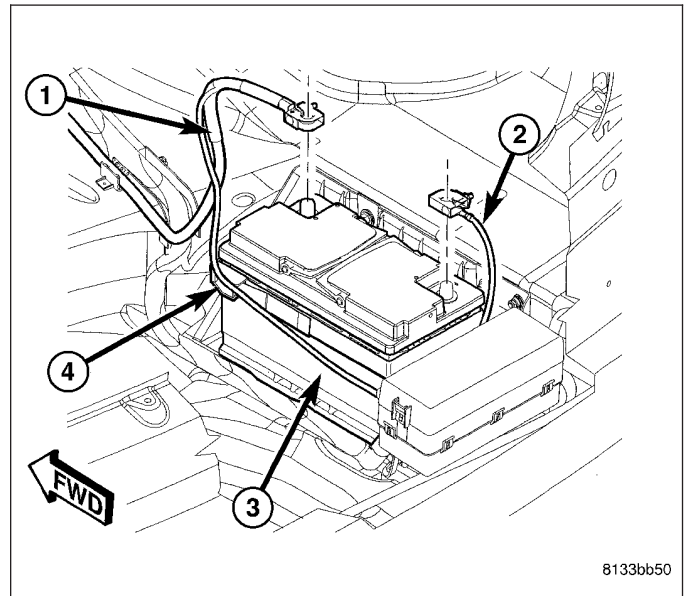
- Monitor the Antilock Brake System (ABS) and Electronic Stability Program (ESP) for proper operation.
- Detect wheel locking or wheel slipping tendencies by monitoring the speed of all four wheels of the vehicle.
- Control fluid modulation to the wheel brakes while the system is in ABS or traction control mode.
- Modulates fluid pressure to the wheel brakes to control vehicle yaw rate in ESP mode.
- Store diagnostic information.
- Provide communication to the scan tool while in diagnostic mode.
- Illuminate the amber TCS/ESP indicator in the instrument cluster.

The ABM constantly monitors the ABS and ESP (if equipped) for proper operation. If the ABM detects a fault, it will turn on the amber TCS/ESP indicator and disable the ABS or ESP if so equipped. The normal base braking system will remain operational at that time.

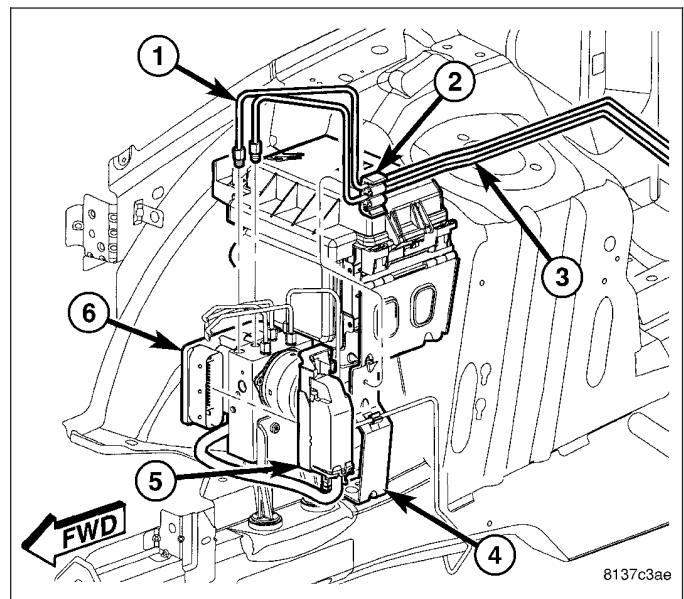
The ABM continuously monitors the speed of each wheel through the signals generated by the wheel speed sensors to determine if any wheel is beginning to lock. When a wheel locking tendency is detected, the ABM commands the ABM solenoid coils to actuate. The coils then open and close the valves in the HCU that modulate brake fluid pressure in some or all of the hydraulic circuits. The ABM continues to control pressure in individual hydraulic circuits until a locking tendency is no longer present.

## REMOVAL

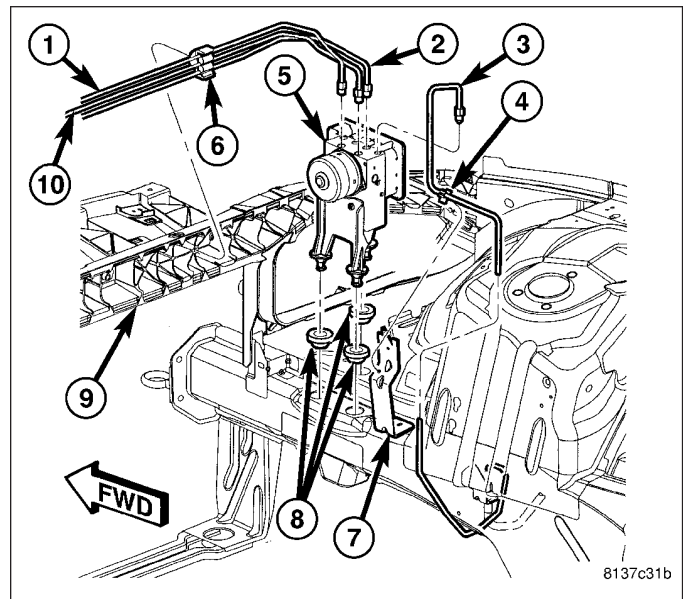
1. Disconnect negative (-) battery cable (2) from battery post and isolate.



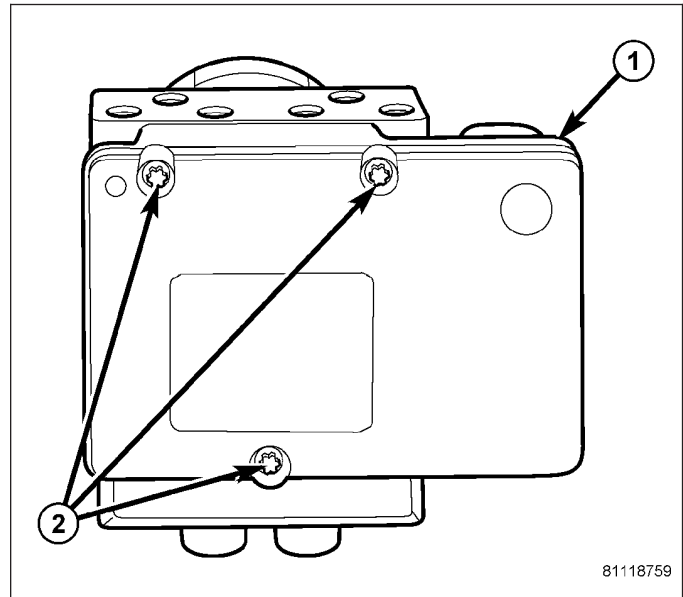
2. Disconnect 47-Way wiring connector (4) at ABM (6).



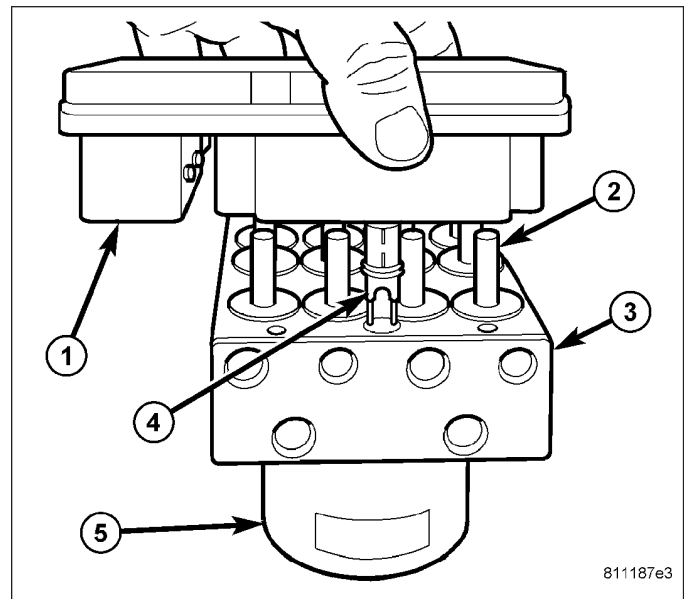
3. Unclip brake tubes (1, 2 and 10) from two routing clips (6) along upper radiator support.
4. Unclip brake tube (3) from routing clip (4) below Fuse And Relay Center.
5. Lift up on entire assembly (5) from mounting grommets (8) and move inboard allowing access to ABM attaching screws. **Do not force brake tubes. Move assembly just enough to access mounting screws.**



6. Remove three screws (2) attaching ABM (1).

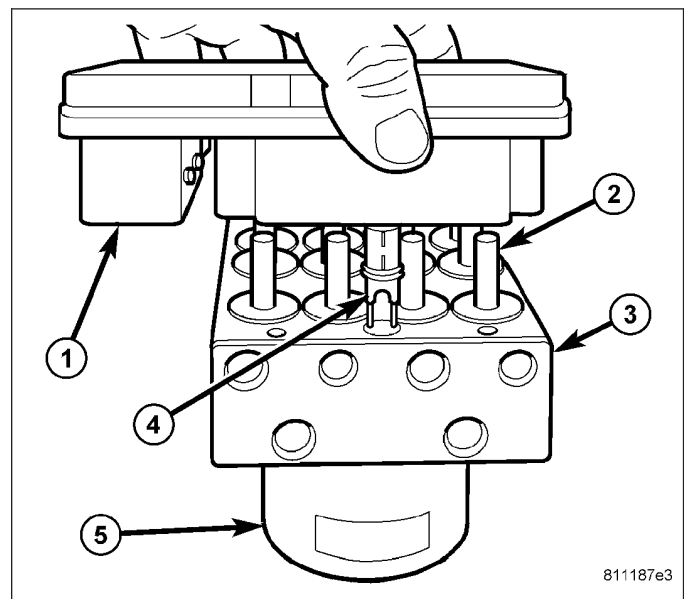


7. Slide ABM (1) off HCU (3).

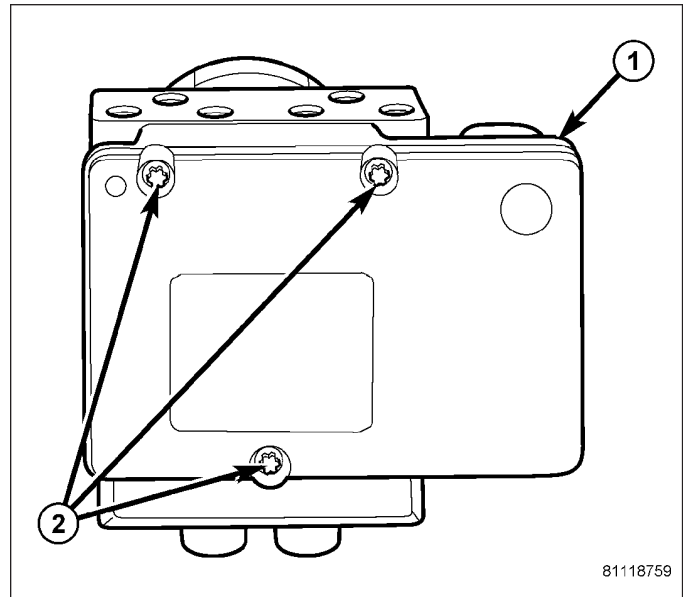


## INSTALLATION

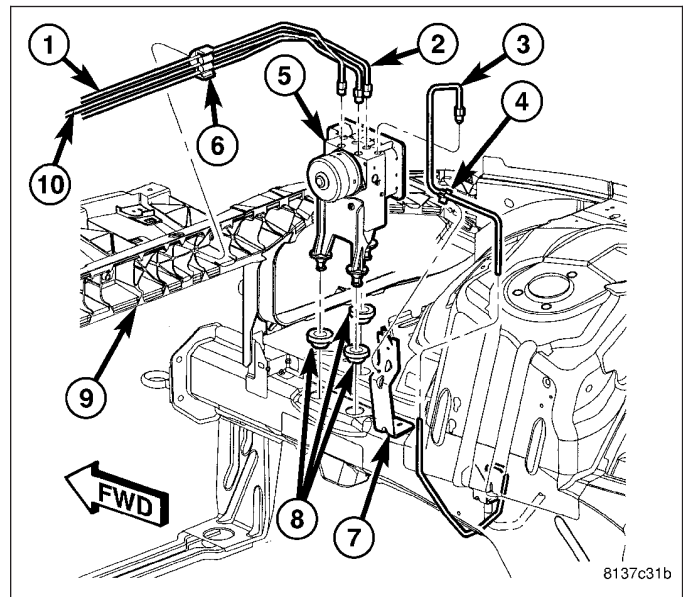
1. Align ABM solenoids and pump/motor wiring connector (4) with HCU valves (2) and connector passage. Slide ABM (1) onto HCU (3).



2. Install three screws attaching ABM (1) to HCU.  
Tighten screws to 2 N·m (17 in. lbs.) torque.

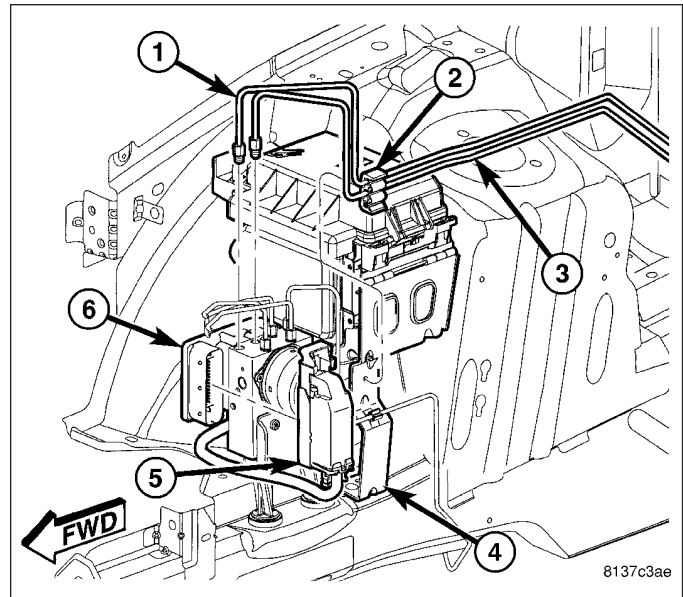


3. Position assembly (5) above mounting grommets (8) and press mounting bracket into place.
4. Clip brake tube (3) to routing clip (4) below Fuse And Relay Center.
5. Clip brake tubes (1, 2 and 10) to two routing clips (6) along upper radiator support.

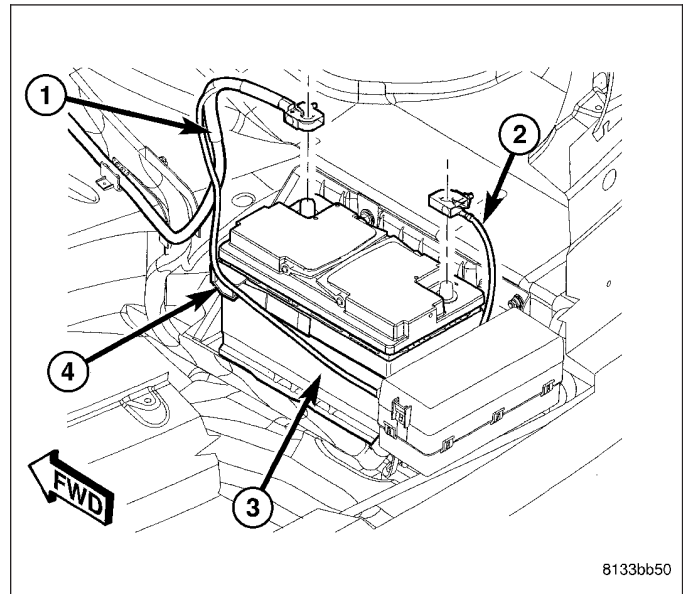




6. Connect 47-way wiring connector (5) at ABM (6).



7. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)
8. Perform Diagnostic Verification Test and clear any faults. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)



## COMMUNICATION

### DESCRIPTION

All models use the Controller Area Network (CAN) protocol for their intra-vehicle communications networks (data buses).

Compared to its predecessor, J1850, CAN architecture offers the following improvements:

- Eight -times faster to ensure that messages reach their destinations in a timely manner (J1850 operates at 10.4 Kbs compared to 83.3 Kbs for the CAN system).
- Built-in error checking capabilities for increased reliability.

### OPERATION

This model uses four buses: CAN B, CAN C, diagnostic CAN C and the LIN (Local Interconnect Network) data bus. CAN B and the LIN bus operate at a lower speed than CAN C and diagnostic CAN C to provide communication among body and interior modules. CAN C is exclusively for critical powertrain, anti-lock brake and electronic stability program functions. The LIN bus is used on a limited basis for the steering wheel switches that control the EVIC. LIN is used for a local area where wires need to be kept to a minimum. The LIN used on this model is a single wire that

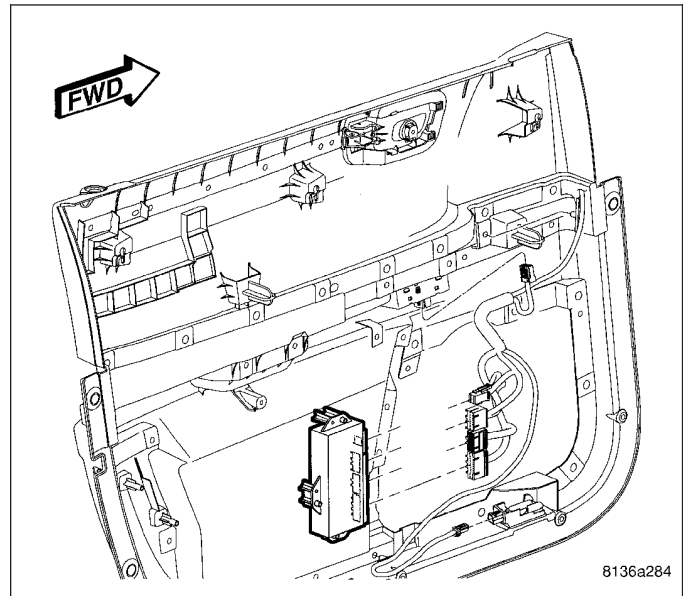
takes information and places it on the CAN B bus. The diagnostic CAN C bus transmits diagnostic information to an industry-standard connector for access by service personnel using a plug-in scan tool. This system allows diagnostic data to be obtained from the other two bus systems without affecting the functions of either.

The added communication speed specifically allows the All-Speed Traction Control and ESP (Electronic Stability Program) modules to notify the powertrain control module when engine torque change or a transmission shift are required to avoid wheel slip and maintain stability. Data from control modules on the CAN-C network elsewhere in the vehicle, such as vehicle speed, is transmitted to the body and interior CAN-B network via an interface in the IPM (Intelligent Power Module).

## DOOR MODULE

### DESCRIPTION

The door modules control the express up and down feature as well as normal window functions. It is used only on vehicles equipped with the express up feature. If equipped with memory system, the door module controls the memory mirror. The modules are attached to each front door trim panel.



### OPERATION

If the vehicle is equipped with the Express Up power window feature there will be a door module on each front door trim panel. The power window switches and motors are directly wired to the modules. If the vehicle is equipped with the Memory System, the exterior power mirrors and switches are also directly wired to the modules along with the rear door window switches. The modules are wired to the accessory delay relay which allows the operation of the windows and mirrors for a given period of time after the ignition is turned off and providing the doors are not opened. The modules communicate with each other and other modules on the vehicle via the CAN-B bus circuit. There are several Diagnostic Trouble Codes (DTC's) the modules will store if there are problems with the power window system or the memory power mirror system.

### ANTI-PINCH

The "Anti-Pinch" function is a safety feature that senses obstacles at the top of the glass and anywhere on the seal where it meets the glass to close during the window closing operation. When a front window switch is pressed to the "Auto-Up" position and the closing window traps an object and the sense current passes its limit, the module will stop the motor and drive the window down approximately 200 millimeters. The pinch force is speed dependent which means that if the vehicle is going over 2km per hour the pinch force will be higher than if the vehicle is stopped.

### PANIC MODE

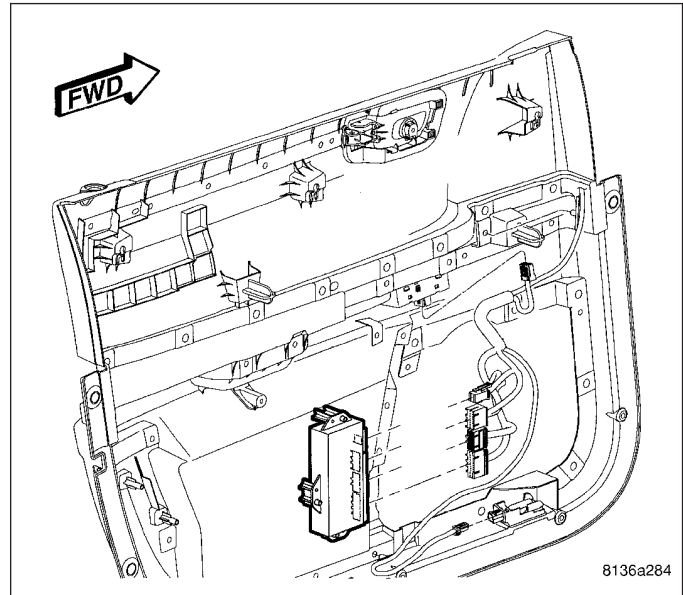
If the window switch is held in the "Auto-Up" position and the closing window traps an object, the module will stop the motor and when the switch is released will drive the window in the opposite direction approximately 10 millimeters. If within 8 seconds after the switch was released to the neutral position, the switch is held again to the "Auto-Up" position, the module will enter the second panic mode. During the second panic mode, the module will drive the

motor with full (stall) force and stop. If within 8 seconds after the switch is released again to the neutral position, the switch is held again to the "Auto-Up" position, the module will drive the motor again with full (stall) force and stop.

## REMOVAL

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

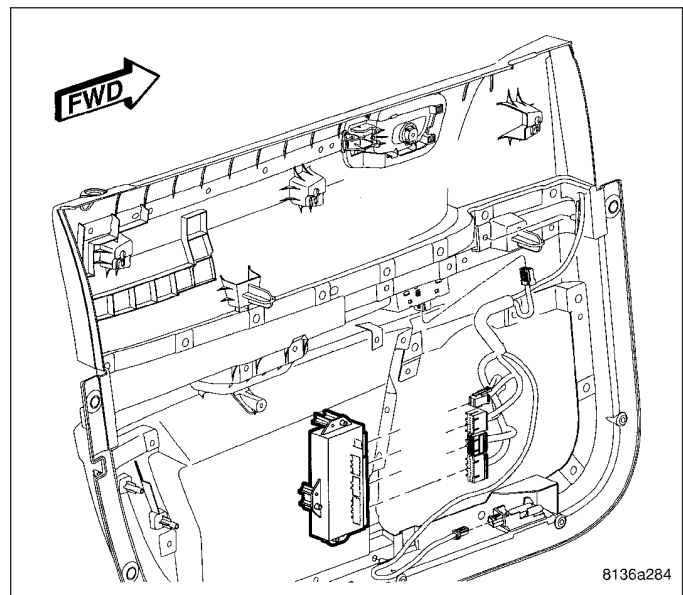
1. Disconnect and isolate the battery negative cable.
2. Remove front door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
3. Disconnect electrical harness connectors.
4. Remove mounting fasteners and module.



## INSTALLATION

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

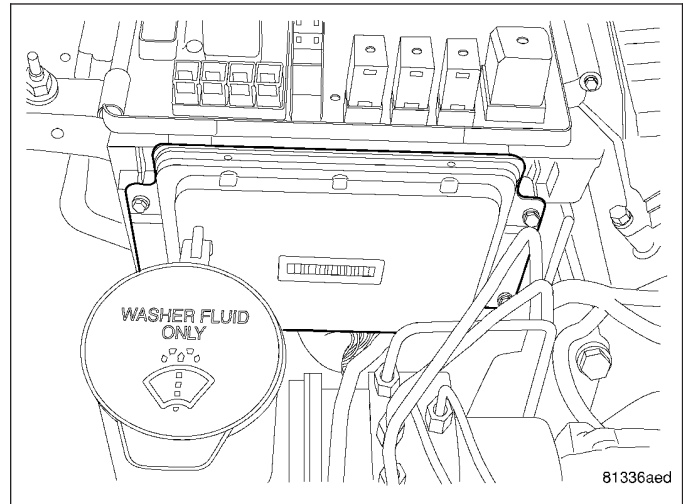
1. Position module.
2. Install and tighten mounting fasteners.
3. Connect electrical harness connectors.
4. Install door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).
5. Connect battery negative cable.



## MODULE-FRONT CONTROL

### DESCRIPTION

The Front Control Module (FCM) is a micro controller based module located in the right front corner of the engine compartment. The front control module mates to the power distribution center to form the Integrated Power Module (IPM). The IPM connects directly to the battery and provides the primary means of circuit protection and power distribution for all vehicle electrical systems. The FCM controls power to some of these vehicle systems electrical and electromechanical loads based on inputs received from hard wired switch inputs and data received on the CAN bus circuit.



### OPERATION

As messages are sent over the CAN bus circuit, the Front Control Module (FCM) reads these messages and controls power to some of the vehicles electrical systems by completing the circuit to ground (low side driver) or completing the circuit to 12 volt power (high side driver). The following functions are controlled by the FCM:

- Air conditioning condenser cooling fan
- Daytime running lamps - if equipped
- Fog Lamps
- Front and rear hazard warning lamps
- Front turn signals
- Headlamps
- Horn
- Radiator fans
- Rear window defroster power and timing
- Stop, turn signal and tail lamps
- Windshield and liftgate wiper and washer systems

The FCM provides the following features for the above function:

- Acts as a link between the CAN bus network for critical powertrain, anti-lock brake systems, electronic stability program systems and the network for body and interior modules.
- Controls the wipers based on messages on the CAN B bus from the rain sensor module (if equipped).
- Controls the adjustable pedal motor on non-memory equipped vehicles.
- Controls back-up lamps.
- Flashes lamps in response to turn signal, Remote Keyless Entry (RKE) and Vehicle Theft Security System (VTSS) inputs.
- Illuminated approach feature that turns the headlamps on when the vehicle is unlocked with the Remote Keyless Entry (RKE) transmitter.
- Minimizes voltage variations to the headlamps to extend bulb life and to equalize the light output from the lamps, which might otherwise differ due to variations in wiring resistance.
- Monitors battery voltage and turns off non-essential functions such as the fog lamps, rear window defogger, and heated seats if necessary to conserve battery power.
- Operates the high-beam headlamps at reduced intensity by pulse-width modulation of the power supply to provide the daytime running lamps.

- Protects the battery from discharge if the headlamps are left on, by automatically turning them off after eight minutes.
- Provides ambient temperature sensor information.
- Provides A/C pressure transducer information.
- Provides brake fluid level information.
- Provides washer fluid level information.
- Provides the variable delay intermittent windshield and liftgate wiper time delay features, and the vehicle speed sensitive windshield wiper delay variation.
- Sounds the horn in response to RKE and VTSS inputs.
- Turns off the horn in the event of excessively long operation that could otherwise damage the horn.
- Turns off the windshield washer motor after 10 seconds of continuous operation to protect the motor.
- Controls headlamp washers (if equipped).
- Provides wheel speed information on non-ABS equipped vehicles.
- Stores vehicle configuration data.

## DIAGNOSIS AND TESTING

## BODY VERIFICATION TEST – VER 1

### Diagnostic Test

#### 1. Perform Body Verification Test

1. Disconnect all jumper wires and reconnect all previously disconnected components and connectors.
2. Ensure that all accessories are turned off.
3. Ensure that the battery is fully charged. If the battery was disconnected for any reason, refer to (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE) for accessory calibration procedures.
4. If the FCM has been replaced, the Pinion Fact MUST be programmed into the FCM. Refer to the scan tool for program procedure.
5. Turn the ignition on.
6. With the scan tool, record and erase DTCs from all modules.
7. Perform this step only if diagnosing faults related to the HVAC system.
  - The Manual Temperature Control (MTC) is not on the Bus and not addressable with a scan tool. Perform the following to clear DTCs from the MTC: 1. Turn the blower control on. 2. Press the A/C mode switch down, turn the blower control to off, wait three seconds and then release the A/C mode switch. 3. When the A/C status indicator begins flashing DTCs, press the A/C mode switch down for three seconds and then release the switch.
  - For vehicles equipped with Automatic Temperature Control (ATC), if repairs were made to any of the HVAC doors, linkage, door actuators, or door actuator circuits, run the actuator calibration function by selecting the following from the scan tool menu: select HVAC, More Options, System Tests, Actuator Calibration Test, and Start. Follow the directions displayed by the scan tool. Allow the test to run to completion before proceeding.
  - For vehicles equipped with MTC, if repairs were made to any of the HVAC doors, linkage, door actuators, or door actuator circuits, run the actuator calibration function by performing the following: 1. Turn the ignition on. 2. Turn the blower control to off. 3. Press the EBL mode switch down for five seconds and then release it. Wait approximately 90 seconds for the calibration process to run to completion before proceeding.
8. Turn the ignition off, wait 10 seconds, and then turn the ignition on.
9. Operate all functions of the system that caused the original concern.
10. With the scan tool, select ECU View and check for DTCs in the modules.
11. Perform this step only if diagnosing faults related to the MTC HVAC system.

**Note: The A/C status indicator displays active DTCs when the EBL status indicator is not illuminated and stored DTCs when the EBL status indicator is illuminated.**

- Perform the following to read DTCs from the MTC: 1. Turn the blower control on. 2. Press the A/C mode switch down, turn the blower control to off, wait three seconds and then release the A/C mode switch. 3. Read the DTCs from the flashing A/C status indicator.

**Are DTCs present in any of the modules or is the original condition still present?**

**Yes** >> The repair is not complete. Refer to the related category for the DTC or symptom that is still present.

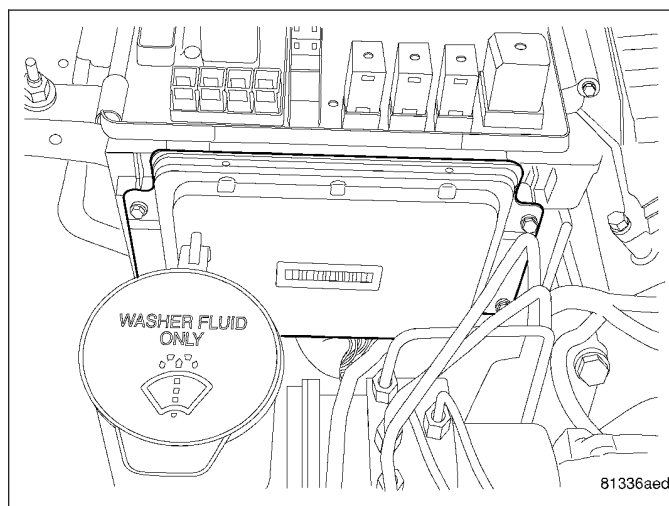
**No** >> The repair is complete.

---

## REMOVAL

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

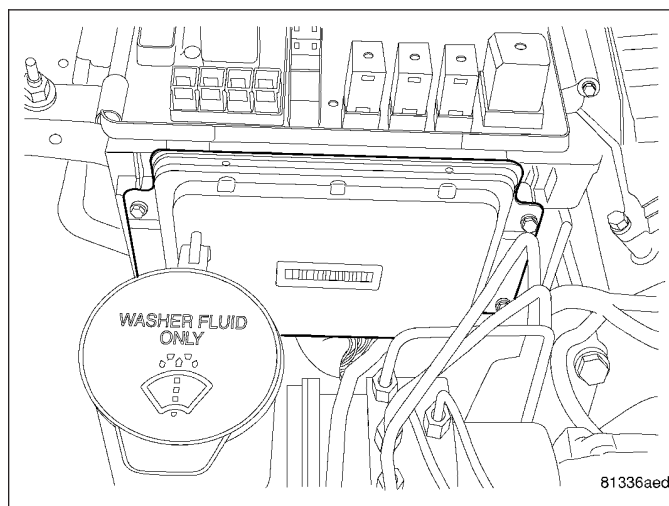
1. Disconnect and isolate the battery negative cable.
2. Remove mounting fasteners.
3. Disconnect electrical connectors and remove Front Control Module (FCM).



## INSTALLATION

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Position Front Control Module (FCM) and connect electrical connectors.
2. Install and tighten mounting fasteners.
3. Connect battery negative cable.

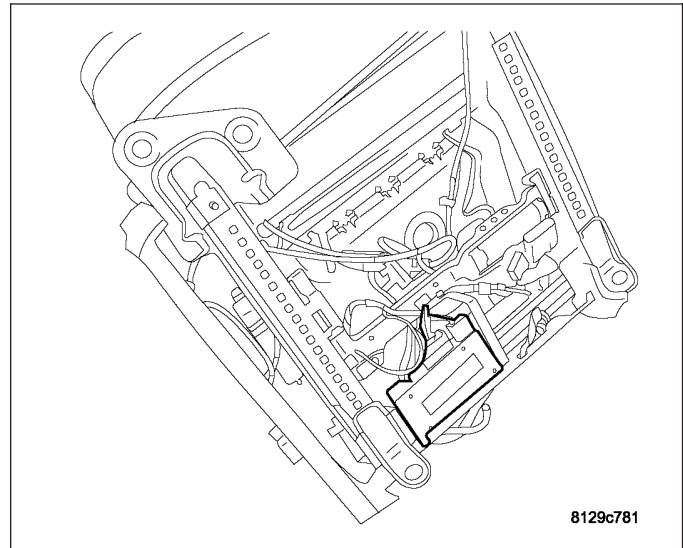




## MODULE-SEAT MEMORY

### DESCRIPTION

The Memory Seat Module (MSM) is located underneath the driver seat, towards the front and on the outboard side. It is used in conjunction with the other modules in the memory system to recall the driver seat to one of two preset seat positions (horizontal, vertical, and recliner). The switch for the memory seat programming and selection mounts on the driver door trim panel. The memory system is able to store and recall all driver side power seat positions, outside mirror positions, power tilt/telescopic steering column positions and power adjustable pedal position. The system can be set for two different drivers. On vehicles with a factory installed radio connected to the Controller Area Network (CAN) data bus network, the memory system is also able to store and recall up to twelve radio station presets (six AM and six FM), also for two drivers. The memory system will also store and recall the last station listened to for each driver, even if it is not one of the twelve preset stations.



The memory system will automatically recall all of these settings when a button of the memory switch is depressed, or when the doors are unlocked using the Remote Keyless Entry (RKE) transmitter (if the "RKE Linked to Memory" feature is enabled). If the vehicle has more than two drivers the RKE transmitter recall of memory features can be disabled. This is a customer programmable feature of the Electronic Vehicle Information Center (EVIC).

### OPERATION

The Memory Seat Module (MSM) receives battery current through a 25 amp circuit breaker in the Power Distribution Center (PDC) so that the memory system remains operational, regardless of the ignition switch position. When the driver memory switch button is pushed, a resistance signal is sent to the MSM via the Controller Area Network (CAN) bus circuit. The MSM is responsible for the 12v battery feed and ground path to the power seat adjuster motor and other memory system components.

The MSM receives memory set/position switch input through the CAN bus circuit. The MSM also receives hard wired input from the hall effect sensors, mounted on each of the driver power seat adjuster motors and the driver side view mirror motor. The programmed software in the module allows it to know where the seat, adjustable pedals, and steering column tilt/telescope are located in its designed travel by a pulse count generated from the hall effect sensors. This way, when the memory switch is depressed the module will power these components until the correct preset location is achieved. The module will prevent the seat memory recall function from being initiated, if the transmission gear selector lever is not in the Park position, or if the vehicle is moving. These inputs are monitored over the Controller Area Network (CAN) bus circuit by the MSM.

A memory setting is saved by pressing the "set" button, then pressing either the memory "1" or "2" button within 5 seconds of pressing the "set" button.

A memory setting is recalled by pressing either the memory "1" or "2" button, or by pressing the unlock button on a "linked" Remote Keyless Entry (RKE) transmitter.

For driver safety, memorized settings can not be recalled if the transmission is in a position other than Park or the seat belt is latched.

The MSM performs the following functions:

- Positions the driver power seat (vertical, horizontal, and recliner positions).
- Positions the power adjustable pedals.
- Positions the power tilt/telescopic steering column positions.
- Sends the memory save or recall (#1 or #2) command over the CAN data bus circuit to the other memory system components, radio station pre-sets and power mirror positions.



- Provides for “linking” the key FOBs to memory.
- Provides for the easy entry/exit feature.
- Provides the tilt mirrors in reverse feature.

When a memory button is pressed (#1 or #2) on the memory switch, the Driver Door Module (DDM) sends a recall message to the MSM. The MSM will then position the memory system components to the preprogrammed location/setting. When the Remote Keyless Entry (RKE) Transmitter button is pressed, depending on which transmitter (#1 or #2), the SKREEM (RKE Receiver) sends the recall request and FOB number (#1 or #2) data message. This RKE transmitter function depends on if the MSM is programmed to trigger the recall (linked FOBs).

A memory setting is saved by pressing the “set” button, then pressing either the memory “1” or “2” button within 5 seconds of pressing the “set” button.

A memory setting is recalled by pressing either the memory “1” or “2” button, or by pressing the unlock button on a “linked” Remote Keyless Entry (RKE) transmitter.

For driver safety, memorized settings can not be recalled if the transmission is in any position other than park or the seat belt is latched.

A key FOB is “linked” to a memory setting by pressing the “set” button and then pressing either the memory “1” or “2” button within 5 seconds of pressing the set button, then by pressing the “lock” button on the selected key FOB.

The memory system “Easy Entry and /Exit” feature provides the driver with more room to enter or exit the vehicle. When the seat is in a memorized position, it will move rearward 55 millimeters or to the end of its travel, whichever occurs first, when the key is removed from the ignition switch lock cylinder. This is a customer programmable feature of the overhead console. The seat will return to the memory position when the driver turns the vehicle’s ignition switch out of the LOCK position.

The memory system “Tilt in Reverse” feature tilts the outside mirrors down a fixed, incremental angle when the vehicle is shifted into REVERSE with the ignition switch in the RUN position. This feature provides the customer with a better view of the ground and vehicle in the area of the rear tires when backing up. The mirrors move back to their previous position when the vehicle is shifted out of REVERSE.

The memory system “learns” the seat and adjustable pedal motor maximum end positions when the motor reaches the limit of travel in any direction and stalls. Subsequently, movement will stop just short of that position to avoid extra stress on the motors and mechanisms. If the system learned a maximum position as a result of an obstruction, as for instance if a large object was placed on the floor behind the seat, the system can relearn the “true” maximum position through manually operating the power seat after the obstruction is removed.

**Note: It is normal for the power accessories contained in the memory system to stop at the maximum “learned” position and then continue to the “true” maximum position when the control switch is released and then applied in the same direction a second time.**

Certain functions and features of the memory system rely upon resources shared with other electronic modules in the vehicle over the Controller Area Network (CAN) bus. The CAN bus allows the sharing of sensor information. This helps to reduce wire harness complexity, internal controller hardware, and component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities. For diagnosis of these electronic modules or of the CAN bus, the use of a scan tool and the proper diagnostic information are needed.

## DIAGNOSIS AND TESTING

### MEMORY SEAT MODULE

In order to obtain conclusive testing of the memory system, the Controller Area Network (CAN) data bus, and all of the electronic modules that provide inputs to, or receive outputs from the memory system components must be checked. **Any diagnosis of the memory system/module should begin with, the use of a scan tool and the appropriate diagnostic service information.**

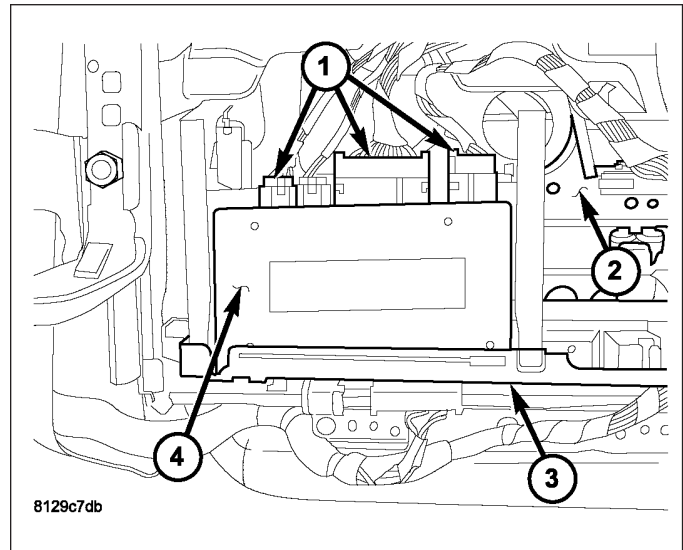
**Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.**

**Note:** Vehicles equipped with the memory/heated seat option utilize a low voltage cut-off feature. This feature turns off the 12v power to the power seat system anytime vehicle voltage is below 11.7v. Be certain to check the vehicle electrical system for proper voltage anytime the power seat system appears inoperative.

Before any testing of the power seat system is attempted, the battery should be fully-charged.

## REMOVAL

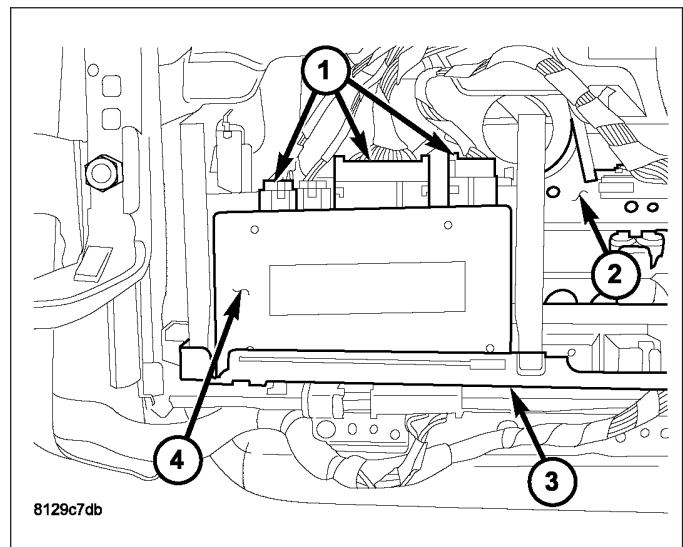
1. Disconnect and isolate the battery negative cable.
2. Remove the driver seat cushion/cover (2) (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - REMOVAL).
3. Pivot the module upward and disconnect the electrical connectors (1).
4. Unsnap the memory seat module (4) from the side brackets.
5. Pull the module rearward to remove it from the front of the seat frame (3).



## INSTALLATION

**CAUTION:** The Memory Seat Module (MSM) mounting tabs can be damaged during module installation. Use care to properly align tabs to prevent binding that could result in tab breakage.

1. Place the module (4) into position making sure the mounting tabs are properly aligned with the front bracket.
2. Push down on the rear of the module (4) snapping the retaining clips into place in the side brackets.
3. Connect the MSM rear harness connectors (1).
4. Connect the MSM front harness connectors.
5. Install the driver seat cushion/cover (2) (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - INSTALLATION).
6. Connect the battery negative cable.
7. Verify system and vehicle operation.

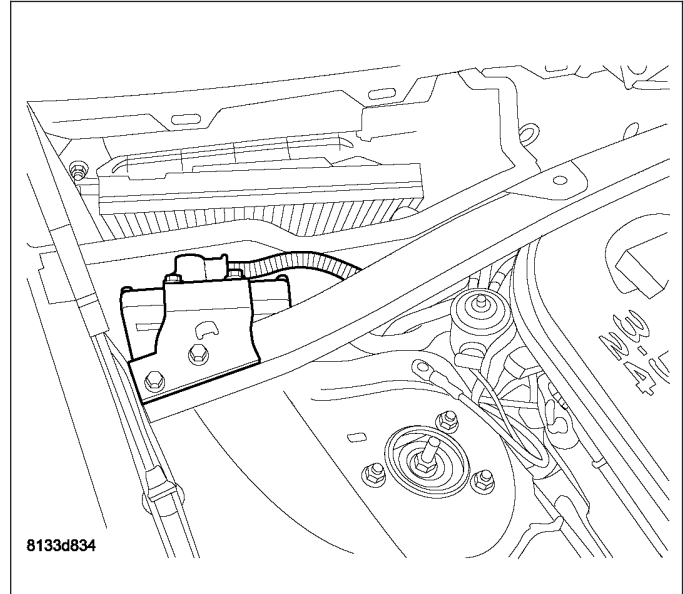


## MODULE-POWERTRAIN CONTROL

### DESCRIPTION

#### DESCRIPTION - PCM

The Powertrain Control Module (PCM) is located in the engine compartment. The PCM is referred to as NGC.



### MODES OF OPERATION

As input signals to the Powertrain Control Module (PCM) change, the PCM adjusts its response to the output devices. For example, the PCM must calculate different injector pulse width and ignition timing for idle than it does for wide open throttle (WOT).

The PCM will operate in two different modes: **Open Loop and Closed Loop.**

During Open Loop modes, the PCM receives input signals and responds only according to preset PCM programming. Input from the oxygen (O<sub>2</sub>S) sensors is not monitored during Open Loop modes.

During Closed Loop modes, the PCM will monitor the oxygen (O<sub>2</sub>S) sensors input. This input indicates to the PCM whether or not the calculated injector pulse width results in the ideal air-fuel ratio. This ratio is 14.7 parts air-to-1 part fuel. By monitoring the exhaust oxygen content through the O<sub>2</sub>S sensor, the PCM can fine tune the injector pulse width. This is done to achieve optimum fuel economy combined with low emission engine performance.

The fuel injection system has the following modes of operation:

- Ignition switch ON
- Engine start-up (crank)
- Engine warm-up
- Idle
- Cruise
- Acceleration
- Deceleration
- Wide open throttle (WOT)
- Ignition switch OFF

The ignition switch On, engine start-up (crank), engine warm-up, acceleration, deceleration and wide open throttle modes are Open Loop modes. The idle and cruise modes, (with the engine at operating temperature) are Closed Loop modes.

#### IGNITION SWITCH (KEY-ON) MODE

This is an Open Loop mode. When the fuel system is activated by the ignition switch, the following actions occur:

- The PCM pre-positions the idle air control (IAC) motor.
- The PCM determines atmospheric air pressure from the MAP sensor input to determine basic fuel strategy.
- The PCM monitors the engine coolant temperature sensor input. The PCM modifies fuel strategy based on this input.
- Intake manifold air temperature sensor input is monitored.
- Throttle position sensor (TPS) is monitored.
- The auto shutdown (ASD) relay is energized by the PCM for approximately three seconds.
- The fuel pump is energized through the fuel pump relay by the PCM. The fuel pump will operate for approximately three seconds unless the engine is operating or the starter motor is engaged.
- The O2S sensor heater element is energized via the O2S relays. The O2S sensor input is not used by the PCM to calibrate air-fuel ratio during this mode of operation.

## ENGINE START-UP MODE

This is an Open Loop mode. The following actions occur when the starter motor is engaged.

The PCM receives inputs from:

- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Starter motor relay
- Camshaft position sensor signal

The PCM monitors the crankshaft position sensor. If the PCM does not receive a crankshaft position sensor signal within approximately 3 seconds of cranking the engine, it will shut down the fuel injection system.

The fuel pump is activated by the PCM through the fuel pump relay.

Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.

The PCM determines the proper ignition timing according to input received from the crankshaft position sensor.

## ENGINE WARM-UP MODE

This is an Open Loop mode. During engine warm-up, the PCM receives inputs from:

- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)

Based on these inputs the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM adjusts engine idle speed through the idle air control (IAC) motor and adjusts ignition timing.
- The PCM operates the A/C compressor clutch through the clutch relay. This is done if A/C has been selected by the vehicle operator and requested by the A/C thermostat.
- When engine has reached operating temperature, the PCM will begin monitoring O2S sensor input. The system will then leave the warm-up mode and go into closed loop operation.

## IDLE MODE

When the engine is at operating temperature, this is a Closed Loop mode. At idle speed, the PCM receives inputs from:

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Battery voltage
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Oxygen sensors

Based on these inputs, the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM monitors the O<sub>2</sub>S sensor input and adjusts air-fuel ratio by varying injector pulse width. It also adjusts engine idle speed through the idle air control (IAC) motor.
- The PCM adjusts ignition timing by increasing and decreasing spark advance.
- The PCM operates the A/C compressor clutch through the clutch relay. This happens if A/C has been selected by the vehicle operator and requested by the A/C thermostat.

## CRUISE MODE

When the engine is at operating temperature, this is a Closed Loop mode. At cruising speed, the PCM receives inputs from:

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Oxygen (O<sub>2</sub>S) sensors

Based on these inputs, the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then adjust the injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM monitors the O<sub>2</sub>S sensor input and adjusts air-fuel ratio. It also adjusts engine idle speed through the idle air control (IAC) motor.
- The PCM adjusts ignition timing by turning the ground path to the coil on and off.
- The PCM operates the A/C compressor clutch through the clutch relay. This happens if A/C has been selected by the vehicle operator and requested by the A/C thermostat.

## ACCELERATION MODE

This is an Open Loop mode. The PCM recognizes an abrupt increase in throttle position or MAP pressure as a demand for increased engine output and vehicle acceleration. The PCM increases injector pulse width in response to increased throttle opening.

## DECELERATION MODE

When the engine is at operating temperature, this is an Open Loop mode. During hard deceleration, the PCM receives the following inputs.

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Vehicle speed

If the vehicle is under hard deceleration with the proper rpm and closed throttle conditions, the PCM will ignore the oxygen sensor input signal. The PCM will enter a fuel cut-off strategy in which it will not supply a ground to the injectors. If a hard deceleration does not exist, the PCM will determine the proper injector pulse width and continue injection.

Based on the above inputs, the PCM will adjust engine idle speed through the idle air control (IAC) motor.

The PCM adjusts ignition timing by turning the ground path to the coil on and off.

## WIDE OPEN THROTTLE MODE

This is an Open Loop mode. During wide open throttle operation, the PCM receives the following inputs.

- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal

During wide open throttle conditions, the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off. The PCM ignores the oxygen sensor input signal and provides a predetermined amount of additional fuel. This is done by adjusting injector pulse width.
- The PCM adjusts ignition timing by turning the ground path to the coil on and off.

## IGNITION SWITCH OFF MODE

When ignition switch is turned to OFF position, the PCM stops operating the injectors, ignition coil, ASD relay and fuel pump relay.

## DESCRIPTION - 5 VOLT SUPPLIES

Two different Powertrain Control Module (PCM) five volt supply circuits are used; primary and secondary.

## DESCRIPTION - IGNITION CIRCUIT SENSE

This circuit ties the ignition switch to the Powertrain Control Module (PCM).

## DESCRIPTION - POWER GROUNDS

The Powertrain Control Module (PCM) has 2 main grounds. Both of these grounds are referred to as power grounds. All of the high-current, noisy, electrical devices are connected to these grounds as well as all of the sensor returns. The sensor return comes into the sensor return circuit, passes through noise suppression, and is then connected to the power ground.



The power ground is used to control ground circuits for the following PCM loads:

- Generator field winding
- Fuel injectors
- Ignition coil(s)
- Certain relays/solenoids
- Certain sensors

## DESCRIPTION - SENSOR RETURN

The Sensor Return circuits are internal to the Powertrain Control Module (PCM).

Sensor Return provides a low-noise ground reference for all engine control system sensors. Refer to Power Grounds for more information.

## OPERATION

### OPERATION - PCM

1. Also refer to Modes of Operation.

The PCM operates the fuel system. The PCM is a pre-programmed, triple microprocessor digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, certain transmission features, speed control, air conditioning compressor clutch engagement and idle speed. The PCM can adapt its programming to meet changing operating conditions.

The PCM receives input signals from various switches and sensors. Based on these inputs, the PCM regulates various engine and vehicle operations through different system components. These components are referred to as Powertrain Control Module (PCM) Outputs. The sensors and switches that provide inputs to the PCM are considered Powertrain Control Module (PCM) Inputs.

The PCM adjusts ignition timing based upon inputs it receives from sensors that react to: engine rpm, manifold absolute pressure, engine coolant temperature, throttle position, transmission gear selection (automatic transmission), vehicle speed and the brake switch.

The PCM adjusts idle speed based on inputs it receives from sensors that react to: throttle position, vehicle speed, transmission gear selection, engine coolant temperature and from inputs it receives from the air conditioning clutch switch and brake switch.

Based on inputs that it receives, the PCM adjusts ignition coil dwell. The PCM also adjusts the generator charge rate through control of the generator field and provides speed control operation.

#### Note: PCM Inputs:

- A/C request
- Auto shutdown (ASD) sense
- Battery temperature
- Battery voltage
- Brake switch
- J1850 bus circuits
- Camshaft position sensor signal
- Crankshaft position sensor
- Data link connections for DRB scan tool
- Engine coolant temperature sensor
- Five volts (primary)
- Five volts (secondary)
- Fuel level
- Generator (battery voltage) output
- Ignition circuit sense (ignition switch in on/off/crank/run position)
- Intake manifold air temperature sensor
- Leak detection pump (switch) sense (if equipped)

- Manifold absolute pressure (MAP) sensor
- Oil pressure
- Overdrive/override switch
- Oxygen sensors
- Park/neutral switch (auto. trans. only)
- Power ground
- Sensor return
- Signal ground
- Speed control multiplexed single wire input
- Throttle position sensor
- Transmission governor pressure sensor
- Transmission temperature sensor
- Vehicle speed (from ABS module)

**Note: PCM Outputs:**

- A/C clutch relay
- Auto shutdown (ASD) relay
- J1850 (+/-) circuits for: speedometer, voltmeter, fuel gauge, oil pressure gauge/lamp, engine temp. gauge and speed control warn. lamp
- Data link connection for DRBIII® scan tool
- EGR valve control solenoid (if equipped)
- EVAP canister purge solenoid
- Fuel injectors
- Fuel pump relay
- Generator field driver (-)
- Generator field driver (+)
- Generator lamp (if equipped)
- Idle air control (IAC) motor
- Ignition coil
- Leak detection pump
- Malfunction indicator lamp (Check engine lamp). Driven through J1850 circuits.
- Overdrive indicator lamp (if equipped). Driven through J1850 circuits.
- Oxygen sensor heater relays (if equipped).
- Radiator cooling fan relay (pulse width modulated)
- Speed control source
- Speed control vacuum solenoid
- Speed control vent solenoid
- Tachometer (if equipped). Driven through J1850 circuits.
- Transmission convertor clutch circuit
- Transmission 3–4 shift solenoid
- Transmission relay
- Transmission temperature lamp (if equipped)
- Transmission variable force solenoid

## OPERATION - 5 VOLT SUPPLIES

Primary 5-volt supply:

- supplies the required 5 volt power source to the Crankshaft Position (CKP) sensor.
- supplies the required 5 volt power source to the Camshaft Position (CMP) sensor.
- supplies a reference voltage for the Manifold Absolute Pressure (MAP) sensor.
- supplies a reference voltage for the Throttle Position Sensor (TPS) sensor.



Secondary 5-volt supply:

- supplies the required 5 volt power source to the oil pressure sensor.
- supplies the required 5 volt power source for the Vehicle Speed Sensor (VSS) (if equipped).
- supplies the 5 volt power source to the transmission pressure sensor (if equipped with an RE automatic transmission).

## **OPERATION - IGNITION CIRCUIT SENSE**

The ignition circuit sense input tells the PCM the ignition switch has energized the ignition circuit.

Battery voltage is also supplied to the PCM through the ignition switch when the ignition is in the RUN or START position. This is referred to as the "ignition sense" circuit and is used to "wake up" the PCM.

## **DIAGNOSIS AND TESTING**

## NGC POWERTRAIN VERIFICATION TEST VER - 1

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

### Diagnostic Test

#### 1. NGC POWERTRAIN VERIFICATION TEST VER - 1

**Note:** 1. If this vehicle is equipped with an Electron Throttle Control system, and the APP Sensors, PCM, or Throttle Body Assembly have been replaced, use a scan tool to perform the ETC RELEARN function.

**Note:** 2. If the PCM or FCM have been replaced, the Pinion Factor **MUST** be programmed into the FCM. While programming the Pinion Factor into the FCM the scan tool will send the Pinion Factor information to the PCM at the same time. Refer to the scan tool for program procedure.

**Note:** 3. If the PCM has been replaced and the correct VIN and mileage have not been programmed, a DTC will set in the ABS Module, Airbag Module and the SKIM.

**Note:** 4. If the vehicle is equipped with a Sentry Key Immobilizer System, Secret Key data must be updated. Refer to the Service Information for the PCM, SKIM and the Transponder (ignition key) for programming information.

5. Inspect the vehicle to ensure that all components related to the repair are properly installed and connected.

6. Inspect the engine oil for fuel contamination. Replace the oil and filter as necessary.

7. Attempt to start the engine.

8. If the No Start condition is still present, refer to the Engine Electrical Diagnostic list and perform the diagnostic testing as necessary, refer to any Technical Service Bulletins that may apply.

9. Run the engine for one warm-up cycle to verify operation.

10. With the scan tool, confirm that no DTCs or Secondary Indicators are present and that all components are functioning properly.

**Note:** The PCM can detect and compensate for variances in the engine and its components. To learn these variations, the PCM uses the input of the actual crankshaft rotation pattern and ideal crankshaft rotation pattern that has been calibrated into the PCM. The PCM then compares the two patterns. The variation between the two values is the Adaptive Numerator. If the Adaptive Numerator is not learned by the PCM, the misfire monitor will not run and the Multi-Cylinder Displacement System (MDS) will not operate. Without MDS operation, the customer will experience decreased fuel economy. If the customer experiences decrease fuel economy or after any repair use the scan tool to ensure that the Adaptive Numerator is learned.

**Are any DTCs or symptoms remaining?**

**Yes** >> Check for any related Technical Service Bulletins and/or refer to the appropriate Diagnostic Procedure.

**No** >> Repair is complete.

---

## NGC POWERTRAIN VERIFICATION TEST VER - 2

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

### Diagnostic Test

#### 1. NGC POWERTRAIN VERIFICATION TEST VER - 2

**Note:** 1. If this vehicle is equipped with a Electronic Throttle Control system, and the APP Sensors, PCM, or Throttle Body Assembly have been replaced, use a scan tool to perform the ETC RELEARN function.

**Note:** 2. If the PCM or FCM have been replaced, the Pinion Factor **MUST** be programmed into the FCM. While programming the Pinion Factor into the FCM the scan tool will send the Pinion Factor information to the PCM at the same time. Refer to the scan tool for program procedure.

**Note:** 3. If the PCM has been replaced and the correct VIN and mileage have not been programmed, a DTC will set in the ABS Module, Airbag Module and the SKIM.

**Note:** 4. If the vehicle is equipped with a Sentry Key Immobilizer System, Secret Key data must be updated. Refer to the Service Information for the PCM, SKIM and the Transponder (ignition key) for programming information.

5. Inspect the vehicle to make sure that all components related to the repair are properly installed and connected.
6. With a scan tool, clear DTCs and Reset Memory all engine values.
7. Run the engine for one warm-up cycle to verify proper operation.
8. Road test the vehicle. Use all accessories that may be related to this repair.
9. With the scan tool, confirm that no DTC's or Secondary Indicators are present and that all components are functioning properly.
10. If this test is being performed after a No Trouble Code test, verify the symptom is no longer present.

**Note:** The PCM can detect and compensate for variances in the engine and its components. To learn these variations, the PCM uses the input of the actual crankshaft rotation pattern and ideal crankshaft rotation pattern that has been calibrated into the PCM. The PCM then compares the two patterns. The variation between the two values is the Adaptive Numerator. If the Adaptive Numerator is not learned by the PCM, the misfire monitor will not run and the Multi-Cylinder Displacement System (MDS) will not operate. Without MDS operation, the customer will experience decreased fuel economy. If the customer experiences decrease fuel economy or after any repair use the scan tool to ensure that the Adaptive Numerator is learned.

**Are any DTCs or symptoms remaining?**

**Yes** >> Check for any related Technical Service Bulletins and/or refer to the appropriate Diagnostic Procedure.

**No** >> Repair is complete.

---

## NGC POWERTRAIN VERIFICATION TEST VER - 3

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

### Diagnostic Test

#### 1. NGC POWERTRAIN VERIFICATION TEST VER - 3

1. If this vehicle is equipped with an Electronic Throttle Control system, and the APP Sensors, PCM, or Throttle Body Assembly has been replaced use a scan tool to perform the ETC RELEARN function.

**Note: 2. After completing the Powertrain Verification Test the Transmission Verification Test must be performed.**

**Note: 3. If the PCM has been replaced and the correct VIN and mileage have not been programmed, a DTC will set in the ABS Module, Airbag Module and the SKIM.**

**Note: 4. If the vehicle is equipped with a Sentry Key Immobilizer System, Secret Key data must be updated. Refer to the Service Information for the PCM, SKIM and the Transponder (ignition key) for programming information.**

5. Inspect the vehicle to make sure that all components related to the repair are properly installed and connected.

6. With the scan tool, clear DTCs.

7. Perform generator output test. Refer to the appropriate service information as necessary.

8. Start the engine and set engine speed to 2000 RPM for at least thirty seconds.

9. Cycle the ignition key off and on.

10. With the scan tool, read the DTCs.

**Note: The PCM can detect and compensate for variances in the engine and its components. To learn these variations, the PCM uses the input of the actual crankshaft rotation pattern and ideal crankshaft rotation pattern that has been calibrated into the PCM. The PCM then compares the two patterns. The variation between the two values is the Adaptive Numerator. If the Adaptive Numerator is not learned by the PCM, the misfire monitor will not run and the Multi-Cylinder Displacement System (MDS) will not operate. Without MDS operation, the customer will experience decreased fuel economy. If the customer experiences decrease fuel economy or after any repair use the scan tool to ensure that the Adaptive Numerator is learned.**

**Are any DTCs or symptoms remaining?**

**Yes** >> Check for any Technical Service Bulletins and/or refer to the appropriate Diagnostic Procedure.

**No** >> Repair is complete.

---

## NGC POWERTRAIN VERIFICATION TEST VER - 4

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

### Diagnostic Test

#### 1. NGC POWERTRAIN VERIFICATION TEST VER - 4

**Note:** If this vehicle is equipped with an Electronic Throttle Control system, and the APP Sensors, PCM, or Throttle Body Assembly have been replaced, use the scan tool to perform the ETC RELEARN function.

**Note:** 2. After completing the Powertrain Verification Test the Transmission Verification Test must be performed.

**Note:** 3. If the PCM has been replaced and the correct VIN and mileage have not been programmed, a DTC will set in the ABS Module, Airbag Module and the SKIM.

**Note:** 4. If the vehicle is equipped with a Sentry Key Immobilizer System, Secret Key data must be updated. Refer to the Service Information for the PCM, SKIM and the Transponder (ignition key) for programming information.

5. Inspect the vehicle to make sure that all engine components are properly installed and connected.
6. Connect the scan tool to the data link connector and erase all codes.
7. Turn the speed control ON (if equipped, cruise light will be on).
8. Depress and release the SET Switch when the vehicle speed is greater than 35 MPH. The speed control should engage and hold the selected speed.
9. Press and hold the RESUME/ACCEL Switch. The vehicle speed should increase by at least 2 MPH.
10. Press and hold the COAST switch. The vehicle speed should decrease.
11. Using caution, press and release the brake pedal. The speed control should disengage.
12. Bring the vehicle speed back up to 35 MPH.
13. Press the RESUME/ACCEL switch. The speed control should resume the previously set speed.
14. Hold down the SET switch. The vehicle should decelerate.
15. Make sure vehicle speed is greater than 35 mph and release the SET Switch. The vehicle should adjust and set a new vehicle speed.
16. Press and release the CANCEL switch. The speed control should disengage.
17. Bring the vehicle speed back up above 35 mph and engage speed control.
18. Turn the Speed Control Off. (Cruise light will be off). The speed control should disengage.

**Note: OVERTHOOT/UNDERSHOOT FOLLOWING SPEED CONTROL SET.**

20. If the vehicle operator repeatedly presses and releases the SET button with their foot off of the accelerator (referred to as "lift foot set"), the vehicle may accelerate and exceed the desired set speed by up to 5 mph (8 km/h).
21. It may also decelerate to less than the desired set speed, before finally achieving the desired set speed.
22. The Speed Control System has an adaptive strategy that compensates for vehicle-to-vehicle variations in speed control cable lengths.
23. When the speed control is set with the vehicles operators foot off of the accelerator pedal, the speed control thinks there is excessive speed control cable slack and adapts accordingly.
24. If the "lift foot sets" are continually used, a speed control overshoot/undershoot condition will develop.
25. To "unlearn" the overshoot/undershoot condition, the vehicle operator has to press and release the set button while maintaining the desired set speed using the accelerator pedal (not decelerating or accelerating).
26. Then turn the cruise control switch to the OFF position (or press the CANCEL button if equipped) after waiting 10 seconds.
27. This procedure must be performed approximately 10-15 times to completely unlearn the overshoot/undershoot condition.

**NGC POWERTRAIN VERIFICATION TEST VER - 4 (CONTINUED)**

**Note:** The PCM can detect and compensate for variances in the engine and its components. To learn these variations, the PCM uses the input of the actual crankshaft rotation pattern and ideal crankshaft rotation pattern that has been calibrated into the PCM. The PCM then compares the two patterns. The variation between the two values is the Adaptive Numerator. If the Adaptive Numerator is not learned by the PCM, the misfire monitor will not run and the Multi-Cylinder Displacement System (MDS) will not operate. Without MDS operation, the customer will experience decreased fuel economy. If the customer experiences decrease fuel economy or after any repair use the scan tool to ensure that the Adaptive Numerator is learned.

**Did the Speed Control pass the above test?**

**Yes** >> Repair is complete.

**No** >> Check for any related Technical Service Bulletins and/or refer to the appropriate Diagnostic Procedure.

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## NGC POWERTRAIN VERIFICATION TEST VER - 5

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

### Diagnostic Test

#### 1. NGC POWERTRAIN VERIFICATION TEST VER - 5

**Note:** 1. After completing the Powertrain Verification Test the Transmission Verification Test must be performed.

**Note:** 2. If the PCM has been replaced and the correct VIN and mileage have not been programmed, a DTC will set in the ABS Module, Airbag Module and the SKIM.

**Note:** 3. If the vehicle is equipped with a Sentry Key Immobilizer System, Secret Key data must be updated. Refer to the Service Information for the PCM, SKIM and the Transponder (ignition key) for programming information.

**Note:** 4. If this vehicle is equipped with an Electronic Throttle Control system, and the APP Sensors, PCM, or Throttle Body Assembly have been replaced, use the scan tool to perform the ETC RELEARN function.

**Note:** 5. When replacing an O2 Sensor, the PCM RAM memory must be cleared, either by disconnecting the PCM C-1 connector or momentarily disconnecting the Battery negative terminal.

6. The NGC learns the characteristics of each O2 heater element and these old values should be cleared when installing a new O2 sensor. The customer may experience driveability issues if this is not performed.

7. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.

8. Connect the scan tool to the data link connector.

9. Make sure the fuel tank has at least a quarter tank of fuel. Turn off all accessories.

10. If the Catalyst was replaced, with the scan tool go to the Miscellaneous Menu Option "Catalyst Replaced" and press enter.

11. If a Comprehensive Component DTC was repaired, perform steps 12 - 14. If a Major OBDII Monitor DTC was repaired skip those steps and continue verification.

12. After the ignition has been off for at least 10 seconds, restart the vehicle and run 2 minutes.

13. With the scan tool, monitor the appropriate pre-test enabling conditions until all conditions have been met. Once the conditions have been met, switch screen to the appropriate OBDII monitor, (Audible beeps when the monitor is running).

14. If the repaired OBDII trouble code has reset or was seen in the monitor while on the road test, the repair is not complete. Check for any related technical service bulletins or flash updates and return to Engine Electrical Diagnostic List.

15. If the conditions cannot be duplicated, erase all DTCs with the DRBIII®.

16. If another DTC has set, return to the Engine Electrical Diagnostic List and follow the path specified for that DTC.

**Note:** The PCM can detect and compensate for variances in the engine and its components. To learn these variations, the PCM uses the input of the actual crankshaft rotation pattern and ideal crankshaft rotation pattern that has been calibrated into the PCM. The PCM then compares the two patterns. The variation between the two values is the Adaptive Numerator. If the Adaptive Numerator is not learned by the PCM, the misfire monitor will not run and the Multi-Cylinder Displacement System (MDS) will not operate. Without MDS operation, the customer will experience decreased fuel economy. If the customer experiences decrease fuel economy or after any repair use the scan tool to ensure that the Adaptive Numerator is learned.

**Did the OBDII Monitor run successfully and has the Good Trip Counter changed to one or more?**

**Yes** >> Repair is complete.

**No** >> Check for any related Technical Service Bulletins and/or refer to the appropriate Diagnostic Procedure.

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## NGC POWERTRAIN VERIFICATION TEST VER - 6

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

### Diagnostic Test

#### 1. NGC POWERTRAIN VERIFICATION TEST VER - 6

1. Install the Miller Tool #8404 Evaporative Emission Leak Detector (EELD) according to the instructions in the previous DTC table.
2. Set the smoke/air control switch to AIR.
3. Insert the tester's AIR supply tip (clear hose) into the appropriate calibration orifice on the tester's control panel (based on DTC leak size).
4. Press the remote smoke/air start button.
5. Position the red flag on the air flow meter so it is aligned with the indicator ball.
6. When the calibration is complete, release the remote button. The EELD flow meter is now calibrated in liters per minute to the size of leak indicated by the DTC set in the PCM.
7. Install the service port adapter #8404-14 on the vehicle's service port.
8. Connect the Air supply hose from the EELD to the vehicle.
9. Press the remote button to activate AIR flow.

**Note:** 10. Larger volume fuel tanks, lower fuel levels or if the vehicle is equipped with a Flow Management Valve may indicate high flow and will require 4 to 5 minutes to fill.

11. Compare the flow meter indicator ball reading to the red flag.
12. ABOVE the red flag indicates a leak present.
13. BELOW the red flag indicates a sealed system.

**Note:** If this vehicle is equipped with an Electronic Throttle Control system, and the APP Sensors, PCM, or Throttle Body Assembly have been replaced, use the scan tool to perform the ETC RELEARN function.

15. If the indicator ball shows a leak present, perform the smoke test indicated in the previous test and identify the leak and repair. Perform this verification test when the repair is complete.

**Note:** The PCM can detect and compensate for variances in the engine and its components. To learn these variations, the PCM uses the input of the actual crankshaft rotation pattern and ideal crankshaft rotation pattern that has been calibrated into the PCM. The PCM then compares the two patterns. The variation between the two values is the Adaptive Numerator. If the Adaptive Numerator is not learned by the PCM, the misfire monitor will not run and the Multi-Cylinder Displacement System (MDS) will not operate. Without MDS operation, the customer will experience decreased fuel economy. If the customer experiences decrease fuel economy or after any repair use the scan tool to ensure that the Adaptive Numerator is learned.

**Did the indicator ball indicate the a leak is present?**

**Yes** >> Repeat the DTC test to identify the leak and repair.

**No** >> Repair is complete.

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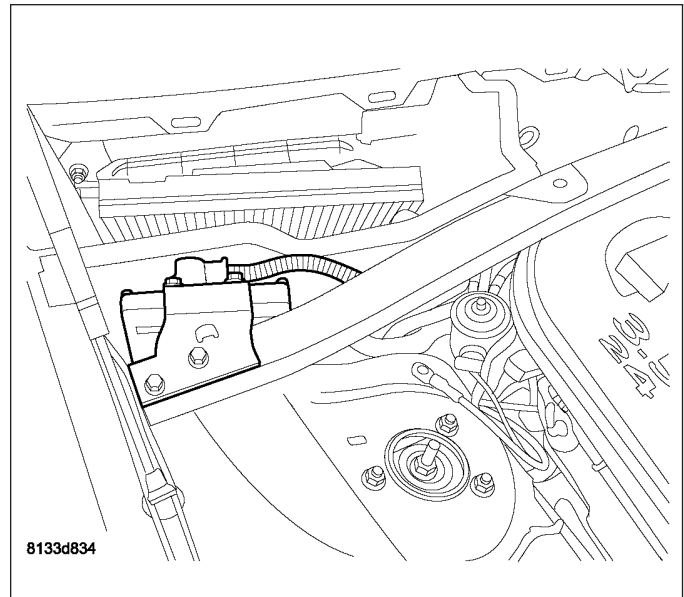
## REMOVAL

**USE THE SCAN TOOL TO REPROGRAM THE NEW POWERTRAIN CONTROL MODULE (PCM) WITH THE VEHICLES ORIGINAL IDENTIFICATION NUMBER (VIN) AND THE VEHICLES ORIGINAL MILEAGE. IF THIS STEP IS NOT DONE, A DIAGNOSTIC TROUBLE CODE (DTC) MAY BE SET.**

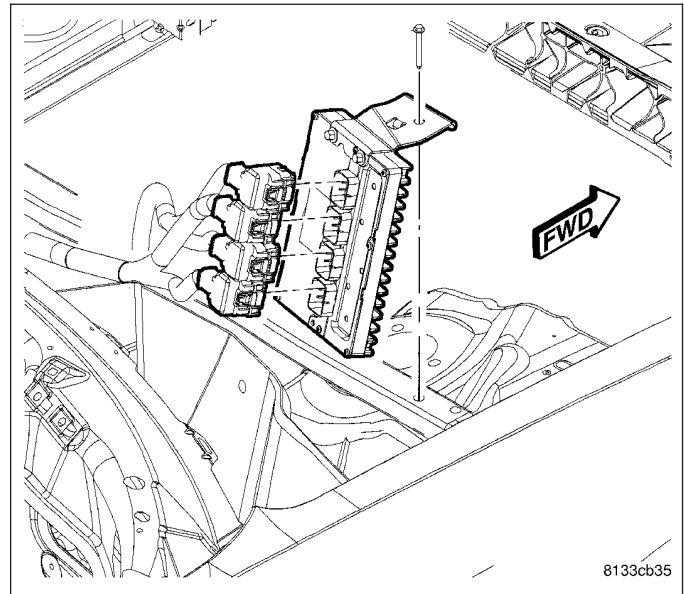
To avoid possible voltage spike damage to PCM, ignition key must be off, and negative battery cable must be disconnected before unplugging PCM connectors.



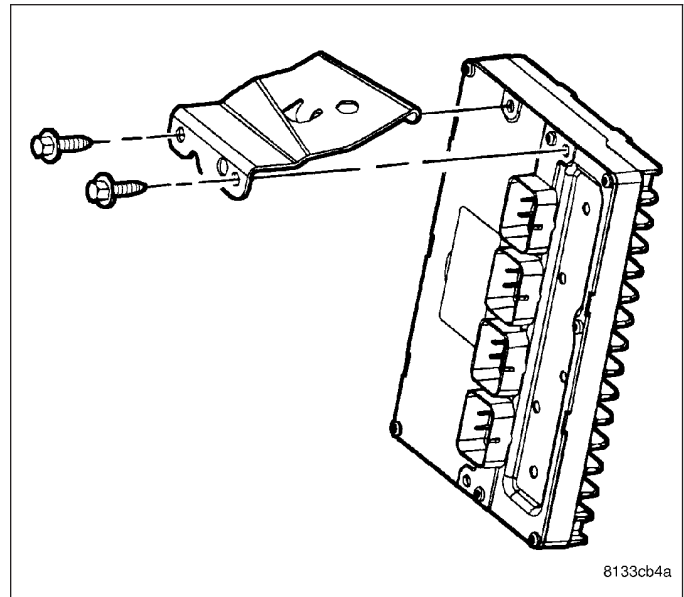
1. Disconnect negative battery cable.



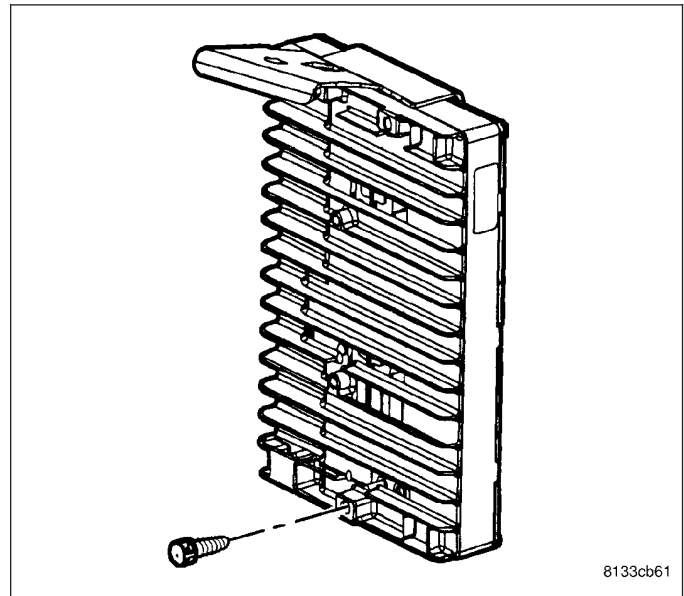
2. Remove PCM bracket-to-body mounting bolt.
3. Remove assembly from vehicle.
4. Unlock and disconnect the electrical connectors from PCM.



5. Remove bracket from PCM.



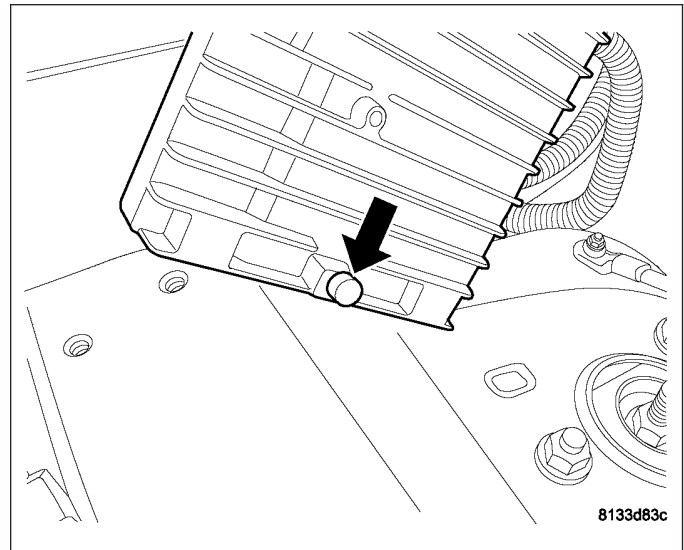
6. Remove the rubber bumper from PCM.



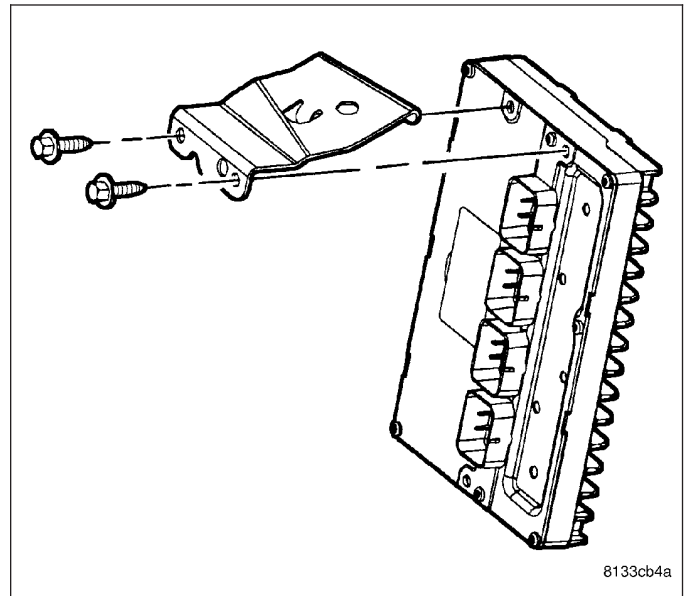
## INSTALLATION

USE THE SCAN TOOL TO REPROGRAM THE NEW POWERTRAIN CONTROL MODULE (PCM) WITH THE VEHICLES ORIGINAL IDENTIFICATION NUMBER (VIN) AND THE VEHICLES ORIGINAL MILEAGE. IF THIS STEP IS NOT DONE, A DIAGNOSTIC TROUBLE CODE (DTC) MAY BE SET.

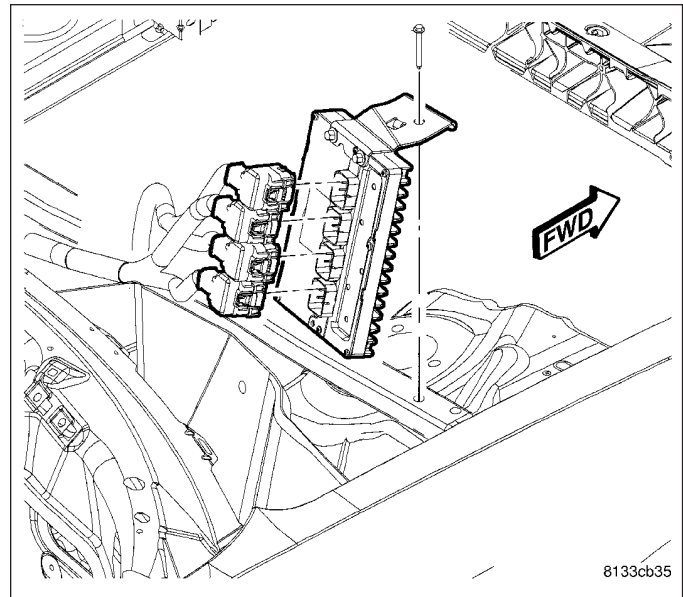
1. Install rubber bumper to PCM back.
2. Check pins in electrical connectors for damage.  
Repair as necessary.
3. Install electrical connectors to PCM.



4. Install mounting bracket to PCM.



5. Install assembly to body. Install bolt and tighten 9 N·m (80 in. lbs.) torque.



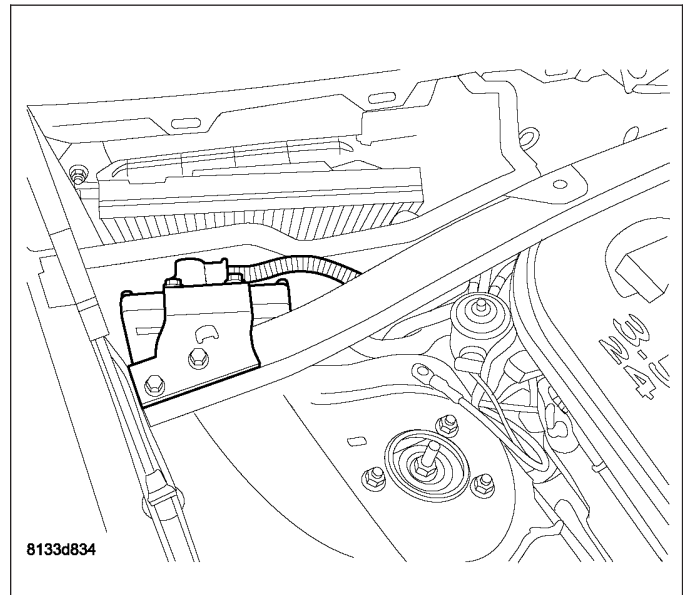
6. Connect negative cable to battery.
7. Use the scan tool to reprogram new PCM with vehicles original Identification Number (VIN) and original vehicle mileage.

## MODULE-TRANSMISSION CONTROL

### DESCRIPTION

#### TRANSMISSION CONTROL MODULE - 42RLE

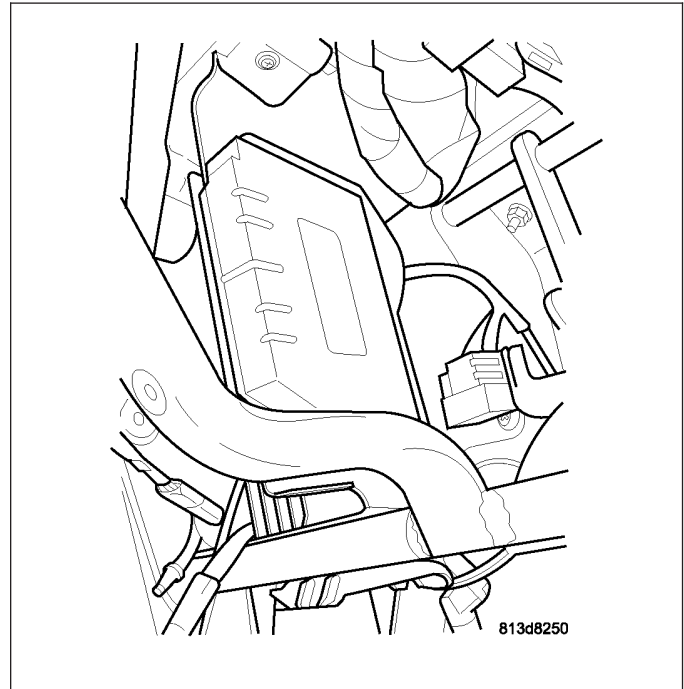
The Transmission Control Module (TCM) is a sub-module within the Powertrain Control Module (PCM). The Powertrain Control Module (PCM) is located in the right rear of the engine compartment, just in front of the windshield.



## TRANSMISSION CONTROL MODULE - NAG1

The electronic control system consists of various components providing inputs to the transmission control module (TCM). The TCM monitors transmission sensors, shift lever position, and bus messages to determine transmission shift strategy. After shift strategies are determined, the TCM controls the actuation of transmission solenoids, which controls the routing of hydraulic fluid within the transmission, by moving a sequence of four valves to make a shift occur.

The NAG1 electronic transmission has a fully adaptive control system. The system performs its functions based on continuous real-time sensor feedback information. In addition the TCM receives information from the PCM (engine management) and ABS (chassis systems) controllers over the CAN bus. The CAN bus is a high-speed communication bus that allows real time control capability between various controllers. Most messages are sent every 20 milliseconds. This means critical information can be shared between the transmission, engine, and ABS controllers. The CAN bus is a two wire bus with a CAN Bus (+) circuit and a CAN Bus (-) circuit. These circuits are twisted pairs in the harness to reduce the potential of radio and noise interference.



The transmission control system automatically adapts to changes in engine performance, vehicle speed, and transmission temperature variations to provide consistent shift quality. The control system ensures that clutch operation during up-shifting and downshifting is more responsive without increased harshness. The TCM activates the solenoid valves and moves valves in the valve body to achieve the necessary gear changes. The required pressure level is calculated from the load condition, engine speed. Vehicle speed (from ABS module) and transmission oil temperature, matched to the torque to be transmitted. The TCM is located under the left side of the instrument panel.

## OPERATION

### TRANSMISSION CONTROL MODULE - 42RLE

The Transmission Control Module (TCM) controls all electronic operations of the transmission. The TCM receives information regarding vehicle operation from both direct and indirect inputs, and selects the operational mode of the transmission. Direct inputs are hard wired to, and used specifically by the TCM. Indirect inputs are shared with the TCM via the vehicle communication bus.

Some examples of **direct inputs** to the TCM are:

- Battery (B+) voltage
- Ignition "ON" voltage
- Transmission Control Relay (Switched B+)
- Throttle Position Sensor
- Crankshaft Position Sensor
- Transmission Range Sensor
- Pressure Switches
- Transmission Temperature Sensor
- Input Shaft Speed Sensor
- Output Shaft Speed Sensor
- Line Pressure Sensor

Some examples of **indirect inputs** to the TCM are:

- Engine/Body Identification
- Manifold Pressure
- Target Idle
- Torque Reduction Confirmation
- Engine Coolant Temperature
- Ambient/Battery Temperature
- Scan Tool Communication

Based on the information received from these various inputs, the TCM determines the appropriate shift schedule and shift points, depending on the present operating conditions and driver demand. This is possible through the control of various direct and indirect outputs.

Some examples of TCM **direct outputs** are:

- Transmission Control Relay
- Solenoids
- Torque Reduction Request

Some examples of TCM **indirect outputs** are:

- Transmission Temperature (to PCM)
- PRNDL Position (to cluster/CCN)

In addition to monitoring inputs and controlling outputs, the TCM has other important responsibilities and functions:

- Storing and maintaining Clutch Volume Indexes (CVI)
- Storing and selecting appropriate Shift Schedules
- System self-diagnostics
- Diagnostic capabilities (with scan tool)

**Note:** If the TCM has been replaced, the “Quick Learn Procedure” must be performed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

## BATTERY FEED

A fused, direct battery feed to the TCM is used for continuous power. This battery voltage is necessary to retain memory in the TCM. When the battery (B+) is disconnected, this memory is lost. When the battery (B+) is restored, this memory loss is detected by the TCM and a Diagnostic Trouble Code (DTC) is set.

## CLUTCH VOLUME INDEXES (CVI)

An important function of the TCM is to monitor Clutch Volume Indexes (CVI). CVIs represent the volume of fluid needed to compress a clutch pack.

The TCM monitors gear ratio changes by monitoring the Input and Output Speed Sensors. The Input, or Turbine Speed Sensor sends an electrical signal to the TCM that represents input shaft rpm. The Output Speed Sensor provides the TCM with output shaft speed information.

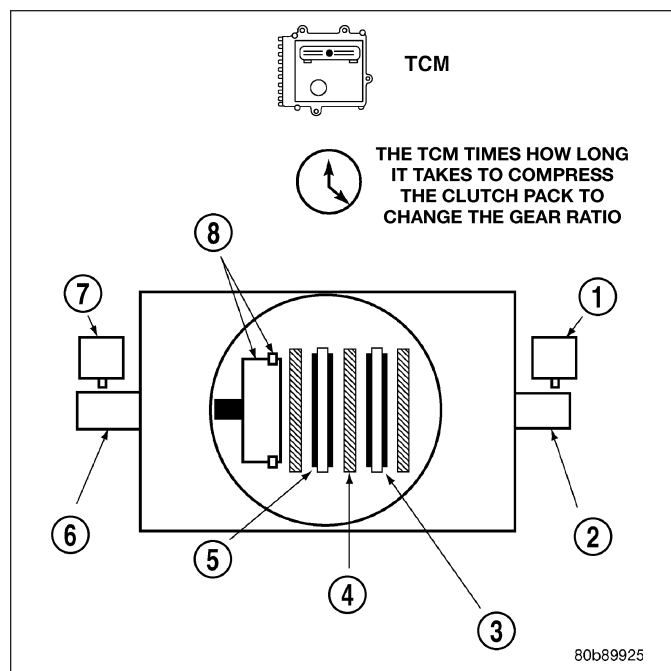
By comparing the two inputs, the TCM can determine transmission gear position. This is important to the CVI calculation because the TCM determines CVIs by monitoring how long it takes for a gear change to occur.

Gear ratios can be determined by using the Scan Tool and reading the Input/Output Speed Sensor values in the "Monitors" display. Gear ratio can be obtained by dividing the Input Speed Sensor value by the Output Speed Sensor value.

For example, if the input shaft is rotating at 1000 rpm and the output shaft is rotating at 500 rpm, then the TCM can determine that the gear ratio is 2:1. In direct drive (3rd gear), the gear ratio changes to 1:1. The gear ratio changes as clutches are applied and released. By monitoring the length of time it takes for the gear ratio to change following a shift request, the TCM can determine the volume of fluid used to apply or release a friction element.

The volume of transmission fluid needed to apply the friction elements are continuously updated for adaptive controls. As friction material wears, the volume of fluid need to apply the element increases.

Certain mechanical problems within the input clutch assembly can cause inadequate or out-of-range element volumes. Also, defective Input/Output Speed Sensors and wiring can cause these conditions. The following chart identifies the appropriate clutch volumes and when they are monitored/updated:



CLUTCH VOLUMES		
Clutch	When Updated	Proper Clutch Volume
L/R	2-1 or 3-1 downshift	45 to 134
2C	3-2 kickdown shift	25 to 85
OD	2-3 upshift	30 to 100
4C	3-4 upshift	30 to 85
UD	4-3 kickdown shift	30 to 100

## SHIFT SCHEDULES

As mentioned earlier, the TCM has programming that allows it to select a variety of shift schedules. Shift schedule selection is dependent on the following:

- Shift lever position
- Throttle position
- Engine load
- Fluid temperature
- Software level

As driving conditions change, the TCM appropriately adjusts the shift schedule. Refer to the following chart to determine the appropriate operation expected, depending on driving conditions.

Schedule	Condition	Expected Operation
<b>Extreme Cold</b>	Oil temperature below -16° F	-Park, Reverse, Neutral and 1st and 3rd gear only in D position, 2nd gear only in Manual 2 or L -No EMCC
<b>Super Cold</b>	Oil temperature between -12° F and 10° F	- Delayed 2-3 upshift - Delayed 3-4 upshift - Early 4-3 coastdown shift - High speed 4-2, 3-2, 2-1 kickdown shifts are prevented -Shifts at high throttle openings will be early. - No EMCC
<b>Cold</b>	Oil temperature between 10° F and 36° F	-Shift schedule is the same as Super Cold except that the 2-3 upshifts are not delayed.
<b>Warm</b>	Oil temperature between 40° F and 80° F	- Normal operation (upshift, kickdowns, and coastdowns) - No EMCC
<b>Hot</b>	Oil temperature between 80° F and 240° F	- Normal operation (upshift, kickdowns, and coastdowns) - Normal EMCC operation
<b>Overheat</b>	Oil temperature above 240° F or engine coolant temperature above 244° F	- Delayed 2-3 upshift - Delayed 3-4 upshift - 3rd gear FEMCC from 30-48 mph - 3rd gear PEMCC above 35 mph - Above 25 mph the torque converter will not unlock unless the throttle is closed or if a wide open throttle 2nd PEMCC to 1 kickdown is made



## TRANSMISSION CONTROL MODULE - NAG1

The transmission control module (TCM) determines the current operating conditions of the vehicle and controls the shifting process for shift comfort and driving situations. It receives this operating data from sensors and broadcast messages from other modules.

The TCM uses inputs from several sensors that are directly hardwired to the controller and it uses several indirect inputs that are used to control shifts. This information is used to actuate the proper solenoids in the valve body to achieve the desired gear.

The shift lever assembly (SLA) has sensors that are monitored by the TCM to calculate shift lever position. The reverse light switch, an integral part of the SLA, controls the reverse light relay control circuit. The Brake/Transmission Shift Interlock (BTSI) solenoid and the park lockout solenoid (also part of the SLA) are controlled by the TCM.

The PCM and ABS broadcast messages over the controller area network (CAN) bus for use by the TCM. The TCM uses this information, with other inputs, to determine the transmission operating conditions.

The TCM:

- determines the momentary operating conditions of the vehicle.
- controls all shift processes.
- considers shift comfort and the driving situation.

The TCM controls the solenoid valves for modulating shift pressures and gear changes. Relative to the torque being transmitted, the required pressures are calculated from load conditions, engine rpm, vehicle speed, and ATF temperature.

The following functions are contained in the TCM:

- Shift Program
- Downshift Safety
- Torque Converter Lock-Up Clutch.
- Adaptation.

The TCM continuously checks for electrical problems, mechanical problems, and some hydraulic problems. When a problem is sensed, the TCM stores a diagnostic trouble code (DTC). Some of these codes cause the transmission to go into "Limp-In" or "default" mode. Some DTCs cause permanent Limp-In and others cause temporary Limp-In. The NAG1 defaults in the current gear position if a DTC is detected, then after a key cycle the transmission will go into Limp-in, which is mechanical 2nd gear. Some DTCs may allow the transmission to resume normal operation (recover) if the detected problem goes away. A permanent Limp-In DTC will recover when the key is cycled, but if the same DTC is detected for three key cycles the system will not recover and the DTC must be cleared from the TCM with the appropriate scan tool.

**Note: If the TCM has been replaced, the "TCM Adaptation Procedure" must be performed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)**

## TCM SIGNALS

The TCM registers one part of the input signals by direct inputs, the other part by CAN bus. In addition to the direct control of the actuators, the TCM sends various output signals by CAN bus to other control modules.

### Selector Lever Position

A series of sensors in the SLA inform the TCM of the position of the selector lever.

The TCM monitors the SLA for all shift lever positions through five position circuits. The SLA provides a low-current 12-volt signal to the TCM. The TCM compares the on/off signals to programmed combinations to determine the exact position of the shift lever.

### ATF Temperature Sensor

The ATF temperature sensor is a positive temperature co-efficient (PTC) thermistor. It measures the temperature of the transmission fluid and is a direct input signal for the TCM. The temperature of the ATF has an influence on the shifttime and resulting shift quality. As the temperature rises, resistance rises, and therefore, the probing voltage is decreasing. Because of its registration, the shifting process can be optimized in all temperature ranges.

The ATF temperature sensor is wired in series with the park/neutral contact. The temperature signal is transmitted to the TCM only when the reed contact of the park/neutral contact is closed because the TCM only reads ATF temperature while in any forward gear, or REVERSE. When the transmission is in PARK or NEUTRAL, the TCM will substitute the engine temperature for the ATF temperature.

### **Starter Interlock**

The TCM monitors a contact switch wired in series with the transmission temperature sensor to determine PARK and NEUTRAL positions. The contact switch is open in PARK and NEUTRAL. The TCM senses transmission temperature as high (switch supply voltage), confirming switch status as open. The TCM then broadcasts a message over CAN bus to confirm switch status. The PCM receives this information and allows operation of the starter circuit.

### **N2 and N3 Speed Sensors**

The N2 and N3 Input Speed Sensors are two Hall-effect speed sensors that are mounted internally in the transmission and are used by the TCM to calculate the transmission's input speed. Since the input speed cannot be measured directly, two of the drive elements are measured. Two input speed sensors were required because both drive elements are not active in all gears.

### **CAN Bus Indirect Input Signals**

A 2.5-volt bias (operating voltage) is present on the CAN bus any time the ignition switch is in the RUN position. Both the TCM and the ABS apply this bias. On this vehicle, the CAN bus is used for module data exchange only. The indirect inputs used on the NAG1 electronic control system are:

- Wheel Speed Sensors.
- Transfer Case Switch Status.
- Brake Switch.
- Engine RPM.
- Engine Temperature.
- Cruise Control Status.
- Gear Limit Request.
- Throttle Position - 0% at idle, 100% at WOT. If open, TCM assumes idle (0% throttle opening).
- Odometer Mileage
- Maximum Effective Torque.
- Engine in Limp-In Mode/Mileage Where DTC Was Set.

### **BRAKE TRANSMISSION SHIFT INTERLOCK (BTSI)**

The BTSI solenoid prevents shifting out of the PARK position until the ignition key is in the RUN position and the brake pedal is pressed. The TCM controls the ground while the ignition switch supplies power to the BTSI solenoid. The PCM monitors the brake switch and broadcasts brake switch status messages over the CAN C bus. If the park brake is depressed and there is power (Run/Start) to SLA, the BTSI solenoid deactivates. The TCM monitors this for the SLA because the SLA does not communicate on the CAN bus.

## SHIFT SCHEDULES

The basic shift schedule includes up and downshifts for all five gears. The TCM adapts the shift program according to driving style, accelerator pedal position and deviation of vehicle speed. Influencing factors are:

- Road Conditions.
- Incline, Decline and Altitude.
- Trailer Operation, Loading.
- Engine Coolant Temperature.
- Cruise Control Operation.
- Sporty Driving Style.
- Low and High ATF Temperature.

<b>Upshift To:</b>	<b>1-2</b>	<b>2-3</b>	<b>3-4</b>	<b>4-5</b>
<b>Activated By Solenoid:</b>	1-2/4-5	2-3	3-4	1-2/4-5
<b>Shift Point (at 35.2% of throttle)</b>	29 km/h (18 mph)	48 km/h (30 mph)	68 km/h (42 mph)	85 km/h (53 mph)

<b>Downshift From:</b>	<b>5-4</b>	<b>4-3</b>	<b>3-2</b>	<b>2-1</b>
<b>Activated By Solenoid:</b>	1-2/4-5	3-4	2-3	1-2/4-5
<b>Shift Point</b>	55.7 km/h (34.61 mph)	40.5 km/h (25.17 mph)	24.4 km/h (15.16 mph)	15.1 km/h (9.38 mph)

## DOWNSHIFT SAFETY

Selector lever downshifts are not performed if inadmissible high engine rpm is sensed.

## ADAPTATION

To equalize tolerances and wear, an automatic adaptation takes place for:

- Shift Time.
- Clutch Filling Time.
- Clutch Filling Pressure.
- Torque Converter Lock-Up Control.

Adaptation data may be stored permanently and to some extent, can be diagnosed.

## Driving Style Adaptation

The shift point is modified in steps based on the information from the inputs. The control module looks at inputs such as:

- vehicle acceleration and deceleration (calculated by the TCM).
- rate of change as well as the position of the throttle pedal (fuel injection information from the PCM).
- lateral acceleration (calculated by the TCM).
- gear change frequency (how often the shift occurs).

Based on how aggressive the driver is, the TCM moves up the shift so that the present gear is held a little longer before the next upshift. If the driving style is still aggressive, the shift point is modified up to ten steps. If the driving returns to normal, then the shift point modification also returns to the base position.

This adaptation has no memory. The adaptation to driving style is nothing more than a shift point modification meant to assist an aggressive driver. The shift points are adjusted for the moment and return to base position as soon as the inputs are controlled in a more normal manner.

## CONTROLLER MODES OF OPERATION

### Permanent Limp-In Mode

When the TCM determines there is a non-recoverable condition present that does not allow proper transmission operation, it places the transmission in permanent Limp-In Mode. When the condition occurs the TCM turns off all solenoids as well as the solenoid supply output circuit. If this occurs while the vehicle is moving, the transmission remains in the current gear position until the ignition is turned off or the shifter is placed in the "P" position. When the shifter has been placed in "P," the transmission only allows 2nd gear operation. If this occurs while the vehicle is not moving, the transmission only allows operation in 2nd gear.

### Temporary Limp-In Mode

This mode is the same as the permanent Limp-In Mode except if the condition is no longer present, the system resumes normal operation.

### Under Voltage Limp-In Mode

When the TCM detects that system voltage has dropped below 8.5 volts, it disables voltage-dependant diagnostics and places the transmission in the temporary Limp-In Mode. When the TCM senses that the voltage has risen above 9.0 volts, normal transmission operation is resumed.

### Hardware Error Mode

When the TCM detects a major internal error, the transmission is placed in the permanent Limp-In Mode and ceases all communication over the CAN bus. When the TCM has entered this mode normal transmission operation does not resume until all DTCs are cleared from the TCM.

### Loss of Drive

If the TCM detects a situation that has resulted or may result in a catastrophic engine or transmission problem, the transmission is placed in the neutral position. Improper Ratio, Input Sensor Overspeed or Engine Overspeed DTCs cause the loss of drive.

### Controlled Limp-in Mode

When a failure does not require the TCM to shut down the solenoid supply, but the failure is severe enough that the TCM places the transmission into a predefined gear, there are several shift performance concerns. For instance, if the transmission is slipping, the controller tries to place the transmission into 3rd gear and maintain 3rd gear for all forward drive conditions.

## STANDARD PROCEDURE

### TCM QUICK LEARN - 42RLE Only

The quick learn procedure requires the use of the appropriate scan tool.

This program allows the electronic transmission system to recalibrate itself. This will provide the proper transmission operation. The quick learn procedure should be performed if any of the following procedures are performed:

- Transmission Assembly Replacement
- Transmission Control Module Replacement
- Solenoid Pack Replacement
- Clutch Plate and/or Seal Replacement
- Valve Body Replacement or Recondition

To perform the Quick Learn Procedure, the following conditions must be met:

- The brakes must be applied
- The engine speed must be above 500 rpm
- The throttle angle (TPS) must be less than 3 degrees
- The shift lever position must stay in PARK until prompted to shift to overdrive

- The shift lever position must stay in overdrive after the Shift to Overdrive prompt until the scan tool indicates the procedure is complete.
- The calculated oil temperature must be above 60° and below 200°

## TCM ADAPTATION - NAG1 Only

The adaptation procedure requires the use of the appropriate scan tool. This program allows the electronic transmission system to re-calibrate itself. This will provide the proper baseline transmission operation. The adaptation procedure should be performed if any of the following procedures are performed:

- Transmission Assembly Replacement
- Transmission Control Module Replacement
- Clutch Plate and/or Seal Replacement
- Electrohydraulic Unit Replacement or Recondition

1. With the scan tool, reset the Transmission adaptives. Resetting the adaptives will set the adaptives to factory settings.

**Note: Perform the Coast Down Adaptations first. The Transmission Temperature must be greater than 60°C (140°F) and less than 70°C (158°F). Failure to stay within these temperature ranges will void the procedure.**

2. Drive the vehicle until the transmission temperature is in the specified range.
3. Perform 4 to 5 coast downs from 5th to 4th gear and then 4th to 3rd gear.

**Note: For Upshift adaptation, the Transmission temperature must be greater than 60°C (140°F) and less than 100°C (212°F). Failure to stay within these temperature ranges will void this procedure.**

4. From a stop, moderately accelerate the vehicle and obtain all forward gear ranges while keeping the Engine RPM below 1800 RPM. Repeat this procedure 4 to 5 times.
5. Obtaining 5th gear may be difficult at 1800 RPM. Allow the transmission to shift into 5th gear at a higher RPM then lower the RPM to 1800 and perform manual shifts between 4th and 5th gears using the shift lever.
6. The TCM will store the adaptives every 10 minutes. After completion of the adaptation procedure make sure the vehicle stays running for at least 10 minutes.
7. It is possible to manually store the adaptives under the 10 minute time frame using the scan tool Store Adaptives procedure.

# ENGINE SYSTEMS

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## BATTERY SYSTEM

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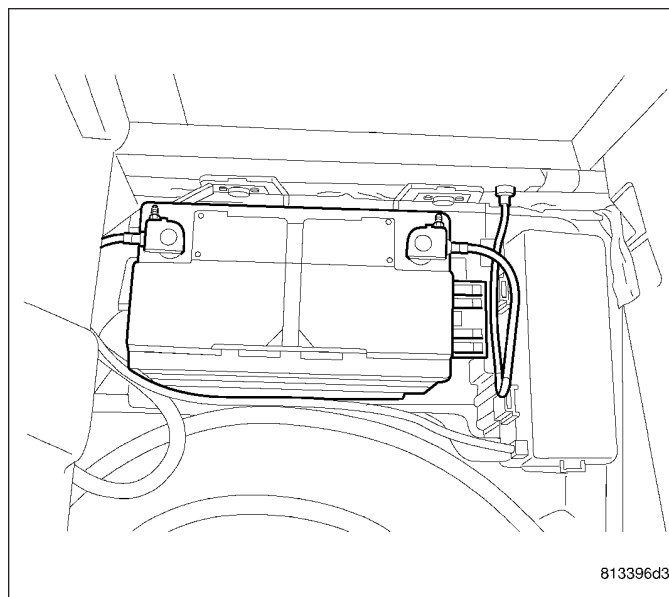
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## BATTERY SYSTEM

### DESCRIPTION

This vehicle is equipped with a single 12-volt battery located in the rear floor area near the spare tire. The battery system for this vehicle covers the following related components:

- **Battery** - The storage battery provides a reliable means of storing a renewable source of electrical energy within the vehicle.
- **Battery Cables** - The battery cables connect the positive and negatively charged battery terminal posts to the vehicle electrical system.
- **Battery Holddown** - The battery holddown hardware secures the battery in the battery tray.
- **Battery Retention Strap** - The battery retention strap securely holds the battery in place in the event of a rear impact collision.
- **Battery Tray** - The battery tray provides a secure mounting location in the vehicle for the battery and an anchor point for the battery hold-down hardware.



For battery system maintenance schedules (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION). (Refer to LUBRICATION & MAINTENANCE/JUMP STARTING - STANDARD PROCEDURE) for the proper jump starting procedure. The battery must be fully-charged before any battery system diagnosis or testing procedures can be performed.

## OPERATION

The battery system is designed to provide a safe, efficient, reliable and mobile means of delivering and storing electrical energy. This electrical energy is required to operate the engine starting system, as well as many of the other vehicle accessory systems for limited durations while the engine and/or the charging system are not operating. The battery system is also designed to provide a reserve of electrical energy to supplement the charging system for short durations while the engine is running and the electrical current demands of the vehicle exceed the output of the charging system. In addition to delivering, and storing electrical energy for the vehicle, the battery system serves as a capacitor and voltage stabilizer for the vehicle electrical system. It absorbs most abnormal or transient voltages caused by the switching of any of the electrical components or circuits in the vehicle.

## DIAGNOSIS AND TESTING

### BATTERY SYSTEM

The battery, starting, and charging systems in the vehicle operate with one another and must be tested as a complete system. In order for the engine to start and the battery to maintain its charge properly, all of the components that are used in these systems must perform within specifications. It is important that the battery, starting, and charging systems be thoroughly tested and inspected any time a battery needs to be charged or replaced. The cause of abnormal battery discharge, overcharging or early battery failure must be diagnosed and corrected before a battery is replaced and before a vehicle is returned to service. The service information for these systems has been separated within this service manual to make it easier to locate the specific information you are seeking. However, when attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used for the battery, starting, and charging systems include the most basic conventional diagnostic methods, to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of an induction-type milliampere ammeter, a volt/ohmmeter, a battery charger, a carbon pile rheostat (load tester) and a 12-volt test lamp may be required. All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any inoperative system it detects. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) for the proper charging system on-board diagnostic test procedures.



## MICRO 420 BATTERY TESTER

The Micro 420 automotive battery system tester is designed to help the dealership technicians diagnose the cause of a defective battery. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE) for directions on using the Micro 420 battery tester.

BATTERY SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
THE BATTERY SEEMS WEAK OR DEAD WHEN ATTEMPTING TO START THE ENGINE.	1. The electrical system ignition-off draw is excessive.	1. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE - IGNITION-OFF DRAW TEST) for the proper test procedures. Repair the excessive ignition-off draw, as required.
	2. The charging system is faulty.	2. Determine if the charging system is performing to specifications. Repair the faulty charging system, as required.
	3. The battery is discharged.	3. Determine the battery state-of-charge using the Micro 420 battery tester, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE). Charge the faulty battery as required.
	4. The battery terminal connections are loose or corroded.	4. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/CABLES - DIAGNOSIS AND TESTING). Clean and tighten the battery terminal connections, as required.
	5. The battery has an incorrect size or rating for this vehicle.	5. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - SPECIFICATIONS) for the proper size and rating. Replace an incorrect battery, as required.
	6. The battery is faulty.	6. Determine the battery cranking capacity using the Micro 420 battery tester, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE). Replace the faulty battery, as required.
	7. The starting system is faulty.	7. Determine if the starting system is performing to specifications. Repair the faulty starting system, as required.
	8. The battery is physically damaged.	8. Inspect the battery for loose terminal posts or a cracked and leaking case. Replace the damaged battery, as required.



BATTERY SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
THE BATTERY STATE OF CHARGE CANNOT BE MAINTAINED.	<ol style="list-style-type: none"> <li>1. The battery has an incorrect size or rating for this vehicle.</li> <li>2. The battery terminal connections are loose or corroded.</li> <li>3. The electrical system ignition-off draw is excessive.</li> <li>4. The battery is faulty.</li> <li>5. The starting system is faulty.</li> <li>6. The charging system is faulty.</li> <li>7. Electrical loads exceed the output of the charging system.</li> <li>8. Slow driving or prolonged idling with high-amperage draw systems in use.</li> </ol>	<ol style="list-style-type: none"> <li>1. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - SPECIFICATIONS) for the proper size and rating. Replace an incorrect battery, as required.</li> <li>2. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/CABLES - DIAGNOSIS AND TESTING). Clean and tighten the battery terminal connections, as required.</li> <li>3. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE) for the proper test procedures. Repair the faulty electrical system, as required.</li> <li>4. Test the battery using the Micro 420 battery tester,(Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE). Replace the faulty battery, as required.</li> <li>5. Determine if the starting system is performing to specifications. Repair the faulty starting system, as required.</li> <li>6. Determine if the charging system is performing to specifications. Repair the faulty charging system, as required.</li> <li>7. Inspect the vehicle for aftermarket electrical equipment which might cause excessive electrical loads.</li> <li>8. Advise the vehicle operator, as required.</li> </ol>
THE BATTERY WILL NOT ACCEPT A CHARGE.	<ol style="list-style-type: none"> <li>1. The battery is faulty.</li> </ol>	<ol style="list-style-type: none"> <li>1. Test the battery using the Micro 420 battery tester,(Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE). Replace the faulty battery, as required.</li> </ol>

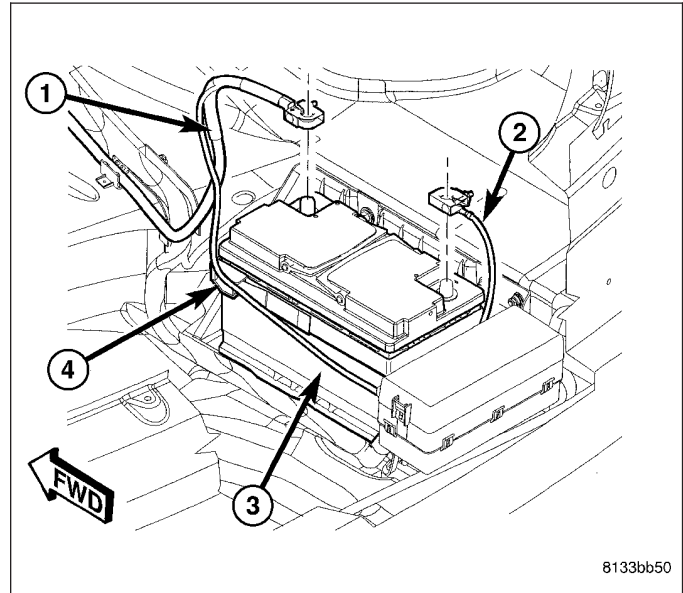
## STANDARD PROCEDURE

### BATTERY RECONNECTION

**Note:** This reconnection procedure is to be performed anytime the battery has been disconnected.

1. Connect the battery negative cable (2) to the battery post and tighten the clamp nut.
2. Install the rear compartment floor trim panel.

**CAUTION:** Once the battery has been connected, review and perform the following information as applicable.



### AUTO UP FRONT WINDOW

If the vehicle is equipped with the auto-up front window feature, once the battery is reconnected the door module needs to be calibrated. The door module requires calibration anytime the battery or door module has been disconnected for any length of time. To calibrate, perform the following:

1. Connect the battery cables.
2. Using the window switch, raise the window to the full UP position. Hold the switch in position for 1 second, then drive the window all the way down to the bottom.

### ELECTRONIC STABILITY PROGRAM (ESP)

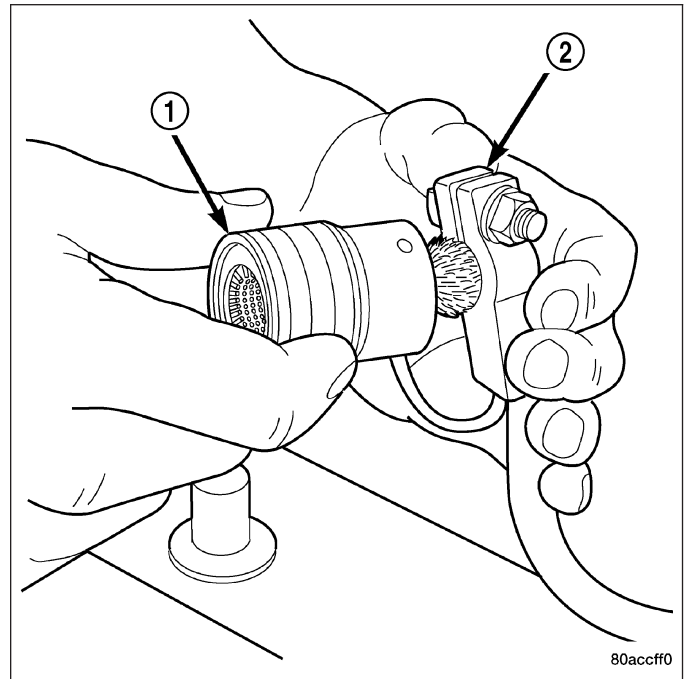
If the vehicle is equipped with ESP, once the battery is reconnected, the Steering Angle Sensor (SAS) needs to be calibrated. The SAS requires calibration anytime the battery or an ABS (ESP) component has been disconnected for any length of time. To calibrate, perform the following:

1. Start the engine.
2. Center the steering wheel.
3. Turn the steering wheel all the way to the left until the internal stop in the steering gear is met, then turn the wheel all the way to the right until the opposite internal stop in the steering gear is met.
4. Center the steering wheel.
5. Stop the engine.

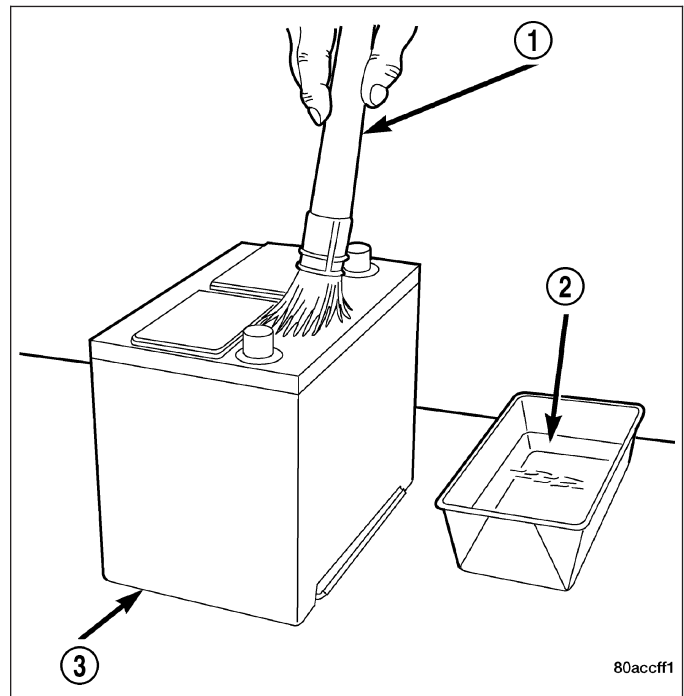
### CLEANING

The following information details the recommended cleaning procedures for the battery and related components. In addition to the maintenance schedules found in this service manual, (Refer to LUBRICATION & MAINTENANCE/ MAINTENANCE SCHEDULES - DESCRIPTION) it is recommended that these procedures be performed any time the battery or related components must be removed for vehicle service.

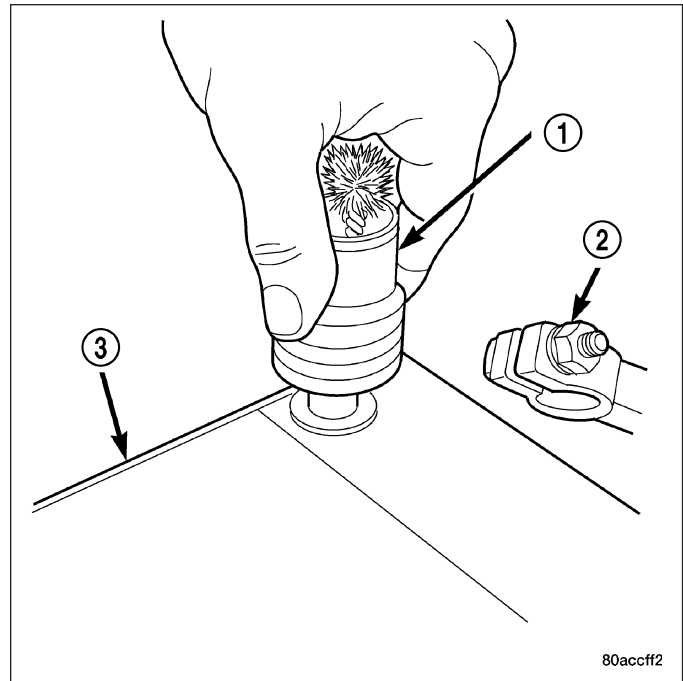
1. Clean the battery cable terminal clamps (2) of all corrosion. Remove any corrosion using a wire brush or cleaning tool (1), and a sodium bicarbonate (baking soda) and warm water cleaning solution.



2. Clean the battery tray and battery holddown hardware using a stiff bristle parts cleaning brush and a sodium bicarbonate (baking soda) and warm water cleaning solution.
3. If the removed battery is to be reinstalled, clean the outside of the battery case and the top cover (3) with a sodium bicarbonate (baking soda) and warm water cleaning solution (2) using a stiff bristle parts cleaning brush (1) to remove any acid film. Rinse the battery with clean water. Ensure that the cleaning solution does not enter the battery cells through the vent holes. If the battery is being replaced, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - SPECIFICATIONS) for the factory-installed battery specifications. Confirm that the replacement battery is the correct size and has the correct ratings for the vehicle.



4. Clean any corrosion from the battery terminals with a wire brush or terminal cleaner (1), and a sodium bicarbonate (baking soda) and warm water cleaning solution.



## INSPECTION

The following information details the recommended inspection procedures for the battery and related components. In addition to the maintenance schedules, (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION), it is recommended that these procedures be performed any time the battery or related components are removed for vehicle service.

1. Inspect the battery cable terminals for damage. Replace any battery cable that has a damaged or deformed terminal.
2. Inspect the battery tray and battery holddown hardware for damage. Replace any damaged parts.
3. Inspect the battery case for cracks or other damage that could result in electrolyte leaks. Also, check the battery terminals for looseness. Batteries with damaged cases or loose terminals must be replaced.
4. Inspect the battery built-in test indicator sight glass (if equipped) for an indication of the battery condition. If the battery is discharged, charge as required, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE - BATTERY CHARGING).

## SPECIFICATIONS

### BATTERY

The battery Group Size number, the Cold Cranking Amperage (CCA) rating, and the Reserve Capacity (RC) rating or Ampere-Hours (AH) rating can be found on the original equipment battery label. Be certain that a replacement battery has the correct Group Size number, as well as CCA, and RC or AH ratings that equal or exceed the original equipment specification for the vehicle being serviced. Battery sizes and ratings are discussed in more detail below.

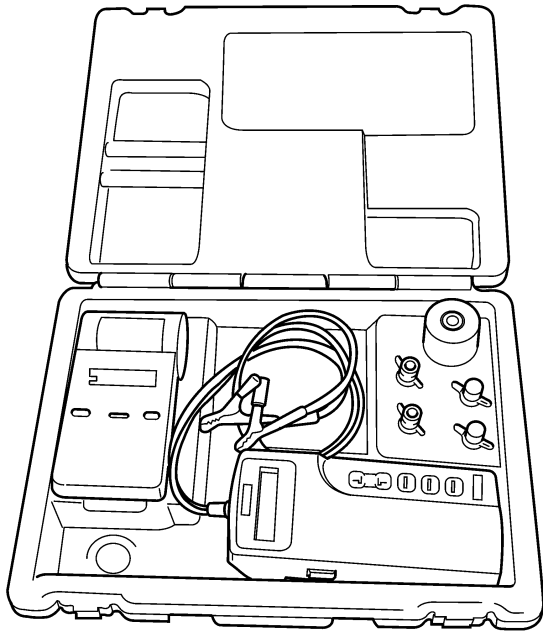
- **Group Size** - The outside dimensions and terminal placement of the battery conform to standards established by the Battery Council International (BCI). Each battery is assigned a BCI Group Size number to help identify a correctly-sized replacement.
- **Cold Cranking Amperage** - The Cold Cranking Amperage (CCA) rating specifies how much current (in amperes) the battery can deliver for thirty seconds at -18° C (0° F). Terminal voltage must not fall below 7.2 volts during or after the thirty second discharge period. The CCA required is generally higher as engine displacement increases, depending also upon the starter current draw requirements.
- **Reserve Capacity** - The Reserve Capacity (RC) rating specifies the time (in minutes) it takes for battery terminal voltage to fall below 10.5 volts, at a discharge rate of 25 amperes. RC is determined with the battery fully-charged at 26.7° C (80° F). This rating estimates how long the battery might last after a charging system failure, under minimum electrical load.

- **Ampere-Hours** - The Ampere-Hours (AH) rating specifies the current (in amperes) that a battery can deliver steadily for twenty hours, with the voltage in the battery not falling below 10.5 volts. This rating is also sometimes identified as the twenty-hour discharge rating.

BATTERY CLASSIFICATIONS & RATINGS					
Part Number	BCI Group Size Classification	Cold Cranking Amperage	Reserve Capacity	Ampere - Hours	Load Test Amperage
04608719AB	H7	730	140 Minutes	72	250

## SPECIAL TOOLS

### BATTERY SYSTEM SPECIAL TOOLS



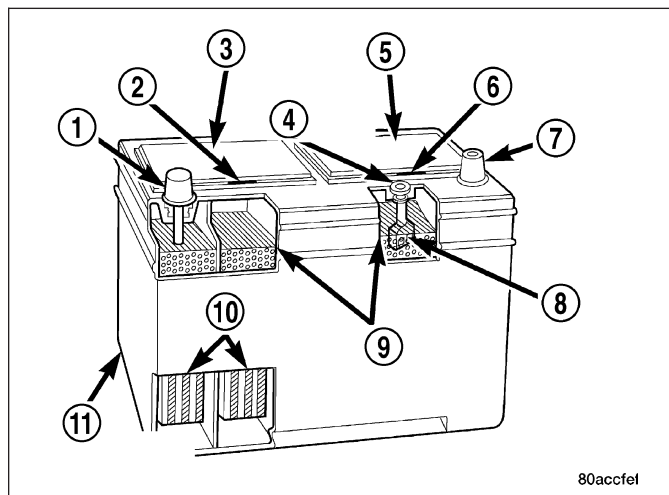
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## BATTERY

### DESCRIPTION

This vehicle is equipped with a single, 12-volt, maintenance-free battery located in the rear floor area near the spare tire. The battery is comprised of the following components:

- Positive Post (1)
- Vent (2)
- Cell Cap (3)
- Vent (4)
- Cell Cap (5)
- Vent (6)
- Negative Post (7)
- Indicator Eye (8) if equipped
- Electrolyte Level (9)
- Plate Groups (10)
- Maintenance Free Battery assembly (11)



This battery is designed to provide a safe, efficient and reliable means of storing electrical energy in a chemical form. This means of energy storage allows the battery to produce the electrical energy required to operate the engine starting system, as well as to operate many of the other vehicle accessory systems for limited durations while the engine and/or the charging system are not operating. The battery is made up of six individual cells that are connected in series. Each cell contains positively charged plate groups that are connected with lead straps to the positive terminal post, and negatively charged plate groups that are connected with lead straps to the negative terminal post. Each plate consists of a stiff mesh framework or grid coated with lead dioxide (positive plate) or sponge lead (negative plate). Insulators or plate separators made of a non-conductive material are inserted between the positive and negative plates to prevent them from contacting or shorting against one another. These dissimilar metal plates are submerged in a sulfuric acid and water solution called an electrolyte.

The battery Group Size number, the Cold Cranking Amperage (CCA) rating, and the Reserve Capacity (RC) rating or Ampere-Hours (AH) rating can be found on the original equipment battery label. Be certain that a replacement battery has the correct Group Size number, as well as CCA, and RC or AH ratings that equal or exceed the original equipment specification for the vehicle being serviced. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - SPECIFICATIONS) for the proper factory-installed battery specifications.

### OPERATION

The battery is designed to store electrical energy in a chemical form. When an electrical load is applied to the terminals of the battery, an electrochemical reaction occurs. This reaction causes the battery to discharge electrical current from its terminals. As the battery discharges, a gradual chemical change takes place within each cell. The sulfuric acid in the electrolyte combines with the plate materials, causing both plates to slowly change to lead sulfate. At the same time, oxygen from the positive plate material combines with hydrogen from the sulfuric acid, causing the electrolyte to become mainly water. The chemical changes within the battery are caused by the movement of excess or free electrons between the positive and negative plate groups. This movement of electrons produces a flow of electrical current through the load device attached to the battery terminals.

As the plate materials become more similar chemically, and the electrolyte becomes less acid, the voltage potential of each cell is reduced. However, by charging the battery with a voltage higher than that of the battery itself, the battery discharging process is reversed. Charging the battery gradually changes the sulfated lead plates back into sponge lead and lead dioxide, and the water back into sulfuric acid. This action restores the difference in the electron charges deposited on the plates, and the voltage potential of the battery cells. For a battery to remain useful, it must be able to produce high-amperage current over an extended period. A battery must also be able to accept a charge, so that its voltage potential may be restored.

The battery is vented to release excess hydrogen gas that is created when the battery is being charged or discharged. However, even with these vents, hydrogen gas can collect in or around the battery. If hydrogen gas is exposed to flame or sparks, it may ignite. If the electrolyte level is low, the battery may arc internally and explode. If the battery cell caps cannot be removed, the battery must be replaced if the electrolyte level becomes low.

## DIAGNOSIS AND TESTING

### BATTERY

The battery must be completely charged and the terminals should be properly cleaned and inspected before diagnostic procedures are performed. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - CLEANING) and (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - INSPECTION) for the proper battery cleaning and inspection procedures. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE - BATTERY CHARGING) for the proper battery charging procedures.

### MICRO 420 BATTERY TESTER

The Micro 420 automotive battery tester is designed to help the dealership technicians diagnose the cause of an inoperative battery. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE - USING MICRO 420 BATTERY TESTER) for instructions on the use of the Micro 420 battery tester.

**WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING OR LOOSE POSTS, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.**

**WARNING: EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.**

**WARNING: THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.**

A battery that will not accept a charge is inoperative, and must be replaced. Further testing is not required. A fully-charged battery must be load tested to determine its cranking capacity. A battery that is fully-charged, but does not pass the load test, is inoperative and must be replaced.

**Note: Completely discharged batteries may take several hours to accept a charge. Refer to Standard Procedures for the proper battery charging procedures.**

## STANDARD PROCEDURE

### BATTERY CHARGING

Battery charging is the means by which the battery can be restored to its full voltage potential. A battery is fully-charged when:

- Micro 420 electrical system tester indicates battery is OK.
- All of the battery cells are gassing freely during battery charging.
- Open-circuit voltage of the battery is 12.4 volts or above.

**WARNING: NEVER EXCEED TWENTY AMPERES WHEN CHARGING A COLD (-1° C [30° F] OR LOWER) BATTERY. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.**

**WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING, LOOSE POSTS, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.**

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**WARNING: IF THE BATTERY IS EQUIPPED WITH REMOVABLE CELL CAPS, BE CERTAIN THAT EACH OF THE CELL CAPS IS IN PLACE AND TIGHT BEFORE THE BATTERY IS RETURNED TO SERVICE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT FROM LOOSE OR MISSING CELL CAPS.**

**CAUTION: Always disconnect and isolate the battery negative cable before charging a battery. Do not exceed sixteen volts while charging a battery. Damage to the vehicle electrical system components may result.**

**CAUTION: Battery electrolyte will bubble inside the battery case during normal battery charging. Electrolyte boiling or being discharged from the battery vents indicates a battery overcharging condition. Immediately reduce the charging rate or turn off the charger to evaluate the battery condition. Damage to the battery may result from overcharging.**

**CAUTION: The battery should not be hot to the touch. If the battery feels hot to the touch, turn off the charger and let the battery cool before continuing the charging operation. Damage to the battery may result.**

After the battery has been charged to 12.4 volts or greater, perform a load test to determine the battery cranking capacity, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE - USING MICRO 420 BATTERY TESTER) for the proper battery load test procedures. If the battery will endure a load test, return the battery to service. If the battery will not endure a load test, it is inoperative and must be replaced.

Clean and inspect the battery hold downs, tray, terminals, posts, and top before completing battery service. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - CLEANING) and (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - INSPECTION) for the proper battery system cleaning and inspection procedures.

**CHARGING A COMPLETELY DISCHARGED BATTERY**

The following procedure should be used to recharge a completely discharged battery. Unless this procedure is properly followed, a good battery may be needlessly replaced.

1. Measure the voltage at the battery posts with a voltmeter, accurate to 1/10 (0.10) volt. If the reading is below ten volts, the battery charging current will be low. It could take some time before the battery accepts a current greater than a few milliamperes. Such low current may not be detectable on the ammeters built into many battery chargers.
2. Disconnect and isolate the battery negative cable. Connect the battery charger leads. Some battery chargers are equipped with polarity-sensing circuitry. This circuitry protects the battery charger and the battery from being damaged if they are improperly connected. If the battery state-of-charge is too low for the polarity-sensing circuitry to detect, the battery charger will not operate. This makes it appear that the battery will not accept charging current. See the instructions provided by the manufacturer of the battery charger for details on how to bypass the polarity-sensing circuitry.
3. Battery chargers vary in the amount of voltage and current they provide. The amount of time required for a battery to accept measurable charging current at various voltages is shown in the Charge Rate Table. If the charging current is still not measurable at the end of the charging time, the battery is inoperative and must be replaced. If the charging current is measurable during the charging time, the battery may be good and the charging should be completed in the normal manner.

CHARGE RATE TABLE	
Voltage	Hours
16.0 volts maximum	up to 4 hours
14.0 to 15.9 volts	up to 8 hours
13.9 volts or less	up to 16 hours

## CHARGING TIME REQUIRED

The time required to charge a battery will vary, depending upon the following factors:

- **Battery Capacity** - A completely discharged heavy-duty battery requires twice the charging time of a small capacity battery.
- **Temperature** - A longer time will be needed to charge a battery at -18° C (0° F) than at 27° C (80° F). When a fast battery charger is connected to a cold battery, the current accepted by the battery will be very low at first. As the battery warms, it will accept a higher charging current rate (amperage).
- **Charger Capacity** - A battery charger that supplies only five amperes will require a longer charging time. A battery charger that supplies twenty amperes or more will require a shorter charging time.
- **State-Of-Charge** - A completely discharged battery requires more charging time than a partially discharged battery. Electrolyte is nearly pure water in a completely discharged battery. At first, the charging current (amperage) will be low. As the battery charges, the specific gravity of the electrolyte will gradually rise.

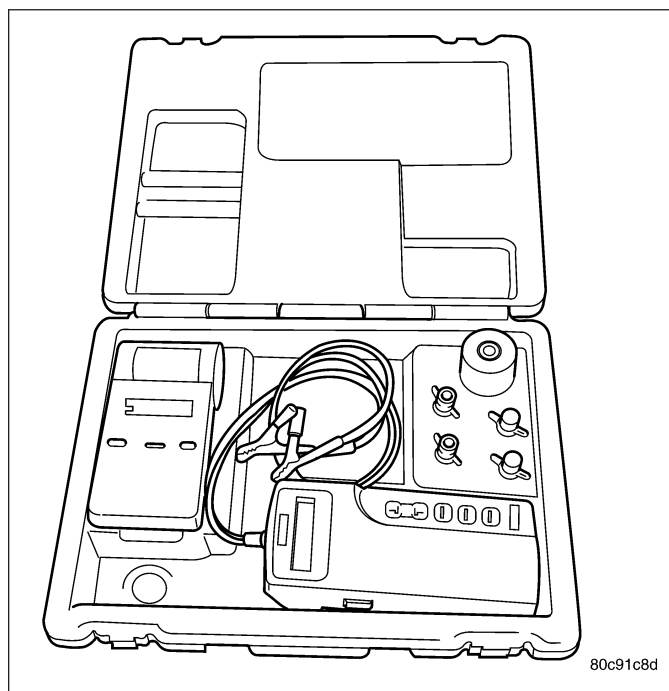
The Battery Charging Time Table gives an indication of the time required to charge a typical battery at room temperature based upon the battery state-of-charge and the charger capacity.

BATTERY CHARGING TIME TABLE			
Charging Amperage	5 Amps	10 Amps	20 Amps
Open Circuit Voltage	Hours Charging @ 21° C (70° F)		
12.25 to 12.49	6 hours	3 hours	1.5 hours
12.00 to 12.24	10 hours	5 hours	2.5 hours
10.00 to 11.99	14 hours	7 hours	3.5 hours
Below 10.00	18 hours	9 hours	4.5 hours

## USING MICRO 420 BATTERY TESTER

Always use the Micro 420 Instruction Manual that was supplied with the tester as a reference. If the Instruction Manual is not available the following procedure can be used:

**WARNING: ALWAYS WEAR APPROPRIATE EYE PROTECTION AND USE EXTREME CAUTION WHEN WORKING WITH BATTERIES.**



BATTERY TESTING

1. If testing the battery OUT-OF-VEHICLE, clean the battery terminals with a wire brush before testing, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - CLEANING).
2. If testing the battery IN-THE-VEHICLE, make certain all of the vehicle accessory loads are OFF, including the ignition. **The preferred test position is at the battery terminals.** If the battery is not accessible, you may test using both the positive and negative jumper posts. Select TESTING AT JUMPER POST when connecting to that location.
3. Connect the tester to the battery or jumper posts, the red clamp to positive (+) and the black clamp to negative (-).

**Note: Multiple batteries connected in parallel must have the ground cable disconnected to perform a battery test. Failure to disconnect may result in false battery test readings.**

4. Using the ARROW key select **in** or **out** of vehicle testing and press ENTER to make a selection.
5. If not selected, choose the Cold Cranking Amp (CCA) battery rating. Or select the appropriate battery rating for your area (see menu). The tester will then run its self programmed test of the battery and display the results. Refer to the test result table noted below.

**CAUTION: If REPLACE BATTERY is the result of the test, this may mean a poor connection between the vehicle's cables and battery exists. After disconnecting the vehicle's battery cables from the battery, retest the battery using the OUT-OF-VEHICLE test before replacing.**

6. While viewing the battery test result, press the CODE button and the tester will prompt you for the last 4 digits of the VIN. Use the UP/DOWN arrow buttons to scroll to the correct character; then press ENTER to select and move to the next digit. Then press the ENTER button to view the SERVICE CODE. Pressing the CODE button a second time will return you to the test results.

BATTERY TEST RESULTS	
GOOD BATTERY	Return to service
GOOD - RECHARGE	Fully charge battery and return to service
CHARGE & RETEST	Fully charge battery and retest battery
REPLACE BATTERY	Replace the battery and retest complete system
BAD-CELL REPLACE	Replace the battery and retest complete system

**Note: The SERVICE CODE is required on every warranty claim submitted for battery replacement.**

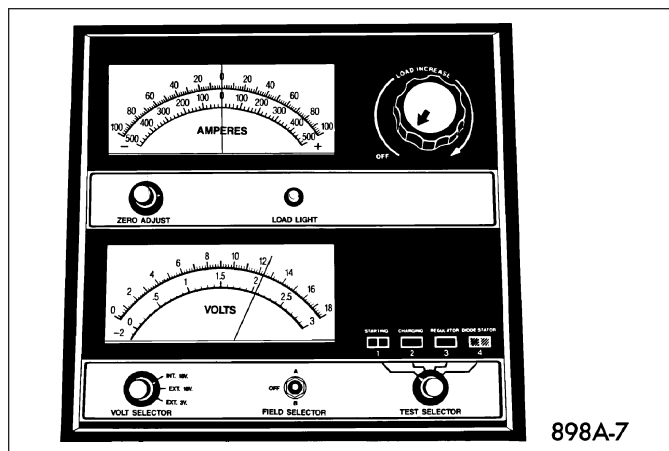
OPEN-CIRCUIT VOLTAGE TEST

A battery open-circuit voltage (no load) test will show the approximate state-of-charge of a battery. This test can be used in place of the hydrometer test when a hydrometer is not available, or for maintenance-free batteries with non-removable cell caps.

Before proceeding with this test, completely charge the battery, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/ BATTERY - STANDARD PROCEDURE - BATTERY CHARGING).

1. Before measuring the open-circuit voltage, the surface charge must be removed from the battery. Turn on the headlamps for fifteen seconds, then allow up to five minutes for the battery voltage to stabilize.
2. Disconnect and isolate both battery cables, negative cable first.

3. Using a voltmeter connected to the battery posts, measure the open-circuit voltage.



See the Open-Circuit Voltage Table. This voltage reading will indicate the battery state-of-charge, but will not reveal its cranking capacity. If a battery has an open-circuit voltage reading of 12.4 volts or greater, it may be load tested to reveal its cranking capacity, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE - USING MICRO 420 BATTERY TESTER).

OPEN CIRCUIT VOLTAGE TABLE	
Open Circuit Voltage	Charge Percentage
11.7 volts or less	0%
12.0 volts	25%
12.2 volts	50%
12.4 volts	75%
12.6 volts or more	100%

## IGNITION-OFF DRAW TEST

The term Ignition-Off Draw (IOD) identifies a normal condition where power is being drained from the battery with the ignition switch in the Off position. A normal vehicle electrical system will draw from five to thirty-five milliamperes (0.005 to 0.035 ampere) with the ignition switch in the Off position, and all non-ignition controlled circuits in proper working order. Up to thirty-five milliamperes are needed to enable the memory functions for the Powertrain Control Module (PCM), digital clock, electronically tuned radio, and other modules which may vary with the vehicle equipment.

A vehicle that has not been operated for approximately twenty days, may discharge the battery to an inadequate level. When a vehicle will not be used for twenty days or more (stored), remove the IOD fuse from the Junction Block (JB). This will reduce battery discharging.

Excessive IOD can be caused by:

- Electrical items left on.
- Inoperative or improperly adjusted switches.
- Inoperative or shorted electronic modules and components.
- An internally shorted generator.
- Intermittent shorts in the wiring.

If the IOD is over thirty-five milliamperes, the problem must be found and corrected before replacing a battery. In most cases, the battery can be charged and returned to service after the excessive IOD condition has been corrected.

1. Verify that all electrical accessories are off. Turn off all lamps, remove the ignition key, and close all doors. If the vehicle is equipped with an illuminated entry system or an electronically tuned radio, allow the electronic timer function of these systems to automatically shut off (time out). This may take up to three minutes. See the Electronic Module Ignition-Off Draw Table for more information.

ELECTRONIC MODULE IGNITION-OFF DRAW (IOD) TABLE			
Module	Time Out? (If Yes, Interval And Wake-Up Input)	IOD	IOD After Time Out
Radio	No	1 to 3 milliamperes	N/A
Audio Power Amplifier	No	up to 1 milliamperes	N/A
Central Timer Module (CTM)	No	4.75 milliamperes (max.)	N/A
Powertrain Control Module (PCM)	No	0.95 milliamperes	N/A
ElectroMechanical Instrument Cluster (EMIC)	No	0.44 milliamperes	N/A
Combination Flasher	No	0.08 milliamperes	N/A

- Determine that the underhood lamp is operating properly, then disconnect the lamp wire harness connector or remove the lamp bulb.
- Disconnect the battery negative cable.
- Set an electronic digital multi-meter to its highest amperage scale. Connect the multi-meter between the disconnected battery negative cable terminal clamp and the battery negative terminal post. Make sure that the doors remain closed so that the illuminated entry system is not activated. The multi-meter amperage reading may remain high for up to three minutes, or may not give any reading at all while set in the highest amperage scale, depending upon the electrical equipment in the vehicle. The multi-meter leads must be securely clamped to the battery negative cable terminal clamp and the battery negative terminal post. If continuity between the battery negative terminal post and the negative cable terminal clamp is lost during any part of the IOD test, the electronic timer function will be activated and all of the tests will have to be repeated.
- After about three minutes, the high-amperage IOD reading on the multi-meter should become very low or non-existent, depending upon the electrical equipment in the vehicle. If the amperage reading remains high, remove and replace each fuse or circuit breaker in the Power Distribution Center (PDC) and then in the Junction Block (JB), one at a time until the amperage reading becomes very low, or nonexistent. Refer to the appropriate wiring information for complete PDC and JB fuse, circuit breaker, and circuit identification. This will isolate each circuit and identify the circuit that is the source of the high-amperage IOD. If the amperage reading remains high after removing and replacing each fuse and circuit breaker, disconnect the wire harness from the generator. If the amperage reading now becomes very low or nonexistent, diagnose and repair the Charging System as necessary. After the high-amperage IOD has been corrected, switch the multi-meter to progressively lower amperage scales and, if necessary, repeat the fuse and circuit breaker remove-and-replace process to identify and correct all sources of excessive IOD. It is now safe to select the lowest milliamperes scale of the multi-meter to check the low-amperage IOD.

**CAUTION:** Do not open any doors, or turn on any electrical accessories with the lowest milliamperes scale selected, or the multi-meter may be damaged.

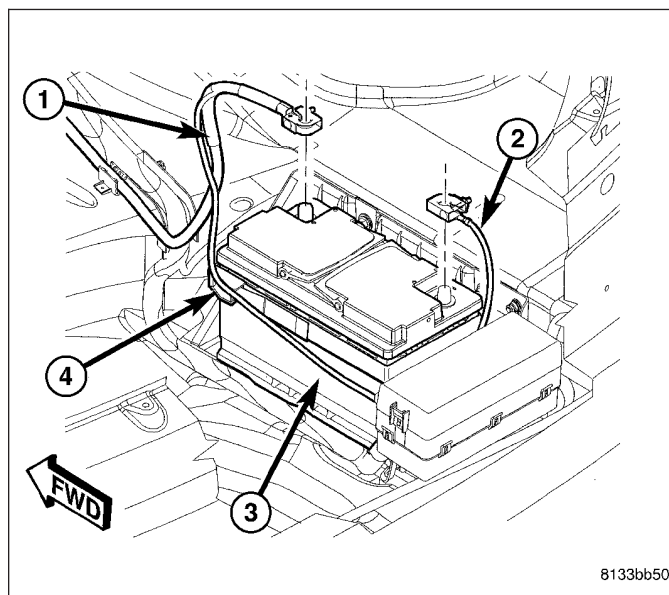
- Observe the multi-meter reading. The low-amperage IOD should not exceed thirty-five milliamperes (0.035 ampere). If the current draw exceeds thirty-five milliamperes, isolate each circuit using the fuse and circuit breaker remove-and-replace process in Step 5. The multi-meter reading will drop to within the acceptable limit when the source of the excessive current draw is disconnected. Repair this circuit as required; whether a wiring short, incorrect switch adjustment, or an inoperative component is the cause.

## REMOVAL

**WARNING:** A SUITABLE PAIR OF HEAVY DUTY RUBBER GLOVES AND SAFETY GLASSES SHOULD BE WORN WHEN REMOVING OR SERVICING A BATTERY.

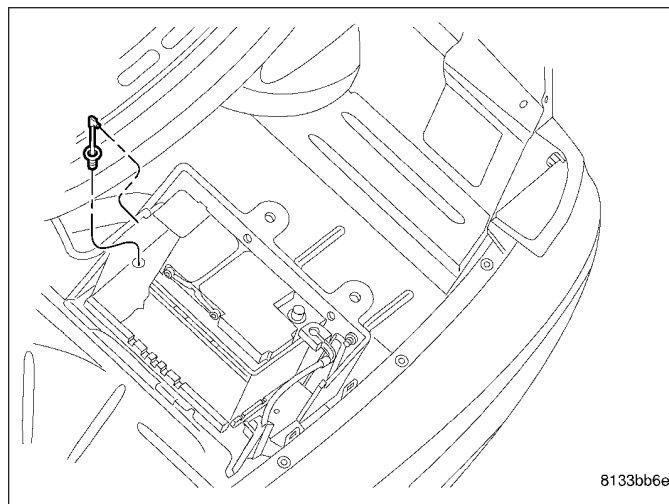
**WARNING: REMOVE METALLIC JEWELRY TO AVOID INJURY BY ACCIDENTAL ARCING OF BATTERY CURRENT.**

1. Make sure ignition switch is in OFF position and all accessories are turned OFF.
2. Remove the rear compartment floor, trim panel to gain access to the battery.
3. Disconnect the battery negative cable (2) from the battery terminal.
4. Disconnect the battery positive cable (1) from the battery terminal.
5. Unlatch the battery retention strap (4).

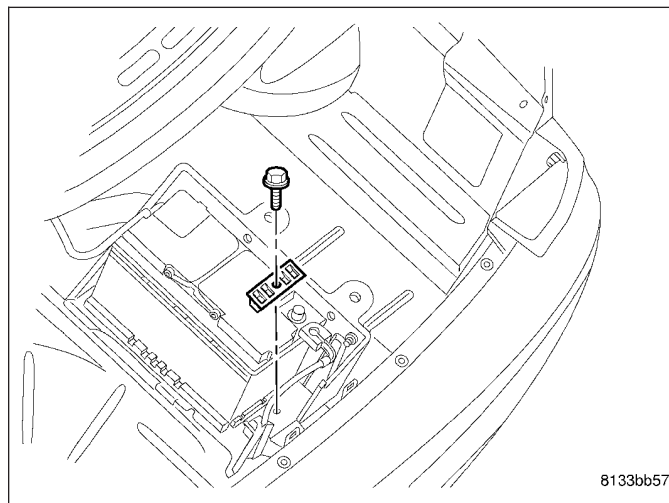


**CAUTION: Use care when disconnecting the battery vent tube from the battery. The vent tube nipple is made of plastic and is easily damaged if not disconnected properly.**

6. Gently disconnect the battery vent tube from the battery nipple.



7. Remove the battery hold down clamp and remove the battery from the vehicle.



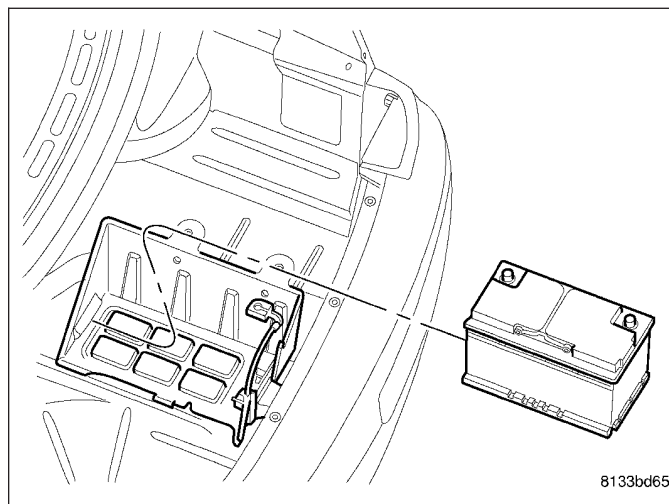


## INSTALLATION

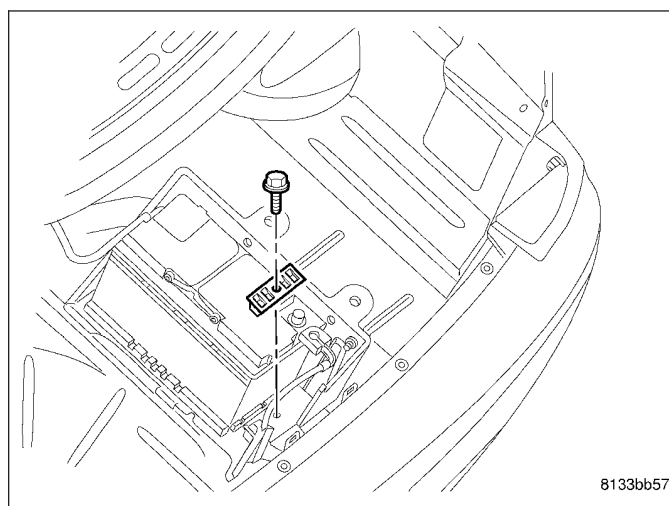
**WARNING: A SUITABLE PAIR OF HEAVY DUTY RUBBER GLOVES AND SAFETY GLASSES SHOULD BE WORN WHEN REMOVING OR SERVICING A BATTERY.**

**WARNING: REMOVE METALLIC JEWELRY TO AVOID INJURY BY ACCIDENTAL ARCING OF BATTERY CURRENT.**

1. Position the battery in the battery tray.

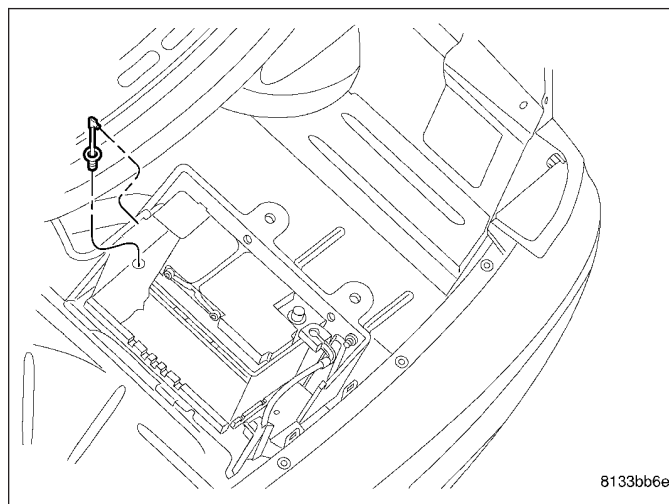


2. Install the battery hold down clamp and bolt.  
Torque the bolt to 4 N·m (35 in. lbs.).

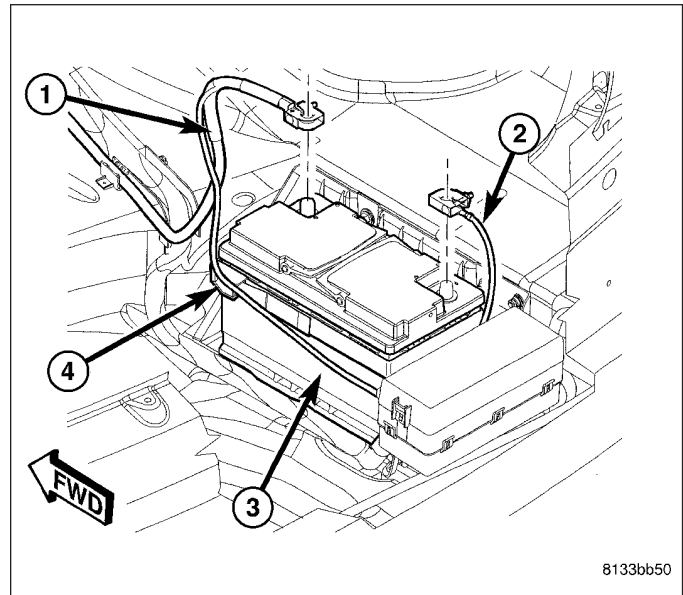


**CAUTION: Use care when connecting the battery vent tube to the battery. The vent tube nipple is made of plastic and is easily damaged if not connected properly.**

3. Gently connect the battery vent tube to the battery nipple.



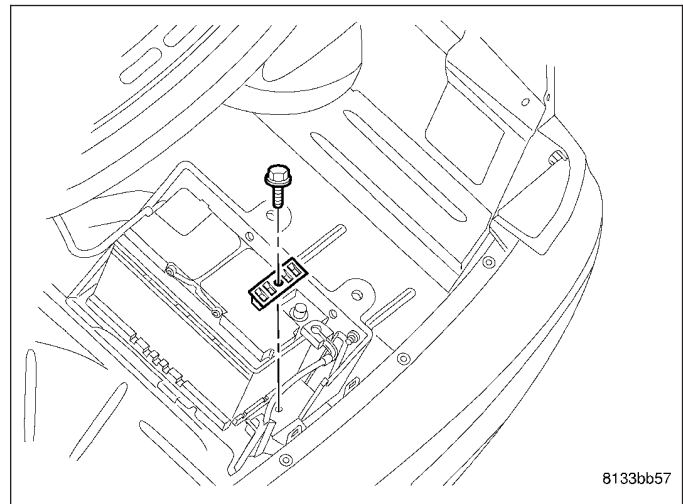
4. Latch the battery retention strap (4).
5. Connect the battery positive cable (1).
6. Connect the battery negative cable (2).
7. Install the rear compartment floor trim panel.



## BATTERY HOLDDOWN

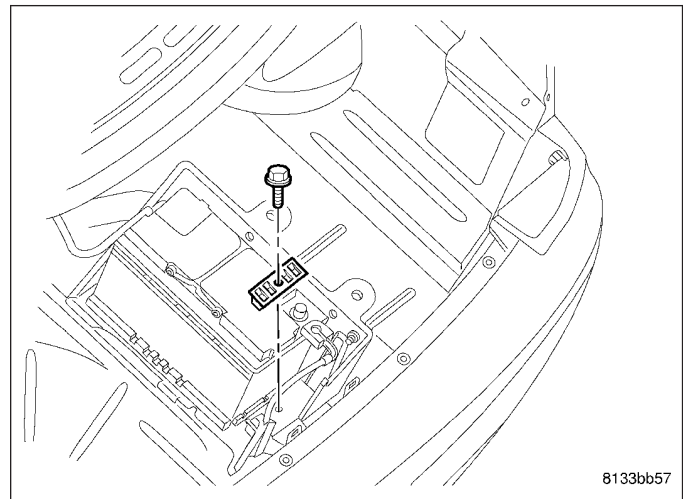
### REMOVAL

1. Verify that the ignition switch and all accessories are OFF.
2. Remove the rear compartment floor, trim panel to gain access to the battery.
3. Disconnect and isolate the battery negative cable.
4. Remove the bolt from the battery hold down and remove the hold down.



### INSTALLATION

1. Install the battery hold down clamp and bolt. Torque the bolt to 4 N·m (35 in. lbs.).
2. Connect the battery negative cable.
3. Install the rear compartment floor trim panel.

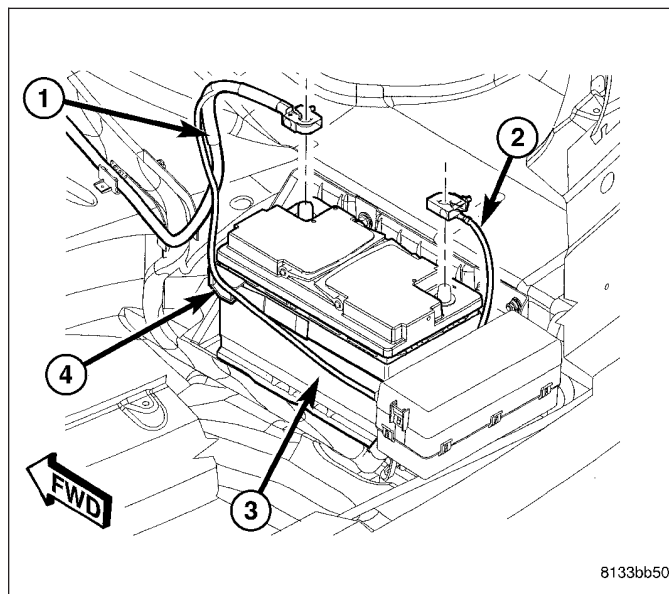




## BATTERY CABLES

### DESCRIPTION

The battery cables (1) and (2) are large gauge, stranded copper wires sheathed within a heavy plastic or synthetic rubber insulating jacket. The wire used in the battery cables combines excellent flexibility and reliability with high electrical current carrying capacity. The battery cables feature a stamped brass clamping type female battery terminal crimped onto one end of the battery cable wire and then solder-dipped. A square headed pinch-bolt and hex nut are installed at the open end of the female battery terminal clamp. Large eyelet type terminals are crimped onto the opposite end of the battery cable wire and then solder-dipped. The battery positive cable wires (1) have a red insulating jacket to provide visual identification and feature a larger female battery terminal clamp to allow connection to the larger battery positive terminal post. The battery negative cable wires (2) have a black insulating jacket and a smaller female battery terminal clamp.



The battery cables cannot be repaired and, if damaged or faulty they must be replaced. Both the battery positive and negative cables are available for service replacement only as a unit with the battery wire harness, which may include portions of the wiring circuits for the generator and other components on some models. Refer to the appropriate wiring information for the location of the proper battery cable wire harness diagrams. The wiring information also includes proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

### OPERATION

The battery cables connect the battery terminal posts to the vehicle electrical system. These cables also provide a path back to the battery for electrical current generated by the charging system for restoring the voltage potential of the battery. The female battery terminal clamps on the ends of the battery cable wires provide a strong and reliable connection of the battery cable to the battery terminal posts. The terminal pinch bolts allow the female terminal clamps to be tightened around the male terminal posts on the top of the battery. The eyelet terminals secured to the opposite ends of the battery cable wires from the female battery terminal clamps provide secure and reliable connection of the battery cables to the vehicle electrical system.

## DIAGNOSIS AND TESTING

### BATTERY CABLES

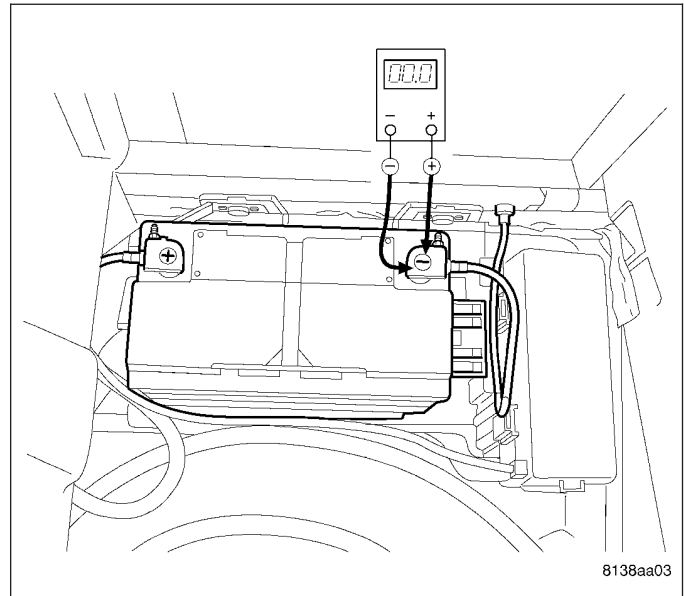
A voltage drop test will determine if there is excessive resistance in the battery cable terminal connections or the battery cable. If excessive resistance is found in the battery cable connections, the connection point should be disassembled, cleaned of all corrosion or foreign material, then reassembled. Following reassembly, check the voltage drop for the battery cable connection and the battery cable again to confirm repair.

When performing the voltage drop test, it is important to remember that the voltage drop is giving an indication of the resistance between the two points at which the voltmeter probes are attached. **EXAMPLE:** When testing the resistance of the battery positive cable, touch the voltmeter leads to the battery positive cable terminal clamp and to the battery positive cable eyelet terminal at the starter solenoid B(+) terminal stud. If you probe the battery positive terminal post and the battery positive cable eyelet terminal at the starter solenoid B(+) terminal stud, you are reading the combined voltage drop in the battery positive cable terminal clamp-to-terminal post connection and the battery positive cable.

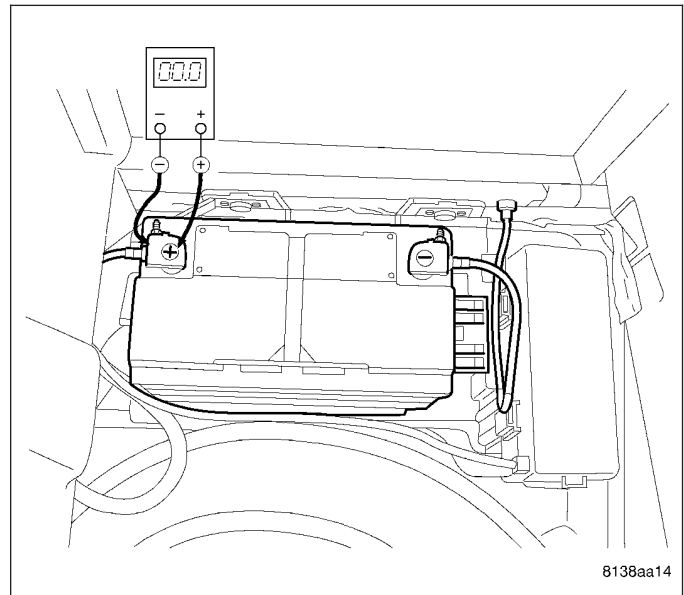
### VOLTAGE DROP TEST

The following operation will require a voltmeter accurate to 1/10 (0.10) volt. Before performing this test, be certain that the following procedures are accomplished:

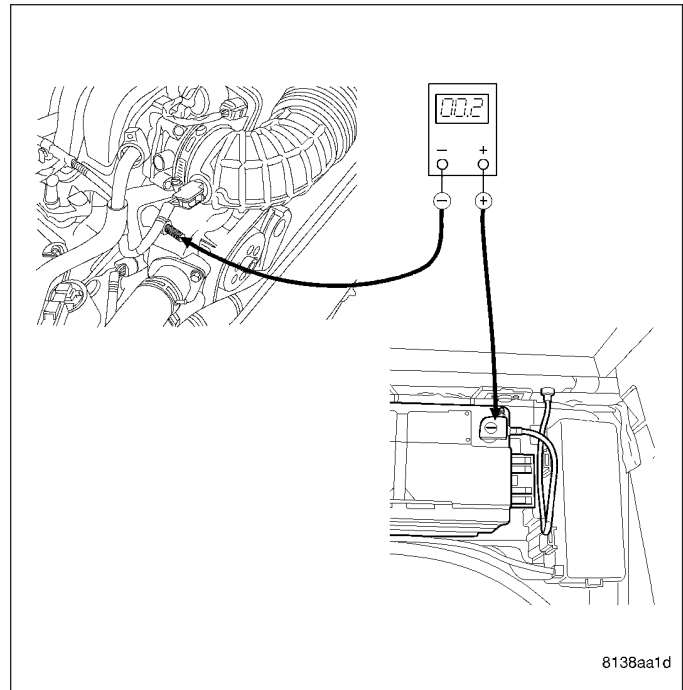
- The battery is fully-charged, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE - BATTERY CHARGING) for the proper battery charging procedure.
  - The battery has successfully passed a load test, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE - USING MICRO 420 BATTERY TESTER) for the proper load test procedure.
  - Fully engage the parking brake.
  - If the vehicle is equipped with an automatic transmission, place the gearshift selector lever in the Park position. If the vehicle is equipped with a manual transmission, place the gearshift selector lever in the Neutral position and block the clutch pedal in the fully depressed position.
  - Verify that all lamps and accessories are turned off.
  - To prevent the engine from starting, remove the Automatic Shut Down (ASD) relay. The ASD relay is located in the Power Distribution Center (PDC), in the engine compartment. See the fuse and relay layout label affixed to the underside of the PDC cover for ASD relay identification and location.
1. Remove the spare tire cover to gain access to the battery. Connect the positive lead of the voltmeter to the battery negative terminal post. Connect the negative lead of the voltmeter to the battery negative cable terminal clamp. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor connection between the battery negative cable terminal clamp and the battery negative terminal post.



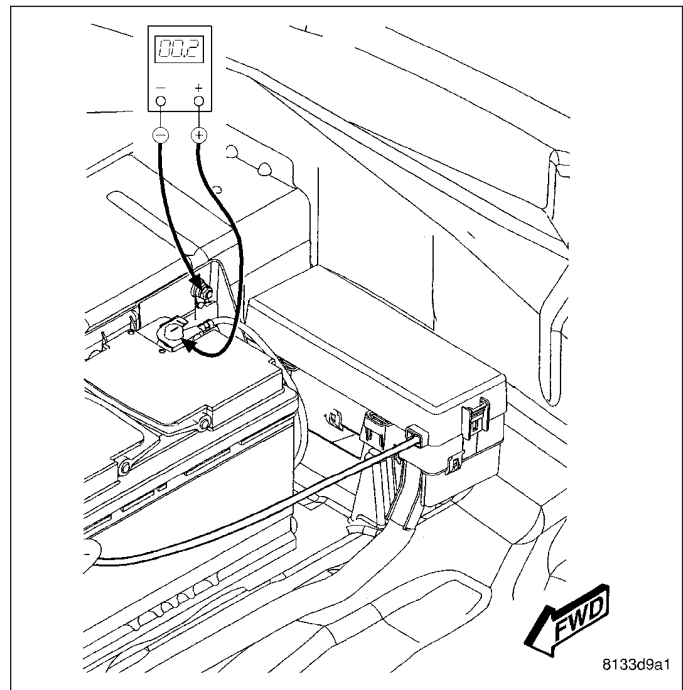
2. Connect the positive lead of the voltmeter to the battery positive terminal post. Connect the negative lead of the voltmeter to the battery positive cable terminal clamp. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor connection between the battery positive cable terminal clamp and the battery positive terminal post.



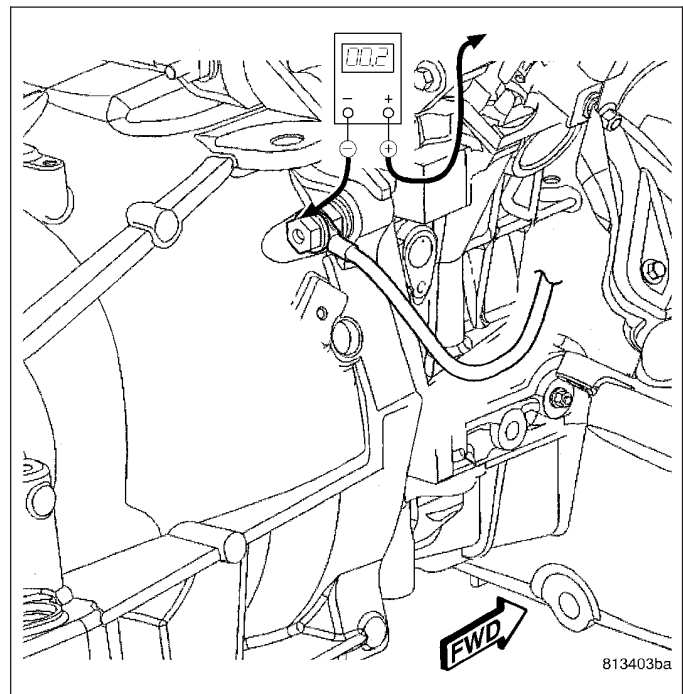
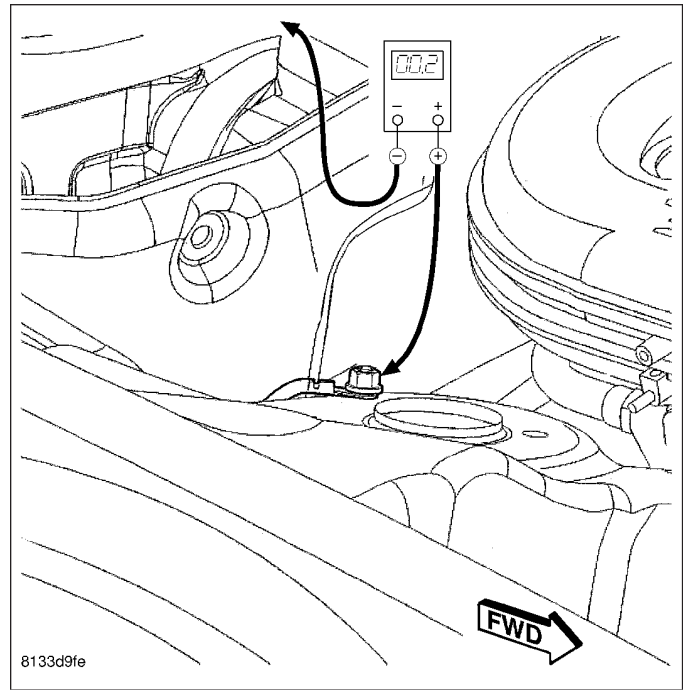
3. Using a suitable jumper wire, connect the voltmeter to measure between the battery negative cable terminal clamp and a good clean ground on the engine block. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery negative cable eyelet terminal connection at the transmission housing. Repeat the test. If the reading is still above 0.2 volt, perform Step 4 and Step 5.



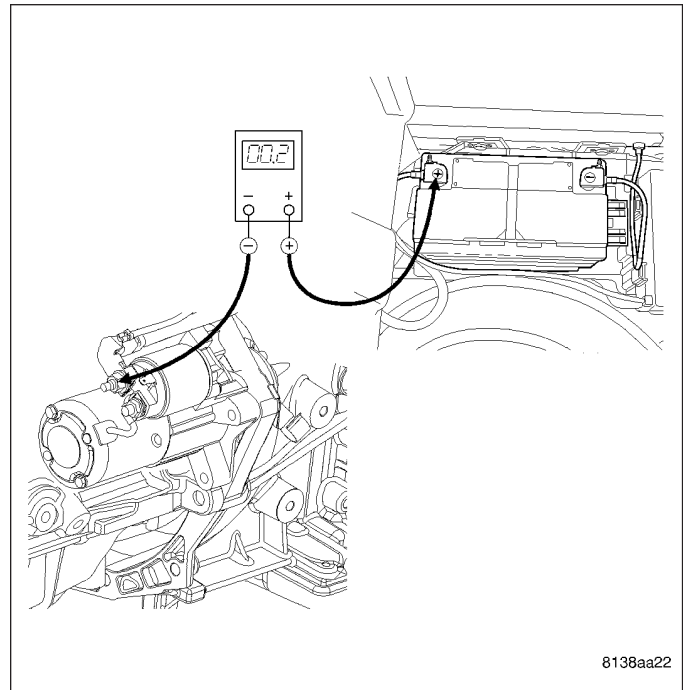
4. Connect the voltmeter to measure between the battery negative cable terminal clamp and the battery negative cable eyelet terminal connection at the vehicle body. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery negative cable eyelet terminal connection at the vehicle body. Repeat the test. If the reading is still above 0.2 volt, replace the battery rear negative cable, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/CABLES - REMOVAL).



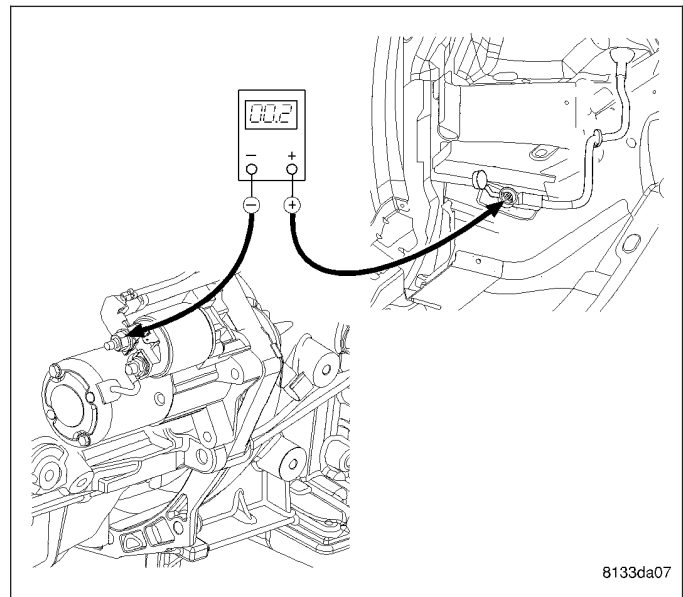
5. Connect the voltmeter to measure between the battery negative cable eyelet terminal connection at the right front strut tower and the battery negative cable eyelet terminal connection at the transmission housing. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery negative cable eyelet terminal connection at the right front strut tower. Repeat the test. If the reading is still above 0.2 volt, replace the battery front negative cable, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/CABLES - REMOVAL).



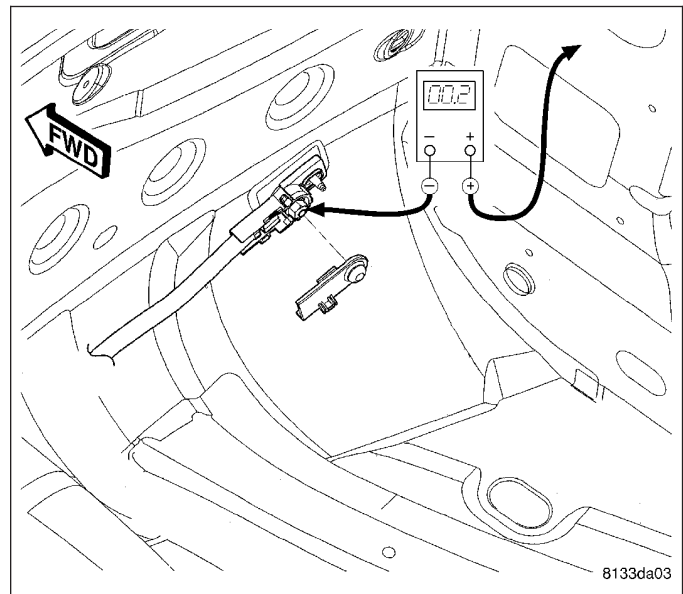
6. Using a suitable jumper wire, connect the voltmeter to measure between the battery positive cable terminal clamp and the starter solenoid B(+) terminal stud. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery positive cable eyelet terminal connection at the starter solenoid B(+) terminal stud. Repeat the test. If the reading is still above 0.2 volt, perform Step 7 and Step 8.



7. Remove the right front wheelhouse splash shield to gain access to the battery positive cable bulkhead outside terminal, (Refer to 23 - BODY/EXTERIOR/RF WHEELHOUSE SPLASH SHIELD - REMOVAL). Connect the voltmeter to measure between the battery positive cable bulkhead outside terminal and the starter solenoid B(+) terminal stud. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery positive cable bulkhead outside terminal connection. Repeat the test. If the reading is still above 0.2 volt, replace the battery front positive cable, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/CABLES - REMOVAL).



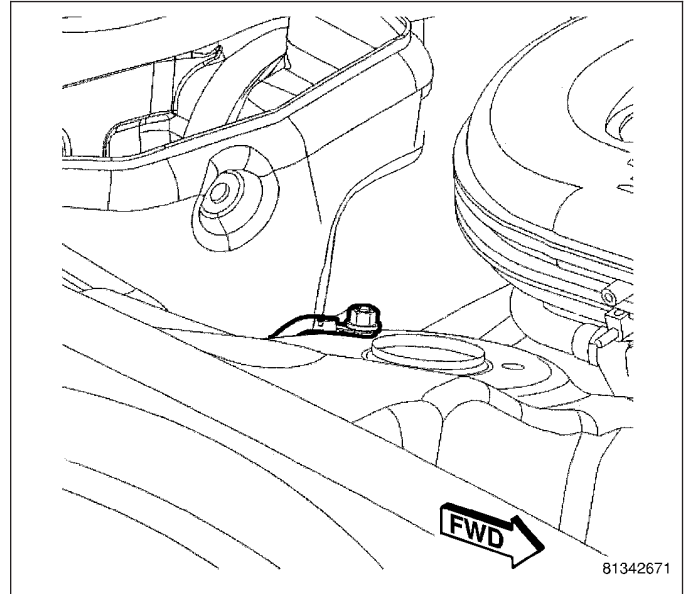
8. Remove the right front carpet to gain access to the battery positive cable bulkhead inside terminal. Connect the voltmeter to measure between the battery positive cable terminal clamp and the battery positive cable bulkhead inside terminal connection. Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery positive cable bulkhead inside terminal connection. Repeat the test. If the reading is still above 0.2 volt, replace the battery rear positive cable, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/CABLES - REMOVAL).



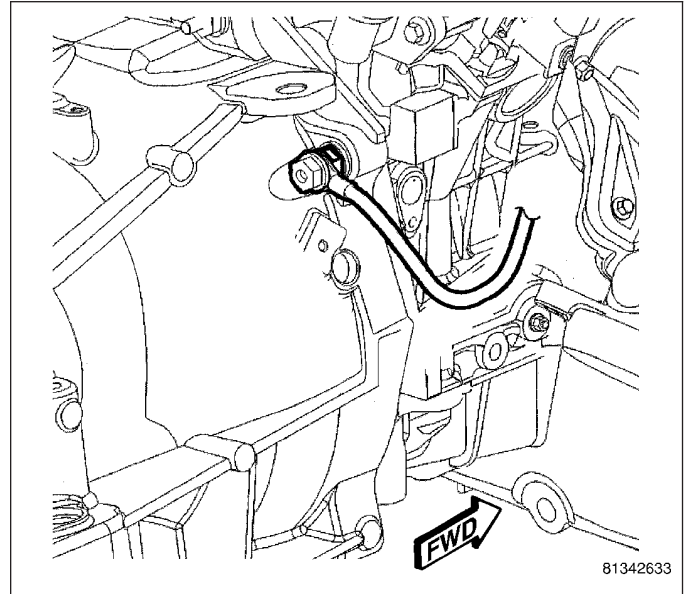
## REMOVAL

### NEGATIVE - ENGINE COMPARTMENT

1. Turn the ignition switch to the Off position. Be certain that all electrical accessories are turned off.
2. Remove the spare tire cover to gain access to the battery.
3. Disconnect and isolate the battery negative cable.
4. Remove the fastener securing the battery negative cable to the right front strut tower.



5. Raise vehicle on hoist, (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).
6. Remove the fastener securing the battery negative cable to the transmission housing.

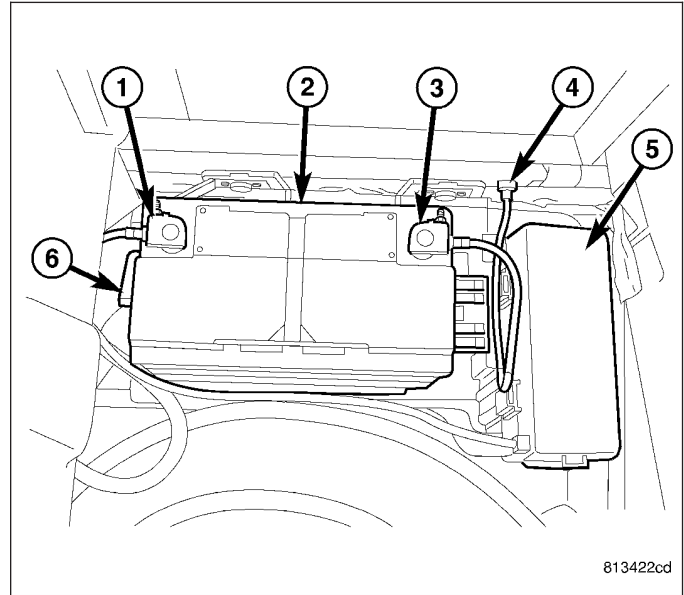


7. One at a time, remove the battery cable retaining pushpins, fasteners and routing clips until the cable is free from the vehicle.
8. Remove the battery cable from the engine compartment.

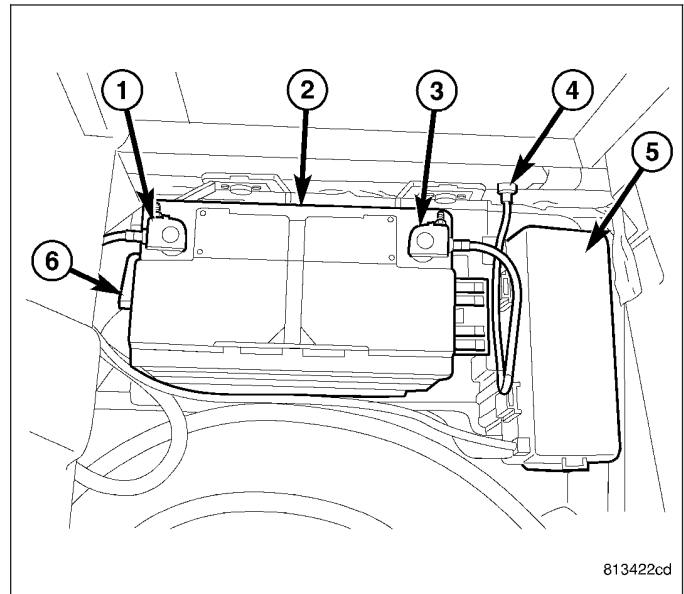


**NEGATIVE - REAR COMPARTMENT**

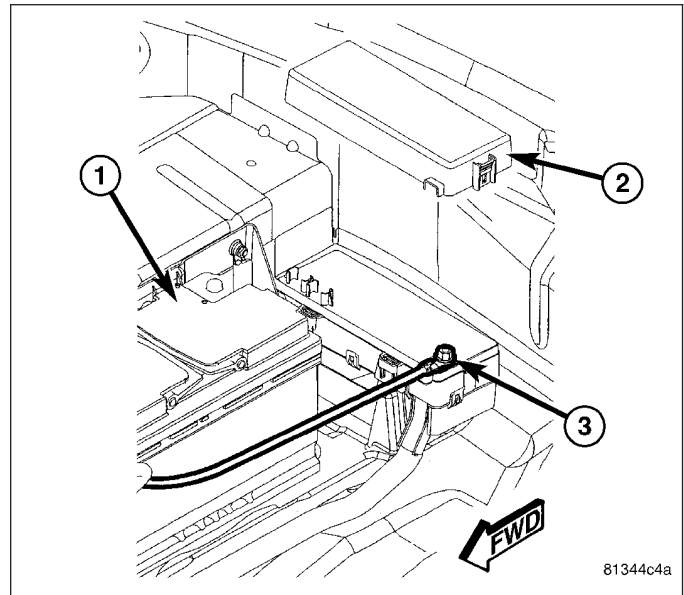
1. Turn the ignition switch to the Off position. Be certain that all electrical accessories are turned off.
2. Remove the spare tire cover to gain access to the battery.
3. Disconnect and isolate the battery negative cable (3).
4. Remove the fastener (4) securing the battery negative cable to the body.
5. Remove the cable from the vehicle.

**POSITIVE - BATTERY TO BULKHEAD**

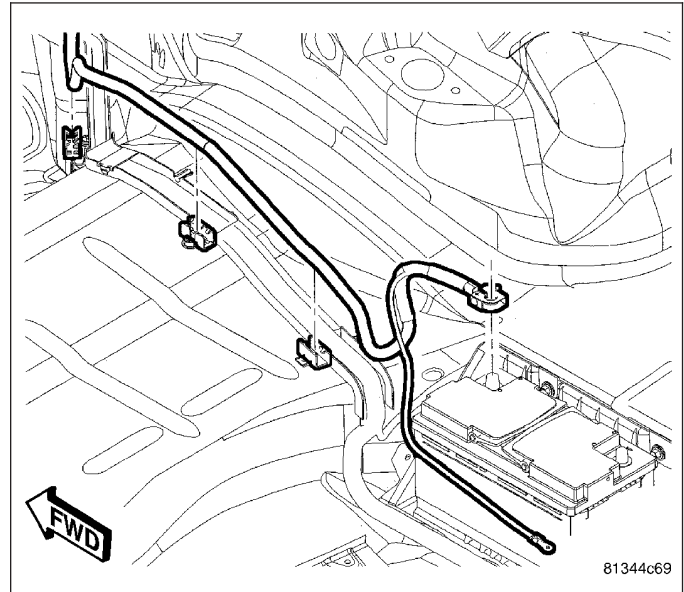
1. Turn the ignition switch to the Off position. Be certain that all electrical accessories are turned off.
2. Remove the spare tire cover to gain access to the battery.
3. Disconnect and isolate the battery negative cable (3).
4. Disconnect the battery positive cable (1).



5. Remove the Power Distribution Center (PDC) cover (2).
6. Remove the battery positive cable to rear PDC fastener (3).



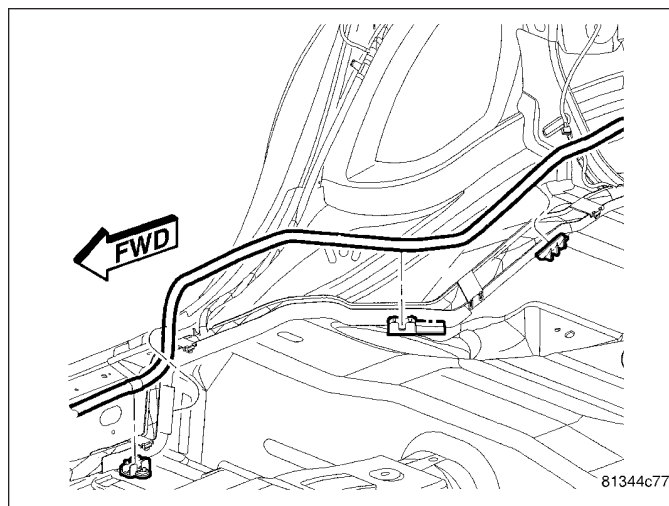
7. One at a time, free the battery positive cable from the routing clips located in the rear compartment area.



8. Remove the right, front seat, (Refer to 23 - BODY/SEATS/SEAT - REMOVAL).
9. Remove the right, rear seat cushion. Pull upward at forward edge of each retainer loop of the rear seat cushion to disengage retainer loops from cups in floor.
10. Remove the right, front and rear door sill trim panels.
11. Remove the right, B - pillar lower trim panel, (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - REMOVAL).
12. position carpet aside to gain access to the battery positive cable.

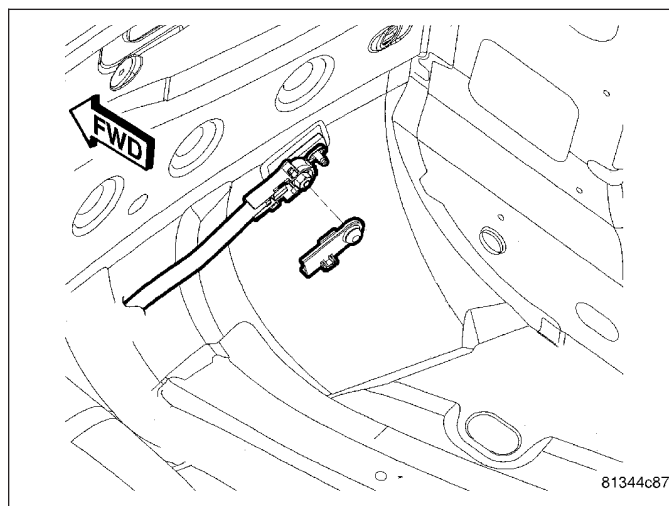


13. One at a time, free the battery positive cable from the routing clips located in the rear seat area.

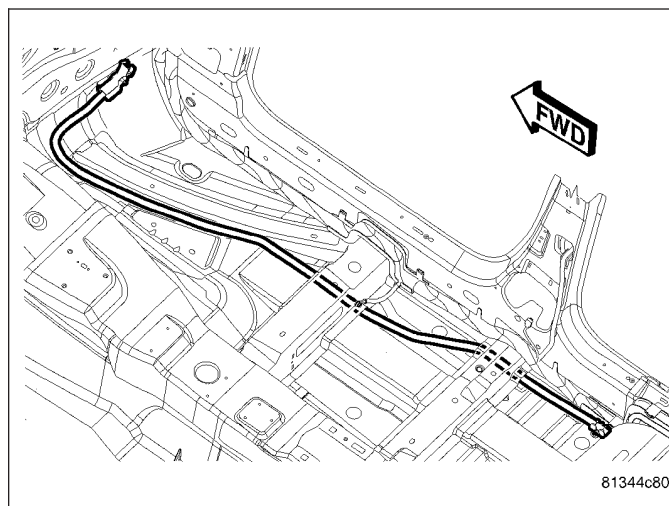


14. Position the bulkhead insulator aside to gain access to the battery positive cable bulkhead fastener.

15. Remove the battery positive cable to bulkhead fastener.

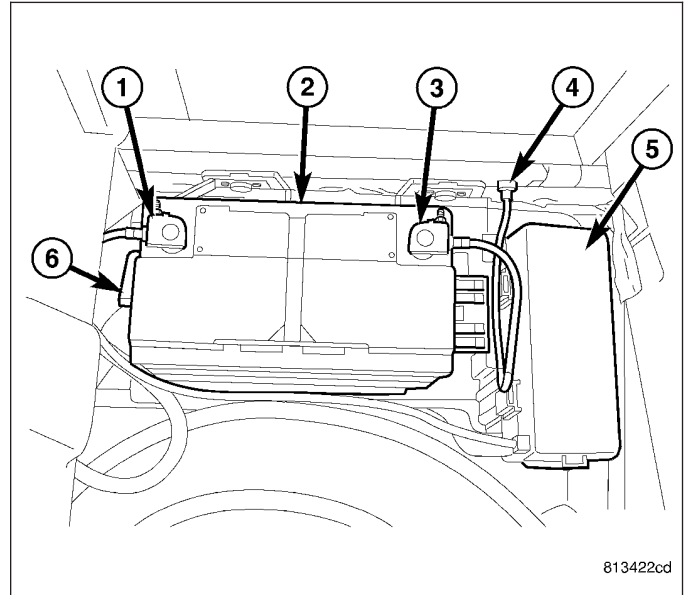


16. Remove the battery positive cable from the vehicle making note of the cable routing under the floor cross members.

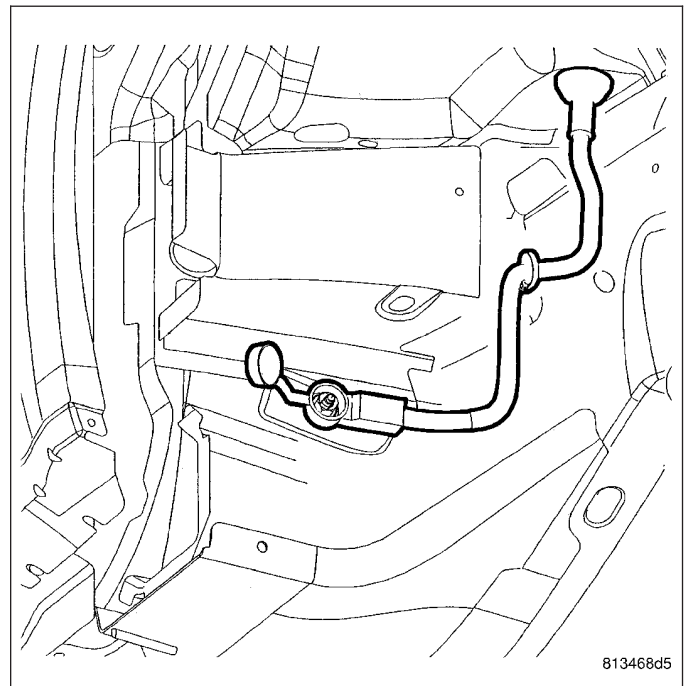


**POSITIVE - ENGINE COMPARTMENT**

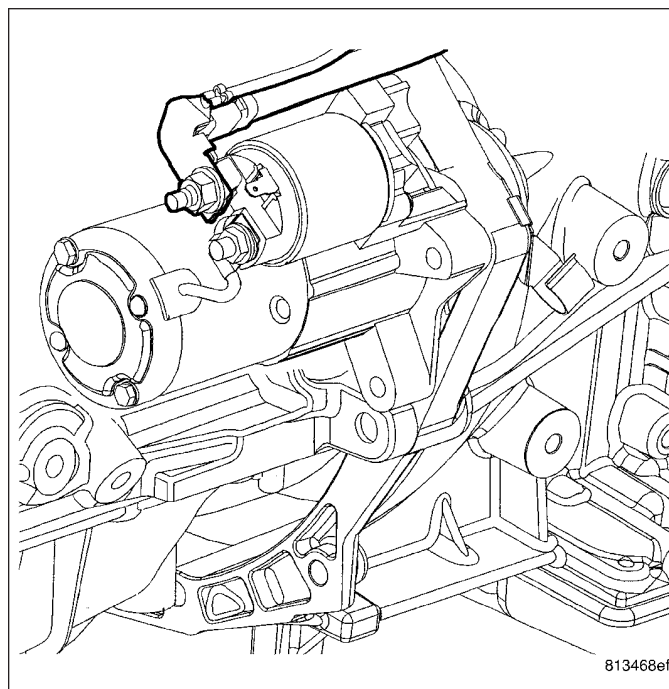
1. Turn the ignition switch to the Off position. Be certain that all electrical accessories are turned off.
2. Remove the spare tire cover to gain access to the battery.
3. Disconnect and isolate the battery negative cable (3).



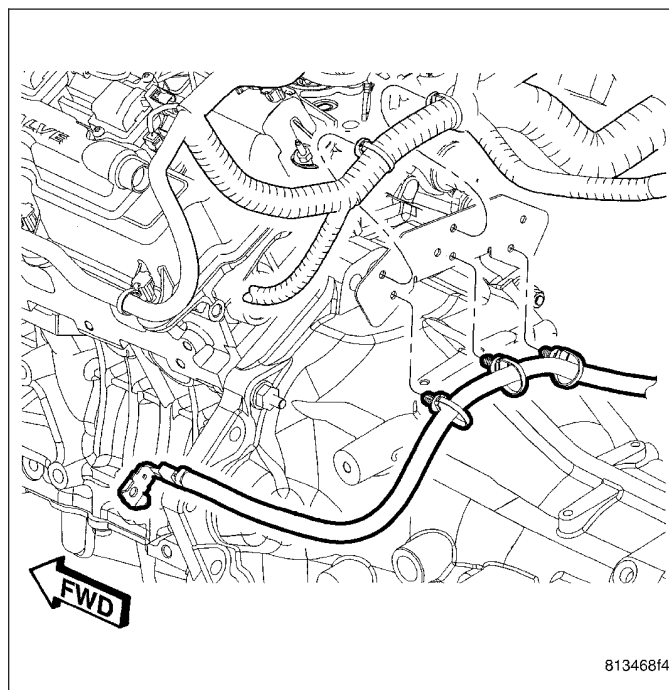
4. Raise vehicle on hoist, (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).
5. Remove the right front wheelhouse splash shield to gain access to the battery positive cable bulkhead outside terminal, (Refer to 23 - BODY/EXTERIOR/RF WHEELHOUSE SPLASH SHIELD - REMOVAL).
6. Remove the battery positive cable to bulkhead fastener.



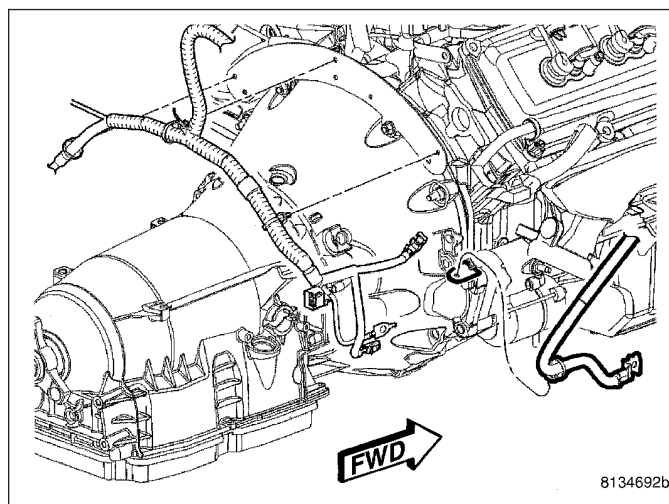
7. Remove the battery positive cable to starter fastener.



8. On the 2.7L and 3.5L free the battery positive cable from the routing clips located at the back of the engine.



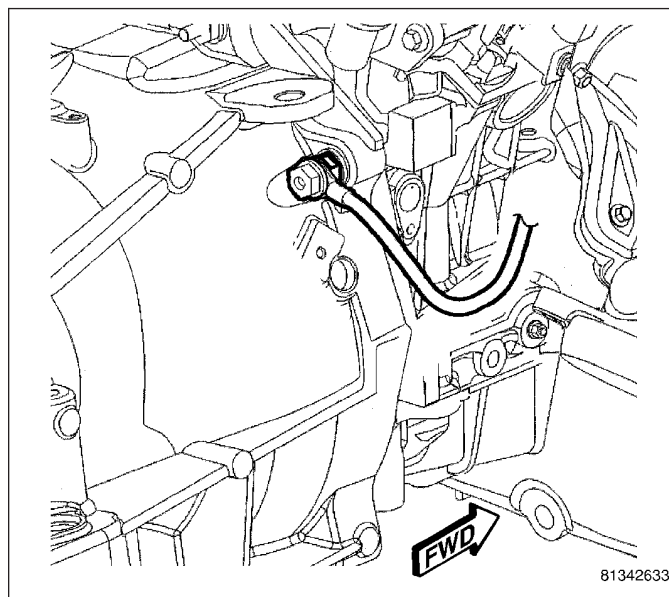
9. On the 5.7L free the battery positive cable from the routing clip located at the back of the starter.
10. Remove the battery positive cable from the vehicle making note of the cable routing.



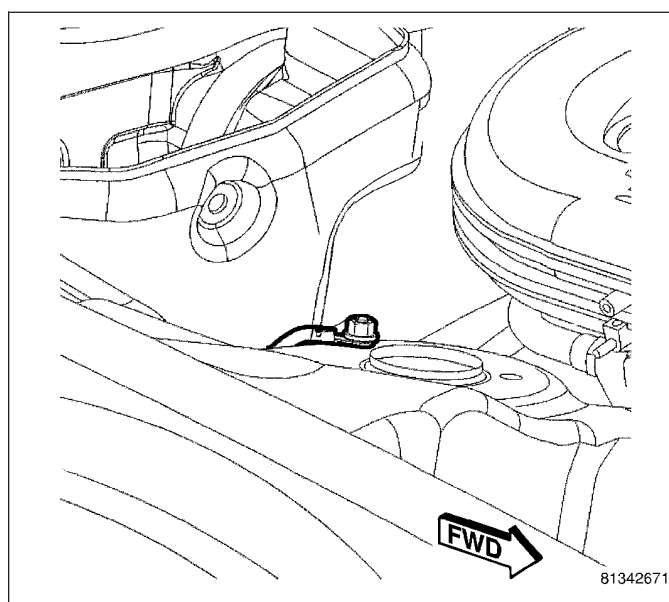
## INSTALLATION

### NEGATIVE - ENGINE COMPARTMENT

1. Position the battery negative cable in the engine compartment.
2. Raise vehicle on hoist, (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).
3. Install the fastener securing the battery negative cable to the transmission housing. Torque the bolt to 11 N·m (8 ft. lbs.).



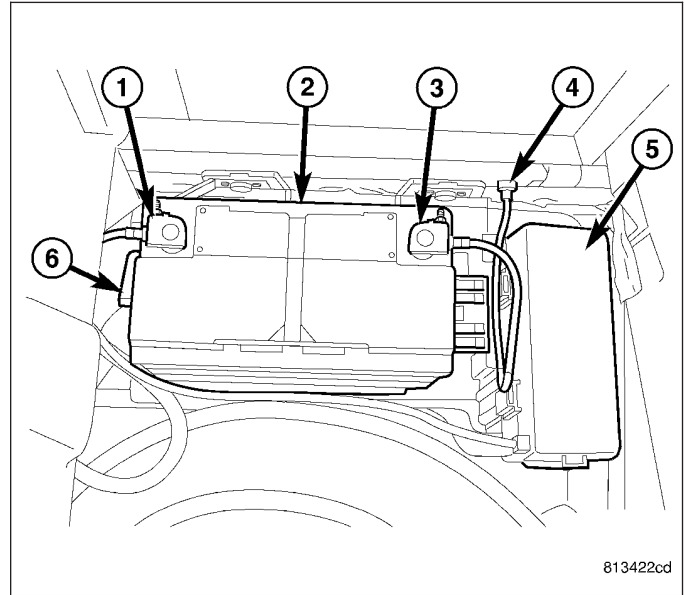
4. One at a time, install the battery cable retaining pushpins, fasteners and routing clips until the cable is installed exactly where it was in the vehicle.
5. Lower vehicle.
6. Install the fastener securing the battery negative cable to the right front strut tower.



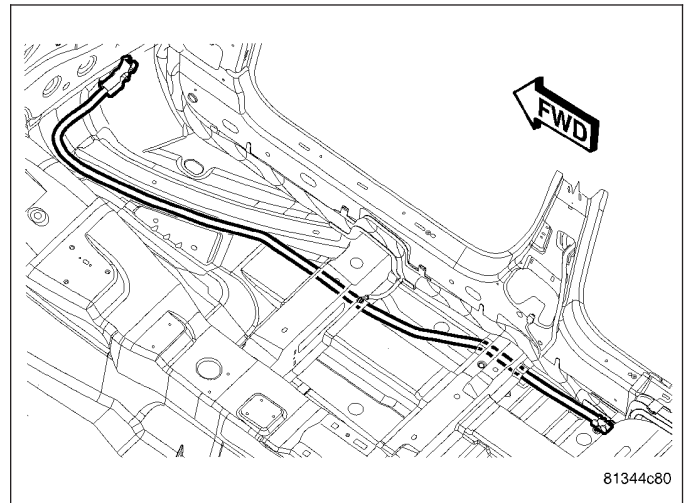
7. Connect the battery negative cable.
8. Install the spare tire cover.

**NEGATIVE - REAR COMPARTMENT**

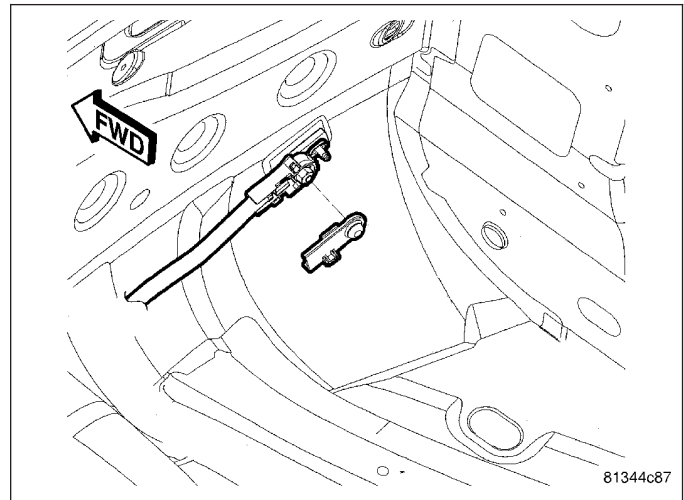
1. Position the battery negative cable in the vehicle.
2. Install the fastener (4) securing the battery negative cable to the body.
3. Connect the battery negative cable (3).
4. Install the spare tire cover.

**POSITIVE - BATTERY TO BULKHEAD**

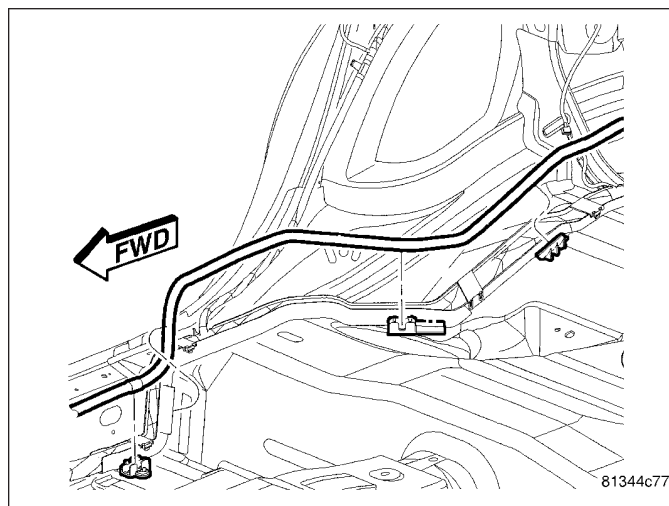
1. Position the battery positive cable in the vehicle taking care to route the cable under the floor cross members.



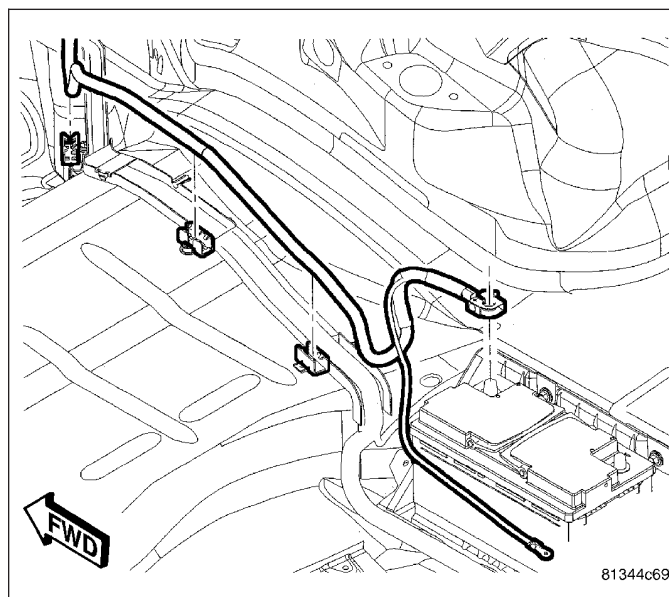
2. Position the bulkhead insulator aside to gain access to the battery positive cable bulkhead fastener.
3. Install the battery positive cable to bulkhead fastener.
4. Position the bulkhead insulator back to the normal position.



1. One at a time, secure the battery positive cable to the routing clips located in the rear seat area.

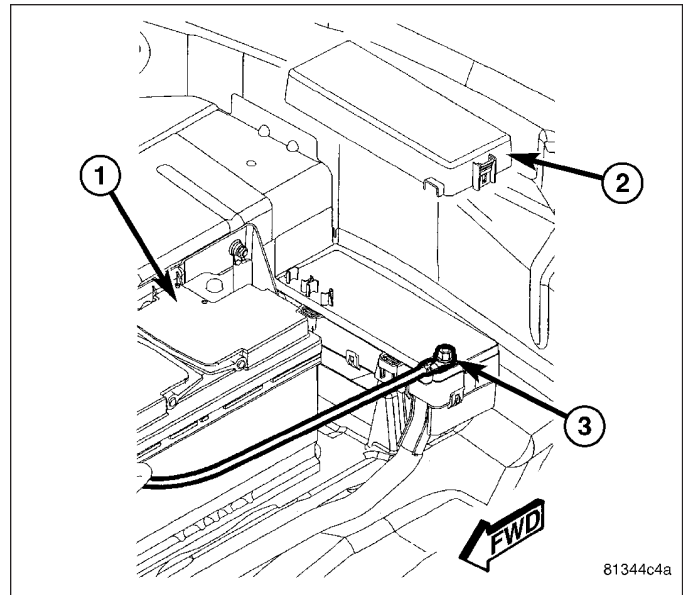


2. One at a time, secure the battery positive cable to the routing clips located in the rear compartment area.



3. Position the carpet back to the normal position.
4. Install the right, B - pillar lower trim panel, (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - INSTALLATION).
5. Install the right, front and rear door sill trim panels.
6. Install the right, rear seat cushion. Engage retainer loops into cup on floor kick up. Push downward at forward edge at each retainer loop of the rear seat cushion to engage retainers.
7. Install the right, front seat, (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION).

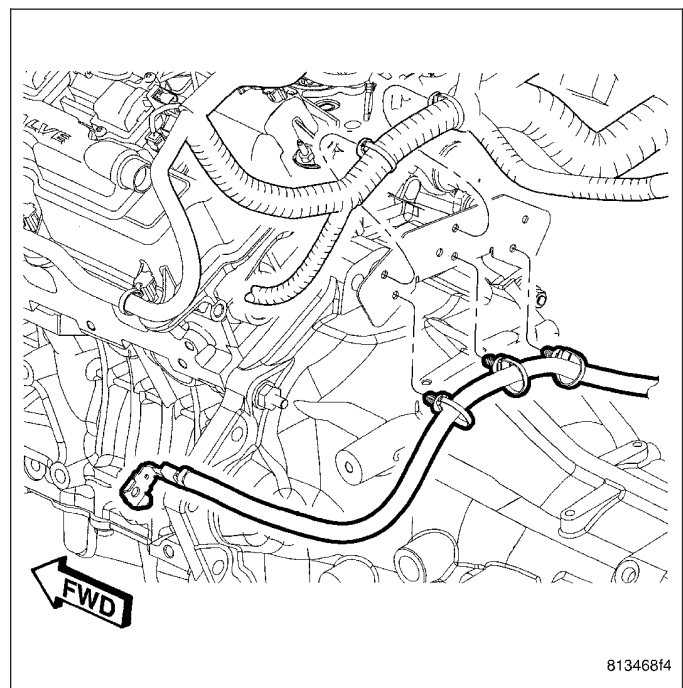
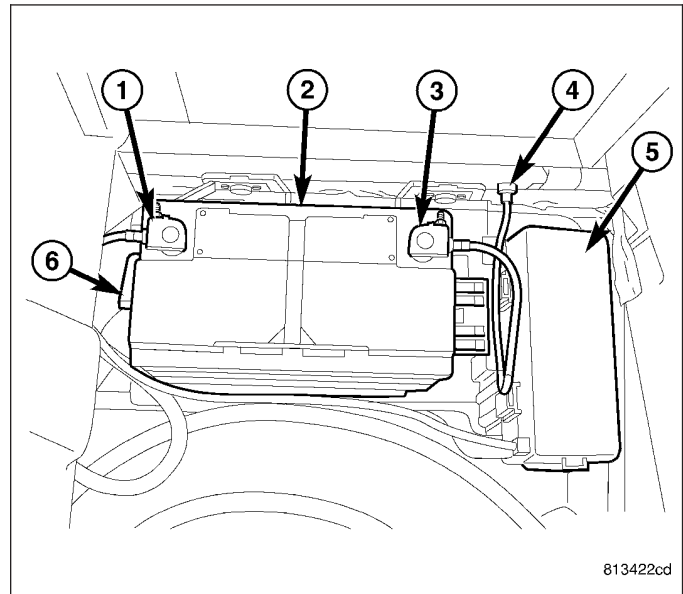
8. Install the battery positive cable to rear Power Distribution Center (PDC) fastener (3).



9. Install the PDC cover (5).
10. Connect the battery positive cable (1).
11. Connect the battery negative cable (3).
12. Install the spare tire cover.

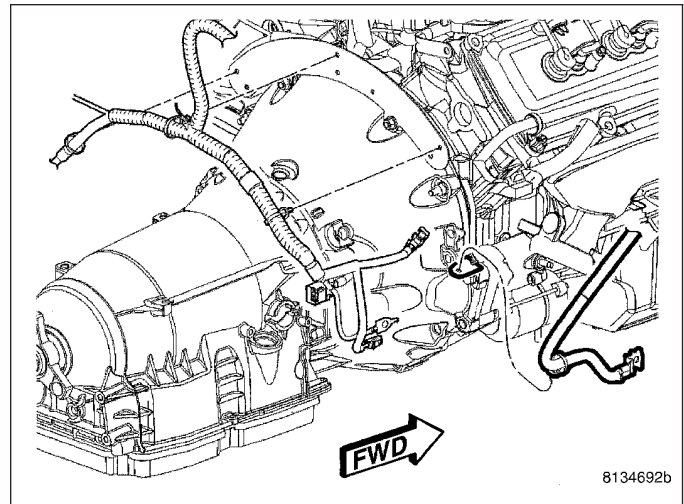
### POSITIVE - ENGINE COMPARTMENT

1. Position the battery positive cable in the engine compartment.
2. On the 2.7L and 3.5L secure the battery positive cable to the routing clips located at the back of the engine.

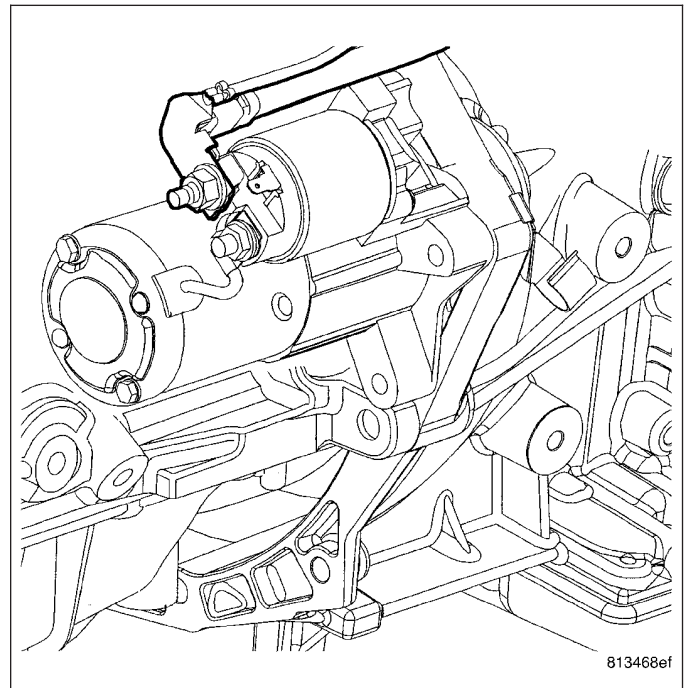




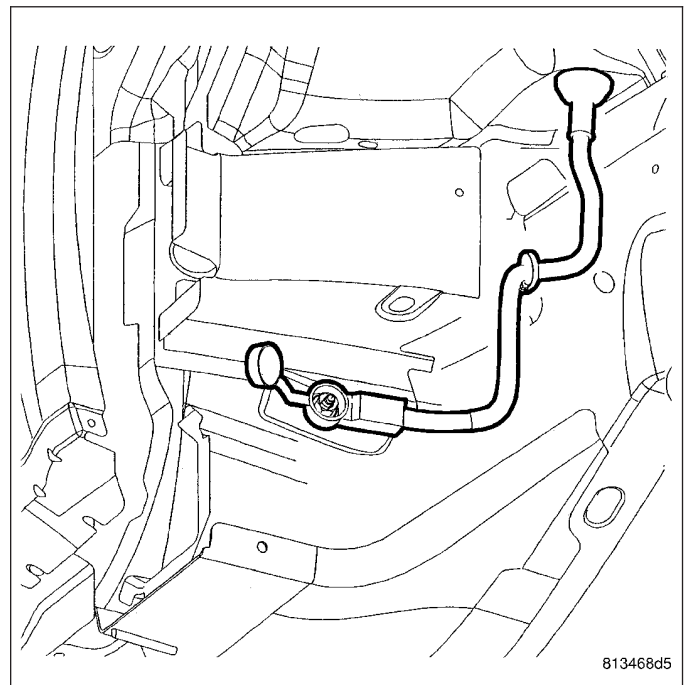
3. On the 5.7L secure the battery positive cable to the routing clip located at the back of the starter.



4. Install the battery positive cable to starter fastener.

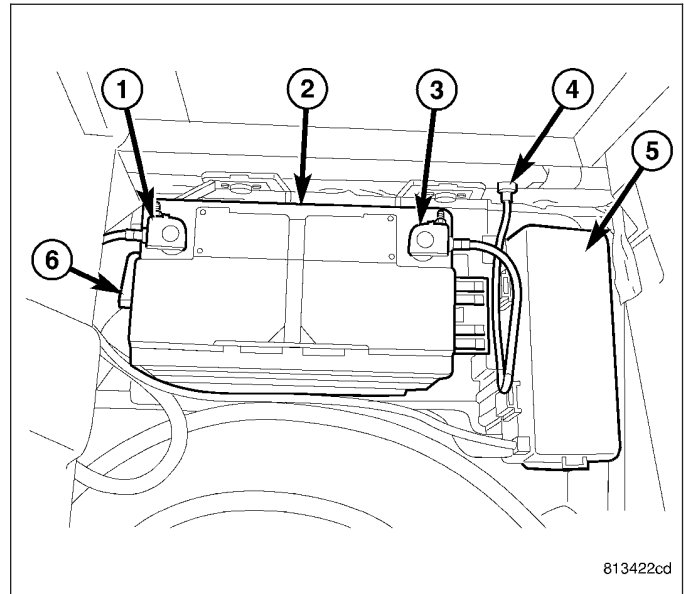


5. Install the battery positive cable to bulkhead fastener.





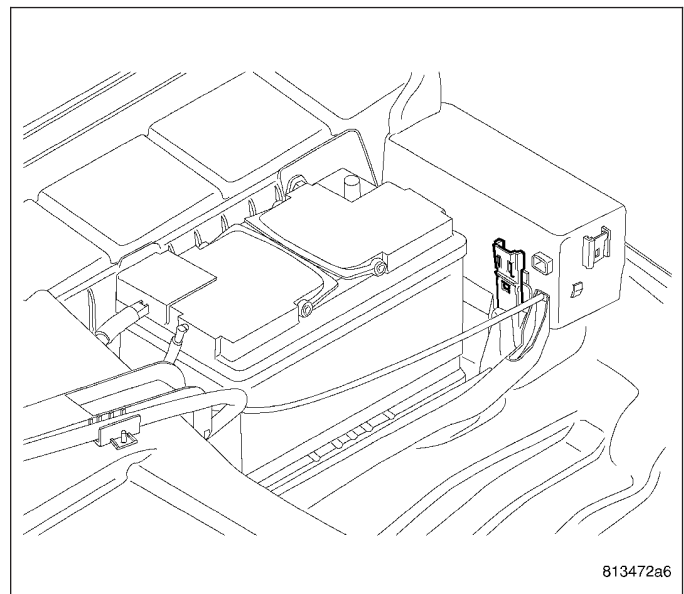
6. Install the right front wheelhouse splash shield, (Refer to 23 - BODY/EXTERIOR/RF WHEELHOUSE SPLASH SHIELD - INSTALLATION).
7. Lower vehicle.
8. Connect the battery negative cable (3).
9. Install the spare tire cover.



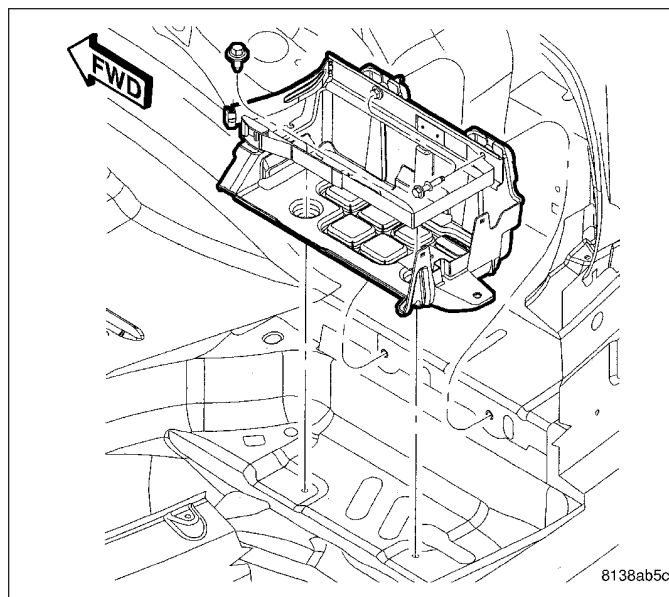
## BATTERY TRAY

### REMOVAL

1. Remove the battery, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - REMOVAL).
2. Using a small flat bladed tool, gently release the two mounting tabs that secure the Power Distribution Center (PDC) to the battery tray. Position the PDC aside.

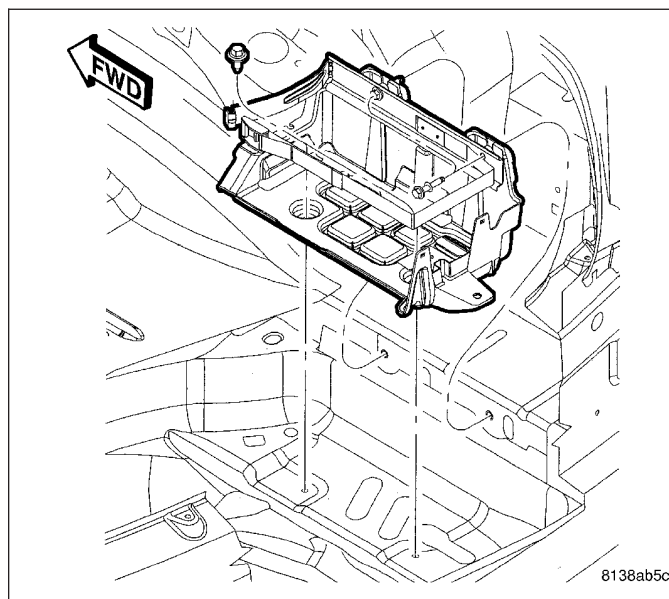


3. Remove the battery tray mounting fasteners and remove the battery tray from the vehicle.

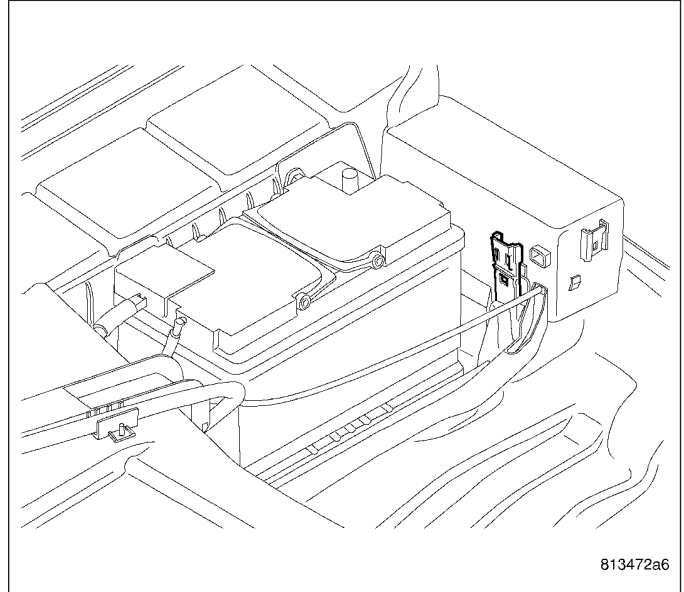


## INSTALLATION

1. Position the battery tray in the vehicle and install the mounting fasteners.



2. Position the Power Distribution Center (PDC) onto the battery tray mounting tabs. Gently apply downward pressure on the PDC until it snaps into place.



3. Install the battery, (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - INSTALLATION).

# CHARGING

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## CHARGING

### DESCRIPTION - CHARGING SYSTEM

The charging system consists of:

- Generator
- Decoupler Pulley (If equipped)
- Electronic Voltage Regulator (EVR) circuitry within the Powertrain Control Module (PCM)
- Ignition switch (refer to the Ignition System section for information)
- Battery (refer to the Battery section for information)
- Ambient Air Temperature (If equipped)
- Inlet Air Temperature (calculated battery temperature)(If equipped)
- Voltmeter (refer to the Instrument Cluster section for information if equipped)
- Wiring harness and connections (refer to the Wiring section for information)
- Accessory drive belt (refer to the Cooling section for more information)
- Battery Temperature sensor (if equipped)

### OPERATION - CHARGING SYSTEM

The charging system is turned on and off with the ignition switch. The system is on when the engine is running and the ASD relay is energized. The ASD relay is energized when the PCM grounds the ASD control circuit. This voltage is connected through the PCM or IPM (intelligent power module) (if equipped) and supplied to one of the generator field terminals (Gen. Source +) at the back of the generator.

The generator is driven by the engine through a serpentine belt and pulley or decoupler pulley arrangement.

The amount of DC current produced by the generator is controlled by the EVR (field control) circuitry contained within the PCM. This circuitry is connected in series with the second rotor field terminal and ground.

An Ambient air temperature sensor is mounted on the bumper used to calculate the temperature near the battery. This temperature data, along with data from monitored line voltage (battery voltage sense circuit), is used by the PCM to vary the battery charging rate. This is done by cycling the feed path to control the strength of the rotor magnetic field. The PCM then compensates and regulates generator current output accordingly to maintain system voltage at the targeted system voltage based on battery temperature.

All vehicles are equipped with On-Board Diagnostics (OBD). All OBD-sensed systems, including EVR (field control) circuitry, are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for certain failures it detects and illuminate the (MIL) lamp. Refer to On-Board Diagnostics in the Electronic Control Modules(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ POWERTRAIN CONTROL MODULE - DESCRIPTION) section for more DTC information.

The Charging system "Battery" light indicates problems with the charging system (voltage too high/low, generator failure, etc.). If an extreme condition is indicated, the lamp will be illuminated. The signal to activate the lamp is sent via the PCI bus circuits. The lamp is located on the instrument panel. Refer to the Instrument Cluster section for additional information.

The PCM uses the inlet air temperature sensor or ambient temperature sensor to control the charge system voltage. This temperature, along with data from monitored line voltage, is used by the PCM to vary the battery charging rate. The system voltage is higher at cold temperatures and is gradually reduced as the calculated battery temperature increases.

The ambient temperature sensor is used to control the battery voltage based upon ambient temperature (approximation of battery temperature). The PCM maintains the optimal output of the generator by monitoring battery voltage and controlling it to a range of 13.5 - 14.7 volts based on battery temperature.

## DIAGNOSIS AND TESTING

### ON-BOARD DIAGNOSTIC SYSTEM

The Powertrain Control Module (PCM) monitors critical input and output circuits of the charging system, making sure they are operational. A Diagnostic Trouble Code (DTC) is assigned to each input and output circuit monitored by the OBD system. Some circuits are checked continuously and some are checked only under certain conditions.

If the OBD system senses that a monitored circuit is bad, it will put a DTC into electronic memory. The DTC will stay in electronic memory as long as the circuit continues to be bad. The PCM is programmed to clear the memory after 40 good trip if the problem does not occur again.

### DIAGNOSTIC TROUBLE CODES

A DTC description can be read using the DRBIII® scan tool. Refer to the appropriate Powertrain Diagnostic Procedures manual for information.

A DTC does not identify which component in a circuit is bad. Thus, a DTC should be treated as a symptom, not as the cause for the problem. In some cases, because of the design of the diagnostic test procedure, a DTC can be the reason for another DTC to be set. Therefore, it is important that the test procedures be followed in sequence, to understand what caused a DTC to be set.

### ERASING DIAGNOSTIC TROUBLE CODES

The DRBIII® Scan Tool must be used to erase a DTC.

The following procedures may be used to diagnose the charging system if:

- the check gauges lamp or battery lamp is illuminated with the engine running
- the voltmeter (if equipped) does not register properly
- an undercharged or overcharged battery condition occurs.

Remember that an undercharged battery is often caused by:

- accessories being left on with the engine not running
- a faulty or improperly adjusted switch that allows a lamp to stay on. Refer to Ignition-Off Draw Test (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE)
- loose generator belt.

### INSPECTION

The Powertrain Control Module (PCM) monitors critical input and output circuits of the charging system, making sure they are operational. A Diagnostic Trouble Code (DTC) is assigned to each input and output circuit monitored by the On-Board Diagnostic (OBD) system. Some charging system circuits are checked continuously, and some are checked only under certain conditions.

Refer to Diagnostic Trouble Codes in; Powertrain Diagnostic manual for more DTC information. This will include a complete list of DTC's including DTC's for the charging system.

To perform a complete test of the charging system, refer to the appropriate Powertrain Diagnostic Procedures service manual and the DRBIII® scan tool. Perform the following inspections before attaching the scan tool.

1. Inspect the battery condition. Refer to the Battery section (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - DIAGNOSIS AND TESTING) for procedures.

2. Inspect condition of battery cable terminals, battery posts, connections at engine block, starter solenoid and relay. They should be clean and tight. Repair as required.
3. Inspect all fuses in both the fuseblock and Power Distribution Center (PDC) or IPM (if equipped) for tightness in receptacles. They should be properly installed and tight. Repair or replace as required.
4. Inspect generator mounting bolts for tightness. Replace or tighten bolts if required. Refer to the Generator Removal/Installation section of this group for torque specifications (Refer to 8 - ELECTRICAL/CHARGING - SPECIFICATIONS).
5. Inspect generator drive belt condition and tension. Tighten or replace belt as required. Refer to Belt Tension Specifications(Refer to 7 - COOLING/ACCESSORY DRIVE - SPECIFICATIONS).
6. Inspect decoupler pulley (if equipped). Ensure decoupler pulley is driving the alternator rotor.
7. Inspect automatic belt tensioner (if equipped). Refer to the Cooling System for more information.
8. Inspect generator electrical connections at generator field, battery output, and ground terminal (if equipped). Also check generator ground wire connection at engine (if equipped). They should all be clean and tight. Repair as required.

## SPECIFICATIONS

### TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Generator Mounting Bolts - 2.7L	65	48	-
Generator Mounting Bolts - 3.5L	65	48	-
Generator Mounting Bolts - 5.7L	41	30	-
Generator Support Bracket Bolt/Nuts - 5.7L	41	30	-
Generator B+ Output Cable Terminal Nut	12	-	108

## GENERATOR

### DESCRIPTION

The generator is belt-driven by the engine. It is serviced only as a complete assembly. If the generator fails for any reason, the entire assembly must be replaced. The generator produces DC voltage.

### OPERATION

As the energized rotor begins to rotate within the generator, the spinning magnetic field induces a current into the windings of the stator coil.

The Y type stator winding connections deliver the induced AC current to 6 positive and 6 negative diodes for rectification. From the diodes, rectified DC current is delivered to the vehicles electrical system through the generator, battery, and ground terminals.

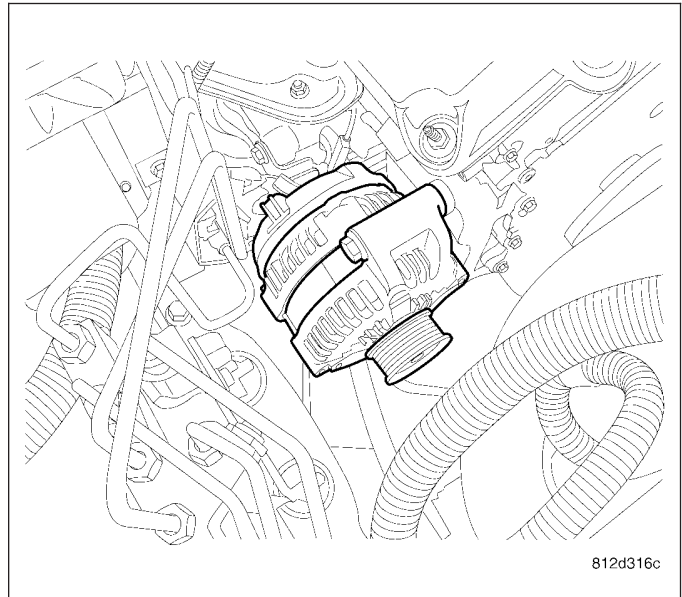
Noise emitting from the generator may be caused by:

- Worn, loose or defective bearings
- Loose or defective drive pulley
- Incorrect, worn, damaged or misadjusted drive belt
- Loose mounting bolts
- Misaligned drive pulley
- Defective stator or diode
- Damaged internal fins

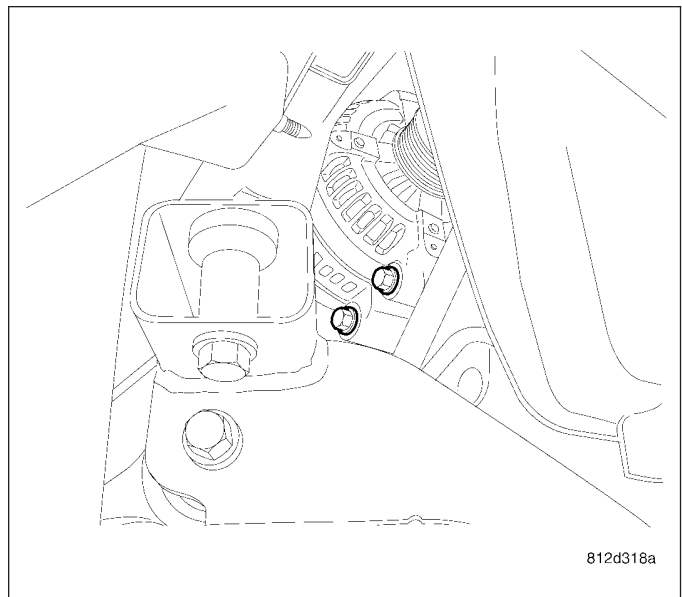
## REMOVAL

### 2.7L

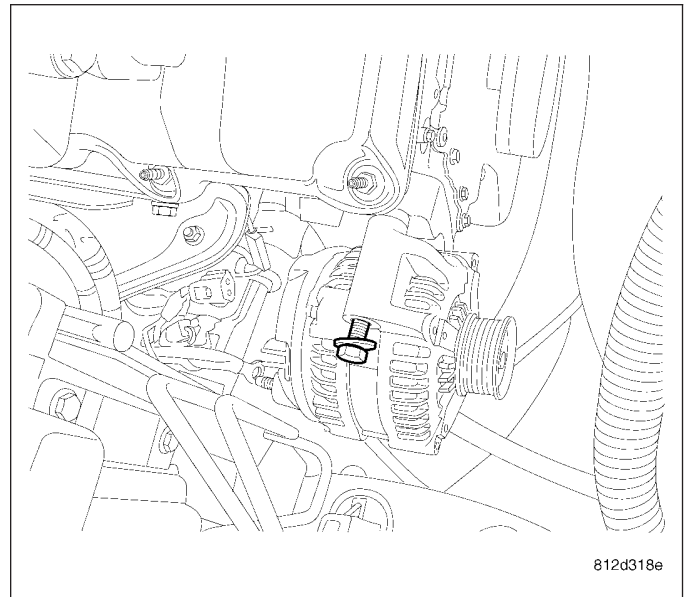
1. Disconnect negative battery cable.
2. Remove generator drive belt. Refer to the Cooling System section.



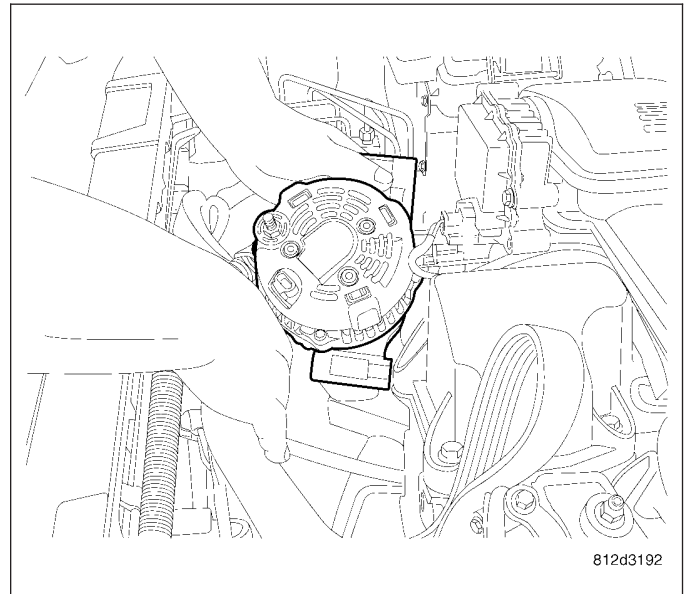
3. Disconnect generator field circuit plug.
4. Remove B+ terminal nut and wire.
5. Remove 2 lower mounting bolts.



6. Remove upper bolt.



7. Remove generator.

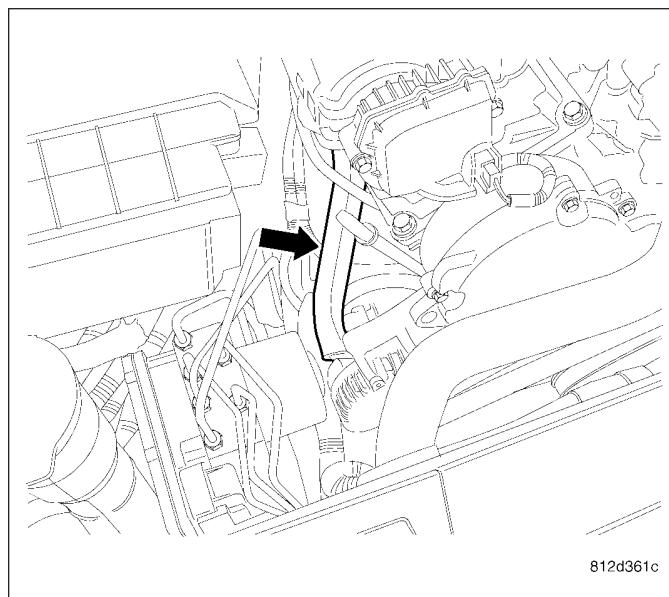


### 3.5L

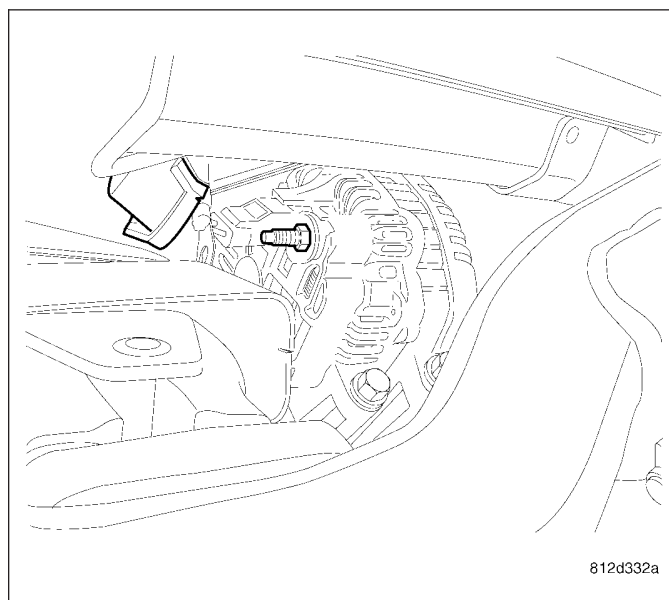
1. Disconnect negative battery cable.
2. Remove generator drive belt. Refer to the Cooling System section.



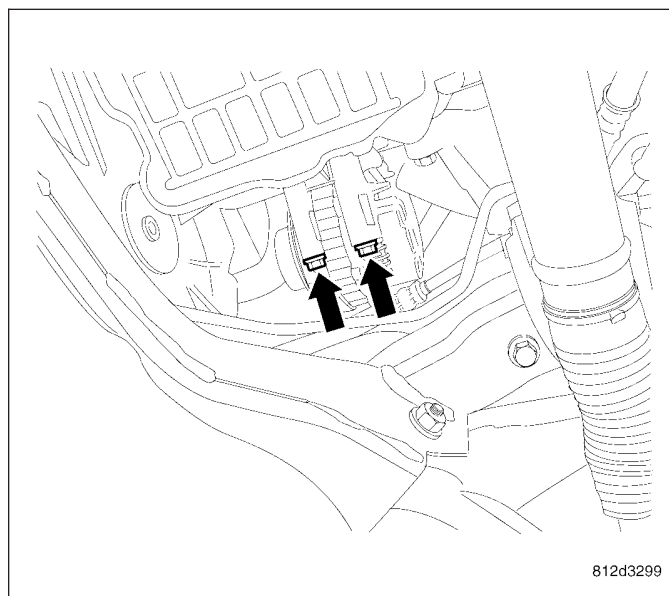
3. Remove bracket bolts.
4. Remove upper mounting bolt.



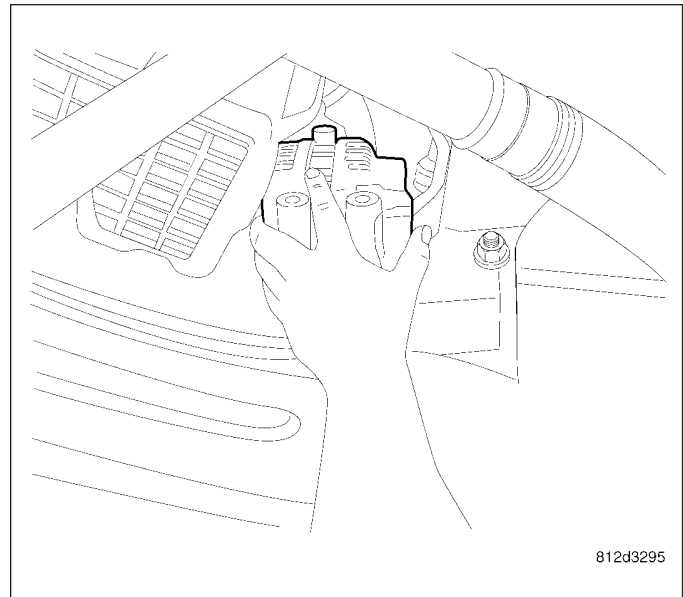
5. Raise and support vehicle.
6. Remove middle splash pan.
7. Disconnect generator field circuit plug.
8. Remove B+ terminal nut and wire.



9. Remove lower mounting bolts.



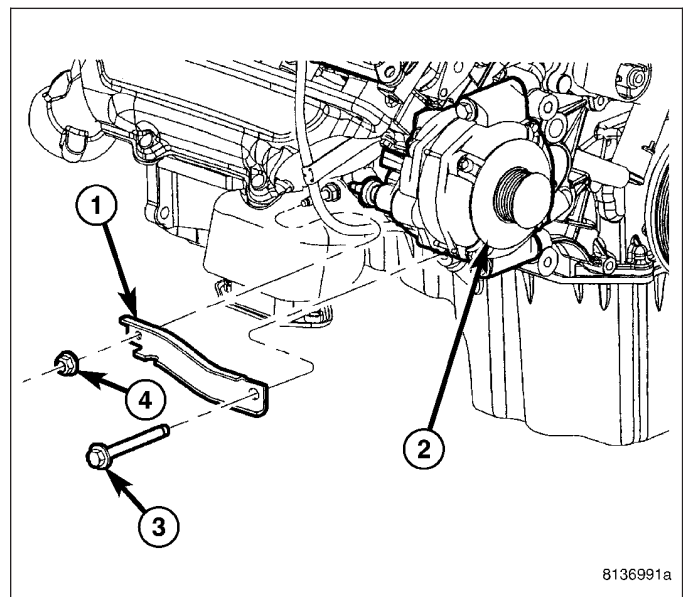
10. Remove generator.



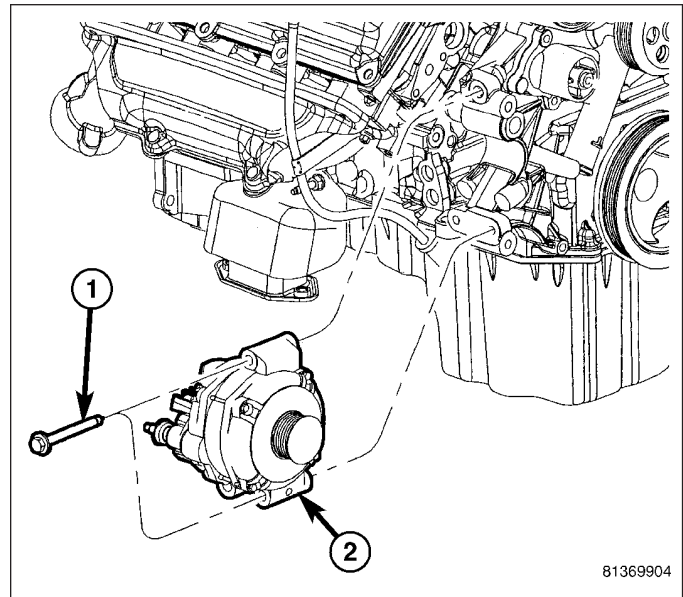
## 5.7L

**WARNING: DISCONNECT NEGATIVE CABLE FROM BATTERY BEFORE REMOVING BATTERY OUTPUT WIRE (B+ WIRE) FROM GENERATOR. FAILURE TO DO SO CAN RESULT IN INJURY OR DAMAGE TO ELECTRICAL SYSTEM.**

1. Disconnect negative battery cable at battery.
2. Remove generator drive belt. Refer to 7, Cooling System for procedure.
3. Raise and support vehicle.
4. Unsnap plastic insulator cap from B+ output terminal.
5. Remove B+ terminal mounting nut at rear of generator. Disconnect terminal from generator.
6. Disconnect field wire connector at rear of generator by pushing on connector tab.
7. Remove generator support bracket nut (4) and bolt (3). Remove support bracket (1).



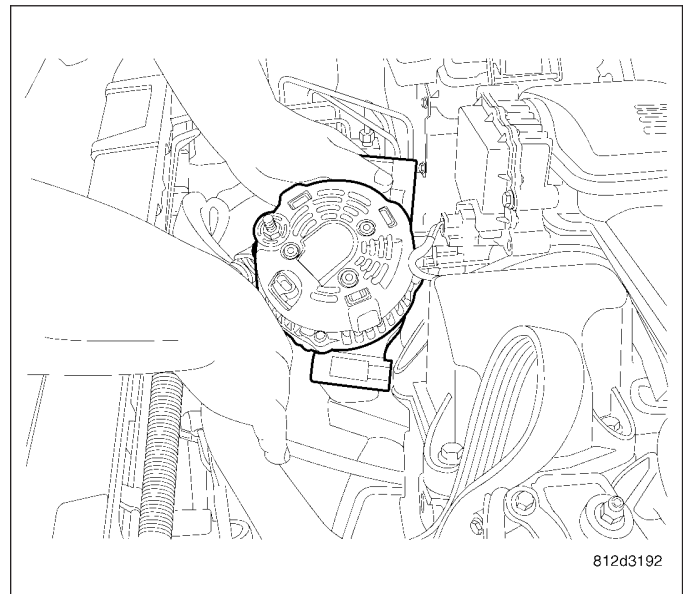
8. Remove 2 generator mounting bolts (1).
9. Remove generator (2) from vehicle.



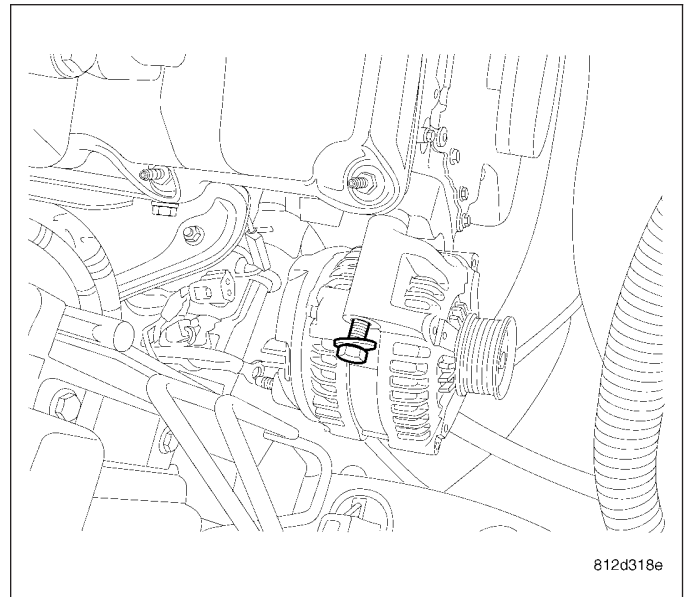
## INSTALLATION

### 2.7L

1. Install generator.

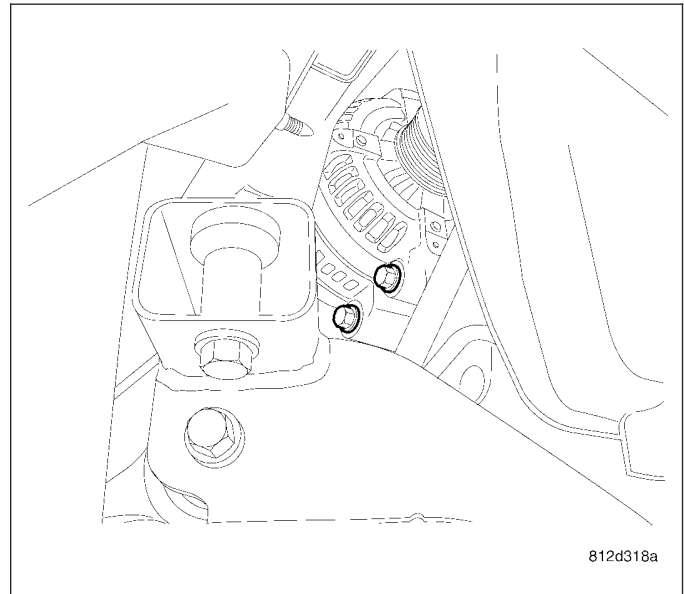


2. Install upper bolt mounting bolt.



3. Install 2 lower mounting bolts.

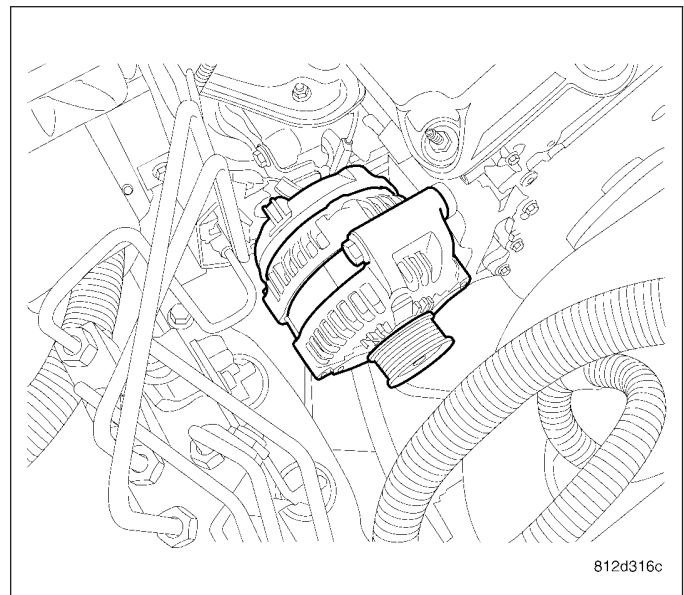
4. Tighten bolts to 65 N·m (48 ft. lbs.).



5. Install B+ terminal nut and wire. Tighten nut to 13 N·m (115 in. lbs.).

6. Connect generator field circuit plug.

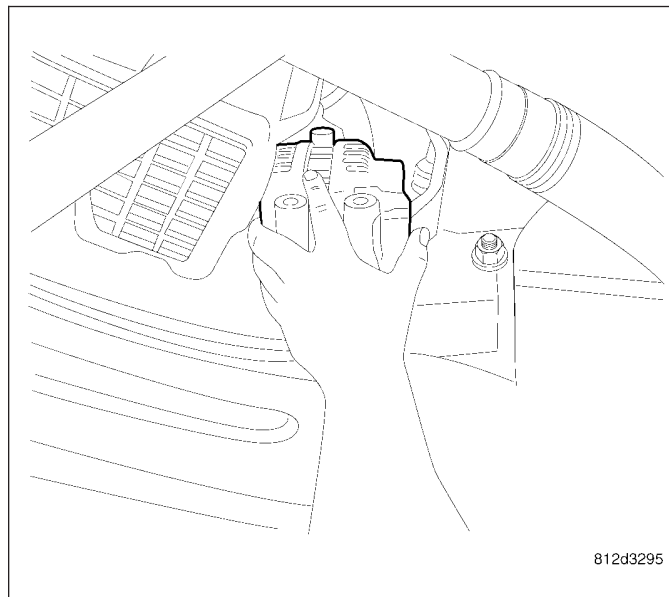
7. Install generator drive belt. Refer to the Cooling System section.



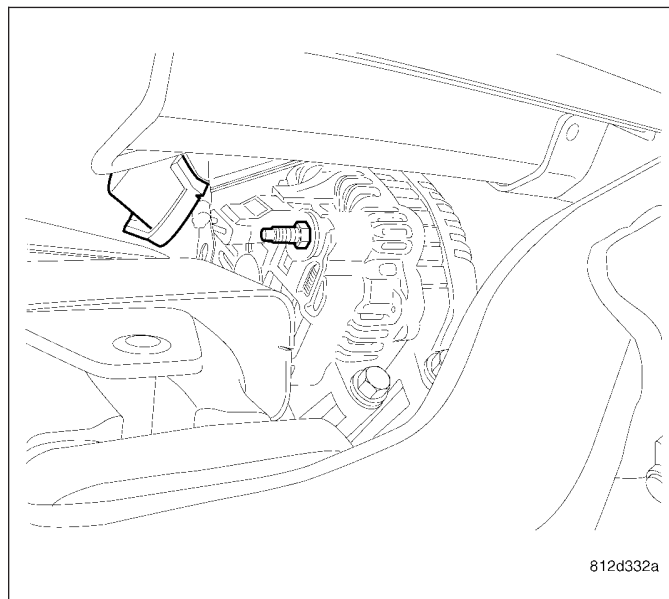
8. Connect negative battery cable.

### 3.5L

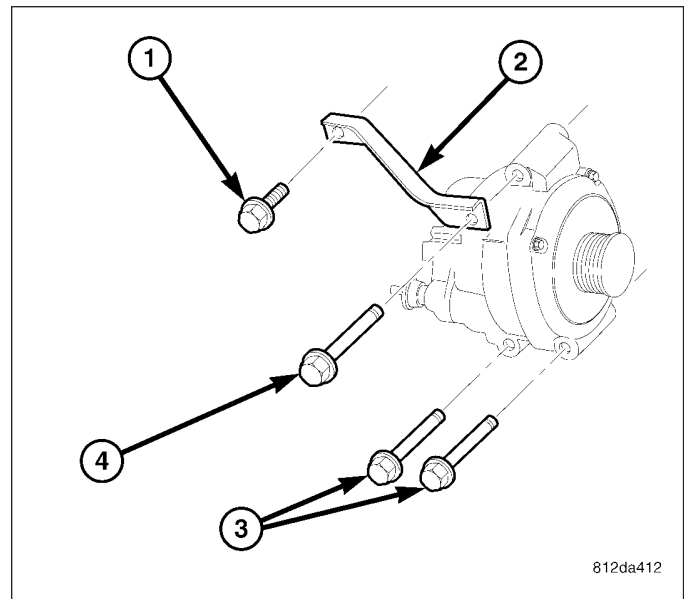
1. Install generator.



2. Install lower mounting bolts (3). Loosen install the upper mounting bolt (4).
3. Tighten lower mounting bolts to 65 N·m (48 ft. lbs.).
4. Connect generator field circuit plug.
5. Install B+ terminal nut and wire. Tighten nut to 13 N·m (115 in. lbs.).
6. Install middle splash pan.
7. Lower vehicle.

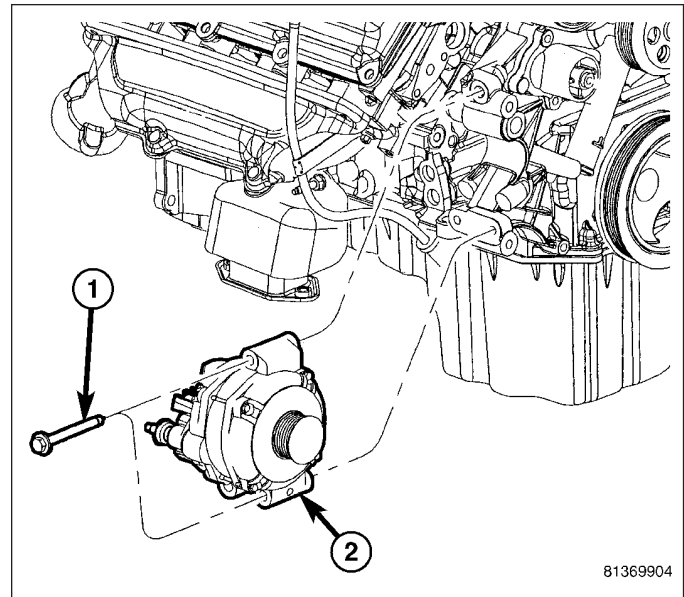


8. Remove loose installed upper bolt (4).
9. Install bracket (2) and bracket bolt (1).
10. Install upper mounting bolt (4) and bracket (2).
11. Tighten upper mounting bolt to 65 N·m (48 ft. lbs.).
12. Tighten Bracket bolt to 54 N·m (40 ft. lbs.).
13. Install generator drive belt. Refer to the Cooling System section.
14. Connect negative battery cable.

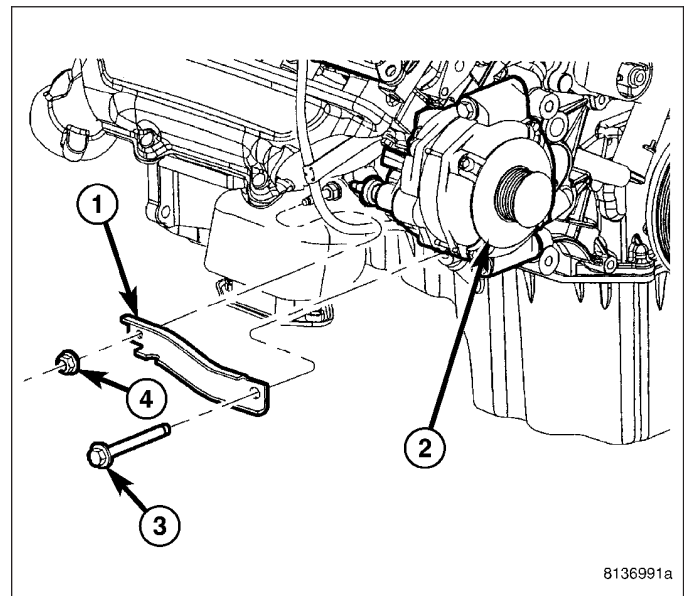


## 5.7L

1. Position generator (2) to engine and install 2 mounting bolts (1).
2. Tighten bolts. Refer to Torque Specifications.



3. Position support bracket (1) to generator and install bolt (3) and nut (4). Tighten bolt / nut. Refer to Torque Specifications.



4. Snap field wire connector into rear of generator.
5. Install B+ terminal eyelet to generator output stud. Tighten mounting nut. Refer to Torque Specifications.
6. Lower vehicle.

**CAUTION:** Never force a belt over a pulley rim using a screwdriver. The synthetic fiber of the belt can be damaged.

**CAUTION:** When installing a serpentine accessory drive belt, the belt **MUST** be routed correctly. The water pump may be rotating in the wrong direction if the belt is installed incorrectly, causing the engine to over-heat. Refer to belt routing label in engine compartment, or refer to Belt Schematics in 7, Cooling System.

7. Install generator drive belt. Refer to 7, Cooling System for procedure.
8. Install negative battery cable to battery.

## VOLTAGE REGULATOR

### DESCRIPTION

The Electronic Voltage Regulator (EVR) is not a separate component. It is actually a voltage regulating circuit located within the Powertrain Control Module (PCM). The EVR is not serviced separately. If replacement is necessary, the PCM must be replaced.

### OPERATION

The amount of DC current produced by the generator is controlled by EVR circuitry contained within the PCM. This circuitry is connected in series with the generator's second rotor field terminal and its ground.

Voltage is regulated within the PCM on the NGC vehicles, to control the strength of the rotor magnetic field. The EVR circuitry monitors system line voltage at the PDC and calculated battery temperature or inlet air temperature sensor (refer to Inlet Air Temperature Sensor, if equipped, for more information ). It then determines a target charging voltage. If sensed battery voltage is lower than the target voltage, the PCM feeds the field winding until sensed battery voltage is at the target voltage. A circuit in the PCM cycles the feed side of the generator field at 250 times per second (250Hz), but has the capability to feed the field control wire 100% of the time (full field) to achieve the target voltage. If the charging rate cannot be monitored (limp-in), a duty cycle of 20% is used by the PCM in order to have some generator output. Also refer to Charging System Operation for additional information.

# STARTING

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## STARTING

### DESCRIPTION

The starting system consists of:

- Starter relay
- Starter motor (including an integral starter solenoid)

Other components to be considered as part of starting system are:

- Battery
- Battery cables
- Ignition switch and key lock cylinder
- Clutch pedal position switch (manual transmission)
- Park/neutral position switch (automatic transmission)
- Wire harnesses and connections.

The Battery, Starting, and Charging systems operate in conjunction with one another, and must be tested as a complete system. For correct operation of starting/charging systems, all components used in these 3 systems must perform within specifications. When attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used in each of these groups include the most basic conventional diagnostic methods, to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of an induction-type milliampere ammeter, volt/ohmmeter, battery charger, carbon pile rheostat (load tester), and 12-volt test lamp may be required.

### OPERATION

These components form two separate circuits. A high amperage circuit that feeds the starter motor up to 300+ amps, and a control circuit that operates on less than 20 amps.

The PCM controls a double start over-ride safety that does not allow the starter to be engaged if the engine is already running.

### DIAGNOSIS AND TESTING

#### DIAGNOSIS AND TESTING - STARTING SYSTEM TEST

For circuit descriptions and diagrams, refer to the Wiring Diagrams.



**WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO THE PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

## INSPECTION

Before removing any unit from the starting system for repair or diagnosis, perform the following inspections:

- **Battery** - Visually inspect the battery for indications of physical damage and loose or corroded cable connections. Determine the state-of-charge and cranking capacity of the battery. Charge or replace the battery, if required. Refer to the Battery section for more information.
- **Ignition Switch** - Visually inspect the ignition switch for indications of physical damage and loose or corroded wire harness connections.
- **Transmission Range Sensor or Park/Neutral Switch** - Visually inspect the transmission range sensor for indications of physical damage and loose or corroded wire harness connections.
- **Starter Relay** - Visually inspect the starter relay for indications of physical damage and loose or corroded wire harness connections.
- **Starter Motor** - Visually inspect the starter motor for indications of physical damage and loose or corroded wire harness connections.
- **Starter Solenoid** - Visually inspect the starter solenoid for indications of physical damage and loose or corroded wire harness connections.
- **Wiring** - Visually inspect the wire harness for damage. Repair or replace any faulty wiring, as required. Check for loose or corroded wire harness connections at main engine ground and remote jump post.
- **Power Distribution Center (PDC)** - Visually inspect the B+ connections at the PDC for physical damage and loose or corroded harness connections.

## STARTING SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSE	CORRECTION
STARTER FAILS TO ENGAGE.	1. BATTERY DISCHARGED OR FAULTY. 2. STARTING CIRCUIT WIRING FAULTY. 3. STARTER RELAY FAULTY. 4. IGNITION SWITCH FAULTY. 5. PARK/NEUTRAL POSITION SWITCH (AUTO TRANS) FAULTY OR MIS-ADJUSTED. 6. CLUTCH INTERLOCK SWITCH (MAN TRANS) FAULTY. 7. STARTER SOLENOID FAULTY. 8. STARTER ASSEMBLY FAULTY. 9. FAULTY TEETH ON RING GEAR.	1. REFER TO THE BATTERY SECTION FOR MORE INFORMATION. CHARGE OR REPLACE BATTERY, IF REQUIRED. 2. REFER TO FEED CIRCUIT RESISTANCE TEST AND FEED CIRCUIT TEST IN THIS SECTION. 3. REFER TO RELAY TEST, IN THIS SECTION. REPLACE RELAY, IF NECESSARY. 4. REFER TO IGNITION SWITCH TEST, IN THE STEERING SECTION OR 8 WIRING DIAGRAMS. REPLACE SWITCH, IF NECESSARY. 5. REFER PARK/NEUTRAL POSITION SWITCH TEST, IN THE TRANSAXLE. SECTION FOR MORE INFORMATION. REPLACE SWITCH, IF NECESSARY. 6. REFER TO CLUTCH PEDAL POSITION SWITCH TEST, IN THE CLUTCH. SECTION. REPLACE SWITCH, IF NECESSARY. 7. REFER TO SOLENOID TEST, IN THIS SECTION. REPLACE STARTER ASSEMBLY, IF NECESSARY. 8. IF ALL OTHER STARTING SYSTEM COMPONENTS AND CIRCUITS CHECK OK, REPLACE STARTER ASSEMBLY. 9. ROTATE FLYWHEEL 360°, AND INSPECT TEETH AND RING GEAR REPLACED IF DAMAGED.

CONDITION	POSSIBLE CAUSE	CORRECTION
	10. PCM DOUBLE START OVERRIDE OUTPUT FAILURE.	10. REFER TO PCM DIAGNOSTIC. CHECK FOR CONTINUITY BETWEEN PCM AND TERMINAL 85. REPAIR OPEN CIRCUIT AS REQUIRED. IF OK, PCM MAY BE DEFECTIVE.
STARTER ENGAGES, FAILS TO TURN ENGINE.	1. BATTERY DISCHARGED OR FAULTY. 2. STARTING CIRCUIT WIRING FAULTY. 3. STARTER ASSEMBLY FAULTY. 4. ENGINE SEIZED. 5. LOOSE CONNECTION AT BATTERY, PDC, STARTER, OR ENGINE GROUND. 6. FAULTY TEETH ON RING GEAR.	1. REFER TO THE BATTERY SECTION FOR MORE INFORMATION. CHARGE OR REPLACE BATTERY AS NECESSARY. 2. REFER TO THE FEED CIRCUIT RESISTANCE TEST AND THE FEED CIRCUIT TEST IN THIS SECTION. REPAIR AS NECESSARY. 3. IF ALL OTHER STARTING SYSTEM COMPONENTS AND CIRCUITS CHECK OK, REPLACE STARTER ASSEMBLY. 4. REFER TO THE ENGINE SECTION, FOR DIAGNOSTIC AND SERVICE PROCEDURES. 5. INSPECT FOR LOOSE CONNECTIONS. 6. ROTATE FLYWHEEL 360°, AND INSPECT TEETH AND RING GEAR REPLACED IF DAMAGED.
STARTER ENGAGES, SPINS OUT BEFORE ENGINE STARTS.	1. BROKEN TEETH ON STARTER RING GEAR. 2. STARTER ASSEMBLY FAULTY.	1. REMOVE STARTER. INSPECT RING GEAR AND REPLACE IF NECESSARY. 2. IF ALL OTHER STARTING SYSTEM COMPONENTS AND CIRCUITS CHECK OK, REPLACE STARTER ASSEMBLY.
STARTER DOES NOT DISENGAGE.	1. STARTER IMPROPERLY INSTALLED. 2. STARTER RELAY FAULTY. 3. IGNITION SWITCH FAULTY. 4. STARTER ASSEMBLY FAULTY. 5. FAULTY TEETH ON RING GEAR.	1. INSTALL STARTER. TIGHTEN STARTER MOUNTING HARDWARE TO CORRECT TORQUE SPECIFICATIONS. 2. REFER TO RELAY TEST, IN THIS SECTION. REPLACE RELAY, IF NECESSARY. 3. REFER TO IGNITION SWITCH TEST, IN THE STEERING SECTION. REPLACE SWITCH, IF NECESSARY. 4. IF ALL OTHER STARTING SYSTEM COMPONENTS AND CIRCUITS CHECK OK, REPLACE STARTER ASSEMBLY. 5. ROTATE FLYWHEEL 360°, AND INSPECT TEETH AND RING GEAR REPLACED IF DAMAGED.

## DIAGNOSIS AND TESTING - FEED CIRCUIT RESISTANCE TEST

Before proceeding with this operation, review Diagnostic Preparation and Starter Feed Circuit Tests. The following operation will require a voltmeter, accurate to 1/10 of a volt.

**CAUTION:** Ignition and Fuel systems must be disabled to prevent engine start while performing the following tests.

1. To disable the Ignition and Fuel systems, disconnect the Automatic Shutdown Relay (ASD). The ASD relay is located in the Power Distribution Center (PDC). Refer to the PDC cover for proper relay location.
2. Gain access to battery terminals.

3. With all wiring harnesses and components properly connected, perform the following:
  - a. Connect the negative lead of the voltmeter to the battery negative post, and positive lead to the battery negative cable clamp. Rotate and hold the ignition switch in the START position. Observe the voltmeter. If voltage is detected, correct poor contact between cable clamp and post.
  - b. Connect positive lead of the voltmeter to the battery positive post, and negative lead to the battery positive cable clamp. Rotate and hold the ignition switch key in the START position. Observe the voltmeter. If voltage is detected, correct poor contact between the cable clamp and post.
  - c. Connect negative lead of voltmeter to battery negative terminal, and positive lead to engine block near the battery cable attaching point. Rotate and hold the ignition switch in the START position. If voltage reads above 0.2 volt, correct poor contact at ground cable attaching point. If voltage reading is still above 0.2 volt after correcting poor contacts, replace ground cable.
4. Connect positive voltmeter lead to the starter motor housing and the negative lead to the battery negative terminal. Hold the ignition switch key in the START position. If voltage reads above 0.2 volt, correct poor starter to engine ground.
  - a. Connect the positive voltmeter lead to the battery positive terminal, and negative lead to battery cable terminal on starter solenoid. Rotate and hold the ignition switch in the START position. If voltage reads above 0.2 volt, correct poor contact at battery cable to solenoid connection. If reading is still above 0.2 volt after correcting poor contacts, replace battery positive cable.
  - b. If resistance tests do not detect feed circuit failures, replace the starter motor.

## DIAGNOSIS AND TESTING - CONTROL CIRCUIT TEST

The starter control circuit has:

- Starter motor with integral solenoid
- Starter relay
- Transmission range sensor, or Park/Neutral Position switch with automatic transmissions
- Ignition switch
- Battery
- All related wiring and connections
- Powertrain Control Module (PCM)

**CAUTION:** Before performing any starter tests, the ignition and fuel systems must be disabled.

- To disable ignition and fuel systems, disconnect the Automatic Shutdown Relay (ASD). The ASD relay is located in the Power Distribution Center (PDC). Refer to the PDC cover for the proper relay location.

## STARTER SOLENOID

**WARNING:** CHECK TO ENSURE THAT THE TRANSMISSION IS IN THE PARK POSITION WITH THE PARKING BRAKE APPLIED. THIS MAY RESULT IN PERSONAL INJURY OR DEATH.

1. Verify battery condition. Battery must be in good condition with a full charge before performing any starter tests. Refer to Battery Tests.
2. Perform Starter Solenoid test BEFORE performing the starter relay test.
3. Perform a visual inspection of the starter/starter solenoid for corrosion, loose connections or faulty wiring.
4. Locate and remove the starter relay from the Power Distribution Center (PDC). Refer to the PDC label for relay identification and location.
5. Connect a remote starter switch or a jumper wire between the remote battery positive post and terminal 87 of the starter relay connector.
  - a. If engine cranks, starter/starter solenoid is good. Go to the Starter Relay Test.
  - b. If engine does not crank or solenoid chatters, check wiring and connectors from starter relay to starter solenoid and from the battery positive terminal to starter post for loose or corroded connections. Particularly at starter terminals.

- c. Repeat test. If engine still fails to crank properly, trouble is within starter or starter mounted solenoid, and replace starter. Inspect the ring gear teeth.

## STARTER RELAY

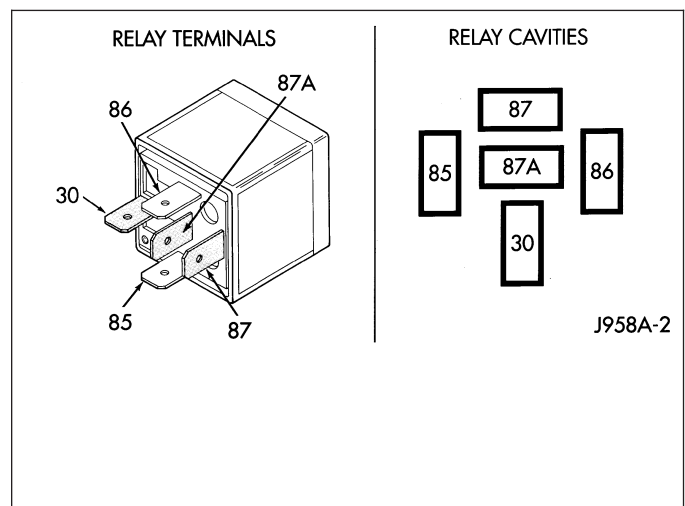
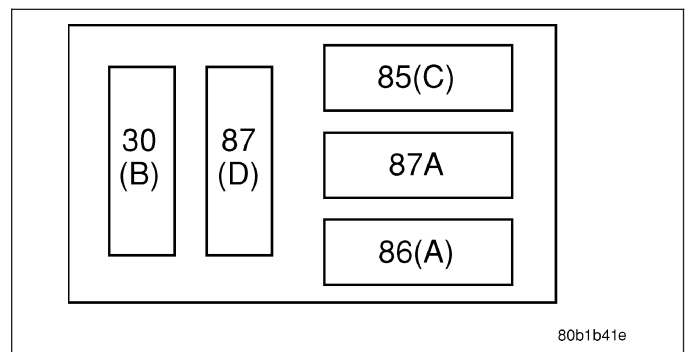
**WARNING: CHECK TO ENSURE THAT THE TRANSMISSION IS IN THE PARK/NEUTRAL POSITION WITH THE PARKING BRAKE APPLIED. THIS MAY RESULT IN PERSONAL INJURY OR DEATH.**

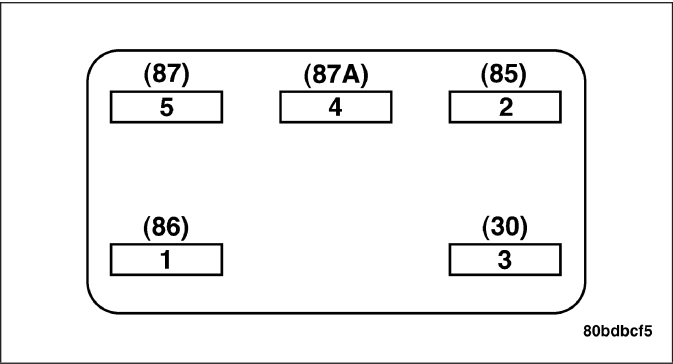
## RELAY TEST

The starter relay is located in the Power Distribution Center (PDC) in the engine compartment. Refer to the PDC label for relay identification and location.

Remove the starter relay from the PDC as described in this group to perform the following tests:

1. A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.
2. Resistance between terminals 85 and 86 (electromagnet) should be  $75 \pm 5$  ohms. If OK, go to Step 3. If not OK, replace the faulty relay.
3. Connect a battery B+ lead to terminals 85 and a ground lead to terminal 86 to energize the relay. The relay should click. Also test for continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, refer to Relay Circuit Test procedure. If not OK, replace the faulty relay.





CAV	FUNCTION
30	B (+)
85	IGNITION SWITCH OUTPUT
86	PCM-CONTROLLED GROUND
87	STARTER RELAY OUTPUT
87A	NO CONNECT

RELAY CIRCUIT TEST

1. The relay common feed terminal cavity (30) is connected to battery voltage and should be hot at all times. If OK, go to Step 2. If not OK, repair the open circuit to the PDC fuse as required.
2. The relay normally closed terminal (87A) is connected to terminal 30 in the de-energized position, but is not used for this application. Go to Step 3.
3. The relay normally open terminal (87) is connected to the common feed terminal (30) in the energized position. This terminal supplies battery voltage to the starter solenoid field coils. There should be continuity between the cavity for relay terminal 87 and the starter solenoid terminal at all times. If OK, go to Step 4. If not OK, repair the open circuit to the starter solenoid as required.
4. The coil battery terminal (85) is connected to the electromagnet in the relay. It is energized when the ignition switch is held in the Start position and the clutch pedal is depressed (manual trans). Check for battery voltage at the cavity for relay terminal 86 with the ignition switch in the Start position and the clutch pedal is depressed (manual trans), and no voltage when the ignition switch is released to the On position. If OK, go to Step 5. If not OK, check for an open or short circuit to the ignition switch and repair, if required. If the circuit to the ignition switch is OK, see the Ignition Switch Test procedure in this group.
5. The coil ground terminal (86) is connected to the electromagnet in the relay. It is grounded by the PCM if the conditions are right to start the car. For automatic trans. cars the PCM must see Park Neutral switch low and near zero engine speed (rpm). For manual trans. cars the PCM only needs to see near zero engine speed (rpm) and low clutch interlock input and see near zero engine speed (rpm). To diagnose the Park Neutral switch of the trans range sensor refer to the transaxle section. Check for continuity to ground while the ignition switch is in the start position and if equipped the clutch pedal depressed. If not OK and the vehicle has an automatic trans. verify Park Neutral switch operation. If that checks OK check for continuity between PCM and the terminal 86. Repair open circuit as required. Also check the clutch interlock switch operation if equipped with a manual transmission. If OK, the PCM may be defective.

SAFETY SWITCHES

For diagnostics of the Transmission Range Sensor, refer to the Transaxle section for more information.  
If equipped with Clutch Interlock/Upstop Switch, refer to Diagnosis and Testing in the Clutch section.

IGNITION SWITCH

After testing starter solenoid and relay, test ignition switch and wiring. Refer to the Ignition Section or Wiring Diagrams for more information. Check all wiring for opens or shorts, and all connectors for being loose or corroded.

BATTERY

For battery diagnosis and testing, refer to the Battery section for procedures.

## ALL RELATED WIRING AND CONNECTORS

Refer to Wiring Diagrams for more information.

## SPECIFICATIONS

### TORQUE

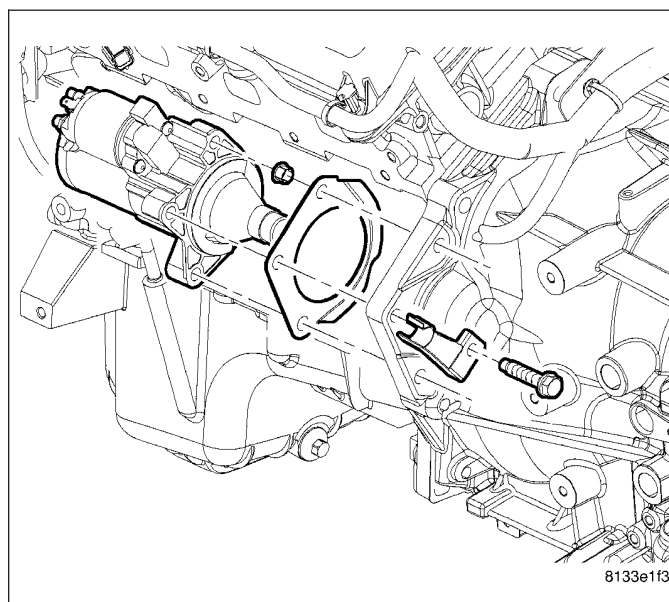
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
2.7L Starter Mounting bolts	54.2	40	-
3.5L Starter Mounting bolts	54.2	40	-
5.7L Starter Mounting bolts	54.2	40	-
Intermediate Shaft Pinch Bolt	43	32	-
Starter B+ Nut	11	-	97.4

## STARTER MOTOR

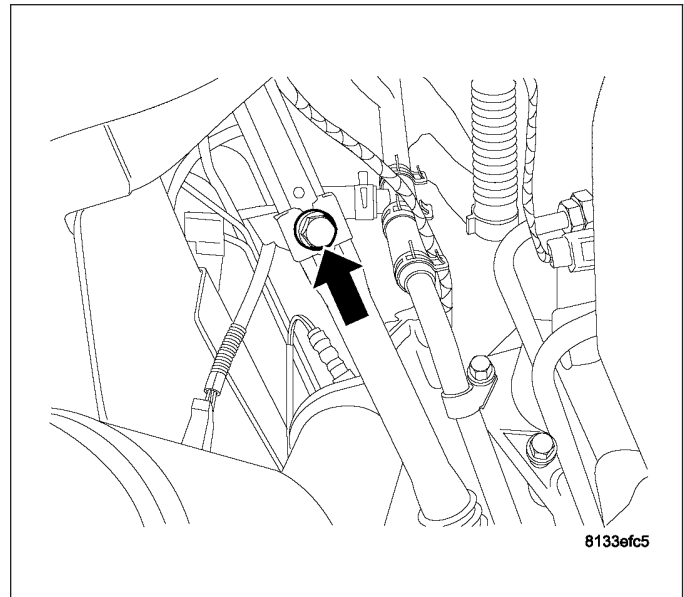
### REMOVAL

#### 2.7L

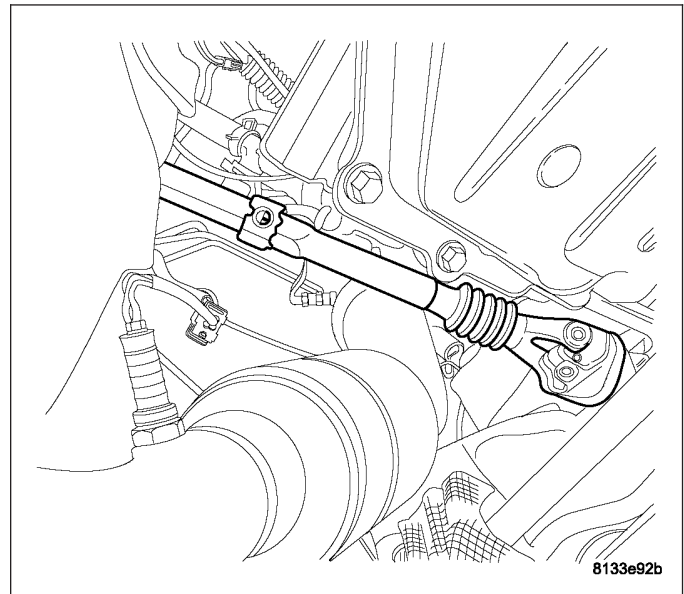
1. Disconnect negative battery cable
2. Install steering wheel holder locking steering wheel in straight-ahead position.
3. Raise vehicle and support.
4. Remove the underbody splash shield.
5. Starter assembly.



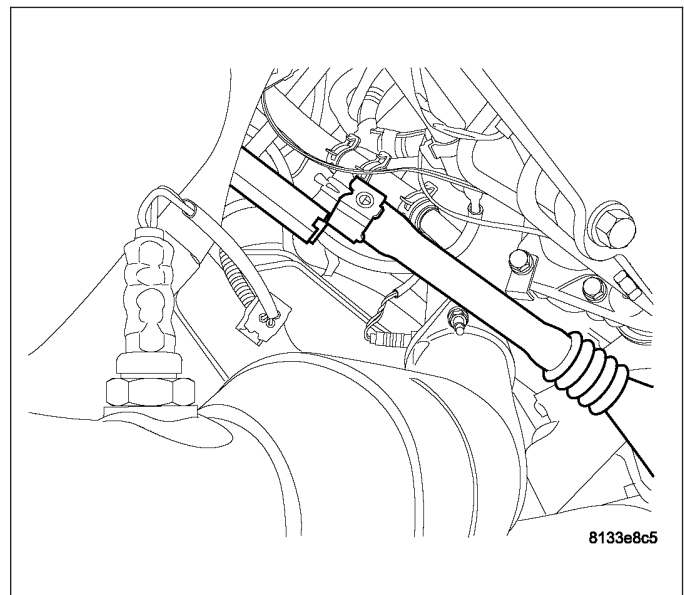
6. Remove the intermediate steering shaft center bolt.



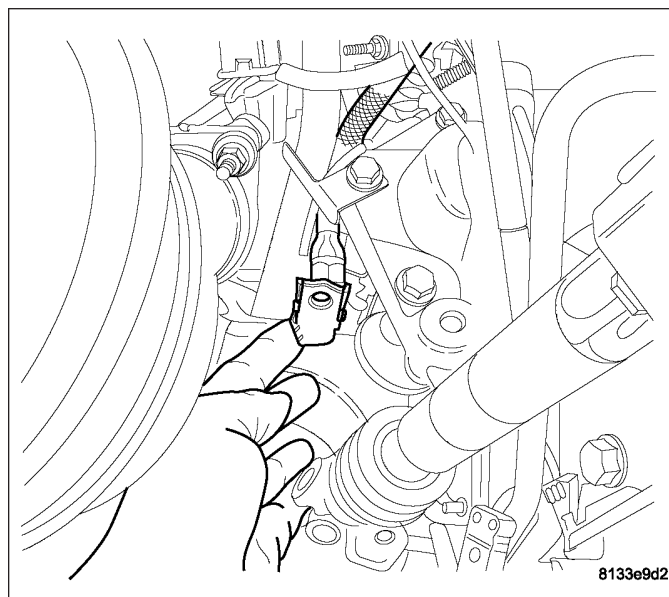
7. Bolt removed.



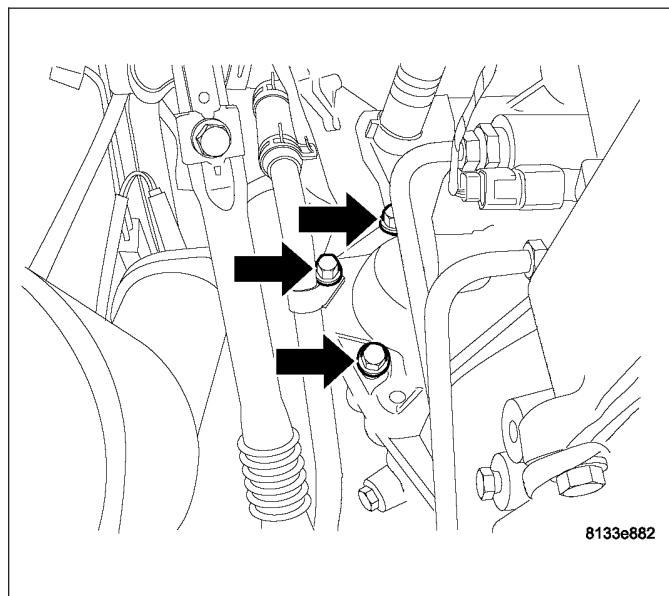
8. Separate the intermediate steering shaft upper and lower shaft.



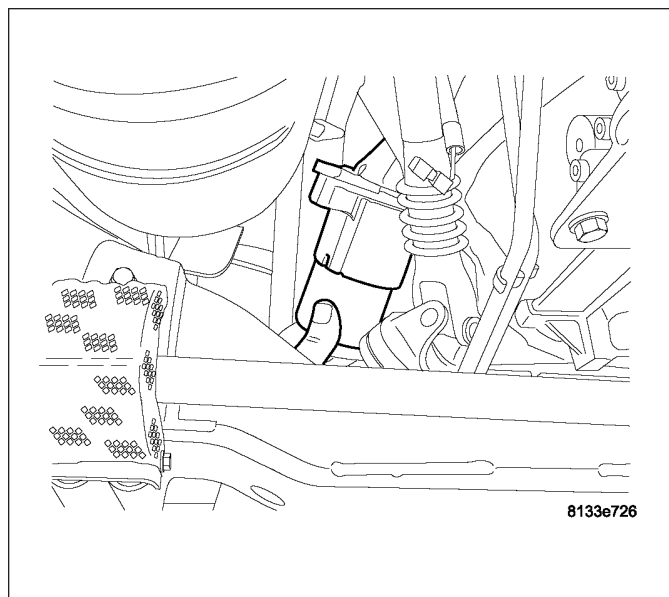
9. Disconnect the electrical connection from the starter.



10. Remove the 3 starter mounting bolts and wiring clip.

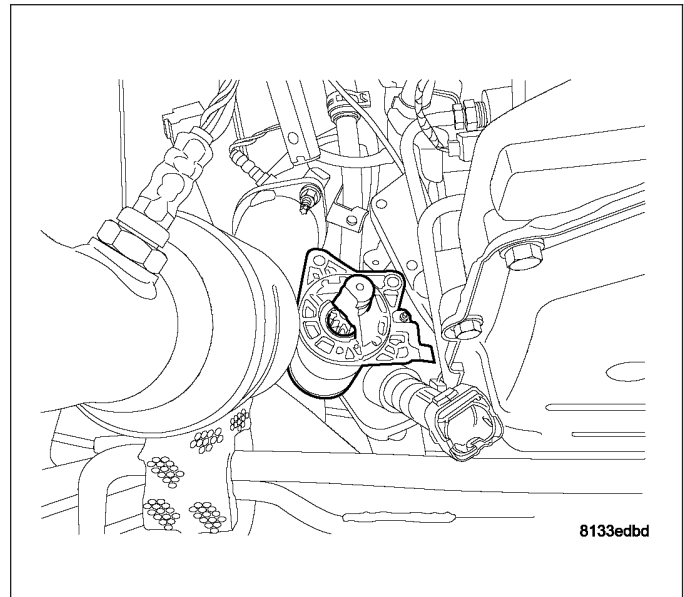


11. Pull starter forward and down.

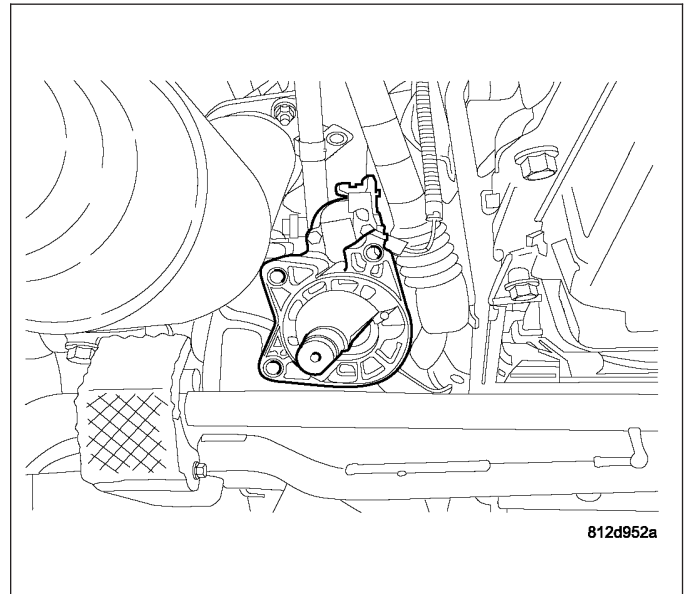




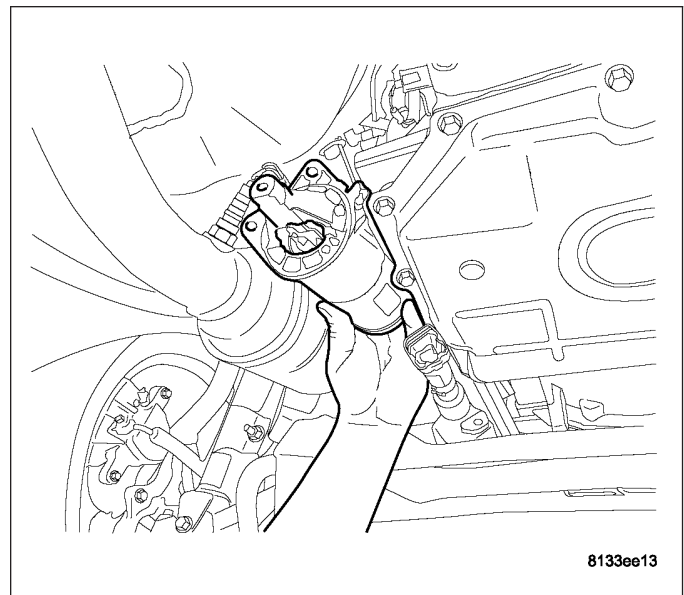
12. Work starter up and around exhaust.



13. Work starter past the intermediate steering shaft.

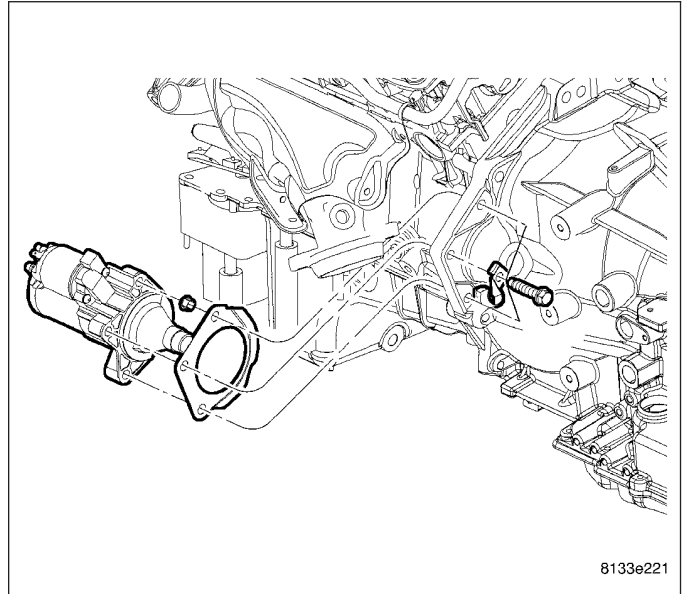


14. Remove starter from vehicle.

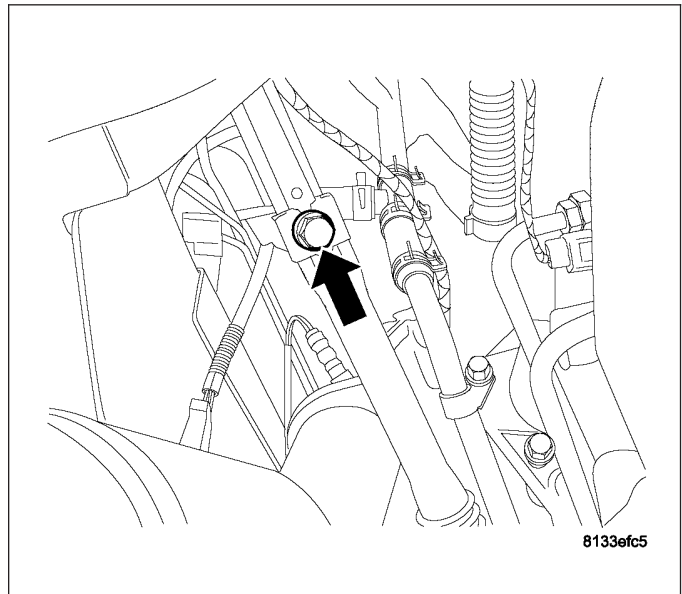


### 3.5L

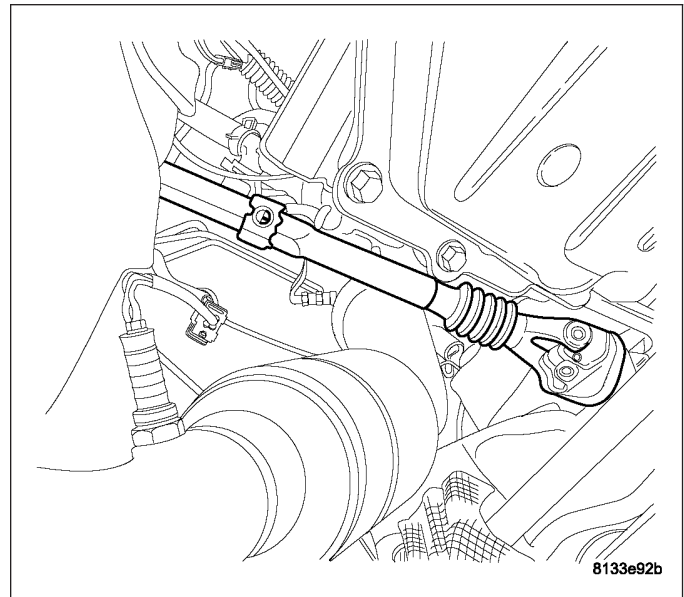
1. Disconnect negative battery cable
2. Install steering wheel holder locking steering wheel in straight-ahead position.
3. Raise vehicle and support.
4. Remove the underbody splash shield.
5. Starter assembly.



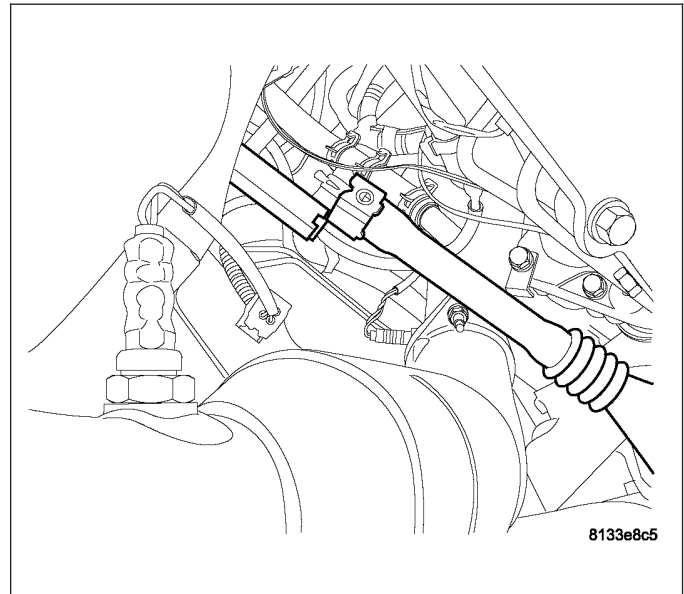
6. Remove the intermediate steering shaft center bolt.



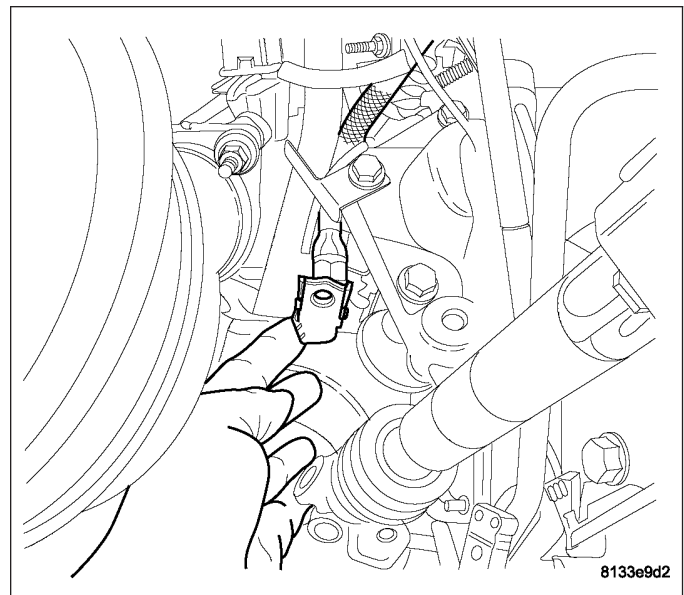
7. Bolt removed.



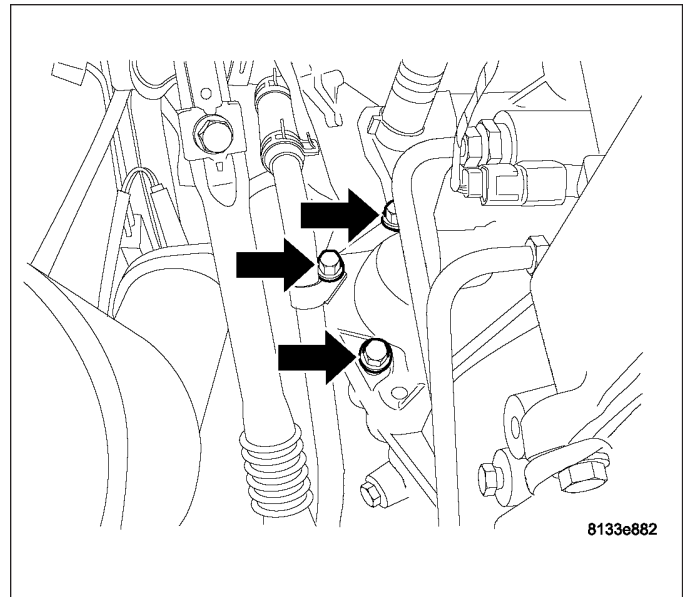
8. Separate the intermediate steering shaft upper and lower shaft.



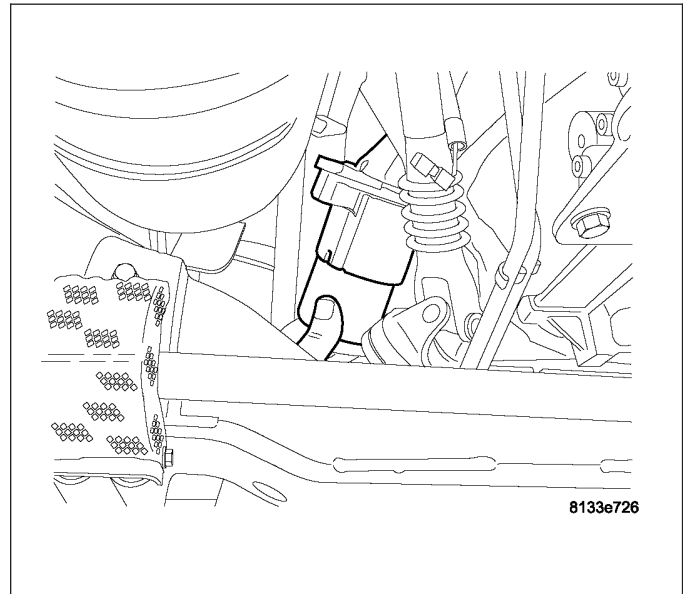
9. Disconnect the electrical connection from the starter.



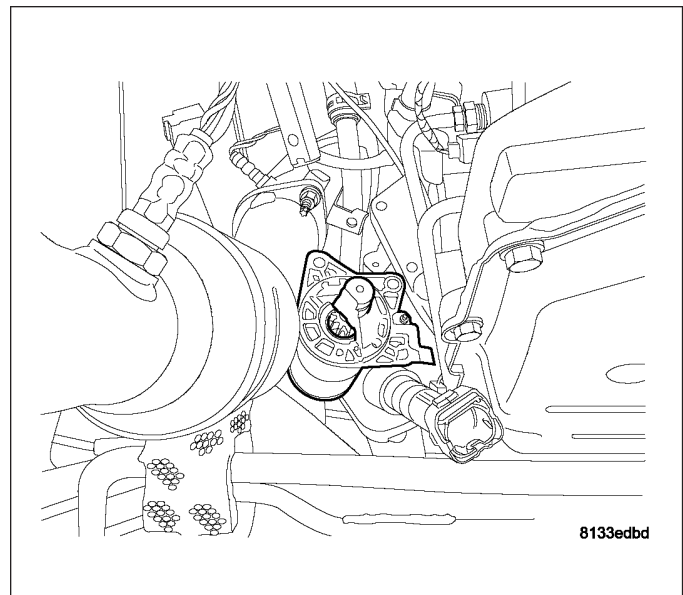
10. Remove the 3 starter mounting bolts and wiring clip.



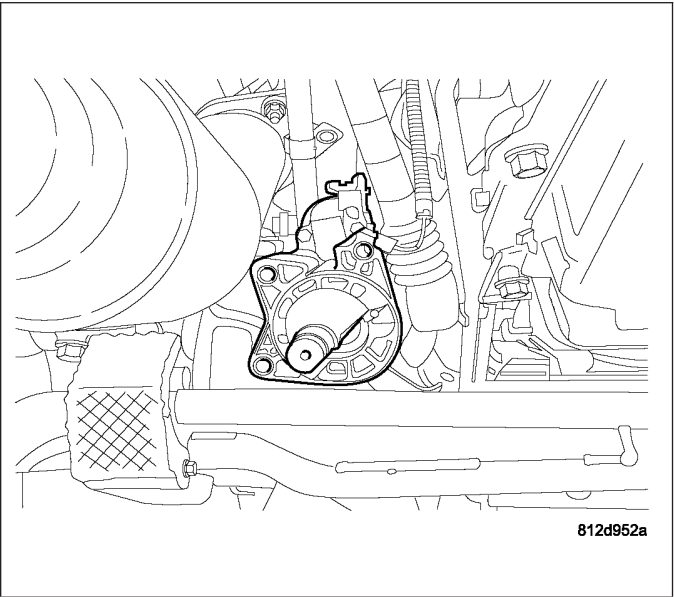
11. Pull starter forward and down.



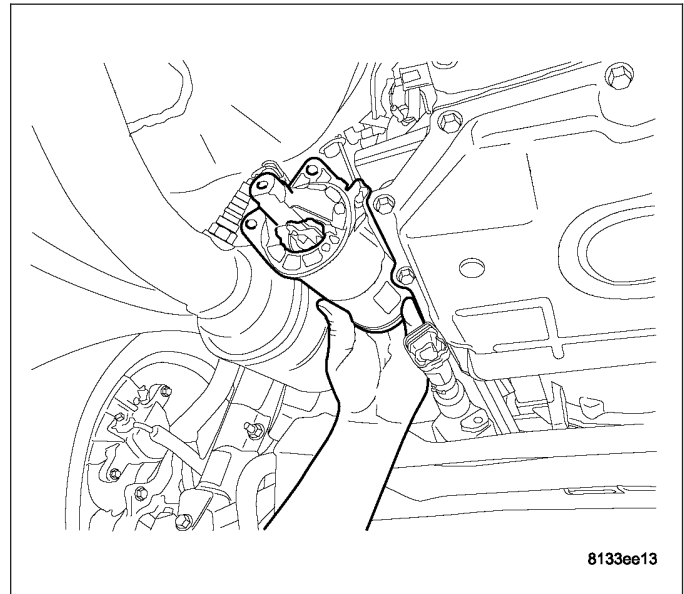
12. Work starter up and around exhaust.



13. Work starter past the intermediate steering shaft.

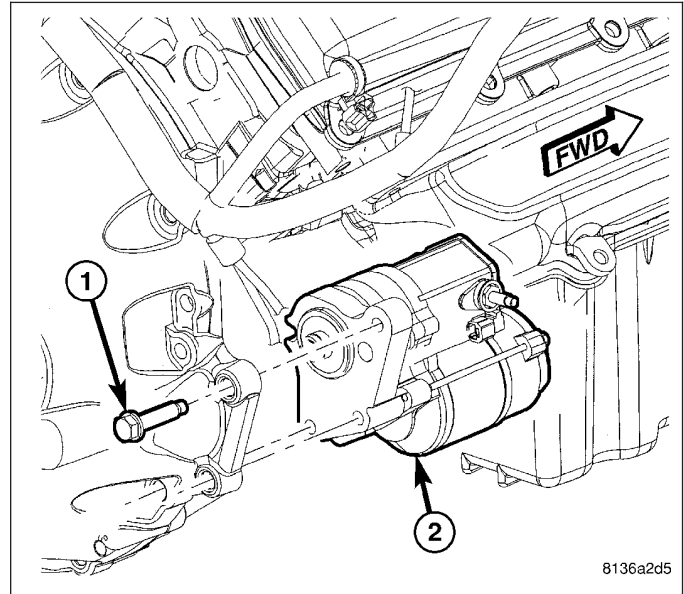


14. Remove starter from vehicle.



**5.7L****REAR WHEEL DRIVE (RWD)**

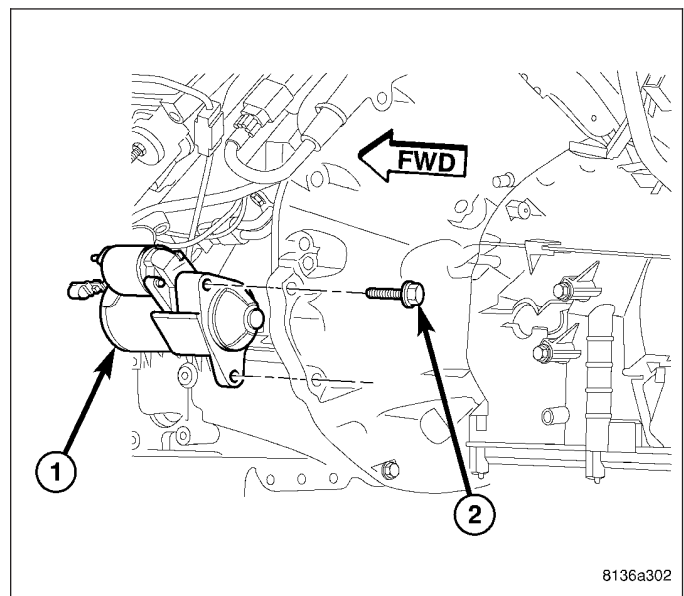
1. Disconnect and isolate negative battery cable.
2. Raise and support vehicle.
3. Remove three starter mounting bolts (1).
4. Move starter motor (2) towards front of vehicle far enough for nose of starter to clear. Always support starter motor (2) during this process. Do not let starter motor hang from wire harness.
5. Remove battery cable-to-solenoid nut.
6. Remove solenoid wire from solenoid stud.
7. Remove starter motor.

**ALL WHEEL DRIVE (AWD)**

1. Disconnect and isolate negative battery cable.
2. Raise and support vehicle.

The steering gear assembly must be partially lowered to gain access to starter. Do not disconnect any hydraulic hoses or remove any steering linkage. Proceed.

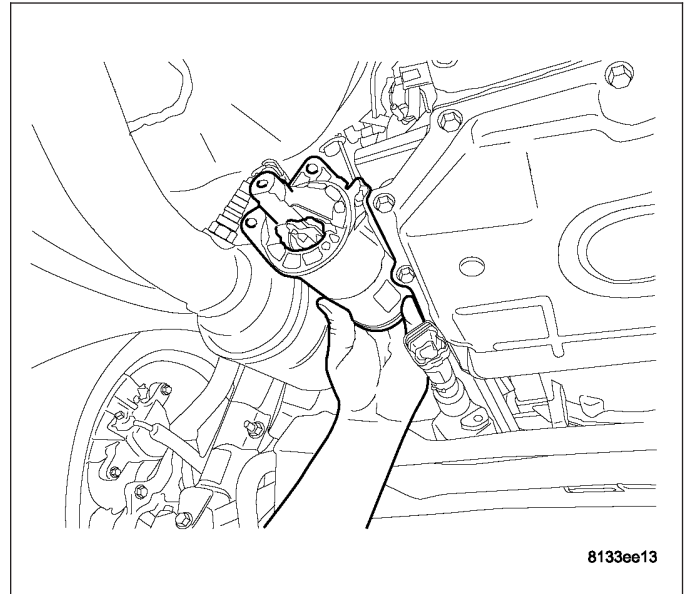
3. Remove coupling bolt (pinch bolt) securing steering gear to steering column.
4. Remove three steering gear mounting bolts and slightly lower gear. Temporarily support the steering gear.
5. Remove steering gear heat-shield.
6. Remove two starter mounting bolts (2).
7. Move starter motor (1) towards front of vehicle far enough for nose of starter to clear. Always support starter motor (1) during this process. Do not let starter motor hang from wire harness.
8. Remove battery cable-to-solenoid nut.
9. Remove solenoid wire from solenoid stud.
10. Remove starter motor.



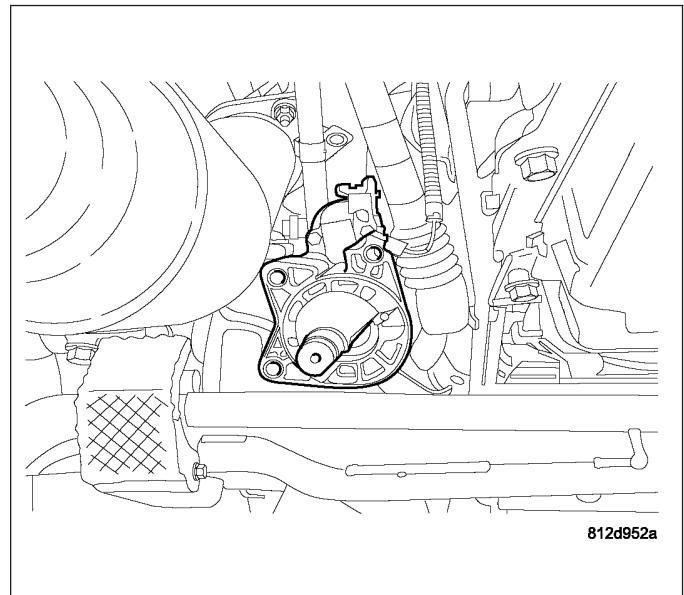
## INSTALLATION

### 2.7L

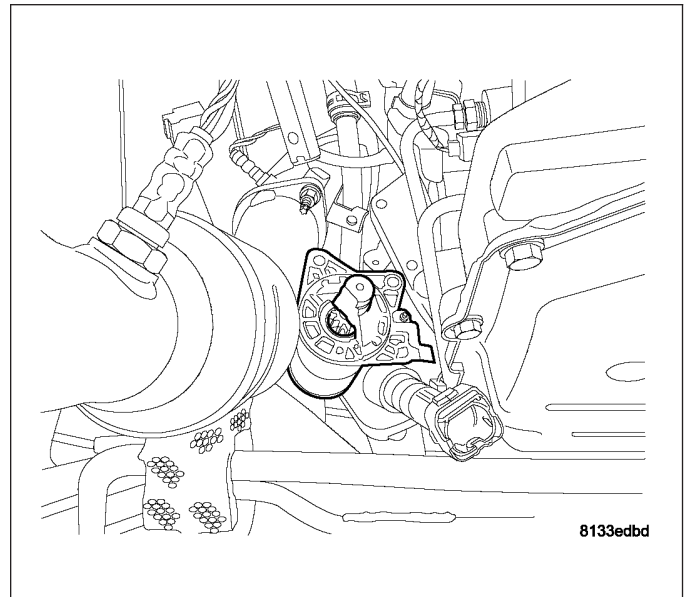
1. Work starter up and pass the transmission and exhaust.



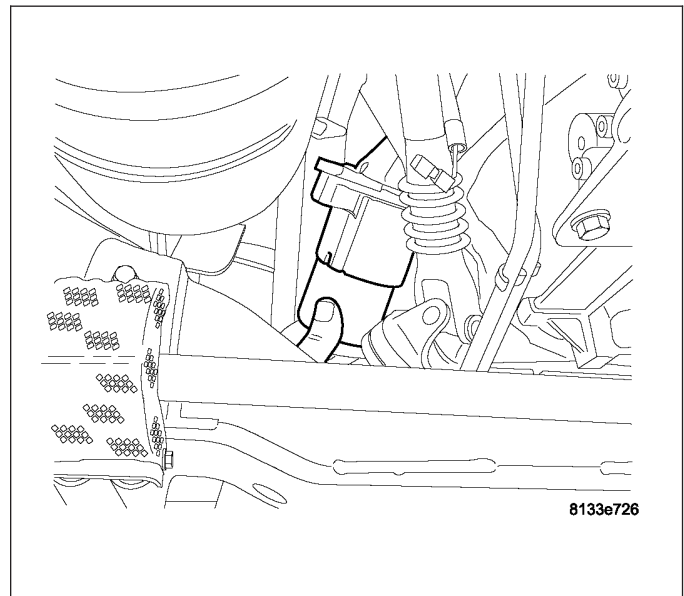
2. Work starter up and pass the intermediate shafts.



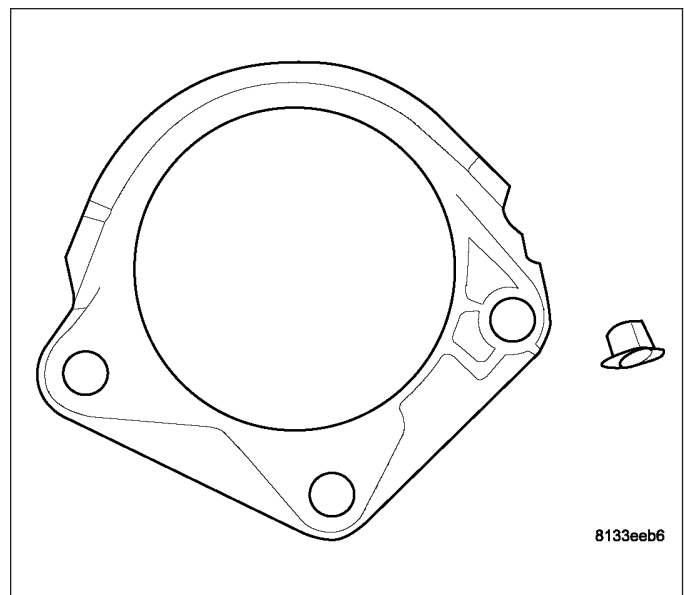
3. Starter pass the intermediate shaft.



4. Angle starter up toward engine.

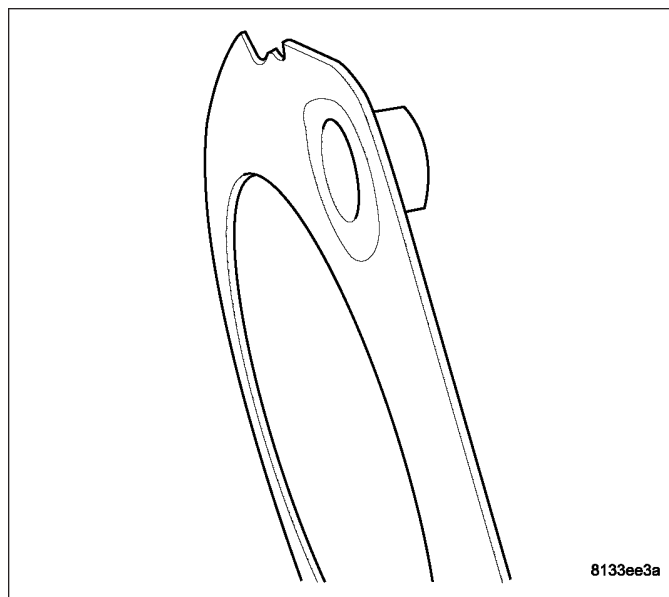


5. Install plastic retainer into starter dust shield. The dust shield has TOP marked on it and the plastic retainer goes in the hole.

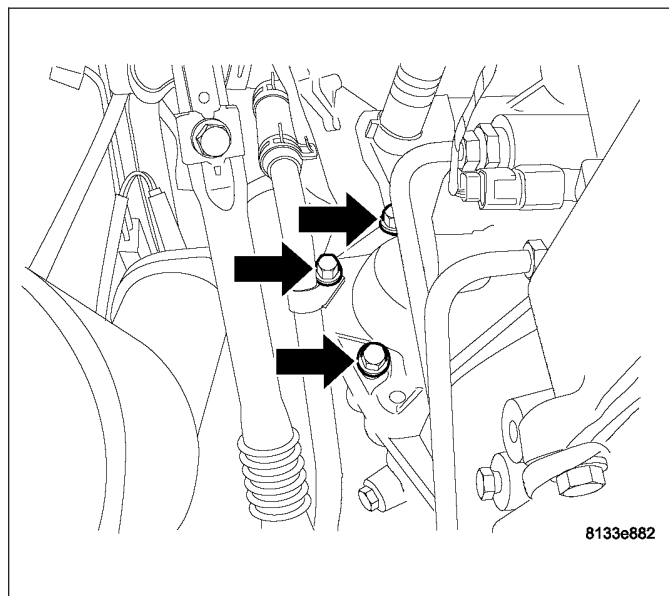




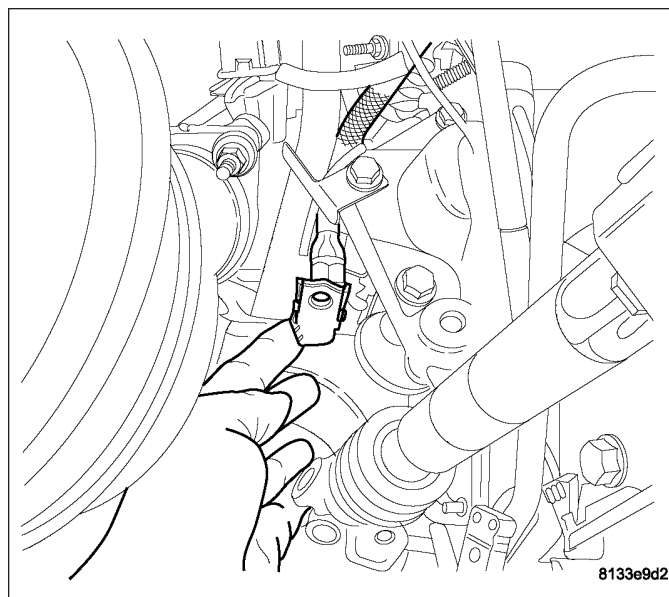
6. Plastic retainer installed.
7. Install dust shield to the engine block using the plastic retainer to hold dust shield in place.



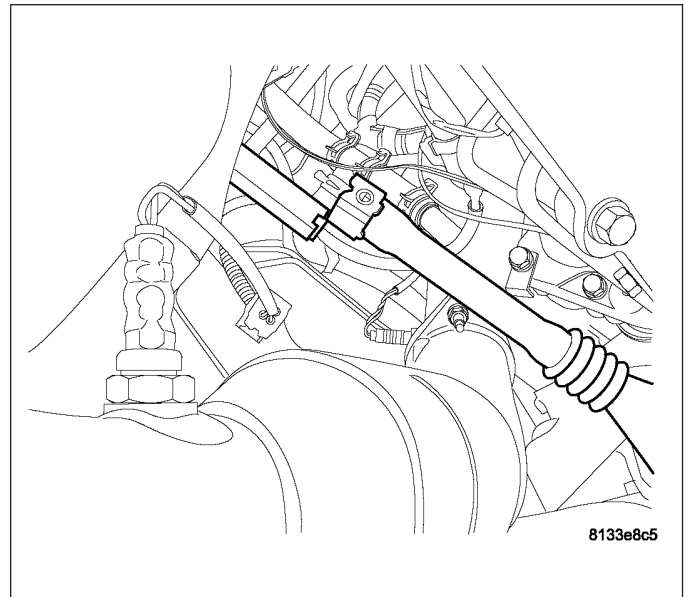
8. Install starter.
9. Install starter bolts.
10. Tighten bolts to 54.2 N·m (40 ft. lbs.).



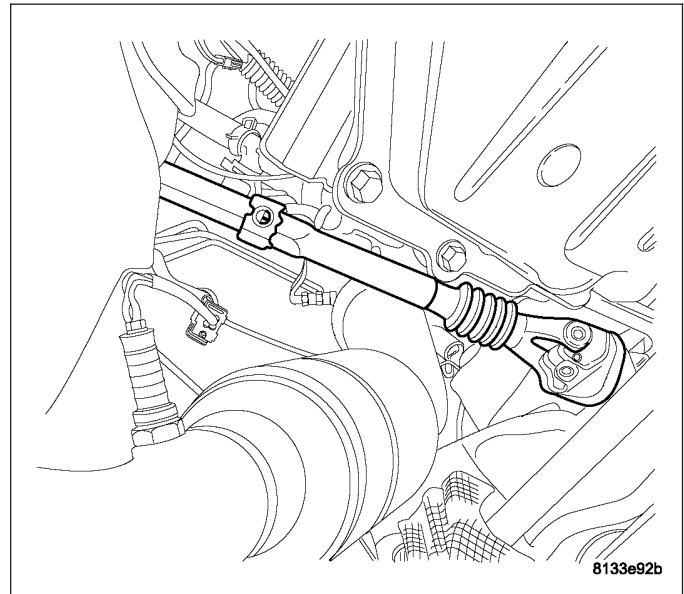
11. Install electrical connection to starter.



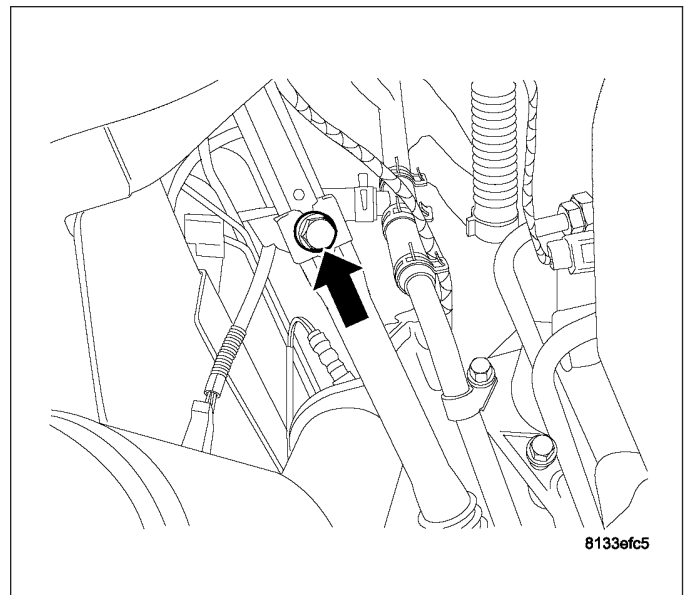
12. Match flats inside intermediate shaft with that in intermediate shaft extension, then slide intermediate shaft onto extension.



13. Aline the hole in the shafts.

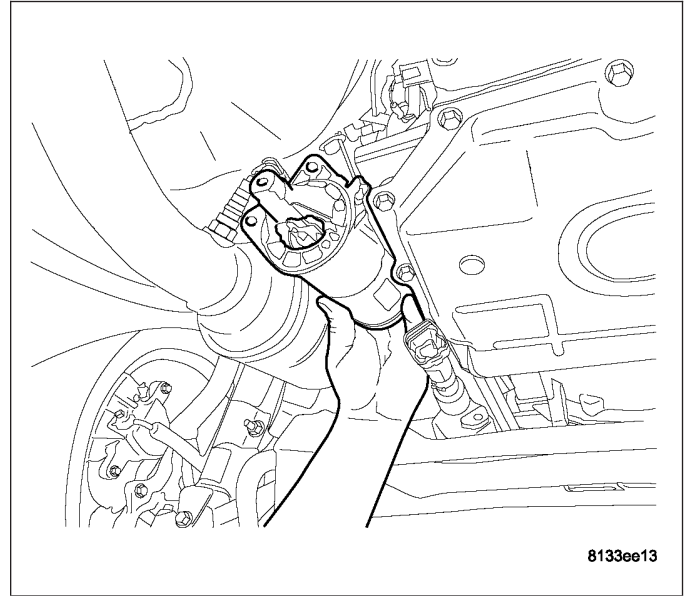


14. Install pinch bolt fastening intermediate shaft to intermediate shaft extension.  
15. Tighten pinch bolt to 43 N·m (32 ft. lbs.).  
16. Install the underbody splash shield.  
17. Lower vehicle.  
18. Remove the steering wheel holder.  
19. Connect negative battery cable.

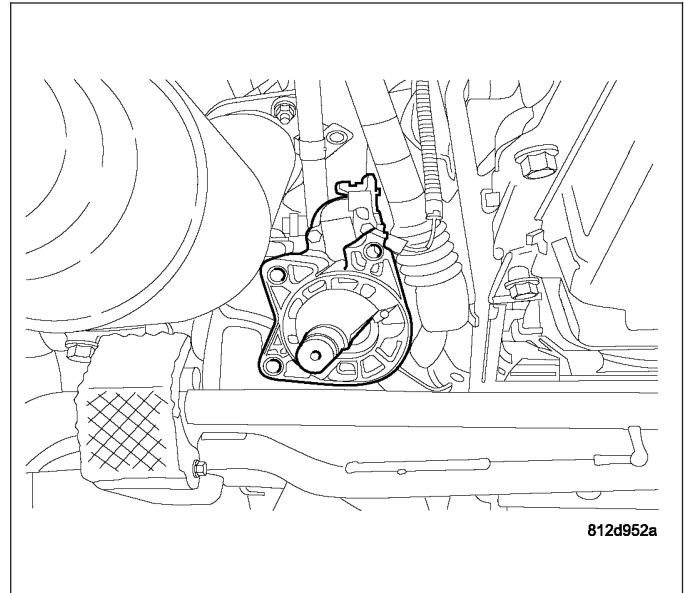


**3.5L**

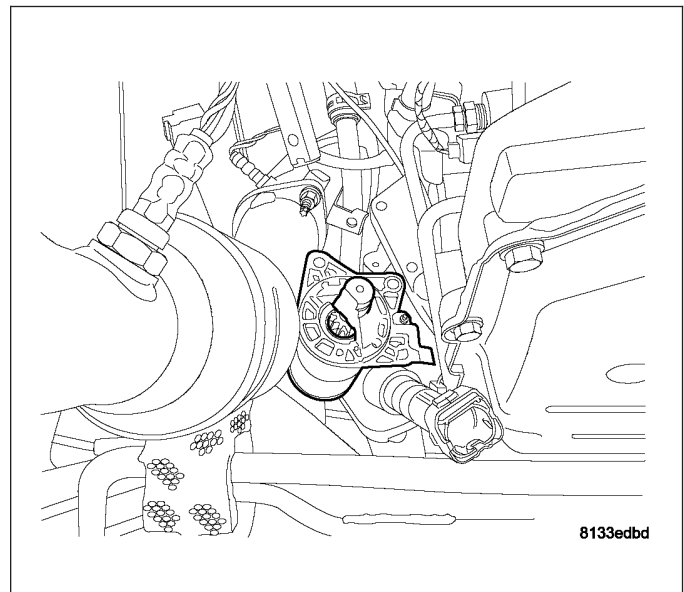
1. Work starter up and pass the transmission and exhaust.



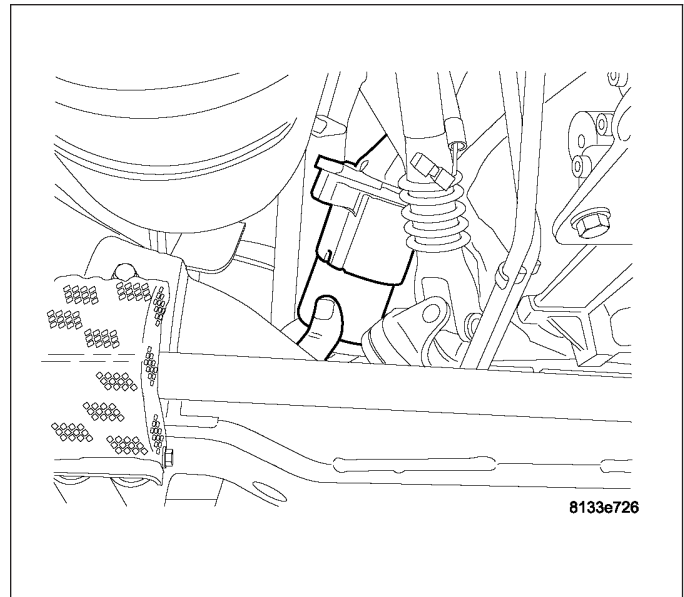
2. Work starter up and pass the intermediate shafts.



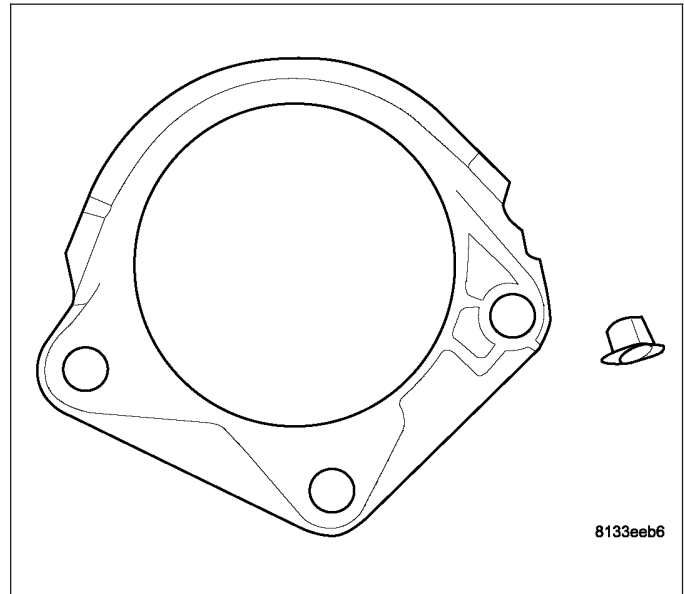
3. Starter pass the intermediate shaft.



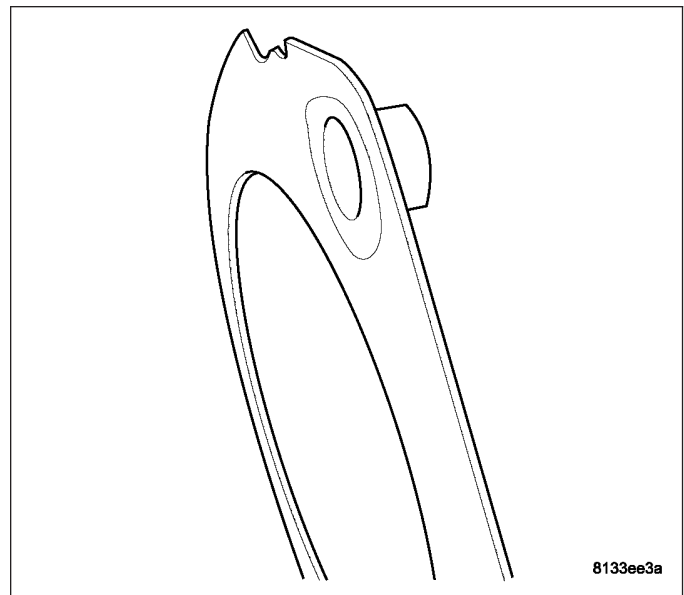
4. Angle starter up toward engine.



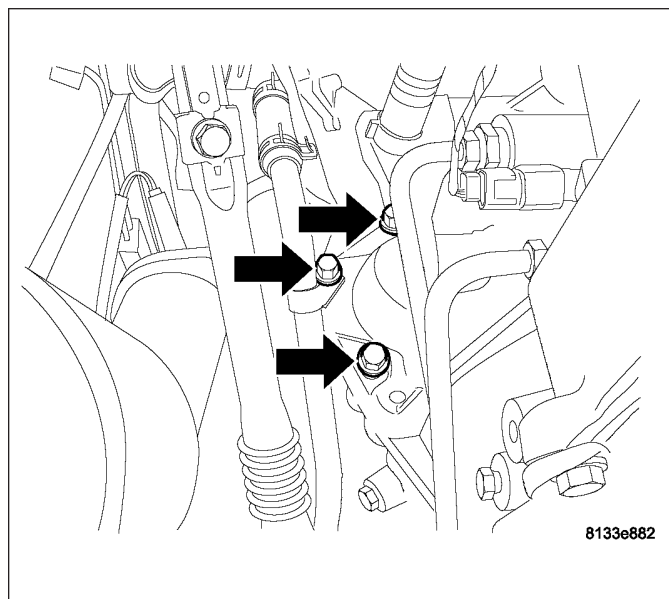
5. Install plastic retainer into starter dust shield. The dust shield has TOP marked on it and the plastic retainer goes in the hole.



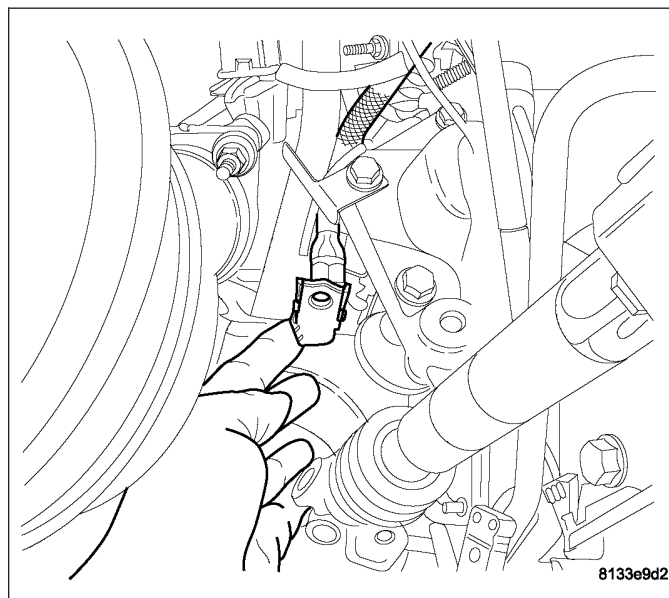
6. Plastic retainer installed.
7. Install dust shield to the engine block using the plastic retainer to hold dust shield in place.



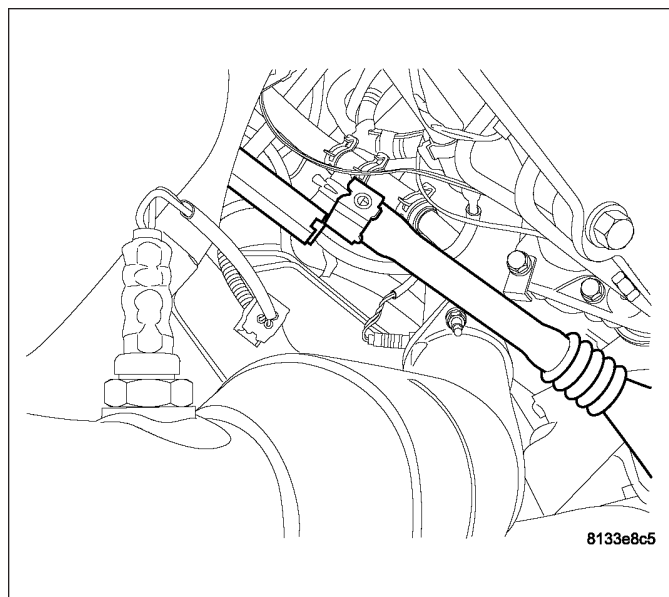
8. Install starter.
9. Install starter bolts.
10. Tighten bolts to 54.2 N·m (40 ft. lbs.).



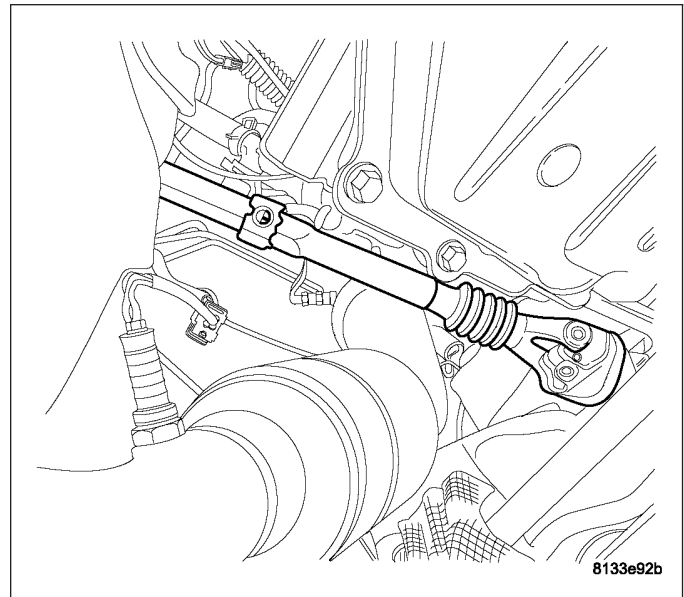
11. Install electrical connection to starter.



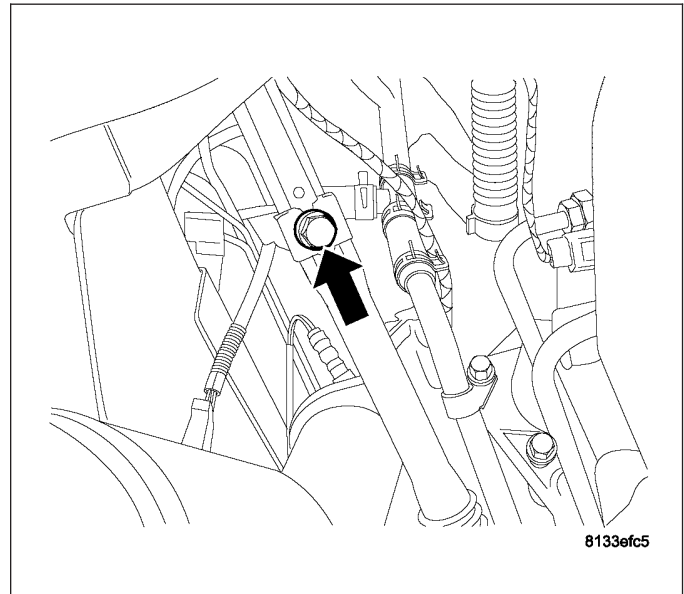
12. Match flats inside intermediate shaft with that in intermediate shaft extension, then slide intermediate shaft onto extension.



13. Aline the hole in the shafts.



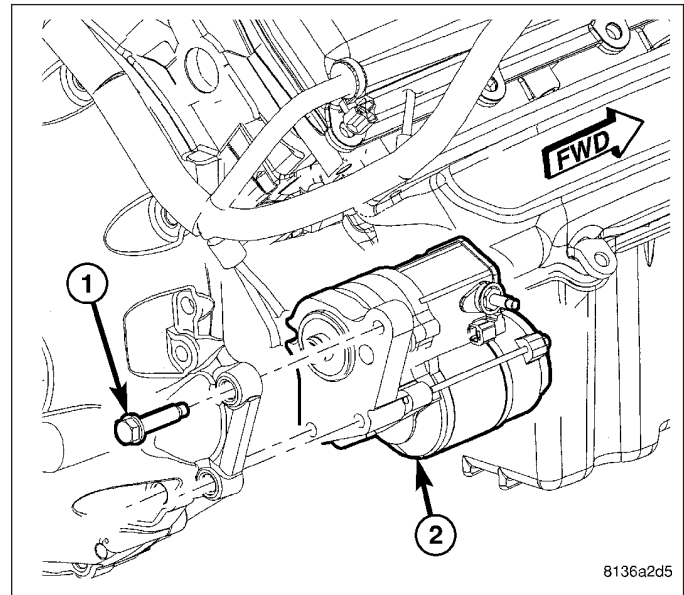
- 14. Install pinch bolt fastening intermediate shaft to intermediate shaft extension.
- 15. Tighten pinch bolt to 43 N·m (32 ft. lbs.).
- 16. Install the underbody splash shield.
- 17. Lower vehicle.
- 18. Remove the steering wheel holder.
- 19. Connect negative battery cable.



## 5.7L

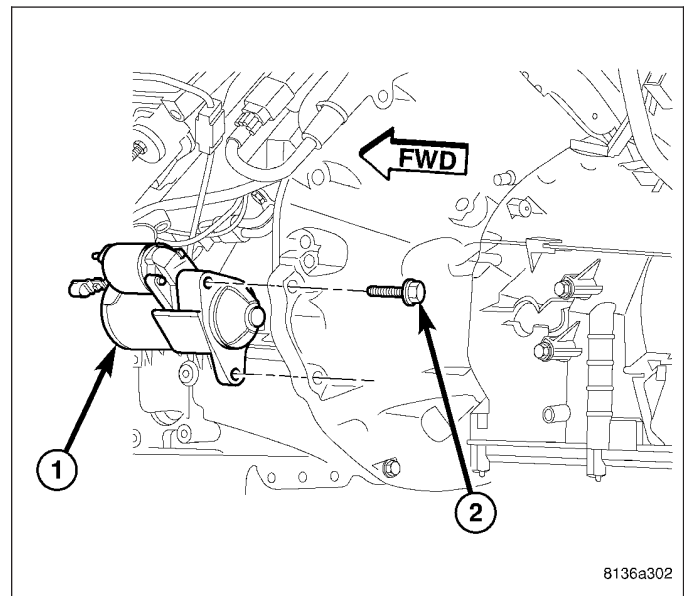
### REAR WHEEL DRIVE (RWD)

1. Position starter (2) into transmission but do not install bolts.
2. Connect solenoid wire to starter motor (snaps on).
3. Position battery cable to solenoid stud. Install and tighten battery cable eyelet nut. Refer to Torque Specifications. Do not allow starter motor to hang from wire harness.
4. Install and tighten three mounting bolts (1). Refer to Torque Specifications.
5. Lower vehicle.
6. Connect negative battery cable.



### ALL WHEEL DRIVE (AWD)

1. Position starter (1) into transmission but do not install bolts.
2. Connect solenoid wire to starter motor (snaps on).
3. Position battery cable to solenoid stud. Install and tighten battery cable eyelet nut. Refer to Torque Specifications. Do not allow starter motor to hang from wire harness.
4. Install and tighten both mounting bolts (2). Refer to Torque Specifications.
5. Install steering gear assembly and mounting bolts. Install steering column coupling bolt (pinch bolt). Refer to Steering section for torque specifications.
6. Install steering gear heat-shield.
7. Lower vehicle.
8. Connect negative battery cable.



# HEATED SYSTEMS

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## HEATED GLASS - SERVICE INFORMATION

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## HEATED GLASS - SERVICE INFORMATION

### DESCRIPTION

#### CHRYSLER

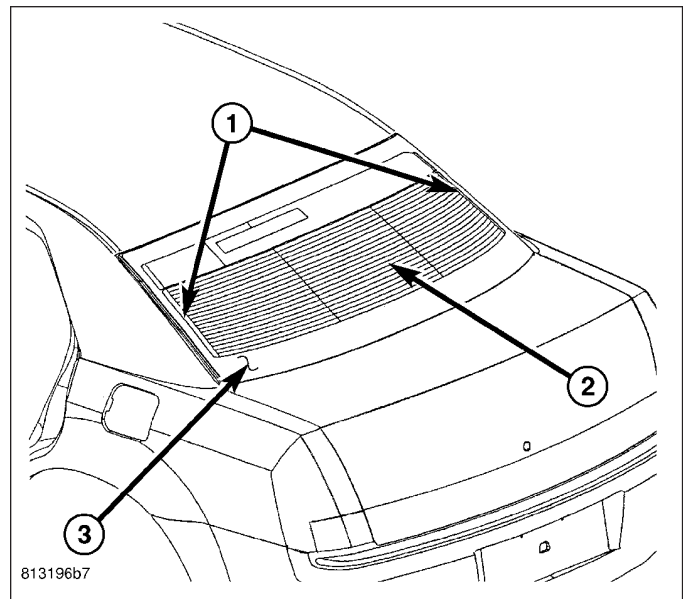
**CAUTION:** Grid lines can be damaged or scraped off with sharp instruments. Care should be taken in cleaning glass or removing foreign materials, decals or stickers. Normal glass cleaning solvents or hot water used with rags or toweling is recommended.



The rear window defogger system, also known as electric backlight (EBL), consists of two vertical bus bars (1) linked by a series of grid lines (2) fired onto the inside surface of the rear window (3).

The EBL system is turned ON or OFF by a control switch located on the A/C-heater control at the center of the instrument panel and by a rear window defogger relay timing circuit integral to the front control module (FCM) (Refer to 8 - ELECTRICAL/HEATED GLASS/SWITCH-REAR WINDOW DEFOGGER - DESCRIPTION).

Circuit protection is provided by a fuse located in the junction block (JB).



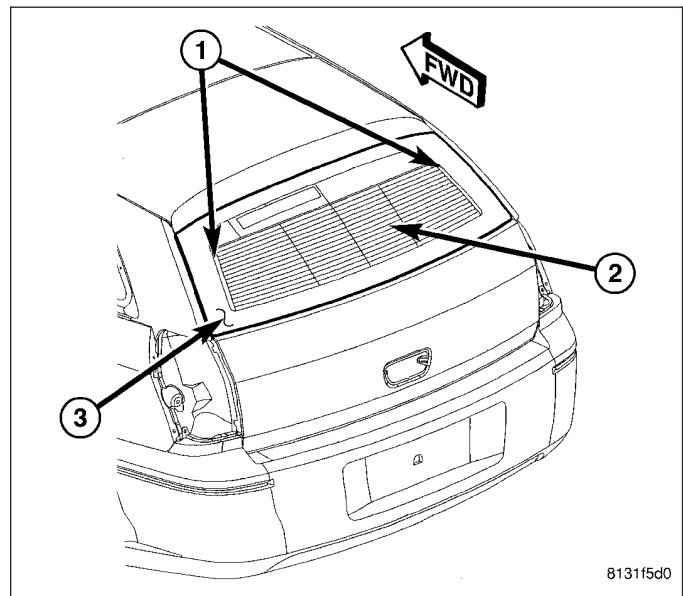
## DODGE

**CAUTION:** Grid lines can be damaged or scraped off with sharp instruments. Care should be taken in cleaning glass or removing foreign materials, decals or stickers. Normal glass cleaning solvents or hot water used with rags or toweling is recommended.

The rear window defogger system, also known as electric backlight (EBL), consists of two vertical bus bars (1) linked by a series of grid lines (2) fired onto the inside surface of the rear window (3).

The EBL system is turned ON or OFF by a control switch located on the A/C-heater control at the center of the instrument panel and by a rear window defogger relay timing circuit integral to the front control module (FCM) (Refer to 8 - ELECTRICAL/HEATED GLASS/SWITCH-REAR WINDOW DEFOGGER - DESCRIPTION).

Circuit protection is provided by a fuse located in the junction block (JB).



## OPERATION

The electric backlight (EBL) system is controlled by a momentary switch (1) located in the A/C-heater control (2) on the instrument panel. When the defogger switch for the EBL system is pressed to the On position, current is directed to the rear defogger grid lines and the heated power mirrors (when equipped). The heated grid lines heat the glass to help clear the rear window and side mirror surfaces of fog or frost.

A yellow indicator (3) in the defogger switch will illuminate to indicate when the EBL system is turned on. The front control module (FCM) contains the EBL system control circuitry.

**Note: The EBL system turns off automatically after approximately ten minutes of initial operation. Each following activation cycle of the EBL system will last approximately five minutes.**

The EBL system will be automatically turned off after a programmed time interval of about ten minutes. After the initial time interval has expired, if the defogger switch is turned on again during the same ignition cycle, the EBL system will automatically turn off after about five minutes.

The EBL system will automatically shut off if the ignition switch is turned to the Off position, or it can be turned off manually by depressing the defogger switch a second time.

Repair of the rear defogger grid lines, bus bars, terminals or pigtail wires can be accomplished using the Mopar Rear Window Defogger Repair Kit (Part Number 04549275) or equivalent (Refer to 8 - ELECTRICAL/HEATED GLASS/REAR WINDOW DEFOGGER GRID - STANDARD PROCEDURE - GRID LINE REPAIR).

## DIAGNOSIS AND TESTING

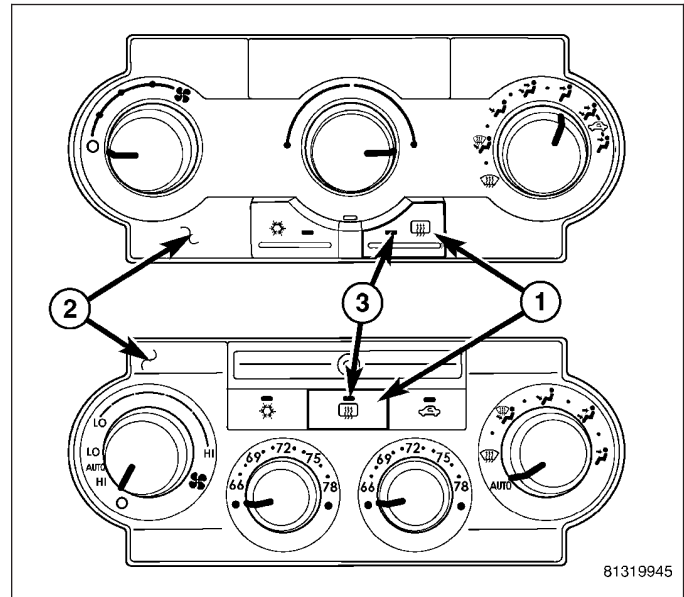
### ELECTRIC BACKLIGHT (EBL) SYSTEM

**Note: Illumination of the defogger switch indicator lamp means that there is electrical current available at the output of the rear window defogger logic circuitry, but does not confirm that the electrical current is reaching the rear glass heating grid lines.**

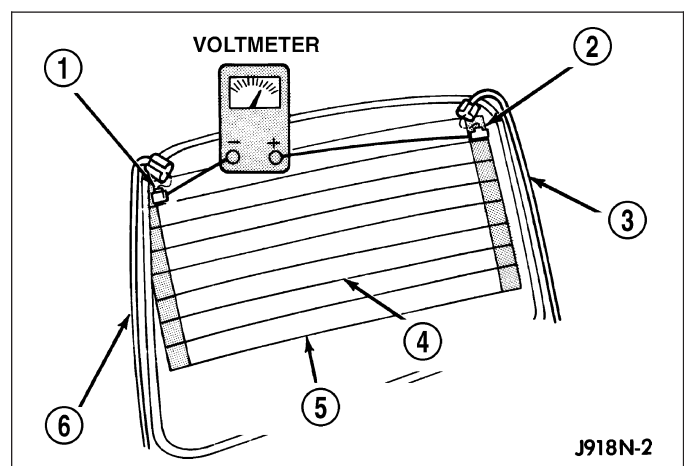
**Note: For circuit descriptions and diagrams of the rear window defogger system, refer to 8W - WIRING DIAGRAM INFORMATION.**

Operation of the electrical backlight (EBL) system can be confirmed by the following:

1. If equipped with the automatic temperature control (ATC) heating-A/C system, use a scan tool and check for diagnostic trouble codes (DTCs) related to the A/C-heater control and the front control module (FCM). If equipped with the manual temperature control (MTC) heating-A/C system, use the A/C-heater control to check for diagnostic trouble codes (DTCs) related to the A/C-heater control (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING - HVAC SELF DIAGNOSTICS). If no DTCs are found, go to Step 2. If any DTCs are found, repair as required, then proceed to Step 2.
2. Turn the ignition switch to the On position. Set the defogger switch in the On position. The rear win-



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dow defogger operation can be checked by feeling the rear window or outside rear view mirror glass. A distinct difference in temperature between the grid lines (4 and 5) and the adjacent clear glass or the mirror glass can be detected within three to four minutes of operation.

3. If a temperature difference is not detected, use a 12-volt DC voltmeter and contact the rear glass heating grid terminal A (1) with the negative lead, and terminal B (2) with the positive lead. The voltmeter should read battery voltage. If the voltmeter does not read battery voltage, check the following:
  - Confirm that the ignition switch is in the On position.
  - Make sure that the rear glass heating grid feed wire (3) and ground wire (6) are connected to the terminals. Confirm that the ground wire has continuity to ground.
  - Check the EBL relay and fuse located in the junction block at the rear of the vehicle. The relay and fuse must be tight in their receptacles and all electrical connections must be secure (Refer to 8 - ELECTRICAL/HEATED GLASS/RELAY-REAR WINDOW DEFOGGER - REMOVAL).

When the above steps have been completed and the rear glass heating grid is still inoperative, one or more of the following is faulty:

- Rear window defogger control switch in the A/C-heater control.
- Rear window defogger grid lines (all grid lines would have to be broken, or the power feed or the ground wire disconnected, for the entire heating grid to be inoperative).

## GRID-REAR WINDOW DEFOGGER

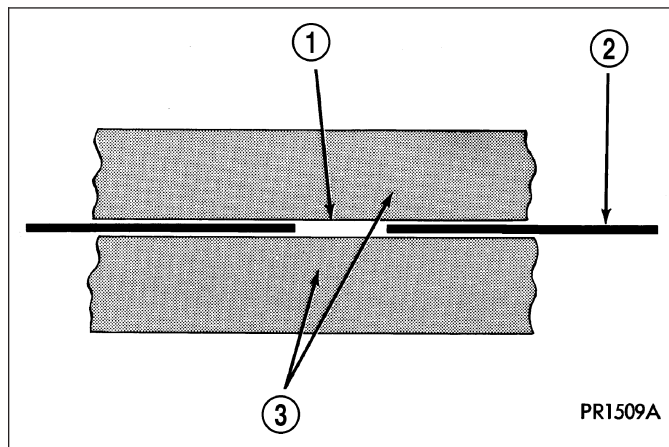
### STANDARD PROCEDURE

### GRID LINE AND TERMINAL REPAIR PROCEDURE

**WARNING:** Materials contained in the Repair Kit (Part Number 04549275) may cause skin or eye irritation. The kit contains epoxy resin and amine type hardener, which are harmful if swallowed. Avoid contact with the skin and eyes. For skin contact, wash the affected areas with soap and water. For contact with the eyes, flush with plenty of water. Do not take internally. If taken internally, induce vomiting and call a physician immediately. Use with adequate ventilation. Do not use near fire or flame. Contains flammable solvents. Keep out of the reach of children. Failure to follow the warnings could result in possible personal injury or death.

Repair of the rear glass heating grid lines, bus bars, terminals or pigtail wires can be accomplished using the Mopar Rear Window Defogger Repair Kit (Part Number 04549275) or equivalent.

1. Mask the repair area with masking tape (3) so that the conductive epoxy can be applied neatly. Extend the epoxy application onto the grid line (2) or the bus bar on each side of the break (1).
2. Follow the instructions in the repair kit for preparing the damaged area.
3. Remove the package separator clamp and mix the two conductive epoxy components thoroughly within the packaging. Fold the package in half and cut the center corner to dispense the epoxy.
4. For grid line repairs, mask the area to be repaired with masking tape or use a template.
5. Apply the epoxy through the slit in the masking tape or template. Overlap both ends of the break by at least 19 millimeters (0.75 inch).



6. For a terminal or pigtail wire replacement, mask the adjacent areas so the epoxy can be extended onto the adjacent grid line as well as the bus bar. Apply a thin layer of epoxy to the area where the terminal or pigtail wire was fastened and onto the adjacent grid line.
7. Apply a thin layer of conductive epoxy to the terminal or bare wire end of the pigtail and place it in the proper location on the bus bar. To prevent the terminal or pigtail wire from moving while the epoxy is curing, it must be wedged or clamped.

8. Carefully remove the masking tape or template.

**CAUTION: Do not allow the glass surface to exceed 204° C (400° F) when using a heat gun, or the glass may fracture.**

9. Allow the epoxy to cure 24 hours at room temperature, or carefully use a heat gun for fifteen minutes. When using a heat gun, hold it approximately 25.4 centimeters (10 inches) from the repair and do not allow the glass surface to exceed 204° C (400° F).

10. After the conductive epoxy is properly cured, remove the wedge or clamp from the terminal or pigtail wire. Do not attach the wire harness connectors until the curing process is complete.

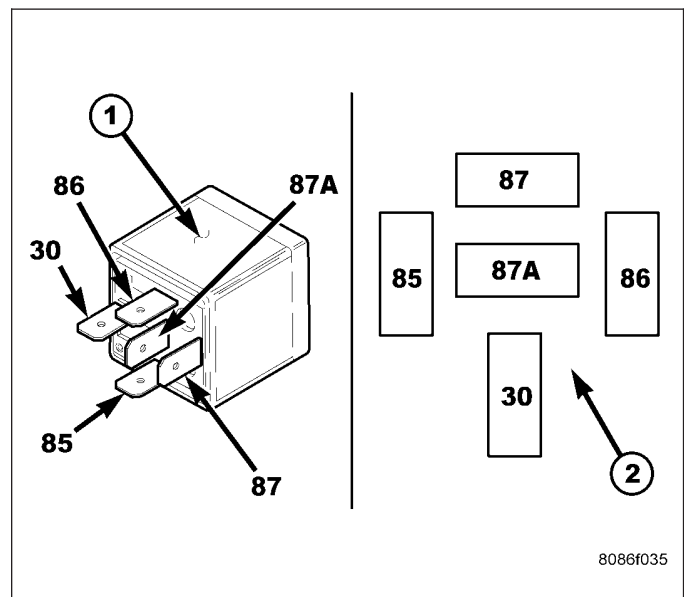
11. Check the operation of the rear window defogger glass heating grid.

## RELAY-REAR WINDOW DEFOGGER

### DESCRIPTION

The rear window defogger (EBL) relay (1) is a International Standards Organization (ISO)-type relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal functions and patterns (2). The EBL relay is an electromechanical device that switches battery current through a fuse in the rear junction block to the rear window defogger grid and when equipped, switches battery current to the outside mirror heating grids. The EBL relay is energized when the relay coil is provided a ground path by the control circuitry within the front control module (FCM).

The EBL relay is located in the junction block (JB) at the rear of the vehicle, near the battery.



### OPERATION

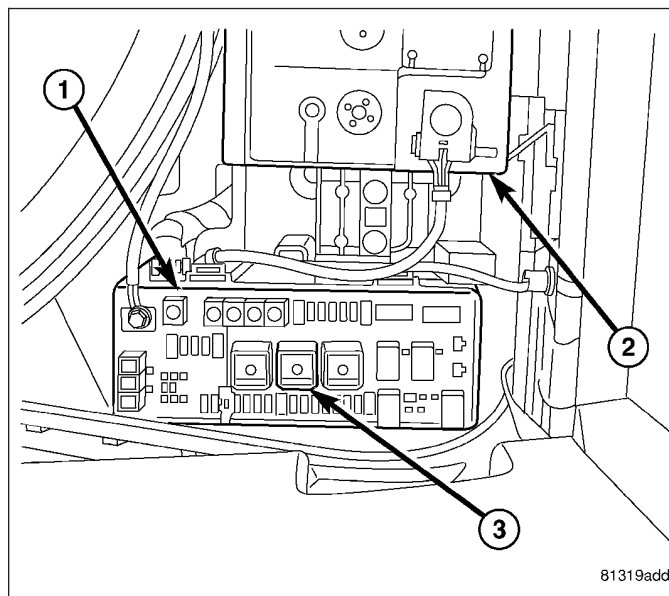
The ISO-standard rear window defogger (EBL) relay consists of an electromagnetic coil, a resistor or diode, and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When the electromagnetic coil is energized, it draws the movable contact away from the normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When the electromagnetic coil is de-energized, spring pressure returns the movable contact to the normally closed position. The resistor is connected in parallel with the electromagnetic coil in the relay, and helps to dissipate voltage spikes that are produced when the coil is de-energized.

Refer to the appropriate wiring information for diagnosis and testing of the EBL relay and for complete EBL system wiring diagrams.

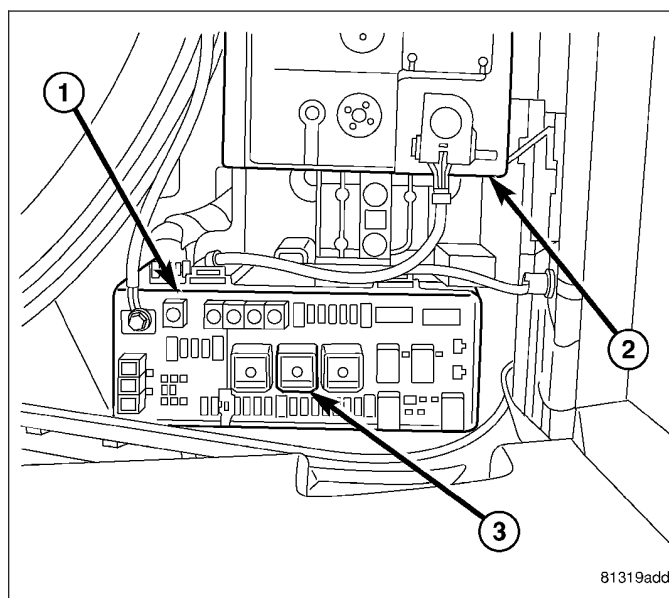
## REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Open the cover of the junction block (1) located at the rear of the vehicle near the battery (2).
3. Remove the EBL relay (3) from the junction block.



## INSTALLATION

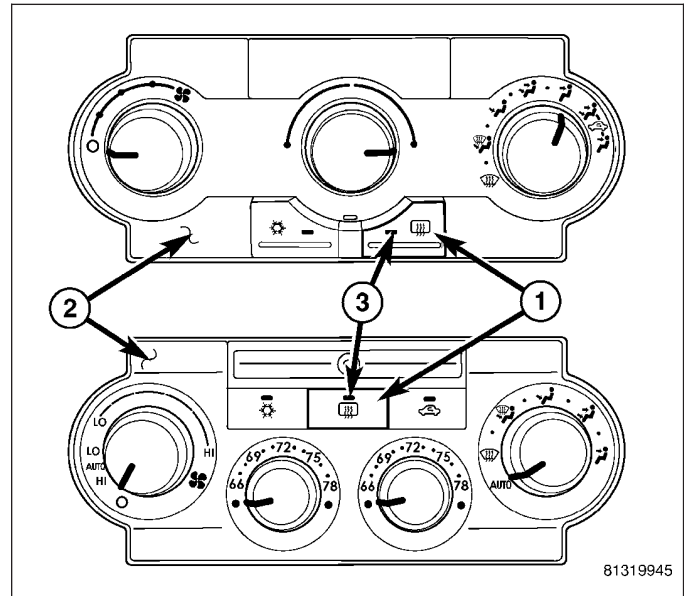
1. Position the EBL relay (3) into the proper receptacle of the junction block (1) located at the rear of the vehicle near the battery (2).
2. Align the EBL relay terminals with the terminal cavities in the junction block receptacle and push down firmly on the relay until the terminals are fully seated.
3. Close the cover of the junction block.
4. Reconnect the negative battery cable.



## SWITCH-REAR WINDOW DEFOGGER

### DESCRIPTION

The rear window defogger switch (1) is integrated into the A/C-heater control (2) which is mounted to the center of the instrument panel. The rear window defogger switch and the rear window defogger LED indicator (3) cannot be repaired and, if faulty or damaged, the A/C-heater control must be replaced (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/CONTROL-A/C HEATER - REMOVAL).



### OPERATION

An LED indicator will illuminate when the rear window defogger control switch is activated. When the control switch is activated, the A/C-heater control requests the front control module (FCM) to operate the rear window defogger (EBL) relay via the controller area network (CAN) B bus. The EBL relay controls the current to flow to the grids of the rear window defogger and to the heated power side view mirrors, when equipped. The EBL relay will be on for approximately ten minutes or until the control switch or the ignition switch is turned off.



HEATED MIRRORS - SERVICE INFORMATION

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HEATED MIRRORS - SERVICE INFORMATION

DESCRIPTION

The heated mirror system only operates in concert with the EBL system. For more information, refer to 8 - ELECTRICAL/HEATED GLASS - DESCRIPTION.

OPERATION

When the rear window defogger switch (1) located on the A/C-heater control (2) is pressed, the rear window defogger (EBL) system becomes activated and an electric heater grid located behind the glass of each of the outside rear view mirrors is energized. When energized, each of these heater grids produce heat to help clear the outside rear view mirrors of ice, snow, or fog. A yellow indicator (3) in the defogger switch will illuminate to indicate when the EBL system is turned on. The A/C-heater control contains the EBL system control circuitry.

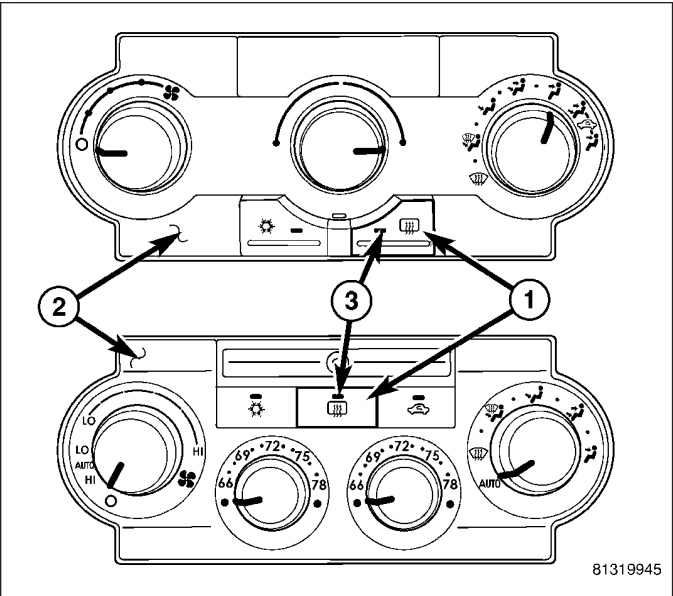
**Note:** The EBL system turns off automatically after approximately ten minutes of initial operation. Each following activation cycle of the EBL system will last approximately five minutes.

The EBL system will be automatically turned off after a programmed time interval of about ten minutes. After the initial time interval has expired, if the defogger switch is turned on again during the same ignition cycle, the EBL system will automatically turn off after about five minutes.

The EBL system will automatically shut off if the ignition switch is turned to the Off position, or it can be turned off manually by depressing the defogger switch a second time.

If the outside mirror heating grids are both inoperative, refer to 8 - ELECTRICAL/HEATED GLASS - DIAGNOSIS AND TESTING in this group. If only one of the outside mirror heating grids is inoperative, refer to 8 - ELECTRICAL/POWER MIRRORS - DIAGNOSIS AND TESTING.

The heating grid behind each outside mirror glass cannot be repaired and, if faulty or damaged, the mirror glass must be replaced (Refer to 23 - BODY/EXTERIOR/MIRROR-SIDE VIEW - GLASS - REMOVAL) and (Refer to 23 - BODY/EXTERIOR/MIRROR-SIDE VIEW - GLASS - INSTALLATION).



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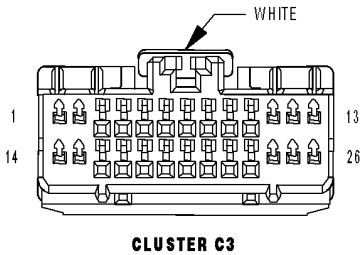
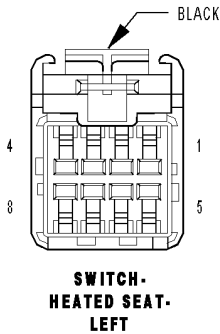
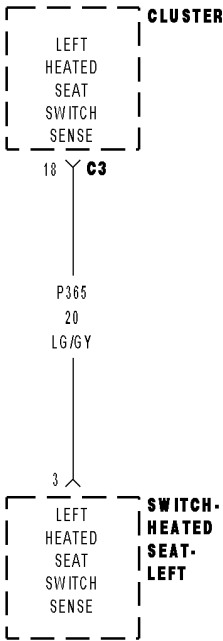
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B1096-FRONT RIGHT SEAT HEATER		U0164-LOST COMMUNICATION WITH HVAC	
CONTROL CIRCUIT LOW . . . . .	25	CONTROL MODULE . . . . .	70
B1098-FRONT RIGHT SEAT HEATER		U0168-LOST COMMUNICATION WITH	
CONTROL CIRCUIT OPEN . . . . .	30	VEHICLE SECURITY CONTROL MODULE	
B120E-LEFT HEATED SEAT HI INDICATOR		(SKREEM/WCM) . . . . .	70
CONTROL CIRCUIT HIGH . . . . .	34	U0169-LOST COMMUNICATION WITH	
B120F-LEFT HEATED SEAT HI INDICATOR		SUNROOF CONTROL MODULE . . . . .	70
CONTROL CIRCUIT OPEN . . . . .	37	U0181-LOST COMMUNICATION WITH	
B1216-LEFT HEATED SEAT LO INDICATOR		HEADLAMP LEVELING TRANSLATOR . . . .	71
CONTROL CIRCUIT HIGH . . . . .	41	U0184-LOST COMMUNICATION WITH	
B1217-LEFT HEATED SEAT LO INDICATOR		RADIO . . . . .	71
CONTROL CIRCUIT OPEN . . . . .	44	U0186-LOST COMMUNICATION WITH	
B121A-RIGHT HEATED SEAT HI INDICATOR		AUDIO AMPLIFIER . . . . .	71
CONTROL CIRCUIT HIGH . . . . .	48	U0195-LOST COMMUNICATION WITH	
B121B-RIGHT HEATED SEAT HI INDICATOR		SDARS . . . . .	71
CONTROL CIRCUIT OPEN . . . . .	51	U0197-LOST COMMUNICATION WITH HFM .	71
B1222-RIGHT HEATED SEAT LO INDICATOR		U0199-LOST COMMUNICATION WITH	
CONTROL CIRCUIT HIGH . . . . .	55	DRIVER DOOR MODULE . . . . .	71
B1223-RIGHT HEATED SEAT LO INDICATOR		U0200-LOST COMMUNICATION WITH	
CONTROL CIRCUIT OPEN . . . . .	58	PASSENGER DOOR MODULE . . . . .	71
B210D-BATTERY VOLTAGE LOW . . . . .	62	U0209-LOST COMMUNICATION WITH	
B210E-BATTERY VOLTAGE HIGH . . . . .	64	MEMORY SEAT CONTROL MODULE . . . . .	71
B221A-HEATED SEAT MODULE INTERNAL .	66	U0212-LOST COMMUNICATION WITH	
U0019-CAN B BUS – HSM . . . . .	67	SCCM - CAN B . . . . .	71
U0141-LOST COMMUNICATION WITH		U0231-LOST COMMUNICATION WITH RAIN	
FRONT CONTROL MODULE . . . . .	70	SENSING MODULE . . . . .	71
		SCHEMATICS AND DIAGRAMS . . . . .	72

## HEATED SEATS - ELECTRICAL DIAGNOSTICS

### DIAGNOSIS AND TESTING



B1084-LEFT HEATED SEAT SWITCH INPUT CIRCUIT/PERFORMANCE



**B1084-LEFT HEATED SEAT SWITCH INPUT CIRCUIT/PERFORMANCE (CONTINUED)**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:** Ignition on, during the heated seat operation.
- **Set Condition:** This code is set after the Cluster detects the heated seat switch sense circuit low for a predetermined amount of time.

Possible Causes
(P365) LEFT HEATED SEAT SWITCH SENSE SHORTED TO GROUND
LEFT HEATED SEAT SWITCH
CLUSTER

**Diagnostic Test****1. VERIFY THAT DTC B1084-LEFT HEATED SEAT SWITCH INPUT CIRCUIT/PERFORMANCE IS ACTIVE**

With the scan tool, record and erase DTC's

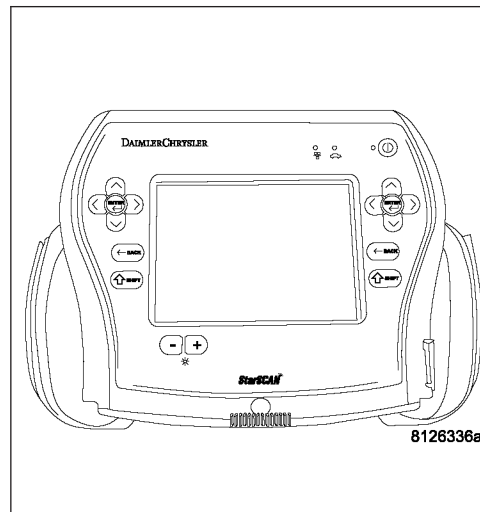
Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

**Is the DTC B1084 LEFT HEATED SEAT SWITCH INPUT CIRCUIT/PERFORMANCE active?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**2. DISCONNECT THE LEFT HEATED SEAT SWITCH CONNECTOR AND CHECK SWITCH STATUS**

Turn the ignition switch off.

Disconnect the Left Heated Seat Switch connector.

**Note: Check connectors - Clean and repair as necessary.**

Turn the ignition on.

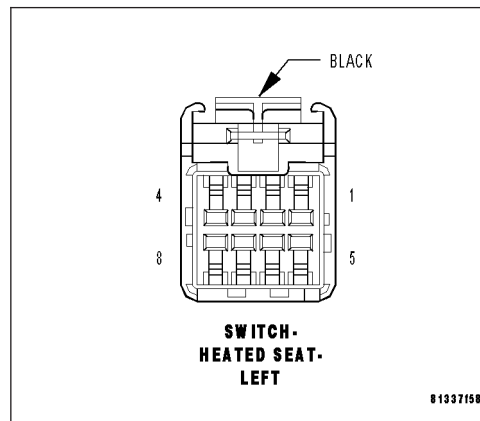
With the scan tool in CCN Inputs/Outputs, read the Left Heated Seat state.

**Does the switch state display Not Set?**

**Yes** >> Replace the Left Heated Seat Switch.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 3



**B1084-LEFT HEATED SEAT SWITCH INPUT CIRCUIT/PERFORMANCE (CONTINUED)****3. CHECK THE (P365) LEFT HEATED SEAT SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition switch off.

Disconnect the Cluster C3 connector.

Measure the resistance between ground and the (P365) Left Heated Seat Switch sense circuit.

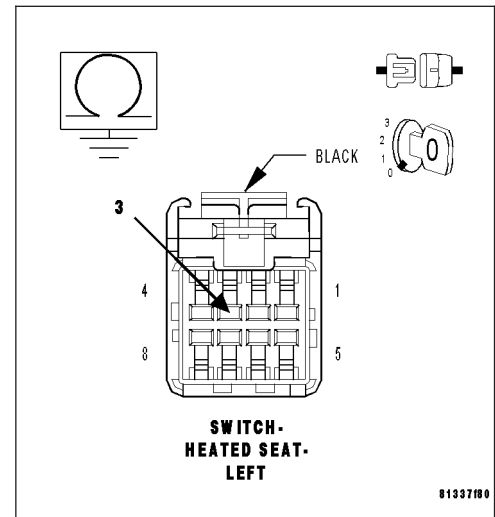
**Was the resistance below 5.0 ohms?**

**Yes** >> Repair the (P365) Left Heated Seat Switch sense circuit for a short to ground

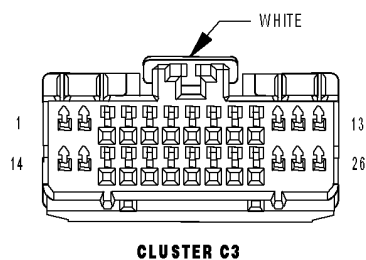
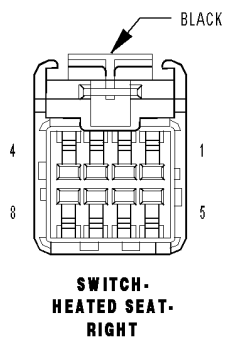
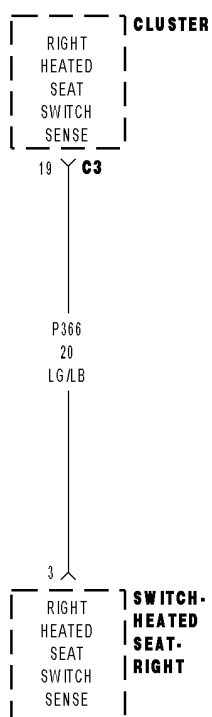
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Replace the Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).



## B1087-RIGHT HEATED SEAT SWITCH INPUT CIRCUIT/PERFORMANCE



**B1087-RIGHT HEATED SEAT SWITCH INPUT CIRCUIT/PERFORMANCE (CONTINUED)**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:** Ignition on, during the heated seat operation.
- **Set Condition:** This code is set after the Cluster detects the heated seat switch sense circuit low for a predetermined amount of time.

Possible Causes
(P366) RIGHT HEATED SEAT SWITCH SENSE SHORTED TO GROUND RIGHT HEATED SEAT SWITCH CLUSTER

**Diagnostic Test****1. VERIFY THAT DTC B1087-RIGHT HEATED SEAT SWITCH INPUT CIRCUIT/PERFORMANCE IS ACTIVE**

With the scan tool, record and erase DTC's

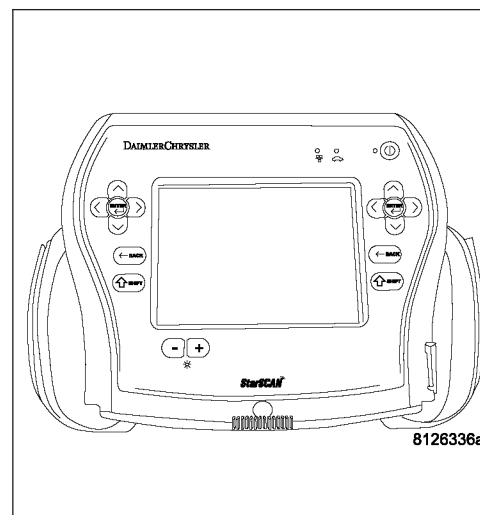
Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

**Is the DTC B1087 RIGHT HEATED SEAT SWITCH INPUT CIRCUIT/PERFORMANCE active?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**2. DISCONNECT THE RIGHT HEATED SEAT SWITCH CONNECTOR AND CHECK SWITCH STATUS**

Turn the ignition switch off.

Disconnect the Right Heated Seat Switch connector.

**Note: Check connectors - Clean and repair as necessary.**

Turn the ignition on.

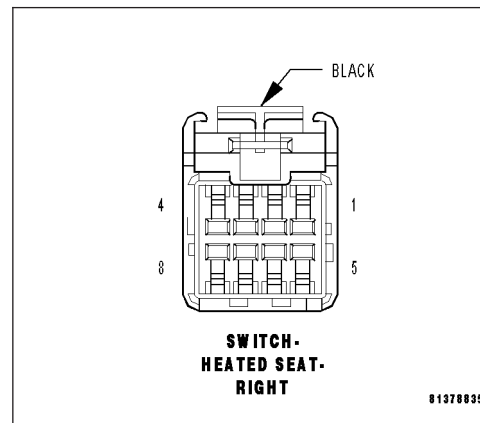
With the scan tool in CCN Inputs/Outputs, read the Right Heated Seat state.

**Does the switch state display Not Set?**

**Yes** >> Replace the Right Heated Seat Switch.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 3



**B1087-RIGHT HEATED SEAT SWITCH INPUT CIRCUIT/PERFORMANCE (CONTINUED)****3. CHECK THE (P366) RIGHT HEATED SEAT SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition switch off.

Disconnect the Cluster C3 connector.

Measure the resistance between ground and the (P366) Right Heated Seat Switch sense circuit.

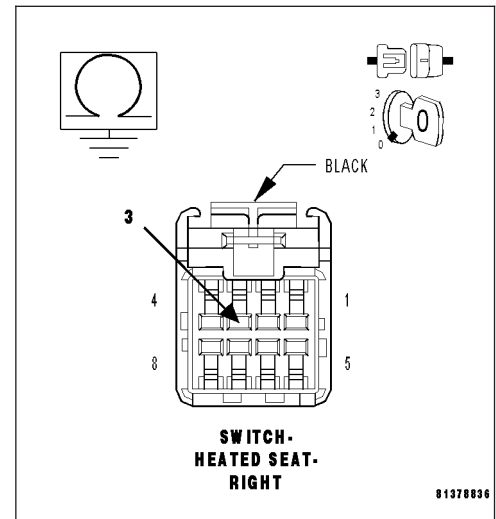
**Was the resistance below 5.0 ohms?**

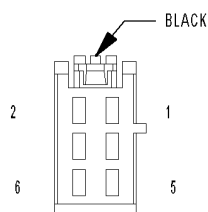
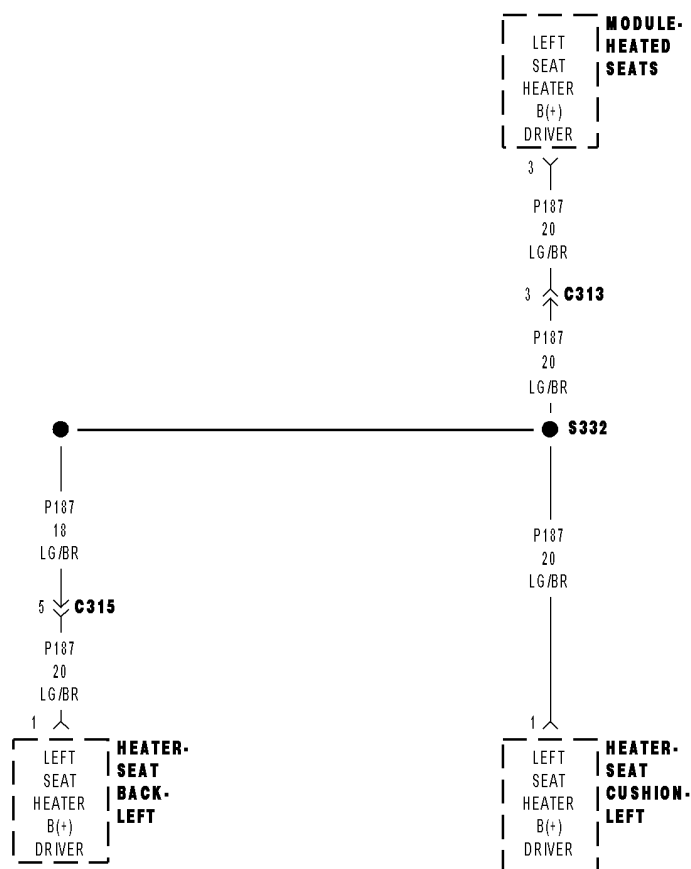
**Yes** >> Repair the (P366) Right Heated Seat Switch sense circuit for a short to ground

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

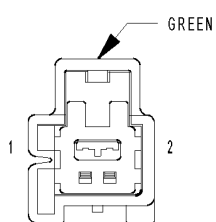
**No** >> Replace the Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

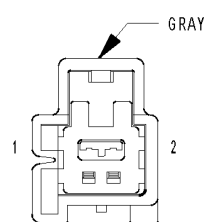


**B1092-FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW**

**MODULE-HEATED SEATS**



**HEATER-SEAT CUSHION-LEFT**



**HEATER-SEAT BACK-LEFT**

**B1092-FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW (CONTINUED)**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:** Ignition on, during the heated seat operation.
- **Set Condition:** This code is set immediately after the Heated Seat Module detects the control circuit shorted to ground.

Possible Causes
(P187) DRIVER SEAT HEATER B(+) DRIVER SHORTED TO GROUND SEAT HEATER ELEMENT PIGTAIL HARNESS SHORTED SEAT CUSHION HEATER ELEMENT SHORTED SEAT BACK HEATER ELEMENT SHORTED HEATED SEAT MODULE

**Diagnostic Test****1. VERIFY THAT DTC B1092-FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW IS ACTIVE**

With the scan tool, record and erase DTC's

Operate the Heated Seat Switch in both positions several times.

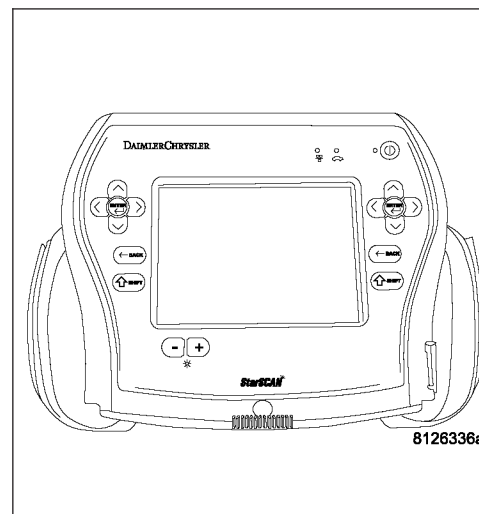
With the scan tool, read DTC's.

**Does the DTC B1092 FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW reset?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).





**B1092-FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW (CONTINUED)****2. DISCONNECT LEFT CUSHION HEATER 2-WAY CONNECTOR AND READ DTC'S**

Disconnect the Left Seat Cushion Heater connector.

**Note: Check connectors - Clean and repair as necessary.**

With the scan tool, erase HSM DTC's

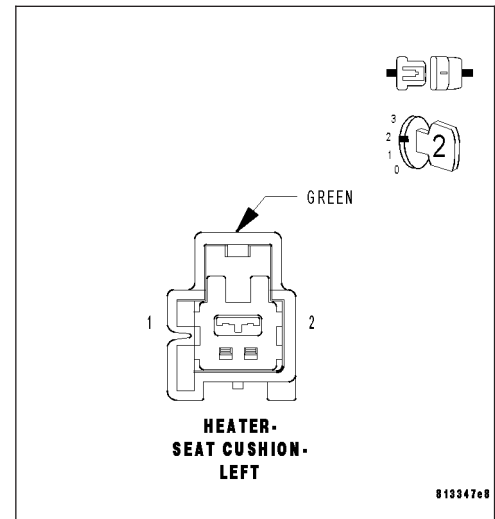
Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

**Does the scan tool display the same DTC?**

**Yes** >> Go To 7

**No** >> Go To 3

**3. CHECK THE LEFT SEAT BACK HEATER RESISTANCE**

Disconnect the Left Seat Back Heater connector.

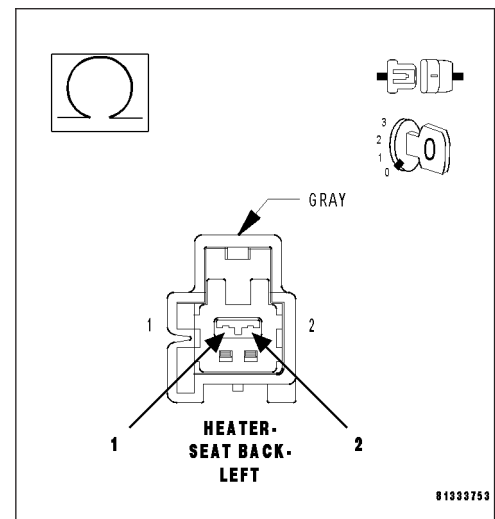
**Note: Check connectors - Clean and repair as necessary.**

Check the resistance of the seat back heater element by measuring between the (P187) Left Seat Heater B(+) Driver and the Ground circuit at the Left seat back heater connector.

**Is the resistance below 4.0 ohms?**

**No** >> Go To 4

**Yes** >> Replace the seat back heater element as necessary.  
Perform BODY VERIFICATION TEST – VER 1(Refer to BODY VERIFICATION TEST – VER 1).



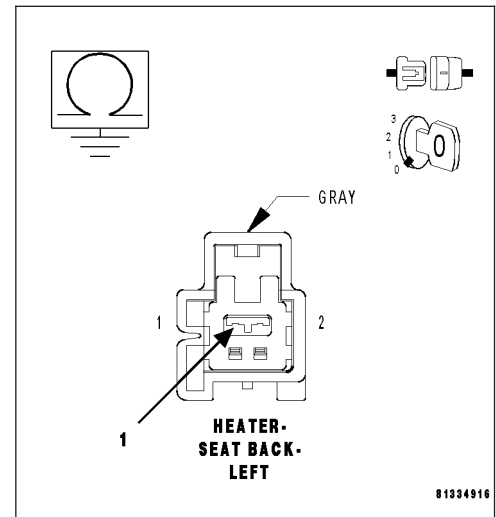
**B1092-FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW (CONTINUED)****4. CHECK THE LEFT SEAT BACK HEATER FOR A SHORT TO GROUND**

Measure between the (P187) Left Seat Heater B(+) Driver circuit at the Left seat back heater connector and the seat frame for a short to ground.

**Is the resistance below 1000 ohms?**

**Yes** >> Repair the pigtail harness for a short to ground condition or replace the seat back heater element as necessary.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 5

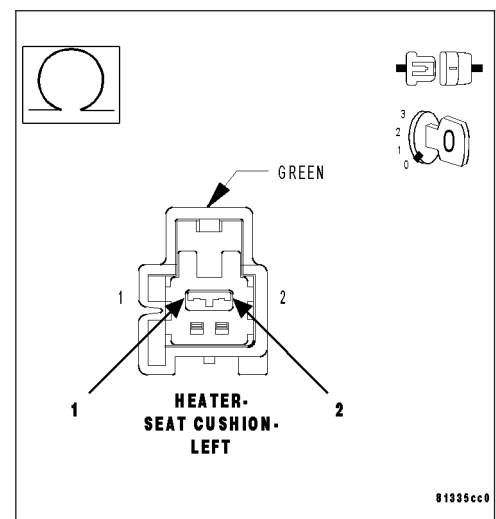
**5. CHECK THE LEFT CUSHION HEATER RESISTANCE**

Check the resistance of the cushion heater element by measuring between the (P187) Left Seat Heater B(+) Driver and the Ground circuit at the Left seat cushion heater connector.

**Was the resistance below 3.5 ohms?**

**No** >> Go To 6

**Yes** >> Replace the heater element as necessary.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).



**B1092-FRONT LEFT SEAT HEATER CONTROL CIRCUIT LOW (CONTINUED)****6. CHECK THE LEFT CUSHION HEATER FOR A SHORT TO GROUND**

Measure between the (P187) Left Seat Heater B(+) Driver circuit at the Left seat cushion heater connector and the seat frame for a short to ground.

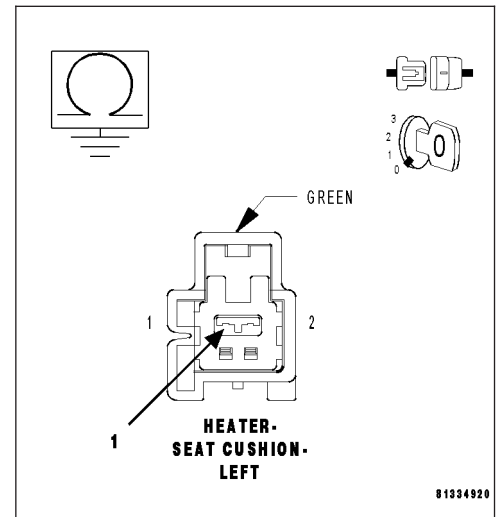
**Is the resistance below 1000 ohms?**

**Yes** >> Repair the pigtail harness or replace the heater element as necessary.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for an intermittent short to ground.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**7. Check the (P187) Left Seat Heater B(+) Driver circuit for a short to ground**

Disconnect the Heat Seat Module connector.

**Note: Check connectors - Clean and repair as necessary.**

Measure the (P187) Left Seat Heater B(+) Driver circuit to ground at the HSM connector.

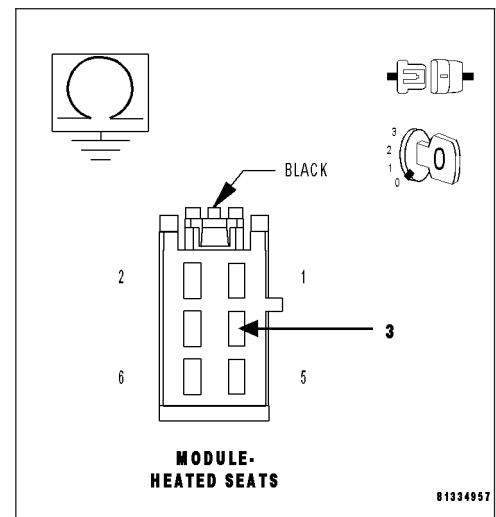
**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (P187) Left Seat Heater B(+) Driver circuit for a short to ground.

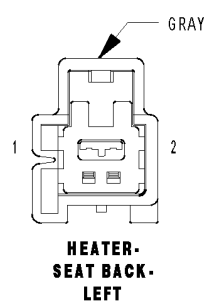
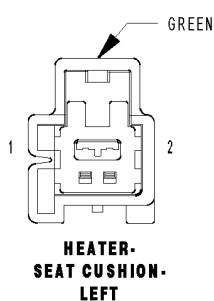
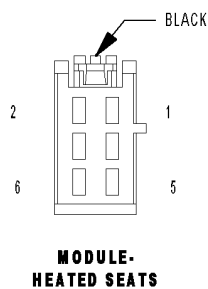
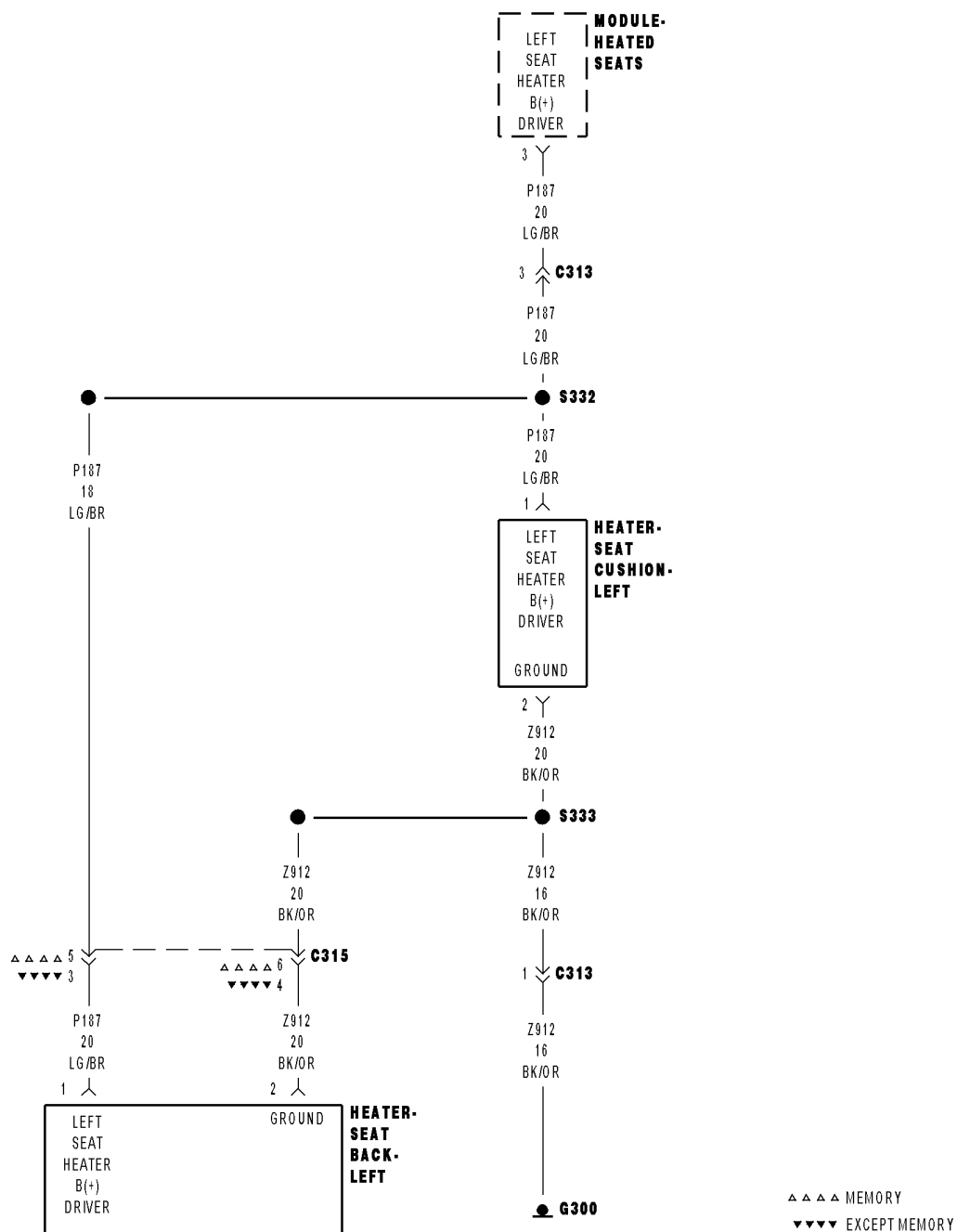
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Replace the Heated Seat Module.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).



# B1094-FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN



**B1094-FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN (CONTINUED)**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:** Ignition on, during the heated seat operation.
- **Set Condition:** This code is set immediately after the Heated Seat Module detects an open in the seat heater B(+) driver circuit.

Possible Causes
(P187) LEFT SEAT HEATER B(+) DRIVER WIRE OPEN
(Z912) GROUND WIRE OPEN
SEAT CUSHION HEATER ELEMENT OPEN
SEAT BACK HEATER ELEMENT OPEN
HEATED SEAT MODULE

**Diagnostic Test****1. VERIFY THAT DTC B1094-FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN IS ACTIVE**

With the scan tool, record and erase DTC's

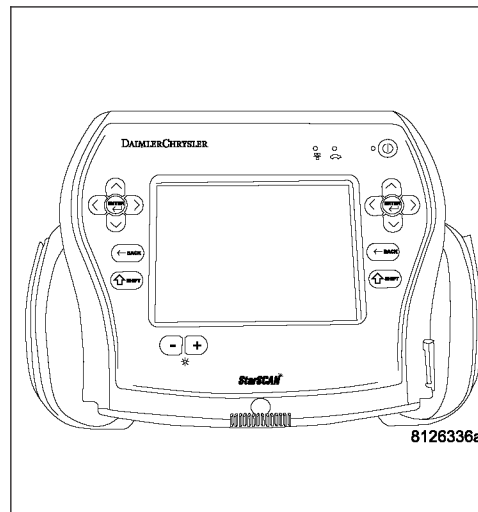
Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

**Does the DTC B1094 FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN reset?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**2. CHECK FOR AN OPEN SEAT HEATER ELEMENT**

Disconnect the Left Seat Cushion Heater 2 – way connector.

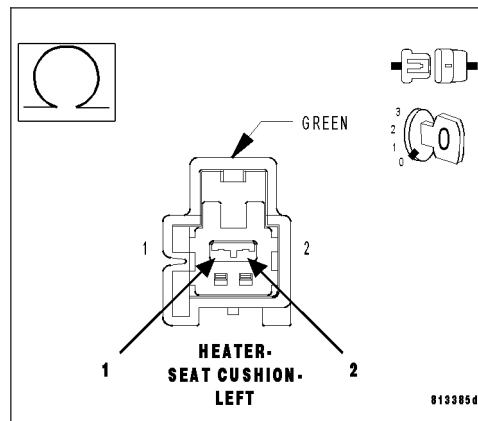
**Note: Check connectors - Clean and repair as necessary.**

Measure the total resistance of the cushion and seat back heater elements at the Left Seat Cushion 2 – way connector (seat side).

**Is the total resistance 2.5 ohms + or – .5 ohms?**

**Yes** >> Go To 4

**No** >> Go To 3



**B1094-FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN (CONTINUED)****3. CHECK THE LEFT SEAT BACK HEATER RESISTANCE**

Disconnect the Left Seat Back Heater 2 – way connector.

**Note: Check connectors - Clean and repair as necessary.**

Check the resistance of the seat back heater element by measuring between the (P187) Left Seat Heater B(+) Driver and the Ground circuit at the connector.

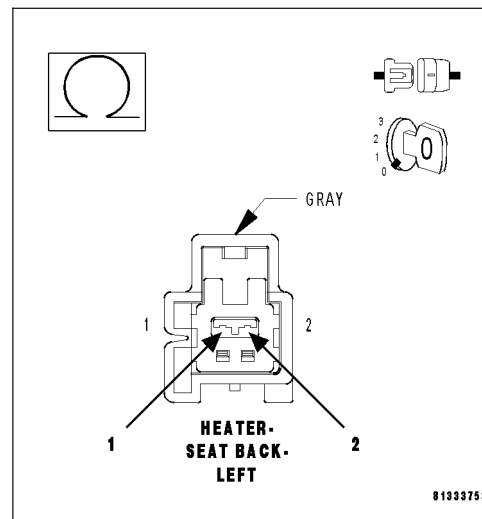
**Is the resistance above 5.8 ohms?**

**Yes** >> Repair the open pigtail harness or replace the seat back heater element as necessary.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair the open pigtail harness or replace the seat cushion heater element as necessary.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**4. CHECK THE LEFT SEAT HEATER GROUND CIRCUIT RESISTANCE**

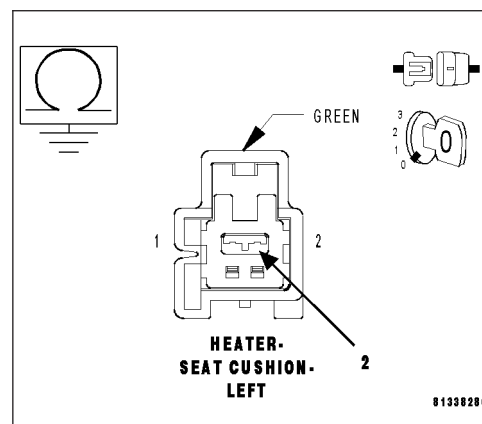
Measure the resistance of the Ground circuit at the Left Seat Heater Cushion 2 – way connector.

**Was the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open ground circuit.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).



**B1094-FRONT LEFT SEAT HEATER CONTROL CIRCUIT OPEN (CONTINUED)****5. Check the (P187) Left Seat Heater B(+) Driver circuit for an open.**

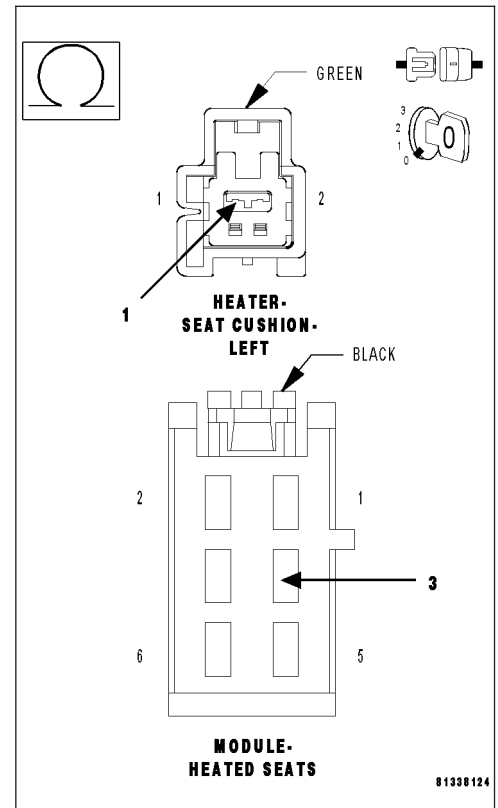
Disconnect the Heated Seat Module connector.

**Note: Check connectors - Clean and repair as necessary.**

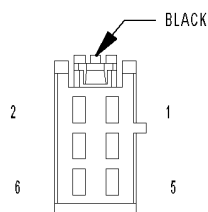
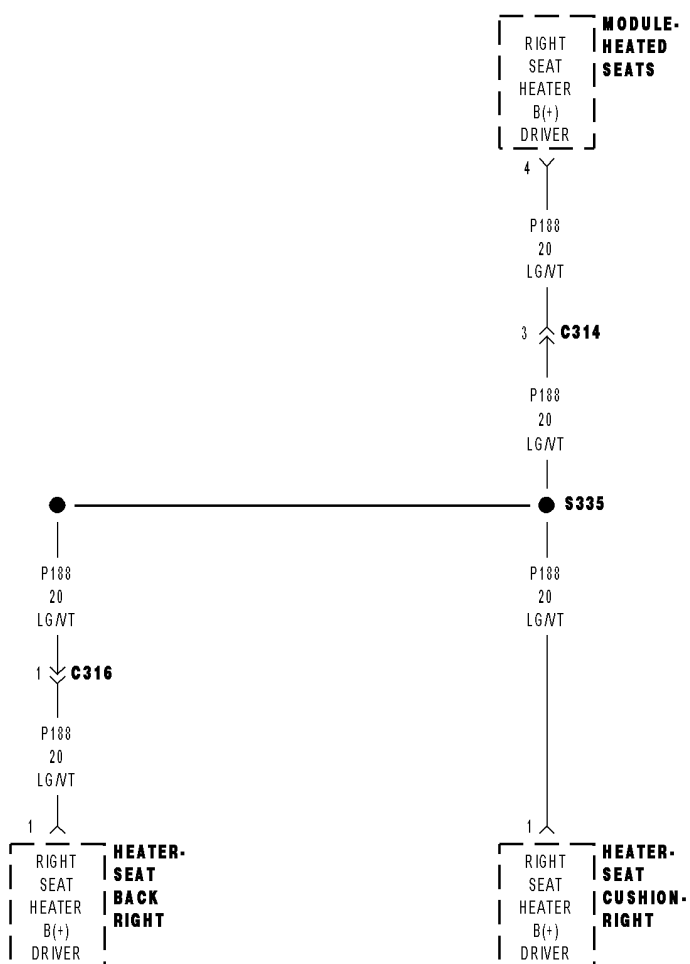
Measure the (P187) Left Seat Heater B(+) Driver circuit from the Left Seat Cushion Heater 2-way connector (harness side) to the HSM connector.

**Is the resistance below 5.0 ohms?**

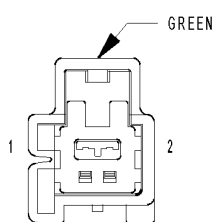
- Yes** >> Replace the Heated Seat Module.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Repair the (P187) Left Seat Heater B(+) Driver circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).



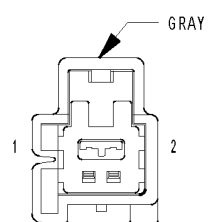
## B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW



**MODULE-  
HEATED SEATS**



**HEATER-  
SEAT CUSHION-  
RIGHT**



**HEATER-  
SEAT BACK-  
RIGHT**



**B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW (CONTINUED)**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**Ignition on, during the heated seat operation.
- **Set Condition:**This code is set immediately after the Heated Seat Module detects the seat heater B(+) driver circuit shorted to ground.

Possible Causes
(P188) RIGHT SEAT HEATER B(+) DRIVER SHORTED TO GROUND SEAT HEATER ELEMENT PIGTAIL HARNESS SHORTED SEAT CUSHION HEATER ELEMENT SHORTED SEAT BACK HEATER ELEMENT SHORTED HEATED SEAT MODULE

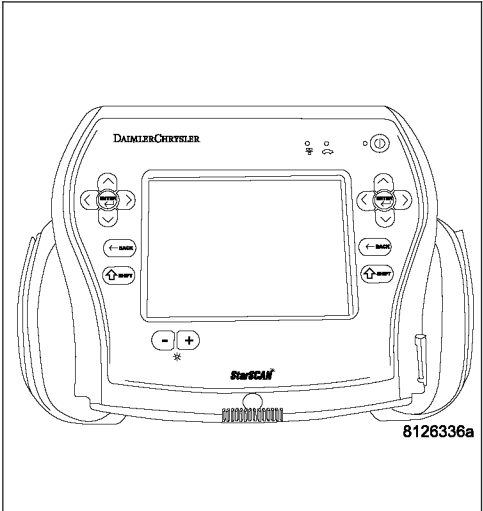
**Diagnostic Test**

**1. VERIFY THAT DTC B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW IS ACTIVE**

With the scan tool, record and erase DTC's  
Operate the Heated Seat Switch in both positions several times.  
With the scan tool, read DTC's.

**Does the DTC B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW reset?**

- Yes**
- >> Go To 2
- No**
- >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).



**B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW (CONTINUED)****2. DISCONNECT RIGHT SEAT CUSHION HEATER 2-WAY CONNECTOR AND READ DTC'S**

Disconnect the Right Seat Cushion Heater connector.

**Note: Check connectors - Clean and repair as necessary.**

With the scan tool, erase HSM DTC's

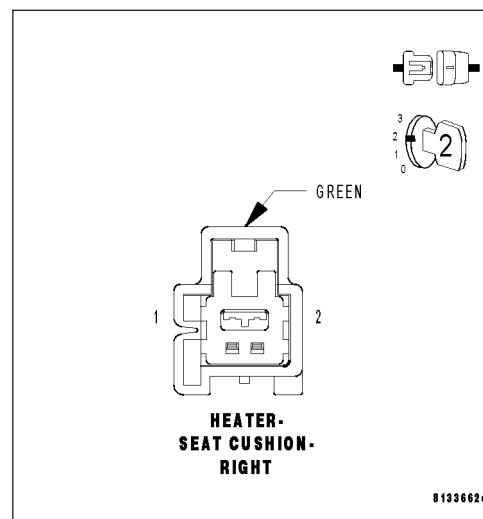
Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

**Does the scan tool display the same DTC?**

**Yes** >> Go To 7

**No** >> Go To 3

**3. CHECK THE RIGHT SEAT BACK HEATER RESISTANCE**

Disconnect the Right Seat Back Heater connector.

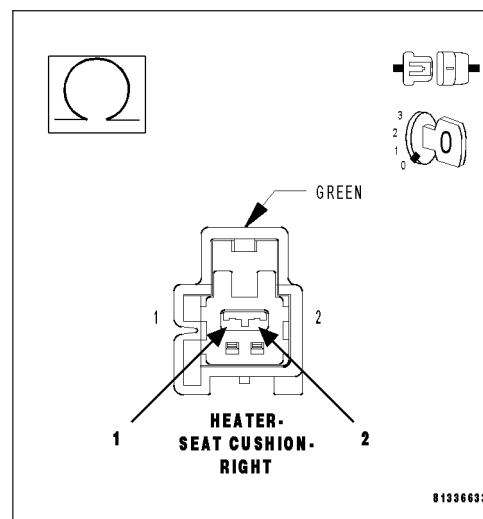
**Note: Check connectors - Clean and repair as necessary.**

Check the resistance of the seat back heater element by measuring between the (P188) Right Seat Heater B(+) Driver and the Ground circuit at the Right seat back heater connector.

**Is the resistance below 4.0 ohms?**

**No** >> Go To 4

**Yes** >> Replace the seat back heater element as necessary.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

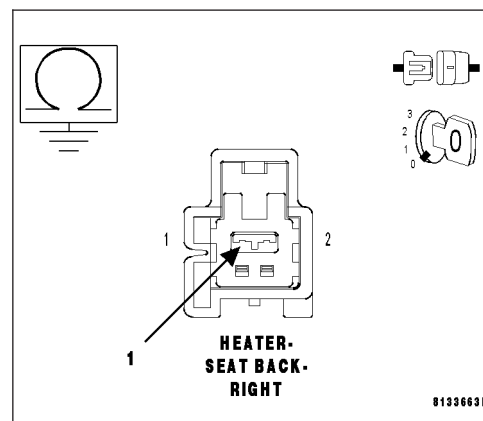
**4. CHECK THE RIGHT SEAT BACK HEATER FOR A SHORT TO GROUND**

Measure between the (P188) Right Seat Heater B(+) Driver circuit at the Right Seat Back Heater connector and the seat frame for a short to ground.

**Is the resistance below 1000 ohms?**

**Yes** >> Repair the pigtail harness for a short to ground condition or replace the seat back heater element as necessary.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 5



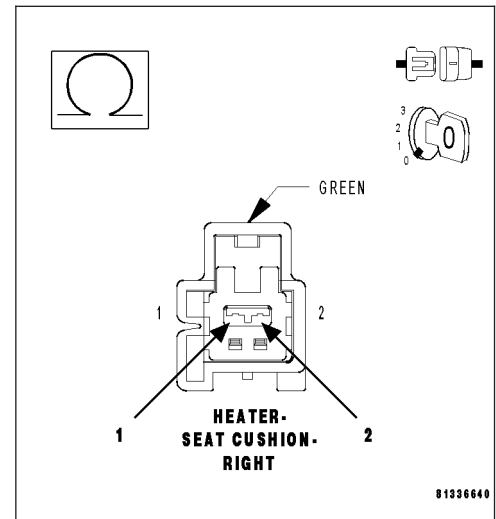
**B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW (CONTINUED)****5. CHECK THE RIGHT SEAT CUSHION HEATER RESISTANCE**

Check the resistance of the cushion heater element by measuring between the (P188) Right Seat Heater B(+) Driver and the Ground circuit at the Right seat cushion heater connector.

**Was the resistance below 3.5 ohms?**

**No** >> Go To 6

**Yes** >> Replace the heater element as necessary.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

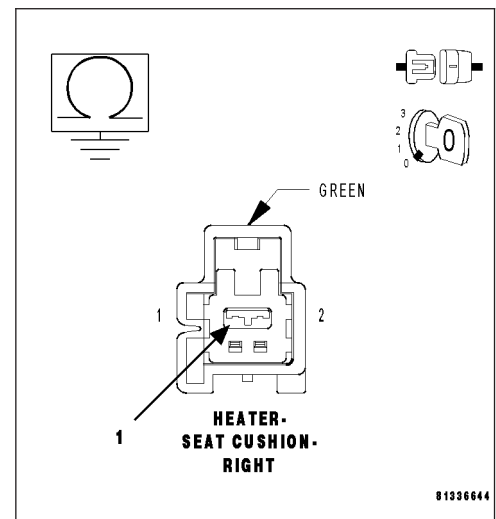
**6. CHECK THE RIGHT SEAT CUSHION HEATER FOR A SHORT TO GROUND**

Measure between the (P188) Right Seat Heater B(+) Driver circuit at the Right Seat Cushion Heater connector and the seat frame for a short to ground.

**Is the resistance below 1000 ohms?**

**Yes** >> Repair the pigtail harness or replace the heater element as necessary.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for an intermittent short to ground.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).



**B1096-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT LOW (CONTINUED)****7. Check the (P188) Right Seat Heater B(+) Driver circuit for a short to ground**

Disconnect the Heated Seat Module connector.

**Note: Check connectors - Clean and repair as necessary.**

Measure the (P188) Right Seat Heater B(+) Driver circuit to ground at the HSM connector.

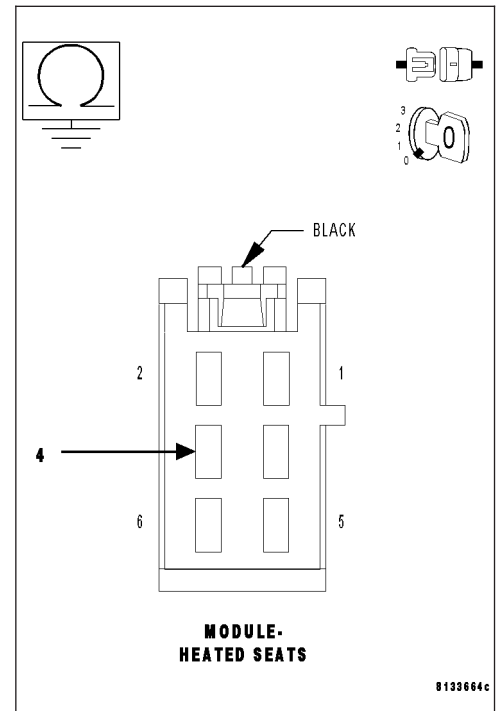
**Is the resistance below 5.0 ohms?**

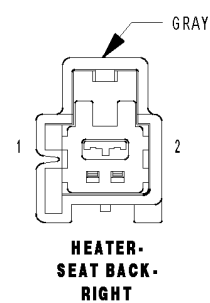
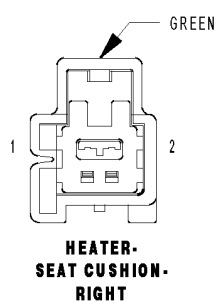
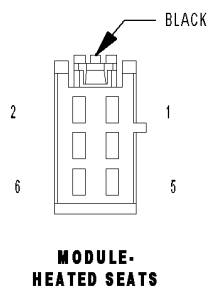
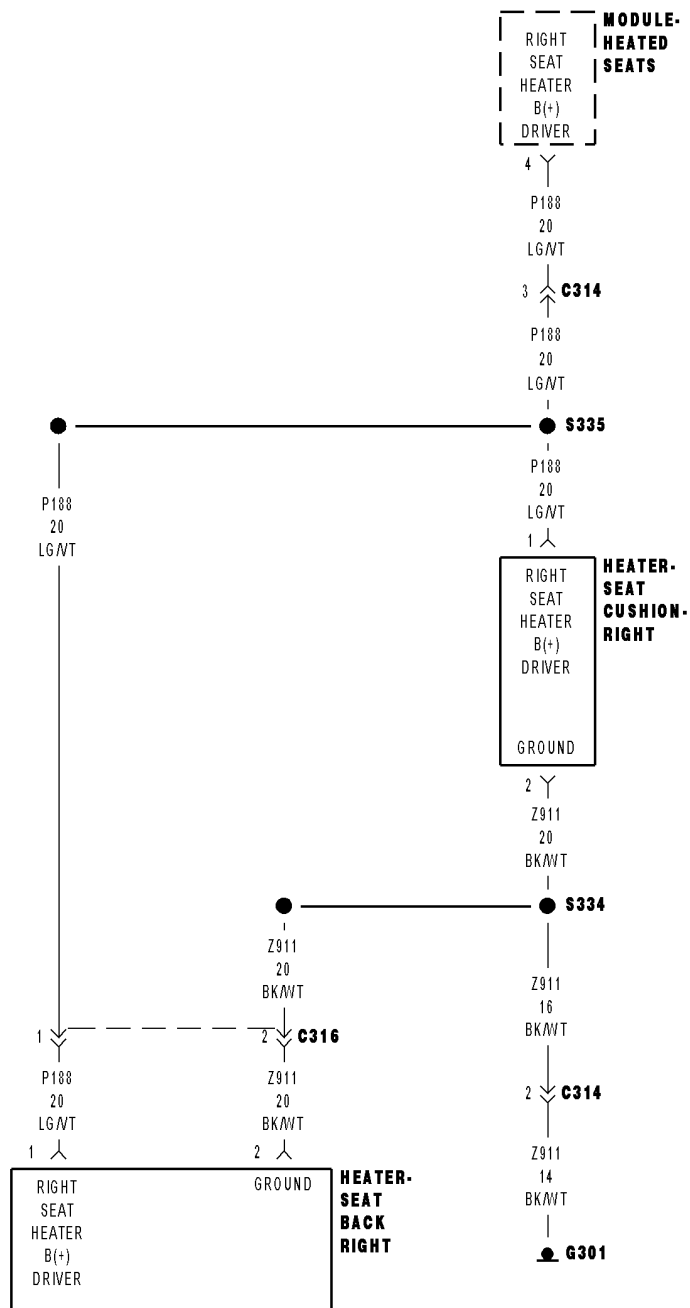
**Yes** >> Repair the (P188) Right Seat Heater B(+) Driver circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Replace the Heated Seat Module.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).



**B1098-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN**

**B1098-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN (CONTINUED)**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:** Ignition on, during the heated seat operation.
- **Set Condition:** This code is set immediately after the Heated Seat Module detects an open in the seat heat B(+) driver circuit.

Possible Causes
(P188) PASSENGER SEAT HEATER B(+) DRIVER WIRE OPEN
(Z911) GROUND WIRE OPEN
SEAT CUSHION HEATER ELEMENT OPEN
SEAT BACK HEATER ELEMENT OPEN
HEATED SEAT MODULE

**Diagnostic Test****1. VERIFY THAT DTC B1098-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN IS ACTIVE**

With the scan tool, record and erase DTC's

Operate the Heated Seat Switch in both positions several times.

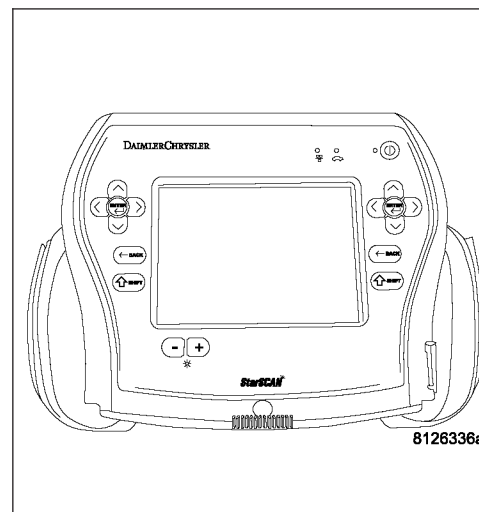
With the scan tool, read DTC's.

**Does the DTC B1098 FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN reset?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**2. CHECK FOR AN OPEN SEAT HEATER ELEMENT**

Disconnect the Right Seat Cushion Heater 2 – way connector.

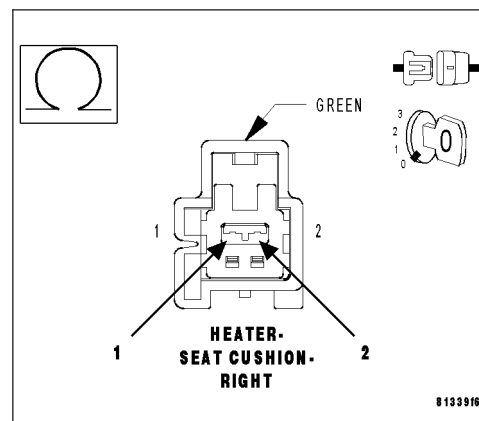
**Note: Check connectors - Clean and repair as necessary.**

Measure the total resistance of the cushion and seat back heater elements at the Right Seat Cushion Heater 2 – way connector (seat side).

**Is the total resistance 2.5 ohms + or – .5 ohms?**

**Yes** >> Go To 4

**No** >> Go To 3



**B1098-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN (CONTINUED)****3. CHECK THE RIGHT SEAT BACK PAD HEATER RESISTANCE**

Disconnect the Right Seat Back Heater 2 – way connector.

**Note: Check connectors - Clean and repair as necessary.**

Check the resistance of the seat back heater element by measuring between the (P188) Right Seat Heater B(+) Driver and the Ground circuit at the Right seat back heater connector.

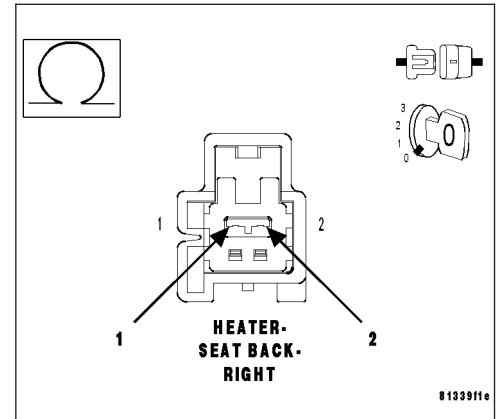
**Is the resistance above 5.8 ohms?**

**Yes** >> Repair the open pigtail harness or replace the seat back heater element as necessary.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair the open pigtail harness or replace the seat cushion heater element as necessary.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**4. CHECK THE RIGHT SEAT HEATER GROUND CIRCUIT RESISTANCE**

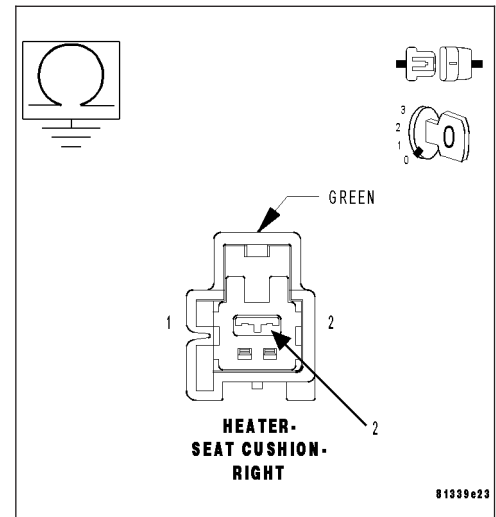
Measure the resistance of the Ground circuit at the Right Seat Cushion Heater 2 – way connector (harness side).

**Was the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open ground circuit.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).



**B1098-FRONT RIGHT SEAT HEATER CONTROL CIRCUIT OPEN (CONTINUED)****5. Check the (P188) Right Seat Heater B(+) Driver circuit for an open.**

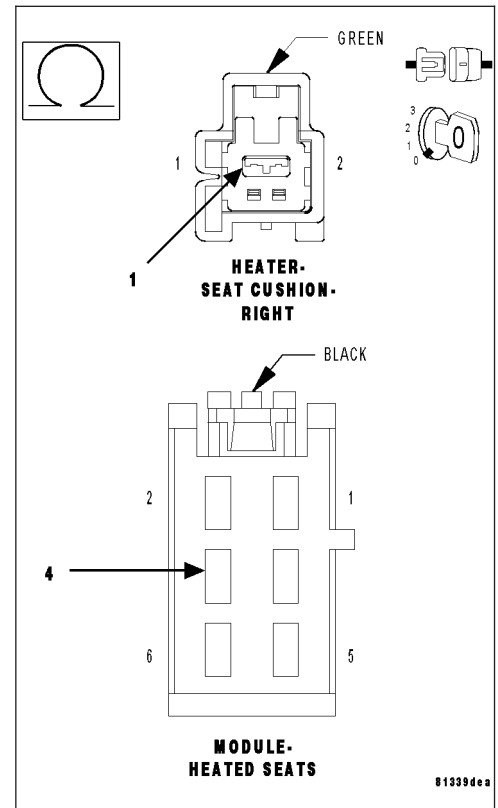
Disconnect the Heated Seat Module connector.

**Note: Check connectors - Clean and repair as necessary.**

Measure the (P188) Right Seat Heater B(+) Driver circuit from the Right Seat Cushion Heater connector to the HSM connector.

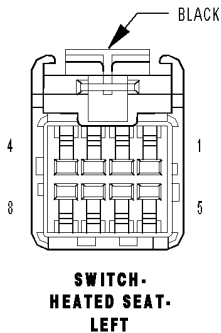
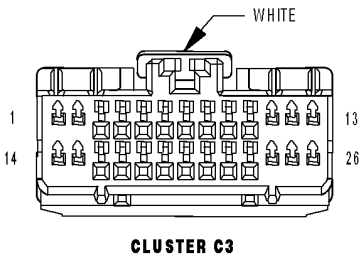
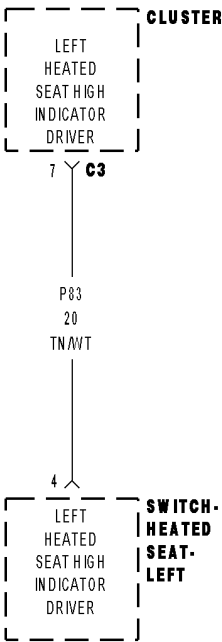
**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Heated Seat Module.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Repair the (P188) Right Seat Heater B(+) Driver circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).





B120E-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH



**B120E-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH (CONTINUED)**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**Continuously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects excessive voltage on the heated seat indicator control circuit.

Possible Causes
(P83) LEFT HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT SHORTED TO BATTERY
LEFT HEATED SEAT SWITCH
CLUSTER

**Diagnostic Test****1. VERIFY THAT DTC B120E-LEFT HEATED SEAT SWITCH HI INDICATOR CONTROL CIRCUIT HIGH IS ACTIVE**

With the scan tool, record and erase DTC's

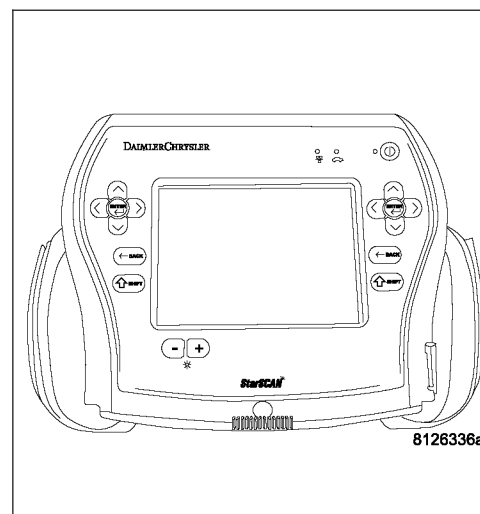
Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

**Does the DTC B120E-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH reset?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**2. DISCONNECT THE LEFT HEATED SEAT SWITCH AND RE-READ DTC**

Disconnect the Left Heated Seat Switch connector.

With the scan tool erase DTC's

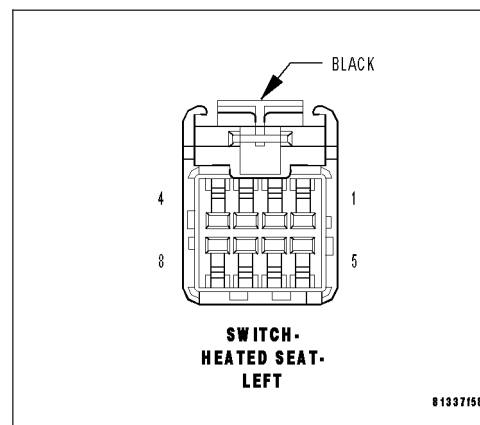
Cycle the ignition switch off then back on.

With the scan tool, read DTC's.

**Does the DTC B120E-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH reset?**

**Yes** >> Go To 3

**No** >> Replace the Left Heated Seat switch.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).



**B120E-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH (CONTINUED)****3. DISCONNECT THE CLUSTER C3 CONNECTOR AND CHECK FOR VOLTAGE**

Disconnect the Cluster C3 connector.

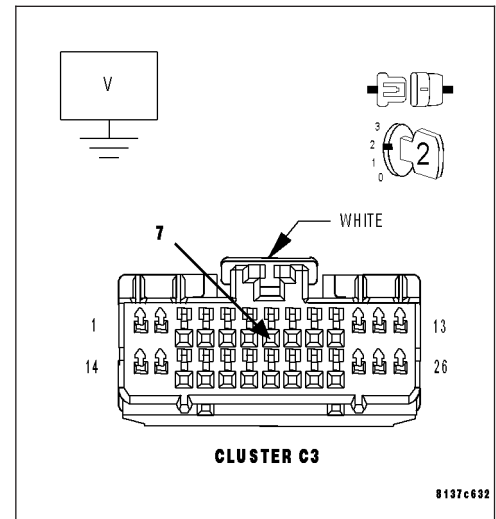
**Note: Check connectors - Clean and repair as necessary.**

Turn the ignition on.

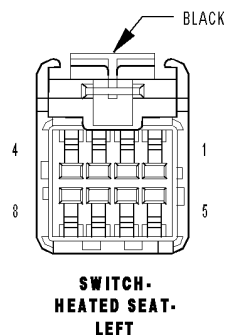
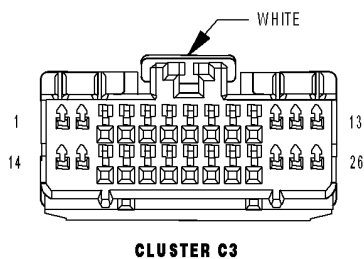
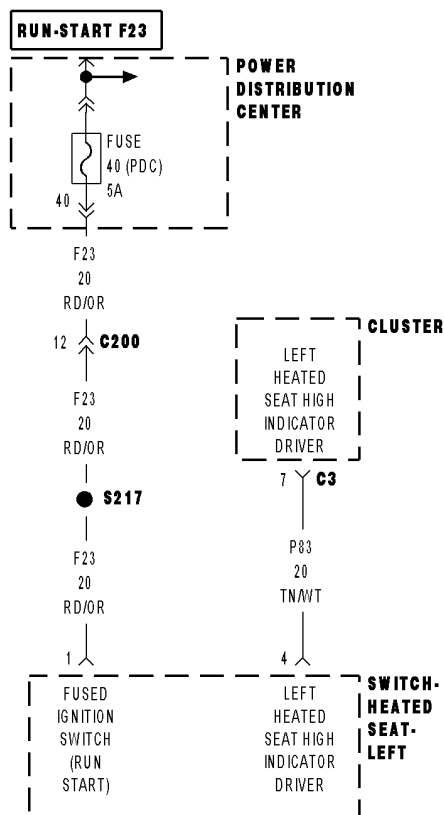
Measure the voltage at the (P83) Left Heated Seat High Indicator Driver circuit at the Cluster C3 connector.

**Is there any voltage present?**

- Yes** >> Repair the (P83) Left Heated Seat High Indicator Driver circuit for a short to battery.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Replace the Cluster in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).



# B120F-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT OPEN



**B120F-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT OPEN (CONTINUED)**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**Continuously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects low voltage on the heated seat indicator control circuit.

Possible Causes
PDC FUSE #40 (F23) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN (P83) LEFT HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT OPEN/SHORTED TO GROUND LEFT HEATED SEAT SWITCH CLUSTER

**Diagnostic Test****1. VERIFY THAT DTC B120F-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT OPEN IS ACTIVE**

With the scan tool, record and erase DTC's

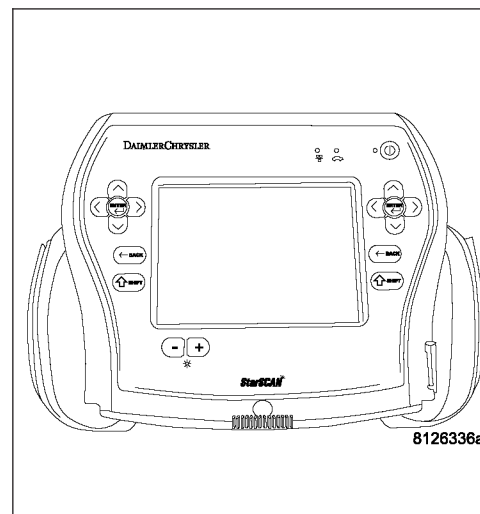
Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

**Does the DTC B120F-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT OPEN reset?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**2. INSPECT PDC FUSE #40**

Check PDC fuse #40.

**Is the fuse open?**

**Yes** >> Check for a possible short to ground on the (F23) Fused Ignition Switch Output (Run-Start) Circuit and replace the fuse as necessary.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 3

**B120F-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT OPEN (CONTINUED)****3. DISCONNECT THE CLUSTER C3 CONNECTOR AND CHECK FOR VOLTAGE**

Reinstall fuse if removed in previous test.

Disconnect the Cluster C3 connector.

**Note: Check connectors - Clean and repair as necessary.**

Turn the ignition on.

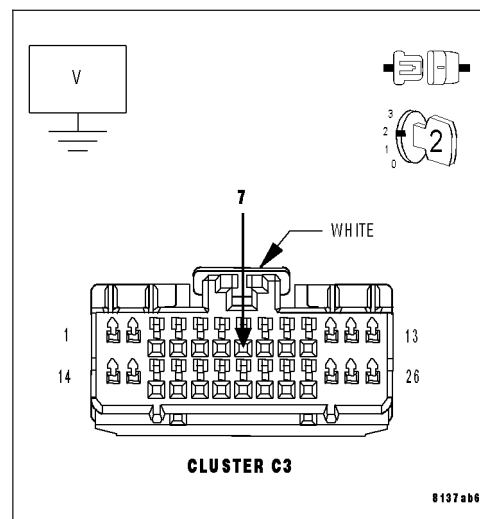
Measure the voltage at the (P83) Left Heated Seat High Indicator Driver circuit at the Cluster C3 connector.

**Is the voltage above 10.0 volts?**

**Yes** >> Replace the Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 4

**4. CHECK THE (F23) FUSED IGNITION SWITCH OUTPUT (RUN-START)**

Disconnect the Left Heated Seat switch connector.

**Note: Check connectors - Clean and repair as necessary.**

Turn the ignition on.

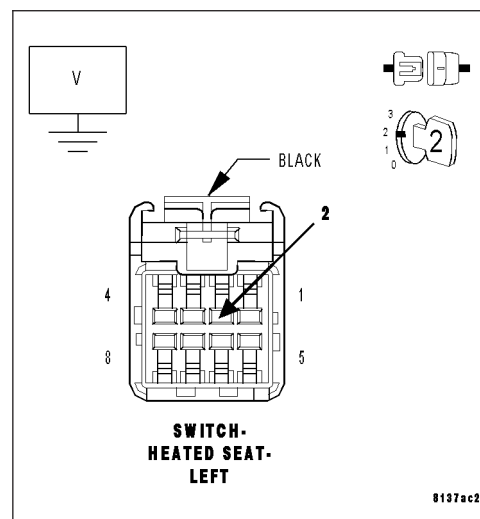
Measure the voltage of the (F23) Fused Ignition Switch Output (Run-Start) circuit at the Left Heated Seat Switch connector.

**Is the voltage above 10.0 volts ?**

**Yes** >> Go To 5

**No** >> Repair the (F23) Fused Ignition Switch Output (Run-Start) circuit for an open.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

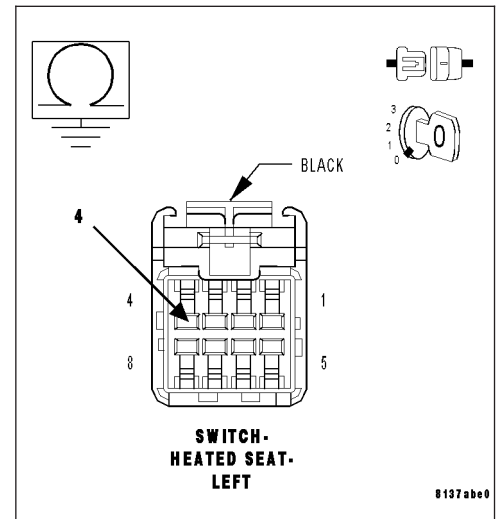


**B120F-LEFT HEATED SEAT HI INDICATOR CONTROL CIRCUIT OPEN (CONTINUED)****5. CHECK THE (P83) LEFT HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (P83) Left Heated Seat High Indicator Driver circuit.

**Was the resistance below 5.0 ohms?**

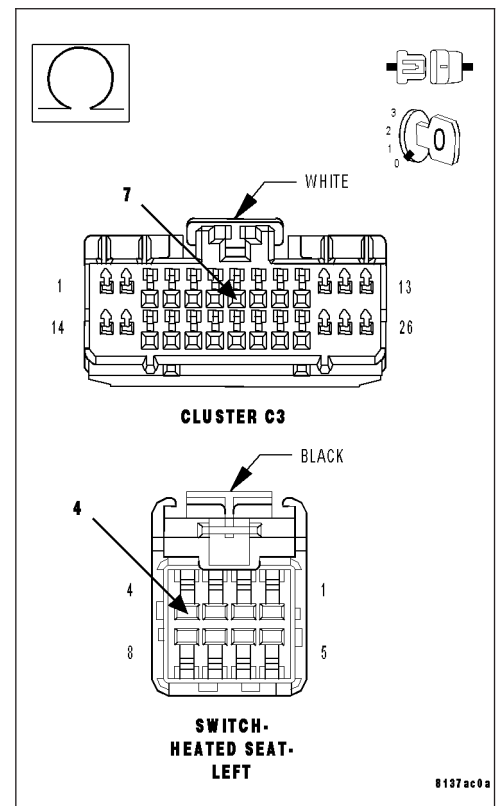
- Yes** >> Repair the (P83) Left Heated Seat High Indicator Driver circuit for a short to ground  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Go To 6

**6. CHECK THE (P83) LEFT HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT FOR AN OPEN**

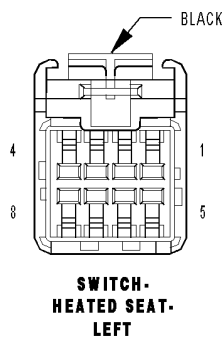
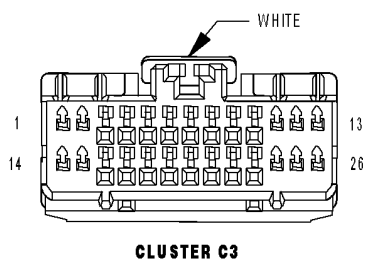
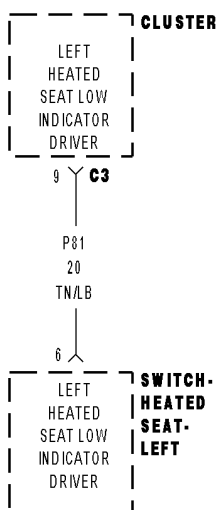
Measure the resistance of the (P83) Left Heated Seat High Indicator Driver circuit between the Cluster C3 connector and the Left Heated Seat Switch connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Left Heated Seat Switch.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Repair the (P83) Left Heated Seat High Indicator Driver circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).



## B1216-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH





**B1216-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH (CONTINUED)**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**Continuously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects excessive voltage on the heated seat indicator control circuit.

Possible Causes
(P81) LEFT HEATED SEAT LO INDICATOR DRIVER CIRCUIT SHORTED TO BATTERY
LEFT HEATED SEAT SWITCH
CLUSTER

**Diagnostic Test****1. VERIFY THAT DTC B1216-LEFT HEATED SEAT SWITCH LO INDICATOR CONTROL CIRCUIT HIGH IS ACTIVE**

With the scan tool, record and erase DTC's

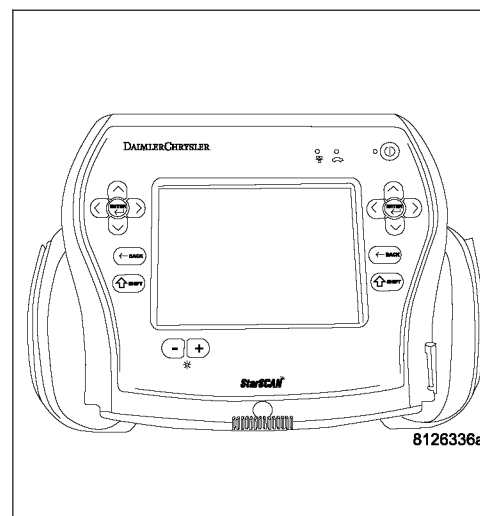
Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

**Does the DTC B1216-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH reset?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**2. DISCONNECT THE DRIVER HEATED SEAT SWITCH AND RE-READ DTC**

Disconnect the Left Heated Seat Switch connector.

With the scan tool erase DTC's

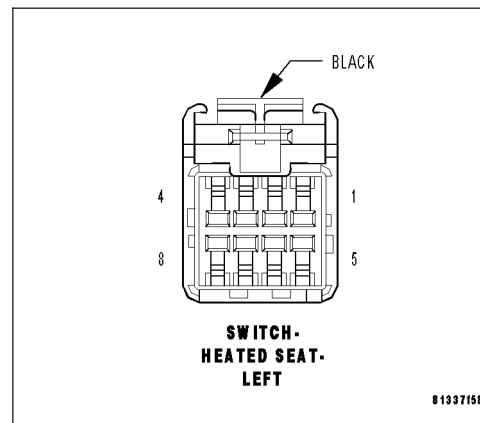
Cycle the ignition switch off then back on.

With the scan tool, read DTC's.

**Does the DTC B1216-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH reset?**

**Yes** >> Go To 3

**No** >> Replace the Left Heated Seat switch.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).



**B1216-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH (CONTINUED)****3. DISCONNECT THE CLUSTER C3 CONNECTOR AND CHECK FOR VOLTAGE**

Disconnect the Cluster C3 connector.

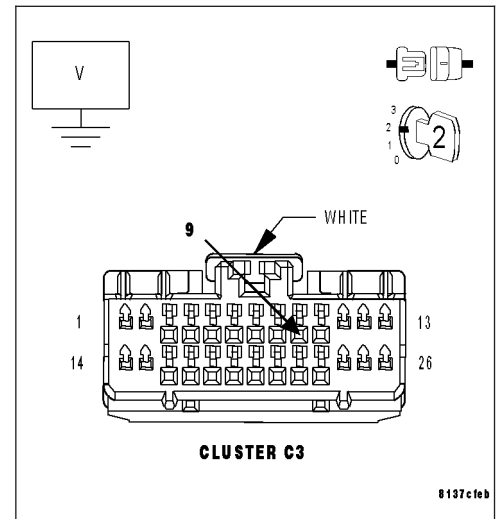
**Note: Check connectors - Clean and repair as necessary.**

Turn the ignition on.

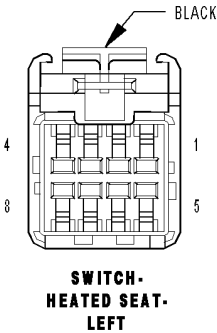
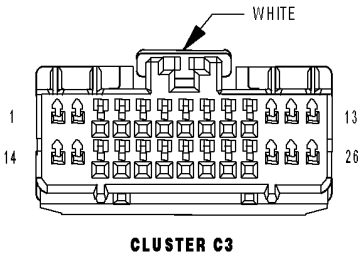
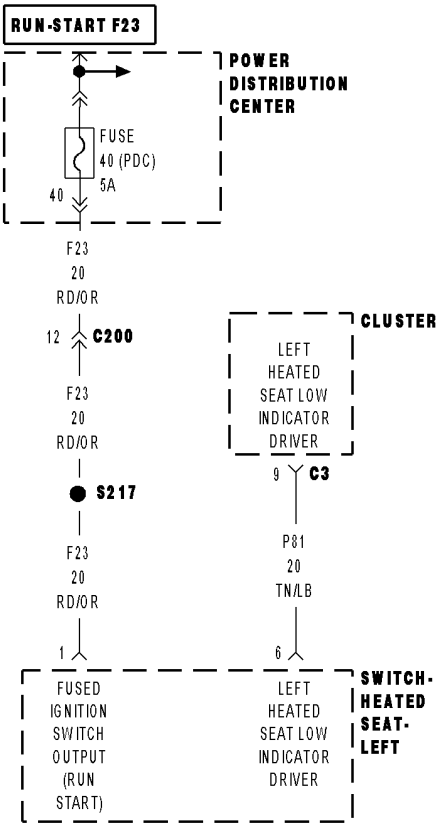
Measure the voltage at the (P81) Left Heated Seat Low Indicator Driver circuit at the Cluster C3 connector.

**Is there any voltage present?**

- Yes** >> Repair the (P81) Left Heated Seat Low Indicator Driver circuit for a short to battery.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Replace the Cluster in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST – VER 1).



B1217-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT OPEN



**B1217-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT OPEN (CONTINUED)**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**Continuously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects low voltage on the heated seat indicator control circuit.

Possible Causes
PDC FUSE #40 (F23) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN (P81) LEFT HEATED SEAT LOW INDICATOR DRIVER CIRCUIT OPEN/SHORTED TO GROUND LEFT HEATED SEAT SWITCH CLUSTER

**Diagnostic Test****1. VERIFY THAT DTC B1217-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT OPEN IS ACTIVE**

With the scan tool, record and erase DTC's

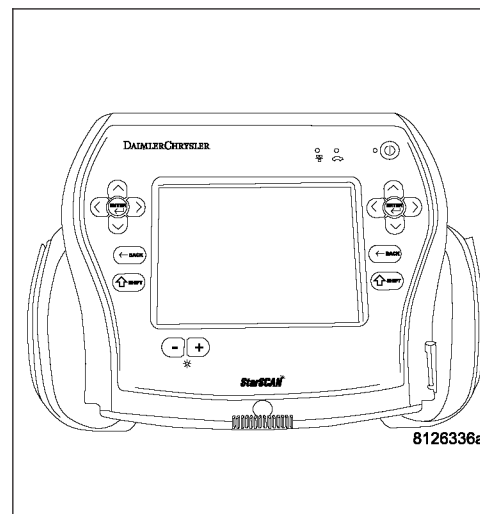
Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

**Does the DTC B1217-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT OPEN reset?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
 Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**2. INSPECT PDC FUSE #40**

Check Junction Block fuse #2.

**Is the fuse open?**

**Yes** >> Check for a possible short to ground on the (F23) Fused Ignition Switch Output (Run-Start) Circuit and replace the fuse as necessary.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 3

**B1217-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT OPEN (CONTINUED)****3. DISCONNECT THE CLUSTER C3 CONNECTOR AND CHECK FOR VOLTAGE**

Reinstall fuse if removed in previous test.

Disconnect the Cluster C3 connector.

**Note: Check connectors - Clean and repair as necessary.**

Turn the ignition on.

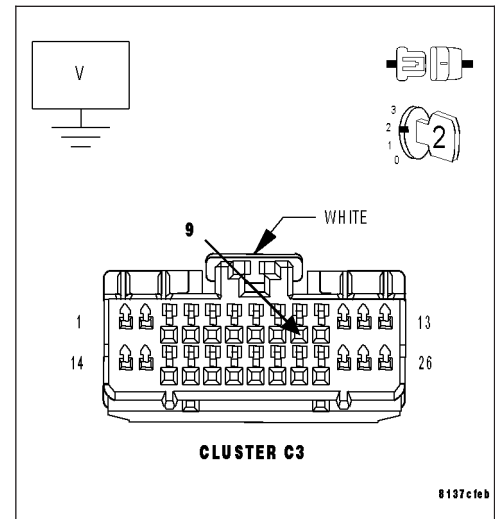
Measure the voltage at the (P81) Left Heated Seat Low Indicator Driver circuit at the Cluster C3 connector.

**Is the voltage above 10.0 volts?**

**Yes** >> Replace the Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4

**4. CHECK THE (F23) FUSED IGNITION SWITCH OUTPUT (RUN-START)**

Disconnect the Left Heated Seat switch connector.

**Note: Check connectors - Clean and repair as necessary.**

Turn the ignition on.

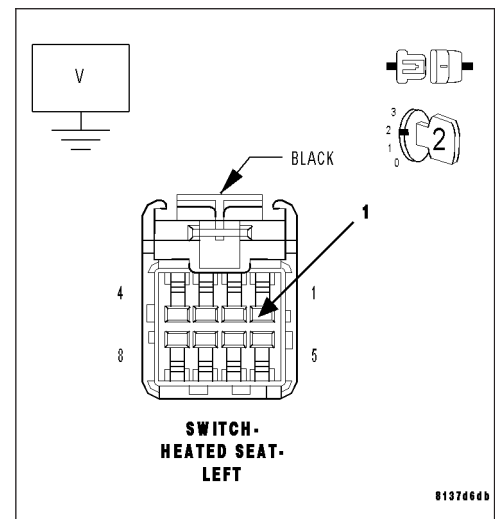
Measure the voltage of the (F23) Fused Ignition Switch Output (Run-Start) circuit at the Left Heated Seat Switch connector.

**Is the voltage above 10.0 volts ?**

**Yes** >> Go To 5

**No** >> Repair the (F23) Fused Ignition Switch Output (Run-Start) circuit for an open.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

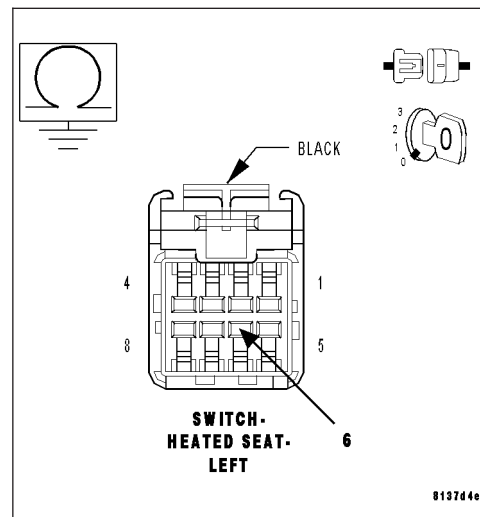


**B1217-LEFT HEATED SEAT LO INDICATOR CONTROL CIRCUIT OPEN (CONTINUED)****5. CHECK THE (P81) LEFT HEATED SEAT LO INDICATOR DRIVER CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (P81) Left Heated Seat Lo Indicator Driver circuit.

**Was the resistance below 5.0 ohms?**

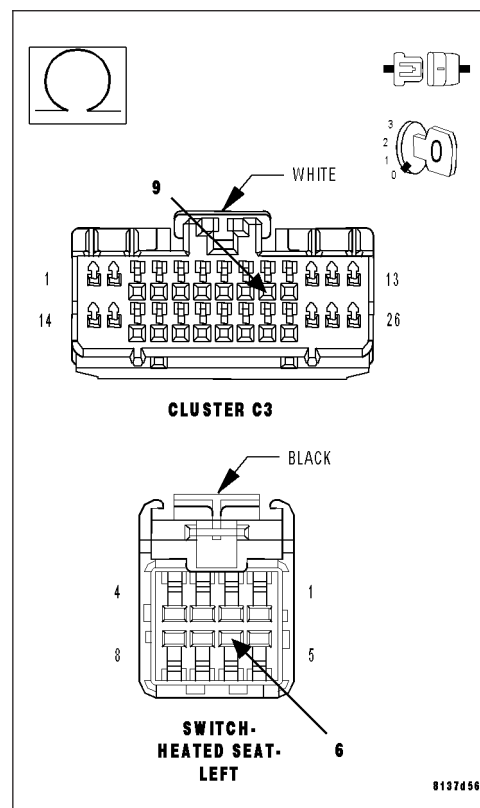
- Yes** >> Repair the (P81) Left Heated Seat Lo Indicator Driver circuit for a short to ground  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Go To 6

**6. CHECK THE (P81) LEFT HEATED SEAT LO INDICATOR DRIVER CIRCUIT FOR AN OPEN**

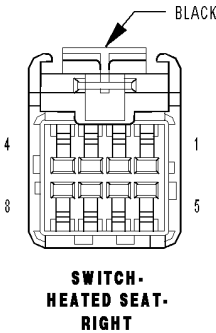
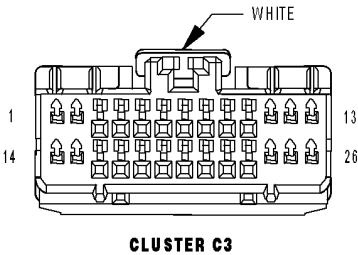
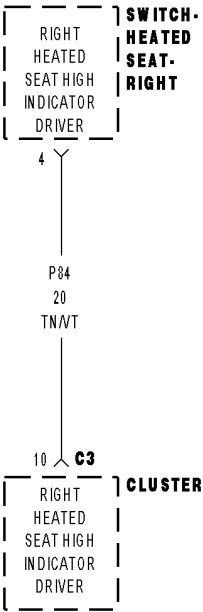
Measure the resistance of the (P81) Left Heated Seat Lo Indicator Driver circuit between the Cluster C3 connector and the Driver Heated Seat Switch connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Left Heated Seat Switch.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Repair the (P81) Left Heated Seat Lo Indicator Driver circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



B121A-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH



**B121A-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH (CONTINUED)**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**Continuously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects excessive voltage on the heated seat indicator control circuit.

Possible Causes
(P84) RIGHT HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT SHORTED TO BATTERY
RIGHT HEATED SEAT SWITCH
CLUSTER

**Diagnostic Test****1. VERIFY THAT DTC B121A-RIGHT HEATED SEAT SWITCH HI INDICATOR CONTROL CIRCUIT HIGH IS ACTIVE**

With the scan tool, record and erase DTC's

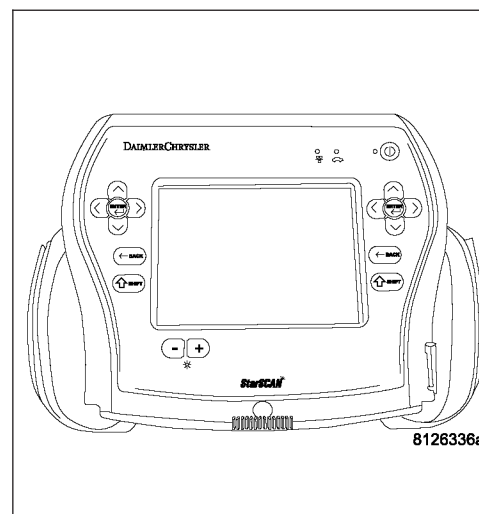
Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

**Does the DTC B121A-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH reset?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**2. DISCONNECT THE RIGHT HEATED SEAT SWITCH AND RE-READ DTC**

Disconnect the Right Heated Seat Switch connector.

With the scan tool erase DTC's

Cycle the ignition switch off then back on.

With the scan tool, read DTC's.

**Does the DTC B121A-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH reset?**

**Yes** >> Go To 3

**No** >> Replace the Right Heated Seat switch.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



**B121A-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT HIGH (CONTINUED)****3. DISCONNECT THE CLUSTER C-3 CONNECTOR AND CHECK FOR VOLTAGE**

Disconnect the Cluster C-3 connector.

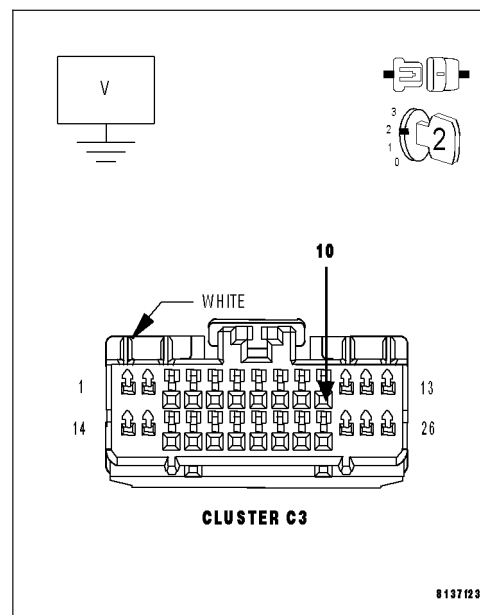
**Note: Check connectors - Clean and repair as necessary.**

Turn the ignition on.

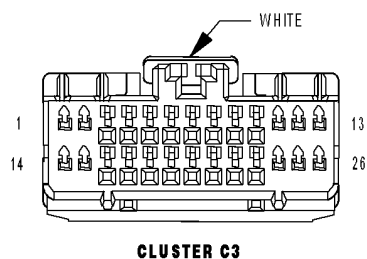
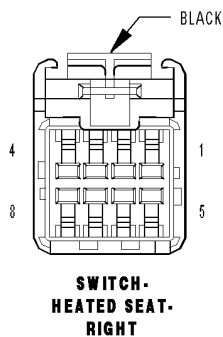
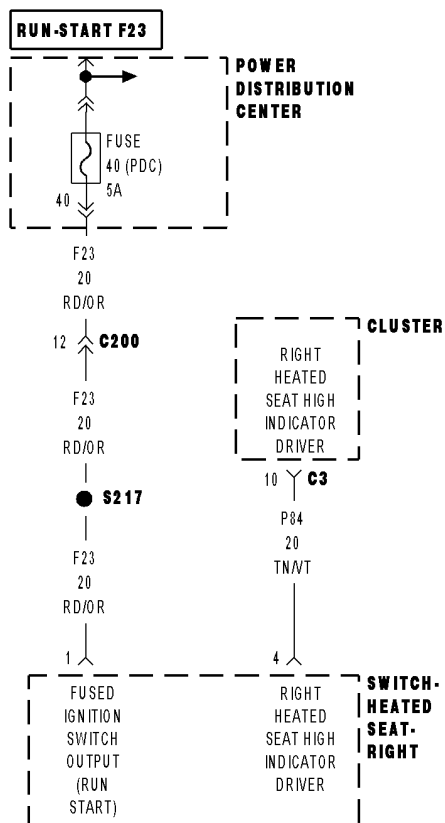
Measure the voltage at the (P84) Right Heated Seat High Indicator Driver circuit at the Cluster C-3 connector.

**Is there any voltage present?**

- Yes** >> Repair the (P84) Right Heated Seat High Indicator Driver circuit for a short to battery.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Replace the Cluster in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



# B121B-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT OPEN



**B121B-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT OPEN (CONTINUED)**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:** Continuously with the ignition on.
- **Set Condition:** This code is set immediately when the Cluster detects low voltage on the heated seat indicator control circuit.

Possible Causes
PDC FUSE #40 (F23) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN (P84) RIGHT HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT OPEN/SHORTED TO GROUND RIGHT HEATED SEAT SWITCH CLUSTER

**Diagnostic Test****1. VERIFY THAT DTC B121B-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT OPEN IS ACTIVE**

With the scan tool, record and erase DTC's

Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

**Does the DTC B121B-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT OPEN reset?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**2. INSPECT PDC FUSE #40**

Check PDC fuse #40.

**Is the fuse open?**

**Yes** >> Check for a possible short to ground on the (F23) Fused Ignition Switch Output (Run-Start) Circuit and replace the fuse as necessary.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 3

**B121B-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT OPEN (CONTINUED)****3. DISCONNECT THE CLUSTER C3 CONNECTOR AND CHECK FOR VOLTAGE**

Reinstall fuse if removed in previous test.

Disconnect the Cluster C3 connector.

**Note: Check connectors - Clean and repair as necessary.**

Turn the ignition on.

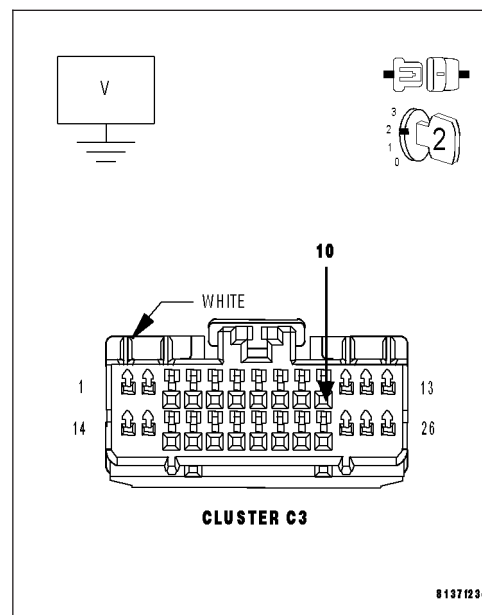
Measure the voltage at the (P84) Right Heated Seat High Indicator Driver circuit at the Cluster C3 connector.

**Is the voltage above 10.0 volts?**

**Yes** >> Replace the Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4

**4. CHECK THE (F23) FUSED IGNITION SWITCH OUTPUT (RUN-START)**

Disconnect the Right Heated Seat switch connector.

**Note: Check connectors - Clean and repair as necessary.**

Turn the ignition on.

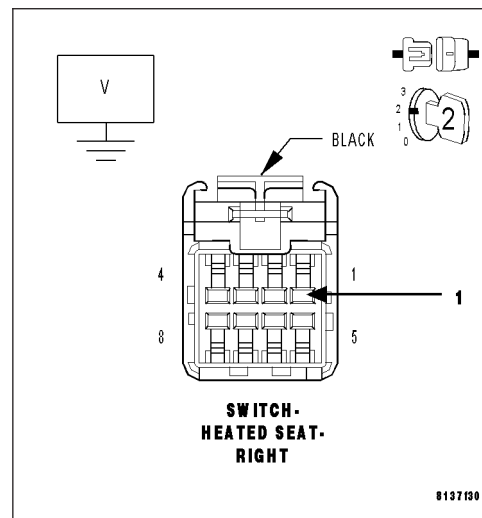
Measure the voltage of the (F23) Fused Ignition Switch Output (Run-Start ) circuit at the Right Heated Seat Switch connector.

**Is the voltage above 10.0 volts ?**

**Yes** >> Go To 5

**No** >> Repair the (F23) Fused Ignition Switch Output (Run-Start ) circuit for an open.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

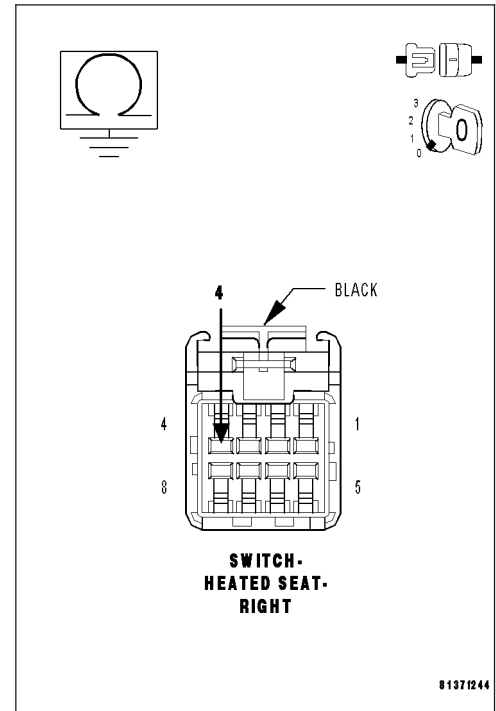


**B121B-RIGHT HEATED SEAT HI INDICATOR CONTROL CIRCUIT OPEN (CONTINUED)****5. CHECK THE (P84) RIGHT HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (P84) Right Heated Seat High Indicator Driver circuit.

**Was the resistance below 5.0 ohms?**

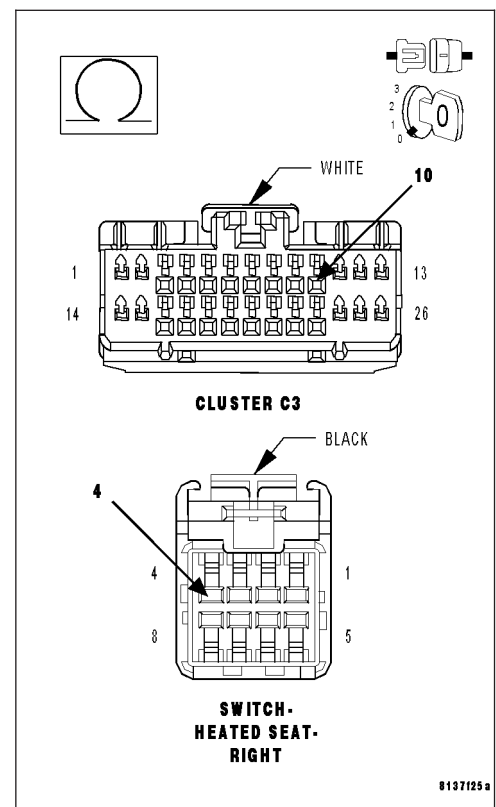
- Yes** >> Repair the (P84) Right Heated Seat High Indicator Driver circuit for a short to ground  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Go To 6

**6. CHECK THE (P84) RIGHT HEATED SEAT HIGH INDICATOR DRIVER CIRCUIT FOR AN OPEN**

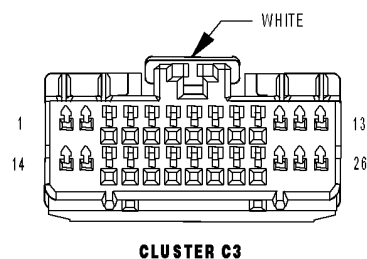
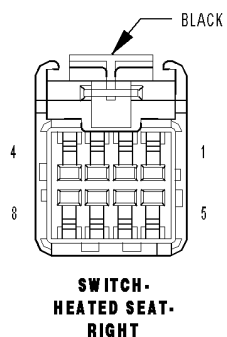
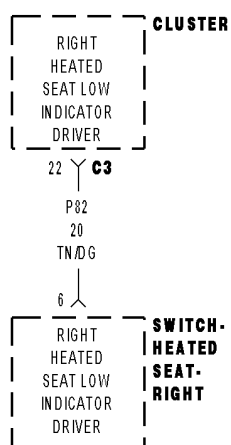
Measure the resistance of the (P84) Right Heated Seat High Indicator Driver circuit between the Cluster C3 connector and the Right Heated Seat Switch connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Right Heated Seat Switch.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Repair the (P84) Right Heated Seat High Indicator Driver circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



## B1222-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH



**B1222-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH (CONTINUED)**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**Continuously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects excessive voltage on the heated seat indicator control circuit.

Possible Causes
(P82) RIGHT HEATED SEAT LOW INDICATOR DRIVER CIRCUIT SHORTED TO BATTERY
RIGHT HEATED SEAT SWITCH
CLUSTER

**Diagnostic Test****1. VERIFY THAT DTC B1222-RIGHT HEATED SEAT SWITCH LO INDICATOR CONTROL CIRCUIT HIGH IS ACTIVE**

With the scan tool, record and erase DTC's

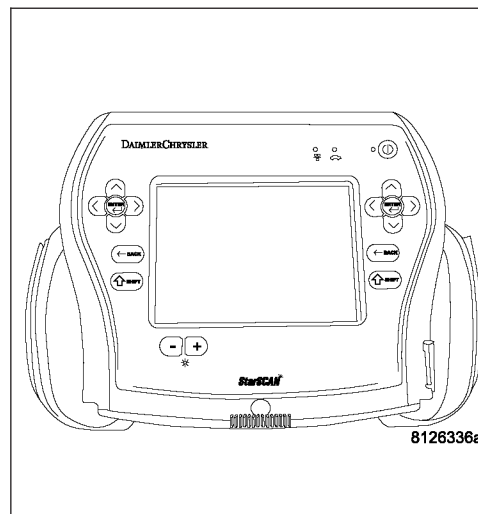
Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

**Does the DTC B1222-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH reset?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**2. DISCONNECT THE PASSENGER HEATED SEAT SWITCH AND RE-READ DTC**

Disconnect the Right Heated Seat Switch connector.

With the scan tool erase DTC's

Cycle the ignition switch off then back on.

With the scan tool, read DTC's.

**Does the DTC B1222-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH reset?**

**Yes** >> Go To 3

**No** >> Replace the Right Heated Seat switch.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**B1222-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT HIGH (CONTINUED)****3. DISCONNECT THE CLUSTER C-3 CONNECTOR AND CHECK FOR VOLTAGE**

Disconnect the Cluster C-3 connector.

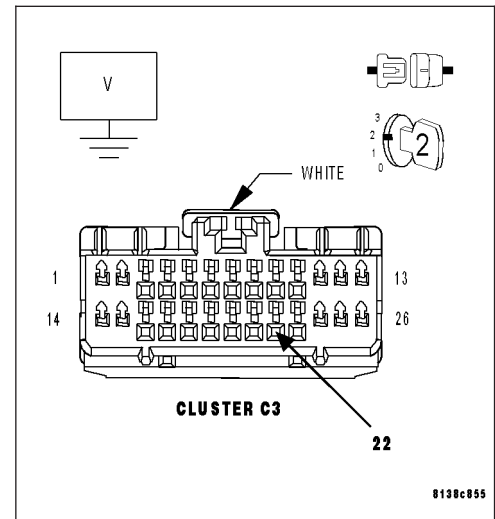
**Note: Check connectors - Clean and repair as necessary.**

Turn the ignition on.

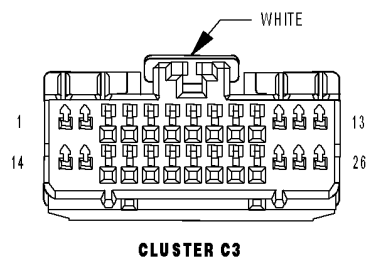
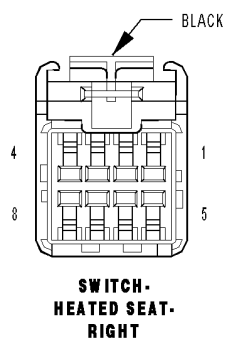
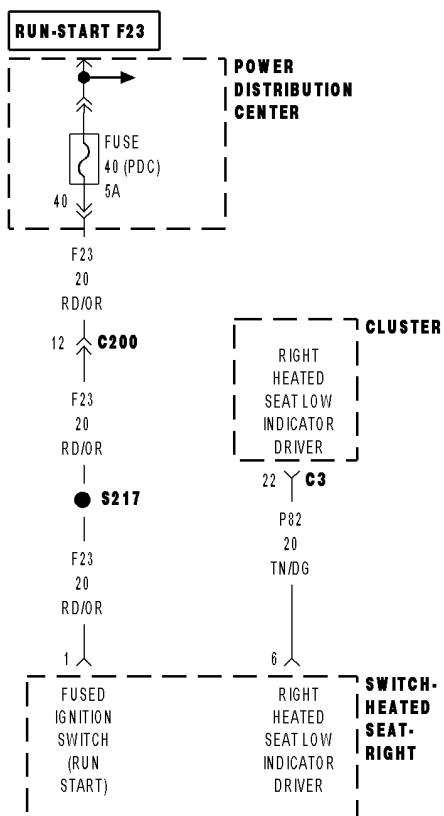
Measure the voltage at the (P82) Right Heated Seat Low Indicator Driver circuit at the Cluster C-3 connector.

**Is there any voltage present?**

- Yes** >> Repair the (P82) Right Heated Seat Low Indicator Driver circuit for a short to battery.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Replace the Cluster in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).





**B1223-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT OPEN**

**B1223-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT OPEN (CONTINUED)**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**Continuously with the ignition on.
- **Set Condition:**This code is set immediately when the Cluster detects low voltage on the heated seat indicator control circuit.

Possible Causes
PDC FUSE #40 (F23) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN (P82) RIGHT HEATED SEAT LOW INDICATOR DRIVER CIRCUIT OPEN/SHORTED TO GROUND RIGHT HEATED SEAT SWITCH CLUSTER

**Diagnostic Test****1. VERIFY THAT DTC B1223-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT OPEN IS ACTIVE**

With the scan tool, record and erase DTC's

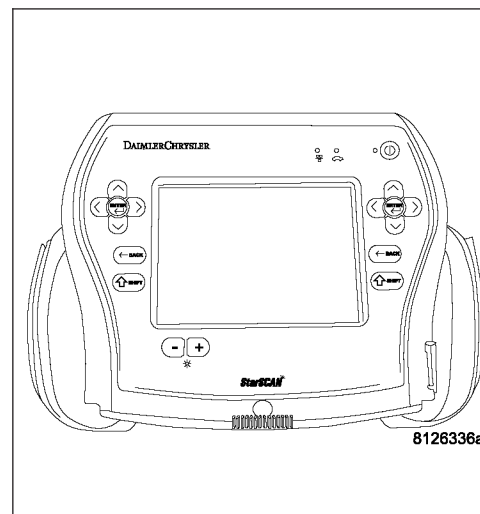
Operate the Heated Seat Switch in both positions several times.

With the scan tool, read DTC's.

**Does the DTC B1223-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT OPEN reset?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
 Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**2. INSPECT PDC FUSE #40**

Check Junction Block fuse #2.

**Is the fuse open?**

**Yes** >> Check for a possible short to ground on the (F23) Fused Ignition Switch Output (Run-Start) Circuit and replace the fuse as necessary.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 3

**B1223-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT OPEN (CONTINUED)****3. DISCONNECT THE CLUSTER C-3 CONNECTOR AND CHECK FOR VOLTAGE**

Reinstall fuse if removed in previous test.

Disconnect the Cluster C-3 connector.

**Note: Check connectors - Clean and repair as necessary.**

Turn the ignition on.

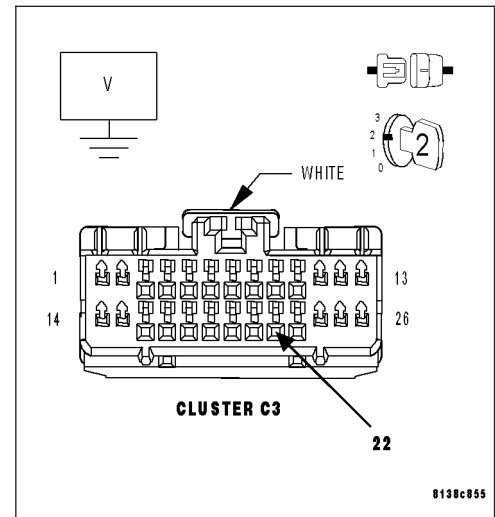
Measure the voltage at the (P82) Right Heated Seat Low Indicator Driver circuit at the Cluster C-3 connector.

**Is the voltage above 10.0 volts?**

**Yes** >> Replace the Cluster in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4

**4. CHECK THE (F23) FUSED IGNITION SWITCH OUTPUT (RUN-START)**

Disconnect the Right Heated Seat switch connector.

**Note: Check connectors - Clean and repair as necessary.**

Turn the ignition on.

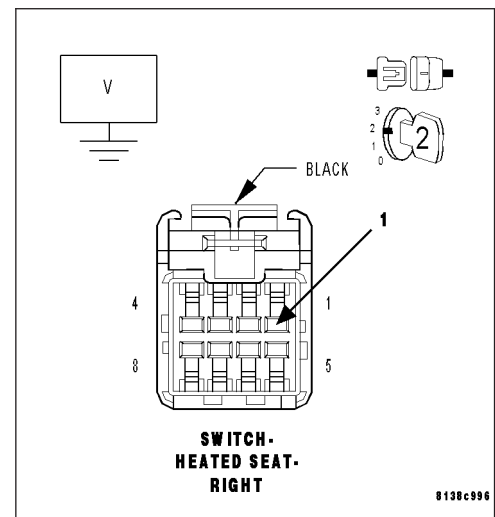
Measure the voltage of the (F23) Fused Ignition Switch Output circuit at the Right Heated Seat Switch connector.

**Is the voltage above 10.0 volts ?**

**Yes** >> Go To 5

**No** >> Repair the (F23) Fused Ignition Switch Output circuit for an open.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

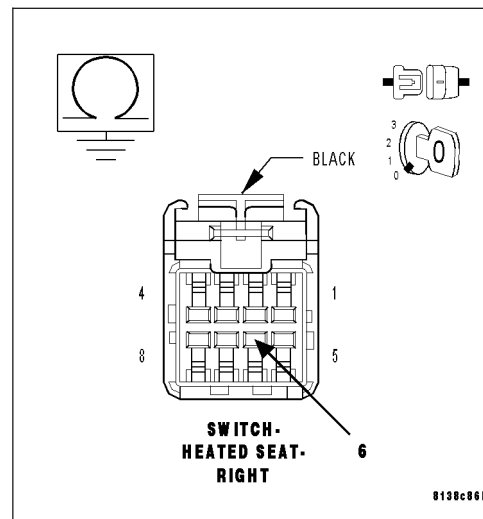


**B1223-RIGHT HEATED SEAT LO INDICATOR CONTROL CIRCUIT OPEN (CONTINUED)****5. CHECK THE (P82) RIGHT HEATED SEAT LO INDICATOR DRIVER CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (P82) Right Heated Seat Lo Indicator Driver circuit.

**Was the resistance below 5.0 ohms?**

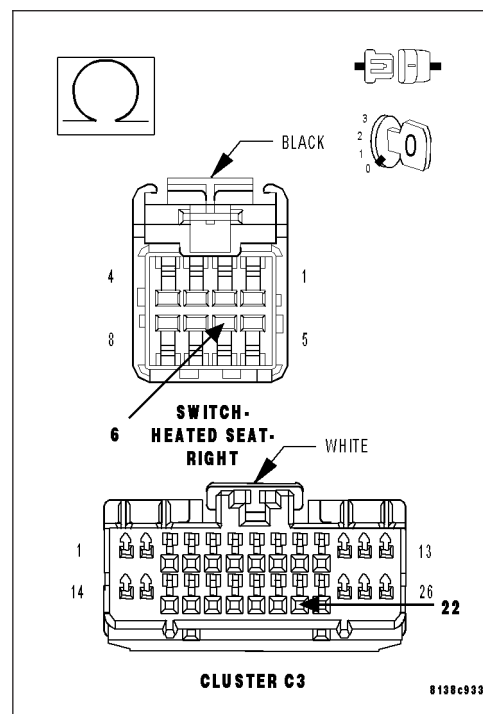
- Yes** >> Repair the (P82) Right Heated Seat Lo Indicator Driver circuit for a short to ground  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Go To 6

**6. CHECK THE (P82) RIGHT HEATED SEAT LO INDICATOR DRIVER CIRCUIT FOR AN OPEN**

Measure the resistance of the (P82) Right Heated Seat Lo Indicator Driver circuit between the Cluster C-3 connector and the Right Heated Seat Switch connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Right Heated Seat Switch.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Repair the (P82) Right Heated Seat Lo Indicator Driver circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



## B210D-BATTERY VOLTAGE LOW

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**Engine running, during heated seat operation.
- **Set Condition:**This code is set immediately after the Heated Seat Module receives a low charging system voltage message over the CAN B Bus or detects voltage under 11.3 volts on the (A33) Fused B(+) circuit.

Possible Causes
CHARGING SYSTEM VOLTAGE LOW (A33) FUSED B(+) CIRCUIT HEATED SEAT MODULE

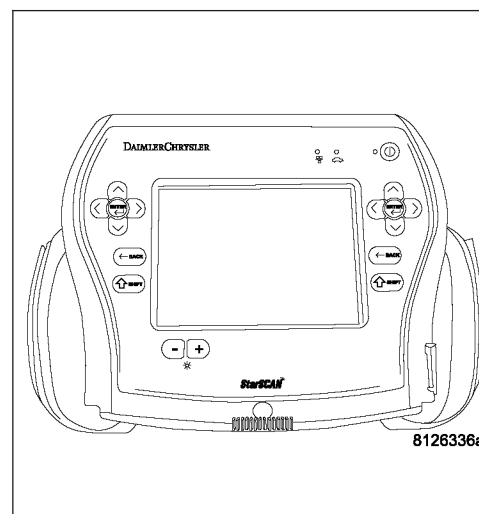
## Diagnostic Test

### 1. CHECK PCM FOR CHARGING SYSTEM DTC

With the scan tool, read Powertrain Control Module DTC's.

**Are there any Charging System DTC's set in the Powertrain Control Module?**

- Yes** >> (Refer to 8 - ELECTRICAL/CHARGING - DIAGNOSIS AND TESTING) for Charging System diagnostic procedures.
- No** >> Go To 2  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



### 2. VERIFY THAT DTC B210D-BATTERY VOLTAGE LOW IS ACTIVE

With the scan tool, record and erase DTC's

Turn the ignition switch to the Off position then start the engine and let run for one minute.

With the scan tool, read DTC's.

**Does the DTC B210D-BATTERY VOLTAGE LOW reset?**

- Yes** >> Go To 3
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**B210D-BATTERY VOLTAGE LOW (CONTINUED)****3. CHECK THE VOLTAGE ON THE (A940) FUSED B(+) CIRCUIT**

Disconnect the Heated Seat Module connector.

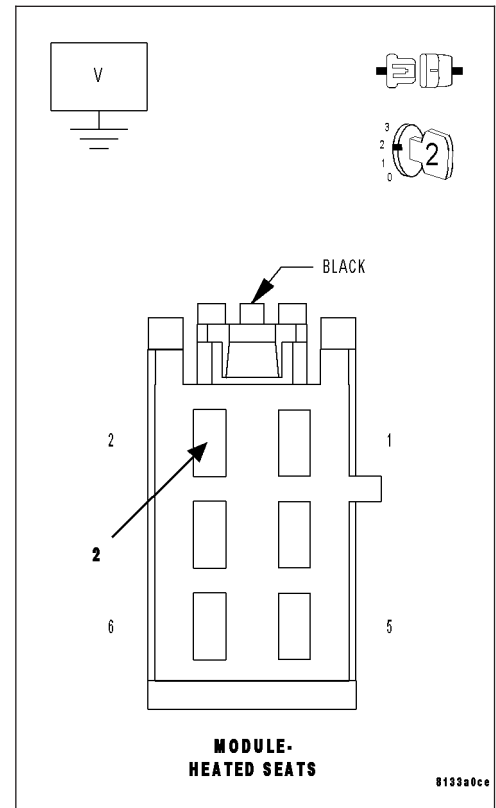
**Note: Check connectors - Clean and repair as necessary.**

Start the engine and let idle.

Measure the voltage on the (A33) Fused B(+) circuit at the HSM connector and compare to voltage at the vehicle battery.

**Is the voltage at the HSM connector the same as measured at the battery?**

- Yes** >> Replace the Heated Seat Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Repair the (A33) Fused B(+) circuit as necessary.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



## B210E-BATTERY VOLTAGE HIGH

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:** Engine running, during heated seat operation.
- **Set Condition:** This code is set immediately after the Heated Seat Module receives a high charging system voltage message over the CAN B Bus or detects voltage over 15 volts on the (A33) Fused B(+) circuit.

Possible Causes
CHARGING SYSTEM VOLTAGE HIGH (A33) FUSED B(+) CIRCUIT HEATED SEAT MODULE

## Diagnostic Test

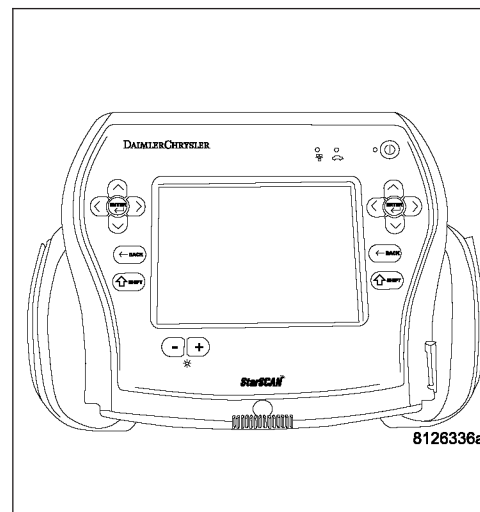
### 1. CHECK PCM FOR CHARGING SYSTEM DTC

With the scan tool, read Powertrain Control Module DTC's.

**Are there any Charging System DTC's set in the Powertrain Control Module?**

**Yes** >> (Refer to 8 - ELECTRICAL/CHARGING - DIAGNOSIS AND TESTING) for Charging System diagnostic procedures.

**No** >> Go To 2



### 2. VERIFY THAT DTC B210E-BATTERY VOLTAGE HIGH IS ACTIVE

With the scan tool, record and erase DTC's

Turn the ignition switch to the Off position then start the engine and let run for one minute.

Attempt to operate the heated seats.

With the scan tool, read DTC's.

**Does the DTC B210E-BATTERY VOLTAGE HIGH reset?**

**Yes** >> Go To 3

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**B210E-BATTERY VOLTAGE HIGH (CONTINUED)****3. CHECK THE VOLTAGE ON THE (A940) FUSED B(+) CIRCUIT**

Disconnect the Heated Seat Module connector.

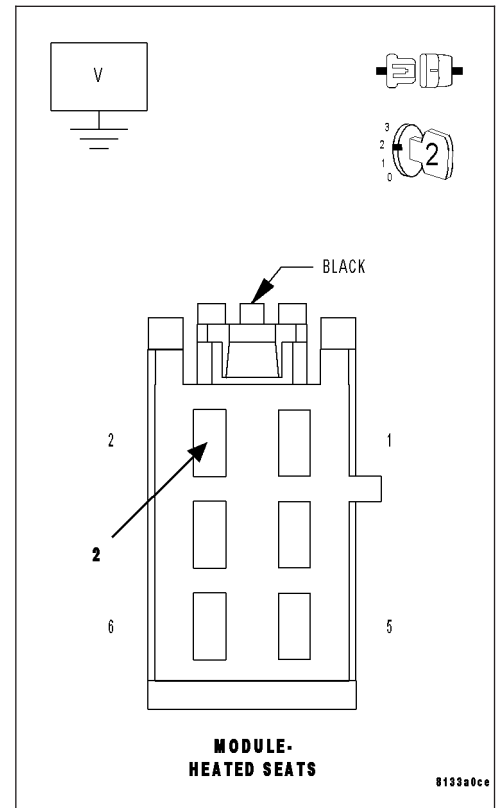
**Note: Check connectors - Clean and repair as necessary.**

Start the engine and let idle.

Measure the voltage on the (A33) Fused B(+) circuit at the HSM connector and compare to voltage at the vehicles battery.

**Is the voltage at the HSM connector the same as measured at the battery?**

- Yes** >> Replace the Heated Seat Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Repair the (A33) Fused B(+) circuit as necessary.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).





B221A-HEATED SEAT MODULE INTERNAL

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**Ignition on.
- **Set Condition:**This code is set immediately if the Heated Seat Module internal self test fails.

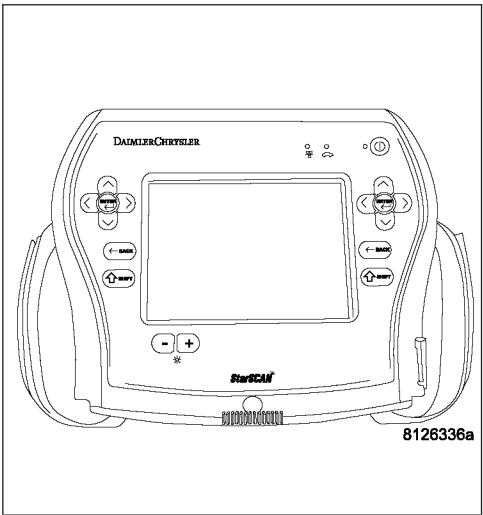
Possible Causes
HEATED SEAT MODULE

Diagnostic Test

1. VERIFY THAT DTC B221A-HEATED SEAT MODULE INTERNAL IS ACTIVE

With the scan tool, record and erase DTC's  
Cycle the ignition switch off then back on.  
With the scan tool, read DTC's.

- Does the DTC B221A-HEATED SEAT MODULE INTERNAL reset?**
- Yes** >> Replace the Heated Seat Module.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).





**U0019–CAN B BUS – HSM (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Continuously
- **Set Condition:**  
Whenever the Can B Bus (+) or B Bus (–) circuit is open, shorted to voltage or shorted to ground, this code will set.

Possible Causes
CAN B BUS DTC's IN FRONT CONTROL MODULE (D54) CAN B BUS (–) CIRCUIT OPEN (D55) CAN B BUS (+) CIRCUIT OPEN HEATED SEAT MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Cycle the ignition from on to off 3 times.

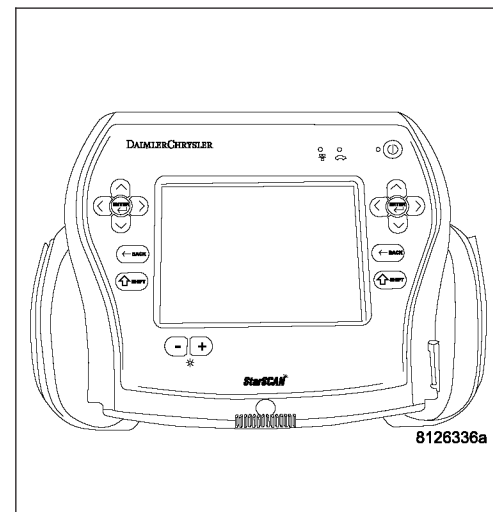
Turn the ignition on.

With the scan tool, read DTC's.

**Does the scan tool display U0019 CAN B BUS CIRCUIT?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

**2. CHECK FRONT CONTROL MODULE DTC's**

With the scan tool, read Front Control Module DTC's

**Does the scan tool display any CAN B BUS DTC's – ACTIVE?**

**Yes** >> Refer to the symptom list for problems related to Communication in the ELECTRICAL.– ELECTRONIC CONTROL MODULES – ELECTRICAL DIAGNOSES section.

**No** >> Go to 3

**U0019-CAN B BUS – HSM (CONTINUED)****3. CAN B BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Heated Seat Module connector.

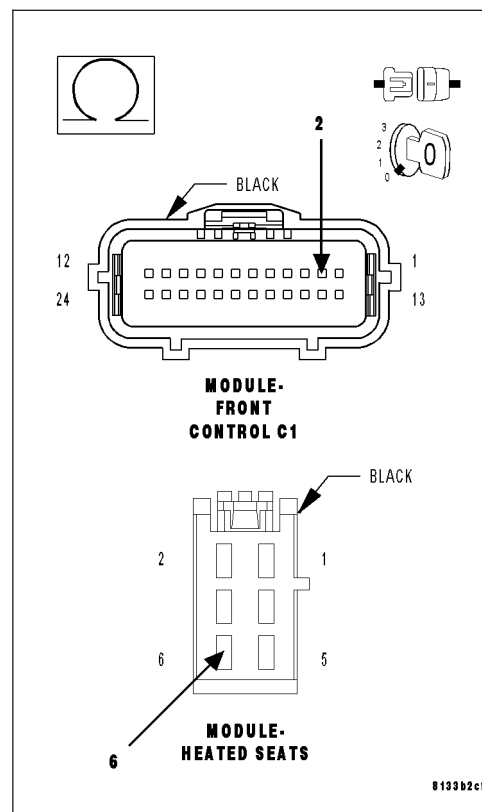
Disconnect the Front Control Module C1 connector.

Measure the resistance of the (D55) Can B Bus (+) circuit between the Front Control Module C1 connector and the Heated Seat Module connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the Can B Bus (+) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

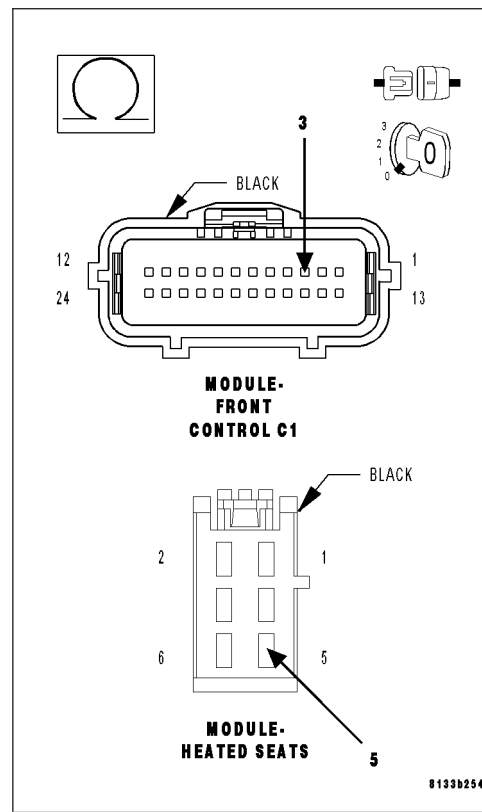
**4. CAN B BUS (-) CIRCUIT OPEN**

Measure the resistance of the (D54) Can B Bus (-) circuit between the Front Control Module C1 connector and the Heated Seat Module connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Replace the Heated Seat Module.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Repair the Can B Bus (-) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



### **U0019-CAN B BUS – HSM (CONTINUED)**

### **U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

### **U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

### **U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

### **U0155-LOST COMMUNICATION WITH CLUSTER/CCN**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

### **U0156-LOST COMMUNICATION WITH EOM**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

### **U0159-LOST COMMUNICATION WITH PARKING ASSIST CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

### **U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

### **U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

### **U0169-LOST COMMUNICATION WITH SUNROOF CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0169-LOST COMMUNICATION WITH SUNROOF CONTROL MODULE (CONTINUED)****U0181-LOST COMMUNICATION WITH HEADLAMP LEVELING TRANSLATOR**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0184-LOST COMMUNICATION WITH RADIO**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0195-LOST COMMUNICATION WITH SDARS**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0197-LOST COMMUNICATION WITH HFM**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0212-LOST COMMUNICATION WITH SCCM - CAN B**

For a complete wiring diagram Refer to Section 8W.

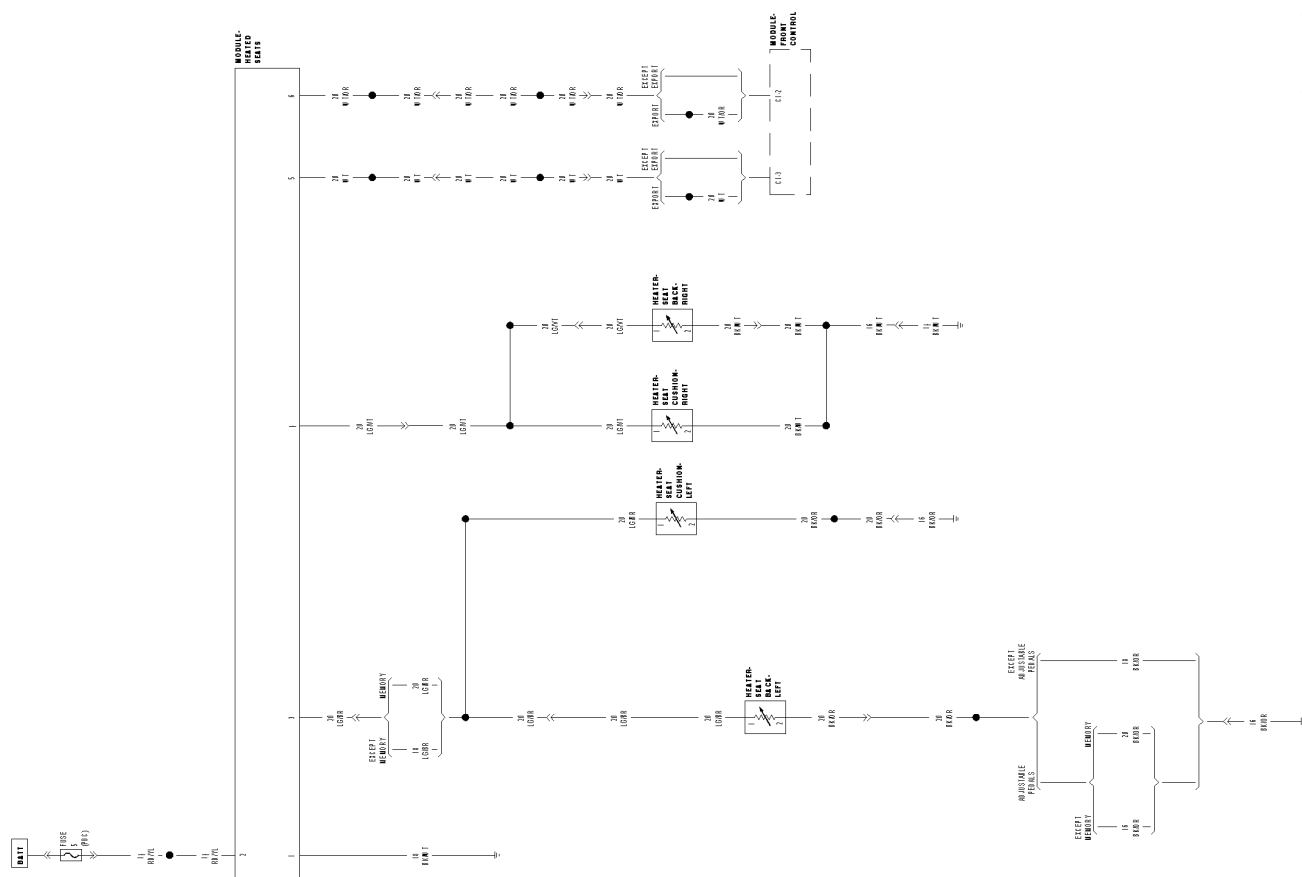
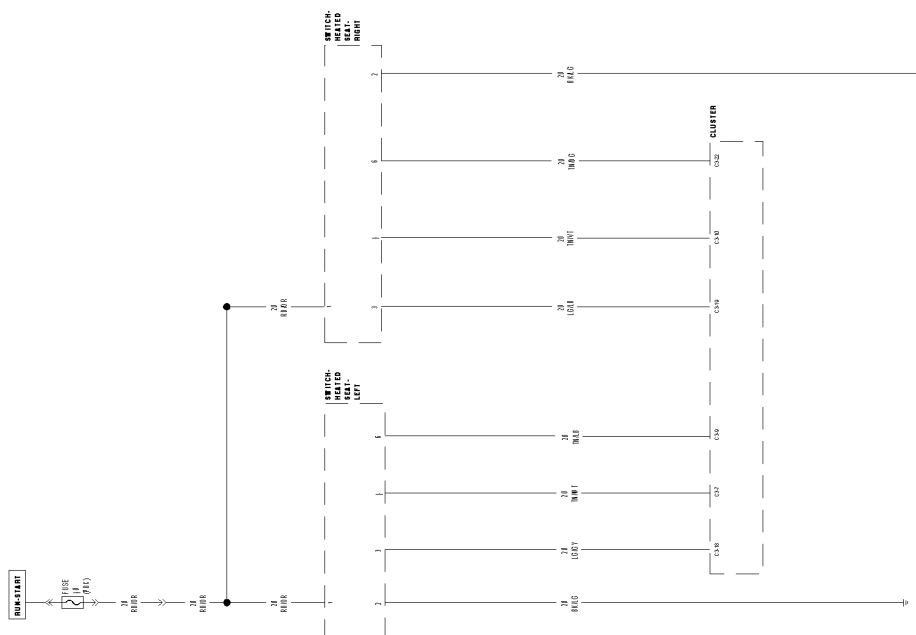
(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0231-LOST COMMUNICATION WITH RAIN SENSING MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## SCHEMATICS AND DIAGRAMS



## HEATED SEAT SYSTEM

31391E9B

## HEATED SEATS - SERVICE INFORMATION

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## HEATED SEATS - SERVICE INFORMATION

### DESCRIPTION

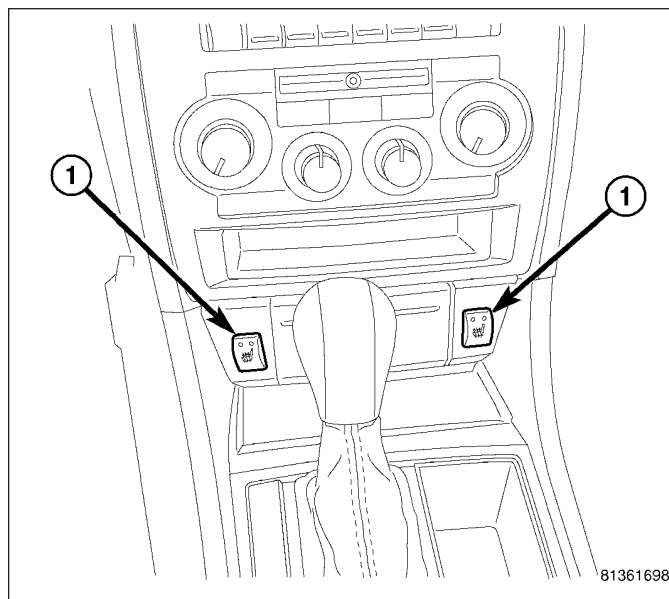
**WARNING:** The front passenger seat assembly contains critical components that affect the front passenger airbag deployment. Correctly functioning front passenger seat components are critical for the Occupant Classification System (OCS) to properly classify the front passenger and calculate the proper airbag deployment. Unapproved modifications or service procedures to the front passenger seat assembly, its related components, or trim cover may inadvertently change the airbag deployment in case of a frontal crash. This could result in death or serious injury to the front seat passenger if the vehicle is involved in an accident. The following requirements must be strictly adhered to:

- Do not modify the front passenger seat assembly or components in any way.
- Do not modify the front seat center console or center position seat in any way.
- Do not use prior or future model year seat trim covers not designated for the specific model being repaired. Always use the correct seat trim cover specified for the vehicle.
- Do not replace the seat trim cover with an aftermarket trim cover.
- Do not add a secondary trim cover other than those approved by DaimlerChrysler/Mopar.
- At no time should any Supplemental Restraint System (SRS) component or SRS related component or fastener be modified or replaced with any part except those which are approved by DaimlerChrysler/Mopar.



Vehicles with the heated seat option can be visually identified by the two heated seat switches (1) located in the center stack of the instrument panel. The heated seat system allows the driver and front seat passenger to select from two different levels of electrical seat heating (HI/LO). The heated seat system for this vehicle includes the following major components, which are described in further detail later in this section:

- **Heated Seat Elements** - Four heated seat elements are used per vehicle. Two heated seat elements are integral to each seat, one in the seat back and the other in the seat cushion.
- **Heated Seat Module** - One heated seat module is used per vehicle. The Heated Seat Module is mounted under the right front seat. This module contains the control logic and software for the front heated seat system. The module communicates on the Controller Area Network (CAN) data bus.
- **Heated Seat Switches** - Two heated seat switches are used per vehicle, one for each heated seat. Both switches are mounted in the instrument panel center stack.
- **Instrument Cluster (CCN)** - A Cab Compartment Node (CCN) is part of the instrument cluster on this vehicle. The CCN utilizes integrated software and information carried on the CAN data bus. The CCN serves as the link between the heated seat switches and the heated seat module.



## OPERATION

The heated seat system operates on battery current received through a fuse in the Integrated Power Module (IPM). Fused ignition switch output (run) circuits are used, so that the heated seat system will only operate when the ignition switch is in the On position. The heated seat system will turn Off automatically whenever the ignition switch is turned to any position except On.

A Heated Seat Module is used to control the heated seat system. The module responds to heated seat switch messages and ignition switch status inputs by controlling the 12v output to the front seat heating elements through integral solid-state relays.

When either of the heated seat switches are depressed a resistance signal is sent to the Cab Compartment Node (CCN) or instrument cluster. The CCN then sends a message via the Controller Area Network (CAN) data bus to the heated seat module, signaling the module to energize the heating element for the selected seat. Amber Light Emitting Diodes (LEDs) in the top portion of each switch indicate the level of heat in use: Two LEDs are illuminated for high, one for low, and none for off. Pressing the switch once will select high-level heating. Pressing the switch a second time will select low-level heating. Pressing the switch a third time will shut the heating elements off.

The heated seat module energizes an integral solid-state relay, which supplies battery current to the heating elements. When high-temperature heating is selected, the heaters provide a boosted heat level during the first four minutes of operation after heating is activated. The heat output then drops to the normal high-temperature level. If high-level heating is selected, the control system will automatically switch to the low level after two hours of continuous operation. At that time, the number of illuminated LEDs changes from two to one, indicating the change. Operation on the low setting also turns off automatically after two hours.

The module will automatically turn off the heating elements if it detects an OPEN or LOW short in the heating element circuit.

## DIAGNOSIS AND TESTING

### HEATED SEAT SYSTEM

In order to obtain conclusive testing, the heated seat system and the Controller Area Network (CAN) data bus circuit must be checked. **Any diagnosis of the heated seat system should begin with, the use of a scan tool and the appropriate diagnostic service information.**

Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.

**Note:** Vehicles equipped with the heated seat option utilize a low voltage cut-off feature. This feature turns off power to the heated seat system anytime vehicle voltage is below 11.1v or above 15.5v. Be certain to check the vehicle electrical system for proper voltage anytime the power seat system appears inoperative.

Before any testing of the power seat system is attempted, the battery should be fully-charged.

## HEATER-CUSHION PAD

### DESCRIPTION

Vehicles equipped with the optional heated seat system have two, carbon fiber heated seat elements, located in each front seat. One heating element is used for each seat cushion and another for each seat back.

Each of the heated seat element consists of multiple heating circuits operating in parallel throughout the carbon fiber element. The heated seat elements are captured between the leather trim cover and the seat cushion assembly. If a malfunction occurs in one or more of the individual carbon fiber circuits, the others will continue to provide heat.

The heated seat elements cannot be repaired. If found to be damaged or inoperative, a new heating element assembly must be installed.

### OPERATION

One end of the heated seat element is connected to ground at all times through a splice under the seat. Battery current is directed to the other end of the heated seat element by the heated seat module. The heated seat module will energize the heated seat element when the heated seat switch is depressed in the Low or High position.

As electrical current passes through the heated seat element, the resistance of the wire used in the element disperses some of the electrical current in the form of heat. The heat produced by the heated seat element then radiates through the underside of the seat cushion and seat back trim covers, warming the seat cover and its occupant.

## DIAGNOSIS AND TESTING

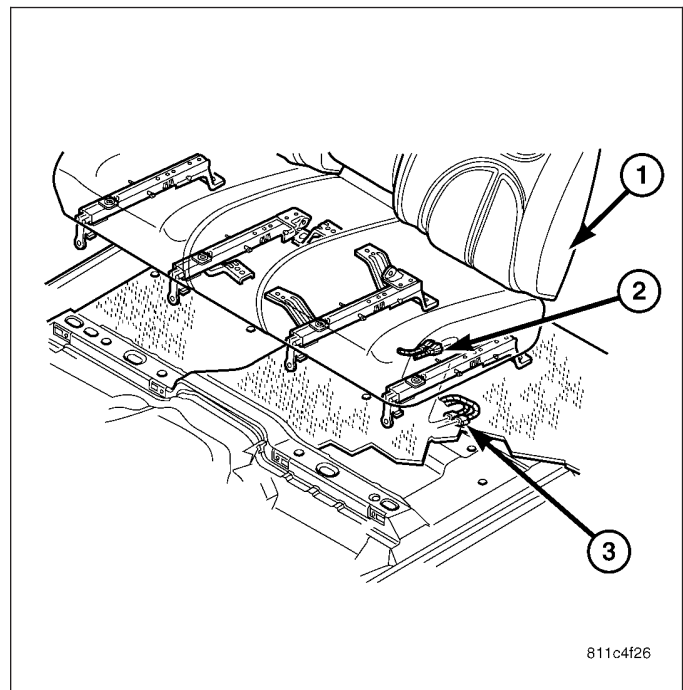
### HEATED SEAT ELEMENT

Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.

The wire harness connectors (2&3) for the heating elements are located under the seat (1).

**Note:** When checking heated seat elements for continuity, be certain to move the heating element being checked. Moving the element, such as sitting in the seat will eliminate the possibility of an intermittent open in the element which would only be evident if the element was in a certain position. Failure to check the element in various positions could result in an incomplete test.

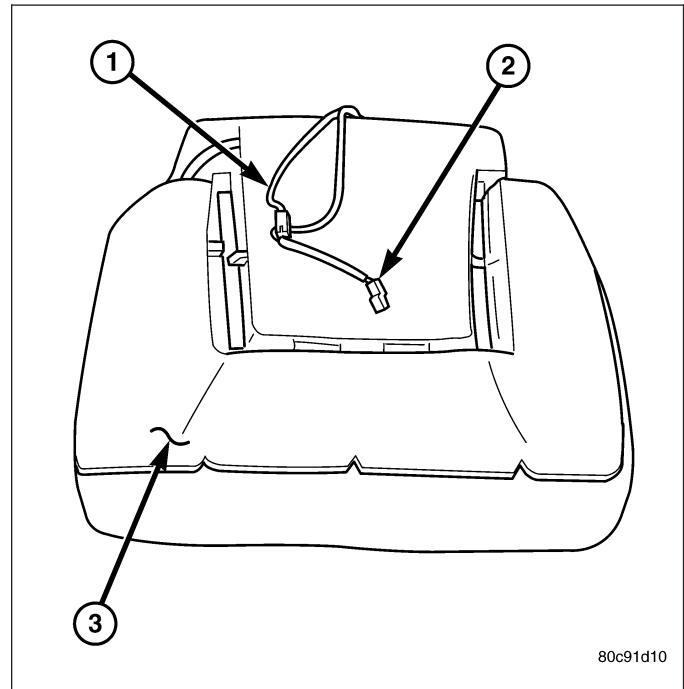
1. Locate and disconnect the seat electrical connector.
2. Check the resistance between the circuit leading in and out of the suspect heated seat element. The resistance should be between 3.8 - 4.8 ohms for a seat cushion element and 4.3 - 5.4 ohms for a seat back element. If OK, (Refer to 8 - ELECTRICAL/ HEATED SEATS - DIAGNOSIS AND TESTING). If not OK, replace the inoperative heated seat element.



## REMOVAL

**Note:** Do not remove the factory installed heating elements (3) from the seat or seat back cushions. The original element is permanently attached and cannot be removed without permanent damage. The replacement heating element is designed to be applied directly on top of the inoperative factory installed heating element.

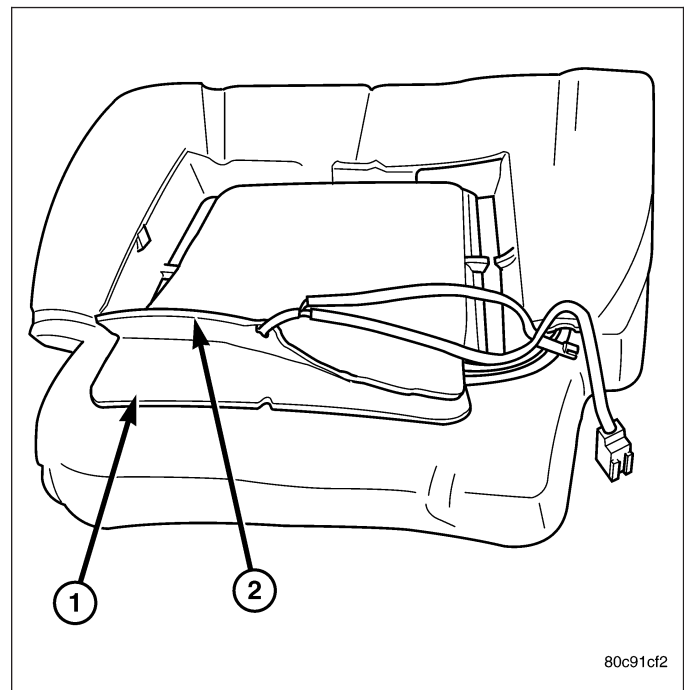
1. Disconnect and isolate the battery negative cable.
2. Remove the appropriate seat cushion, (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - REMOVAL) or seat back trim cover, (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION / COVER - REMOVAL).
3. Disconnect the inoperative heated seat cushion or seat back element electrical connectors (2).
4. Locate the wires leading from the inoperative heating element and cut them off flush with the edge of the original heating element.



## INSTALLATION

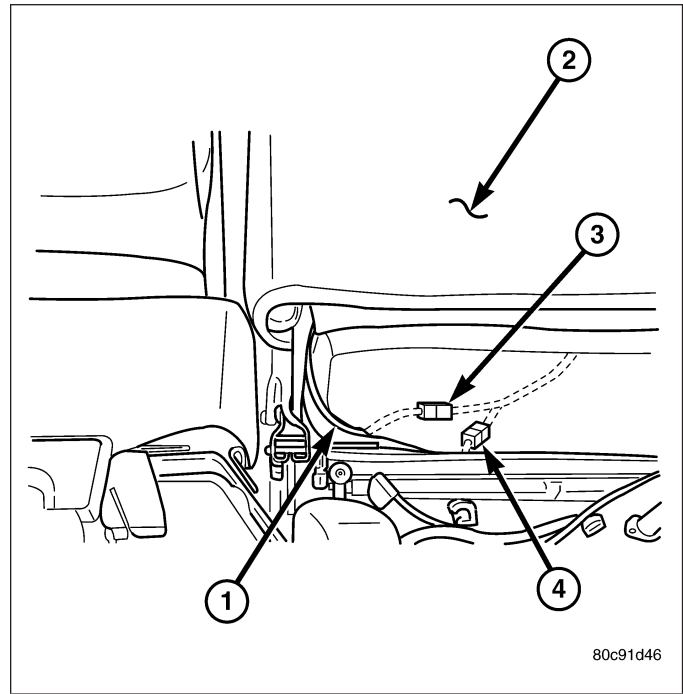
1. Peel off the adhesive backing on the back of the replacement heating element (2) and stick directly on top of the factory installed heating element (1).

**CAUTION:** During the installation of the replacement heating element, be careful not to fold or crease the element assembly. Folds or creases will cause premature failure.



2. Connect the new heating element electrical connectors (3&4).
3. Connect the battery negative cable.
4. Verify heated seat system operation.
5. Install the appropriate seat cushion, (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - INSTALLATION) or seat back trim cover, (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION / COVER - INSTALLATION).

**Note:** Make certain the seat wire harness is correctly routed through the seat and seat back. The excess wire between the cushion and back elements should be securely tucked between the rear of the cushion foam and the rear carpet flap of the trim cover.

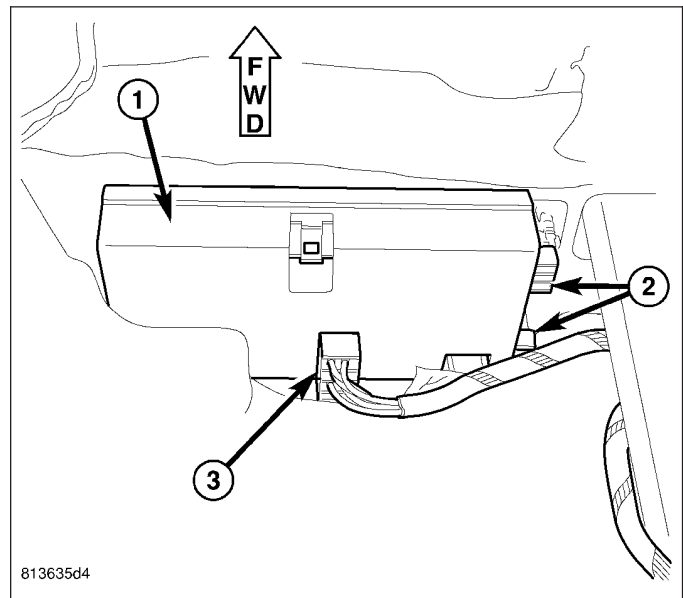


## MODULE-HEATED SEATS

### DESCRIPTION

The heated seat module (1) is located under the right front seat. It has a single electrical connector (3) and four locking tabs (2) that secure it to the floor cross member. The module can be accessed through the separation between the front and rear carpet assemblies.

The heated seat module is a microprocessor designed to use Controller Area Network (CAN) data bus messages from the instrument cluster also known as the Cabin Compartment Node (CCN). The CCN receives inputs from the heated seat switches and in turn signals the heated seat module to operate the heated seat elements for both front seats.



### OPERATION

The heated seat module operates on fused battery current received from the ignition switch. The module is grounded to the body at all times through the electrical connector. Inputs to the module include Controller Area Network (CAN) data bus messages and standard hardwired 12volt power and ground. In response to the CAN inputs the heated seat module will control the battery current to the appropriate heated seat elements.

When a heated seat switch CAN data bus signal is received by the heated seat module, the module energizes the selected heated seat element. The Low heat set point is about 38C (100.4°F), and the High heat set point is about 42C (107.6°F).

If the heated seat module detects a heated seat element OPEN or SHORT circuit, it will record and store the appropriate diagnostic trouble code (DTC).

## DIAGNOSIS AND TESTING

### HEATED SEAT MODULE

In order to obtain conclusive testing, the heated seat system and the Controller Area Network (CAN) data bus circuit must be checked. **Any diagnosis of the heated seat system should begin with, the use of a scan tool and the appropriate diagnostic service information.**

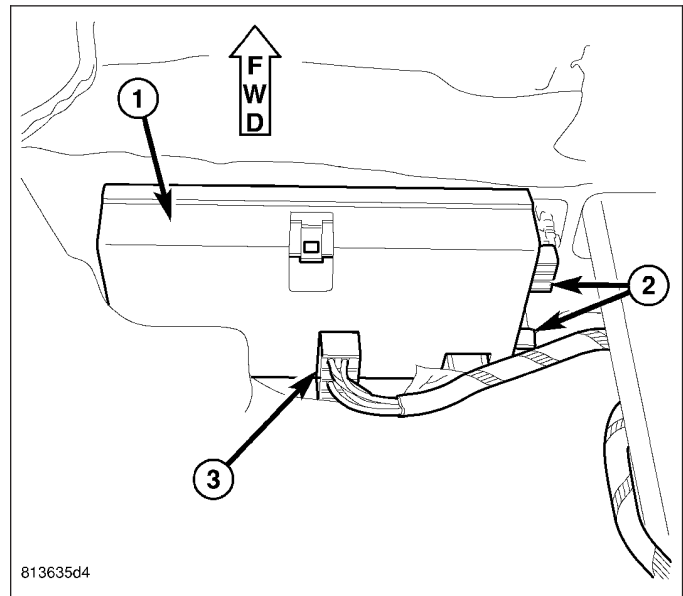
**Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.**

**Note:** Vehicles equipped with the heated seat option utilize a low voltage cut-off feature. This feature turns off power to the heated seat system anytime vehicle voltage is below 11.0v or above 15.5v. Be certain to check the vehicle electrical system for proper voltage anytime the power seat system appears inoperative.

Before any testing of the power seat system is attempted, the battery should be fully-charged.

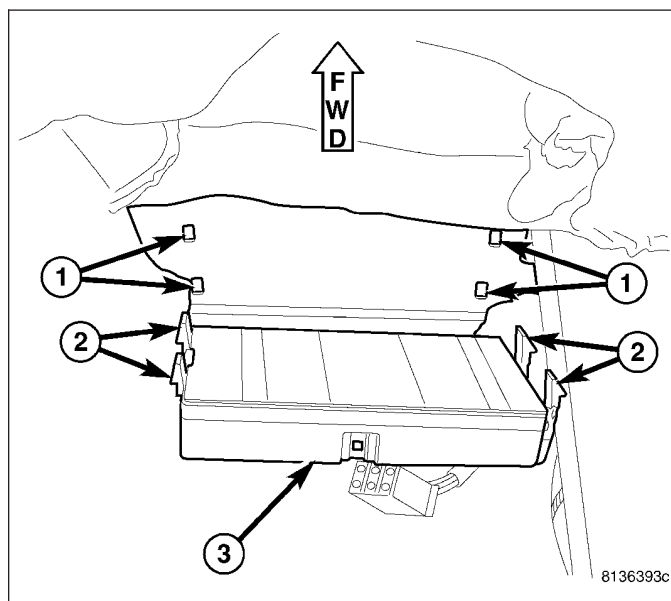
## REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the right front seat from the vehicle, (Refer to 23 - BODY/SEATS/SEAT - REMOVAL).
3. Reposition the front carpet assembly aside to gain access to the heated seat module (1).
4. Disconnect the wire harness connector (3) from the heated seat module (1).
5. Unsnap the heated seat module retaining clips (2) from the floor crossmember.
6. Remove the heated seat module (1) from the vehicle.

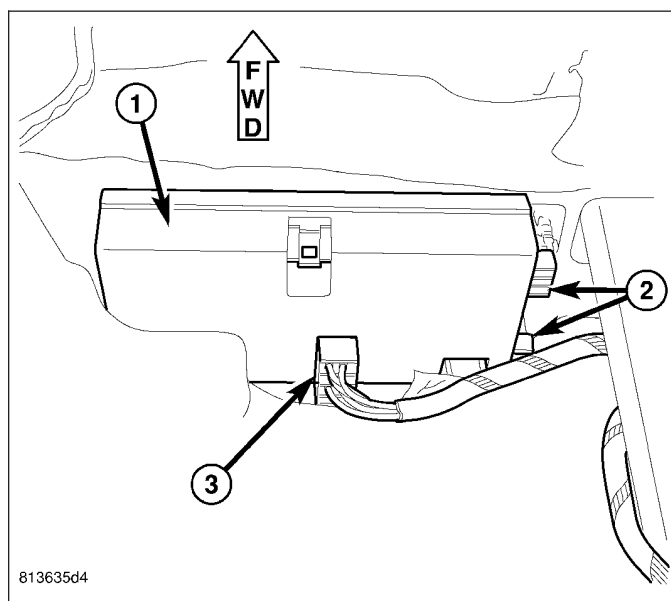


## INSTALLATION

1. Install the heated seat module (3) in the vehicle.
2. Position the retaining clips (2) with the retaining holes (1) in the floor cross member. Firmly apply even pressure to the module (3) until all four retaining clips (2) snap into place.



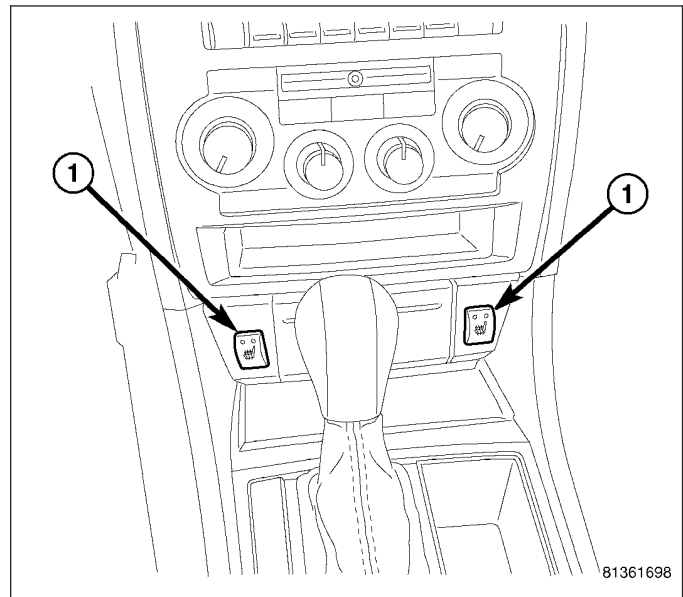
3. Connect the wire harness connector (3) to the heated seat module (1).
4. Reposition the front carpet assembly to the original position.
5. Install the right, front seat, (Refer to 23 - BODY/ SEATS/SEAT - INSTALLATION).
6. Connect the battery negative cable.
7. Check for proper heated seat system operation.



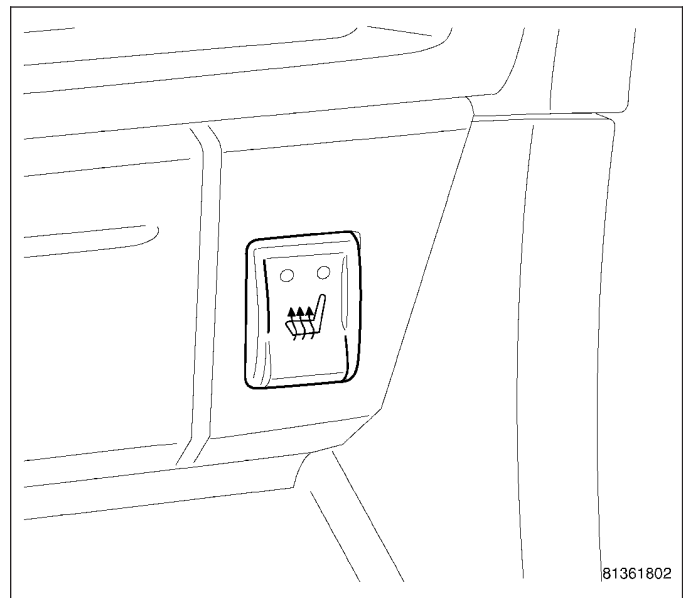
## SWITCH-HEATED SEAT

### DESCRIPTION

The heated seat switches (1) are both mounted in the instrument panel. The two switches are snapped into mounting holes in the instrument panel center bezel. The two heated seat switches are identical in appearance and construction.



Each heated seat switch provides a resistor-multiplexed signal to the Cab Compartment Node (CCN). Amber Light Emitting Diodes (LEDs) in the top portion of each switch indicate the level of heat in use: Two LEDs are illuminated for high, one for low, and none for off. Pressing the switch once will select high-level heating. Pressing the switch a second time will select low-level heating. Pressing the switch a third time will shut the heating elements off.



The LED indicator lamps in each heated seat switch cannot be repaired. If the LED lamps are inoperative or damaged, or the switch is inoperative or damaged the individual heated seat switch assembly must be replaced.

### OPERATION

The heated seat switches receive battery current through a fused ignition switch output (run) circuit when the ignition switch is in the On position. Depressing the heated seat switch provides a hard-wired resistor multiplexed signal to the Cabin Compartment Node (CCN). The CCN is responsible for supplying the Controller Area Network (CAN) data bus message to the heated seat module, signaling the module to power the heated seat element of the selected seat and maintain the temperature setting.

If the heated seat switch is depressed to a different position (Low or High) than the currently selected state, the CCN will go through the process again to change the temperature setting. If a heated seat switch is depressed a second time to the same position as the currently selected state, the CCN and heated seat module interpret the second input as a request to turn the seat heater OFF. The CCN will then signal the heated seat module to turn the heated seat elements for that seat off.



## DIAGNOSIS AND TESTING

### HEATED SEAT SWITCH

In order to obtain conclusive testing, the heated seat system and the Controller Area Network (CAN) data bus circuit must be checked. **Any diagnosis of the heated seat system should begin with, the use of a scan tool and the appropriate diagnostic service information.**

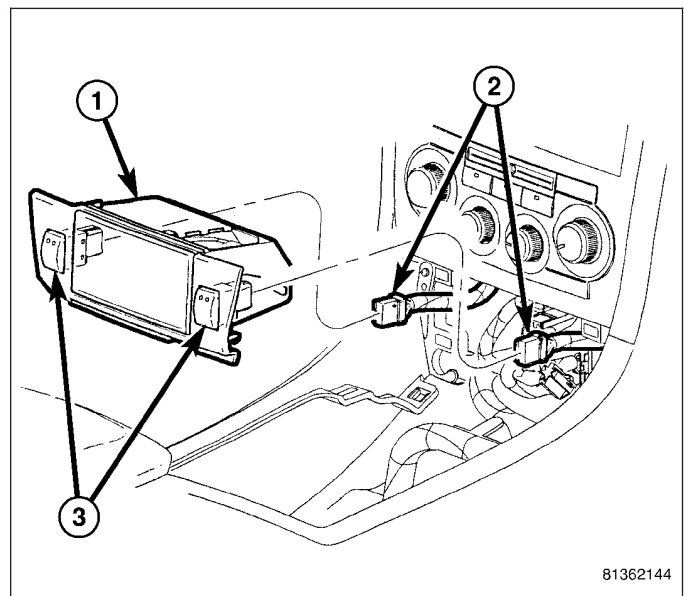
**Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.**

**Note: Vehicles equipped with the heated seat option utilize a low voltage cut-off feature. This feature turns off power to the heated seat system anytime vehicle voltage is below 11.0v or above 15.5v. Be certain to check the vehicle electrical system for proper voltage anytime the power seat system appears inoperative.**

Before any testing of the power seat system is attempted, the battery should be fully-charged.

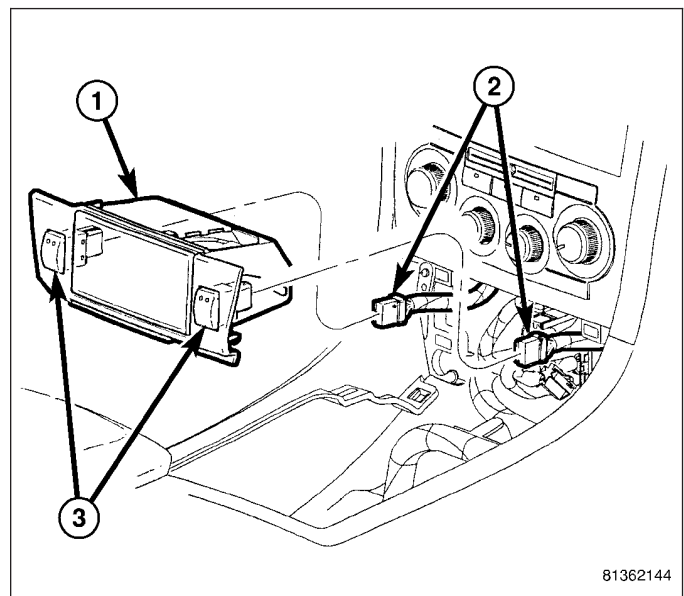
### REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the ash receiver (1) from the instrument panel, (Refer to 23 - BODY/INSTRUMENT PANEL/ASH RECEIVER - REMOVAL).
3. Disconnect the heated seat switch connector (2) from the heated seat switch (3).
4. From the back of the ash receiver (1), gently pry the switch (3) free and push the heated seat switch out through the front of the bezel.



### INSTALLATION

1. From the front of the ash receiver (1), gently push the heated seat switch (3) in through the front of the bezel.
2. Connect the heated seat switch connector (2) onto the heated seat switch (3).
3. Install the ash receiver (1) into the instrument panel, (Refer to 23 - BODY/INSTRUMENT PANEL/ASH RECEIVER - INSTALLATION).
4. Connect the battery negative cable.
5. Verify heated seat system operation.







HORN

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HORN - ELECTRICAL DIAGNOSTICS

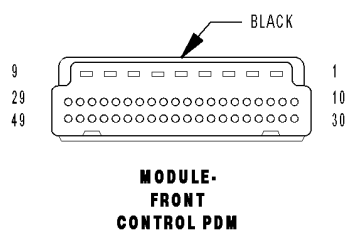
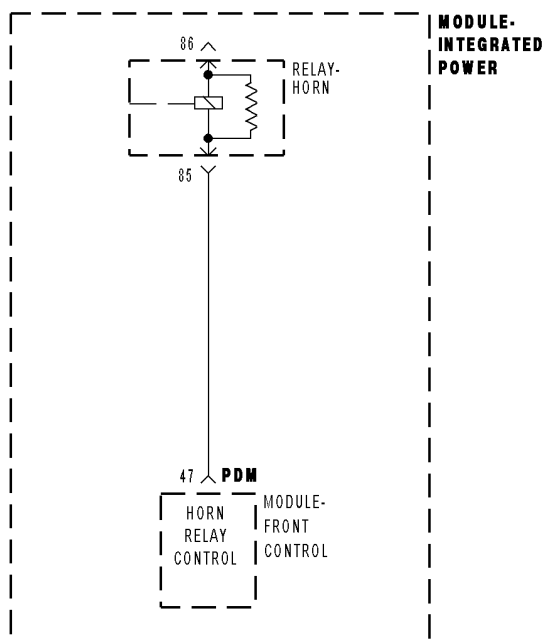
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HORN - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

# B2336-HORN CONTROL CIRCUIT LOW – FCM



**B2336–HORN CONTROL CIRCUIT LOW – FCM (CONTINUED)**

For the Horn System circuit diagram (Refer to 8 - ELECTRICAL/HORN - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Front Control Module detects a shorted low condition on the Horn Relay Control circuit this DTC will set.

Possible Causes
HORN FUSE (A905) FUSED B(+) OPEN RELAY POWER DISTRIBUTION CENTER FRONT CONTROL MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase DTC's

Operate the Horn Switch several times.

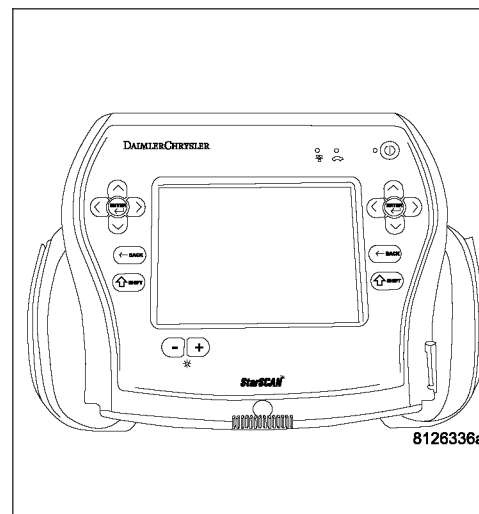
Cycle the ignition from on to off 3 times and leave on.

With the scan tool, read DTC's.

**Does the scan tool display B2336 – HORN CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**2. HORN FUSE**

Using a 12-volt test light connected to ground, check the Horn fuse.

**Does the test light illuminate and was the fuse OK?**

**No** >> Replace the horn fuse if open and check for a short to ground on the Horn Relay Output circuit or correct the open B(+) circuit to the fuse.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Go To 3

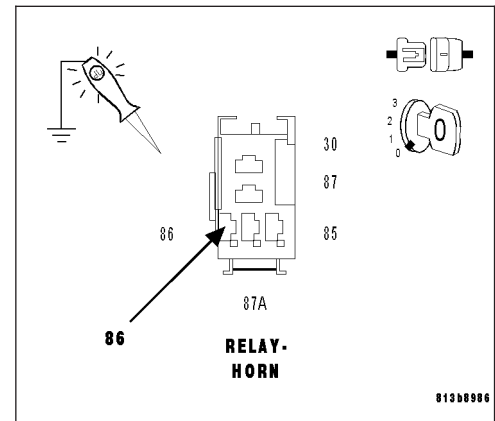
**B2336-HORN CONTROL CIRCUIT LOW – FCM (CONTINUED)****3. OPEN (A905) FUSED B(+) TO RELAY**

Remove the Horn Relay from the PDC.

Using a 12-volt test light connected to ground, check the Fused B(+) circuit at the relay connector.

**Does the test light illuminate?**

- No** >> Replace the Power Distribution Center.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- Yes** >> Go To 4

**4. HORN RELAY**

Install a known good relay in place of the Horn Relay.

With the scan tool erase DTC's

Operate the Horn Switch several times.

Cycle the ignition from on to off 3 times and leave on.

With the scan tool, read DTC's.

**Does the scan tool display B2336 – HORN CONTROL CIRCUIT LOW?**

- No** >> Replace the original Horn Relay.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- Yes** >> Go To 5

**5. (X4) HORN RELAY CONTROL SHORTED**

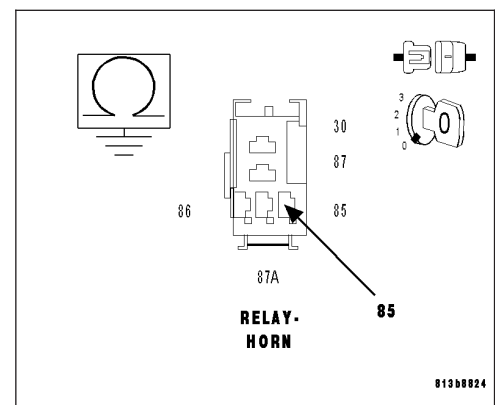
Remove the Horn Relay.

Disconnect the Front Control Module from the PDC 49 – way connector.

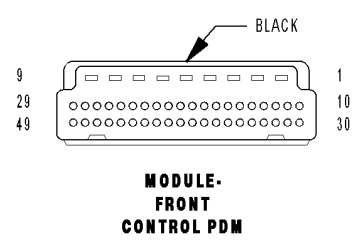
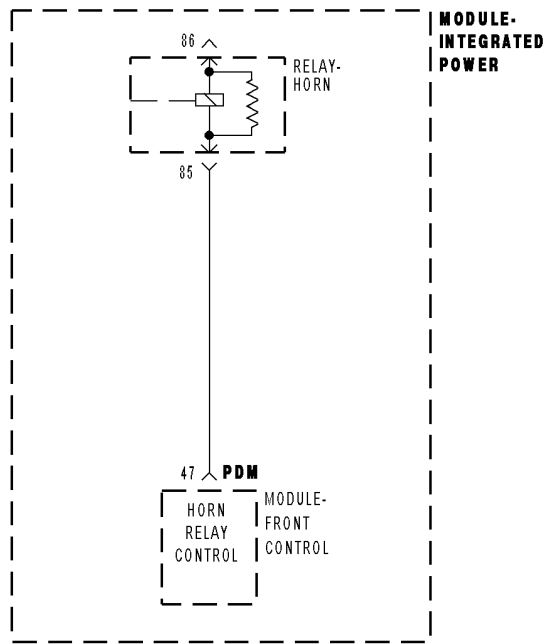
Measure the resistance between ground and the (X4) Horn Relay Control circuit at the relay.

**Is the resistance below 1000.0 ohms?**

- Yes** >> Replace the Power Distribution Center.  
Perform BODY VERIFICATION TEST - VER 1.
- No** >> Replace the Front Control Module.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



# **B2337-HORN CONTROL CIRCUIT HIGH – FCM**



**B2337-HORN CONTROL CIRCUIT HIGH – FCM (CONTINUED)**

For the Horn System circuit diagram (Refer to 8 - ELECTRICAL/HORN SYSTEM - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Front Control Module detects excessive current on the Horn Relay Control circuit.

Possible Causes
HORN RELAY POWER DISTRIBUTION CENTER FRONT CONTROL MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase DTC's

Operate the Horn Switch several times.

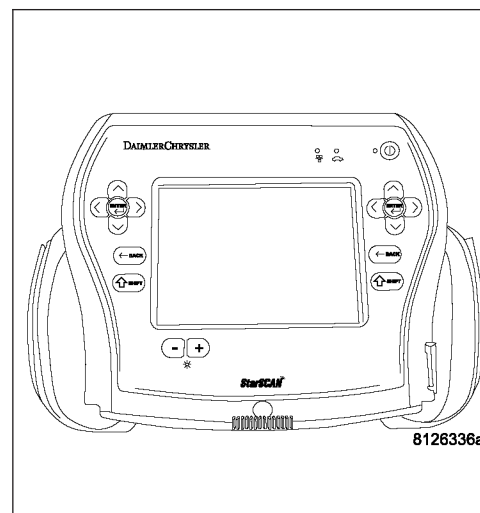
Cycle the ignition from on to off 3 times and leave on.

With the scan tool, read DTC's.

**Does the scan tool display B2337 – HORN CONTROL CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.

**2. HORN RELAY**

Turn the ignition off.

Install a known good relay in place of the Horn Relay.

With the scan tool erase DTC's

Operate the Horn Switch several times.

Cycle the ignition from on to off 3 times and leave on.

With the scan tool, read DTC's.

**Does the scan tool display B2337 – HORN CONTROL CIRCUIT HIGH?**

**No** >> Replace the original Horn Relay.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Go To 3

**B2337-HORN CONTROL CIRCUIT HIGH – FCM (CONTINUED)****3. SHORTED POWER DISTRIBUTION CENTER**

Remove the Horn Relay.

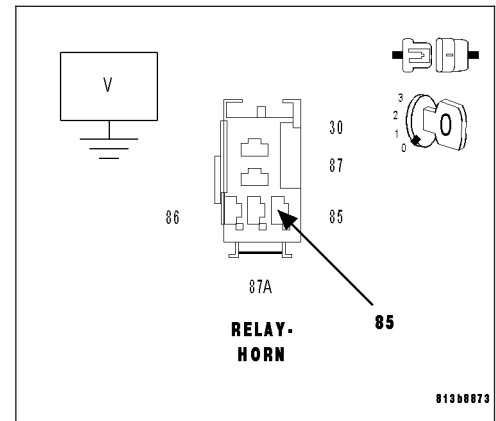
Disconnect the Front Control Module from the PDC 49 – way connector.

Turn the ignition on.

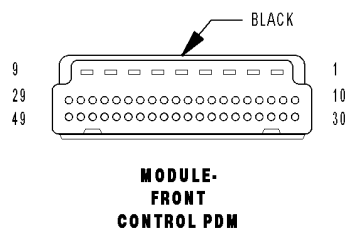
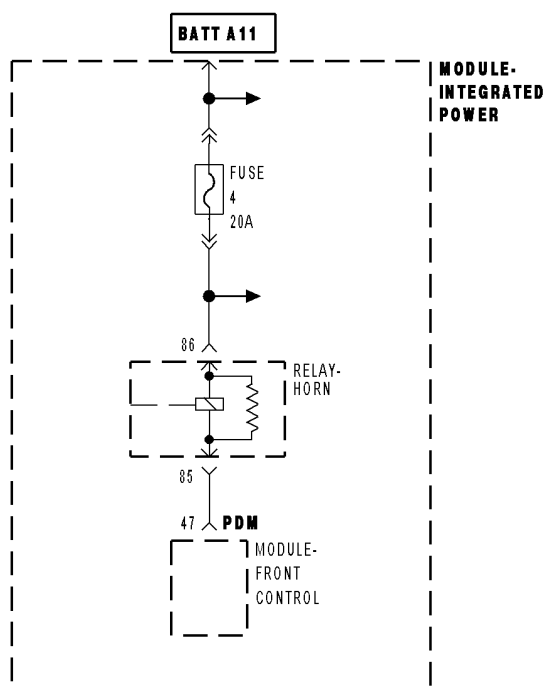
Measure the voltage between (X4) Horn Relay Control circuit and ground.

**Is there any voltage present?**

- Yes** >> Replace the Power Distribution Center.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Replace the Front Control Module.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).





**B2338—HORN CONTROL CIRCUIT OPEN – FCM**

**B2338–HORN CONTROL CIRCUIT OPEN – FCM (CONTINUED)**

For the Horn System circuit diagram (Refer to 8 - ELECTRICAL/HORN SYSTEM - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Front Control Module does not detect voltage on the Horn Relay Control circuit.

Possible Causes
HORN FUSE B(+) OPEN RELAY POWER DISTRIBUTION CENTER FRONT CONTROL MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase DTC's

Operate the Horn Switch several times.

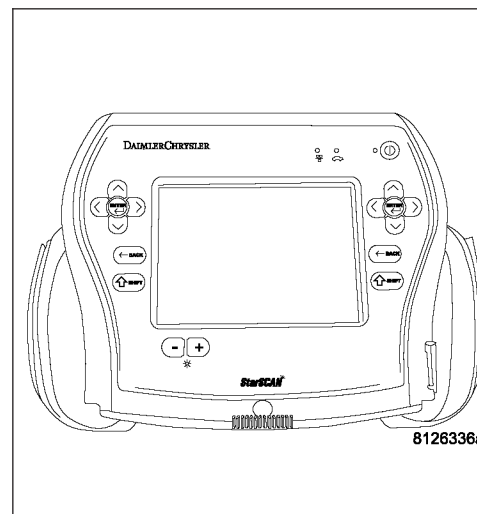
Cycle the ignition from on to off 3 times and leave on.

With the scan tool, read DTC's.

**Does the scan tool display B2338 – HORN CONTROL CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**2. HORN FUSE**

Using a 12-volt test light connected to ground, check the Horn fuse.

**Does the test light illuminate and was the fuse OK?**

**No** >> Replace the horn fuse if open and check for a short to ground on the Horn Relay Output circuit or correct the open B(+) circuit to the fuse.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Go To 3

**B2338-HORN CONTROL CIRCUIT OPEN – FCM (CONTINUED)****3. OPEN FUSED B(+) TO RELAY**

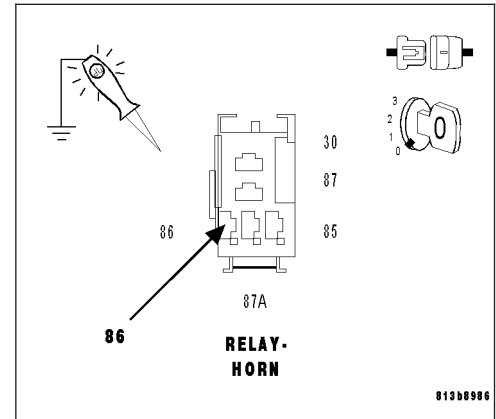
Remove the Horn Relay from the PDC.

Using a 12-volt test light connected to ground, check the Fused B(+) circuit at the relay connector.

**Does the test light illuminate?**

**No** >> Replace the Power Distribution Center.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Go To 4

**4. HORN RELAY**

Install a known good relay in place of the Horn Relay.

With the scan tool erase DTC's

Operate the Horn Switch several times.

Cycle the ignition from on to off 3 times and leave on.

With the scan tool, read DTC's.

**Does the scan tool display B2338 – HORN CONTROL CIRCUIT OPEN?**

**No** >> Replace the original Horn Relay.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

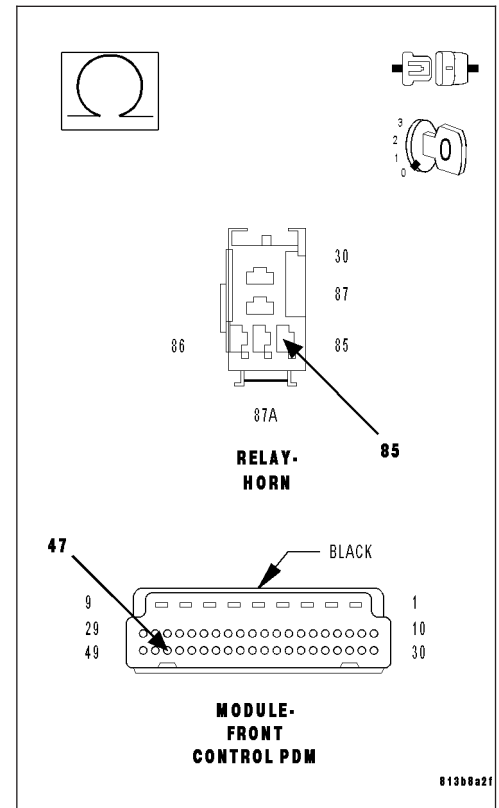
**Yes** >> Go To 5

**B2338-HORN CONTROL CIRCUIT OPEN – FCM (CONTINUED)****5. (X4)HORN RELAY CONTROL OPEN**

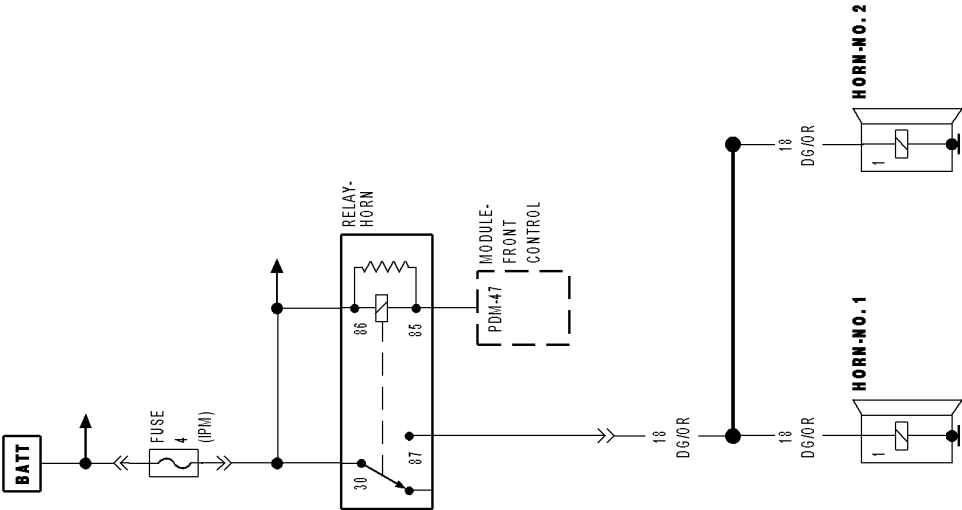
Measure the resistance of the (X4)Horn Relay Control circuit from the relay connector to FCM connector.

**Is the resistance below 3.0 ohms?**

- Yes** >> Replace the Front Control Module.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Replace the Power Distribution Center.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



SCHEMATICS AND DIAGRAMS



HORN RELAY SYSTEM

HORN SYSTEM- SERVICE INFORMATION

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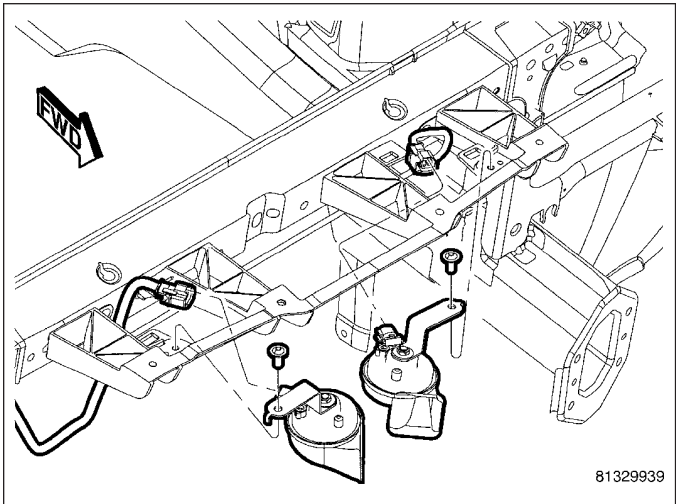
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HORN SYSTEM- SERVICE INFORMATION

DESCRIPTION

The dual-note horn system features two electromagnetic horn units. The horn system includes the following major components:

- **Horn** - The two horns are located behind the grille below a trim cover.
- **Horn Switch** - The horn switch is molded into the driver airbag trim cover.



OPERATION

The horn system operates on battery current received through a fuse in the Integrated Power Module (IPM). The horn system circuit is designed so that the system will remain operational, regardless of the ignition switch position.

DIAGNOSIS AND TESTING - HORN SYSTEM

The most reliable, efficient, and accurate means to diagnose the horn system requires the use of a scan tool and the proper Diagnostic Procedures information.

Refer to the appropriate wiring information.

In most cases, any problem involving continually sounding horns can be quickly alleviated by removing the horn fuse from the Integrated Power Module (IPM).

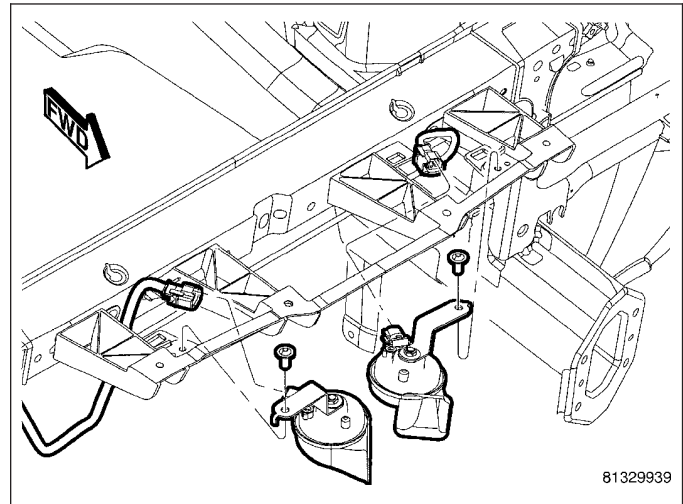
**WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

## HORN

### REMOVAL

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

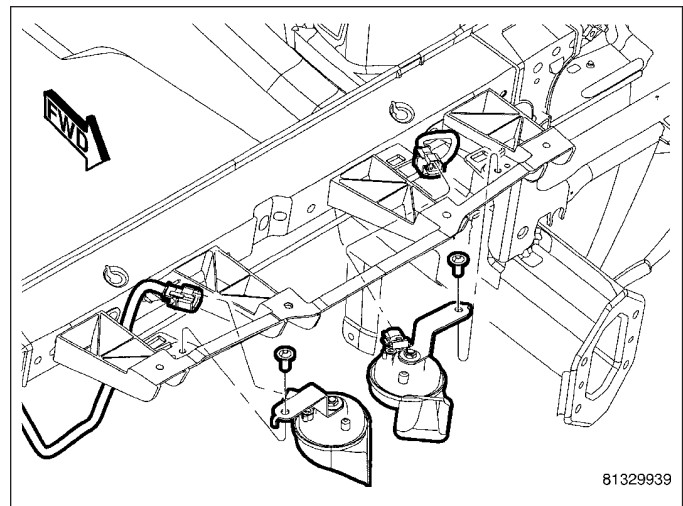
1. Disconnect and isolate the battery negative cable.
2. Remove cover above horn.
3. Disconnect electrical harness connector.
4. Remove mounting fastener and remove horn.



### INSTALLATION

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Position horn. Install and tighten mounting fasteners.
2. Connect electrical harness connector.
3. Install cover above horn.
4. Connect battery negative cable.



## SWITCH-HORN

### DESCRIPTION

The horn switch is molded into the driver airbag cover. The horn switch can not be serviced separately. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).

### DIAGNOSIS AND TESTING

#### HORN SWITCH

The most reliable, efficient, and accurate means to diagnose the horn system requires the use of a scan tool and the proper Diagnostic Procedures information.

For complete circuit diagrams, refer to the appropriate wiring information.

**WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**





# IGNITION CONTROL

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## IGNITION SYSTEMS - ELECTRICAL DIAGNOSTICS

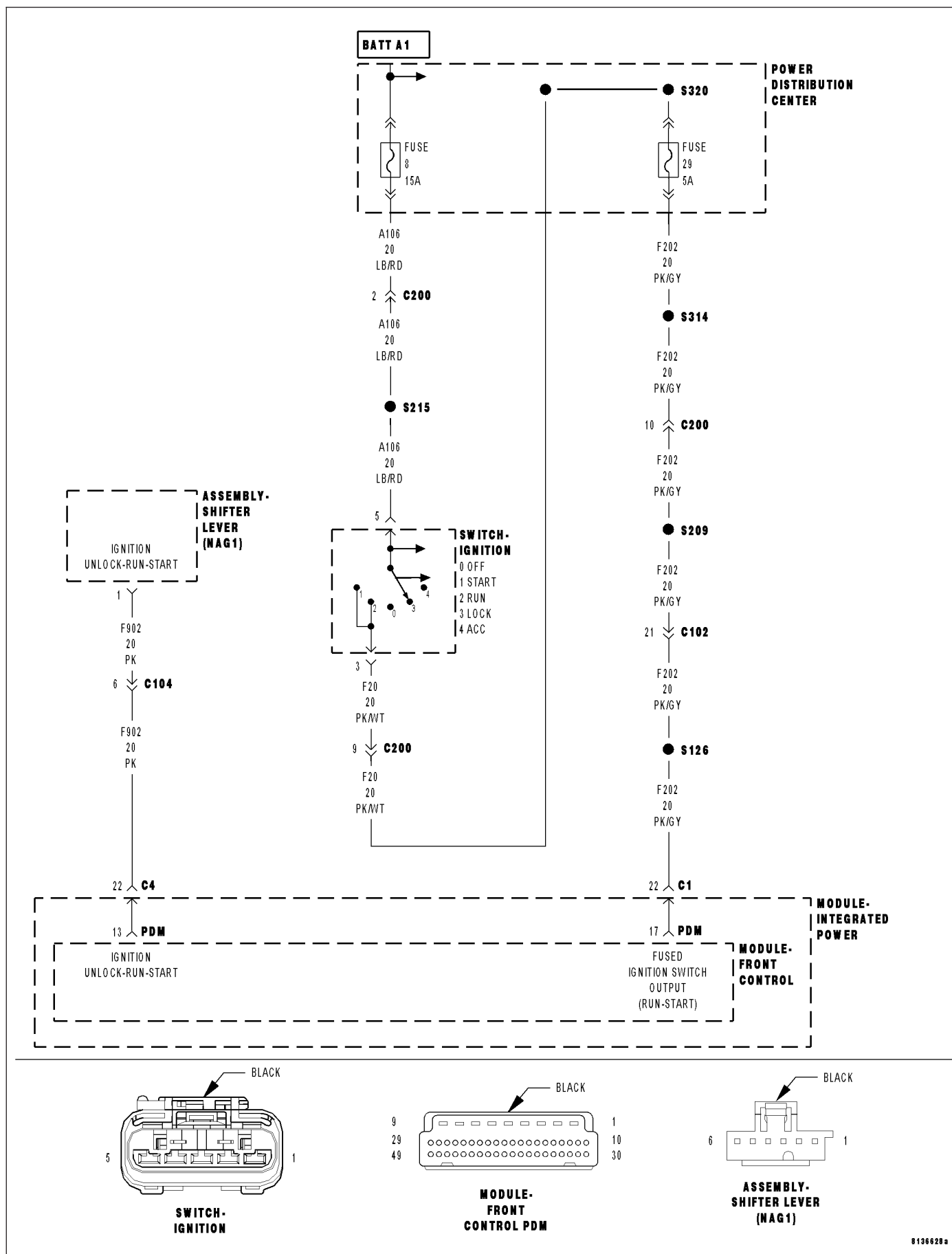
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## IGNITION SYSTEMS - ELECTRICAL DIAGNOSTICS

### DIAGNOSIS AND TESTING

## B2100-IGNITION RUN/START INPUT CIRCUIT PERFORMANCE



**B2100-IGNITION RUN/START INPUT CIRCUIT PERFORMANCE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Anytime the ignition input is compared against the CAN B Bus ignition status message.
- **Set Condition:**  
The Front Control Module will set this DTC if the CAN bus message and the hardwired ignition circuit do not match.

Possible Causes
ACTIVE IGNITION RELATED FCM DTCS (A106) FUSED B+ CIRCUIT OPEN (F20) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN (F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN REAR PDC FUSE IGNITION SWITCH FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

**Note:** If B2104 or B2105 are active, perform those tests first before proceeding.

**Note:** Check the rear PDC fuses. An open fuse can cause this DTC to set. If open refer to the wiring diagrams to help isolate a possible shorted circuit.

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**2. CHECK THE (F20) FUSED IGNITION SWITCH OUTPUT CIRCUIT FOR AN OPEN**

Turn the ignition off.

Remove the fused ignition switch output fuse from the rear PDC.

Turn the ignition on.

Measure the voltage of the (F20) Fused Ignition Switch Output circuit (input side of fuse).

**Is the voltage above 10.0 volts?**

**Yes** >> Go To 3

**No** >> Go To 4

**B2100-IGNITION RUN/START INPUT CIRCUIT PERFORMANCE (CONTINUED)****3. (F202) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN**

Turn the ignition off.

Remove the FCM from the Power Distribution Module.

**Note: Install the fuse in the rear PDC.**

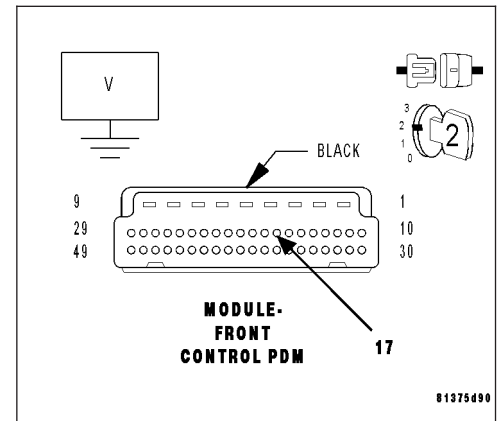
Turn the ignition on.

Measure the voltage of the (F202) Fused Ignition Switch Output circuit.

**Is the voltage above 10.0 volts?**

**Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair the (F202) Ignition Switch Output circuit for an open between the rear PDC and the front PDM.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**4. (A106) FUSED B+ CIRCUIT OPEN**

Turn the ignition off.

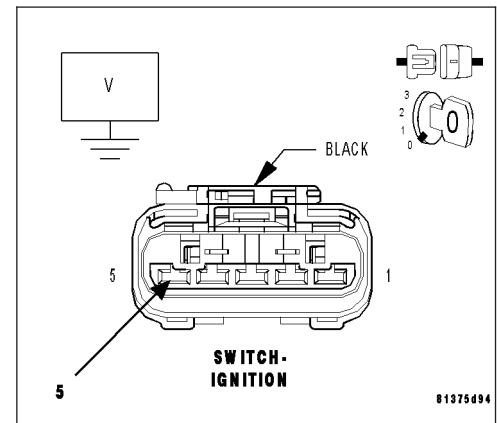
Disconnect the Ignition Switch harness connector.

Measure the voltage of the (A106) Fused B+ circuit.

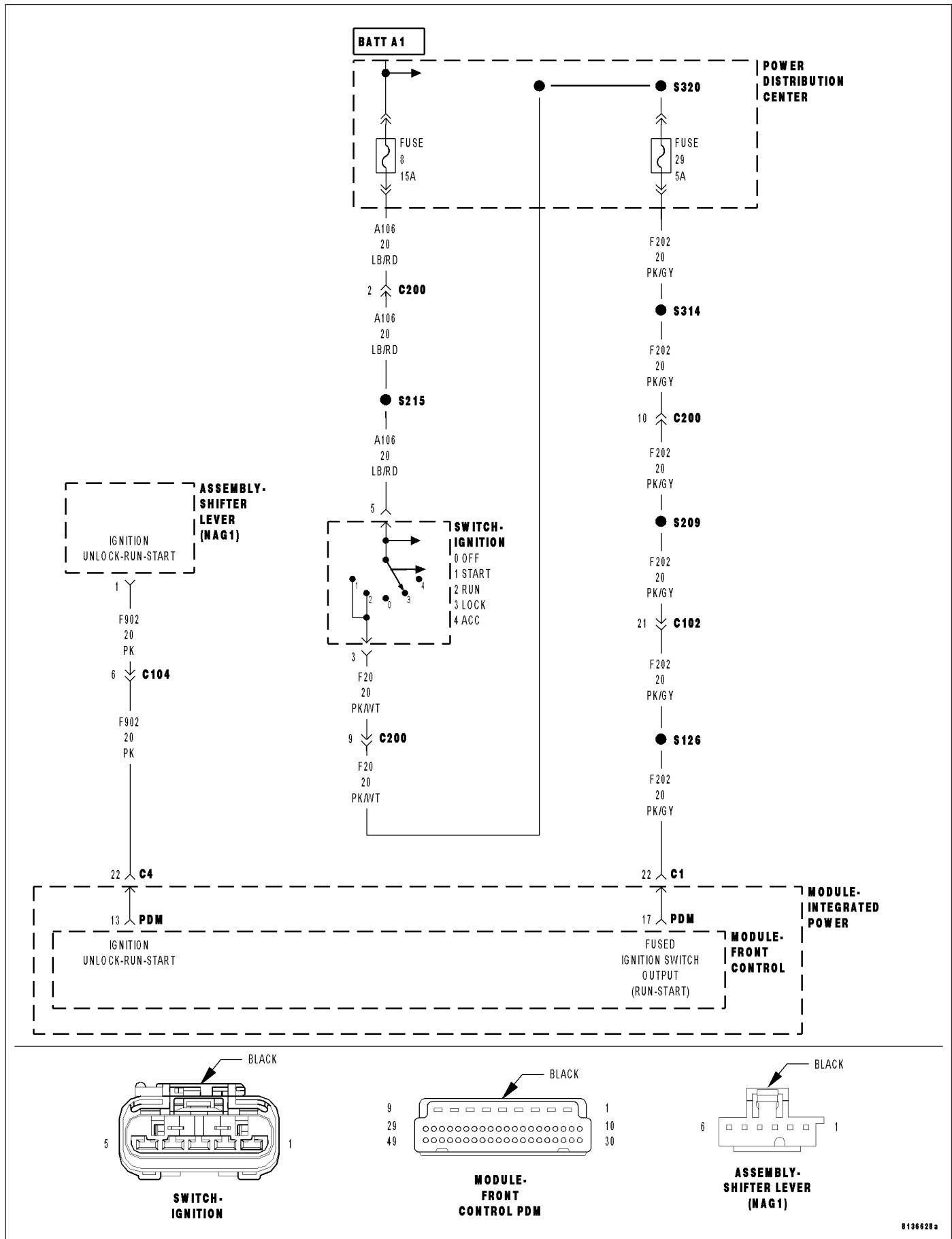
**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (F20) Fused Ignition Switch Output circuit for an open between the Ignition Switch and the rear PDC. If ok, replace the Ignition Switch in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair the (A106) Fused B+ circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



# B2104-IGNITION UNLOCK RUN/START CONTROL CIRCUIT LOW



**B2104-IGNITION UNLOCK RUN/START CONTROL CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Front Control Module will set this DTC within 500ms if the ignition unlock run/start circuit voltage is less than the expected value.

Possible Causes
(F902) IGNITION UNLOCK RUN START CIRCUIT SHORTED TO GROUND SHIFTER LEVER ASSEMBLY FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**2. SHIFTER LEVER ASSEMBLY**

With the scan tool, erase the FCM DTC's.

Turn the ignition off.

Disconnect the Shifter Lever Assembly harness connector.

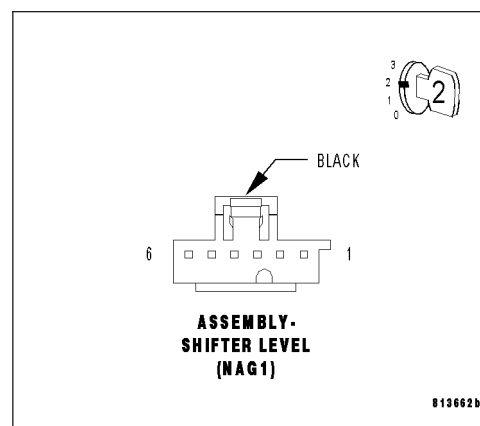
Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active FCM DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 3

**No** >> Replace the Shifter Lever Assembly in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**B2104-IGNITION UNLOCK RUN/START CONTROL CIRCUIT LOW (CONTINUED)****3. (F902) IGNITION UNLOCK RUN START CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Remove the FCM from the Power Distribution Module.

Measure the resistance between ground and the (F902) Ignition Unlock Run Start circuit.

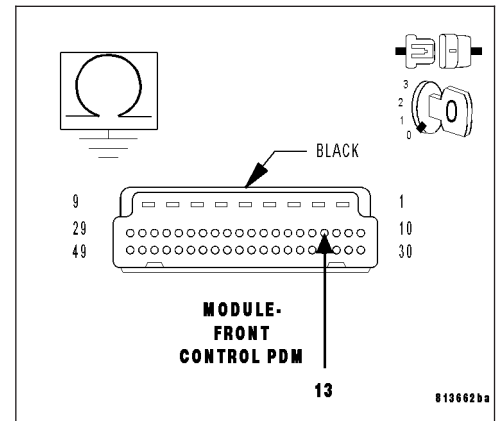
**Is the resistance below 100.0 ohms?**

**Yes** >> Repair the (F902) Ignition Unlock Run Start circuit for a short to ground.

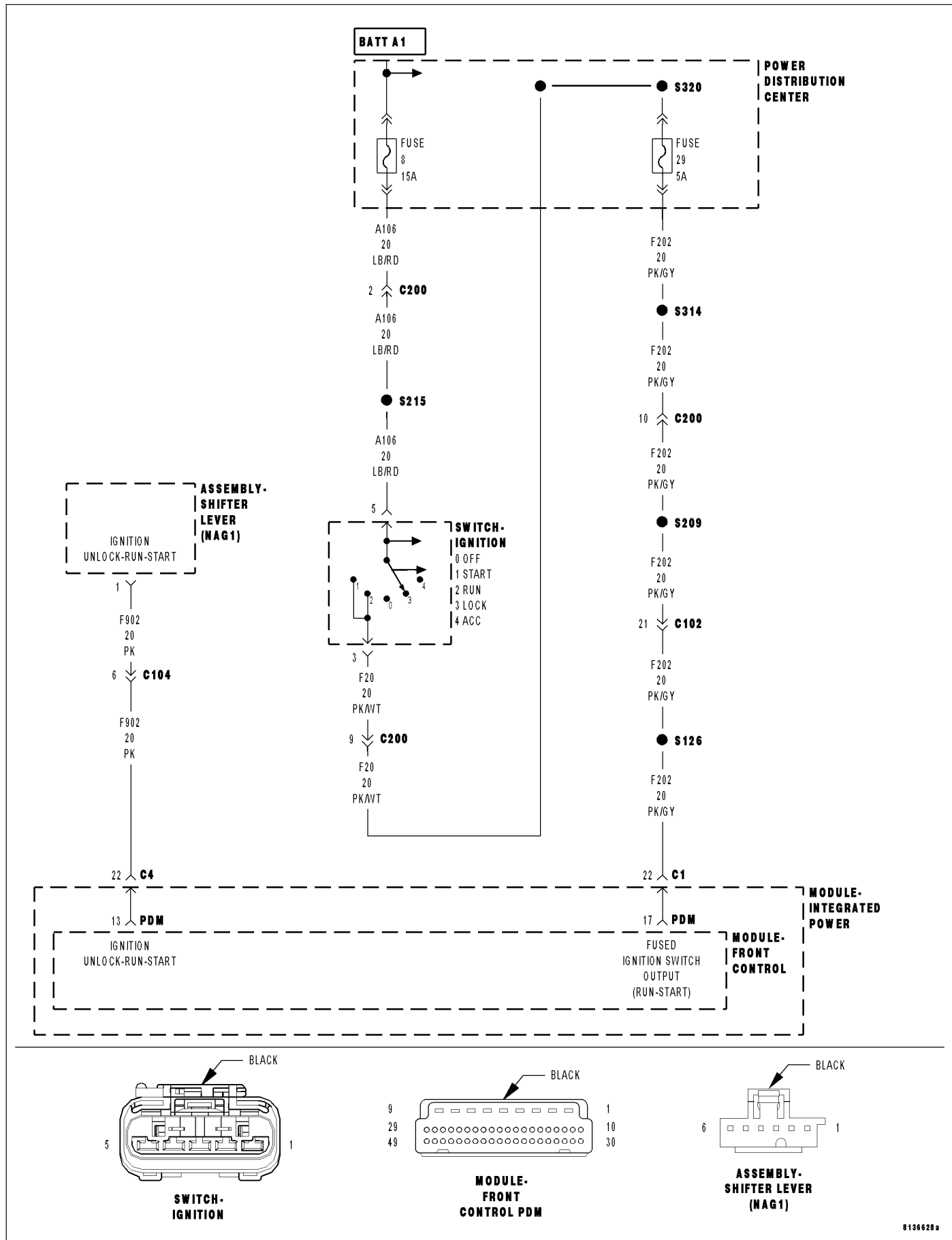
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).





**B2105-IGNITION UNLOCK RUN/START CONTROL CIRCUIT HIGH**

**B2105-IGNITION UNLOCK RUN/START CONTROL CIRCUIT HIGH (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on or off and with the FCM awake.
- **Set Condition:**  
The Front Control Module will set this DTC within 2 seconds if the ignition unlock run/start circuit voltage is not what the expected value should be.

Possible Causes
(F902) IGNITION UNLOCK RUN START CIRCUIT OPEN
(F902) IGNITION UNLOCK RUN START CIRCUIT SHORTED TO VOLTAGE
SHIFTER LEVER ASSEMBLY
FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds then turn the ignition off.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**2. (F902) IGNITION UNLOCK RUN START CIRCUIT SHORTED TO VOLTAGE**

Disconnect the Shifter Lever Assembly harness connector.

Cycle the ignition switch from off to on then back to off.

**Note: The ignition switch must be in the off position when performing the following step.**

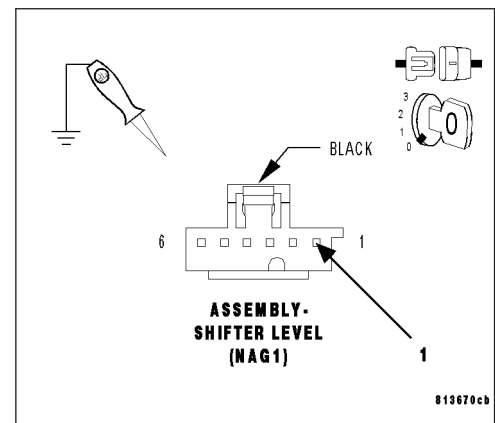
Using a 12-volt test light connected to ground, check the (F902) Ignition Unlock Run Start circuit.

**Does the test light illuminate brightly?**

**Yes** >> Repair the (F902) Ignition Unlock Run Start circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 3



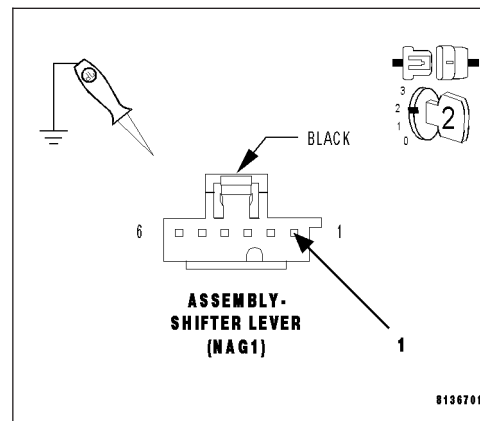
**B2105-IGNITION UNLOCK RUN/START CONTROL CIRCUIT HIGH (CONTINUED)****3. SHIFTER LEVER ASSEMBLY**

Turn the ignition on.

With the test light still connected from the previous step, check the (F902) Ignition Unlock Run Start circuit.

**Does the test light illuminate brightly?**

- Yes** >> Replace the Shifter Lever Assembly in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Go To 4

**4. (F902) IGNITION UNLOCK RUN START CIRCUIT OPEN**

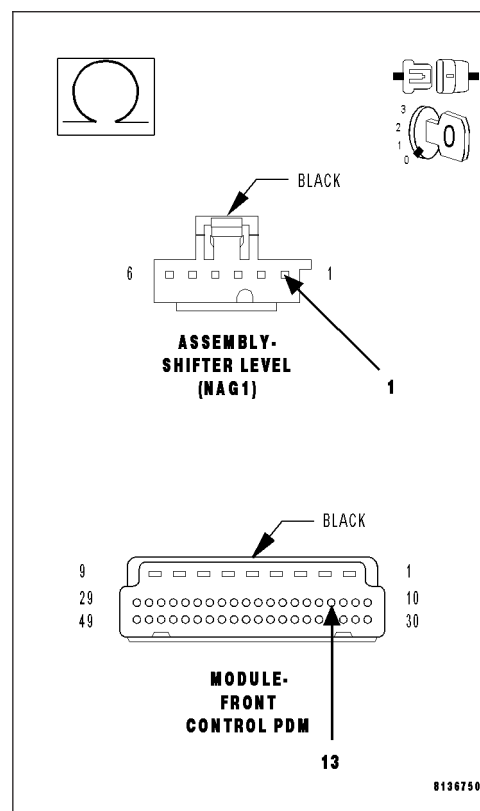
Turn the ignition off.

Remove the FCM from the Power Distribution Module.

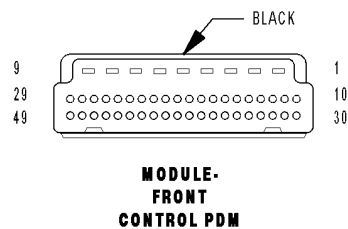
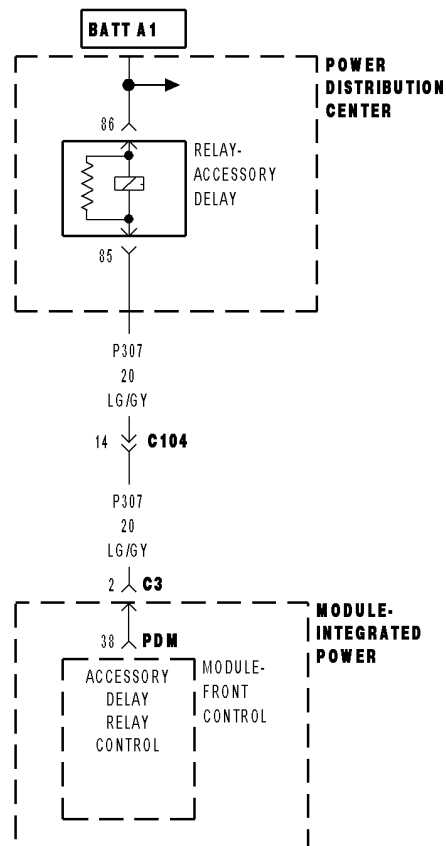
Measure the resistance of the (F902) Ignition Unlock Run Start circuit between the Shifter Lever Assembly and the FCM-PDM connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Repair the (F902) Ignition Unlock Run Start circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



# B211E-IGNITION RUN/ACC/PAD CONTROL CIRCUIT LOW



**B211E-IGNITION RUN/ACC/PAD CONTROL CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Front Control Module will set this DTC within 500ms if the (P307) Accessory Delay Relay Control circuit is open or shorted to ground.

Possible Causes
(P307) ACCESSORY DELAY RELAY CONTROL CIRCUIT OPEN (P307) ACCESSORY DELAY RELAY CONTROL CIRCUIT SHORTED TO GROUND ACCESSORY DELAY RELAY FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**2. ACCESSORY DELAY RELAY**

Turn the ignition off.

Install a substitute relay in place of the original Accessory Delay Relay.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active FCM DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 3

**No** >> Replace the original Accessory Delay Relay.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

**B211E-IGNITION RUN/ACC/PAD CONTROL CIRCUIT LOW (CONTINUED)****3. (P307) ACCESSORY DELAY RELAY CONTROL CIRCUIT OPEN**

Turn the ignition off.

Remove the FCM from the Power Distribution Module.

Remove the Accessory Delay Relay from the Rear Power Distribution Module.

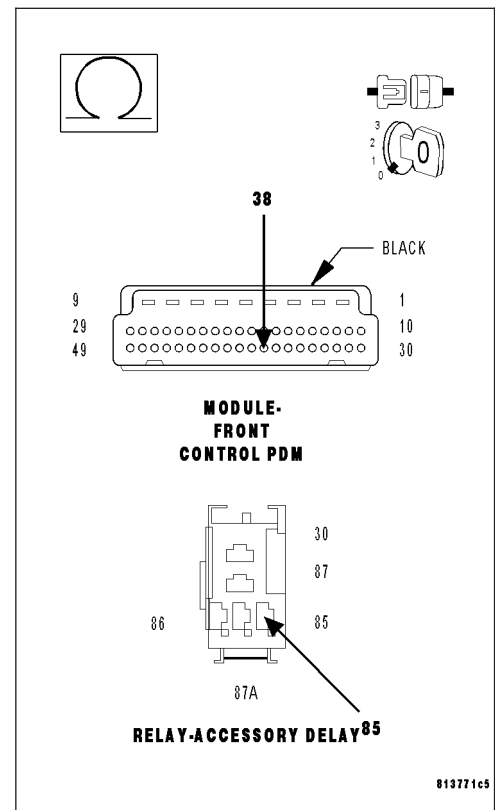
Measure the resistance of the Accessory Delay Relay Control circuit from the Front Control Module PDM connector to the Relay connector.

**Is the resistance below 10.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the Accessory Delay Relay Control circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**4. (P307) ACCESSORY DELAY RELAY CONTROL CIRCUIT SHORTED TO GROUND**

Measure the resistance between ground and the (P307) Accessory Delay Relay Control circuit at the relay cavity (85).

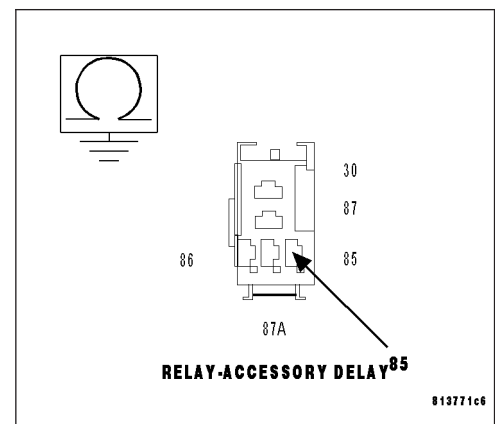
**Is the resistance below 100.0 ohms?**

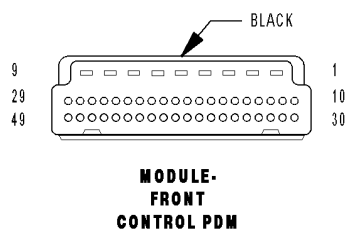
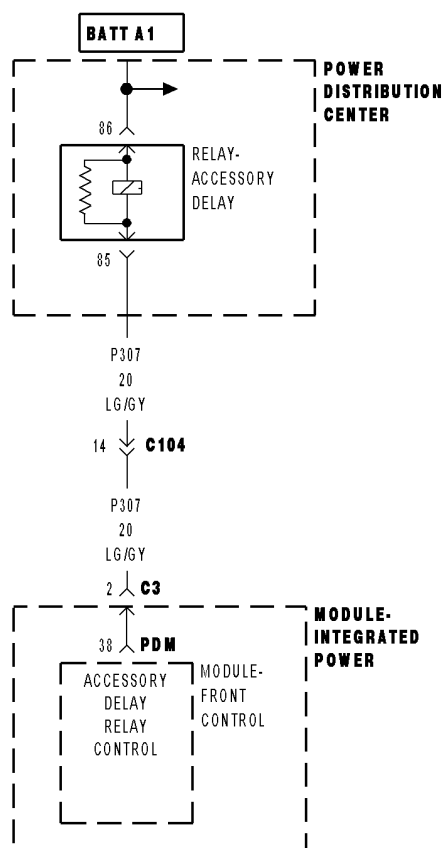
**Yes** >> Repair the (P307) Accessory Delay Relay Control circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**B211F-IGNITION RUN/ACC/PAD CONTROL CIRCUIT HIGH**

**B211F-IGNITION RUN/ACC/PAD CONTROL CIRCUIT HIGH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Front Control Module will set this DTC within 500ms if the (P307) Ignition Run/Acc/Pad Relay Control circuit is shorted to voltage.

Possible Causes
(P307) ACCESSORY DELAY RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE ACCESSORY DELAY RELAY FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**2. ACCESSORY DELAY RELAY**

Turn the ignition off.

Install a substitute relay in place of the original Accessory Delay Relay.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active FCM DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 3

**No** >> Replace the original relay.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---



**B211F-IGNITION RUN/ACC/PAD CONTROL CIRCUIT HIGH (CONTINUED)****3. (P307) ACCESSORY DELAY RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE**

Turn the ignition off.

Remove the FCM from the Power Distribution Module.

Remove the Accessory Delay Relay from the Rear Power Distribution Module.

Turn the ignition on.

Measure the voltage of the (P307) Accessory Delay Relay Control circuit at the relay connector (cavity 85).

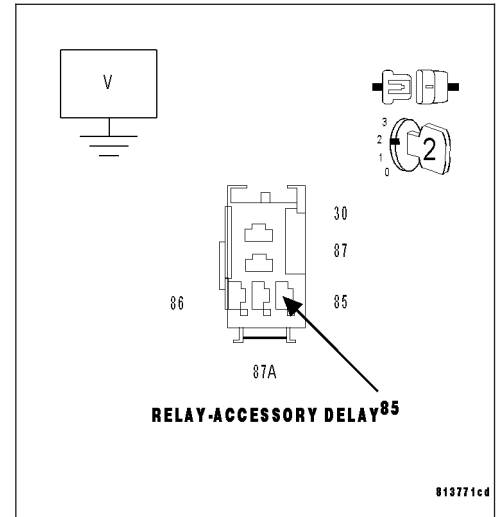
**Is there any voltage present?**

**Yes** >> Repair the (P307) Accessory Delay Relay Control circuit for a short to voltage.

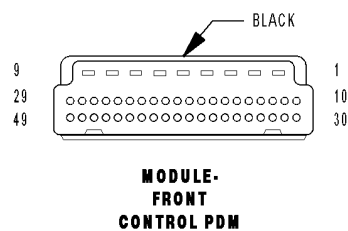
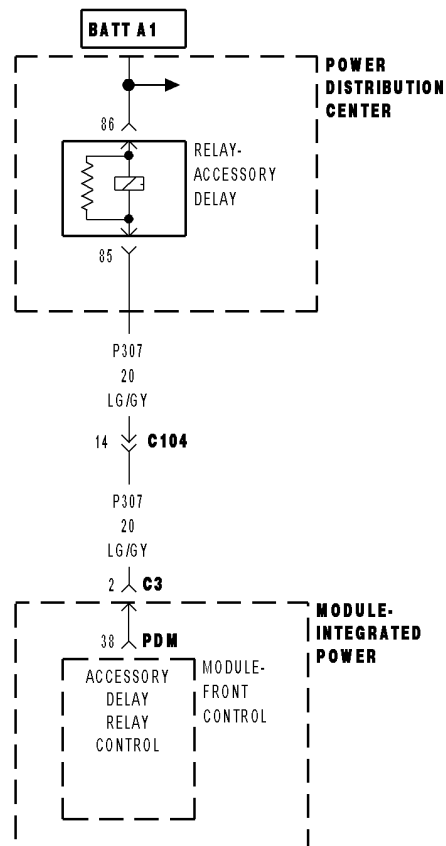
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If OK, replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



# B2120-IGNITION RUN/ACC/PAD CONTROL CIRCUIT OPEN



**B2120-IGNITION RUN/ACC/PAD CONTROL CIRCUIT OPEN (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Front Control Module will set this DTC within 500ms if the (P307) Ignition Accessory Delay Relay Control circuit is open.

Possible Causes
(P307) ACCESSORY DELAY RELAY CONTROL CIRCUIT OPEN ACCESSORY DELAY RELAY FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**2. ACCESSORY DELAY RELAY**

Turn the ignition off.

Install a substitute relay in place of the original Accessory Delay Relay.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active FCM DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 3

**No** >> Replace the original Accessory Delay Relay.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

**B2120-IGNITION RUN/ACC/PAD CONTROL CIRCUIT OPEN (CONTINUED)****3. (P307) ACCESSORY DELAY RELAY CONTROL CIRCUIT OPEN**

Turn the ignition off.

Remove the FCM from the Power Distribution Module.

Remove the Accessory delay Relay from the Rear Power Distribution Module.

Measure the resistance of the Accessory Delay Relay Control circuit from the FCM-PDM connector to the relay connector.

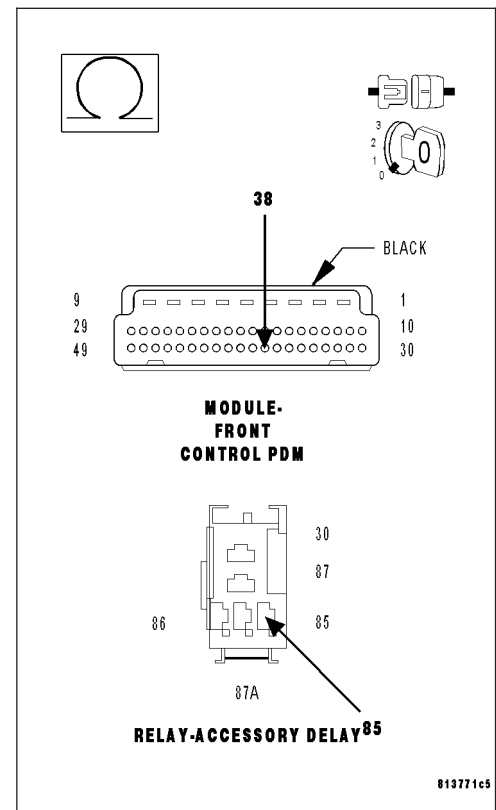
**Is the resistance below 10.0 ohms?**

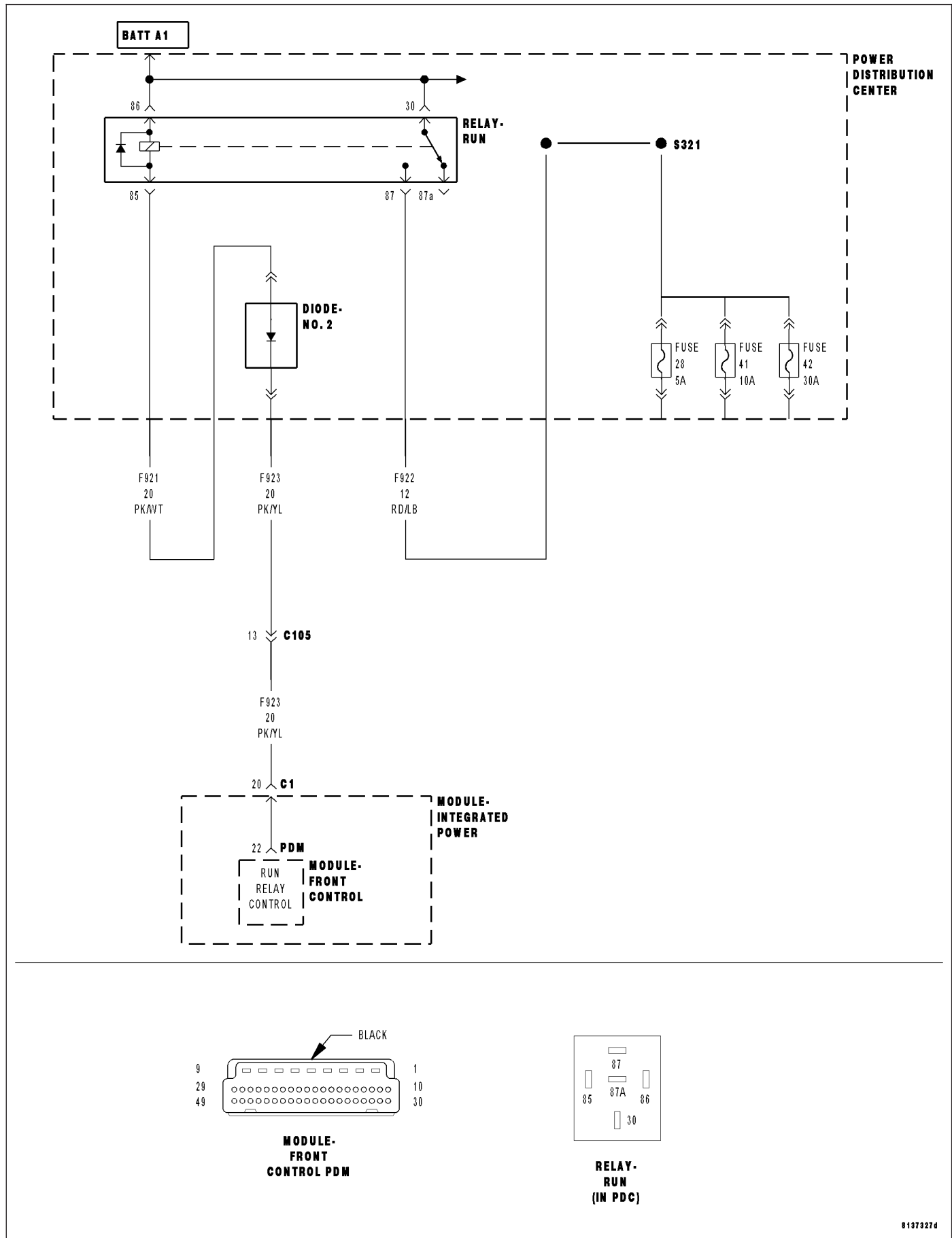
**No** >> Repair the Accessory Delay Relay Control circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If OK, replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**B2122-IGNITION RUN CONTROL CIRCUIT LOW**

**B2122-IGNITION RUN CONTROL CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Front Control Module will set this DTC within 500ms if the (F921) or (F923) run relay control circuit voltage is open or shorted to ground.

Possible Causes
(F921) or (F923) RUN RELAY CONTROL CIRCUIT OPEN OR SHORTED TO GROUND RUN RELAY FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**2. RUN RELAY**

Turn the ignition off.

Install a substitute run relay in place of the original run relay.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active FCM DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 3

**No** >> Replace the original run relay.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

**B2122-IGNITION RUN CONTROL CIRCUIT LOW (CONTINUED)****3. (F921) or (F923) RUN RELAY CONTROL CIRCUIT OPEN**

Turn the ignition off.

Remove the FCM from the Power Distribution Module.

Remove the run relay from the Rear Power Distribution Module.

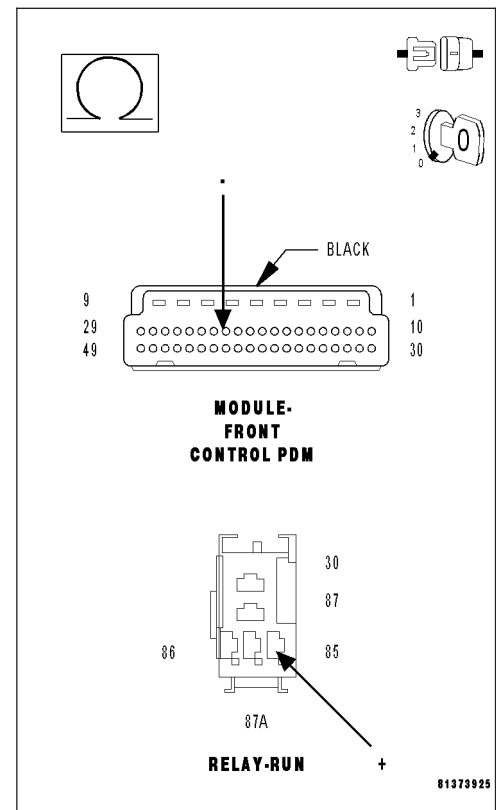
**Note: This circuit contains a diode. When checking resistance of this circuit the red ohmmeter lead must be connected to the run relay cavity (85) and the black ohmmeter lead must be connected to the FCM-PDM connector.**

Measure the resistance of the Run Relay Control circuit.

**Is the resistance below 10.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the Run Relay Control circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**4. (F921) RUN RELAY CONTROL CIRCUIT SHORTED TO GROUND**

**Note: This circuit contains a diode. When checking for a short to ground you must check both sides of the diode.**

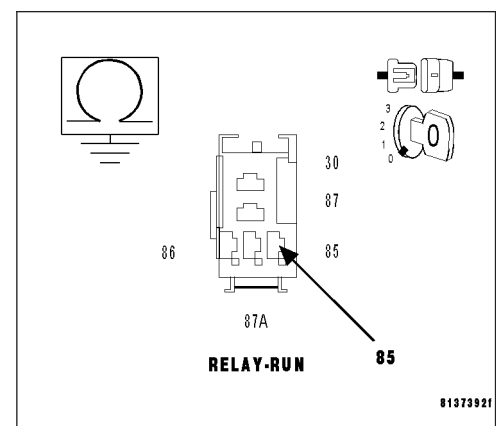
Measure the resistance between ground and the (F921) Run Relay Control circuit at the run relay cavity (85).

**Is the resistance below 10.0 ohms?**

**Yes** >> Repair the (F921) Run Relay Control circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 5



**B2122-IGNITION RUN CONTROL CIRCUIT LOW (CONTINUED)****5. (F923) RUN RELAY CONTROL CIRCUIT SHORTED TO GROUND**

**Note:** This circuit contains a diode. When checking for a short to ground you must check both sides of the diode.

Measure the resistance between ground and the (F923) Run Relay Control circuit at the FCM-PDM connector.

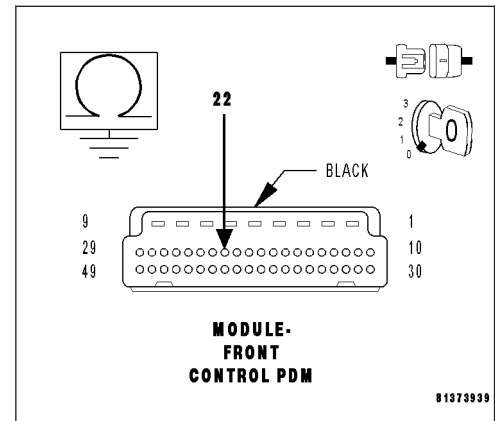
**Is the resistance below 10.0 ohms?**

**Yes** >> Repair the (F923) Run Relay Control circuit for a short to ground.

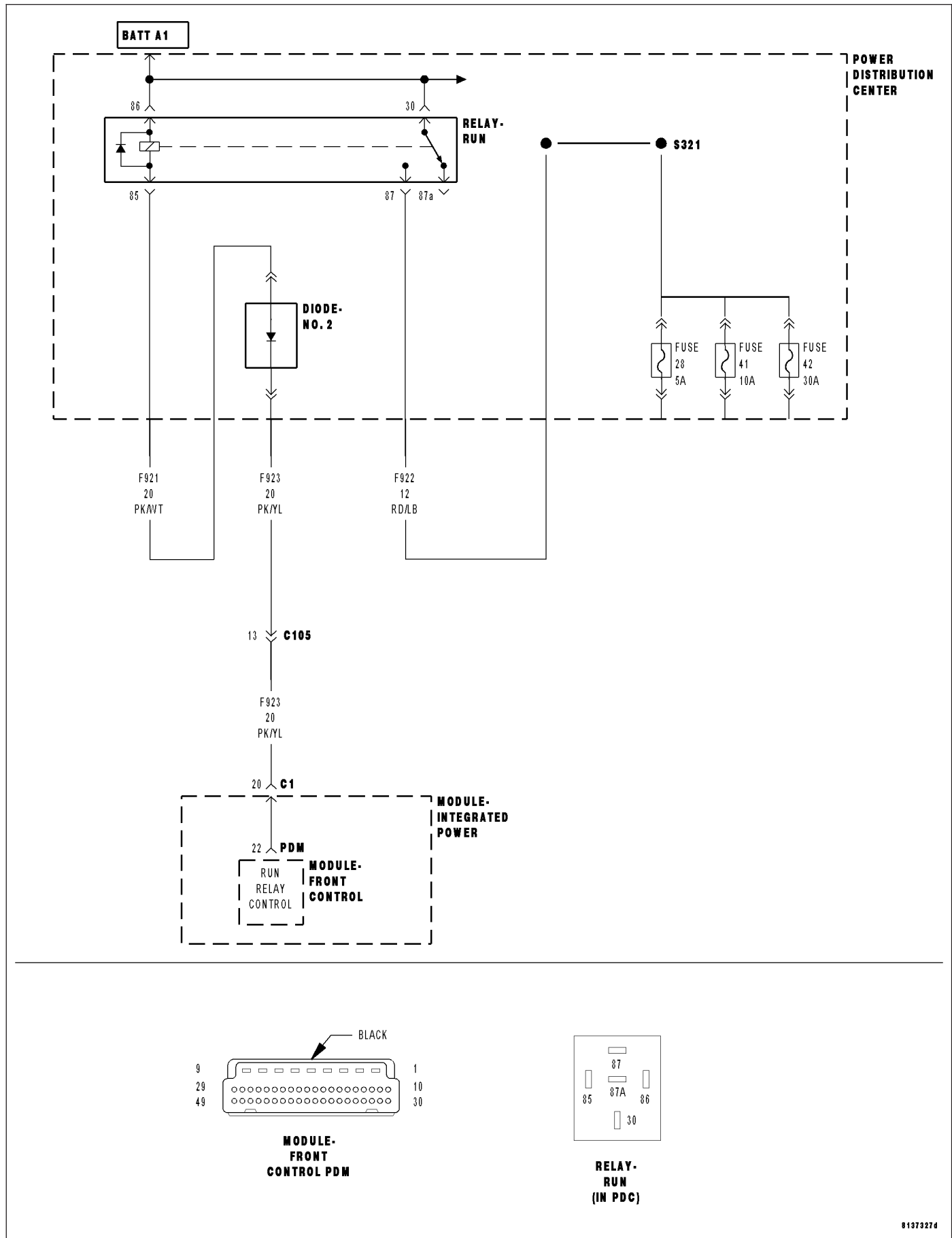
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).





**B2123-IGNITION RUN CONTROL CIRCUIT HIGH**

**B2123-IGNITION RUN CONTROL CIRCUIT HIGH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Front Control Module will set this DTC within 500ms if the (F921) or (F923) run relay control circuit voltage is shorted to voltage.

Possible Causes
(F921) or (F923) RUN RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE RUN RELAY FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**2. RUN RELAY**

Turn the ignition off.

Install a substitute run relay in place of the original run relay.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active FCM DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 3

**No** >> Replace the original run relay.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

**B2123-IGNITION RUN CONTROL CIRCUIT HIGH (CONTINUED)****3. (F921) RUN RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE**

**Note:** This circuit contains a diode. When checking for a short to voltage you must check both sides of the diode.

Turn the ignition off.

Remove the FCM from the Power Distribution Module.

Remove the run relay from the Rear Power Distribution Module.

Turn the ignition on.

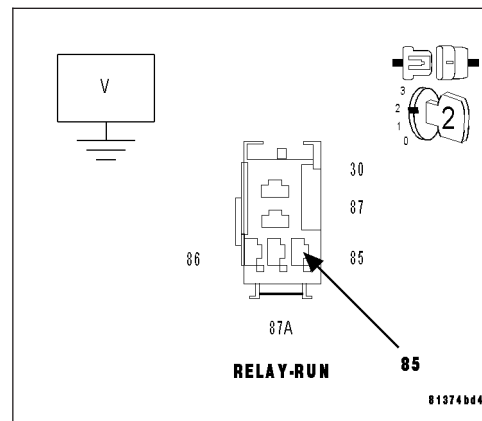
Measure the voltage of the (F921) Run Relay Control circuit at the run relay cavity (85).

**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (F921) Run Relay Control circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 4

**4. (F923) RUN RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE**

**Note:** This circuit contains a diode. When checking for a short to voltage you must check both sides of the diode.

Measure the voltage of the (F923) Run Relay Control circuit at the FCM–PDM connector.

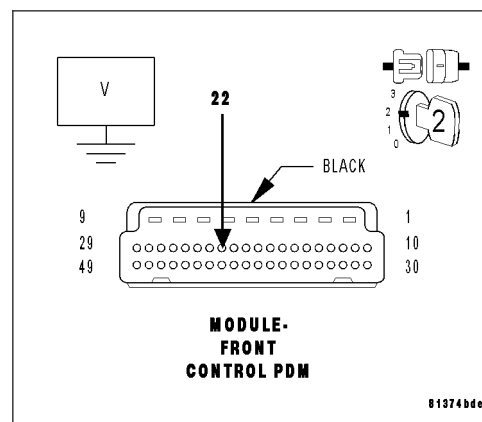
**Is the voltage above 10.0 volts?**

**Yes** >> Repair the (F923) Run Relay Control circuit for a short to voltage.

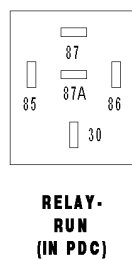
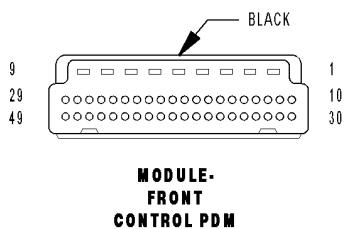
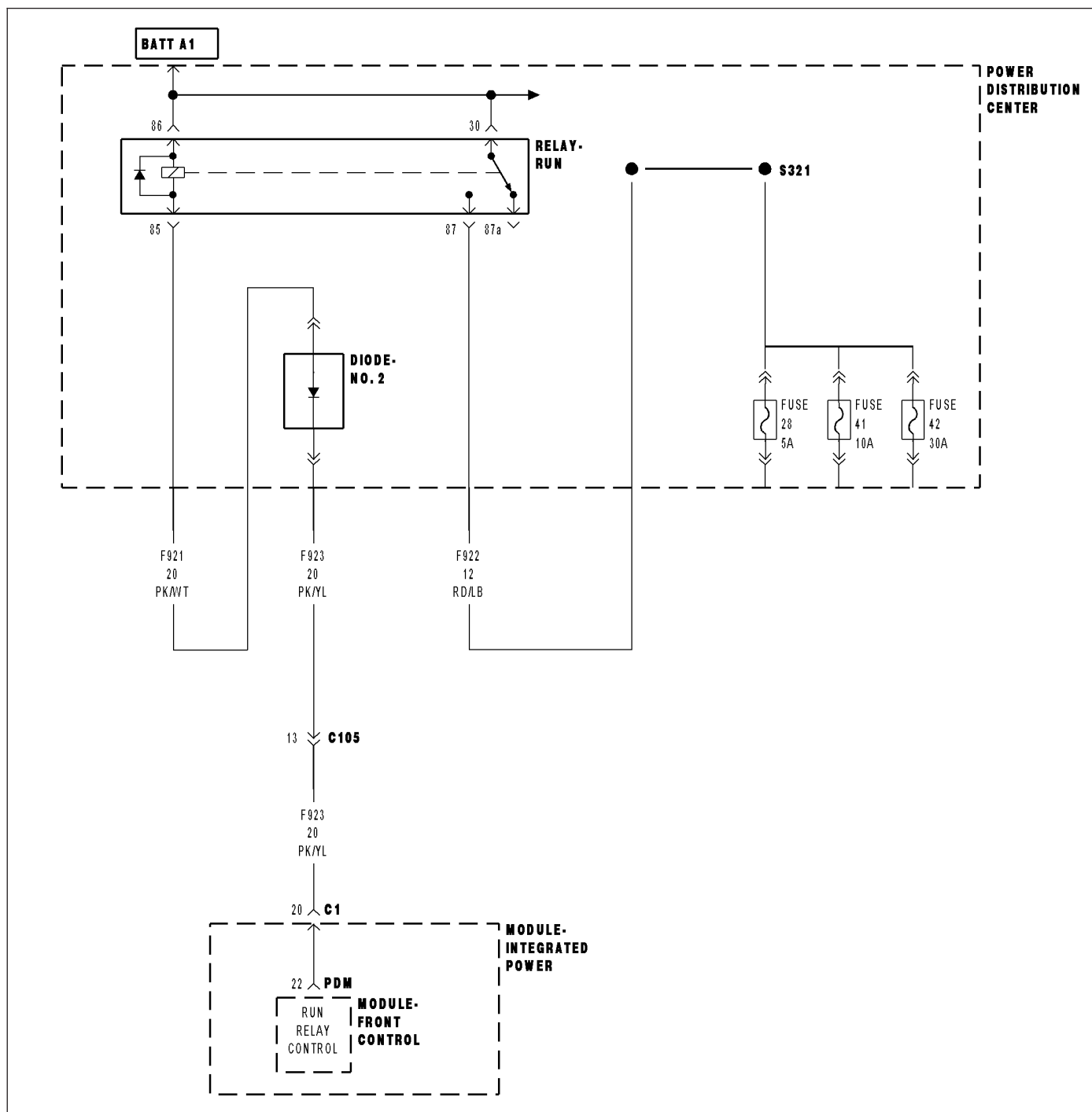
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



# B2124-IGNITION RUN CONTROL CIRCUIT OPEN



**B2124-IGNITION RUN CONTROL CIRCUIT OPEN (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Front Control Module will set this DTC within 500ms if the (F921) or (F923) run relay control circuit voltage is open or shorted to ground.

Possible Causes
(F921) or (F923) RUN RELAY CONTROL CIRCUIT OPEN OR SHORTED TO GROUND RUN RELAY FRONT CONTROL MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**2. RUN RELAY**

Turn the ignition off.

Install a substitute run relay in place of the original run relay.

Cycle the ignition switch from off to on, leaving the ignition on for a minimum of 90 seconds.

With the scan tool, read the active FCM DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 3

**No** >> Replace the original run relay.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

**B2124-IGNITION RUN CONTROL CIRCUIT OPEN (CONTINUED)****3. (F921) or (F923) RUN RELAY CONTROL CIRCUIT OPEN**

Turn the ignition off.

Remove the FCM from the Power Distribution Module.

Remove the run relay from the Rear Power Distribution Module.

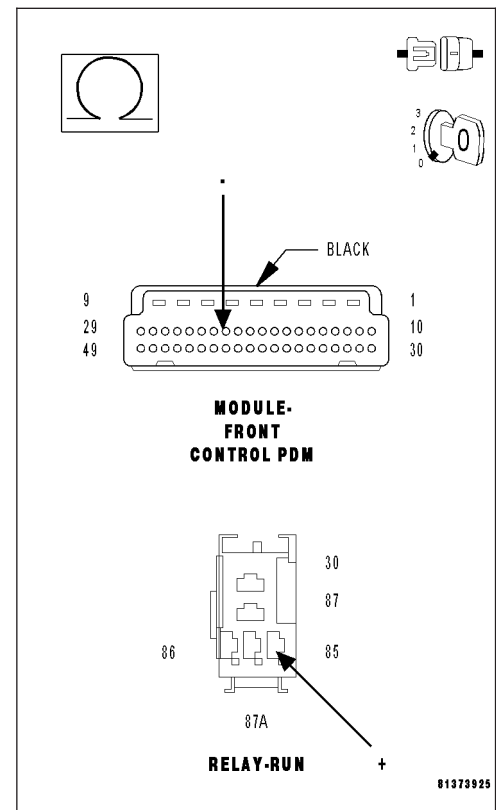
**Note:** This circuit contains a diode. When checking resistance of this circuit the red ohmmeter lead must be connected to the run relay cavity (85) and the black ohmmeter lead must be connected to the FCM-PDM connector.

Measure the resistance of the Run Relay Control circuit.

**Is the resistance below 10.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the Run Relay Control circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**4. (F921) RUN RELAY CONTROL CIRCUIT SHORTED TO GROUND**

**Note:** This circuit contains a diode. When checking for a short to ground you must check both sides of the diode.

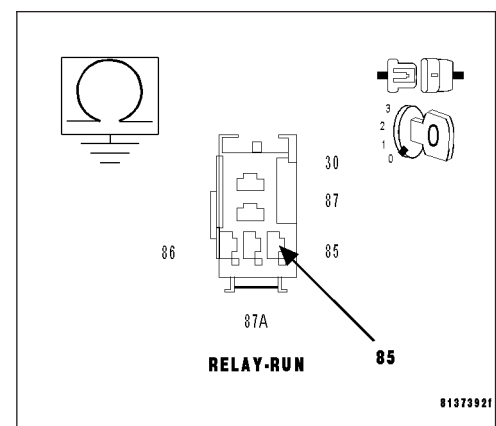
Measure the resistance between ground and the (F921) Run Relay Control circuit at the run relay cavity (85).

**Is the resistance below 10.0 ohms?**

**Yes** >> Repair the (F921) Run Relay Control circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 5



**B2124-IGNITION RUN CONTROL CIRCUIT OPEN (CONTINUED)****5. (F923) RUN RELAY CONTROL CIRCUIT SHORTED TO GROUND**

**Note:** This circuit contains a diode. When checking for a short to ground you must check both sides of the diode.

Measure the resistance between ground and the (F923) Run Relay Control circuit at the FCM-PDM connector.

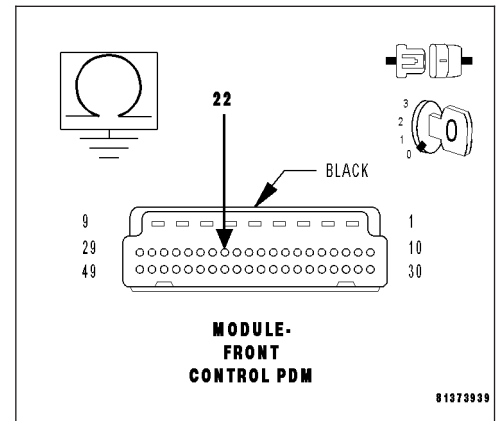
**Is the resistance below 10.0 ohms?**

**Yes** >> Repair the (F923) Run Relay Control circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Front Control Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



# IGNITION SYSTEM - SERVICE INFORMATION

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## IGNITION SYSTEM - SERVICE INFORMATION

### DESCRIPTION

### IGNITION SYSTEM

**Note:** All engines use a fixed ignition timing system. Basic ignition timing is not adjustable. All spark advance is determined by the Powertrain Control Module (PCM).

The ignition system used on these engines is referred to as the Direct Ignition System (DIS). The system's three main components are the coils, crankshaft position sensor, and camshaft position sensor. If equipped with the coil on plug ignition system it utilizes an ignition coil for every cylinder, it is mounted directly over the each spark plug.

### DESCRIPTION - 5.7L V-8 ENGINE

The ignition system is controlled by the Powertrain Control Module (PCM) on all engines.



**For additional information, also refer to Ignition Coil Description and Operation.**

The 5.7L V-8 engine is equipped with 16 spark plugs. Two plugs are used for each cylinder. The 5.7L is also equipped with 8 separate and independent ignition coils. The one-piece coil bolts directly to the cylinder head cover and attaches the coils secondary output terminal directly to a spark plug using a rubber boot seal. Each coil is also equipped with a second output terminal. This second terminal connects a conventional spark plug cable directly to a spark plug on the opposite cylinder bank. A separate primary electrical connector is used for each coil.

Eight conventional spark plug cables are used with the 5.7L. These cables connect a coil on one cylinder bank, directly to a spark plug on the opposite cylinder bank. The cables are placed and routed in a special plastic loom to keep them separated. This loom is clipped to the intake manifold. To prevent a mismatch of cables, a corresponding spark plug / coil number is displayed on each plug cable: 1/6, 2/3, 4/7 and 5/8. These numbers (2) and (3) can also be found on the top of the intake manifold.

Two knock sensors (one for each cylinder bank) are used to help control spark knock.

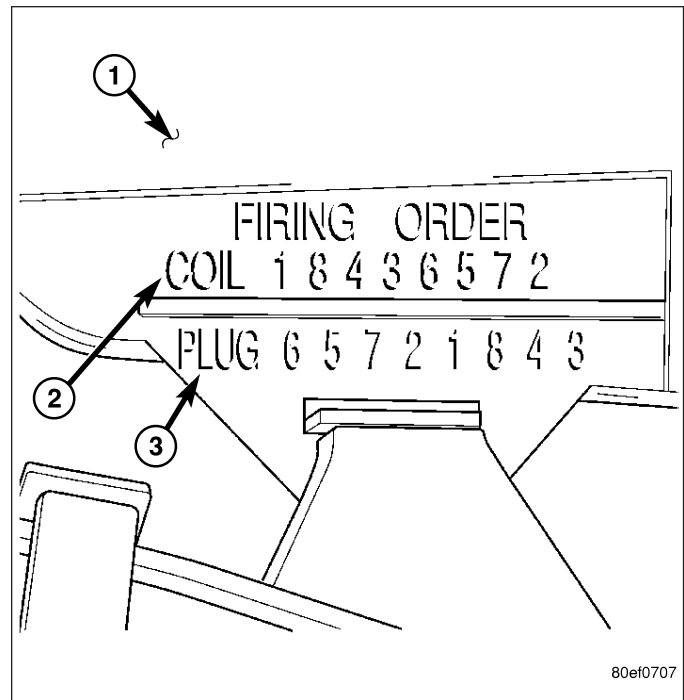
The 5.7L engine will not use a conventional distributor.

The ignition system consists of:

- 16 Spark Plugs (2 per cylinder)
- 8 Separate, Dual-Secondary Output, Ignition Coils
- 2 Knock Sensors
- 8 Secondary Ignition Cables
- Powertrain Control Module (PCM)
- Also to be considered part of the ignition system are certain inputs from the Crankshaft Position, Camshaft Position, Throttle Position, MAP and two knock sensors

**OPERATION - IGNITION SYSTEM**

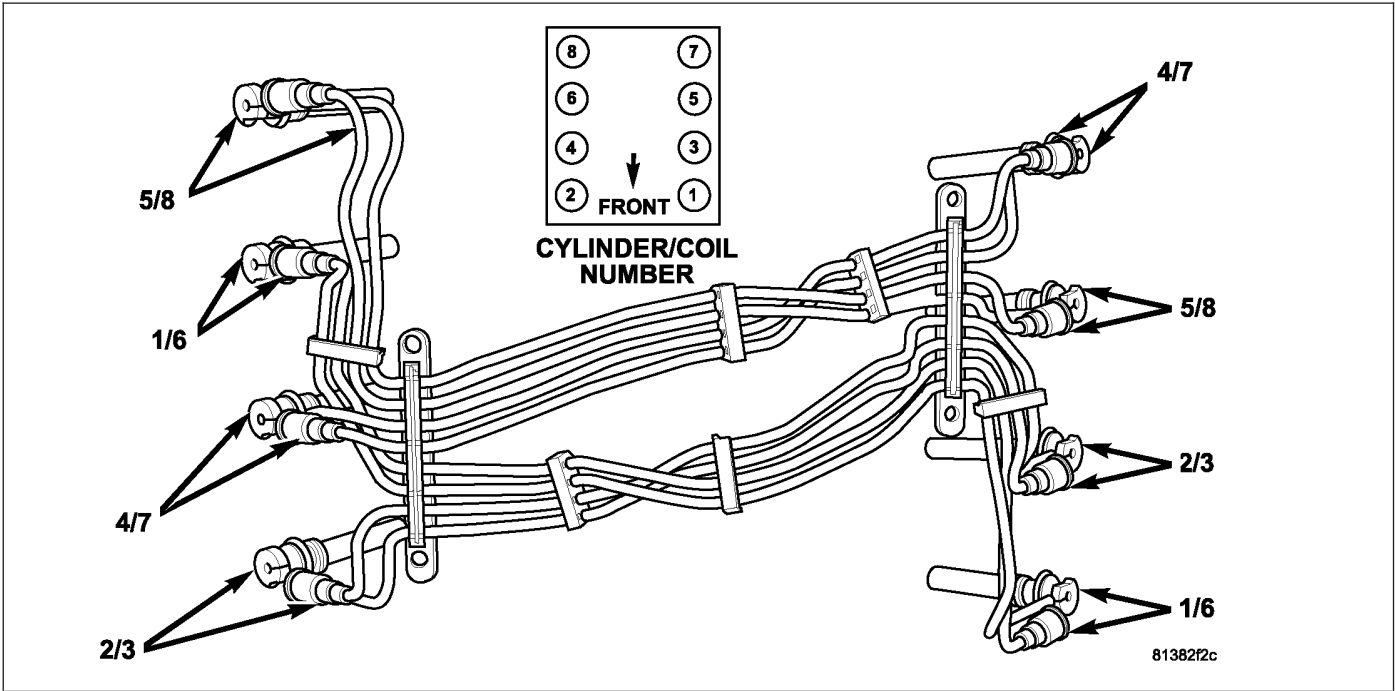
The crankshaft position sensor and camshaft position sensor are hall effect devices. The camshaft position sensor and crankshaft position sensor generate pulses that are inputs to the PCM. The PCM determines engine position from these sensors. The PCM calculates injector sequence and ignition timing from crankshaft & camshaft position. For a description of both sensors, refer to Camshaft Position Sensor and Crankshaft Position Sensor.



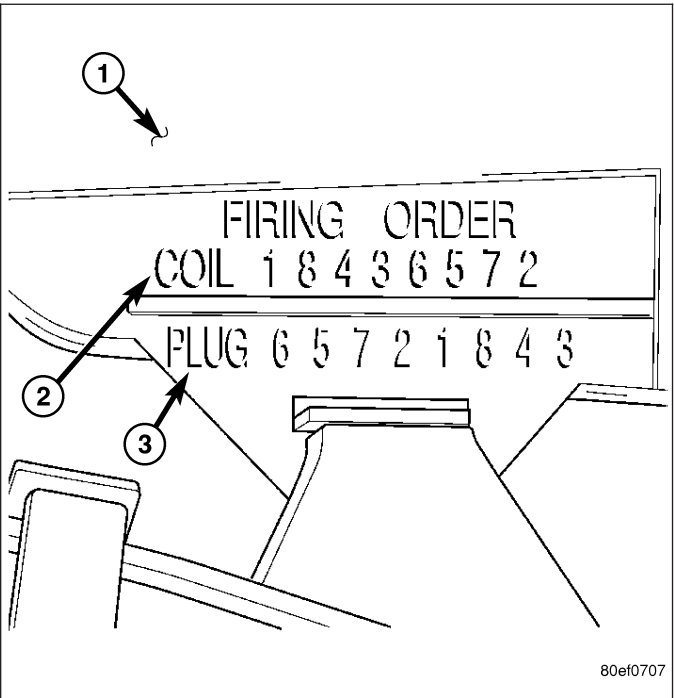
**SPECIFICATIONS****TORQUE**

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Camshaft Position Sensor - 2.7L	12	-	105
Camshaft Position Sensor - 3.5L	12	-	105
Crankshaft Position Sensor - 2.7L	12	-	105
Crankshaft Position Sensor - 3.5L	12	-	105
Ignition Coil Mounting - 2.7L	6.2	-	55
Ignition Coil Mounting - 3.5L	6.7	-	60
Knock Sensor - 2.7L	10	-	83
Knock Sensor - 3.5L	20	15.2	-
Spark Plugs - 2.7L	17.6	-	155
Spark Plugs - 3.5L	28	20	-
Capacitor Nut	12	8.8	106
Camshaft Position Sensor - 5.7L V-8 Engine	12	9	105
Crankshaft Position Sensor - 5.7L V-8 Engine	12	9	105
Ignition Coil Mounting - 5.7L V-8 Engine	12	9	105 (± 20)
* Knock Sensor - 5.7L V-8 Engine	20	15	176
** Spark Plugs - 5.7L V-8 Engine	18 (± 3)	13 (± 2)	-
* Do not apply any sealant, thread-locker or adhesive to bolts. Poor sensor performance may result.			
** Torque critical tapered design. Do not exceed 15 ft. lbs.			

FIRING ORDER / CABLE ROUTING – 5.7L V-8 ENGINE



Eight conventional spark plug cables are used with the 5.7L. These cables connect a coil on one cylinder bank, directly to a spark plug on the opposite cylinder bank. The cables are placed and routed in special plastic looms to keep them separated. These plastic looms are clipped to the intake manifold. To prevent a miss-match of cables, a corresponding spark plug / coil number is displayed on each plug cable: 1/6, 2/3, 4/7 and 5/8. These numbers (2) and (3) can also be found on the top of the intake manifold.



SPARK PLUG CABLE RESISTANCE

MINIMUM	MAXIMUM
250 Ohms Per Inch	1000 Ohms Per Inch
3000 Ohms Per Foot	12,000 Ohms Per Foot

## SPARK PLUGS

ENGINE	PLUG TYPE	ELECTRODE GAP
2.7L	RE10PMC5	0.048 TO 0.058 in.
3.5L	ZFR5LP-13G	0.048 TO 0.058 in.
5.7L V-8	Champion - RE14MCC4	1.14 mm (.045 in.)

## IGNITION COIL RESISTANCE - 5.7L V-8

PRIMARY RESISTANCE @ 21-27°C (70-80°F)
0.558 - 0.682 Ohms (Plus or Minus 10% @ 70-80° F)

## IGNITION TIMING-5.7L

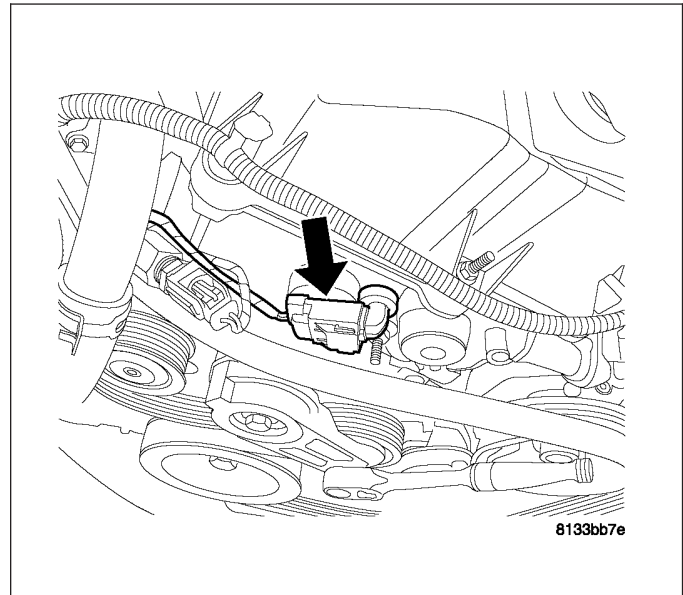
Ignition timing is not adjustable on the 5.7L engine.

## SENSOR-CAMSHAFT POSITION

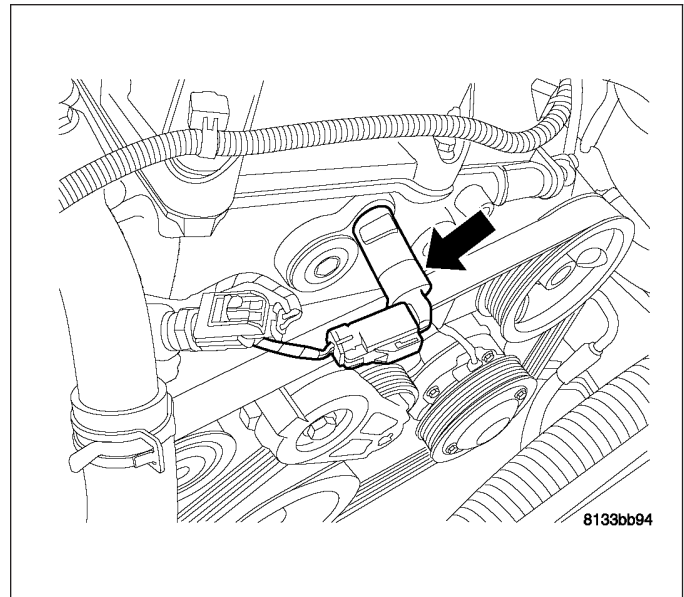
### REMOVAL

#### 2.7L

1. Disconnect negative battery cable.
2. Unlock and disconnect electrical connector.

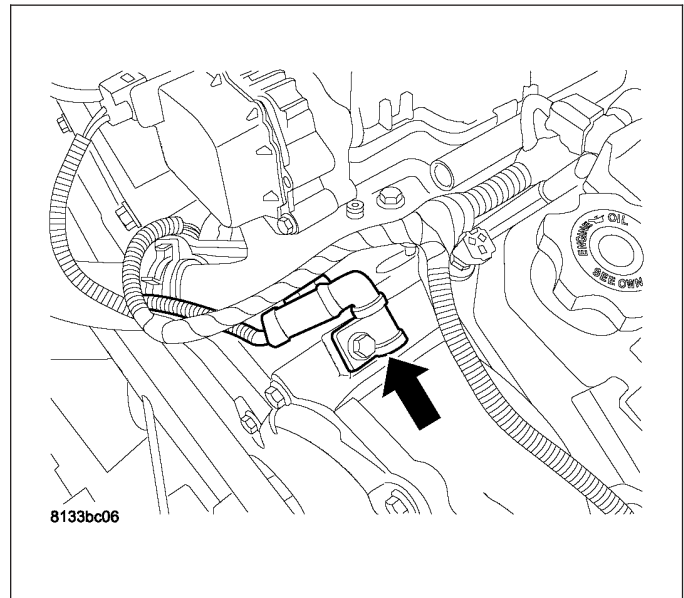


3. Remove mounting bolt.
4. Remove sensor.

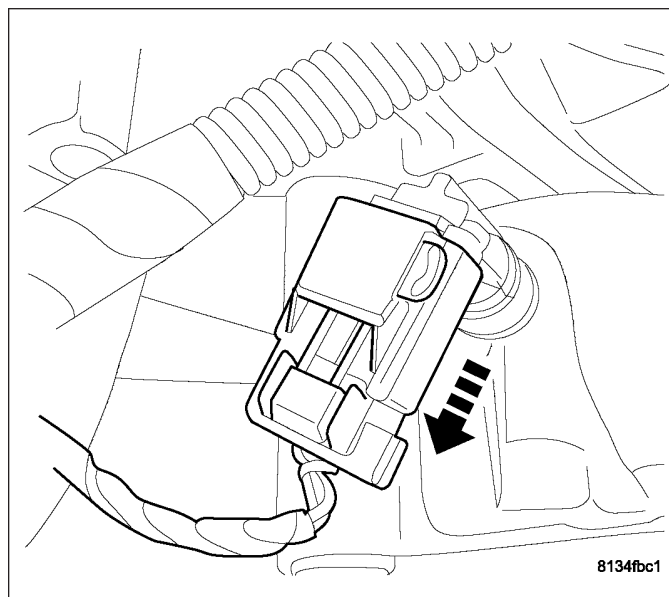


### 3.5L

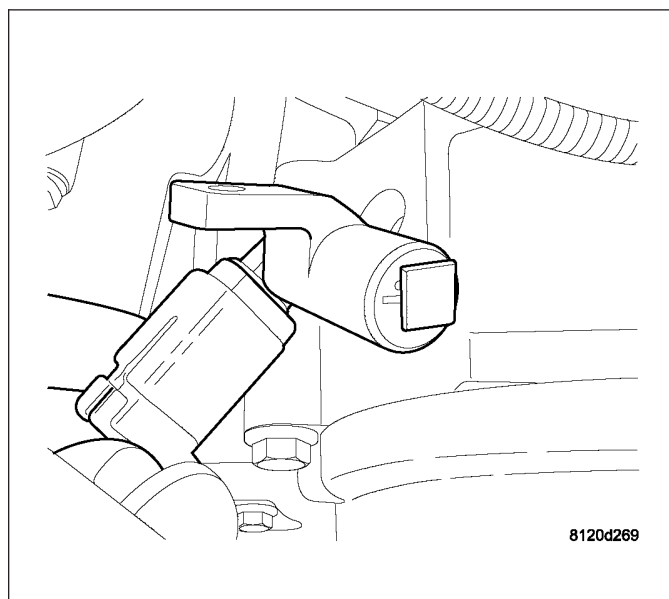
1. Camshaft Position Sensor location.
2. Disconnect negative battery cable.



3. Unlock electrical connector.
4. Remove electrical connector.



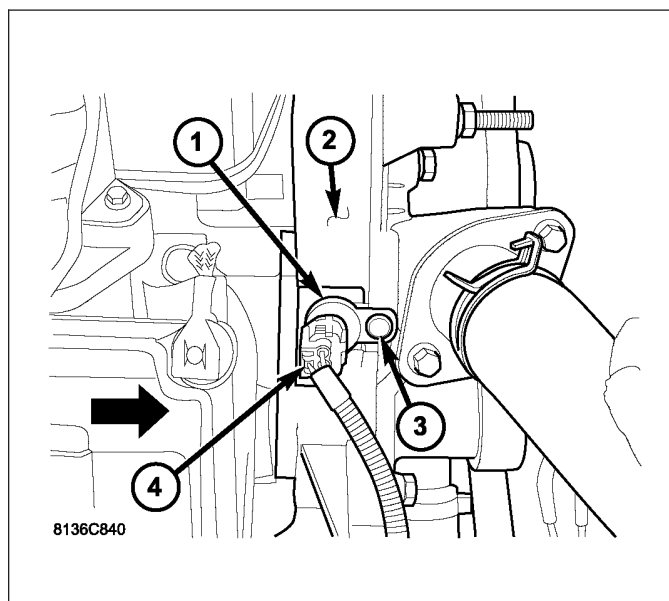
5. Remove mounting bolt.
6. Remove sensor.



## 5.7L

The Camshaft Position Sensor (CMP) on the 5.7L V-8 engine (1) is bolted to the front/top of the timing chain cover (2).

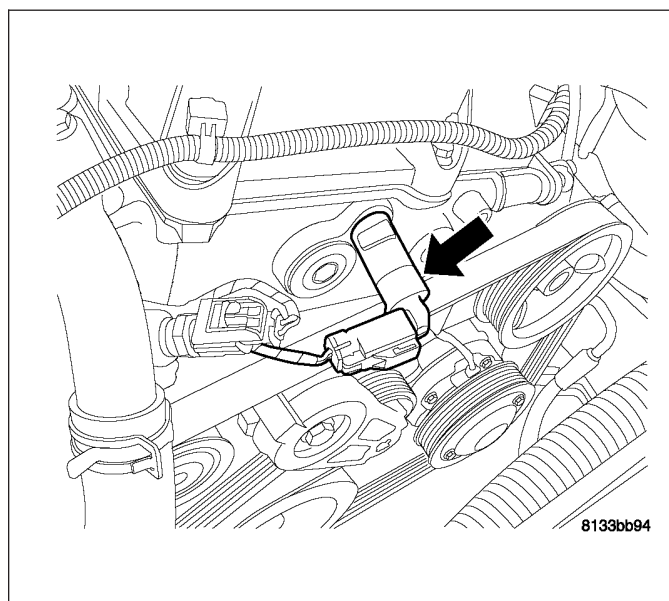
1. Disconnect electrical connector (4) at CMP sensor.
2. Remove sensor mounting bolt (3).
3. Carefully twist sensor from timing chain cover.
4. Check condition of sensor o-ring.



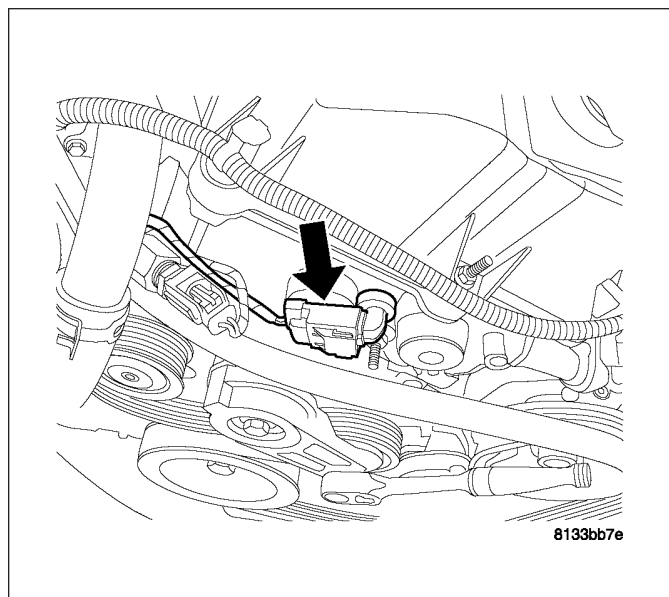
## INSTALLATION

### 2.7L

1. Install sensor.
2. Install mounting bolt.
3. Tighten bolt to 12 N·m (105 in. lbs.).

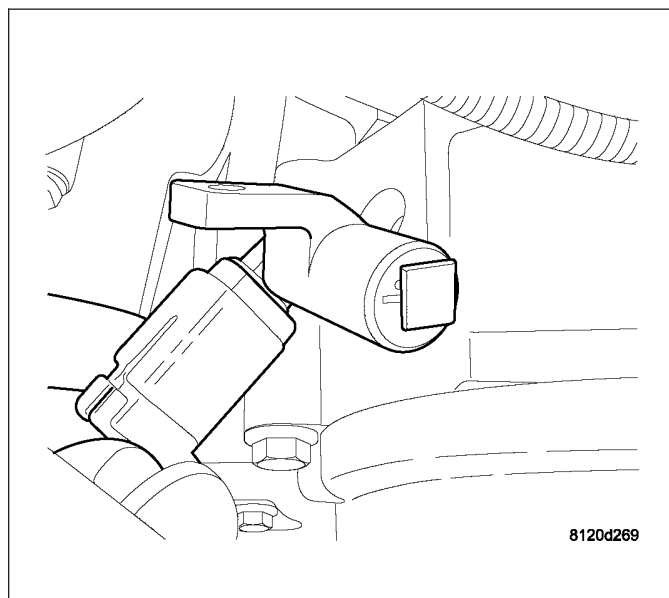


4. Connect electrical connector and lock.
5. Connect negative battery cable.



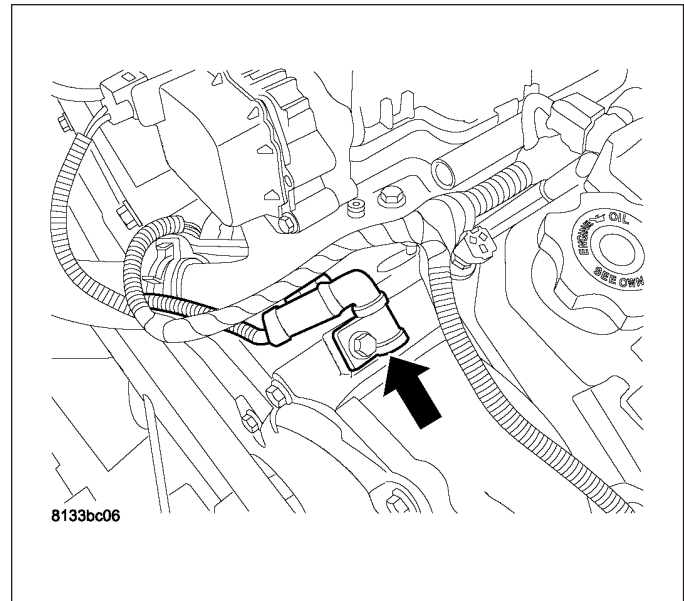
### 3.5L

1. Install new spacer to sensor if installing the old sensor or new sensor will have the spacer installed.

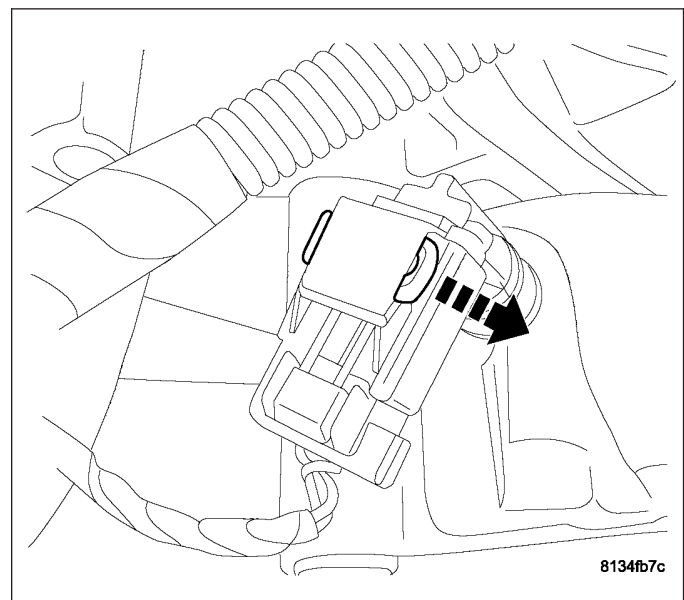




2. Install sensor and insert until sensor makes contact with tone wheel.
3. Install mounting bolt.
4. Tighten mounting bolt to 12 N·m (105 in. lbs.).



5. Install electrical connector.
6. Lock connector.
7. Connect negative battery cable.

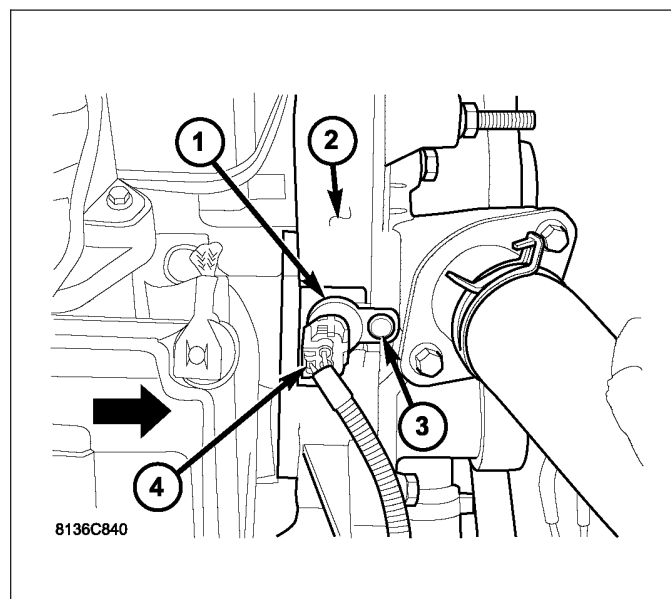


**5.7L**

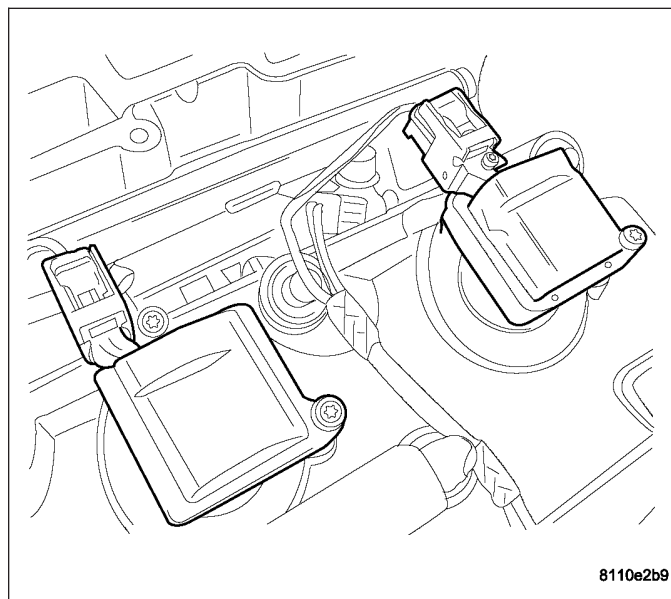
1. Clean out machined hole in timing chain cover.
2. Apply a small amount of engine oil to sensor o-ring.
3. Install sensor (1) into timing chain cover (2) with a slight rocking action. Do not twist sensor into position as damage to o-ring may result.

**CAUTION:** Before tightening sensor mounting bolt, be sure sensor is completely flush to timing chain cover. If sensor is not flush, damage to sensor mounting tang may result.

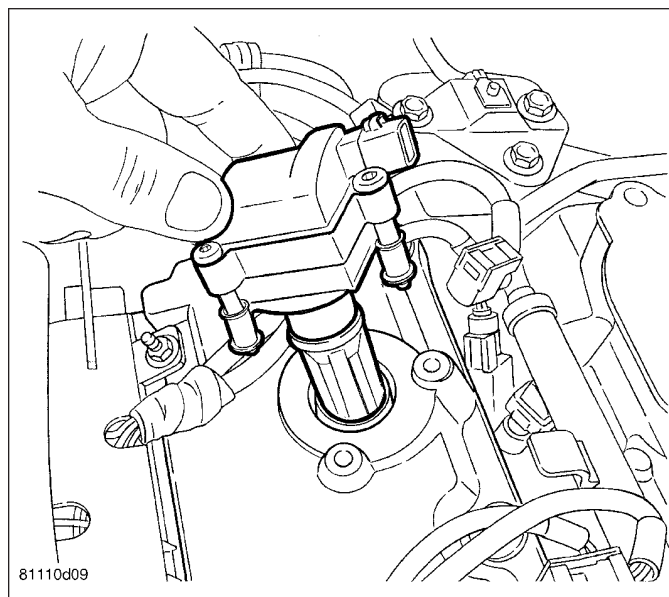
4. Install mounting bolt (3) and tighten. Refer to Torque Specifications.
5. Connect electrical connector (4) to sensor

**COIL-IGNITION****REMOVAL****2.7L**

1. Disconnect negative battery cable.
2. Remove the intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL)
3. Prior to removing the ignition coils, spray compressed air around the coil area and spark plug.

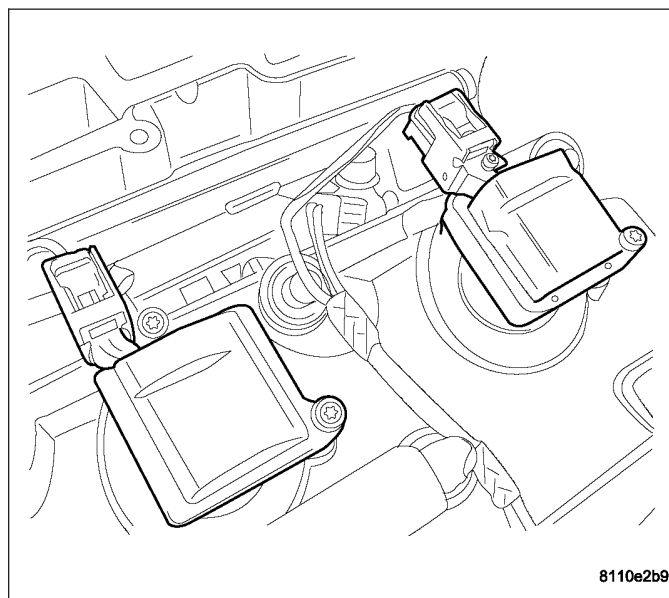


4. Remove electrical connector from ignition coil.
5. Remove 2 fasteners from ignition coil assembly.
6. Remove ignition coil assembly.



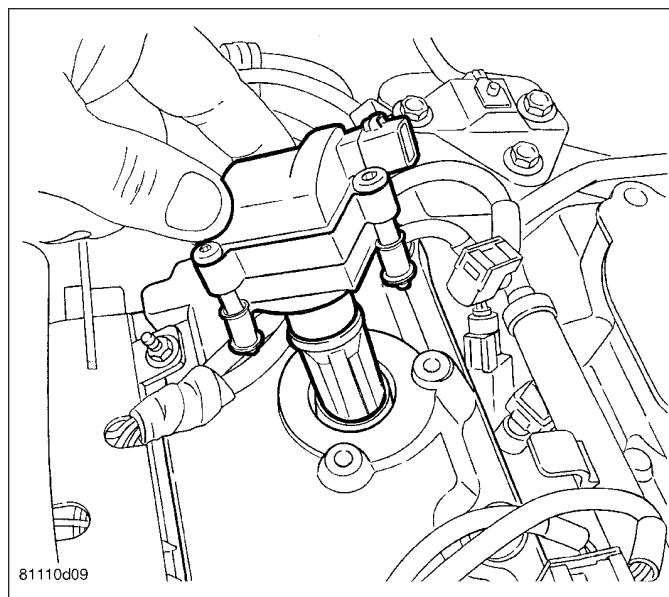
### 3.5L

1. Disconnect negative battery cable.
2. Remove the intake manifold, (Refer to 9 - ENGINE/ MANIFOLDS/INTAKE MANIFOLD - REMOVAL)
3. Prior to removing the ignition coils, spray compressed air around the coil area and spark plug.
4. Unlock and remove electrical connector from ignition coil.



On 3.5L engines, it is necessary to loosen the screws by alternating back and forth. Do not lose the spacers under the coil when loosening the screws.

5. Remove 2 fasteners from ignition coil assembly.
6. Remove ignition coil assembly.

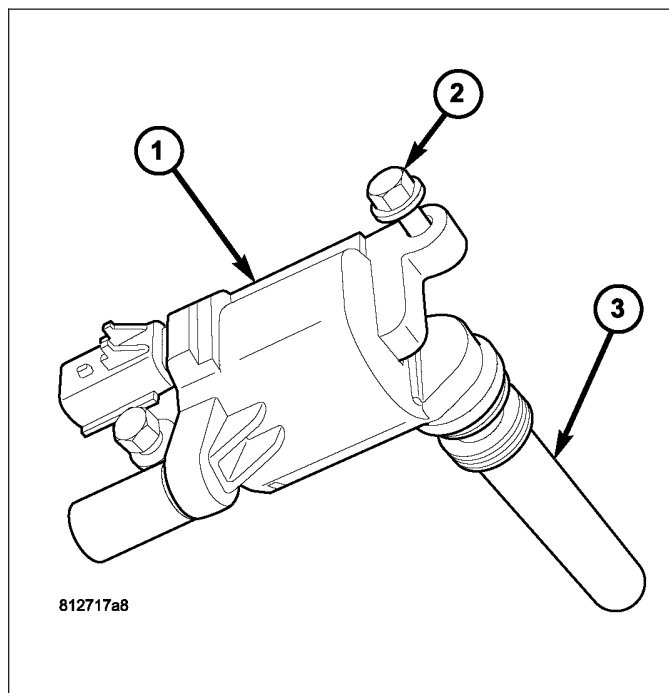


## 5.7L

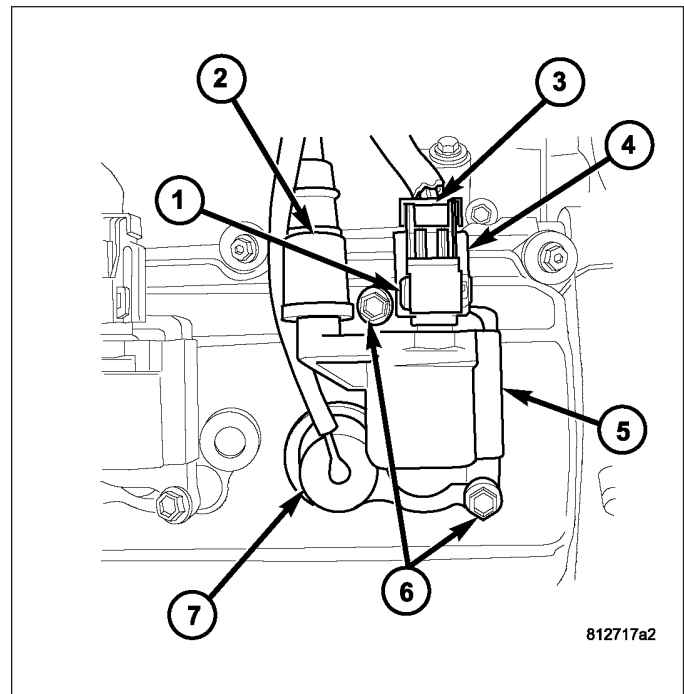
Before removing or disconnecting any spark plug cables, note their original position. Remove cables one-at-a-time. To prevent ignition crossfire, spark plug cables **MUST** be placed in cable tray (routing loom) into their original position.

An individual ignition coil (1) is used at each cylinder. The coil mounts to the top of the valve cover with two bolts (2). The bottom of the coil is equipped with a rubber boot (3) to seal the spark plug to the coil. Inside each rubber boot is a spring. The spring is used for a mechanical contact between the coil and the top of the spark plug.

1. Depending on which coil is being removed, the throttle body air intake tube or intake box may need to be removed to gain access to coil.



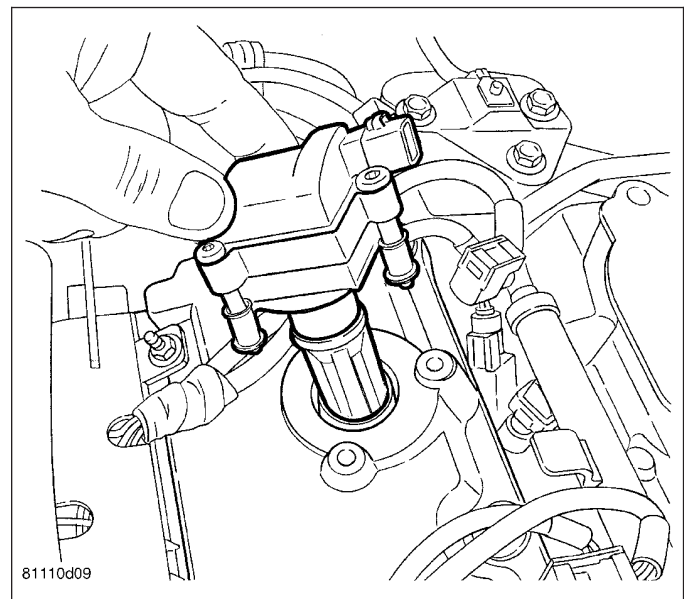
2. Unlock electrical connector (4) by moving slide lock (1) first. Press on release lock (3) while pulling electrical connector from coil.
3. Disconnect secondary high-voltage cable (2) from coil with a twisting action.
4. Clean area at base of coil with compressed air before removal.
5. Remove two mounting bolts (6) (note that mounting bolts are retained to coil).
6. Carefully pull up coil from cylinder head opening with a slight twisting action.
7. Remove coil from vehicle.
8. Before installing spark plug cables to either the spark plugs or coils, or before installing a coil to a spark plug, apply dielectric grease to inside of boots.



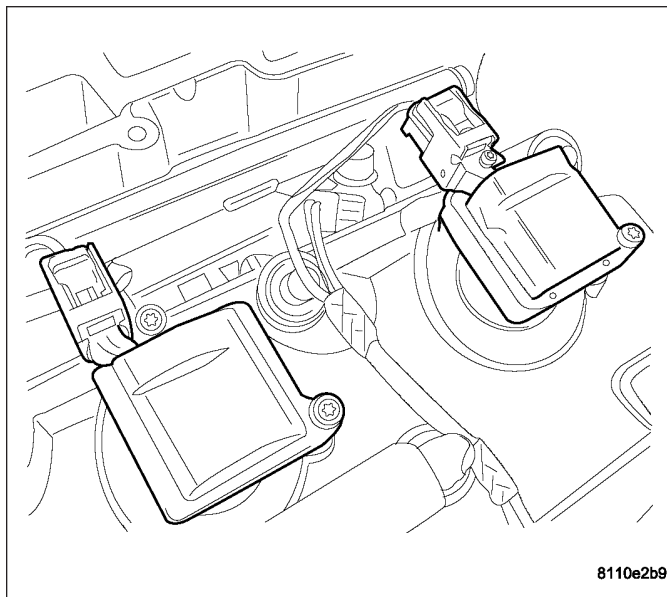
## INSTALLATION

### 2.7L

1. Install ignition coil assembly to spark plug.
2. Install coil screws and tighten: 2.7L engine to 6.2 N·m (55 in. lbs.).
3. Connect the electrical connector and lock.



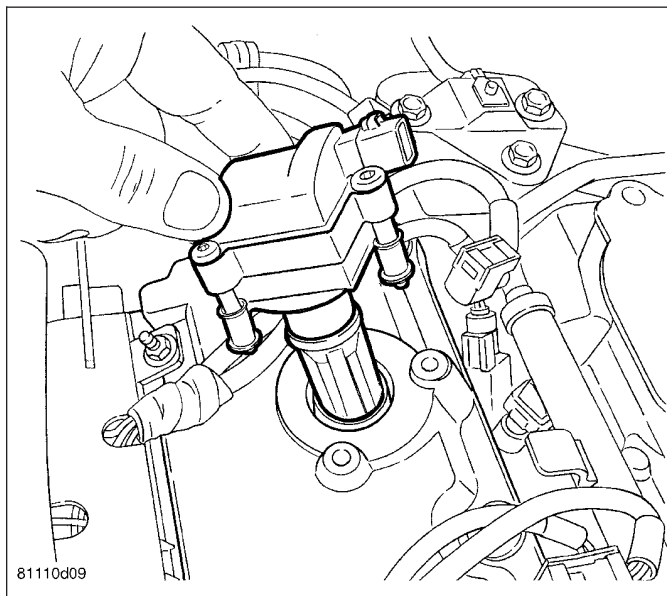
4. Install the intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION)
5. Connect negative battery cable.



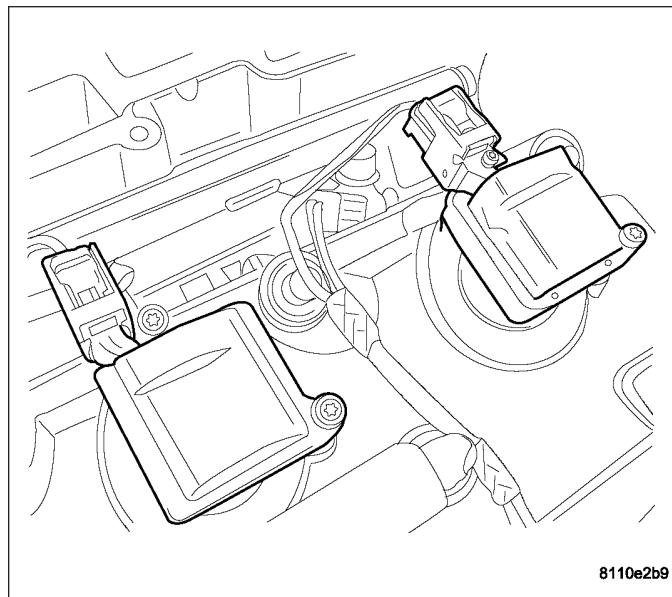
### 3.5L

On 3.5L engines, it is necessary to tighten the screws by alternating back and forth. Do not lose the spacers under the coil when installing ignition coils.

1. Install ignition coil assembly to spark plug.
2. Install coil screws and tighten 3.5L engines to 6.7 N·m (60 in. lbs.).
3. Connect the electrical connector and lock.

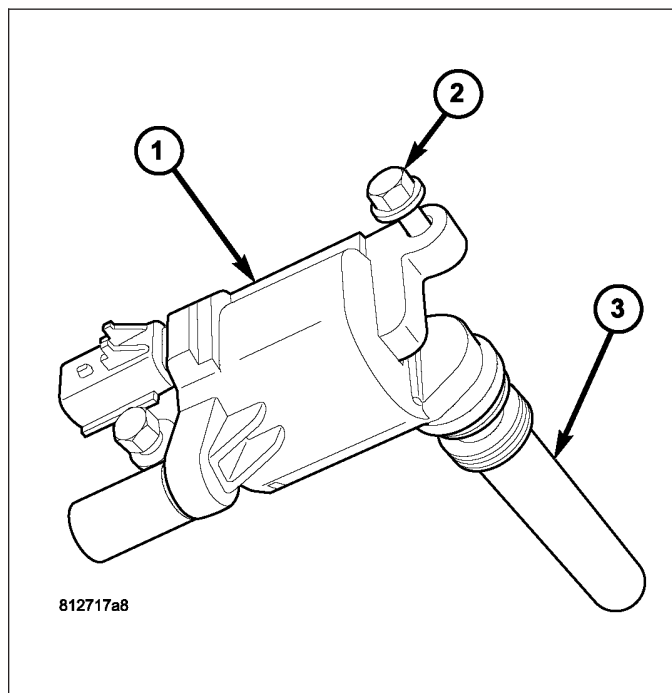


4. Install the intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION)
5. Connect negative battery cable.

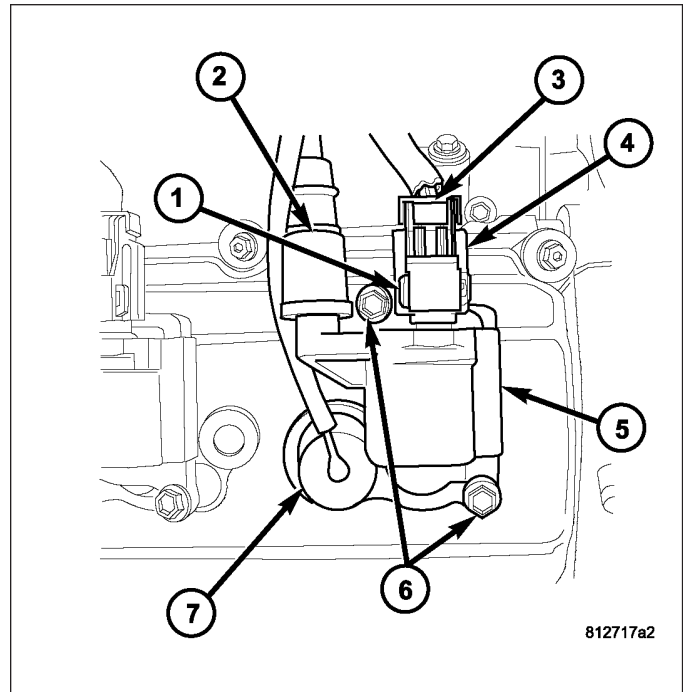


## 5.7L

1. Using compressed air, blow out any dirt or contaminants from around top of spark plug.
2. Before installing spark plug cables to either the spark plugs or coils, or before installing a coil to a spark plug, apply dielectric grease to inside of boots.
3. Position ignition coil into cylinder head opening and push boot (3) onto spark plug. Twist coil into position.
4. Install two coil mounting bolts (2). Refer to torque specifications.

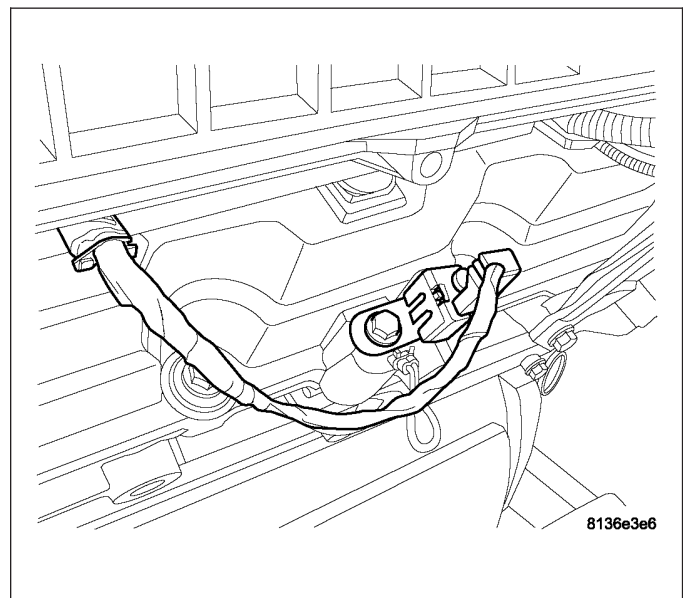


5. Connect electrical connector (1) to coil by snapping into position.
6. Install cable to coil. To prevent ignition crossfire, spark plug cables **MUST** be placed in cable tray (routing loom) into their original position. Refer to Spark Plug Cable Removal for a graphic.
7. If necessary, install throttle body air tube.



## CAPACITOR-IGNITION COIL REMOVAL

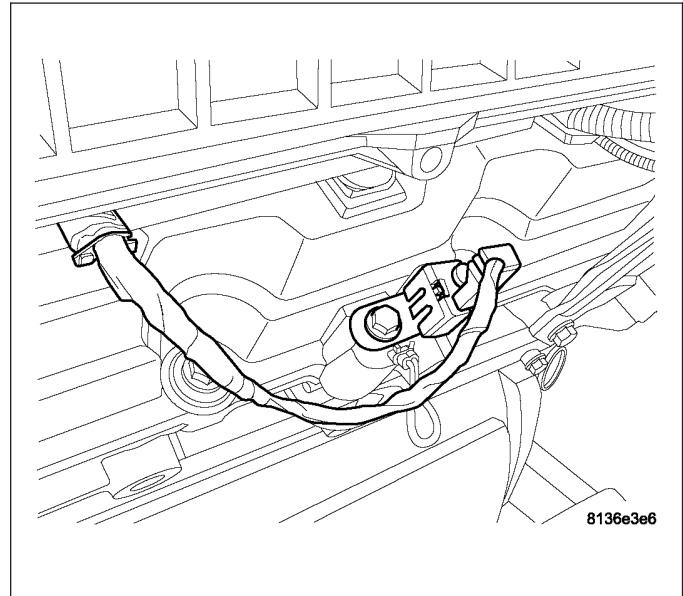
1. Remove the negative battery cable.
2. Disconnect the electrical connector.
3. Remove nut and capacitor.





## INSTALLATION

1. Install capacitor and tighten nut.
2. Attach electrical connector to capacitor.
3. Install the negative battery cable

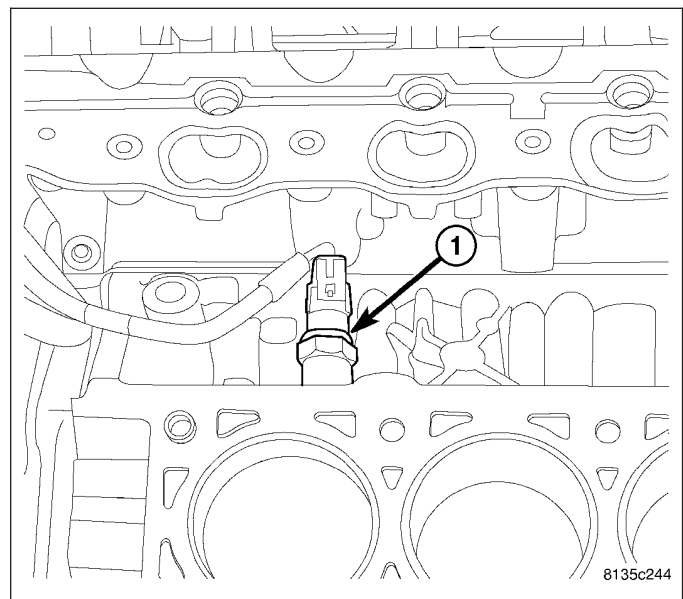


## SENSOR-KNOCK

### REMOVAL

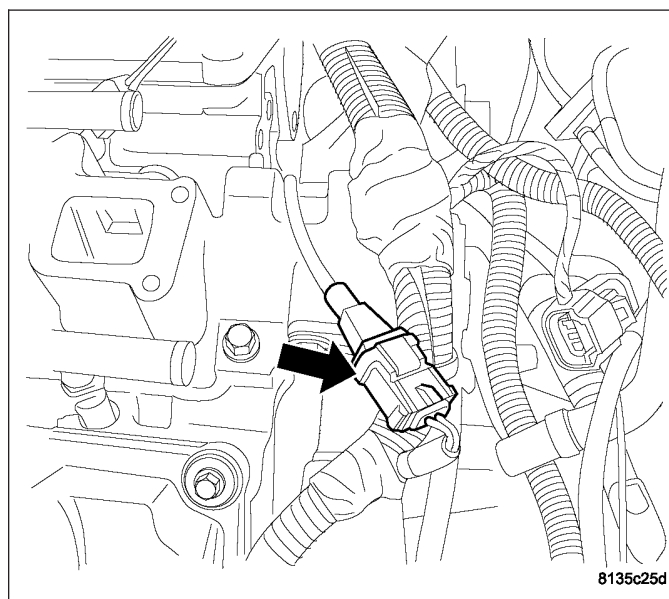
#### 2.7L

1. Disconnect negative battery cable.  
The sensors screws into the cylinder block, directly below the intake manifold.
2. Remove intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL)
3. Remove the passenger side cylinder head, refer to the Engine section (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
4. Disconnect electrical connector from knock sensor.
5. Use a crows foot socket to remove the knock sensors.

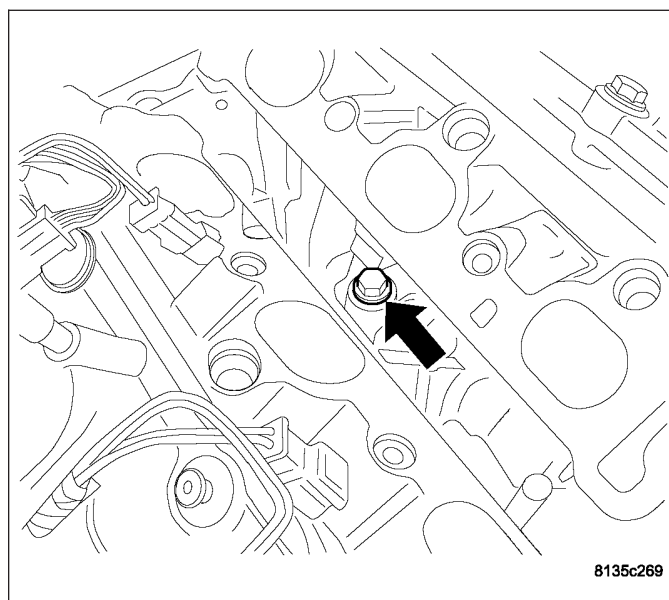


### 3.5L

1. Disconnect the negative battery cable.
2. Remove the upper intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL)
3. Disconnect the electrical connector.



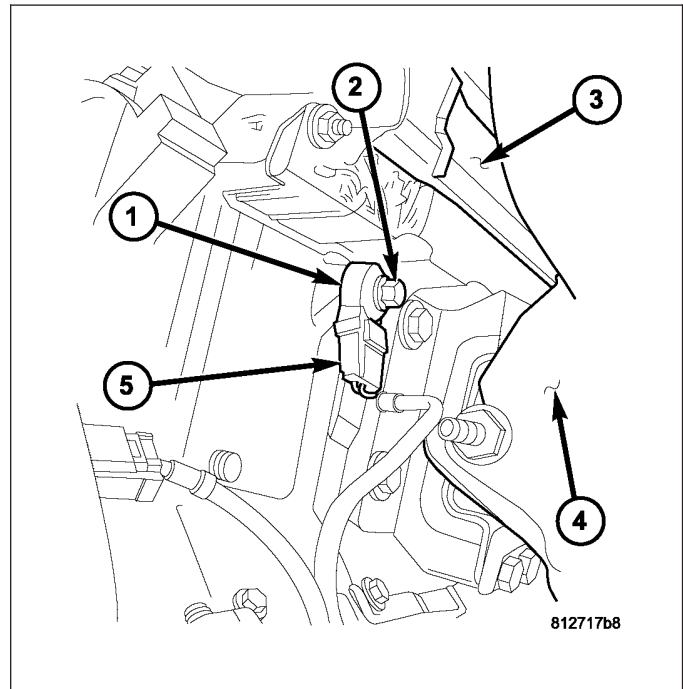
4. Remove the knock sensor.



## 5.7L

Two sensors (1) are used. Each sensor is bolted to the outside of cylinder block below the exhaust manifold (3).

1. Raise vehicle.
2. Disconnect knock sensor electrical connector (5).
3. Remove sensor mounting bolt (2). Note foam strip on bolt threads. This foam is used only to retain the bolts to sensors for plant assembly. It is not used as a sealant. Do not apply any adhesive, sealant or thread locking compound to these bolts.
4. Remove sensor from engine.

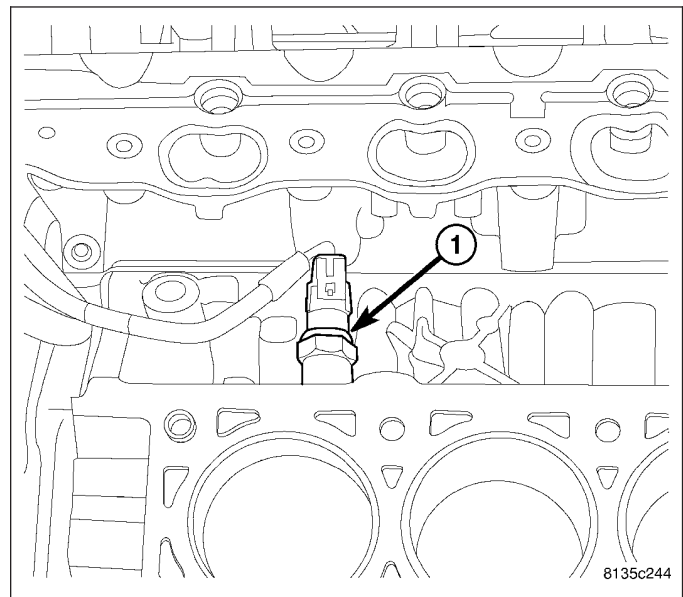


## INSTALLATION

### 2.7L

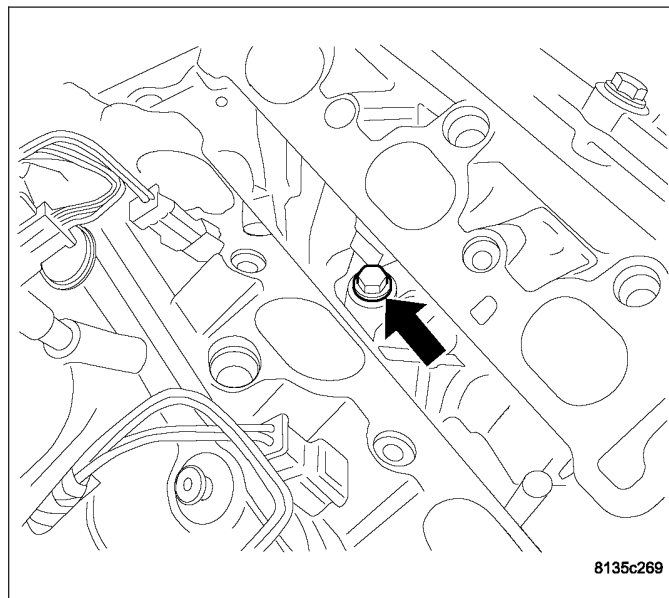
The sensors screws into the cylinder block, directly below the intake manifold.

1. Install knock sensor. Tighten knock sensor to 10 N·m (7 ft. lbs.) torque. **Over or under tightening effects knock sensor performance resulting in possible improper spark control.**
2. Attach electrical connector to knock sensor.
3. Install the passenger side cylinder head, (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION)
4. Install intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION)
5. connect negative battery cable.

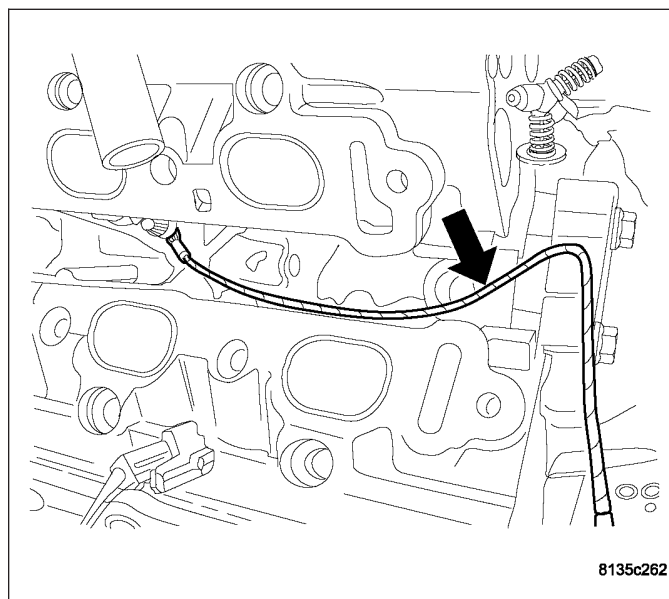


### 3.5L

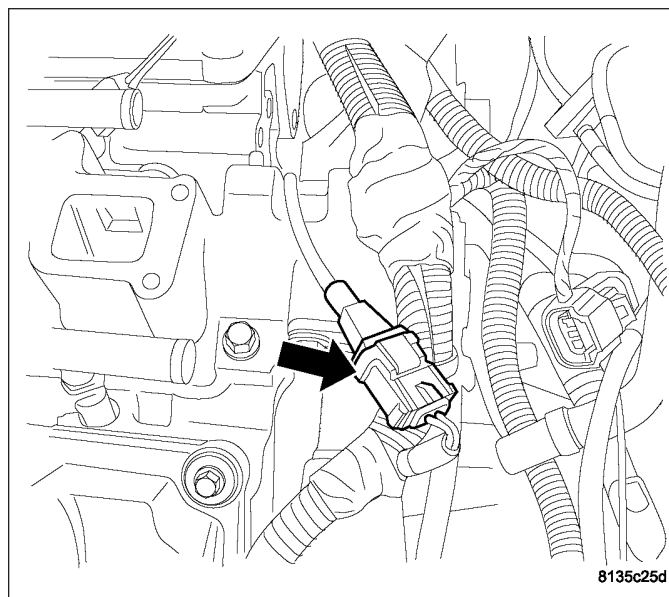
1. Install knock sensor. Tighten knock sensor to 20 N·m (15.2 in. lbs.) torque. **Over or under tightening effects knock sensor performance, possibly causing improper spark control.**



2. Route the knock sensor wire in the proper location.
3. Install the intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION)



4. Connect electrical connector.
5. Connect negative battery cable.



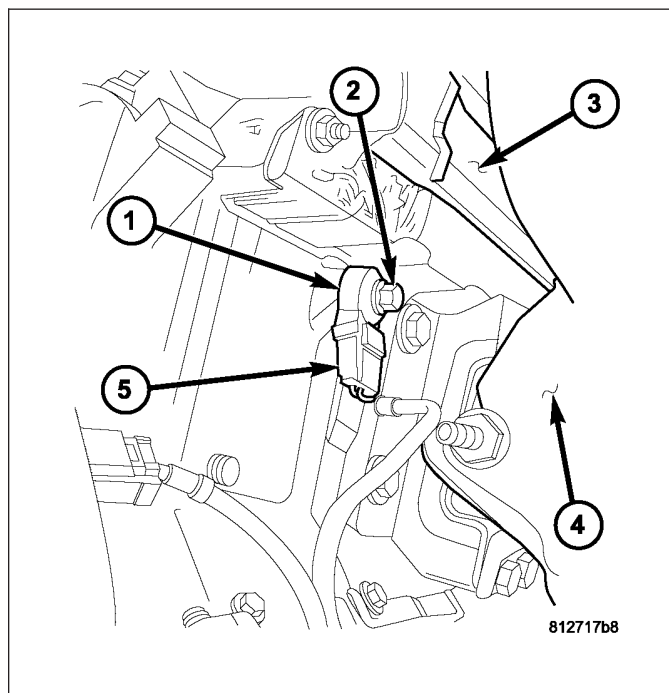
## 5.7L

1. Thoroughly clean knock sensor mounting hole.
2. Install sensor (1) into cylinder block.

**Note:** Over or under tightening the sensor mounting bolts will affect knock sensor performance, possibly causing improper spark control. Always use the specified torque when installing the knock sensors. The torque for the knock sensor bolt is relatively light for an 8mm bolt.

**Note:** Note foam strip on bolt threads. This foam is used only to retain the bolts to sensors for plant assembly. It is not used as a sealant. Do not apply any adhesive, sealant or thread locking compound to these bolts.

3. Install and tighten mounting bolt (2). Refer to torque specification.
4. Install electrical connector to sensor.



## SPARK PLUG

### DESCRIPTION - PLATINUM PLUGS

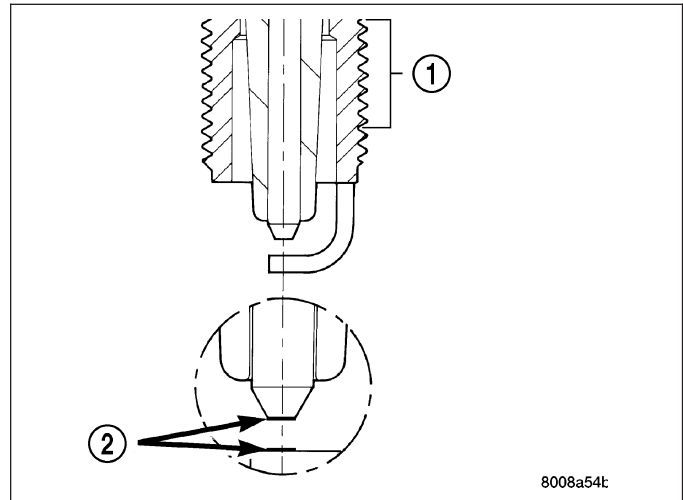
The V6 engines use platinum resistor spark plugs. They have resistance values of 6,000 to 20,000 ohms when checked with at least a 1000 volt tester. For spark plug identification and specifications, Refer to the Specifications section.

**Do not use an ohm meter to check the resistance of the spark plugs. This will give an inaccurate reading.**

When the spark plugs use a single or double platinum tips and they have a recommended service life of 100,000 miles for normal driving conditions per schedule A in this manual. The spark plugs have a recommended service life of 75,000 miles for severe driving conditions per schedule B in this manual. A thin platinum pad is welded to both

or just the center electrode end(s) as shown in. Extreme care must be used to prevent spark plug cross threading, mis-gapping and ceramic insulator damage during plug removal and installation.

**CAUTION:** Cleaning of the platinum plug may damage the platinum tip.



## REMOVAL

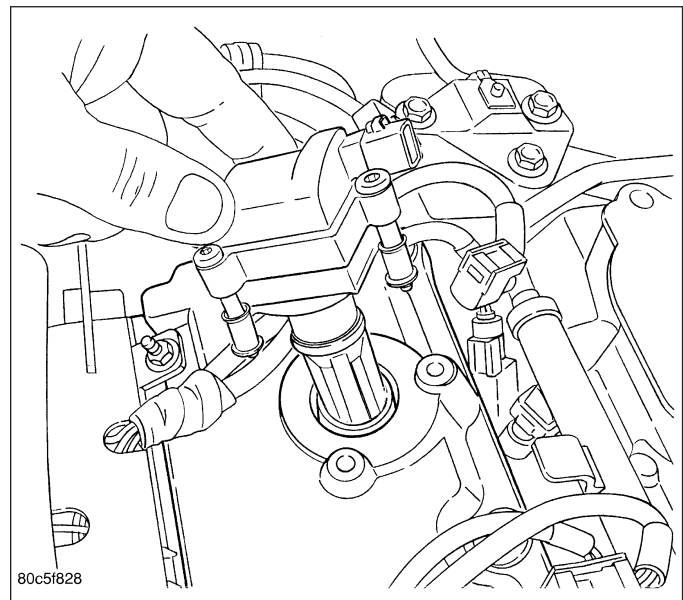
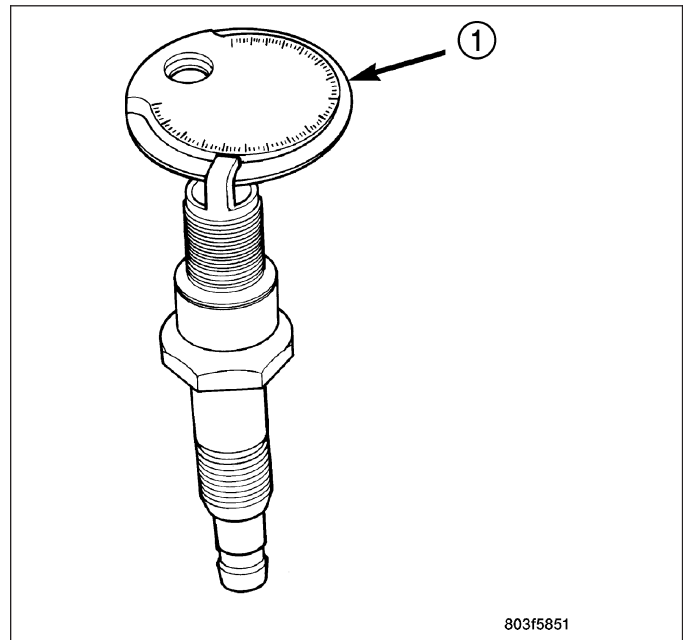
### 2.7L

Always remove the ignition coil assembly by grasping at the spark plug boot, turning the assembly 1/2 turn and pulling straight back in a steady motion.

1. Disconnect the negative battery cable.
2. Remove the intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
3. Prior to removing the ignition coils, spray compressed air around the coil area and spark plug.

On 3.5L engines, it is necessary to loosen the screws by alternating back and forth. Do not lose the spacers under the coil when loosening the screws.

4. Remove the ignitions coil.
5. Remove the spark plug using a quality socket with a rubber or foam insert.
6. Inspect the spark plug condition.



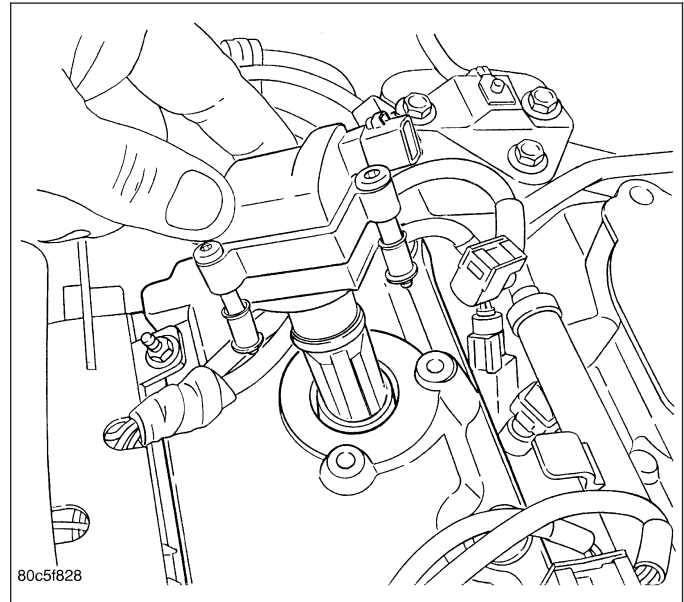
### 3.5L

Always remove the ignition coil assembly by grasping at the spark plug boot, turning the assembly 1/2 turn and pulling straight back in a steady motion.

1. Disconnect the negative battery cable.
2. Remove the intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
3. Prior to removing the ignition coils, spray compressed air around the coil area and spark plug.

On 3.5L engines, it is necessary to loosen the screws by alternating back and forth. Do not lose the spacers under the coil when loosening the screws.

4. Remove the ignitions coil.
5. Remove the spark plug using a quality socket with a rubber or foam insert.
6. Inspect the spark plug condition.



### 5.7L

Eight of the 16 spark plugs are located under an ignition coil; the other 8 are not. If spark plug being removed is under coil, coil must be removed to gain access to spark plug. Refer to Ignition Coil Removal/Installation and observe all CAUTIONS and WARNINGS.

Before removing or disconnecting any spark plug cables, note their original position. Remove cables one-at-a-time. To prevent ignition crossfire, spark plug cables **MUST** be placed in cable tray (routing loom) into their original position. Refer to Spark Plug Cable Removal for a graphic.

Before installing spark plug cables to either the spark plugs or coils, apply dielectric grease to inside of boots.

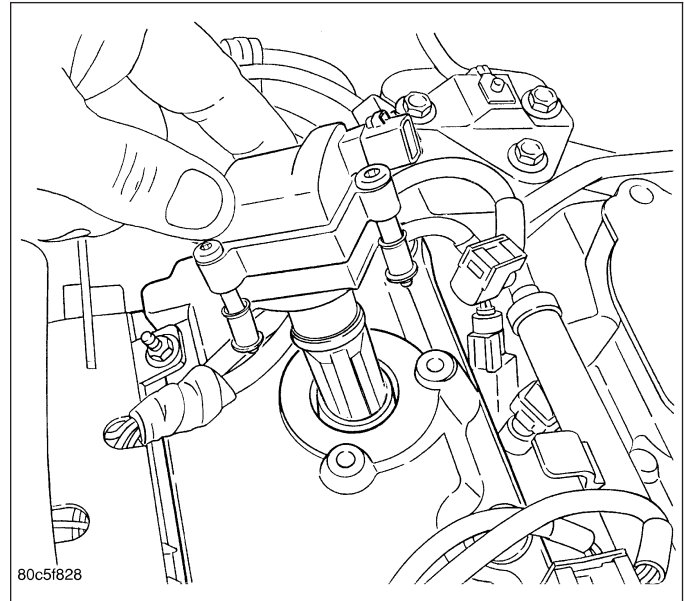
1. Remove necessary air filter tubing at throttle body.
2. Prior to removing ignition coil (if coil removal is necessary), spray compressed air around coil base at cylinder head cover.
3. Prior to removing spark plug, spray compressed air into cylinder head opening. This will help prevent foreign material from entering combustion chamber.
4. Remove spark plug from cylinder head using a quality socket with a rubber or foam insert.
5. Inspect spark plug condition.



## INSTALLATION

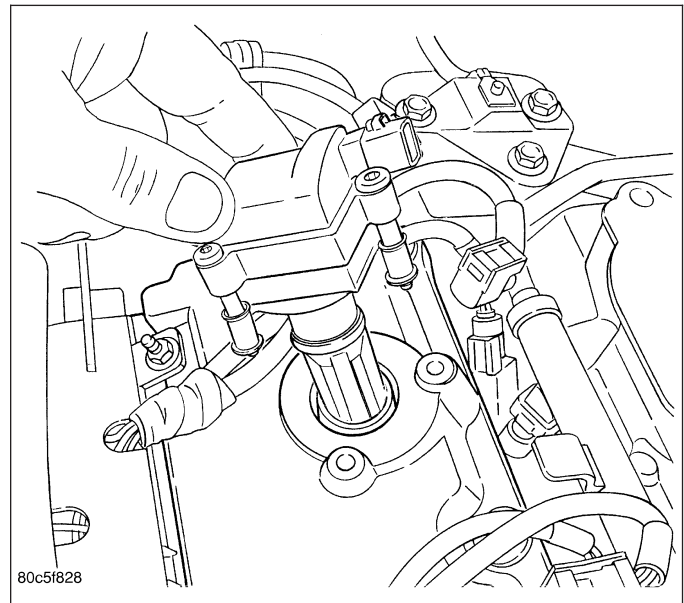
### 2.7L

1. To avoid cross threading, start the spark plug into the cylinder head by hand.
2. Tighten spark plugs. Tighten to 28 N·m (20 ft. lbs.).
3. Install ignition coil assembly onto spark plug.
4. Hand tighten coil screws.
5. Tighten ignition coil screws to 6.7 N·m (60 in. lbs.).
6. Connect and lock the electrical connector.
7. Install the intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION)
8. Connect the negative battery cable.



### 3.5L

1. To avoid cross threading, start the spark plug into the cylinder head by hand.
2. Tighten spark plugs. Tighten to 28 N·m (20 ft. lbs.).
3. Install ignition coil assembly onto spark plug.
4. Hand tighten coil screws.
5. Tighten ignition coil screws to 6.7 N·m (60 in. lbs.).
6. Connect and lock the electrical connector.
7. Install the intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION)
8. Connect the negative battery cable.



### 5.7L

1. Special care should be taken when installing spark plugs into the cylinder head spark plug wells. Be sure the plugs do not drop into the plug wells as electrodes can be damaged.
2. Start the spark plug into cylinder head by hand to avoid cross threading aluminum threads. To aid in installation, attach a piece of rubber hose, or an old spark plug boot to spark plug.
3. The 5.7L V-8 is equipped with torque critical design spark plugs. Do not exceed 15 ft. lbs. torque. Tighten spark plugs. Refer to torque specifications.

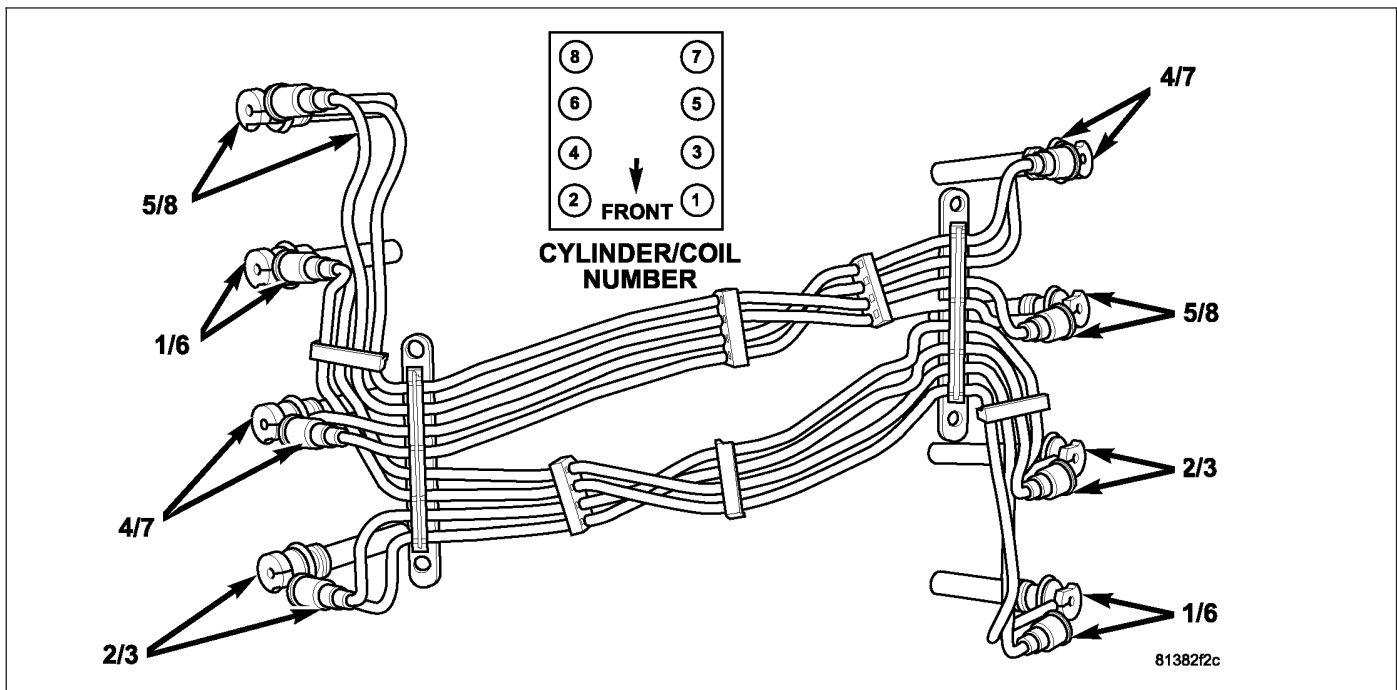


4. Before installing spark plug cables to either the spark plugs or coils, apply dielectric grease to inside of boots.
5. To prevent ignition crossfire, spark plug cables **MUST** be placed in cable tray (routing loom) into their original position. Refer to Spark Plug Cable Removal for a graphic.
6. Install ignition coil(s) to necessary spark plugs. Refer to Ignition Coil Installation.
7. Install spark plug cables to remaining spark plugs. Remember to apply dielectric grease to inside of boots.

## SPARK PLUG CABLES

### REMOVAL

#### 5.7L

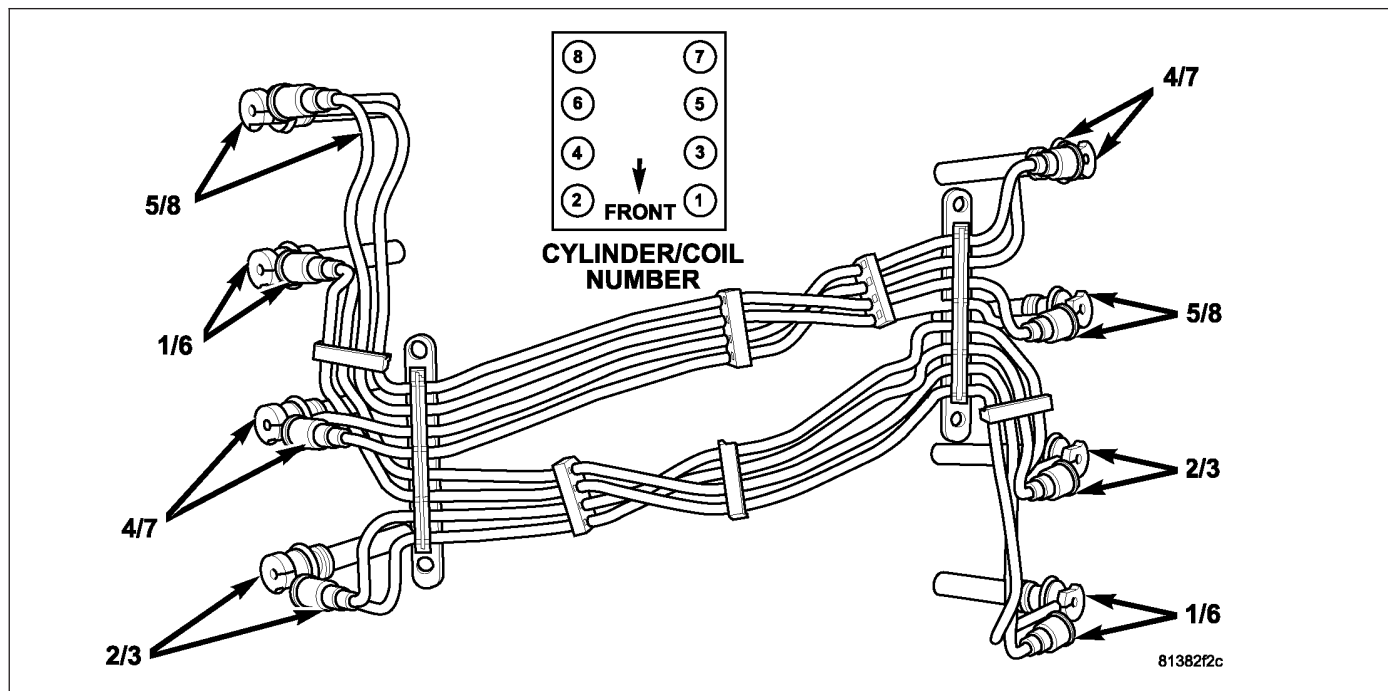


Spark plug cables on the 5.7L engine are paired on cylinders 1/6, 2/3, 4/7 and 5/8. Before removing or disconnecting any spark plug cables, note their original position. Remove cables one-at-a-time. To prevent ignition crossfire, spark plug cables **MUST** be placed in the routing looms into their original position. The cable retention clips must also be securely locked.

Before installing spark plug cables to either the spark plugs or coils, apply dielectric grease to inside of boots.

## INSTALLATION

### 5.7L



1. Install cables into the proper engine cylinder firing order sequence.
2. When replacing the spark plug and coil cables, route the cables correctly and secure them in the proper retainers. Failure to route the cables properly may cause the radio to reproduce ignition noise. It could also cause cross-ignition of the plugs, or, may short-circuit the cables to ground.
3. When installing new cables, make sure a positive connection is made. A snap should be felt when a good connection is made.
4. Refer to Spark Plug Cable Removal for additional information.



# INSTRUMENT CLUSTER

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## INSTRUMENT CLUSTER - ELECTRICAL DIAGNOSTICS

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INSTRUMENT CLUSTER - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

**B1200-AIRBAG WARNING INDICATOR CIRCUIT LOW**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on and when requested to turn on by the Occupant Restraint Controller (ORC).
- **Set Condition:**  
The Instrument Cluster software detects the voltage across the Airbag Lamp is below 0.5 volts when ON.

Possible Causes
INSTRUMENT CLUSTER

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

**Note:** The Instrument Cluster performs internal tests on the Airbag Lamp during each ignition cycle.

With the scan tool, erase DTCs.

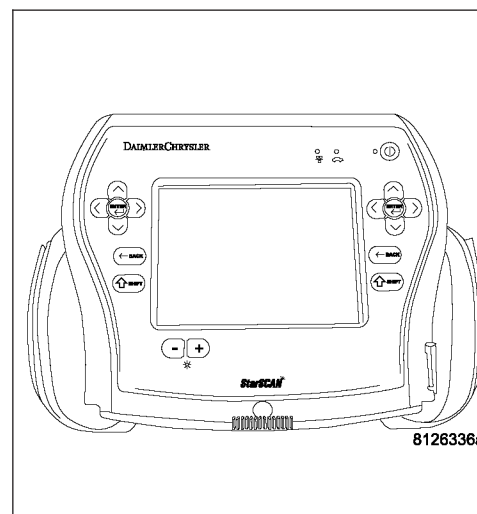
Turn the ignition off, wait 10 seconds, then turn the ignition on.

Wait for the Instrument Cluster to perform the bulb check.

With the scan tool, read DTCs.

**Is the DTC active?**

- Yes** >> Replace and program the Instrument Cluster in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Test complete.



B1201-AIRBAG WARNING INDICATOR CIRCUIT OPEN

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on and when requested to turn on by the Occupant Restraint Controller (ORC).
- **Set Condition:**  
The Instrument Cluster software detects the voltage across the Airbag Lamp is above 4.0 volts when ON.

Possible Causes
INSTRUMENT CLUSTER

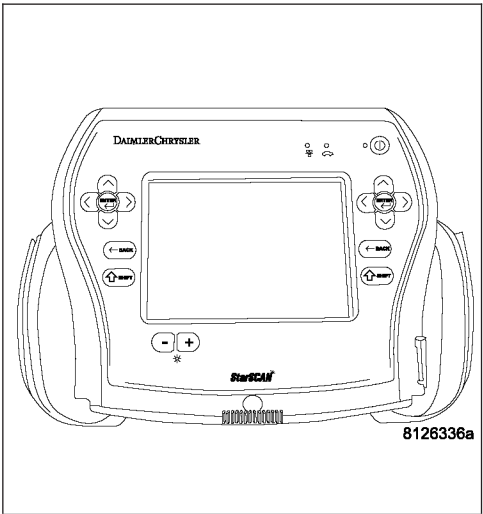
Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

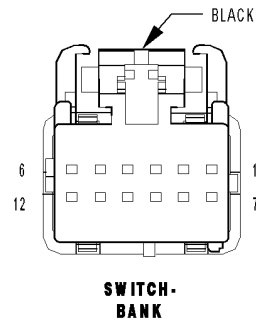
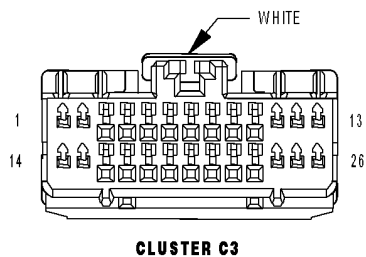
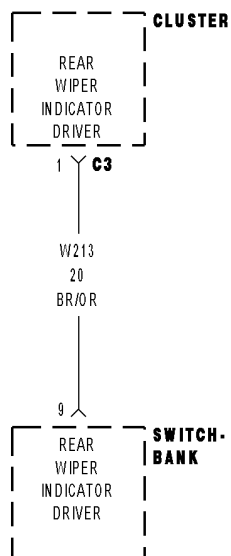
**Note:** The Instrument Cluster performs internal tests on the Airbag Lamp during each ignition cycle.

With the scan tool, erase DTCs.  
Turn the ignition off, wait 10 seconds, then turn the ignition on.  
Wait for the Instrument Cluster to perform the bulb check.  
With the scan tool, read DTCs.

- Is the DTC active?**
- Yes**    >> Replace and program the Instrument Cluster in accordance with the Service Information.  
            Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- No**      >> Test complete.



## B1225-REAR WIPER INDICATOR CONTROL CIRCUIT LOW





**B1225-REAR WIPER INDICATOR CONTROL CIRCUIT LOW (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition Run-Start transition to on.
- **Set Condition:**  
Rear Wiper Output status HIGH.

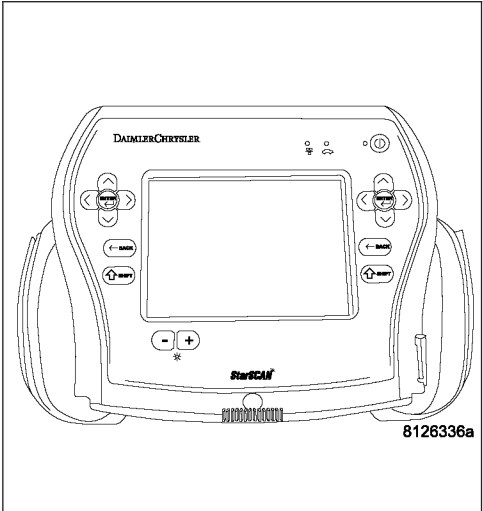
Possible Causes
(W213) REAR WIPER INDICATOR DRIVER CIRCUIT OPEN (F23) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN SWITCH BANK INSTRUMENT CLUSTER

**Diagnostic Test**

**1. CHECK FOR AN ACTIVE DTC**

Turn the ignition on.  
With the scan tool, record and erase DTCs.  
Activate the rear wiper switch.  
Wait 30 seconds.  
With the scan tool, read DTCs.

- Is the DTC active?**
- Yes**    >> Go To 2
- No**    >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1225-REAR WIPER INDICATOR CONTROL CIRCUIT LOW (CONTINUED)****2. CHECK FOR VOLTAGE AT THE SWITCH BANK HARNESS CONNECTOR**

Disconnect the Switch Bank harness connector.

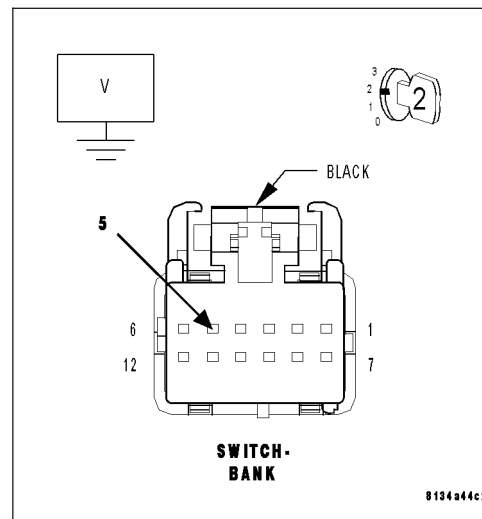
Check the voltage on the (F23) Fused Ignition Switch Output (Run-Start) circuit.

**Is the voltage above 10.0 volts?**

**Yes** >> Go To 3

**No** >> Repair the (F23) Fused Ignition Switch Output (Run-Start) circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**3. CHECK THE (W213) REAR WIPER INDICATOR DRIVER CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Instrument Cluster C3 harness connector.

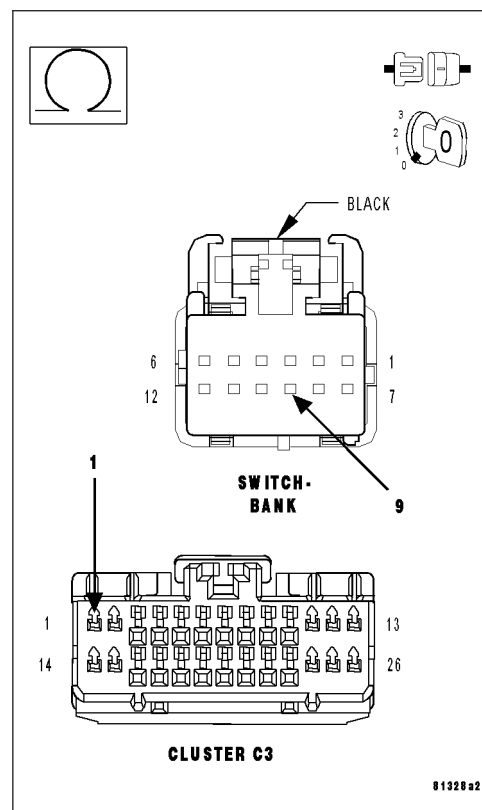
Measure the resistance of the (W213) Rear Wiper Indicator Driver Circuit between the Instrument Cluster Harness connector and the Switch Bank harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (W213) Rear Wiper Indicator Driver Circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4



**B1225-REAR WIPER INDICATOR CONTROL CIRCUIT LOW (CONTINUED)****4. CHECK THE OPERATION OF THE REAR WIPER SWITCH**

Turn the ignition on.

Reconnect the Switch Bank harness connector.

Measure the voltage on the (W213) Rear Wiper Indicator Driver Circuit at the Instrument Cluster C3 harness connector.

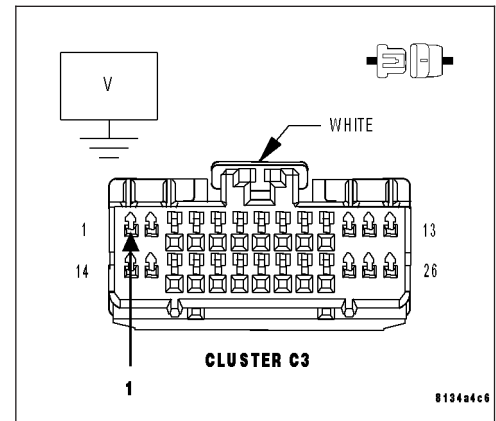
**Is the voltage above 10.0 volts?**

**Yes** >> Replace the instrument Cluster in accordance with the service information.

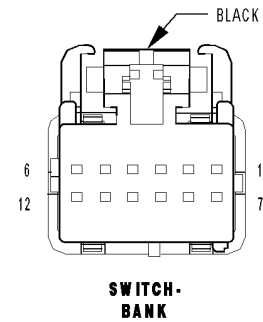
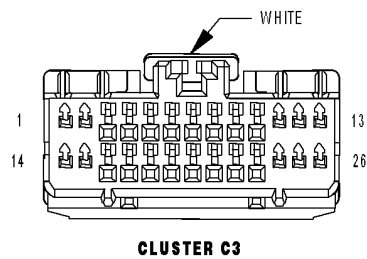
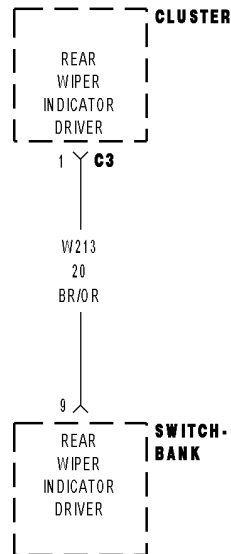
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Switch Bank in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



## B1226-REAR WIPER INDICATOR CONTROL CIRCUIT HIGH



**B1226-REAR WIPER INDICATOR CONTROL CIRCUIT HIGH (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition Run-Start transition to on.
- **Set Condition:**  
Rear Wiper Output status LOW.

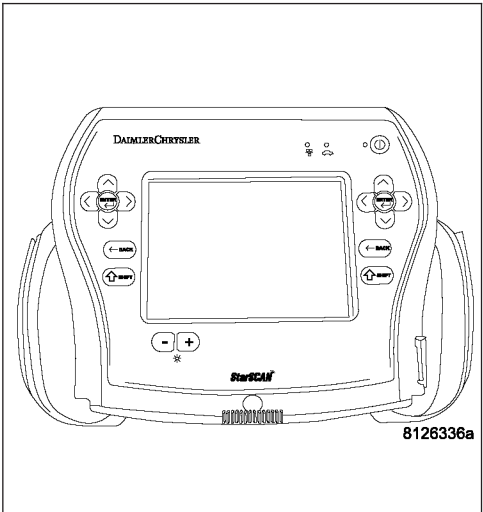
Possible Causes
(W213) REAR WIPER INDICATOR DRIVER CIRCUIT SHORT TO VOLTAGE SWITCH BANK INSTRUMENT CLUSTER

**Diagnostic Test**

**1. CHECK FOR AN ACTIVE DTC**

Turn the ignition on.  
With the scan tool, record and erase DTCs.  
Activate the rear wiper switch.  
Wait 30 seconds.  
With the scan tool, read DTCs.

- Is the DTC active?**
- Yes**    >> Go To 2
- No**    >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1226-REAR WIPER INDICATOR CONTROL CIRCUIT HIGH (CONTINUED)****2. CHECK THE (W213) REAR WIPER INDICATOR DRIVER CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect Switch Bank harness connector.

Disconnect the Instrument Cluster C3 harness connector.

Turn the ignition on.

Measure the voltage on the (W213) Rear Wiper Indicator Driver circuit.

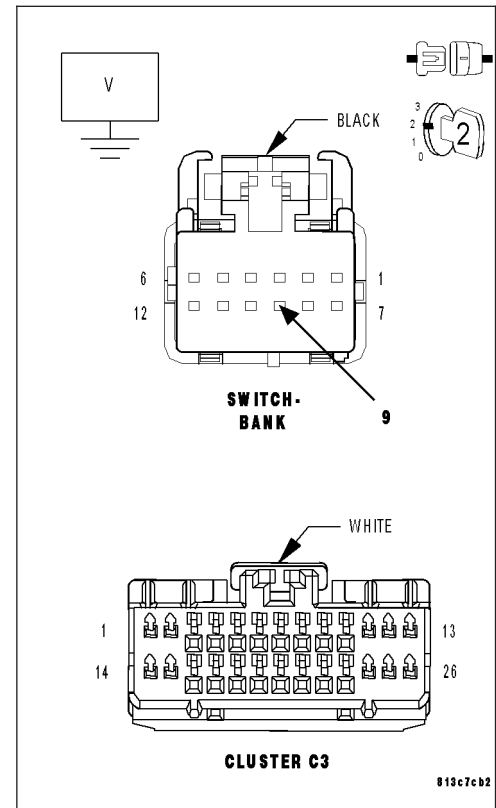
**Is the voltage above 5 volts?**

**Yes** >> Repair the (W213) Rear Wiper Indicator Driver circuit for a short to voltage.

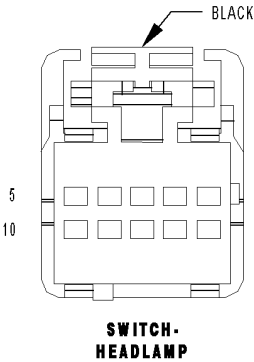
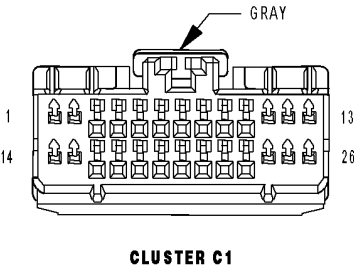
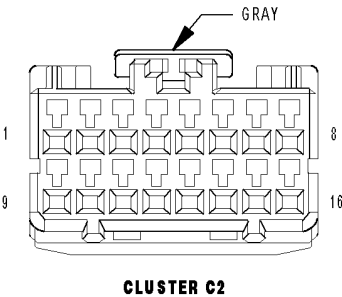
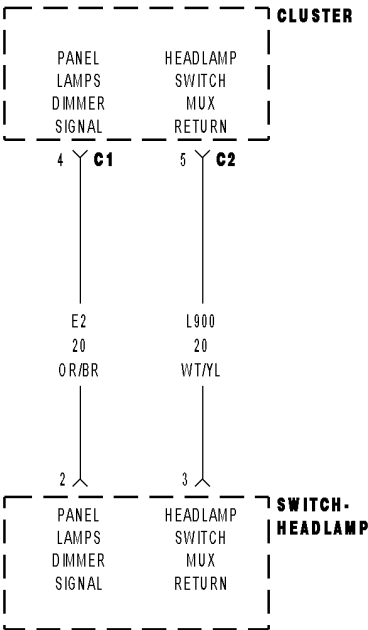
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



B160A-PANEL DIMMER INPUT CIRCUIT LOW



**B160A-PANEL DIMMER INPUT CIRCUIT LOW (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the Instrument Cluster awake.
- **Set Condition:**  
Panel Dimmer Input less than 0.5 volts.

Possible Causes
(E2) PANEL LAMPS DIMMER SIGNAL CIRCUIT SHORTED TO GROUND HEADLAMP SWITCH INSTRUMENT CLUSTER

**Diagnostic Test****1. CHECK FOR AN ACTIVE DTC**

Turn the ignition on.

With the scan tool, record and erase DTCs.

Activate the Panel Dimmer Switch.

Wait 30 seconds.

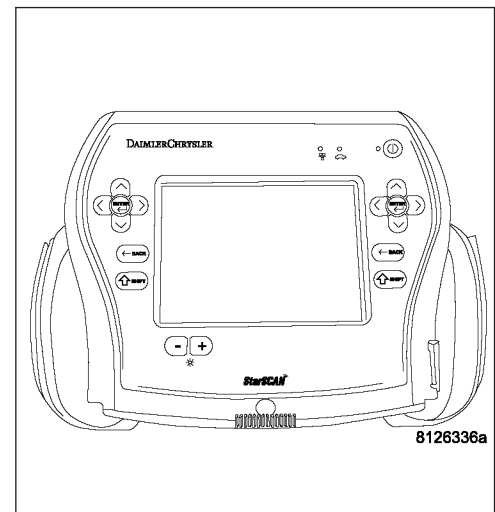
With the scan tool, read DTCs.

**Is the DTC active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**2. CHECK OPERATION OF HEADLAMP SWITCH**

Disconnect the Headlamp Switch harness connector.

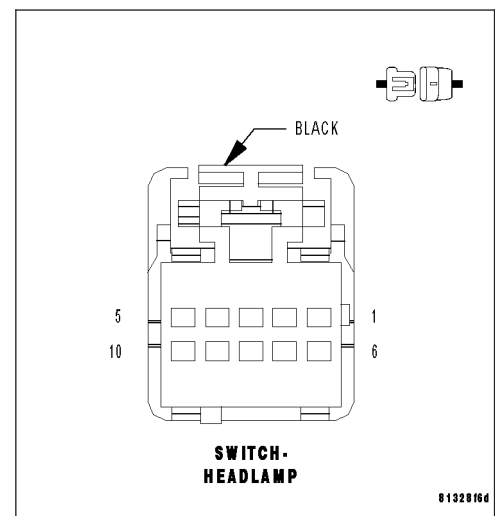
With the scan tool, read Instrument Cluster DTCs.

**Does the scan tool display-B160B-PANEL DIMMER INPUT CIRCUIT HIGH?**

**Yes** >> Replace the Headlamp Switch in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 3





**B160A-PANEL DIMMER INPUT CIRCUIT LOW (CONTINUED)****3. CHECK THE (E2) PANEL LAMPS DIMMER SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Instrument Cluster C1 harness connector.

Measure the resistance between ground and the (E2) Panel Lamps Dimmer Signal Circuit.

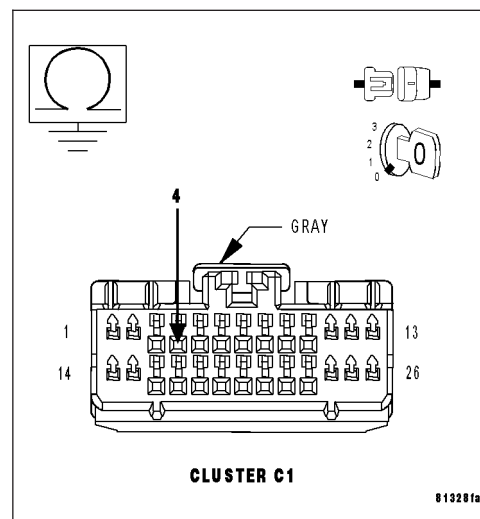
**Is the resistance below 10K ohms?**

**Yes** >> Repair the (E2) Panel Lamps Dimmer Signal Circuit for a short to ground.

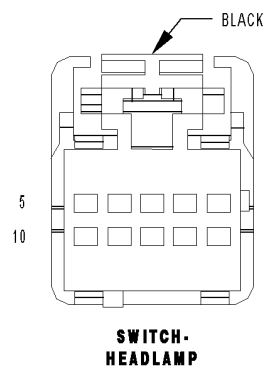
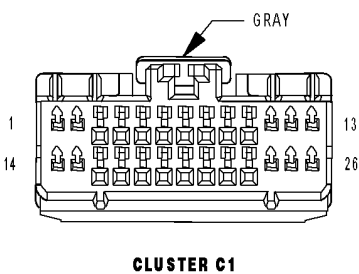
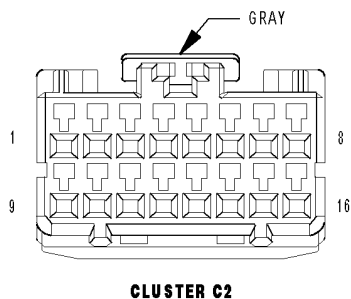
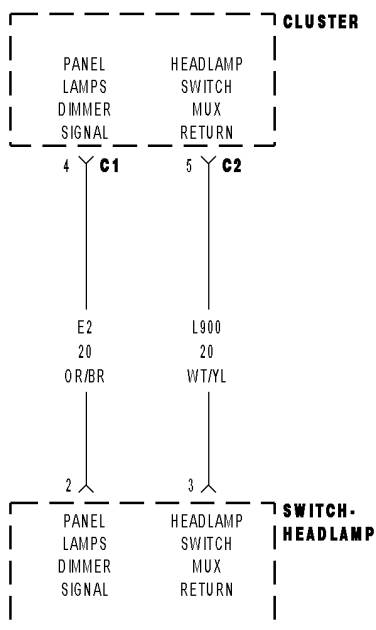
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



## B160B-PANEL DIMMER INPUT CIRCUIT HIGH



**B160B-PANEL DIMMER INPUT CIRCUIT HIGH (CONTINUED)**

For the Instrument Cluster circuit diagram.

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the Instrument Cluster awake.
- **Set Condition:**  
Panel Dimmer Input greater than 4.8 volts.

**Possible Causes**

(E2) PANEL LAMPS DIMMER SIGNAL CIRCUIT SHORTED TO VOLTAGE  
(L900) HEADLAMP SWITCH MUX RETURN CIRCUIT SHORTED TO VOLTAGE  
(L900) HEADLAMP SWITCH MUX RETURN CIRCUIT OPEN  
(E2) PANEL LAMPS DIMMER SIGNAL CIRCUIT OPEN  
HEADLAMP SWITCH

**Diagnostic Test****1. CHECK FOR AN ACTIVE DTC**

Turn the ignition on.

With the scan tool, record and erase DTCs.

Activate the Panel Dimmer Switch.

Wait 30 seconds.

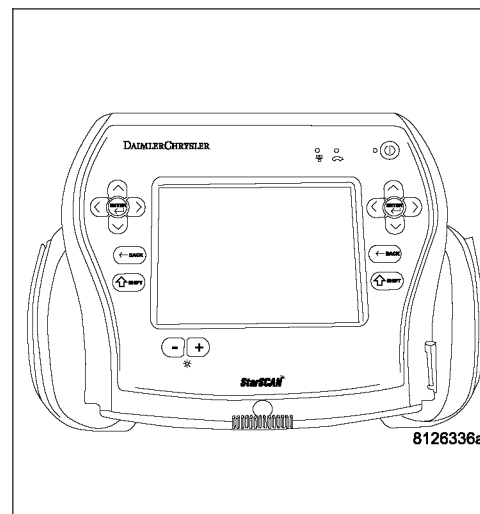
With the scan tool, read DTCs.

**Is the DTC active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B160B-PANEL DIMMER INPUT CIRCUIT HIGH (CONTINUED)****2. CHECK THE (E2) PANEL LAMPS DIMMER SIGNAL CIRCUIT, AND THE (L900) HEADLAMP SWITCH MUX RETURN CIRCUIT FOR A SHORT TO VOLTAGE**

Disconnect the Headlamp Switch harness connector.

Turn the ignition on.

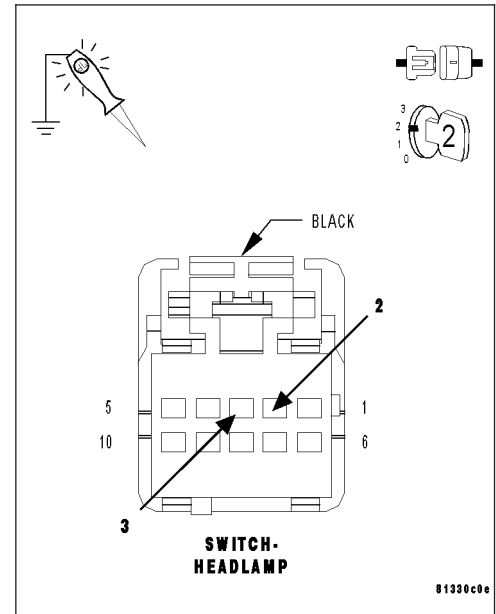
Using a test light, measure for voltage on the (E2) Panel Lamps Dimmer Signal circuit.

Using a test light, measure for voltage on the (L900) Headlamp Switch MUX Return circuit.

**Is voltage present on the E2 or L900 circuit?**

**Yes** >> Repair the E2 or the L900 for a short to voltage.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 3

**3. CHECK THE OPERATION OF THE PANEL LAMPS DIMMER SWITCH**

Connect a jumper wire at the Headlamp Switch harness connector between the (E2) Panel Lamps Dimmer Signal circuit and the (L900) Headlamp Switch MUX Return circuit.

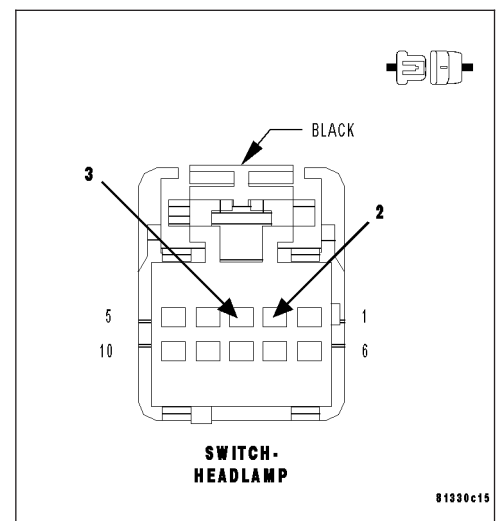
With the scan tool, read DTCs.

**Does the Scan tool display-B160A-PANEL DIMMER INPUT CIRCUIT LOW?**

**Yes** >> Replace the Headlamp Switch in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4



**B160B-PANEL DIMMER INPUT CIRCUIT HIGH (CONTINUED)****4. CHECK THE (L900) HEADLAMP SWITCH MUX RETURN CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Instrument Cluster C2 harness connector.

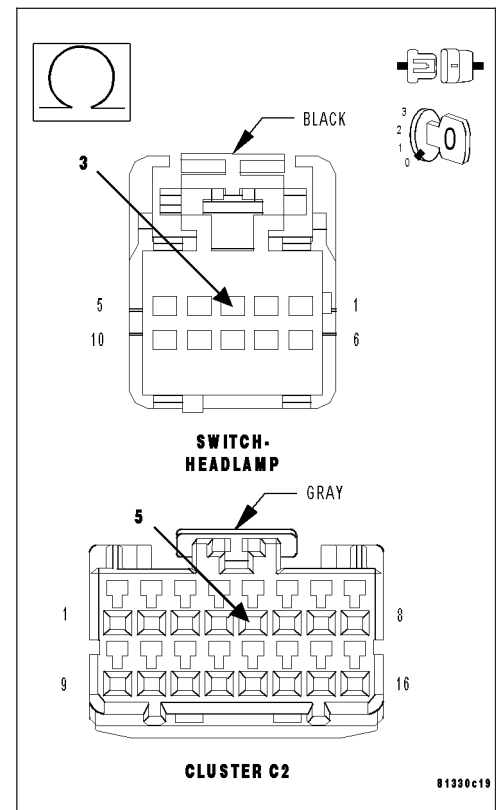
Measure the resistance of the (L900) Headlamp Switch MUX Return circuit between the Instrument Cluster C2 harness connector and the Headlamp Switch harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (L900) Headlamp Switch MUX Return circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 5

**5. CHECK THE (E2) PANEL LAMPS DIMMER SIGNAL CIRCUIT FOR AN OPEN**

Disconnect the Instrument Cluster C1 harness connector.

Measure the resistance of the (E2) Panel Lamps Dimmer Signal circuit between the Instrument Cluster C1 harness connector and the Headlamp Switch harness connector.

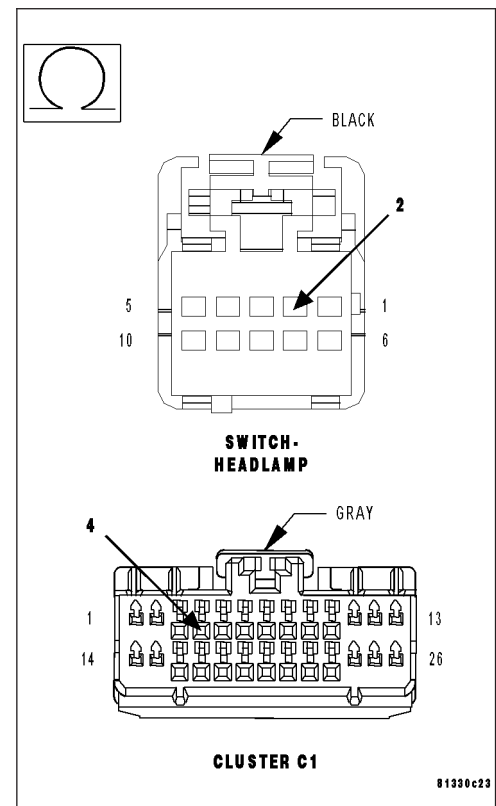
**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (E2) Panel Lamps Dimmer Signal circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).





**B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the Ignition on, and the Panel Illumination active.
- **Set Condition:**  
Panel Illumination Status HIGH.

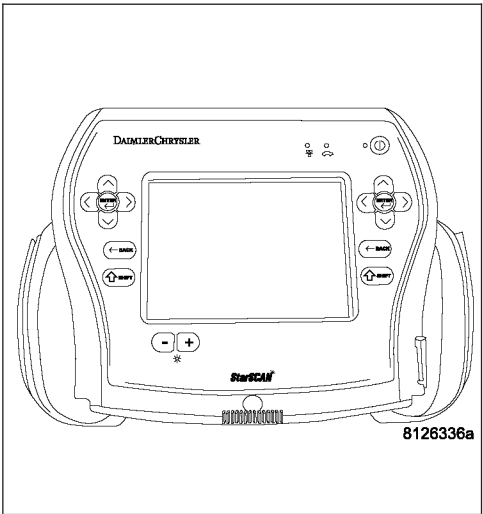
Possible Causes
(E12) PANEL LAMPS DRIVER CIRCUIT SHORTED TO GROUND HEADLAMP SWITCH SHORTED TO GROUND DRIVER HEATED SEAT SWITCH SHORTED TO GROUND PASSENGER HEATED SEAT SWITCH SHORTED TO GROUND CLOCK MODULE SHORTED TO GROUND PRNDL LAMP SHORTED TO GROUND SWITCH BANK SHORTED TO GROUND INSTRUMENT CLUSTER

**Diagnostic Test**

**1. CHECK FOR AN ACTIVE DTC**

Turn the ignition on.  
With the scan tool, record and erase DTCs.  
Activate the Panel Illumination.  
Wait 30 seconds.  
With the scan tool, read DTCs.

- Is the DTC active?**
- Yes**    >> Go To 2
- No**    >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW (CONTINUED)****2. CHECK THE SWITCH BANK FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Switch Bank harness connector.

Turn the ignition on.

Activate the Panel Illumination.

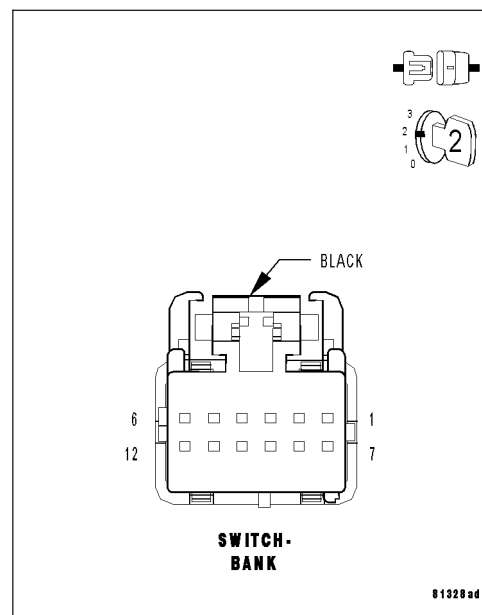
With the scan tool, read DTCs.

**Does the scan tool display-B1614-PANEL ILLUMINATION CONTROL CIRCUIT HIGH?**

**Yes** >> Replace the Switch Bank in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 3

**3. CHECK THE HEADLAMP SWITCH FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Headlamp Switch harness connector.

Turn the ignition on.

Activate the Panel Illumination.

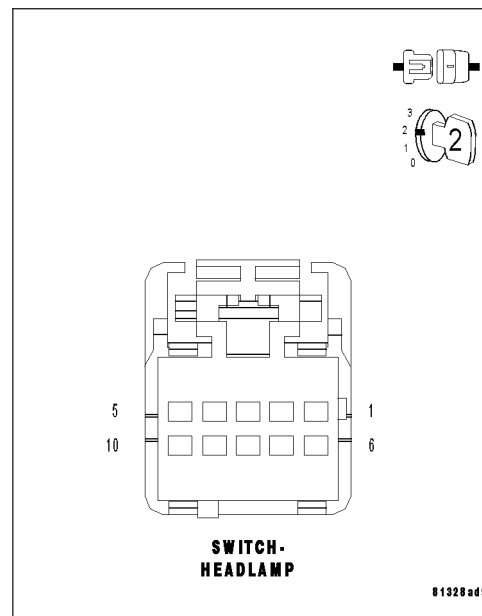
With the scan tool, read DTCs.

**Does the scan tool display-B1614-PANEL ILLUMINATION CONTROL CIRCUIT HIGH?**

**Yes** >> Replace the Headlamp Switch in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4





**B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW (CONTINUED)****4. CHECK THE DRIVER HEATED SEAT SWITCH FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Driver Heated Seat Switch harness connector.

Turn the ignition on.

Activate the Panel Illumination.

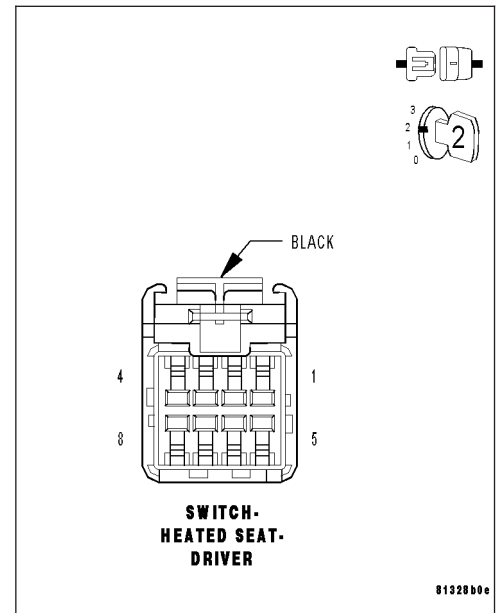
With the scan tool, read DTCs.

**Does the scan tool display-B1614-PANEL ILLUMINATION CONTROL CIRCUIT HIGH?**

**Yes** >> Replace the Driver Heated Seat Switch in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 5

**5. CHECK THE PASSENGER HEATED SEAT SWITCH FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Passenger Heated Seat Switch harness connector.

Turn the ignition on.

Activate the Panel Illumination.

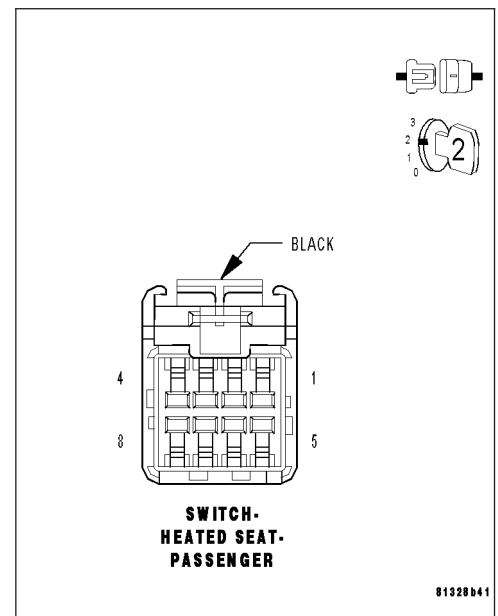
With the scan tool, read DTCs.

**Does the scan tool display-B1614-PANEL ILLUMINATION CONTROL CIRCUIT HIGH?**

**Yes** >> Replace the Passenger Heated Seat Switch in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 6



**B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW (CONTINUED)****6. CHECK THE CLOCK MODULE FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Clock Module harness connector.

Turn the ignition on.

Activate the Panel Illumination.

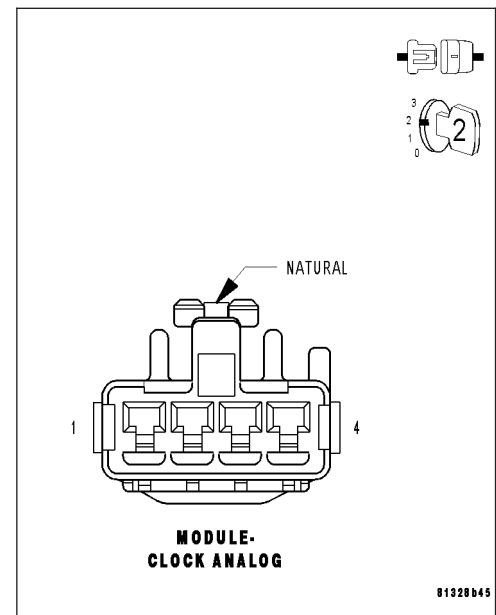
With the scan tool, read DTCs.

**Does the scan tool display-B1614-PANEL ILLUMINATION CONTROL CIRCUIT HIGH?**

**Yes** >> Replace the Clock Module in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 7

**7. CHECK THE PRNDL LAMP FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the PRNDL Lamp harness connector.

Turn the ignition on.

Activate the Panel Illumination.

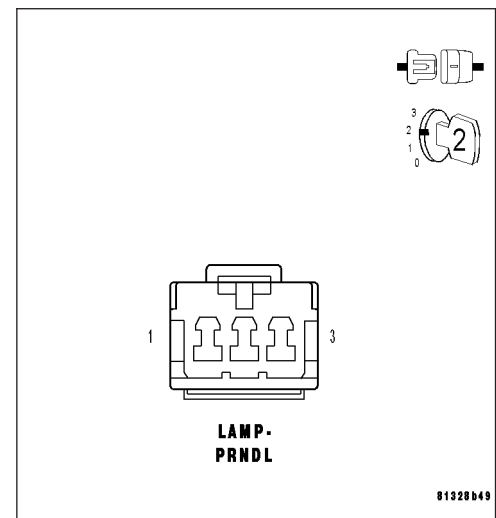
With the scan tool, read DTCs.

**Does the scan tool display-B1614-PANEL ILLUMINATION CONTROL CIRCUIT HIGH?**

**Yes** >> Replace the PRNDL Lamp in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 8



**B1613-PANEL ILLUMINATION CONTROL CIRCUIT LOW (CONTINUED)****8. CHECK THE (E12) PANEL LAMPS DRIVER CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Instrument Cluster C3 harness connector.

With all the above components disconnected, measure the resistance to ground of the (E12) Panel Lamps Driver Circuit from the Instrument Cluster C3 harness connector.

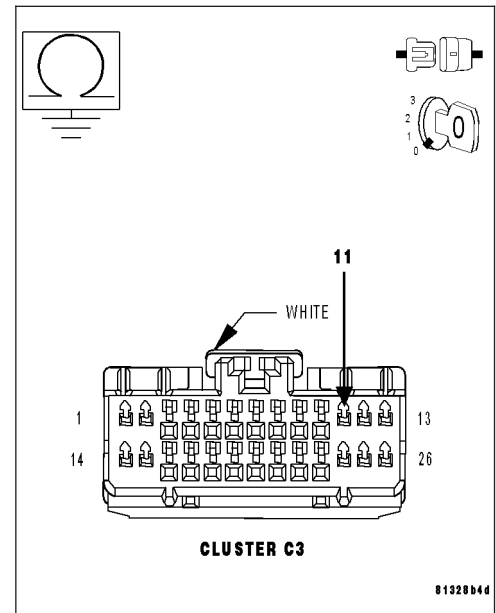
**Is the resistance less than 10K ohms?**

**Yes** >> Repair the (E12) Panel Lamps Driver circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).





**B1614-PANEL ILLUMINATION CONTROL CIRCUIT HIGH (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the Ignition on, and the Panel Illumination not active.
- **Set Condition:**  
Panel Illumination status HIGH.

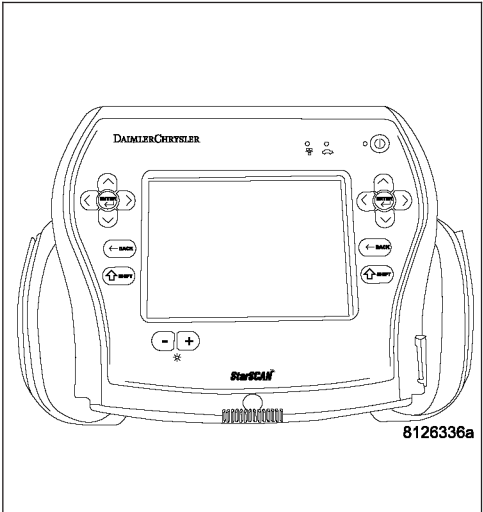
Possible Causes
(E12) PANEL LAMPS DRIVER CIRCUIT FOR AN OPEN INSTRUMENT CLUSTER

**Diagnostic Test**

**1. CHECK FOR AN ACTIVE DTC**

Turn the ignition on.  
With the scan tool, record and erase DTCs.  
Activate the Panel Illumination.  
Wait 30 seconds.  
With the scan tool, read DTCs.

- Is the DTC active?**
- Yes**    >> Go To 2
- No**    >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1614-PANEL ILLUMINATION CONTROL CIRCUIT HIGH (CONTINUED)****2. CHECK (E12) PANEL LAMPS DRIVER CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Instrument Cluster C3 harness connector.

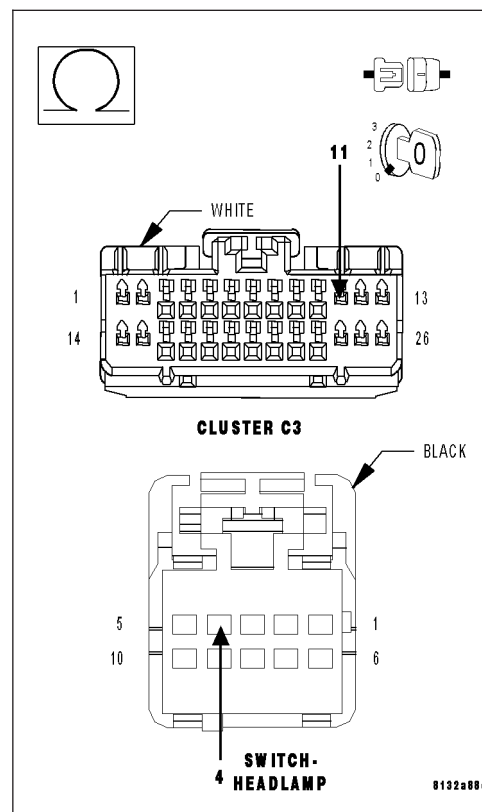
Disconnect the Headlamp Switch harness connector.

Measure the resistance of the (E12) Panel Lamps Driver Circuit between the Instrument Cluster C3 harness connector and the Headlamp Switch harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (E12) Panel Lamps Driver Circuit for an open. Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Instrument Cluster in accordance with the service information. Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



The diagram illustrates the electrical connections for the 8130A5000. It features a central power distribution center (PDC) with a 40 5A fuse. The connections are as follows:

- Cluster C3:** Connected to the PDC via a 2-wire line (C3). It includes an indicator dimmer signal and a control-A/C-heater (MTC) signal.
- Control-A/C-Heater C1 (MTC):** Connected to the PDC via a 9-wire line (C1). It includes an indicator dimmer signal and a control-A/C-heater (MTC) signal.
- Run-Start F20:** Connected to the PDC via a 40 5A fuse. It includes a 20-wire line (F23) and a 20-wire line (RD/OR).
- Switch-Bank:** Connected to the PDC via a 5-wire line (F23) and a 5-wire line (RD/OR). It includes a 20-wire line (F23) and a 20-wire line (RD/OR).

Below the diagram are three component views:

- Cluster C3:** A 14-pin connector with a white wire.
- Control-A/C-Heater C1 (MTC):** A 9-pin connector with a black wire.
- Switch-Bank:** A 12-pin connector with a black wire.

**B1694-ACCESSORY DIMMING CONTROL CIRCUIT HIGH (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Indicator Dimming Signal active. ATC not present.
- **Set Condition:**  
Indicator Dimmer Signal Output status LOW.

Possible Causes
(E22) INDICATOR DIMMER SIGNAL CIRCUIT SHORTED TO VOLTAGE INSTRUMENT CLUSTER

**Diagnostic Test****1. CHECK FOR AN ACTIVE DTC**

Turn the ignition on.

With the scan tool, record and erase DTCs.

Activate the Accessory Dimming.

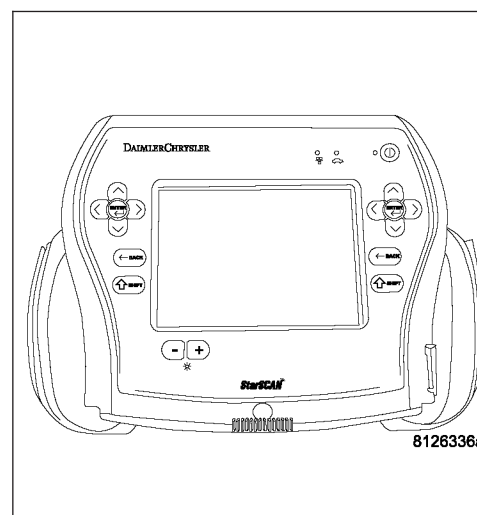
With the scan tool, read DTCs.

**Is the DTC active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).





**B1694-ACCESSORY DIMMING CONTROL CIRCUIT HIGH (CONTINUED)****2. CHECK (E22) INDICATOR DIMMER SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Instrument Cluster C3 harness connector.

Disconnect the Switch Bank harness connector.

Disconnect the A/C Heater Control C1 (MTC) harness connector.

Turn the ignition on.

Check the voltage on the (E22) Indicator Dimmer Signal circuit.

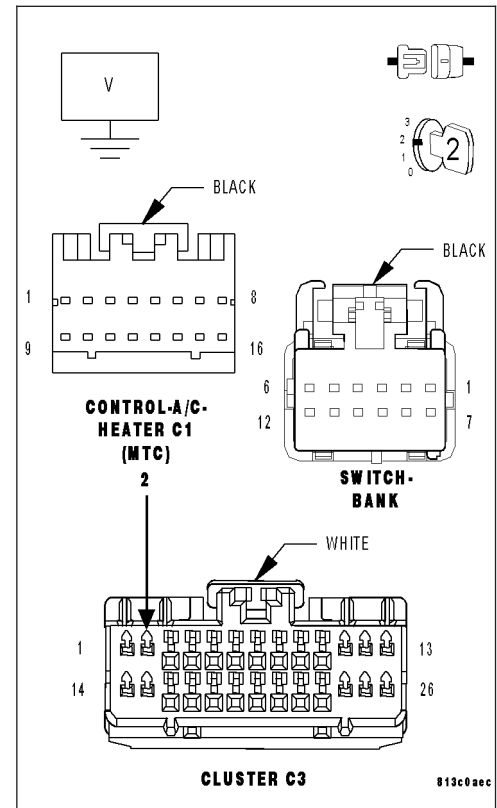
**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (E22) Indicator Dimmer Signal circuit for a short to voltage.

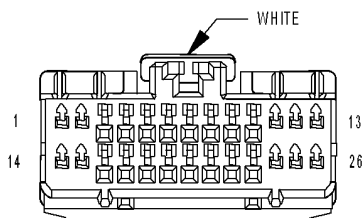
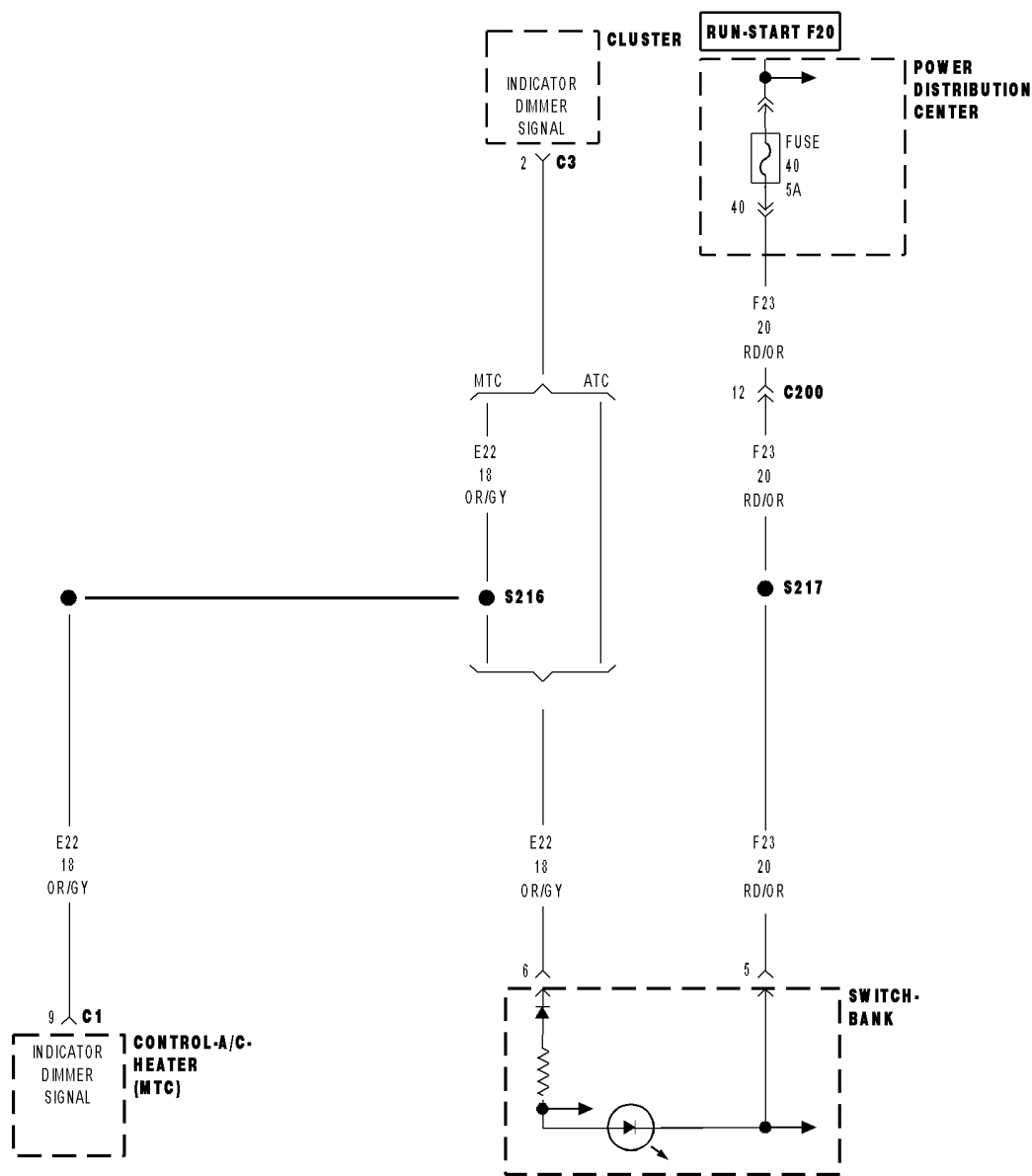
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Instrument Cluster in accordance with the service information.

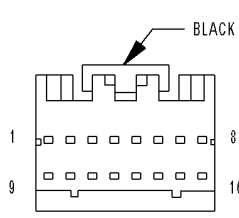
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



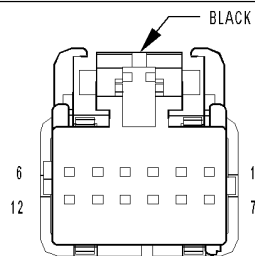
# B1695-ACCESSORY DIMMING CONTROL CIRCUIT OPEN



**CLUSTER C3**



**CONTROL-A/C-HEATER C1 (MTC)**



**SWITCH-BANK**

**B1695-ACCESSORY DIMMING CONTROL CIRCUIT OPEN (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition Run/Start transition to on, and ATC not present.
- **Set Condition:**  
Input Dimmer Signal Output status HIGH.

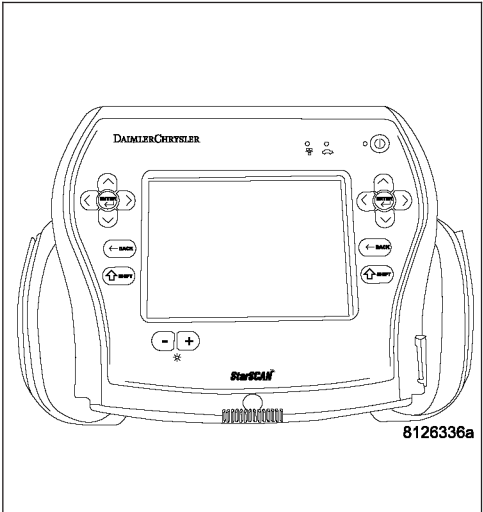
Possible Causes
(E22) INDICATOR DIMMER SIGNAL CIRCUIT OPEN INSTRUMENT CLUSTER

**Diagnostic Test**

**1. CHECK FOR AN ACTIVE DTC**

Turn the ignition on.  
With the scan tool, record and erase DTCs.  
Activate the rear wiper switch.  
With the scan tool, read DTCs.

- Is the DTC active?**
- Yes**    >> Go To 2
- No**    >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1695-ACCESSORY DIMMING CONTROL CIRCUIT OPEN (CONTINUED)****2. CHECK THE (E22) INDICATOR DIMMER SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the Instrument Cluster C3 harness connector.

Disconnect the Switch Bank harness connector.

Measure the resistance of the (E22) Indicator Dimmer Signal Circuit between the Instrument Cluster C3 Harness connector and the Switch Bank harness connector.

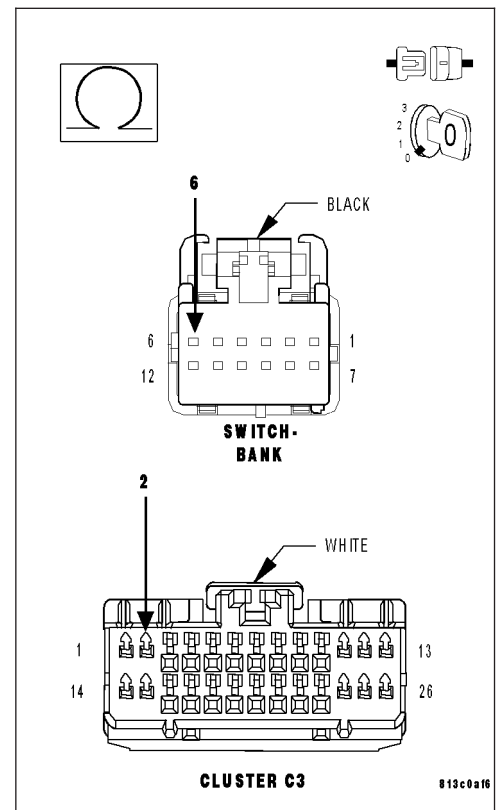
**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (E22) Indicator Dimmer Signal Circuit for an open.

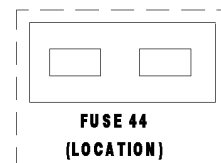
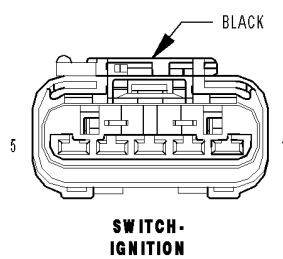
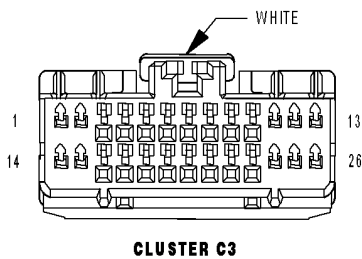
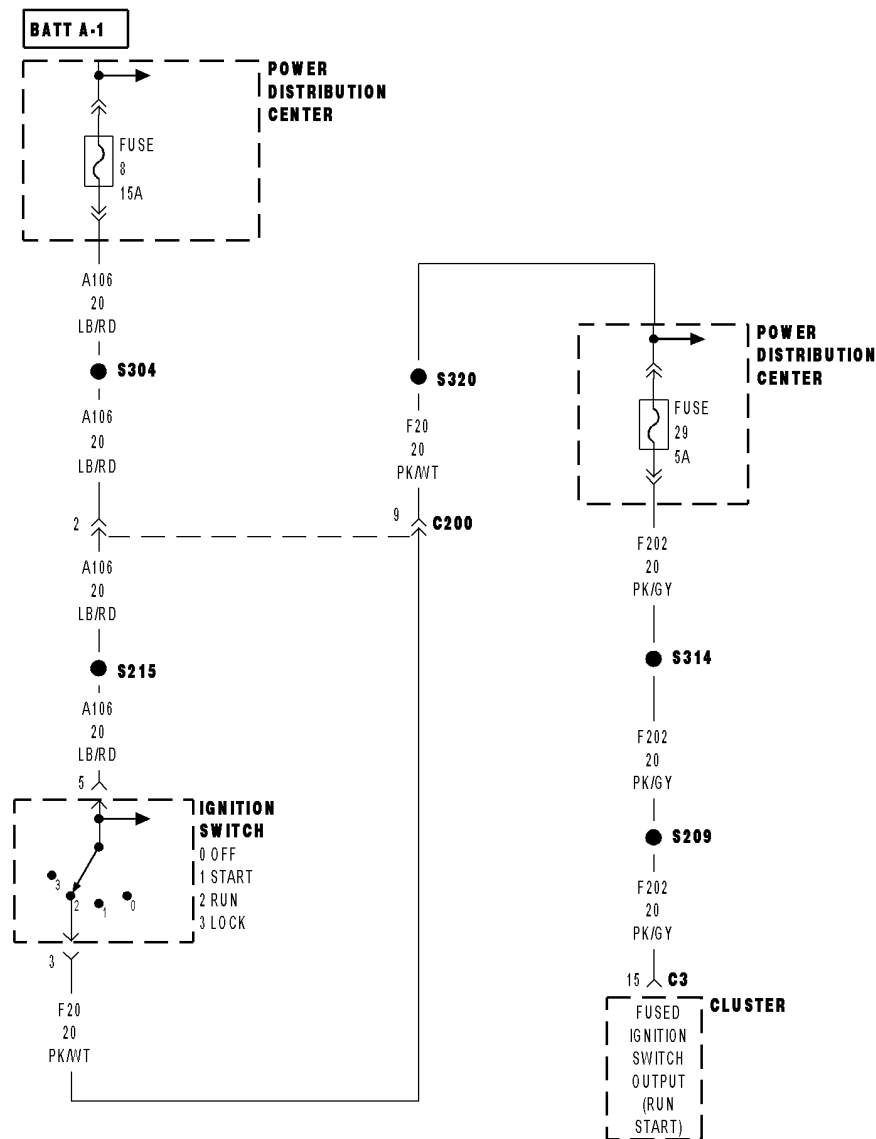
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



## B2107-IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE



**B2107-IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the Instrument Cluster awake.
- **Set Condition:**  
Ignition switch in RUN or START, and Ignition RUN/START LOW. Ignition Switch in LOCK or UNLOCK, and Ignition RUN/START HIGH.

Possible Causes
FUSED IGNITION SWITCH FUSES (F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) OPEN (A106) FUSED B+ CIRCUIT OPEN IGNITION SWITCH INSTRUMENT CLUSTER

**Diagnostic Test****1. CHECK FOR AN ACTIVE DTC**

Turn the ignition on.

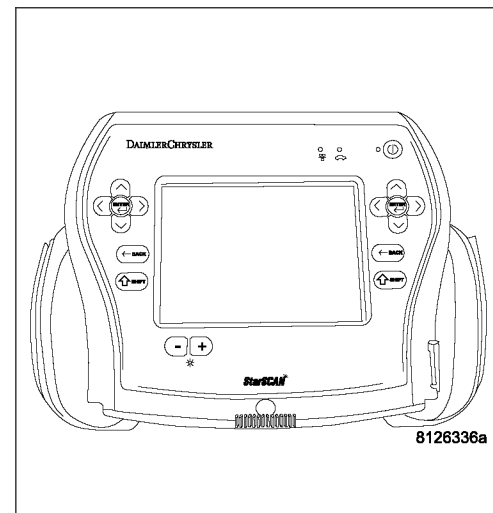
With the scan tool, record and erase DTCs.

Wait 30 seconds.

With the scan tool, read DTCs.

**Is the DTC active?**

- Yes** >> Go To 2
- No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.
- Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**2. CHECK PDC FUSES**

Inspect PDC fuses #8, and #29 in the PDC.

**Is either fuse open?**

- Yes** >> Using the wiring diagram/schematic as a guide, inspect the wiring and connectors for a short to ground condition.
- Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Go To 3

**B2107-IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE (CONTINUED)****3. CHECK FOR VOLTAGE ON THE (F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT**

Turn the ignition off.

Disconnect the Instrument Cluster C3 harness connector.

Turn the ignition on.

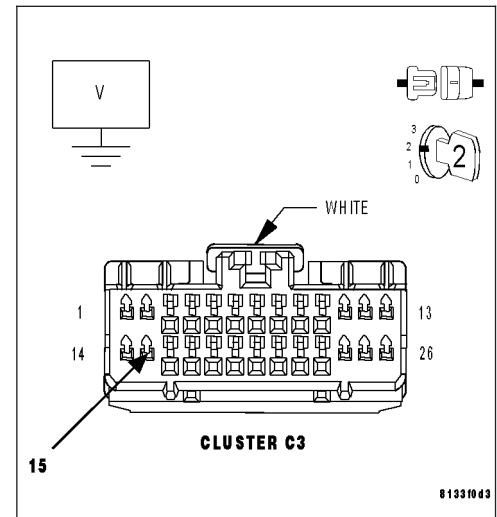
Measure the voltage of the (F202) Fused Ignition Switch Output (Run-Start) circuit.

**Is the voltage above 10.0 volts?**

**Yes** >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4

**4. CHECK THE (F202, F20) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN**

Disconnect the Ignition Switch harness connector.

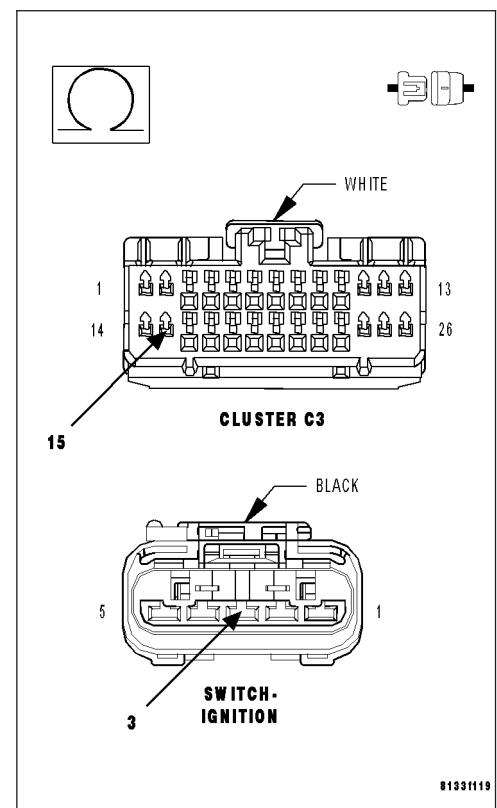
Measure the resistance of the (F202, F20) Fused Ignition Switch Output (Run-Start) circuit between the Instrument Cluster C3 harness connector and the Ignition Switch harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (F202, F20) Fused Ignition Switch Output (Run-Start) circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 5

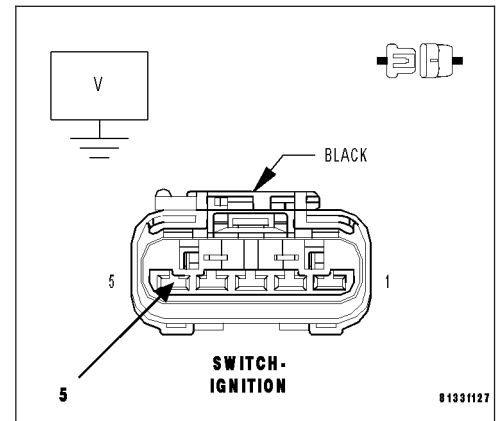


**B2107-IGNITION SWITCH SENSE INPUT CIRCUIT/PERFORMANCE (CONTINUED)****5. CHECK THE (A106) FUSED B+ CIRCUIT FOR AN OPEN**

Measure the voltage on the (A106) Fused B+ circuit at the Ignition Switch harness connector.

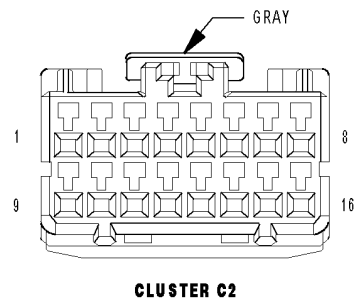
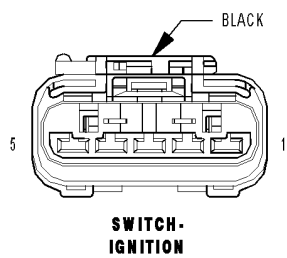
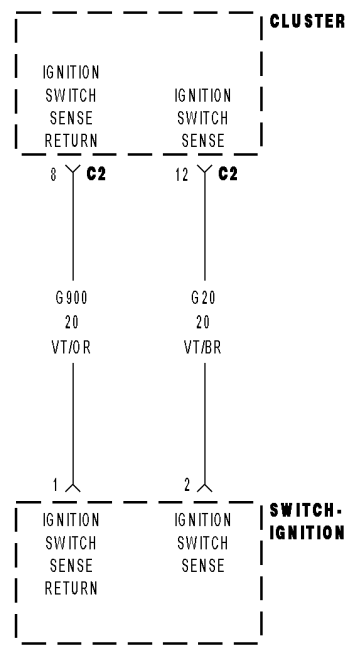
**Is the voltage above 10.0 volts?**

- Yes** >> Replace the Ignition Switch in accordance with the service information.
- No** >> Repair the (A106) Fused B+ circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).





B2108-IGNITION SWITCH SENSE INPUT CIRCUIT LOW



**B2108-IGNITION SWITCH SENSE INPUT CIRCUIT LOW (CONTINUED)**

For the Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the Instrument Cluster awake.
- **Set Condition:**  
Ignition Switch Sense circuit voltage less than .3 volts.

Possible Causes
(G20) IGNITION SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND (G20) IGNITION SWITCH SENSE CIRCUIT SHORT TO (G900) IGNITION SWITCH SENSE RETURN CIRCUIT IGNITION SWITCH INSTRUMENT CLUSTER

**Diagnostic Test****1. CHECK FOR AN ACTIVE DTC**

Turn the ignition on.

With the scan tool, record and erase DTCs.

Wait 30 seconds.

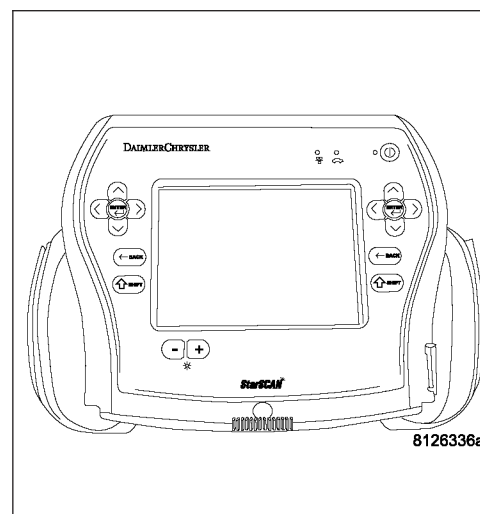
With the scan tool, read DTCs.

**Is the DTC active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B2108-IGNITION SWITCH SENSE INPUT CIRCUIT LOW (CONTINUED)****2. CHECK OPERATION OF IGNITION SWITCH**

Turn the ignition off.

Disconnect the Ignition Switch harness connector.

Connect a jumper wire between Ignition Switch harness connector cavities 3 and 5.

**Note: This will provide power to the vehicle systems with the ignition switch disconnected.**

With the scan tool, erase Instrument Cluster DTCs.

Wait 30 seconds.

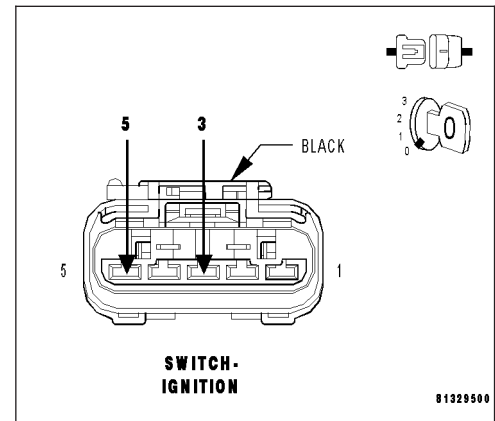
With the scan tool, read Instrument Cluster DTCs.

**Does the scan tool display-B2109-IGNITION SWITCH SENSE INPUT CIRCUIT HIGH?**

**Yes** >> Replace the Ignition Switch in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 3



**3. CHECK THE (G20) IGNITION SWITCH SENSE CIRCUIT FOR A SHORT TO THE (G900) IGNITION SWITCH SENSE RETURN CIRCUIT**

Remove the jumper wire between Ignition Switch harness connector cavities 3 and 5.

Disconnect the Instrument Cluster C2 harness connector.

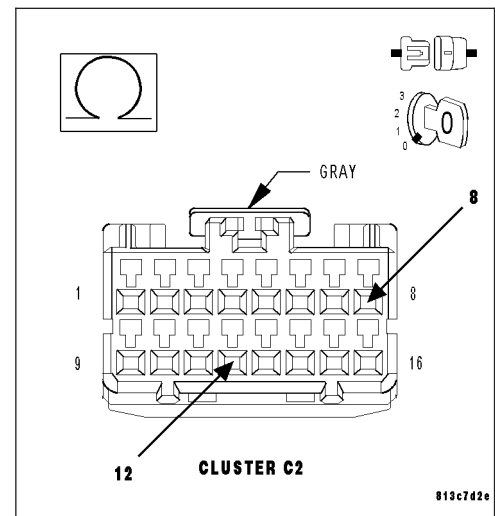
Measure the resistance between the (G20) Ignition Switch Sense Circuit and the (G900) Ignition Switch Sense Return circuit.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (G20) Ignition Switch Sense Circuit for a short to the (G900) Ignition Switch Sense Return circuit.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4

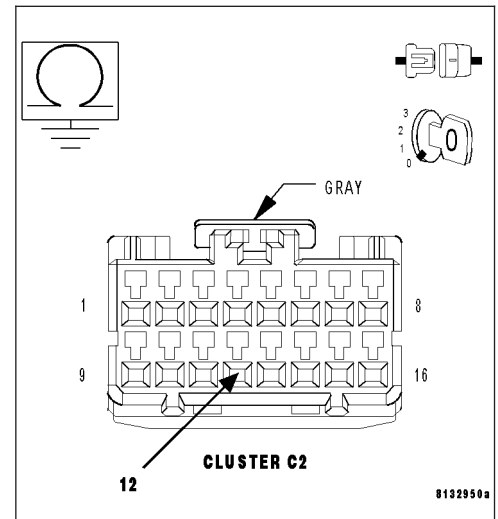


**B2108-IGNITION SWITCH SENSE INPUT CIRCUIT LOW (CONTINUED)****4. CHECK THE (G20) IGNITION SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND**

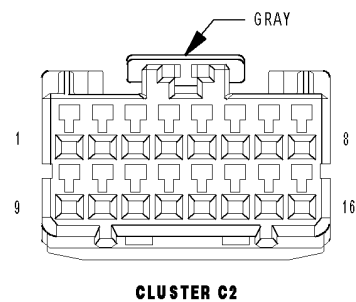
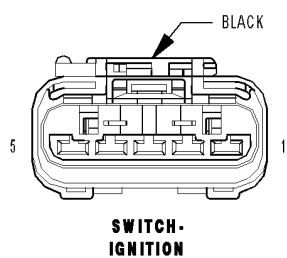
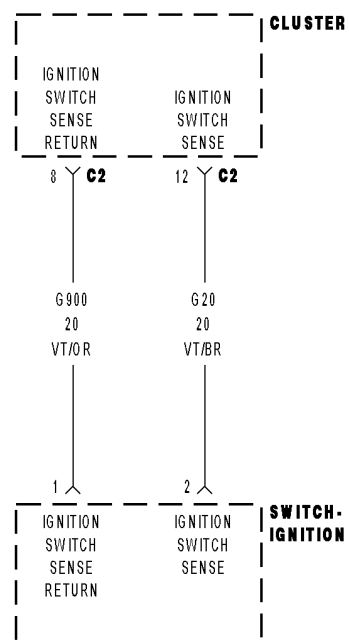
Measure the resistance between ground and the (G20) Ignition Switch Sense Circuit.

**Is the resistance below 10K ohms?**

- Yes** >> Repair the (G20) Ignition Switch Sense Circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Replace the Instrument Cluster in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



## B2109-IGNITION SWITCH SENSE INPUT CIRCUIT HIGH



**B2109-IGNITION SWITCH SENSE INPUT CIRCUIT HIGH (CONTINUED)**

For the Instrument Cluster circuit diagram (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the Instrument Cluster awake.
- **Set Condition:**  
Ignition Switch Sense circuit voltage greater than 4.7 volts.

Possible Causes
(G20) IGNITION SWITCH SENSE CIRCUIT OPEN (G900) IGNITION SWITCH SENSE RETURN CIRCUIT OPEN IGNITION SWITCH INSTRUMENT CLUSTER

**Diagnostic Test****1. CHECK FOR AN ACTIVE DTC**

Turn the ignition on.

With the scan tool, record and erase DTCs

Wait 30 seconds.

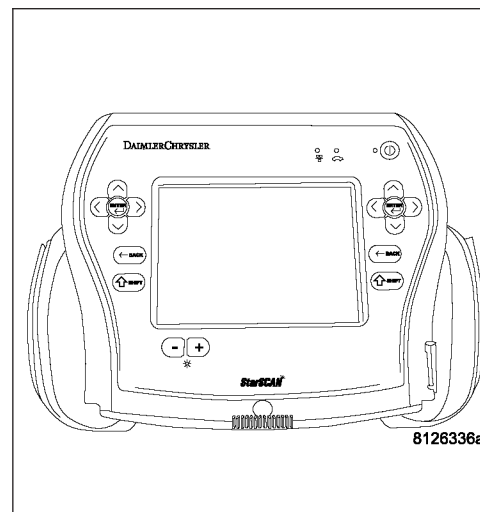
With the scan tool, read DTCs.

**Is the DTC active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B2109-IGNITION SWITCH SENSE INPUT CIRCUIT HIGH (CONTINUED)****2. CHECK THE (G20) IGNITION SWITCH SENSE CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Ignition Switch harness connector.

Connect a jumper wire between Ignition Switch harness connector cavities 3 and 5.

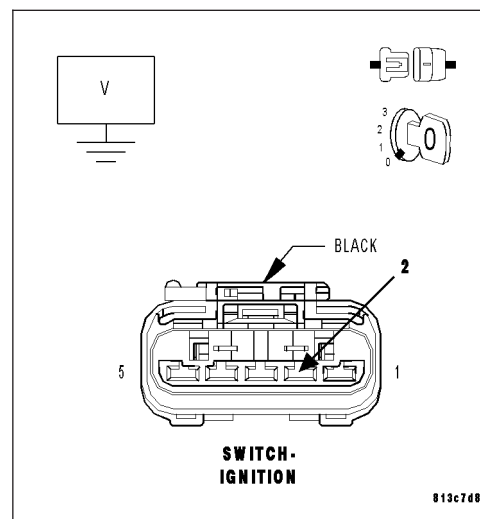
**Note: This will provide power to the vehicle systems with the ignition switch disconnected.**

Measure the voltage on the (G20) Ignition Switch Sense circuit.

**Is the voltage above 5.4 volts?**

**Yes** >> Go To 3

**No** >> Go To 4

**3. CHECK THE (G20) IGNITION SWITCH SENSE CIRCUIT FOR A SHORT TO VOLTAGE**

Remove the jumper wire between Ignition Switch harness connector cavities 3 and 5.

Disconnect the Instrument Cluster C2 harness connector.

Measure the voltage of the (G20) Ignition Switch Sense Circuit.

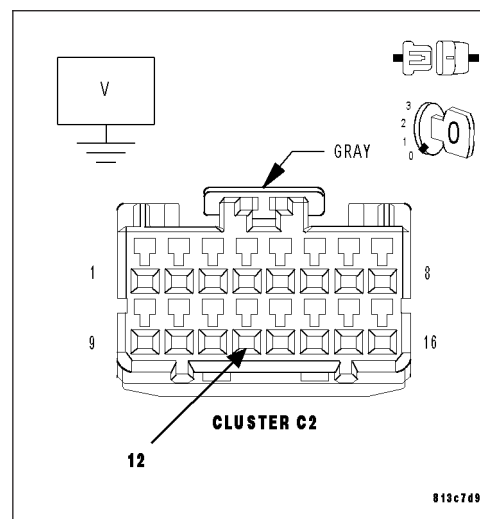
**Is the voltage above 5.4 volts?**

**Yes** >> Repair the (G20) Ignition Switch Sense circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B2109-IGNITION SWITCH SENSE INPUT CIRCUIT HIGH (CONTINUED)****4. CHECK OPERATION OF IGNITION SWITCH**

Turn the ignition off.

Disconnect the Ignition Switch harness connector.

Connect a jumper wire between Ignition Switch harness connector cavities 3 and 5.

**Note: This will provide power to the vehicle systems with the ignition switch disconnected.**

Connect a jumper wire between Ignition Switch harness connector cavities 1 and 2.

With the scan tool, erase Instrument Cluster DTCs.

Wait 30 seconds.

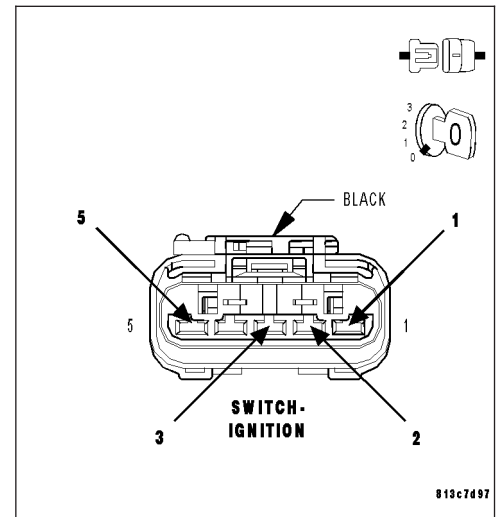
With the scan tool, read Instrument Cluster DTCs.

**Does the scan tool display-B2108-IGNITION SWITCH SENSE INPUT CIRCUIT LOW?**

**Yes** >> Replace the Ignition Switch in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 5

**5. CHECK THE (G900) IGNITION SWITCH SENSE RETURN CIRCUIT FOR AN OPEN.**

Remove the jumper wire between Ignition Switch harness connector cavities 3 and 5.

Disconnect the Instrument Cluster C2 harness connector.

Measure the resistance of the (G900) Ignition Switch Sense Return circuit between the Instrument Cluster C2 harness connector and the Ignition Switch Harness connector.

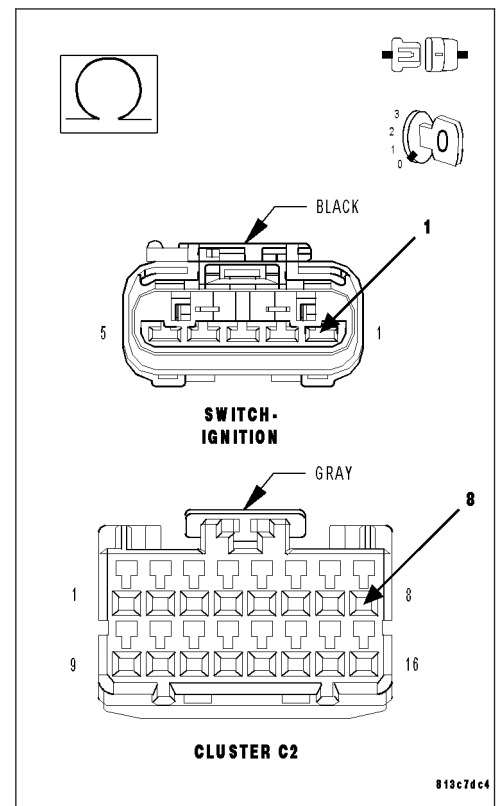
**Is the resistance greater than 5 ohms?**

**Yes** >> Repair the (G900) Ignition Switch Sense Return circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).





**B2213–CCN INTERNAL**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the Instrument Cluster awake.
- **Set Condition:**  
The Instrument Cluster detects an internal failure.

Possible Causes
INSTRUMENT CLUSTER

**Diagnostic Test**

**1. REPLACE THE INSTRUMENT CLUSTER**

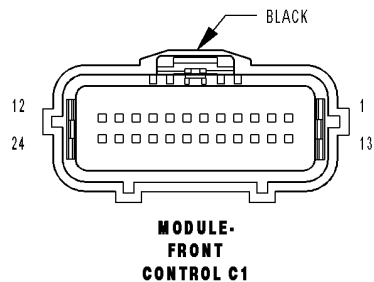
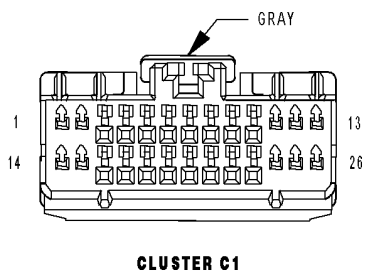
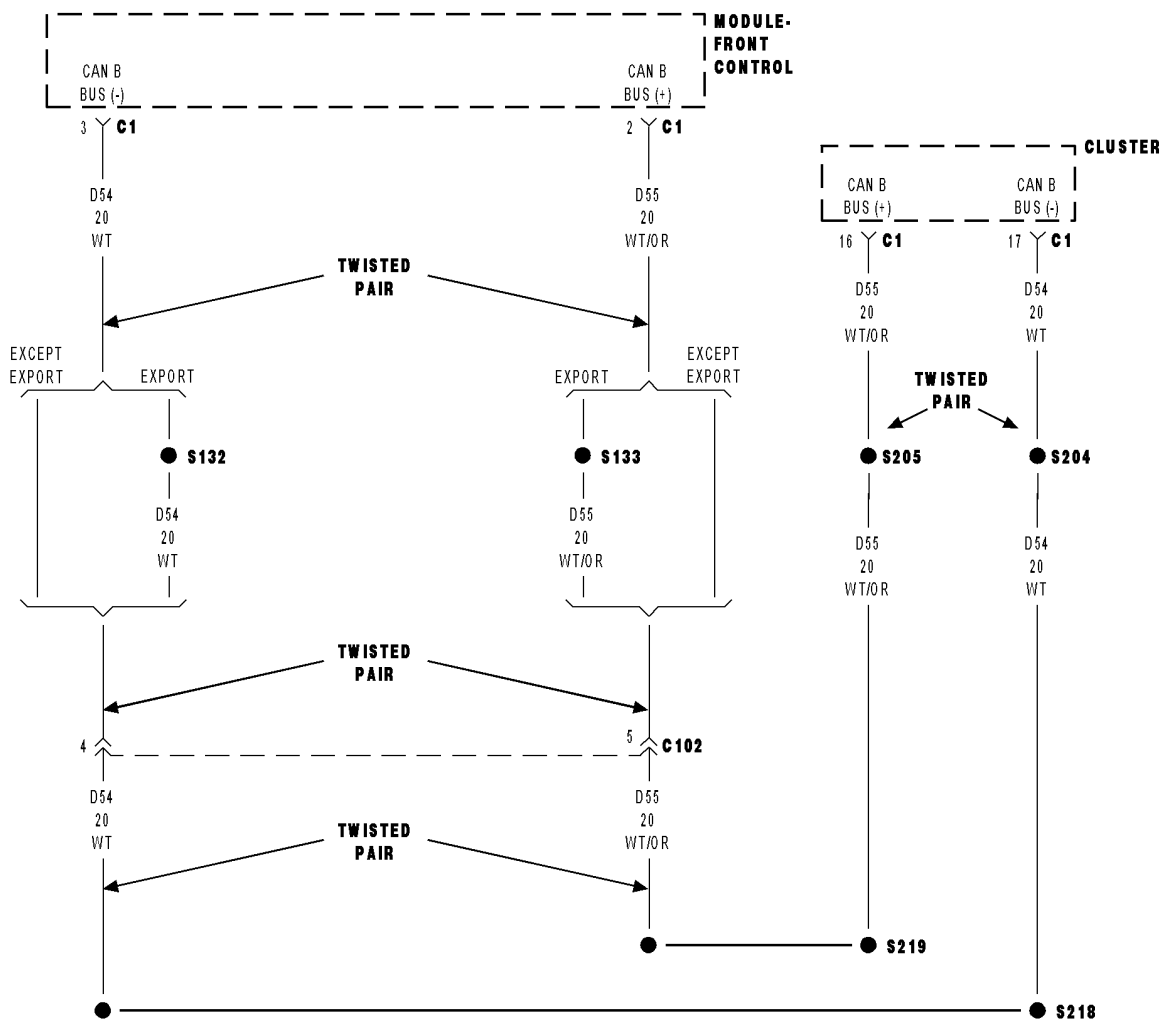
When this code is set, the Instrument Cluster must be replaced.

**View Repair**

**Repair**

Replace the Instrument Cluster in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

# U0019-CAN B BUS



**U0019–CAN B BUS (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the Instrument Cluster awake.
- **Set Condition:**  
Whenever the Can B Bus (+) or B Bus (–) circuit is open, shorted to voltage or shorted to ground, this code will set.

Possible Causes
CAN B BUS DTCs IN FRONT CONTROL MODULE (D54) CAN B BUS (–) CIRCUIT OPEN (D55) CAN B BUS (+) CIRCUIT OPEN INSTRUMENT CLUSTER

**Diagnostic Test****1. CHECK FOR AN ACTIVE DTC**

Turn the ignition on.

With the scan tool, record and erase DTCs.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

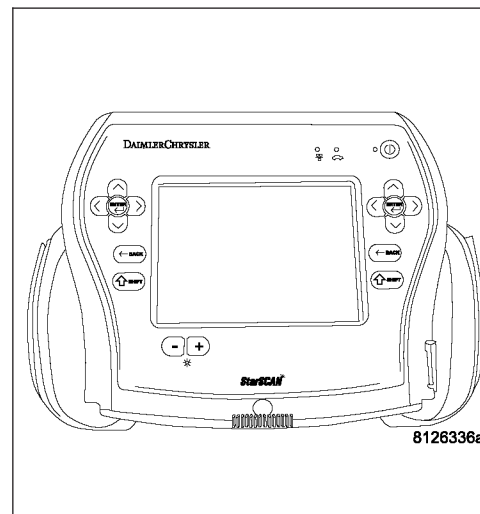
With the scan tool, read DTCs.

**Is the DTC active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**2. CHECK FRONT CONTROL MODULE DTCs**

With the scan tool, read Front Control Module DTCs.

**Does the scan tool display the U0019–CAN B BUS DTC?**

**Yes** >> Refer to the symptom list for problems related to Communication in the ELECTRICAL.– ELECTRONIC CONTROL MODULES – ELECTRICAL DIAGNOSES section.

**No** >> Go to 3

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

## U0019-CAN B BUS (CONTINUED)

### 3. CAN B BUS (+) CIRCUIT OPEN

Turn the ignition off.

Disconnect the Instrument Cluster C1 harness connector.

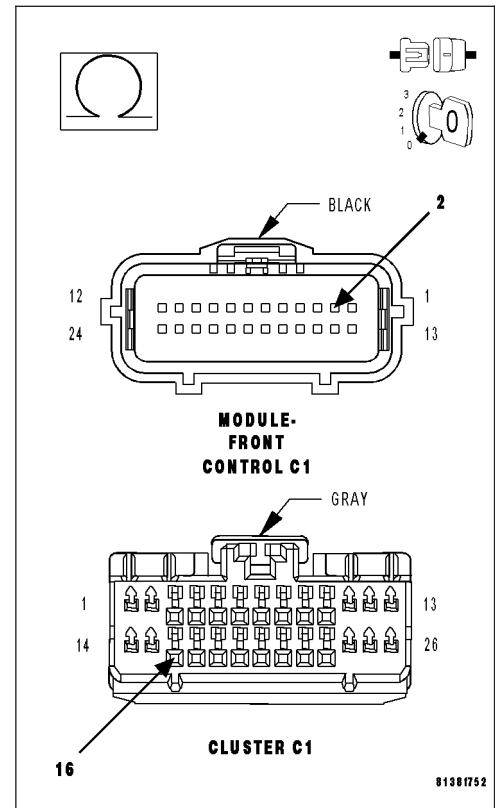
Disconnect the Front Control Module C1 harness connector.

Measure the resistance of the (D55) Can B Bus (+) circuit between the Front Control Module C1 harness connector and the Instrument Cluster C1 harness connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the Can B Bus (+) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



### 4. CAN B BUS (-) CIRCUIT OPEN

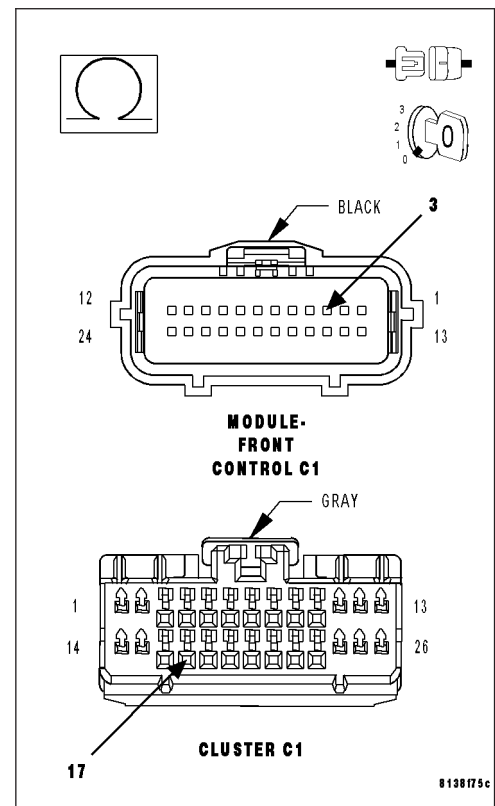
Measure the resistance of the (D54) Can B Bus (-) circuit between the Front Control Module C1 harness connector and the Instrument Cluster C1 harness connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Replace the Instrument Cluster in accordance with the service information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Repair the Can B Bus (-) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



## **U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0155-LOST COMMUNICATION WITH CLUSTER/CCN**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0159-LOST COMMUNICATION WITH PARKING ASSIST CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0167-LOST COMMUNICATION WITH INTRUSION TRANSCEIVER CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0169-LOST COMMUNICATION WITH SUNROOF CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0184-LOST COMMUNICATION WITH RADIO**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0195-LOST COMMUNICATION WITH SDARS**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0196-LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0212-LOST COMMUNICATION WITH SCCM-CAN-B**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0231-LOST COMMUNICATION WITH RAIN SENSING MODULE**

For a complete wiring diagram **Refer to Section 8W.**

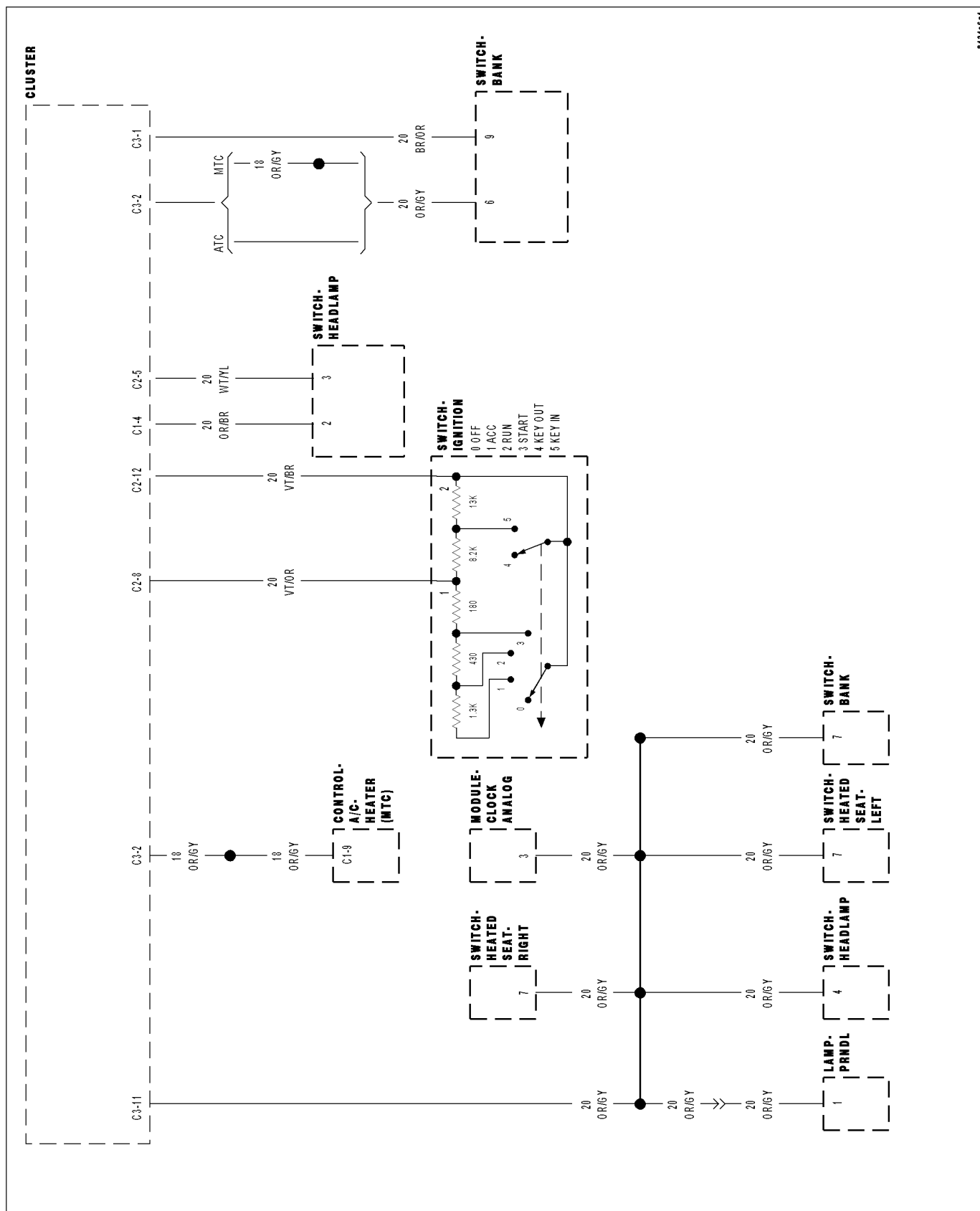
**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0241-LOST COMMUNICATION WITH AUTO HIGHBEAM HEADLAMP CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

# SCHEMATICS AND DIAGRAMS



813166a1

CLUSTER SYSTEM SCHEMATIC



INSTRUMENT CLUSTER - SERVICE INFORMATION

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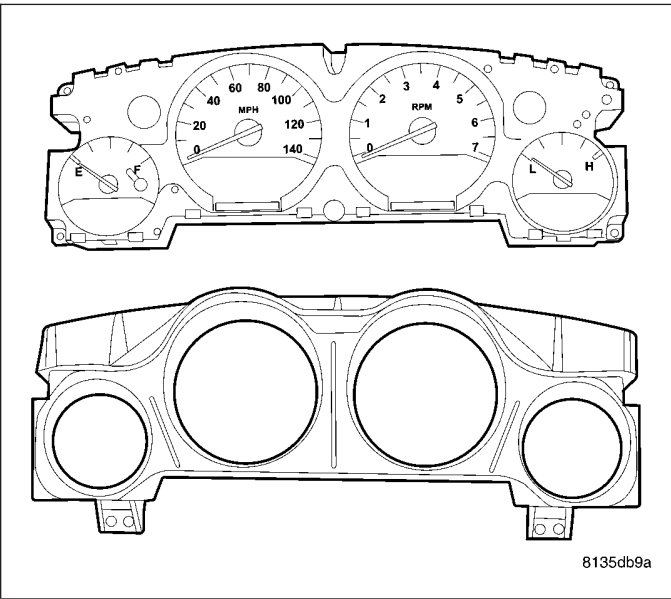
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INSTRUMENT CLUSTER - SERVICE INFORMATION

DESCRIPTION

The instrument cluster is an ElectroMechanical Instrument Cluster (EMIC) that is located in the instrument panel above the steering column opening, directly in front of the driver. The remainder of the EMIC, including the mounts and the electrical connections, are concealed within the instrument panel behind the cluster bezel. Besides analog gauges and indicators, the EMIC module incorporates two blue-green digital Vacuum Fluorescent Display (VFD) units for displaying odometer/trip odometer information, engine hours, automatic transmission gear selector position (PRNDL), several warning or reminder indications and certain diagnostic information. The instrument cluster also includes the hardware and software necessary to serve as the electronic body control module and is sometimes referred to as the Cab Compartment Node or CCN.

Besides typical instrument cluster gauge and indicator support, the electronic functions and features that the EMIC supports or controls include the following:



- **Accessory Power Delay Relay Control** - The EMIC provides timing and control for the accessory power delay relay based upon inputs from both the ignition switch and the door ajar switches.
- **Audible Warnings** - The EMIC electronic circuit board is equipped with an audible tone transducer and programming that allows it to provide various audible alerts to the vehicle operator, including chime tones and beep tones. An electromechanical relay is also soldered onto the circuit board to produce audible clicks that emulate the sound of a conventional turn signal or hazard warning flasher. (Refer to 8 - ELECTRICAL/CHIME/BUZZER - DESCRIPTION).
- **Automatic Headlamps Control** - On models equipped with optional automatic headlamps, the EMIC monitors inputs from both the headlamp switch and a sun load sensor located on the top of the instrument panel to provide automatic headlamps.
- **Brake Lamp Control** - The EMIC provides electronic brake lamp request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for brake lamp control, excluding control of the Center High Mounted Stop Lamp (CHMSL), which remains controlled by a direct hard wired output of the brake lamp switch.

- **Brake Transmission Shift Interlock Control** - The EMIC monitors inputs from the brake lamp switch, ignition switch, and the Transmission Range Sensor (TRS), then controls a high-side driver output to operate the Brake Transmission Shift Interlock (BTSI) solenoid that locks and unlocks the automatic transmission gearshift selector lever on the steering column.
- **Compass Mini Trip Computer Support** - The EMIC provides support for the optional Compass Mini Trip Computer (CMTC) by calculating average fuel economy, distance to empty and outside temperature values and storing trip odometer and elapsed ignition on time data. The EMIC receives data and reset requests from the CMTC and transmits the appropriate information for the CMTC to display using electronic messaging.
- **Enhanced Accident Response Support** - The EMIC monitors an input from the Occupant Restraint Controller (ORC) and, following an airbag deployment, will immediately disable the power lock output, unlock all doors by activating the power unlock output, then enables the power lock output if the power lock switch input remains inactive for two seconds. The EMIC also monitors an input from the Powertrain Control Module (PCM) to automatically turn on the interior lighting after an airbag deployment event, ten seconds after the vehicle speed is zero. The interior lighting remains illuminated until the ignition switch is turned to the Off position, at which time the interior lighting returns to normal operation and control. These Enhanced Accident Response System (EARS) features are each dependent upon a functional vehicle electrical system following the vehicle impact event.
- **Exterior Lamp Load Shedding** - The EMIC provides a battery saver feature which will automatically turn off all exterior lamps that remain on with the ignition switch in the Off position after a timed interval of about five minutes.
- **Exterior Lighting Control** - The EMIC provides electronic head lamp and/or park lamp request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for the appropriate exterior lamp control of standard head and park lamps, as well as optional front fog lamps. This includes support for headlamp beam selection and the optical horn feature, also known as flash-to-pass.
- **Exterior Lighting Fail-safe** - In the absence of a headlamp switch input, the EMIC will turn on the cluster illumination lamps and provide electronic headlamp low beam and park lamp request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for default exterior lamp operation. The FCM will also provide default park lamp and headlamp low beam operation and the EMIC will turn on the cluster general illumination lighting if there is a failure of the electronic data bus communication between the EMIC and the FCM.
- **Fuel Level Data Support** - The EMIC provides a current source for and receives a hard wired analog input from the fuel level sending unit located on the fuel pump module in the fuel tank. The EMIC uses this input to calculate the proper fuel gauge needle position and low fuel indicator operation. Based upon this input, the EMIC also calculates fuel level, average fuel economy and distance to empty data, then uses electronic messaging to transmit this data over the CAN data bus for use by other electronic modules in the vehicle.
- **Heated Seat Control** - The EMIC monitors inputs from the ignition switch and electronic engine speed messages from the Powertrain Control Module (PCM) to control a high side driver output to the heated seat switch Light Emitting Diode (LED) indicators. This input allows the heated seat switches to wake up the heated seat module if the switch is actuated. The EMIC will de-energize the heated seat switch LED indicators, which deactivates the heated seat system, if the ignition switch is turned to any position except On or Start, or if the engine speed message indicates zero. (Refer to 8 - ELECTRICAL/HEATED SEATS - DESCRIPTION).
- **Horn Control** - The EMIC monitors an input from the horn switch and provides electronic horn request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for horn relay control. The EMIC also controls horn relay operation in this manner to provide the horn features of the optional Remote Keyless Entry (RKE) or Vehicle Theft Security System (VTSS).
- **Interior Lamp Load Shedding** - The EMIC provides a battery saver feature which will automatically turn off all interior lamps that remain on after a timed interval of about fifteen minutes.
- **Interior Lighting Control** - The EMIC monitors inputs from the interior lighting switch, the door ajar switches, the reading lamp switches, and the Sentry Key Remote Entry Module (SKREEM) to provide courtesy lamp control. This includes support for timed illuminated entry with theater-style fade-to-off and courtesy illumination defeat features.
- **Panel Lamps Dimming Control** - The EMIC monitors hard wired multiplexed inputs from the headlamp switch on the instrument panel, then provides a hard wired 12-volt Pulse-Width Modulated (PWM) output that synchronizes the dimming level of all panel lamps dimmer controlled lamps with that of the cluster illumination lighting.
- **Power Locks** - The EMIC monitors inputs from the power lock switches and the Sentry Key Remote Entry Module (SKREEM) to provide control of the power lock motors through high side driver outputs to the motors.

This includes support for rolling door locks (also known as automatic door locks), automatic door unlock, brief-case lock mode, door lock inhibit mode, and central locking (with the optional Vehicle Theft Security System only). (Refer to 8 - ELECTRICAL/POWER LOCKS - DESCRIPTION).

- **Remote Keyless Entry** - The EMIC supports the standard Remote Keyless Entry (RKE) system features, including support for the RKE Lock, Unlock (with optional driver-door-only unlock, and unlock-all-doors), Panic, audible chirp, optical chirp, illuminated entry modes, an RKE programming mode, as well as optional Vehicle Theft Security System (VTSS) arming (when the proper VTSS arming conditions are met) and disarming.
- **Remote Radio Switch Interface** - The EMIC monitors inputs from the optional remote radio switches and then provides the appropriate electronic data bus messages to the radio to select the radio operating mode, volume control, preset station scan and station seek features.
- **Turn Signal & Hazard Warning Lamp Control** - The EMIC monitors hard wired multiplexed inputs from the multi-function switch on the steering column, then provides electronic turn and hazard lamp request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for turn and hazard lamp control. The EMIC also provides an audible click at one of two rates to emulate normal and bulb out turn or hazard flasher operation based upon electronic lamp outage messages from the FCM, and provides an audible turn signal on chime warning if a turn is signalled continuously for more than about 1.6 kilometers (one mile) and the vehicle speed remains greater than about twenty-four kilometers-per-hour (fifteen miles-per-hour).
- **Vacuum Fluorescent Display Synchronization** - The EMIC monitors hard wired multiplexed inputs from the headlamp switch on the instrument panel, then transmits electronic panel lamp dimming level messages which allows all other electronic modules on the CAN data bus with Vacuum Fluorescent Display (VFD) units to coordinate their illumination intensity with that of the EMIC VFD units. This includes a parade mode (also known as funeral mode) that allows all VFD units in the vehicle to be illuminated at full (daytime) intensity while driving during daylight hours with the exterior lamps turned On.
- **Vehicle Theft Security System Control** - The EMIC monitors inputs from the door ajar switches, the liftgate ajar switch, the ignition switch, and the Sentry Key REmote Entry Module (SKREEM), then provides electronic horn and lighting request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for the appropriate VTSS alarm output features.
- **Wiper/Washer System Control** - The EMIC monitors both hard wired multiplexed inputs from the front wiper and washer switches in the multi-function switch on the steering column and electronic messages from the rear wiper and washer switches in the heater and air conditioner control on the instrument panel. The EMIC then provides electronic wiper and/or washer request messages to the Front Control Module (FCM) located on the Integrated Power Module (IPM) for the appropriate front or rear wiper and washer system features. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - DESCRIPTION).

## ELECTRONIC VEHICLE INFORMATION CENTER

Eight switches mounted on the steering wheel control the Electronic Vehicle Information Center (EVIC). Pressing the switches, conveniently selects from a variety of useful information. Personal settings, hands-free system communication system screens, Navigation system screens, trip computer functions, outside temperature, compass headings, audio modes and System Status messages including Tire Pressure Monitor System warnings can be displayed in the EVIC. For more detailed information (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFORMATION CENTER - DESCRIPTION).

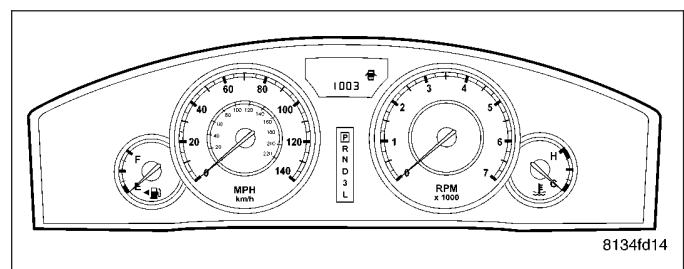
## CHRYSLER INSTRUMENT CLUSTERS

Three clusters are offered on Chrysler 300 sedans.

### 300 AND 300 TOURING EDITION

The Chrysler 300 and base 300 Touring Edition model instrument clusters include the following features:

- Four large easy to read gauges: Fuel, speedometer, tachometer and engine temperature.
- Electroluminescent silhouette-lit alabaster gauges (gauge faces glow blue-green when headlamps are on). Electroluminescent lighting is totally uniform and glare free for optimum driver visibility.
- Black gauge pointers.
- Vertical vacuum-fluorescent transmission shift-range indicator.

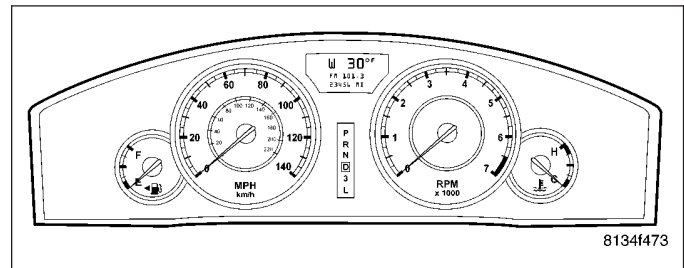


- Up to 19 warning indicators depending on equipment level.
- Chrome gauge rings.
- 140-mph speedometer.
- Vacuum-fluorescent odometer with outside temperature indicator and three warning indicators: Trunk Ajar, Low Washer Fluid, and Door Ajar.

### 300 TOURING LUXURY AND LUXURY SPORT

Instrument clusters on Chrysler 300 Touring Edition with Luxury or Luxury Sport packages include the following features:

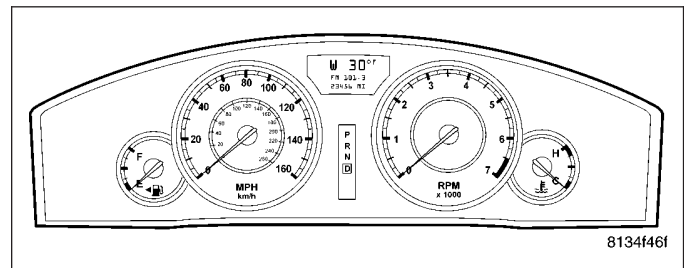
- Four large easy to read gauges: Fuel, speedometer, tachometer and engine temperature.
- Electroluminescent silhouette-lit alabaster gauges (gauge faces glow blue-green when headlamps are on). Electroluminescent lighting is totally uniform and glare free for optimum driver visibility.
- Black gauge pointers.
- Vertical vacuum-fluorescent transmission shift-range indicator.
- Up to 19 warning indicators depending on equipment level.
- Chrome gauge rings.
- Electronic Vehicle Information Center with driver-interactive three-line dot-matrix display controlled by steering wheel switches.



### HEMI C AND EXPORT 300C

The Chrysler 300Hemi C and Export 300C instrument cluster include the following features:

- Four large easy to read gauges: Fuel, speedometer, tachometer and engine temperature.
- Electroluminescent silhouette-lit alabaster gauges (gauge faces glow blue-green when headlamps are on). Electroluminescent lighting is totally uniform and glare free for optimum driver visibility.
- Black gauge pointers.
- Vertical vacuum-fluorescent transmission shift-range indicator.
- Up to 19 warning indicators depending on equipment level.
- Chrome gauge rings.
- Electronic Vehicle Information Center with driver-interactive three-line dot-matrix display controlled by steering wheel switches.
- 160-mph speedometer.



### APPEARANCE AND LIGHTING

Alabaster gauge faces with black nomenclature and black pointers provide excellent visibility in daylight. With the headlamps on, the electroluminescent gauges glow blue-green. The lighting intensity of the gauges can be adjusted to suit the driver's preference, using the thumbwheel dimmer control that is part of the headlamp switch. Electroluminescent lighting is totally uniform and glare free for optimum driver visibility.

### FIXED SEGMENT DISPLAYS

The standard cluster features two fixed—segment vacuum fluorescent digital displays to show transmission range and odometer reading. The fixed-segment odometer display also includes the following indicators:

**ODOMETER DISPLAY INDICATORS**

INDICATOR	DISPLAY	COLOR
Trunk Ajar	ISO	Blue/Green
Low Wash	ISO	Blue/Green
Door Ajar	ISO	Blue/Green
Outside Temperature	Numeric	Blue/Green

**INDICATOR LAMPS**

The following indicator lamps are included in all instrument clusters. Actual usage depends on how the vehicle is equipped.

**INDICATOR LAMPS**

INDICATOR	DISPLAY	COLOR
Right Turn	ISO	Green
Left Turn	ISO	Green
Front Fog Lamps	ISO	Green
Rear Fog (Export Only)	ISO	Amber
High Beam	ISO	Blue
Brake	Word U.S. only/ISO Export	Red
Seat Belt	ISO	Red
Airbag	ISO	Red
Electronic Throttle Control	ISO	Red
Low Oil Pressure	ISO	Red
Engine Temperature	ISO	Red
Charge	ISO	Red
VTA (Vehicle Theft Alarm)	Dot	Red
ABS	ISO	Amber
Check Engine	ISO	Amber
BAS (Brake Assist)	ISO	Amber
ASR/ESP (Anti-Slip Regulation/Electronic Stability Program)	ISO	Amber
Low Fuel	ISO	Amber
TPM (Tire Pressure Monitor)	ISO	Amber

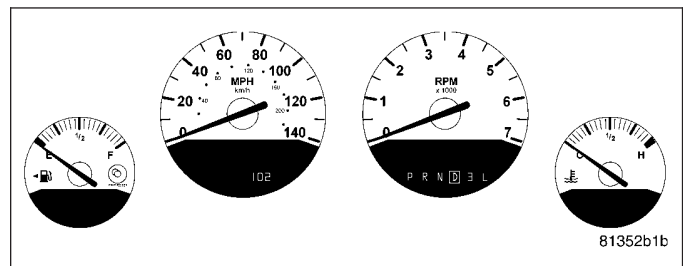
**DODGE INSTRUMENT CLUSTERS**

Two clusters are offered on the Dodge Magnum Sports Tourer.

**DODGE MAGNUM SE AND SXT**

The Magnum SE and SXT instrument clusters include the following features:

- Horizontal odometer with outside temperature indicator and four blue-green ISO messages (fixed segment display).
- Vertical transmission shift-range indicator.
- White mask and lens assembly for individual gauges.
- Electroluminescent silhouette-lit white gauges (gauges glow white when headlights are on).
- Four large easy to read gauges: Fuel, 140-mph speedometer, tachometer and engine temperature.
- Non-lit orange pointers.

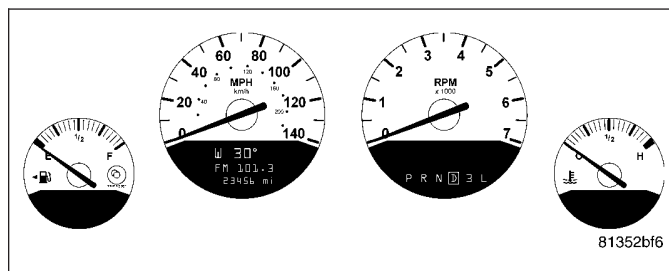




**DODGE MAGNUM RT**

The Magnum RT instrument cluster includes the following features:

- Vertical transmission shift-range indicator.
- White mask and lens assembly for individual gauges.
- Electroluminescent silhouette-lit white gauges (gauges glow white when headlamps are on).
- Four large easy to read gauges: Fuel, 140-mph speedometer, tachometer and engine temperature.
- Non-lit orange pointers.
- Dot-matrix Electronic Vehicle Information Center with Driver-Interactive Display.
- 160-mph speedometer.

**APPEARANCE AND LIGHTING**

White gauge faces with black nomenclature provide excellent visibility in daylight. Pointers are non-lit orange. With the headlamps on, the electroluminescent gauges glow white. The lighting intensity of the gauges can be adjusted to suit the driver's preference, using the thumbwheel dimmer control that is part of the headlamp switch. Electroluminescent lighting is uniform and glare free for optimum driver visibility.

**FIXED SEGMENT DISPLAYS**

The standard cluster features two fixed—segment vacuum fluorescent digital displays to show transmission range and odometer reading. The fixed-segment odometer display also includes the following indicators:

**ODOMETER DISPLAY INDICATORS**

INDICATOR	DISPLAY	COLOR
Hatch Ajar	ISO	Blue/Green
Low Wash	ISO	Blue/Green
Door Ajar	ISO	Blue/Green
Outside Temperature	Numeric	Blue/Green

**INDICATOR LAMPS**

The following indicator lamps are included in all instrument clusters. Actual usage depends on how the vehicle is equipped.

**INDICATOR LAMPS**

INDICATOR	DISPLAY	COLOR
Right Turn	ISO	Green
Left Turn	ISO	Green
Front Fog Lamps	ISO	Green
High Beam	ISO	Blue
Brake	Word U.S. only/ISO Export	Red
Seat Belt	ISO	Red
Airbag	ISO	Red
Electronic Throttle Control	ISO	Red
Low Oil Pressure	ISO	Red

INDICATOR	DISPLAY	COLOR
Engine Temperature	ISO	Red
Charge	ISO	Red
VTA (Vehicle Theft Alarm)	Dot	Red
ABS	ISO	Amber
Check Engine	ISO	Amber
BAS (Brake Assist)	ISO	Amber
ASR/ESP (Anti-Slip Regulation/Electronic Stability Program)	ISO	Amber
Low Fuel	ISO	Amber
TPM (Tire Pressure Monitor)	ISO	Amber

## OPERATION

The microprocessor-based EMIC hardware and software uses various inputs to control the gauges and indicators visible on the face of the cluster. Some of these inputs are hard wired, but most are in the form of electronic messages that are transmitted by other electronic modules over the Controller Area Network (CAN) data bus. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - OPERATION).

The EMIC microprocessor smooths the input data using algorithms to provide gauge readings that are accurate, stable and responsive to operating conditions. These algorithms are designed to provide gauge readings during normal operation that are consistent with customer expectations. However, when abnormal conditions exist such as high coolant temperature, the algorithm can drive the gauge pointer to an extreme position and the microprocessor can sound a chime through the on-board audible tone transducer to provide distinct visual and audible indications of a problem to the vehicle operator. The EMIC may also produce audible warnings for other electronic modules in the vehicle based upon electronic tone request messages received over the CAN data bus. Each audible warning is intended to provide the vehicle operator with an audible alert to supplement a visual indication.

The EMIC circuitry operates on battery current received through a fused B(+) fuse on a non-switched fused B(+) circuit, and on battery current received through a fused ignition switch output (run-start) fuse on a fused ignition switch output (run-start) circuit. This arrangement allows the EMIC to provide some features regardless of the ignition switch position, while other features will operate only with the ignition switch in the On or Start positions. The EMIC circuitry is grounded through a ground circuit of the instrument panel wire harness.

The EMIC also has a self-diagnostic actuator test capability (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING), which will test each of the CAN bus message-controlled functions of the cluster by lighting the appropriate indicators, positioning the gauge needles at several predetermined calibration points across the gauge faces, and illuminating all segments of the odometer/trip odometer and gear selector indicator Vacuum-Fluorescent Display (VFD) units.

## GAUGES

All gauges receive battery current through the EMIC circuitry only when the ignition switch is in the On or Start positions. With the ignition switch in the Off position battery current is not supplied to any gauges, and the EMIC circuitry is programmed to move all of the gauge needles back to the low end of their respective scales. Therefore, the gauges do not accurately indicate any vehicle condition unless the ignition switch is in the On or Start positions.

All of the EMIC gauges are air core magnetic units. Two fixed electromagnetic coils are located within each gauge. These coils are wrapped at right angles to each other around a movable permanent magnet. The movable magnet is suspended within the coils on one end of a pivot shaft, while the gauge needle is attached to the other end of the shaft. One of the coils has a fixed current flowing through it to maintain a constant magnetic field strength. Current flow through the second coil changes, which causes changes in its magnetic field strength. The current flowing through the second coil is changed by the EMIC circuitry in response to messages received over the CAN data bus. The gauge needle moves as the movable permanent magnet aligns itself to the changing magnetic fields created around it by the electromagnets.

## ENGINE COOLANT TEMPERATURE GAUGE

This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The engine coolant temperature gauge is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Engine Temperature Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is between the low end of normal [about 54° C (130° F)] and the high end of normal [about 122° C (252° F)], the gauge needle is moved to the actual relative temperature position on the gauge scale.
- **Engine Temperature Low Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is below the low end of normal [about 54° C (130° F)], the gauge needle is held at the "C" increment at low end of the gauge scale. The gauge needle remains at the low end of the gauge scale until the cluster receives a message from the PCM indicating that the engine temperature is above about 54° C (130° F), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Engine Temperature High Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is above about 122° C (252° F), the gauge needle is moved into the red zone on the gauge scale, the engine temperature indicator is illuminated, and a single chime tone is sounded. The gauge needle remains in the red zone and the engine temperature indicator remains illuminated until the cluster receives a message from the PCM indicating that the engine temperature is below about 122° C (252° F), or until the ignition switch is turned to the Off position, whichever occurs first. The chime tone feature will only repeat during the same ignition cycle if the engine temperature indicator is cycled off and then on again by the appropriate engine temperature messages from the PCM.
- **Communication Error** - If the cluster fails to receive an engine temperature message, it will hold the gauge needle at the last indication for about five seconds or until the ignition switch is turned to the Off position, whichever occurs first. After five seconds, the cluster will move the gauge needle to the low end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the engine coolant temperature gauge needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the engine coolant temperature sensor to determine the engine operating temperature. The PCM then sends the proper engine coolant temperature messages to the instrument cluster. For further diagnosis of the engine coolant temperature gauge or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the engine temperature indicator due to a high engine temperature gauge reading, it may indicate that the engine or the engine cooling system requires service. The engine coolant temperature gauge is serviced as a unit with the instrument cluster.

## FUEL GAUGE

The fuel gauge gives an indication to the vehicle operator of the level of fuel in the fuel tank. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and a hard wired input received by the cluster from the fuel level sending unit on the fuel pump module in the fuel tank.

The fuel gauge is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Fuel Level Sending Unit Input** - The cluster provides a constant current source to the fuel level sending unit and monitors a return input on a fuel level sense circuit. The resistance through the fuel level sending unit increases as the fuel level falls and decreases as the fuel level rises causing changes in the sense input voltage. The cluster programming applies an algorithm to calculate the proper fuel gauge needle position based upon the fuel level sense input, then moves the gauge needle to the proper relative position on the gauge



scale. This algorithm is used to dampen gauge needle movement against the negative effect that fuel sloshing within the fuel tank can have on accurate inputs from the fuel tank sending unit to the cluster.

- **Less Than Ten Percent Tank Full Input** - Each time the fuel level sense input to the cluster indicates the fuel tank is about ten percent full or less for ten consecutive seconds and the vehicle speed is zero, or for sixty consecutive seconds and the vehicle speed is greater than zero, the gauge needle is moved to about the one-eighth graduation on the gauge scale, the low fuel indicator is illuminated, and a single chime tone is sounded. The low fuel indicator remains illuminated until the fuel level sense input indicates that the fuel tank is greater than about thirteen percent full for ten consecutive seconds and the vehicle speed is zero, or for sixty consecutive seconds and the vehicle speed is greater than zero, or until the ignition switch is turned to the Off position, whichever occurs first. The chime tone feature will only repeat during the same ignition cycle if the low fuel indicator is cycled off and then on again by the appropriate inputs from the fuel level sending unit.
- **Less Than Empty Stop Input** - Each time the cluster receives a fuel level sense input that indicates the fuel level in the fuel tank is less than the Empty gauge needle stop position, the gauge needle is moved to the low end of the gauge scale and the low fuel indicator is illuminated immediately. This input would indicate that the fuel level sense input to the cluster is a short circuit.
- **More Than Full Stop Input** - Each time the cluster receives a fuel level sense input that indicates the fuel level in the fuel tank is more than the Full gauge needle stop position, the gauge needle is moved to the low end of the gauge scale and the low fuel indicator is illuminated immediately. This input would indicate that the fuel level sense input to the cluster is an open circuit.
- **Actuator Test** - Each time the cluster is put through the actuator test, the fuel gauge needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

The instrument cluster continually monitors the fuel tank sending unit to determine the level of fuel in the fuel tank. The cluster then sends the proper fuel level messages to other electronic modules in the vehicle over the Controller Area Network (CAN) data bus. For further diagnosis of the fuel gauge or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The fuel gauge is serviced as a unit with the instrument cluster.

## SPEEDOMETER

The speedometer gives an indication to the vehicle operator of the vehicle road speed. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The speedometer is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Vehicle Speed Message** - Each time the cluster receives a vehicle speed message from the PCM it will calculate the correct vehicle speed reading and position the gauge needle at that relative speed position on the gauge scale. The cluster will receive a new vehicle speed message and reposition the gauge pointer accordingly about every 88 milliseconds. The gauge needle will continually be positioned at the relative vehicle speed position on the gauge scale until the vehicle stops moving, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster fails to receive a speedometer message, it will hold the gauge needle at the last indication for about three seconds, or until the ignition switch is turned to the Off position, whichever occurs first. After three seconds, the gauge needle will return to the left end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the speedometer needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the vehicle speed sensor to determine the vehicle road speed. The PCM then sends the proper vehicle speed messages to the instrument cluster. For further diagnosis of the speedometer or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The speedometer is serviced as a unit with the instrument cluster.

## TACHOMETER

The tachometer gives an indication to the vehicle operator of the engine speed. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The tachometer is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Engine Speed Message** - Each time the cluster receives an engine speed message from the PCM it will calculate the correct engine speed reading and position the gauge needle at that relative speed position on the gauge scale. The cluster will receive a new engine speed message and reposition the gauge pointer accordingly about every 88 milliseconds. The gauge needle will continually be repositioned at the relative engine speed position on the gauge scale until the engine stops running, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster fails to receive an engine speed message, it will hold the gauge needle at the last indication for about three seconds, or until the ignition switch is turned to the Off position, whichever occurs first. After three seconds, the gauge needle will return to the left end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the tachometer needle will be swept to several calibration points on the gauge scale in a prescribed sequence in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the crankshaft position sensor to determine the engine speed. The PCM then sends the proper engine speed messages to the instrument cluster. For further diagnosis of the tachometer or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The tachometer is serviced as a unit with the instrument cluster.

The gauges are diagnosed using the EMIC self-diagnostic actuator test (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the CAN data bus and the electronic data bus message inputs to the EMIC that control each gauge require the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

## VACUUM-FLUORESCENT DISPLAYS

The Vacuum-Fluorescent Display (VFD) units are soldered to the EMIC electronic circuit board. With the ignition switch in the Off or Accessory positions, the odometer display is activated when the driver door is opened (Rental Car mode) and is deactivated when the driver door is closed. Otherwise, both display units are active when the ignition switch is in the On or Start positions, and inactive when the ignition switch is in the Off or Accessory positions.

The illumination intensity of the VFD units is controlled by the EMIC circuitry based upon an input from the headlamp switch and a dimming level input received from the panel dimmer switch. The EMIC synchronizes the illumination intensity of other VFD units with that of the units in the EMIC by sending electronic dimming level messages to other electronic modules in the vehicle over the CAN data bus.

While in the odometer mode with the ignition switch in the On position and the engine not running, depressing the odometer/trip odometer switch for about six seconds will display the engine hours information. Holding this switch depressed while turning the ignition switch from the Off position to the On position will initiate the EMIC self-diagnostic actuator test. Refer to the instrument cluster diagnosis and testing service information for additional details on this cluster function. The EMIC microprocessor remembers which display mode is active when the ignition switch is turned to the Off position, and returns the VFD display to that mode when the ignition switch is turned On again.

The VFD units are diagnosed using the EMIC self-diagnostic actuator test (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the CAN data bus and the electronic data bus message inputs to the EMIC that control some of the VFD functions requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

## TRANSMISSION RANGE INDICATOR

The electronic transmission range indicator gives an indication to the vehicle operator of the transmission gear that has been selected with the automatic transmission gear selector lever. This indicator is controlled by the instrument

cluster circuit board based upon cluster programming and electronic messages received from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The transmission range indicator information is displayed by a dedicated Vacuum Fluorescent Display (VFD) unit soldered onto the instrument cluster electronic circuit board, and the VFD will not display the transmission range indicator information after the ignition switch is turned to the Off position. Each time the cluster is disconnected from battery current for more than about five minutes, it must configure itself for the automatic transmission model that is in the vehicle once it is reconnected to battery current. The instrument cluster circuitry operates the transmission range indicator VFD to provide the following features:

- **Selected Gear Message** - Each time the cluster receives a selected gear message from the PCM, a box will be illuminated around the appropriate character in the gear selector indicator VFD. The box will remain illuminated until the cluster receives a different selected gear message, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster fails to receive a selected gear message from the PCM within three seconds, the instrument cluster circuitry will display all gear selector positions boxed (selected) until a valid selected gear message is received or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the gear selector indicator VFD will display all of its characters at once, then step through each character segment individually during the VFD portion of the test to confirm the functionality of the VFD and the cluster control circuitry.

The PCM continually monitors a hard wired multiplex input from the Transmission Range Sensor (TRS), then sends the proper selected gear messages to the instrument cluster. For further diagnosis of the transmission range indicator or the instrument cluster circuitry that controls this function, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The Transmission Range indicator is serviced with the instrument cluster.

## INDICATORS

Indicators are located in various positions within the EMIC and are all connected to the EMIC electronic circuit board. The various EMIC indicators are controlled by different strategies; some receive fused ignition switch output from the EMIC circuitry and have a switched ground, while others are grounded through the EMIC circuitry and have a switched battery feed. However, all indicators are completely controlled by the EMIC microprocessor based upon various hard wired and electronic message inputs. All indicators except those located within the VFD units are illuminated at a fixed intensity, which is not affected by the selected illumination intensity of the electro-luminescent EMIC general illumination lamp. The illumination intensity of those within the VFD units is synchronized with that of the EMIC general illumination lamp.

In addition, certain indicators in this instrument cluster are automatically configured or self-configured. This feature allows the configurable indicators to be enabled by the EMIC circuitry for compatibility with certain optional equipment. The EMIC defaults for the ABS indicator and airbag indicator are enabled, and these configuration settings must be programmatically disabled in the EMIC using a diagnostic scan tool for vehicles that do not have this equipment. The automatically configured or self-configured indicators remain latent in each EMIC at all times and will be active only when the EMIC receives the appropriate CAN message inputs for that optional system or equipment.

## ABS INDICATOR

The ABS indicator gives an indication to the vehicle operator when the ABS system is faulty or inoperative. This indicator is controlled by a transistor on the

instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Controller Antilock Brake (CAB) over the Controller Area Network (CAN) data bus.

The ABS indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the ABS indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the ABS indicator is illuminated for about four seconds as a bulb test. The entire bulb test is a function of the CAB.
- **ABS Lamp-On Message** - Each time the cluster receives a lamp-on message from the CAB, the ABS indicator will be illuminated. The indicator remains illuminated until the cluster receives a lamp-off message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.



- **Communication Error** - If the cluster receives no lamp-on or lamp-off messages from the CAB for five consecutive message cycles, the ABS indicator is illuminated. The indicator remains illuminated until the cluster receives a valid message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the instrument cluster is put through the actuator test, the ABS indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.
- **ABS Diagnostic Test** - The ABS indicator is blinked on and off by lamp-on and lamp-off messages from the CAB during the performance of the ABS diagnostic tests.

The CAB continually monitors the ABS circuits and sensors to decide whether the system is in good operating condition. The CAB then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the CAB sends a lamp-on message after the bulb test, it indicates that the CAB has detected a system malfunction and/or that the ABS system has become inoperative. The CAB will store a Diagnostic Trouble Code (DTC) for any malfunction it detects. Each time the ABS indicator fails to light due to an open or short in the cluster ABS indicator circuit, the cluster sends a message notifying the CAB of the condition, then the instrument cluster and the CAB will each store a DTC. The ABS indicator is serviced with the instrument cluster.

## AIRBAG INDICATOR

The airbag indicator gives an indication to the vehicle operator when the airbag system is faulty or inoperative. The airbag indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Occupant Restraint Controller (ORC) over the Controller Area Network (CAN) data bus.



The airbag indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the airbag indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the airbag indicator is illuminated for about six to eight seconds. The entire bulb test is a function of the ORC.
- **ORC Lamp-On Message** - Each time the cluster receives a lamp-on message from the ORC, the airbag indicator will be illuminated. The indicator remains illuminated for about twelve seconds or until the cluster receives a lamp-off message from the ORC, whichever is longer.
- **Communication Error** - If the cluster receives no airbag messages for ten consecutive message cycles, the airbag indicator is illuminated. The indicator remains illuminated until the cluster receives a single lamp-off message from the ORC.
- **Actuator Test** - Each time the cluster is put through the actuator test, the airbag indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry. The actuator test illumination of the airbag indicator is a function of the instrument cluster.

The ORC continually monitors the airbag system circuits and sensors to decide whether the system is in good operating condition. The ORC then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the ORC sends a lamp-on message after the bulb test, it indicates that the ORC has detected a system malfunction and/or that the airbags and seat belt tensioners may not deploy when required, or may deploy when not required. The ORC will store a Diagnostic Trouble Code (DTC) for any malfunction it detects. Each time the airbag indicator fails to illuminate due to an open or short in the cluster airbag indicator circuit, the cluster sends a message notifying the ORC of the condition, the instrument cluster and the ORC will each store a DTC, and the cluster will flash the seat belt indicator on and off as a backup to notify the vehicle operator. The Airbag indicator is serviced with the instrument cluster.



## BRAKE/PARK BRAKE INDICATOR

The brake indicator gives an indication to the vehicle operator when the parking brake is applied, when there are certain brake hydraulic system malfunctions as indicated by a low brake hydraulic fluid level condition, or when the brake fluid level switch is disconnected.

The brake indicator can also give an indication when certain faults are detected in the Antilock Brake System (ABS). This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming, electronic messages received by the cluster from the Controller Antilock Brake (CAB) over the Controller Area Network (CAN) data bus, and a hard wired input from the park brake switch.

The brake indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the brake indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the brake indicator is illuminated for about four seconds as a bulb test. The entire bulb test is a function of the CAB.
- **Brake Lamp-On Message** - Each time the cluster receives a lamp-on message from the CAB, the brake indicator will be illuminated. The CAB can also send brake lamp-on messages as feedback during ABS diagnostic procedures. The indicator remains illuminated until the cluster receives a lamp-off message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Park Brake Switch Input** - Each time the cluster detects ground on the park brake switch sense circuit (park brake switch closed = park brake applied or not fully released) while the ignition switch is in the On position, the brake indicator flashes on and off. The indicator continues to flash until the park brake switch sense input to the cluster is an open circuit (park brake switch open = park brake fully released), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the instrument cluster is put through the actuator test, the brake indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The park brake switch on the park brake pedal mechanism provides a hard wired ground input to the instrument cluster circuitry through the park brake switch sense circuit whenever the park brake is applied or not fully released. The CAB continually monitors the ABS system circuits and sensors, including the brake fluid level switch on the brake master cylinder reservoir, to decide whether the system is in good operating condition. The CAB then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the CAB sends a lamp-on message after the bulb test, it indicates that the CAB has detected a brake hydraulic system malfunction and/or that the ABS system has become inoperative. The CAB will store a Diagnostic Trouble Code (DTC) for any malfunction it detects. The Brake/Park Brake indicator is serviced with the instrument cluster.

## CHARGING INDICATOR

The charging indicator gives an indication to the vehicle operator when the electrical system voltage is too low or too high. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The charging indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the charging indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the charging indicator is illuminated by the instrument cluster for about two seconds as a bulb test.
- **Voltage Low Message** - Each time the cluster receives a message from the PCM indicating the electrical system voltage is low (less than about 11.5 volts is a charge fail condition), the charging indicator will be illuminated. The indicator remains illuminated until the cluster receives a message from the PCM indicating the



electrical system voltage is normal (greater than about 12.0 volts, but less than 16.0 volts), or until the ignition switch is turned to the Off position, whichever occurs first.

- **Voltage High Message** - Each time the cluster receives a message from the PCM indicating the electrical system voltage is high (greater than about 16.0 volts), the charging indicator will be illuminated. The indicator remains illuminated until the cluster receives a message from the PCM indicating the electrical system voltage is normal (less than about 15.5 volts, but greater than 11.5 volts), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the charging indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the electrical system voltage to control the generator output. The PCM then sends the proper system voltage messages to the instrument cluster. If the instrument cluster turns on the charging indicator due to a charge fail or voltage high condition, it may indicate that the charging system requires service. For further diagnosis of the charging indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The Charging indicator is serviced with the instrument cluster.

## ENGINE TEMPERATURE INDICATOR

The engine temperature indicator gives an indication to the vehicle operator when the engine temperature gauge reading reflects a condition requiring immediate attention.

This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The engine temperature indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the engine temperature indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the engine temperature indicator is illuminated for about two seconds as a bulb test. The entire bulb test is a function of the PCM.
- **Engine Temperature High Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is above about 122° C (252° F), the engine temperature indicator will be illuminated and a single chime tone is sounded. The indicator remains illuminated until the cluster receives a message from the PCM indicating that the engine coolant temperature is below about 119° C (246° F), or until the ignition switch is turned to the Off position, whichever occurs first. The chime tone feature will only repeat during the same ignition cycle if the engine temperature indicator is cycled off and then on again by the appropriate engine temperature messages from the PCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the engine temperature indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the engine coolant temperature sensor to determine the engine operating temperature. The PCM then sends the proper engine coolant temperature messages to the instrument cluster. For further diagnosis of the engine temperature indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the engine temperature indicator due to a high engine temperature gauge reading, it may indicate that the engine or the engine cooling system requires service. The Engine Temperature indicator is serviced with the instrument cluster.



## ELECTRONIC THROTTLE CONTROL INDICATOR

The Electronic Throttle Control (ETC) indicator gives an indication to the vehicle operator when the ETC system is faulty or inoperative. The ETC indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.



The ETC indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the ETC indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the ETC indicator is illuminated for about fifteen seconds. The entire bulb test is a function of the PCM.
- **ETC Lamp-On Message** - Each time the cluster receives a lamp-on message from the PCM, the ETC indicator will be illuminated. The indicator can be flashed on and off, or illuminated solid, as dictated by the PCM message. The indicator remains illuminated solid or continues to flash for about twelve seconds or until the cluster receives a lamp-off message from the PCM, whichever is longer. If the indicator is illuminated solid with the engine running the vehicle will usually remain drivable. If the indicator is flashing with the engine running the vehicle may require towing. A flashing indicator means the ETC system requires immediate service.
- **Actuator Test** - Each time the cluster is put through the actuator test, the ETC indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry. The actuator test illumination of the ETC indicator is a function of the PCM.

The PCM continually monitors the ETC system circuits and sensors to decide whether the system is in good operating condition. The PCM then sends the proper lamp-on or lamp-off messages to the instrument cluster. If the PCM sends a lamp-on message after the bulb test, it indicates that the PCM has detected an ETC system malfunction and/or that the ETC system is inoperative. The PCM will store a Diagnostic Trouble Code (DTC) for any malfunction it detects. Each time the ETC indicator fails to illuminate due to an open or short in the cluster ETC indicator circuit, the cluster sends a message notifying the PCM of the condition, the instrument cluster and the PCM will each store a DTC. The Electronic Throttle Control indicator is serviced with the instrument cluster.

## FOG LAMP INDICATOR

The fog lamp indicator gives an indication to the vehicle operator whenever the optional fog lamps are illuminated. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Front Control Module (FCM) (also known as the Integrated Power Module/IPM) over the Controller Area Network (CAN) data bus.



The fog lamp indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, the LED can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the fog lamp indicator for the following reasons:

- **Fog Lamp-On Message** - Each time the cluster receives a fog lamp-on message from the FCM indicating the fog lamp relay is energized, the fog lamp indicator will be illuminated. The indicator remains illuminated until the cluster receives a fog lamp-off message from the FCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the fog lamp indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster continually monitors a hard wired input from the headlamp switch to determine the selected fog lamp switch status. The instrument cluster then sends the proper fog lamp-on and lamp-off messages to the FCM over the CAN data bus. The FCM activates the fog lamp relay then sends the proper fog lamp indicator lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the fog lamp indicator or the

instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The Fog Lamp indicator is serviced with the instrument cluster.

## HIGH BEAM INDICATOR

The high beam indicator gives an indication to the vehicle operator whenever the headlamp high beams are illuminated. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and a hard wired multiplex input received by the cluster from the headlamp beam select switch circuitry of the multi-function switch on the washer/beam select switch mux circuit.



The high beam indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, the LED can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the high beam indicator for the following reasons:

- **High Beam Headlamps-On Input** - Each time the cluster detects a high beam headlamps-on input from the headlamp beam select switch circuitry of the multi-function switch on the washer/beam select switch mux circuit, the headlamp high beams and the high beam indicator will be illuminated. The headlamp high beams and the high beam indicator remain illuminated until the cluster receives a high beam headlamps-off input from the multi-function switch, or until the exterior lamp load shedding (battery saver) timed interval expires, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the high beam indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster continually monitors the headlamp switch and the multi-function switch to determine the proper headlamp low beam and high beam control. The instrument cluster then sends the proper low beam and high beam lamp-on and lamp-off messages to the Front Control Module (FCM) over the Controller Area Network (CAN) data bus and turns the high beam indicator on or off accordingly. For further diagnosis of the high beam indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The High Beam indicator is serviced with the instrument cluster.

## LOW FUEL INDICATOR

The low fuel indicator gives an indication to the vehicle operator when the level of fuel in the fuel tank becomes low. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and a hard wired input received by the cluster from the fuel level sending unit on the fuel pump module in the fuel tank.



The low fuel indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the low fuel indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the low fuel indicator is illuminated for about two seconds as a bulb test.
- **Less Than Ten Percent Tank Full Input** - The cluster provides a constant current source to the fuel level sending unit and monitors a return input on a fuel level sense circuit. The resistance through the fuel level sending unit increases as the fuel level falls and decreases as the fuel level rises causing changes in the sense input voltage. Each time the fuel level sense input to the cluster indicates the fuel tank is about ten percent full or less for ten consecutive seconds and the vehicle speed is zero, or for sixty consecutive seconds and the vehicle speed is greater than zero, the fuel gauge needle is moved to about the one-eighth graduation on the gauge scale, the low fuel indicator is illuminated, and a single chime tone is sounded. The low fuel indicator remains illuminated until the fuel level sense input indicates that the fuel tank is greater than about thirteen percent full for ten consecutive seconds and the vehicle speed is zero, or for sixty consecutive seconds and the vehicle speed is greater than zero, or until the ignition switch is turned to the Off position, which-



ever occurs first. The chime tone feature will only repeat during the same ignition cycle if the low fuel indicator is cycled off and then on again by the appropriate inputs from the fuel level sending unit.

- **Less Than Empty Stop Input** - Each time the cluster receives a fuel level sense input that indicates the fuel level in the fuel tank is less than the Empty gauge needle stop position, the gauge needle is moved to the low end of the gauge scale and the low fuel indicator is illuminated immediately. This input would indicate that the fuel level sense input to the cluster is a short circuit.
- **More Than Full Stop Input** - Each time the cluster receives a fuel level sense input that indicates the fuel level in the fuel tank is more than the Full gauge needle stop position, the gauge needle is moved to the low end of the gauge scale and the low fuel indicator is illuminated immediately. This input would indicate that the fuel level sense input to the cluster is an open circuit.
- **Actuator Test** - Each time the cluster is put through the actuator test, the low fuel indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster continually monitors the fuel tank sending unit to determine the level of fuel in the fuel tank. The cluster then sends the proper fuel level messages to other electronic modules in the vehicle over the Controller Area Network (CAN) data bus. For further diagnosis of the low fuel indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The Low Fuel indicator is serviced with the instrument cluster.

## LOW OIL PRESSURE INDICATOR

The low oil pressure indicator gives an indication to the vehicle operator when the engine oil pressure reading reflects a condition requiring immediate attention. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus.

The low oil pressure indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the low oil pressure indicator for the following reasons:

- **Engine Oil Pressure Low Message** - Each time the cluster receives a message from the PCM indicating the engine oil pressure is about 6.9 kPa (1 psi) or lower, the low oil pressure indicator will be illuminated. The indicator remains illuminated until the cluster receives a message from the PCM indicating that the engine oil pressure is above about 6.9 kPa (1 psi), or until the ignition switch is turned to the Off position, whichever occurs first. The cluster will only turn the indicator on in response to an engine oil pressure low message if the engine speed is greater than zero.
- **Actuator Test** - Each time the cluster is put through the actuator test, the low oil pressure indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the engine oil pressure sensor to determine the engine oil pressure. The PCM then sends the proper engine oil pressure messages to the instrument cluster. For further diagnosis of the low oil pressure indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The Low Oil Pressure indicator is serviced with the instrument cluster.

## MALFUNCTION INDICATOR LAMP

The Malfunction Indicator Lamp (MIL) gives an indication to the vehicle operator when the Powertrain Control Module (PCM) has recorded a Diagnostic Trouble Code (DTC) for an On-Board Diagnostics II (OBDII) emissions-related circuit or component malfunction. The MIL is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the PCM over the Controller Area Network (CAN) data bus.



The MIL Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the MIL for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the indicator is illuminated for about fifteen seconds as a bulb test. The entire bulb test is a function of the PCM.
- **MIL Lamp-On Message** - Each time the cluster receives a MIL lamp-on message from the PCM, the indicator will be illuminated. The indicator can be flashed on and off, or illuminated solid, as dictated by the PCM message. For some DTC's, if a problem does not recur, the PCM will send a lamp-off message automatically. Other DTC's may require that a fault be repaired and the PCM be reset before a lamp-off message will be sent. For more information on the PCM, and the DTC set and reset parameters, (Refer to 25 - EMISSIONS CONTROL - OPERATION).
- **Communication Error** - If the cluster receives no messages from the PCM for ten consecutive message cycles, the MIL is illuminated by the instrument cluster to indicate a loss of bus communication. The indicator remains controlled and illuminated by the cluster until a valid message is received from the PCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the MIL indicator will be turned on during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the fuel and emissions system circuits and sensors to decide whether the system is in good operating condition. The PCM then sends the proper lamp-on or lamp-off messages to the instrument cluster. For further diagnosis of the MIL or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the MIL after the bulb test, it may indicate that a malfunction has occurred and that the fuel and emissions systems may require service. The Malfunction Indicator Lamp is serviced with the instrument cluster.

## SEAT BELT INDICATOR

The seat belt indicator gives an indication to the vehicle operator of the status of the driver side front seat belt. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and a hard wired input from the seat belt switch in the driver side front seat belt retractor through the seat belt indicator driver circuit.



The seat belt indicator also includes a programmable enhanced seat belt reminder or "beltminder" feature that is enabled when the vehicle is shipped from the factory. This beltreminder feature can be disabled and enabled by the customer using a specific programming event sequence, or by the dealer using a diagnostic scan tool.

The seat belt indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the seat belt indicator for the following reasons:

- **Seat Belt Reminder Function** - Each time the cluster receives a battery current input on the fused ignition switch output (run-start) circuit, the indicator will be illuminated as a seat belt reminder for about six seconds, or until the ignition switch is turned to the Off position, whichever occurs first. This reminder function will occur regardless of the status of the seat belt switch input to the cluster.
- **Driver Side Front Seat Belt Not Buckled - Beltminder Active** - Following the seat belt reminder function, each time the cluster detects an open circuit on the seat belt indicator driver circuit (seat belt switch open = seat belt unbuckled) with the ignition switch in the Start or On positions, the indicator will be illuminated. In addition, if the driver side front seat belt remains unbuckled about sixty seconds after the conclusion of the seat belt reminder function with the vehicle speed greater than about 8 kilometers-per-hour (5 miles-per-hour), the seat belt indicator will begin to cycle between flashing on and off for three seconds, then lighting solid for two seconds. The seat belt indicator will continue to cycle between flashing and solid illumination for thirteen complete cycles, until the seat belt indicator driver input to the cluster is closed to ground (seat belt switch closed = seat belt buckled), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Driver Side Front Seat Belt Not Buckled - Beltminder Inactive** - Following the seat belt reminder function, each time the cluster detects an open circuit on the seat belt indicator driver circuit (seat belt switch open = seat belt unbuckled) with the ignition switch in the Start or On positions, the indicator will be illuminated. The

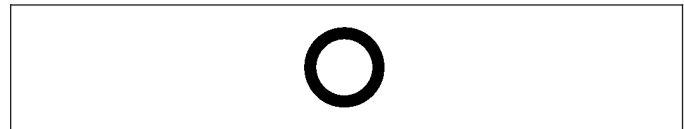
seat belt indicator remains illuminated until the seat belt indicator driver input to the cluster is closed to ground (seat belt switch closed = seat belt buckled), or until the ignition switch is turned to the Off position, whichever occurs first.

- **Airbag Indicator Backup** - If the instrument cluster detects a fault in the airbag indicator circuit it will send a message indicating the fault to the Occupant Restraint Controller (ORC), then flash the seat belt indicator on and off. The cluster will continue to flash the seat belt indicator until the airbag indicator circuit fault is resolved, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the seat belt indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The seat belt switch is connected in series between ground and the seat belt indicator driver input to the instrument cluster. The seat belt switch input to the instrument cluster circuitry may be diagnosed using conventional diagnostic tools and methods. Refer to the appropriate wiring information. The Seat Belt indicator is serviced with the instrument cluster.

## SECURITY INDICATOR

The security indicator gives an indication to the vehicle operator when the Vehicle Theft Security System (VTSS) is arming or is armed. On models equipped with the Sentry Key Immobilizer System (SKIS), the security indicator also gives an indication to the vehicle operator of the status of the SKIS. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming, hard wired inputs to the cluster from the various security system components, electronic messages received by the cluster from the Sentry Key REMote Entry Module (SKREEM) over the Controller Area Network (CAN) data bus.



The security indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, the LED can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the security indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the security indicator illuminates for about two seconds as a bulb test. The entire bulb test is a function of the SKREEM.
- **VTSS Indication** - During the sixteen second VTSS arming function, the cluster will flash the security indicator on and off repeatedly at a steady, fast rate to indicate that the VTSS is in the process of arming. Following successful VTSS arming, the cluster flashes the security indicator on and off continuously at a slower rate to indicate that the VTSS is armed. The security indicator continues flashing at the slower rate until the VTSS is disarmed or triggered. If the VTSS has alarmed and rearmed, the cluster will flash the security indicator at a steady, slow rate for about thirty seconds after the VTSS is disarmed.
- **SKIS Lamp-On Message** - Each time the cluster receives a SKIS lamp-on message from the SKREEM, the security indicator will be illuminated. The indicator can be flashed on and off, or illuminated solid, as dictated by the SKREEM message. The indicator remains illuminated solid or continues to flash until the cluster receives a SKIS lamp-off message from the SKREEM, or until the ignition switch is turned to the Off position, whichever occurs first. For more information on the SKIS and the security indicator control parameters, (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/SENTRY KEY IMMOBILIZER SYSTEM - OPERATION).
- **Communication Error** - If the cluster receives no SKIS lamp-on or lamp-off messages from the SKREEM for ten consecutive message cycles, the security indicator is illuminated by the instrument cluster. The indicator remains controlled and illuminated by the cluster until a valid SKIS lamp-on or lamp-off message is received from the SKREEM.
- **Actuator Test** - Each time the instrument cluster is put through the actuator test, the security indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster circuitry controls the security indicator whenever the ignition switch is in the Off position and the VTSS is arming, armed, or alarming. Whenever the ignition switch is in the On or Start positions, the SKREEM performs a self-test to decide whether the SKIS is in good operating condition and whether a valid key is present in the ignition lock cylinder. The SKREEM then sends the proper lamp-on or lamp-off messages to the instrument cluster. For further diagnosis of the security indicator or the instrument cluster circuitry that controls the indicator,

(Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster flashes the security indicator upon ignition On, or turns on the security indicator solid after the bulb test, it indicates that a SKIS malfunction has occurred or that the SKIS is inoperative. The Security indicator is serviced with the instrument cluster.

### TRACTION CONTROL INDICATOR

The traction control indicator gives an indication to the vehicle operator when the electronic Traction Control System (TCS) has been activated. This indicator is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Controller Antilock Brake (CAB) over the Controller Area Network (CAN) data bus.



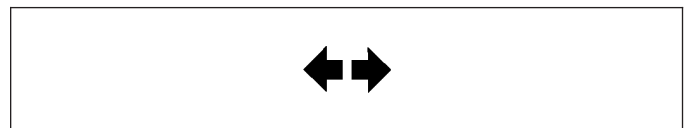
The traction control indicator is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The indicator only illuminates when it is switched to ground by the instrument cluster circuitry. The instrument cluster will turn on the traction control indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the traction control indicator is illuminated for about four seconds as a bulb test. The entire bulb test is a function of the CAB.
- **Traction Control Lamp-On Message** - Each time the cluster receives a traction control lamp-on message from the CAB indicating that the TCS has been activated, the traction control indicator will be illuminated. The indicator remains illuminated until the cluster receives a traction control lamp-off message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the traction control indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The CAB continually monitors the traction control switch to determine the proper outputs to the components of the Antilock Brake System (ABS). The CAB then sends the proper traction control lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the traction control indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The Traction Control indicator is serviced with the instrument cluster.

### TURN SIGNAL INDICATORS

The turn signal indicators give an indication to the vehicle operator that the turn signal (left or right indicator flashing) or hazard warning (both left and right indicators flashing) have been selected and are operating. These indicators are controlled by transistors on



the instrument cluster electronic circuit board based upon the cluster programming, a hard wired multiplex input received by the cluster from the turn signal and hazard warning switch circuitry of the multi-function switch on the turn/hazard switch mux circuit, and electronic messages received from the Front Control Module (FCM) (also known as the Integrated Power Module/IPM) over the Controller Area Network (CAN) data bus.

Each turn signal indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, each LED can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the turn signal indicators for the following reasons:

- **Turn Signal-On Input** - Each time the cluster detects a turn signal-on input from the turn signal switch circuitry of the multi-function switch on the turn/hazard switch mux circuit, it sends the appropriate electronic turn signal switch status messages to the FCM over the CAN data bus. The FCM responds to these messages by controlling a battery voltage output and the flash rate for either the right or left turn signal lamps. The FCM also sends the appropriate electronic messages back to the EMIC to control the illumination and flash rate of the right or left turn signal indicators, as well as to control the click rate of an electromechanical relay soldered onto the EMIC electronic circuit board that emulates the sound emitted by a conventional turn signal flasher.



The turn signals and the turn signal indicators continue to flash on and off until the cluster receives a turn signal-off input from the multi-function switch, or until the ignition switch is turned to the Off position, whichever occurs first.

- **Hazard Warning-On Input** - Each time the cluster detects a hazard warning-on input from the hazard warning switch circuitry of the multi-function switch on the turn/hazard switch mux circuit, it sends the appropriate electronic hazard switch status messages to the FCM over the CAN data bus. The FCM responds to these messages by controlling a battery voltage output and the flash rate for each of the right and left turn signal lamps. The FCM also sends the appropriate electronic messages back to the EMIC to control the illumination and flash rate of the right and left turn signal indicators, as well as to control the click rate of an electromechanical relay soldered onto the EMIC electronic circuit board that emulates the sound emitted by a conventional hazard warning flasher. The turn signals and the turn signal indicators continue to flash on and off until the cluster receives a hazard warning-off input from the multi-function switch.
- **Lamp Out Mode** - The instrument cluster also sends electronic turn signal on and off messages to the FCM over the CAN data bus, and the FCM flashes the appropriate exterior turn signal lamps. If the FCM detects an inoperative turn signal lamp or circuit, it increases the flash rate for the remaining operative turn signals and sends an electronic message back to the instrument cluster. The instrument cluster then increases the flash rate of the turn signal indicator(s) and the clicking rate of the electromechanical relay to provide an indication of the problem to the vehicle operator.
- **Actuator Test** - Each time the cluster is put through the actuator test, the turn signal indicators will be turned on, then off again during the bulb check portion of the test to confirm the functionality of each LED and the cluster control circuitry.

The instrument cluster continually monitors the multi-function switch and electronic messages from the FCM to determine the proper turn signal and hazard warning system control. For further diagnosis of the turn signal indicators or the instrument cluster circuitry that controls the indicators, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The Turn Signal indicators are serviced with the instrument cluster.

## CLUSTER ILLUMINATION

The EMIC has a single electro-luminescent lamp that provides cluster back lighting whenever the exterior lighting is turned On. The illumination intensity of this lamp is adjusted when the interior lighting thumbwheel on the headlamp switch is rotated (down to dim, up to brighten) to one of six available minor detent positions. The EMIC monitors a resistor multiplexed input from the headlamp switch on a dimmer input circuit. In response to that input, the EMIC electronic circuitry converts a fused 12-volt input it receives on a hard wired panel lamps dimmer switch signal circuit into a 12-volt Pulse Width Modulated (PWM) output.

The EMIC uses this PWM output to control the illumination intensity of the electro-luminescent cluster illumination lamp and the VFD units on the EMIC circuit board, then provides a synchronized PWM output on various hard wired fused panel lamps dimmer switch signal circuits to control and synchronize the illumination intensity of other incandescent illumination lamps in the vehicle. The EMIC also transmits electronic dimming level messages over the CAN data bus to other electronic modules in the vehicle to control and synchronize the illumination intensity of their VFD units to that of the EMIC VFD units.

In addition, the thumbwheel on the headlamp switch has a Parade Mode position to provide a parade or funeral mode. The EMIC monitors the request for this mode from the headlamp switch, then transmits an electronic dimming level message to illuminate all VFD units in the vehicle at full (daytime) intensity for easier visibility when driving in daylight with the exterior lighting turned On.

The electro-luminescent lamp unit consists of layers of phosphor, carbon, indium tin oxide, and dielectric applied by a silk-screen process between two polyester membranes and includes a short pigtail wire and connector. The lamp pigtail wire is connected to a connector receptacle on the EMIC circuit board. The EMIC powers this lamp with an Alternating Current (AC) rated at 80 volts rms (root mean squared) and 415 Hertz produced by a transformer on the circuit board, which excites the phosphor particles causing them to luminesce.

## ELECTRONIC VEHICLE INFORMATION CENTER

The following Modes allow the driver to access and display the driver- interactive features:

### TRIP MODE

Provides a choice of units displayed in English or metric. The following information can be displayed at the top of the screen: Average MPG, distance to empty (DTE), Trip A and Trip B odometers, and elapsed time. The odometer

is displayed at the bottom of the screen. If warnings exist, they will replace the odometer in the display. The driver can scroll to view multiple warnings.

### COMPASS, TEMPERATURE AND AUDIO MODE

Compass heading and outside temperature are displayed at the top of the screen. On the lower half of the screen the audio mode is displayed along with the odometer.

### TELEPHONE MODE

Provides the following information and features for the optional hands-free communications system:

- Phone status: idle, voice mail, roaming, battery strength and signal strength in increments of 20 percent.
- Call status: Incoming call, connecting, connected, air time in minutes and seconds, call ended, busy, call failed, roaming and no phone connection.
- Caller ID phone number display.

### NAVIGATION MODE

Displays Turn-by-Turn directions that appear in the display as the vehicle approaches a designated turn within a programmed route.

### PERSONAL SETTINGS MODE

Allows the driver to set and recall features when the transmission is in Park.

### SYSTEM STATUS MODE

Displays warnings and user interaction messages. Initial warnings will be displayed full-screen for three seconds, then override the odometer and show text warnings on the bottom line of the display. Critical text warnings will be displayed until the failure is corrected. Non-critical text warnings will be displayed for 60 seconds. The driver can scroll to view multiple messages. A single chime sounds for all warnings.

For a more detailed operation of the EVIC (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - OPERATION).

## DIAGNOSIS AND TESTING

### INSTRUMENT CLUSTER

**WARNING:** To avoid personal injury or death, on vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment, personal injury or death.

If all of the instrument cluster gauges and indicators are inoperative, be certain to check the instrument cluster fused B(+) fuse and the instrument cluster fused B(+) and ground circuits for shorts or opens. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

If an individual hard wired gauge or indicator is inoperative, refer to the diagnosis and testing service information for that specific gauge or indicator. If an individual Controller Area Network (CAN) data bus message-controlled gauge or indicator is inoperative, perform the Actuator Test as follows:

**CAUTION:** Instrument clusters used in this model automatically configure themselves for compatibility with the features and optional equipment in the vehicle in which they are initially installed. The instrument cluster is programmed to do this by embedding the Vehicle Identification Number (VIN) and other information critical to proper cluster operation into electronic memory. This embedded information is learned through electronic messages received from other electronic modules in the vehicle over the Controller Area Network (CAN) data bus, and through certain hard wired inputs received when the cluster is connected to the vehicle electrically. Once configured, the instrument cluster memory may be irreparably damaged and certain irreversible configuration errors may occur if the cluster is connected electrically to another vehicle; or, if an electronic module from another vehicle is connected that provides data to the instrument cluster (including odometer values) that conflicts with that which was previously learned and stored. Therefore, the practice of exchanging (swapping) instrument clusters and other electronic modules in this vehicle with those removed from another vehicle must always be avoided. Failure to observe this caution may result in instrument cluster damage, which is not reimbursable under the terms of the product warranty. Service replacement instrument clusters are provided with the correct VIN, and the certified odometer and engine hours values embedded into cluster memory, but will otherwise be automatically configured for compatibility with the features and optional equipment in the vehicle in which they are initially installed.

**Note:** Certain indicators in this instrument cluster are automatically configured. This feature allows those indicators to be activated or deactivated for compatibility with certain optional equipment. If the problem being diagnosed involves improper illumination of the cruise indicator, the electronic throttle control indicator, the tow/haul indicator, the service four-wheel drive indicator, the four-wheel drive low indicator, the four-wheel drive lock indicator, the transmission overtemp indicator, the security indicator or the gear selector indicator, disconnect and isolate the battery negative cable. After about five minutes, reconnect the battery negative cable and turn the ignition switch to the On position. The instrument cluster should automatically relearn the equipment in the vehicle and properly configure the configurable indicators accordingly.

## ACTUATOR TEST

The instrument cluster actuator test will put the instrument cluster into its self-diagnostic mode. In this mode the instrument cluster can perform a self-diagnostic test that will confirm that the instrument cluster circuitry, the gauges, and the indicators are capable of operating as designed. During the actuator test the instrument cluster circuitry will position each of the gauge needles at various calibration points and illuminate all of the segments in the Vacuum Fluorescent Display (VFD) units.

Successful completion of the actuator test will confirm that the instrument cluster is operational. However, there may still be a problem with the CAN data bus, the Powertrain Control Module (PCM), the Front Control Module (FCM), the Transmission Control Module (TCM), the Occupant Restraint Controller (ORC), the Controller Anti-lock Brake (CAB), or the hard wired inputs to one of these electronic control modules. Use a diagnostic scan tool to diagnose these components. Refer to the appropriate diagnostic information.

1. Begin the test with the ignition switch in the Off position.
2. Depress the odometer/trip odometer switch button.
3. While still holding the odometer/trip odometer switch button depressed, turn the ignition switch to the On position, but do not start the engine.
4. Release the odometer/trip odometer switch button.
5. The instrument cluster will simultaneously begin to illuminate all of the operational segments in both VFD units, and perform a bulb check of each operational LED indicator. The VFD segments and LED indicators remain illuminated as each gauge needle is swept to several calibration points and back. If a VFD segment or an LED indicator fails to illuminate, or if a gauge needle fails to sweep through the calibration points and back during this test, the instrument cluster must be replaced.
6. The actuator test is now completed. The instrument cluster will automatically exit the self-diagnostic mode and return to normal operation at the completion of the test. The actuator test will be aborted if the ignition switch is turned to the Off position, or if a vehicle speed message indicating that the vehicle is moving is received from the PCM over the CAN data bus during the test.
7. Go back to Step 1 to repeat the test, if necessary.

## STANDARD PROCEDURE

### ENHANCED SEATBELT REMINDER PROGRAMMING

The seatbelt indicator also includes a programmable enhanced seatbelt reminder or "beltminder" feature that is enabled when the vehicle is shipped from the factory. This beltreminder feature provides extended and modified visual seatbelt indicator and audible chime warning responses to an unbuckled driver side front seat belt. The beltreminder feature may be disabled or enabled by the customer using the programming sequence that follows, or by the dealer using a diagnostic scan tool. The following sequence of events must occur within sixty (60) seconds of the ignition switch being placed in the On position in order for the programming to be completed successfully.

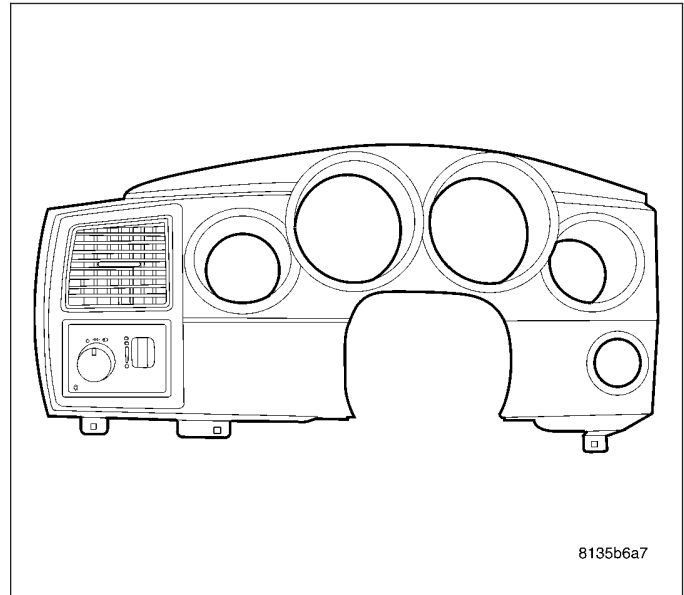
1. With the ignition switch in any position except On or Start, buckle the driver side front seat belt.
2. Turn the ignition switch to the On position and wait for the seatbelt indicator reminder function to conclude (about six seconds).
3. Unbuckle and buckle the driver side front seat belt three or more times, ending with the belt buckled.
4. Turn the ignition switch to any position except On or Start to toggle the beltreminder feature from its current setting (from active to inactive, or from inactive to active). A single chime tone will provide an audible confirmation that the programming sequence has been successfully completed.

### REMOVAL

1. Disconnect and isolate the battery negative cable.
- 2.

**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

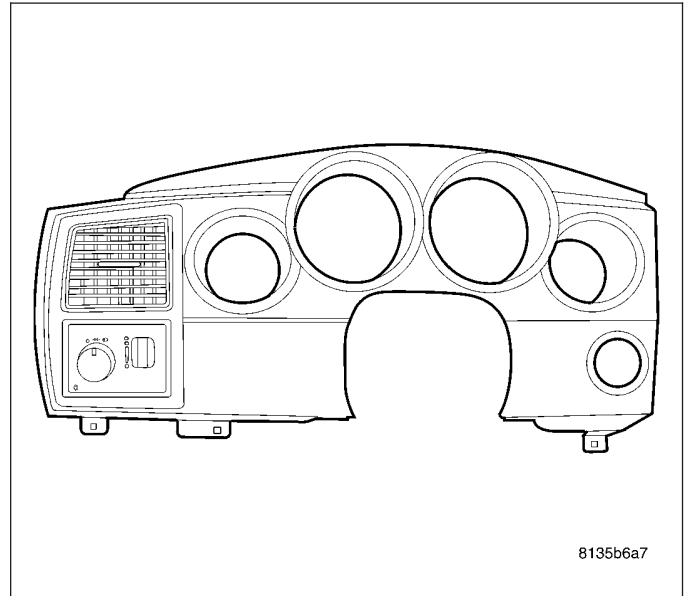
3. Remove the instrument cluster bezel (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL).
4. Remove the four cluster retaining screws.
5. Disconnect the cluster electrical connectors.
6. Remove cluster from instrument panel.





## INSTALLATION

1. Position cluster into instrument panel opening.
2. Connect the cluster electrical connectors.
3. Install the four cluster retaining screws.
4. Install the cluster bezel (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - INSTALLATION).
5. Connect the battery negative cable.



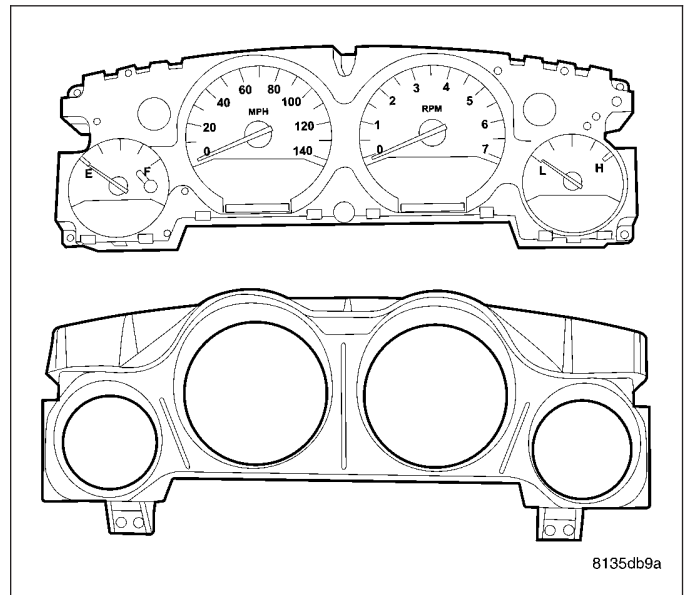
## CLUSTER LENS

### REMOVAL

1. Disconnect and isolate the battery negative cable.
- 2.

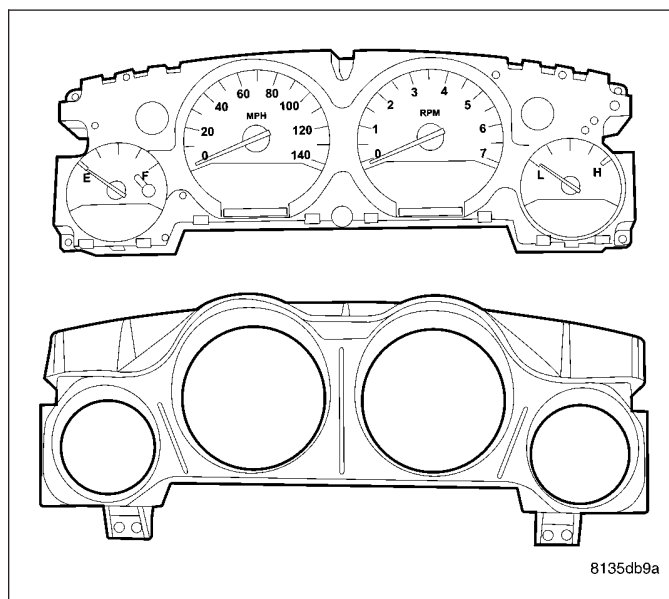
**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

3. Remove the instrument cluster bezel (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL).
4. Remove the cluster lens retaining screws.
5. Separate the cluster lens from the cluster and remove from Instrument panel.



## INSTALLATION

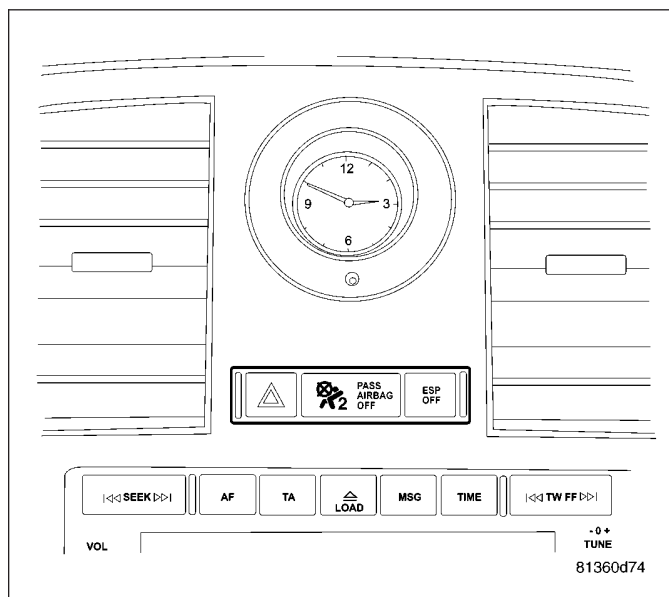
1. Place cluster lens into position on cluster.
2. Install the cluster lens screws.
3. Install the cluster bezel (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - INSTALLATION).
4. Connect the battery negative cable.



## INSTRUMENT PANEL SWITCH POD

### DESCRIPTION

The Instrument Panel Switch Pod is located in the instrument panel center bezel just above the radio, and between the A/C outlet ducts. The switch pod includes push button controls for the Hazard Flashers, Electronic Stability Program (ESP) or Anti-Slip Regulation (ASR) Off switch, and on Dodge models Rear Wiper/Washer. Also the Passenger Airbag Disabled (PAD) Indicator is located within the switch pod. The switch pod is a single unit with one wire connector and two mounting tabs and cannot be taken apart or serviced. If one or more of the switches, or illumination is inoperative, the entire pod must be replaced.



There are different configurations depending on the model and country.

## DOMESTIC SEDAN

The sedan for sale in North America will have a Hazard Switch, Passenger Airbag Disabled (PAD) Indicator, and Electronic Stability Program (ESP) Off Switch.



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## DOMESTIC WAGON

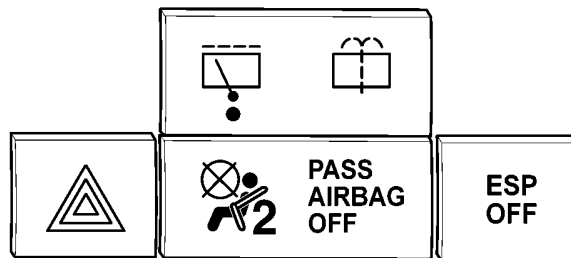
The wagon for sale in North America will have Rear Wipe/Wash Switch, Hazard Switch, Passenger Airbag Disabled (PAD) Indicator, and Electronic Stability Program (ESP) Off Switch.



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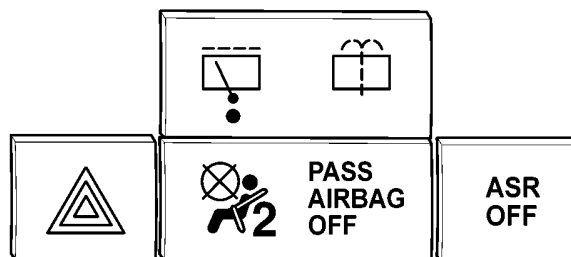
## EXPORT WAGON

The wagon for sale outside North America will have Rear Wipe/Wash Switch, Hazard Switch, Passenger Airbag Disabled (PAD) Indicator, and Electronic Stability Program (ESP) Off Switch.



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Export wagons may also have Rear Wipe/Wash Switch, Hazard Switch, Passenger Airbag Disabled (PAD) Indicator, and Anti-Slip Regulation (ASR) Off Switch.



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## OPERATION

### LIFTGATE WIPER AND WASHER SWITCH

A liftgate wiper and washer rocker switch provides intermittent wiper operation as well as rear washer operation. Pressing one side of the rocker switch knob actuates the washer system, while pressing the other side of the rocker switch knob turns the intermittent rear wiper ON and OFF. When the rear intermittent wiper is ON, an indicator in the switch knob is illuminated. Refer to Wipers/Washers for description and operation of the Rear Wiper/Washer Switch.

## HAZARD WARNING SWITCH

A latching push-button hazard-warning switch is placed in the instrument panel switch pod. This is an ergonomic place for the switch where it can be conveniently reached. Refer to Lamps/Lighting - Exterior for description and operation of the hazard warning switch.

## PASSENGER AIRBAG DISABLED (PAD) INDICATOR

The indicator is placed in the instrument panel switch pod. This is an ergonomic place for the indicator where it can be conveniently seen by all interior occupants. Refer to Restraints for description and operation of the Passenger Airbag Disabled (PAD) Indicator.

## ELECTRONIC STABILITY PROGRAM (ESP) OFF SWITCH

A momentary contact, push-button ESP switch is placed in the instrument panel switch pod. This is an ergonomic place for the switch where it can be conveniently reached. Refer to Brakes for description and operation of the ESP system and ESP off switch.

## ANTI-SLIP REGULATION (ASR) OFF SWITCH

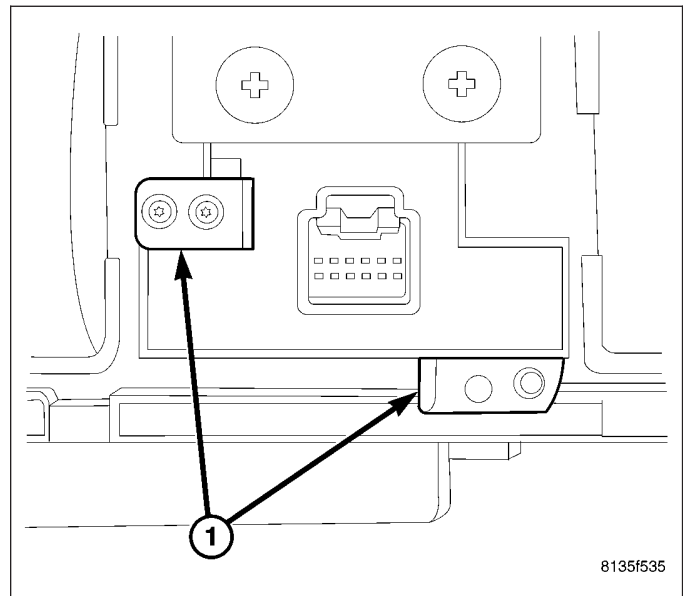
A momentary contact, push-button ASR switch is placed in the instrument panel switch pod. This is an ergonomic place for the switch where it can be conveniently reached. Refer to Brakes for description and operation of the ASR system and ASR off switch.

## REMOVAL

1. Disconnect and isolate the battery negative cable.
- 2.

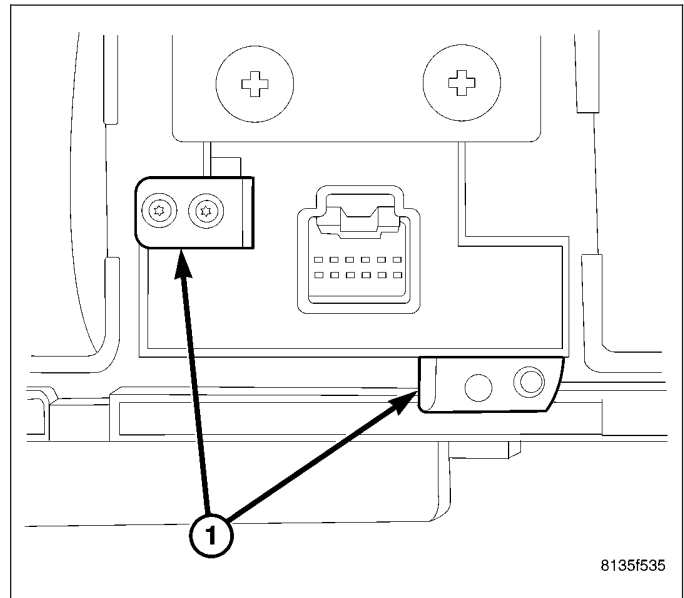
**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

3. Remove the instrument panel center bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).
4. Remove the two screws (1) from the rear of the switch pod.
5. Separate switch from center bezel.



## INSTALLATION

1. Place the switch pod in the bezel opening and install the two screws (1).
2. Install the instrument panel center bezel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).
3. Connect the battery negative cable.



# LAMPS

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## LAMPS/LIGHTING - EXTERIOR - ELECTRICAL DIAGNOSTICS

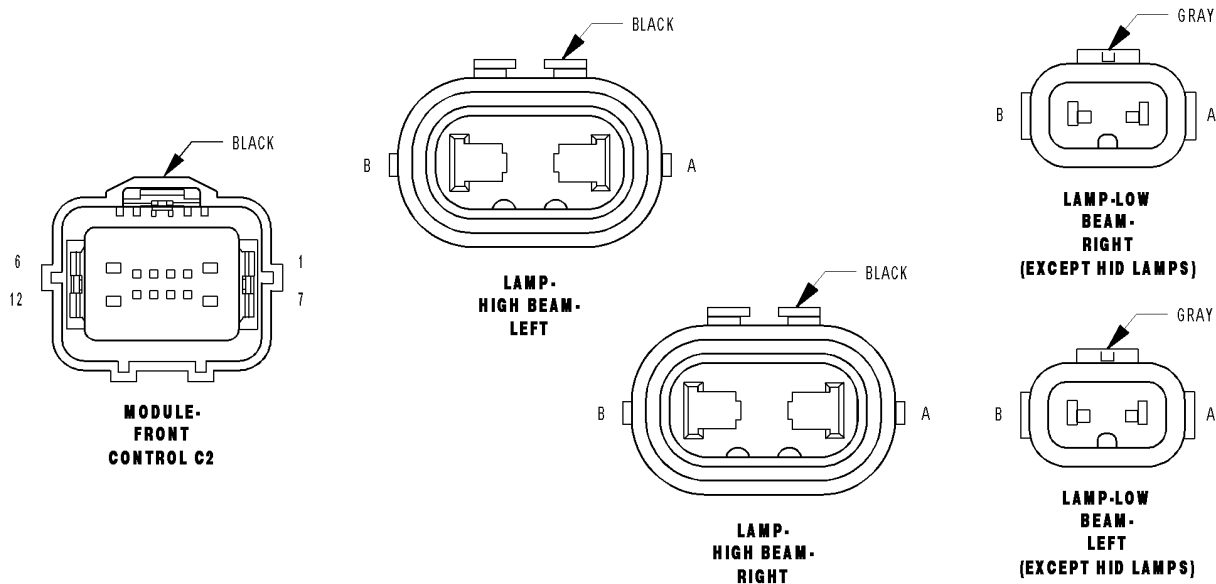
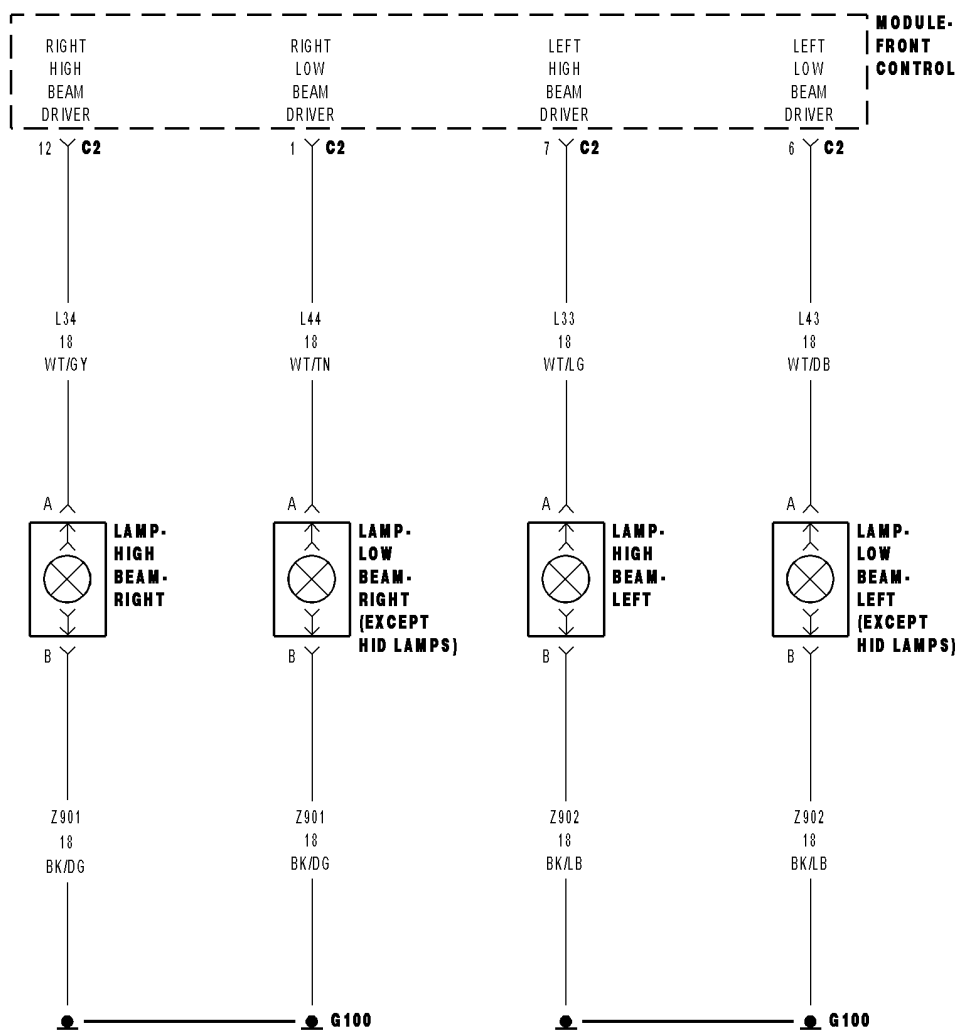
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## **LAMPS/LIGHTING - EXTERIOR - ELECTRICAL DIAGNOSTICS**

### **DIAGNOSIS AND TESTING**

## B162B-LEFT LOW BEAM CONTROL CIRCUIT LOW





**B162B-LEFT LOW BEAM CONTROL CIRCUIT LOW (CONTINUED)**

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the FCM detects a LOW condition.

Possible Causes
(L43) LEFT LOW BEAM CONTROL CIRCUIT FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

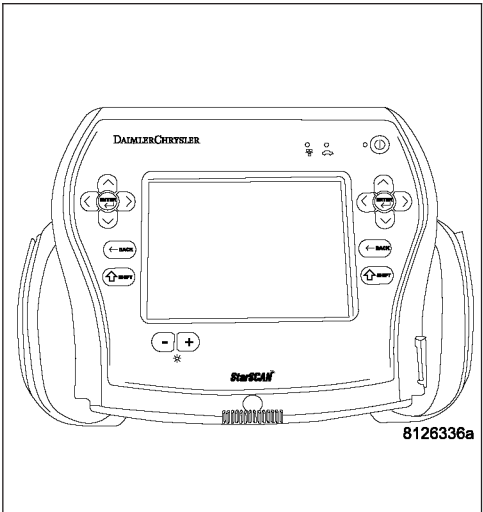
**Diagnostic Test**

**1. INTERMITTENT CONDITION**

- Turn the ignition on.
- With the Scan Tool, clear all FCM DTC's.
- Turn the Headlamps on.
- With the Scan Tool read the DTC information.

**Does the Scan Tool read: B162B-LEFT LOW BEAM CONTROL CIRCUIT LOW?**

- Yes**    >> Go To 2
- No**    >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST - VER 1.



**B162B-LEFT LOW BEAM CONTROL CIRCUIT LOW (CONTINUED)****2. (L43) LEFT LOW BEAM CONTROL CIRCUIT**

Turn the ignition off.

Disconnect the FCM C2 harness connector.

Measure the resistance between ground and the (L43) Left Low Beam Control circuit.

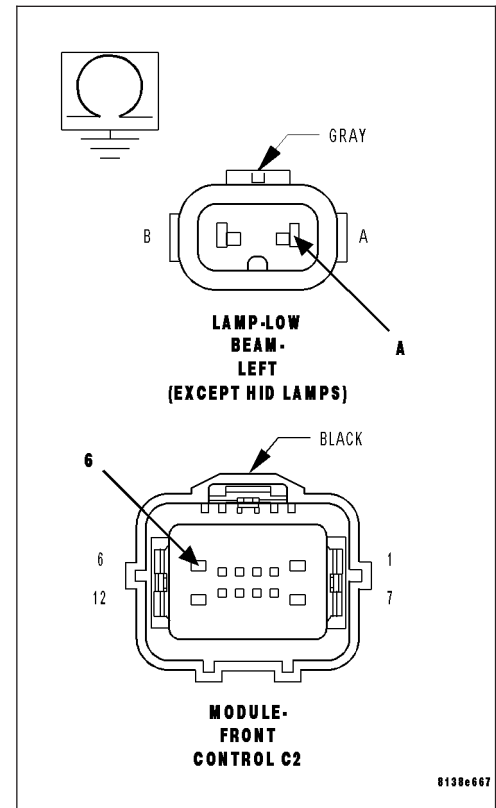
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Front Control Module (FCM) in accordance with the service information.

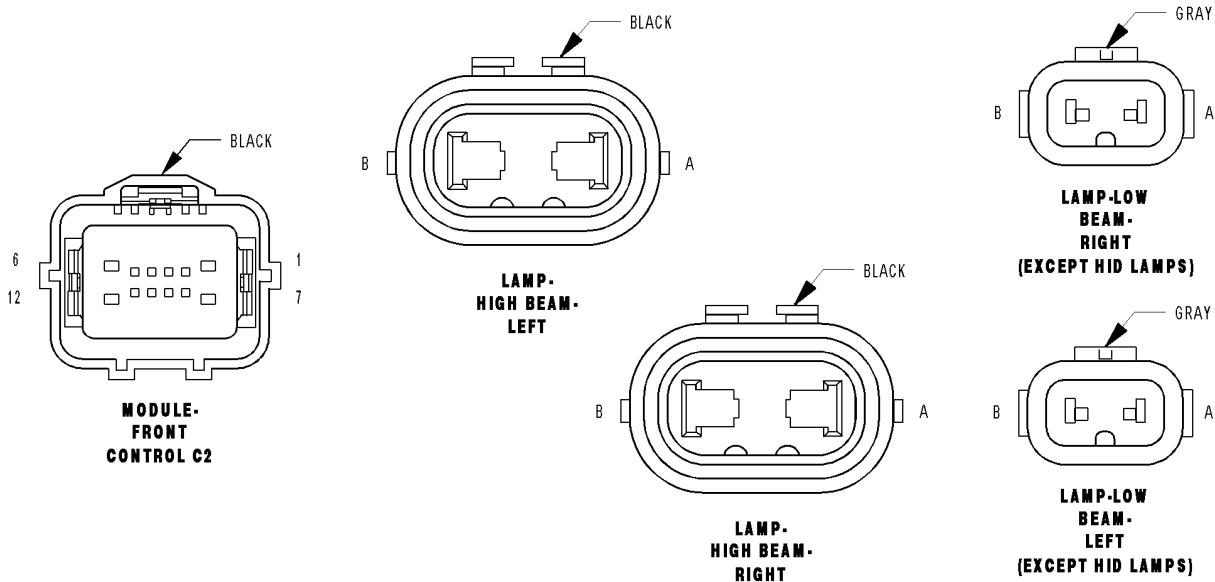
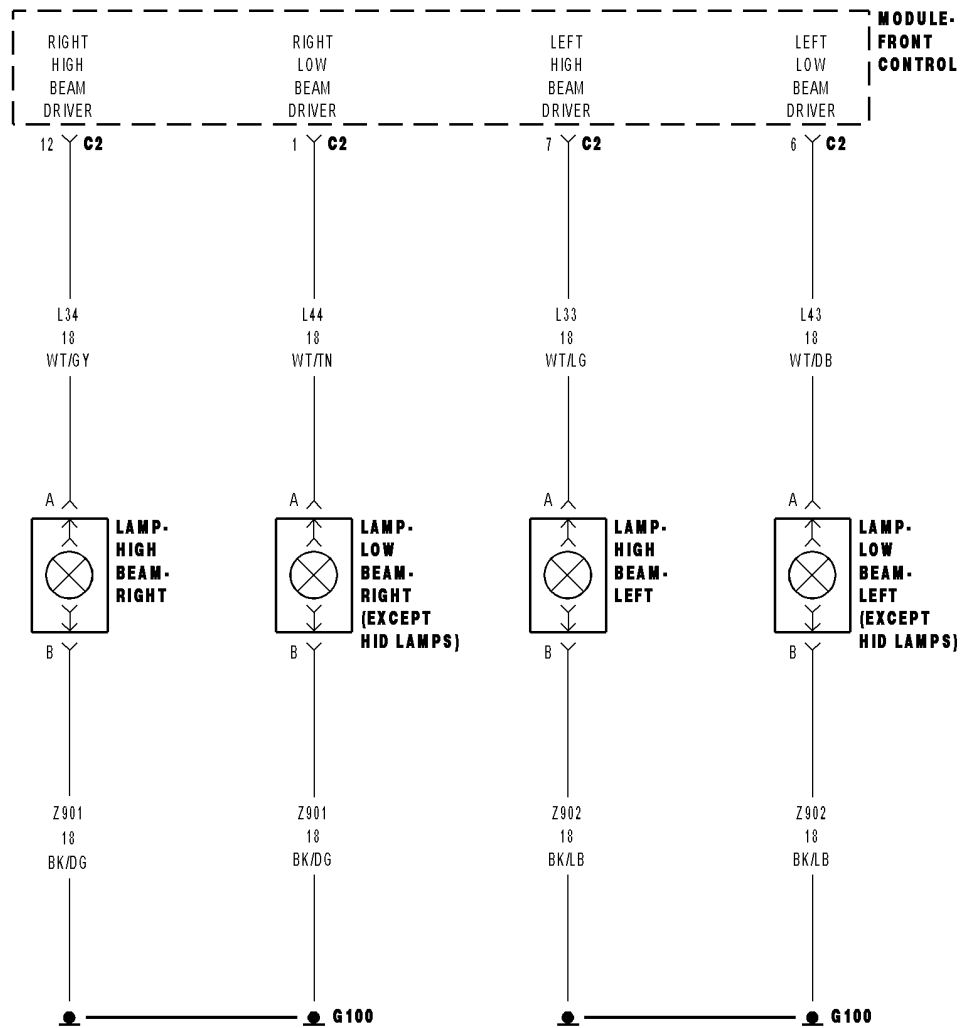
Perform the BODY VERIFICATION TEST - VER 1.

**No** >> Repair the (L43) Left Low Beam Control circuit for a short to ground condition.

Perform the BODY VERIFICATION TEST - VER 1.



## B162F-RIGHT LOW BEAM CONTROL CIRCUIT LOW



**B162F-RIGHT LOW BEAM CONTROL CIRCUIT LOW (CONTINUED)**

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the FCM detects a LOW condition.

Possible Causes
(L44) RIGHT LOW BEAM CONTROL CIRCUIT FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Headlamps on.

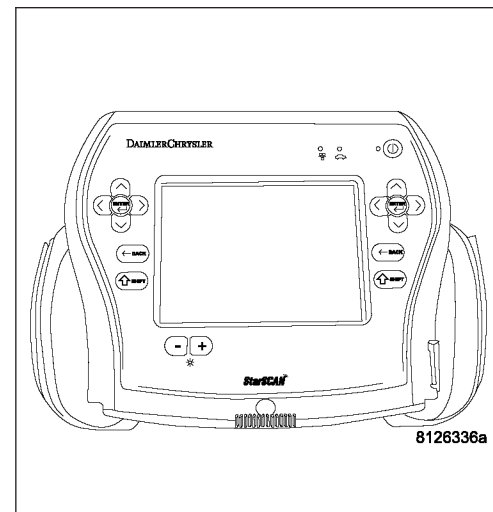
With the Scan Tool read the DTC information.

**Does the Scan Tool read: B162F-RIGHT LOW BEAM CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1.



**B162F-RIGHT LOW BEAM CONTROL CIRCUIT LOW (CONTINUED)****2. (L44) RIGHT LOW BEAM CONTROL CIRCUIT**

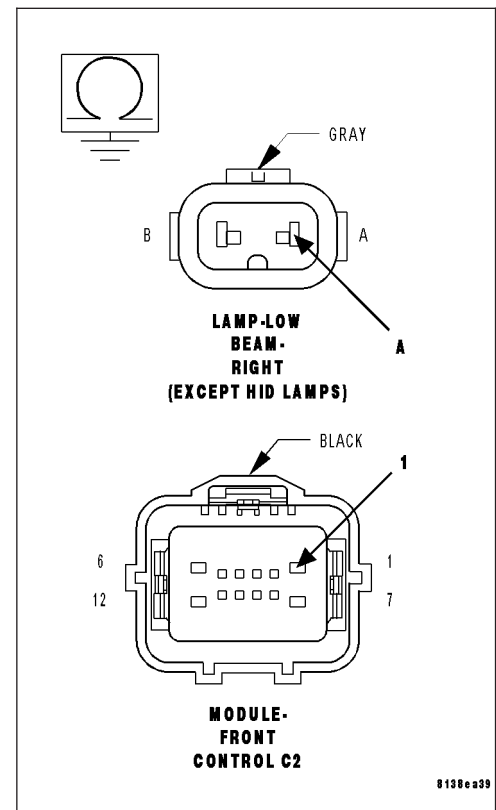
Turn the ignition off.

Disconnect the FCM C2 harness connector.

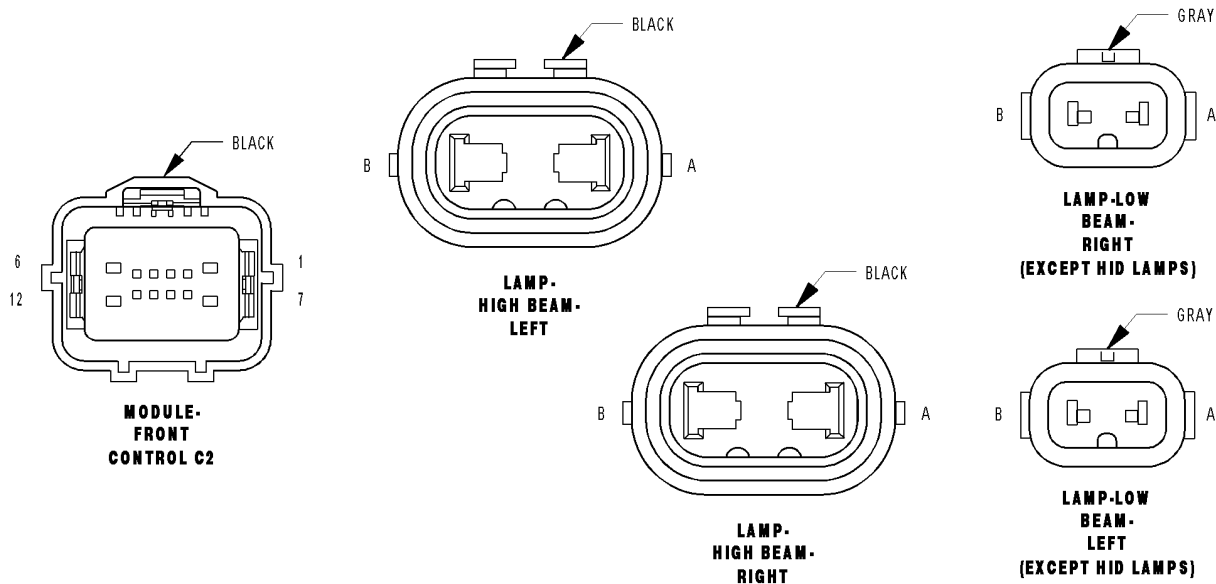
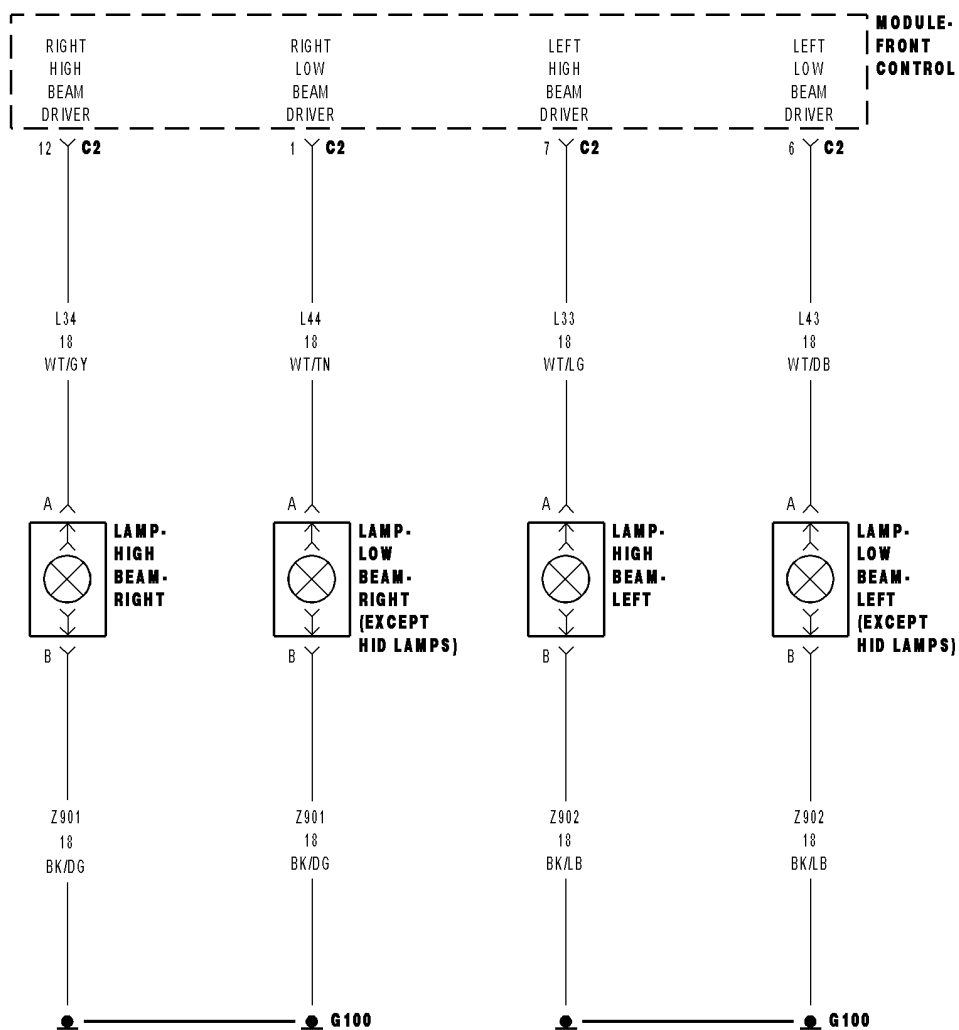
Measure the resistance between ground and the (L44) Right Low Beam Control circuit.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Front Control Module (FCM) in accordance with the service information.  
Perform the BODY VERIFICATION TEST - VER 1.
- No** >> Repair the (L44) Right Low Beam Control circuit for a short to ground condition.  
Perform the BODY VERIFICATION TEST - VER 1.



# B1630-RIGHT LOW BEAM CONTROL CIRCUIT HIGH



**B1630-RIGHT LOW BEAM CONTROL CIRCUIT HIGH (CONTINUED)**

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the FCM detects a LOW condition.

Possible Causes
(L44) RIGHT LOW BEAM CONTROL CIRCUIT FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

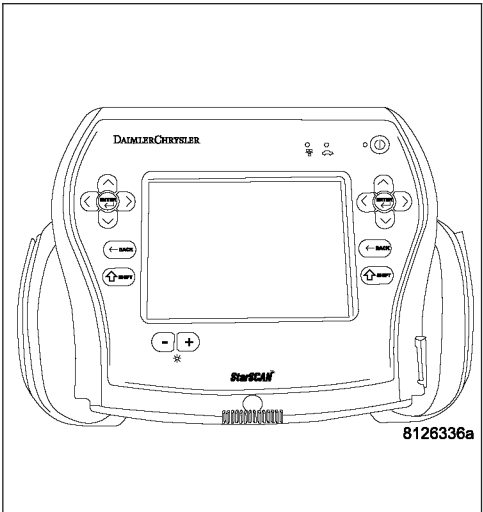
**Diagnostic Test**

**1. INTERMITTENT CONDITION**

- Turn the ignition on.
- With the Scan Tool, clear all FCM DTC's.
- Turn the Headlamps on.
- With the Scan Tool read the DTC information.

**Does the Scan Tool read: B1630-RIGHT LOW BEAM CONTROL CIRCUIT HIGH?**

- Yes** >> Go To 2
- No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST - VER 1.



**B1630-RIGHT LOW BEAM CONTROL CIRCUIT HIGH (CONTINUED)****2. (L44) RIGHT LOW BEAM CONTROL CIRCUIT**

Turn the ignition off.

Disconnect the FCM C2 harness connector.

Measure the resistance of the (L44) Right Low Beam Control circuit.

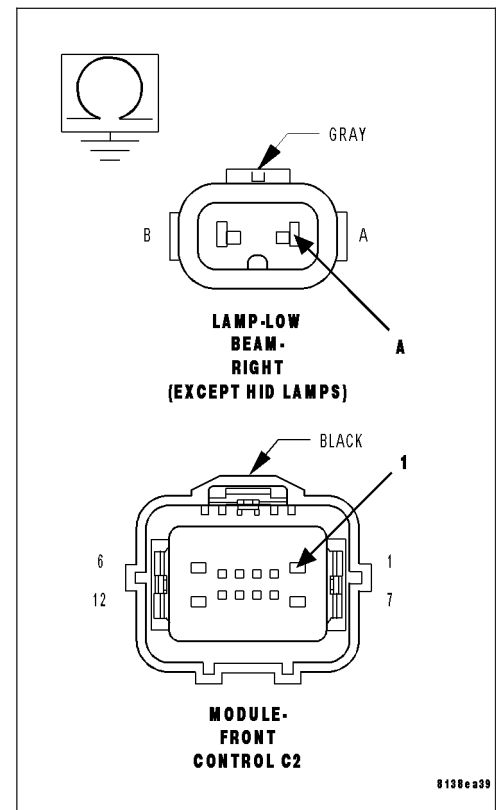
**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (L44) Right Low Beam Control circuit for a short to battery condition.

Perform the BODY VERIFICATION TEST - VER 1.

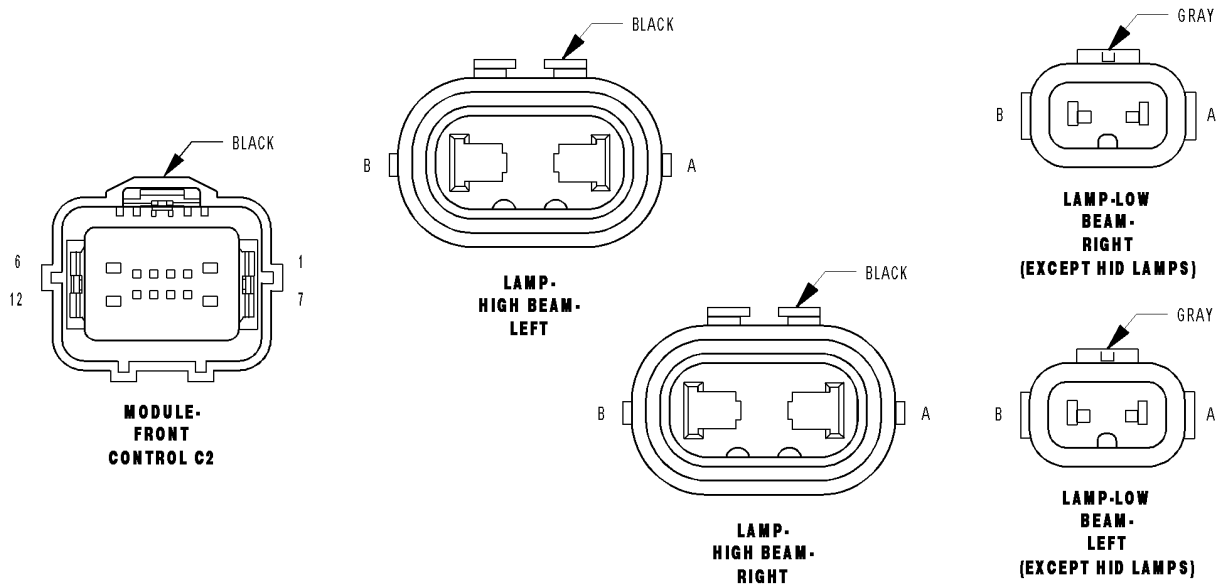
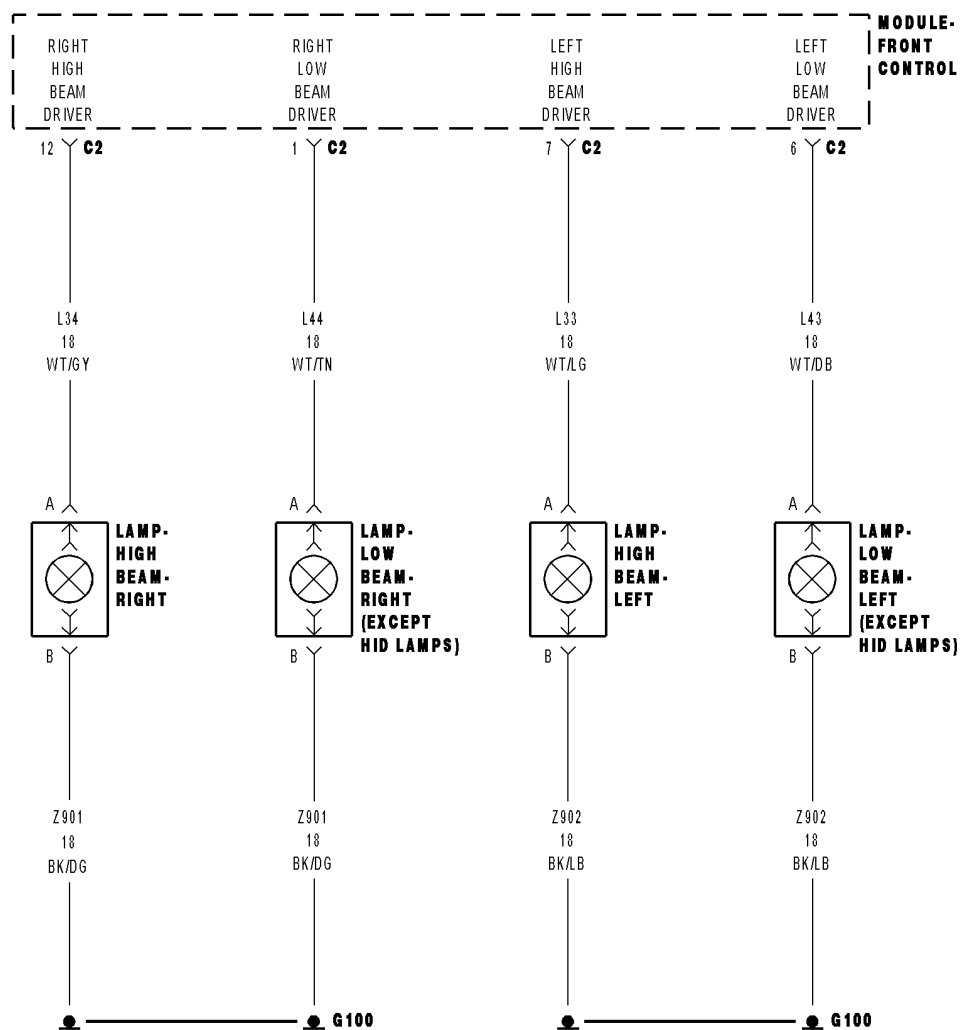
**No** >> Replace the Front Control Module (FCM) in accordance with the service information.

Perform the BODY VERIFICATION TEST - VER 1.





## B1633-LEFT HI BEAM CONTROL CIRCUIT LOW



**B1633-LEFT HI BEAM CONTROL CIRCUIT LOW (CONTINUED)**

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the FCM detects a LOW condition.

Possible Causes
(L33) LEFT HIGHBEAM OUTPUT CIRCUIT FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Highbeam Headlamps on.

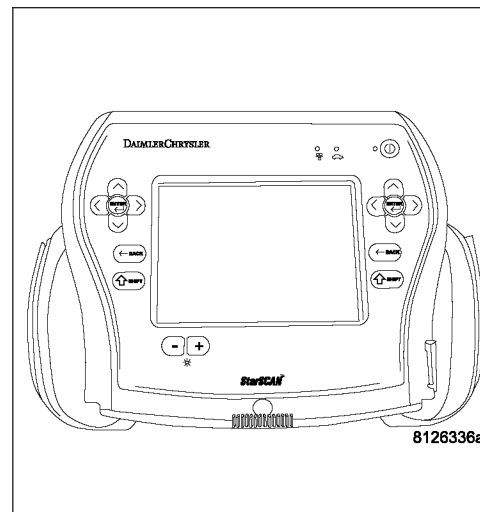
With the Scan Tool read the DTC information.

**Does the Scan Tool read: B1633-LEFT HI BEAM CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1.



**B1633-LEFT HI BEAM CONTROL CIRCUIT LOW (CONTINUED)****2. (L33) LEFT HIGHBEAM OUTPUT CIRCUIT**

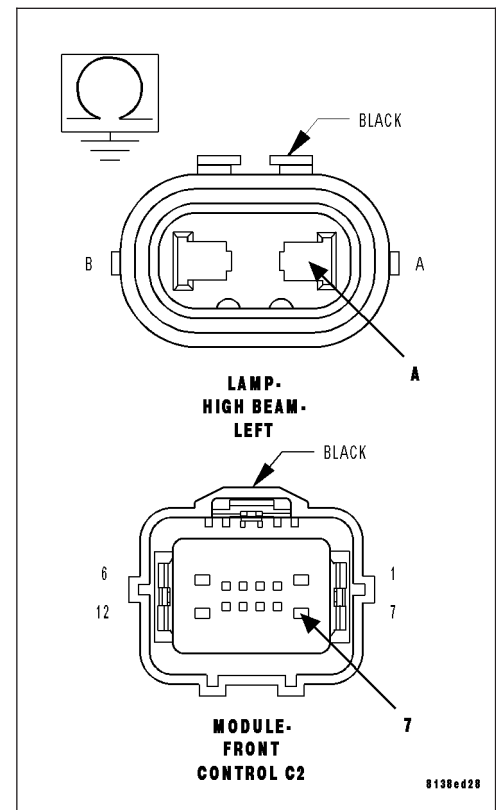
Turn the ignition off.

Disconnect the FCM C2 harness connector.

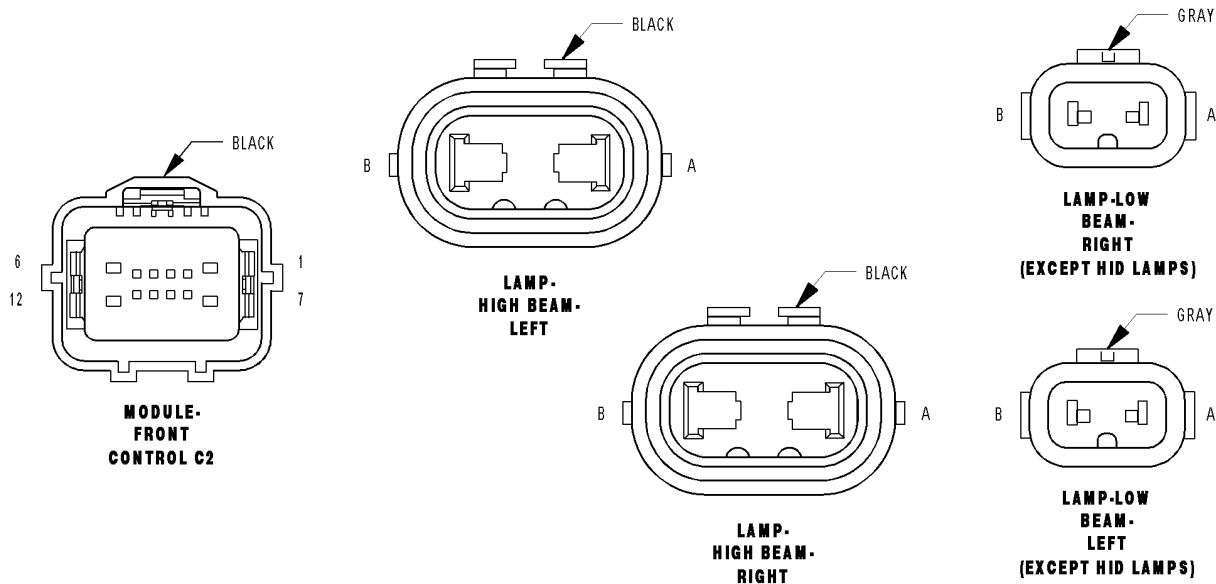
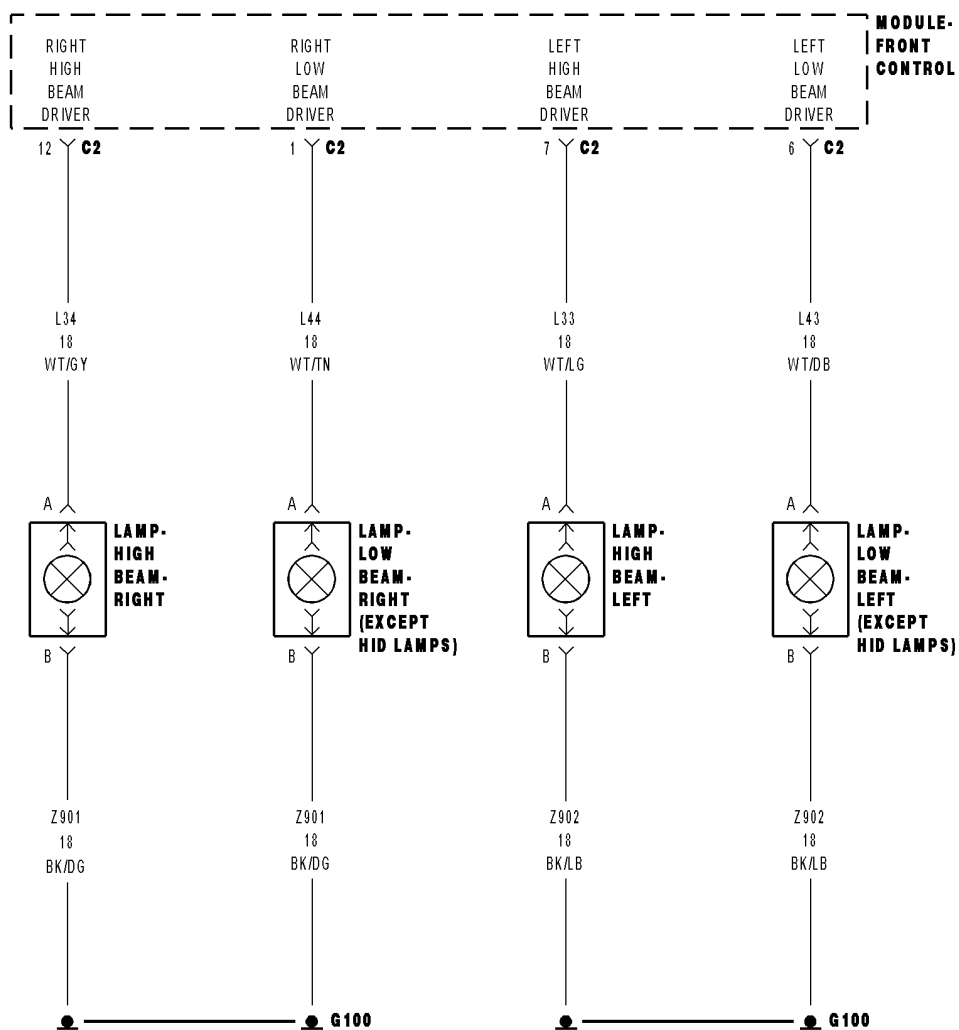
Measure the resistance between ground and the Left Highbeam Output circuit.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Front Control Module (FCM) in accordance with the service information.  
Perform the BODY VERIFICATION TEST - VER 1.
- No** >> Repair the (L33) Left Highbeam Output circuit for a short to ground condition.  
Perform the BODY VERIFICATION TEST - VER 1.



## B1634-LEFT HI BEAM CONTROL CIRCUIT HIGH



**B1634-LEFT HI BEAM CONTROL CIRCUIT HIGH (CONTINUED)**

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the FCM detects a HIGH condition.

Possible Causes
(L33) HIGH BEAM CONTROL CIRCUIT FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

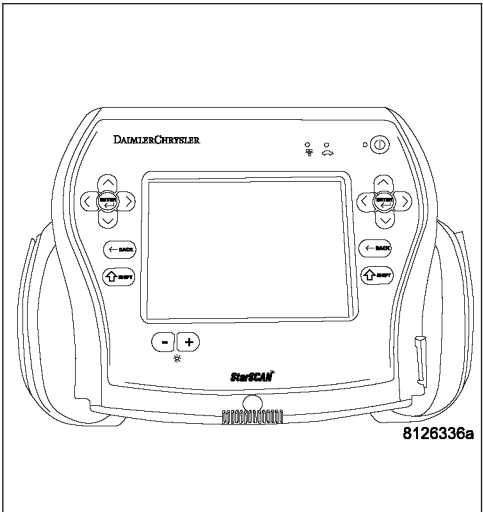
**Diagnostic Test**

**1. INTERMITTENT CONDITION**

- Turn the ignition on.
- With the Scan Tool, clear all FCM DTC's.
- Turn the Headlamps on.
- With the Scan Tool read the DTC information.

**Does the Scan Tool read: B1634-LEFT HI BEAM CONTROL CIRCUIT HIGH?**

- Yes**
- >> Go To 2
- No**
- >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST - VER 1.



**B1634-LEFT HI BEAM CONTROL CIRCUIT HIGH (CONTINUED)****2. (L33) HIGH BEAM CONTROL CIRCUIT**

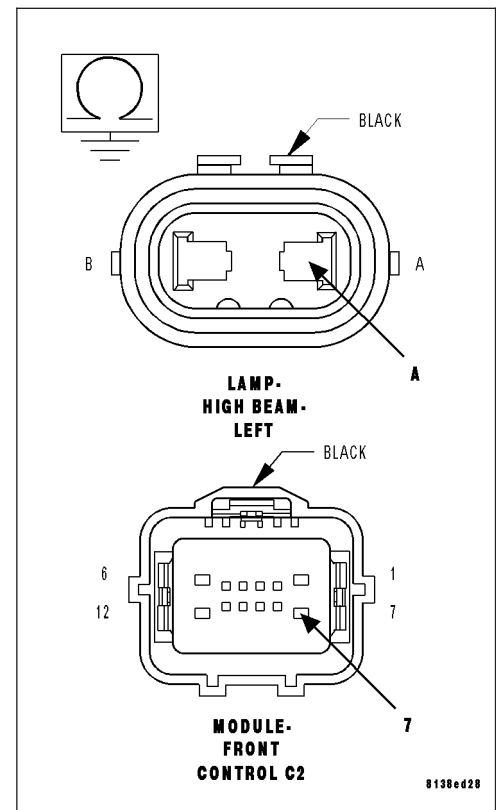
Turn the ignition off.

Disconnect the FCM C2 harness connector.

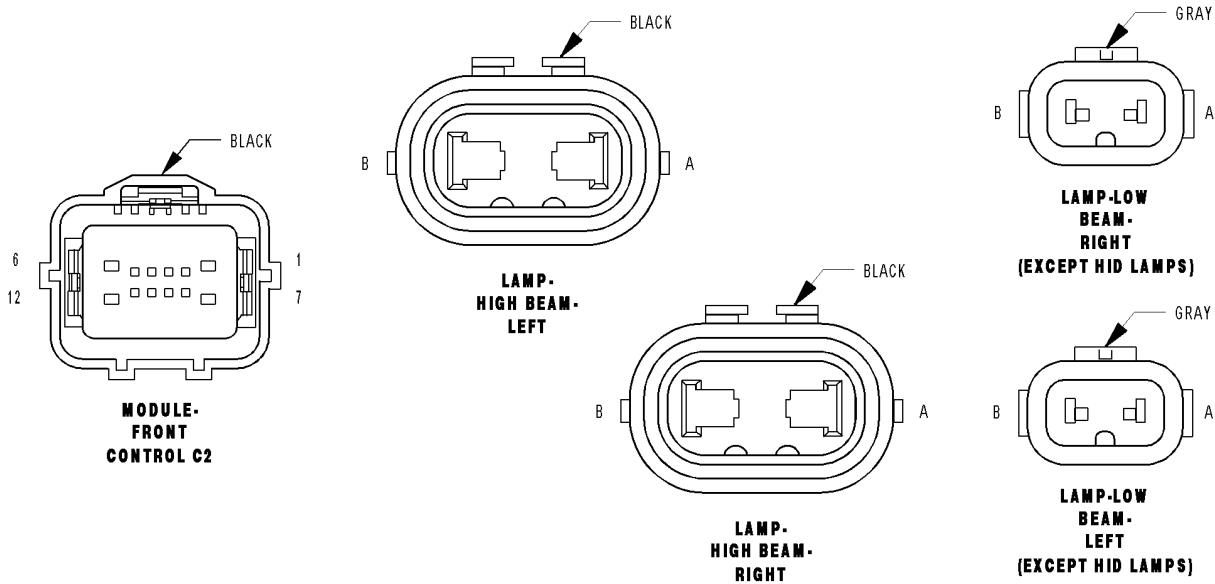
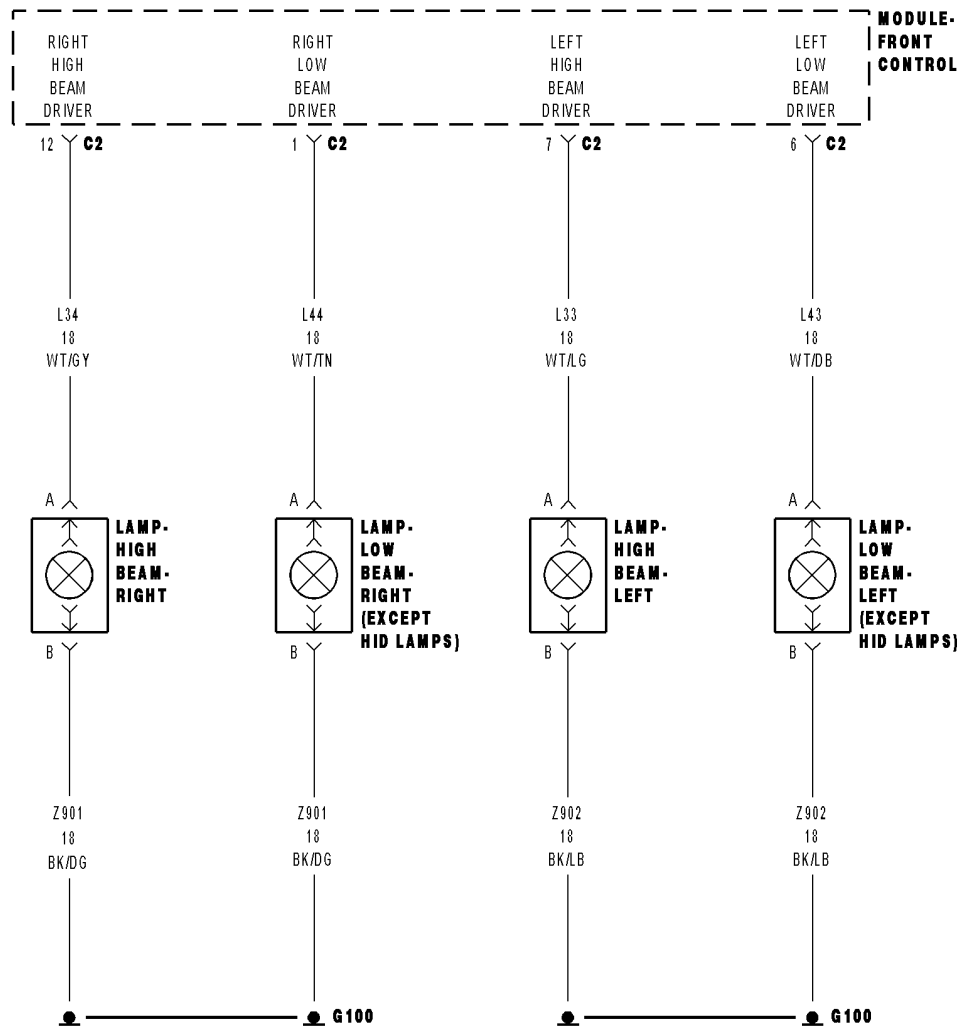
Measure the resistance of the (L33) High Beam Control circuit.

**Is the resistance above 5.0 ohms?**

- Yes** >> Repair the (L33) High Beam Control circuit for a short to battery condition.  
Perform the BODY VERIFICATION TEST - VER 1.
- No** >> Replace the Front Control Module (FCM) in accordance with the service information.  
Perform the BODY VERIFICATION TEST - VER 1.



## B1637-RIGHT HI BEAM CONTROL CIRCUIT LOW



**B1637-RIGHT HI BEAM CONTROL CIRCUIT LOW (CONTINUED)**

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Highbeam Headlamps activated.
- **Set Condition:**
- When the FCM detects a High condition.

Possible Causes
(L34) RIGHT HIGHBEAM OUTPUT CIRCUIT FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Highbeam Headlamps on.

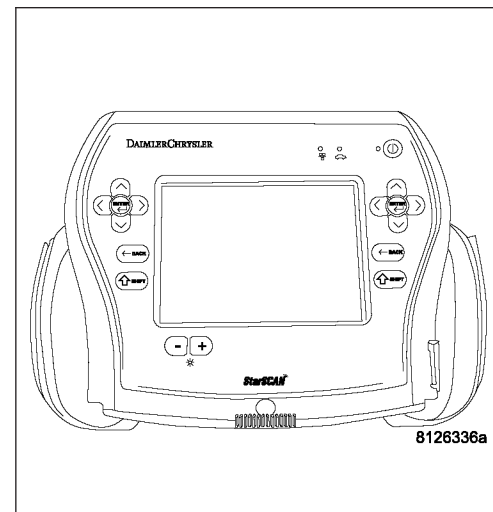
With the Scan Tool read the DTC information.

**Does the Scan Tool read: B1637-RIGHT HI BEAM CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1.





**B1637-RIGHT HI BEAM CONTROL CIRCUIT LOW (CONTINUED)****2. (L34) RIGHT HIGHBEAM OUTPUT CIRCUIT**

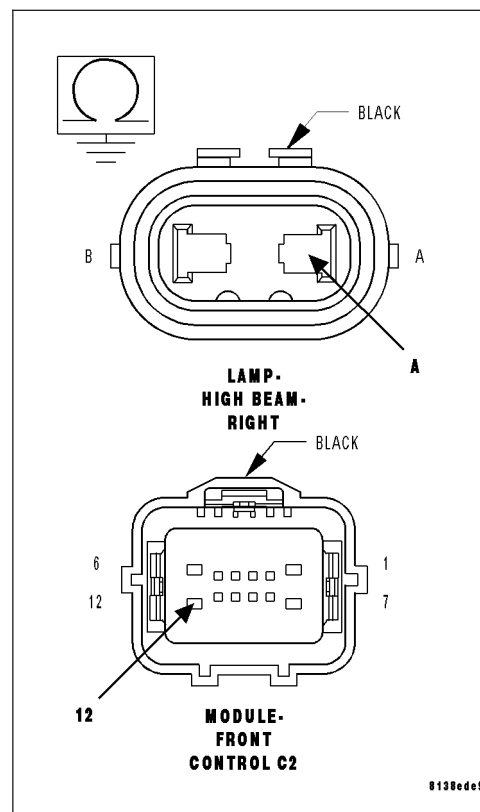
Turn the ignition off.

Disconnect the FCM C2 harness connector.

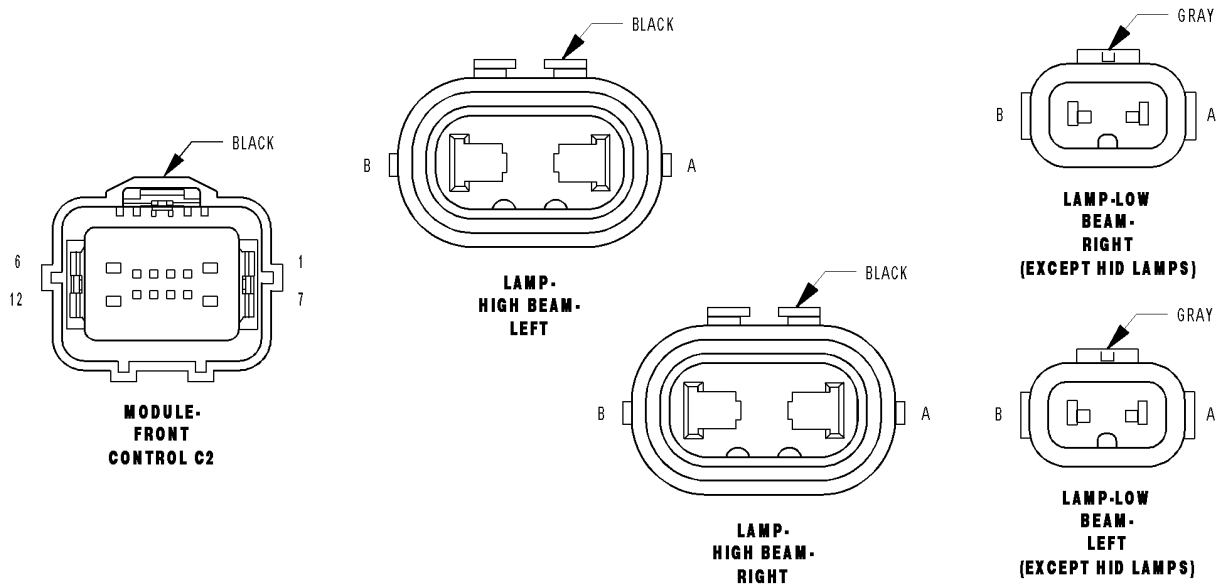
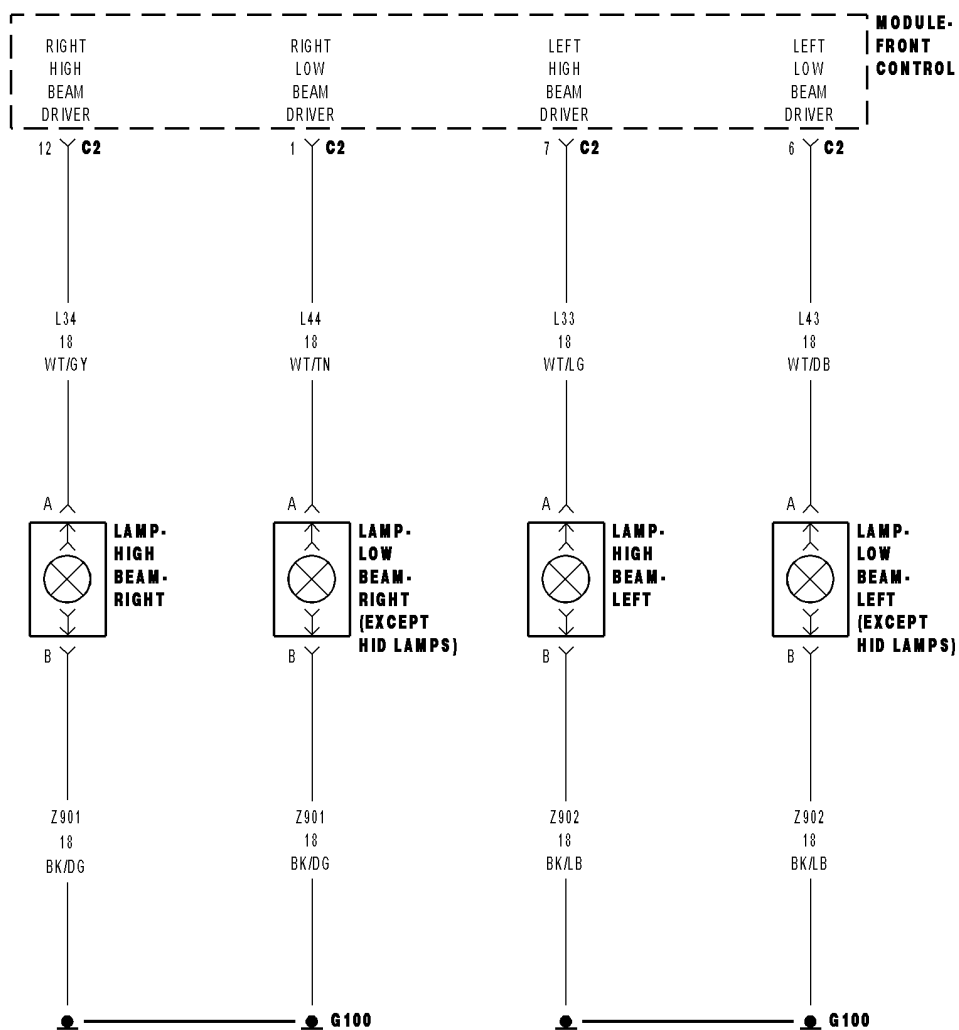
Measure the resistance between ground and the Right Highbeam Output circuit.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Front Control Module (FCM) in accordance with the service information.  
Perform the BODY VERIFICATION TEST - VER 1.
- No** >> Repair the (L34) Right Highbeam Output circuit for a short to ground condition.  
Perform the BODY VERIFICATION TEST - VER 1.



## B1638-RIGHT HI BEAM CONTROL CIRCUIT HIGH



**B1638-RIGHT HI BEAM CONTROL CIRCUIT HIGH (CONTINUED)**

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Headlamps activated.
- **Set Condition:**
- When the FCM detects a HIGH condition.

Possible Causes
(L34) HIGH BEAM CONTROL CIRCUIT FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

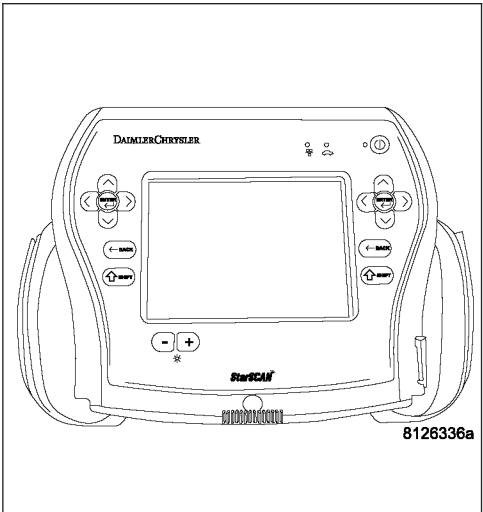
**Diagnostic Test**

**1. INTERMITTENT CONDITION**

- Turn the ignition on.
- With the Scan Tool, clear all FCM DTC's.
- Turn the Headlamps on.
- With the Scan Tool read the DTC information.

**Does the Scan Tool read: B1638-RIGHT HI BEAM CONTROL CIRCUIT HIGH?**

- Yes**    >> Go To 2
- No**    >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST - VER 1.



**B1638-RIGHT HI BEAM CONTROL CIRCUIT HIGH (CONTINUED)****2. (L34) HIGH BEAM CONTROL CIRCUIT**

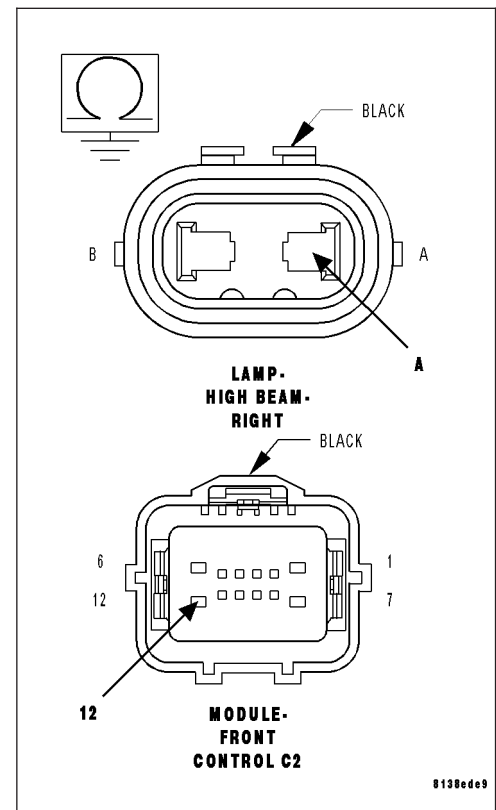
Turn the ignition off.

Disconnect the FCM C2 harness connector.

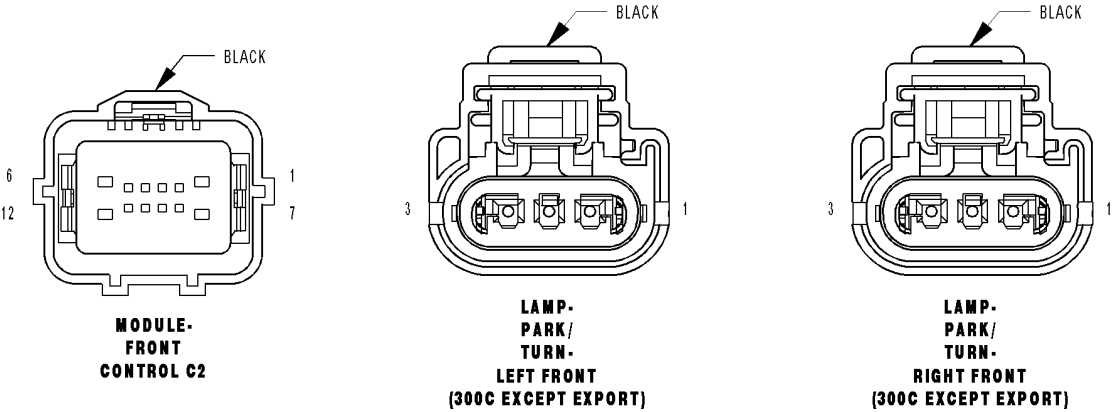
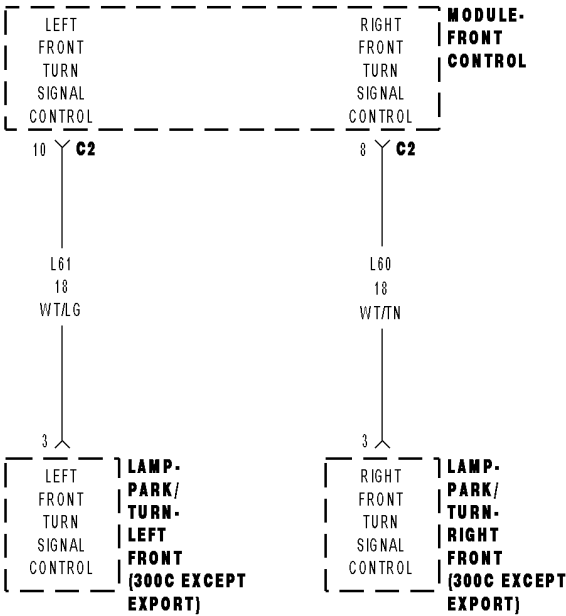
Measure the resistance of the (L34) High Beam Control circuit.

**Is the resistance above 5.0 ohms?**

- Yes** >> Repair the (L34) High Beam Control circuit for a short to battery condition.  
Perform the BODY VERIFICATION TEST - VER 1.
- No** >> Replace the Front Control Module (FCM) in accordance with the service information.  
Perform the BODY VERIFICATION TEST - VER 1.



B163B-FRONT LEFT TURN CONTROL CIRCUIT LOW



**B163B-FRONT LEFT TURN CONTROL CIRCUIT LOW (CONTINUED)**

For the Exterior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
(L61) FRONT LEFT TURN SIGNAL CONTROL CIRCUIT POWER DISTRIBUTION CENTER FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Left Turn Signals on.

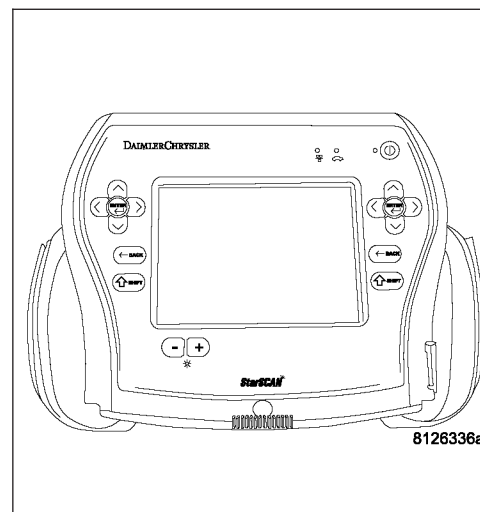
With the Scan Tool read the DTC information.

**Does the Scan Tool read: B163B-FRONT LEFT TURN CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST - VER 1.



**B163B-FRONT LEFT TURN CONTROL CIRCUIT LOW (CONTINUED)****2. L61 FRONT LEFT TURN SIGNAL CONTROL CIRCUIT**

Turn the ignition off.

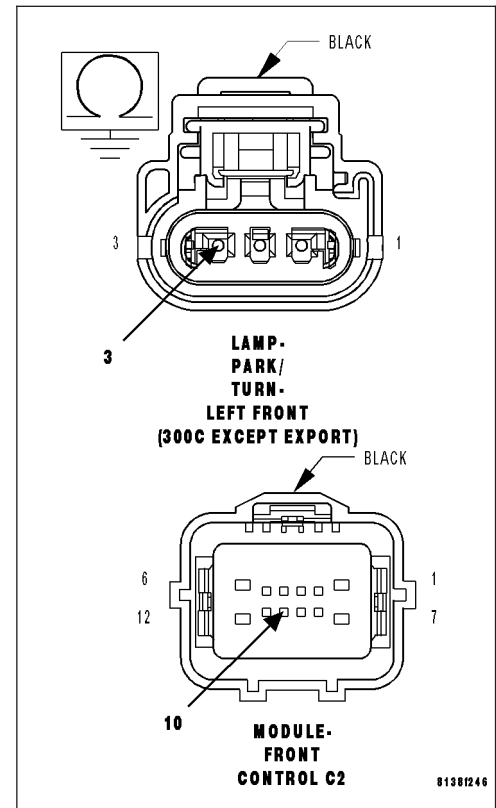
Disconnect the FCM C2 connector.

Measure the resistance between ground and the (L61) Front Left Turn Signal Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (L61) Front Left Turn Signal Control circuit for a short to ground.  
Perform the BODY VERIFICATION TEST - VER 1.

**3. FRONT CONTROL MODULE**

Turn the ignition off.

Disconnect the FCM C2 connector.

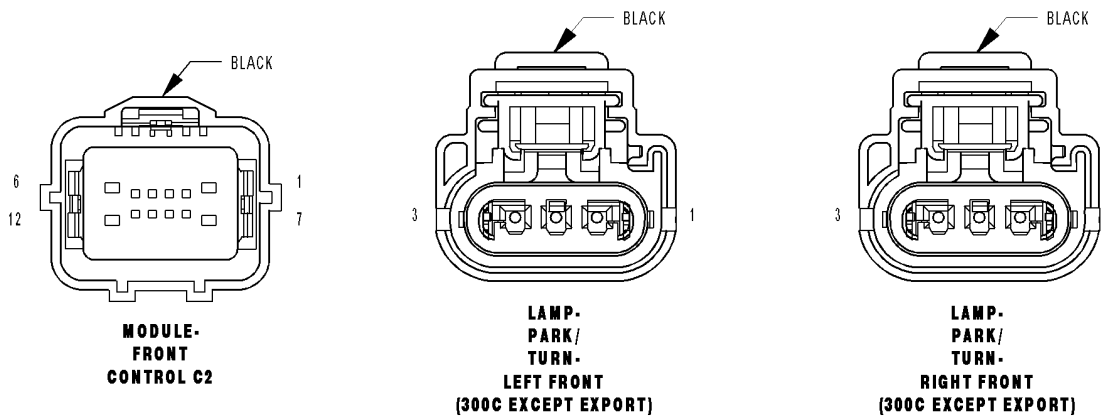
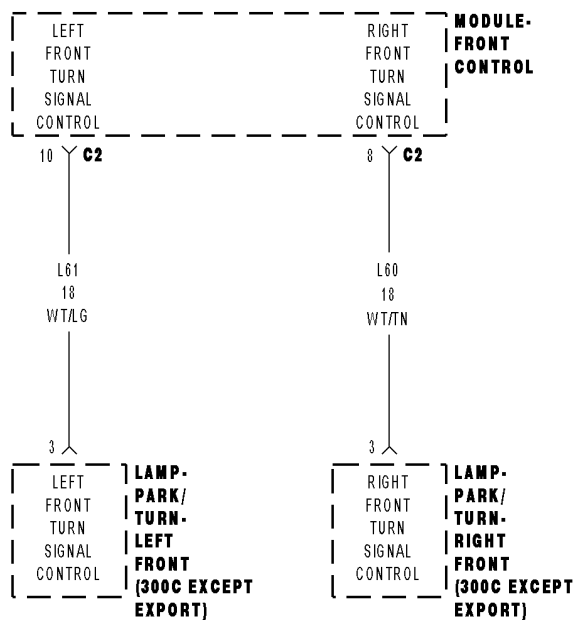
Measure the resistance between ground and the (L61) Front Left Turn Signal Control circuit in the FCM.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Power Distribution Center in accordance with the service information.  
Perform the BODY VERIFICATION TEST - VER 1.

**No** >> Replace the Front Control Module in accordance with the service information.  
Perform the BODY VERIFICATION TEST - VER 1.

## B163C-FRONT LEFT TURN CONTROL CIRCUIT HIGH





**B163C-FRONT LEFT TURN CONTROL CIRCUIT HIGH (CONTINUED)**

For the Exterior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Front Control Module detects a short to battery on the Control circuit.

Possible Causes
(L61) TURN SIGNAL CONTROL CIRCUIT POWER DISTRIBUTION CENTER FRONT CONTROL MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

Clear all FCM DTC's

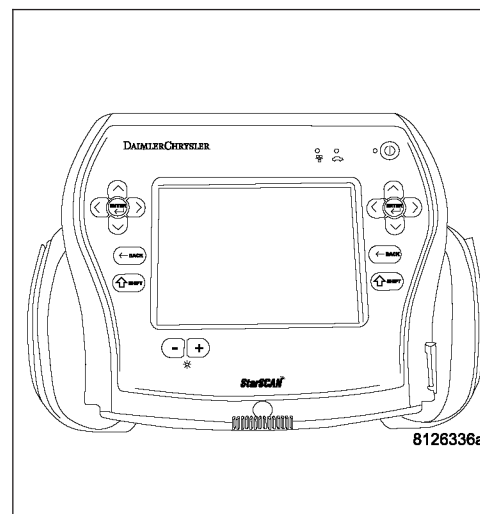
Turn the Left Turn Signal on.

With the scan tool, read DTC's.

**Does the scan tool read: B163C-FRONT LEFT TURN CONTROL CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.



**B163C-FRONT LEFT TURN CONTROL CIRCUIT HIGH (CONTINUED)****2. L61 LEFT TURN SIGNAL CONTROL CIRCUIT**

Turn the ignition off.

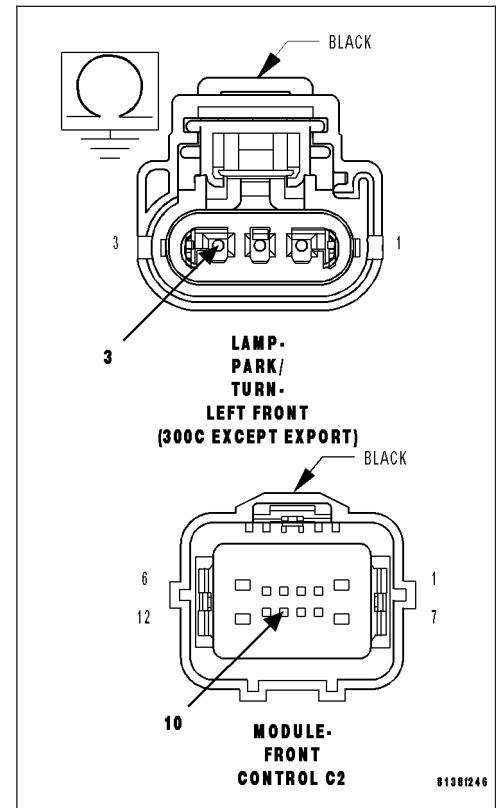
Disconnect the FCM C2 connector.

Measure the resistance of the (L61) Front Left Turn Signal Control circuit.

**Is the resistance above 5.0 ohms?**

**No** >> Repair the (L61) Turn Signal Control circuit.  
Perform BODY VERIFICATION TEST - VER 1.

**Yes** >> Go To 3

**3. FRONT CONTROL MODULE**

Turn the ignition off.

Disconnect the Front Control Module from the PDC 49-way connector.

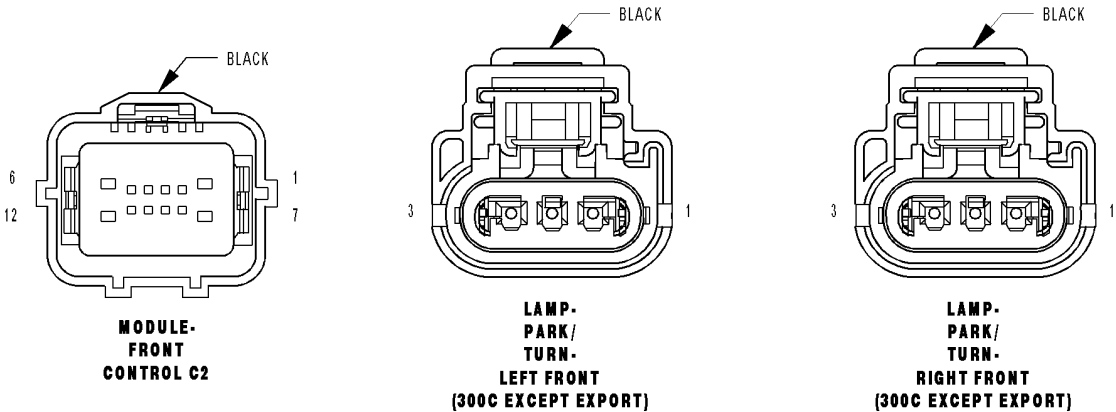
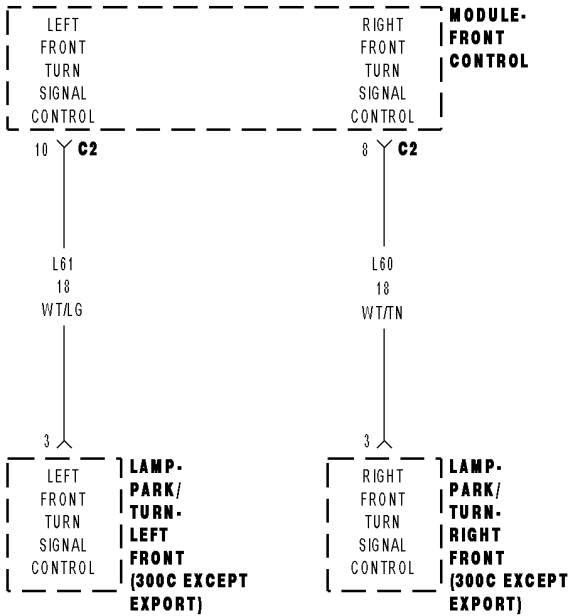
Measure the voltage between (L61) Front Left Turn Signal Control circuit and ground.

**Is there any voltage present?**

**Yes** >> Replace the Power Distribution Center in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Replace the Front Control Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1.

B163F-FRONT RIGHT TURN CONTROL CIRCUIT LOW



**B163F-FRONT RIGHT TURN CONTROL CIRCUIT LOW (CONTINUED)**

For the Exterior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
(L60) FRONT RIGHT TURN SIGNAL CONTROL CIRCUIT FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

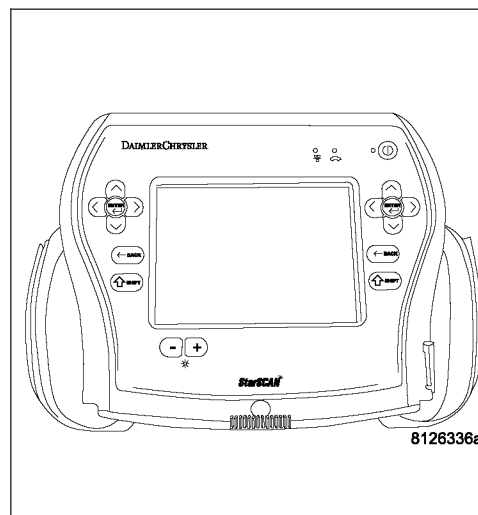
Turn the Right Turn Signals on.

With the Scan Tool read the DTC information.

**Does the Scan Tool read: B163F-FRONT RIGHT TURN CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST - VER 1.



**B163F-FRONT RIGHT TURN CONTROL CIRCUIT LOW (CONTINUED)****2. L60 FRONT RIGHT TURN SIGNAL CONTROL CIRCUIT**

Turn the ignition off.

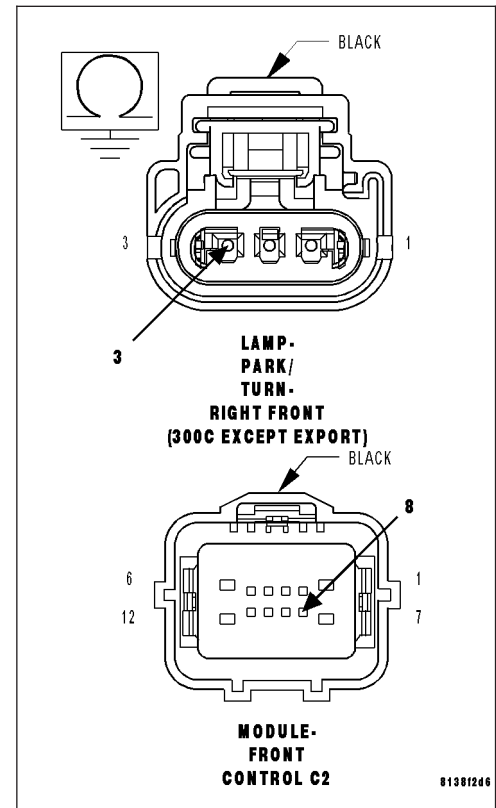
Disconnect the FCM C2 harness connector.

Measure the resistance between ground and the (L60) Front Turn Signal Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (L60) Front Right Turn Signal Control circuit for a short to ground.  
Perform the BODY VERIFICATION TEST - VER 1.

**3. FRONT CONTROL MODULE**

Turn the ignition off.

Disconnect the FCM connector.

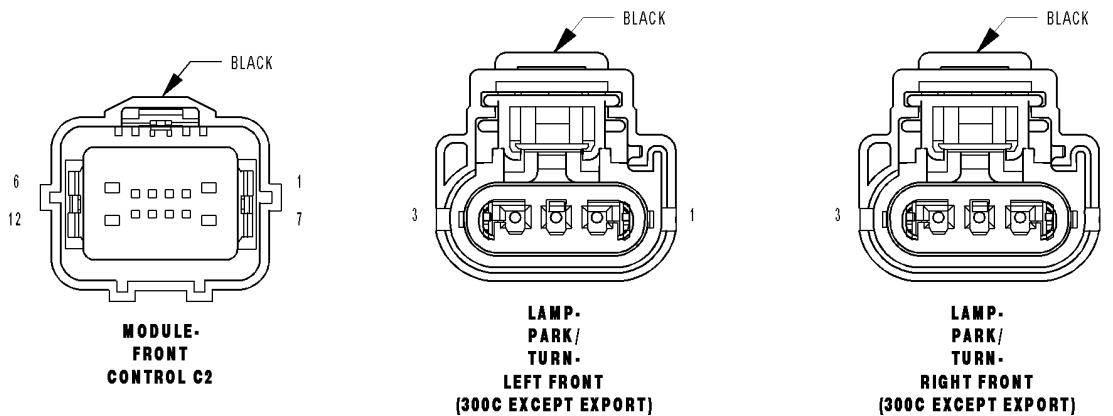
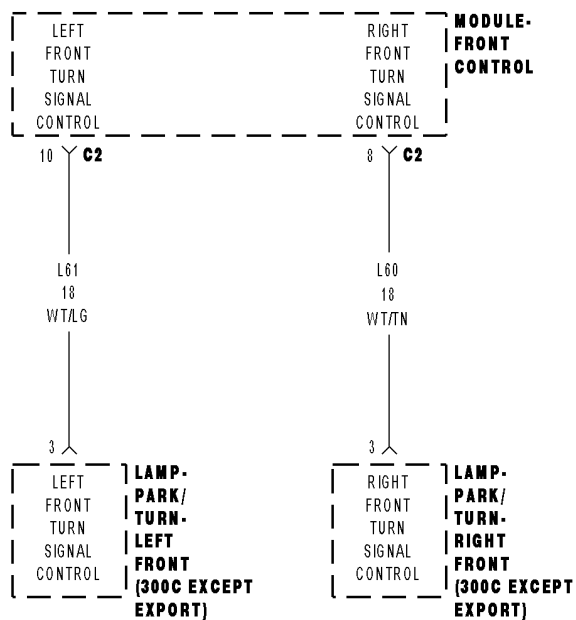
Measure the resistance between ground and the (L60) Front Right Turn Signal Control circuit in the FCM.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Power Distribution Center in accordance with the service information.  
Perform the BODY VERIFICATION TEST - VER 1.

**No** >> Replace the Front Control Module in accordance with the service information.  
Perform the BODY VERIFICATION TEST - VER 1.

## B1640-FRONT RIGHT TURN CONTROL CIRCUIT HIGH



**B1640-FRONT RIGHT TURN CONTROL CIRCUIT HIGH (CONTINUED)**

For the Exterior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Front Control Module detects a short to battery on the Control circuit.

Possible Causes
(L60) TURN SIGNAL CONTROL CIRCUIT POWER DISTRIBUTION CENTER FRONT CONTROL MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

Clear all FCM DTC's

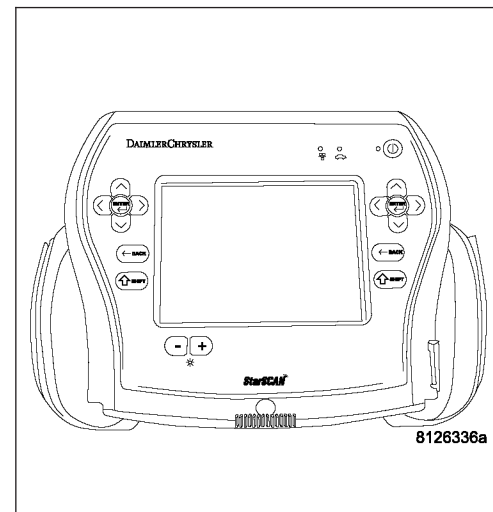
Turn the Right Turn Signal on.

With the scan tool, read DTC's.

**Does the scan tool read: B1640-FRONT RIGHT TURN CONTROL CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.



**B1640-FRONT RIGHT TURN CONTROL CIRCUIT HIGH (CONTINUED)****2. L60 RIGHT TURN SIGNAL CONTROL CIRCUIT**

Turn the ignition off.

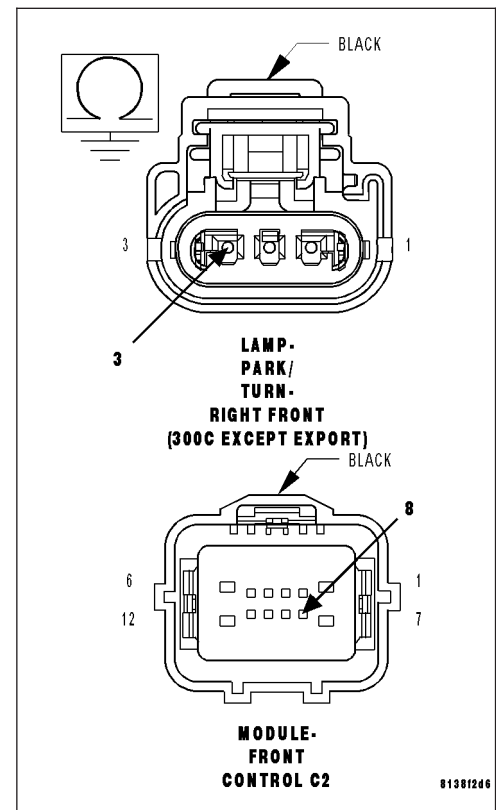
Disconnect the PDC connector from the FCM.

Measure the resistance of the (L60) Front Right Turn Signal Control circuit.

**Is the resistance above 5.0 ohms?**

**No** >> Repair the (L60) Turn Signal Control circuit.  
Perform BODY VERIFICATION TEST - VER 1.

**Yes** >> Go To 3

**3. FRONT CONTROL MODULE**

Turn the ignition off.

Disconnect the Front Control Module from the PDC 49 way connector.

Measure the voltage between (L60) Front Right Turn Signal Control circuit and ground.

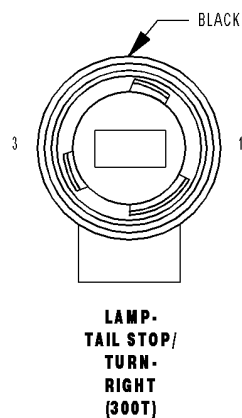
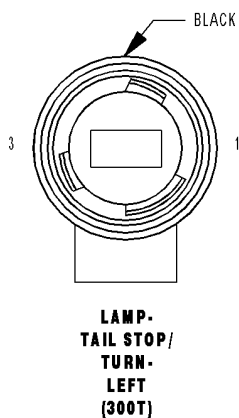
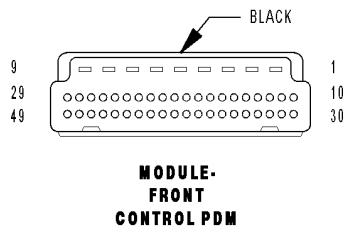
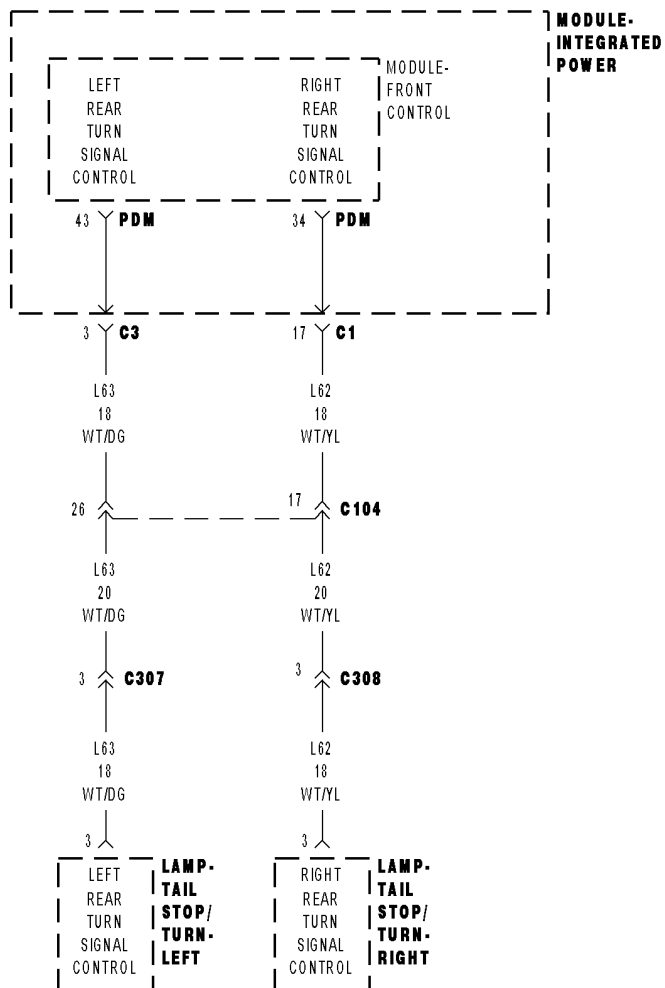
**Is there any voltage present?**

**Yes** >> Replace the Power Distribution Center.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Replace the Front Control Module.  
Perform BODY VERIFICATION TEST - VER 1.



# B1643-REAR LEFT TURN CONTROL CIRCUIT LOW



**B1643-REAR LEFT TURN CONTROL CIRCUIT LOW (CONTINUED)**

For the Exterior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
(L63) REAR LEFT TURN SIGNAL CONTROL CIRCUIT MODULE POWER DISTRIBUTION CENTER FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

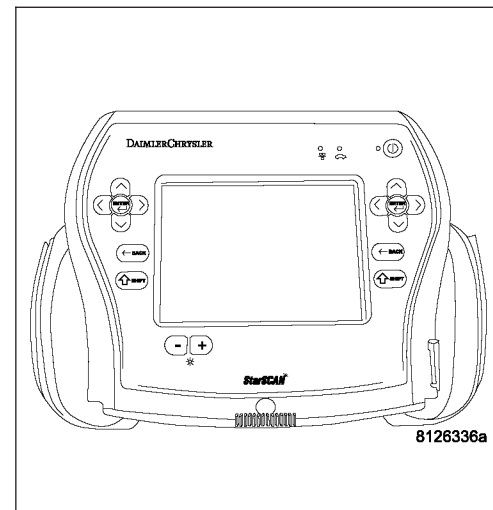
Turn the Left Turn Signals on.

With the Scan Tool read the DTC information.

**Does the Scan Tool read: B1643-REAR LEFT TURN CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST-VER1.



**B1643-REAR LEFT TURN CONTROL CIRCUIT LOW (CONTINUED)****2. L63 LEFT TURN SIGNAL CONTROL CIRCUIT**

Turn the ignition off.

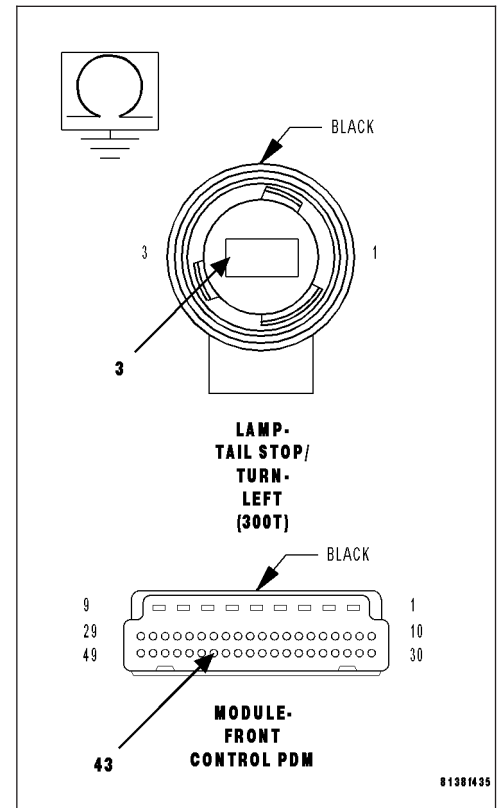
Disconnect the FCM PDM connector.

Measure the resistance between ground and the (L63) Rear Left Turn Signal Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (L63) Rear Left Turn Signal Control circuit for a short to ground.  
Perform the BODY VERIFICATION TEST-VER1.

**3. FRONT CONTROL MODULE**

Turn the ignition off.

Disconnect the FCM connector.

Disconnect the PDM connector.

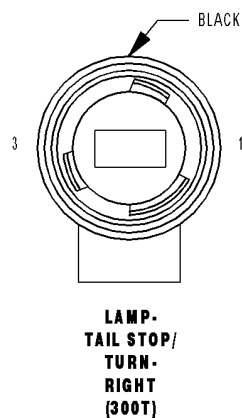
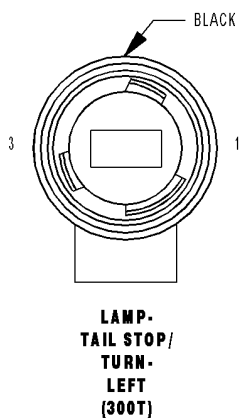
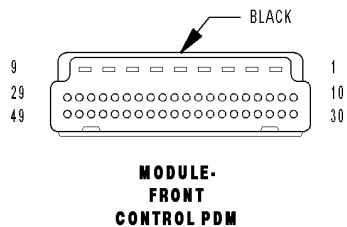
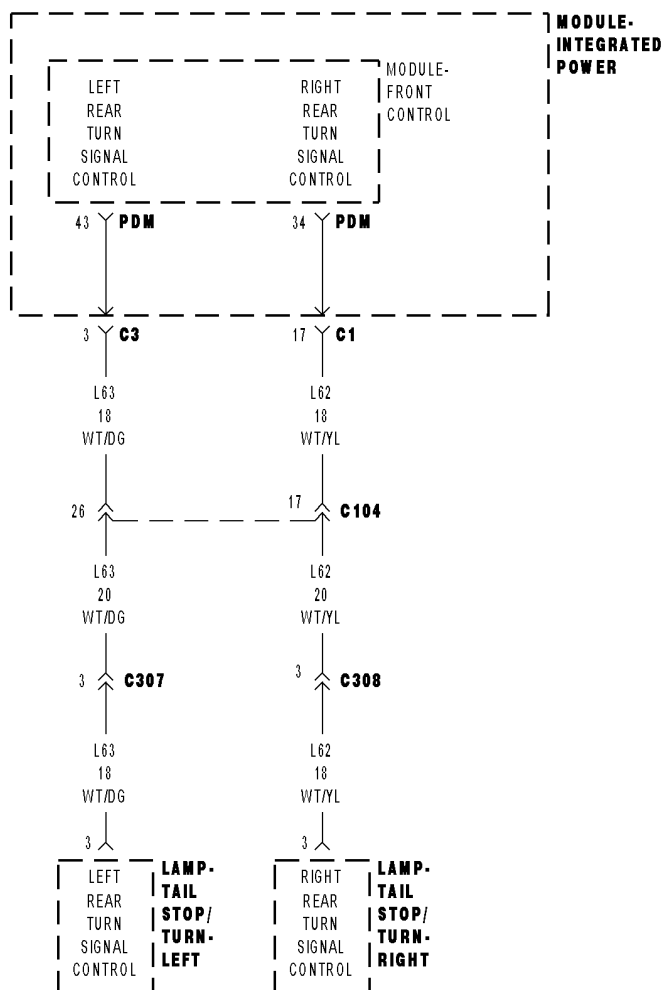
Measure the resistance between ground and the (L63) Left Turn Signal Control circuit in the PDM.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Module Power Distribution Center in accordance with the service information.  
Perform the BODY VERIFICATION TEST-VER1.

**No** >> Replace the Front Control Module in accordance with the service information.  
Perform the BODY VERIFICATION TEST-VER1.

## B1644-REAR LEFT TURN CONTROL CIRCUIT HIGH



**B1644-REAR LEFT TURN CONTROL CIRCUIT HIGH (CONTINUED)**

For the Horn System circuit diagram (Refer to 8 - ELECTRICAL/HORN SYSTEM - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Front Control Module detects a short to battery on the Control circuit.

Possible Causes
(L63) TURN SIGNAL CONTROL CIRCUIT POWER DISTRIBUTION CENTER FRONT CONTROL MODULE

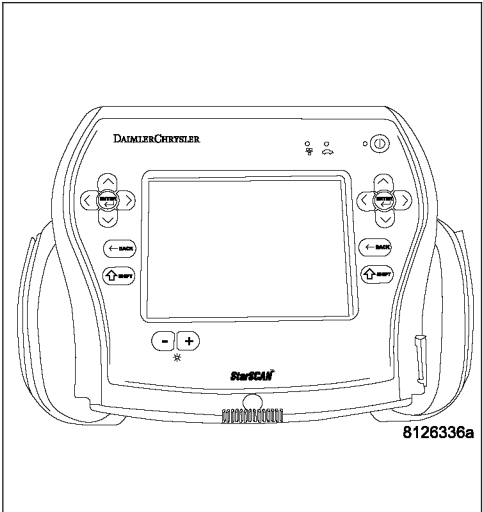
**Diagnostic Test**

**1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.  
Clear all FCM DTC's  
Turn the Left Turn Signal on.  
With the scan tool, read DTC's.

**Does the scan tool read: B1644-REAR LEFT TURN CONTROL CIRCUIT HIGH?**

- Yes**    >> Go To 2
- No**    >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.



**B1644-REAR LEFT TURN CONTROL CIRCUIT HIGH (CONTINUED)****2. L63 LEFT TURN SIGNAL CONTROL CIRCUIT**

Turn the ignition off.

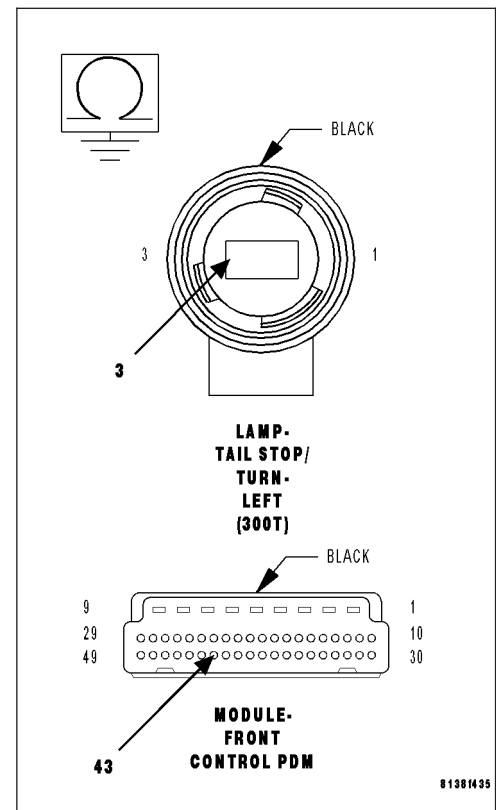
Disconnect the PDM connector from the FCM.

Measure the resistance of the (L63) Left Rear Turn Signal Control circuit.

**Is the resistance above 5.0 ohms?**

**No** >> Repair the (L63) Turn Signal Control circuit.  
Perform BODY VERIFICATION TEST - VER 1.

**Yes** >> Go To 3

**3. FRONT CONTROL MODULE**

Turn the ignition off.

Disconnect the Front Control Module from the PDM 49 way connector.

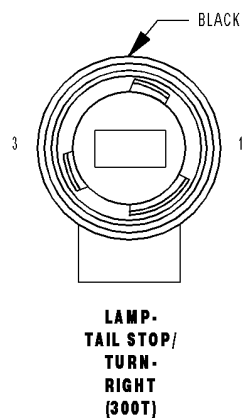
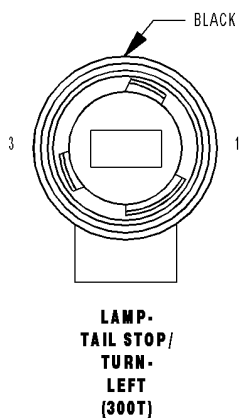
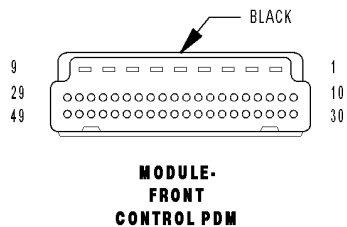
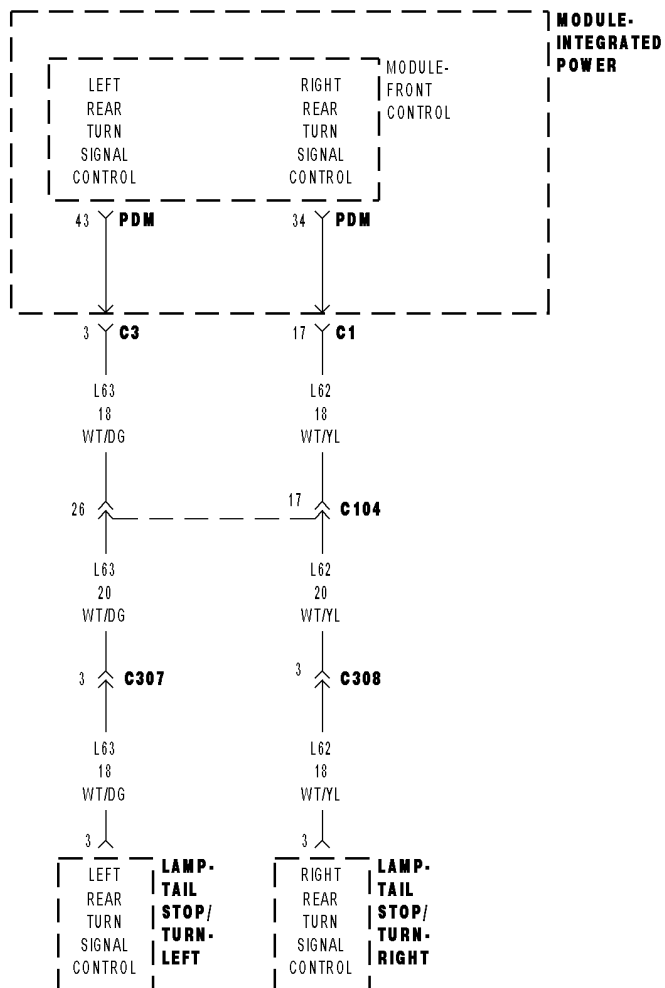
Measure the voltage between (L63) Left Rear Turn Signal Control circuit and ground.

**Is there any voltage present?**

**Yes** >> Replace the Power Distribution Center.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Replace the Front Control Module.  
Perform BODY VERIFICATION TEST - VER 1.

## B1647-REAR RIGHT TURN CONTROL CIRCUIT LOW



**B1647-REAR RIGHT TURN CONTROL CIRCUIT LOW (CONTINUED)**

For the Exterior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
(L62) REAR RIGHT TURN SIGNAL CONTROL CIRCUIT MODULE POWER DISTRIBUTION CENTER FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

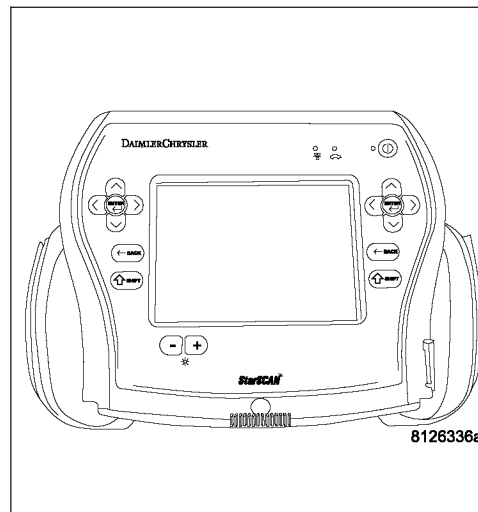
Turn the Right Turn Signals on.

With the Scan Tool read the DTC information.

**Does the Scan Tool read: B1647-REAR RIGHT TURN CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST-VER1.





**B1647-REAR RIGHT TURN CONTROL CIRCUIT LOW (CONTINUED)****2. L62 RIGHT TURN SIGNAL CONTROL CIRCUIT**

Turn the ignition off.

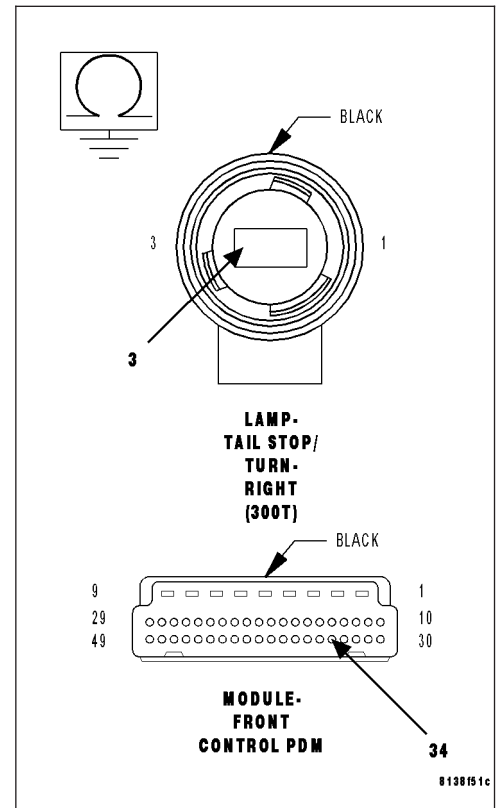
Disconnect the FCM PDM connector.

Measure the resistance between ground and the (L62) Rear Turn Signal Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (L62) Rear Right Turn Signal Control circuit for a short to ground.  
Perform the BODY VERIFICATION TEST-VER1.

**3. FRONT CONTROL MODULE**

Turn the ignition off.

Disconnect the FCM connector.

Disconnect the PDM connector.

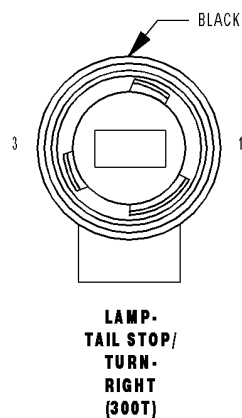
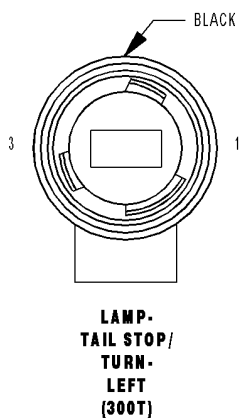
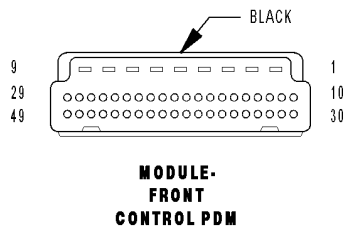
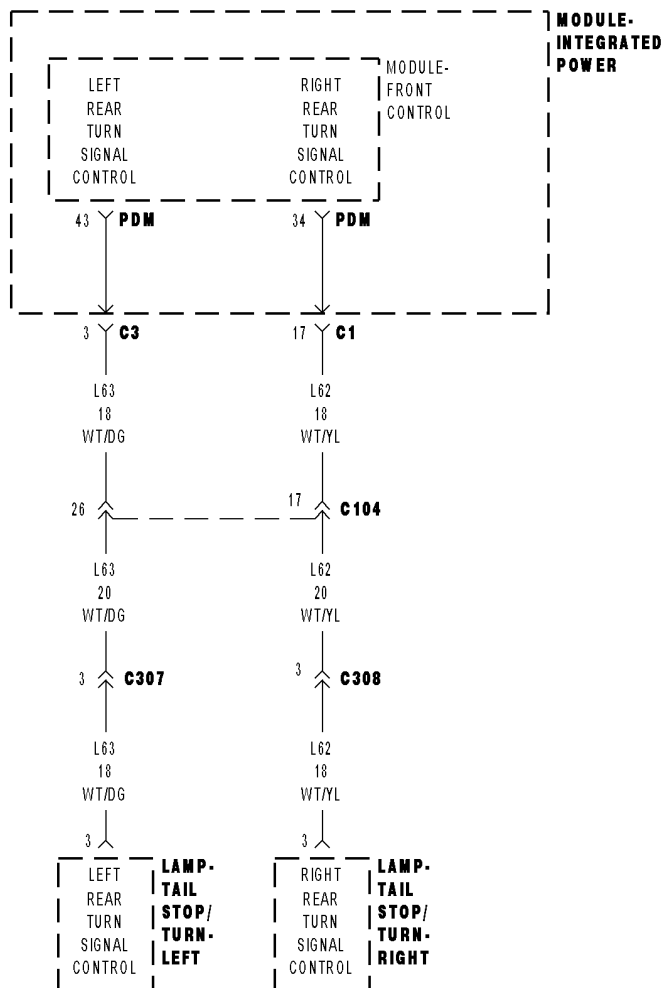
Measure the resistance between ground and the (L62) Right Turn Signal Control circuit in the PDM.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Module Power Distribution Center in accordance with the service information.  
Perform the BODY VERIFICATION TEST-VER1.

**No** >> Replace the Front Control Module in accordance with the service information.  
Perform the BODY VERIFICATION TEST-VER1.

## B1648-REAR RIGHT TURN CONTROL CIRCUIT HIGH



**B1648-REAR RIGHT TURN CONTROL CIRCUIT HIGH (CONTINUED)**

For the Horn System circuit diagram (Refer to 8 - ELECTRICAL/HORN SYSTEM - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Front Control Module detects a short to battery on the Control circuit.

Possible Causes
(L62) TURN SIGNAL CONTROL CIRCUIT POWER DISTRIBUTION CENTER FRONT CONTROL MODULE

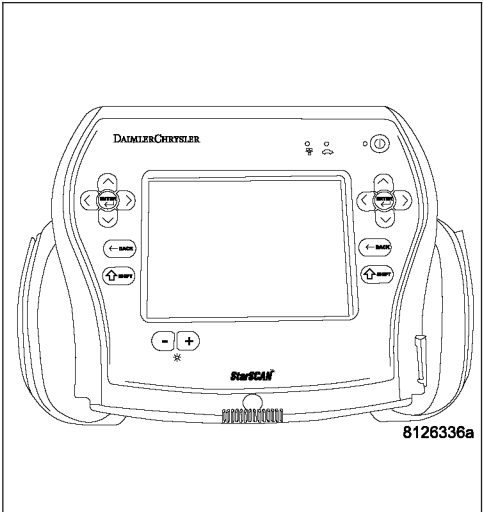
Diagnostic Test

1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.  
Clear all FCM DTC's  
Turn the Right Turn Signal on.  
With the scan tool, read DTC's.

**Does the scan tool read: B1648-REAR RIGHT TURN CONTROL CIRCUIT HIGH?**

- Yes**    >> Go To 2
- No**    >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.



**B1648-REAR RIGHT TURN CONTROL CIRCUIT HIGH (CONTINUED)****2. L62 RIGHT TURN SIGNAL CONTROL CIRCUIT**

Turn the ignition off.

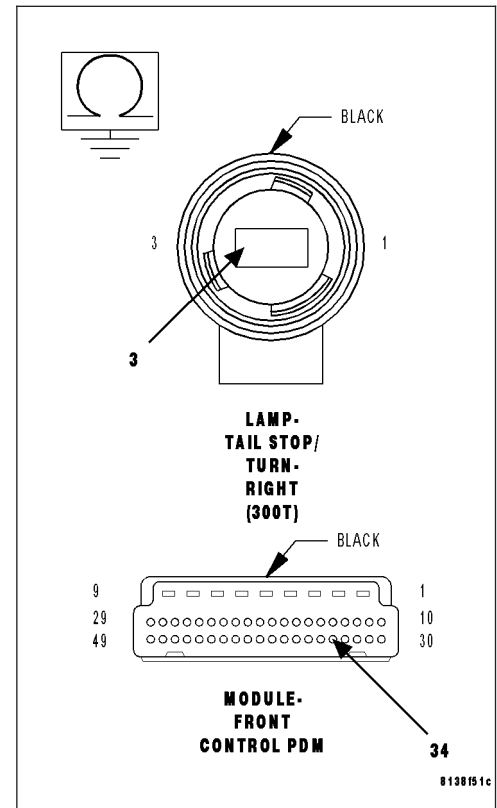
Disconnect the PDM connector from the FCM.

Measure the resistance of the (L62) Right Rear Turn Signal Control circuit.

**Is the resistance above 5.0 ohms?**

**No** >> Repair the (L62) Turn Signal Control circuit.  
Perform BODY VERIFICATION TEST - VER 1.

**Yes** >> Go To 3

**3. FRONT CONTROL MODULE**

Turn the ignition off.

Disconnect the Front Control Module from the PDM 49 way connector.

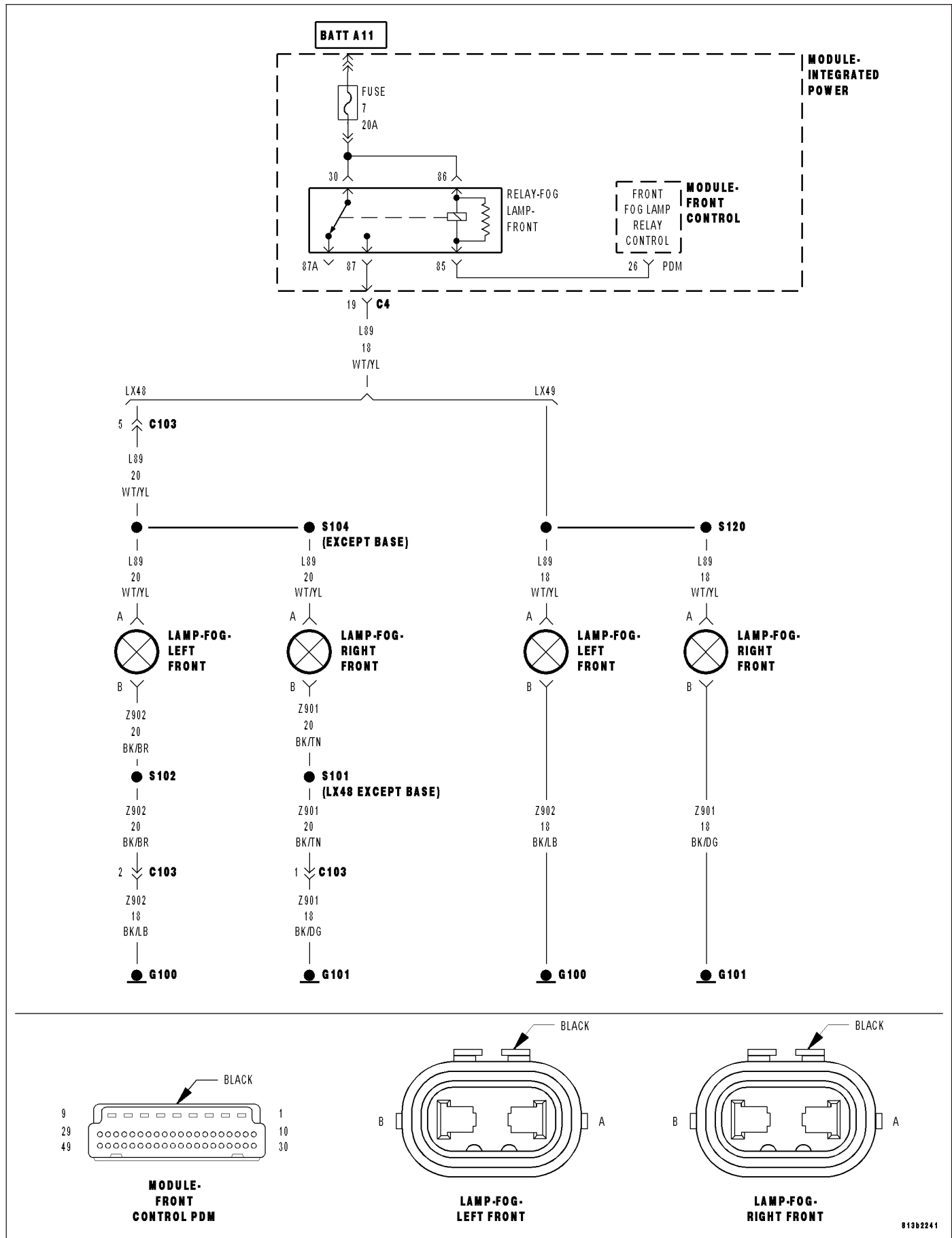
Measure the voltage between (L62) Right Rear Turn Signal Control circuit and ground.

**Is there any voltage present?**

**Yes** >> Replace the Power Distribution Center.  
Perform BODY VERIFICATION TEST - VER 1.

**No** >> Replace the Front Control Module.  
Perform BODY VERIFICATION TEST - VER 1.

## B1659-FRONT FOG LAMP CONTROL CIRCUIT LOW



**B1659-FRONT FOG LAMP CONTROL CIRCUIT LOW (CONTINUED)**

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Fog Lamps activated.
- **Set Condition:**
- When the FCM detects a LOW condition.

Possible Causes
(L139) FOG LAMP CONTROL CIRCUIT FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Fog Lamps on.

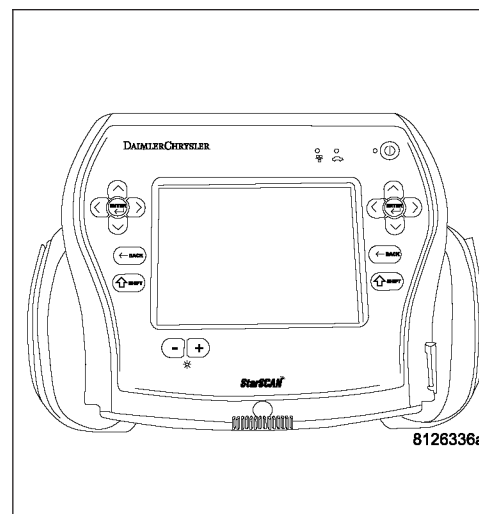
With the Scan Tool read the DTC information.

**Does the Scan Tool read: B1659-FRONT FOG LAMP CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST-VER1.

**2. (L139) FOG LAMP CONTROL CIRCUIT**

Turn the ignition off.

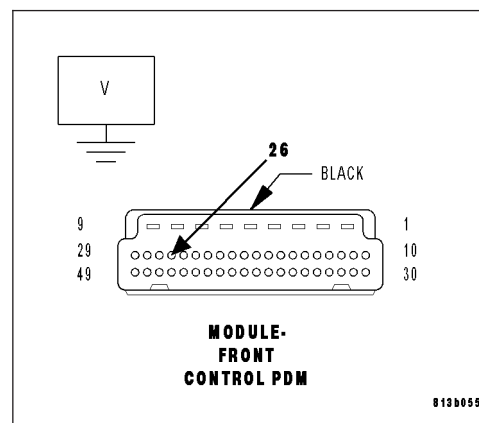
Disconnect the FCM PDM harness connector.

Measure the resistance between ground and the (L139) Fog Lamp Control circuit.

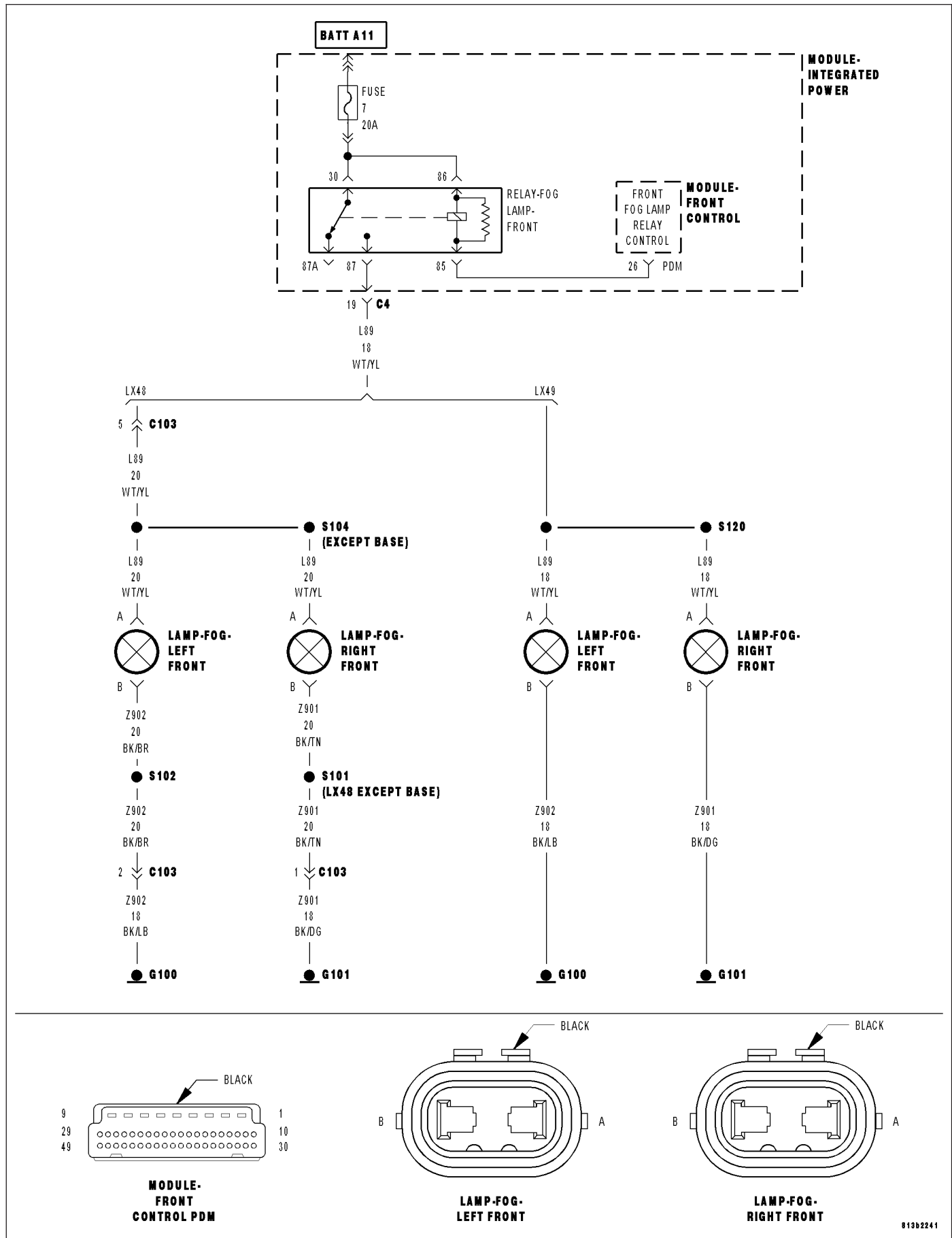
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Front Control Module (FCM) in accordance with the service information.  
Perform the BODY VERIFICATION TEST VER1.

**No** >> Repair the (L139) Fog Lamp Control circuit for a short to ground condition.  
Perform the BODY VERIFICATION TEST VER1.



# B1660-FRONT FOG LAMP CONTROL CIRCUIT HIGH



**B1660-FRONT FOG LAMP CONTROL CIRCUIT HIGH (CONTINUED)**

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Front Fog Lamps activated.
- **Set Condition:**
- When the FCM detects a HIGH condition.

Possible Causes
FRONT FOG LAMP RELAY
MODULE-POWER DISTRIBUTION
FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

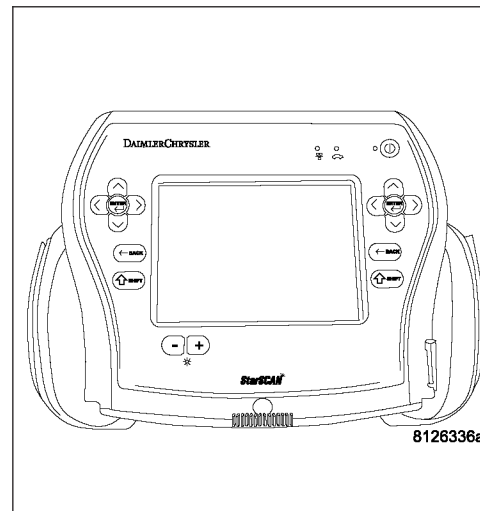
Actuate the Front Fog Lamps.

With the Scan Tool read the DTC information.

**Does the Scan Tool read: B1660-FRONT FOG LAMP CONTROL CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST-VER1.

**2. FRONT FOG LAMP RELAY**

Turn the ignition off.

Remove and install a known good relay in place of the Front Fog Lamp Relay.

**Do the Front Fog Lamps operate normally?**

**Yes** >> Replace the Front Fog Lamp Relay in accordance with the service information.  
Perform the BODY VERIFICATION TEST VER1.

**No** >> Go To 3



**B1660-FRONT FOG LAMP CONTROL CIRCUIT HIGH (CONTINUED)****3. FRONT CONTROL MODULE**

Turn the ignition off.

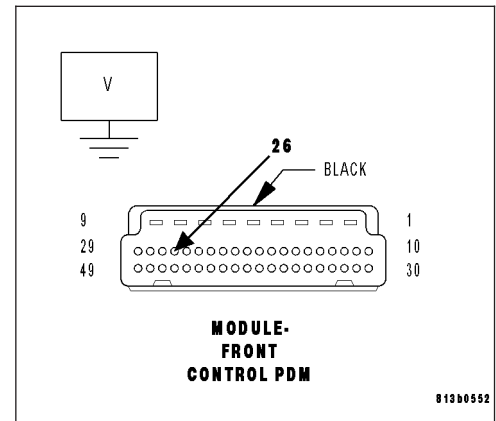
Remove the Front Fog Lamp Relay from the MPD.

Remove the FCM from the Module Power Distribution.

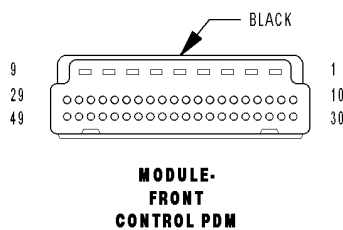
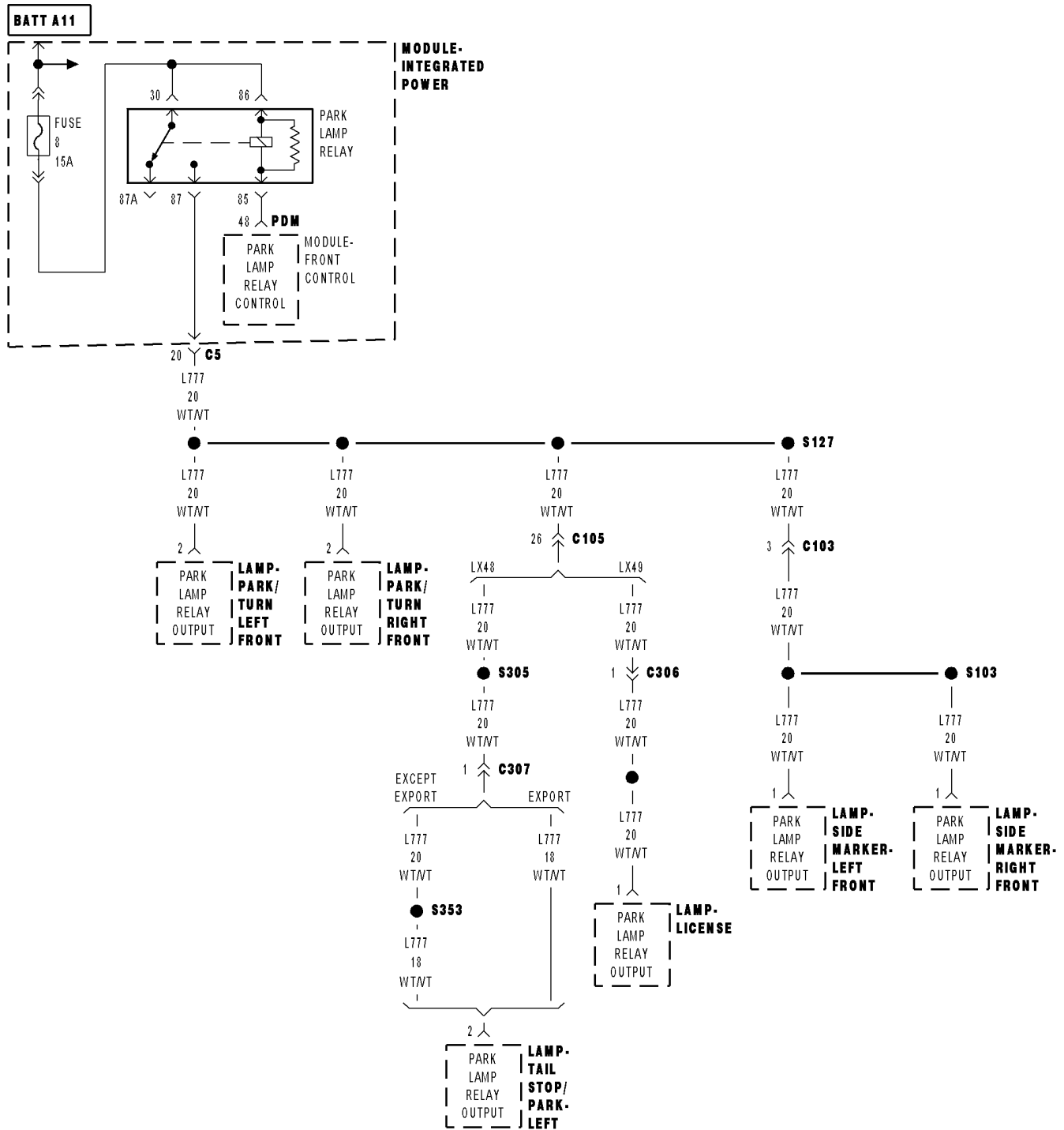
Measure the voltage of the (L139) Front Fog Lamp Relay Output circuit and ground.

**Is the voltage above 1.0 volts?**

- Yes** >> Replace the Module Power Distribution center in accordance with the service information.  
Perform the BODY VERIFICATION TEST-VER1.
- No** >> Replace the Module Front Control in accordance with the service information.  
Perform the BODY VERIFICATION TEST-VER1.



## B165C-PARK LAMP CONTROL CIRCUIT LOW



B165C-PARK LAMP CONTROL CIRCUIT LOW (CONTINUED)

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**
- With the Park Lamps activated.
- **Set Condition:**
- When the FCM detects a LOW condition.

Possible Causes
(L177) PARK LAMP CONTROL CIRCUIT FRONT CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

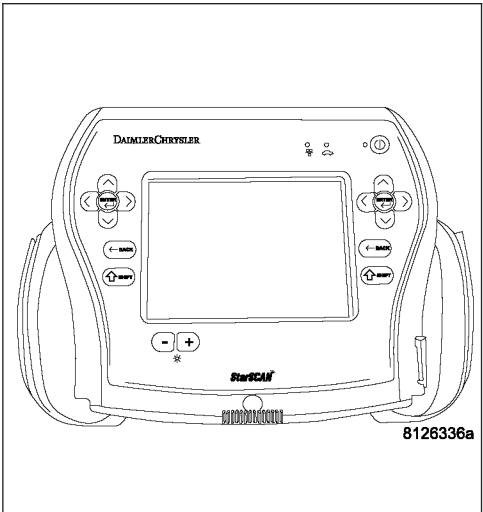
Diagnostic Test

1. INTERMITTENT CONDITION

Turn the ignition on.  
With the Scan Tool, clear all FCM DTC's.  
Turn the Park Lamps on.  
With the Scan Tool read the DTC information.

Does the Scan Tool read: B165C-PARK LAMP CONTROL CIRCUIT LOW?

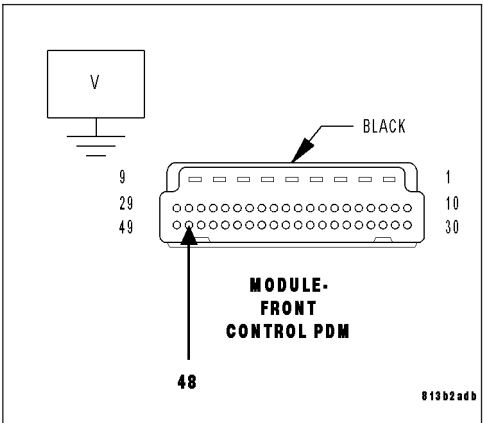
- Yes >> Go To 2
- No >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST-VER1.



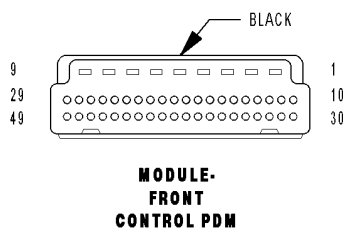
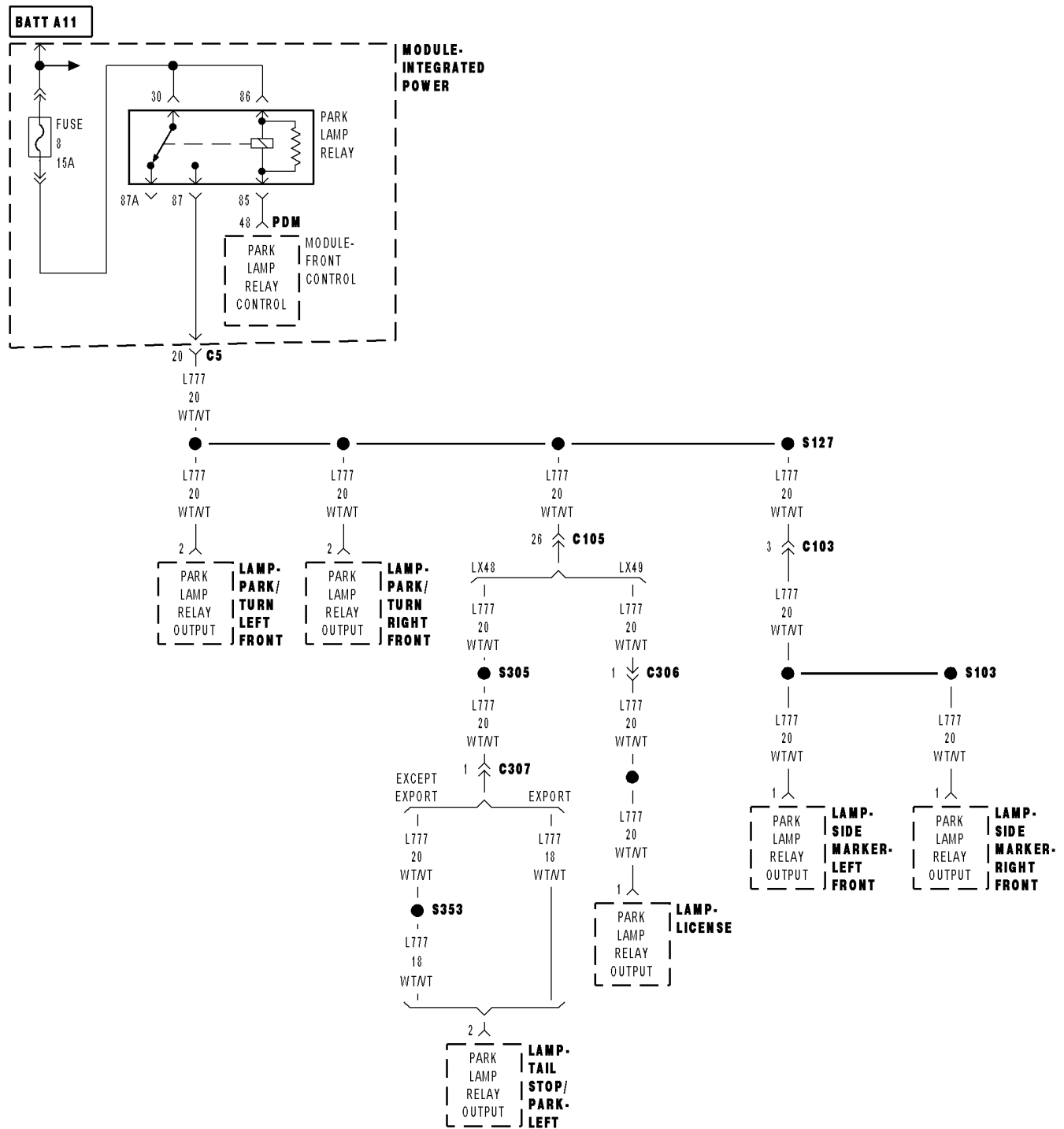
2. (L177) PARK LAMP CONTROL CIRCUIT

Turn the ignition off.  
Disconnect the FCM PDM harness connector.  
Measure the resistance between ground and the (L177) Park Lamp Control circuit.

- Is the resistance below 5.0 ohms?
- Yes >> Replace the Front Control Module (FCM) in accordance with the service information.  
Perform the BODY VERIFICATION TEST VER1.
- No >> Repair the (L177) Park Lamp Control circuit for a short to ground condition.  
Perform the BODY VERIFICATION TEST VER1.



## B165D-PARK LAMP CONTROL CIRCUIT HIGH



**B165D-PARK LAMP CONTROL CIRCUIT HIGH (CONTINUED)**

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the Front Fog Lamps activated.
- **Set Condition:**
- When the FCM detects a HIGH condition.

Possible Causes
PARK LAMP RELAY
MODULE-POWER DISTRIBUTION
FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

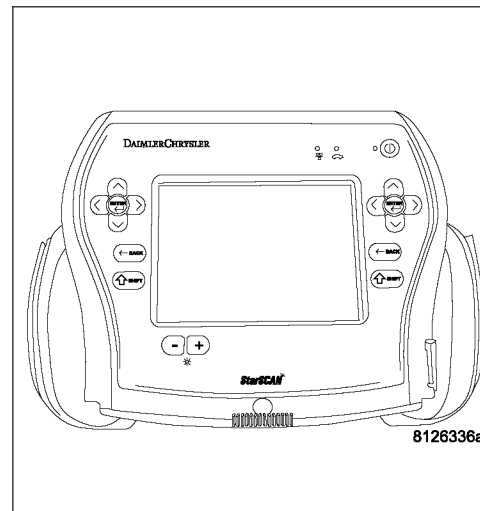
Actuate the Park Lamps.

With the Scan Tool read the DTC information.

**Does the Scan Tool read: B165D-PARK LAMP CONTROL CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST-VER1.

**2. PARK LAMP RELAY**

Turn the ignition off.

Remove and install a known good relay in place of the Park Lamp Relay.

**Do the Front Fog Lamps operate normally?**

**Yes** >> Replace the Park Lamp Relay in accordance with the service information.  
Perform the BODY VERIFICATION TEST VER1.

**No** >> Go To 3

**B165D-PARK LAMP CONTROL CIRCUIT HIGH (CONTINUED)****3. FRONT CONTROL MODULE**

Turn the ignition off.

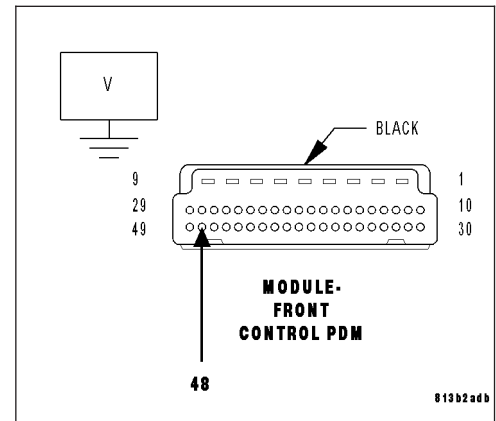
Remove the Park Lamp Relay from the MPD.

Remove the FCM from the Module Power Distribution.

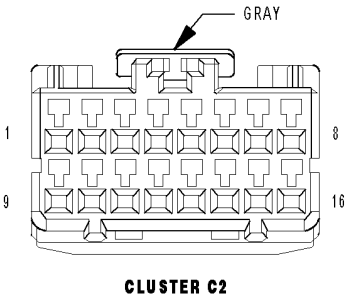
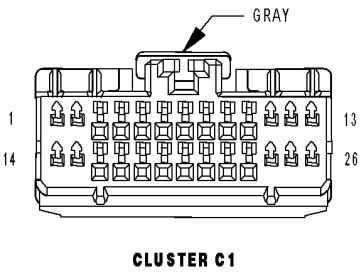
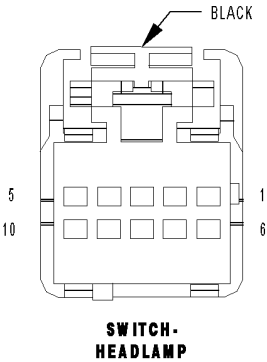
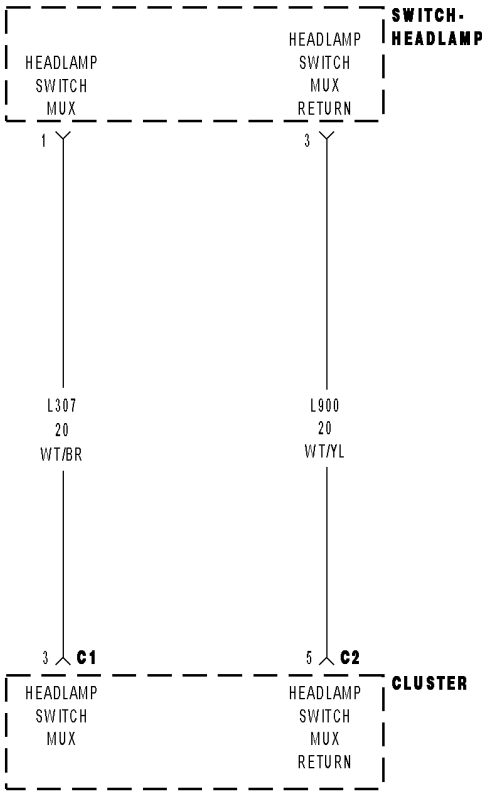
Measure the voltage of the (L177) Park Lamp Relay Output circuit and ground.

**Is the voltage above 1.0 volts?**

- Yes** >> Replace the Module Power Distribution center in accordance with the service information.  
Perform the BODY VERIFICATION TEST-VER1.
- No** >> Replace the Module Front Control in accordance with the service information.  
Perform the BODY VERIFICATION TEST-VER1.



B1607-HEADLAMP SWITCH INPUT CIRCUIT LOW



**B1607-HEADLAMP SWITCH INPUT CIRCUIT LOW (CONTINUED)**

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
HEADLAMP SWITCH (L900) MUX RETURN CIRCUIT INSTRUMENT CLUSTER

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all CCN DTC's.

Turn the Headlamps on.

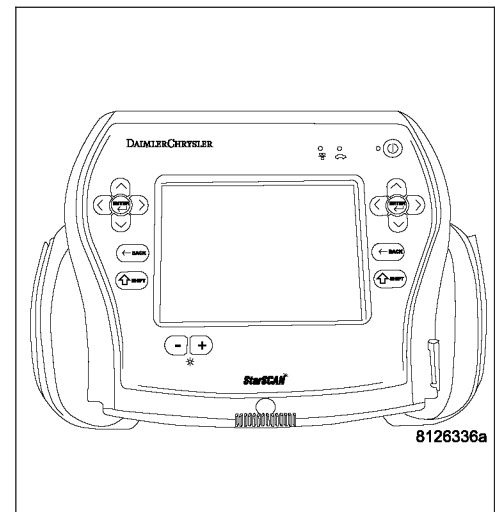
With the Scan Tool, read the DTC information.

**Does the Scan Tool read: B1607-HEADLAMP SWITCH INPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST — VER 1.

**2. HEADLAMP SWITCH**

Disconnect the Headlamp Switch connector.

Turn the ignition on.

Measure the voltage of the (L900) MUX Return circuit.

**Does the voltage read 5.0 volts?**

**Yes** >> Go To 3

Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Replace the Headlamp Switch in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.



**B1607-HEADLAMP SWITCH INPUT CIRCUIT LOW (CONTINUED)****3. (L900) MUX RETURN CIRCUIT**

Turn the ignition off.

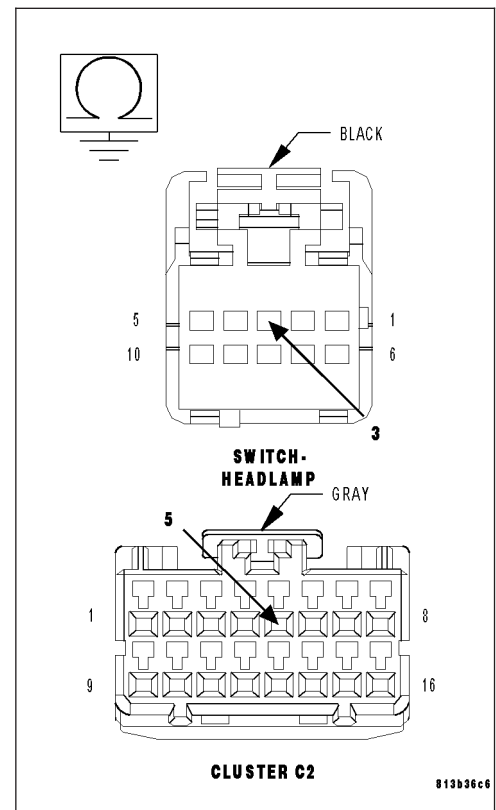
Disconnect the Headlamp Switch connector.

Disconnect the Instrument Cluster C2 connector.

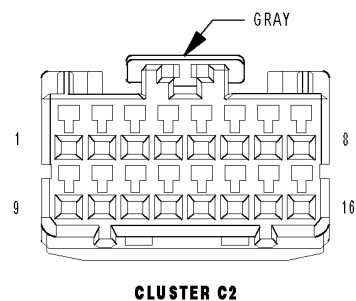
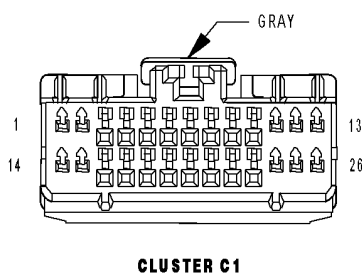
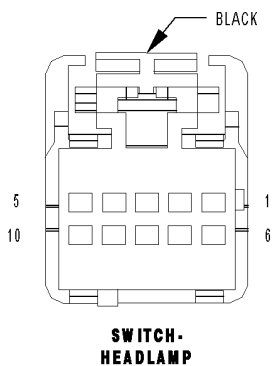
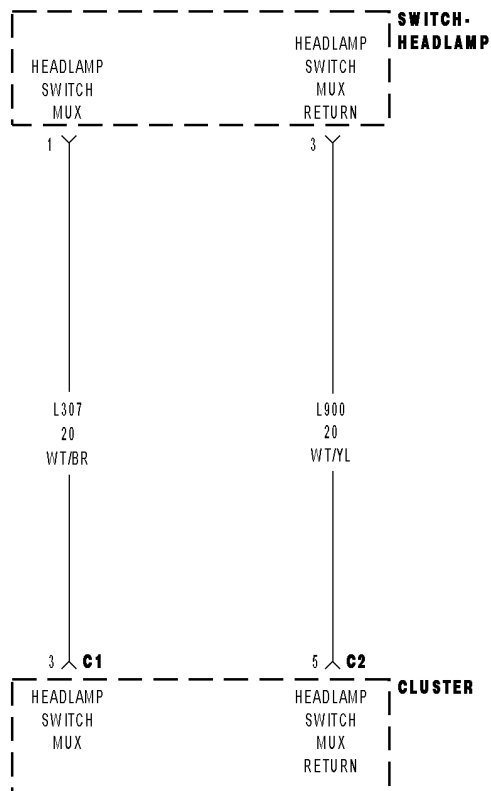
Measure the resistance of the (L900) MUX Return circuit to ground.

**Is the resistance below 5.0 ohms?**

- Yes** >> Repair the (L900) Headlamp MUX return circuit.  
Perform the BODY VERIFICATION TEST — VER 1.
- No** >> Replace the Instrument Cluster in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.



## B1608-HEADLAMP SWITCH INPUT CIRCUIT HIGH



**B1608-HEADLAMP SWITCH INPUT CIRCUIT HIGH (CONTINUED)**

For the Exterior Lighting system circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
HEADLAMP SWITCH (L900) HEADLAMP MUX RETURN CIRCUIT (L307) HEADLAMP MUX INPUT CIRCUIT INSTRUMENT CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

**Diagnostic Test**

**1. INTERMITTENT CONDITION**

Turn the ignition on.

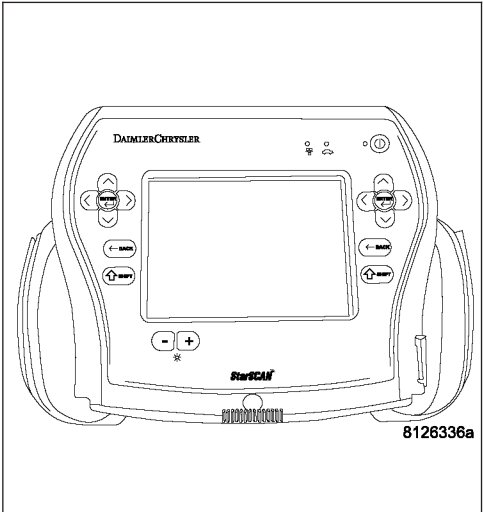
With the Scan Tool, clear all CCN DTC's.

Turn the Headlamps on.

With the Scan Tool, read the DTC information.

**Does the Scan Tool read: B1608-HEADLAMP SWITCH INPUT CIRCUIT HIGH?**

- Yes**    >> Go To 2
- No**     >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.
- Perform the BODY VERIFICATION TEST — VER 1.



**2. HEADLAMP SWITCH**

Disconnect the Headlamp Switch connector.

Turn the ignition on.

Measure the voltage between the (L900) Headlamp MUX Return circuit and (L307) Headlamp Input MUX circuit.

**Does the voltage read 0.0 volts?**

- Yes**    >> Replace the Headlamp Switch in accordance with the service information.
- Perform the BODY VERIFICATION TEST — VER 1.
- No**     >> Go To 3

**B1608-HEADLAMP SWITCH INPUT CIRCUIT HIGH (CONTINUED)****3. (L900) MUX RETURN CIRCUIT**

Turn the ignition off.

Disconnect the Headlamp Switch connector.

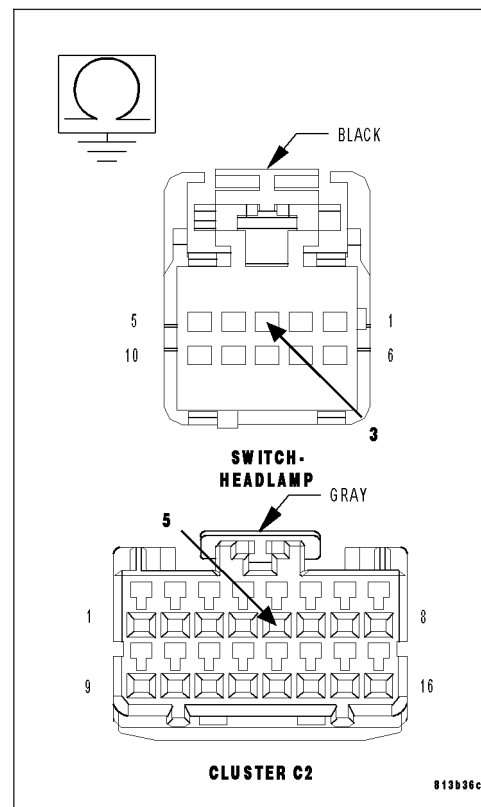
Disconnect the Instrument Cluster C2 connector.

Measure the resistance of the (L900) Headlamp MUX Return circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (L900) Headlamp MUX Return circuit.  
Perform the BODY VERIFICATION TEST — VER 1.

**4. INSTRUMENT CLUSTER**

Turn the ignition off.

Disconnect the Headlamp Switch connector.

Disconnect the Instrument Cluster C2 connector.

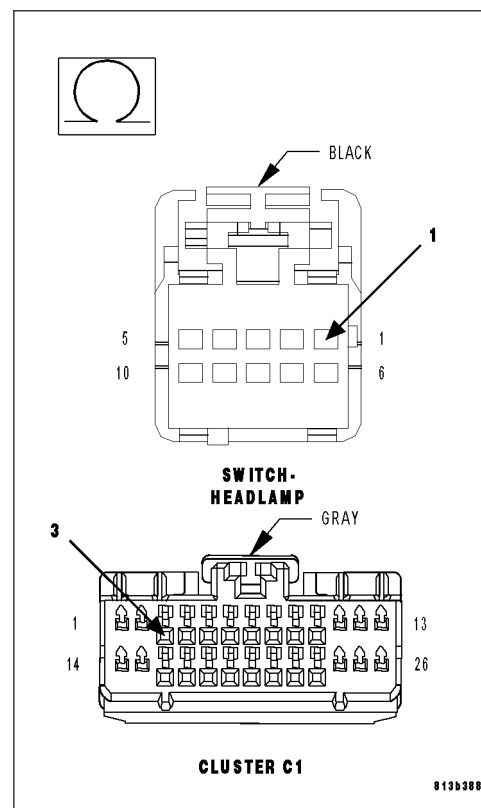
Measure the resistance of the (L307) Headlamp MUX circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the instrument Cluster in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Repair the (L307) Headlamp MUX circuit.  
Perform the BODY VERIFICATION TEST — VER 1.





**B167A-LEFT FRONT HEADLAMP LIGHT SOURCE CIRCUIT (CONTINUED)**

For the Exterior Lighting System circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:
- Continuously with the ignition on.
- Set Condition:
- The code will set when the HID Module detects an INOP Headlamp Source.

Possible Causes
HEADLAMP SOURCE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test**

**1. Verify DTC B167A-LEFT FRONT HEADLAMP LIGHT SOURCE CIRCUIT IS ACTIVE**

**Note:** If a DTC is set, erase the DTC and attempt to reset the DTC.  
**If the DTC resets, follow test.**

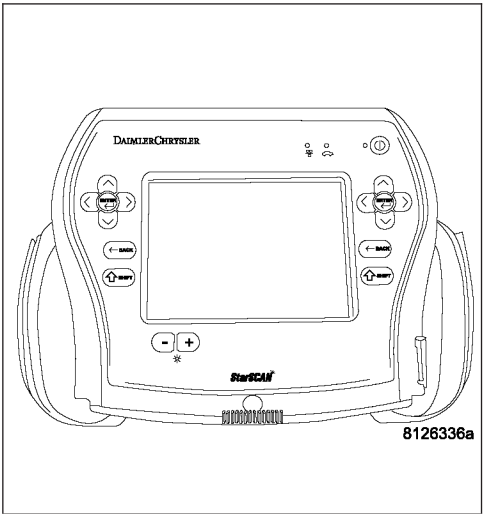
This is a Headlamp Source failure

[View repair](#)

**Does the DTC reset and read B167A-LEFT FRONT HEADLAMP LIGHT SOURCE CIRCUIT?**

**Repair**

- Replace the appropriate Headlamp Source in accordance with the service information.
- Perform the BODY VERIFICATION TEST — VER 1.





**B167B-RIGHT FRONT HEADLAMP LIGHT SOURCE CIRCUIT (CONTINUED)**

For the Exterior Lighting System circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:
- Continuously with the ignition on.
- Set Condition:
- The code will set when the HID Module detects an INOP Headlamp Source.

Possible Causes
HEADLAMP SOURCE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test**

**1. Verify DTC B167B-RIGHT FRONT HEADLAMP LIGHT SOURCE CIRCUIT IS ACTIVE**

**Note: If a DTC is set, erase the DTC and attempt to reset the DTC.  
If the DTC resets, follow test.**

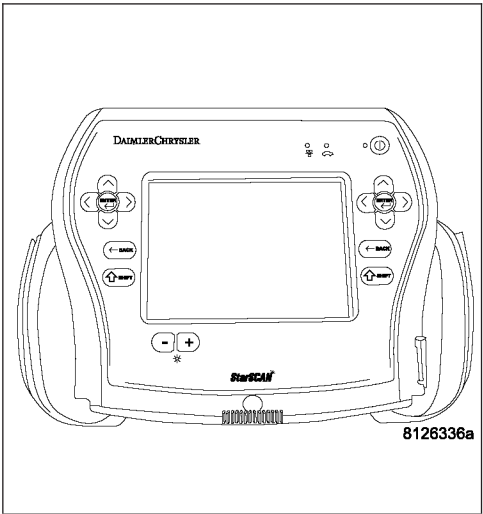
This is a Headlamp Source failure

[View repair](#)

**Does the DTC reset and read B167B-RIGHT FRONT HEADLAMP  
LIGHT SOURCE CIRCUIT?**

**Repair**

Replace the appropriate Headlamp Source in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.





B2235-LEFT FRONT HEADLAMP BALLAST ECU INTERNAL

For the Exterior Lighting System circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:
- Continuously with the Headlamps on.
- Set Condition:
- The code will set when a Check Sum error is detected.

Possible Causes
LEFT HEADLAMP BALLAST ECU FAILURE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. Verify DTC B2235-LEFT FRONT HEADLAMP BALLAST ECU INTERNAL IS ACTIVE

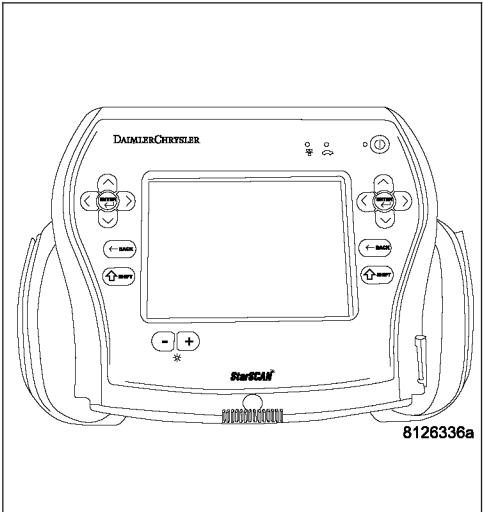
**Note:** If a DTC is set, erase the DTC and attempt to reset the DTC.  
**If the DTC resets, follow test.**

This is an internal Ballast ECU failure  
[View repair](#)

**Does the DTC reset and read B2235-LEFT FRONT HEADLAMP BALLAST ECU INTERNAL?**

Repair

Replace the Left Side Headlamp Ballast ECU in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.



**B2236-RIGHT FRONT HEADLAMP BALLAST ECU INTERNAL**

For the Exterior Lighting System circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:
- Continuously with the Headlamps on.
- Set Condition:
- The code will set when a Check Sum error is detected.

Possible Causes
RIGHT HEADLAMP BALLAST ECU FAILURE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. Verify DTC B2236-RIGHT FRONT HEADLAMP BALLAST ECU INTERNAL IS ACTIVE**

**Note: If a DTC is set, erase the DTC and attempt to reset the DTC.**

**If the DTC resets, follow test.**

This is an internal Headlamp Ballast ECU failure

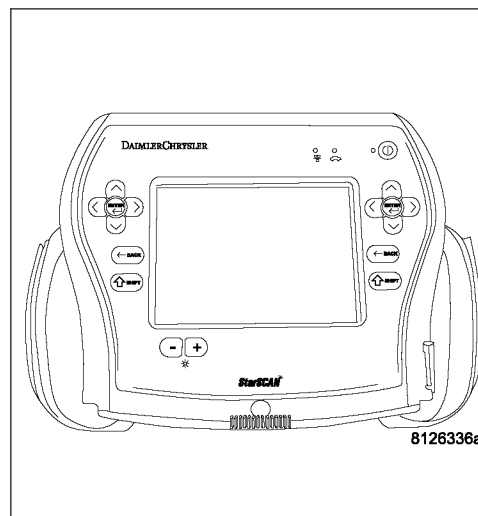
View repair

**Does the DTC reset and read B2236-RIGHT FRONT HEADLAMP BALLAST ECU INTERNAL?**

**Repair**

Replace the Right Side Headlamp Ballast ECU in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.



B2239-HID LEVELING TRANSLATOR ECU INTERNAL

For the Exterior Lighting System circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:
- Continuously with the ignition on.
- Set Condition:
- The code will set when the HID Module detects an internal failure.

Possible Causes
MODULE INTERNAL FAILURE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.

Diagnostic Test

1. Verify DTC B2239-HID LEVELING TRANSLATOR ECU INTERNAL IS ACTIVE

**Note:** If a DTC is set, erase the DTC and attempt to reset the DTC.  
**If the DTC resets, follow test.**

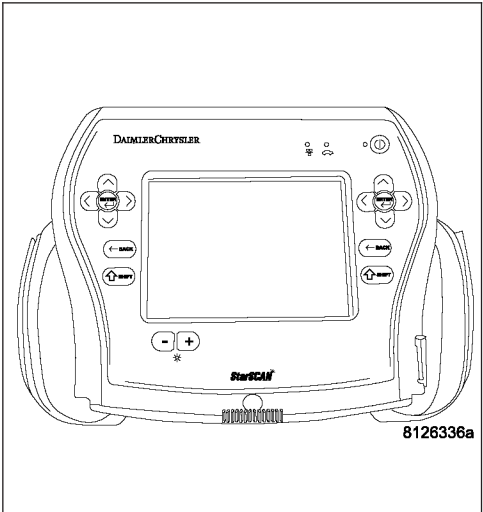
This is an internal module failure

View repair

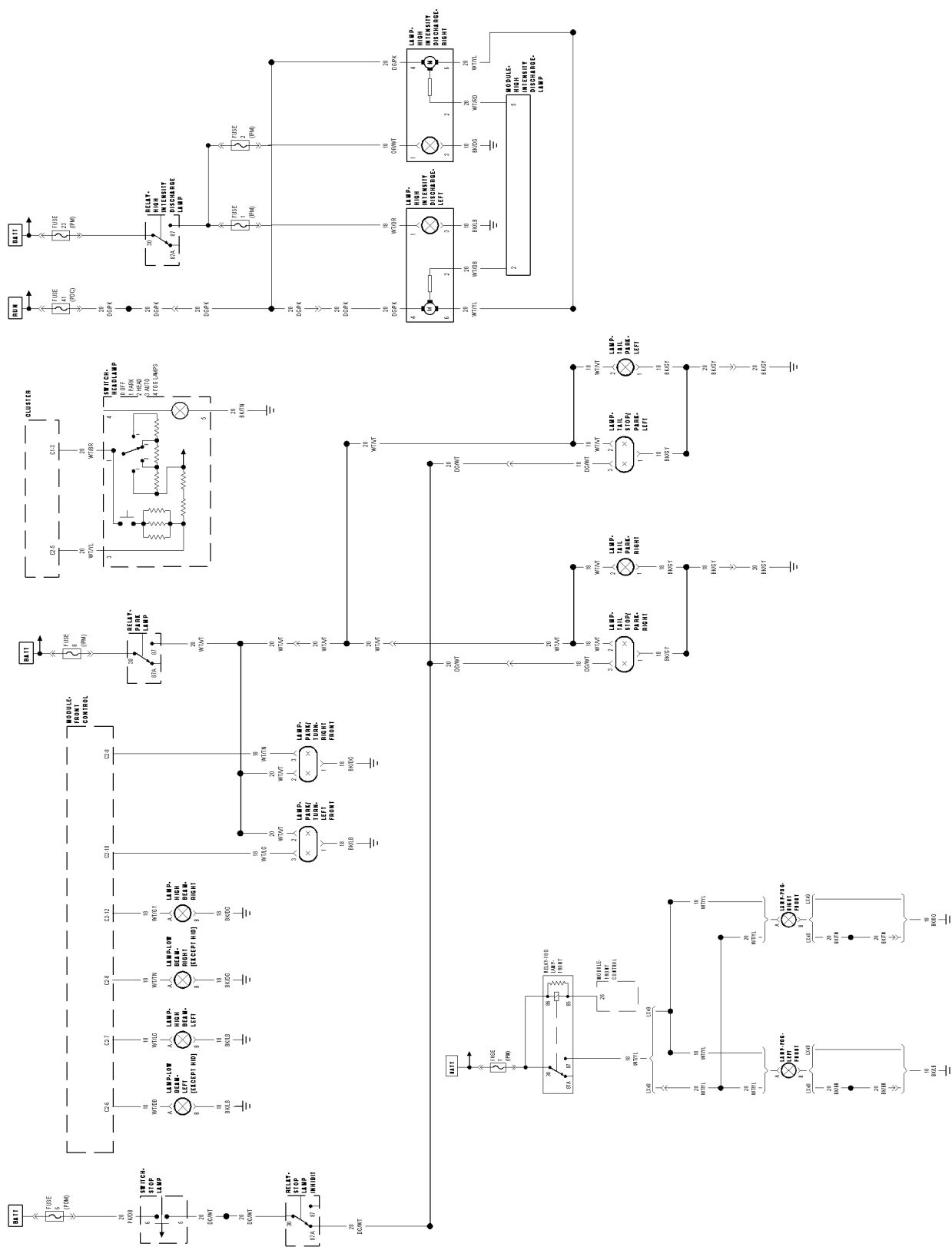
**Does the DTC reset and read B2239-HID LEVELING TRANSLATOR ECU INTERNAL?**

Repair

- Replace the HID Translator Module in accordance with the service information.
- Perform the BODY VERIFICATION TEST — VER 1.



## SCHEMATICS AND DIAGRAMS



## LAMPS/LIGHTING - EXTERIOR - SERVICE INFORMATION

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## LAMPS/LIGHTING - EXTERIOR - SERVICE INFORMATION

### DESCRIPTION

The exterior lighting system for this model includes the following exterior lamp units:

- **Center High Mounted Stop Lamp** - A Center High Mounted Stop Lamp (CHMSL) is centered on the rear shelf trim panel at the base of the backlite on sedans, and on the liftgate spoiler just above the liftgate glass opening at the rear of the vehicle on the wagon.
- **Front Fog Lamps** - Vehicles equipped with this option have a fog lamp unit mounted near each outboard end of the front bumper support, behind the lower portion of the front fascia.
- **Front Headlamp Units** - A front headlamp unit is mounted to the front of each front fender panel on either side of the grille opening.
- **License Plate Lamp** - A rear license plate lamp unit is mounted to the rear fascia, just above the license plate tub.

- **Tail Lamp Units** - A tail lamp unit is mounted to the rear of each quarter panel on either side of the liftgate opening.

These exterior lighting lamps and their controls are combined to provide the following exterior lighting features:

- **Automatic Headlamps** - Vehicles with the automatic headlamps option are equipped with a unique headlamp switch that includes an automatic position and a sun load sensor located on the top of the instrument panel to sense ambient light levels. When the Auto position of the headlamp switch is selected, the headlamps are turned On automatically when ambient light levels are low.
- **Daytime Running Lamps** - Vehicles manufactured for sale in Canada illuminate the low beam filament of the headlamp bulb in each front lamp unit to serve as the Daytime Running Lamps (DRL). Fleet vehicles manufactured for sale in the United States illuminate the high beam filament of the headlamp bulb in each front lamp unit to serve as the DRL.

Other components of the exterior lighting system for this model include:

- **Backup Lamp Switch** - A Transmission Range Sensor (TRS) integral to the solenoid pack on the valve body of the electronic automatic transmission performs the backup lamp switch function for this model.
- **Brake Lamp Switch** - A plunger-type brake lamp switch is located on the steering column support bracket under the instrument panel and is actuated by the brake pedal arm.
- **Front Control Module** - The Front Control Module (FCM) is integral to the Integrated Power Module (IPM). The FCM/IPM is located in the engine compartment, near the battery and the Power Distribution Center (PDC). (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION - DESCRIPTION).
- **Headlamp Switch** - A headlamp switch is located on the left side of the instrument panel, below and outboard of the steering column. The headlamp switch includes a rotary knob for the park lamps and headlamps On or Off, and a push button switch for selecting the front fog lamps on vehicles so equipped. The headlamp switch also features a vertical thumbwheel for selecting the panel lamps dimming level, a Parade mode to illuminate all Vacuum Fluorescent Display (VFD) units at full brightness for visibility when driving in daylight with the exterior lighting turned On, and for interior lighting control.
- **Instrument Cluster** - The ElectroMechanical Instrument Cluster (EMIC) is also known as the Cab Control Node (CCN) in this vehicle. The EMIC/CCN is located in the instrument panel above the steering column opening, directly in front of the driver. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DESCRIPTION).
- **Multi-Function Switch** - The multi-function switch is located on the steering column, just below the steering wheel. A control stalk that extends from the left side of the switch is used to select the turn signal lamps (right or left) and to select the headlamp beam (low, high or optical horn).

## OPERATION

### DAYTIME RUNNING LAMPS

Power is reduced using pulse-width modulation (PWM) to the high beams, where by the power is switched on and off rapidly instead of remaining on continuously. The duration and interval of the power pulses is programmed into the IPM.

### AUTOMATIC HEADLAMP SYSTEM

Automatic headlamps are controlled by the Cab Compartment Node (CCN). With the headlamp switch in the AUTO position, the CCN will control the headlamp, parking, side marker, tail and instrumentation lamps based on ambient light levels. Ambient light levels are monitored by the CCN using the ambient light signal present. Ambient light readings are averaged to limit cycling the lamps ON and OFF when passing through areas with varying light levels. The automatic headlamps will only function when the engine is running with RPM > 300. When the headlamp switch is in the AUTO position (Automatic mode), the Headlamp Time Delay system will function when the ignition switch is placed in any position other than run/start.

### HEADLAMP TIME DELAY SYSTEM

The headlamp time delay system is activated by turning the headlamps ON (high or low beam) while the engine is running, turning the ignition switch OFF, and then turning the headlamp switch OFF. The Cab Compartment Node (CCN) will allow the headlamps to remain ON for 90 seconds (configurable) before they automatically turn off (If the key is in the ignition during the headlamp time delay mode, then both the headlamps and park lamps (including panel dimming) will be ON). Refer to the Owner's Manual for more information.

If the headlamp switch is in the Auto Headlamp Position, the headlamps are ON due to the night signal from the ambient light sensor and the ignition switch is in any position other than run/start, the CCN shall enter a 90 second (configurable) Auto Headlamps time delay mode. If the key is in the ignition during the headlamp time delay mode, then both the headlamps and park lamps (including panel dimming) will be ON. If the key is not in the ignition, then only the headlamps will be ON. The CCN will allow the headlamps to remain ON for 90 seconds before they automatically turn OFF. Refer to the Owner's Manual for more information.

## **WARNING**

**Eye protection should be used when servicing glass components. Personal injury or death could result.**

**This vehicle contains mercury added devices added by the manufacturer: High Intensity Discharge (HID) headlamps. Remove devices before vehicle disposal. Upon removal of devices, please reuse, recycle, or dispose of as hazardous waste.**

**Do not back probe any connectors or pierce any wiring to the HID headlamp system. High voltage (a/c voltage) is used in this system and component and personal injury or death could result (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP - DIAGNOSIS AND TESTING - HID HEADLAMPS).**

**Do not power up the headlamp assembly with the headlamp access cover off. A high voltage a/c (alternating current) shock may occur causing personal injury or death.**

**On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.**

**Do not touch the glass of halogen bulbs with fingers or other possibly oily surface, reduced bulb life will result. Do not use bulbs other than those indicated in the bulb application table. Damage to lamp and/or daytime running lamp module can result. Do not use fuses, circuit breakers or relays having greater amperage value than indicated on the fuse panel or in the owners manual.**

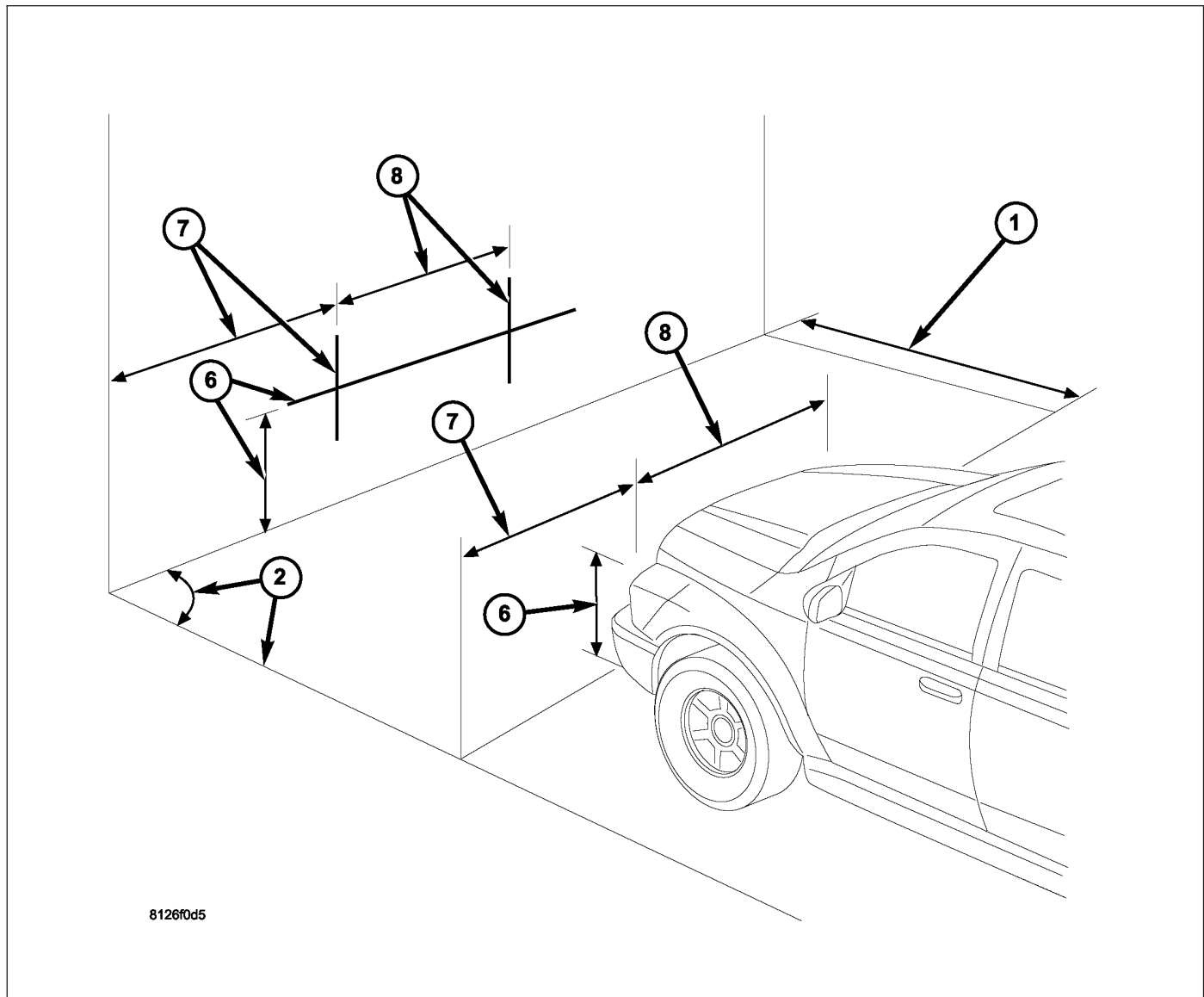
**Do not use bulbs other than those listed in the bulb application table. Damage to lamp can result. Do not touch bulbs with fingers or other oily surfaces. Bulb life will be reduced.**

## **STANDARD PROCEDURE**

### **FRONT LAMP AIMING**

#### **VEHICLE PREPARATION FOR LAMP ALIGNMENT**

1. Check for and correct any burnt out bulbs.
2. Repair or replace any faulty, worn or damaged body or suspension components that could hinder proper lamp alignment.
3. Verify proper tire inflation pressures.
4. Remove any accumulations of mud, snow or ice from the vehicle underbody and clean the front lamp lenses.
5. Verify that there is no load in the vehicle (cargo or passengers), except for the driver.
6. The fuel tank should be Full. Add 2.94 kilograms (6.5 pounds) of weight over the fuel tank for each estimated gallon of missing fuel.
7. Verify correct vehicle suspension height.

**LAMP ALIGNMENT SCREEN PREPARATION**

The procedure that follows will prepare a suitable front lamp alignment screen.

1. Tape a line on a level floor 7.62 meters (25 feet) away from and parallel to the flat wall that will be used as the lamp alignment screen. The level floor will be used as the horizontal zero reference.
2. An adjacent wall or floor member that is perpendicular to the alignment screen can be used as the vertical zero reference. If there is no adjacent wall or floor member that is perpendicular to the screen, tape a second line on the floor perpendicular to both the alignment screen and the first line, and outboard of either side of where the vehicle will be positioned. This will be used as the vertical zero reference.
3. Position the vehicle so that the side of the vehicle is parallel to the vertical zero reference, and so that the front of the lamp lenses are in the vertical plane of the parallel line taped on the floor 7.62 meters (25 feet) away from the screen.
4. Rock the vehicle side-to-side three times to allow the suspension to stabilize.
5. Jounce the front suspension three times by pushing downward on the front bumper and releasing.
6. Measure the distance between the optical center of one of the lamps being aimed (head or fog) and the floor (horizontal zero reference). Transfer this measurement to the alignment screen with a piece of tape placed horizontally to the floor. This line will be used as the lamp horizontal reference.
7. Measure the distance between the vertical zero reference and the optical center of the nearest lamp being aimed (head or fog). Transfer this measurement to the alignment screen with a piece of tape placed vertically across the appropriate (head or fog) lamp horizontal reference. This is the centerline reference for the first lamp.



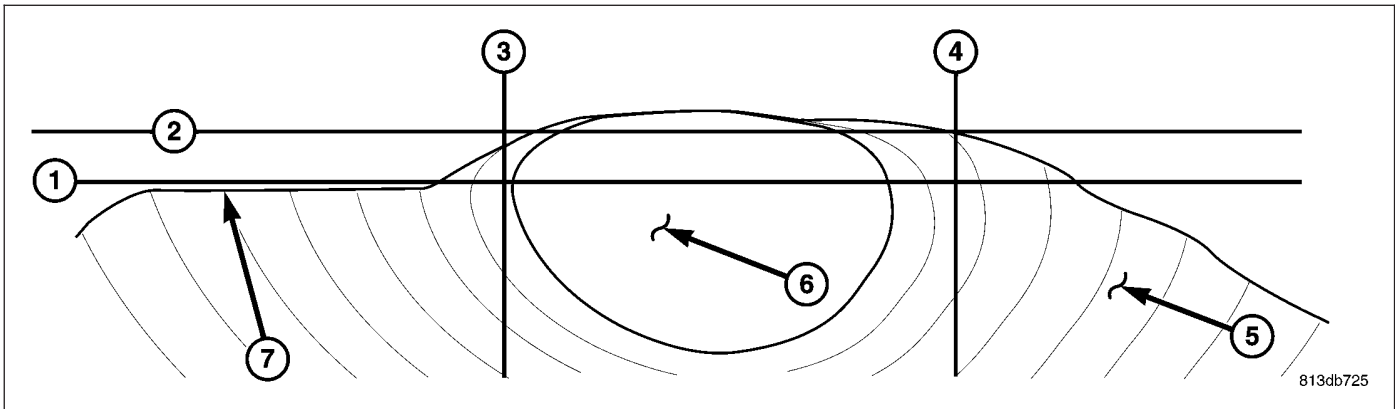
8. Measure the distance on center between the first and the second lamp being aimed. Transfer this measurement to the alignment screen with a second piece of tape placed vertically across the appropriate (head or fog) lamp horizontal reference. This is the centerline reference for the second lamp.

## HEADLAMP ALIGNMENT

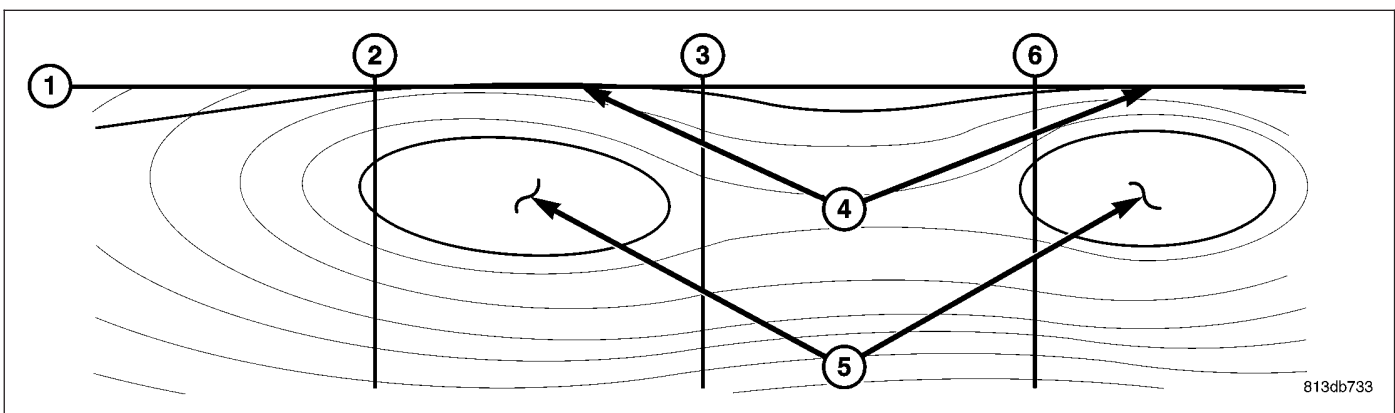
There are two different kinds of headlamp aiming procedures, depending on which type of headlamp the vehicle is equipped with:

- **Visual Aim Optical Left (VOL)** - 300C with halogen, 300C w/HID, and 300C w/HID - Export.
- **Visual Aim Optical Right (VOR)** - 300/300 Touring and Dodge Magnum.

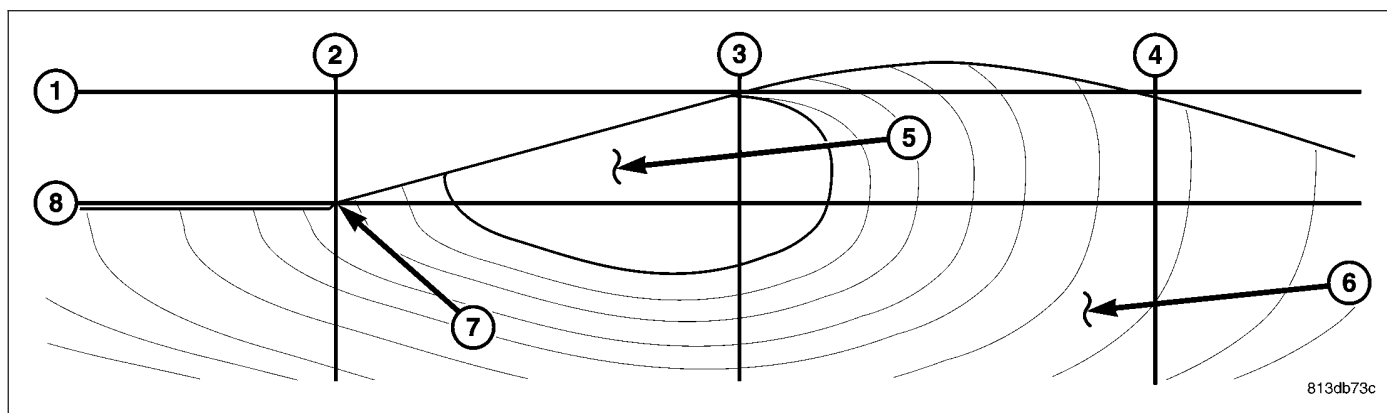
The VOL or VOR is embossed on the lower front of each headlamp unit.



**VOL Headlamp Aiming** - With the horizontal centerline of the headlamp (2) transferred on the wall, measure down 53 mm (2.1 in). This line (1) will be the vertical aiming mark. Using the left side of the headlamp vertical centerline (3), adjust the headlamp unit so the residual light from the headlamp, not the hot spot (6), is below the line (1) that was marked previously 53 mm (2.1 in) below the horizontal centerline (2). The ideal alignment should be (7). The right headlamp aiming will be the same, but using the area left of right headlamp vertical centerline.



**VOR Headlamp Aiming** - With the horizontal centerline of the headlamp (1) transferred on the wall, this line (1) will be the vertical aiming mark. Using the right side of the headlamp vertical centerline (2 or 6). Adjust the headlamp unit so the residual light from the headlamp (4), is below the horizontal centerline (1). The ideal alignment should be (4).



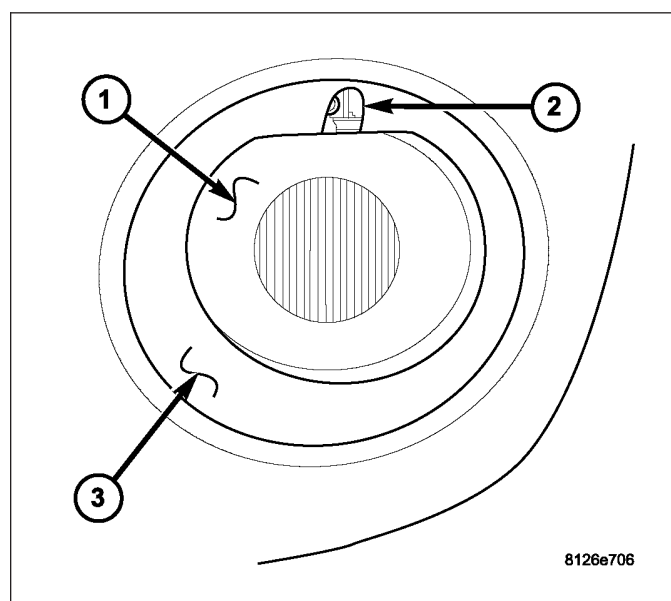
**VOL Export Headlamp Aiming** - With the horizontal centerline of the headlamp (1) transferred on the wall, measure down 76 mm (3 in). This line (8) will be the vertical aiming mark. Using the intersecting point (7) of the horizontal centerline (8) and the vertical centerline (2) for the left headlamp, adjust the headlamp unit horizontally and vertically so (7) is the intersecting point at lines (8 and 2). For the right headlamp unit, cover up the left headlamp and follow the same procedure but intersecting at (8 and 4).

1. Turn the headlamps On and select the Low beams.
2. Rotate the headlamp vertical adjustment screw (and horizontal on export) on each lamp to adjust the beam height as required.

## FOG LAMP ALIGNMENT

A properly aimed front fog lamp will project a pattern on the alignment screen 100 millimeters (4 inches) below the fog lamp centerline and straight ahead of the lamp.

1. Turn the fog lamps On.
2. Rotate the fog lamp vertical adjustment screw (2) on each lamp to adjust the beam height as required.



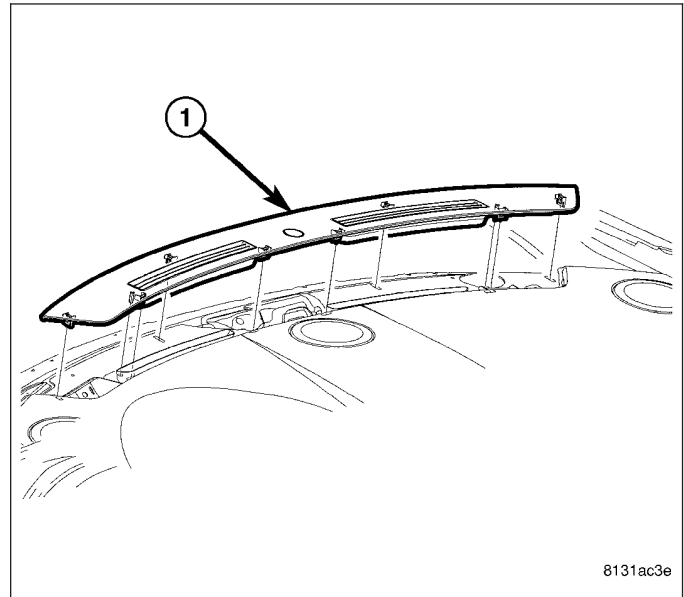
**SPECIFICATIONS****EXTERIOR LAMPS****BULB APPLICATION TABLE**

LAMP	BULB
<b>CHRYSLER 300/300 TOURING</b>	
Back-Up	3057
CHMSL	LED (Replace as unit)
Front Fog	9145/H10
Front Park/Turn	3757AK
Front Sidemarker	W5W
High Beam Headlamp	9005
License	168
Low Beam Headlamp	9006
Rear Sidemarker	168
Tail/Stop/Turn	3057
<b>CHRYSLER 300C</b>	
Back-Up	3057
CHMSL	LED (Replace as unit)
Front Fog	9145/H10
Front Park/Turn	3157AK
Front Sidemarker	W5W
High Beam Headlamp	9005
License	W5W
Low Beam Headlamp (Halogen)	9006XS
Low Beam Headlamp (HID)	DIS
Tail/Stop/Turn	3057
<b>DODGE MAGNUM</b>	
Back-Up	921/W16W
CHMSL	LED (Replace as unit)
Front Fog	9145/H10
Front Park/Turn	3457AK
Front Sidemarker	194NA
High Beam Headlamp	9005
License	W5W
Low Beam Headlamp	9006
Rear Sidemarker	3757APY27/7W
Tail/Stop/Turn	3157KP27/7W

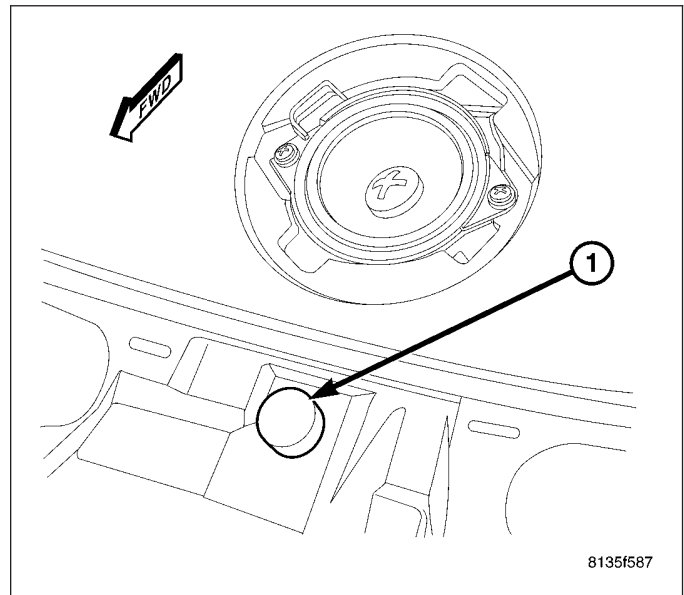
## AUTO HEADLAMP SENSOR

### REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the defroster grille (Refer to 23 - BODY/ INSTRUMENT PANEL/DEFROSTER GRILLE - REMOVAL).

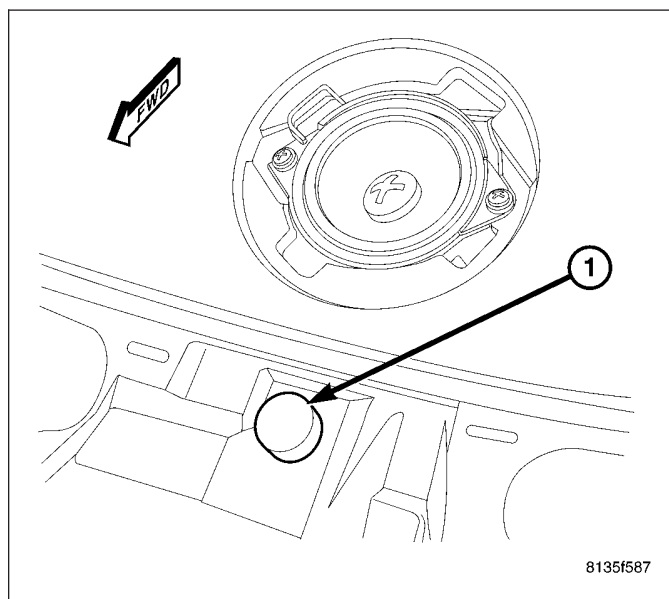


3. Using a trim stick (special tool #C-4755) or equivalent, gently pry up on the auto headlamp sensor (1).
4. Pull the sensor from the top of the instrument panel.
5. Disconnect the one electrical connector.

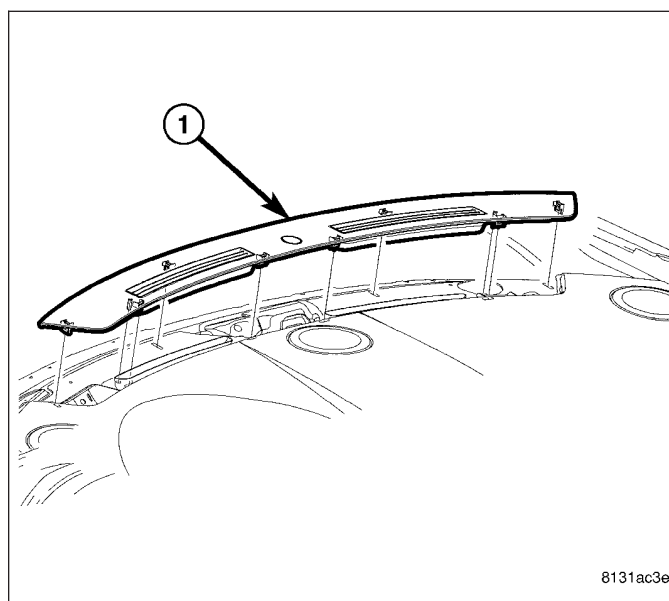


## INSTALLATION

1. Connect the one electrical connector.
2. Position the auto headlamp sensor (1) in instrument panel and press firmly down to snap into place.



3. Install the defroster grille (Refer to 23 - BODY/INSTRUMENT PANEL/DEFROSTER GRILLE - INSTALLATION).
4. Connect the battery negative cable.

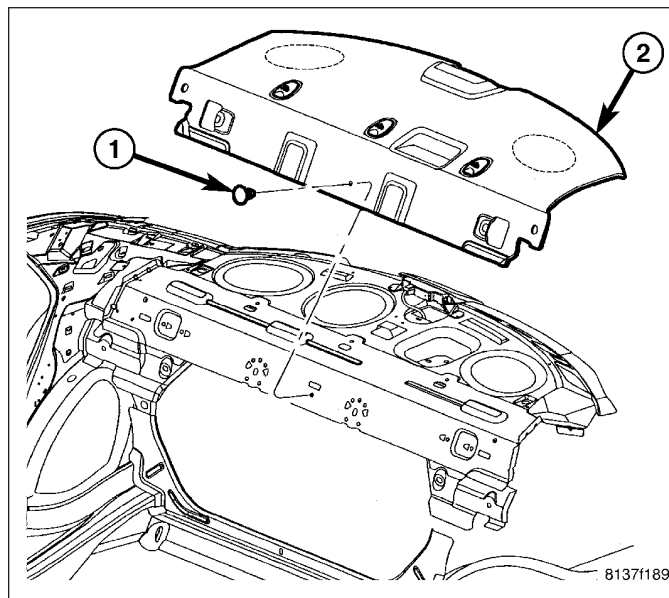


## CENTER HIGH MOUNTED STOP LAMP

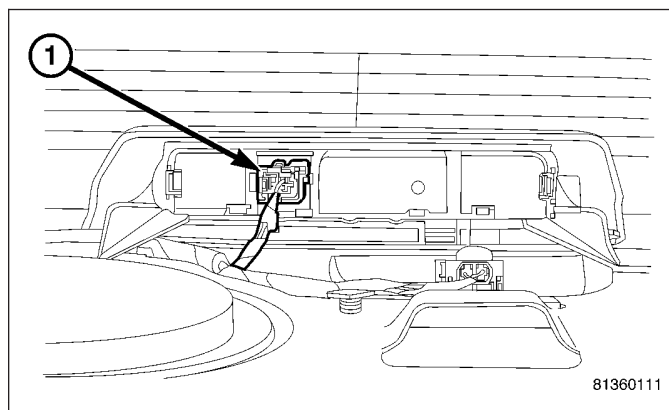
### REMOVAL

#### SEDAN

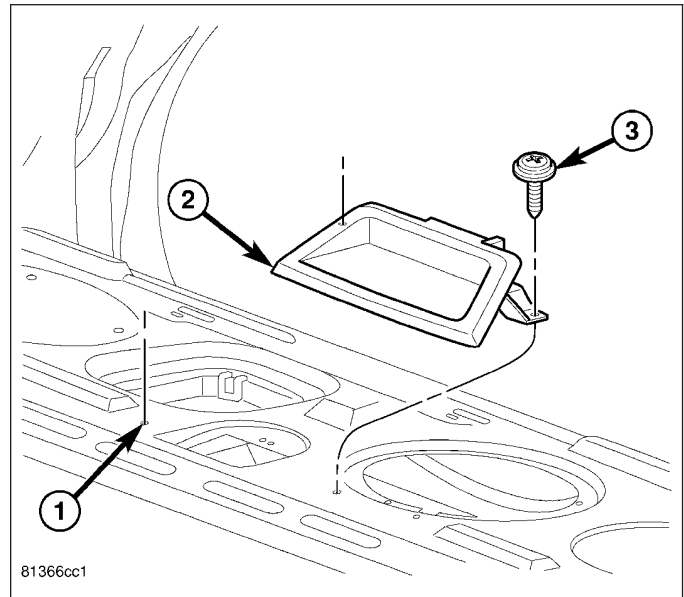
1. Disconnect and isolate the battery negative cable.
2. Remove the rear shelf trim panel (Refer to 23 - BODY/INTERIOR/REAR SHELF TRIM PANEL - REMOVAL).



3. Disconnect the CHMSL electrical connector (1).

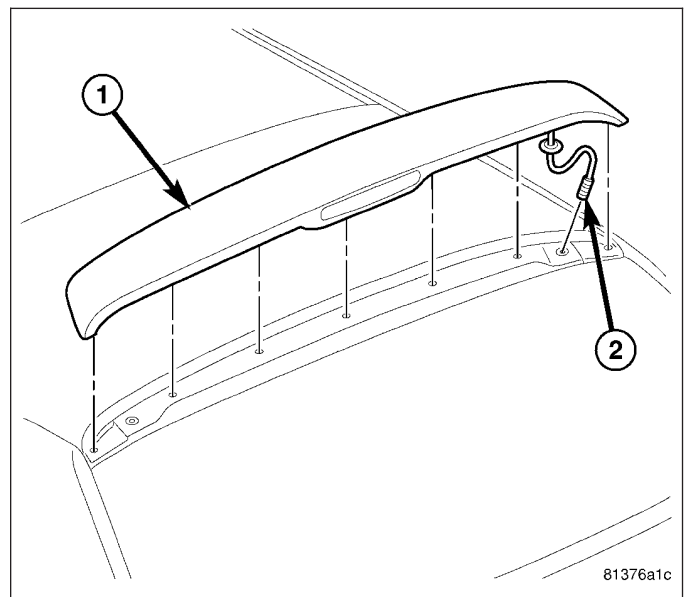


4. Remove the two mounting fasteners (3) to the CHMSL (2).



## WAGON

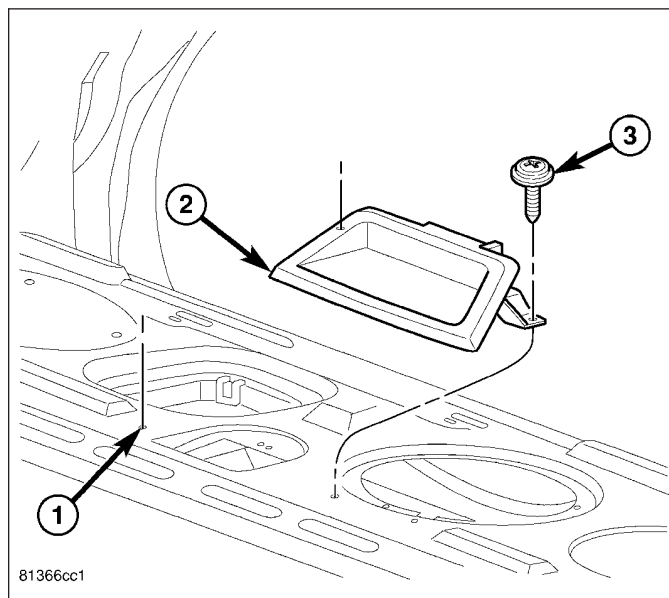
1. Remove the rear spoiler (Refer to 23 - BODY/EXTERIOR/SPOILER - REMOVAL).
2. With the rear spoiler on bench, remove the fasteners and electrical connector from the CHMSL.



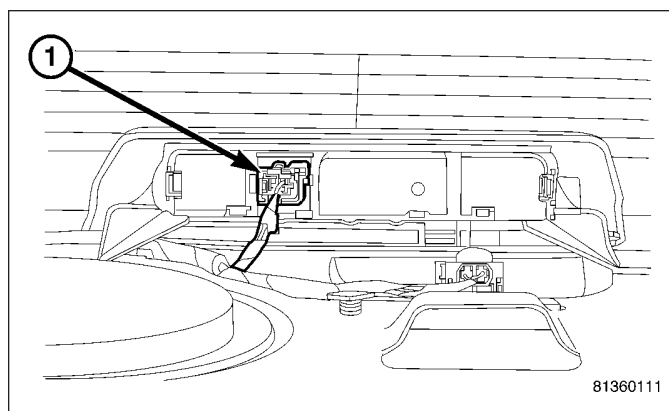
## INSTALLATION

### SEDAN

1. Place the center high mounted stop lamp (2) into position at the bottom of the backlite.
2. Install and tighten the mounting fasteners (3).

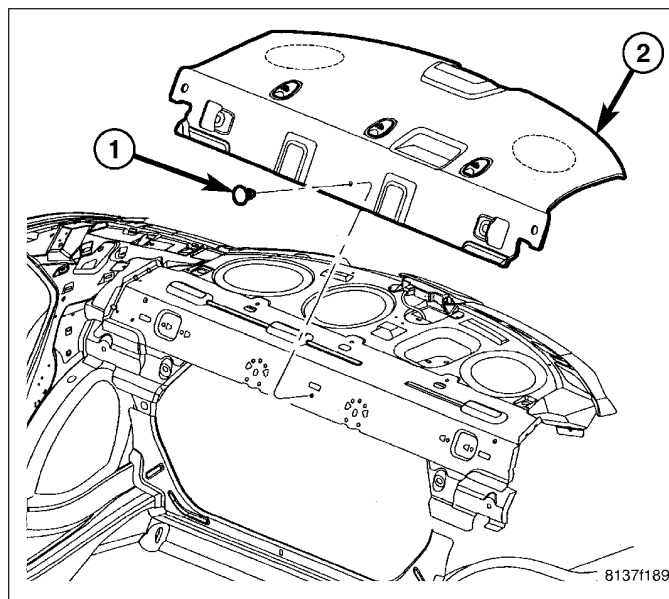


3. Connect the electrical connector (1).



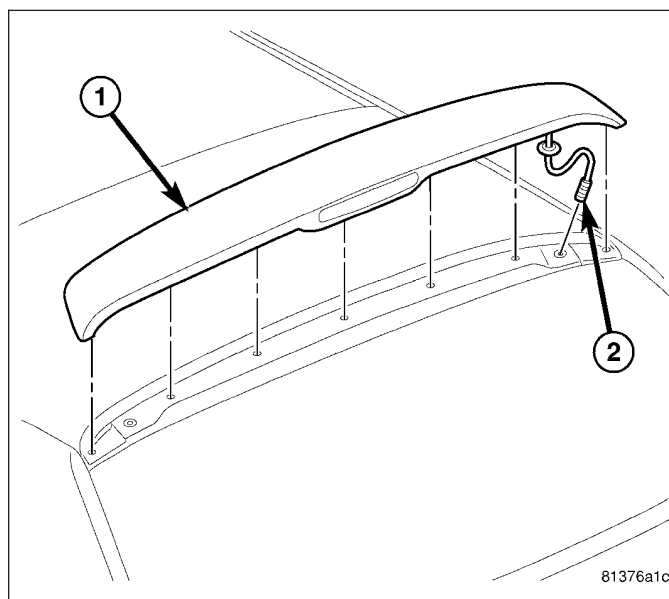


4. Install the rear shelf trim (Refer to 23 - BODY/INTERIOR/REAR SHELF TRIM PANEL - INSTALLATION).
5. Connect the battery negative cable.



## WAGON

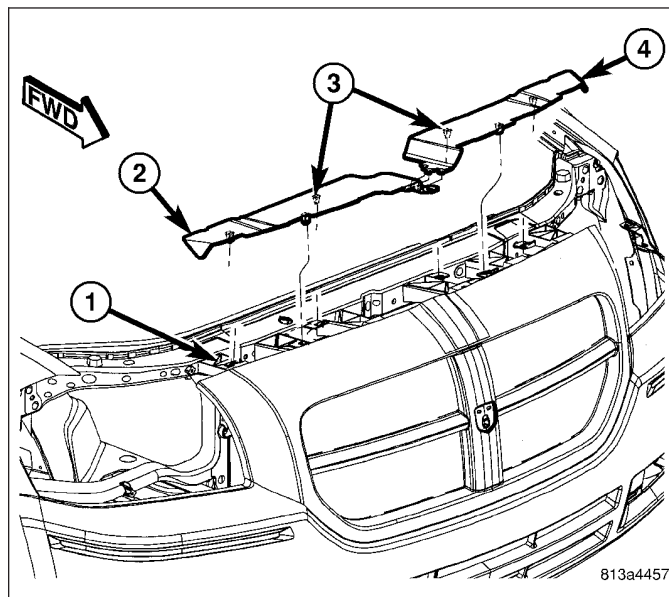
1. Place the CHMSL on the spoiler (1) and install and tighten the mounting fasteners.
2. Install the spoiler (Refer to 23 - BODY/EXTERIOR/SPOILER - INSTALLATION).



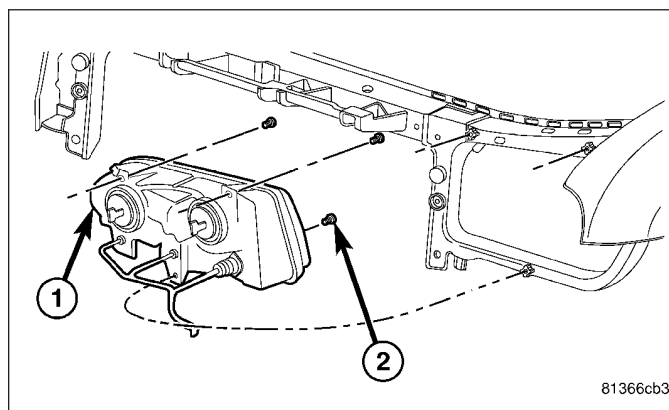
## FOG LAMP UNIT

### REMOVAL

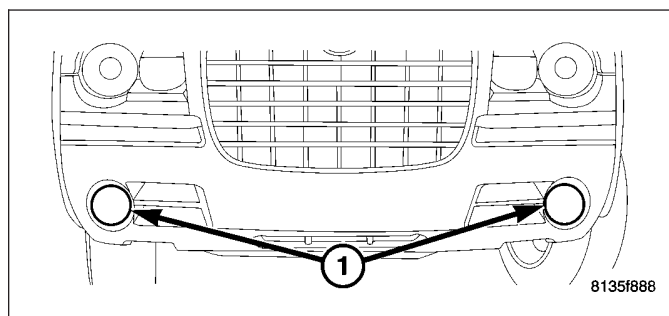
1. Disconnect and isolate the battery negative cable.
2. Open hood and remove the upper radiator closeout panel (2 and 4).
3. Remove the six upper fascia retaining fasteners (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).



4. Remove the headlamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - REMOVAL).

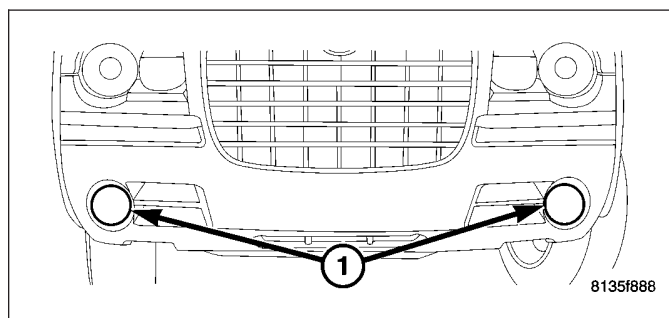


5. From behind the bumper fascia, disconnect the harness connector.
6. Remove two fog lamp unit mounting fasteners.
7. Remove fog lamp unit (1).

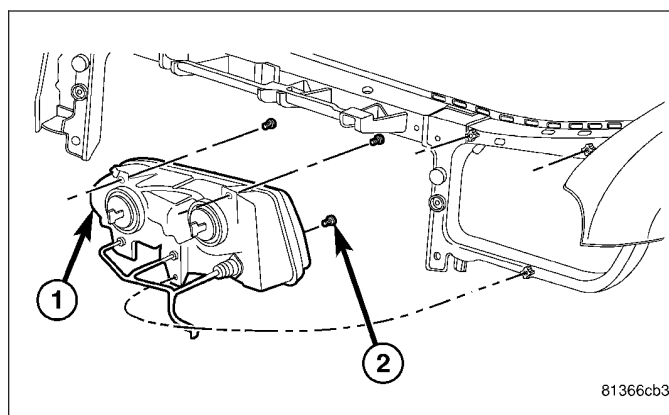


## INSTALLATION

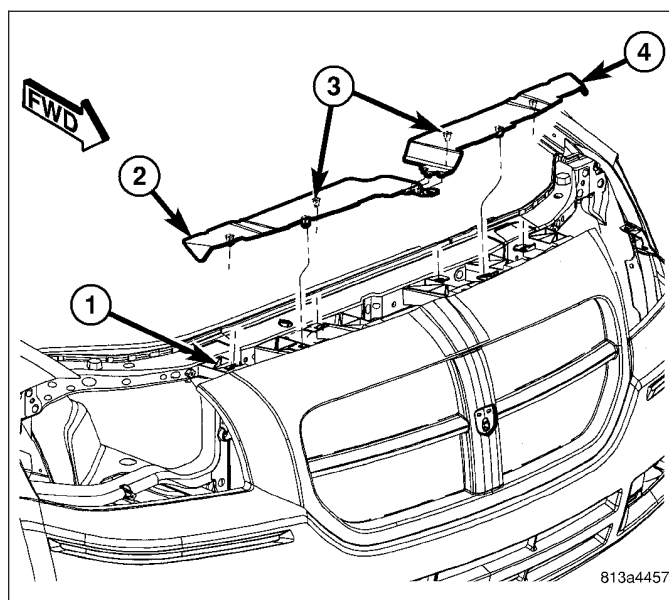
1. Position the fog lamp unit (1) in fascia opening.
2. Install the two fog lamp unit mounting fasteners.
3. Connect the harness connector.



4. Install the headlamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION).



5. Install the six upper fascia retaining fasteners (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).
6. Install the upper radiator closeout panel (2 and 4).
7. Connect the battery negative cable.

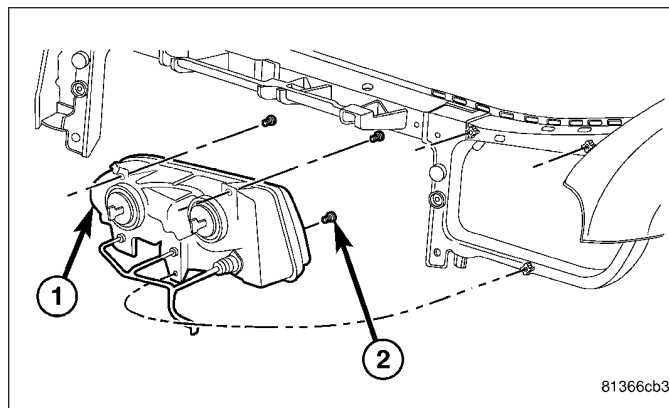


## FRONT SIDE MARKER LAMP

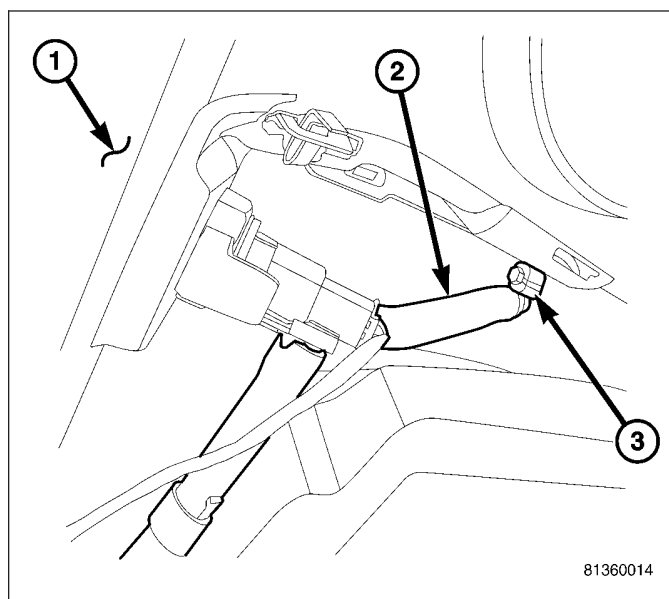
### REMOVAL

#### CHRYSLER

1. Disconnect and isolate the battery negative cable.
2. Remove the headlamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - REMOVAL).

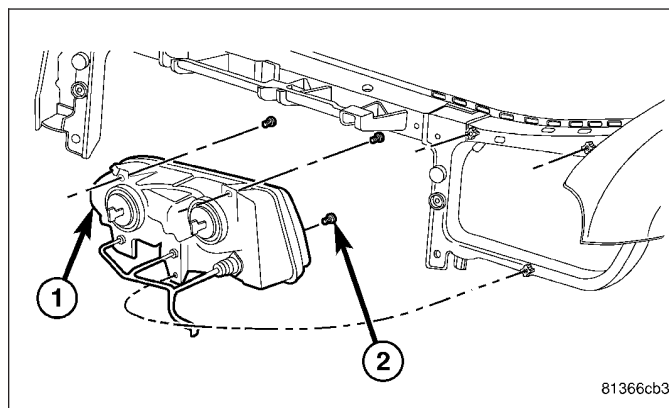


3. It may be necessary to loosen the fascia (1) to gain access to the side marker lamp (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).
4. Remove side marker lamp from side marker lamp unit by twisting lamp socket.



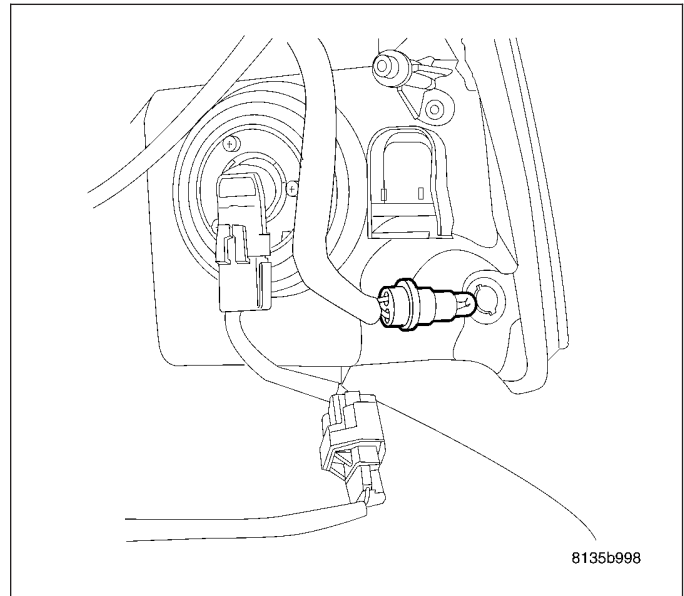
#### DODGE

1. Disconnect and isolate the battery negative cable.
2. Remove the headlamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP



UNIT - REMOVAL).

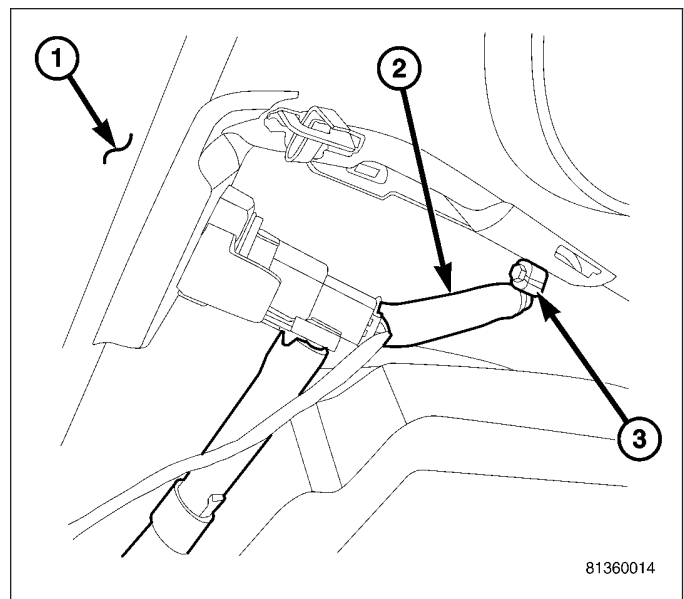
3. Remove the front side marker lamp from the head-lamp unit.



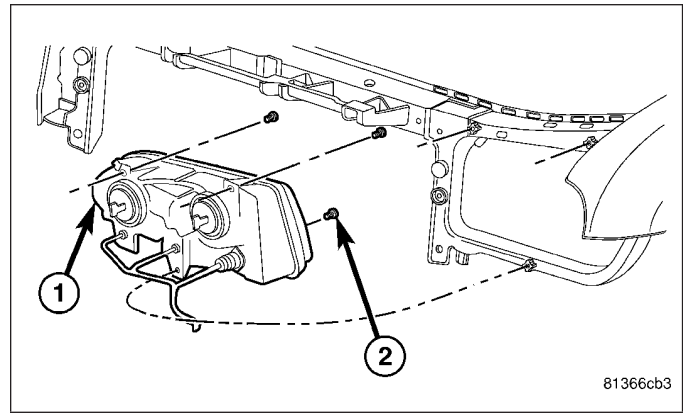
## INSTALLATION

### CHRYSLER

1. Install the side marker lamp into side marker lamp unit by twisting lamp socket.
2. If the fascia (1) was loosened to gain access to the side marker lamp, install the fascia (Refer to 13 - FRAME & BUMPERS/BUMPERS/Front FASCIA - INSTALLATION).

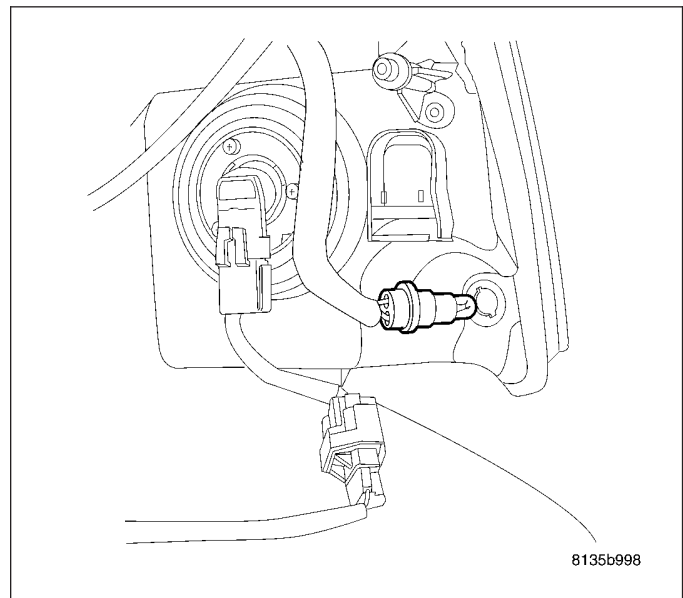


3. Install the headlamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION).
4. Connect the battery negative cable.

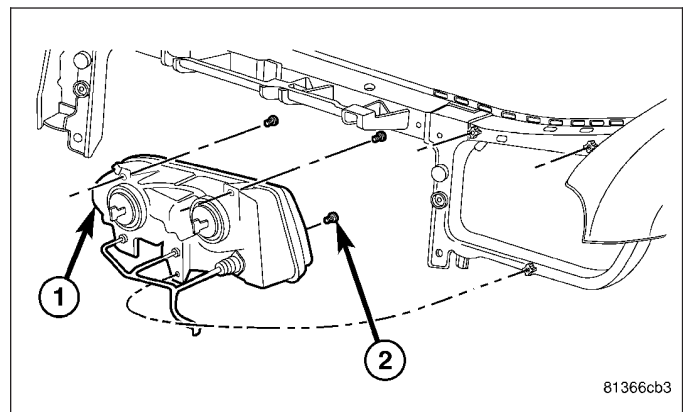


## DODGE

1. Install the front side marker lamp into the headlamp unit.



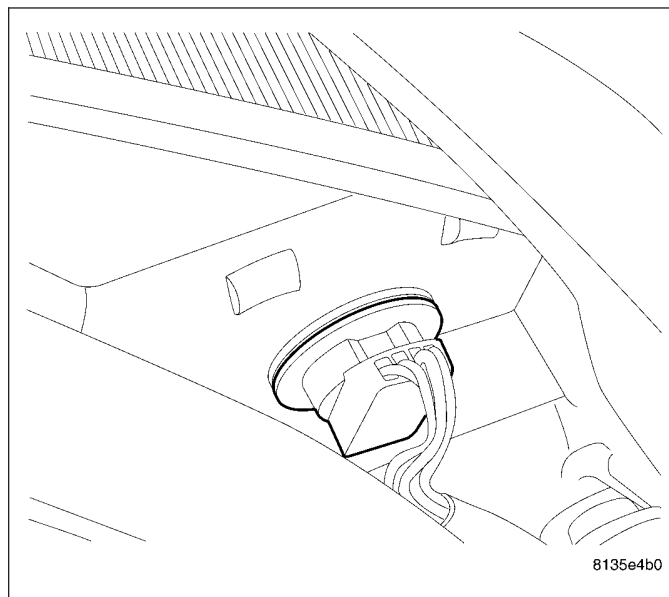
2. Install the headlamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION).
3. Connect the battery negative cable.



## FRONT PARK/TURN SIGNAL LAMP

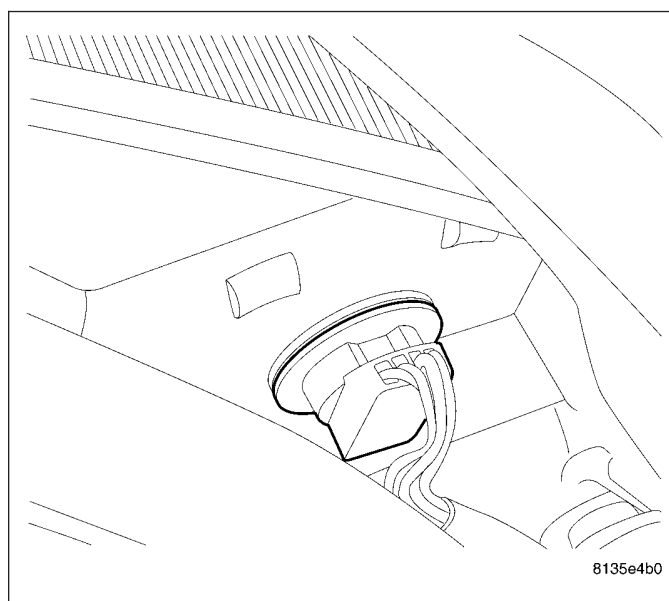
### REMOVAL

1. Disconnect and isolate the battery negative cable.
2. From atop the headlamp unit, reach behind and just below the upper radiator crossmember and twist the park/turn signal lamp socket out.
3. Remove the lamp from the socket.



### INSTALLATION

1. Install lamp into socket.
2. Install lamp socket (1) into the headlamp unit. Twist socket clockwise.
3. Connect the battery negative cable.



## HEADLAMP

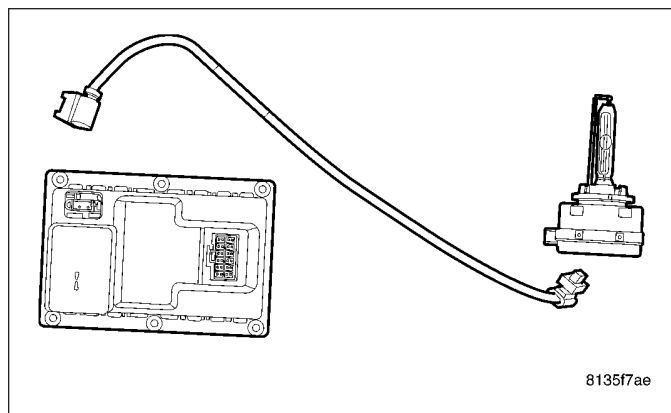
### DESCRIPTION

Quad headlamps are standard equipment on this model. They are halogen headlamps, both low and high beams.

This vehicle may be equipped with optional **High Intensity Discharge (HID)** low beams. The HID type lamp is used in place of the conventional halogen low beam lamp. High beam lamps remain the same halogen type.

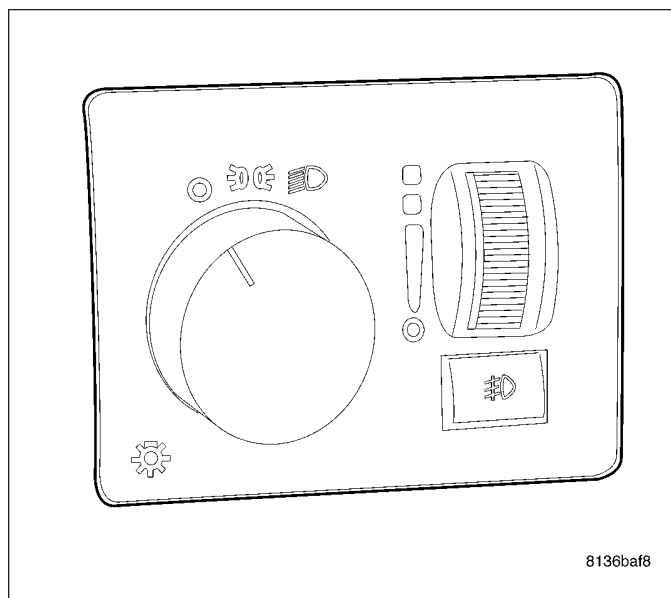
HID lamps get their name from the intense white light produced by the electrical discharge. The light produced by the HID lamps appears as a white color as opposed to the yellow color of the standard halogen lamps.

HID lighting provides about three times the light output of standard halogen lamps while using less energy. The lamps are also designed to last 10 times longer than standard halogen lamps.



## OPERATION

To turn on the headlamps, turn the left knob of the headlamp switch clockwise to the first detent for parking lamp and instrument panel lamp operation. Turn to the second detent for headlamp, park lamp and instrument panel lamp operation.



High Intensity Discharge Headlamps (HID) rely on an AC (alternating current) electrical charge to ignite xenon gas contained in a sealed beam lamp. The HID lamps are similar in operation to common vapor filled street headlamps. Instead of using a filament to produce light, the gas inside the lamp is ignited by creating an arc between two electrodes.

The color of the light source is classified as its color temperature. As the color temperature increases, the color of the light moves from yellow to blue-white to white. The light produced by the HID lamps appears as a white color as opposed to the yellow color of the standard (halogen) lamps. HID lamps provide light as a higher color temperature than standard halogen lamps.

For the color temperature of different lamp types, refer to the COLOR TEMPERATURE table. As a point of reference, typical sunlight at noon has a color temperature of 4977° C (8990° F).

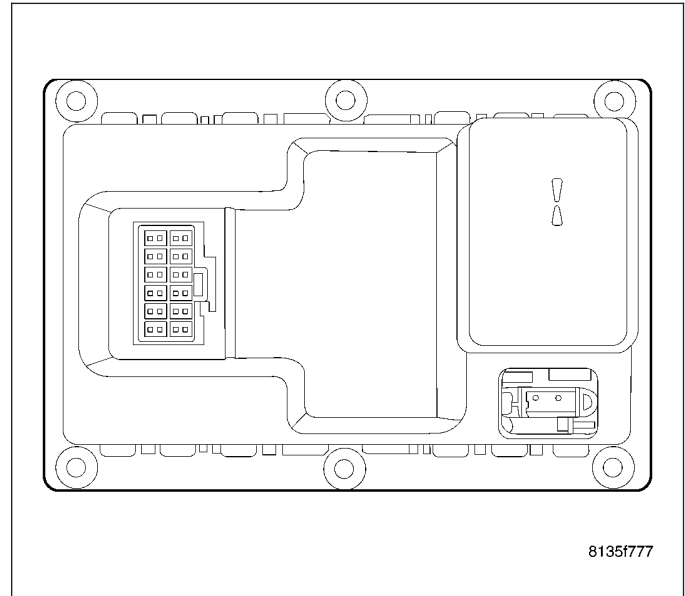
## COLOR TEMPERATURE

LAMP	TEMPERATURE
INCANDESCENT LAMPS	2527° C (4580° F)
HALOGEN LAMPS	2927° C (5300° F)
HID LAMPS	3827° C (6920° F)

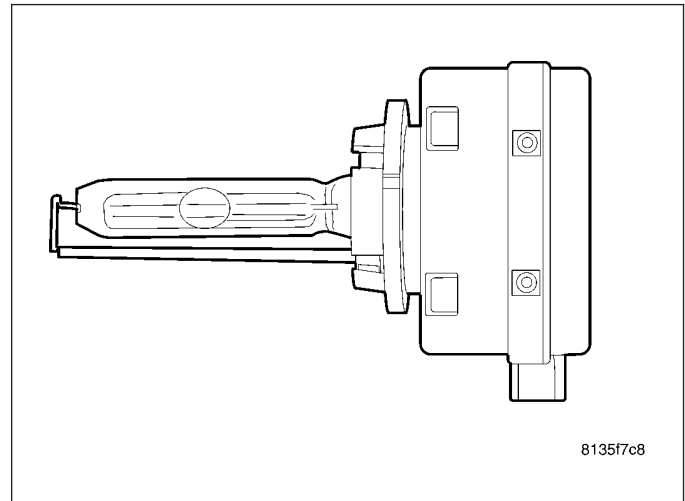


There are three components to each of the HID headlamps:

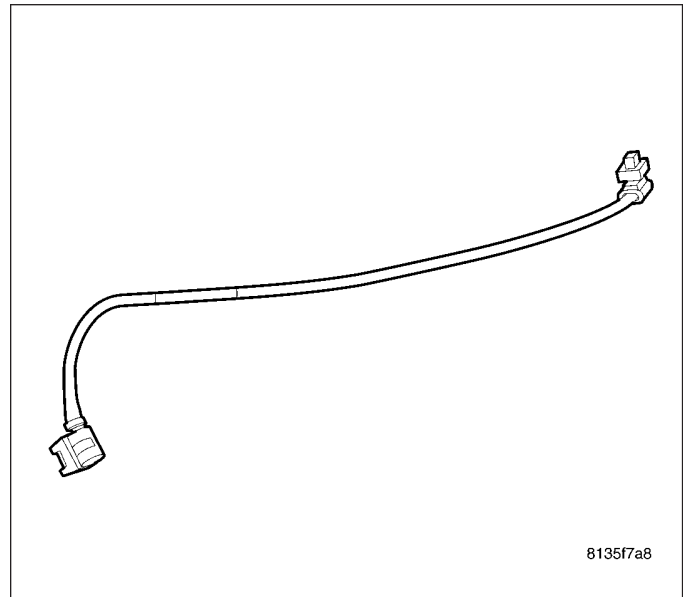
1. **Ballast Module** - The 12 volt Direct Current (DC) power supplied by the low beam relay is converted to Alternating Current (AC) power by the ballast module. Each lamp requires its own ballast module. The ballast converts and steps up the low beam relay output to 800 volts AC, and supplies the lamp assembly via a cable connected to the igniter.



2. **Lamp/Igniter** - The lamp contains electrodes and xenon gas. The lamp takes about 10-15 seconds of warm-up time to reach full operation. The light appears blue during warm-up and then turns to white. The igniter controls the voltage applied to the lamp electrodes. The igniter uses the voltage supplied by the ballast module and momentarily steps up the voltage to 25,000 volts to start the lamp. Once ignited, it will reduce the voltage to 85 volts.



3. **Cable** - The cable is used to transfer the high voltage produced by the ballast module to the lamp/igniter.



## DIAGNOSIS AND TESTING

### HIGH INTENSITY DISCHARGE HEADLAMPS

The High Intensity Discharge (HID) headlamps are supplied B+ voltage and ground, the same as normal halogen low beam lamps. The low beam system is different from there forward. The ballast module is mounted to the bottom of the headlamp unit. The ballast module has internal circuit protection to prevent module damage in case of an open or shorted circuit. The module has overcharge and undercharge circuit protection. If either is sensed, the module will not illuminate the headlamps for that key cycle or until the fault is corrected. Recycle the ignition and headlamp switch if both headlamps do not illuminate. Before determining the headlamp assembly is faulty, check the connector at the headlamp and check if there is voltage coming from the IPM pin providing the power to the respective headlamp. If the module senses a short or open circuit condition, it will not operate the lamp/igniter.

**WARNING:** The headlamp unit must be removed to perform these tests (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - REMOVAL). Failure to do so could result in personal injury or death.

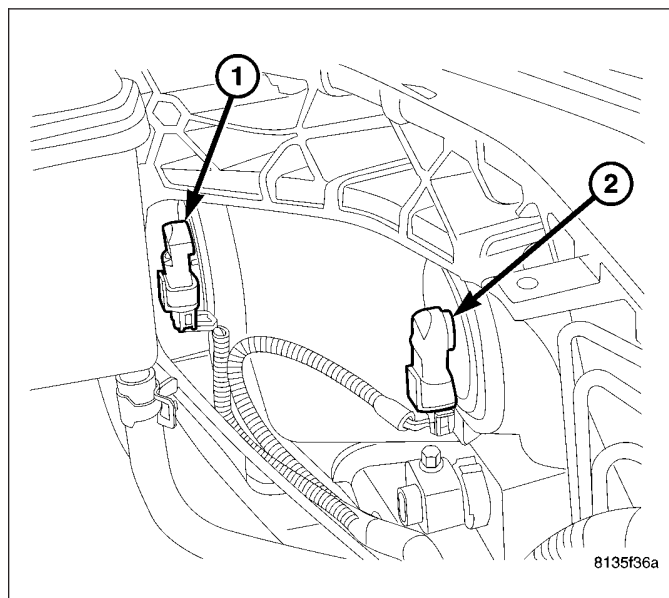
1. Inspect lamp for a burned out lamp. If lamp is burned out it will appear black or smoky, similar to a normal halogen bulb. If lamp looks OK, go to Step 2.
2. Check for B+ battery voltage at the connector going into the ballast module. Refer to Wiring Diagrams for connector location. If battery voltage and a good ground are present, go to Step 3. If B+ voltage and a good ground are not present, refer to Wiring Diagrams for circuit and connector locations to find short or open circuit.
3. Plug in a known good ballast module and check for lamp operation. If lamp lights, replace ballast module. If lamp still fails to light, replace igniter assembly.

## REMOVAL

### HALOGEN HEADLAMP

**Note:** If replacing the left low or high beam headlamp, the air box has to be removed first (Refer to 9 - ENGINE/AIR INTAKE SYSTEM - REMOVAL).

1. Disconnect and isolate the battery negative cable.
2. Disconnect the lamp electrical connector.
3. Twist lamp (1 and 2) out of headlamp housing.

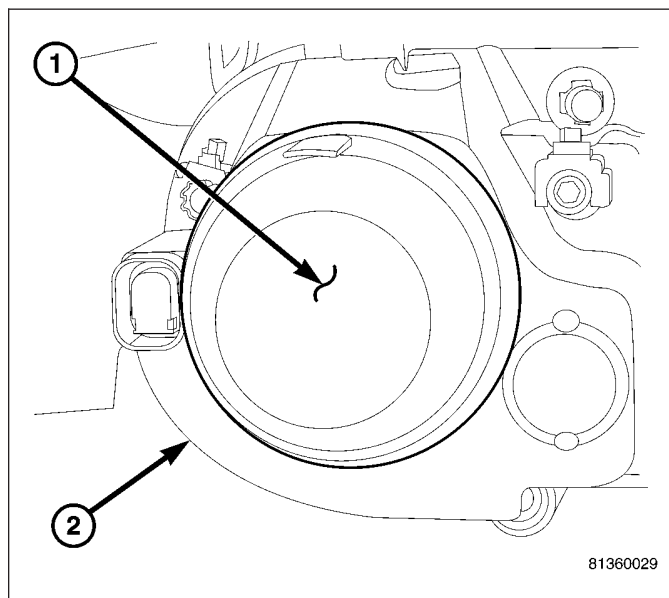


### HIGH INTENSITY DISCHARGE (HID) HEADLAMPS (IF EQUIPPED) - LOW BEAM

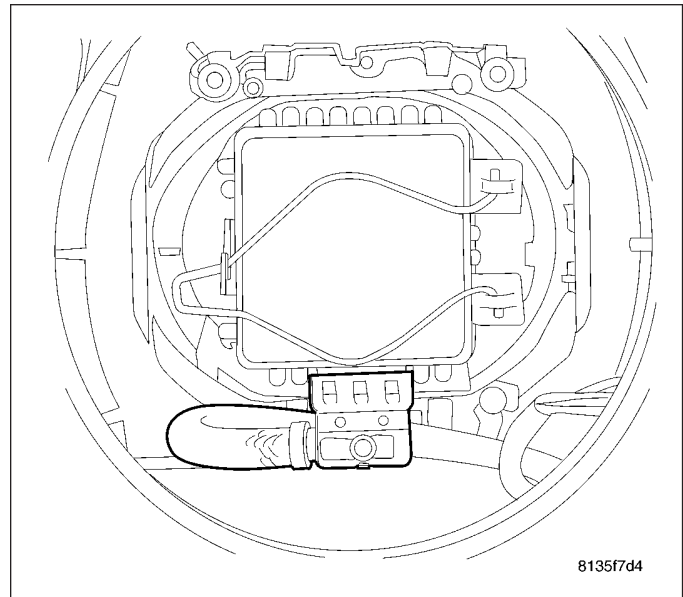
#### HEADLAMP

**Note:** If replacing the left front low beam HID headlamp, the air box has to be removed first (Refer to 9 - ENGINE/AIR INTAKE SYSTEM - REMOVAL).

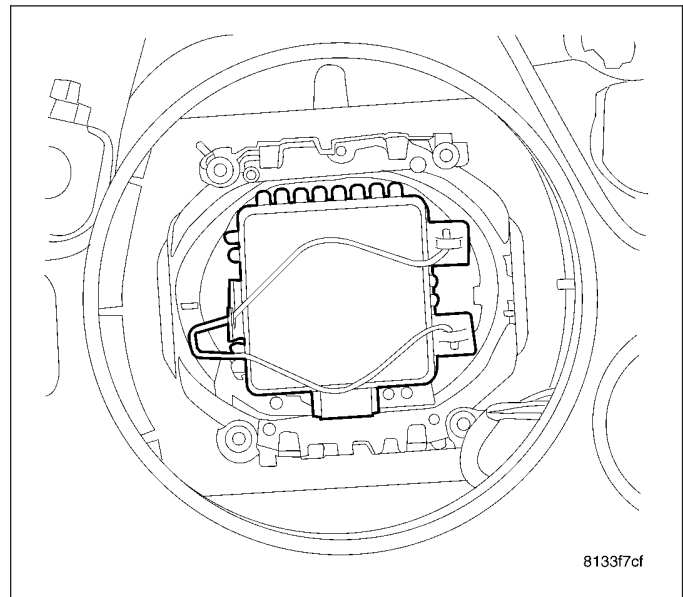
1. Disconnect and isolate the battery negative cable.
2. Remove the rubber boot (1) protecting the lamp/igniter from the elements.



3. Disconnect the electrical cable connector to the lamp/igniter by pulling straight down.

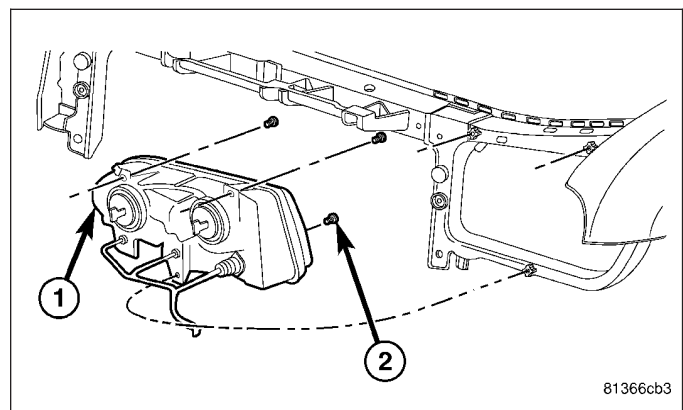


4. Release the retaining wire clip on the back of the lamp/igniter.
5. Grab the igniter by pulling rearward and rocking it slightly as you pull.
6. Pull the igniter straight out of the headlamp unit. The lamp is integral to the igniter and cannot be separated.



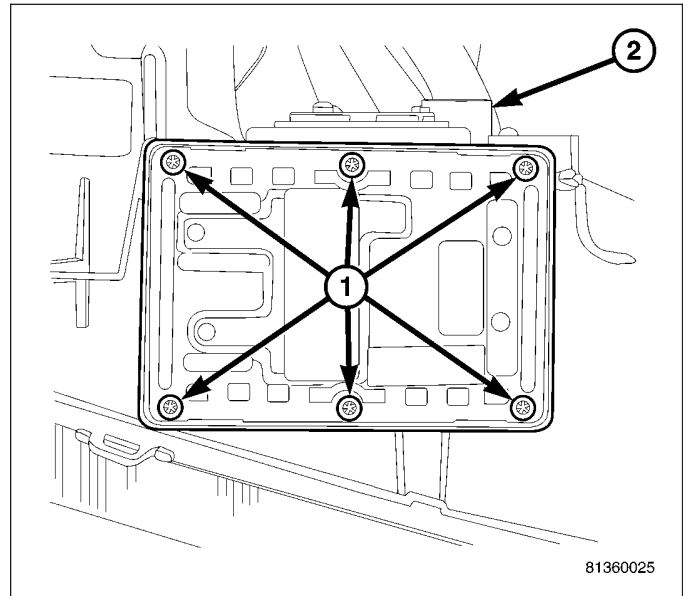
## BALLAST MODULE

1. Remove the headlamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP

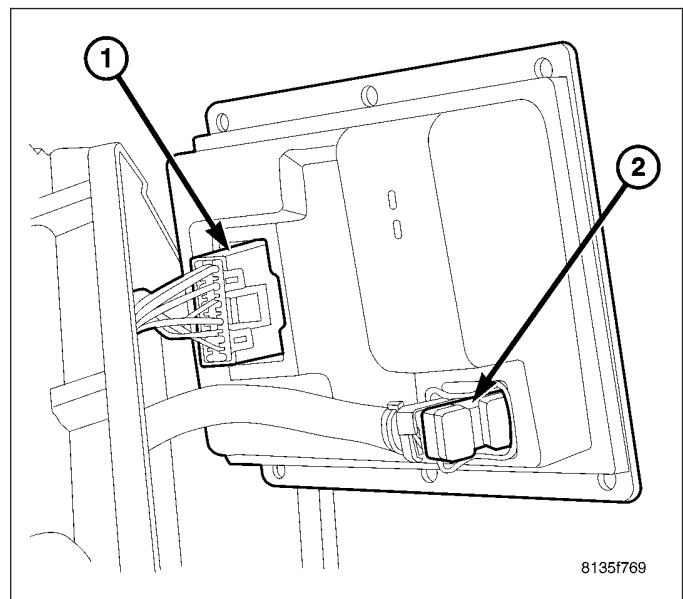


UNIT - REMOVAL).

2. From the underside of the headlamp unit, remove the six retaining screws (1).

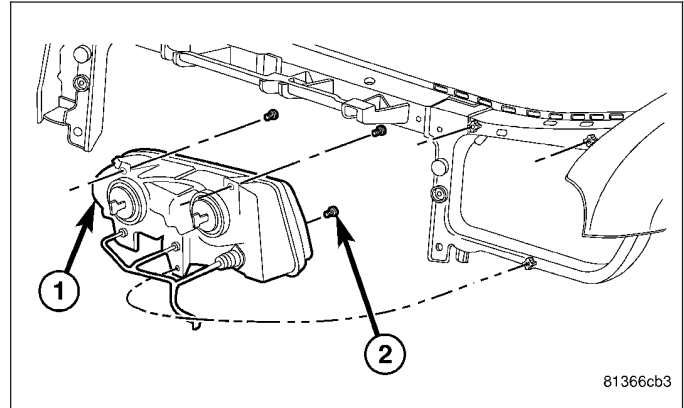


3. Pull the ballast module out of headlamp unit.
4. Disconnect the two electrical connectors (1 and 2).
  - One of the connectors (1) will be a standard push tab to release connector.
  - The second connector (2) has a lever that must be rotated away or down from the wire of the cable and connector.
5. Separate ballast module from headlamp unit.

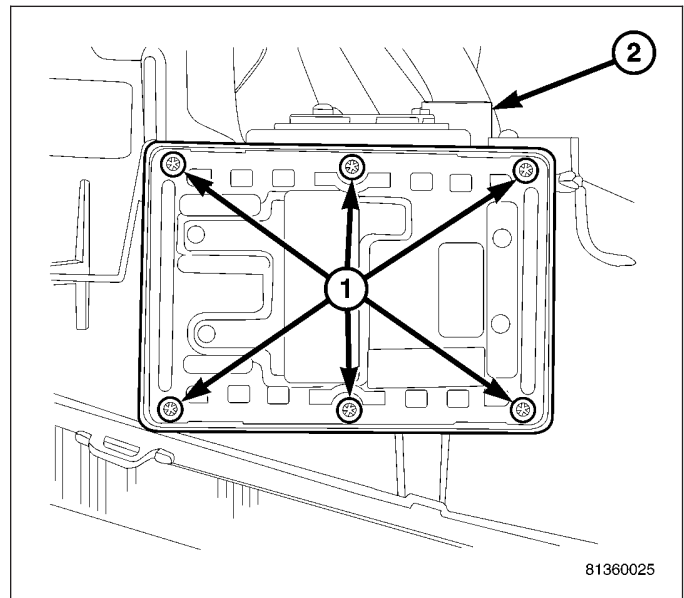


**CABLE**

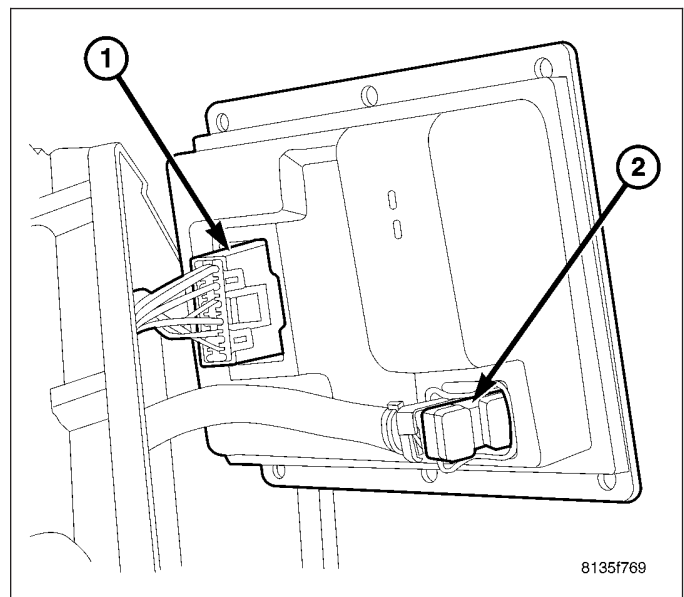
1. Remove the headlamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - REMOVAL).



2. From the underside of the headlamp unit, remove the six retaining screws (1).

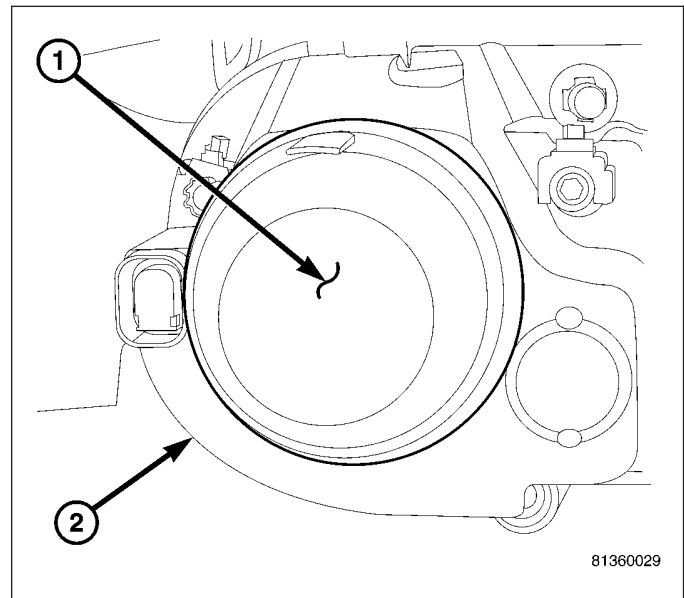


3. Pull the ballast module out of headlamp unit.
4. Disconnect the cable connector (2) Move the lever away or down from the wire of the cable and

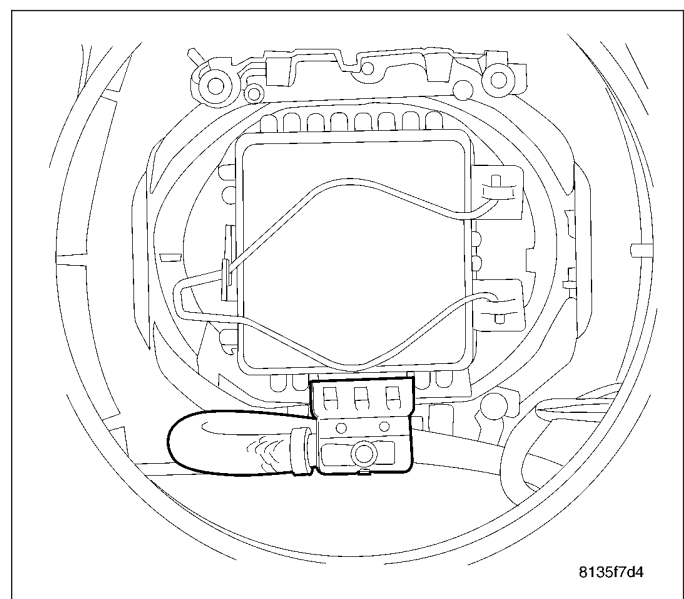


connector.

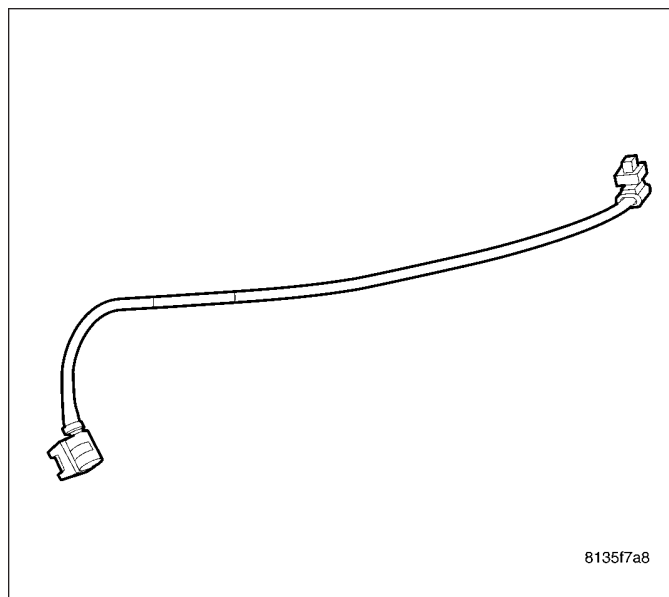
5. Remove the rubber boot (1) protecting the lamp/igniter from the elements.



6. Disconnect the electrical cable connector to the lamp/igniter by pulling straight down.



7. Maneuver cable through headlamp unit to separate.

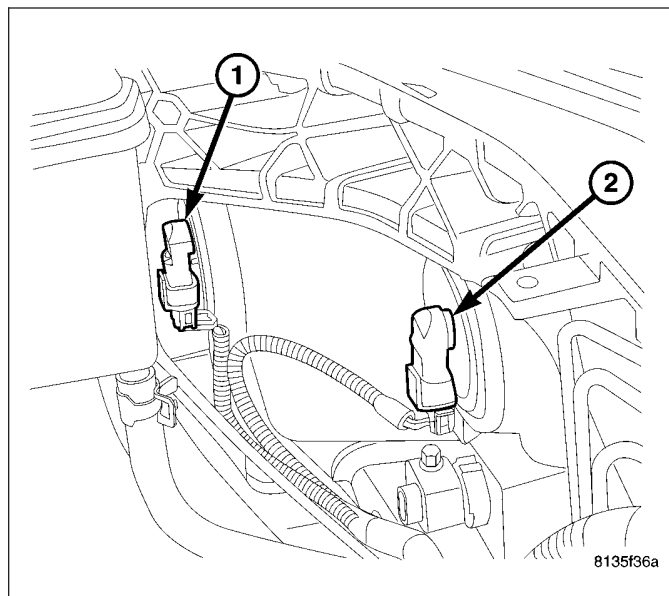


## INSTALLATION

### HALOGEN HEADLAMP

1. Twist lamp (1 or 2) into headlamp housing clockwise.
2. Connect the lamp electrical connector.
3. Connect the battery negative cable.

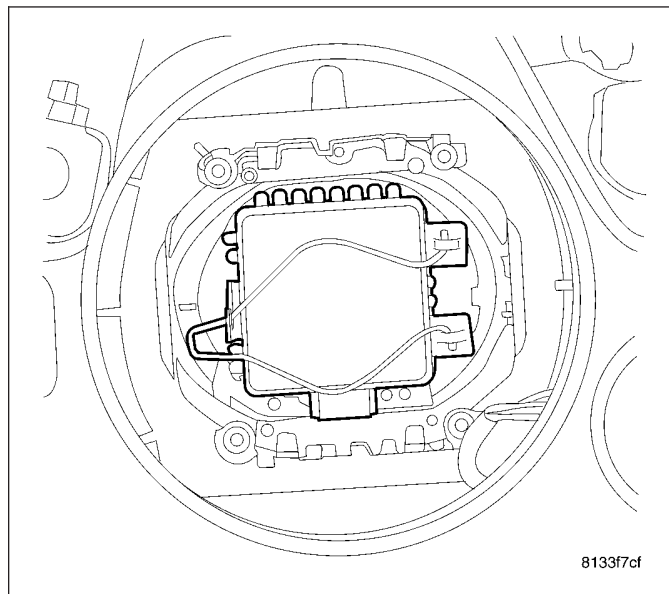
**Note:** If replacing the left low or high beam headlamp, the air box has to be reinstalled (Refer to 9 - ENGINE/AIR INTAKE SYSTEM - INSTALLATION).



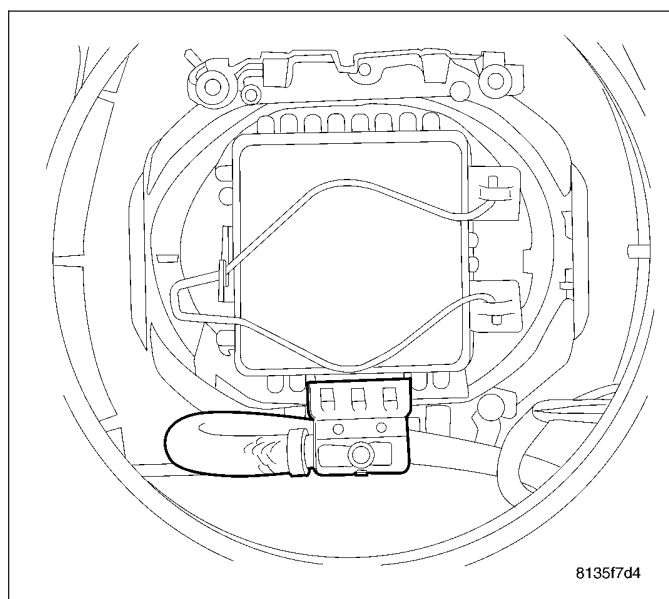


**HIGH INTENSITY DISCHARGE (HID) HEADLAMPS (IF EQUIPPED) - LOW BEAM****HEADLAMP**

1. Push the igniter straight into the headlamp unit with the connector pointing straight down. The lamp is integral to the igniter.
2. Put the retaining wire clip on the back of the lamp/igniter.

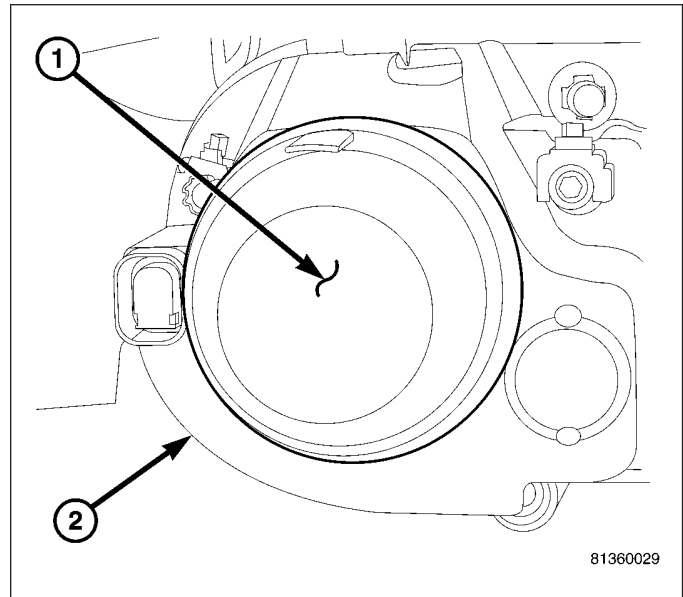


3. Connect the electrical cable connector to the lamp/igniter.



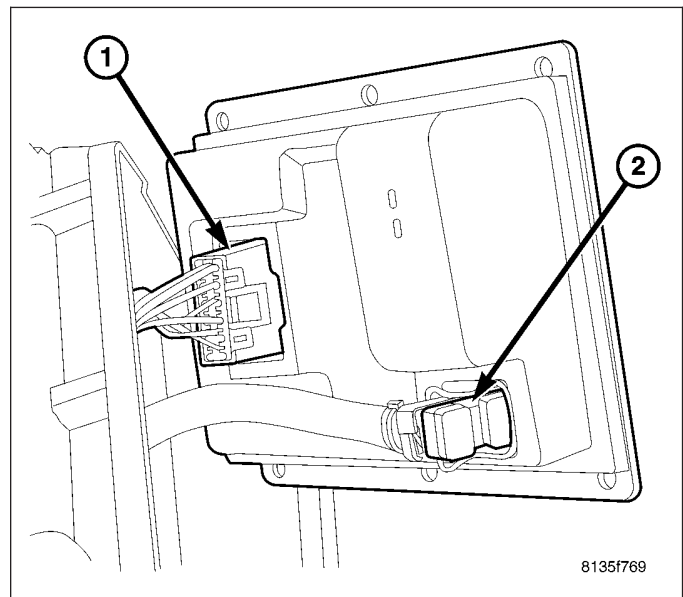
4. Install the rubber boot (1) protecting the lamp/igniter from the elements.
5. Connect the battery negative cable.

**Note:** If replacing the left low beam headlamp, the air box has to be reinstalled (Refer to 9 - ENGINE/AIR INTAKE SYSTEM - INSTALLATION).

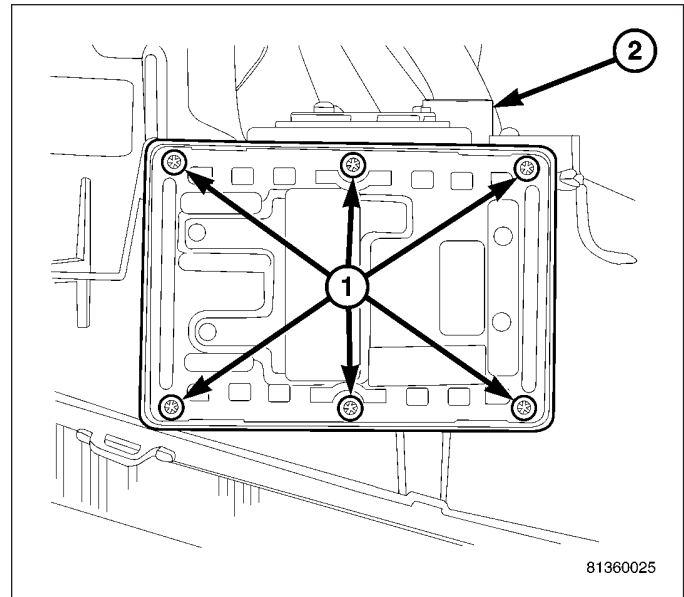


## BALLAST MODULE

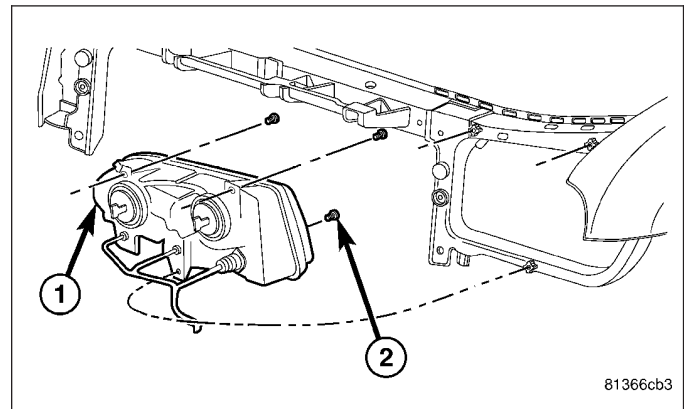
1. Connect the two electrical connectors (1 and 2).
  - One of the connectors (1) will be a standard push tab to release connector.
  - The second connector (2) has a lever that must be locked when connected.
2. Position the ballast module in of headlamp unit.



3. From the underside of the headlamp unit, install the six retaining screws (1).

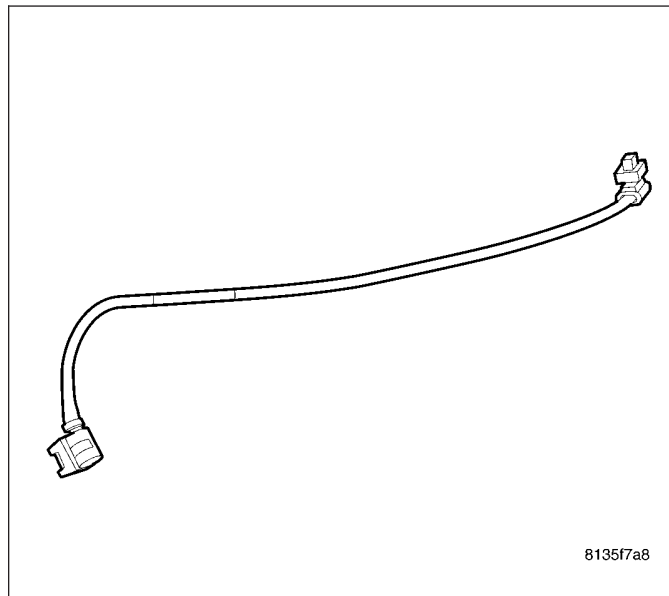


4. Install the headlamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION).

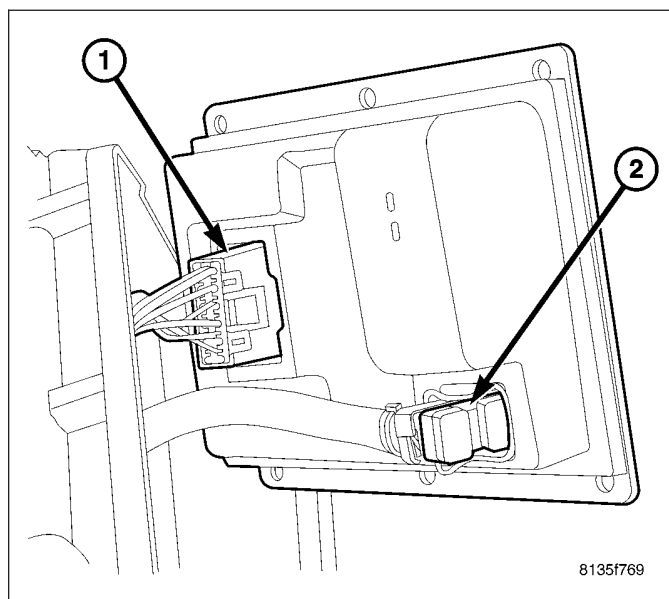


**CABLE**

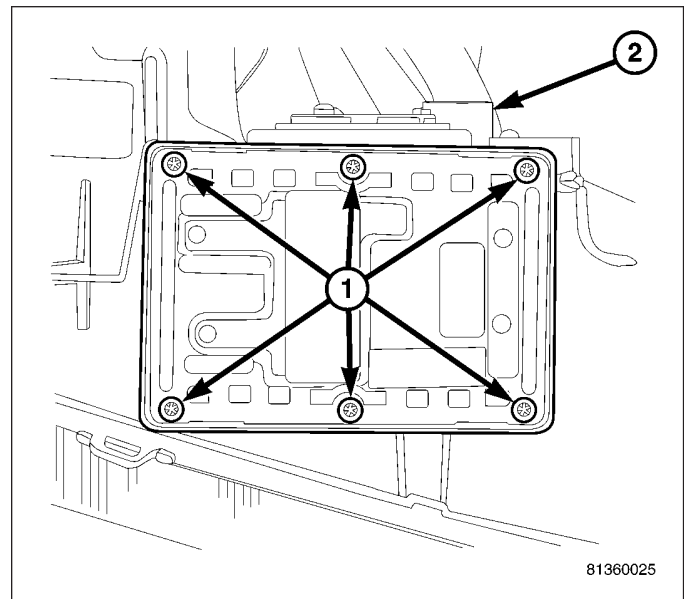
1. Maneuver cable through headlamp unit.



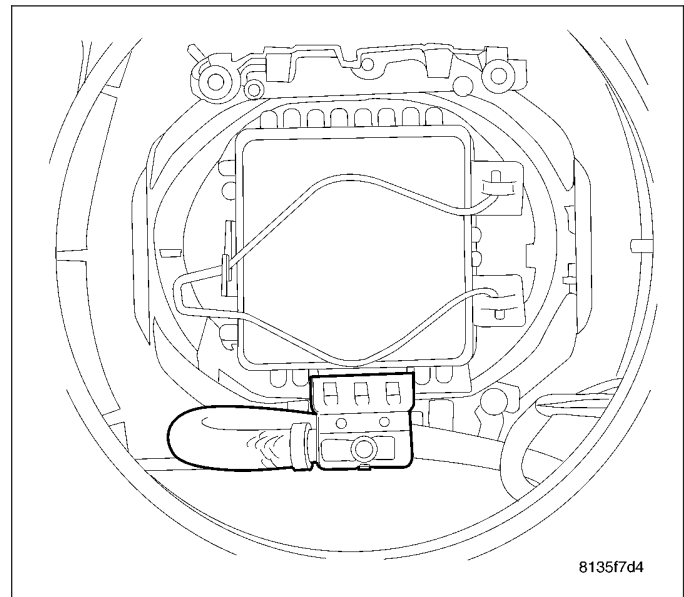
2. Connect the cable electrical connectors (2). The connector (2) has a lever that must be locked when connected.



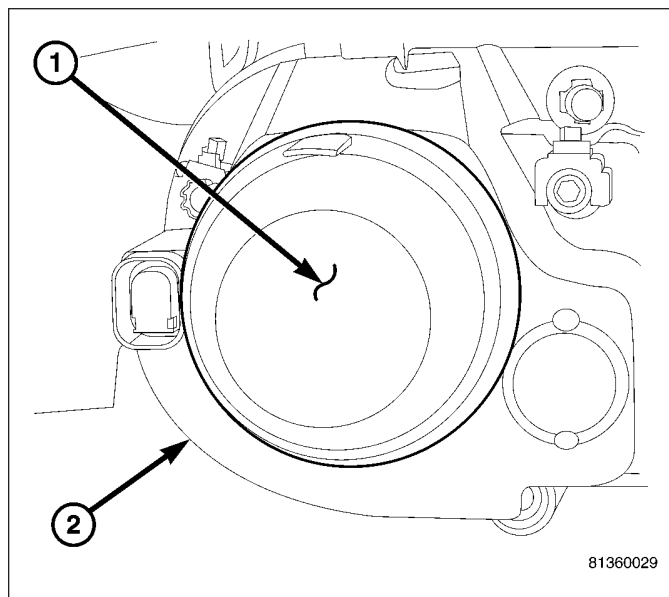
3. From the underside of the headlamp unit, install the six retaining screws (1).



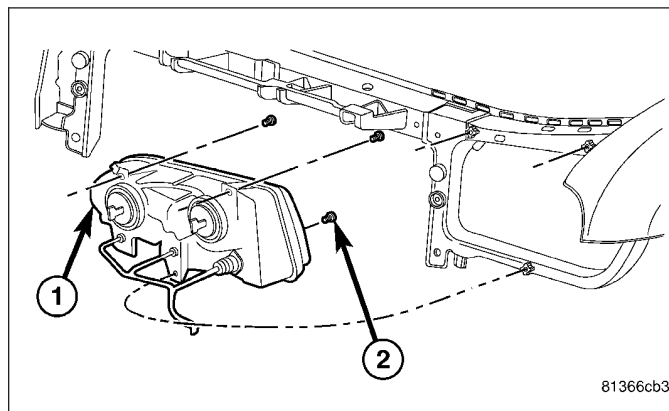
4. Connect the electrical cable connector to the lamp/igniter.



5. Install the rubber boot (1) protecting the lamp/igniter from the elements.



6. Install the headlamp unit (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION).

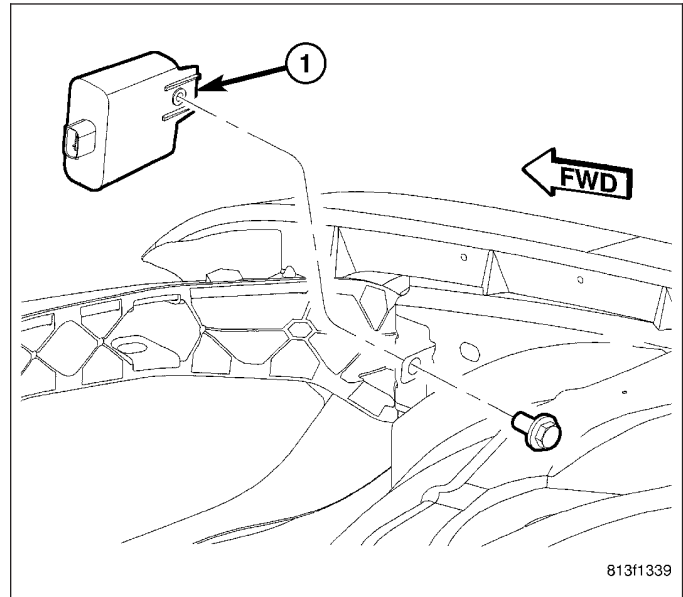


## HEADLAMP LEVELING MODULE - EXPORT

### DESCRIPTION

The Headlamp Leveling Module or HID Translator Module is the remote electronic sub-component of the headlamp leveling system. The HID translator module is used to translate communication of the headlamps leveling system. The sensors communicate over a K-Line to the headlamp stepper motors, then to the translator module. To enable the scan tool to read system inputs and outputs, and to retrieve Diagnostic Trouble Codes (DTC's), the translator module must convert this K-Line data into Controller Area Network (CAN) data.

The HID translator module is located inside the right front engine compartment, just behind the headlamp unit. It is mounted to a stamped steel bracket by one fastener and has one electrical connector that connects it to the wiring harness.



### OPERATION

The system is designed to automatically level the vehicle, regardless of cargo or passenger loads. When the vehicle is loaded with passengers and/or cargo, as the ignition is turned to RUN, the system will look at the front and rear sensors and make an adjustment based upon feedback from the sensor to see if it has approximately 27.5 degrees from its zero or neutral position. The headlamp stepper motor then adjusts the headlamp up or down for proper headlamp aiming.

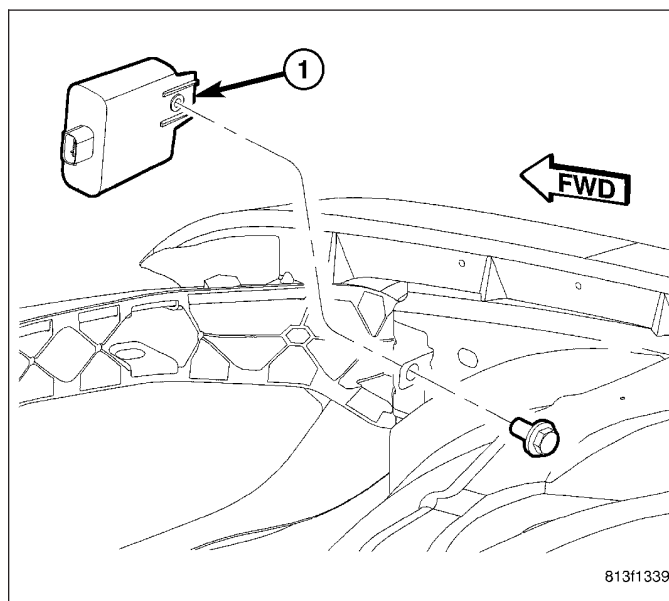
**Note: If the headlamp leveling module (HID translator module) is replaced, the system needs to be calibrated using a Scan Tool.**

When in calibration mode, the vehicle doors, trunk/liftgate, and hood must be closed. In addition, the vehicle may not be touched (bounced or bumped) until the calibration is complete. The headlamps must be ON to power the stepper motors. The approximate calibration time is 12 - 15 seconds. The scan tool will display a "status of calibration" message. These being either "still in progress", "passed", or "failed."

If a system fault occurs, the translator module will store the Diagnostic Trouble Code (DTC) and enable it to be read using the scan tool and assist in diagnosing the headlamp leveling system.

## REMOVAL

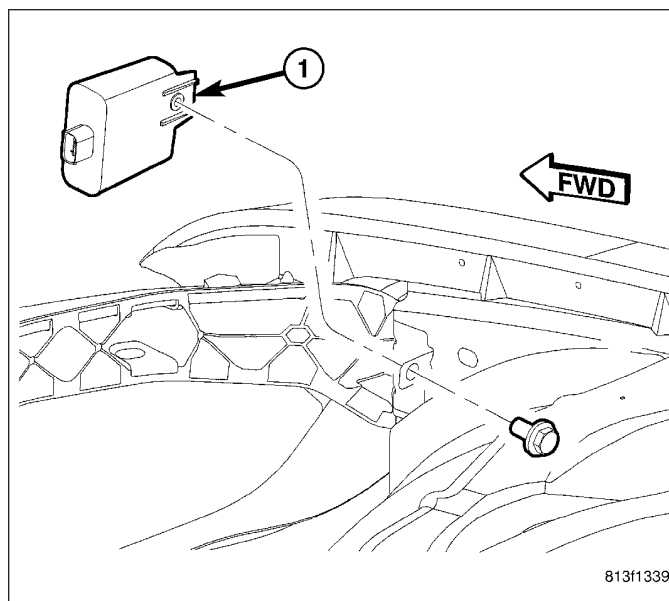
1. Disconnect and isolate the battery negative cable.
2. disconnect the one electrical connector to the HID translator module.
3. Remove the one bolt holding the module to the bracket.



## INSTALLATION

**WARNING:** When replacing the headlamp leveling module/HID translator module, the system must be calibrated using a Scan Tool.

1. Install the one bolt holding the module to the bracket.
2. Connect the one electrical connector to the HID translator module.
3. Connect the battery negative cable.
4. Using a Scan Tool, calibrate the headlamp leveling system.

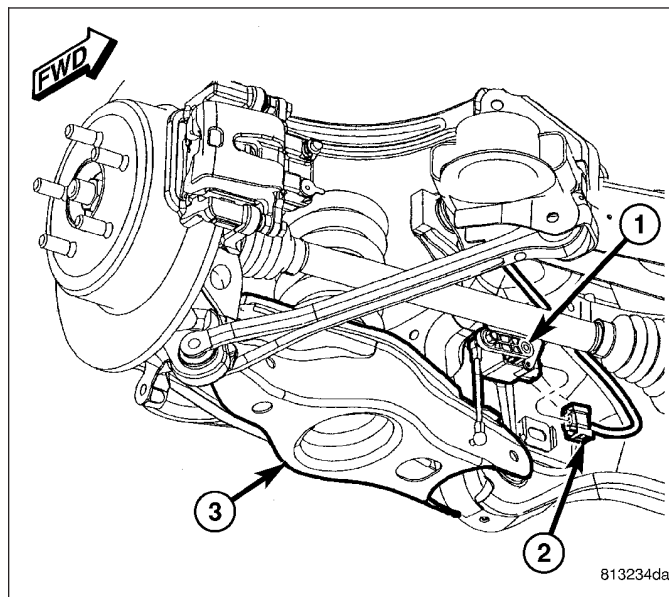




## HEADLAMP LEVEL SENSOR - EXPORT

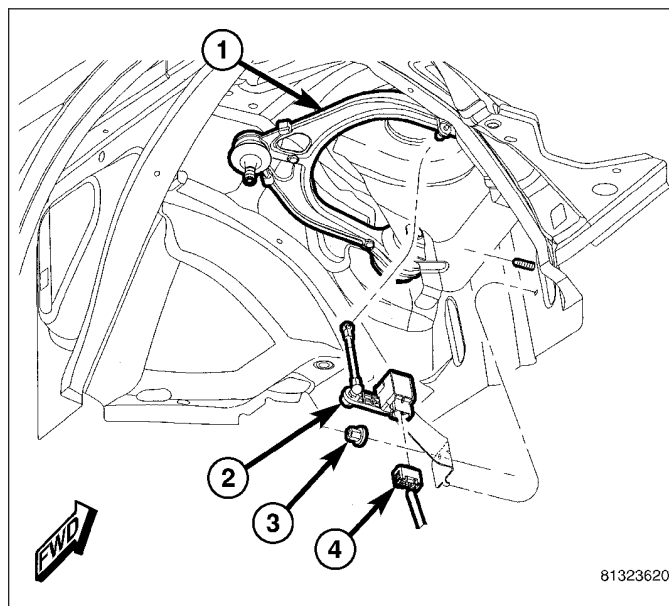
### DESCRIPTION

The headlamp leveling system uses two headlamp level sensors to determine when the vehicle has had its ride height or angle changes, due to passenger or cargo additions. There is one sensor (1) mounted on the spring link (3) on the right side of the rear suspension.



There is a second sensor (2) mounted on the upper control arm (1) on the right side, in the front of the vehicle.

Each sensor has a link that is connected to the suspension and to the sensor, one electrical connector that connects the sensor to the vehicle's electrical system wiring harness, and one bracket that mounts with one nut to the vehicle.



### OPERATION

The system is designed to automatically level the vehicle, regardless of cargo or passenger loads. When the vehicle is loaded with passengers and/or cargo, as the ignition is turned to RUN, the system will look at the front and rear sensors and make an adjustment to the headlamp stepper motors based upon feedback from the sensor to see if it has moved approximately 27.5 degrees from its zero or neutral position. The headlamp stepper motor then adjusts the headlamp up or down for proper headlamp aiming.

The headlamp level sensors act like a potentiometer to relay information via the data bus to the HID translator module when the vehicle has changed its angle or ride height in either the front or rear of the vehicle.

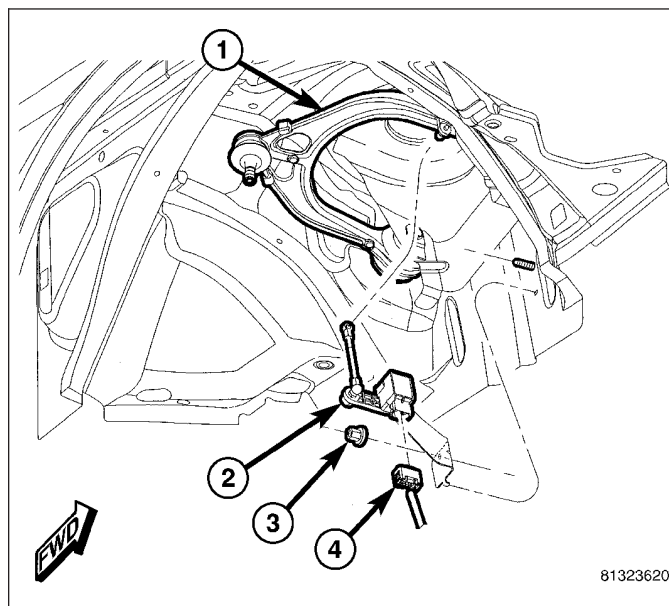
**Note:** If the headlamp leveling module (HID translator module) is replaced, the system needs to be calibrated using a Scan Tool.

When in calibration mode, the vehicle doors, trunk/liftgate, and hood must be closed. In addition, the vehicle may not be touched (bounced or bumped) until the calibration is complete. The headlamps must be ON to power the stepper motors. The approximate calibration time is 12 - 15 seconds. The scan tool will display a "status of calibration" message. These being either "still in progress", "passed", or "failed."

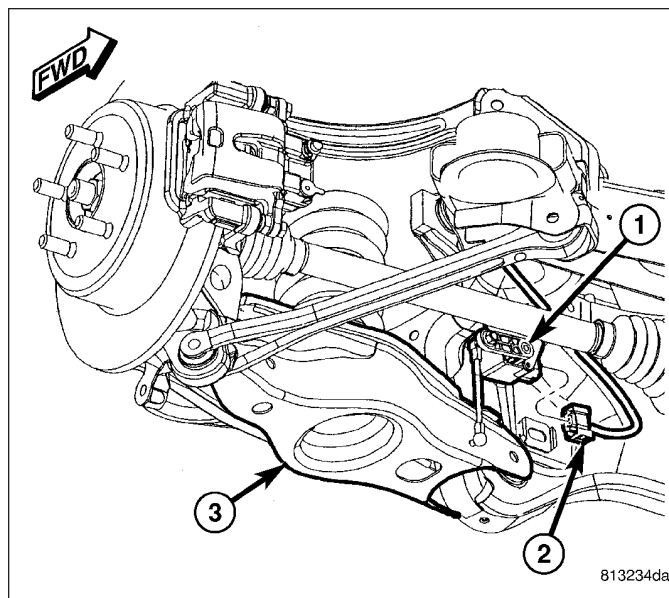
If a system fault occurs, the translator module will store the Diagnostic Trouble Code (DTC) and enable it to be read using the scan tool and assist in diagnosing the headlamp leveling system.

## REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Hoist vehicle.
3. Unsnap the sensor link from the upper control arm (front) (1).

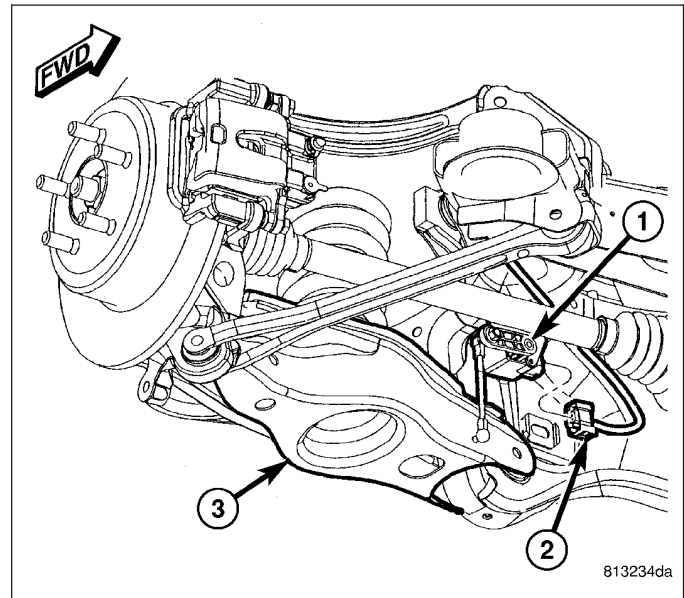


4. Unsnap the sensor link from the spring link (rear) (3).
5. Disconnect the electrical connector (2).
6. Remove the one retaining nut to the sensor and bracket (1).

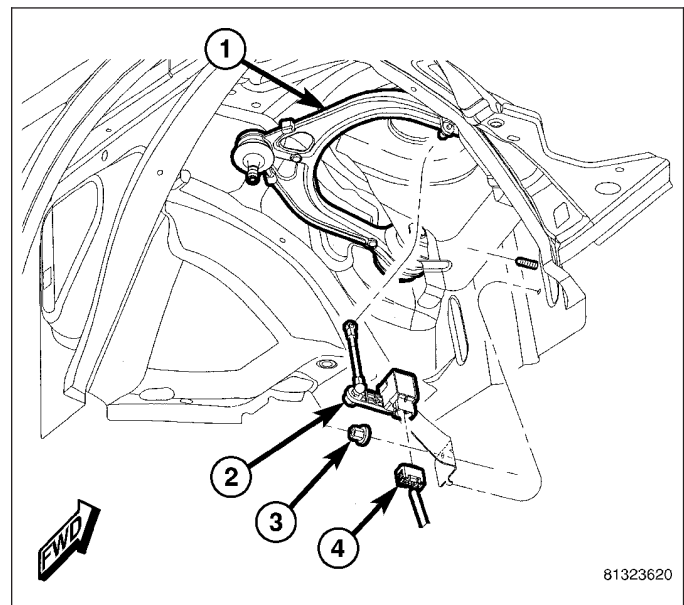


## INSTALLATION

1. Install the one retaining nut to the sensor and bracket (1).
2. Connect the electrical connector (2).
3. Snap the sensor link onto the spring link (rear) (3).



4. Snap the sensor link onto the upper control arm (front) (1).
5. Remove the vehicle from the hoist.
6. Connect the battery negative cable.



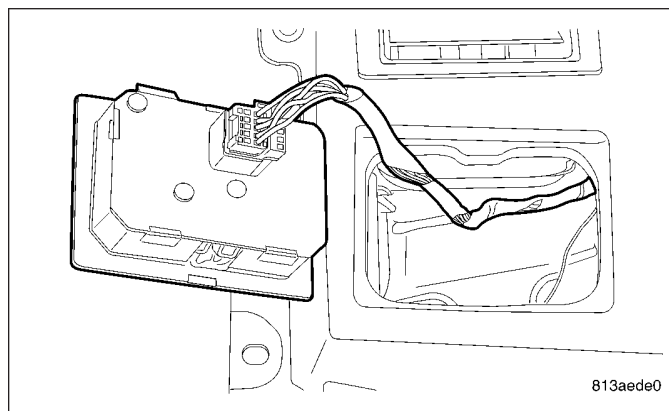
## SWITCH-HEADLAMP

### REMOVAL

1. Disconnect and isolate the battery negative cable.

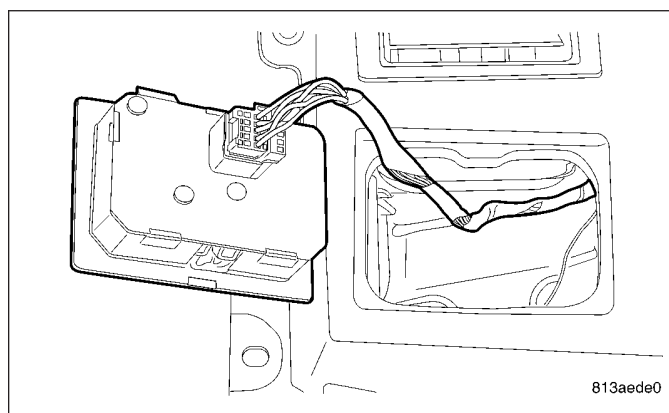
**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

2. Remove steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).
3. From underneath and behind the instrument panel, push up on the lower clip on headlamp switch then wiggle it down and out of instrument panel.
4. Disconnect the headlamp switch electrical connector.



## INSTALLATION

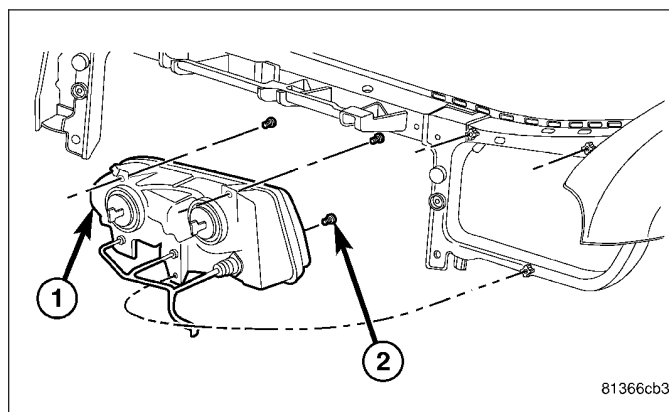
1. Connect the headlamp switch electrical connector.
2. Position headlamp switch in instrument panel and firmly snap into place.
3. Install the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).



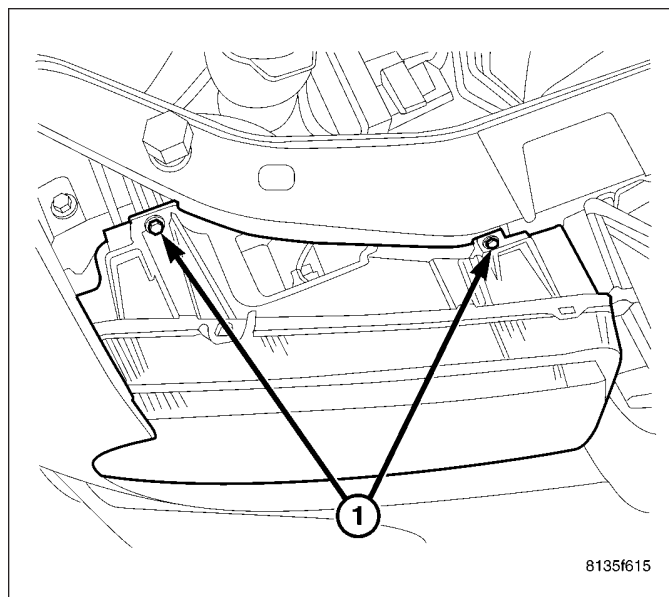
## HEADLAMP UNIT

### REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Open hood and remove the two upper headlamp unit mounting screws.

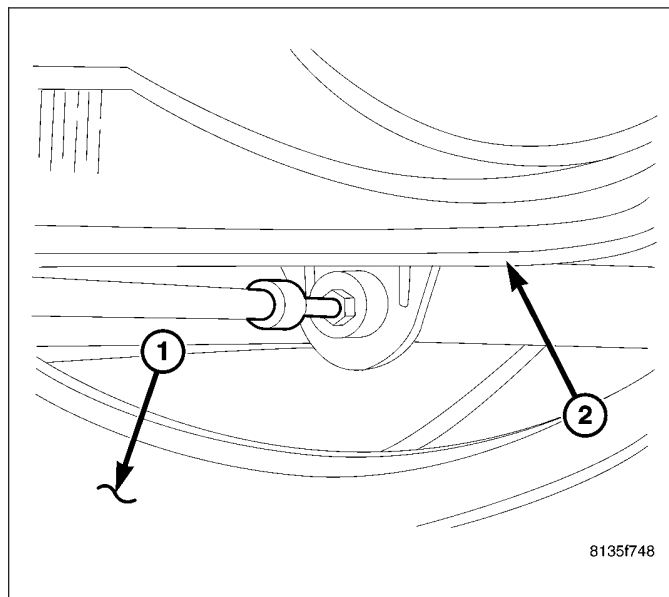


3. The two upper retaining screws (1) are located just in front of the upper radiator crossmember.

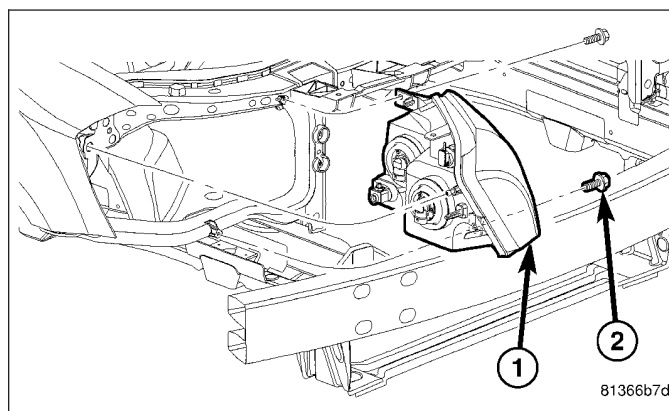


**Note:** It may be necessary to loosen the side of the fascia to access the lower headlamp unit retaining screw (Refer to 13 - FRAME & BUMPERS/ BUMPERS/FRONT FASCIA - REMOVAL).

4. Remove the one lower headlamp unit retaining screw.

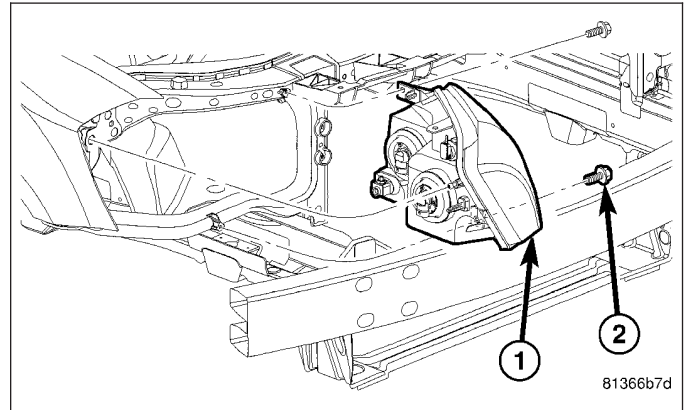


5. Disconnect the electrical connectors.  
6. Separate headlamp unit from vehicle.



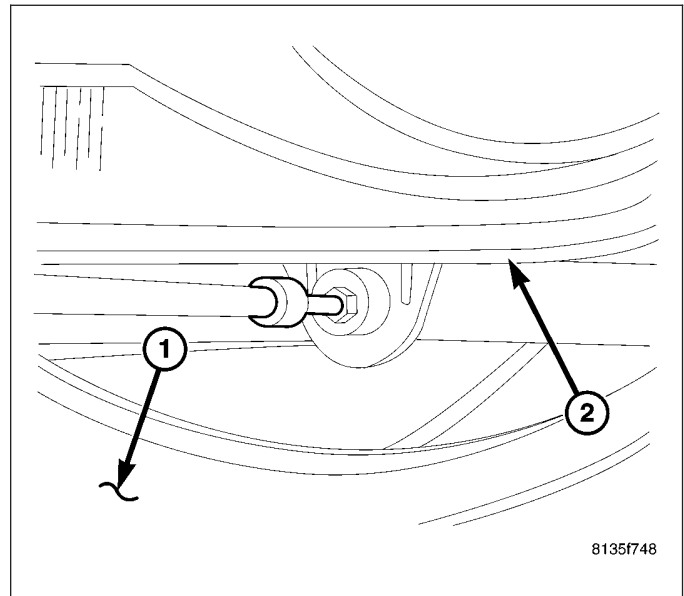
## INSTALLATION

1. Position the headlamp unit in the opening in the headlamp mounting crossmember.
2. Connect the electrical connector.

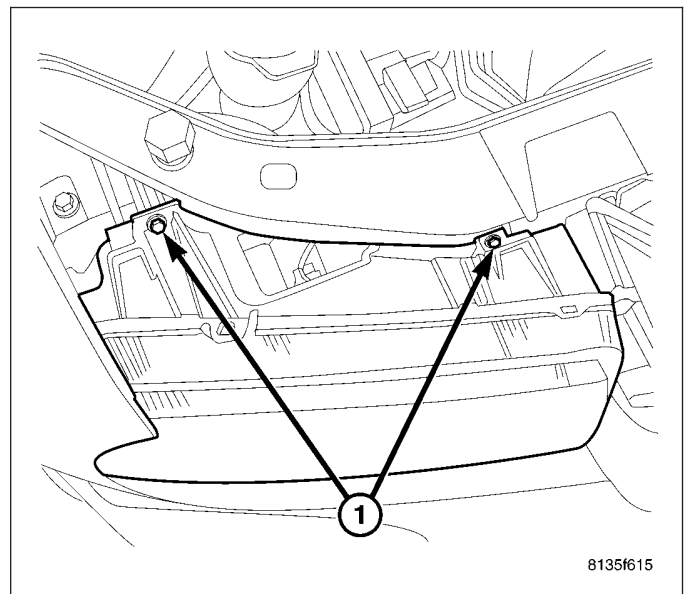


3. Install the one lower headlamp unit retaining screw.

**Note:** If the fascia was loosened, reattach it (Refer to 13 - FRAME & BUMPERS/BUMPERS/Front FASCIA - INSTALLATION).



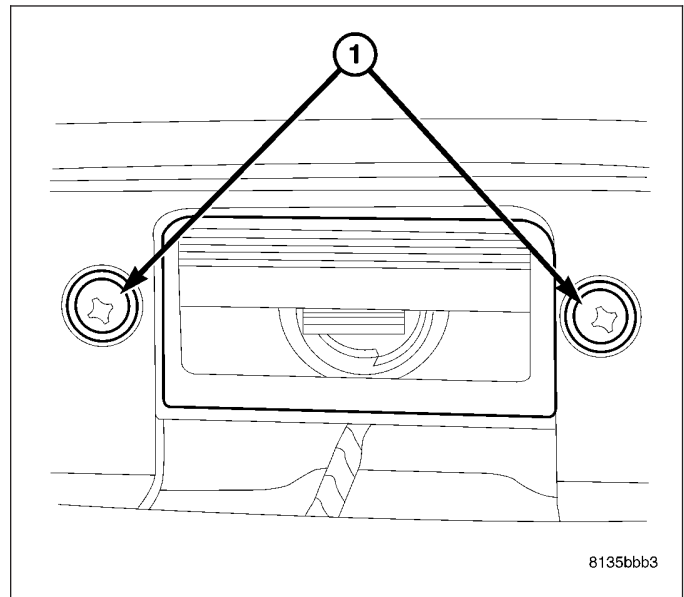
4. Install the two upper retaining screws (1).
5. Connect the battery negative cable.



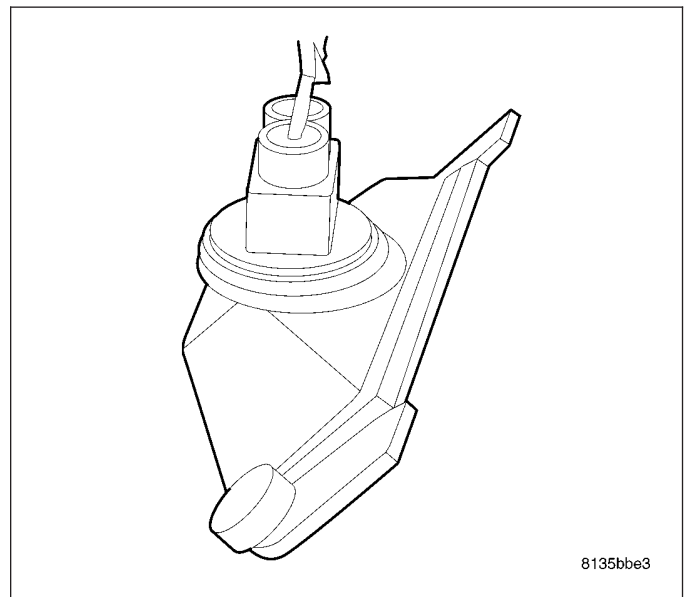
## LICENSE PLATE LAMP UNIT

### REMOVAL

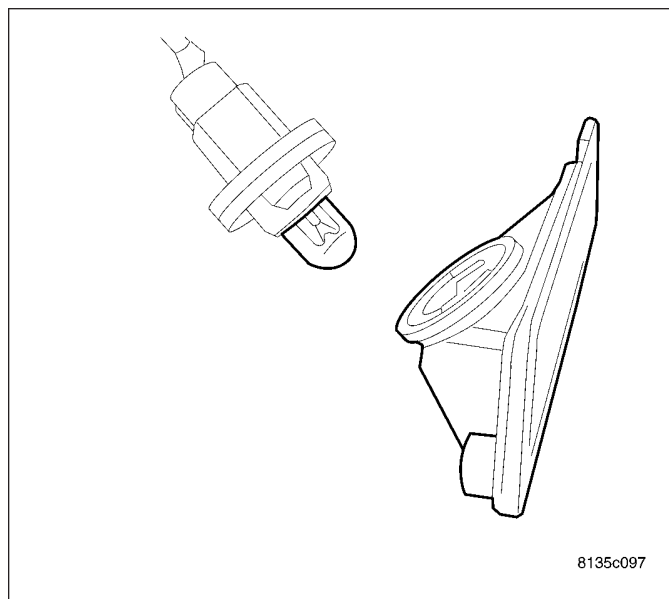
1. Remove the two mounting screws (1) to the license lamp unit.



2. Remove the lamp socket from the lamp unit by twisting socket counterclockwise.

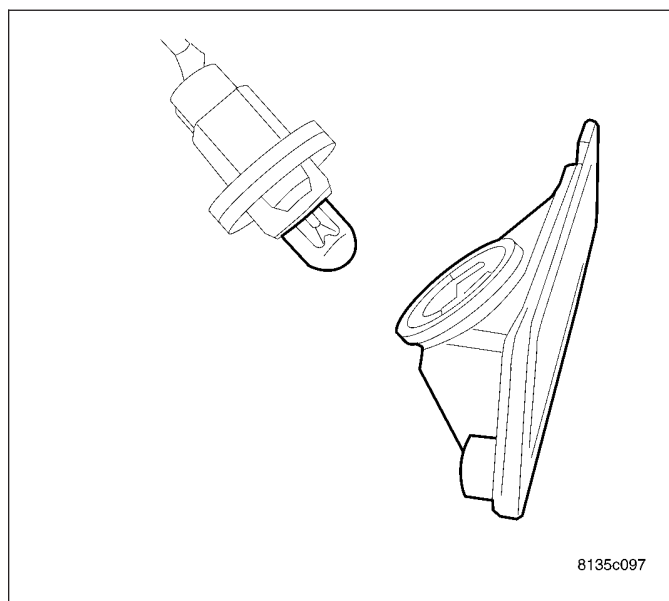


3. Separate socket from lamp.



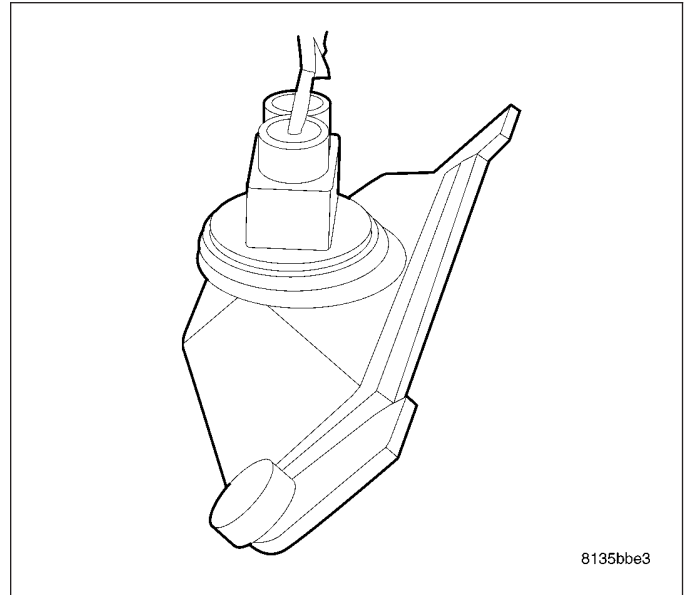
## INSTALLATION

1. Position lamp socket into lamp unit.

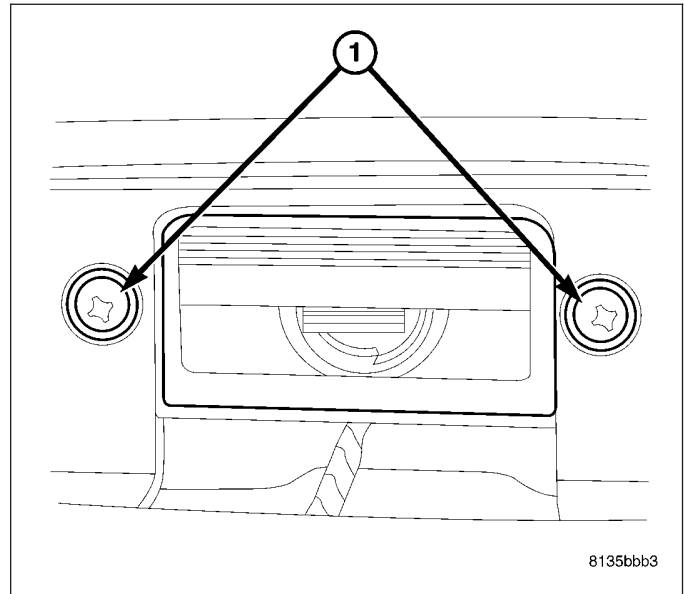




2. Twist the socket clockwise until stops.



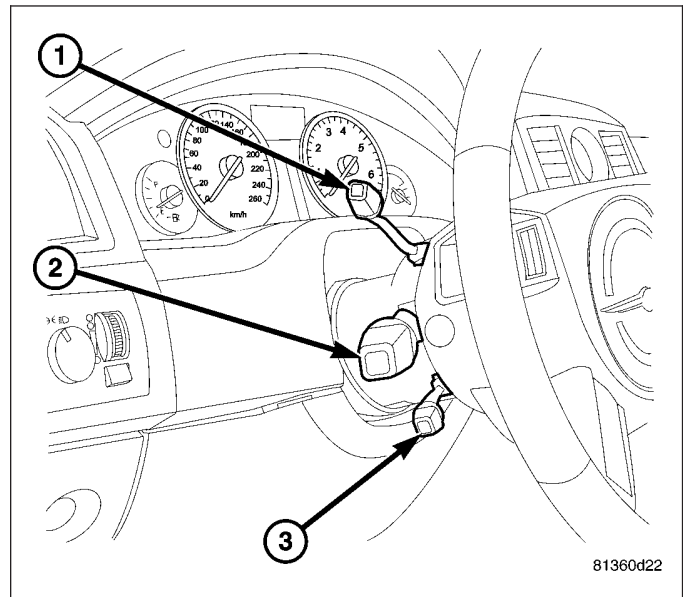
3. Maneuver the lamp unit up into rear fascia and install the two retaining screws (1).



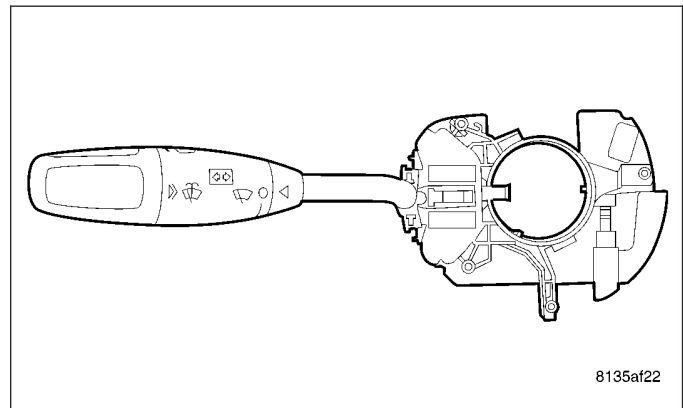
## MULTI-FUNCTION SWITCH

### DESCRIPTION

The multi-function switch (2) is located on the steering column, just below the steering wheel, within the Steering Column Control Module (SCCM).



The only visible components of the multi-function switch are the control stalk and control knob that extend through the SCCM on the left side of the column. The remainder of the switch including its mounting provisions, its electrical connection, and the turn signal cancel actuator are concealed within the SCCM.



Each of the switch controls has white International Control and Display Symbol graphics applied to it, which clearly identify its many functions. Three integral locating posts on the switch housing, slide into channels in a receptacle in the circuit board within the SCCM. A single integral connector receptacle in the circuit board connects the switch to the vehicle electrical system through the instrument panel wire harness.

The multi-function switch provides the vehicle operator with a control interface for the following functions:

- **Front Washer Control** - The multi-function switch control knob provides a momentary position for front washer system operation.
- **Front Wiper Control** - The multi-function switch control knob provides two continuous front wipe switch positions, low speed or high speed; and, an intermittent front wipe mode with six delay interval positions.
- **Headlamp Beam Selection** - The multi-function switch control stalk provides detent switching for selection of the headlamp high or low beams. There is also an intermediate momentary position that allows the headlamp high beam circuits to be momentarily flashed to provide an optical horn feature (sometimes referred to as flash-to-pass) as an optical signalling device.
- **Turn Signal Control** - The multi-function switch control stalk provides momentary non-detent (lane change) switching and detent switching with automatic cancellation for both the left and right turn signal lamps.

The multi-function switch cannot be adjusted or repaired. If any function of the switch is faulty, or if the switch is damaged, the entire switch must be replaced as a unit (Refer to 19 - STEERING/COLUMN/STEERING COLUMN CONTROL MODULE - DISASSEMBLY).

## OPERATION

The multi-function switch operates as follows:

- **Front Washer Control** - The control knob on the end of the multi-function switch control stalk is depressed towards the steering column to momentarily activate the washer pump in the front washer mode. The washer pump will continue to operate in the front washer mode until the control knob is released. The multi-function switch provides an output by sending electronic front washer switch status messages to the Front Control Module (FCM) over the Controller Area Network (CAN) data bus. The FCM responds by energizing or de-energizing the washer pump in the front washer mode.
- **Front Wiper Control** - The control knob on the end of the multi-function switch control stalk is rotated to one of the continuous front wiper detents, to one of six intermittent ( or auto wipe sensitivity positions if so equipped) wiper detents, or to the Off position to select the front wiper mode. The multi-function switch provides an output by sending electronic front wiper switch status messages to the FCM over the CAN data bus. The FCM responds by energizing or de-energizing the wiper on/off and high/low relays in the Power Distribution Center (PDC) for front wiper system control.
- **Headlamp Beam Selection** - The control stalk of the multi-function switch is pushed toward the instrument panel for a latching high beam selection. Pulling the stalk rearward toward the steering wheel for a latching low beam selection. Each time the control stalk is actuated to the momentary position with the headlamps turned off, the headlamp high beams will be illuminated for as long as the control stalk is held in this position. The multi-function switch provides an output to the FCM over the CAN data bus. The FCM energizes or de-energizes the selected low or high beam circuits.
- **Turn Signal Control** - The control stalk of the multi-function switch is moved upward to activate the right turn signal circuitry, and, downward to activate the left turn signal circuitry. The turn signal switch has a detent position in each direction that provides turn signals with automatic cancellation, and an intermediate, momentary position in each direction that provides turn signals only until the control stalk is released. When the control stalk is moved to a turn signal switch detent position, the cancel actuator extends toward the center of the steering column. A turn signal cancel cam that is integral to the clockspring rotates with the steering wheel and the cam lobes contact the cancel actuator when it is extended from the multi-function switch. When the steering wheel is rotated during a turning maneuver, one of the two turn signal cancel cam lobes will contact the turn signal cancel actuator. The cancel actuator latches against the cancel cam rotation in the direction opposite that which is signaled. If the left turn signal detent is selected, the lobes of the cancel cam will ratchet past the cancel actuator when the steering wheel is rotated to the left, but will unlatch the cancel actuator as the steering wheel rotates to the right and returns to center, which will cancel the turn signal event and release the control stalk from the detent so it returns to the neutral Off position. When a turn signal is activated, the multi-function switch provides an output to the FCM over the CAN data bus. In addition, the message is sent to the CCN via the CAN bus to activate the proper signal within the EMIC. The FCM energizes and flashes or de-energizes the selected left or right turn signal circuits.

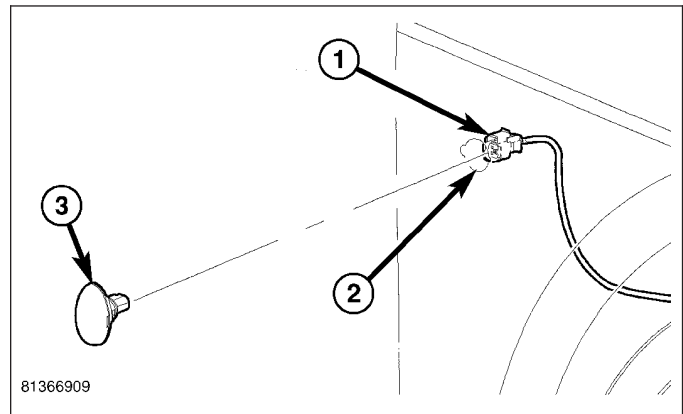
The multi-function switch can be diagnosed using a diagnostic scan tool and the appropriate diagnostic information.

The multi-function switch cannot be adjusted or repaired. If any function of the switch is faulty, or if the switch is damaged, the entire switch must be replaced as a unit (Refer to 19 - STEERING/COLUMN/STEERING COLUMN CONTROL MODULE - DISASSEMBLY).

## REPEATER LAMP - EXPORT

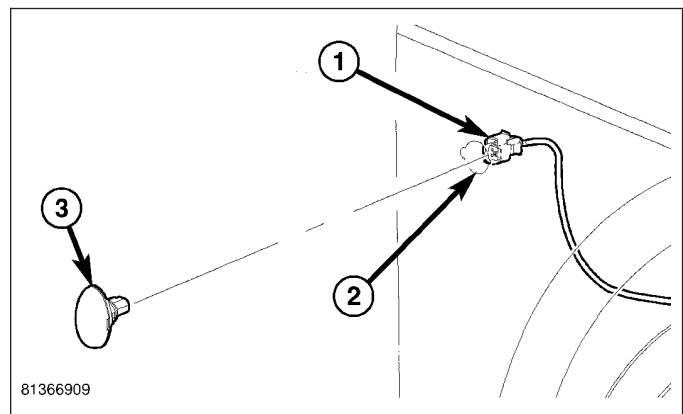
### REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Using a trim stick (C-4755) or equivalent, Gently pry the lamp from the fender.
3. Disconnect the wire harness connector (1) and remove lamp (3).



### INSTALLATION

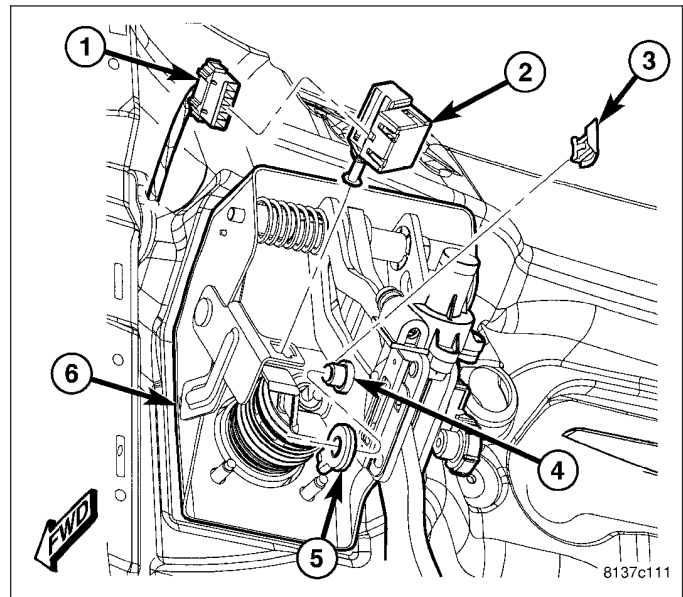
1. Connect the harness connector (2) to the repeater lamp (3).
2. Install the lamp (3) into the fender (2), firmly snapping into place with hand.
3. Connect the battery negative cable.



## SWITCH - STOP LAMP

### DESCRIPTION

The stop lamp switch (2) is located under the instrument panel at the brake pedal arm. This switch contains three internal switches controlling various functions of the vehicle, one of them controls operation of the vehicle's brake lamps. Other functions of the internal switches include speed control deactivation and brake sense for the ABS and the brake transmission shift interlock.



### OPERATION

The stop lamp switch has three internal switches used for various functions. Among these are:

- Brake lamp actuation
- Speed control deactivation, and
- Brake sense for ABS and brake transmission shift interlock

When the brake pedal is in the released position, the plunger on the outside of the stop lamp switch is pushed inward by the brake pedal. In this position, the electrical contacts for one internal switch are open while the electrical contacts for other two internal switches are closed.

When the brake pedal is pressed, the plunger on the outside of the stop lamp switch extends outward. This action closes the electrical contacts for the one internal switch and opens the contacts for the remaining two switches within the stop lamp switch. The internal switch which closes when the brake pedal is pressed completes the circuit to the brake lamps at the rear of the vehicle, thus allowing illumination of the brake lamps and the center-high-mounted stop lamp (CHMSL).

### DIAGNOSIS AND TESTING

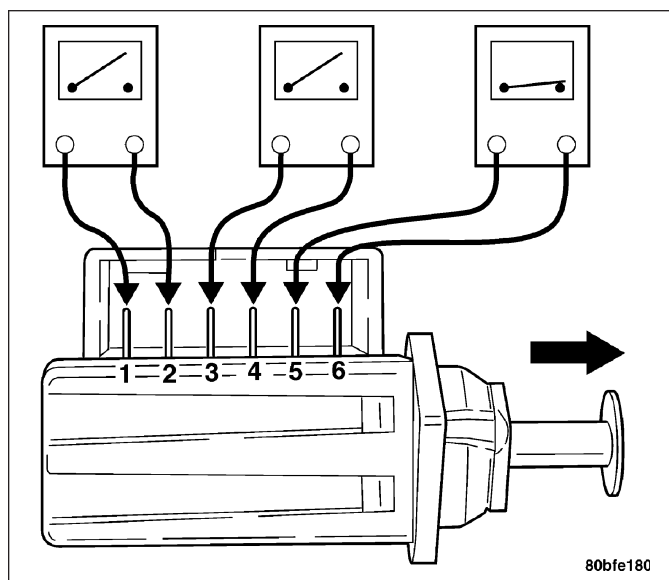
#### STOP LAMP SWITCH

**Note:** Before proceeding with this diagnostic test, verify the adjustment of the stop lamp switch to rule out misadjustment. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/STOP LAMP SWITCH - ADJUSTMENTS)

If the electrical circuit has been tested and the stop lamp switch is suspected of being faulty, it can be tested using the following method.

1. Remove the switch from the vehicle. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/STOP LAMP SWITCH - REMOVAL)

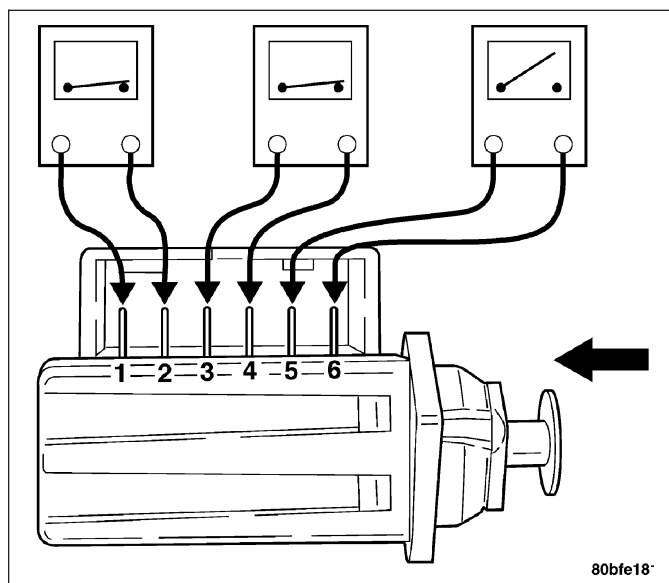
2. With the switch in the released position (plunger extended), use an ohmmeter to test each of the three internal switches as shown. You should achieve the results as indicated in the figure.



3. Gently push the plunger on the stop lamp switch in until it stops.
4. With the switch in the depressed position (plunger pushed in), use an ohmmeter to test each of the three internal switches as shown. You should achieve the results as indicated in the figure.

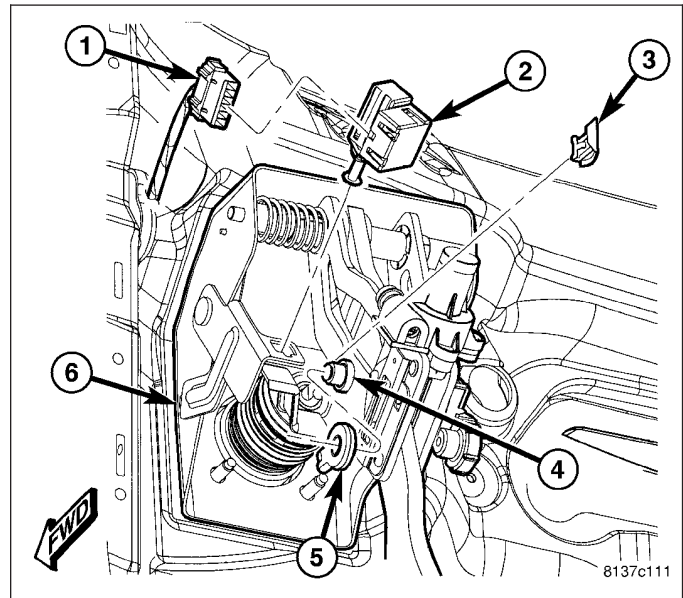
If you do not achieve the results as indicated in both figures, the switch is faulty and must be replaced.

5. Install the switch in the vehicle. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/STOP LAMP SWITCH - INSTALLATION)



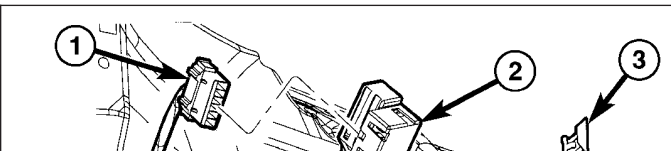
## REMOVAL

1. Depress and hold the brake pedal.
2. Remove the stop lamp switch (2) from it's bracket on the brake pedal assembly (6). To do so, rotate the stop lamp switch in a counterclockwise direction approximately 30 degrees from its proper mounting position. Pull the switch rearward and remove it from it's mounting bracket.
3. Disconnect the wiring harness connector (1) from the switch.



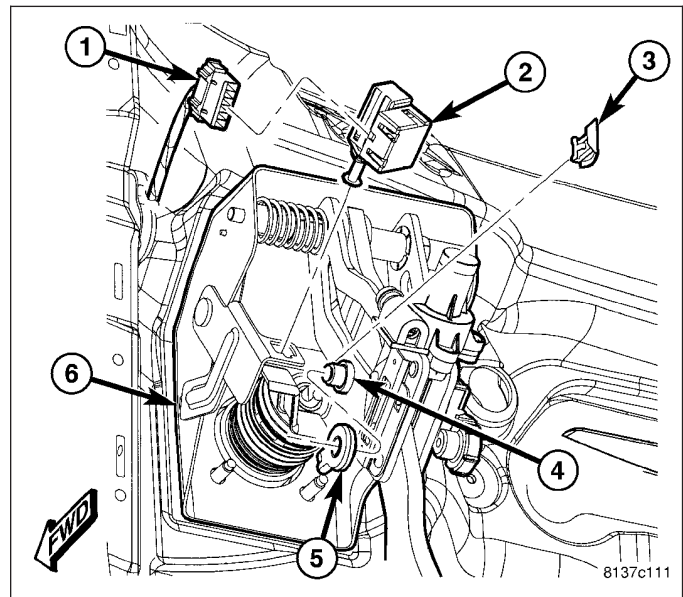
## INSTALLATION

**Note:** Prior to installing the stop lamp switch into it's bracket, the plunger must be moved to its fully extended position using the procedure described in Step 1.

1. Hold the stop lamp switch firmly in one hand. Using your other hand, pull outward on the plunger of the switch until it has ratcheted out to its fully extended position.
  2. Connect the wiring harness connector (1) to the stop lamp switch (2).
  3. Mount the stop lamp switch into the bracket on the brake pedal assembly (6) as follows: Depress the brake pedal as far down as possible. Install the switch in it's bracket by aligning the index key on switch with the notch in the square mounting hole of the mounting bracket. Once the switch is fully seated, rotate the switch clockwise approximately 30° to lock the switch into the bracket.
- 
- The diagram shows a line drawing of the brake pedal assembly. Three numbered callouts are present: (1) points to a wiring harness connector, (2) points to the stop lamp switch, and (3) points to a small component, likely a pin or clip, used for mounting the switch to the bracket. The switch is shown being inserted into a bracket on the pedal assembly.

**CAUTION:** Do not use excessive force when pulling back on the brake pedal to adjust the stop lamp switch. If too much force is used, damage to the stop lamp switch or striker can result.

4. Gently pull back on brake pedal until the pedal stops moving. This will cause the switch plunger to ratchet backward to the correct position.
5. Check for proper operation of the brake lamps and speed control.



## ADJUSTMENTS

### STOP LAMP SWITCH ADJUSTMENT

1. Depress and hold the brake pedal.
2. Remove the stop switch from it's bracket. To do so, rotate the stop lamp switch in a counterclockwise direction approximately 30 degrees from its proper mounting position. Pull the switch rearward and remove it from it's mounting bracket.
3. Hold the stop lamp switch firmly in one hand. Using your other hand, pull outward on the plunger of the switch until it has ratcheted out to its fully extended position.
4. Mount the stop lamp switch into the bracket as follows: Depress the brake pedal as far down as possible. Install the switch in it's bracket by aligning the index key on switch with the notch in the square mounting hole of the mounting bracket. Once the switch is fully seated, rotate the switch clockwise approximately 30° to lock the switch into the bracket.

**CAUTION:** Do not use excessive force when pulling back on the brake pedal to adjust the stop lamp switch. If to much force is used, damage to the stop lamp switch or striker can result.

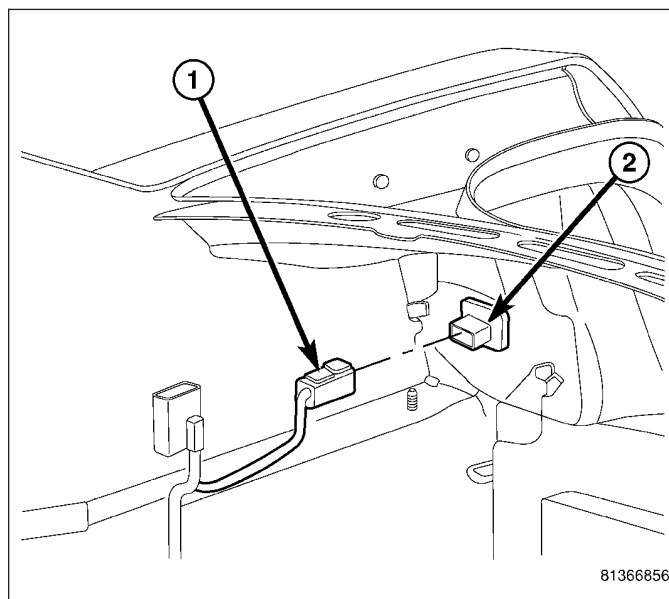
5. Gently pull back on brake pedal until the pedal stops moving. This will cause the switch plunger to ratchet backward to the correct position.
6. Check for proper operation of the brake lamps and speed control.

## TAIL LAMP UNIT

### REMOVAL

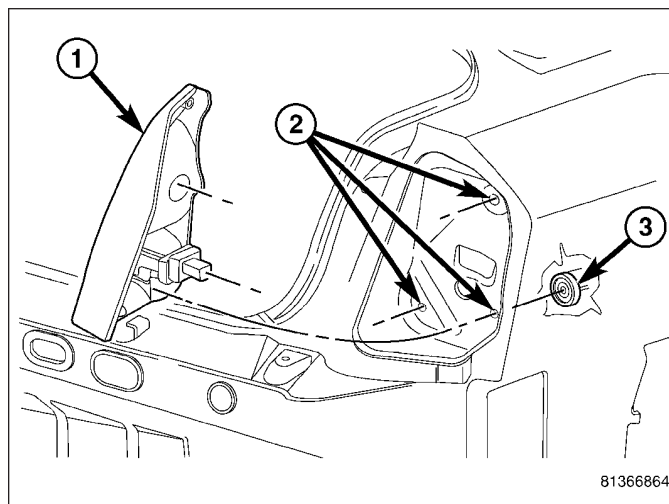
#### SEDAN

1. Disconnect and isolate the battery negative cable.
2. From inside the trunk, peel back the trunk trim and disconnect the electrical connector.



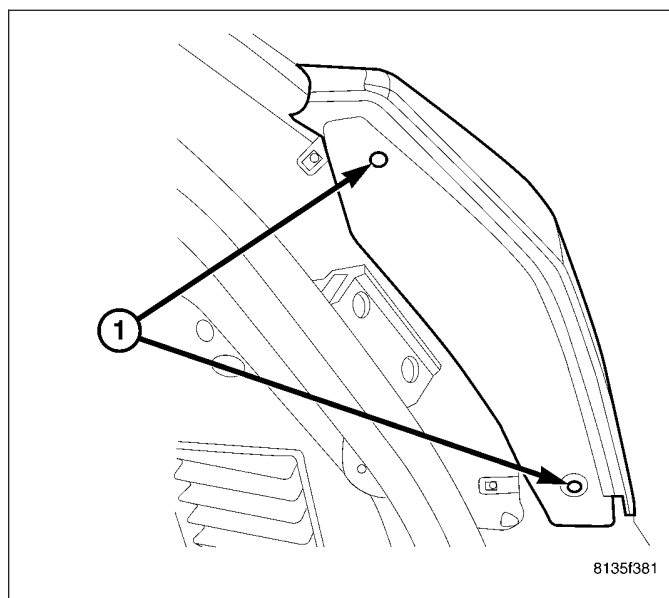


3. Remove the three plastic wing nuts (3).
4. Pull the tail lamp unit (1) straight out of the rear of the quarter trim panel.

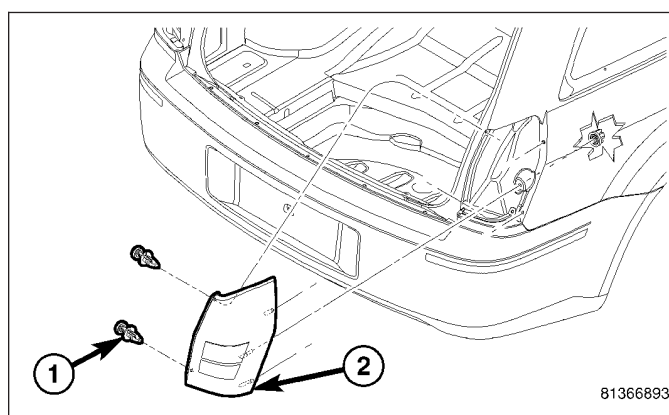


## WAGON

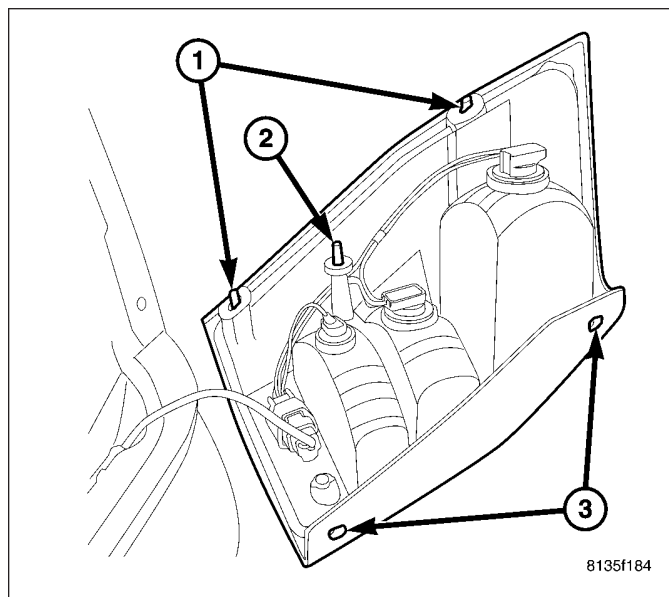
1. Disconnect and isolate the battery negative cable.
2. Remove the two push fasteners (1) in the liftgate opening.



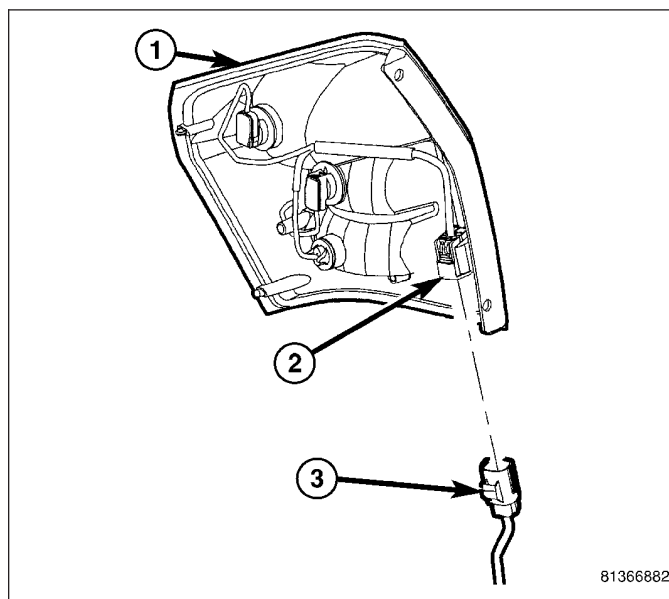
3. From inside the cargo area, using a trim stick (special tool #C-4755) or equivalent, gently pry the access panel off the rear of the quarter trim panel.
4. Remove the one plastic wing nut.



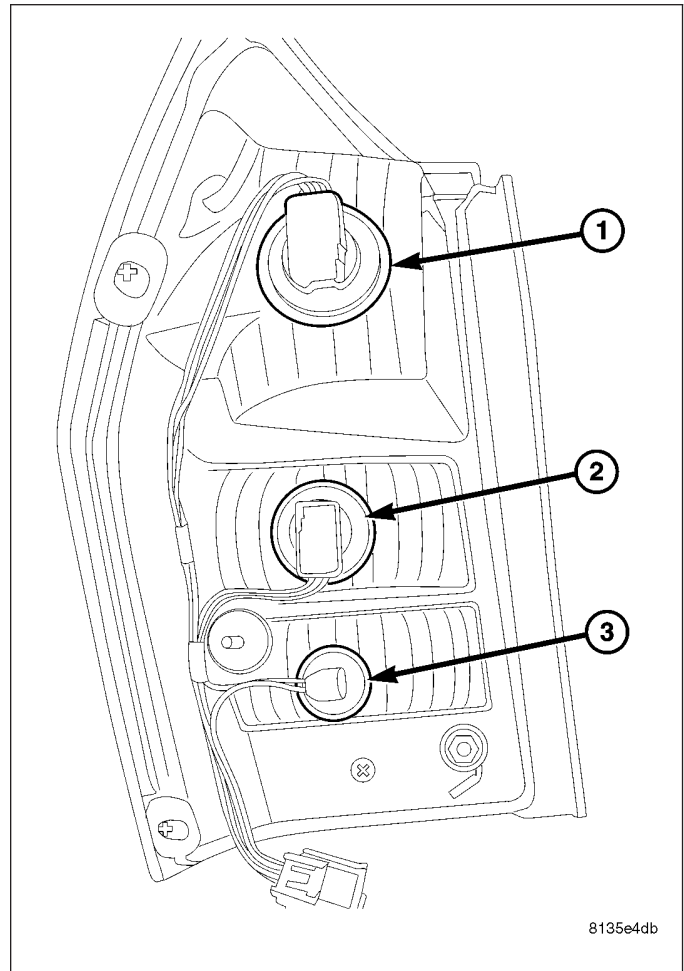
5. Pulling rearward, release the mounting tabs of the tail lamp unit (1).



6. Disconnect the electrical connector (3) from tail lamp unit (1).



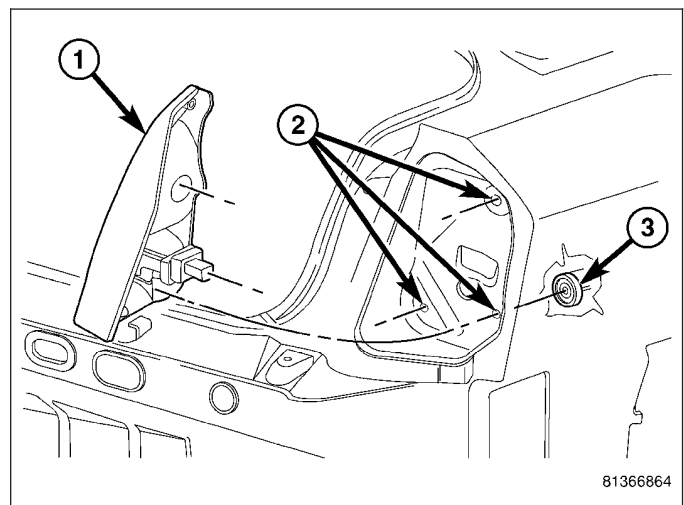
1. Twist counterclockwise to remove the Stop (1), Turn Signal (2), or Back-Up lamps.



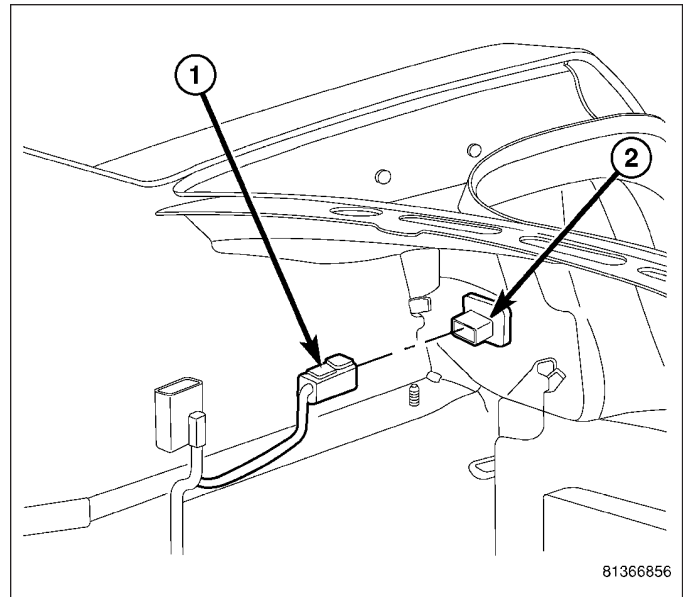
## INSTALLATION

### SEDAN

1. Position the tail lamp unit (1) in the rear quarter panel of vehicle.
2. Install and tighten the three plastic wing nuts (3).

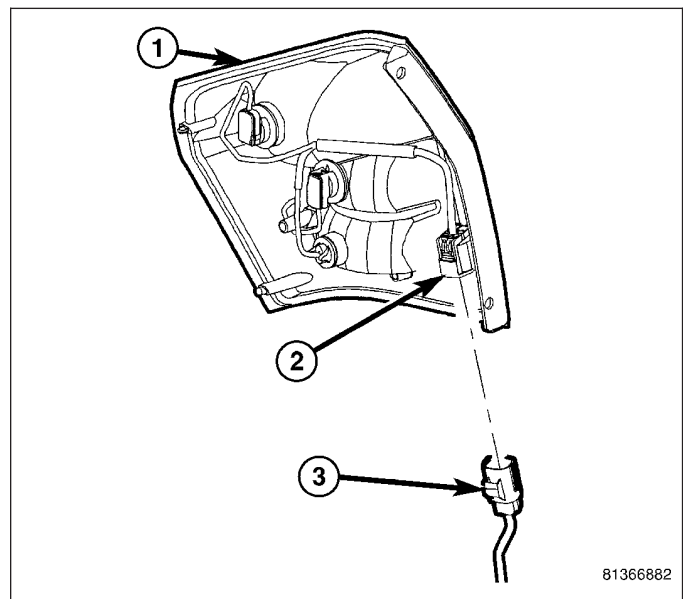


3. From within the trunk, connect the electrical connector (1) to tail lamp unit (2).
4. Replace trunk carpeting.
5. Connect the battery negative cable.

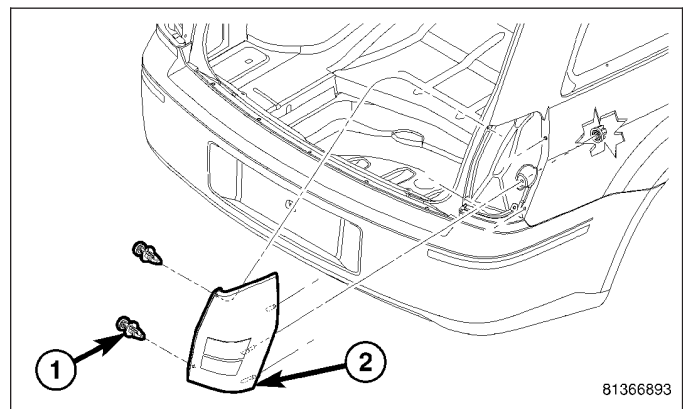


## WAGON

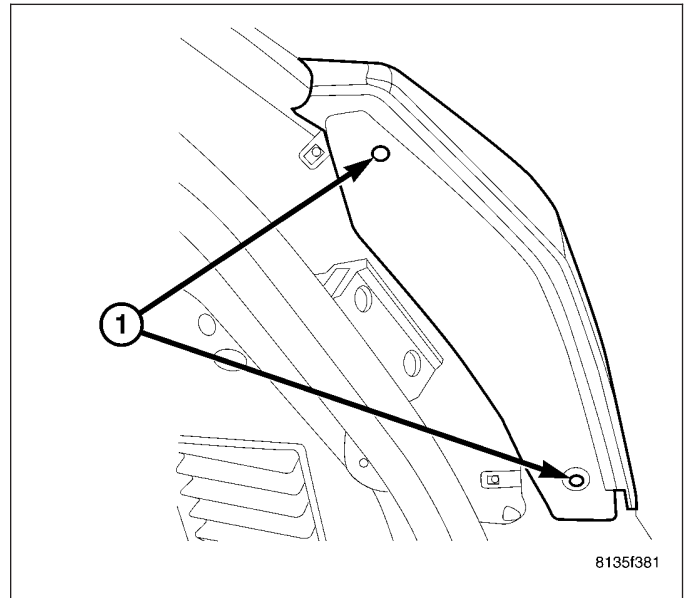
1. Connect the electrical connector (3) to the tail lamp unit (2).



2. Position the tail lamp unit (2) in quarter panel opening.
3. Give a firm push forward to seat the indexing pins.



4. Install and tighten the one plastic wing nut.
5. Install the two push pin fasteners (1) in the liftgate opening.
6. Connect the battery negative cable.



LAMPS/LIGHTING - INTERIOR - ELECTRICAL DIAGNOSTICS

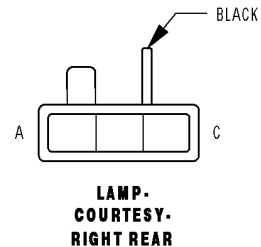
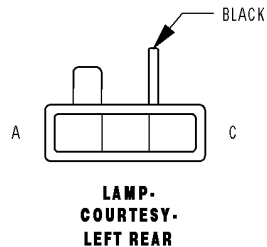
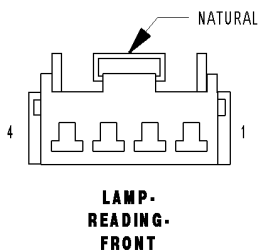
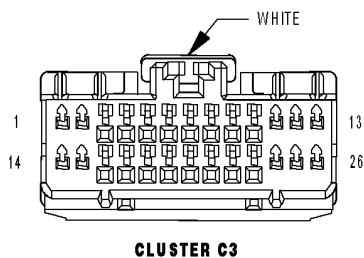
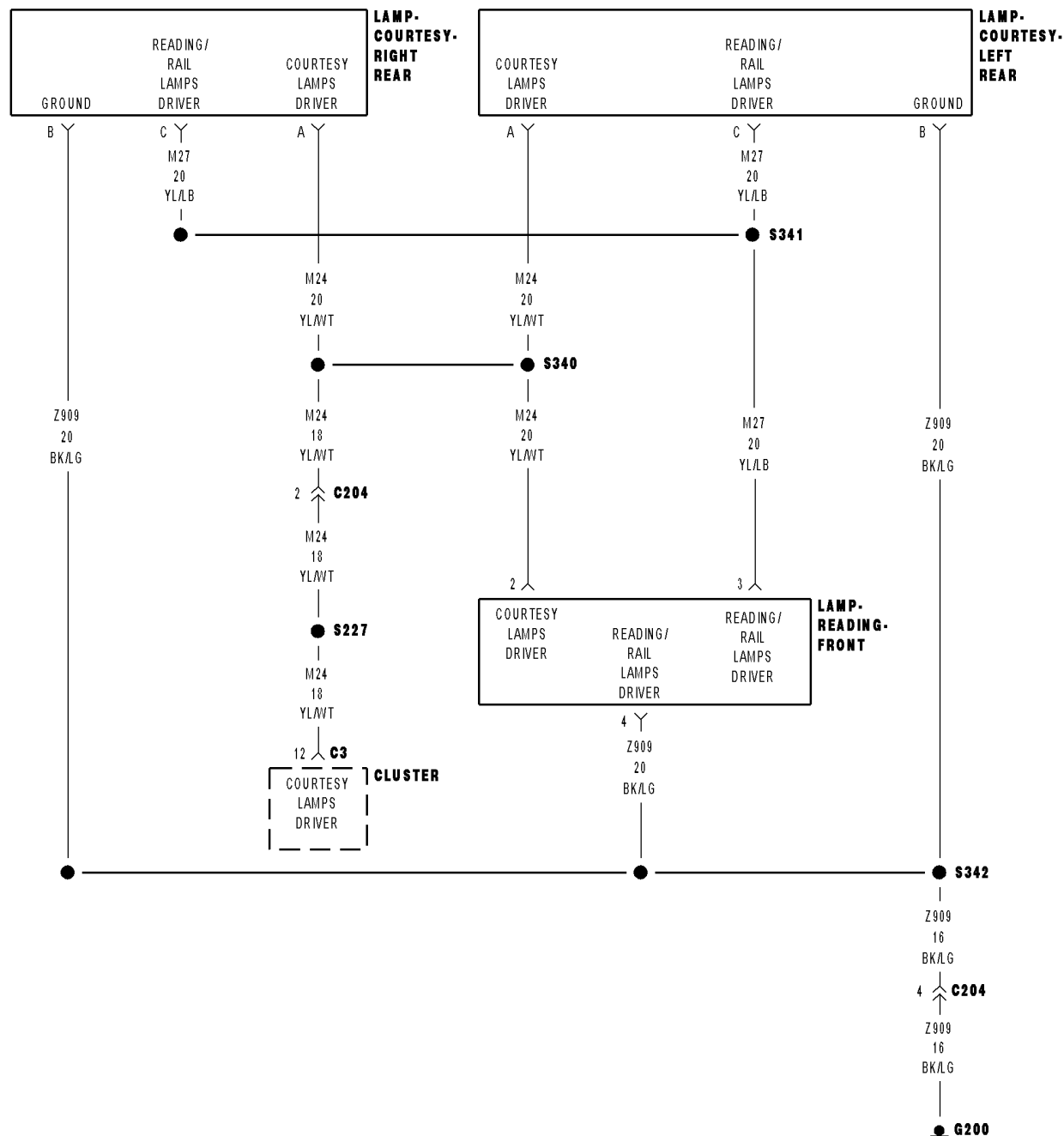
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LAMPS/LIGHTING - INTERIOR - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

# B161B-COURTESY/DOME LAMP OUTPUT CIRCUIT SHORT TO GROUND



**B161B-COURTESY/DOME LAMP OUTPUT CIRCUIT SHORT TO GROUND (CONTINUED)**

For the Interior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
(M24) COURTESY LAMP DRIVER CIRCUIT SHORT TO GROUND INSTRUMENT CLUSTER

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

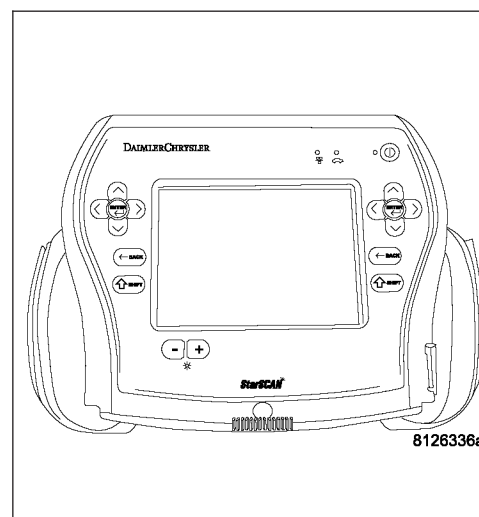
With the Scan Tool, clear all CCN DTC's.

Turn the Dome Lamps on.

With the Scan Tool, read the DTC information.

**Does the Scan Tool read: B161B-COURTESY/DOME LAMP OUTPUT CIRCUIT SHORT TO GROUND?**

- Yes** >> Go To 2
- No** >> The condition that caused the symptom is currently not present.  
Inspect the related wiring for a possible intermittent condition.  
Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.

**2. HEADLAMP SWITCH**

Disconnect the Headlamp Switch connector.

Turn the Ignition on.

Using the Scan Tool.

**Does the Scan Tool display Headlamp Switch 5.0 volts?**

- Yes** >> Go To 3
- No** >> Replace the Headlamp Switch in accordance with the service information.



**B161B-COURTESY/DOME LAMP OUTPUT CIRCUIT SHORT TO GROUND (CONTINUED)****3. INSTRUMENT CLUSTER/DRIVER CIRCUIT SHORT**

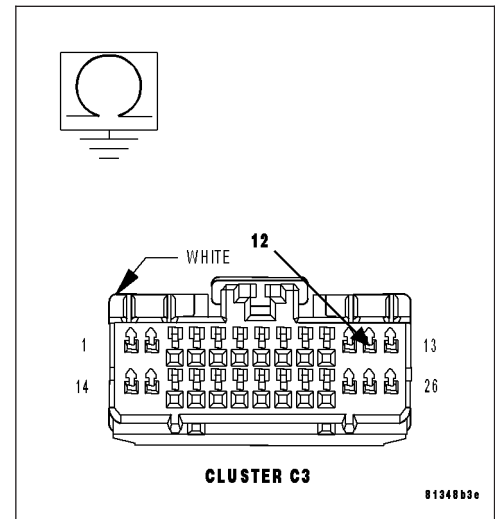
Turn the ignition on.

Disconnect the Instrument Cluster C3 connector.

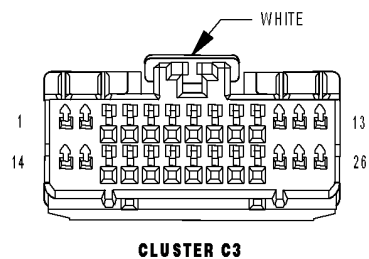
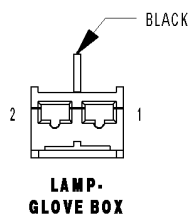
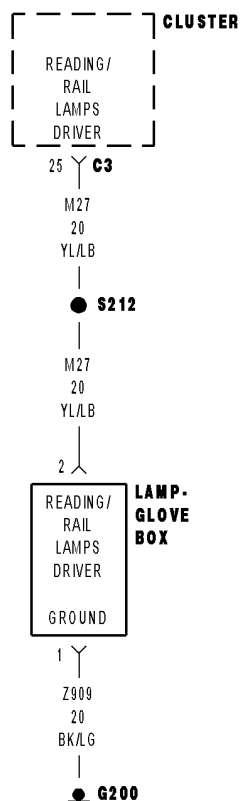
Measure the resistance of the (M24) Courtesy Lamp Driver circuit to ground.

**Is the resistance below 5.0 ohms?**

- Yes**    >> Repair the (M24) Courtesy lamp Driver circuit.  
             Perform the BODY VERIFICATION TEST — VER 1.
- No**      >> Replace the Instrument Cluster in accordance with the service information.  
             Perform the BODY VERIFICATION TEST — VER 1.



## B1623-GLOVEBOX/MAP LAMP OUTPUT CIRCUIT SHORT TO GROUND



**B1623-GLOVEBOX/MAP LAMP OUTPUT CIRCUIT SHORT TO GROUND (CONTINUED)**

For the Interior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
(M27) GLOVE BOX/MAP LAMP OUTPUT CIRCUIT SHORT TO GROUND INSTRUMENT CLUSTER

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

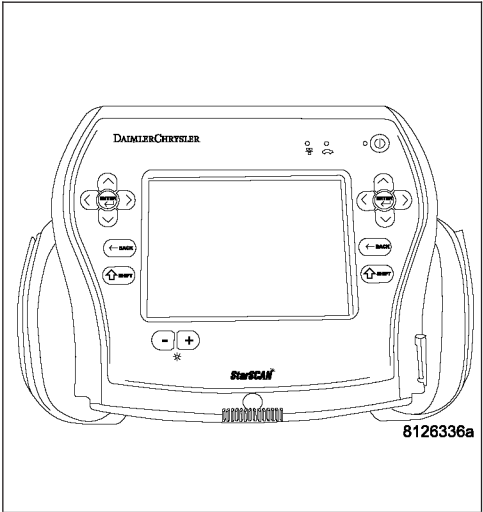
**Diagnostic Test**

**1. INTERMITTENT CONDITION**

Turn the ignition on.  
With the Scan Tool, clear all CCN DTC's.  
Turn the Glove Box lamps on.  
With the Scan Tool, read the DTC information.

**Does the Scan Tool read: B1623-GLOVEBOX/MAP LAMP OUTPUT CIRCUIT SHORT TO GROUND?**

- Yes**    >> Go To 2
- No**    >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.



**B1623-GLOVEBOX/MAP LAMP OUTPUT CIRCUIT SHORT TO GROUND (CONTINUED)****2. INSTRUMENT CLUSTER**

Turn the ignition off.

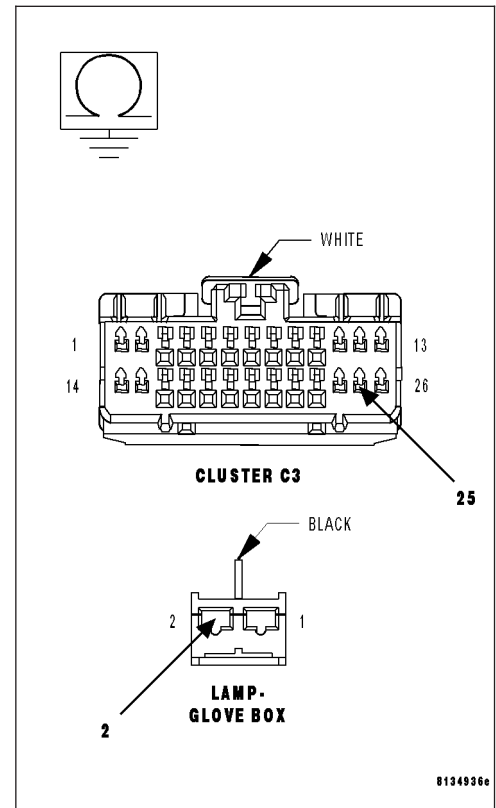
Disconnect the Glovebox Lamp Switch harness connector.

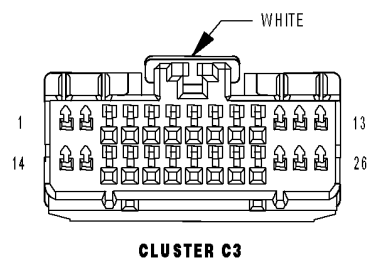
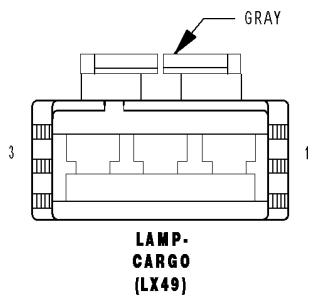
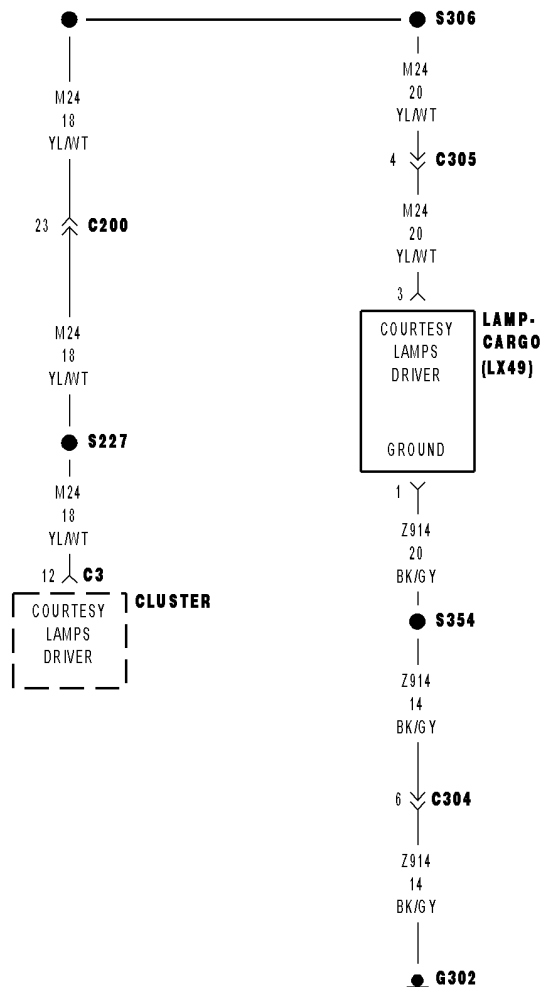
Disconnect the Instrument Cluster C3 connector.

Measure the resistance of the (M27) Glovebox Lamp Output circuit to ground.

**Is the resistance below 5.0 ohms?**

- Yes** >> Repair the (M27) Glovebox-Map Lamp Output circuit.  
Perform the BODY VERIFICATION TEST — VER 1.
- No** >> Replace the Instrument Cluster in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.



**B1627-CARGO LAMP OUTPUT CIRCUIT SHORT TO GROUND**

**B1627-CARGO LAMP OUTPUT CIRCUIT SHORT TO GROUND (CONTINUED)**

For the Interior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
Headlamp Switch (M22) Cargo Lamp Output Circuit Short to Ground Instrument Cluster

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. Intermittent Condition**

turn the ignition on.

With the Scan Tool, clear all CCN DTC's.

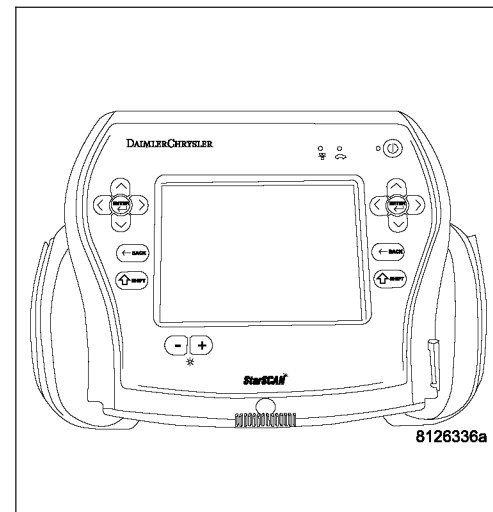
Turn the Cargo Lamps on.

With the Scan Tool, read the DTC information.

**Does the SCan Tool read: B1627-CARGO LAMP OUTPUT CIRCUIT SHORT TO GROUND?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.

**2. Headlamp Switch**

Disconnect the Headlamp Switch connector.

Turn the ignition on.

Using the Scan Tool, read DTC's.

**Does the Scan Tool display Headlamp Switch 5.0 volts?**

**Yes** >> Go To 3

**No** >> Replace the Headlamp Switch.  
Perform the BODY VERIFICATION TEST VER — 1.

**B1627-CARGO LAMP OUTPUT CIRCUIT SHORT TO GROUND (CONTINUED)****3. Instrument Cluster**

Turn the ignition off.

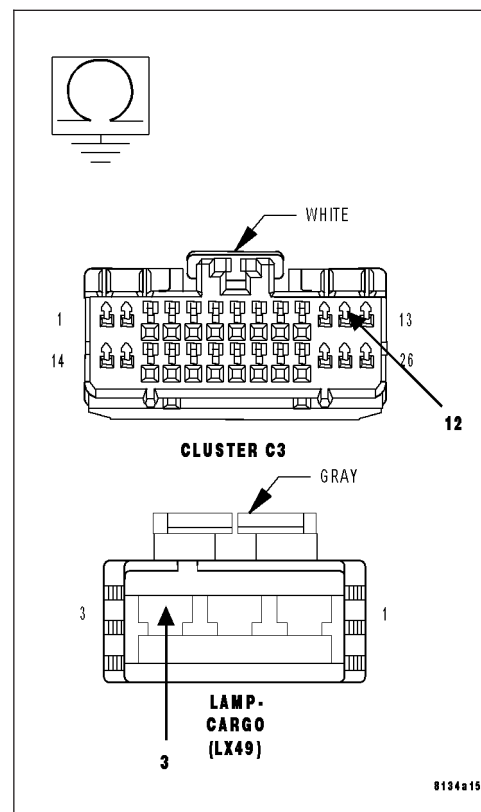
Disconnect the Headlamp Switch connector.

Disconnect the Instrument Cluster C3 connector.

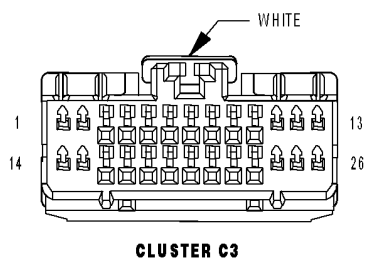
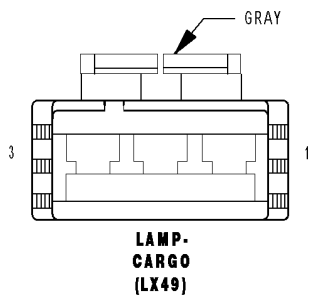
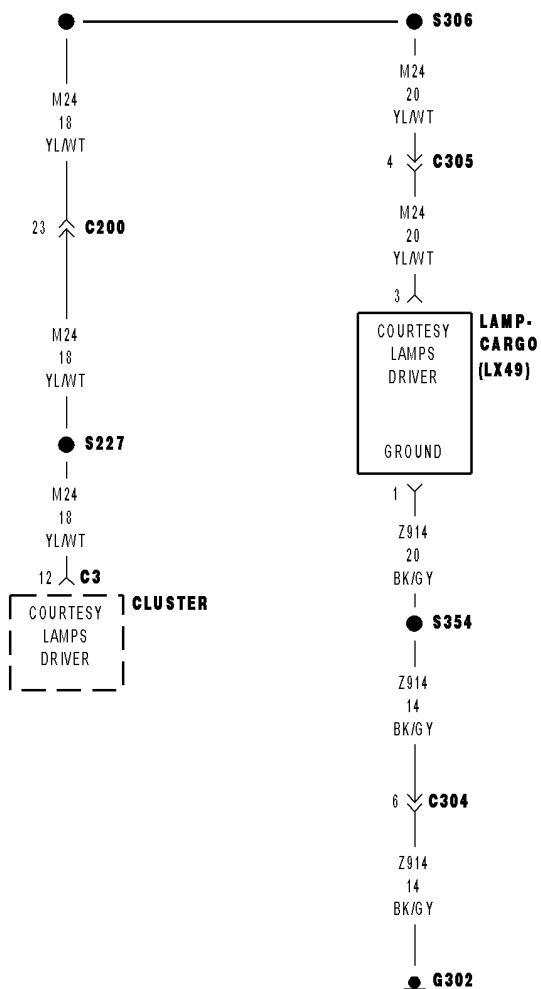
Measure the resistance of the of the (M22) Cargo Lamp Output circuit to ground.

**Is the resistance below 5.0 ohms?**

- Yes** >> Repair the Cargo Lamp Output circuit.  
Perform the BODY VERIFICATION TEST VER — 1.
- No** >> Replace the Instrument Cluster in accordance with the service information.  
Perform the BODY VERIFICATION TEST VER — 1.



## B1629-CARGO LAMP OUTPUT CIRCUIT OPEN





**B1629-CARGO LAMP OUTPUT CIRCUIT OPEN (CONTINUED)**

For the Interior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
HEADLAMP SWITCH (M24) CARGO LAMP OUTPUT CIRCUIT OPEN INSTRUMENT CLUSTER

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

turn the ignition on.

With the Scan Tool, clear all CCN DTC's.

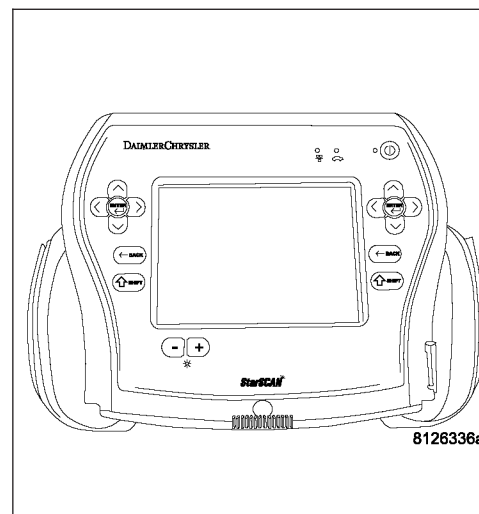
Turn the Cargo Lamps on.

With the Scan Tool, read the DTC information.

**Does the SCan Tool read: B1629-CARGO LAMP OUTPUT CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.

**2. HEADLAMP SWITCH**

Disconnect the Headlamp Switch connector.

Turn the ignition on.

Using the Scan Tool, read DTC's.

**Does the Scan Tool display Headlamp Switch 5.0 volts?**

**Yes** >> Go To 3

**No** >> Replace the Headlamp Switch.  
Perform the BODY VERIFICATION TEST VER — 1.

**B1629-CARGO LAMP OUTPUT CIRCUIT OPEN (CONTINUED)****3. INSTRUMENT CLUSTER**

Turn the ignition off.

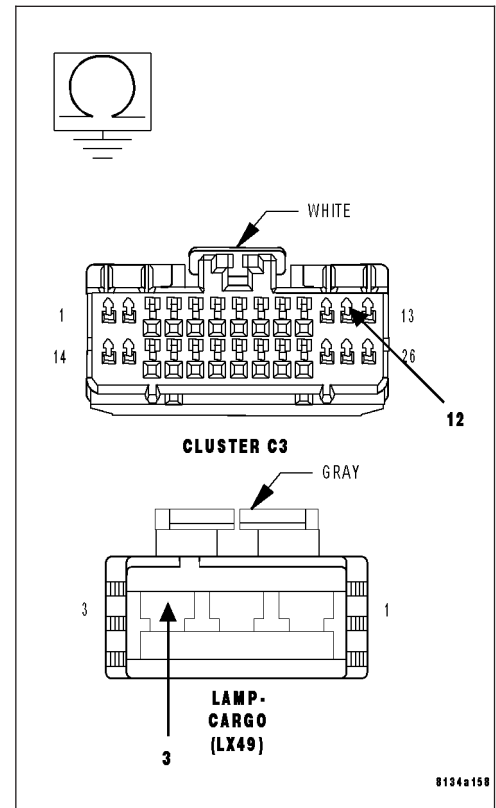
Disconnect the Headlamp Switch connector.

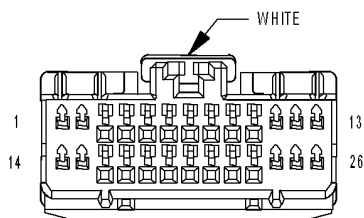
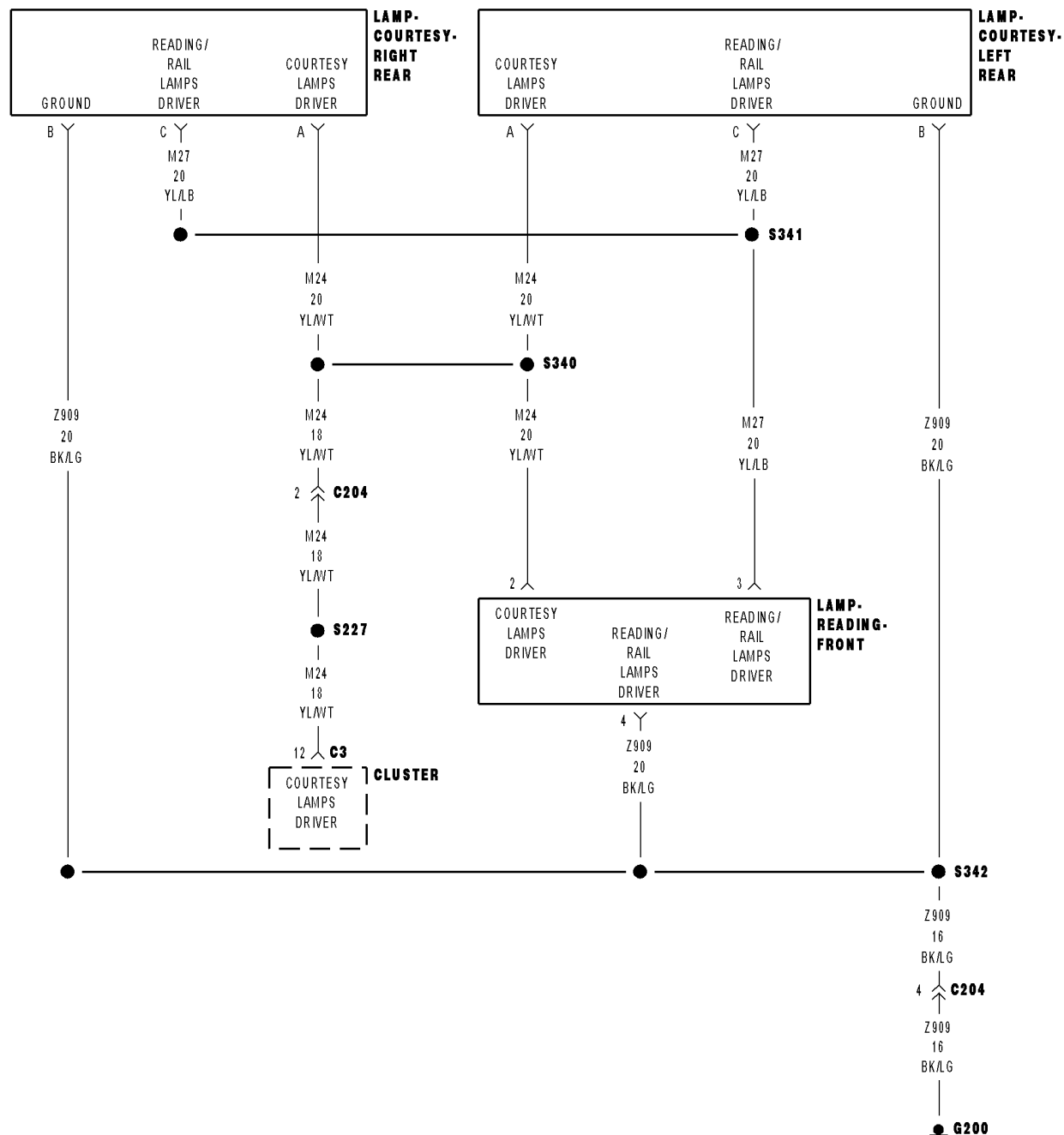
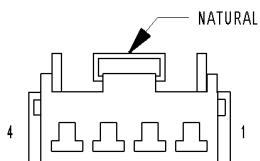
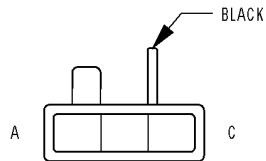
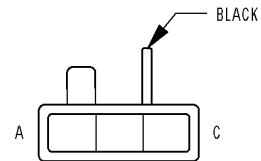
Disconnect the Instrument Cluster C3 connector.

Measure the resistance of the of the (M24) Cargo Lamp Output circuit.

**Is the resistance above 5.0 ohms?**

- Yes** >> Repair the (M24) Cargo Lamp Output circuit.  
Perform the BODY VERIFICATION TEST VER — 1.
- No** >> Replace the Instrument Cluster in accordance with the service information.  
Perform the BODY VERIFICATION TEST VER — 1.



**B161C-COURTESY/DOME LAMP CONTROL CIRCUIT HIGH****CLUSTER C3****LAMP-READING-FRONT****LAMP-COURTESY-LEFT REAR****LAMP-COURTESY-RIGHT REAR**

**B161C-COURTESY/DOME LAMP CONTROL CIRCUIT HIGH (CONTINUED)**

For the Interior Lighting System circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Instrument Cluster detects a short to battery on the Control circuit.

Possible Causes
(M27) CONTROL CIRCUIT INSTRUMENT CLUSTER

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

Clear all CCN DTC's

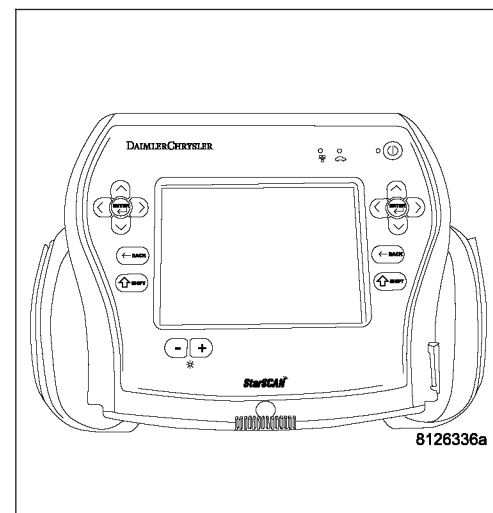
Turn the Courtesy Lamps on.

With the scan tool, read DTC's.

**Does the scan tool read: B161C-COURTESY/DOME LAMP CONTROL CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.



**B161C-COURTESY/DOME LAMP CONTROL CIRCUIT HIGH (CONTINUED)****2. M27 COURTESY LAMP CONTROL CIRCUIT**

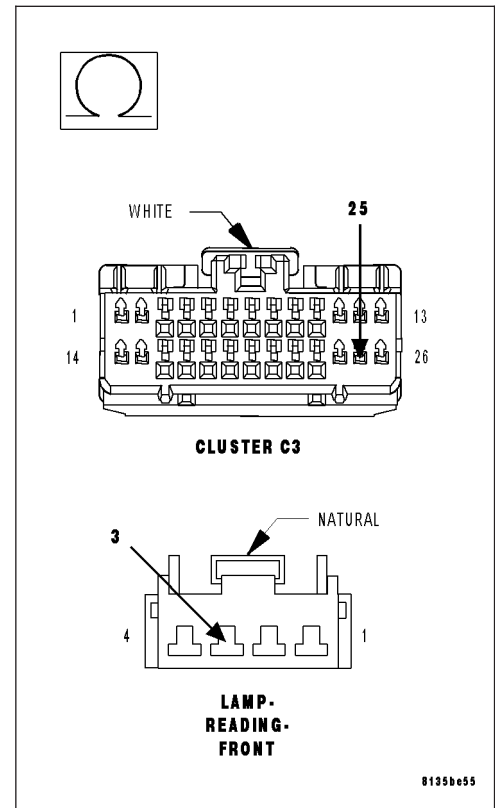
Turn the ignition off.

Disconnect the Instrument Cluster C3 harness connector.

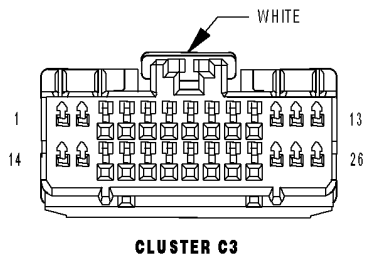
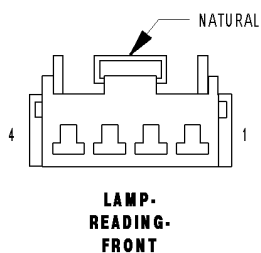
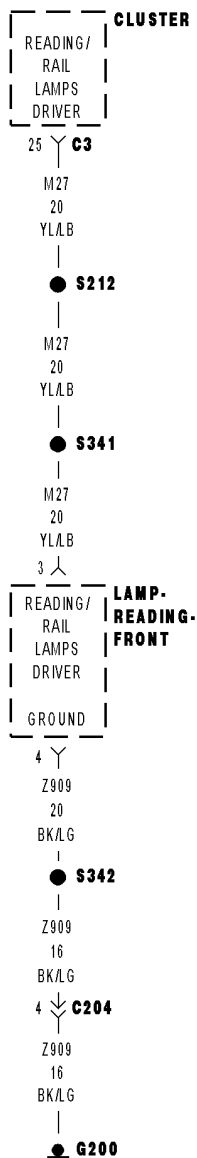
Measure the resistance of the (M27) Courtesy Lamp Control circuit.

**Is the resistance above 5.0 ohms?**

- No**     >> Repair the (M27) Courtesy Lamp Control circuit.  
             Perform BODY VERIFICATION TEST - VER 1.
- Yes**     >> Replace the Instrument Cluster in accordance with the service information.  
             Perform BODY VERIFICATION TEST - VER 1.



## B161F-READING LAMP CONTROL CIRCUIT LOW



**B161F-READING LAMP CONTROL CIRCUIT LOW (CONTINUED)**

For the Interior Lighting circuit diagram (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
M27 READING/RAIL LAMP DRIVER READING/MAP LAMP ASSEMBLY INSTRUMENT CLUSTER

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test**

**1. INTERMITTENT CONDITION**

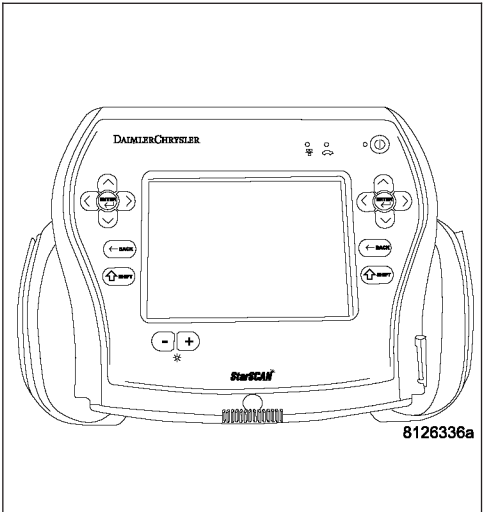
- Turn the ignition on.
- With the Scan Tool, clear all CCN DTC's.
- Turn the Reading Lamps on.
- With the Scan Tool read the DTC information.

**Does the Scan Tool read: B161F-READING LAMP CONTROL CIRCUIT LOW?**

- Yes**

>> Go To 2
- No**

>> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST-VER1.



**B161F-READING LAMP CONTROL CIRCUIT LOW (CONTINUED)****2. M27 READING/RAIL LAMPS DRIVER**

Turn the ignition off.

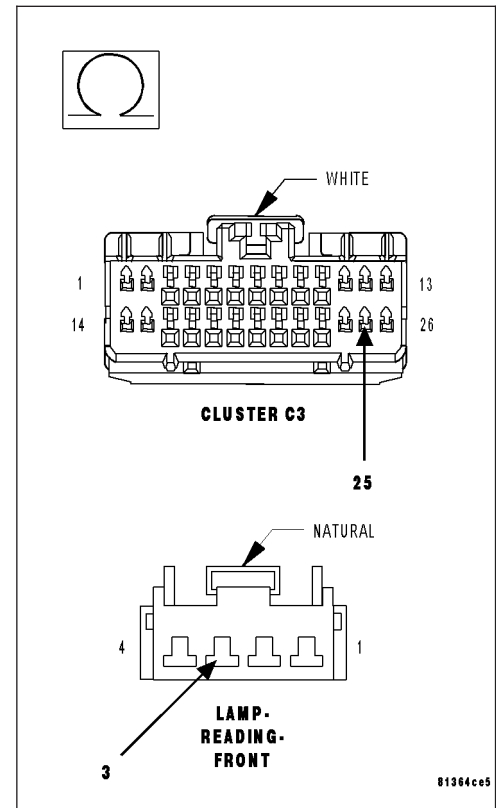
Disconnect the CCN C3 harness connector.

Measure the resistance between ground and the (M27) Reading/Rail Lamps Driver circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (M27) Reading/Rail Lamps Driver circuit for a short to ground.  
Perform the BODY VERIFICATION TEST-VER1.

**3. INSTRUMENT CLUSTER**

Turn the ignition off.

Disconnect the CCN C3 harness connector.

Disconnect the Reading/Map Lamp connector.

Measure the resistance between ground and the (M27) Reading/Rail Lamps Driver circuit.

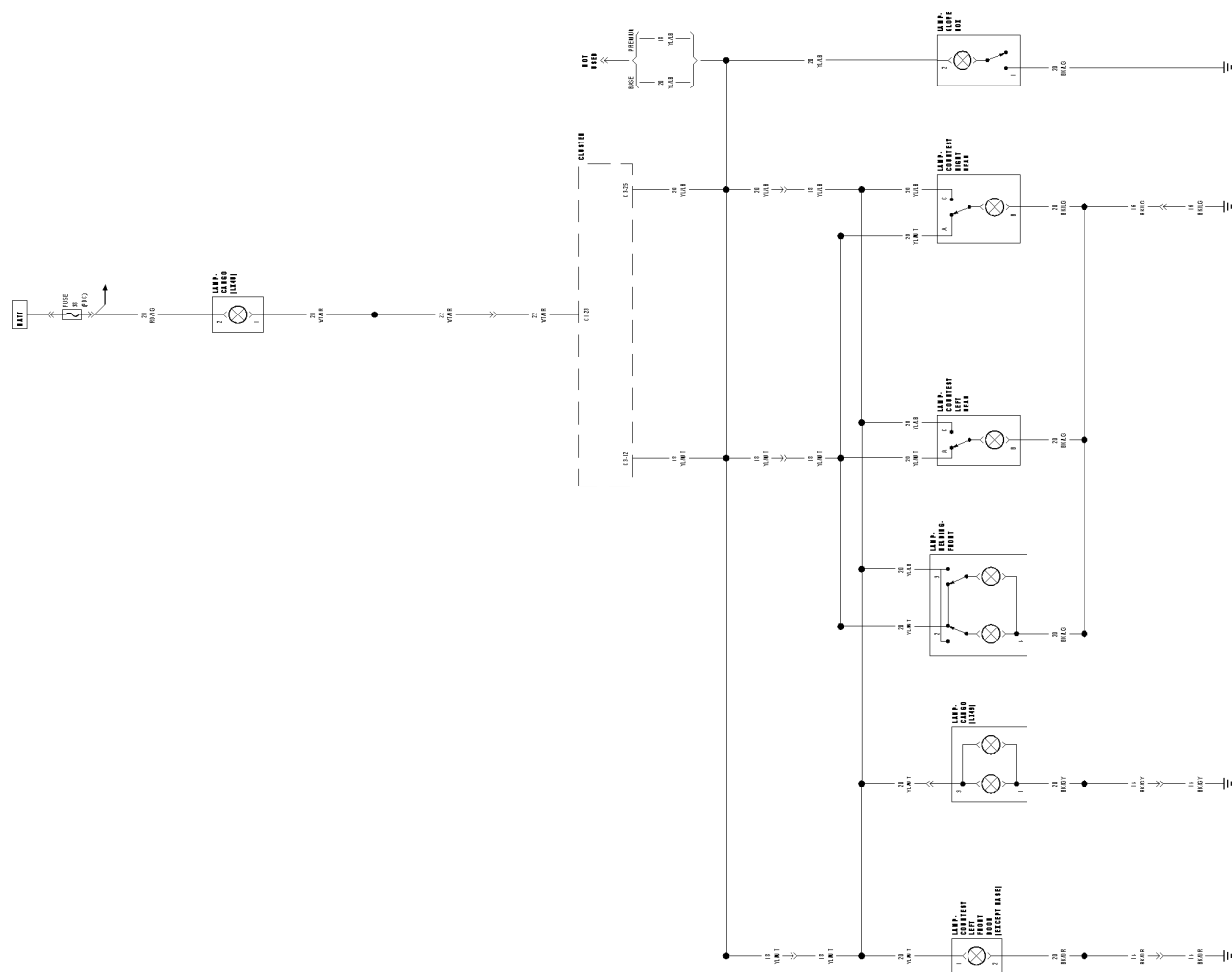
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Instrument Cluster in accordance with the service information.  
Perform the BODY VERIFICATION TEST-VER1.

**No** >> Replace the Reading/Map Lamp Assembly in accordance with the service information.  
Perform the BODY VERIFICATION TEST-VER1.



81341dc9



## INTERIOR LIGHTING MAIN SCHEMATIC

## LAMPS/LIGHTING - INTERIOR - SERVICE INFORMATION

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## LAMPS/LIGHTING - INTERIOR - SERVICE INFORMATION

## SPECIFICATIONS

## INTERIOR LAMPS

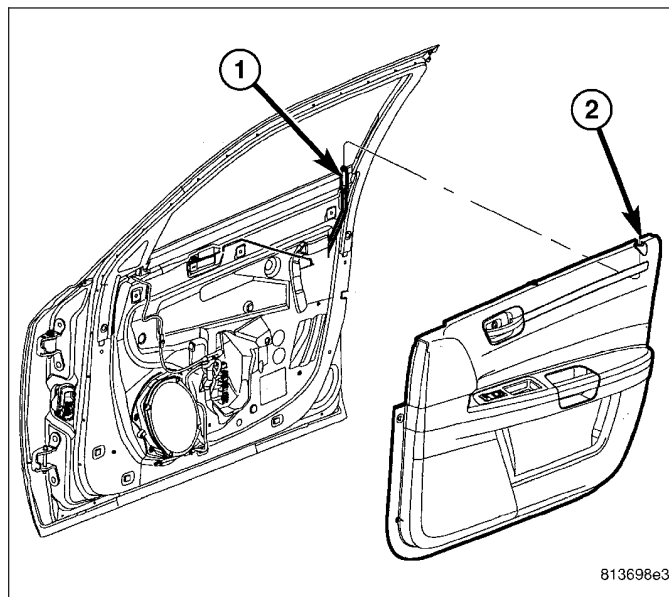
## BULB APPLICATION TABLE

LAMP	BULB
<b>CHRYSLER</b>	
Door Courtesy	562
Glove Box	194
Overhead Console	578
Rear Courtesy	W5W
Shift Indicator	JKLE14140
Trunk	579
Visor Vanity	A6220
<b>DODGE</b>	
Door Courtesy	562
Glove Box	194
Liftgate	578
Overhead Console	578
Rear Courtesy	W5W
Shift Indicator	JKLE14140
Visor Vanity	A6220

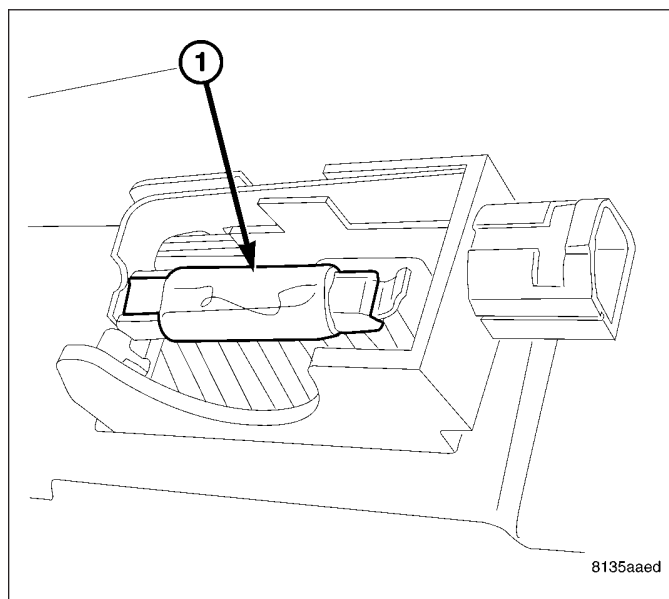
## DOOR COURTESY LAMP

### REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the front door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).

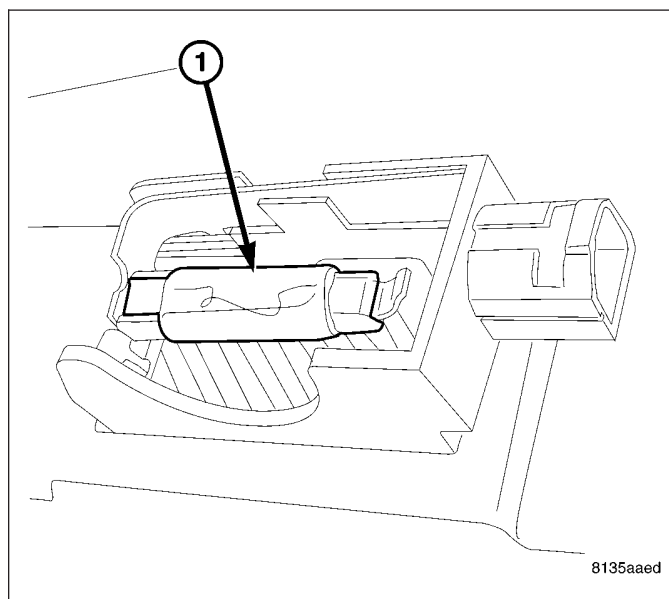


3. With the trim panel on bench, gently pull the door courtesy lamp (1) out of courtesy lamp unit.

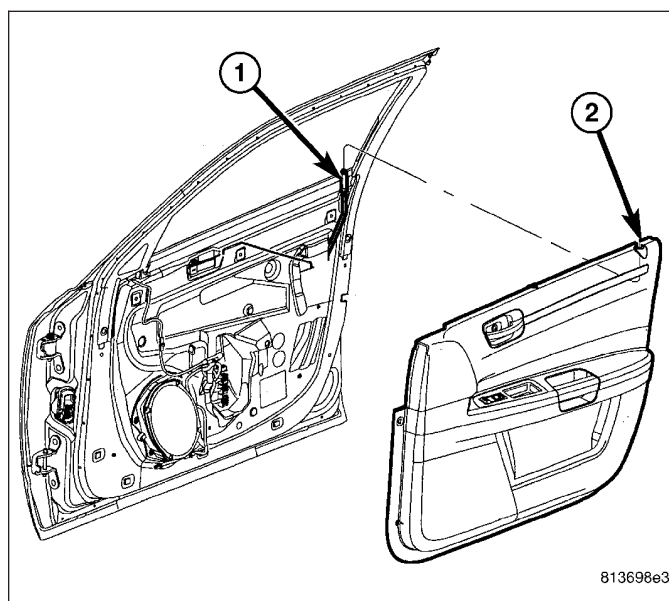


## INSTALLATION

1. Place the door courtesy lamp (1) into the courtesy lamp unit.



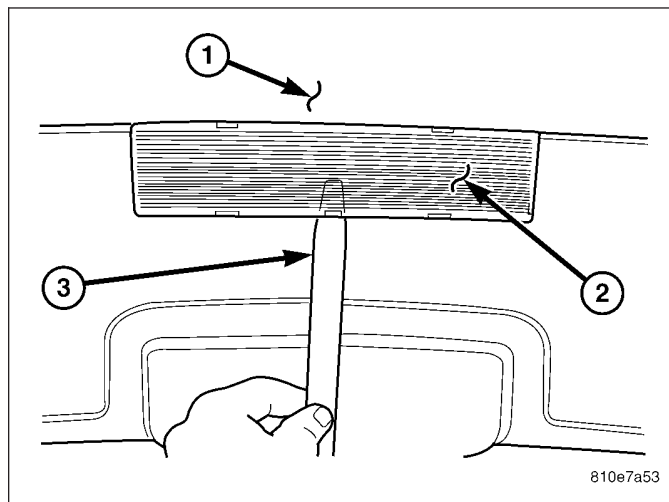
2. Install the front door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).
3. Connect the battery negative cable.



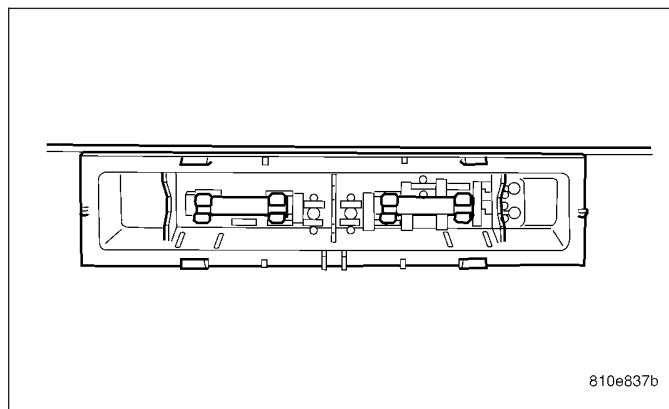
## LIFTGATE LAMP

### REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Open liftgate.
3. Using a trim stick (3) (special tool #C-4755) or equivalent, gently pry out on liftgate lamp lens (2) and remove from trim panel (1).

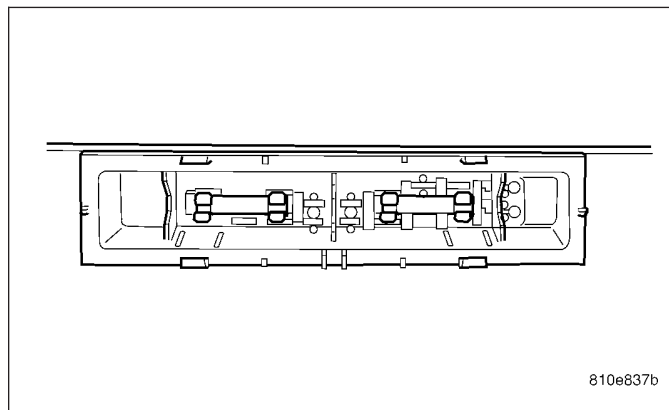


4. Gently pry up on the edge of the affected lamp and pull out of the liftgate lamp unit to remove.

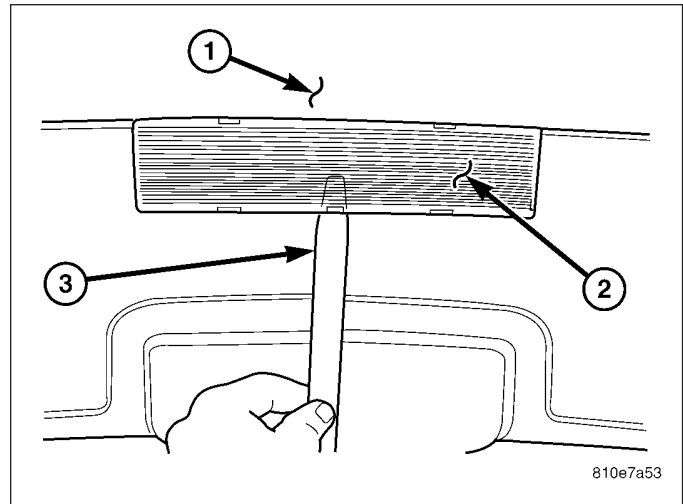


### INSTALLATION

1. Place new lamp over retaining clips in liftgate lamp unit retaining clips and firmly snap into place.



2. Place the liftgate lamp lens (2) over the retaining pins making sure that they are lined up and then firmly snap into place.
3. Connect the battery negative cable.

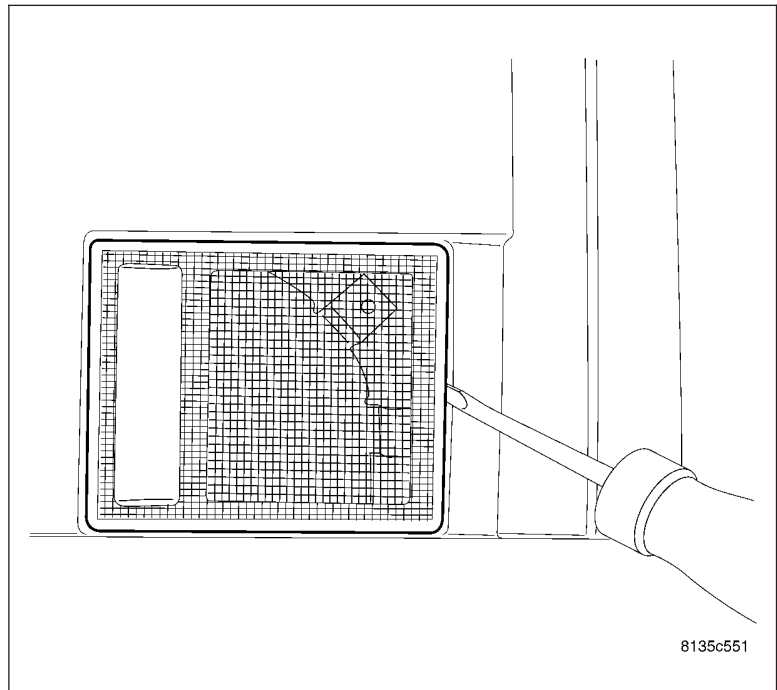


## READING LAMP

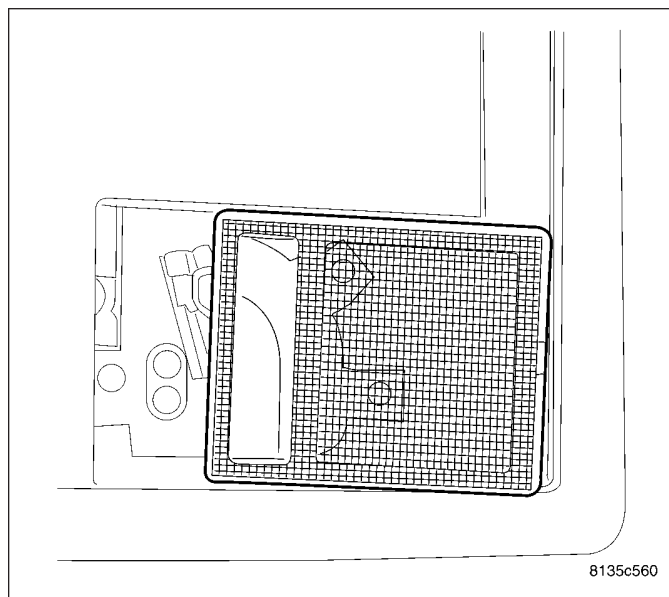
### REMOVAL

#### OVERHEAD CONSOLE

1. Disconnect and isolate the battery negative cable.
2. Using a trim stick (special tool #C-4755) or equivalent, gently pry out the top (toward windshield) side of the reading lamp lens.

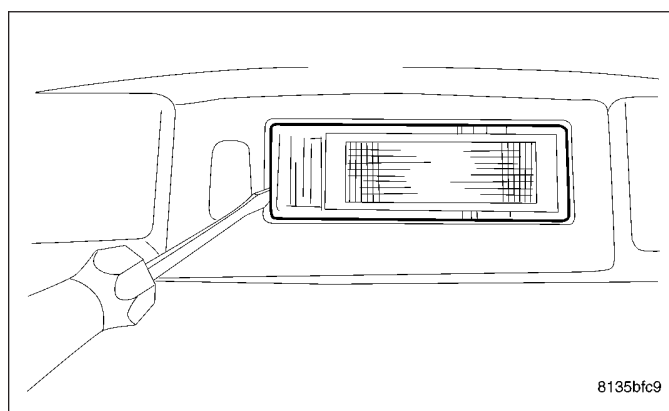


3. Lift the top of the lens up and slide forward (toward windshield) until the tab is released from the overhead console.
4. Gently pull the lamp out of the overhead console.

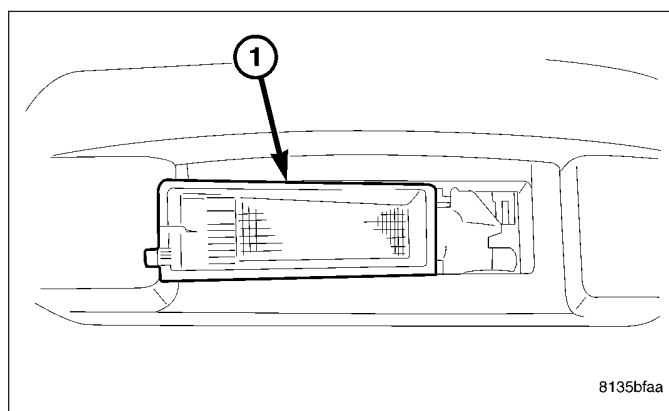


## REAR

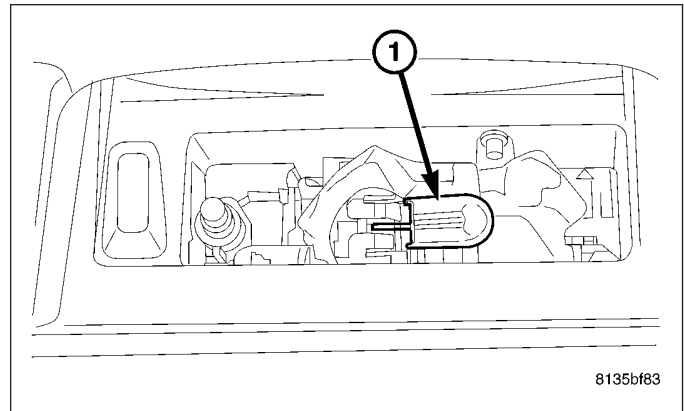
1. Disconnect and isolate the battery negative cable.
2. Using a trim stick (special tool #C-4755) or equivalent, gently pry out the edge of the reading lamp lens. There will be a small slot on the side of the lens that should be used. Looking at the unit it will be on the left side of the lens.



3. Lift out on the lens and slide the lens to the left so that the retaining tabs are exposed and the lens can be then removed.



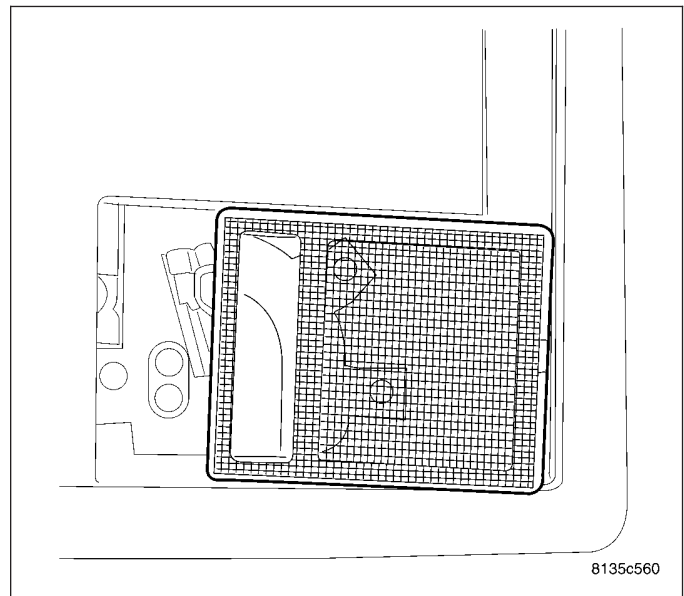
4. Grasp lamp with fingers and firmly pull lamp (1) from unit.



## INSTALLATION

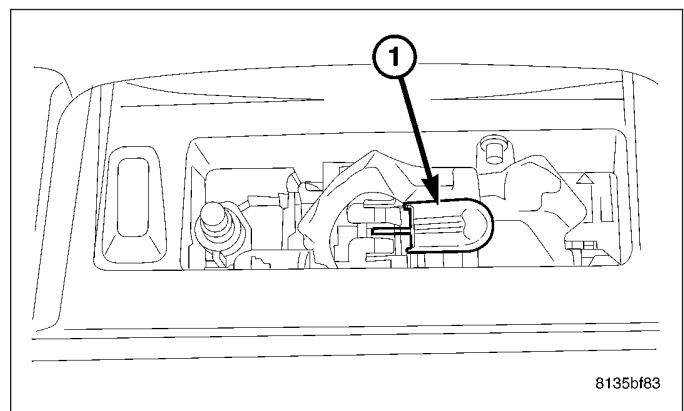
### OVERHEAD CONSOLE

1. Firmly push the lamp into the overhead console.
2. Place the tab inside the rear edge of the overhead console. Carefully push down on the front of the lens making sure to snap in both sides of the lens.
3. Connect the battery negative cable.



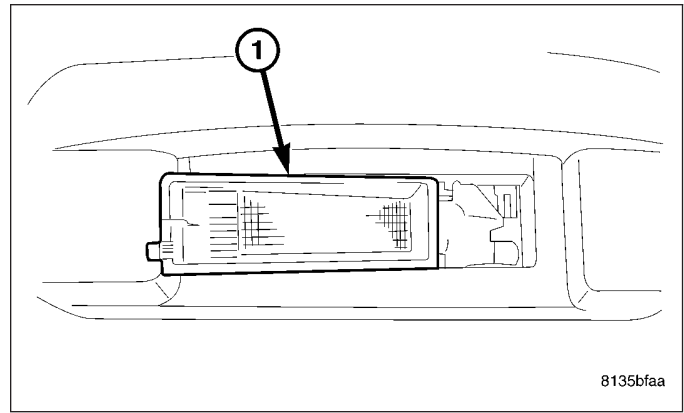
### REAR

1. Firmly push the lamp (1) into the reading lamp unit.





2. Looking at the lamp unit place the right side in first and make sure the tabs are under the lip of the unit. Slide right and then firmly snap lens (1) into place.
3. Connect the battery negative cable.



# MESSAGE SYSTEMS

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## OVERHEAD CONSOLE - ELECTRICAL DIAGNOSTICS

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## **OVERHEAD CONSOLE - ELECTRICAL DIAGNOSTICS**

### **DIAGNOSIS AND TESTING**

**B1A32-UNIVERSAL GARAGE DOOR SWITCH 1 STUCK**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Electronic Overhead Module detects the UGDO switch in the closed position for more than 2 minutes.

Possible Causes
ELECTRONIC OVERHEAD MODULE

**Diagnostic Test****1. REPLACE THE ELECTRONIC OVERHEAD MODULE**

When this code is set, the Electronic Overhead Module must be replaced.

**Repair**

Replace the Electronic Overhead Module in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

---

**B1A33-UNIVERSAL GARAGE DOOR SWITCH 2 STUCK**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Electronic Overhead Module detects the UGDO switch in the closed position for more than 2 minutes.

Possible Causes
ELECTRONIC OVERHEAD MODULE

**Diagnostic Test**

**1. REPLACE THE ELECTRONIC OVERHEAD MODULE**

When this code is set, the Electronic Overhead Module must be replaced.

**Repair**

Replace the Electronic Overhead Module in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**B1A34-UNIVERSAL GARAGE DOOR SWITCH 3 STUCK**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Electronic Overhead Module detects the UGDO switch in the closed position for more than 2 minutes.

Possible Causes
ELECTRONIC OVERHEAD MODULE

**Diagnostic Test****1. REPLACE THE ELECTRONIC OVERHEAD MODULE**

When this code is set, the Electronic Overhead Module must be replaced.

**Repair**

Replace the Electronic Overhead Module in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

---

B2217 - EVIC/EOM/CMTC INTERNAL

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, internal self test routine running.
- **Set Condition:**  
The Electronic Overhead Module fails one of seven internal tests.

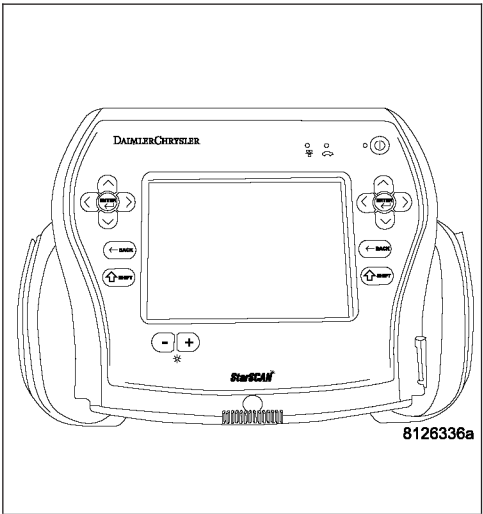
Possible Causes
ELECTRONIC OVERHEAD MODULE

Diagnostic Test

1. VERIFY OPERATION OF THE ELECTRONIC OVERHEAD MODULE

Turn the ignition on.  
With the scan tool, erase Electronic Overhead Module DTCs.  
With the scan tool, activate the Electronic Overhead Module self test.  
Wait for self test to complete.  
With the scan tool, read Electronic Overhead Module DTCs.

- Does the scan tool display: B2217–EVIC/EOM/CMTC INTERNAL?**
- YES**    >> Replace the Electronic Overhead Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- NO**      >> Test complete.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B222D - ECU UNABLE TO CONFIGURE / CONFIGURATION NOT LEARNED**

For the Electronic Overhead Module circuit diagram (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Electronic Overhead Module does not receive the configuration information from the Front Control Module.

POSSIBLE CAUSES
NO COMMUNICATION WITH FRONT CONTROL MODULE
ACTIVE FCM DTCs

**Diagnostic Test****1. CHECK FOR AN ACTIVE DTC**

Turn the ignition on.

With the scan tool, record and erase any Electronic Overhead Module DTCs.

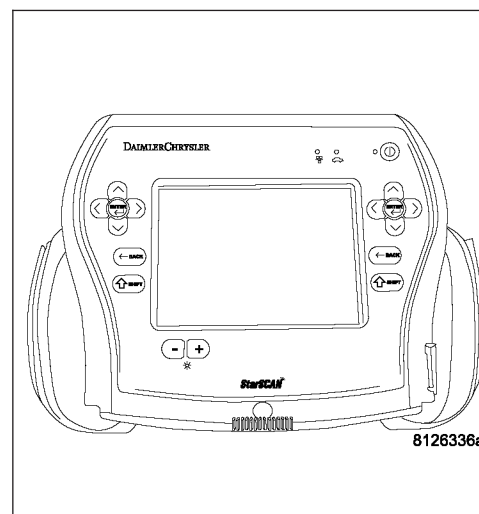
Turn the ignition off, wait 30 seconds then turn the ignition on.

With the scan tool, read DTCs.

**Is the DTC active?**

**Yes** >> Go To 2

**No** >> The condition that caused this code to set is not present at this time. Using the wiring diagram as a guide, inspect the wiring and connectors for an intermittent condition. Operate the system several times and recheck for active DTCs. Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

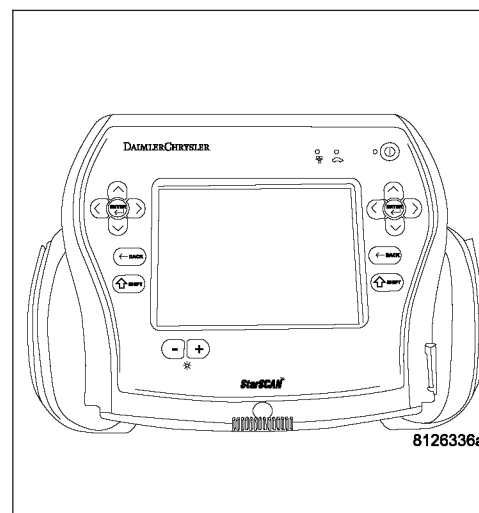
**2. CHECK COMMUNICATION TO THE FRONT CONTROL MODULE**

With the scan tool, check to see if the Front Control Module is active on the bus.

**Is the scan tool able to communicate with the Front Control Module?**

**Yes** >> Replace the Electronic Overhead Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Refer to the symptom list for problems related to Communication. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).





**B2331–VEHICLE NEEDS DEGAUSSED**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Vehicle speed greater than 10 mph.
- **Set Condition:**  
The magnetic field around the vehicle is greater than 2.4 gauss.

**Diagnostic Test****1. PERFORM THE VEHICLE DEMAGNETIZING PROCEDURE**

**Note:** A blank compass display indicates that vehicle degaussing is required.

**Note:** After demagnetizing, the vehicle will enter Auto Fast-Cal when the ignition is turned on.

**Note:** Ensure that the correct compass variance is stored in the compass memory. See “Setting Compass Variance” in the Service Information.

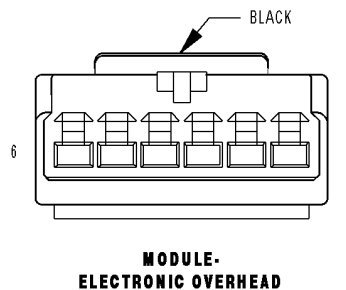
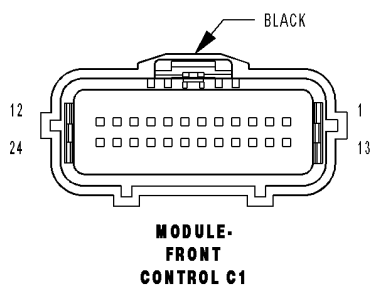
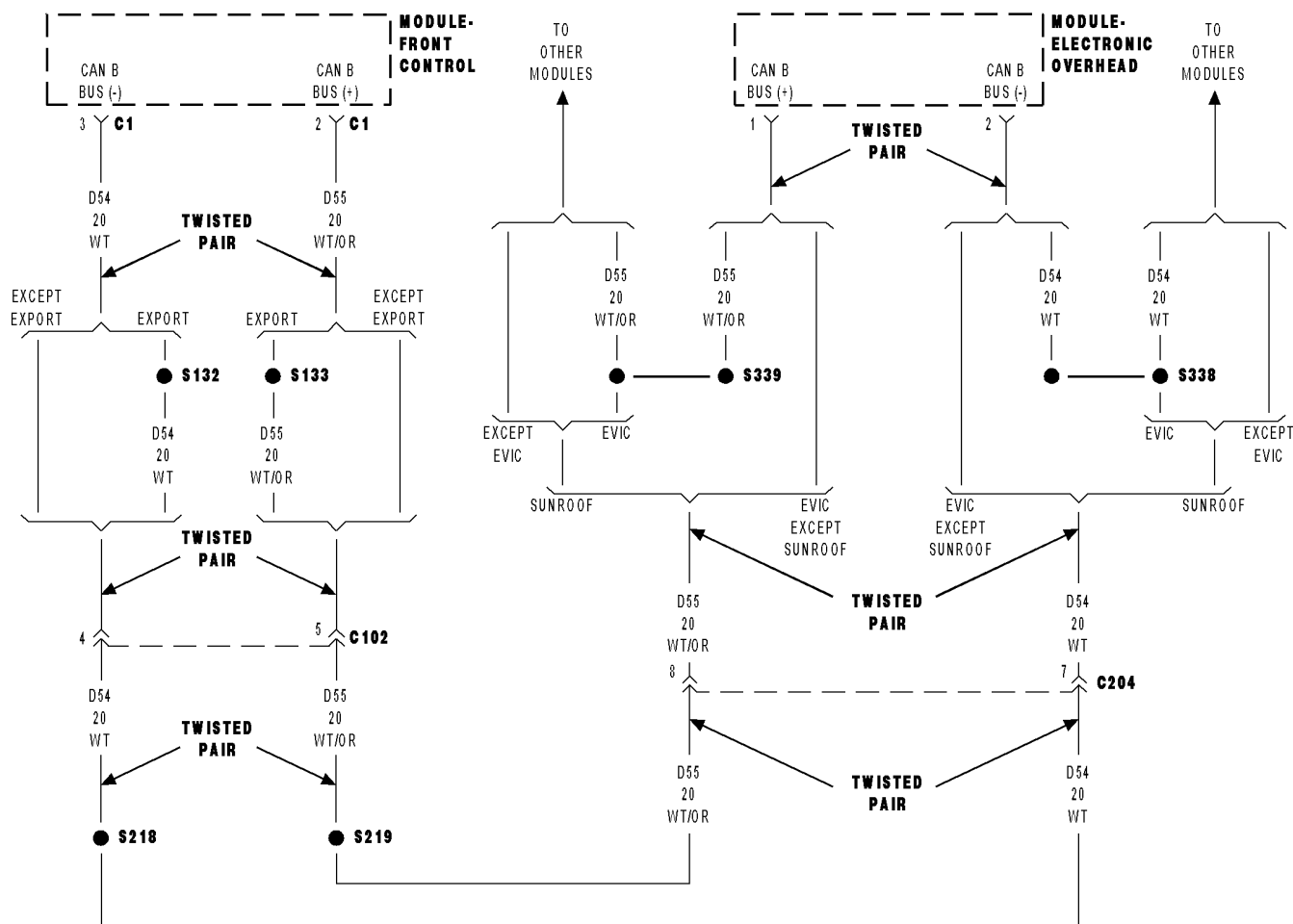
**View repair.**

**Repair**

Refer to the Service Information and perform the Compass Demagnetizing Standard Procedure.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

---

# U0019-CAN B BUS



**U0019–CAN B BUS (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Continuously.
- **Set Condition:**  
If the Can B Bus (+) or B Bus (–) circuit is open, shorted to voltage, or shorted to ground.

**Possible Causes**

CAN B BUS DTCs IN FRONT CONTROL MODULE  
(D55) CAN B BUS (+) CIRCUIT OPEN  
(D54) CAN B BUS (–) CIRCUIT OPEN  
ELECTRONIC OVERHEAD MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC U0019–CAN B BUS**

Turn the ignition on.

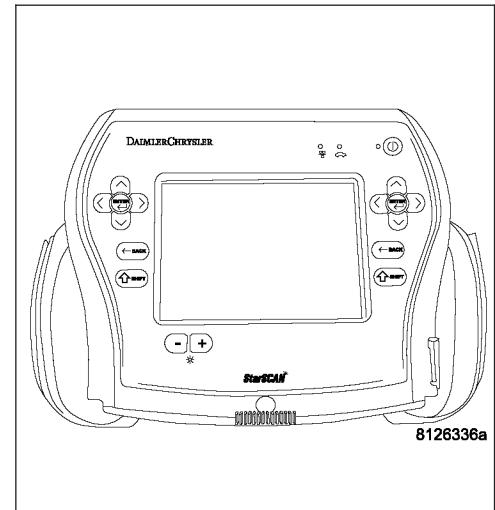
With the scan tool, record and erase any Electronic Overhead Module DTCs.

Turn the ignition off, wait 30 seconds then turn the ignition on.

With the scan tool, read DTCs.

**Is DTC U0019–CAN B BUS active?**

- Yes** >> Go To 2
- No** >> The condition that caused this code to set is not present at this time. Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**2. CHECK FOR ACTIVE CAN B BUS RELATED DTCs IN THE FRONT CONTROL MODULE**

With the scan tool, read Front Control Module DTCs

**Does the scan tool display any active CAN B BUS related DTCs?**

- Yes** >> Diagnose and repair the DTC(s). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)
- No** >> Go to 3

**U0019-CAN B BUS (CONTINUED)****3. CHECK (D55) CAN B BUS (+) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the Electronic Overhead Module harness connector.

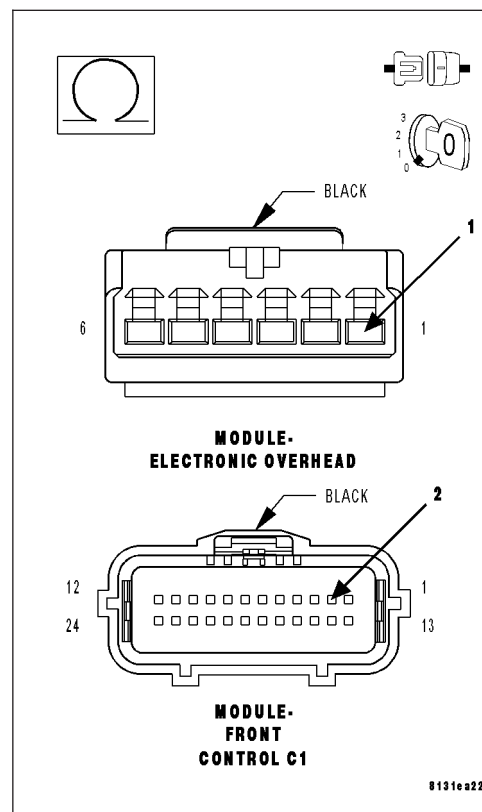
Disconnect the Front Control Module C1 harness connector.

Measure the resistance of the (D55) Can B Bus (+) circuit between the Front Control Module C1 harness connector and the Electronic Overhead Module harness connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the Can B Bus (+) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

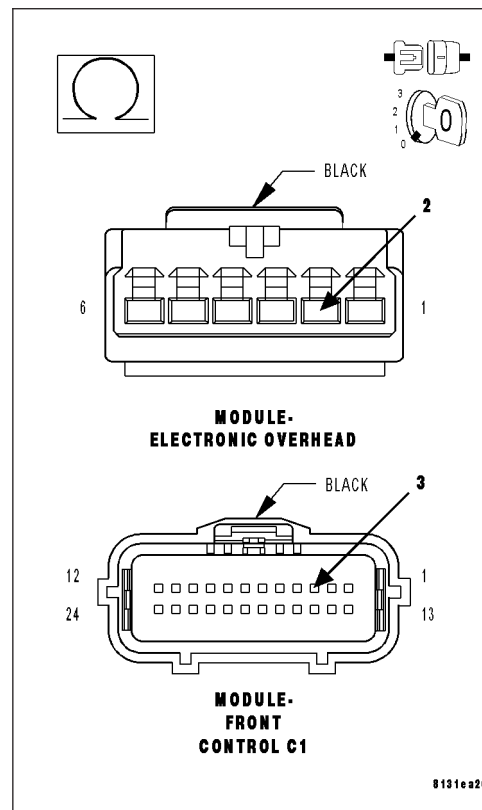
**4. CHECK THE (D54) CAN B BUS (-) CIRCUIT FOR AN OPEN**

Measure the resistance of the (D54) Can B Bus (-) circuit between the Front Control Module C1 harness connector and the Electronic Overhead Module harness connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Replace the Electronic Overhead Module in accordance with the service information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Repair the Can B Bus (-) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



## **U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0155-LOST COMMUNICATION WITH CLUSTER/CCN**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0159-LOST COMMUNICATION WITH PARKING ASSIST CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0167-LOST COMMUNICATION WITH INTRUSION TRANSCEIVER CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0169-LOST COMMUNICATION WITH SUNROOF CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0184-LOST COMMUNICATION WITH RADIO**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0195-LOST COMMUNICATION WITH SDARS**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0196-LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0212-LOST COMMUNICATION WITH SCCM-CAN-B**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0231-LOST COMMUNICATION WITH RAIN SENSING MODULE**

For a complete wiring diagram **Refer to Section 8W.**

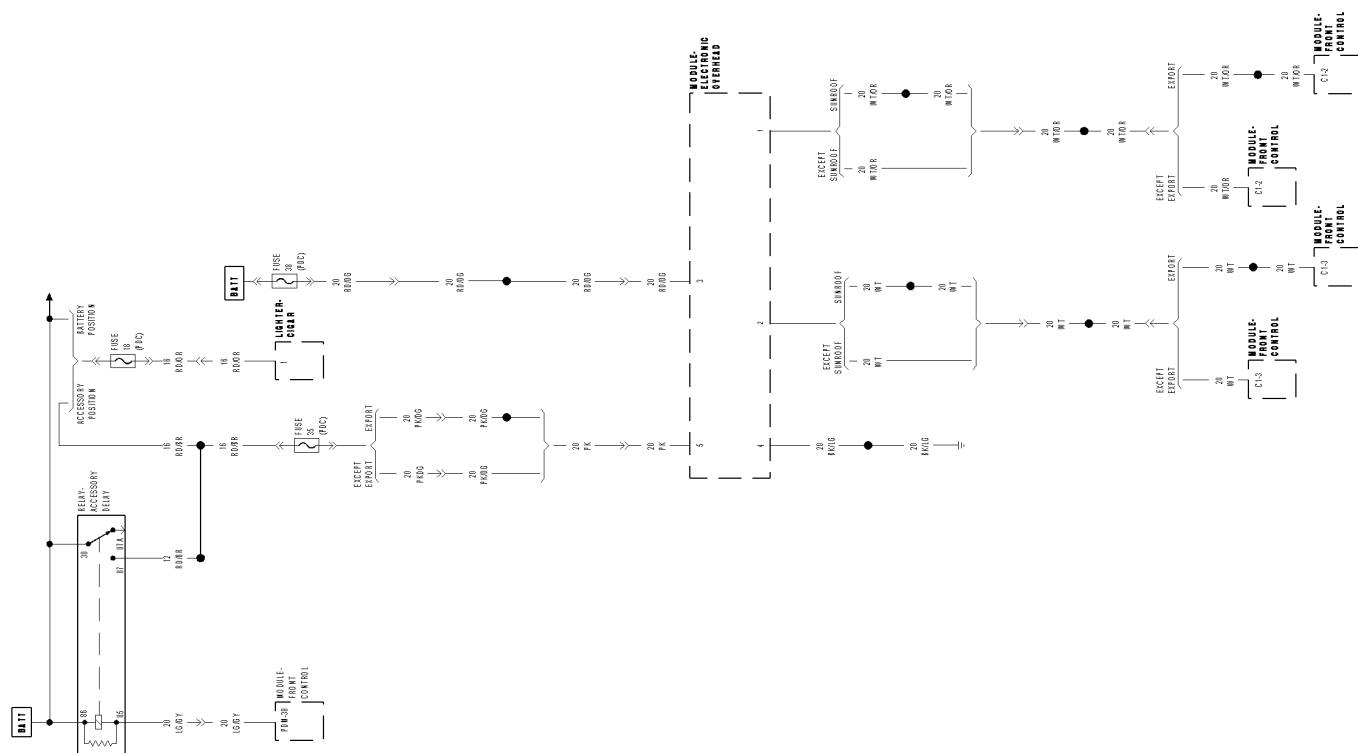
**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0241-LOST COMMUNICATION WITH AUTO HIGHBEAM HEADLAMP CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

# SCHEMATICS AND DIAGRAMS



EOM SYSTEM SCHEMATIC



## OVERHEAD CONSOLE - SERVICE INFORMATION

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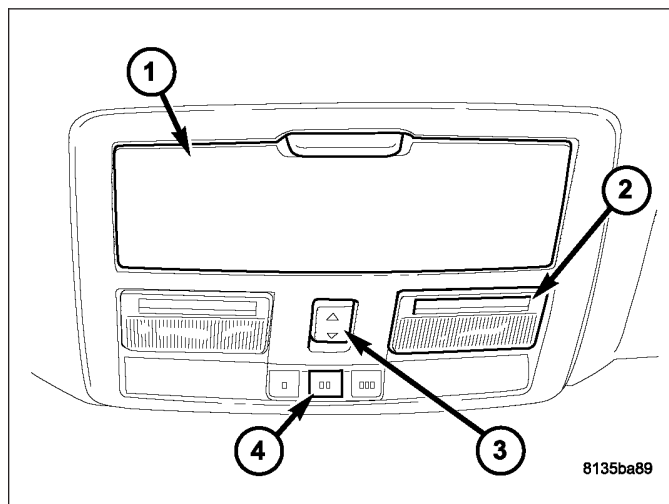
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## OVERHEAD CONSOLE - SERVICE INFORMATION

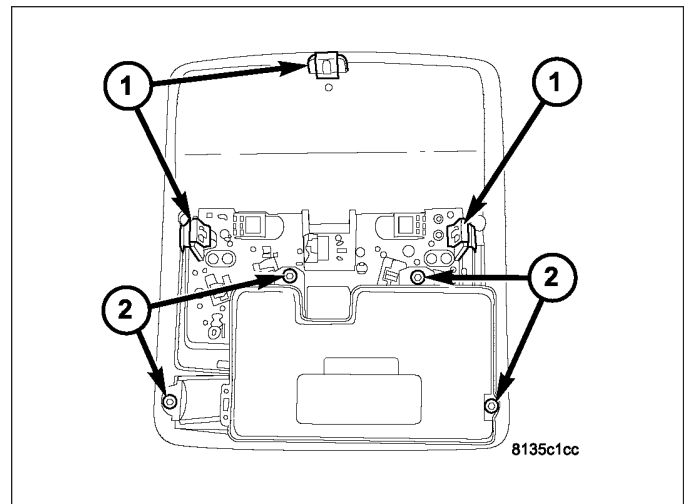
## DESCRIPTION

An overhead console is standard on this vehicle and includes the following components:

- Overhead storage compartment (1)
- Front map/reading lamps (2)
- Power sunroof switch (3) - if equipped
- Universal transmitter (4)
- Electronic Overhead Module

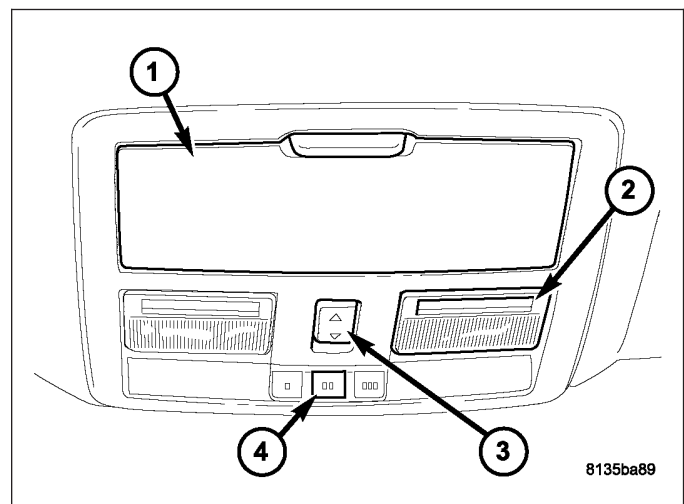


The overhead console assembly is mounted by three snap clips (1) securing it to a molded plastic retainer bracket located above the headliner. The Electronic Overhead Module is secured to the overhead console with screws (2).

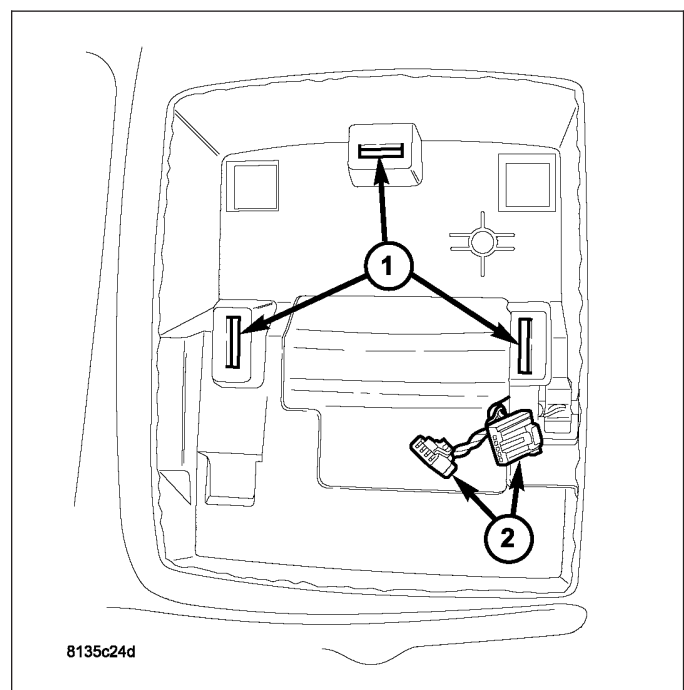


## REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Pull downward on the sides of the overhead console housing firmly and evenly to disengage the snap clips from the overhead console bracket.

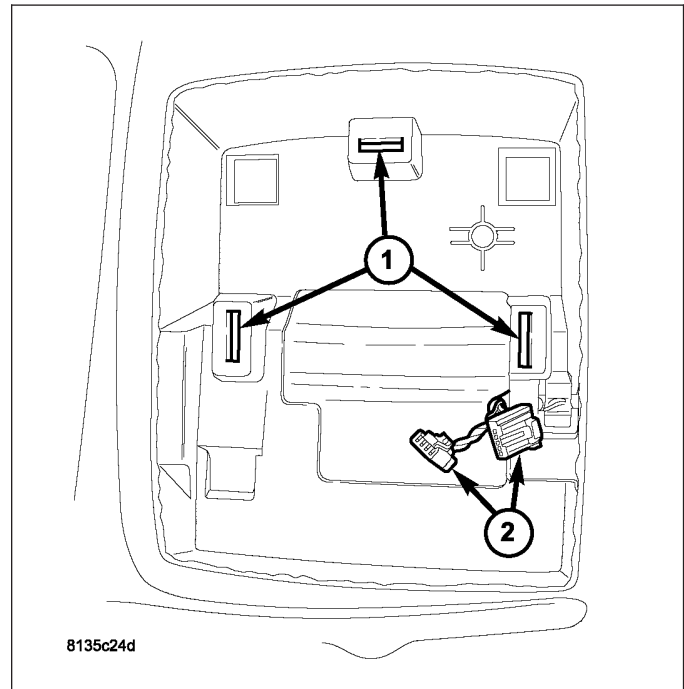


3. Lower the overhead console from the headliner far enough to access the wire harness connectors (2).
4. Disconnect the roof wire harness connectors (2) from the overhead console wire harness connector.
5. Remove the overhead console from the headliner.



## INSTALLATION

1. Position the overhead console near the mounting location on the headliner.
2. Reconnect the roof wire harness connectors (2) to the overhead console.
3. Align the snap clips on the overhead console housing with their receptacles (1) in the overhead console bracket.
4. Push upward firmly and evenly on the sides of the overhead console housing over the snap clip locations until the snap clip is fully engaged with its receptacle in the overhead console bracket.
5. Reconnect the battery negative cable.



## ELECTRONIC VEHICLE INFORMATION CENTER

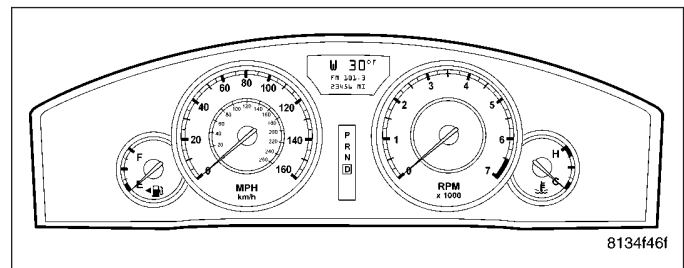
### DESCRIPTION

The Electronic Vehicle Information Center (EVIC) features a driver-interactive display. The display is located in the upper part of the instrument cluster between the speedometer and tachometer. This system conveniently allows the driver to select a variety of useful information by pressing the switches mounted on the steering wheel. The EVIC displays information related to the following:

- System Status
- Vehicle information warning message displays
- Tire Pressure Monitor System — If Equipped
- Personal Settings (customer programmable features)
- Compass display
- Outside temperature display
- Trip computer functions
- UConnect™ hands-free communication system displays — If Equipped
- Navigation system screens — If Equipped
- Audio mode display

The EVIC system is comprised of several different components. Those components are:

- Instrument Cluster
- Steering Wheel Switches
- Ambient Temperature Sensor
- Electronic Overhead Module
- Controller Area Network (CAN) Data Bus
- Local Interface Network (LIN) Data Bus



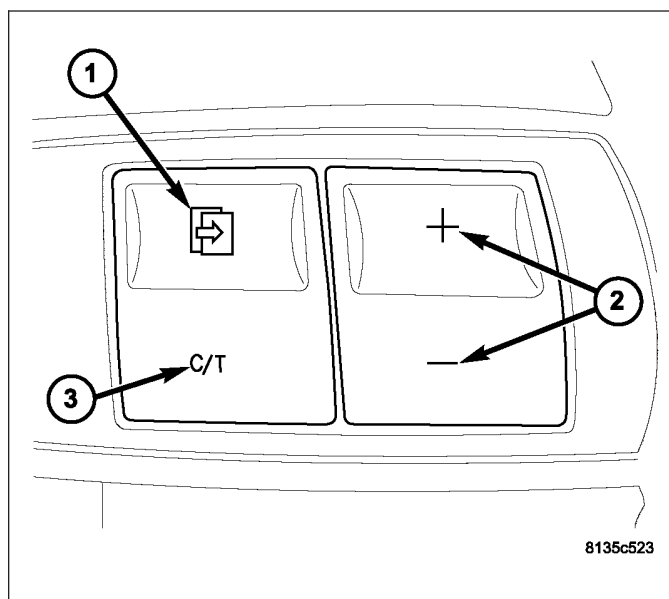
The EVIC display is part of the Instrument Cluster assembly and is not serviced as a separate component. If the display is inoperative the complete Instrument Cluster assembly must be replaced, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL). If the steering wheel switches are inoperative and require replacement, (Refer to 8 - ELECTRICAL/AUDIO/REMOTE SWITCHES - REMOVAL) for the appropriate procedure. If the compass position sensor (Electronic Overhead Module) is inoperative and requires replacement, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/UNIVERSAL TRANSMITTER - REMOVAL) for the appropriate procedure.

## OPERATION

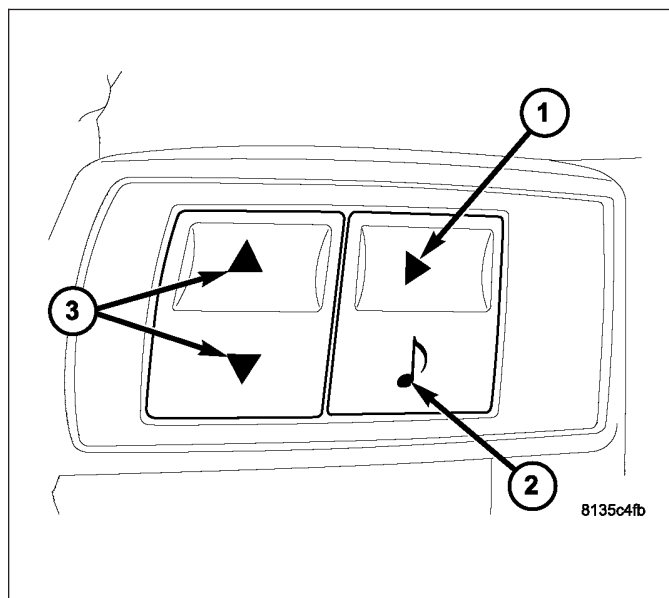
The Electronic Vehicle Information Center (EVIC) uses both non-switched and ignition switched sources of battery current so that some of its features remain operational at any time, while others may only operate with the ignition switch in the On position. When the ignition switch is turned to the On position, the EVIC display will return to the last function being displayed before the ignition was turned to the Off position.

The EVIC system is comprised of several different components that communicate over the Controller Area Network (CAN) and Local Interface Network (LIN) Data Buses. If the system is inoperative a scan tool and the appropriate diagnostic information must be used to diagnose the system.

The steering wheel switches are used to operate the different functions of the EVIC system. Pressing and releasing the MENU button (1) will change the mode displayed between Trip Functions, Navigation (If Equipped), System Status, Personal Settings, and Telephone (If Equipped). Pressing and releasing the C/T (compass/thermometer) button (3) will cause the EVIC to return to the compass/thermometer/trip computer display mode from any other mode.



The SCROLL buttons (3) are used to scroll through Trip Functions, Navigation (If Equipped), System Status Messages, and Personal Settings (Customer Programmable Features). Pressing and releasing the FUNCTION SELECT button (1) accepts a selected choice. The AUDIO MODE SELECT button (2) changes the mode of the radio from AM to FM to Tape to CD, or to Satellite (SAT) depending on which radio is in the vehicle. This button can also be used to return to a previous navigation menu selection.



## EVIC DISPLAY MODES

### SYSTEM STATUS MODE

Displays warnings and user interaction messages. Initial warnings will be displayed full-screen for three seconds, then override the odometer and show text warnings on the bottom line of the display. Critical text warnings will be displayed until the failure is corrected. Non-critical text warnings will be displayed for 60 seconds. The driver can scroll to view multiple messages by using the SCROLL buttons.

When the appropriate conditions exist, the EVIC displays the following messages:

- Turn Signal On (with a continuous warning chime)
- Left Front Turn Signal Lamp Out
- Left Rear Turn Signal Lamp Out
- Right Front Turn Signal Lamp Out
- Right Rear Turn Signal Lamp Out
- RKE Battery Low (with a single chime)
- Memory #1/#2 Profile Set
- Memory #1/#2 Profile Recall
- Memory System Disabled – Vehicle Not In Park (with a single chime)
- Memory System Disabled – Seat Belt Buckled (with a single chime)
- Personal Settings Not Available – Vehicle Not in Park
- Left/Right Front Door Ajar (one or more, with a single chime if speed is above 1 mph)
- Left/Right Rear Door Ajar (one or more, with a single chime if speed is above 1 mph)
- Door (S) Ajar (with a single chime if vehicle is in motion)
- Trunk Ajar (with a single chime)
- Low Washer Fluid (with a single chime)
- Adjustable Pedals Disabled – Cruise Engaged
- Adjustable Pedals Disabled – Vehicle In Reverse
- Channel 1, 2, OR 3 Transmit
- Channel 1, 2, OR 3 Training
- Channel 1, 2, OR 3 Trained
- Clearing Channels
- Channels Cleared
- Channels Defaulted
- Did Not Train
- Left Front Tire Low Pressure
- Left Rear Tire Low Pressure
- Right Front Tire Low Pressure
- Right Rear Tire Low Pressure
- Check Tire Pressure Monitoring (TPM) System
- Service Park Assist System

### TRIP MODE

Provides a choice of units displayed in English or metric. The following information can be displayed at the top of the screen:

- Average Miles Per Gallon (MPG)
- Distance to empty (DTE)
- Trip A odometer
- Trip B odometer
- Elapsed time

The EVIC trip computer features several functions that can be reset. Pressing and releasing the FUNCTION SELECT button once will clear the resettable function currently being displayed. Reset will only occur if a resettable function is currently being displayed. To reset all resettable functions, press and release the FUNCTION SELECT

button a second time within 3 seconds of resetting the currently displayed function (>Reset ALL will be displayed during this 3 second window).

The odometer is displayed at the bottom of the screen. If warnings exist, they will replace the odometer in the display. The driver can scroll to view information in the EVIC by using the SCROLL buttons.

### **COMPASS, TEMPERATURE AND AUDIO MODE**

Compass heading and outside temperature are displayed at the top of the screen. On the lower half of the screen the audio mode is displayed along with the odometer. Eight-point compass headings are displayed (N, S, E, W, NE, NW, SE, SW) and up to 15 compass variance settings can be set and recalled. Outside temperature is displayed in °C (degrees Celsius) or °F (degrees Fahrenheit). Audio mode can display any one of 12 radio station preset frequencies, CD disc number, CD track number, tape, and one of 200 Satellite Radio Channels - if equipped.

### **TELEPHONE MODE - IF EQUIPPED**

Provides the following information and features for the optional hands-free communications system:

- Phone status: idle, voice mail, roaming, battery strength and signal strength in increments of 20 percent
- Call status: Incoming call, connecting, connected, air time in minutes and seconds, call ended, busy, call failed, roaming and no phone connection
- Caller ID phone number display

### **NAVIGATION MODE - IF EQUIPPED**

When the Navigation System is On, the steering wheel buttons can be used to select the Map or Menu display on the Navigation Unit. When the Menu display is active, the SCROLL buttons can be used to scroll through the list, the FUNCTION SELECT button can be used to select an item, and the AUDIO MODE SELECT button can be used to return to the previous menu. When the Map display is active, pressing the FUNCTION SELECT button will change the Navigation Unit Display to the Menu.

If Turn by Turn Navigation is enabled through Personal Settings, the Navigation System will provide turn by turn directions to the programmed destination in the EVIC display. The name of the approaching road is displayed at the top of the screen, followed by an arrow to show the direction of the turn and the remaining distance to the turn counted down.

### **PERSONAL SETTINGS MODE (CUSTOMER PROGRAMMABLE FEATURES)**

Allows the driver to set and recall features when the transmission is in Park by pressing and releasing the MENU button until Personal Settings is displayed in the EVIC. The following personal settings can be set and recalled:

- Language: English, Spanish, German, Italian or French
- Display units in English or Metric
- Lock doors automatically at 15 mph (24 Kph), On or Off
- Unlock door automatically on exit, On or Off
- Remote Keyless Entry unlock driver door on first press or unlock all doors on first press
- Recall Memory with Remote Keyless Entry Unlock, On or Off
- Sound horn with Remote Keyless Entry Lock, On or Off
- Delay turning headlamps off for 0, 30, 60 or 90 seconds
- Headlamps on with wipers, On or Off
- Rain Sensing Intermittent Wipers, On or Off
- Automatically move seat back on exit, On or Off
- Tilt mirrors down and in when transmission is shifted to Reverse, On or Off
- Delay Power off to accessories until exit off, 45-seconds maximum, 5-minute maximum, 10-minute maximum or 60-minute maximum
- Turn headlamps on with Remote Keyless Entry Lock, On or Off
- Turn headlamps on with Remote Keyless Entry Unlock, Off or 30 seconds
- Park Assist System, On or Off
- Confirmation of Voice Commands, On or Off
- Turn-by-Turn Navigation, On or Off

## DIAGNOSIS AND TESTING

### ELECTRONIC VEHICLE INFORMATION CENTER

The Electronic Vehicle Information Center (EVIC) data is obtained from several components on the Controller Area Network (CAN) Data Bus circuit. The EVIC will not function properly if the bus messages from any of these components is not receive. If no EVIC data is displayed, check the CAN Data Bus circuit communications, the Instrument Cluster functions and the Front Control Module (FCM).

The use of a scan tool and the proper diagnostic procedures information are recommended for further testing of the EVIC and the CAN Data Bus circuit. Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.

## STANDARD PROCEDURE

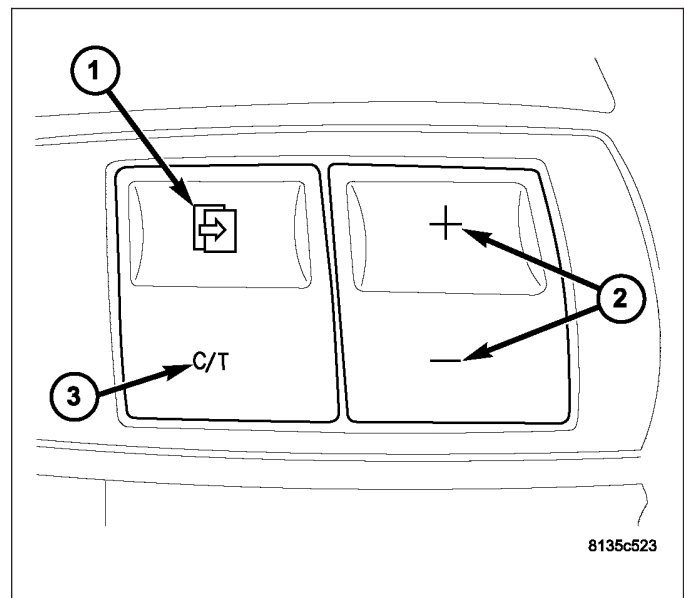
### COMPASS CALIBRATION

**CAUTION:** Do not place any external magnets, such as magnetic roof mount antennas, in the vicinity of the compass. Do not use magnetic tools when servicing the overhead console.

The electronic compass unit features a self-calibrating design, which simplifies the calibration procedure. This feature automatically updates the compass calibration while the vehicle is being driven. This allows the compass unit to compensate for small changes in the residual magnetism that the vehicle may acquire during normal use. If the compass readings appear to be erratic or the Electronic Vehicle Information Center (EVIC) displays "CAL", perform the following calibration procedure. Also, any time EVIC service replacement components are installed, they must be calibrated using this procedure. Do not attempt to calibrate the compass near large metal objects such as other vehicles, large buildings, or bridges; or, near overhead or underground power lines.

Calibrate the compass manually as follows:

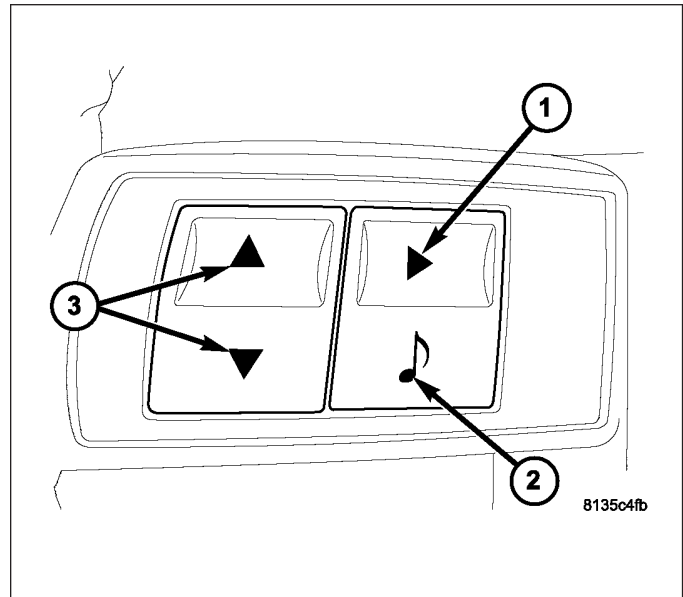
1. Turn the ignition switch to the On position.
2. Depress and hold the C/T push button (3) for approximately two seconds.



3. Use the SCROLL buttons (3) until MANUAL COMPASS CALIBRATION is highlighted.
4. Press and release the FUNCTION SELECT button (1) to start the calibration. The message "CAL" will appear in the EVIC display.
5. Drive the vehicle on a level surface, away from large metal objects and power lines, through one or two **complete** circles in not less than 16 seconds. The "CAL" message will disappear from the display to indicate that the compass is now calibrated.

**Note:** A blank compass display indicates that vehicle degaussing (demagnetizing) is necessary.

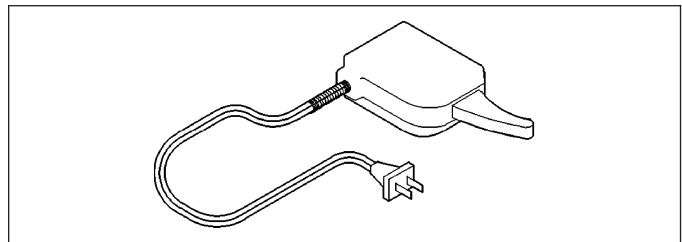
**Note:** If the "CAL" message remains in the display, either there is excessive magnetism near the compass, or the unit is inoperative. Repeat the calibration procedure at least one more time.



**Note:** If the wrong direction is still indicated in the compass display, the area selected for calibration may be too close to a strong magnetic field. Repeat the calibration procedure in another location.

## COMPASS DEMAGNETIZING

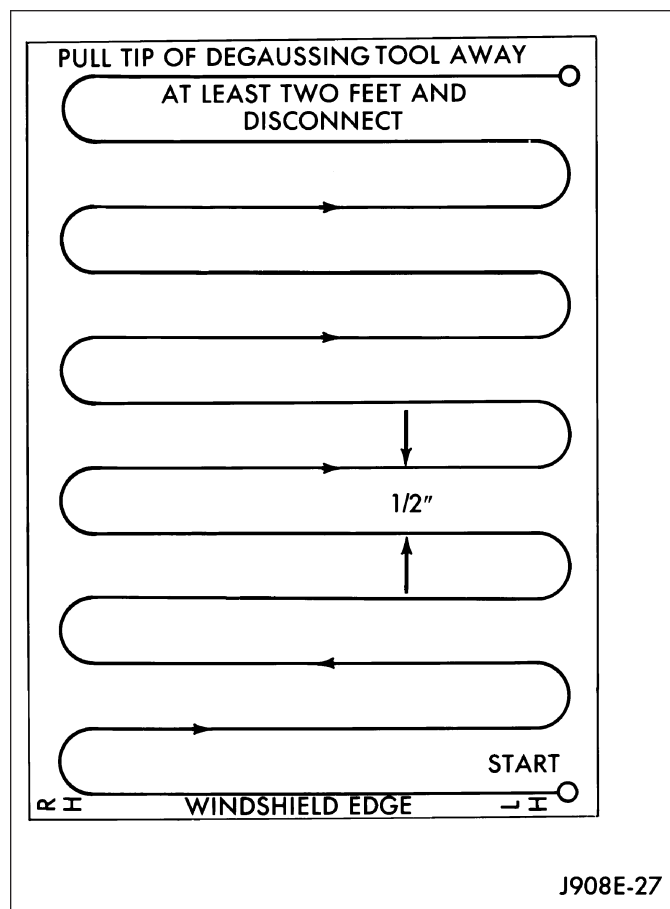
A degaussing tool (Special Tool 6029) is used to demagnetize, or degauss, the roof panel above the overhead console. Equivalent units must be rated as continuous duty for 110/115 volts and 60 Hz. They must also have a field strength of over 350 gauss at 7 millimeters (0.25 inch) beyond the tip of the probe.





To demagnetize the roof panel proceed as follows:

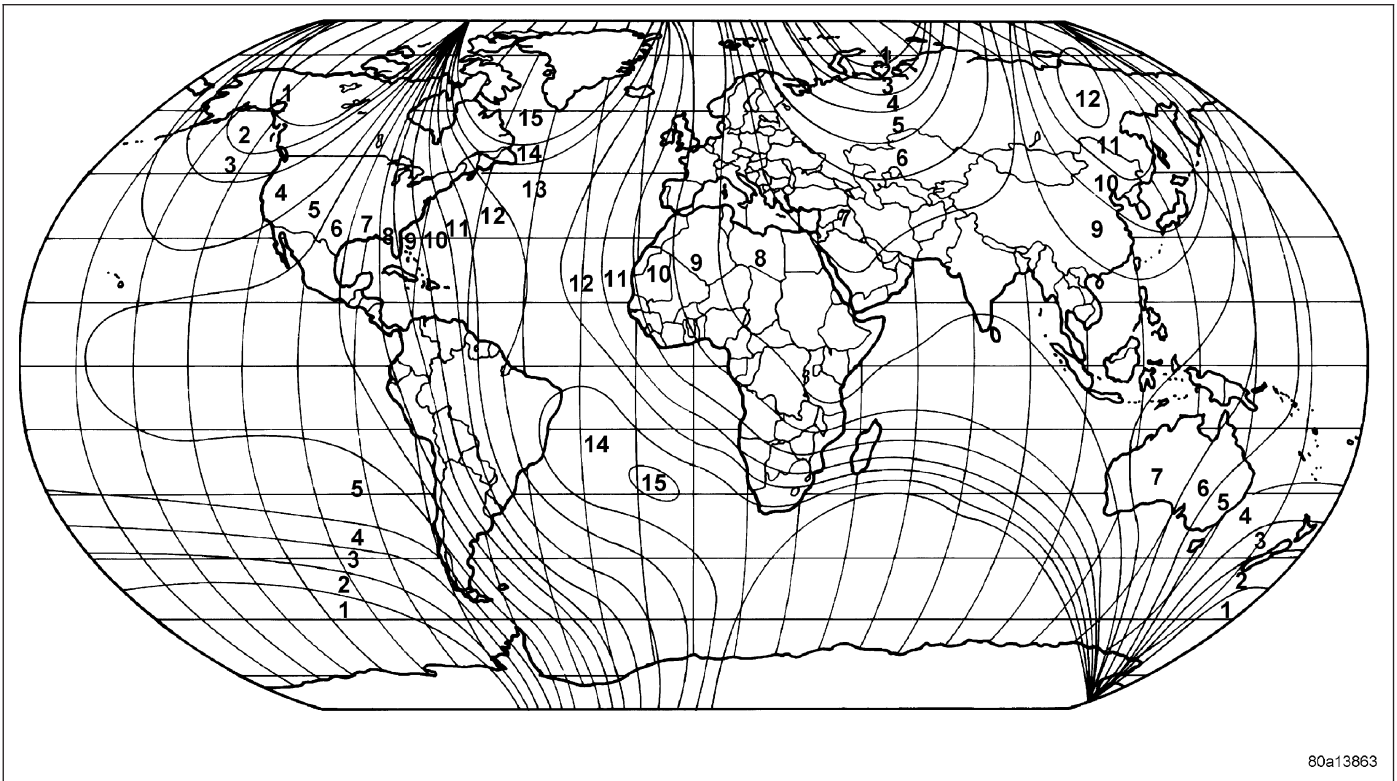
1. Be certain that the ignition switch is in the Off position, before you begin the demagnetizing procedure.
2. Place a piece of paper approximately 22 by 28 centimeters (8.5 by 11 inches), oriented on the vehicle lengthwise from front to rear, on the center line of the roof at the windshield header. The purpose of the paper is to protect the roof panel from scratches, and to define the area to be demagnetized.
3. Connect the degaussing tool to an electrical outlet, while keeping the tool at least 61 centimeters (2 feet) away from the compass unit.
4. Slowly approach the center line of the roof panel at the windshield header, with the degaussing tool connected.
5. Contact the roof panel with the plastic coated tip of the degaussing tool. Be sure that the template is in place to avoid scratching the roof panel. Using a slow, back-and-forth sweeping motion, and allowing 13 millimeters (0.50 inch) between passes, move the tool at least 11 centimeters (4 inches) to each side of the roof center line, and 28 centimeters (11 inches) back from the windshield header.
6. With the degaussing tool still energized, slowly back it away from the roof panel. When the tip of the tool is at least 61 centimeters (2 feet) from the roof panel, disconnect the tool.
7. Calibrate the compass, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - STANDARD PROCEDURE - COMPASS CALIBRATION) and adjust the compass variance, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - STANDARD PROCEDURE - COMPASS VARIATION ADJUSTMENT).



## COMPASS VARIATION ADJUSTMENT

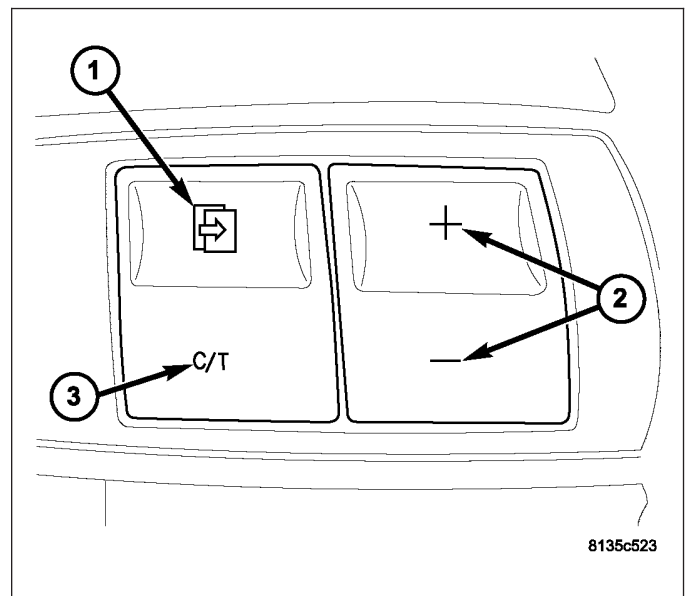
Compass variance, also known as magnetic declination, is the difference in angle between magnetic north and true geographic north. In some geographic locations, the difference between magnetic and geographic north is great enough to cause the compass to give false readings. If this problem occurs, the compass variance setting may need to be changed.

To set the compass variance:



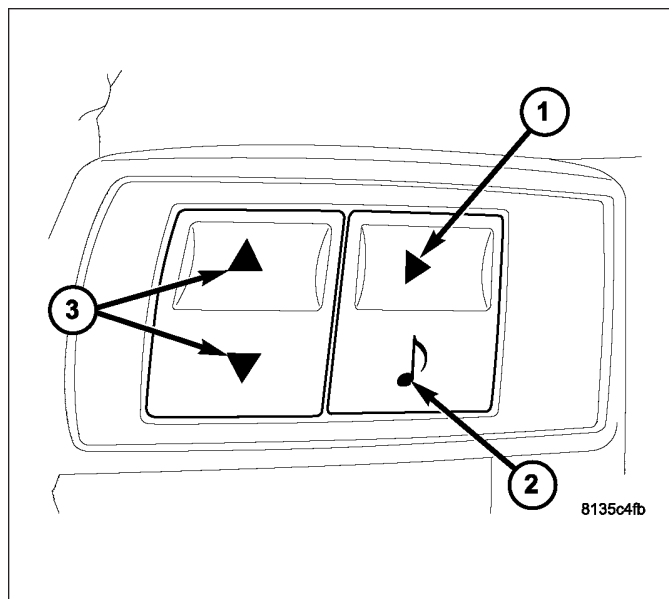
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1. Using the Variance Settings map, find your geographic location and note the zone number.
2. Turn the ignition switch to the On position.
3. Depress and hold the C/T push button (3) for approximately two seconds.

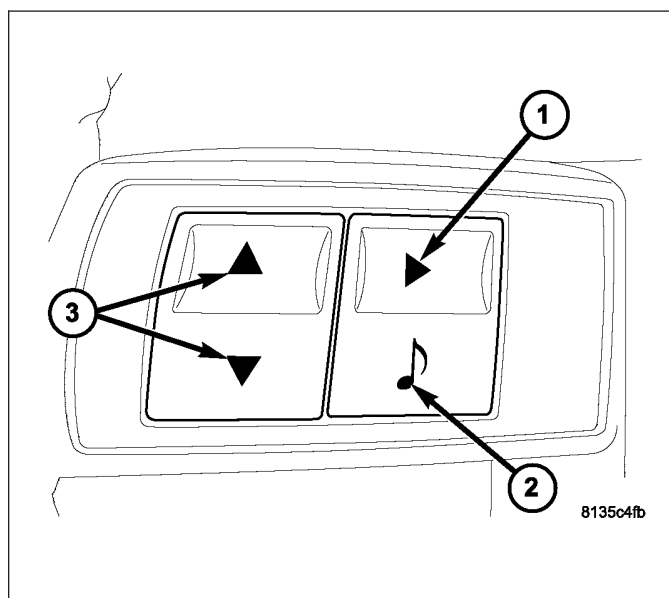


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4. Use the SCROLL buttons (3) until COMPASS VARIANCE is highlighted. The "COMPASS VARIANCE" message and the last variance zone number will be displayed.
5. Press and release the FUNCTION SELECT button (1) until the zone number for your geographic location appears in the display.



6. Depress and release the C/T push button (3) to exit.
7. Confirm that the correct directions are now indicated by the compass.



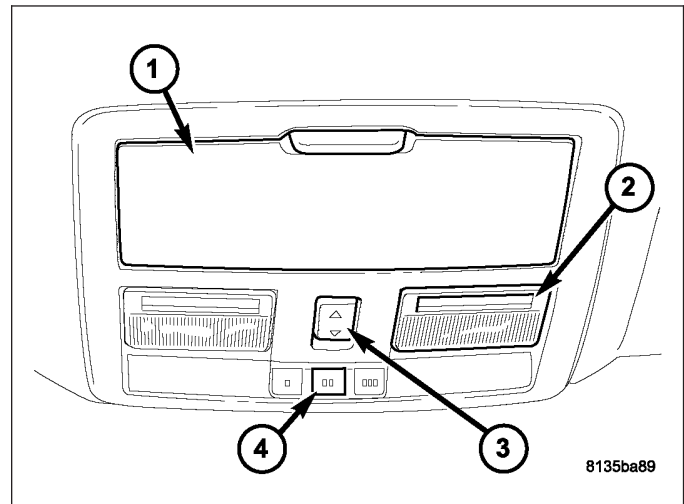
## UNIVERSAL TRANSMITTER

### DESCRIPTION

The universal transmitter transceiver is integral to the overhead console. The only visible component of the universal transmitter are the three transmitter push buttons (4) at the front of the overhead console. The buttons are marked with one, two or three illuminated dots, respectively, for identification of each channel.

Each of the three universal transmitter push buttons controls an independent radio transmitter channel. Each of these three channels can be trained to transmit a different radio frequency signal for the remote operation of garage door openers, motorized gate openers, home or office lighting, security systems or just about any other device that can be equipped with a radio receiver in the 286 to 399 MegaHertz (MHz) frequency range for remote operation. The universal transmitter is capable of operating systems using either rolling code or non-rolling code technology. The system will not transmit operating signals if the Vehicle Theft Security System is armed.

The universal transmitter cannot be repaired, and is available for service only as a unit. This unit includes the push button switches and the plastic module.



### DIAGNOSIS AND TESTING

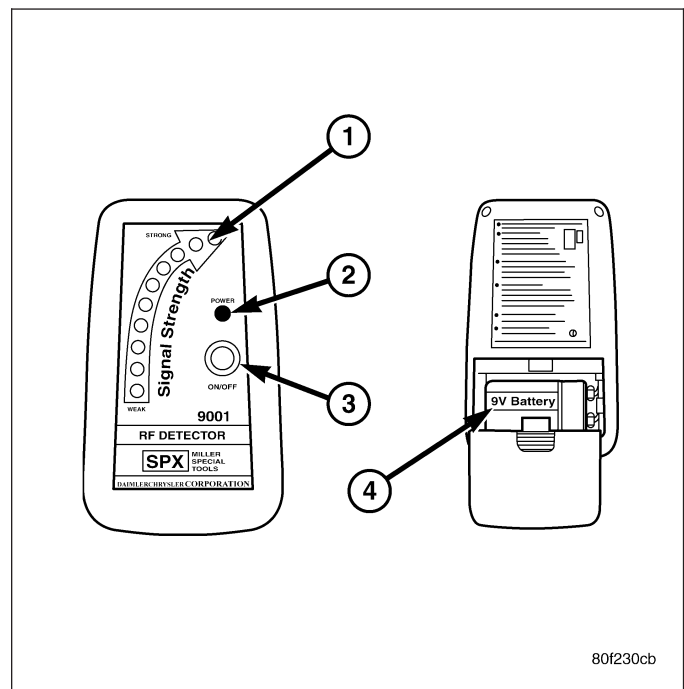
#### UNIVERSAL TRANSMITTER

If the Universal Transmitter is inoperative, but the Electronic Vehicle Information Center (EVIC) is operating normally, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/UNIVERSAL TRANSMITTER - STANDARD PROCEDURE) for instructions on training the Transmitter. Retrain the Transmitter with a known good transmitter as instructed and test the Transmitter operation again.

If the unit is still inoperative, test the universal transmitter with Radio Frequency Detector special tool. as described below:

1. Turn the Radio Frequency (RF) Detector ON. A "chirp" will sound and the green power LED will light. If the green LED does not light, replace the battery.
2. Hold the RF detector within one inch of the TRAINED universal transmitter and press any of the transmitters buttons.
3. The red signal detection LEDs will light and the tool will beep if a radio signal is detected. Repeat this test for each button. If any button is inoperative, replace the universal transmitter assembly, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/UNIVERSAL TRANSMITTER - REMOVAL).

If both the Transmitter and the EVIC module are inoperative, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - DIAGNOSIS AND TESTING) for further diagnosis. Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.



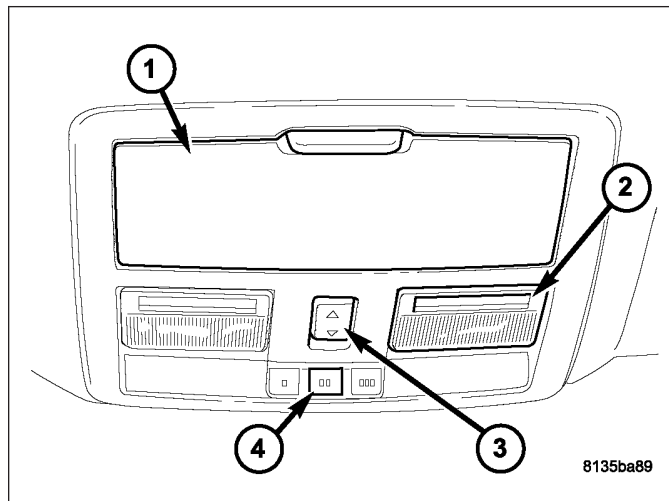
## STANDARD PROCEDURE

### PROGRAMMING TRANSMITTER CODES

**CAUTION:** Vehicle exhaust contains carbon monoxide, a dangerous gas. Do not run the vehicle's exhaust while training the transceiver. Exhaust gas can cause serious injury or death.

**CAUTION:** Your motorized door or gate will open and close while you are training the Universal Transceiver. Do not train the transceiver if people or pets are in the path of the door or gate. A moving door or gate can cause serious injury or death to people and pets or damage to objects.

The Electronic Vehicle Information Center (EVIC) features a driver-interactive display which includes HomeLink system messages. The EVIC is located in the upper part of the cluster between the speedometer and tachometer.



1. Press and hold the two outer HomeLink buttons (4), and release only when the EVIC display shows "Channels Cleared" (after 20 seconds). **Do not** hold the buttons for longer than 30 seconds and **do not** repeat step one to program a second and/or third hand-held transmitter to the remaining two HomeLink buttons.
2. Position the end of your hand-held transmitter 1-3 inches (3-8 cm) away from the HomeLink buttons.
3. Simultaneously press and hold both the HomeLink button that you want to train and the hand-held transmitter buttons. **Do not release the buttons until step 4 has been completed.**
4. The EVIC display will show "Channel X Training" (where X is Channel 1, 2, or 3). Release both buttons after the EVIC display shows "Channel X Trained".

**Note:** If the EVIC display shows "Did Not Train" repeat steps 2–4.

5. Press and hold the just trained HomeLink button and observe the EVIC display. If the EVIC display shows "Channel X Transmit" (where X is Channel 1, 2, or 3), programming is complete and your device should activate when the HomeLink button is pressed and released.

**Note:** To program the remaining two HomeLink buttons, begin with "Programming" step two. Do not repeat step one.

**Note:** If your hand-held transmitter appears to program the universal transceiver, but your garage door does not operate using the transmitter and your garage door opener was manufactured after 1995, your garage door opener may have a multiple security code system (rolling code system). Please proceed to steps 6–8 to complete the programming of a rolling code equipped device (most common garage door openers require this step).

6. At the garage door opener receiver (motor-head unit) in the garage, locate the "learn" or "smart" button. This can usually be found where the hanging antenna wire is attached to the motor-head unit.
7. Firmly press and release the "learn" or "smart" button. (The name and color of the button may vary by manufacturer.)

**Note:** There are 30 seconds in which to initiate step eight.

8. Return to the vehicle and firmly **press, hold for two seconds and release** the programmed HomeLink button. Repeat the "**press/hold/release**" sequence a second time, and, depending on the brand of the garage door opener (or other rolling code equipped device), repeat this sequence a third time to complete the programming.
9. HomeLink should now activate your rolling code equipped device.

10. To program the remaining two HomeLink buttons, begin with "Programming" step two. Do not repeat step one.

## ERASING TRANSMITTER CODES

**Note:** Individual channels cannot be erased. Erasing the transmitter codes will erase ALL programmed codes.

To erase programming from the three buttons (individual buttons cannot be erased but can be "reprogrammed" - note below), follow the step noted:

- Press and hold the two outer HomeLink buttons and release only when the Electronic Vehicle Information Center (EVIC) display shows "Channels Cleared" (after 20 seconds). Release both buttons. Do not hold for longer than 30 seconds. HomeLink is now in the train (or learning) mode and can be programmed at any time, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/UNIVERSAL TRANSMITTER - STANDARD PROCEDURE).

## REPROGRAMMING TRANSMITTER CODES

**CAUTION:** Vehicle exhaust contains carbon monoxide, a dangerous gas. Do not run the vehicle's exhaust while training the transceiver. Exhaust gas can cause serious injury or death.

**CAUTION:** Your motorized door or gate will open and close while you are training the Universal Transceiver. Do not train the transceiver if people or pets are in the path of the door or gate. A moving door or gate can cause serious injury or death to people and pets or damage to objects.

To program a device to HomeLink using a HomeLink button previously trained, follow these steps:

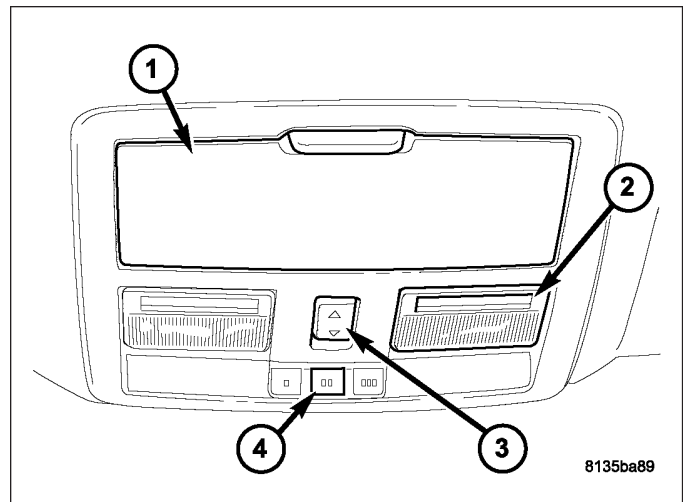
1. Press and hold the desired HomeLink button (4).  
**Do NOT** release the button.

2. The EVIC display will show "Channel X Transmit" (where X is Channel 1, 2, or 3) for 20 seconds and then change to "Channel X Training". Without releasing the HomeLink button, proceed to step 3.

3. Position the end of your hand-held transmitter 1-3 inches (3-8 cm) away from the HomeLink buttons.

4. Simultaneously press and hold both the HomeLink button that you want to train and the hand-held transmitter buttons. **Do not release the buttons until step 4 has been completed.**

5. Press and hold the just trained HomeLink button and observe the EVIC display. If the EVIC display shows "Channel X Transmit" (where X is Channel 1, 2, or 3), programming is complete and your device should activate when the HomeLink button is pressed and released.



**Note:** To program the remaining two HomeLink buttons, begin with "Programming" step two. Do not repeat step one.

**Note:** If your hand-held transmitter appears to program the universal transceiver, but your garage door does not operate using the transmitter and your garage door opener was manufactured after 1995, your garage door opener may have a multiple security code system (rolling code system). Please proceed to steps 6-8 to complete the programming of a rolling code equipped device (most common garage door openers require this step).

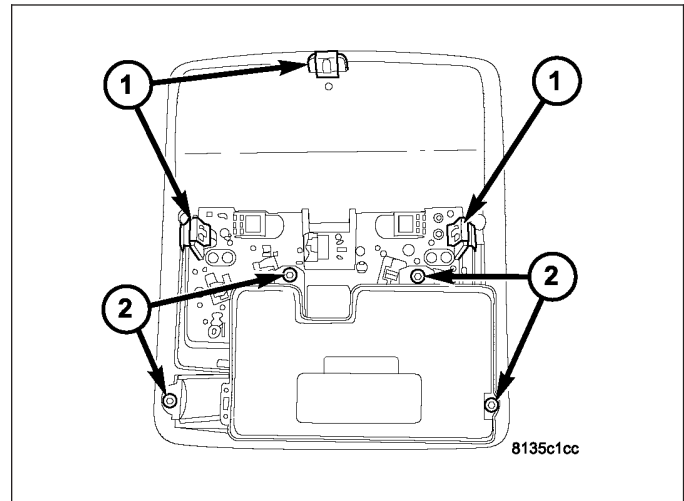
6. At the garage door opener receiver (motor-head unit) in the garage, locate the "learn" or "smart" button. This can usually be found where the hanging antenna wire is attached to the motor-head unit.
7. Firmly press and release the "learn" or "smart" button. (The name and color of the button may vary by manufacturer.)

**Note:** There are 30 seconds in which to initiate step eight.

8. Return to the vehicle and firmly **press, hold for two seconds and release** the programmed HomeLink button. Repeat the "**press/hold/release**" sequence a second time, and, depending on the brand of the garage door opener (or other rolling code equipped device), repeat this sequence a third time to complete the programming.
9. HomeLink should now activate your rolling code equipped device.

## REMOVAL

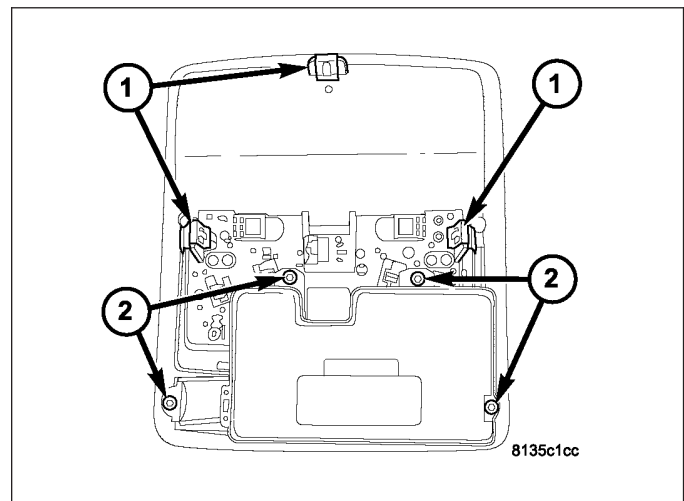
1. Disconnect and isolate the battery negative cable.
2. Remove the overhead console assembly, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).
3. Remove the universal transmitter retaining screws (2) and separate the transmitter from the overhead console.



## INSTALLATION

**Note:** In addition to the Universal Transmitter operation the Electronic Overhead Module is responsible for some of the compass functions. Anytime the Electronic Overhead Module is replaced the compass variance value must be set, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - STANDARD PROCEDURE - COMPASS VARIATION ADJUSTMENT).

1. Position the universal transmitter onto the overhead console assembly and install the retaining screws (2).
2. Install the overhead console assembly, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION).
3. Connect the battery negative cable.
4. Program the universal transmitter codes, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/UNIVERSAL TRANSMITTER - STANDARD PROCEDURE).



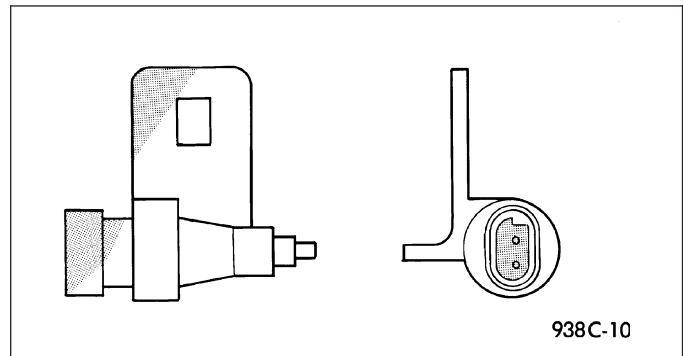


## SENSOR-AMBIENT AIR TEMPERATURE

### DESCRIPTION

The ambient temperature sensor is a variable resistor type sensor. It is mounted to the lower front fascia behind the radiator grille and in front of the engine compartment.

The ambient temperature sensor cannot be adjusted or repaired and, if inoperative or damaged, it must be replaced.



### OPERATION

The ambient temperature sensor is a variable resistor that operates on a five-volt reference signal sent by the Front Control Module (FCM). The resistance in the sensor changes as temperature changes, changing the temperature sensor signal circuit voltage to the FCM. Based upon the resistance in the sensor, the FCM senses a specific voltage on the temperature sensor signal circuit. The FCM then translates the voltage into a temperature reading that it sent over the Controller Area Network (CAN) data bus to other modules utilizing temperature information.

### DIAGNOSIS AND TESTING

#### AMBIENT TEMPERATURE SENSOR

The temperature function is supported by the ambient temperature sensor, a wiring circuit, and the Front Control Module (FCM). If any portion of the ambient temperature sensor circuit fails or if the Controller Area Network (CAN) data bus information is missing, a (— —) will appear in the Electronic Vehicle Information Center (EVIC) display in place of the temperature. When the sensor is exposed to temperatures above 55° C (130° F), or if the sensor circuit is shorted, 55° C (130° F) will appear in the EVIC display in place of the temperature. When the sensor is exposed to temperatures below - 40° C (- 40° F) or if the sensor circuit is open, - 40° C (- 40° F) will appear in the EVIC display.

The ambient temperature sensor circuit can also be diagnosed using the following Sensor Test, and Sensor Circuit Test. If the temperature sensor and circuit are confirmed to be OK, but the temperature display is inoperative or incorrect, test the EVIC operation, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - DIAGNOSIS AND TESTING).

#### SENSOR TEST

1. Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the ambient temperature sensor harness connector.
2. Measure the resistance of the ambient temperature sensor. At - 40° C (- 40° F), the sensor resistance is 336 kilohms. At 55° C (130° F), the sensor resistance is 2.488 kilohms. The sensor resistance should read between these two values. If OK, refer to Sensor Circuit Test in this group. If not OK, replace the inoperative ambient temperature sensor.

#### SENSOR CIRCUIT TEST

Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.

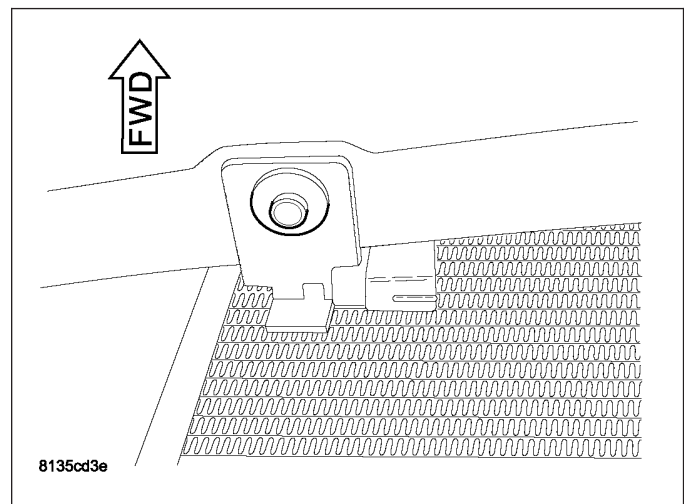
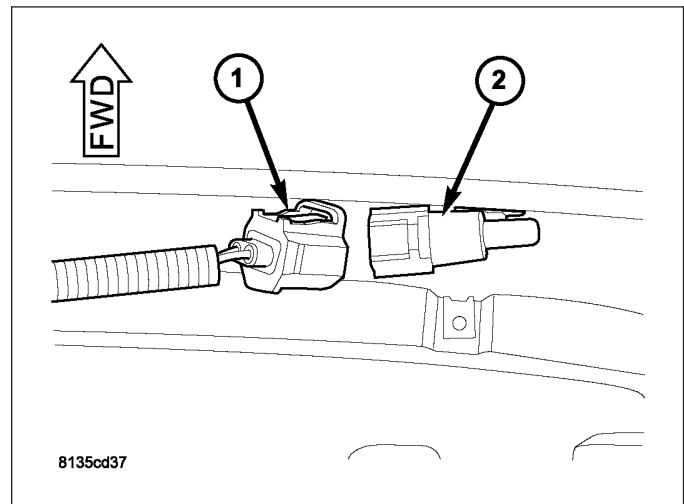
1. Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the wire harness connectors from the ambient temperature sensor and the FCM.
2. Connect a jumper wire between the two terminals in the body half of the ambient temperature sensor harness connector.



3. Check for continuity between the sensor return circuit and the ambient temperature sensor signal circuit cavities of the FCM harness connector. There should be continuity. If OK, go to Step 4. If not OK, repair the open sensor return circuit or ambient temperature sensor signal circuit to the ambient temperature sensor as required.
4. Check for continuity between the ambient temperature sensor signal circuit cavity of the FCM harness connector and a good ground. There should be no continuity. If OK, test the EVIC operation, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - DIAGNOSIS AND TESTING). If not OK, repair the shorted ambient temperature sensor signal circuit as required.

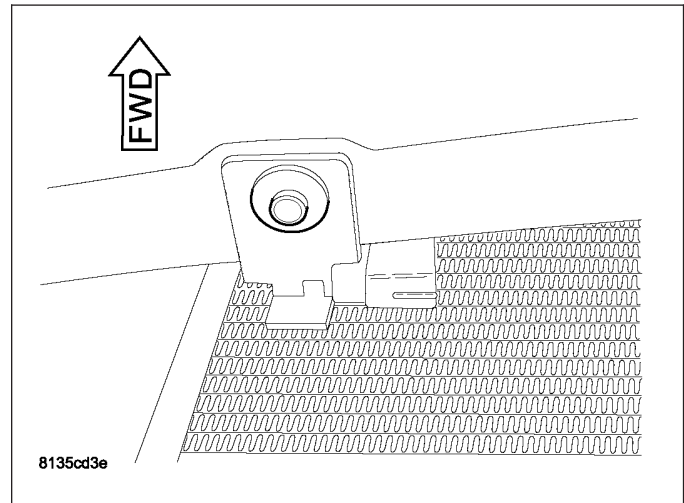
## REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the belly pan, (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL).
3. Disconnect the wire harness connector (1) from the ambient temperature sensor (2).
4. Remove the fastener that secures the ambient temperature sensor bracket to the front fascia.
5. Remove the ambient temperature sensor from the vehicle.

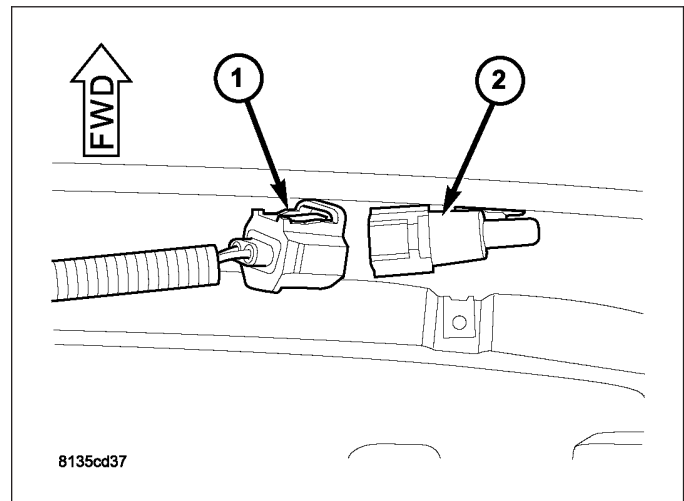


## INSTALLATION

1. Position the ambient temperature sensor in the vehicle.
2. Install the fastener that secures the ambient temperature sensor to the front fascia.



3. Connect the wire harness connector (1) to the ambient temperature sensor (2).
4. Install the belly pan, (Refer to 23 - BODY/EXTERIOR/BELLY PAN - INSTALLATION).
5. Connect the battery negative cable.





# POWER SYSTEMS

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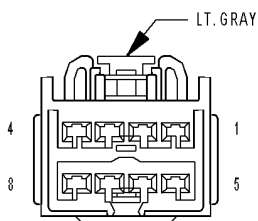
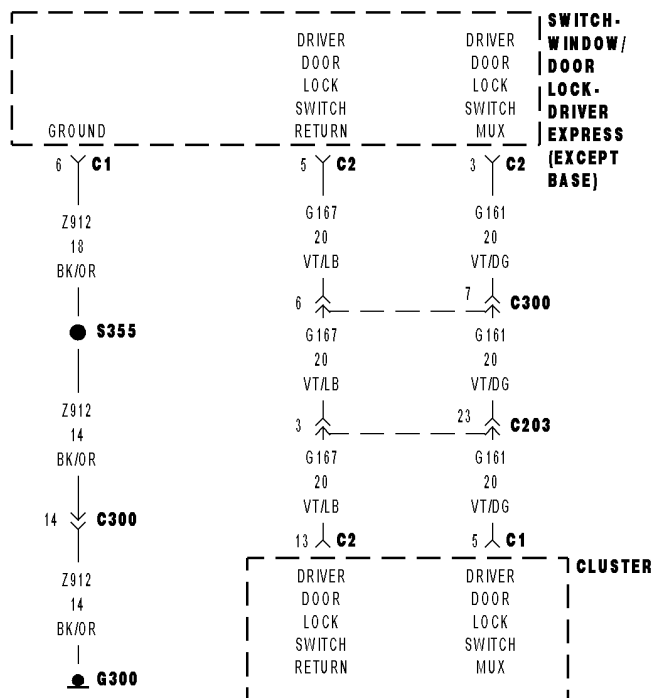
## POWER LOCKS - ELECTRICAL DIAGNOSTICS

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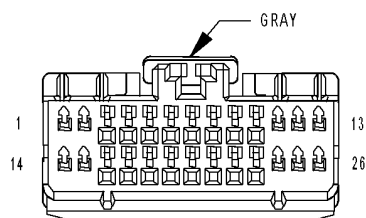
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## POWER LOCKS - ELECTRICAL DIAGNOSTICS

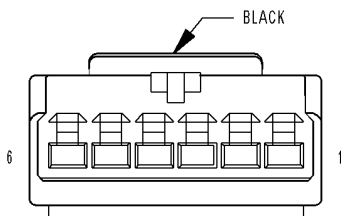
### DIAGNOSIS AND TESTING

**B1801—DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW — CLUSTER**

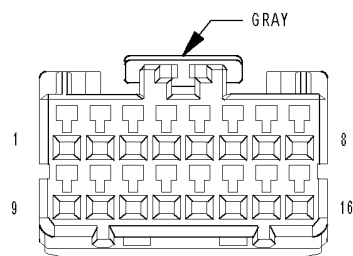
**SWITCH-WINDOW/DOOR LOCK-DRIVER EXPRESS C1 (EXCEPT BASE)**



**CLUSTER C1**



**SWITCH-WINDOW/DOOR LOCK-DRIVER EXPRESS C2 (EXCEPT BASE)**



**CLUSTER C2**

**B1801-DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW — CLUSTER (CONTINUED)**

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Driver Door Lock Switch Mux circuit is below 0.15 volts for over 10 seconds.

Possible Causes
(G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND
(G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO THE (G167) DRIVER DOOR LOCK SWITCH RETURN CIRCUIT
DOOR LOCK SWITCH SHORT TO GROUND
INSTRUMENT CLUSTER

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase DTC's

Operate the Driver Door Lock Switch in all positions several times.

Turn the ignition on and wait 30 seconds.

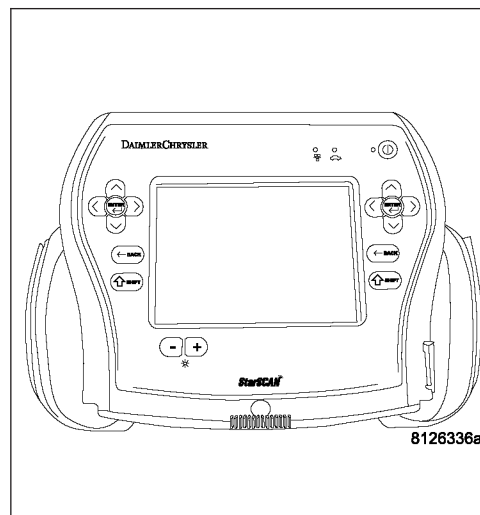
With the scan tool, read DTC's.

**Does the scan tool display B1801-DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1801-DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW — CLUSTER (CONTINUED)****2. DOOR LOCK SWITCH SHORTED**

With the scan tool, erase DTC's.

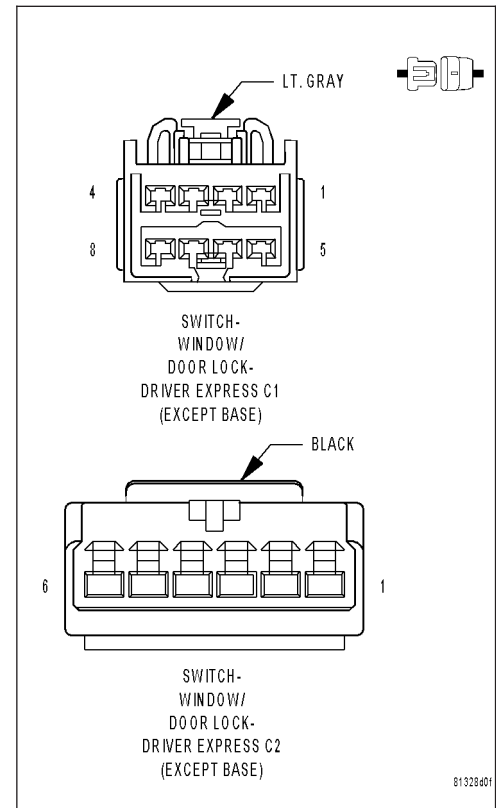
Disconnect the Driver Window/Door Lock Switch C1 and C2 connectors.

With the scan tool, read DTC's.

**Does the scan tool display B1801-DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW?**

**No** >> Replace the Driver Express Window/Door Lock Switch.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 3

**3. (G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND**

Turn the ignition off.

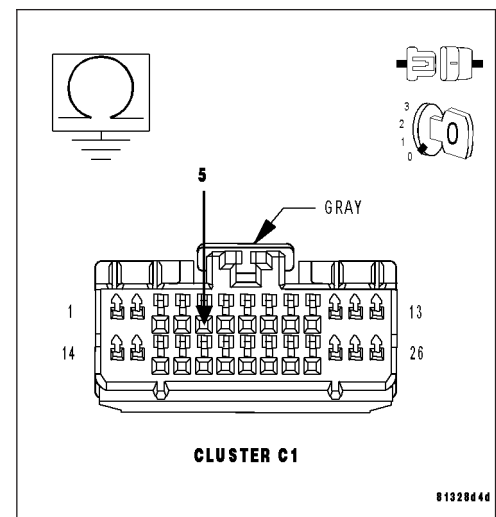
Disconnect the Cluster C1 connector.

Measure the resistance between ground and the (G161) Driver Door Lock Switch Mux circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (G161) Driver Door Lock Switch Mux circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



**B1801-DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW — CLUSTER (CONTINUED)****4. (G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO (G167) DRIVER DOOR LOCK SWITCH RETURN CIRCUIT**

Disconnect the Cluster C2 connector.

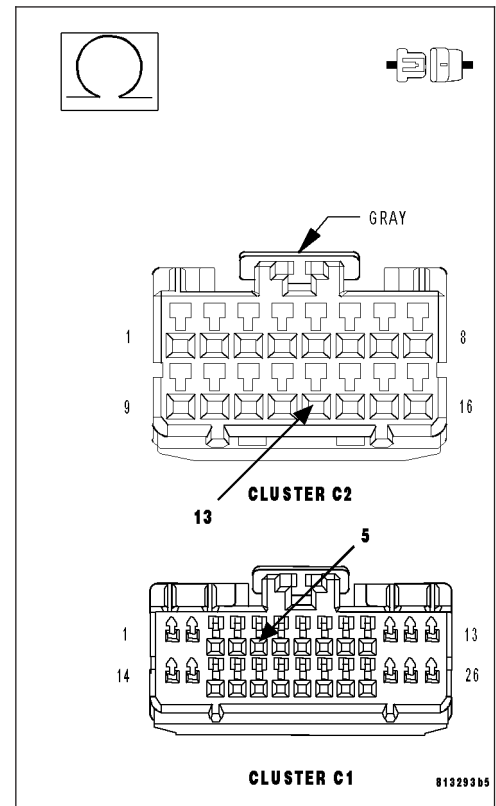
Measure the resistance between the (G161) Driver Door Lock Switch Mux circuit (in the C1 connector) and the (G167) Driver Door Lock Switch Return circuit (in the C2 connector).

**Is the resistance below 10000.0 ohms?**

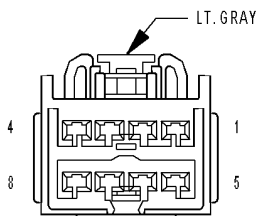
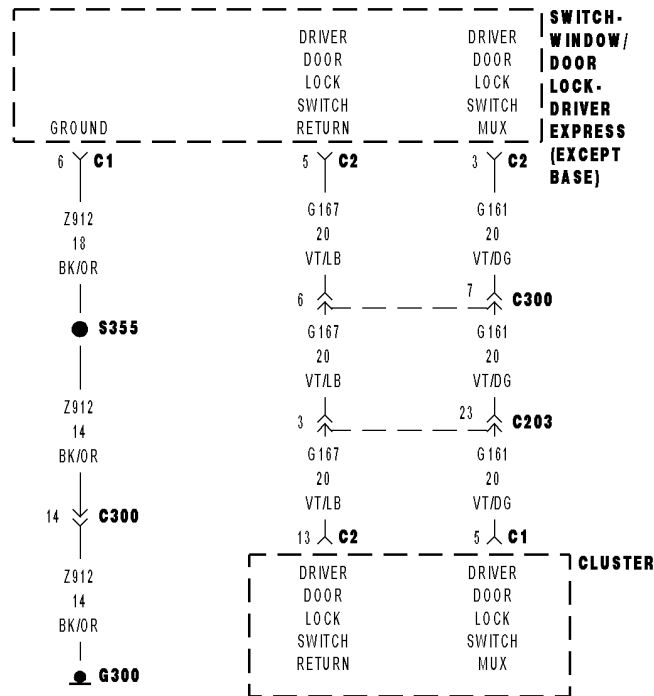
**Yes** >> Repair the (G161) Driver Door Lock Switch Mux circuit for a short to the (G167) Driver Door Lock Switch Return circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

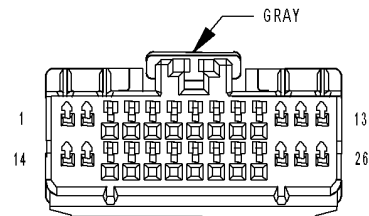
**No** >> Replace the Instrument Cluster.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



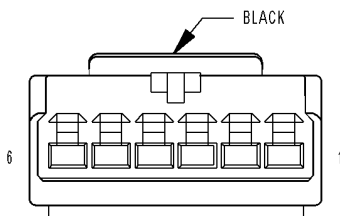


**B1803—DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK— CLUSTER**

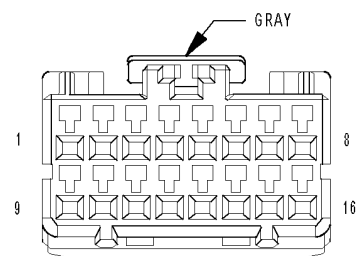
**SWITCH-WINDOW/DOOR LOCK-DRIVER EXPRESS C1 (EXCEPT BASE)**



**CLUSTER C1**



**SWITCH-WINDOW/DOOR LOCK-DRIVER EXPRESS C2 (EXCEPT BASE)**



**CLUSTER C2**

**B1803–DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK— CLUSTER (CONTINUED)**

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Driver Door Lock Switch Mux circuit is between 0.8 and 1.5 volts for over 30 seconds.

Possible Causes
(G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND
(G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO THE (G167) DRIVER DOOR LOCK SWITCH RETURN CIRCUIT
DOOR LOCK SWITCH SHORT TO GROUND
INSTRUMENT CLUSTER

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase DTC's

Operate the Driver Door Lock Switch in all positions several times.

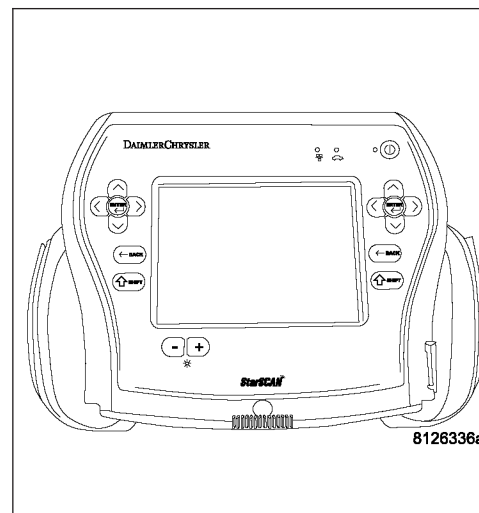
Turn the ignition on and wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B1803–DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B1803-DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK— CLUSTER (CONTINUED)****2. DOOR LOCK SWITCH SHORTED**

With the scan tool, erase DTC's.

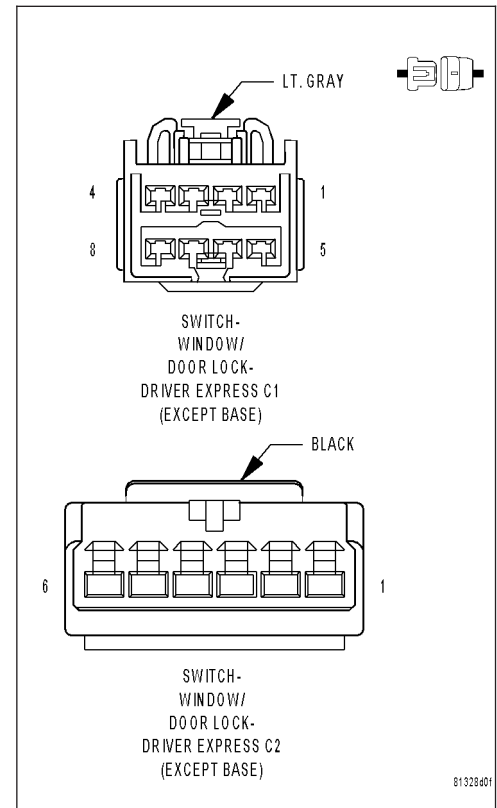
Disconnect the Driver Window/Door Lock Switch C1 and C2 connectors.

With the scan tool, read DTC's.

**Does the scan tool display B1803-DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK?**

**No** >> Replace the Driver Express Window/Door Lock Switch.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 3

**3. (G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND**

Turn the ignition off.

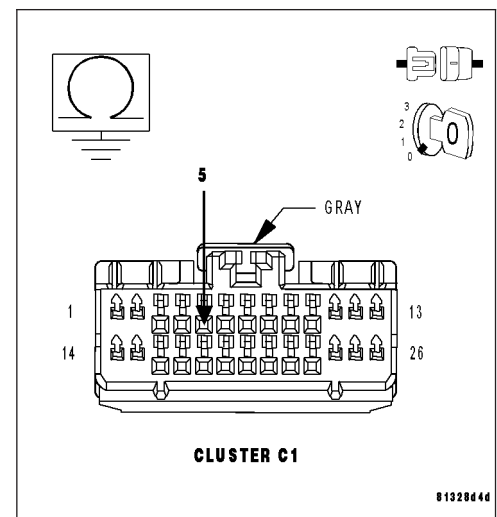
Disconnect the Cluster C1 connector.

Measure the resistance between ground and the (G161) Driver Door Lock Switch Mux circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (G161) Driver Door Lock Switch Mux circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



**B1803-DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK— CLUSTER (CONTINUED)****4. (G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO (G167) DRIVER DOOR LOCK SWITCH RETURN CIRCUIT**

Disconnect the Cluster C2 connector.

Measure the resistance between the (G161) Driver Door Lock Switch Mux circuit and the (G167) Driver Door Lock Switch Return circuit in the Cluster C2 connector.

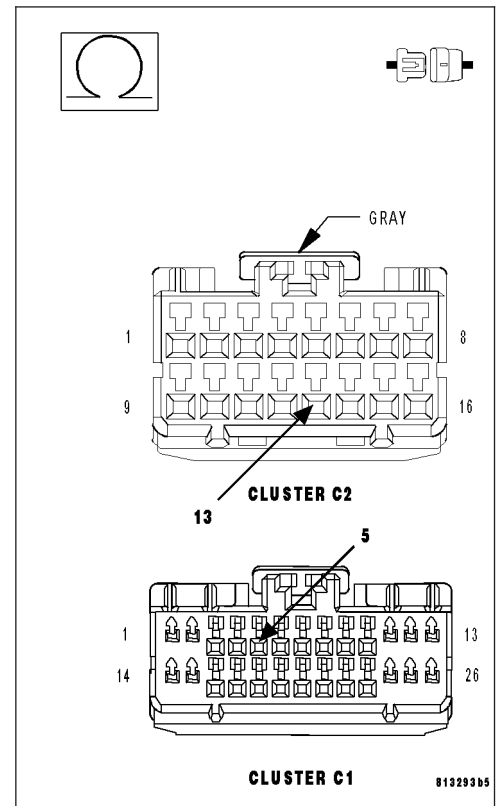
**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (G161) Driver Door Lock Switch Mux circuit for a short to the (G167) Driver Door Lock Switch Return circuit.

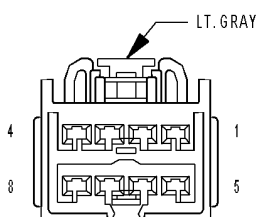
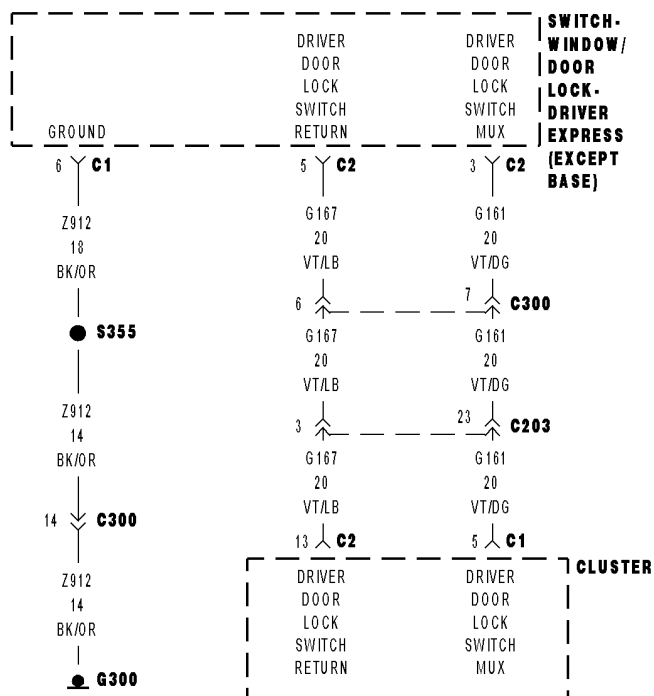
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Instrument Cluster.

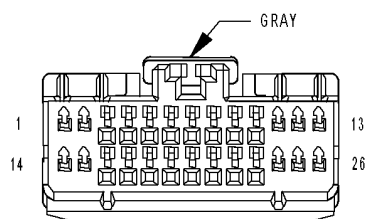
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



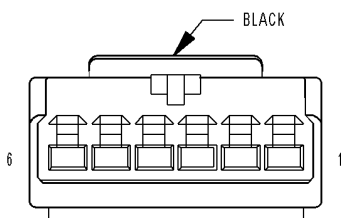
# B1804-DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK—CLUSTER



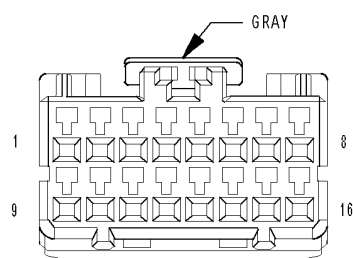
SWITCH-WINDOW/DOOR LOCK-DRIVER EXPRESS C1 (EXCEPT BASE)



CLUSTER C1



SWITCH-WINDOW/DOOR LOCK-DRIVER EXPRESS C2 (EXCEPT BASE)



CLUSTER C2

**B1804–DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK— CLUSTER (CONTINUED)**

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Driver Door Lock Switch Mux circuit is between 0.15 and 0.8 volts for over 30 seconds.

Possible Causes
(G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND
(G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO THE (G167) DRIVER DOOR LOCK SWITCH RETURN CIRCUIT
DOOR LOCK SWITCH SHORT TO GROUND
INSTRUMENT CLUSTER

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

With the scan tool, record and erase DTC's

Operate the Driver Door Lock Switch in all positions several times.

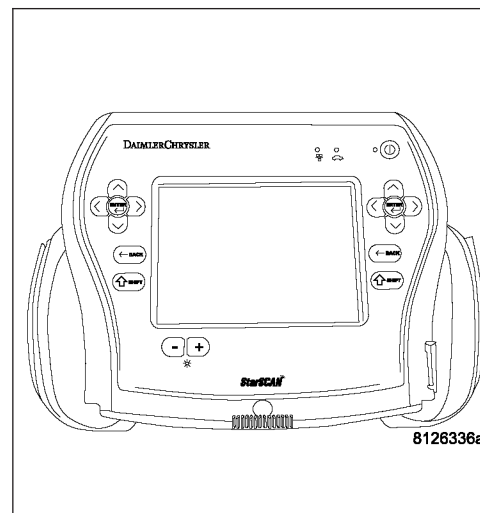
Turn the ignition on and wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B1804–DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B1804-DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK— CLUSTER (CONTINUED)****2. DOOR LOCK SWITCH SHORTED**

With the scan tool, erase DTC's.

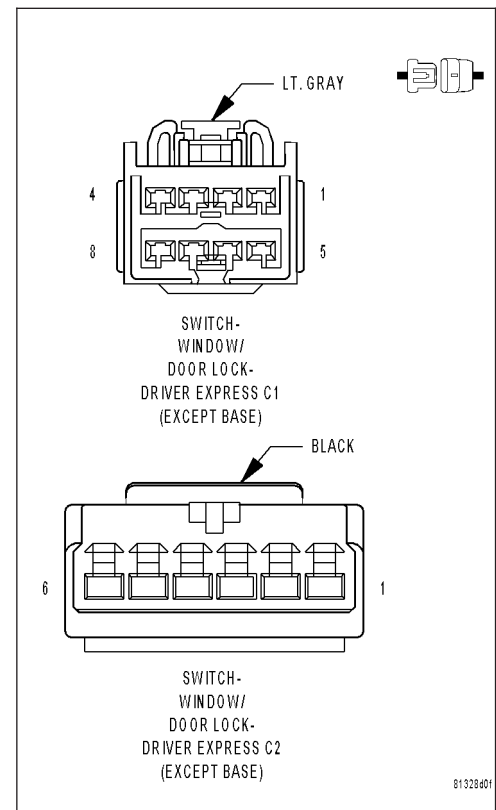
Disconnect the Driver Window/Door Lock Switch C1 and C2 connectors.

With the scan tool, read DTC's.

**Does the scan tool display B1804-DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK?**

**No** >> Replace the Driver Express Window/Door Lock Switch.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 3

**3. (G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND**

Turn the ignition off.

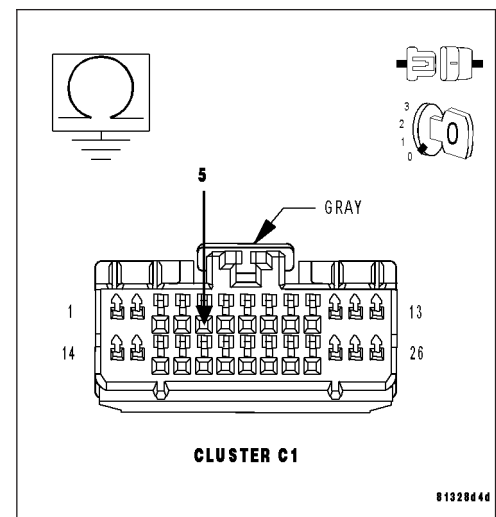
Disconnect the Cluster C1 connector.

Measure the resistance between ground and the (G161) Driver Door Lock Switch Mux circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (G161) Driver Door Lock Switch Mux circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



**B1804-DRIVER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK— CLUSTER (CONTINUED)****4. (G161) DRIVER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO (G167) DRIVER DOOR LOCK SWITCH RETURN CIRCUIT**

Disconnect the Cluster C2 connector.

Measure the resistance between the (G161) Driver Door Lock Switch Mux circuit and the (G167) Driver Door Lock Switch Return circuit in the Cluster C2 connector.

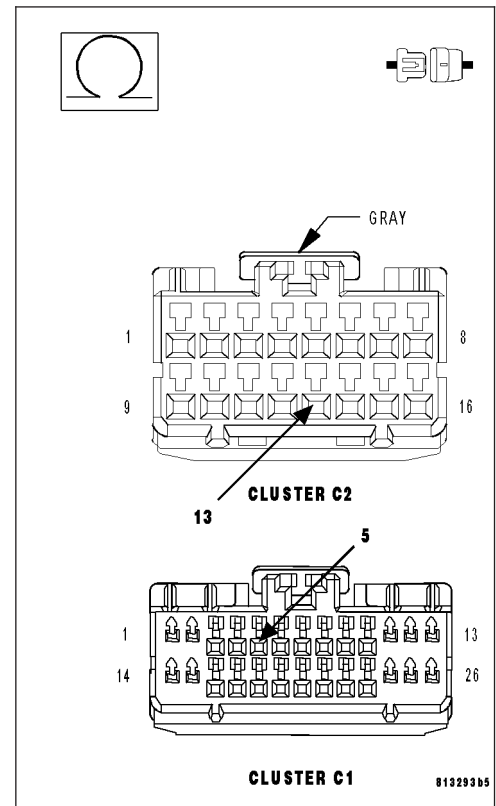
**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (G161) Driver Door Lock Switch Mux circuit for a short to the (G167) Driver Door Lock Switch Return circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

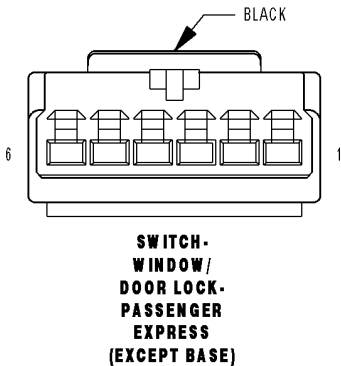
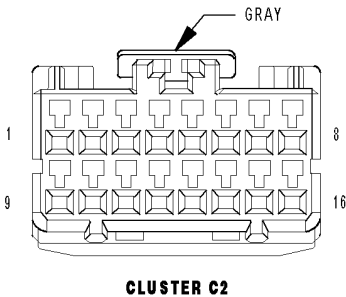
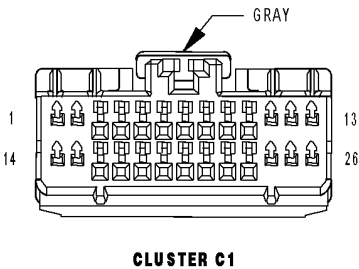
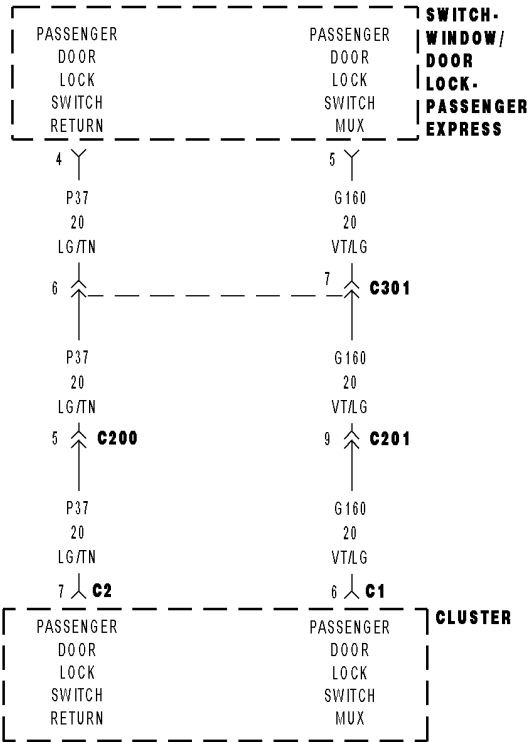
**No** >> Replace the Instrument Cluster.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.





B1806-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW — CLUSTER



**B1806-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW — CLUSTER (CONTINUED)**

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Passenger Door Lock Switch Mux circuit is below 0.15 volts for over 10 seconds.

Possible Causes
(G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND
(G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO THE (P37) PASSENGER DOOR LOCK SWITCH RETURN CIRCUIT
DOOR LOCK SWITCH SHORT TO GROUND
INSTRUMENT CLUSTER

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase DTC's

Operate the Passenger Door Lock Switch in all positions several times.

Turn the ignition on and wait 30 seconds.

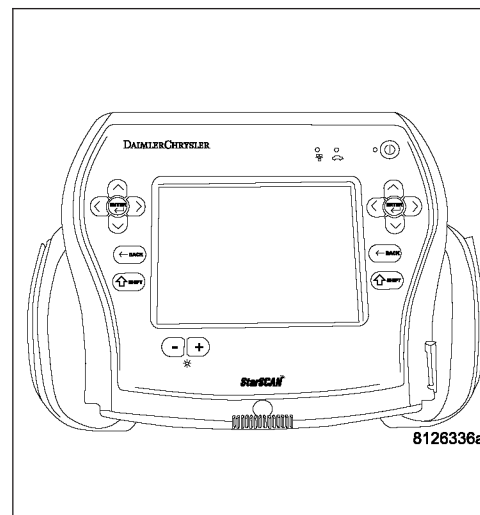
With the scan tool, read DTC's.

**Does the scan tool display B1806-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B1806-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW — CLUSTER (CONTINUED)****2. DOOR LOCK SWITCH SHORTED**

With the scan tool, erase DTC's.

Disconnect the Passenger Express Window/Door Lock Switch connector.

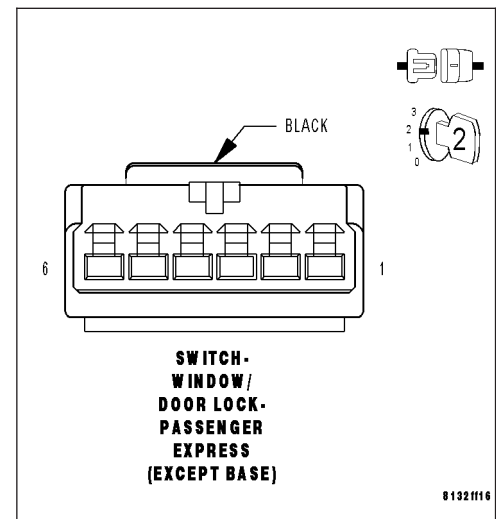
With the scan tool, read DTC's.

**Does the scan tool display B1806-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW?**

**No** >> Replace the Passenger Express Window/Door Lock Switch.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 3

**3. (G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND**

Turn the ignition off.

Disconnect the Cluster C1 connector.

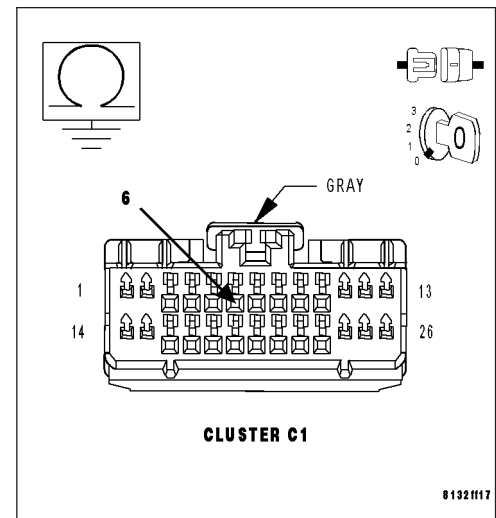
Measure the resistance between ground and the (G160) Passenger Door Lock Switch Mux circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (G160) Passenger Door Lock Switch Mux circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



**B1806-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT LOW — CLUSTER (CONTINUED)****4. (G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO (P37) PASSENGER DOOR LOCK SWITCH RETURN CIRCUIT**

Disconnect the Cluster C2 connector.

Measure the resistance between the (G160) Passenger Door Lock Switch Mux circuit and the (P37) Passenger Door Lock Switch Return circuit.

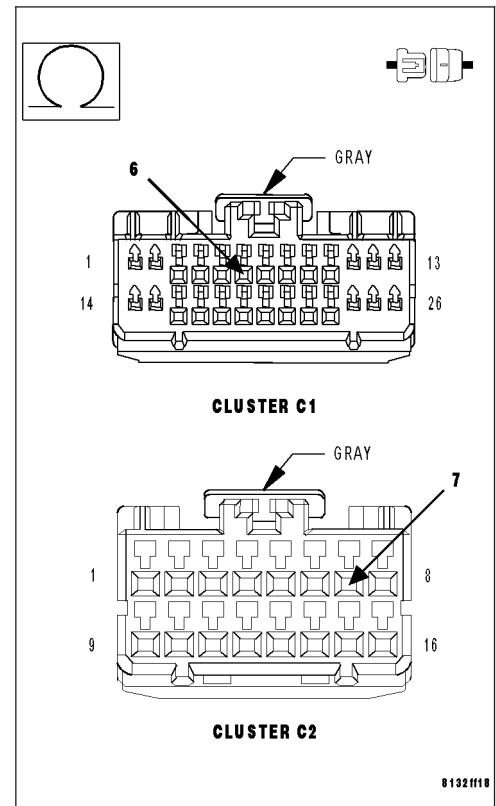
**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (G160) Passenger Door Lock Switch Mux circuit for a short to the (P37) Passenger Door Lock Switch Return circuit.

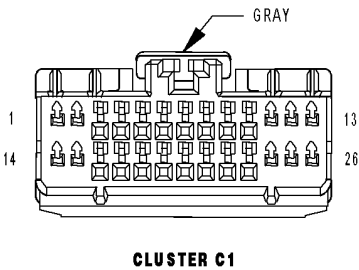
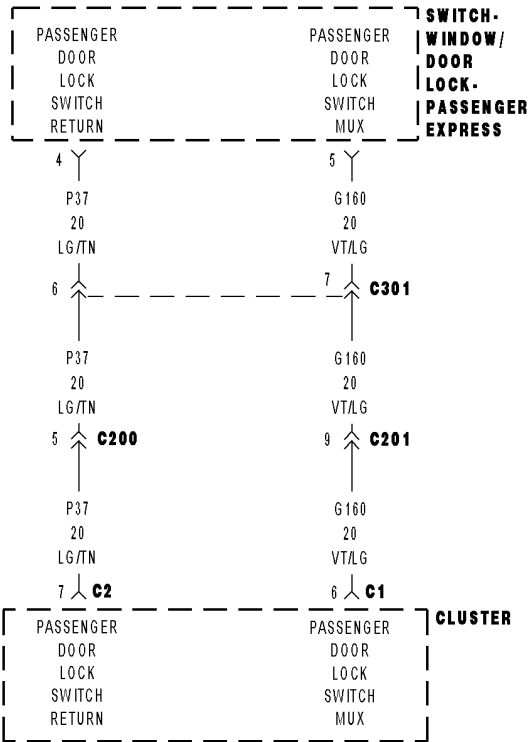
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Instrument Cluster.

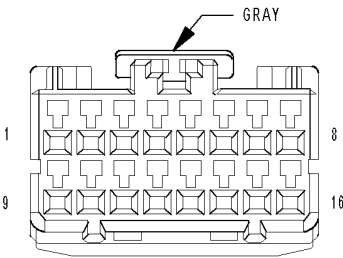
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



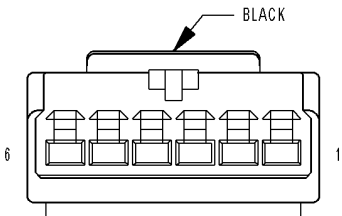
B1808-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK — CLUSTER



CLUSTER C1



CLUSTER C2



SWITCH-  
WINDOW/  
DOOR LOCK-  
PASSENGER  
EXPRESS  
(EXCEPT BASE)

**B1808-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK — CLUSTER (CONTINUED)**

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Passenger Door Lock Switch Mux circuit is between 0.8 and 1.5 volts for over 30 seconds.

Possible Causes
(G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND
(G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO THE (P37) PASSENGER DOOR LOCK SWITCH RETURN CIRCUIT
DOOR LOCK SWITCH SHORT TO GROUND
INSTRUMENT CLUSTER

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase DTC's

Operate the Passenger Door Lock Switch in all positions several times.

Turn the ignition on and wait 30 seconds.

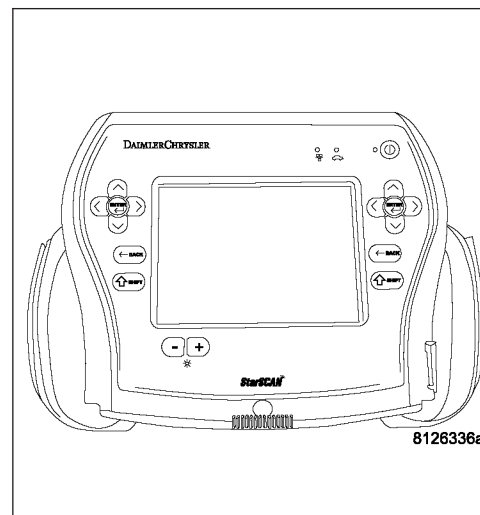
With the scan tool, read DTC's.

**Does the scan tool display B1808-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST – VER 1.



**B1808-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK — CLUSTER (CONTINUED)****2. DOOR LOCK SWITCH SHORTED**

With the scan tool, erase DTC's.

Disconnect the Passenger Express Window/Door Lock Switch connector.

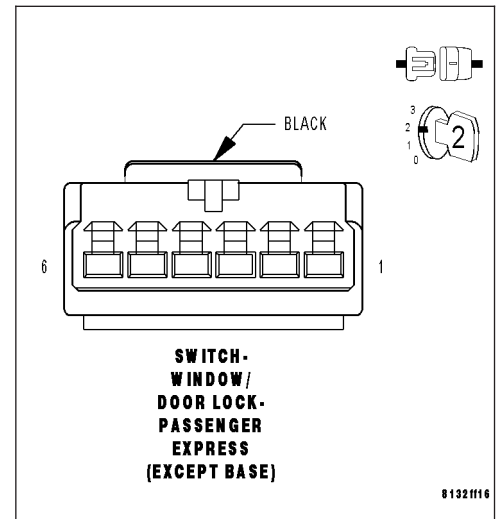
With the scan tool, read DTC's.

**Does the scan tool display B1808-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK?**

**No** >> Replace the Passenger Express Window/Door Lock Switch.

Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 3

**3. (G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND**

Turn the ignition off.

Disconnect the Cluster C1 connector.

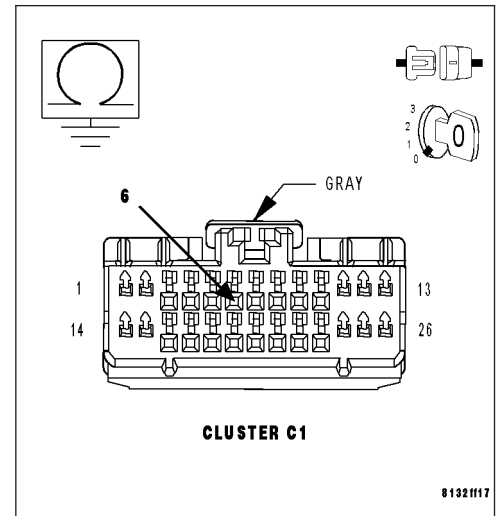
Measure the resistance between ground and the (G160) Passenger Door Lock Switch Mux circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (G160) Passenger Door Lock Switch Mux circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



**B1808-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK LOCK — CLUSTER (CONTINUED)****4. (G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO (P37) PASSENGER DOOR LOCK SWITCH RETURN CIRCUIT**

Disconnect the Cluster C2 connector.

Measure the resistance between the (G160) Passenger Door Lock Switch Mux circuit and the (P37) Passenger Door Lock Switch Return circuit.

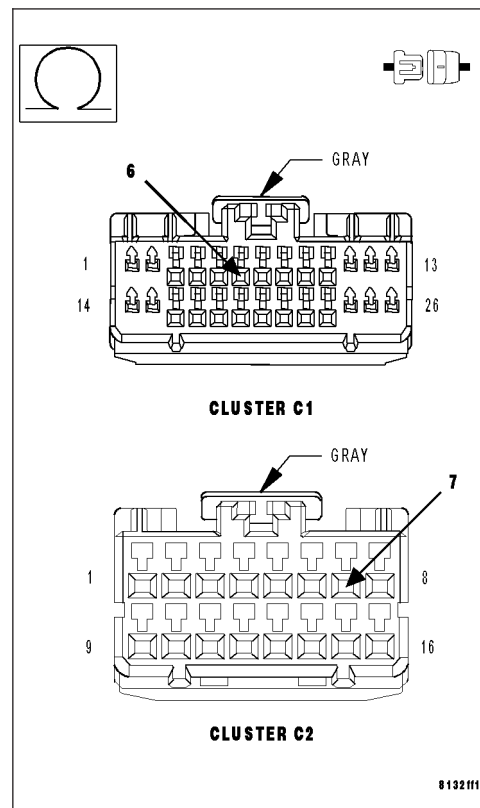
**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (G160) Passenger Door Lock Switch Mux circuit for a short to the (P37) Passenger Door Lock Switch Return circuit.

Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST – VER 1.

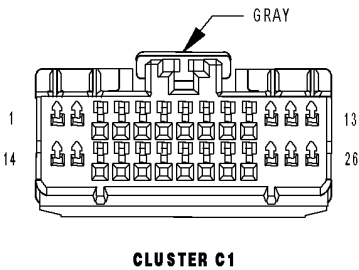
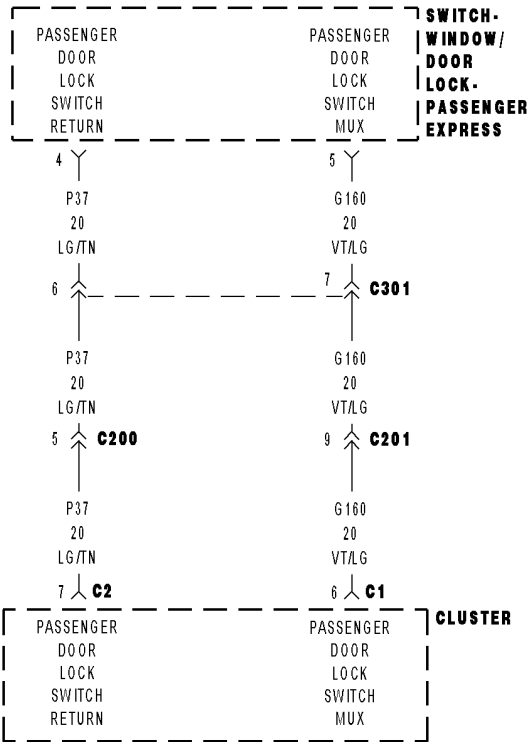
**No** >> Replace the Instrument Cluster.

Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST – VER 1.

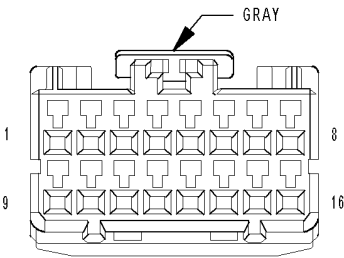




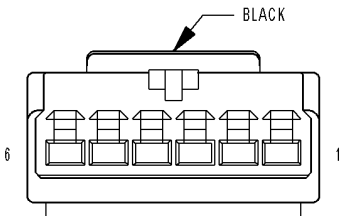
B1809-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK — CLUSTER



CLUSTER C1



CLUSTER C2



SWITCH-  
WINDOW/  
DOOR LOCK-  
PASSENGER  
EXPRESS  
(EXCEPT BASE)

**B1809-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK — CLUSTER (CONTINUED)**

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Passenger Door Lock Switch Mux circuit is between 0.15 and 0.8 volts for over 30 seconds.

Possible Causes
(G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND
(G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO THE (P37) PASSENGER DOOR LOCK SWITCH RETURN CIRCUIT
DOOR LOCK SWITCH SHORT TO GROUND
INSTRUMENT CLUSTER

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase DTC's

Operate the Passenger Door Lock Switch in all positions several times.

Turn the ignition on and wait 30 seconds.

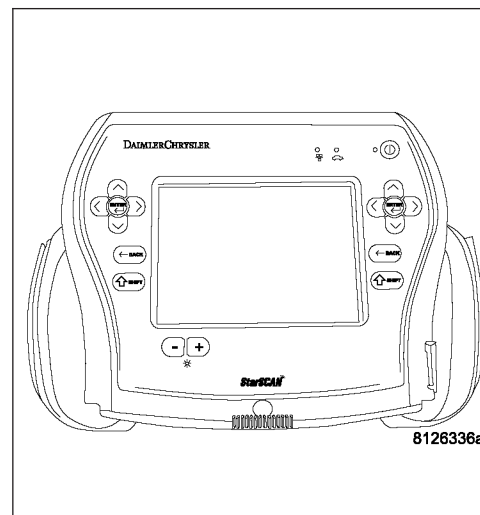
With the scan tool, read DTC's.

**Does the scan tool display B1809-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B1809-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK — CLUSTER (CONTINUED)****2. DOOR LOCK SWITCH SHORTED**

With the scan tool, erase DTC's.

Disconnect the Passenger Express Window/Door Lock Switch connector.

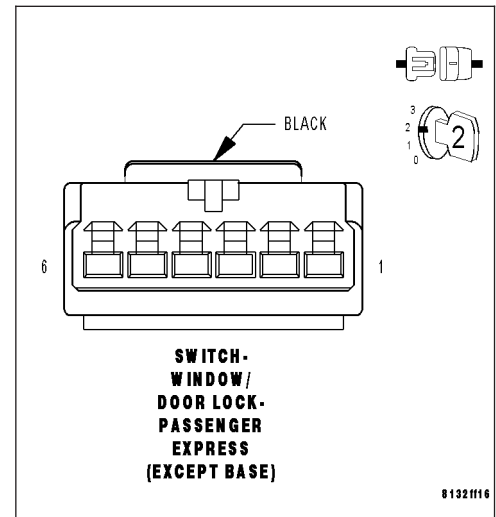
With the scan tool, read DTC's.

**Does the scan tool display B1809-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK?**

**No** >> Replace the Passenger Express Window/Door Lock Switch.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 3

**3. (G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO GROUND**

Turn the ignition off.

Disconnect the Cluster C1 connector.

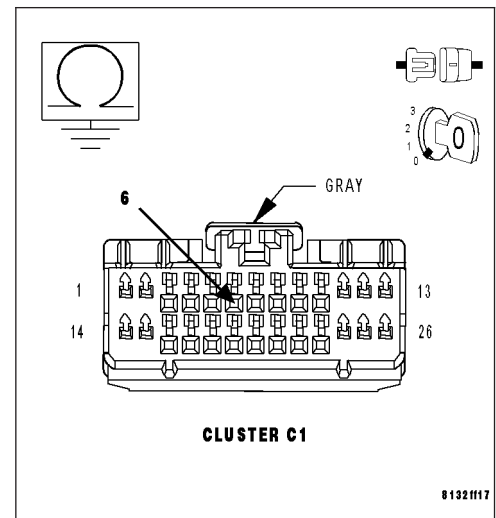
Measure the resistance between ground and the (G160) Passenger Door Lock Switch Mux circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (G160) Passenger Door Lock Switch Mux circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



**B1809-PASSENGER DOOR LOCK/UNLOCK SWITCH CIRCUIT STUCK UNLOCK — CLUSTER (CONTINUED)****4. (G160) PASSENGER DOOR LOCK SWITCH MUX CIRCUIT SHORT TO (P37) PASSENGER DOOR LOCK SWITCH RETURN CIRCUIT**

Disconnect the Cluster C2 connector.

Measure the resistance between the (G160) Passenger Door Lock Switch Mux circuit and the (P37) Passenger Door Lock Switch Return circuit.

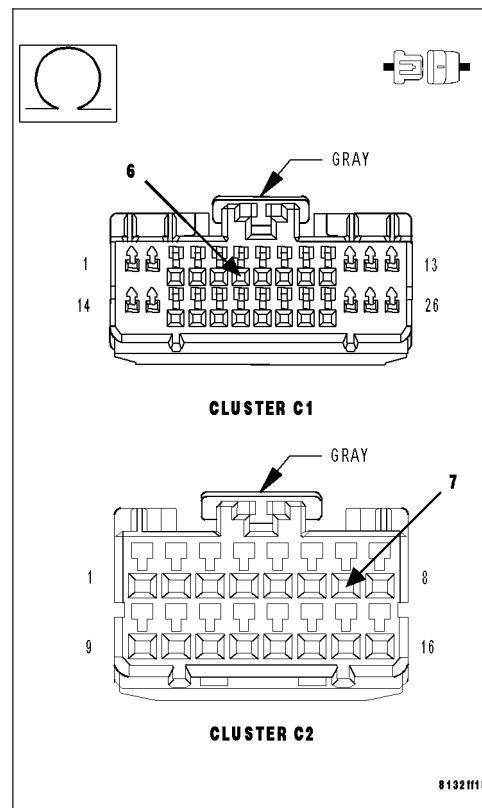
**Is the resistance below 10000.0 ohms?**

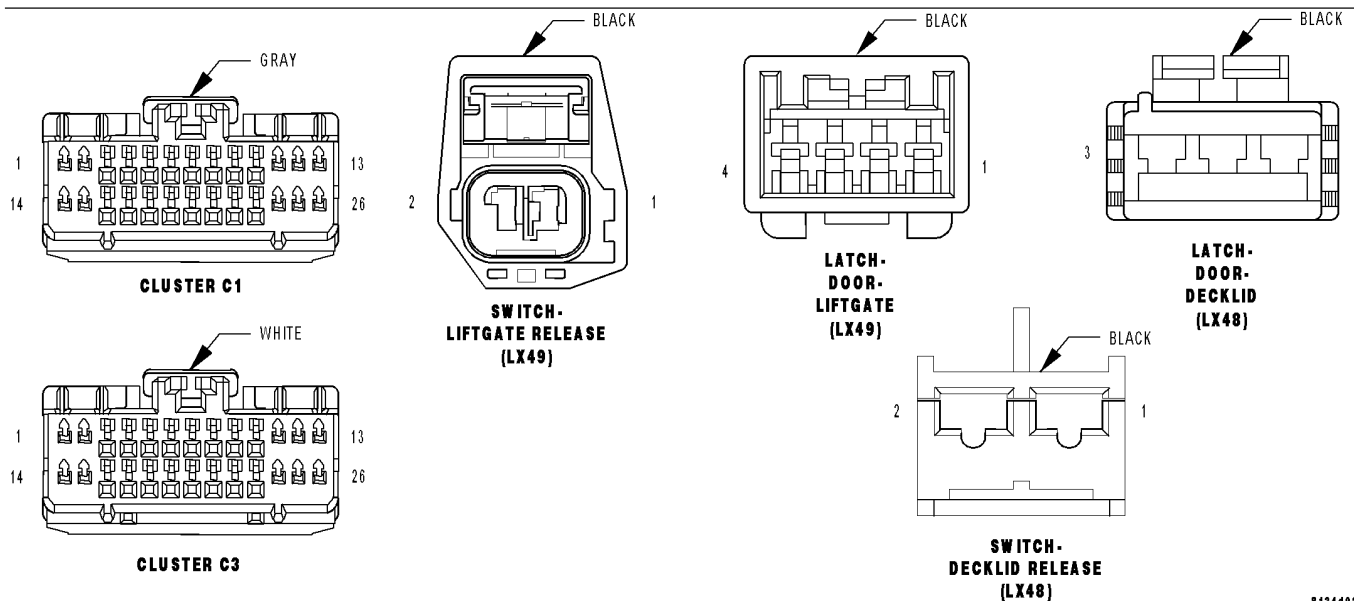
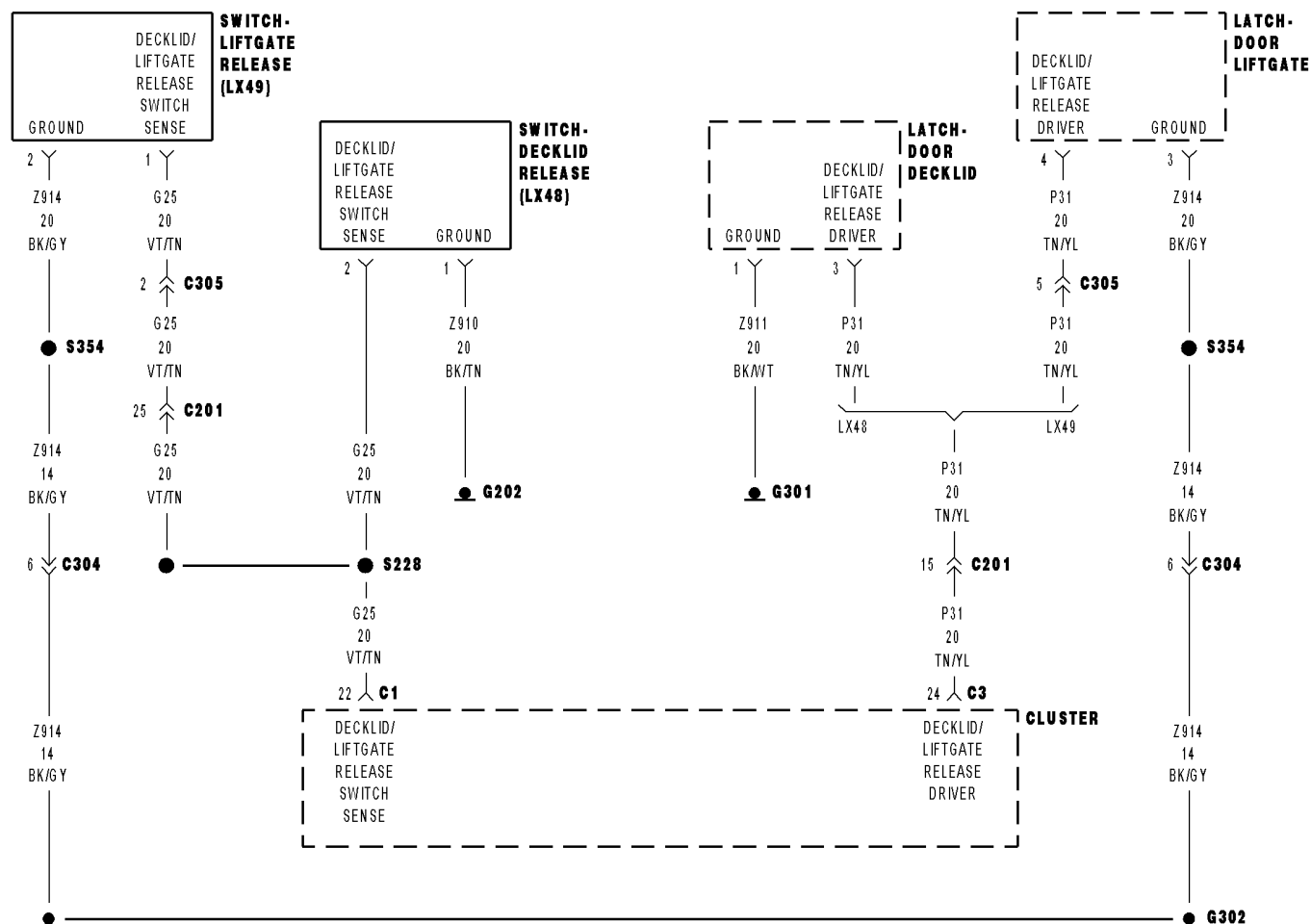
**Yes** >> Repair the (G160) Passenger Door Lock Switch Mux circuit for a short to the (P37) Passenger Door Lock Switch Return circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Instrument Cluster.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**\*DECKLID/LIFTGATE RELEASE INOPERATIVE**

**\*DECKLID/LIFTGATE RELEASE INOPERATIVE (CONTINUED)**

For the Power Door Lock circuit diagram(Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(P31) DECKLID/LIFTGATE RELEASE DRIVER CIRCUIT SHORT TO GROUND (P31) DECKLID/LIFTGATE RELEASE DRIVER CIRCUIT SHORT TO VOLTAGE (P31) DECKLID/LIFTGATE RELEASE DRIVER CIRCUIT OPEN DECKLID/LIFTGATE RELEASE GROUND CIRCUIT OPEN (G25) DECKLID/LIFTGATE RELEASE SWITCH SENSE CIRCUIT SHORT TO GROUND (G25) DECKLID/LIFTGATE SWITCH SENSE CIRCUIT OPEN DECKLID OR LIFTGATE SWITCH GROUND CIRCUIT OPEN DECKLID OR LIFTGATE SWITCH INOPERATIVE DECKLID OR LIFTGATE LATCH INOPERATIVE INSTRUMENT CLUSTER

**Diagnostic Test****1. DECKLID/LIFTGATE OPERATIONAL FROM RKE ONLY**

**Is the Decklid Or Liftgate operational from the RKE only?**

**No** >> Go To 2

**Yes** >> Go To 7

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**\*DECKLID/LIFTGATE RELEASE INOPERATIVE (CONTINUED)****2. DECKLID OR LIFTGATE LATCH INOPERATIVE**

**Note: Ensure all fuses are good before proceeding.**

Disconnect the liftgate or decklid latch connector.

Connect a test light between the (P31) Decklid/Liftgate Release Driver circuit and the Ground circuit.

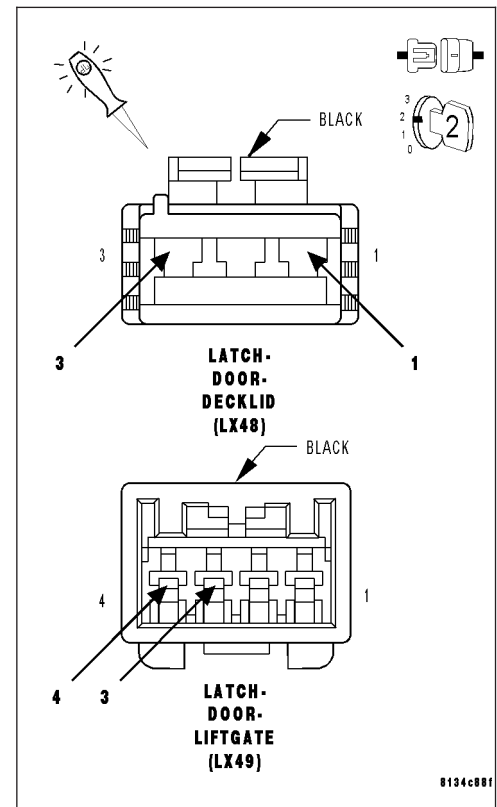
Turn the ignition on.

Operate the decklid or liftgate and observe the test light.

**Does the testlight illuminate brightly for approximately 300 ms. when the decklid or liftgate is operated?**

**Yes** >> Replace the Decklid or Liftgate Latch.  
Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.

**No** >> Go To 3

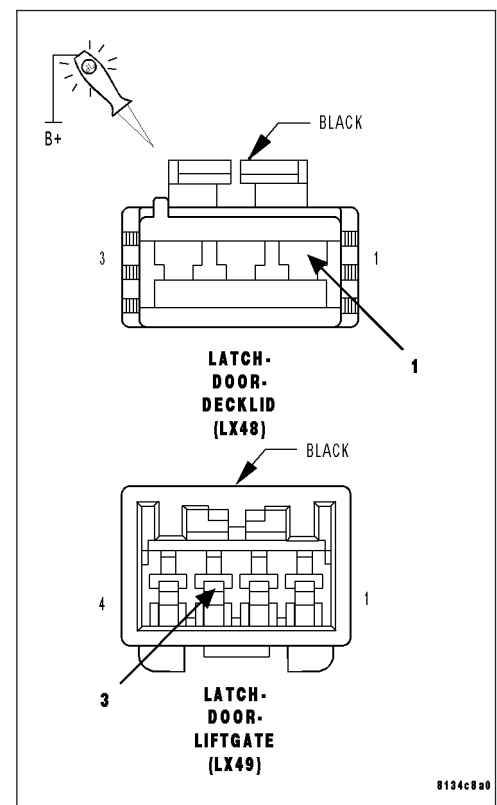
**3. OPEN GROUND CIRCUIT.**

Using a 12-volt test light connected to 12-volts, check the Ground circuit in the latch connector.

**Does the test light illuminate brightly?**

**No** >> Repair the Ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.

**No** >> Go To 4



**\*DECKLID/LIFTGATE RELEASE INOPERATIVE (CONTINUED)****4. (P31) DECKLID/LIFTGATE RELEASE DRIVER CIRCUIT SHORT TO GROUND.**

Turn the ignition off.

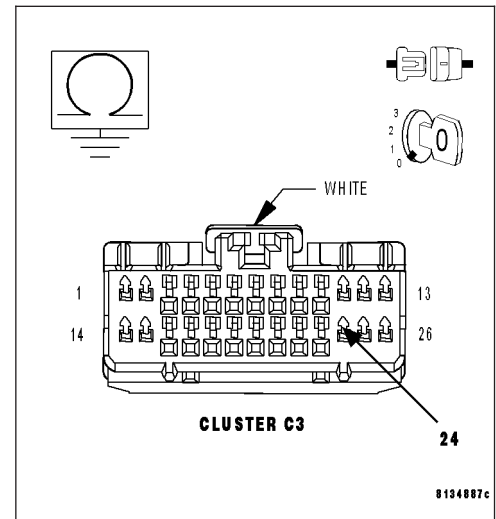
Disconnect the Cluster C3 connector.

Measure the resistance between Ground and the (P31) Decklid/Liftgate Release Driver circuit.

**Is the resistance below 1000.0 ohms?**

**Yes** >> Repair the (P31) Decklid/Liftgate Release Driver circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. (P31) DECKLID/LIFTGATE RELEASE DRIVER CIRCUIT SHORT TO VOLTAGE.**

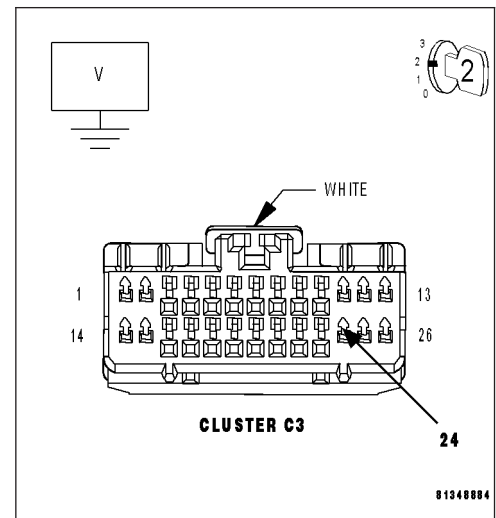
Turn the ignition on.

Measure the voltage between Ground and the (P31) Decklid/Liftgate Release Driver circuit.

**Is there any voltage present?**

**Yes** >> Repair the (P31) Decklid/Liftgate Release Driver circuit for a short to voltage.  
Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.

**No** >> Go To 6





**\*DECKLID/LIFTGATE RELEASE INOPERATIVE (CONTINUED)****6. (P31) DECKLID/LIFTGATE RELEASE DRIVER CIRCUIT OPEN.**

Turn the ignition off.

Measure the resistance of the (P31) Decklid/Liftgate Release Driver circuit between the Latch connector and the Cluster C3 connector.

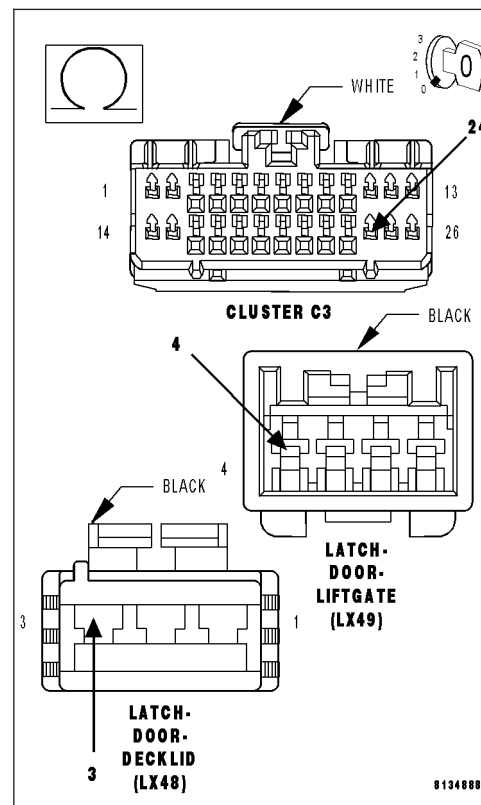
**Is the resistance below 5.0 ohms?**

**No** >> Repair the (P31) Decklid/Liftgate Release Driver circuit for an open.

Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.

**Yes** >> Replace the Instrument Cluster.

Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.

**7. IS THIS VEHICLE A 4 DOOR SEDAN?**

**Is this vehicle a 4 door sedan?**

**Yes** >> Go To 8

**No** >> Go To 12

**8. DECKLID SWITCH INOPERATIVE.**

**Note: Ensure the Decklid Latch is connected before proceeding.**

Disconnect the Decklid Release Switch connector.

Turn the Ignition On.

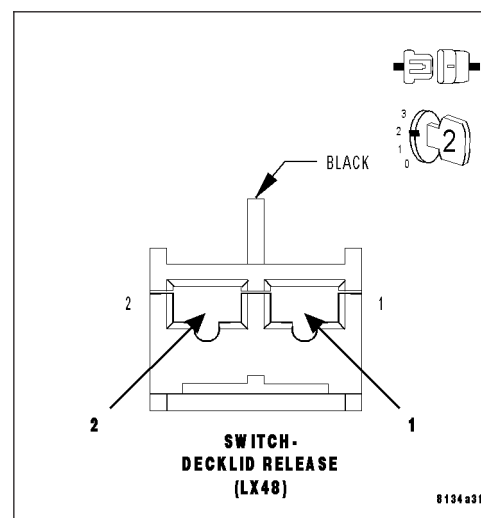
Momentarily connect a jumper wire between the (G25) Decklid/Liftgate Release Switch Sense circuit and the Ground circuit.

**Did the decklid open?**

**Yes** >> Replace the decklid switch.

Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.

**No** >> Go To 9



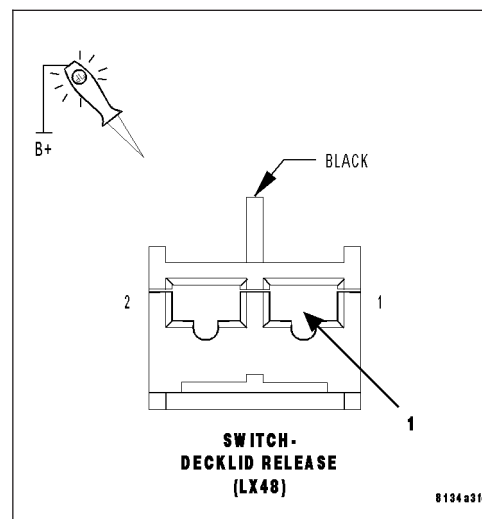
**\*DECKLID/LIFTGATE RELEASE INOPERATIVE (CONTINUED)****9. SWITCH GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check the Ground circuit.

**Does the test light illuminate brightly?**

**No** >> Repair the Ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.

**Yes** >> Go To 10

**10. (P25) DECKLID/LIFTGATE RELEASE SWITCH SENSE CIRCUIT SHORT TO GROUND.**

Turn the ignition off.

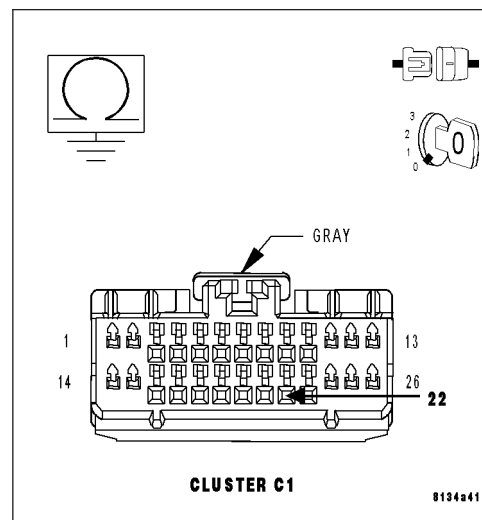
Disconnect the Cluster C1 connector.

Measure the resistance between Ground and the (G25) Decklid/Liftgate Release Switch sense circuit.

**Is the resistance below 1000.0 ohms?**

**Yes** >> Repair the (G25) Decklid/Liftgate Release Switch Sense circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.

**No** >> Go To 11



**\*DECKLID/LIFTGATE RELEASE INOPERATIVE (CONTINUED)****11. (P25) DECKLID/LIFTGATE RELEASE SWITCH SENSE CIRCUIT OPEN.**

Measure the resistance of the (G25) Decklid/Liftgate Release Switch sense circuit between the Switch connector and the Cluster C1 connector.

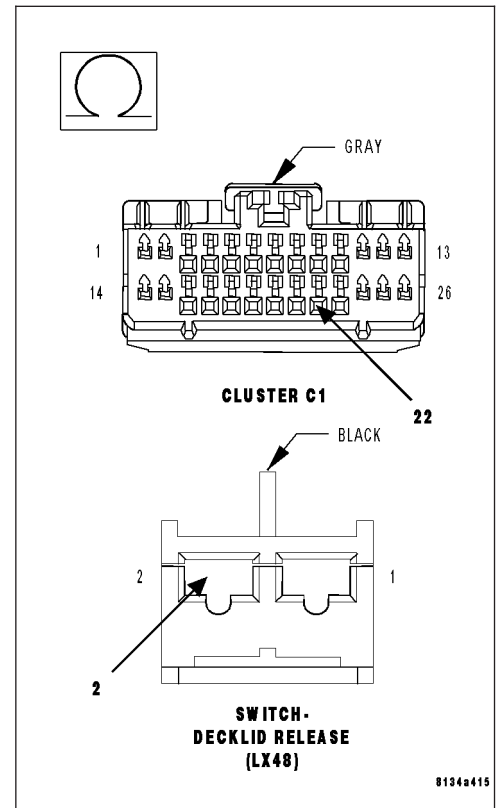
**Is the resistance below 5.0 ohms?**

**No** >> Repair the (G25) Decklid/Liftgate Release Switch Sense circuit for an open.

Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.

**Yes** >> Replace the Instrument Cluster

Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.

**12. LIFTGATE SWITCH INOPERATIVE.**

Turn the Ignition Off.

Disconnect the Liftgate Release Switch connector.

Connect an ohmmeter between the terminals of the switch connector (Switch Side).

Press and hold the switch closed while measuring the resistance of the switch.

**Is the resistance approximately 4700.0 ohms?**

**No** >> Replace the liftgate switch.

Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.

**Yes** >> Go TO 13

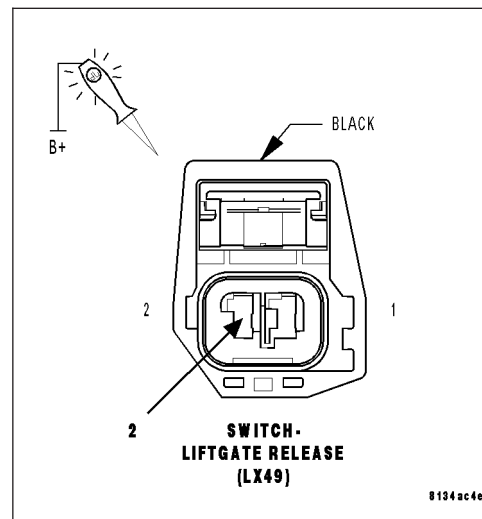
**\*DECKLID/LIFTGATE RELEASE INOPERATIVE (CONTINUED)****13. SWITCH GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12-volts, check the Ground circuit in the Liftgate Release Switch harness connector..

**Does the test light illuminate brightly?**

**No** >> Repair the Ground circuit for an open. Perform BODY VERIFICATION TEST - VER 1 (Refer to BODY VERIFICATION TEST - VER 1.

**Yes** >> Go To 14

**14. (P25) DECKLID/LIFTGATE RELEASE SWITCH SENSE CIRCUIT SHORT TO GROUND.**

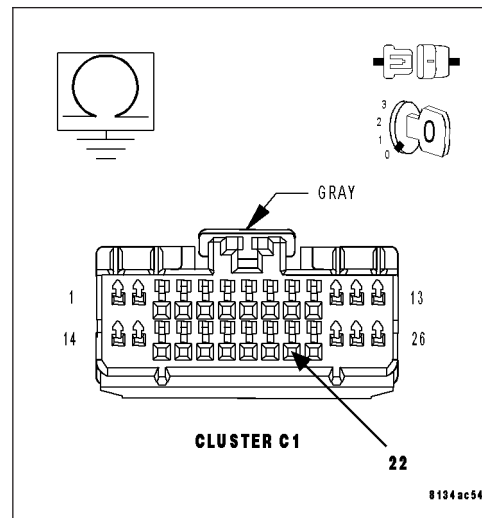
Disconnect the Cluster C1 connector.

Measure the resistance between Ground and the (G25) Decklid/Liftgate Release Switch sense circuit.

**Is the resistance below 1000.0 ohms?**

**Yes** >> Repair the (G25) Decklid/Liftgate Release Switch Sense circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1 (Refer to BODY VERIFICATION TEST - VER 1.

**No** >> Go To 11



**\*DECKLID/LIFTGATE RELEASE INOPERATIVE (CONTINUED)****15. (P25) DECKLID/LIFTGATE RELEASE SWITCH SENSE CIRCUIT OPEN.**

Measure the resistance of the (G25) Decklid/Liftgate Release Switch sense circuit between the Switch connector and the Cluster C1 connector.

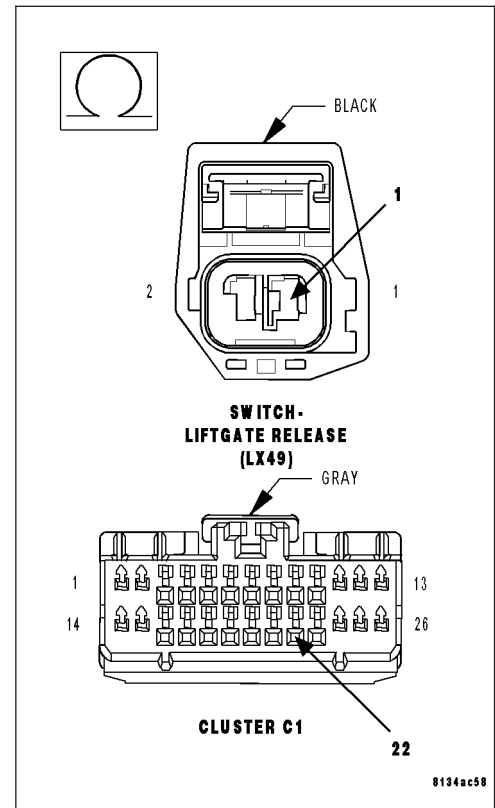
**Is the resistance below 5.0 ohms?**

**No** >> Repair the (G25) Decklid/Liftgate Release Switch Sense circuit for an open.

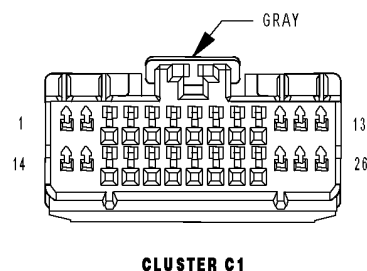
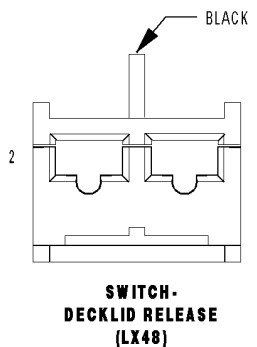
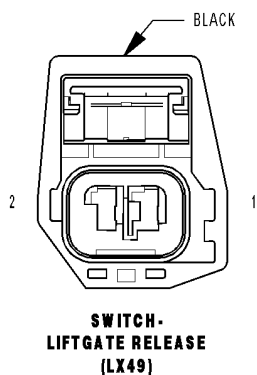
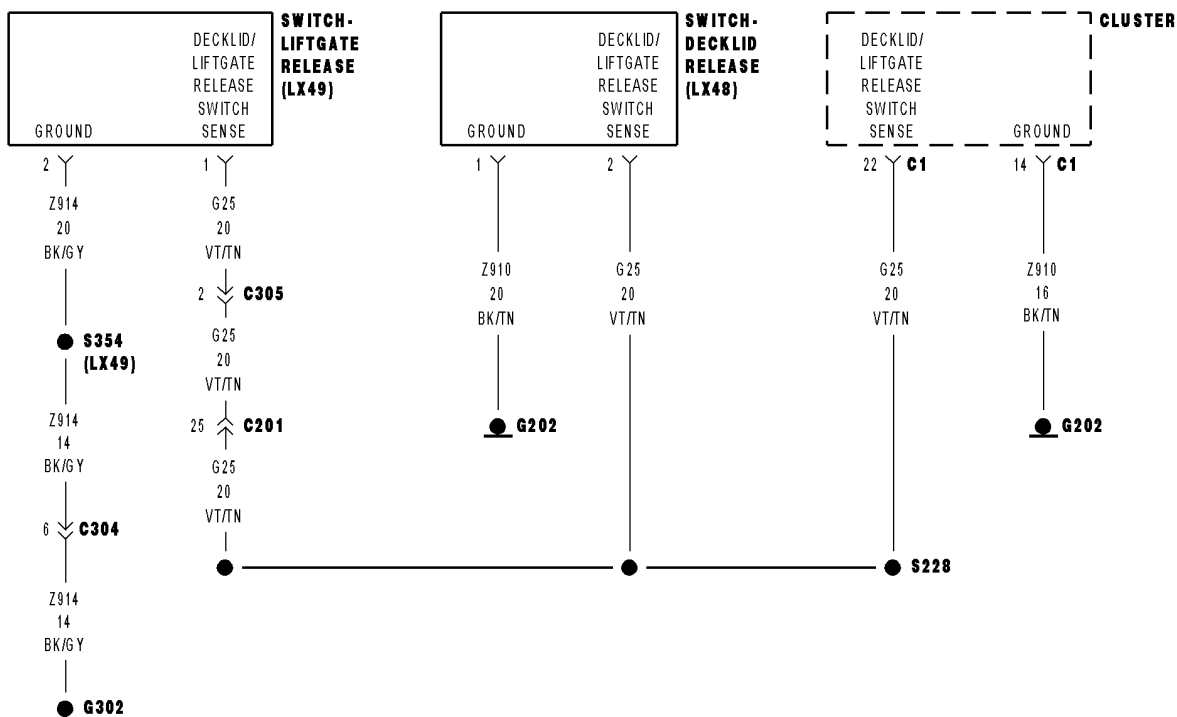
Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.

**Yes** >> Replace the Instrument Cluster

Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.



## B1826-TRUNK RELEASE SWITCH INPUT CIRCUIT LOW



**B1826-TRUNK RELEASE SWITCH INPUT CIRCUIT LOW (CONTINUED)**

For the Power Door Lock circuit diagram(Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the module is awake
- **Set Condition:**  
When the (G25) Decklid/Liftgate Release Switch Sense circuit is shorted low for over 30 seconds.

Possible Causes
(G25) DECKLID/LIFTGATE RELEASE SWITCH SENSE CIRCUIT SHORT TO GROUND DECKLID OR LIFTGATE SWITCH SHORTED TO GROUND INSTRUMENT CLUSTER

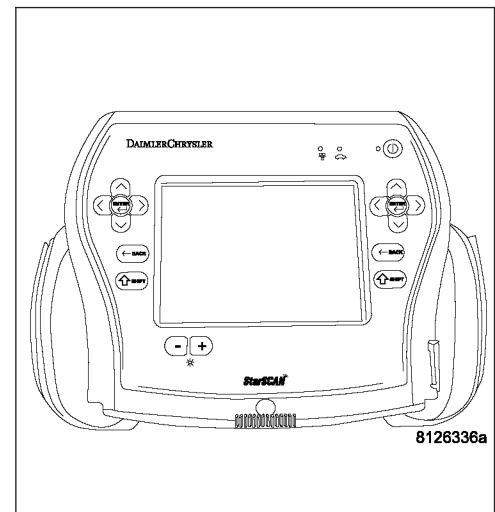
**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase DTC's  
Operate the Decklid or Liftgate Switch several times.  
Turn the ignition on and wait 30 seconds.  
With the scan tool, read DTC's.

**Does the scan tool display B1826-TRUNK RELEASE SWITCH INPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST – VER 1).



**B1826-TRUNK RELEASE SWITCH INPUT CIRCUIT LOW (CONTINUED)****2. TRUNK SWITCH SHORTED**

Disconnect the Decklid or Liftgate Release Switch connector.

With the scan tool, record and erase DTC's

Cycle the ignition from on to off 3 times.

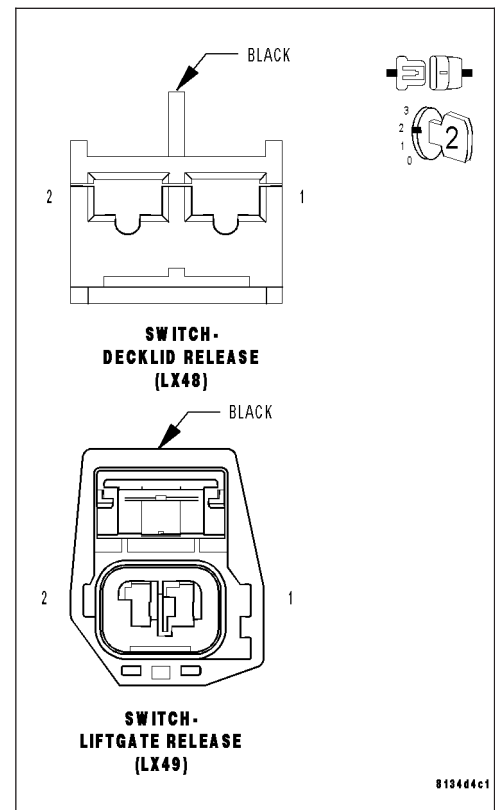
Turn the ignition on.

With the scan tool, read DTC's.

**Does the scan tool display B1826-TRUNK RELEASE SWITCH INPUT CIRCUIT LOW?**

**No** >> Replace the decklid or liftgate switch.  
Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Go To 3

**3. (P25) DECKLID/LIFTGATE RELEASE SWITCH SENSE CIRCUIT SHORT TO GROUND.**

Turn the ignition off.

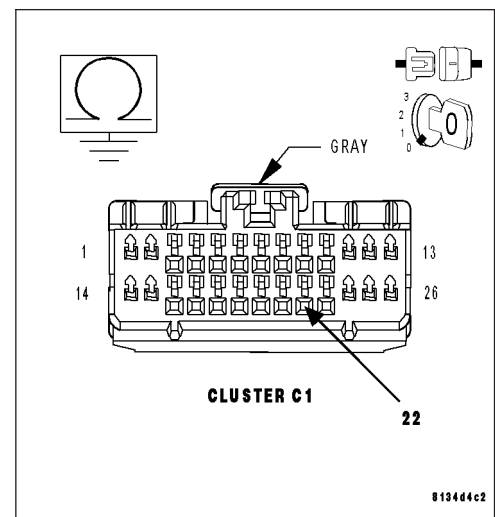
Disconnect the Cluster C1 connector.

Measure the resistance between Ground and the (G25) Decklid/Liftgate Release Switch sense circuit.

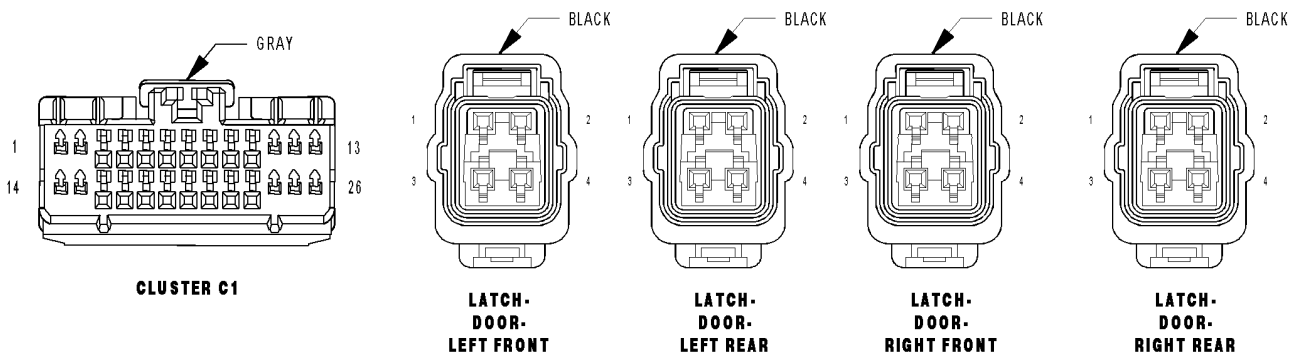
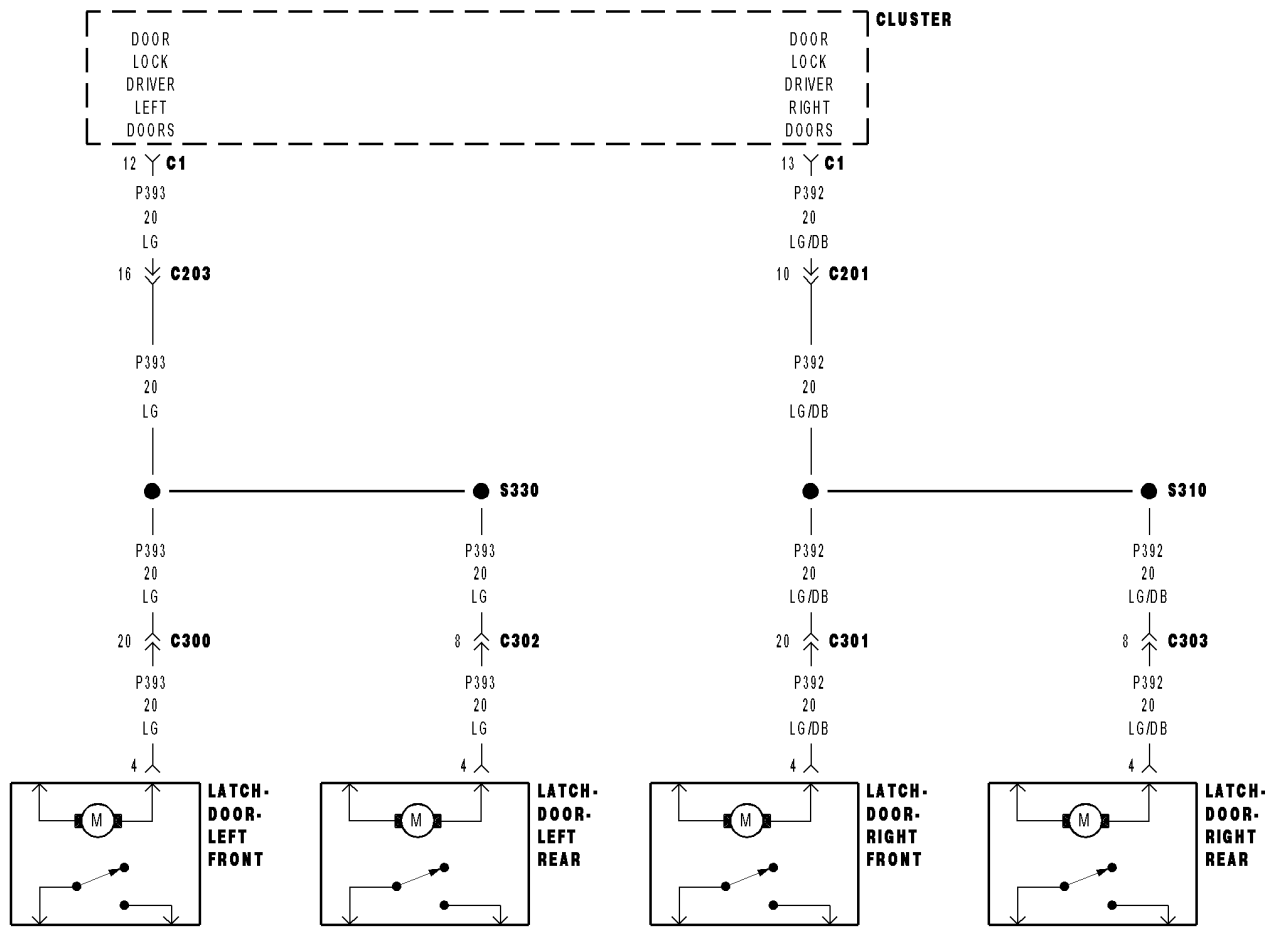
**Is the resistance below 1000.0 ohms?**

**Yes** >> Repair the (G25) Decklid/Liftgate Release Switch Sense circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Instrument Cluster  
Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1).





**\*ALL DOORS FAIL TO LOCK**

**\*ALL DOORS FAIL TO LOCK (CONTINUED)**

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The Door Lock Driver Right Doors circuit and the Door Lock Driver Left Doors circuits are connected together inside the Cluster. Therefore either circuit shorted will affect all door locks. Depending on where the short is, some doors may lock.

Possible Causes
(P392) DOOR LOCK DRIVER RIGHT DOORS CIRCUIT SHORT TO GROUND
(P393) DOOR LOCK DRIVER LEFT DOORS CIRCUIT SHORT TO GROUND
CLUSTER

**Diagnostic Test****1. CHECK FOR DOOR LOCK DTC'S**

Turn the ignition on.

With the scan tool, record and erase DTC's.

Turn the ignition off, wait 10 seconds then turn the ignition on.

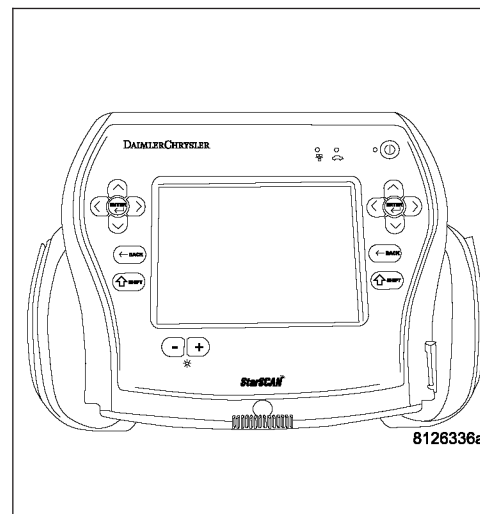
Try to operate the door locks several times.

With the scan tool, read active DTC's.

**Does the scan tool display any Door Lock System DTC's?**

**No** >> Go To 2

**Yes** >> Refer to symptom list for problems related to POWER DOOR LOCKS.



**\*ALL DOORS FAIL TO LOCK (CONTINUED)****2. CHECK (P392) DOOR LOCK DRIVER RIGHT DOORS CIRCUIT FOR A SHORT TO GROUND**

**Note:** If only one motor is inoperative when the door locks are actuated, disconnect that motor and retest to see if the other doors lock properly. If they do, replace the defective motor.

**Note:** Ensure the door lock inhibit (key in ignition) and the door ajar systems are operating properly before proceeding. These systems affect the door lock locking functions if they are not working as they should.

Turn the ignition off.

Disconnect the Cluster C1 connector.

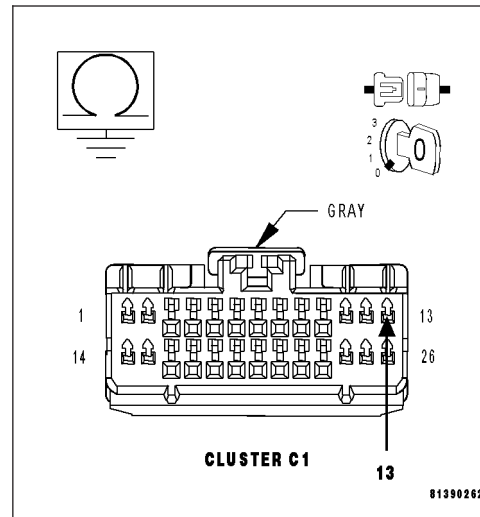
Measure the resistance between ground and the (P392) Door Lock Driver Right Doors circuit.

**Is the resistance below 1000.0 ohms?**

**No** >> Go To 3

**Yes** >> Repair the (P392) Door Lock Driver Right Doors circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**3. CHECK (P393) DOOR LOCK DRIVER LEFT DOORS CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (P393) Door Lock Driver Left Doors circuit.

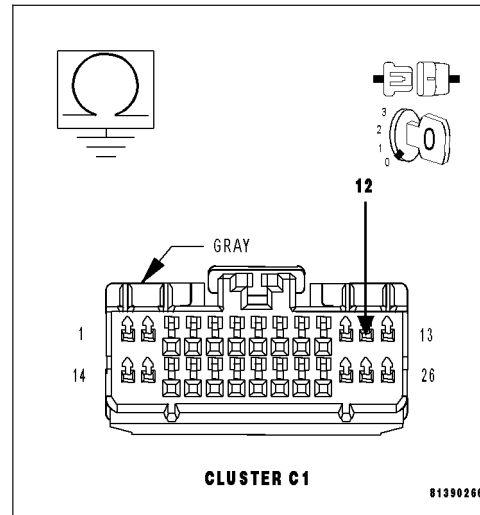
**Is the resistance below 1000.0 ohms?**

**No** >> Replace the Cluster in accordance with service information.

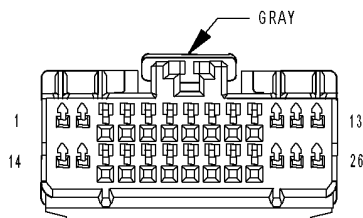
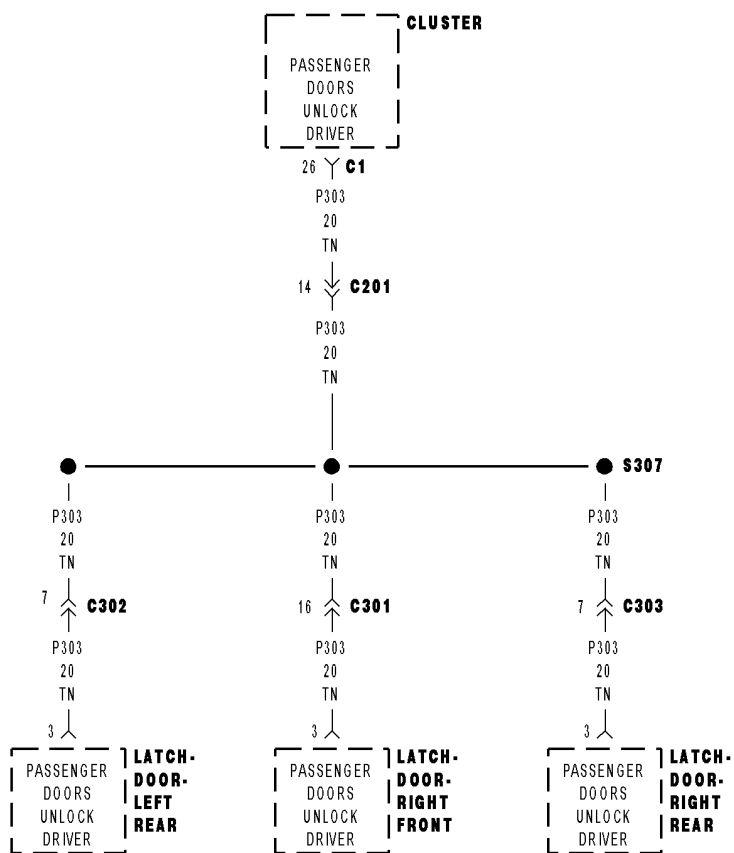
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Repair the (P393) Door Lock Driver Left Doors circuit for a short to ground.

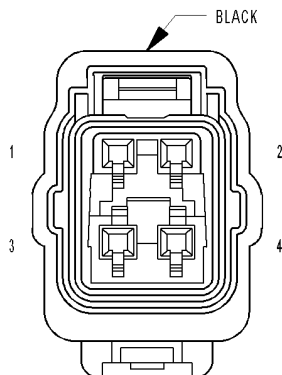
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



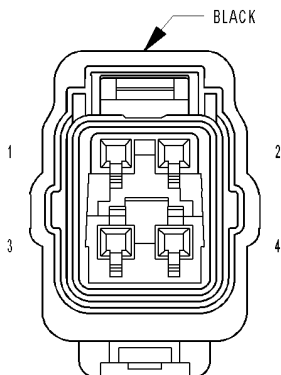
# \*PASSENGER DOORS FAIL TO UNLOCK



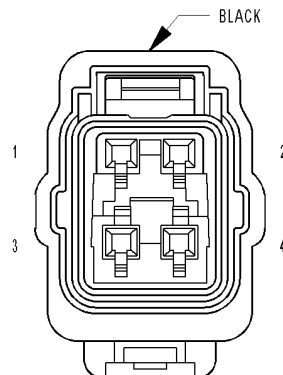
**CLUSTER C1**



**LATCH-  
DOOR-  
LEFT  
REAR**



**LATCH-  
DOOR-  
RIGHT  
FRONT**



**LATCH-  
DOOR-  
RIGHT  
REAR**

**\*PASSENGER DOORS FAIL TO UNLOCK (CONTINUED)**

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(P303) PASSENGER DOORS UNLOCK DRIVER CIRCUIT SHORT TO GROUND CLUSTER

**Diagnostic Test**

**1. (P303) PASSENGER DOORS UNLOCK DRIVER CIRCUIT SHORT TO GROUND**

**Note:** If only one motor fails to unlock when the door locks are actuated, disconnect that motor and retest to see if the other doors unlock properly. If they do, replace the defective motor.

Turn the ignition off.

Disconnect the Cluster C1 connector.

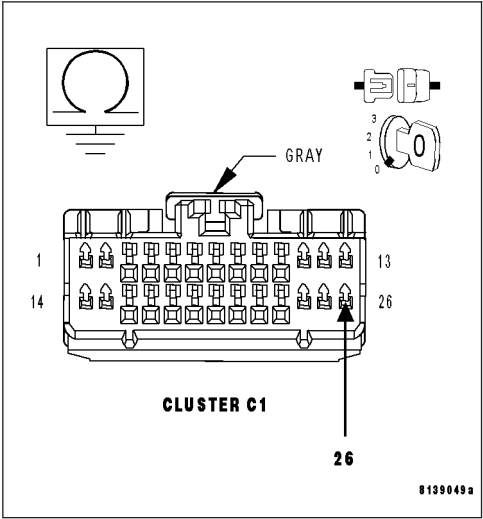
Measure the resistance between ground and the (P303) Passenger Doors Unlock Driver circuit.

**Is the resistance below 1000.0 ohms?**

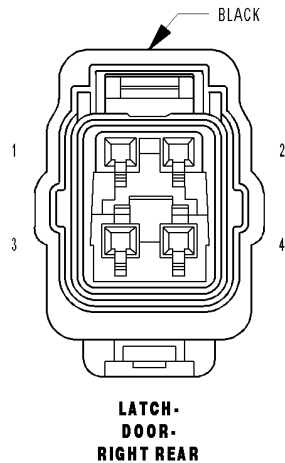
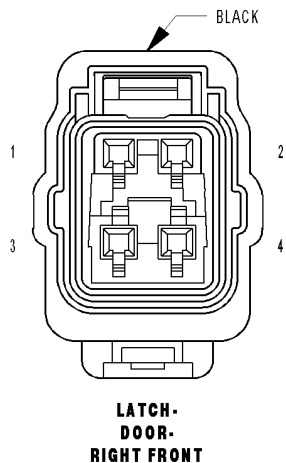
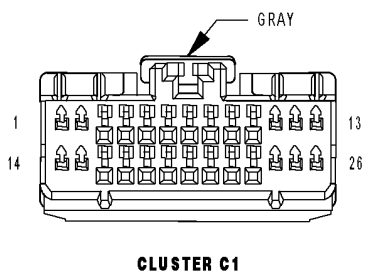
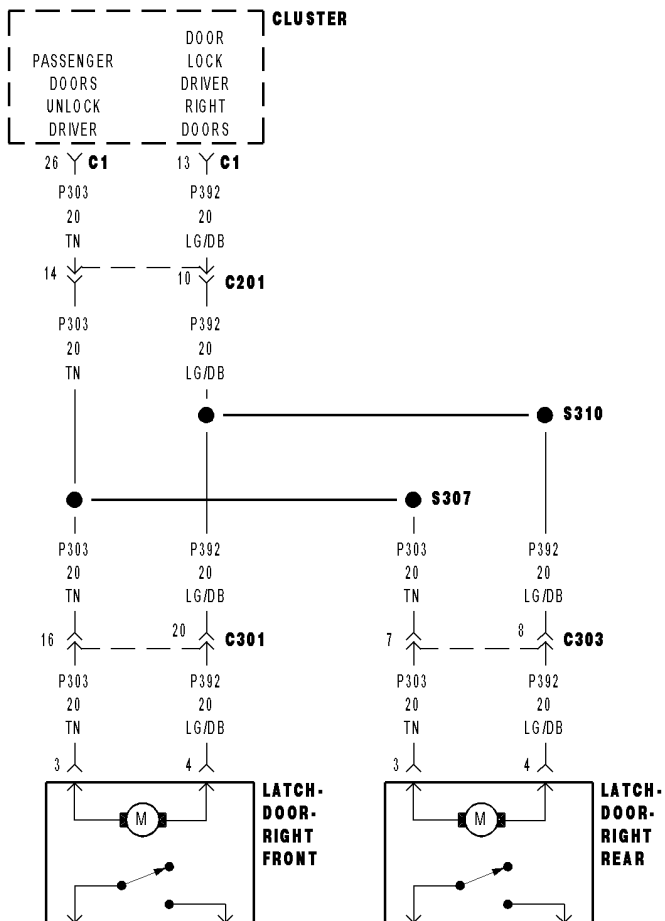
- No

>> Replace the Cluster in accordance with service information.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.
- Yes

>> Repair the (P303) Passenger Doors Unlock Driver circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**\*RIGHT DOOR LOCKS INOPERATIVE**



**\*RIGHT DOOR LOCKS INOPERATIVE (CONTINUED)**

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(P392) DOOR LOCK DRIVER RIGHT DOORS CIRCUIT OPEN (P303) PASSENGER DOOR UNLOCK DRIVER CIRCUIT OPEN CLUSTER

**Diagnostic Test**

**1. CHECK (P392) DOOR LOCK DRIVER RIGHT DOORS CIRCUIT FOR AN OPEN**

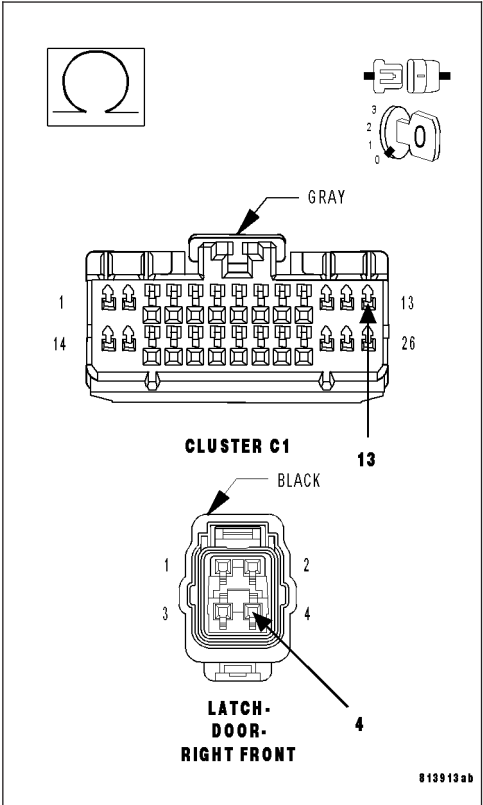
**Note:** Graphics show Right Front Latch, Right Rear is similar.

Turn the ignition off.  
Remove either right door inner trim panels to gain access to the door latch connector.  
Disconnect the Right Door Latch connector.  
Disconnect the Instrument Cluster C1 connector.  
Measure the resistance of the (P392) Door Lock Driver Right Doors circuit between the Cluster C1 connector and the Right Door Latch connector.

- Is the resistance below 2.0 ohms?
- Yes

>> Go To 2
- No

>> Repair the (P392) Door Lock Driver Right Doors circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**\*RIGHT DOOR LOCKS INOPERATIVE (CONTINUED)****2. CHECK (P303) PASSENGER DOORS UNLOCK DRIVER CIRCUIT FOR AN OPEN**

Measure the resistance of the (P303) Passenger Doors Unlock Driver circuit.

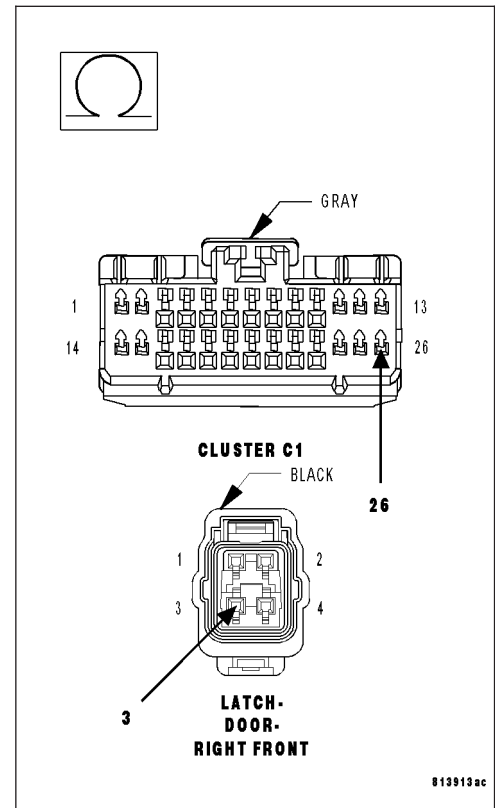
**Is the resistance below 2.0 ohms?**

**Yes** >> Replace the Cluster in accordance with service information.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

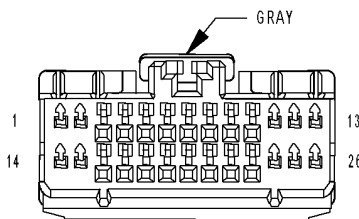
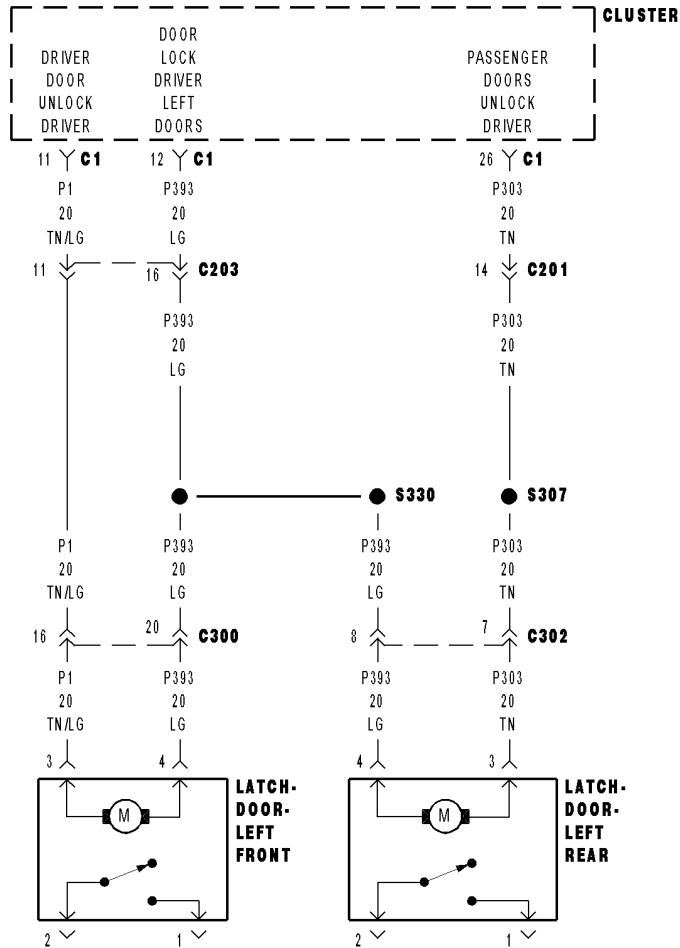
**No** >> Repair the (P303) Passenger Doors Unlock Driver circuit for an open.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

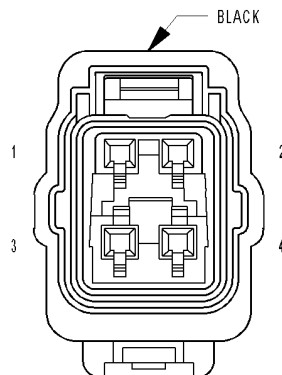




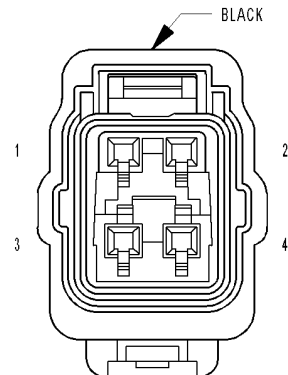
# \*LEFT DOOR LOCKS INOPERATIVE



**CLUSTER C1**



**LATCH-DOOR-LEFT FRONT**



**LATCH-DOOR-LEFT REAR**

**\*LEFT DOOR LOCKS INOPERATIVE (CONTINUED)**

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(P393) DOOR LOCK DRIVER LEFT DOORS CIRCUIT OPEN (P303) PASSENGER DOOR UNLOCK DRIVER CIRCUIT OPEN CLUSTER

**Diagnostic Test****1. CHECK (P393) DOOR LOCK DRIVER LEFT DOORS CIRCUIT FOR AN OPEN**

Turn the ignition off.

Remove the left door door inner trim panel to gain access to the door latch connector.

Disconnect the Left Rear Door Latch connector.

Disconnect the Instrument Cluster C1 connector.

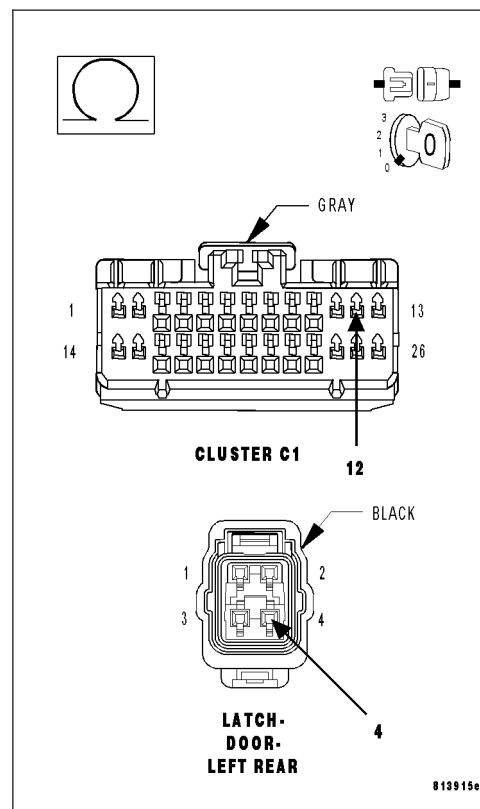
Measure the resistance of the (P393) Door Lock Driver Left Doors circuit between the Cluster C1 connector and the Left Rear Door Latch connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 2

**No** >> Repair the (P393) Door Lock Driver Left Doors circuit for an open.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

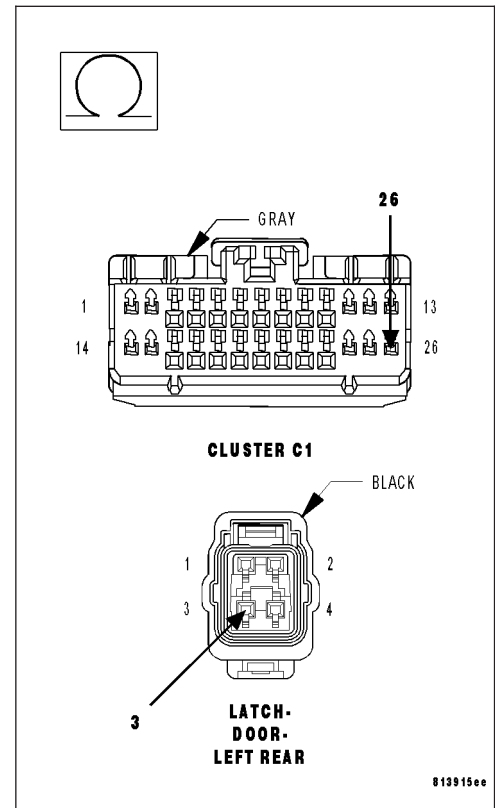


**\*LEFT DOOR LOCKS INOPERATIVE (CONTINUED)****2. CHECK (P303) PASSENGER DOORS UNLOCK DRIVER CIRCUIT FOR AN OPEN**

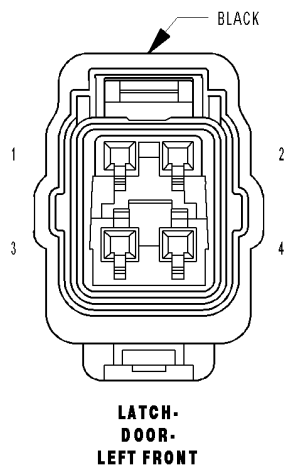
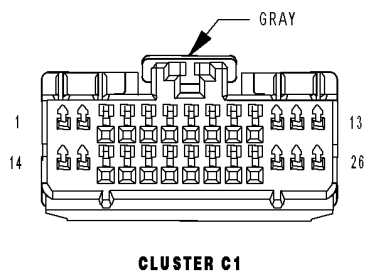
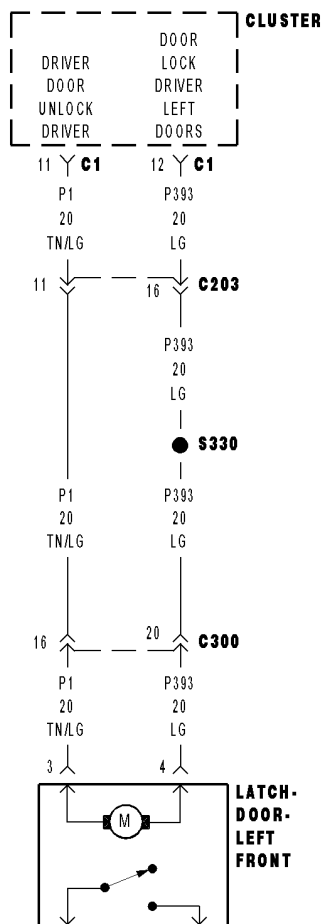
Measure the resistance of the (P303) Passenger Doors Unlock Driver circuit between the Cluster C1 connector and the Left Rear Door Latch connector.

**Is the resistance below 2.0 ohms?**

- Yes** >> Replace the Cluster in accordance with service information.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.
- No** >> Repair the (P303) Passenger Doors Unlock Driver circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**\*DRIVER DOOR LOCK INOPERATIVE**



**\*DRIVER DOOR LOCK INOPERATIVE (CONTINUED)**

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(P393) DOOR LOCK DRIVER LEFT DOORS CIRCUIT OPEN (P393) DOOR LOCK DRIVER LEFT DOORS CIRCUIT SHORT TO GROUND (P1) DRIVER DOOR UNLOCK DRIVER CIRCUIT OPEN (P1) DRIVER DOOR UNLOCK DRIVER CIRCUIT SHORT TO GROUND DRIVER DOOR LATCH CLUSTER

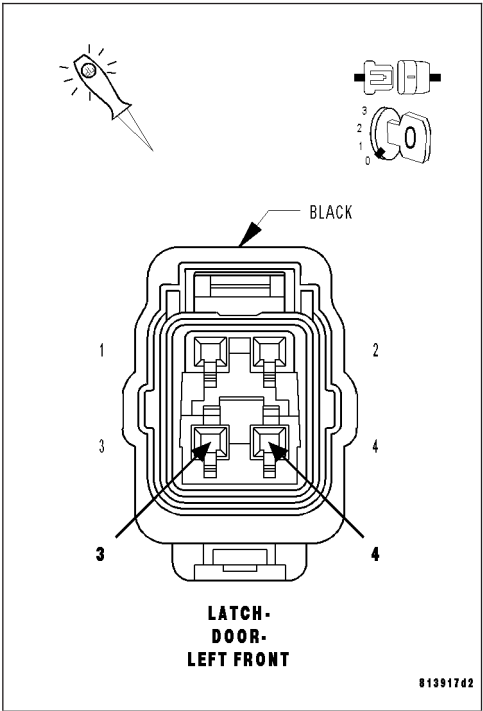
**Diagnostic Test**

**1. DRIVER DOOR LATCH INOPERATIVE**

Disconnect the Driver Door Latch connector.  
Connect a test light between the (P393) Door Lock Driver Left Doors circuit and the (P1) Driver Door Unlock Driver circuit.  
Close the front doors or trip the door latches to the closed position.  
Operate the door locks in both positions and observe the test light.

**Does the test light illuminate brightly for approximately 300 ms. when the door locks are actuated?**

- Yes**    >> Replace the Driver Door Latch.  
          Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.
- No**      >> Go To 2



**\*DRIVER DOOR LOCK INOPERATIVE (CONTINUED)****2. CHECK (P1) DRIVER DOOR UNLOCK DRIVER CIRCUIT FOR AN OPEN**

Disconnect the Cluster C1 connector.

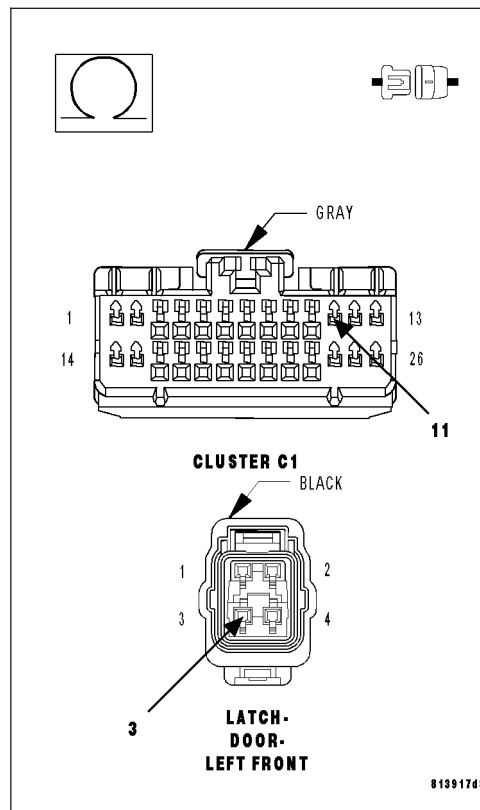
Measure the resistance of the (P1) Driver Door Unlock Driver circuit between the Latch connector and the Cluster C1 connector.

**Is the resistance below 2.0 ohms?**

**No** >> Repair the (P1) Driver Door Unlock Driver circuit for an open.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 3

**3. CHECK (P1) DRIVER DOOR UNLOCK DRIVER CIRCUIT FOR A SHORT TO GROUND**

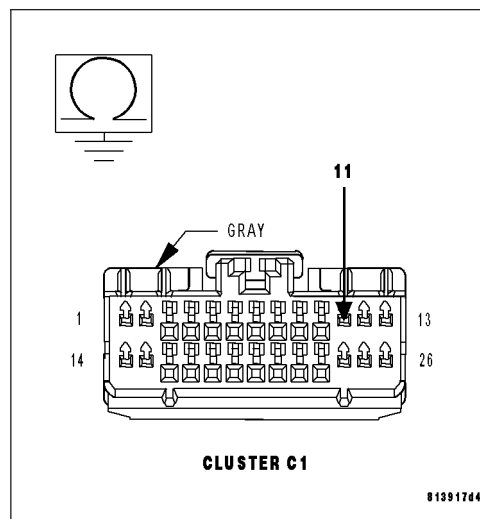
Measure the resistance between Ground and the (P1) Driver Door Unlock Driver circuit.

**Is the resistance below 1000.0 ohms?**

**Yes** >> Repair the (P1) Driver Door Unlock Driver circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



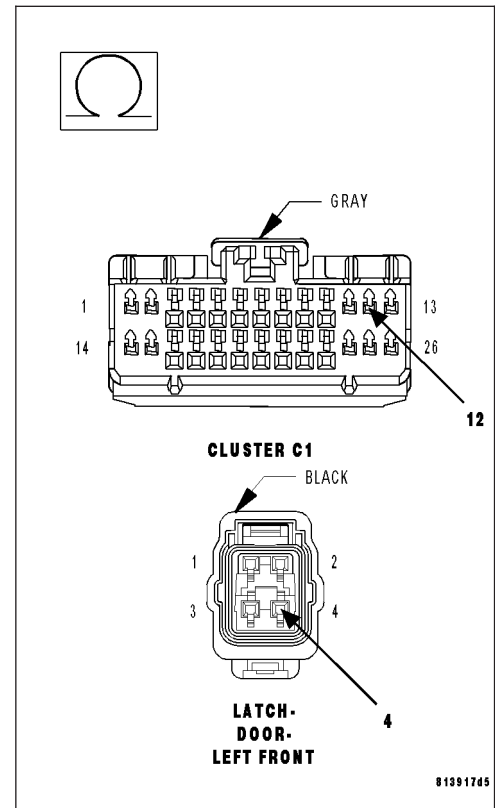
**\*DRIVER DOOR LOCK INOPERATIVE (CONTINUED)****4. CHECK (P393) DOOR LOCK DRIVER LEFT DOORS CIRCUIT FOR AN OPEN**

Measure the resistance of the (P393) Door Lock Driver Left Doors circuit between the Cluster C1 connector and the Driver Door Latch connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the (P393) Door Lock Driver Left Doors circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**5. CHECK (P393) DOOR LOCK DRIVER LEFT DOORS CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between Ground and the (P393) Door Lock Driver Left Doors circuit.

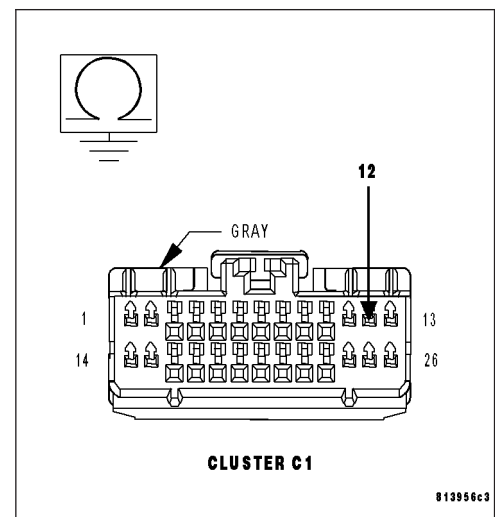
**Is the resistance below 1000.0 ohms?**

**Yes** >> Repair the (P393) Door Lock Driver Left Doors circuit for a short to ground.

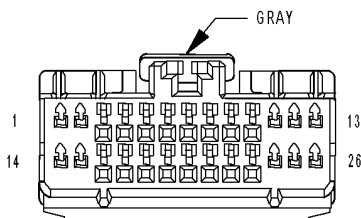
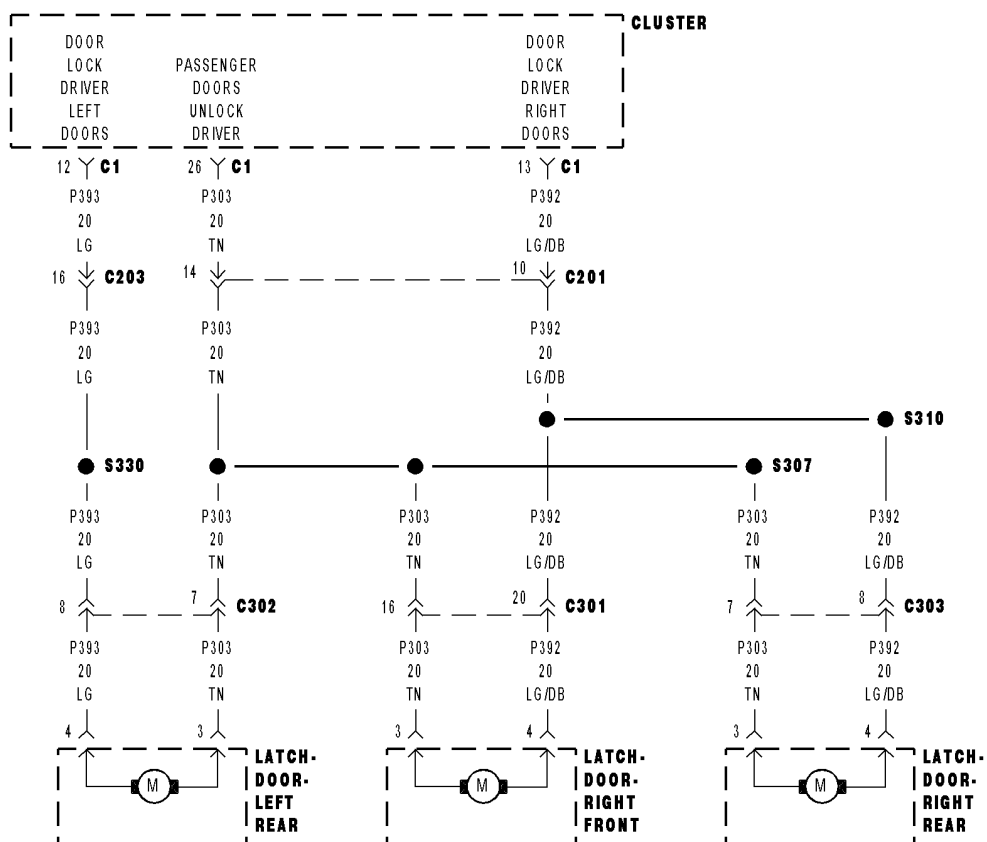
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Instrument Cluster in accordance with service information.

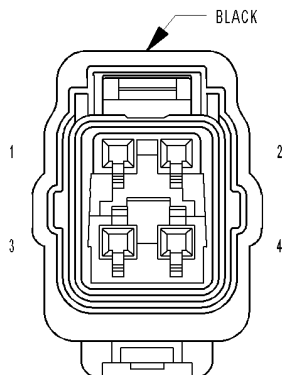
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



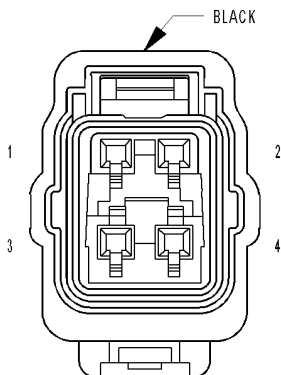
**\*ONE PASSENGER DOOR LOCK INOPERATIVE**



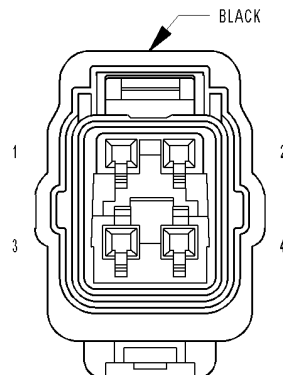
**CLUSTER C1**



**LATCH-DOOR-LEFT REAR**



**LATCH-DOOR-RIGHT FRONT**



**LATCH-DOOR-RIGHT REAR**



**\*ONE PASSENGER DOOR LOCK INOPERATIVE (CONTINUED)**

For the Power Door Lock circuit diagram (Refer to 8 - ELECTRICAL/POWER LOCKS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(P392) OR (P393) DOOR LOCK DRIVER CIRCUIT OPEN
(P392) OR (P393) DOOR LOCK DRIVER CIRCUIT SHORT TO GROUND
(P303) PASSENGER DOOR UNLOCK DRIVER CIRCUIT OPEN
(P303) PASSENGER DOOR UNLOCK DRIVER CIRCUIT SHORT TO GROUND
DOOR LATCH

**Diagnostic Test**

**1. PASSENGER DOOR LATCH INOPERATIVE**

**Note:** Graphics show Right Front Latch but the other 2 passenger latches are similar.

Turn the ignition off.

Disconnect the inoperative Passenger Door latch connector.

Connect a test light between the (P392/3) Door Lock Driver circuit and the (P303) Passenger Door Unlock Driver circuit.

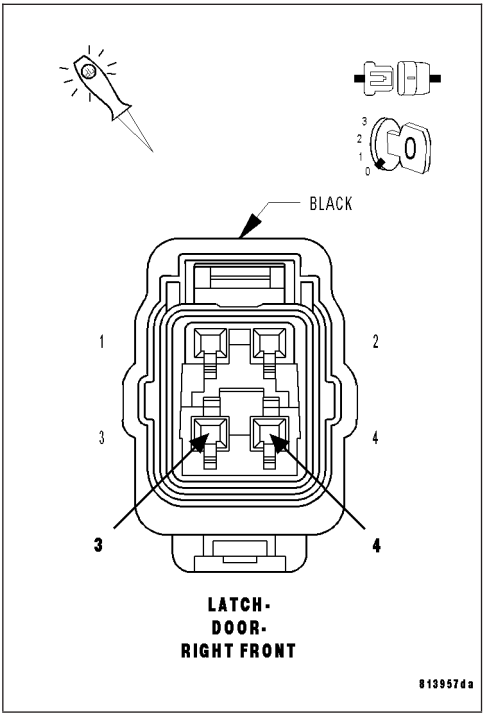
Close the front doors or trip the door latches to the closed position.

Operate the door locks in both positions and observe the test light.

**Does the test light illuminate brightly for approximately 300 ms. when the door locks are actuated?**

**Yes**    >> Replace the Passenger Door Latch.  
          Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1.

**No**    >> Go To 2



**\*ONE PASSENGER DOOR LOCK INOPERATIVE (CONTINUED)****2. CHECK (P303) PASSENGER DOOR UNLOCK DRIVER CIRCUIT FOR AN OPEN**

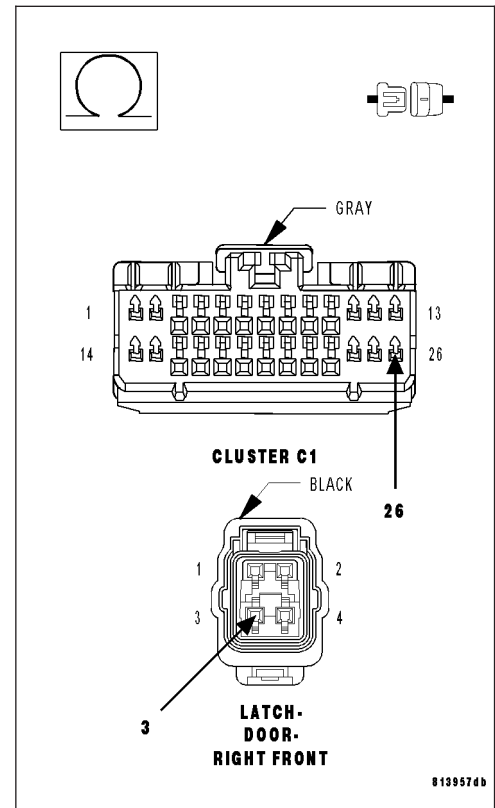
Disconnect the Cluster C1 connector.

Measure the resistance of the (P303) Passenger Door Unlock Driver circuit between the Latch connector and the Cluster C1 connector.

**Is the resistance below 2.0 ohms?**

**No** >> Repair the (P303) Passenger Door Unlock Driver circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 3

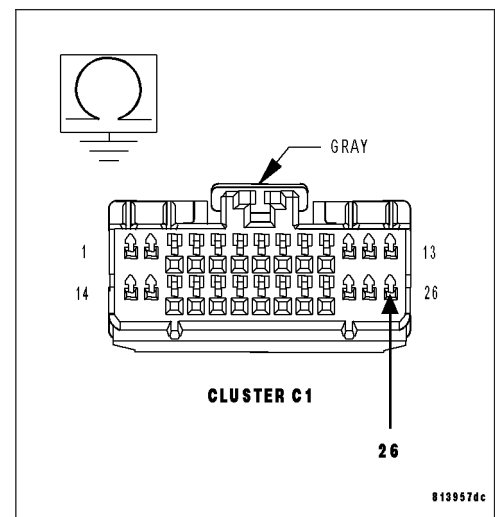
**3. CHECK (P303) PASSENGER DOOR UNLOCK DRIVER CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between Ground and the (P303) Passenger Door Unlock Driver circuit.

**Is the resistance below 1000.0 ohms?**

**Yes** >> Repair the (P303) Passenger Door Unlock Driver circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4

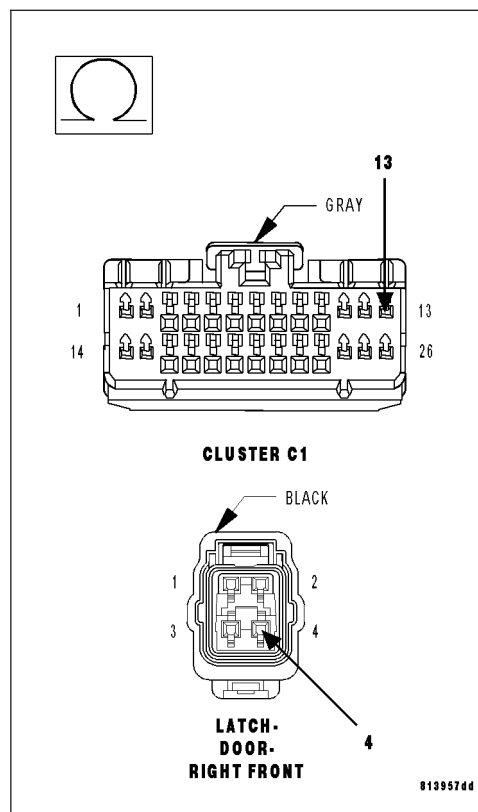


**\*ONE PASSENGER DOOR LOCK INOPERATIVE (CONTINUED)****4. CHECK (P392/3) DOOR LOCK DRIVER CIRCUIT FOR AN OPEN**

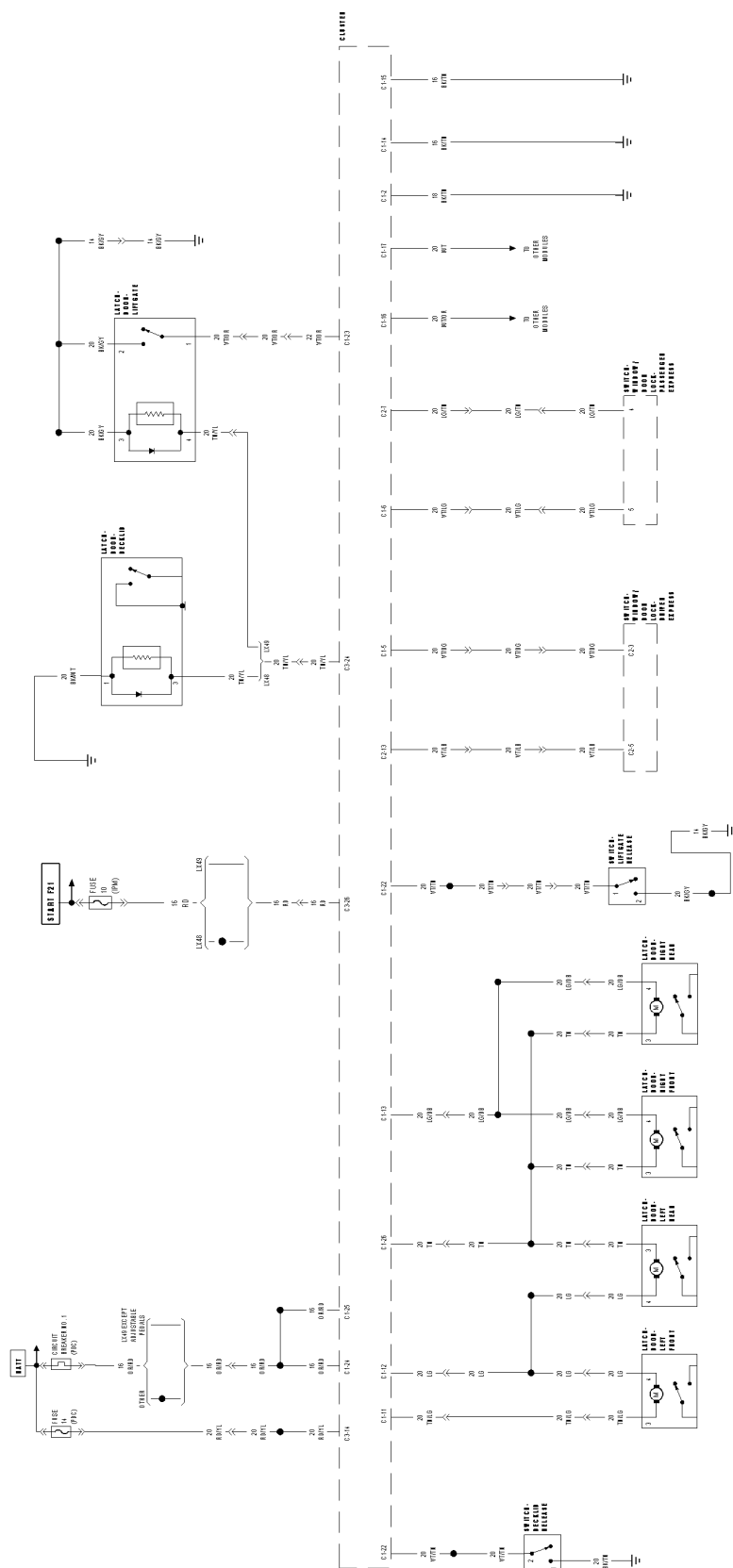
Measure the resistance of the (P392/3) Door Lock Driver circuit between the Cluster C1 connector and the Passenger Door Latch connector.

**Is the resistance below 2.0 ohms?**

- Yes** >> Repair the (P392/3) Door Lock Driver circuit for a short to ground.
- No** >> Repair the (P392/3) Door Lock Driver circuit for an open. Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



## SCHEMATICS AND DIAGRAMS



8134C249

POWER LOCKS

POWER LOCKS - SERVICE INFORMATION

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POWER LOCKS - SERVICE INFORMATION

DESCRIPTION

POWER LOCKS

The power lock system allows all of the doors and liftgate to be locked or unlocked electrically by operating a switch on either front door trim panel. The power lock system receives non-switched battery current through a fuse in the Junction Block (JB), so that the power locks remain operational, regardless of the ignition switch position.

The instrument cluster locks the doors automatically when the vehicle is driven beyond the speed of 25.7 Km/h (15 mph), all doors are closed, and the accelerator pedal is depressed. The rolling door lock feature can be disabled through the EVIC.

This vehicle also offers several customer programmable features, which allows the selection of several optional electronic features to suit individual preferences.

The power lock system for this vehicle can also be operated remotely using the Remote Keyless Entry (RKE) transmitters.

CENTRAL LOCKING/UNLOCKING

- The central locking system controls powered operation of the door and liftgate locks and the illuminated entry system. Central locking included the following features:
- Automatic locking of the doors and liftgate when the vehicle speed exceeds approximately 25 km/h (15 mph).
  - Locking prevention with a door lock switch or the RKE transmitter if the key is in the ignition switch and the driver's door is open.
  - Driver selectable unlocking mode: Unlock only the driver's door or all doors and the liftgate with one press of the RKE transmitter unlock button. The driver's door cylinder can also be used to unlock the door. One turn of the cylinder will unlock the driver's door, two turns within 5 seconds will unlock all doors.
  - Automatic illumination of interior courtesy lamps when the vehicle is unlocked.
  - Locking all doors and the liftgate by pressing the lock button on the RKE transmitter, or by pressing a lock switch on one of the front doors.

## DOOR LOCK MOTORS

The lock mechanisms are actuated by a reversible electric motor mounted within each door. The power lock motors are integral to the door latch units.

The power lock motors cannot be adjusted or repaired. If inoperative or damaged, the door latch unit must be replaced.

## REMOTE KEYLESS ENTRY

The Remote Keyless Entry (RKE) system locks and unlocks the doors and liftgate, turns on interior lamps, and arms and disarms the Vehicle Theft Security System (if equipped). The RKE system operates on non-switched battery current through a fuse in the Integrated Power Module (IPM), so that the system remains operational, regardless of the ignition switch position.

The RKE transmitters are also equipped with a Panic button. If the Panic button on the RKE transmitter is depressed, the horn will sound and the exterior lights will flash on the vehicle for about three minutes, or until the Panic button is depressed a second time. A vehicle speed of about 25.7 kilometers-per-hour (15 miles-per-hour) will also cancel the panic event.

The RKE system can also perform other functions on this vehicle. If the vehicle is equipped with the optional Vehicle Theft Security System (VTSS), the RKE transmitter will arm the VTSS when the Lock button is depressed, and disarm the VTSS when the Unlock button is depressed.

The RKE system includes two transmitters when the vehicle is shipped from the factory, but the system can retain the vehicle access codes of up to a total of eight transmitters. The transmitter codes are retained in the RKE module memory, even if the battery is disconnected. If an RKE transmitter is faulty or lost, new transmitter vehicle access codes can be programmed into the system using a scan tool.

This vehicle also offers several customer programmable features, which allows the selection of several optional electronic features to suit individual preferences. Customer programmable feature options affecting the RKE system include:

- **Remote Unlock Sequence** - Allows the option of having only the driver side front door unlock when the RKE transmitter Unlock button is depressed the first time. The remaining doors unlock when the button is depressed a second time within 5 seconds of the first unlock press. Another option is having all doors and liftgate unlock upon the first depression of the RKE transmitter Unlock button.
- **Sound Horn on Lock** - Allows the option of having the horn sound a short chirp as an audible verification that the RKE system received a valid Lock request from the RKE transmitter, or having no audible verification.
- **Flash Lights with Lock and Unlock** - Allows the option of having the park lamps flash as an optical verification that the RKE system received a valid Lock request or Unlock request from the RKE transmitter, or having no optical verification.
- **Programming Additional Transmitters** - Allows up to a total of eight transmitter vehicle access codes to be stored in the receiver memory.

Certain functions and features of the RKE system rely upon resources shared with other electronic modules in the vehicle over the CAN data bus network. For diagnosis of these electronic modules or of the data bus network, the use of a scan tool and the appropriate diagnostic information are required.

## OPERATION

### POWER LOCKS

The instrument cluster locks or unlocks the doors when an actuation input signal from a door lock switch or Remote Keyless Entry (RKE) transmitter is received. The instrument cluster turns on the output drivers and provides a voltage level to the door lock motor for a specified time. All passenger doors can be locked or unlocked using a mechanical button mounted on the door trim panel. The drivers door can be locked or unlocked by using the key cylinder.

## DOOR LOCK MOTORS

The door lock motors are controlled by the instrument cluster. A positive and negative battery connection to the two motor terminals will cause the motor to move in one direction. Reversing the current will cause the motor to move in the opposite direction.

## REMOTE KEYLESS ENTRY

- **LOCK:** Pressing the LOCK button locks all doors, sounds horn (chirp) once if enabled, flashes the park lamps once if enabled, and arms the Vehicle Theft Security System (VTSS), if enabled. The chirp verifies that the instrument cluster has sent a message for door lock operation. If a door has not been closed before pressing the LOCK button, the vehicle may not be secured and the VTSS (if equipped) will not arm until the door is closed.
- **UNLOCK:** Pressing the UNLOCK button once will unlock the driver's door first if enabled, flashes the park lamps twice if enabled, activates the illuminated entry system, and disarms the Vehicle Theft Security System (VTSS), if equipped. Pressing the UNLOCK button twice within five seconds will unlock all doors, if driver's door first is enabled.
- **PANIC:** Pressing the PANIC button sounds the horns at half second intervals, flashes the exterior lamps, and turns ON the interior lamps. The panic alarm will remain on for three minutes, or until the PANIC button is actuated again or the vehicle speed exceeds 25.7 Km/h (15 mph) will cancel the panic event.

## DIAGNOSIS AND TESTING

### POWER LOCKS

The most reliable, efficient, and accurate means to diagnose the power lock system requires the use of a scan tool and the proper Diagnostic Procedures information.

Refer to the appropriate wiring information.

Following are tests that will help to diagnose the hard wired components and circuits of the power lock system. However, these tests may not prove conclusive in the diagnosis of this system. In order to obtain conclusive testing of the power lock system, the CAN data bus network must be checked.

### PRELIMINARY DIAGNOSIS

As a preliminary diagnosis for the power lock system, note the system operation while you actuate both the Lock and Unlock functions with the power lock switches and with the Remote Keyless Entry (RKE) transmitter. Then, proceed as follows:

- If the entire power lock system fails to function with either the power lock switches or the RKE transmitter, check the fuse in the Junction Block (JB).
- If the power lock system functions with both power lock switches, but not with the RKE transmitter, proceed to diagnosis of the Remote Keyless Entry (RKE) system.
- If the power lock system functions with the RKE transmitter, but not with one or both power lock switches, proceed to diagnosis of the door lock switches.
- If the driver side power lock switch operates only the driver side front door power lock motor, but all other power lock motors operate with the passenger side power lock switch or the RKE transmitter, use a scan tool and the appropriate diagnostic information to diagnose the CAN data bus.
- If only one power lock motor fails to operate with both power lock switches and the RKE transmitter, use a scan tool and the appropriate diagnostic information to diagnose the CAN data bus.

## SWITCH-WINDOW/DOOR LOCK

### DESCRIPTION

A window/lock switch located in each front door trim panel. The driver's side window/lock switch includes the following:

- **Power Lock Switch** - A two-way, momentary, resistor multiplexed switch to control the power lock system.
- **Power Window Lockout Switch** - A two-way, latching, push-button switch allows the vehicle operator to lock out the power window switches on each passenger door so that the passenger door power windows may be operated only from the master switches.
- **Power Window Switches** - A two-way, momentary power window switch for the driver side front door also has a second detent in the Down direction and internal circuitry to provide an Auto-Down feature for the driver side front door power window. In addition to the power window switch for its own door, the window/lock switch houses individual master switches for each passenger door power window.

The passenger side window/lock switch includes the following:

- **Power Lock Switch** - A two-way, momentary, resistor multiplexed switch to control the power lock system.
- **Power Window Switch** - A two-way, momentary power window switch for the passenger side front door.

## OPERATION

The driver side window/lock switch combines a power lock switch, a driver power window switch with an Auto-down feature, master switches for each passenger door power window, a power window lockout switch, a power mirror selector switch, and four power mirror adjustment switches in a single assembly. The switches in the window/lock switch can be diagnosed using conventional diagnostic tools and methods.

### Power Lock Switch

The power lock switch circuitry is connected in series between ground and the driver door switch mux input of the instrument cluster (without memory). If equipped with the memory system, the circuitry is connected to the memory mirror module. Each power lock switch position (Lock, Unlock, and Neutral) provides a different resistance value to the instrument cluster or memory mirror input, which allows the instrument cluster or memory module to sense the switch position. Based upon the power lock switch input, the instrument cluster or memory module controls the battery and ground feed outputs to the individual power lock motors to lock or unlock the door latches. The Light-Emitting Diode (LED) in the power lock switch is connected to battery current through the power window circuit breaker in the Integrated Power Module (IPM) on a fused ignition switch output (run-acc) circuit so that the switch will be illuminated whenever the ignition switch is in the On or Accessory positions.

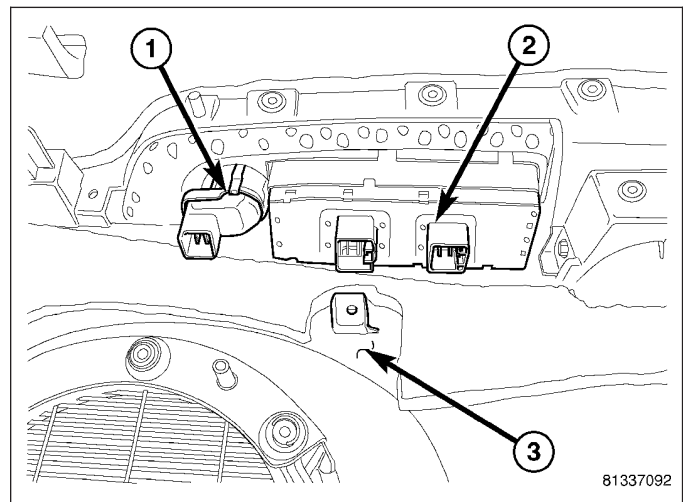
### Power Window Switches

The power window switch circuitry is connected to battery current through a circuit breaker in the Integrated Power Module (IPM) on a fused ignition switch output (run-acc) circuit so that the power windows will operate whenever the ignition switch is in the On or Accessory positions. Each two-way, momentary master passenger power window switch in the window/lock switch provides battery current and ground to the individual power window switches on each passenger door so that the power window switch controls the battery current and ground feeds to its respective power window motor. The switch for the driver side front door power window includes an auto-down feature. When this switch is depressed to a second momentary detent position and released, the driver door power window is automatically operated through an internal circuit and relay to its fully lowered position. The Auto-down event is cancelled if the switch paddle is depressed a second time in either the Up or Down direction. When the two position window lockout switch in the window/lock switch is depressed and latched in the lockout position, the battery current feed to each of the individual passenger power window switches is interrupted so that the passenger door power windows can only be operated from the switches in the window/lock switch. The window lockout switch also controls the battery current feed for the LED in each passenger power window switch so that the switch will not be illuminated when it is locked out.

## REMOVAL

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Disconnect and isolate the battery negative cable.
2. Remove the door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
3. Using a flat bladed tool, remove the window/lock switch (2) from the door trim panel.

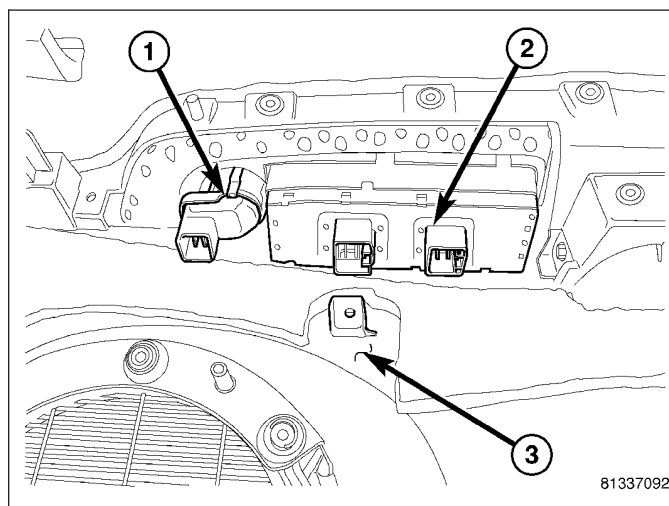




## INSTALLATION

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Install window/lock switch (2) to door trim panel and snap into place.
2. Install door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).
3. Connect battery negative cable.

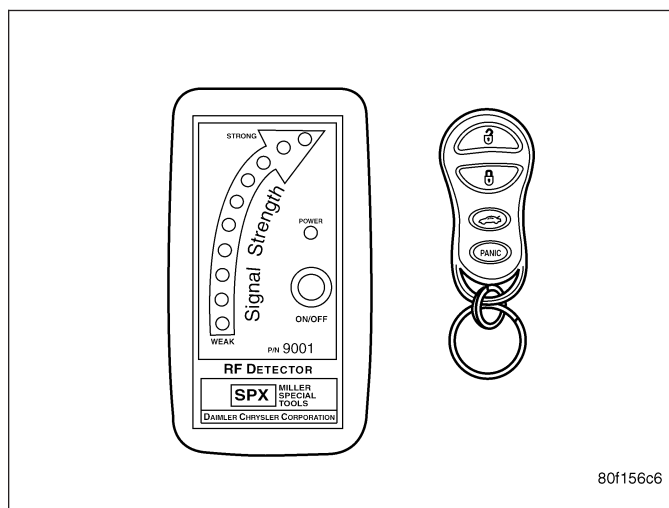


## REMOTE KEYLESS ENTRY TRANSMITTER

### DIAGNOSIS AND TESTING

#### REMOTE KEYLESS ENTRY TRANSMITTER

Using special tool 9001, first test to ensure that the transmitter is functioning. Typical testing distance is 2.5 centimeters (1 inch) for Asian transmitters and 30.5 centimeters (12 inches) for all others. To test, position the transmitter as shown. Press any transmitter button, then test each button individually. The tool will beep if a radio signal strength that lights five or more LED's is detected. Repeat this test three times. If transmitter fails any of the test refer to the proper Diagnostic Procedures information.



### STANDARD PROCEDURE

#### REMOTE KEYLESS ENTRY CUSTOMER PREFERENCES

##### HORN CHIRP DISABLING/ENABLING

The horn chirp can be toggled using a scan tool or by using the Remote Keyless Entry (RKE) transmitter.

To DISABLE (cancel) the horn chirp feature: With the ignition in the ON position, press and hold the transmitter LOCK button for four seconds. While pressing the LOCK button in, press the PANIC button within 6 seconds. Release both buttons when a single chime is heard.

To ENABLE the horn chirp feature, repeat the above procedure.

## UNLOCK SEQUENCE

The unlock sequence can be toggled using a scan tool or by using the following procedure.

1. Place the key in the ignition.
2. Within 10 seconds, cycle the key from the OFF position to the ON position four times, ending in the ON position (Do not start the engine).
3. Within 30 seconds, press the driver's door lock switch in the UNLOCK direction. A single chime will be heard to indicate the feature has been disabled.

This will toggle between Driver door first and Unlock all doors function.

To ENABLE this feature, repeat the above procedure.

## REMOTE KEYLESS ENTRY TRANSMITTER BATTERIES

The Remote Keyless Entry (RKE) transmitter case snaps open and shut for battery access. To replace the RKE transmitter batteries:

1. Using a trim stick or a thin coin, gently pry at the notch in the center seam of the RKE transmitter case halves located near the key ring until the two halves unsnap.
2. Lift the back half of the transmitter case off of the RKE transmitter.
3. Remove the two batteries from the RKE transmitter.
4. Replace the battery with a new CR2032. Be certain that the battery is installed with the polarity correctly oriented.
5. Align the two RKE transmitter case halves with each other, and squeeze them firmly and evenly together using hand pressure until they snap back into place.

## REMOTE KEYLESS ENTRY TRANSMITTER PROGRAMMING

If vehicle is not equipped with Sentry Key Theft Deterrent, new Remote Keyless Entry (RKE) transmitters can be programmed using a scan tool and the proper Diagnostic Procedures manual. If vehicle is equipped with Sentry Key Theft Deterrent, (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE).

## SPECIFICATIONS

### REMOTE KEYLESS ENTRY TRANSMITTER

Normal operation range is up to 20 meters (60 feet) of the vehicle. Range may be better or worse depending on the environment around the vehicle.

## POWER MIRRORS - ELECTRICAL DIAGNOSTICS

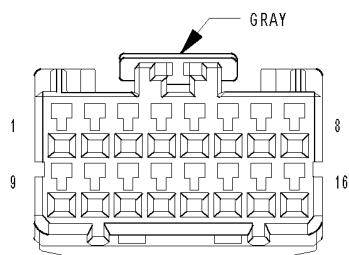
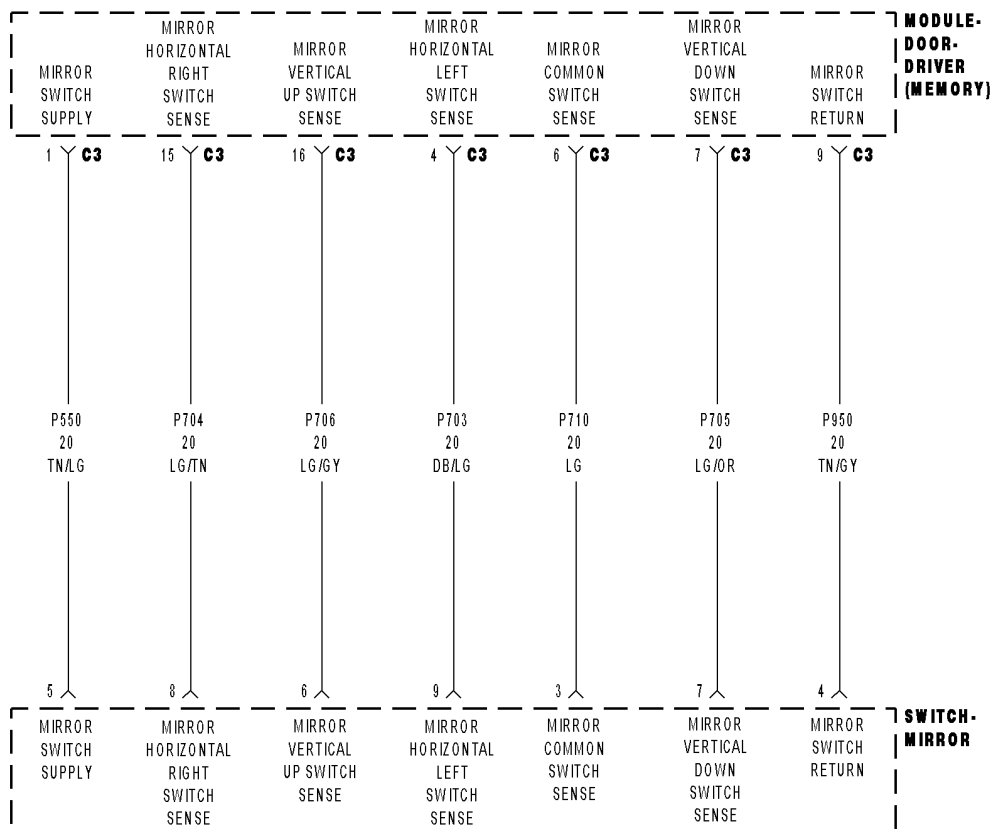
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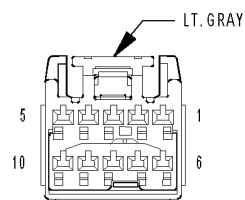
## POWER MIRRORS - ELECTRICAL DIAGNOSTICS

## DIAGNOSIS AND TESTING

# B1D04-MIRROR ADJUST SWITCH INPUT CIRCUIT/PERFORMANCE – DRIVER DOOR MODULE



**MODULE-  
DOOR-  
DRIVER C3  
(MEMORY)**



**SWITCH-  
MIRROR**

**B1D04-MIRROR ADJUST SWITCH INPUT CIRCUIT/PERFORMANCE – DRIVER DOOR MODULE (CONTINUED)**

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Continuously

- **Set Condition:**

When the Driver Door Module receives a mirror movement comand from the switch but then senses an open or shorted circuit on one of the switch sense circuits for over 100 ms., this code will set.

Possible Causes
(P703) MIRROR HORIZONTAL LEFT SWITCH SENSE OPEN
(P703) MIRROR HORIZONTAL LEFT SWITCH SENSE SHORT TO GROUND
(P703) MIRROR HORIZONTAL LEFT SWITCH SENSE CIRCUIT SHORTED TO ANOTHER SWITCH SENSE CIRCUIT
(P704) MIRROR HORIZONTAL RIGHT SWITCH SENSE OPEN
(P704) MIRROR HORIZONTAL RIGHT SWITCH SENSE SHORT TO GROUND
(P704) MIRROR HORIZONTAL RIGHT SWITCH SENSE CIRCUIT SHORTED TO ANOTHER SWITCH SENSE CIRCUIT
(P705) MIRROR VERTICAL DOWN SWITCH SENSE OPEN
(P705) MIRROR VERTICAL DOWN SWITCH SENSE SHORT TO GROUND
(P705) MIRROR VERTICAL DOWN SWITCH SENSE CIRCUIT SHORTED TO ANOTHER SWITCH SENSE CIRCUIT
(P706) MIRROR VERTICAL UP SWITCH SENSE OPEN
(P706) MIRROR VERTICAL UP SWITCH SENSE SHORT TO GROUND
(P706) MIRROR VERTICAL UP SWITCH SENSE CIRCUIT SHORTED TO ANOTHER SWITCH SENSE CIRCUIT
(P710) MIRROR COMMON SWITCH SENSE OPEN
(P710) MIRROR COMMON SWITCH SENSE SHORT TO GROUND
(P710) MIRROR COMMON SWITCH SENSE CIRCUIT SHORTED TO ANOTHER SWITCH SENSE CIRCUIT
MIRROR SWITCH
DRIVER DOOR MODULE

## Theory of Operation

This code will only set in vehicles that have the Memory System. The supply circuit for the Memory Mirrors are supplied by the Driver Door Module.

**B1D04-MIRROR ADJUST SWITCH INPUT CIRCUIT/PERFORMANCE – DRIVER DOOR MODULE (CONTINUED)****Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Press the Mirror Switch in all directions several times.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

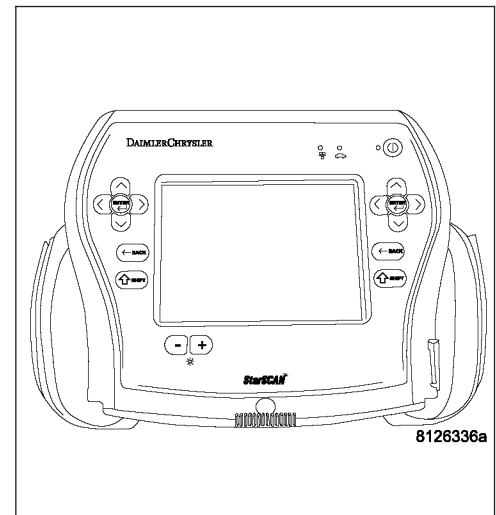
With the scan tool, read DTC's.

**Does the scan tool display B1D04-MIRROR ADJUST SWITCH INPUT CIRCUIT/PERFORMANCE?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. If the conditions returns, replace the switch.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**2. TEST THE SWITCH**

Turn the ignition off.

Remove the Driver Window/Door Lock Switch assembly.

Test the Mirror Switch in all positions by using the procedure in SERVICE INFORMATION / POWER LOCKS / WINDOW/LOCK SWITCH / DIAGNOSING & TESTING / WINDOW/LOCK SWITCH.

**Does the switch pass the test in all positions**

**No** >> Replace the Mirror Switch..

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Go to 3

**B1D04-MIRROR ADJUST SWITCH INPUT CIRCUIT/PERFORMANCE – DRIVER DOOR MODULE (CONTINUED)****3. TEST FOR SWITCH SENSE WIRE SHORT TO GROUND**

Disconnect the Driver Door Module C3 connector.

Measure the resistance between Ground and the (P703) Mirror Horizontal Left Switch Sense circuit in the Driver Door Module connector.

Measure the resistance between Ground and the (P704) Mirror Horizontal Right Switch Sense circuit in the Driver Door Module connector.

Measure the resistance between Ground and the (P705) Mirror Vertical Down Switch Sense circuit in the Driver Door Module connector.

Measure the resistance between Ground and the (P706) Mirror Vertical Up Switch Sense circuit in the Driver Door Module connector.

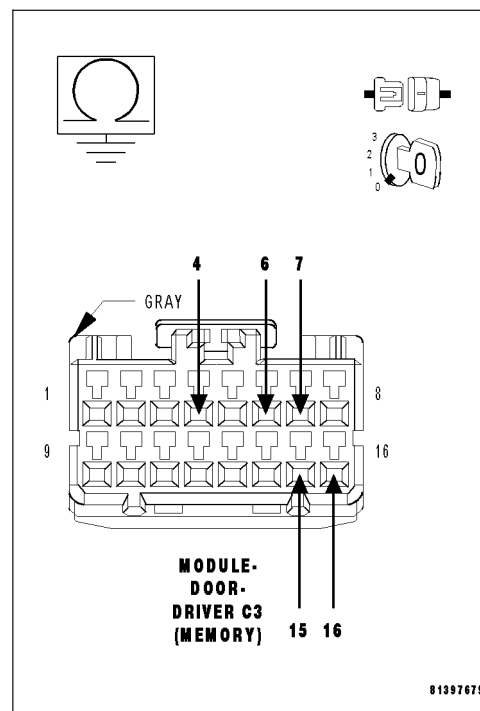
Measure the resistance between Ground and the (P710) Mirror Common Switch Sense circuit in the Driver Door Mirror Module connector.

**Is the resistance below 5000.0 ohms in any of the circuits?**

**Yes** >> Repair the Appropriate Switch Sense circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go to 4

**4. TEST FOR SWITCH SENSE CIRCUIT OPEN**

Disconnect the Mirror Switch connector.

Measure the resistance of the (P703) Mirror Horizontal Left Switch Sense circuit between the Driver Door Module connector and the Mirror Switch connector.

Measure the resistance of the (P704) Mirror Horizontal Right Switch Sense circuit between the Driver Door Module connector and the Mirror Switch connector.

Measure the resistance of the (P705) Mirror Vertical Down Switch Sense circuit between the Driver Door Module connector and the Mirror Switch connector.

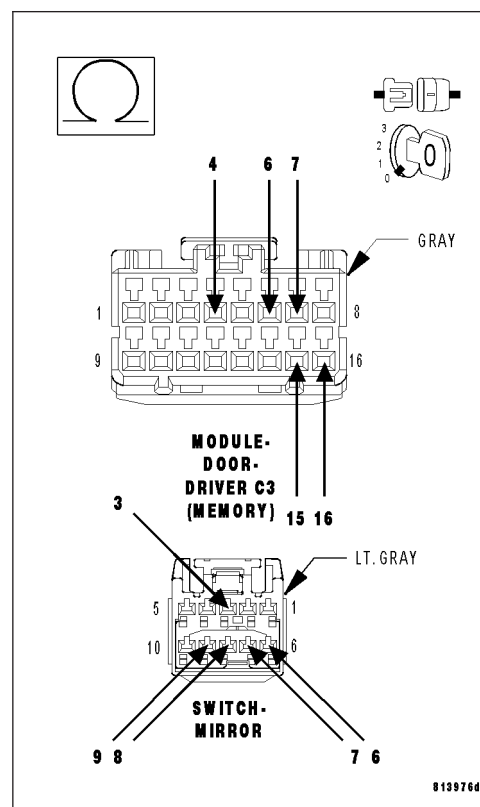
Measure the resistance of the (P706) Mirror Vertical Up Switch Sense circuit between the Driver Door Module connector and the Mirror Switch connector.

Measure the resistance of the (P710) Mirror Common Switch Sense circuit between the Driver Door Module connector and the Mirror Switch connector.

**Is the resistance below 2.0 ohms in all of the Switch Sense circuits?**

**No** >> Repair the Appropriate Switch Sense circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Go to 5

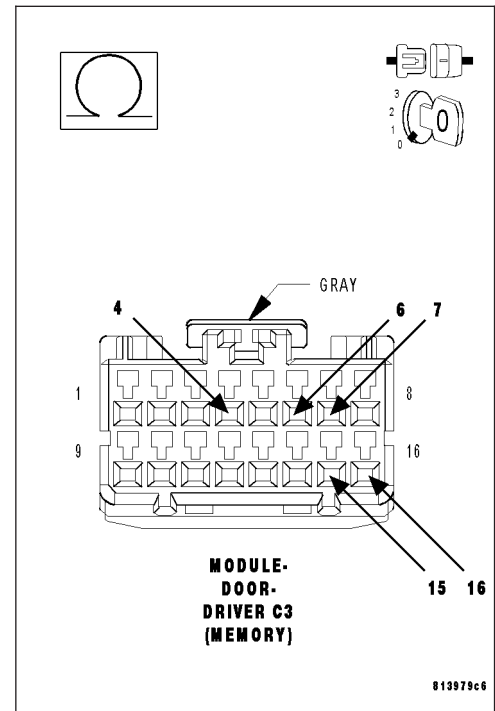


**B1D04-MIRROR ADJUST SWITCH INPUT CIRCUIT/PERFORMANCE – DRIVER DOOR MODULE (CONTINUED)****5. TEST FOR A SWITCH SENSE CIRCUIT SHORTED TO ANOTHER SWITCH SENSE CIRCUIT**

Measure the resistance between each of the switch sense circuits to each of the other switch sense circuits.

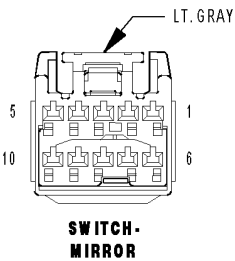
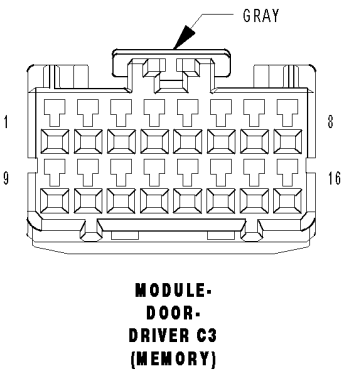
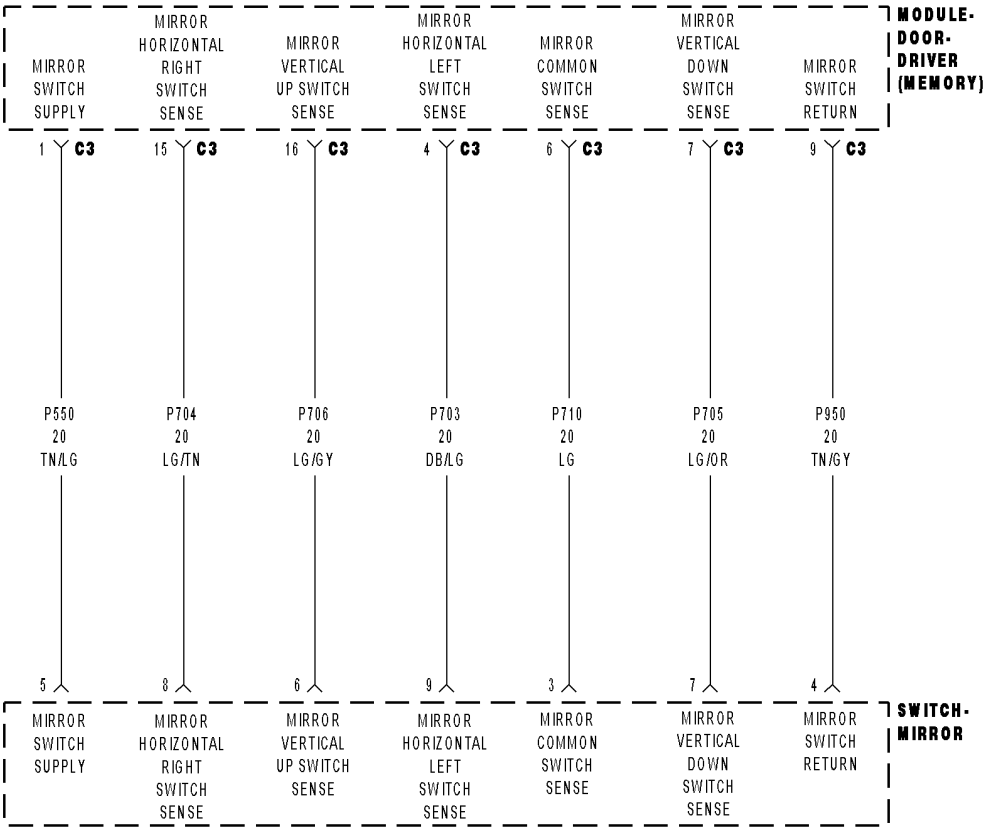
**Is the resistance below 10000.0 ohms between any of the switch sense circuits?**

- Yes** >> Repair the appropriate switch sense circuit for a short to the other switch sense circuits.  
Perform the BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Replace the Driver Door Module.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).





B1D07-MIRROR ADJUST SWITCH INPUT CIRCUIT STUCK- DRIVER DOOR  
MODULE



**B1D07-MIRROR ADJUST SWITCH INPUT CIRCUIT STUCK- DRIVER DOOR MODULE (CONTINUED)**

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Continuously

- **Set Condition:**

When the Driver Door Module receives a mirror movement comand from the switch for over 30 seconds., this code will set.

Possible Causes
MIRROR SWITCH
DRIVER DOOR MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Press the Mirror Switch in all directions several times.

Cycle the ignition from on to off 3 times.

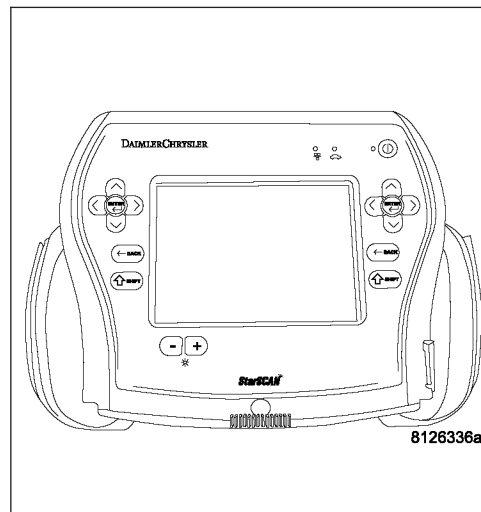
Turn the ignition on.

With the scan tool, read DTC's.

**Does the scan tool display B1D07-MIRROR ADJUST SWITCH INPUT CIRCUIT STUCK?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. If the conditions returns, replace the switch.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



### 2. TEST THE SWITCH

Turn the ignition off.

Remove the Driver Window/Door Lock Switch assembly.

Remove the Mirror Switch.

Test the Mirror Switch in all positions by using the procedure in SERVICE INFORMATION / POWER LOCKS / WINDOW/LOCK SWITCH / DIAGNOSING & TESTING / WINDOW/LOCK SWITCH.

**Does the switch pass the test in all positions**

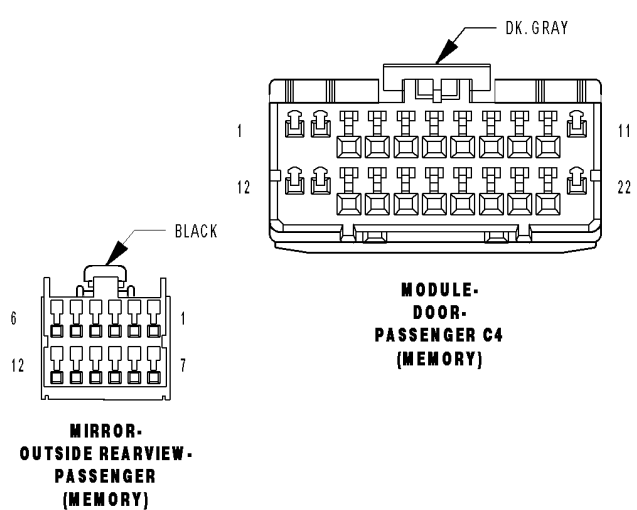
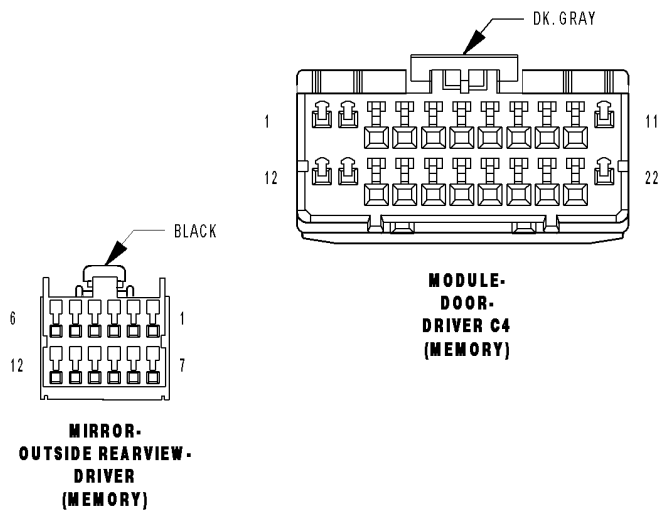
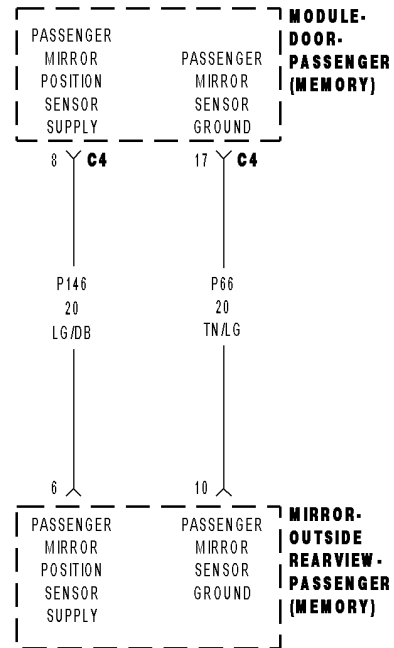
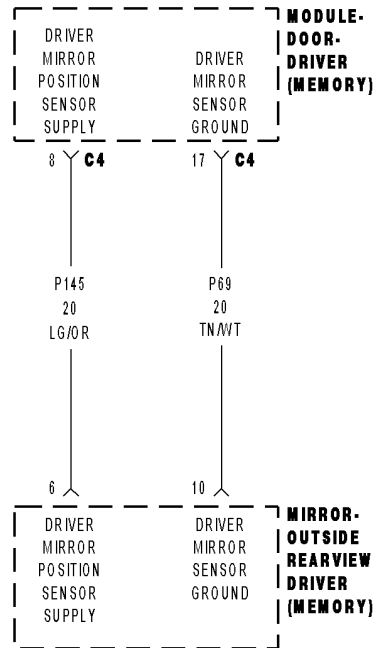
**No** >> Replace the Mirror Switch..

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Replace the Driver Door Module.

Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1).

## B1D09,B1D12-MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT LOW – MEMORY MIRROR MODULE



**B1D09,B1D12-MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT LOW – MEMORY MIRROR MODULE (CONTINUED)**

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Continuously

- **Set Condition:**

When the Driver Door Module senses voltage below 4.3 volts on the Mirror Position Sensor Supply circuit for over 30ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P145) OR (P146) MIRROR POSISTION SENSOR SUPPLY CIRCUIT SHORT TO GROUND
(P145) OR (P146) MIRROR POSISTION SENSOR SUPPLY CIRCUIT SHORTED TO (P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT.
MIRROR SHORTED
DRIVER OR PASSENGER DOOR MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Mirror Switch in all directions several times.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

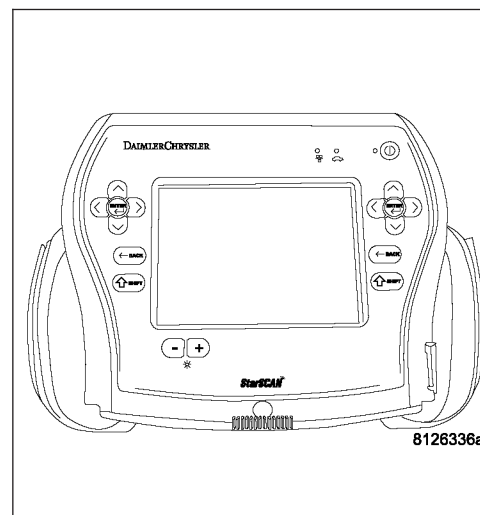
With the scan tool, read DTC's.

**Does the scan tool display B1D09 or B1D12-MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



## B1D09,B1D12-MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT LOW – MEMORY MIRROR MODULE (CONTINUED)

**2. TEST FOR A SHORTED MIRROR**

Turn the ignition off.

Disconnect the appropriate mirror connector.

Turn the ignition on.

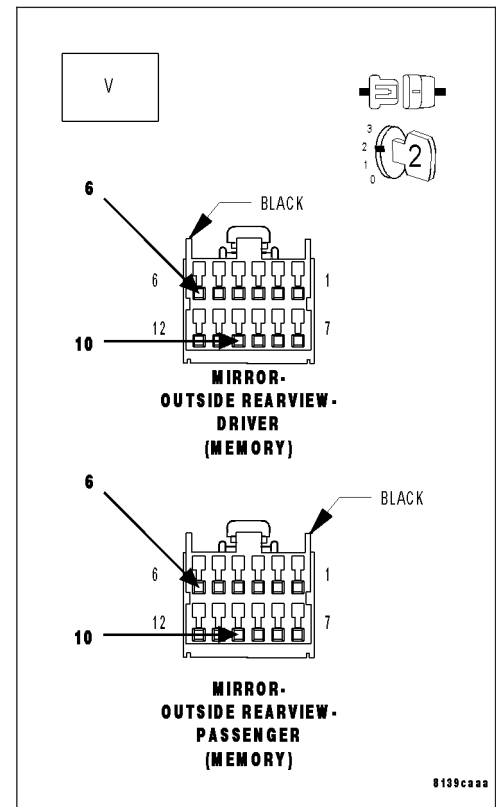
Measure the voltage between the (P145) or (P146) Mirror Position Sensor Supply circuit and the ((P69) or (P66) Mirror Sensor Ground circuit.

**Is the voltage above 4.6 volts?**

**Yes** >> Replace the Mirror.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go to 3

**3. TEST THE (P145) OR (P146) MIRROR POSITION SENSOR SUPPLY WIRE**

Turn the ignition off.

Disconnect the appropriate Driver Door Module connector.

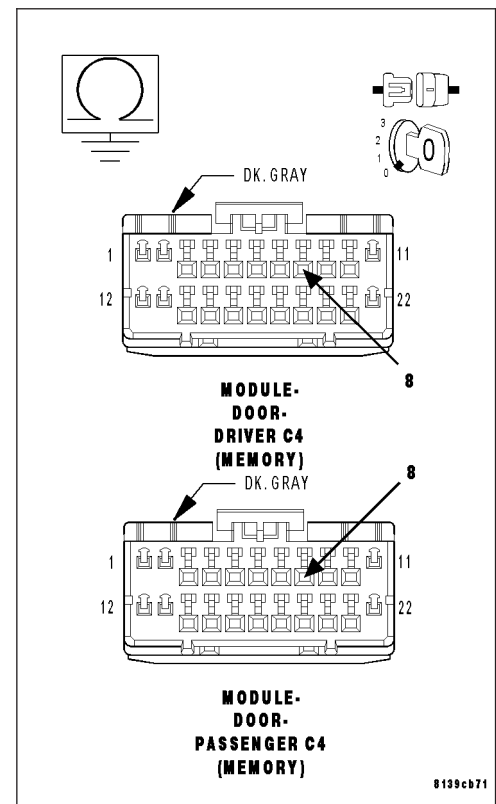
Measure the resistance between ground and the (P145) or (P146) Mirror Position Sensor Supply circuit.

**Is the resistance below 5000.0 ohms?**

**Yes** >> Repair the (P145) or (P146) Mirror Position Sensor Supply circuit for a short to ground..

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go to 4



**B1D09,B1D12-MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT LOW – MEMORY MIRROR MODULE (CONTINUED)****4. TEST THE (P145) OR (P146) MIRROR POSITION SENSOR SUPPLY WIRE SHORTED TO THE (P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT.**

Measure the resistance between the (P145) or (P146) Mirror Position Sensor Supply circuit and the (P69) or (P66) Mirror Sensor Ground circuit.

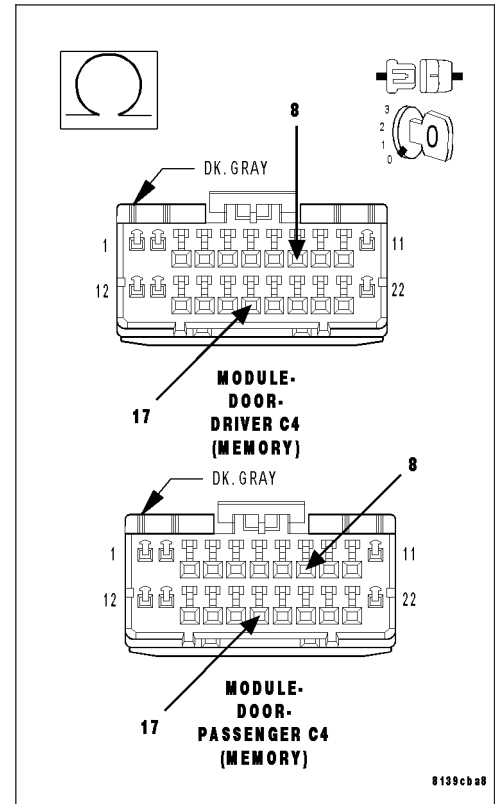
**Is the resistance below 5000.0 ohms?**

**Yes** >> Repair the (P145) or (P146) Mirror Position Sensor Supply circuit for a short to the (P69) or (P66) Sensor Ground Circuit..

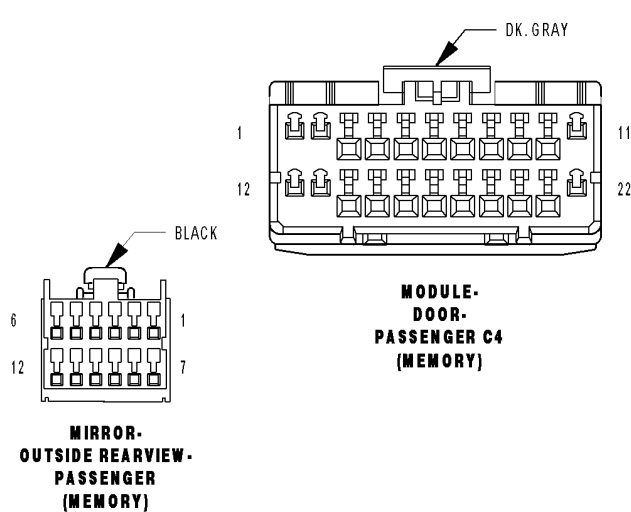
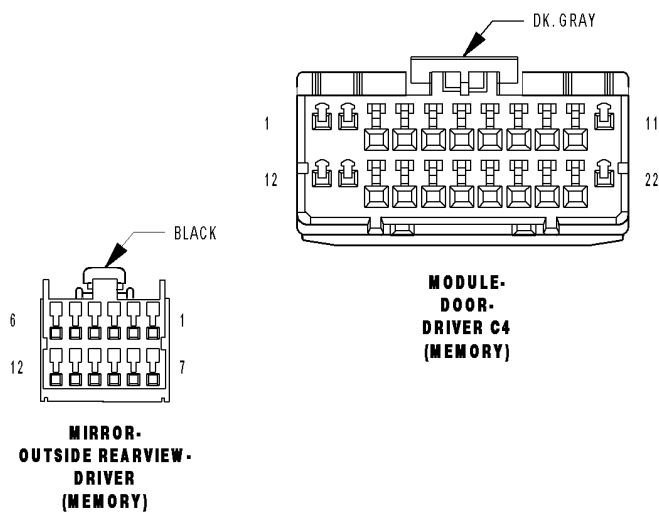
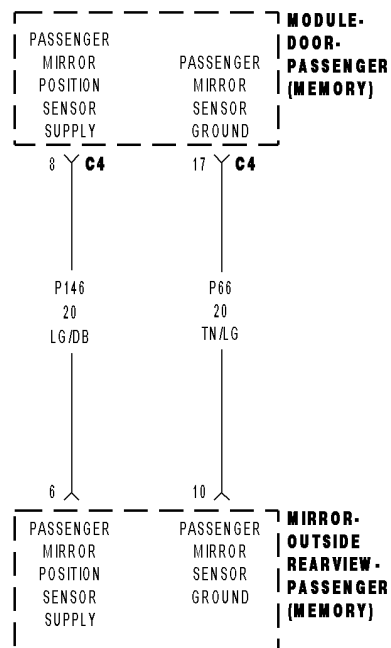
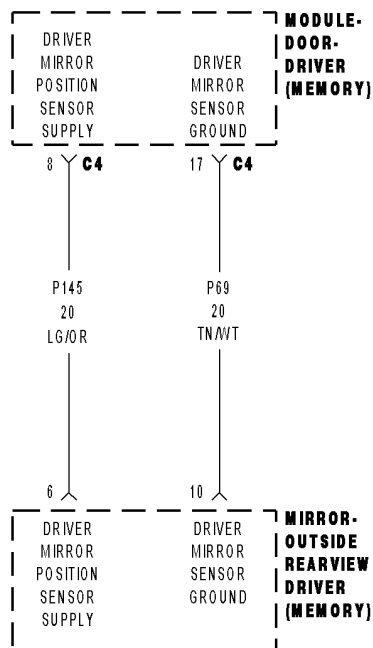
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the appropriate Driver Door Module.

Perform BODY VERIFICATION TEST - VER 1(Refer to BODY VERIFICATION TEST - VER 1)..



# B1D0A,B1D13-MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT HIGH – DOOR MODULE



**B1D0A,B1D13-MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT HIGH – DOOR MODULE (CONTINUED)**

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Continuously

- **Set Condition:**

When the Driver/Passenger Door Module senses voltage above 5.5 volts on the Mirror Position Sensor Supply circuit for over 30ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P145) OR (P146) MIRROR POSITION SENSOR SUPPLY CIRCUIT OPEN
(P145) OR (P146) MIRROR POSITION SENSOR SUPPLY CIRCUIT SHORT TO VOLTAGE
(P69) R (P66) MIRROR SENSOR GROUND CIRCUIT OPEN
MIRROR OPEN
DRIVER/PASSENGER DOOR MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Mirror Switch in all directions several times.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

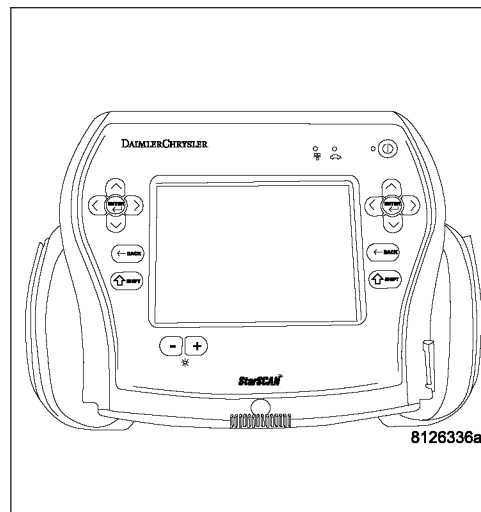
With the scan tool, read DTC's.

**Does the scan tool display B1D0A or B1d13-MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).





**B1D0A,B1D13-MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT HIGH - DOOR MODULE (CONTINUED)****2. TEST FOR AN OPEN MIRROR**

Turn the ignition off.

Disconnect the appropriate mirror connector.

Turn the ignition on.

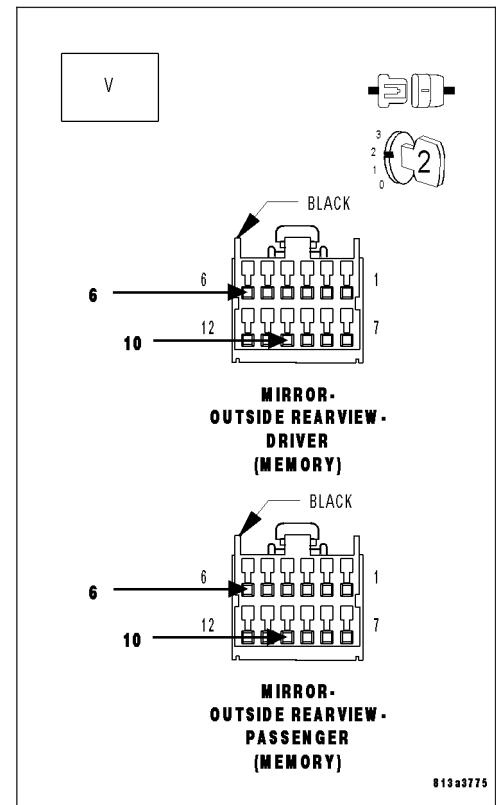
Measure the voltage between the (P145) or (P146) Mirror Position Sensor Supply circuit and the ((P69) or (P66) Mirror Sensor Ground circuit.

**Is the voltage between 4.8 and 5.2 volts?**

**Yes** >> Replace the Mirror.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go to 3

**3. TEST THE (P145) OR (P146) MIRROR POSITION SENSOR SUPPLY WIRE FOR AN OPEN**

Turn the ignition off.

Disconnect the appropriate Door Module C4 connector.

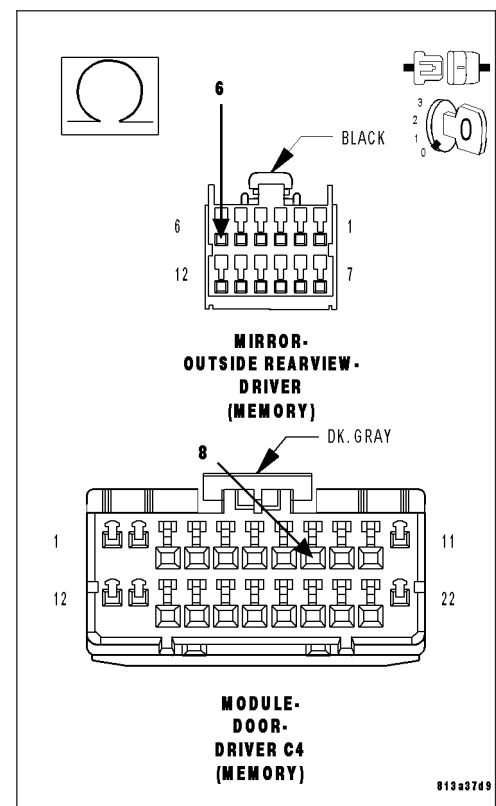
Measure the resistance between of the (P145) or (P146) Mirror Position Sensor Supply circuit between the Module connector and the Mirror connector..

**Is the resistance below 2.0 ohms?**

**No** >> Repair the (P145) or (P146) Mirror Position Sensor Supply circuit for an open..

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Go to 4



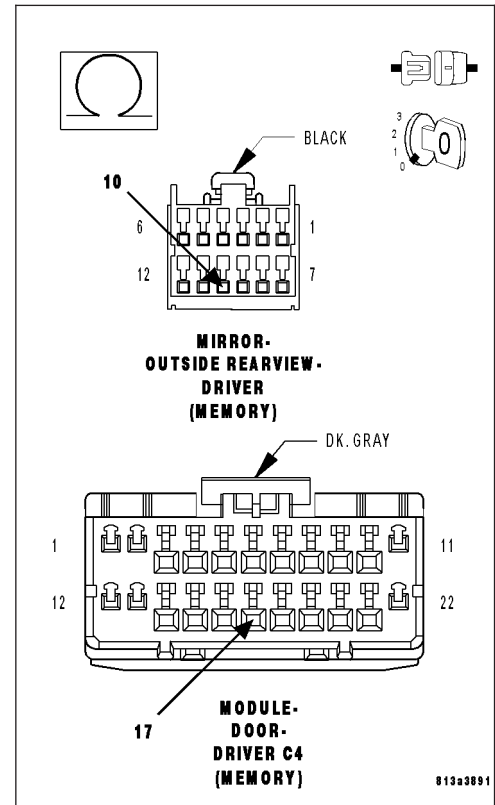
**B1D0A,B1D13-MIRROR POSITION SENSOR POWER SUPPLY CIRCUIT HIGH – DOOR MODULE (CONTINUED)****4. TEST THE (P69) OR (P66) MIRROR SENSOR GROUND WIRE FOR AN OPEN**

Measure the resistance of the ((P69) or (P66) Mirror Sensor Ground circuit between the Module connector and the Mirror connector.

**Is the resistance below 2.0 ohms?**

**No** >> Repair the (P69) or (P66) Mirror Sensor Ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Go to 5  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**5. TEST THE (P145) OR (P146) MIRROR POSITION SENSOR SUPPLY WIRE SHORTED TO VOLTAGE**

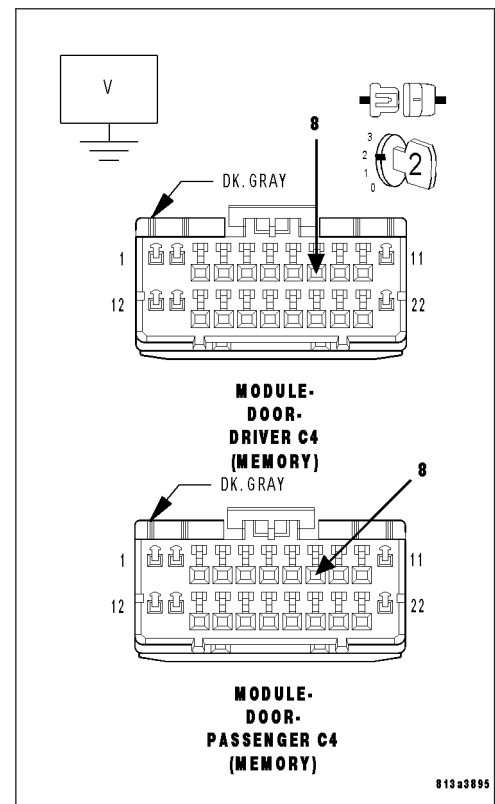
Turn the ignition on.

Measure the voltage between ground and the (P145) or (P146) Mirror Position Sensor Supply circuit.

**Is there any voltage present?**

**Yes** >> Repair the (P145) or (P146) Mirror Position Sensor Supply circuit for a short to voltage.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the appropriate Door Module.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



**B1D0C,B1D15-MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT LOW – DOOR MODULE**

DRIVER  
MIRROR  
VERTICAL  
POSITION  
SIGNAL

**MODULE-  
DOOR-  
DRIVER  
(MEMORY)**

7 C4

P67  
20  
TN/OR

DRIVER  
MIRROR  
VERTICAL  
POSITION  
SIGNAL

**MIRROR-  
OUTSIDE  
REARVIEW-  
DRIVER  
(MEMORY)**

PASSENGER  
MIRROR  
VERTICAL  
POSITION  
SIGNAL

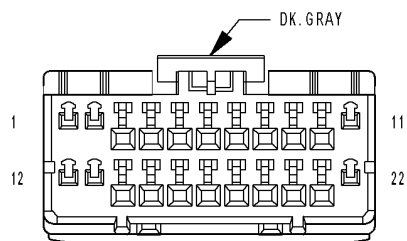
**MODULE-  
DOOR-  
PASSENGER  
(MEMORY)**

7 C4

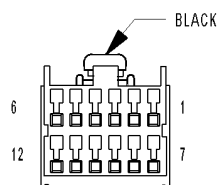
P64  
20  
TN

PASSENGER  
MIRROR  
VERTICAL  
POSITION  
SIGNAL

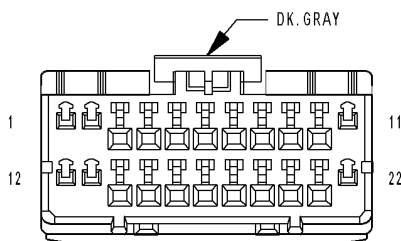
**MIRROR-  
OUTSIDE  
REARVIEW-  
PASSENGER  
(MEMORY)**



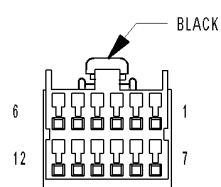
**MODULE-  
DOOR-  
DRIVER C4  
(MEMORY)**



**MIRROR-  
OUTSIDE REARVIEW-  
DRIVER  
(MEMORY)**



**MODULE-  
DOOR-  
PASSENGER C4  
(MEMORY)**



**MIRROR-  
OUTSIDE REARVIEW-  
PASSENGER  
(MEMORY)**

**B1D0C,B1D15-MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT LOW – DOOR MODULE (CONTINUED)**

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Continuously

- **Set Condition:**

When the Driver/Passenger Door Module senses a value below the parameter of the mirror sensor on the Mirror Vertical Position Signal circuit for over 60ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL CIRCUIT SHORT TO GROUND
(P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL CIRCUIT SHORTED TO (P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT.
MIRROR SHORTED
DRIVER/PASSENGER DOOR MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Mirror Switch in all directions several times.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

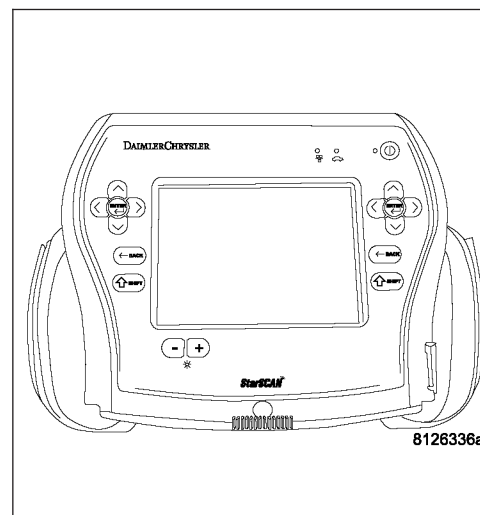
With the scan tool, read DTC's.

**Does the scan tool display B1D0C or B1D15-MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



**B1D0C,B1D15-MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT LOW – DOOR MODULE (CONTINUED)****2. TEST FOR A SHORTED MIRROR**

Disconnect the appropriate mirror connector.

With the scan tool, erase DTC's.

Operate the Mirror Switch in all directions several times.

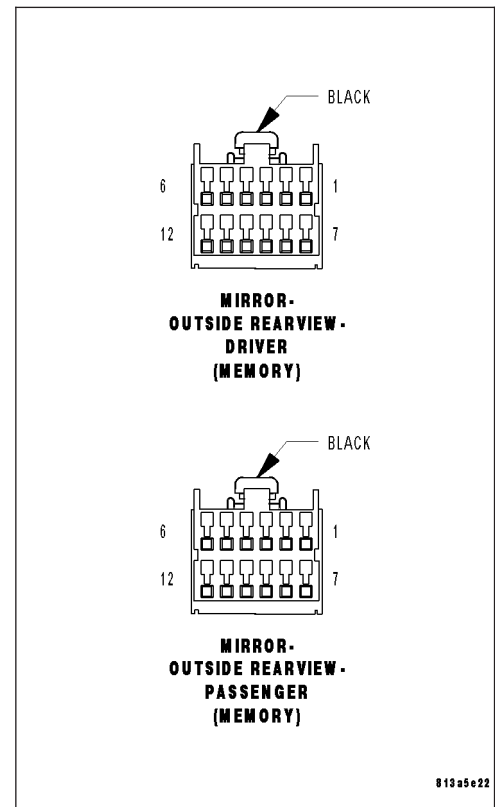
Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read DTC's.

**Does the scan tool display B1D0C or B1D15-MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT LOW?**

- No** >> Replace the Mirror.  
 Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- Yes** >> Go to 3

**3. TEST THE (P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL WIRE FOR A SHORT TO GROUND**

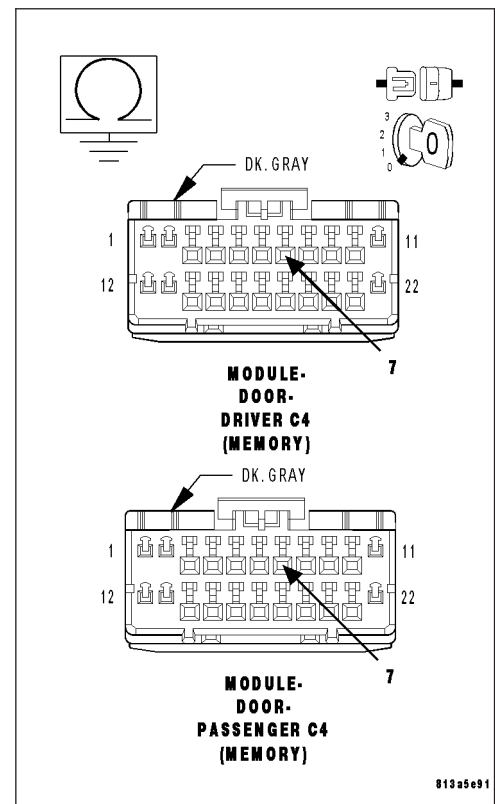
Turn the ignition off.

Disconnect the appropriate Door Module C4 connector.

Measure the resistance between ground and the (P67) or (P64) Mirror Vertical Position Signal circuit.

**Is the resistance below 5000.0 ohms?**

- Yes** >> Repair the (P67) or (P64) Mirror Vertical Position Signal circuit for a short to ground.  
 Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Go to 4



**B1D0C,B1D15-MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT LOW – DOOR MODULE (CONTINUED)****4. TEST THE (P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL CIRCUIT SHORTED TO THE (P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT.**

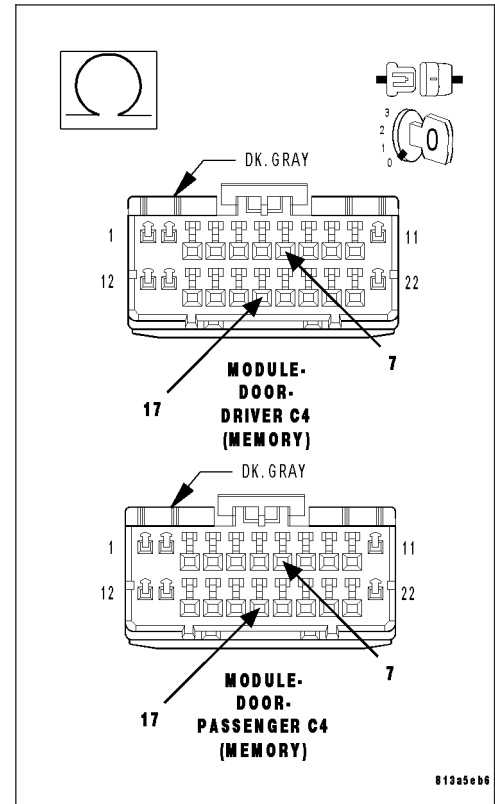
Measure the resistance between the (P67) or (P64) Mirror Vertical Position Signal circuit and the (P69) or (P66) Mirror Sensor Ground circuit.

**Is the resistance below 5000.0 ohms?**

**Yes** >> Repair the (P67) or (P64) Mirror Vertical Position Signal circuit for a short to the (P69) or (P66) Sensor Ground Circuit..

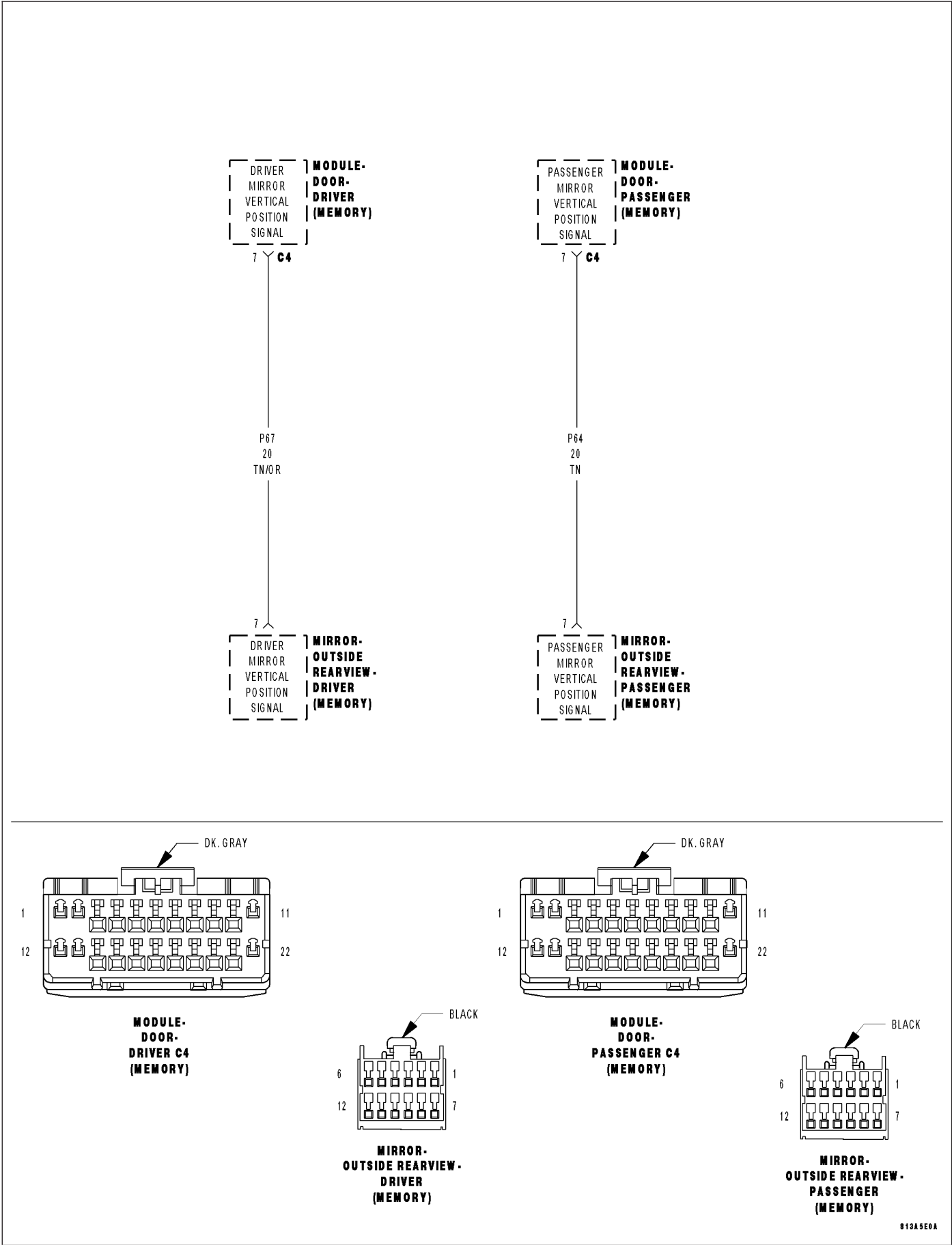
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the appropriate Door Module.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



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B1D0D,B1D16–MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT HIGH – DOOR  
MODULE



**B1D0D,B1D16-MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT HIGH – DOOR MODULE (CONTINUED)**

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Continuously

- **Set Condition:**

When the Driver/Passenger Door Module senses a value above the parameter of the mirror sensor on the Mirror Vertical Position Signal circuit for over 60ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL CIRCUIT SHORT TO VOLTAGE
(P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL CIRCUIT OPEN
(P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT OPEN
MIRROR SHORTED
DRIVER/PASSENGER DOOR MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Mirror Switch in all directions several times.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

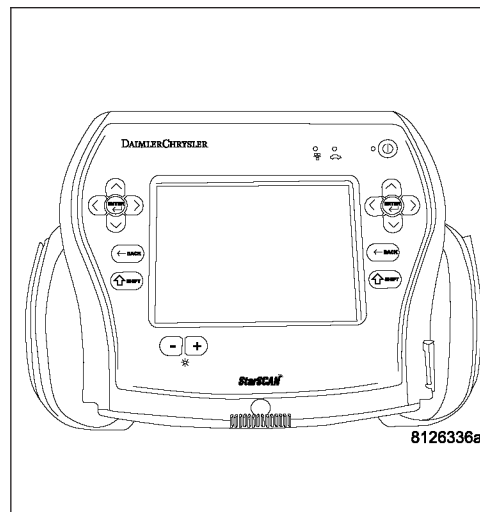
With the scan tool, read DTC's.

**Does the scan tool display B1D0D or B1D16-MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).





**B1D0D,B1D16-MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT HIGH – DOOR MODULE (CONTINUED)****2. TEST FOR A SHORTED MIRROR**

Disconnect the appropriate mirror connector.

With the scan tool, erase DTC's.

Operate the Mirror Switch in all directions several times.

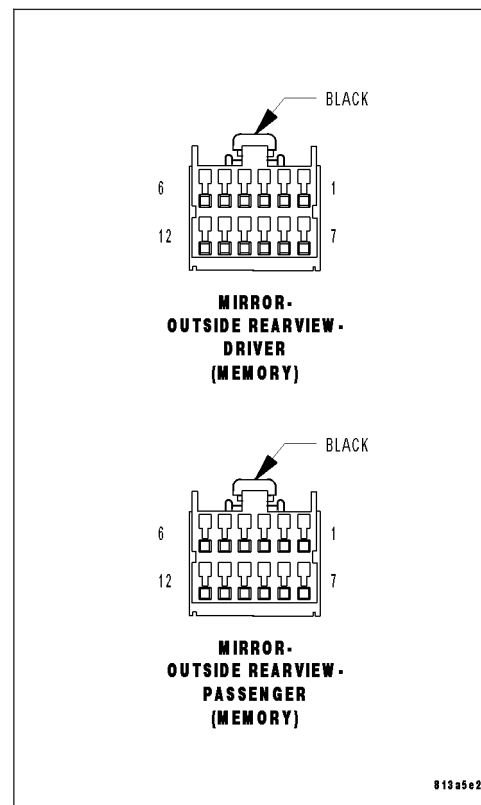
Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read DTC's.

**Does the scan tool display B1D0D or B1D16-MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT HIGH?**

- No** >> Replace the Mirror.  
 Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- Yes** >> Go to 3

**3. TEST THE (P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL WIRE FOR A SHORT TO VOLTAGE**

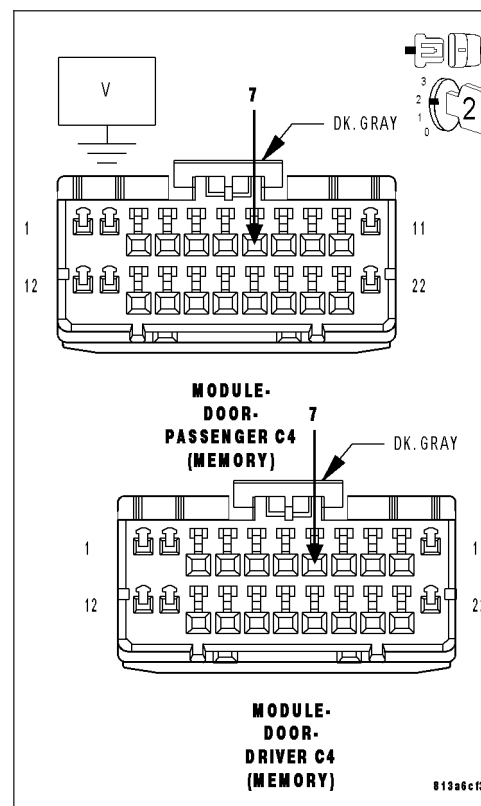
Turn the ignition off.

Disconnect the appropriate Door Module C4 connector.

Measure the voltage between the (P67) or (P64) Mirror Vertical Position Signal circuit and ground.

**Is there any voltage present?**

- Yes** >> Repair the (P67) or (P64) Mirror Vertical Position Signal circuit for a short to voltage.  
 Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Go to 4



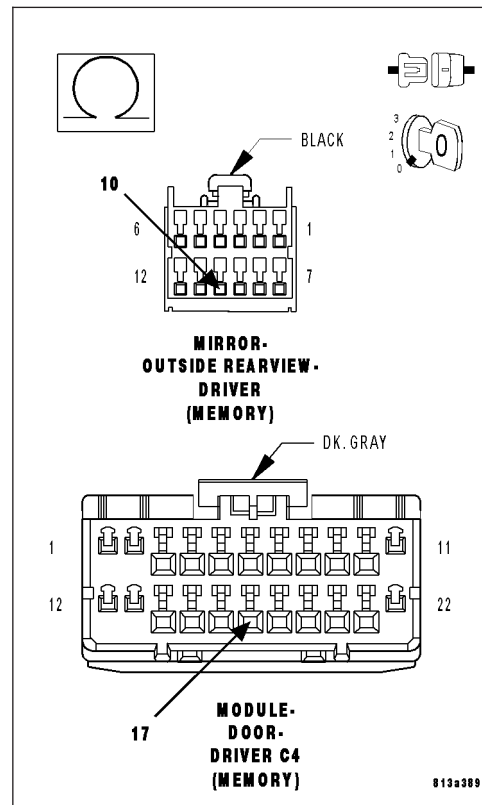
**B1D0D,B1D16-MIRROR VERTICAL POSITION SENSOR INPUT CIRCUIT HIGH – DOOR MODULE (CONTINUED)****4. TEST THE (P69) OR (P66) MIRROR SENSOR GROUND WIRE FOR AN OPEN**

Measure the resistance of the (P69) or (P66) Mirror Sensor Ground circuit between the Module connector and the Mirror connector.

**Is the resistance below 2.0 ohms?**

**No** >> Repair the (P69) or (P66) Mirror Sensor Ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Go to 5

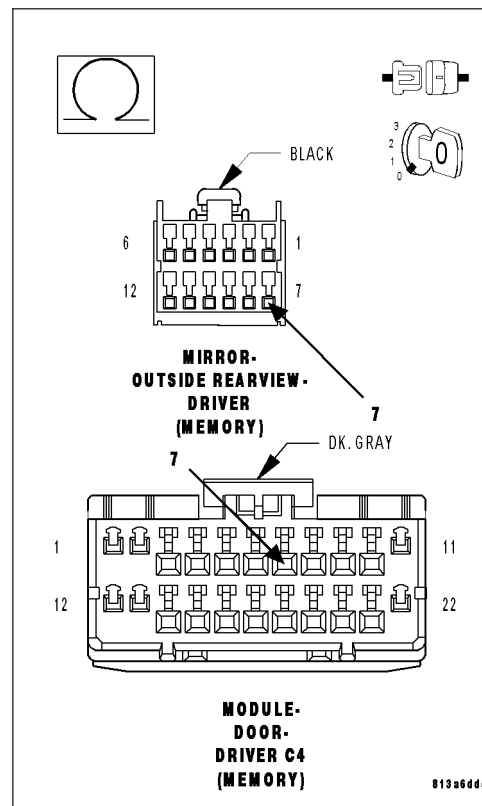
**5. TEST THE (P67) OR (P64) MIRROR VERTICAL POSITION SIGNAL WIRE FOR AN OPEN**

Measure the resistance of the (P67) or (P64) Mirror Vertical Position Signal circuit between the Module connector and the Mirror connector.

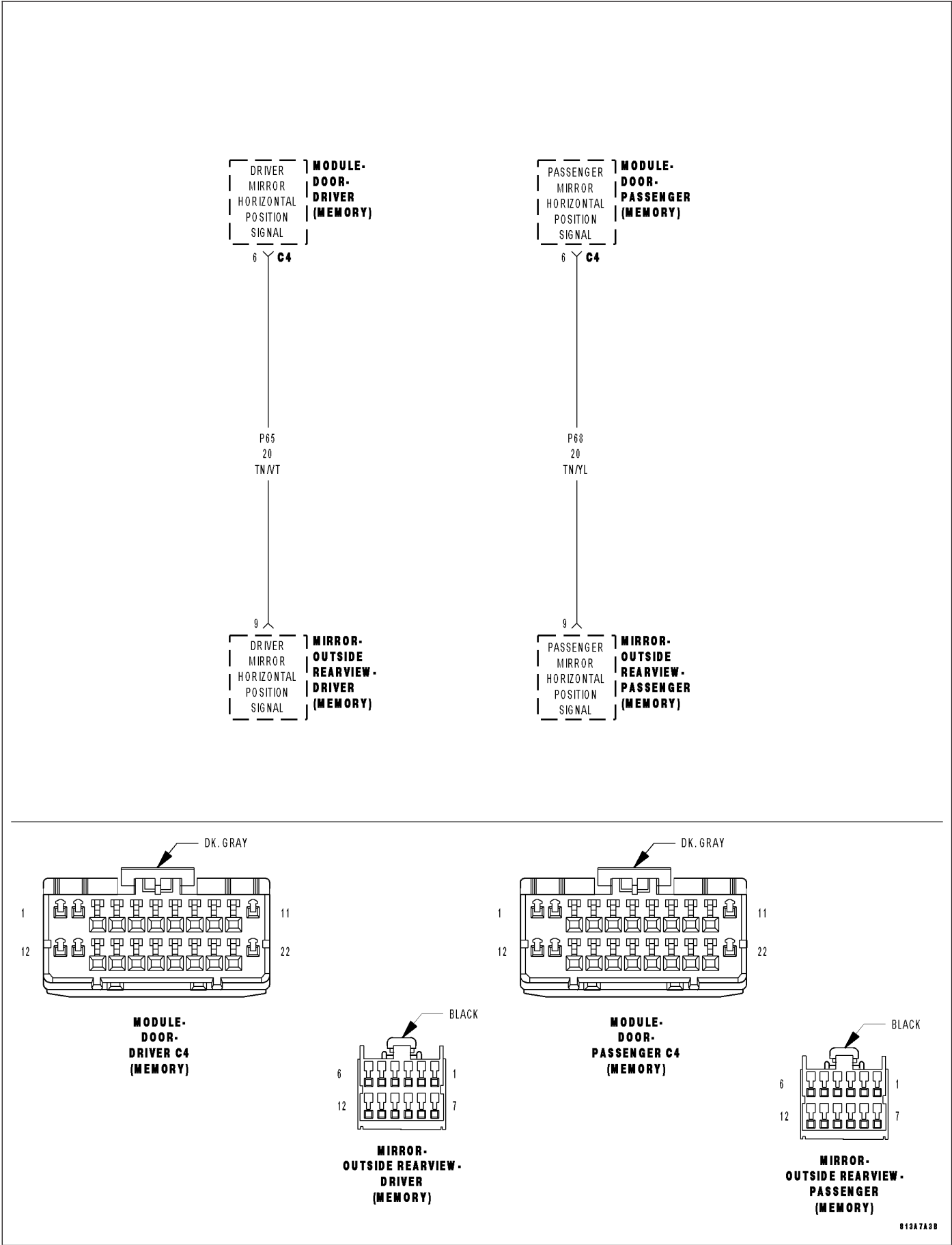
**Is the resistance below 2.0 ohms?**

**No** >> Repair the (P67) or (P64) Mirror Vertical Position Signal circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Replace the appropriate Door Module.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



B1D0F,B1D18–MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT LOW – DOOR MODULE



**B1D0F,B1D18-MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT LOW – DOOR MODULE (CONTINUED)**

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Continuously

- **Set Condition:**

When the Driver/Passenger Door Module senses a value below the parameter of the mirror sensor on the Mirror Horizontal Position Signal circuit for over 60ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL CIRCUIT SHORT TO GROUND
(P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL CIRCUIT SHORTED TO (P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT.
MIRROR SHORTED
DRIVER/PASSENGER DOOR MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Mirror Switch in all directions several times.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

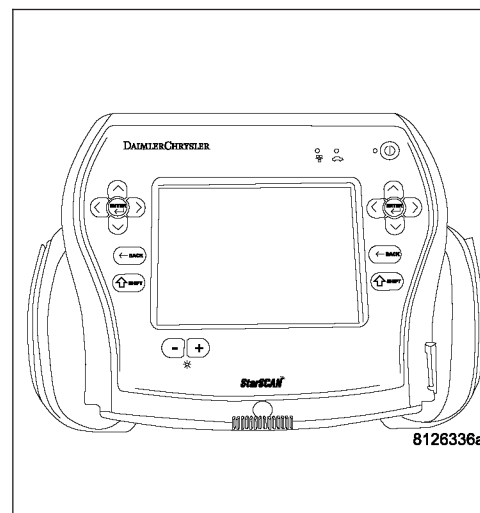
With the scan tool, read DTC's.

**Does the scan tool display B1D0F or B1D18-MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



**B1D0F,B1D18-MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT LOW – DOOR MODULE (CONTINUED)****2. TEST FOR A SHORTED MIRROR**

Disconnect the appropriate mirror connector.

With the scan tool, erase DTC's.

Operate the Mirror Switch in all directions several times.

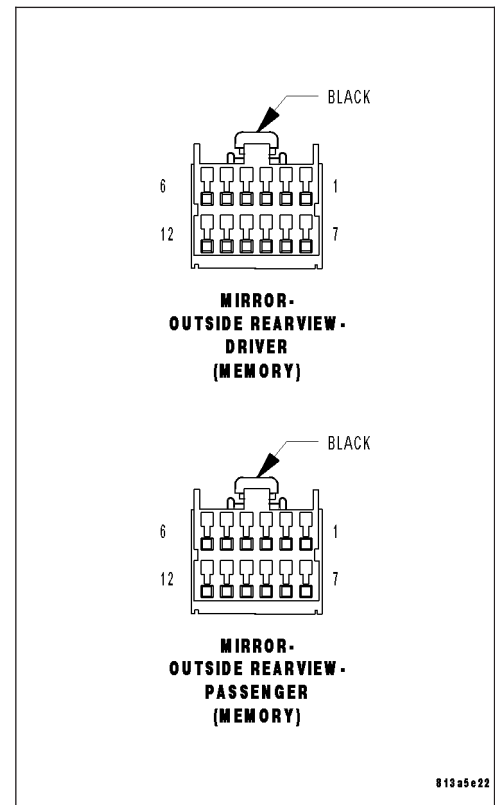
Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read DTC's.

**Does the scan tool display B1D0F or B1D18-MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT LOW?**

- No** >> Replace the Mirror.  
 Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- Yes** >> Go to 3

**3. TEST THE (P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL WIRE FOR A SHORT TO GROUND**

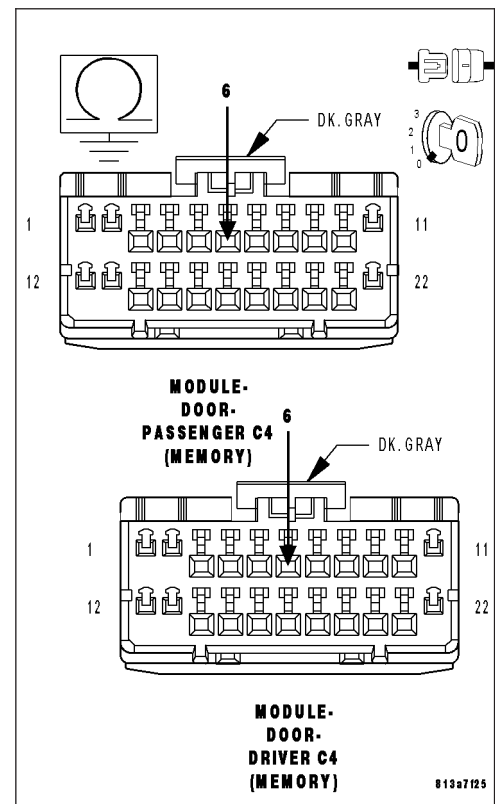
Turn the ignition off.

Disconnect the appropriate Door Module C4 connector.

Measure the resistance between ground and the (P65) or (P68) Mirror Horizontal Position Signal circuit.

**Is the resistance below 5000.0 ohms?**

- Yes** >> Repair the (P65) or (P68) Mirror Horizontal Position Signal circuit for a short to ground.  
 Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Go to 4



**B1D0F,B1D18-MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT LOW – DOOR MODULE (CONTINUED)****4. TEST THE (P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL CIRCUIT SHORTED TO THE (P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT.**

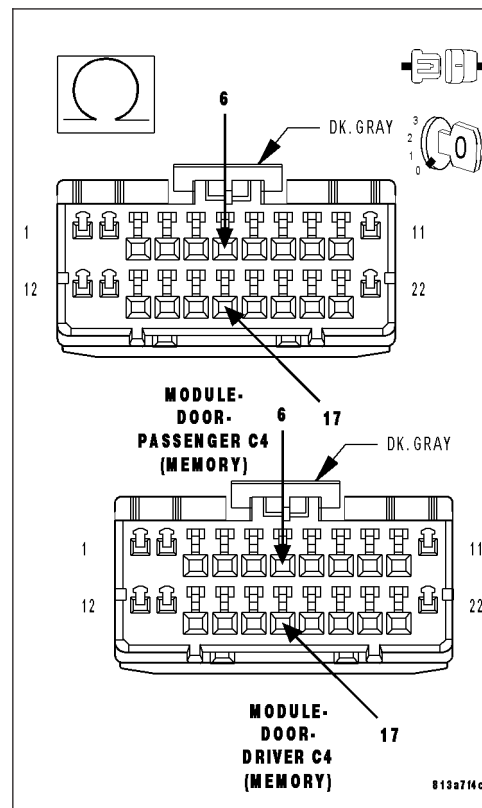
Measure the resistance between the (P65) or (P68) Mirror Horizontal Position Signal circuit and the (P69) or (P66) Mirror Sensor Ground circuit.

**Is the resistance below 5000.0 ohms?**

**Yes** >> Repair the (P65) or (P68) Mirror Horizontal Position Signal circuit for a short to the (P69) or (P66) Sensor Ground Circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the appropriate Door Module.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



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**B1D10,B1D19-MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT HIGH – DOOR MODULE**

DRIVER  
MIRROR  
HORIZONTAL  
POSITION  
SIGNAL

**MODULE-  
DOOR-  
DRIVER  
(MEMORY)**

6 C4

P65  
20  
TN/VT

9

DRIVER  
MIRROR  
HORIZONTAL  
POSITION  
SIGNAL

**MIRROR-  
OUTSIDE  
REARVIEW-  
DRIVER  
(MEMORY)**

PASSENGER  
MIRROR  
HORIZONTAL  
POSITION  
SIGNAL

**MODULE-  
DOOR-  
PASSENGER  
(MEMORY)**

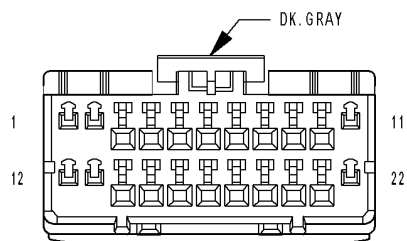
6 C4

P68  
20  
TN/YL

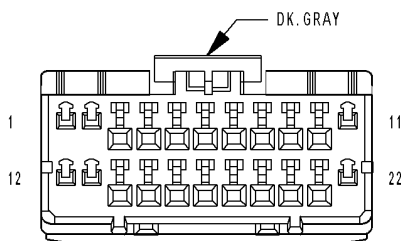
9

PASSENGER  
MIRROR  
HORIZONTAL  
POSITION  
SIGNAL

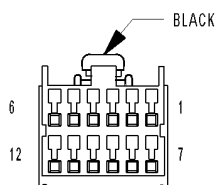
**MIRROR-  
OUTSIDE  
REARVIEW-  
PASSENGER  
(MEMORY)**



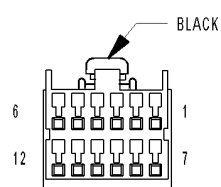
**MODULE-  
DOOR-  
DRIVER C4  
(MEMORY)**



**MODULE-  
DOOR-  
PASSENGER C4  
(MEMORY)**



**MIRROR-  
OUTSIDE REARVIEW-  
DRIVER  
(MEMORY)**



**MIRROR-  
OUTSIDE REARVIEW-  
PASSENGER  
(MEMORY)**

**B1D10,B1D19-MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT HIGH – DOOR MODULE (CONTINUED)**

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Continuously

- **Set Condition:**

When the Driver/Passenger Door Module senses a value above the parameter of the mirror sensor on the Mirror Horizontal Position Signal circuit for over 60ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL CIRCUIT SHORT TO VOLTAGE
(P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL CIRCUIT OPEN
(P69) OR (P66) MIRROR SENSOR GROUND CIRCUIT OPEN
MIRROR OPEN
DRIVER/PASSENGER DOOR MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Mirror Switch in all directions several times.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

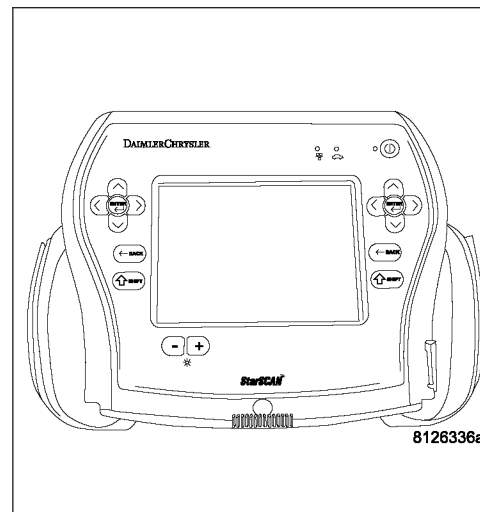
With the scan tool, read DTC's.

**Does the scan tool display B1D10 or B1D19-MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).





## B1D10,B1D19-MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT HIGH - DOOR MODULE (CONTINUED)

**2. TEST FOR AN OPEN MIRROR**

Disconnect the appropriate mirror connector.

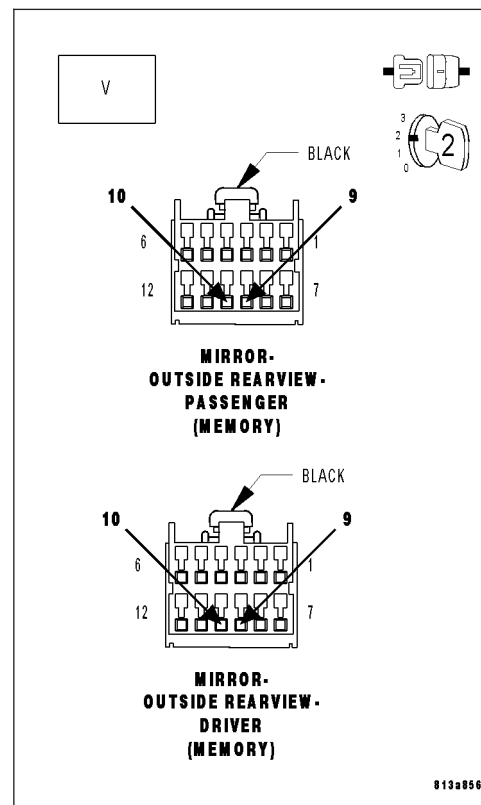
Turn the ignition on.

Measure the voltage between the (P65) or (P68) Mirror Horizontal Position Signal circuit and the (P69) or (P66) Mirror Sensor Ground circuit.

**Is the voltage between 4.8 and 5.2 volts?**

**Yes** >> Replace the Mirror.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go to 3

**3. TEST THE (P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL WIRE FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the appropriate Door Module C4 connector.

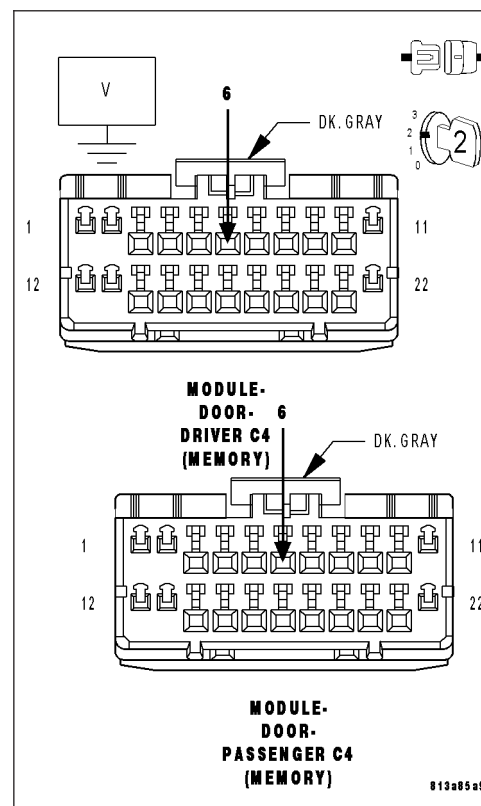
Turn the ignition on.

Measure the voltage between the (P65) or (P68) Mirror Horizontal Position Signal circuit and ground.

**Is there any voltage present?**

**Yes** >> Repair the (P65) or (P68) Mirror Horizontal Position Signal circuit for a short to voltage.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go to 4



**B1D10,B1D19-MIRROR HORIZONTAL POSITION SENSOR INPUT CIRCUIT HIGH – DOOR MODULE (CONTINUED)****4. TEST THE (P69) OR (P66) MIRROR SENSOR GROUND WIRE FOR AN OPEN**

Turn the ignition off.

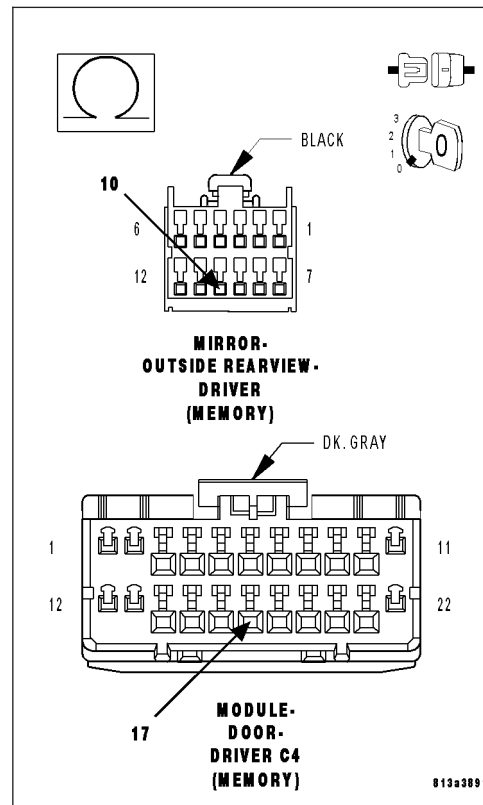
Measure the resistance of the (P69) or (P66) Mirror Sensor Ground circuit between the Module connector and the Mirror connector.

**Is the resistance below 2.0 ohms?**

**No** >> Repair the (P69) or (P66) Mirror Sensor Ground circuit for an open.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Go to 5

**5. TEST THE (P65) OR (P68) MIRROR HORIZONTAL POSITION SIGNAL WIRE FOR AN OPEN**

Measure the resistance of the (P65) or (P68) Mirror Horizontal Position Signal circuit between the Module connector and the Mirror connector.

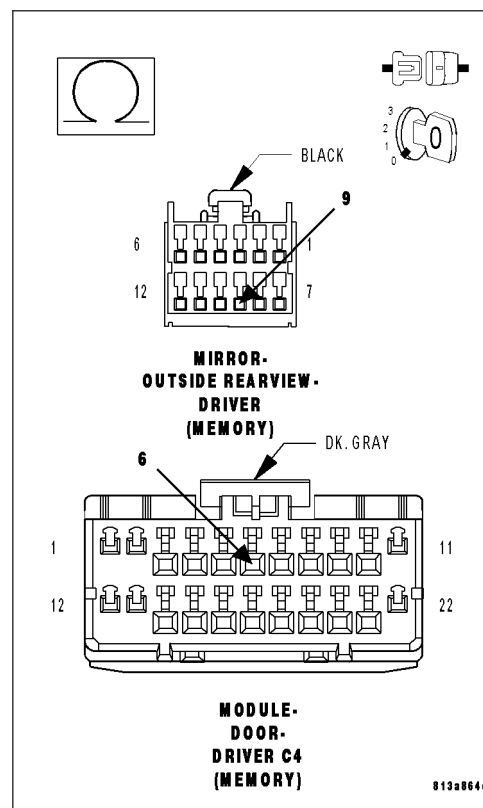
**Is the resistance below 2.0 ohms?**

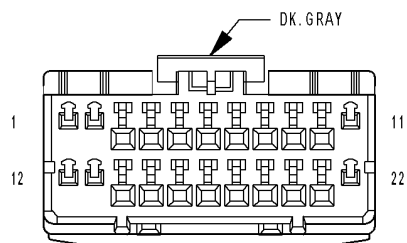
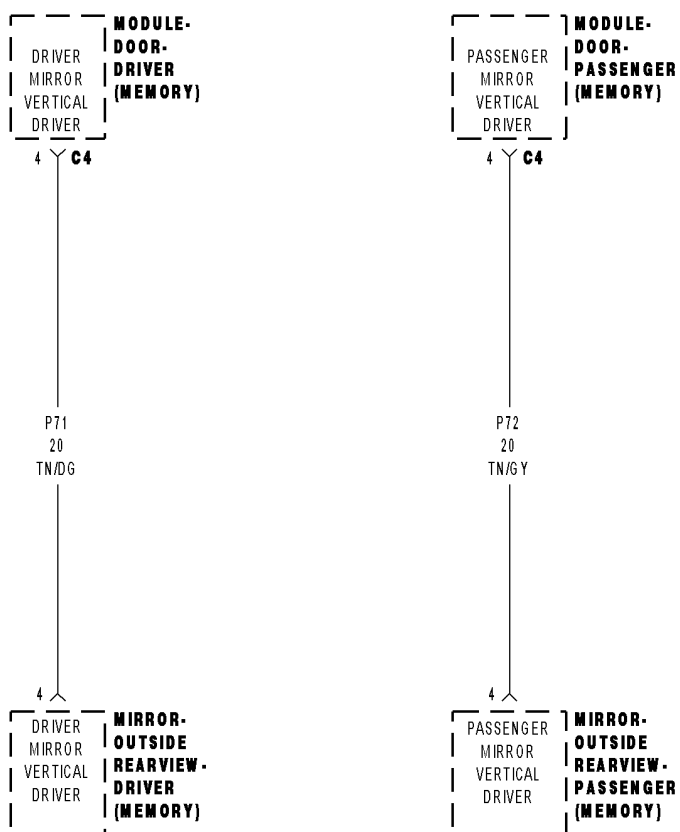
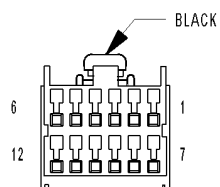
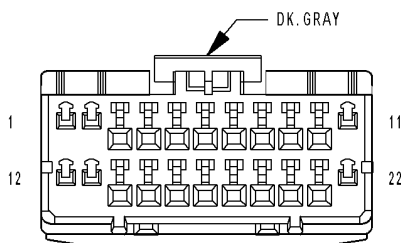
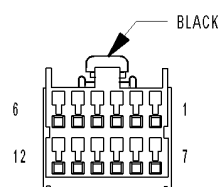
**No** >> Repair the (P65) or (P68) Mirror Horizontal Position Signal circuit for an open.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Replace the appropriate Door Module.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



**B1D1E,B1D2A-MIRROR VERTICAL MOTOR CONTROL CIRCUIT/PERFORMANCE – DOOR MODULE****MODULE-  
DOOR-  
DRIVER C4  
(MEMORY)****MIRROR-  
OUTSIDE REARVIEW-  
DRIVER  
(MEMORY)****MODULE-  
DOOR-  
PASSENGER C4  
(MEMORY)****MIRROR-  
OUTSIDE REARVIEW-  
PASSENGER  
(MEMORY)**

**B1D1E,B1D2A-MIRROR VERTICAL MOTOR CONTROL CIRCUIT/PERFORMANCE – DOOR MODULE (CONTINUED)**

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Continuously

- **Set Condition:**

When the Memory Mirror Module senses a value below the tolerance of the mirror motor on the Mirror Vertical Motor Control circuit for over 10ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P71) OR (P72) MIRROR VERTICAL DRIVER CIRCUIT SHORT TO GROUND
(P71) OR (P72) MIRROR VERTICAL DRIVER CIRCUIT SHORTED TO THE (Z912) OR (Z911) GROUND CIRCUIT
MIRROR SHORTED
DRIVER/PASSENGER DOOR MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Mirror Switch in all directions several times.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

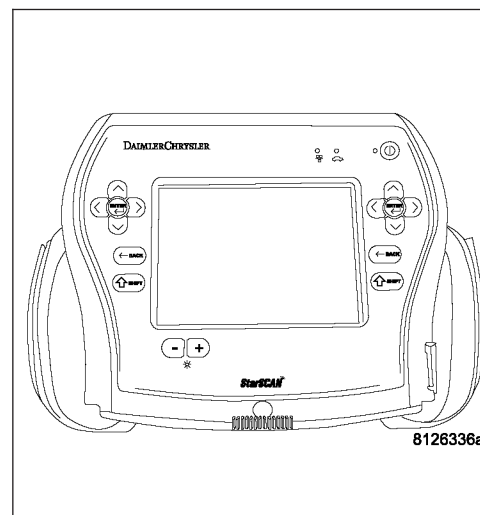
With the scan tool, read DTC's.

**Does the scan tool display B1D1E or B1D2A-MIRROR VERTICAL MOTOR CONTROL CIRCUIT/PERFORMANCE?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



## B1D1E,B1D2A-MIRROR VERTICAL MOTOR CONTROL CIRCUIT/PERFORMANCE – DOOR MODULE (CONTINUED)

**2. TEST FOR A SHORTED MIRROR**

Disconnect the appropriate mirror connector.

With the scan tool, erase DTC's.

Operate the Mirror Switch in all directions several times.

Cycle the ignition from on to off 3 times.

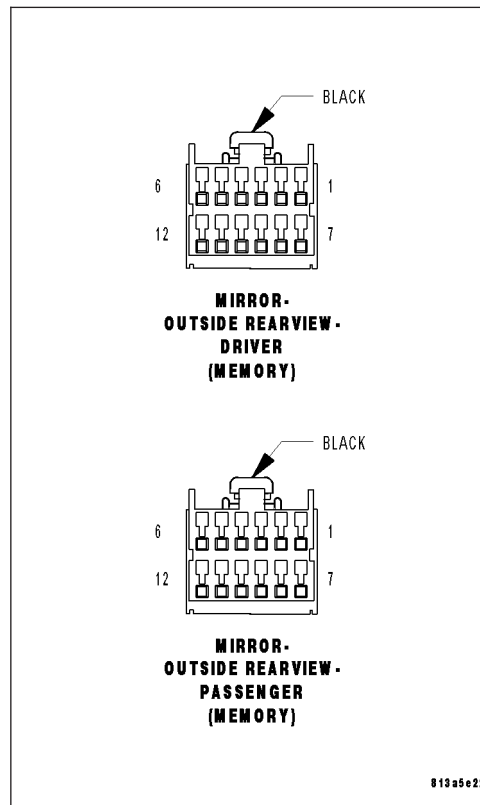
Turn the ignition on.

With the scan tool, read DTC's.

**Does the scan tool display B1D1E or B1D2A-MIRROR VERTICAL MOTOR CONTROL CIRCUIT/PERFORMANCE?**

**No** >> Replace the Mirror.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Go to 3

**3. TEST THE (P71) OR (P72) MIRROR VERTICAL MOTOR DRIVER WIRE FOR A SHORT TO GROUND**

Turn the ignition off.

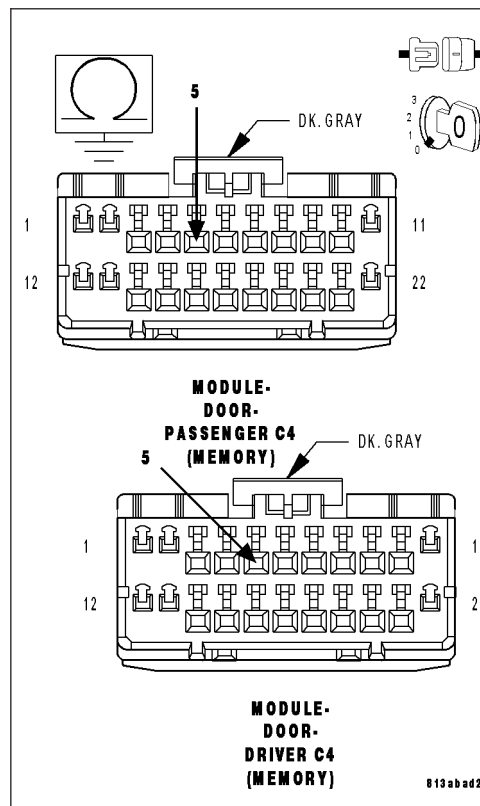
Disconnect the appropriate Door Module C4 connector.

Measure the resistance between ground and the (P71) or (P72) Mirror Vertical Motor Driver circuit.

**Is the resistance below 5000.0 ohms?**

**Yes** >> Repair the (P71) or (P72) Mirror Vertical Motor Driver circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go to 4

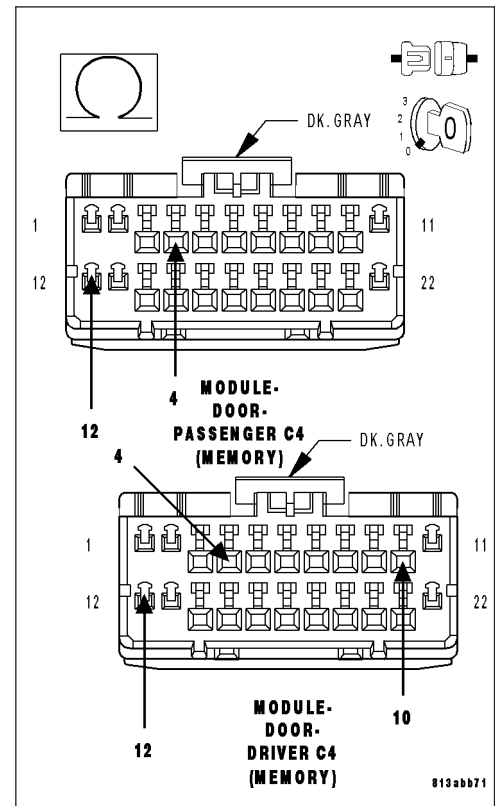


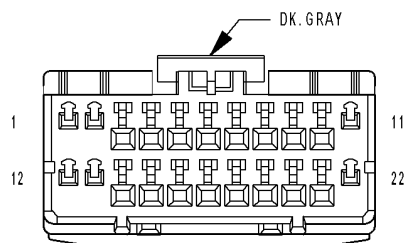
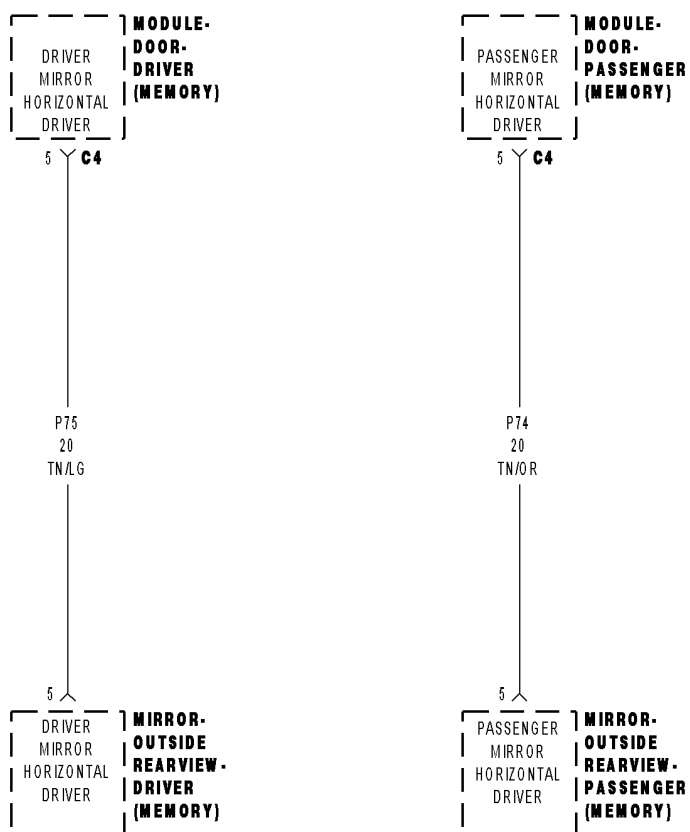
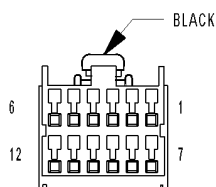
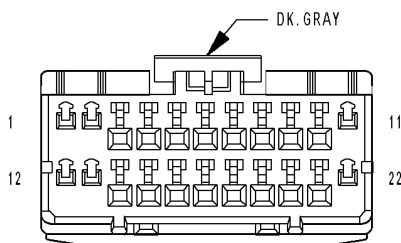
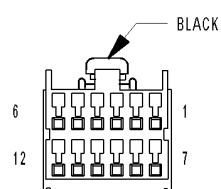
**B1D1E,B1D2A-MIRROR VERTICAL MOTOR CONTROL CIRCUIT/PERFORMANCE – DOOR MODULE (CONTINUED)****4. TEST THE (P71) OR (P72) MIRROR VERTICAL MOTOR DRIVER CIRCUIT SHORTED TO THE (Z912) GROUND CIRCUIT.**

Measure the resistance between the (P71) or (P72) Mirror Vertical Motor Driver circuit and the (Z912) or (Z911) Ground circuit.

**Is the resistance below 5000.0 ohms?**

- Yes** >> Repair the (P71) or (P72) Mirror Vertical Motor Driver circuit for a short to the (Z912) or (Z911) Ground Circuit. Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Replace the appropriate Door Module. Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



**B1D22,B1D2E-MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT/PERFORMANCE – DOOR MODULE****MODULE-DOOR-DRIVER C4 (MEMORY)****MIRROR-OUTSIDE REARVIEW-DRIVER (MEMORY)****MODULE-DOOR-PASSENGER C4 (MEMORY)****MIRROR-OUTSIDE REARVIEW-PASSENGER (MEMORY)**

**B1D22,B1D2E-MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT/PERFORMANCE – DOOR MODULE (CONTINUED)**

For the Power Memory Mirror System circuit diagram(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Continuously

- **Set Condition:**

When the Driver/Passenger Door Module senses a value below the tolerance of the mirror motor on the Mirror Horizontal Motor Driver circuit for over 10ms., this code will set.**Note: This test covers both the Driver and Passenger code depending on the side the code appeared in.**

Possible Causes
(P75) OR (P74) MIRROR HORIZONTAL DRIVER CIRCUIT SHORT TO GROUND
(P75) OR (P74) MIRROR HORIZONTAL DRIVER CIRCUIT SHORTED TO THE (Z912) OR (Z911) GROUND CIRCUIT.
MIRROR SHORTED
DRIVER/PASSENGER DOOR MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Mirror Switch in all directions several times.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

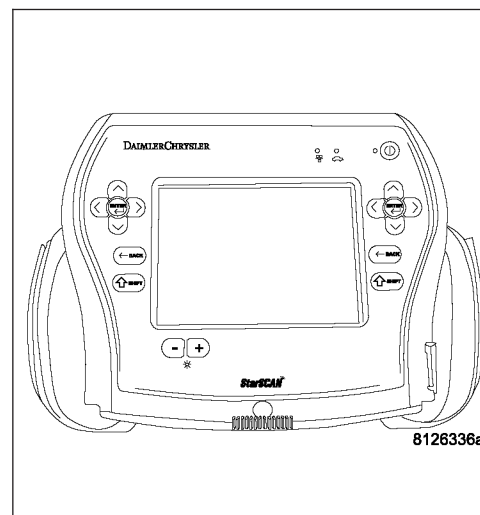
With the scan tool, read DTC's.

**Does the scan tool display B1D22 or B1D2E-MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT/PERFORMANCE?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).





## B1D22,B1D2E-MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT/PERFORMANCE – DOOR MODULE (CONTINUED)

**2. TEST FOR A SHORTED MIRROR**

Disconnect the appropriate mirror connector.

With the scan tool, erase DTC's.

Operate the Mirror Switch in all directions several times.

Cycle the ignition from on to off 3 times.

Turn the ignition on.

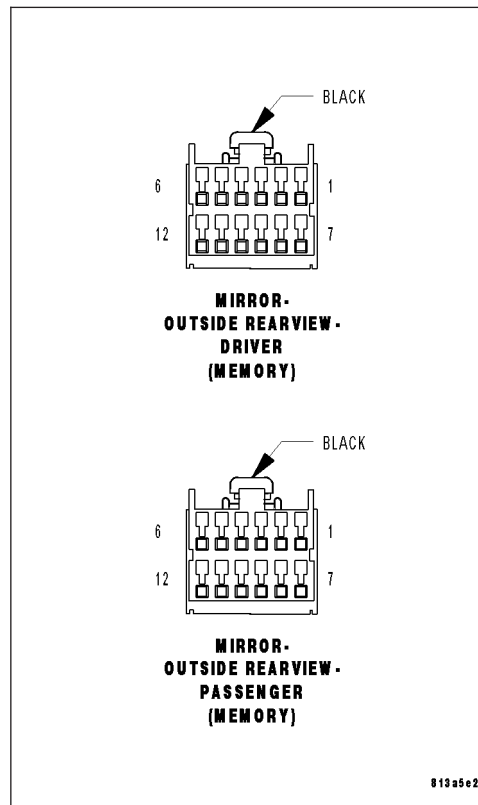
With the scan tool, read DTC's.

**Does the scan tool display B1D22 or B1D2E-MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT/PERFORMANCE?**

**No** >> Replace the Mirror.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**Yes** >> Go to 3

**3. TEST THE (P75) OR (P74) MIRROR HORIZONTAL MOTOR DRIVER WIRE FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the appropriate Door Module C4 connector.

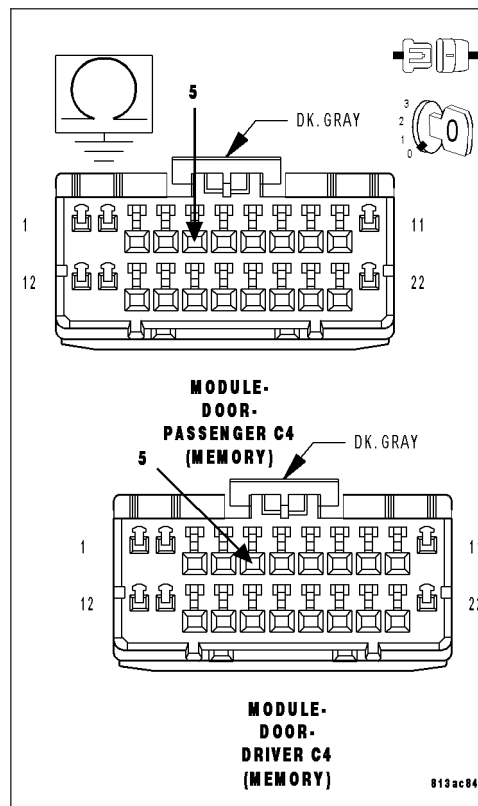
Measure the resistance between ground and the (P75) or (P74) Mirror Horizontal Motor Driver circuit.

**Is the resistance below 5000.0 ohms?**

**Yes** >> Repair the (P75) or (P74) Mirror Horizontal Motor Driver circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go to 4



**B1D22,B1D2E-MIRROR HORIZONTAL MOTOR CONTROL CIRCUIT/PERFORMANCE – DOOR MODULE (CONTINUED)****4. TEST THE (P75) OR (P74) MIRROR HORIZONTAL MOTOR DRIVER CIRCUIT SHORTED TO THE (Z912) OR (Z911) GROUND CIRCUIT.**

Measure the resistance between the (P75) or (P74) Mirror Horizontal Driver circuit and the (Z912) or (Z911) Ground circuit.

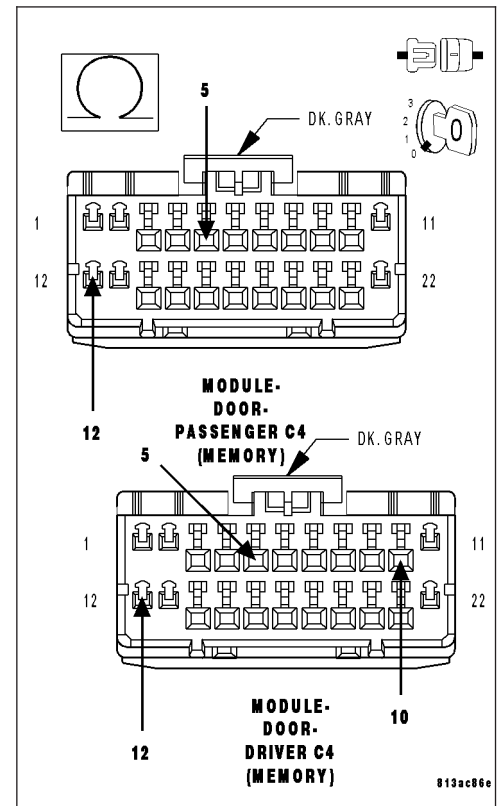
**Is the resistance below 5000.0 ohms?**

**Yes** >> Repair the (P75) or (P74) Mirror Horizontal Motor Driver circuit for a short to the (Z912) or (Z911) Mirror Heater Ground Circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

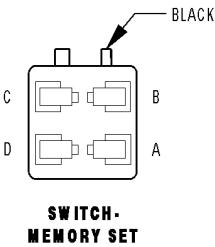
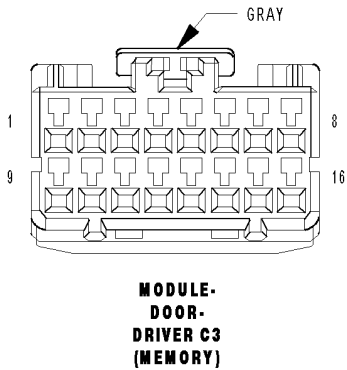
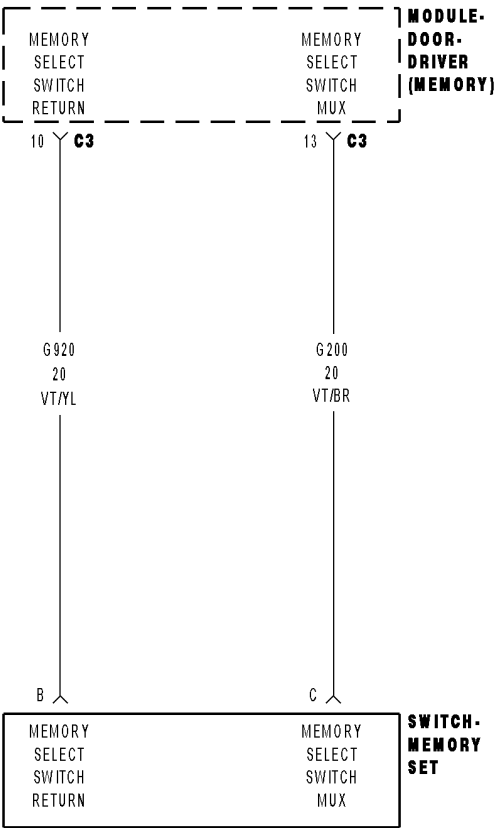
**No** >> Replace the appropriate Door Module.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



813ac86e

B1D4D–MEMORY SWITCH INPUT CIRCUIT STUCK – DOOR MODULE



**B1D4D-MEMORY SWITCH INPUT CIRCUIT STUCK – DOOR MODULE (CONTINUED)**

For the Power Memory Mirror System circuit diagram (Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Memory Select Switch Mux is under 2.6 volts for over 30 seconds.

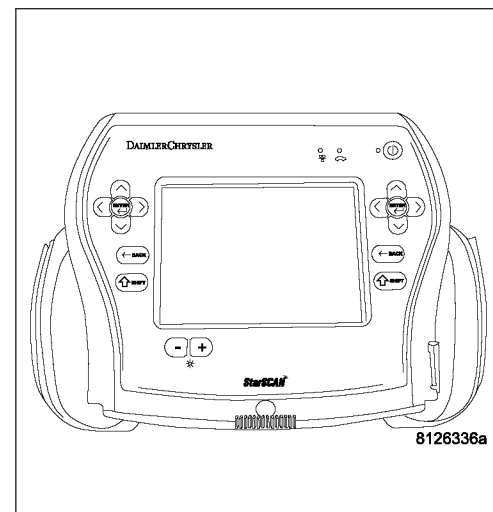
Possible Causes
(P200) MEMORY SELECT SWITCH MUX WIRE PARTIAL SHORT TO GROUND
(P200) MEMORY SELECT SWITCH MUX CIRCUIT SHORTED TO THE (G920) MEMORY SELECT SWITCH RETURN CIRCUIT
MEMORY SET SWITCH
DRIVER DOOR MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase DTC's  
Press the Memory Set Switch several times in all positions.  
Cycle the ignition from on to off 3 times.  
Turn the ignition on.  
With the scan tool, read DTC's.

**Does the scan tool display MEMORY SWITCH INPUT CIRCUIT STUCK?**

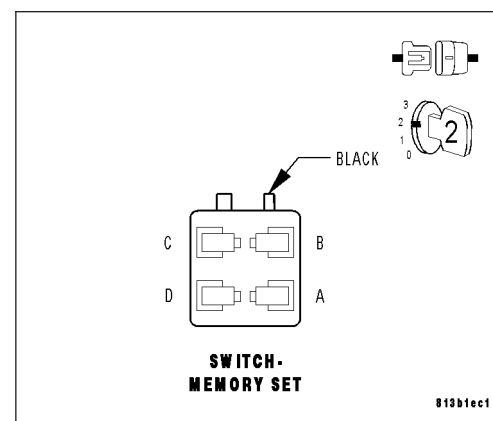
- Yes** >> Go To 2
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**2. MEMORY SELECTOR SWITCH SHORTED TO GROUND**

With the scan tool, erase DTC's.  
Disconnect the Memory Set Switch connector.  
Turn the ignition on.  
With the scan tool, read DTC's.

**Does the scan tool display MEMORY SWITCH INPUT CIRCUIT STUCK?**

- No** >> Replace the Memory Set Switch.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- Yes** >> Go to 3



**B1D4D-MEMORY SWITCH INPUT CIRCUIT STUCK – DOOR MODULE (CONTINUED)****3. (P200) MEMORY SELECT SWITCH MUX CIRCUIT SHORT TO THE GROUND**

Disconnect the Driver Door Module C3 connector.

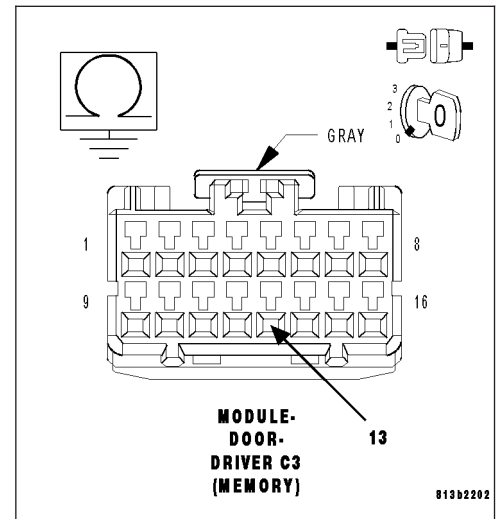
Measure the resistance between ground and the (P200) Memory Select Switch Mux circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the Memory Select Switch Mux wire for a short to ground.

Perform the BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go to 4

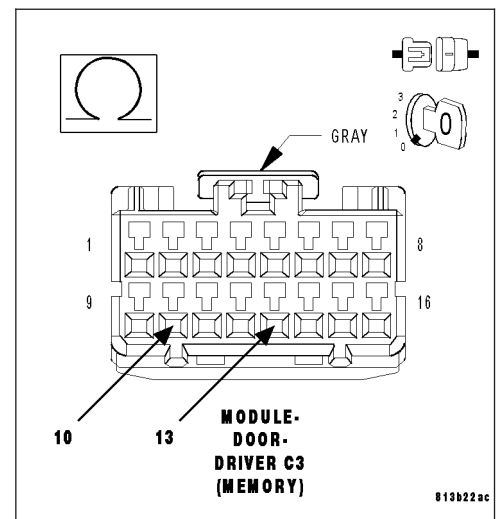
**4. (P200) MEMORY SELECT SWITCH MUX CIRCUIT SHORT TO THE (G920) MEMORY SELECT SWITCH RETURN CIRCUIT**

Measure the resistance between the (P200) Memory Select Switch Mux circuit and the (G920) Memory Select Switch Return circuit in the Driver Door Module C3 connector.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (P200) Memory Select Switch Mux circuit for a short to the (G920) Memory Select Switch return circuit. Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Driver Door Module. Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



**B210D-BATTERY VOLTAGE LOW**

For the Power Mirror System circuit diagram.(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**Engine running.
- **Set Condition:**This code is set immediately after the Door Module detects voltage under 11.3 volts on the (A913) Fused B(+) circuit.

Possible Causes
CHARGING SYSTEM VOLTAGE LOW (A913) FUSED B(+) CIRCUIT DRIVER/PASSENGER DOOR MODULE

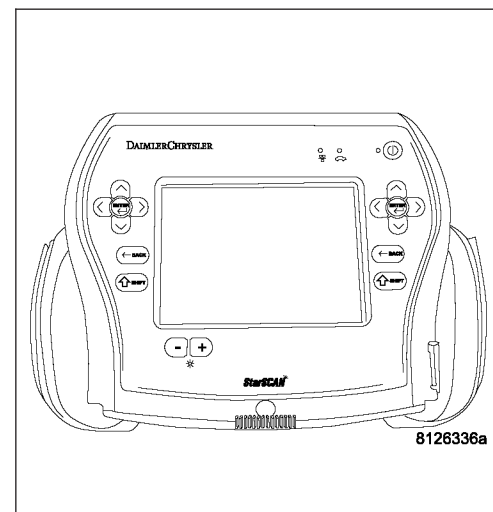
**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. CHECK PCM FOR CHARGING SYSTEM DTC**

With the scan tool, read Powertrain Control Module DTC's.

**Are there any Charging System DTC's set in the Powertrain Control Module?**

- Yes** >> (Refer to 8 - ELECTRICAL/CHARGING - DIAGNOSIS AND TESTING) for Charging System diagnostic procedures.
- No** >> Go To 2  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**2. VERIFY THAT DTC B210D-BATTERY VOLTAGE LOW IS ACTIVE**

With the scan tool, record and erase DTC's

Turn the ignition switch to the Off position then start the engine and let run for one minute.

With the scan tool, read DTC's.

**Does the DTC B210D-BATTERY VOLTAGE LOW reset?**

- Yes** >> Go To 3
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**B210D-BATTERY VOLTAGE LOW (CONTINUED)****3. CHECK THE VOLTAGE ON THE (A913) FUSED B(+) CIRCUIT**

Disconnect the appropriate Door Module C4 connector.

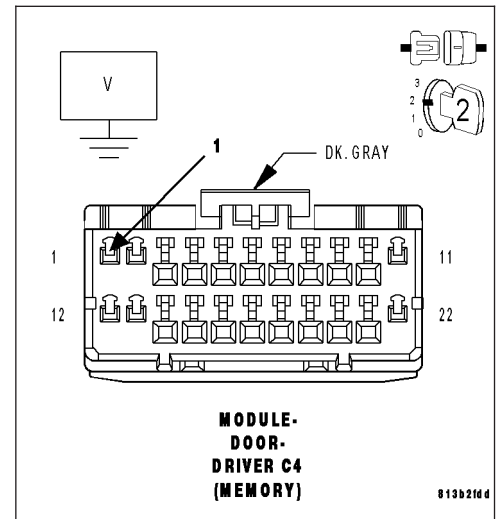
**Note: Check connectors - Clean and repair as necessary.**

Start the engine and let idle.

Measure the voltage on the (A913) Fused B(+) circuit at the Door Module C4 connector and compare to voltage at the vehicle battery.

**Is the voltage at the Door Module C4 connector the same as measured at the battery?**

- Yes** >> Replace the Driver/Passenger Door Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Repair the (A913) Fused B(+) circuit as necessary.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



**B210E-BATTERY VOLTAGE HIGH**

For the Power Mirror System circuit diagram.(Refer to 8 - ELECTRICAL/POWER MIRRORS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**Engine running.
- **Set Condition:**This code is set immediately after the Door Module detects voltage over 15 volts on the (A913) Fused B(+) circuit.

Possible Causes
CHARGING SYSTEM VOLAGE HIGH (A913) FUSED B(+) CIRCUIT DRIVER/PASSENGER DOOR MODULE

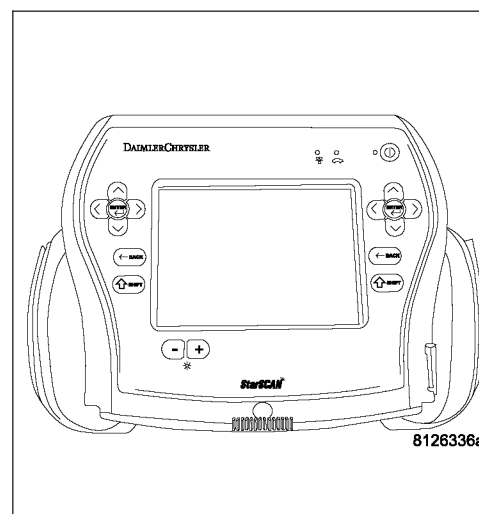
**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. CHECK PCM FOR CHARGING SYSTEM DTC**

With the scan tool, read Powertrain Control Module DTC's.

**Are there any Charging System DTC's set in the Powertrain Control Module?**

- Yes** >> (Refer to 8 - ELECTRICAL/CHARGING - DIAGNOSIS AND TESTING) for Charging System diagnostic procedures.
- No** >> Go To 2  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).

**2. VERIFY THAT DTC B210E-BATTERY VOLTAGE HIGH IS ACTIVE**

With the scan tool, record and erase DTC's

Turn the ignition switch to the Off position then start the engine and let run for one minute.

With the scan tool, read DTC's.

**Does the DTC B210E-BATTERY VOLTAGE HIGH reset?**

- Yes** >> Go To 3
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



**B210E-BATTERY VOLTAGE HIGH (CONTINUED)****3. CHECK THE VOLTAGE ON THE (A913) FUSED B(+) CIRCUIT**

Disconnect the appropriate Door Module C4 connector.

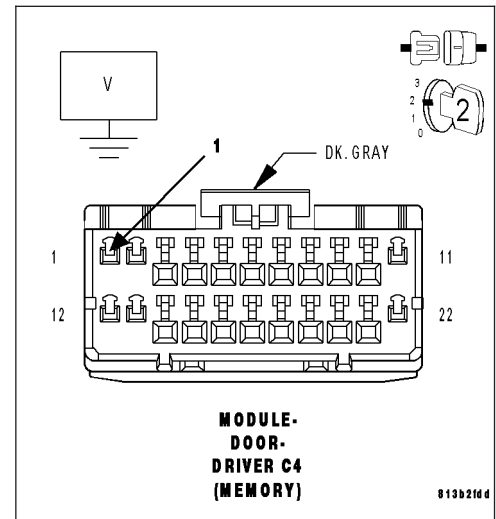
**Note: Check connectors - Clean and repair as necessary.**

Start the engine and let idle.

Measure the voltage on the (A913) Fused B(+) circuit at the Door Module C4 connector and compare to voltage at the vehicle battery.

**Is the voltage at the Door Module C4 connector the same as measured at the battery?**

- Yes** >> Replace the Driver/Passenger Door Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Repair the (A913) Fused B(+) circuit as necessary.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



**B2218,B2219-DOOR MODULE INTERNAL**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:** Ignition on.
- **Set Condition:** This code is set immediately if the Driver/Passenger Door Module internal self test fails.

Possible Causes
DRIVER/PASSENGER DOOR MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. VERIFY THAT DTC B2218, B2219-DOOR MODULE INTERNAL IS ACTIVE**

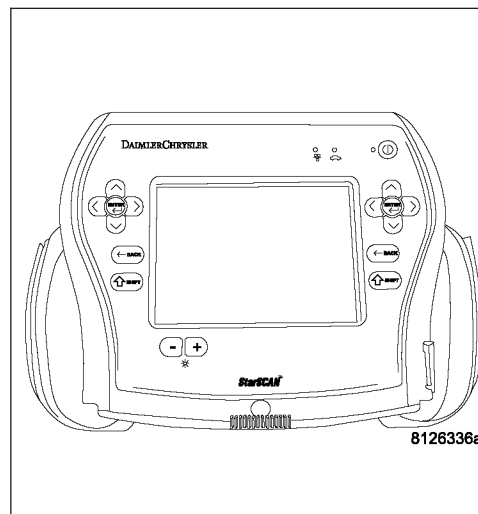
With the scan tool, record and erase DTC's

Cycle the ignition switch off then back on.

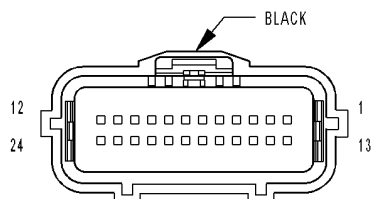
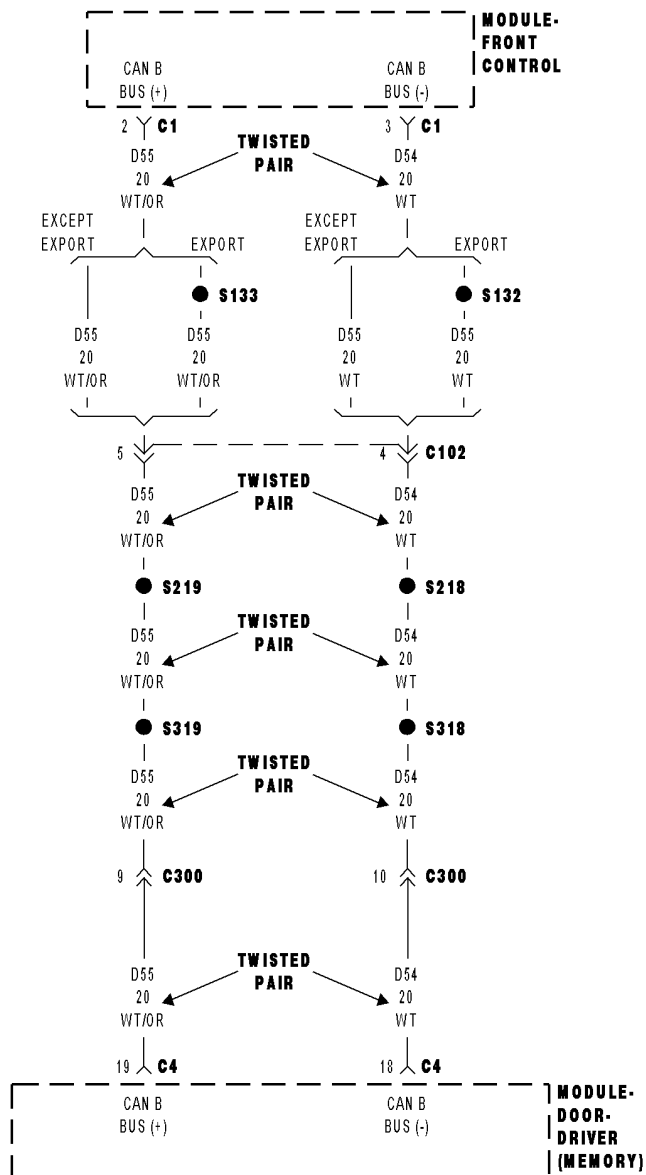
With the scan tool, read DTC's.

**Does the DTC B2218 or B2219 - DOOR MODULE INTERNAL reset?**

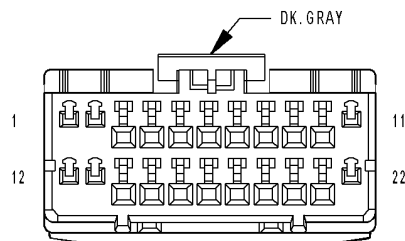
- Yes** >> Replace the appropriate Door Module.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST – VER 1.(Refer to BODY VERIFICATION TEST - VER 1).



## U0019-CAN B BUS – DRIVER DOOR MODULE



**MODULE-FRONT  
CONTROL C1**



**MODULE-DOOR-  
DRIVER C4  
(MEMORY)**

**U0019-CAN B BUS – DRIVER DOOR MODULE (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Continuously
- **Set Condition:**  
Whenever the CAN B Bus (+) or CAN B (-) circuit is open.

Possible Causes
CAN B BUS DTC's IN FRONT CONTROL MODULE (D55) CAN B BUS (+) CIRCUIT OPEN (D54) CAN B BUS (-) CIRCUIT OPEN DRIVER DOOR MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTCs**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**2. CHECK FRONT CONTROL MODULE DTC's**

With the scan tool, read Front Control Module active DTC's

**Does the scan tool display any CAN B BUS DTC's – ACTIVE?**

**Yes** >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**U0019-CAN B BUS – DRIVER DOOR MODULE (CONTINUED)****3. (D55) CAN B BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the Driver Door Module C4 connector.

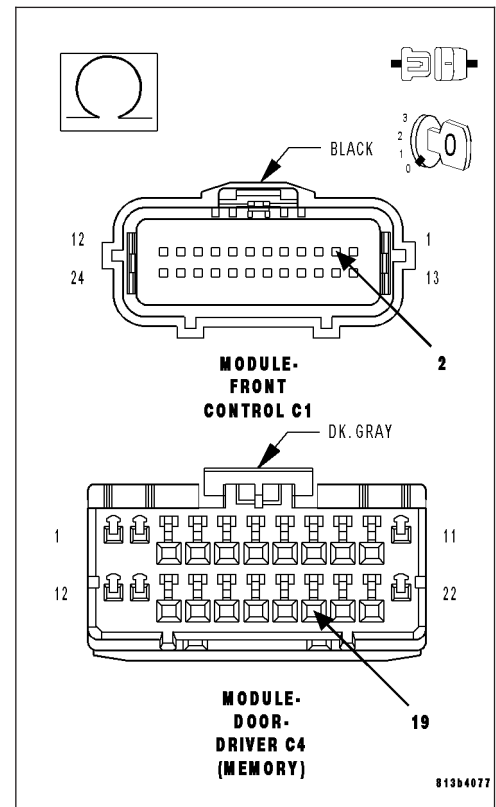
Disconnect the Front Control Module C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the Driver Door Module C4 connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (D55) CAN B Bus (+) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

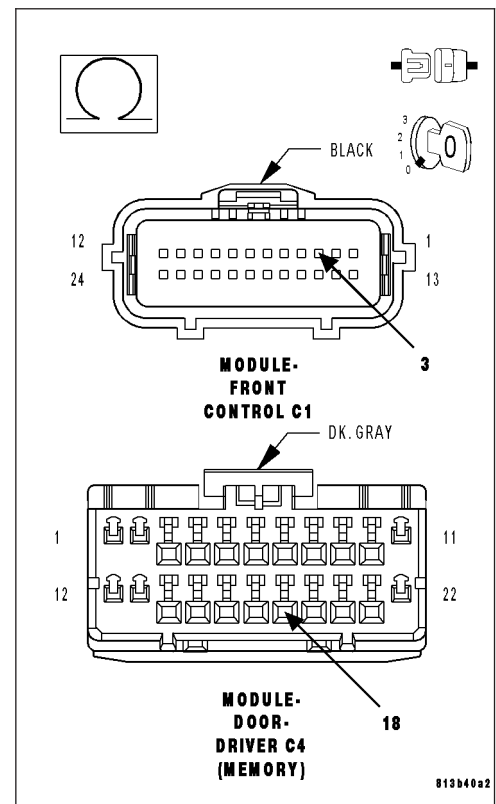
**4. (D54) CAN B BUS (–) CIRCUIT OPEN**

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module C1 connector and the Driver Door Module C4 connector.

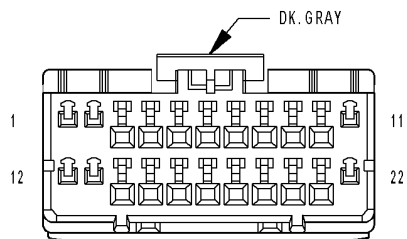
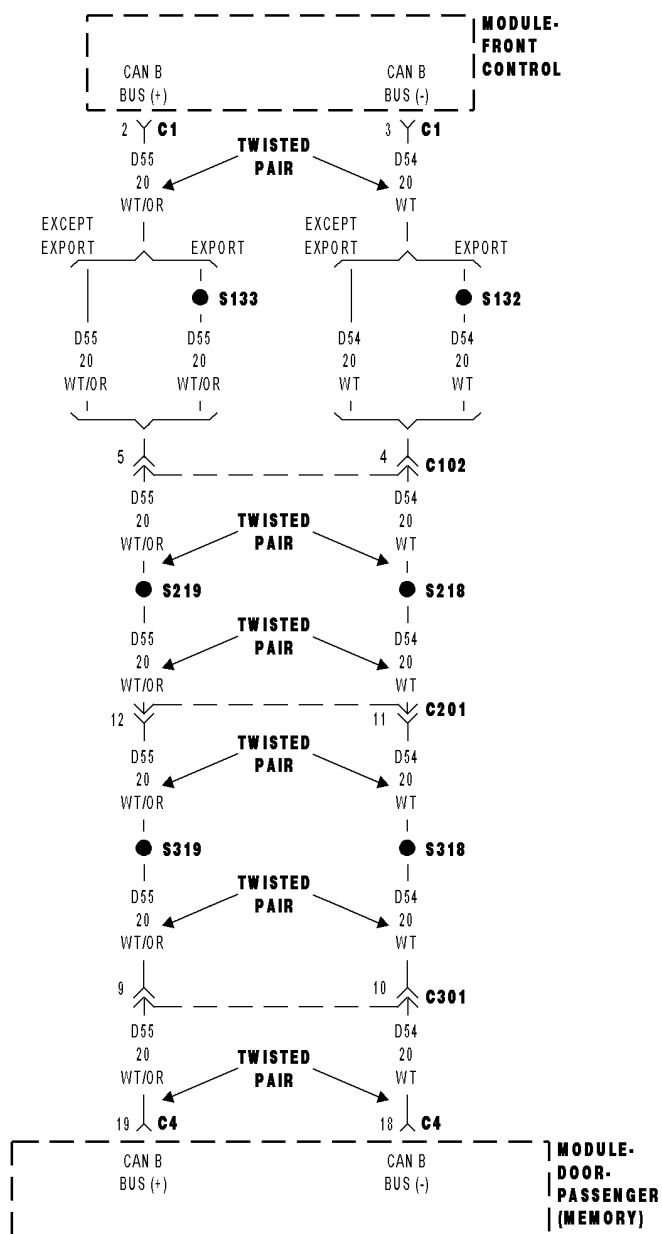
**Is the resistance below 2.0 ohms?**

**Yes** >> Replace the Driver Door Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

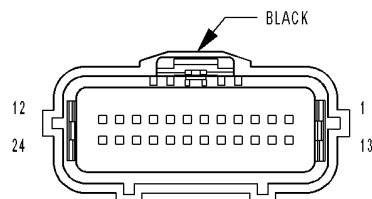
**No** >> Repair the (D54) CAN B Bus (–) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



# U0019-CAN B BUS – PASSENGER DOOR MODULE



**MODULE-DOOR-PASSENGER C4 (MEMORY)**



**MODULE-FRONT CONTROL C1**

**U0019–CAN B BUS – PASSENGER DOOR MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
Whenever the CAN B Bus (+) or CAN B (-) circuit is open.

Possible Causes
CAN B BUS DTC's IN FRONT CONTROL MODULE (D55) CAN B BUS (+) CIRCUIT OPEN (D54) CAN B BUS (-) CIRCUIT OPEN PASSENGER DOOR MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTCs**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**2. CHECK FRONT CONTROL MODULE DTC's**

With the scan tool, read Front Control Module active DTC's

**Does the scan tool display any CAN B BUS DTC's – ACTIVE?**

**Yes** >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**U0019-CAN B BUS – PASSENGER DOOR MODULE (CONTINUED)****3. (D55) CAN B BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the Passenger Door Module C4 connector.

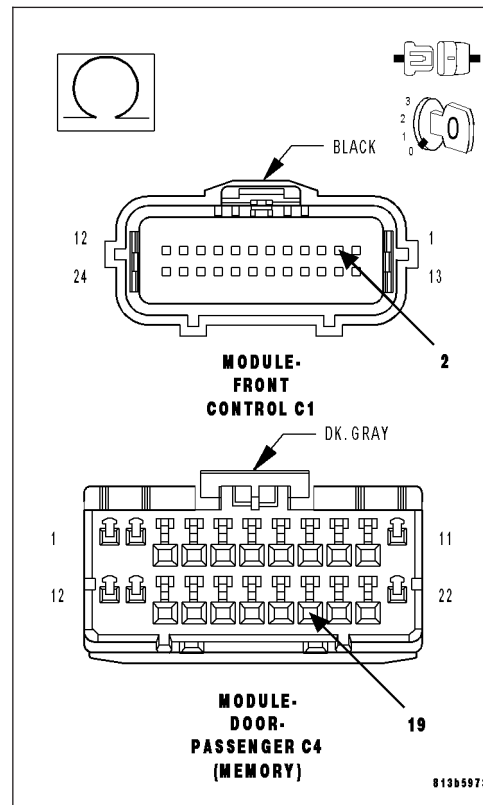
Disconnect the Front Control Module C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the Passenger Door Module C4 connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (D55) CAN B Bus (+) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

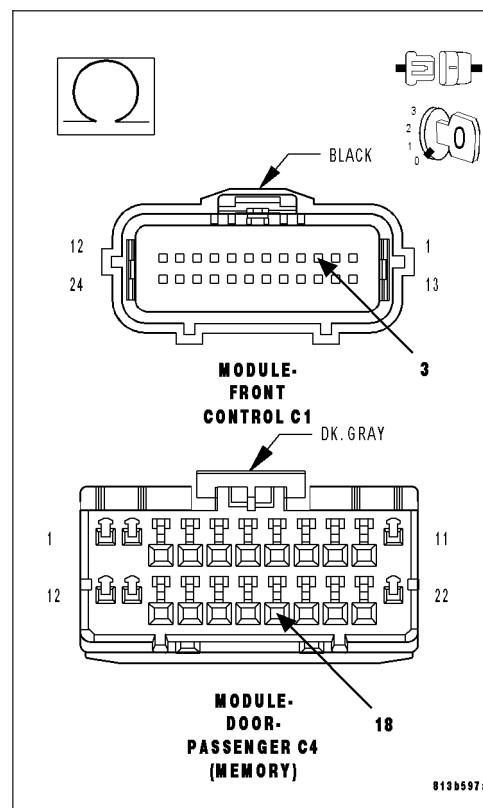
**4. (D54) CAN B BUS (–) CIRCUIT OPEN**

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module C1 connector and the Passenger Door Module C4 connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Replace the Passenger Door Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair the (D54) CAN B Bus (–) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).





## **U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0155-LOST COMMUNICATION WITH CLUSTER/CCN**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0156-LOST COMMUNICATION WITH EOM**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0159-LOST COMMUNICATION WITH PARKING ASSIST CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0169-LOST COMMUNICATION WITH SUNROOF CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0169-LOST COMMUNICATION WITH SUNROOF CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0184-LOST COMMUNICATION WITH RADIO**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0195-LOST COMMUNICATION WITH SDARS**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0197-LOST COMMUNICATION WITH HANDS FREE PHONE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0212-LOST COMMUNICATION WITH SCCM - CAN B**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0231-LOST COMMUNICATION WITH RAIN SENSING MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.



POWER MIRRORS - SERVICE INFORMATION

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POWER MIRRORS - SERVICE INFORMATION

DESCRIPTION

AUTOMATIC DAY/NIGHT MIRROR

The automatic day/night mirror system is able to automatically change the reflectance of the inside rear view and outside left mirror in order to reduce the glare of headlamps approaching the vehicle from the rear. The automatic day/night rear view mirror receives battery current through a fuse in the junction block only when the ignition switch is in the On position.

OUTSIDE REAR VIEW MIRROR

The power operated rear view mirrors allow the driver to adjust both outside mirrors electrically from the driver side front seat position by operating a switch on the driver side front door trim panel. The power mirrors receive a non-switched battery feed through a fuse in the junction block so that the system will remain operational, regardless of the ignition switch position.

OPERATION

AUTOMATIC DAY/NIGHT MIRROR

A switch located on the bottom of the automatic day/night mirror housing allows the vehicle operator to select whether the automatic dimming feature is operational. When the automatic day/night mirror is turned on, the mirror switch is lighted by an integral Light-Emitting Diode (LED). The mirror will automatically disable its self-dimming feature whenever the vehicle is being driven in reverse. The day/night mirror is automatically turned ON each time the ignition is turned to the ON position, regardless if it was previously turned OFF.

DIAGNOSIS AND TESTING

POWER MIRRORS

Any diagnosis of the Power Mirror system should begin with the use of scan tool. For information on the use of the scan tool, refer to the appropriate Diagnostic Service information.

For complete circuit diagrams, refer to the appropriate wiring information.

1. Check the fuses in the Power Distribution Center (PDC) and the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse(s).
2. Check for battery voltage at the fuse in the junction block. If OK, go to Step 3. If not OK, repair the open circuit to the PDC as required.

3. Disconnect and isolate the battery negative cable. Remove the driver side power window switch and bezel assembly and unplug the wire harness connector from the power mirror switch. Connect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity in the door wire harness half of the power mirror switch wire harness connector. If OK, go to Step 4. If not OK, repair the open circuit to the junction block as required.
4. Disconnect and isolate the battery negative cable. Check for continuity between the ground circuit cavity in the door wire harness half of the power mirror switch wire harness connector and a good ground. There should be continuity. If not OK, repair open in the ground circuit.

## MIRROR-INSIDE REARVIEW

### DESCRIPTION

The automatic day/night mirror uses a thin layer of electrochromic material between two pieces of conductive glass to form the face of the mirror. When the mirror switch is in the On position, two photocell sensors are used by the mirror circuitry to monitor external light levels and adjust the reflectance of the mirror.

### OPERATION

The ambient photocell sensor is located on the forward-facing (windshield side) of the rear view mirror housing, and detects the ambient light levels outside of the vehicle. The headlamp photocell sensor is located inside the rear view mirror housing behind the mirror glass and faces rearward, to detect the level of the light being received at the rear window side of the mirror. When the circuitry of the automatic day/night mirror detects that the difference between the two light levels is too great (the light level received at the rear of the mirror is much higher than that at the front of the mirror), it begins to darken the mirror.

The automatic day/night mirror circuitry also monitors the transmission using an input from the backup lamp circuit. The mirror circuitry is programmed to automatically disable its self-dimming feature whenever it senses that the transmission backup lamp circuit is energized.

The automatic day/night mirror is a completely self-contained unit and cannot be repaired. If faulty or damaged, the entire mirror assembly must be replaced.

## DIAGNOSIS AND TESTING

### AUTOMATIC DAY/NIGHT MIRROR

**For complete circuit diagrams, refer to the appropriate wiring information.**

1. Check the fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.
2. Turn the ignition switch to the On position. Check for battery voltage at the fuse in the junction block. If OK, go to Step 3. If not OK, repair the open circuit to the ignition switch as required.
3. Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Unplug the wire harness connector from the automatic day/night mirror. Connect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run/start) circuit cavity of the automatic day/night mirror wire harness connector. If OK, go to Step 4. If not OK, repair the open circuit to the junction block as required.
4. Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Check for continuity between the ground circuit cavity of the automatic day/night mirror wire harness connector and a good ground. There should be continuity. If OK, go to Step 5. If not OK, repair the circuit to ground as required.
5. Connect the battery negative cable. Turn the ignition switch to the On position. Apply the parking brake. Place the transmission gear selector lever in the Reverse position. Check for battery voltage at the backup lamp switch output circuit cavity of the automatic day/night mirror wire harness connector. If OK, go to Step 6. If not OK, repair the open circuit as required.
6. Turn the ignition switch to the Off position. Disconnect the battery negative cable. Plug in the automatic day/night mirror wire harness connector. Connect the battery negative cable. Cover the forward facing ambient photocell sensor to keep out any ambient light. Turn the ignition switch to the On position. Place the transmission gear selector lever in the Neutral position. Place the mirror switch in the On (the LED in the mirror switch is lighted) position. Cover the forward facing ambient photocell sensor to keep out any ambient light.

**Note:** The ambient photocell sensor must be covered completely, so that no light reaches the sensor. Use a finger pressed tightly against the sensor, or cover the sensor completely with electrical tape.

7. Shine a light into the rearward facing headlamp photocell sensor. The mirror glass should darken. If OK, go to Step 8. If not OK, replace the faulty automatic day/night mirror unit.
8. With the mirror glass darkened, place the transmission gear selector lever in the Reverse position. The mirror should return to its normal reflectance. If not OK, replace the faulty automatic day/night mirror.

## SWITCH-MIRROR

### DESCRIPTION

A power mirror switch is located on the driver's door trim panel, attached to the window/lock switch. The power mirror switch includes the following:

- **Power Mirror Selector Switch** - A three-position rotary joystick switch selects the right or left power mirror for adjustment, or turns the power mirror system Off in the center position.
- **Power Mirror Adjustment Switch** - A momentary joystick directional switch allows the driver to adjust the selected power mirror in the Up, Down, Right or Left directions.

### OPERATION

The power mirror switch circuitry is connected to battery current through a fuse in the IPM on a fused B(+) circuit so that the power mirrors remain operational regardless of the ignition switch position. A rotary joystick selector switch has three positions, one to select the right mirror, one to select the left mirror, and a center Off position. After the right or left mirror is selected, the joystick is moved to move the selected mirror Up, Down, Right or Left.

In vehicles without Memory Mirrors the power mirror switch circuitry controls the battery current and ground feeds to each of the four (two in each mirror head) power mirror motors. In vehicles with Memory Mirrors the mirror switch connects to the driver power mirror module. The driver memory mirror module uses the mirror switch inputs to control the battery current and ground feeds to driver mirror motor and sends a CAN Bus message to the passenger mirror module. The passenger mirror module controls the battery current and ground feeds to passenger mirror motors based on the CAN bus message from the driver memory module.

In vehicles equipped with the exterior day/night mirror, the operation of the dimming feature is controlled by the interior day/night mirror. The exterior mirror is hard wired to the interior mirror.

## DIAGNOSIS AND TESTING

### POWER MIRROR SWITCH

1. Disconnect and isolate the battery negative cable.
2. Remove the power mirror switch (Refer to 8 - ELECTRICAL/POWER MIRRORS/POWER MIRROR SWITCH - REMOVAL).
3. Disconnect the wire harness connector from the switch.
4. Test the switch continuity. refer to the Power Mirror Switch Tests chart to determine if the continuity is correct for the switch in each switch position. If not OK, replace the inoperative switch as required.

### POWER MIRROR SWITCH TEST

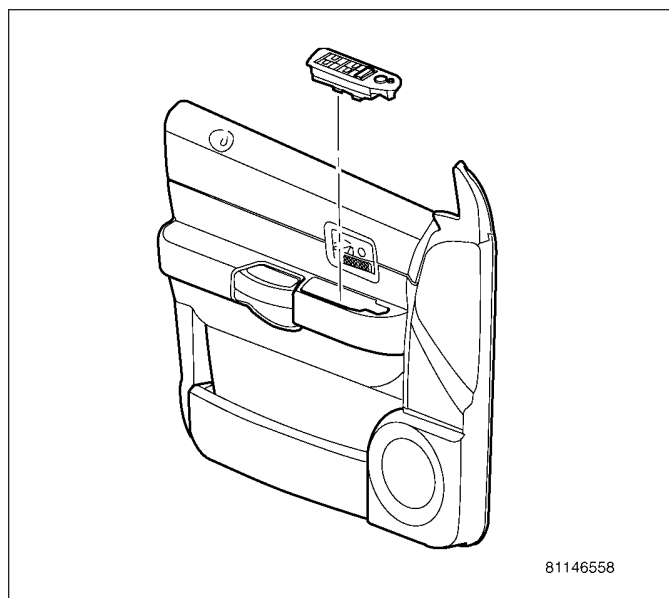
SWITCH POSITION	CONTINUITY BETWEEN PINS OF MIRROR SWITCH
LEFT MIRROR SELECTED	
UP	PINS 5 & 7, PINS 4 & 3
DOWN	PINS 4 & 7, PINS 5 & 3
RIGHT	PINS 4 & 9, PINS 5 & 3
LEFT	PINS 4 & 3, PINS 5 & 9

SWITCH POSITION	CONTINUITY BETWEEN PINS OF MIRROR SWITCH
RIGHT MIRROR SELECTED	
UP	PINS 4 & 3, PINS 5 & 6
DOWN	PINS 4 & 6, PINS 5 & 3
RIGHT	PINS 4 & 8, PINS 5 & 3
LEFT	PINS 4 & 3, PINS 5 & 8

## REMOVAL

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

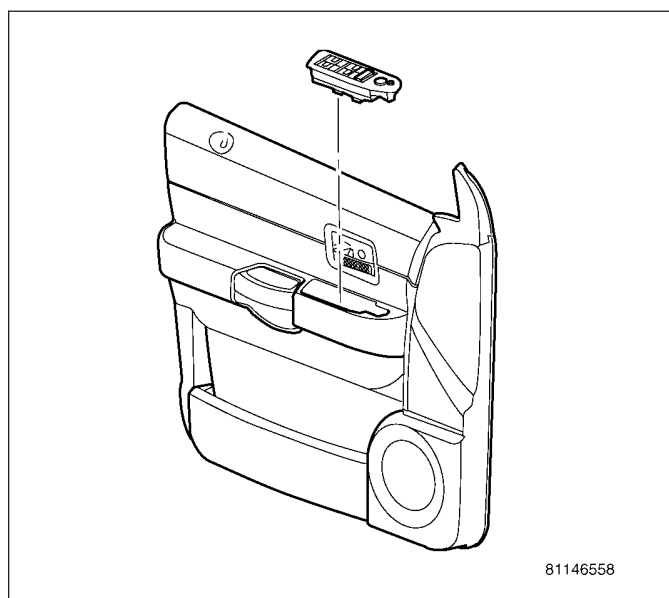
1. Disconnect and isolate the battery negative cable.
2. Remove the window/lock switch (Refer to 8 - ELECTRICAL/POWER LOCKS/POWER LOCK SWITCH - REMOVAL).
3. Remove the power mirror switch from the window/lock switch by twisting the switch counter-clockwise.



## INSTALLATION

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Install power mirror switch to window/lock switch assembly.
2. Connect wire harness connectors to switches.
3. Install window/lock switch assembly (Refer to 8 - ELECTRICAL/POWER LOCKS/POWER LOCK SWITCH - INSTALLATION).
4. Connect battery negative cable.





## POWER SEATS - ELECTRICAL DIAGNOSTICS

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## POWER SEATS - ELECTRICAL DIAGNOSTICS

### DIAGNOSIS AND TESTING

## B1D62-POWER SEAT SWITCH STUCK

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Memory Seat Module detects the switch engaged in an active position for over 50 seconds, this code will set.

Possible Causes
DRIVER SEAT SWITCH

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

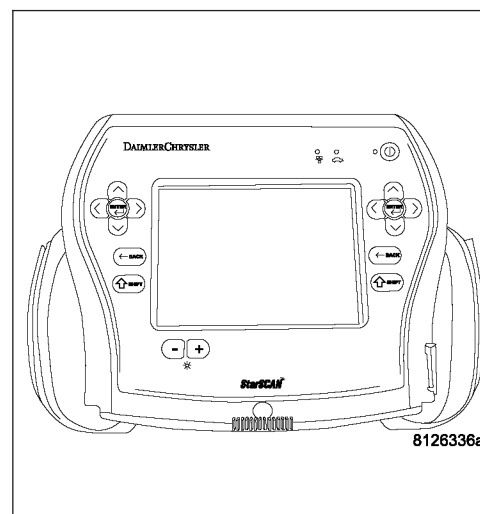
Press the Seat Switch in all directions several times.

Wait one minute.

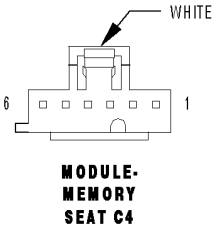
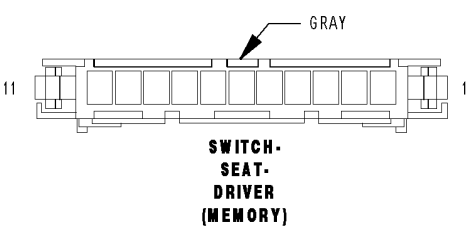
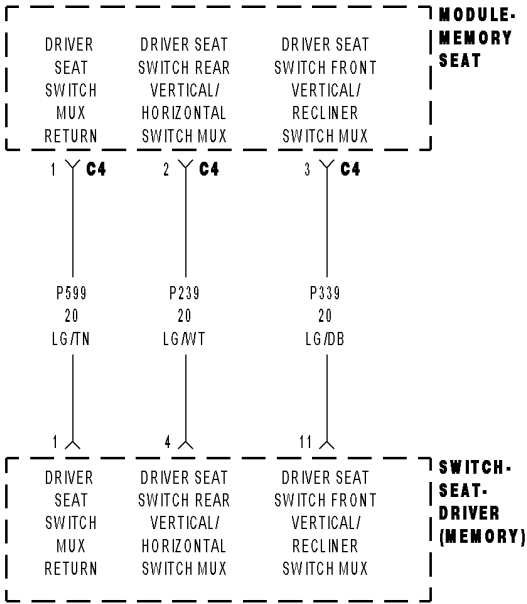
With the scan tool, read DTC's.

#### Does the scan tool display B1D62-POWER SEAT SWITCH STUCK?

- Yes** >> Replace the Driver Seat Switch as necessary.  
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



B1D63-POWER SEAT SWITCH OPEN



**B1D63-POWER SEAT SWITCH OPEN (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
When the Memory Seat Module detects an open driver seat switch MUX circuit this code will set.

Possible Causes
(P239) DRIVER SEAT REAR VERTICAL/HORIZONTAL SWITCH MUX OPEN
(P339) DRIVER SEAT FRONT VERTICAL/RECLINER SWITCH MUX OPEN
(P599) DRIVER SEAT SWITCH MUX RETURN OPEN
DRIVER SEAT SWITCH
MEMORY SEAT MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Press the Seat Switch in all directions several times.

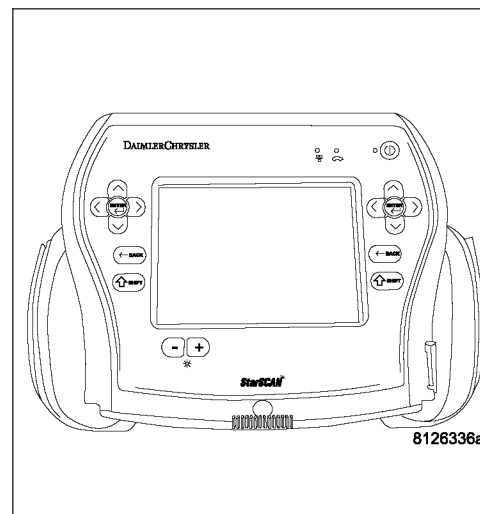
Wait one minute.

With the scan tool, read DTC's.

**Does the scan tool display B1D63-POWER SEAT SWITCH OPEN?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



**B1D63-POWER SEAT SWITCH OPEN (CONTINUED)****2. CHECK THE (P239) DRIVER SEAT REAR VERTICAL/HORIZONTAL SWITCH MUX CIRCUIT RESISTANCE**

Disconnect the Memory Seat Module C4 connector.

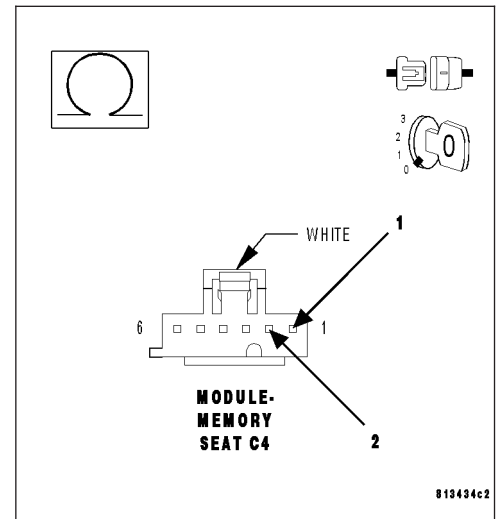
**Note: Check connectors - Clean and repair as necessary.**

Measure the resistance between the (P239) Driver Seat Rear Vertical/Horizontal Switch MUX circuit and the (P599) Driver Seat Switch MUX Return circuit in the C4 connector.

**Is the resistance 47.0 ohms + or – 1.0?**

**Yes** >> Go To 3

**No** >> Go To 5

**3. CHECK THE (P339) DRIVER SEAT FRONT VERTICAL/RECLINER SWITCH MUX CIRCUIT RESISTANCE**

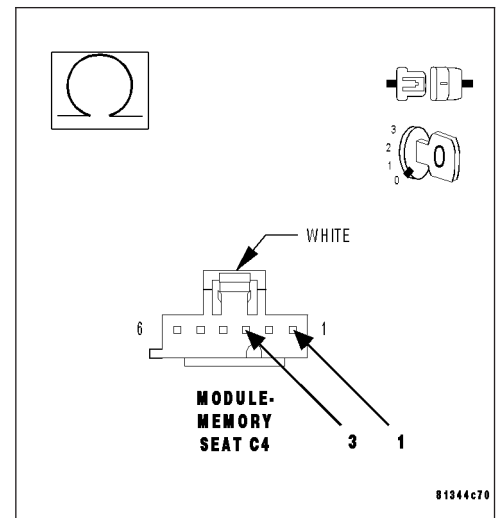
Measure the resistance between the (P339) Driver Seat Front Vertical/Recliner Switch MUX circuit and the (P599) Driver Seat Switch MUX Return circuit in the C4 connector.

**Is the resistance 47.0 ohms + or – 1.0?**

**Yes** >> Replace the Memory Seat Module.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**No** >> Go To 4



**B1D63-POWER SEAT SWITCH OPEN (CONTINUED)****4. CHECK THE (P339) DRIVER SEAT FRONT VERTICAL/RECLINER SWITCH MUX WIRE RESISTANCE**

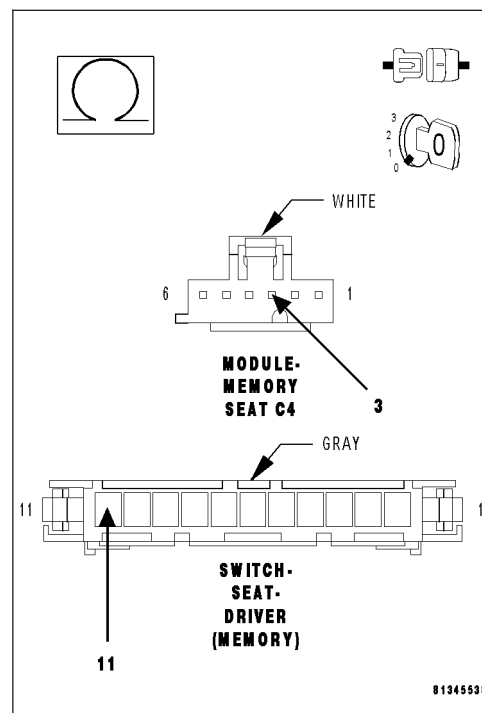
Disconnect the Driver Seat Switch.

**Note:** Check connectors - Clean and repair as necessary.

Measure the resistance of the (P339) Driver Seat Front Vertical/Recliner Switch MUX circuit between the C4 connector and the Driver Seat Switch connector.

**Is the resistance below 1.0 ohm?**

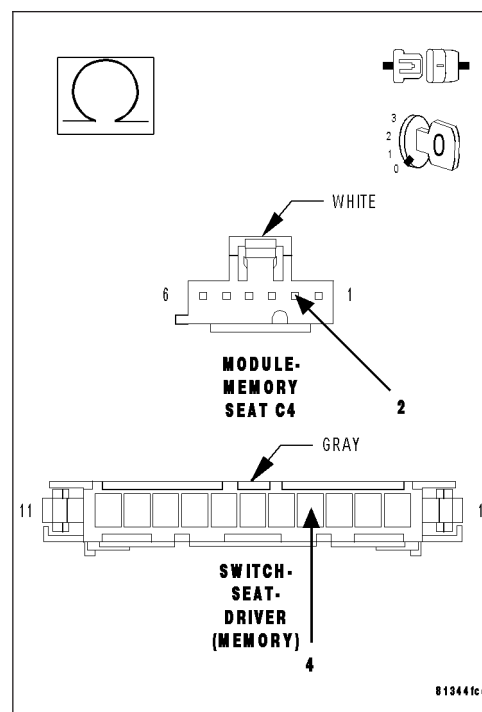
- Yes** >> Replace the Driver Seat Switch.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)
- No** >> Repair the (P339) Driver Seat Front Vertical/Recliner Switch MUX circuit for an open.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**5. CHECK THE (P239) DRIVER SEAT REAR VERTICAL/HORIZONTAL SWITCH MUX WIRE RESISTANCE**

Measure the resistance of the (P239) Driver Seat Rear Vertical/Horizontal Switch MUX circuit between the C4 connector and the Driver Seat Switch connector.

**Is the resistance below 1.0 ohm?**

- Yes** >> Go To 6
- No** >> Repair the (P239) Driver Seat Rear Vertical/Horizontal Switch MUX circuit for an open.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

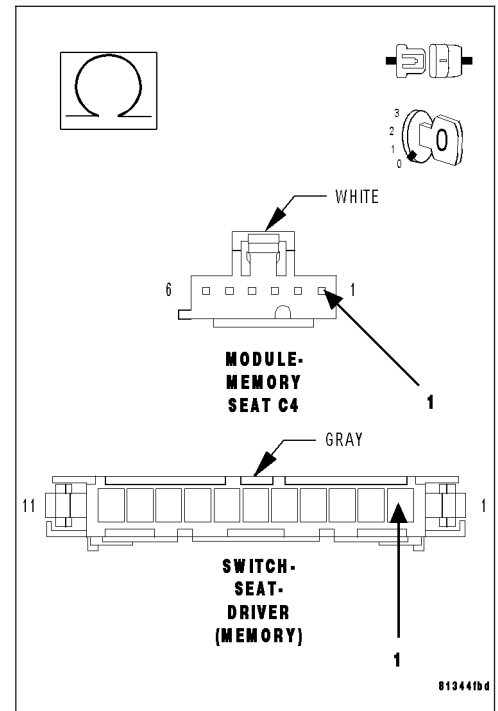


**B1D63-POWER SEAT SWITCH OPEN (CONTINUED)****6. CHECK THE (P599) DRIVER SEAT SWITCH MUX RETURN WIRE RESISTANCE**

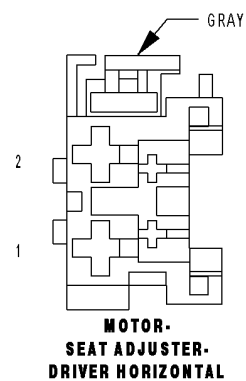
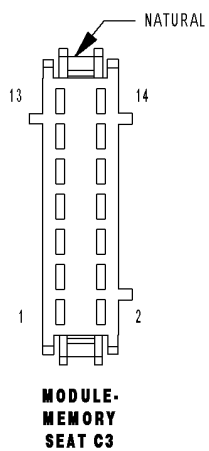
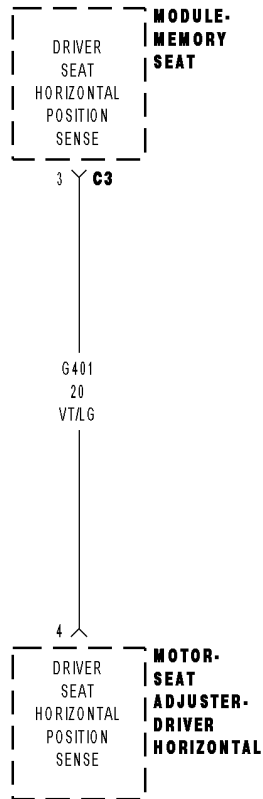
Measure the resistance of the (P599) Driver Seat Switch MUX Return circuit between the C4 connector and the Driver Seat Switch connector.

**Is the resistance below 1.0 ohm?**

- Yes** >> Replace the Driver Seat Switch.  
Perform BODY VERIFICATION TEST – VER 1(Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Repair the (P599) Driver Seat Switch MUX Return circuit for an open.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



## B1D6D-SEAT HORIZONTAL POSITION SENSOR CIRCUIT LOW





**B1D6D-SEAT HORIZONTAL POSITION SENSOR CIRCUIT LOW (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).

- **Set Condition:**

If sensor voltage is not within a specified range this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G401) DRIVER SEAT HORIZONTAL POSITION SENSE CIRCUIT SHORTED TO GROUND
DRIVER HORIZONTAL SEAT ADJUSTER MOTOR
MEMORY SEAT MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the Seat Switch in the Horizontal position 3 times.

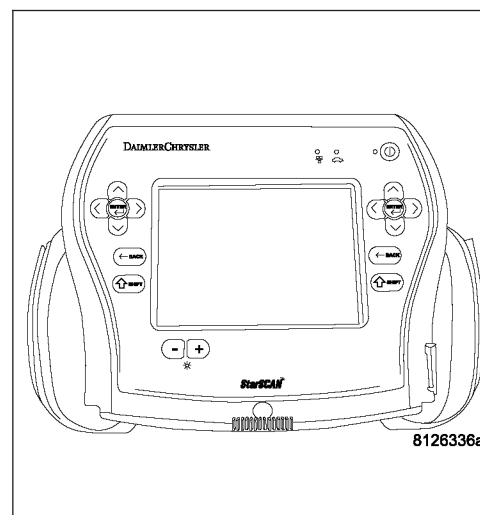
With the scan tool, read DTC's.

**Does the scan tool display B1D6D-SEAT HORIZONTAL POSITION SENSOR CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



**B1D6D-SEAT HORIZONTAL POSITION SENSOR CIRCUIT LOW (CONTINUED)****2. CHECK THE (G401) DRIVER SEAT HORIZONTAL POSITION SENSE VOLTAGE**

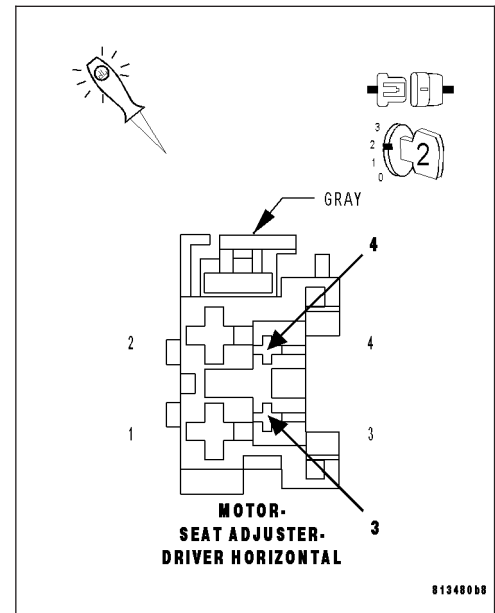
Disconnect the Driver Horizontal Seat Adjuster Motor.

**Note: Check connectors – Clean and repair as necessary.**

Move the Seat Switch in the Horizontal position during the next step. Using a 12-volt test light connect one lead to the (G401) Driver Seat Horizontal Position Sense circuit and the other lead to Driver Seat Horizontal Sensor Ground at the Driver Horizontal Seat Adjuster Motor connector.

**Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?**

- Yes** >> Replace the seat track horizontal motor assembly.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)
- No** >> Go To 3

**3. CHECK THE (G401) DRIVER SEAT HORIZONTAL POSITION SENSE WIRE FOR A SHORT TO GROUND**

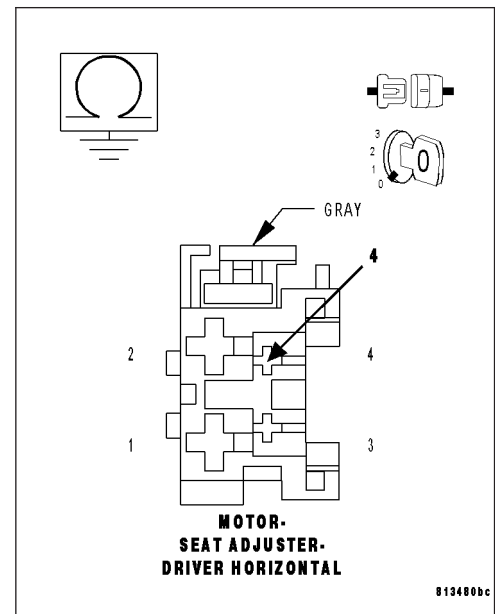
Disconnect the Memory Seat Module C3 connector.

**Note: Check connectors – Clean and repair as necessary.**

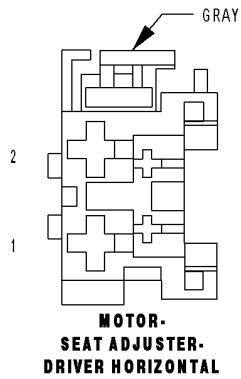
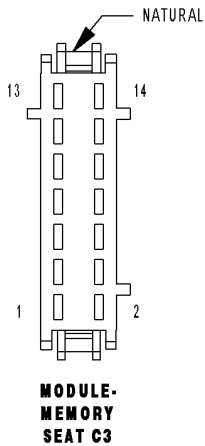
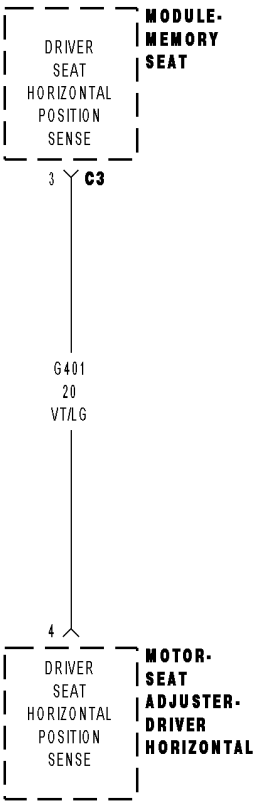
Measure the resistance of the (G401) Driver Seat Horizontal Position Sense wire at the Driver Horizontal Seat Adjuster Motor connector to ground.

**Is the resistance below 1000.0 ohm?**

- Yes** >> Repair the (G401) Driver Seat Horizontal Position Sense circuit for a short to ground.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)
- No** >> Replace the Memory Seat Module.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



B1D6E-SEAT HORIZONTAL POSITION SENSOR CIRCUIT HIGH



**B1D6E-SEAT HORIZONTAL POSITION SENSOR CIRCUIT HIGH (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).

- **Set Condition:**

If during motor operation the sensor voltage is not within a specified range this code will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G401) DRIVER SEAT HORIZONTAL POSITION SENSE CIRCUIT SHORTED TO VOLTAGE
DRIVER RECLINER SEAT ADJUSTER MOTOR
MEMORY SEAT MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the seat switch in the horizontal position 3 times.

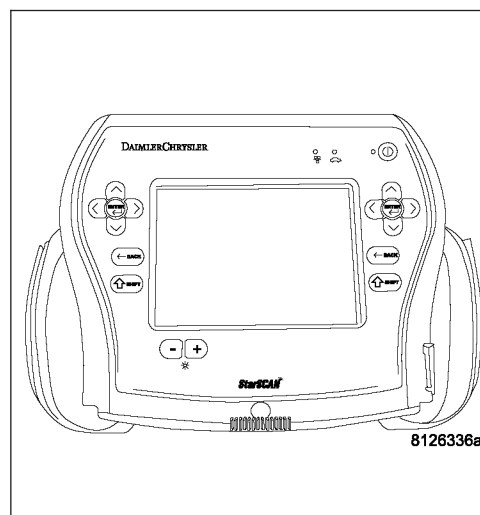
With the scan tool, read DTC's.

**Does the scan tool display B1D6E-SEAT HORIZONTAL POSITION SENSOR CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



**B1D6E-SEAT HORIZONTAL POSITION SENSOR CIRCUIT HIGH (CONTINUED)****2. CHECK THE (G401) DRIVER SEAT HORIZONTAL POSITION SENSE VOLTAGE**

Disconnect the Driver Horizontal Seat Adjuster Motor.

**Note: Check connectors – Clean and repair as necessary.**

With the scan tool erase DTC's

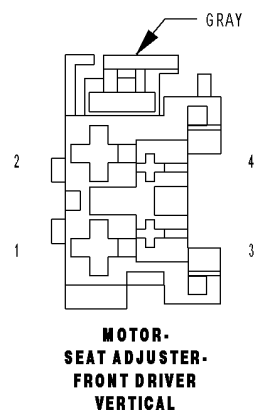
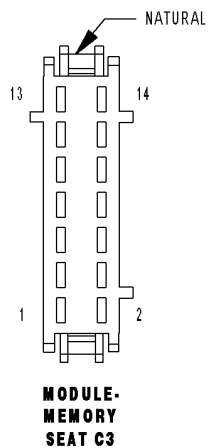
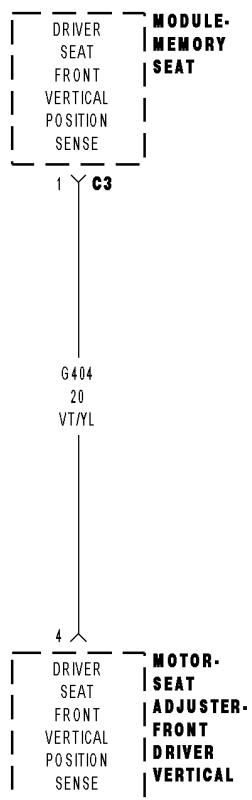
Move the seat switch in the horizontal positions 3 times.

With the scan tool, read DTC's.

**Does the same DTC reset?**

- No** >> Inspect the position sense wire for a possible intermittent short to voltage from another circuit, if OK replace the Driver Horizontal Seat Adjuster Motor assembly.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)
- Yes** >> Inspect the position sense wire for a possible short to voltage from another circuit, if OK replace the Memory Seat Module.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)
-

## B1D71-SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT LOW



**B1D71-SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT LOW (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).

- **Set Condition:**

If sensor voltage is not within a specified range this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE CIRCUIT SHORTED TO GROUND
FRONT DRIVER VERTICAL SEAT ADJUSTER MOTOR
MEMORY SEAT MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the Seat Switch in the Front Vertical position 3 times.

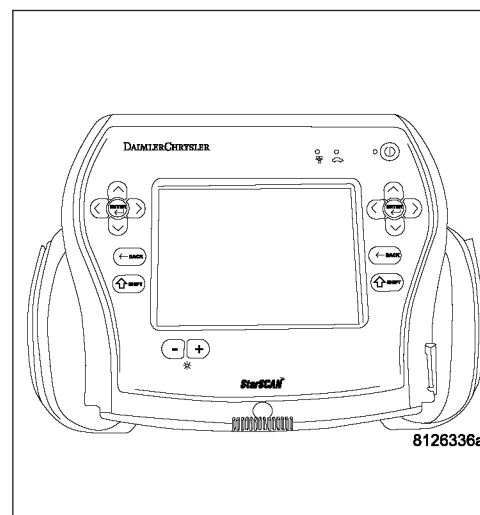
With the scan tool, read DTC's.

**Does the scan tool display B1D71-SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



**B1D71-SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT LOW (CONTINUED)****2. CHECK THE (G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE VOLTAGE**

Disconnect the Front Driver Vertical Seat Adjuster Motor.

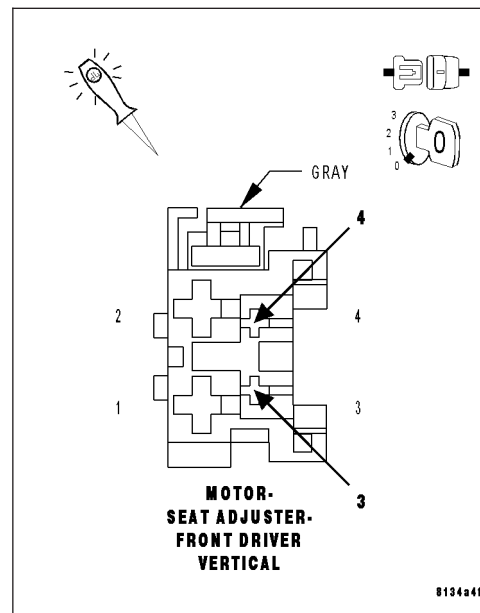
**Note: Check connectors – Clean and repair as necessary.**

Move the seat switch in the front vertical position during the next step. Using a 12-volt test light connect one lead to the (G404) Driver Seat Front Vertical Position Sense circuit and the other lead to the Driver Seat Front Vertical Sensor Ground at the Front Driver Seat Adjuster Motor connector.

**Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?**

**Yes** >> Replace the Front Driver Seat Adjuster Motor assembly. Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. CHECK THE (G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE WIRE FOR A SHORT TO GROUND**

Disconnect the Memory Seat Module C3 connector.

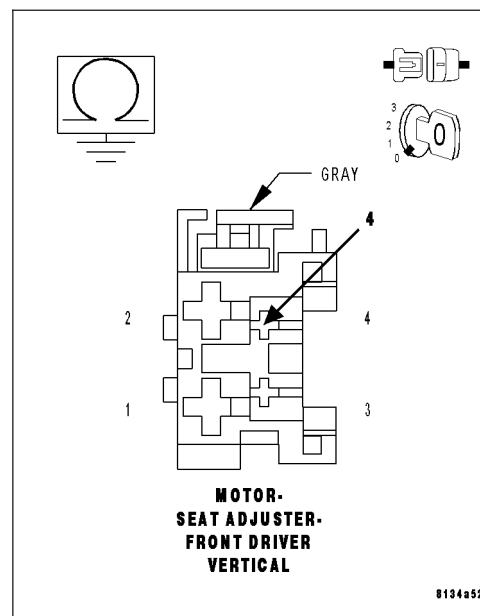
**Note: Check connectors – Clean and repair as necessary.**

Measure the resistance of the (G404) Driver Seat Front Vertical Position Sense wire at the Front Driver Vertical Seat Adjuster Motor connector to ground.

**Is the resistance below 1000.0 ohm?**

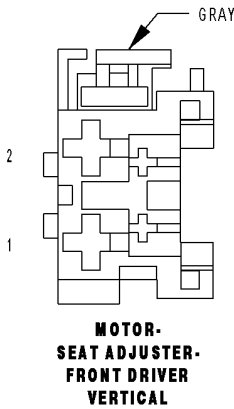
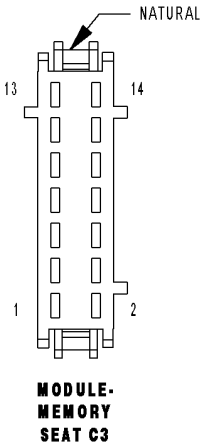
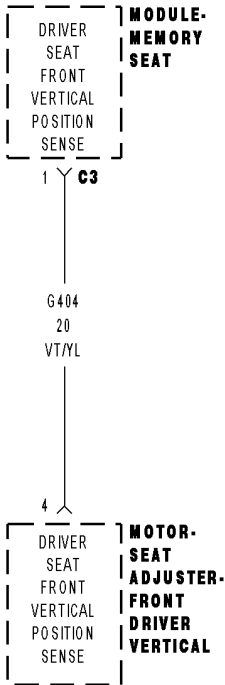
**Yes** >> Repair the (G404) Driver Seat Front Vertical Position Sense circuit for a short to ground. Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**No** >> Replace the Memory Seat Module. Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)





B1D72-SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT HIGH



**B1D72-SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT HIGH (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).

- **Set Condition:**

If during motor operation the sensor voltage is not within a specified range this code will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE CIRCUIT SHORTED TO VOLTAGE REAR DRIVER VERTICAL SEAT ADJUSTER MOTOR MEMORY SEAT MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the seat switch front vertical position 3 times.

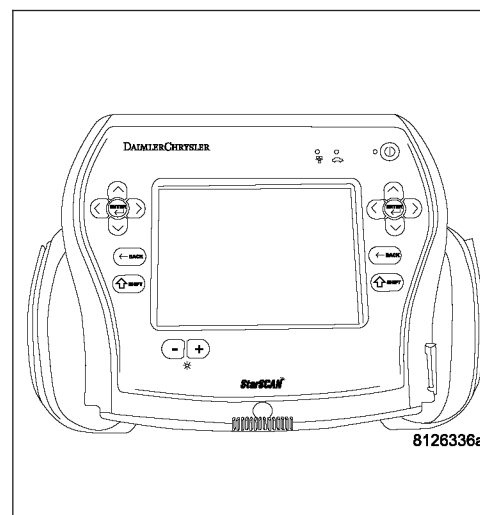
With the scan tool, read DTC's.

**Does the scan tool display B1D72-SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



**B1D72-SEAT FRONT VERTICAL POSITION SENSOR CIRCUIT HIGH (CONTINUED)****2. CHECK THE (G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE VOLTAGE**

Disconnect the Front Driver Vertical Seat Adjuster Motor.

**Note: Check connectors – Clean and repair as necessary.**

With the scan tool erase DTC's

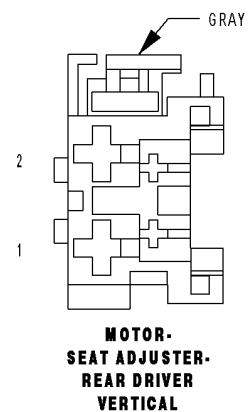
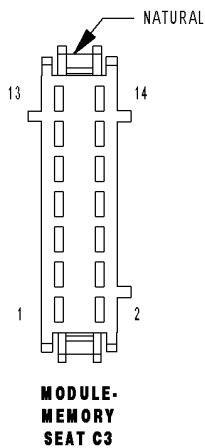
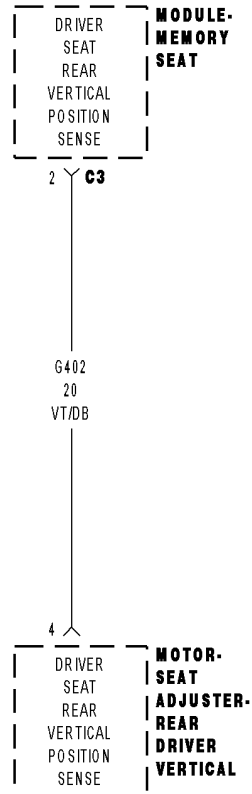
Move the seat switch in the both front vertical positions 3 times.

With the scan tool, read DTC's.

**Does the same DTC reset?**

- No** >> Inspect the position sense wire for a possible intermittent short to another circuit, if OK replace the Front Driver Vertical Seat Adjuster Motor assembly.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)
- Yes** >> Inspect the position sense wire for a possible short to another circuit, if OK replace the Memory Seat Module.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)
-

## B1D75-SEAT REAR VERTICAL POSITION SENSOR CIRCUIT LOW



**B1D75-SEAT REAR VERTICAL POSITION SENSOR CIRCUIT LOW (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).

- **Set Condition:**

If sensor voltage is not within a specified range this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G402) DRIVER SEAT REAR VERTICAL POSITION SENSE CIRCUIT SHORTED TO GROUND REAR DRIVER VERTICAL SEAT ADJUSTER MOTOR MEMORY SEAT MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the Seat Switch in the Rear Vertical position 3 times.

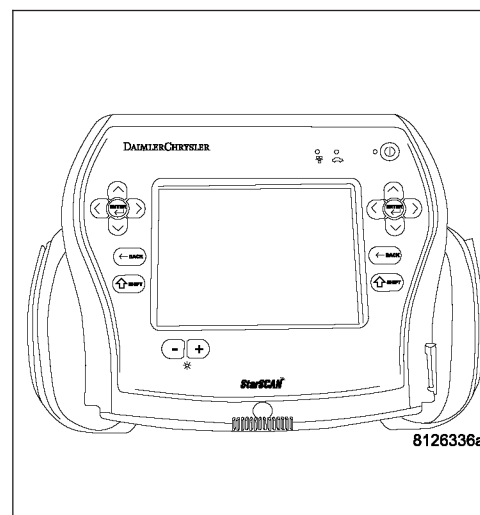
With the scan tool, read DTC's.

**Does the scan tool display B1D75-SEAT REAR VERTICAL POSITION SENSOR CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



**B1D75-SEAT REAR VERTICAL POSITION SENSOR CIRCUIT LOW (CONTINUED)****2. CHECK THE (G402) DRIVER SEAT REAR VERTICAL POSITION SENSE VOLTAGE**

Disconnect the Rear Driver Vertical Seat Adjuster Motor.

**Note: Check connectors – Clean and repair as necessary.**

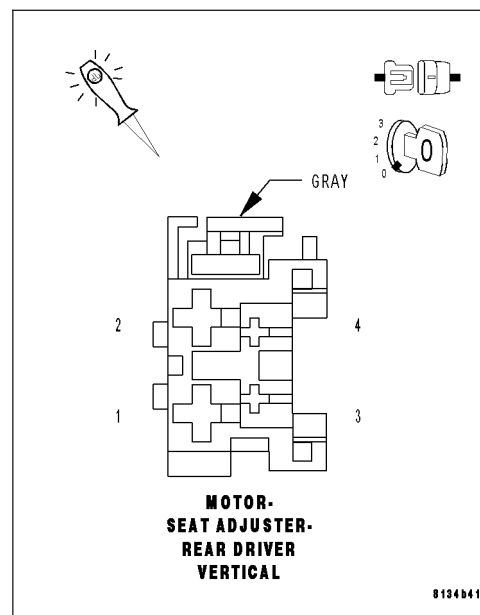
Move the seat switch in the rear vertical position during the next step. Using a 12-volt test light connect one lead to the (G402) Driver Seat Rear Vertical Position Sense circuit and the other lead to Driver Seat Rear Vertical Sensor Ground at the Rear Driver Seat Adjuster Motor connector.

**Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?**

**Yes** >> Replace the Rear Driver Vertical Seat Adjuster Motor assembly.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. CHECK THE (G402) DRIVER SEAT REAR VERTICAL POSITION SENSE WIRE FOR A SHORT TO GROUND**

Disconnect the Memory Seat Module C3 connector.

**Note: Check connectors – Clean and repair as necessary.**

Measure the resistance of the (G402) Driver Seat Rear Vertical Position Sense wire at the Rear Driver Vertical Seat Adjuster Motor connector to ground.

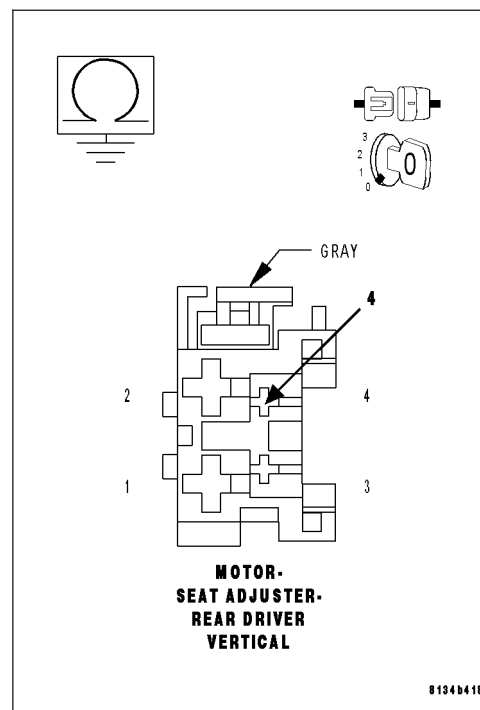
**Is the resistance below 1000.0 ohm?**

**Yes** >> Repair the (G402) Driver Seat Rear Vertical Position Sense circuit for a short to ground.

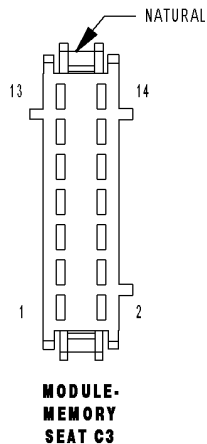
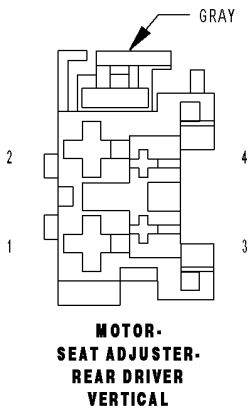
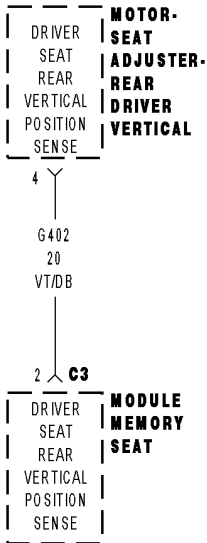
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**No** >> Replace the Memory Seat Module.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



B1D76-SEAT REAR VERTICAL POSITION SENSOR CIRCUIT HIGH



**B1D76–SEAT REAR VERTICAL POSITION SENSOR CIRCUIT HIGH (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).

- **Set Condition:**

If during motor operation the sensor voltage is not within a specified range this code will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G402) DRIVER SEAT REAR VERTICAL POSITION SENSE CIRCUIT SHORTED TO VOLTAGE REAR DRIVER VERTICAL SEAT ADJUSTER MOTOR MEMORY SEAT MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the seat switch rear vertical position 3 times.

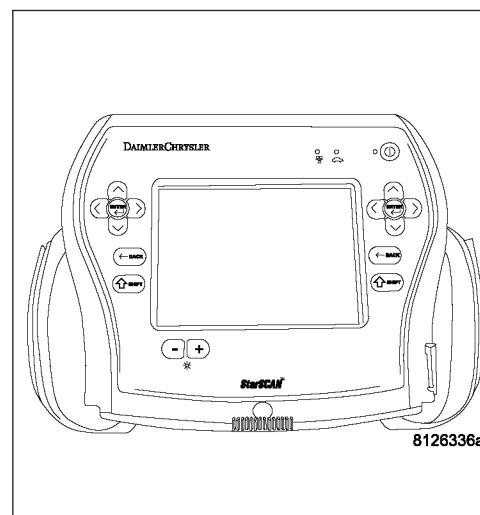
With the scan tool, read DTC's.

**Does the scan tool display B1D76–SEAT REAR VERTICAL POSITION SENSOR CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)





**B1D76-SEAT REAR VERTICAL POSITION SENSOR CIRCUIT HIGH (CONTINUED)****2. CHECK THE (G402) DRIVER SEAT REAR VERTICAL POSITION SENSE VOLTAGE**

Disconnect the Rear Driver Vertical Seat Adjuster Motor.

**Note: Check connectors – Clean and repair as necessary.**

With the scan tool erase DTC's

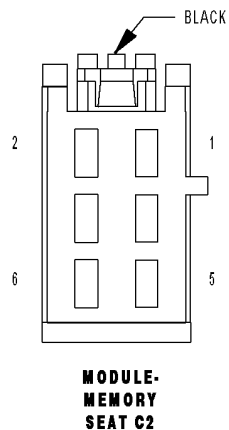
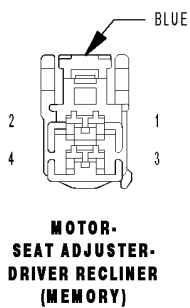
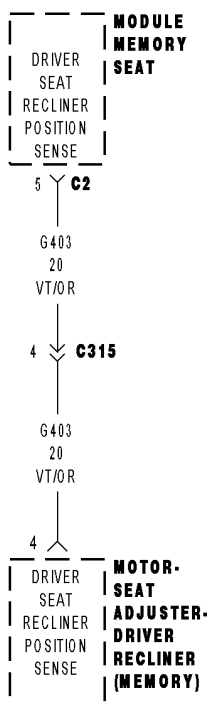
Move the seat switch in the both rear vertical positions 3 times.

With the scan tool, read DTC's.

**Does the same DTC reset?**

- No** >> Inspect the position sense wire for a possible intermittent short to voltage from another circuit, if OK replace the Rear Driver Vertical Seat Adjuster Motor assembly.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)
- Yes** >> Inspect the position sense wire for a possible short to voltage from another circuit, if OK replace the Memory Seat Module.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)
-

## B1D79-SEAT RECLINER POSITION SENSOR CIRCUIT LOW



**B1D79–SEAT RECLINER POSITION SENSOR CIRCUIT LOW (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).

- **Set Condition:**

If sensor voltage is not within a specified range this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G403) DRIVER SEAT RECLINER POSITION SENSE CIRCUIT SHORTED TO GROUND
DRIVER RECLINER SEAT ADJUSTER MOTOR
MEMORY SEAT MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the Seat Switch recliner position 3 times.

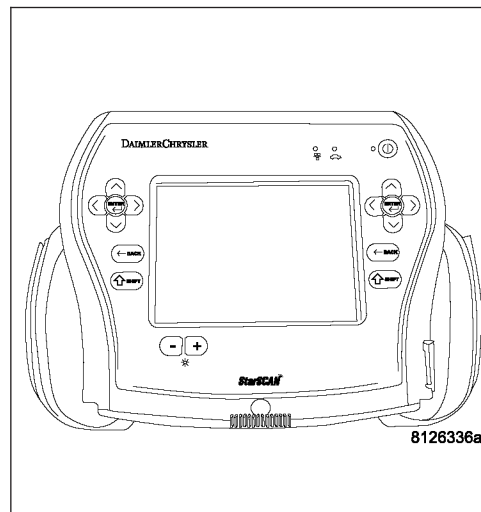
With the scan tool, read DTC's.

**Does the scan tool display B1D79–SEAT RECLINER POSITION SENSOR CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



**B1D79-SEAT RECLINER POSITION SENSOR CIRCUIT LOW (CONTINUED)****2. CHECK THE (G403) DRIVER SEAT RECLINER POSITION SENSE VOLTAGE**

Disconnect the Driver Recliner Seat Adjuster Motor.

**Note: Check connectors – Clean and repair as necessary.**

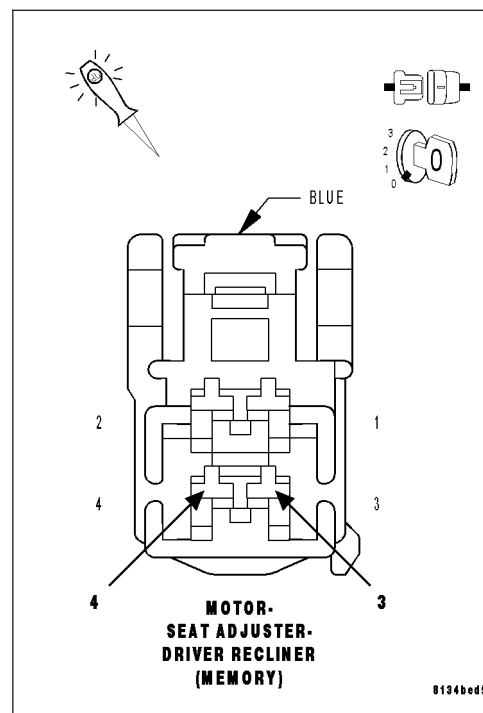
Move the seat switch in the recliner position during the next step.

Using a 12-volt test light connect one lead to the (G403) Driver Seat Recliner Position Sense circuit and the other lead to Driver Seat Recliner Position Sensor Ground at the Driver Recliner Seat Adjuster Motor connector.

**Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?**

**Yes** >> Replace the Driver Recliner Seat Adjuster Motor assembly. Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. CHECK THE (G403) DRIVER SEAT RECLINER POSITION SENSE WIRE FOR A SHORT TO GROUND**

Disconnect the Memory Seat Module C2 connector.

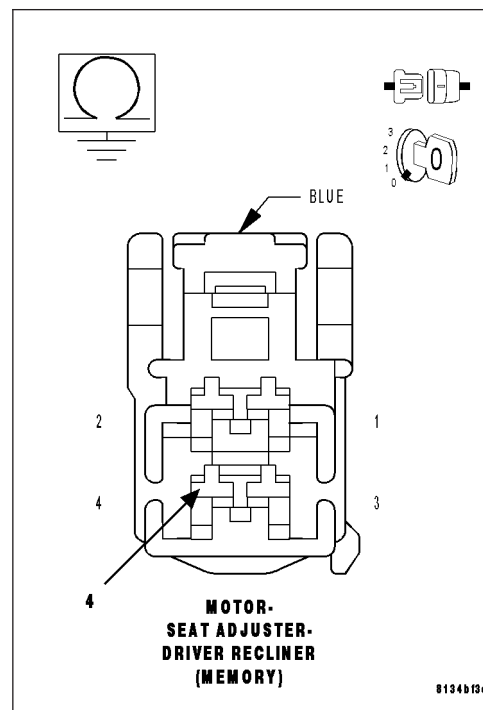
**Note: Check connectors – Clean and repair as necessary.**

Measure the resistance of the (G403) Driver Seat Recliner Position Sense wire at the Driver Recliner Seat Adjuster Motor connector to ground.

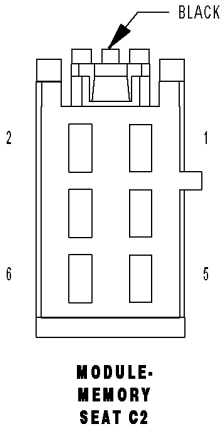
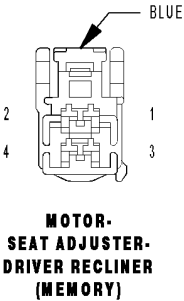
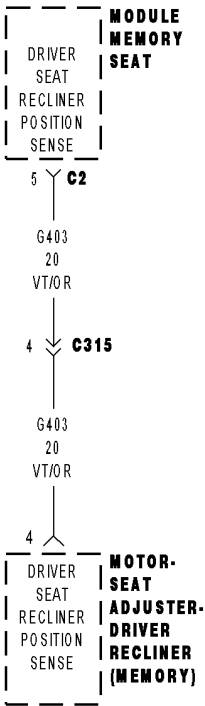
**Is the resistance below 1000.0 ohm?**

**Yes** >> Repair the (G403) Driver Seat Recliner Position Sense circuit for a short to ground. Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**No** >> Replace the Memory Seat Module. Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



B1D7A–SEAT RECLINER POSITION SENSOR CIRCUIT HIGH



**B1D7A-SEAT RECLINER POSITION SENSOR CIRCUIT HIGH (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

When the seat motor is activated (sensor supply voltage is switched on whenever motor is activated).

- **Set Condition:**

If during motor operation the sensor voltage is not within a specified range this code will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
(G403) DRIVER SEAT RECLINER POSITION SENSE CIRCUIT SHORTED TO VOLTAGE
DRIVER RECLINER SEAT ADJUSTER MOTOR
MEMORY SEAT MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the seat switch recliner position 3 times.

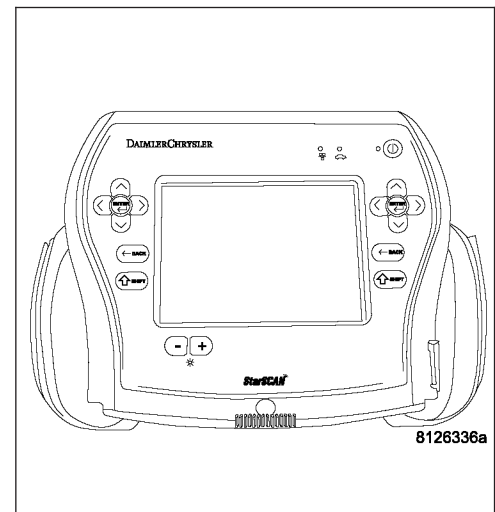
With the scan tool, read DTC's.

**Does the scan tool display B1D7A-SEAT BACKREST POSITION SENSOR CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



**B1D7A-SEAT RECLINER POSITION SENSOR CIRCUIT HIGH (CONTINUED)****2. CHECK THE (G403) DRIVER SEAT RECLINER POSITION SENSE VOLTAGE**

Disconnect the Driver Recliner Seat Adjuster Motor.

**Note: Check connectors – Clean and repair as necessary.**

With the scan tool erase DTC's

Move the seat switch in the both recliner positions 3 times.

With the scan tool, read DTC's.

**Does the same DTC reset?**

**No** >> Inspect the position sense wire for a possible intermittent short to voltage from another circuit, if OK replace the Driver Recliner Seat Adjuster Motor assembly.

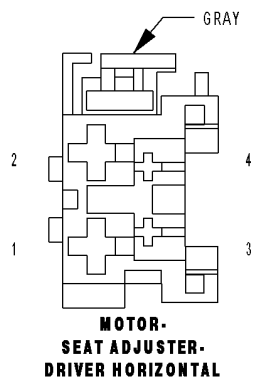
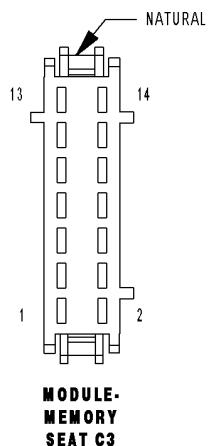
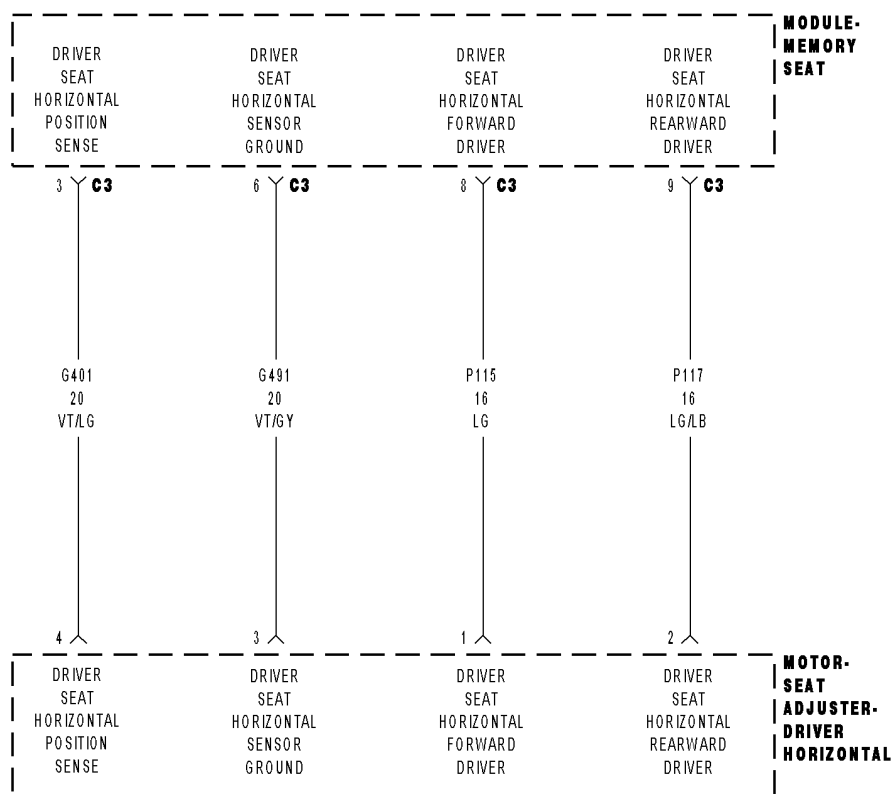
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**Yes** >> Inspect the position sense wire for a possible short to voltage from another circuit, if OK replace the Memory Seat Module.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

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## B1D7B-SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE





**B1D7B-SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the seat motor is activated.
- **Set Condition:**  
If the Memory Seat Module does not detect the rotation of the seat motor this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

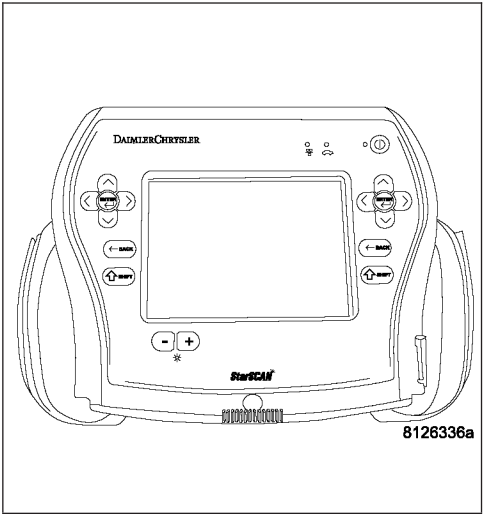
Possible Causes
SEAT POSITION SENSOR CIRCUIT DIAGNOSTIC TROUBLE CODES (G401) DRIVER SEAT HORIZONTAL POSITION SENSE CIRCUIT OPEN (G491) DRIVER SEAT HORIZONTAL SENSOR GROUND CIRCUIT OPEN (P115) DRIVER SEAT HORIZONTAL FORWARD DRIVER (P117) DRIVER SEAT HORIZONTAL REARWARD DRIVER DRIVER HORIZONTAL SEAT ADJUSTER MOTOR MEMORY SEAT MODULE

**Diagnostic Test**

**1. CHECK FOR RELATED DIAGNOSTIC TROUBLE CODES**

Turn the ignition on.  
With the scan tool, read DTC's.

- Does the scan tool display any seat position sensor DTC's?**
- Yes**    >> Diagnose and repair the other DTC(s) first. Refer to the Table of Contents in this Section for a complete list of symptoms.
- No**    >> Go To 2



**B1D7B-SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****2. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the Seat Switch in the Horizontal position 3 times.

With the scan tool, read DTC's.

**Does the scan tool display B1D7B-SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE?**

**Yes** >> Go To 3

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**3. CHECK THE (G401) DRIVER SEAT HORIZONTAL POSITION SENSE VOLTAGE**

Disconnect the Driver Horizontal Seat Adjuster Motor.

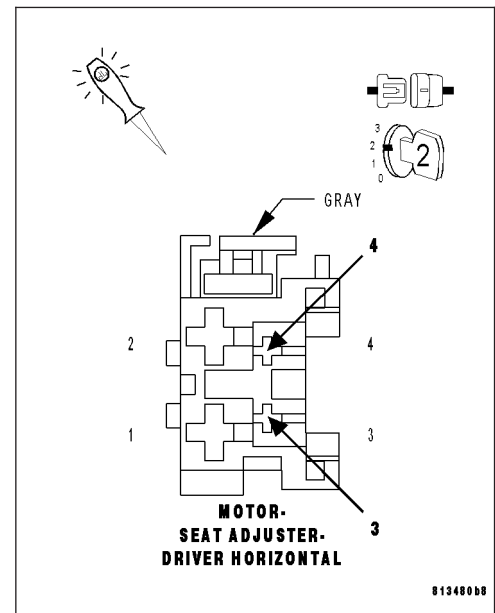
**Note: Check connectors – Clean and repair as necessary.**

Move the Seat Switch in the Horizontal position during the next step. Using a 12-volt test light connect one lead to the (G401) Driver Seat Horizontal Position Sense circuit and the other lead to Driver Seat Horizontal Sensor Ground at the Driver Horizontal Seat Adjuster Motor connector.

**Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?**

**Yes** >> Go To 4

**No** >> Go To 5



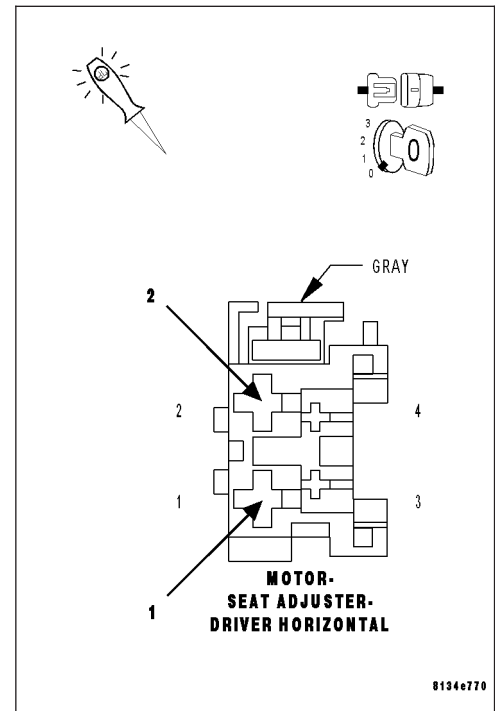
**B1D7B-SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****4. CHECK THE DRIVER SEAT HORIZONTAL FORWARD/REARWARD DRIVER VOLTAGE**

Move the Seat Switch in the Horizontal position during the next step.  
Using a 12-volt test light connect one lead to the (P115) Driver Seat Horizontal Forward Driver circuit and the other lead to (P117) Driver Seat Horizontal Rearward Driver circuit at the Driver Horizontal Seat Adjuster Motor connector.

**Does the test light illuminate with the seat switch engaged?**

**Yes** >> Replace the track/horizontal motor assembly.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**No** >> Go To 7

**5. CHECK THE (G401) DRIVER SEAT HORIZONTAL POSITION SENSE WIRE FOR AN OPEN**

Disconnect the Memory Seat Module C3 connector.

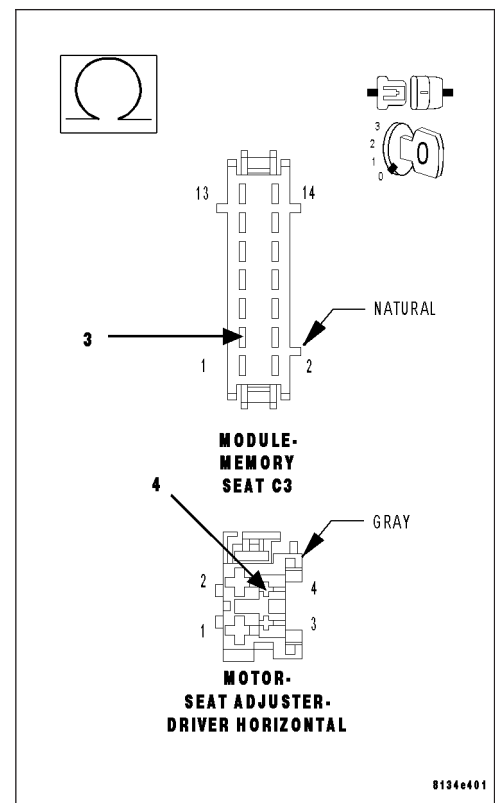
**Note: Check connectors – Clean and repair as necessary.**

Measure the resistance of the (G401) Driver Seat Horizontal Position Sense circuit at the Driver Horizontal Seat Adjuster Motor connector to the C3 connector.

**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (G401) Driver Seat Horizontal Position Sense circuit for an open.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**No** >> Go To 6



### B1D7B-SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)

## 6. CHECK THE (G491) DRIVER SEAT HORIZONTAL SENSOR GROUND FOR AN OPEN

Measure the resistance of the (G491) Driver Seat Horizontal Sensor Ground circuit at the Driver Horizontal Seat Adjuster Motor connector to the C3 connector.

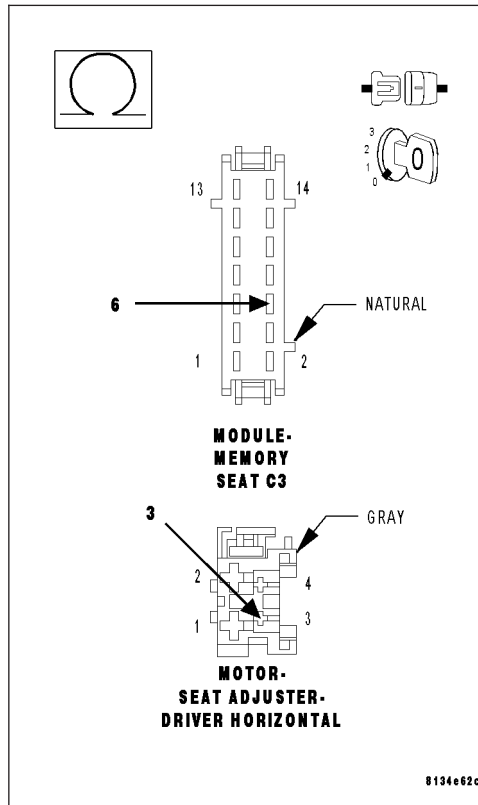
**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (G491) Driver Seat Horizontal Sensor Ground circuit for an open.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**No** >> Replace the Memory Seat Module.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



## 7. CHECK THE (P115) DRIVER SEAT HORIZONTAL FORWARD DRIVER WIRE FOR AN OPEN

Disconnect the Memory Seat Module C3 connector.

**Note: Check connectors – Clean and repair as necessary.**

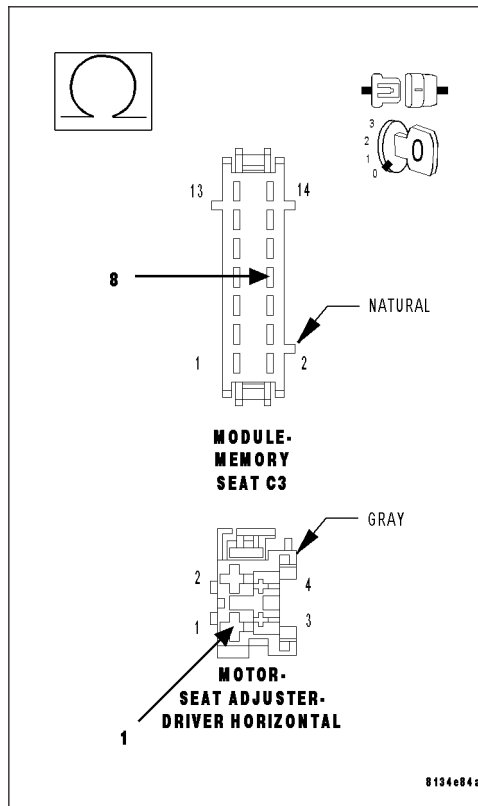
Measure the resistance of the (P115) Driver Seat Horizontal Forward Driver circuit at the Driver Horizontal Seat Adjuster Motor connector to the C3 connector.

Is the resistance above 1.0 ohm?

**Yes** >> Repair the (P115) Driver Seat Horizontal Forward Driver circuit for an open.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**No** >> Go To 8



**B1D7B-SEAT HORIZONTAL MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****8. CHECK THE (P117) DRIVER SEAT HORIZONTAL REARWARD DRIVER AN OPEN**

Measure the resistance of the (P117) Driver Seat Horizontal Rearward Driver circuit at the Driver Horizontal Seat Adjuster Motor connector to the C3 connector.

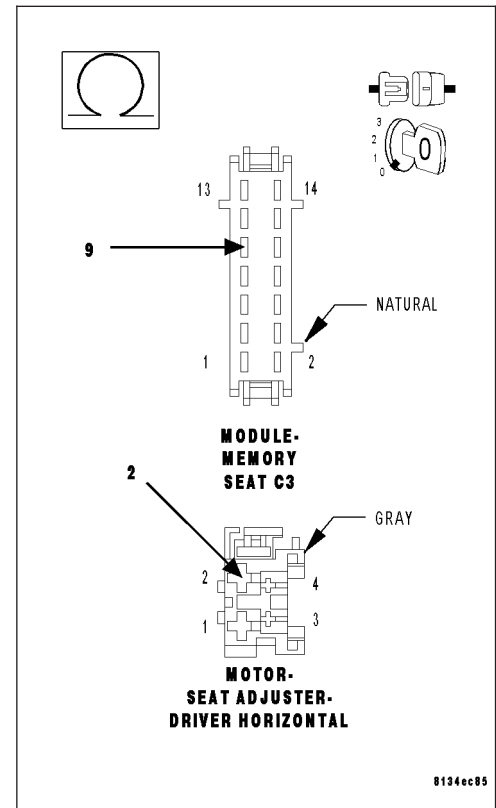
**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (P117) Driver Seat Horizontal Rearward Driver circuit for an open.

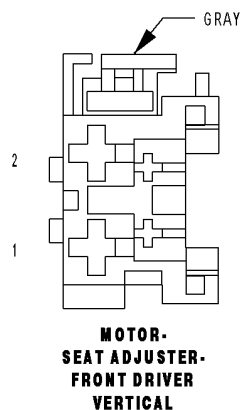
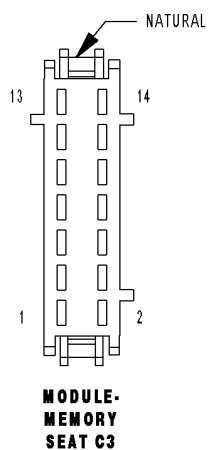
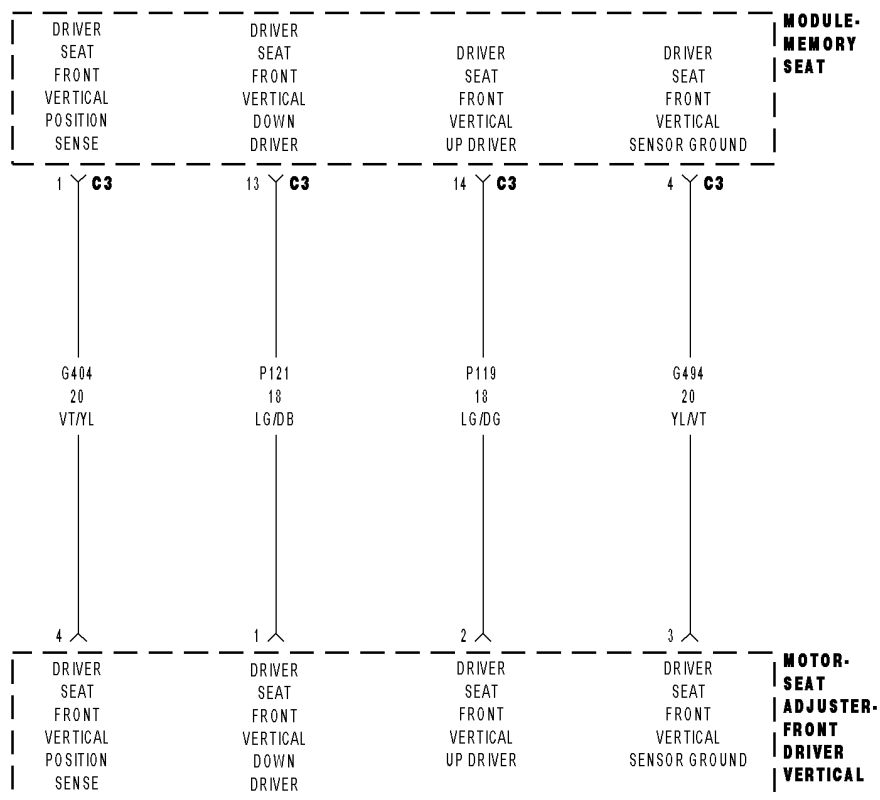
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)

**No** >> Replace the Memory Seat Module.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1(Refer to 8 - ELECTRICAL/POWER SEATS - DIAGNOSIS AND TESTING)



## B1D7F-SEAT FRONT VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE



**B1D7F-SEAT FRONT VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Whenever the seat motor is activated.

- **Set Condition:**

If the Memory Seat Module does not detect the rotation of the seat motor this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
SEAT POSITION SENSOR CIRCUIT DIAGNOSTIC TROUBLE CODES (G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE CIRCUIT OPEN (G494) DRIVER SEAT FRONT VERTICAL SENSOR GROUND CIRCUIT OPEN (P119) DRIVER SEAT FRONT VERTICAL UP DRIVER (P121) DRIVER SEAT FRONT VERTICAL DOWN DRIVER FRONT DRIVER VERTICAL SEAT ADJUSTER MOTOR MEMORY SEAT MODULE

## Diagnostic Test

### 1. CHECK FOR RELATED DIAGNOSTIC TROUBLE CODES

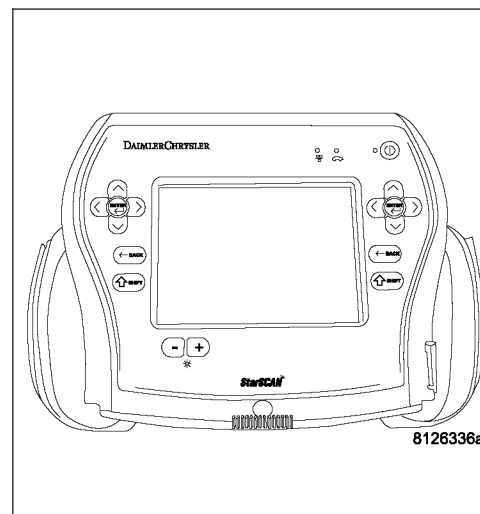
Turn the ignition on.

With the scan tool, read DTC's.

**Does the scan tool display any seat position sensor DTC's?**

**Yes** >> Diagnose and repair other DTC(s) first. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2



### 2. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the Seat Switch in the Front Vertical position 3 times.

With the scan tool, read DTC's.

**Does the scan tool display B1D7F-SEAT FRONT VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE?**

**Yes** >> Go To 3

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

**B1D7F-SEAT FRONT VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****3. CHECK THE (G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE VOLTAGE**

Disconnect the Front Driver Vertical Seat Adjuster Motor.

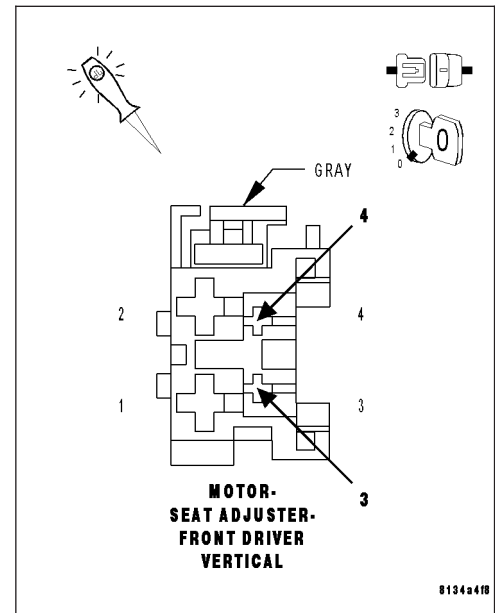
**Note: Check connectors – Clean and repair as necessary.**

Move the Seat Switch in the front vertical position during the next step. Using a 12-volt test light connect one lead to the (G404) Driver Seat Front Vertical Position Sense circuit and the other lead to Driver Seat Front Vertical Sensor Ground at the Driver Front Vertical Seat Adjuster Motor connector.

**Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?**

**Yes** >> Go To 4

**No** >> Go To 5

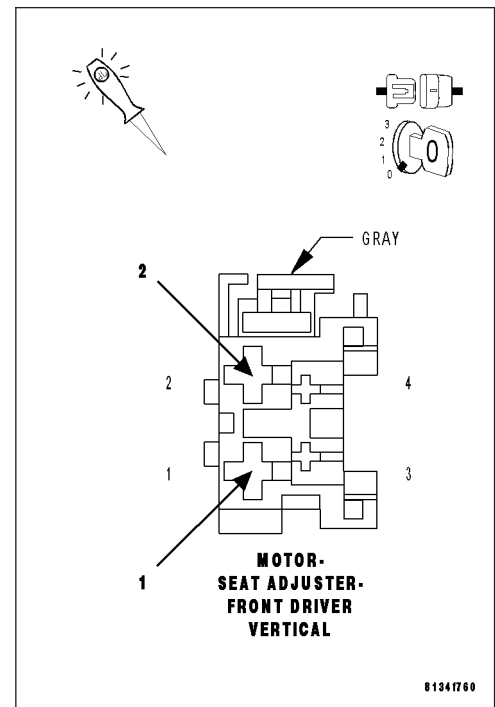
**4. CHECK THE DRIVER SEAT FRONT VERTICAL UP/DOWN DRIVER VOLTAGE**

Move the Seat Switch in the front vertical position during the next step. Using a 12-volt test light connect one lead to the (G119) Driver Seat Front Vertical Up Driver circuit and the other lead to (P121) Driver Seat Front Vertical Down Driver circuit at the Front Driver Vertical Seat Adjuster Motor connector.

**Does the test light illuminate with the seat switch engaged?**

**Yes** >> Replace the Front Driver Vertical Seat Adjuster motor assembly.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

**No** >> Go To 7





**B1D7F-SEAT FRONT VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****5. CHECK THE (G404) DRIVER SEAT FRONT VERTICAL POSITION SENSE WIRE FOR AN OPEN**

Disconnect the Memory Seat Module C3 connector.

**Note: Check connectors – Clean and repair as necessary.**

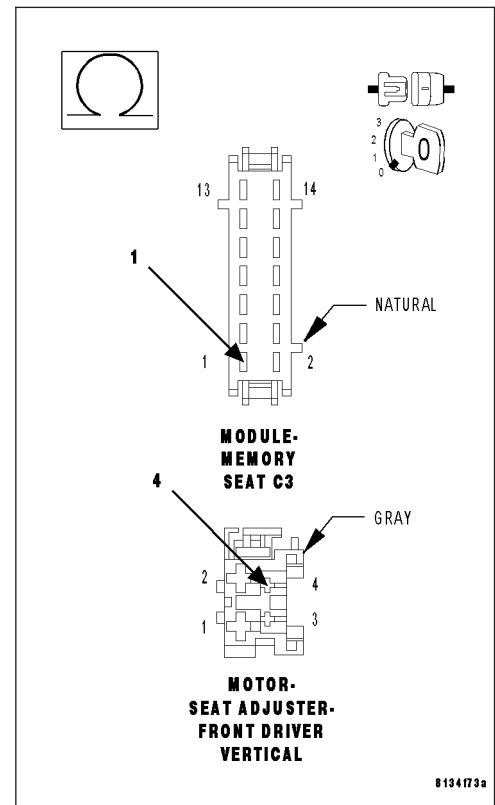
Measure the resistance of the (G404) Driver Seat Front Vertical Position Sense circuit at the Front Driver Vertical Seat Adjuster Motor connector to the C3 connector.

**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (G404) Driver Seat Front Vertical Position Sense circuit for an open.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

**No** >> Go To 6

**6. CHECK THE (G494) DRIVER SEAT FRONT VERTICAL SENSOR GROUND FOR AN OPEN**

Measure the resistance of the (G494) Driver Seat Front Vertical Sensor Ground circuit at the Driver Front Vertical Seat Adjuster Motor connector to the C3 connector.

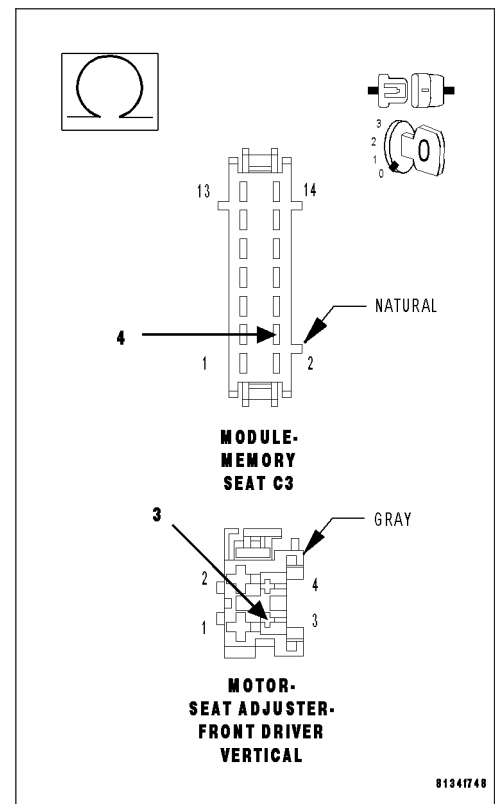
**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (G494) Driver Seat Front Vertical Sensor Ground circuit for an open.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

**No** >> Replace the Memory Seat Module.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1



**B1D7F-SEAT FRONT VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****7. CHECK THE (P119) DRIVER SEAT FRONT VERTICAL UP DRIVER WIRE FOR AN OPEN**

Disconnect the Memory Seat Module C3 connector.

**Note: Check connectors – Clean and repair as necessary.**

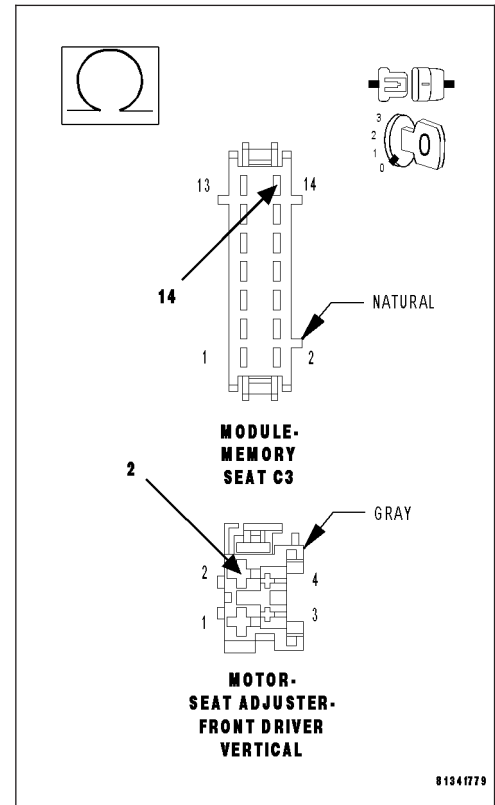
Measure the resistance of the (P119) Driver Seat Front Vertical Up Driver circuit at the Driver Front Vertical Seat Adjuster Motor connector to the C3 connector.

**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (P119) Driver Seat Front Vertical Up Driver circuit for an open.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

**No** >> Go To 8

**8. CHECK THE (P121) DRIVER SEAT FRONT VERTICAL DOWN DRIVER AN OPEN**

Measure the resistance of the (P121) Driver Seat Front Vertical Down Driver circuit at the Driver Front Vertical Seat Adjuster Motor connector to the C3 connector.

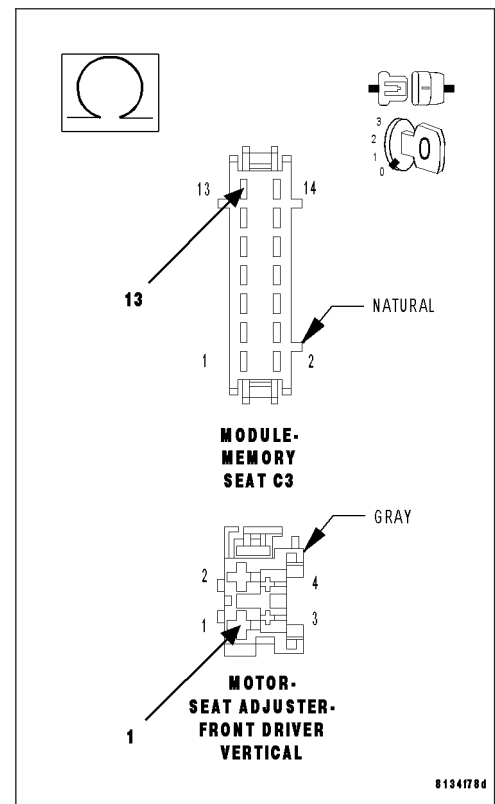
**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (P121) Driver Seat Front Vertical Down Driver circuit for an open.

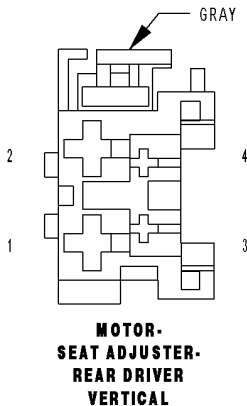
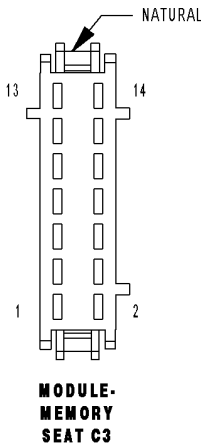
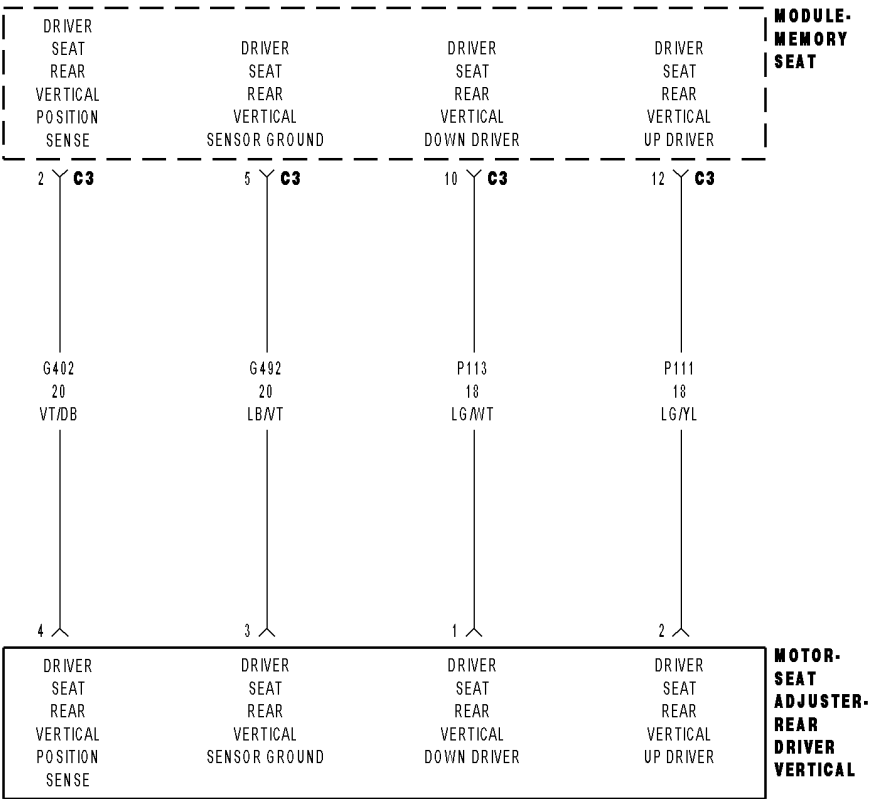
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

**No** >> Replace the Memory Seat Module.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1



B1D83–SEAT REAR VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE



**B1D83–SEAT REAR VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Whenever the seat motor is activated.

- **Set Condition:**

If the Memory Seat Module does not detect the rotation of the seat motor this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
SEAT POSITION SENSOR CIRCUIT DIAGNOSTIC TROUBLE CODES (G402) DRIVER SEAT REAR VERTICAL POSITION SENSE CIRCUIT OPEN (G492) DRIVER SEAT REAR VERTICAL SENSOR GROUND CIRCUIT OPEN (P111) DRIVER SEAT REAR VERTICAL UP DRIVER (P113) DRIVER SEAT REAR VERTICAL DOWN DRIVER REAR DRIVER VERTICAL SEAT ADJUSTER MOTOR MEMORY SEAT MODULE

## Diagnostic Test

### 1. CHECK FOR RELATED DIAGNOSTIC TROUBLE CODES

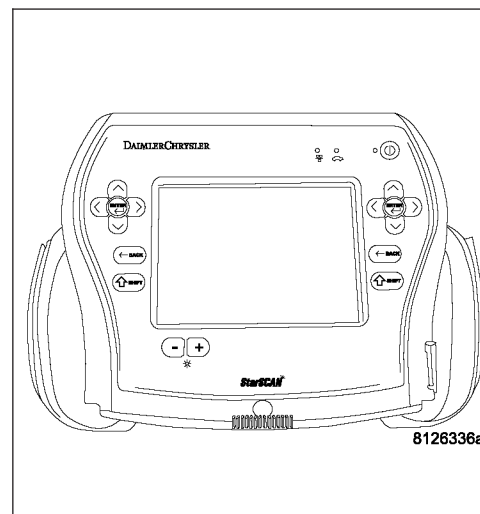
Turn the ignition on.

With the scan tool, read DTC's.

**Does the scan tool display any seat position sensor DTC's?**

**Yes** >> Diagnose and repair other DTC(s) first. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2



### 2. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the Seat Switch in the Rear Vertical position 3 times.

With the scan tool, read DTC's.

**Does the scan tool display B1D83–SEAT REAR VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE?**

**Yes** >> Go To 3

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

**B1D83-SEAT REAR VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****3. CHECK THE (G402) DRIVER SEAT REAR VERTICAL POSITION SENSE VOLTAGE**

Disconnect the Rear Driver Vertical Seat Adjuster Motor.

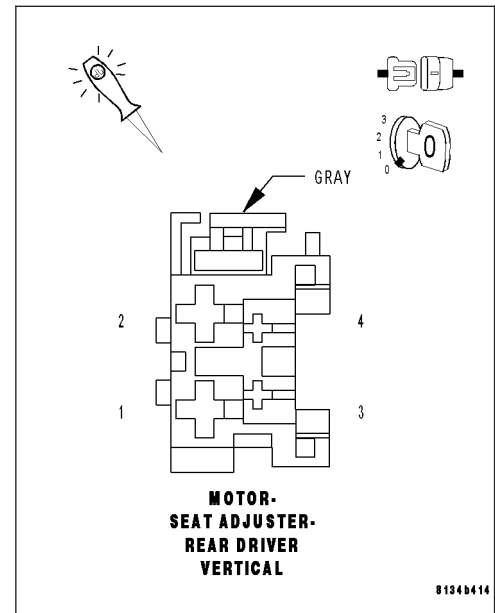
**Note: Check connectors – Clean and repair as necessary.**

Move the Seat Switch in the rear vertical position during the next step. Using a 12-volt test light connect one lead to the (G402) Driver Seat Rear Vertical Position Sense circuit and the other lead to Driver Seat Rear Vertical Sensor Ground at the Driver Rear Vertical Seat Adjuster Motor connector.

**Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?**

**Yes** >> Go To 4

**No** >> Go To 5

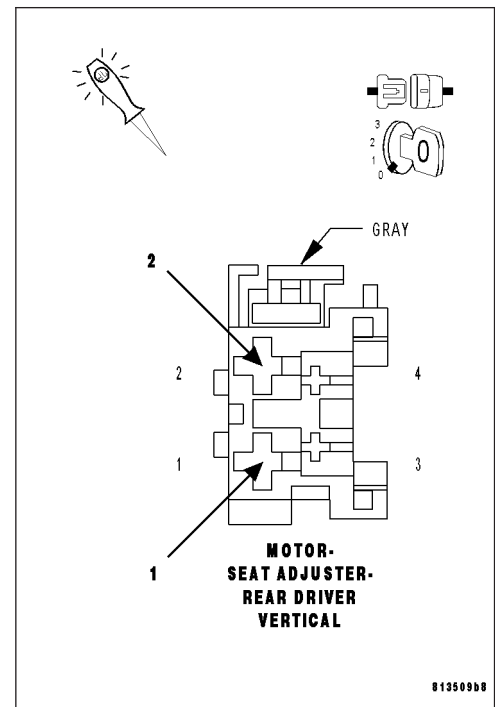
**4. CHECK THE DRIVER SEAT REAR VERTICAL UP/DOWN DRIVER VOLTAGE**

Move the Seat Switch in the rear vertical position during the next step. Using a 12-volt test light connect one lead to the (P111) Driver Seat Rear Vertical Up Driver circuit and the other lead to (P113) Driver Seat Rear Vertical Down Driver circuit at the Rear Driver Vertical Seat Adjuster Motor connector.

**Does the test light illuminate with the seat switch engaged?**

**Yes** >> Replace the Rear Driver Vertical Seat Adjuster motor assembly.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

**No** >> Go To 7



**B1D83-SEAT REAR VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****5. CHECK THE (G402) DRIVER SEAT REAR VERTICAL POSITION SENSE WIRE FOR AN OPEN**

Disconnect the Memory Seat Module C3 connector.

**Note: Check connectors – Clean and repair as necessary.**

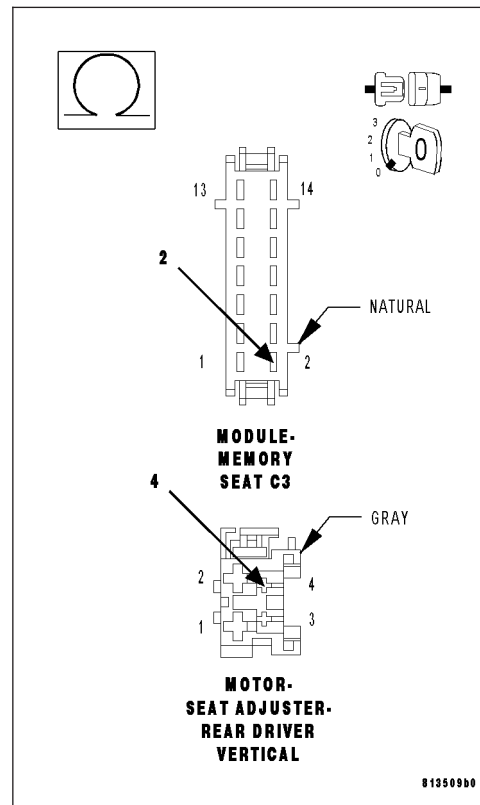
Measure the resistance of the (G402) Driver Seat Rear Vertical Position Sense circuit at the Rear Driver Vertical Seat Adjuster Motor connector to the C3 connector.

**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (G402) Driver Seat Rear Vertical Position Sense circuit for an open.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

**No** >> Go To 6

**6. CHECK THE (G492) DRIVER SEAT REAR VERTICAL SENSOR GROUND FOR AN OPEN**

Measure the resistance of the (G492) Driver Seat Rear Vertical Sensor Ground circuit at the Driver Rear Vertical Seat Adjuster Motor connector to the C3 connector.

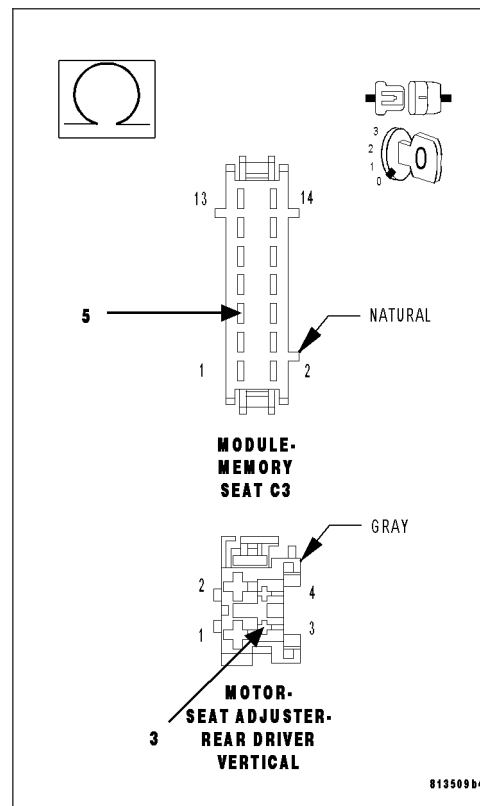
**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (G492) Driver Seat Rear Vertical Sensor Ground circuit for an open.

Perform MEMORY SYSTEM VERIFICATION TEST – VER 1

**No** >> Replace the Memory Seat Module.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1



**B1D83-SEAT REAR VERTICAL MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****7. CHECK THE (P111) DRIVER SEAT REAR VERTICAL UP DRIVER WIRE FOR AN OPEN**

Disconnect the Memory Seat Module C3 connector.

**Note: Check connectors – Clean and repair as necessary.**

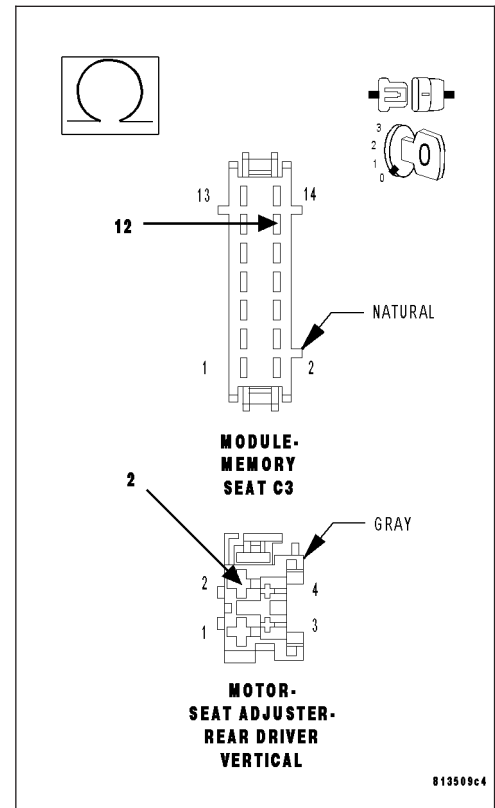
Measure the resistance of the (P111) Driver Seat Rear Vertical Up Driver circuit at the Driver Rear Vertical Seat Adjuster Motor connector to the C3 connector.

**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (P111) Driver Seat Rear Vertical Up Driver circuit for an open.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

**No** >> Go To 8

**8. CHECK THE (P113) DRIVER SEAT REAR VERTICAL DOWN DRIVER AN OPEN**

Measure the resistance of the (P113) Driver Seat Rear Vertical Down Driver circuit at the Driver Rear Vertical Seat Adjuster Motor connector to the C3 connector.

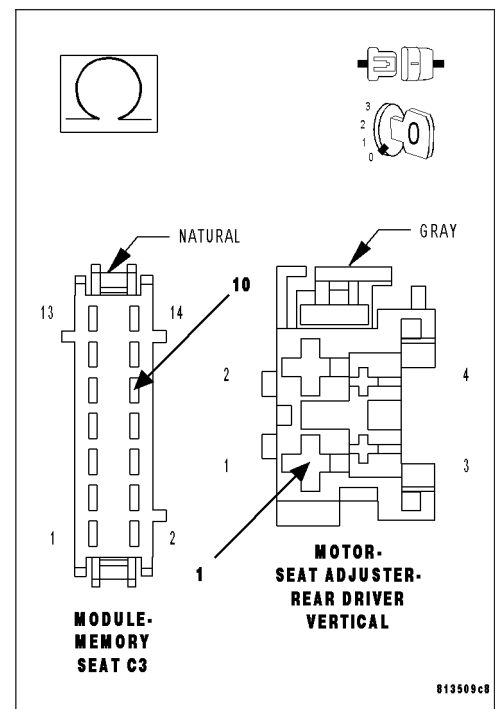
**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (P113) Driver Seat Rear Vertical Down Driver circuit for an open.

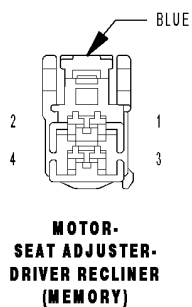
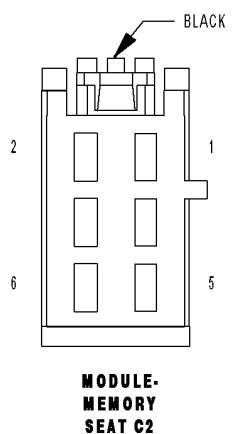
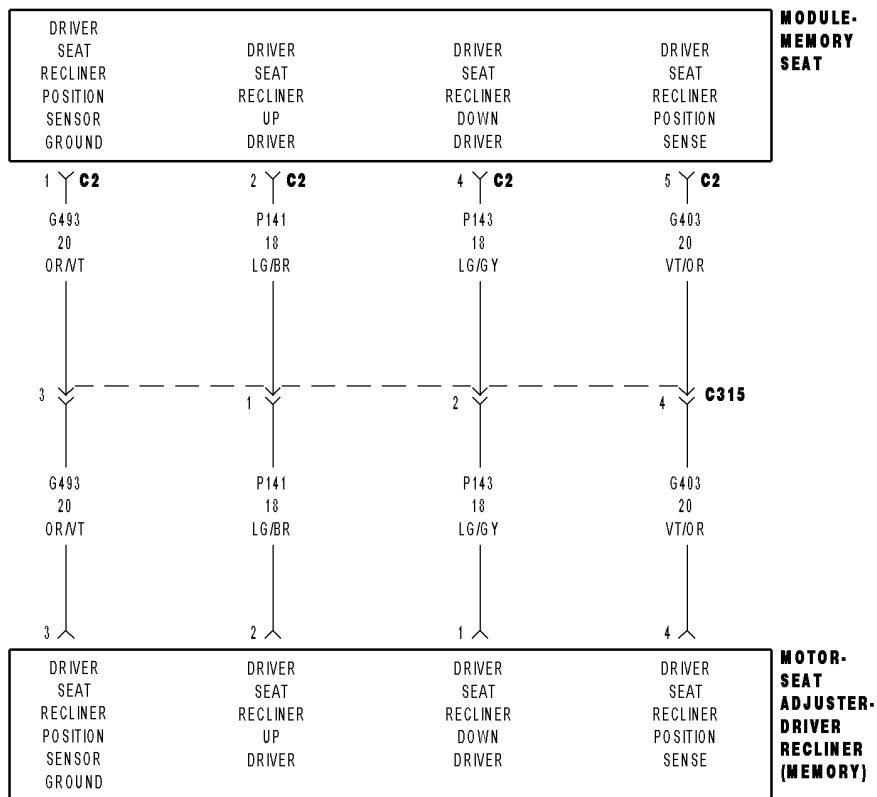
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

**No** >> Replace the Memory Seat Module.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1



## B1D87-SEAT RECLINER MOTOR CONTROL CIRCUIT PERFORMANCE





**B1D87-SEAT RECLINER MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Whenever the seat motor is activated.

- **Set Condition:**

If the Memory Seat Module does not detect the rotation of the seat motor this DTC will set. This DTC will only set when the seat switch is moved in the same direction three consecutive times.

Possible Causes
SEAT POSITION SENSOR CIRCUIT DIAGNOSTIC TROUBLE CODES (G403) DRIVER SEAT RECLINER POSITION SENSE CIRCUIT OPEN (G493) DRIVER SEAT RECLINER POSITION SENSOR GROUND CIRCUIT OPEN (P141) DRIVER SEAT RECLINER UP DRIVER (P143) DRIVER SEAT RECLINER DOWN DRIVER DRIVER RECLINER SEAT ADJUSTER MOTOR MEMORY SEAT MODULE

## Diagnostic Test

### 1. CHECK FOR RELATED DIAGNOSTIC TROUBLE CODES

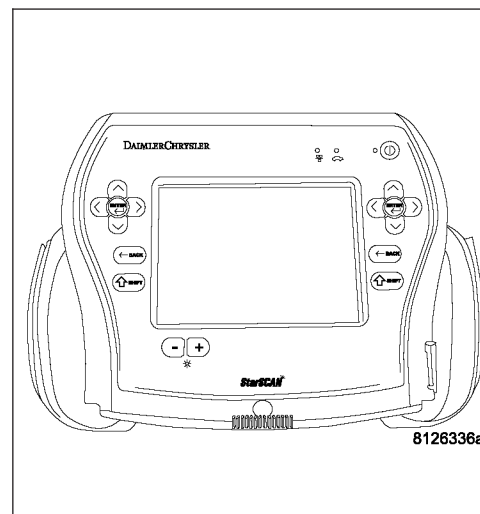
Turn the ignition on.

With the scan tool, read DTC's.

**Does the scan tool display any seat position sensor DTC's?**

**Yes** >> Diagnose and repair the other DTC(s) first. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2



### 2. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the Seat Switch in the Recliner position 3 times.

With the scan tool, read DTC's.

**Does the scan tool display B1D7B-SEAT BACKREST MOTOR CONTROL CIRCUIT PERFORMANCE?**

**Yes** >> Go To 3

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

**B1D87-SEAT RECLINER MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****3. CHECK THE (G403) DRIVER SEAT RECLINER POSITION SENSE VOLTAGE**

Disconnect the Driver Recliner Seat Adjuster Motor.

**Note: Check connectors – Clean and repair as necessary.**

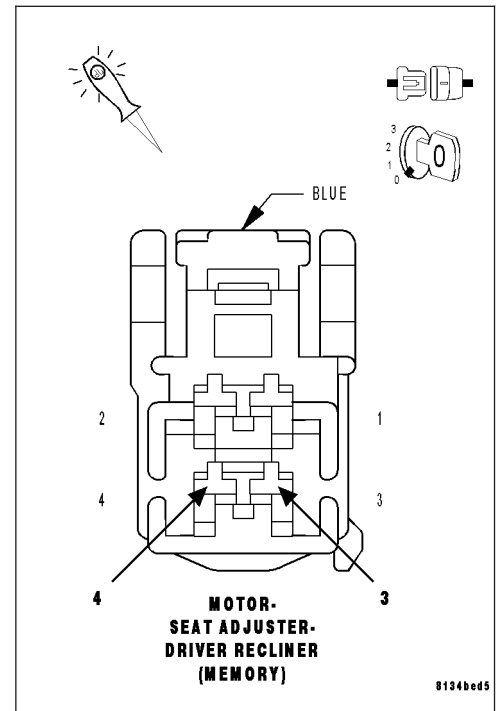
Move the Seat Switch in the Recliner position during the next step.

Using a 12-volt test light connect one lead to the (G403) Driver Seat Recliner Position Sense circuit and the other lead to Driver Seat Recliner Position Sensor Ground at the Driver Recliner Seat Adjuster Motor connector.

**Does the test light illuminate for approximately 2 seconds then turn off with the seat switch engaged?**

**Yes** >> Go To 4

**No** >> Go To 5

**4. CHECK THE DRIVER SEAT RECLINER FORWARD/REARWARD DRIVER VOLTAGE**

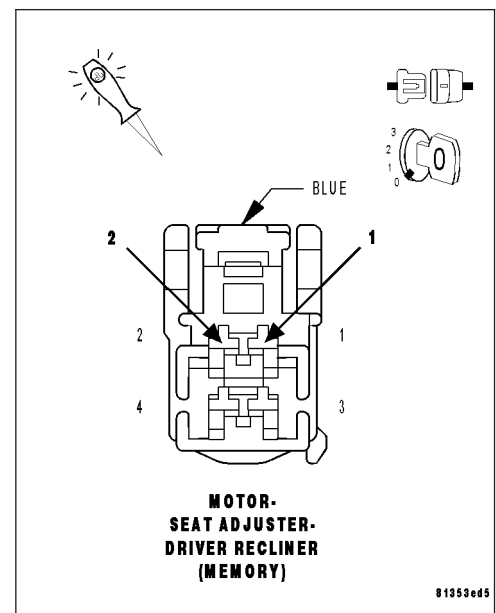
Move the Seat Switch in the Recliner position during the next step.

Using a 12-volt test light connect one lead to the (P141) Driver Seat Recliner Up Driver circuit and the other lead to (P143) Driver Seat Recliner Down Driver circuit at the Driver Recliner Seat Adjuster Motor connector.

**Does the test light illuminate with the seat switch engaged?**

**Yes** >> Replace the Recliner motor assembly.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

**No** >> Go To 7



**B1D87-SEAT RECLINER MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****5. CHECK THE (G403) DRIVER SEAT RECLINER POSITION SENSE WIRE FOR AN OPEN**

Disconnect the Memory Seat Module C2 connector.

**Note: Check connectors – Clean and repair as necessary.**

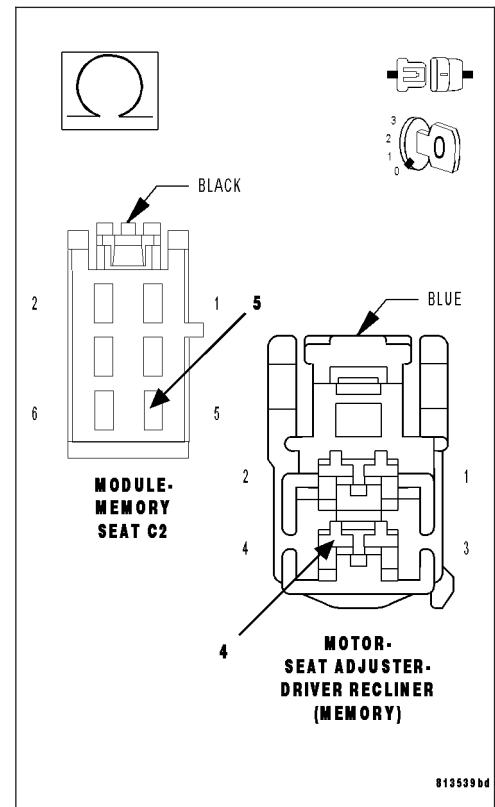
Measure the resistance of the (G403) Driver Seat Recliner Position Sense circuit at the Driver Recliner Seat Adjuster Motor connector to the C2 connector.

**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (G403) Driver Seat Recliner Position Sense circuit for an open.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

**No** >> Go To 6

**6. CHECK THE (G493) DRIVER SEAT RECLINER POSTION SENSOR GROUND FOR AN OPEN**

Measure the resistance of the (G493) Driver Seat Recliner Position Sensor Ground circuit at the Driver Recliner Seat Adjuster Motor connector to the C2 connector.

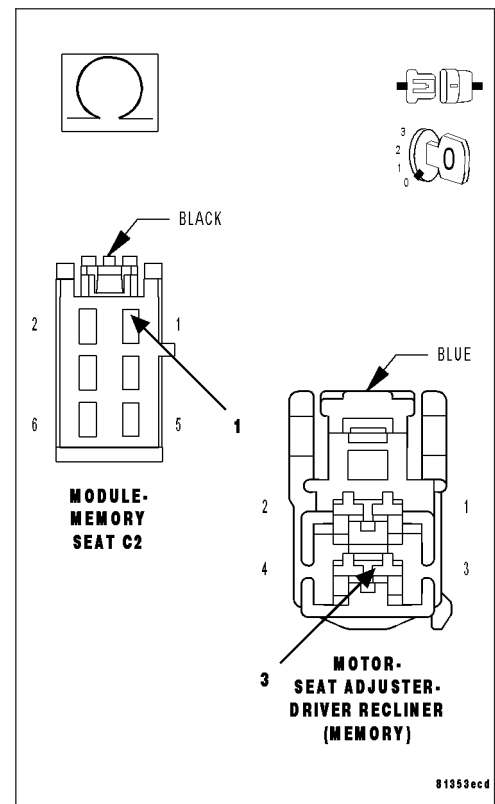
**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (G493) Driver Seat Recliner Position Senor Ground circuit for an open.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

**No** >> Replace the Memory Seat Module.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1



**B1D87-SEAT RECLINER MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****7. CHECK THE (P141) DRIVER SEAT RECLINER UP DRIVER WIRE FOR AN OPEN**

Disconnect the Memory Seat Module C2 connector.

**Note: Check connectors – Clean and repair as necessary.**

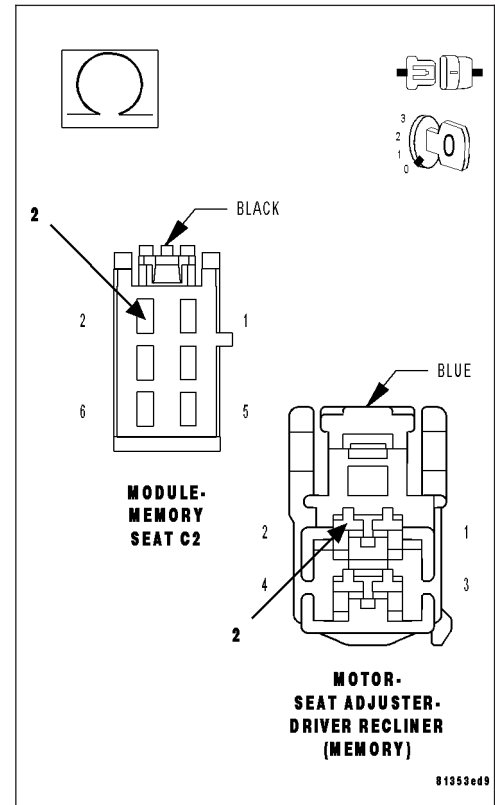
Measure the resistance of the (P141) Driver Seat Recliner Up Driver circuit at the Driver Recliner Seat Adjuster Motor connector to the C2 connector.

**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (P141) Driver Seat Recliner Up Driver circuit for an open.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

**No** >> Go To 8

**8. CHECK THE (P143) DRIVER SEAT RECLINER DOWN DRIVER AN OPEN**

Measure the resistance of the (P143) Driver Seat Recliner Down Driver circuit at the Driver Recliner Seat Adjuster Motor connector to the C2 connector.

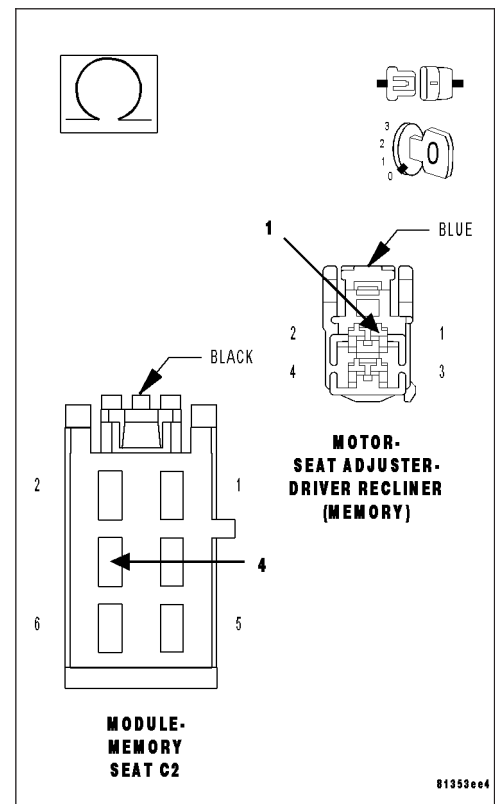
**Is the resistance above 1.0 ohm?**

**Yes** >> Repair the (P143) Driver Seat Recliner Down Driver circuit for an open.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1

**No** >> Replace the Memory Seat Module.

Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1



## B1D9B–SEAT HORIZONTAL FRONT STOP NOT LEARNED

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the seat motor is activated.
- **Set Condition:**  
Seat becomes de-standardized. If the seat is not standardized, an Easy Exit/Entry function can not be performed. If seat is standardized (learn seat cushion horizontal front hardstop) and then becomes de-standardized (conditions are: seat cushion motor is 5% past the expected hard stop position or seat cushion hall sensor failure is occurred), a DTC is logged.

Possible Causes
OTHER DIAGNOSTIC TROUBLE CODES SET IN THE MEMORY SEAT MODULE
SEAT STANDERDIZATION ROUTINE NOT PERFORMED

### Diagnostic Test

#### 1. CHECK FOR RELATED DIAGNOSTIC TROUBLE CODES

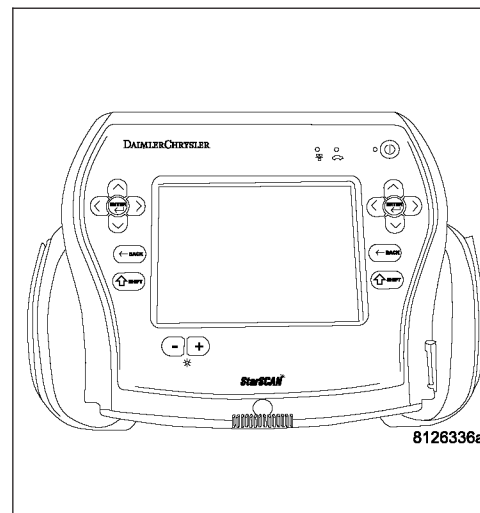
Turn the ignition on.

With the scan tool, read DTC's.

**Does the scan tool display any seat position sensor or circuit performance DTC's?**

**Yes** >> Diagnose and repair the other DTC(s) first. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2



#### 2. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Move the seat in the full forward horizontal position.

With the scan tool, read DTC's.

**Does the scan tool display B1D9B–SEAT HORIZONTAL FRONT STOP NOT LEARNED?**

**Yes** >> With the scan tool, perform the MSM Standard Routine.  
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

**B210D-BATTERY VOLTAGE LOW**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**Engine running, during seat motor operation.
- **Set Condition:**This code is set immediately after the Seat Memory Module receives a low charging system voltage message over the CAN B Bus or detects voltage under 9.5 volts on the (A110) Fused B(+) circuit.

Possible Causes
CHARGING SYSTEM VOLTAGE LOW (A110) FUSED B(+) CIRCUIT SEAT MEMORY MODULE

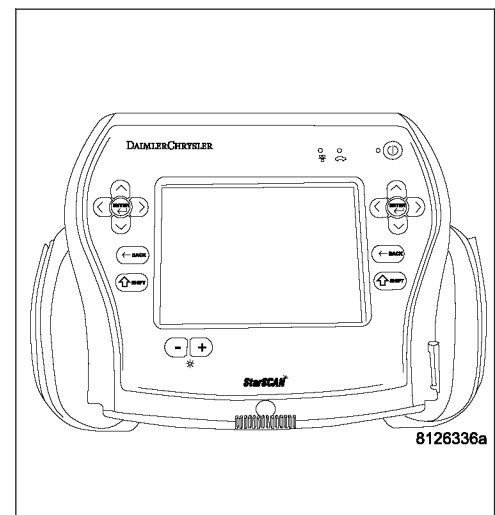
**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. CHECK PCM FOR CHARGING SYSTEM DTC**

With the scan tool, read Powertrain Control Module DTC's.

**Are there any Charging System DTC's set in the Powertrain Control Module?**

- Yes** >> (Refer to 8 - ELECTRICAL/CHARGING - DIAGNOSIS AND TESTING) for Charging System diagnostic procedures.
- No** >> Go To 2  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.

**2. VERIFY THAT DTC B210D-BATTERY VOLTAGE LOW IS ACTIVE**

With the scan tool, record and erase DTC's

Turn the ignition switch to the Off position then start the engine and operate the driver power seat.

With the scan tool, read DTC's.

**Does the DTC B210D-BATTERY VOLTAGE LOW reset?**

- Yes** >> Go To 3
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.

**B210D-BATTERY VOLTAGE LOW (CONTINUED)****3. CHECK THE VOLTAGE ON THE (A110) FUSED B(+) CIRCUIT**

Disconnect the Memory Seat Module connector.

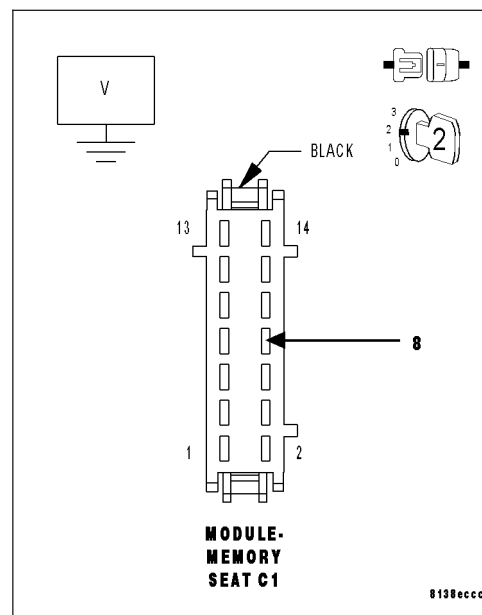
**Note: Check connectors - Clean and repair as necessary.**

Start the engine and let idle.

Measure the voltage on the (A110) Fused B(+) circuit at the MSM connector and compare to voltage at the vehicle battery.

**Is the voltage at the MSM connector the same as measured at the battery?**

- Yes** >> Replace the Memory Seat Module in accordance with the service information.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.
- No** >> Repair the (A110) Fused B(+) circuit as necessary.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.



**B210E-BATTERY VOLTAGE HIGH**

For the Heated Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:** Engine running, during seat operation.
- **Set Condition:** This code is set immediately after the Memory Seat Module receives a high charging system voltage message over the CAN B Bus or detects voltage over 16.5 volts on the (A110) Fused B(+) circuit.

Possible Causes
CHARGING SYSTEM VOLTAGE HIGH (A110) FUSED B(+) CIRCUIT MEMORY SEAT MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

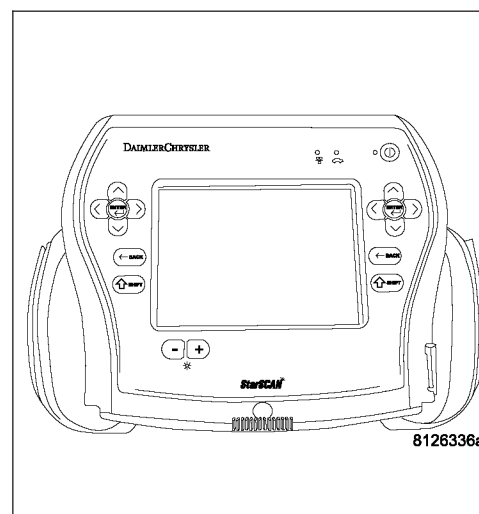
**Diagnostic Test****1. CHECK PCM FOR CHARGING SYSTEM DTC**

With the scan tool, read Powertrain Control Module DTC's.

**Are there any Charging System DTC's set in the Powertrain Control Module?**

**Yes** >> (Refer to 8 - ELECTRICAL/CHARGING - DIAGNOSIS AND TESTING) for Charging System diagnostic procedures.

**No** >> Go To 2

**2. VERIFY THAT DTC B210E-BATTERY VOLTAGE HIGH IS ACTIVE**

With the scan tool, record and erase DTC's

Turn the ignition switch to the Off position then start the engine and let run for one minute.

Attempt to operate the driver power seat.

With the scan tool, read DTC's.

**Does the DTC B210E-BATTERY VOLTAGE HIGH reset?**

**Yes** >> Go To 3

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.



**B210E-BATTERY VOLTAGE HIGH (CONTINUED)****3. CHECK THE VOLTAGE ON THE (A110) FUSED B(+) CIRCUIT**

Disconnect the Seat Memory Module connector.

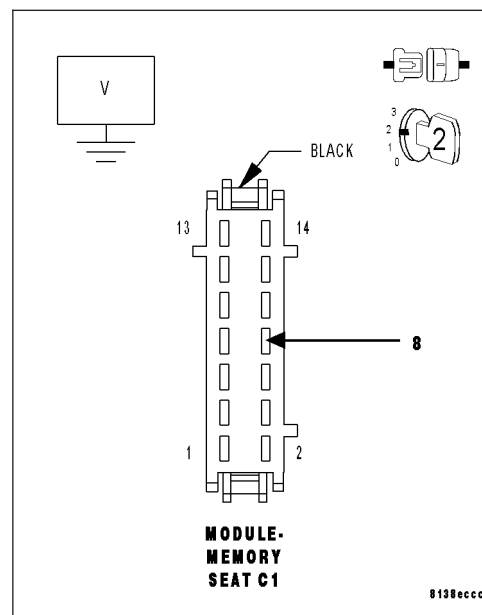
**Note: Check connectors - Clean and repair as necessary.**

Start the engine and let idle.

Measure the voltage on the (A110) Fused B(+) circuit at the MSM connector and compare to voltage at the vehicles battery.

**Is the voltage at the MSM connector the same as measured at the battery?**

- Yes** >> Replace the Memory Seat Module in accordance with the service information.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.
- No** >> Repair the (A110) Fused B(+) circuit as necessary.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.



## B221C- MEMORY SEAT MODULE INTERNAL

For the Power Seat System circuit diagram (Refer to 8 - ELECTRICAL/HEATED SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:** Ignition on.
- **Set Condition:** This code is set immediately if the Memory Seat Module internal self test fails.

Possible Causes
MEMORY SEAT MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

### Diagnostic Test

#### 1. VERIFY THAT DTC B221C- MEMORY SEAT MODULE INTERNAL IS ACTIVE

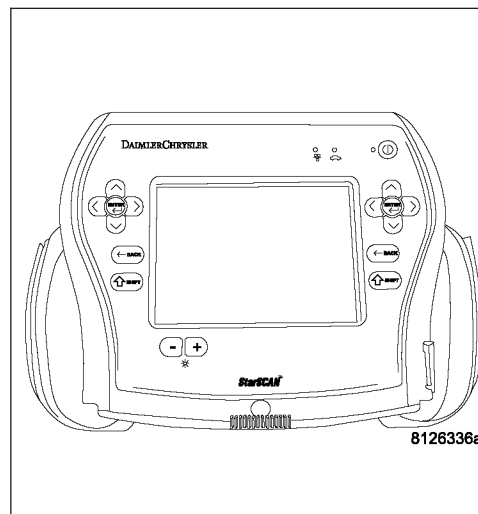
With the scan tool, record and erase DTC's

Cycle the ignition switch off then back on.

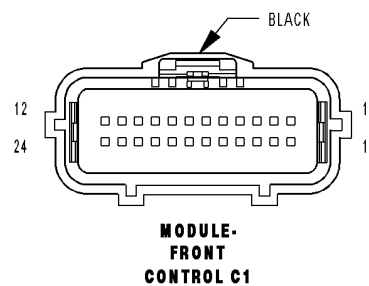
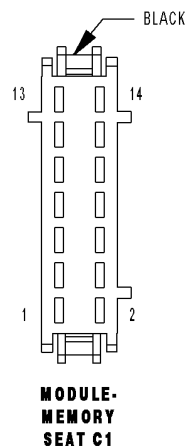
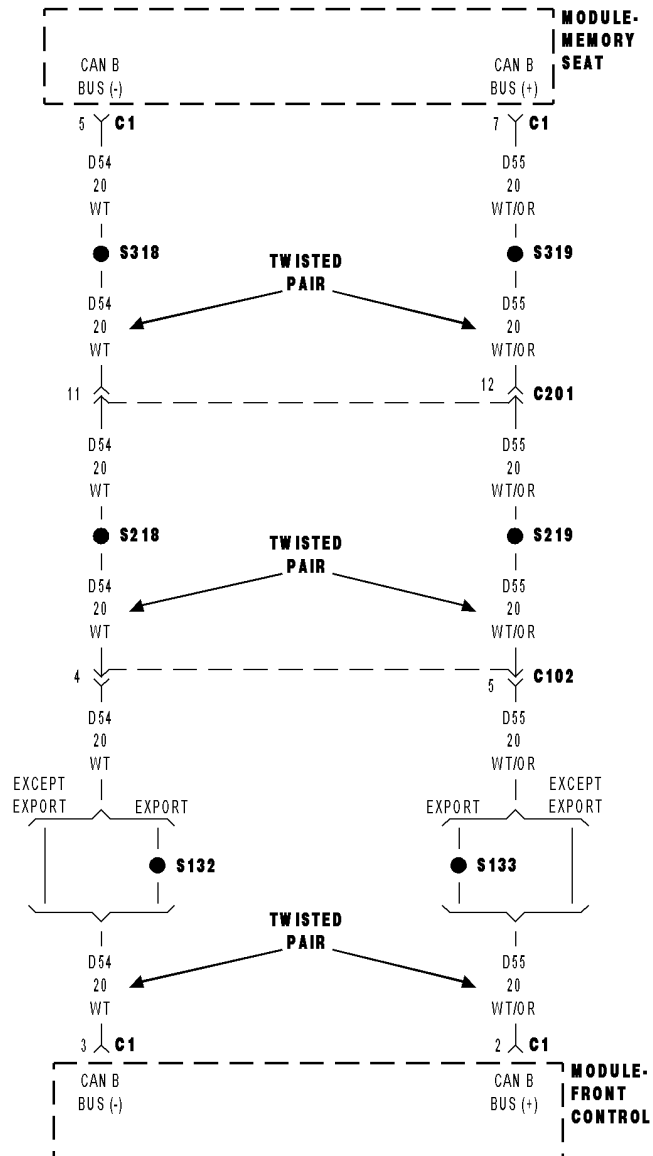
With the scan tool, read DTC's.

**Does the DTC B221C-MEMORY SEAT MODULE INTERNAL reset?**

- Yes** >> Replace the Memory Seat Module.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.
- No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform POWER SEAT SYSTEM VERIFICATION TEST – VER 1.



## U0020-CAN B BUS OFF PERFORMANCE



**U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
The Memory Seat Module detects the (D55) CAN B Bus (+) circuit or (D54) CAN B Bus (-) circuit open.

Possible Causes
(D55) CAN B BUS (+) CIRCUIT OPEN (D54) CAN B BUS (-) CIRCUIT OPEN MEMORY SEAT MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase MSM DTC's

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active MSM DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

**2. (D55) CAN B BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Memory Seat Module C1 harness connector.

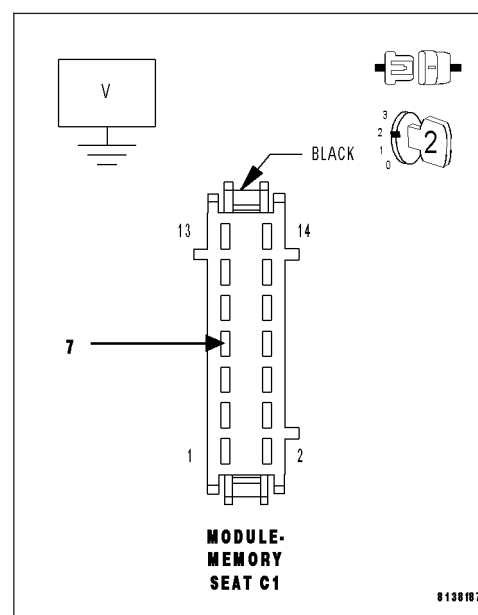
Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

**Is there any voltage present?**

**Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Memory Seat Module in accordance with the service information.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) CAN B Bus (+) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.



**U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)****3. (D54) CAN B BUS (-) CIRCUIT OPEN**

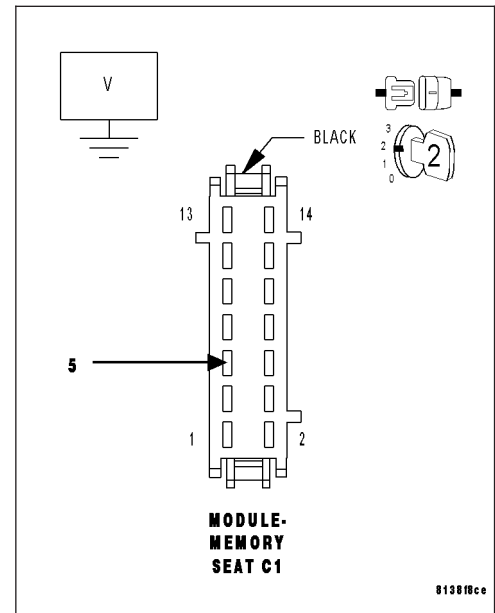
Turn the ignition off.

Disconnect the Memory Seat Module C1 harness connector.

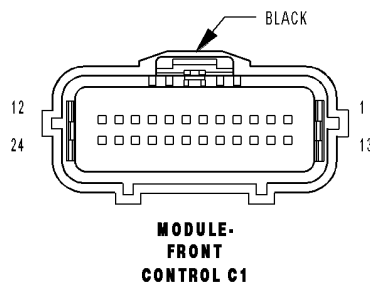
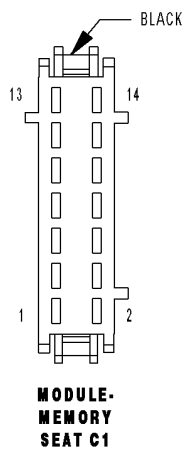
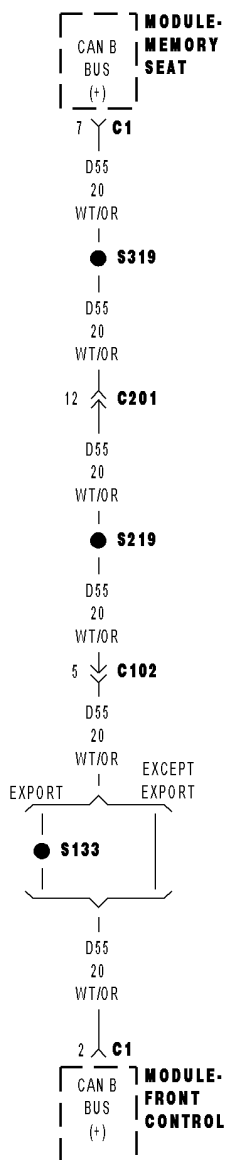
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

**Is there any voltage present?**

- Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Memory Seat Module in accordance with the service information.  
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.
- No** >> Repair the (D54) CAN B Bus (-) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.



# U0021-CAN B BUS (+) CIRCUIT OPEN



**U0021-CAN B BUS (+) CIRCUIT OPEN (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
The Memory Seat Module detects the (D55) CAN B Bus (+) circuit is open.

Possible Causes
(D55) CAN B BUS (+) CIRCUIT OPEN MEMORY SEAT MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase MSM DTC's

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active MSM DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

**2. (D55) CAN B BUS (+) CIRCUIT OPEN**

Turn the ignition off.

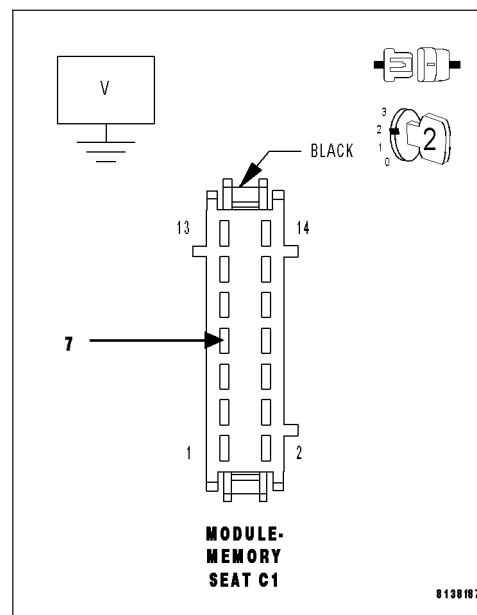
Disconnect the Memory Seat Module C1 harness connector.

Measure the voltage between the (D55) CAN B Bus (+) circuit and ground.

**Is there any voltage present?**

**Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Memory Seat Module in accordance with the service information.  
Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

**No** >> Repair the (D55) CAN B Bus (+) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.



## **U0022-CAN B BUS (+) CIRCUIT LOW**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

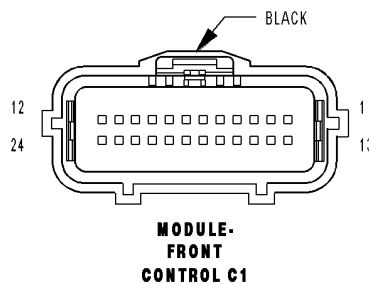
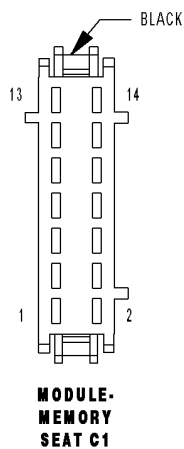
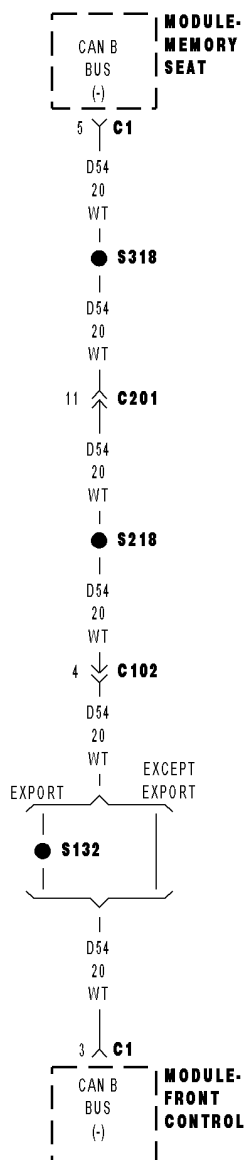
## **U0023-CAN B BUS (+) CIRCUIT HIGH**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.



## U0024-CAN B BUS (-) CIRCUIT OPEN



**U0024-CAN B BUS (-) CIRCUIT OPEN (CONTINUED)**

For the Power Seat System circuit diagram(Refer to 8 - ELECTRICAL/POWER SEATS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
The Memory Seat Module detects the (D54) CAN B Bus (-) circuit is open.

Possible Causes
(D54) CAN B BUS (-) CIRCUIT OPEN MEMORY SEAT MODULE

**Theory of Operation****Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase MSM DTC's

Cycle the ignition from on to off 3 times.

Turn the ignition on.

With the scan tool, read active MSM DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

**2. (D54) CAN B BUS (-) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Memory Seat Module C1 harness connector.

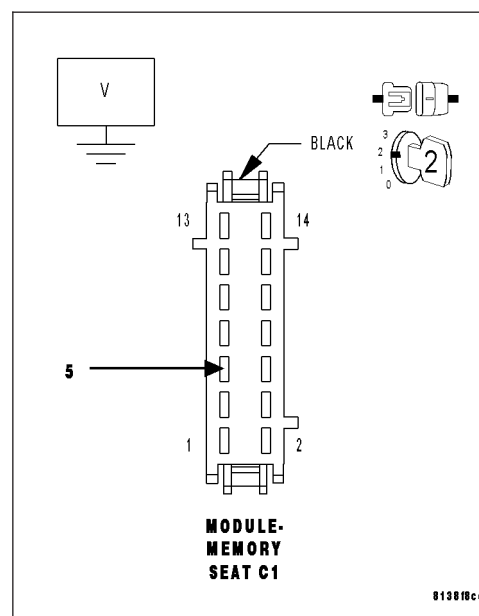
Measure the voltage between the (D54) CAN B Bus (-) circuit and ground.

**Is there any voltage present?**

**Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace the Memory Seat Module in accordance with the service information.

Perform POWER SEAT SYSTEM VERIFICATION TEST - VER 1.

**No** >> Repair the (D54) CAN B Bus (-) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.



## **U0025-CAN B BUS (-) CIRCUIT LOW**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0026-CAN B BUS (-) CIRCUIT HIGH**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0155-LOST COMMUNICATION WITH CLUSTER/CCN**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0156-LOST COMMUNICATION WITH EOM**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0159-LOST COMMUNICATION WITH PARKING ASSIST CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0169-LOST COMMUNICATION WITH SUNROOF CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0181-LOST COMMUNICATION WITH HEADLAMP LEVEL TRANSLATOR**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0184-LOST COMMUNICATION WITH RADIO**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0195-LOST COMMUNICATION WITH SDARS**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0197-LOST COMMUNICATION WITH HANDS FREE PHONE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0212-LOST COMMUNICATION WITH SCCM**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0231-LOST COMMUNICATION WITH RAIN SENSING MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## POWER SEAT SYSTEM VERIFICATION TEST – VER 1

### Diagnostic Test

#### 1. Perform Power Seat System Verification Test

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.

Ensure that all accessories are turned off.

Ensure that the battery is fully charged.

Turn the ignition on.

If either the Memory Seat Module or the Driver Horizontal Seat Adjuster Motor/Seat Track was replaced, the MSM Standard Routine must be performed using the scan tool.

With the scan tool, record and erase DTCs from all modules.

Operate the driver seat in all positions.

With the Memory Switch on the Driver's Door, program the Driver's Seat #1 Button to a desired position and Driver #2 Button to a different position.

Verify that both Memory positions can be recalled from the RKE transmitter and the Memory Switch on the Driver's Door.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, select ECU View.

Check for DTCs in the modules.

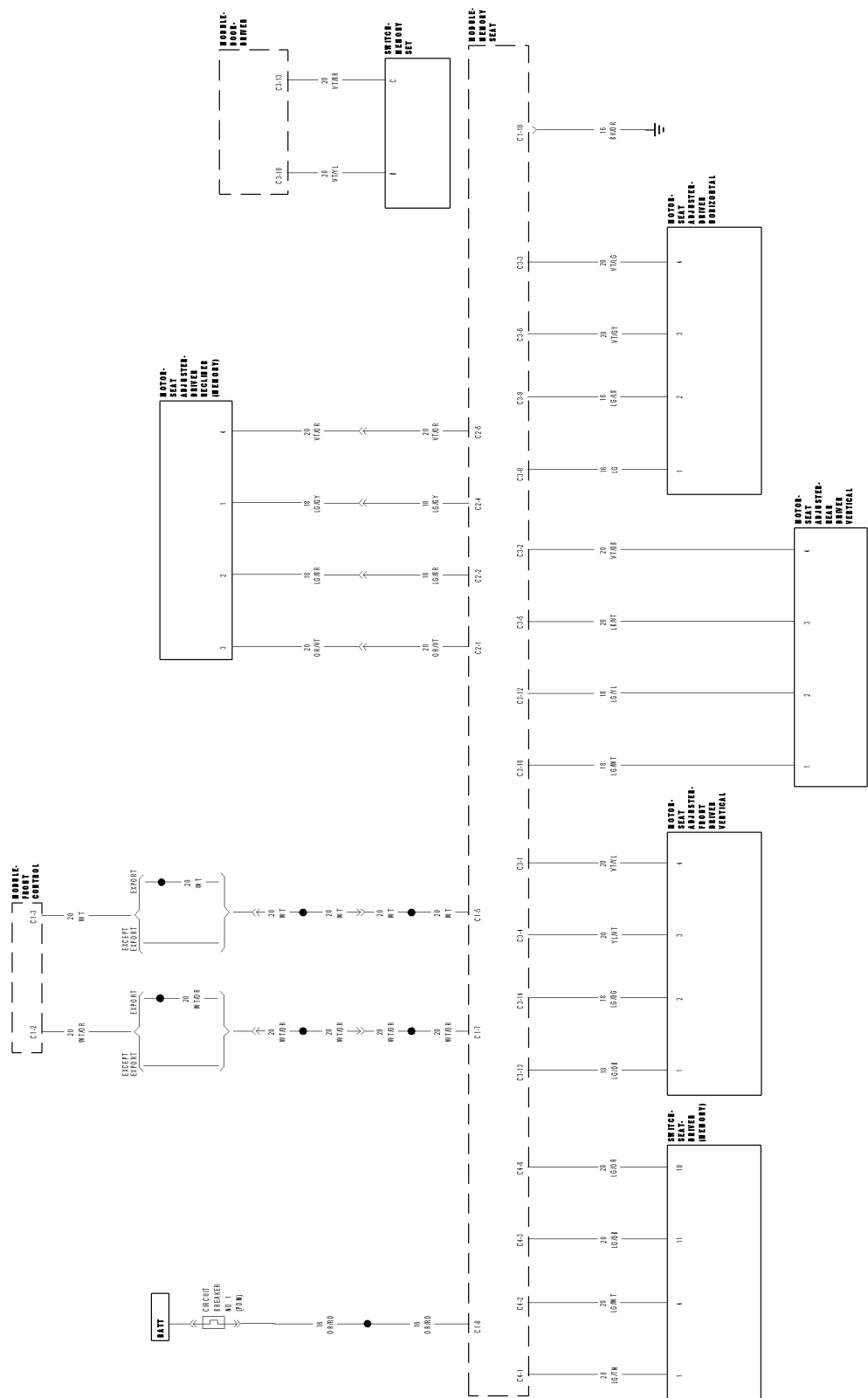
#### **Are DTCs present in any of the modules or is the original condition still present?**

**Yes** >> The repair is not complete. Refer to the related category for the DTC or symptom that is still present.

**No** >> The repair is complete.

---

SCHEMATICS AND DIAGRAMS



POWER SEAT SYSTEM MSM

## POWER SEATS - SERVICE INFORMATION

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## POWER SEATS - SERVICE INFORMATION

### DESCRIPTION

#### POWER SEAT SYSTEM

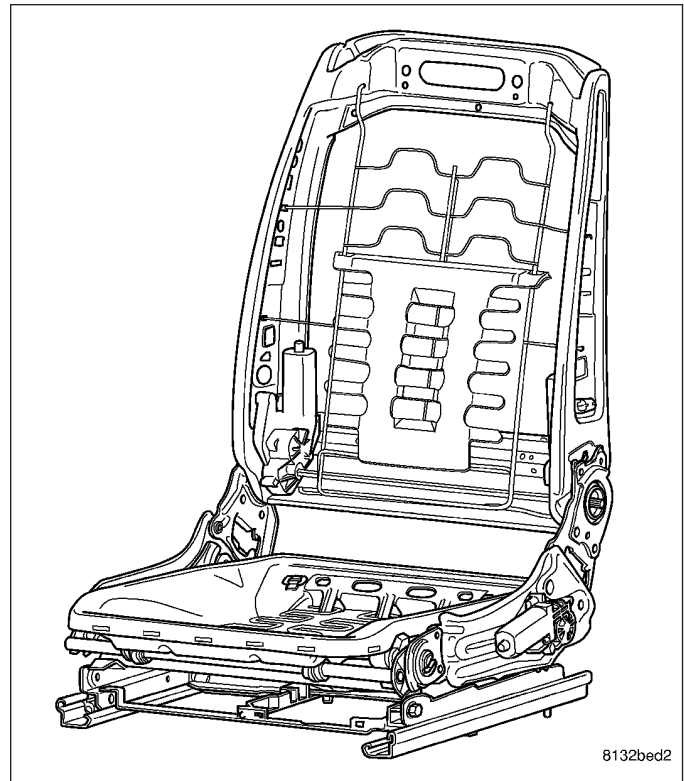
**WARNING:** The front passenger seat assembly contains critical components that affect the front passenger airbag deployment. Correctly functioning front passenger seat components are critical for the Occupant Classification System (OCS) to properly classify the front passenger and calculate the proper airbag deployment. Unapproved modifications or service procedures to the front passenger seat assembly, its related components, or trim cover may inadvertently change the airbag deployment in case of a frontal crash. This could result in death or serious injury to the front seat passenger if the vehicle is involved in an accident. The following requirements must be strictly adhered to:

- Do not modify the front passenger seat assembly or components in any way.
- Do not modify the front seat center console or center position seat in any way.
- Do not use prior or future model year seat trim covers not designated for the specific model being repaired. Always use the correct seat trim cover specified for the vehicle.
- Do not replace the seat trim cover with an aftermarket trim cover.
- Do not add a secondary trim cover other than those approved by DaimlerChrysler/Mopar.
- At no time should any Supplemental Restraint System (SRS) component or SRS related component or fastener be modified or replaced with any part except those which are approved by DaimlerChrysler/Mopar.



The power seat system allows the driver and front seat passenger to electrically adjust their seating positions using the power seat switches located on the outboard seat cushion side shield of each front seat.

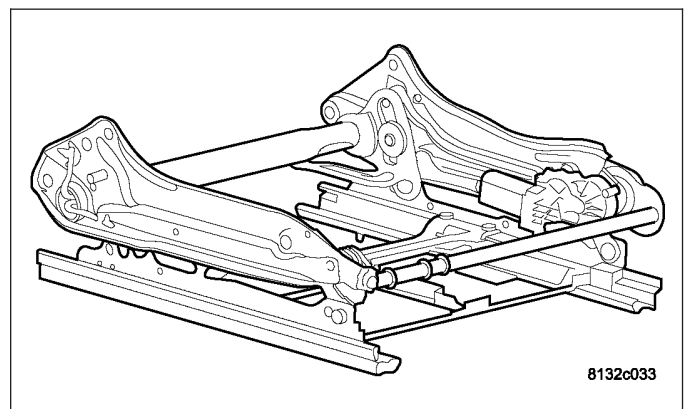
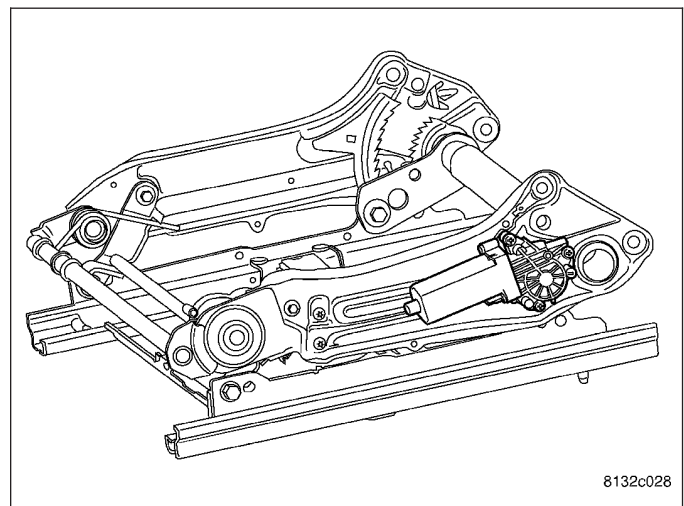
A driver side eight-way power seat includes a six-way adjustable seat cushion track and a two-way power seat back. The driver power seat can be adjusted up, down, front up, front down, forward, rearward, recliner forward, and recliner rearward. A passenger side six-way power seat includes a six-way adjustable seat cushion track and a manual seat back recliner. The passenger power front seat can be adjusted up, down, front up, front down, forward and rearward. The power seat system is also available with the heated seat option and memory seat option that automatically positions the driver power seat for two different drivers (Refer to 8 - ELECTRICAL/HEATED SEATS - DESCRIPTION ) and MEMORY SEAT SYSTEM below.



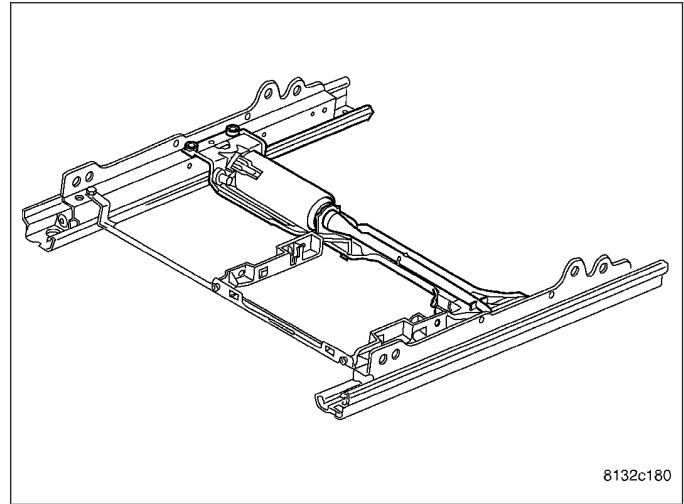
The power seat system for this vehicle includes the following major components:

- **Power Seat Adjuster** - The power seat adjuster is made up of the upper and lower power seat adjuster assemblies. The upper power seat adjuster contains two reversible motors that are connected to worm-drive gearboxes that move the seat adjuster through a combination of screw-type drive units. These motors are the height adjust motor and the front tilt motor. On vehicles equipped with non-memory power seats, each motor contains a self-resetting circuit breaker to protect it from overload. On vehicles equipped with memory power seats the motor overload protection is a function of the Memory Seat Module (MSM). Consecutive or frequent resetting of the circuit breakers may damaged the motors. The height adjust motor is located on the rear of the upper power seat adjuster assembly and controls the up and down movement of the entire seat. The height adjust motor can be serviced separately from the power seat adjuster assembly.

The front tilt motor is located on the front of the upper power seat adjuster assembly and controls the up and down movement of the seat front only. The front tilt motor can be serviced separately from the power seat adjuster assembly.



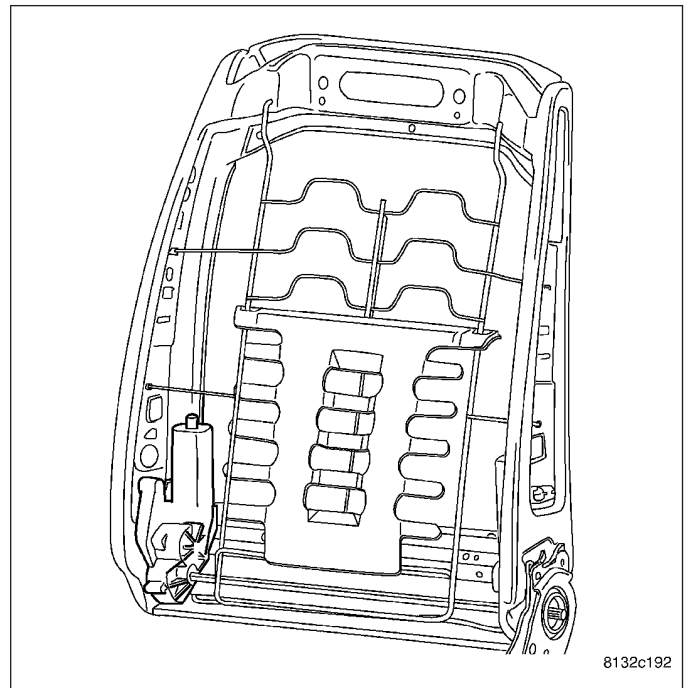
The lower power seat adjuster contains one reversible motor that is connected to a worm-drive gearbox that moves the seat adjuster through a screw-type drive unit. On vehicles equipped with non-memory power seats, the motor will contain a self-resetting circuit breaker to protect it from overload. On vehicles equipped with memory power seats the motor overload protection is a function of the Memory Seat Module (MSM). The motor is part of the lower power seat track unit and must be replaced as an assembly, (Refer to 23 - BODY/SEATS/SEAT ADJUSTERS - REMOVAL).



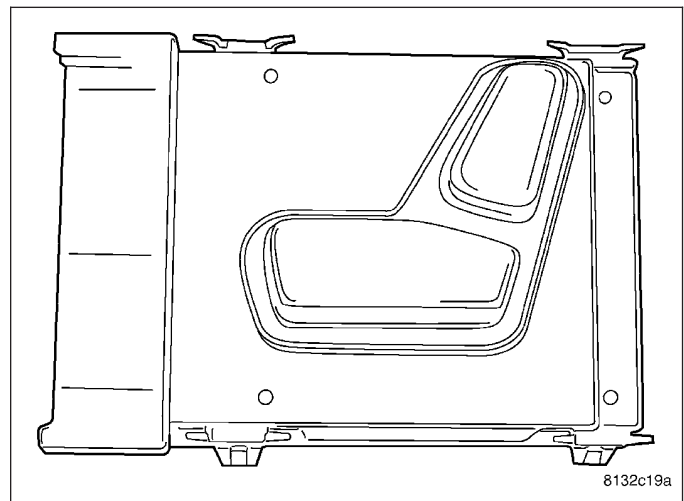
- **Power Seat Recliner** - The power seat recliner replaces the manual seat recliner on the driver seat only.

The driver power seat option includes an electrically operated power seat back recliner mechanism. The power seat recliner switch is integral to the power seat switch assembly, but is actuated with a separate switch knob.

The power seat recliner motor cannot be repaired. If the unit is inoperative or damaged, the seat back frame must be replaced, (Refer to 8 - ELECTRICAL/POWER SEATS/POWER SEAT MOTOR - REMOVAL).



- **Power Seat Switches** - Vehicles may be equipped with driver only, or driver and passenger power seat switches. One seat switch is used for each front seat. The power seat switches are paddle-type levers mounted on the outboard seat side shields. Movement of the seat cushions and backs mimics the action of the switch paddles. (Refer to 8 - ELECTRICAL/POWER SEATS/SEAT SWITCH - DESCRIPTION) for additional information.



## MEMORY SEAT SYSTEM

An electronic memory seat system is available on certain models. The memory system is able to store and recall all driver side power seat positions, outside mirror positions, power tilt/telescopic steering column positions and power adjustable pedal position. The system can be set for two different drivers. On vehicles with a factory installed radio connected to the Controller Area Network (CAN) data bus network, the memory system is also able to store and recall up to twelve radio station presets (six AM and six FM), also for two drivers. The memory system will also store and recall the last station listened to for each driver, even if it is not one of the twelve preset stations.

The memory system will automatically recall all of these settings when a button of the memory switch is depressed, or when the doors are unlocked using the Remote Keyless Entry (RKE) transmitter (if enabled). If the vehicle has more than two drivers the RKE transmitter recall of memory features can be disabled. This is a customer programmable feature of the Electronic Vehicle Information Center (EVIC) set through the use of the appropriate steering wheel switches. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - OPERATION) for additional information on the customer programmable features.

The memory system also has an "Easy Entry and /Exit" feature that provides the driver with more room to enter or exit the vehicle. When the seat is in a memorized position, it will move rearward 55 millimeters or to the end of its travel, whichever occurs first, when the key is removed from the ignition switch lock cylinder. This is also a customer programmable feature of the Electronic Vehicle Information Center (EVIC) set through the use of the appropriate steering wheel switches.

The memory system also has a "Tilt in Reverse" feature that tilts the outside mirrors down a fixed, incremental angle when the vehicle is shifted into REVERSE with the ignition switch in the RUN position. This feature provides the customer with a better view of the ground and vehicle in the area of the rear tires when backing up. The mirrors move back to their previous position when the vehicle is shifted out of REVERSE.

The memory system includes the following components:

- **Memory Selector Switch** - located in the driver door trim panel.
- **Driver Door Module (DDM)** - located in the driver door, behind the trim panel.
- **Passenger Door Module (PDM)** - located in the passenger door, behind the trim panel.
- **Hall Effect Sensors - Outside Mirror** - The hall effect sensor is permanently installed on the outside mirror motor. This hall effect sensor is used to provide a reference signal to the memory heated seat mirror module, letting the module know the exact position of the mirror.
- **Sentry Key Remote Entry Module (SKREEM)** - located at ignition key cylinder.
- **Remote Keyless Entry (RKE) Transmitter** - located with ignition key.
- **Memory Seat Module (MSM)** - located underneath the driver seat and also controls the Adjustable Pedals.
- **Hall Effect Sensors - Seat Track** - These hall effect sensors are permanently installed in each of the power seat track motors. They are used to provide a reference signal to the memory heated seat mirror module, letting the module know the exact position of the seat cushion and recliner.
- **Radio** - located in the instrument panel center stack.
- **Automatic Temperature Control (ATC)** - located in the instrument panel center stack.

Certain functions and features of the memory system rely upon resources shared with other electronic modules in the vehicle over the Controller Area Network (CAN) bus. The CAN bus allows the sharing of sensor information. This helps to reduce wire harness complexity, internal controller hardware, and component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities. For diagnosis of these electronic modules or of the CAN bus, the use of a scan tool and the proper diagnostic information are needed.

## OPERATION

### POWER SEAT SYSTEM

The power seat system receives battery current through a 50 amp fuse in the Power Distribution Center (PDC) so that the power seats remain operational, regardless of the ignition switch position.

When a power seat switch is actuated, a battery feed and a ground path are applied through the power seat switch contacts to the appropriate motor or motors. The motor and drive unit operate to move the seat in the selected direction until the switch is released, or until the travel limit of the power seat track is reached. When the switch is moved in the opposite direction, the battery feed and ground path to the motor is reversed through the switch contacts. This causes the motor to run in the opposite direction.

## MEMORY SEAT SYSTEM

The Memory Seat Module (MSM) receives battery current through a 25 amp circuit breaker in the Power Distribution Center (PDC) so that the power seats remain operational, regardless of the ignition switch position. When the driver memory seat switch control knob is actuated, a resistance signal is sent to the MSM via the Controller Area Network (CAN) bus circuit. The MSM is responsible for the 12v battery feed and ground path to the power seat adjuster motor. The adjuster motor operates to move the power seat adjuster mechanism through its drive unit in the selected direction until the switch is released, or until the travel limit of the adjuster is reached.

The MSM receives memory set/position switch input through the CAN bus circuit. The MSM also receives hard wired input from the hall effect sensors, mounted on each of the driver power seat adjuster motors and the driver side view mirror motor. The programmed software in the module allows it to know where the seat/mirror is located in its designed travel by a pulse count generated from the hall effect sensors. This way, when the memory switch is depressed the module will power the seat adjuster/mirror motors until the correct preset location is achieved. The module will prevent the seat memory recall function from being initiated, if the transmission gear selector lever is not in the Park position, or if the vehicle is moving. These inputs are monitored over the Controller Area Network (CAN) bus circuit by the MSM.

A memory setting is saved by pressing the "set" button, then pressing either the memory "1" or "2" button within 5 seconds of pressing the "set" button.

A memory setting is recalled by pressing either the memory "1" or "2" button, or by pressing the unlock button on a "linked" Remote Keyless Entry (RKE) transmitter.

For driver safety, memorized settings can not be recalled if the transmission is in a position other than Park or the seat belt is latched.

## DIAGNOSIS AND TESTING

### MEMORY SEAT SYSTEM

In order to obtain conclusive testing of the power seats with and without the memory system option, the Controller Area Network (CAN) bus, and all of the electronic modules that provide inputs to, or receive outputs from the memory system components must be checked. Use a scan tool and the proper diagnostic information to accurately diagnose the power seat/memory seat systems.

**Note: Vehicles equipped with the memory/heated seat option utilize a low voltage cut-off feature. This feature turns off the 12v power to the power seat system anytime vehicle voltage is below 11.0v. Be certain to check the vehicle electrical system for proper voltage anytime the power seat system appears inoperative.**

Before any testing of the power seat system is attempted, the battery should be fully-charged.

### POWER SEAT ADJUSTER

Operate the power seat switch and move the seat in all directions. The seat should move in each of the selected directions.

If the power seat adjuster fails to operate in more than one direction, proceed as follows:

1. Inspect the power seat adjuster motors to ensure the electrical connectors are fully seated to the motors. If OK, go to Step 2. If not OK, connect the electrical connector to the fully seated position.
2. Check the power seat fuse in the power distribution center. If OK, go to Step 3. If not OK, replace the inoperative fuse.
3. Remove the power seat switch from the seat cushion side panel. Check for battery voltage at the fused B(+) circuit cavity of the power seat switch wire harness connector. If OK, go to Step 4. If not OK, repair the open circuit to the power distribution center as required.
4. Check for continuity between the ground circuit cavity of the power seat switch wire harness connector and a good ground. There should be continuity. If OK, go to Step 5. If not OK, repair the open circuit to ground as required.
5. (Refer to 8 - ELECTRICAL/POWER SEATS/SEAT SWITCH - DIAGNOSIS AND TESTING). If the switch tests OK, check the wire harness between the power seat switch and the motor. If the circuits check OK, replace the faulty power seat adjuster assembly. If the circuits are not OK, repair the wire harness as required.

## STANDARD PROCEDURE

### MEMORY SYSTEM PROGRAMMING

The Memory Seat Module (MSM) interfaces with the Remote Keyless Entry (RKE) system via the Controller Area Network (CAN) bus. The proper procedure of setting and recalling a memory position using the RKE is as follows:

1. Press and release memory switch 1 or 2 to recall memory position 1 or 2.
2. Adjust the seat, recliner, adjustable pedal position, set radio station presets, set HVAC temperature preset, and the side view mirrors to the desired position.
3. Press momentarily and release memory switch S.
4. Within five seconds, press momentarily and release memory switch 1 or 2.
5. To link the RKE transmitter: within ten seconds, press and release the "LOCK" button on one of the RKE transmitters

To program the second driver's position, repeat the above procedure using memory switch 2. The second RKE transmitter can be programmed in the same fashion as indicated in step 5 Step 5.

**Note:** The module will abort a recall if the transmission is moved out of park or if any seat movement is activated whether manually or by memory recall. The module will also abort a recall if any movement of the adjustable pedals is detected.

To recall either of the programmed positions momentarily press and release either memory selector switch 1 or 2. If using RKE, just press and release the "UNLOCK" button on the proper transmitter for either position 1 or 2.

A recall is possible any time the vehicle transmission is in PARK and the seatbelt is unbuckled. This condition is monitored by the MSM.

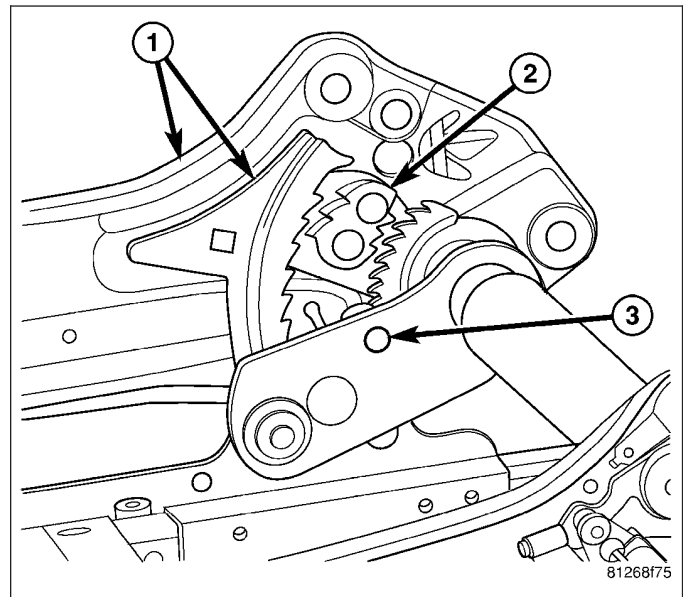
## MOTOR-SEAT ADJUSTER

### REMOVAL

**WARNING:** A seat structure that has seen significant load may have the locking mechanism activated and may exhibit the following symptoms:

- Locking pawl (2) loose
- Locking pawl (2) engaged into the seat frame sidemember (1)
- Height adjuster only works on outboard side
- Broken or missing shear pin (3)

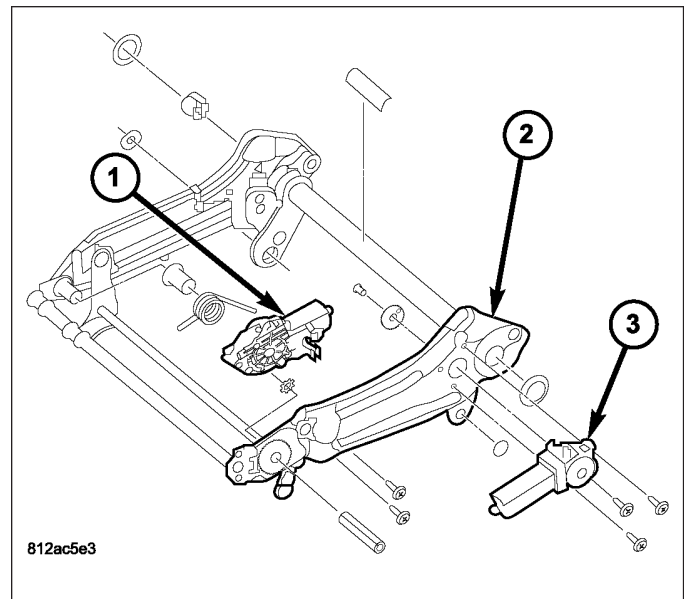
If any one or more of these symptoms exist replace the height adjuster assembly. Do not attempt any repairs. Failure to follow these instructions may result in personal injury or death.



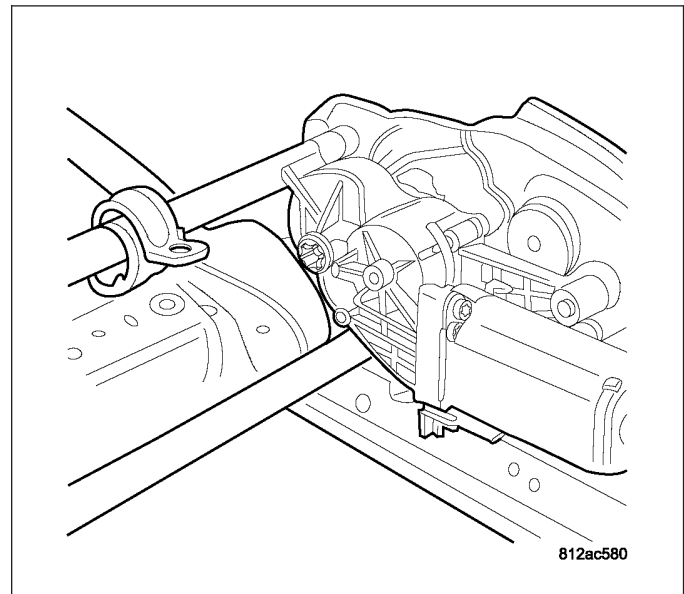


## FRONT TILT MOTOR

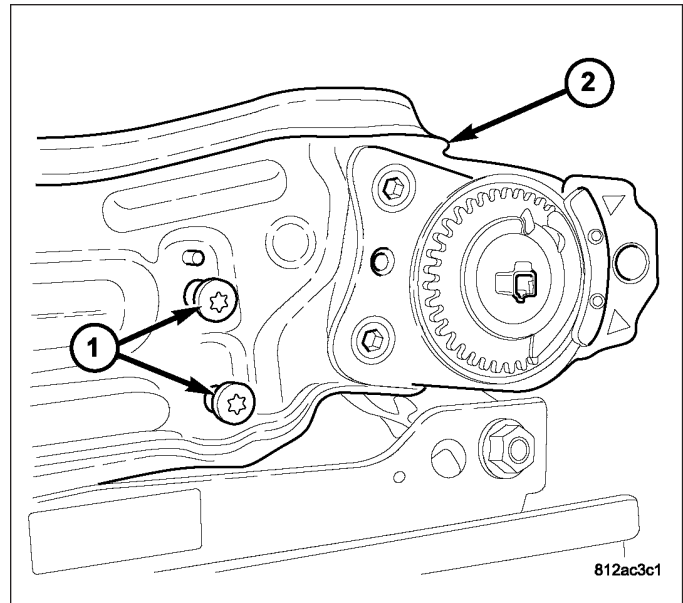
1. Disconnect and isolate the battery negative cable.
2. Remove the affected seat with the inoperative motor (1) (Refer to 23 - BODY/SEATS/SEAT - FRONT - REMOVAL).
3. Remove the seat cushion and pan (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - REMOVAL).



4. Disconnect the motor electrical connector.



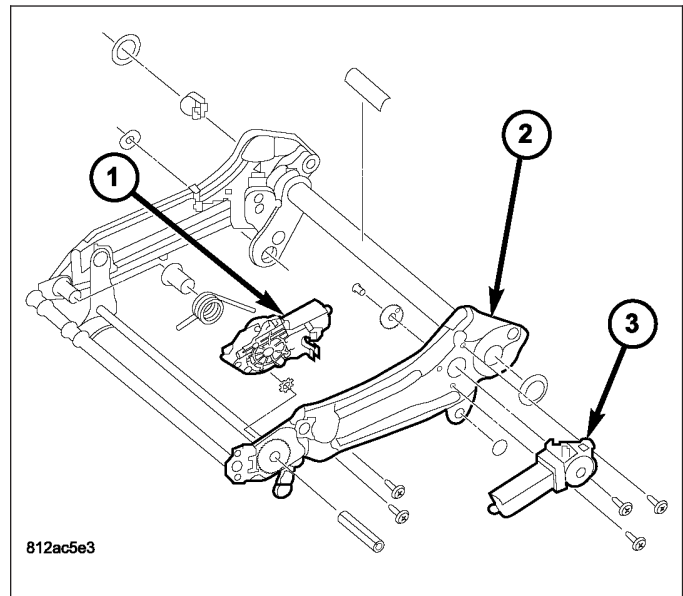
5. Remove the fasteners holding the motor to the seat adjuster (1).
6. Remove motor from seat adjuster (2).



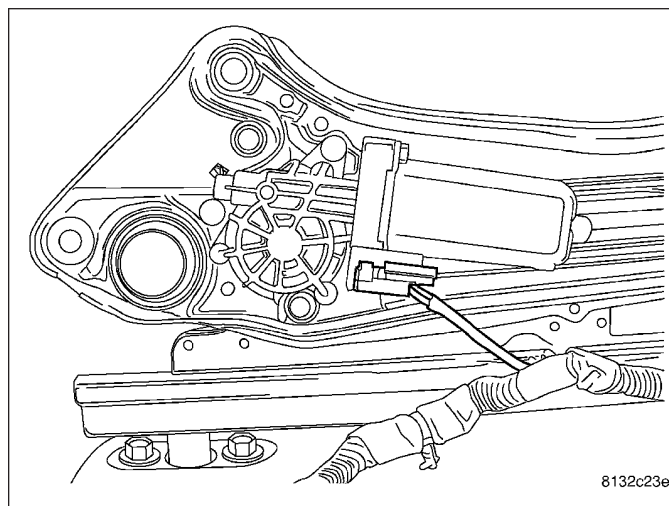
## HEIGHT ADJUST MOTOR

**WARNING:** Use caution when removing the height adjust motor (3) if the motor is inoperative, and the power seat is not in the full up position. The seat adjuster assembly (2) is under load from the height adjust spring and may cause the motor to rotate under pressure when the fasteners are removed. The seat adjuster assembly also may spring upward when the motor is removed. If the height adjust motor is operative, move the power seat to the full up position prior to disconnecting the battery.

1. Disconnect and isolate the battery negative cable.
2. Remove the affected seat with the inoperative motor (3) (Refer to 23 - BODY/SEATS/SEAT - FRONT - REMOVAL).
3. Remove the seat cushion and pan (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - REMOVAL).



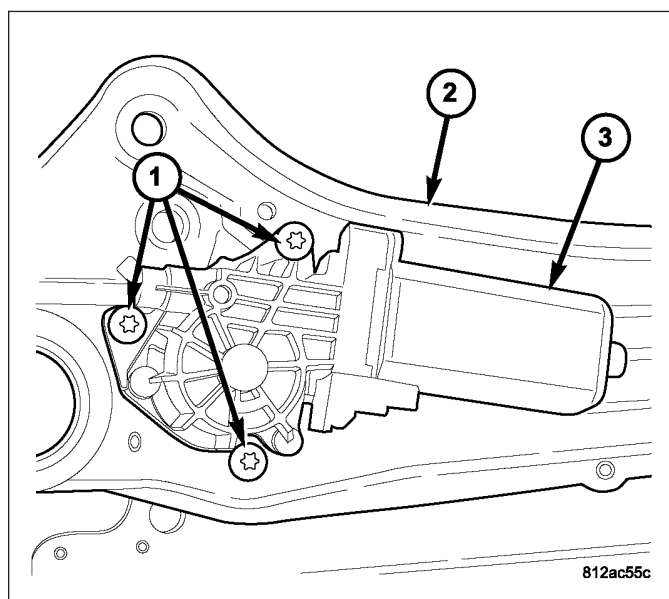
4. Disconnect the motor electrical connector.



5. Remove the fasteners (1) holding the motor (3) to the seat adjuster (2).

6. Remove screw and washer from the motor shaft.

7. Remove motor (3) from seat adjuster (2).

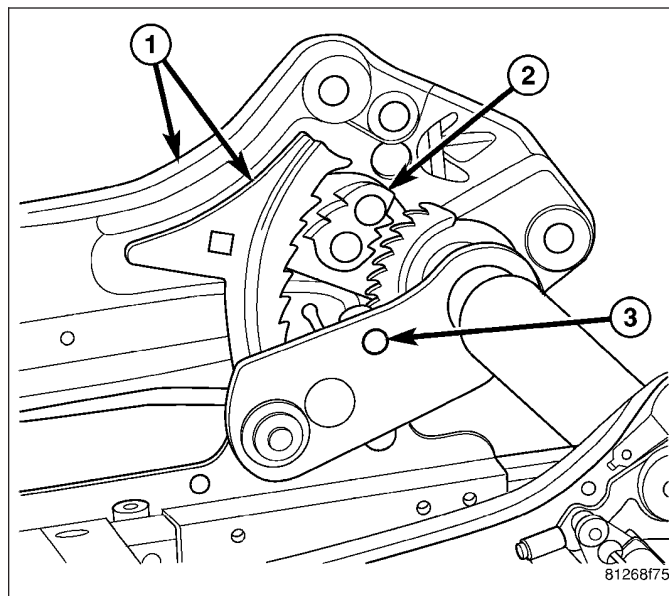


## INSTALLATION

**WARNING:** A seat structure that has seen significant load may have the locking mechanism activated and may exhibit the following symptoms:

- Locking pawl (2) loose
- Locking pawl (2) engaged into the seat frame sidemember (1)
- Height adjuster only works on outboard side
- Broken or missing shear pin (3)

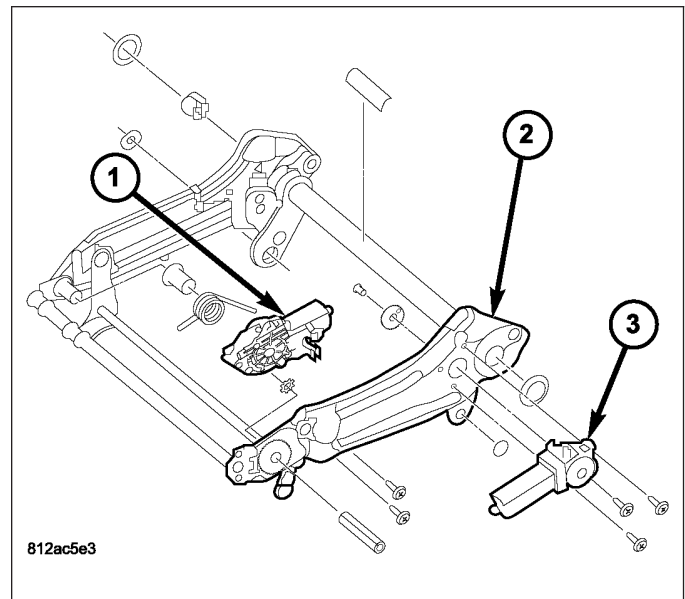
If any one or more of these symptoms exist replace the height adjuster assembly. Do not attempt any repairs. Failure to follow these instructions may result in personal injury or death.



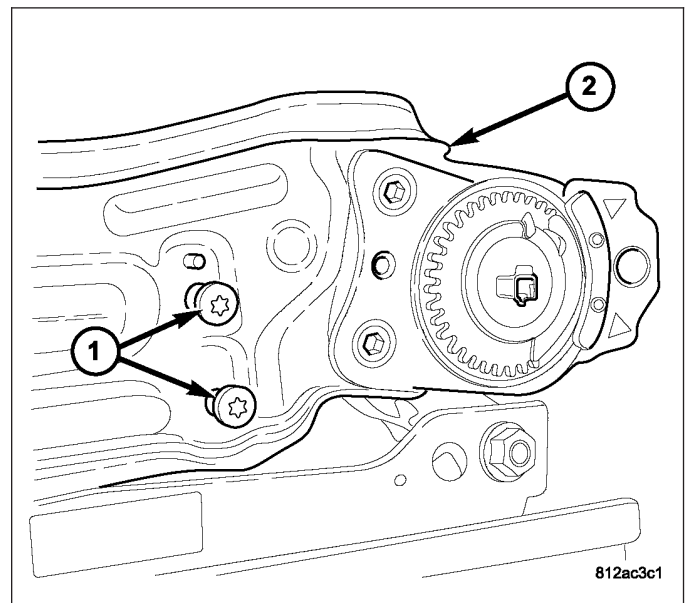


**FRONT TILT MOTOR**

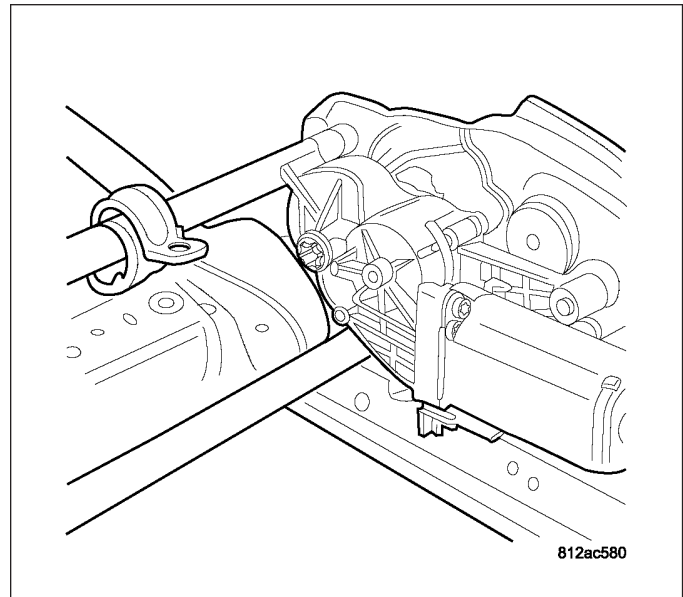
1. Position motor (1) on seat adjuster (2).



2. Install the fasteners (1) holding the motor to the seat adjuster (2). Tighten the screws to 5 N·m (44 in. lbs.).

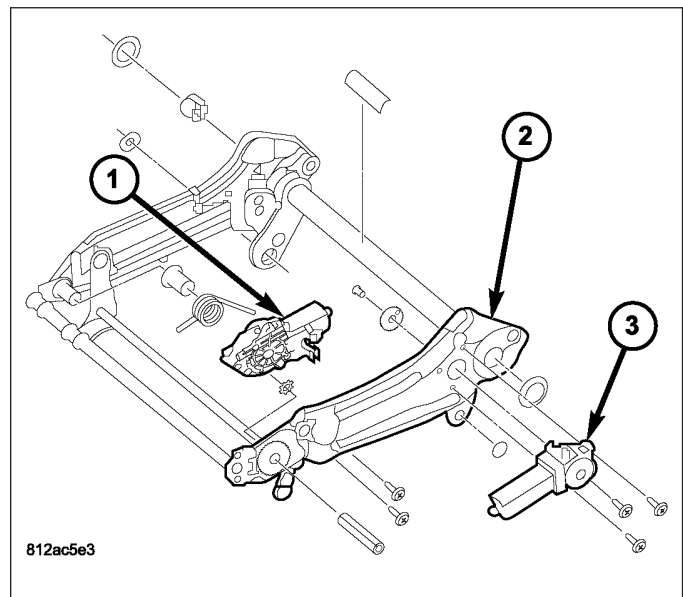


3. Connect the motor electrical connector.
4. Install the seat cushion (Refer to 23 - BODY/ SEATS/SEAT CUSHION COVER - INSTALLATION).
5. Clip the wire harness to cushion pan.
6. Install the seat assembly (Refer to 23 - BODY/ SEATS/SEAT - INSTALLATION).
7. Connect the battery negative cable.
8. Verify normal operation of the power seat assembly.

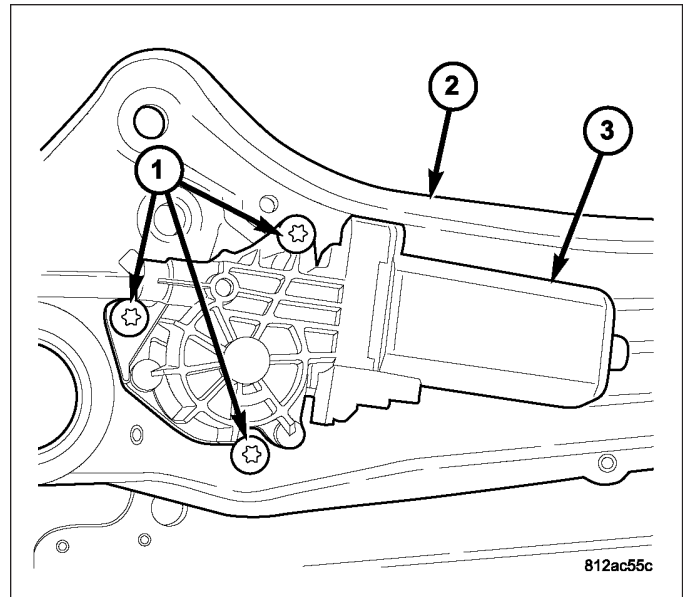


## HEIGHT ADJUST MOTOR

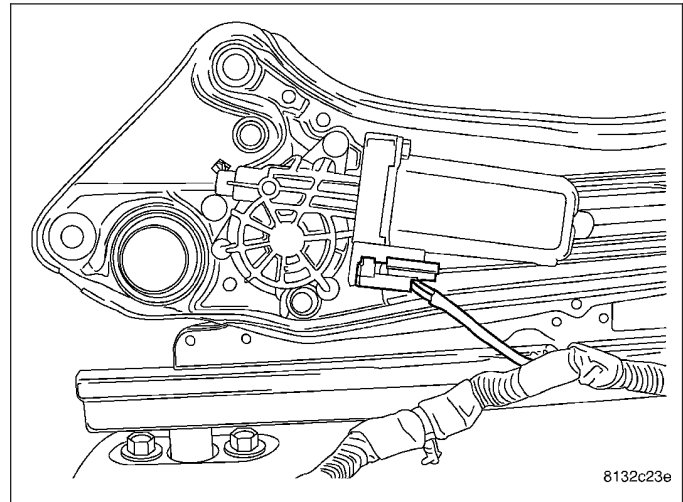
1. Ensure the seat adjuster (2) is in the full up position by pulling upward on the upper adjuster assembly.
2. Position motor (3) on seat adjuster (2).
3. Install the motor shaft screw and washer and tighten until snug. **Do not torque screw at this time.**



4. Install the screws (1) holding the motor (3) to the seat adjuster (2). **It may be necessary to twist the motor slightly to align the fastener holes.**
5. Starting with the bottom screw, tighten the motor screws (1) to 9 N·m (80 in. lbs.).
6. Tighten the motor shaft screw and washer to 6.5 N·m (57.5 in. lbs.).



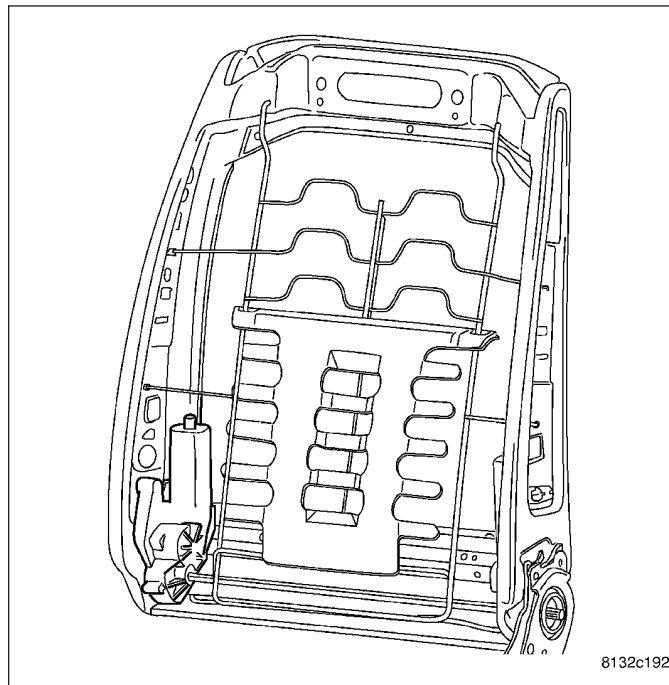
7. Connect the motor electrical connector.
8. Install the seat cushion (Refer to 23 - BODY/ SEATS/SEAT CUSHION COVER - INSTALLATION).
9. Clip the wire harness to cushion pan.
10. Install the seat assembly (Refer to 23 - BODY/ SEATS/SEAT - INSTALLATION).
11. Connect the battery negative cable.
12. Verify normal operation of the power seat assembly.



## POWER SEAT RECLINER

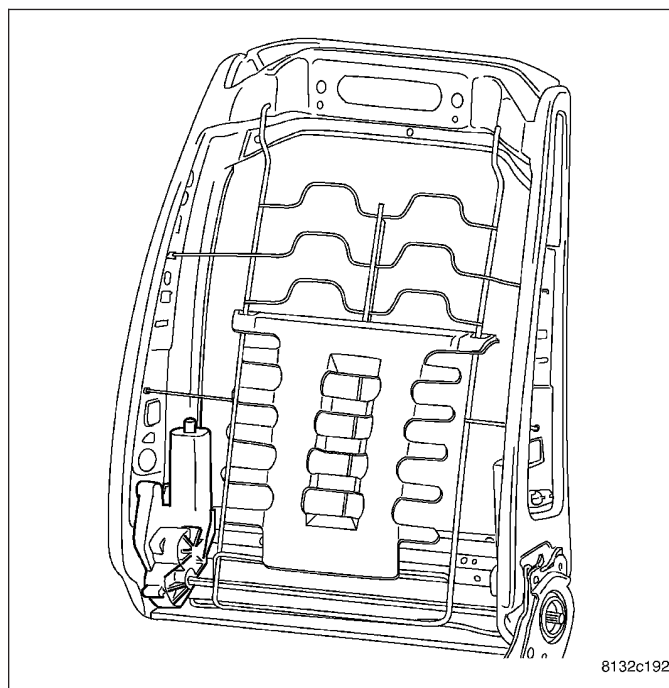
### REMOVAL

1. Remove the seat back frame assembly(Refer to 23 - BODY/SEATS/SEAT BACK CUSHION/COVER - REMOVAL).
2. Remove any parts that will need to be installed on new seat back frame assembly.



### INSTALLATION

1. Install parts from old seat back assembly as necessary.
2. Install the seat back (1) (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION/COVER - INSTALLATION).



## SWITCH-SEAT

### DESCRIPTION

The driver power seat can be adjusted in eight different ways using the power seat switch. The passenger power seat can be adjusted in six different ways. The power seat switch is located on the lower outboard side of the seat cushion on the seat cushion side shield on all models.

The individual switches in the power seat switch assembly cannot be repaired. If one switch is damaged or faulty, the entire power seat switch must be replaced.

### OPERATION

When a power seat switch is actuated, a battery feed and a ground path are applied through the switch contacts to the power seat adjuster or recliner adjuster motor. The selected adjuster motor operates to move the seat or recliner through its drive unit in the selected direction until the switch is released, or until the travel limit of the adjuster is reached. When the switch is moved in the opposite direction, the battery feed and ground path to the motor are reversed through the switch contacts. This causes the adjuster motor to run in the opposite direction.

On vehicles equipped with memory system, a resistance signal is sent to the Memory Seat Module (MSM) via the Controller Area Network (CAN) bus circuit, when the driver memory seat switch control knob is actuated. The MSM is responsible for the 12v battery feed and ground path to the power seat adjuster motor. The adjuster motor operates to move the power seat adjuster mechanism through its drive unit in the selected direction until the switch is released, or until the travel limit of the adjuster is reached.

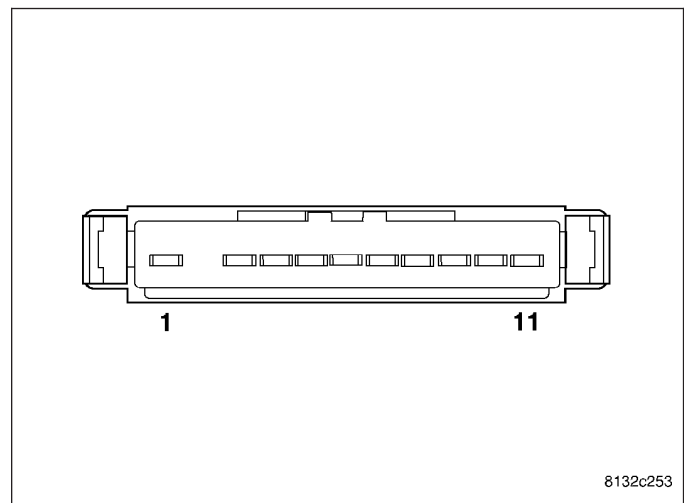
No power seat switch should be held applied in any direction after the adjuster has reached its travel limit. The power seat adjuster motors each contain a self-resetting circuit breaker to protect them from overload. However, consecutive or frequent resetting of the circuit breaker may result in motor damage.

### DIAGNOSIS AND TESTING

#### POWER SEAT SWITCH

##### DRIVER WITHOUT MEMORY SEAT SYSTEM

1. Disconnect and isolate the battery negative cable.
2. Remove the power seat switch from the power seat (Refer to 8 - ELECTRICAL/POWER SEATS/SEAT SWITCH - REMOVAL).
3. Use an ohmmeter to test the continuity of the power seat switch. Refer to DRIVER POWER SEAT SWITCH WITHOUT MEMORY SEAT SYSTEM CONTINUITY table. If not OK, replace the faulty power seat switch. If switch tests OK (Refer to 8 - ELECTRICAL/POWER SEATS/POWER SEAT ADJUSTER - DIAGNOSIS AND TESTING).

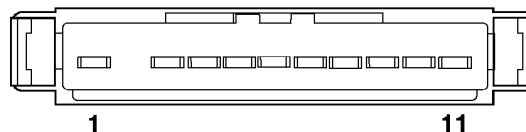


**DRIVER POWER SEAT SWITCH WITHOUT MEMORY SEAT SYSTEM CONTINUITY**

SWITCH POSITION	CONTINUITY BETWEEN
OFF	7-1, 7-2, 7-3, 7-4, 7-5, 7-8, 7-9, 7-10, 7-11
RECLINER UP	6-3, 7-1, 7-2, 7-4, 7-5, 7-8, 7-9, 7-10, 7-11
RECLINER DOWN	6-1, 7-2, 7-3, 7-4, 7-5, 7-8, 7-9, 7-10, 7-11
HORIZONTAL FORWARD	6-8, 7-1, 7-2, 7-3, 7-4, 7-5, 7-9, 7-10, 7-11
HORIZONTAL REARWARD	6-4, 7-1, 7-2, 7-3, 7-5, 7-8, 7-9, 7-10, 7-11
FRONT TILT DOWN	6-5, 7-1, 7-2, 7-3, 7-4, 7-8, 7-9, 7-10, 7-11
FRONT TILT UP	6-9, 7-1, 7-2, 7-3, 7-4, 7-5, 7-8, 7-10, 7-11
REAR TILT DOWN	6-10, 7-1, 7-2, 7-3, 7-4, 7-5, 7-8, 7-9, 7-11
REAR TILT UP	6-11, 7-1, 7-2, 7-3, 7-4, 7-5, 7-8, 7-9, 7-10

**PASSENGER SEAT**

1. Disconnect and isolate the battery negative cable.
2. Remove the power seat switch from the power seat (Refer to 8 - ELECTRICAL/POWER SEATS/SEAT SWITCH - REMOVAL).
3. Use an ohmmeter to test the continuity of the power seat switch. Refer to PASSENGER POWER SEAT SWITCH CONTINUITY table. If not OK, replace the faulty power seat switch. If switch tests OK (Refer to 8 - ELECTRICAL/POWER SEATS/POWER SEAT ADJUSTER - DIAGNOSIS AND TESTING).



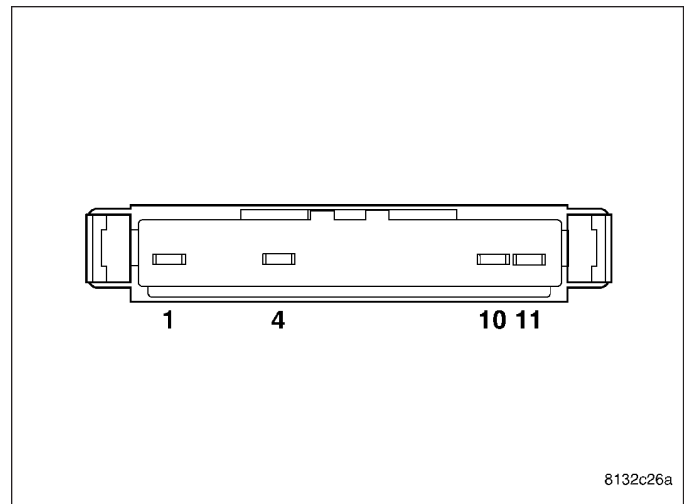
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**PASSENGER POWER SEAT SWITCH CONTINUITY**

SWITCH POSITION	CONTINUITY BETWEEN
OFF	7-4, 7-5, 7-8, 7-9, 7-10, 7-11
HORIZONTAL FORWARD	6-8, 7-4, 7-5, 7-9, 7-10, 7-11
HORIZONTAL REARWARD	6-4, 7-5, 7-8, 7-9, 7-10, 7-11
FRONT TILT DOWN	6-5, 7-4, 7-8, 7-9, 7-10, 7-11
FRONT TILT UP	6-9, 7-4, 7-5, 7-8, 7-10, 7-11
REAR TILT DOWN	6-10, 7-4, 7-5, 7-8, 7-9, 7-11
REAR TILT UP	6-11, 7-4, 7-5, 7-8, 7-9, 7-10

## DRIVER WITH MEMORY SEAT SYSTEM

1. Disconnect and isolate the battery negative cable.
2. Remove the power seat switch from the power seat (Refer to 8 - ELECTRICAL/POWER SEATS/SEAT SWITCH - REMOVAL).
3. Use an ohmmeter to test the resistance of the power seat switch. Refer to DRIVER POWER SEAT SWITCH WITH MEMORY SEAT SYSTEM CONTINUITY table. If not OK, replace the faulty power seat switch. If switch tests OK (Refer to 8 - ELECTRICAL/POWER SEATS/POWER SEAT ADJUSTER - DIAGNOSIS AND TESTING).



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## DRIVER POWER SEAT SWITCH WITH MEMORY SEAT SYSTEM CONTINUITY

SWITCH POSITION	CONTINUITY BETWEEN	RESISTANCE VALUE
OFF	10-4	OPEN
OFF	10-11	OPEN
OFF	1-4	47 OHMS
OFF	1-11	47 OHMS
REAR TILT UP	10-11	169 OHMS
REAR TILT DOWN	10-11	76 OHMS
HORIZONTAL FORWARD	10-11	43 OHMS
HORIZONTAL REARWARD	10-11	10 OHMS
RECLINER UP	10-4	43 OHMS
RECLINER DOWN	10-4	10 OHMS
FRONT TILT UP	10-4	169 OHMS
FRONT TILT DOWN	10-4	76 OHMS
ALL RESISTANCE VALUES ARE $\pm$ FIVE PERCENT		

## REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the seat cushion side panel from the seat and disconnect the electrical harness connector.
3. Using a small flat bladed tool, gently release the four mounting tabs that secure the power seat switch and separate switch from trim panel.

## INSTALLATION

1. Position the power seat switch on the seat cushion side panel. Gently apply pressure to the switch until the four mounting tabs that secure the switch snap into place.
2. Connect the power seat switch electrical connector.
3. Install the seat cushion side panel on the seat.
4. Connect the battery negative cable.
5. Verify normal operation of the power seat assembly.

POWER TOP - ELECTRICAL DIAGNOSIS

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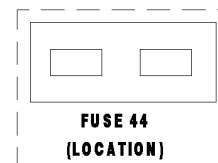
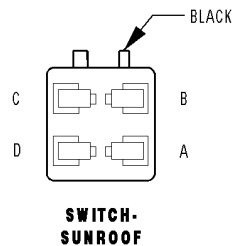
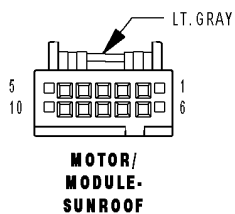
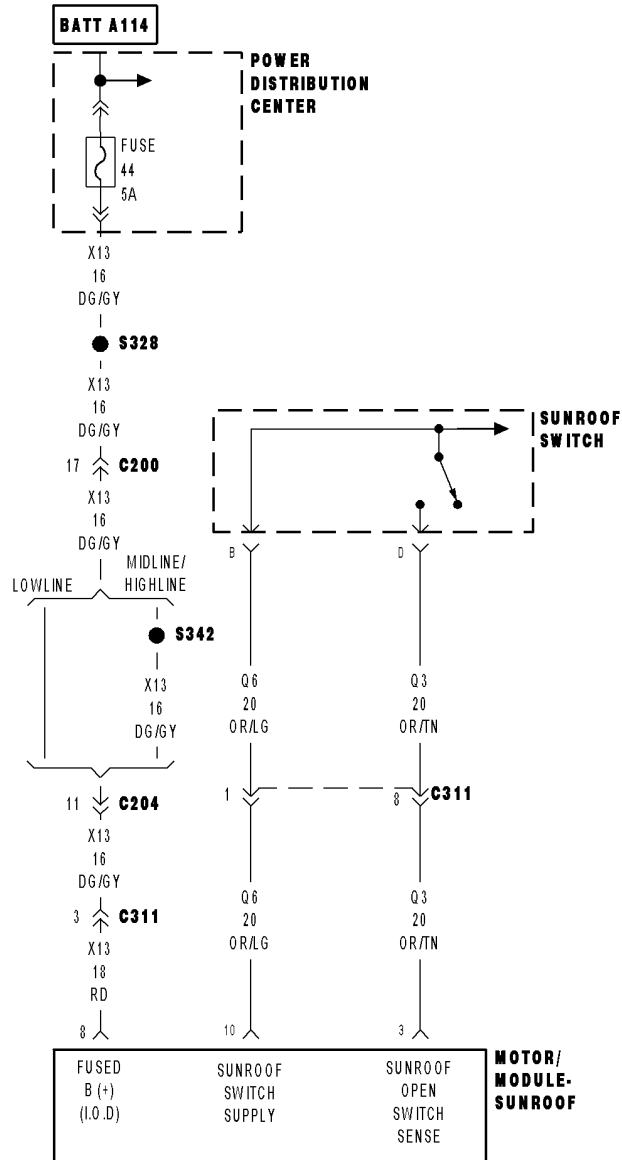
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POWER TOP - ELECTRICAL DIAGNOSIS

DIAGNOSIS AND TESTING



## B1841–SUNROOF OPEN SWITCH INPUT CIRCUIT HIGH



**B1841–SUNROOF OPEN SWITCH INPUT CIRCUIT HIGH (CONTINUED)**

For the Sunroof circuit diagram (Refer to 8 - ELECTRICAL/POWER TOP - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The Sunroof Motor/Module supplies a 12 volt supply circuit to the sunroof switch. When the switch is closed to any of the 3 sense circuits (open, close or vent), it sends that command back to the module.

- **When Monitored:**  
Whenever the Sunroof module is awake.
- **Set Condition:**  
Whenever the module has determined that the open switch has been applied for over 15 seconds or there is a short to voltage on the Sunroof Open Switch Sense circuit, this code will set.

Possible Causes
(Q3) SUNROOF OPEN SWITCH SENSE CIRCUIT SHORT TO VOLTAGE (Q3) SUNROOF OPEN SWITCH SENSE CIRCUIT SHORT TO (Q6) SUNROOF SWITCH SUPPLY CIRCUIT SUNROOF SWITCH SHORTED SUNROOF MOTOR/MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Press and release the Sunroof Switch in all positions several times.

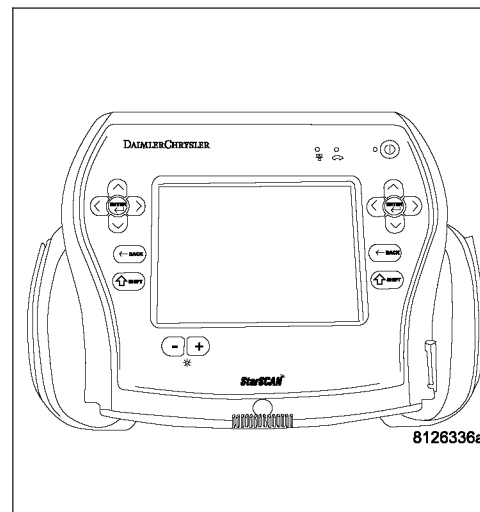
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B1841–SUNROOF OPEN SWITCH INPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Check the switch for any binding conditions and using the wiring diagram/schematic as a guide, inspect the wiring and connectors.



**B1841–SUNROOF OPEN SWITCH INPUT CIRCUIT HIGH (CONTINUED)****2. SUNROOF SWITCH SHORTED**

With the scan tool, erase DTC's.

Turn the ignition off.

Disconnect the Sunroof Switch connector.

Turn the ignition on and wait 30 seconds.

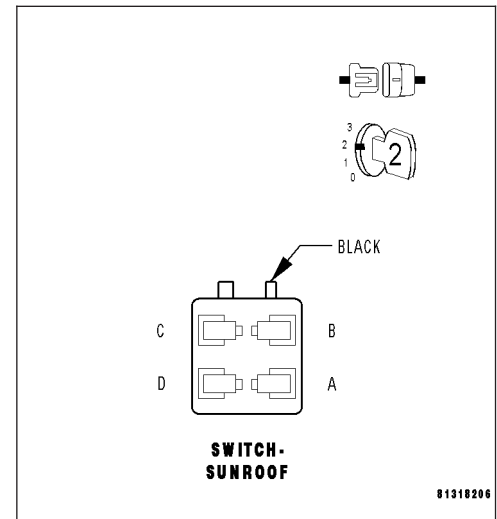
With the scan tool, read DTC's.

**Does the scan tool display B1841–SUNROOF OPEN SWITCH INPUT CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the Sunroof Switch.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**3. (Q3) SUNROOF OPEN SWITCH SENSE CIRCUIT SHORT TO VOLTAGE**

**Note:** To further diagnose the sunroof, it is necessary to lower or remove the headliner.

Turn the ignition off.

Lower the headliner to gain access to the Sunroof Motor/Module connector.

Disconnect the Sunroof Motor/Module connector.

**Note:** Ensure the A-Pillar connector is connected before proceeding.

Turn the ignition on.

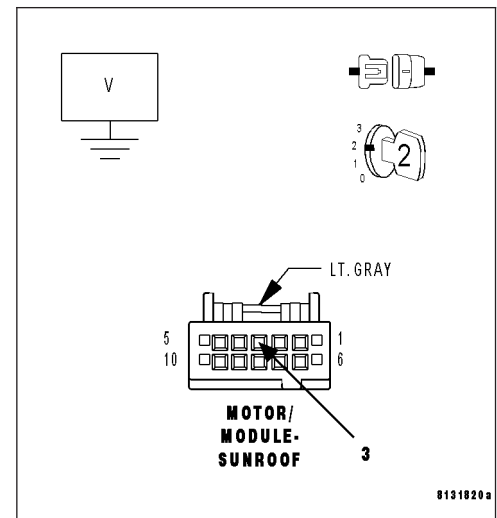
Measure the voltage between the (Q3) Sunroof Open Switch Sense circuit and Ground.

**Is the voltage above 0.4 volts?**

**Yes** >> Repair the (Q3) Sunroof Open Switch Sense circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



**B1841-SUNROOF OPEN SWITCH INPUT CIRCUIT HIGH (CONTINUED)****4. (Q3) SUNROOF OPEN SWITCH SENSE CIRCUIT SHORT TO (Q6) SUNROOF SWITCH SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the A-Pillar connector.

Measure the resistance between the (Q3) Sunroof Open Switch Sense circuit and the (Q6) Sunroof Switch Supply circuit in the Sunroof Motor/Module connector.

**Is the resistance below 1000.0 ohms?**

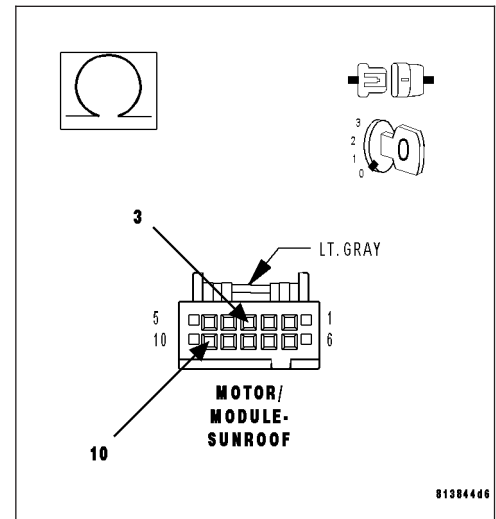
**Yes** >> Repair the (Q3) Sunroof Open Switch Sense circuit for a short to the (Q6) Sunroof Switch Supply circuit.

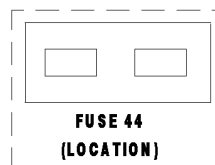
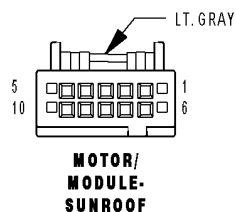
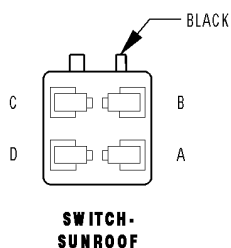
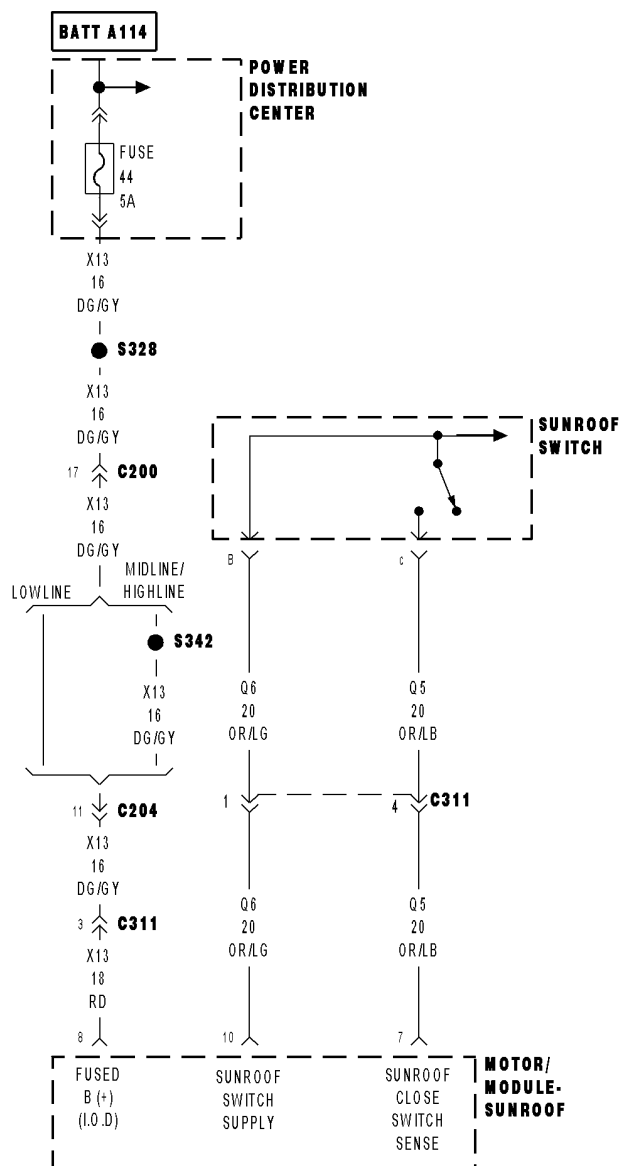
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Sunroof Motor/Module.

Perform the Sunroof Position Calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - SUNROOF POSITION CALIBRATION). Perform the Excessive Force Limitation Calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - EXCESSIVE FORCE LIMITATION CALIBRATION).

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B1844–SUNROOF CLOSE SWITCH INPUT CIRCUIT HIGH**

**B1844-SUNROOF CLOSE SWITCH INPUT CIRCUIT HIGH (CONTINUED)**

For the Sunroof circuit diagram (Refer to 8 - ELECTRICAL/POWER TOP - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The Sunroof Motor/Module supplies a 12 volt supply circuit to the sunroof switch. When the switch is closed to any of the 3 sense circuits (open, close or vent), it sends that command back to the module.

- **When Monitored:**  
Whenever the Sunroof module is awake.
- **Set Condition:**  
Whenever the module has determined that the close switch has been applied for over 15 seconds or there is a short to voltage on the Sunroof Close Switch Sense circuit, this code will set.

Possible Causes
(Q5) SUNROOF CLOSE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE (Q5) SUNROOF CLOSE SWITCH SENSE CIRCUIT SHORT TO (Q6) SUNROOF SWITCH SUPPLY CIRCUIT SUNROOF SWITCH SHORTED SUNROOF MOTOR/MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Press and release the Sunroof Switch in all positions several times.

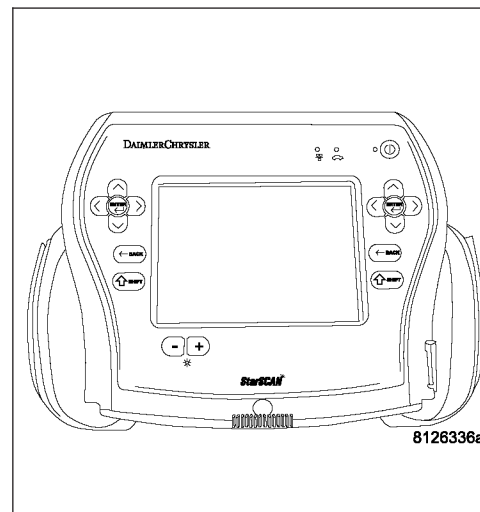
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B1844-SUNROOF CLOSE SWITCH INPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Check the switch for any binding conditions and using the wiring diagram/schematic as a guide, inspect the wiring and connectors.



**B1844-SUNROOF CLOSE SWITCH INPUT CIRCUIT HIGH (CONTINUED)****2. SUNROOF SWITCH SHORTED**

With the scan tool, erase DTC's.

Turn the ignition off.

Disconnect the Sunroof Switch connector.

Turn the ignition on and wait 30 seconds.

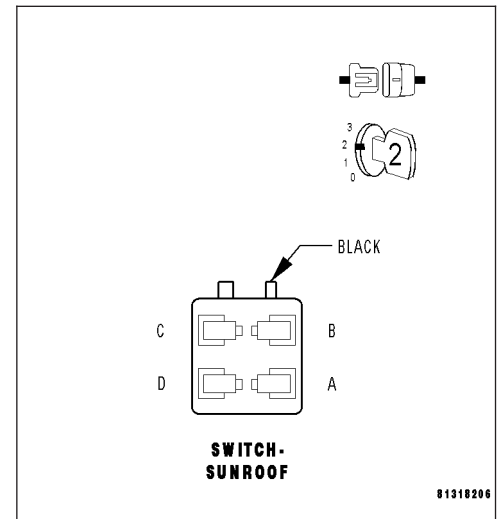
With the scan tool, read DTC's.

**Does the scan tool display B1844-SUNROOF CLOSE SWITCH INPUT CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the Sunroof Switch.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**3. (Q5) SUNROOF CLOSE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE**

**Note: To further diagnose the sunroof, it is necessary to lower or remove the headliner.**

Turn the ignition off.

Lower the headliner to gain access to the Sunroof Motor/Module connector.

Disconnect the Sunroof Motor/Module connector.

**Note: Ensure the A-Pillar connector is connected before proceeding.**

Turn the ignition on.

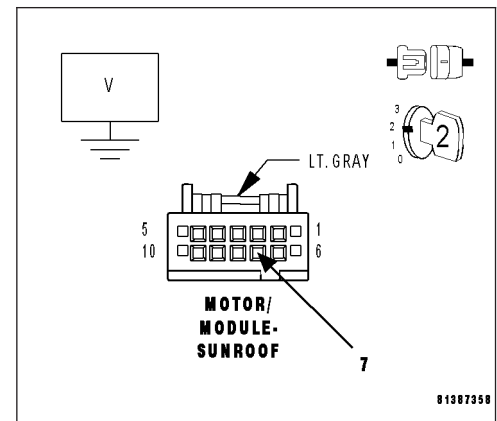
Measure the voltage between the (Q5) Sunroof Close Switch Sense circuit and Ground.

**Is the voltage above 0.4 volts?**

**Yes** >> Repair the (Q5) Sunroof Close Switch Sense circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



**B1844-SUNROOF CLOSE SWITCH INPUT CIRCUIT HIGH (CONTINUED)****4. (Q5) SUNROOF CLOSE SWITCH SENSE CIRCUIT SHORT TO (Q6) SUNROOF SWITCH SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the A-Pillar connector.

Measure the resistance between the (Q5) Sunroof Close Switch Sense circuit and the (Q6) Sunroof Switch Supply circuit in the Sunroof Motor/Module connector.

**Is the resistance below 1000.0 ohms?**

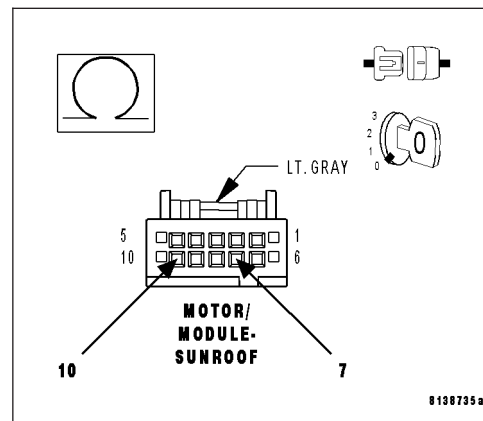
**Yes** >> Repair the (Q5) Sunroof Close Switch Sense circuit for a short to the (Q6) Sunroof Switch Supply circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Sunroof Motor/Module.

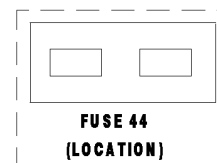
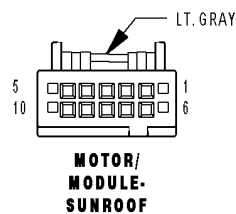
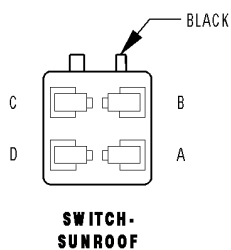
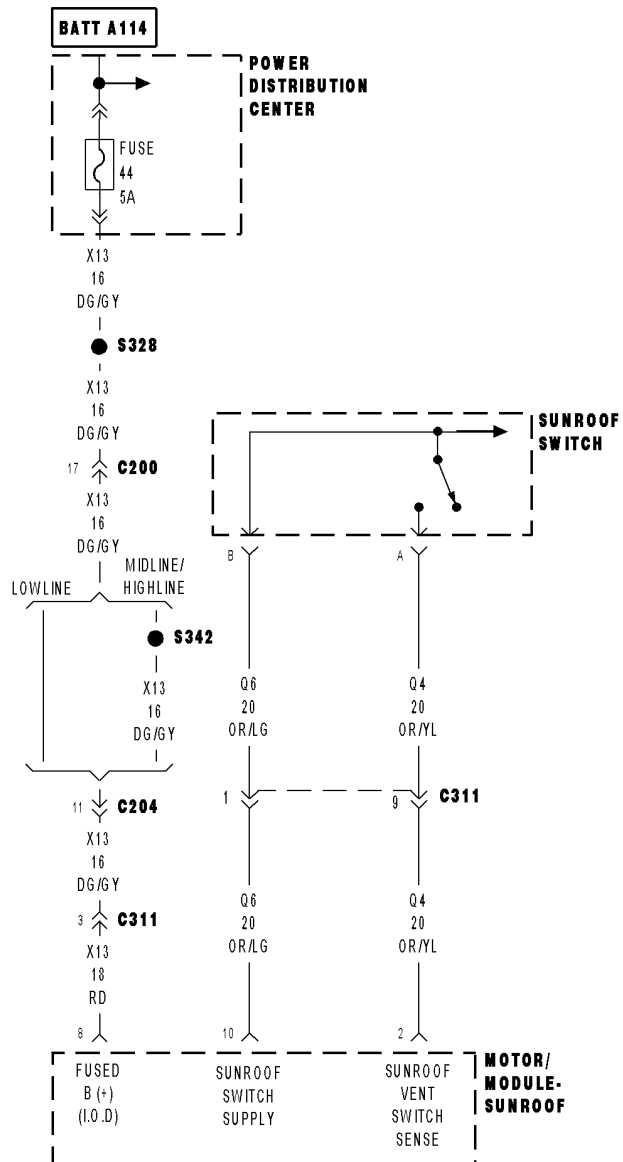
Perform the Sunroof Position Calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - SUNROOF POSITION CALIBRATION). Perform the Excessive Force Limitation Calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - EXCESSIVE FORCE LIMITATION CALIBRATION).

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.





## B1847-SUNROOF VENT SWITCH INPUT CIRCUIT HIGH



**B1847–SUNROOF VENT SWITCH INPUT CIRCUIT HIGH (CONTINUED)**

For the Sunroof circuit diagram (Refer to 8 - ELECTRICAL/POWER TOP - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The Sunroof Motor/Module supplies a 12 volt supply circuit to the sunroof switch. When the switch is closed to any of the 3 sense circuits (open, close or vent), it sends that command back to the module.

- **When Monitored:**  
Whenever the Sunroof module is awake.
- **Set Condition:**  
Whenever the module has determined that the vent switch has been applied for over 15 seconds or there is a short to voltage on the Sunroof Vent Switch Sense circuit, this code will set.

Possible Causes
(Q4) SUNROOF VENT SWITCH SENSE CIRCUIT SHORT TO VOLTAGE (Q4) SUNROOF VENT SWITCH SENSE CIRCUIT SHORT TO (Q6) SUNROOF SWITCH SUPPLY CIRCUIT SUNROOF SWITCH SHORTED SUNROOF MOTOR/MODULE

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Press and release the Sunroof Switch in all positions several times.

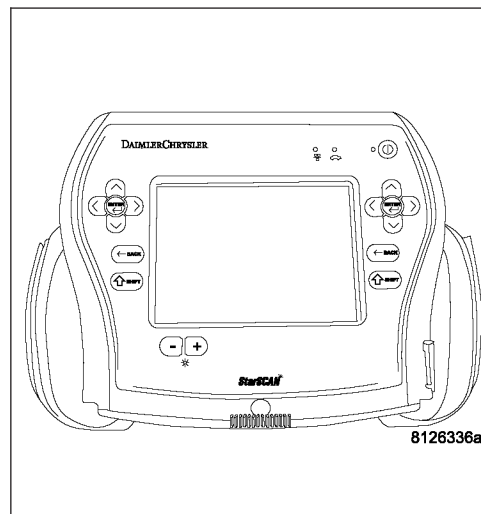
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B1847–SUNROOF VENT SWITCH INPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Check the switch for any binding conditions and using the wiring diagram/schematic as a guide, inspect the wiring and connectors.



**B1847-SUNROOF VENT SWITCH INPUT CIRCUIT HIGH (CONTINUED)****2. SUNROOF SWITCH SHORTED**

With the scan tool, erase DTC's.

Turn the ignition off.

Disconnect the Sunroof Switch connector.

Turn the ignition on and wait 30 seconds.

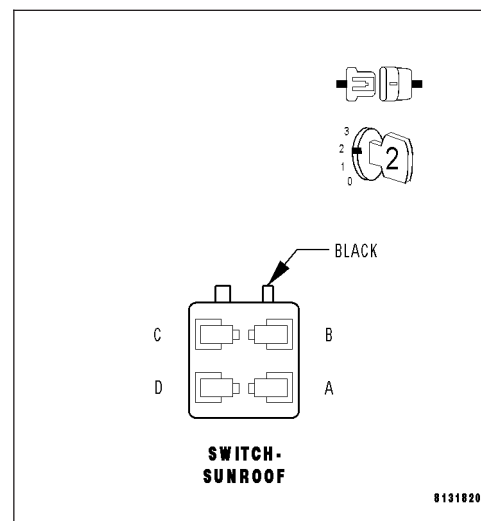
With the scan tool, read DTC's.

**Does the scan tool display B1847-SUNROOF VENT SWITCH INPUT CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the Sunroof Switch.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**3. (Q4) SUNROOF VENT SWITCH SENSE CIRCUIT SHORT TO VOLTAGE**

**Note:** To further diagnose the sunroof, it is necessary to lower or remove the headliner.

Turn the ignition off.

Lower the headliner to gain access to the Sunroof Motor/Module connector.

Disconnect the Sunroof Motor/Module connector.

**Note:** Ensure the A-Pillar connector is connected before proceeding.

Turn the ignition on.

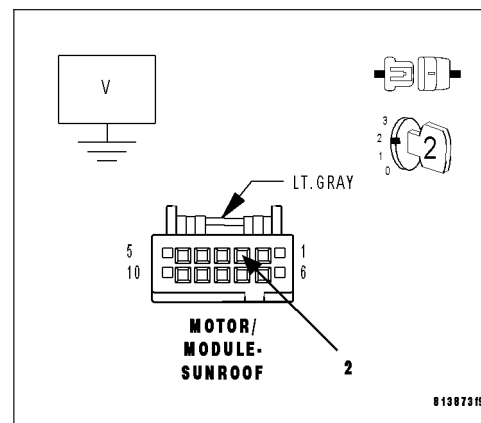
Measure the voltage between the (Q4) Sunroof Vent Switch Sense circuit and Ground.

**Is the voltage above 0.4 volts?**

**Yes** >> Repair the (Q4) Sunroof Vent Switch Sense circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



**B1847-SUNROOF VENT SWITCH INPUT CIRCUIT HIGH (CONTINUED)****4. (Q4) SUNROOF VENT SWITCH SENSE CIRCUIT SHORT TO (Q6) SUNROOF SWITCH SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the A-Pillar connector.

Measure the resistance between the (Q4) Sunroof Vent Switch Sense circuit and the (Q6) Sunroof Switch Supply circuit in the Sunroof Motor/Module connector.

**Is the resistance below 1000.0 ohms?**

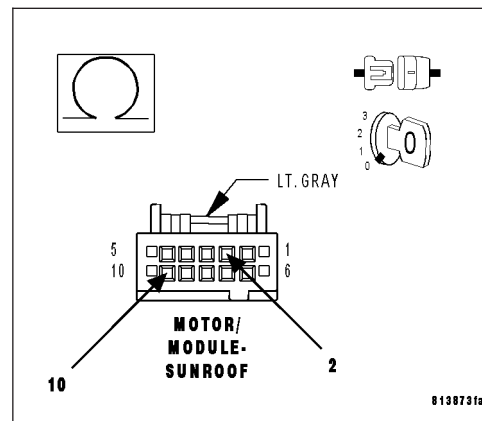
**Yes** >> Repair the (Q4) Sunroof Vent Switch Sense circuit for a short to the (Q6) Sunroof Switch Supply circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Sunroof Motor/Module.

Perform the Sunroof Position Calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - SUNROOF POSITION CALIBRATION). Perform the Excessive Force Limitation Calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - EXCESSIVE FORCE LIMITATION CALIBRATION).

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B1849–SUNROOF MOTOR CONTROL CIRCUIT/PERFORMANCE (STALLED)**

For the Sunroof circuit diagram (Refer to 8 - ELECTRICAL/POWER TOP - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the Sunroof motor/module is in motion.
- **Set Condition:**  
Whenever the sunroof motor/module is attempting to move the sunroof in response to the input switches (or in response to an obstacle), and it doesn't appear to be responding correctly. This code is usually set when there is some type of binding in the sunroof mechanism.

Possible Causes
SUNROOF MOTOR/MODULE
MECHANICAL BINDING, STICKING OR CABLES OUT OF CALIBRATION

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Sunroof Switch in all positions several times.

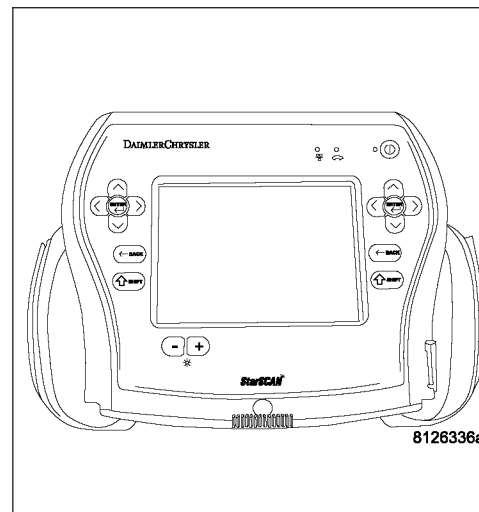
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B1849–SUNROOF MOTOR CONTROL CIRCUIT/PERFORMANCE (STALLED)?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Check for any binding or sticking conditions.



**B1849-SUNROOF MOTOR CONTROL CIRCUIT/PERFORMANCE (STALLED) (CONTINUED)****2. SUNROOF MOTOR**

**Note:** To further diagnose the sunroof, it is necessary to lower or remove the headliner.

**Note:** Any time the Sunroof Motor is removed, it is necessary to perform the Position Calibration when the motor is re-installed.

Turn the ignition off.

Lower the headliner to gain access to the Sunroof Motor/Module.

Remove the Sunroof Motor/Module from the sunroof.

**Note:** Ensure the A-Pillar connector is connected before proceeding.

Turn the ignition on.

While holding the motor firmly in your hand, have an assistant press the sunroof switch Open and after the motor stops press Close (NOT VENT) several times and observe the motor operation.

**Did the motor operate smoothly and powerful ?**

**Yes** >> Repair or replace the sunroof mechanism as necessary in accordance with Service Information. Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Sunroof Motor Module.  
Perform the Sunroof Position Calibration. (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE) Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST – VER 1.

---

## B2227–SUNROOF ECU INTERNAL

For the Sunroof circuit diagram (Refer to 8 - ELECTRICAL/POWER TOP - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the Sunroof module is awake.
- **Set Condition:**  
Whenever the module has determined that there is a motor or electronic malfunction, this code will set.

Possible Causes
SUNROOF MOTOR/MODULE

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Sunroof Switch in all positions several times.

Wait 30 seconds.

With the scan tool, read DTC's.

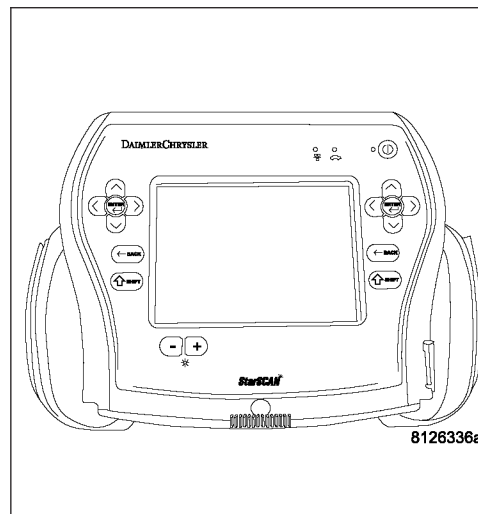
#### Does the scan tool display B2227–SUNROOF ECU INTERNAL?

**Yes** >> Replace the Sunroof Motor/Module.

Perform the Sunroof Position Calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - SUNROOF POSITION CALIBRATION). Perform the Excessive Force Limitation Calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - EXCESSIVE FORCE LIMITATION CALIBRATION).

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> The conditions that caused this code to set are not present at this time. Operate the Sunroof several times and recheck for DTC's. If the code reappears now or later, replace the Sunroof Motor/Module.



## **U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

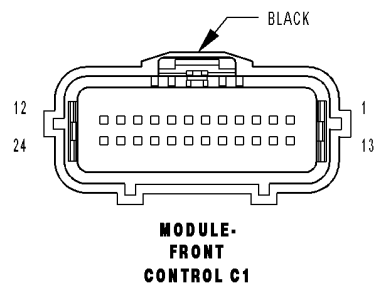
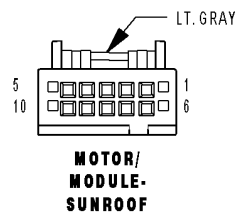
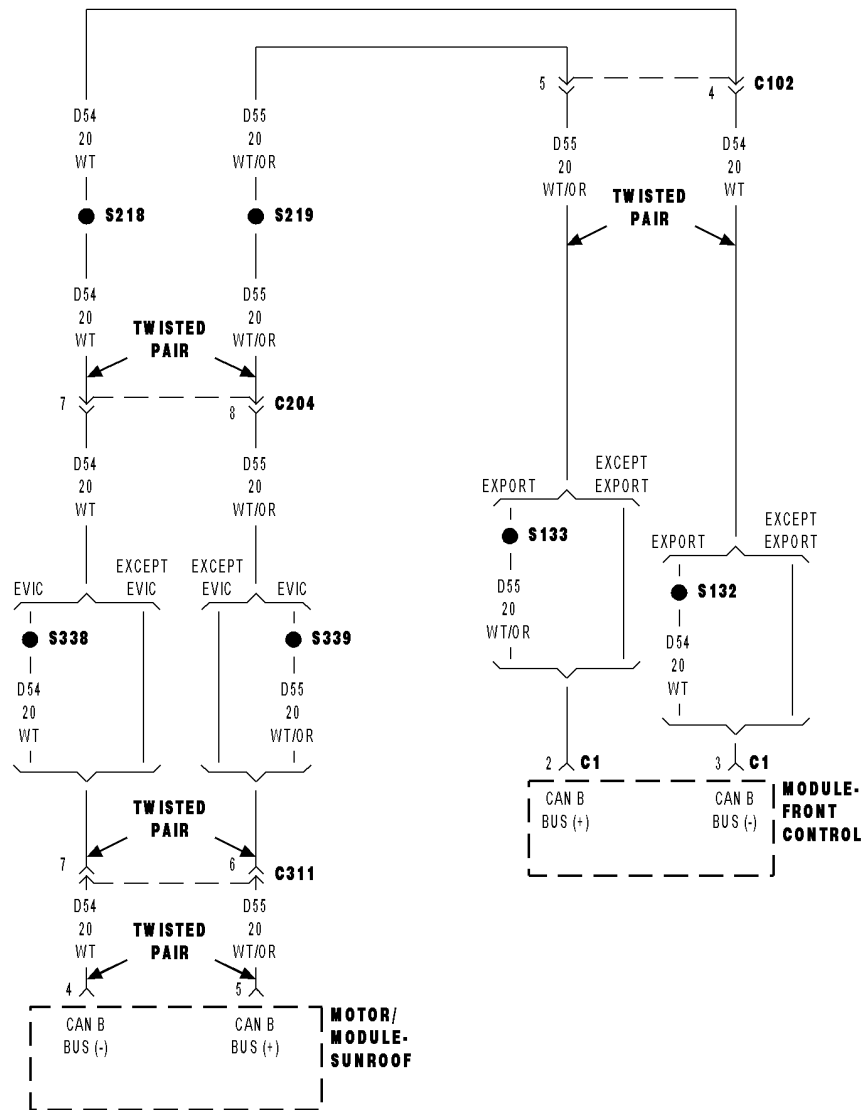
## **U0155-LOST COMMUNICATION WITH CLUSTER/CCN**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.



## U0019—CAN B BUS



**U0019-CAN B BUS (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Continuously
- **Set Condition:**  
Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage or shorted to ground.

Possible Causes
CAN B BUS DTC's IN FRONT CONTROL MODULE (D55) CAN B BUS (+) CIRCUIT OPEN (D54) CAN B BUS (-) CIRCUIT OPEN SUNROOF MOTOR/MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTCs**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Turn the ignition off and wait 30 seconds.

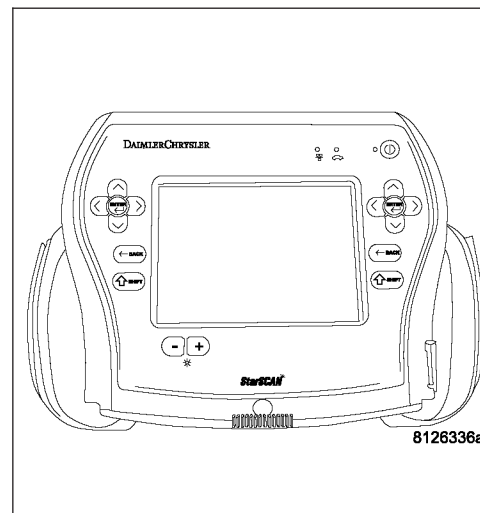
Turn the ignition on.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition.  
Visually inspect the related wiring harness connectors.  
Look for broken, bent, pushed out, or corroded terminals.

**2. CHECK FRONT CONTROL MODULE DTC's**

With the scan tool, read Front Control Module active DTC's

**Does the scan tool display any CAN B BUS DTC's – ACTIVE?**

**Yes** >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**U0019-CAN B BUS (CONTINUED)****3. (D55) CAN B BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the Sunroof Motor/Module connector.

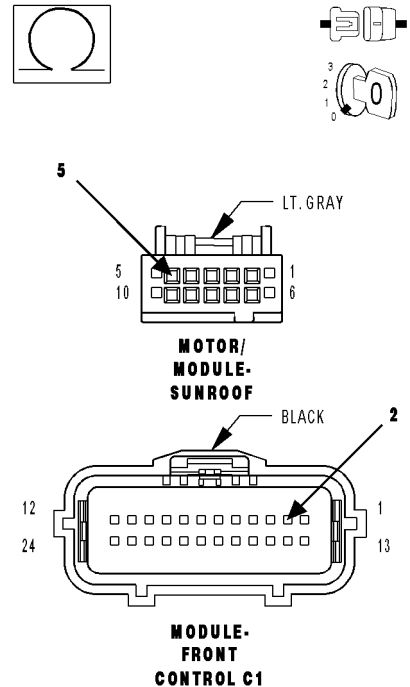
Disconnect the Front Control Module C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the Sunroof Motor/Module connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (D55) CAN B Bus (+) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



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**4. (D54) CAN B BUS (–) CIRCUIT OPEN**

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module C1 connector and the Sunroof Motor/Module connector.

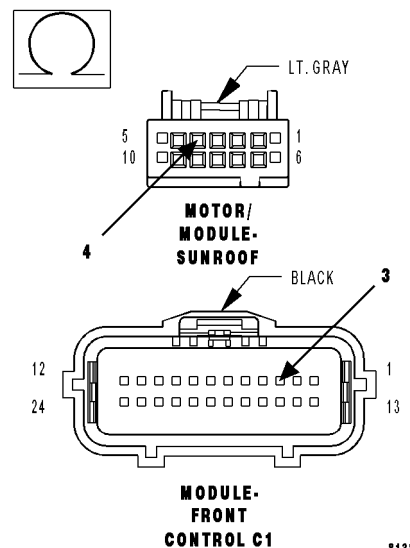
**Is the resistance below 2.0 ohms?**

**Yes** >> Replace the Sunroof Motor/Module in accordance with the service information.

Perform the Sunroof Position Calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - SUNROOF POSITION CALIBRATION). Perform the Excessive Force Limitation Calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - EXCESSIVE FORCE LIMITATION CALIBRATION).

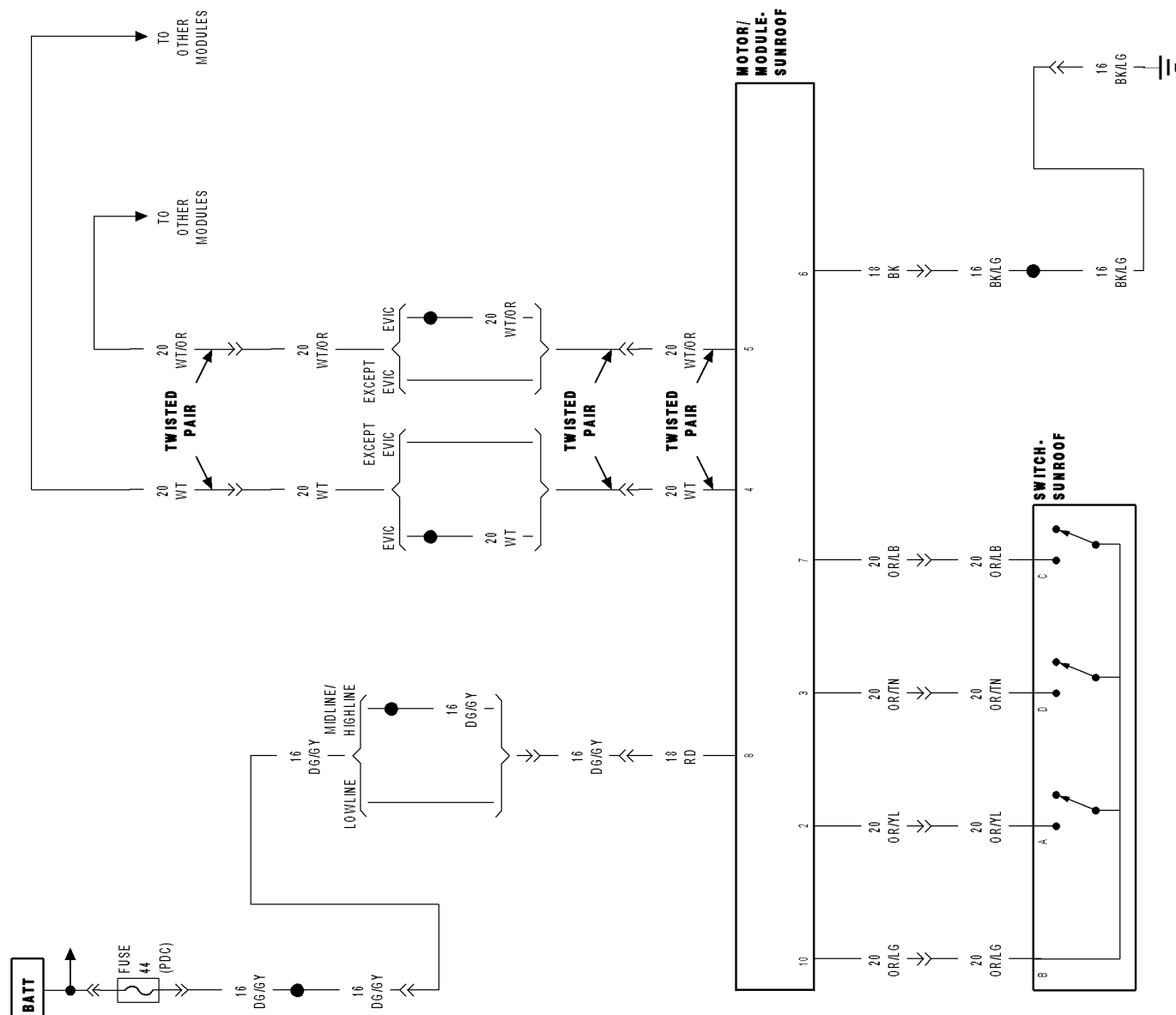
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair the (D54) CAN B Bus (–) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



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## SCHEMATICS AND DIAGRAMS



POWER TOP SYSTEM

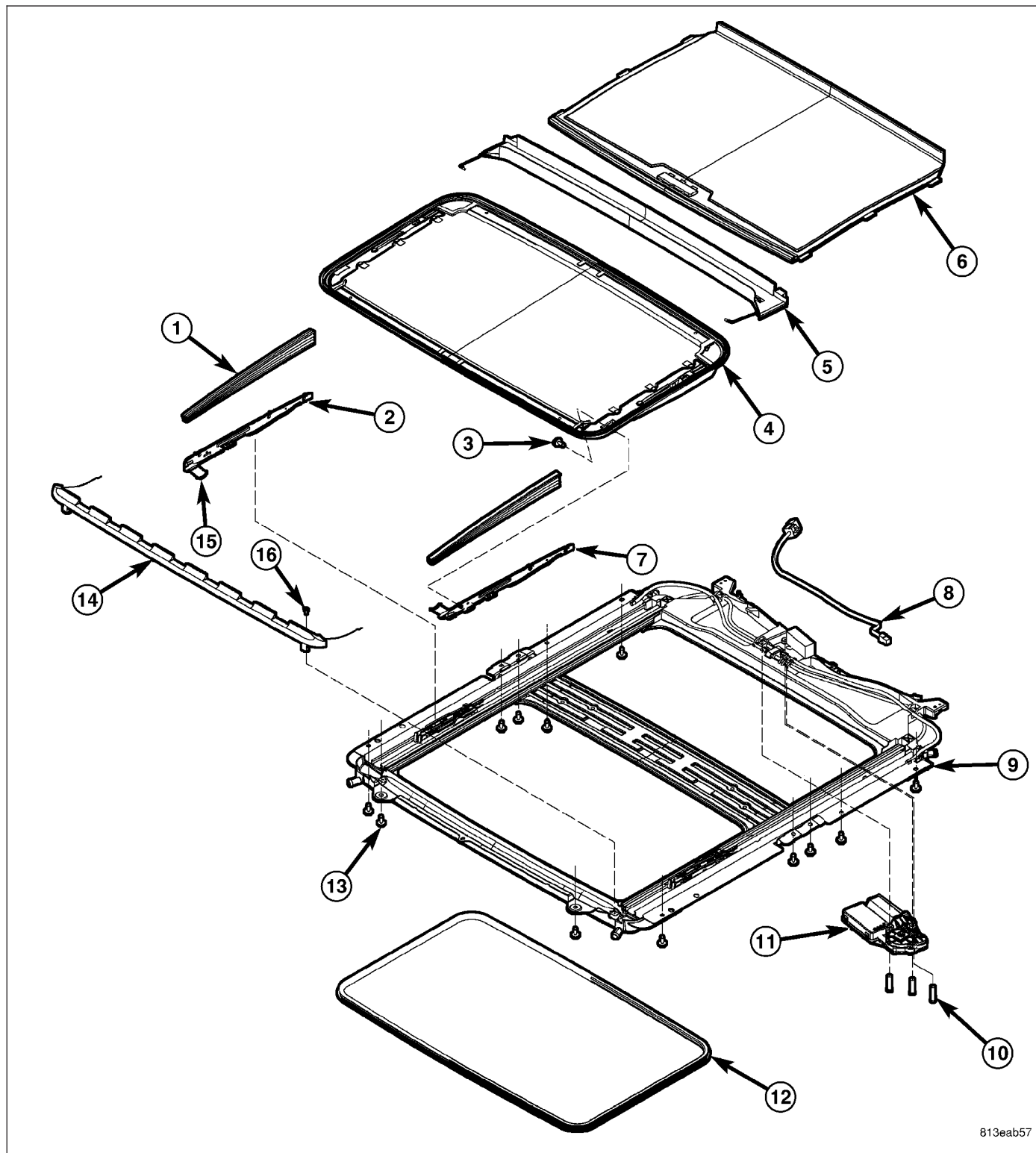
POWER TOP - SUNROOF SERVICE INFO

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## POWER TOP - SUNROOF SERVICE INFO

### DESCRIPTION



813eab57

**EXPLODED VIEW**

The power sunroof system allows the sunroof to be opened, closed or placed in the vent position electrically by actuating a switch in the overhead console. The sunroof system receives battery feed through a fuse in the Power Distribution Center (PDC). The sunroof will operate normally with the key in any position while the Accessory Delay system is active.

1 - MECHANISM COVERS (2)  
2 - RIGHT HAND GLASS GUIDE  
3 - GLASS FASTENERS (4)  
4 - GLASS ASSEMBLY  
5 - DRAIN CHANNEL  
6 - SUNSHADE  
7 - LEFT SUNROOF GLASS GUIDE  
8 - WIRE HARNESS

9 - SUNROOF ASSEMBLY  
10 - MOTOR FASTENERS (3)  
11 - SUNROOF MOTOR/MODULE ASSEMBLY  
12 - TRIM LACE  
13 - ASSEMBLY FASTENERS (12)  
14 - WIND DEFLECTOR  
15 - RIGHT SUNROOF GLASS GUIDE  
16 - WIND DEFLECTOR STRAP SCREWS (2)

The sunroof glass panel tilts upward at the rear for ventilation and slides rearward under the roof when open. The panel seals flush with the roof in the closed position to eliminate wind noise. The sunroof includes a manual-sliding sunshade to cover the deep-tinted glass panel.

In addition to the standard power sunroof operation, this vehicle offers several additional features. There is an express (one-touch) opening and closing feature as well as Excessive Force Limitation (EFL). The EFL function detects obstacles trapped between the glass and the vehicle roof during a closing motion. Upon sensing an obstacle the EFL function will reverse direction of the glass to allow removal of the obstacle.

The main components of the power sunroof system are:

- The motor/module assembly
- The power sunroof glass and frame assembly
- The power sunroof switch
- The manual-sliding sunshade

## OPERATION

This vehicle has a vent, tilt and slide power sunroof system with express (one-touch) open and closing feature. The sunroof system receives constant battery feed through a fuse in the Power Distribution Center (PDC). The sunroof will operate normally with the key in any position while the Accessory Delay system is active. If the sunroof is moving when the key is turned to the START position (crank engine), all motions stop until the key is released, then the previously requested sunroof motion will resume. The sunroof will also complete a requested motion if the Accessory Delay system goes inactive while the motion is in progress.

A combination push-button and rocker switch module mounted in the overhead console controls sunroof operation. The sunroof switch is a rocker design with a push button in the center of the two halves of the rocker. Pressing the rocker towards the front of the car commands the sunroof closed. Pressing the rocker towards the rear of the car commands the sunroof open. Pressing the center push button commands the sunroof up into the vent position (Rear of sunroof glass raises above the vehicle roof with glass still covering the sunroof opening). All switch commands operate with the glass starting in any position. (Refer to 8 - ELECTRICAL/POWER TOP/SWITCH - OPERATION) for additional information.

An electronic control system, integral to the motor/module assembly, provides the express open and close functions. Pressing the "open" or "close" end of the rocker switch moves the sunroof glass panel to the full open or full closed position, respectively. During express closing, anytime an obstacle is detected in the way of the glass, the motor will stop and reverse travel to avoid pinching an occupant's finger, ice in the track, etc. This function is called Excessive Force Limitation (EFL). There are two methods of overriding the EFL function.

1. When three EFL events occur without the glass being allowed to fully close, the next close attempt will only move while the close switch is continuously actuated. This allows the sunroof to be forced closed if multiple close attempts fail.
2. If the sunroof close switch is continuously actuated during an EFL event, through the reversal, and during a two second wait time, then continuing to hold the close switch will cause the roof to move towards close with the EFL protection disabled. This allows the sunroof to be forced closed if it is known that a reversal will occur.

While in EFL override, the closing motion will cease if the sunroof switch is released at any time.

The motor/module is programmed to learn the speed required to drive the panel based on position and recalibrates itself as needed. If the sunroof becomes uncalibrated, it will only respond to the vent switch. If the vent switch is pressed, the glass will move toward vent; if the switch is released, all motion stops. In the event that the sunroof system becomes uncalibrated perform the sunroof position calibration procedure, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE -SUNROOF POSITION CALIBRATION).

## DIAGNOSIS AND TESTING

### POWER TOP - SUNROOF

Any diagnosis of the power sunroof system should begin with the use of a scan tool and the proper Diagnostic Procedures Information. The scan tool can provide confirmation that the Controller Area Network (CAN) Data Bus is functional, that all of the electronic modules are sending and receiving the proper messages on the CAN Data Bus, and that the power sunroof motor is being sent the proper hard wired output by the sunroof switch.

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

**Refer to the appropriate diagnostic information.**

## MOTOR/MODULE-SUNROOF

### DIAGNOSIS AND TESTING

#### MOTOR/MODULE - SUNROOF

Any diagnosis of the power sunroof system should begin with the use of a scan tool and the proper Diagnostic Procedures Information. The scan tool can provide confirmation that the Controller Area Network (CAN) Data Bus is functional, that all of the electronic modules are sending and receiving the proper messages on the CAN Data Bus, and that the power sunroof motor is being sent the proper hard wired output by the sunroof switch.

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

**Refer to the appropriate diagnostic information.**

## STANDARD PROCEDURE

### SUNROOF POSITION CALIBRATION

Press the power sunroof switch (Open, Closed, and Vent). If no movement occurs when either the open switch or closed switch is pressed, but the system does move when the vent button is pressed and held, the system is not calibrated. Perform the following procedure to position calibrate the power sunroof system.

1. Turn the ignition to the RUN position.
2. Press the vent button on the power sunroof switch and hold until the sunroof glass panel has moved to the full vent position and the motor movement has stopped for at least 1 second.
3. Press the close switch on the power sunroof switch and hold for a moment (at least 100ms) and release. The sunroof glass panel should continue travel to the full close position. If the sunroof glass panel does not return to the full close position, refer to the appropriate diagnostic information for full system diagnosis.
4. Verify proper system operation.

### EXCESSIVE FORCE LIMITATION (EFL) CALIBRATION

**Note:** Verify the battery is in good condition prior to performing this procedure. Do not leave the vehicle on a battery charger while performing this procedure. If the voltage at the sunroof motor/module drops below 11 volts or exceeds 15 volts at anytime while this procedure is being performed, the Excessive Force Limitation (EFL) function will not be properly calibrated.



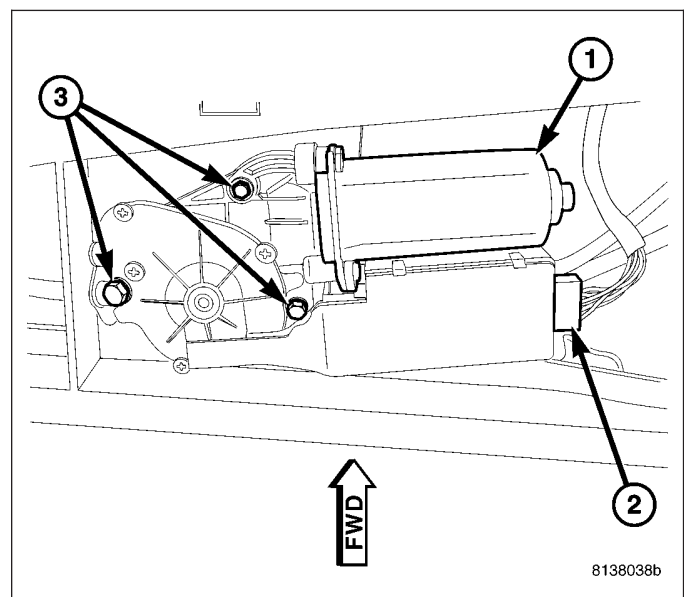
1. Turn the ignition to the RUN position.
2. Press the vent button on the power sunroof switch and hold until the sunroof glass panel has moved to the full vent position and the motor movement has stopped for at least 1 second.
3. Press the close position on the power sunroof switch and release. The sunroof glass panel should continue travel to the full closed position. **This will be considered the first sunroof closed position in a series of four sunroof closes.**
4. Press the vent button on the power sunroof switch and release. The sunroof glass panel should move to the full vent position. After the sunroof motor/module has stopped, press the close position on the power sunroof switch and release. The sunroof glass panel should continue travel to the full closed position. **This will be considered the second sunroof closed position in a series of four sunroof closes.**
5. Continue to move the sunroof glass to the “vent” then “closed” positions two more times so that the sunroof glass has moved to the closed position a total of four times starting with the first sunroof close in step 3.
6. Press the open position on the power sunroof switch and release. The sunroof glass panel should continue travel to the full open position.
7. Press the close position on the power sunroof switch and release. The sunroof glass panel should continue travel to the full closed position. **This will be considered the first sunroof closed position in a series of five sunroof closes.**
8. Press the open position on the power sunroof switch and release. The sunroof glass panel should move to the full open position. After the sunroof motor/module has stopped, press the close position on the power sunroof switch and release. The sunroof glass panel should continue travel to the full closed position. **Continue to move the sunroof glass to the “open” then “closed” position four more times so that the sunroof glass has moved to the closed position a total of five times starting with the first sunroof close in step 7.**

Verify proper EFL calibration by placing a standard pencil at the front of the sunroof and then moving the sunroof to the full closed position. The sunroof should reverse direction upon contact without damage to the pencil.

## REMOVAL

**WARNING:** The Excessive Force Limitation (EFL) feature must be calibrated any time a sunroof motor/module is replaced with a new component. Failure to perform this procedure could result in vehicle damage and/or personal injury. (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - EXCESSIVE FORCE LIMITATION (EFL) CALIBRATION) for the appropriate procedure.

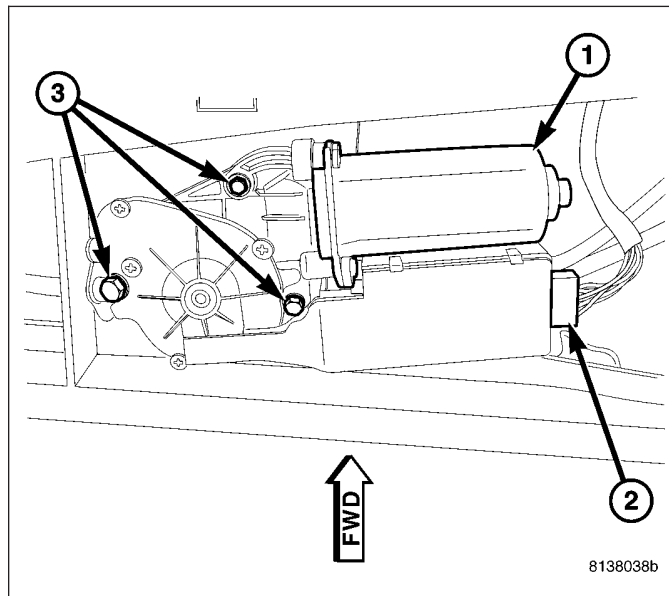
1. Disconnect the battery negative cable.
2. Remove the vehicle headliner, (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).
3. Remove the power sunroof motor/module electrical connector (2).
4. Remove the retaining screws (3) and remove the motor/module (1) from the vehicle.



## INSTALLATION

**WARNING:** The Excessive Force Limitation (EFL) feature must be calibrated any time a sunroof motor/module is replaced with a new component. Failure to perform this procedure could result in vehicle damage and/or personal injury. (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - EXCESSIVE FORCE LIMITATION (EFL) CALIBRATION) for the appropriate procedure.

1. Position the power sunroof motor/module (1) in the vehicle.
2. Install the motor/module retaining screws (3). Tighten the screws to 4 N·m (35 in. lbs.).
3. Connect the motor/module electrical connector (2).
4. Connect the battery negative cable and move the sunroof through one open and close cycle to confirm proper system operation.
5. Install the vehicle headliner, (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION).
6. Perform the sunroof position calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - SUNROOF POSITION CALIBRATION).
7. Perform the Excessive Force Limitation (EFL) calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - EXCESSIVE FORCE LIMITATION (EFL) CALIBRATION).
8. Verify proper operation of the power sunroof system.



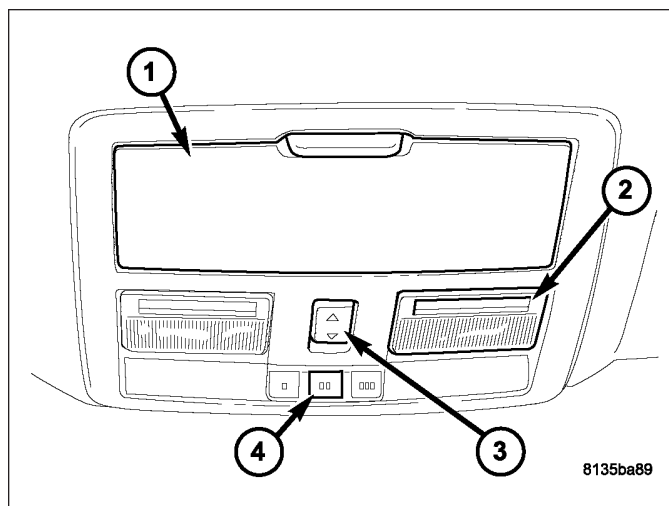
## SWITCH - SUNROOF

### DESCRIPTION

The power sunroof switch (3) is a combination push-button and rocker switch module mounted in the overhead console. The sunroof switch is a direct contact unit that is directly wired to the sunroof motor/module assembly. The sunroof switch performs the following functions:

- Power sunroof open (back of switch pushed)
- Power sunroof closed (front of switch pushed)
- Power sunroof vent (switch center button pushed)

The power sunroof switch is part of the overhead console assembly and cannot be replaced separately. If the switch is damaged or inoperative the overhead console must be replaced, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).



### OPERATION

The power sunroof switch is hard wired to the sunroof motor/module assembly. The switch receives battery current from the motor/module when the ignition switch is in the RUN and ACCESSORY positions or the vehicle Accessory Delay System is active. When one of the switch positions is pressed it sends battery current back to the motor/module, signaling it to move the power sunroof to the appropriate position. The motor/module will perform one of the following functions:

- Power sunroof open (back of switch pushed)
- Power sunroof closed (front of switch pushed)
- Power sunroof vent (switch center button pushed)

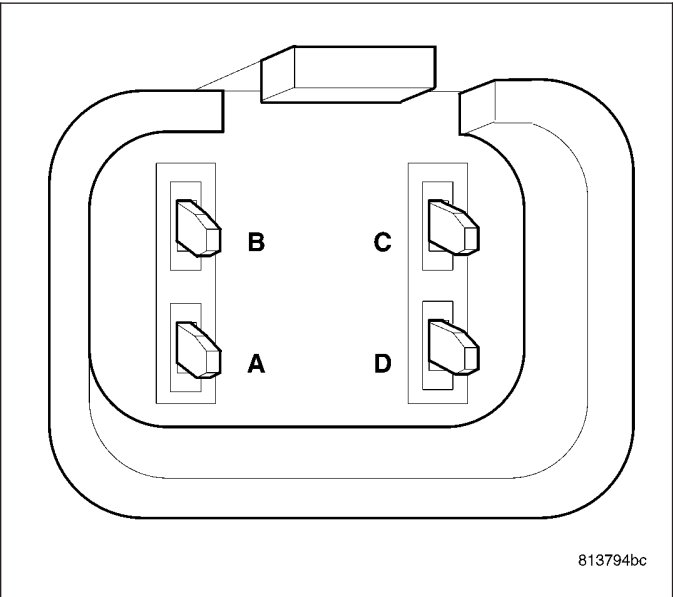
DIAGNOSIS AND TESTING

SWITCH - POWER SUNROOF

Any diagnosis of the power sunroof system should begin with the use of a scan tool and the proper Diagnostic Procedures Information. The scan tool can provide confirmation that the Controller Area Network (CAN) Data Bus circuit is functional, that all of the electronic modules are sending and receiving the proper messages on the CAN Data Bus, and that the power sunroof motor/module assembly is being sent the proper hard wired output by the sunroof switch.

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds. If completing the appropriate diagnostic information results in the sunroof switch being inoperative, perform the following test prior to switch replacement.

1. Disconnect and isolate the battery negative cable.
2. Remove the overhead console, (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).
3. Disconnect the power sunroof switch wire harness connector.
4. Using an ohmmeter, test the continuity of the power sunroof switch in each switch position. Refer to the POWER SUNROOF SWITCH CONTINUITY TABLE . If OK, inspect the wiring harness and connectors for damage. Use a scan tool and the proper Diagnostic Procedures Information to complete diagnosis of the power sunroof system. If not OK, replace the overhead console.



POWER SUNROOF SWITCH CONTINUITY TABLE

SWITCH POSITION	CONTINUITY BETWEEN PINS
OFF	NO CONTINUITY
SUNROOF OPEN	B & D
SUNROOF CLOSED	B & C
SUNROOF VENT	B & A

## POWER WINDOWS - ELECTRICAL DIAGNOSTICS

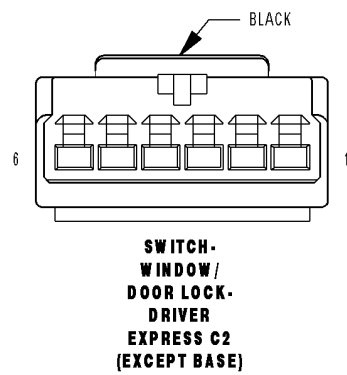
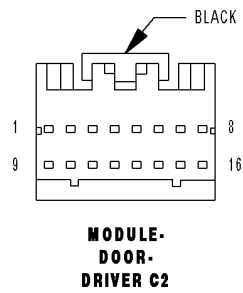
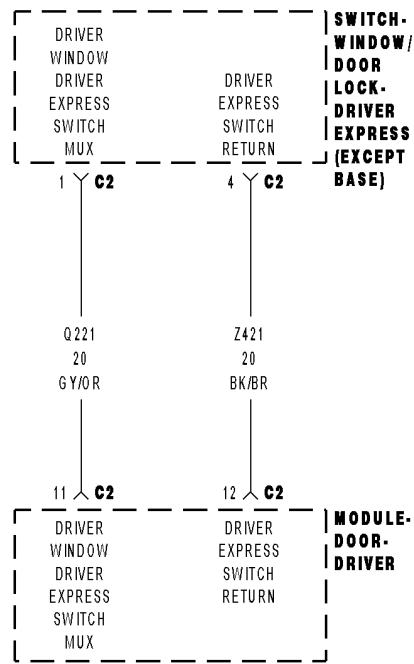
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## POWER WINDOWS - ELECTRICAL DIAGNOSTICS

## DIAGNOSIS AND TESTING

B1852–DRIVER WINDOW SWITCH CIRCUIT STUCK – DDM



**B1852-DRIVER WINDOW SWITCH CIRCUIT STUCK – DDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the module is awake.
- **Set Condition:**  
When the Driver Window Driver Express Switch Mux circuit is below 3.5 volts for over 30 seconds.

Possible Causes
(Q221) DRIVER WINDOW DRIVER EXPRESS SWITCH MUX CIRCUIT SHORT TO GROUND
(Q221) DRIVER WINDOW DRIVER EXPRESS SWITCH MUX CIRCUIT SHORT TO THE (Z421) DRIVER EXPRESS SWITCH RETURN CIRCUIT
WINDOW/DOOR LOCK SWITCH SHORT TO GROUND
DRIVER DOOR MODULE (DDM)

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Driver Window Switch in all positions several times.

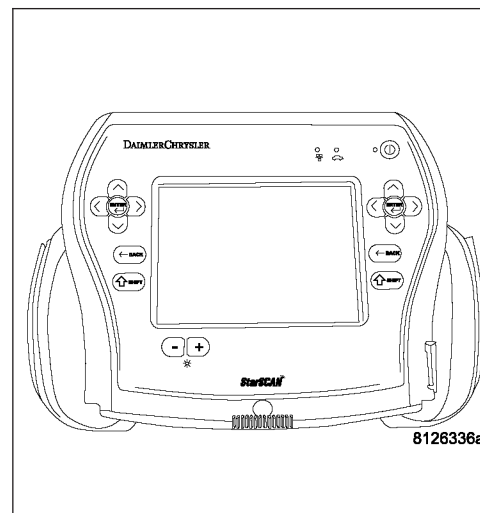
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B1852-DRIVER WINDOW SWITCH CIRCUIT STUCK?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B1852-DRIVER WINDOW SWITCH CIRCUIT STUCK – DDM (CONTINUED)****2. DRIVER WINDOW SWITCH SHORTED**

With the scan tool, erase DTC's.

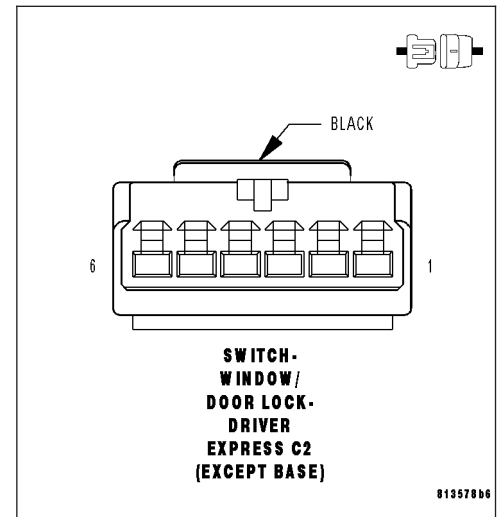
Disconnect the Driver Window/Door Lock Switch C2 connector.

With the scan tool, read DTC's.

**Does the scan tool display B1852-DRIVER WINDOW SWITCH CIRCUIT STUCK?**

**No** >> Replace the Driver Express Window/Door Lock Switch.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 3

**3. (Q221) DRIVER WINDOW DRIVER EXPRESS SWITCH MUX CIRCUIT SHORT TO GROUND**

Turn the ignition off.

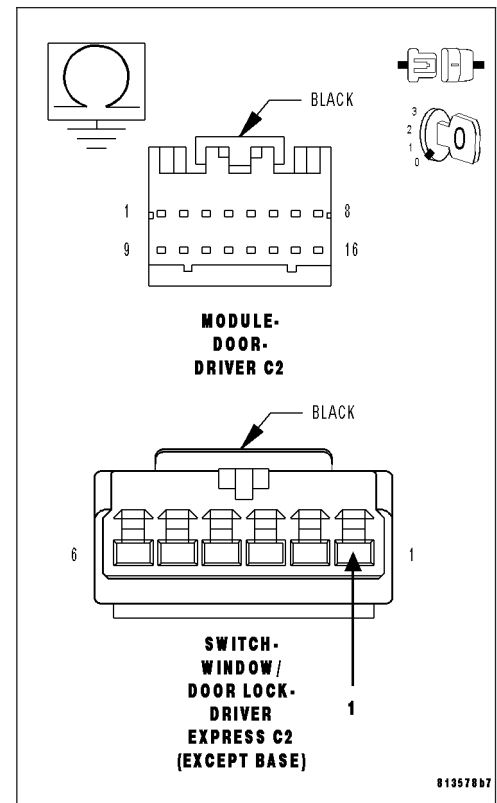
Disconnect the Driver Door Module C2 connector.

Measure the resistance between ground and the (Q221) Driver Window Driver Express Switch Mux circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (Q221) Driver Window Driver Express Switch Mux circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 4



**B1852-DRIVER WINDOW SWITCH CIRCUIT STUCK – DDM (CONTINUED)****4. (Q221) DRIVER WINDOW DRIVER EXPRESS SWITCH MUX CIRCUIT SHORT TO (Z421) DRIVER EXPRESS SWITCH RETURN CIRCUIT**

Measure the resistance between the (Q221) Driver Window Driver Express Switch Mux circuit and the (Z421) Driver Express Switch Return circuit.

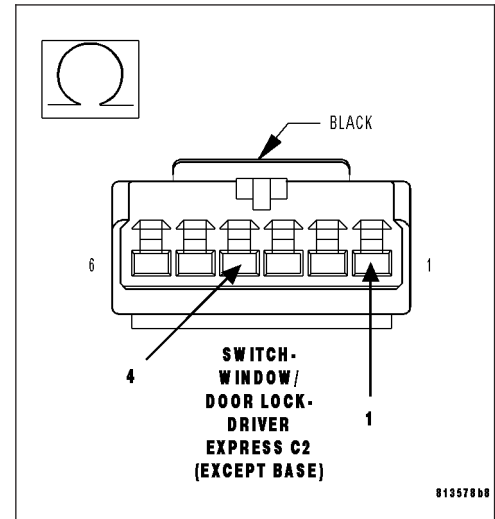
**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (Q221) Driver Window Driver Express Switch Mux circuit for a short to the (Z421) Driver Express Switch Return circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

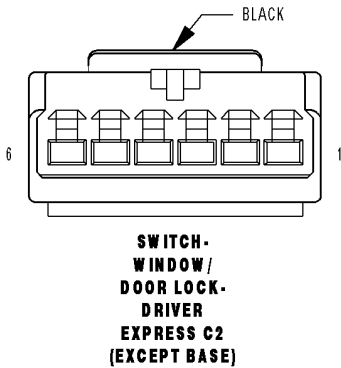
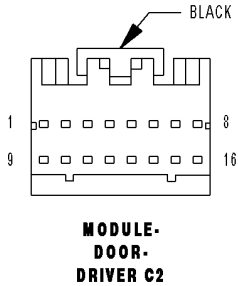
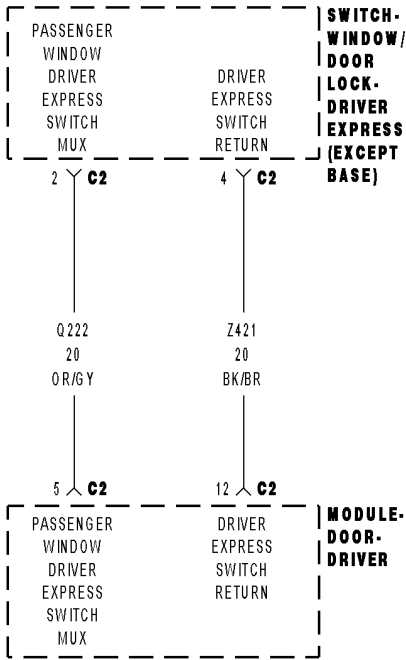
**No** >> Replace the Driver Door Module.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.





B1868–DRIVER PASSENGER WINDOW SWITCH CIRCUIT STUCK – DDM



**B1868-DRIVER PASSENGER WINDOW SWITCH CIRCUIT STUCK – DDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the module is awake.
- **Set Condition:**  
When the Passenger Window Driver Express Switch Mux circuit is below 3.5 volts for over 30 seconds.

**Possible Causes**

(Q222) PASSENGER WINDOW DRIVER EXPRESS SWITCH MUX CIRCUIT SHORT TO GROUND  
(Q222) PASSENGER WINDOW DRIVER EXPRESS SWITCH MUX CIRCUIT SHORT TO THE (Z421) DRIVER EXPRESS SWITCH RETURN CIRCUIT  
WINDOW/DOOR LOCK SWITCH SHORT TO GROUND  
DRIVER DOOR MODULE (DDM)

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Driver Passenger Window Switch in all positions several times.

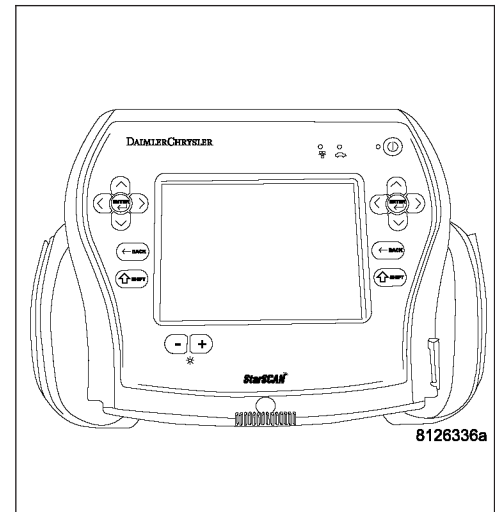
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B1868-DRIVER PASSENGER WINDOW SWITCH CIRCUIT STUCK?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B1868-DRIVER PASSENGER WINDOW SWITCH CIRCUIT STUCK – DDM (CONTINUED)****2. DRIVER WINDOW SWITCH SHORTED**

With the scan tool, erase DTC's.

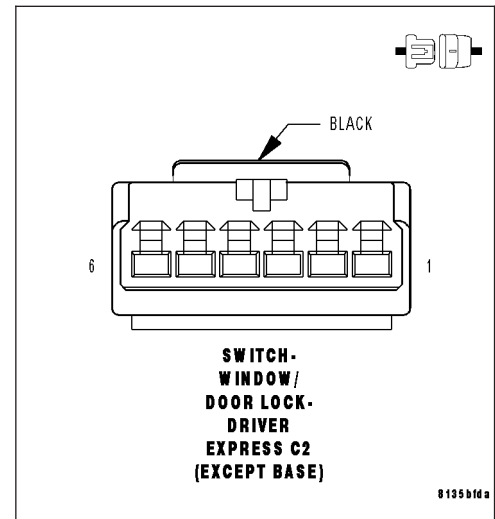
Disconnect the Driver Window/Door Lock Switch C2 connector.

With the scan tool, read DTC's.

**Does the scan tool display B1868-DRIVER PASSENGER WINDOW SWITCH CIRCUIT STUCK?**

**No** >> Replace the Driver Express Window/Door Lock Switch.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to  
BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 3

**3. (Q222) PASSENGER WINDOW DRIVER EXPRESS SWITCH MUX CIRCUIT SHORT TO GROUND**

Turn the ignition off.

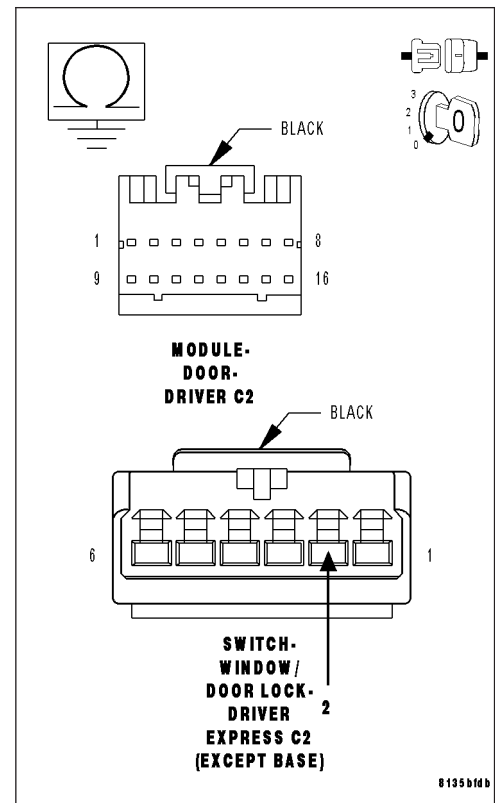
Disconnect the Driver Door Module C2 connector.

Measure the resistance between ground and the (Q222) Passenger Window Driver Express Switch Mux circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (Q222) Passenger Window Driver Express Switch Mux circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to  
BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



**B1868-DRIVER PASSENGER WINDOW SWITCH CIRCUIT STUCK – DDM (CONTINUED)****4. (Q222) PASSENGER WINDOW DRIVER EXPRESS SWITCH MUX CIRCUIT SHORT TO (Z421) DRIVER EXPRESS SWITCH RETURN CIRCUIT**

Measure the resistance between the (Q222) Passenger Window Driver Express Switch Mux circuit and the (Z421) Driver Express Switch Return circuit.

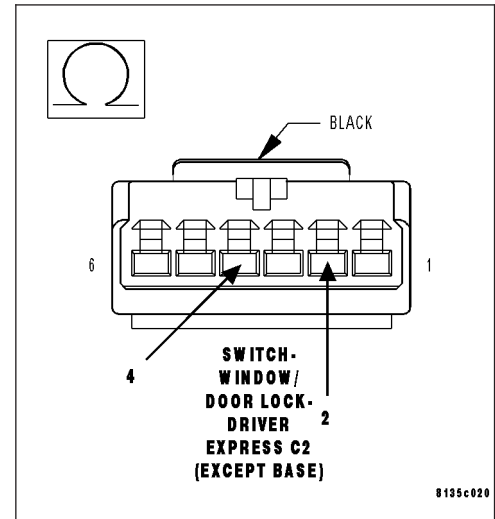
**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (Q222) Passenger Window Driver Express Switch Mux circuit for a short to the (Z421) Driver Express Switch Return circuit.

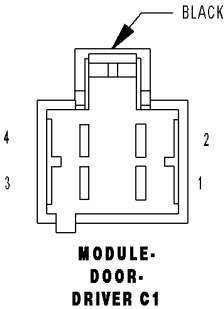
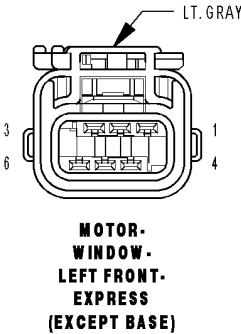
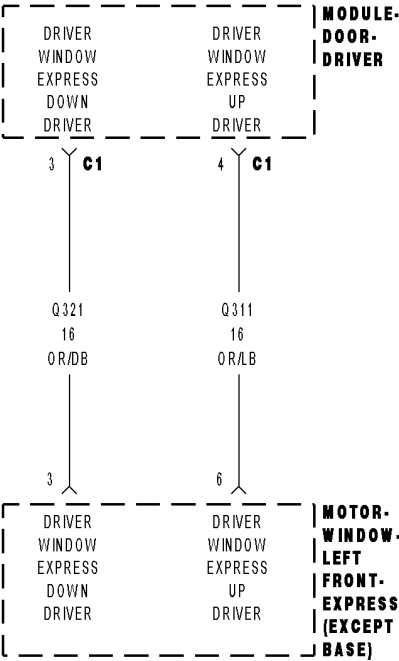
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Driver Door Module.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



B1854–DRIVER WINDOW MOTOR CONTROL CIRCUIT LOW – DDM



**B1854-DRIVER WINDOW MOTOR CONTROL CIRCUIT LOW – DDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the module is awake.
- **Set Condition:**  
When both Driver Window Driver circuits (Up and Down) are grounded during a window movement command, this code will set.

Possible Causes
(Q321) DRIVER WINDOW EXPRESS DOWN DRIVER CIRCUIT SHORT TO GROUND
(Q311) DRIVER WINDOW EXPRESS UP DRIVER CIRCUIT SHORT TO GROUND
(Q321) DRIVER WINDOW EXPRESS DOWN DRIVER CIRCUIT SHORTED TO THE (Q311) DRIVER WINDOW EXPRESS UP DRIVER CIRCUIT
WINDOW MOTOR SHORTED
DRIVER DOOR MODULE (DDM)

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Try to operate the Driver Window up and down several times.

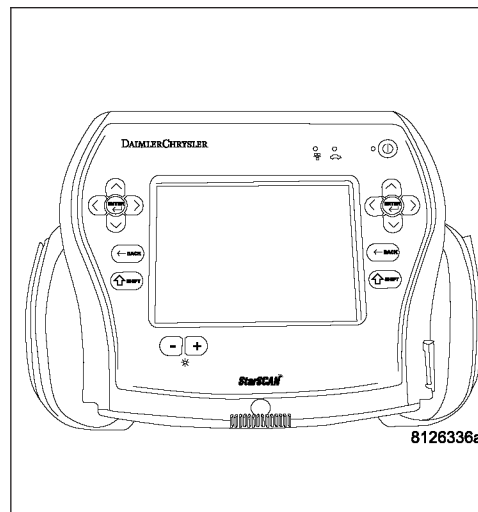
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B1854-DRIVER WINDOW MOTOR CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B1854-DRIVER WINDOW MOTOR CONTROL CIRCUIT LOW – DDM (CONTINUED)****2. WINDOW MOTOR SHORTED**

With the scan tool, erase DTC's.

Turn the ignition off.

Disconnect the Driver Window Motor connector.

Turn the ignition on.

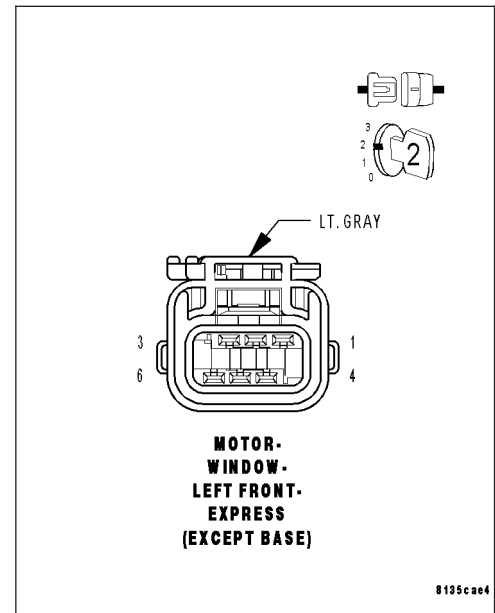
Operate the driver window switch up and down several times.

With the scan tool, read DTC's.

**Does the scan tool display B1854-DRIVER WINDOW MOTOR CONTROL CIRCUIT LOW?**

**No** >> Replace the Window Motor.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to  
BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 3

**3. (Q321) DRIVER WINDOW EXPRESS DOWN DRIVER CIRCUIT SHORT TO GROUND**

Turn the ignition off.

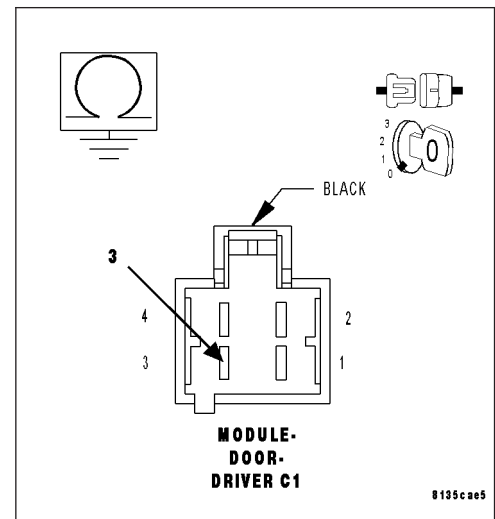
Disconnect the Driver Door Module C1 connector.

Measure the resistance between Ground and the (Q321) Driver Window Express Down Driver circuit.

**Is the resistance below 1000.0 ohms?**

**Yes** >> Repair the (Q321) Driver Window Express Down Driver circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to  
BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



**B1854-DRIVER WINDOW MOTOR CONTROL CIRCUIT LOW – DDM (CONTINUED)****4. (Q311) DRIVER WINDOW EXPRESS UP DRIVER CIRCUIT SHORT TO GROUND**

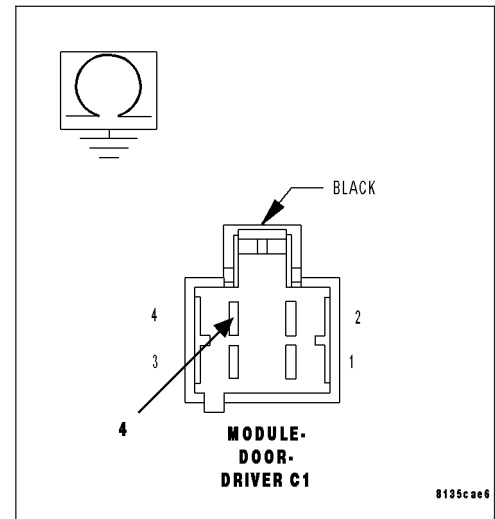
Measure the resistance between Ground and the (Q311) Driver Window Express Up Driver circuit.

**Is the resistance below 1000.0 ohms?**

**Yes** >> Repair the (Q311) Driver Window Express Up Driver circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go TO 5

**5. (Q321) DRIVER WINDOW EXPRESS DOWN DRIVER CIRCUIT SHORT TO (Q311) DRIVER WINDOW EXPRESS UP DRIVER CIRCUIT**

Measure the resistance between the (Q321) Driver Window Express Down Driver circuit and the (Q311) Driver Window Express Up Driver circuit.

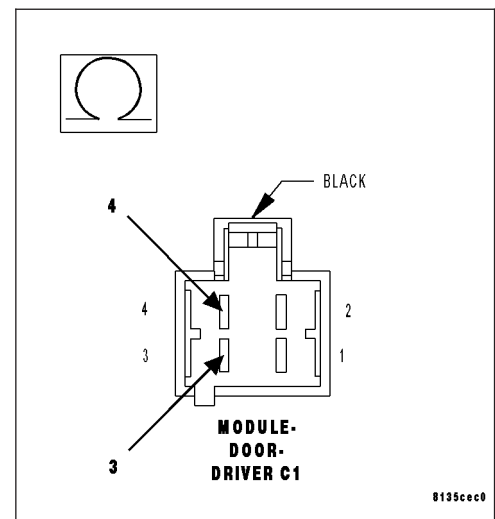
**Is the resistance below 1000.0 ohms?**

**Yes** >> Repair the (Q321) Driver Window xpress Down Driver circuit for a short to the (Q311) Driver Window Express Up Driver circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

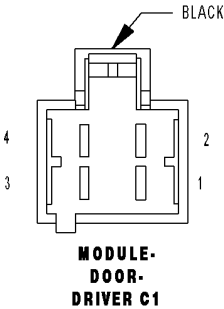
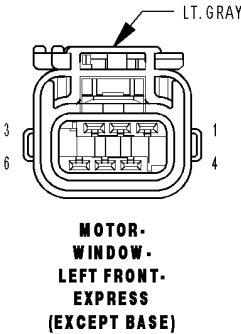
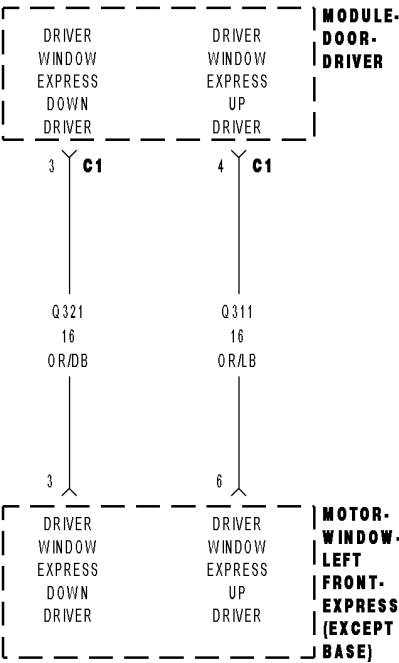
**No** >> Replace the Driver Door Module.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.





B1855–DRIVER WINDOW MOTOR CONTROL CIRCUIT HIGH – DDM



**B1855-DRIVER WINDOW MOTOR CONTROL CIRCUIT HIGH – DDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the module is awake.
- **Set Condition:**  
When both Driver Window Driver circuits (Up and Down) are supplied with voltage during a window movement command, this code will set.

Possible Causes
(Q321) DRIVER WINDOW EXPRESS DOWN DRIVER CIRCUIT SHORT TO VOLTAGE
(Q311) DRIVER WINDOW EXPRESS UP DRIVER CIRCUIT SHORT TO VOLTAGE
DRIVER DOOR MODULE (DDM)

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Try to operate the Driver Window up and down several times.

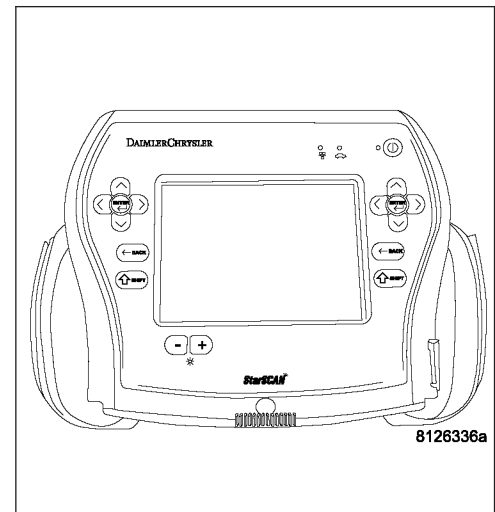
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B1855-DRIVER WINDOW MOTOR CONTROL CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**2. (Q321) DRIVER WINDOW EXPRESS DOWN DRIVER CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Driver Door Module C1 connector.

Turn the ignition on.

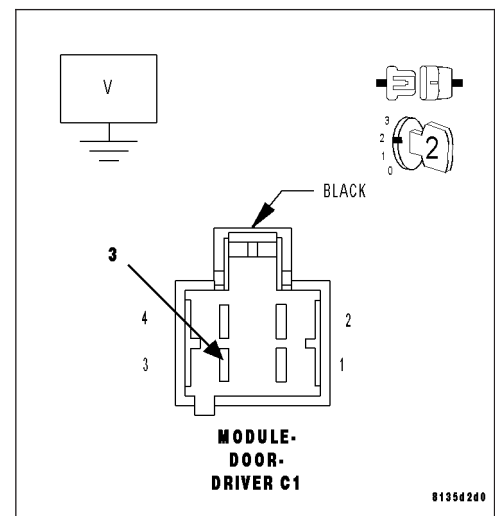
Measure the voltage between the (Q321) Driver Window Express Down Driver circuit and Ground.

**Is there any voltage present?**

**Yes** >> Repair the (Q321) Driver Window Express Down Driver circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3



**B1855-DRIVER WINDOW MOTOR CONTROL CIRCUIT HIGH – DDM (CONTINUED)****3. (Q311) DRIVER WINDOW EXPRESS UP DRIVER CIRCUIT SHORT TO VOLTAGE**

Measure the voltage between the (Q311) Driver Window Express Up Driver circuit and Ground.

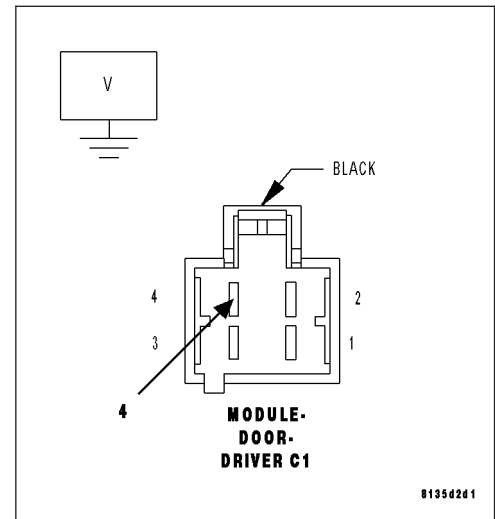
**Is there any voltage present?**

**Yes** >> Repair the (Q311) Driver Window Express Up Driver circuit for a short to voltage.

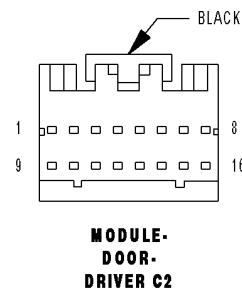
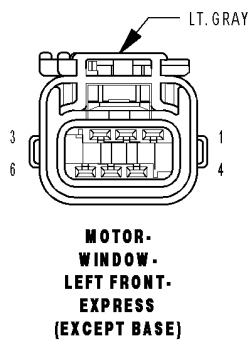
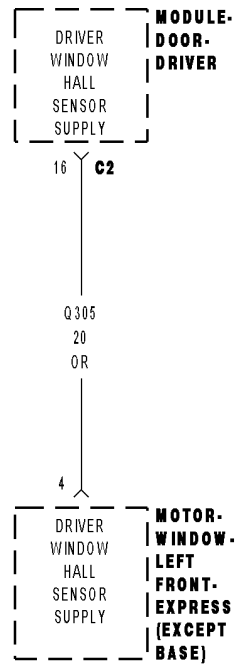
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Driver Door Module.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



## B1858—DRIVER WINDOW POSITION SENSOR POWER SUPPLY LOW – DDM



**B1858-DRIVER WINDOW POSITION SENSOR POWER SUPPLY LOW – DDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the module is awake.
- **Set Condition:**  
When the Driver Window Hall Sensor Supply circuit falls below 1.4 volts for over 315 ms., this code will set.

Possible Causes
(Q305) DRIVER WINDOW HALL SENSOR SUPPLY CIRCUIT SHORT TO GROUND WINDOW MOTOR SHORTED DRIVER DOOR MODULE (DDM)

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Driver Window up and down several times.

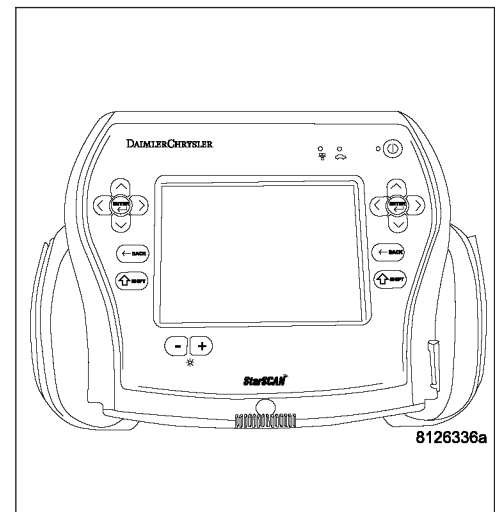
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B1858-DRIVER WINDOW POSITION SENSOR POWER SUPPLY LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B1858-DRIVER WINDOW POSITION SENSOR POWER SUPPLY LOW – DDM (CONTINUED)****2. WINDOW MOTOR SHORTED**

With the scan tool, erase DTC's.

Turn the ignition off.

Disconnect the Driver Window Motor connector.

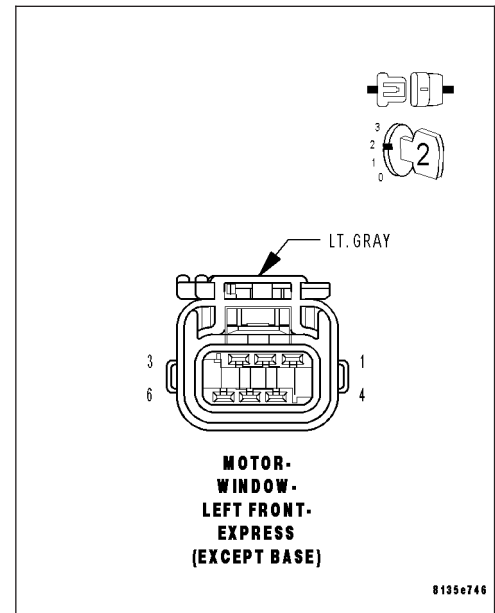
Turn the ignition on.

Operate the driver window switch up and down several times.

With the scan tool, read DTC's.

**Does the scan tool display B1858-DRIVER WINDOW POSITION SENSOR POWER SUPPLY LOW?**

- No** >> Replace the Window Motor.  
 Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.
- Yes** >> Go To 3

**3. (Q305) DRIVER WINDOW HALL SENSOR SUPPLY CIRCUIT SHORT TO GROUND**

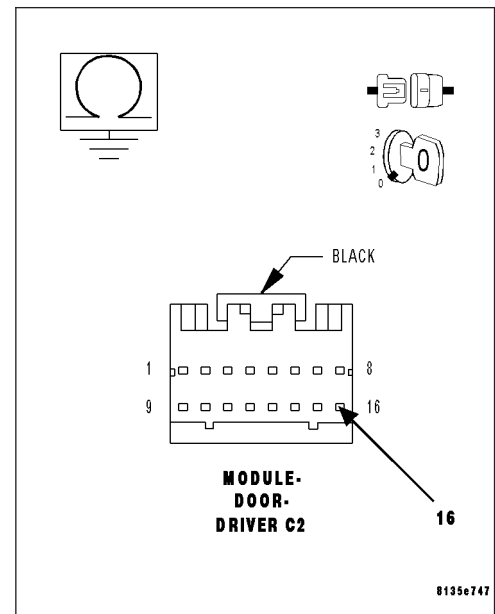
Turn the ignition off.

Disconnect the Driver Door Module C2 connector.

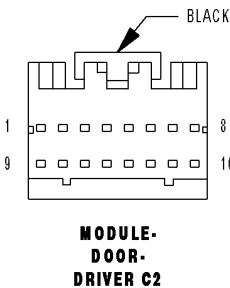
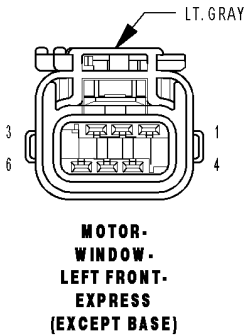
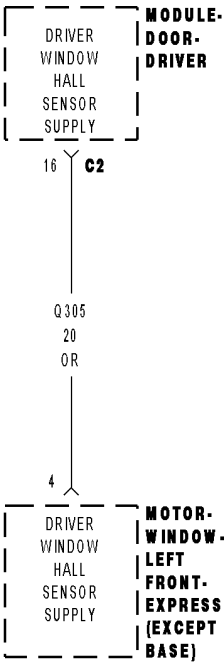
Measure the resistance between Ground and the (Q305) Driver Window Hall Sensor Supply circuit.

**Is the resistance below 1000.0 ohms?**

- Yes** >> Repair the (Q305) Driver Window Hall Sensor Supply circuit for a short to ground.  
 Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.
- No** >> Replace the Driver Door Module.  
 Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



B1859–DRIVER WINDOW POSITION SENSOR POWER SUPPLY HIGH – DDM



**B1859-DRIVER WINDOW POSITION SENSOR POWER SUPPLY HIGH – DDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Whenever the power is turned off to the module and it goes from being awake to sleep mode.

- **Set Condition:**

When the Driver Window Hall Sensor Supply circuit is above 0.96 volts for over 15 ms. and the power to the module has been turned off, this code will set.

Possible Causes
(Q305) DRIVER WINDOW HALL SENSOR SUPPLY CIRCUIT SHORT TO VOLTAGE DRIVER DOOR MODULE (DDM)

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Driver Window up and down several times.

Wait 30 seconds.

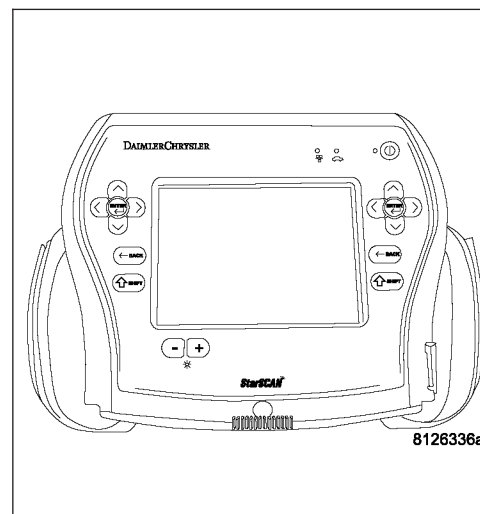
With the scan tool, read the stored DTC's.

**Does the scan tool display B1859-DRIVER WINDOW POSITION SENSOR POWER SUPPLY HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.





**B1859-DRIVER WINDOW POSITION SENSOR POWER SUPPLY HIGH – DDM (CONTINUED)****2. (Q305) DRIVER WINDOW HALL SENSOR SUPPLY CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Driver Door Module C2 connector.

Turn the ignition on.

Measure the voltage between the (Q305) Driver Window Hall Sensor Supply circuit and Ground.

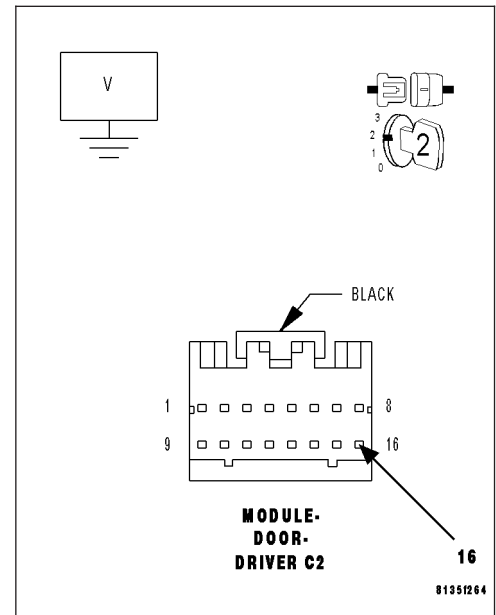
**Is there any voltage present?**

**Yes** >> Repair the (Q305) Driver Window Hall Sensor Supply circuit for a short to voltage.

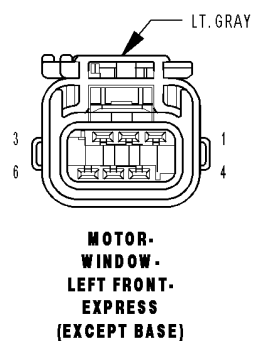
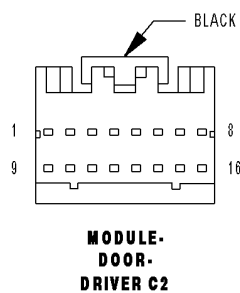
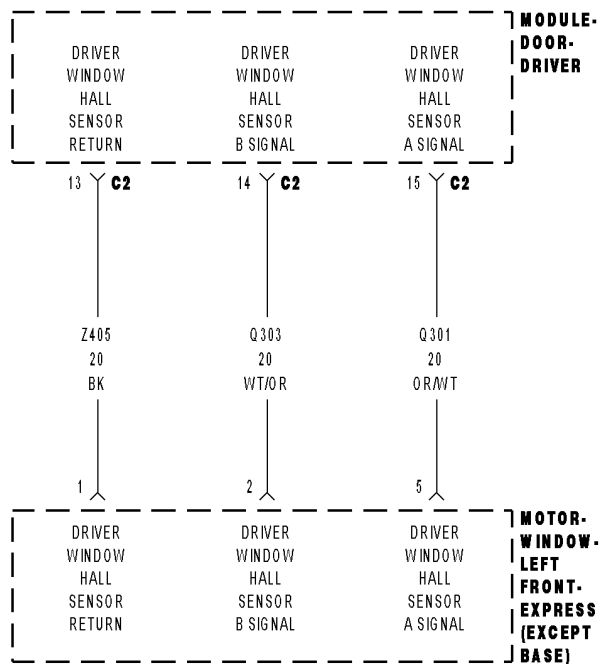
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Driver Door Module.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



## B185A-DRIVER WINDOW POSITION SENSOR CIRCUIT PERFORMANCE - DDM



**B185A-DRIVER WINDOW POSITION SENSOR CIRCUIT PERFORMANCE - DDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the module is awake.
- **Set Condition:**  
When one or both of the window motor hall sensors does not generate a signal during a window movement, this code will set.

Possible Causes
(Q301) DRIVER WINDOW HALL SENSOR A SIGNAL CIRCUIT SHORT TO GROUND
(Q303) DRIVER WINDOW HALL SENSOR B SIGNAL CIRCUIT SHORT TO GROUND
(Q301) DRIVER WINDOW HALL SENSOR A SIGNAL CIRCUIT SHORTED TO THE (Q303) DRIVER WINDOW HALL SENSOR B SIGNAL CIRCUIT
(Q301) DRIVER WINDOW HALL SENSOR A SIGNAL CIRCUIT SHORTED TO THE (Z405) DRIVER WINDOW HALL SENSOR RETURN CIRCUIT
(Q303) DRIVER WINDOW HALL SENSOR B SIGNAL CIRCUIT SHORTED TO THE (Z405) DRIVER WINDOW HALL SENSOR RETURN CIRCUIT
(Q301) DRIVER WINDOW HALL SENSOR A SIGNAL CIRCUIT OPEN
(Q303) DRIVER WINDOW HALL SENSOR B SIGNAL CIRCUIT OPEN
WINDOW MOTOR MALFUNCTION

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Try to operate the Driver Window up and down several times.

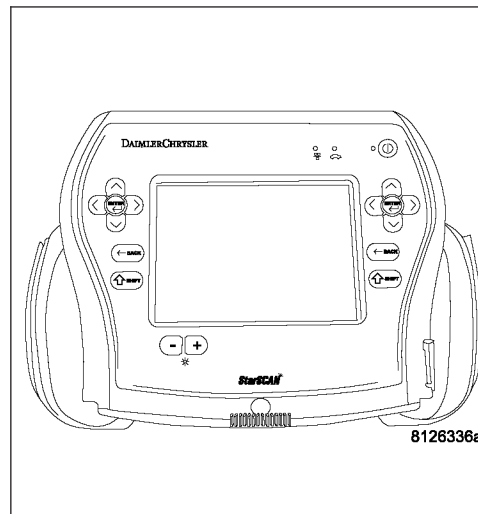
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B185A-DRIVER WINDOW POSITION SENSOR CIRCUIT PERFORMANCE?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B185A-DRIVER WINDOW POSITION SENSOR CIRCUIT PERFORMANCE - DDM (CONTINUED)****2. (Q301) DRIVER WINDOW HALL SENSOR A SIGNAL SHORT TO GROUND**

Turn the ignition off.

Disconnect the Driver Window Motor connector.

Disconnect the Driver Door Module C2 connector.

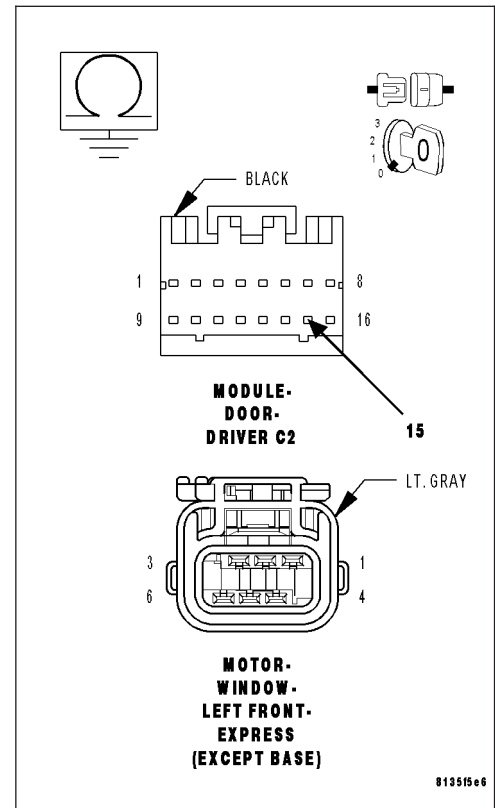
Measure the resistance between Ground and the Driver Window Hall Sensor A Signal circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the Driver Window Hall Sensor A signal circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

**3. (Q303) DRIVER WINDOW HALL SENSOR B SIGNAL CIRCUIT SHORT TO GROUND**

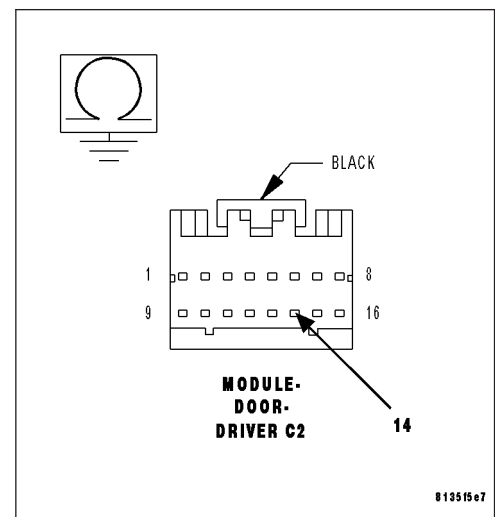
Measure the resistance between Ground and the (Q303) Driver Window Hall Sensor B Signal circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (Q303) Driver Window Hall Sensor B Signal circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



**B185A-DRIVER WINDOW POSITION SENSOR CIRCUIT PERFORMANCE - DDM (CONTINUED)****4. (Q301) DRIVER WINDOW HALL SENSOR A SIGNAL CIRCUIT OPEN**

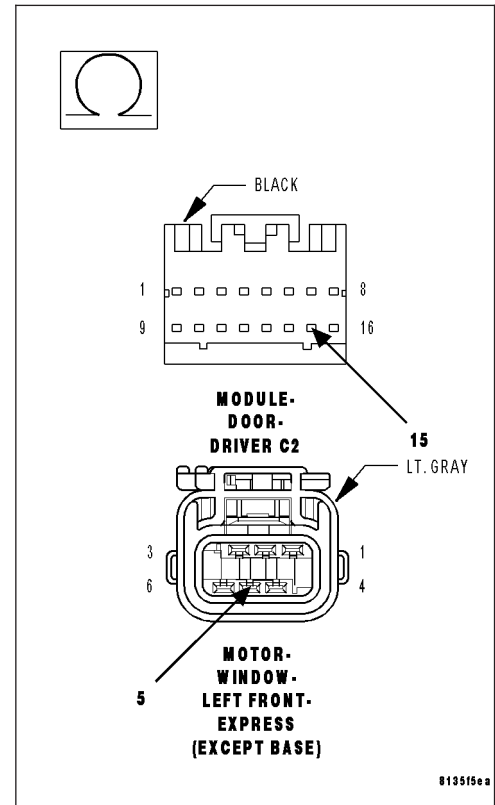
Measure the resistance of the (Q301) Driver Window Hall Sensor A Signal circuit between the Motor connector and the Module C2 connector.

**Is the resistance below 1.0 ohms?**

**No** >> Repair the (Q301) Driver Window Hall Sensor A Signal circuit for an open.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 5

**5. (Q303) DRIVER WINDOW HALL SENSOR B SIGNAL CIRCUIT OPEN**

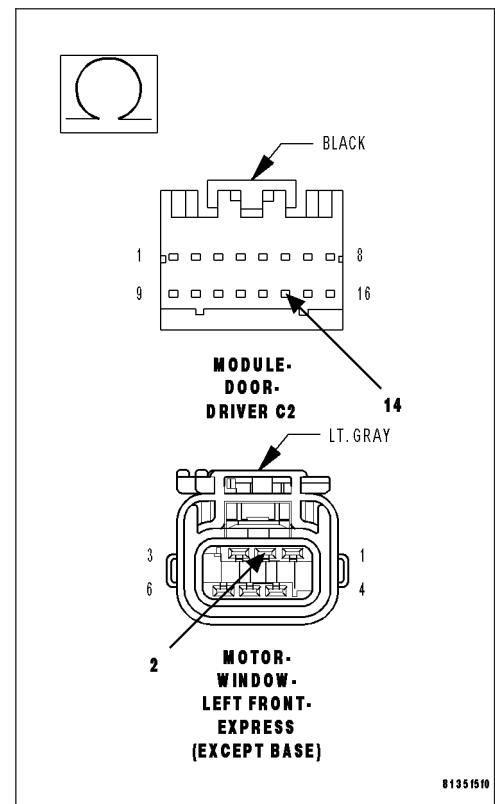
Measure the resistance of the (Q303) Driver Window Hall Sensor B Signal circuit between the Motor connector and the Module C2 connector.

**Is the resistance below 1.0 ohms?**

**No** >> Repair the (Q303) Driver Window Hall Sensor B Signal circuit for an open.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go TO 6



**B185A-DRIVER WINDOW POSITION SENSOR CIRCUIT PERFORMANCE - DDM (CONTINUED)****6. (Q303) DRIVER WINDOW HALL SENSOR B SIGNAL CIRCUIT SHORTED TO THE (Z405) DRIVER WINDOW HALL SENSOR RETURN**

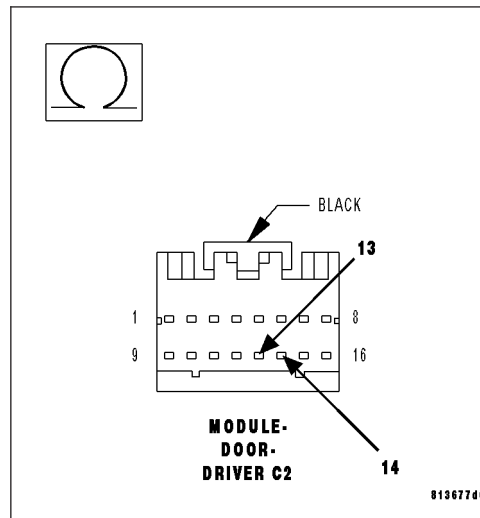
Measure the resistance between the (Q303) Driver Window Hall Sensor B Signal circuit and the (Z405) Driver Window Hall Sensor Return circuit.

**Is the resistance below 10000.0 ohms?**

**No** >> Repair the (Q303) Driver Window Hall Sensor B Signal circuit for a short to the Driver Window Hall Sensor Return circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go TO 7

**7. (Q301) DRIVER WINDOW HALL SENSOR A SIGNAL CIRCUIT SHORTED TO THE (Z405) DRIVER WINDOW HALL SENSOR RETURN**

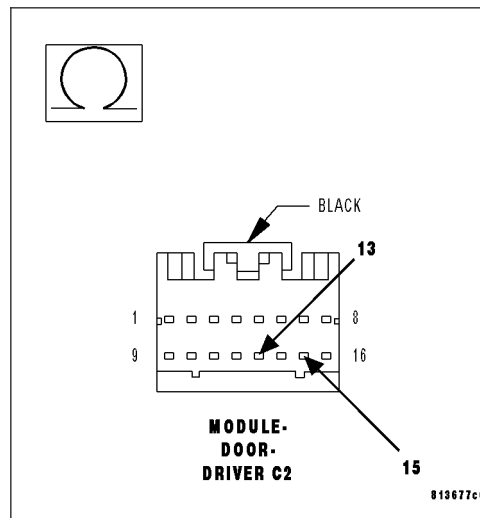
Measure the resistance between the (Q301) Driver Window Hall Sensor A Signal circuit and the (Z405) Driver Window Hall Sensor Return circuit.

**Is the resistance below 10000.0 ohms?**

**No** >> Repair the (Q301) Driver Window Hall Sensor A Signal circuit for a short to the (Z405) Driver Window Hall Sensor Return circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go TO 8



**B185A-DRIVER WINDOW POSITION SENSOR CIRCUIT PERFORMANCE - DDM (CONTINUED)****8. (Q301) DRIVER WINDOW HALL SENSOR A SIGNAL CIRCUIT SHORT TO (Q303) DRIVER WINDOW HALL SENSOR B SIGNAL CIRCUIT**

Measure the resistance between the (Q301) Driver Window Hall Sensor A Signal circuit and the (Q303) Driver Window Hall Sensor B Signal circuit.

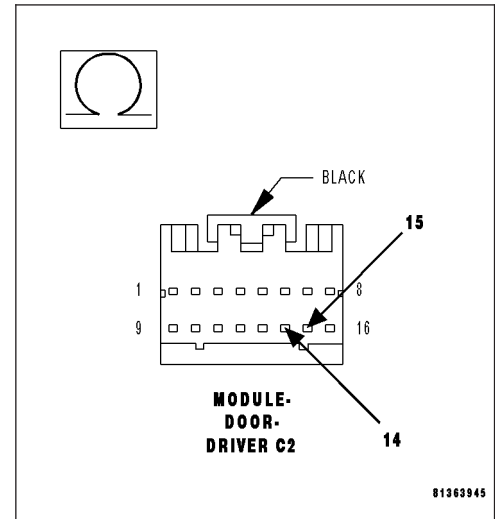
**Is the resistance below 1000.0 ohms?**

**Yes** >> Repair the (Q301) Driver Window Hall Sensor A Signal circuit for a short to the (Q303) Driver Window Hall Sensor B Signal circuit.

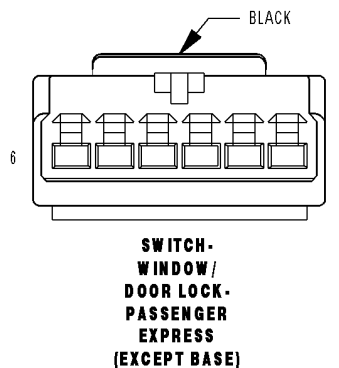
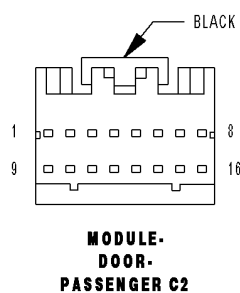
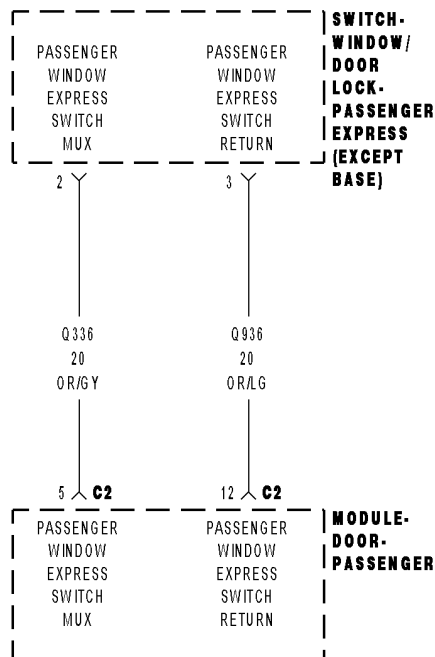
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Window Motor.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



## B185D-PASSENGER WINDOW SWITCH CIRCUIT STUCK - PDM





**B185D-PASSENGER WINDOW SWITCH CIRCUIT STUCK - PDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the module is awake.
- **Set Condition:**  
When the Passenger Window Express Switch Mux circuit is below 3.5 volts for over 30 seconds.

Possible Causes
(Q336) PASSENGER WINDOW EXPRESS SWITCH MUX CIRCUIT SHORT TO GROUND (Q336) PASSENGER WINDOW DRIVER EXPRESS SWITCH MUX CIRCUIT SHORT TO THE (Q936) PASSENGER WINDOW EXPRESS SWITCH RETURN CIRCUIT WINDOW/DOOR LOCK SWITCH SHORT TO GROUND PASSENGER DOOR MODULE (PDM)

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Passenger Window Switch in all positions several times.

Wait 30 seconds.

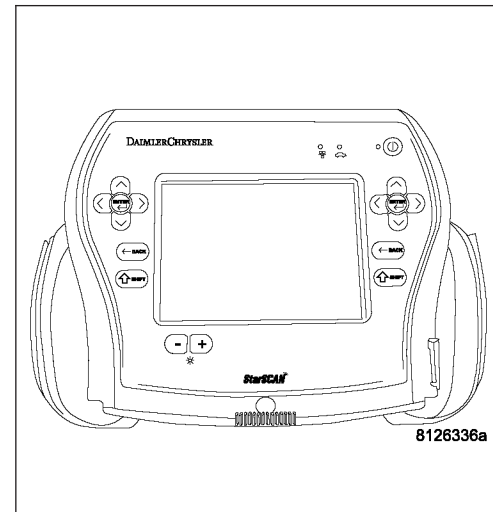
With the scan tool, read DTC's.

**Does the scan tool display B185D-PASSENGER WINDOW SWITCH CIRCUIT STUCK?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Check for a sticking switch and using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B185D-PASSENGER WINDOW SWITCH CIRCUIT STUCK - PDM (CONTINUED)****2. DRIVER WINDOW SWITCH SHORTED**

With the scan tool, erase DTC's.

Disconnect the Passenger Window/Door Lock Switch connector.

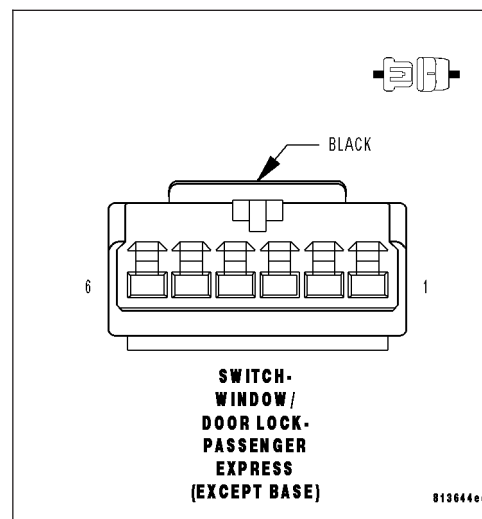
With the scan tool, read DTC's.

**Does the scan tool display B185D-PASSENGER WINDOW SWITCH CIRCUIT STUCK?**

**No** >> Replace the Passenger Express Window/Door Lock Switch.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 3

**3. (Q336) PASSENGER WINDOW EXPRESS SWITCH MUX CIRCUIT SHORT TO GROUND**

Turn the ignition off.

Disconnect the Passenger Door Module C2 connector.

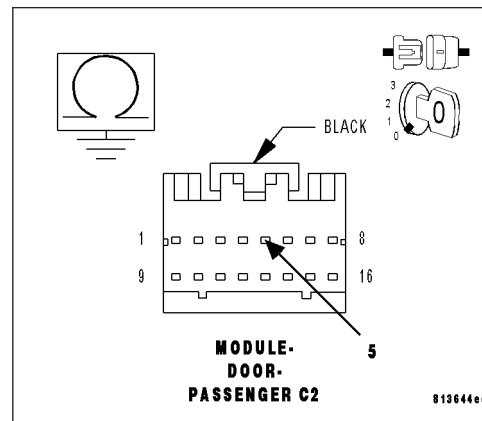
Measure the resistance between ground and the (Q336) Passenger Window Express Switch Mux circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (Q336) Passenger Window Express Switch Mux circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4

**4. (Q336) PASSENGER WINDOW EXPRESS SWITCH MUX CIRCUIT SHORT TO (Q936) PASSENGER EXPRESS SWITCH RETURN CIRCUIT**

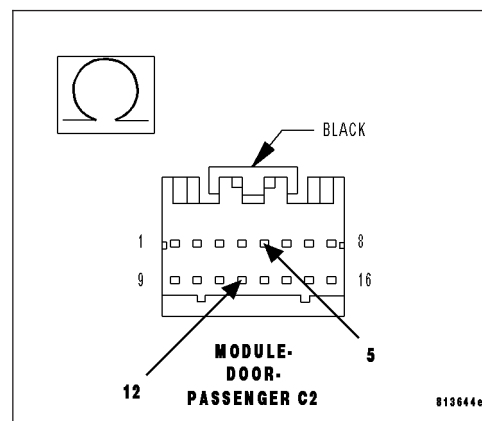
Measure the resistance between the (Q336) Passenger Window Express Switch Mux circuit and the (Q936) Passenger Express Switch Return circuit.

**Is the resistance below 10000.0 ohms?**

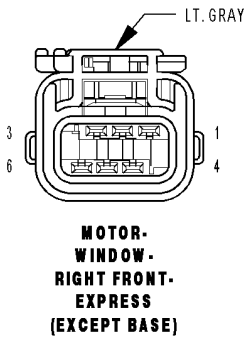
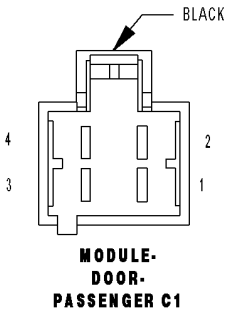
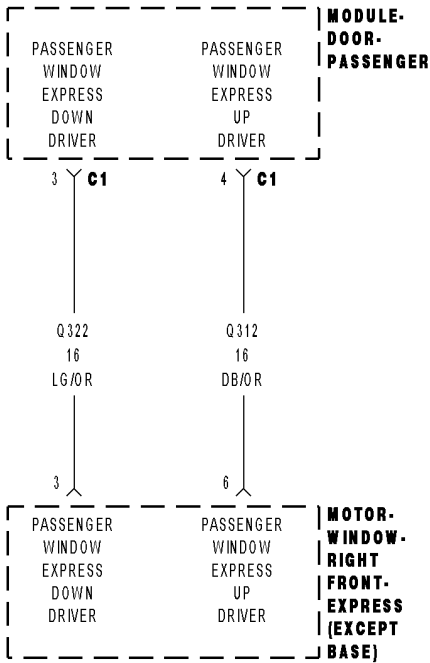
**Yes** >> Repair the (Q336) Passenger Express Switch Mux circuit for a short to the (Q936) Passenger Window Express Switch Return circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Passenger Door Module.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



B185F-PASSENGER WINDOW MOTOR CONTROL CIRCUIT LOW – PDM



**B185F-PASSENGER WINDOW MOTOR CONTROL CIRCUIT LOW – PDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the module is awake.
- **Set Condition:**  
When both Passenger Window Driver circuits (Up and Down) are grounded during a window movement command, this code will set.

Possible Causes
(Q322) PASSENGER WINDOW EXPRESS DOWN DRIVER CIRCUIT SHORT TO GROUND
(Q312) PASSENGER WINDOW EXPRESS UP DRIVER CIRCUIT SHORT TO GROUND
(Q322) PASSENGER WINDOW EXPRESS DOWN DRIVER CIRCUIT SHORTED TO THE (Q312) PASSENGER WINDOW EXPRESS UP DRIVER CIRCUIT
WINDOW MOTOR SHORTED
PASSENGER DOOR MODULE (PDM)

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Try to operate the Passenger Window up and down several times.

Wait 30 seconds.

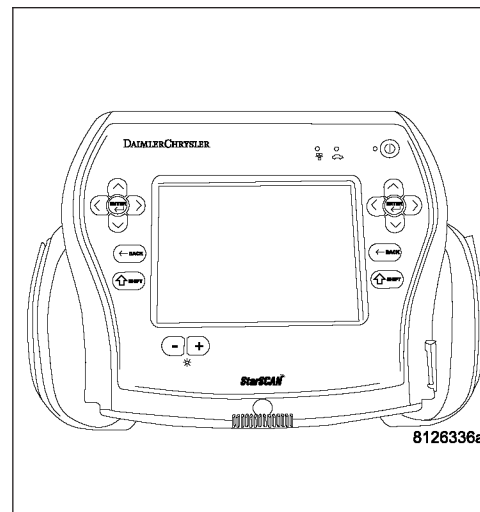
With the scan tool, read DTC's.

**Does the scan tool display B185F-PASSENGER WINDOW MOTOR CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B185F-PASSENGER WINDOW MOTOR CONTROL CIRCUIT LOW – PDM (CONTINUED)****2. WINDOW MOTOR SHORTED**

With the scan tool, erase DTC's.

Turn the ignition off.

Disconnect the Passenger Window Motor connector.

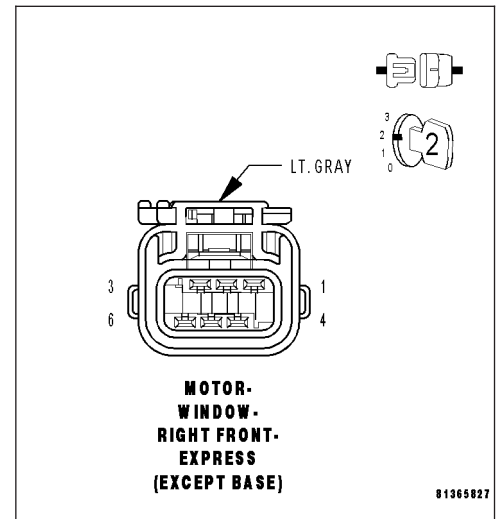
Turn the ignition on.

Operate the passenger window switch up and down several times.

With the scan tool, read DTC's.

**Does the scan tool display B185F-PASSENGER WINDOW MOTOR CONTROL CIRCUIT LOW?**

- No** >> Replace the Window Motor.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.
- Yes** >> Go To 3

**3. (Q322) PASSENGER WINDOW EXPRESS DOWN DRIVER CIRCUIT SHORT TO GROUND**

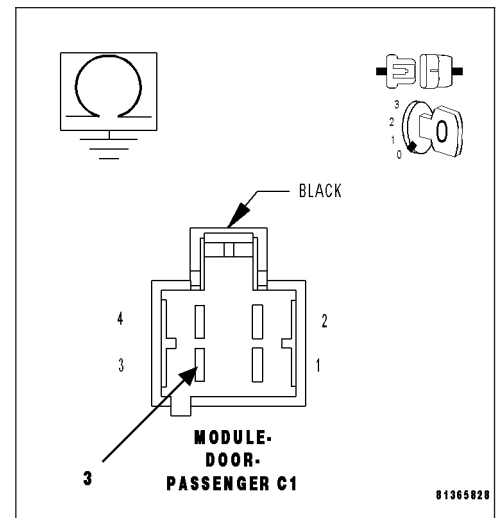
Turn the ignition off.

Disconnect the Passenger Door Module C1 connector.

Measure the resistance between Ground and the (Q322) Passenger Window Express Down Driver circuit.

**Is the resistance below 1000.0 ohms?**

- Yes** >> Repair the (Q322) Passenger Window Express Down Driver circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.
- No** >> Go To 4



**B185F-PASSENGER WINDOW MOTOR CONTROL CIRCUIT LOW – PDM (CONTINUED)****4. (Q312) PASSENGER WINDOW EXPRESS UP DRIVER CIRCUIT SHORT TO GROUND**

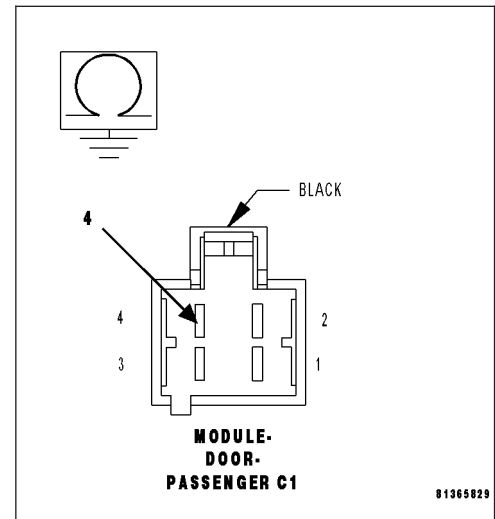
Measure the resistance between Ground and the (Q312) Passenger Window Express Up Driver circuit.

**Is the resistance below 1000.0 ohms?**

**Yes** >> Repair the (Q312) Passenger Window Express Up Driver circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go TO 5

**5. (Q322) PASSENGER WINDOW EXPRESS DOWN DRIVER CIRCUIT SHORT TO (Q312) PASSENGER WINDOW EXPRESS UP DRIVER CIRCUIT**

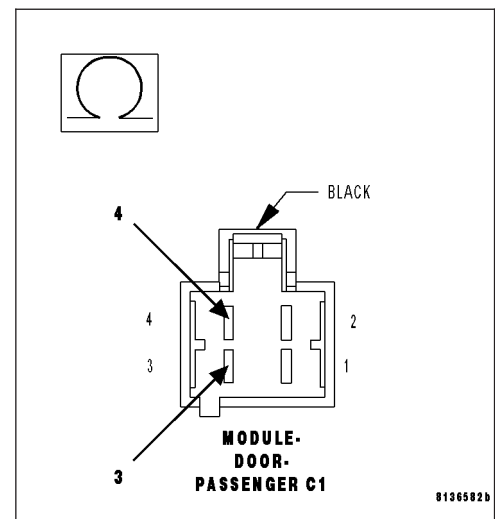
Measure the resistance between the (Q322) Passenger Window Express Down Driver circuit and the (Q312) Passenger Window Express Up Driver circuit.

**Is the resistance below 1000.0 ohms?**

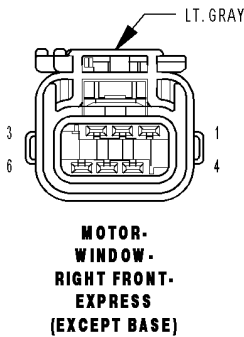
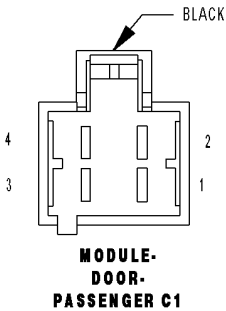
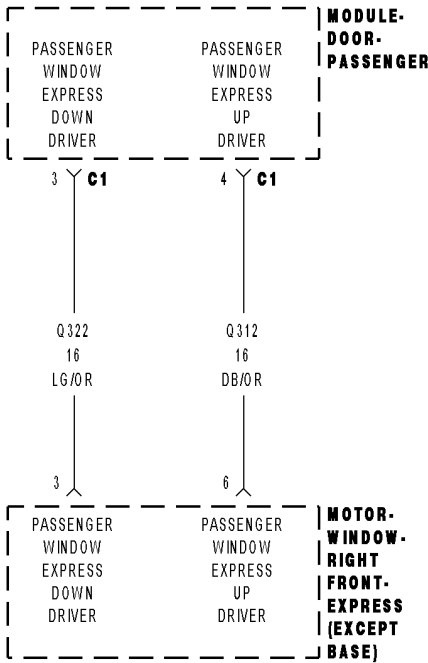
**Yes** >> Repair the (Q322) Passenger Window Express Down Driver circuit for a short to the (Q312) Passenger Window Express Up Driver circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Passenger Door Module.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



B1860-PASSENGER WINDOW MOTOR CONTROL CIRCUIT HIGH – PDM



**B1860-PASSENGER WINDOW MOTOR CONTROL CIRCUIT HIGH – PDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Whenever the module is awake.
- **Set Condition:**  
When both Passenger Window Driver circuits (Up and Down) are supplied with voltage during a window movement command, this code will set.

Possible Causes
(Q322) PASSENGER WINDOW EXPRESS DOWN DRIVER CIRCUIT SHORT TO VOLTAGE
(Q312) PASSENGER WINDOW EXPRESS UP DRIVER CIRCUIT SHORT TO VOLTAGE
PASSENGER DOOR MODULE (DDM)

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Try to operate the Passenger Window up and down several times.

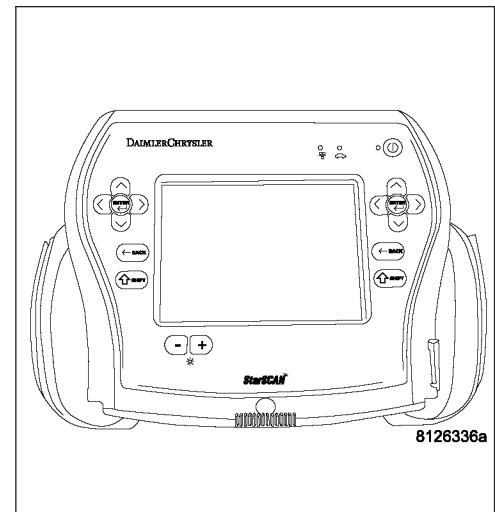
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B1860-PASSENGER WINDOW MOTOR CONTROL CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**2. (Q322) PASSENGER WINDOW EXPRESS DOWN DRIVER CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the Passenger Door Module C1 connector.

Turn the ignition on.

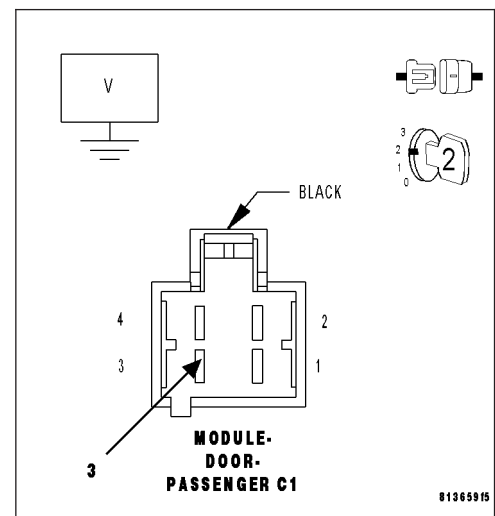
Measure the voltage between the (Q322) Passenger Window Express Down Driver circuit and Ground.

**Is there any voltage present?**

**Yes** >> Repair the (Q322) Passenger Window Express Down Driver circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3





**B1860-PASSENGER WINDOW MOTOR CONTROL CIRCUIT HIGH – PDM (CONTINUED)****3. (Q312)PASSENGER WINDOW EXPRESS UP DRIVER CIRCUIT SHORT TO VOLTAGE**

Measure the voltage between the (Q312) Passenger Window Express Up Driver circuit and Ground.

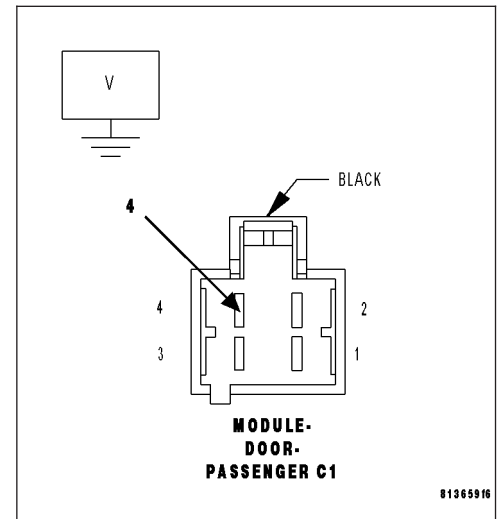
**Is there any voltage present?**

**Yes** >> Repair the (Q312) Passenger Window Express Up Driver circuit for a short to voltage.

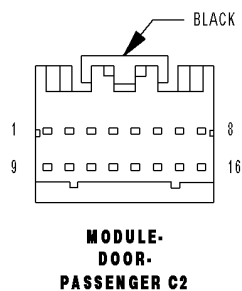
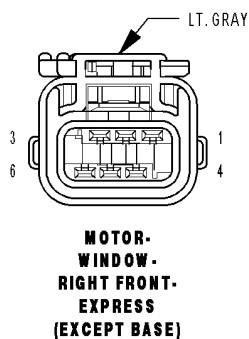
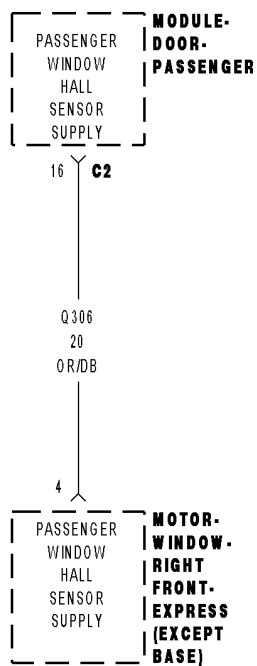
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Passenger Door Module.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



## B1863-PASSENGER WINDOW POSITION SENSOR POWER SUPPLY LOW – PDM



**B1863-PASSENGER WINDOW POSITION SENSOR POWER SUPPLY LOW – PDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the module is awake.
- **Set Condition:**  
When the Passenger Window Hall Sensor Supply circuit falls below 1.4 volts for over 315 ms., this code will set.

Possible Causes
(Q306) PASSENGER WINDOW HALL SENSOR SUPPLY CIRCUIT SHORT TO GROUND
WINDOW MOTOR SHORTED
PASSENGER DOOR MODULE (PDM)

**Diagnostic Test****1. TEST FOR INTERMITTENT CONDITION**

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Passenger Window up and down several times.

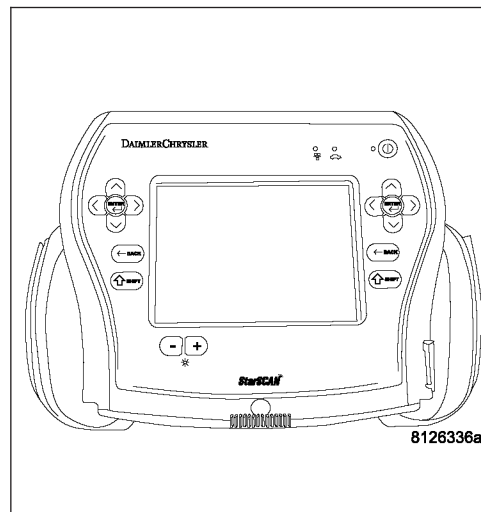
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B1863-PASSENGER WINDOW POSITION SENSOR POWER SUPPLY LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B1863-PASSENGER WINDOW POSITION SENSOR POWER SUPPLY LOW – PDM (CONTINUED)****2. WINDOW MOTOR SHORTED**

With the scan tool, erase DTC's.

Turn the ignition off.

Disconnect the Passenger Window Motor connector.

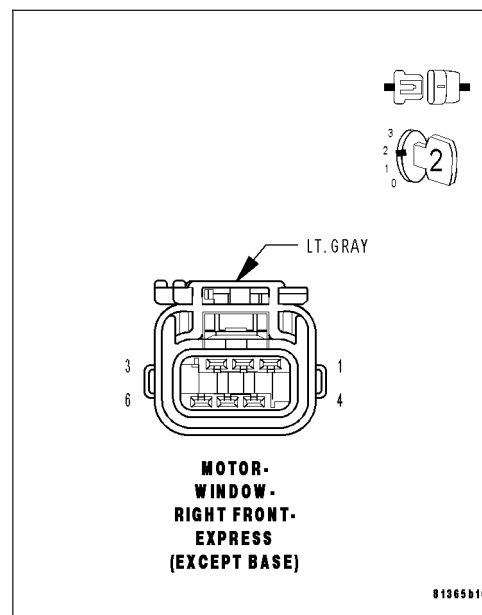
Turn the ignition on.

Operate the passenger window switch up and down several times.

With the scan tool, read DTC's.

**Does the scan tool display B1863-PASSENGER WINDOW POSITION SENSOR POWER SUPPLY LOW?**

- No** >> Replace the Window Motor.  
 Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.
- Yes** >> Go To 3

**3. (Q306) PASSENGER WINDOW HALL SENSOR SUPPLY CIRCUIT SHORT TO GROUND**

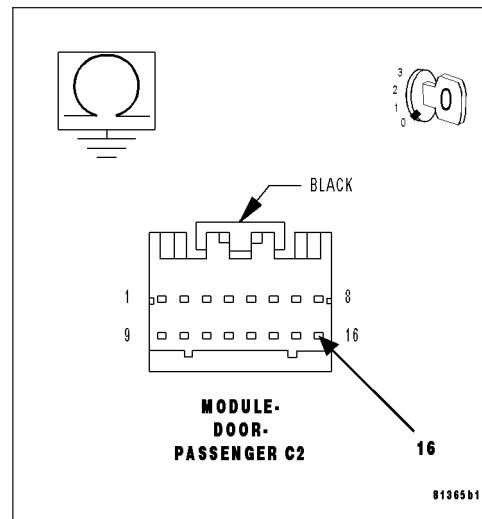
Turn the ignition off.

Disconnect the Passenger Door Module C2 connector.

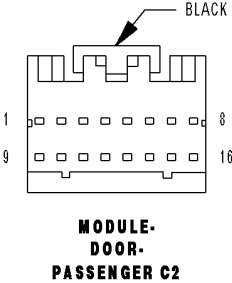
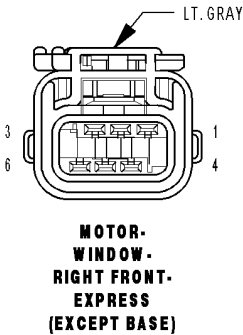
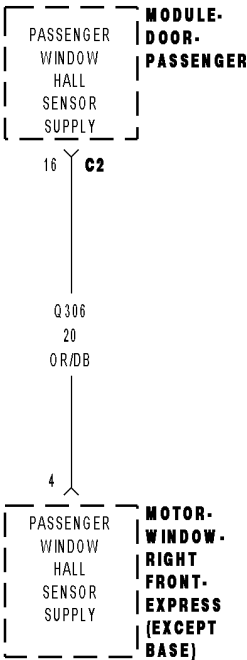
Measure the resistance between Ground and the (Q306) Passenger Window Hall Sensor Supply circuit.

**Is the resistance below 1000.0 ohms?**

- Yes** >> Repair the (Q306) Passenger Window Hall Sensor Supply circuit for a short to ground.  
 Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.
- No** >> Replace the Passenger Door Module.  
 Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



B1864-PASSENGER WINDOW POSITION SENSOR POWER SUPPLY HIGH – PDM



**B1864-PASSENGER WINDOW POSITION SENSOR POWER SUPPLY HIGH – PDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Whenever the power is turned off to the module and it goes from being awake to sleep mode.

- **Set Condition:**

When the Passenger Window Hall Sensor Supply circuit is above 0.96 volts for over 15 ms. and the power to the module has been turned off, this code will set.

Possible Causes
(Q306) P[ASSENGER WINDOW HALL SENSOR SUPPLY CIRCUIT SHORT TO VOLTAGE
PASSENGER DOOR MODULE (PDM)

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Operate the Passenger Window up and down several times.

Wait 30 seconds.

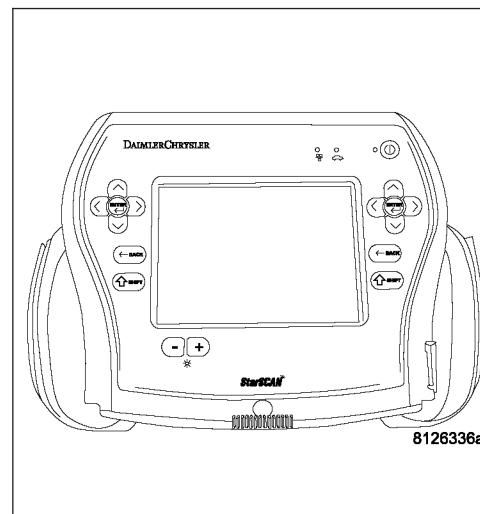
With the scan tool, read the stored DTC's.

**Does the scan tool display B1864-PASSENGER WINDOW POSITION SENSOR POWER SUPPLY HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



### 2. (Q306) PASSENGER WINDOW HALL SENSOR SUPPLY CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Passenger Door Module C2 connector.

Turn the ignition on.

Measure the voltage between the (Q306) Passenger Window Hall Sensor Supply circuit and Ground.

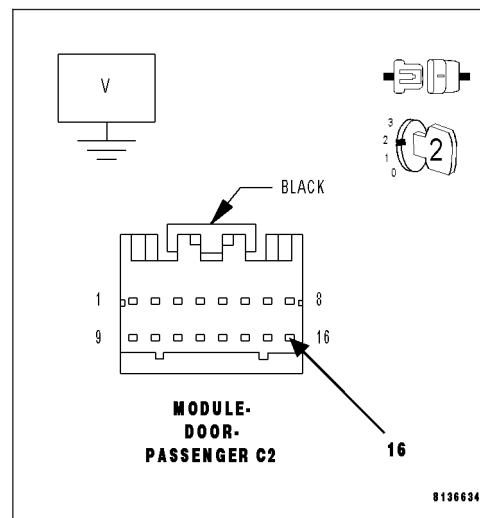
**Is there any voltage present?**

**Yes** >> Repair the (Q306) Passenger Window Hall Sensor Supply circuit for a short to voltage.

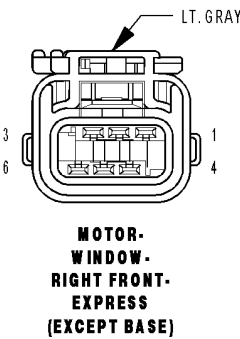
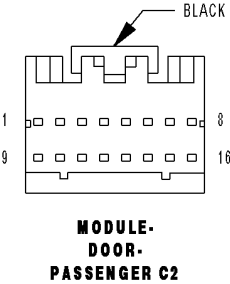
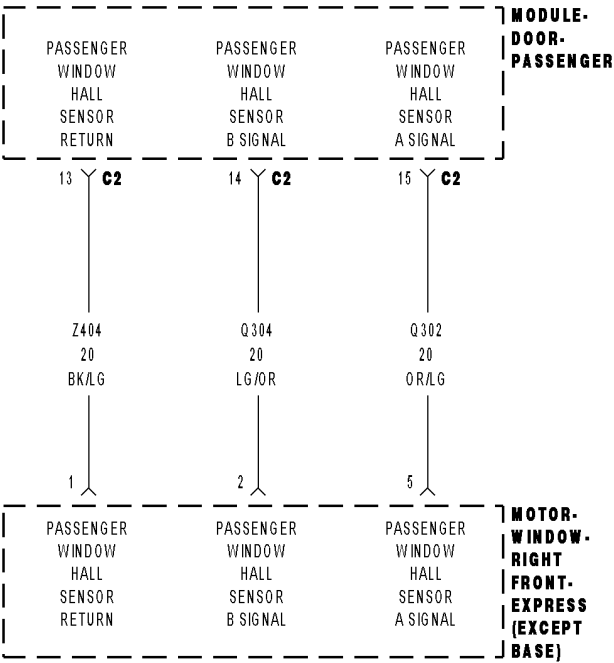
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Passenger Door Module.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



B1865-PASSENGER WINDOW POSITION SENSOR CIRCUIT PERFORMANCE - PDM



**B1865-PASSENGER WINDOW POSITION SENSOR CIRCUIT PERFORMANCE - PDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Whenever the module is awake.

- **Set Condition:**

When one or both of the window motor hall sensors do not generate a signal within 1.25 ms during a window movement, this code will set.

Possible Causes
(Q302) PASSENGER WINDOW HALL SENSOR A SIGNAL CIRCUIT SHORT TO GROUND
(Q304) PASSENGER WINDOW HALL SENSOR B SIGNAL CIRCUIT SHORT TO GROUND
(Q302) PASSENGER WINDOW HALL SENSOR A SIGNAL CIRCUIT SHORTED TO THE (Q304) PASSENGER WINDOW HALL SENSOR B SIGNAL CIRCUIT
(Q302) PASSENGER WINDOW HALL SENSOR A SIGNAL CIRCUIT SHORTED TO THE (Z404) PASSENGER WINDOW HALL SENSOR RETURN CIRCUIT
(Q304) PASSENGER WINDOW HALL SENSOR B SIGNAL CIRCUIT SHORTED TO THE (Z404) PASSENGER WINDOW HALL SENSOR RETURN CIRCUIT
(Q302) PASSENGER WINDOW HALL SENSOR A SIGNAL CIRCUIT OPEN
(Q304) PASSENGER WINDOW HALL SENSOR B SIGNAL CIRCUIT OPEN
WINDOW MOTOR MALFUNCTION

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Try to operate the Passenger Window up and down several times.

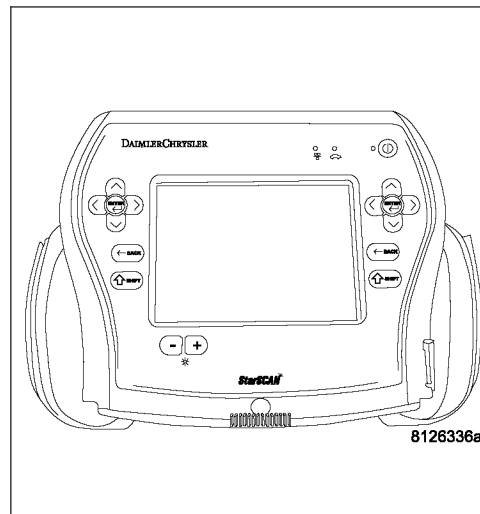
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B1865-PASSENGER WINDOW POSITION SENSOR CIRCUIT PERFORMANCE?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.





**B1865-PASSENGER WINDOW POSITION SENSOR CIRCUIT PERFORMANCE - PDM (CONTINUED)****2. (Q302) PASSENGER WINDOW HALL SENSOR A SIGNAL SHORT TO GROUND**

Turn the ignition off.

Disconnect the Passenger Window Motor connector.

Disconnect the Passenger Door Module C2 connector.

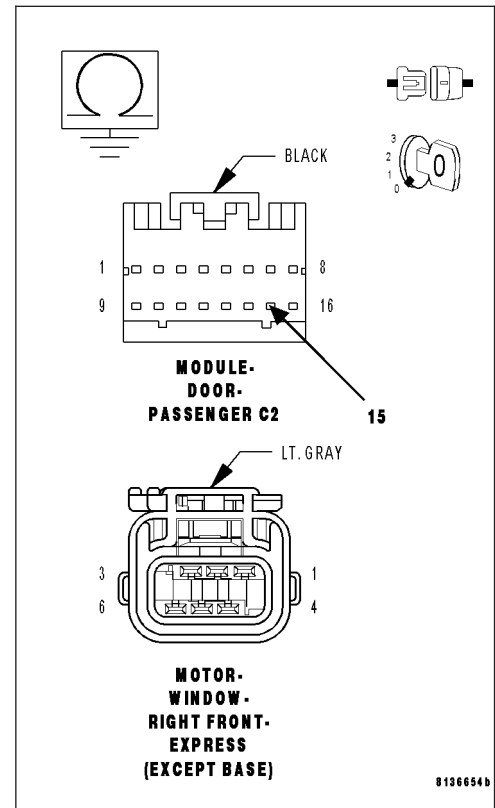
Measure the resistance between Ground and the Passenger Window Hall Sensor A Signal circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the Passenger Window Hall Sensor A signal circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 3

**3. (Q304) PASSENGER WINDOW HALL SENSOR B SIGNAL CIRCUIT SHORT TO GROUND**

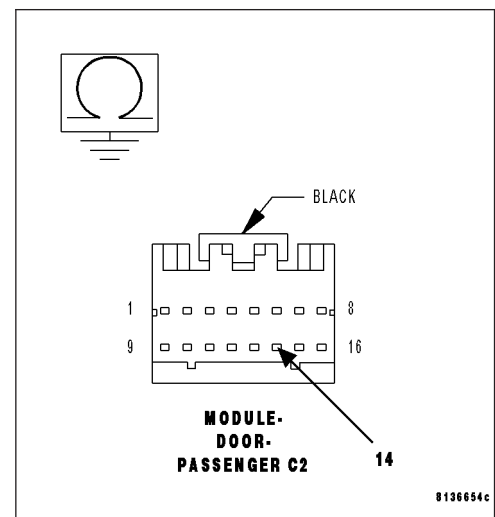
Measure the resistance between Ground and the (Q304) Passenger Window Hall Sensor B Signal circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (Q304) Passenger Window Hall Sensor B Signal circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



**B1865-PASSENGER WINDOW POSITION SENSOR CIRCUIT PERFORMANCE - PDM (CONTINUED)****4. (Q302) PASSENGER WINDOW HALL SENSOR A SIGNAL CIRCUIT OPEN**

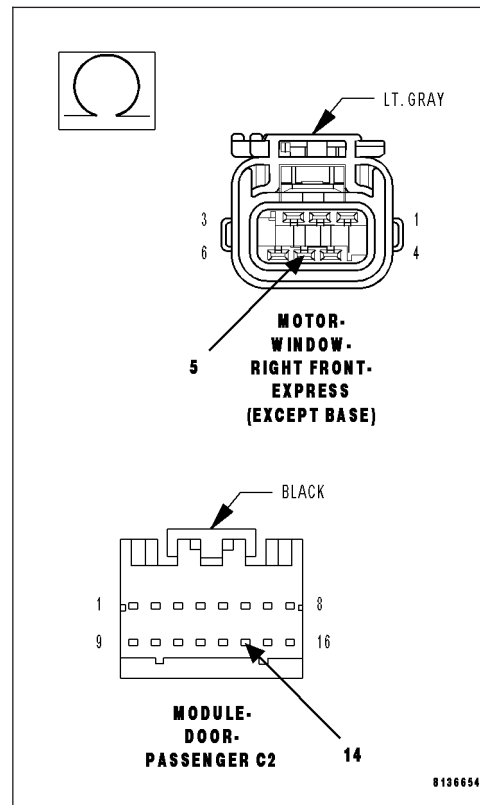
Measure the resistance of the (Q302) Passenger Window Hall Sensor A Signal circuit between the Motor connector and the Module C2 connector.

**Is the resistance below 1.0 ohms?**

**No** >> Repair the (Q302) Passenger Window Hall Sensor A Signal circuit for an open.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 5

**5. (Q304) PASSENGER WINDOW HALL SENSOR B SIGNAL CIRCUIT OPEN**

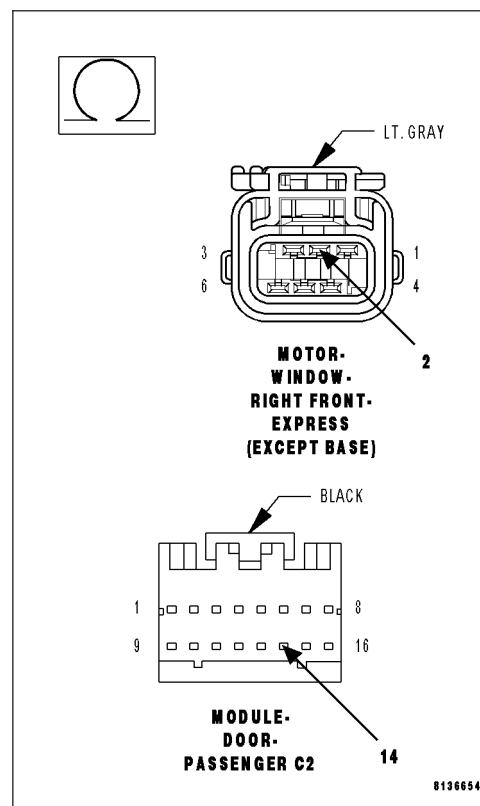
Measure the resistance of the (Q304) Passenger Window Hall Sensor B Signal circuit between the Motor connector and the Module C2 connector.

**Is the resistance below 1.0 ohms?**

**No** >> Repair the (Q304) Passenger Window Hall Sensor B Signal circuit for an open.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go TO 6



**B1865-PASSENGER WINDOW POSITION SENSOR CIRCUIT PERFORMANCE - PDM (CONTINUED)****6. (Q304) PASSENGER WINDOW HALL SENSOR B SIGNAL CIRCUIT SHORTED TO (Z404) PASSENGER WINDOW HALL SENSOR RETURN**

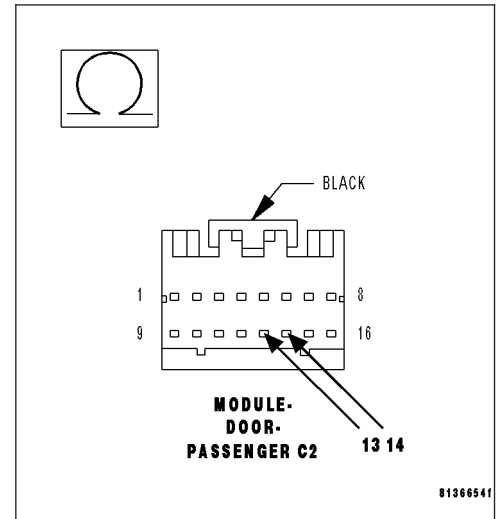
Measure the resistance between the (Q304) Passenger Window Hall Sensor B Signal circuit and the (Z404) Passenger Window Hall Sensor Return circuit in the PDM C2 connector.

**Is the resistance below 10000.0 ohms?**

**No** >> Repair the (Q304) Passenger Window Hall Sensor B Signal circuit for a short to the (Z404) Passenger Window Hall Sensor Return circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go TO 7

**7. (Q302) PASSENGER WINDOW HALL SENSOR A SIGNAL CIRCUIT SHORTED TO (Z404) PASSENGER WINDOW HALL SENSOR RETURN**

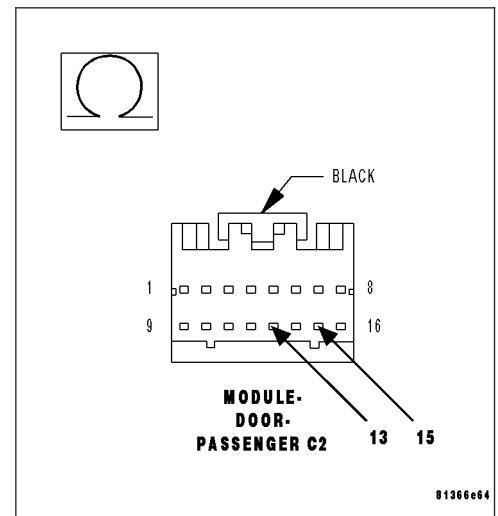
Measure the resistance between the (Q302) Passenger Window Hall Sensor A Signal circuit and the (Z404) Passenger Window Hall Sensor Return circuit in the PDM C2 connector.

**Is the resistance below 10000.0 ohms?**

**No** >> Repair the (Q302) Passenger Window Hall Sensor A Signal circuit for a short to the (Z404) Passenger Window Hall Sensor Return circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go TO 8



**B1865-PASSENGER WINDOW POSITION SENSOR CIRCUIT PERFORMANCE - PDM (CONTINUED)****8. (Q304) PASSENGER WINDOW HALL SENSOR A SIGNAL CIRCUIT SHORT TO (Q304) PASSENGER WINDOW HALL SENSOR B SIGNAL CIRCUIT**

Measure the resistance between the (Q302) Passenger Window Hall Sensor A Signal circuit and the (Q304) Passenger Window Hall Sensor B Signal circuit.

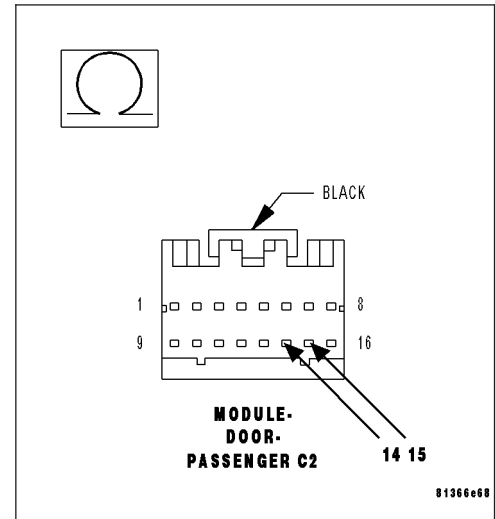
**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (Q302) Passenger Window Hall Sensor A Signal circuit for a short to the (Q304) Passenger Window Hall Sensor B Signal circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Replace the Window Motor.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



## B210D-BATTERY VOLTAGE LOW – DDM/PDM

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
At all times.
- **Set Condition:**  
Anytime the module senses voltage input below 9.5 volts, this code will set.

POSSIBLE CAUSES
LOW VOLTAGE ENGINE DTC
DRIVER OR PASSENGER DOOR MODULE

## Diagnostic Test

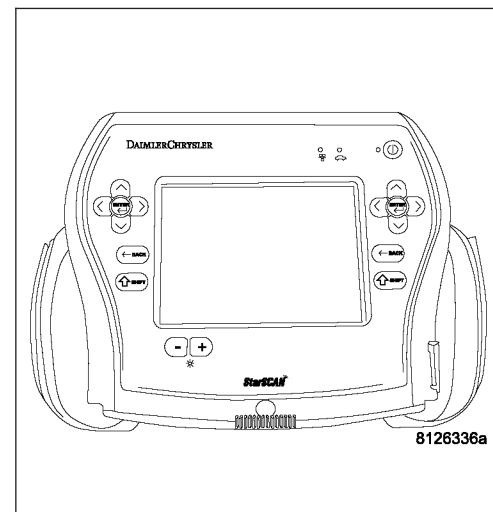
### 1. CHECK ENGINE DTC's

With the scan tool, read ENGINE DTC's

**Are there any ENGINE DTC's present?**

**No** >> Go to 2

**Yes** >> Refer to symptom list for problems related to ENGINE.



**B210D-BATTERY VOLTAGE LOW – DDM/PDM (CONTINUED)****2. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase DTC's

Start the engine and run for 2 minutes.

With the scan tool, read DTC's.

**Does the scan tool display B210D-BATTERY VOLTAGE LOW?**

**Yes** >> Replace the appropriate Door Module.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

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**B210E-BATTERY VOLTAGE HIGH – DDM/PDM**

For the Power Window circuit diagram

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
At all times.
- **Set Condition:**  
Anytime the module senses voltage input above 15.9 volts, this code will set.

POSSIBLE CAUSES
HIGH VOLTAGE ENGINE DTC
DRIVER OR PASSENGER DOOR MODULE

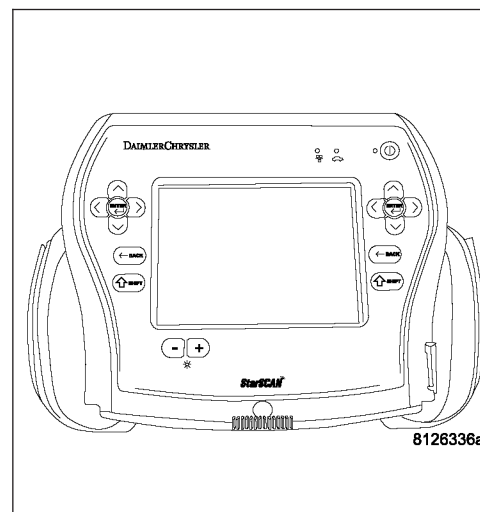
**Diagnostic Test****1. CHECK ENGINE DTC's**

With the scan tool, read ENGINE DTC's

**Are there any ENGINE DTC's present?**

**No** >> Go to 2

**Yes** >> Refer to symptom list for problems related to ENGINE.

**2. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase DTC's

Start the engine and run for 2 minutes.

With the scan tool, read DTC's.

**Does the scan tool display B210E-BATTERY VOLTAGE HIGH?**

**Yes** >> Replace the appropriate Door Module.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**B2218, B2219—DRIVER/PASSENGER DOOR MODULE INTERNAL – DDM/PDM**

For the Power Windows circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
At all times
- **Set Condition:**  
Whenever the module detects an EEPROM failure

POSSIBLE CAUSES
DRIVER OR PASSENGER DOOR MODULE

**Diagnostic Test****1. Replace the Door Module**

**Note:** Anytime this code is logged, the module must be replaced.

**Repair**

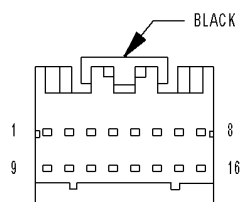
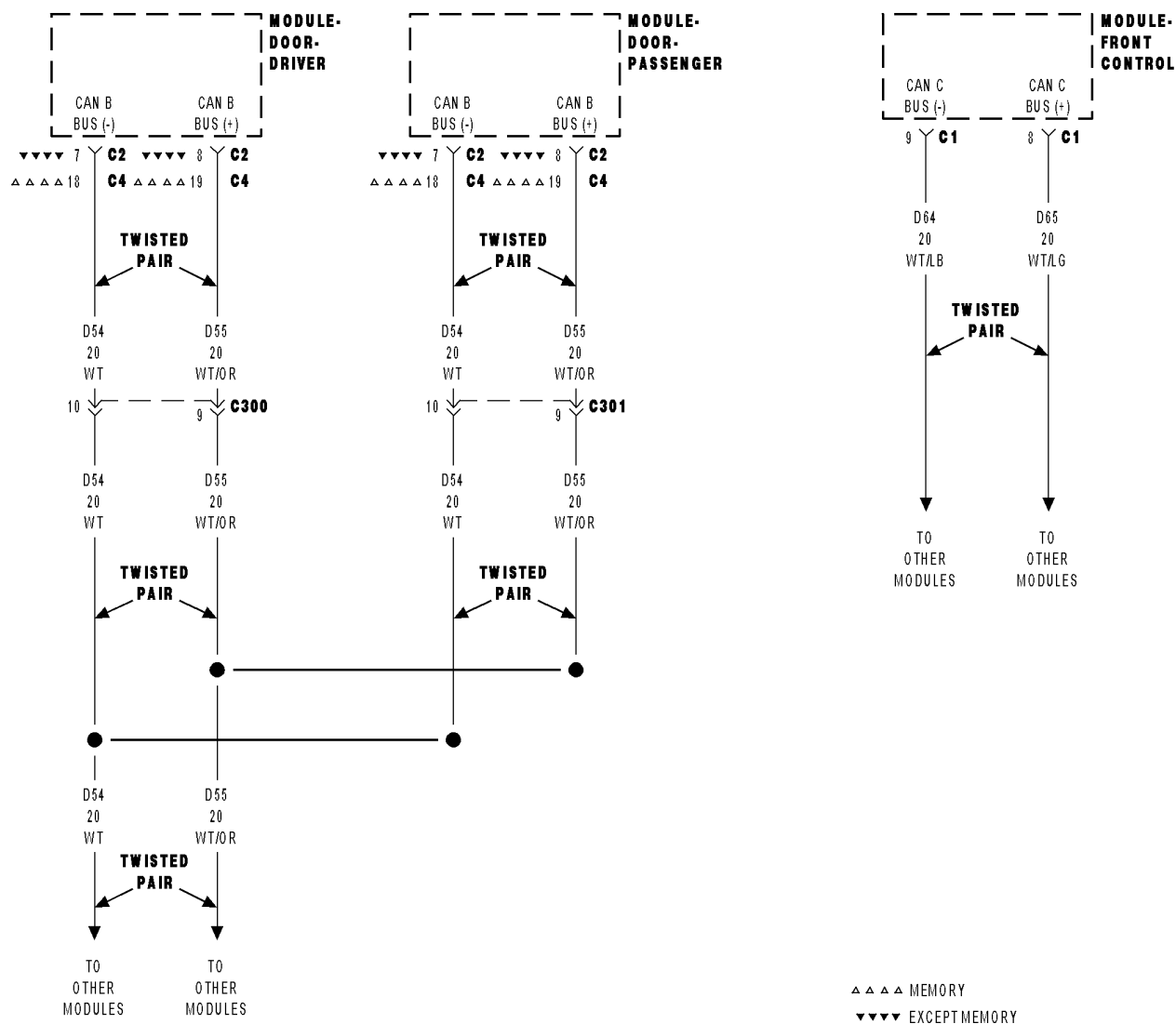
Replace the appropriate Door Module.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

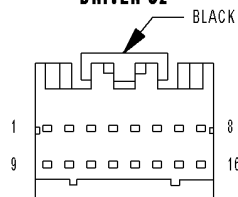
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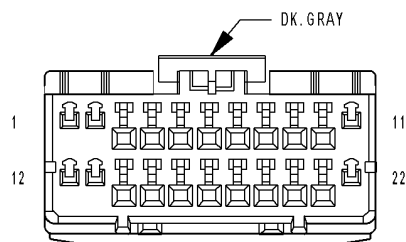
## U0019-CAN B BUS-DDM/PDM



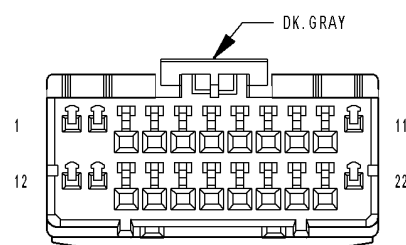
MODULE-DOOR-DRIVER C2



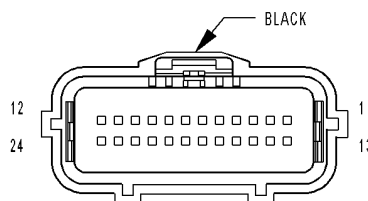
MODULE-DOOR-PASSENGER C2



MODULE-DOOR-DRIVER C4 (MEMORY)



MODULE-DOOR-PASSENGER C4 (MEMORY)



MODULE-FRONT CONTROL C1

**U0019-CAN B BUS-DDM/PDM (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Continuously
- **Set Condition:**  
Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open.

Possible Causes
CAN B BUS DTC's IN FRONT CONTROL MODULE (D55) CAN B BUS (+) CIRCUIT OPEN (D54) CAN B BUS (-) CIRCUIT OPEN DRIVER OR PASSENGER DOOR MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTCs**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**2. CHECK FRONT CONTROL MODULE DTC's**

With the scan tool, read Front Control Module active DTC's

**Does the scan tool display any CAN B BUS DTC's – ACTIVE?**

**Yes** >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. MEMORY SYSTEM EQUIPPED?**

**IS THIS VEHICLE EQUIPPED WITH THE MEMORY SYSTEM?**

**No** Go To 4

**Yes** >> Go To 6

**U0019-CAN B BUS-DDM/PDM (CONTINUED)****4. (D55) CAN B BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the appropriate Door Module C2 connector.

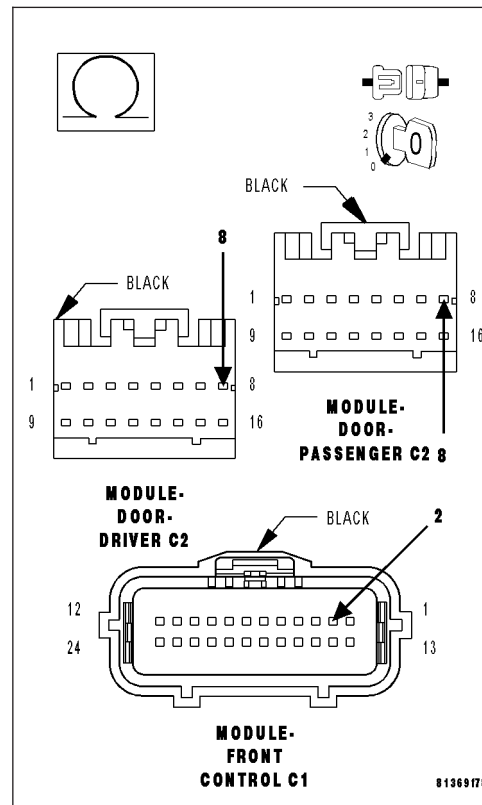
Disconnect the Front Control Module C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the Door Module C2 connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the (D55) CAN B Bus (+) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

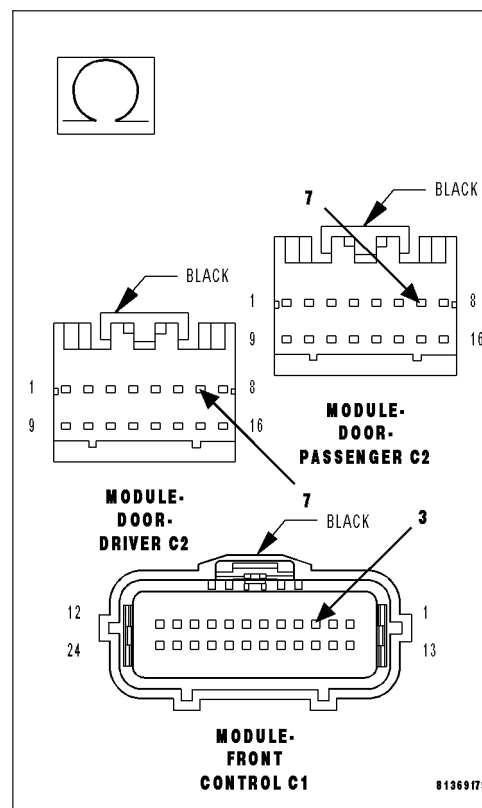
**5. (D54) CAN B BUS (-) CIRCUIT OPEN**

Measure the resistance of the (D54) CAN B Bus (-) circuit between the Front Control Module C1 connector and the Door Module C2 connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Replace the appropriate Door Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair the (D54) CAN B Bus (-) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**U0019-CAN B BUS-DDM/PDM (CONTINUED)****6. (D55) CAN B BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the appropriate Door Module C4 connector.

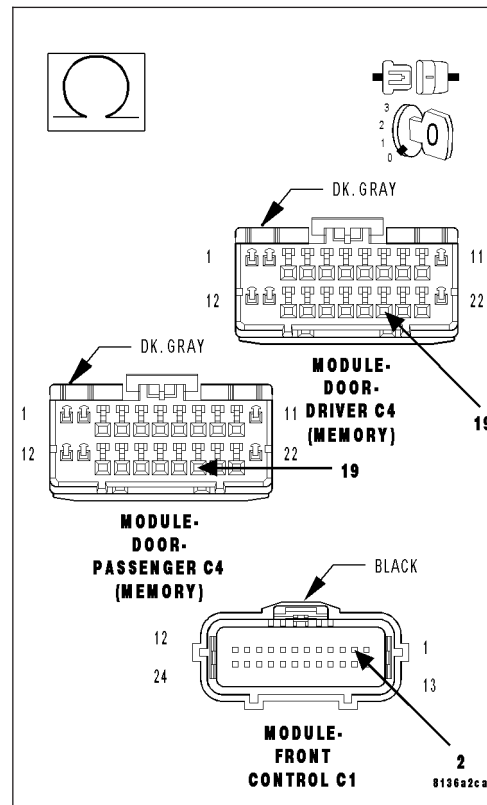
Disconnect the Front Control Module C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the Door Module C4 connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the (D55) CAN B Bus (+) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

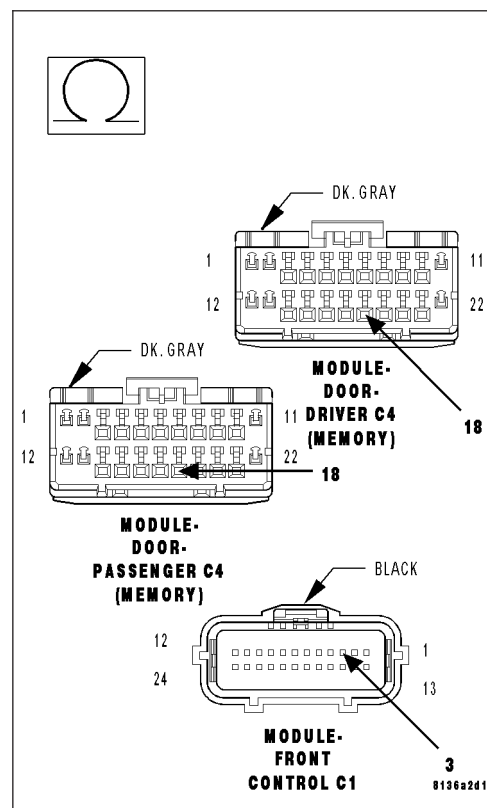
**7. (D54) CAN B BUS (-) CIRCUIT OPEN**

Measure the resistance of the (D54) CAN B Bus (-) circuit between the Front Control Module C1 connector and the Door Module C4 connector.

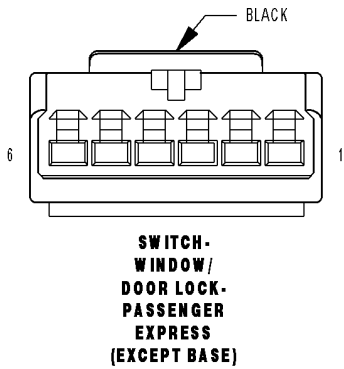
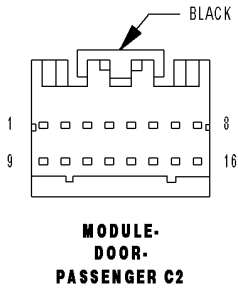
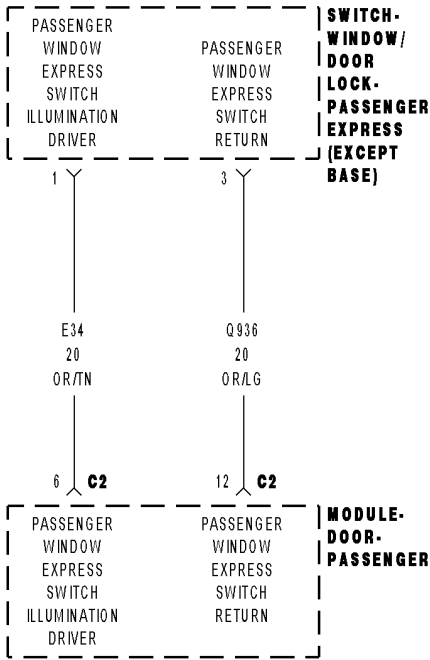
**Is the resistance below 2.0 ohms?**

**Yes** >> Replace the appropriate Door Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair the (D54) CAN B Bus (-) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



B16A4-PASSENGER WINDOW SWITCH BACKLIGHTING CIRCUIT LOW – PDM



**B16A4-PASSENGER WINDOW SWITCH BACKLIGHTING CIRCUIT LOW – PDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Whenever the module is awake, the park lamps are on and the window lock out switch is on.

- **Set Condition:**

When the Passenger Window Express Switch Illumination Driver circuit falls below 3.0 volts for over 25 ms. and the above conditions are met, this code will set.

Possible Causes
(E34) PASSENGER WINDOW EXPRESS SWITCH ILLUMINATION DRIVER CIRCUIT SHORT TO GROUND
(E34) PASSENGER WINDOW EXPRESS SWITCH ILLUMINATION DRIVER CIRCUIT SHORT TO (Q936) PASSENGER WINDOW EXPRESS SWITCH RETURN
WINDOW/DOOR LOCK SWITCH SHORTED
PASSENGER DOOR MODULE (PDM)

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Ensure the passenger window lock out switch is on.

Turn the park lights on.

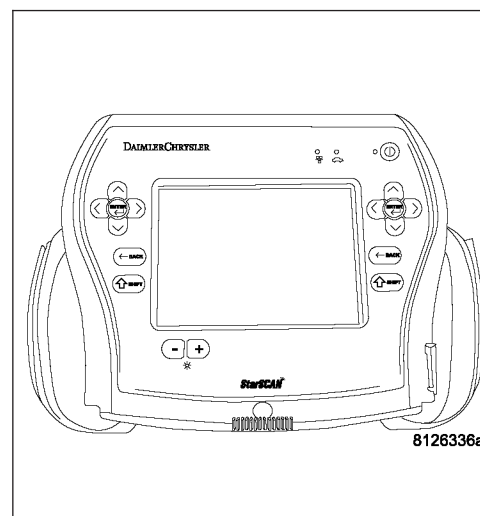
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B16A4-PASSENGER WINDOW SWITCH BACKLIGHTING CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**B16A4-PASSENGER WINDOW SWITCH BACKLIGHTING CIRCUIT LOW – PDM (CONTINUED)****2. WINDOW/DOOR LOCK SWITCH SHORTED**

With the scan tool, erase DTC's.

Turn the ignition off.

Disconnect the Passenger Window/Door Lock Switch connector.

Turn the ignition on.

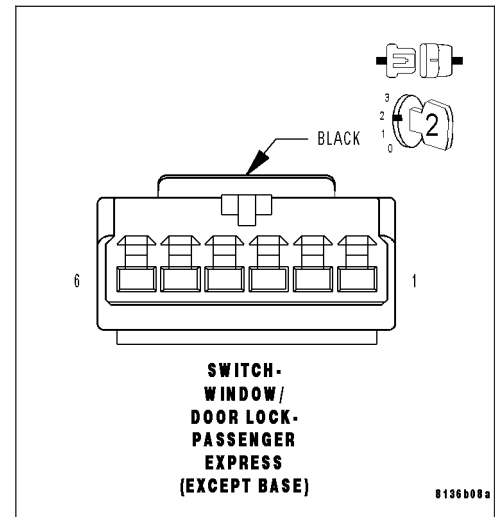
Operate the passenger window lock out switch several times.

With the scan tool, read DTC's.

**Does the scan tool display B16a4-PASSENGER WINDOW SWITCH BACKLIGHTING CIRCUIT LOW?**

**No** >> Replace the Window/Door Lock Switch.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 3

**3. (E34) PASSENGER WINDOW EXPRESS SWITCH ILLUMINATION DRIVER CIRCUIT SHORT TO GROUND**

Turn the ignition off.

Turn the park lamps off.

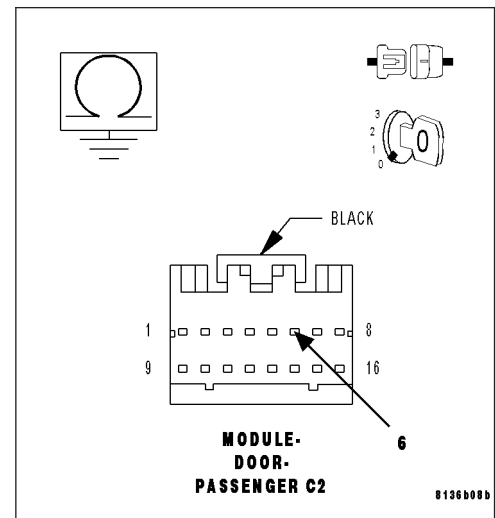
Disconnect the Passenger Door Module C2 connector.

Measure the resistance between Ground and the (E34) Passenger Window Express Switch Illumination Driver circuit.

**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (E34) Passenger Window Express Switch Illumination Driver circuit for a short to ground.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**No** >> Go To 4



**B16A4-PASSENGER WINDOW SWITCH BACKLIGHTING CIRCUIT LOW – PDM (CONTINUED)****4. (E34) PASSENGER WINDOW EXPRESS SWITCH ILLUMINATION DRIVER CIRCUIT SHORT TO (Q936) PASSENGER WINDOW EXPRESS SWITCH RETURN**

Measure the resistance between the (E34) Passenger Window Express Switch Illumination Driver circuit and the (Q936) Passenger Window Express Switch Return circuit.

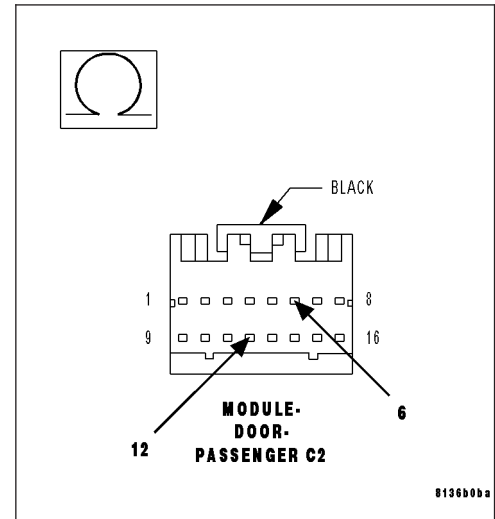
**Is the resistance below 10000.0 ohms?**

**Yes** >> Repair the (E34) Passenger Window Express Switch Illumination Driver circuit for a short to the (Q936) Passenger Window Express Switch Return circuit.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

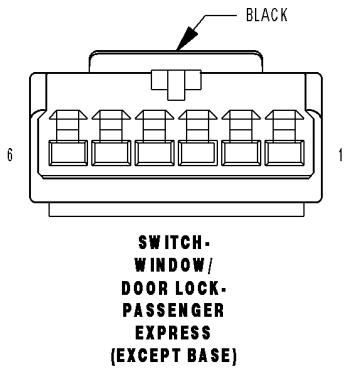
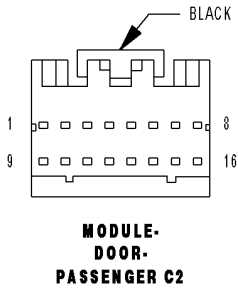
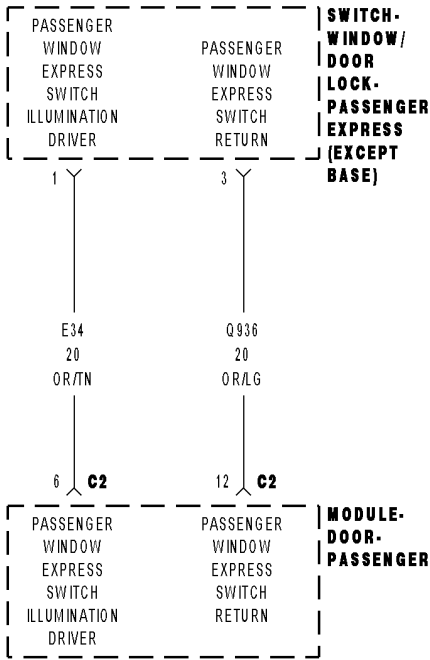
**No** >> Replace the Passenger Door Module.

Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.





B16A5-PASSENGER WINDOW SWITCH BACKLIGHTING CIRCUIT HIGH – PDM



**B16A5-PASSENGER WINDOW SWITCH BACKLIGHTING CIRCUIT HIGH – PDM (CONTINUED)**

For the Power Window circuit diagram (Refer to 8 - ELECTRICAL/POWER WINDOWS - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Whenever the power is turned off to the module and it goes from awake to sleep mode.

- **Set Condition:**

When the Passenger Window Express Switch Illumination Driver circuit is above 2.5 volts for over 15 ms. and the switch illumination output is turned off.

Possible Causes
(E34) PASSENGER WINDOW EXPRESS SWITCH ILLUMINATION DRIVER CIRCUIT SHORT TO VOLTAGE WINDOW/DOOR LOCK SWITCH SHORTED PASSENGER DOOR MODULE (PDM)

## Diagnostic Test

### 1. TEST FOR INTERMITTENT CONDITION

Turn the ignition on.

With the scan tool, record and erase DTC's

Ensure the passenger window lock out switch is off.

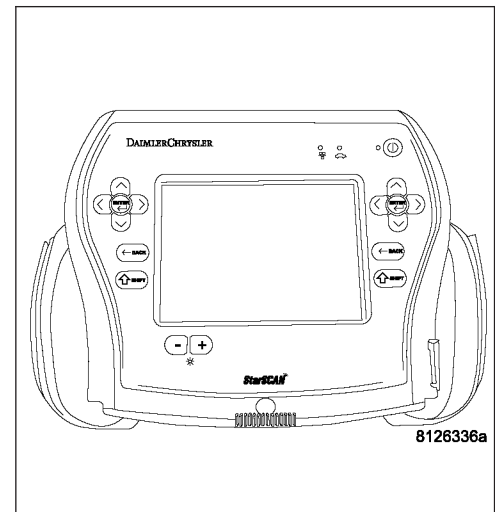
Wait 30 seconds.

With the scan tool, read DTC's.

**Does the scan tool display B16A5-PASSENGER WINDOW SWITCH BACKLIGHTING CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The conditions that caused this code to set are not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



### 2. WINDOW/DOOR LOCK SWITCH SHORTED

With the scan tool, erase DTC's.

Turn the ignition off.

Disconnect the Passenger Window/Door Lock Switch connector.

Turn the ignition on.

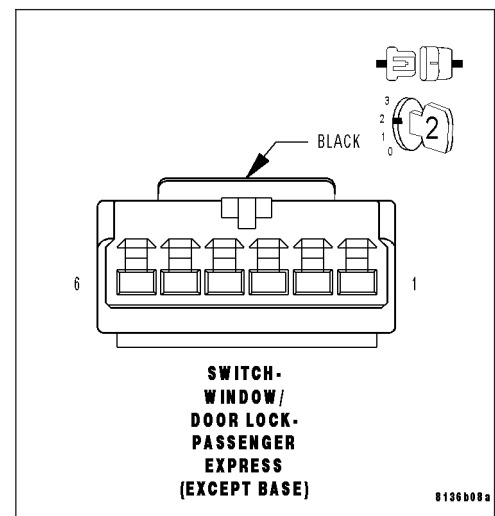
Operate the passenger window lock out switch several times.

With the scan tool, read DTC's.

**Does the scan tool display B16A5-PASSENGER WINDOW SWITCH BACKLIGHTING CIRCUIT HIGH?**

**No** >> Replace the Window/Door Lock Switch.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.

**Yes** >> Go To 3



**B16A5-PASSENGER WINDOW SWITCH BACKLIGHTING CIRCUIT HIGH – PDM (CONTINUED)****3. (E34) PASSENGER WINDOW EXPRESS SWITCH ILLUMINATION DRIVER CIRCUIT SHORT TO VOLTAGE**

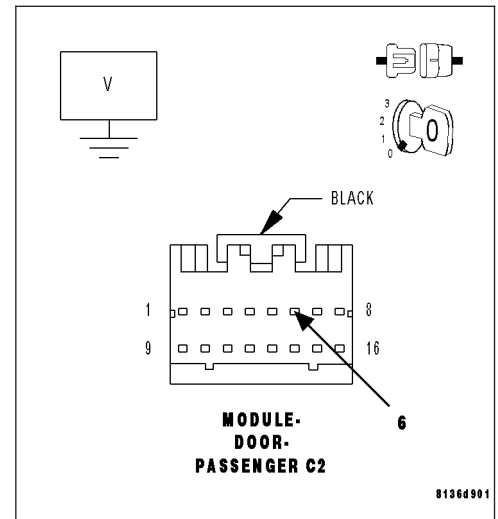
Turn the ignition off.

Disconnect the Passenger Door Module C2 connector.

Measure the voltage between the (E34) Passenger Window Express Switch Illumination Driver circuit and Ground.

**Is there any voltage present?**

- Yes** >> Repair the (E34) Passenger Window Express Switch Illumination Driver circuit for a short to voltage.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.
- No** >> Replace the Passenger Door Module.  
Perform BODY VERIFICATION TEST - VER 1.(Refer to BODY VERIFICATION TEST – VER 1.



**U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0155-LOST COMMUNICATION WITH CLUSTER/CCN**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0156-LOST COMMUNICATION WITH EOM**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0159-LOST COMMUNICATION WITH PARKING ASSIST CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

**U0169-LOST COMMUNICATION WITH SUNROOF CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0181-LOST COMMUNICATION WITH HEADLAMP LEVELING TRANSLATOR**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0184-LOST COMMUNICATION WITH RADIO**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0195-LOST COMMUNICATION WITH SDARS**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0212-LOST COMMUNICATION WITH SCCM - CAN B**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0231-LOST COMMUNICATION WITH RAIN SENSING MODULE**

For a complete wiring diagram **Refer to Section 8W.**

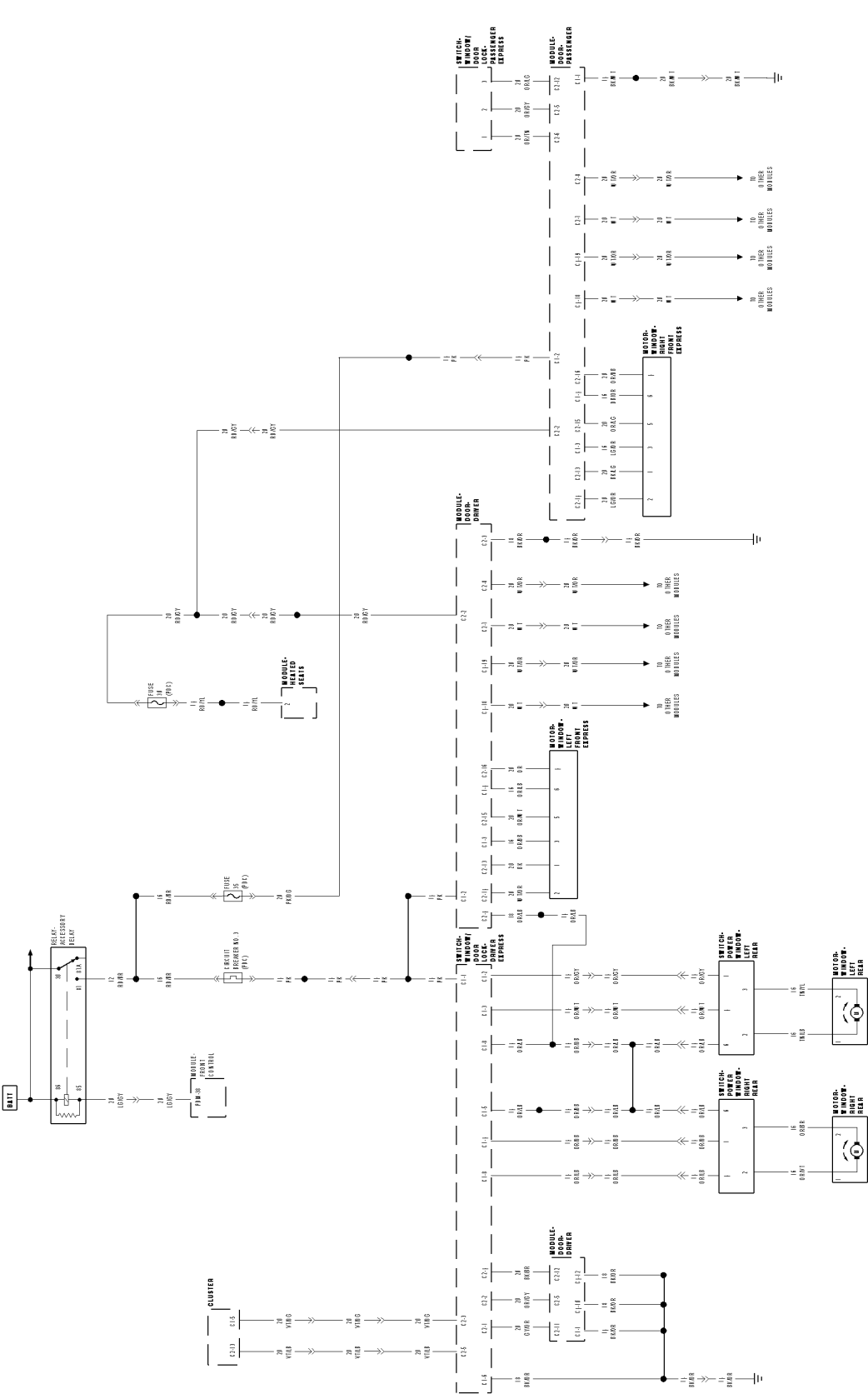
**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

SCHEMATICS AND DIAGRAMS



POWER WINDOW CIRCUIT DIAGRAM

## POWER WINDOWS - SERVICE INFORMATION

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## POWER WINDOWS - SERVICE INFORMATION

### DESCRIPTION

The power window system allows each of the door windows to be raised and lowered electrically by actuating a switch on the trim panel of each respective door. A master switch on the driver side front door trim panel allows the driver to raise or lower each of the passenger door windows and to lock out the individual switches on the passenger doors from operation. The power window system receives battery feed through a circuit breaker in the Junction Block (JB), only when the ignition switch is in the ON position.

The power window system includes the power window switches on each door trim panel, circuit breaker, door modules and the power window motors inside each door.

The window motors are replaced with the window regulator assembly. If the window motors require replacement, the window regulator must be replaced.

### OPERATION

#### POWER WINDOW SWITCH

The power windows are controlled by a window/lock switch on the trim panel of each front door. Switches in the driver door window/lock switch allows the driver to control the passenger windows.

The power window switch for the driver side front door window has a second detent position beyond the normal Down position that provides an automatic one-touch window down feature.

Some vehicles may be equipped with an express closing feature (front windows only). During an express closing, anytime an obstacle is detected in the way of the glass, the motor will stop and reverse travel to avoid pinching an occupant's fingers, etc. Modules in the doors are programmed to compare the position of the glass to the amount of current that is being used to drive up the glass.

The system also includes various features to manage the perceived forces on the glass as it travels up. If the express closing calibration is lost, the system will self-calibrate itself after the windows are moved up and down two cycles.

The power window switches control the battery and ground feeds to the power window motors. All of the passenger door power window switches receive their battery and ground feeds through the circuitry of the window/lock switch. When the power window lockout switch is in the Lock position, the battery feed for the individual passenger door power window switches is interrupted.

#### POWER WINDOW MOTOR

A permanent magnet reversible motor moves the window regulator through an integral gearbox mechanism. A positive and negative battery connection to the two motor terminals will cause the motor to rotate in one direction. Reversing the current through these same two connections will cause the motor to rotate in the opposite direction.

In addition, each power window motor is equipped with an integral self-resetting circuit breaker to protect the motor from overloads.



## DIAGNOSIS AND TESTING

### POWER WINDOWS

Any diagnosis of the Power Windows system should begin with the use of scan tool. For information on the use of the scan tool, refer to the appropriate Diagnostic Service information.

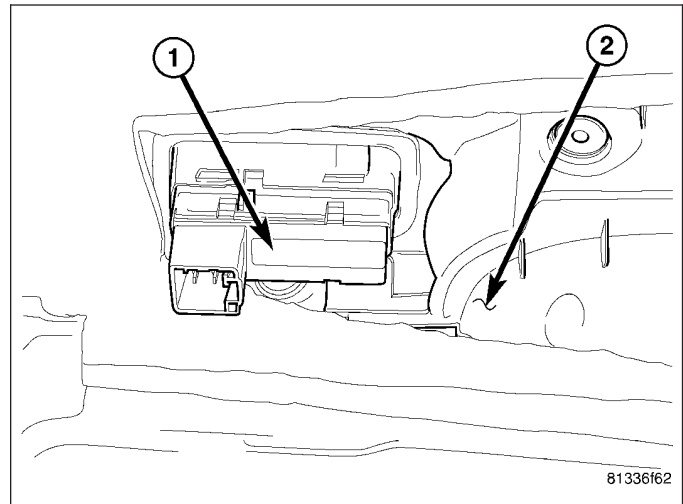
For complete circuit diagrams, refer to the appropriate wiring information.

## POWER WINDOW SWITCH

### REMOVAL

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

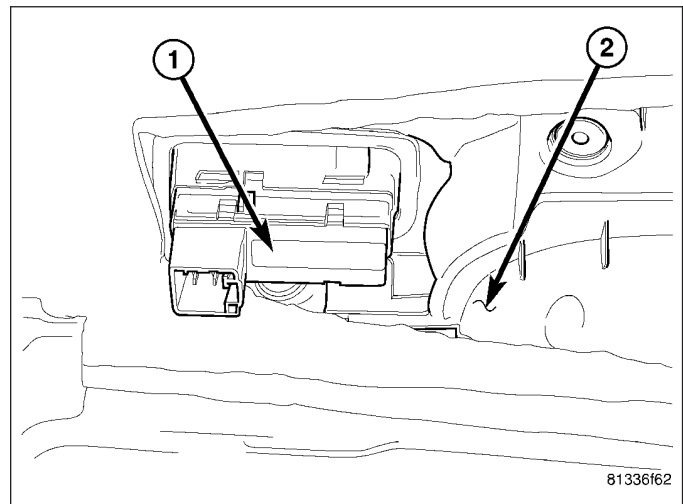
1. Disconnect and isolate the battery negative cable.
2. Remove rear door trim panel (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL).
3. Remove switch (1) from door trim panel (2).



### INSTALLATION

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Install switch (1) to rear door trim panel (2).
2. Install rear door trim panel (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION).
3. Connect battery negative cable.



# RESTRAINTS

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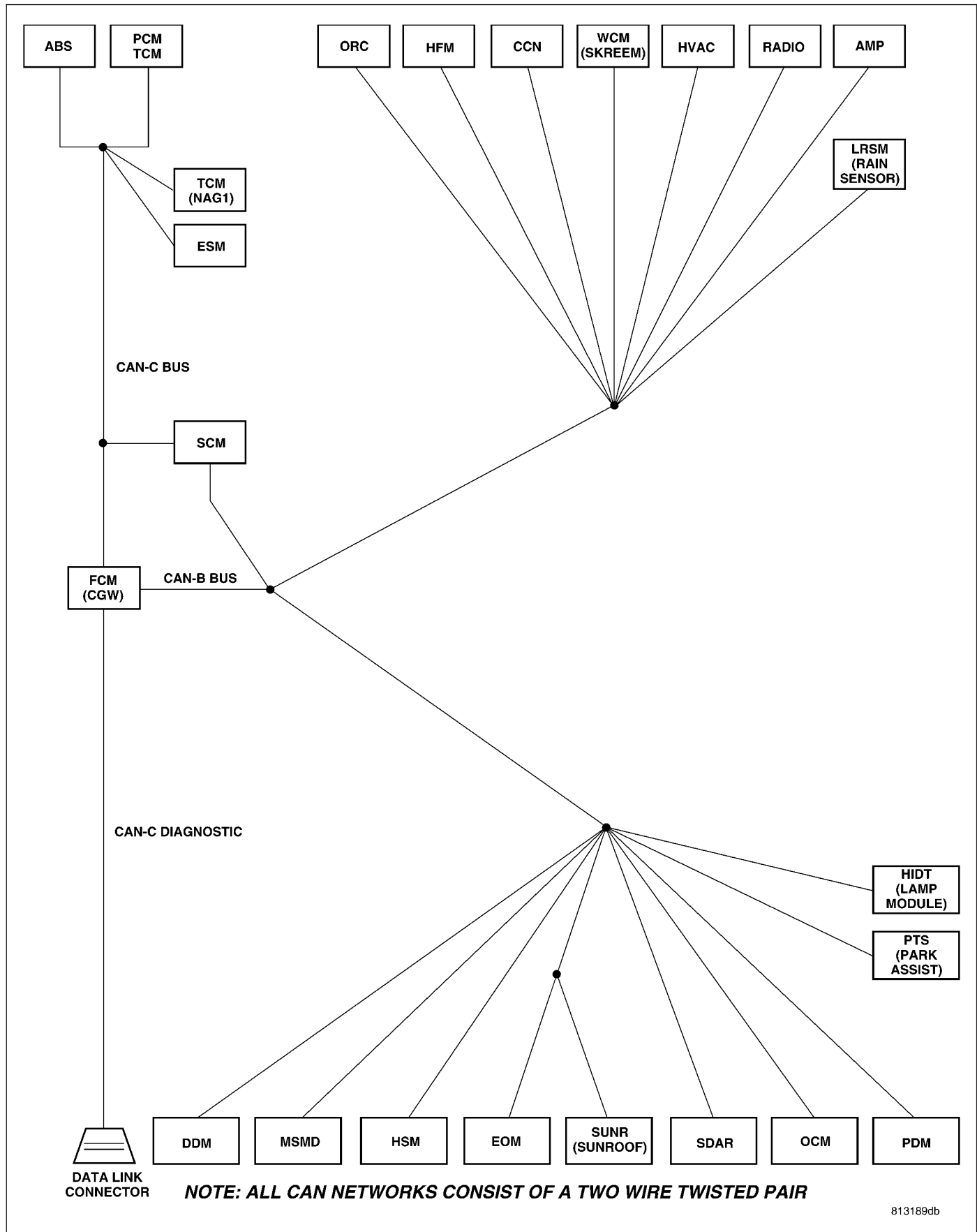
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## RESTRAINTS - ELECTRICAL DIAGNOSTICS

### DIAGNOSIS AND TESTING

**B1203-SRS WARNING INDICATOR CIRCUIT/PERFORMANCE**

**B1203-SRS WARNING INDICATOR CIRCUIT/PERFORMANCE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the CAN B bus for a message from the Instrument Cluster containing the airbag warning indicator status. The ORC requests the warning lamp status from the Instrument Cluster once every second.

- **Set Condition:**

This DTC will set immediately if the indicator status is LOW or HIGH.

Possible Causes
INSTRUMENT CLUSTER ACTIVE DTCs
ORC

**Diagnostic Test****1. CHECK FOR AN ACTIVE DTC**

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read ORC DTCs.

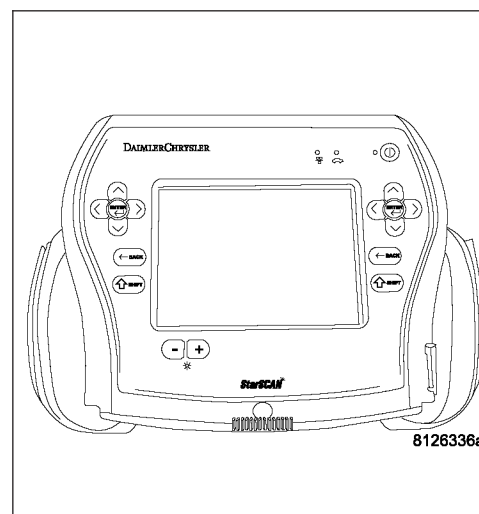
**Select DTC type.**

**Active**

Go To 2

**Stored**

Go To 4

**2. CHECK FOR INSTRUMENT CLUSTER DTCs**

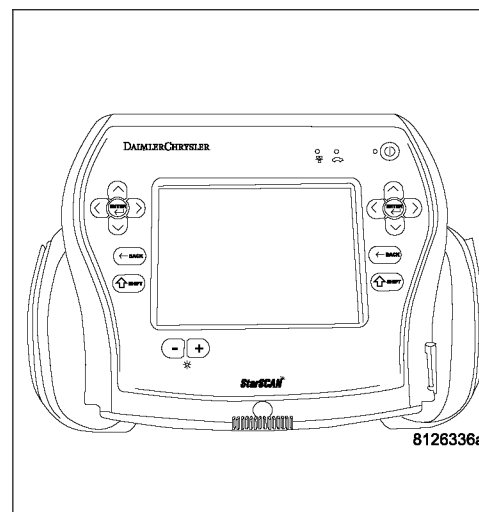
With the scan tool, read Instrument Cluster DTCs.

**Does the scan tool display any Instrument Cluster DTCs?**

**Yes** >> Refer to the symptom list for problems related to the Instrument Cluster.

Perform the ORC VERIFICATION TEST-VER 1.

**No** >> Go To 3



**B1203-SRS WARNING INDICATOR CIRCUIT/PERFORMANCE (CONTINUED)****3. REPLACE THE ORC**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Repair**

Replace the ORC in accordance with the service information.  
Perform the ORC VERIFICATION TEST-VER 1.

**4. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

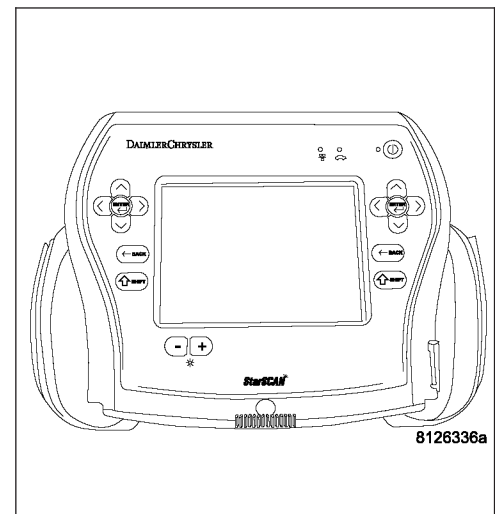
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

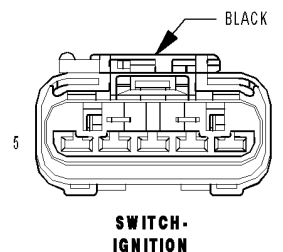
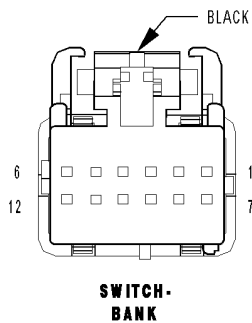
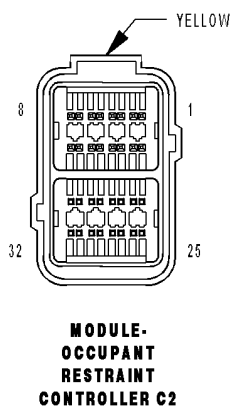
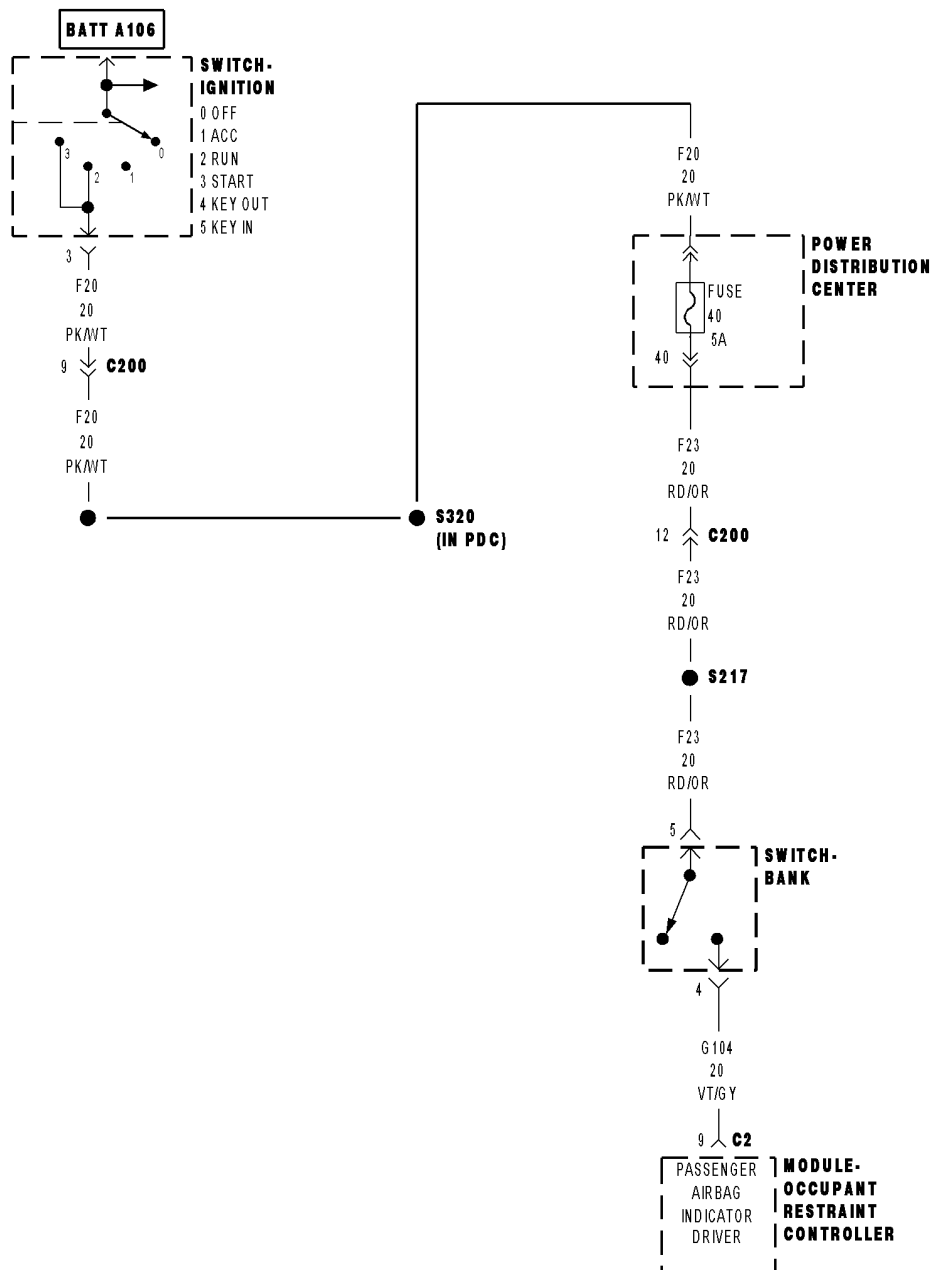
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



# B1204-PASSENGER AIRBAG INDICATOR CIRCUIT LOW





**B1204-PASSENGER AIRBAG INDICATOR CIRCUIT LOW (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).  
For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
If the Occupant Restraint Controller (ORC) cannot detect voltage on the (G104) Passenger Airbag Indicator Driver circuit.

Possible Causes
(G104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT SHORTED TO GROUND PASSENGER AIRBAG ON/OFF INDICATOR LAMP ORC

**Diagnostic Test**

**1. VERIFY THAT DTC B1204 PASSENGER AIRBAG INDICATOR CIRCUIT LOW IS ACTIVE**

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

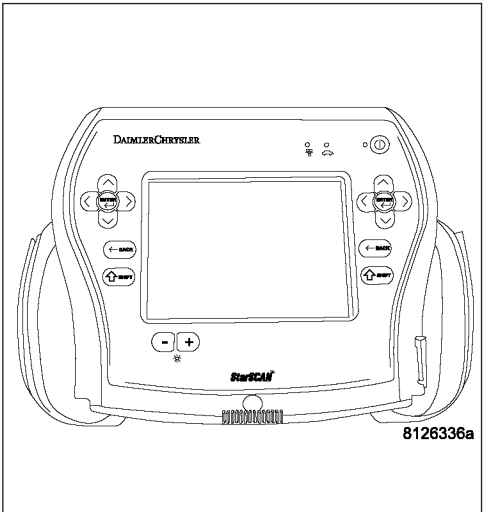
**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active: B1204 PASSENGER AIRBAG INDICATOR CIRCUIT LOW?**

- Yes**    >> Go To 2
- No**    >> Go To 5



**B1204-PASSENGER AIRBAG INDICATOR CIRCUIT LOW (CONTINUED)****2. CHECK FOR ACTIVE DTC B1204 PASSENGER AIRBAG INDICATOR CIRCUIT LOW WITH SWITCH BANK CONNECTOR DISCONNECTED**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the Switch Bank connector.

**Note:** Check connectors - Clean and repair as necessary.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, erase ORC DTCs.

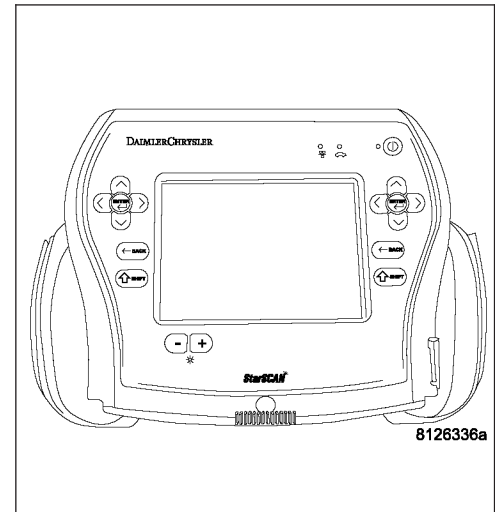
Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active: B1204 PASSENGER AIRBAG INDICATOR CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the Passenger Airbag On/Off Indicator Lamp in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1.

**3. CHECK (G104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the ORC C2 connector.

**Note:** Check connectors - Clean and repair as necessary.

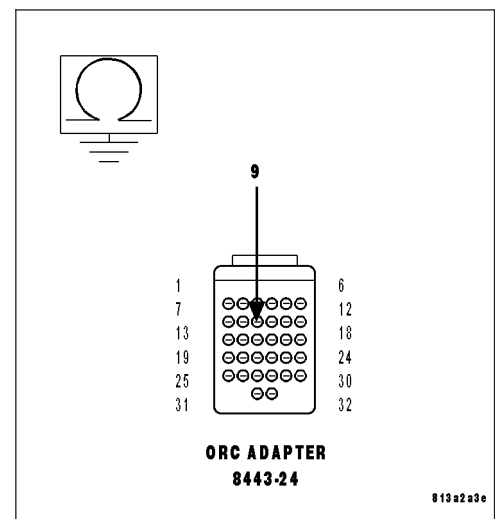
Connect the appropriate Load Tool ORC Adaptor to the ORC connector.

Measure the resistance of the (G104) Passenger Airbag Indicator Driver circuit between ground and the ORC Adaptor.

**Is the resistance below 100.0 ohms?**

**Yes** >> Repair the (G104) Passenger Airbag Indicator Driver circuit for a short to ground.  
Perform ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4



**B1204-PASSENGER AIRBAG INDICATOR CIRCUIT LOW (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Repair**

Replace the ORC in accordance with the service information.  
Perform the ORC VERIFICATION TEST-VER 1.

**5. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

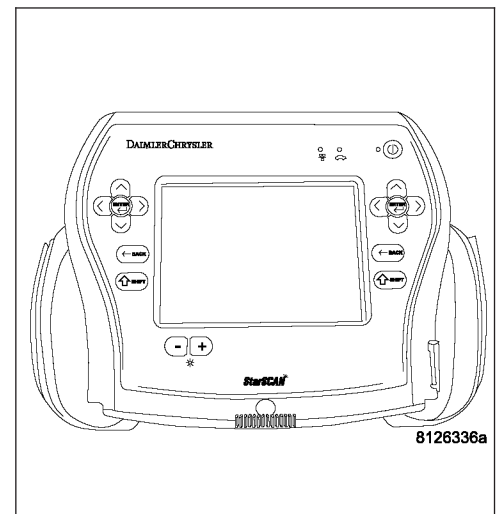
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

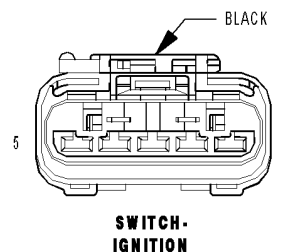
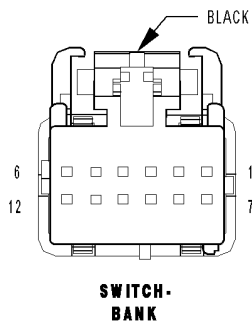
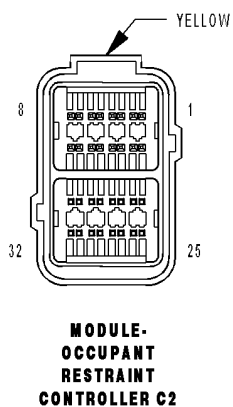
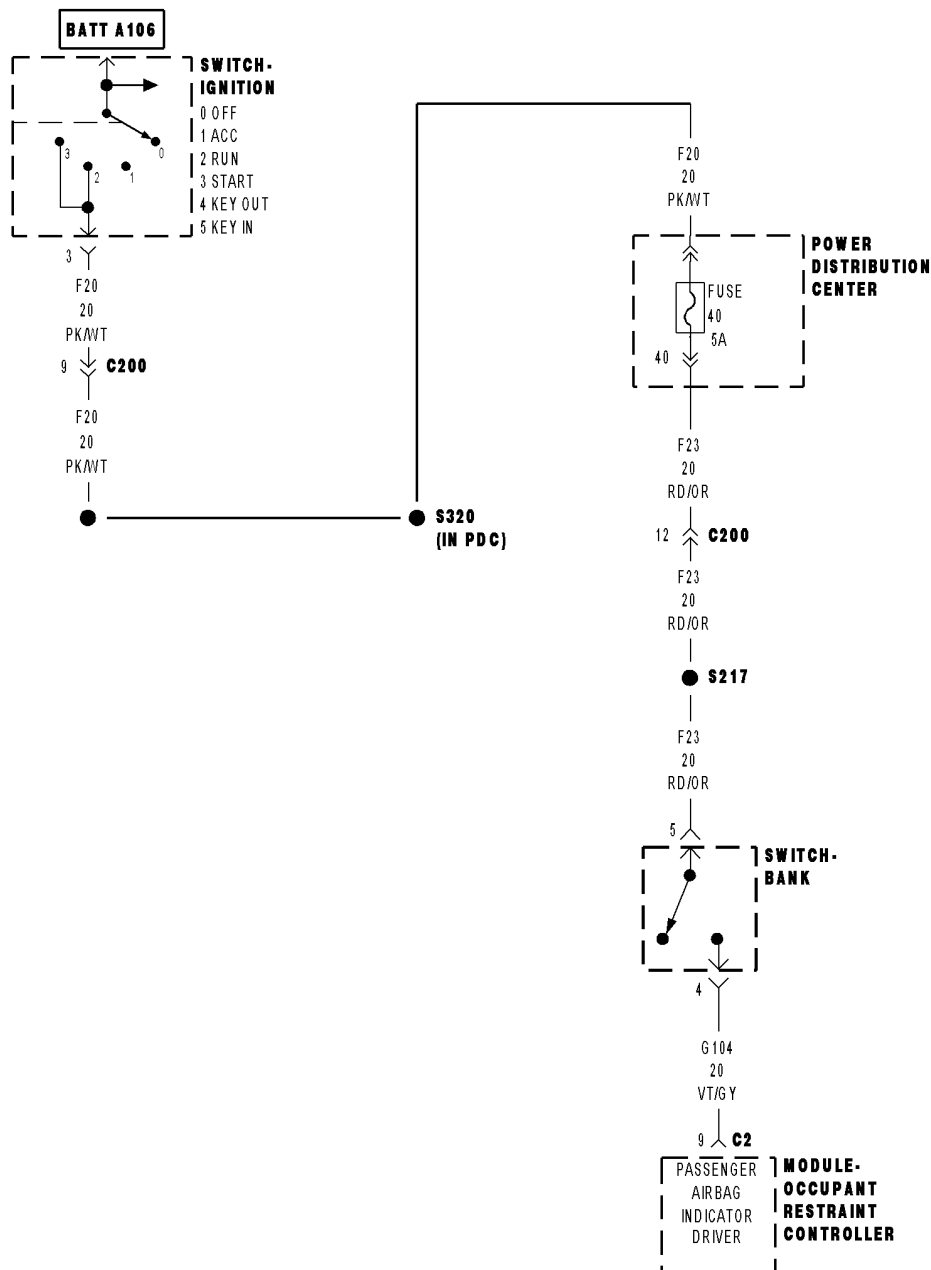
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



# B1205-PASSENGER AIRBAG INDICATOR CIRCUIT HIGH



**B1205-PASSENGER AIRBAG INDICATOR CIRCUIT HIGH (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).  
For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
If the Occupant Restraint Controller (ORC) senses a low resistance to battery voltage on the (G104) Passenger Airbag Indicator Driver circuit.

Possible Causes
(G104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT SHORTED TO (F23) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT
(G104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT SHORTED TO VOLTAGE
PASSENGER AIRBAG ON/OFF INDICATOR LAMP
ORC

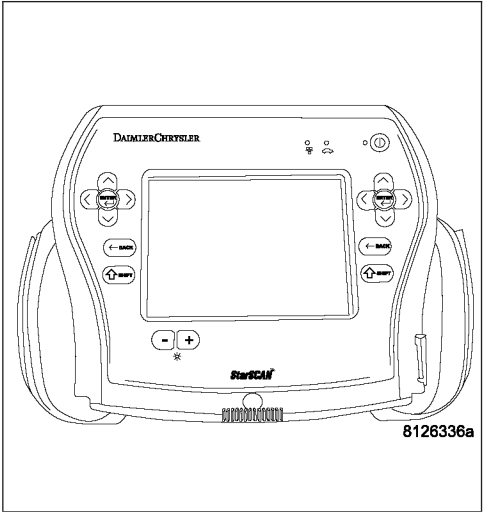
**Diagnostic Test**

**1. VERIFY THAT DTC B1205 PASSENGER AIRBAG INDICATOR CIRCUIT HIGH IS ACTIVE**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.
- Turn the ignition on.
- With the scan tool, read ORC DTCs.

**Does the scan tool display active: B1205 PASSENGER AIRBAG INDICATOR CIRCUIT HIGH?**

- Yes**    >> Go To 2
- No**    >> Go To 6



**B1205-PASSENGER AIRBAG INDICATOR CIRCUIT HIGH (CONTINUED)****2. CHECK (G104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT FOR A SHORT TO (F23) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**WARNING:** If the Occupant Classification Module (OCM) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Remove the Airbag Run-Start Fuse from the PDC.

Disconnect the ORC C1 and C2 connectors.

Disconnect the OCM C1 connector.

Disconnect the Switch Bank connector.

**Note: Check connectors - Clean and repair as necessary.**

Connect the appropriate Load Tool ORC Adaptor to the ORC connectors.

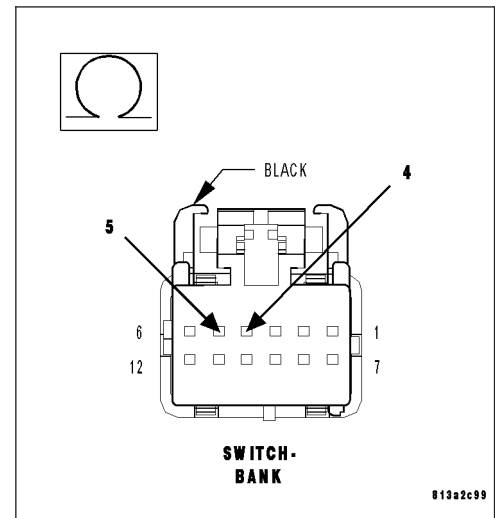
Measure the resistance between the (G104) Passenger Airbag Indicator Driver circuit and the (F23) Fused Ignition Switch Output (Run-Start) circuit in the Switch Bank connector.

**Is the resistance below 100.0 ohms?**

**Yes** >> Repair the (G104) Passenger Airbag Indicator Driver circuit for a short to the (F23) Fused Ignition Switch Output (Run-Start) circuit.

Perform ORC VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK (G104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT FOR A SHORT TO VOLTAGE**

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

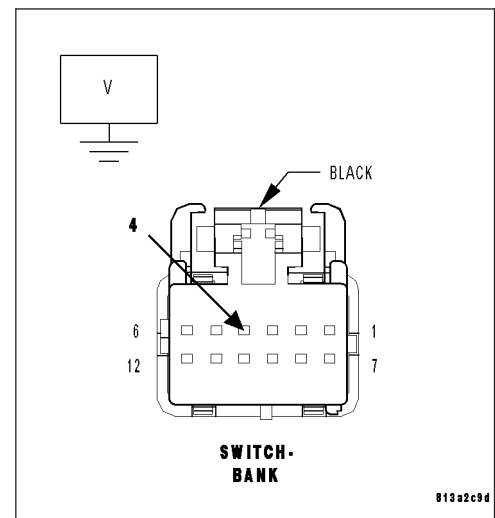
Measure the voltage of the (G104) Passenger Airbag Indicator Driver circuit.

**Is there any voltage present?**

**Yes** >> Repair the (G104) Passenger Airbag Indicator Driver circuit for a short to voltage.

Perform ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4



**B1205-PASSENGER AIRBAG INDICATOR CIRCUIT HIGH (CONTINUED)****4. CHECK FOR ACTIVE DTC B1205 PASSENGER AIRBAG INDICATOR CIRCUIT HIGH WITH SWITCH BANK CONNECTOR DISCONNECTED**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Remove the Load Tool ORC Adaptor from the ORC connectors.

Reconnect the ORC C1 and C2 connectors.

Reconnect the OCM C1 connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, erase ORC DTCs.

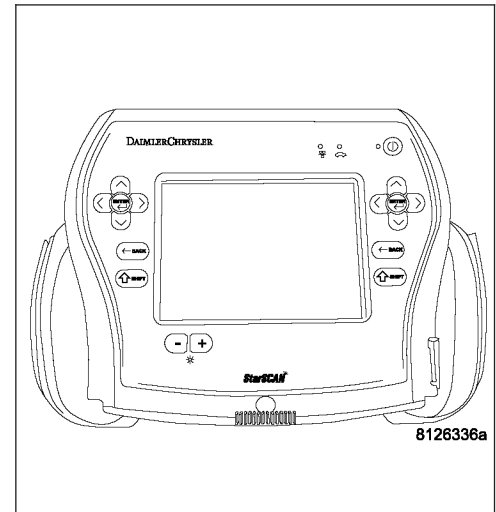
Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active: B1205 PASSENGER AIRBAG INDICATOR CIRCUIT HIGH?**

**Yes** >> Go To 5

**No** >> Replace the Passenger Airbag On/Off Indicator Lamp in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1.

**5. REPLACE THE ORC**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Repair**

Replace the ORC in accordance with the service information.  
Perform the ORC VERIFICATION TEST-VER 1.

**B1205-PASSENGER AIRBAG INDICATOR CIRCUIT HIGH (CONTINUED)****6. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

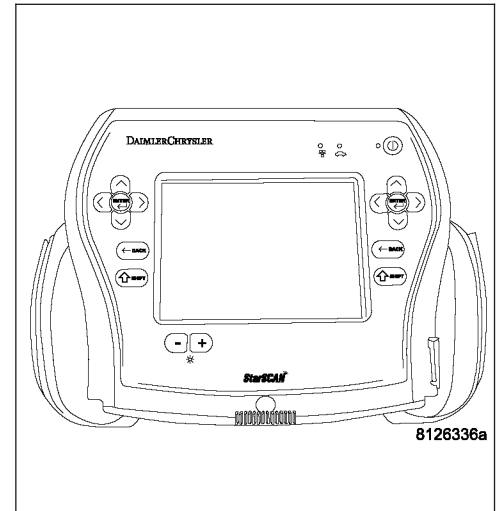
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

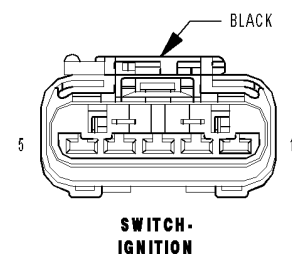
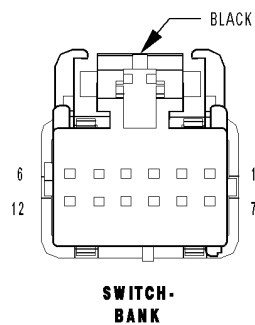
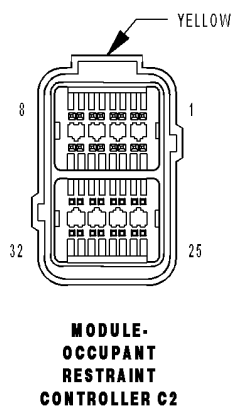
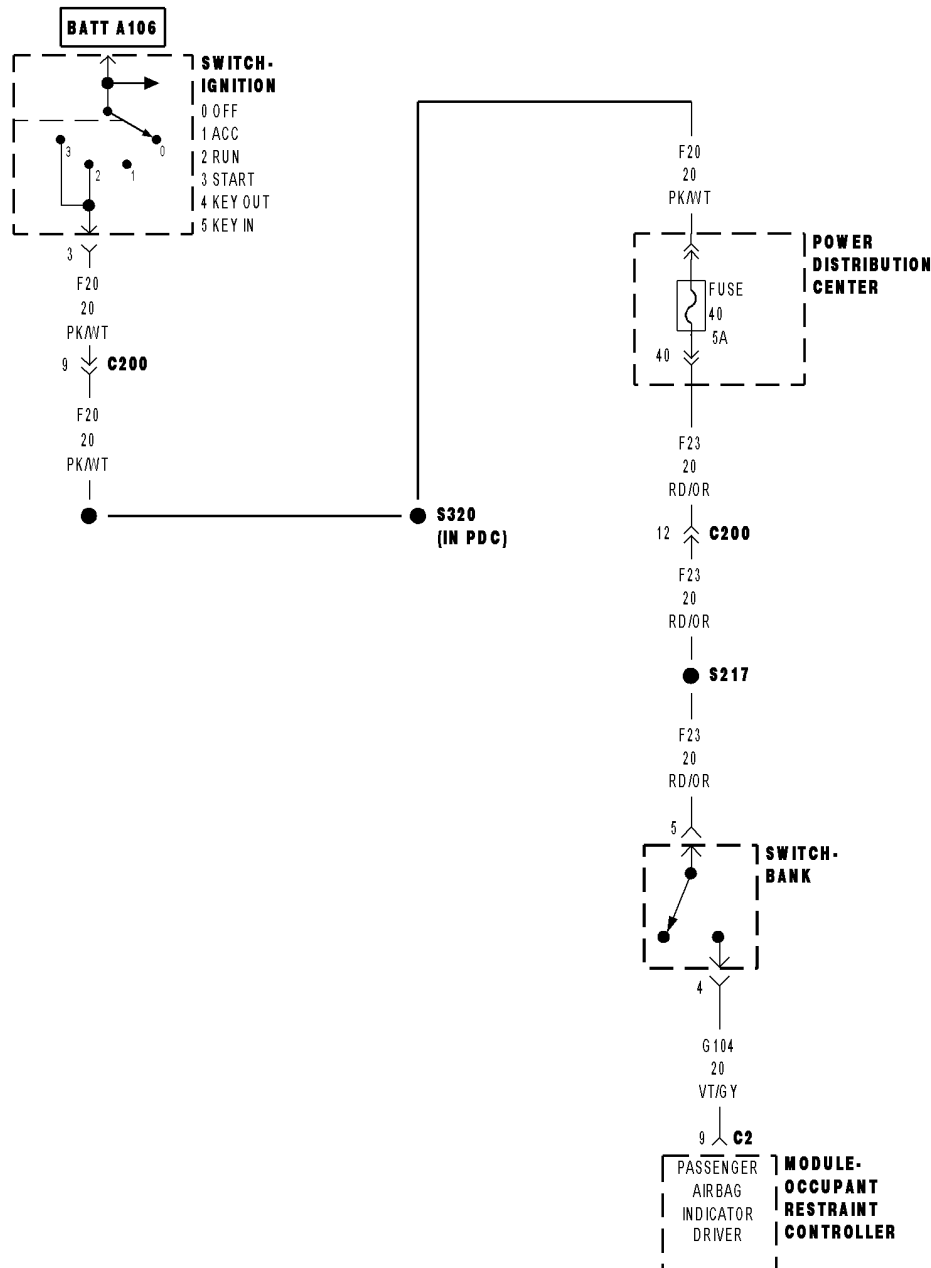
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.





**B1206-PASSENGER AIRBAG INDICATOR CIRCUIT OPEN**

**B1206-PASSENGER AIRBAG INDICATOR CIRCUIT OPEN (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
If the Occupant Restraint Controller (ORC) cannot detect voltage on the (G104) Passenger Airbag Indicator Driver circuit.

Possible Causes
SWITCH BANK CONNECTOR DISCONNECTED (G104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT OPEN PASSENGER AIRBAG ON/OFF INDICATOR LAMP ORC

**Diagnostic Test****1. VERIFY THAT DTC B1206 PASSENGER AIRBAG INDICATOR CIRCUIT OPEN IS ACTIVE**

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

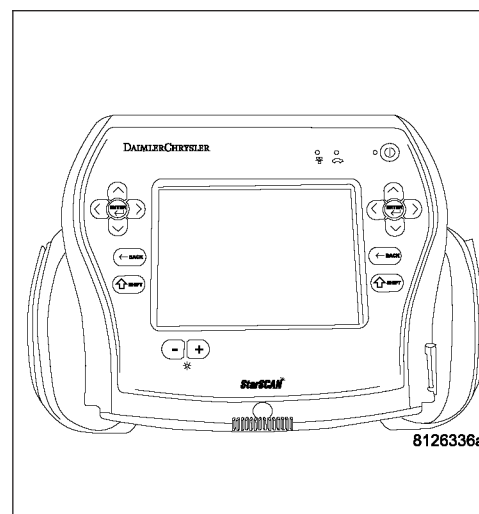
Turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active: B1206 PASSENGER AIRBAG INDICATOR CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> Go To 6

**2. VERIFY THAT SWITCH BANK CONNECTOR IS CONNECTED**

Turn the ignition off.

Gain access to the Switch Bank connector.

**Is the Switch Bank connected to the dash harness?**

**Yes** >> Go To 3

**No** >> Connect the Switch Bank to the dash harness.  
Perform ORC VERIFICATION TEST - VER 1.

**B1206-PASSENGER AIRBAG INDICATOR CIRCUIT OPEN (CONTINUED)****3. CHECK (G104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT OPERATION**

Disconnect the Switch Bank connector.

Connect a Test Light between the (G104) Passenger Airbag Indicator Driver circuit and the (F23) Fused Ignition Switch Output (Run-Start) circuit in the Switch Bank connector.

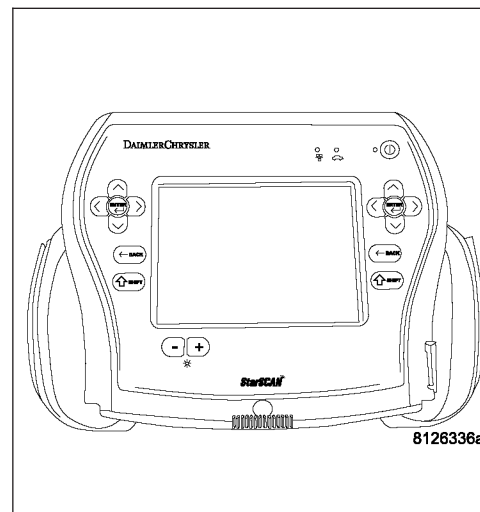
Turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active: B1206 PASSENGER AIRBAG INDICATOR CIRCUIT OPEN?**

**Yes** >> Go To 4

**No** >> Replace the Passenger Airbag On/Off Indicator Lamp in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1.

**4. CHECK (G104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT FOR AN OPEN**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the ORC C2 connector.

**Note:** Check connectors - Clean and repair as necessary.

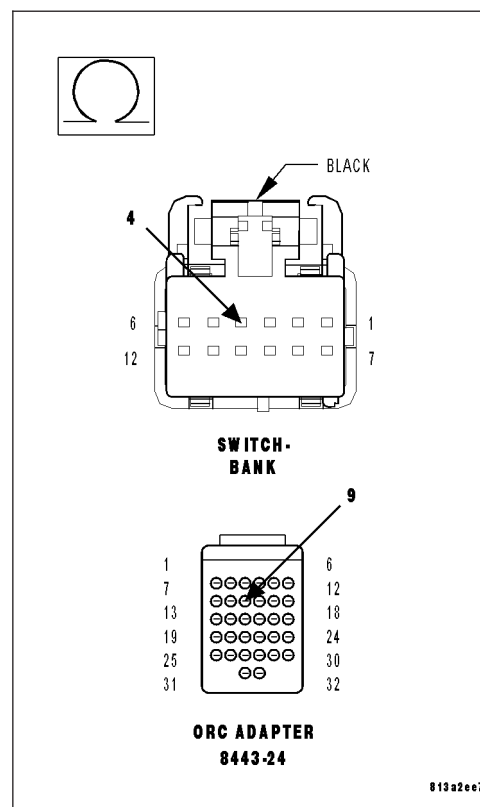
Connect the appropriate Load Tool ORC Adaptor to the ORC connector.

Measure the resistance of the (G104) Passenger Airbag Indicator Driver circuit between the ORC Adaptor and the Switch Bank connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the (G104) Passenger Airbag Indicator Driver circuit for an open.  
Perform ORC VERIFICATION TEST - VER 1.



**B1206-PASSENGER AIRBAG INDICATOR CIRCUIT OPEN (CONTINUED)****5. REPLACE THE ORC**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Repair**

Replace the ORC in accordance with the service information.  
Perform the ORC VERIFICATION TEST-VER 1.

**6. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

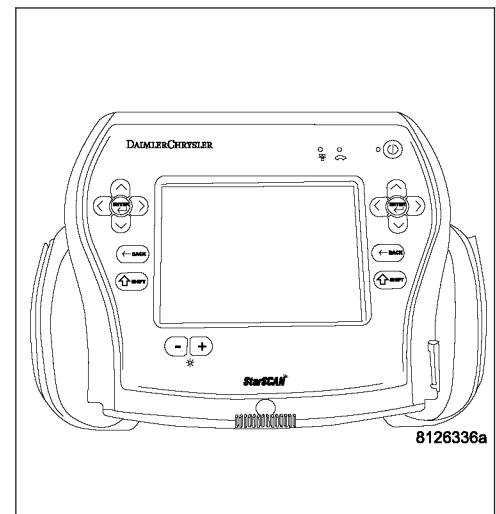
If only stored codes return, continue the test until the problem area has been isolated.

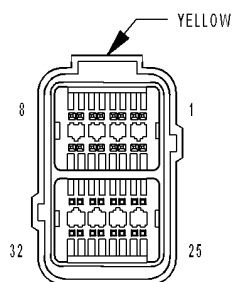
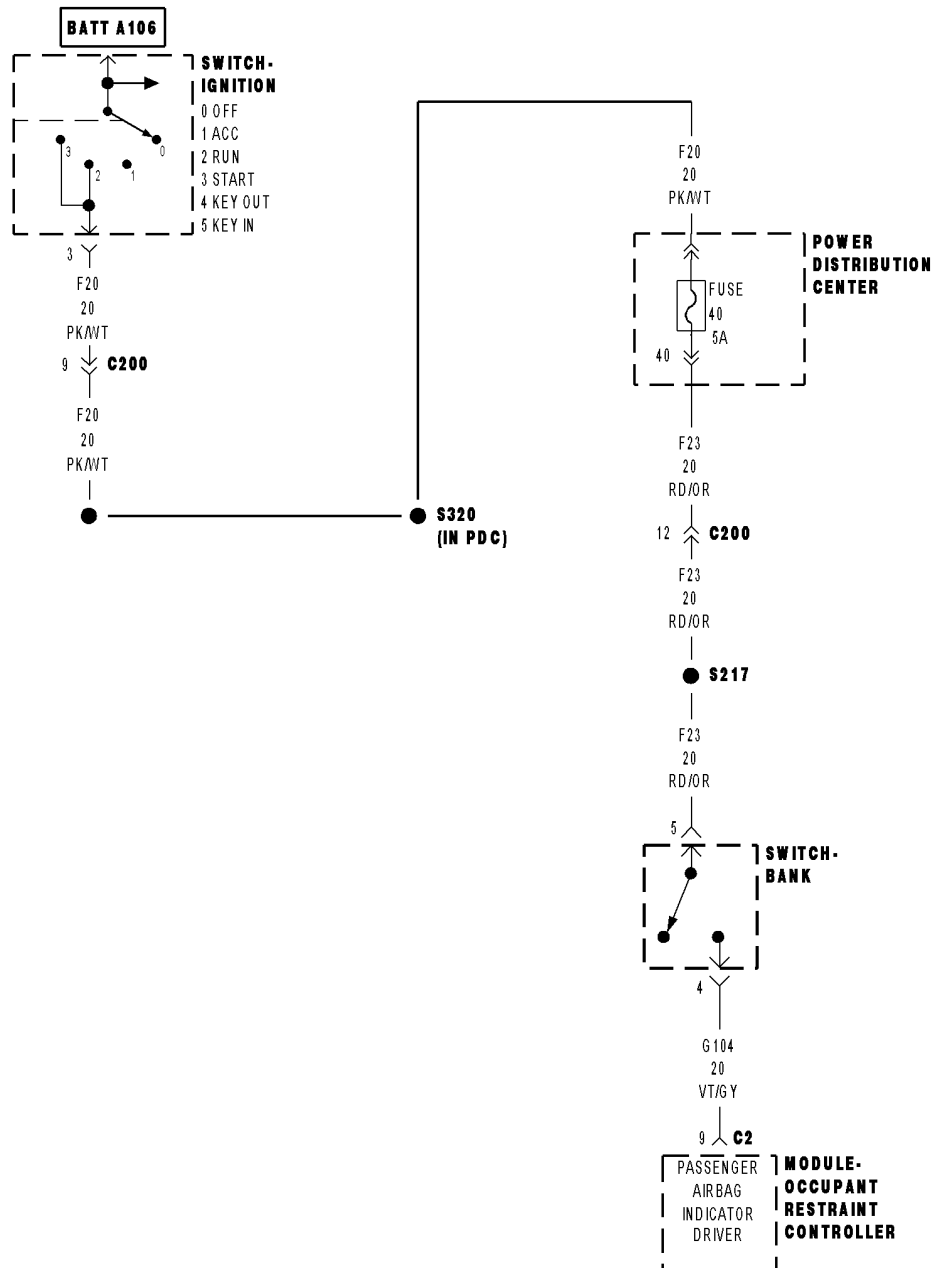
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

**Does the scan tool display any ACTIVE DTCs?**

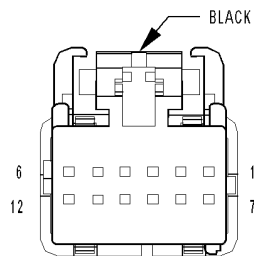
**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.

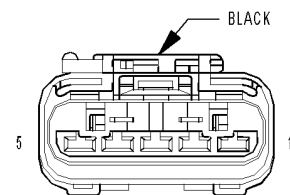


**B1207-PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER**

**MODULE-OCCUPANT RESTRAINT CONTROLLER C2**



**SWITCH-BANK**



**SWITCH-IGNITION**

**B1207-PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
When the Occupant Restraint Controller (ORC) detects over current on the (G104) Passenger Airbag Indicator Driver circuit.

Possible Causes
(G104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT SHORTED TO (F23) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT
(G104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT SHORTED TO VOLTAGE
PASSENGER AIRBAG ON/OFF INDICATOR LAMP
ORC

**Diagnostic Test****1. VERIFY THAT DTC B1207 PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER IS ACTIVE**

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

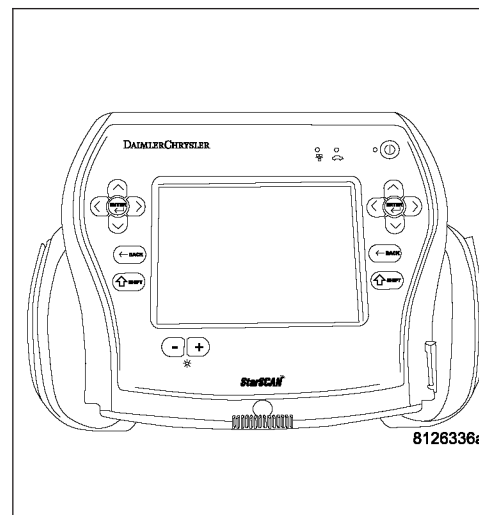
Turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active: B1207 PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 2

**No** >> Go To 6



**B1207-PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER (CONTINUED)****2. CHECK (G104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT FOR A SHORT TO (F23) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**WARNING:** If the Occupant Classification Module (OCM) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Remove the Airbag Run-Start Fuse from the PDC.

Disconnect the ORC C1 and C2 connectors.

Disconnect the OCM C1 connector.

Disconnect the Switch Bank connector.

**Note: Check connectors - Clean and repair as necessary.**

Connect the appropriate Load Tool ORC Adaptor to the ORC connectors.

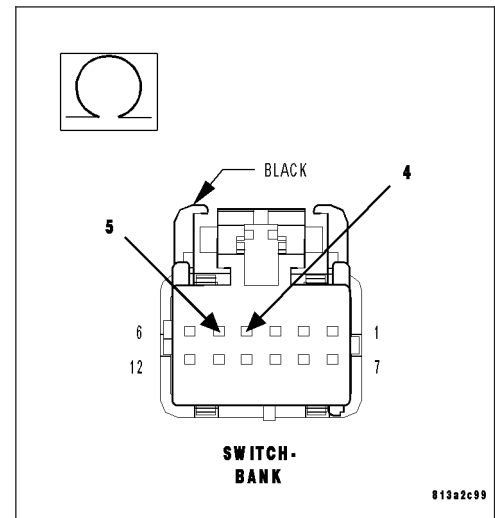
Measure the resistance between the (G104) Passenger Airbag Indicator Driver circuit and the (F23) Fused Ignition Switch Output (Run-Start) circuit in the Switch Bank connector.

**Is the resistance below 100.0 ohms?**

**Yes** >> Repair the (G104) Passenger Airbag Indicator Driver circuit for a short to the (F23 Fused Ignition Switch Output (Run-Start) circuit.

Perform ORC VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK (G104) PASSENGER AIRBAG INDICATOR DRIVER CIRCUIT FOR A SHORT TO VOLTAGE**

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

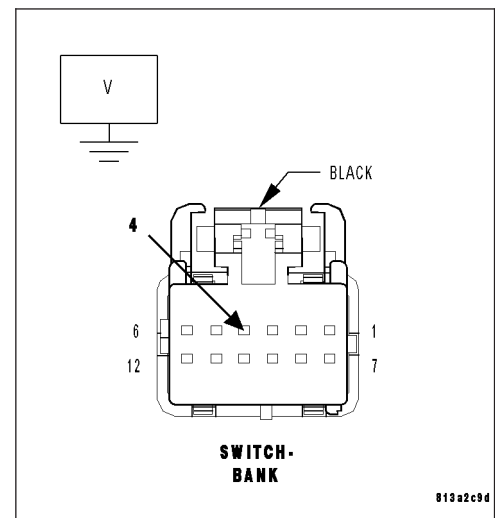
Measure the voltage of the (G104) Passenger Airbag Indicator Driver circuit.

**Is there any voltage present?**

**Yes** >> Repair the (G104) Passenger Airbag Indicator Driver circuit for a short to voltage.

Perform ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4



**B1207-PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER (CONTINUED)****4. CHECK FOR ACTIVE DTC B1207 PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER WITH SWITCH BANK CONNECTOR DISCONNECTED**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Remove the Load Tool ORC Adaptor from the ORC connectors.

Reconnect the ORC C1 and C2 connectors.

Reconnect the OCM C1 connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, erase ORC DTCs.

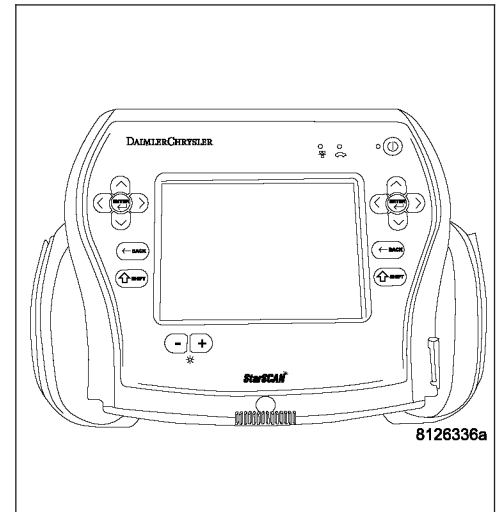
Turn the ignition off, wait 10 seconds, and then turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active: B1207 PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 5

**No** >> Replace the Passenger Airbag On/Off Indicator Lamp in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1.

**5. REPLACE THE ORC**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Repair**

Replace the ORC in accordance with the service information.  
Perform the ORC VERIFICATION TEST-VER 1.



**B1207-PASSENGER AIRBAG INDICATOR CIRCUIT SHORTED TOGETHER (CONTINUED)****6. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

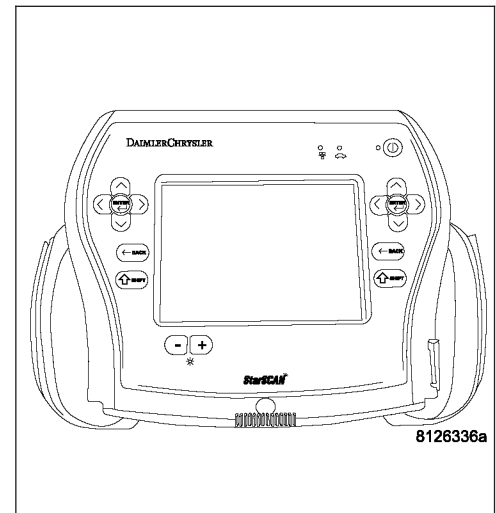
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

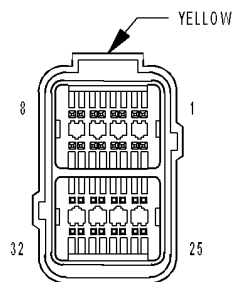
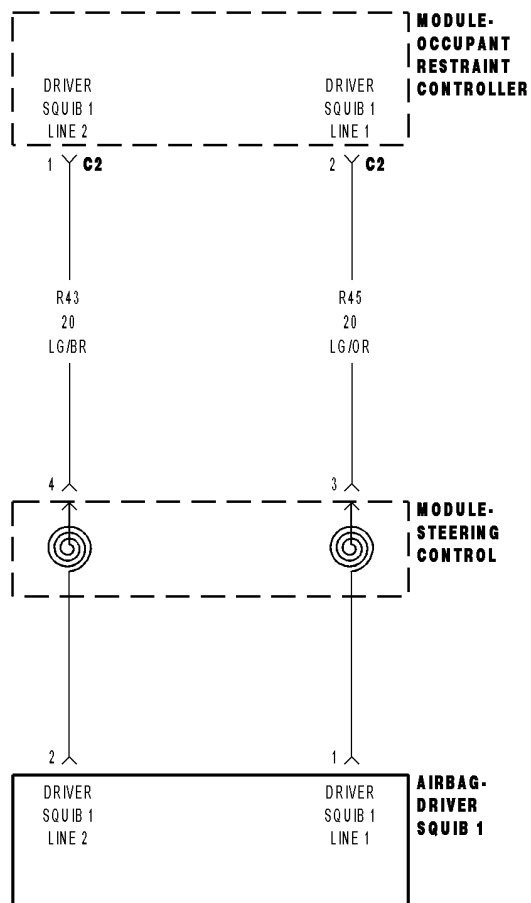
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

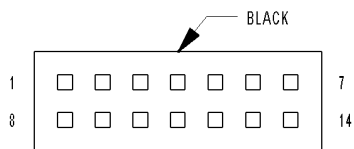
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



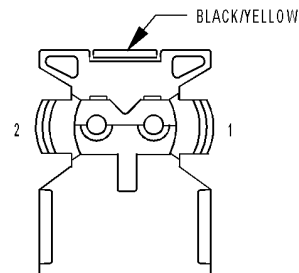
## B1B00-DRIVER AIRBAG SQUIB 1 CIRCUIT LOW



**MODULE-  
OCCUPANT  
RESTRAINT  
CONTROLLER C2**



**MODULE-  
STEERING CONTROL**



**AIRBAG-  
DRIVER  
SQUIB 1**

**B1B00-DRIVER AIRBAG SQUIB 1 CIRCUIT LOW (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Driver Squib 1 circuits.
- **Set Condition:**  
The ORC has detected low resistance on the Driver Squib 1 circuits.

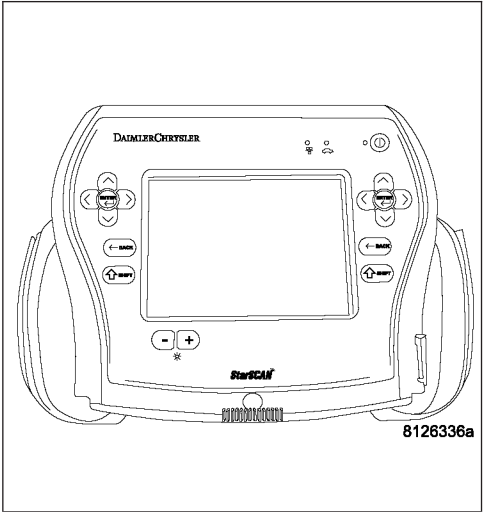
Possible Causes
(R43) DRIVER SQUIB 1 LINE 2 CIRCUIT OR (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT SHORTED TO GROUND CLOCKSPRING DRIVER AIRBAG ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 6



**B1B00-DRIVER AIRBAG SQUIB 1 CIRCUIT LOW (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN DRIVER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Driver Airbag Squib connectors.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag Squib connectors.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

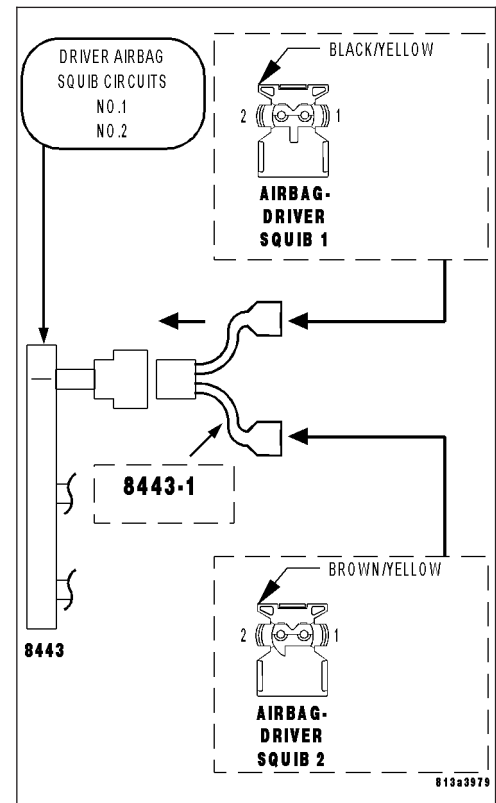
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B00 DRIVER AIRBAG SQUIB 1 CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the Driver Airbag in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**3. CHECK CLOCKSPRING SQUIB CIRCUITS FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool Jumper from the Driver Airbag Squib connectors.

Remove the Steering Control Module from the steering column in accordance with the Service Information.

Disconnect the Steering Control Module connector.

**Note:** Check connectors - Clean and repair as necessary.

With the Steering Control Module Connector attached to the steering column, connect the 8443 Load Tool and appropriate Jumper to the Steering Control Module connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

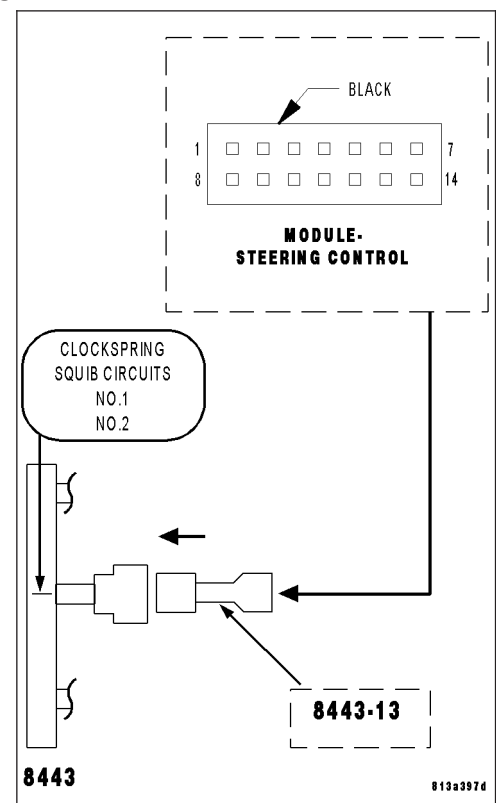
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B00 DRIVER AIRBAG SQUIB 1 CIRCUIT LOW?**

**Yes** >> Go To 4

**No** >> Replace the Clockspring in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1



**B1B00-DRIVER AIRBAG SQUIB 1 CIRCUIT LOW (CONTINUED)****4. CHECK (R43) DRIVER SQUIB 1 LINE 2 CIRCUIT AND (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Steering Control Module connector.

Disconnect the ORC connectors.

**Note: Check connectors - Clean and repair as necessary.**

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

Measure the resistance of the (R43) Driver Squib 1 Line 2 circuit between ground and the Steering Column Module connector.

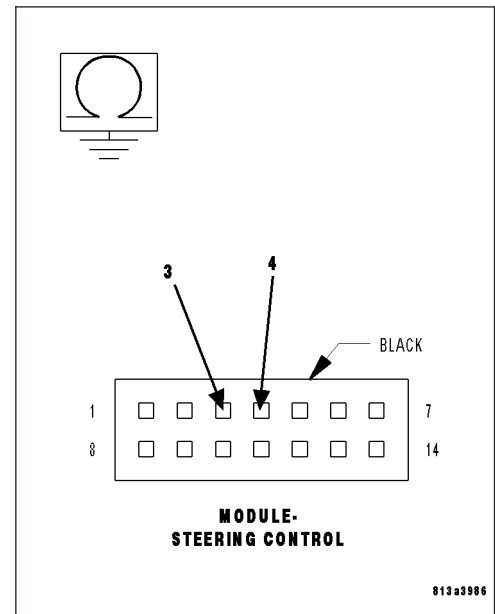
Measure the resistance of the (R45) Driver Squib 1 Line 1 circuit between ground and the Steering Column Module connector.

**Is the resistance below 10K ohms for either measurement?**

**Yes** >> Repair the Driver Squib 1 circuits with a resistance below 10K ohms for a short to ground.

Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 5

**5. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**B1B00-DRIVER AIRBAG SQUIB 1 CIRCUIT LOW (CONTINUED)****6. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

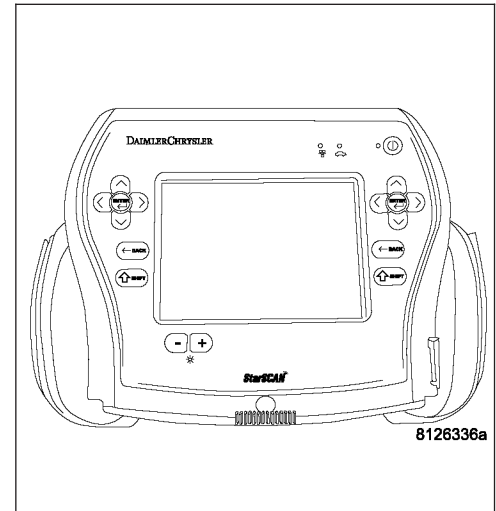
If only stored codes return continue the test until the problem area has been isolated.

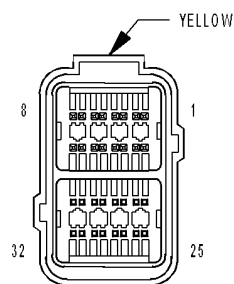
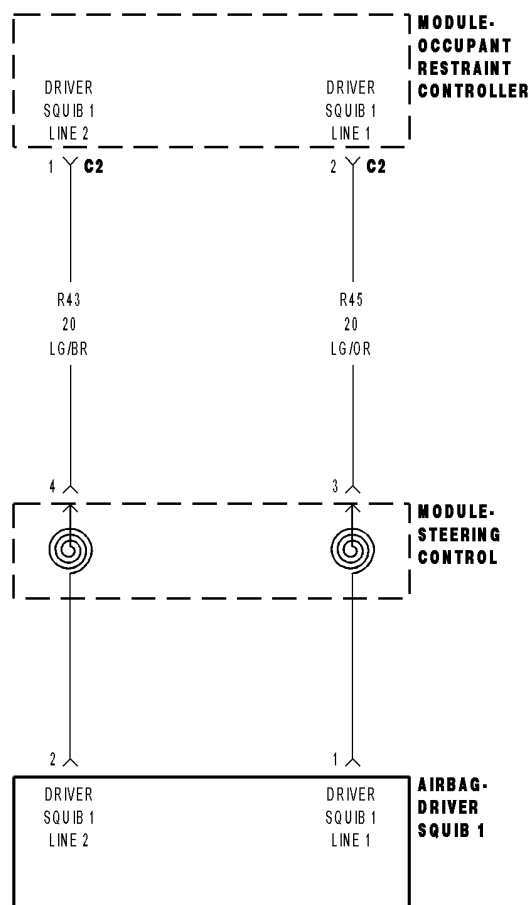
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

**Are any ACTIVE DTCs present?**

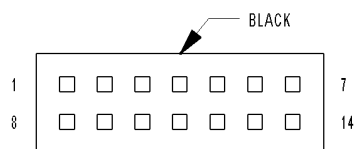
**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.

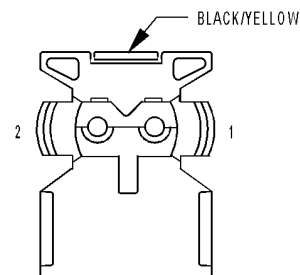


**B1B01-DRIVER AIRBAG SQUIB 1 CIRCUIT HIGH**

**MODULE-OCCUPANT  
RESTRAINT  
CONTROLLER C2**



**MODULE-  
STEERING CONTROL**



**AIRBAG-  
DRIVER  
SQUIB 1**

**B1B01-DRIVER AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the voltage on the Driver Squib 1 circuits.

- **Set Condition:**

The ORC has detected voltage on the Driver Squib 1 circuits.

Possible Causes
(R43) DRIVER SQUIB 1 LINE 2 CIRCUIT OR (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT SHORTED TO BATTERY CLOCKSPRING DRIVER AIRBAG ORC

## Diagnostic Test

### 1. DETERMINE ACTIVE OR STORED DTC

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

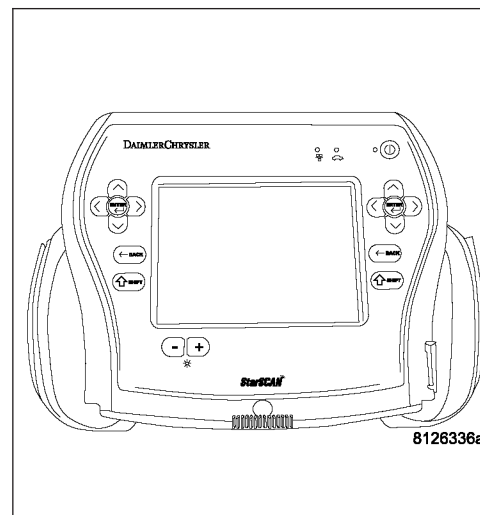
Is the DTC active or stored?

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 6





**B1B01-DRIVER AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN DRIVER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Driver Airbag Squib connectors.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag Squib connectors.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

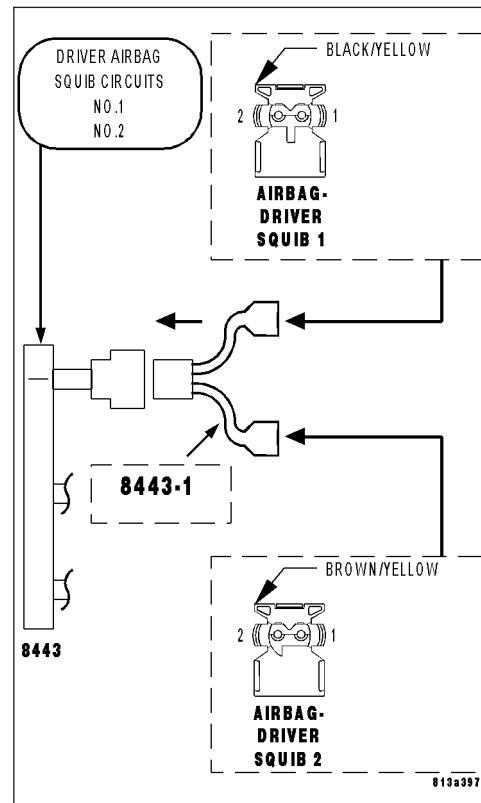
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B01 DRIVER AIRBAG SQUIB 1 CIRCUIT HIGH?**

**Yes** >> Go To 3

**No** >> Replace the Driver Airbag in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**3. CHECK CLOCKSPRING SQUIB CIRCUITS FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Driver Airbag Squib connectors.

Remove the Steering Control Module from the steering column in accordance with the Service Information.

Disconnect the Steering Control Module connector.

**Note:** Check connectors - Clean and repair as necessary.

With the Steering Control Module Connector attached to the steering column, connect the 8443 Load Tool and appropriate Jumper to the Steering Control Module connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

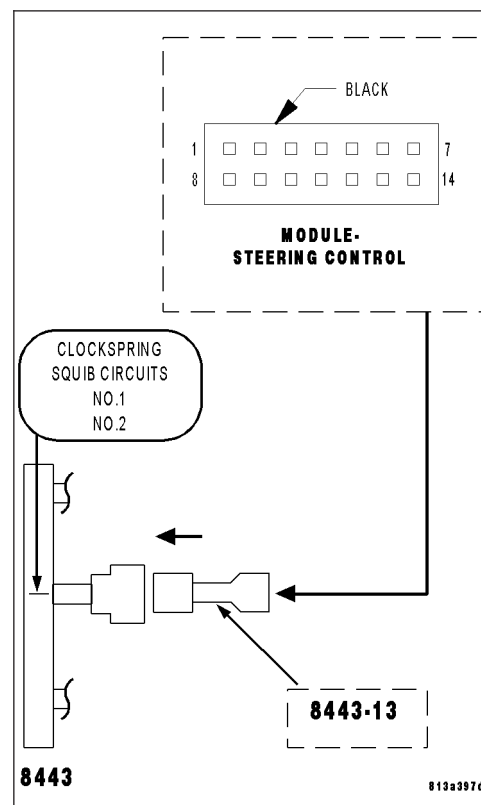
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B01 DRIVER AIRBAG SQUIB 1 CIRCUIT HIGH?**

**Yes** >> Go To 4

**No** >> Replace the Clockspring in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1



**B1B01-DRIVER AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)****4. CHECK (R43) DRIVER SQUIB 1 LINE 2 CIRCUIT AND (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Steering Control Module connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R43) Driver Squib 1 Line 2 circuit between the Steering Control Module connector and ground.

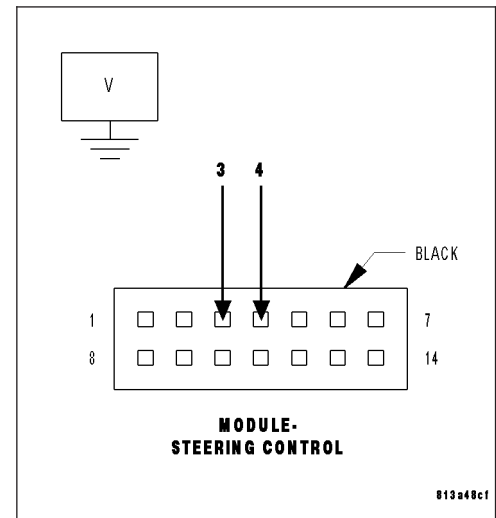
Measure the voltage of the (R45) Driver Squib 1 Line 1 circuit between the Steering Control Module connector and ground.

**Is there any voltage present for either measurement?**

**Yes** >> Repair the Driver Squib 1 circuits with voltage present for a short to Battery.

Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 5

**5. REPLACE THE ORC**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**B1B01-DRIVER AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)****6. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

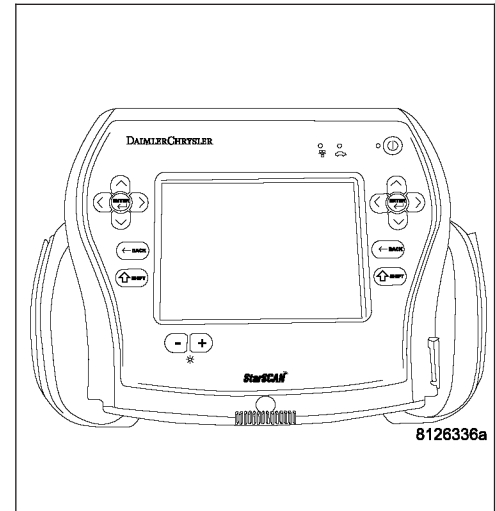
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC's in question.

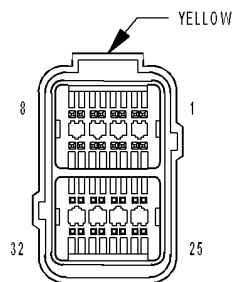
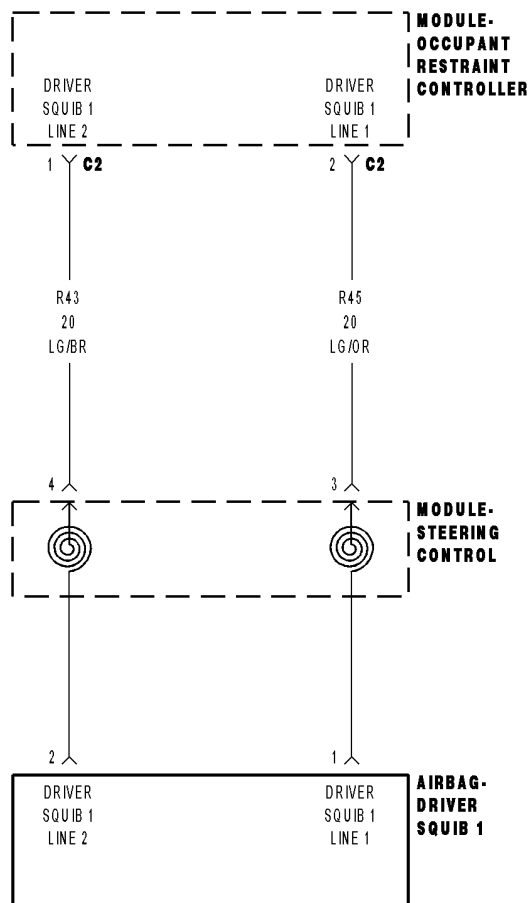
**Are any ACTIVE DTC's present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

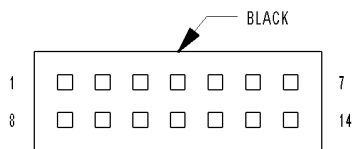
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



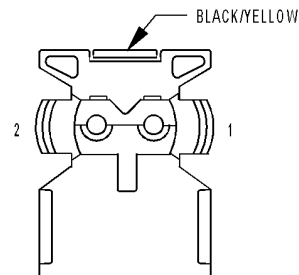
## B1B02-DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN



**MODULE-OCCUPANT RESTRAINT CONTROLLER C2**



**MODULE-STEERING CONTROL**



**AIRBAG-DRIVER SQUIB 1**

**B1B02-DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Driver Squib 1 circuits.
- **Set Condition:**  
The ORC has detected an open or high resistance on the Driver Squib 1 circuits.

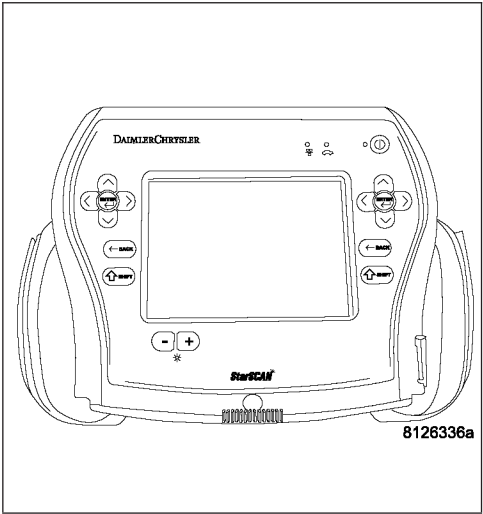
Possible Causes
(R43) DRIVER SQUIB 1 LINE 2 CIRCUIT OPEN (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT OPEN CLOCKSPRING DRIVER AIRBAG ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 7



**B1B02-DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)****2. CHECK FOR OPEN SQUIB CIRCUITS IN DRIVER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Driver Airbag Squib connectors.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag Squib connectors.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

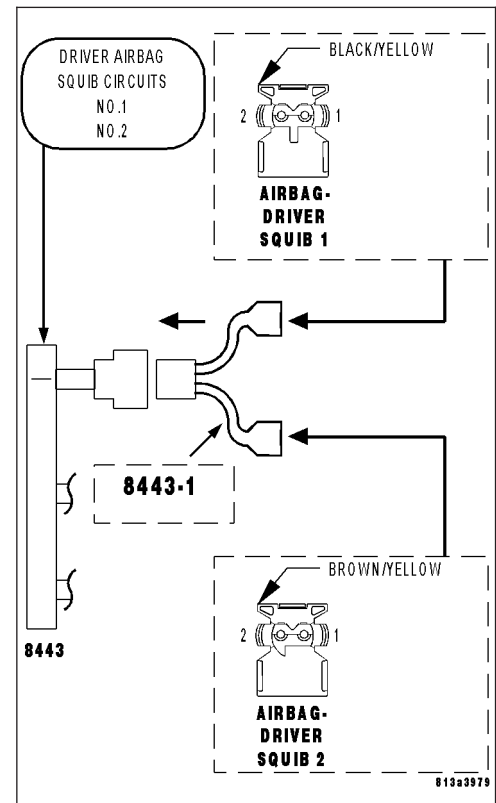
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B02 DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN?**

**Yes** >> Go To 3

**No** >> Replace the Driver Airbag in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**3. CHECK CLOCKSPring SQUIB CIRCUITS FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Driver Airbag Squib connectors.

Remove the Steering Control Module from the steering column in accordance with the Service Information.

Disconnect the Steering Control Module connector.

**Note:** Check connectors - Clean and repair as necessary.

With the Steering Control Module Connector attached to the steering column, connect the 8443 Load Tool and appropriate Jumper to the Steering Control Module connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

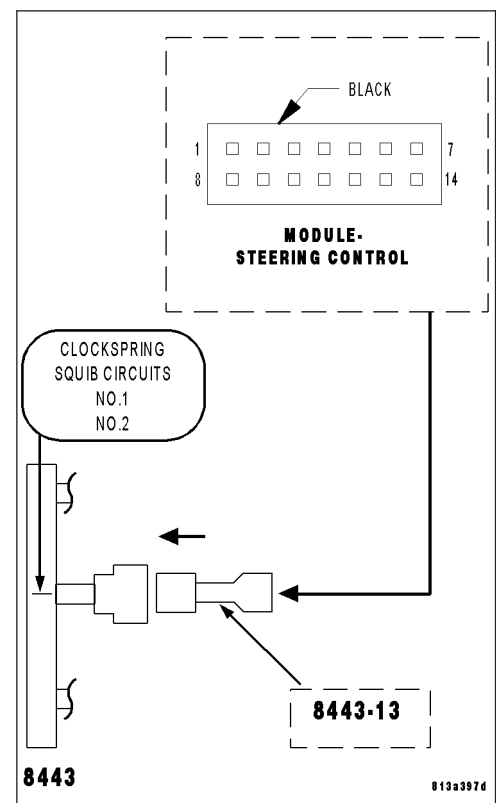
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B02 DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN?**

**Yes** >> Go To 4

**No** >> Replace the Clockspring in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1



**B1B02-DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)****4. CHECK (R43) DRIVER SQUIB 1 LINE 2 CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Steering Control Module connector.

Disconnect the ORC connectors.

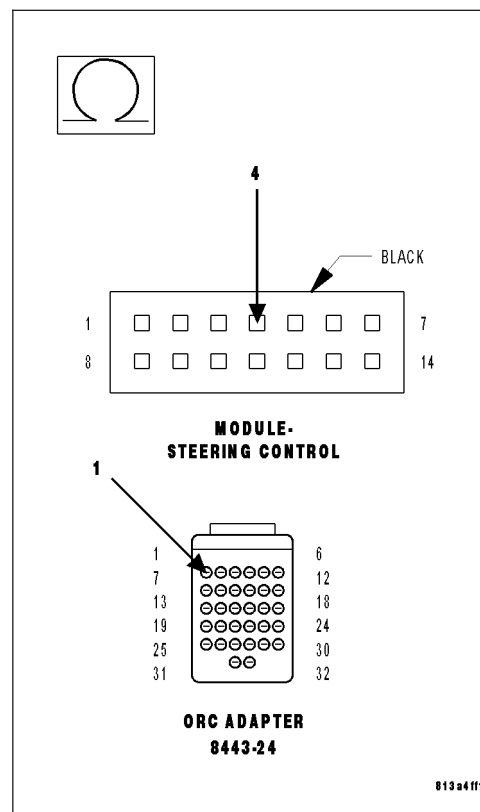
**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector. Measure the resistance of the (R43) Driver Squib 1 Line 2 circuit between the Steering Control Module connector and the ORC Load Tool Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 5

**No** >> Repair the (R43) Driver Squib 1 Line 2 circuit for an open. Then, Go To 5

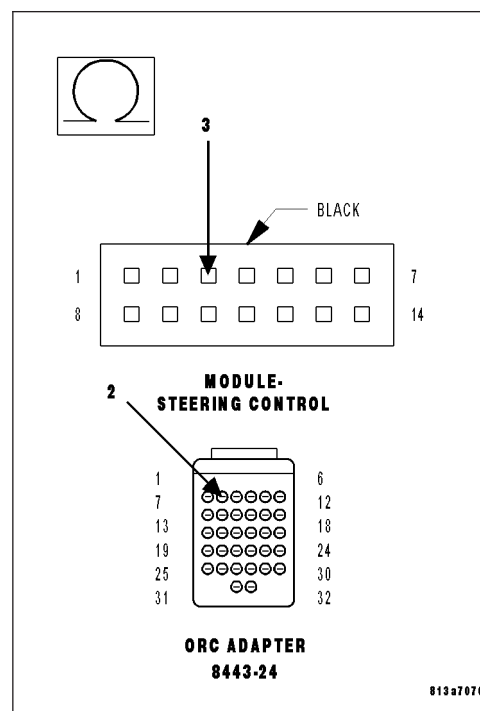
**5. CHECK (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT FOR AN OPEN**

Measure the resistance of the (R45) Driver Squib 1 Line 1 circuit between the Steering Control Module connector and the ORC Load Tool Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 6

**No** >> Repair the (R45) Driver Squib 1 Line 1 circuit for an open. Perform ORC VERIFICATION TEST - VER 1



**B1B02-DRIVER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)****6. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**7. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

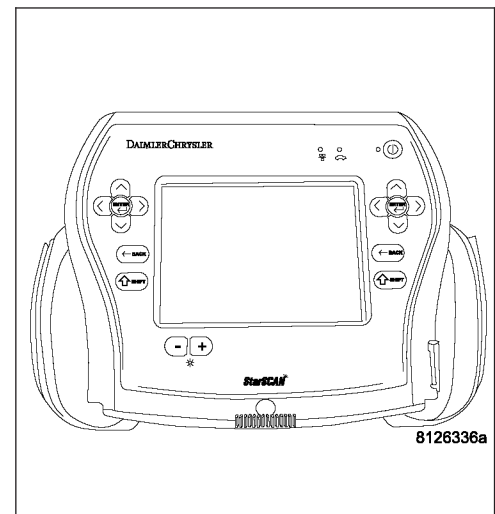
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

**Are any ACTIVE DTC's present?**

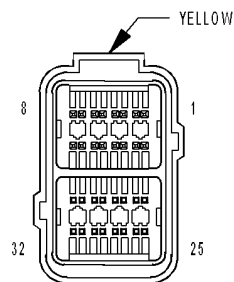
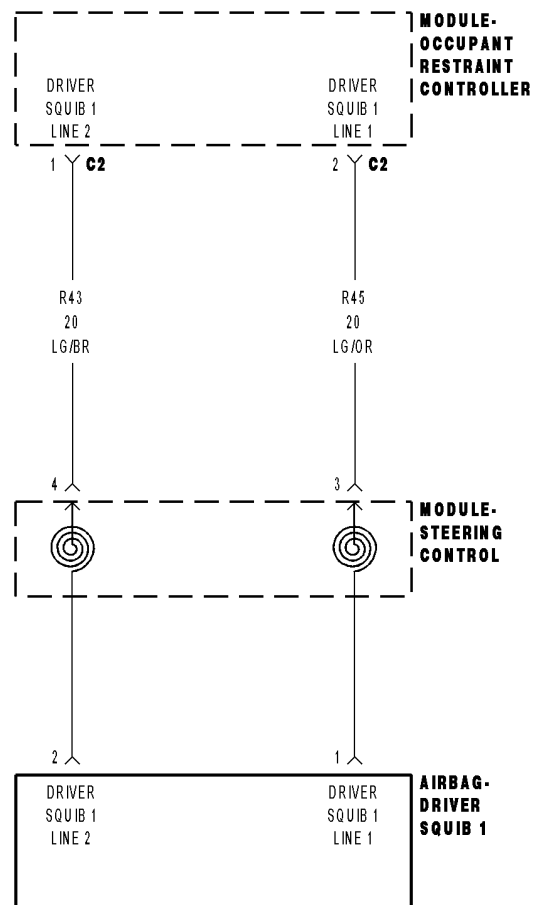
**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.

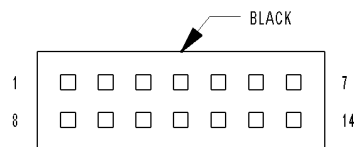




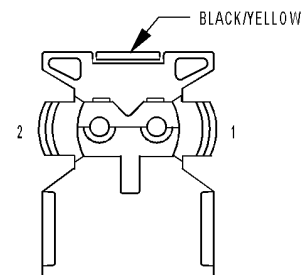
## B1B03-DRIVER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER



**MODULE-OCCUPANT RESTRAINT CONTROLLER C2**



**MODULE-STEERING CONTROL**



**AIRBAG-DRIVER SQUIB 1**

**B1B03-DRIVER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Driver Squib 1 circuits.

- **Set Condition:**

The ORC has detected low resistance between the Driver Squib 1 circuits.

Possible Causes
(R43) DRIVER SQUIB 1 LINE 2 CIRCUIT SHORTED TO (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT
CLOCKSPRING
DRIVER AIRBAG
ORC

## Diagnostic Test

### 1. DETERMINE ACTIVE OR STORED DTC

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

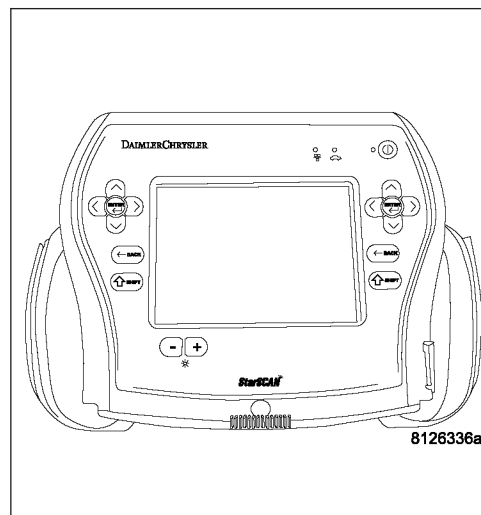
Is the DTC active or stored?

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 6



## B1B03-DRIVER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER (CONTINUED)

## 2. CHECK FOR SHORTED SQUIB CIRCUITS IN DRIVER AIRBAG

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

Disconnect the Driver Airbag Squib connectors.

**Note: Check connectors - Clean and repair as necessary.**

Connect the 8443 Load Tool and appropriate Jumper to the Driver Air-bag Squib connectors.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

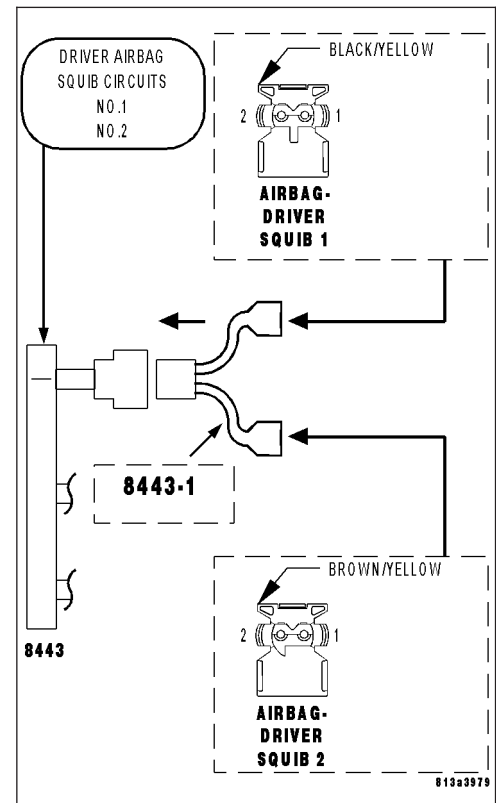
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B03 DRIVER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 3

**No** >> Replace the Driver Airbag in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1



### 3. CHECK CLOCKSPring SQUIB CIRCUITS FOR A SHORT TOGETHER

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool ORC from the Driver Airbag Squib connectors.

Remove the Steering Control Module from the steering column in accordance with the Service Information.

Disconnect the Steering Control Module connector.

**Note: Check connectors - Clean and repair as necessary.**

With the Steering Control Module Connector attached to the steering column, connect the 8443 Load Tool and appropriate Jumper to the Steering Control Module connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

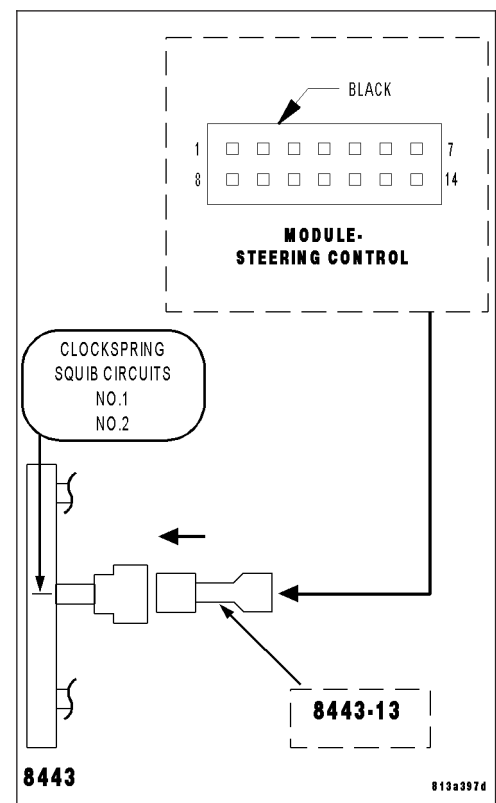
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B03 DRIVER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 4

**No** >> Replace the Clockspring in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1



**B1B03-DRIVER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER (CONTINUED)****4. CHECK (R43) DRIVER SQUIB 1 LINE 2 CIRCUIT FOR A SHORT TO (R45) DRIVER SQUIB 1 LINE 1 CIRCUIT**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Steering Control Module connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

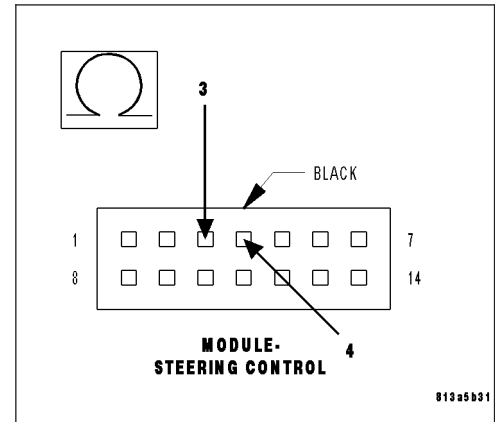
Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

Measure the resistance between the (R43) Driver Squib 1 Line 2 circuit and the (R45) Driver Squib 1 Line 1 circuit at the Steering Control Module connector.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (R43) Driver Squib 1 Line 2 circuit for a short to the (R45) Driver Squib 1 Line 1 circuit.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 5

**5. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**B1B03-DRIVER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER (CONTINUED)****6. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

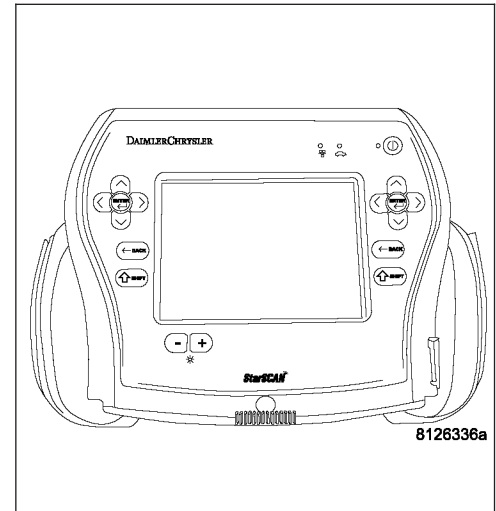
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

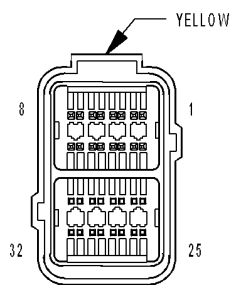
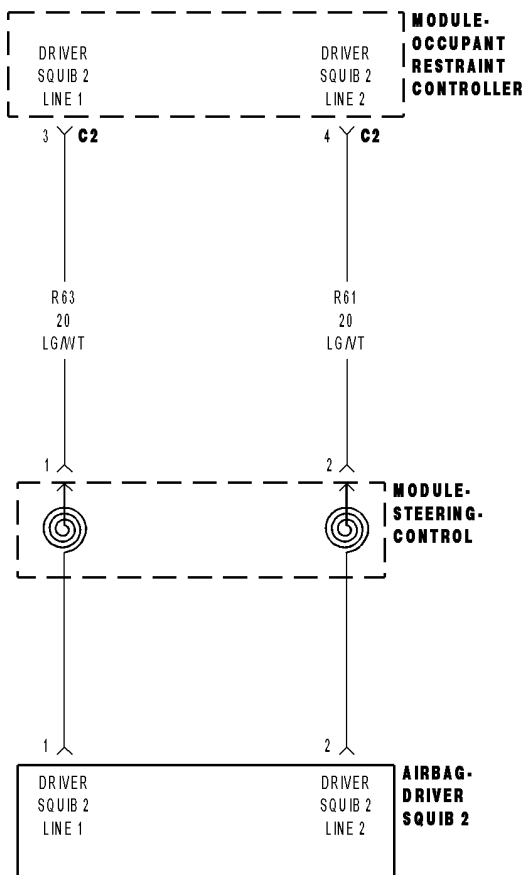
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

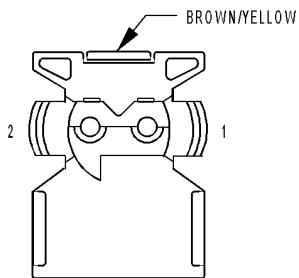
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



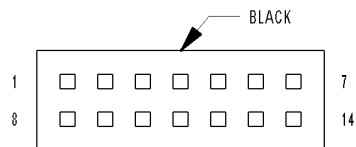
## B1B04-DRIVER AIRBAG SQUIB 2 CIRCUIT LOW



**MODULE-  
OCCUPANT  
RESTRAINT  
CONTROLLER C2**



**AIRBAG-  
DRIVER  
SQUIB 2**



**MODULE-  
STEERING CONTROL**

**B1B04-DRIVER AIRBAG SQUIB 2 CIRCUIT LOW (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Driver Squib 2 circuits.
- **Set Condition:**  
The ORC has detected low resistance on the Driver Squib 2 circuits.

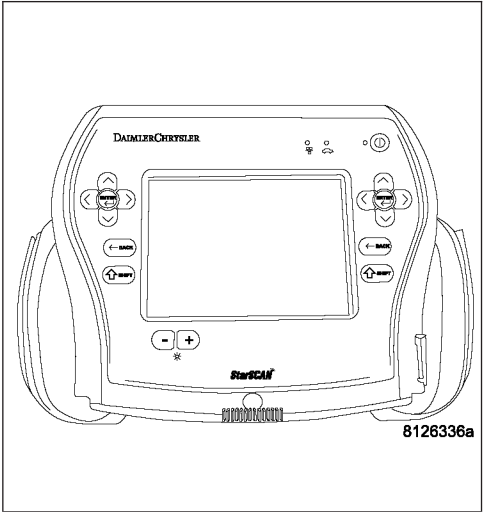
Possible Causes
(R63) DRIVER SQUIB 2 LINE 1 CIRCUIT OR (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT SHORTED TO GROUND CLOCKSPRING DRIVER AIRBAG ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 6



**B1B04-DRIVER AIRBAG SQUIB 2 CIRCUIT LOW (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN DRIVER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Driver Airbag Squib connectors.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag Squib connectors.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

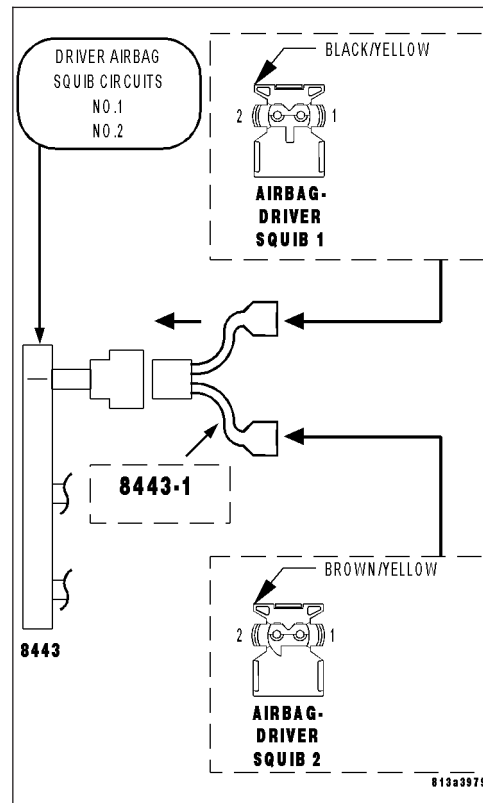
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B04 DRIVER AIRBAG SQUIB 2 CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the Driver Airbag in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**3. CHECK CLOCKSPRING SQUIB CIRCUITS FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool Jumper from the Driver Airbag Squib connectors.

Remove the Steering Control Module from the steering column in accordance with the Service Information.

Disconnect the Steering Control Module connector.

**Note:** Check connectors - Clean and repair as necessary.

With the Steering Control Module Connector attached to the steering column, connect the 8443 Load Tool and appropriate Jumper to the Steering Control Module connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

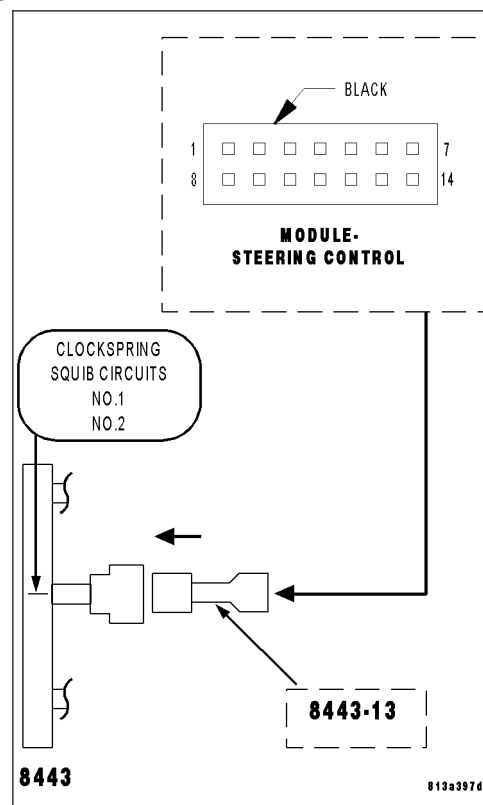
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B04 DRIVER AIRBAG SQUIB 2 CIRCUIT LOW?**

**Yes** >> Go To 4

**No** >> Replace the Clockspring in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1





**B1B04-DRIVER AIRBAG SQUIB 2 CIRCUIT LOW (CONTINUED)****4. CHECK (R63) DRIVER SQUIB 2 LINE 1 CIRCUIT AND (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Steering Control Module connector.

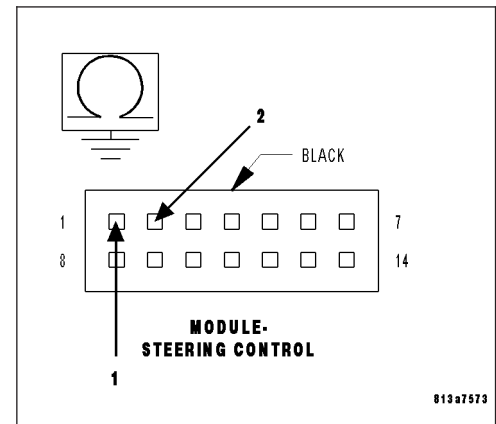
Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

Measure the resistance of the (R63) Driver Squib 2 Line 1 circuit between ground and the Steering Column Module connector.

Measure the resistance of the (R61) Driver Squib 2 Line 2 circuit between ground and the Steering Column Module connector.



**Is the resistance below 10K ohms for either measurement?**

**Yes** >> Repair the Driver Squib 2 circuits with a resistance below 10K ohms for a short to ground.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 5

**5. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**B1B04-DRIVER AIRBAG SQUIB 2 CIRCUIT LOW (CONTINUED)****6. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

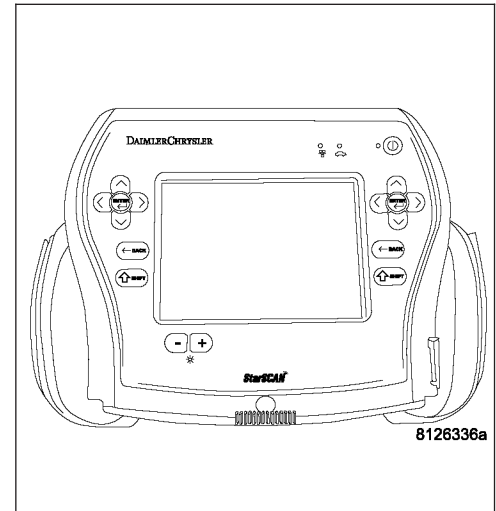
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

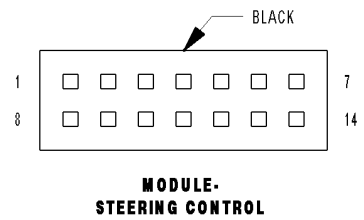
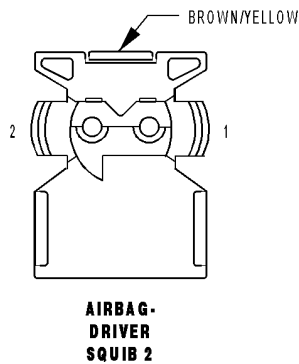
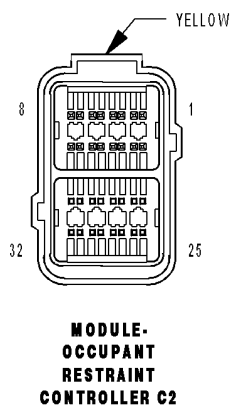
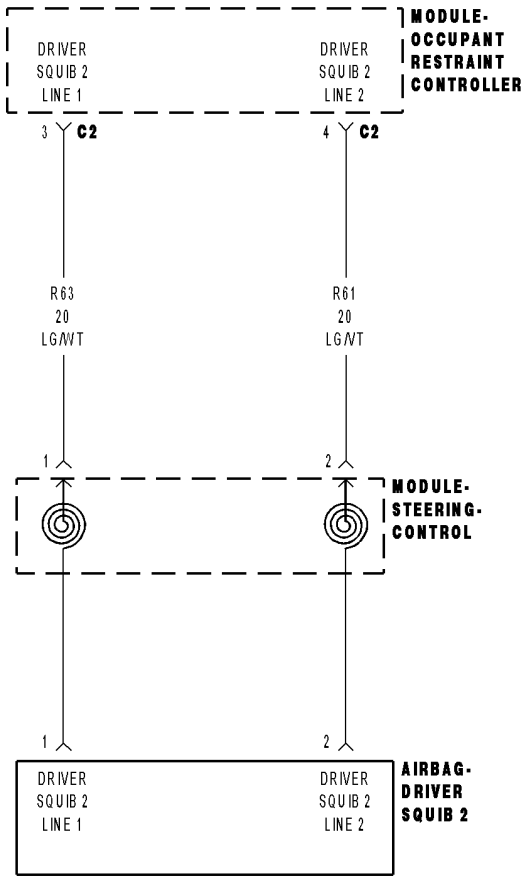
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



B1B05-DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH



**B1B05-DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the voltage on the Driver Squib 2 circuits.

- **Set Condition:**

The ORC has detected voltage on the Driver Squib 2 circuits.

Possible Causes
(R63) DRIVER SQUIB 2 LINE 1 CIRCUIT OR (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT SHORTED TO BATTERY CLOCKSPRING DRIVER AIRBAG ORC

## Diagnostic Test

### 1. DETERMINE ACTIVE OR STORED DTC

**Note:** Ensure the battery is fully charged.

**Note:** The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

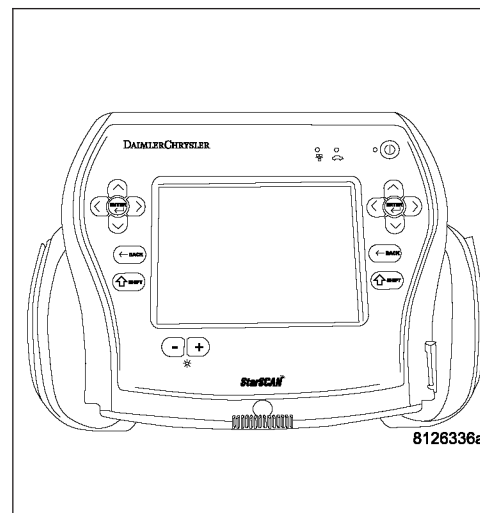
Is the DTC active or stored?

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 6



**B1B05-DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN DRIVER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Driver Airbag Squib connectors.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag Squib connectors.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

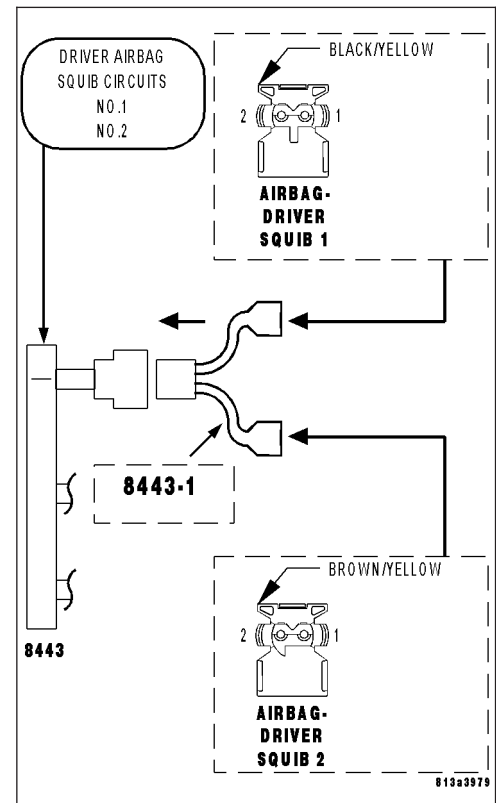
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B05 DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH?**

**Yes** >> Go To 3

**No** >> Replace the Driver Airbag in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**3. CHECK CLOCKSPRING SQUIB CIRCUITS FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Driver Airbag Squib connectors.

Remove the Steering Control Module from the steering column in accordance with the Service Information.

Disconnect the Steering Control Module connector.

**Note:** Check connectors - Clean and repair as necessary.

With the Steering Control Module connector attached to the steering column, connect the 8443 Load Tool and appropriate Jumper to the Steering Control Module connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

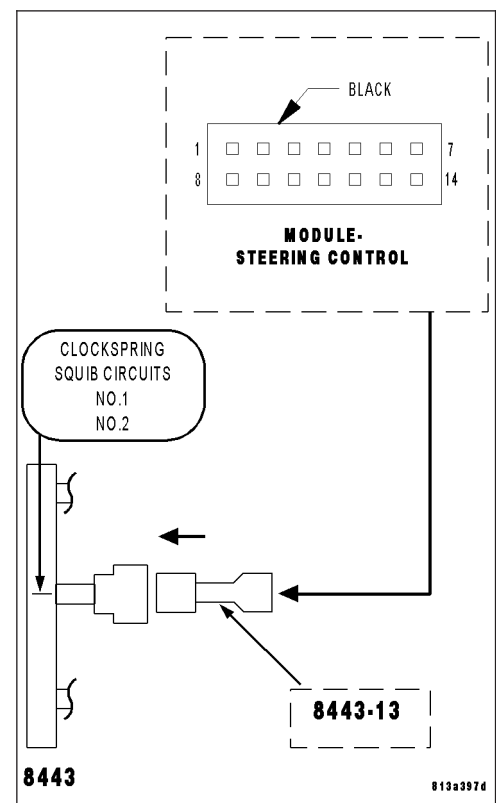
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B05 DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH?**

**Yes** >> Go To 4

**No** >> Replace the Clockspring in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1



**B1B05-DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH (CONTINUED)****4. CHECK (R63) DRIVER SQUIB 2 LINE 1 CIRCUIT AND (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Steering Control Module connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R63) Driver Squib 2 Line 1 circuit between the Steering Control Module connector and ground.

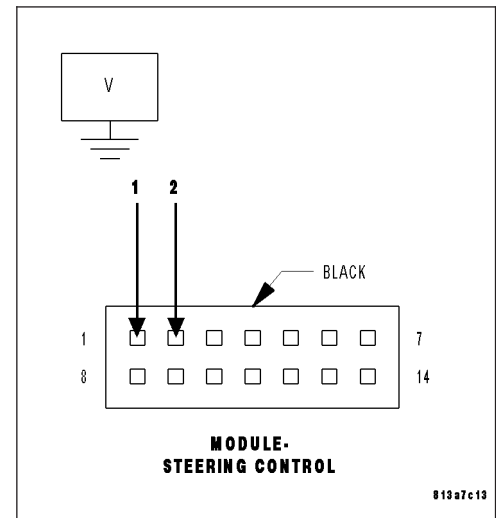
Measure the voltage of the (R61) Driver Squib 2 Line 2 circuit between the Steering Control Module connector and ground.

**Is there any voltage present for either measurement?**

**Yes** >> Repair the Driver Squib 2 circuits with voltage present for a short to Battery.

Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 5

**5. REPLACE THE ORC**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**B1B05-DRIVER AIRBAG SQUIB 2 CIRCUIT HIGH (CONTINUED)****6. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

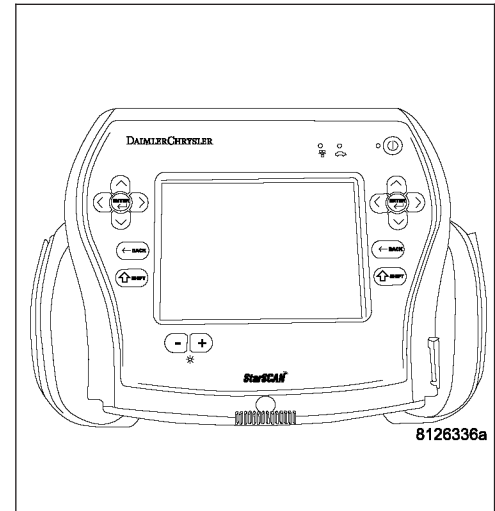
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC's in question.

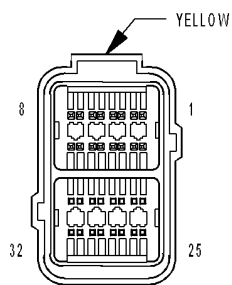
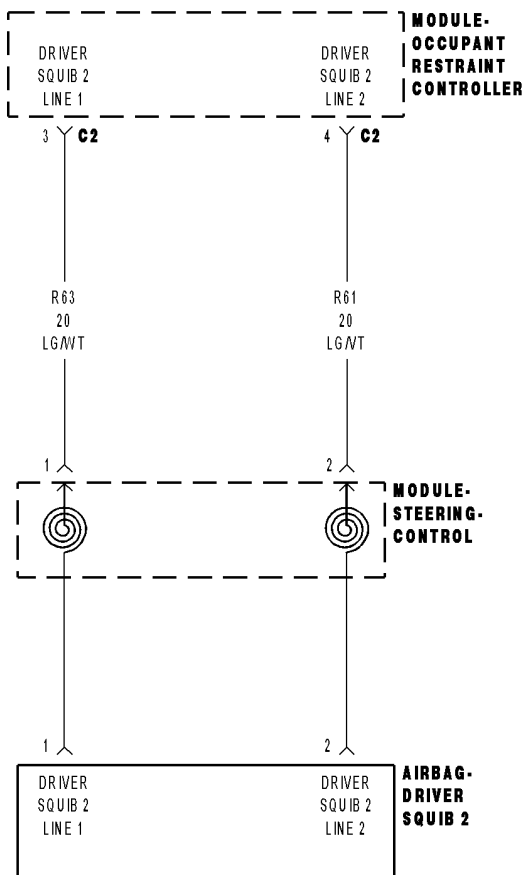
**Are any ACTIVE DTC's present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

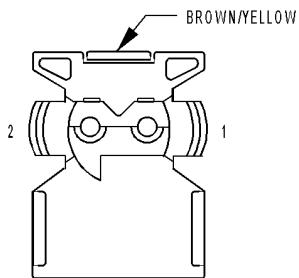
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



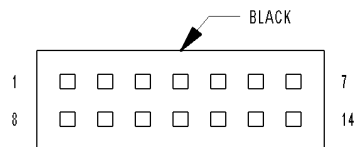
## B1B06-DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN



**MODULE-  
OCCUPANT  
RESTRAINT  
CONTROLLER C2**



**AIRBAG-  
DRIVER  
SQUIB 2**



**MODULE-  
STEERING CONTROL**



**B1B06-DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Driver Squib 2 circuits.
- **Set Condition:**  
The ORC has detected an open or high resistance on the Driver Squib 2 circuits.

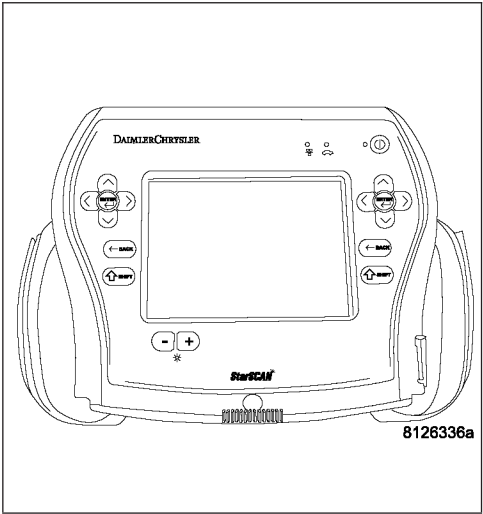
Possible Causes
(R63) DRIVER SQUIB 2 LINE 1 CIRCUIT OPEN (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT OPEN CLOCKSPRING DRIVER AIRBAG ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 7



**B1B06-DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)****2. CHECK FOR OPEN SQUIB CIRCUITS IN DRIVER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Driver Airbag Squib connectors.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag Squib connectors.

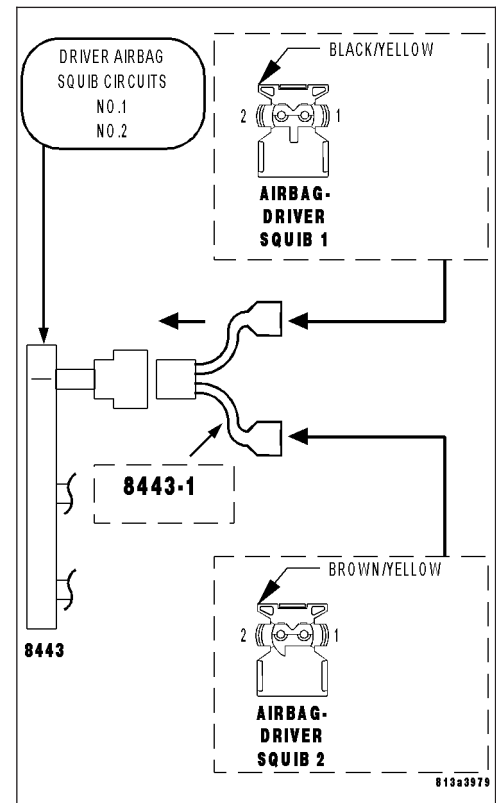
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B06 DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN?**

**Yes** >> Go To 3

**No** >> Replace the Driver Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK CLOCKSPRING SQUIB CIRCUITS FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Driver Airbag Squib connectors.

Remove the Steering Control Module from the steering column in accordance with the Service Information.

Disconnect the Steering Control Module connector.

**Note:** Check connectors - Clean and repair as necessary.

With the Steering Control Module connector attached to the steering column, connect the 8443 Load Tool and appropriate Jumper to the Steering Control Module connector.

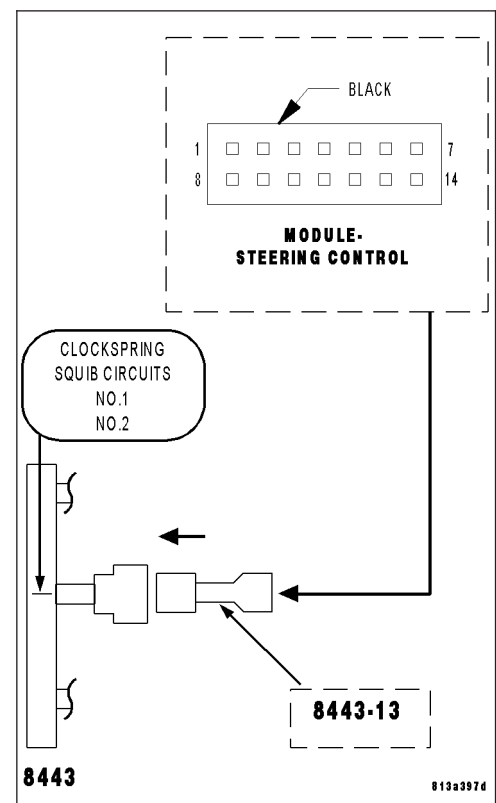
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B06 DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN?**

**Yes** >> Go To 4

**No** >> Replace the Clockspring in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1



**B1B06-DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)****4. CHECK (R63) DRIVER SQUIB 2 LINE 1 CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool and Jumper from the Steering Control Module connector.

Disconnect the ORC connectors.

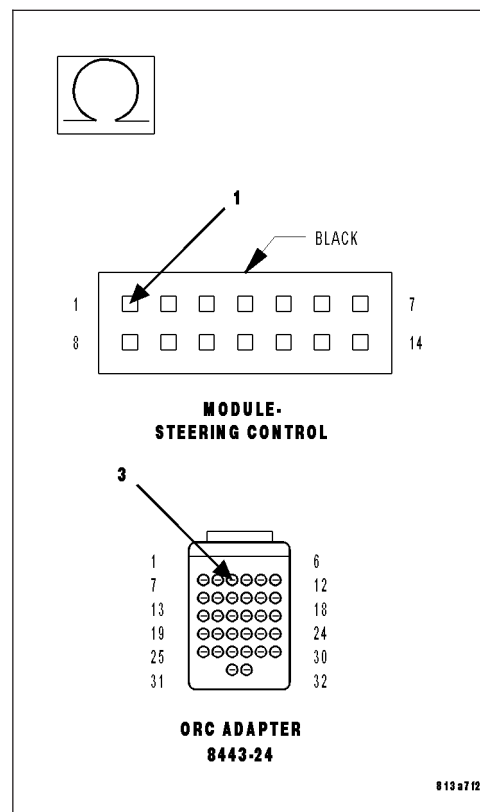
**Note: Check connectors - Clean and repair as necessary.**

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector. Measure the resistance of the (R63) Driver Squib 2 Line 1 circuit between the Steering Control Module connector and the ORC Load Tool Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 5

**No** >> Repair the (R63) Driver Squib 2 Line 1 circuit for an open.  
Then, Go To 5  
Perform ORC VERIFICATION TEST - VER 1

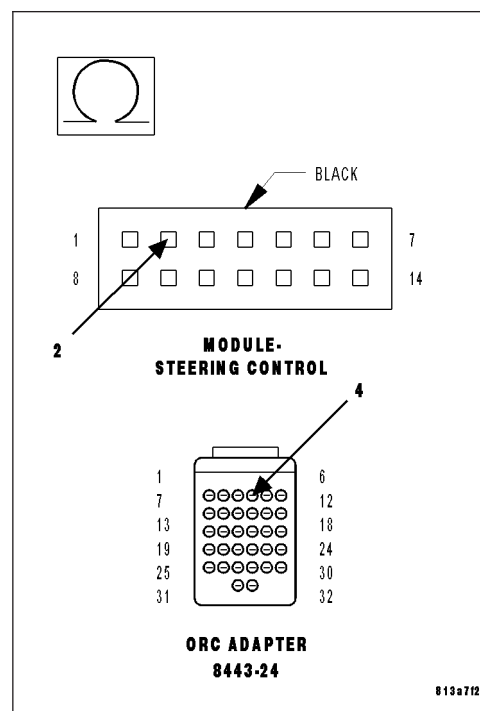
**5. CHECK (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT FOR AN OPEN**

Measure the resistance of the (R61) Driver Squib 2 Line 2 circuit between the Steering Control Module connector and the ORC Load Tool Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 6

**No** >> Repair the (R61) Driver Squib 2 Line 2 circuit for an open.  
Perform ORC VERIFICATION TEST - VER 1



**B1B06-DRIVER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)****6. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**7. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

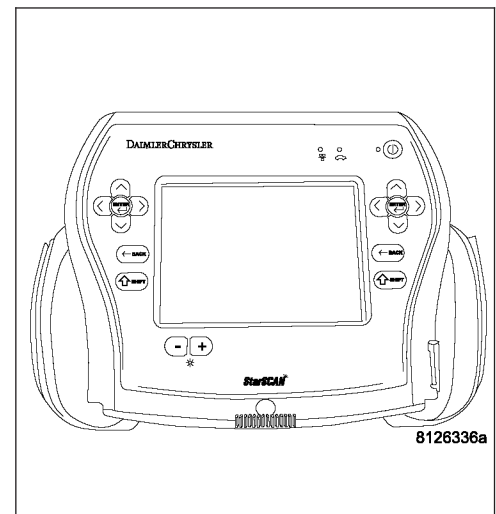
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

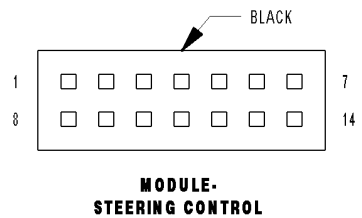
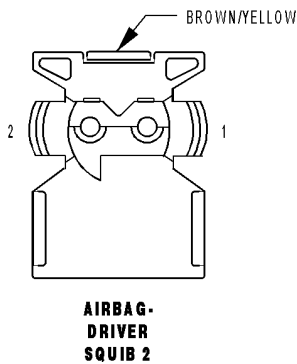
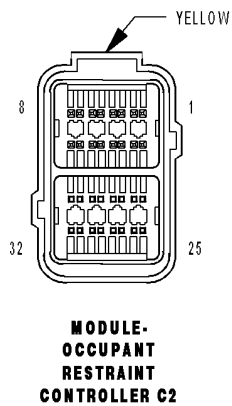
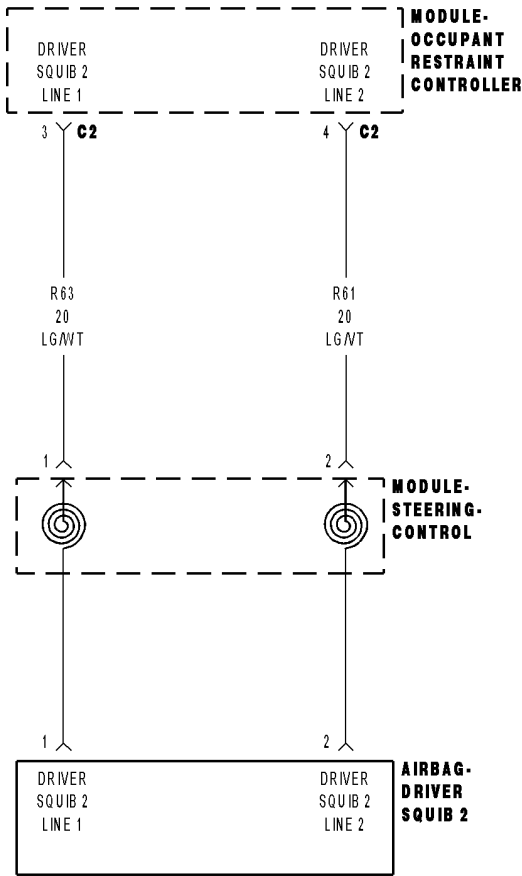
**Are any ACTIVE DTC's present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



B1B07-DRIVER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER



**B1B07-DRIVER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Driver Squib 2 circuits.

- **Set Condition:**

The ORC has detected low resistance between the Driver Squib 2 circuits.

Possible Causes
(R63) DRIVER SQUIB 2 LINE 1 CIRCUIT SHORTED TO (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT CLOCKSPRING DRIVER AIRBAG ORC

## Diagnostic Test

### 1. DETERMINE ACTIVE OR STORED DTC

**Note:** Ensure the battery is fully charged.

**Note:** The Scan Tool, SRS Airbag Load Tool MRL 8443 and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

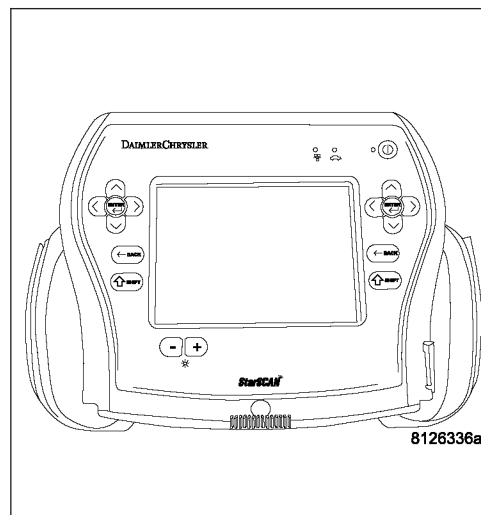
Is the DTC active or stored?

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 6



**B1B07-DRIVER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN DRIVER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

Disconnect the Driver Airbag Squib connectors.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Driver Airbag Squib connectors.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

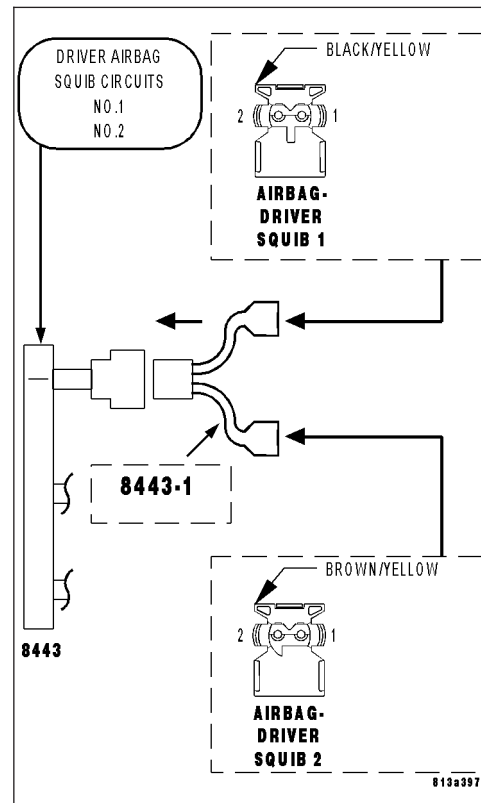
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B07 DRIVER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 3

**No** >> Replace the Driver Airbag in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**3. CHECK CLOCKSPring SQUIB CIRCUITS FOR A SHORT TOGETHER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the 8443 Load Tool ORC from the Driver Airbag Squib connectors.

Remove the Steering Control Module from the steering column in accordance with the Service Information.

Disconnect the Steering Control Module connector.

**Note:** Check connectors - Clean and repair as necessary.

With the Steering Control Module connector attached to the steering column, connect the 8443 Load Tool and appropriate Jumper to the Steering Control Module connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

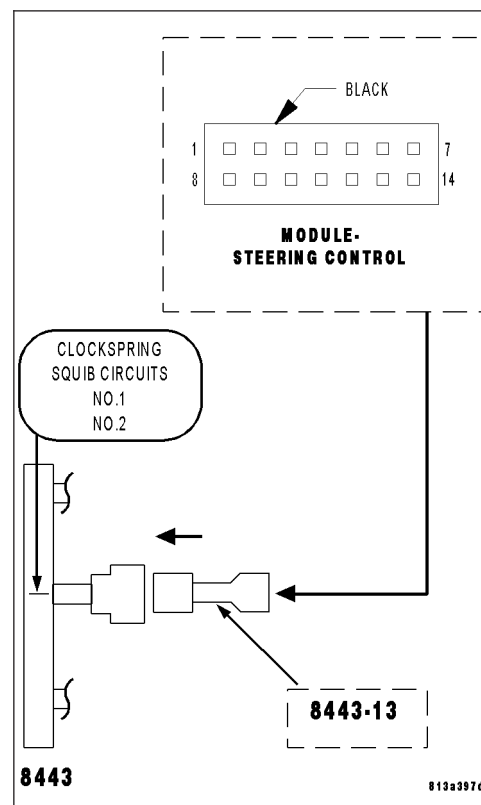
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B07 DRIVER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 4

**No** >> Replace the Clockspring in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1



**B1B07-DRIVER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER (CONTINUED)****4. CHECK (R63) DRIVER SQUIB 2 LINE 1 CIRCUIT FOR A SHORT TO (R61) DRIVER SQUIB 2 LINE 2 CIRCUIT**

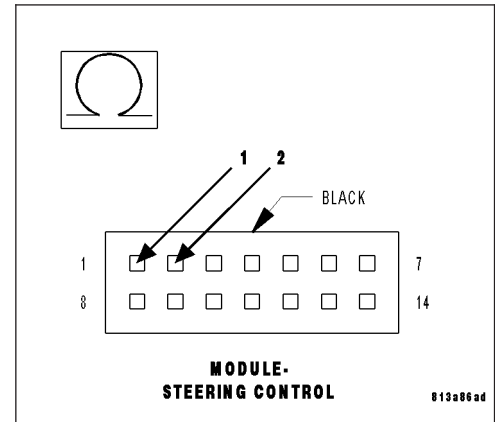
**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Steering Control Module connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

Measure the resistance between the (R63) Driver Squib 2 Line 1 circuit and the (R61) Driver Squib 2 Line 2 circuit at the Steering Control Module connector.



**Is the resistance below 10K ohms?**

**Yes** >> Repair the (R63) Driver Squib 2 Line 1 circuit for a short to the (R61) Driver Squib 2 Line 2 circuit.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 5

**5. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1



**B1B07-DRIVER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER (CONTINUED)****6. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

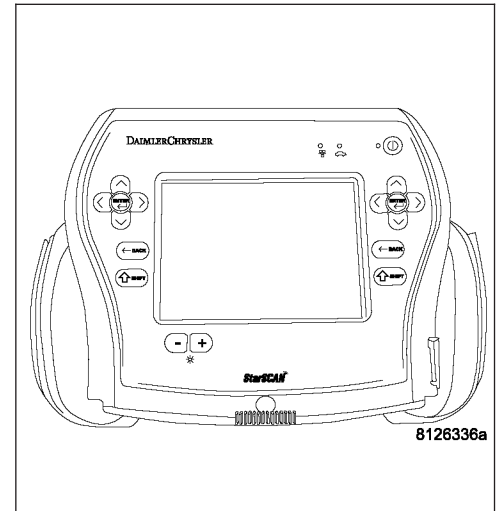
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

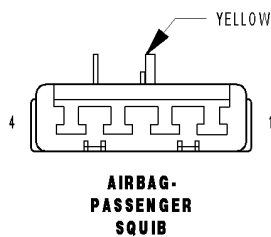
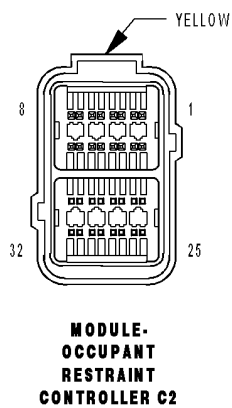
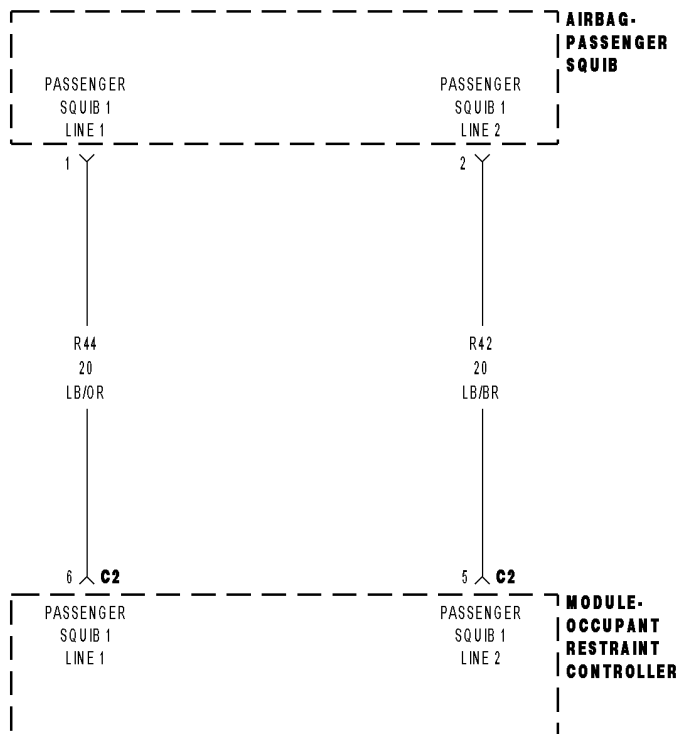
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B08-PASSENGER AIRBAG SQUIB 1 CIRCUIT LOW



**B1B08-PASSENGER AIRBAG SQUIB 1 CIRCUIT LOW (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Squib 1 circuits.
- **Set Condition:**  
The ORC has detected low resistance on the Passenger Squib 1 circuits.

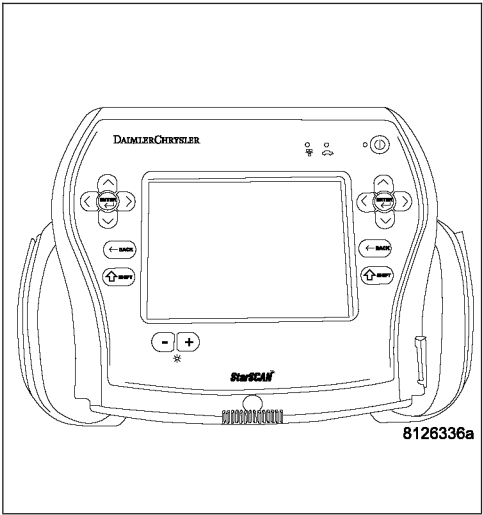
Possible Causes
(R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT OR (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT SHORTED TO GROUND
PASSENGER AIRBAG
ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 5



**B1B08-PASSENGER AIRBAG SQUIB 1 CIRCUIT LOW (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN PASSENGER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the Passenger Airbag Squib connector.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool to the Passenger Airbag Squib connector.

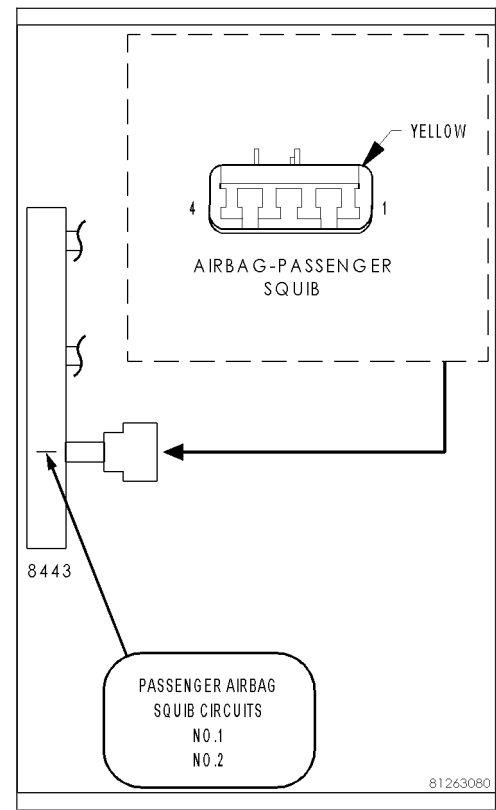
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B08 PASSENGER AIRBAG SQUIB 1 CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the Passenger Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT AND (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the 8443 Load Tool from the Passenger Airbag Squib connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

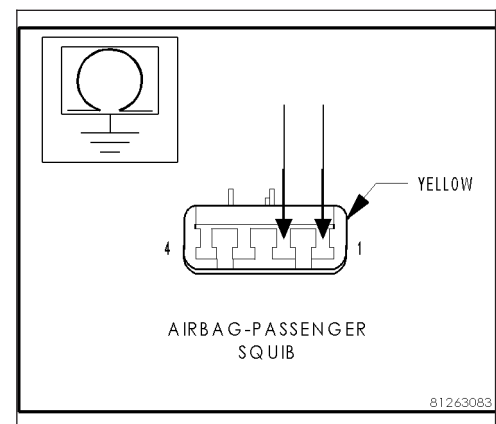
Measure the resistance of the (R42) Passenger Squib 1 Line 2 circuit between ground and the Passenger Airbag Squib connector.

Measure the resistance of the (R44) Passenger Squib 1 Line 1 circuit between ground and the Passenger Airbag Squib connector.

**Is the resistance below 10K ohms on either circuit?**

**Yes** >> Repair the Passenger Squib 1 circuits with a resistance below 10K ohms for a short to ground.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 4



**B1B08-PASSENGER AIRBAG SQUIB 1 CIRCUIT LOW (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

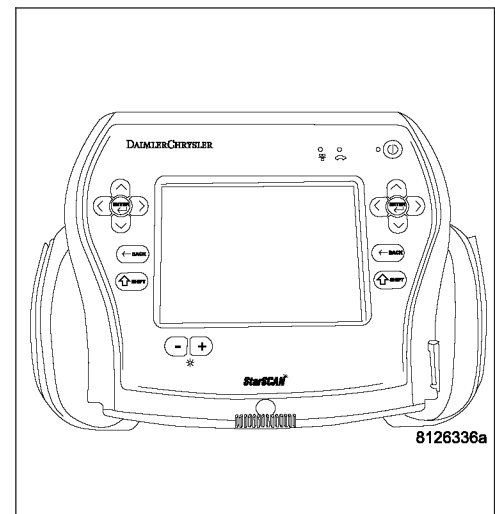
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

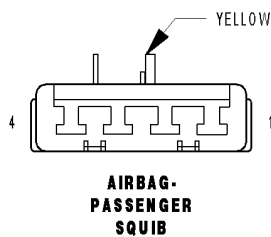
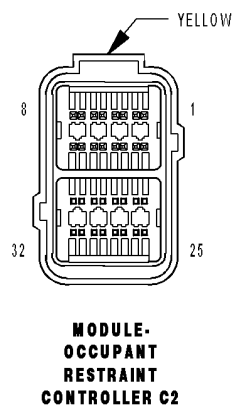
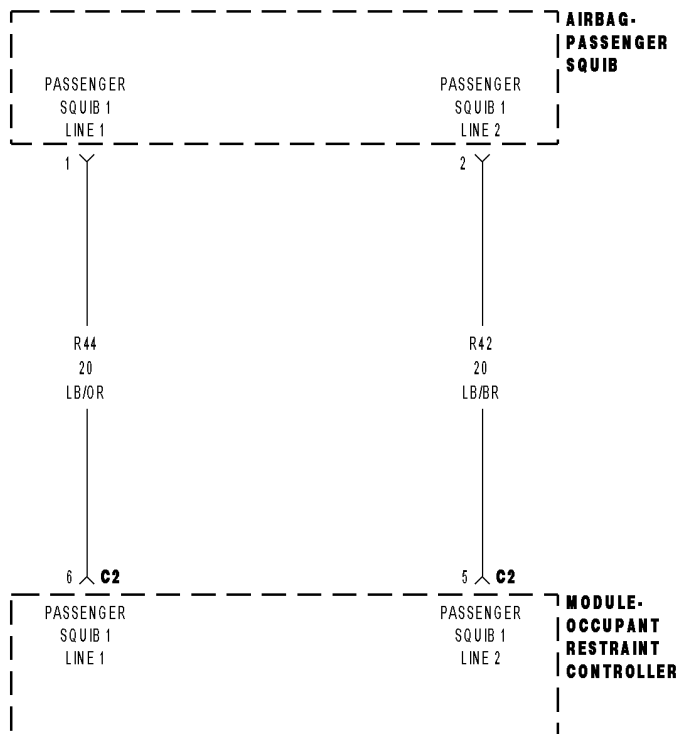
**Are any ACTIVE DTC's present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B09-PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH



**B1B09-PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the voltage on the Passenger Squib 1 circuits.
- **Set Condition:**  
When the ORC has detected voltage on the Passenger Squib 1 circuits.

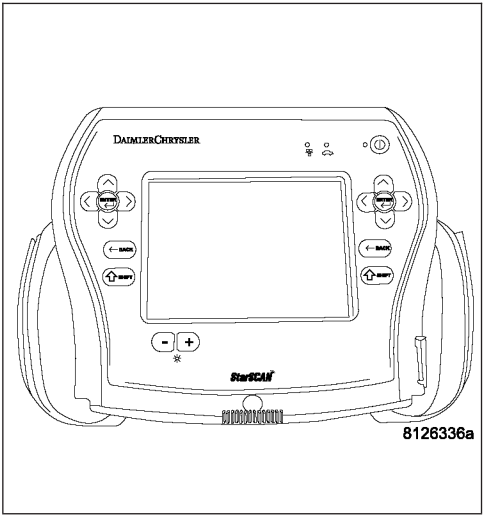
Possible Causes
(R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT OR (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT SHORTED TO BATTERY PASSENGER AIRBAG ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 5



**B1B09-PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN PASSENGER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the Passenger Airbag Squib connector.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool to the Passenger Airbag Squib connector.

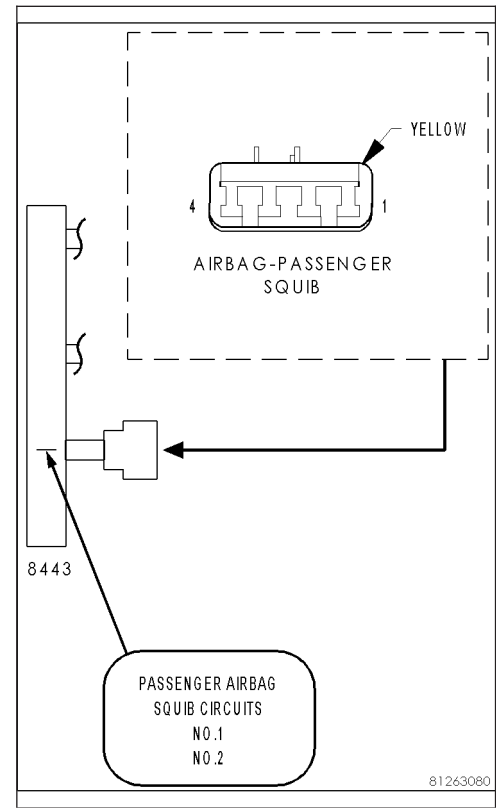
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B09 PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH?**

**Yes** >> Go To 3

**No** >> Replace the Passenger Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT AND (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the 8443 Load Tool from the Passenger Airbag Squib connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

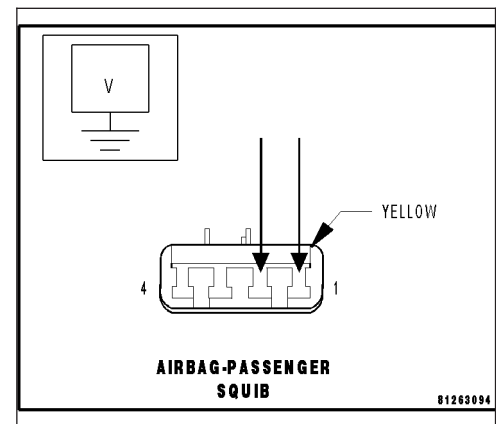
Measure the voltage of the (R42) Passenger Squib 1 Line 2 circuit between the Passenger Airbag Squib connector and ground.

Measure the voltage of the (R44) Passenger Squib 1 Line 1 circuit between the Passenger Airbag Squib connector and ground.

**Is there any voltage present on either circuit?**

**Yes** >> Repair the Passenger Squib 1 circuits with voltage present for a short to battery.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 4





**B1B09-PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

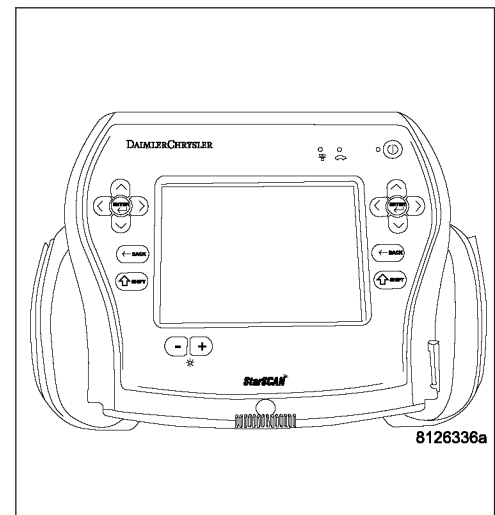
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

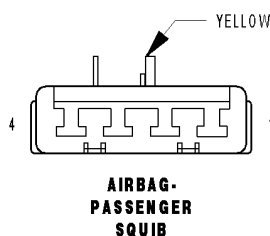
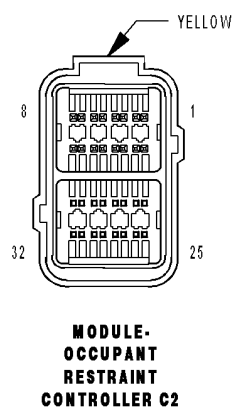
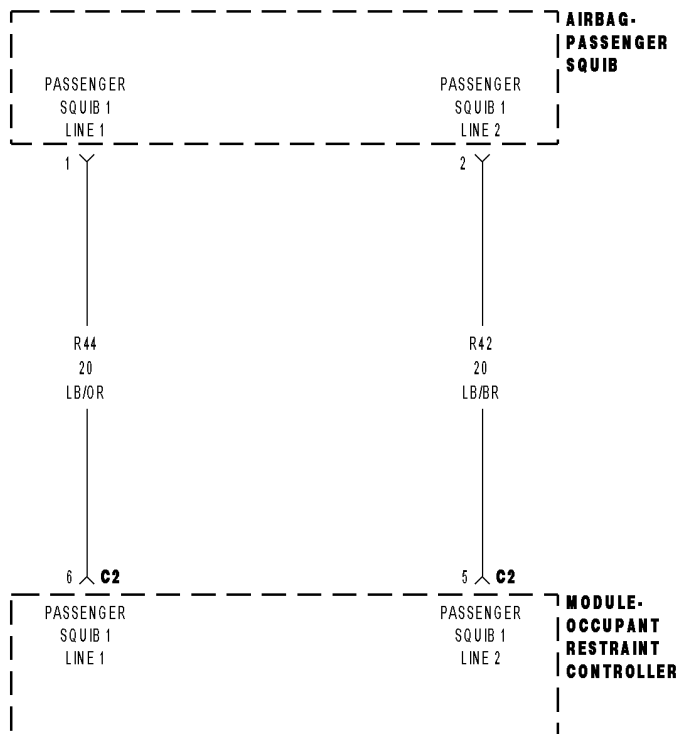
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B0A-PASSENGER AIRBAG SQUIB 1 CIRCUIT OPEN



**B1B0A-PASSENGER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Squib 1 circuits.
- **Set Condition:**  
The ORC has detected an open or high resistance on the Passenger Squib 1 circuits.

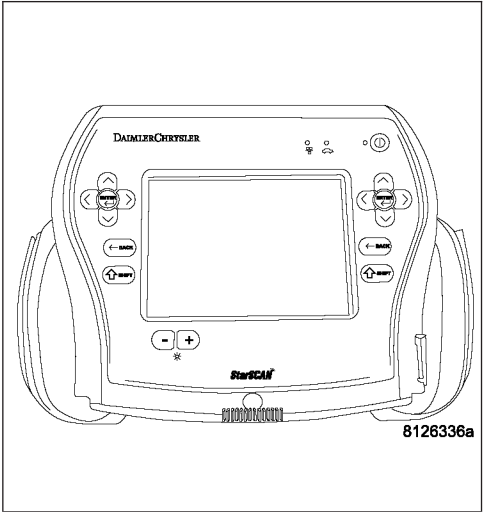
Possible Causes
(R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT OPEN (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT OPEN PASSENGER AIRBAG ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 6



**B1B0A-PASSENGER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)****2. CHECK FOR OPEN SQUIB CIRCUITS IN PASSENGER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Passenger Airbag Squib connector.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool to the Passenger Airbag Squib connector.

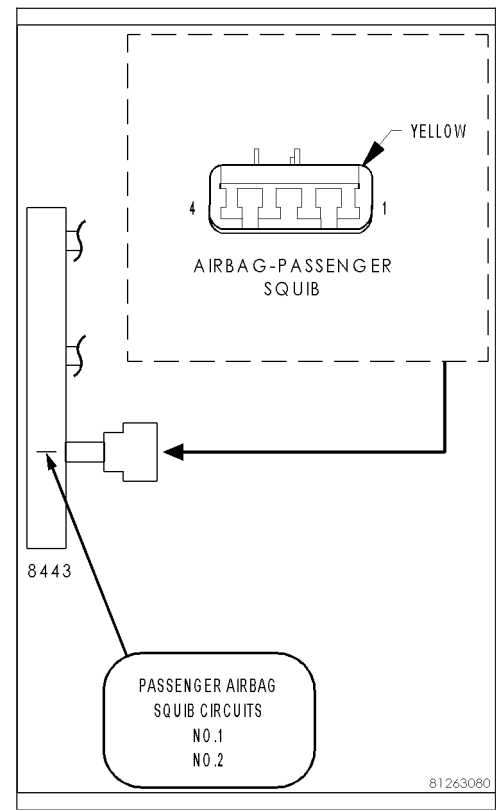
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B0A PASSENGER AIRBAG SQUIB 1 CIRCUIT OPEN?**

**Yes** >> Go To 3

**No** >> Replace the Passenger Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool from the Passenger Airbag Squib connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

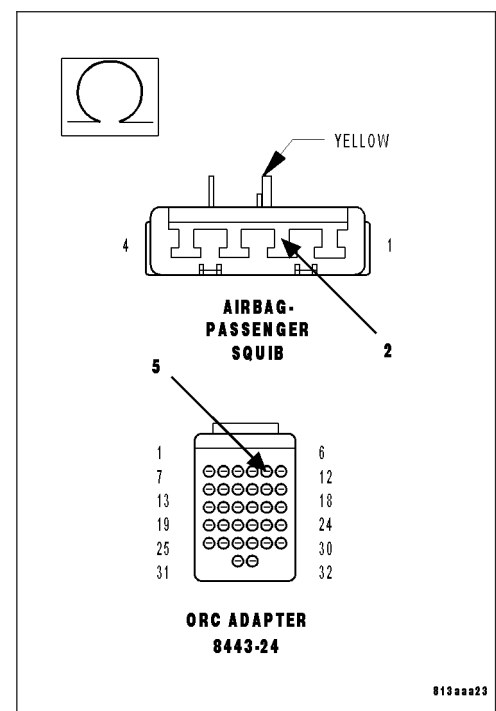
Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

Measure the resistance of the (R42) Passenger Squib 1 Line 2 circuit between the Passenger Airbag Squib connector and the 8443 ORC Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 4

**No** >> Repair the (R42) Passenger Squib 1 Line 2 circuit for and open. Then, Go To 4



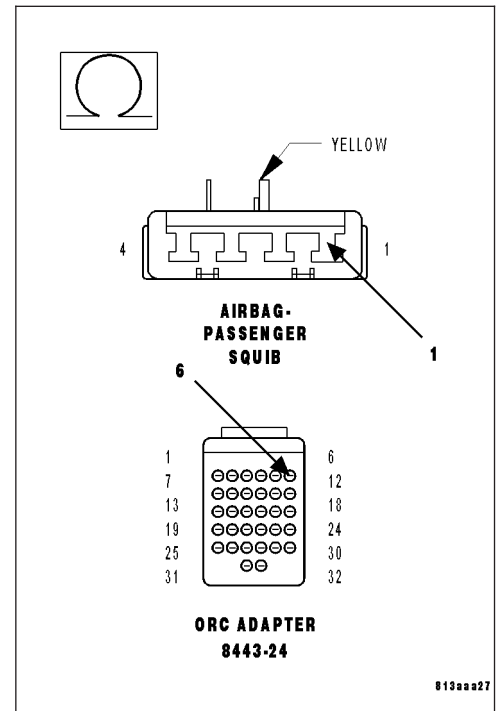
**B1B0A-PASSENGER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)****4. CHECK (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT FOR AN OPEN**

Measure the resistance of the (R44) Passenger Squib 1 Line 1 circuit between the Passenger Airbag Squib connector and the 8443 ORC Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 5

**No** >> Repair the (R44) Passenger Squib 1 Line 1 circuit for an open.  
Perform ORC VERIFICATION TEST - VER 1

**5. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

If there are no possible causes remaining, view repair.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**B1B0A-PASSENGER AIRBAG SQUIB 1 CIRCUIT OPEN (CONTINUED)****6. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

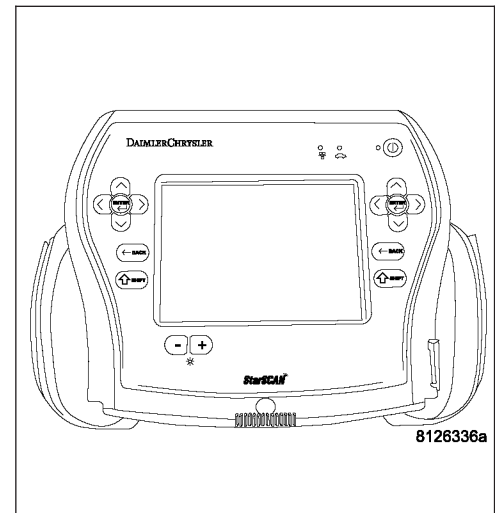
If only stored codes return continue the test until the problem area has been isolated.

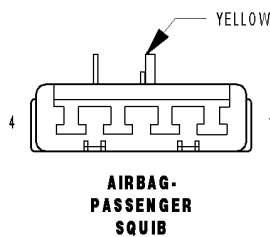
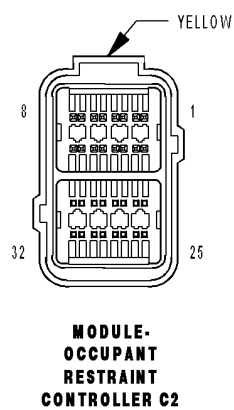
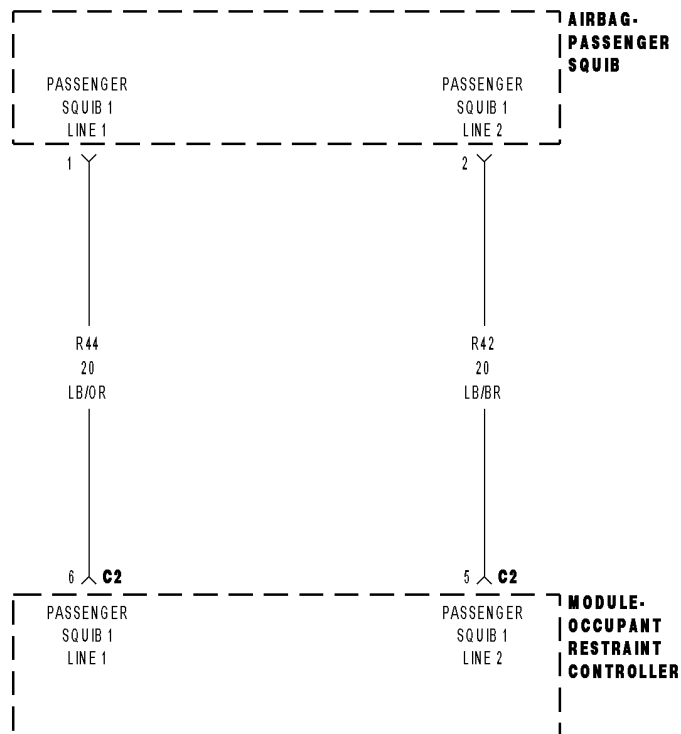
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



**B1B0B-PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER**

**B1B0B-PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Squib 1 circuits.

- **Set Condition:**

The ORC has detected low resistance between the Passenger Squib 1 circuits.

Possible Causes
(R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT SHORTED TO (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT PASSENGER AIRBAG ORC

## Diagnostic Test

### 1. DETERMINE ACTIVE OR STORED DTC

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

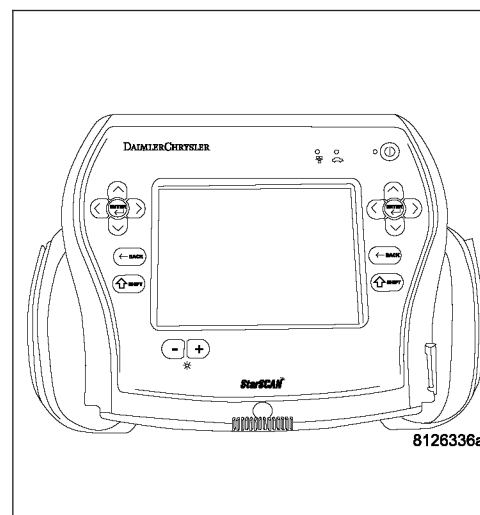
Is the DTC active or stored?

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 5





**B1B0B-PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN PASSENGER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the Passenger Airbag Squib connector.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool to the Passenger Airbag Squib connector.

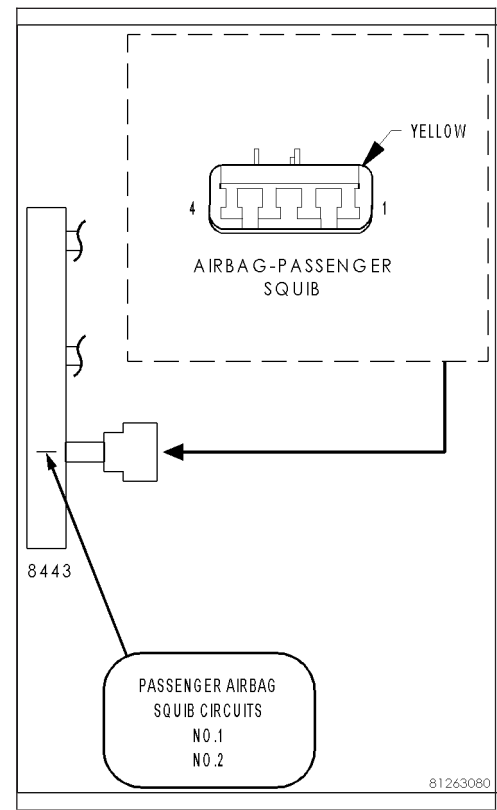
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B0B PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 3

**No** >> Replace the Passenger Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R42) PASSENGER SQUIB 1 LINE 2 CIRCUIT FOR A SHORT TO (R44) PASSENGER SQUIB 1 LINE 1 CIRCUIT**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the 8443 Load Tool from the Passenger Airbag Squib connector.

Disconnect the ORC connectors.

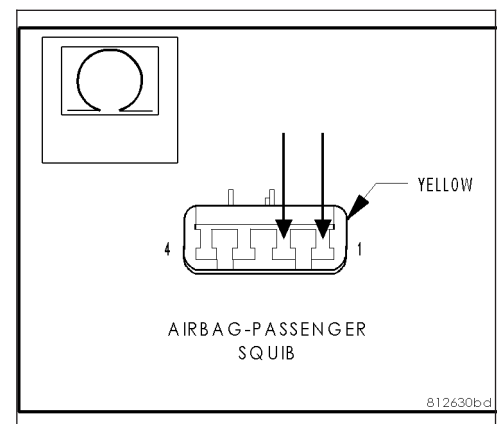
**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.  
Measure the resistance between the (R42) Passenger Squib 1 Line 2 circuit and the (R44) Passenger Squib 1 Line 1 circuit at the Passenger Airbag Squib connector.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (R42) Passenger Squib 1 Line 2 circuit for a short to the (R44) Passenger Squib 1 Line 1 circuit.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 4



**B1B0B-PASSENGER AIRBAG SQUIB 1 CIRCUIT SHORTED TOGETHER (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

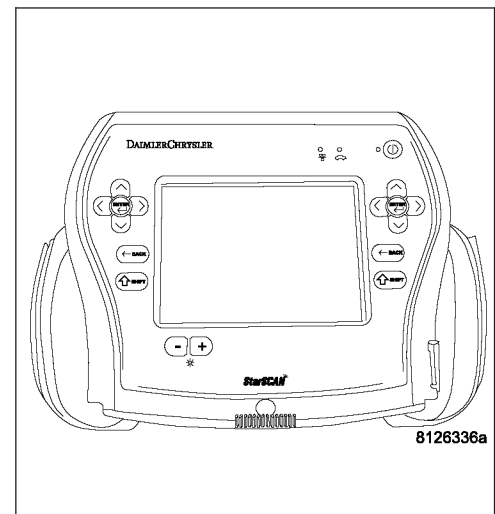
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

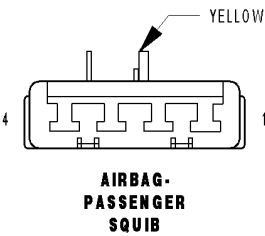
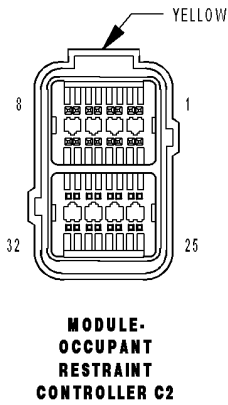
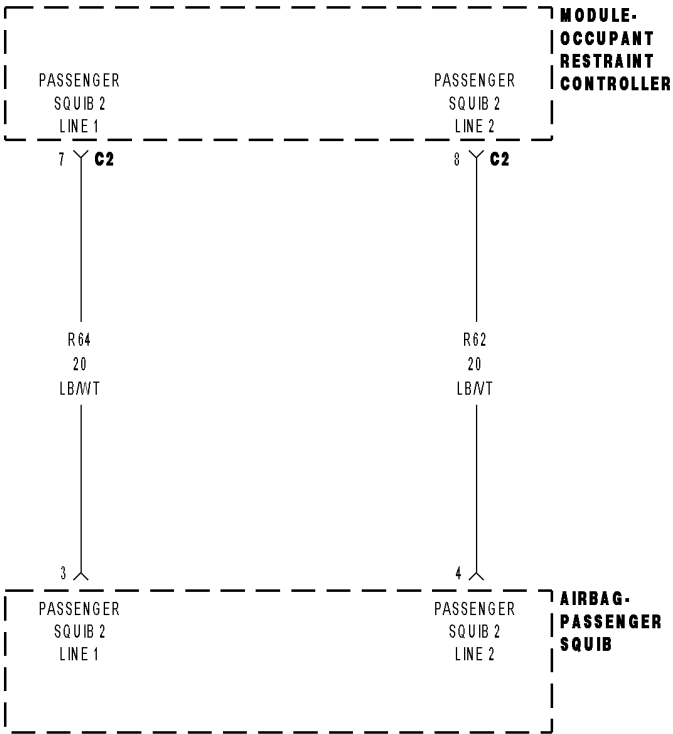
**Are any ACTIVE DTC's present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



B1B0C-PASSENGER AIRBAG SQUIB 2 CIRCUIT LOW



**B1B0C-PASSENGER AIRBAG SQUIB 2 CIRCUIT LOW (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Squib 2 circuits.

- **Set Condition:**

The ORC has detected low resistance on the Passenger Squib 2 circuits.

Possible Causes
(R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT OR (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT SHORTED TO GROUND
PASSENGER AIRBAG
ORC

## Diagnostic Test

### 1. DETERMINE ACTIVE OR STORED DTC

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

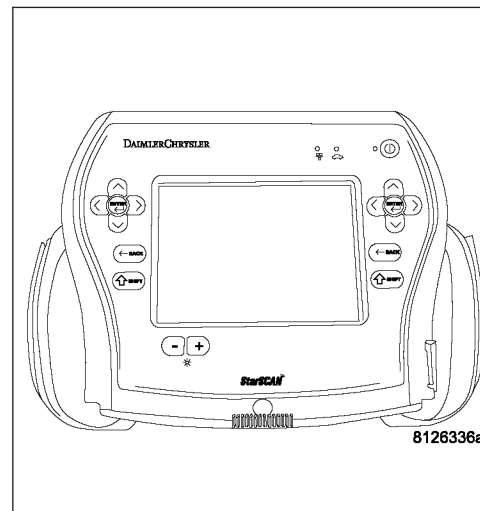
Is the DTC active or stored?

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 5



**B1B0C-PASSENGER AIRBAG SQUIB 2 CIRCUIT LOW (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN PASSENGER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the Passenger Airbag Squib connector.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool to the Passenger Airbag Squib connector.

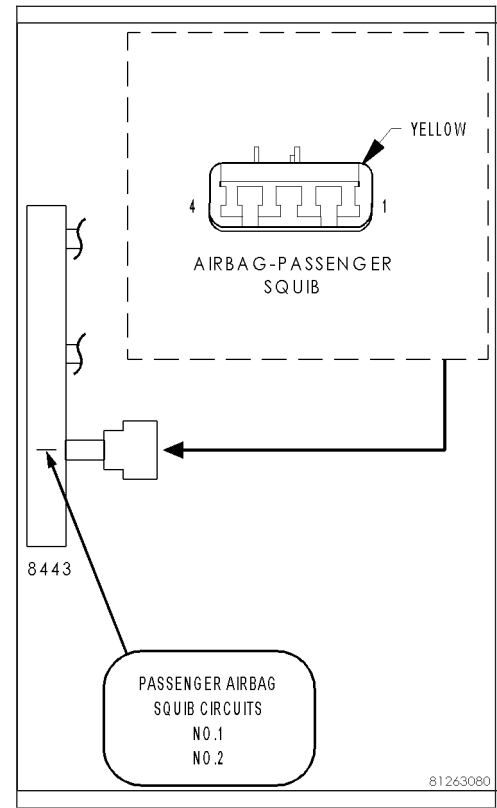
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B0C PASSENGER AIRBAG SQUIB 2 CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the Passenger Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT AND (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the 8443 Load Tool from the Passenger Airbag Squib connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

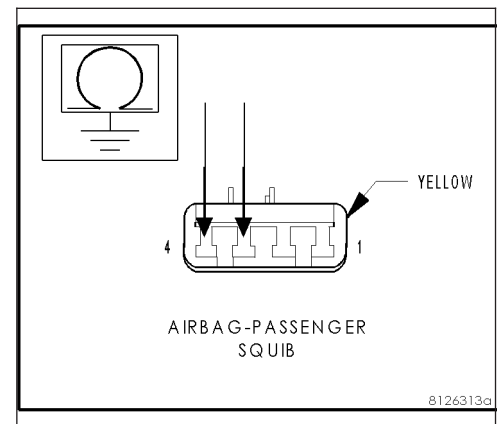
Measure the resistance of the (R64) Passenger Squib 2 Line 1 circuit between ground and the Passenger Airbag Squib connector.

Measure the resistance of the (R62) Passenger Squib 2 Line 2 circuit between ground and the Passenger Airbag Squib connector.

**Is the resistance below 10K ohms on either circuit?**

**Yes** >> Repair the Passenger Squib 2 circuits with a resistance below 10K ohms for a short to ground.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 4



**B1B0C-PASSENGER AIRBAG SQUIB 2 CIRCUIT LOW (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

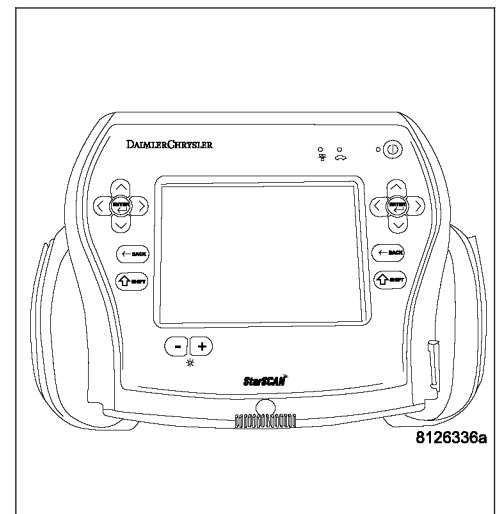
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

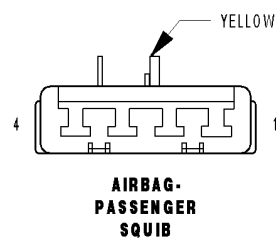
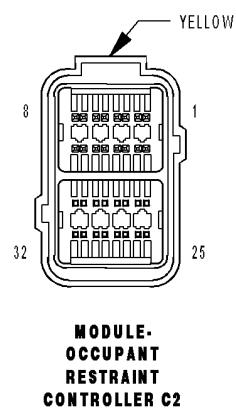
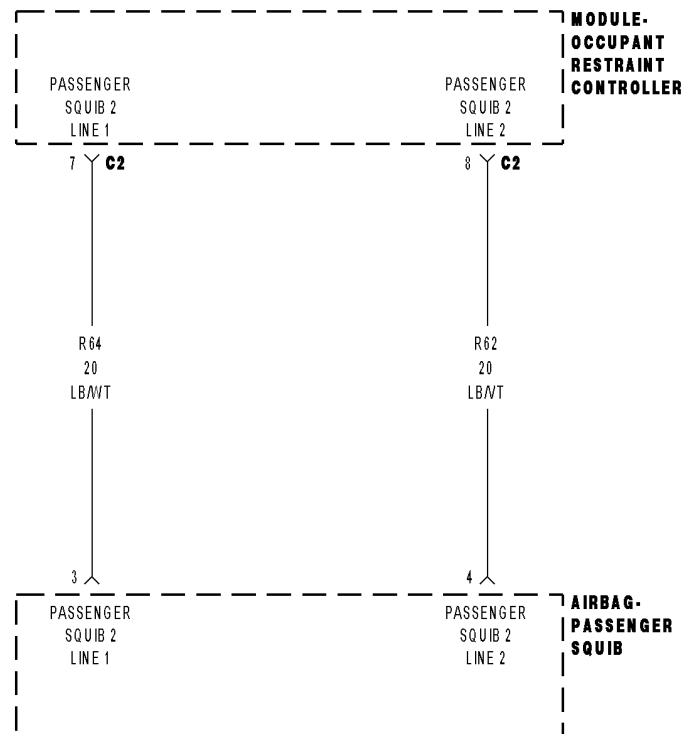
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



# B1B0D-PASSENGER AIRBAG SQUIB 2 CIRCUIT HIGH



**B1B0D-PASSENGER AIRBAG SQUIB 2 CIRCUIT HIGH (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the voltage of the Passenger Squib 2 circuits.

- **Set Condition:**

The ORC has detected voltage on the Passenger Squib 2 circuits.

Possible Causes
(R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT OR (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT SHORTED TO BATTERY
PASSENGER AIRBAG
ORC

## Diagnostic Test

### 1. DETERMINE ACTIVE OR STORED DTC

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

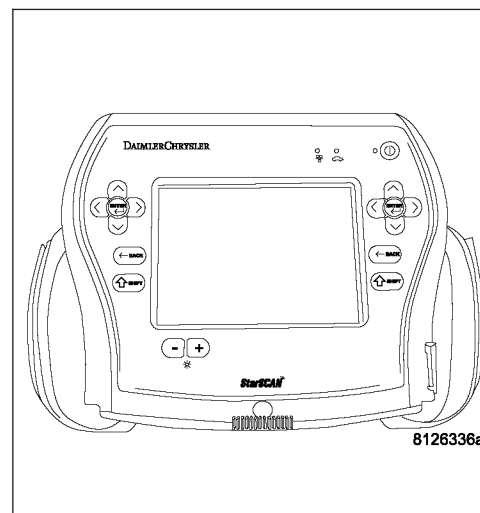
Is the DTC active or stored?

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 5





**B1B0D-PASSENGER AIRBAG SQUIB 2 CIRCUIT HIGH (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN PASSENGER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the Passenger Airbag Squib connector.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool to the Passenger Airbag Squib connector.

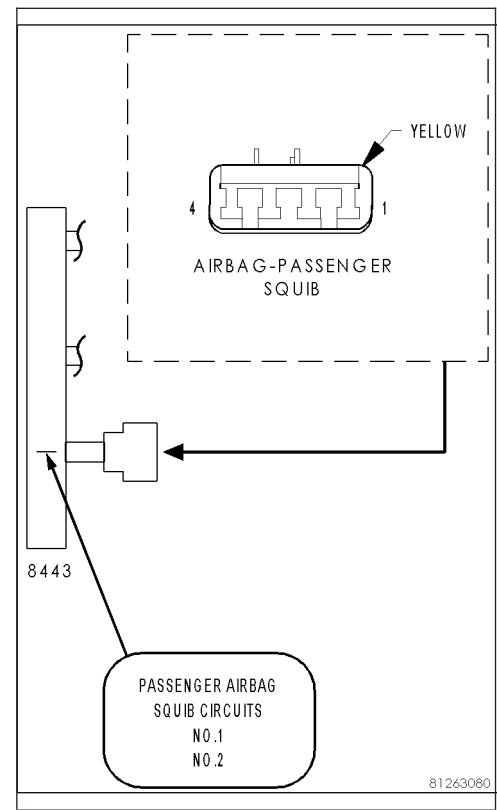
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B0D PASSENGER AIRBAG SQUIB 2 CIRCUIT HIGH?**

**Yes** >> Go To 3

**No** >> Replace the Passenger Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT AND (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the 8443 Load Tool from the Passenger Airbag Squib connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

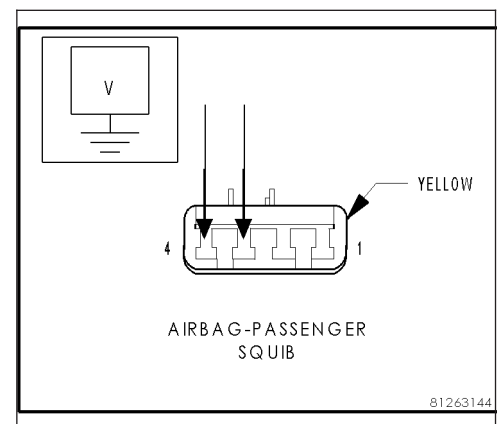
Measure the voltage of the (R64) Passenger Squib 2 Line 1 circuit between the Passenger Airbag Squib connector and ground.

Measure the voltage of the (R62) Passenger Squib 2 Line 2 circuit between the Passenger Airbag Squib connector and ground.

**Is there any voltage present on either circuit?**

**Yes** >> Repair the Passenger Squib 2 circuits with voltage present for a short to battery.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 4



**B1B0D-PASSENGER AIRBAG SQUIB 2 CIRCUIT HIGH (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

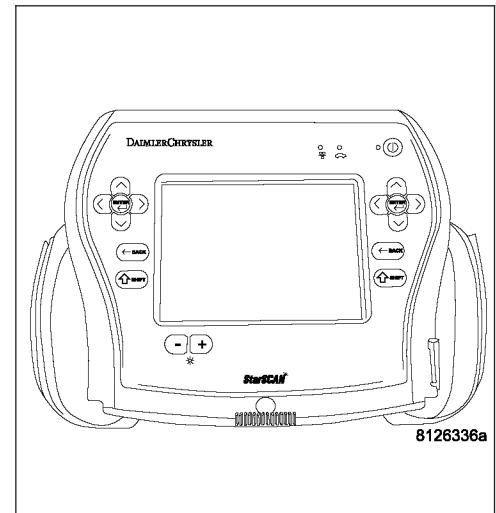
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

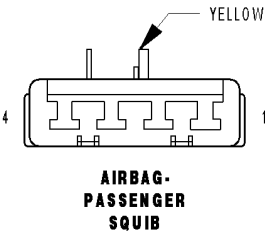
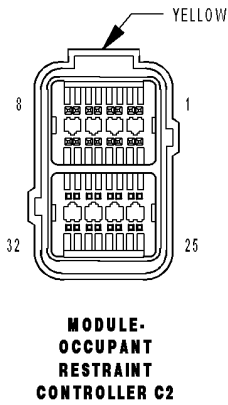
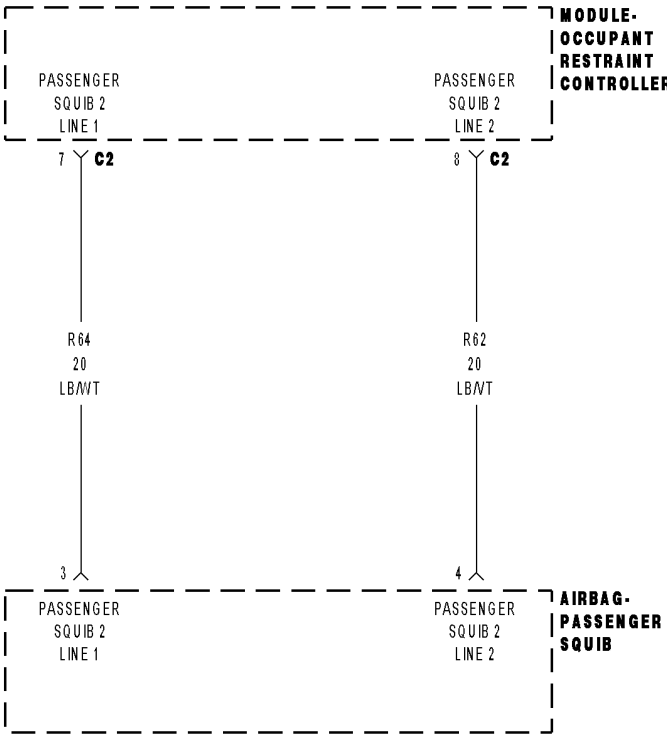
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



B1B0E-PASSENGER AIRBAG SQUIB 2 CIRCUIT OPEN



**B1B0E-PASSENGER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Squib 2 circuits.

- **Set Condition:**

The ORC has detected an open or high resistance on the Passenger Squib 2 circuits.

Possible Causes
(R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT OPEN (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT OPEN PASSENGER AIRBAG ORC

## Diagnostic Test

### 1. DETERMINE ACTIVE OR STORED DTC

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

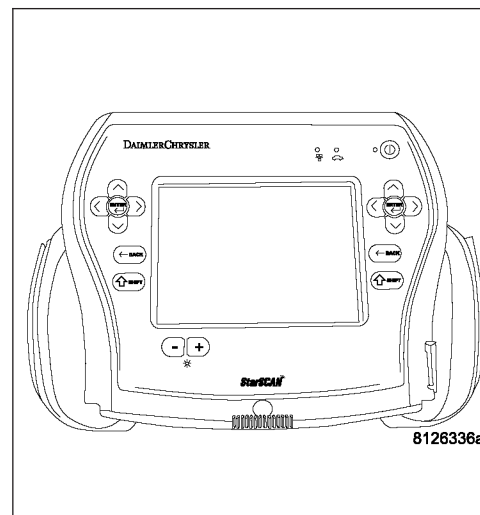
Is the DTC active or stored?

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 6



**B1B0E-PASSENGER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)****2. CHECK FOR OPEN SQUIB CIRCUITS IN PASSENGER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Passenger Airbag Squib connector.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool to the Passenger Airbag Squib connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

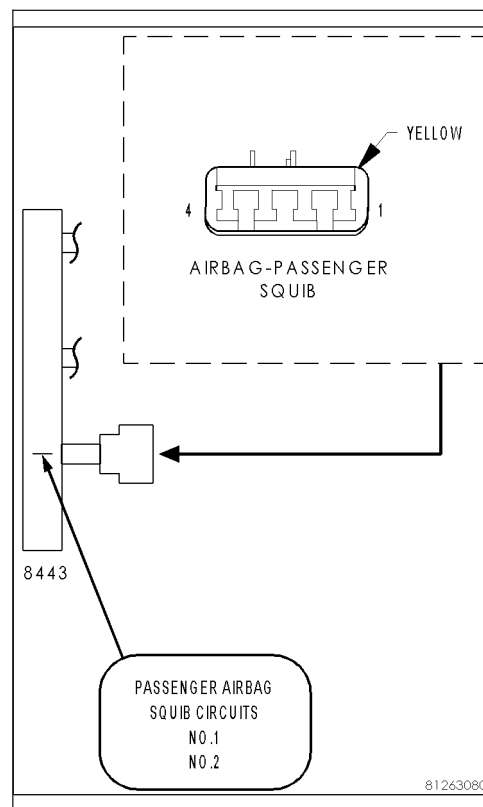
With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B0E PASSENGER AIRBAG SQUIB CIRCUIT OPEN?**

**Yes** >> Go To 3

**No** >> Replace the Passenger Airbag in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool from the Passenger Airbag Squib connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

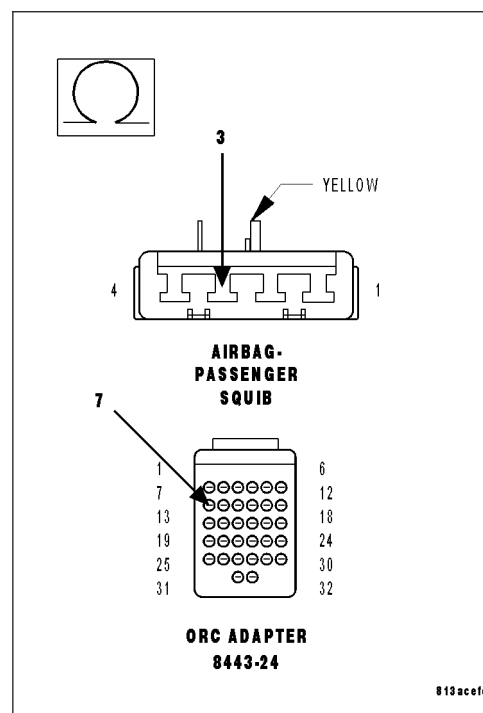
Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.

Measure the resistance of the (R64) Passenger Squib 2 Line 1 circuit between the Passenger Airbag Squib connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go to 4

**No** >> Repair the (R64) Passenger Squib 2 Line 1 circuit for an open. Then, Go To 4



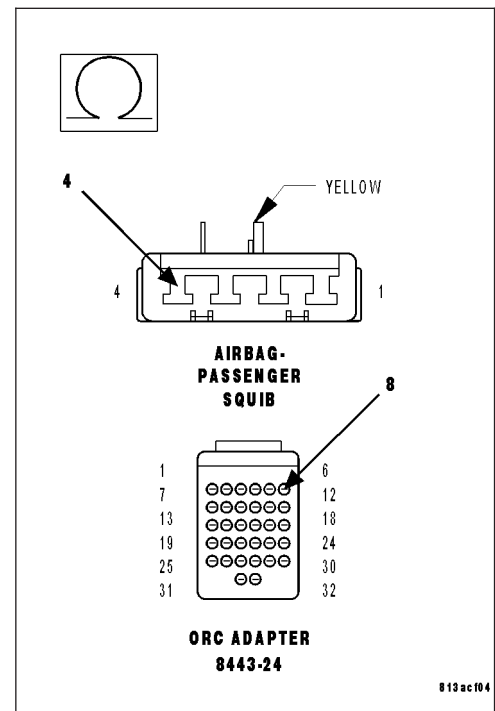
**B1B0E-PASSENGER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)****4. CHECK (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT FOR AN OPEN**

Measure the resistance of the (R62) Passenger Squib 2 Line 2 circuit between the Passenger Airbag Squib connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 5

**No** >> Repair the (R62) Passenger Squib 2 Line 2 circuit for an open.  
Perform ORC VERIFICATION TEST - VER 1

**5. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**B1B0E-PASSENGER AIRBAG SQUIB 2 CIRCUIT OPEN (CONTINUED)****6. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Passenger Airbag circuits, rotate the steering wheel from stop to stop.

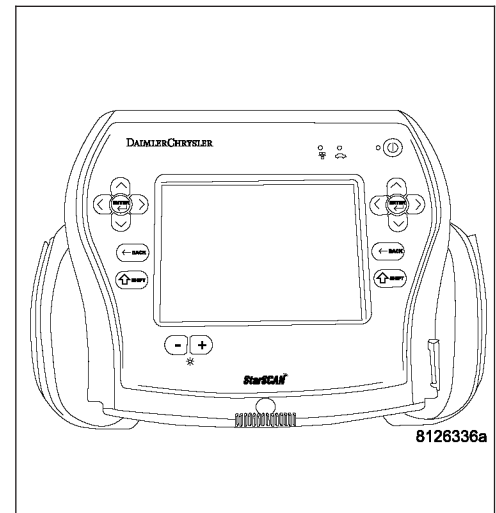
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

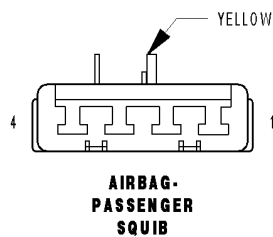
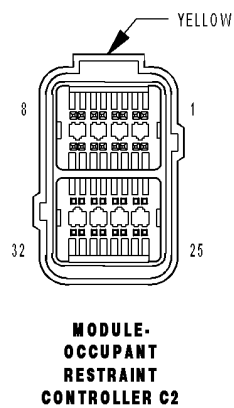
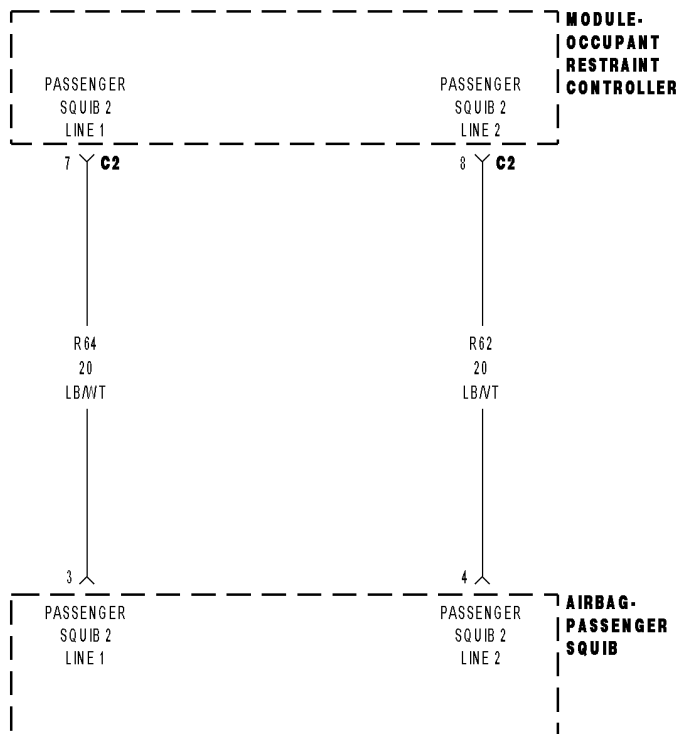
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B0F-PASSENGER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER





**B1B0F-PASSENGER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Squib 2 circuits.
- **Set Condition:**  
The ORC has detected low resistance between the Passenger Squib 2 circuits.

Possible Causes
(R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT SHORTED TO (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT PASSENGER AIRBAG ORC

**Diagnostic Test**

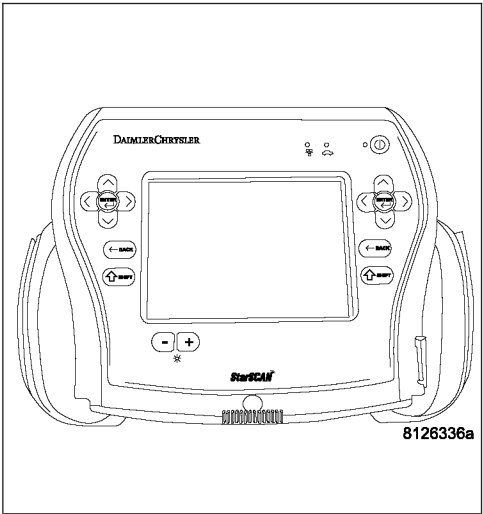
**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

Is the DTC active or stored?

**ORC - ACTIVE DTC**  
Go To 2

**ORC - STORED DTC**  
Go To 5



**B1B0F-PASSENGER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN PASSENGER AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the Passenger Airbag Squib connector.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool to the Passenger Airbag Squib connector.

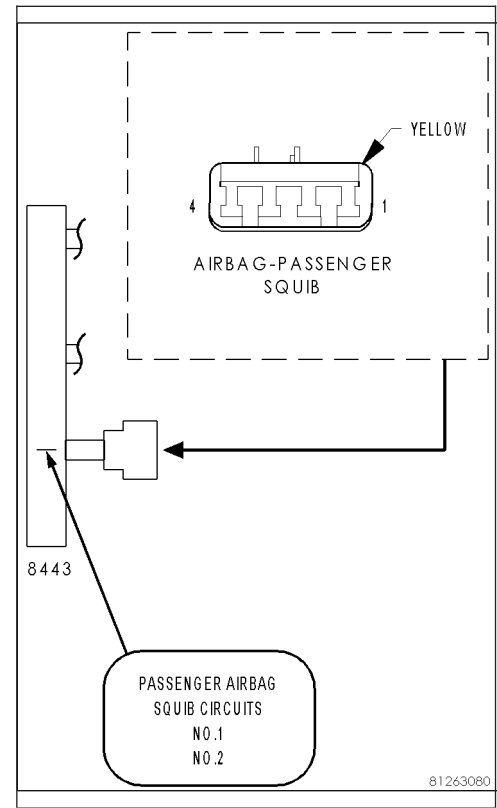
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B0F PASSENGER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 3

**No** >> Replace the Passenger Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R64) PASSENGER SQUIB 2 LINE 1 CIRCUIT FOR A SHORT TO (R62) PASSENGER SQUIB 2 LINE 2 CIRCUIT**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the 8443 Load Tool from the Passenger Airbag Squib connector.

Disconnect the ORC connectors.

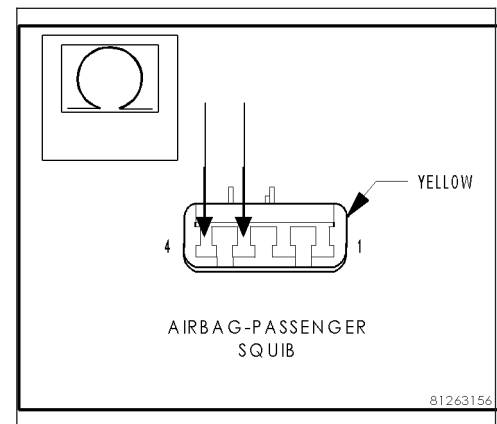
**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C2 connector.  
Measure the resistance between the (R64) Passenger Squib 2 Line 1 circuit and the (R62) Passenger Squib 2 Line 2 circuit at the Passenger Airbag Squib connector.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (R64) Passenger Squib 2 Line 1 circuit for a short to the (R62) Passenger Squib 2 Line 2 circuit.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go to 4



**B1B0F-PASSENGER AIRBAG SQUIB 2 CIRCUIT SHORTED TOGETHER (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

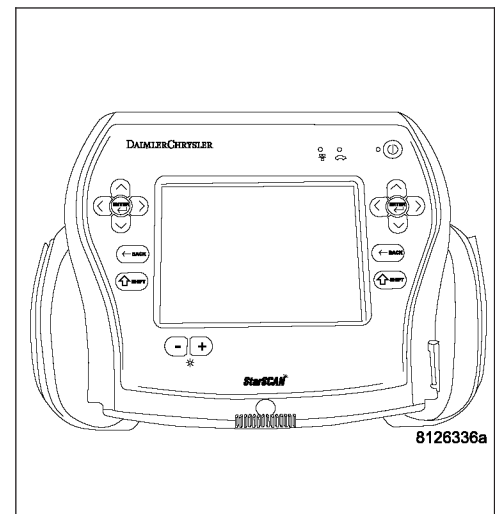
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

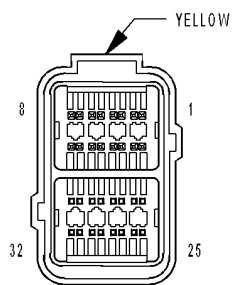
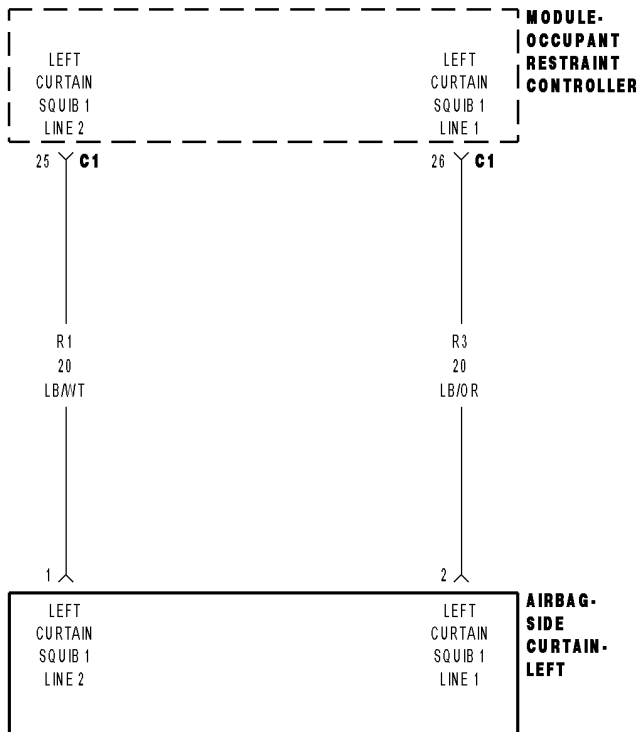
**Are any ACTIVE DTCs present?**

**Yes**    >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

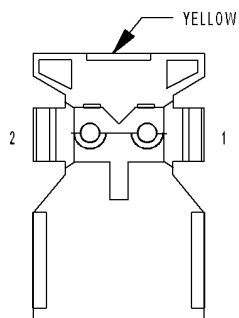
**No**    >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B18-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT LOW



**MODULE-OCCUPANT RESTRAINT CONTROLLER C1**



**AIRBAG-SIDE CURTAIN-LEFT**

**B1B18-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT LOW (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Left Curtain Squib 1 circuits.
- **Set Condition:**  
The ORC has detected low resistance of the Left Curtain Squib 1 circuits.

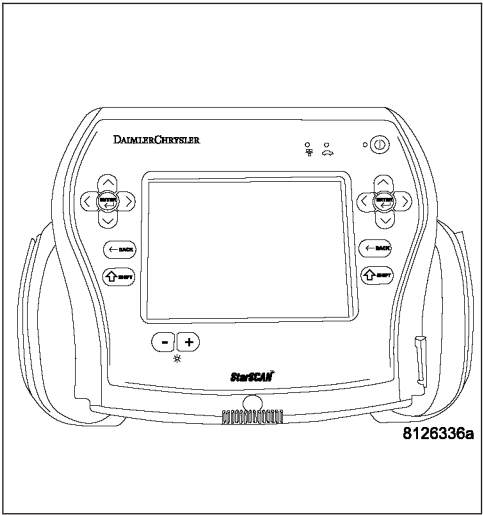
Possible Causes
(R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT OR (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT SHORTED TO GROUND LEFT SIDE CURTAIN AIRBAG ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 5



**B1B18-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT LOW (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN LEFT SIDE CURTAIN AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Left Side Curtain Airbag connector.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Left Side Curtain Airbag connector.

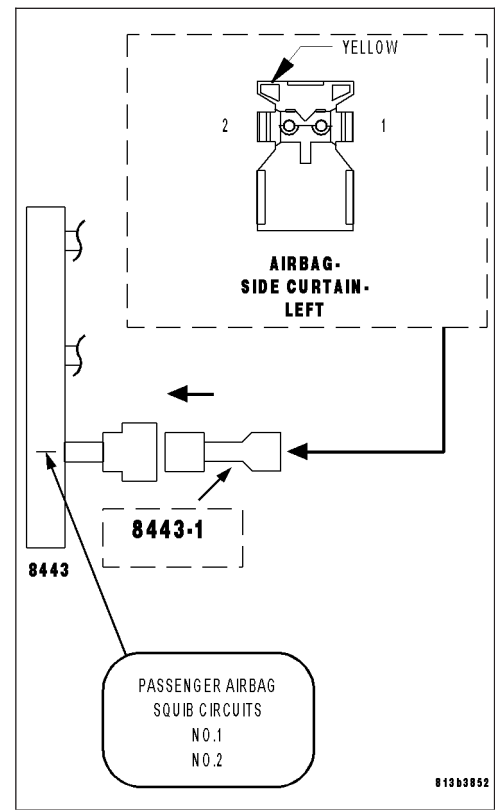
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B18 LEFT SIDE CURTAIN SQUIB 1 CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the Left Side Curtain Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT AND (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Left Side Curtain Airbag connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the resistance of the (R3) Left Curtain Squib 1 Line 1 circuit between ground and the Left Side Curtain Airbag connector.

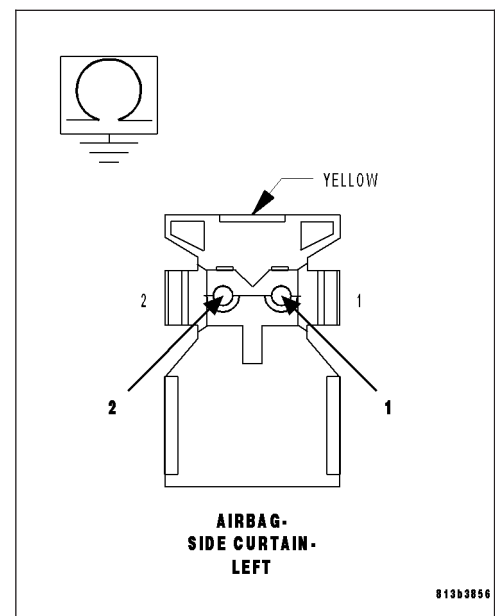
Measure the resistance of the (R1) Left Curtain Squib 1 Line 2 circuit between ground and the Left Side Curtain Airbag connector.

**Is the resistance below 10K ohms on either circuit?**

**Yes** >> Repair the Left Curtain Squib 1 circuits with a resistance below 10K ohms for a short to ground.

Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 4



**B1B18-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT LOW (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

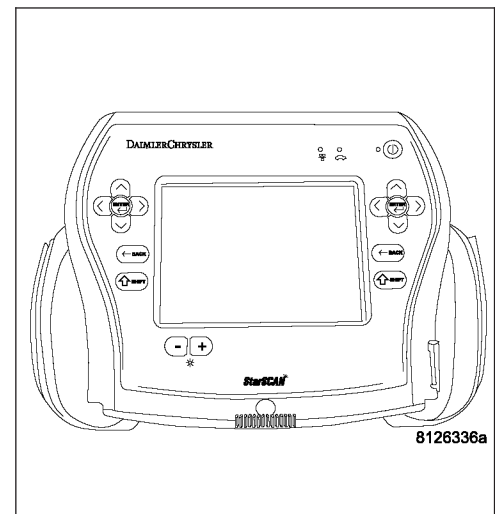
IF only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

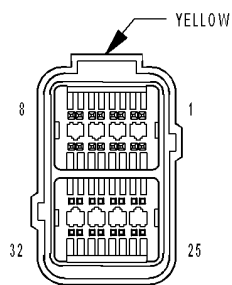
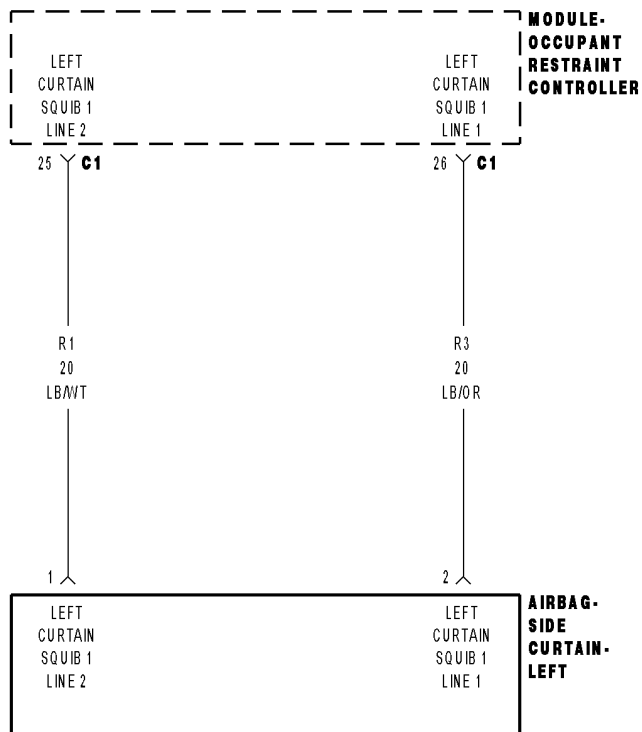
**Are any ACTIVE DTC's present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

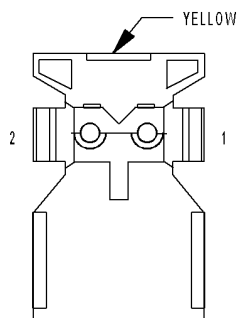
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B19-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT HIGH



**MODULE-  
OCCUPANT  
RESTRAINT  
CONTROLLER C1**



**AIRBAG-  
SIDE CURTAIN-  
LEFT**



**B1B19-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT HIGH (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the voltage on the Left Curtain Squib 1 circuits.
- **Set Condition:**  
The ORC has detected voltage on the Left Curtain Squib 1 circuits.

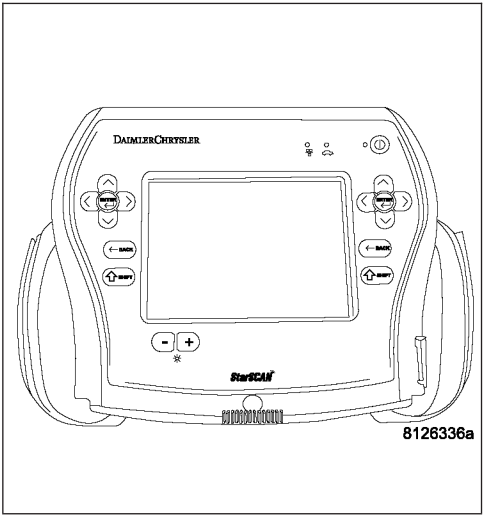
Possible Causes
(R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT OR (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT SHORTED TO BATTERY
LEFT SIDE CURTAIN AIRBAG
ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 5



**B1B19-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT HIGH (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN LEFT SIDE CURTAIN AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the Left Side Curtain Airbag connector.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Left Side Curtain Airbag connector.

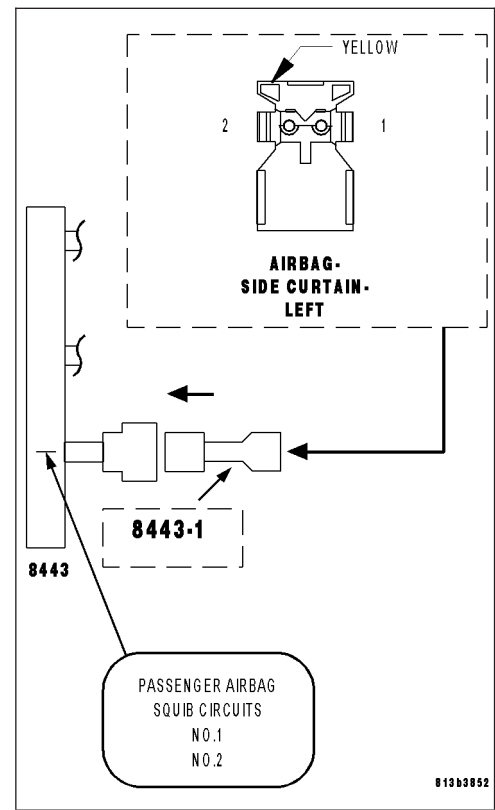
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B19 LEFT SIDE CURTAIN SQUIB 1 CIRCUIT HIGH?**

**Yes** >> Go To 3

**No** >> Replace the Left Side Curtain Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT AND (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the 8443 Load Tool and Jumper from the Left Side Curtain Airbag connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

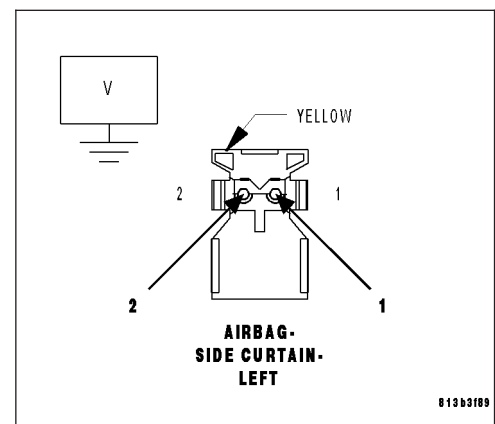
Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the voltage of the (R3) Left Curtain Squib 1 Line 1 circuit between the Left Side Curtain Airbag connector and ground.

Measure the voltage of the (R1) Left Curtain Squib 1 Line 2 circuit between the Left Side Curtain Airbag connector and ground.

**Is there any voltage present on either circuit?**

**Yes** >> Repair the Left Curtain Squib 1 circuits with voltage present for a short to battery.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 4



**B1B19-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT HIGH (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off then disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

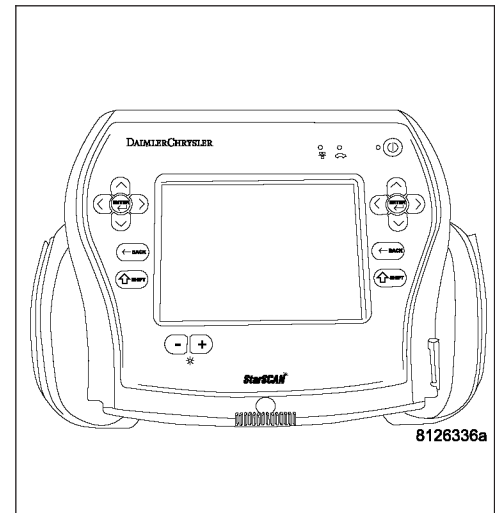
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

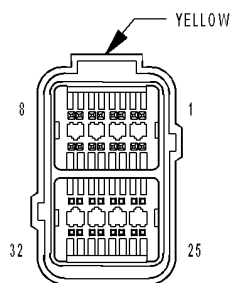
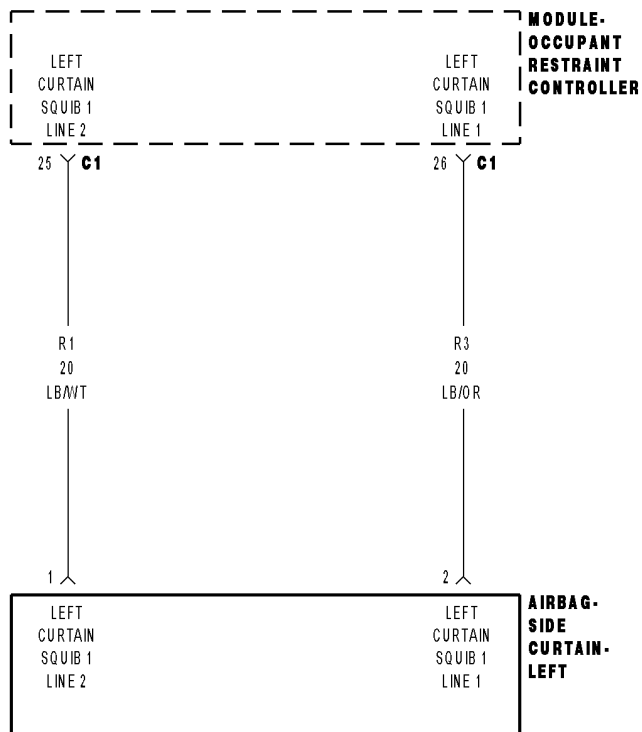
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

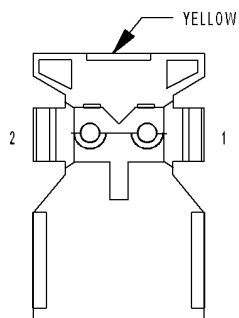
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B1A-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN



**MODULE-OCCUPANT RESTRAINT CONTROLLER C1**



**AIRBAG-SIDE CURTAIN-LEFT**

**B1B1A-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Left Curtain Squib 1 circuits.
- **Set Condition:**  
The ORC has detected an open or high resistance on the Left Curtain Squib 1 circuits.

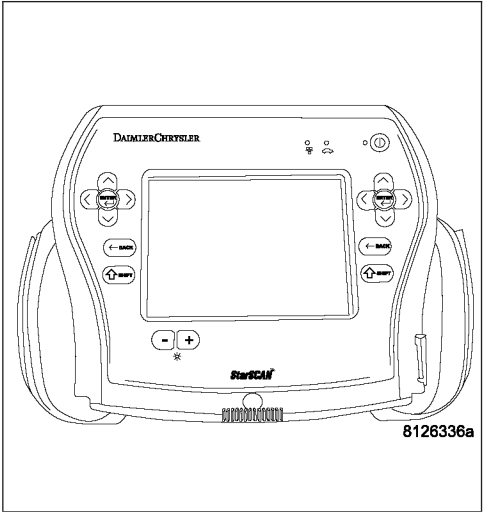
Possible Causes
(R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT OPEN (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT OPEN LEFT SIDE CURTAIN AIRBAG ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 6



**B1B1A-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN (CONTINUED)****2. CHECK FOR OPEN SQUIB CIRCUITS IN LEFT SIDE CURTAIN AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Left Side Curtain Airbag connector.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Left Side Curtain Airbag connector.

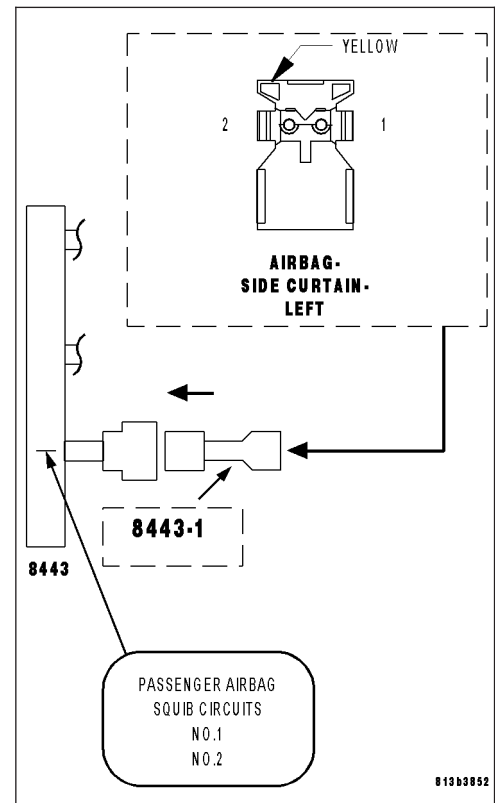
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B1A LEFT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN?**

**Yes** >> Go To 3

**No** >> Replace the Left Side Curtain Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Left Side Curtain Airbag connector.

Disconnect the ORC connectors.

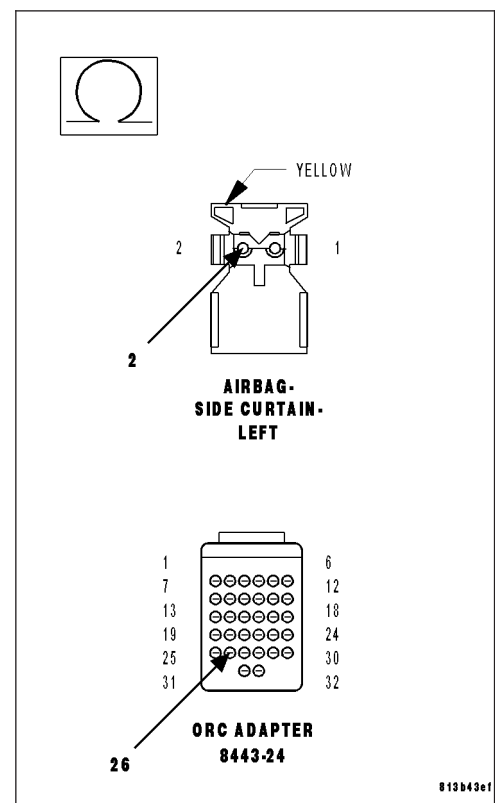
**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the resistance of the (R3) Left Curtain Squib 1 Line 1 circuit between the Left Side Curtain Airbag connector and the Load Tool ORC Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 4

**No** >> Repair the (R3) Left Curtain Squib 1 Line 1 circuit for an open. Then, Go To 4



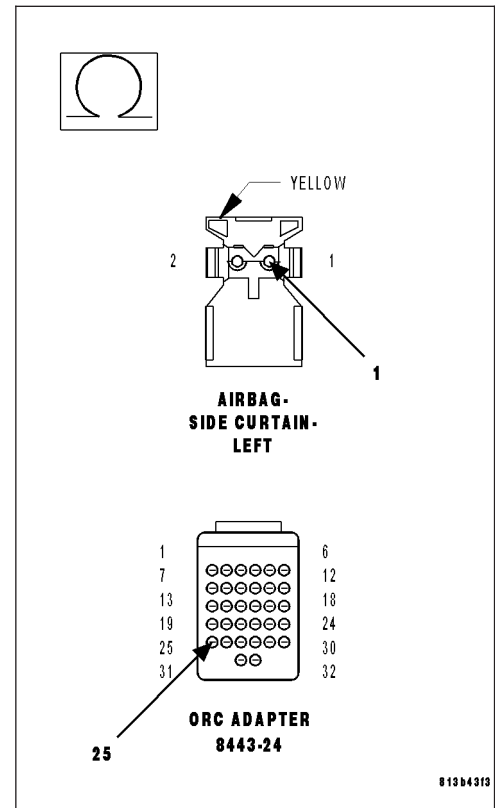
**B1B1A-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN (CONTINUED)****4. CHECK (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT FOR AN OPEN**

Measure the resistance of the (R1) Left Curtain Squib 1 Line 2 circuit between the Left Side Curtain Airbag connector and the Load Tool ORC Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 5

**No** >> Repair the (R1) Left Curtain Squib 1 Line 2 circuit for an open.  
Perform ORC VERIFICATION TEST - VER 1

**5. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**B1B1A-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN (CONTINUED)****6. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

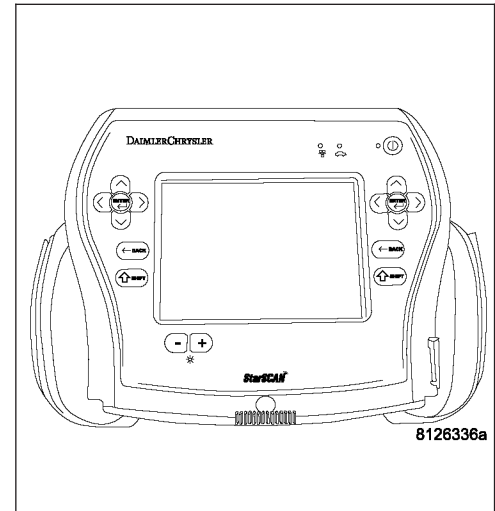
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

**Are any ACTIVE DTCs present?**

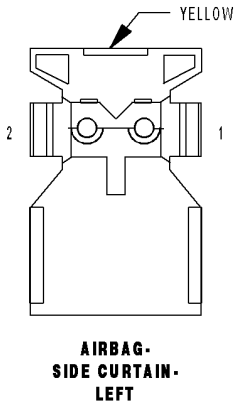
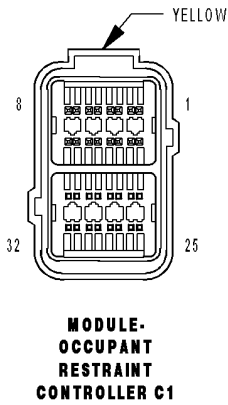
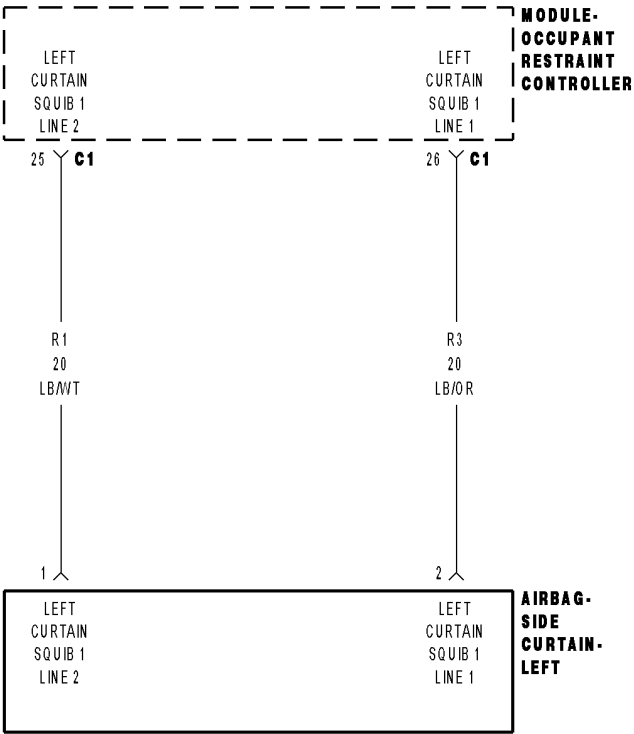
**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.





B1B1B-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT SHORTED TOGETHER



**B1B1B-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Left Curtain Squib 1 circuits.

- **Set Condition:**

The ORC has detected low resistance between the Left Curtain Squib 1 circuits.

Possible Causes
(R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT SHORTED TO (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT LEFT SIDE CURTAIN AIRBAG ORC

## Diagnostic Test

### 1. DETERMINE ACTIVE OR STORED DTC

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

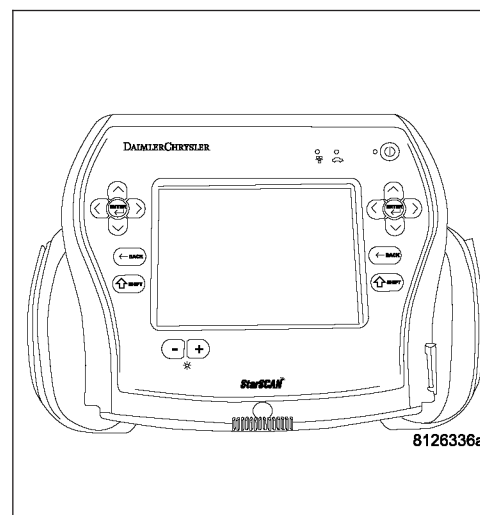
Is the DTC active or stored?

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 5



**B1B1B-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT SHORTED TOGETHER (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN LEFT SIDE CURTAIN AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Left Side Curtain Airbag connector.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Left Side Curtain Airbag connector.

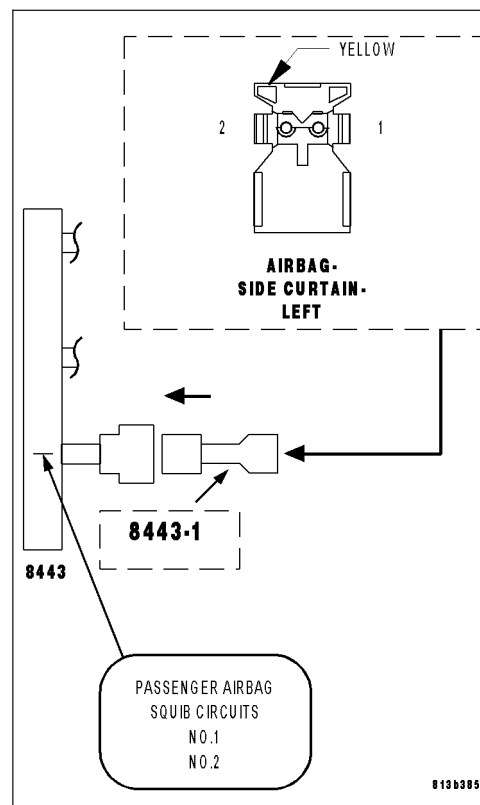
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B1B LEFT SIDE CURTAIN SQUIB 1 CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 3

**No** >> Replace the Left Side Curtain Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R3) LEFT CURTAIN SQUIB 1 LINE 1 CIRCUIT FOR A SHORT TO (R1) LEFT CURTAIN SQUIB 1 LINE 2 CIRCUIT**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Left Side Curtain Airbag connector.

Disconnect the ORC connectors.

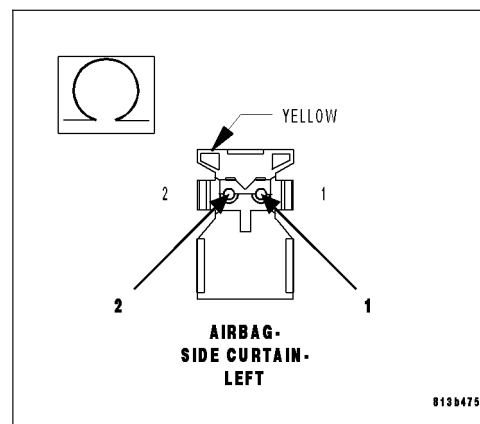
**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the resistance between the (R3) Left Curtain Squib 1 Line 1 circuit and the (R1) Left Curtain Squib 1 Line 2 circuit at the Left Side Curtain Airbag connector.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (R3) Left Curtain Squib 1 Line 1 circuit for a short to the (R1) Left Curtain Squib 1 Line 2 circuit.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 4



**B1B1B-LEFT SIDE CURTAIN SQUIB 1 CIRCUIT SHORTED TOGETHER (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

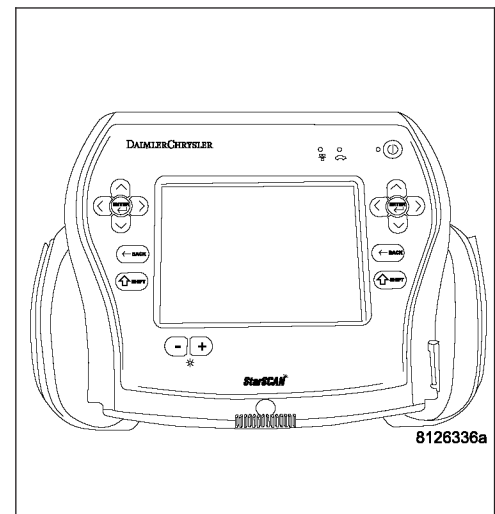
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

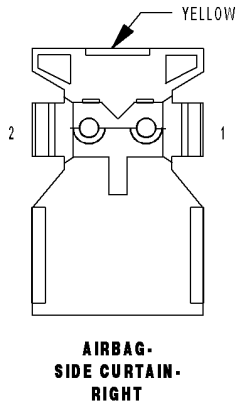
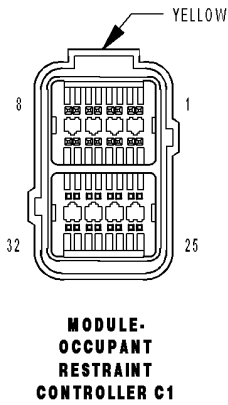
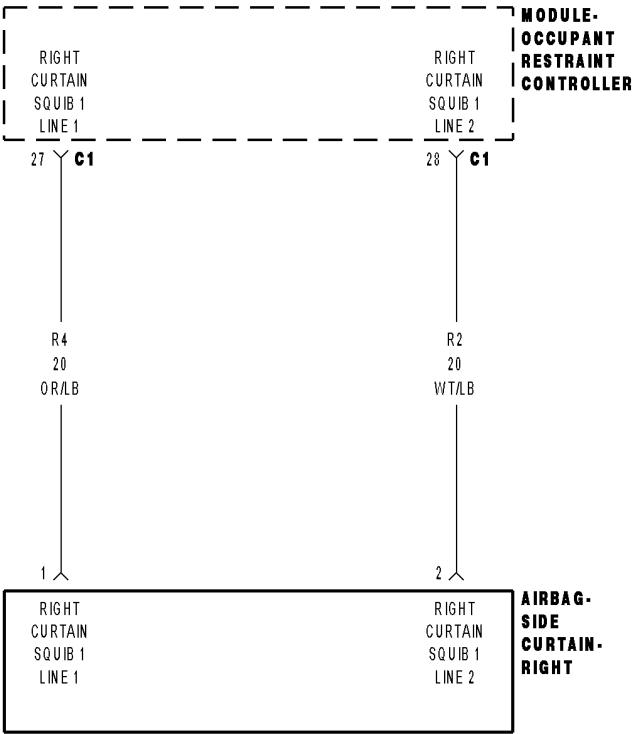
**Are any ACTIVE DTC's present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



B1B20-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT LOW



**B1B20-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT LOW (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Right Curtain Squib 1 circuits.

- **Set Condition:**

The ORC has detected low resistance on the Right Curtain Squib 1 circuits.

Possible Causes
(R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT OR (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT SHORTED TO GROUND RIGHT SIDE CURTAIN AIRBAG ORC

**Diagnostic Test****1. DETERMINE ACTIVE OR STORED DTC**

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

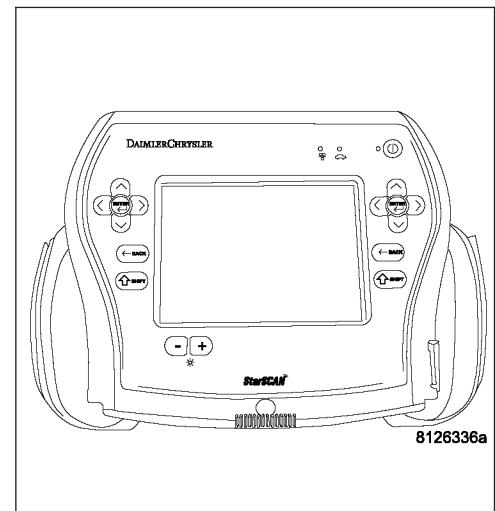
**Is the DTC active or stored?**

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 5



**B1B20-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT LOW (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN RIGHT SIDE CURTAIN AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Right Side Curtain Airbag connector.

**WARNING:** To avoid personal injury or death, do not place an intact undeployed curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Right Side Curtain Airbag connector.

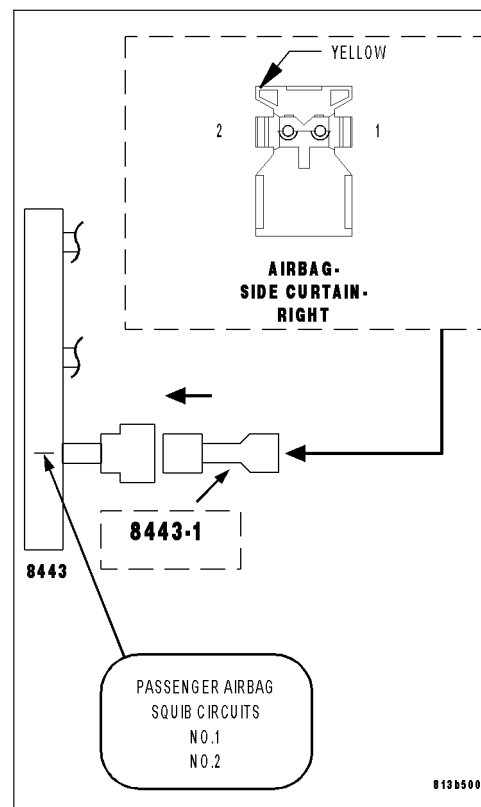
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B20 RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the Right Side Curtain Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT AND (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Right Side Curtain Airbag connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

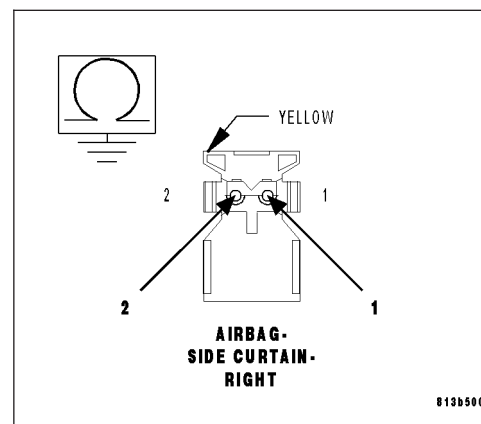
Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the resistance of the (R4) Right Curtain Squib 1 Line 1 circuit between ground and the Right Side Curtain Airbag connector.

Measure the resistance of the (R2) Right Curtain Squib 1 Line 2 circuit between ground and the Right Side Curtain Airbag connector.

**Is the resistance below 10K ohms on either circuit?**

**Yes** >> Repair the Right Curtain Squib 1 circuits with a resistance below 10K ohms for a short to ground.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go to 4



**B1B20-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT LOW (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

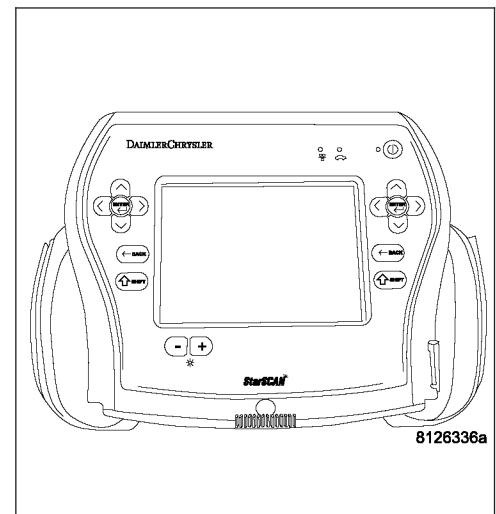
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

**Are any ACTIVE DTC's present?**

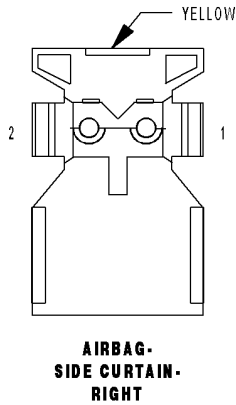
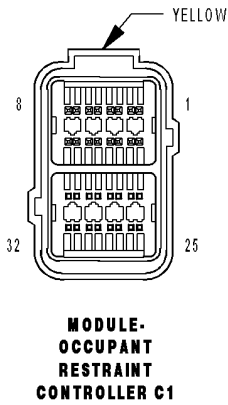
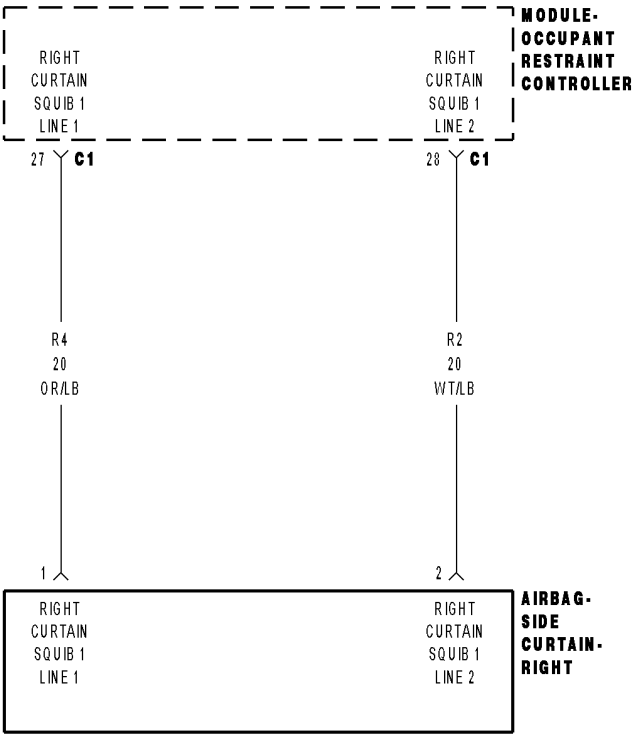
**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.





B1B21-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT HIGH



**B1B21-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT HIGH (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the voltage on the Right Curtain Squib 1 circuits.

- **Set Condition:**

When the ORC detects voltage on the Right Curtain Squib 1 circuits.

Possible Causes
(R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT OR (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT SHORTED TO BATTERY RIGHT SIDE CURTAIN AIRBAG ORC

**Diagnostic Test****1. DETERMINE ACTIVE OR STORED DTC**

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

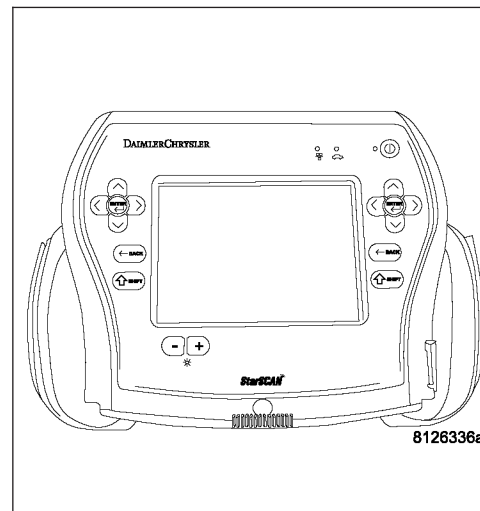
Is the DTC active or stored?

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 5



**B1B21-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT HIGH (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN RIGHT SIDE CURTAIN AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Right Side Curtain Airbag connector.

**WARNING:** To avoid personal injury or death, do not place an intact uncoupled curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Right Side Curtain Airbag connector.

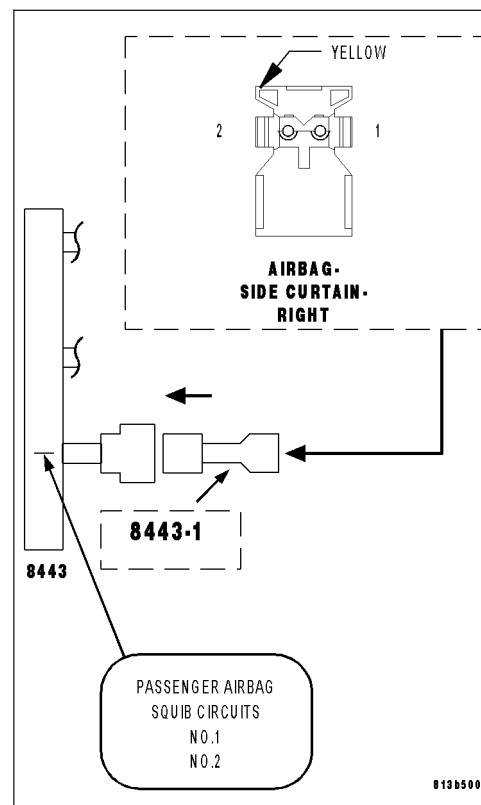
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B21 RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT HIGH?**

**Yes** >> Go To 3

**No** >> Replace the Right Side Curtain Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT AND (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Right Side Curtain Airbag connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

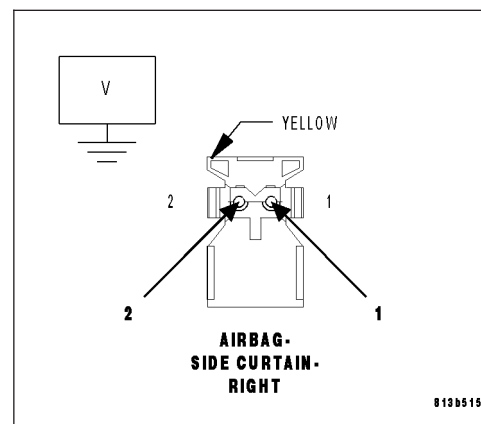
Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the voltage of the (R4) Right Curtain Squib 1 Line 1 circuit between the Right Side Curtain Airbag connector and ground.

Measure the voltage of the (R2) Right Curtain Squib 1 Line 2 circuit between the Right Side Curtain Airbag connector and ground.

**Is there any voltage present on either circuit?**

**Yes** >> Repair the Right Curtain Squib 1 circuits with voltage present for a short to battery.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go to 4



**B1B21-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT HIGH (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

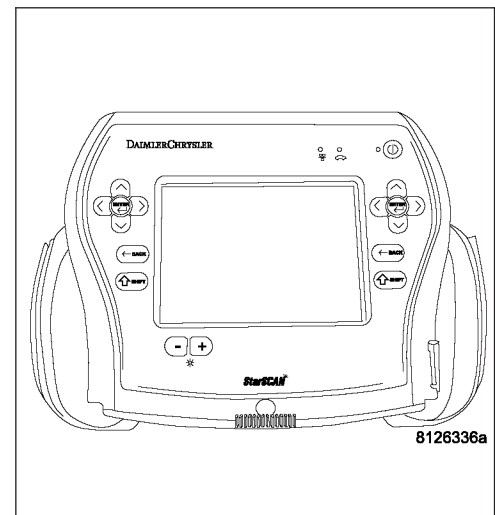
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

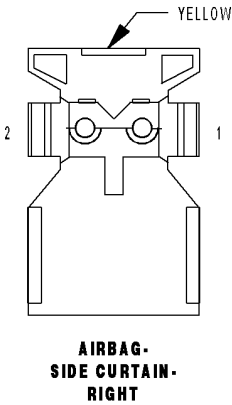
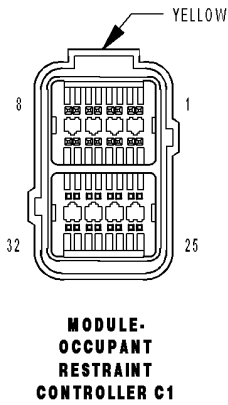
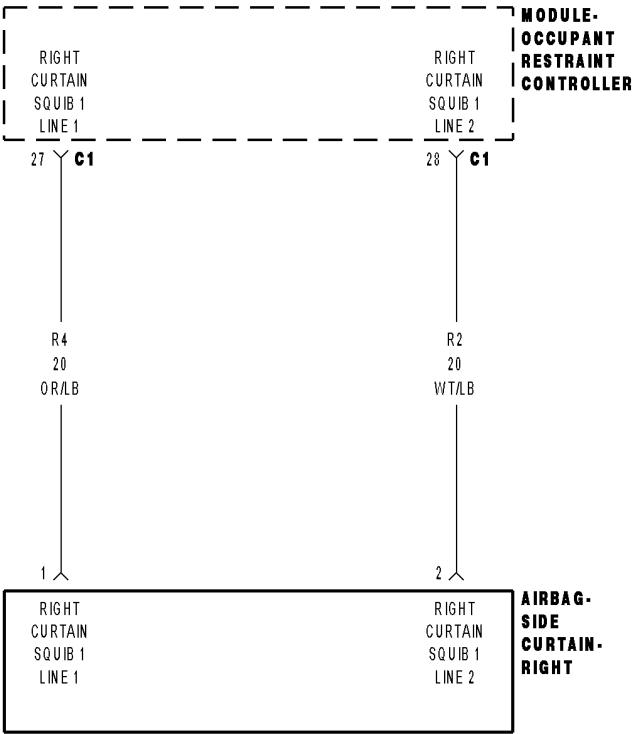
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer



B1B22-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN



**B1B22-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Right Curtain Squib 1 circuits.

- **Set Condition:**

When the ORC has detects an open or high resistance on the Right Curtain Squib 1 circuits.

Possible Causes
(R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT OPEN (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT OPEN RIGHT SIDE CURTAIN AIRBAG ORC

## Diagnostic Test

### 1. DETERMINE ACTIVE OR STORED DTC

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

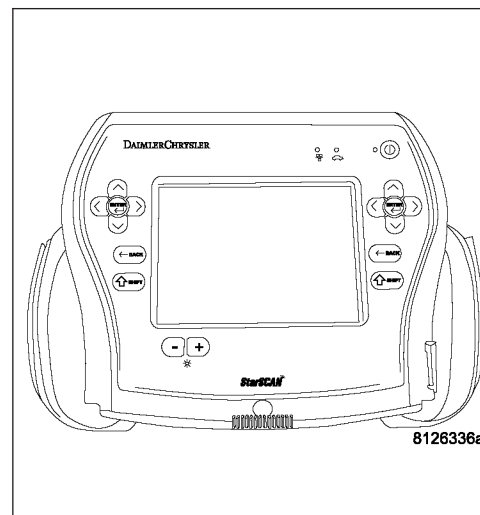
**Is the DTC active or stored?**

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 6



**B1B22-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN (CONTINUED)****2. CHECK FOR OPEN SQUIB CIRCUITS IN RIGHT SIDE CURTAIN AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Right Side Curtain Airbag connector.

**WARNING:** To avoid personal injury or death, do not place an intact uncoupled curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Right Side Curtain Airbag connector.

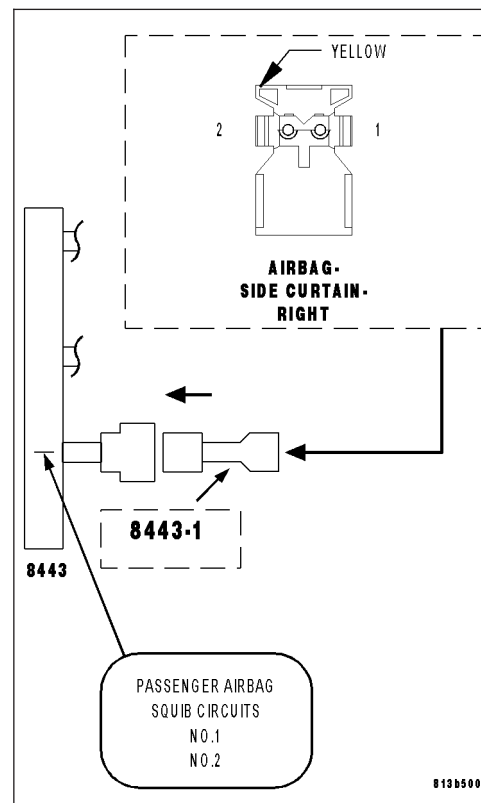
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B22 RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN?**

**Yes** >> Go to 3

**No** >> Replace the Right Side Curtain Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Right Side Curtain Airbag connector.

Disconnect the ORC connectors.

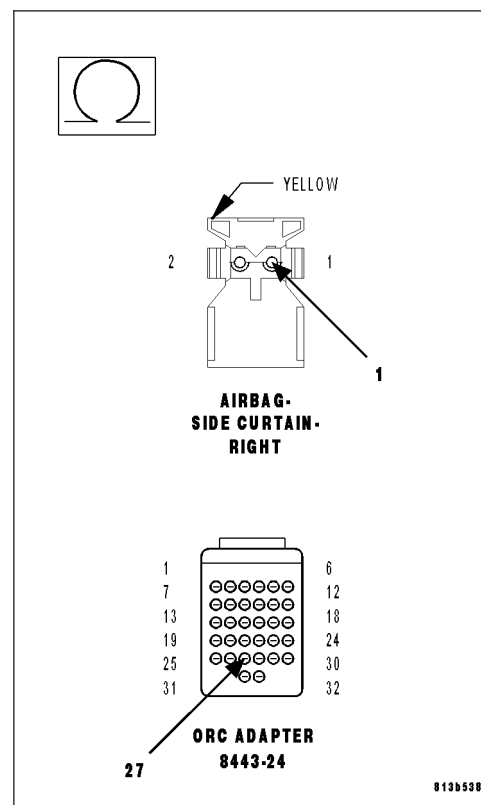
**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the resistance of the (R4) Right Curtain Squib 1 Line 1 circuit between the Right Side Curtain Airbag connector and the 8443 ORC Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 4

**No** >> Repair the (R4) Right Curtain Squib 1 Line 1 circuit for an open. Then, Go To 4



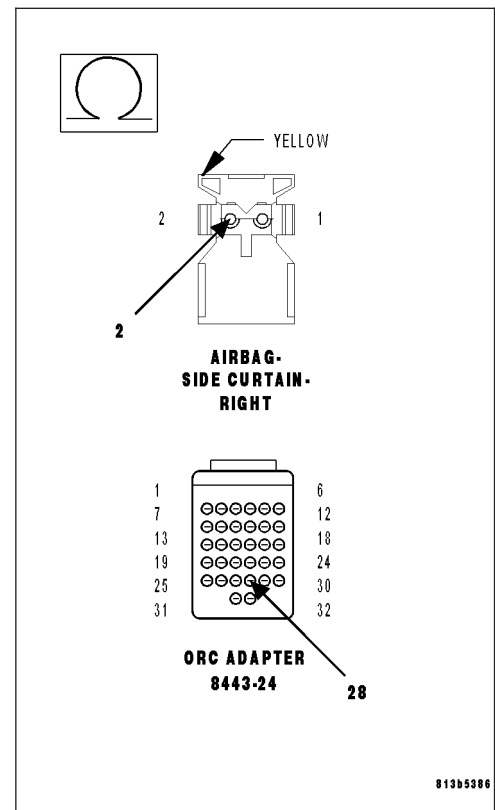
**B1B22-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN (CONTINUED)****4. CHECK (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT FOR AN OPEN**

Measure the resistance of the (R2) Right Curtain Squib 1 Line 2 circuit between the Right Side Curtain Airbag connector and the 8443 ORC Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 5

**No** >> Repair the (R2) Right Curtain Squib 1 Line 2 circuit for an open.  
Perform ORC VERIFICATION TEST - VER 1

**5. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1



**B1B22-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT OPEN (CONTINUED)****6. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

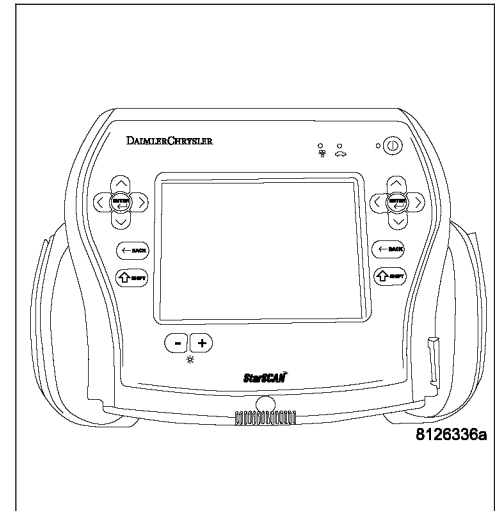
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

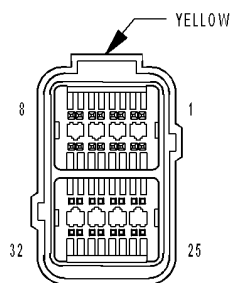
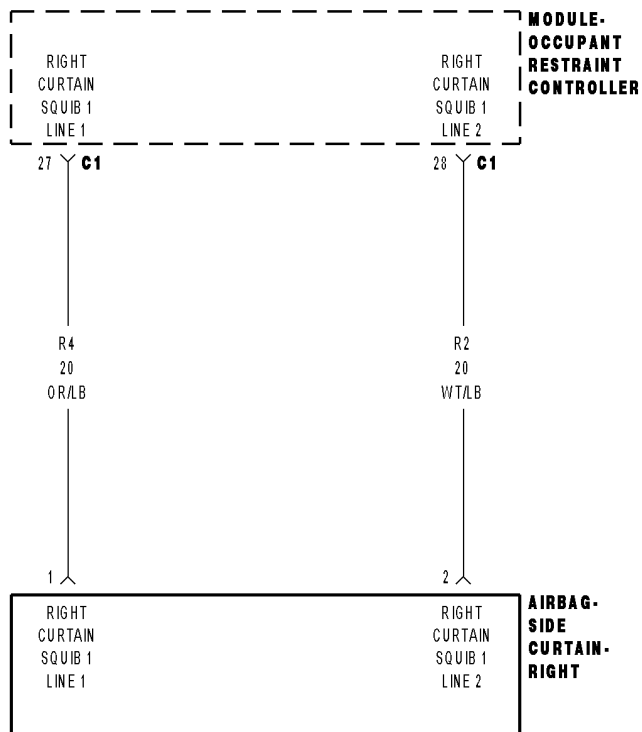
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

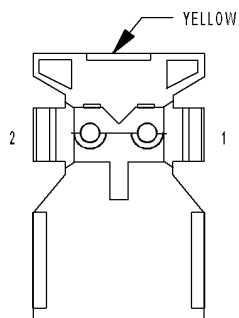
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B23-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT SHORTED TOGETHER



**MODULE-OCCUPANT RESTRAINT CONTROLLER C1**



**AIRBAG-SIDE CURTAIN-RIGHT C1**

**B1B23-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Right Curtain Squib 1 circuits.
- **Set Condition:**  
The ORC has detected low resistance between the Right Curtain Squib 1 circuits.

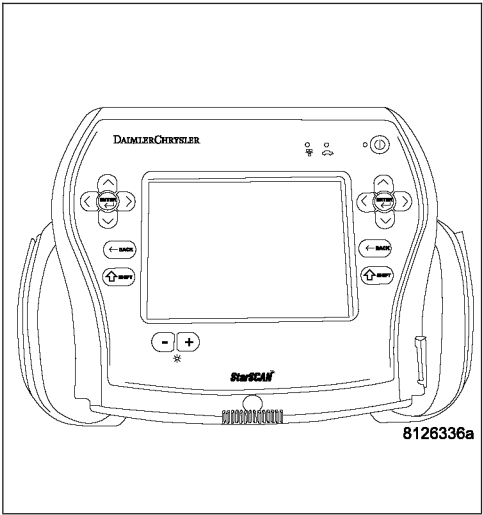
Possible Causes
(R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT SHORTED TO (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT RIGHT SIDE CURTAIN AIRBAG ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 5



**B1B23-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT SHORTED TOGETHER (CONTINUED)****2. CHECK FOR SHORTED SQUIB CIRCUITS IN RIGHT SIDE CURTAIN AIRBAG**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Right Side Curtain Airbag connector.

**WARNING:** To avoid personal injury or death, do not place an intact uncoupled curtain airbag face down on a hard surface, the airbag will propel into the air if accidentally deployed.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Right Side Curtain Airbag connector.

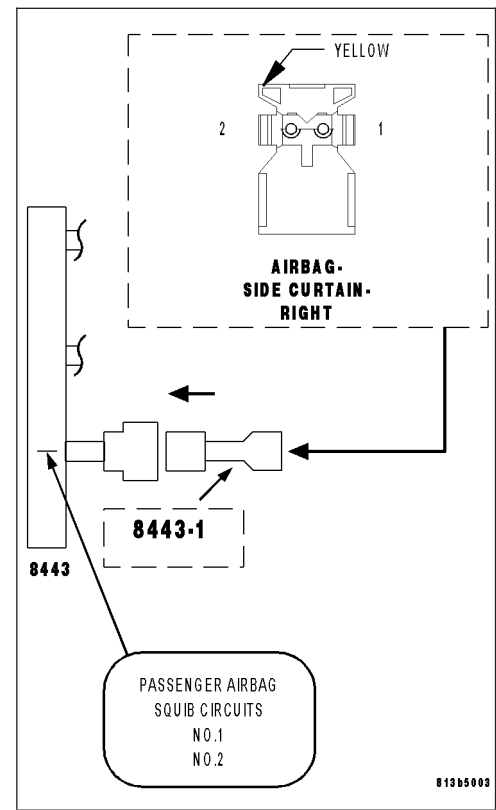
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B23 RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go to 3

**No** >> Replace the Right Side Curtain Airbag in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R4) RIGHT CURTAIN SQUIB 1 LINE 1 CIRCUIT FOR A SHORT TO (R2) RIGHT CURTAIN SQUIB 1 LINE 2 CIRCUIT**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Right Side Curtain Airbag connector.

Disconnect the ORC connectors.

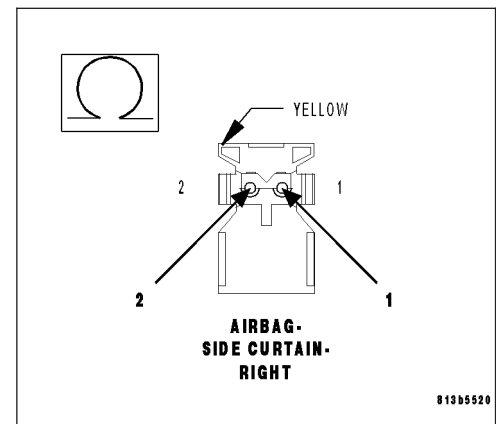
**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the resistance between the (R4) Right Curtain Squib 1 Line 1 circuit and the (R2) Right Curtain Squib 1 Line 2 circuit at the Right Side Curtain Airbag connector.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (R4) Right Curtain Squib 1 Line 1 circuit for a short to the (R2) Right Curtain Squib 1 Line 2 circuit.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go to 4



**B1B23-RIGHT SIDE CURTAIN SQUIB 1 CIRCUIT SHORTED TOGETHER (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

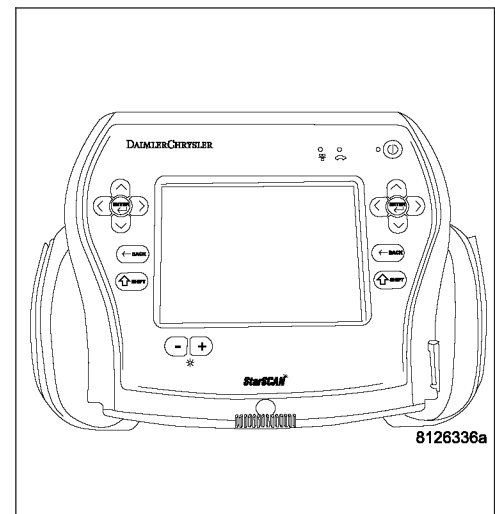
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

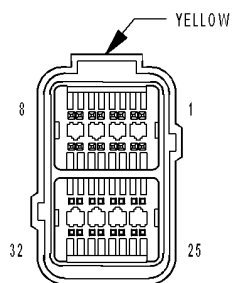
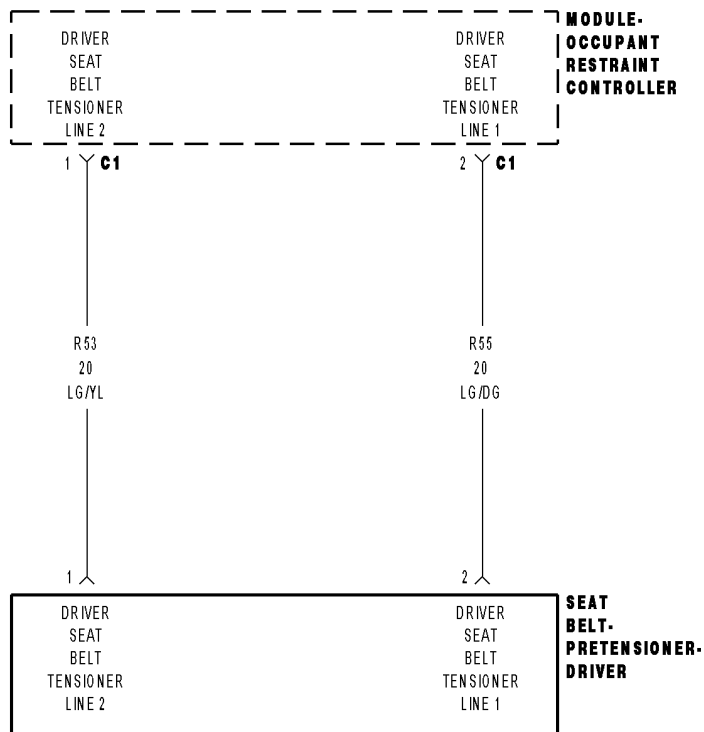
**Are any ACTIVE DTC's present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

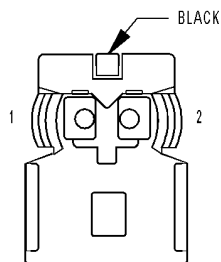
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B28-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT LOW



**MODULE-OCCUPANT RESTRAINT CONTROLLER C1**



**SEAT BELT-PRETENSIONER-DRIVER**

**B1B28-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT LOW (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Driver Seat Belt Tensioner circuits.
- **Set Condition:**  
The ORC has detected low resistance on the Driver Seat Belt Tensioner circuits.

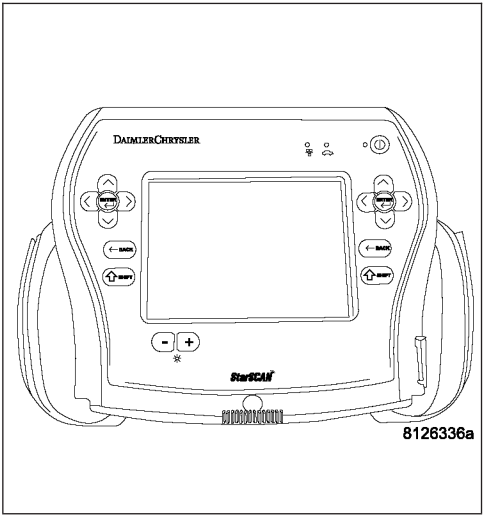
Possible Causes
(R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT OR (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT SHORTED TO GROUND DRIVER SEAT BELT PRETENSIONER ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 5



**B1B28-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT LOW (CONTINUED)****2. CHECK FOR SHORTED DRIVER SEAT BELT PRETENSIONER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Driver Seat Belt Pretensioner connector.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Driver Seat Belt Pretensioner connector.

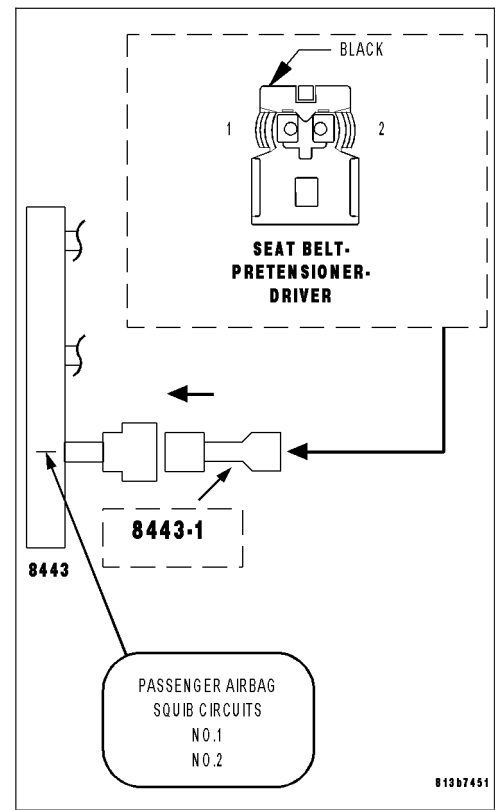
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B28 1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the Driver Seat Belt Pretensioner in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT AND (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Driver Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

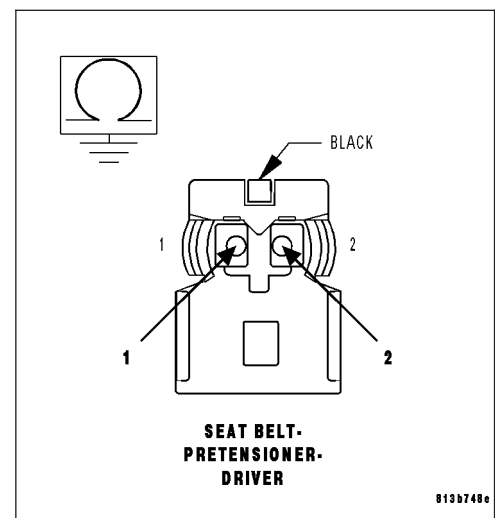
Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the resistance of the (R55) Driver Seat Belt Tensioner Line 1 circuit between ground and the Driver Seat Belt Pretensioner connector.

Measure the resistance of the (R53) Driver Seat Belt Tensioner Line 2 circuit between ground and the Driver Seat Belt Pretensioner connector.

**Is the resistance below 10K ohms on either circuit?**

**Yes** >> Repair the Driver Seat Belt Tensioner circuits with a resistance below 10K ohms for a short to ground.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 4





**B1B28-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT LOW (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

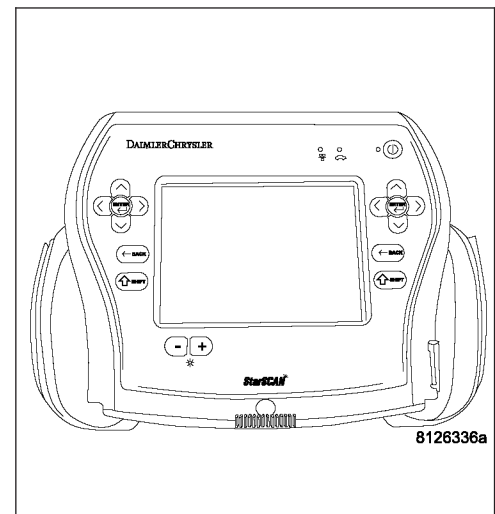
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

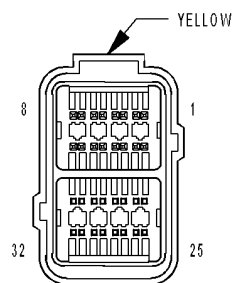
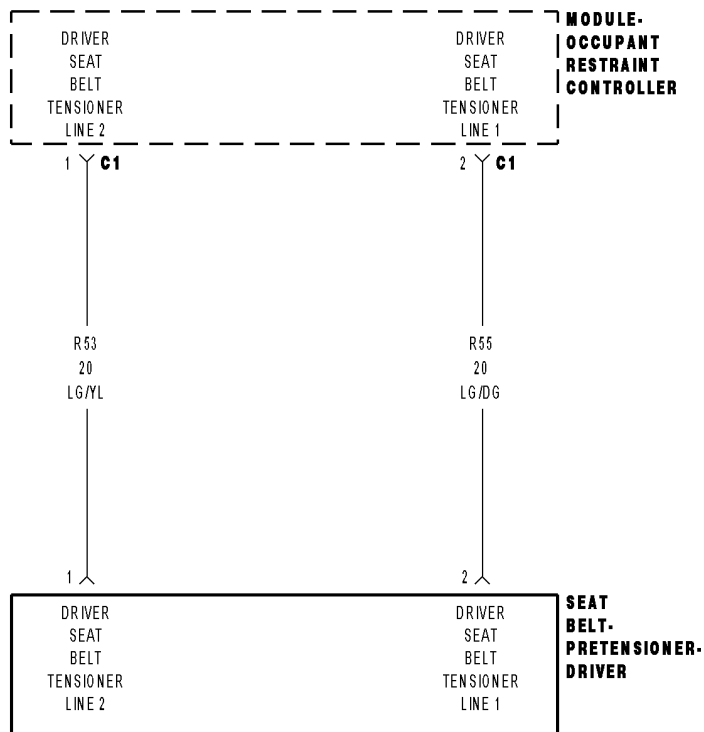
**Are any ACTIVE DTC's present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

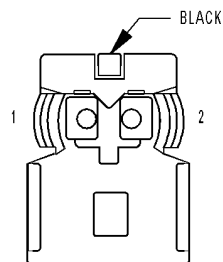
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B29-PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH



**MODULE-OCCUPANT RESTRAINT CONTROLLER C1**



**SEAT BELT-PRETENSIONER-DRIVER**

**B1B29-PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the voltage on the Driver Seat Belt Tensioner circuits.
- **Set Condition:**  
The ORC detects voltage on the Driver Seat Belt Tensioner circuits.

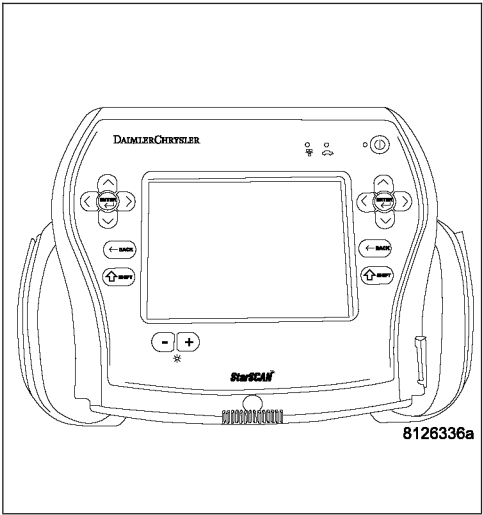
Possible Causes
(R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT OR (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT SHORTED TO BATTERY DRIVER SEAT BELT PRETENSIONER ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 5



**B1B29-PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)****2. CHECK FOR SHORTED DRIVER SEAT BELT PRETENSIONER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Driver Seat Belt Pretensioner connector.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Driver Seat Belt Pretensioner connector.

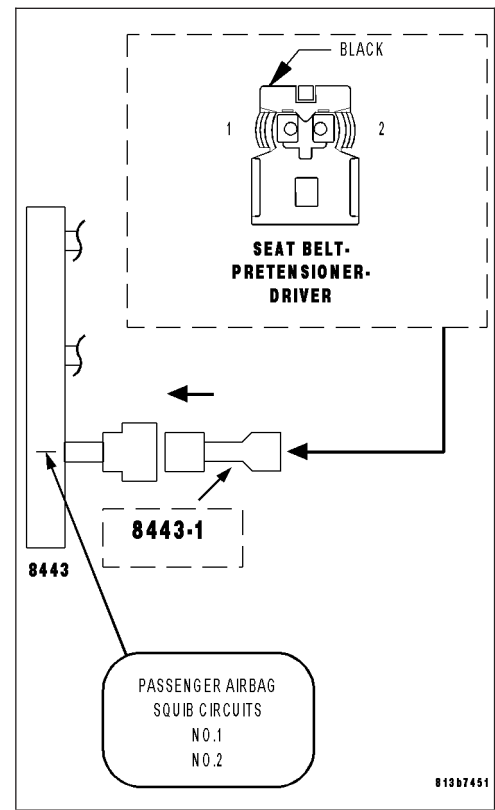
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B29 1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT HIGH?**

**Yes** >> Go To 3

**No** >> Replace the Driver Seat Belt Pretensioner in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT AND (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Driver Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

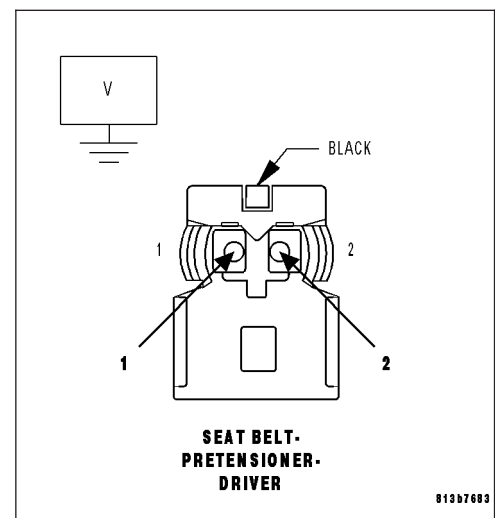
Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the voltage of the (R55) Driver Seat Belt Tensioner Line 1 circuit between the Driver Seat Belt Pretensioner connector and ground.

Measure the voltage of the (R53) Driver Seat Belt Tensioner Line 2 circuit between the Driver Seat Belt Pretensioner connector and ground.

**Is there any voltage present on either circuit?**

**Yes** >> Repair the Driver Seat Belt Tensioner circuits with voltage present for a short to battery.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 4



**B1B29-PASSENGER AIRBAG SQUIB 1 CIRCUIT HIGH (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

---

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return continue the test until the problem area has been isolated.

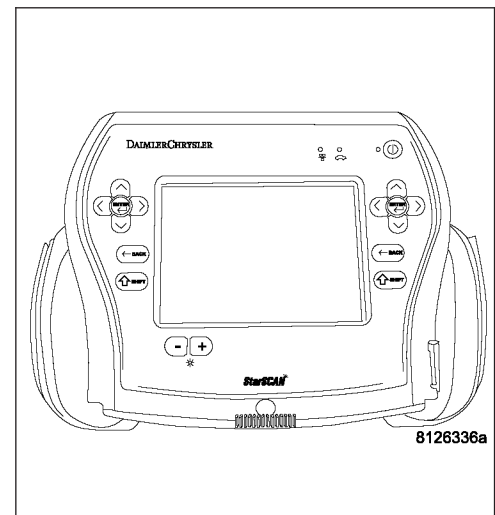
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

**Are any ACTIVE DTCs present?**

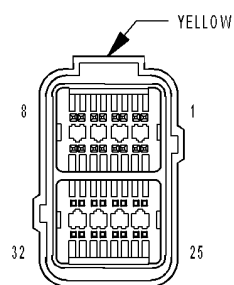
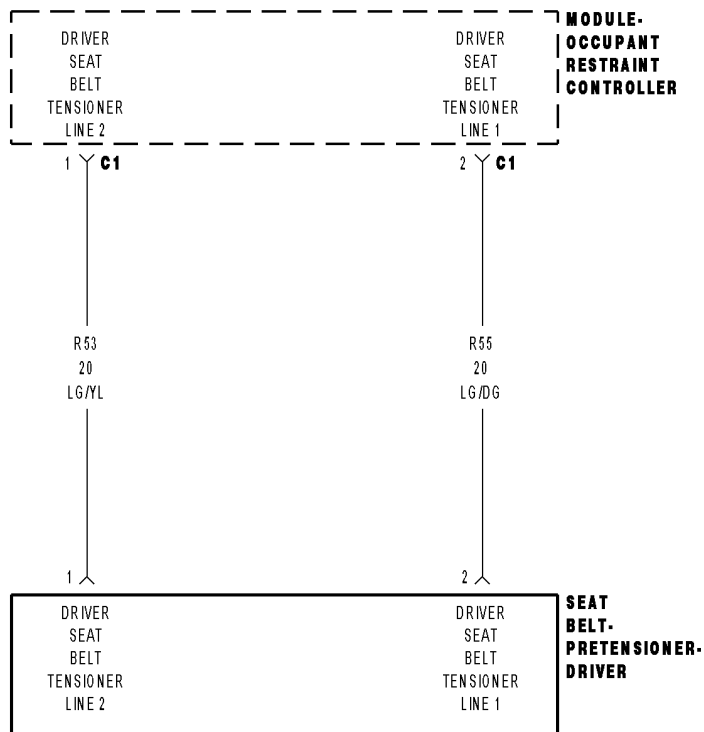
**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.

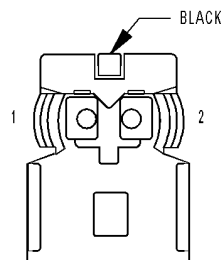
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## B1B2A-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT OPEN



**MODULE-OCCUPANT RESTRAINT CONTROLLER C1**



**SEAT BELT-PRETENSIONER-DRIVER**

**B1B2A-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT OPEN (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Driver Seat Belt Tensioner circuits.
- **Set Condition:**  
The ORC has detected an open or high resistance on the Driver Seat Belt Tensioner circuits.

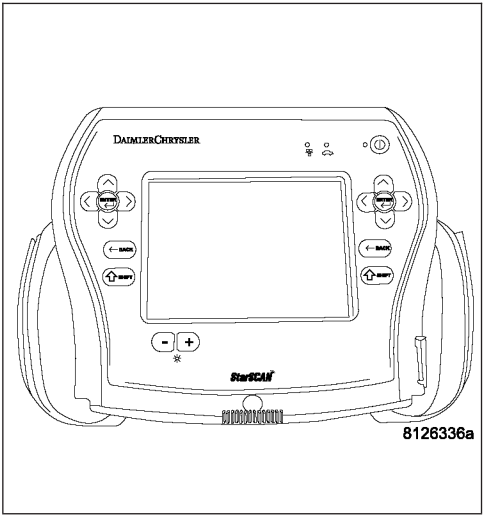
Possible Causes
(R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT OR (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT OPEN DRIVER SEAT BELT PRETENSIONER ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 6



**B1B2A-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT OPEN (CONTINUED)****2. CHECK FOR OPEN DRIVER SEAT BELT PRETENSIONER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Driver Seat Belt Pretensioner connector.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Driver Seat Belt Pretensioner connector.

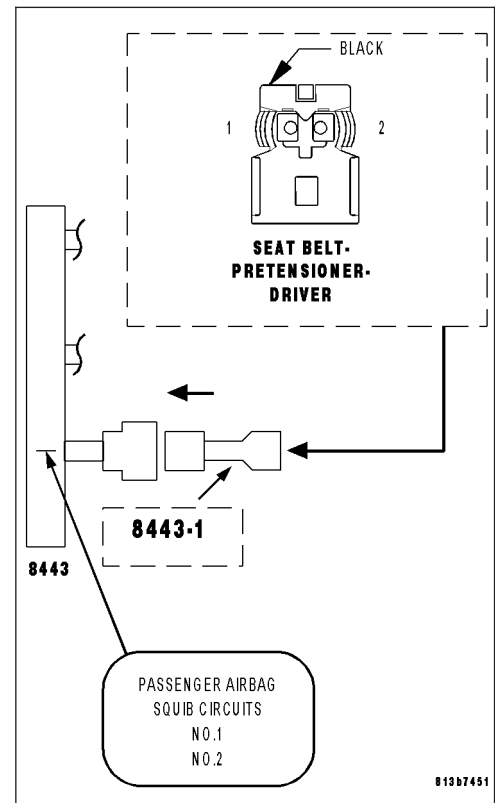
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B2A 1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT OPEN?**

**Yes** >> Go To 3

**No** >> Replace the Driver Seat Belt Pretensioner in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Driver Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

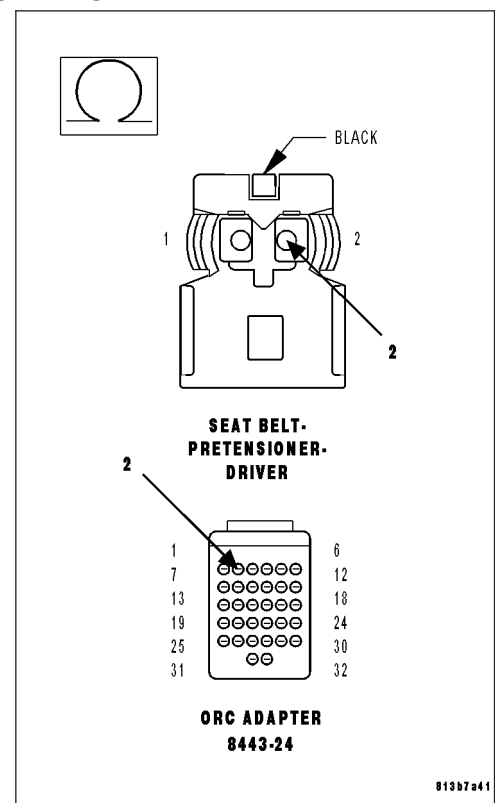
**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the resistance of the (R55) Driver Seat Belt Tensioner Line 1 circuit between the Driver Seat Belt Pretensioner connector and the 8443 ORC Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 4

**No** >> Repair the (R55) Driver Seat Belt Tensioner Line 1 circuit for and open. Then Go To 4





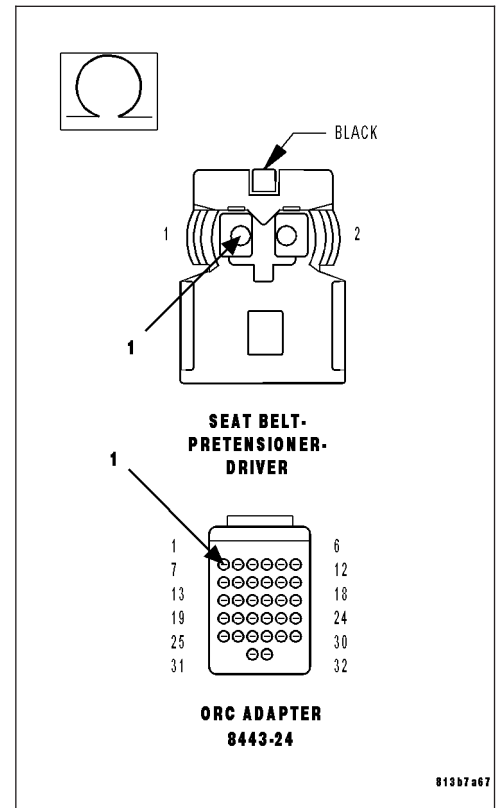
**B1B2A-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT OPEN (CONTINUED)****4. CHECK (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT FOR AN OPEN**

Measure the resistance of the (R53) Driver Seat Belt Tensioner Line 2 circuit between the Driver Seat Belt Pretensioner connector and the 8443 ORC Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 5

**No** >> Repair the (R53) Driver Seat Belt Tensioner Line 2 circuit for and open.  
Perform ORC VERIFICATION TEST - VER 1

**5. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**B1B2A-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT OPEN (CONTINUED)****6. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.**

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

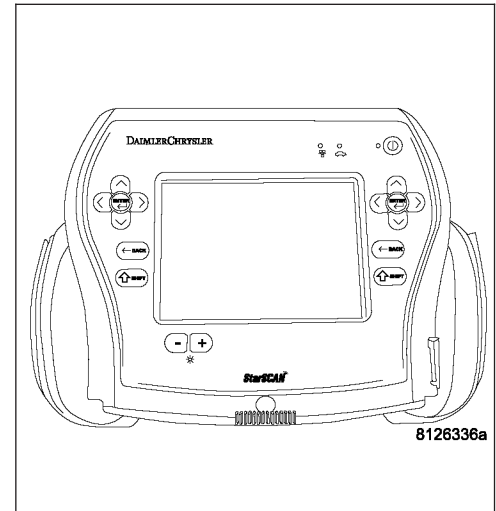
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

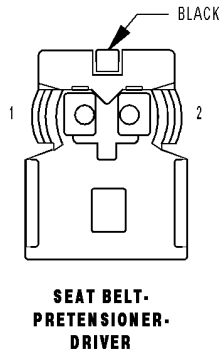
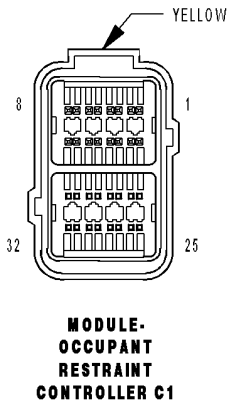
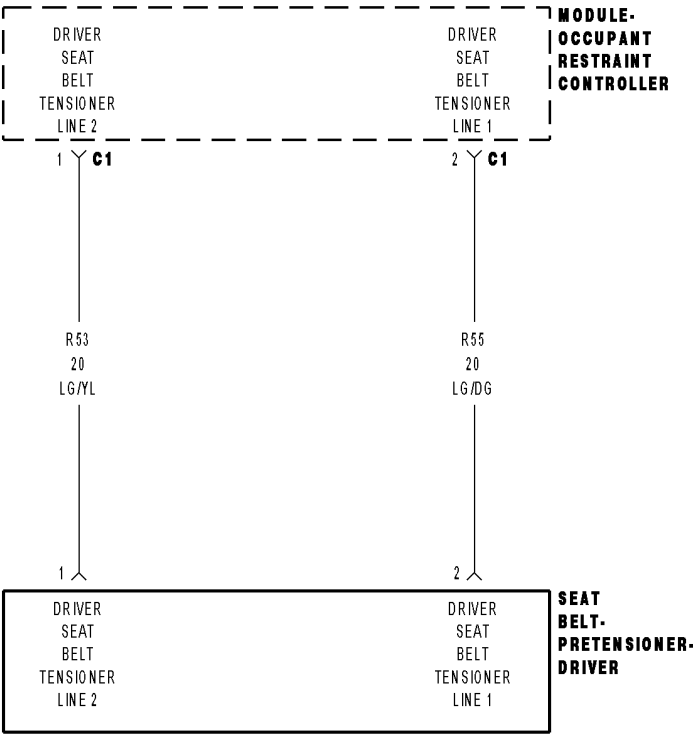
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



B1B2B-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT SHORTED TOGETHER



**B1B2B-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Driver Seat Belt Tensioner circuits.

- **Set Condition:**

The ORC has detected low resistance between the Driver Seat Belt Tensioner circuits.

Possible Causes
(R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT SHORTED TO (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT
DRIVER SEAT BELT PRETENSIONER
ORC

## Diagnostic Test

### 1. SELECT ACTIVE OR STORED DTC

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

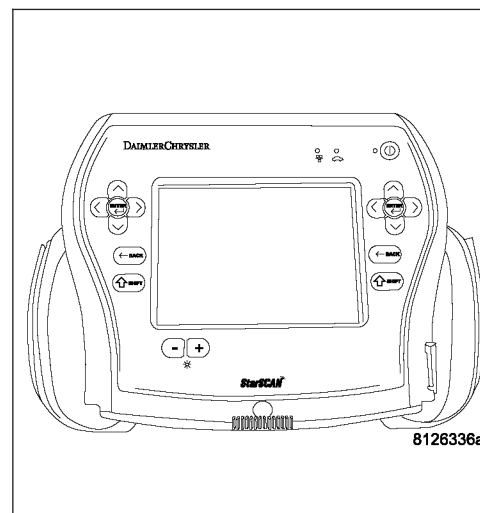
Is the DTC active or stored?

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 5



**B1B2B-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT SHORTED TOGETHER (CONTINUED)****2. CHECK FOR SHORTED DRIVER SEAT BELT PRETENSIONER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Driver Seatbelt Pretensioner connector.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Driver Seat Belt Pretensioner connector.

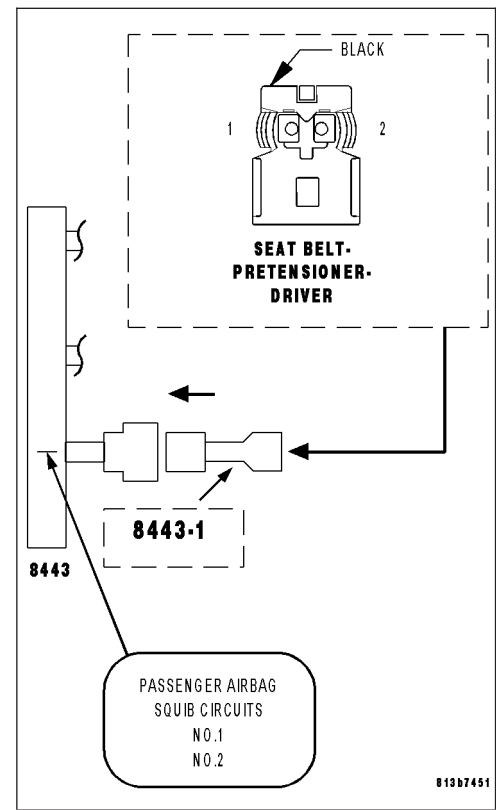
**WARNING:** To avoid personal injury or death, turn the ignition on then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B2B 1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 3

**No** >> Replace the Driver Seat Belt Pretensioner in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R55) DRIVER SEAT BELT TENSIONER LINE 1 CIRCUIT FOR A SHORT TO (R53) DRIVER SEAT BELT TENSIONER LINE 2 CIRCUIT**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Driver Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

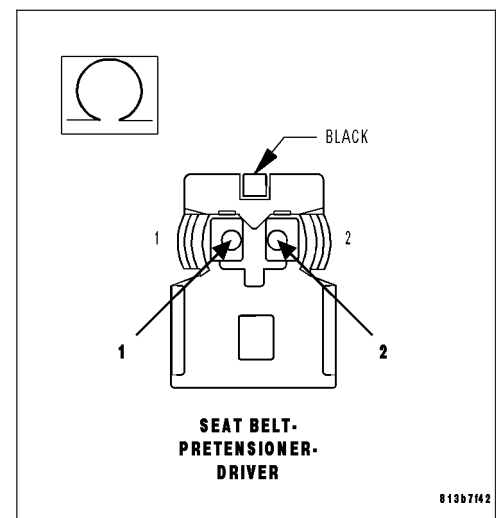
Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the resistance between the (R55) Driver Seat Belt Tensioner Line 1 circuit and the (R53) Driver Seat Belt Tensioner Line 2 circuit at the Driver Seat Belt Pretensioner connector.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (R55) Driver Seat Belt Tensioner Line 1 circuit for a short to the (R53) Driver Seat Belt Tensioner Line 2 circuit.

Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 4



**B1B2B-1st ROW DRIVER SEAT BELT PRETENSIONER CIRCUIT SHORTED TOGETHER (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

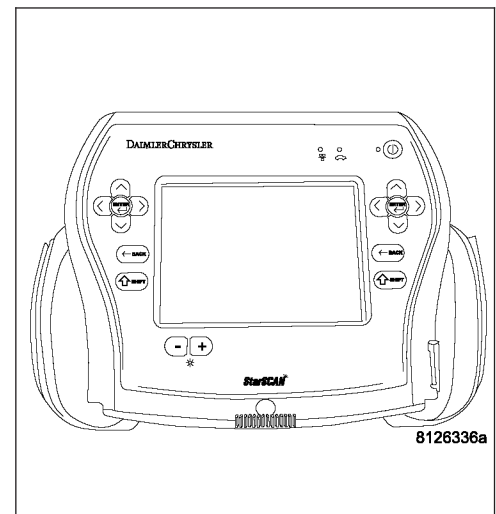
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

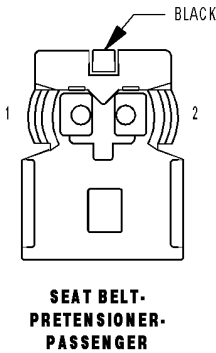
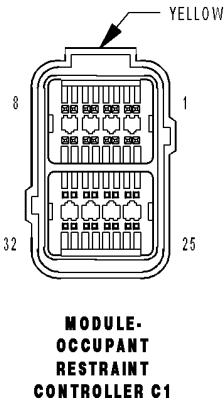
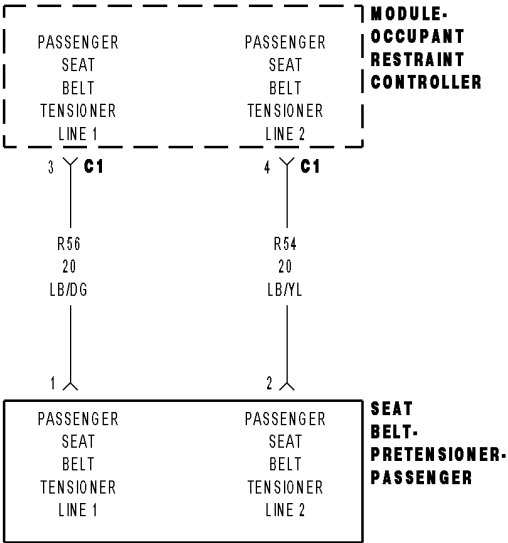
**Are any ACTIVE DTC's present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



B1B2C-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT LOW



**B1B2C-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT LOW (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Seat Belt Tensioner circuits.

- **Set Condition:**

The ORC has detected low resistance on the Passenger Seat Belt Tensioner circuits.

Possible Causes
(R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT OR (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT SHORTED TO GROUND PASSENGER SEAT BELT PRETENSIONER ORC

**Diagnostic Test****1. DETERMINE ACTIVE OR STORED DTC**

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

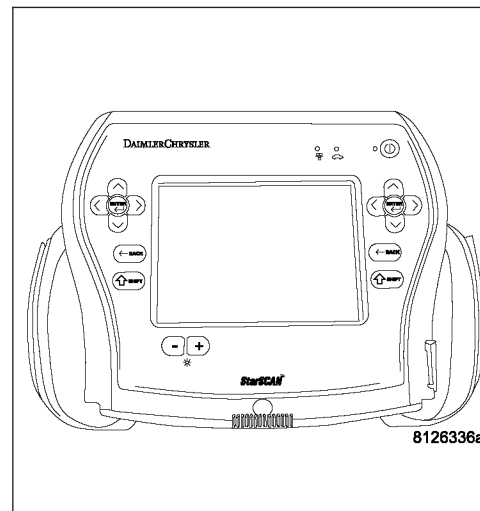
Is the DTC active or stored?

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 5





**B1B2C-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT LOW (CONTINUED)****2. CHECK FOR SHORTED PASSENGER SEAT BELT PRETENSIONER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Passenger Seat Belt Pretensioner connector.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Passenger Seat Belt Pretensioner connector.

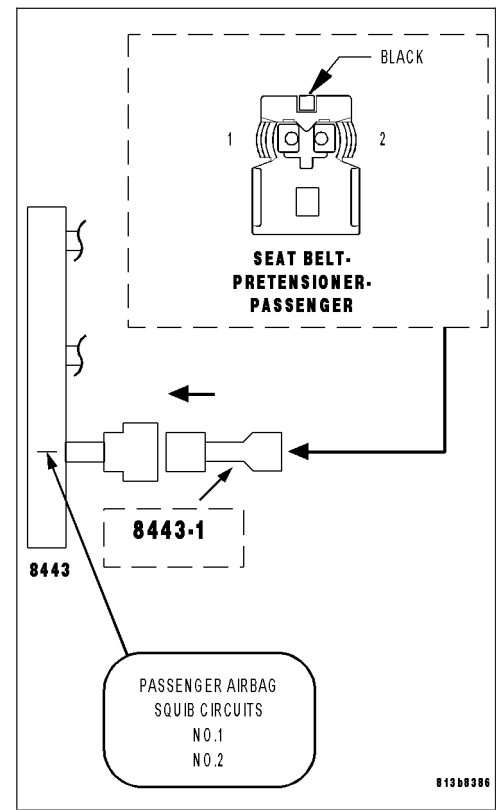
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B2C 1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the Passenger Seat Belt Pretensioner in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT AND (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT FOR A SHORT TO GROUND**

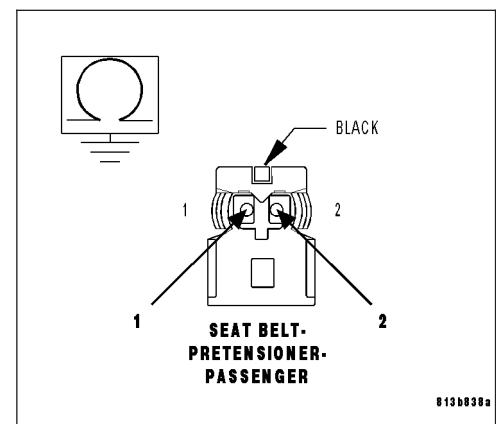
**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Passenger Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the resistance of the (R56) Passenger Seat Belt Tensioner Line 1 circuit between ground and the Passenger Seat Belt Pretensioner connector.

Measure the resistance of the (R54) Passenger Seat Belt Tensioner Line 2 circuit between ground and the Passenger Seat Belt Pretensioner connector.



**Is the resistance below 10K ohms on either circuit?**

**Yes** >> Repair the Passenger Seat Belt Tensioner circuits with a resistance below 10k ohms for a short to ground.

Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 4

**B1B2C-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT LOW (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

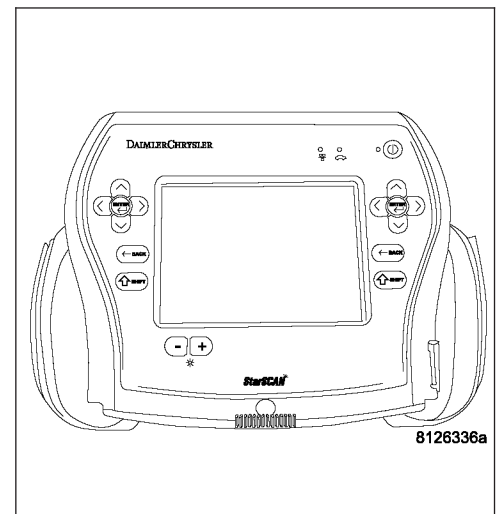
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

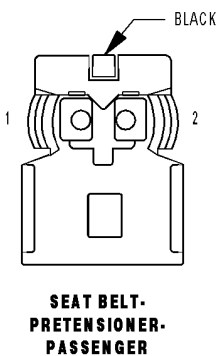
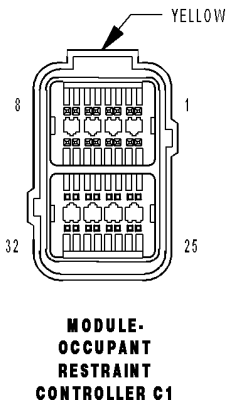
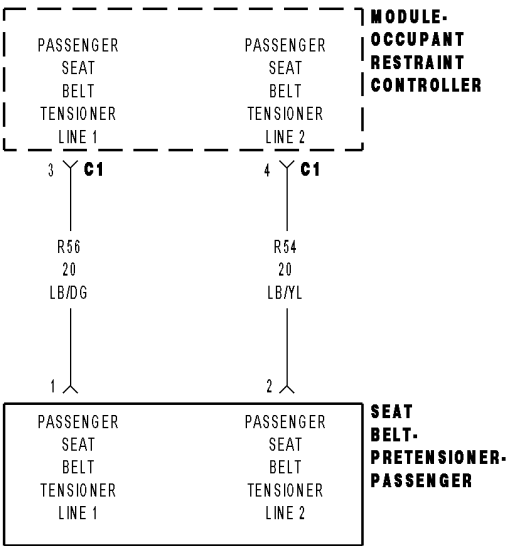
**Are any ACTIVE DTC's present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



B1B2D-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT HIGH



**B1B2D-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT HIGH (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the voltage on the Passenger Seat Belt Tensioner circuits.

- **Set Condition:**

The ORC detects voltage on the Passenger Seat Belt Tensioner circuits.

Possible Causes
(R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT OR (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT SHORTED TO BATTERY PASSENGER SEAT BELT PRETENSIONER ORC

## Diagnostic Test

### 1. DETERMINE ACTIVE OR STORED DTC

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

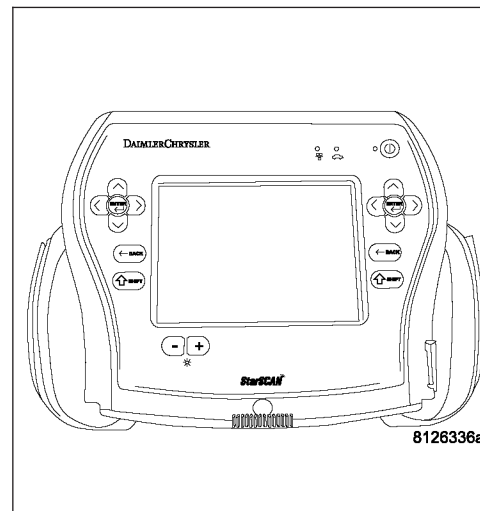
Is the DTC active or stored?

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 5



**B1B2D-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT HIGH (CONTINUED)****2. CHECK FOR SHORTED PASSENGER SEAT BELT PRETENSIONER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the Passenger Seat Belt Pretensioner connector.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Passenger Seat Belt Pretensioner connector.

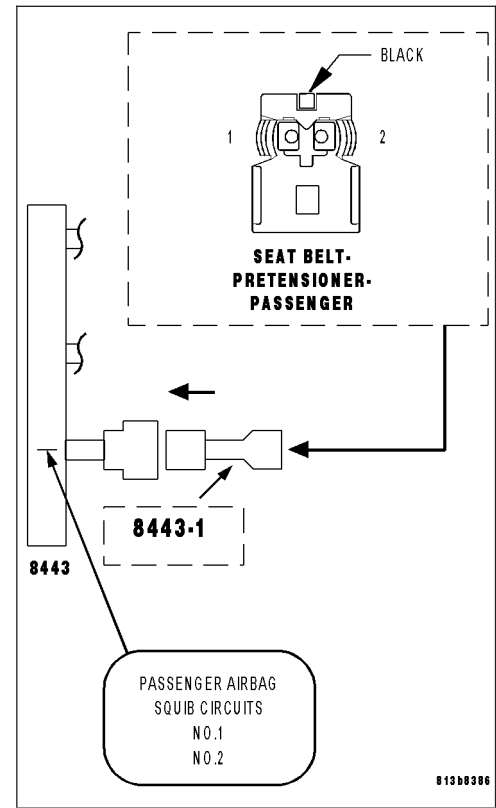
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B2D 1st ROW PASSENGER SEAT BELT TENSIONER CIRCUIT HIGH?**

**Yes** >> Go To 3

**No** >> Replace the Passenger Seat Belt Pretensioner in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT AND (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the 8443 Load Tool and Jumper from the Passenger Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

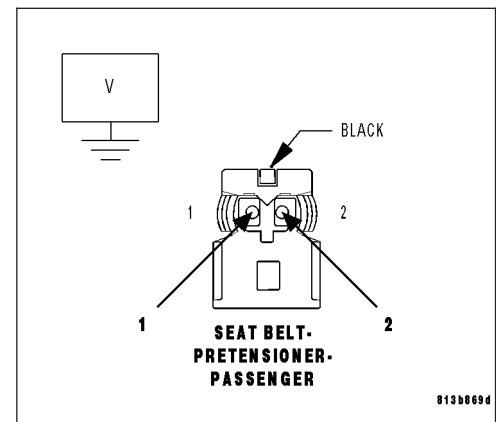
Measure the voltage of the (R56) Passenger Seat Belt Tensioner Line 1 circuit between the Passenger Seat Belt Pretensioner connector and ground.

Measure the voltage of the (R54) Passenger Seat Belt Tensioner Line 2 circuit between the Passenger Seat Belt Pretensioner connector and ground.

**Is there any voltage present on either circuit?**

**Yes** >> Repair the Passenger Seat Belt Tensioner circuits with voltage present for a short to battery.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go To 4



**B1B2D-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT HIGH (CONTINUED)****4. OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

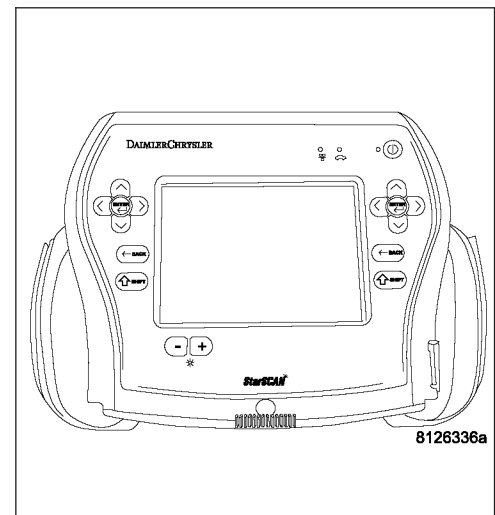
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

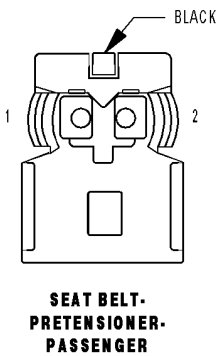
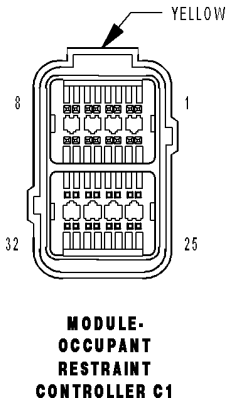
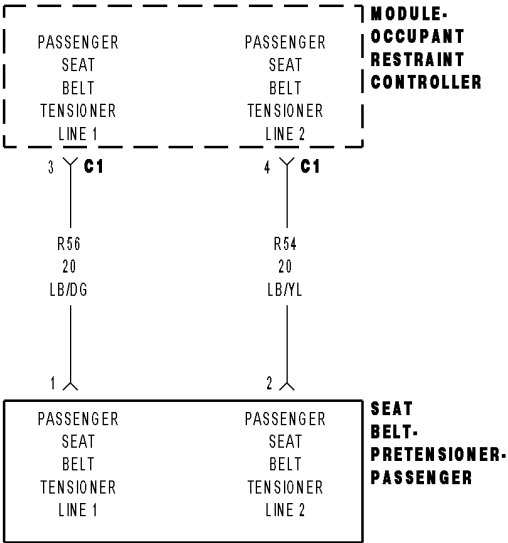
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer



B1B2E-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT OPEN



**B1B2E-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT OPEN (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Seat Belt Tensioner circuits.

- **Set Condition:**

The ORC has detected an open or high resistance on the Passenger Seat Belt Tensioner circuits.

Possible Causes
(R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT OR (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT OPEN PASSENGER SEAT BELT PRETENSIONER ORC

**Diagnostic Test****1. DETERMINE ACTIVE OR STORED DTC**

**Note:** Ensure the battery is fully charged.

**Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

Select Active or Stored DTC.

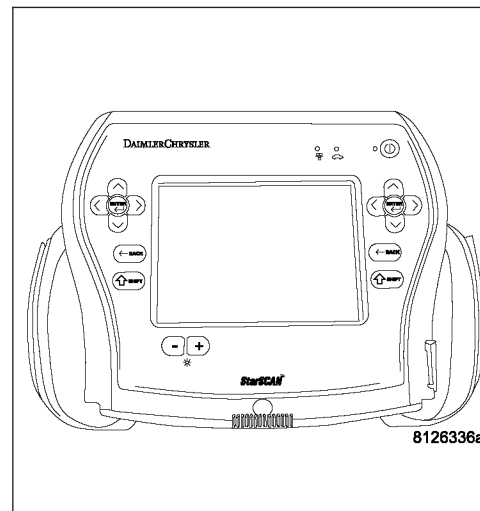
Is the DTC active or stored?

**ORC - ACTIVE DTC**

Go To 2

**ORC - STORED DTC**

Go To 6





**B1B2E-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT OPEN (CONTINUED)****2. CHECK FOR OPEN PASSENGER SEAT BELT PRETENSIONER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Passenger Seat Belt Pretensioner connector.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Passenger Seat Belt Pretensioner connector.

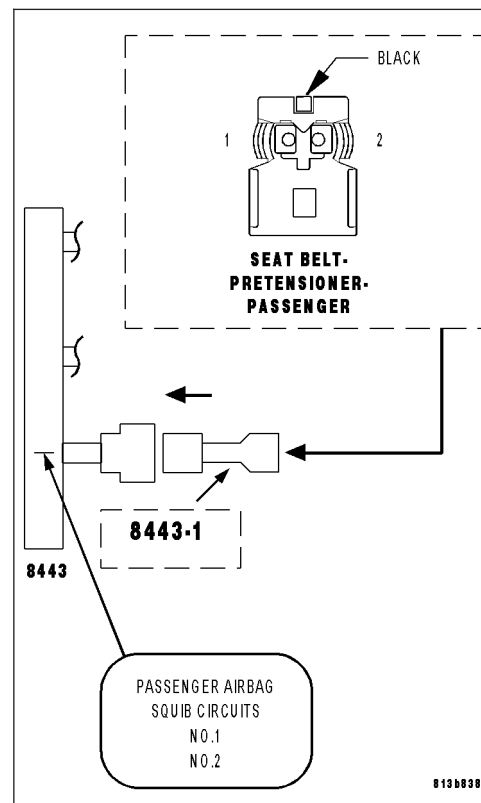
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B2E 1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT OPEN?**

**Yes** >> Go To 3

**No** >> Replace the Passenger Seat Belt Pretensioner in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the 8443 Load Tool and Jumper from the Passenger Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

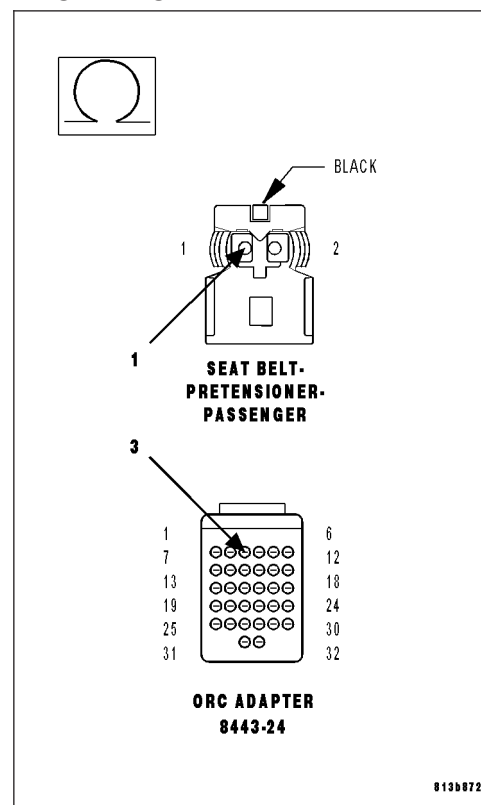
**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the resistance of the (R56) Passenger Seat Belt Tensioner Line 1 circuit between the Passenger Seat Belt Pretensioner connector and the 8443 ORC Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 4

**No** >> Repair the (R56) Passenger Seat Belt Tensioner Line 1 circuit for an open. Then Go To 4



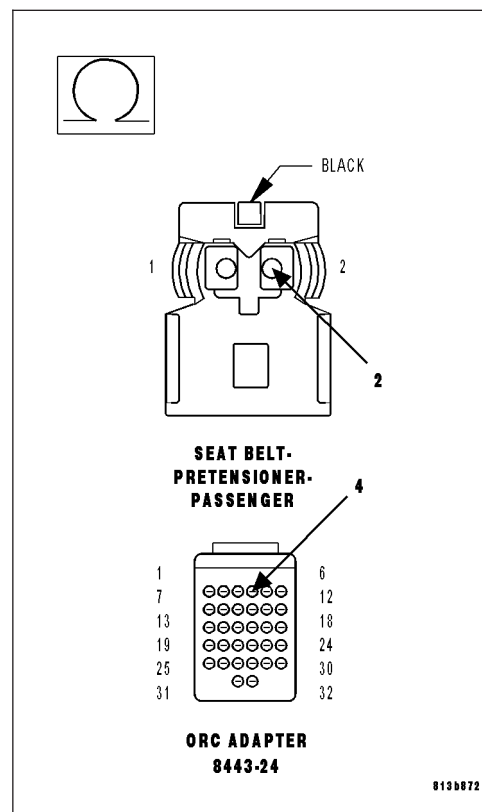
**B1B2E-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT OPEN (CONTINUED)****4. CHECK (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT FOR AN OPEN**

Measure the resistance of the (R54) Passenger Seat Belt Tensioner Line 2 circuit between the Passenger Seat Belt Pretensioner connector and the 8443 ORC Adaptor.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go to 5

**No** >> Repair the (R54) Passenger Seat Belt Tensioner Line 2 circuit for an open.  
Perform ORC VERIFICATION TEST - VER 1

**5. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**B1B2E-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT OPEN (CONTINUED)****6. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

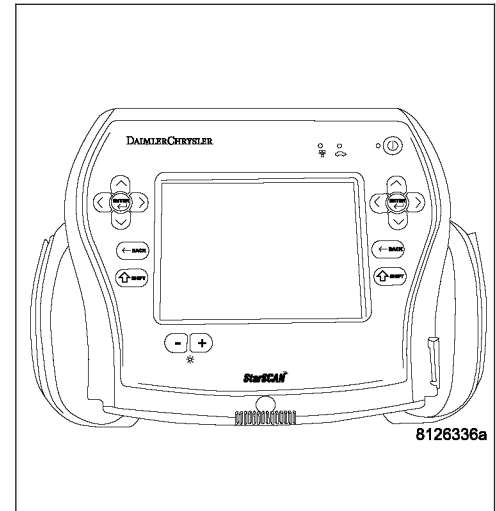
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

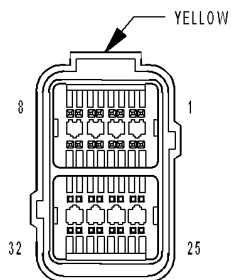
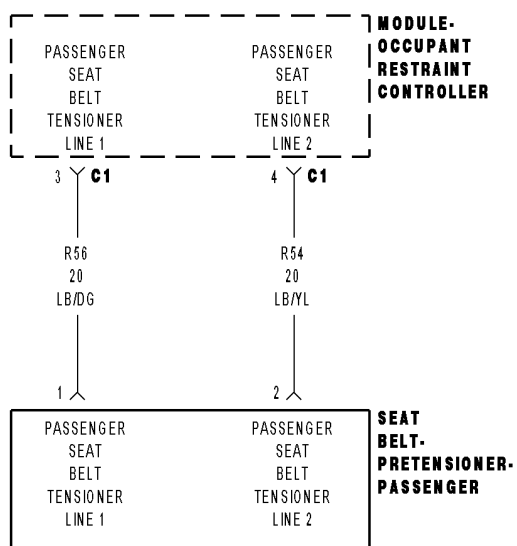
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

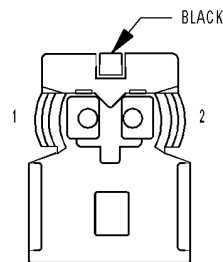
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B2F-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT SHORTED TOGETHER



**MODULE-OCCUPANT  
RESTRAINT  
CONTROLLER C1**



**SEAT BELT-  
PRETENSIONER-  
PASSENGER**

**B1B2F-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT SHORTED TOGETHER (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on, the Occupant Restraint Controller (ORC) monitors the resistance of the Passenger Seat Belt Tensioner circuits.
- **Set Condition:**  
The ORC has detected low resistance between the Passenger Seat Belt Tensioner circuits.

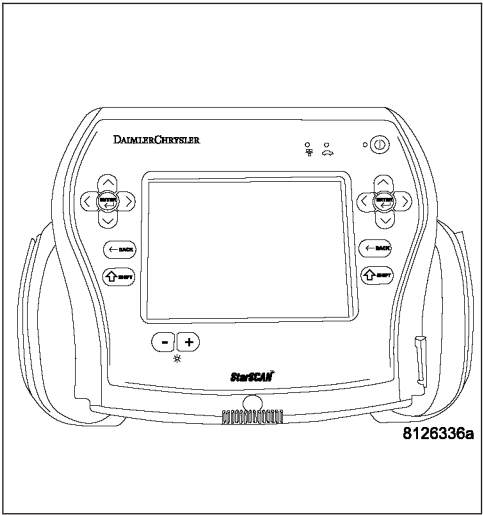
Possible Causes
(R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT SHORTED TO (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT PASSENGER SEAT BELT PRETENSIONER ORC

**Diagnostic Test**

**1. DETERMINE ACTIVE OR STORED DTC**

- Note:** Ensure the battery is fully charged.
- Note:** The scan tool, SRS Airbag Load Tool MRL 8443, and DVOM are required to perform the following test.
- Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.
- Select Active or Stored DTC.

- Is the DTC active or stored?
- ORC - ACTIVE DTC**  
Go To 2
- ORC - STORED DTC**  
Go To 5



**B1B2F-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT SHORTED TOGETHER (CONTINUED)****2. CHECK FOR SHORTED PASSENGER SEAT BELT PRETENSIONER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the Passenger Seat Belt Pretensioner connector.

**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool and appropriate Jumper to the Passenger Seat Belt Pretensioner connector.

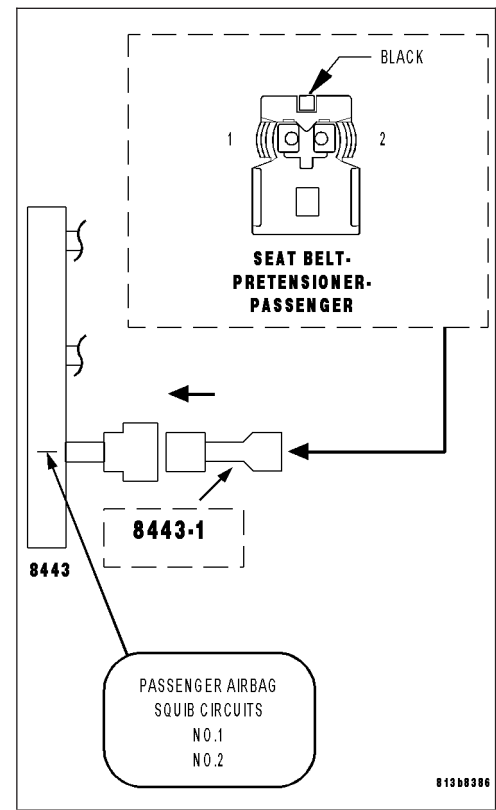
**WARNING:** To avoid personal injury or death, turn the ignition on then reconnect the battery.

With the scan tool, read the active ORC DTC's.

**Does the scan tool display: B1B2F 1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT SHORTED TOGETHER?**

**Yes** >> Go To 3

**No** >> Replace the Passenger Seat Belt Pretensioner in accordance with the Service Information.  
Perform ORC VERIFICATION TEST - VER 1

**3. CHECK (R56) PASSENGER SEAT BELT TENSIONER LINE 1 CIRCUIT FOR A SHORT TO THE (R54) PASSENGER SEAT BELT TENSIONER LINE 2 CIRCUIT**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.  
Disconnect the 8443 Load Tool and Jumper from the Passenger Seat Belt Pretensioner connector.

Disconnect the ORC connectors.

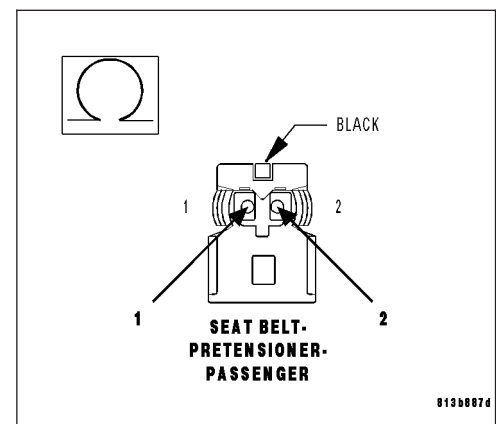
**Note:** Check connectors - Clean and repair as necessary.

Connect the 8443 Load Tool ORC Adaptor to the ORC C1 connector. Measure the resistance between the (R56) Passenger Seat Belt Tensioner Line 1 circuit and the (R54) Passenger Seat Belt Tensioner Line 2 circuit at the Passenger Seat Belt Pretensioner connector.

**Is the resistance below 10K ohms?**

**Yes** >> Repair the (R56) Passenger Seat Belt Tensioner Line 1 circuit for a short to the (R54) Passenger Seat Belt Tensioner Line 2 circuit.  
Perform ORC VERIFICATION TEST - VER 1

**No** >> Go to 4



**B1B2F-1st ROW PASSENGER SEAT BELT PRETENSIONER CIRCUIT SHORTED TOGETHER (CONTINUED)****4. REPLACE THE ORC**

**WARNING:** If the Occupant Restraint Controller (ORC) is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Note:** When reconnecting airbag system components the Ignition must be turned off and the Battery must be disconnected.

**Repair**

Replace the ORC in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1

**5. STORED ORC DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

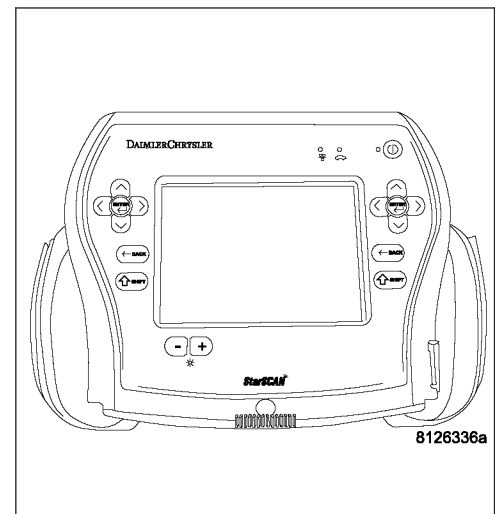
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

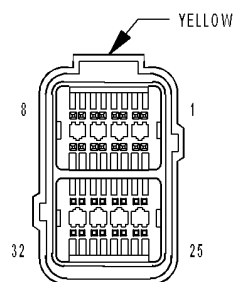
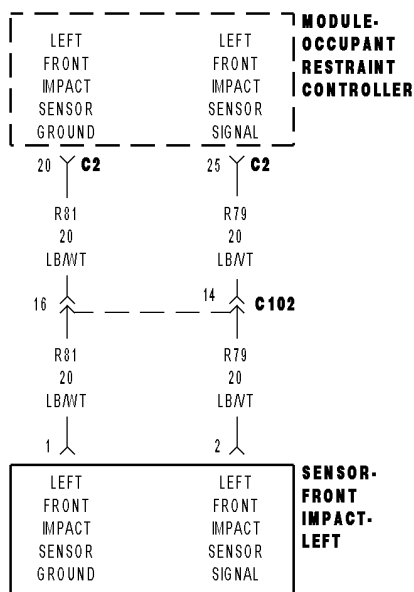
**Are any ACTIVE DTC's present?**

**Yes** >> Select the appropriate diagnostic procedure from the Table of Contents in this section.

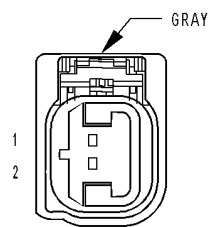
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B70-UP-FRONT LEFT SATELLITE ACCELERATION SENSOR INTERNAL



**MODULE-  
OCCUPANT  
RESTRAINT  
CONTROLLER C2**



**SENSOR-  
FRONT IMPACT-  
LEFT**



**B1B70-UP-FRONT LEFT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).  
For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
The Occupant Restraint Controller (ORC) continuously communicates with the Front Left Impact Sensor over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**  
This code will set, if the ORC and the Front Left Impact Sensor do not establish and maintain valid data communications.

Possible Causes
(R79) SIGNAL CIRCUIT SHORTED TO BATTERY (R79) SIGNAL CIRCUIT SHORTED TO GROUND (R79, R81) FRONT LEFT IMPACT SENSOR CIRCUITS SHORTED TOGETHER (R81) FRONT LEFT IMPACT SENSOR GROUND CIRCUIT OPEN (R79) FRONT LEFT IMPACT SENSOR SIGNAL CIRCUIT OPEN ORC, FRONT LEFT IMPACT SENSOR

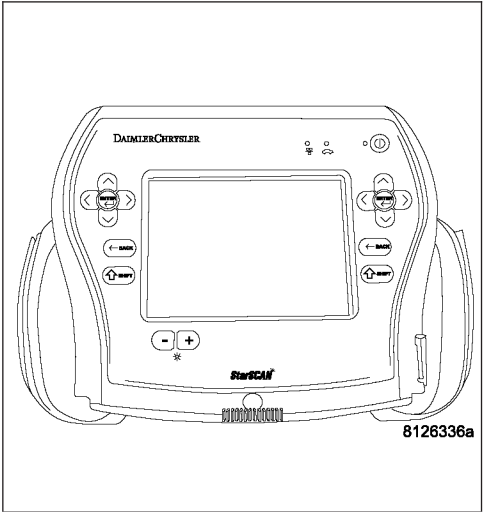
**Diagnostic Test**

**1. VERIFY THAT DTC B1B70-UP-FRONT LEFT SATELLITE ACCELERATION SENSOR INTERNAL IS ACTIVE**

**Note:** Ensure the battery is fully charged.  
**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.  
Turn the ignition on.  
With the scan tool, read ORC DTCs.

**Does the scan tool display active: B1B70-UP-FRONT LEFT SATELLITE ACCELERATION SENSOR INTERNAL?**

- Yes**     >> Go To 2  
**No**     >> Go To 9



**B1B70-UP-FRONT LEFT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)****2. CHECK THE (R79, R81) FRONT LEFT IMPACT SENSOR SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Front Left Impact Sensor connector.

Disconnect the ORC connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

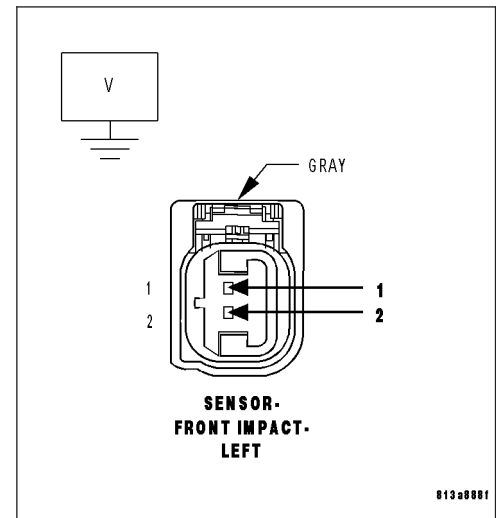
Measure the voltage of the (R79) Front Left Impact Sensor Signal circuit and (R81) Sensor Ground circuit at the Front Left Impact Sensor connector and ground.

**Is there any voltage present?**

**Yes** >> Repair the (R79, R81) Front Left Impact Sensor circuits for a short to battery.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (R79) FRONT LEFT IMPACT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

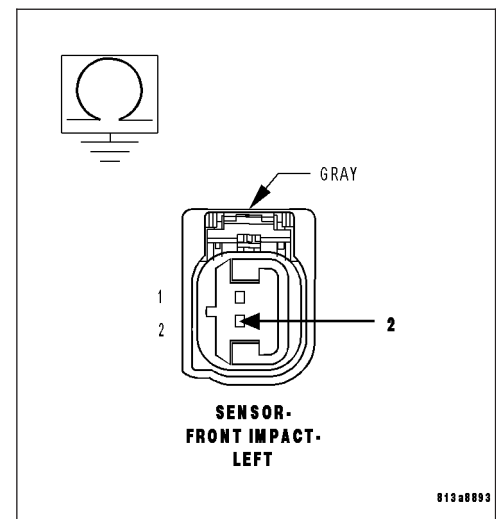
Measure the resistance of the (R79) Front Left Impact Sensor Signal circuit between the Front Left Impact Sensor connector and ground.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R79) Front Left Impact Sensor Signal circuit for a short to ground.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4



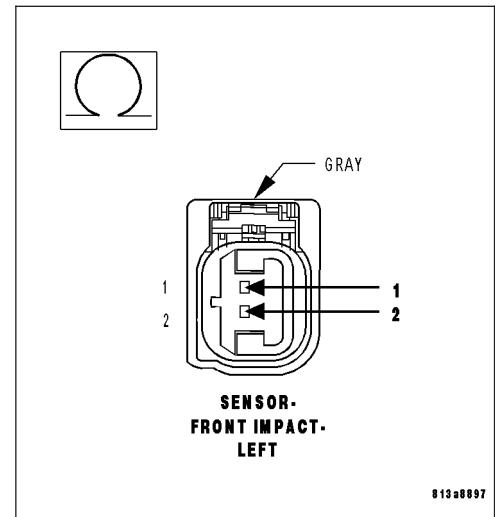
**B1B70-UP-FRONT LEFT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)****4. CHECK THE (R79, R81) FRONT LEFT IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER**

Measure the resistance between the (R79) Front Left Impact Sensor Signal and (R81) Sensor Ground circuits at the Front Left Impact Sensor connector.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R79, R81) Front Left Impact Sensor circuits shorted together.  
Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (R81) FRONT LEFT IMPACT SENSOR GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

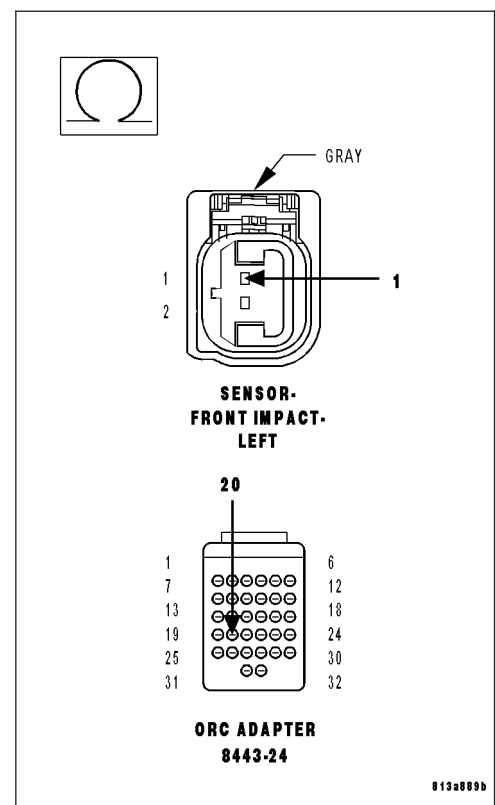
Connect the 8443 Load Tool ORC Adaptor to the Occupant Restraint Control Module connector.

Measure the resistance of the (R81) Front Left Impact Sensor Ground circuit between the Front Left Impact Sensor connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 6

**No** >> Repair the (R81) Front Left Impact Sensor 1 Ground circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.



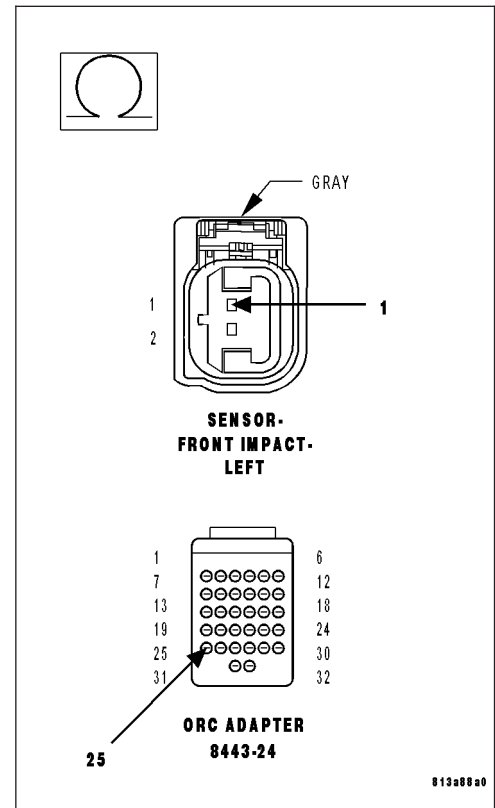
**B1B70-UP-FRONT LEFT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)****6. CHECK THE (R79) FRONT LEFT IMPACT SENSOR CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Measure the resistance of the (R79) Front Left Impact Sensor Ground circuit between the Front Left Impact Sensor connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 7

**No** >> Repair the (R79) Front Left Impact Sensor Signal circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.

**7. CHECK OPERATION OF THE FRONT LEFT IMPACT SENSOR**

Replace the Front Left Impact Sensor.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

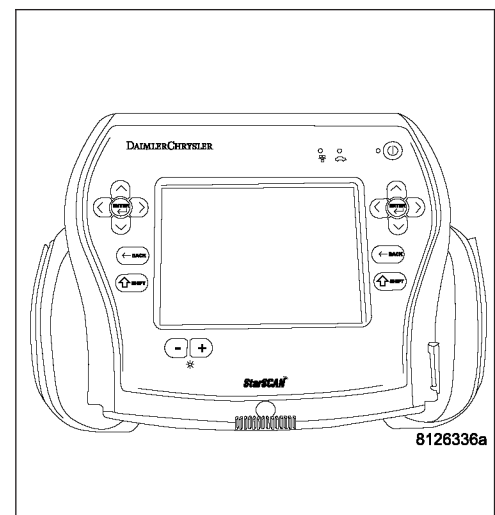
Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

**Did the active Front Left Impact Sensor DTC return?**

**Yes** >> Go To 8

**No** >> Repair is complete.  
Perform the ORC VERIFICATION TEST - VER 1.



**B1B70-UP-FRONT LEFT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)****8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with Service Information.

Perform the ORC VERIFICATION TEST - VER 1.

**9. TEST FOR AN INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

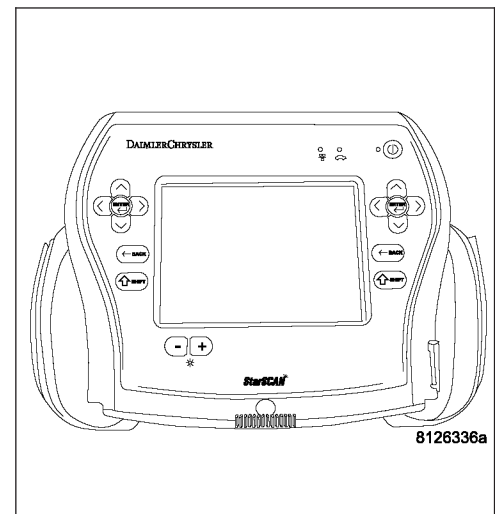
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

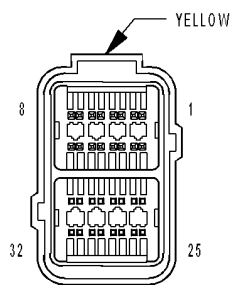
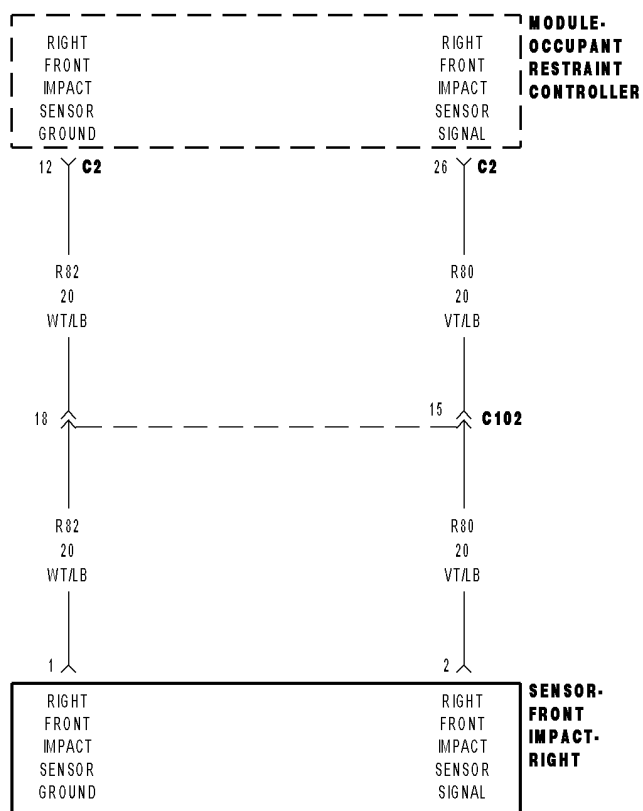
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

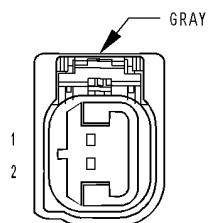
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B71-UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR INTERNAL



**MODULE-OCCUPANT RESTRAINT CONTROLLER C2**



**SENSOR-FRONT IMPACT-RIGHT**

**B1B71-UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The Occupant Restraint Controller (ORC) continuously communicates with the Front Right Impact Sensor over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.

- **Set Condition:**

This code will set, if the ORC and the Front Right Impact Sensor do not establish and maintain valid data communications.

Possible Causes
(R80) SIGNAL CIRCUIT SHORTED TO BATTERY
(R80) SIGNAL CIRCUIT SHORTED TO GROUND
(R80, R82) FRONT RIGHT IMPACT SENSOR CIRCUITS SHORTED TOGETHER
(R82) FRONT RIGHT IMPACT SENSOR GROUND CIRCUIT OPEN
(R80) FRONT RIGHT IMPACT SENSOR SIGNAL CIRCUIT OPEN
ORC, FRONT RIGHT IMPACT SENSOR

**Diagnostic Test****1. VERIFY THAT DTC B1B71-UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR INTERNAL IS ACTIVE**

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

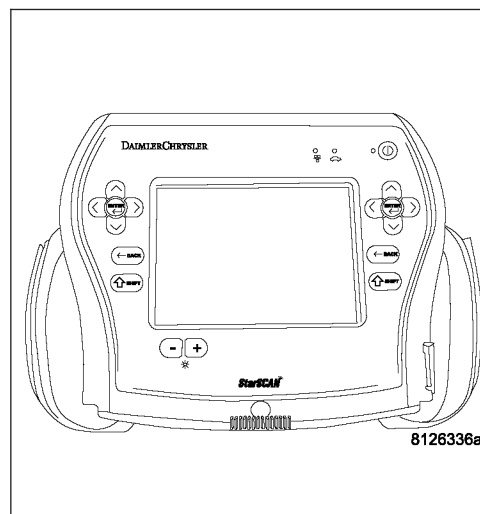
Turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active: B1B71-UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR INTERNAL?**

**Yes**     >> Go To 2

**No**     >> Go To 9



**B1B71-UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)****2. CHECK THE (R80, R82) FRONT RIGHT IMPACT SENSOR SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Front Right Impact Sensor connector.

Disconnect the ORC connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

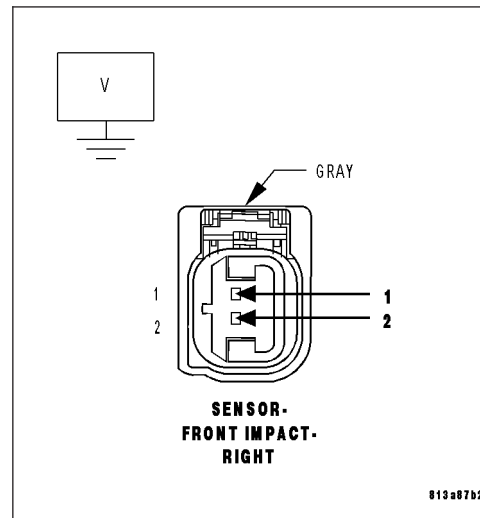
Measure the voltage of the (R80) Front Right Impact Sensor Signal circuit and (R82) Sensor Ground circuit at the Front Right Impact Sensor connector and ground.

**Is there any voltage present?**

**Yes** >> Repair the (R80, R82) Front Right Impact Sensor circuits for a short to battery.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (R80) FRONT RIGHT IMPACT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn ignition on, then reconnect the battery.

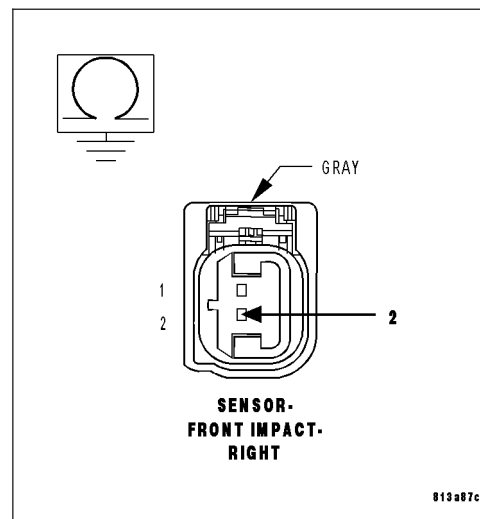
Measure the resistance of the (R80) Front Right Impact Sensor Signal circuit between the Front Right Impact Sensor connector and ground.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R80) Front Right Impact Sensor Signal circuit for a short to ground.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4





**B1B71-UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)****4. CHECK THE (R80, R82) FRONT RIGHT IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER**

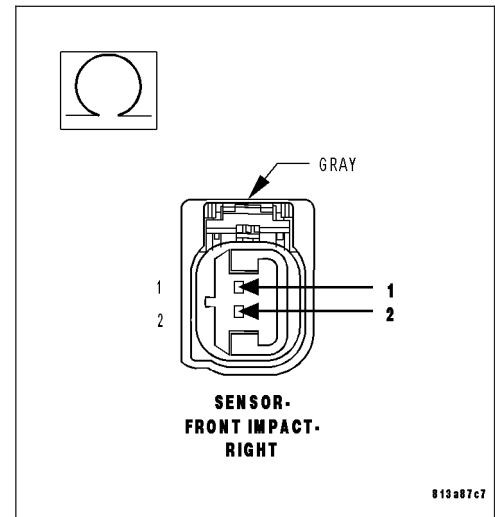
Measure the resistance between the (R80) Front Right Impact Sensor Signal and (R82) Sensor Ground circuits at the Front Right Impact Sensor connector.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R80, R82) Front Right Impact Sensor circuits shorted together.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (R82) FRONT RIGHT IMPACT SENSOR GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

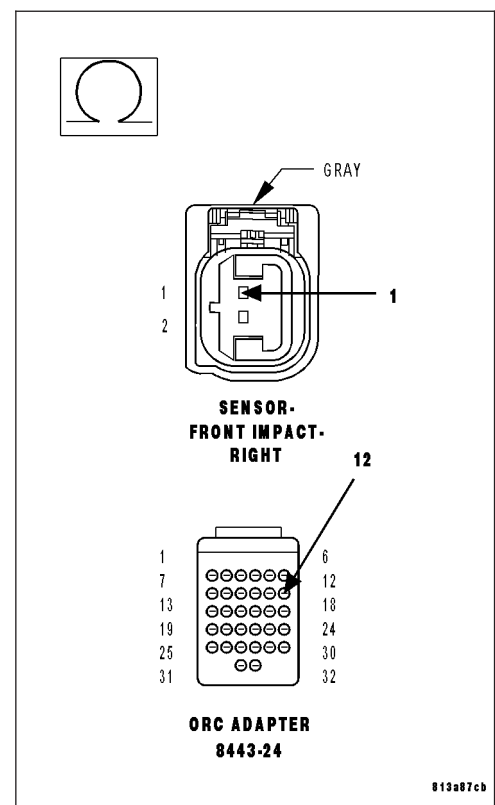
Measure the resistance of the (R82) Front Right Impact Sensor Ground circuit between the Front Right Impact Sensor connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 6

**No** >> Repair the (R82) Front Right Impact Sensor 2 Ground circuit for an open or high resistance.

Perform the ORC VERIFICATION TEST - VER 1.



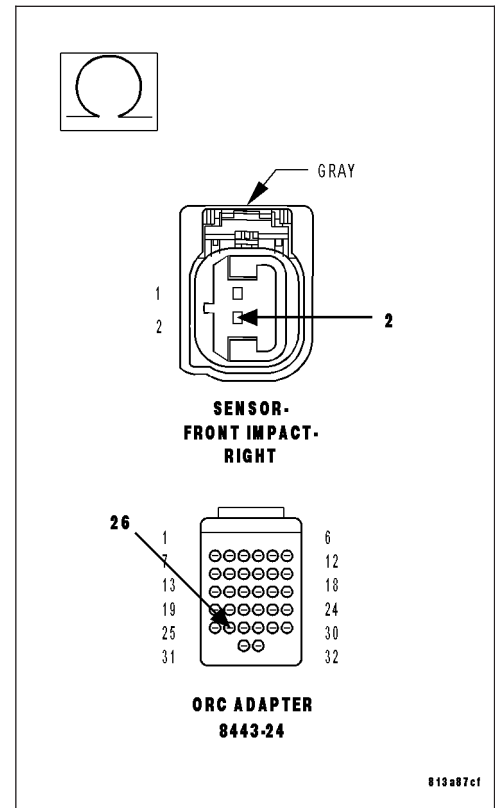
**B1B71-UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)****6. CHECK THE (R80) FRONT RIGHT IMPACT SENSOR CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Measure the resistance of the (R80) Front Right Impact Sensor Signal circuit between the Front Right Impact Sensor connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 7

**No** >> Repair the (R80) Front Right Impact Sensor Signal circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.

**7. CHECK OPERATION OF THE FRONT RIGHT IMPACT SENSOR**

Replace the Front Right Impact Sensor.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

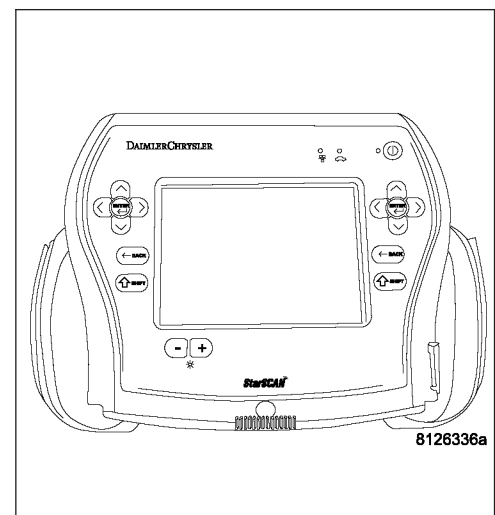
Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

**Did the active Front Right Impact Sensor DTC return?**

**Yes** >> Go To 8

**No** >> Repair is complete.  
Perform the ORC VERIFICATION TEST - VER 1.



**B1B71-UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR INTERNAL (CONTINUED)****8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with Service Instructions.

Perform the ORC VERIFICATION TEST - VER 1.

**9. TEST FOR AN INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

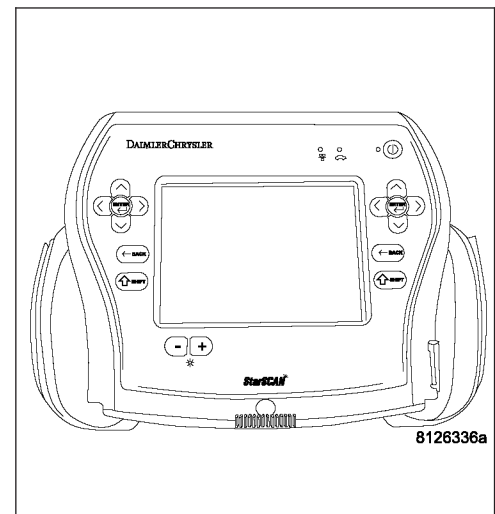
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

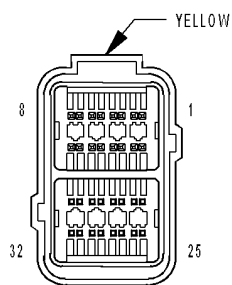
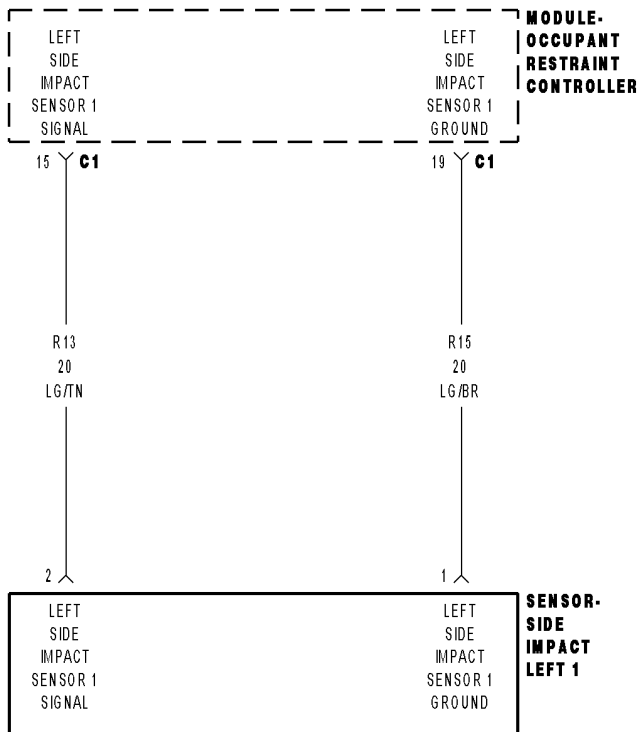
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

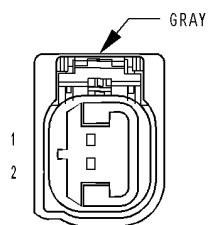
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B72-LEFT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL



**MODULE-  
OCCUPANT  
RESTRAINT  
CONTROLLER C1**



**SENSOR-  
SIDE IMPACT-  
LEFT 1**

**B1B72-LEFT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).  
For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
The Occupant Restraint Controller (ORC) continuously communicates with the Left Side Impact Sensor 1 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**  
This code will set, if the ORC and the Left Side Impact Sensor 1 do not establish and maintain valid data communications.

Possible Causes
(R13) SIGNAL CIRCUIT SHORTED TO BATTERY (R13) SIGNAL CIRCUIT SHORTED TO GROUND (R13, R15) LEFT SIDE IMPACT SENSOR 1 CIRCUITS SHORTED TOGETHER (R15) LEFT SIDE IMPACT SENSOR 1 GROUND CIRCUIT OPEN (R13) LEFT SIDE IMPACT SENSOR 1 SIGNAL CIRCUIT OPEN ORC, LEFT SIDE IMPACT SENSOR 1

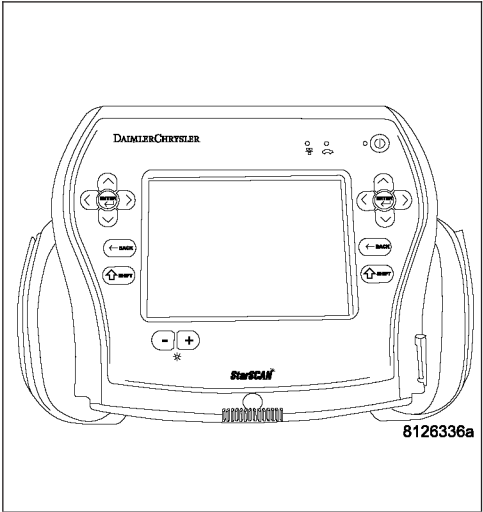
**Diagnostic Test**

**1. VERIFY THAT DTC B1B72-LEFT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL 1 IS ACTIVE**

**Note:** Ensure the battery is fully charged.  
**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.  
Turn the ignition on.  
With the scan tool, read ORC DTCs.

**Does the scan tool display active: B1B72-LEFT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL?**

- Yes**    >> Go To 2  
**No**    >> Go To 9



**B1B72-LEFT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)****2. CHECK THE (R13, R15) LEFT SIDE IMPACT SENSOR 1 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Left front Impact Sensor 1 connector.

Disconnect the ORC connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

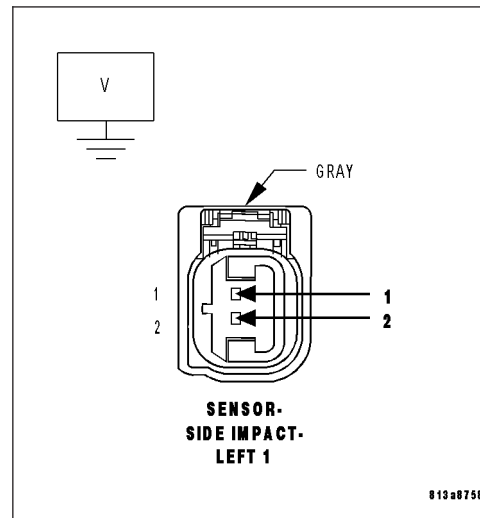
Measure the voltage of the (R13) Left Side Impact Sensor 1 Signal circuit and (R15) Sensor Ground circuit at the Left Side Impact Sensor 1 connector and ground.

**Is there any voltage present?**

**Yes** >> Repair the (R13, R15) Left Side Impact Sensor 1 circuits for a short to battery.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (R13) LEFT SIDE IMPACT SENSOR 1 SIGNAL CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn ignition on, then reconnect the battery.

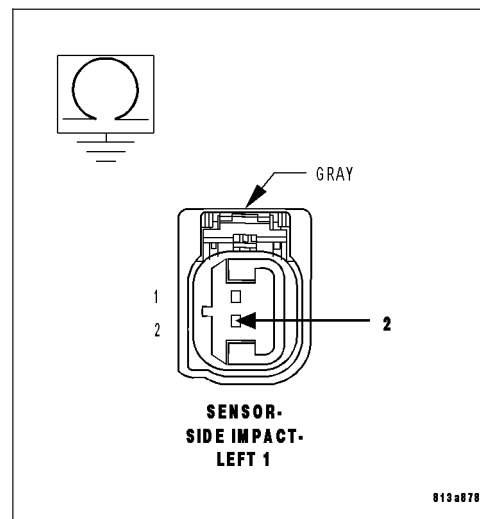
Measure the resistance of the (R13) Left Side Impact Sensor 1 Signal circuit between the Left Side Impact Sensor 1 connector and ground.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R13) Left Side Impact Sensor 1 Signal circuit for a short to ground.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4



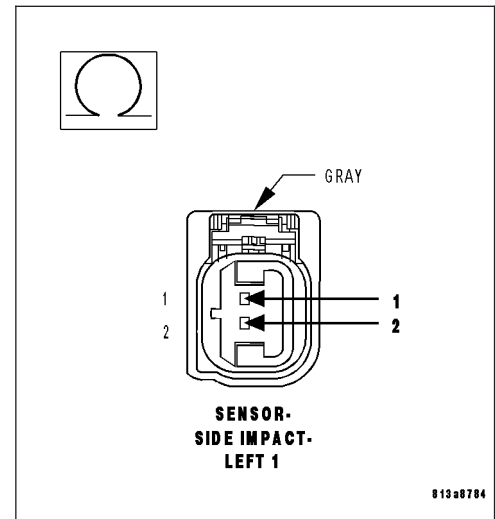
**B1B72-LEFT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)****4. CHECK THE (R13, R15) LEFT SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER**

Measure the resistance between the (R13) Left Side Impact Sensor 1 Signal and (R15) Sensor Ground circuits at the Left Side Impact Sensor 1 connector.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R13, R15) Left Side Impact Sensor 1 circuits shorted together.  
Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (R15) LEFT SIDE IMPACT SENSOR 1 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

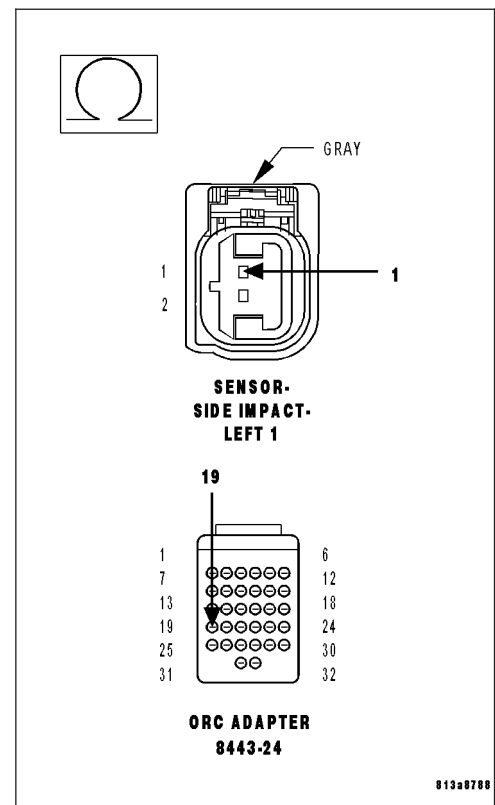
Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

Measure the resistance of the (R15) Left Side Impact Sensor 1 Ground circuit between the Left Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 6

**No** >> Repair the (R15) Left Side Impact Sensor 1 Ground circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.



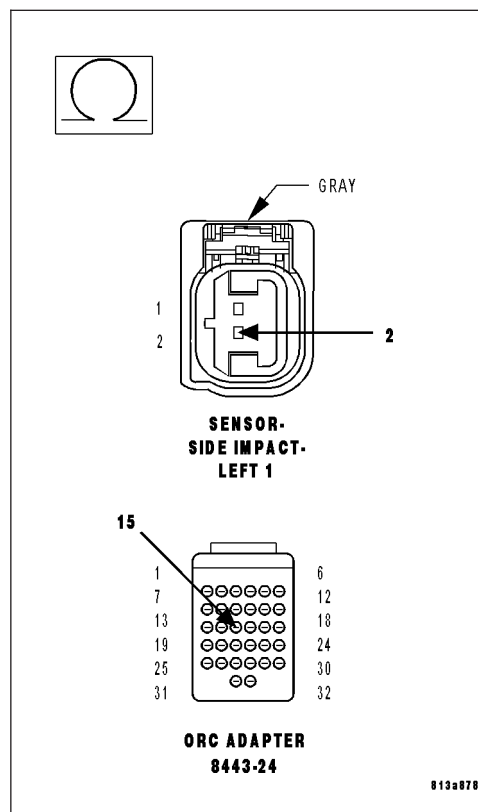
**B1B72-LEFT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)****6. CHECK THE (R13) LEFT SIDE IMPACT SENSOR 1 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Measure the resistance of the (R13) Left Side Impact Sensor 1 Signal circuit between the Left Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 7

**No** >> Repair the (R13) Left Side Impact Sensor 1 Signal circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.

**7. CHECK OPERATION OF THE LEFT SIDE IMPACT SENSOR 1**

Replace the Left Side Impact Sensor 1.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

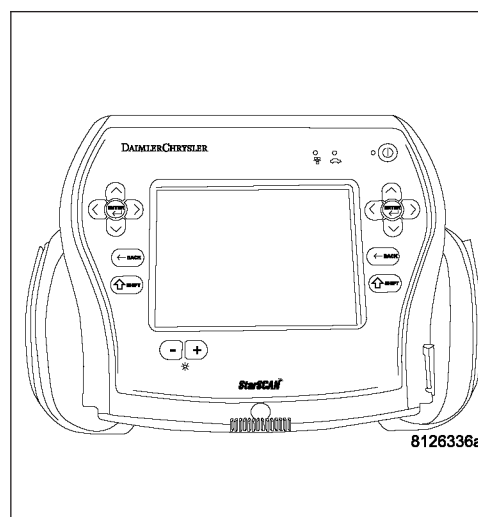
Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

**Did the active Left Side Impact Sensor 1 DTC return?**

**Yes** >> Go To 8

**No** >> Repair is complete.  
Perform the ORC VERIFICATION TEST - VER 1.





**B1B72-LEFT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)****8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with Service Instructions.

Perform the ORC VERIFICATION TEST - VER 1.

**9. TEST FOR AN INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

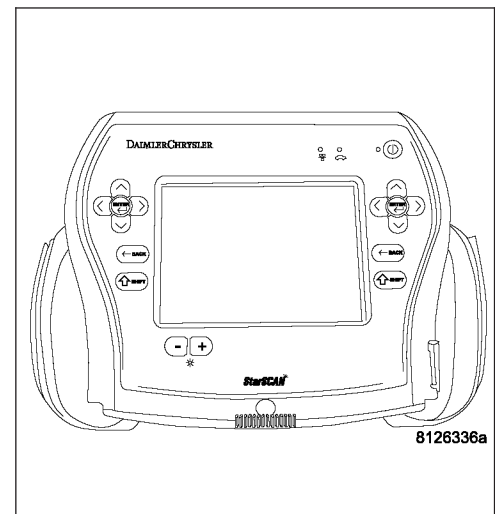
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

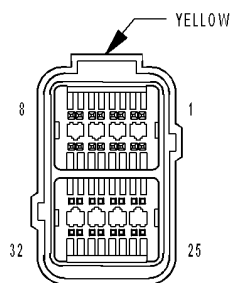
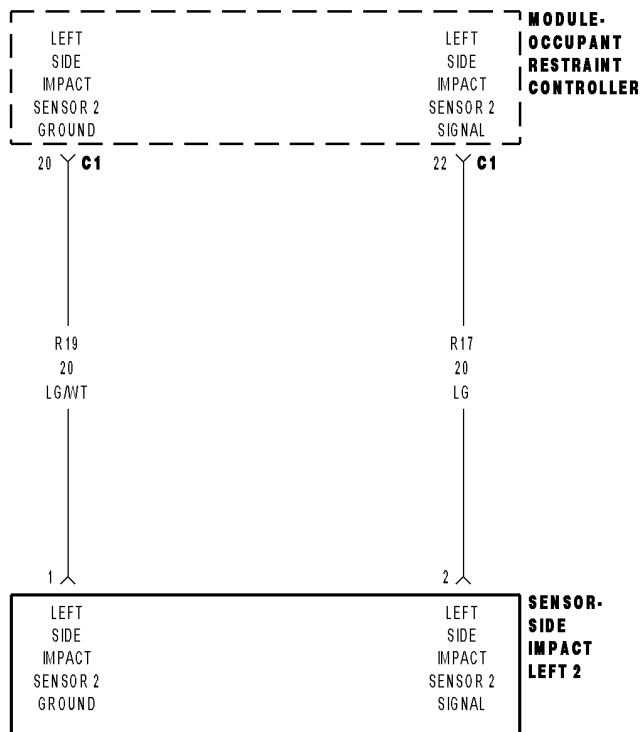
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

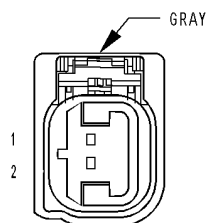
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B73-LEFT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL



**MODULE-  
OCCUPANT  
RESTRAINT  
CONTROLLER C1**



**SENSOR-  
SIDE IMPACT-  
LEFT 2**

**B1B73-LEFT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).  
For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
The Occupant Restraint Controller (ORC) continuously communicates with the Left Side Impact Sensor 2 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.
- **Set Condition:**  
This code will set, if the ORC and the Left Side Impact Sensor 2 do not establish and maintain valid data communications.

Possible Causes
(R17) SIGNAL CIRCUIT SHORTED TO BATTERY (R17) SIGNAL CIRCUIT SHORTED TO GROUND (R17, R19) LEFT SIDE IMPACT SENSOR 2 CIRCUITS SHORTED TOGETHER (R19) LEFT SIDE IMPACT SENSOR 2 GROUND CIRCUIT OPEN (R17) LEFT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT OPEN ORC, LEFT SIDE IMPACT SENSOR 2

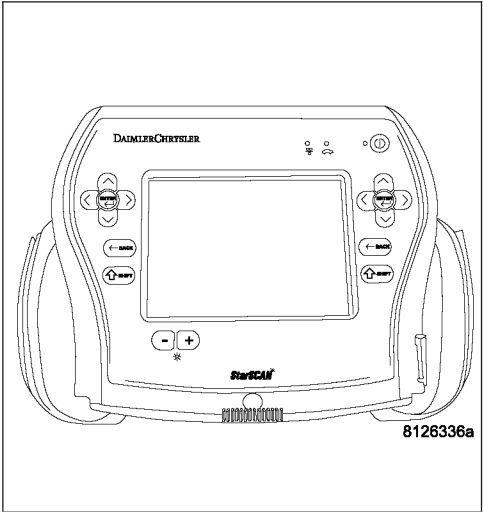
**Diagnostic Test**

**1. VERIFY THAT DTC B1B73-LEFT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL IS ACTIVE**

**Note:** Ensure the battery is fully charged.  
**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.  
Turn the ignition on.  
With the scan tool, read ORC DTCs.

**Does the scan tool display active: B1B73-LEFT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL?**

- Yes**    >> Go To 2  
**No**    >> Go To 9



**B1B73-LEFT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)****2. CHECK THE (R17, R19) LEFT SIDE IMPACT SENSOR 2 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Left front Impact Sensor 2 connector.

Disconnect the ORC connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

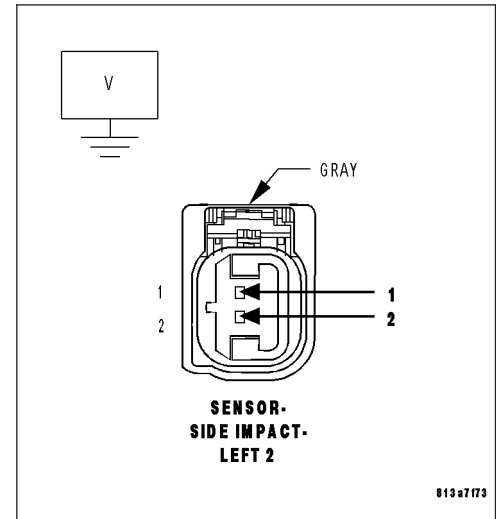
Measure the voltage of the (R17) Left Side Impact Sensor 2 Signal circuit and (R19) Sensor Ground circuit at the Left Side Impact Sensor 2 connector and ground.

**Is there any voltage present?**

**Yes** >> Repair the (R17, R19) Left Side Impact Sensor 2 circuits for a short to battery.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (R17) LEFT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn ignition on, then reconnect the battery.

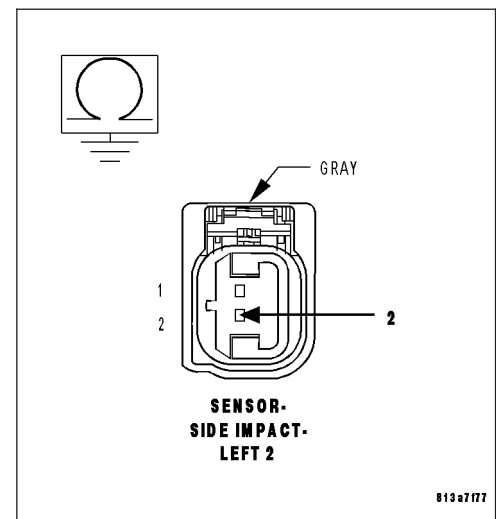
Measure the resistance of the (R17) Left Side Impact Sensor 2 Signal circuit between the Left Side Impact Sensor 2 connector and ground.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R17) Left Side Impact Sensor 2 Signal circuit for a short to ground.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4



**B1B73-LEFT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)****4. CHECK THE (R17, R19) LEFT SIDE IMPACT SENSOR 2 CIRCUITS FOR A SHORT TOGETHER**

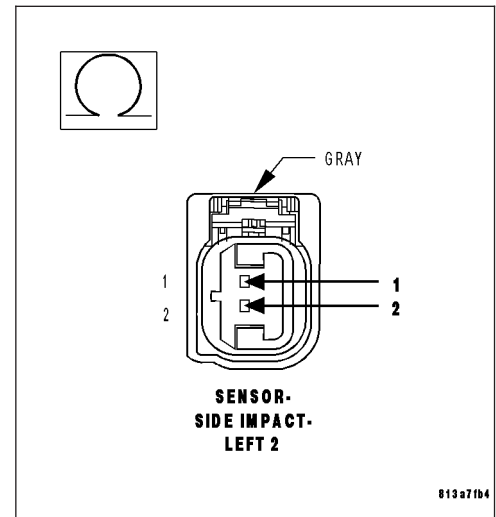
Measure the resistance between the (R17) Left Side Impact Sensor 2 Signal and (R19) Sensor Ground circuits at the Left Side Impact Sensor 2 connector.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R17, R19) Left Side Impact Sensor 2 circuits shorted together.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (R19) LEFT SIDE IMPACT SENSOR 2 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

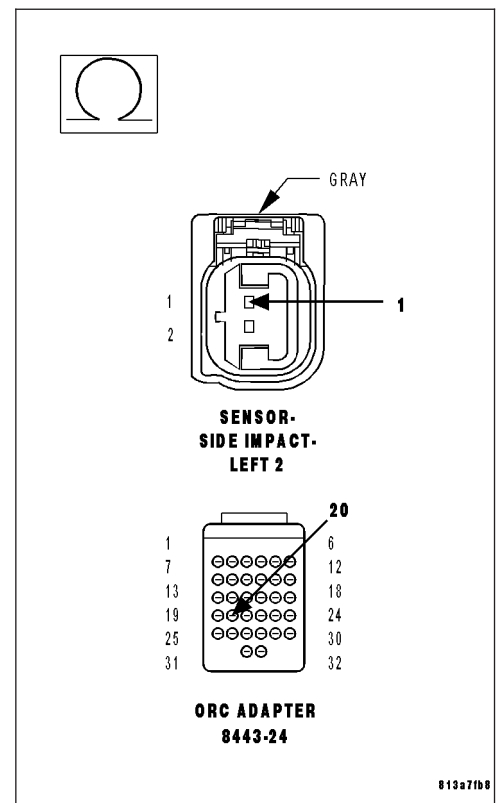
Measure the resistance of the (R19) Left Side Impact Sensor 2 Ground circuit between the Left Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 6

**No** >> Repair the (R19) Left Side Impact Sensor 2 Ground circuit for an open or high resistance.

Perform the ORC VERIFICATION TEST - VER 1.



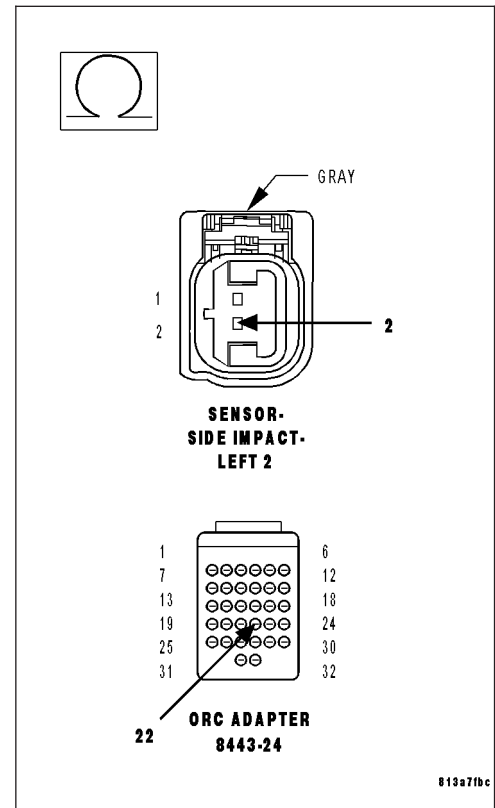
**B1B73-LEFT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)****6. CHECK THE (R17) LEFT SIDE IMPACT SENSOR 2 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Measure the resistance of the (R17) Left Side Impact Sensor 2 Signal circuit between the Left Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 7

**No** >> Repair the (R17) Left Side Impact Sensor 2 Signal circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.

**7. CHECK OPERATION OF THE LEFT SIDE IMPACT SENSOR 2**

Replace the Left Side Impact Sensor 2.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

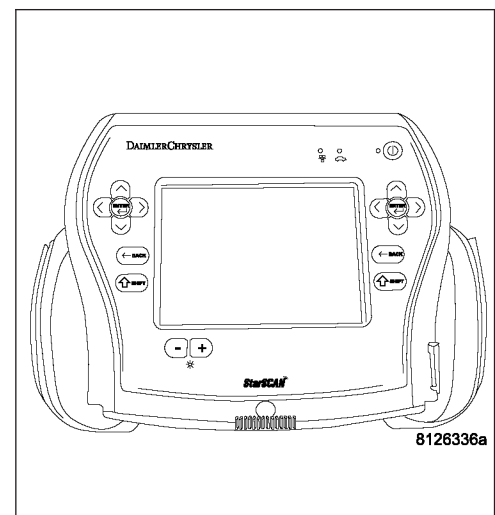
Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

**Did the active Left Side Impact Sensor 2 DTC return?**

**Yes** >> Go To 8

**No** >> Repair is complete.  
Perform the ORC VERIFICATION TEST - VER 1.



**B1B73-LEFT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)****8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with Service Instructions.

Perform the ORC VERIFICATION TEST - VER 1.

**9. TEST FOR AN INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

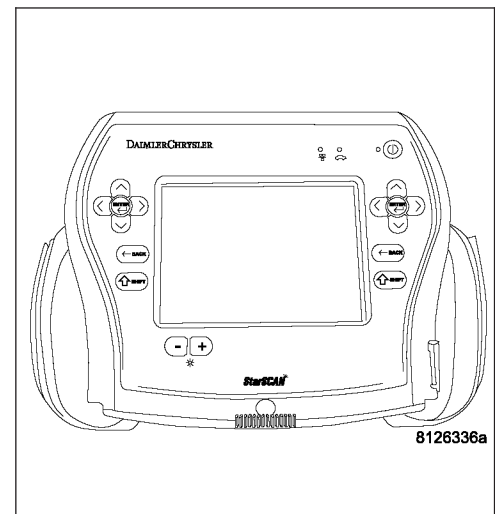
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

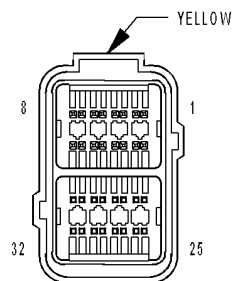
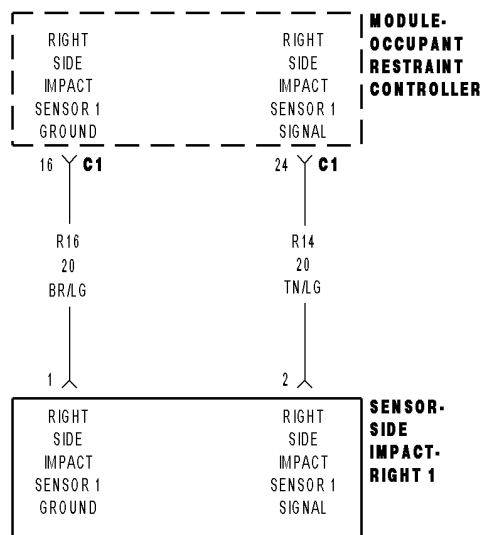
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

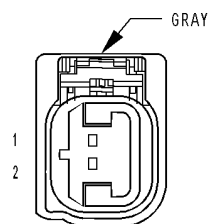
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B75-RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL



**MODULE-  
OCCUPANT  
RESTRAINT  
CONTROLLER C1**



**SENSOR-  
SIDE IMPACT-  
RIGHT 1**



**B1B75-RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The Occupant Restraint Controller (ORC) continuously communicates with the Right Side Impact Sensor 1 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.

- **Set Condition:**

This code will set, if the ORC and the Right Side Impact Sensor 1 do not establish and maintain valid data communications.

Possible Causes
(R14) SIGNAL CIRCUIT SHORTED TO BATTERY
(R14) SIGNAL CIRCUIT SHORTED TO GROUND
(R14, R16) RIGHT SIDE IMPACT SENSOR 1 CIRCUITS SHORTED TOGETHER
(R16) RIGHT SIDE IMPACT SENSOR 1 GROUND CIRCUIT OPEN
(R14) RIGHT SIDE IMPACT SENSOR 1 SIGNAL CIRCUIT OPEN
ORC, RIGHT SIDE IMPACT SENSOR 1

**Diagnostic Test****1. VERIFY THAT DTC B1B75-RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL**

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

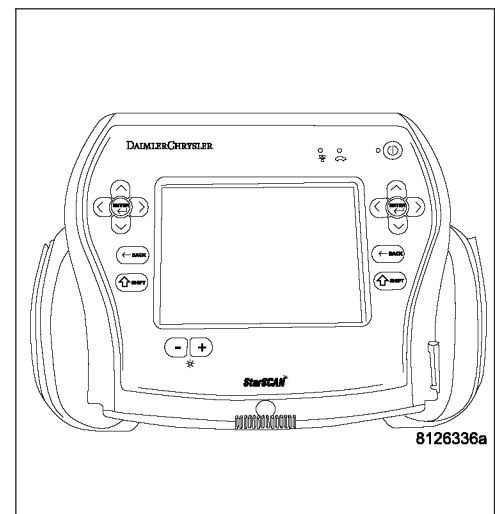
Turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active: B1B75-RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL?**

**Yes**     >> Go To 2

**No**     >> Go To 9



**B1B75-RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)****2. CHECK THE (R14, R16) RIGHT SIDE IMPACT SENSOR 1 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Right front Impact Sensor 1 connector.

Disconnect the ORC connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

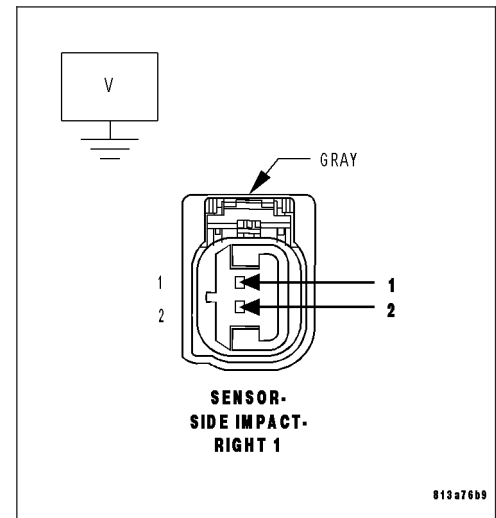
Measure the voltage of the (R14) Right Side Impact Sensor 1 Signal circuit and (R16) Sensor Ground circuit at the Right Side Impact Sensor 1 connector and ground.

**Is there any voltage present?**

**Yes** >> Repair the (R14, R16) Right Side Impact Sensor 1 circuits for a short to battery.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (R14) RIGHT SIDE IMPACT SENSOR 1 SIGNAL CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn ignition on, then reconnect the battery.

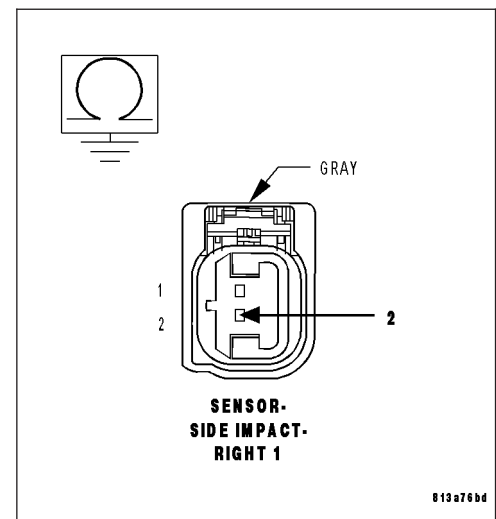
Measure the resistance of the (R14) Right Side Impact Sensor 1 Signal circuit between the Right Side Impact Sensor 1 connector and ground.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R14) Right Side Impact Sensor 1 Signal circuit for a short to ground.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4



**B1B75-RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)****4. CHECK THE (R14, R16) RIGHT SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER**

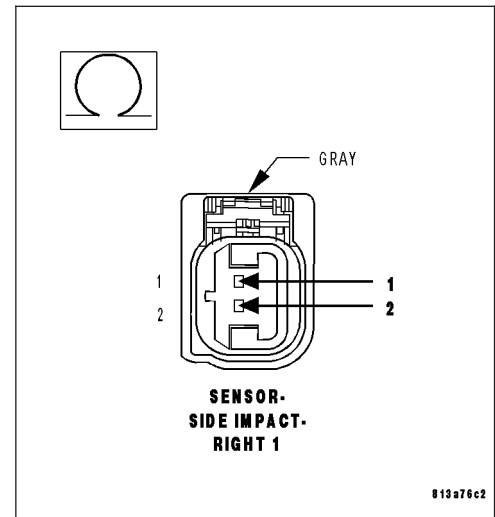
Measure the resistance between the (R14) Right Side Impact Sensor 1 Signal and (R16) Sensor Ground circuits at the Right Side Impact Sensor 1 connector.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R14, R16) Right Side Impact Sensor 1 circuits shorted together.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (R16) RIGHT SIDE IMPACT SENSOR 1 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

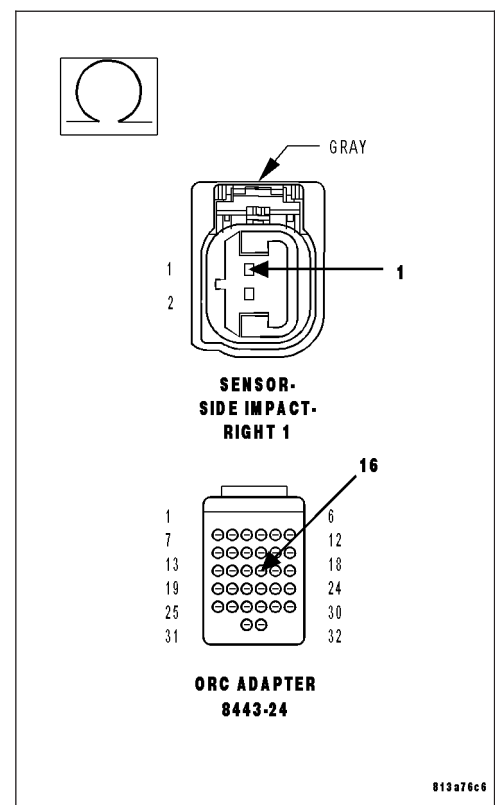
Measure the resistance of the (R16) Right Side Impact Sensor 1 Ground circuit between the Right Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 6

**No** >> Repair the (R16) Right Side Impact Sensor 1 Ground circuit for an open or high resistance.

Perform the ORC VERIFICATION TEST - VER 1.



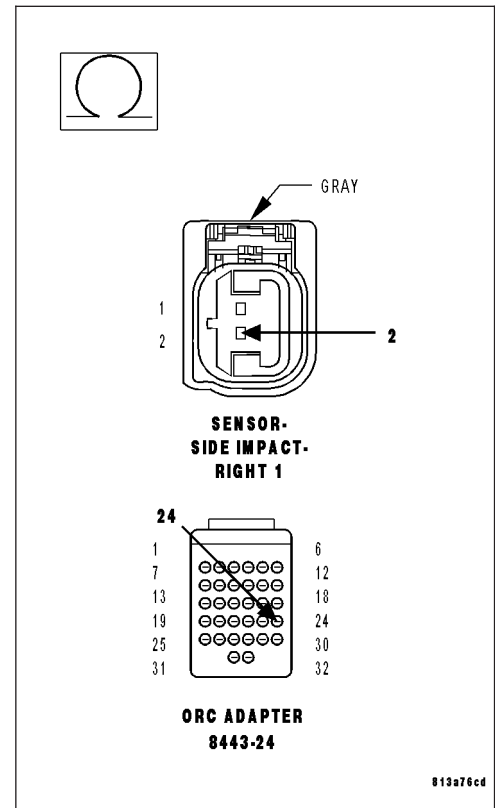
**B1B75-RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)****6. CHECK THE (R14) RIGHT SIDE IMPACT SENSOR 1 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Measure the resistance of the (R14) Right Side Impact Sensor 1 Signal circuit between the Right Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 7

**No** >> Repair the (R14) Right Side Impact Sensor 1 Signal circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.

**7. CHECK OPERATION OF THE RIGHT SIDE IMPACT SENSOR 1**

Replace the Right Side Impact Sensor 1.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

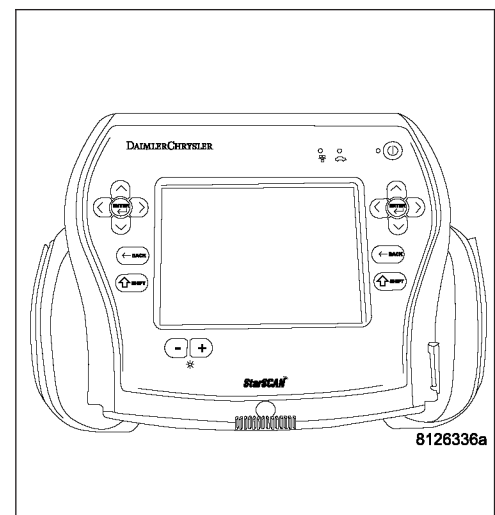
Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

**Did the active Right Side Impact Sensor 1 DTC return?**

**Yes** >> Go To 8

**No** >> Repair is complete.  
Perform the ORC VERIFICATION TEST - VER 1.



**B1B75-RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 INTERNAL (CONTINUED)****8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with Service Instructions.  
Perform the ORC VERIFICATION TEST - VER 1.

**9. TEST FOR AN INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

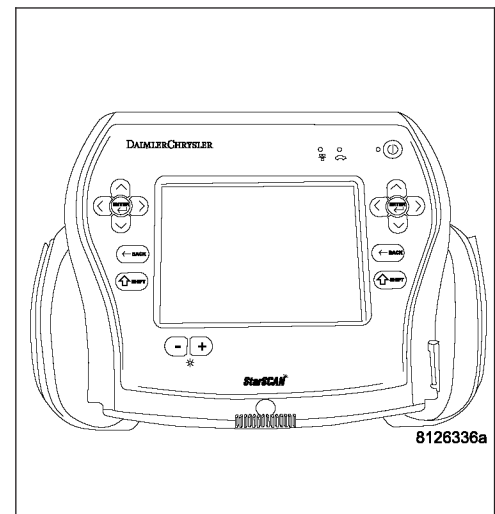
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

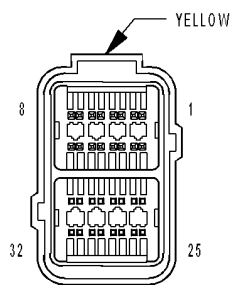
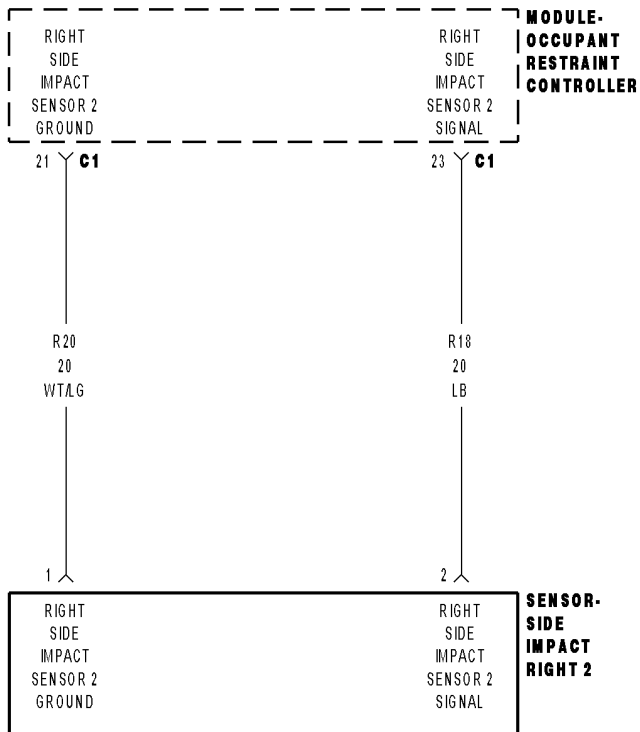
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

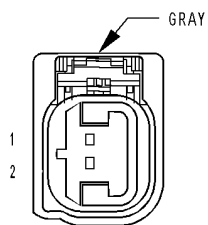
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B76-RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL



**MODULE-  
OCCUPANT  
RESTRAINT  
CONTROLLER C1**



**SENSOR-  
SIDE IMPACT-  
RIGHT 2**

**B1B76-RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The Occupant Restraint Controller (ORC) continuously communicates with the Right Side Impact Sensor 2 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.

- **Set Condition:**

This code will set, if the ORC and the Right Side Impact Sensor 2 do not establish and maintain valid data communications.

Possible Causes
(R18) SIGNAL CIRCUIT SHORTED TO BATTERY
(R18) SIGNAL CIRCUIT SHORTED TO GROUND
(R18, R20) RIGHT SIDE IMPACT SENSOR 2 CIRCUITS SHORTED TOGETHER
(R20) RIGHT SIDE IMPACT SENSOR 2 GROUND CIRCUIT OPEN
(R18) RIGHT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT OPEN
ORC, RIGHT SIDE IMPACT SENSOR 2

**Diagnostic Test****1. VERIFY ACTIVE B1B76-RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL**

Turn the ignition on.

With the scan tool, read ORC DTCs.

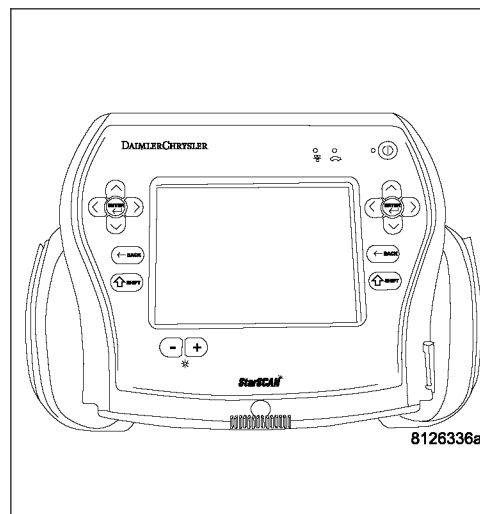
**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

**Does the scan tool display an active: B1B76-RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL?**

**Yes**     >> Go To 2

**No**     >> Go To 9



**B1B76-RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)****2. CHECK THE (R18, R20) RIGHT SIDE IMPACT SENSOR 2 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Right front Impact Sensor 2 connector.

Disconnect the ORC connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

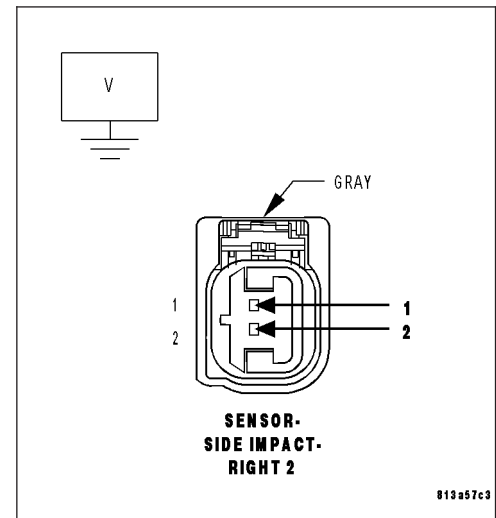
Measure the voltage of the (R18) Right Side Impact Sensor 2 Signal circuit and (R20) Sensor Ground circuit at the Right Side Impact Sensor 2 connector and ground.

**Is there any voltage present?**

**Yes** >> Repair the (R18, R20) Right Side Impact Sensor 2 circuits for a short to battery.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (R18) RIGHT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT FOR A SHORT TO GROUND**

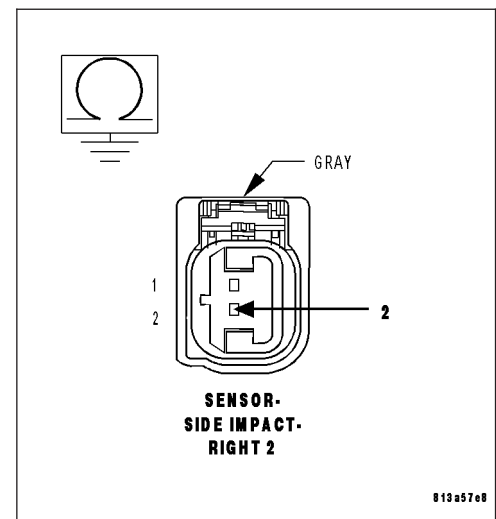
Measure the resistance of the (R18) Right Side Impact Sensor 2 Signal circuit between the Right Side Impact Sensor 2 connector and ground.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R18) Right Side Impact Sensor 2 Signal circuit for a short to ground.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4





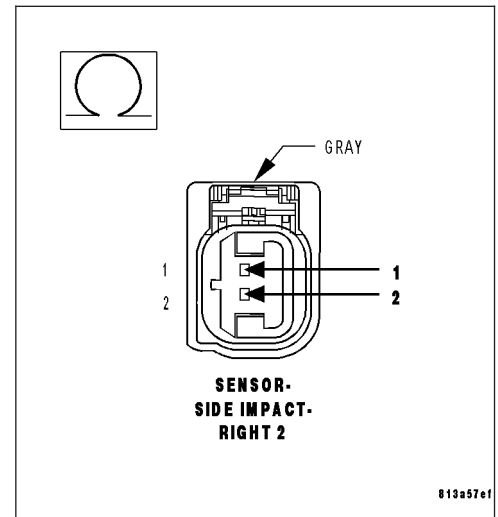
**B1B76-RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)****4. CHECK THE (R18, R20) RIGHT SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER**

Measure the resistance between the (R18) Right Side Impact Sensor 2 Signal and (R20) Sensor Ground circuits at the Right Side Impact Sensor 2 connector.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R18, R20) Right Side Impact Sensor 2 circuits shorted together.  
Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (R18) RIGHT SIDE IMPACT SENSOR 2 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

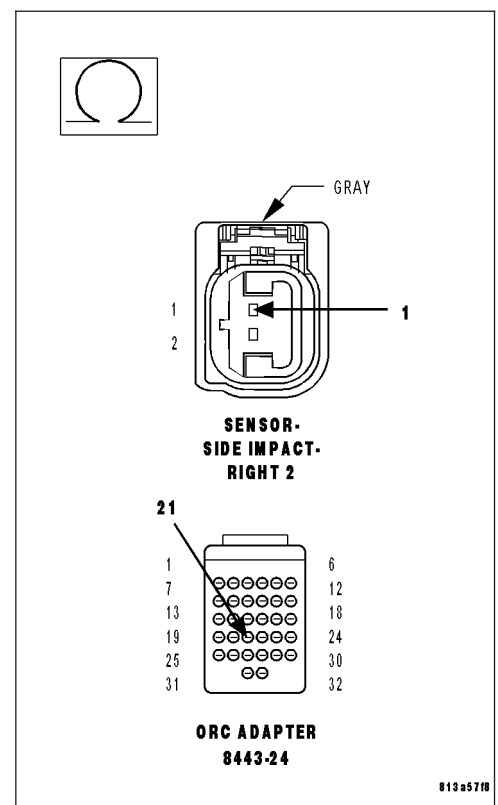
Connect the 8443 Load Tool ORC Adaptor to the Occupant Restraint Controller C2 connector.

Measure the resistance of the (R20) Right Side Impact Sensor 2 Ground circuit between the Right Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 6

**No** >> Repair the (R20) Right Side Impact Sensor 2 Ground circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.



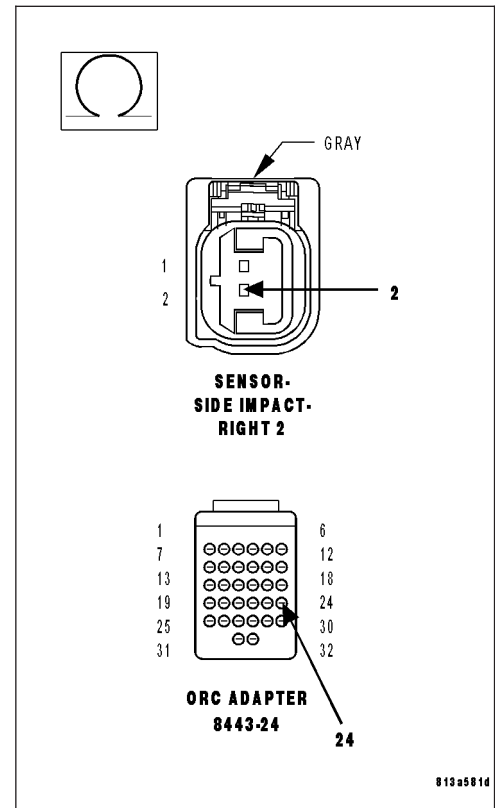
**B1B76-RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)****6. CHECK THE (R18) RIGHT SIDE IMPACT SENSOR 2 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Measure the resistance of the (R18) Right Side Impact Sensor 2 Signal circuit between the Right Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 7

**No** >> Repair the (R18) Right Side Impact Sensor 2 Signal circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.

**7. CHECK OPERATION OF THE RIGHT SIDE IMPACT SENSOR 2**

Replace the Right Side Impact Sensor 2.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

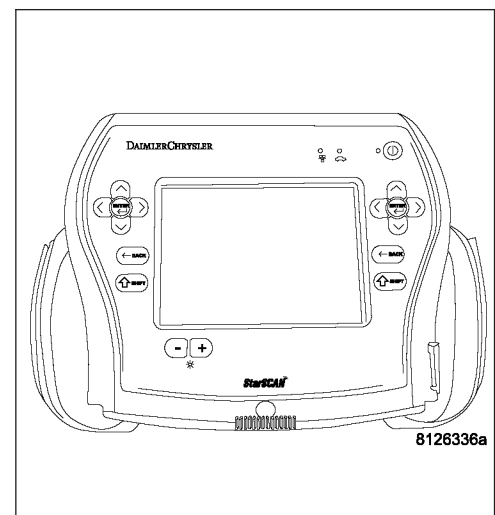
Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

**Did the active Right Side Impact Sensor 2 DTC return?**

**Yes** >> Go To 8

**No** >> Repair is complete.  
Perform the ORC VERIFICATION TEST - VER 1.



**B1B76-RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 INTERNAL (CONTINUED)****8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

**Repair**

Replace the Occupant Restraint Controller in accordance with Service Instructions.  
Perform the ORC VERIFICATION TEST - VER 1.

**9. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

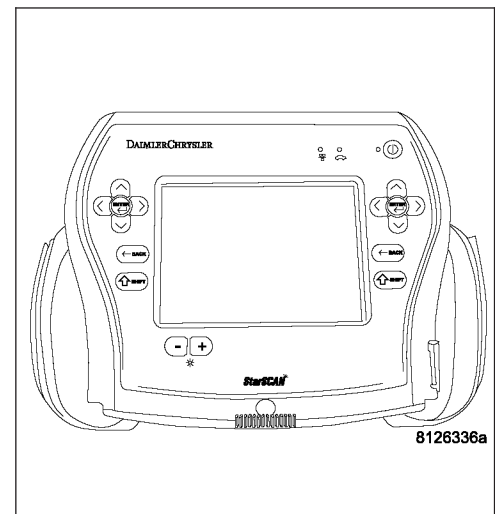
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

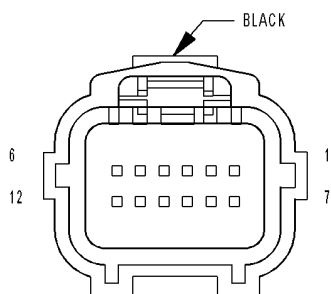
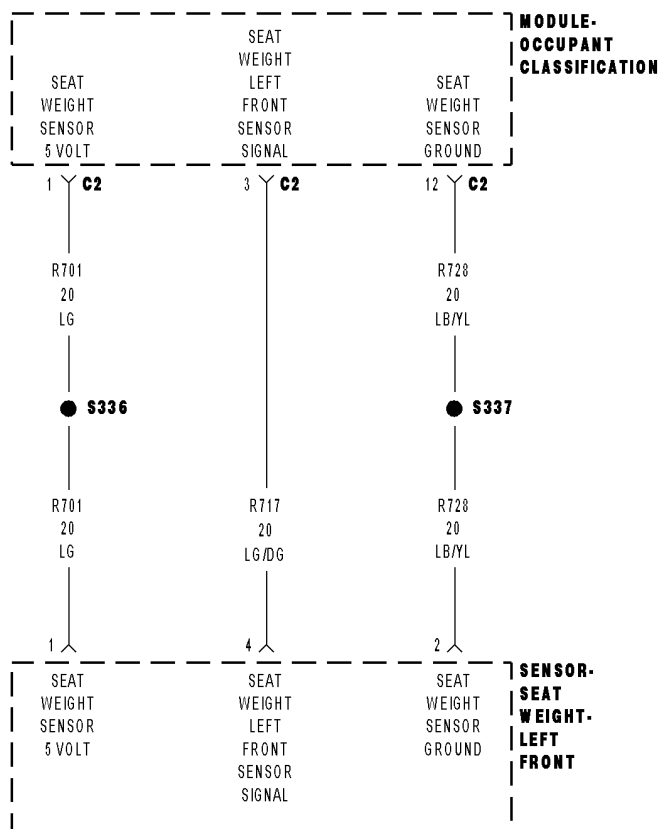
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

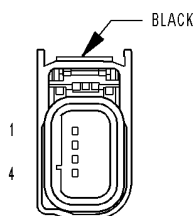
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE



**MODULE-OCCUPANT CLASSIFICATION C2**



**SENSOR-SEAT WEIGHT-LEFT FRONT**

**B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When CAN ignitions status is Run or SNA, during auto zero and while performing the Occupant Classification Module System Verification Test.
- **Set Condition:**  
During the occupant classification verification test: if the module detects that the sensor input is less than 1.4 volts or greater than 3.6 volts. During auto zero: if the module detects that the sensor input is less than 1 volt or greater than 4 volts.

Possible Causes
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED LEFT-FRONT PASSENGER SEAT WEIGHT SENSOR DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN OCCUPANT CLASSIFICATION MODULE (OCM)

**Diagnostic Test**

**1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)**

**Note:** Ensure the battery is fully charged.

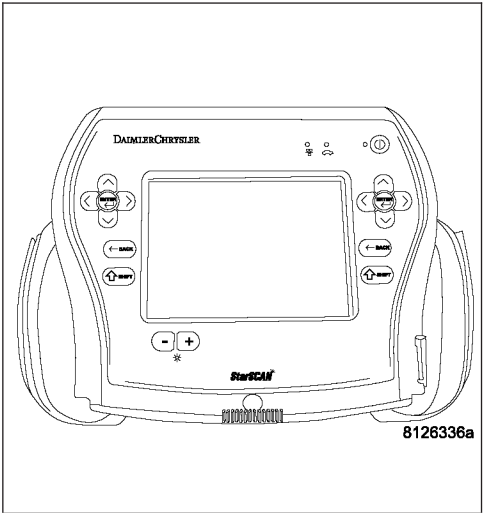
**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**

- Yes**
- >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.
- No**
- >> Go To 2



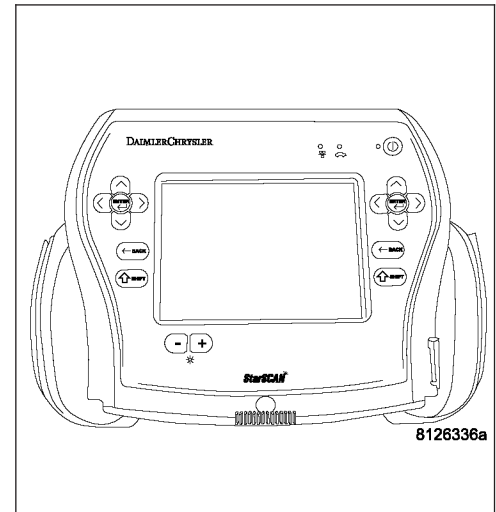
**B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE (CONTINUED)****2. VERIFY THAT DTC B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE?**

**Yes** >> Go To 3

**No** >> Go To 5

**3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 4

**B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE (CONTINUED)****4. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST**

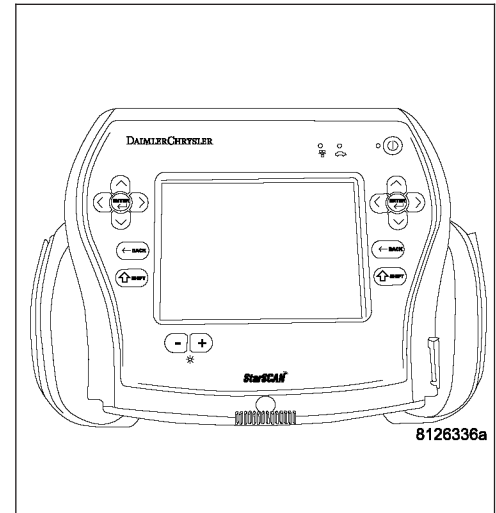
Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

**Note:** Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.



**Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?**

**Yes** >> Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.  
Perform OCS VERIFICATION TEST - VER 1.

**No - But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

---

**B1B78-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT PERFORMANCE (CONTINUED)****5. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

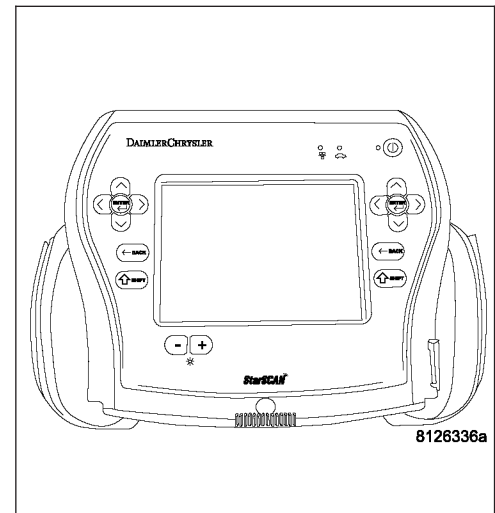
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

**Does the scan tool display any ACTIVE DTCs?**

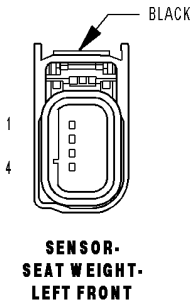
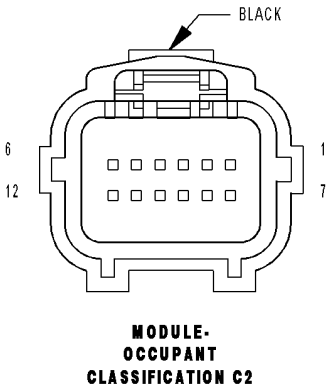
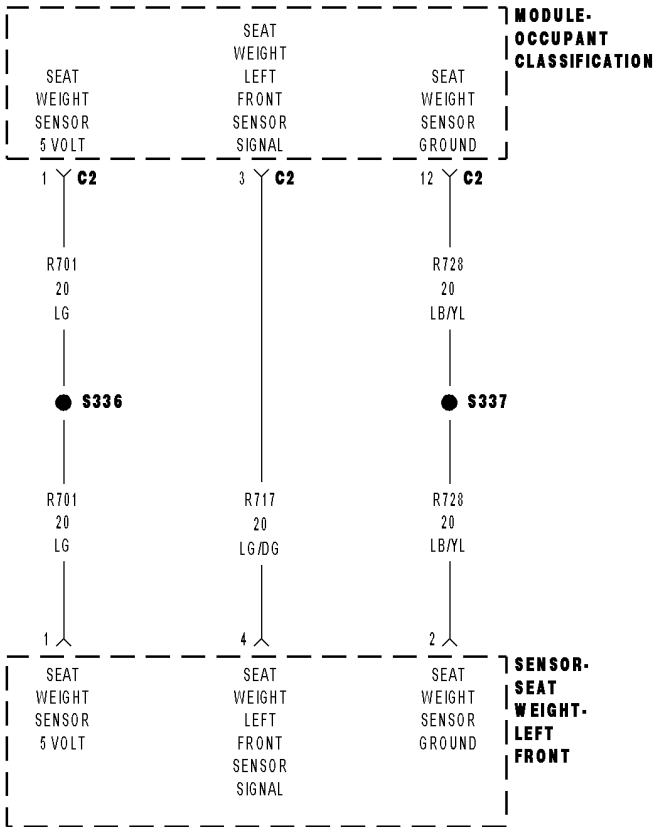
**Yes** >> Select appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.





B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW



**B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

While the CAN bus ignition status is in IGN\_RUN, the module checks the sensor input ranges.

- **Set Condition:**

If the module detects that the sensor input is less than  $3.4 \pm .6\%$  of the (R701) Seat Weight Sensor 5 Volt circuit voltage. This DTC will also set if the (R701) Seat Weight Sensor 5 Volt circuit is shorted to ground. However, this condition would prevent communication with the OCM and cause a Lost Communication With OCM DTC to set in other modules.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT OPEN (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT OPEN LEFT-FRONT SEAT WEIGHT SENSOR OCCUPANT CLASSIFICATION MODULE (OCM)

## Diagnostic Test

### 1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

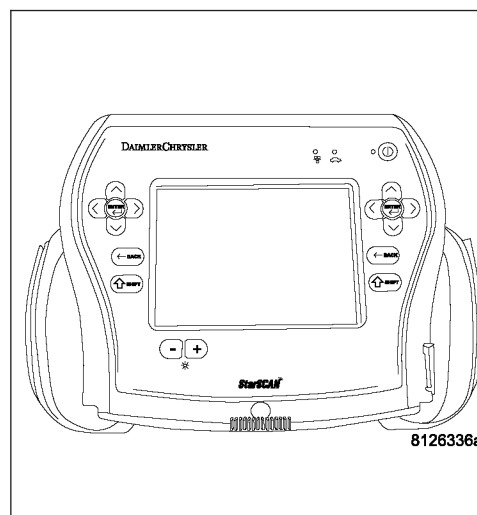
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**

**Yes** >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2



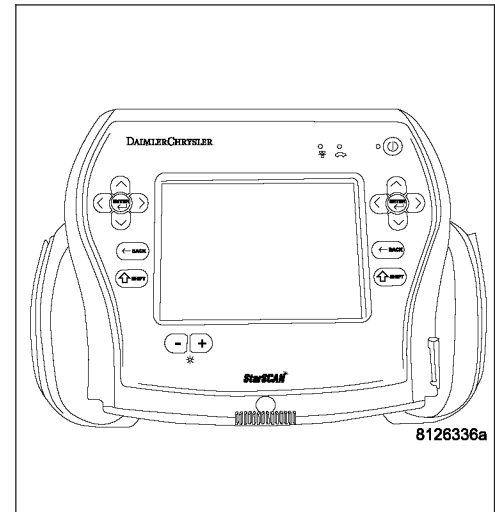
**B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW (CONTINUED)****2. VERIFY THAT DTC B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Go To 10



---

**3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 4

---

**4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY**

Verify that the Passenger Seat Harness is routed correctly.

**Is the Passenger Seat Harness routed correctly?**

**Yes** >> Go To 5

**No** >> Reroute the Passenger Seat Harness as necessary. Then, Go To 5

---

**B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW (CONTINUED)****5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE**

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

**Note:** Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

**Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?**

**Yes - More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active.**

Perform the Diagnosis/Checkout Procedure For Seat Weight Sensors.

Perform OCS VERIFICATION TEST - VER 1

**Yes - Only DTC B1B79 Is Active.**

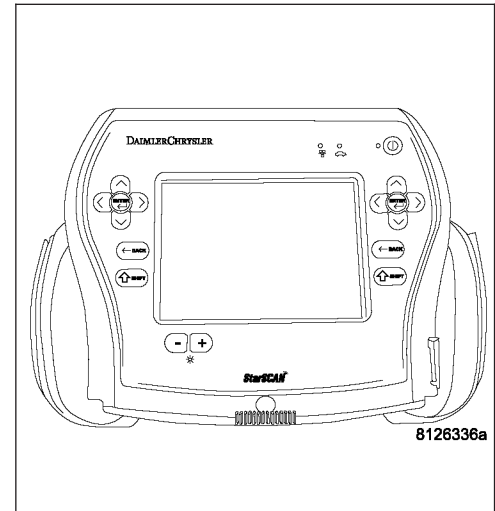
Go To 6

**No - But Other DTCs Present.**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No - No Active DTCs Present.**

Perform OCS VERIFICATION TEST - VER 1.

**6. CHECK VOLTAGE OF (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Left-Front Seat Weight Sensor connector.

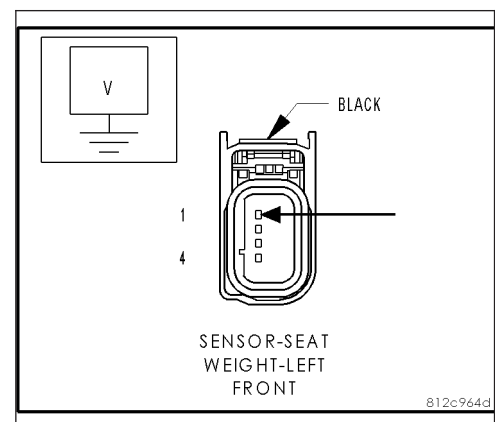
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R701) Seat Weight Sensor 5 Volt circuit.

**Is the voltage above 4.8 volts?**

**Yes** >> Go To 7

**No** >> Go To 9



**B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW (CONTINUED)****7. CHECK (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the OCM C2 connector.

Measure the resistance of the (R717) LT-FT Seat Weight Sensor Signal circuit between ground and the OCM C2 connector.

**Is the resistance below 10k ohms?**

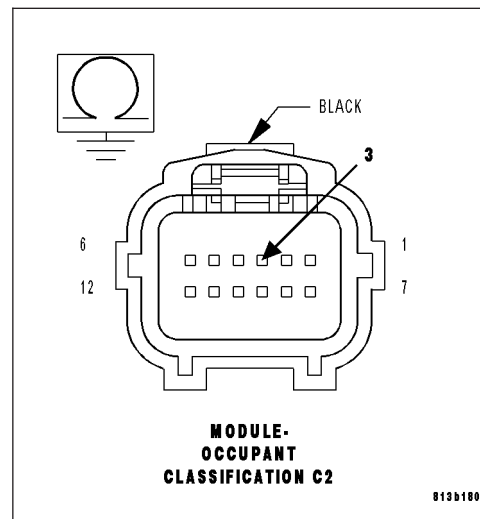
**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 8

**8. CHECK (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR AN OPEN**

Measure the resistance of the (R717) LT-FT Seat Weight Sensor Signal circuit between the OCM C2 connector and the Left-Front Seat Weight Sensor connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Left-Front Seat Weight Sensor in accordance with the Service Information. Perform OCS VERIFICATION TEST - VER 1. If DTC B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW returns active, replace the OCM in accordance with the Service Information.

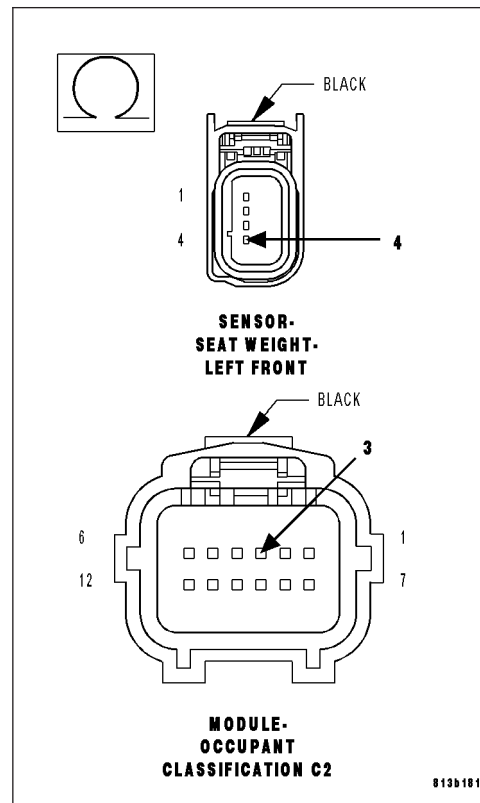
Perform OCS VERIFICATION TEST - VER 1.

**No** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.



**B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW (CONTINUED)****9. CHECK (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R701) Seat Weight Sensor 5 Volt circuit between the OCM C2 connector and the Left-Front Seat Weight Sensor connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the OCM in accordance with the Service Information.

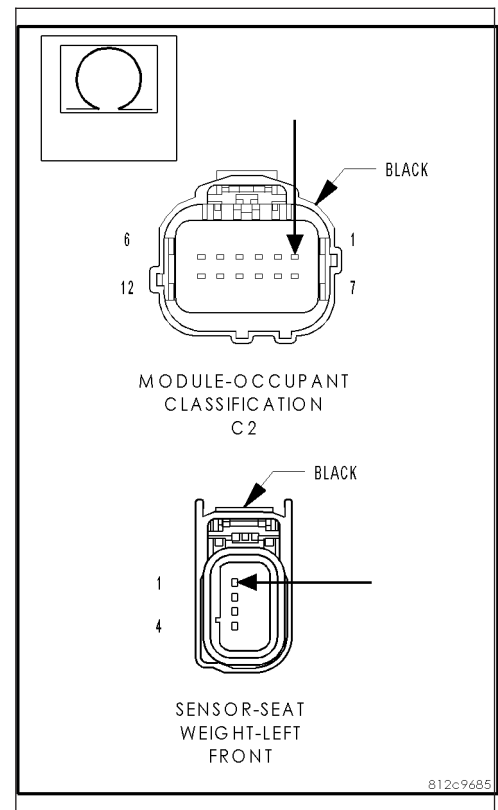
Perform OCS VERIFICATION TEST - VER 1.

**No** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.



**B1B79-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT LOW (CONTINUED)****10. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

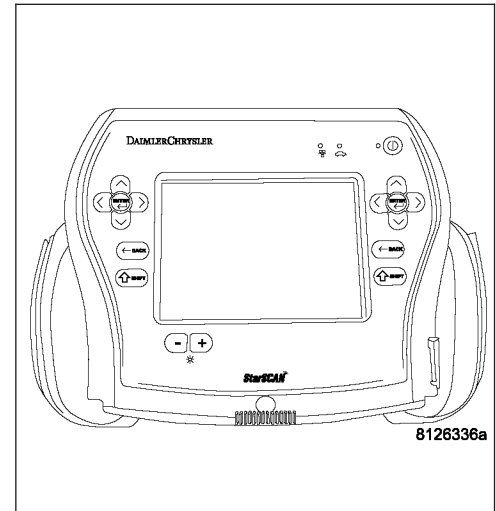
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

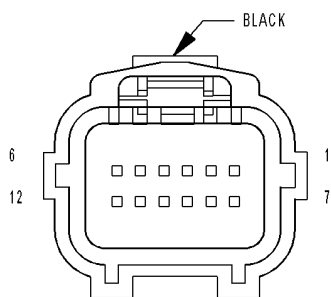
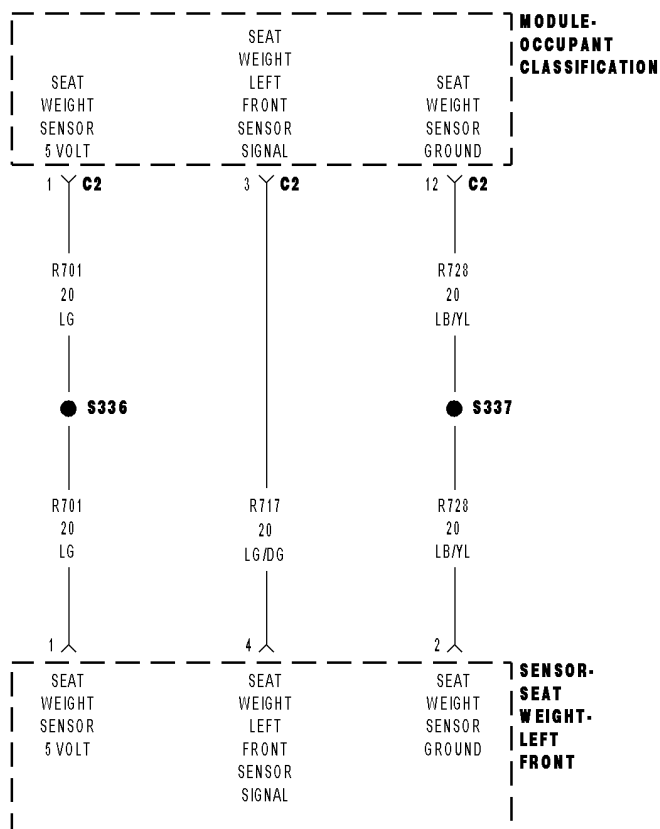
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

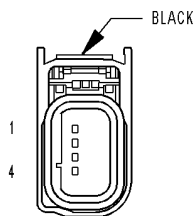
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B7A-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH



**MODULE-OCCUPANT CLASSIFICATION C2**



**SENSOR-SEAT WEIGHT-LEFT FRONT**



**B1B7A-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
While the CAN bus ignition status is in IGN\_RUN, the module checks the sensor input ranges.
- **Set Condition:**  
If the module detects that the sensor input is greater than 96 ± 0.6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT OPEN LEFT-FRONT SEAT WEIGHT SENSOR OCCUPANT CLASSIFICATION MODULE (OCM)

**Diagnostic Test**

**1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)**

**Note:** Ensure the battery is fully charged.

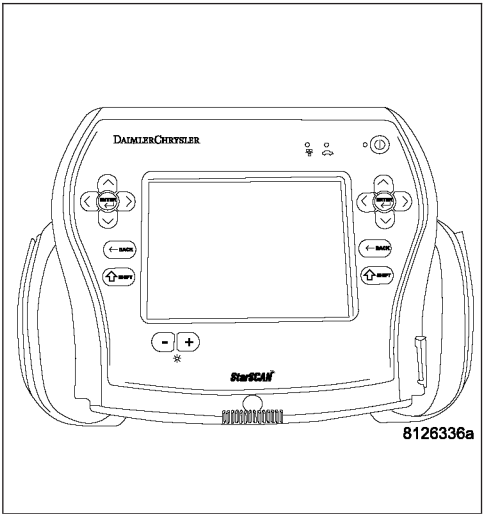
**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**

- Yes**
- >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.
- No**
- >> Go To 2



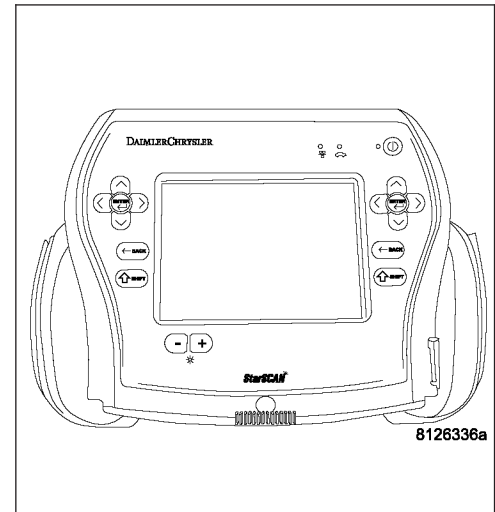
**B1B7A-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH (CONTINUED)****2. VERIFY THAT DTC B1B7A-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B7A-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH?**

**Yes** >> Go To 3

**No** >> Go To 9

**3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 4

**4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY**

Verify that the Passenger Seat Harness is routed correctly.

**Is the Passenger Seat Harness routed correctly?**

**Yes** >> Go To 5

**No** >> Reroute the Passenger Seat Harness as necessary.

Perform OCS VERIFICATION TEST - VER 1.

**B1B7A-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH (CONTINUED)****5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE**

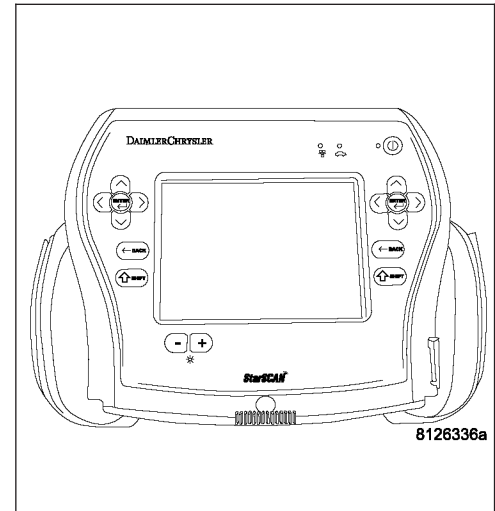
Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

**Note:** Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.



**Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?**

**Yes - More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active**

Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.

Perform OCS VERIFICATION TEST - VER 1.

**Yes - Only DTC B1B7A Is Active**

Go To 6

**No - But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No - No Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

**B1B7A-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH (CONTINUED)****6. CHECK (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the OCM C2 connector.

Measure the voltage of the (R717) LT-FT Seat Weight Sensor Signal circuit.

**Is the voltage above 0.2 volts?**

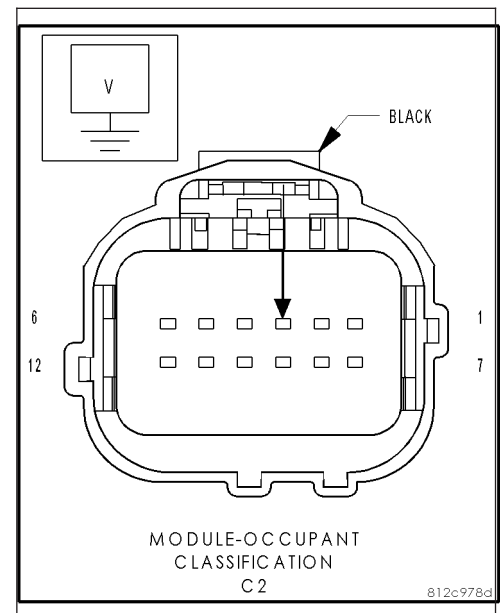
**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK (R717) LT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT**

Disconnect the Left-Front Seat Weight Sensor connector.

Measure the resistance between the (R717) LT-FT Seat Weight Sensor Signal circuit and the (R701) Seat Weight Sensor 5 Volt circuit.

**Is the resistance below 10K ohms?**

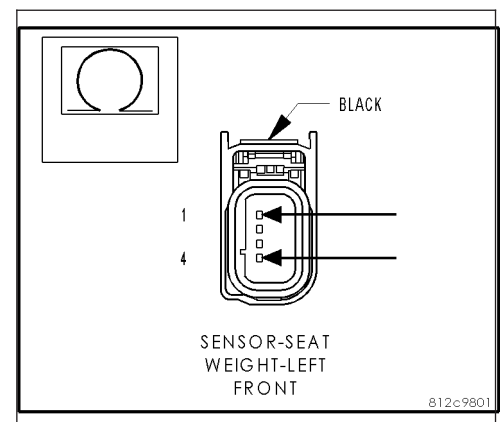
**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 8



**B1B7A-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH (CONTINUED)****8. CHECK (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT FOR AN OPEN**

Measure the resistance of the (R728) Seat Weight Sensor Ground circuit between the OCM C2 connector and the Left-Front Seat Weight Sensor connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the OCM in accordance with the Service Information.

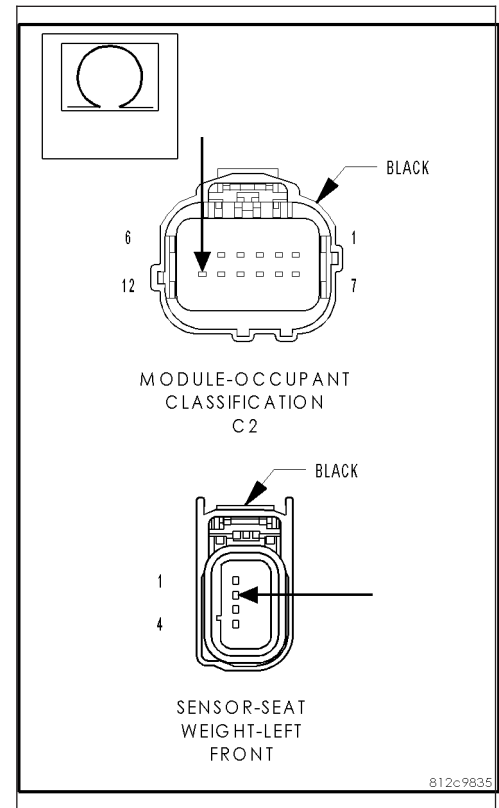
Perform OCS VERIFICATION TEST - VER 1.

**No** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.



**B1B7A-PASSENGER SEAT WEIGHT SENSOR 3 - LEFT FRONT INPUT CIRCUIT HIGH (CONTINUED)****9. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

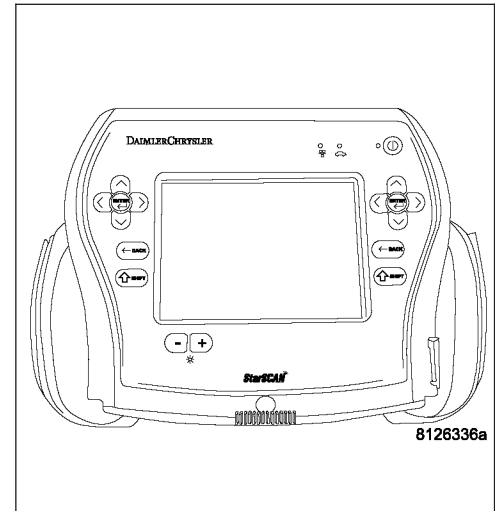
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

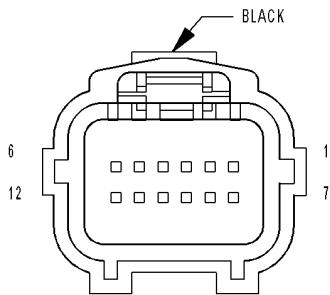
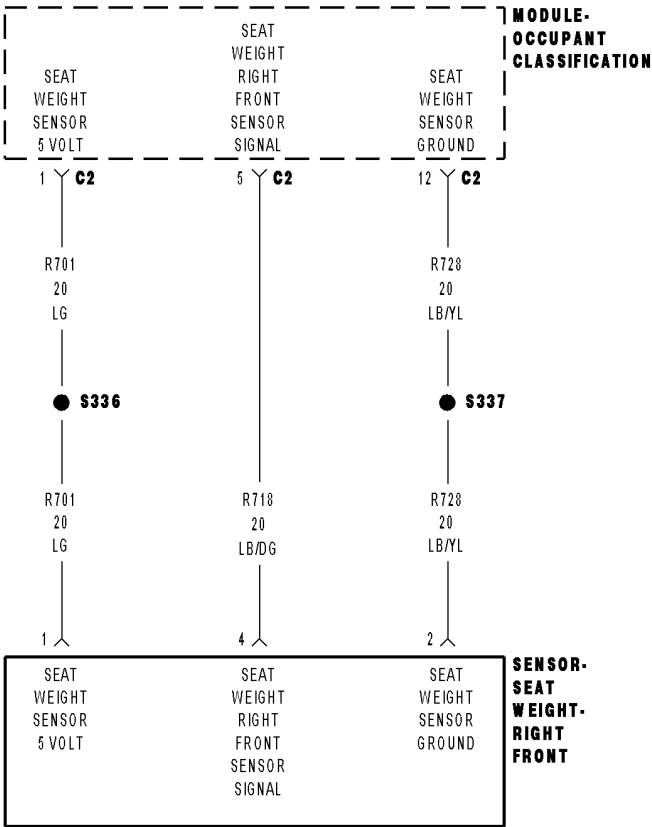
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

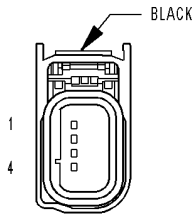
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE



**MODULE-  
OCCUPANT  
CLASSIFICATION C2**



**SENSOR-  
SEAT WEIGHT-  
RIGHT FRONT**

**B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

When CAN ignitions status is Run or SNA, during auto zero and while performing the Occupant Classification Module System Verification Test.

- **Set Condition:**

During the occupant classification verification test: if the module detects that the sensor input is less than 1.4 volts or greater than 3.6 volts. During auto zero: if the module detects that the sensor input is less than 1 volt or greater than 4 volts.

Possible Causes
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
RIGHT-FRONT PASSENGER SEAT WEIGHT SENSOR
DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN
OCCUPANT CLASSIFICATION MODULE (OCM)

## Diagnostic Test

### 1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

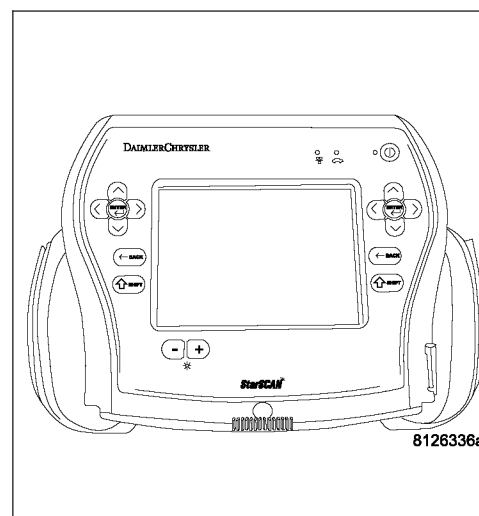
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**

**Yes** >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2





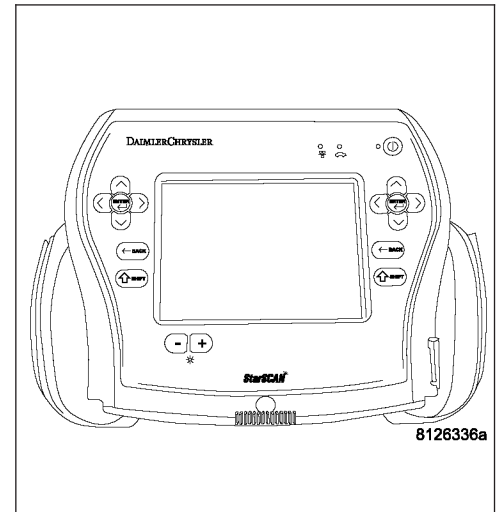
**B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE (CONTINUED)****2. VERIFY THAT DTC B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE?**

**Yes** >> Go To 3

**No** >> Go To 5



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**3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 4

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**B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE (CONTINUED)****4. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST**

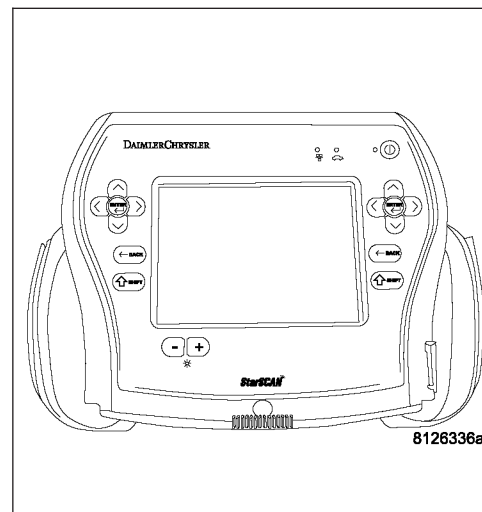
Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

**Note:** Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.



**Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?**

**Yes** >> Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.  
Perform OCS VERIFICATION TEST - VER 1.

**No, But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

**B1B7D-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT PERFORMANCE (CONTINUED)****5. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

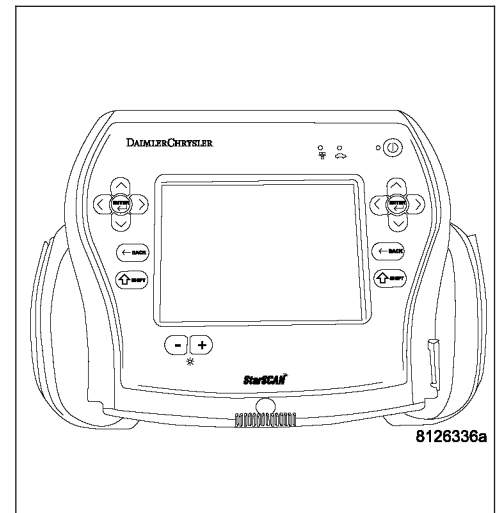
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

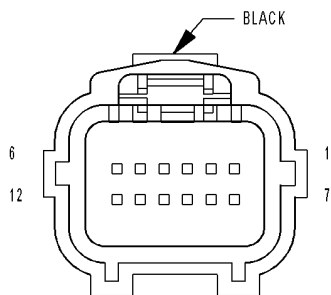
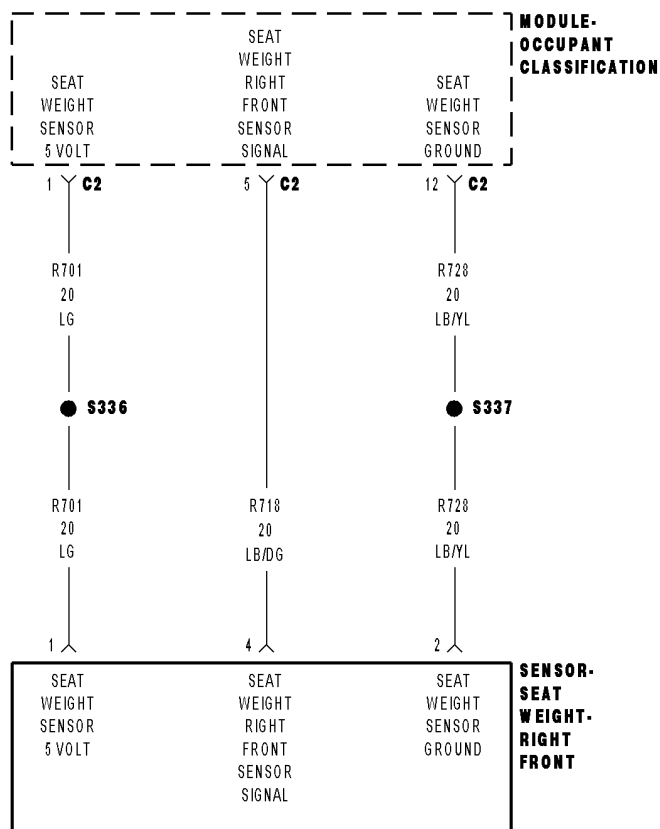
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

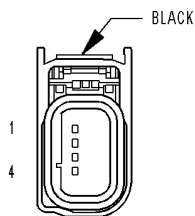
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW



**MODULE-OCCUPANT CLASSIFICATION C2**



**SENSOR-SEAT WEIGHT-RIGHT FRONT**

**B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
While the CAN bus ignition status is in IGN\_RUN, the module checks the sensor input ranges.
- **Set Condition:**  
If the module detects that the sensor input is less than 3.4 ± 0.6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage. This DTC will also set if the (R701) Seat Weight Sensor 5 Volt circuit is shorted to ground. However, this condition would prevent communication with the OCM and cause a Lost Communication With OCM DTC to set in other modules.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT OPEN (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT OPEN RIGHT-FRONT SEAT WEIGHT SENSOR OCCUPANT CLASSIFICATION MODULE (OCM)

**Diagnostic Test**

**1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)**

**Note:** Ensure the battery is fully charged.

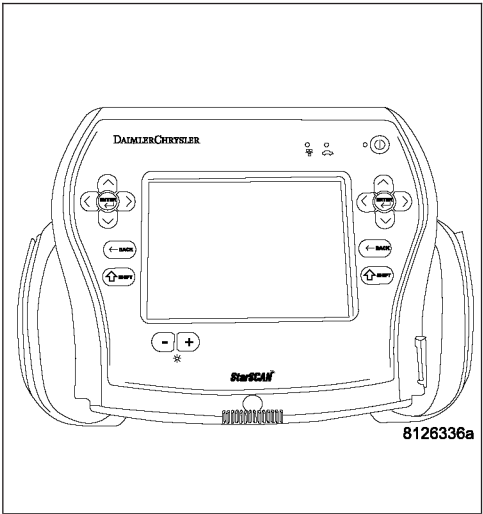
**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**

- Yes**
- >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.
- No**
- >> Go To 2



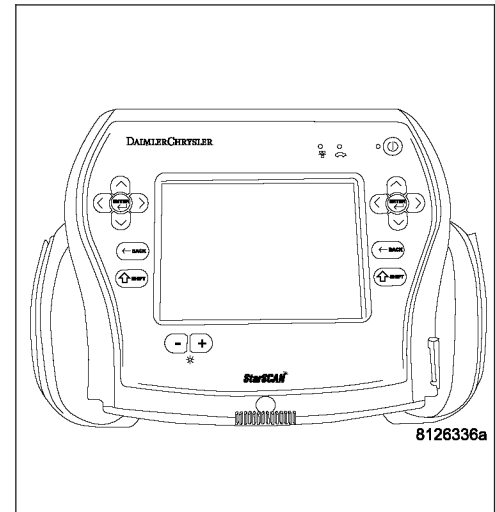
**B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW (CONTINUED)****2. VERIFY THAT DTC B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Go To 10

**3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 4

**4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY**

Verify that the Passenger Seat Harness is routed correctly.

**Is the Passenger Seat Harness routed correctly?**

**Yes** >> Go To 5

**No** >> Reroute the Passenger Seat Harness as necessary. Then, Go To 5

**B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW (CONTINUED)****5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE**

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

**Note:** Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

**Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?**

**Yes - More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active**

Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.

Perform OCS VERIFICATION TEST - VER 1.

**Yes - Only DTC B1B7E Is Active**

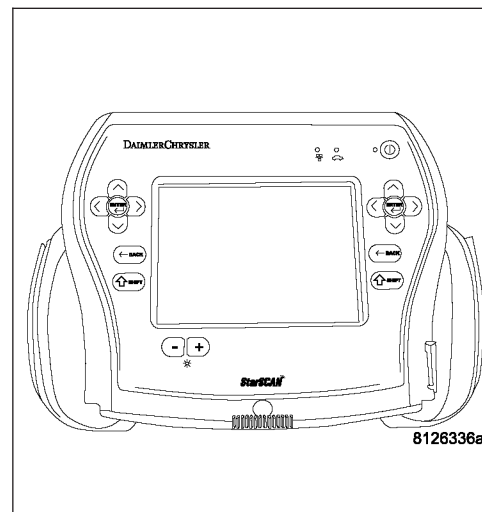
Go To 6

**No - But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No - No Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

**6. CHECK VOLTAGE OF (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Right-Front Seat Weight Sensor connector.

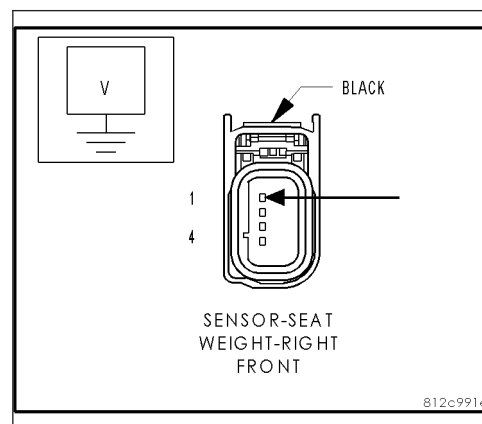
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R701) Seat Weight Sensor 5 Volt circuit.

**Is the voltage above 4.8 volts?**

**Yes** >> Go To 7

**No** >> Go To 9



**B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW (CONTINUED)****7. CHECK (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the OCM C2 connector.

Measure the resistance of the (R718) RT-FT Seat Weight Sensor Signal circuit between ground and the OCM C2 connector.

**Is the resistance below 10k ohms?**

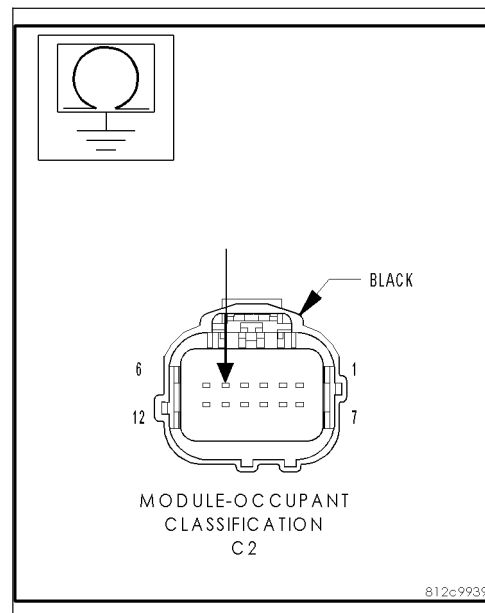
**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 8

**8. CHECK (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR AN OPEN**

Measure the resistance of the (R718) RT-FT Seat Weight Sensor Signal circuit between the OCM C2 connector and the Right-Front Seat Weight Sensor connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Right-Front Seat Weight Sensor in accordance with the Service Information. Perform OCS VERIFICATION TEST - VER 1. If DTC B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW returns active, replace the OCM in accordance with the Service Information.

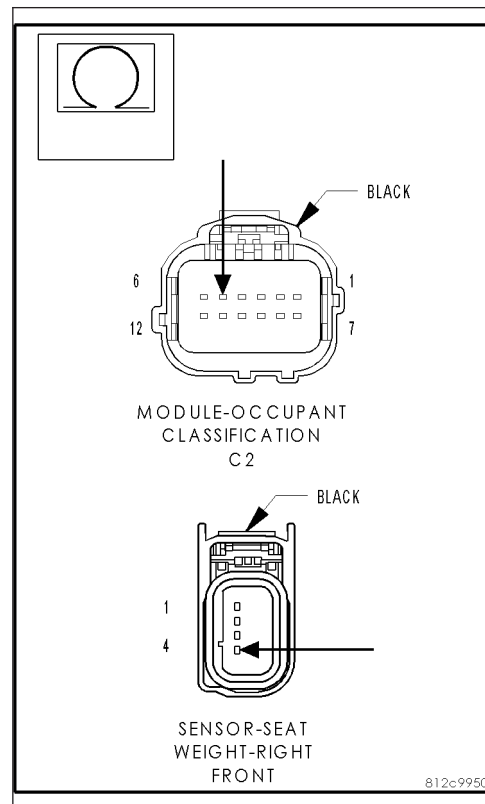
Perform OCS VERIFICATION TEST - VER 1.

**No** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.





**B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW (CONTINUED)****9. CHECK (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R701) Seat Weight Sensor 5 Volt circuit between the OCM C2 connector and the Right-Front Seat Weight Sensor connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the OCM in accordance with the Service Information.

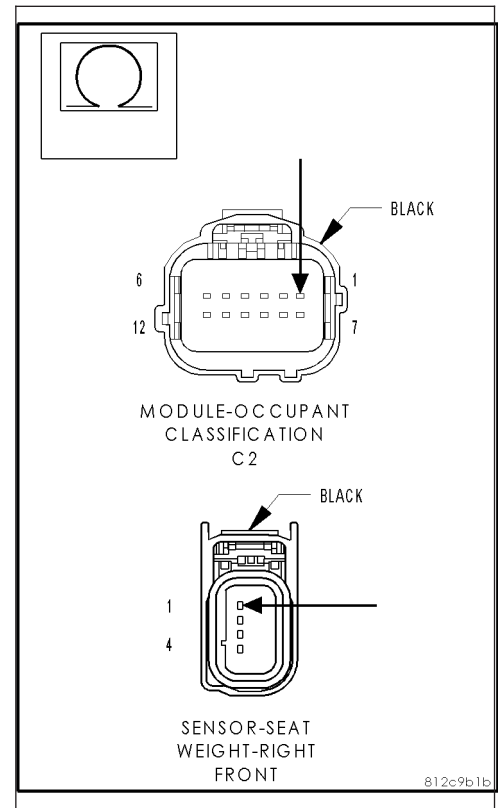
Perform OCS VERIFICATION TEST - VER 1.

**No** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.



**B1B7E-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT LOW (CONTINUED)****10. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

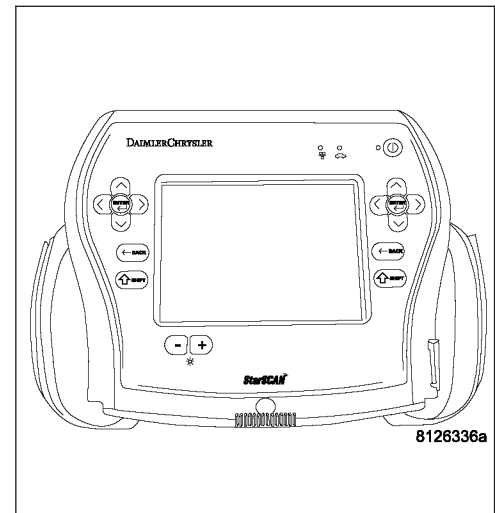
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

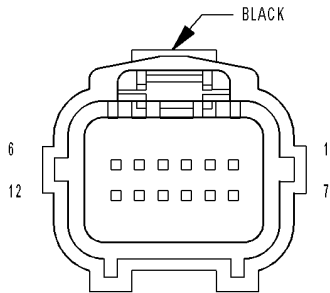
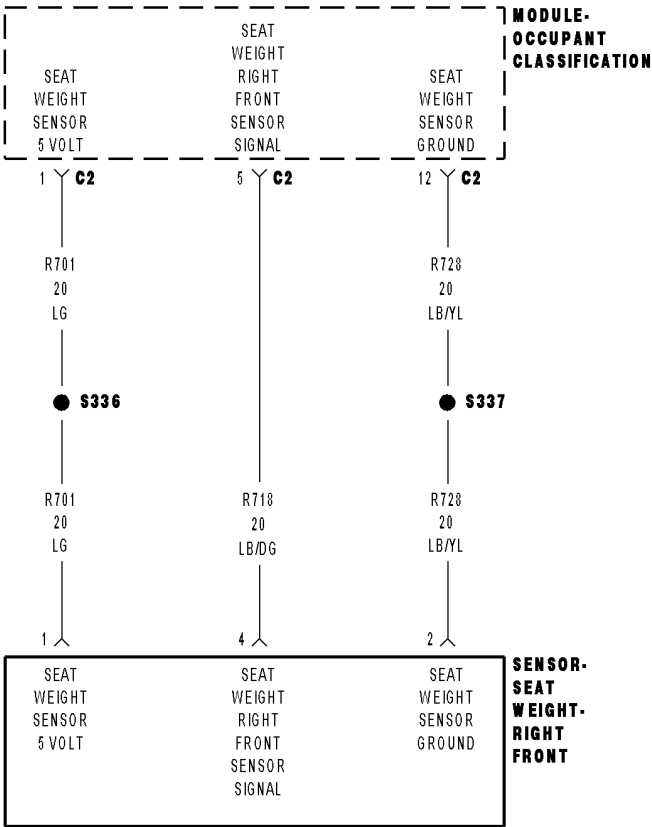
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

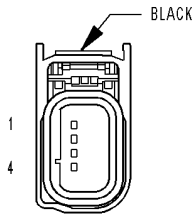
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH



**MODULE-  
OCCUPANT  
CLASSIFICATION C2**



**SENSOR-  
SEAT WEIGHT-  
RIGHT FRONT**

**B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

While the CAN bus ignition status is in IGN\_RUN, the module checks the sensor input ranges.

- **Set Condition:**

If the module detects that the sensor input is greater than  $96 \pm 0.6\%$  of the (R701) Seat Weight Sensor 5 Volt circuit voltage.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT OPEN RIGHT-FRONT SEAT WEIGHT SENSOR OCCUPANT CLASSIFICATION MODULE (OCM)

## Diagnostic Test

### 1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

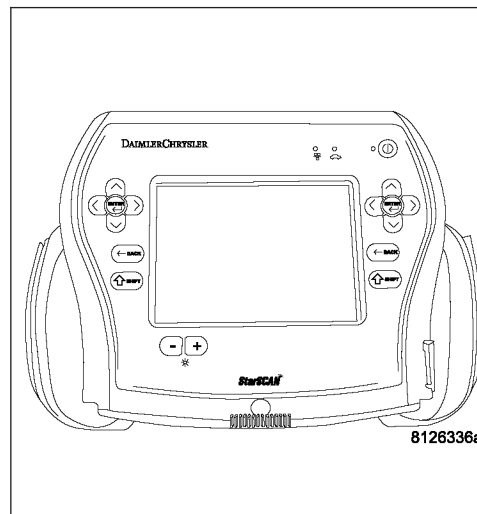
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**

**Yes** >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2



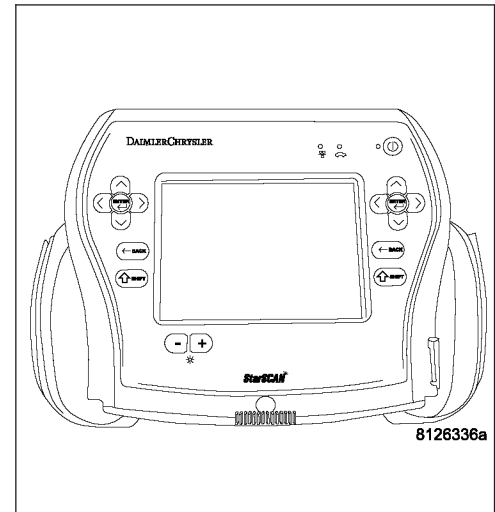
**B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH (CONTINUED)****2. VERIFY THAT DTC B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH?**

**Yes** >> Go To 3

**No** >> Go To 9



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**3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 4

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**4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY**

Verify that the Passenger Seat Harness is routed correctly.

**Is the Passenger Seat Harness routed correctly?**

**Yes** >> Go To 5

**No** >> Reroute the Passenger Seat Harness as necessary.

Perform OCS VERIFICATION TEST - VER 1.

---

**B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH (CONTINUED)****5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE**

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

**Note:** Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

**Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?**

**Yes, More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active**

Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.

Perform OCS VERIFICATION TEST - VER 1.

**Yes, Only DTC B1B7F Is Active**

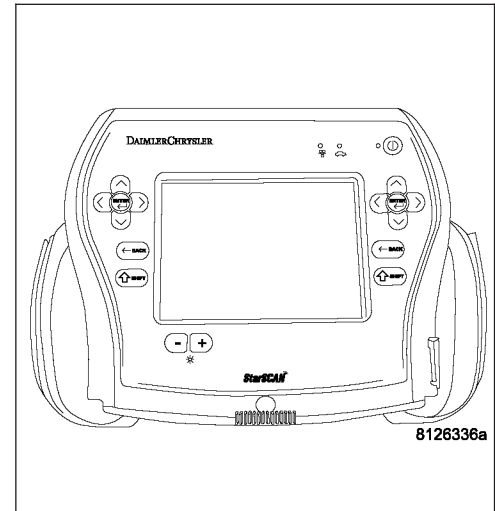
Go To 6

**No, But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

**6. CHECK (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the voltage of the (R718) RT-FT Seat Weight Sensor Signal circuit.

**Is the voltage above 0.2 volts?**

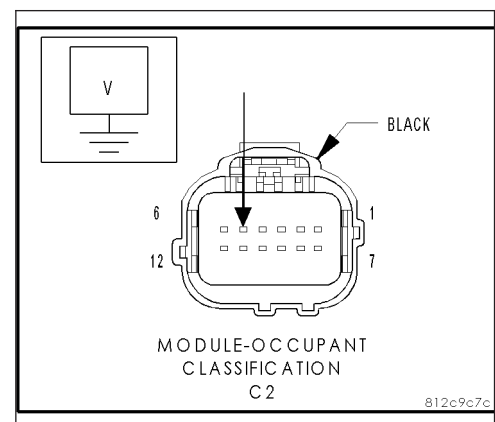
**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 7



**B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH (CONTINUED)****7. CHECK (R718) RT-FT SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT**

Disconnect the Right-Front Seat Weight Sensor connector.

Measure the resistance between the (R718) RT-FT Seat Weight Sensor Signal circuit and the (R701) Seat Weight Sensor 5 Volt circuit.

**Is the resistance below 10K ohms?**

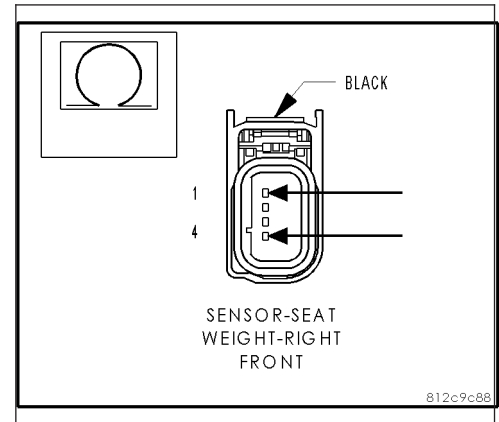
**Yes** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 8

**8. CHECK (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT FOR AN OPEN**

Measure the resistance of the (R728) Seat Weight Sensor Ground circuit between the OCM C2 connector and the Right-Front Seat Weight Sensor connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the OCM in accordance with the Service Information.

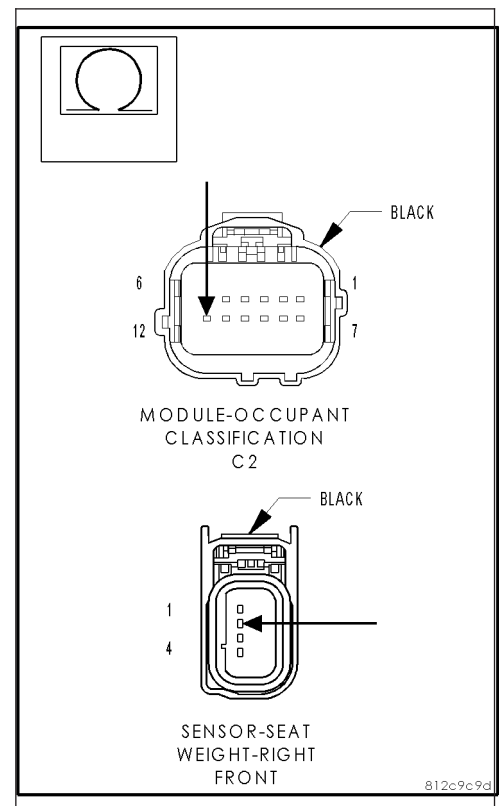
Perform OCS VERIFICATION TEST - VER 1.

**No** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.



**B1B7F-PASSENGER SEAT WEIGHT SENSOR 2 - RIGHT FRONT INPUT CIRCUIT HIGH (CONTINUED)****9. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

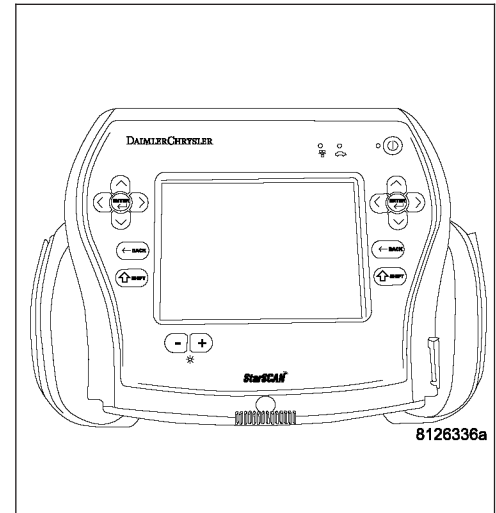
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

**Does the scan tool display any ACTIVE DTCs?**

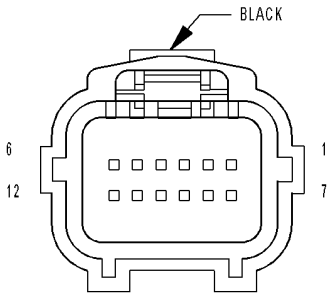
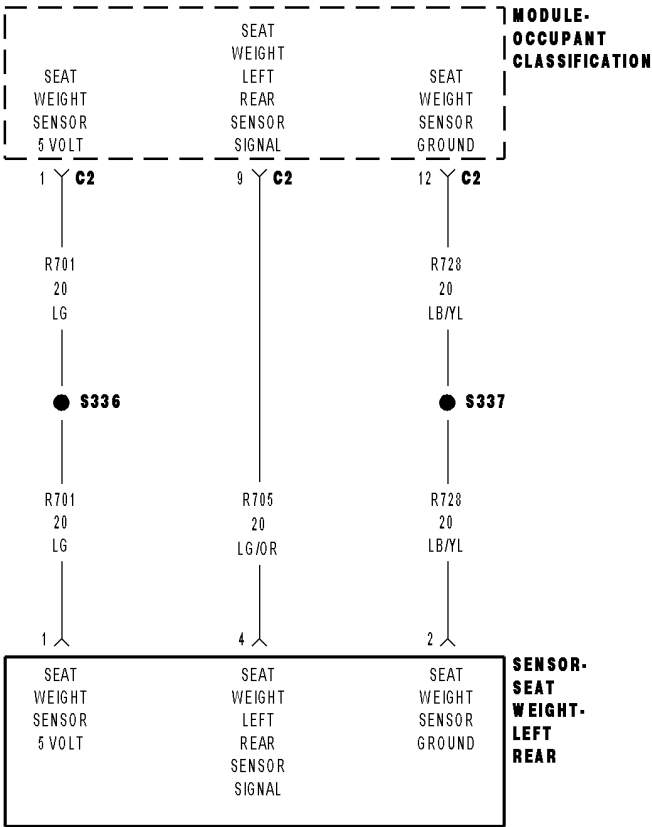
**Yes** >> Select appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.

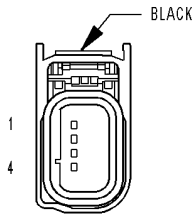




B1B82-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE



**MODULE-  
OCCUPANT  
CLASSIFICATION C2**



**SENSOR-  
SEAT WEIGHT-  
LEFT REAR**

**B1B82-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

When CAN ignitions status is Run or SNA, during auto zero and while performing the Occupant Classification Module System Verification Test.

- **Set Condition:**

During the occupant classification verification test: if the module detects that the sensor input is less than 1.4 volts or greater than 3.6 volts. During auto zero: if the module detects that the sensor input is less than 1 volt or greater than 4 volts.

Possible Causes
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED LEFT-REAR PASSENGER SEAT WEIGHT SENSOR DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN OCCUPANT CLASSIFICATION MODULE (OCM)

## Diagnostic Test

### 1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

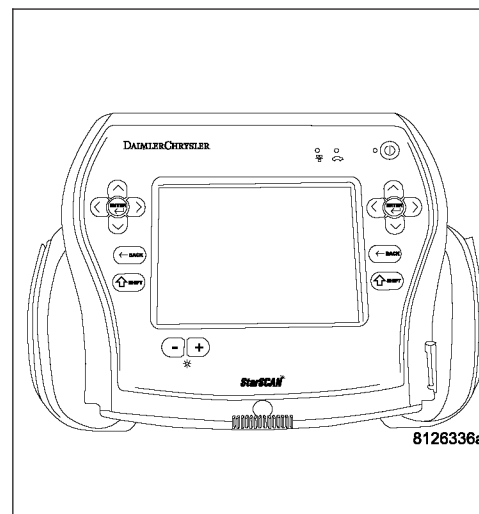
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**

**Yes** >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2



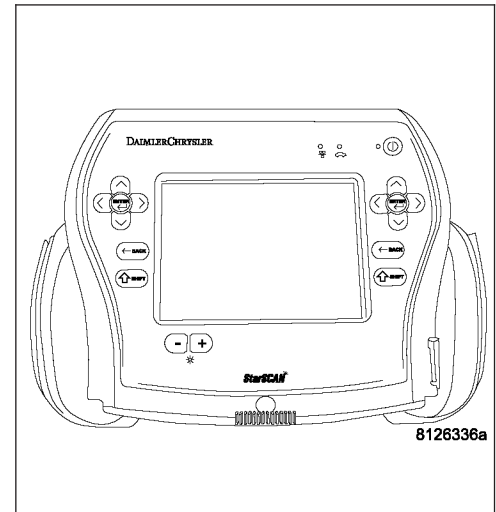
**B1B82-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE (CONTINUED)****2. VERIFY THAT DTC B1B82-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B82-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE?**

**Yes** >> Go To 3

**No** >> Go To 5



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**3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 4

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**B1B82-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE (CONTINUED)****4. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST**

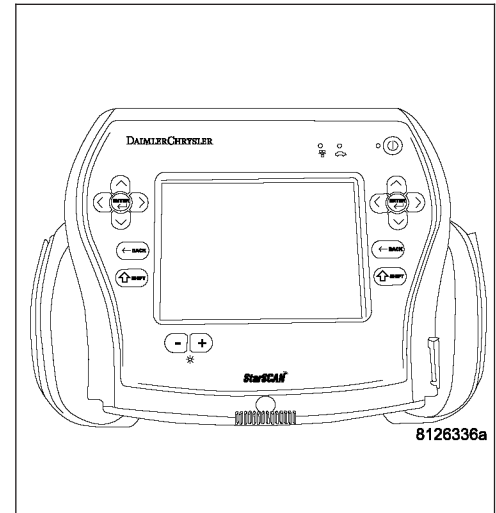
Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

**Note:** Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.



**Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?**

**Yes** >> Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.

**No - But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No - No Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

**B1B82-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR PERFORMANCE (CONTINUED)****5. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

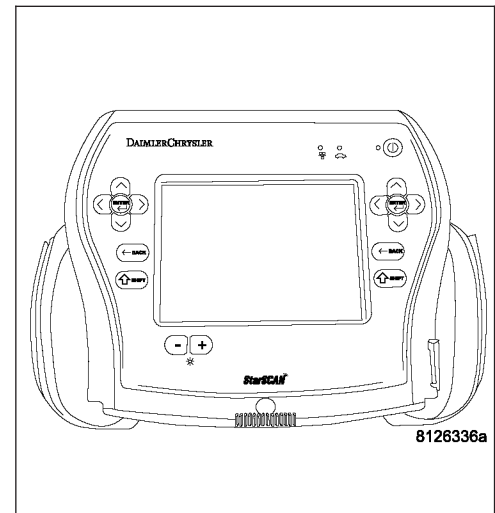
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

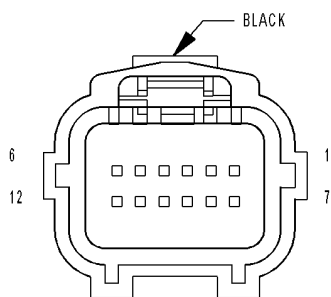
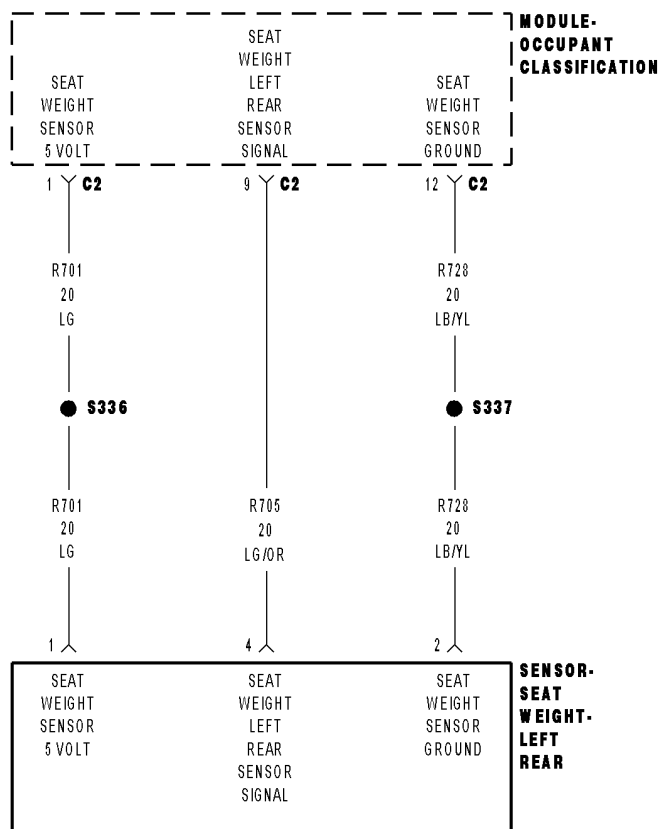
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

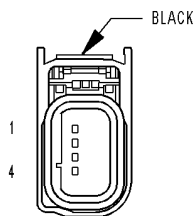
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW



**MODULE-OCCUPANT CLASSIFICATION C2**



**SENSOR-SEAT WEIGHT-LEFT REAR**

**B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

While the CAN bus ignition status is in IGN\_RUN, the module checks the sensor input ranges.

- **Set Condition:**

If the module detects that the sensor input is less than  $3.4 \pm 0.6\%$  of the (R701) Seat Weight Sensor 5 Volt circuit voltage. This DTC will also set if the (R701) Seat Weight Sensor 5 Volt circuit is shorted to ground. However, this condition would prevent communication with the OCM and cause a Lost Communication With OCM DTC to set in other modules.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT OPEN (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT OPEN LEFT-REAR SEAT WEIGHT SENSOR OCCUPANT CLASSIFICATION MODULE (OCM)

## Diagnostic Test

### 1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

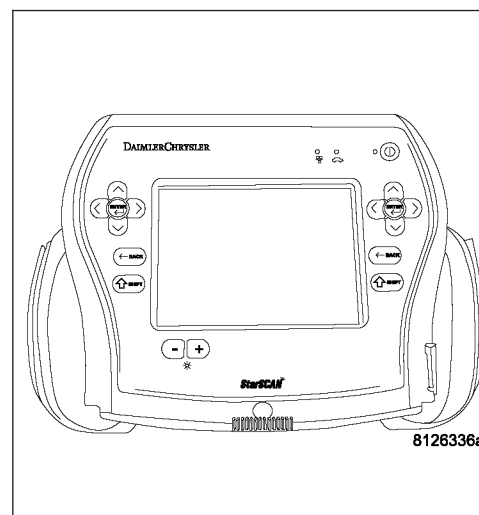
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**

**Yes**    >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No**    >> Go To 2



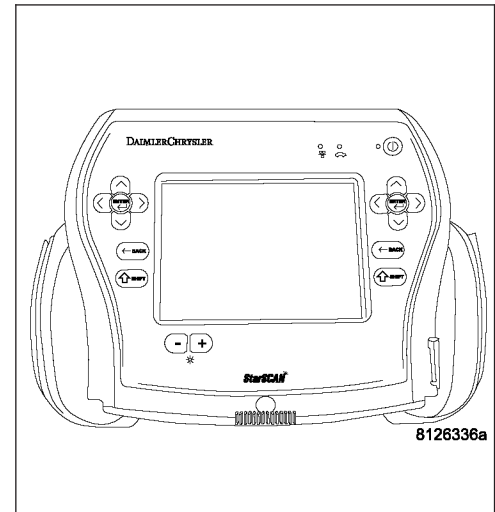
**B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW (CONTINUED)****2. VERIFY THAT DTC B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Go To 10

**3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 4

**4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY**

Verify that the Passenger Seat Harness is routed correctly.

**Is the Passenger Seat Harness routed correctly?**

**Yes** >> Go To 5

**No** >> Reroute the Passenger Seat Harness as necessary.

Perform OCS VERIFICATION TEST - VER 1.



**B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW (CONTINUED)****5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE**

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

**Note:** Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

**Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?**

**Yes - More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active**

Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.

Perform OCS VERIFICATION TEST - VER 1.

**Yes - Only DTC B1B83 Is Active**

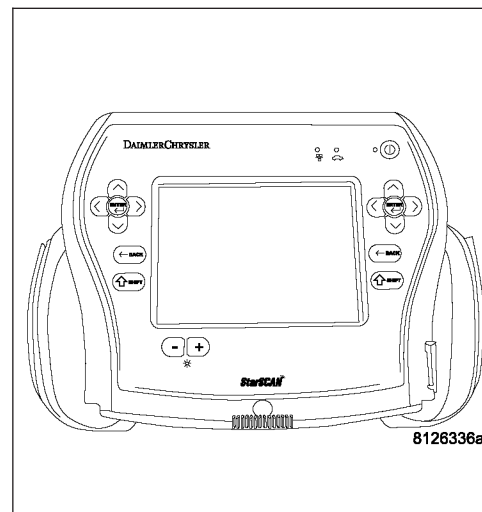
Go To 6

**No - But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No - No Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

**6. CHECK VOLTAGE OF (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Left-Rear Seat Weight Sensor connector.

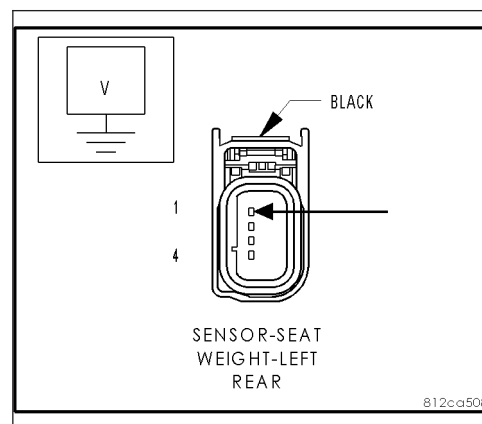
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R701) Seat Weight Sensor 5 Volt circuit.

**Is the voltage above 4.8 volts?**

**Yes** >> Go To 7

**No** >> Go To 9



**B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW (CONTINUED)****7. CHECK (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R705) LT-RR Seat Weight Sensor Signal circuit between ground and the OCM C2 connector.

**Is the resistance below 10k ohms?**

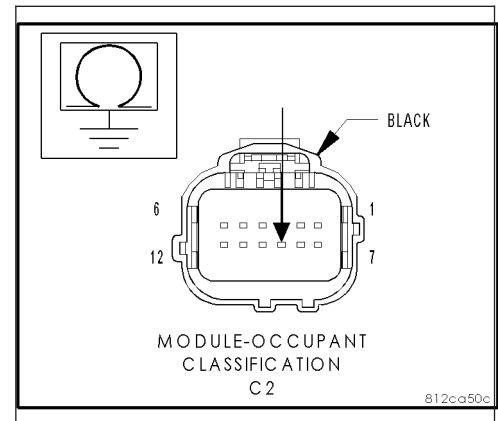
**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 8

**8. CHECK (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR AN OPEN**

Measure the resistance of the (R705) LT-RR Seat Weight Sensor Signal circuit between the OCM C2 connector and the Left-Rear Seat Weight Sensor connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Left-Rear Seat Weight Sensor in accordance with the Service Information. Perform OCS VERIFICATION TEST - VER 1. If DTC B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW returns active, replace the OCM in accordance with the Service Information.

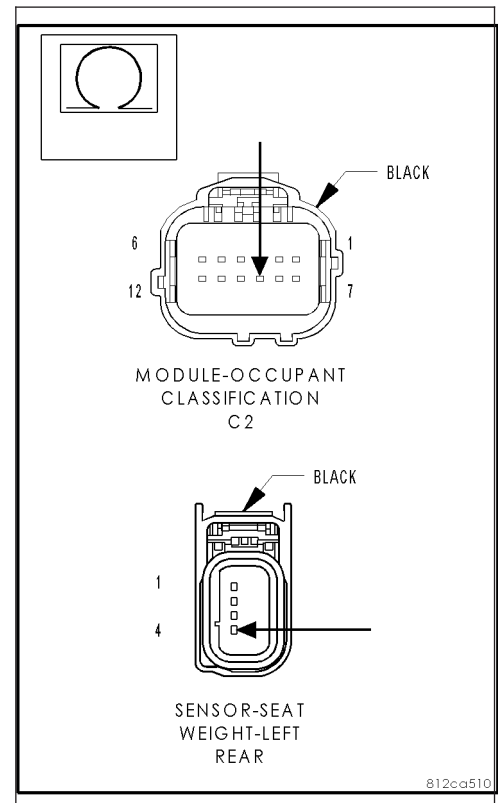
Perform OCS VERIFICATION TEST - VER 1.

**No** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.



**B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW (CONTINUED)****9. CHECK (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R701) Seat Weight Sensor 5 Volt circuit between the OCM C2 connector and the Left-Rear Seat Weight Sensor connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the OCM in accordance with the Service Information.

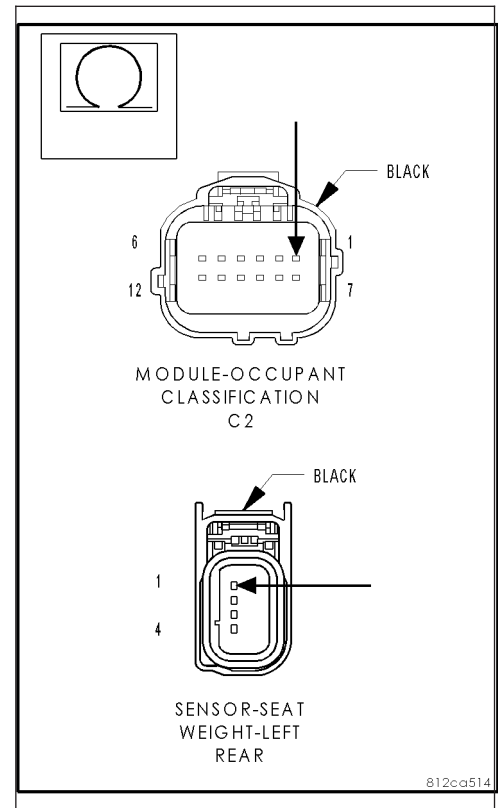
Perform OCS VERIFICATION TEST - VER 1.

**No** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.



**B1B83-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT LOW (CONTINUED)****10. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

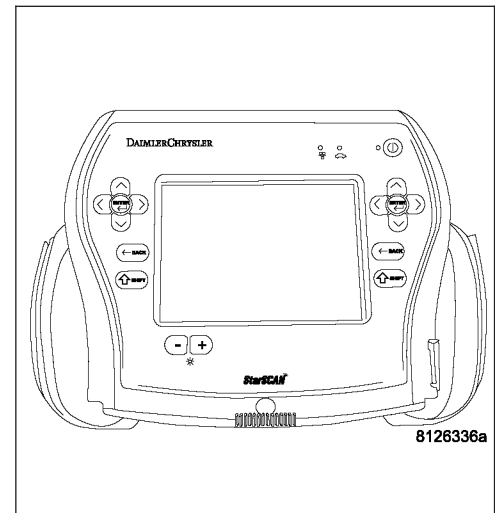
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

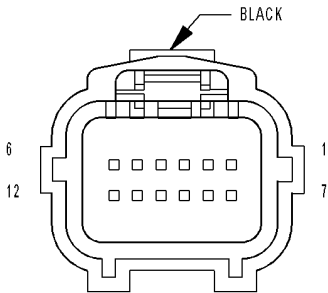
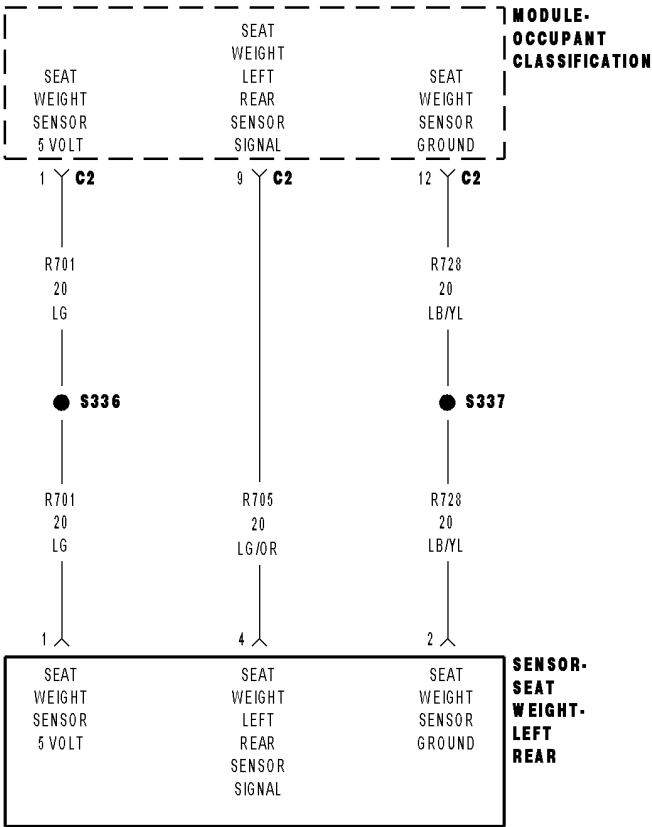
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

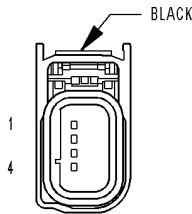
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH



**MODULE-  
OCCUPANT  
CLASSIFICATION C2**



**SENSOR-  
SEAT WEIGHT-  
LEFT REAR**

**B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

While the CAN bus ignition status is in IGN\_RUN, the module checks the sensor input ranges.

- **Set Condition:**

If the module detects that the sensor input is greater than  $96 \pm 0.6\%$  of the (R701) Seat Weight Sensor 5 Volt circuit voltage.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT OPEN LEFT-REAR SEAT WEIGHT SENSOR OCCUPANT CLASSIFICATION MODULE (OCM)

## Diagnostic Test

### 1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

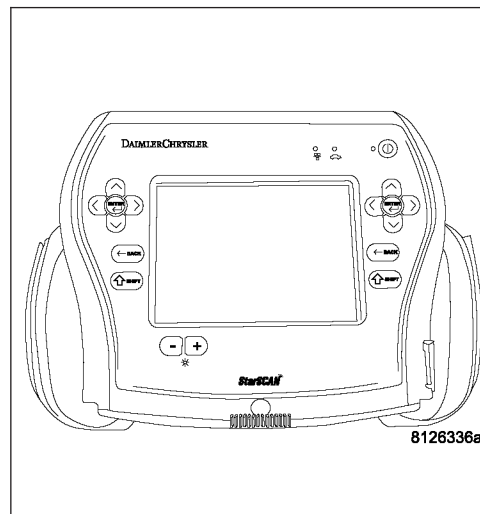
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**

**Yes** >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2



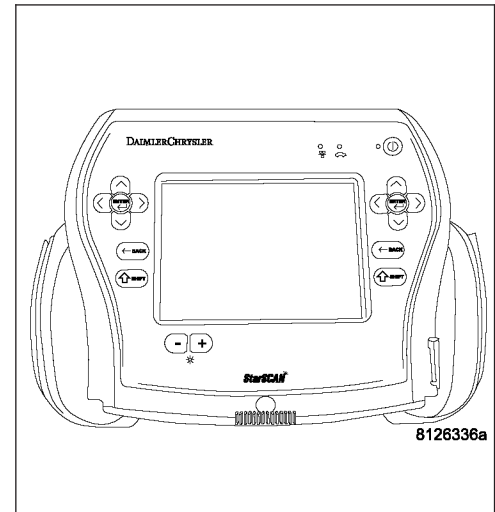
**B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH (CONTINUED)****2. VERIFY THAT DTC B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH?**

**Yes** >> Go To 3

**No** >> Go To 9



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**3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 4

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**4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY**

Verify that the Passenger Seat Harness is routed correctly.

**Is the Passenger Seat Harness routed correctly?**

**Yes** >> Go To 5

**No** >> Reroute the Passenger Seat Harness as necessary.

Perform OCS VERIFICATION TEST - VER 1.

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**B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH (CONTINUED)****5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE**

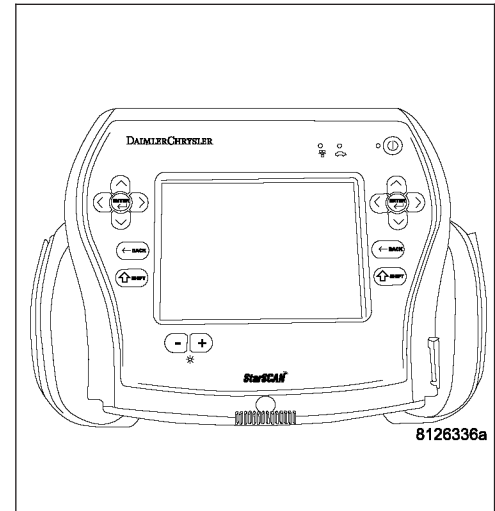
Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

**Note:** Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.



**Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?**

**Yes - More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active**

Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.

Perform OCS VERIFICATION TEST - VER 1.

**Yes - Only DTC B1B84 Is Active**

Go To 6

**No - But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No - Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

**6. CHECK (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the voltage of the (R705) LT-RR Seat Weight Sensor Signal circuit.

**Is the voltage above 0.2 volts?**

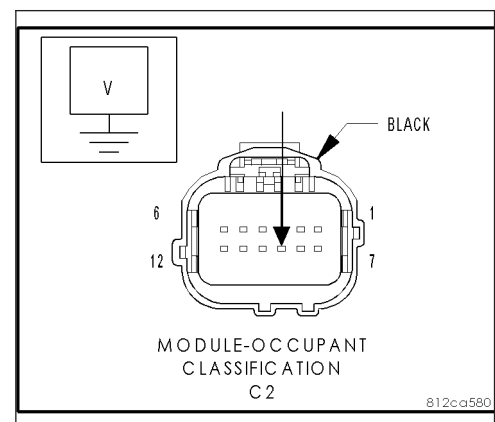
**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 7





**B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH (CONTINUED)****7. CHECK (R705) LT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT**

Disconnect the Left-Rear Seat Weight Sensor connector.

Measure the resistance between the (R705) LT-RR Seat Weight Sensor Signal circuit and the (R701) Seat Weight Sensor 5 Volt circuit.

**Is the resistance below 10K ohms?**

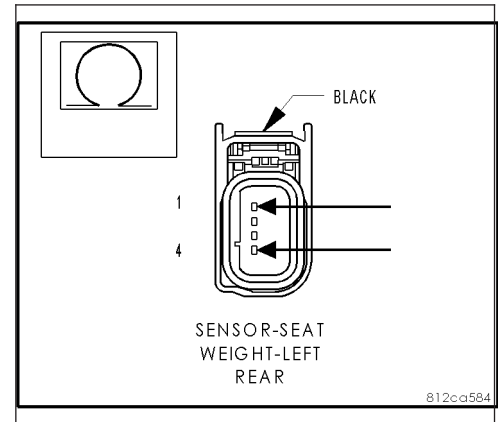
**Yes** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 8

**8. CHECK (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT FOR AN OPEN**

Measure the resistance of the (R728) Seat Weight Sensor Ground circuit between the OCM C2 connector and the Left-Rear Seat Weight Sensor connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the OCM in accordance with the Service Information.

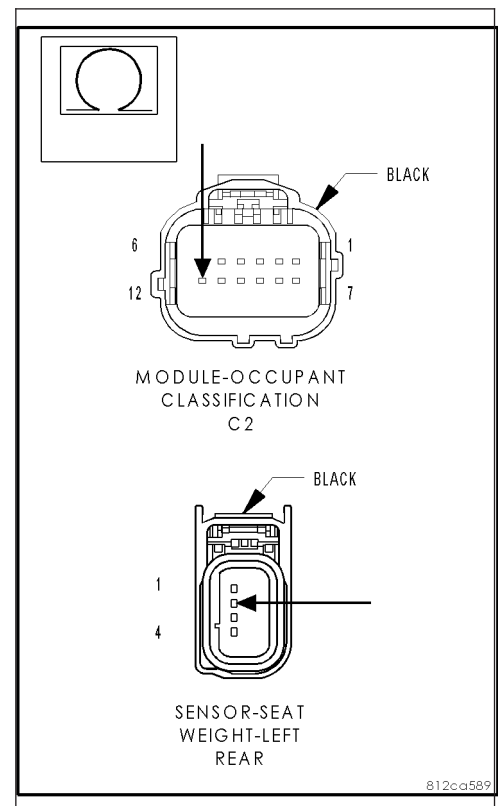
Perform OCS VERIFICATION TEST - VER 1.

**No** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.



**B1B84-PASSENGER SEAT WEIGHT SENSOR 4 - LEFT REAR INPUT CIRCUIT HIGH (CONTINUED)****9. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

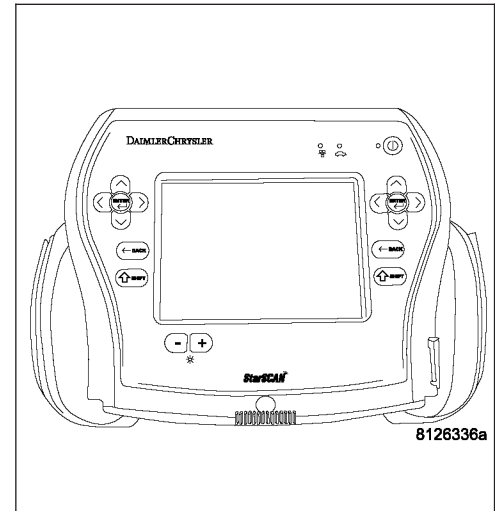
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

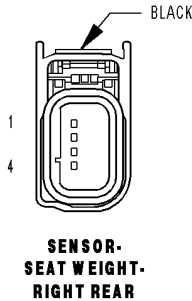
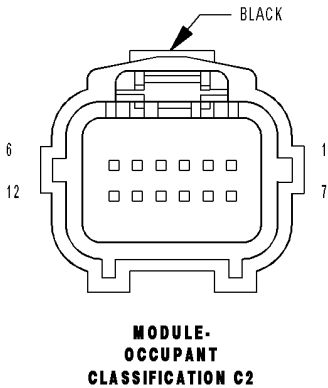
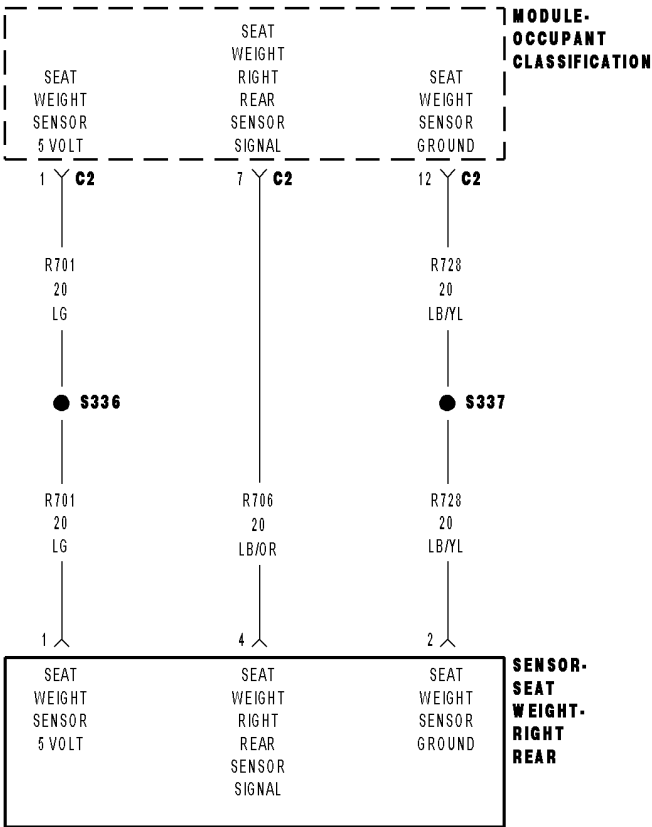
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE



**B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

When CAN ignitions status is Run or SNA, during auto zero and while performing the Occupant Classification Module System Verification Test.

- **Set Condition:**

During the occupant classification verification test: if the module detects that the sensor input is less than 1.4 volts or greater than 3.6 volts. During auto zero: if the module detects that the sensor input is less than 1 volt or greater than 4 volts.

Possible Causes
PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED RIGHT-REAR PASSENGER SEAT WEIGHT SENSOR DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN OCCUPANT CLASSIFICATION MODULE (OCM)

## Diagnostic Test

### 1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

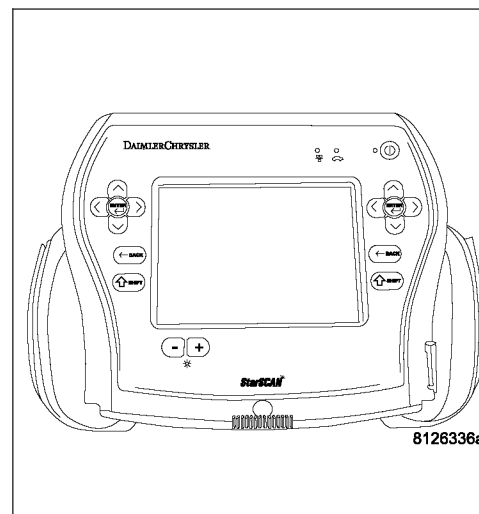
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**

**Yes** >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2



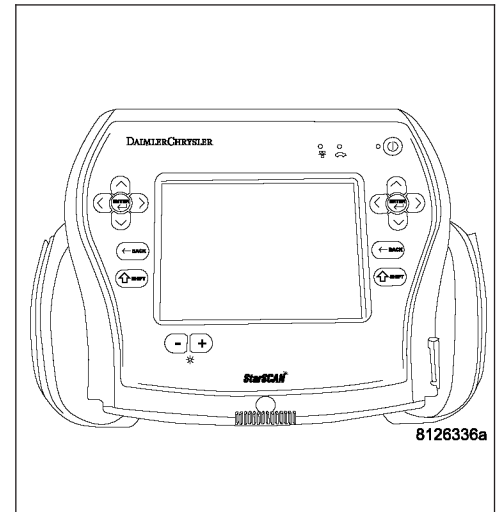
**B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE (CONTINUED)****2. VERIFY THAT DTC B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE?**

**Yes** >> Go To 3

**No** >> Go To 5



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**3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 4

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**B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE (CONTINUED)****4. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST**

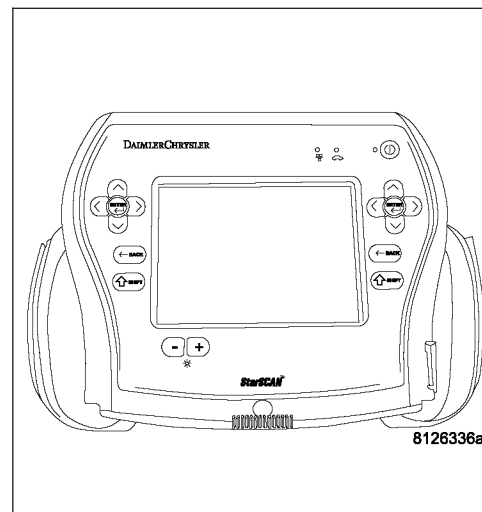
Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

**Note:** Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.



**Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?**

**Yes** >> Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.  
Perform OCS VERIFICATION TEST - VER 1.

**No - But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No - No Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

**B1B87-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR PERFORMANCE (CONTINUED)****5. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

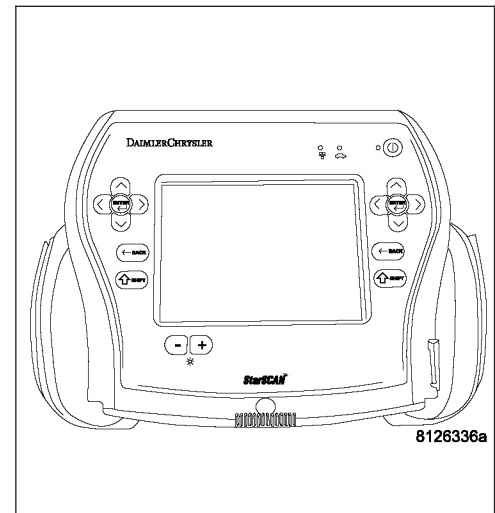
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

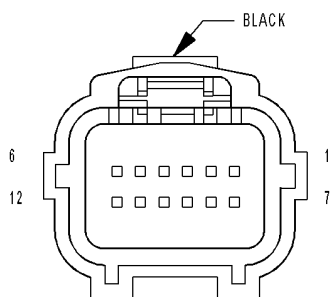
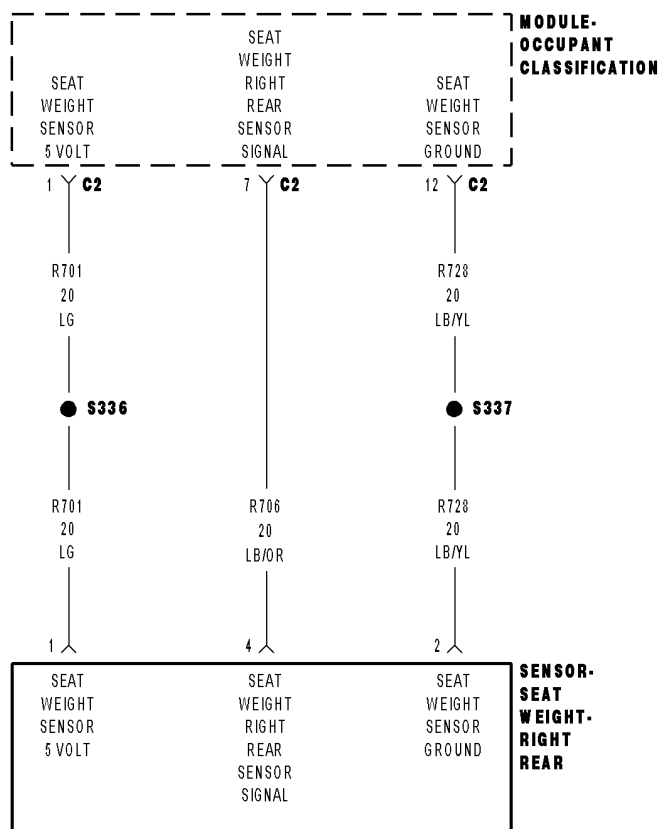
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

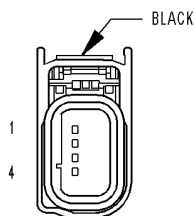
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW



**MODULE-  
OCCUPANT  
CLASSIFICATION C2**



**SENSOR-  
SEAT WEIGHT-  
RIGHT REAR**



**B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
While the CAN bus ignition status is in IGN\_RUN, the module checks the sensor input ranges.
- **Set Condition:**  
If the module detects that the sensor input is less than 3.4 ± 0.6% of the (R701) Seat Weight Sensor 5 Volt circuit voltage. This DTC will also set if the (R701) Seat Weight Sensor 5 Volt circuit is shorted to ground. However, this condition would prevent communication with the OCM and cause a Lost Communication With OCM DTC to set in other modules.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT OPEN (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT OPEN RIGHT-REAR SEAT WEIGHT SENSOR OCCUPANT CLASSIFICATION MODULE (OCM)

**Diagnostic Test**

**1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)**

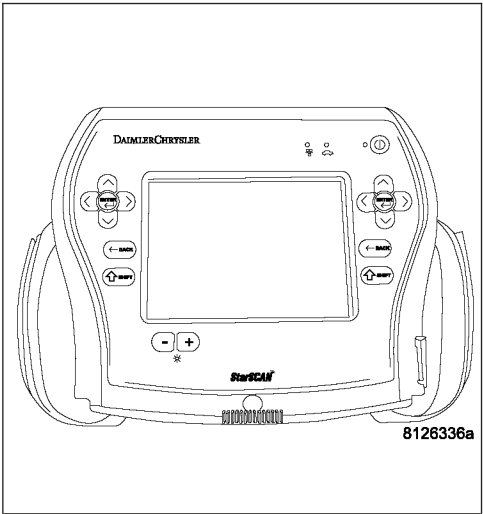
**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

- Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**
- Yes**    >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.
- No**     >> Go To 2



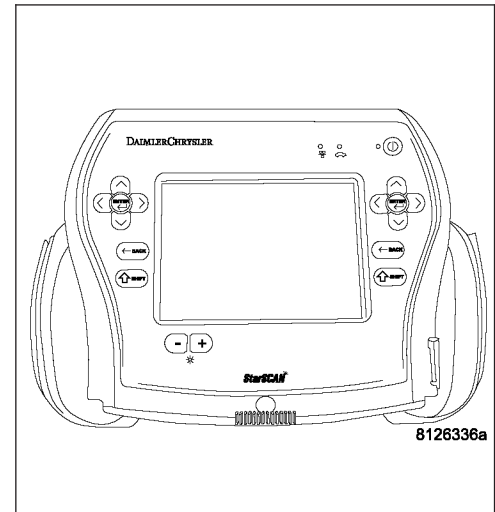
**B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW (CONTINUED)****2. VERIFY THAT DTC B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Go To 10

**3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 4

**4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY**

Verify that the Passenger Seat Harness is routed correctly.

**Is the Passenger Seat Harness routed correctly?**

**Yes** >> Go To 5

**No** >> Reroute the Passenger Seat Harness as necessary.

Perform OCS VERIFICATION TEST - VER 1.

**B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW (CONTINUED)****5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE**

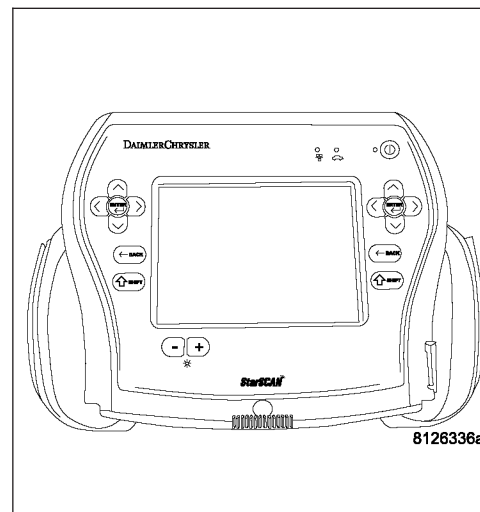
Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

**Note:** Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.



**Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?**

**Yes, More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active**

Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.

Perform OCS VERIFICATION TEST - VER 1.

**Yes - Only DTC B1B88 Is Active**

Go To 6

**No - But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No - No Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

**6. CHECK VOLTAGE OF (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Right-Rear Seat Weight Sensor connector.

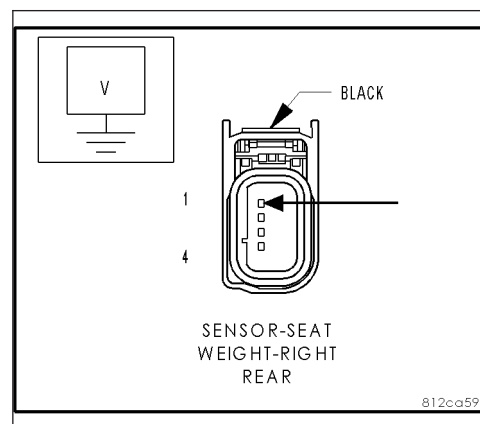
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R701) Seat Weight Sensor 5 Volt circuit.

**Is the voltage above 4.8 volts?**

**Yes** >> Go To 7

**No** >> Go To 9



**B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW (CONTINUED)****7. CHECK (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R706) RT-RR Seat Weight Sensor Signal circuit between ground and the OCM C2 connector.

**Is the resistance below 10k ohms?**

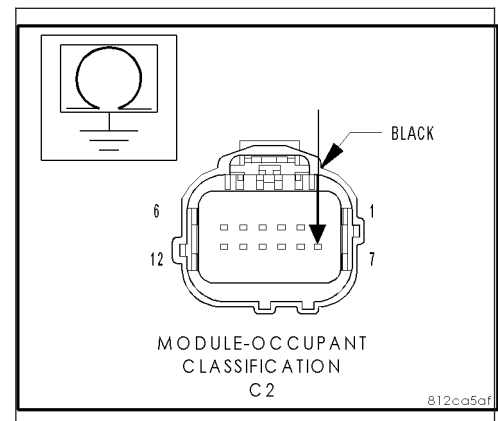
**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 8

**8. CHECK (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR AN OPEN**

Measure the resistance of the (R706) RT-RR Seat Weight Sensor Signal circuit between the OCM C2 connector and the Right-Rear Seat Weight Sensor connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Right-Rear Seat Weight Sensor in accordance with the Service Information. Perform OCS VERIFICATION TEST - VER 1. If DTC B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW returns active, replace the OCM in accordance with the Service Information.

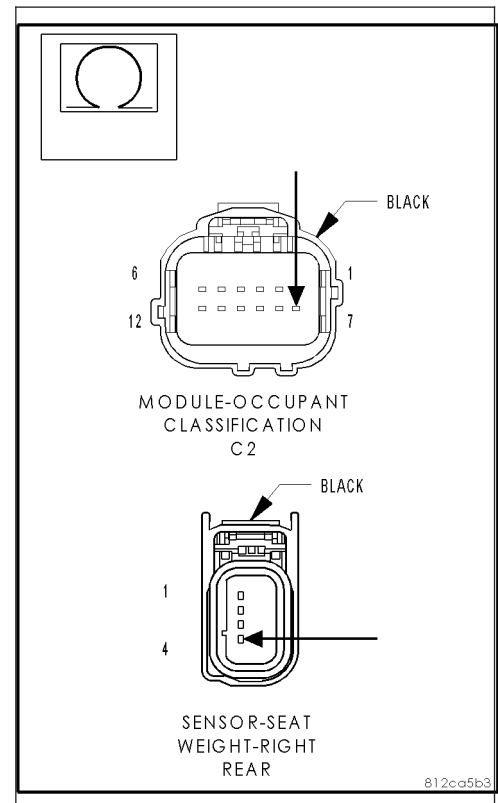
Perform OCS VERIFICATION TEST - VER 1.

**No** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.



**B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW (CONTINUED)****9. CHECK (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the resistance of the (R701) Seat Weight Sensor 5 Volt circuit between the OCM C2 connector and the Right-Rear Seat Weight Sensor connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the OCM in accordance with the Service Information.

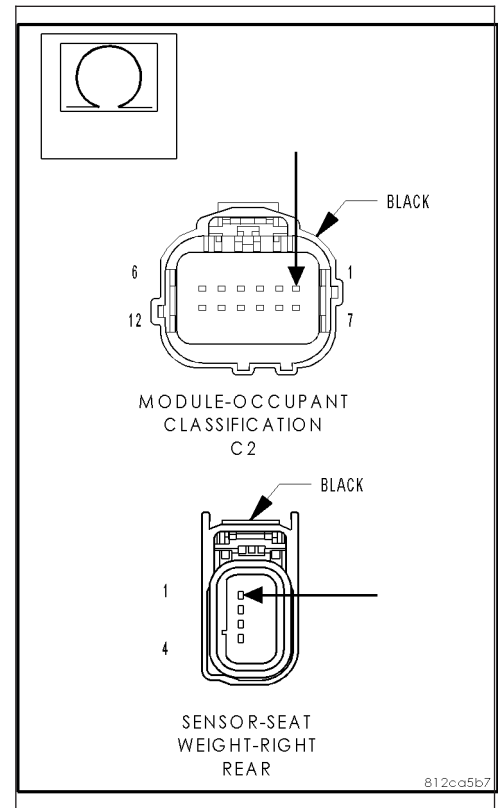
Perform OCS VERIFICATION TEST - VER 1.

**No** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.



**B1B88-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT LOW (CONTINUED)****10. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

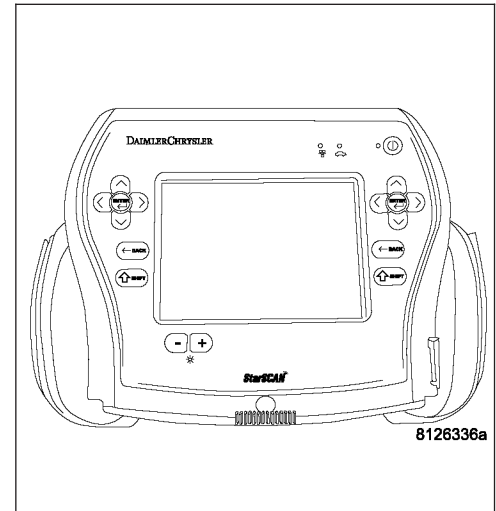
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

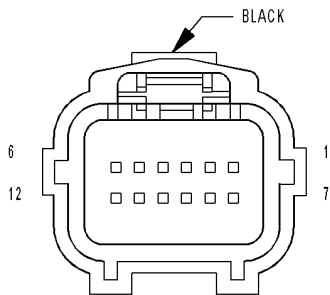
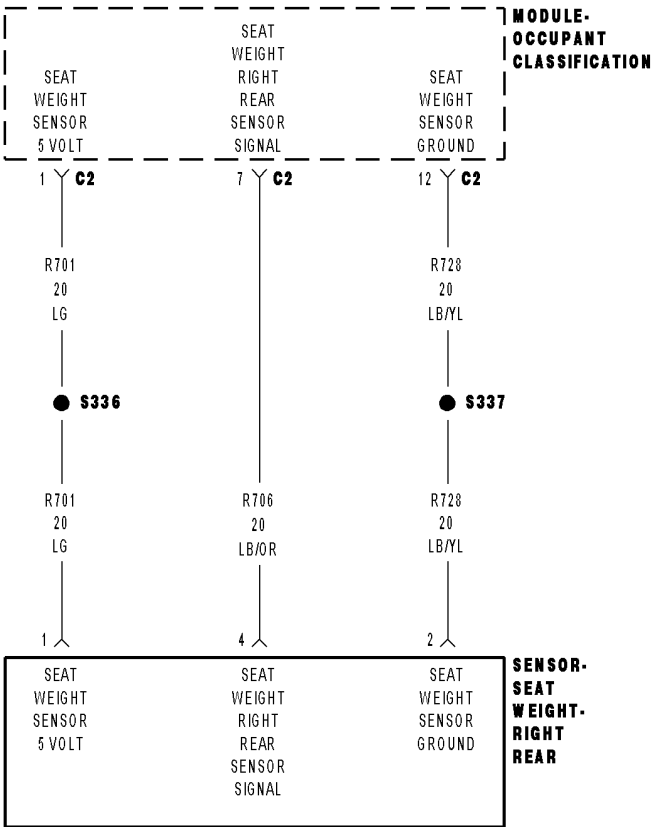
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

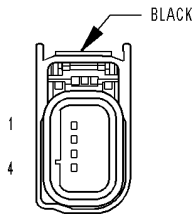
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH



MODULE-  
OCCUPANT  
CLASSIFICATION C2



SENSOR-  
SEAT WEIGHT-  
RIGHT REAR

**B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

While the CAN bus ignition status is in IGN\_RUN, the module checks the sensor input ranges.

- **Set Condition:**

If the module detects that the sensor input is greater than  $96 \pm 0.6\%$  of the (R701) Seat Weight Sensor 5 Volt circuit voltage.

Possible Causes
PASSENGER SEAT HARNESS IMPROPERLY ROUTED PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT SHORTED TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT OPEN RIGHT-REAR SEAT WEIGHT SENSOR OCCUPANT CLASSIFICATION MODULE (OCM)

## Diagnostic Test

### 1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

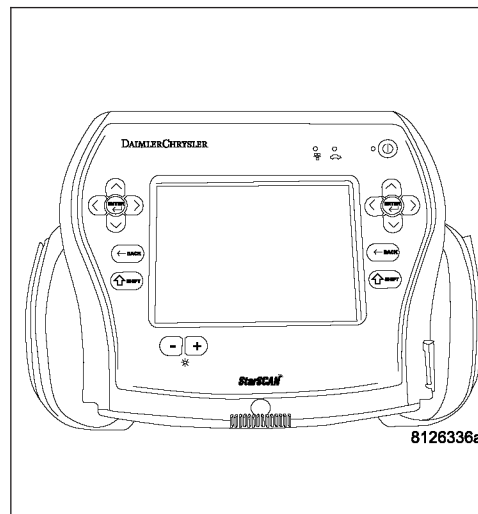
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**

**Yes** >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2





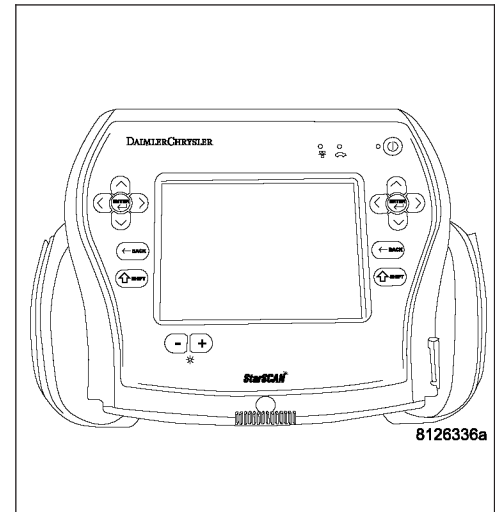
**B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH (CONTINUED)****2. VERIFY THAT DTC B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH?**

**Yes** >> Go To 3

**No** >> Go To 9



---

**3. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 4

---

**4. VERIFY THAT PASSENGER SEAT HARNESS IS ROUTED CORRECTLY**

Verify that the Passenger Seat Harness is routed correctly.

**Is the Passenger Seat Harness routed correctly?**

**Yes** >> Go To 5

**No** >> Reroute the Passenger Seat Harness as necessary.

Perform OCS VERIFICATION TEST - VER 1.

---

**B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH (CONTINUED)****5. CHECK IF MORE THAN ONE PASSENGER SEAT WEIGHT SENSOR DTC IS ACTIVE**

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

**Note:** Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.

**Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR DTCs?**

**Yes - More Than One PASSENGER SEAT WEIGHT SENSOR DTC Is Active**

Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.

Perform OCS VERIFICATION TEST - VER 1.

**Yes - Only DTC B1B89 Is Active**

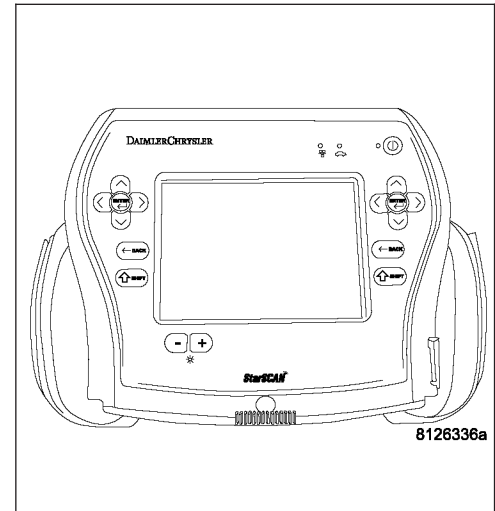
Go To 6

**No - But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No - No Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

**6. CHECK (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C2 connector.

Measure the voltage of the (R706) RT-RR Seat Weight Sensor Signal circuit.

**Is the voltage above 0.2 volts?**

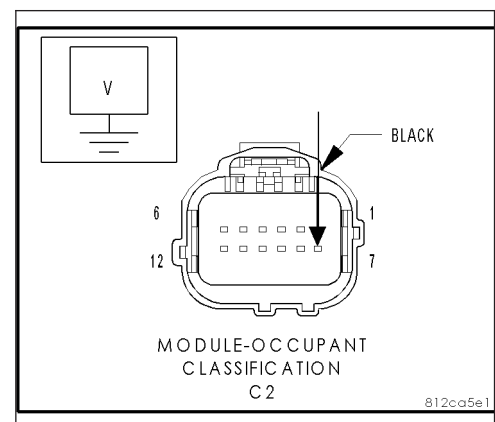
**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 7



**B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH (CONTINUED)****7. CHECK (R706) RT-RR SEAT WEIGHT SENSOR SIGNAL CIRCUIT FOR A SHORT TO (R701) SEAT WEIGHT SENSOR 5 VOLT CIRCUIT**

Disconnect the Right-Rear Seat Weight Sensor connector.

Measure the resistance between the (R706) RT-RR Seat Weight Sensor Signal circuit and the (R701) Seat Weight Sensor 5 Volt circuit.

**Is the resistance below 10K ohms?**

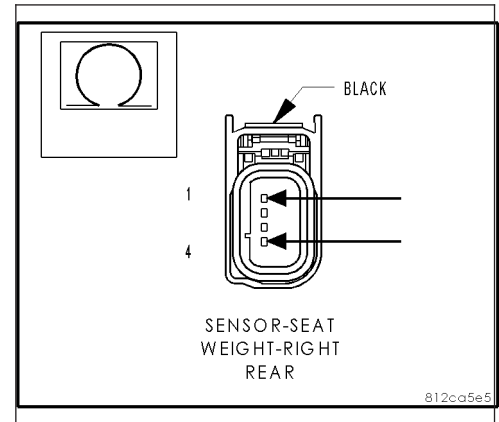
**Yes** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 8

**8. CHECK (R728) SEAT WEIGHT SENSOR GROUND CIRCUIT FOR AN OPEN**

Measure the resistance of the (R728) Seat Weight Sensor Ground circuit between the OCM C2 connector and the Right-Rear Seat Weight Sensor connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the OCM in accordance with the Service Information.

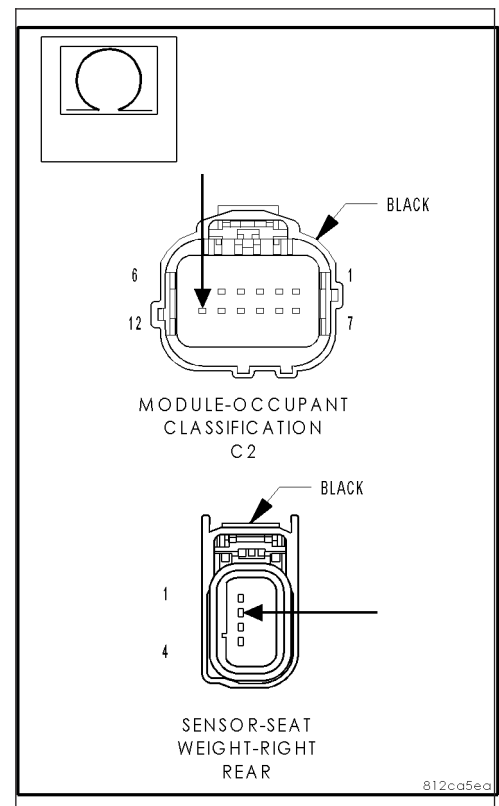
Perform OCS VERIFICATION TEST - VER 1.

**No** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.



**B1B89-PASSENGER SEAT WEIGHT SENSOR 1 - RIGHT REAR INPUT CIRCUIT HIGH (CONTINUED)****9. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

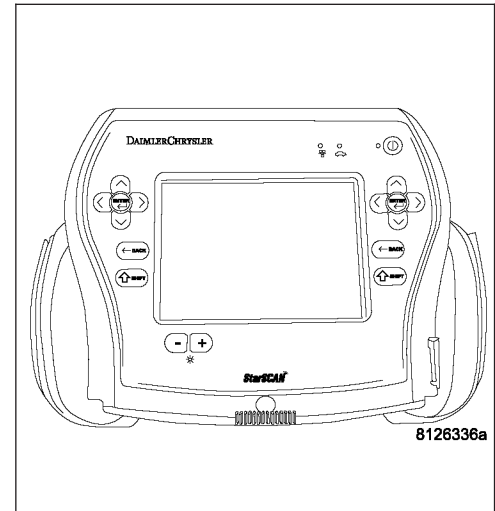
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

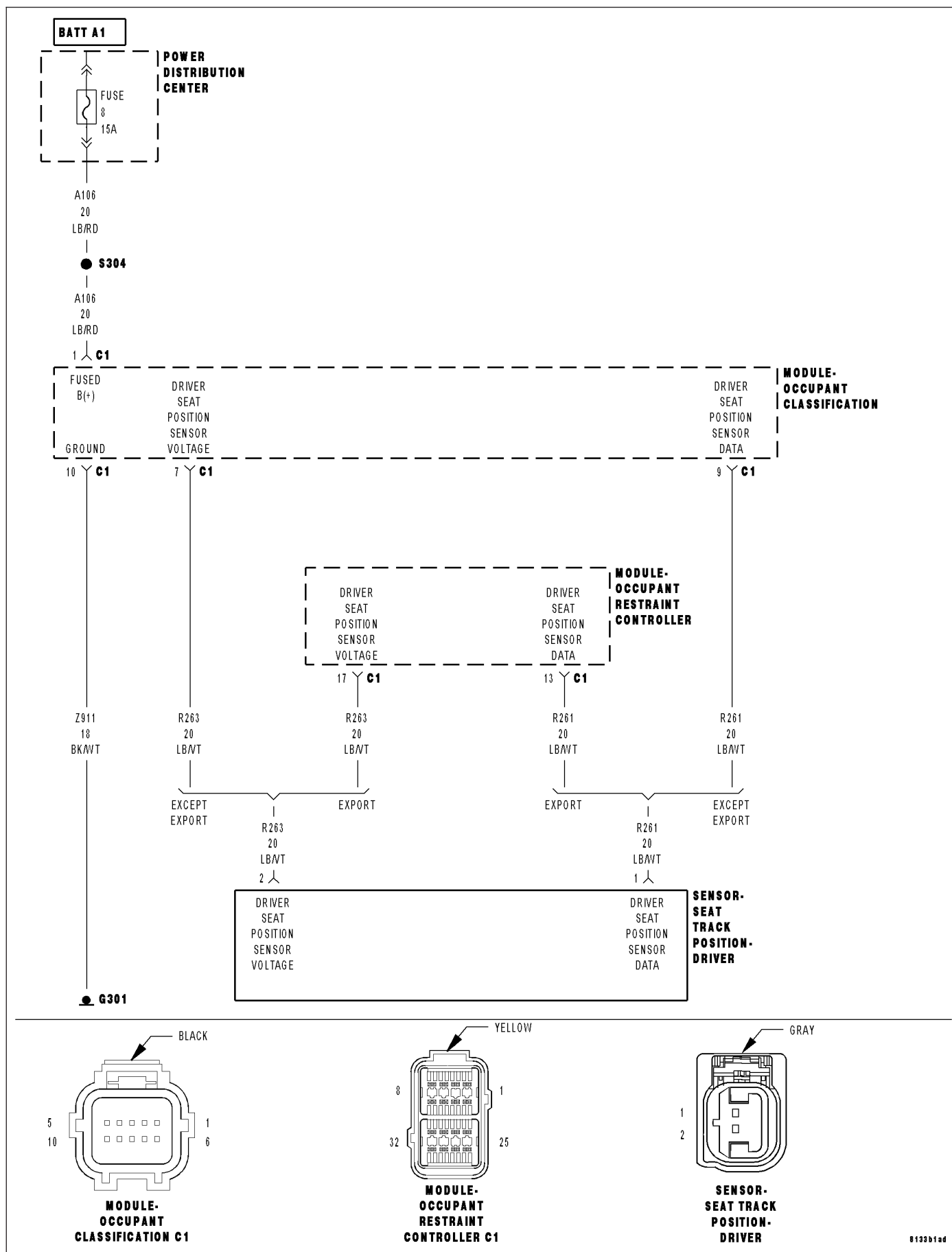
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE



**B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

While the CAN bus ignition status is in IGN\_RUN, the module checks the sensor input ranges.

- **Set Condition:**

If the module detects that the sensor input is between 8 and 12 mA.

Possible Causes
DRIVER SEAT TRACK POSITION SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

## Diagnostic Test

### 1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, BATTERY FAULTS, & SEAT TRACK POSITION SENSOR CIRCUIT HIGH OR LOW FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

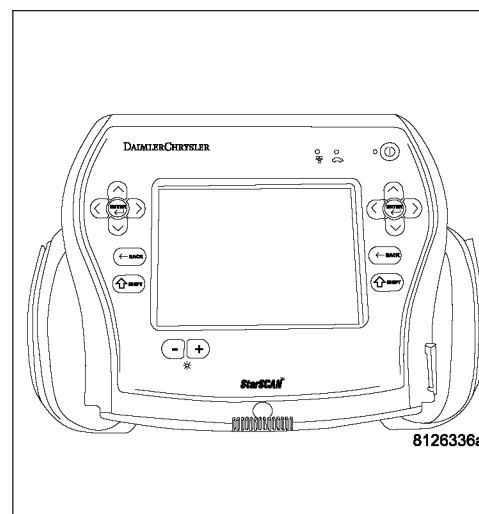
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, battery faults, or Seat Track Position Sensor Circuit High or Low faults?**

**Yes** >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2



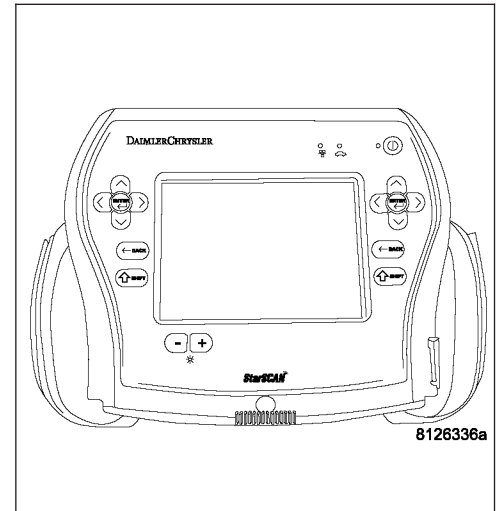
**B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE (CONTINUED)****2. VERIFY THAT B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE?**

**Yes** >> Go To 3

**No** >> Go To 4

**3. PERFORM SEAT TRACK POSITION SENSOR PERFORMANCE TEST**

With the scan tool, erase OCM DTCs.

Turn the ignition off, wait 10 seconds and then turn the ignition on.

Cycle the driver seat to the full forward position and then to the full rearward position.

Return the driver seat to its approximate original position.

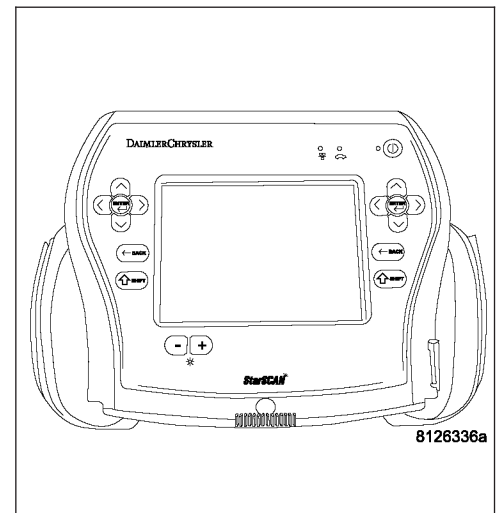
Wait two minutes, and then with the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE?**

**Yes** >> Replace the Driver Seat Track Position Sensor in accordance with the Service Information.

Perform the OCS VERIFICATION TEST-VER 1. If DTC B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE returns active, replace the OCM in accordance with the Service Information.

**No** >> Perform the OCS VERIFICATION TEST-VER 1.



**B1B8C-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT PERFORMANCE (CONTINUED)****4. TEST FOR AN INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

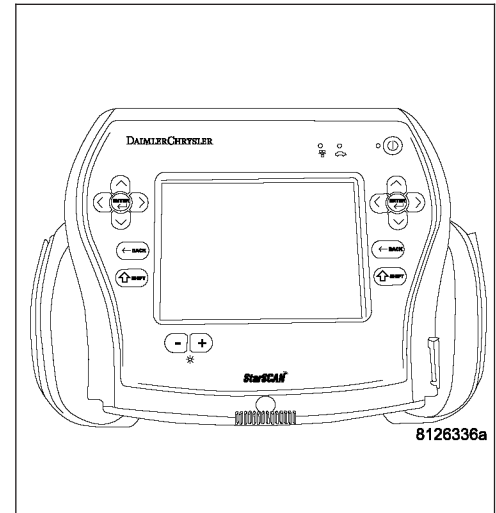
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

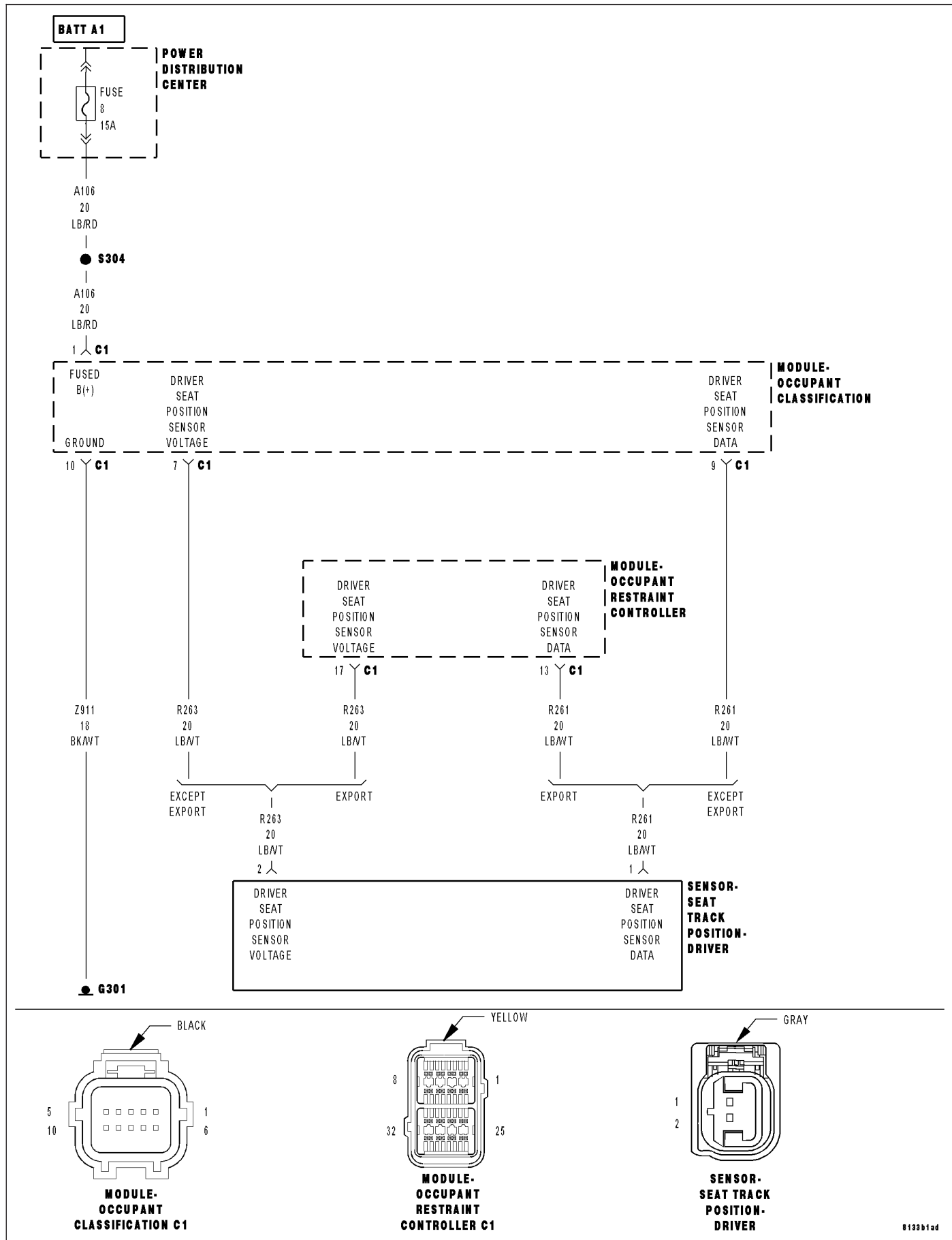
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.





**B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW**

**B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW (CONTINUED)**

For the Occupant Classification circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

While the CAN bus ignition status is in IGN\_RUN and the module is configured for a Seat Track Position Sensor, the module checks the sensor input current ranges.

- **Set Condition:**

If the module detects that the sensor input is less than or equal to 0.3 ma. This DTC may set when the current is between 0.3 mA and 2.0 mA.

Possible Causes
DRIVER SEAT HARNESS IMPROPERLY ROUTED
DRIVER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
DRIVER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT, PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT SHORTED TO GROUND
(R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT SHORTED TO GROUND
(R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT OPEN
(R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT OPEN
DRIVER SEAT TRACK POSITION SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

## Diagnostic Test

### 1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

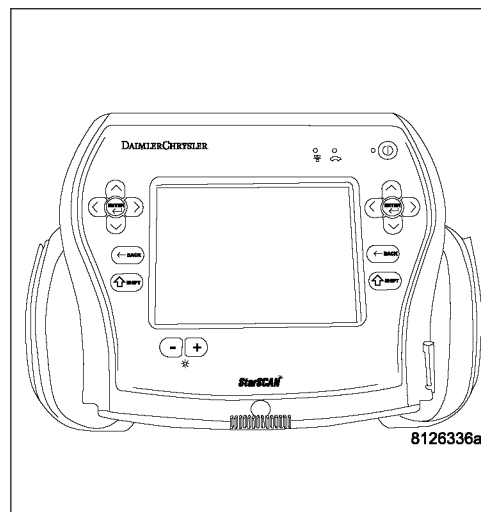
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**

**Yes** >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2



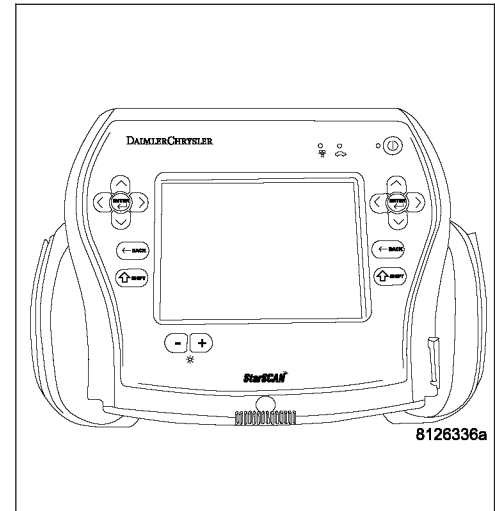
**B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW (CONTINUED)****2. VERIFY THAT DTC B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Go To 7



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**3. INSPECT DRIVER SEAT HARNESS WIRES & CONNECTORS**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Driver Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Driver Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 4

---

**4. VERIFY THAT DRIVER SEAT HARNESS IS ROUTED CORRECTLY**

Verify that the Driver Seat Harness is routed correctly.

**Is the Driver Seat Harness routed correctly?**

**Yes** >> Go To 5

**No** >> Reroute the Driver Seat Harness as necessary.

Perform OCS VERIFICATION TEST - VER 1.

---

**B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW (CONTINUED)****5. CHECK (R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT & (R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (R261) Seat Position Sensor Data-Driver circuit.

Measure the resistance between ground and the (R263) Seat Position Sensor Voltage-Driver circuit.

**Is the resistance below 10k ohms on either circuit?**

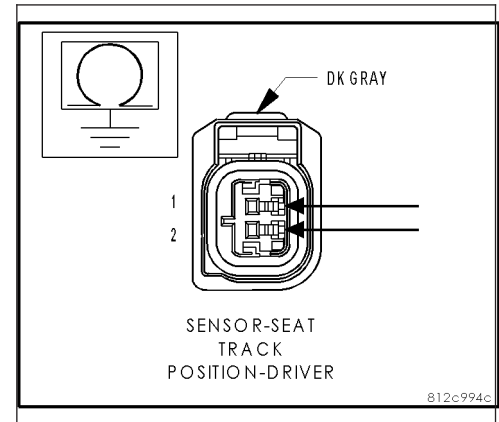
**Yes** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Driver Seat Harness in accordance with the service information.

Perform the OCS VERIFICATION TEST-VER 1.

**No** >> Go To 6

**6. CHECK (R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT & (R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT FOR AN OPEN**

Disconnect the OCM C1 connector.

Measure the resistance of the (R261) Seat Position Sensor Data-Driver circuit between the OCM C1 connector and the Driver Seat Track Position Sensor connector.

Measure the resistance of the (R263) Seat Position Sensor Voltage-Driver circuit between the OCM C1 connector and the Driver Seat Track Position Sensor connector.

**Is the resistance of either circuit above 5.0 ohms?**

**Yes** >>

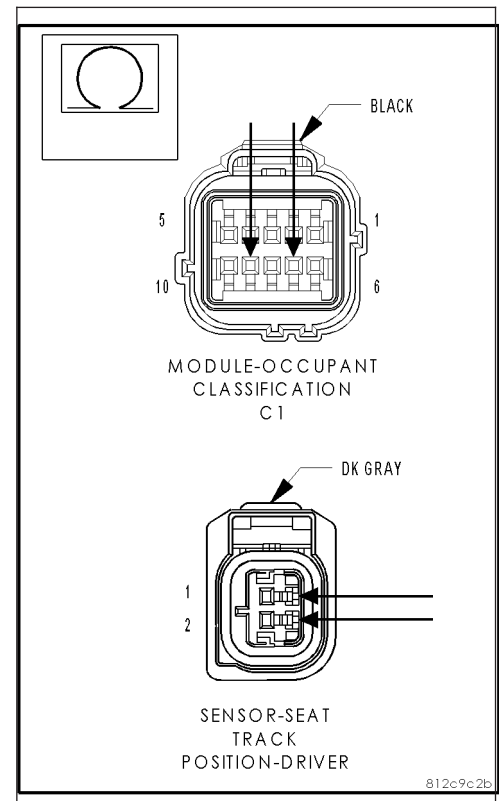
**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Driver Seat Harness in accordance with the Service Information.

Perform the OCS VERIFICATION TEST-VER 1.

**No** >> Replace the OCM in accordance with the service information.

Perform the OCS VERIFICATION TEST-VER 1.



**B1B8D-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT LOW (CONTINUED)****7. TEST FOR AN INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

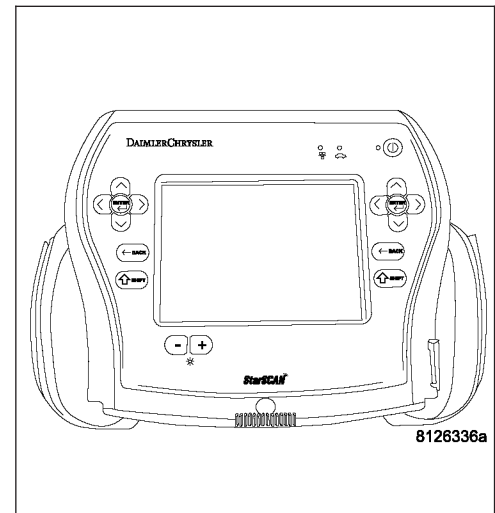
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

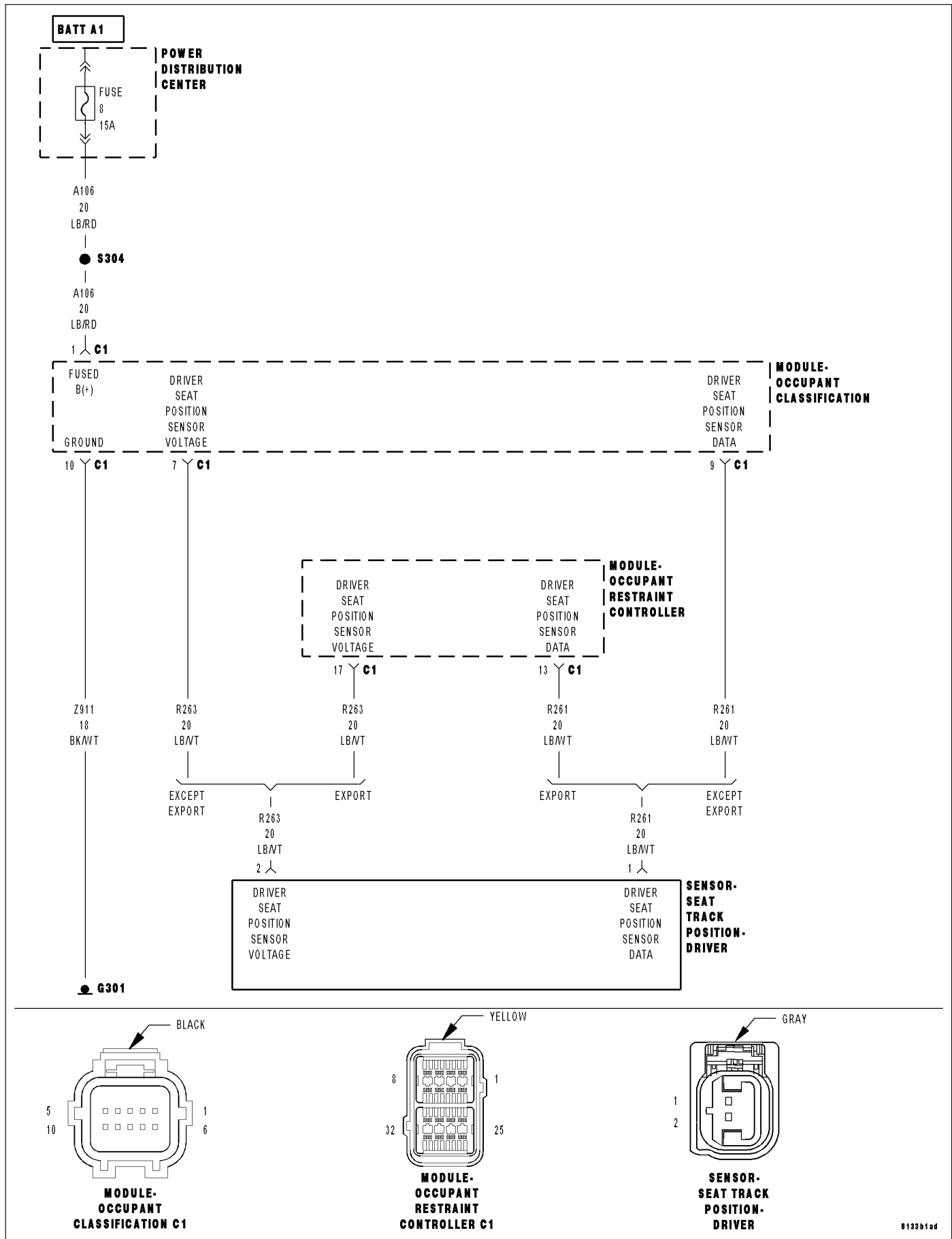
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH



**B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

While the CAN bus ignition status is in IGN\_RUN and the module is configured for a Seat Track Position Sensor, the module checks the sensor input current ranges.

- **Set Condition:**

If the module detects that the sensor input is greater than or equal to 20.5 mA. This DTC may set when the current is between 17 mA and 20.5 mA.

Possible Causes
DRIVER SEAT HARNESS IMPROPERLY ROUTED
DRIVER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN
DRIVER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT, PUSHED OUT, SPREAD, CORRODED, CONTAMINATED
(R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT SHORTED TO VOLTAGE
(R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT SHORTED TO VOLTAGE
(R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT SHORTED TO (R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT
DRIVER SEAT TRACK POSITION SENSOR
OCCUPANT CLASSIFICATION MODULE (OCM)

## Diagnostic Test

### 1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

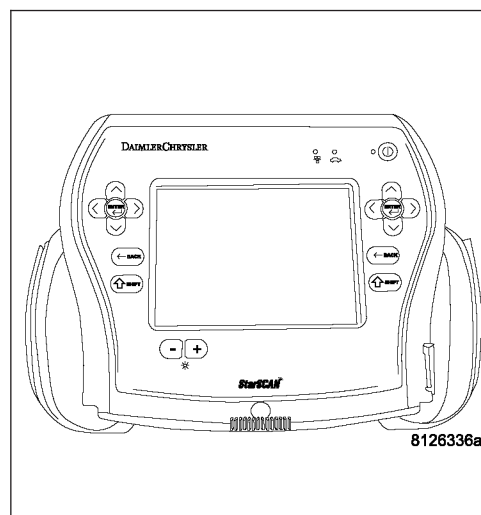
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**

**Yes** >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2



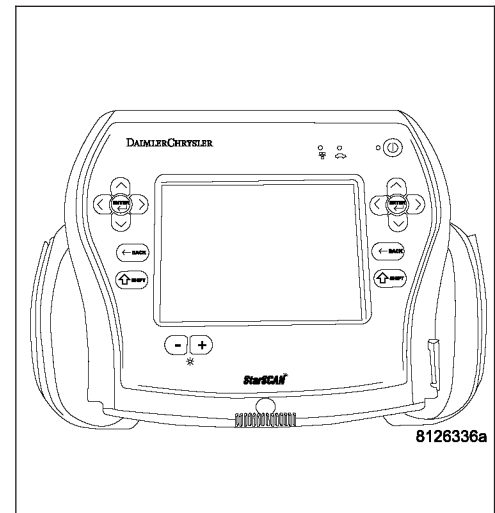
**B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH (CONTINUED)****2. VERIFY THAT DTC B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH?**

**Yes** >> Go To 3

**No** >> Go To 8

**3. INSPECT DRIVER SEAT HARNESS WIRES & CONNECTORS**

With the scan tool, erase OCM DTCs.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the Driver Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Driver Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 4

**4. VERIFY THAT DRIVER SEAT HARNESS IS ROUTED CORRECTLY**

Verify that the Driver Seat Harness is routed correctly.

**Is the Driver Seat Harness routed correctly?**

**Yes** >> Go To 5

**No** >> Reroute the Driver Seat Harness as necessary.

Perform OCS VERIFICATION TEST - VER 1.



**B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH (CONTINUED)****5. CHECK FOR DTC B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH WITH DRIVER SEAT TRACK POSITION SENSOR DISCONNECTED**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Disconnect the Driver Seat Track Position Sensor connector.

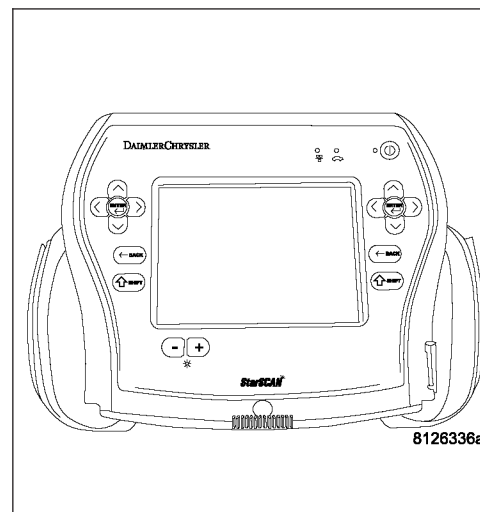
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Wait two minutes, and then with the scan tool, read OCM DTCs.

**Does the scan tool display: B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH?**

**Yes** >> Go To 6

**No** >> Replace the Driver Seat Track Position Sensor in accordance with the service information.  
Perform the OCS VERIFICATION TEST-VER 1.

**6. CHECK (R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT & (R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT FOR A SHORT TO VOLTAGE**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C1 connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (R261) Seat Position Sensor Data-Driver circuit.

Measure the voltage of the (R263) Seat Position Sensor Voltage-Driver circuit.

**Is the voltage above 0.2 volts on either circuit?**

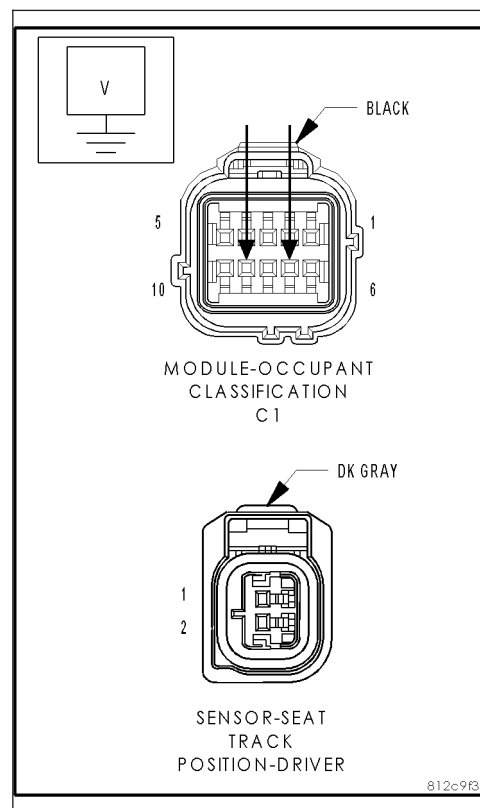
**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Driver Seat Harness in accordance with the Service Information.

Perform the OCS VERIFICATION TEST-VER 1.

**No** >> Go To 7



**B1B8E-DRIVER SEAT TRACK POSITION SENSOR CIRCUIT HIGH (CONTINUED)****7. CHECK (R261) SEAT POSITION SENSOR DATA-DRIVER CIRCUIT FOR A SHORT TO (R263) SEAT POSITION SENSOR VOLTAGE-DRIVER CIRCUIT**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Measure the resistance between the (R261) Seat Position Sensor Data-Driver circuit and the (R263) Seat Position Sensor Voltage-Driver circuit.

**Is the resistance below 10k ohms?**

**Yes** >>

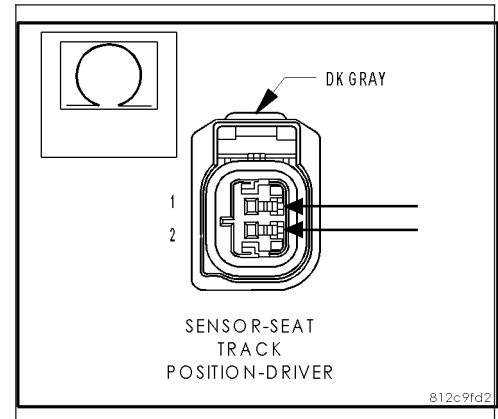
**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Driver Seat Harness in accordance with the service information.

Perform the OCS VERIFICATION TEST-VER 1.

**No** >> Replace the OCM in accordance with the Service information.

Perform the OCS VERIFICATION TEST-VER 1.

**8. TEST FOR AN INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

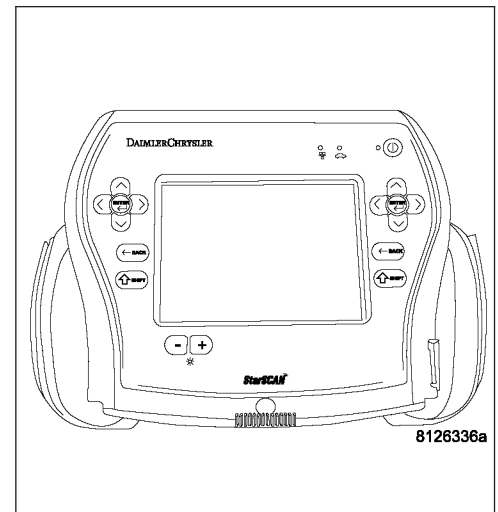
If only stored codes return continue the test until the problem area has been isolated.

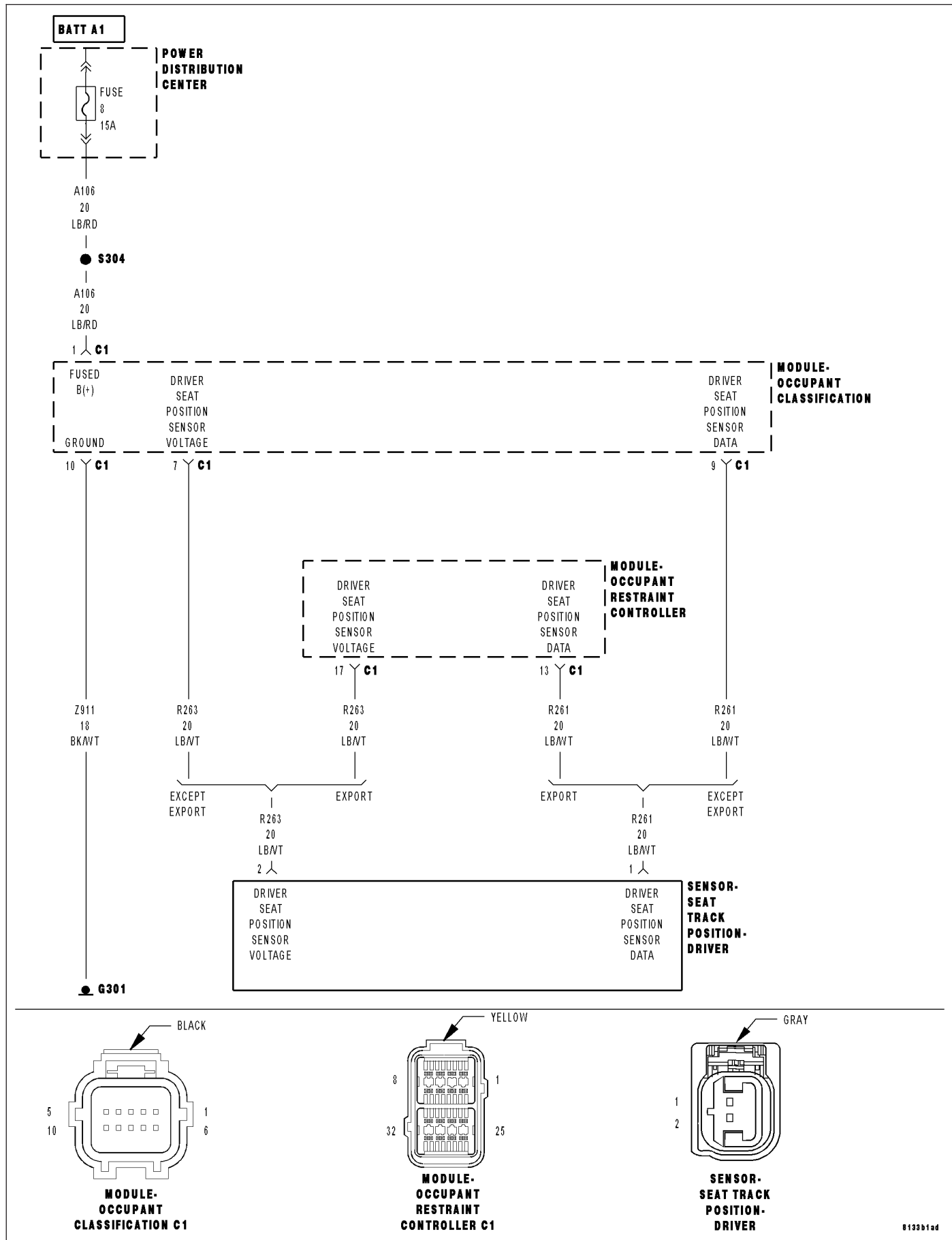
In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



**B1B91-DRIVER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH**

**B1B91-DRIVER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on the OCM monitors the Seat Track Position Sensors circuits.

- **Set Condition:**

If the module detects current on the Seat Track Position Sensors circuits and the module is not configured for STPS.

Possible Causes
SENSORS
WIRING
OCCUPANT CLASSIFICATION MODULE (OCM)

## Diagnostic Test

### 1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

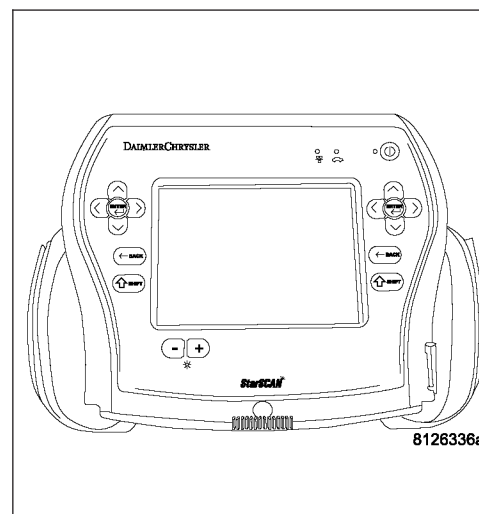
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**

**Yes** >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 2



**B1B91-DRIVER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH (CONTINUED)****2. VERIFY THAT B1B91-DRIVER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH IS ACTIVE**

With the scan tool, erase OCM DTCs.

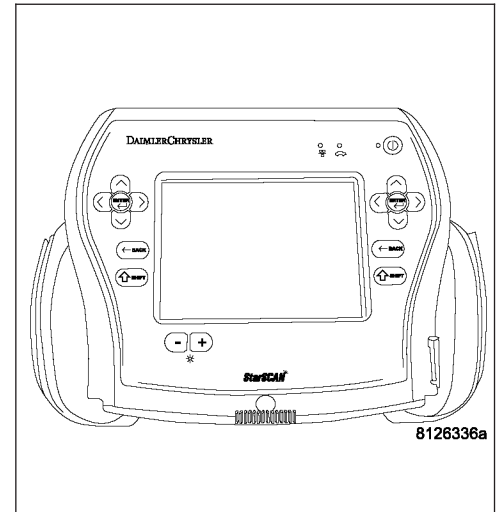
Turn the ignition off, wait 10 seconds and then turn the ignition on.

Wait 2 minutes, and then with the scan tool, read OCM DTCs.

**Does the scan tool display active: B1B91-DRIVER SEAT TRACK POSITION SENSOR CONFIGURATION MISMATCH?**

**Yes** >> Go To 3

**No** >> Perform the OCS VERIFICATION TEST-VER. 1



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**3. VERIFY WIRING**

Turn the ignition off.

Inspect the driver and passenger seat wiring for Seat Position Sensors.

**Are Seat Position Sensor(s) present?**

**Yes** >> Replace the OCM in accordance with the Service Information.  
Perform the OCS VERIFICATION TEST-VER. 1

**No** >> Perform the OCS VERIFICATION TEST-VER. 1

---

## B1BA5-AIRBAG SQUIB CONFIGURATION MISMATCH

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
If an Occupant Restraint Controller (ORC) configured for vehicles without side airbags is installed in a vehicle with side airbags.

Possible Causes
POWERTRAIN CONTROL MODULE (PCM)
OCCUPANT RESTRAINT CONTROLLER (ORC)

### Diagnostic Test

#### 1. VERIFY THAT DTC B1BA5 AIRBAG SQUIB CONFIGURATION MISMATCH IS ACTIVE

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

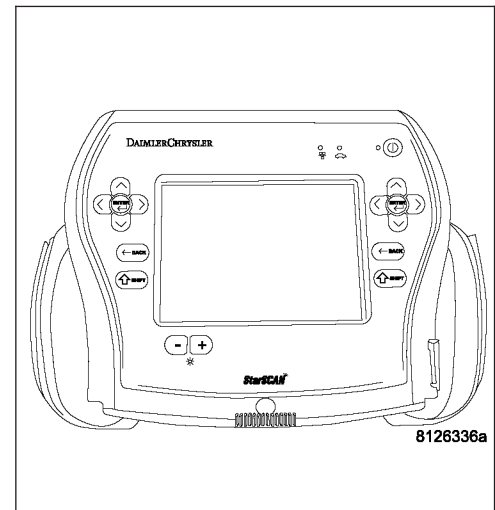
Turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active: B1BA5 AIRBAG SQUIB CONFIGURATION MISMATCH?**

**Yes** >> Go To 2

**No** >> Go To 5



#### 2. VERIFY THAT VEHICLE IS EQUIPPED WITH OCCUPANT CLASSIFICATION SYSTEM (OCS)

Vehicles equipped with a Occupant Classification System (OCS) will have a Passenger Airbag On/Off Indicator Lamp mounted to the dashboard. Verify that the vehicle is equipped with this indicator lamp.

With the scan tool, select ECU View and check that the Occupant Classification Module (OCM) is active on the bus.

**Is the vehicle equipped with an Occupant Classification System (OCS)?**

**Yes** >> Go To 3

**No** >> Replace the ORC in accordance with Service Information.  
Perform ORC VERIFICATION TEST - VER 1.

**B1BA5-AIRBAG SQUIB CONFIGURATION MISMATCH (CONTINUED)****3. CHECK ORC PART NUMBER WITH SCAN TOOL**

With the scan tool, select ECU View, select ORC, select ECU Details, and read the ORC part number.

**Is the part number correct for the vehicle?**

**Yes** >> Go To 4

**No** >> Replace the ORC in accordance with Service Information.  
Perform ORC VERIFICATION TEST - VER 1.

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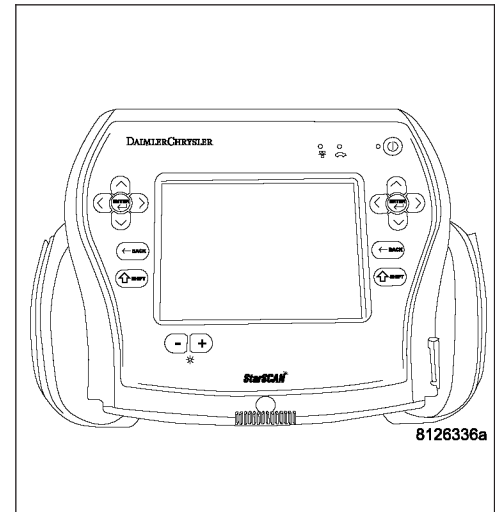
**4. CHECK VIN WITH SCAN TOOL**

With the scan tool, read the VIN.

**Is the correct VIN displayed?**

**Yes** >> Replace the ORC in accordance with Service Information.  
Perform ORC VERIFICATION TEST - VER 1.

**No** >> Replace the Powertrain Control Module (PCM) in accordance with Service Information.  
Perform ORC VERIFICATION TEST - VER 1.



**B1BA5-AIRBAG SQUIB CONFIGURATION MISMATCH (CONTINUED)****5. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

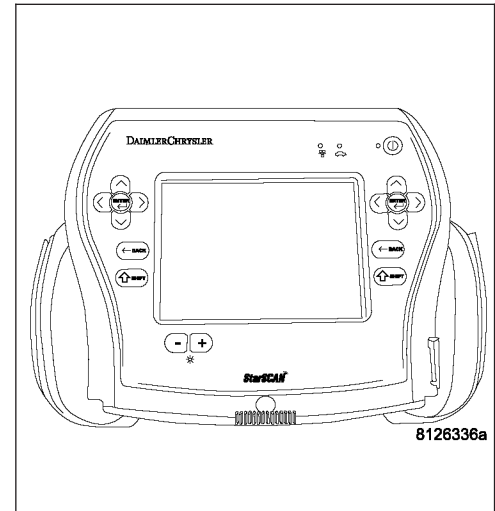
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.





**B1BA5-AIRBAG SQUIB CONFIGURATION MISMATCH (CONTINUED)**  
**B1BA6-OCCUPANT CLASSIFICATION UNDETERMINED**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on or off.

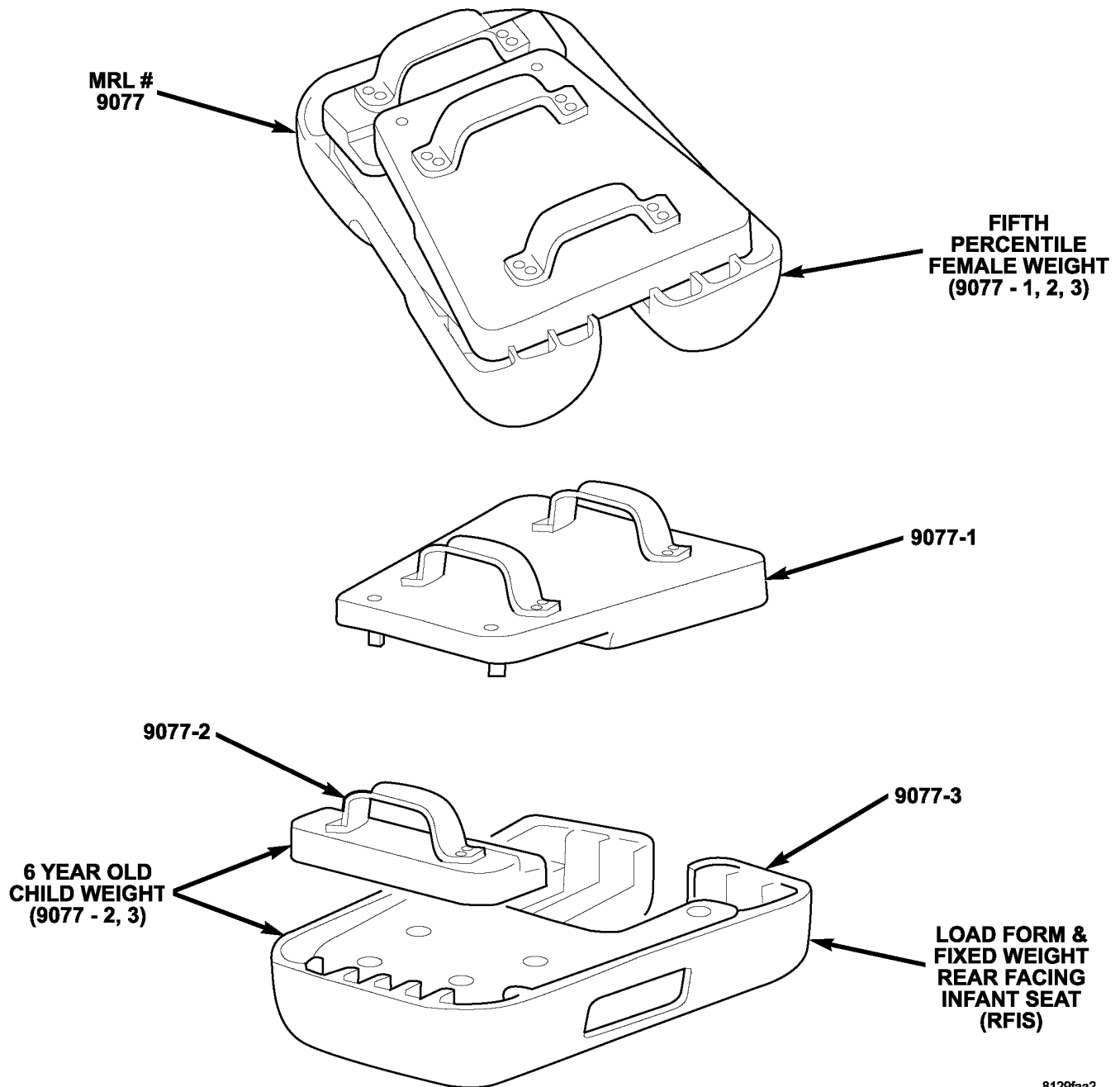
- **Set Condition:**

Because other DTCs have made occupant detection impossible. This DTC will set in addition to all sensor and module DTCs and will be erased when the repairs are completed.

Refer to **B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED** for the diagnostic test procedure.

## B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED

### OCCUPANT CLASSIFICATION SEAT WEIGHTS



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**B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED (CONTINUED)**

- **When Monitored:**

With the CAN ignition status as IGN\_RUN, the module tries to detect potentially damaging events and monitors the CAN Bus for the X Impact messages (crash event causing one or more airbag or pretensioner to deploy) or upon detecting an Offset Event (if equipped).

- **Set Condition:**

This DTC will set if the module detects a potentially damaging event or the X Impact messages from the CAN Bus input.

Possible Causes
B1BA7-OCS VERIFICATION REQUIRED DTC ACTIVE

**Diagnostic Test****1. CHECK FOR OCCUPANT CLASSIFICATION MODULE (OCM) ACTIVE DTCs:**

- ACTIVE INTERNAL FAULTS
- IGNITION FAULTS
- BATTERY FAULT
- SEAT WEIGHT SENSOR DTCs

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

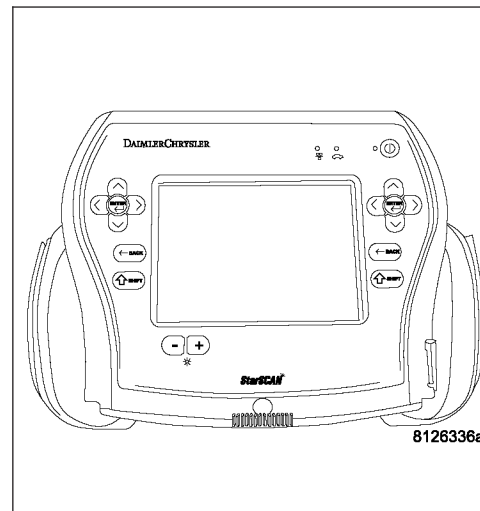
Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display any active DTCs listed above?**

**Yes**    >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No**    >> Go To 2

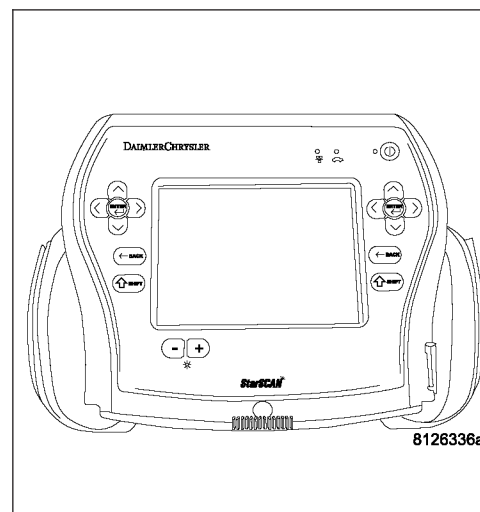
**2. VERIFY THAT DTC B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED?**

**Yes**    >> Go To 3

**No**    >> Go To 4



**B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED (CONTINUED)****3. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST**

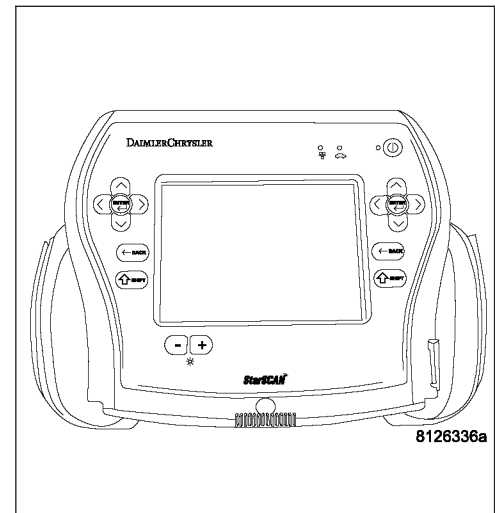
Verify that the passenger seat is empty.

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**Note:** Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.



**Does the scan tool display active: B1BA7-OCCUPANT CLASSIFICATION SYSTEM VERIFICATION REQUIRED?**

**Yes** >> Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.  
Perform OCS VERIFICATION TEST - VER 1.

**No, But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

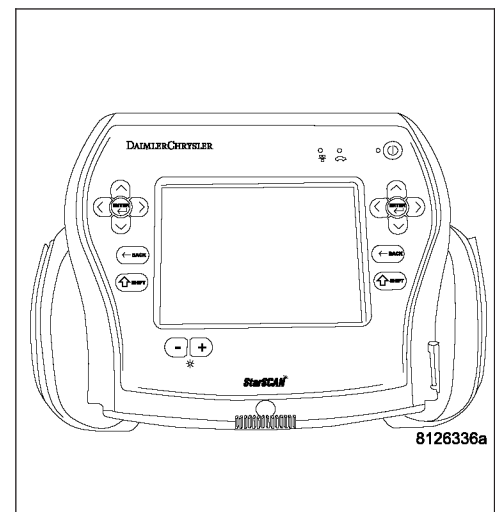
**4. CHECK FOR ACTIVE DTC B1BA8-OCM SYSTEM OUT OF CALIBRATION/NOT CALIBRATED**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1BA8-OCM SYSTEM OUT OF CALIBRATION/NOT CALIBRATED?**

**Yes** >> Diagnose and repair the DTC. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Perform OCS VERIFICATION TEST - VER 1.



## B1BA8-OCM SYSTEM OUT OF CALIBRATION/NOT CALIBRATED

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
While the CAN bus ignition status is IGN\_RUN or SNA.
- **Set Condition:**  
This DTC will set if the module has initiated a rezero and did not successfully complete the system verification.

### Diagnostic Test

#### 1. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST

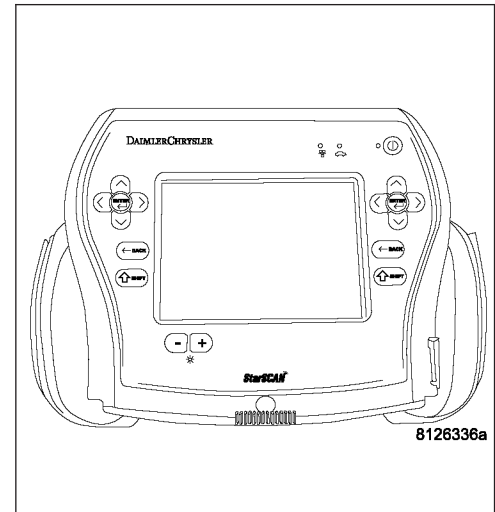
Verify that the passenger seat is empty.

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**Note:** Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.



**Does the scan tool display any active DTCs?**

**Yes - B1BA8 DTC Returned**

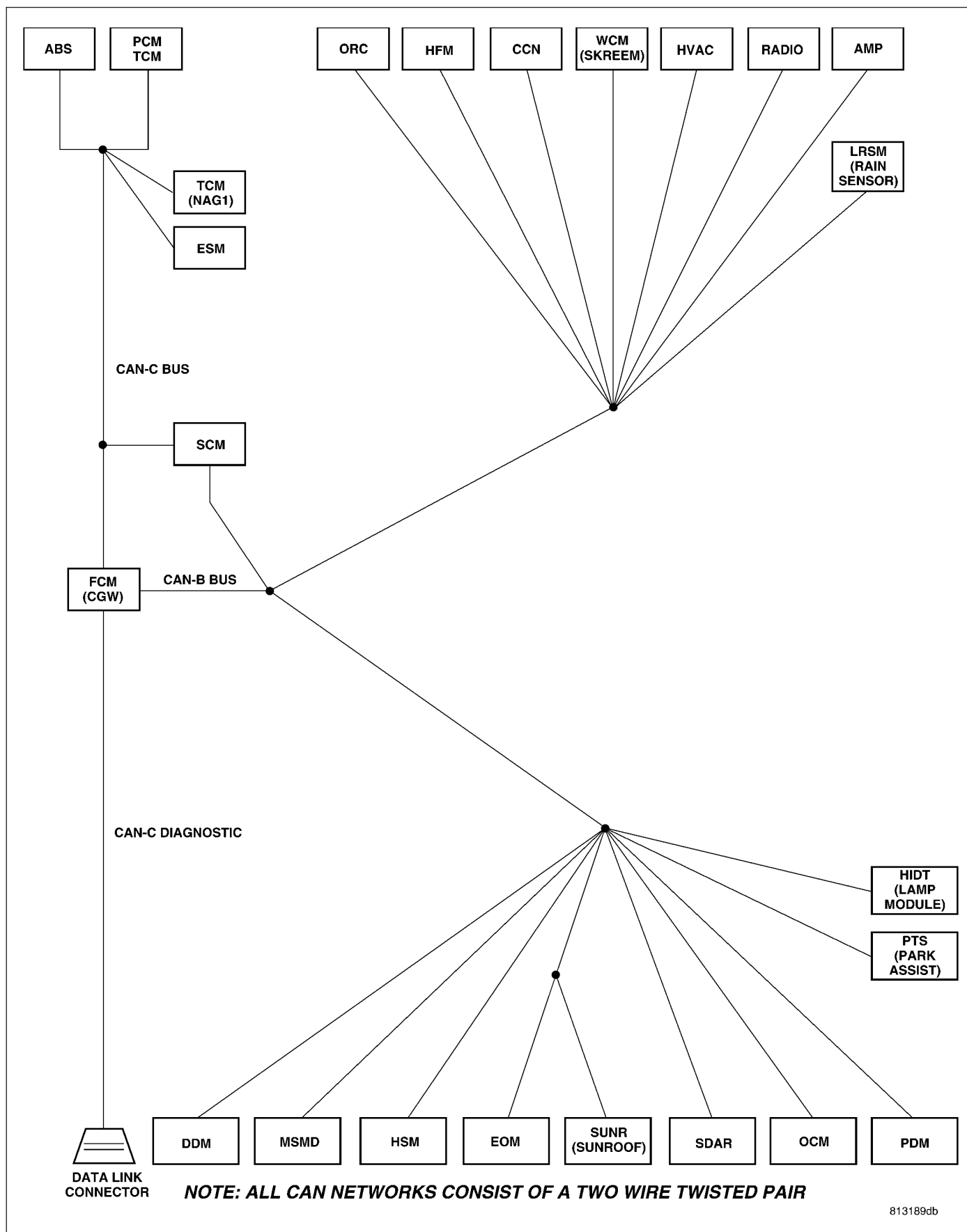
Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.

**Yes - But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No - Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

**B1BB8-SRS WARNING INDICATOR STATUS MISMATCH**

**B1BB8-SRS WARNING INDICATOR STATUS MISMATCH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
After the Instrument Cluster bulb check is completed, the ORC compares the lamp request by the ORC (On or Off) and the Lamp On request by the Instrument Cluster (On or Off) Can bus messages. Each message is transmitted one time per second or when a change in the lap state occurs.
- **Set Condition:**  
If the lamp request by the ORC (On or Off), and the Lamp On by the Instrument Cluster (On or Off), messages do not match, this code will set.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER, INSTRUMENT CLUSTER MESSAGE MISMATCH INSTRUMENT CLUSTER OCCUPANT RESTRAINT CONTROLLER

**Diagnostic Test**

**1. CHECK FOR AN ACTIVE DTC**

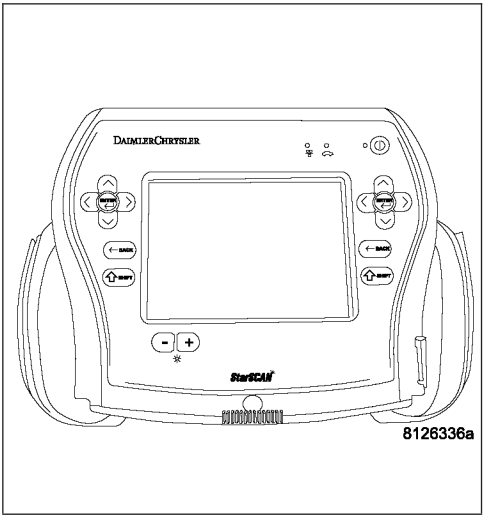
**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

- Select DTC type.**
- Active**                      Go To 2
- Stored**                      Go To 5

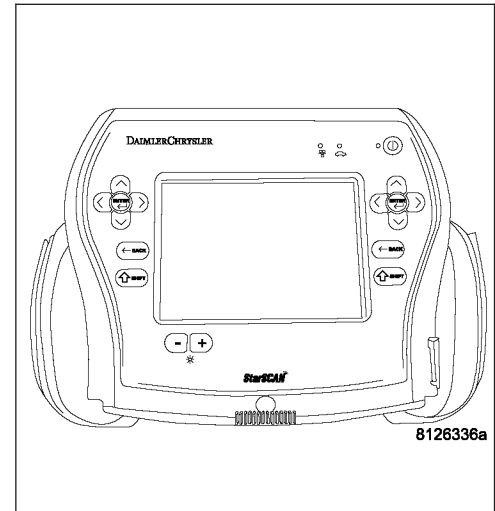


**B1BB8-SRS WARNING INDICATOR STATUS MISMATCH (CONTINUED)****2. CHECK FOR ACTIVE INSTRUMENT CLUSTER DTCs**

With the scan tool, read Instrument Cluster DTCs.

**Does the scan tool display and active Instrument Cluster DTCs?**

- Yes** >> Refer to symptom list for problems related to the Instrument Cluster.  
Perform the ORC VERIFICATION TEST-VER 1.
- No** >> Go To 3

**3. CHECK THE ORC AND INSTRUMENT CLUSTER FOR LAMP STATUS**

With the scan tool view the Instrument Cluster Data Display.

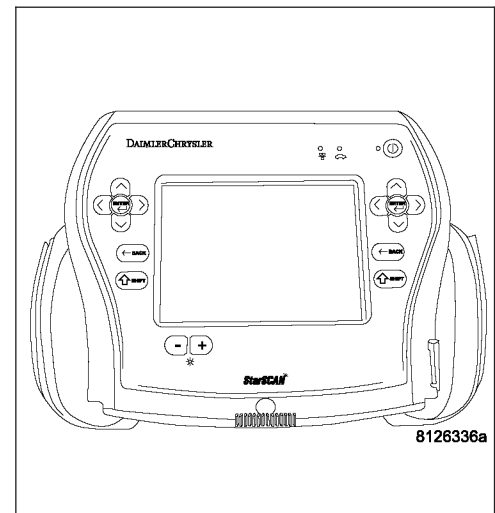
Cycle the ignition key and observe the SRS Indicator Lamp Request status (Set/Not Set) during the Instrument Cluster bulb check.

With the scan tool view the ORC Data Display.

Cycle the ignition key and observe the SRS Indicator Lamp Status (Lamp On/Lamp Off) during the Instrument Cluster bulb check.

**Did the Data Display information match the operation of the lamp?**

- Yes** >> Go To 4
- No** >> Replace the Instrument Cluster in accordance with the service information.  
Perform the ORC VERIFICATION TEST-VER 1.

**4. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with the service information.  
Perform the ORC VERIFICATION TEST-VER 1.



**B1BB8-SRS WARNING INDICATOR STATUS MISMATCH (CONTINUED)****5. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

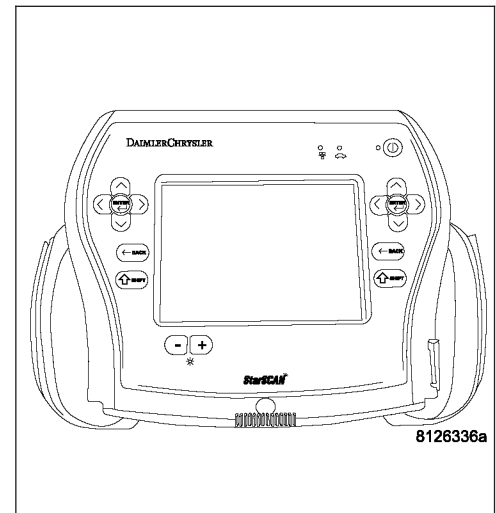
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

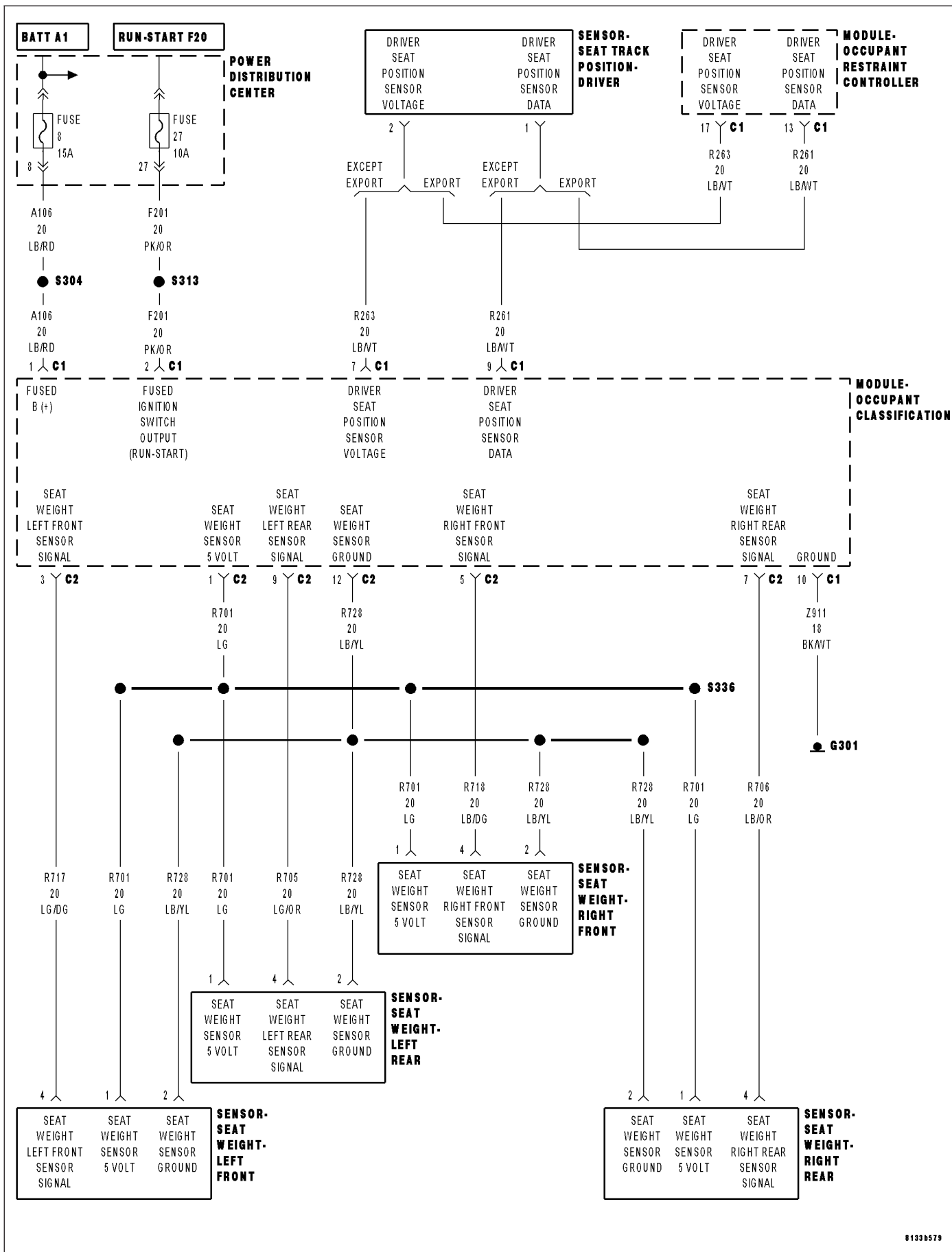
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1BBA-PASSENGER SEAT WEIGHT SENSOR SUPPLY CIRCUIT



**B1BBA-PASSENGER SEAT WEIGHT SENSOR SUPPLY CIRCUIT (CONTINUED)**

For a complete wiring diagram Refer to **Section 8W**.

- **When Monitored:**  
While the CAN bus ignition status is in IGN\_RUN, the module checks the sensor supply.
- **Set Condition:**  
If the OCM detects that the sensor supply shorted. **Note: A shorted supply circuit will cause a 'NO RESPONSE FROM OCM' condition.**

Possible Causes
OCS SUPPLY CIRCUIT SHORTED
OCCUPANT CLASSIFICATION MODULE (OCM)

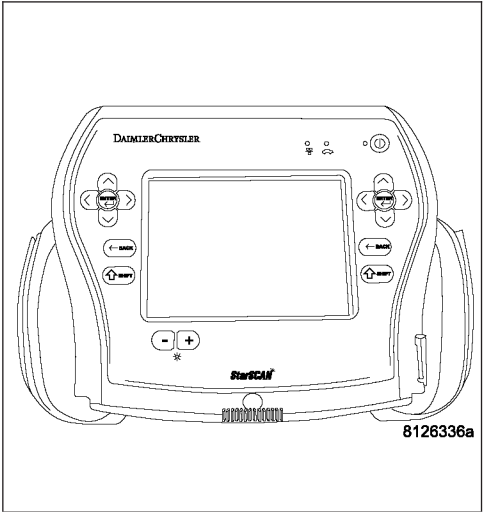
**Diagnostic Test**

**1. VERIFY THAT B1BBA-PASSENGER SEAT WEIGHT SENSOR SUPPLY CIRCUIT DTC IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1BBA-PASSENGER SEAT WEIGHT SENSOR SUPPLY CIRCUIT?**

- Yes**
- >> Replace the OCM in accordance with the Service Information.  
Perform the OCS VERIFICATION REQUIRED procedure.
- No**
- >> Go To 2



**2. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

- Yes**
- >>
- Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.  
Replace the Passenger Seat Harness in accordance with the Service Information.  
Perform OCS VERIFICATION TEST - VER 1.
- No**
- >> Go To 3

**B1BBA-PASSENGER SEAT WEIGHT SENSOR SUPPLY CIRCUIT (CONTINUED)****3. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

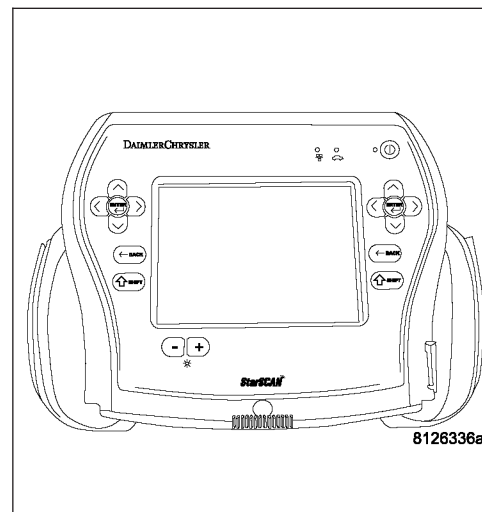
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



The diagram illustrates the electrical connections for the Occupant Restraint Controller (ORC). It is divided into several functional sections:

- POWER DISTRIBUTION CENTER:** Shows connections for BATT A1 (8A, 15A) and RUN-START F20 (27A, 10A). Fuses are indicated for each circuit. The BATT A1 circuit includes a fuse and a connection to the ORC. The RUN-START F20 circuit includes a fuse and a connection to the ORC.
- SENSOR-SEAT TRACK POSITION-DRIVER:** Shows connections for DRIVER SEAT POSITION SENSOR VOLTAGE and DRIVER SEAT POSITION SENSOR DATA. The voltage signal is connected to the ORC via a 2-pin connector. The data signal is connected to the ORC via a 1-pin connector.
- SENSOR-SEAT TRACK POSITION-DRIVER:** Shows connections for DRIVER SEAT POSITION SENSOR VOLTAGE and DRIVER SEAT POSITION SENSOR DATA. The voltage signal is connected to the ORC via a 17-pin connector (C1). The data signal is connected to the ORC via a 13-pin connector (C1).
- MODULE-OCCUPANT RESTRAINT CONTROLLER:** Shows connections for DRIVER SEAT POSITION SENSOR VOLTAGE and DRIVER SEAT POSITION SENSOR DATA. The voltage signal is connected to the ORC via a 17-pin connector (C1). The data signal is connected to the ORC via a 13-pin connector (C1).
- MODULE-OCCUPANT CLASSIFICATION:** Shows connections for SEAT WEIGHT LEFT FRONT SENSOR SIGNAL, SEAT WEIGHT LEFT REAR SENSOR SIGNAL, SEAT WEIGHT RIGHT FRONT SENSOR SIGNAL, SEAT WEIGHT RIGHT REAR SENSOR SIGNAL, and GROUND. These signals are connected to the ORC via various connectors (C2, C1).
- SENSOR-SEAT WEIGHT-LEFT REAR:** Shows connections for SEAT WEIGHT SENSOR 5 VOLT, SEAT WEIGHT LEFT REAR SENSOR SIGNAL, and SEAT WEIGHT SENSOR GROUND. These signals are connected to the ORC via a 1-pin connector (C2).
- SENSOR-SEAT WEIGHT-LEFT FRONT:** Shows connections for SEAT WEIGHT LEFT FRONT SENSOR SIGNAL, SEAT WEIGHT SENSOR 5 VOLT, and SEAT WEIGHT SENSOR GROUND. These signals are connected to the ORC via a 3-pin connector (C2).
- SENSOR-SEAT WEIGHT-RIGHT FRONT:** Shows connections for SEAT WEIGHT RIGHT FRONT SENSOR SIGNAL, SEAT WEIGHT SENSOR 5 VOLT, and SEAT WEIGHT SENSOR GROUND. These signals are connected to the ORC via a 5-pin connector (C2).
- SENSOR-SEAT WEIGHT-RIGHT REAR:** Shows connections for SEAT WEIGHT RIGHT REAR SENSOR SIGNAL, SEAT WEIGHT SENSOR 5 VOLT, and SEAT WEIGHT SENSOR GROUND. These signals are connected to the ORC via a 7-pin connector (C2).

The diagram uses standard automotive symbols for fuses, connectors, and ground points. Wire colors and gauges are indicated throughout the diagram.

**B1BBB-PASSENGER SEAT WEIGHT SENSOR INPUTS SHORTED TOGETHER (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**

While the CAN bus ignition status is in IGN\_RUN.

- **Set Condition:**

If the OCM detects any two sensors voltages below 20mV for 10 minutes while any other sensor is greater than 40mV. Note: 1 a/d count is equal to 5mV. **Note: A shorted supply circuit will cause a 'NO RESPONSE FROM OCM' condition.**

Possible Causes
OCS SENSOR CIRCUITS SHORTED TOGETHER
OCCUPANT CLASSIFICATION MODULE (OCM)

**Diagnostic Test****1. VERIFY THAT B1BBA-PASSENGER SEAT WEIGHT SENSOR SUPPLY CIRCUIT DTC IS ACTIVE**

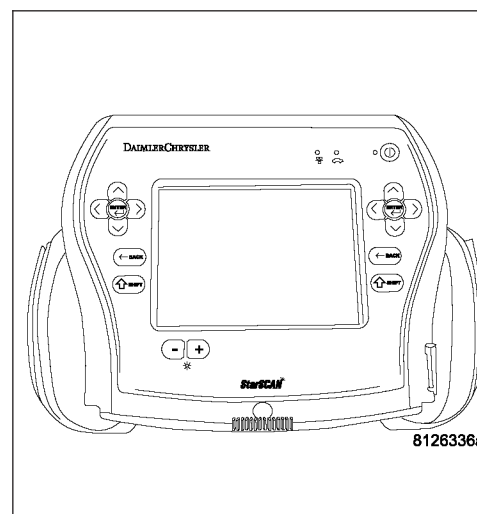
With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1BBB-PASSENGER SEAT WEIGHT SENSOR INPUTS SHORTED TOGETHER ?**

**Yes** >> Replace the OCM in accordance with the Service Information.

Perform the OCS VERIFICATION REQUIRED procedure.

**No** >> Go To 2

**2. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note: Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.**

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 3

**B1BBB-PASSENGER SEAT WEIGHT SENSOR INPUTS SHORTED TOGETHER (CONTINUED)****3. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from the OCM.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

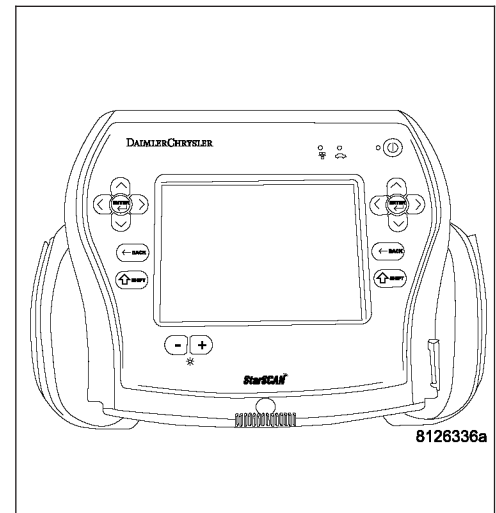
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

**Are any ACTIVE DTCs present?**

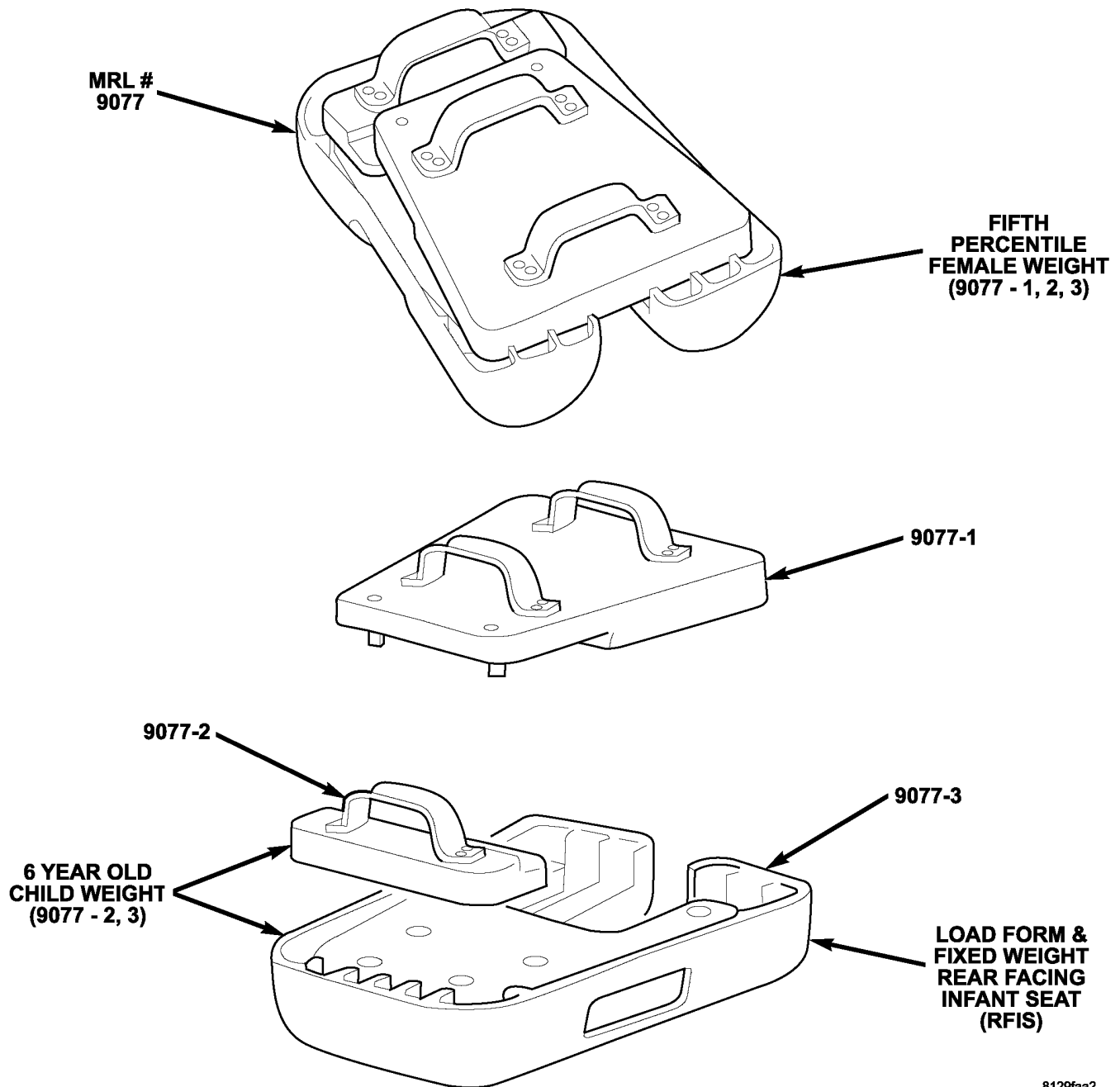
**Yes** >> Select the appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1BBC-OCS NEGATIVE SYSTEM WEIGHT

### OCCUPANT CLASSIFICATION SEAT WEIGHTS





B1BBC-OCS NEGATIVE SYSTEM WEIGHT (CONTINUED)

- **When Monitored:**  
While the CAN bus ignition status is in IGN\_RUN, the module checks the sensor input ranges.
- **Set Condition:**  
If the module detects a seat weight sensor input with the total seat weight below -6.5 kg +/- 1kg.

Possible Causes
DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN
OBJECT UNDER SEAT OR REAR SEAT FOLDED DOWN AND RESTING AGAINST PASSENGER SEAT
OCCUPANT CLASSIFICATION MODULE (OCM)

Diagnostic Test

1. TEST CONDITIONS

- ACTIVE INTERNAL DTC
- IGNITION DTC
- BATTERY DTC
- SEAT WEIGHT SENSOR DTC

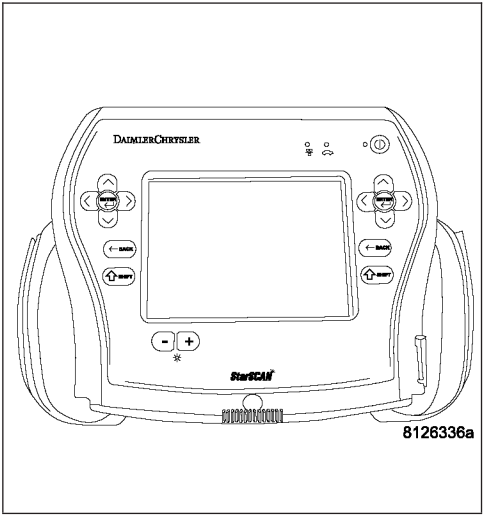
**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

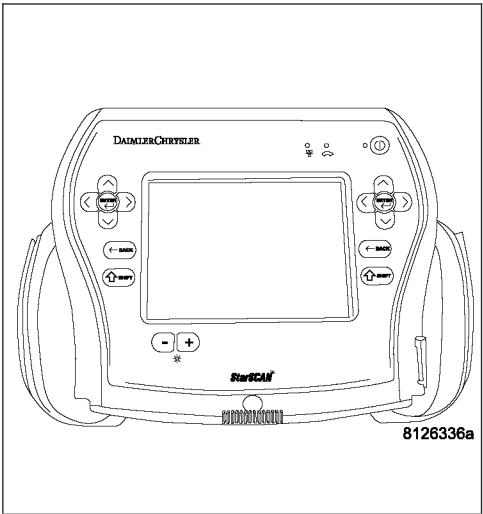
- Does the scan tool display any active DTCs listed above?
- Yes**    >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.
- No**      >> Go To 2



2. ACTIVE OR STORED DTC

With the scan tool, read OCM DTCs.

- Does the scan tool display active: B1BBC–NEGATIVE SYSTEM WEIGHT?
- Yes**    >> Go To 3
- No**      >> Go To 4



**B1BBC-OCS NEGATIVE SYSTEM WEIGHT (CONTINUED)****3. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST**

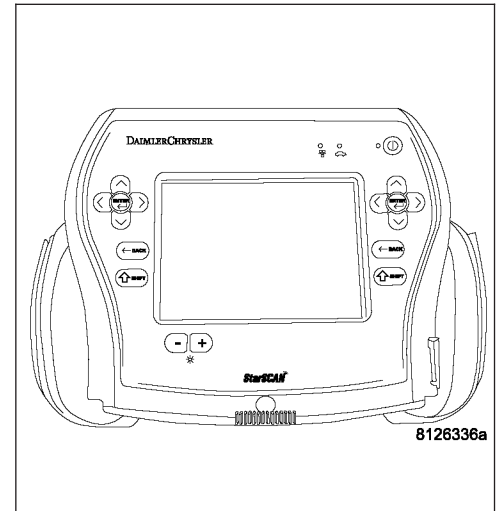
Verify that the passenger seat is empty.

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**Note: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.**

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1BA8-OCS NOT CALIBRATED DTC?**

**Yes** >> Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.  
Perform OCS VERIFICATION TEST - VER 1.

**No - But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No - No Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

---

**B1BBC-OCS NEGATIVE SYSTEM WEIGHT (CONTINUED)****4. STORED B1BBC-OCS NEGATIVE SYSTEM WEIGHT DTC**

With the scan tool, record and erase all DTC's from all Airbag System Modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool monitor active codes as you work through the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

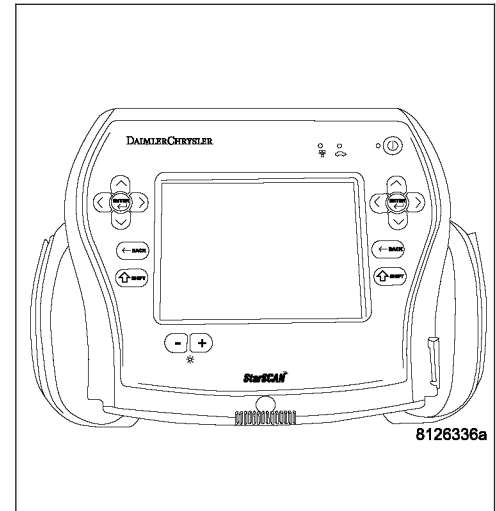
IF only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

**Are any ACTIVE DTC's present?**

**Yes** >> Select appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## B1BBD-OCM CURRENT CONFIGURATION TABLE UNPROGRAMMED

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

If the Configuration Table is not programmed at the supplier or when the checksum is invalid.

- **Set Condition:**

This DTC will set if the module was received unprogrammed from the supplier, the vehicle line was not identified correctly or if the flash procedure was not completed successfully

Possible Causes
NEW OCCUPANT CLASSIFICATION MODULE
INTERNAL CHECKSUM FAILURE

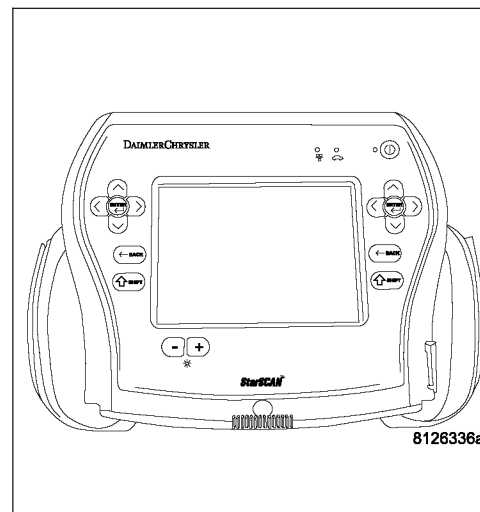
## Diagnostic Test

### 1. MODULE CONFIGURATION

**Does the scan tool display B1BBD-OCM CURRENT CONFIGURATION TABLE UNPROGRAMMED?**

**Yes** >> Perform the B1BA7-OCS VERIFICATION REQUIRED diagnostic procedure.

**No** >> Replace the Occupant Classification Module in accordance with the service information.  
With the scan tool, perform the OCM SYSTEM VERIFICATION procedure.



B1BC7-DEPLOYMENT DATA RECORD FULL

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**  
This DTC will set if the module identifies an out of range internal circuit.

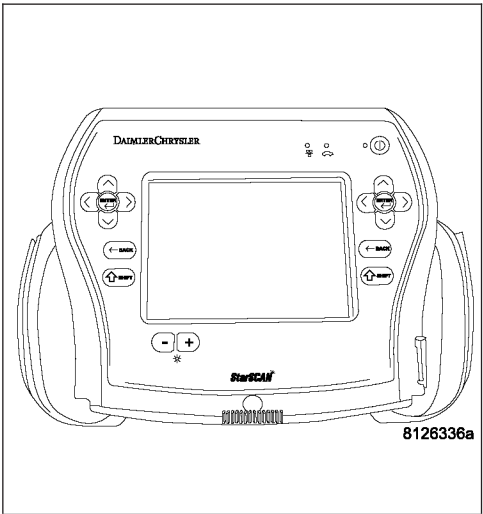
Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. CHECK FOR ACTIVE DTC

Turn the ignition on.  
With the scan tool, read ORC DTCs.

- Is the Deployment Data Record Full DTC active?
- Yes**    >> Go To 2
- No**    >> Perform the ORC VERIFICATION TEST-VER. 1.



2. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

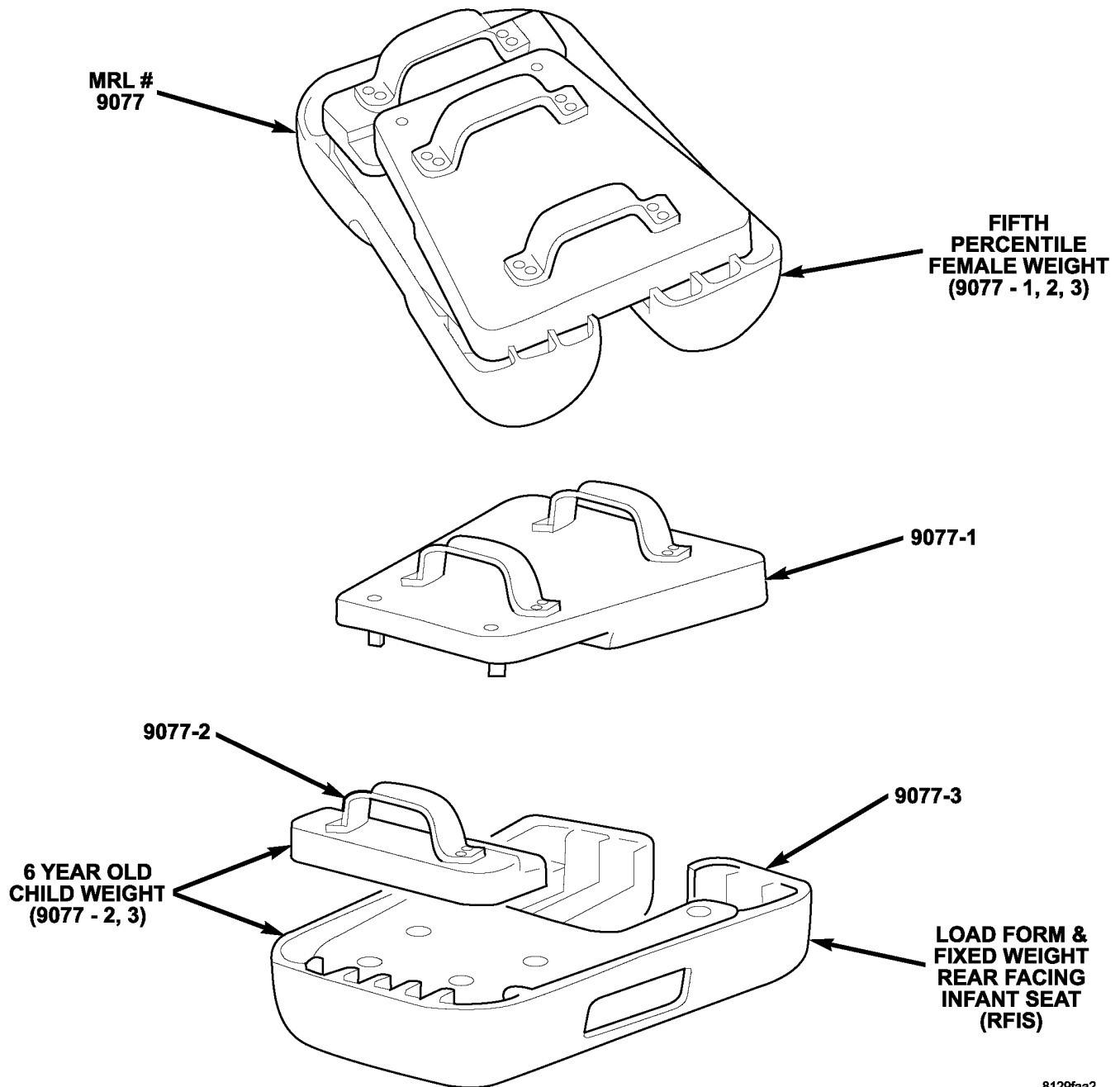
**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

- View repair.
- Repair**
- Replace the Occupant Restraint Controller in accordance with the service information.  
Perform the ORC VERIFICATION TEST-VER 1.

## B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE

### OCCUPANT CLASSIFICATION SEAT WEIGHTS



**B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
While the CAN bus ignition status is in IGN\_RUN, the module checks the sensor input ranges.
- **Set Condition:**  
If the module detects the difference between 2 sensors is less than 3 A/D (15 mV) counts for 10 consecutive minutes while at least one sensor count is changing and greater than 8 A/D (40 mV) counts.

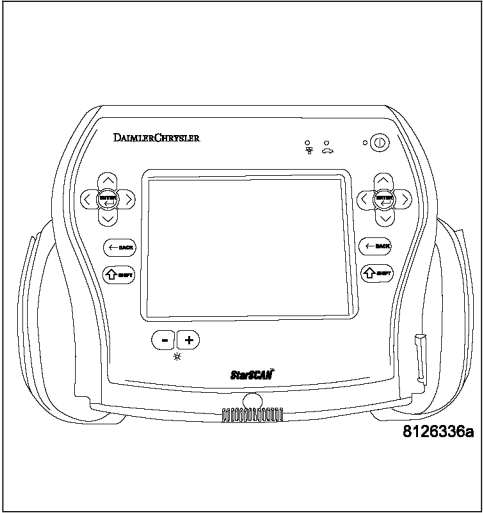
Possible Causes
OTHER SEAT WEIGHT SENSOR FAULTS ACTIVE IN THE OCM PASSENGER SEAT HARNESS WIRES CHAFFED, PIERCED, PINCHED, PARTIALLY BROKEN PASSENGER SEAT HARNESS CONNECTOR TERMINALS BROKEN, BENT PUSHED OUT, SPREAD, CORRODED, CONTAMINATED PASSENGER SEAT WEIGHT SENSORS DAMAGE TO THE PASSENGER SEAT STRUCTURE, RISER ASSEMBLY, CROSSMEMBERS, SEAT TRACKS, FLOOR PAN OCCUPANT CLASSIFICATION MODULE (OCM)

**Diagnostic Test**

**1. CHECK FOR ACTIVE INTERNAL FAULTS, IGNITION FAULTS, & BATTERY FAULTS IN THE OCCUPANT CLASSIFICATION MODULE (OCM)**

- Note:** Ensure the battery is fully charged.
- Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.
- Turn the ignition on, then off, and then on again.
- Note:** This DTC will take 10 minutes to mature, allow plenty of time for the code to mature between as you work through the test steps.
- With the scan tool, read Occupant Classification Module (OCM) DTCs.

- Does the scan tool display any active DTCs relating to internal faults, ignition faults, or battery faults?**
- Yes**    >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.
- No**     >> Go To 2



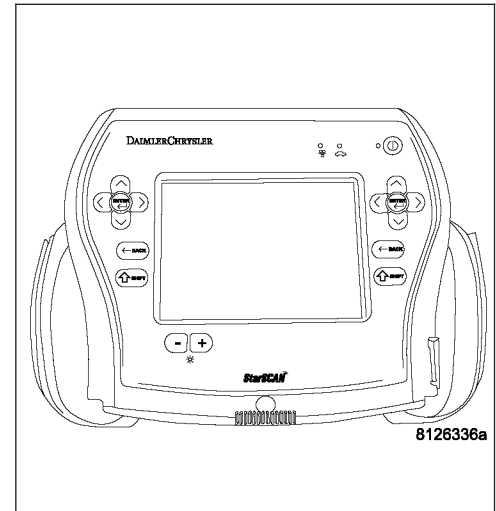
**B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE (CONTINUED)****2. VERIFY THAT DTC B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE IS ACTIVE**

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE?**

**Yes** >> Go To 3

**No** >> Go To 6

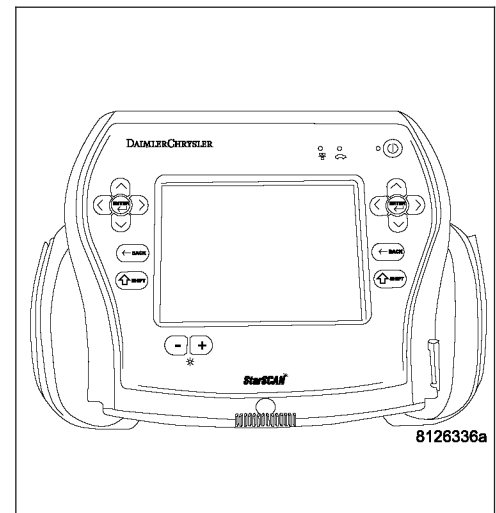
**3. CHECK FOR OTHER ACTIVE PASSENGER SEAT WEIGHT SENSOR FAULTS IN THE OCM**

With the scan tool, read OCM DTCs.

**Does the scan tool display any other active Seat Weight Sensor DTCs?**

**Yes** >> Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Go To 4





**B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE (CONTINUED)****4. INSPECT PASSENGER SEAT HARNESS WIRES & CONNECTORS**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the Passenger Seat Harness wiring and connectors. Look for chafed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

**Are any of these conditions present?**

**Yes** >>

**Note:** Do not attempt to repair the Seat Harness. Replace the Seat Harness if the condition inspecting or testing for is present in the Seat Harness.

Replace the Passenger Seat Harness in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST**

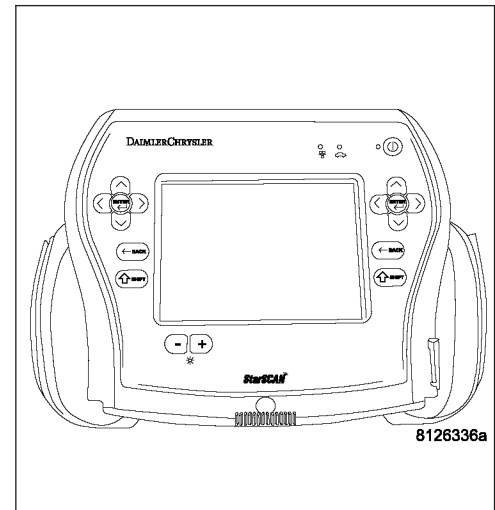
Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

**Note:** Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, wait two minutes, and then proceed as follows.

With the scan tool, read OCM DTCs.



**Does the scan tool display any active PASSENGER SEAT WEIGHT SENSOR PERFORMANCE DTCs?**

**Yes** >> Perform the \*Diagnosis/Checkout Procedure For Seat Weight Sensors.

Perform OCS VERIFICATION TEST - VER 1.

**Other DTCs ACTIVE**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Perform OCS VERIFICATION TEST - VER 1.

**B1BC8-PASSENGER SEAT WEIGHT SENSORS PERFORMANCE (CONTINUED)****6. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**Note: This DTC will take 10 minutes to mature, allow plenty of time for the code to mature between as you work through the test steps.**

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

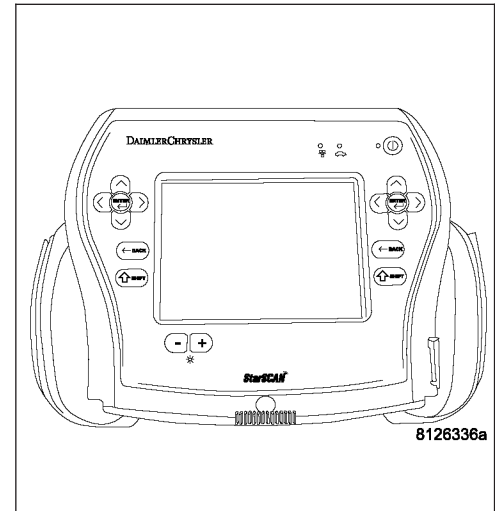
If only stored codes return, continue the test until the problem area has been isolated.

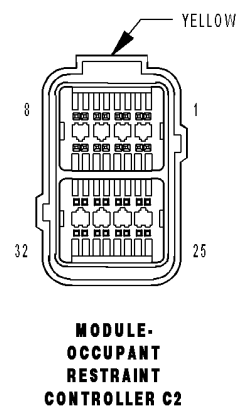
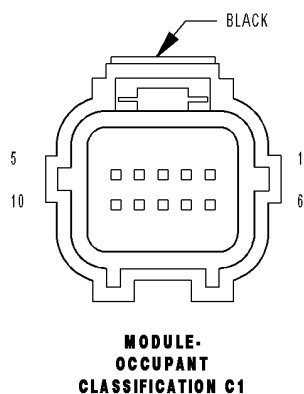
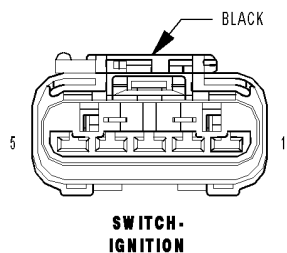
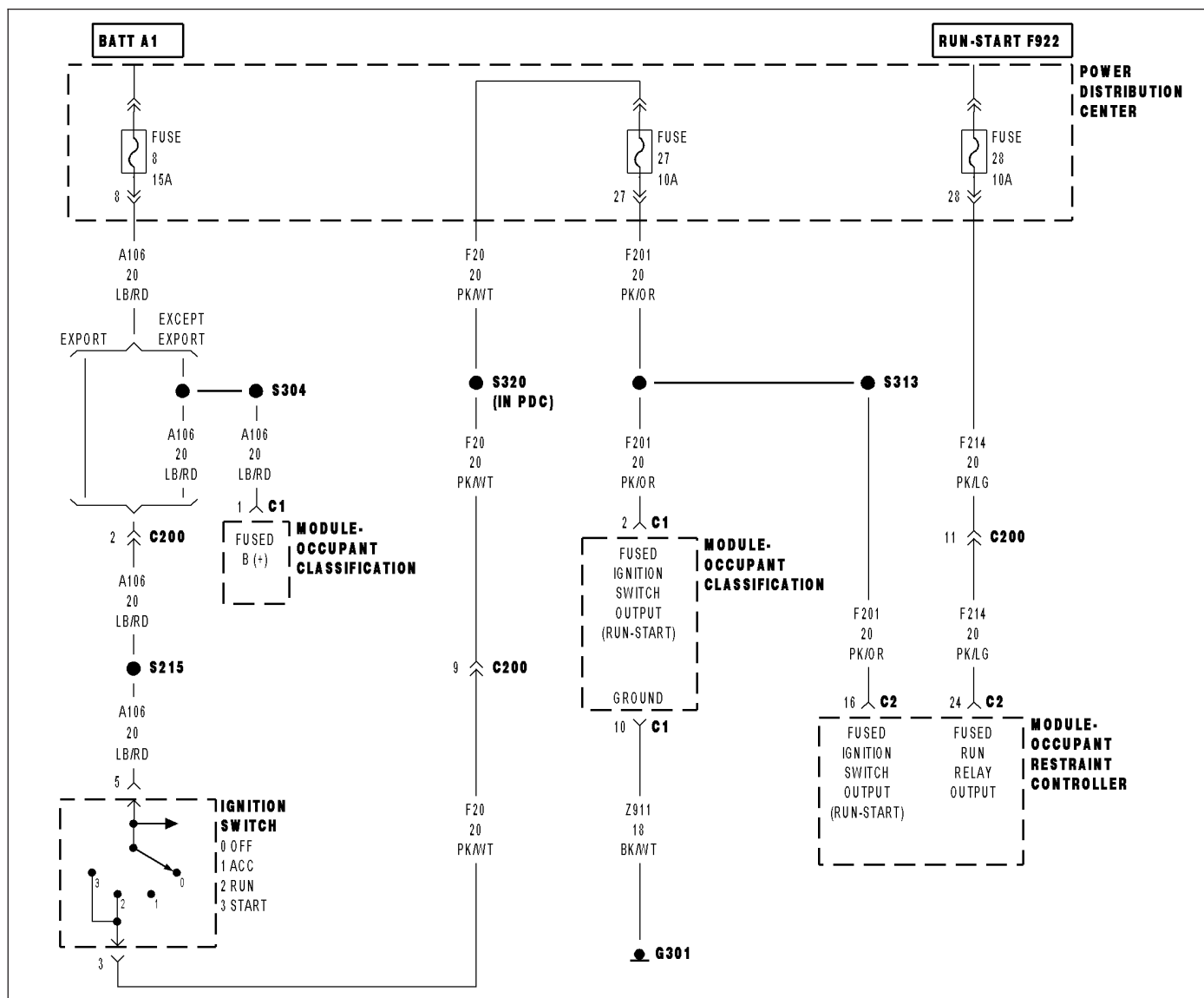
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



**B2101-IGNITION RUN/START INPUT CIRCUIT LOW**

**B2101-IGNITION RUN/START INPUT CIRCUIT LOW (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

While the CAN bus is RUN or SNA and the IOD status is "IN". The module checks the (F201) Fused Ignition Switch Output (Run-Start) circuit voltage input range.

- **Set Condition:**

With the ignition on, if voltage on the (F201) Fused Ignition Switch Output (Run-Start) circuit is equal to or below  $6.25 \pm 0.25$  volts. Within 60 seconds of turning the ignition off, if the (F201) Fused Ignition Switch Output (Run-Start) circuit is 2.4 to 5.0 volts.

Possible Causes
(F20) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
(F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORTED TO GROUND
OPEN FUSE (27)
(F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
OCCUPANT CLASSIFICATION MODULE (OCM)
OCCUPANT RESTRAINT CONTROLLER (ORC)

## Diagnostic Test

### 1. VERIFY THAT DTC B2101 IGNITION RUN/START INPUT CIRCUIT LOW IS ACTIVE IN THE ORC.

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

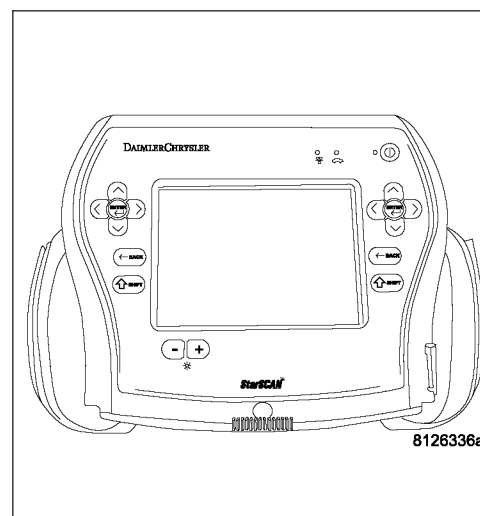
Turn the ignition on.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

**Does the scan tool display active: B2101 IGNITION RUN/START INPUT CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Go To 2



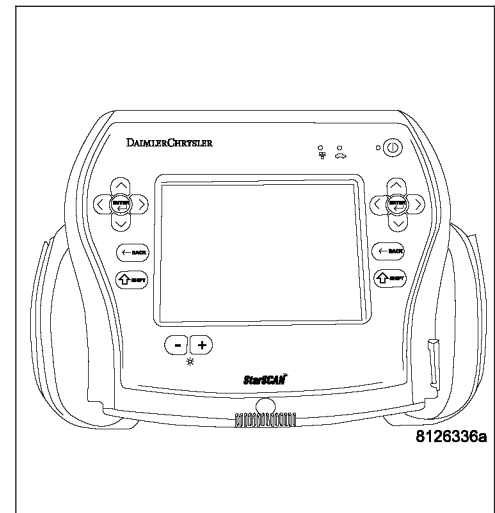
**B2101-IGNITION RUN/START INPUT CIRCUIT LOW (CONTINUED)****2. CHECK FOR ACTIVE DTC B2101 IGNITION RUN/START INPUT CIRCUIT LOW IN OCM.**

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display active: B2101 IGNITION RUN/START INPUT CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Go To 11

**3. INSPECT AIRBAG RUN-START FUSE**

Turn the ignition off.

Remove the Airbag Run-Start Fuse from the rear Power Distribution Center and inspect the fuse.

**Note: Check connectors - Clean and repair as necessary.**

**Is the Run/Start fuse open?**

**Yes** >> Go To 4

**No** >> Go To 7

**4. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE**

Measure the resistance of the (F201) Fused Ignition Switch Output (Run-Start) circuit between ground and the Airbag Run-Start fuse terminal (output side).

**Is the resistance below 100.0 ohms?**

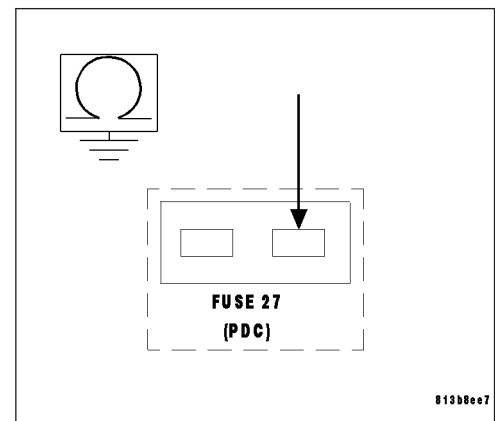
**Yes** >> Go To 5

**No** >> Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Replace Airbag Run-Start Fuse.

Perform ORC VERIFICATION TEST - VER 1.

Perform OCS VERIFICATION TEST - VER 1.



**B2101-IGNITION RUN/START INPUT CIRCUIT LOW (CONTINUED)****5. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE WITH ORC CONNECTORS DISCONNECTED**

**WARNING:** If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the both ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

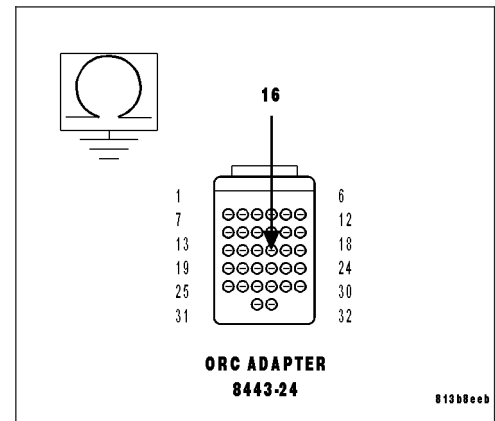
Connect the Load Tool ORC 8443-24 Adaptor to the ORC C2 connector.

Measure the resistance of the (F201) Fused Ignition Switch Output (Run-Start) circuit between 8443-24 adaptor and ground).

**Is the resistance below 100.0 ohms?**

**Yes** >> Go To 6

**No** >> Replace the ORC in accordance with the Service Information.  
Replace the Airbag Run-Start Fuse.  
Perform ORC VERIFICATION TEST - VER 1.  
Perform OCS VERIFICATION TEST - VER 1.

**6. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE WITH OCM C1 CONNECTOR DISCONNECTED**

**WARNING:** If the Occupant Classification Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

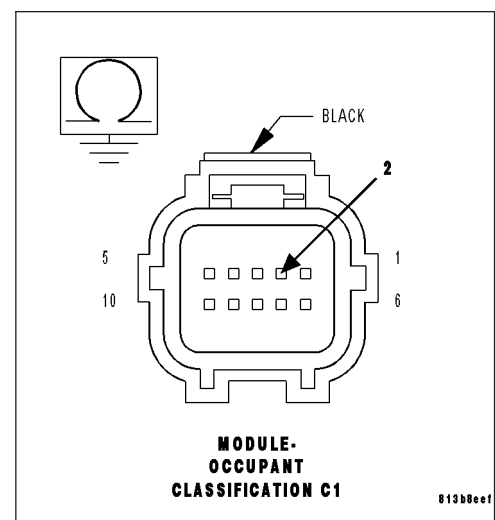
Disconnect the OCM C1 connector.

Measure the resistance of the (F201) Fused Ignition Switch Output (Run-Start) circuit between ground and the Occupant Classification Module C1 connector.

**Is the resistance below 100.0 ohms?**

**Yes** >> Repair the (F201) Fused Ignition Switch Output (Run-Start) circuit for a short to ground.  
Replace the Airbag Run-Start Fuse.  
Perform ORC VERIFICATION TEST - VER 1.  
Perform OCS VERIFICATION TEST - VER 1.

**No** >> Replace the OCM in accordance with the Service Information.  
Replace the Airbag Run-Start Fuse.  
Perform ORC VERIFICATION TEST - VER 1.  
Perform OCS VERIFICATION TEST - VER 1.



**B2101-IGNITION RUN/START INPUT CIRCUIT LOW (CONTINUED)****7. CHECK (F201) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN**

Turn the ignition on.

Measure the voltage of the (F20) Ignition Switch Output (Run-Start) circuit at the Airbag Run-Start fuse terminal (supply side).

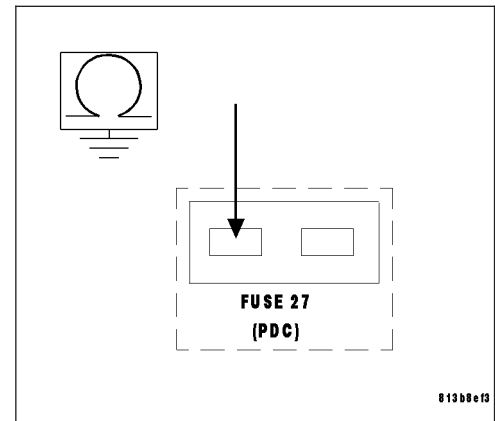
**Is the voltage above 6.0 volts?**

**Yes** >> Go To 8

**No** >> Repair the open (F20) Ignition Switch Output (Run-Start) circuit.

Perform ORC VERIFICATION TEST - VER 1.

Perform OCS VERIFICATION TEST - VER 1.

**8. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN**

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Reinstall the Airbag Run-Start Fuse.

Disconnect the both ORC connectors.

**Note: Check connectors - Clean and repair as necessary.**

Install the Airbag Load tool ORC 8443-24 adaptor to the ORC C2 connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

Measure the voltage of the (F201) Fused Ignition Switch Output (Run-Start) Circuit between the 8443-24 connector and ground.

**Is the voltage above 6.0 volts?**

**Yes** >> Replace the ORC in accordance with the Service Information.

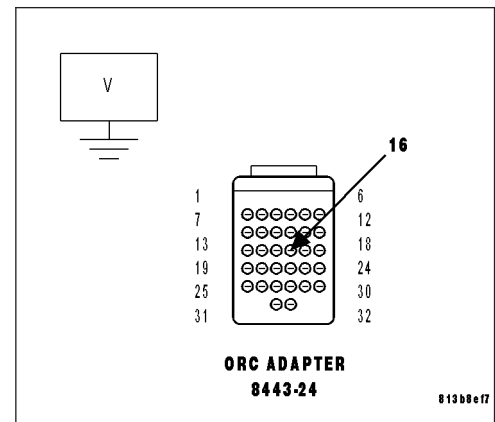
Perform ORC VERIFICATION TEST - VER 1.

Perform OCS VERIFICATION TEST - VER 1 if DTC B2101 IGNITION RUN/START INPUT CIRCUIT LOW was Active in the OCM.

**No** >> Repair the open (F201) Fused Ignition Switch Output (Run-Start) circuit.

Perform ORC VERIFICATION TEST - VER 1.

Perform OCS VERIFICATION TEST - VER 1 if DTC B2101 IGNITION RUN/START INPUT CIRCUIT LOW was Active in the OCM.



**B2101-IGNITION RUN/START INPUT CIRCUIT LOW (CONTINUED)****9. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Reinstall the Airbag Run-Start Fuse.

Disconnect the both Occupant Classification Module (OCM) connectors.

**Note:** Check connectors - Clean and repair as necessary.

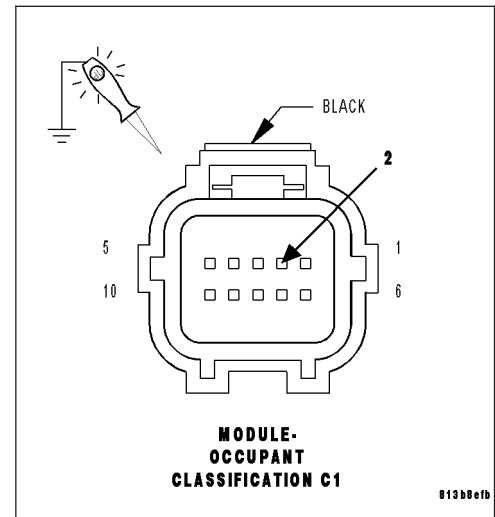
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (F201) Fused Ignition Switch Output (Run-Start) Circuit between the OCM connector and ground.

**Is the voltage above 6.0 volts?**

**Yes** >> Go To 10

**No** >> Repair the open (F201) Fused Ignition Switch Output (Run-Start) circuit between the OCM and the splice.  
Perform ORC VERIFICATION TEST - VER 1.  
Perform OCS VERIFICATION TEST - VER 1.

**10. VERIFY THAT DTC B2101 IGNITION RUN/START INPUT LOW DTC IS ACTIVE.**

Reconnect both Occupant Restraints Controller (ORC) connectors.

Reconnect both Occupant Classification Module (OCM) connectors.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs and Occupant Classification Module (OCM) DTCs.

**Select the module displaying the active: B2101 IGNITION RUN/START INPUT CIRCUIT LOW?**

**Occupant Restraint Controller (ORC)**

Replace the Occupant Restraint Controller (ORC) in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1.

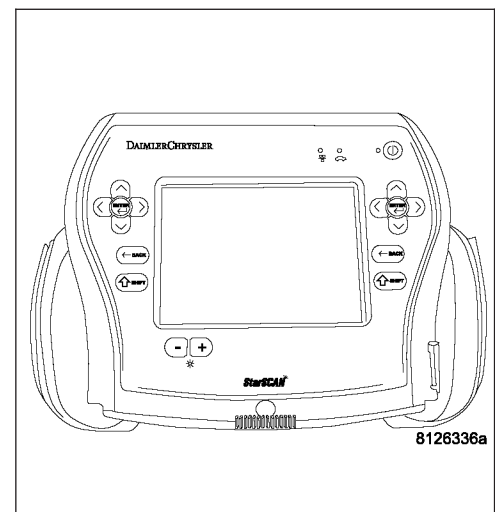
Perform OCS VERIFICATION TEST - VER 1 if DTC B2101 IGNITION RUN/START INPUT CIRCUIT LOW was Active in the OCM.

**Occupant Classification Module (OCM)**

Replace the Occupant Classification Module (OCM) in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1.

Perform OCS VERIFICATION TEST - VER 1 if DTC B2101 IGNITION RUN/START INPUT CIRCUIT LOW was Active in the OCM.





**B2101-IGNITION RUN/START INPUT CIRCUIT LOW (CONTINUED)****11. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

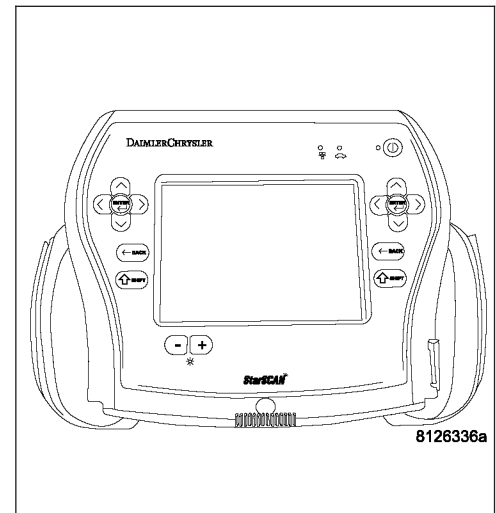
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

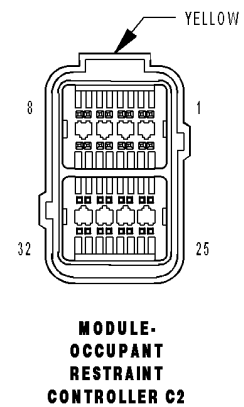
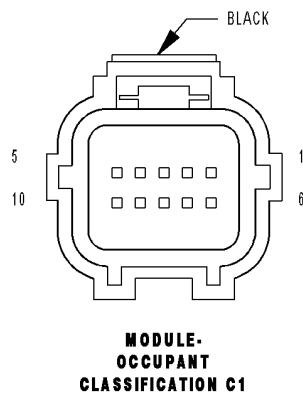
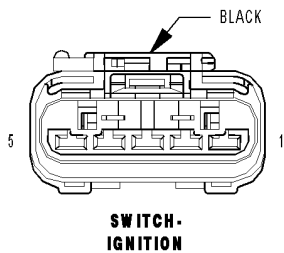
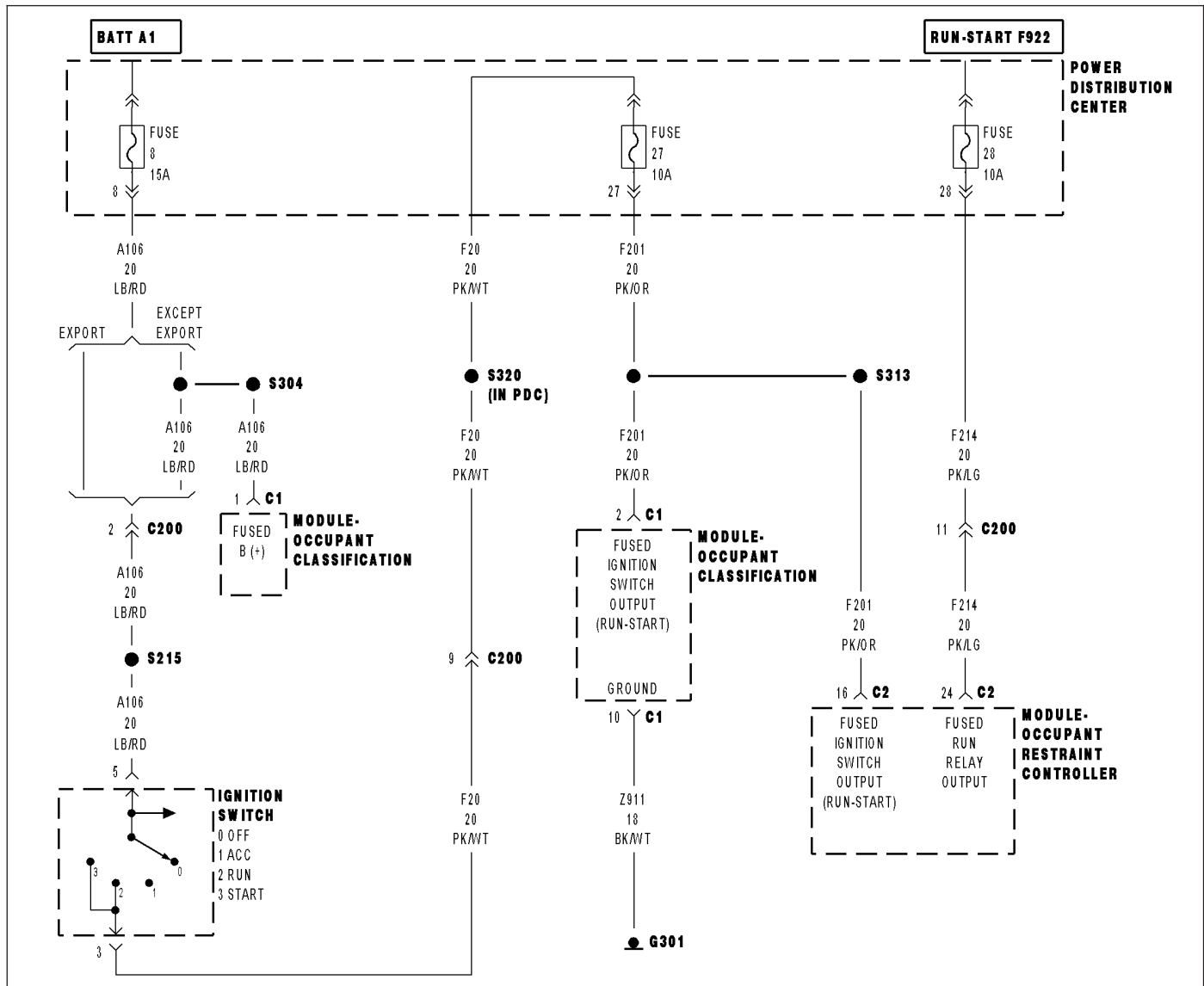
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

**No** >> No problem found Erase all codes before returning vehicle to customer.



# B2102-IGNITION RUN/START INPUT CIRCUIT HIGH



**B2102-IGNITION RUN/START INPUT CIRCUIT HIGH (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
While the CAN bus ignition status is RUN or SNA and the IOD status is "IN". The module checks the (F201) Fused Ignition Switch Output (Run-Start) circuit voltage input range.
- **Set Condition:**  
If the module detects that the ignition voltage is greater than 24.25 volts  $\pm$ 0.25 volts for 10 seconds.

Possible Causes
VEHICLE CHARGING SYSTEM VEHICLE WIRING & HARNESS CONNECTORS OCCUPANT RESTRAINT CONTROLLER

**Diagnostic Test**

**1. VERIFY THAT DTC B2102-IGNITION RUN/START INPUT CIRCUIT HIGH IS ACTIVE**

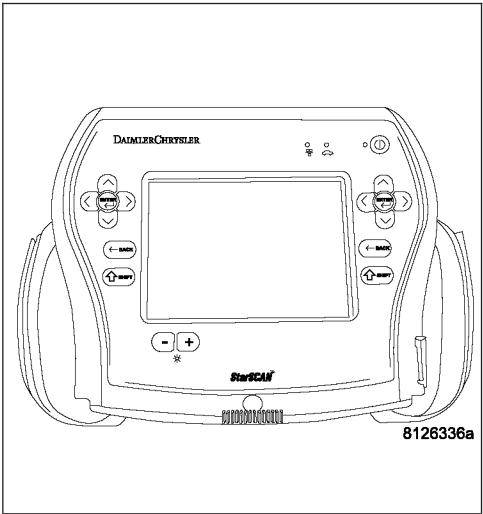
**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on, then off, and then on again.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

- Does the scan tool display active: B2102-IGNITION RUN/START INPUT CIRCUIT HIGH?**
- Yes**    >> Go To 2
- No**    >> Go To 3

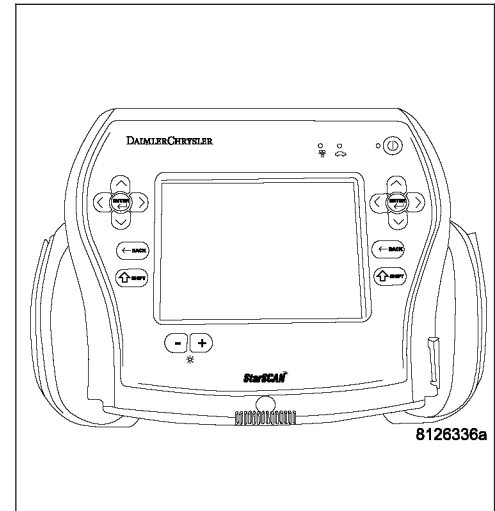


**B2102-IGNITION RUN/START INPUT CIRCUIT HIGH (CONTINUED)****2. CHECK FOR CHARGING SYSTEM RELATED DTCs IN THE POWERTRAIN CONTROL MODULE (PCM)**

With the scan tool in ECU View, select PCM and check for any Charging System related DTCs.

**Does the scan tool display any Charging System related DTCs?**

- Yes** >> Diagnose and repair the DTCs. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- No** >> Replace the ORC in accordance with the Service Information.  
Perform OCS VERIFICATION TEST - VER 1.

**3. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

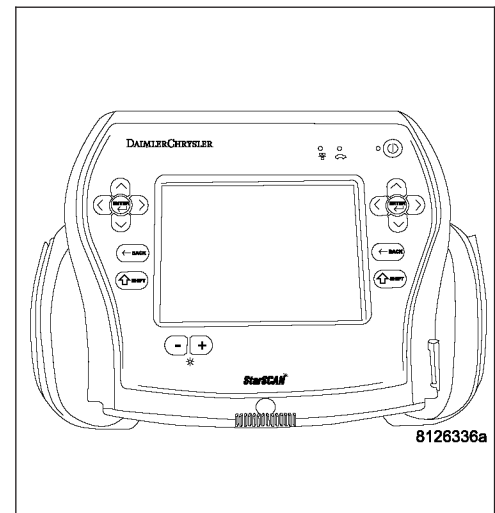
If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

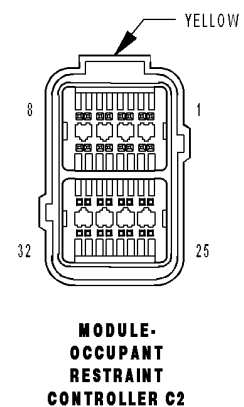
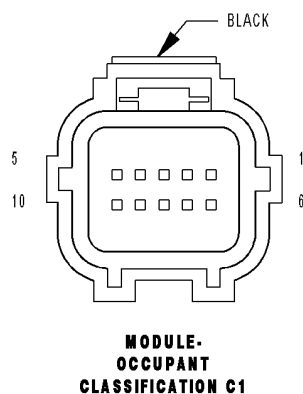
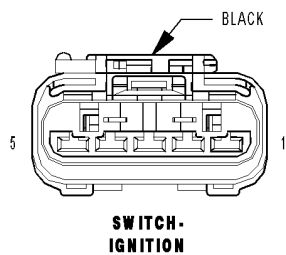
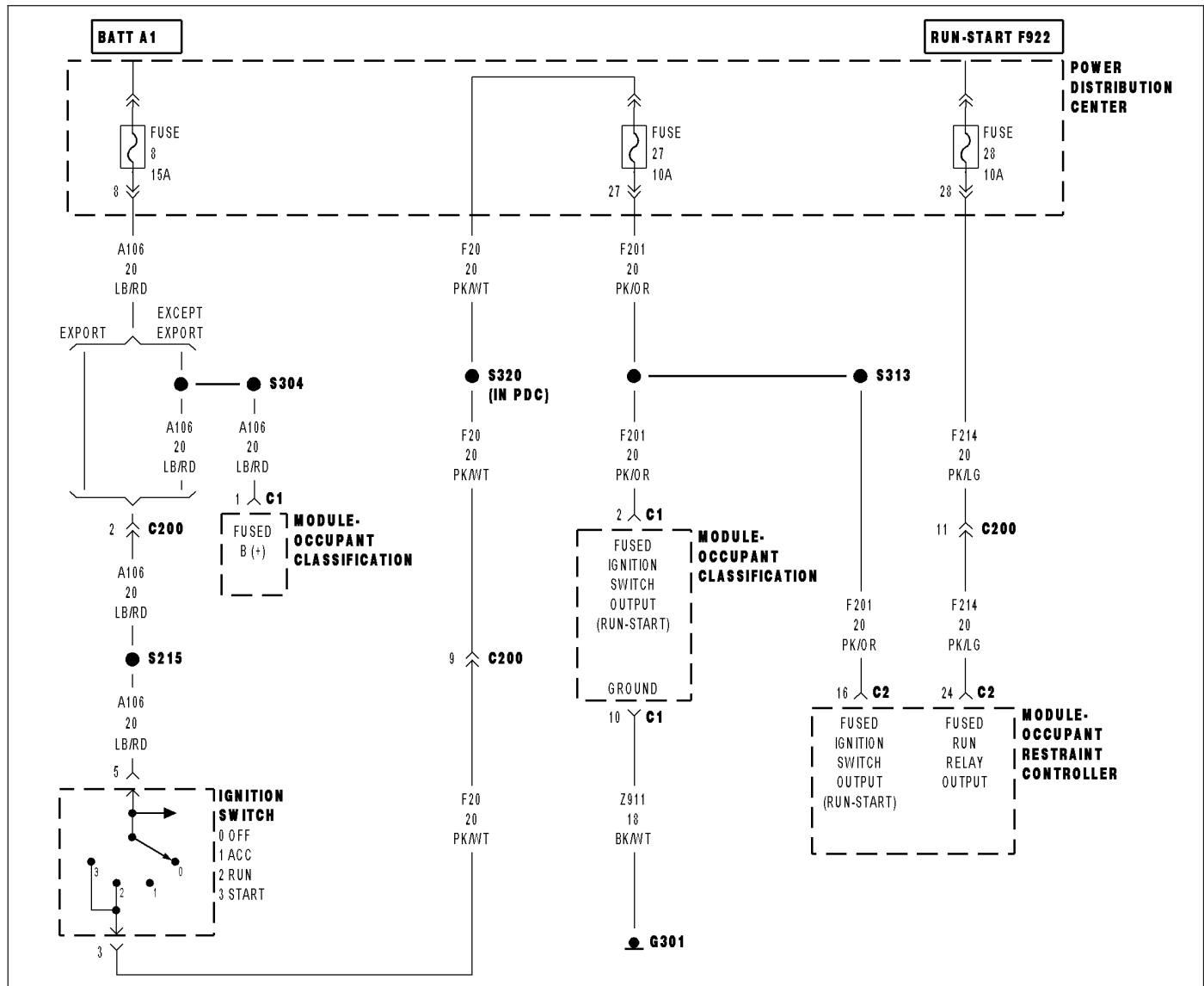
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

**Does the scan tool display any ACTIVE DTCs?**

- Yes** >> Select appropriate symptom from Symptom List.
- No** >> No problem found Erase all codes before returning vehicle to customer.



**B210D-BATTERY VOLTAGE LOW**

**B210D-BATTERY VOLTAGE LOW (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

OCM-While the CAN bus ignition status received is RUN or SNA, the module checks the (A106) Fused B+ circuit voltage input range and the (F214) Fused Run Relay Output (RUN only) circuit voltage input range.

- **Set Condition:**

OCM-If the module detects that the battery voltage is less than or equal to 6.25 volts  $\pm 0.25$  volts.

- **When Monitored:**

ORC-While the CAN bus ignition status received is RUN or SNA, the module checks the (F201) Fused Ignition Switch Output (RUN/START) circuit and the (F214) Fused Run Relay Output (RUN only) circuit voltage input range.

- **Set Condition:**

ORC-If the module detects that the battery voltage is less than or equal to 6.25 volts  $\pm 0.25$  volts on either the F201 or F214 circuits.

Possible Causes
OCM (A106) FUSED B(+) CIRCUIT
ORC (F201) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN
ORC (F214) FUSED RUN RELAY OUTPUT CIRCUIT OPEN
VEHICLE CHARGING SYSTEM
OCCUPANT CLASSIFICATION MODULE
OCCUPANT RESTRAINT CONTROLLER

## Diagnostic Test

### 1. CHECK FOR AN ACTIVE DTC

**Note:** Ensure the battery is fully charged.

**Note:** Troubleshoot any PCM charging/cranking DTCs before proceeding.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Turn the ignition on.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

**Select module and DTC type.**

**OCM Active**

Go To 2

**OCM Stored**

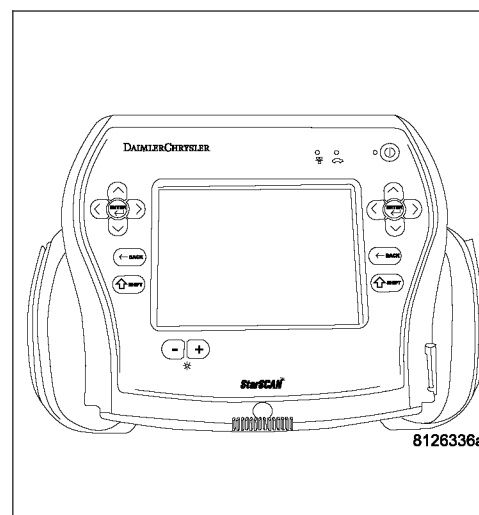
Go To 4

**ORC Active**

Go To 3

**ORC Stored**

Go To 4



**B210D-BATTERY VOLTAGE LOW (CONTINUED)****2. TEST THE VOLTAGE OF OCM (A106) FUSED B(+) AND (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUITS.**

**WARNING: WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the OCM C1 connector.

**WARNING: WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (A201) Fused Ignition Switch Output (Run-Start) circuit.

Measure the voltage of the (A106) Fused B+ circuit.

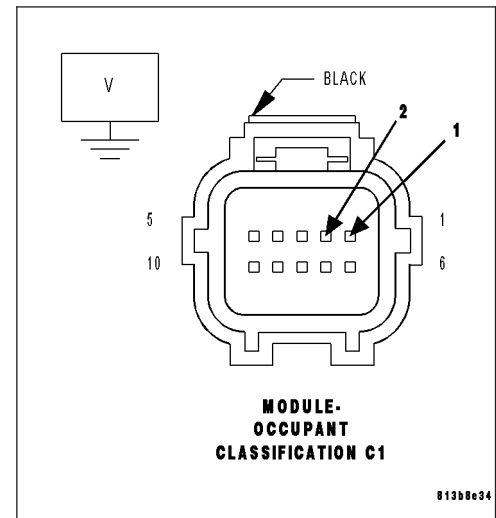
**Is the voltage above 6.75 volts on both circuits?**

**Yes** >> Replace the OCM in accordance with the service information. Perform the Occupant Classification Module System Verification Test.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Repair the (A106) FUSED B(+) and/or (F201) Fused Ignition Switch Output (Run-Start) circuits for an open.

Perform OCS VERIFICATION TEST - VER 1.

**3. MEASURE THE VOLTAGE OF ORC (F201) FUSED IGNITION SWITCH OUTPUT (RUN/START) AND (F214) FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUITS**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the ORC C1 connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the F201 and F214 circuits.

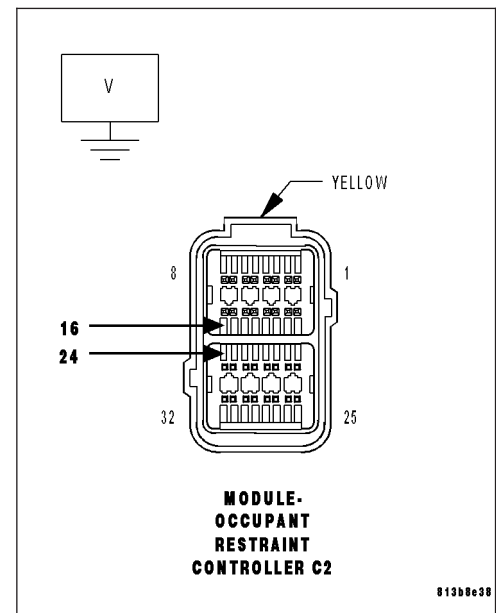
**Is the voltage above 6.75 volts on both circuits?**

**Yes** >> Replace the ORC in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1.

**No** >> Repair the appropriate circuit or circuits for an open.

Perform ORC VERIFICATION TEST - VER 1.



**B210D-BATTERY VOLTAGE LOW (CONTINUED)****4. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

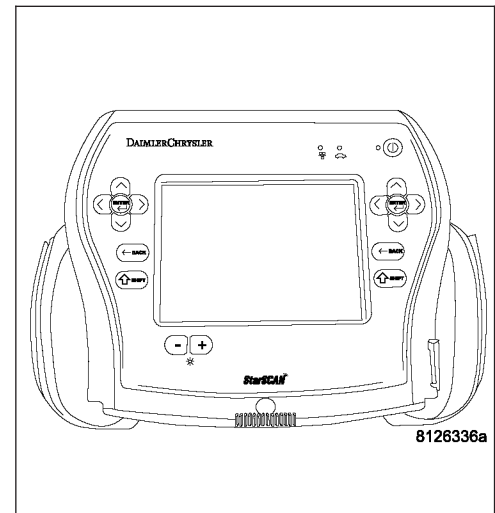
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

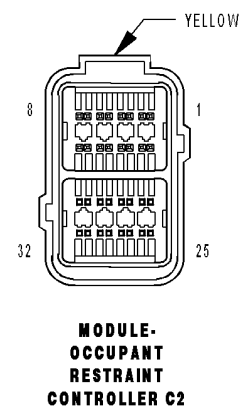
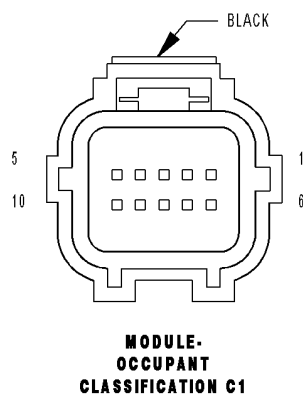
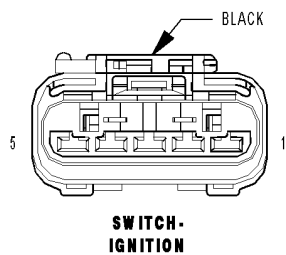
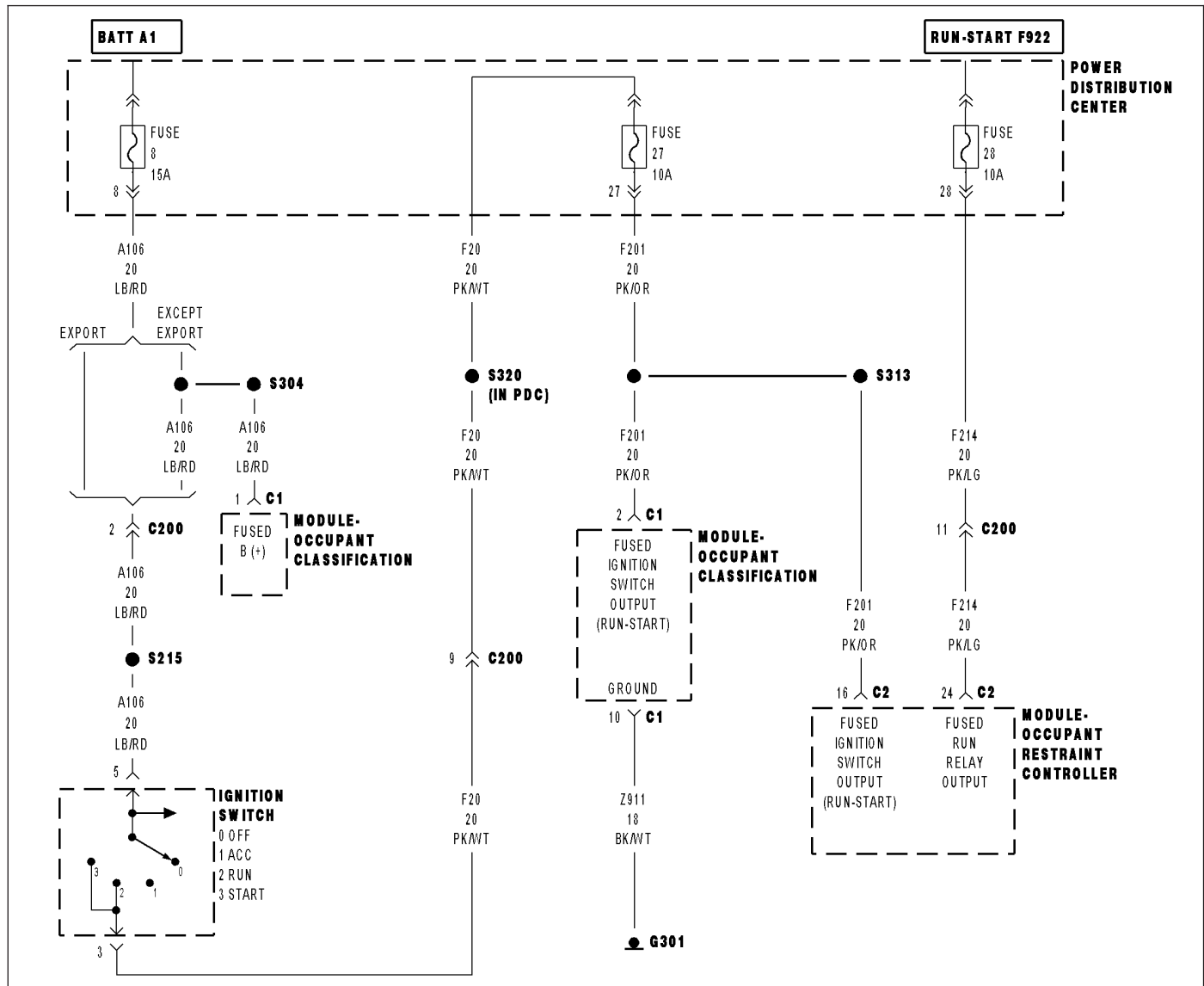
**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

**No** >> No problem found Erase all codedxcxs before returning vehicle to customer.





**B210E-BATTERY VOLTAGE HIGH**

**B210E-BATTERY VOLTAGE HIGH (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

While the CAN bus ignition status received is RUN or SNA, the module checks the (A106) Fused B+ circuit voltage input range.

- **Set Condition:**

If the module detects that the battery voltage is greater than or equal to 24.25 volts  $\pm 0.25$  volts for 10 seconds.

Possible Causes
VEHICLE CHARGING SYSTEM
OCCUPANT CLASSIFICATION MODULE (OCM)

**Diagnostic Test****1. CHECK FOR AN ACTIVE DTC**

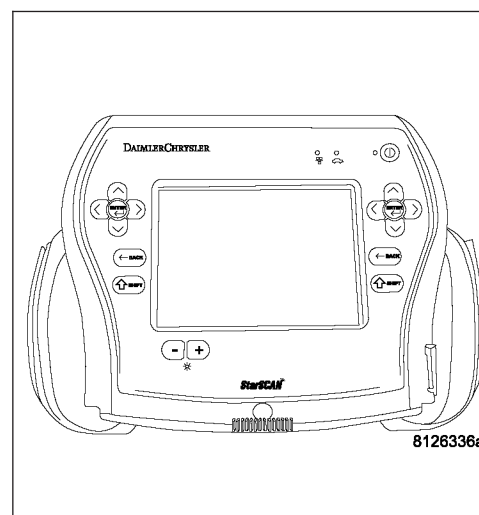
Turn the ignition on, then off, and then on again.

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B210E-BATTERY VOLTAGE HIGH?**

**Yes** >> Go To 2

**No** >> Go To 4

**2. CHECK THE BATTERY VOLTAGE TO THE OCCUPANT CLASSIFICATION MODULE**

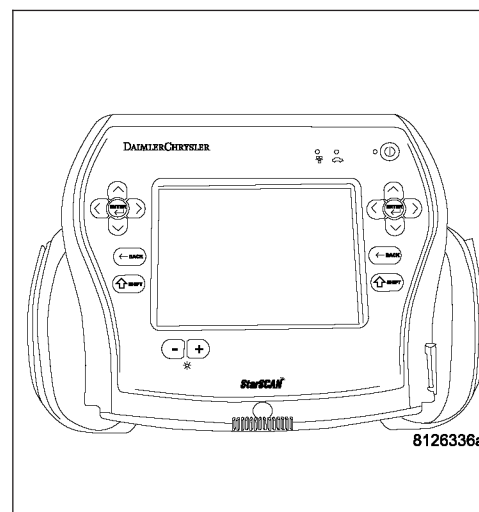
With the scan tool in Data Display, read OCM battery voltage.

**Is the battery voltage greater than 24.25 volts  $\pm 0.25$  volts?**

**Yes** >> Go To 3—

**No** >> Replace the OCM in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

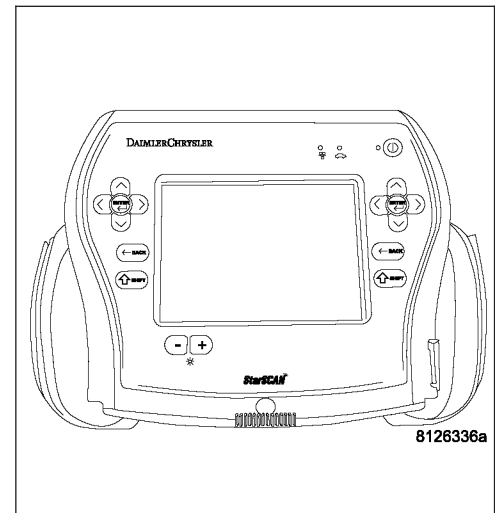


**B210E-BATTERY VOLTAGE HIGH (CONTINUED)****3. CHECK FOR CHARGING SYSTEM RELATED DTCs IN THE POWERTRAIN CONTROL MODULE (PCM)**

With the scan tool in ECU View, select PCM and check for any Charging System related DTCs.

**Does the scan tool display any Charging System related DTCs?**

- Yes** >> Diagnose and repair the DTCs. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- No** >> Replace the OCM in accordance with the Service Information.  
Perform OCS VERIFICATION TEST - VER 1.

**4. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

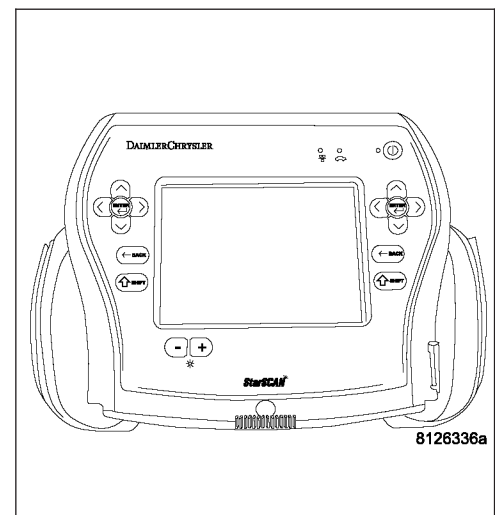
If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

If only stored codes return, continue the test until the problem area has been isolated.

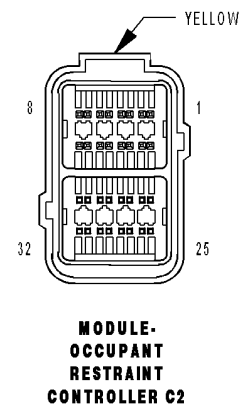
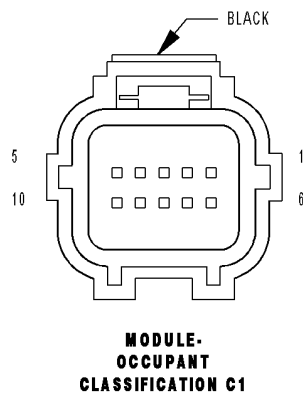
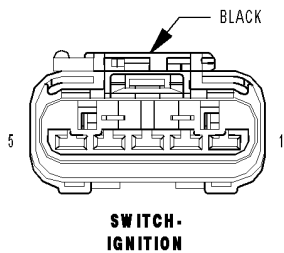
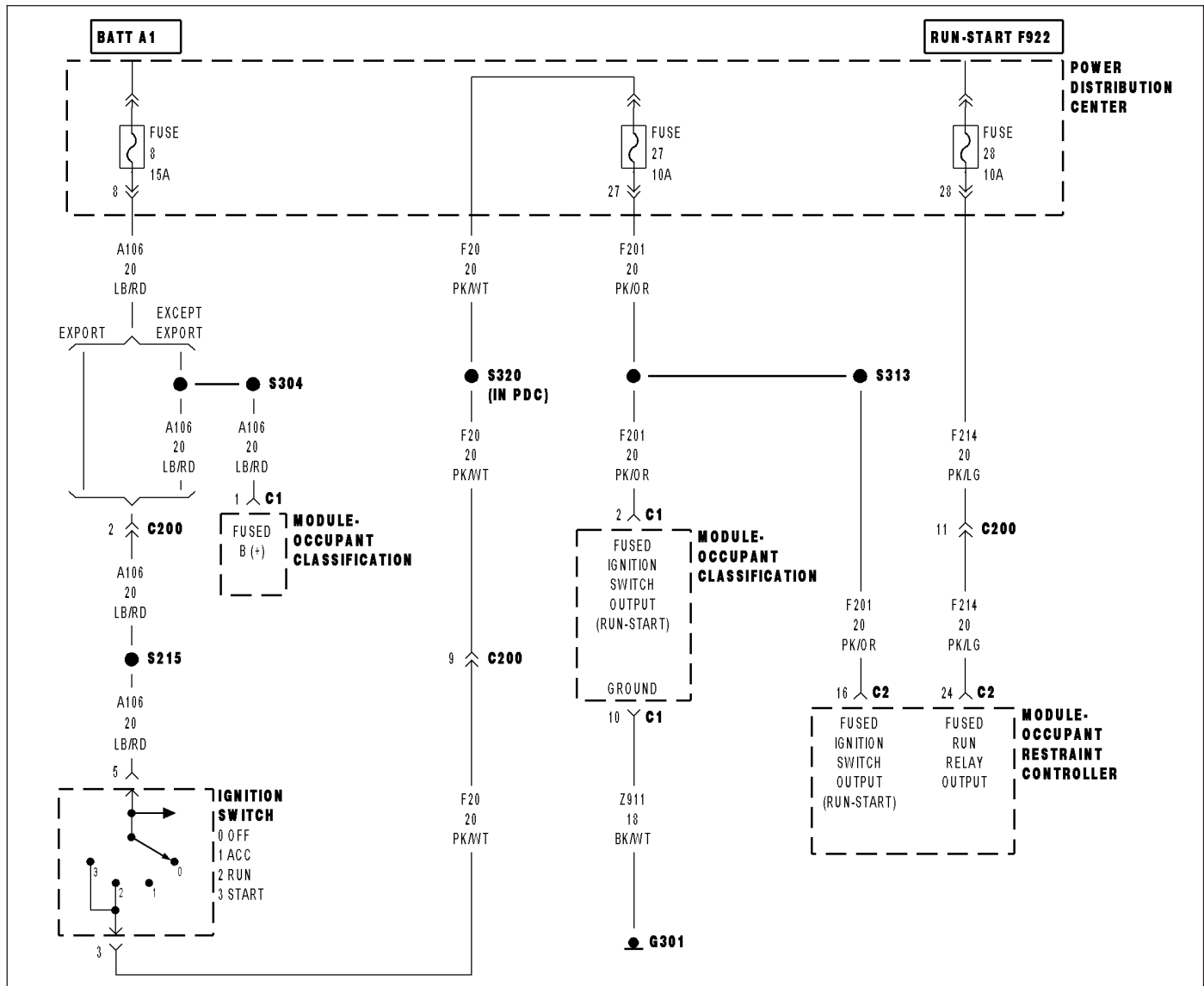
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

**Does the scan tool display any ACTIVE DTCs?**

- Yes** >> Select appropriate symptom from Symptom List.
- No** >> No problem found Erase all codes before returning vehicle to customer.



# B212C-IGNITION RUN/START INPUT CIRCUIT OPEN



**B212C-IGNITION RUN/START INPUT CIRCUIT OPEN (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition in the Run-Start position.
- **Set Condition:**  
If voltage on the (F201) Fused Ignition Switch Output (Run-Start) circuit drops below 6.0 volts.

Possible Causes
(F20) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
(F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORTED TO GROUND
OPEN FUSE (27)
(F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
OCCUPANT CLASSIFICATION MODULE (OCM)
OCCUPANT RESTRAINT CONTROLLER (ORC)

**Diagnostic Test****1. VERIFY THAT DTC B212C IGNITION RUN/START INPUT CIRCUIT OPEN IS ACTIVE IN THE ORC.**

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

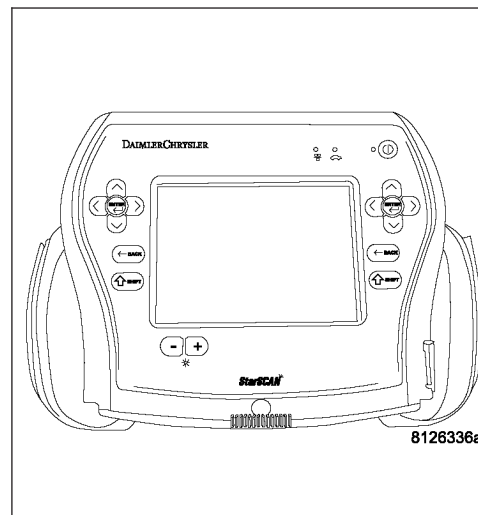
Turn the ignition on.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

**Does the scan tool display active: B212C IGNITION RUN/START INPUT CIRCUIT OPEN?**

**Yes**     >> Go To 3

**No**     >> Go To 2



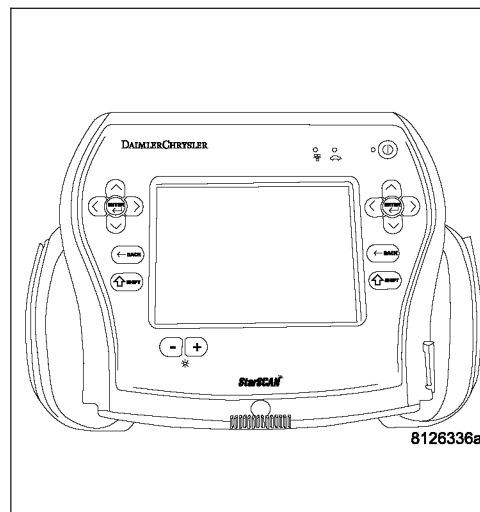
**B212C-IGNITION RUN/START INPUT CIRCUIT OPEN (CONTINUED)****2. CHECK FOR ACTIVE DTC B212C IGNITION RUN/START INPUT CIRCUIT OPEN IN OCM.**

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display active: B212C IGNITION RUN/START INPUT CIRCUIT OPEN?**

**Yes** >> Go To 3

**No** >> Go To 11

**3. INSPECT AIRBAG RUN-START FUSE**

Turn the ignition off.

Remove the Airbag Run-Start Fuse from the rear Power Distribution Center and inspect the fuse.

**Note: Check connectors - Clean and repair as necessary.**

**Is the Run/Start fuse open?**

**Yes** >> Go To 4

**No** >> Go To 7

**4. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE**

Measure the resistance of the (F201) Fused Ignition Switch Output (Run-Start) circuit between ground and the Airbag Run-Start fuse terminal (output side).

**Is the resistance below 100.0 ohms?**

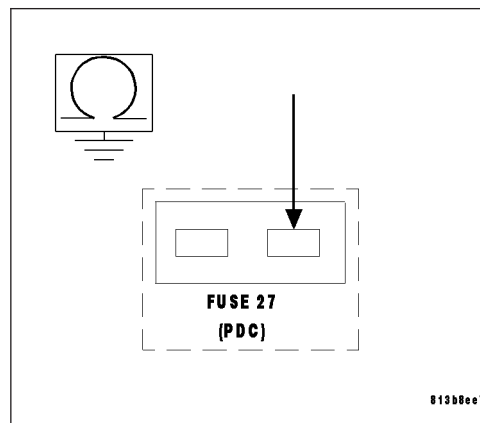
**Yes** >> Go To 5

**No** >> Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Replace Airbag Run-Start Fuse.

Perform ORC VERIFICATION TEST - VER 1.

Perform OCS VERIFICATION TEST - VER 1.



**B212C-IGNITION RUN/START INPUT CIRCUIT OPEN (CONTINUED)****5. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE WITH ORC CONNECTORS DISCONNECTED**

**WARNING:** If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the both ORC connectors.

**Note:** Check connectors - Clean and repair as necessary.

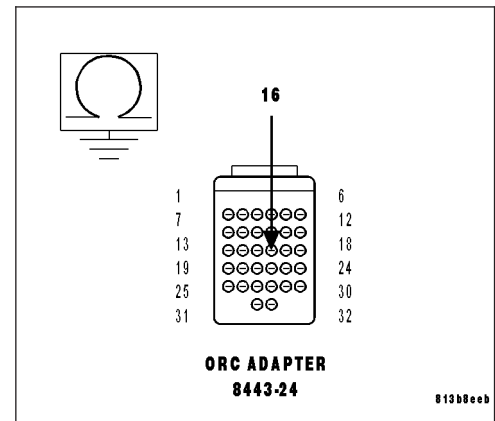
Connect the Load Tool ORC 8443-24 Adaptor to the ORC C2 connector.

Measure the resistance of the (F201) Fused Ignition Switch Output (Run-Start) circuit between 8443-24 adaptor and ground).

**Is the resistance below 100.0 ohms?**

**Yes** >> Go To 6

**No** >> Replace the ORC in accordance with the Service Information.  
Replace the Airbag Run-Start Fuse.  
Perform ORC VERIFICATION TEST - VER 1.  
Perform OCS VERIFICATION TEST - VER 1.

**6. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT RESISTANCE WITH OCM C1 CONNECTOR DISCONNECTED**

**WARNING:** If the Occupant Classification Module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

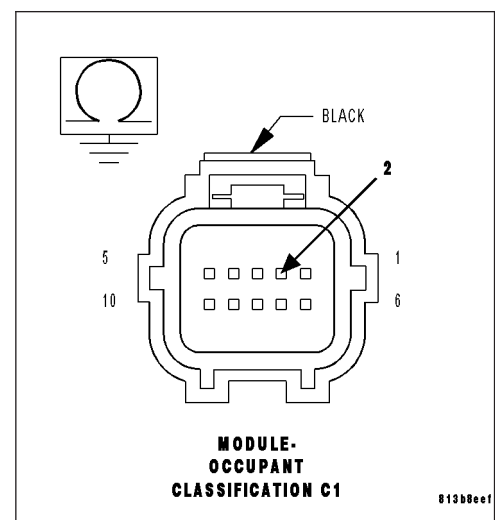
Disconnect the OCM C1 connector.

Measure the resistance of the (F201) Fused Ignition Switch Output (Run-Start) circuit between ground and the Airbag Run-Start fuse terminal (output side).

**Is the resistance below 100.0 ohms?**

**Yes** >> Repair the (F201) Fused Ignition Switch Output (Run-Start) circuit for a short to ground.  
Replace the Airbag Run-Start Fuse.  
Perform ORC VERIFICATION TEST - VER 1.  
Perform OCS VERIFICATION TEST - VER 1.

**No** >> Replace the OCM in accordance with the Service Information.  
Replace the Airbag Run-Start Fuse.  
Perform ORC VERIFICATION TEST - VER 1.  
Perform OCS VERIFICATION TEST - VER 1.



**B212C-IGNITION RUN/START INPUT CIRCUIT OPEN (CONTINUED)****7. CHECK (F201) IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN**

Turn the ignition on.

Measure the voltage of the (F20) Ignition Switch Output (Run-Start) circuit at the Airbag Run-Start fuse terminal (supply side).

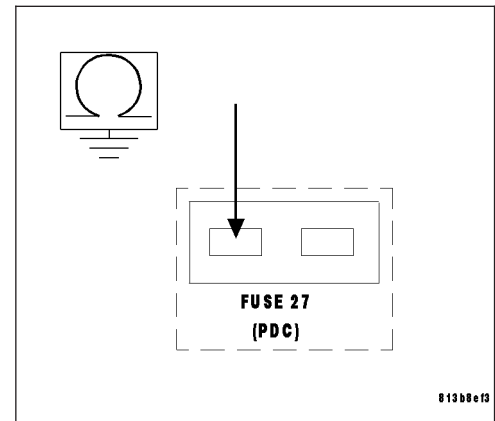
**Is the voltage above 6.0 volts?**

**Yes** >> Go To 8

**No** >> Repair the open (F20) Ignition Switch Output (Run-Start) circuit.

Perform ORC VERIFICATION TEST - VER 1.

Perform OCS VERIFICATION TEST - VER 1.

**8. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN**

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Reinstall the Airbag Run-Start Fuse.

Disconnect the both ORC connectors.

**Note: Check connectors - Clean and repair as necessary.**

Install the Airbag Load tool ORC 8443-24 adaptor to the ORC C2 connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

Measure the voltage of the (F201) Fused Ignition Switch Output (Run-Start) Circuit between the 8443-24 connector and ground.

**Is the voltage above 6.0 volts?**

**Yes** >> Replace the ORC in accordance with the Service Information.

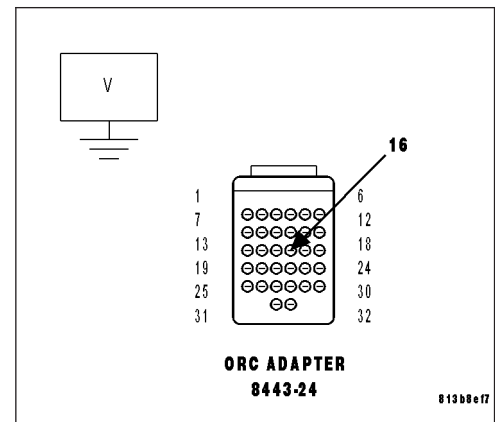
Perform ORC VERIFICATION TEST - VER 1.

Perform OCS VERIFICATION TEST - VER 1 if DTC B210C IGNITION RUN/START INPUT CIRCUIT OPEN was Active in the OCM.

**No** >> Repair the open (F201) Fused Ignition Switch Output (Run-Start) circuit.

Perform ORC VERIFICATION TEST - VER 1.

Perform OCS VERIFICATION TEST - VER 1 if DTC B210C IGNITION RUN/START INPUT CIRCUIT OPEN was Active in the OCM.





**B212C-IGNITION RUN/START INPUT CIRCUIT OPEN (CONTINUED)****9. CHECK (F201) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding. Reinstall the Airbag Run-Start Fuse.

Disconnect the both Occupant Classification Module (OCM) connectors.

**Note:** Check connectors - Clean and repair as necessary.

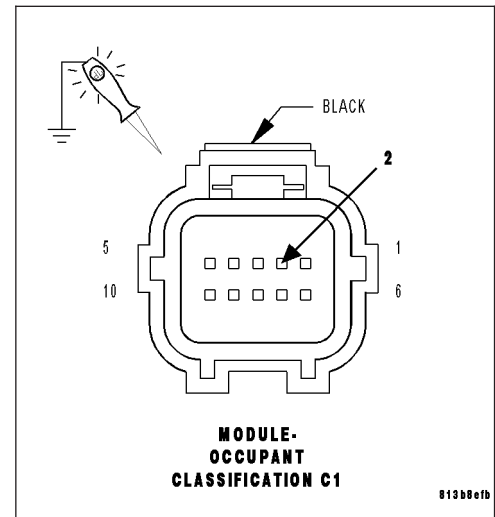
**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (F201) Fused Ignition Switch Output (Run-Start) Circuit between the OCM connector and ground.

**Is the voltage above 6.0 volts?**

**Yes** >> Go To 10

**No** >> Repair the open (F201) Fused Ignition Switch Output (Run-Start) circuit between the OCM and the splice.  
Perform ORC VERIFICATION TEST - VER 1.  
Perform OCS VERIFICATION TEST - VER 1.

**10. VERIFY THAT DTC B212C IGNITION RUN/START DTC IS ACTIVE.**

Reconnect both Occupant Restraints Controller (ORC) connectors.

Reconnect both Occupant Classification Module (OCM) connectors.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs and Occupant Classification Module (OCM) DTCs.

**Select the module displaying the active: B212C IGNITION RUN/START INPUT CIRCUIT OPEN?**

**Occupant Restraint Controller (ORC)**

Replace the Occupant Restraint Controller (ORC) in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1.

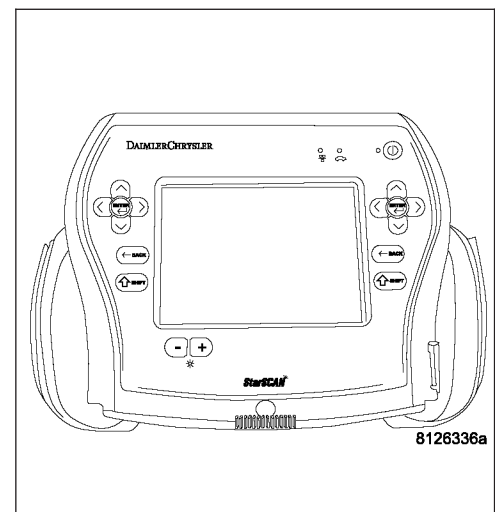
Perform OCS VERIFICATION TEST - VER 1 if DTC B212C IGNITION RUN/START INPUT CIRCUIT OPEN was Active in the OCM.

**Occupant Classification Module (OCM)**

Replace the Occupant Classification Module (OCM) in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1.

Perform OCS VERIFICATION TEST - VER 1 if DTC B212C IGNITION RUN/START INPUT CIRCUIT OPEN was Active in the OCM.



**B212C-IGNITION RUN/START INPUT CIRCUIT OPEN (CONTINUED)****11. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

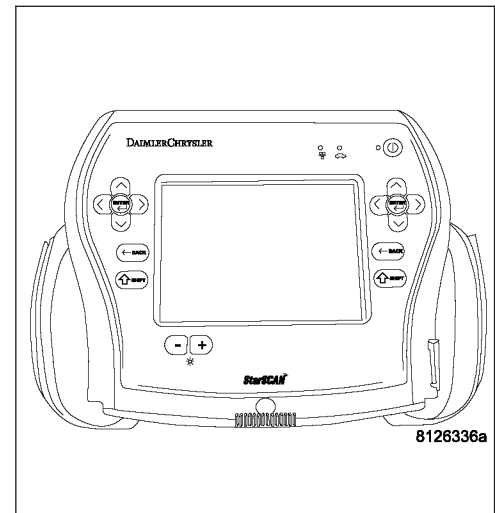
If only stored codes return, continue the test until the problem area has been isolated.

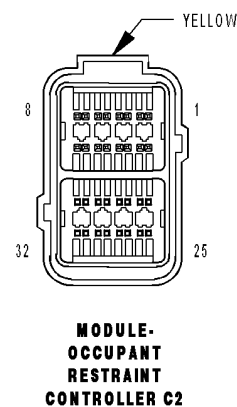
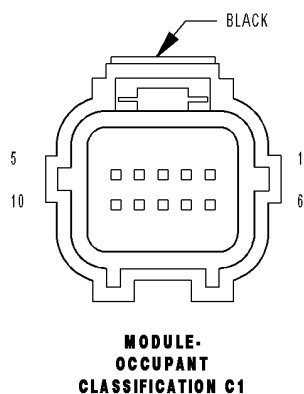
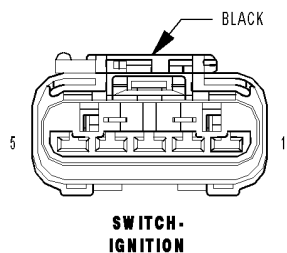
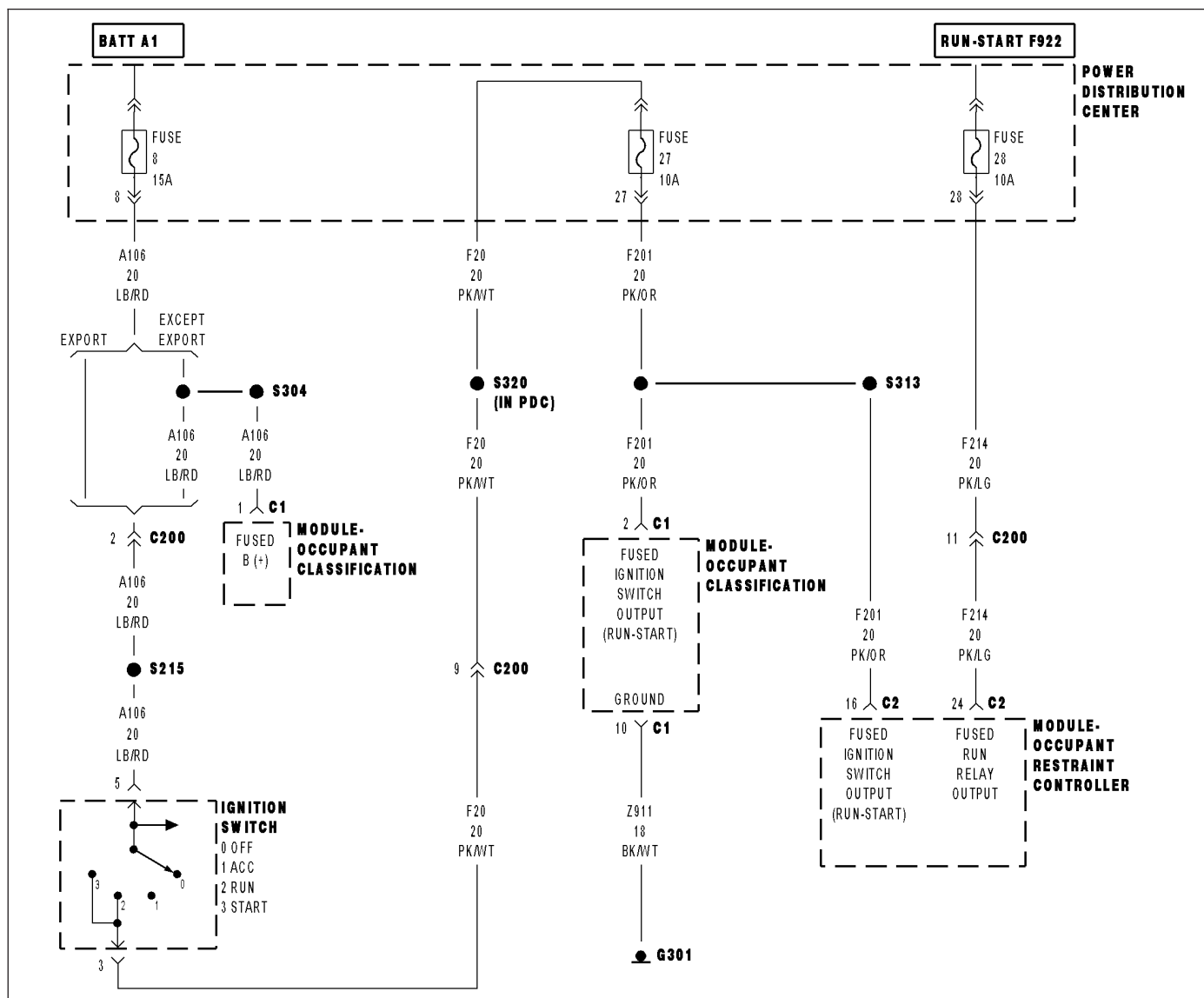
In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

**No** >> No problem found Erase all codes before returning vehicle to customer.



**B212D-IGNITION RUN ONLY INPUT CIRCUIT OPEN**

**B212D-IGNITION RUN ONLY INPUT CIRCUIT OPEN (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition in the Run position.
- **Set Condition:**  
If voltage on the (F214) Fused Run Relay Output circuit drops below 6.0 volts.

Possible Causes
RUN RELAY CONTROL CIRCUIT RUN RELAY INOPERATIVE OR OPEN TERMINAL 87 POWER DISTRIBUTION CENTER (F922) RUN RELAY CIRCUIT OPEN FUSE 28 OPEN (F214) FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR SHORTED TO GROUND OCCUPANT RESTRAINT CONTROLLER (ORC)

**Diagnostic Test****1. VERIFY THAT DTC B212D IGNITION RUN ONLY INPUT CIRCUIT OPEN IS ACTIVE**

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

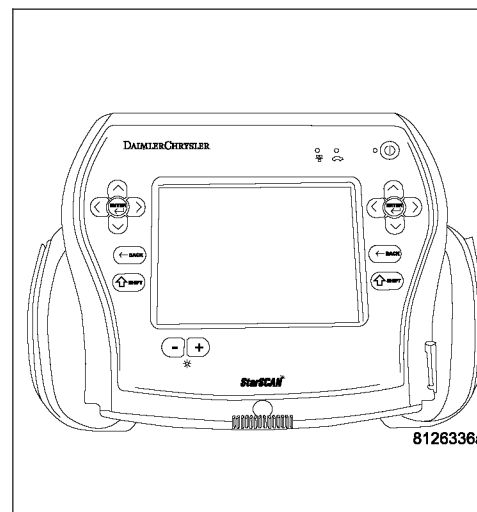
Turn the ignition on.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

**Does the scan tool display active: B212D IGNITION RUN ONLY INPUT CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> Go To 9



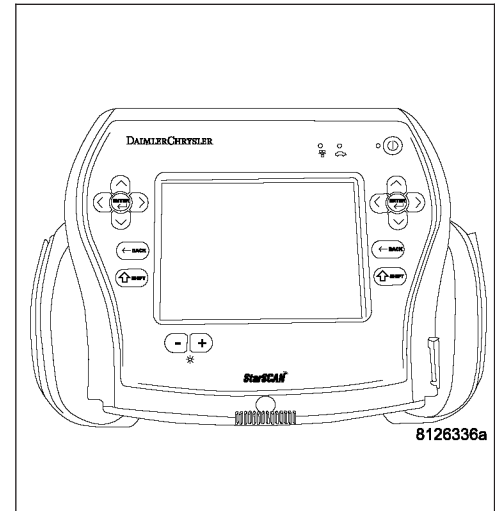
**B212D-IGNITION RUN ONLY INPUT CIRCUIT OPEN (CONTINUED)****2. CHECK FOR ACTIVE FCM RUN RELAY CONTROL CIRCUIT DTC**

With the scan tool, read Front Control Module (FCM) DTCs.

**Does the scan tool display active: B2122, B2123 or B2124 DTC's?**

**Yes** >> (Refer to 8 - ELECTRICAL/IGNITION CONTROL - DIAGNOSIS AND TESTING - B2122), (Refer to 8 - ELECTRICAL/IGNITION CONTROL - DIAGNOSIS AND TESTING - B2123), (Refer to 8 - ELECTRICAL/IGNITION CONTROL - DIAGNOSIS AND TESTING - B2124).

**No** >> Go To 3

**3. INSPECT AIRBAG RUN CIRCUIT FUSE**

Turn the ignition off.

Remove the Airbag Run Circuit Fuse No. 28 from the Power Distribution Center and inspect the fuse.

**Note: Check connectors - Clean and repair as necessary.**

**Is the fuse open?**

**Yes** >> Go To 4

**No** >> Go To 6

**4. CHECK (F214) FUSED RUN RELAY OUTPUT CIRCUIT RESISTANCE**

Measure the resistance of the (F214) Run Relay Output circuit between the Airbag Run Relay Output Circuit fuse No. 28 (supply side) terminal and ground.

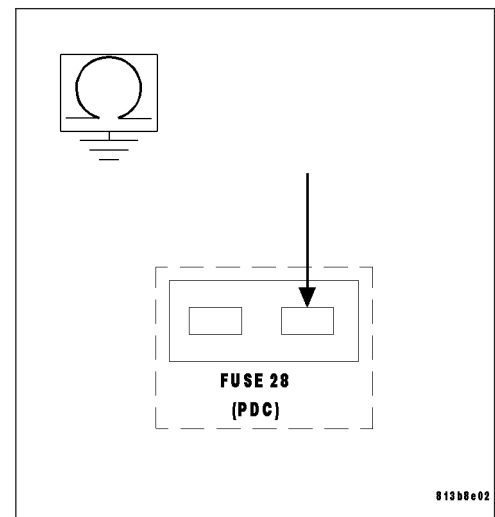
**Is the resistance below 100.0 ohms?**

**Yes** >> Go To 5

**No** >> Using the wiring diagram/schematic as a guide, inspect the related wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

Replace Airbag Run Circuit Fuse.

Perform ORC VERIFICATION TEST - VER 1.



**B212D-IGNITION RUN ONLY INPUT CIRCUIT OPEN (CONTINUED)****5. CHECK (F214 ) FUSED RUN RELAY OUTPUT CIRCUIT RESISTANCE WITH ORC C2 CONNECTOR DISCONNECTED**

**WARNING:** If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the ORC C1 connector.

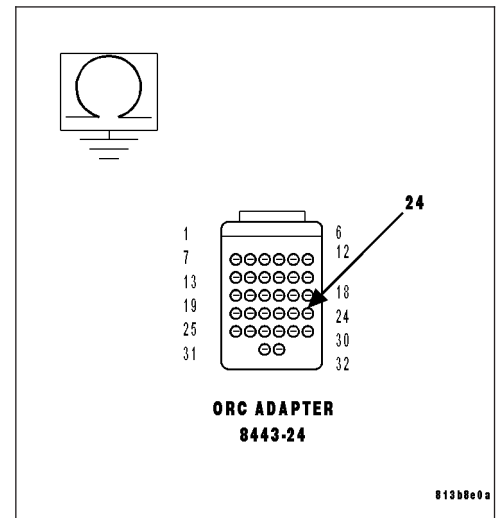
**Note:** Check connectors - Clean and repair as necessary.

Connect the appropriate Load Tool ORC 8443-24 Adaptor to the ORC connector.

Measure the resistance of the (F214) Fused Run Relay Output circuit between 8443-24 adaptor and ground.

**Is the resistance below 100.0 ohms?**

- Yes** >> Repair the (F214) Fused Run Relay Output circuit for a short to ground.  
 Replace the Airbag Run Circuit Fuse.  
 Perform ORC VERIFICATION TEST - VER 1.
- No** >> Replace the ORC in accordance with the Service Information.  
 Replace the Airbag Run Circuit Fuse.  
 Perform ORC VERIFICATION TEST - VER 1.

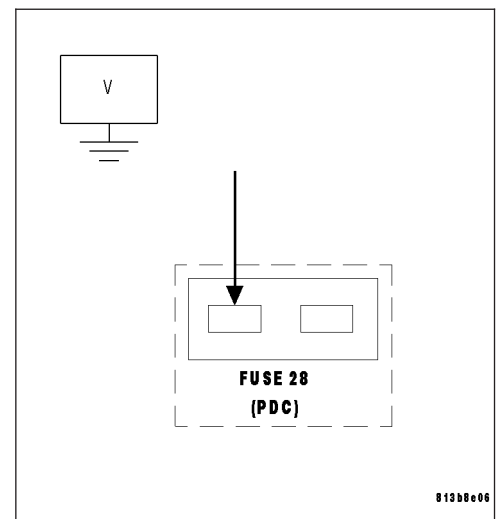
**6. CHECK (F922) RUN RELAY OUTPUT CIRCUIT VOLTAGE**

Turn the ignition on.

Measure the voltage of the (F922) Run Relay Output circuit at the Airbag Run Circuit fuse terminal (supply side).

**Is the voltage above 6.0 volts?**

- Yes** >> Go To 7
- No** >> Go To 8



**B212D-IGNITION RUN ONLY INPUT CIRCUIT OPEN (CONTINUED)****7. CHECK (F214) FUSED RUN RELAY OUTPUT CIRCUIT FOR AN OPEN**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Reinstall the Airbag Run Circuit Fuse.

Disconnect the ORC C1 connector.

**Note:** Check connectors - Clean and repair as necessary.

Connect the Airbag Load Tool ORC 8443-24 Adaptor to the ORC C1 harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

Measure the voltage of the (F214) Fused Run Relay Output Circuit between the 8443-24 adaptor and ground.

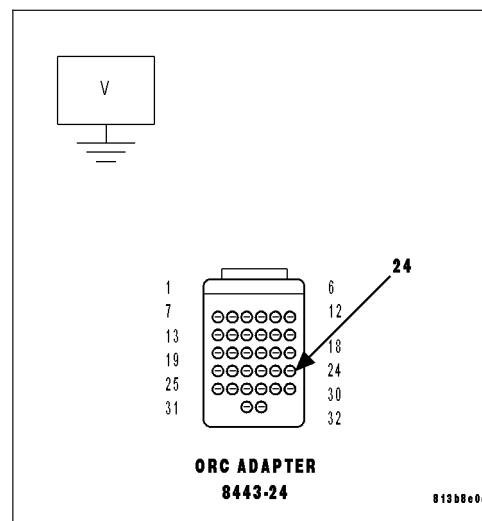
**Is the voltage above 6.0 volts?**

**Yes** >> Replace the ORC in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1.

**No** >> Repair the open (F214) Fused Run Relay Output circuit.

Perform ORC VERIFICATION TEST - VER 1.

**8. CHECK RUN RELAY INOPERATIVE OR OPEN OUTPUT**

Turn the ignition off.

Reinstall the Airbag Run Circuit Fuse.

Disconnect the Run Relay.

**Note:** Check connectors - Clean and repair as necessary.

Replace the Run Relay with a known good relay.

Turn the ignition on.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

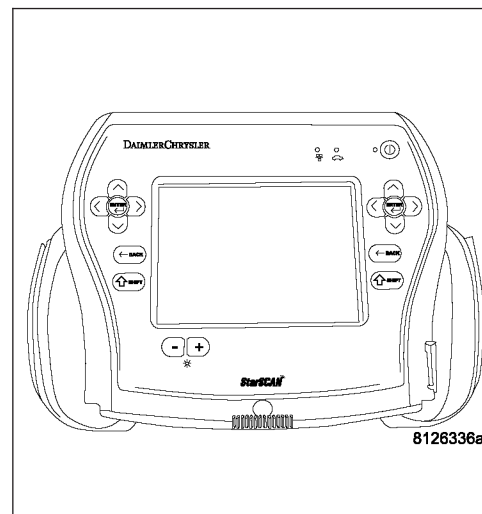
**Does the scan tool display active: B212D IGNITION RUN ONLY INPUT CIRCUIT OPEN?**

**Yes** >> Repair the open (F922) Run Relay Output circuit.

Perform ORC VERIFICATION TEST - VER 1.

**No** >> Remove the test relay and Replace the Airbag Run Relay.

Perform ORC VERIFICATION TEST - VER 1.



**B212D-IGNITION RUN ONLY INPUT CIRCUIT OPEN (CONTINUED)****9. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTCs from all Airbag modules. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING: To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.**

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

With the scan tool, monitor active codes as you work through the following steps.

**WARNING: To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.**

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

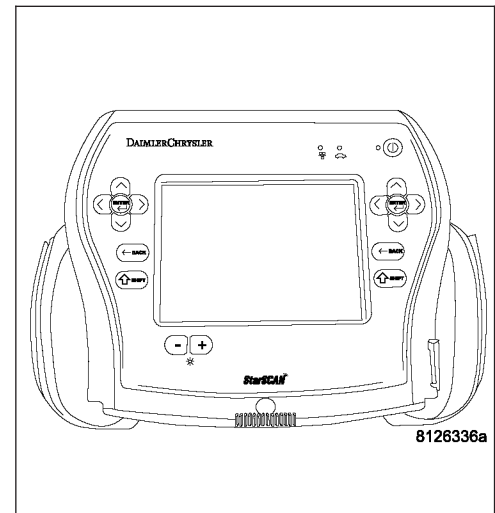
If only stored codes return, continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting the active DTC in question.

**Does the scan tool display any ACTIVE DTCs?**

**Yes** >> Select appropriate symptom from Symptom List.

**No** >> No problem found Erase all codes before returning vehicle to customer.





## B2201-CALIBRATION MISMATCH

- **When Monitored:**

With the Ignition on.

- **Set Condition:**

This DTC will be set when the VIN stored in the PCM does not match the VIN stored in the Occupant Restraint Controller (ORC). The ORC does not support a stored B2201 DTC.

Possible Causes
INCORRECT PCM
OCCUPANT RESTRAINT CONTROLLER (ORC)

### Diagnostic Test

#### 1. VERIFY THAT DTC B2201-CALIBRATION MISMATCH IS ACTIVE

Turn the ignition on.

With the scan tool, read ORC DTCs.

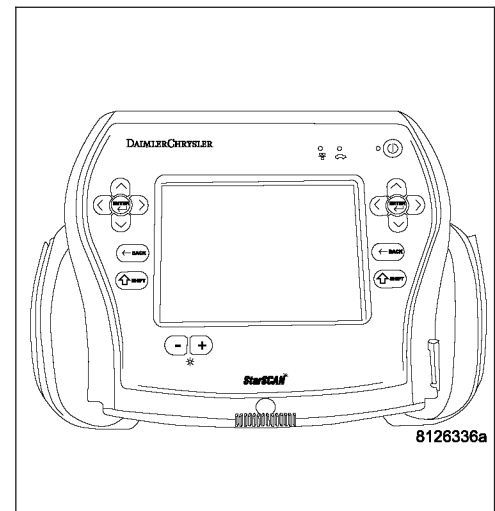
**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

Does the scan tool display active: B2201-CALIBRATION MISMATCH?

**Yes**    >> Go To 2

**No**    >> Test Complete.



#### 2. CHECK VIN IN PCM

With the scan tool compare the VIN that is programmed into the PCM to the VIN stored in the ORC.

Does the VIN programmed into the PCM match the VIN stored in the ORC?

**Yes**    >> Go To 3

**No**    >> Replace and program the Powertrain Control Module in accordance with the service information. Ensure the PCM is replaced with the correct vehicle line PCM.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

## B2201-CALIBRATION MISMATCH (CONTINUED)

### 3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

View repair.

#### Repair

Replace the Occupant Restraint Controller in accordance with the service information.  
Perform the ORC VERIFICATION TEST-VER 1.

---

## B2205-ORIGINAL VIN MISSING/MISMATCH

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Occupant Restraint Controller will receive and monitor the VIN message from the PCM and record the VIN if different from the last VIN.

Possible Causes
INCORRECT VIN PROGRAMMED IN PCM
OCCUPANT RESTRAINT CONTROLLER

### Diagnostic Test

#### 1. VERIFY THAT DTC B2205-ORIGINAL VIN MISSING/MISMATCH

Turn the ignition on.

With the scan tool, read ORC DTCs.

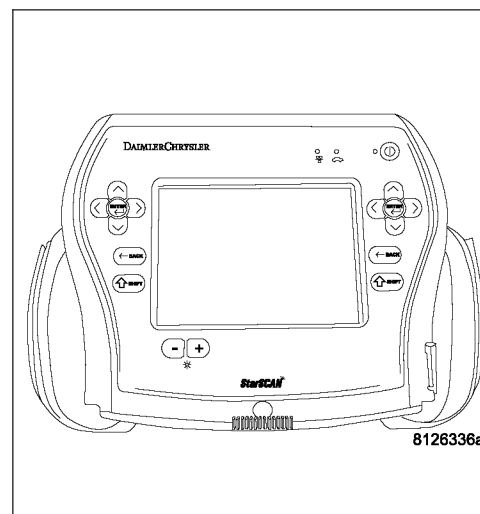
**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

**Does the scan tool display active :B2205-ORIGINAL VIN MISSING/MISMATCH?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition.  
Visually inspect the related wiring harness connectors.  
Look for broken, bent, pushed out, or corroded terminals.



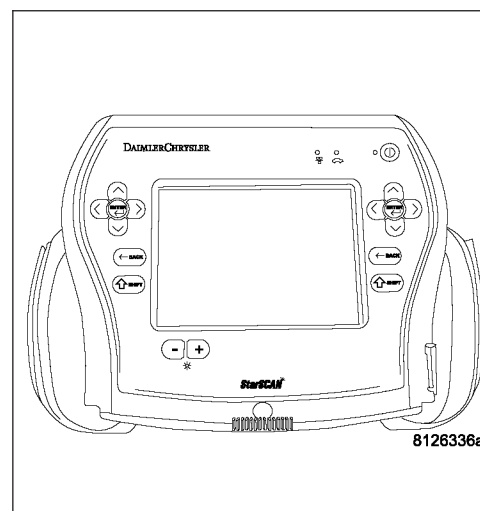
#### 2. CHECK VIN IN PCM

With the scan tool compare the VIN that is programmed into the PCM to the VIN on the vehicle.

**Does the VIN programmed into the PCM match the vehicles VIN?**

**Yes** >> Go To 3

**No** >> Replace the Powertrain Control Module in accordance with Service Information.  
Perform the (NGC) POWERTRAIN VERIFICATION TEST-VER. 1



**B2205-ORIGINAL VIN MISSING/MISMATCH (CONTINUED)**

**3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

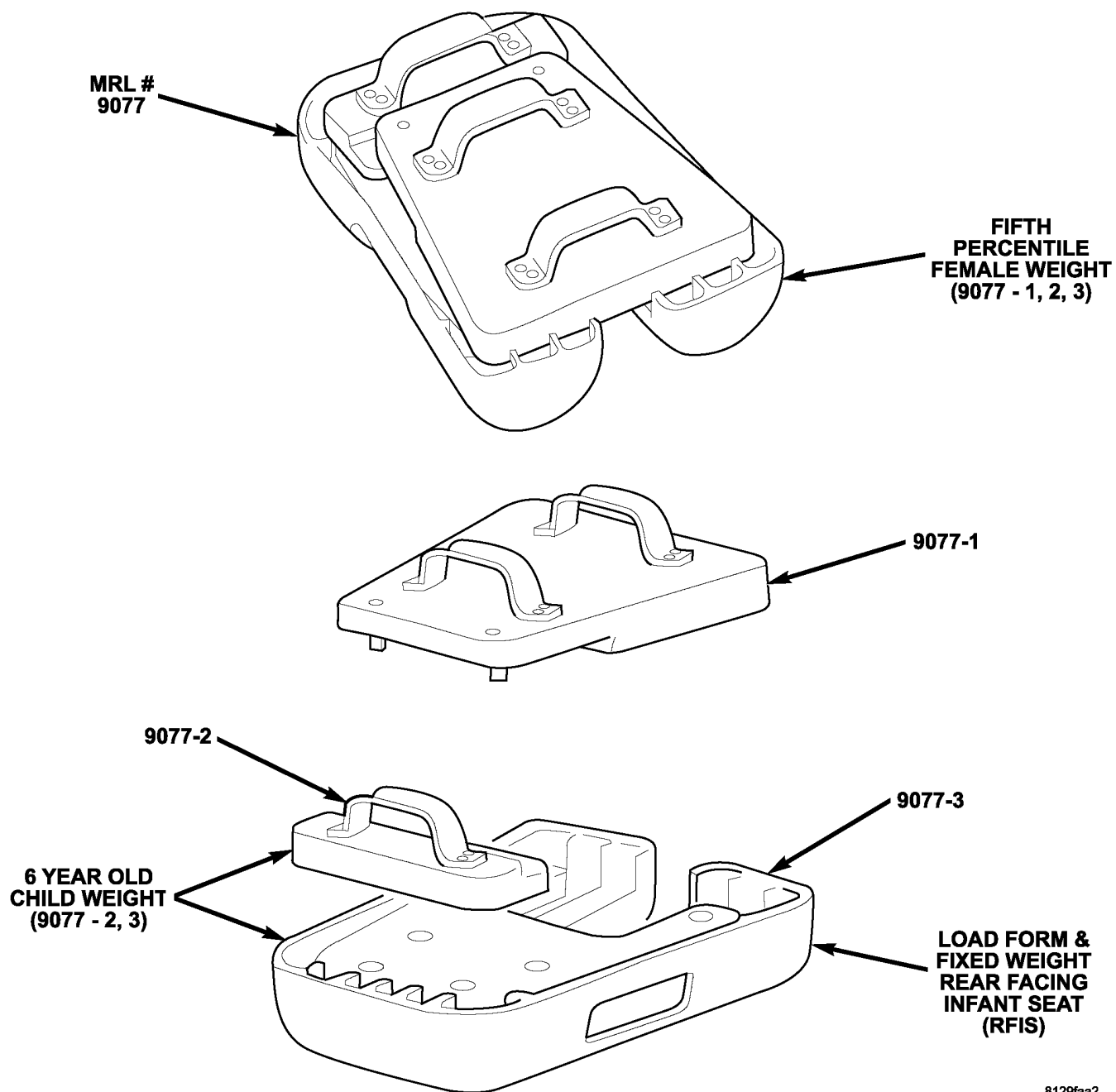
**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**View repair.**

**Repair**

Replace the Occupant Restraint Controller in accordance with the service information.  
Perform the ORC VERIFICATION TEST-VER 1.

---

**B2206-CURRENT VIN MISSING/MISMATCH****OCCUPANT CLASSIFICATION SEAT WEIGHTS**

8129faa2

**B2206-CURRENT VIN MISSING/MISMATCH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
During power-up, the ORC/OCM monitors the CAN bus for the VIN message.
- **Set Condition:**  
This DTC will set if the VIN information received from the PCM is different from the stored VIN.

Possible Causes
INCORRECT VIN PROGRAMMED INTO THE PCM OCCUPANT CLASSIFICATION MODULE (OCM) OCCUPANT RESTRAINT CONTROLLER (ORC)

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

**Note:** Troubleshoot any Ignition, Battery, Seat Weight Sensor, or OCM Internal DTCs **BEFORE** proceeding

**Note:** Ensure that the battery is fully charged.

With the scan tool, read DTCs.

Select the module and DTC type.

**OCM-Active**

Go To 2

**OCM-Stored**

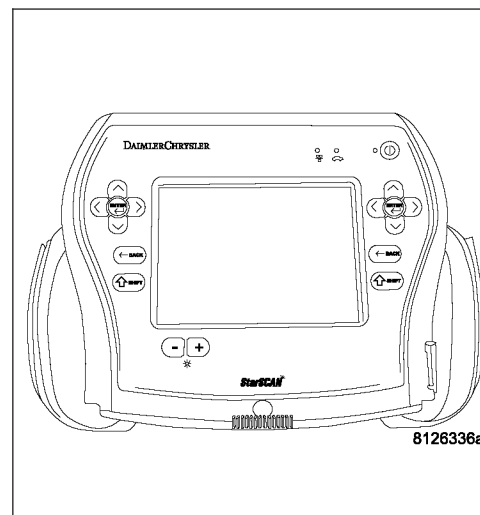
Erase code with scan tool, test complete.

**ORC-Active**

Go To 4

**ORC-Stored**

Erase code with scan tool, test complete.

**2. CHECK THE VIN STORED IN THE PCM**

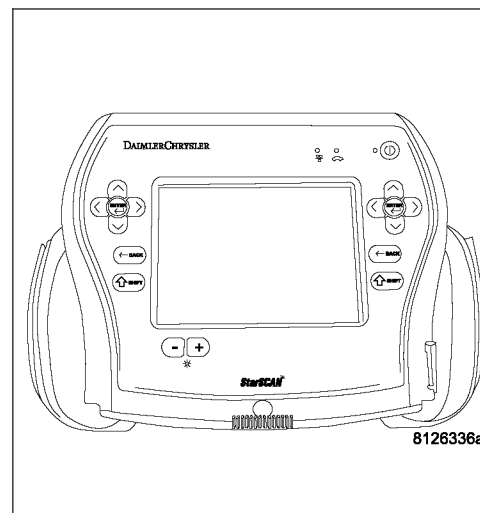
With the scan tool, compare the VIN that is stored in the PCM to the VIN of the vehicle's VIN plate.

**Does the VIN that is stored in the PCM match the vehicle's VIN?**

**Yes** >> Go To 3

**No** >> Replace and Configure the Powertrain Control Module in accordance with the service information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



**B2206-CURRENT VIN MISSING/MISMATCH (CONTINUED)****3. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST**

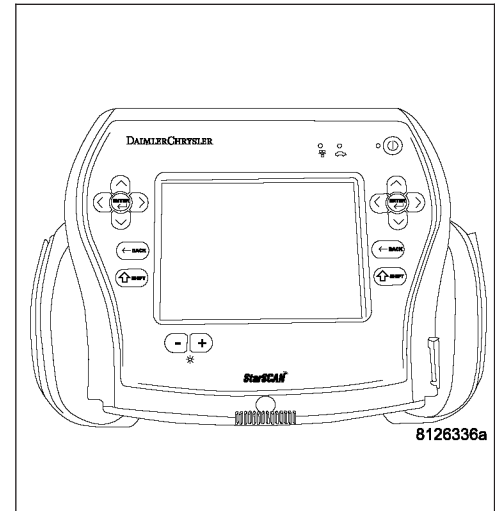
Verify that the passenger seat is empty.

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**Note:** Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.

**Does the scan tool display active: B2206-CURRENT VIN MISSING/MISMATCH?**

**Yes** >> Replace the OCM in accordance with the Service Information.  
Perform OCS VERIFICATION TEST - VER 1.

**No - But Other DTCs Present**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No - No Active DTCs Present**

Perform OCS VERIFICATION TEST - VER 1.

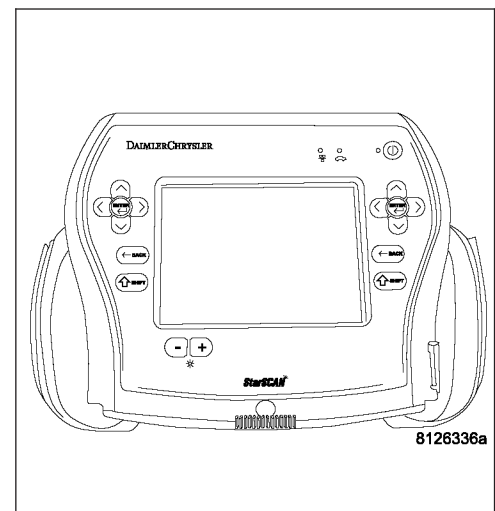
**4. CHECK THE VIN STORED IN THE PCM**

With the scan tool, compare the VIN that is stored in the PCM to the VIN of the vehicle's VIN plate.

**Does the VIN that is stored in the PCM match the vehicle's VIN?**

**Yes** >> Go To 5

**No** >> Replace and Configure the Powertrain Control Module in accordance with the service information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5. Refer to (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).



**B2206-CURRENT VIN MISSING/MISMATCH (CONTINUED)**

**5. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**View repair.**

**Repair**

Replace the Occupant Restraint Controller in accordance with the service information.  
Perform the ORC VERIFICATION TEST-VER 1.

---



B2207-OCCUPANT RESTRAINT CONTROLLER INTERNAL 1

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**  
This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

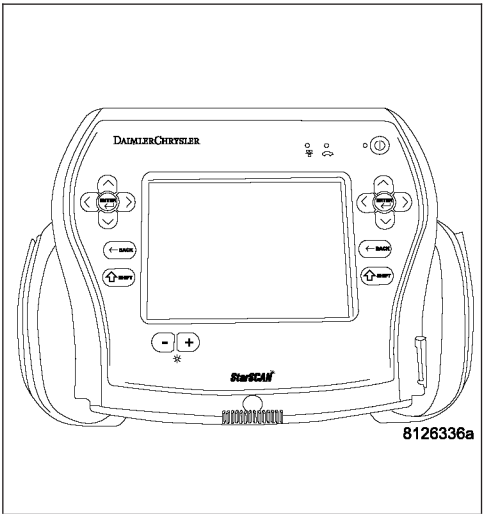
**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions could result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

Repair

- Replace the Occupant Restraint Controller in accordance with the Service Information.
- Perform the ORC VERIFICATION TEST-VER. 1.



**B2208-OCCUPANT RESTRAINT CONTROLLER INTERNAL 2**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**  
This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

**Diagnostic Test****1. REPLACE OCCUPANT RESTRAINT CONTROLLER**

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

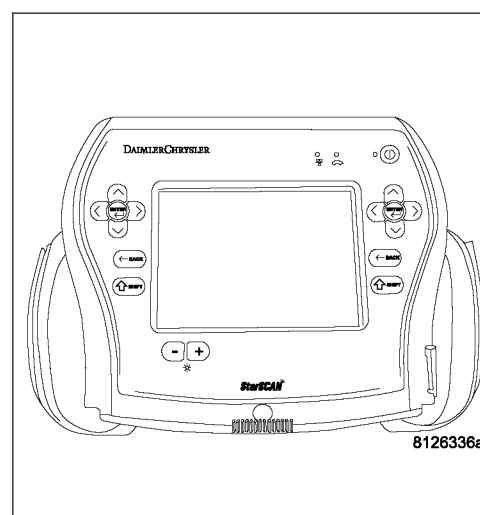
**WARNING:** If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions could result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with the Service Information.

Perform the ORC VERIFICATION TEST-VER. 1.



B2209-OCCUPANT RESTRAINT CONTROLLER INTERNAL 3

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**  
This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

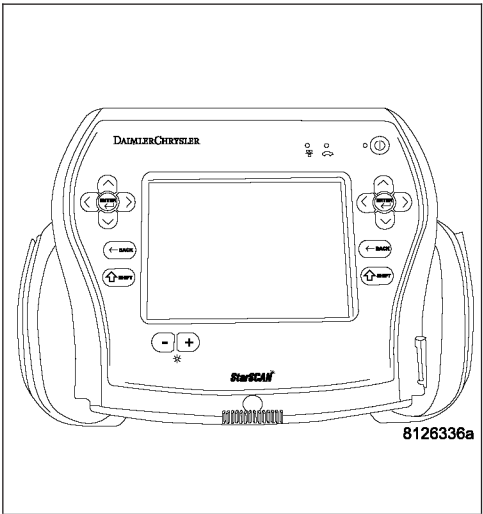
**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions could result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

Repair

- Replace the Occupant Restraint Controller in accordance with the Service Information.
- Perform the ORC VERIFICATION TEST-VER. 1.



**B220A-OCCUPANT RESTRAINT CONTROLLER INTERNAL 4**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**  
This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

**Diagnostic Test****1. REPLACE OCCUPANT RESTRAINT CONTROLLER**

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

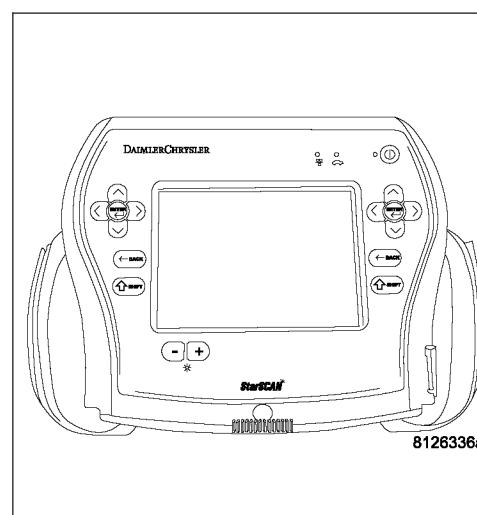
**WARNING:** If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions could result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with the Service Information.

Perform the ORC VERIFICATION TEST-VER. 1.



B220B-OCCUPANT RESTRAINT CONTROLLER FIRING STORED ENERGY

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**  
This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.  
With the scan tool, erase and read ORC DTCs.

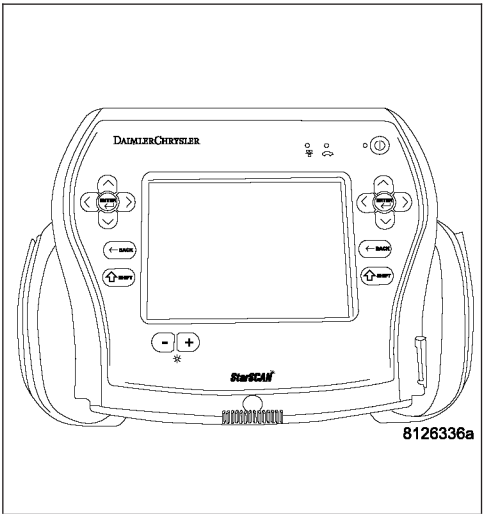
**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions can result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with the Service Information.  
Perform the ORC VERIFICATION TEST-VER. 1.



**B220C-OCCUPANT RESTRAINT CONTROLLER ACCELEROMETER 1 INTERNAL**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**  
This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

**Diagnostic Test****1. REPLACE OCCUPANT RESTRAINT CONTROLLER**

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

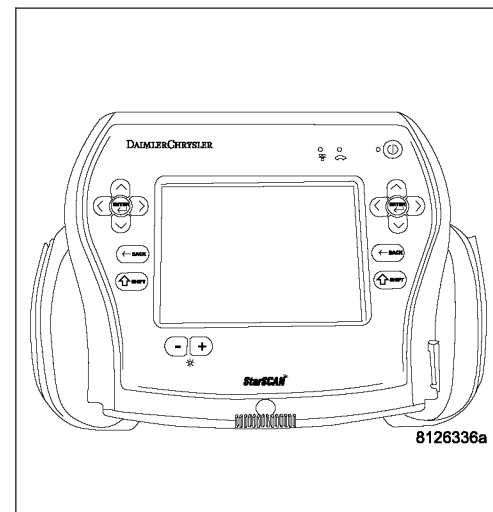
**WARNING:** If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions can result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with the Service Information.

Perform the ORC VERIFICATION TEST-VER. 1.



**B220D-OCCUPANT RESTRAINT CONTROLLER ACCELEROMETER 2 INTERNAL**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**  
This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

**Diagnostic Test**

**1. REPLACE OCCUPANT RESTRAINT CONTROLLER**

Turn the ignition on.  
With the scan tool, erase and read ORC DTCs.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions can result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with the Service Information.  
Perform the ORC VERIFICATION TEST-VER. 1.

**B220F-OCCUPANT RESTRAINT CONTROLLER CONTROL DRIVER 1**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**  
This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

**Diagnostic Test****1. REPLACE OCCUPANT RESTRAINT CONTROLLER**

Turn the ignition on.

With the scan tool, erase and read ORC DTCs.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

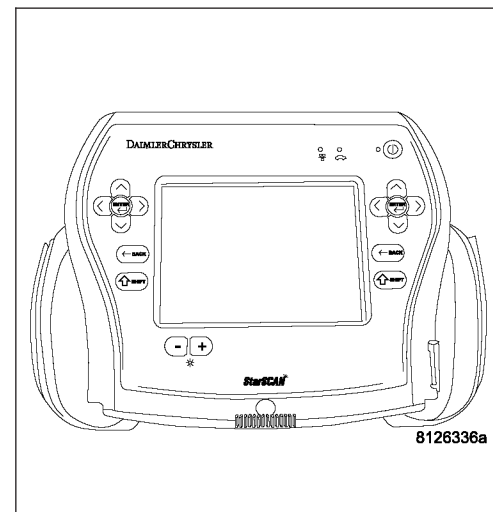
**WARNING:** If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions can result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with the Service Information.

Perform the ORC VERIFICATION TEST-VER. 1





B2210-OCCUPANT RESTRAINT CONTROLLER CONTROL DRIVER 2

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. The module's on board diagnostics continuously performs internal circuit tests.
- **Set Condition:**  
This DTC will set if the module identifies an out of range internal circuit.

Possible Causes
OCCUPANT RESTRAINT CONTROLLER

Diagnostic Test

1. REPLACE OCCUPANT RESTRAINT CONTROLLER

Turn the ignition on.  
With the scan tool, erase and read ORC DTCs.

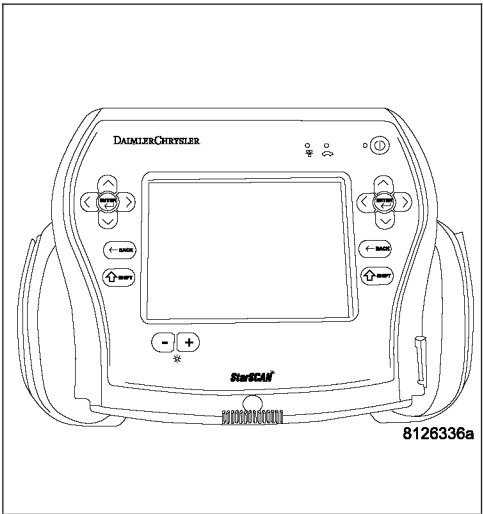
**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the Occupant Restraint Controller is dropped at any time, it must be replaced. Failure to take proper precautions can result in accidental airbag deployment and personal injury or death.

When this code is set, view repair.

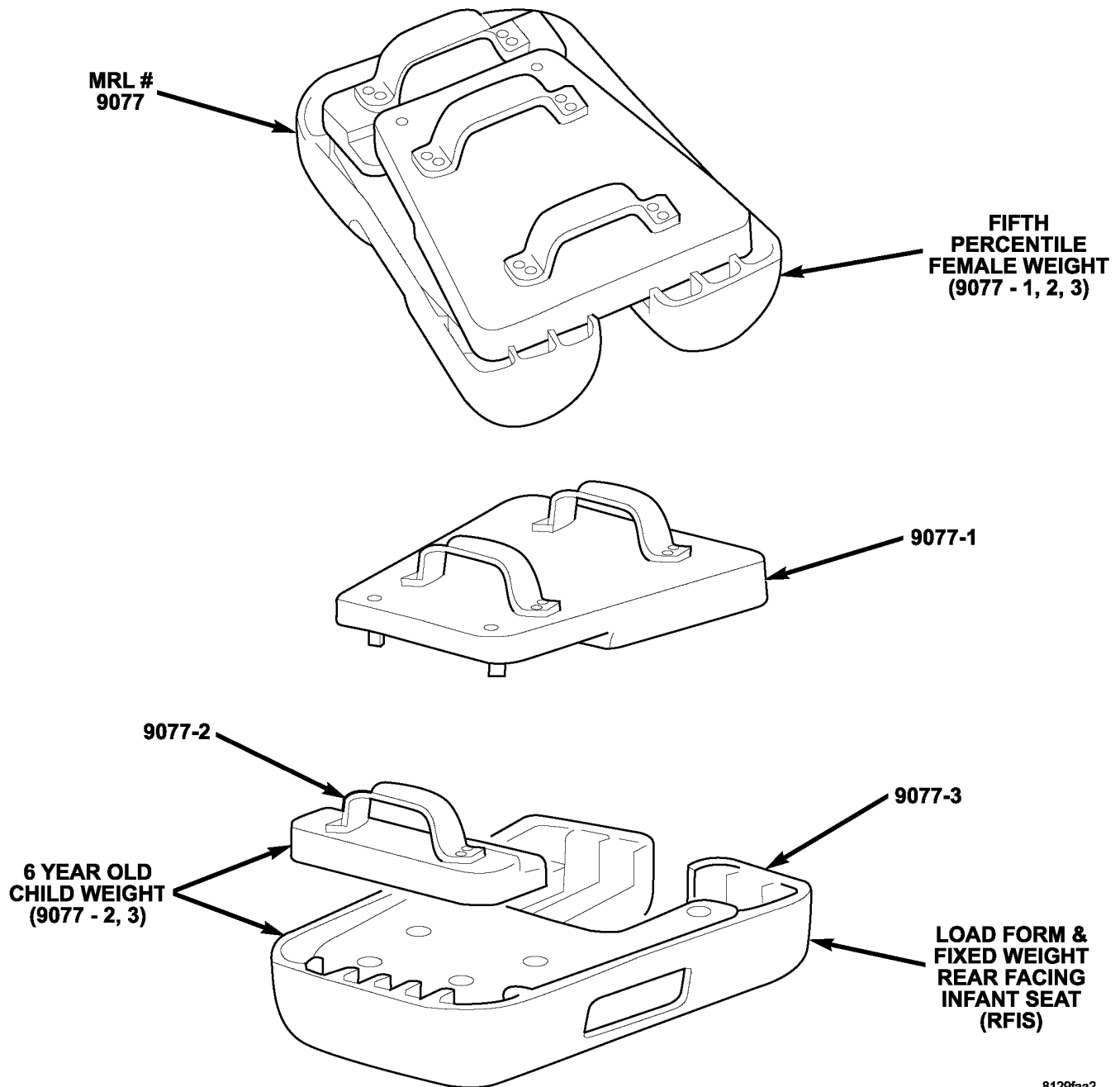
**Repair**

Replace the Occupant Restraint Controller in accordance with the Service Information.  
Perform the ORC VERIFICATION TEST-VER. 1



## B2212-OCCUPANT CLASSIFICATION MODULE INTERNAL

### OCCUPANT CLASSIFICATION SEAT WEIGHTS



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**B2212-OCCUPANT CLASSIFICATION MODULE INTERNAL (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
While the IGN status is RUN or SNA, while the CAN bus system voltage is between 10 and 16 volts, and during the OCS Verification Test.
- **Set Condition:**  
This DTC will set if the module detects an internal failure.

Possible Causes
OCCUPANT CLASSIFICATION MODULE

**Diagnostic Test**

**1. PERFORM THE OCCUPANT CLASSIFICATION MODULE VERIFICATION TEST**

**Note:** Ensure that the passenger seat is empty.

**Note:** Ensure that all seat and strain gauge sensor bolts are properly torqued.

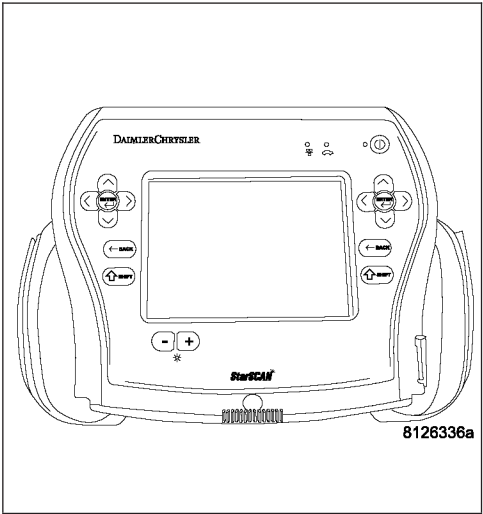
With the scan tool, erase OCM DTCs.

Turn the ignition off, wait 10 seconds and turn ignition on.

With the scan tool, read OCM DTCs.

**Did the DTC: B2212-OCCUPANT CLASSIFICATION MODULE INTERNAL reset?**

- Yes**    >> Go To 2
- No**    >> Perform the OCS VERIFICATION TEST-VER 1.



**B2212-OCCUPANT CLASSIFICATION MODULE INTERNAL (CONTINUED)****2. PERFORM OCCUPANT CLASSIFICATION MODULE SYSTEM VERIFICATION TEST**

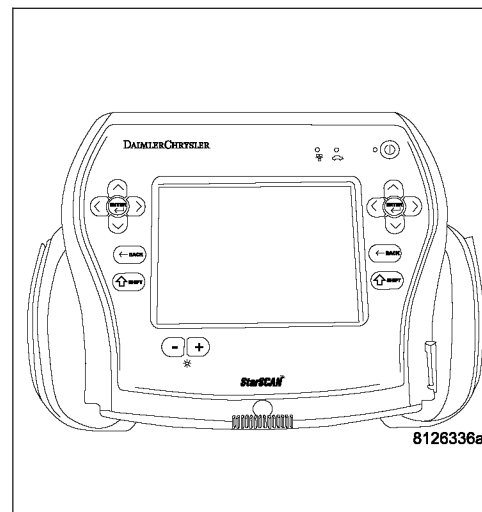
Verify that the passenger seat is empty.

Verify that all of the Seat Weight Sensor mounting screws are torqued to specification. Refer to 23 - BODY/SEATS.

**Note: Failure to follow the test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.**

With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed on the scan tool. When the test is complete, proceed as follows.

With the scan tool, read OCM DTCs.



**Does the scan tool display any active DTCs?**

**Yes - B2212 is ACTIVE**

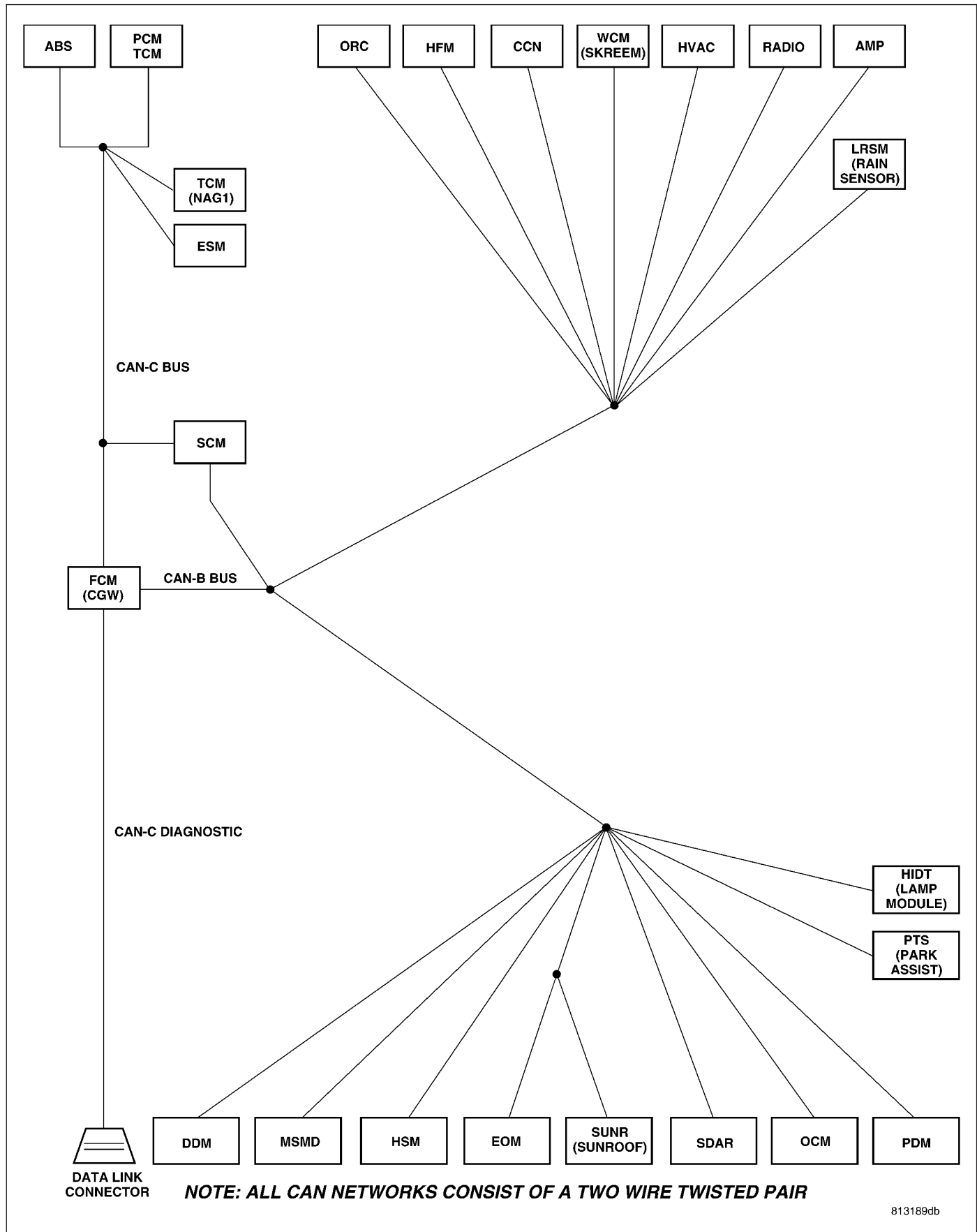
Replace the Occupant Classification Module in accordance with the service information.

**Yes - other DTCs ACTIVE**

Diagnose and repair the DTCs. Refer to the Table of Contents in this Section for a complete list of symptoms.

**No** >> Perform OCS VERIFICATION TEST - VER 1.

---

**B223B-VEHICLE CONFIGURATION MISMATCH**

**B223B-VEHICLE CONFIGURATION MISMATCH (CONTINUED)**

For the Airbag circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Front Control Module sends a message to the Occupant Restraint Controller (ORC) that the vehicle is not equipped with an Occupant Classification Module (OCM) but the ORC is receiving OCM messages over the Can B bus.

Possible Causes
INCORRECT PCM
OCCUPANT RESTRAINT CONTROLLER

**Diagnostic Test****1. VERIFY THAT DTC B223B-VEHICLE CONFIGURATION MISMATCH IS ACTIVE**

Turn the ignition on.

With the scan tool, read ORC DTCs.

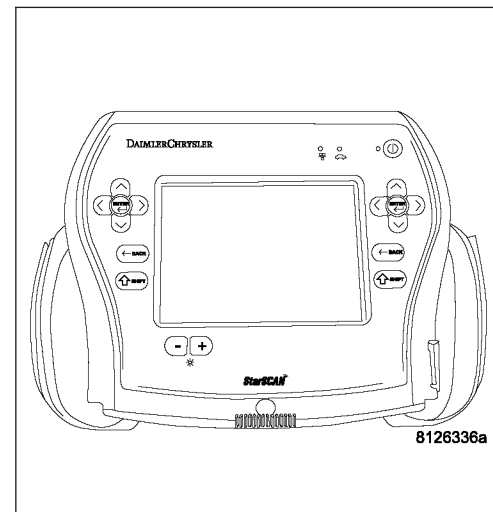
**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

**Does the scan tool display active: B223B-VEHICLE CONFIGURATION MISMATCH?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Perform the ORC VERIFICATION TEST-VER. 1



**B223B-VEHICLE CONFIGURATION MISMATCH (CONTINUED)****2. COMPARE STORED VINS IN THE PCM AND ORC**

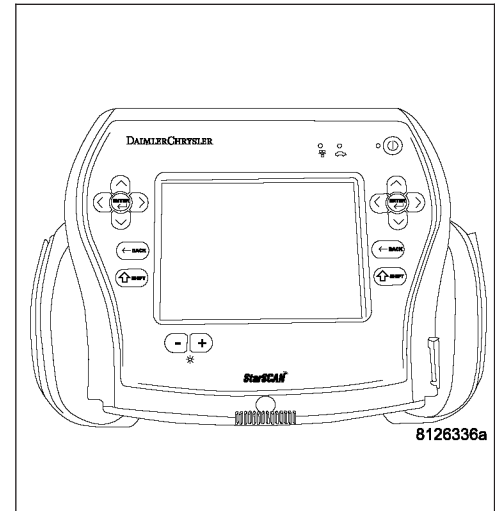
With the scan tool, read and record the VIN that is stored in the PCM.

With the scan tool, read and record the VIN that is stored in the ORC.

**Do the VINs stored in the PCM and ORC match?**

**Yes** >> Go To 3

**No** >> Replace and program the Powertrain Control Module in accordance with the Service Information. Ensure the PCM is replaced with the correct VIN.

**3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

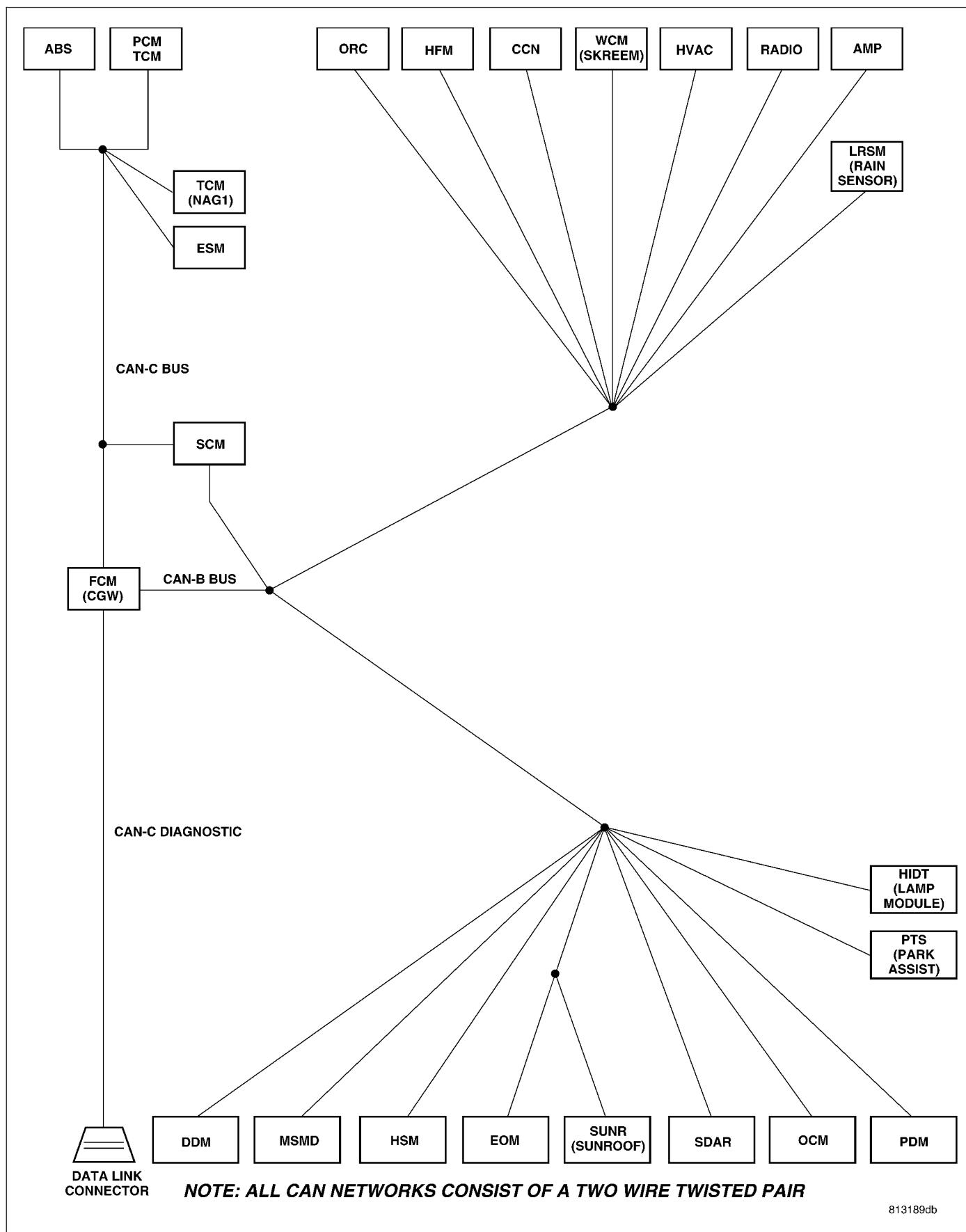
**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**View repair.**

**Repair**

Replace the Occupant Restraint Controller in accordance with the service information.  
Perform the ORC VERIFICATION TEST-VER 1.

**B223D-OCCUPANT CLASSIFICATION MODULE DTC PRESENT**



**B223D-OCCUPANT CLASSIFICATION MODULE DTC PRESENT (CONTINUED)**

For the Occupant Classification System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
This DTC will set if the ORC receives a bus message with the active OCM DTC Present bit set.

Possible Causes
ACTIVE DTC IN OCCUPANT CLASSIFICATION MODULE
OCCUPANT RESTRAINT CONTROLLER (ORC)

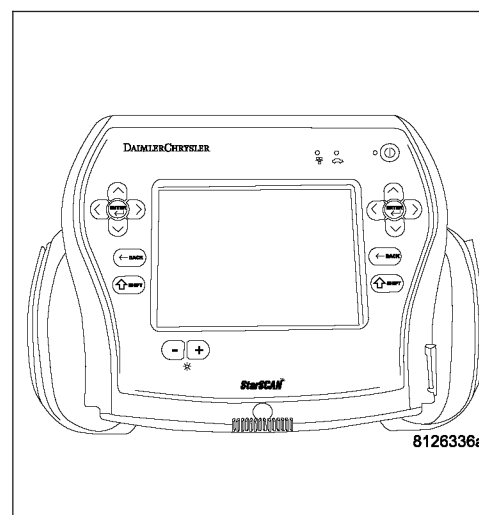
**Diagnostic Test****1. ACTIVE OR STORED DTC**

With the scan tool, read the OCCUPANT RESTRAINT CONTROLLER active DTCs.

**Is the B223D-OCCUPANT CLASSIFICATION MODULE DTC active?**

**Yes** >> Go To 2

**No** >> With the scan tool, perform the ORC VERIFICATION TEST VER-1.

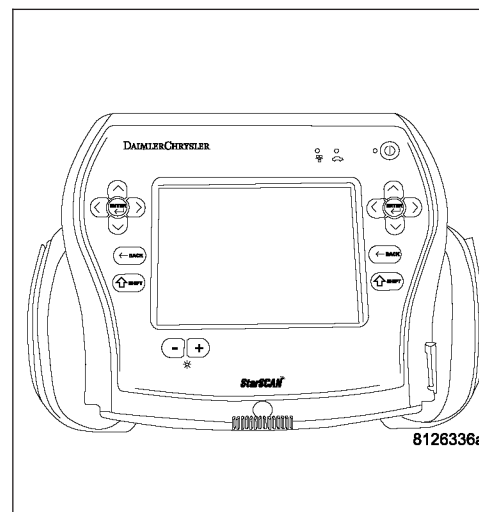
**2. ACTIVE DTC IN OCCUPANT CLASSIFICATION MODULE**

With the scan tool, read the OCCUPANT CLASSIFICATION MODULE active DTCs.

**Are there any active DTC present?**

**Yes** >> Refer to the symptom list for problems related to the OCCUPANT CLASSIFICATION MODULE (OCM).

**No** >> Go To 3



**B223D-OCCUPANT CLASSIFICATION MODULE DTC PRESENT (CONTINUED)**

**3. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

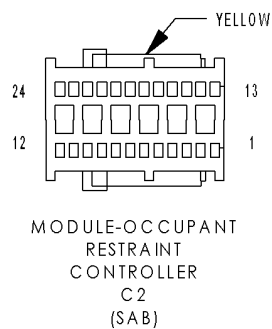
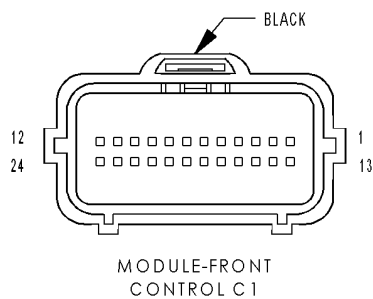
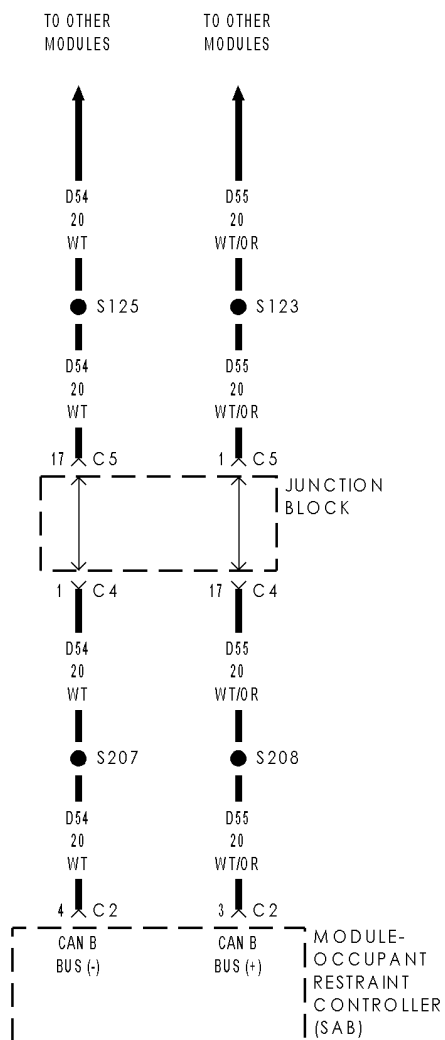
**Repair**

Replace the Occupant Restraint Controller in accordance with Service Instructions.

Perform the ORC VERIFICATION TEST - VER 1.

---

## U0019-CAN B BUS



**U0019–CAN B BUS (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage, or shorted to ground.

Possible Causes
ACTIVE U0019 CAN B BUS DTC IN FRONT CONTROL MODULE (D55) CAN B BUS (+) CIRCUIT OPEN (D54) CAN B BUS (-) CIRCUIT OPEN OCCUPANT RESTRAINT CONTROLLER (ORC)

**Diagnostic Test****1. VERIFY DTC U0019–CAN B BUS IS ACTIVE**

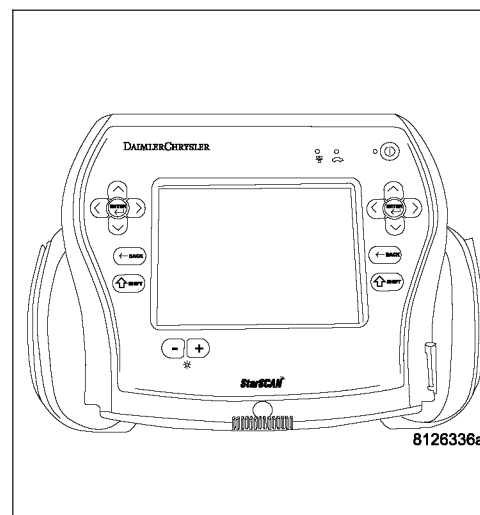
Turn the ignition on.

With the scan tool, read Occupant Restraint Controller (ORC) DTCs.

**Does the scan tool display active: U0019–CAN B BUS?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform ORC VERIFICATION TEST – VER 1.



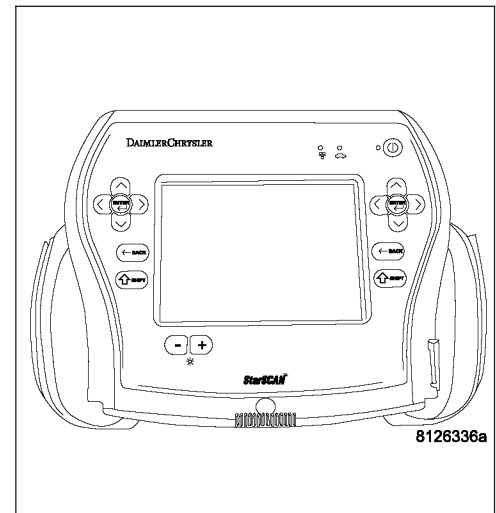
**U0019-CAN B BUS (CONTINUED)****2. CHECK FOR ACTIVE CAN B BUS RELATED DTCS IN THE FRONT CONTROL MODULE (FCM)**

With the scan tool, read Front Control Module (FCM) DTCs

**Does the scan tool display any active CAN B BUS related DTCs?**

**Yes** >> Diagnose and repair the DTC(s). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. CHECK (D55) CAN B BUS (+) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the ORC C2 connector.

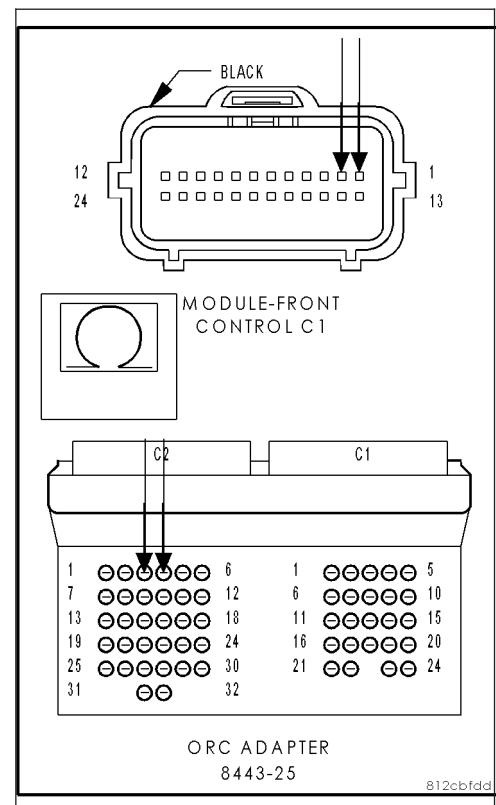
Disconnect the Front Control Module (FCM) C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the ORC C2 connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (D55) CAN B Bus (+) circuit for an open.  
Perform ORC VERIFICATION TEST - VER 1.



**U0019-CAN B BUS (CONTINUED)****4. CHECK (D54) CAN B BUS (-) CIRCUIT FOR AN OPEN**

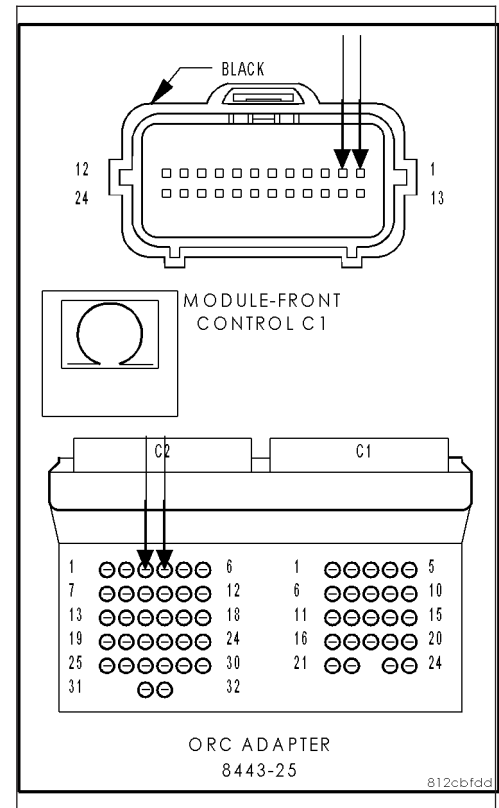
Measure the resistance of the (D54) CAN B Bus (-) circuit between the Front Control Module C1 connector and the ORC C2 connector.

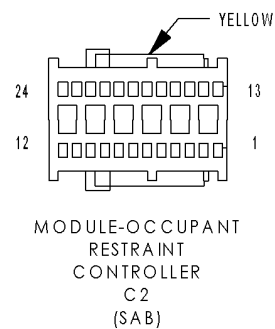
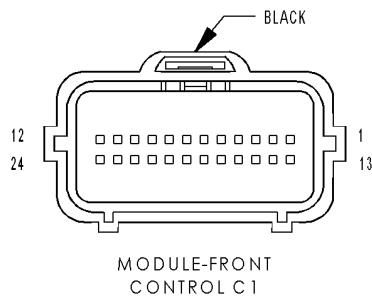
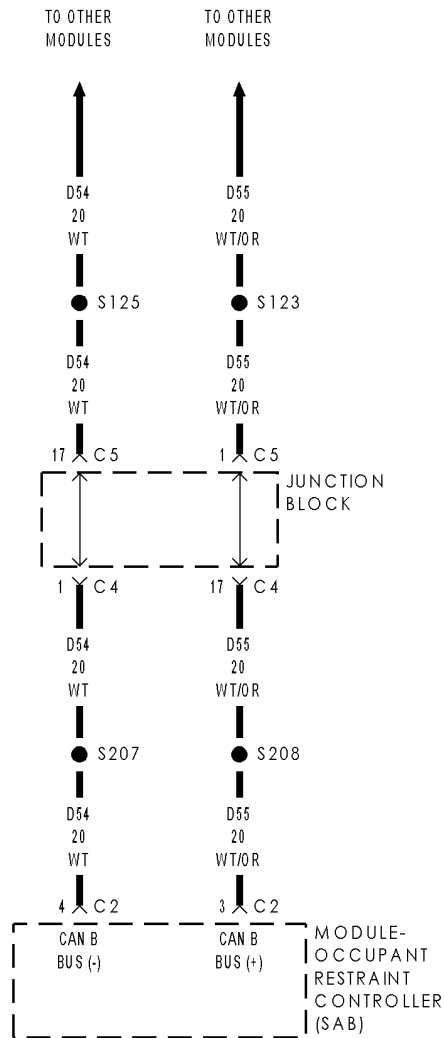
**Is the resistance below 2.0 ohms?**

**Yes** >> Replace the ORC in accordance with the Service Information.

Perform ORC VERIFICATION TEST - VER 1.

**No** >> Repair the (D54) CAN B Bus (-) circuit for an open.  
Perform ORC VERIFICATION TEST - VER 1.



**U0020-CAN B BUS OFF PERFORMANCE**

**U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)**

For the Air Bag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage, or shorted to ground.

Possible Causes
ACTIVE U0020 CAN B BUS DTC IN OCCUPANT CLASSIFICATION MODULE (D55) CAN B BUS (+) CIRCUIT OPEN (D54) CAN B BUS (-) CIRCUIT OPEN OCCUPANT CLASSIFICATION MODULE (OCM)

**Diagnostic Test****1. VERIFY DTC U0020-CAN B BUS IS ACTIVE**

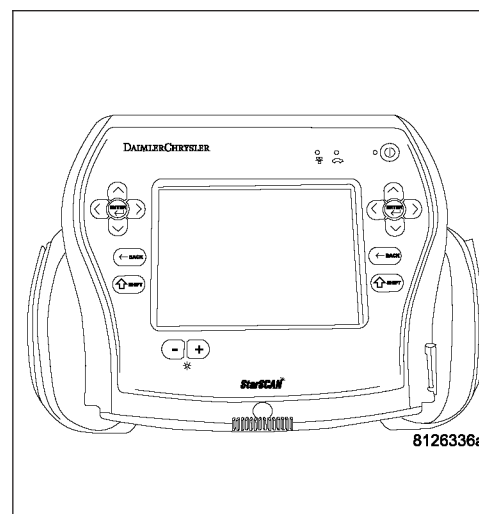
Turn the ignition on.

With the scan tool, read Occupant Classification Module (OCM) DTCs.

**Does the scan tool display active: U0019-CAN B BUS?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform ORC VERIFICATION TEST – VER 1.





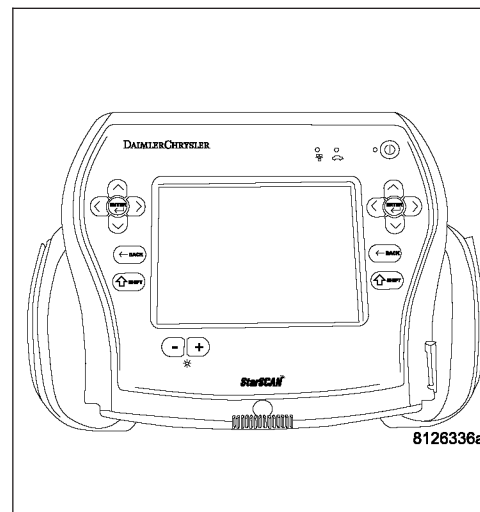
**U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)****2. CHECK FOR ACTIVE CAN B BUS RELATED DTCS IN THE FRONT CONTROL MODULE (FCM)**

With the scan tool, read Front Control Module (FCM) DTCs

**Does the scan tool display any active CAN B BUS related DTCs?**

**Yes** >> Diagnose and repair the DTC(s). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

**No** >> Go To 3

**3. CHECK (D55) CAN B BUS (+) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the OCM C1 connector.

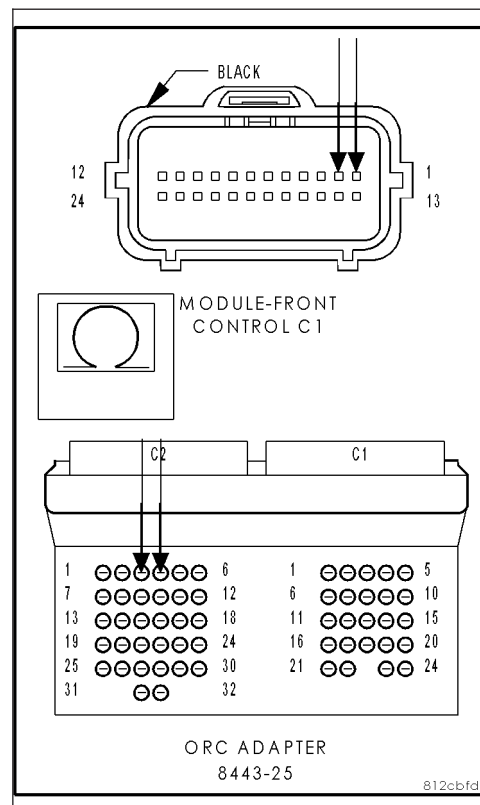
Disconnect the Front Control Module (FCM) C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the OCM C1 connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (D55) CAN B Bus (+) circuit for an open.  
Perform ORC VERIFICATION TEST - VER 1.



**U0020-CAN B BUS OFF PERFORMANCE (CONTINUED)****4. CHECK (D54) CAN B BUS (-) CIRCUIT FOR AN OPEN**

Measure the resistance of the (D54) CAN B Bus (-) circuit between the Front Control Module C1 connector and the OCM C1 connector.

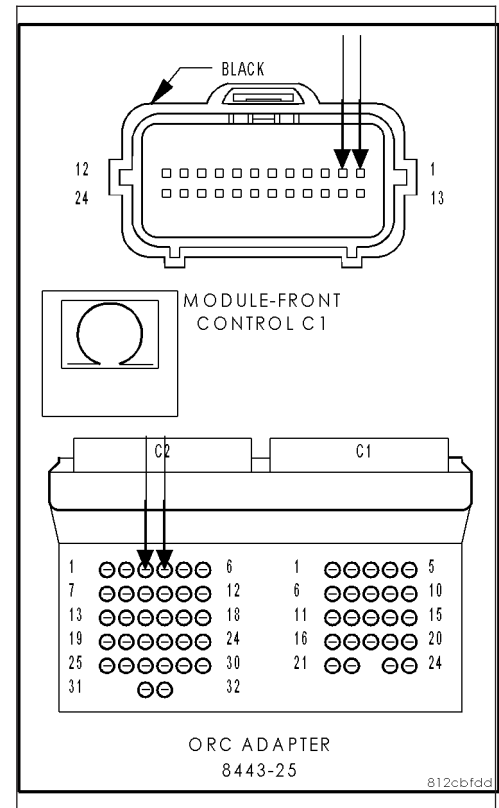
**Is the resistance below 2.0 ohms?**

**Yes** >> Replace the OCM in accordance with the Service Information.

Perform OCS VERIFICATION TEST - VER 1.

**No** >> Repair the (D54) CAN B Bus (-) circuit for an open.

Perform ORC VERIFICATION TEST - VER 1.



## **U0022-CAN B BUS (+) CIRCUIT LOW**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0023-CAN B BUS (+) CIRCUIT HIGH**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0026-CAN B BUS (-) CIRCUIT HIGH**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC)**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0155-LOST COMMUNICATION WITH CLUSTER/CCN**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0156-LOST COMMUNICATION WITH EOM**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

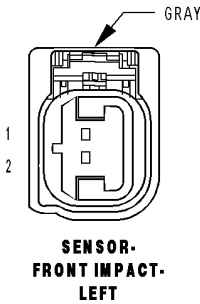
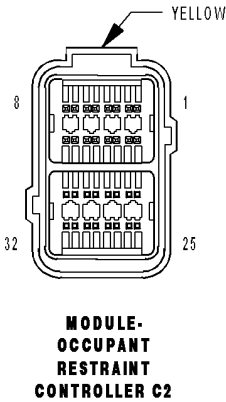
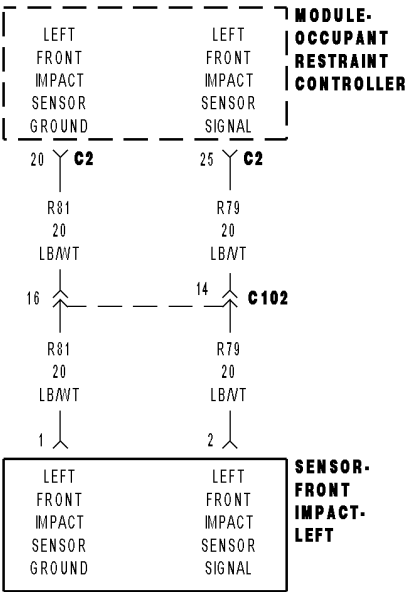
**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR



**U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The Occupant Restraint Controller (ORC) continuously communicates with the Front Left Impact Sensor over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.

- **Set Condition:**

This code will set, if the ORC and the Front Left Impact Sensor do not establish and maintain valid data communications.

Possible Causes
(R79) SIGNAL CIRCUIT SHORTED TO BATTERY
(R79) SIGNAL CIRCUIT SHORTED TO GROUND
(R79, R81) FRONT LEFT IMPACT SENSOR CIRCUITS SHORTED TOGETHER
(R81) FRONT LEFT IMPACT SENSOR GROUND CIRCUIT OPEN
(R79) FRONT LEFT IMPACT SENSOR SIGNAL CIRCUIT OPEN
ORC, FRONT LEFT IMPACT SENSOR

## Diagnostic Test

### 1. VERIFY THAT DTC U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR IS ACTIVE

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

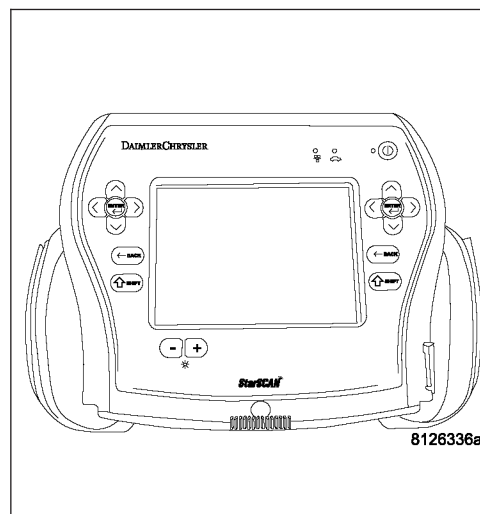
Turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active:U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR?**

**Yes** >> Go To 2

**No** >> Go To 9



**U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR (CONTINUED)****2. CHECK THE (R79, R81) FRONT LEFT IMPACT SENSOR SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Front Left Impact Sensor connector.

Disconnect the ORC connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

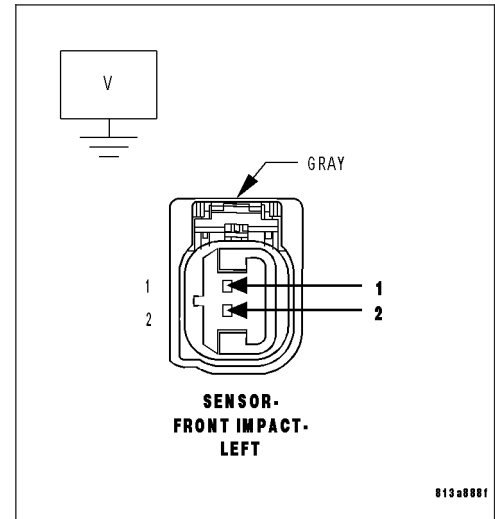
Measure the voltage of the (R79) Front Left Impact Sensor Signal circuit and (R81) Sensor Ground circuit at the Front Left Impact Sensor connector and ground.

**Is there any voltage present?**

**Yes** >> Repair the (R79, R81) Front Left Impact Sensor circuits for a short to battery.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (R79) FRONT LEFT IMPACT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

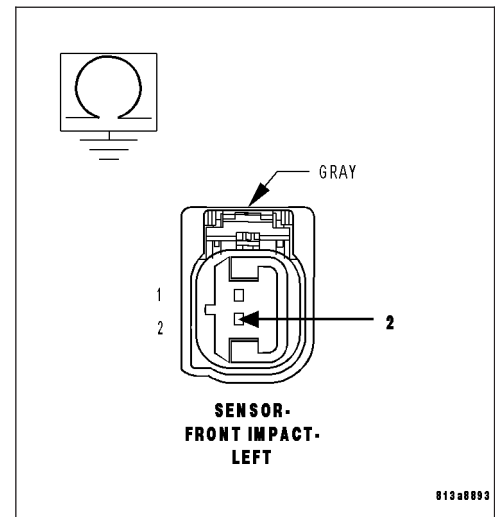
Measure the resistance of the (R79) Front Left Impact Sensor Signal circuit between the Front Left Impact Sensor connector and ground.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R79) Front Left Impact Sensor Signal circuit for a short to ground.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4



**U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR (CONTINUED)****4. CHECK THE (R79, R81) FRONT LEFT IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER**

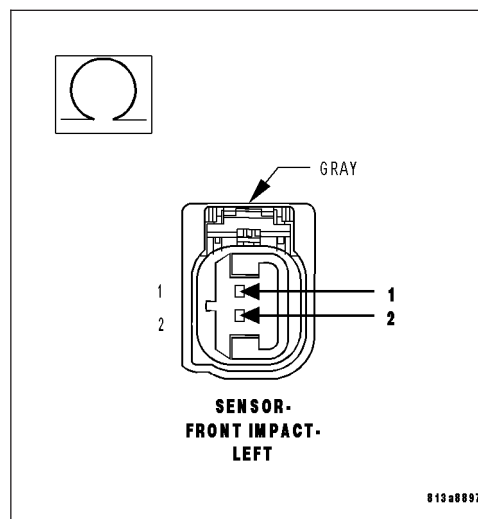
Measure the resistance between the (R79) Front Left Impact Sensor Signal and (R81) Sensor Ground circuits at the Front Left Impact Sensor connector.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R79, R81) Front Left Impact Sensor circuits shorted together.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (R81) FRONT LEFT IMPACT SENSOR GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Connect the 8443 Load Tool ORC Adaptor to the Occupant Restraint Control Module connector.

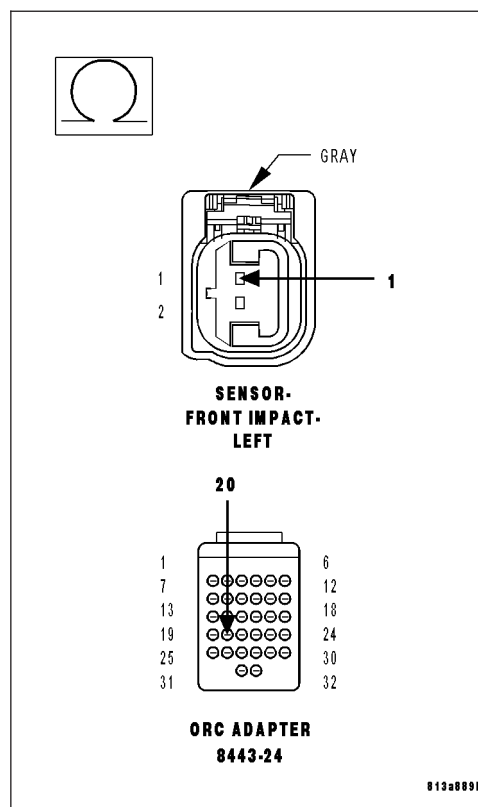
Measure the resistance of the (R81) Front Left Impact Sensor Ground circuit between the Front Left Impact Sensor connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 6

**No** >> Repair the (R81) Front Left Impact Sensor 1 Ground circuit for an open or high resistance.

Perform the ORC VERIFICATION TEST - VER 1.





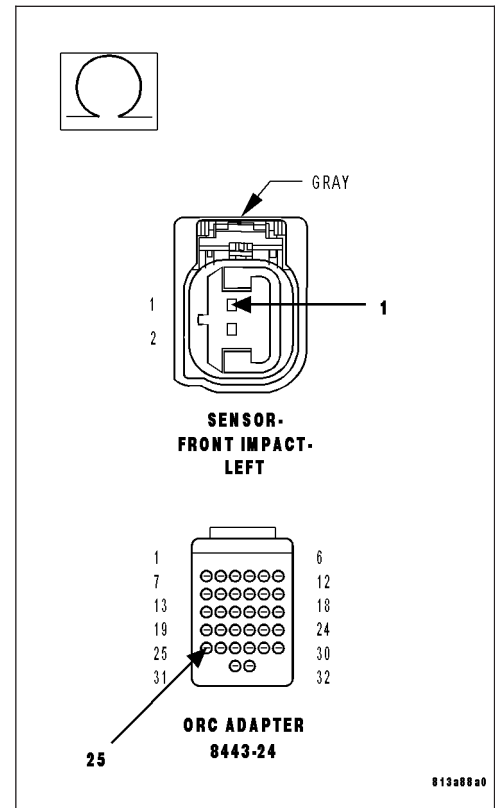
**U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR (CONTINUED)****6. CHECK THE (R79) FRONT LEFT IMPACT SENSOR CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Measure the resistance of the (R79) Front Left Impact Sensor Ground circuit between the Front Left Impact Sensor connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 7

**No** >> Repair the (R79) Front Left Impact Sensor Signal circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.

**7. CHECK OPERATION OF THE FRONT LEFT IMPACT SENSOR**

Replace the Front Left Impact Sensor.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

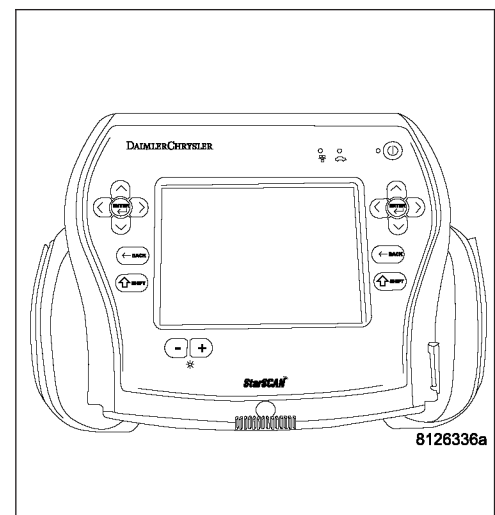
Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

**Did the active Front Left Impact Sensor DTC return?**

**Yes** >> Go To 8

**No** >> Repair is complete.  
Perform the ORC VERIFICATION TEST - VER 1.



**U0170-LOST COMMUNICATION W/UP-FRONT LEFT SATELLITE ACCELERATION SENSOR (CONTINUED)****8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with Service Information.  
Perform the ORC VERIFICATION TEST - VER 1.

**9. TEST FOR AN INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

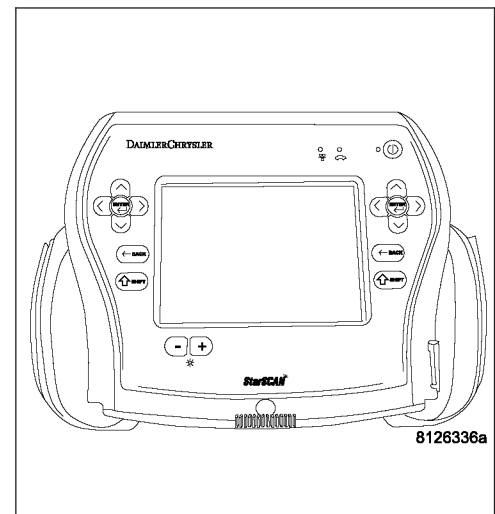
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

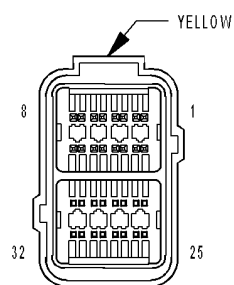
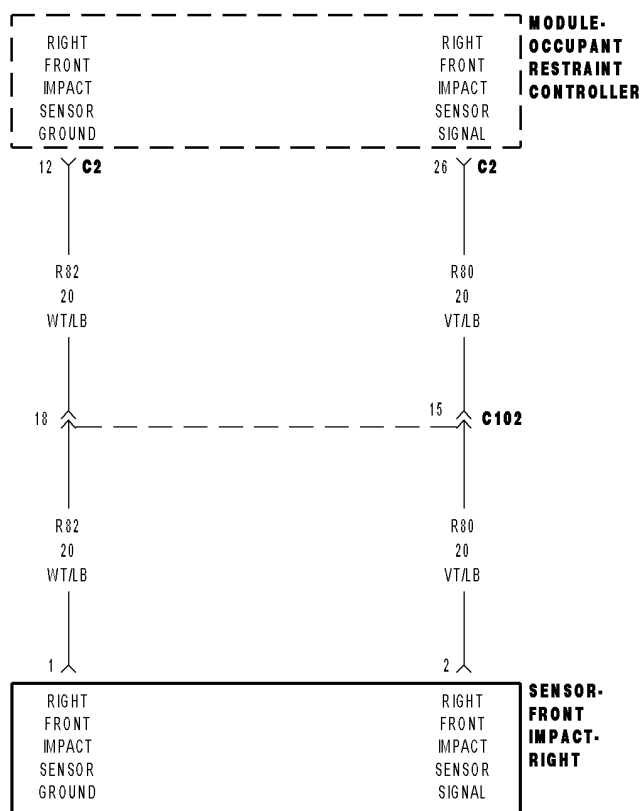
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

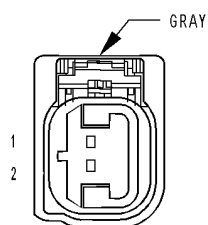
**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



## U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR



**MODULE-OCCUPANT RESTRAINT CONTROLLER C2**



**SENSOR-FRONT IMPACT-RIGHT**

**U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The Occupant Restraint Controller (ORC) continuously communicates with the Front Right Impact Sensor over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.

- **Set Condition:**

This code will set, if the ORC and the Front Right Impact Sensor do not establish and maintain valid data communications.

Possible Causes
(R80) SIGNAL CIRCUIT SHORTED TO BATTERY
(R80) SIGNAL CIRCUIT SHORTED TO GROUND
(R80, R82) FRONT RIGHT IMPACT SENSOR CIRCUITS SHORTED TOGETHER
(R82) FRONT RIGHT IMPACT SENSOR GROUND CIRCUIT OPEN
(R80) FRONT RIGHT IMPACT SENSOR SIGNAL CIRCUIT OPEN
ORC, FRONT RIGHT IMPACT SENSOR

## Diagnostic Test

### 1. VERIFY THAT DTC U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR IS ACTIVE

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

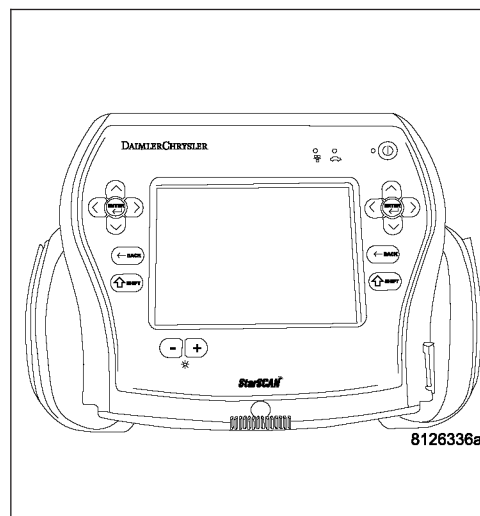
Turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active: U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR?**

**Yes** >> Go To 2

**No** >> Go To 9



**U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR (CONTINUED)****2. CHECK THE (R80, R82) FRONT RIGHT IMPACT SENSOR SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Front Right Impact Sensor connector.

Disconnect the ORC connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

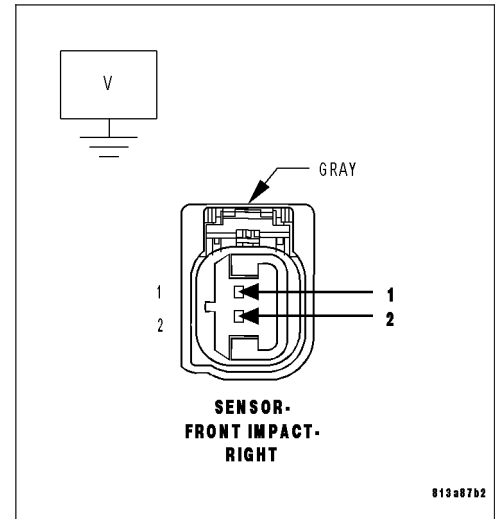
Measure the voltage of the (R80) Front Right Impact Sensor Signal circuit and (R82) Sensor Ground circuit at the Front Right Impact Sensor connector and ground.

**Is there any voltage present?**

**Yes** >> Repair the (R80, R82) Front Right Impact Sensor circuits for a short to battery.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (R80) FRONT RIGHT IMPACT SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn ignition on, then reconnect the battery.

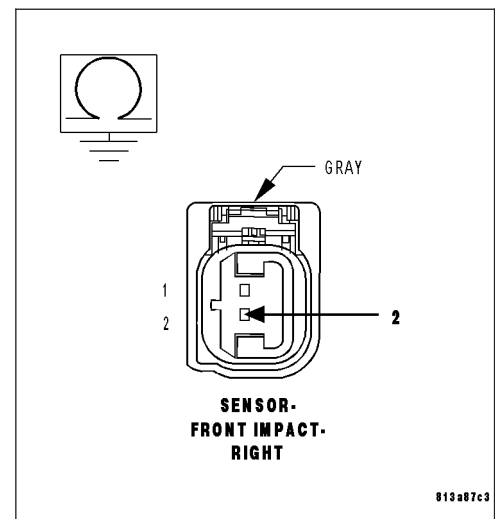
Measure the resistance of the (R80) Front Right Impact Sensor Signal circuit between the Front Right Impact Sensor connector and ground.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R80) Front Right Impact Sensor Signal circuit for a short to ground.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4



**U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR (CONTINUED)****4. CHECK THE (R80, R82) FRONT RIGHT IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER**

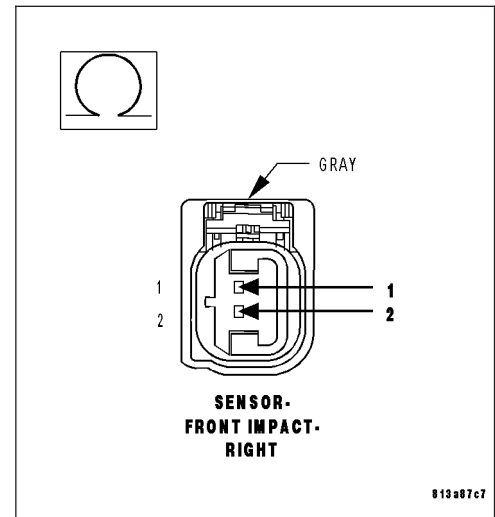
Measure the resistance between the (R80) Front Right Impact Sensor Signal and (R82) Sensor Ground circuits at the Front Right Impact Sensor connector.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R80, R82) Front Right Impact Sensor circuits shorted together.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (R82) FRONT RIGHT IMPACT SENSOR GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

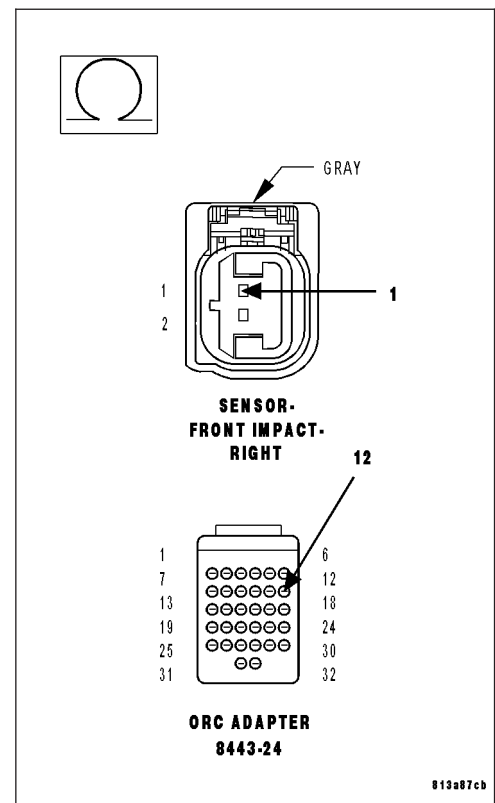
Measure the resistance of the (R82) Front Right Impact Sensor Ground circuit between the Front Right Impact Sensor connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 6

**No** >> Repair the (R82) Front Right Impact Sensor 2 Ground circuit for an open or high resistance.

Perform the ORC VERIFICATION TEST - VER 1.



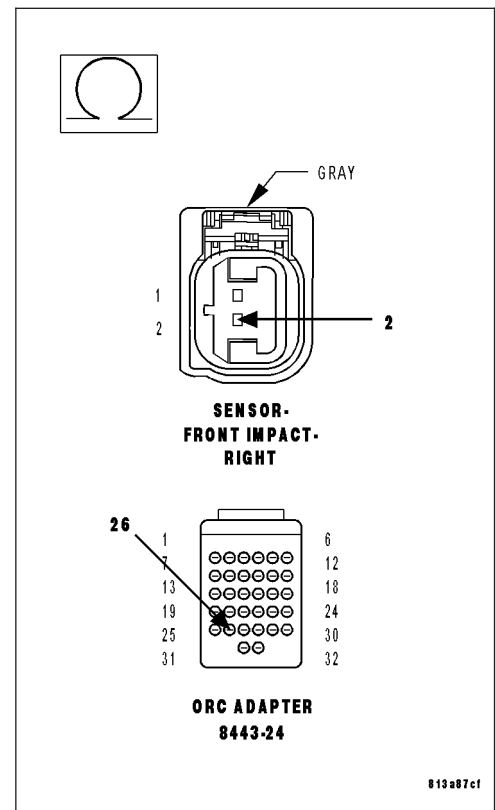
**U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR (CONTINUED)****6. CHECK THE (R80) FRONT RIGHT IMPACT SENSOR CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Measure the resistance of the (R80) Front Right Impact Sensor Signal circuit between the Front Right Impact Sensor connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 7

**No** >> Repair the (R80) Front Right Impact Sensor Signal circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.

**7. CHECK OPERATION OF THE FRONT RIGHT IMPACT SENSOR**

Replace the Front Right Impact Sensor.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

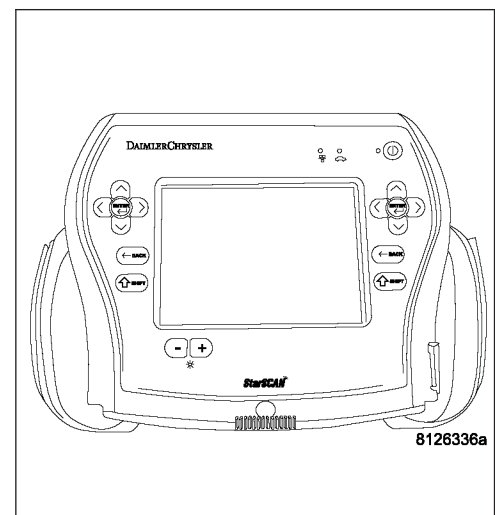
Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

**Did the active Front Right Impact Sensor DTC return?**

**Yes** >> Go To 8

**No** >> Repair is complete.  
Perform the ORC VERIFICATION TEST - VER 1.



**U0171-LOST COMMUNICATION W/UP-FRONT RIGHT SATELLITE ACCELERATION SENSOR (CONTINUED)****8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with Service Instructions.

Perform the ORC VERIFICATION TEST - VER 1.

**9. TEST FOR AN INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

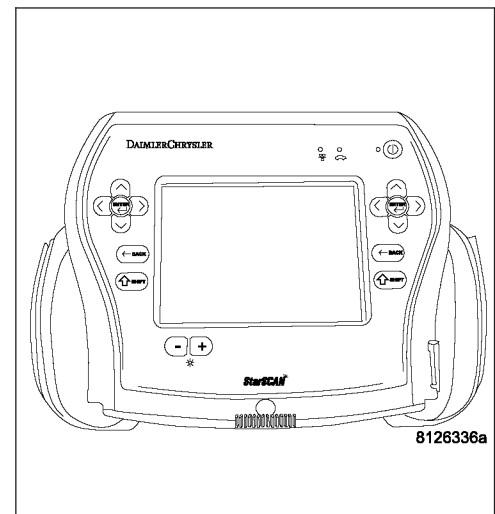
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

**Are any ACTIVE DTCs present?**

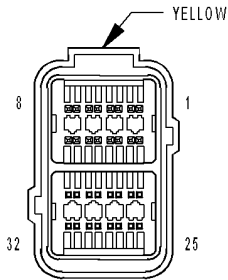
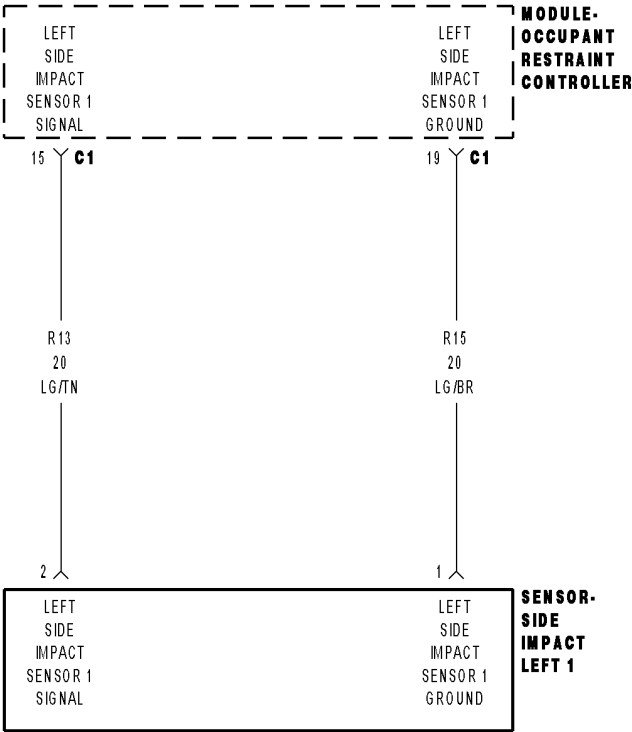
**Yes** >> Select the appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.

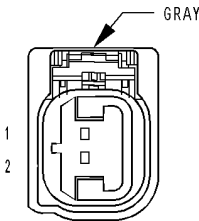




U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1



**MODULE-OCCUPANT RESTRAINT CONTROLLER C1**



**SENSOR-SIDE IMPACT LEFT 1**

**U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The Occupant Restraint Controller (ORC) continuously communicates with the Left Side Impact Sensor 1 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.

- **Set Condition:**

This code will set, if the ORC and the Left Side Impact Sensor 1 do not establish and maintain valid data communications.

Possible Causes
(R13) SIGNAL CIRCUIT SHORTED TO BATTERY
(R13) SIGNAL CIRCUIT SHORTED TO GROUND
(R13, R15) LEFT SIDE IMPACT SENSOR 1 CIRCUITS SHORTED TOGETHER
(R15) LEFT SIDE IMPACT SENSOR 1 GROUND CIRCUIT OPEN
(R13) LEFT SIDE IMPACT SENSOR 1 SIGNAL CIRCUIT OPEN
ORC, LEFT SIDE IMPACT SENSOR 1

## Diagnostic Test

### 1. VERIFY THAT DTC U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1 IS ACTIVE

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

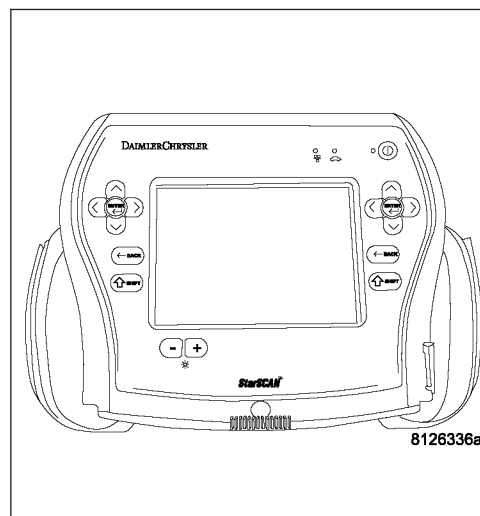
Turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active: U0172-LOST COMMUNICATION W/LEFT SIDE IMPACT SENSOR 1?**

**Yes** >> Go To 2

**No** >> Go To 9



**U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)****2. CHECK THE (R13, R15) LEFT SIDE IMPACT SENSOR 1 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Left front Impact Sensor 1 connector.

Disconnect the ORC connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

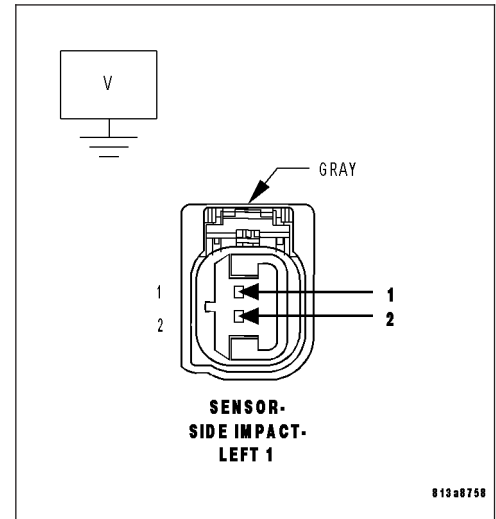
Measure the voltage of the (R13) Left Side Impact Sensor 1 Signal circuit and (R15) Sensor Ground circuit at the Left Side Impact Sensor 1 connector and ground.

**Is there any voltage present?**

**Yes** >> Repair the (R13, R15) Left Side Impact Sensor 1 circuits for a short to battery.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (R13) LEFT SIDE IMPACT SENSOR 1 SIGNAL CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn ignition on, then reconnect the battery.

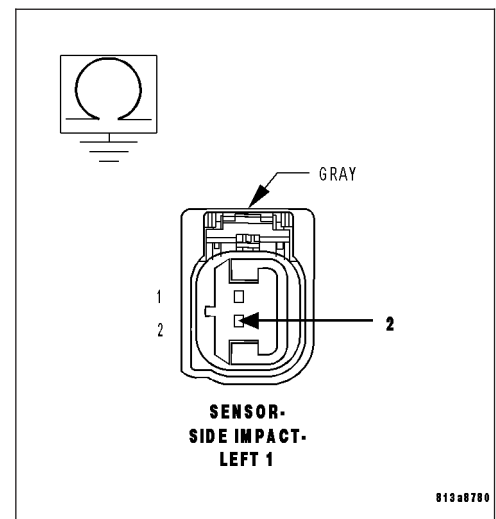
Measure the resistance of the (R13) Left Side Impact Sensor 1 Signal circuit between the Left Side Impact Sensor 1 connector and ground.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R13) Left Side Impact Sensor 1 Signal circuit for a short to ground.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4



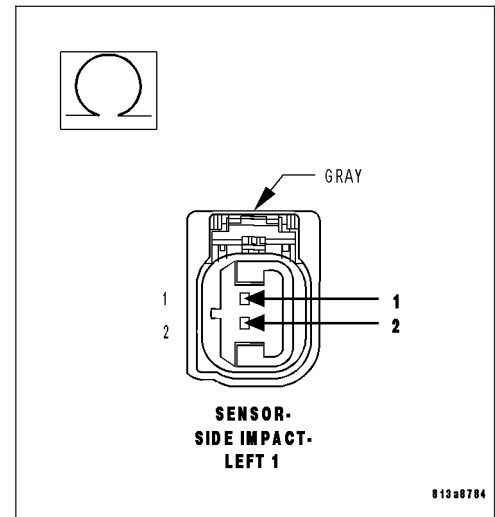
**U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)****4. CHECK THE (R13, R15) LEFT SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER**

Measure the resistance between the (R13) Left Side Impact Sensor 1 Signal and (R15) Sensor Ground circuits at the Left Side Impact Sensor 1 connector.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R13, R15) Left Side Impact Sensor 1 circuits shorted together.  
Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (R15) LEFT SIDE IMPACT SENSOR 1 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

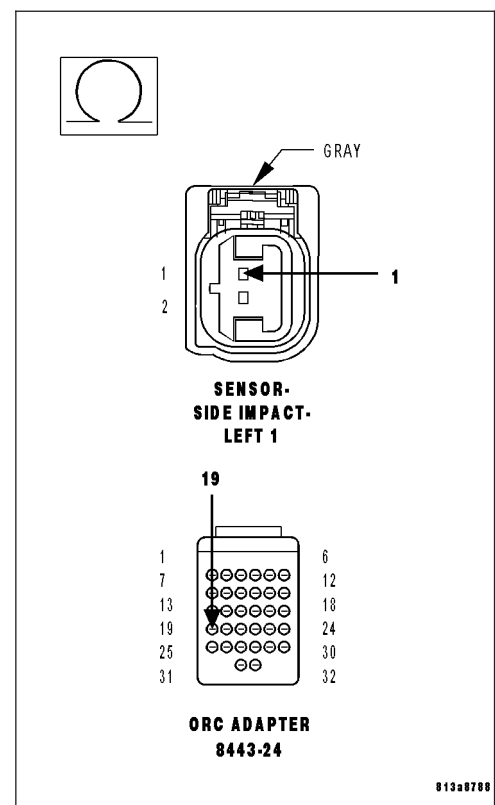
Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

Measure the resistance of the (R15) Left Side Impact Sensor 1 Ground circuit between the Left Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 6

**No** >> Repair the (R15) Left Side Impact Sensor 1 Ground circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.



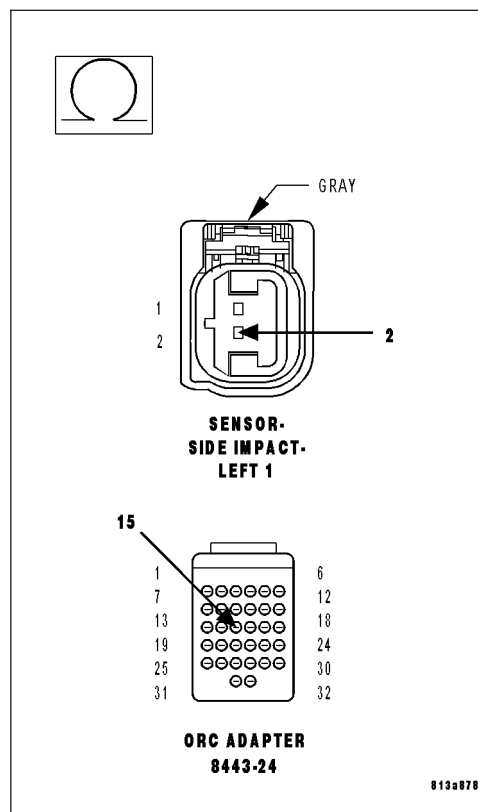
**U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)****6. CHECK THE (R13) LEFT SIDE IMPACT SENSOR 1 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Measure the resistance of the (R13) Left Side Impact Sensor 1 Signal circuit between the Left Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 7

**No** >> Repair the (R13) Left Side Impact Sensor 1 Signal circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.

**7. CHECK OPERATION OF THE LEFT SIDE IMPACT SENSOR 1**

Replace the Left Side Impact Sensor 1.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

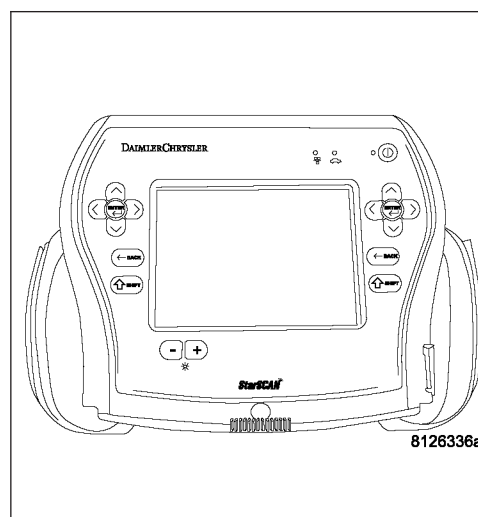
Wait one minute, and read active codes and if there are none present read the stored codes.

**Did the active Left Side Impact Sensor 1 DTC return?**

**Yes** >> Go To 8

**No** >> Repair is complete.

Perform the ORC VERIFICATION TEST - VER 1.



**U0172-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)****8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with Service Instructions.  
Perform the ORC VERIFICATION TEST - VER 1.

**9. TEST FOR AN INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

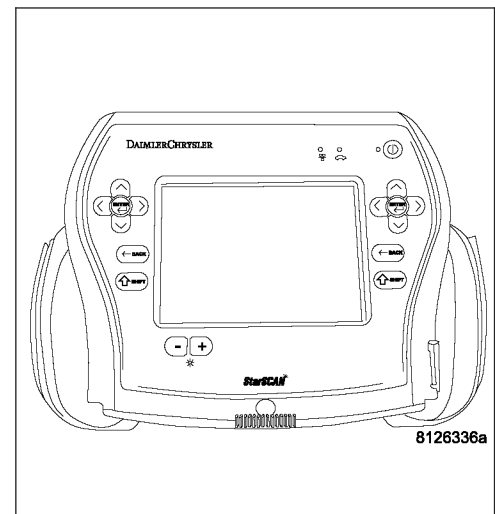
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

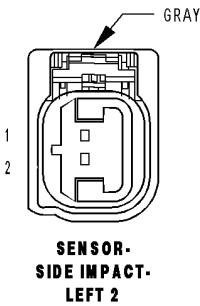
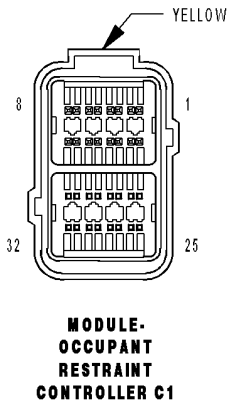
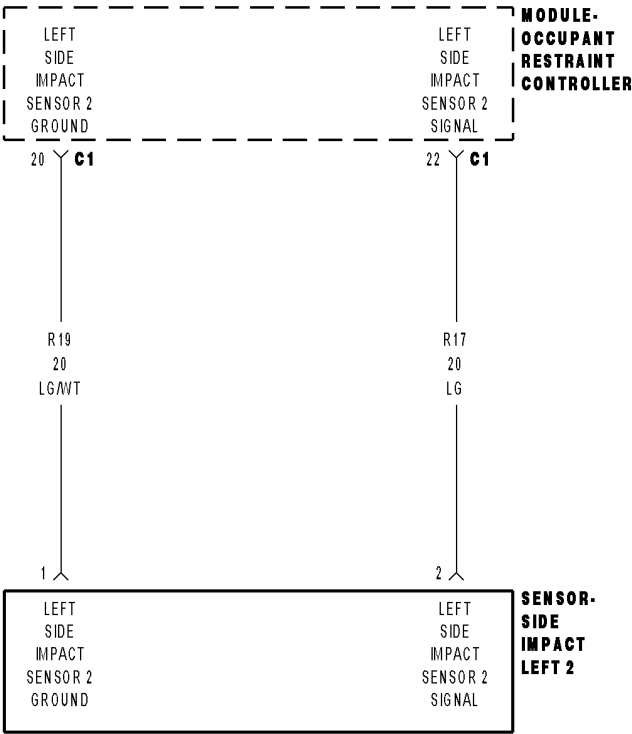
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2



**U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The Occupant Restraint Controller (ORC) continuously communicates with the Left Side Impact Sensor 2 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.

- **Set Condition:**

This code will set, if the ORC and the Left Side Impact Sensor 2 do not establish and maintain valid data communications.

Possible Causes
(R17) SIGNAL CIRCUIT SHORTED TO BATTERY
(R17) SIGNAL CIRCUIT SHORTED TO GROUND
(R17, R19) LEFT SIDE IMPACT SENSOR 2 CIRCUITS SHORTED TOGETHER
(R19) LEFT SIDE IMPACT SENSOR 2 GROUND CIRCUIT OPEN
(R17) LEFT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT OPEN
ORC, LEFT SIDE IMPACT SENSOR 2

**Diagnostic Test****1. VERIFY THAT DTC U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2 IS ACTIVE**

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

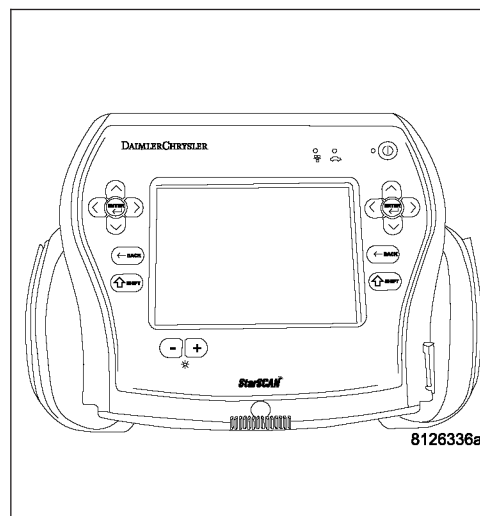
Turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active: U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 1?**

**Yes** >> Go To 2

**No** >> Go To 9





**U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)****2. CHECK THE (R17, R19) LEFT SIDE IMPACT SENSOR 2 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Left front Impact Sensor 2 connector.

Disconnect the ORC connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

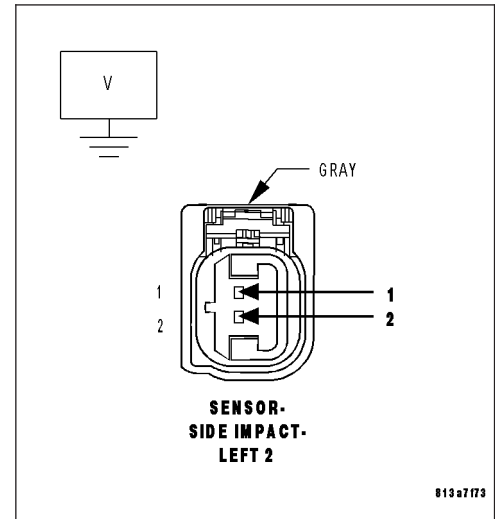
Measure the voltage of the (R17) Left Side Impact Sensor 2 Signal circuit and (R19) Sensor Ground circuit at the Left Side Impact Sensor 2 connector and ground.

**Is there any voltage present?**

**Yes** >> Repair the (R17, R19) Left Side Impact Sensor 2 circuits for a short to battery.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (R17) LEFT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn ignition on, then reconnect the battery.

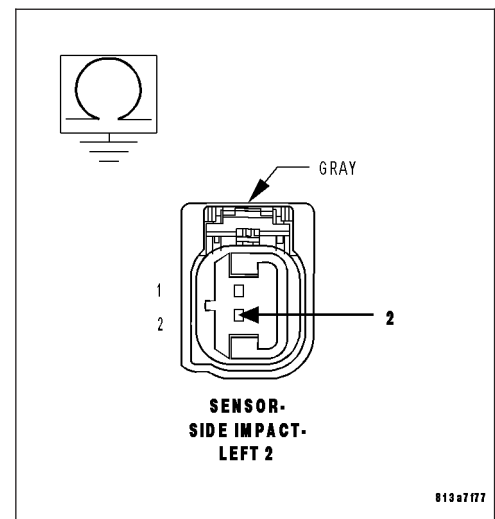
Measure the resistance of the (R17) Left Side Impact Sensor 2 Signal circuit between the Left Side Impact Sensor 2 connector and ground.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R17) Left Side Impact Sensor 2 Signal circuit for a short to ground.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4



**U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)****4. CHECK THE (R17, R19) LEFT SIDE IMPACT SENSOR 2 CIRCUITS FOR A SHORT TOGETHER**

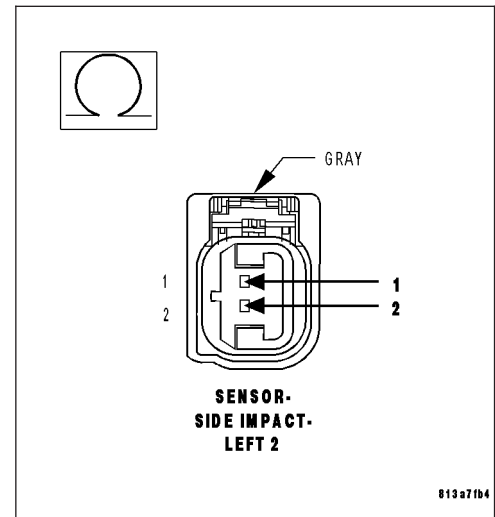
Measure the resistance between the (R17) Left Side Impact Sensor 2 Signal and (R19) Sensor Ground circuits at the Left Side Impact Sensor 2 connector.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R17, R19) Left Side Impact Sensor 2 circuits shorted together.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (R19) LEFT SIDE IMPACT SENSOR 2 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

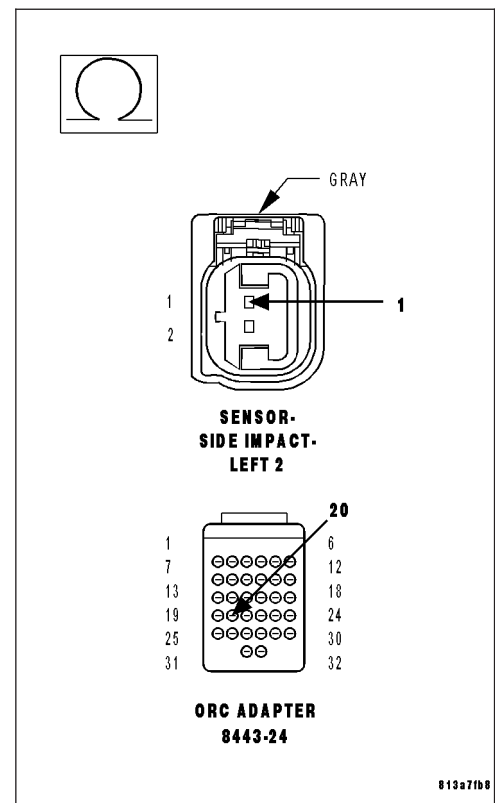
Measure the resistance of the (R19) Left Side Impact Sensor 2 Ground circuit between the Left Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 6

**No** >> Repair the (R19) Left Side Impact Sensor 2 Ground circuit for an open or high resistance.

Perform the ORC VERIFICATION TEST - VER 1.



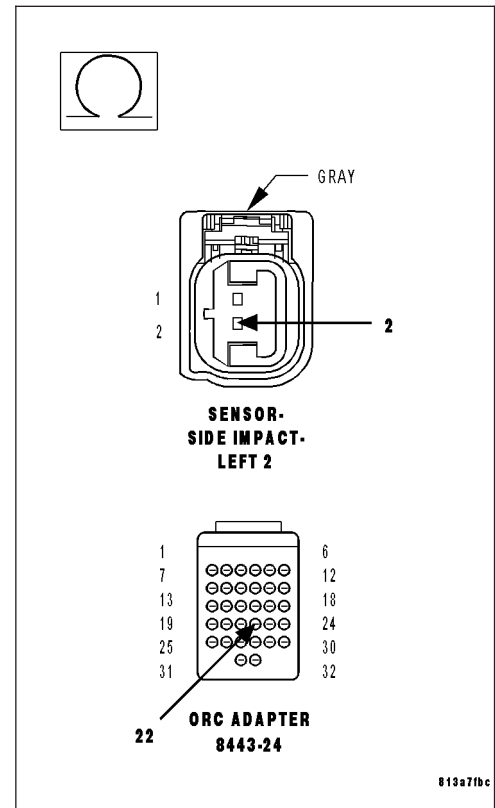
**U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)****6. CHECK THE (R17) LEFT SIDE IMPACT SENSOR 2 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Measure the resistance of the (R17) Left Side Impact Sensor 2 Signal circuit between the Left Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 7

**No** >> Repair the (R17) Left Side Impact Sensor 2 Signal circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.

**7. CHECK OPERATION OF THE LEFT SIDE IMPACT SENSOR 2**

Replace the Left Side Impact Sensor 2.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

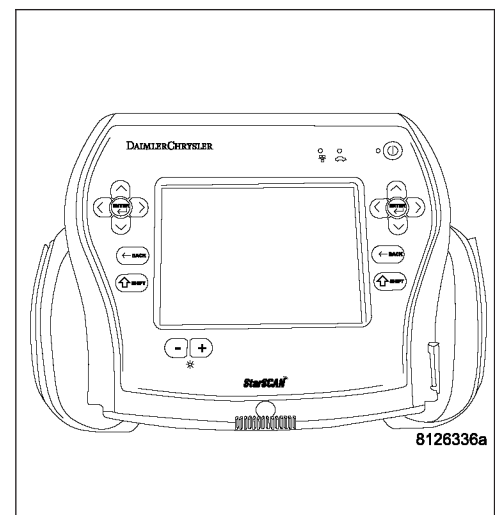
Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

**Did the active Left Side Impact Sensor 2 DTC return?**

**Yes** >> Go To 8

**No** >> Repair is complete.  
Perform the ORC VERIFICATION TEST - VER 1.



**U0173-LOST COMMUNICATION W/LEFT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)****8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with Service Instructions.  
Perform the ORC VERIFICATION TEST - VER 1.

**9. TEST FOR AN INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

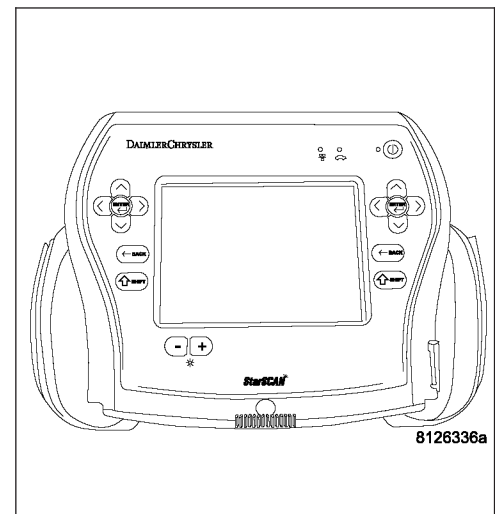
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

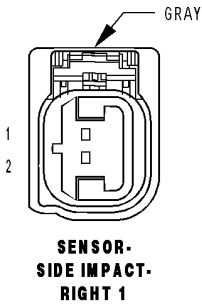
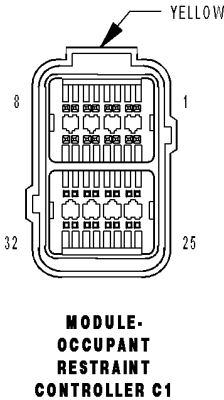
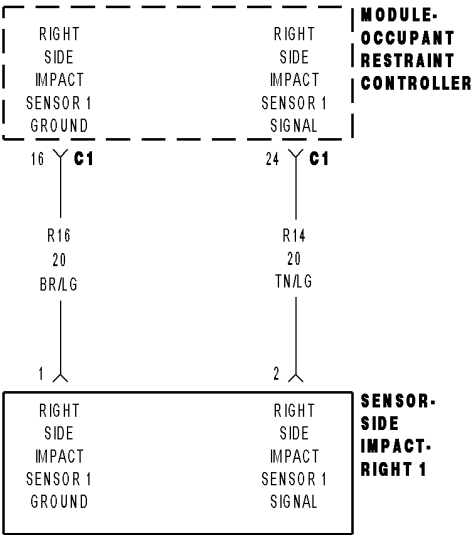
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1



**U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The Occupant Restraint Controller (ORC) continuously communicates with the Right Side Impact Sensor 1 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.

- **Set Condition:**

This code will set, if the ORC and the Right Side Impact Sensor 1 do not establish and maintain valid data communications.

Possible Causes
(R14) SIGNAL CIRCUIT SHORTED TO BATTERY
(R14) SIGNAL CIRCUIT SHORTED TO GROUND
(R14, R16) RIGHT SIDE IMPACT SENSOR 1 CIRCUITS SHORTED TOGETHER
(R16) RIGHT SIDE IMPACT SENSOR 1 GROUND CIRCUIT OPEN
(R14) RIGHT SIDE IMPACT SENSOR 1 SIGNAL CIRCUIT OPEN
ORC, RIGHT SIDE IMPACT SENSOR 1

## Diagnostic Test

### 1. VERIFY THAT DTC U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1

**Note:** Ensure the battery is fully charged.

**Note:** When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.

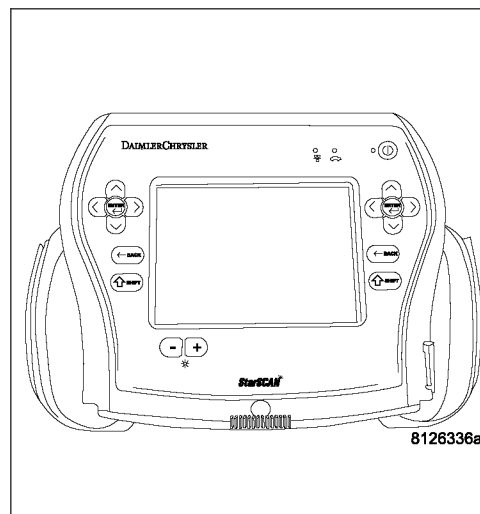
Turn the ignition on.

With the scan tool, read ORC DTCs.

**Does the scan tool display active: U0175- LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1?**

**Yes** >> Go To 2

**No** >> Go To 9



**U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)****2. CHECK THE (R14, R16) RIGHT SIDE IMPACT SENSOR 1 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Right front Impact Sensor 1 connector.

Disconnect the ORC connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

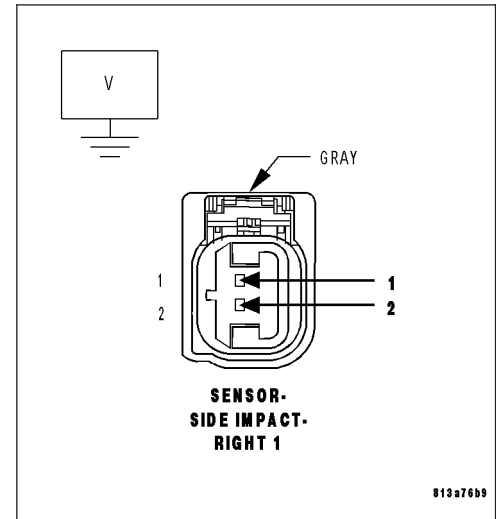
Measure the voltage of the (R14) Right Side Impact Sensor 1 Signal circuit and (R16) Sensor Ground circuit at the Right Side Impact Sensor 1 connector and ground.

**Is there any voltage present?**

**Yes** >> Repair the (R14, R16) Right Side Impact Sensor 1 circuits for a short to battery.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (R14) RIGHT SIDE IMPACT SENSOR 1 SIGNAL CIRCUIT FOR A SHORT TO GROUND**

**WARNING:** To avoid personal injury or death, turn ignition on, then reconnect the battery.

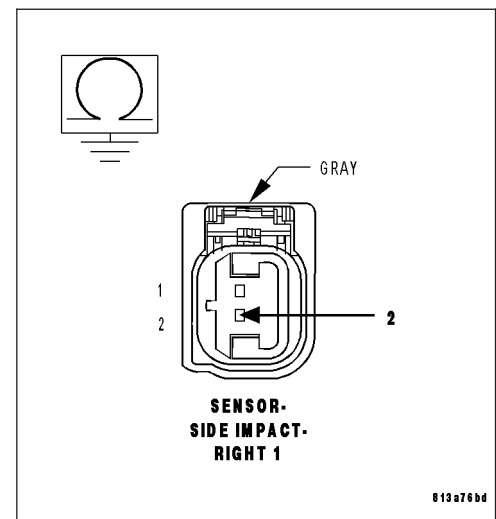
Measure the resistance of the (R14) Right Side Impact Sensor 1 Signal circuit between the Right Side Impact Sensor 1 connector and ground.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R14) Right Side Impact Sensor 1 Signal circuit for a short to ground.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4



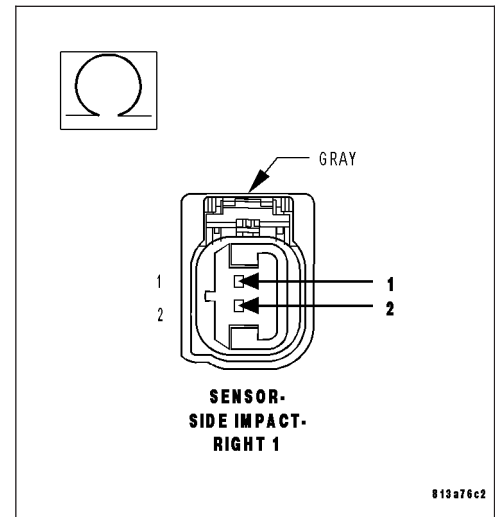
**U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)****4. CHECK THE (R14, R16) RIGHT SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER**

Measure the resistance between the (R14) Right Side Impact Sensor 1 Signal and (R16) Sensor Ground circuits at the Right Side Impact Sensor 1 connector.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R14, R16) Right Side Impact Sensor 1 circuits shorted together.  
Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (R16) RIGHT SIDE IMPACT SENSOR 1 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

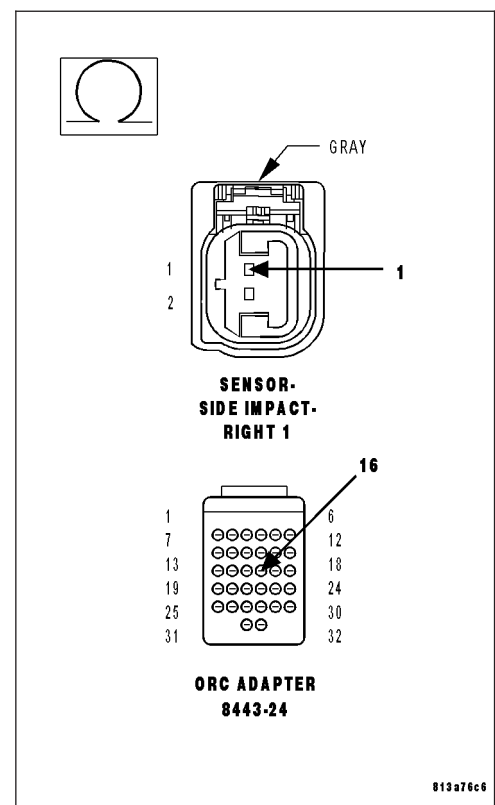
Connect the 8443 Load Tool ORC Adaptor to the Occupant Control Module connector.

Measure the resistance of the (R16) Right Side Impact Sensor 1 Ground circuit between the Right Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 6

**No** >> Repair the (R16) Right Side Impact Sensor 1 Ground circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.





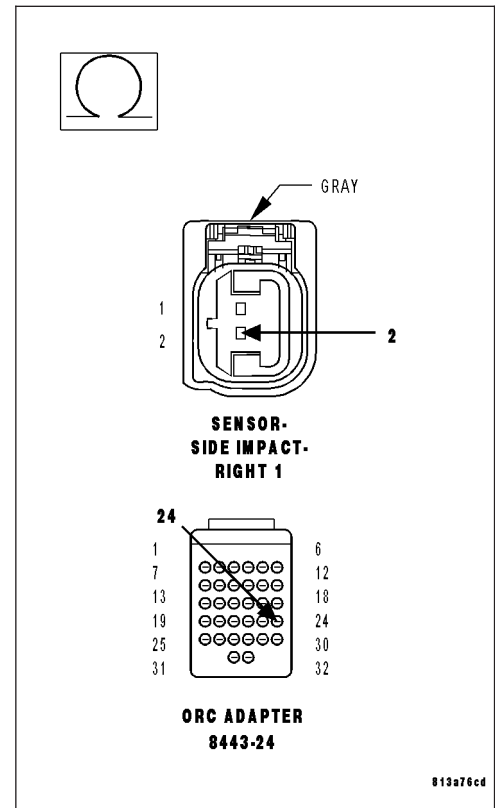
**U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)****6. CHECK THE (R14) RIGHT SIDE IMPACT SENSOR 1 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Measure the resistance of the (R14) Right Side Impact Sensor 1 Signal circuit between the Right Side Impact Sensor 1 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 7

**No** >> Repair the (R14) Right Side Impact Sensor 1 Signal circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.

**7. CHECK OPERATION OF THE RIGHT SIDE IMPACT SENSOR 1**

Replace the Right Side Impact Sensor 1.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

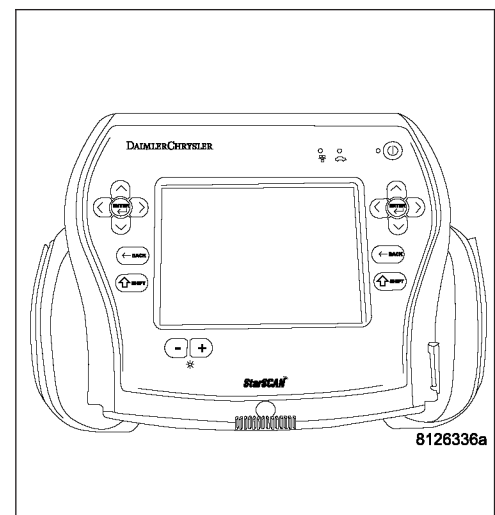
Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

**Did the active Right Side Impact Sensor 1 DTC return?**

**Yes** >> Go To 8

**No** >> Repair is complete.  
Perform the ORC VERIFICATION TEST - VER 1.



**U0175-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 1 (CONTINUED)****8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions could result in accidental airbag deployment and personal injury or death.

If there are no possible causes remaining, view repair.

**Repair**

Replace the Occupant Restraint Controller in accordance with Service Instructions.

Perform the ORC VERIFICATION TEST - VER 1.

**9. TEST FOR AN INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

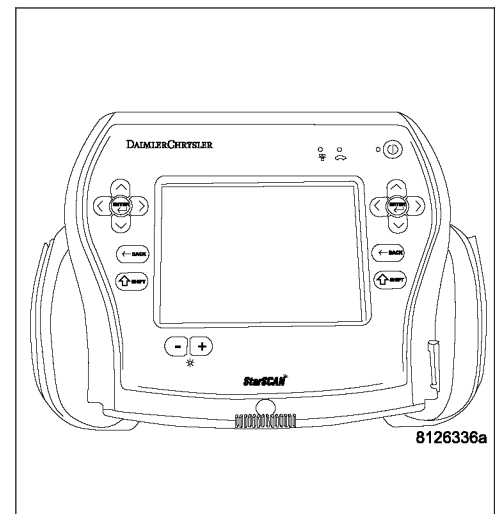
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

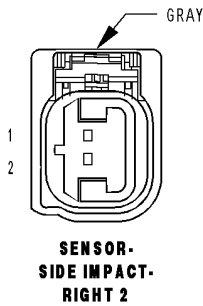
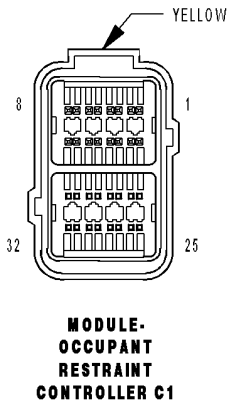
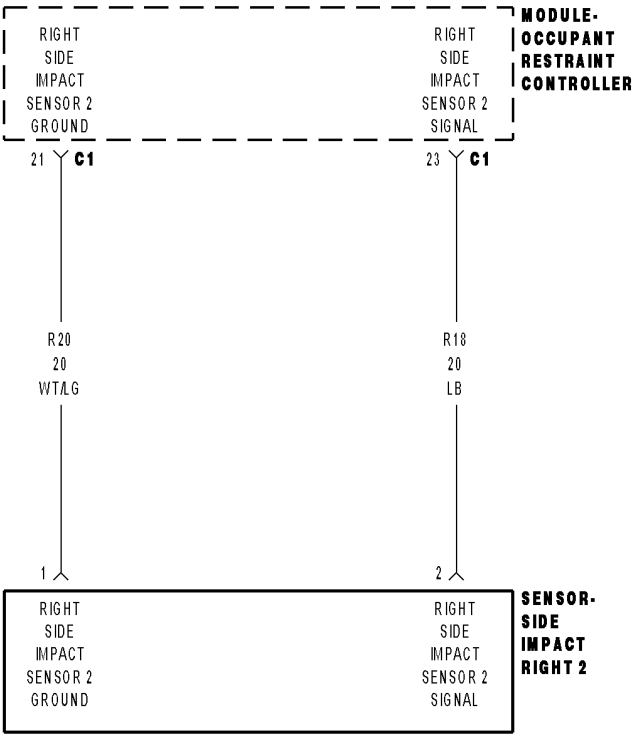
**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.



U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2



**U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)**

For the Airbag System circuit diagram (Refer to 8 - ELECTRICAL/RESTRAINTS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The Occupant Restraint Controller (ORC) continuously communicates with the Right Side Impact Sensor 2 over the sensor signal circuit. The sensor communication and on board diagnostics are powered by the ORC signal.

- **Set Condition:**

This code will set, if the ORC and the Right Side Impact Sensor 2 do not establish and maintain valid data communications.

Possible Causes
(R18) SIGNAL CIRCUIT SHORTED TO BATTERY
(R18) SIGNAL CIRCUIT SHORTED TO GROUND
(R18, R20) RIGHT SIDE IMPACT SENSOR 2 CIRCUITS SHORTED TOGETHER
(R20) RIGHT SIDE IMPACT SENSOR 2 GROUND CIRCUIT OPEN
(R18) RIGHT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT OPEN
ORC, RIGHT SIDE IMPACT SENSOR 2

## Diagnostic Test

### 1. VERIFY ACTIVE DTC U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2

Turn the ignition on.

With the scan tool, read ORC DTCs.

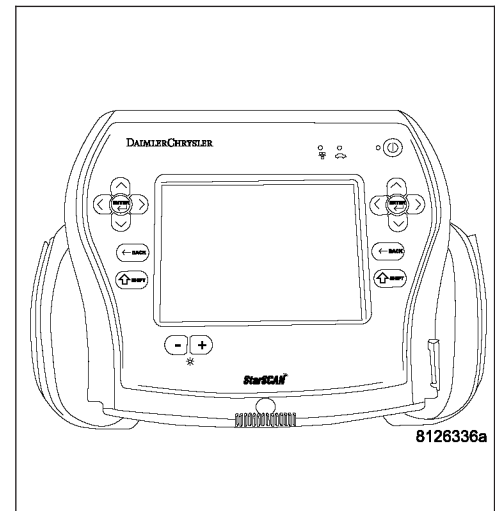
**Note: Ensure the battery is fully charged.**

**Note: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**

**Does the scan tool display an active: U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2?**

**Yes** >> Go To 2

**No** >> Go To 9



**U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)****2. CHECK THE (R18, R20) RIGHT SIDE IMPACT SENSOR 2 SIGNAL AND GROUND CIRCUITS FOR A SHORT TO BATTERY**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Disconnect the Right front Impact Sensor 2 connector.

Disconnect the ORC connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

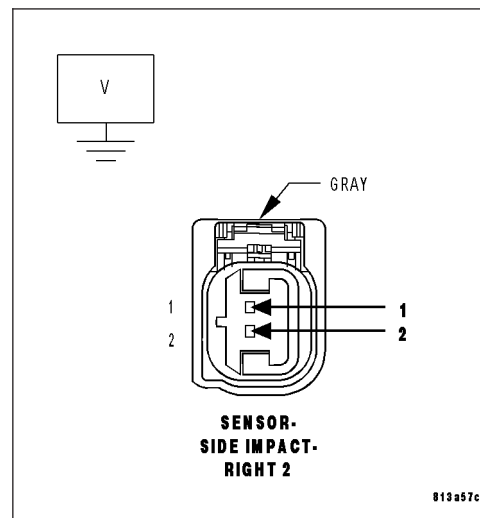
Measure the voltage of the (R18) Right Side Impact Sensor 2 Signal circuit and (R20) Sensor Ground circuit at the Right Side Impact Sensor 2 connector and ground.

**Is there any voltage present?**

**Yes** >> Repair the (R18, R20) Right Side Impact Sensor 2 circuits for a short to battery.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (R18) RIGHT SIDE IMPACT SENSOR 2 SIGNAL CIRCUIT FOR A SHORT TO GROUND**

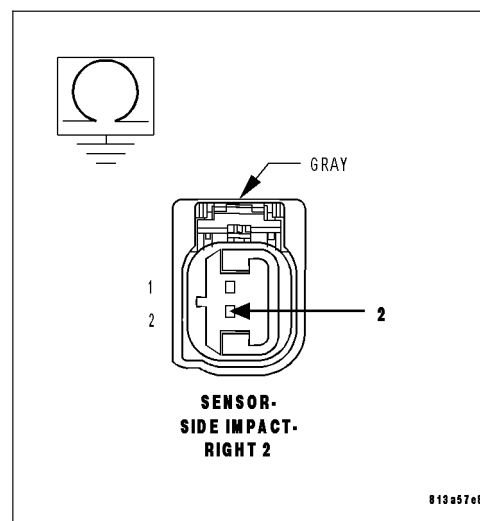
Measure the resistance of the (R18) Right Side Impact Sensor 2 Signal circuit between the Right Side Impact Sensor 2 connector and ground.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R18) Right Side Impact Sensor 2 Signal circuit for a short to ground.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 4



**U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)****4. CHECK THE (R18, R20) RIGHT SIDE IMPACT SENSOR CIRCUITS FOR A SHORT TOGETHER**

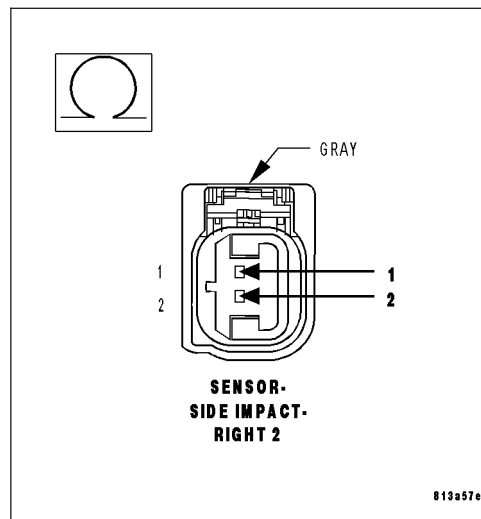
Measure the resistance between the (R18) Right Side Impact Sensor 2 Signal and (R20) Sensor Ground circuits at the Right Side Impact Sensor 2 connector.

**Is the resistance below 100K ohms?**

**Yes** >> Repair the (R18, R20) Right Side Impact Sensor 2 circuits shorted together.

Perform the ORC VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE (R18) RIGHT SIDE IMPACT SENSOR 2 GROUND CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Connect the 8443 Load Tool ORC Adaptor to the Occupant Restraint Controller C2 connector.

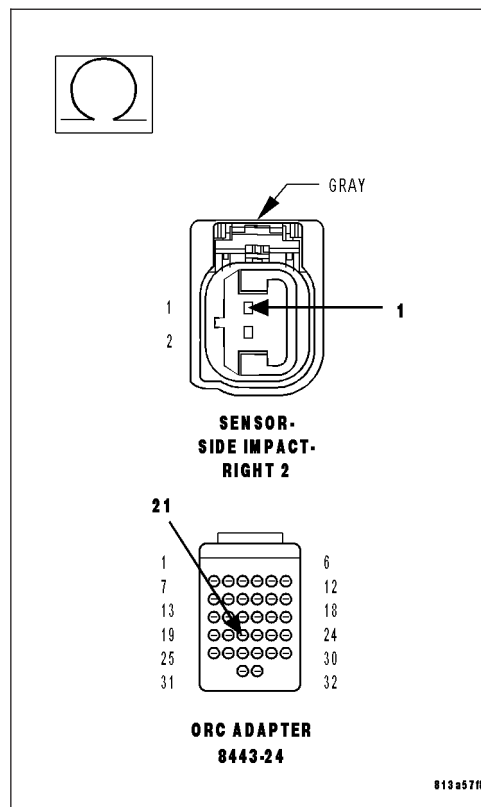
Measure the resistance of the (R20) Right Side Impact Sensor 2 Ground circuit between the Right Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 6

**No** >> Repair the (R20) Right Side Impact Sensor 2 Ground circuit for an open or high resistance.

Perform the ORC VERIFICATION TEST - VER 1.



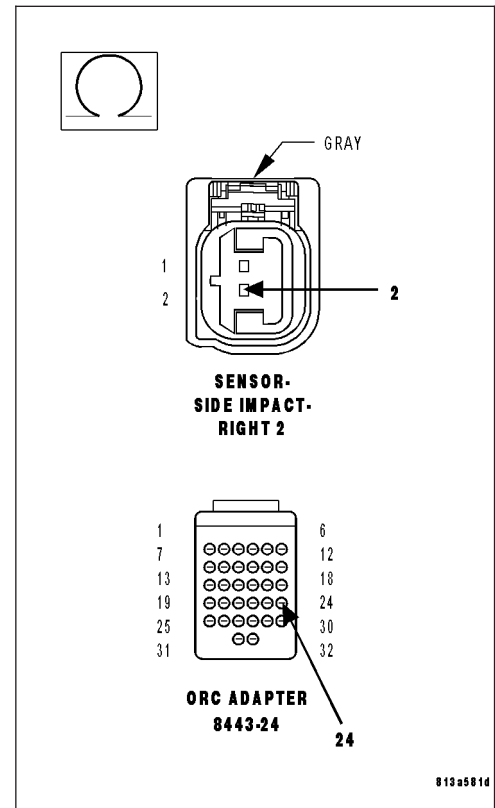
**U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)****6. CHECK THE (R18) RIGHT SIDE IMPACT SENSOR 2 CIRCUIT FOR AN OPEN OR HIGH RESISTANCE**

Measure the resistance of the (R18) Right Side Impact Sensor 2 Signal circuit between the Right Side Impact Sensor 2 connector and the 8443 Load Tool ORC Adaptor.

**Is the resistance below 1 ohm?**

**Yes** >> Go To 7

**No** >> Repair the (R18) Right Side Impact Sensor 2 Signal circuit for an open or high resistance.  
Perform the ORC VERIFICATION TEST - VER 1.

**7. CHECK OPERATION OF THE RIGHT SIDE IMPACT SENSOR 2**

Replace the Right Side Impact Sensor 2.

Reconnect the vehicle body harness to the impact sensor.

Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

**WARNING: To avoid personal injury or death, turn the ignition on, then reconnect the battery.**

Connect the scan tool to the Data Link Connector - use the most current software available.

Use the scan tool and erase the stored codes in all airbag system modules.

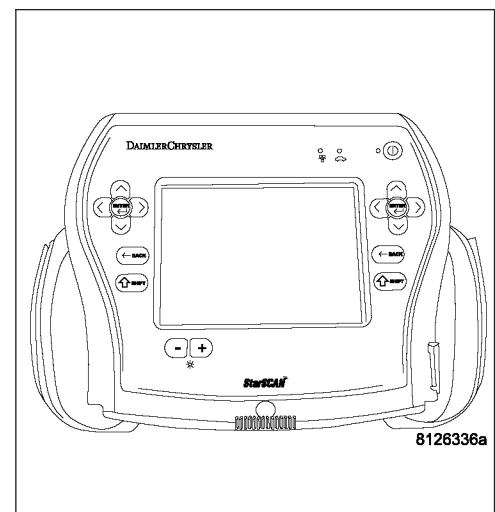
Turn the Ignition Off, and wait 15 seconds before turning the Ignition On.

Wait one minute, and read active codes and if there are none present read the stored codes.

**Did the active Right Side Impact Sensor 2 DTC return?**

**Yes** >> Go To 8

**No** >> Repair is complete.  
Perform the ORC VERIFICATION TEST - VER 1.



**U0176-LOST COMMUNICATION W/RIGHT SIDE SATELLITE ACCELERATION SENSOR 2 (CONTINUED)****8. REPLACE THE OCCUPANT RESTRAINT CONTROLLER**

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

**WARNING:** If the airbag control module is dropped at any time, it must be replaced. Failure to take the proper precautions can result in accidental airbag deployment and personal injury or death.

**Repair**

Replace the Occupant Restraint Controller in accordance with Service Instructions.  
Perform the ORC VERIFICATION TEST - VER 1.

**9. TEST FOR INTERMITTENT CONDITION**

With the scan tool, record and erase all DTC's from all Airbag modules.

If any ACTIVE codes are present they must be resolved before diagnosing any stored codes.

**WARNING:** To avoid personal injury or death, turn the ignition off, disconnect the battery and wait two minutes before proceeding.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals.

The following additional checks may assist you in identifying a possible intermittent problem.

Reconnect any disconnected components and harness connector.

**WARNING:** To avoid personal injury or death, turn the ignition on, then reconnect the battery.

With the scan tool monitor active codes as you work through the following steps.

**WARNING:** To avoid personal injury or death, maintain a safe distance from all airbags while performing the following steps.

Wiggle the wiring harness and connectors of the related airbag circuit or component.

If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop.

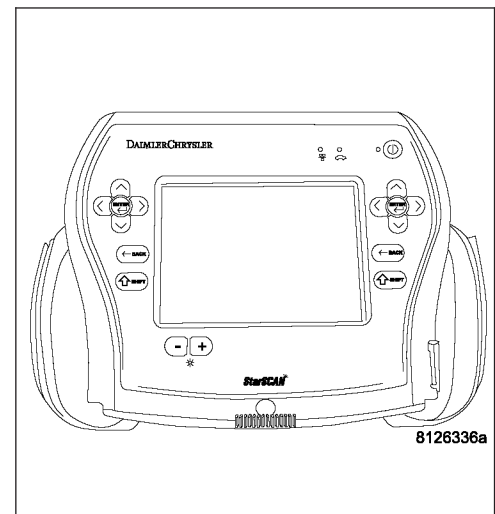
If only stored codes return continue the test until the problem area has been isolated.

In the previous steps you have attempted to recreate the conditions responsible for setting active DTC in question.

**Are any ACTIVE DTCs present?**

**Yes** >> Select the appropriate symptom from Symptom List.

**No** >> No problem found at this time. Erase all codes before returning vehicle to customer.





## **U0184-LOST COMMUNICATION WITH RADIO**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0195-LOST COMMUNICATION WITH SDARS**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0196-LOST COMMUNICATION WITH VEHICLE ENTERTAINMENT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0197-LOST COMMUNICATION WITH HANDS FREE PHONE MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

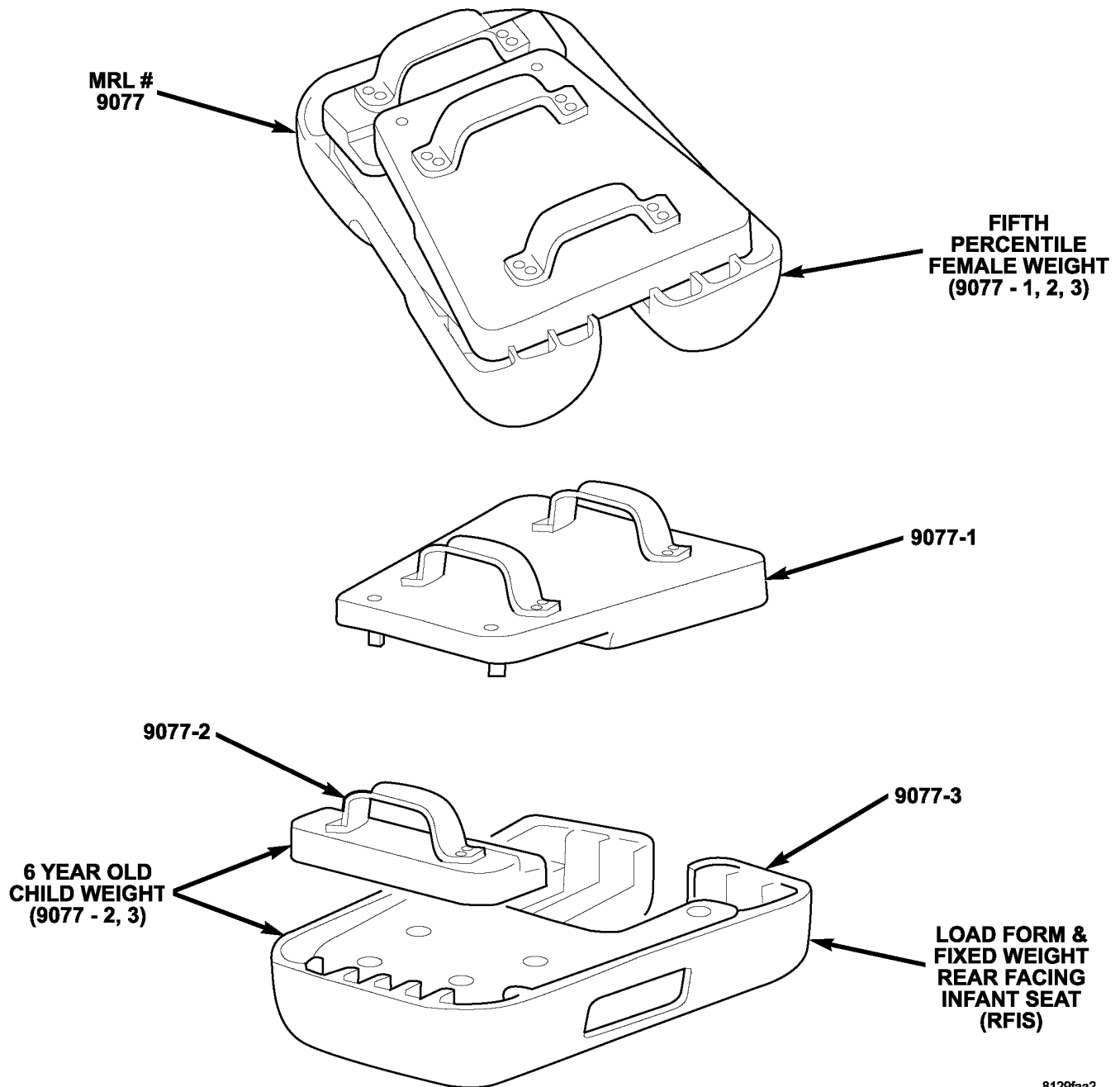
## **U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**\*DIAGNOSIS AND CHECKOUT PROCEDURE FOR SEAT WEIGHT SENSORS**

**OCCUPANT CLASSIFICATION SEAT WEIGHTS**



**\*DIAGNOSIS AND CHECKOUT PROCEDURE FOR SEAT WEIGHT SENSORS (CONTINUED)****1. VERIFY COMPLAINT**

Turn the ignition off.

Move the front passenger seat to the full rear position. Verify that the seat is empty, the seat back is in the normal upright position, and that the seat is not interfering with any interior components.

Verify that all related connectors are properly seated and locked.

Turn the ignition on.

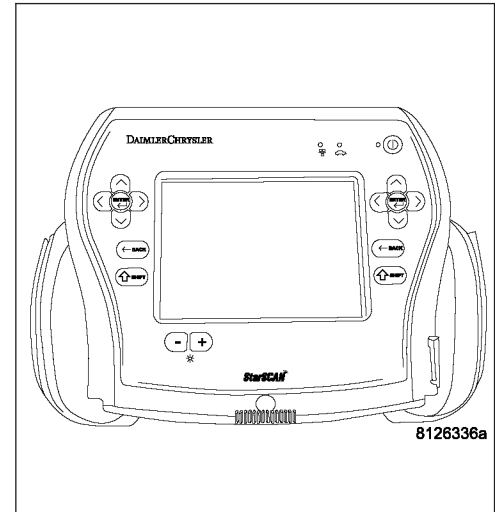
With the scan tool in OCM, select Data Display and note the Passenger Seat Weight Sensor voltage for all four sensors (Left Front, Right Front, Left Rear and Right Rear).

Move the front passenger seat to the mid track position.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors.

Move the front passenger seat to the full forward position.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor in each position (full rear, mid track, and full forward).



**Is any sensor's voltage reading out of the acceptable range in any position?**

**Yes** >> Go To 2

**No** >> Perform test B1BA7 Occupant Classification System Verification Required. If the test passes, the seat weight sensing system is working properly. Return to the procedure that directed you to this procedure.

**2. CHECKING FOR BENT FLOOR PAN**

Turn the ignition off.

Loosen all of the mounting screws retaining the front passenger seat to the vehicle crossmembers, but do not remove them. Verify that the seat is loose and that no binding exists between the seat and the crossmembers.

Move the front passenger seat to the full rear position and then to the full forward position.

Tighten all of the mounting screws to specification. Refer to 23 - BODY/SEATS.

Move the front passenger seat to the full rear position.

Turn the ignition on.

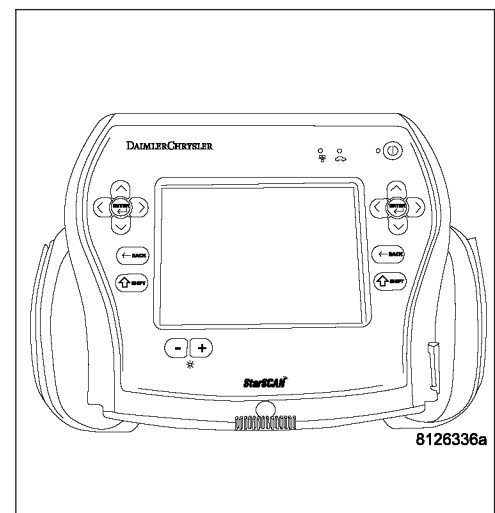
Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors.

Move the front passenger seat to the mid track position.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors.

Move the front passenger seat to the full forward position.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor in each position.



**Is any sensor's voltage reading out of the acceptable range in any position?**

**Yes** >> Go To 3

**No** >> Perform test B1BA7 Occupant Classification System Verification Required. If the test passes, the seat weight sensing system is working properly. Return to the procedure that directed you to this procedure.

**\*DIAGNOSIS AND CHECKOUT PROCEDURE FOR SEAT WEIGHT SENSORS (CONTINUED)****3. CHECKING SEAT TO RISER STRESS**

Turn the ignition off.

Loosen all of the mounting screws retaining the front passenger seat track to the riser, but do not remove them. Verify that the seat track is loose and that no binding exists between the seat track and the risers.

Turn the ignition on.

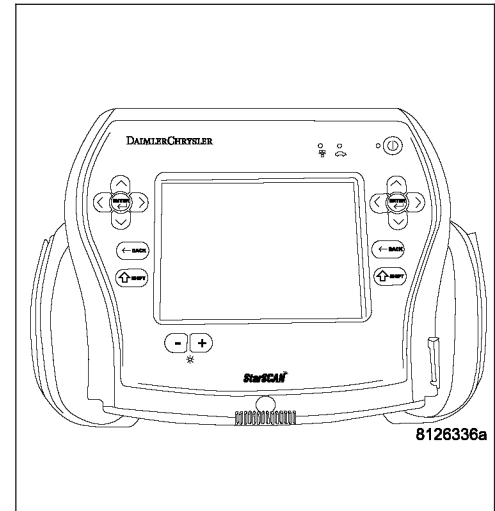
Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.5 to 3.5 volts for each sensor.

**Is any sensor's voltage reading out of the acceptable range?**

**Yes** >> Go To 4

**No** >> Visually inspect for damaged or bent risers and crossmembers. Also, verify that the riser holes line up with the seat mounts in the crossmembers.

If riser damage is apparent, replace the risers in accordance with the Service Information. Then, reinstall the Seat Weight Sensors, and Go To 6.



**Note: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.**

If crossmember or floorpan damage is present, repair or replace the components as necessary in accordance with the Service Information. Reinstall the seat in the vehicle in accordance with the Service Information. Turn the ignition on. With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the directions displayed on the scan tool. When the test is complete, Go To 1.

**4. TEST SEAT FRAME**

Turn the ignition off.

Remove the front passenger seat from the risers in accordance with the Service Information. Return the risers to their normal mounting position.

Turn the ignition on.

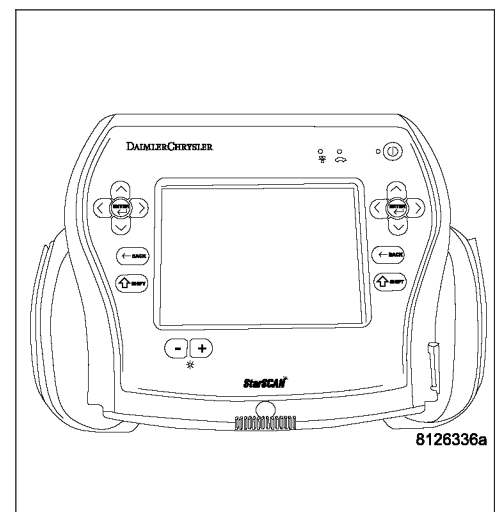
Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor.

**Is any sensor's voltage reading out of the acceptable range?**

**Yes** >> Go To 5

**No** >> Visually inspect for damaged or bent risers, a damaged or bent seat and seat structure, and damaged or bent seat tracks. Also, verify that the holes in the center of the sensors line up with the seat track holes and that the seat track position locating tabs are locked in the same parallel slots. If riser damage is apparent, replace the risers in accordance with the Service Information. Then, reinstall the Seat Weight Sensors, and Go To 6.

If seat or seat track damage is present, replace the components as necessary in accordance with the Service Information. Then, Go To 7



**\*DIAGNOSIS AND CHECKOUT PROCEDURE FOR SEAT WEIGHT SENSORS (CONTINUED)****5. TEST SENSOR**

Turn the ignition off.

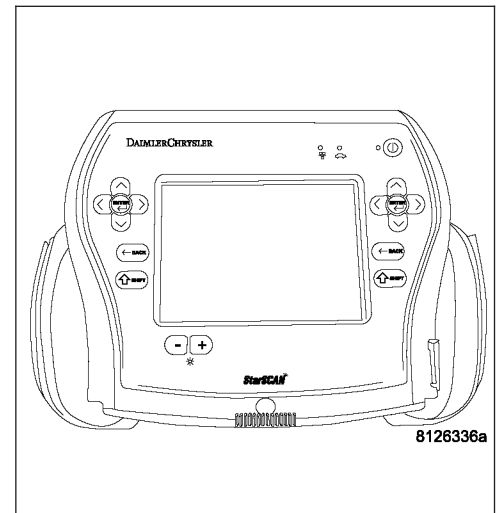
Loosen the mounting screws of all of the Seat Weight Sensors, but do not remove them. Verify that the sensors are loose and that no binding exists between the sensors and the risers.

Turn the ignition on.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor.

**Is any sensor's voltage reading out of the acceptable range?**

- Yes** >> Replace any Seat Weight Sensors that have an unacceptable voltage reading in accordance with the Service Information. Then, Go To 6.
- No** >> Replace the risers in accordance with the Service Information. Then, reinstall the Seat Weight Sensors, and Go To 6

**6. CHECKING FOR IMPROPER SEAT WEIGHT SENSOR TORQUE**

Turn the ignition off.

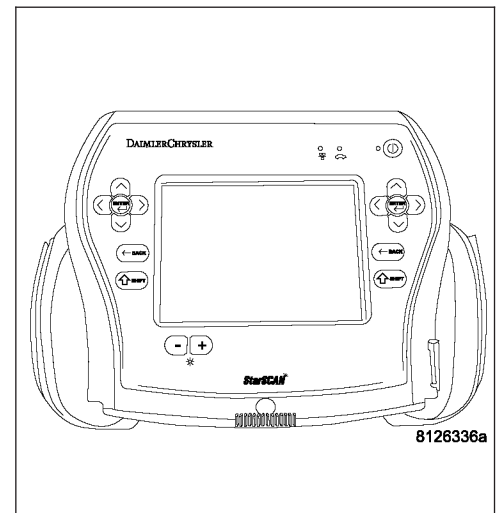
Tighten all of the Seat Weight Sensor mounting screws to specification. Refer to 23 - BODY/SEATS.

Turn the ignition on.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor.

**Is any sensor's voltage reading out of the acceptable range?**

- Yes** >> Loosen the mounting screws of all Seat Weight Sensors with an unacceptable voltage reading, and repeat Steps 5 and 6.
- No** >> Go To 7



**\*DIAGNOSIS AND CHECKOUT PROCEDURE FOR SEAT WEIGHT SENSORS (CONTINUED)****7. TEST SEAT TRACKS**

Turn the ignition off.

Mount the front passenger seat on the risers in accordance with service information.

Turn the ignition on.

Using the scan tool, note the Passenger Seat Weight Sensor voltage for all four sensors. The voltage should be from 1.4 to 3.6 volts for each sensor.

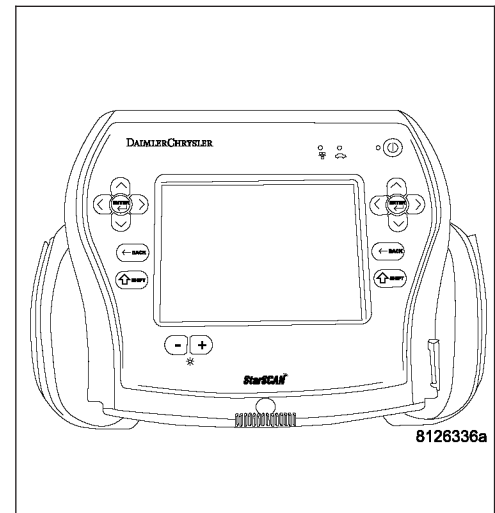
**Is any sensor's voltage reading out of the acceptable range?**

**Yes** >> Replace the seat track in accordance with the Service Information. Verify that no binding exists between the seat and risers. Then, repeat Steps 6 and 7.

**No** >>

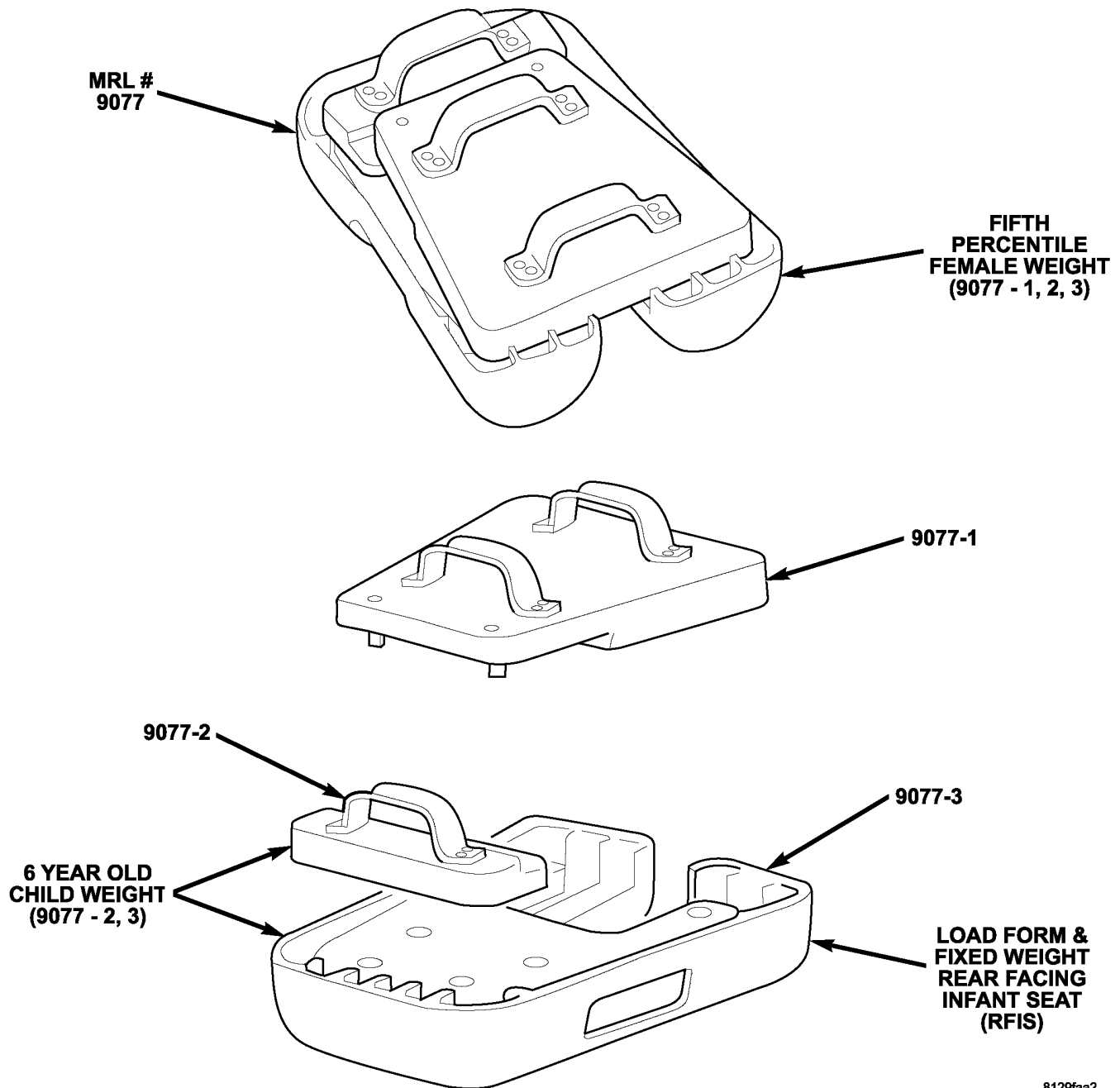
**Note: Failure to follow test instructions or aborting the test will cause faults to set when performing the Occupant Classification Module System Verification Test. To prevent faults due to process errors: Verify That All Tests Steps That Led You Here Were Performed As Directed; Verify That The Ignition Is In Run; Wait 30 Seconds After Changing The Seat Weight Before Proceeding To Allow The System To Stabilize; Only Press Scan Tool Buttons When Directed To Do So; & Perform The Occupant Classification Module System Verification Test To Completion.**

Reinstall the seat in the vehicle in accordance with the Service Information. Turn the ignition on. With the scan tool in OCM, select More Options, select System Tests, and select Occupant Classification Module System Verification Test. Run the test by following the instructions displayed by the scan tool. When the test is complete, Go To 1



**\*OCS VERIFICATION TEST - VER 1**

**OCCUPANT CLASSIFICATION SEAT WEIGHTS**



**\*OCS VERIFICATION TEST - VER 1 (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

**1.**

1. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

**WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION ON THEN RECONNECT THE BATTERY.**

2. Connect the scan tool to the Data Link Connector - use the most current software available.

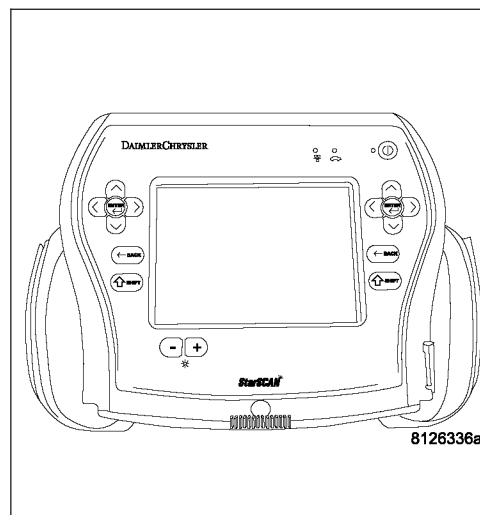
3. With the scan tool to erase stored DTCs in all airbag system modules.

4. Turn the ignition off, and wait 15 seconds, then turn the ignition on.

5. Wait one minute, and read active codes and if there are none present read the stored codes.

6. Note: Read the DTC's in all airbag system related modules.

7. If the scan tool shows any active or stored codes, return to the Table of Content and follow path specified for that trouble code. If no active or stored codes are present, the repair is complete.



**Are any DTC's present or is the original condition still present?**

**Yes** >> Repair is not complete, refer to appropriate symptom list.

**No** >> Repair is complete.



**\*ORC VERIFICATION TEST - VER 1**

For a complete wiring diagram **Refer to Section 8W.**

**1.**

1. Remove any special tools or jumper wires and reconnect all previously disconnected components - except the Battery.

**WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION ON THEN RECONNECT THE BATTERY.**

2. Connect the scan tool to the Data Link Connector - use the most current software available.

3. With the scan tool to erase stored DTCs in all airbag system modules.

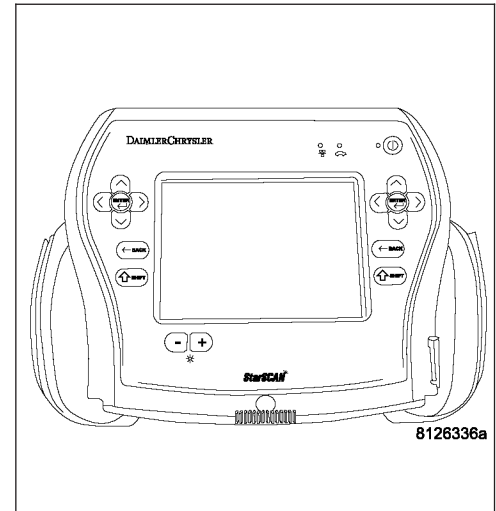
4. Turn the ignition off, and wait 15 seconds, then turn the ignition on.

5. Wait one minute, and read active codes and if there are none present read the stored codes.

6. Note: If equipped with Airbag On - Off switch, read the DTC's in all switch positions.

7. Note: Read the DTC's in all airbag system related modules.

8. If the scan tool shows any active or stored codes, return to the Table of Contents and follow path specified for that trouble code. If no active or stored codes are present, the repair is complete.

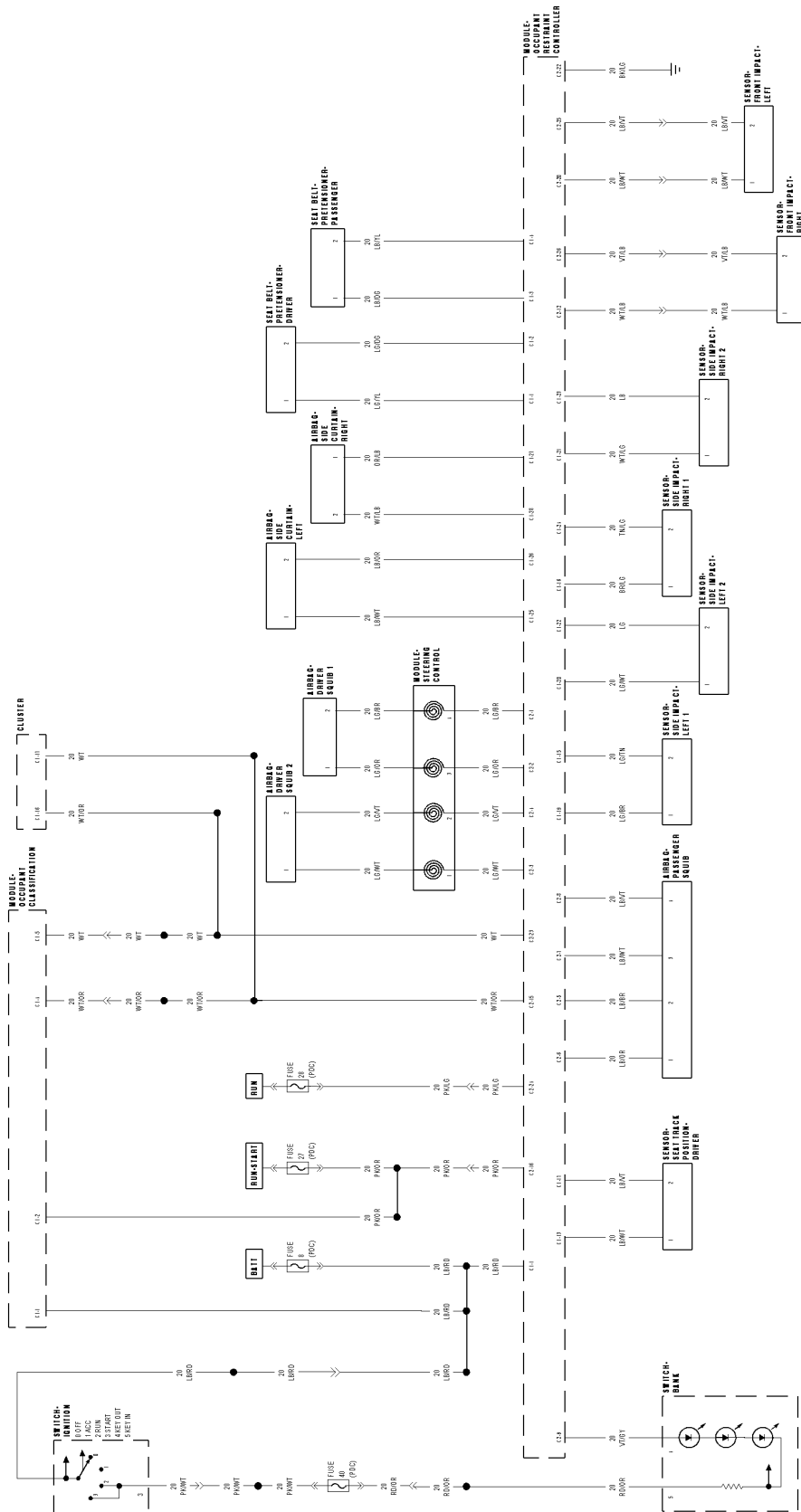


**Are any DTC's present or is the original condition still present?**

**Yes** >> Repair is not complete, refer to appropriate symptom list.

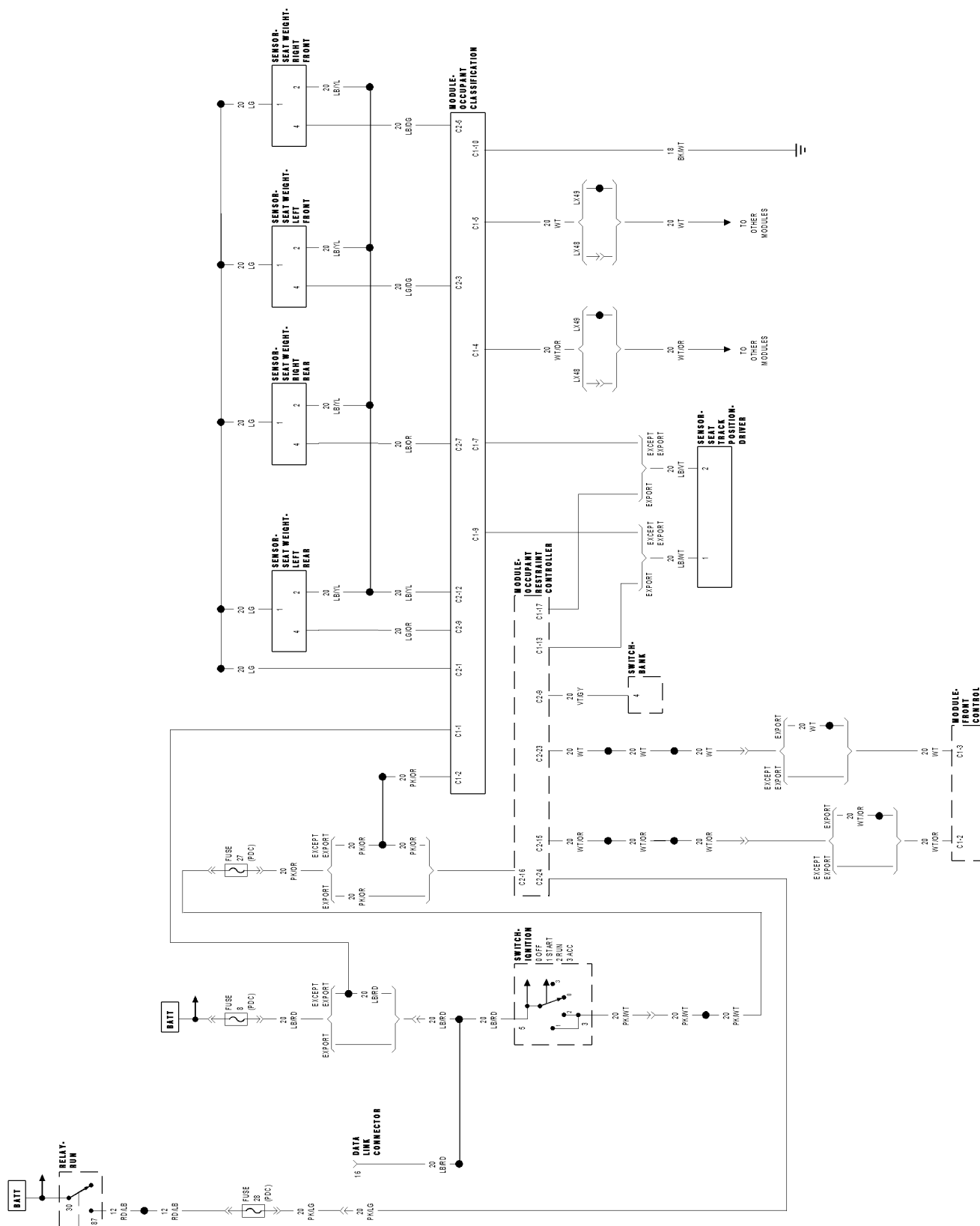
**No** >> Repair is complete.

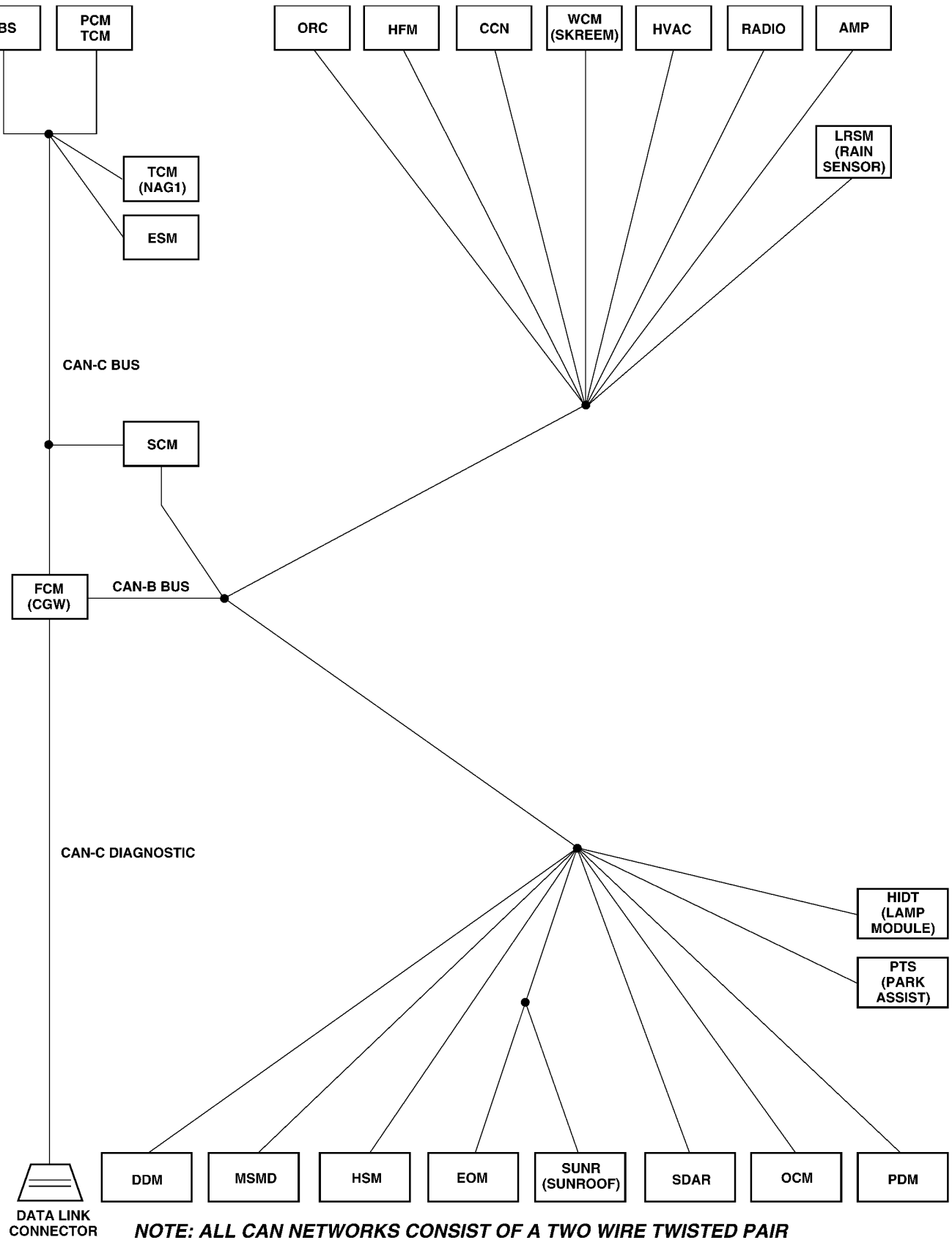
# SCHEMATICS AND DIAGRAMS



81398603

OCCUPANT RESTRAINT CONTROLLER SYSTEM





## RESTRAINTS - SERVICE INFORMATION

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## RESTRAINTS - SERVICE INFORMATION

## DESCRIPTION

The Occupant Restraint System include both active and passive types. Active restraints are those which require the vehicle occupants to take some action to employ, such as fastening a seat belt; while passive restraints require no action by the vehicle occupants to be employed.

## ACTIVE RESTRAINTS

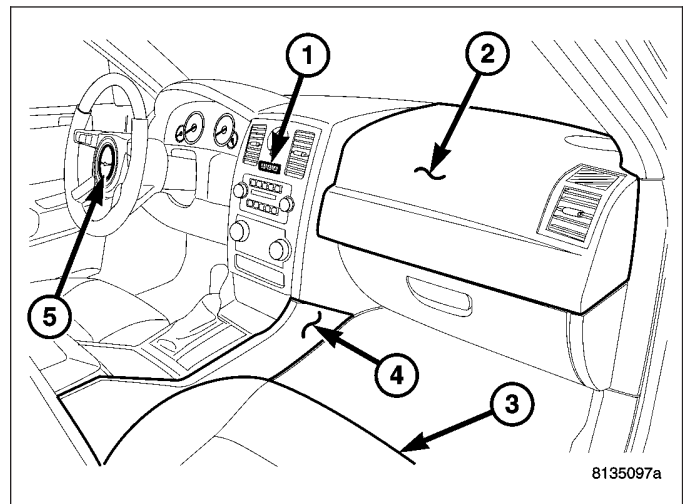
The active restraints include:

- **Front Seat Belts** - Both front seating positions are equipped with three-point seat belt systems employing lower B-pillar mounted inertia latch-type emergency locking retractors, height-adjustable upper B-pillar mounted turning loops, a traveling lower seat belt anchor secured to the outboard side of the seat frame, and a traveling end-release seat belt buckle secured to the inboard side of the seat frame. The driver side front seat belt retractor includes an integral seat belt switch that detects whether the driver side front seat belt has been fastened.
- **Second Row Seat Belts** - All three second row seating positions are equipped with three-point seat belt systems. The outboard seating position belts employ lower C-pillar mounted inertia latch-type emergency locking retractors, self-cinching latch plates for compatibility with child seats, fixed lower seat belt anchors secured to the floor panel. The center position retractor is secured within the center rear seat back panel, and the fixed lower seat belt anchor and the fixed end-release buckle are both secured to the floor panel.
- **Child Restraint Anchors** - All vehicles are equipped with three, fixed-position, child seat upper tether anchors for the second row seating. These upper anchors are integral to the rear shelf panel on sedans, and the back of each second row seat back on wagons. Two lower anchors are also provided for each second row seating position. These lower anchors are accessed from the front of the rear seat where the seat back meets the seat cushion.

## PASSIVE RESTRAINTS

The passive restraints include the following:

- **Dual Front Airbags** - Multistage driver and front passenger airbags are standard in this model. This airbag system is a passive, inflatable, Supplemental Restraint System (SRS) and vehicles with this equipment can be readily identified by the "SRS - AIRBAG" logo molded into the driver airbag trim cover in the center of the steering wheel and also into the passenger airbag door on the top of the instrument panel above the glove box. Vehicles with the airbag system can also be identified by the airbag indicator, which will illuminate in the Electro-Mechanical Instrument Cluster (EMIC) for about seven seconds as a bulb test each time the ignition switch is turned to the On position. A pyrotechnic-type seat belt tensioner is also integral to the driver and passenger front seat belt retractors to work in conjunction with the dual front airbags.
- **Occupant Classification System** - Vehicles manufactured for sale in North America (except Mexico) also include an Occupant Classification System (OCS) with components that are located on the front seats. These components include an Occupant Classification Module (OCM) and four seat weight sensors on the passenger seat, and a seat track position sensor on the driver seat. Vehicles equipped with the OCS components can be readily identified by a passenger airbag disabled indicator located just above the radio, between the a/c outlets on the instrument panel.
- **Curtain Airbags** - Curtain airbags are available when it is also equipped with dual front airbags. This airbag system is a passive, inflatable, Supplemental Restraint System (SRS) and can be readily identified by a molded identification trim button with the "SRS - AIRBAG" logo located on the headliner above each B-pillar.



The supplemental restraint system includes the following major components, which are described in further detail elsewhere in this service information:



- **Airbag Indicator** - The airbag indicator is integral to the ElectroMechanical Instrument Cluster (EMIC), which is located on the instrument panel in front of the driver.
- **Clockspring** - The clockspring is located near the top of the steering column, directly beneath the steering wheel.
- **Curtain Airbag** - In vehicles equipped with this option, a curtain airbag is secured to each inside roof side rail, and extends from the A-pillar to the D-pillar. The curtain airbags are concealed above the headliner trim.
- **Driver Airbag** - The driver airbag is located in the center of the steering wheel, beneath the driver airbag trim cover.
- **Driver Knee Blocker** - The driver knee blocker is a structural unit secured to the back side of and integral to the instrument panel steering column opening cover.
- **Front Impact Sensor** - Two front impact sensors are used on vehicles equipped with dual front airbags, one left side and one right side. One sensor is located on the back side of each vertical member of the radiator support.
- **Occupant Classification Module** - Vehicles equipped with the Occupant Classification System (OCS) include an Occupant Classification Module (OCM) which is secured to the underside of the passenger side front seat cushion frame.
- **Occupant Restraint Controller** - The Occupant Restraint Controller (ORC) is located on a mount on the floor panel transmission tunnel in front of the transmission gear selector, and is concealed below the instrument panel.
- **Passenger Airbag** - The passenger airbag is located in the instrument panel, beneath the passenger airbag door on the top of the instrument panel above the glove box on the passenger side of the vehicle.
- **Passenger Airbag Disabled Indicator** - The Occupant Classification System (OCS) includes a passenger airbag disabled indicator which is located just above the radio in the instrument panel center stack, between the a/c outlets.
- **Passenger Knee Blocker** - The passenger knee blocker is a structural reinforcement that is integral to and concealed within the glove box door.
- **Seat Belt Tensioner** - A seat belt tensioner is integral to both front seat belt retractor units on vehicles equipped with dual front airbags. The seat belt retractor and tensioner units are secured to the right and left inner B-pillars and concealed beneath the lower B-pillar trim.
- **Seat Track Position Sensor** - The Occupant Classification System (OCS) includes two seat track position sensors. One sensor is located on the inboard side of the outboard seat adjuster track on both the driver and the passenger front seats.
- **Seat Weight Sensor** - Vehicles equipped with the Occupant Classification System (OCS) include four seat weight sensors, one on each corner of the passenger side front seat between the seat cushion frame and the seat adjuster tracks.
- **Side Impact Sensor** - Four side impact sensors are used on vehicles equipped with the curtain airbags, two on each side of the vehicle. One sensor is located near each right and left side B-pillar and C-pillar concealed behind the interior trim.

The ORC, the OCM, and the EMIC each contain a microprocessor and programming that allow them to communicate with each other using the Controller Area Network (CAN) data bus. This method of communication is used by the ORC for control of the airbag indicator in the EMIC. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - DESCRIPTION).

## OPERATION

### ACTIVE RESTRAINTS

The primary passenger restraints in this or any other vehicle are the seat belts and child restraint anchors. Seat belts and child restraint anchors are referred to as an active restraint because the vehicle occupants are required to physically fasten and properly adjust these restraints in order to benefit from them. See the owner's manual in the vehicle glove box for more information on the features, use and operation of all of the factory-installed active restraints.

### PASSIVE RESTRAINTS

The passive restraints are referred to as a supplemental restraint system because they were designed and are intended to enhance the protection for the occupants of the vehicle **only** when used in conjunction with the seat belts. They are referred to as passive restraints because the vehicle occupants are not required to do anything to make them operate; however, the vehicle occupants must be wearing their seat belts in order to obtain the maximum safety benefit from the factory-installed supplemental restraint system.

The supplemental restraint system electrical circuits are continuously monitored and controlled by a microprocessor and software contained within the Occupant Restraint Controller (ORC). An airbag indicator in the ElectroMechanical Instrument Cluster (EMIC) illuminates for about seven seconds as a bulb test each time the ignition switch is turned to the On or Start positions. Following the bulb test, the airbag indicator is turned on or off by the ORC to indicate the status of the supplemental restraint system. If the airbag indicator comes on at any time other than during the bulb test, it indicates that there is a problem in the supplemental restraint system electrical circuits. Such a problem may cause airbags not to deploy when required, or to deploy when not required.

Deployment of the supplemental restraints depends upon the angle and severity of an impact. Deployment is not based upon vehicle speed; rather, deployment is based upon the rate of deceleration as measured by the forces of gravity (G force) upon the impact sensors. When an impact is severe enough, the microprocessor in the ORC signals the inflator of the appropriate airbags to deploy their cushions. The front seat belt tensioners are provided with a deployment signal by the ORC in conjunction with the front airbags.

During a frontal vehicle impact, the knee blockers work in concert with properly fastened and adjusted seat belts to restrain both the driver and the front seat passenger in the proper position for an airbag deployment. The knee blockers also absorb and distribute the crash energy from the driver and the front seat passenger to the structure of the instrument panel. The seat belt tensioners remove the slack from the front seat belts to provide further assurance that the driver and front seat passenger are properly positioned and restrained for an airbag deployment.

The airbag deployment and deflation occur very rapidly. In a typical 48 kilometer-per-hour (30 mile-per-hour) barrier impact, from the moment of impact until the airbags are fully inflated takes about 40 milliseconds. Within one to two seconds from the moment of impact, the airbags are almost entirely deflated. The times cited for these events are approximations, which apply only to a barrier impact at the given speed. Actual times will vary somewhat, depending upon the vehicle speed, impact angle, severity of the impact, and the type of collision.

When the ORC monitors a problem in any of the dual front airbag system circuits or components, including the seat belt tensioners, it stores a fault code or Diagnostic Trouble Code (DTC) in its memory circuit and sends an electronic message to the EMIC to turn on the airbag indicator. Proper testing of the supplemental restraint system components, the Controller Area Network (CAN) data bus, the electronic message inputs to and outputs from the EMIC or the ORC, as well as the retrieval or erasure of a DTC from the ORC or the EMIC requires the use of a diagnostic scan tool and the appropriate diagnostic information.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of all of the passive restraints.

### OCCUPANT CLASSIFICATION SYSTEM

In vehicles equipped with the Occupant Classification System (OCS), the OCS automatically suppresses or enables passenger airbag and seat belt tensioner operation based upon whether or not the passenger front seat is occupied and, if the seat is occupied, classifies the size of the occupant and whether the seat is occupied by a child seat.



The OCS has an Occupant Classification Module (OCM) that monitors inputs from the seat weight sensors under the passenger side front seat cushion and from the seat track position sensors on the passenger side and driver side seat adjuster tracks. Based upon those inputs the microprocessor within the OCM classifies the occupant of the passenger front seat, and the proximity of each front seat to the front airbags. The OCM then sends electronic occupant classification messages to the Occupant Restraint Controller (ORC). The microprocessor and programming of the ORC determines whether to enable or disable the deployment circuits for the passenger airbag and seat belt tensioner; and, if enabled, what force level should be used to deploy each front airbag.

The OCS electrical circuits and components are continuously monitored by the OCM, and the OCM is continuously monitored by the ORC. A passenger airbag disabled indicator is located in the instrument panel center stack just above the radio, between the a/c outlets. This indicator receives battery current whenever the ignition switch is in the On or Start positions, and illuminates only when the ORC pulls the indicator control circuit to ground. The indicator illuminates for about seven seconds as a bulb test each time the ignition switch is turned to the On or Start positions. Following the bulb test, the indicator is turned on or off by the ORC based upon the electronic occupant classification messages received from the OCM. This indicator is illuminated whenever the seat is occupied and passenger airbag and seat belt tensioner operation has been suppressed, and is turned off whenever the seat is empty or when the seat is occupied and the passenger airbag and seat belt tensioner are enabled.

When the OCM monitors a problem in any of the OCS circuits or components, it stores a fault code or DTC in its memory circuit and sends an electronic message to the ORC. The ORC then sends an electronic message to the Electro-Mechanical Instrument Cluster (EMIC) to turn on the airbag indicator. If for any reason the OCM is unable to classify the occupant it sends an electronic message to the ORC, and the ORC suppresses passenger airbag and seat belt tensioner operation. Proper testing of the OCS components, the Controller Area Network (CAN) data bus, the electronic message inputs to and outputs from the OCM, the EMIC or the ORC, as well as the retrieval or erasure of a DTC from the OCM, the ORC or the EMIC requires the use of a diagnostic scan tool and the appropriate diagnostic information.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the OCS.

## **WARNING**

**Disconnect and isolate the battery negative cable before beginning any airbag system component diagnosis, testing, removal, or installation procedures. Allow system capacitor to discharge for two minutes before beginning any component service. This will disable the airbag system. Failure to disable the airbag system may result in accidental airbag deployment, personal injury, or death.**

**Do not place an intact undeployed airbag face down on a solid surface. The airbag will propel into the air if accidentally deployed and may result in personal injury or death.**

**When carrying or handling an undeployed airbag, the trim side (face) of the airbag should be pointing towards the body to minimize possibility of injury if accidental deployment occurs. Failure to do this may result in personal injury or death.**

**Replace airbag system components with Mopar® replacement parts. Substitute parts may appear interchangeable, but internal differences may result in inferior occupant protection. Failure to do so may result in occupant personal injury or death.**

**Wear safety glasses, rubber gloves, and long sleeved clothing when cleaning powder residue from vehicle after an airbag deployment. Powder residue emitted from a deployed airbag can cause skin irritation. Flush affected area with cool water if irritation is experienced. If nasal or throat irritation is experienced, exit the vehicle for fresh air until the irritation ceases. If irritation continues, see a physician.**

**Do not use a replacement airbag that is not in the original packaging. This may result in improper deployment, personal injury, or death.**

**The factory installed fasteners, screws and bolts used to fasten airbag components have a special coating and are specifically designed for the airbag system. Do not use substitute fasteners. Use only original equipment fasteners listed in the parts catalog when fastener replacement is required.**

**During, and following, any child restraint anchor service, due to impact event or vehicle repair, carefully inspect all mounting hardware, tether straps, and anchors for proper installation, operation, or damage. If a child restraint anchor is found damaged in any way, the anchor must be replaced. Failure to do this may result in personal injury or death.**

**Deployed and nondeployed airbags may or may not have live pyrotechnic material within the airbag inflator. Do not dispose of driver/passenger/curtain airbags or seat belt tensioners unless you are sure of complete**

deployment. Refer to the Hazardous Substance Control System for proper disposal. Dispose of deployed airbags and tensioners consistent with state, provincial, local, and federal regulations.

After any airbag component testing or service, do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

If the vehicle is equipped with the Occupant Classification System (OCS), do not connect the battery negative cable before performing the OCS Verification Test using the scan tool and the appropriate diagnostic information. Personal injury or death may result if the system test is not performed properly.

Never replace both the Occupant Restraint Controller (ORC) and the Occupant Classification Module (OCM) at the same time. If both require replacement, replace one, then perform the Airbag System test (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM) before replacing the other. Both the ORC and the OCM store Occupant Classification System (OCS) calibration data, which they transfer to one another when one of them is replaced. If both are replaced at the same time, an irreversible fault will be set in both modules and the OCS may malfunction and cause personal injury or death.

If equipped with OCS, the Seat Weight Sensor is a sensitive, calibrated unit and must be handled carefully. Do not drop or handle roughly. If dropped or damaged, replace with another sensor. Failure to do so may result in occupant injury or death.

If equipped with OCS, the front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative, could result in occupant injury, or possibly death.

If equipped with OCS, when the passenger front seat is on the floor, no one should sit in the front passenger seat. This uneven force may damage the sensing ability of the seat weight sensors. If sat on and damaged, the sensor may be inoperative, could result in occupant injury, or possibly death.

## DIAGNOSIS AND TESTING

### AIRBAG SYSTEM

1. With the battery negative cable disconnected, connect the scan tool to the Data Link Connector (DLC).
2. Turn the ignition key to the ON position, then exit vehicle with the scan tool.
3. After checking that no one is inside the vehicle, connect the battery negative remote terminal.
4. Read and record the **ACTIVE** Diagnostic Trouble Code (DTC) data.
5. Read and record any **STORED** DTC's.
6. Refer to the proper diagnostic information if any DTC's are found in Step 4 and Step 5.
7. If the airbag warning lamp either fails to light, or goes ON and stays ON, there is a system malfunction. To test the airbag warning lamp (bulb) operation in the cluster (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Refer to the appropriate diagnostic information for any other system problems.

## STANDARD PROCEDURE

### HANDLING AIRBAGS

#### DEPLOYED AIRBAG

**WARNING:** The vehicle interior may contain a very small amount of powder, a by-product of airbag deployment. This powder can irritate the skin, eyes, nose and throat. Wear safety glasses, rubber gloves, and long sleeved clothing when cleaning any of the powder residue from the vehicle. If you find that the cleanup is irritating your skin, run cool water over the affected area. Also, if you experience nasal or throat irritation, exit the vehicle for fresh air until the irritation ceases. If irritation continues, see a physician.

## UNDEPLOYED AIRBAG

**WARNING:** The airbags must be stored in its original special container until used for service. At no time should a source of electricity be permitted near the inflator on the back of an airbag. When carrying or handling an undeployed airbag, the trim side of the airbag should be pointing toward the body to minimize the possibility of personal injury or death if accidental deployment occurs. Do not place undeployed airbag face down on a solid surface, the airbag will propel into the air if accidental deployment occurs.

## SERVICE AFTER AN AIRBAG DEPLOYMENT

### DRIVER AIRBAG

After a Driver Airbag has been deployed due to a collision, the following **MUST** be replaced:

- Driver Airbag
- Clockspring Assembly
- Steering Wheel
- Complete Steering Column Assembly w/Lower Steering Column Coupler

All other airbag and vehicle components should be closely inspected following any airbag deployment, and should be replaced when visible damage is incurred.

**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

### PASSENGER AIRBAG

After a Passenger Airbag has been deployed due to a collision. the following **MUST** be replaced:

- Passenger Airbag
- Instrument Panel and Pad Assembly

All other airbag and vehicle components should be closely inspected following any airbag deployment, and should be replaced when visible damage is incurred.

**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

### CURTAIN AIRBAG

After a Curtain Airbag has been deployed due to a collision. the following **MUST** be replaced:

- Curtain Airbag Assembly
- Headliner
- A, B, and C-Pillar Trim on deployed side.

All other airbag and vehicle components should be closely inspected following any airbag deployment, and should be replaced when visible damage is incurred.

**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

## OCCUPANT CLASSIFICATION SYSTEM (OCS)

After an impact event, either front, rear, or side, the OCS system components need to be inspected and replaced if found to be damaged.

This includes:

- Occupant Classification Module (OCM)
- Passenger Airbag Disabled Indicator

- Seat Weight Sensor

**WARNING:** Never replace both the Occupant Restraint Controller (ORC) and the Occupant Classification Module (OCM) at the same time. If both require replacement, replace one, then perform the Airbag System test (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM) before replacing the other. Both the ORC and the OCM store Occupant Classification System (OCS) calibration data, which they transfer to one another when one of them is replaced. If both are replaced at the same time, an irreversible fault will be set in both modules and the OCS may malfunction and result in personal injury or death.

Whether replaced or not, the OCS must be re-zeroed to make sure that the system is within proper parameters to sense the occupants weight correctly.

**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

**WARNING:** Following successful completion of the Airbag System test procedure, the Occupant Classification System Verification Test must be done using a scan tool and the appropriate diagnostic information. Personal injury or death may result if the system test is not performed.

## SEAT BELTS AND TENSIONERS

After a frontal impact where an airbag has been deployed due to a collision, the following **MUST** be replaced:

- Front Seat Belt and Retractor (driver and passenger) with integral Tensioners.

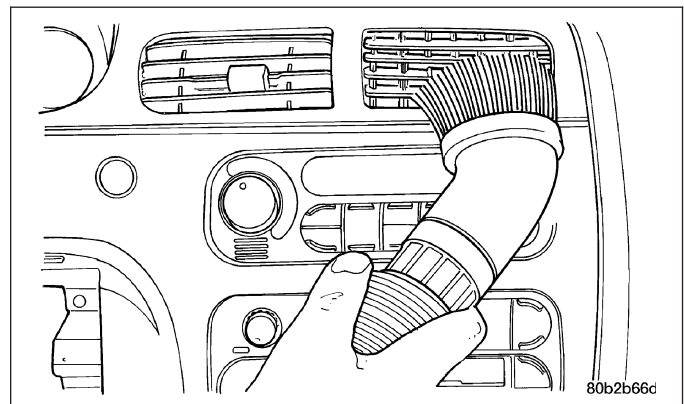
**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

All other seat belts should be closely inspected for cuts, tears, fraying, or damage in any way following any frontal impact or airbag deployment. The other seat belts are to be replaced when visible damage is incurred. Inspect the Lower Anchors and Tether for CHildren (LATCH) child restraint anchors for damage after an impact event and replace as needed.

## CLEAN UP PROCEDURE

Roll or fold the airbag towards its mounting point (i.e. instrument panel, steering wheel, knee blocker, curtain, or seat back). Then tape the ripped cover over the deployed airbag if applicable.

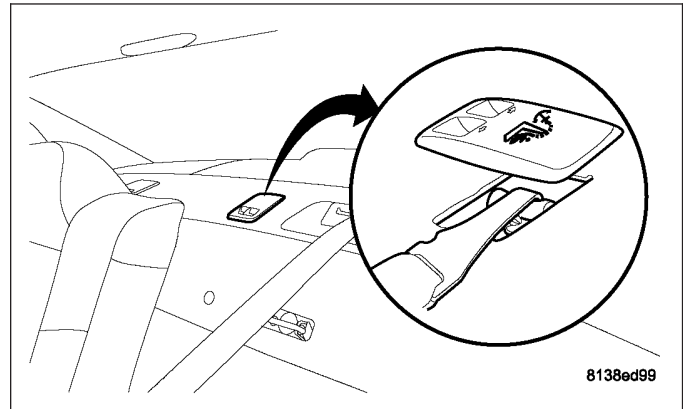
Use a vacuum cleaner to remove any residual powder from the vehicle interior. Work from the outside in to avoid kneeling or sitting in a contaminated area. Vacuum the heater and A/C outlets as well. If the heater or air conditioner was in RECIRC mode at time of airbag deployment, operate blower motor on low speed and vacuum powder residue expelled from the heater and A/C outlets. Multiple vacuum cleaning may be necessary to decontaminate the interior of the vehicle.



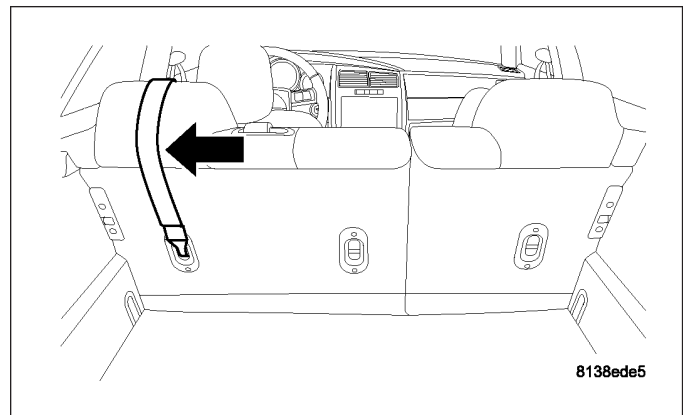
## CHILD RESTRAINT ANCHOR

### DESCRIPTION

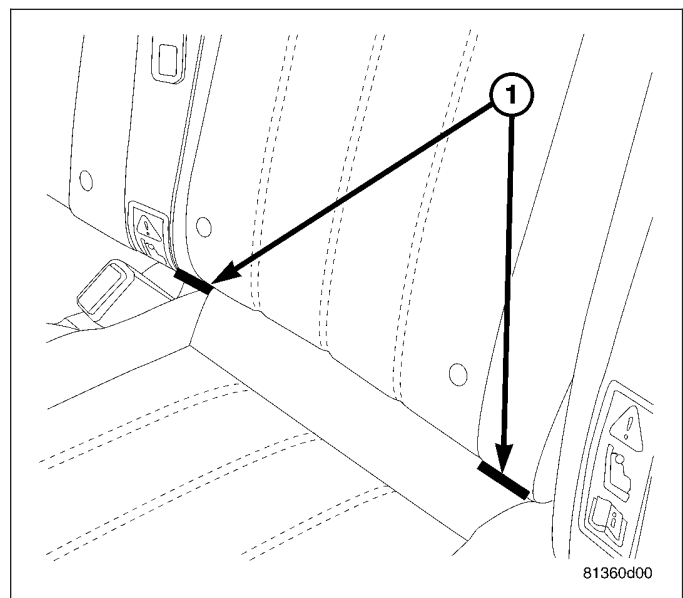
The Lower Anchors and Tether for Children, or LATCH child restraint anchorage system provides for the installation of suitable child restraints in certain seating positions without using the seat belt provided for that seating position. The second row seats are equipped with a fixed-position child restraint upper tether anchor for both the center and the two outboard seating positions, and child restraint lower anchors for all three seating positions.



The three upper tether anchors are integral to the rear shelf panel on sedans and the seat back frame on wagons. These anchors are each constructed from a heavy-gauge steel wire loop. The child restraint upper tether anchors cannot be adjusted or repaired and, if faulty or damaged, they must be replaced.



The lower anchors (1) are permanently mounted to the rear floor pan beneath the seat. These anchors are also constructed from a heavy-gauge steel wire loop welded to the floor pan. They are each accessed from the front of their respective seats, at each side where the seat back meets the seat cushion. These lower anchors cannot be adjusted or repaired and, if faulty or damaged, they must be replaced as a unit.



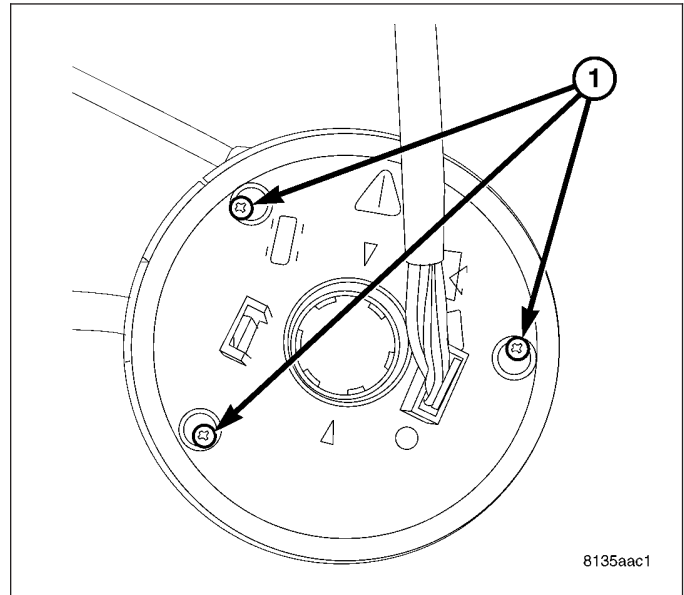
## OPERATION

See the owner's manual in the vehicle glove box for more information on the proper use of all of the factory-installed child restraint anchors.

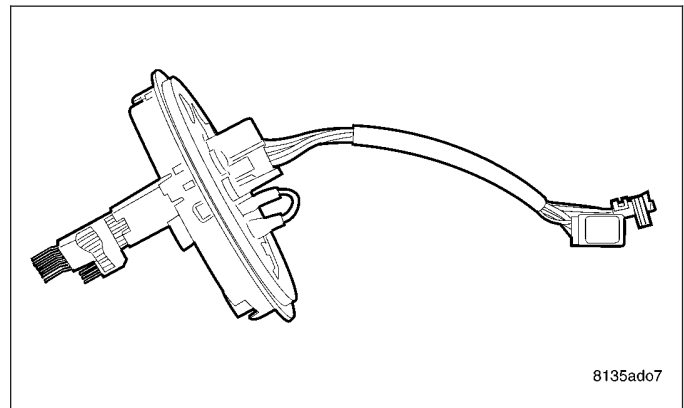
## CLOCKSPRING

### DESCRIPTION

The clockspring assembly is secured with three screws (1) onto the top of the Steering Column Control Module (SCCM) (Refer to 19 - STEERING/COLUMN/STEERING COLUMN CONTROL MODULE - DESCRIPTION) near the top of the steering column behind the steering wheel.



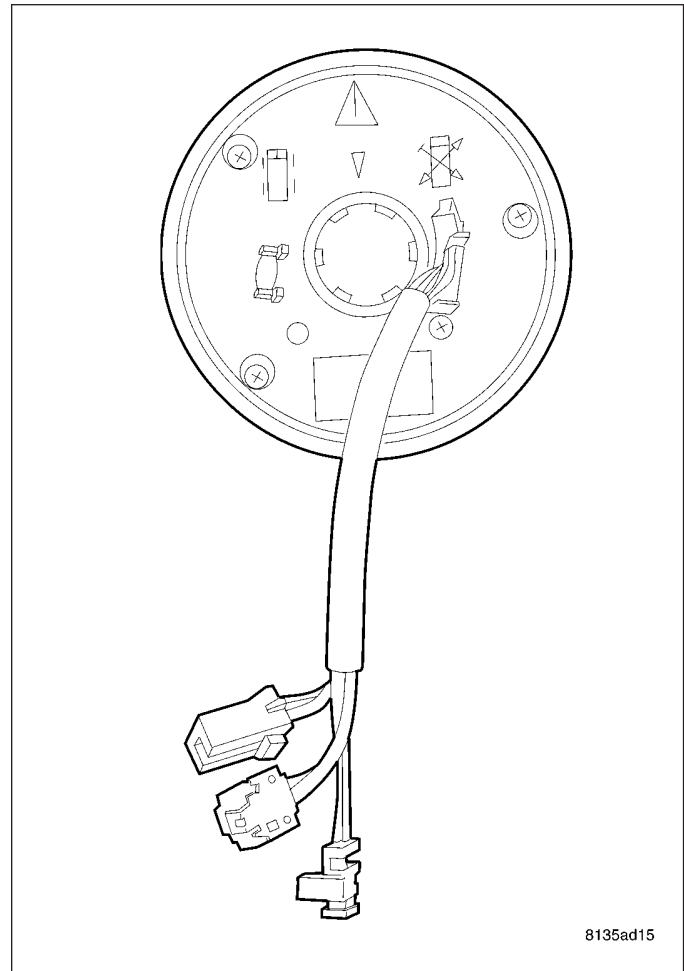
The clockspring consists of a flat, round molded plastic case. Within the plastic case is a spool-like molded plastic rotor with a hub. The surface of the rotor hub has a large center hole. Within the plastic case and wound around the rotor spool is a long ribbon-like tape that consists of several thin copper wire leads sandwiched between two thin plastic membranes. The outer end of the tape terminates at the connector terminals that align themselves into the SCCM self-docking connector that faces the instrument panel, while the inner end of the tape terminates at the pigtail wires and connector receptacles on the hub of the clockspring rotor that face the steering wheel.





Service replacement clocksprings are shipped pre-centered and with the screws backed out and holding the clockspring into place. If reusing a clockspring or installing a new one that you are unsure if it is centered or not, (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING).

The clockspring cannot be repaired. If the clockspring is faulty, damaged, or if the driver airbag has been deployed, the clockspring must be replaced.



## OPERATION

The clockspring is a mechanical electrical circuit component that is used to provide continuous electrical continuity between the fixed instrument panel wire harness and the electrical components mounted on or in the rotating steering wheel. On this model the rotating electrical components include the:

- Driver Airbag
- Horn Switch
- Steering Wheel Switches (if the vehicle is so equipped)

The clockspring case is positioned and secured to Steering Column Control Module (SCCM) mounting housing near the top of the steering column. The connector terminals on the tail of the fixed clockspring case connect the clockspring to the vehicle electrical system through the self-docking connector in the instrument panel wire harness.

The clockspring rotor is movable and is keyed to the steering column shaft that is molded onto the rotor hub. The lobe on the turn signal cancel cam on the lower surface of the clockspring rotor hub contact a turn signal cancel actuator of the multi-function switch to provide automatic turn signal cancellation.

Two short, yellow-sleeved pigtail wires on the upper surface of the clockspring rotor connect the clockspring to the multistage driver airbag, while a steering wheel wire harness connects the two connector receptacles on the upper surface of the clockspring rotor to the horn switch feed pigtail wire connector and, if the vehicle is so equipped, to the optional steering wheel switches on the steering wheel.

Like the clockspring in a timepiece, the clockspring tape has travel limits and can be damaged by being wound too tightly during full stop-to-stop steering wheel rotation. To prevent this from occurring, the clockspring is centered when it is installed on the steering column. Centering the clockspring indexes the clockspring tape to the movable steering components so that the tape can operate within its designed travel limits. However, if the clockspring is removed from the steering column or if the steering shaft is disconnected from the steering gear, the clockspring spool can change position relative to the movable steering components. The clockspring must be re-centered following completion of this service or the tape may be damaged.

Service replacement clocksprings are shipped pre-centered. The screws that retain the clockspring to the SCCM should not be removed until the clockspring has been installed on the SCCM. If the screws have been removed before the clockspring is installed on the SCCM, the clockspring centering procedure must be performed (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING).

The clockspring is located within the SCCM. If the clockspring has to be replaced (Refer to 19 - STEERING/COLUMN/STEERING COLUMN CONTROL MODULE - DISASSEMBLY).

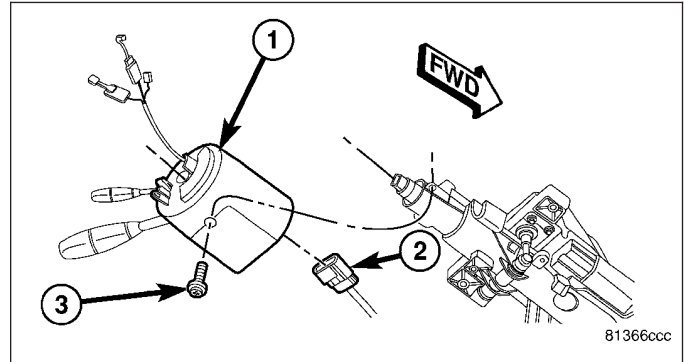
## STANDARD PROCEDURE

### CLOCKSPRING CENTERING

If the rotating tape (wire coil) in the clockspring is not positioned properly with the steering wheel and the front wheels, the clockspring may fail. The following procedure **MUST BE USED** to center the clockspring if it is not known to be properly positioned, or if the front wheels were moved from the straight ahead position.

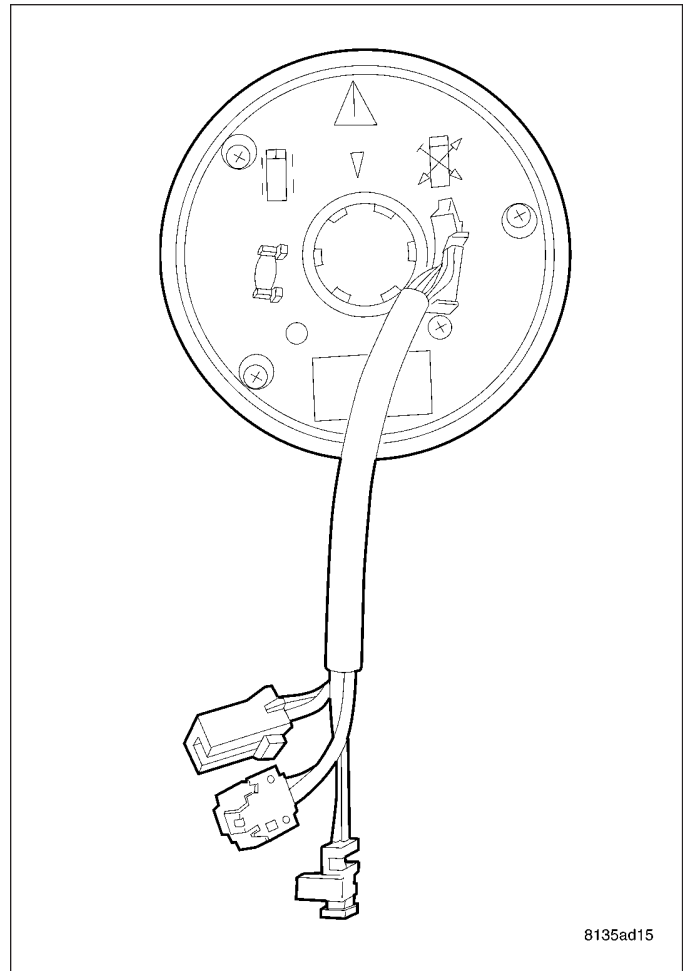
**Note:** Before starting this procedure, be certain to turn the steering wheel until the front wheels are in the straight-ahead position.

1. Position steering wheel and front wheels straight ahead.
2. Remove the Steering Column Control Module (SCCM) (Refer to 19 - STEERING/COLUMN/STEERING COLUMN CONTROL MODULE - REMOVAL).



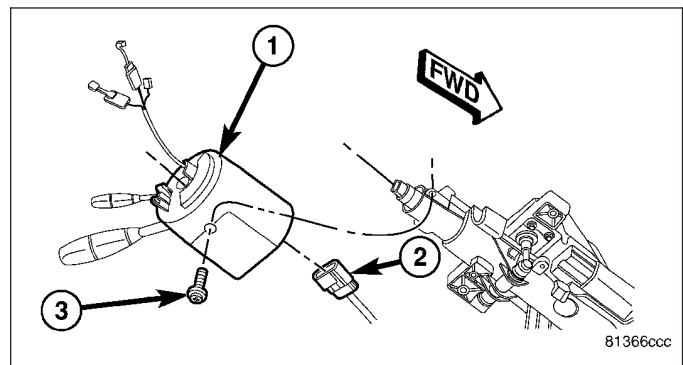


3. Remove the clockspring (Refer to 19 - STEERING/COLUMN/STEERING COLUMN CONTROL MODULE - DISASSEMBLY).
4. The clockspring can rotate approximately 5 3/4 turns from lock to lock. To be properly centered, rotate the clockspring rotor clockwise until the rotor stops. Do not apply excessive force.
5. From the end of travel, rotate the rotor counter-clockwise two turns and then keep going a little more until the wires end up on the right side of the column shaft (at the 3 o'clock position).



6. Install the SCCM (Refer to 19 - STEERING/COLUMN/STEERING COLUMN CONTROL MODULE - INSTALLATION)

**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING). Personal injury or death may result if the system test is not performed properly.



## CURTAIN AIRBAG

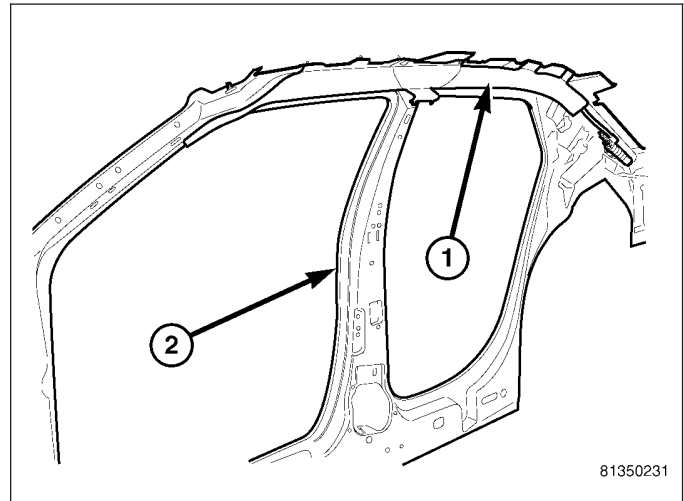
### DESCRIPTION

Curtain airbags are available when also equipped with dual front airbags. These airbags are passive, inflatable, Supplemental Restraint System (SRS) components, and can be readily identified by a molded identification trim button with the "SRS - AIRBAG" logo located near the top of each upper B-pillar trim panel. This system is designed to reduce injuries to the vehicle occupants in the event of a side impact collision.



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Curtain airbags have two individually controlled curtain airbags. These airbags are concealed and mounted above the headliner where they are each secured to one of the roof side rails. Each folded airbag cushion extends along the roof rail from the A-pillar at the front of the vehicle to the D-pillar at the rear of the vehicle. The airbag cushion is initially secured during installation with plastic push-in fasteners to the roof rail.



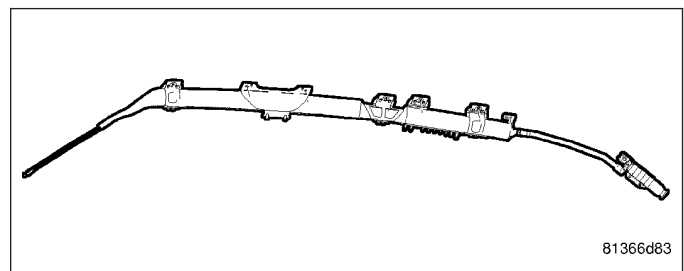
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A long tether extends down the A-pillar from the front of the airbag cushion. A short tether is secured near the top of the D-pillar.

The hybrid-type inflator for each airbag is secured to the roof rail at the rear of airbag, back by the C and D-pillars. The entire assembly is secured to the inside of the roof rail with screws.

An airbag squib harness connector is routed up to the rear of the airbag inflator. The body harness then connects the curtain airbag to the Occupant Restraint Controller (ORC).

The curtain airbag cannot be adjusted or repaired and must be replaced if deployed, faulty, or in any way damaged. Once a curtain airbag has been deployed, the complete airbag, the headliner, the upper A, B, C and D-pillar trim, and all other visibly damaged components must be replaced.



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## OPERATION

Each curtain airbag is deployed individually by an electrical signal generated by the Occupant Restraint Controller (ORC) to which it is connected through squib circuits. The hybrid-type inflator assembly for each airbag contains a small canister of highly compressed inert gas. When the ORC sends the proper electrical signal to the airbag inflator, the electrical energy creates enough heat to ignite chemical pellets within the inflator.

Once ignited, these chemicals burn rapidly and produce the pressure necessary to rupture a containment disk in the inert gas canister. The inflator and inert gas canister are sealed and connected to a tubular manifold so that all of the released gas is directed into the folded curtain airbag cushion, causing the cushion to inflate. As the airbag cushion inflates it will drop down from the roof rail between the edge of the headliner and the side glass/body pillars to form a curtain-like cushion to protect the vehicle occupants during a side impact collision.

The front and rear tethers keep the airbag cushion taut to the side of the vehicle, thus ensuring that the bag will deploy in the proper position. Following the airbag deployment, the airbag cushion quickly deflates by venting the inert gas through the loose weave of the cushion fabric, and the deflated cushion hangs down loosely from the roof rail.

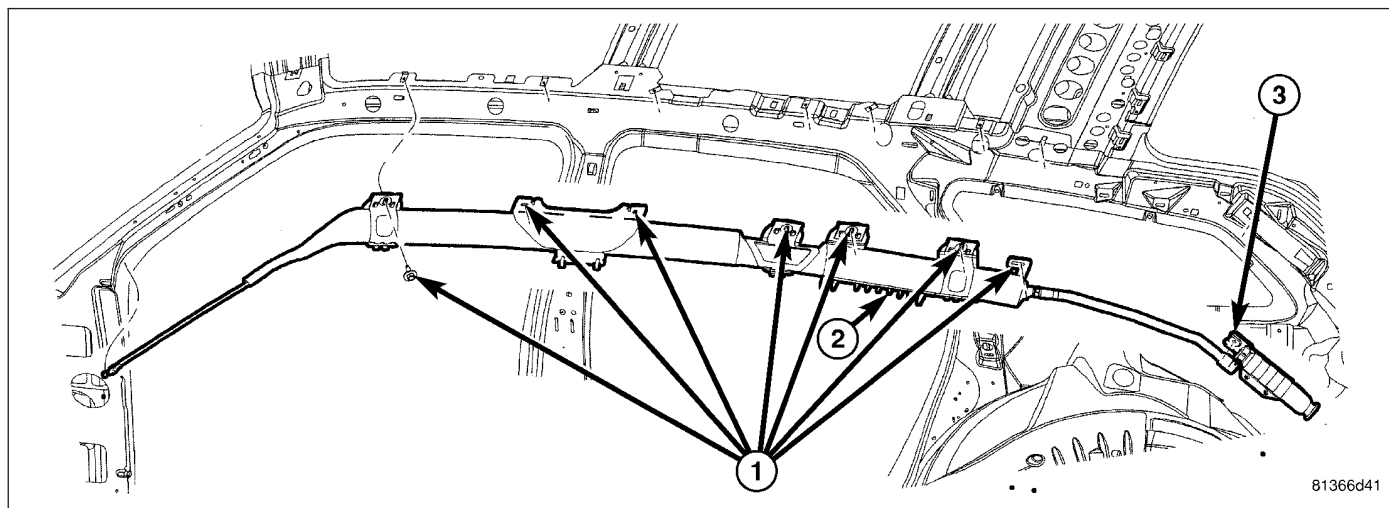
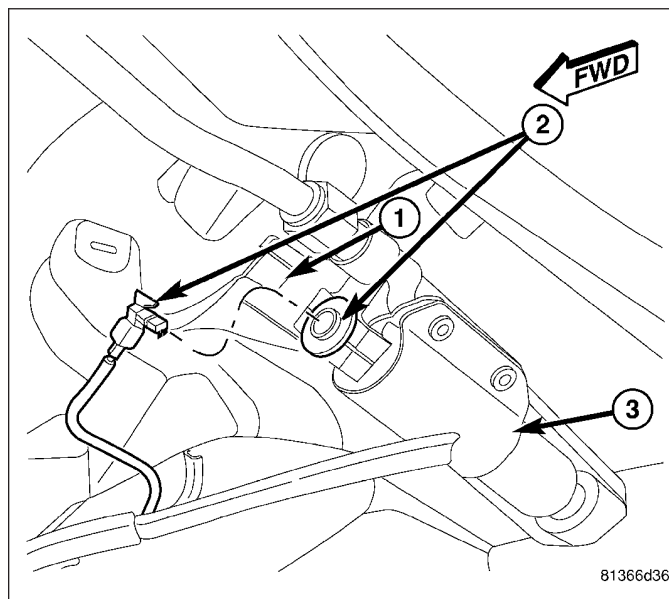
## REMOVAL

**Note:** The sedan and wagon curtain airbags are mounted similar and are removed the same way.

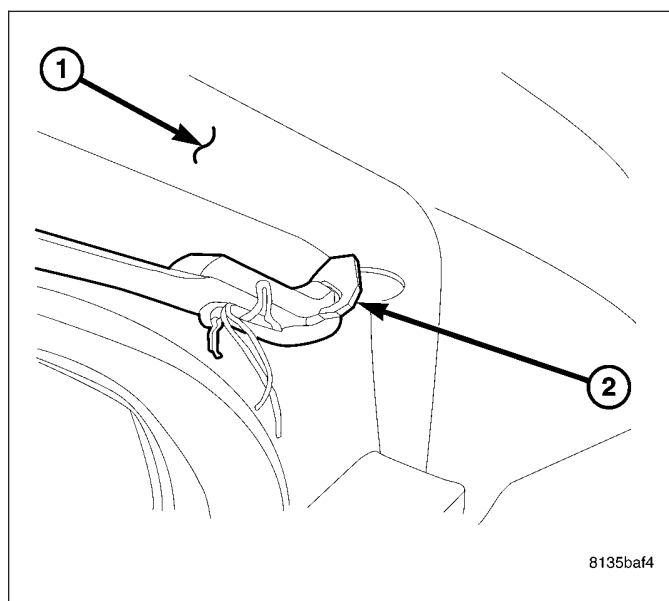
1. Disconnect and isolate the battery negative cable.

**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

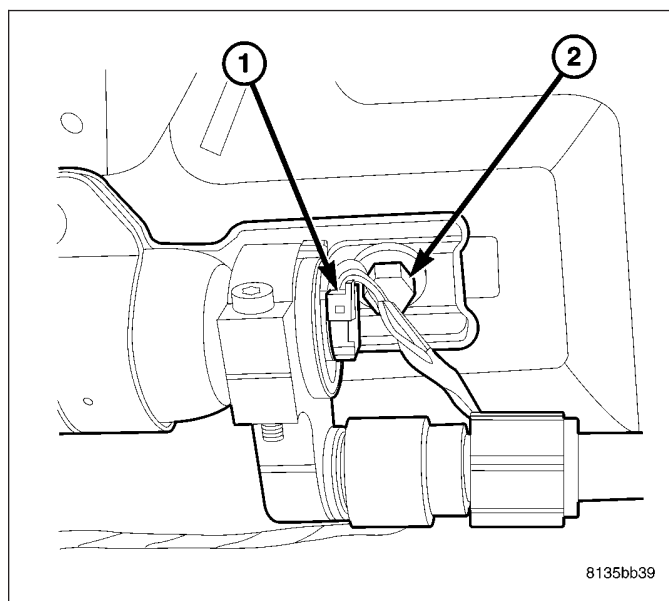
2. Remove the headliner from the vehicle (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).
3. Disconnect the curtain airbag squib connector (2) from the inflator (3).

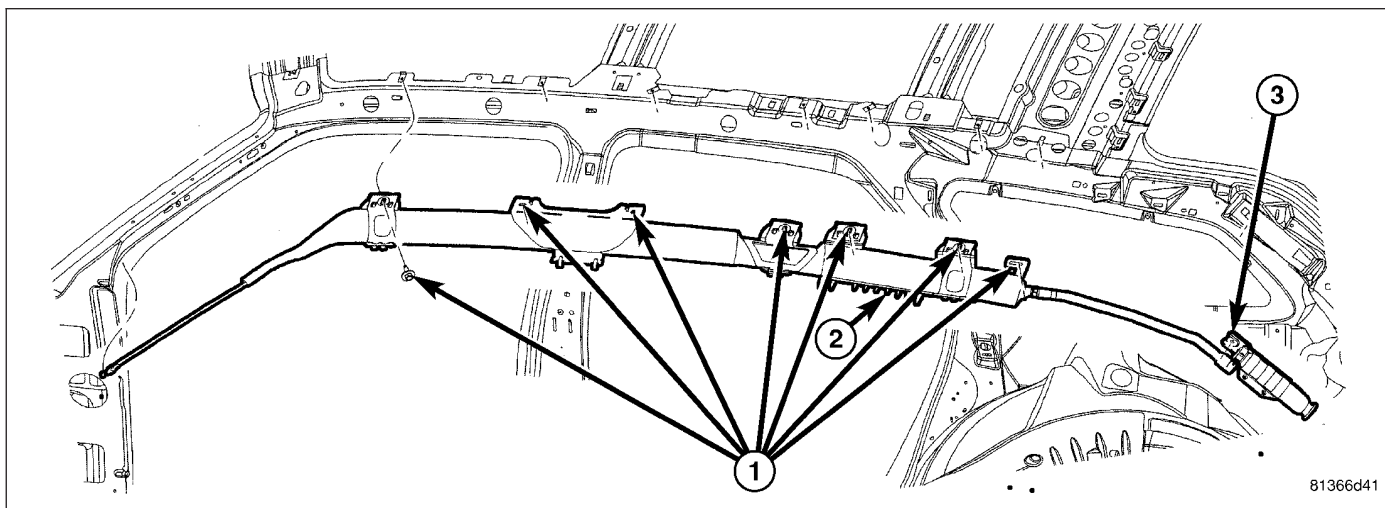


4. Remove the screws (1) that secure the curtain airbag to the spring nuts in the roof side rail.
5. Remove the push pin and unclip the front tether (2) from the A-pillar (1).



6. Remove the bolt (2) holding the inflator to the C/D-pillar.

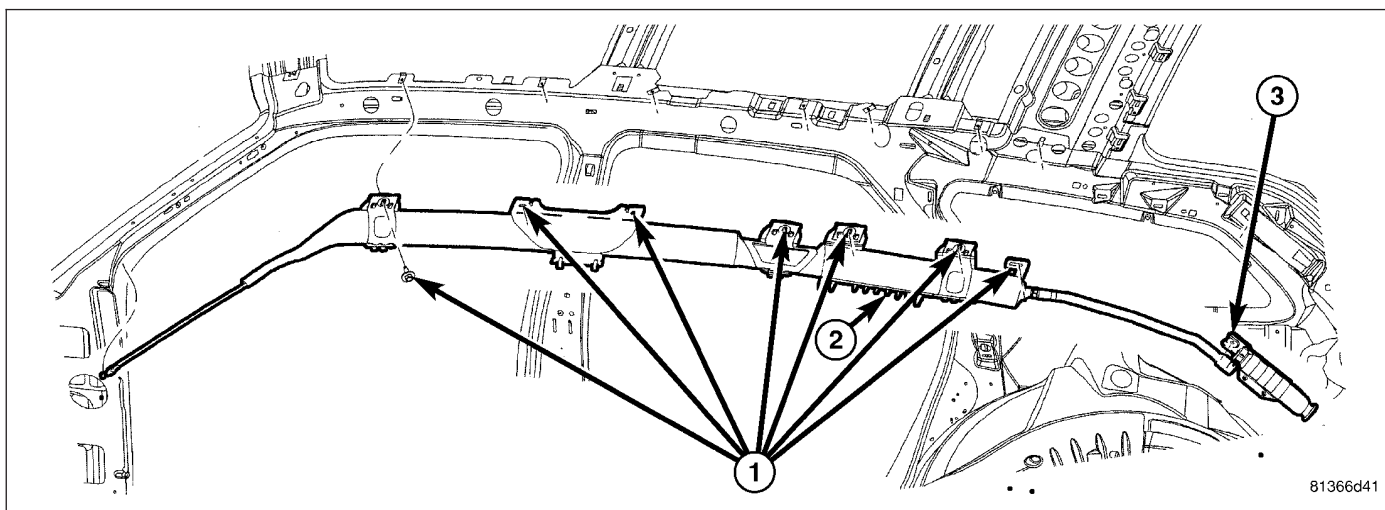




7. The curtain airbag will be held in place with push pins. Release the push pins and remove bag from vehicle.

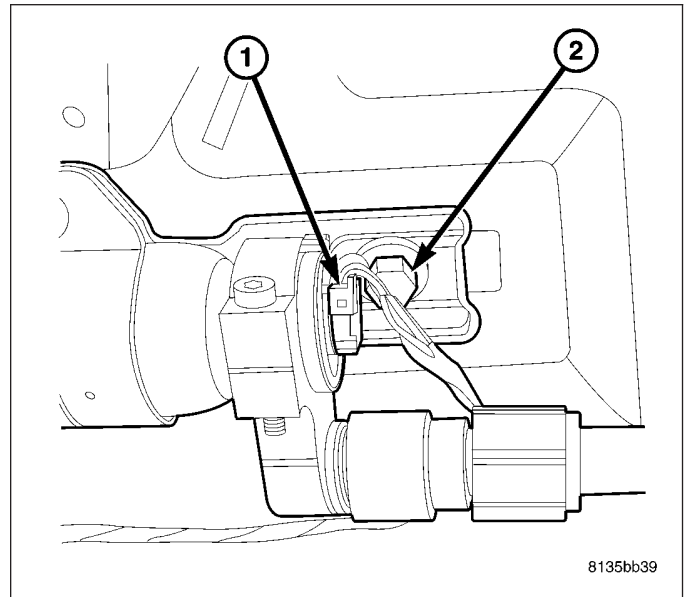
## INSTALLATION

**Note:** The sedan and wagon curtain airbags are mounted similar and are removed the same way.

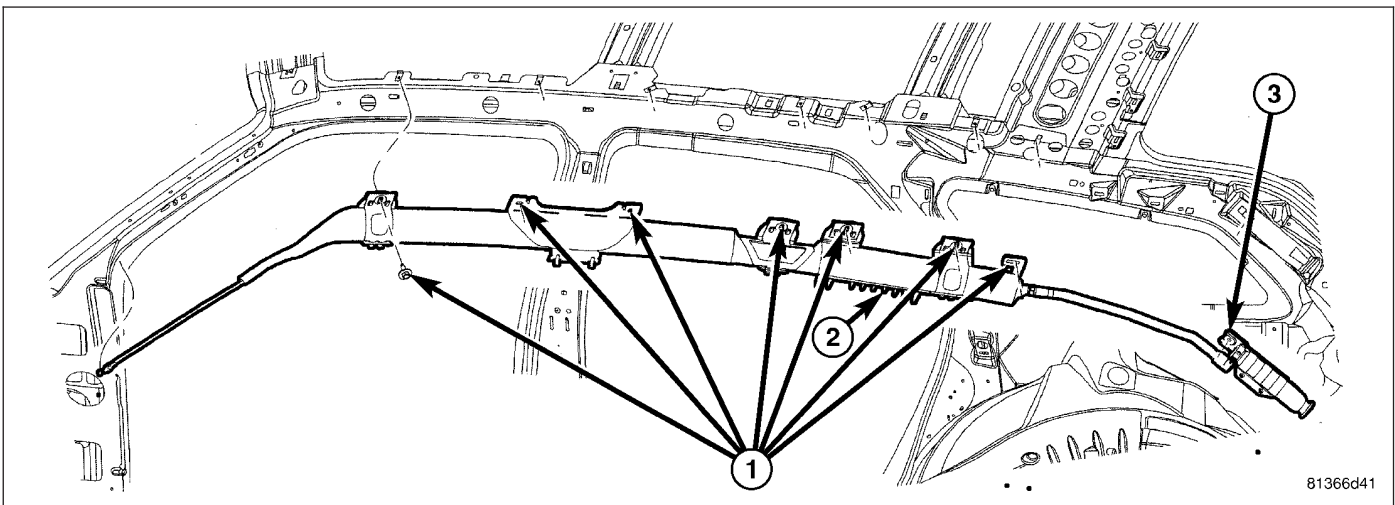
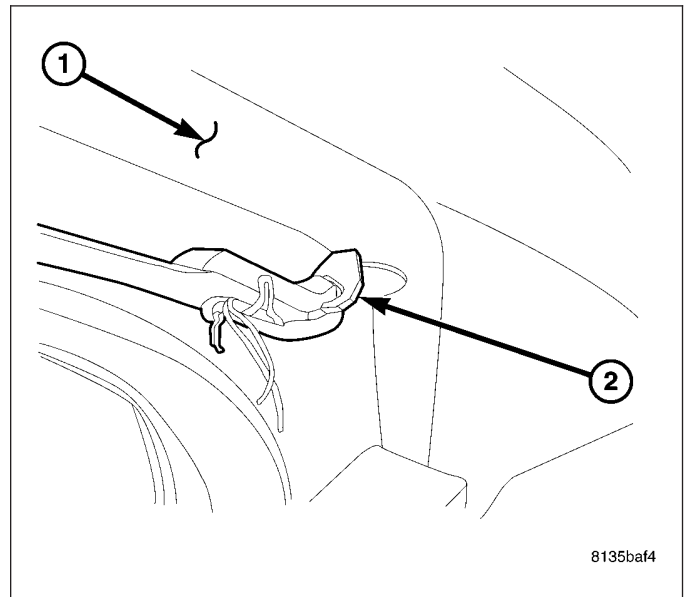


1. Position the curtain airbag in vehicle along roof side rail and install by fastening to roof side rail with integral push fasteners.

2. Install the bolt (2) holding the inflator to the C/D-pillar. Torque bolt to 11 N·m (97 in. lbs.).

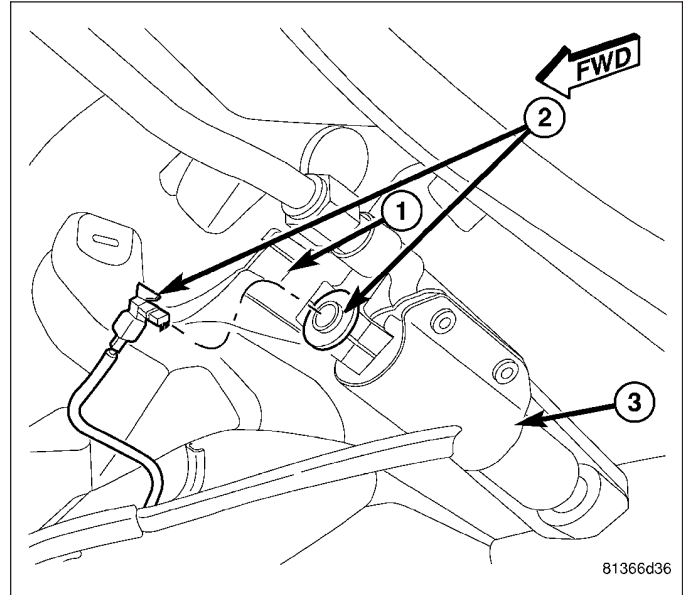


3. Clip the front tether (2) to the A-pillar (1) and install push fastener.



4. Install the screws (1) that secure the curtain airbag to the spring nuts in the roof side rail. Torque screws to 5 N·m (44 in. lbs.).
5. Connect the curtain airbag squib connector (2) to the inflator (3).
6. Install the headliner into the vehicle (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION).

**WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.**

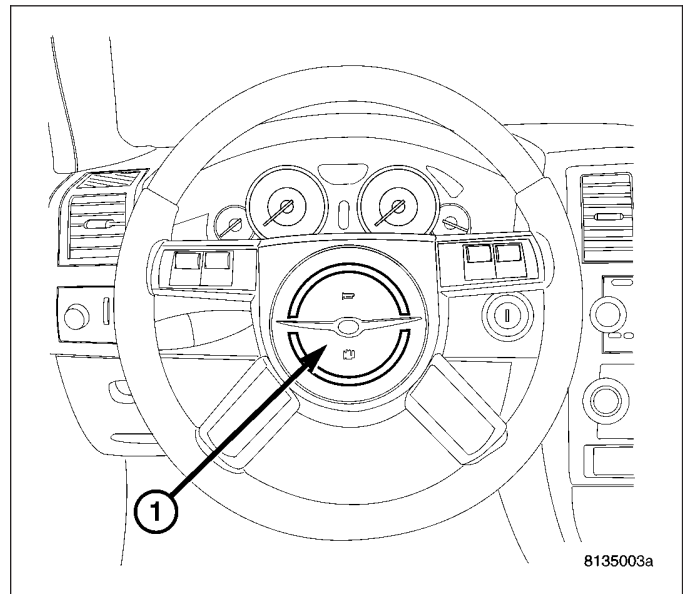


## DRIVER AIRBAG

### DESCRIPTION

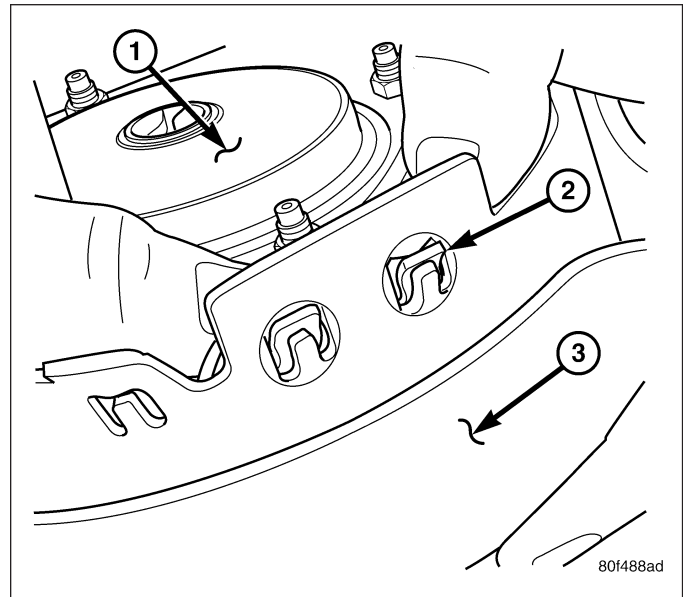
The driver airbag protective trim cover (1) is the most visible part of the driver airbag. The driver airbag is located in the center of the steering wheel (1), where it is secured with two screws to the armature of the four-spoke steering wheel. Concealed beneath the driver airbag trim cover are the horn switch, the folded airbag cushion, the airbag cushion retainer, the airbag housing, the airbag inflator, and the retainers that secure the inflator to the airbag housing.

The airbag cushion, housing, and inflator are secured within the trim cover.



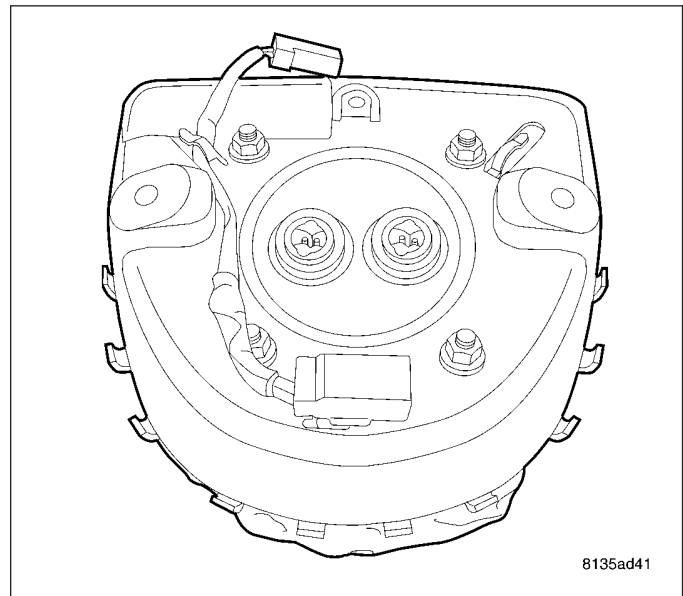


The vertical walls of this trim cover have small windows with blocking tabs that are engaged by hook formations around the perimeter of the airbag housing. Each hook is inserted through one of the windows and the blocking tab in each window keeps the hook properly engaged with the trim cover, locking the trim cover securely into place on the airbag housing.



The resistive membrane-type horn switch is secured with heat stakes to the inside surface of the driver airbag trim cover, between the trim cover and the folded airbag cushion.

The airbag used in this model is a multistage, Next Generation-type that complies with revised federal airbag standards to deploy with less force than those used in some prior models. A radial deploying fabric cushion with internal tethers is used. The airbag inflator is a dual-initiator, non-azide, pyrotechnic-type unit with four mounting studs and is secured to the stamped metal airbag housing by four flanged hex nuts. Two keyed and color-coded connector receptacles on the driver airbag inflator connect the two inflator initiators to the vehicle electrical system through two yellow-jacketed, two-wire pigtail harnesses of the clockspring.



The driver airbag unit cannot be repaired, and must be replaced if deployed or in any way damaged. The driver airbag trim cover and horn switch unit may be disassembled from the driver airbag unit, and is available for separate service replacement.

## OPERATION

The multistage driver airbag is deployed by electrical signals generated by the Occupant Restraint Controller (ORC) through the driver airbag squib 1 and squib 2 circuits to the two initiators in the airbag inflator. By using two initiators, the airbag can be deployed at multiple levels of force. The force level is controlled by the ORC to suit the monitored impact conditions by providing one of three delay intervals between the electrical signals provided to the two initiators. The longer the delay between these signals, the less forcefully the airbag will deploy.

When the ORC sends the proper electrical signals to each initiator, the electrical energy generates enough heat to initiate a small pyrotechnic charge which, in turn ignites chemical pellets within the inflator. Once ignited, these chemical pellets burn rapidly and produce a large quantity of inert gas. The inflator is sealed to the back of the airbag housing and a diffuser in the inflator directs all of the inert gas into the airbag cushion, causing the cushion to inflate. As the cushion inflates, the driver airbag trim cover will split at predetermined breakout lines, then fold back out of the way along with the horn switch unit. Following an airbag deployment, the airbag cushion quickly deflates by venting the inert gas towards the instrument panel through vent holes within the fabric used to construct the back (steering wheel side) panel of the airbag cushion.



Some of the chemicals used to create the inert gas may be considered hazardous while in their solid state before they are burned, but they are securely sealed within the airbag inflator. Typically, both initiators are used and all potentially hazardous chemicals are burned during an airbag deployment event.

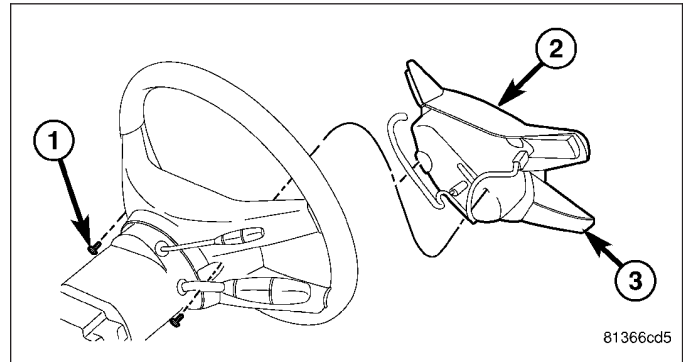
The inert gas that is produced when the chemicals are burned is harmless. However, a small amount of residue from the burned chemicals may cause some temporary discomfort if it contacts the skin, eyes, or breathing passages. If skin or eye irritation is noted, rinse the affected area with plenty of cool, clean water. If breathing passages are irritated, move to another area where there is plenty of clean, fresh air to breath. If the irritation is not alleviated by these actions, contact a physician.

## REMOVAL

1. Disconnect and isolate the battery negative cable.

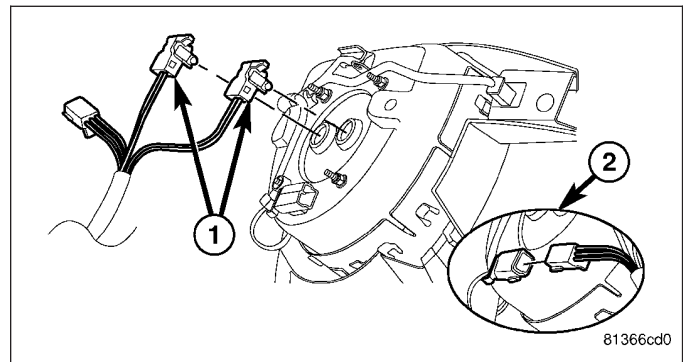
**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

2. From behind the steering wheel (instrument panel side) remove the two screws (1) to the driver airbag (2).



3. Pull airbag rearward and disconnect the two airbag squib connectors (1) and the steering wheel controls connector (2).
4. Separate driver airbag from steering column.

**Note:** The driver airbag trim cover is available for service separately. If the horn switch is faulty or the trim cover is damaged, the airbag cushion assembly may be transferred to a new trim cover. If the airbag is defective, the entire driver airbag and driver airbag trim cover must be replaced as an assembly.

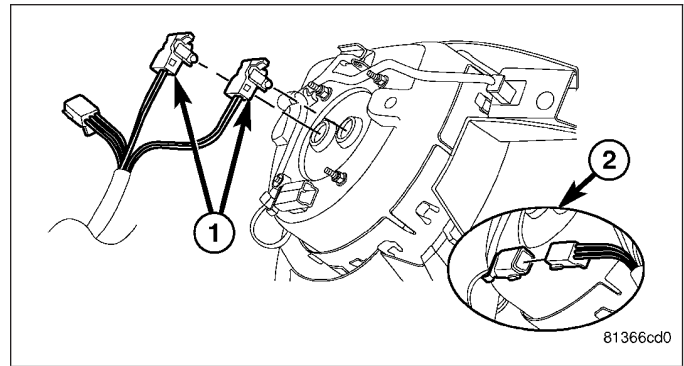


## INSTALLATION

**Note:** The driver airbag trim cover is available for service separately. If the horn switch is faulty or the trim cover is damaged, the airbag cushion assembly may be transferred to a new trim cover. If the airbag is defective, the entire driver airbag and driver airbag trim cover must be replaced as an assembly.

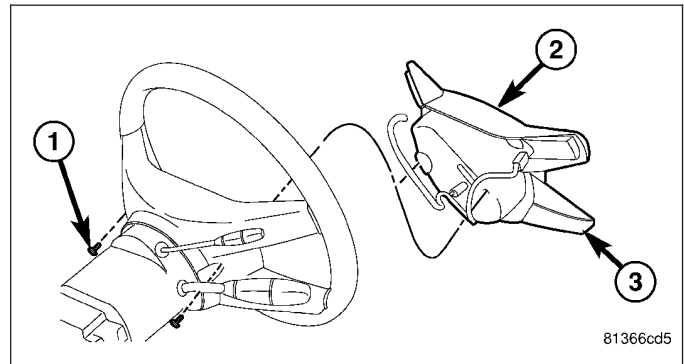
1. Position driver airbag in steering column near mounting location.

2. Connect the two airbag squib connectors (1) and the steering wheel controls connector (2).



3. Position the driver airbag (2) into the steering wheel. From behind the steering wheel (instrument panel side) install the two screws (1) to the driver airbag. Torque the two screws (1) to 10 N·m (89 in. lbs.).

**WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.**



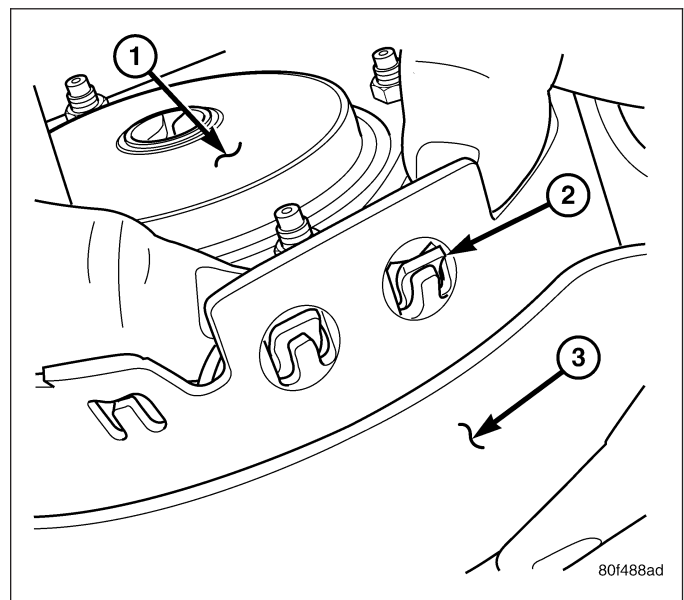
## DRIVER AIRBAG TRIM COVER

### REMOVAL

1. Disconnect and isolate the battery negative cable.

**WARNING: Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.**

2. Remove the driver airbag (2) (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).
3. With driver airbag removed, pick a corner and push down on the inflator (1) or latch hook mounting plate until the latch hooks (2) push out of the driver airbag cover (3).
4. Remove driver airbag from driver airbag cover.
5. The membrane type horn switch is integral to the driver airbag trim cover. If inoperative, the entire trim cover must be replaced.

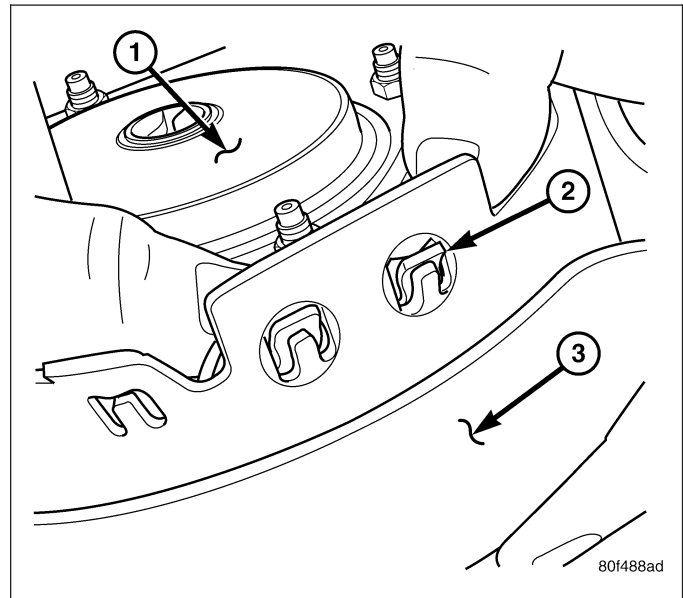


## INSTALLATION

1. Place the driver airbag into new driver airbag trim cover. Be careful not to pinch the airbag cushion between the latch hook mounting plate and the trim cover.

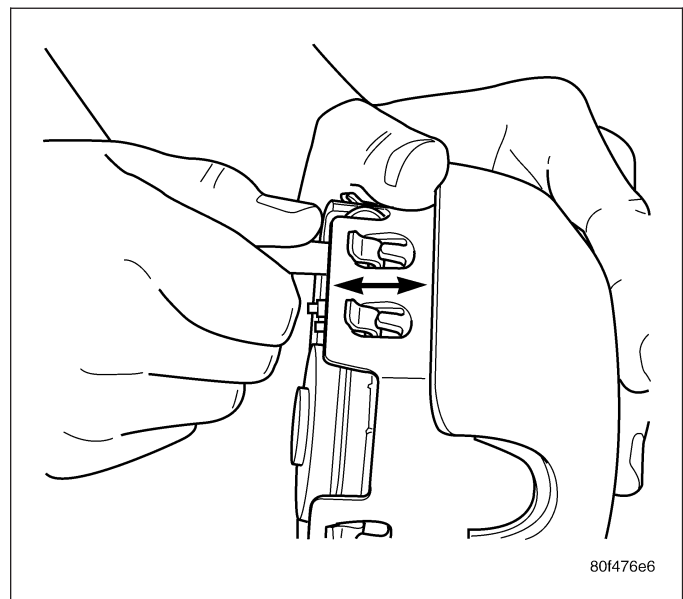
**Note:** Make sure that the horn switch wire harness is routed through the cut-out on the side of the trim cover and positioned in the hook on the back of the housing. Attach connector to the housing.

2. Push down on the latch hook mounting plate and guide the latch hooks into the slots on the driver airbag cover.



3. Once all the latch hooks have been started, pull the driver airbag cover away from the driver airbag to fully seat the latch hooks.
4. Install the driver airbag (2) (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION). Torque the two screws (1) to 10 N·m (89 in. lbs.).

**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.



## FRONT SEAT BELT HEIGHT ADJUSTER

## REMOVAL

1. Remove the upper turning loop (3) trim cover (2).
2. Remove the upper turning loop retaining bolt (4).

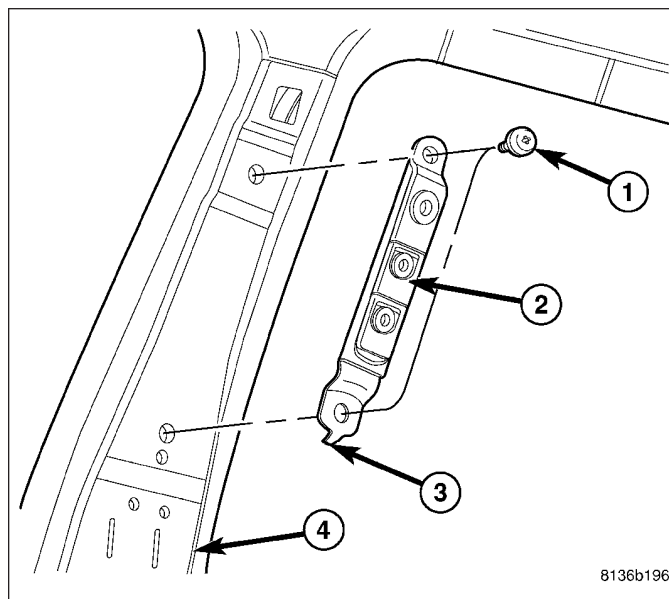
2. Remove the upper turning loop retaining bolt (4).



3. Remove the upper B-pillar trim (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - REMOVAL).

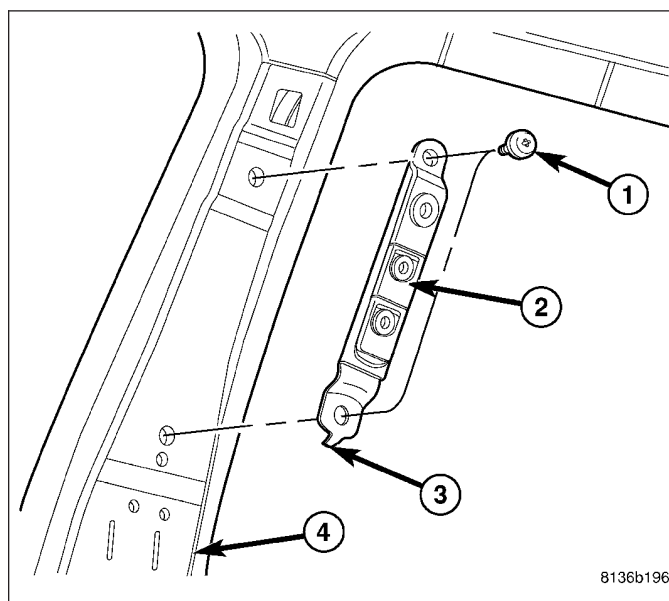


4. Remove the two bolts (1) to the seat belt height adjuster (2).

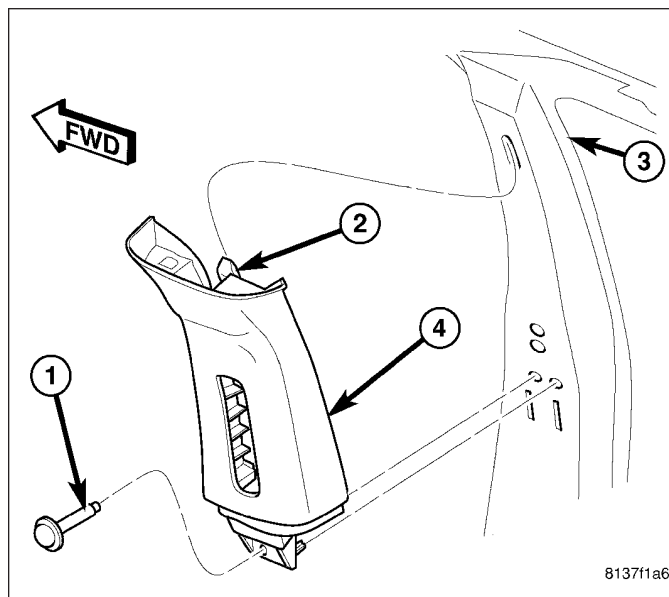


## INSTALLATION

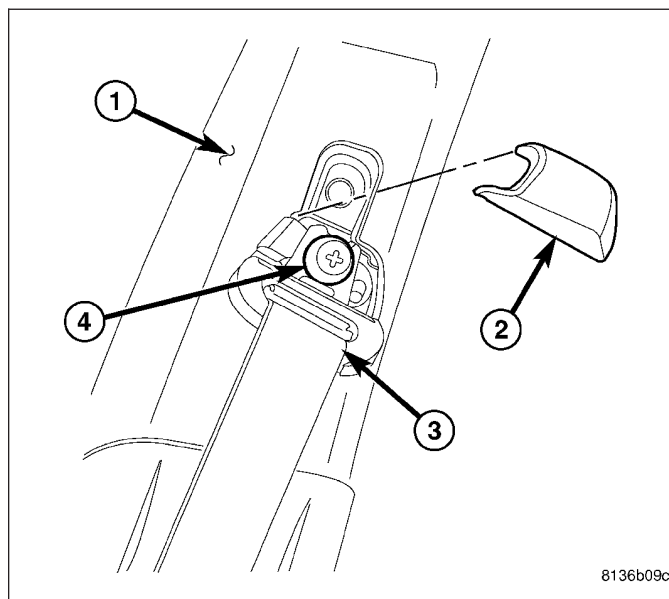
1. Position height adjuster making sure that indexing tab is in the proper hole.
2. Install the two mounting bolts (1). Torque bolts to 32 N·m (24 ft. lbs.).



3. Install the upper B-pillar trim (Refer to 23 - BODY/ INTERIOR/B-PILLAR TRIM - INSTALLATION).



4. Position the upper turning loop (3) and install the retaining bolt (4). Torque bolt to 40 N·m (30 ft. lbs.).
5. Install the upper turning loop (3) trim cover (2).

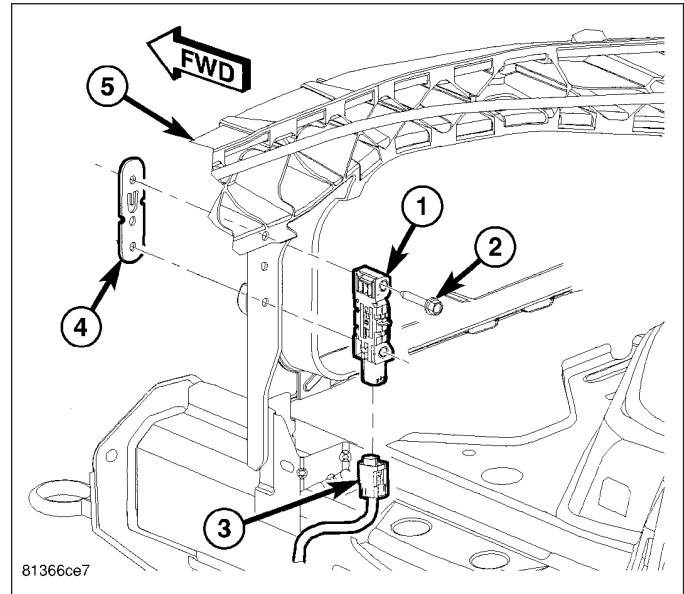


## IMPACT SENSOR

### DESCRIPTION

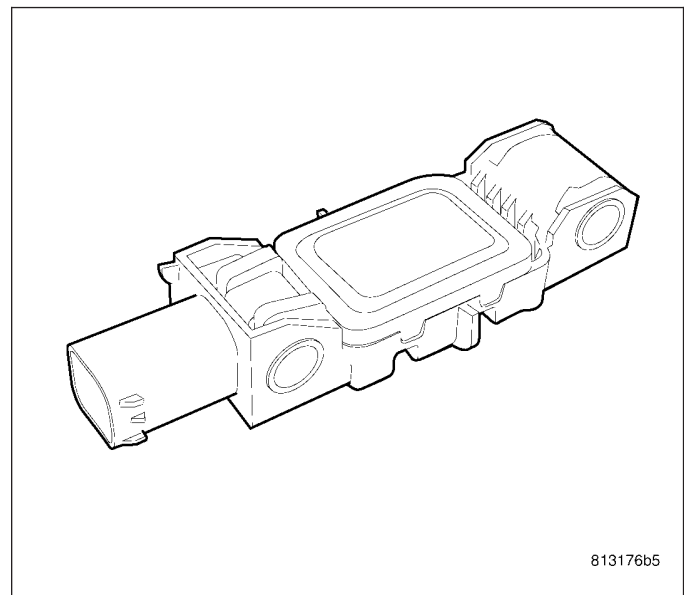
#### FRONT IMPACT SENSORS

Two front impact sensors (1) are used on this model, one each for the left and right sides of the vehicle. These sensors are mounted remotely from the impact sensor that is internal to the Occupant Restraint Controller (ORC). Each front sensor is secured with two screws (2) to the backs of the right and left vertical members of the radiator support within the engine compartment.



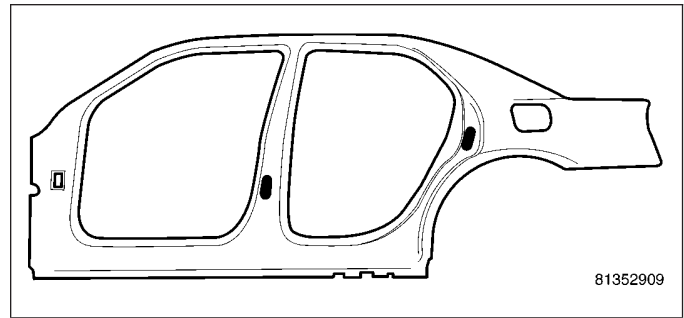
The right and left front impact sensors are identical in construction and calibration. A cavity in the center of the molded black plastic impact sensor housing contains the electronic circuitry of the sensor which includes an electronic communication chip and an electronic impact sensor. Potting material fills the cavity to seal and protect the internal electronic circuitry and components.

The impact sensors cannot be repaired or adjusted and, if damaged or faulty, they must be replaced.



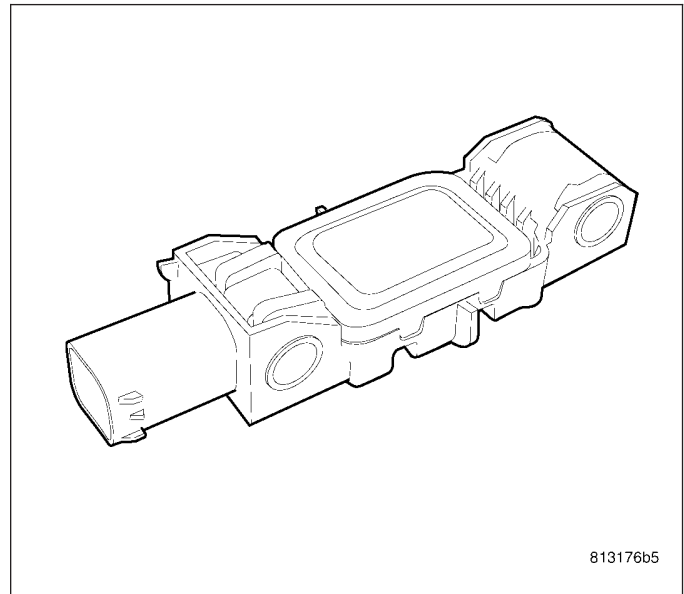
## SIDE IMPACT SENSORS

Four side impact sensors are used on this model when it is equipped with the curtain airbags, two each for the left and right sides of the vehicle. The sedan and wagon side impact sensor locations are identical. These sensors are mounted remotely from the impact sensor that is internal to the Occupant Restraint Controller (ORC). Each side sensor is secured with two screws to the inner right or left B-pillar and C-pillar within the passenger compartment.



The right and left side impact sensors are identical in construction and calibration. A cavity in the center of the molded black plastic impact sensor housing contains the electronic circuitry of the sensor which includes an electronic communication chip and an electronic impact sensor. Potting material fills the cavity to seal and protect the internal electronic circuitry and components.

The impact sensors cannot be repaired or adjusted and, if damaged or faulty, they must be replaced.



## OPERATION

### FRONT IMPACT SENSORS

The front impact sensors are electronic accelerometers that sense the rate of vehicle deceleration, which provides verification of the direction and severity of an impact. Each sensor also contains an electronic communication chip that allows the unit to communicate the sensor status as well as sensor fault information to the microprocessor in the Occupant Restraint Controller (ORC).

The ORC microprocessor continuously monitors all of the passive restraint system electrical circuits to determine the system readiness. If the ORC detects a monitored system fault, it sets a Diagnostic Trouble Code (DTC) and controls the airbag indicator operation accordingly. The impact sensors each receive battery current and ground through dedicated left and right sensor plus and minus circuits from the ORC. The impact sensors and the ORC communicate by modulating the voltage in the sensor plus circuit.

The most reliable, efficient, and accurate means to diagnose the impact sensors, the ORC, and the electronic message communication between the sensors and the ORC requires the use of a scan tool and the appropriate diagnostic information.

### SIDE IMPACT SENSORS

The side impact sensors are electronic accelerometers that sense the rate of vehicle deceleration, which provides verification of the direction and severity of an impact. Each sensor also contains an electronic communication chip that allows the unit to communicate the sensor status as well as sensor fault information to the microprocessor in the Occupant Restraint Controller (ORC).



The ORC microprocessor continuously monitors all of the side passive restraint system electrical circuits to determine the system readiness. If the ORC detects a monitored system fault, it sets a Diagnostic Trouble Code (DTC) and controls the airbag indicator operation accordingly. The impact sensors each receive battery current and ground through the same left or right sensor plus and minus circuits in a series arrangement from the ORC. The impact sensors and the ORC communicate by modulating the voltage in the sensor plus circuit.

The most reliable, efficient, and accurate means to diagnose the impact sensors, the ORC, and the electronic message communication between the sensors and the ORC requires the use of a scan tool and the appropriate diagnostic information.

## REMOVAL

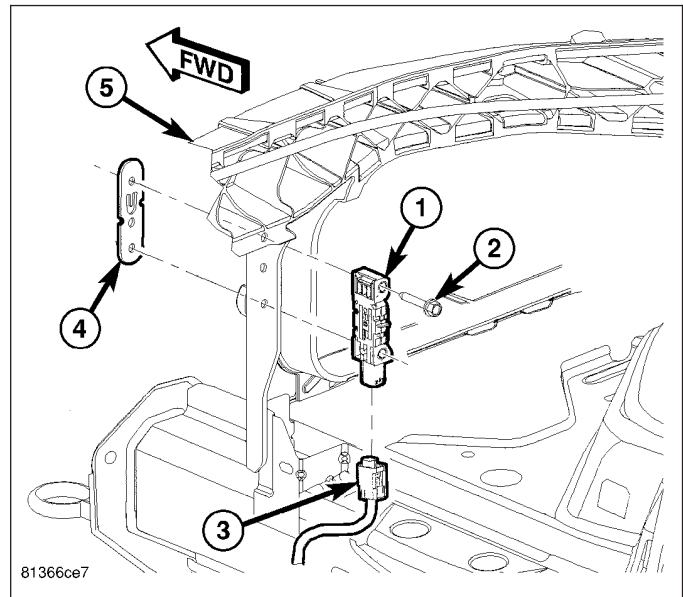
### FRONT IMPACT SENSOR

1. Disconnect and isolate the battery negative cable.

**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

**Note:** If replacing the left front impact sensor, the air intake system needs to be removed (Refer to 9 - ENGINE/AIR INTAKE SYSTEM - REMOVAL).

2. Disconnect the electrical connector (3).
3. Remove the two mounting screws (2).



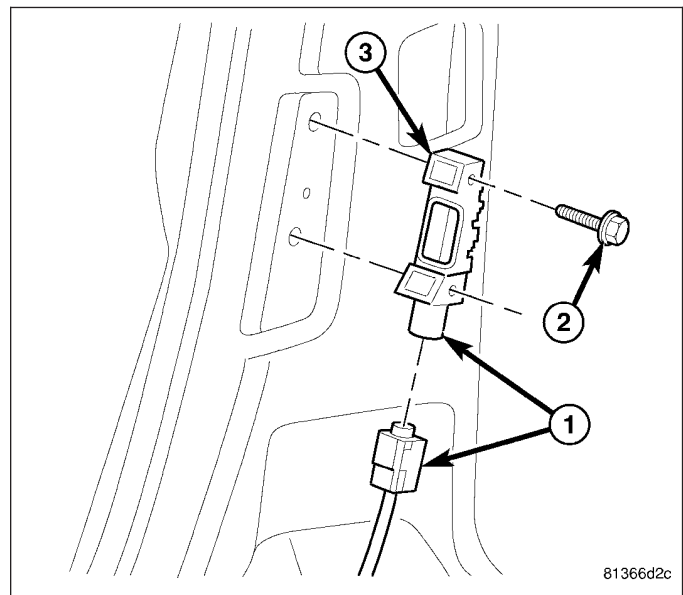
### SIDE IMPACT SENSOR

#### B-PILLAR MOUNTED SIDE IMPACT SENSOR

1. Disconnect and isolate the battery negative cable.

**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

2. Remove the B-pillar trim panel (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - REMOVAL).
3. Disconnect the electrical connector (1).
4. Remove the two retaining screws (2).

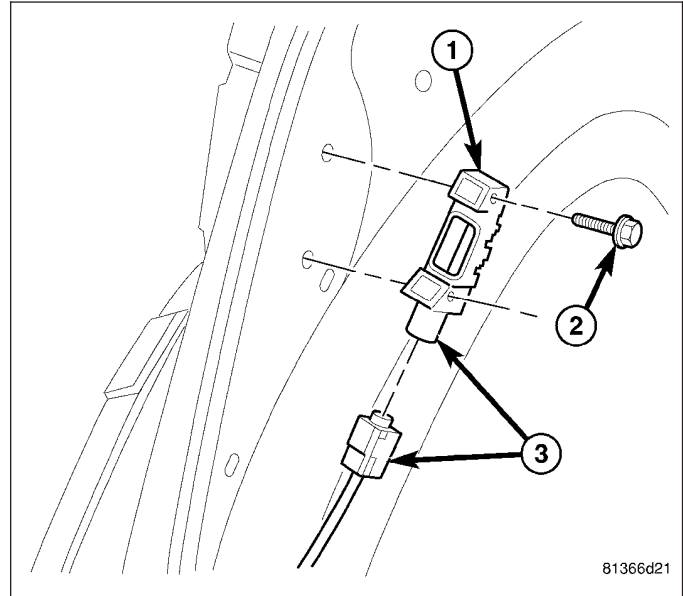


**C-PILLAR MOUNTED SIDE IMPACT SENSOR**

1. Disconnect and isolate the battery negative cable.

**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

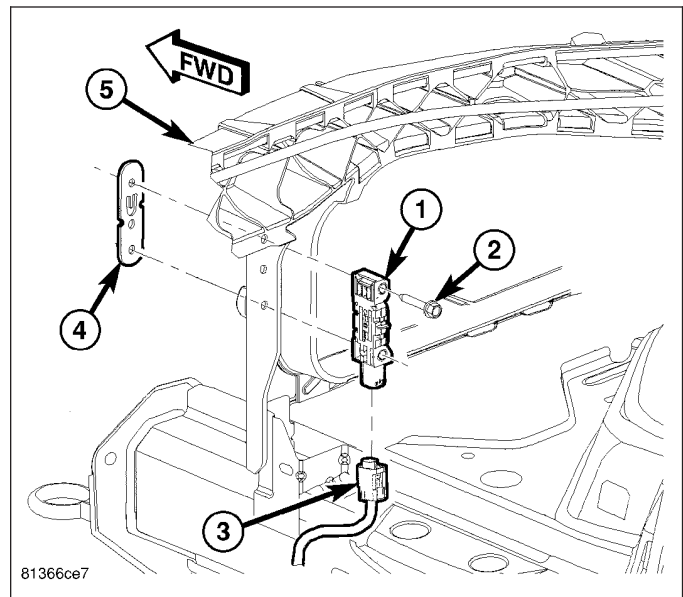
2. Remove the C-pillar trim panel (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).
3. Disconnect the electrical connector (3).
4. Remove the two retaining screws (2).

**INSTALLATION****FRONT IMPACT SENSOR**

1. Position the front impact sensor in the correct mounting location and install the two mounting screws (2). Torque screws (2) to 7 N·m (62 in. lbs.).
2. Connect the electrical connector (3).

**Note:** If replacing the left front impact sensor, the air intake system needs to be installed (Refer to 9 - ENGINE/AIR INTAKE SYSTEM - INSTALLATION).

**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

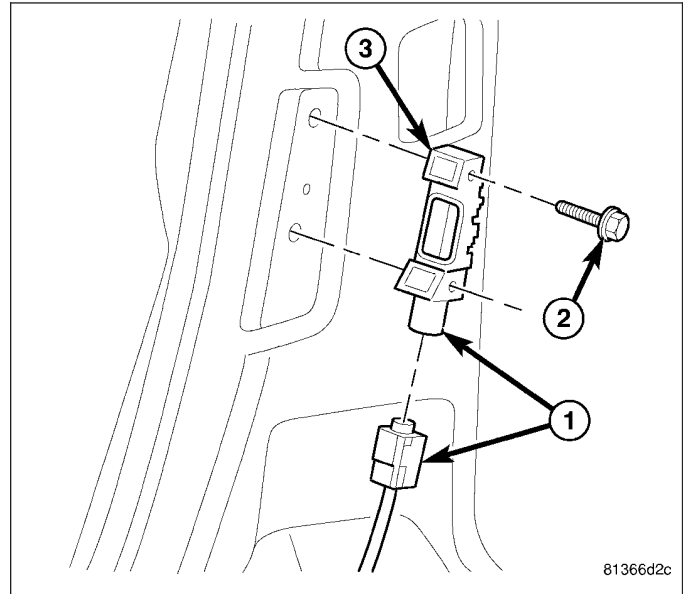


## SIDE IMPACT SENSOR

### B-PILLAR MOUNTED SIDE IMPACT SENSOR

1. Position the B-pillar mounted impact sensor in the correct mounting location and install the two mounting screws (2). Torque screws (2) to 7 N·m (62 in. lbs.).
2. Connect the electrical connector (1).
3. Install the B-pillar trim panel (Refer to 23 - BODY/ INTERIOR/B-PILLAR TRIM - INSTALLATION).

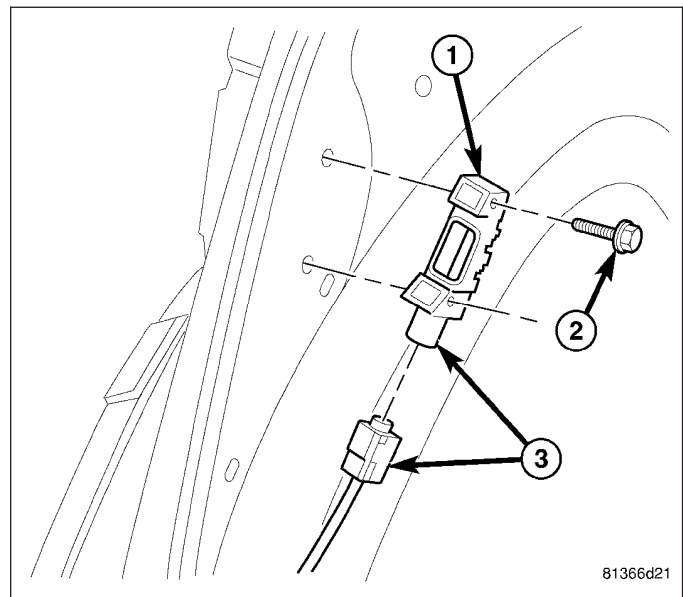
**WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.**



### C-PILLAR MOUNTED SIDE IMPACT SENSOR

1. Position the C-pillar mounted impact sensor in the correct mounting location and install the two mounting screws (2). Torque screws (2) to 7 N·m (62 in. lbs.).
2. Connect the electrical connector (3).
3. Install the C-pillar trim panel (Refer to 23 - BODY/ INTERIOR/C-PILLAR TRIM - INSTALLATION).

**WARNING: Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.**



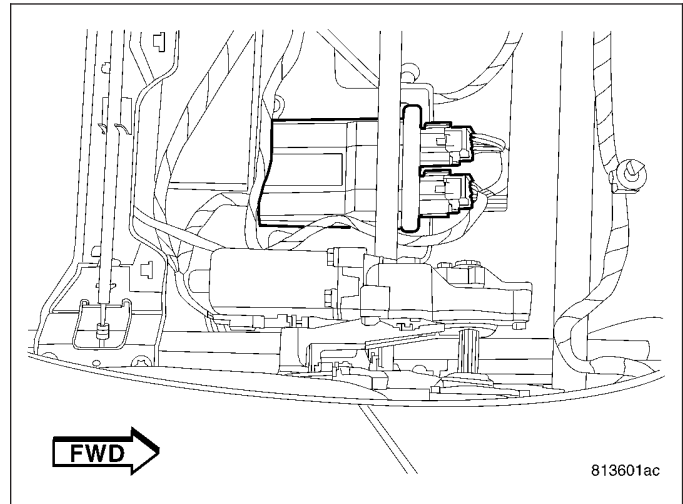
## OCCUPANT CLASSIFICATION MODULE

### DESCRIPTION

The Occupant Classification Module (OCM) is secured with two screws to a mount on the underside of the passenger side front seat cushion frame near the out-board front corner. Concealed within a hollow in the center of the molded plastic OCM housing is a micro-processor and the other electronic circuitry of the module. The module housing is sealed to enclose and protect the internal electronic circuitry. The OCM software is flash programmable.

A non-calibrated OCM is available for service replacement. The OCM and all of the other components of the Occupant Classification System (OCS) including the passenger front seat, the seat weight sensors, the passenger or driver seat track position sensor and the seat adjusters, cushion, back, frame, foam, springs, and wiring harness are a factory-calibrated and assembled unit. Any time any one of these components is removed or replaced for any reason, the OCM must be re-calibrated using a diagnostic scan tool, the Occupant Classification Seat Weight special tool, and the Occupant Classification System Verification Test. Refer to the appropriate diagnostic procedures.

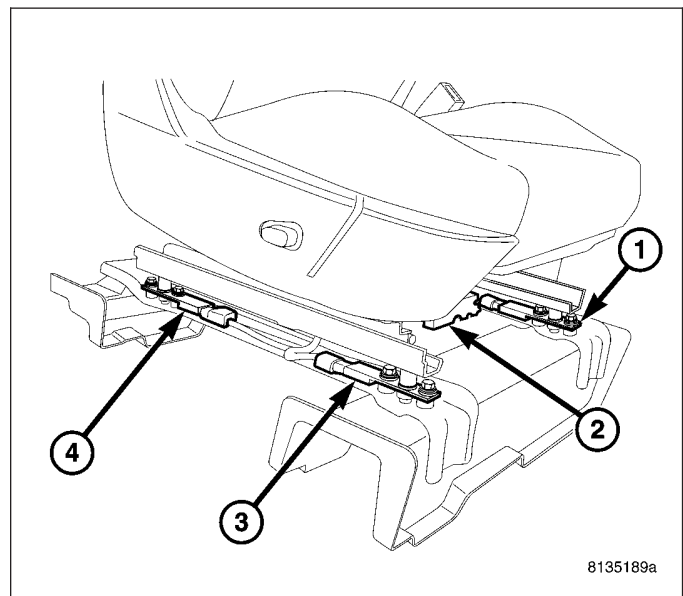
The OCM cannot be adjusted or repaired and, if damaged or faulty, it must be replaced.



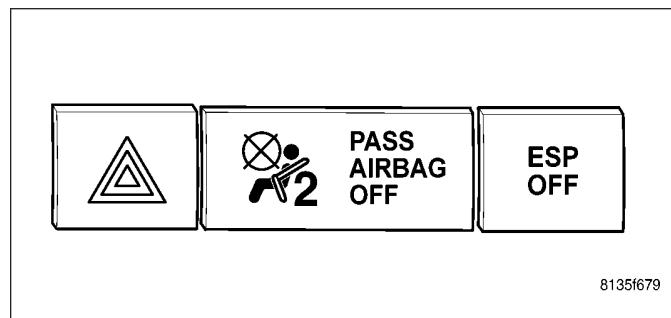
### OPERATION

The microprocessor in the Occupant Classification Module (OCM) (2) contains the Occupant Classification System (OCS) logic circuits. The OCM uses On-Board Diagnostics (OBD) and can communicate with other electronic modules in the vehicle as well as with the diagnostic scan tool using the Controller Area Network (CAN) data bus. This method of communication is also used for OCS diagnosis and testing through the 16-way data link connector located on the driver side lower edge of the instrument panel.

The OCM (2) provides voltage to the four seat weight sensors located on the corners of the passenger front seat (1, 3, and 4), and to the seat track position sensors on the outboard passenger and driver front seat upper seat tracks. The OCM then monitors return inputs from each of the sensors on dedicated hard wired data communication circuits. The seat weight sensor input allows the OCM to determine whether the passenger side front seat is occupied and the relative size of the occupant by providing a weight-sensing reference to the load on the seat. The seat track position sensor provides an additional logic input to the OCM micro-processor that allows it to determine the position of the front seat passenger and driver relative to the front airbags.



Pre-programmed decision algorithms and OCS calibration allow the OCM microprocessor to determine when passenger airbag protection is appropriate based upon the seat load as signaled by the seat weight sensors. When the programmed conditions are met, the OCM sends the proper electronic occupant classification messages over the CAN data bus to the Occupant Restraint Controller (ORC), and the ORC enables or disables the deployment circuits for the passenger front supplemental restraints. The ORC also provides a control output for the Passenger Airbag Disabled (PAD) Indicator in the instrument panel based upon the electronic occupant classification messages it receives from the OCM.



The OCM also sends electronic driver and passenger seat track position messages to the ORC over the CAN data bus. The ORC uses the seat track position data as an additional logic input for determining the force level with which to deploy the multistage front airbags.

The OCM microprocessor continuously monitors all of the OCS electrical circuits and components to determine the system readiness. If the OCM detects a monitored system fault, it sets an active and stored Diagnostic Trouble Code (DTC) and sends the appropriate electronic messages to the ORC over the CAN data bus. Then the ORC sets a DTC and sends messages to control the airbag indicator operation accordingly. An active fault only remains for the duration of the fault, or in some cases for the duration of the current ignition switch cycle, while a stored fault causes a DTC to be stored in memory by the OCM and the ORC. For some DTC's, if a fault does not recur for a number of ignition cycles, the OCM will automatically erase the stored DTC. For other internal faults, the stored DTC is latched forever.

The OCM receives battery current on a fused ignition switch output (run-start) circuit. The OCM receives ground through a ground circuit and take out of the body wire harness. These connections allow the OCM to be operational whenever the ignition switch is in the Start or On positions.

The most reliable, efficient, and accurate means to diagnose the OCM, the CAN data bus network, and the electronic message inputs to and outputs from the OCM requires the use of a diagnostic scan tool and the appropriate diagnostic information.

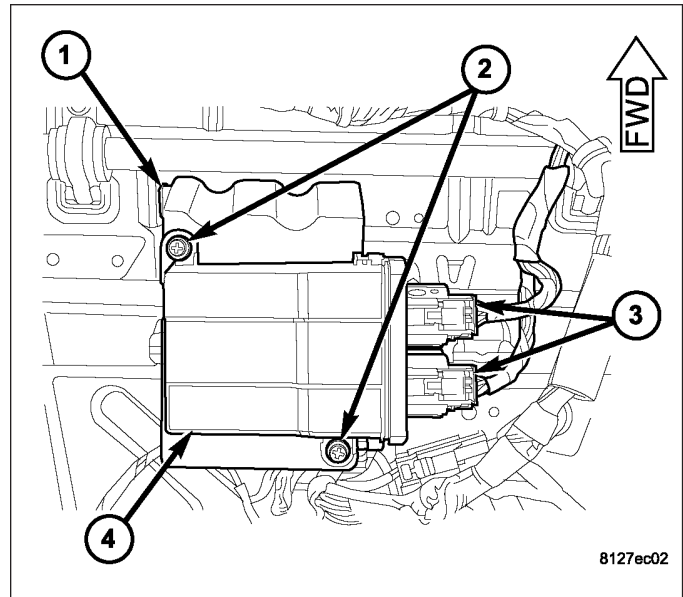
## REMOVAL

**WARNING:** Never replace both the Occupant Restraint Controller (ORC) and the Occupant Classification Module (OCM) at the same time. If both require replacement, replace one, then perform the Airbag System test (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM) before replacing the other. Both the ORC and the OCM store Occupant Classification System (OCS) calibration data, which they transfer to one another when one of them is replaced. If both are replaced at the same time, an irreversible fault will be set in both modules and the OCS may malfunction and cause personal injury or death.

1. Disconnect and isolate the battery negative cable.

**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

2. Reach under the front edge of the passenger front seat cushion to access and disconnect the two harness connectors (3) from the Occupant Classification Module (OCM) (4).
3. Remove the two screws (2) that secure the OCM to the OCM bracket (1).
4. Remove the OCM from under the passenger front seat.



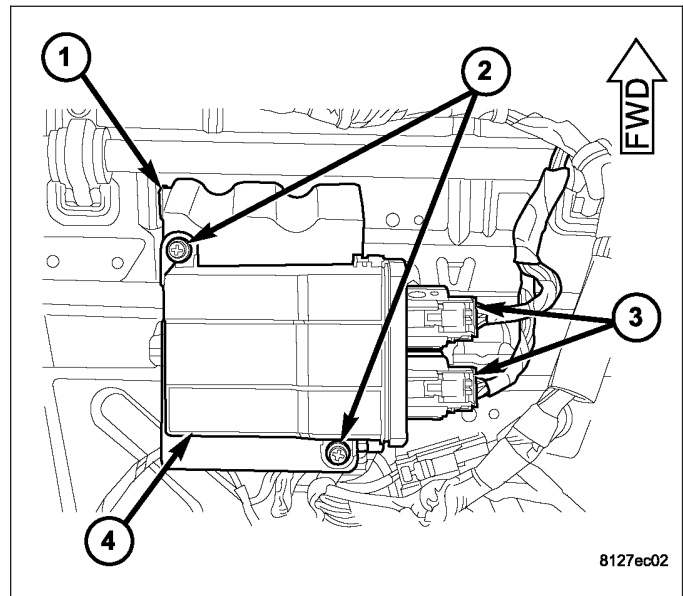
## INSTALLATION

**WARNING:** Never replace both the Occupant Restraint Controller (ORC) and the Occupant Classification Module (OCM) at the same time. If both require replacement, replace one, then perform the Airbag System test (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM) before replacing the other. Both the ORC and the OCM store Occupant Classification System (OCS) calibration data, which they transfer to one another when one of them is replaced. If both are replaced at the same time, an irreversible fault will be set in both modules and the OCS may malfunction and cause personal injury or death.

1. Carefully position the Occupant Classification Module (OCM) (4) to the OCM bracket (1).
2. Install and tighten the two screws (2) that secure the OCM to the OCM bracket. Tighten the screws to 2 N·m (20 in. lbs.).
3. Connect the two harness connectors (3) to the OCM.

**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

**WARNING:** Following successful completion of the Airbag System test procedure, the Occupant Classification System Verification Test must be done using a scan tool and the appropriate diagnostic information.

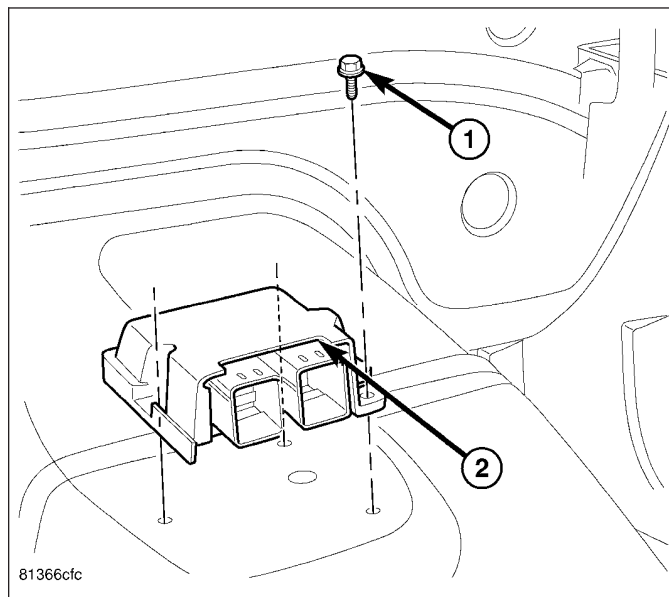




## OCCUPANT RESTRAINT CONTROLLER

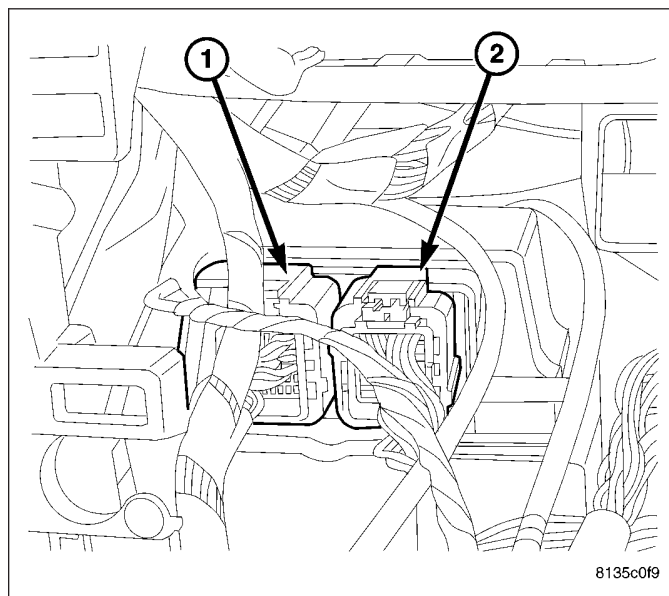
### DESCRIPTION

The Occupant Restraint Controller (ORC) (2), sometimes referred to as the Airbag Control Module (ACM), is secured with three screws to a stamped steel mounting bracket welded onto the top of the floor panel transmission tunnel underneath the instrument panel center stack, beneath the center floor console in the passenger compartment of the vehicle. Concealed within a hollow in the center of the die cast aluminum ORC housing is the electronic circuitry of the ORC which includes a microprocessor, an electronic impact sensor, an electronic safing sensor, and an energy storage capacitor. A stamped metal cover plate is secured to the bottom of the ORC housing with four screws to enclose and protect the internal electronic circuitry and components.



The ORC housing has integral mounting flanges in three locations. Two molded plastic electrical connectors (1 and 2) exit the rearward facing side of the ORC housing. These terminal pins connect the ORC to the vehicle electrical system through two connectors.

The impact sensor and safing sensor internal to the ORC are calibrated for the specific vehicle, and are only serviced as a unit with the ORC. The ORC cannot be repaired or adjusted and, if damaged or faulty, it must be replaced.



### OPERATION

The microprocessor in the Occupant Restraint Controller (ORC) contains the supplemental restraint system logic circuits and controls all of the supplemental restraint system components. The ORC uses On-Board Diagnostics (OBD) and can communicate with other electronic modules in the vehicle as well as with the diagnostic scan tool using the Controller Area Network (CAN) data bus. This method of communication is used for control of the airbag indicator in the ElectroMechanical Instrument Cluster (EMIC) and for supplemental restraint system diagnosis and testing through the 16-way data link connector located on the driver side lower edge of the instrument panel.

The ORC microprocessor continuously monitors all of the supplemental restraint system electrical circuits to determine the system readiness. If the ORC detects a monitored system fault, it sets an active and stored Diagnostic Trouble Code (DTC) and sends electronic messages to the EMIC over the CAN data bus to turn on the airbag indicator. An active fault only remains for the duration of the fault, or in some cases for the duration of the current ignition switch cycle, while a stored fault causes a DTC to be stored in memory by the ORC. For some DTC's, if a

fault does not recur for a number of ignition cycles, the ORC will automatically erase the stored DTC. For other internal faults, the stored DTC is latched forever.

On models equipped with the Occupant Classification System (OCS), the ORC communicates with the Occupant Classification Module (OCM) over the CAN data bus. The ORC will internally disable the passenger airbag and seat belt tensioner deployment circuits if the OCM detects that the passenger front seat is unoccupied or that it is occupied by a load that is inappropriate for an airbag deployment. The ORC also provides a control output to the passenger airbag disabled indicator through the passenger airbag indicator driver circuit. The OCM notifies the ORC when it has detected a monitored system fault and stored a DTC in its memory for any faulty OCS component or circuit, then the ORC sets a DTC and controls the airbag indicator operation accordingly.

The ORC receives battery current through two circuits; a fused ignition switch output (run) circuit and a fused ignition switch output (run-start) circuit. The ORC receives ground through a ground circuit of the instrument panel wire harness. These connections allow the ORC to be operational whenever the ignition switch is in the Start or On positions.

The ORC also contains an energy-storage capacitor. When the ignition switch is in the Start or On positions, this capacitor is continually being charged with enough electrical energy to deploy the front supplemental restraint components for up to one second following a battery disconnect or failure. The purpose of the capacitor is to provide backup supplemental restraint system protection in case there is a loss of battery current supply to the ORC during an impact.

Two sensors are contained within the ORC, an electronic impact sensor and a safing sensor. The ORC also monitors inputs from two remote front impact sensors located on the back of the right and left vertical members of the radiator support near the front of the vehicle. The electronic impact sensors are accelerometers that sense the rate of vehicle deceleration, which provides verification of the direction and severity of an impact. On vehicles equipped with curtain airbags, the ORC also monitors inputs from four additional remote impact sensors located on the left and right inner B-pillars and C-pillars to control deployment of the curtain airbags.

The safing sensor is an electronic accelerometer sensor within the ORC that provides an additional logic input to the ORC microprocessor. The safing sensor is used to verify the need for a supplemental restraint deployment by detecting impact energy of a lesser magnitude than that of the primary electronic impact sensors, and must exceed a safing threshold in order for the airbags to deploy. Vehicles equipped with curtain airbags, feature a second safing sensor within the ORC to provide confirmation to the ORC microprocessor of side impact forces. This second safing sensor is a bi-directional unit that detects impact forces from either side of the vehicle.

Pre-programmed decision algorithms in the ORC microprocessor determine when the deceleration rate as signaled by the impact sensors and the safing sensors indicate an impact that is severe enough to require supplemental restraint system protection and, based upon the severity of the monitored impact, determines the level of front airbag deployment force required for each front seating position. When the programmed conditions are met, the ORC sends the proper electrical signals to deploy the dual multistage front airbags at the programmed force levels, the front seat belt tensioners and, if the vehicle is so equipped, either curtain airbag. For vehicles equipped with the OCS, the passenger airbag and seat belt tensioner will be deployed by the ORC only if enabled by the OCM messages (passenger airbag disabled indicator Off) at the time of the impact.

The most reliable, efficient, and accurate means to diagnose the ORC, the CAN data bus, and the electronic message inputs to and outputs from the ORC requires the use of a diagnostic scan tool and the appropriate diagnostic information.

## REMOVAL

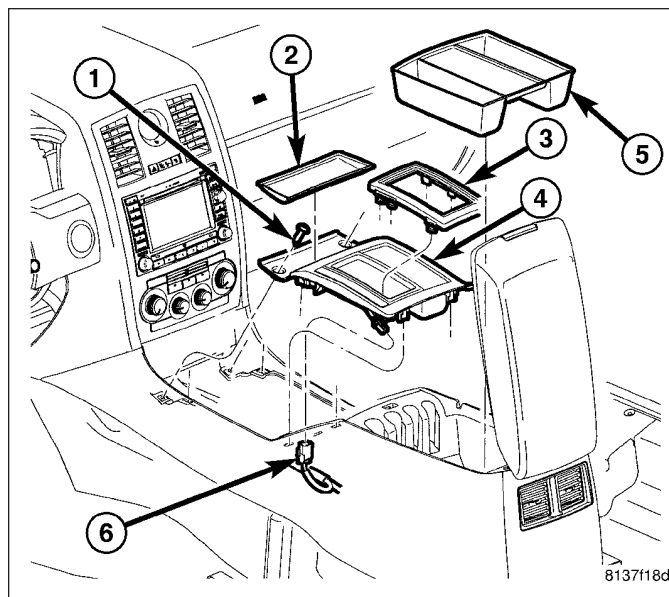
**WARNING:** Never replace both the Occupant Restraint Controller (ORC) and the Occupant Classification Module (OCM) at the same time. If both require replacement, replace one, then perform the Airbag System test (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM) before replacing the other. Both the ORC and the OCM store Occupant Classification System (OCS) calibration data, which they transfer to one another when one of them is replaced. If both are replaced at the same time, an irreversible fault will be set in both modules and the OCS may malfunction and cause personal injury or death.



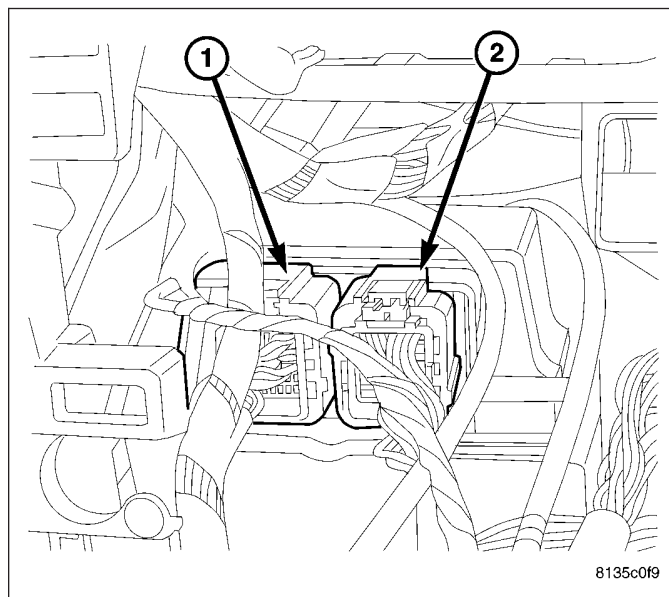
1. Disconnect and isolate the battery negative cable.

**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

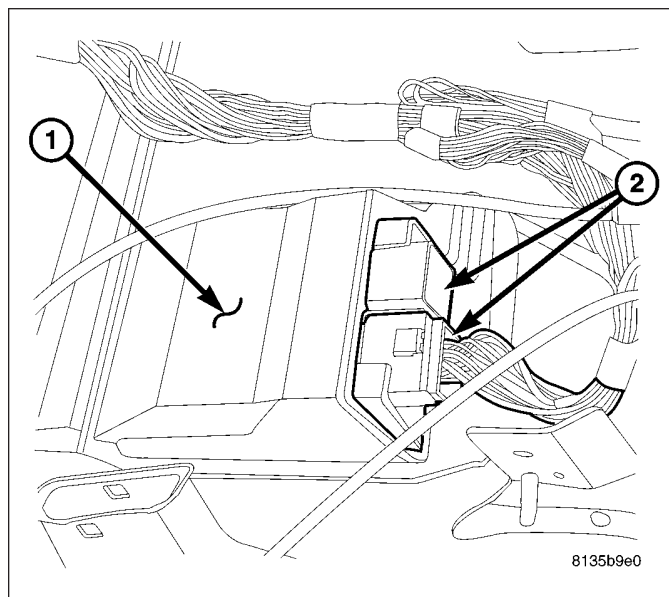
2. Remove the center floor console (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).



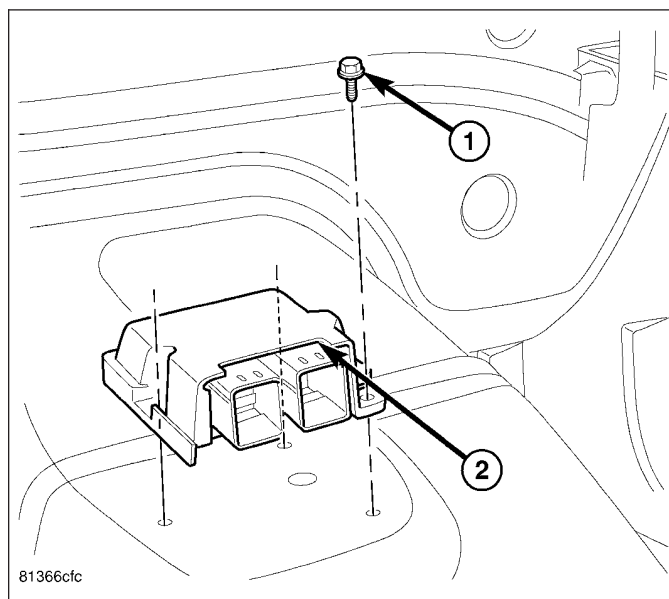
3. Disconnect the two electrical connectors (1 and 2).



4. Move the sound deadening material (1) as needed to access the Occupant Restraint Controller (ORC) mounting screws.



5. Remove the three mounting screws (1) to the ORC (2).

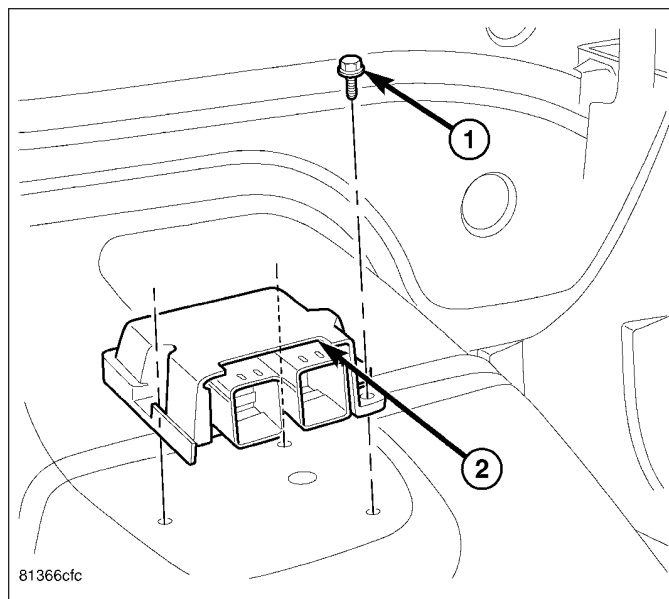


## INSTALLATION

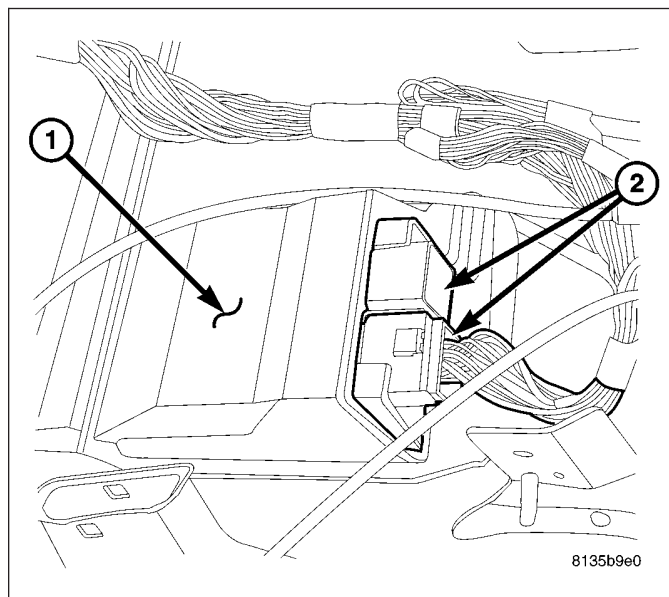
**WARNING:** Do not install ORC if mounting location is deformed or damaged. This will cause the ORC to be improperly located and could result in occupant personal injury or death.

**WARNING:** Never replace both the Occupant Restraint Controller (ORC) and the Occupant Classification Module (OCM) at the same time. If both require replacement, replace one, then perform the Airbag System test (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM) before replacing the other. Both the ORC and the OCM store Occupant Classification System (OCS) calibration data, which they transfer to one another when one of them is replaced. If both are replaced at the same time, an irreversible fault will be set in both modules and the OCS may malfunction and result in personal injury or death.

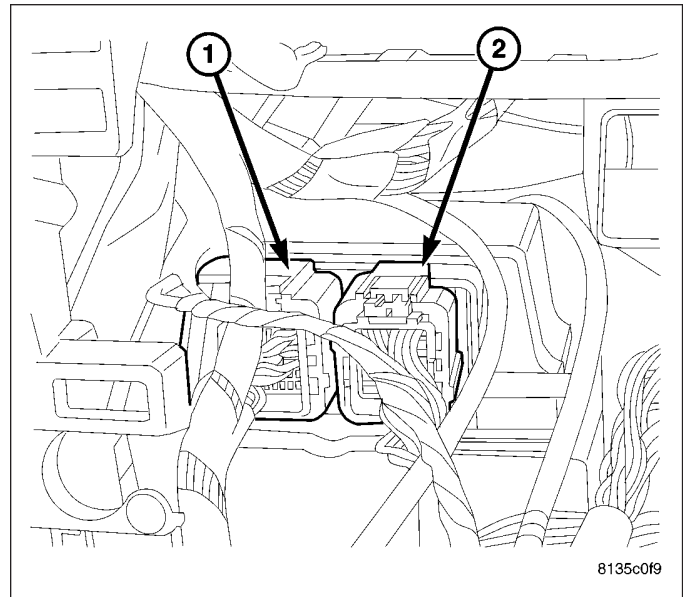
1. Position the ORC (2) into position and install the three mounting screws (1). Tighten the screws to 11 N·m (97 in. lbs.).



2. Make sure to reinstall the sound deadening material (1) over the ORC.

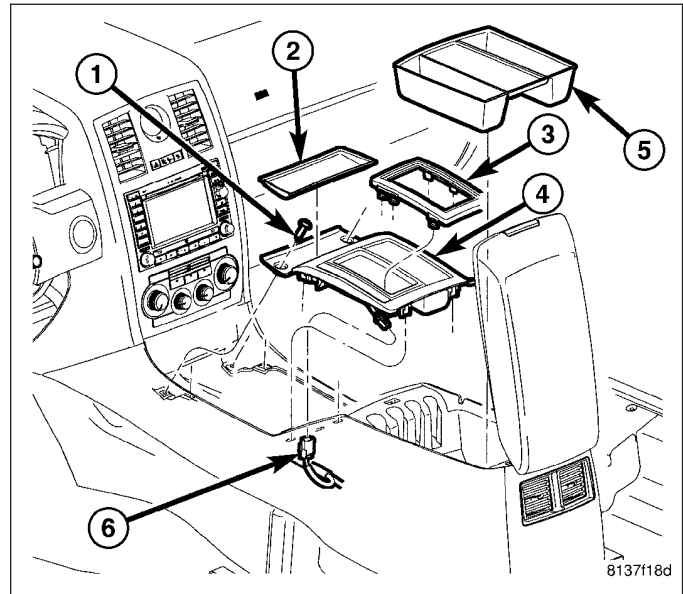


3. Connect the two electrical connectors (1 and 2).



4. Install the center floor console (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).

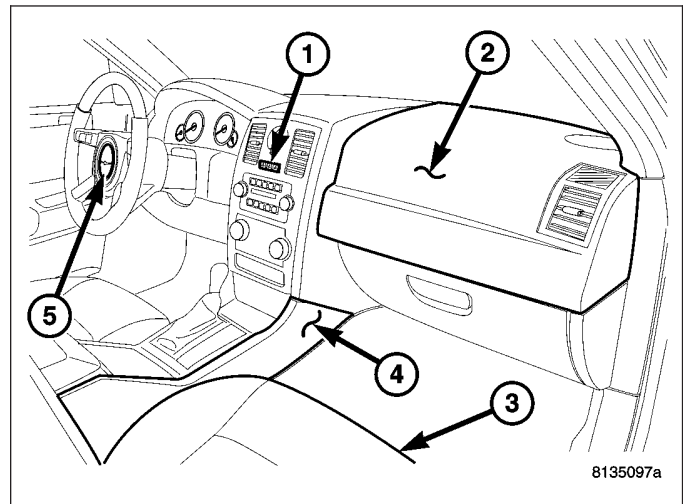
**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.



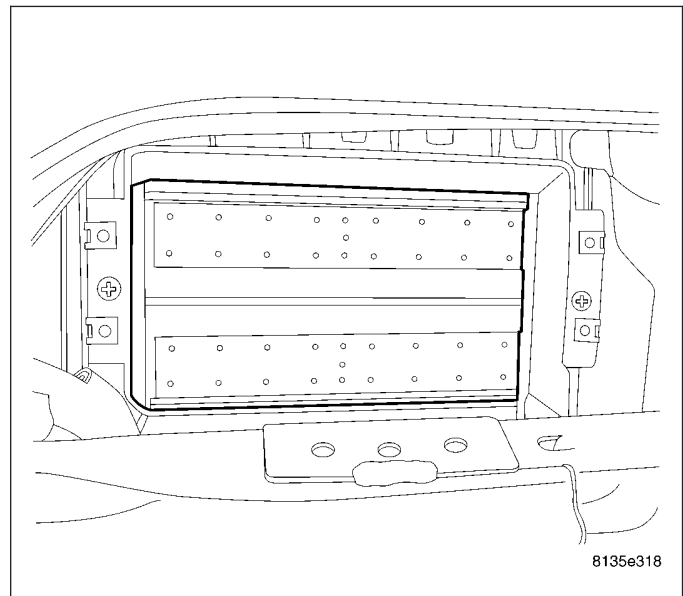
## PASSENGER AIRBAG

### DESCRIPTION

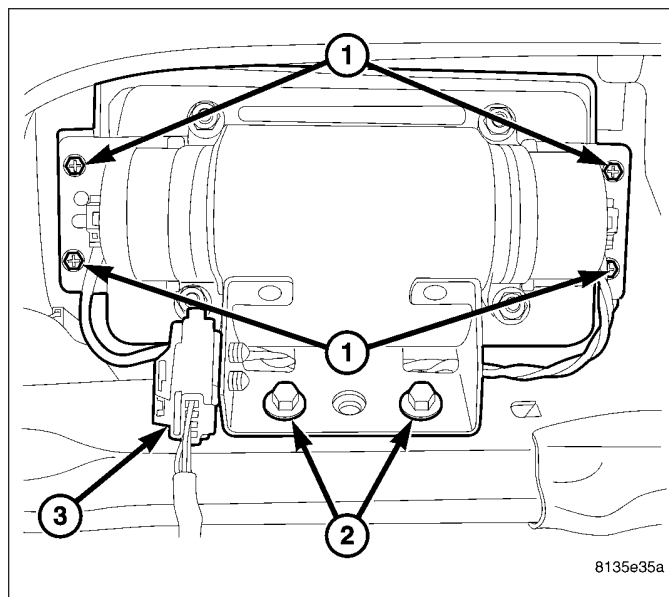
The horizontal surface of the injection molded, thermo-plastic passenger airbag door (2) is the most visible part of the passenger airbag. The passenger airbag door is located above the glove box opening on the top of the instrument panel, in front of the front seat passenger seating position.



Located below the passenger airbag door within the instrument panel is the passenger airbag. The passenger airbag housing fits into a molded receptacle on the back of the airbag door, where twelve stamped hook formations on the forward and rearward edges of the airbag housing are engaged in mating small window openings on the forward and rearward flanges of the receptacle to secure the airbag door to the airbag housing. These airbag door fasteners and mounting provisions are all concealed beneath the instrument panel base trim.



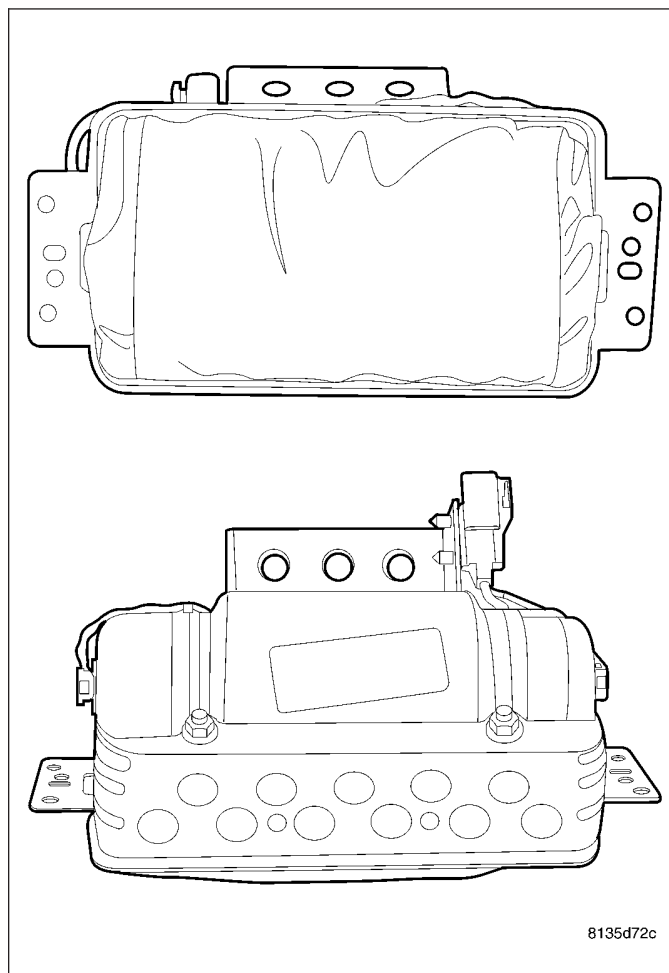
The passenger airbag is secured by four screws (1) through a stamped mounting bracket to the instrument panel cover/pad and two bolts (2) to the instrument panel structural support.



The passenger airbag used in this model is a multi-stage, Next Generation-type that complies with revised federal airbag standards to deploy with less force than those used in some prior models. The passenger airbag consists of a stamped and welded metal housing, the airbag cushion, the airbag inflator, and a stamped metal airbag cushion retainer plate that is secured to the airbag housing. The airbag housing contains the airbag inflator and the folded airbag cushion. A rectangular fabric cushion is used.

The airbag inflator is a non-azide, pyrotechnic-type unit that is secured to and sealed within the airbag housing. A short four-wire pigtail harness with a keyed, yellow connector insulator connects the two inflator initiators to the vehicle electrical system through the instrument panel wire harness.

This passenger airbag cannot be repaired, and must be replaced if deployed, faulty, or in any way damaged.



## OPERATION

The multistage passenger airbag is deployed by electrical signals generated by the Occupant Restraint Controller (ORC) through the passenger airbag squib 1 and squib 2 circuits to the two initiators in the airbag inflator. By using two initiators, the airbag can be deployed at multiple levels of force. The force level is controlled by the ORC to suit the monitored impact conditions by providing one of three delay intervals between the electrical signals provided to the two initiators. The longer the delay between these signals, the less forcefully the airbag will deploy.

When the ORC sends the proper electrical signals to each initiator, the electrical energy generates enough heat to initiate a small pyrotechnic charge which, in turn ignites chemical pellets within the inflator. Once ignited, these chemical pellets burn rapidly and produce a large quantity of inert gas. The inflator is sealed to the airbag cushion and a diffuser in the inflator directs all of the inert gas into the airbag cushion, causing the cushion to inflate. As the cushion inflates, the passenger airbag door will split at predetermined tear seam lines concealed on the inside surface of the door, then the door will pivot up over the top of the instrument panel and out of the way. Following an airbag deployment, the airbag cushion quickly deflates by venting the inert gas through vent holes within the fabric used to construct the back (windshield side) of the airbag cushion. Typically, both initiators are used during an airbag deployment event.

## REMOVAL

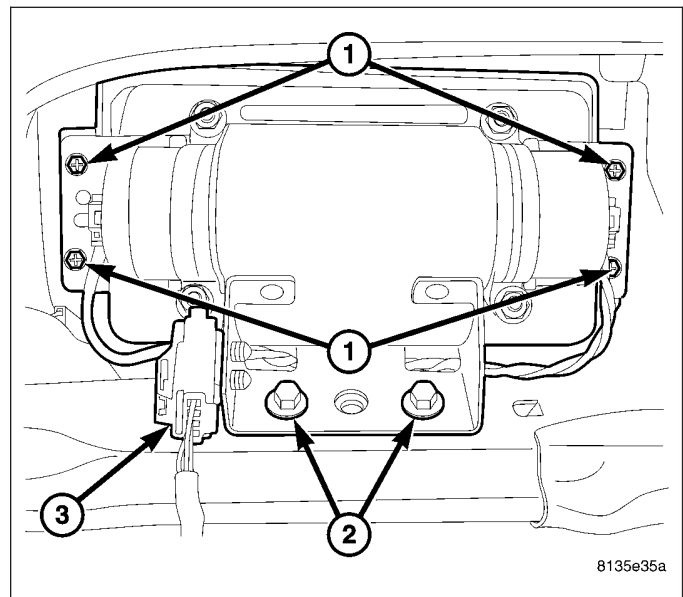
### DEPLOYED PASSENGER AIRBAG

For deployed passenger airbags, the entire instrument panel must be replaced.

1. Open hood.
2. Disconnect and isolate the battery negative cable.

**WARNING: Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.**

3. Remove instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).
4. Disconnect the passenger airbag electrical connector (3).
5. Remove the four left and right passenger airbag mounting screws (1).
6. Remove the two lower passenger airbag mounting bolts (2).
7. Separate passenger airbag from instrument panel.
8. Remove and inspect all reusable components from the instrument panel and transfer to the new instrument panel.
9. Clean powder residue from interior of vehicle (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER AN AIRBAG DEPLOYMENT).

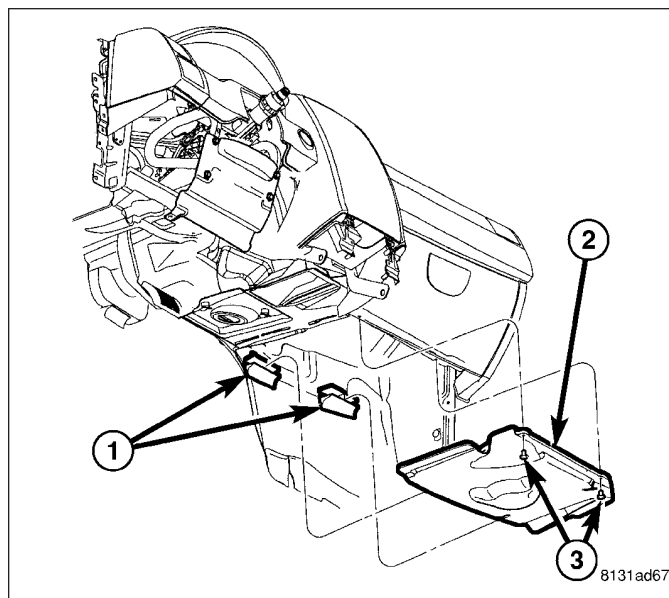


## NONDEPLOYED PASSENGER AIRBAG

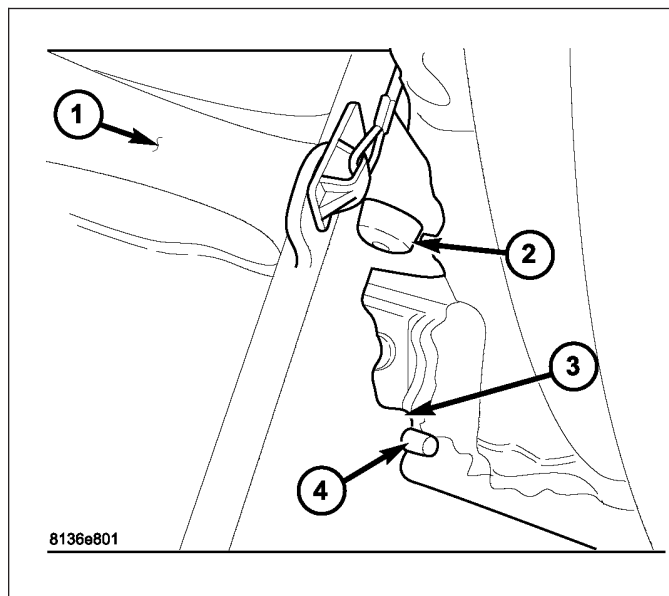
1. Disconnect and isolate the battery negative cable.

**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

2. Remove the right side silencer pad (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL SILENCER - REMOVAL).

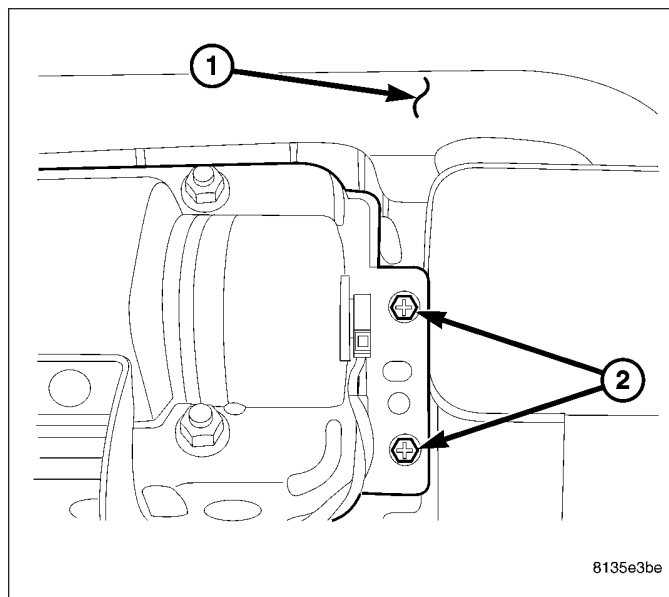


3. Remove the glove box assembly (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - REMOVAL).

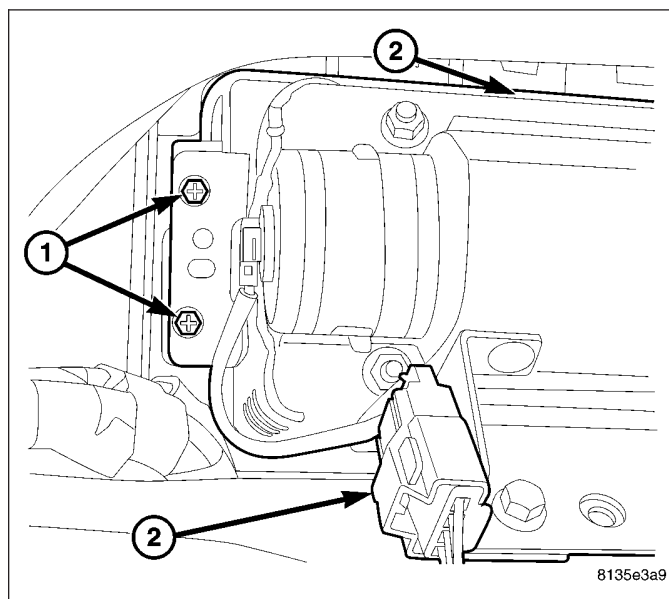




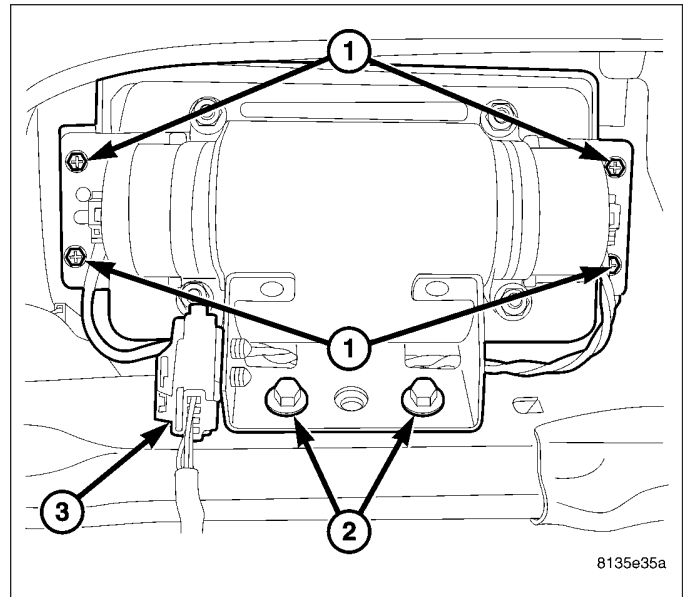
4. Remove the two inboard mounting screws (2) to the passenger airbag just below the distribution duct (1) and to the left of the distribution housing.



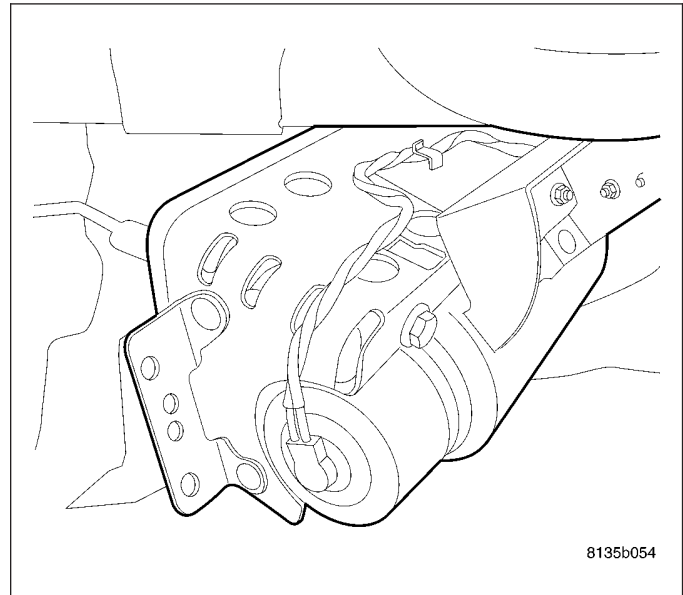
5. Remove the two outboard mounting screws (1) to the passenger airbag just below the distribution duct.



6. Remove the two passenger airbag mounting bolts (2) to the crosscar beam.
7. Disconnect the passenger airbag electrical connector (3).



8. Maneuver the passenger airbag down in a way to clear any obstacles that may impede the removal of the airbag.

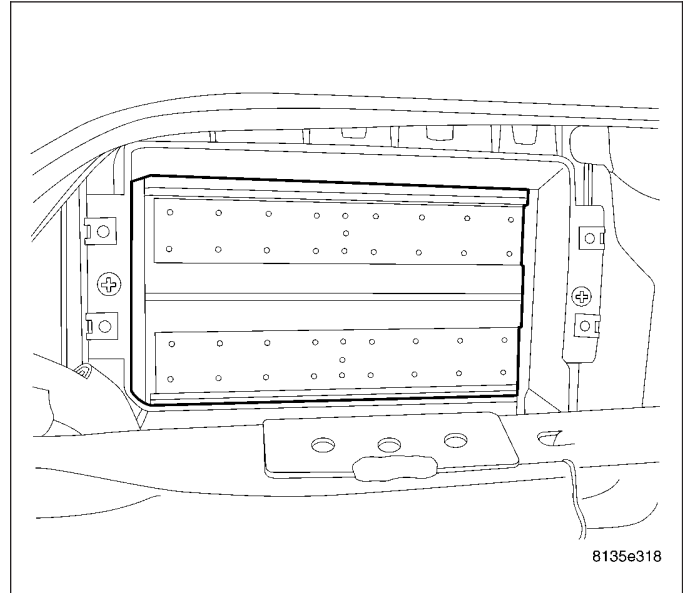


## INSTALLATION

### DEPLOYED PASSENGER AIRBAG

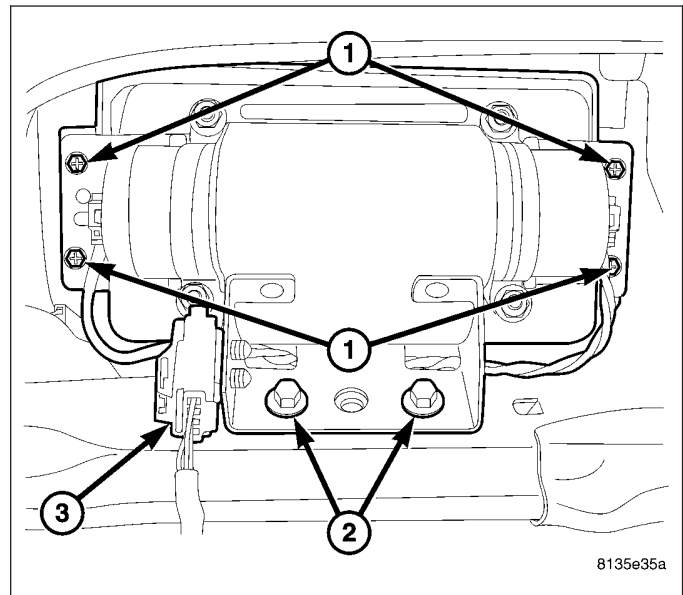
**Note:** For deployed passenger airbags, the entire instrument panel must be replaced.

1. Clean powder residue from interior of vehicle (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER AN AIRBAG DEPLOYMENT).
2. Inspect and transfer all reusable components from the old instrument panel to the new instrument panel.
3. Position new passenger airbag into instrument panel cavity.



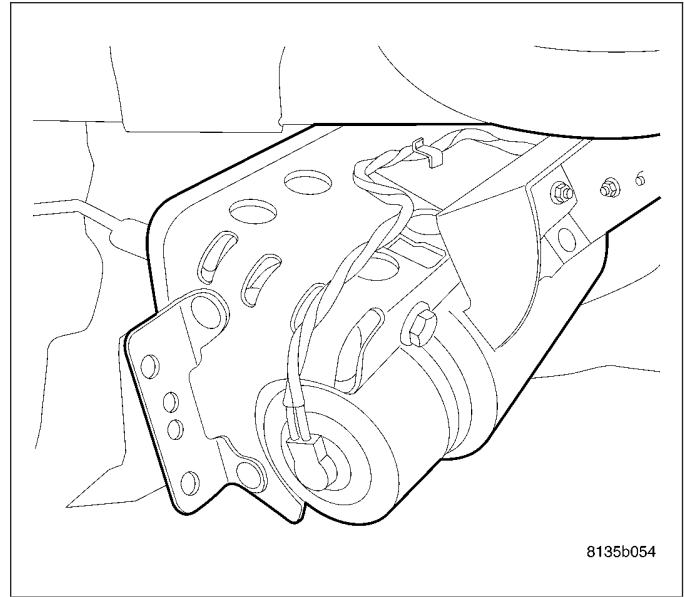
4. Install the two lower passenger airbag mounting bolts (2). Torque bolts to 11.6 N-m (103 in. lbs.).
5. Install the four left and right passenger airbag mounting screws (1). Torque screws to 2.8 N-m (25 in. lbs.).
6. Connect the passenger airbag electrical connector (3).
7. Install new instrument panel assembly (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

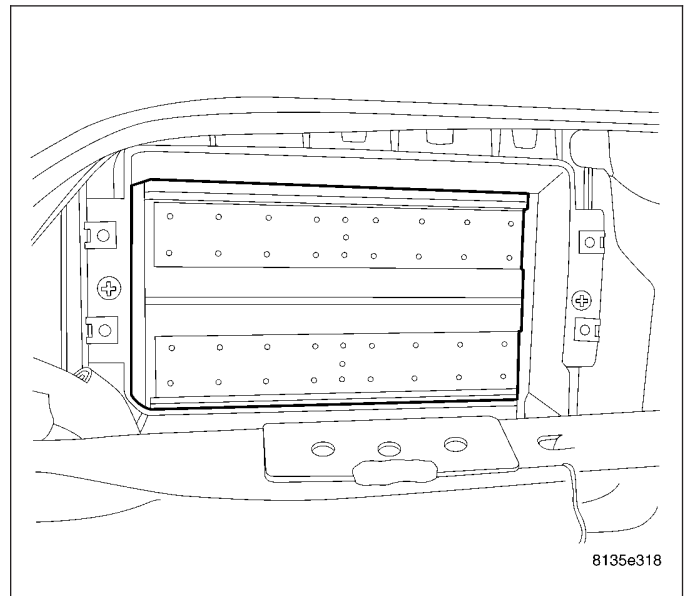


## NONDEPLOYED PASSENGER AIRBAG

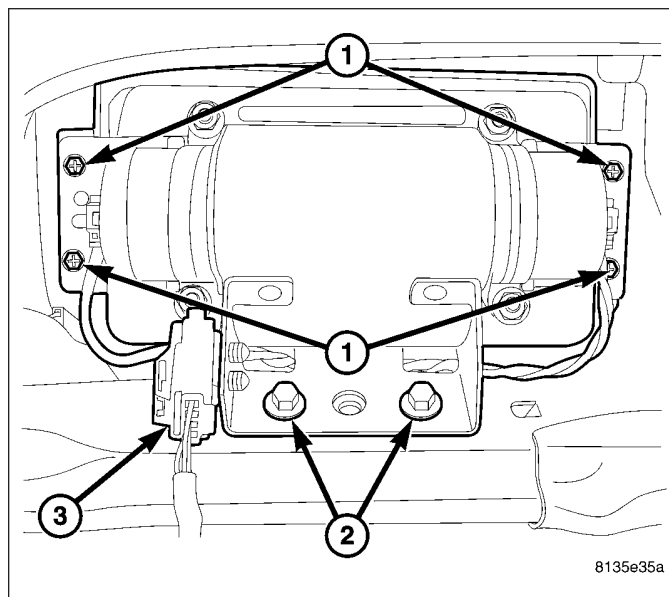
1. Maneuver the passenger airbag up into the instrument panel in a way to clear any obstacles that may impede the installation of the airbag.



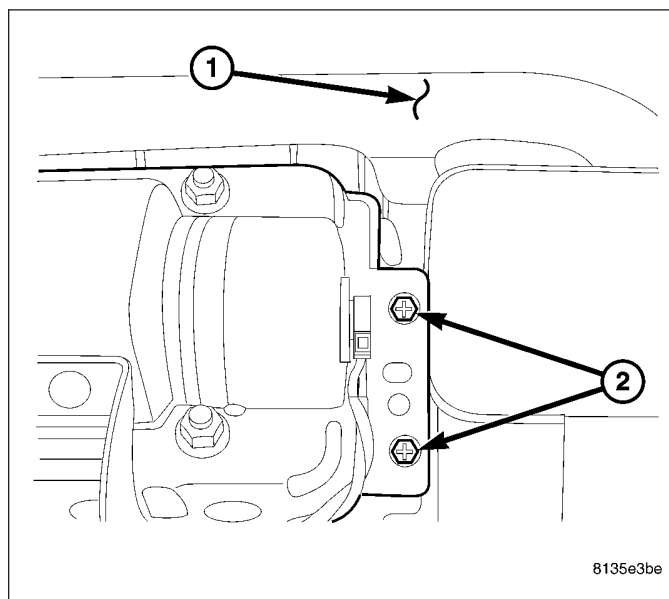
2. Place the passenger into the cavity of the passenger airbag door.



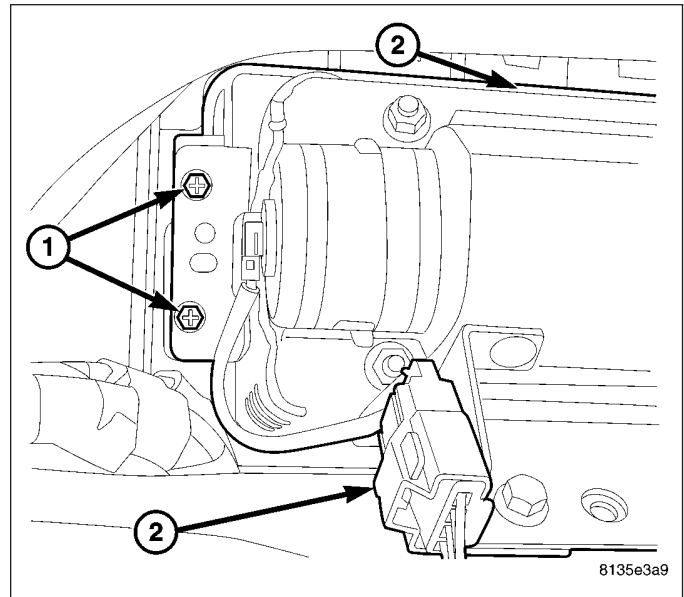
3. Install the two passenger airbag mounting bolts (2) to the crosscar beam. Torque bolts to 11.6 N·m (103 in. lbs.).
4. Connect the passenger airbag electrical connector (3).



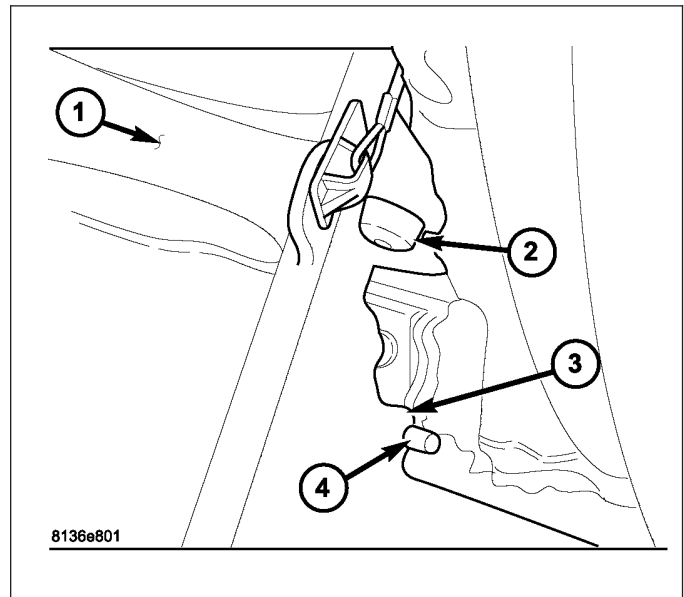
5. Install the two inboard mounting screws (2) to the passenger airbag just below the distribution duct (1) and to the left of the distribution housing. Torque screws to 2.8 N·m (25 in. lbs.).



6. Install the two outboard mounting screws (1) to the passenger airbag just below the distribution duct. Torque screws to 2.8 N·m (25 in. lbs.).

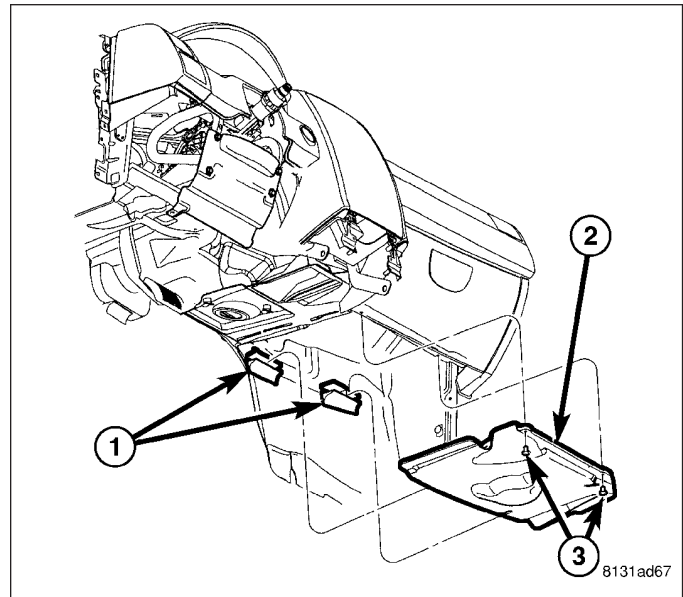


7. Install the glove box assembly (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - INSTALLATION).



8. Install the right side silencer pad (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL SILENCER - INSTALLATION).

**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.



## SEAT BELT & RETRACTOR

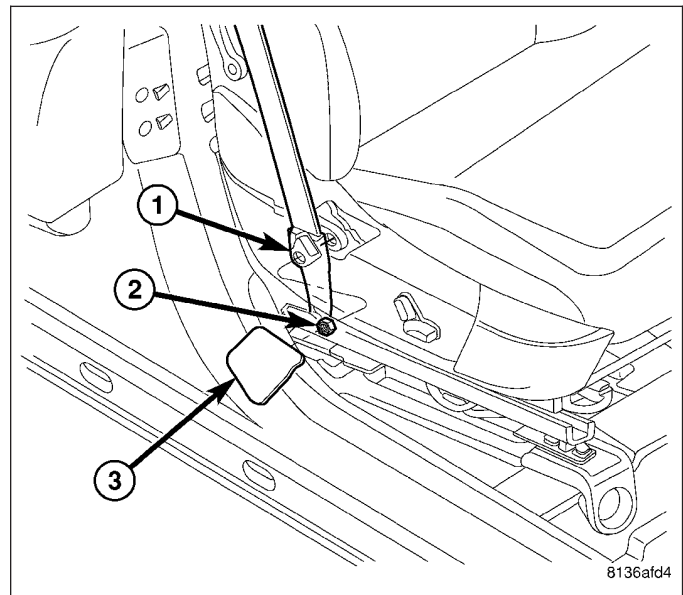
### REMOVAL

#### FRONT

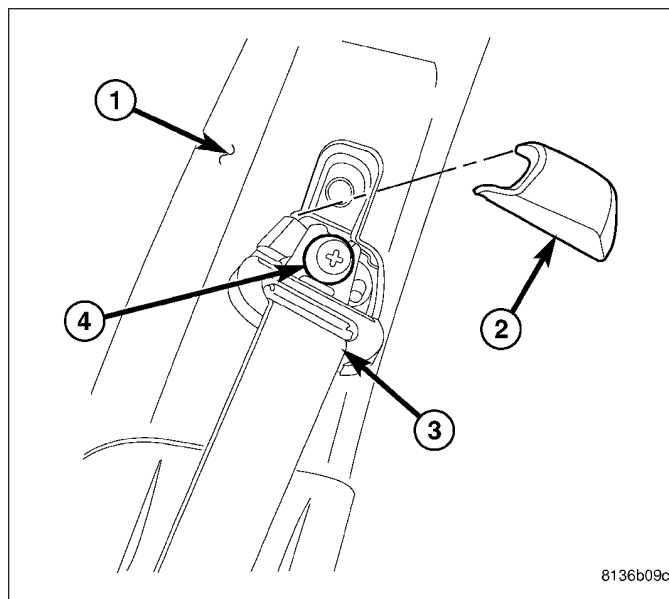
1. Disconnect and isolate the battery negative cable.

**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

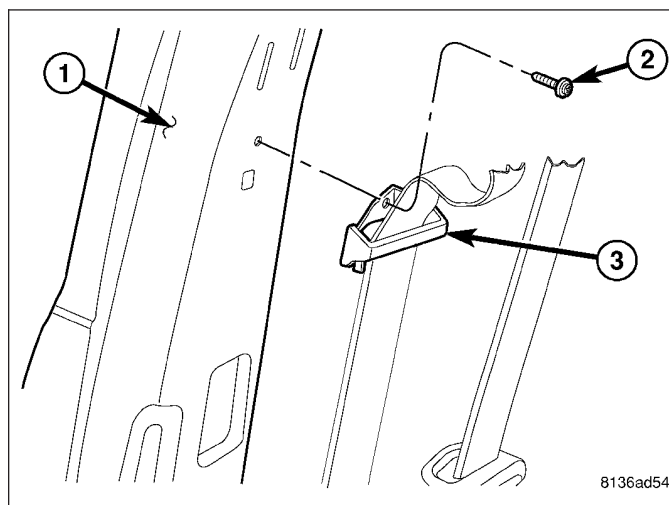
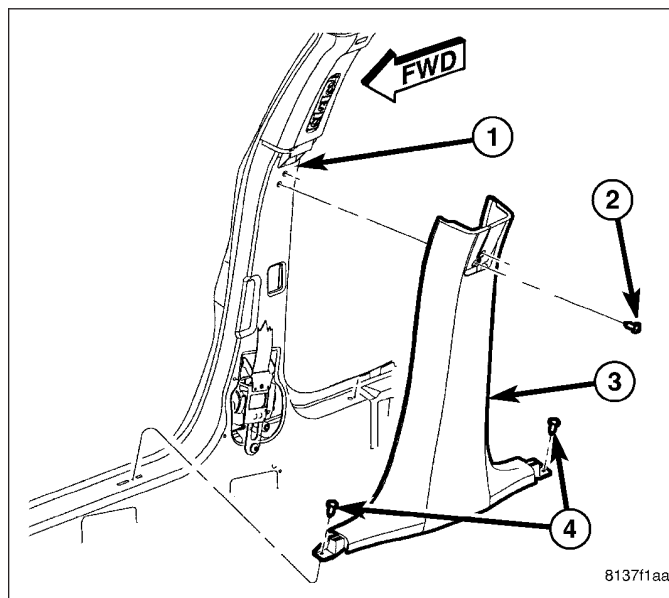
2. Remove trim cover (3) from the seat cushion out-board trim cover.
3. Remove seat belt (1) lower anchor nut (2) from seat cushion frame.



4. Remove the upper turning loop (3) trim cover (2).
5. Remove the upper turning loop retaining bolt (4).
6. Remove the lower B-pillar trim (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - REMOVAL).

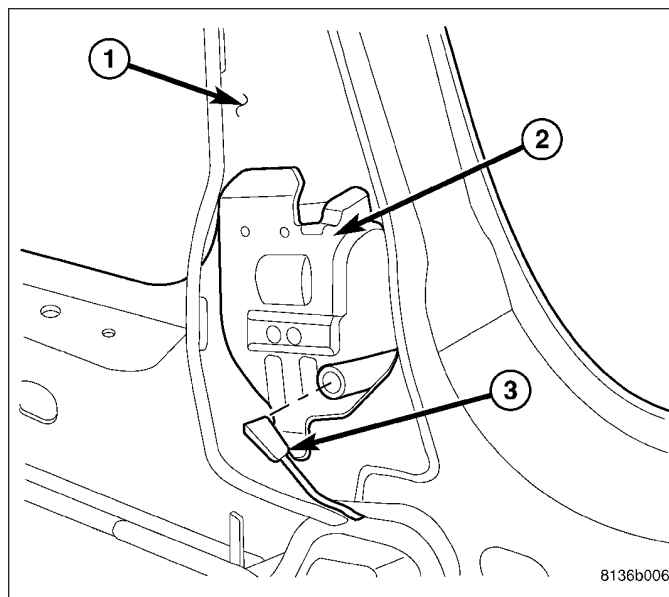


7. Remove the one screw (2) to the front seat belt web guide (3).

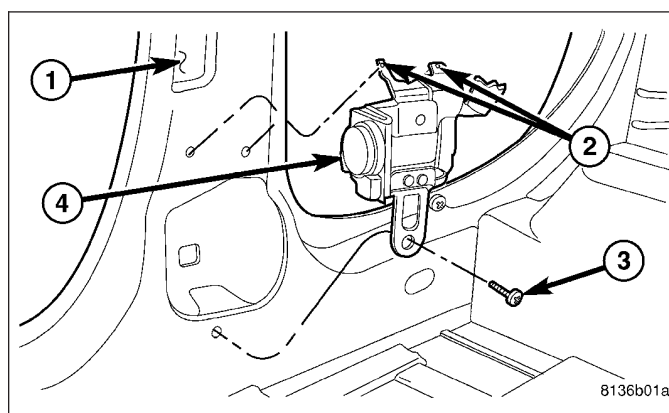




8. Disconnect the tensioner (2) squib connector (3).

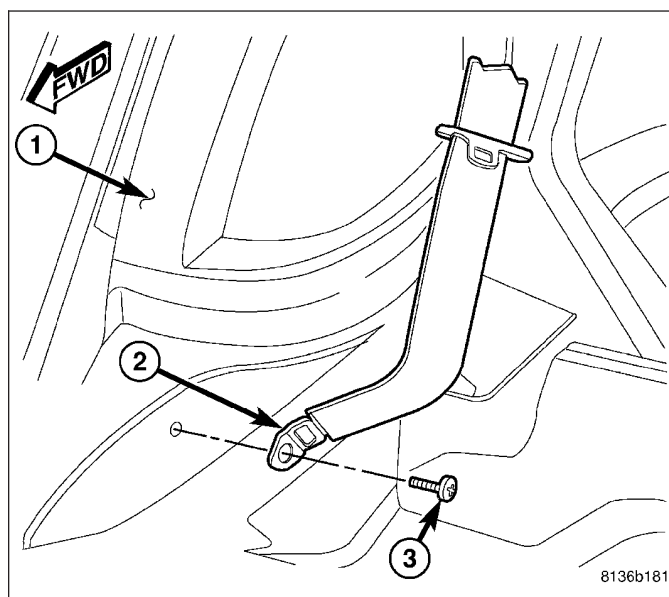


9. Remove the one screw between the upper retractor indexing tabs in B-pillar.
10. Remove the one front seat belt retractor (4) retaining bolt (3).
11. Pull the retractor inboard and release the indexing tabs (2) from the B-pillar (1).

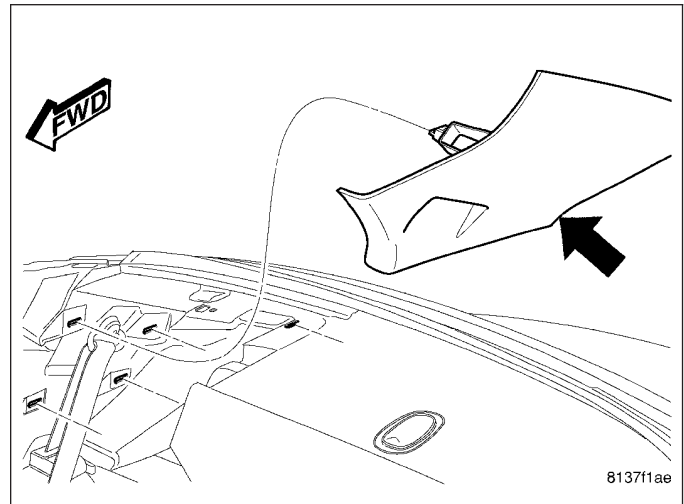


## REAR - SEDAN

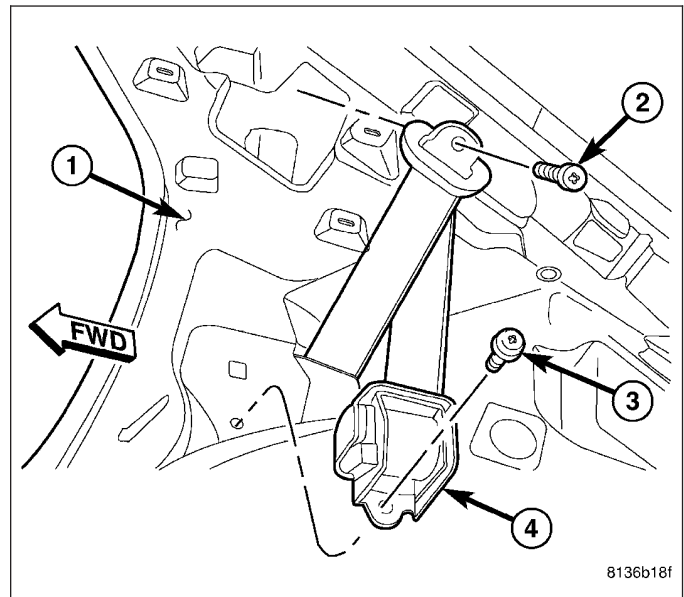
1. Remove the lower seat belt anchor (2) bolt (3).



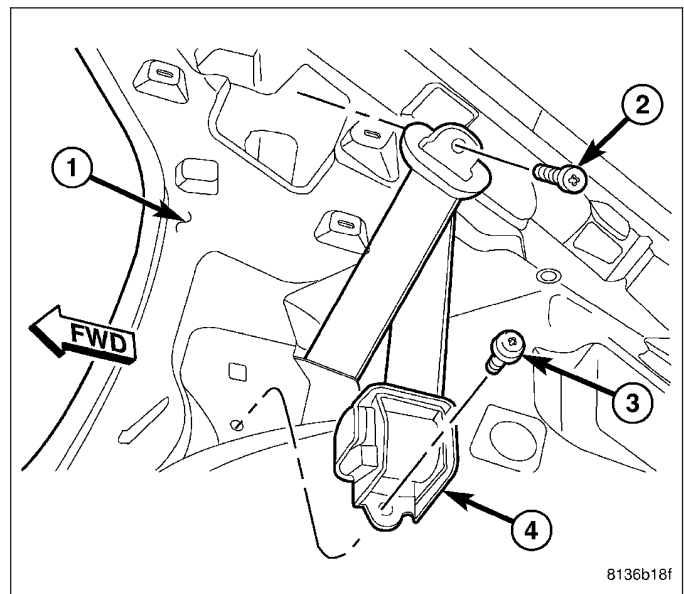
2. Remove the upper C-pillar trim panel (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).



3. Remove the one upper turning loop retaining bolt (2).

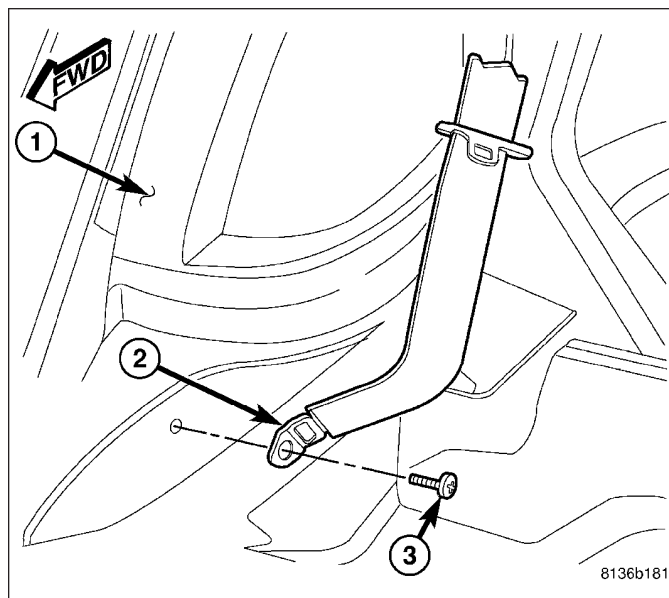


4. Remove the one seat belt retractor (4) mounting bolt (3).
5. Pull retractor inboard and drop down to release tabs from slots.

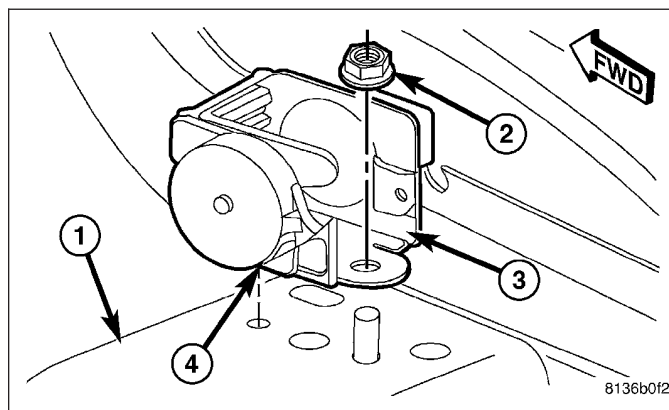


**REAR - WAGON**

1. Remove the lower seat belt anchor (2) bolt (3).

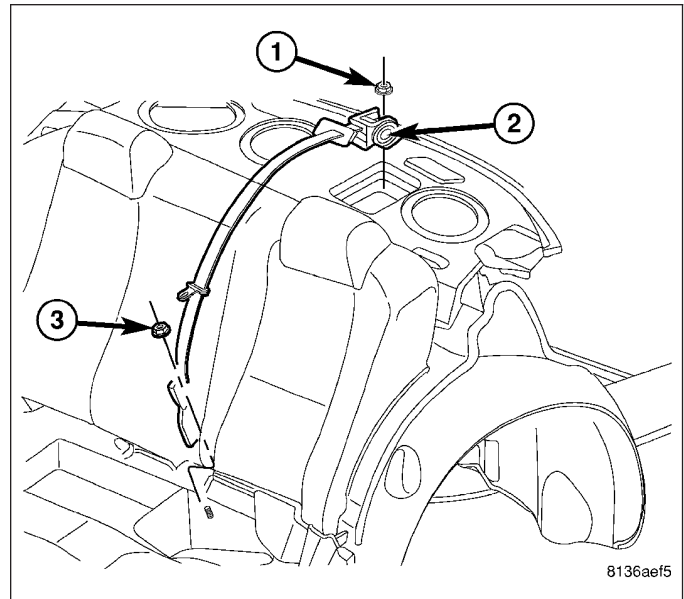


2. Remove the quarter trim panel.
3. Remove the one rear seat belt retractor (4) retaining nut (2).

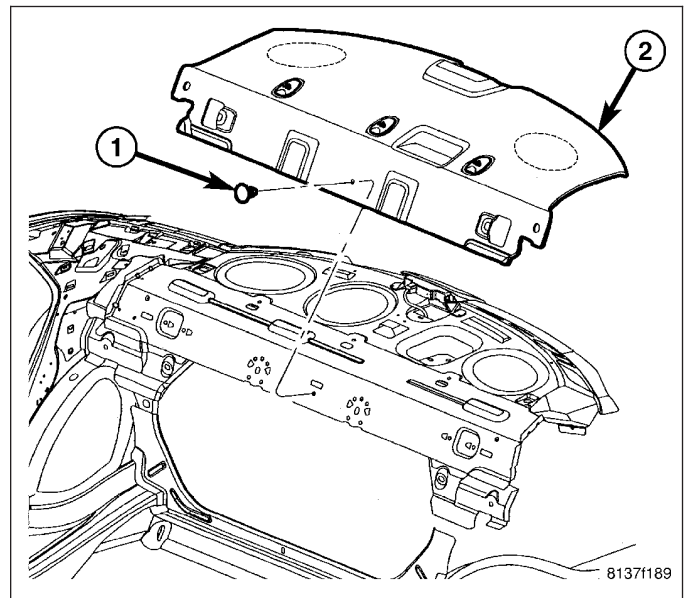


**REAR CENTER - SEDAN**

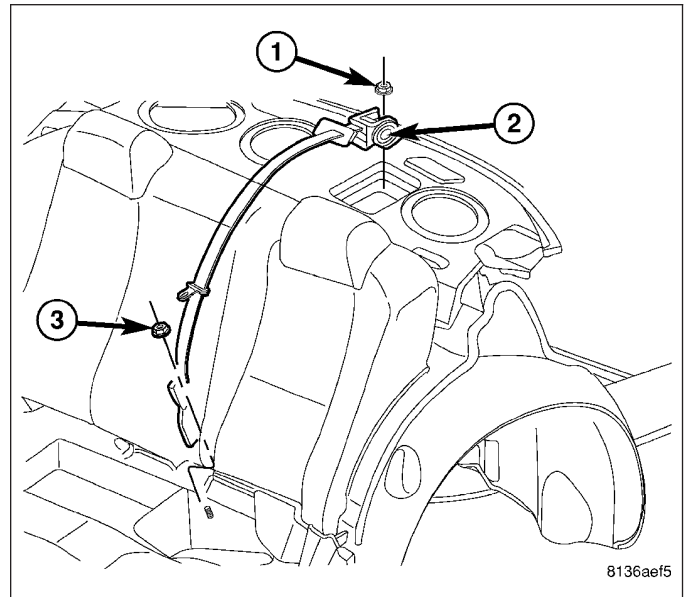
1. Remove the rear seat cushion (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - REMOVAL).
2. Remove the one nut (3) to the seat belt lower anchor.



3. Remove the rear shelf trim panel (Refer to 23 - BODY/INTERIOR/REAR SHELF TRIM PANEL - REMOVAL).



4. Remove the one retaining nut (1) to the center seat belt retractor (2).

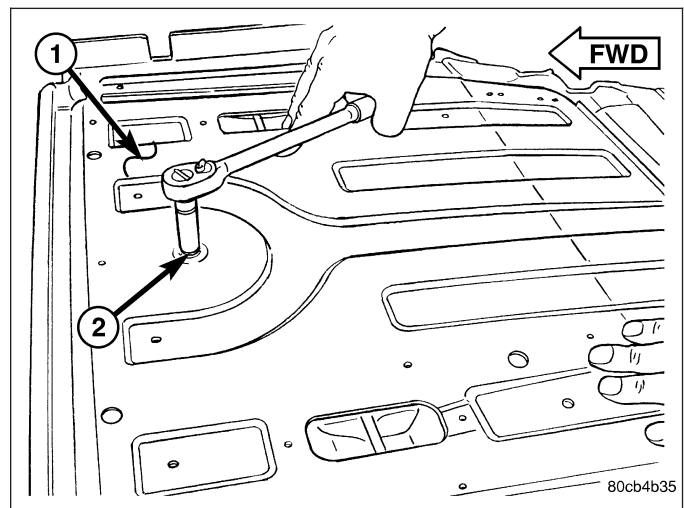


## REAR CENTER - WAGON

1. Remove the left seat back trim cover (60% portion of the rear folding seats) (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION/COVER - REMOVAL).
2. Disconnect the rear seat back latching cable from seat frame.

**Note: If the seat back is not fully latched, the center seat belt will not release from the retractor.**

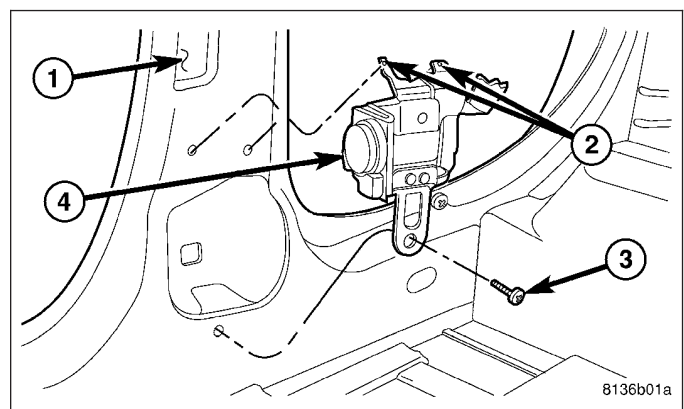
3. Remove the one bolt (2) holding the rear center seat belt retractor.



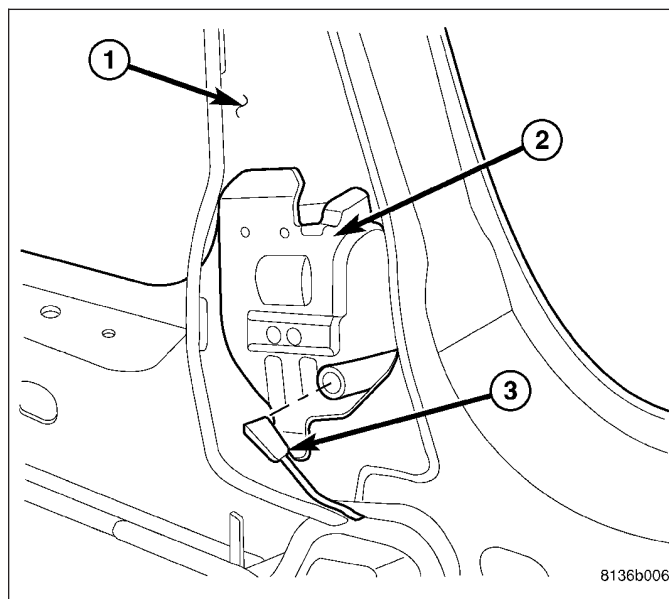
## INSTALLATION

### FRONT

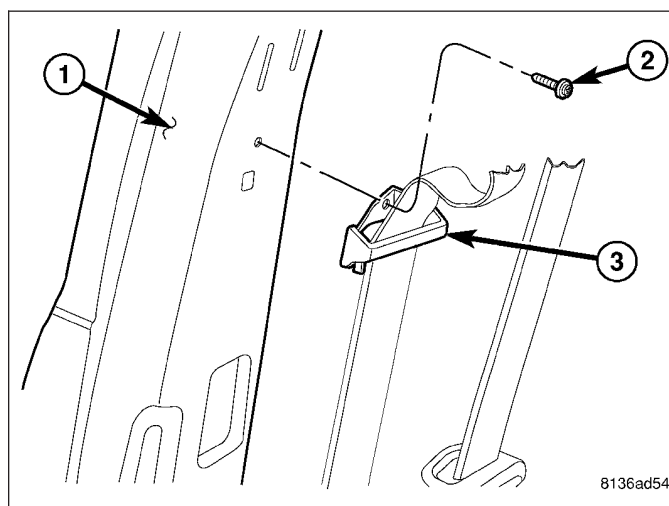
1. Position the retractor in the B-pillar (1) with the indexing tabs (2).
2. Install the one front seat belt retractor (4) retaining bolt (3). Torque bolt to 32 N·m (24 ft. lbs.).



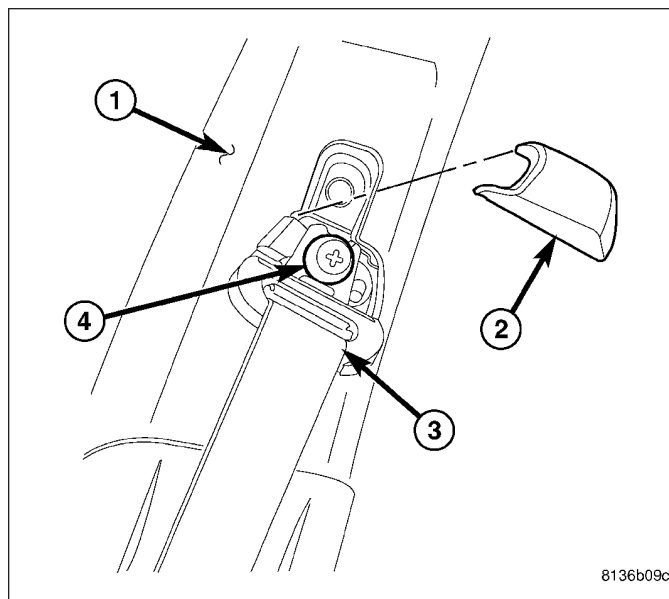
3. Install the one screw between the upper retractor indexing tabs (2) in B-pillar.
4. Connect the tensioner (2) squib connector (3).



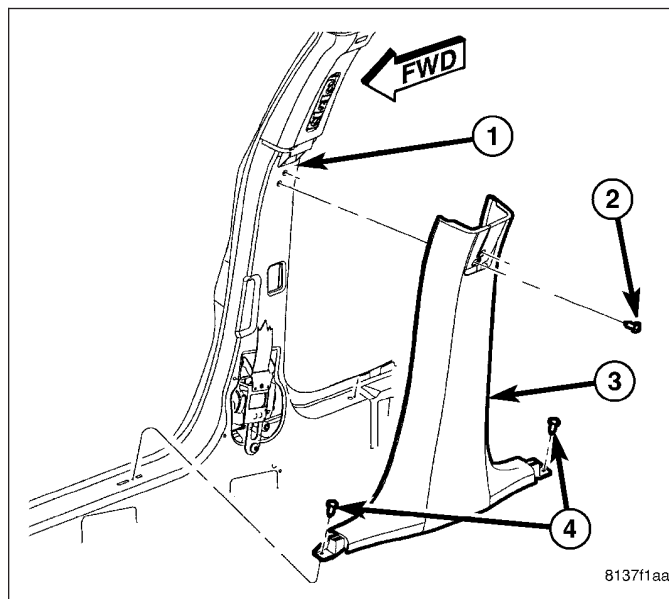
5. Install the one screw (2) to the front seat belt web guide (3). Torque screw to 3 N·m (20 in. lbs.).



6. Position the upper turning loop (3) and install the retaining bolt (4). Torque bolt to 40 N·m (30 ft. lbs.).
7. Install the upper turning loop (3) trim cover (2).

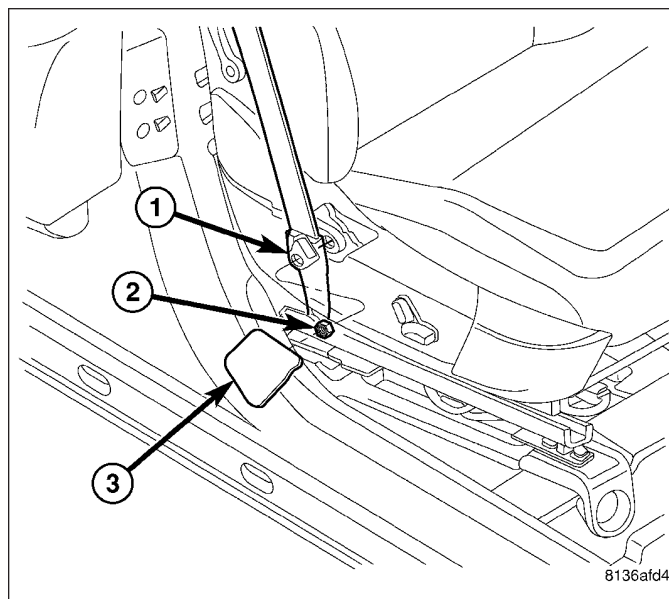


8. Install the lower B-pillar trim (Refer to 23 - BODY/ INTERIOR/B-PILLAR TRIM - INSTALLATION).



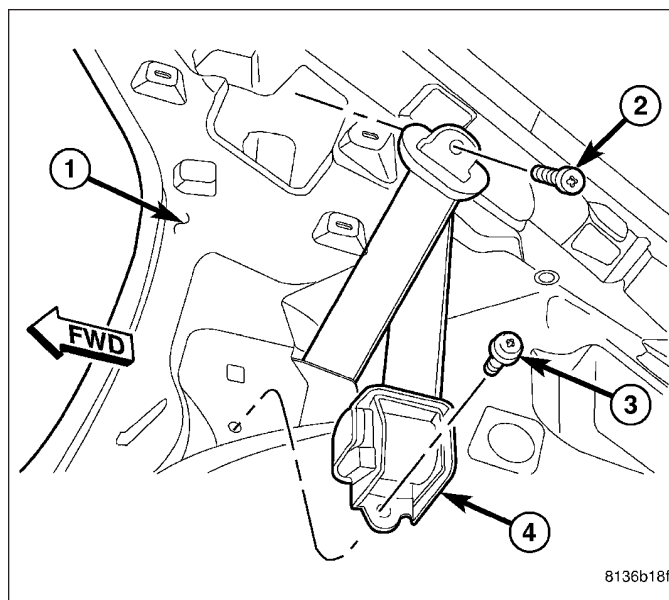
9. Position the seat belt (1) onto the stud on the seat cushion frame and install the lower anchor nut (2). Torque nut to 37 N·m (27 ft. lbs.).
10. Install the trim cover (3) onto the seat cushion outboard trim cover.

**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.



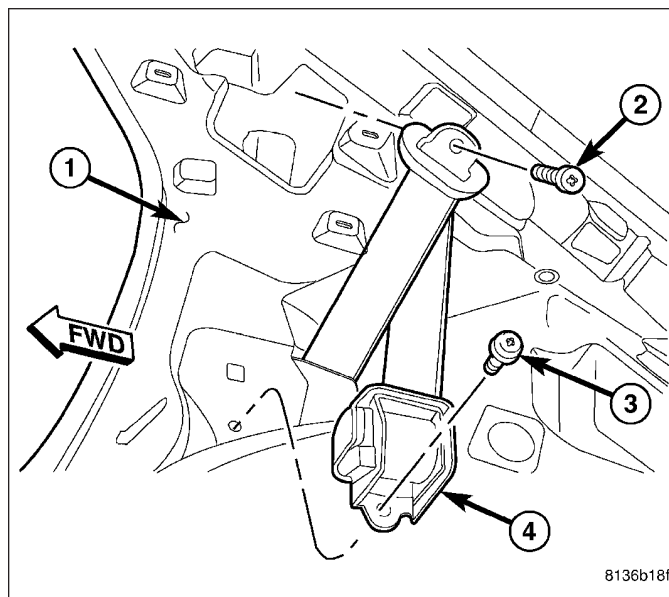
## REAR - SEDAN

1. Position the retractor (4) on the C-pillar to the indexing tab slips up into the pillar.
2. Install the retractor mounting bolt (3). Torque bolt to 32 N·m (24 ft. lbs.).

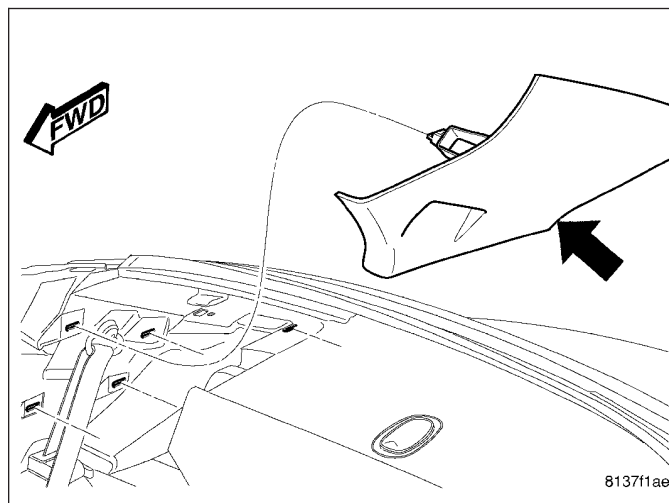




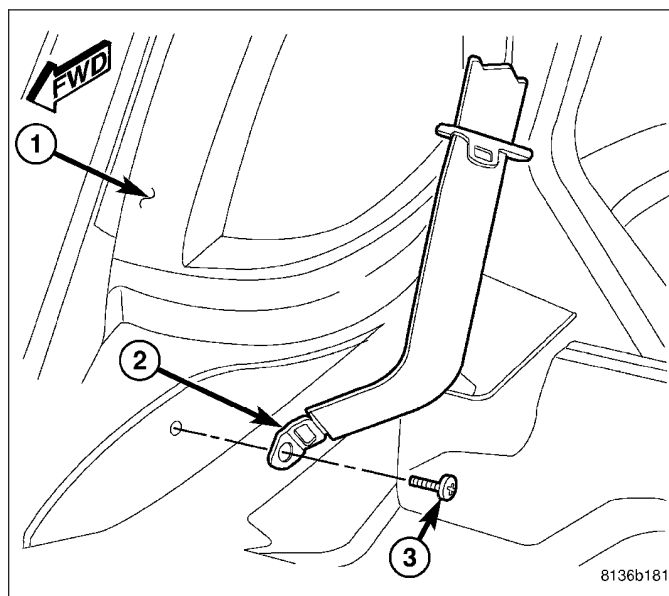
3. Install the one upper turning loop retaining bolt (2).  
Torque bolt to 40 N·m (30 ft. lbs.).



4. Install the upper C-pillar trim panel (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION).

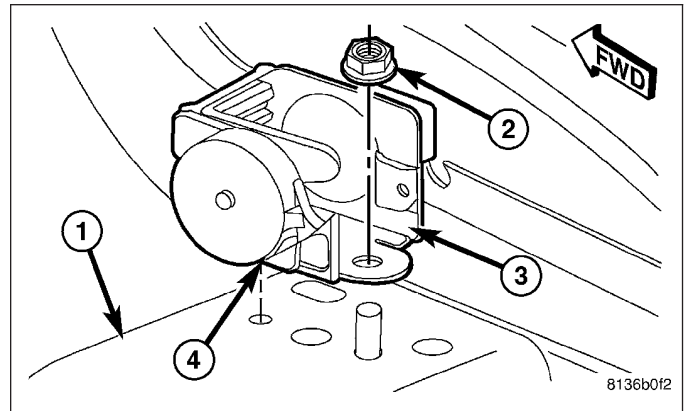


5. Install the lower seat belt anchor (2) bolt (3).  
Torque bolt to 32 N·m (24 ft. lbs.).

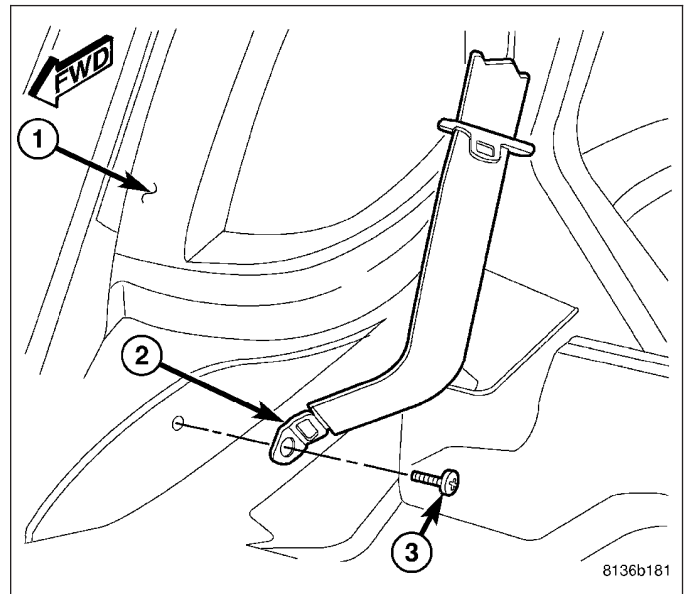


**REAR - WAGON**

1. Place the one rear seat belt retractor (4) so that the indexing tab is in its slot.
2. Install the retaining nut (2). Torque nut to 34 N·m (25 ft. lbs.).
3. Install the quarter trim panel.

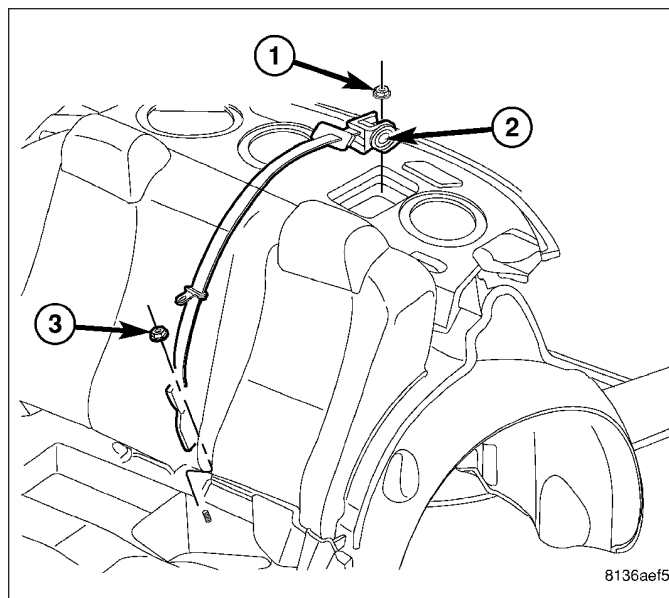


4. Install the lower seat belt anchor (2) bolt (3). Torque bolt to 32 N·m (24 ft. lbs.).

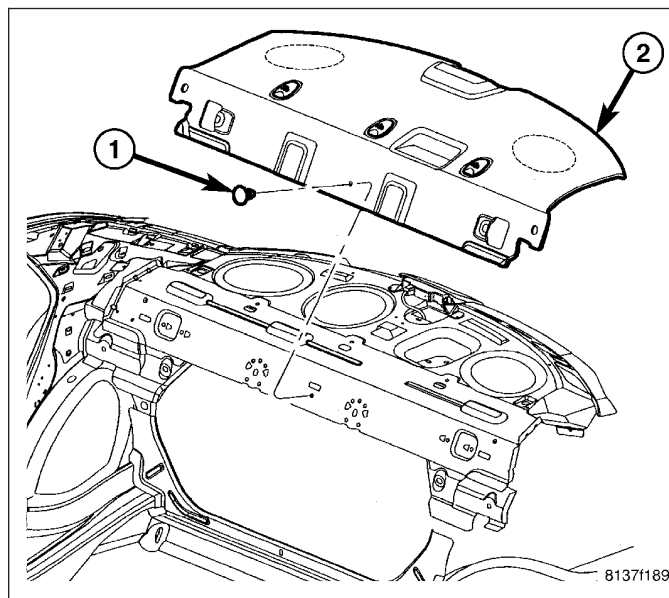


**REAR CENTER - SEDAN**

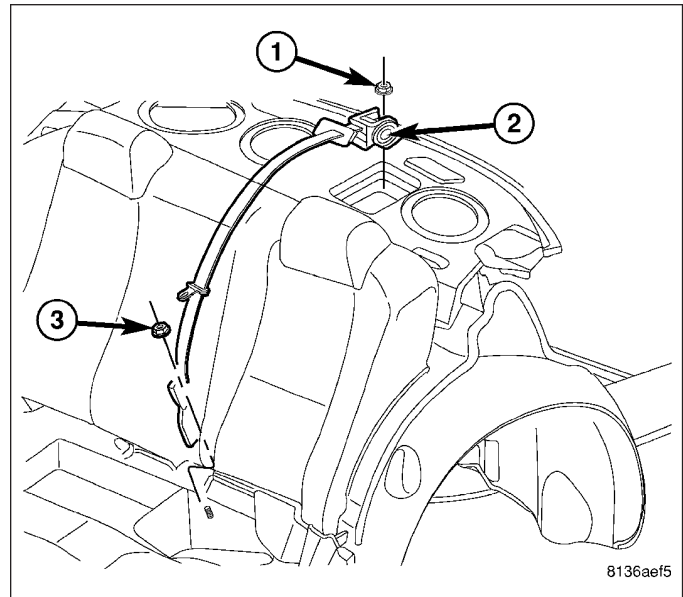
1. Place the rear center retractor (2) into position and install the one retaining nut (1). Torque nut to 34 N·m (25 ft. lbs.).



2. Install the rear shelf trim panel (Refer to 23 - BODY/INTERIOR/REAR SHELF TRIM PANEL - INSTALLATION).

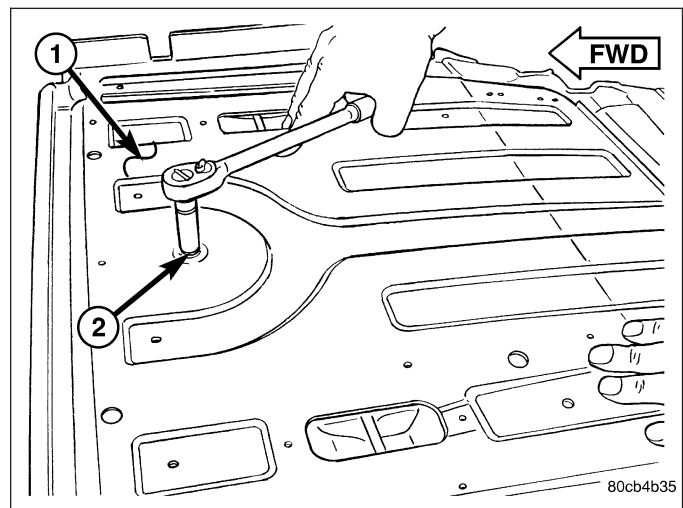


3. Install the one nut (3) to the seat belt lower anchor. Torque nut to 34 N·m (25 ft. lbs.).
4. Install the rear seat cushion (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - INSTALLATION).



## REAR CENTER - WAGON

1. Position the rear center retractor into position in the seat back.
2. Install the one bolt (2) holding the rear center seat belt retractor. Torque nut to 34 N·m (25 ft. lbs.).
3. Install the left seat back trim cover (60% portion of the rear folding seats) (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION).



## SEAT BELT BUCKLE

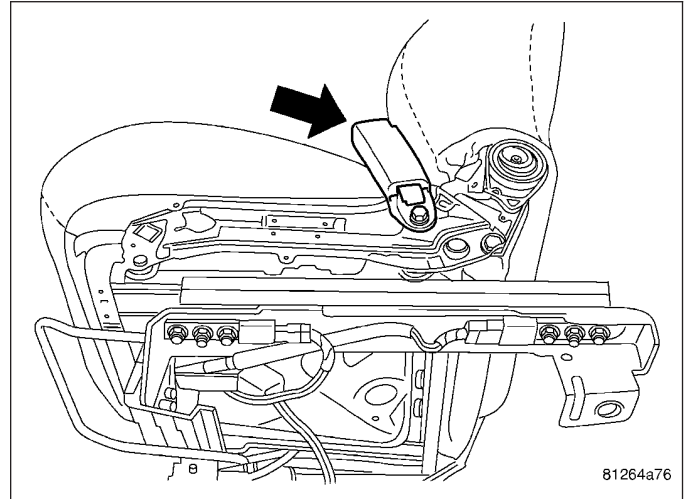
### REMOVAL

#### FRONT SEAT BELT BUCKLE

1. Disconnect and isolate the battery negative cable.

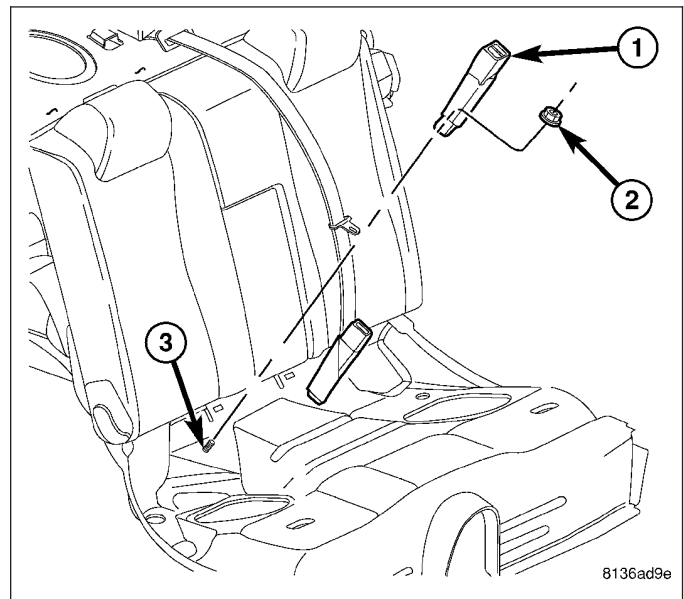
**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

2. Remove center console from vehicle (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).
3. Remove the inner side shield from the front seat cushion.
4. Disconnect the one electrical connector.
5. Remove the one nut to the buckle assembly.



#### REAR SEAT BELT BUCKLE

1. Remove the rear seat cushion (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - REMOVAL).
2. Remove the one nut (2) to the seat belt buckle.



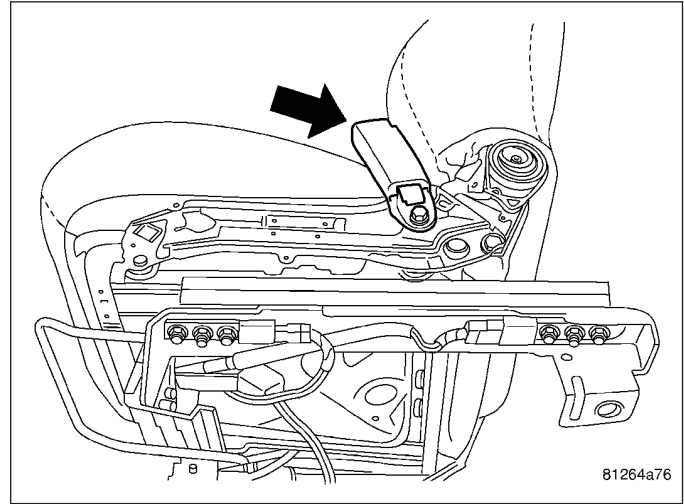
## INSTALLATION

### FRONT SEAT BELT BUCKLE

1. Position the front seat belt buckle onto the stud near the rear of the inboard seat cushion frame.
2. Install the retaining nut onto seat cushion frame. Tighten the nut to 43 N·m (32 ft. lbs.)
3. Connect the seat belt buckle electrical connector.
4. Install the seat cushion side shield.
5. Install floor console (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).

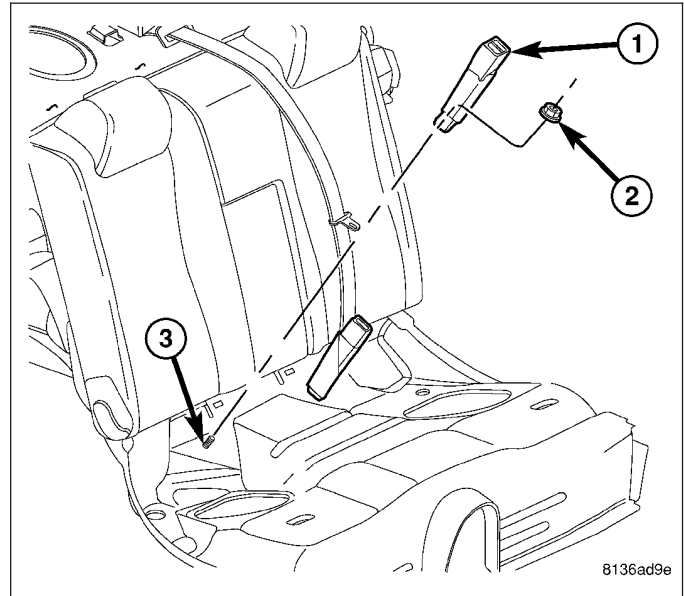
**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

**WARNING:** Following successful completion of the Airbag System test procedure, the Occupant Classification System Verification Test must be done using a scan tool and the appropriate diagnostic information.



### REAR SEAT BELT BUCKLE

1. Position the rear seat belt buckle onto mounting studs (3).
2. Install retaining nut. Torque nut to 34 N·m (25 ft. lbs.).
3. Install rear seat cushion (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - INSTALLATION).



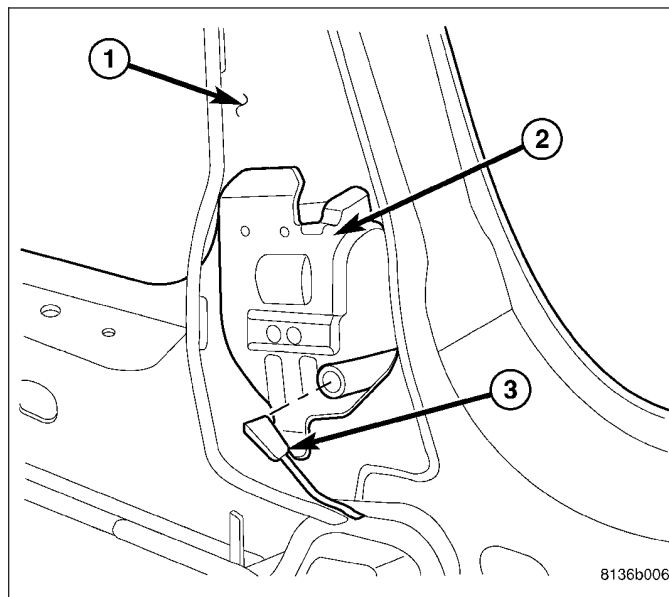
## SEAT BELT TENSIONER

### DESCRIPTION

Seat Belt Tensioners supplement the dual front airbags. The seat belt tensioners are integral to the front seat belt retractors (2), which are secured to the inner B-pillar (1) on the right and left sides of the vehicle. The retractor is concealed beneath the lower B-pillar trim. The seat belt tensioner consists primarily of a sprocket/pinion, a steel tube, a cast metal housing, numerous steel balls, a stamped metal ball trap, a torsion bar, a small pyrotechnically activated gas generator, and a short pigtail wire. All of these components are located on one side of the retractor spool on the outside of the retractor housing except for the torsion bar, which serves as the spindle upon which the retractor spool rides. The seat belt tensioners are controlled by the Occupant Restraint Controller (ORC) and are connected to the vehicle electrical system through the body wire harness (3).

The seat belt tensioners cannot be repaired and, if faulty or damaged, the entire front seat belt and retractor unit must be replaced. If the front airbags

have been deployed, the seat belt tensioners have also been deployed. The seat belt tensioners are not intended for reuse and must be replaced following any front airbag deployment. A growling or grinding sound while attempting to operate the seat belt retractor is a sure indication that the seat belt tensioner has been deployed and requires replacement. Refer to the proper Body Diagnostic Procedures manual for diagnosis and testing.



### OPERATION

The seat belt tensioners are deployed in conjunction with the front airbags by a signal generated by the Occupant Restraint Controller (ORC) through the driver or passenger seat belt tensioner line 1 and line 2 (or squib) circuits. When the ORC sends the proper electrical signal to the tensioners, the electrical energy generates enough heat to initiate a small pyrotechnic gas generator. The gas generator is installed in one end of a steel tube that contains numerous steel balls. As the gas expands, it pushes the steel balls through the tube into a cast metal housing, where a ball guide directs the balls into engagement with the teeth of a sprocket that is geared to one end of the retractor spool. As the balls drive past the sprocket, the sprocket turns and drives the seat belt retractor spool causing the slack to be removed from the front seat belts. The ball trap captures the balls as they leave the sprocket and are expelled from the housing.

Removing excess slack from the front seat belts not only keeps the occupants properly positioned for an airbag deployment following a frontal impact of the vehicle, but also helps to reduce injuries that the occupant might experience in these situations as a result of harmful contact with the steering wheel, steering column, instrument panel and/or windshield. Also, the seat belt tensioner torsion bar that the retractor spool rides upon is designed to deform in order to control the loading being applied to the occupants by the seat belts during a frontal impact, further reducing the potential for occupant injuries.

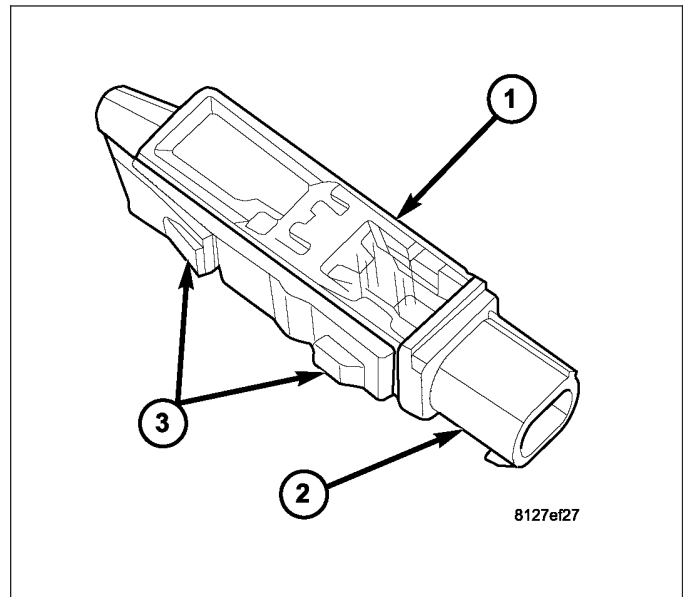
The ORC monitors the condition of the seat belt tensioners through circuit resistance, and will illuminate the airbag indicator in the instrument cluster and store a Diagnostic Trouble Code (DTC) for any fault that is detected. For proper diagnosis of the seat belt tensioners, a scan tool is required and the appropriate body diagnostic information.

## SEAT TRACK POSITION SENSOR

### DESCRIPTION

The seat track position sensor (1) is a Hall Effect-type sensor. This sensor consists of a Hall Effect Integrated Circuit (IC) chip encased in potting material within a cavity of the molded plastic sensor housing. The sensor housing has two integral snap features (3) and snaps into a stamped metal bracket located on the lower outboard seat adjuster track. A molded connector (2) integral to the sensor housing is connected to the vehicle electrical system through the driver seat wire harness.

The seat track position sensor cannot be adjusted or repaired and, if faulty or damaged, the entire sensor must be replaced.



### OPERATION

The seat track position sensor is designed to provide a seat position data input to the Occupant Classification Module (OCM) indicating whether the driver front seat is in a forward or rearward position. The OCM sends electronic seat position messages to the Occupant Restraint Controller (ORC) over the Controller Area Network (CAN) data bus. The ORC uses this data as an additional logic input for use in determining the appropriate deployment force to be used when deploying the multistage front airbags.

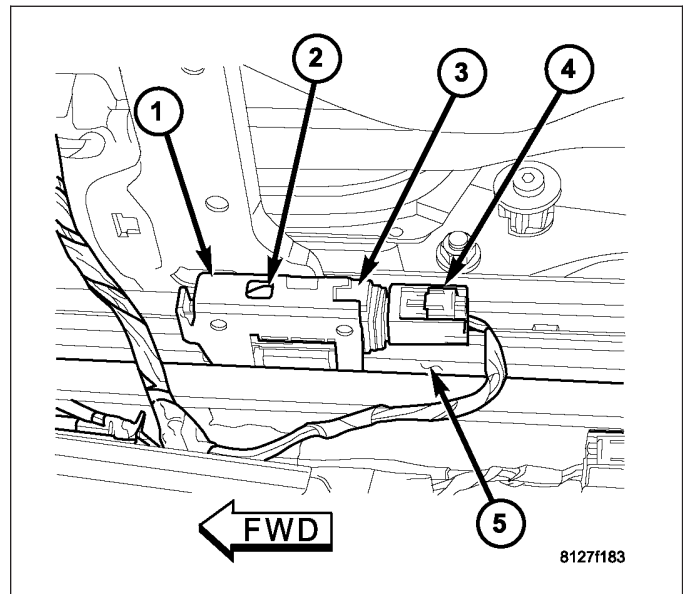
The seat track position sensor receives a nominal five volt supply from the OCM. The sensor communicates the seat position by modulating the voltage returned to the OCM on a sensor data circuit. The OCM also monitors the condition of the sensor circuits and will store a Diagnostic Trouble Code (DTC) for any fault that is detected, then send messages to the ORC to illuminate the airbag indicator in the instrument cluster. For proper diagnosis of the seat track position sensor, a diagnostic scan tool is required and the appropriate diagnostic information.

### REMOVAL

1. Disconnect and isolate the battery negative cable.

**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

2. Reach under the front edge of the front seat cushion to access the seat track position sensor (3) in a bracket (1) located on the lower outboard seat track (5).
3. Disconnect the electrical connector (4) from the sensor.
4. Using a small screwdriver, depress the snap feature (2) and pull the sensor out of the bracket.



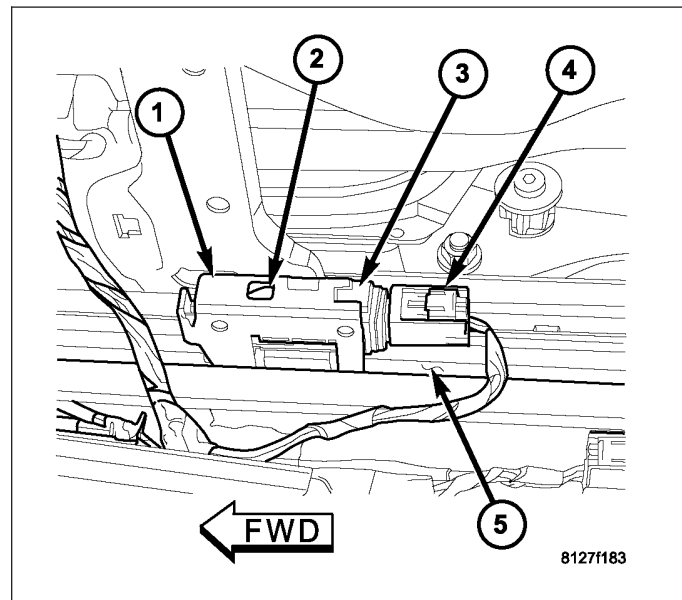


## INSTALLATION

1. Position the seat track position sensor (3) on the end of the bracket (1) located on the lower out-board seat track (5).
2. Push the sensor firmly into the bracket until the snap feature (2) locks into place.
3. Connect the electrical connector (4) to the sensor.

**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

**WARNING:** Following successful completion of the Airbag System test procedure, the Occupant Classification System Verification Test must be done using a scan tool and the appropriate diagnostic information.



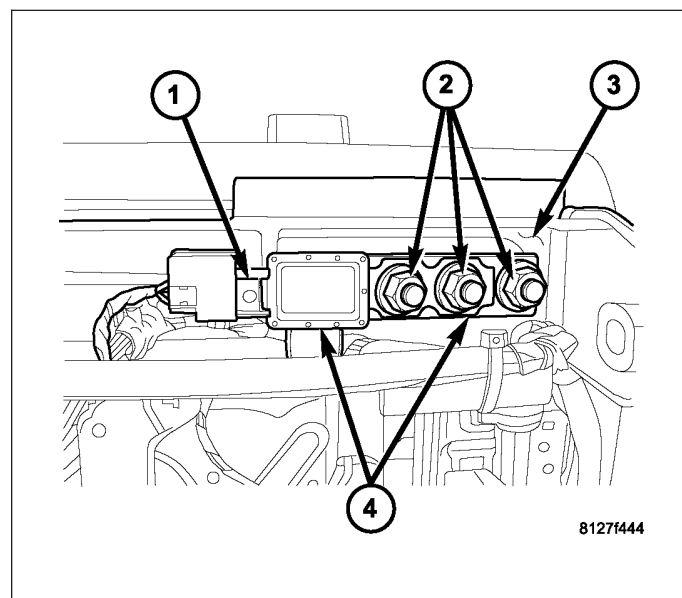
## SEAT WEIGHT SENSOR

### DESCRIPTION

The seat weight sensors (4) are strain gauge-type units. The electronic elements of the sensor are encased in a potting material within the molded plastic sensor housing. Four sensors (4) are used in the Occupant Classification System (OCS). A sensor is located at each corner of the passenger side front seat.

The strain gauge for each sensor is secured by three screws and nuts (2) between the seat cushion frame and the seat adjusters (3). A molded connector receptacle (1) integral to each sensor housing is connected to the vehicle electrical system through a dedicated connector and take out of the passenger seat wire harness beneath the seat cushion frame.

The seat weight sensors cannot be adjusted or repaired and, if faulty or damaged, the entire sensor must be replaced.



**WARNING:** The Seat Weight Sensor is a sensitive, calibrated unit and must be handled carefully. Do not drop or handle roughly. If dropped or damaged, replace with another sensor. Failure to do so may result in occupant injury or death.

**WARNING:** The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative, could result in occupant injury, or possibly death.

**WARNING:** When the seat is on the floor, no one should sit in the front passenger seat. This uneven force may damage the sensing ability of the seat weight sensors. If sat on and damaged, the sensor may be inoperative, could result in occupant injury, or possibly death.

## OPERATION

The seat weight sensor units are designed to sense the relative weight of a load applied to the passenger side front seat, which provides a logic input to the microprocessor of the Occupant Classification Module (OCM). When a load is applied to the seat, the strain gauge of each sensor is flexed causing a change of electrical resistance through the strain gauge. These changes in resistance are measured by the sensor and the internal sensor circuitry changes the sensor output voltage.

Each weight sensor receives a nominal five volts and a ground through parallel hard wired circuits from the OCM. The OCM then monitors the output voltage of each sensor on dedicated hard wired data communication circuits. The hard wired circuits between the sensors and the OCM may be diagnosed and tested using conventional diagnostic tools and procedures. However, the most reliable, efficient, and accurate means to diagnose the seat weight sensor inputs to the OCM, and the electronic message communication between the OCM and the Occupant Restraint Controller (ORC) requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

## REMOVAL

**WARNING:** The Seat Weight Sensor is a sensitive, calibrated unit and must be handled carefully. Do not drop or handle roughly. If dropped or damaged, replace with another sensor. Failure to do so may result in occupant injury or death.

**WARNING:** The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative, could result in occupant injury, or possibly death.

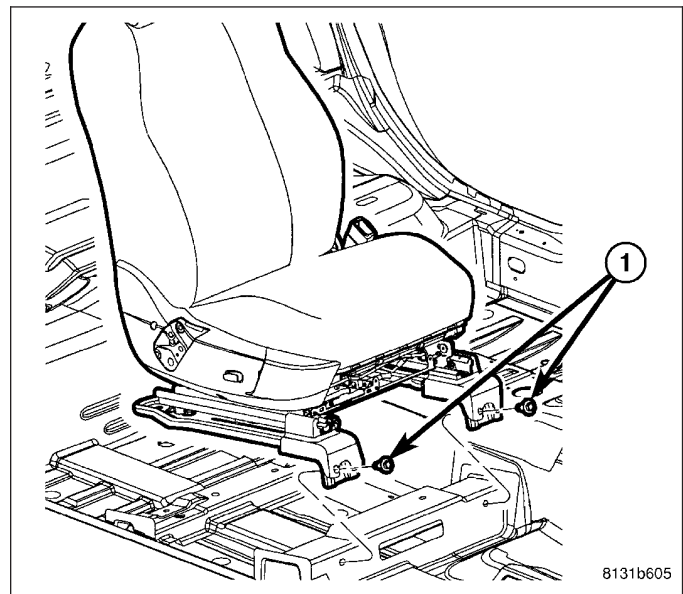
**WARNING:** When the seat is on the floor, no one should sit in the front passenger seat. This uneven force may damage the sensing ability of the seat weight sensors. If sat on and damaged, the sensor may be inoperative, could result in occupant injury, or possibly death.

## MANUAL PASSENGER FRONT SEAT

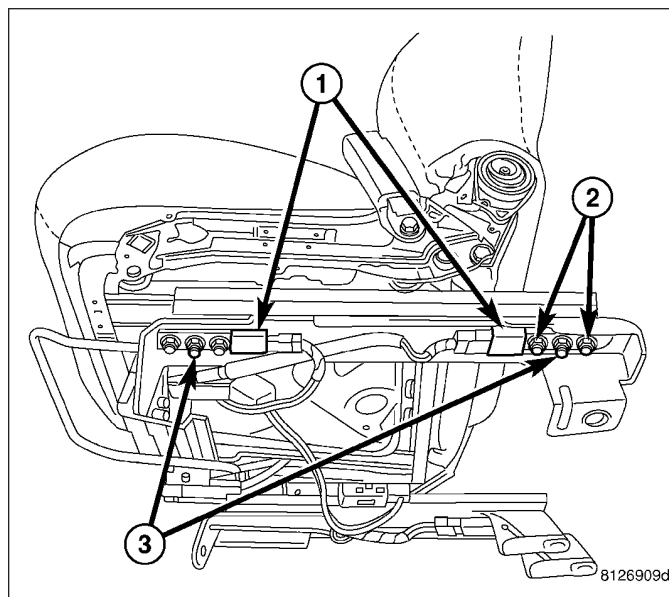
1. Disconnect and isolate the battery negative cable.

**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

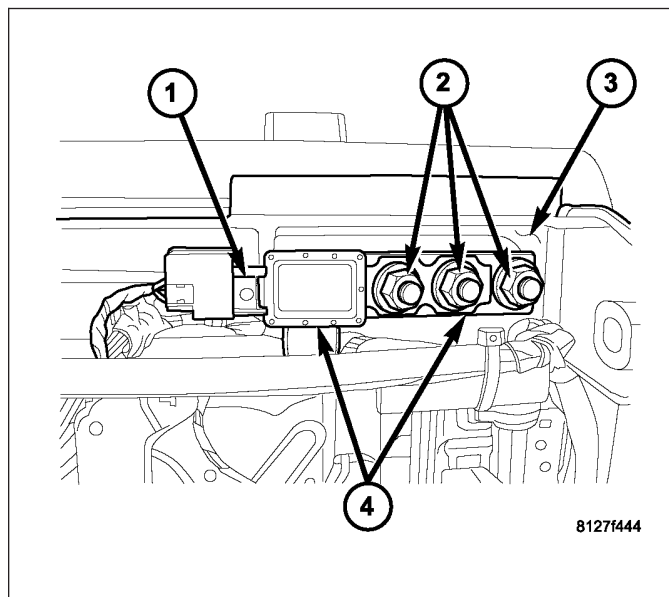
2. Remove front passenger seat (Refer to 23 - BODY/SEATS/SEAT - REMOVAL).



3. Remove the adjuster to riser mounting bolt (3). For additional information (Refer to 23 - BODY/SEATS/ SEAT RISER - REMOVAL).



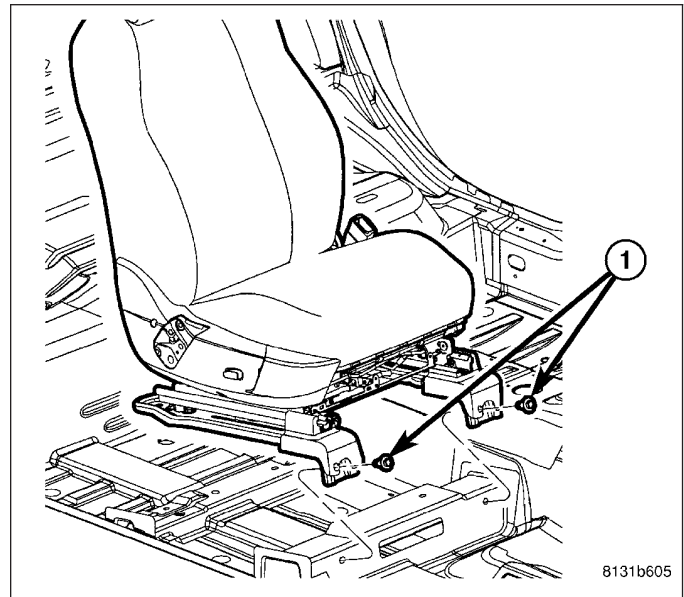
4. Remove the two nuts (2) holding the seat weight sensor (4) to the seat riser.
5. Disconnect the one electrical connector (1).



## POWER FRONT PASSENGER SEAT

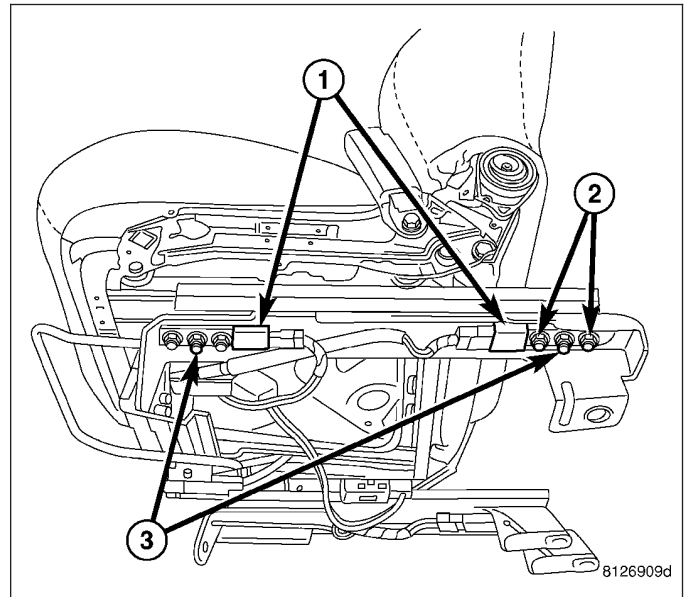
**Note:** If the vehicle is equipped with a power front passenger seat, to remove the adjuster from the riser it is necessary to have battery power to move the seat forward and rearward to access the mounting bolts.

1. Remove front passenger seat mounting bolts (Refer to 23 - BODY/SEATS/SEAT - REMOVAL).

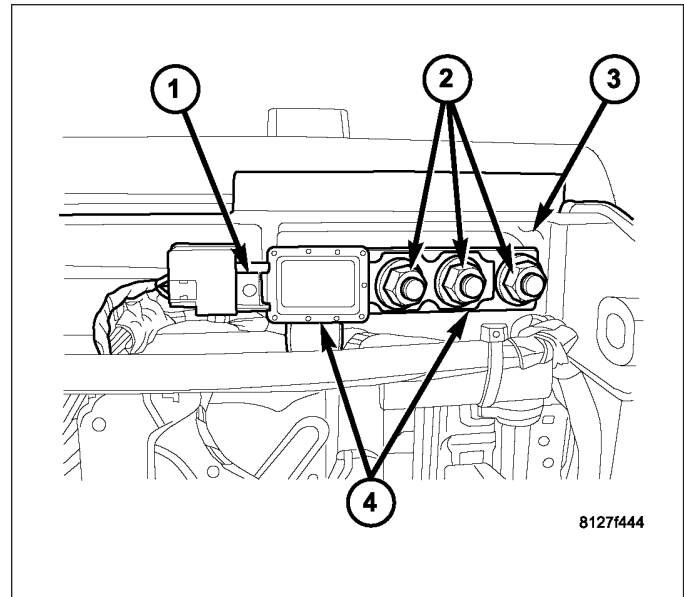


2. Remove the adjuster to riser mounting bolt (3). For additional information (Refer to 23 - BODY/SEATS/SEAT RISER - REMOVAL).
3. Disconnect and isolate the battery negative cable.

**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.



4. Remove the two nuts (2) holding the seat weight sensor (4) to the seat riser.
5. Disconnect the one electrical connector (1).



## INSTALLATION

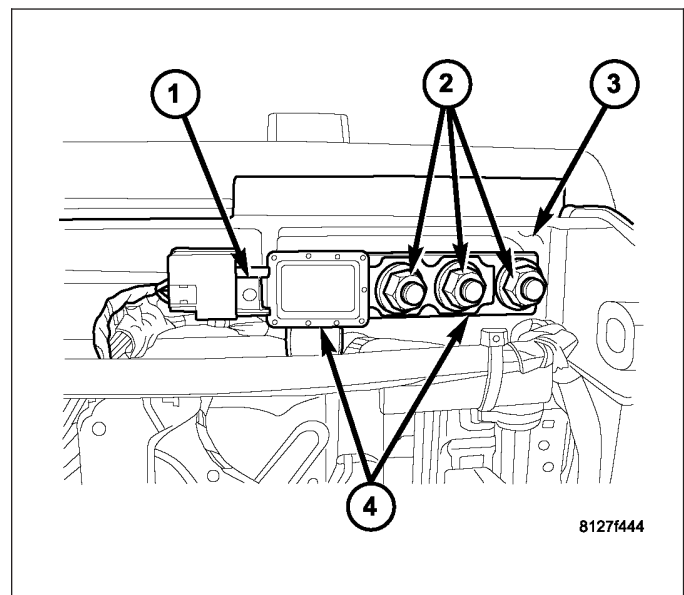
**WARNING:** The Seat Weight Sensor is a sensitive, calibrated unit and must be handled carefully. Do not drop or handle roughly. If dropped or damaged, replace with another sensor. Failure to do so may result in occupant injury or death.

**WARNING:** The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative, could result in occupant injury, or possibly death.

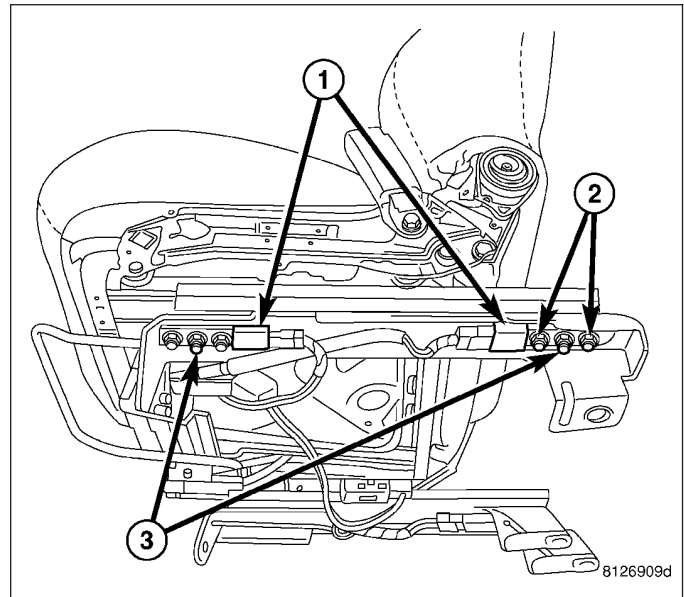
**WARNING:** When the seat is on the floor, no one should sit in the front passenger seat. This uneven force may damage the sensing ability of the seat weight sensors. If sat on and damaged, the sensor may be inoperative, could result in occupant injury, or possibly death.

## MANUAL PASSENGER FRONT SEAT

1. Position the seat weight sensor onto passenger front seat riser.
2. Install the two nuts (2) holding the seat weight sensor (4) to the seat riser. Torque nuts to 40 N·m (30 ft. lbs.).
3. Connect the one electrical connector (1).



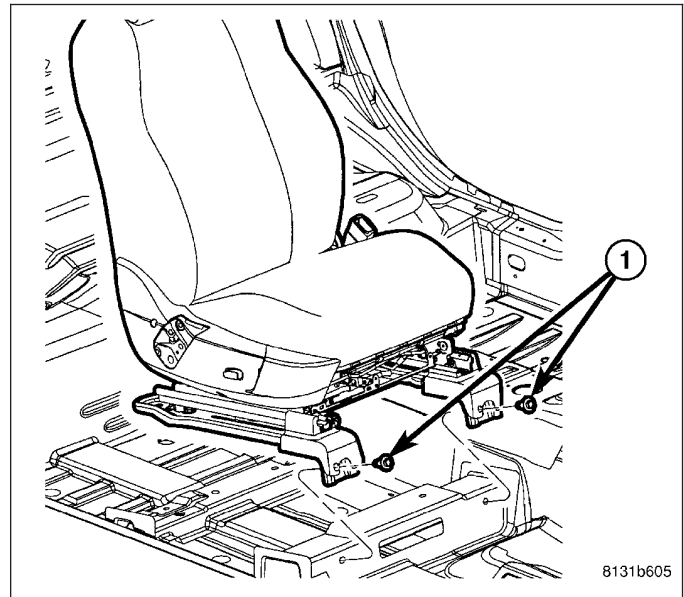
4. Install the adjuster to riser mounting bolt (3). Torque nuts to 45 N·m (33 ft. lbs.). For additional information (Refer to 23 - BODY/SEATS/SEAT RISER - INSTALLATION).



5. Install the front passenger seat (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION)

**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

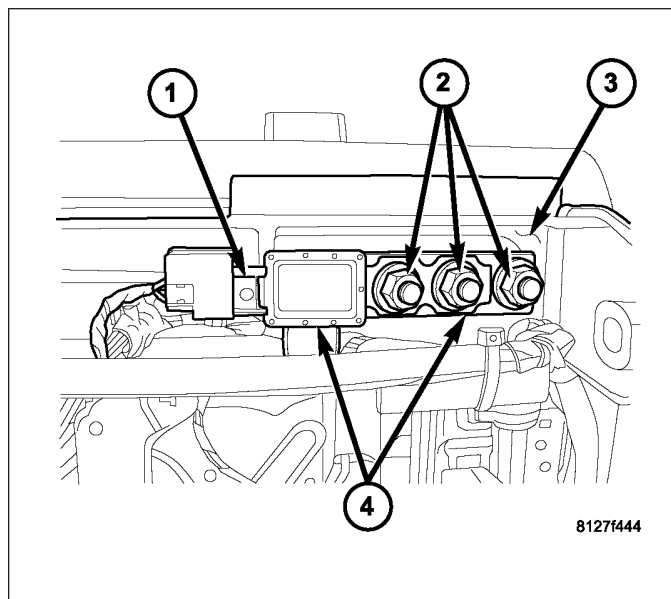
**WARNING:** Following successful completion of the Airbag System test procedure, the Occupant Classification System Verification Test must be done using a scan tool and the appropriate diagnostic information.



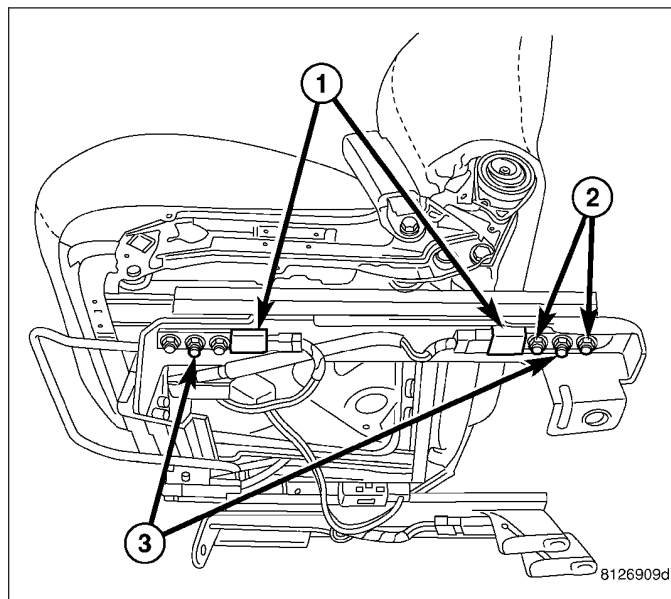
## POWER FRONT PASSENGER SEAT

**Note:** If the vehicle is equipped with a power front passenger seat, to remove the adjuster from the riser it is necessary to have battery power to move the seat forward and rearward to access the mounting bolts.

1. Position the seat weight sensor onto passenger front seat riser.
2. Install the two nuts (2) holding the seat weight sensor (4) to the seat riser. Torque nuts to 40 N·m (30 ft. lbs.).
3. Connect the one electrical connector (1).



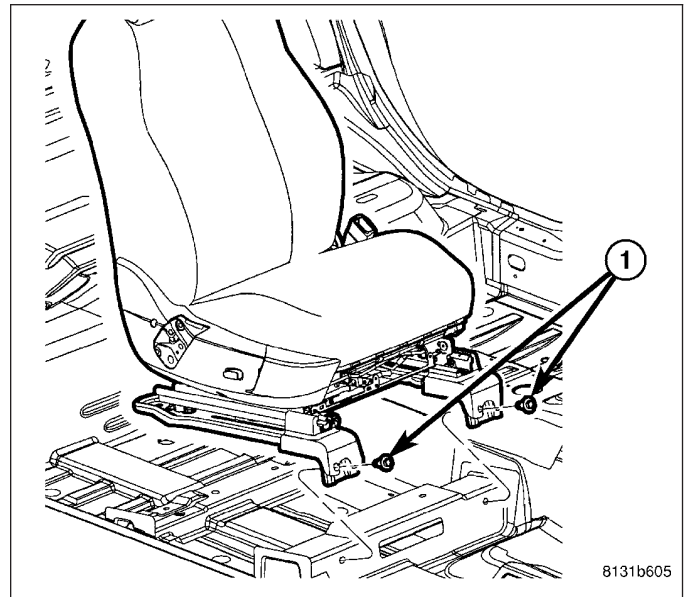
4. Install the adjuster to riser mounting bolt (3). Torque nuts to 45 N·m (33 ft. lbs.). For additional information (Refer to 23 - BODY/SEATS/SEAT RISER - INSTALLATION).



5. Install the front passenger seat bolts (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION).

**WARNING:** Do not connect the battery negative cable (Refer to 8 - ELECTRICAL/RESTRAINTS - DIAGNOSIS AND TESTING - AIRBAG SYSTEM). Personal injury or death may result if the system test is not performed first.

**WARNING:** Following successful completion of the Airbag System test procedure, the Occupant Classification System Verification Test must be done using a scan tool and the appropriate diagnostic information.







# SPEED CONTROL

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### SPEED CONTROL

#### DESCRIPTION

The speed control system is fully and electronically controlled by the Powertrain Control Module (PCM). **A cable and a vacuum controlled servo are not used. This is a servo-less system.** The switche is labeled: ON/OFF, RES/ACCEL, SET, COAST, and CANCEL.

#### OPERATION

When speed control is selected by depressing the ON switch, the PCM allows a set speed to be stored in its RAM for speed control. To store a set speed, depress the SET switch while the vehicle is moving at a speed between 35 and 85 mph. In order for the speed control to engage, the brakes cannot be applied, nor can the gear selector be indicating the transmission is in Park or Neutral.

The speed control can be disengaged manually by:

- Stepping on the brake pedal
- Depressing the OFF switch
- Depressing the CANCEL switch.

**Note: Depressing the OFF switch or turning off the ignition switch will erase the set speed stored in the PCM (the ECM with a diesel engine).**

For added safety, the speed control system is programmed to disengage for any of the following conditions:

- An indication of Park or Neutral
- A rapid increase rpm (indicates that the clutch has been disengaged)
- Excessive engine rpm (indicates that the transmission may be in a low gear)
- The speed signal increases at a rate of 10 mph per second (indicates that the coefficient of friction between the road surface and tires is extremely low)
- The speed signal decreases at a rate of 10 mph per second (indicates that the vehicle may have decelerated at an extremely high rate)

Once the speed control has been disengaged, depressing the RES/ACCEL switch (when speed is greater than 30 mph) restores the vehicle to the target speed that was stored in the PCM (the ECM with a diesel engine).

While the speed control is engaged, the driver can increase the vehicle speed by depressing the RES/ACCEL switch. The new target speed is stored in the PCM (the ECM with a diesel engine) when the RES/ACCEL is released. The PCM (the ECM with a diesel engine) also has a "tap-up" feature in which vehicle speed increases at a rate of approximately 2 mph for each momentary switch activation of the RES/ACCEL switch.

A "tap down" feature is used to decelerate without disengaging the speed control system. To decelerate from an existing recorded target speed, momentarily depress the COAST switch. For each switch activation, speed will be lowered approximately 1 mph.



# VEHICLE THEFT SECURITY

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## VEHICLE THEFT SECURITY - ELECTRICAL DIAGNOSTICS

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## VEHICLE THEFT SECURITY - ELECTRICAL DIAGNOSTICS

### DIAGNOSIS AND TESTING

**B1A24-KEY NOT PROGRAMMED**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition switch on.

Possible Causes
KEY NOT PROGRAMMED
SKREEM

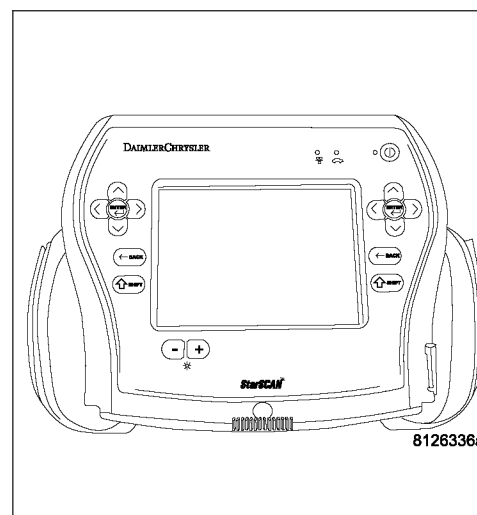
**Diagnostic Test****1. KEY NOT PROGRAMMED**

Turn the ignition on.

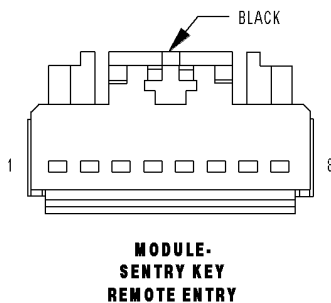
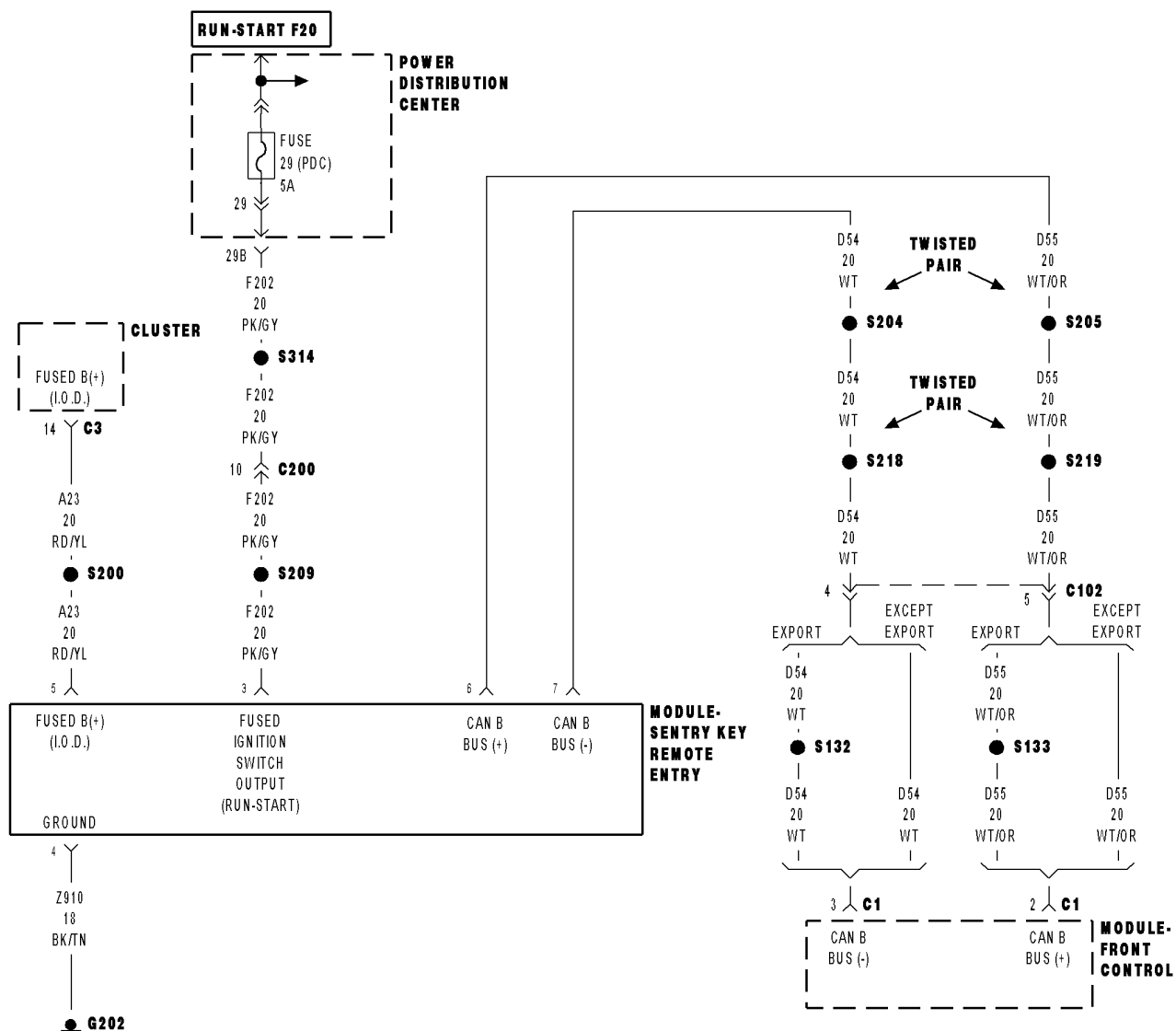
Using a scan tool, attempt to program the key(s) into the SKREEM.

**Was the programming of the key(s) successful?**

- Yes** >> Programming of the key(s) were successful. Test complete.  
Perform SKREEM VERIFICATION TEST.
- No** >> Replace the ignition key and attempt to program it into the SKREEM. If the DTC resets, replace and program the SKREEM in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.



# B1A25-INVALID KEY



**B1A25-INVALID KEY (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
At ignition on and during Key Programming Mode.
- **Set Condition:**  
When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION IGNITION KEY SKREEM INTERMITTENT WIRING HARNESS PROBLEM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs

**Note: Perform the following test several times to ensure the DTC is current.**

Turn the ignition off.

Wait 10 seconds.

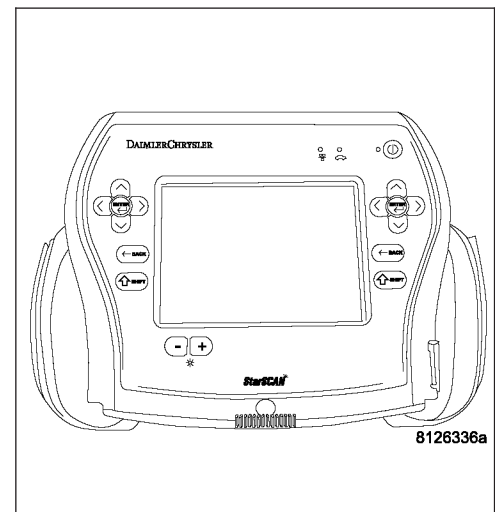
Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the scan tool display the DTC that was previously erased?**

**Yes** >> Go To 2

**No** >> Go To 6

**2. CHECKING FOR MULTIPLE KEYS**

**Are there multiple vehicle ignition keys available?**

**Yes** >> Go To 3

**No** >> Go To 4

**B1A25-INVALID KEY (CONTINUED)****3. MULTIPLE KEY OPERATION**

**Note:** Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Is the DTC present for all ignition keys?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Replace the ignition key(s) that cause the SKIM DTC.  
Perform SKREEM VERIFICATION TEST.

---

**4. REPROGRAM KEY**

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Go To 5

**No** >> Test complete.

---

**5. PROGRAM NEW IGNITION KEY**

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST

**No** >> Test complete.

---



**B1A25-INVALID KEY (CONTINUED)**

**6. INTERMITTENT WIRING HARNESS PROBLEM**

Turn the ignition off.

**Note:** Check the following items:

- Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.
- Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
- Refer to any Technical Service Bulletins (TSB) that may apply.

**Were any problems found?**

**Yes**    >> Repair wiring harness/connectors as necessary.  
            Perform SKREEM VERIFICATION TEST

**No**      >> Test Complete.

---

**B1A26-MAXIMUM NUMBER OF KEYS PROGRAMMED**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition switch on.
- **Set Condition:**  
When the maximum number of key (8) have been programmed into the SKREEM

Possible Causes
MAXIMUM AMOUNT OF KEY PROGRAMMED INTO SKREEM
SKREEM

**Diagnostic Test****1. MAXIMUM AMOUNT OF KEYS PROGRAMMED INTO SKREEM**

**Note:** The below procedure has you clearing all the key information within the SKREEM. It is important to obtain all the customer's ignition key(s) so they may be reprogrammed into the module.

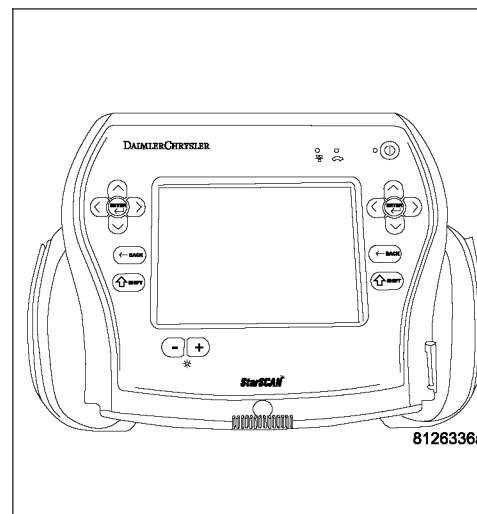
Turn the ignition on.

Using a scan tool, clear all the key information in the SKREEM.

Program the all the customer key(s) into the SKREEM (up to eight only)

**Was the “Maximum Number of Keys Programmed” display again?**

- Yes** >> Replace and program the SKREEM in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.
- No** >> Programming of the key(s) were successful. Test complete.  
Perform SKREEM VERIFICATION TEST.



B1A27-SKREEM PROGRAMMING PERFORMANCE

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition switch on.

Possible Causes
SKREEM

Diagnostic Test

1. SKREEM

**Note:** Before continuing review and check the following conditions.

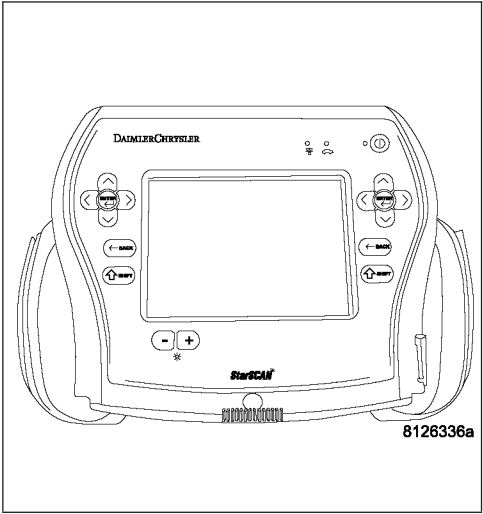
- Review the repair history of the vehicle. Ensure the vehicle has the correct PCM and SKREEM installed. Check the part numbers.
- Using a scan tool, ensure the PCM and SKREEM have been programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINS match.

Turn the ignition on.  
With the scan tool, clear DTC(s).  
Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.  
Using the scan tool, read DTC(s).

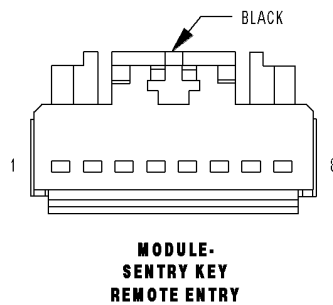
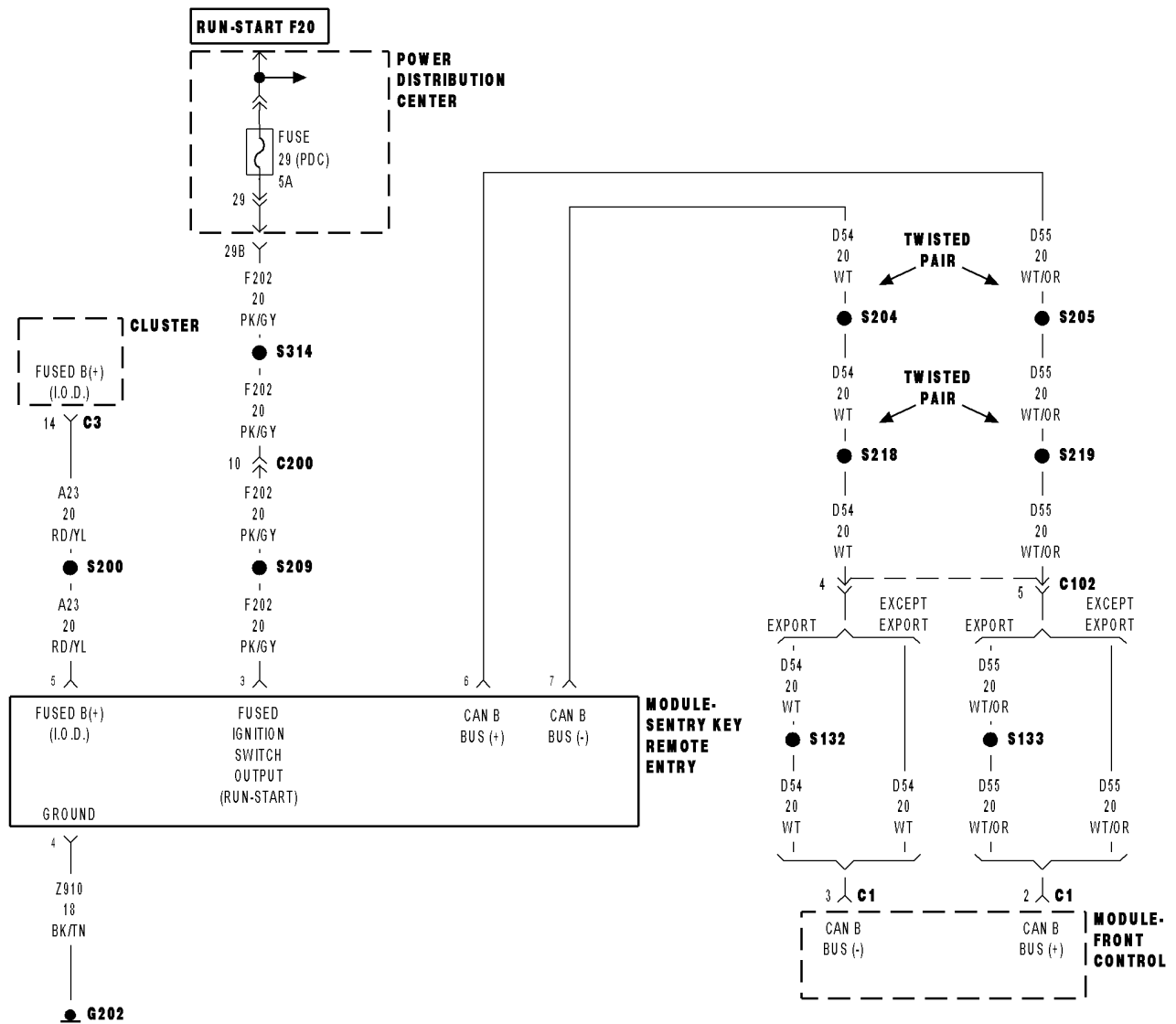
- Does the DTC reset?**
- Yes**

>> Replace and program the SKREEM in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.
- No**

>> The DTC is not active at this time. Test complete.



## B1A28-ECM MISMATCH WITH SKIM



**B1A28-ECM MISMATCH WITH SKIM (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

At ignition on, after ignition on during any rolling code handshake that occurs with the PCM due to a SKIM or PCM reset.

- **Set Condition:**

When a PCM STATUS message with a Valid Key status is not received by the SKIM within 3.5 seconds of transmitting the last Valid Key Code message to the PCM.

Possible Causes
VERIFYING PCM VIN REPLACE SKREEM AND CHECK DTC'S INTERMITTENT WIRING HARNESS PROBLEM PCM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

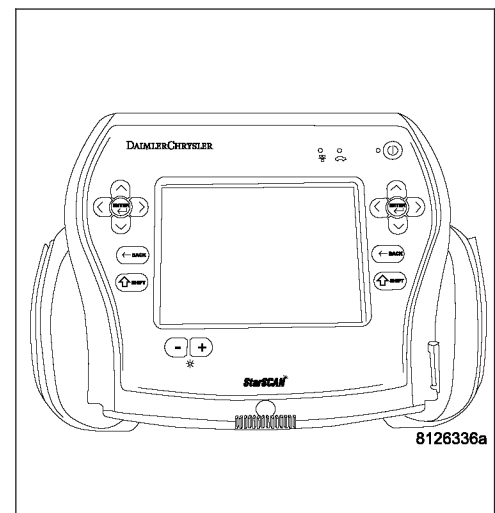
Turn the ignition on and wait 2 minutes.

With the scan tool, read the SKREEM DTCs.

**Does the scan tool display the DTC that was previously erased?**

**Yes** >> Go To 2

**No** >> Go To 4

**2. VERIFYING THE PCM VIN**

Turn the ignition on.

With the scan tool, select Engine system from the main menu.

Display and record the Vehicle Identification Number.

**Note:** Ensure that a VIN has been programmed into the PCM. If a VIN is not displayed, attempt to program the PCM with the correct VIN before continuing.

**Does the VIN recorded from the PCM match the VIN of the vehicle?**

**Yes** >> Go To 3

**No** >> Perform the PCM replaced to update the VIN in the PCM.  
Perform SKREEM VERIFICATION TEST

**B1A28-ECM MISMATCH WITH SKIM (CONTINUED)****3. REPLACE SKREEM AND CHECK DTC'S**

Turn the ignition off.

Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.

Turn the ignition on.

With the scan tool, display and clear all PCM and SKREEM DTC's.

Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle.

With the scan tool, check for SKREEM DTCs.

**Does the scan tool display the same DTC?**

**Yes** >> Replace and program the Powertrain Control Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST

**No** >> The repair is complete.  
Perform SKREEM VERIFICATION TEST

---

**4. INTERMITTENT**

Turn the ignition off.

**Note:** Check for the following conditions:

- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

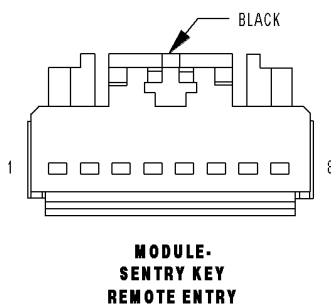
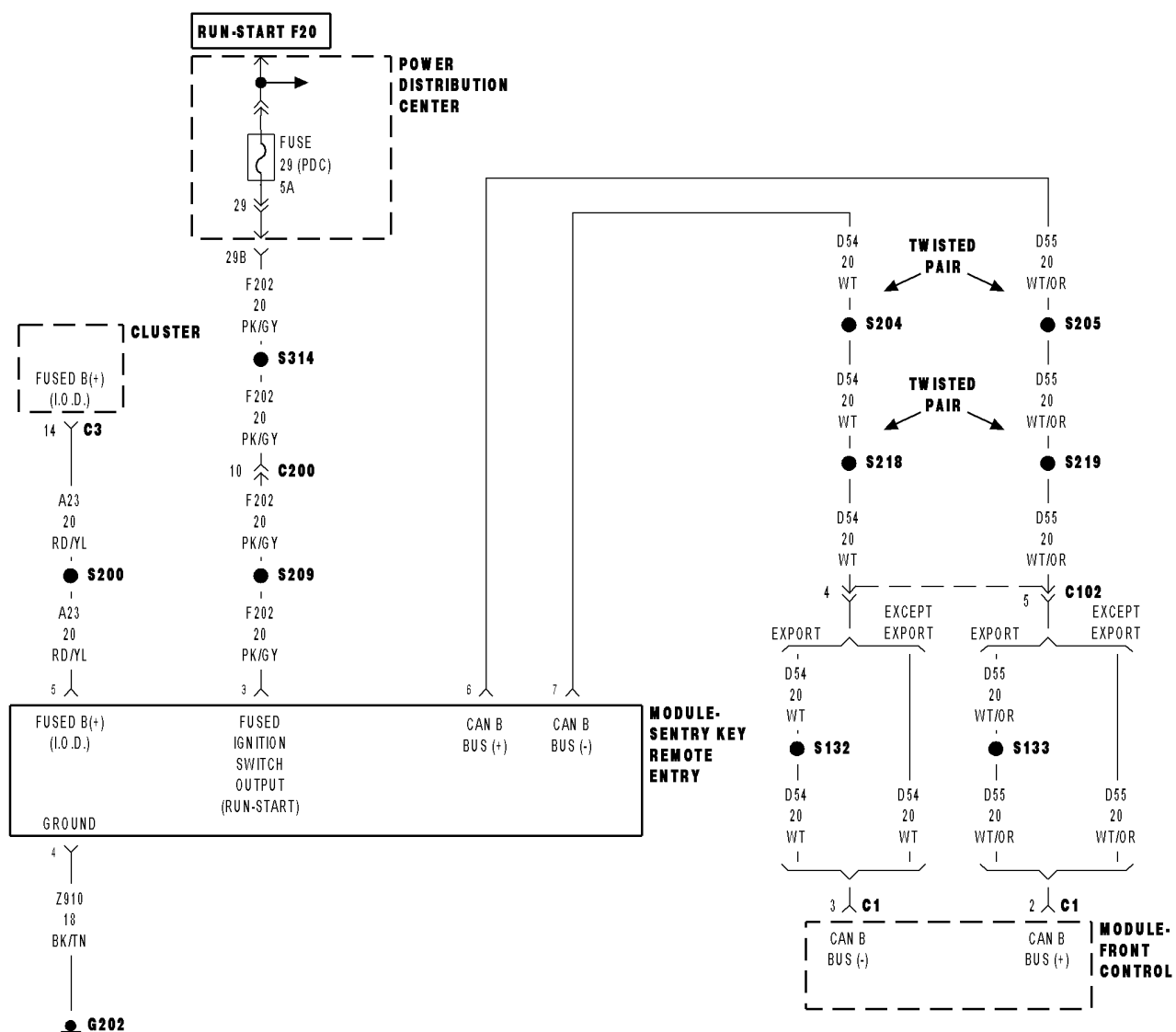
**Were any problems found?**

**Yes** >> Repair wiring harness/connectors as necessary.  
Perform SKREEM VERIFICATION TEST

**No** >> Test Complete.

---

## B1A29-SKIM BASESTATION MISMATCH



**B1A29-SKIM BASESTATION MISMATCH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

At ignition on, after ignition on during any rolling code handshake that occurs with the PCM due to a SKIM or PCM reset.

- **Set Condition:**

When a PCM STATUS message with a Valid Key status is not received by the SKIM within 3.5 seconds of transmitting the last Valid Key Code message to the PCM.

Possible Causes
VERIFYING PCM VIN REPLACE SKREEM AND CHECK DTC'S INTERMITTENT WIRING HARNESS PROBLEM PCM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

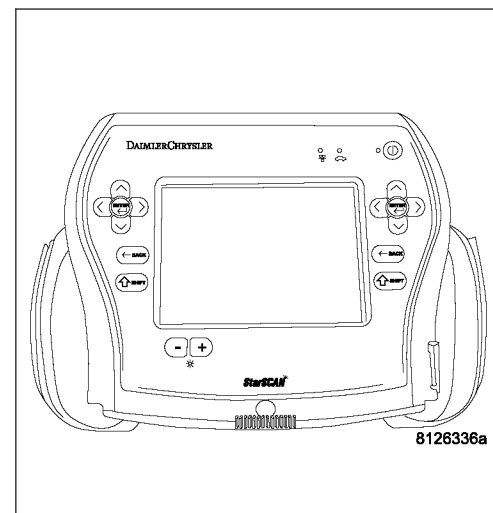
Turn the ignition on and wait 2 minutes.

With the scan tool, read the SKREEM DTCs.

**Does the scan tool display the DTC that was previously erased?**

**Yes** >> Go To 2

**No** >> Go To 4

**2. VERIFYING THE PCM VIN**

Turn the ignition on.

With the scan tool, select Engine system from the main menu.

Display and record the Vehicle Identification Number.

**Note:** Ensure that a VIN has been programmed into the PCM. If a VIN is not displayed, attempt to program the PCM with the correct VIN before continuing.

**Does the VIN recorded from the PCM match the VIN of the vehicle?**

**Yes** >> Go To 3

**No** >> Perform the PCM replaced to update the VIN in the PCM.  
Perform SKREEM VERIFICATION TEST



**B1A29-SKIM BASESTATION MISMATCH (CONTINUED)****3. REPLACE SKREEM AND CHECK DTC'S**

Turn the ignition off.

Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.

Turn the ignition on.

With the scan tool, display and clear all PCM and SKREEM DTC's.

Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle.

With the scan tool, check for SKREEM DTCs.

**Does the scan tool display the same DTC?**

**Yes** >> Replace and program the Powertrain Control Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST

**No** >> The repair is complete.  
Perform SKREEM VERIFICATION TEST

---

**4. INTERMITTENT**

Turn the ignition off.

**Note:** Check for the following conditions:

- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

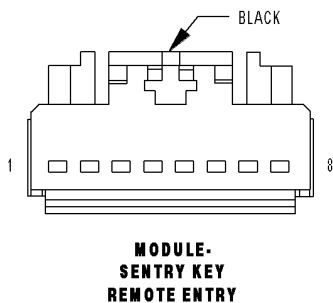
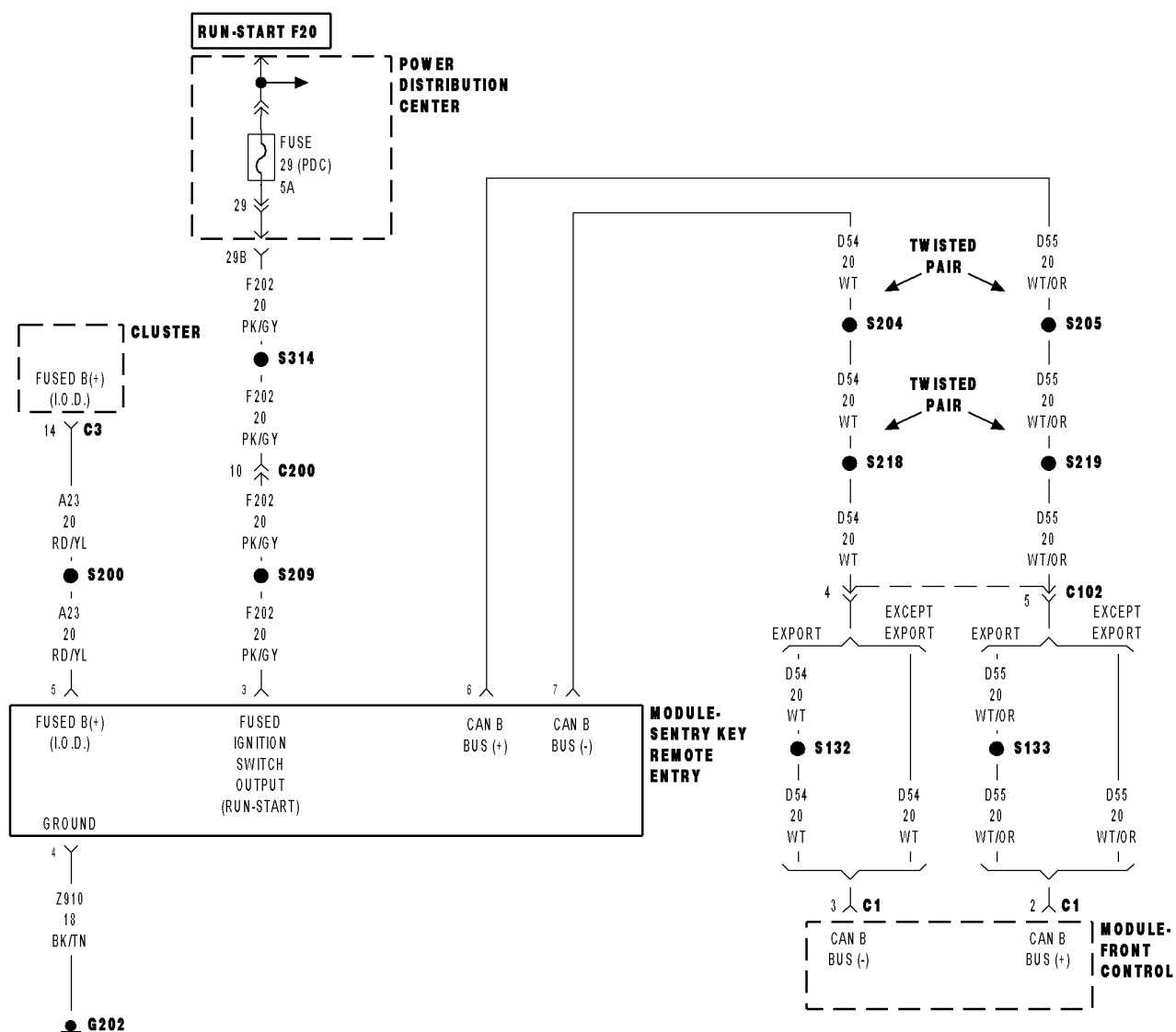
**Were any problems found?**

**Yes** >> Repair wiring harness/connectors as necessary.  
Perform SKREEM VERIFICATION TEST

**No** >> Test Complete.

---

# B1A2A-KEY 1 COMMUNICATION ERROR



B1A2A-KEY 1 COMMUNICATION ERROR (CONTINUED)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
At ignition on and during Key Programming Mode.
- **Set Condition:**  
When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION IGNITION KEY SKREEM INTERMITTENT WIRING HARNESS PROBLEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

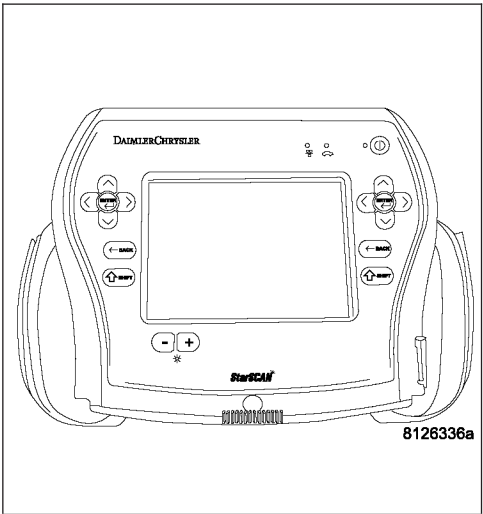
With the scan tool, read and record the SKREEM DTCs.  
With the scan tool, erase the SKREEM DTCs.

**Note:** Perform the following test several times to ensure the DTC is current.

Turn the ignition off.  
Wait 10 seconds.  
Turn the ignition on.  
With the scan tool, read the SKREEM DTCs.

**Does the scan tool display the DTC that was previously erased?**

- Yes**    >> Go To 2  
**No**    >> Go To 6



2. CHECKING FOR MULTIPLE KEYS

**Are there multiple vehicle ignition keys available?**

- Yes**    >> Go To 3  
**No**    >> Go To 4

**B1A2A-KEY 1 COMMUNICATION ERROR (CONTINUED)****3. MULTIPLE KEY OPERATION**

**Note:** Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on

With the scan tool, read the SKREEM DTCs.

**Is the DTC present for all ignition keys?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Replace the ignition key(s) that cause the SKIM DTC.  
Perform SKREEM VERIFICATION TEST.

---

**4. REPROGRAM KEY**

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Go To 5

**No** >> Test complete.

---

**5. PROGRAM NEW IGNITION KEY**

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST

**No** >> Test complete.

---

**B1A2A-KEY 1 COMMUNICATION ERROR (CONTINUED)**

**6. INTERMITTENT WIRING HARNESS PROBLEM**

Turn the ignition off.

**Note:** Check the following items:

- Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.
- Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
- Refer to any Technical Service Bulletins (TSB) that may apply.

**Were any problems found?**

**Yes**    >> Repair wiring harness/connectors as necessary.  
             Perform SKREEM VERIFICATION TEST

**No**     >> Test Complete.

---



**B1A2BA-KEY 2 COMMUNICATION ERROR (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
At ignition on and during Key Programming Mode.
- **Set Condition:**  
When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION IGNITION KEY SKREEM INTERMITTENT WIRING HARNESS PROBLEM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs

**Note: Perform the following test several times to ensure the DTC is current.**

Turn the ignition off.

Wait 10 seconds.

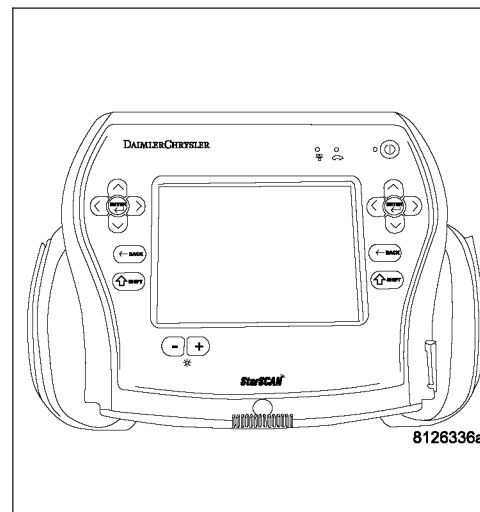
Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the scan tool display the DTC that was previously erased?**

**Yes** >> Go To 2

**No** >> Go To 6

**2. CHECKING FOR MULTIPLE KEYS**

**Are there multiple vehicle ignition keys available?**

**Yes** >> Go To 3

**No** >> Go To 4

**B1A2BA-KEY 2 COMMUNICATION ERROR (CONTINUED)****3. MULTIPLE KEY OPERATION**

**Note:** Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on

With the scan tool, read the SKREEM DTCs.

**Is the DTC present for all ignition keys?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Replace the ignition key(s) that cause the SKIM DTC.  
Perform SKREEM VERIFICATION TEST.

---

**4. REPROGRAM KEY**

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Go To 5

**No** >> Test complete.

---

**5. PROGRAM NEW IGNITION KEY**

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Test complete.

---



**B1A2BA-KEY 2 COMMUNICATION ERROR (CONTINUED)**

**6. INTERMITTENT WIRING HARNESS PROBLEM**

Turn the ignition off.

**Note:** Check the following items:

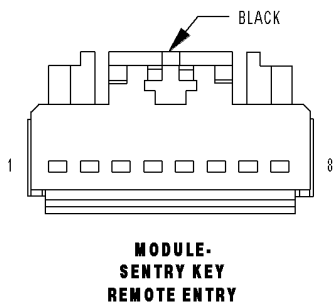
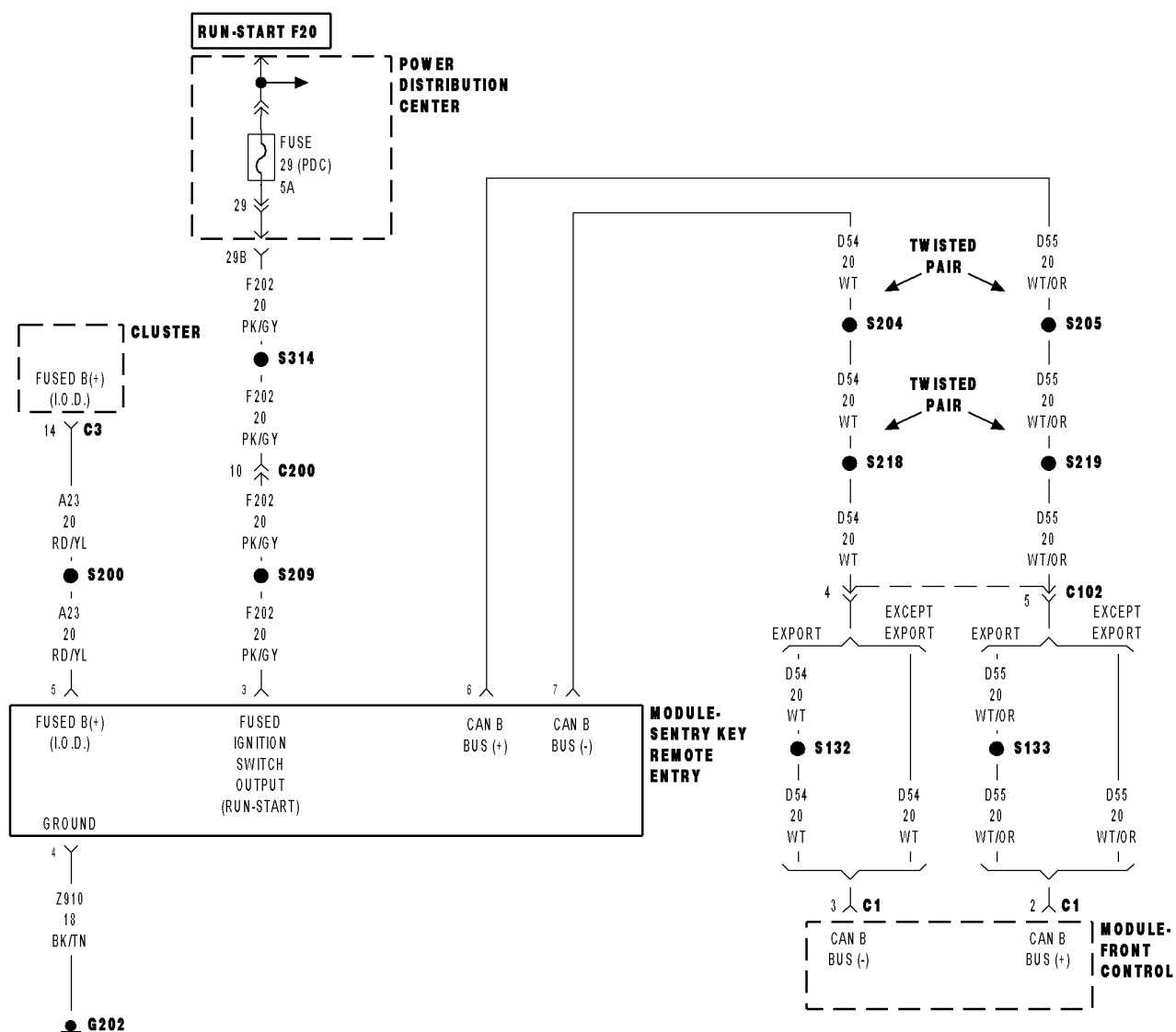
- Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.
- Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
- Refer to any Technical Service Bulletins (TSB) that may apply.

**Were any problems found?**

**Yes**    >> Repair wiring harness/connectors as necessary.  
             Perform SKREEM VERIFICATION TEST

**No**      >> Test Complete.

---

**B1A2C-KEY 3 COMMUNICATION ERROR**

B1A2C-KEY 3 COMMUNICATION ERROR (CONTINUED)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
At ignition on and during Key Programming Mode.
- **Set Condition:**  
When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION IGNITION KEY SKREEM INTERMITTENT WIRING HARNESS PROBLEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs

**Note: Perform the following test several times to ensure the DTC is current.**

Turn the ignition off.

Wait 10 seconds.

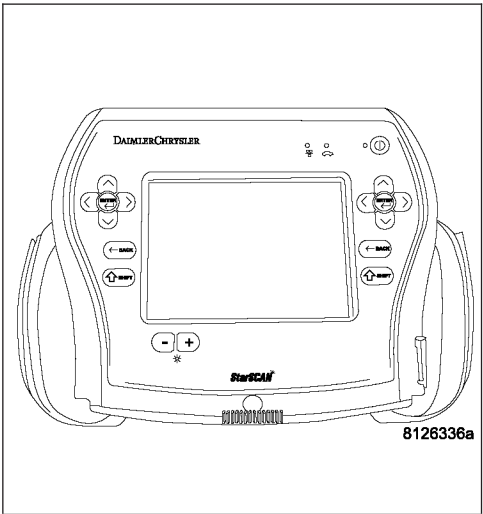
Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the scan tool display the DTC that was previously erased?**

**Yes**     >> Go To 2

**No**     >> Go To 6



2. CHECKING FOR MULTIPLE KEYS

**Are there multiple vehicle ignition keys available?**

**Yes**     >> Go To 3

**No**     >> Go To 4

**B1A2C-KEY 3 COMMUNICATION ERROR (CONTINUED)****3. MULTIPLE KEY OPERATION**

**Note:** Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on

With the scan tool, read the SKREEM DTCs.

**Is the DTC present for all ignition keys?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Replace the ignition key(s) that cause the SKIM DTC.  
Perform SKREEM VERIFICATION TEST.

---

**4. REPROGRAM KEY**

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Go To 5

**No** >> Test complete.

---

**5. PROGRAM NEW IGNITION KEY**

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Test complete.

---

**B1A2C-KEY 3 COMMUNICATION ERROR (CONTINUED)**

**6. INTERMITTENT WIRING HARNESS PROBLEM**

Turn the ignition off.

**Note:** Check the following items:

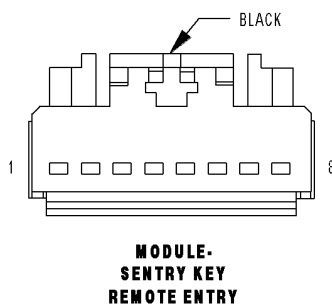
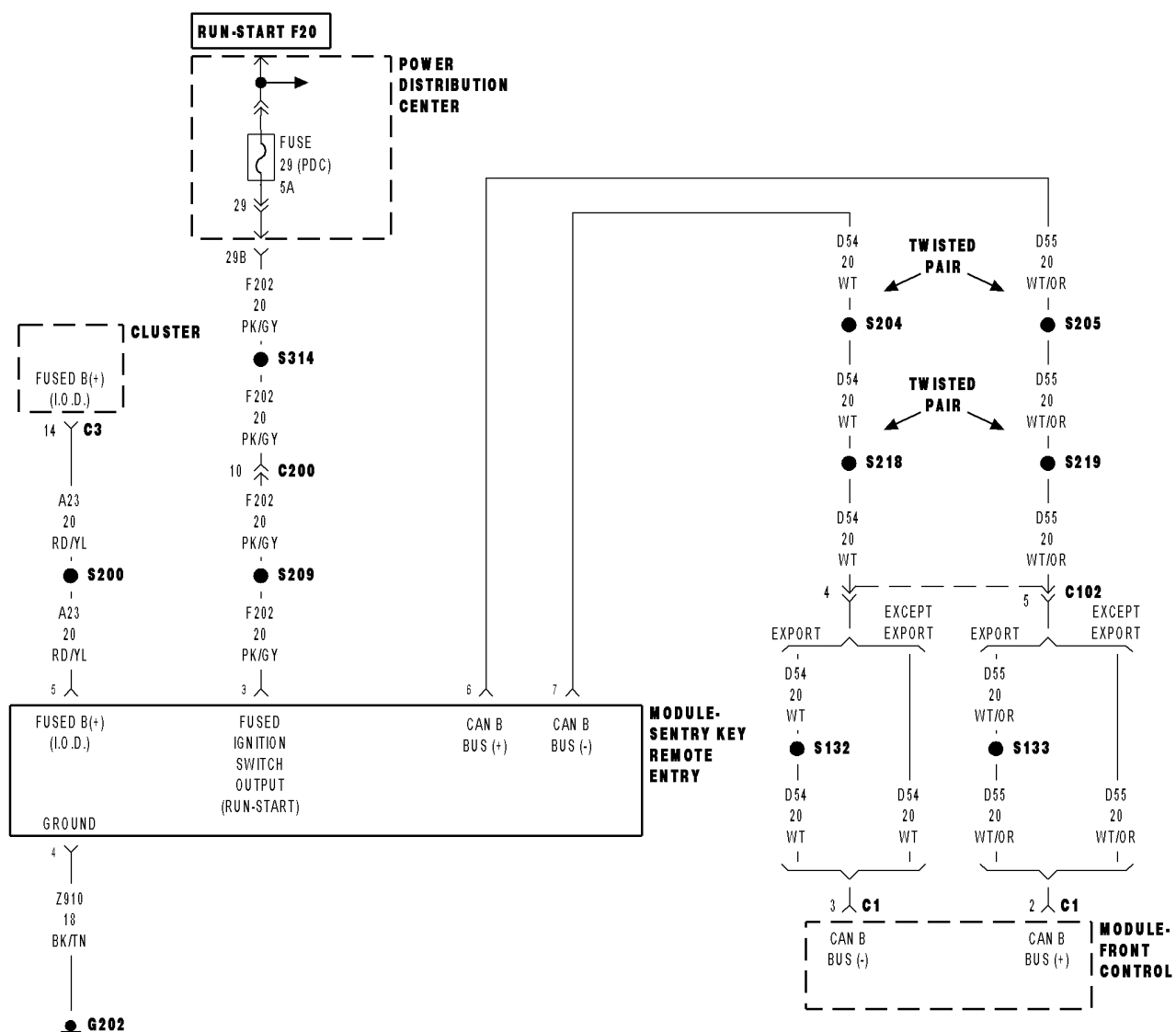
- Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.
- Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
- Refer to any Technical Service Bulletins (TSB) that may apply.

**Were any problems found?**

**Yes**     >> Repair wiring harness/connectors as necessary.  
             Perform SKREEM VERIFICATION TEST.

**No**       >> Test Complete.

---

**B1A2D-KEY 4 COMMUNICATION ERROR**

**B1A2D-KEY 4 COMMUNICATION ERROR (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
At ignition on and during Key Programming Mode.
- **Set Condition:**  
When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION IGNITION KEY SKREEM INTERMITTENT WIRING HARNESS PROBLEM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs

**Note: Perform the following test several times to ensure the DTC is current.**

Turn the ignition off.

Wait 10 seconds.

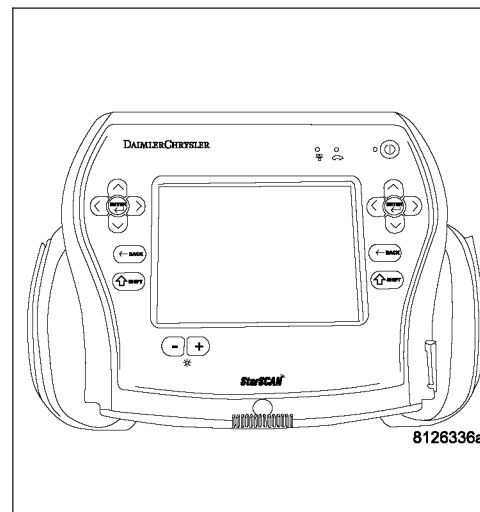
Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the scan tool display the DTC that was previously erased?**

**Yes** >> Go To 2

**No** >> Go To 6

**2. CHECKING FOR MULTIPLE KEYS**

**Are there multiple vehicle ignition keys available?**

**Yes** >> Go To 3

**No** >> Go To 4

**B1A2D-KEY 4 COMMUNICATION ERROR (CONTINUED)****3. MULTIPLE KEY OPERATION**

**Note:** Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Is the DTC present for all ignition keys?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Replace the ignition key(s) that cause the SKIM DTC.  
Perform SKREEM VERIFICATION TEST.

---

**4. REPROGRAM KEY**

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Go To 5

**No** >> Test complete.

---

**5. PROGRAM NEW IGNITION KEY**

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Test complete.

---



**B1A2D-KEY 4 COMMUNICATION ERROR (CONTINUED)**

**6. INTERMITTENT WIRING HARNESS PROBLEM**

Turn the ignition off.

**Note:** Check the following items:

- Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.
- Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
- Refer to any Technical Service Bulletins (TSB) that may apply.

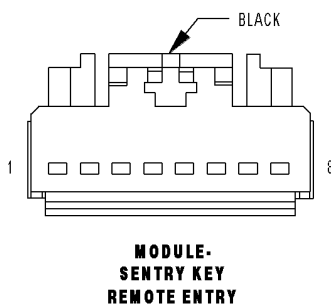
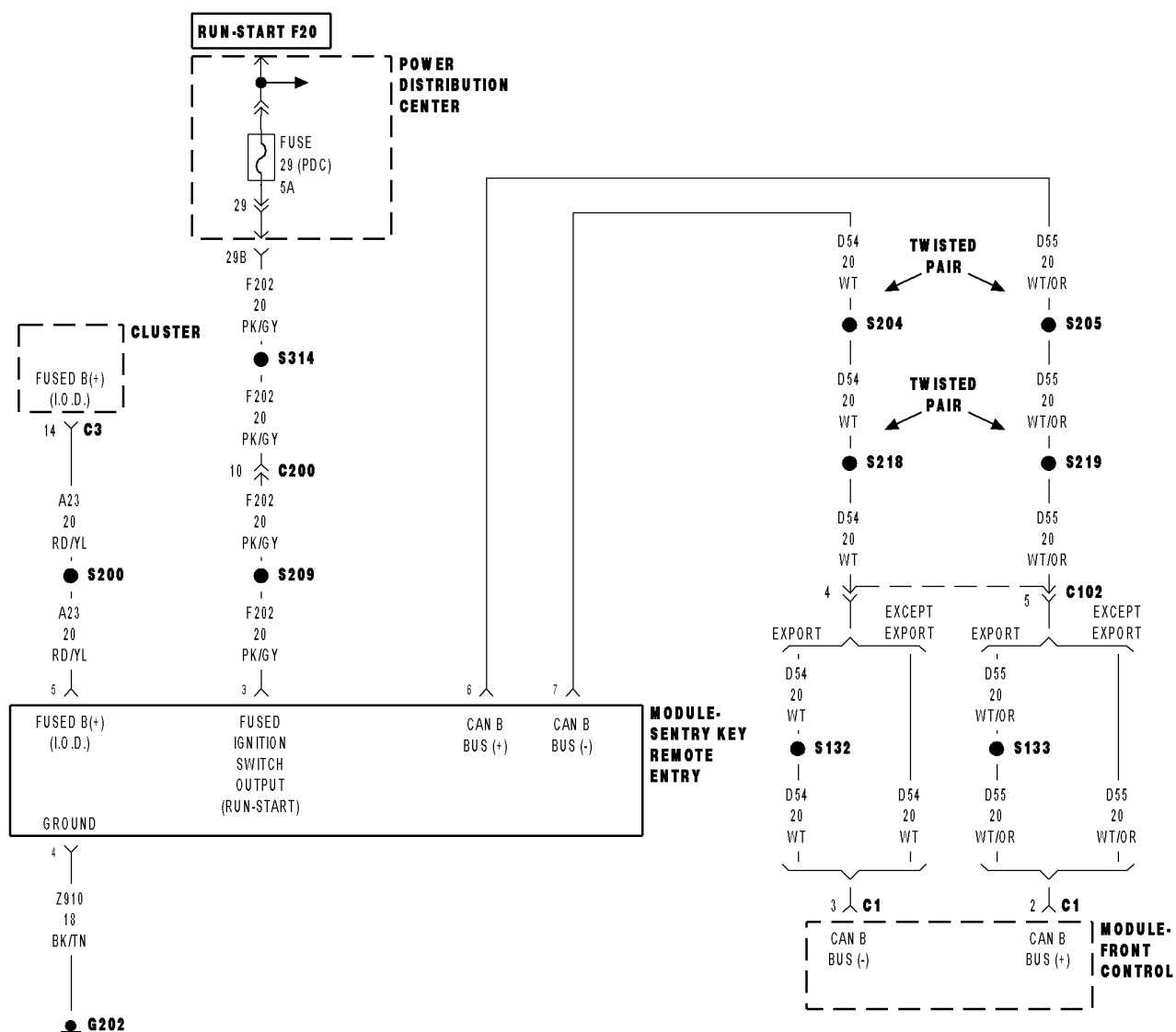
**Were any problems found?**

**Yes**     >> Repair wiring harness/connectors as necessary.  
             Perform SKREEM VERIFICATION TEST.

**No**       >> Test Complete.

---

# B1A2E-KEY 5 COMMUNICATION ERROR



B1A2E-KEY 5 COMMUNICATION ERROR (CONTINUED)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
At ignition on and during Key Programming Mode.
- **Set Condition:**  
When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION IGNITION KEY SKREEM INTERMITTENT WIRING HARNESS PROBLEM

Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs

**Note:** Perform the following test several times to ensure the DTC is current.

Turn the ignition off.

Wait 10 seconds.

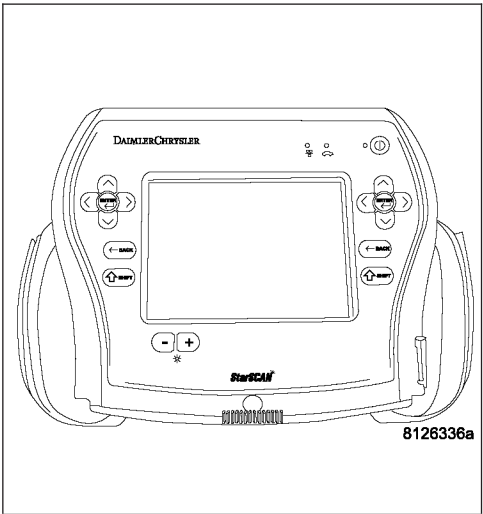
Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the scan tool display the DTC that was previously erased?**

**Yes**     >> Go To 2

**No**     >> Go To 6



2. CHECKING FOR MULTIPLE KEYS

**Are there multiple vehicle ignition keys available?**

**Yes**     >> Go To 3

**No**     >> Go To 4

**B1A2E-KEY 5 COMMUNICATION ERROR (CONTINUED)****3. MULTIPLE KEY OPERATION**

**Note:** Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Is the DTC present for all ignition keys?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST

**No** >> Replace the ignition key(s) that cause the SKIM DTC.  
Perform SKREEM VERIFICATION TEST.

---

**4. REPROGRAM KEY**

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST

**No** >> Test complete.

---

**5. PROGRAM NEW IGNITION KEY**

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST

**No** >> Test complete.

---

**B1A2E-KEY 5 COMMUNICATION ERROR (CONTINUED)**

**6. INTERMITTENT WIRING HARNESS PROBLEM**

Turn the ignition off.

**Note:** Check the following items:

- Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.
- Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
- Refer to any Technical Service Bulletins (TSB) that may apply.

**Were any problems found?**

**Yes**    >> Repair wiring harness/connectors as necessary.  
            Perform SKREEM VERIFICATION TEST.

**No**      >> Test Complete.

---



B1A2F-KEY 6 COMMUNICATION ERROR (CONTINUED)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
At ignition on and during Key Programming Mode.
- **Set Condition:**  
When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION IGNITION KEY SKREEM INTERMITTENT WIRING HARNESS PROBLEM

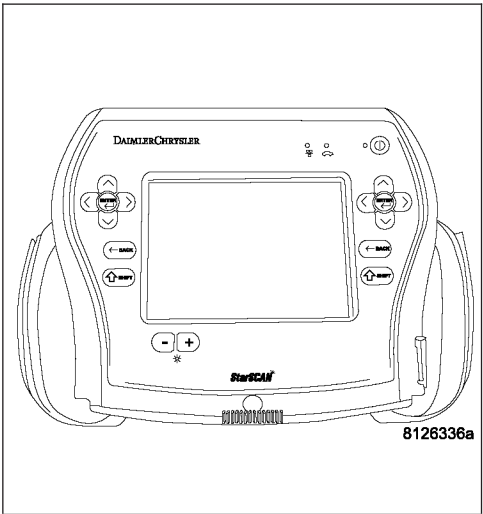
Diagnostic Test

1. DETERMINING IF DTC IS CURRENT

With the scan tool, read and record the SKREEM DTCs.  
With the scan tool, erase the SKREEM DTCs  
**Note: Perform the following test several times to ensure the DTC is current.**  
Turn the ignition off.  
Wait 10 seconds.  
Turn the ignition on.  
With the scan tool, read the SKREEM DTCs.

Does the scan tool display the DTC that was previously erased?

- Yes    >> Go To 2  
No    >> Go To 6



2. CHECKING FOR MULTIPLE KEYS

Are there multiple vehicle ignition keys available?

Yes    >> Go To 3  
No    >> Go To 4

**B1A2F-KEY 6 COMMUNICATION ERROR (CONTINUED)****3. MULTIPLE KEY OPERATION**

**Note:** Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Is the DTC present for all ignition keys?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Replace the ignition key(s) that cause the SKIM DTC.  
Perform SKREEM VERIFICATION TEST.

---

**4. REPROGRAM KEY**

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Go To 5

**No** >> Test complete.

---

**5. PROGRAM NEW IGNITION KEY**

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Test complete.

---



**B1A2F-KEY 6 COMMUNICATION ERROR (CONTINUED)**

**6. INTERMITTENT WIRING HARNESS PROBLEM**

Turn the ignition off.

**Note:** Check the following items:

- Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.
- Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
- Refer to any Technical Service Bulletins (TSB) that may apply.

**Were any problems found?**

**Yes**     >> Repair wiring harness/connectors as necessary.  
             Perform SKREEM VERIFICATION TEST

**No**       >> Test Complete.

---



**B1A30-KEY 7 COMMUNICATION ERROR (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
At ignition on and during Key Programming Mode.
- **Set Condition:**  
When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION IGNITION KEY SKREEM INTERMITTENT WIRING HARNESS PROBLEM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs

**Note:** Perform the following test several times to ensure the DTC is current.

Turn the ignition off.

Wait 10 seconds.

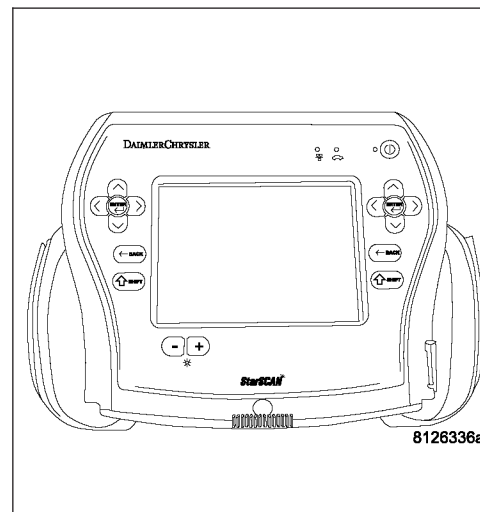
Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the scan tool display the DTC that was previously erased?**

**Yes** >> Go To 2

**No** >> Go To 6

**2. CHECKING FOR MULTIPLE KEYS**

**Are there multiple vehicle ignition keys available?**

**Yes** >> Go To 3

**No** >> Go To 4

**B1A30-KEY 7 COMMUNICATION ERROR (CONTINUED)****3. MULTIPLE KEY OPERATION**

**Note:** Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Is the DTC present for all ignition keys?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Replace the ignition key(s) that cause the SKIM DTC.  
Perform SKREEM VERIFICATION TEST.

---

**4. REPROGRAM KEY**

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Go To 5

**No** >> Test complete.

---

**5. PROGRAM NEW IGNITION KEY**

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Test complete.

---

**B1A30-KEY 7 COMMUNICATION ERROR (CONTINUED)**

**6. INTERMITTENT WIRING HARNESS PROBLEM**

Turn the ignition off.

**Note:** Check the following items:

- Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.
- Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
- Refer to any Technical Service Bulletins (TSB) that may apply.

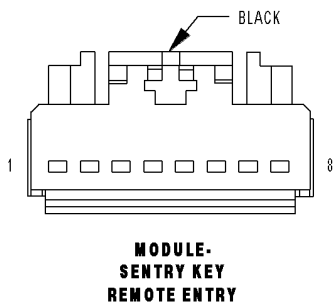
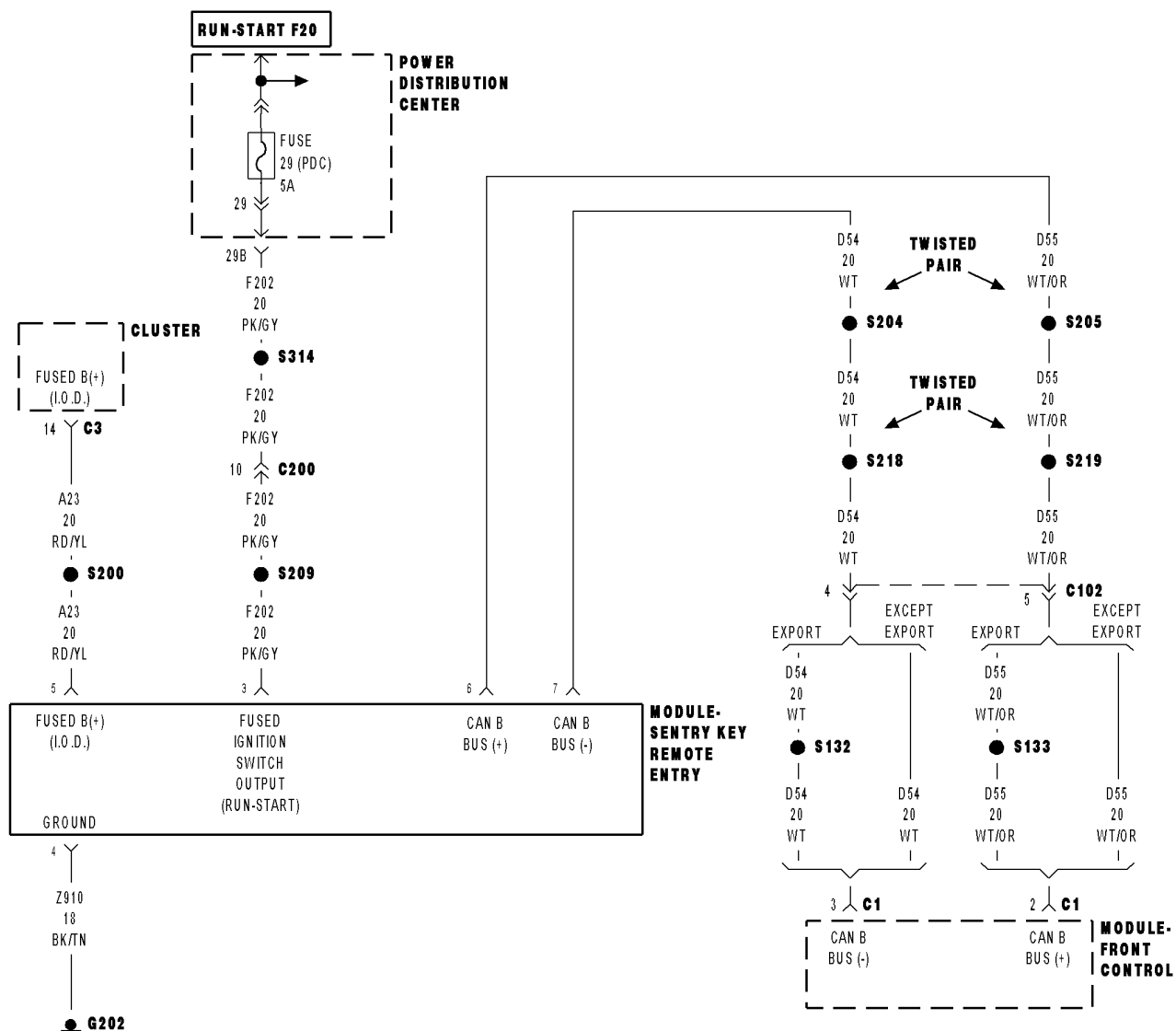
**Were any problems found?**

**Yes**    >> Repair wiring harness/connectors as necessary.  
             Perform SKREEM VERIFICATION TEST.

**No**     >> Test Complete.

---

# B1A31-KEY 8 COMMUNICATION ERROR



**B1A31-KEY 8 COMMUNICATION ERROR (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
At ignition on and during Key Programming Mode.
- **Set Condition:**  
When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION IGNITION KEY SKREEM INTERMITTENT WIRING HARNESS PROBLEM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs

**Note: Perform the following test several times to ensure the DTC is current.**

Turn the ignition off.

Wait 10 seconds.

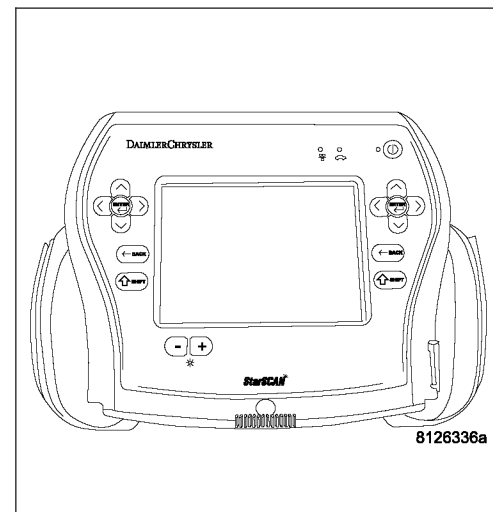
Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the scan tool display the DTC that was previously erased?**

**Yes** >> Go To 2

**No** >> Go To 6

**2. CHECKING FOR MULTIPLE KEYS**

**Are there multiple vehicle ignition keys available?**

**Yes** >> Go To 3

**No** >> Go To 4

**B1A31-KEY 8 COMMUNICATION ERROR (CONTINUED)****3. MULTIPLE KEY OPERATION**

**Note:** Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Is the DTC present for all ignition keys?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Replace the ignition key(s) that cause the SKIM DTC.  
Perform SKREEM VERIFICATION TEST.

---

**4. REPROGRAM KEY**

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Go To 5

**No** >> Test complete.

---

**5. PROGRAM NEW IGNITION KEY**

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST

**No** >> Test complete.

---



**B1A31-KEY 8 COMMUNICATION ERROR (CONTINUED)**

**6. INTERMITTENT WIRING HARNESS PROBLEM**

Turn the ignition off.

**Note:** Check the following items:

- Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.
- Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
- Refer to any Technical Service Bulletins (TSB) that may apply.

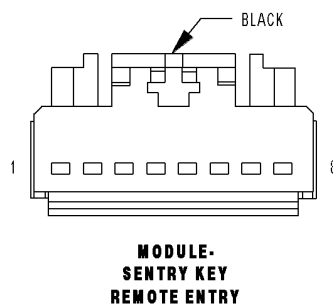
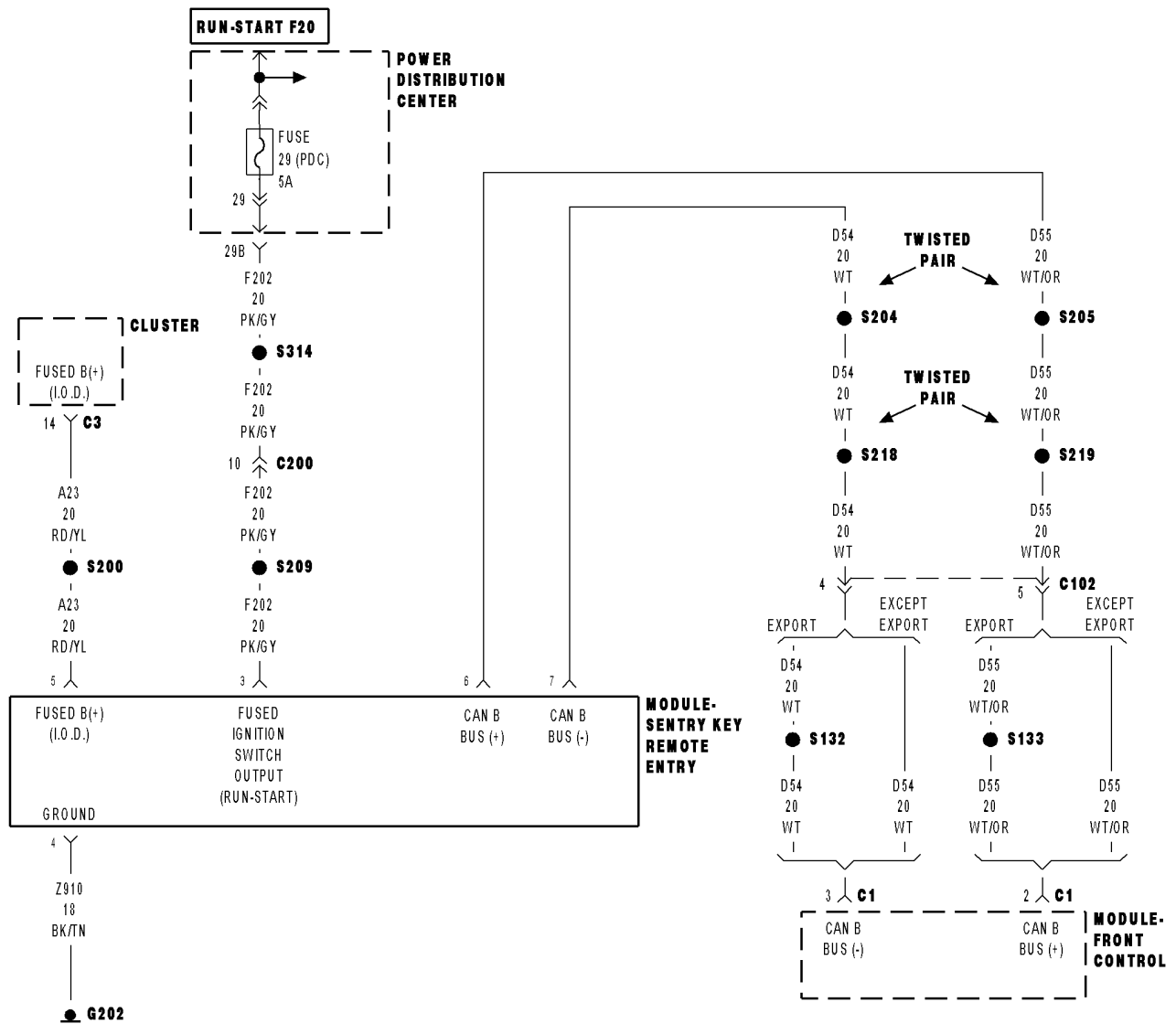
**Were any problems found?**

**Yes**    >> Repair wiring harness/connectors as necessary.  
             Perform SKREEM VERIFICATION TEST.

**No**      >> Test Complete.

---

## B1A35-UNIDENTIFIED KEY COMMUNICATION ERROR



**B1A35-UNIDENTIFIED KEY COMMUNICATION ERROR (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
At ignition on and during Key Programming Mode.
- **Set Condition:**  
When the SKREEM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

Possible Causes
MULTIPLE KEY OPERATION IGNITION KEY SKREEM INTERMITTENT WIRING HARNESS PROBLEM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

With the scan tool, read and record the SKREEM DTCs.

With the scan tool, erase the SKREEM DTCs

**Note: Perform the following test several times to ensure the DTC is current.**

Turn the ignition off.

Wait 10 seconds.

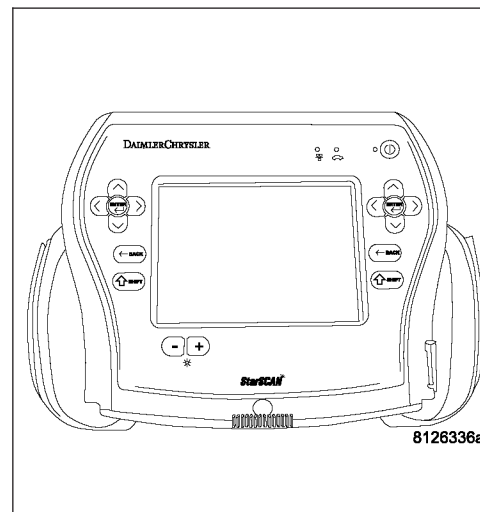
Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the scan tool display the DTC that was previously erased?**

**Yes** >> Go To 2

**No** >> Go To 6

**2. CHECKING FOR MULTIPLE KEYS**

**Are there multiple vehicle ignition keys available?**

**Yes** >> Go To 3

**No** >> Go To 4

**B1A35-UNIDENTIFIED KEY COMMUNICATION ERROR (CONTINUED)****3. MULTIPLE KEY OPERATION**

**Note:** Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys, one at a time.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Is the DTC present for all ignition keys?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Replace the ignition key(s) that cause the SKIM DTC.  
Perform SKREEM VERIFICATION TEST.

---

**4. REPROGRAM KEY**

With the scan tool, attempt to reprogram the ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Go To 5

**No** >> Test complete.

---

**5. PROGRAM NEW IGNITION KEY**

Replace the ignition key with a new key.

With the scan tool, program the new ignition key to the SKREEM.

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

Turn the ignition on.

With the scan tool, read the SKREEM DTCs.

**Does the DTC set again?**

**Yes** >> Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Test complete.

---

**B1A35-UNIDENTIFIED KEY COMMUNICATION ERROR (CONTINUED)**

**6. INTERMITTENT WIRING HARNESS PROBLEM**

Turn the ignition off.

**Note:** Check the following items:

- Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.
- Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
- Refer to any Technical Service Bulletins (TSB) that may apply.

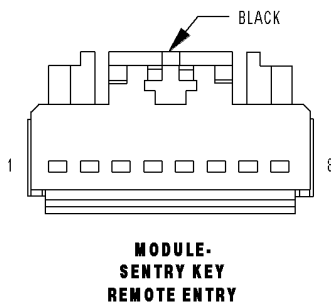
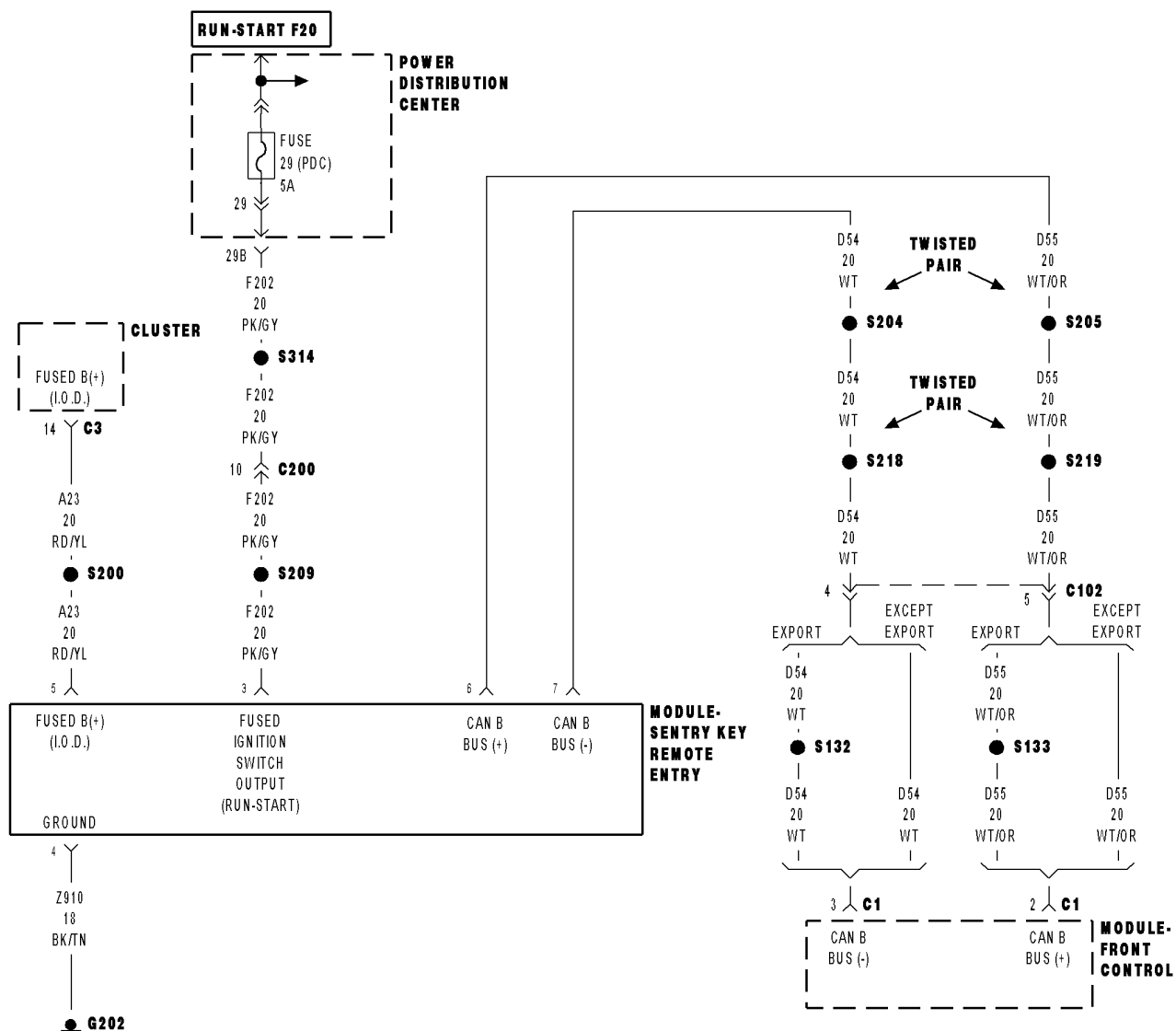
**Were any problems found?**

**Yes**     >> Repair wiring harness/connectors as necessary.  
             Perform SKREEM VERIFICATION TEST.

**No**       >> Test Complete.

---

# B2101-IGNITION RUN/START INPUT LOW



**B2101-IGNITION RUN/START INPUT LOW (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition switch on.
- **Set Condition:**  
The SKREEM has detected the ignition switch input voltage below a calibrated value.

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN SKREEM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

**Note:** Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

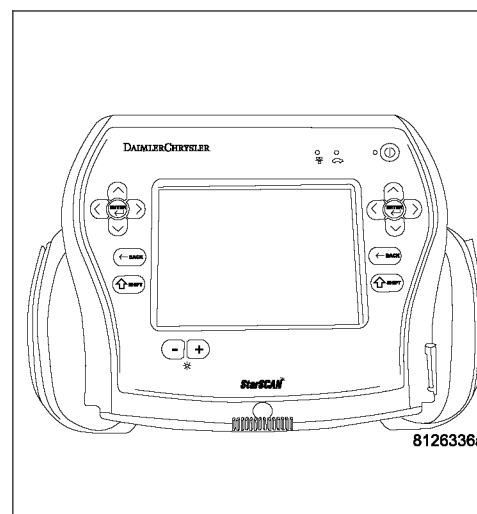
Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

**Does the DTC reset?**

**Yes** >> Go To 3

**No** >> Go to 2

**2. INTERMITTENT CONDITION**

**Note:** Check for any of the follow conditions:

- Poor wire to terminal connection
- Corroded terminals
- Backed out or loose terminals
- Broken wire internal to the insulation
- Dirty (partial) module ground

With the ignition on, wiggle the related wires.

Using a scan tool, read DTC(s).

**Does the DTC reset?**

**Yes** >> Repair the wiring as necessary.

Perform SKREEM VERIFICATION TEST.

**No** >> DTC is not active at this time. Test complete.

**B2101-IGNITION RUN/START INPUT LOW (CONTINUED)****3. FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPENED**

**Note:** Check the related fuses to the Fused Ignition Switch Output (Run-Start) circuit. If the fuse is found to be open, repair the circuit for a shorted condition.

Turn the ignition off.

Disconnect the SKREEM harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, probe the Fused Ignition Switch Output (Run-Start) circuit in the SKREEM harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go to 4

**No** >> Repair the Fused Ignition Switch Output (Run-Start) circuit for an open.  
Perform SKREEM VERIFICATION TEST.

---

**4. SKREEM**

**Note:** A dirty (partial) ground can cause abnormal conditions within a system. Ensure the module has a good ground before continuing.

Turn the ignition off.

Reconnect the SKREEM connector

Back probe the Fused Ignition Switch Output (Run-Start) circuit.

Start the engine.

Using the scan tool, view battery voltage under Data Display in the Engine category.

Compare the voltage on the scan tool to the voltage reading on the voltmeter.

**Is the voltage on the scan tool equal to the voltmeter reading +/- .5 volt?**

**Yes** >> Replace and program the SKREEM in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Repair the Fused Ignition Switch Output (Run-Start) circuit for high resistance.  
Perform SKREEM VERIFICATION TEST.

---



[illegible]

**B2102-IGNITION RUN/START INPUT HIGH (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition switch on.
- **Set Condition:**  
The SKREEM has detected the ignition switch input voltage above a calibrated value.

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SKREEM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

**Note:** Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

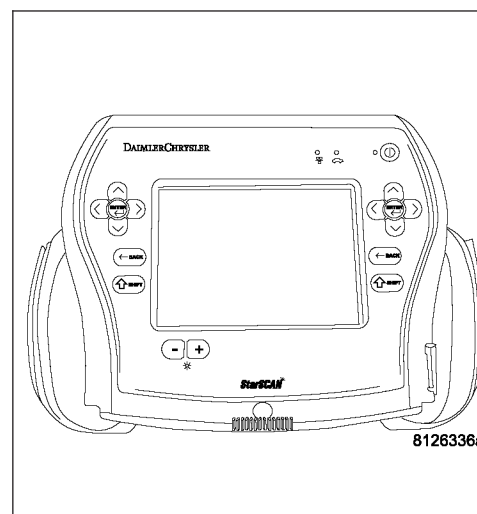
Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

**Does the DTC reset?**

**Yes** >> Go To 3

**No** >> Go to 2

**2. INTERMITTENT CONDITION**

**Note:** Check for any of the follow conditions:

- Poor wire to terminal connection
- Corroded terminals
- Backed out or loose terminals
- Broken wire internal to the insulation
- Dirty (partial) module ground

With the ignition on, wiggle the related wires.

Using a scan tool, read DTC(s).

**Does the DTC reset?**

**Yes** >> Repair the wiring as necessary.

Perform SKREEM VERIFICATION TEST.

**No** >> DTC is not active at this time. Test complete.

**B2102-IGNITION RUN/START INPUT HIGH (CONTINUED)****3. FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORTED TO BATTERY VOLTAGE**

**Note:** A dirty (partial) ground can cause abnormal conditions within a system. Ensure the module has a good ground before continuing.

Turn the ignition off.

Disconnect the SKREEM harness connector.

Using a 12 volt test light connected to ground, probe the Fused Ignition Switch Output (Run-Start) circuit in the SKREEM harness connector.

**Does the test light illuminate brightly?**

- Yes**    >> Repair the Fused Ignition Switch Output (Run-Start) circuit for a short to voltage.  
            Perform SKREEM VERIFICATION TEST.
- No**      >> Replace and program the SKREEM in accordance with the Service Information.  
            Perform SKREEM VERIFICATION TEST.
-



**B210A-SYSTEM VOLTAGE LOW (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition switch on.
- **Set Condition:**  
The SKREEM has detected the system voltage is below a calibrated value.

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN
FUSED (B+) CIRCUIT OPEN
SKREEM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

**Note:** Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

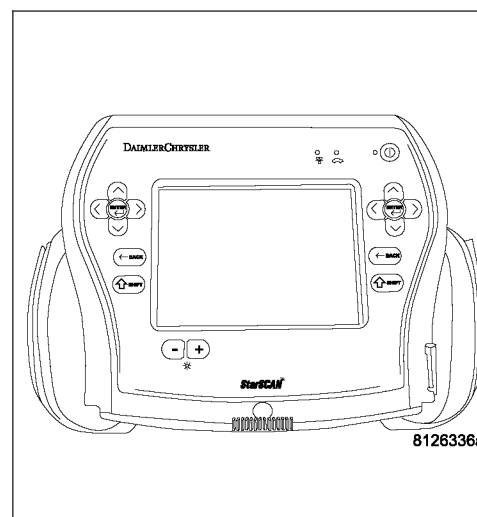
Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

**Does the DTC reset?**

**Yes** >> Go To 3

**No** >> Go to 2

**2. INTERMITTENT CONDITION**

**Note:** Check for any of the follow conditions:

- Poor wire to terminal connection
- Corroded terminals
- Backed out or loose terminals
- Broken wire internal to the insulation
- Dirty (partial) module ground

With the ignition on, wiggle the related wires.

Using a scan tool, read DTC(s).

**Does the DTC reset?**

**Yes** >> Repair the wiring as necessary.  
Perform SKREEM VERIFICATION TEST.

**No** >> DTC is not active at this time. Test complete.

**B210A-SYSTEM VOLTAGE LOW (CONTINUED)****3. FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN**

**Note:** Check the related fuses to the Fused Ignition Switch Output (Run-Start) circuit. If the fuse is found to be open repair the circuit for a shorted condition.

Turn the ignition off.

Disconnect the SKREEM harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, probe the Fused Ignition Switch Output (Run-Start) circuit in the SKREEM harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go to 4

**No** >> Repair the Fused Ignition Switch Output (Run-Start) circuit for an open.  
Perform SKREEM VERIFICATION TEST.

---

**4. FUSED (B+) CIRCUIT OPEN**

Turn the ignition off.

Using a 12 volt test light connected to ground, probe the Fused (B+) circuit in the SKREEM harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go to 5

**No** >> Repair the Fused (B+) circuit for an open.  
Perform SKREEM VERIFICATION TEST.

---

**5. SKREEM**

**Note:** Repeat the below procedure for both the Fused Ignition Switch Output (Run-Start) circuit and the Fused (B+) circuit.

**Note:** A dirty (partial) ground can cause abnormal conditions within a system. Ensure the module has a good ground before continuing.

Turn the ignition off.

Reconnect the SKREEM connector.

Back probe the Fused Ignition Switch Output (Run-Start) circuit and then the Fused (B+) circuit.

Start the engine.

Using the scan tool, view battery voltage under Data Display in the Engine category.

Compare the voltage on the scan tool to the voltage reading on the voltmeter.

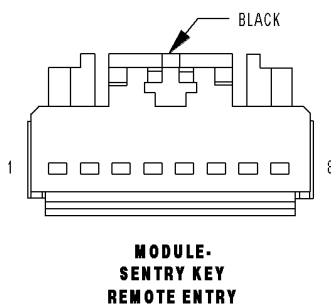
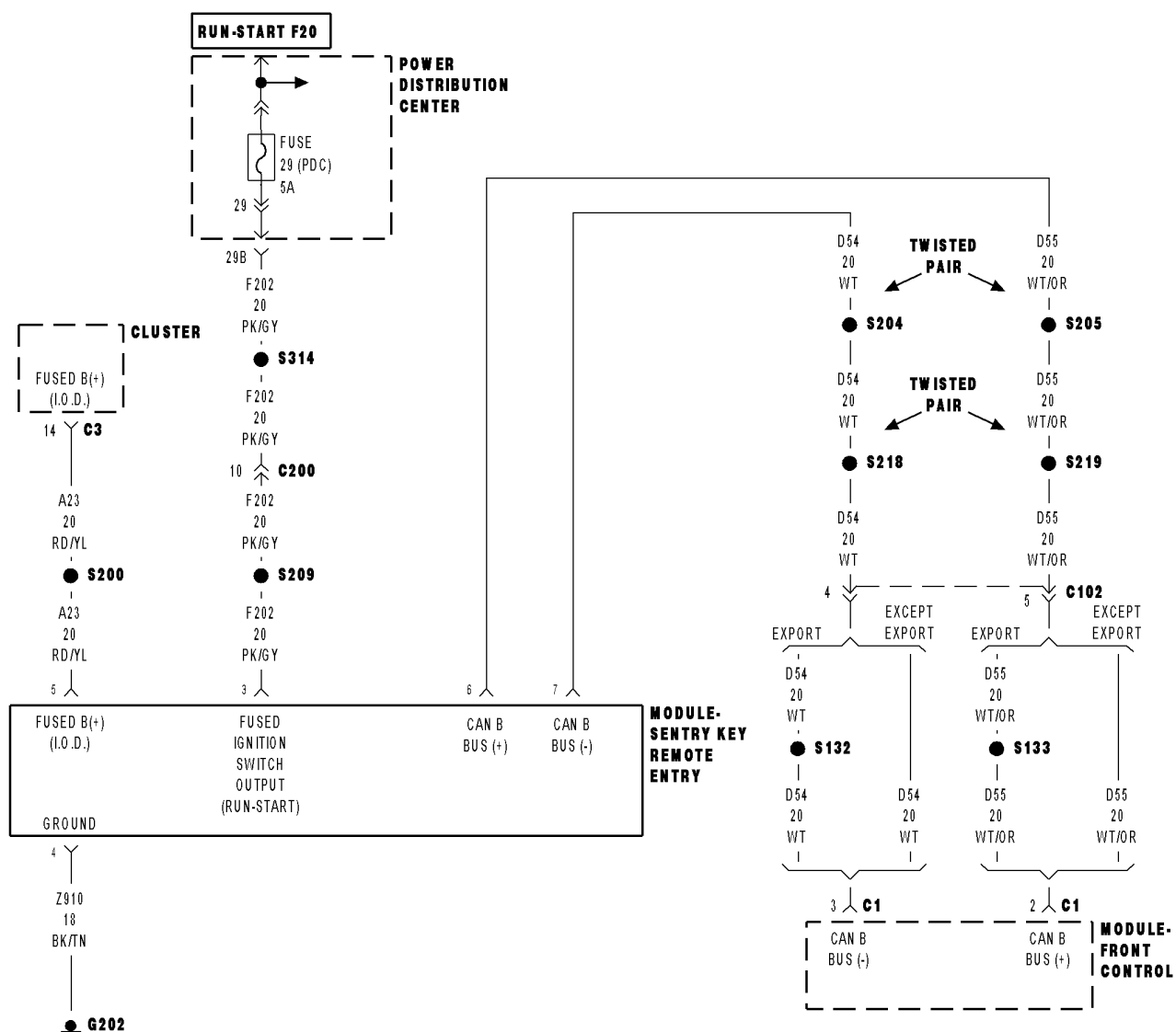
**Is the voltage on the scan tool equal to the voltmeter reading +/- .5 volt?**

**Yes** >> Replace and program the SKREEM in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Repair the circuit(s) that indicated the incorrect voltage.  
Perform SKREEM VERIFICATION TEST.

---

## B210D-SYSTEM VOLTAGE HIGH



**B210D-SYSTEM VOLTAGE HIGH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition switch on.
- **Set Condition:**  
The SKREEM has detected the system voltage above a calibrated value.

Possible Causes
FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SKREEM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

**Note:** Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

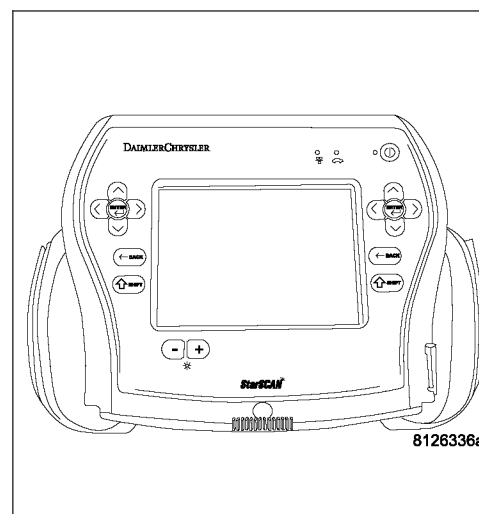
Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

**Does the DTC reset?**

**Yes** >> Go To 3

**No** >> Go to 2

**2. INTERMITTENT CONDITION**

**Note:** Check for any of the follow conditions:

- Poor wire to terminal connection
- Corroded terminals
- Backed out or loose terminals
- Broken wire internal to the insulation
- Dirty (partial) module ground

With the ignition on, wiggle the related wires.

Using a scan tool, read DTC(s).

**Does the DTC reset?**

**Yes** >> Repair the wiring as necessary.

Perform SKREEM VERIFICATION TEST.

**No** >> DTC is not active at this time. Test complete.



**B210D-SYSTEM VOLTAGE HIGH (CONTINUED)****3. FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT SHORTED TO BATTERY VOLTAGE**

**Note:** A dirty (partial) ground can cause abnormal conditions within a system. Ensure the module has a good ground before continuing.

Turn the ignition off.

Disconnect the SKREEM harness connector.

Using a 12 volt test light connected to ground, probe the Fused Ignition Switch Output (Run-Start) circuit in the SKREEM harness connector.

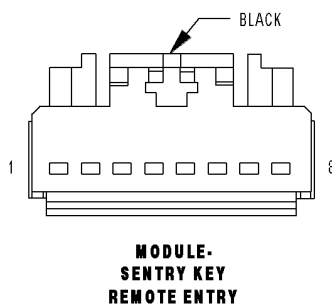
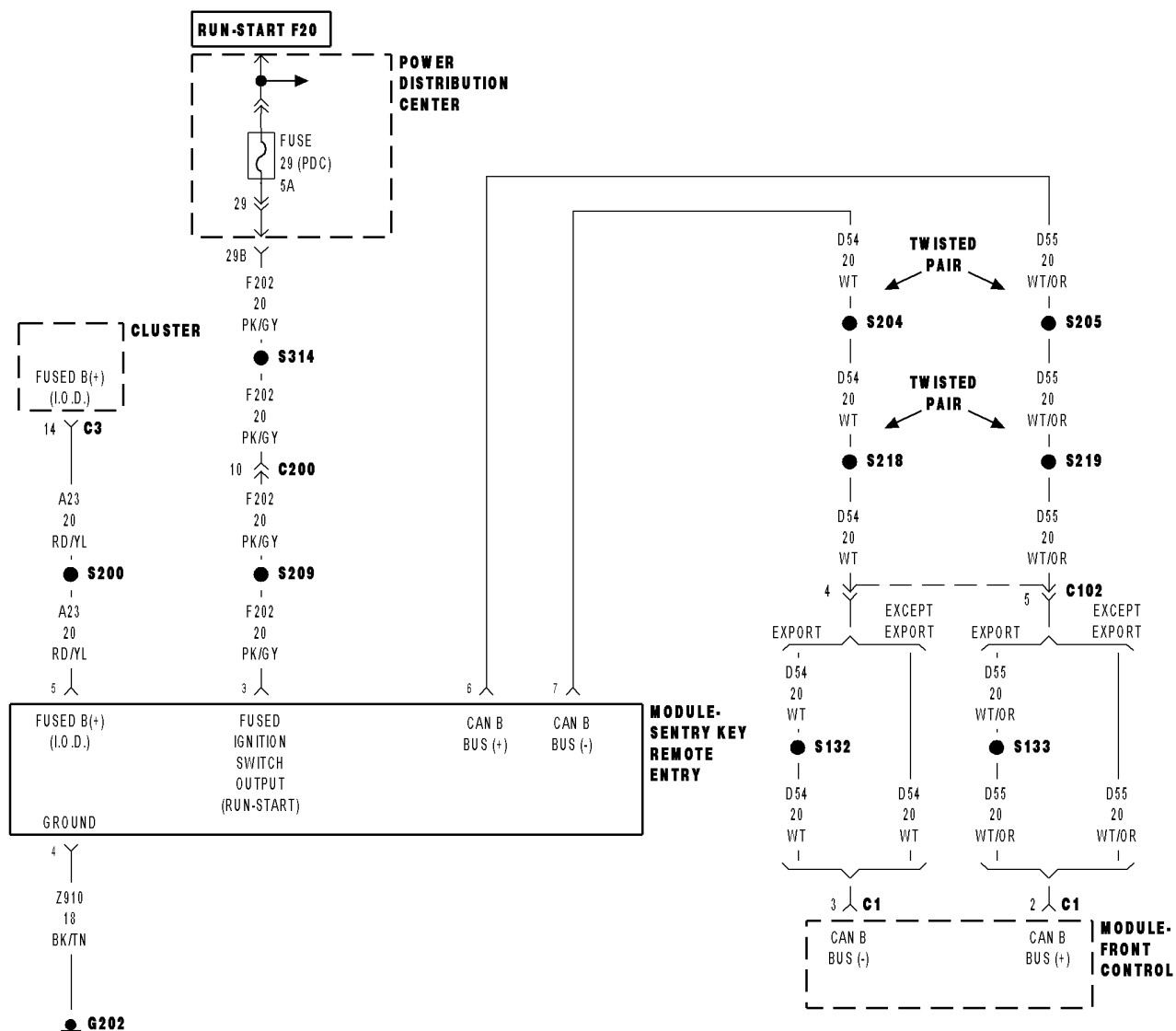
**Does the test light illuminate brightly?**

**Yes** >> Repair the Fused Ignition Switch Output (Run-Start) circuit for a short to voltage.  
Perform SKREEM VERIFICATION TEST.

**No** >> Replace and reprogram the SKREEM in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

---

# B210D-BATTERY VOLTAGE LOW



**B210D-BATTERY VOLTAGE LOW (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition switch on.
- **Set Condition:**  
The SKREEM has detected the Fused (B+) input voltage below a calibrated value.

Possible Causes
FUSED (B+) CIRCUIT OPEN
SKREEM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

**Note:** Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

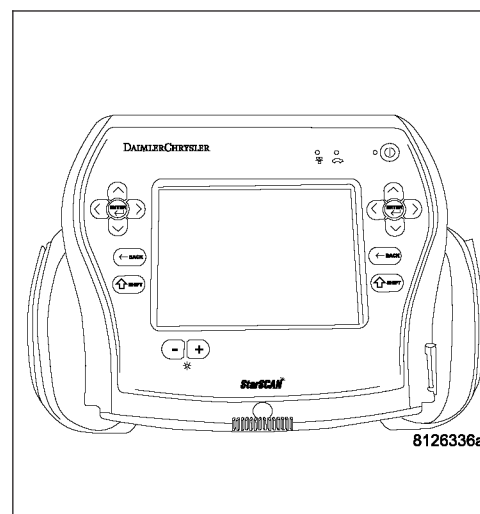
Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

**Does the DTC reset?**

**Yes** >> Go To 3

**No** >> Go to 2

**2. INTERMITTENT CONDITION**

**Note:** Check for any of the follow conditions:

- Poor wire to terminal connection
- Corroded terminals
- Backed out or loose terminals
- Broken wire internal to the insulation
- Dirty (partial) module ground
- Dirty (partial ) module ground

With the ignition on, wiggle the related wires.

Using a scan tool, read DTC(s).

**Does the DTC reset?**

**Yes** >> Repair the wiring as necessary.

Perform SKREEM VERIFICATION TEST.

**No** >> DTC is not active at this time. Test complete.

**B210D-BATTERY VOLTAGE LOW (CONTINUED)****3. FUSED (B+) CIRCUIT OPEN**

**Note:** Check the related fuses to the Fused (B+) circuit. If the fuse is found to be open repair the circuit for a shorted condition.

Turn the ignition off.

Disconnect the SKREEM harness connector.

Turn the ignition on.

Using a 12 volt test light connected to ground, probe the Fused (B+) circuit in the SKREEM harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go to 4

**No** >> Repair the Fused (B+) circuit for an open.  
Perform SKREEM VERIFICATION TEST.

---

**4. SKREEM**

**Note:** A dirty (partial) ground can cause abnormal conditions within a system. Ensure the module has a good ground before continuing.

Turn the ignition off.

Reconnect the SKREEM connector

Back probe the Fused (B+) circuit.

Start the engine.

Using the scan tool, view battery voltage under Data Display in the Engine category.

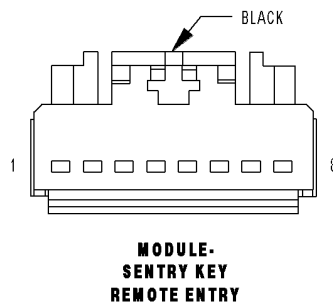
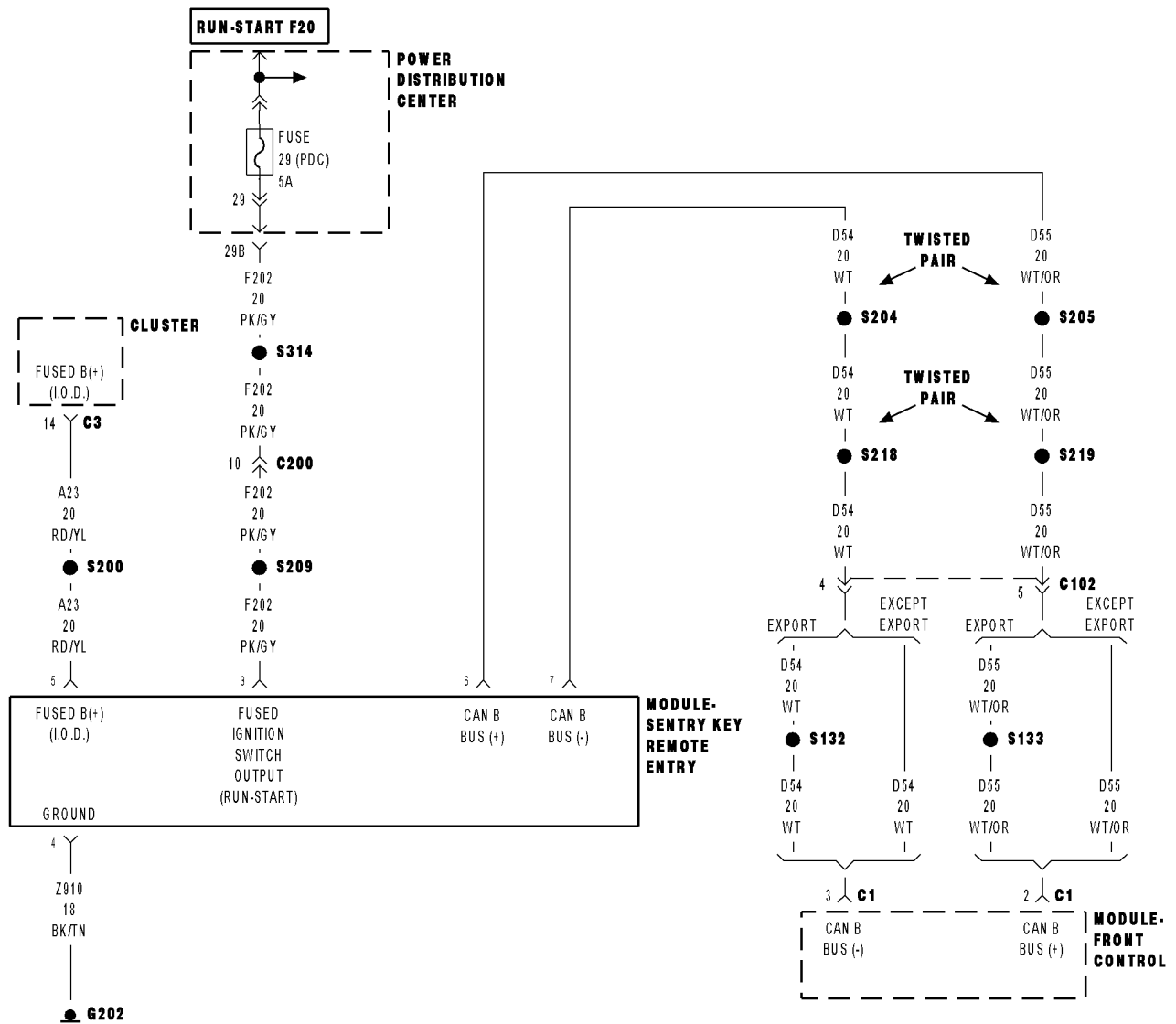
Compare the voltage on the scan tool to the voltage reading on the voltmeter.

**Is the voltage on the scan tool equal to the voltmeter reading +/- .5 volt?**

**Yes** >> Replace and program the SKREEM in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> Repair the Fused (B+) circuit for high resistances.  
Perform SKREEM VERIFICATION TEST.

---

**B210E-BATTERY VOLTAGE HIGH**

**B210E-BATTERY VOLTAGE HIGH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition switch on.
- **Set Condition:**  
The SKREEM has detected the Fused (B+) input voltage above a calibrated value.

Possible Causes
FUSED (B+) CIRCUIT SKREEM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

**Note:** Diagnose any related Powertrain DTC(s) before continuing.

With a scan tool, read and record DTC(s).

With the scan tool, clear DTC(s).

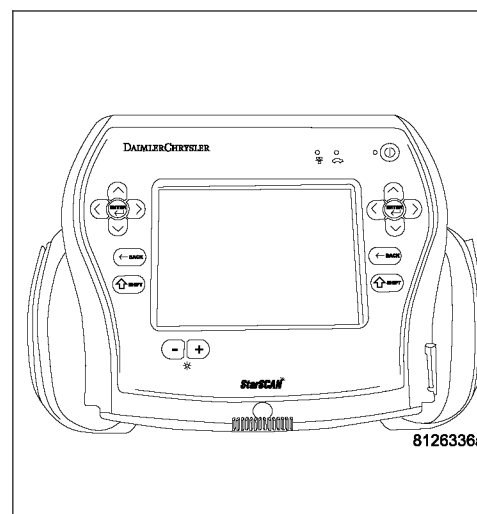
Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

**Does the DTC reset?**

**Yes** >> Go To 3

**No** >> Go to 2

**2. INTERMITTENT CONDITION**

**Note:** Check for any of the follow conditions:

- Poor wire to terminal connection
- Corroded terminals
- Backed out or loose terminals
- Broken wire internal to the insulation
- Dirty (partial) module ground

With the ignition on, wiggle the related wires.

Using a scan tool, read DTC(s).

**Does the DTC reset?**

**Yes** >> Repair the wiring as necessary.

Perform SKREEM VERIFICATION TEST.

**No** >> DTC is not active at this time. Test complete.

**B210E-BATTERY VOLTAGE HIGH (CONTINUED)****3. SKREEM**

**Note:** A dirty (partial) ground can cause abnormal conditions with a system. Ensure the module has a good ground before continuing.

Turn the ignition off.

Back probe the Fused (B+) circuit in the SKREEM harness connector.

Start the engine.

Using a scan tool, view the battery voltage under Data Display in the Engine category.

Compare the voltage on the scan tool to the voltage reading on the voltmeter.

**Is the voltage on the scan tool equal to the voltmeter reading +/- .5 volt?**

**Yes** >> Replace and program the SKREEM in accordance with the Service Information. Perform SKREEM VERIFICATION TEST.

**No** >> Repair the Fused (B+) circuit. Perform SKREEM VERIFICATION TEST.

---

## B2204-ECU CONFIGURATION MISMATCH

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition switch on.

Possible Causes
SKREEM

## Diagnostic Test

### 1. SKREEM

**Note:** Before continuing review and check the following conditions.

- Review the repair history of the vehicle. Ensure the vehicle has the correct PCM and SKREEM installed. Check the part numbers.
- Using a scan tool, ensure the PCM and SKREEM have been programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINS match.

Turn the ignition on.

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

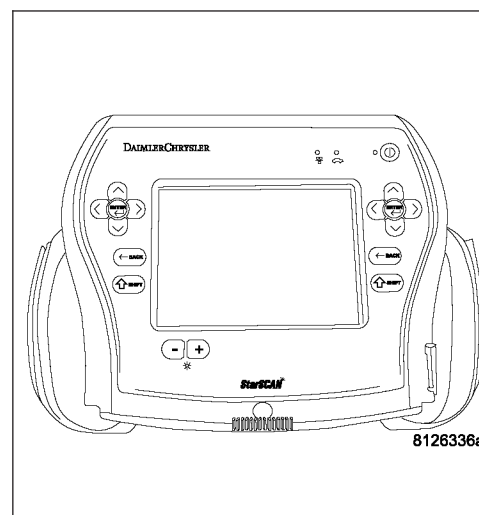
Using the scan tool, read DTC(s).

#### Does the DTC reset?

**Yes** >> Replace and program the SKREEM in accordance with the Service Information.

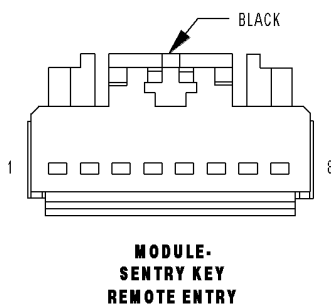
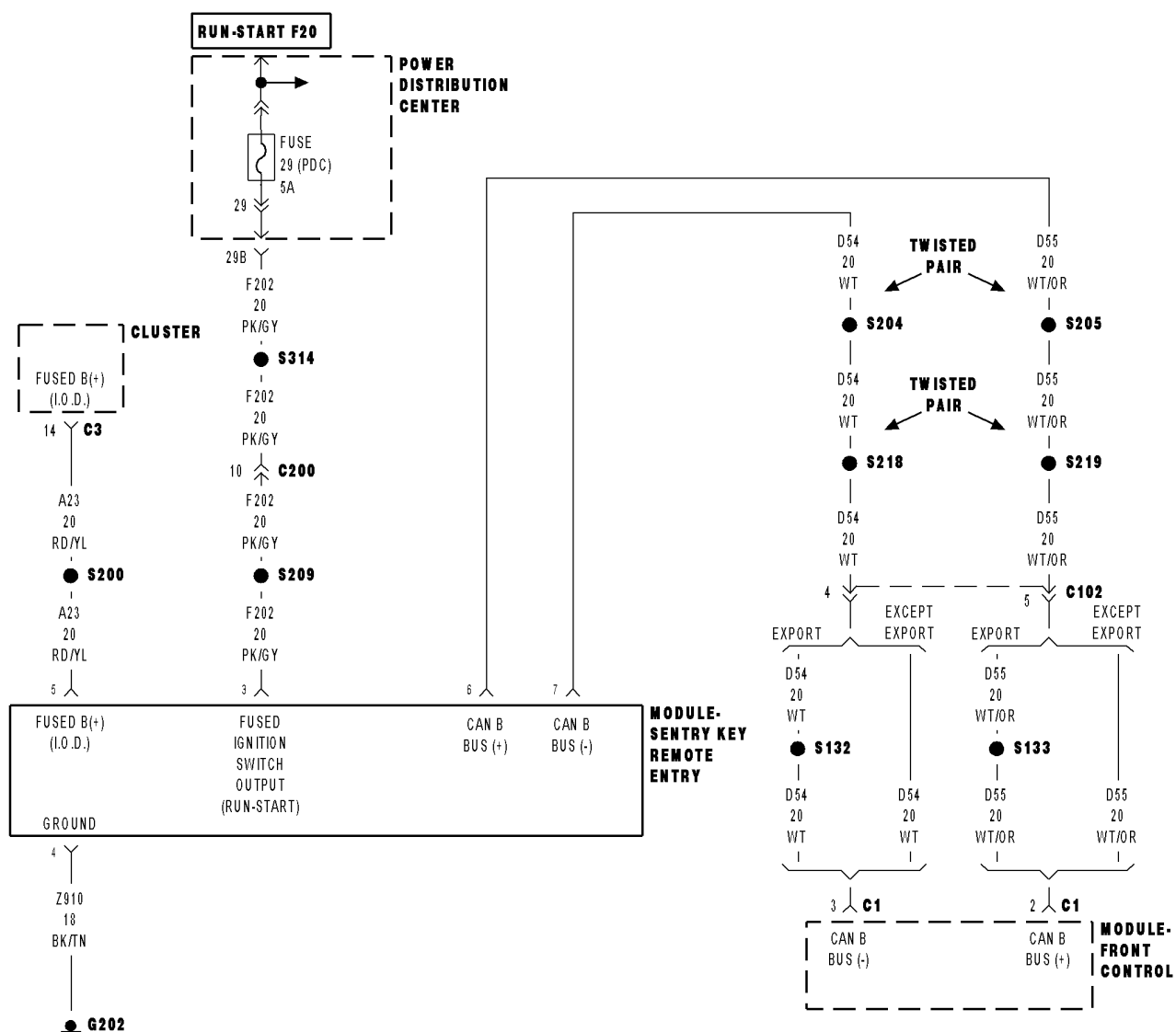
Perform SKREEM VERIFICATION TEST.

**No** >> The DTC is not active at this time. Test complete.





## B2205-ORIGINAL VIN MISSING/MISMATCH



**B2205-ORIGINAL VIN MISSING/MISMATCH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

At ignition on, after ignition on during any rolling code handshake that occurs with the PCM due to a SKIM or PCM reset.

- **Set Condition:**

When a PCM STATUS message with a Valid Key status is not received by the SKIM within 3.5 seconds of transmitting the last Valid Key Code message to the PCM.

Possible Causes
VERIFYING PCM VIN REPLACE SKREEM AND CHECK DTC'S INTERMITTENT WIRING HARNESS PROBLEM PCM

**Diagnostic Test****1. DETERMINING IF DTC IS CURRENT**

With the scan tool, erase the SKREEM DTCs.

Turn the ignition off.

Wait 10 seconds.

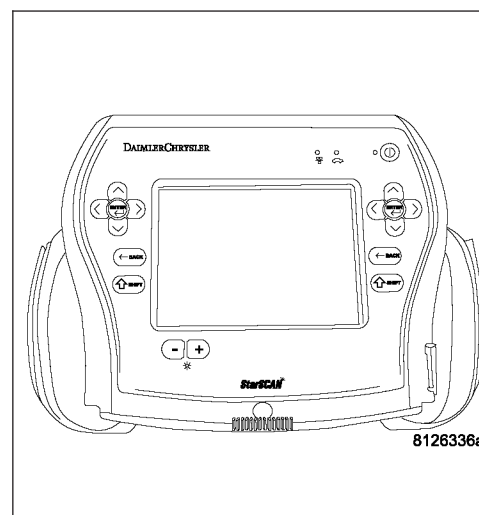
Turn the ignition on and wait 2 minutes.

With the scan tool, read the SKREEM DTCs.

**Does the scan tool display the DTC that was previously erased?**

**Yes** >> Go To 2

**No** >> Go To 4

**2. VERIFYING THE PCM VIN**

Turn the ignition on.

With the scan tool, select Engine system from the main menu.

Display and record the Vehicle Identification Number.

**Note:** Ensure that a VIN has been programmed into the PCM. If a VIN is not displayed, attempt to program the PCM with the correct VIN before continuing.

**Does the VIN recorded from the PCM match the VIN of the vehicle?**

**Yes** >> Go To 3

**No** >> Perform the PCM replaced to update the VIN in the PCM.  
Perform SKREEM VERIFICATION TEST

**B2205-ORIGINAL VIN MISSING/MISMATCH (CONTINUED)****3. REPLACE SKREEM AND CHECK DTC'S**

Turn the ignition off.

Replace and program the Sentry Key Remote Entry Module in accordance with the Service Information.

Turn the ignition on.

With the scan tool, display and clear all PCM and SKREEM DTC's.

Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle.

With the scan tool, check for SKREEM DTCs.

**Does the scan tool display the same DTC?**

**Yes** >> Replace and program the Powertrain Control Module in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST

**No** >> The repair is complete.  
Perform SKREEM VERIFICATION TEST

---

**4. INTERMITTENT**

Turn the ignition off.

**Note:** Check for the following conditions:

- **Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**
- **Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.**
- **Refer to any Technical Service Bulletins (TSB) that may apply.**

**Were any problems found?**

**Yes** >> Repair wiring harness/connectors as necessary.  
Perform SKREEM VERIFICATION TEST

**No** >> Test Complete.

---

**B2224-SKREEM INTERNAL**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition switch on.

Possible Causes
SKREEM

**Diagnostic Test****1. SKREEM**

**Note:** Before continuing review and check the following conditions.

- Review the repair history of the vehicle. Ensure the vehicle has the correct PCM and SKREEM installed. Check the part numbers.
- Using a scan tool, ensure the PCM and SKREEM have been programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINS match.

Turn the ignition on.

With the scan tool, clear DTC(s).

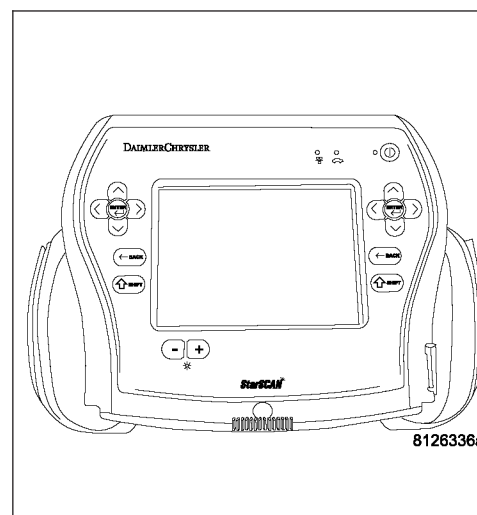
Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

**Does the DTC reset?**

**Yes** >> Replace and program the SKREEM in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

**No** >> The DTC is not active at this time. Test complete.



B2228-SKREEM INTERNAL - RKE RECEIVER

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition switch on.

Possible Causes
SKREEM

Diagnostic Test

1. SKREEM

**Note:** Before continuing review and check the following conditions.

- Review the repair history of the vehicle. Ensure the vehicle has the correct PCM and SKREEM installed. Check the part numbers.
- Using a scan tool, ensure the PCM and SKREEM have been programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINS match.

Turn the ignition on.

With the scan tool, clear DTC(s).

Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

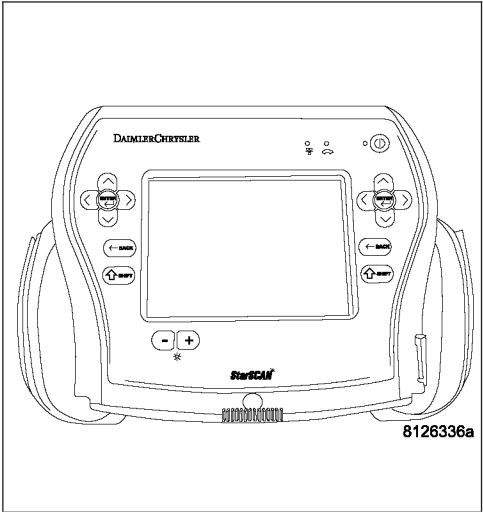
- Does the DTC reset?

Yes

>> Replace and program the SKREEM in accordance with the Service Information.  
Perform SKREEM VERIFICATION TEST.

No

>> The DTC is not active at this time. Test complete.



**B2229-SKREEM INTERNAL - SKIM IMMOBILIZER**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition switch on.

Possible Causes
SKREEM

**Diagnostic Test****1. SKREEM**

**Note:** Before continuing review and check the following conditions.

- Review the repair history of the vehicle. Ensure the vehicle has the correct PCM and SKREEM installed. Check the part numbers.
- Using a scan tool, ensure the PCM and SKREEM have been programmed correctly. Compare the PCM VIN to the SKREEM VIN and ensure the two VINS match.

Turn the ignition on.

With the scan tool, clear DTC(s).

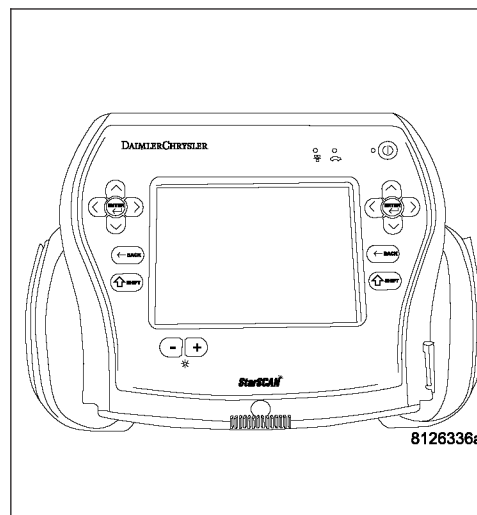
Perform 5 ignition cycles, leaving the ignition switch on for a minimum of 90 seconds per cycle.

Using the scan tool, read DTC(s).

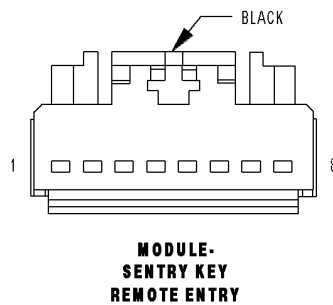
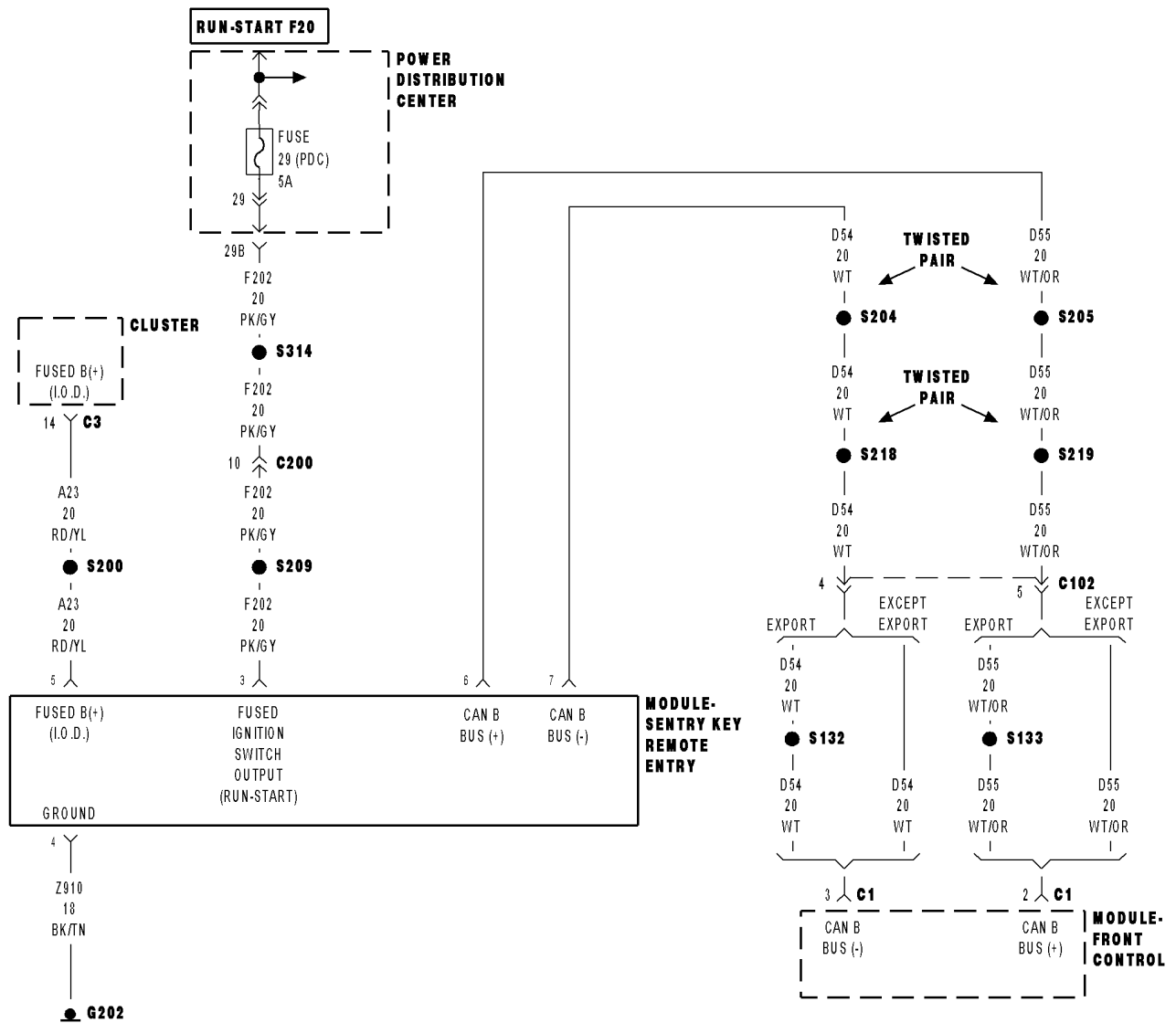
**Does the DTC reset?**

**Yes** >> Replace and program the SKREEM in accordance with the Service Information.  
Perform VERIFICATION TEST.

**No** >> The DTC is not active at this time. Test complete.



## U0019-CAN B BUS



**U0019-CAN B BUS (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
Whenever the CAN B Bus (+) or CAN B Bus (–) circuit is open, shorted to voltage or shorted to ground.

Possible Causes
CAN B BUS DTC's IN FRONT CONTROL MODULE (D55) CAN B BUS (+) CIRCUIT OPEN (D54) CAN B BUS (–) CIRCUIT OPEN SKREEM

**Diagnostic Test****1. CHECK FOR ACTIVE DTC's**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**2. CHECK FRONT CONTROL MODULE DTC's**

With the scan tool, read Front Control Module active DTC's

**Does the scan tool display any CAN B BUS DTC's - ACTIVE?**

**Yes** >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING.

**No** >> Go To 3

---

**3. (D55) CAN B BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the SKREEM connector.

Disconnect the Front Control Module connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module harness connector and the SKREEM harness connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (D55) CAN B Bus (+) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1.

---



**U0019-CAN B BUS (CONTINUED)**

**4. (D54) CAN B BUS (–) CIRCUIT OPEN**

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module harness connector and the SKREEM harness connector.

**Is the resistance below 2.0 ohms?**

- Yes**    >> Replace the SKREEM in accordance with the service information.  
             Perform BODY VERIFICATION TEST - VER 1.
- No**      >> Repair the (D54) CAN B Bus (–) circuit for an open.  
             Perform BODY VERIFICATION TEST - VER 1.
-

## **U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0146-LOST COMMUNICATION WITH CENTRAL GATEWAY**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** and perform the P0141-Lost Communication With Front Control Module test for the diagnostic test procedure.

## **U0155-LOST COMMUNICATION WITH CLUSTER/CCN**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## SKREEM VERIFICATION

For a complete wiring diagram **Refer to Section 8W.**

### Diagnostic Test

#### 1. SKREEM VERIFICATION

**Note:** When entering the PIN, care should be taken because the SKREEM will only allow 3 consecutive attempts to enter the correct PIN. If 3 consecutive incorrect PIN's are entered the SKREEM will Lock Out the scan tool. To exit Lock Mode, the ignition key must remain the Run position for 1 hour. All accessories must be off. A battery charger connected to the battery during this time period is recommended.

1. Reconnect the previously disconnected components and connectors.
2. Obtain the vehicle's unique Personal Identification Number (PIN) assigned to it's original SKREEM. This number can be obtained from the vehicle invoice or from the DaimlerChrysler Customer Center (Phone 1-800-992-1997).
3. With the scan tool, select Miscellaneous Functions, WCM/Wireless Control Module. Then select the desired procedure and follow the display on the scan tool.
4. If the SKREEM was replaced, ensure all the customer's key have been programmed to the new module.
5. With the scan tool, ease all DTCs. Perform 5 ignition key cycles, leaving the key on for at least 90 seconds per cycle.
6. With the scan tool, read SKREEM DTC(s).

#### Are there any SKREEM DTC(s) present?

**Yes**    >> Repair not complete, refer to the appropriate symptom.

**No**     >> Repair is complete.

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# VEHICLE THEFT SECURITY - SERVICE INFORMATION

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## VEHICLE THEFT SECURITY - SERVICE INFORMATION

### DESCRIPTION

#### VEHICLE THEFT SECURITY SYSTEM

The Vehicle Theft Security System (VTSS) protects the vehicle from theft by monitoring door-ajar switches, the ignition circuit and trunk/liftgate ajar for unauthorized entry. If a switch or sensor is triggered, the horn blows intermittently and turn signal lamps flash for up to three minutes after that, the turn signal lamps continue to flash for up to 15 minutes to deter theft of the vehicle. If the alarm was triggered but the warning signals have timed out, the park and tail lamps flash three times instead of the normal twice when unlocking the vehicle with the RKE to alert the driver. Locking the doors in any of the following ways automatically arms the VTSS:

- With an interior power lock switch.
- With a valid RKE transmitter.

The Vehicle Theft Security System (VTSS) is designed to provide perimeter protection against unauthorized use or tampering by monitoring the vehicle door and liftgate ajar circuits, the power lock and unlock circuits, and the ignition switch circuit. If unauthorized use or tampering is detected, the system responds by pulsing the horn for up to about three minutes and flashing the hazard warning lamps for up to about eighteen minutes.

The VTSS includes the following major components, which are described in further detail elsewhere in this service information:

- **Door Ajar Switches** - A door ajar switch is integral to the door latch mechanism of each front and rear door.
- **Front Control Module** - The Front Control Module (FCM) is integral to the Integrated Power Module (IPM). The FCM/IPM is located in the engine compartment, near the battery and the Power Distribution Center (PDC) (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION - DESCRIPTION).
- **Horn Relay** - The horn relay is located in the Power Distribution Center (PDC) in the engine compartment near the battery (Refer to 8 - ELECTRICAL/HORN/HORN RELAY - DESCRIPTION).
- **Ignition Switch** - The ignition switch is located on the steering column in the passenger compartment (Refer to 8 - ELECTRICAL/IGNITION CONTROL/IGNITION SWITCH - DESCRIPTION).
- **Instrument Cluster** - The ElectroMechanical Instrument Cluster (EMIC) is also known as the Cab Control Node (CCN) in this vehicle. The EMIC/CCN is located in the instrument panel above the steering column opening, directly in front of the driver (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DESCRIPTION).
- **Liftgate Ajar Switch - Wagon only** - A liftgate ajar switch is integral to the latch mechanism of the liftgate.
- **Security Indicator** - The security indicator is integral to the instrument cluster (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - OPERATION).

## SENTRY KEY REMOTE ENTRY SYSTEM

The Sentry Key Remote Entry System (SKREES) is designed to provide passive protection against unauthorized vehicle use by disabling the engine, after two (2) seconds of running, whenever an invalid key is used to start the vehicle. The SKREES is active whenever the ignition is on and does not require any customer intervention. The primary components of the system are the Sentry Key Remote Entry Module (SKREEM), Sentry Key (ignition key with a transponder molded into the head), indicator light, Body Control Module (BCM), and the Next Generation Controller (NGC). The SKREEM is mounted on the ignition switch/lock cylinder assembly with the molded, integral antenna mounted around the ignition housing. The indicator light, is located instrument panel switch pod, just to the right of the instrument cluster.

The SKREES is available as a factory-installed standard option on this model. Vehicles equipped with this option can be readily identified by the illumination of the security indicator in the instrument cluster for about three seconds after the ignition switch is turned to the On position as a SKIS bulb test.

The SKREES includes the following major components, which are described in further detail elsewhere in this service information:

- **Powertrain Control Module** - The Powertrain Control Module (PCM) is located in the engine compartment.
- **Sentry Key Remote Entry Module** - The Sentry Key Remote Entry Module (SKREEM) is located on the right side of the steering column near the ignition lock cylinder housing and an integral molded plastic antenna ring circles the ignition lock cylinder like a halo. The SKREEM and its antenna are concealed beneath the instrument panel steering column shrouds.
- **Sentry Key Transponder** - The Sentry Key transponder is contained within the Remote Keyless Entry (RKE) transmitter on the ignition key.
- **Security Indicator** - The security indicator is integral to the ElectroMechanical Instrument Cluster. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - OPERATION).

## OPERATION

The ElectroMechanical Instrument Cluster (EMIC) is used on this model to control and integrate many of the functions and features included in the Vehicle Theft Security System (VTSS). In the VTSS, the EMIC receives inputs indicating the status of the door ajar switches, the liftgate ajar switch and the ignition switch. The EMIC will process the information from all of these inputs, internally control the security indicator as appropriate, and send electronic messages to the Front Control Module (FCM) over the Controller Area Network (CAN) data bus. The FCM internally controls the output to the hazard warning lamps and sends a control output to energize or de-energize the horn relay as appropriate.

Following are paragraphs describing the operation of each of the VTSS features.

### ENABLING

The EMIC must have the VTSS function electronically enabled in order for the VTSS to perform as designed. The logic in the EMIC keeps its VTSS function dormant until it is enabled using a diagnostic scan tool. The VTSS function of the EMIC is enabled on vehicles equipped with the VTSS option at the factory, but a service replacement EMIC must be VTSS-enabled by the dealer using a diagnostic scan tool. Refer to the appropriate diagnostic information.

### ARMING

Passive arming of the VTSS occurs when the vehicle is exited with the key removed from the ignition switch, the headlamps are turned off, and the doors are locked while they are open using the power lock switch. Active arming occurs when the "Lock" button on the Remote Keyless Entry (RKE) transmitter is depressed to lock the vehicle. For active arming to occur, the doors must be closed and the ignition switch must be in the Off position when the RKE transmitter "Lock" button is depressed. The power lock switch will not function if the key is in the ignition switch or the headlamps are turned on with the driver side front door open.

Pre-arming of the VTSS is initiated when a door or the liftgate is open when the vehicle is locked using a power door lock switch or when the RKE transmitter "Lock" button is depressed. Pre-arming will not occur if the key is in the ignition switch or the headlamps are turned on with the driver side front door open. When the VTSS is pre-armed, the arming sequence is delayed until all of the doors and the liftgate have been closed. The VTSS will remain in "Pre-Armed" mode for up to seventeen seconds after all doors and the liftgate have been closed.

Once the VTSS begins the passive or active arming sequence, the security indicator in the instrument cluster will flash rapidly for about seventeen seconds. This indicates that VTSS arming is in progress. If the ignition switch is turned to the On position, a door or the liftgate is opened, a door or the liftgate is unlocked by any means, or the RKE "Panic" button is depressed during the seventeen second arming process, the security indicator will stop flashing and the arming process will abort. Once the seventeen second arming sequence is successfully completed, the security indicator will flash at a slower rate, indicating that the VTSS is armed.

## DISARMING

Since this model is not equipped with lock cylinder switches, passive disarming of the VTSS is only possible if the vehicle is equipped with the optional Sentry Key Immobilizer System (SKIS). On vehicles with SKIS, turning the ignition switch to the On position using a valid SKIS key will passively disarm VTSS. Active disarming of the VTSS occurs when the vehicle is unlocked by depressing the "Unlock" button of the RKE transmitter. Once the alarm has been activated, either disarming method will also deactivate the alarm. Depressing the "Panic" button on the RKE transmitter will **not** disarm the VTSS.

## POWER-UP MODE

When the armed VTSS senses that the battery has been disconnected and reconnected, it enters its power-up mode. In the power-up mode the alarm system remains armed following a battery failure or disconnect. If the VTSS was armed prior to a battery disconnect or failure, the technician or vehicle operator will have to actively or passively disarm the alarm system after the battery is reconnected. The power-up mode will also apply if the battery goes dead while the system is armed, and battery jump-starting is attempted. The VTSS will be armed until the technician or vehicle operator has actively or passively disarmed the alarm system. If the VTSS is in the disarmed mode prior to a battery disconnect or failure, it will remain disarmed after the battery is reconnected or replaced, or if jump-starting is attempted.

## TAMPER ALERT

The VTSS tamper alert feature will sound the horn three times upon disarming, if the alarm was triggered and has since timed-out (about eighteen minutes) or if the battery has been disconnected and reconnected. This feature alerts the vehicle operator that the VTSS alarm was activated while the vehicle was unattended.

## SENTRY KEY IMMOBILIZER SYSTEM

The Sentry Key Immobilizer System (SKIS) is designed to provide passive protection against unauthorized vehicle use by disabling the engine after about two seconds of running, whenever any method other than a valid Sentry Key is used to start the vehicle. The SKIS is considered a passive protection system because it is always active when the ignition system is energized and does not require any customer intervention. The SKIS uses Radio Frequency (RF) communication to obtain confirmation that the key in the ignition switch is a valid key for operating the vehicle. The microprocessor-based SKIS hardware and software also uses electronic messages to communicate with other electronic modules in the vehicle over the Controller Area Network (CAN) data bus. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - OPERATION).

Pre-programmed Sentry Key transponders are provided with the vehicle from the factory. Each Sentry Key REmote Entry Module (SKREEM) will recognize a maximum of eight Sentry Keys. If the customer would like additional keys other than those provided with the vehicle, they may be purchased from any authorized dealer. These additional keys must be programmed to the SKREEM in the vehicle in order for the system to recognize them as valid keys. This can be done by the dealer using a diagnostic scan tool or, if Customer Learn programming is an available SKIS feature in the market where the vehicle was purchased, the customer can program the additional keys, as long as at least two valid Sentry Keys are already available. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE - TRANSPONDER PROGRAMMING).

The SKREEM performs a self-test of the SKIS each time the ignition switch is turned to the On position, and will store fault information in the form of a Diagnostic Trouble Code (DTC) if a system malfunction is detected. The SKIS can be diagnosed, and any stored DTC can be retrieved using a diagnostic scan tool. Refer to the appropriate diagnostic information.

## DIAGNOSIS AND TESTING

### VEHICLE THEFT SECURITY SYSTEM/SENTRY KEY REMOTE ENTRY SYSTEM

#### SENTRY KEY REMOTE ENTRY SYSTEM

Conventional diagnostic methods may not prove conclusive in the diagnosis of the Sentry Key Remote Entry Module (SKREEM) and the Sentry Key Remote Entry System (SKREES), the ElectroMechanical Instrument Cluster (EMIC), the Powertrain Control Module (PCM), the Controller Area Network (CAN) data bus, or the electronic message inputs used to provide the electronic features of the SKREES. The most reliable, efficient, and accurate means to diagnose the SKREEM, the EMIC, the PCM, the CAN data bus, and the electronic message inputs for the SKREES requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

#### SENTRY KEY REMOTE ENTRY SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
SECURITY INDICATOR FAILS TO LIGHT DURING BULB TEST	<ol style="list-style-type: none"><li>1. Light-Emitting Diode (LED) faulty.</li><li>2. Fuse faulty.</li><li>3. Ground path faulty.</li><li>4. Battery feed faulty.</li><li>5. Ignition feed faulty.</li></ol>	<ol style="list-style-type: none"><li>1. Perform the instrument cluster actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING - ACTUATOR TEST)..</li><li>2. Check the SKREEM fused B(+) fuse and the fused ignition switch output (run-start) fuse in the Junction Block (JB). Replace fuses, if required.</li><li>3. Check for continuity to ground at the connector for the SKREEM. Repair wiring, if required.</li><li>4. Check for battery voltage at the connector for the SKREEM. Repair wiring, if required.</li><li>5. Check for battery voltage at the connector for the SKREEM with the ignition switch in the On position. Repair wiring, if required.</li></ol>
SECURITY INDICATOR FLASHES FOLLOWING BULB TEST	<ol style="list-style-type: none"><li>1. Invalid key in ignition switch lock cylinder.</li><li>2. Key-related fault.</li></ol>	<ol style="list-style-type: none"><li>1. Replace the key with a known valid key.</li><li>2. Use a diagnostic scan tool and the appropriate diagnostic information for further diagnosis.</li></ol>
SECURITY INDICATOR LIGHTS SOLID FOLLOWING BULB TEST	<ol style="list-style-type: none"><li>1. SKREES system malfunction/fault detected.</li><li>2. SKREES system inoperative.</li></ol>	<ol style="list-style-type: none"><li>1. Use a diagnostic scan tool and the appropriate diagnostic information for further diagnosis.</li><li>2. Use a diagnostic scan tool and the appropriate diagnostic information for further diagnosis.</li></ol>

#### VEHICLE THEFT SECURITY SYSTEM

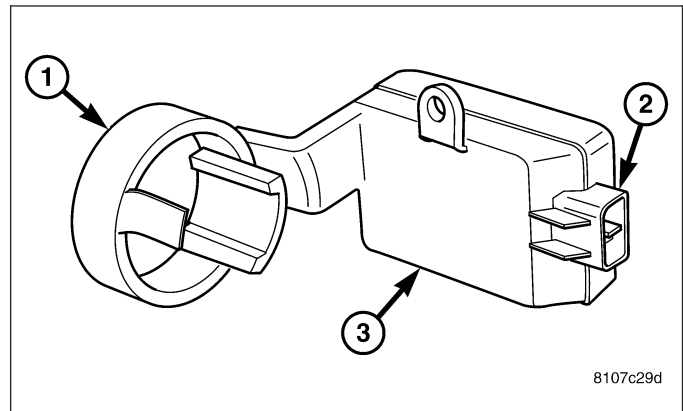
However, conventional diagnostic methods may not prove conclusive in the diagnosis of the ElectroMechanical Instrument Cluster (EMIC), the Front Control Module (FCM), the Controller Area Network (CAN) data bus, or the electronic message inputs used to provide the electronic features of the VTSS. The most reliable, efficient, and accurate means to diagnose the EMIC, the FCM, the CAN data bus, and the electronic message inputs for the VTSS requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.



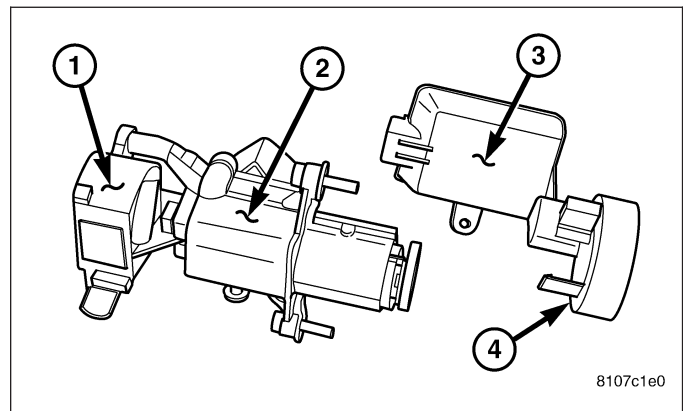
## SENTRY KEY REMOTE ENTRY MODULE

### DESCRIPTION

The Sentry Key Remote Entry Module (SKREEM) (3) performs the functions of what used to be the Sentry Key Immobilizer Module (SKIM), the Remote Keyless Entry (RKE) Module, and the Tire Pressure Monitoring (TPM) System.



The SKREEM is located on and around (antenna ring) (4) the ignition key cylinder (2) along with the ignition switch (1). It is accessible only from behind the instrument panel, to the left of the steering column. Serviceability requires lock cylinder removal to access the complete unit.



### SENTRY KEY IMMOBILIZER

The Sentry Key Immobilizer System (SKIS) authenticates an electronically coded Transponder Key placed into the ignition and sends a valid/invalid key message to the Powertrain Control Module (PCM) based upon the results. The "VALID/INVALID KEY" message communication is performed using a rolling code algorithm via the Programmable Communication Interface (PCI) data bus. A "VALID KEY" message must be sent to the Powertrain Control Module (PCM) within two seconds of ignition ON to free the engine from immobilization.

### REMOTE KEYLESS ENTRY (RKE)

The RKE transmitter uses radio frequency signals to communicate with the SKREEM. The SKREEM is on the Controller Area Network (CAN) data bus network. When the operator presses a button on the transmitter, it sends a specific request to the SKREEM. In turn the SKREEM sends the appropriate request over the CAN bus to the Integrated Power Module (IPM) to activate the park lamps, the headlamps, and the horn for horn chirp.

### TIRE PRESSURE MONITORING (TPM)

If equipped with the Tire Pressure Monitoring (TPM) System, each of the vehicles four wheels will have a valve stem with a pressure sensor and radio transmitter built in. Signals from the tire pressure sensor/transmitter are received and interpreted by the SKREEM.

A sensor/transmitter in a mounted wheel will broadcast its detected pressure once per minute when the vehicle is moving faster than 15 mph (24 km/h). Each sensor/transmitter's broadcast is uniquely coded so that the SKREEM can determine the location.



OPERATION

SENTRY KEY IMMOBILIZER

The Sentry Key Remote Entry Module (SKREEM) receives an encrypted Radio Frequency (RF) signal from the transponder key. The SKREEM then decrypts the signal and broadcasts the requested remote commands to the appropriate modules in the vehicle over the Controller Area Network (CAN) data bus. A valid transponder key ID must be incorporated into the RF signal in order for the SKREEM to pass the message on to the appropriate modules.

Automatic transponder key synchronization is done by the SKREEM if a valid transponder key is inserted into the ignition cylinder, and the ignition is turned ON. This provides a maximum operation window for RKE functions.

Each Sentry Key Remote Entry System (SKREES) consists of a SKREEM and a transponder key. Each system has a secret key code unique to that system. The secret key is electronically coded in the SKREEM and in all programmed transponder keys. It is used for immobilization and RKE functions for data security. In addition, each transponder key will have a unique identification.

REMOTE KEYLESS ENTRY

After pressing the lock button on the RKE transmitter, all of the door locks will lock, the illuminated entry will turn off (providing all doors are closed), and the Vehicle Theft Security System (VTSS) (if equipped) will arm. After pressing the unlock button, on the RKE transmitter, one time, the driver door lock will unlock, the illuminated entry will turn on the courtesy lamps, and the VTSS (if equipped) will disarm. After pressing the unlock button a second time, the remaining door locks will unlock. The Electronic Vehicle Information Center (EVIC) or a scan tool can reprogram this feature to unlock all of the door locks with one press of the unlock button. If the vehicle is equipped with the memory system, the memory message will identify which transmitter (1 or 2) sent the signal. Refer to Overhead Console/Electronic Vehicle Information Center for more information on customer programmable features.

The SKREEM is capable of retaining up to 8 individual access codes (8 transmitters). If the PRNDL is in any position except park, the SKREEM will disable the RKE. The 4 button transmitter uses 1-CR2032 battery. The minimum battery life is approximately 4.7 years based on 20 transmissions a day at 84°F (25°C). Use a scan tool or the Miller Tool 9001 RF Detector to test the RKE transmitter. Use a scan tool or the customer programming method to program the RKE system. However, the SKREEM will only allow RKE programming when the ignition is in the ON position, the PRNDL is in park position, and the VTSS (if equipped) is disarmed.

TIRE PRESSURE MONITORING (TPM)

The SKREEM monitors the signals from the tire pressure sensor/transmitters and determines if any tire has gone below the low pressure threshold LOW TIRE PRESSURE THRESHOLDS table.

LOW TIRE PRESSURE THRESHOLDS

SYSTEM STATUS INDICATOR	TIRE PRESSURE
ON	172 kPa (25 PSI)
OFF	207 kPa (30 PSI)

CRITICAL AND NON-CRITICAL SYSTEM ALERTS

**CRITICAL:** A critical alert will be triggered when a tire pressure has gone below a set threshold pressure. The SKREEM will send a message to the cluster to display “X TIRE(S) LOW PRESSURE”. “X” will be the number of tires reporting low pressure. The message will display for the duration of the current ignition cycle or until an EVIC button is pressed. If the display is removed without correcting the condition, it will reappear 300 seconds to warn the driver of the low pressure condition.

**NON-CRITICAL:** A non-critical alert will be triggered when no signal is received from a sensor/transmitter or when a sensor/transmitter low battery condition is detected. The cluster will display “SERVICE TIRE PRESS. SYSTEM.”

## DIAGNOSIS AND TESTING

### SENTRY KEY REMOTE ENTRY MODULE

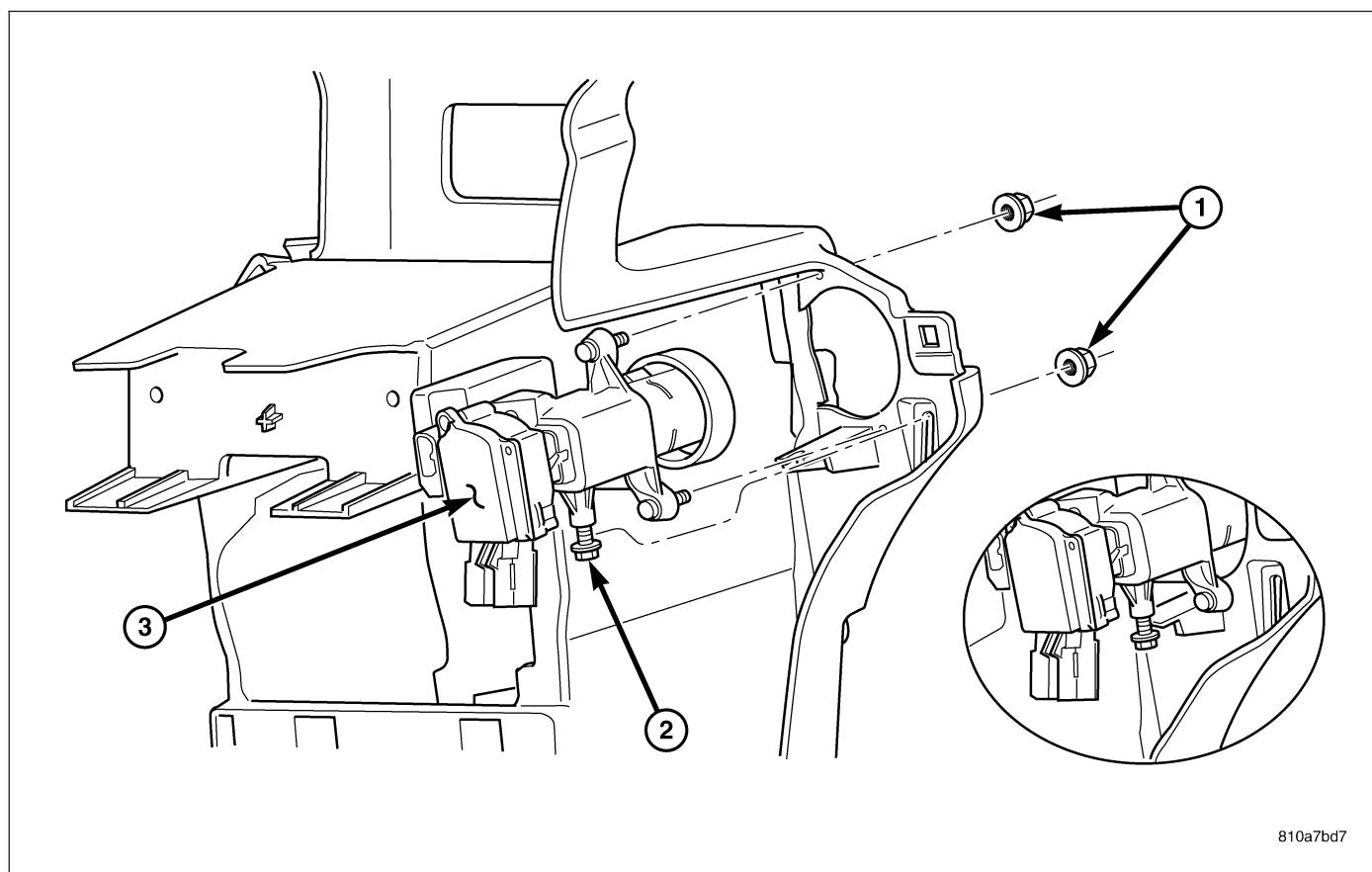
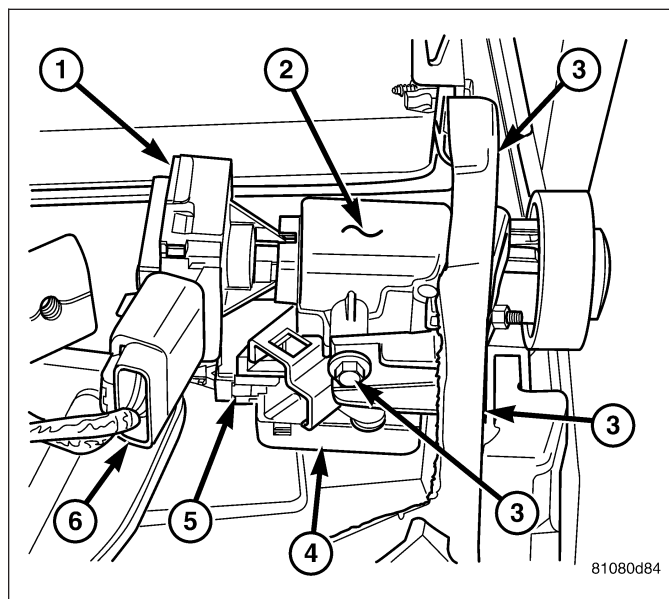
For proper diagnosis and testing of the Sentry Key Remote Entry Module (SKREEM), Remote Keyless Entry (RKE) System, and the Tire Pressure Monitoring (TPM), use a scan tool and appropriate diagnostic information.

### REMOVAL

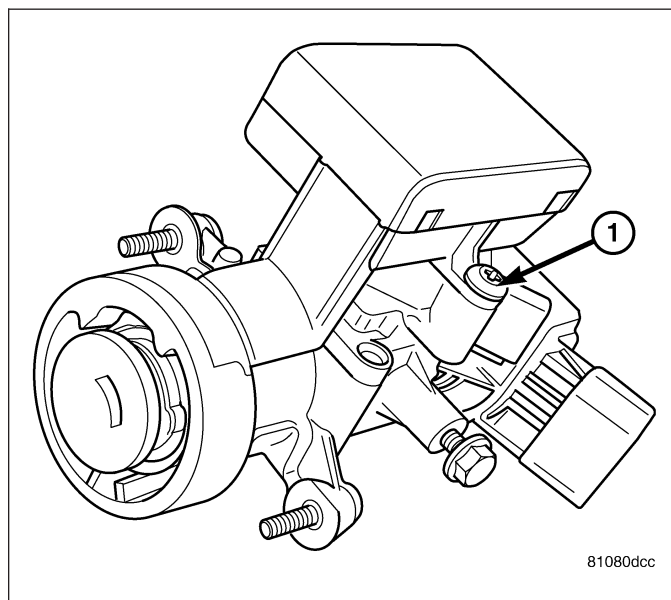
1. Disconnect and isolate the battery negative cable.
- 2.

**WARNING:** Wait two minutes for the airbag system reserve capacitor to discharge before beginning any airbag system or component service. Failure to do so may result in accidental airbag deployment, personal injury or death.

3. Remove the instrument cluster bezel (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL).
4. Remove the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).
5. Reach up behind the left side of the center stack and disconnect the ignition switch (6) and SKREEM (5) electrical connectors.

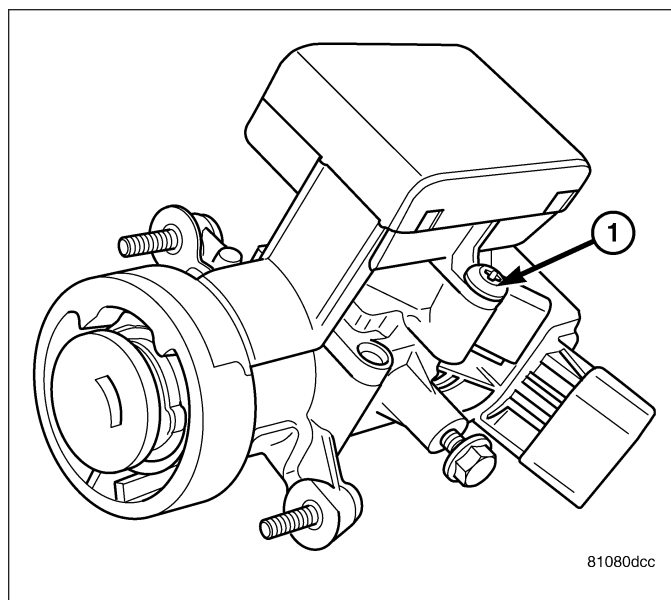


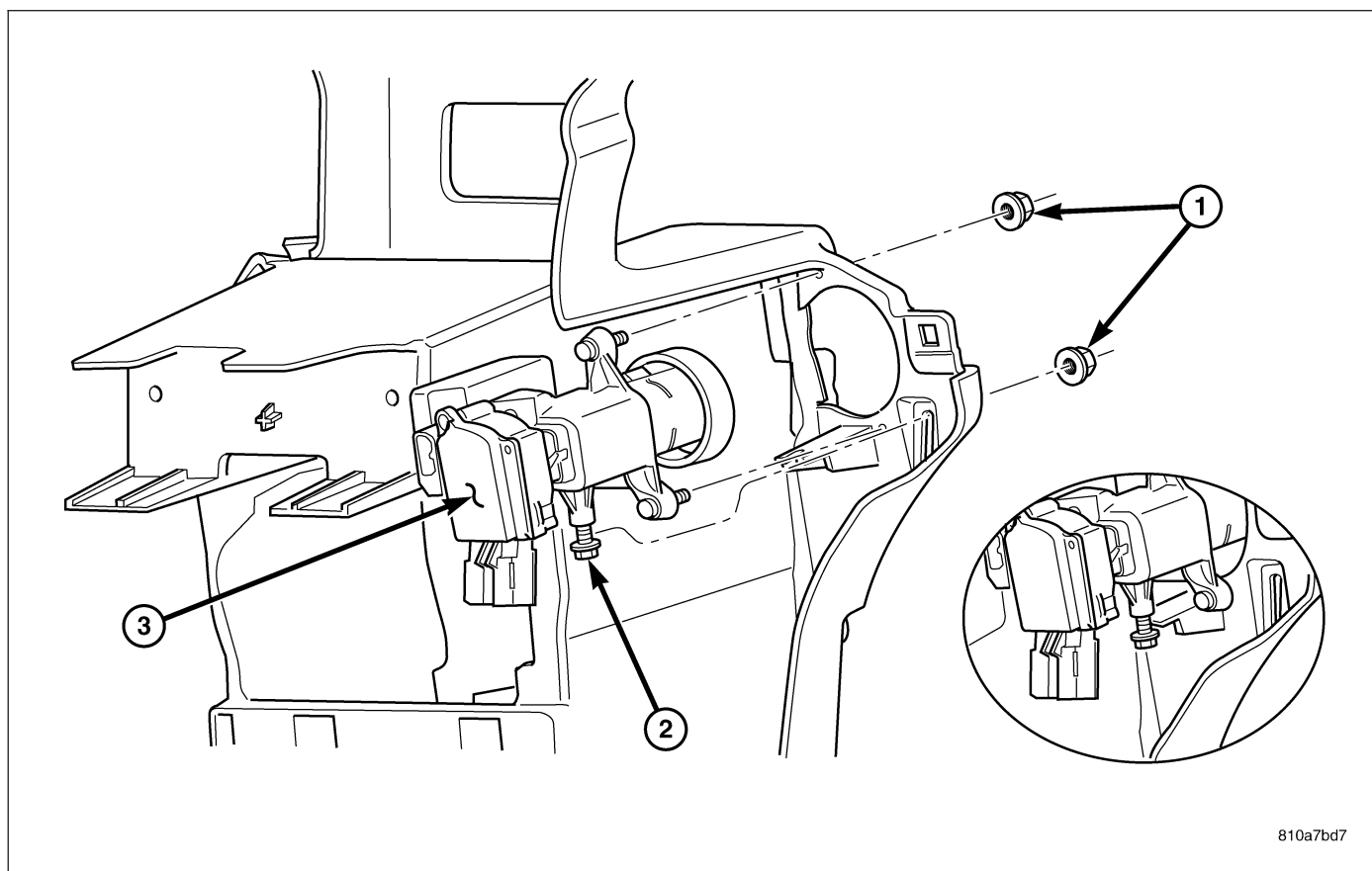
6. From underneath the ignition switch/lock assembly, loosen the lower retaining screw (2).
7. Remove the two mounting nuts (1) from the front of the instrument panel.
8. Push the ignition switch/lock assembly (3) inward toward the bulkhead.
9. Remove the SKREEM mounting screw (1) on the ignition lock assembly and separate the SKREEM from the ignition lock assembly.



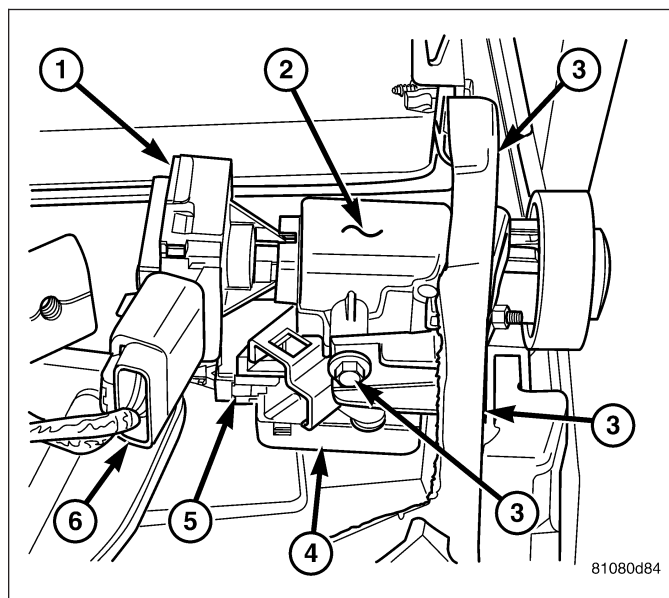
## INSTALLATION

1. Position the SKREEM on the ignition lock housing and install the retaining screw (1).





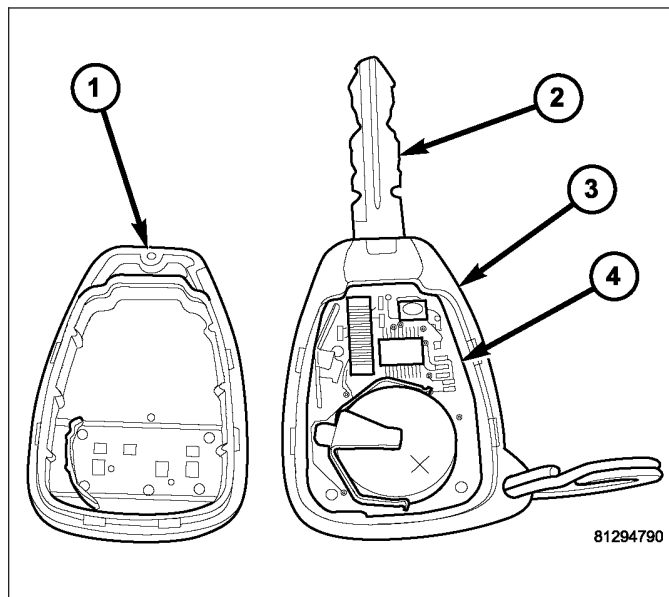
2. Position the ignition switch/lock assembly (3) up in behind the instrument panel and push rearward.
3. Install the two mounting nuts to the front of the instrument panel (1).
4. From underneath the ignition switch/lock assembly, tighten the lower retaining screw (3).
5. Reach up behind the left side of the center stack and connect the ignition switch (6) and SKREEM (5) electrical connectors.
6. Install the cluster bezel (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL).
7. Install the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).
8. Connect the battery negative cable.



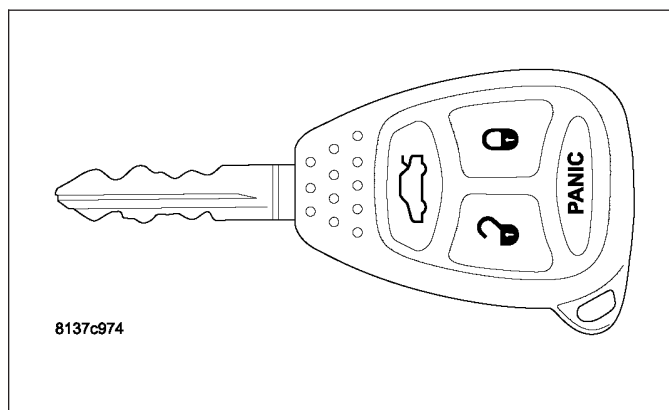
## TRANSPONDER KEY

### DESCRIPTION

Each ignition key (2) used in the Sentry Key Remote Entry System (SKREES) has a transponder chip included on the circuit board (4) beneath the cover (1) of the integral Remote Keyless Entry (RKE) transmitter (3). In addition to having to be cut to match the mechanical coding of the ignition lock cylinder and programmed for operation of the RKE system, each new Sentry Key has a unique transponder identification code that is permanently programmed into it by the manufacturer, and which must be programmed into the Sentry Key REMote Entry Module (SKREEM) to be recognized by the SKREES as a valid key.



The Sentry Key transponder cannot be adjusted or repaired. If faulty or damaged, the entire key and RKE transmitter unit must be replaced.



### OPERATION

When the ignition switch is turned to the On position, the Sentry Key REMote Entry Module (SKREEM) communicates through its antenna with the Sentry Key transponder using a Radio Frequency (RF) signal. The SKREEM then listens for a RF response from the transponder through the same antenna. The Sentry Key transponder chip is within the range of the SKREEM transceiver antenna ring when it is inserted into the ignition lock cylinder. The SKREEM determines whether a valid key is present in the ignition lock cylinder based upon the response from the transponder. If a valid key is detected, that fact is communicated by the SKREEM to the Powertrain Control Module (PCM) over the Controller Area Network (CAN) data bus, and the PCM allows the engine to continue running. If the PCM receives an invalid key message, or receives no message from the SKREEM over the CAN data bus, the engine will be disabled after about two seconds of operation. The ElectroMechanical Instrument Cluster (EMIC) will also respond to the invalid key message on the CAN data bus by flashing the security indicator on and off.

Each Sentry Key has a unique transponder identification code permanently programmed into it by the manufacturer. Likewise, the SKREEM has a unique Secret Key code programmed into it by the manufacturer. When a Sentry Key is programmed into the memory of the SKREEM, the SKREEM stores the transponder identification code from the Sentry Key, and the Sentry Key learns the Secret Key code from the SKREEM. Once the Sentry Key learns the Secret Key code of the SKREEM, it is permanently stored in the memory of the transponder. Therefore, once a Sentry Key has been programmed to a particular vehicle, it cannot be used on any other vehicle (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/TRANSPONDER KEY - STANDARD PROCEDURE).

The Sentry Key REmote Entry System (SKREES) performs a self-test each time the ignition switch is turned to the On position, and will store key-related fault information in the form of a Diagnostic Trouble Code (DTC) in SKREEM memory if a Sentry Key transponder problem is detected. The Sentry Key transponder chip can be diagnosed, and any stored DTC can be retrieved using a diagnostic scan tool. Refer to the appropriate diagnostic information.

Common communication problems:

- Two transponder keys too close together.
- Speed Pass too close to transponder key.

Solid indicator that there is a system failure.

- Loss of PCM communication.
- Failed antenna circuit.

## STANDARD PROCEDURE

### TRANSPONDER PROGRAMMING

All Sentry Keys included with the vehicle are pre-programmed to work with the Sentry Key Remote Entry System (SKREES) when it is shipped from the factory. The Sentry Key REmote Entry Module (SKREEM) can be programmed to recognize up to a total of eight Sentry Keys. When programming a blank Sentry Key transponder, the key must first be cut to match the ignition switch lock cylinder in the vehicle for which it will be used. Once the additional or new key has been cut, the SKREEM must be programmed to recognize it as a valid key. There are two possible methods to program the SKREEM to recognize a new or additional valid key, the Secured Access Method and the Customer Learn Method. Following are the details of these two programming methods.

### SECURED ACCESS METHOD

The Secured Access method applies to all vehicles. This method requires the use of a diagnostic scan tool. This method will also require that you have access to the unique four-digit PIN code that was assigned to the original SKREEM. The PIN code **must** be used to enter the Secured Access Mode in the SKREEM. This PIN number may be obtained from the vehicle owner, from the original vehicle invoice, or from the DaimlerChrysler Customer Center. Refer to the appropriate diagnostic information for the proper Secured Access method programming procedures.

**Note: The Remote Keyless Entry (RKE) Transmitter will also be programmed during this procedure.**

### CUSTOMER LEARN METHOD

The Customer Learn feature is only available on domestic vehicles, or those vehicles which have a U.S. country code designator. This programming method also requires access to at least two valid Sentry Keys. If two valid Sentry Keys are not available, or if the vehicle does not have a U.S. country code designator, the Secured Access Method **must** be used to program new or additional valid keys to the SKREEM. The Customer Learn programming method procedures are as follows:

1. Obtain the blank Sentry Key(s) that are to be programmed as valid keys for the vehicle. Cut the blank key(s) to match the ignition switch lock cylinder mechanical key codes.
2. Insert one of the two valid Sentry Keys into the ignition switch and turn the ignition switch to the On position.
3. After the ignition switch has been in the On position for longer than three seconds, but no more than fifteen seconds, cycle the ignition switch back to the Off position. Replace the first valid Sentry Key in the ignition switch lock cylinder with the second valid Sentry Key and turn the ignition switch back to the On position. The second valid Sentry Key must be inserted in the lock cylinder within fifteen seconds of removing the first valid key.
4. About ten seconds after the completion of Step 3, the security indicator in the instrument cluster will start to flash to indicate that the system has entered the Customer Learn programming mode.
5. Within sixty seconds of entering the Customer Learn programming mode, turn the ignition switch to the Off position, replace the valid Sentry Key with a blank Sentry Key transponder, and turn the ignition switch back to the On position.
6. About ten seconds after the completion of Step 5, the security indicator will stop flashing, stay on solid for three seconds, then turn off to indicate that the blank Sentry Key has been successfully programmed. The SKREES will immediately exit the Customer Learn programming mode. After the ignition is cycled the vehicle may be started using the newly programmed valid Sentry Key.



**Note:** The Remote Keyless Entry (RKE) Transmitter will also be programmed during this procedure.

Each of these steps must be repeated and completed in their entirety for each additional Sentry Key that is to be programmed. If the above steps are not completed in the given sequence, or within the allotted time, the SKREEM will exit the Customer Learn programming mode and the programming will be unsuccessful. The SKREEM will also automatically exit the Customer Learn programming mode if it sees a non-blank Sentry Key transponder when it should see a blank, if it has already programmed eight (8) valid Sentry Keys, or if the ignition switch is turned to the Off position for more than about fifty seconds.

**Note:** If an attempt is made to start the vehicle while in the Customer Learn mode (security indicator flashing), the SKIS will respond as though the vehicle were being started with an invalid key. In other words, the engine will stall after about two seconds of operation. No faults will be set.

**Note:** Once a Sentry Key has been programmed as a valid key to a vehicle, it cannot be programmed as a valid key for use on any other vehicle.

## VTSS/SKIS INDICATOR LAMP

### DESCRIPTION

The Sentry Key Remote Entry System (SKREES) uses an indicator light to convey information on the status of the system to the customer. This light is shared with the Vehicle Theft Security System (VTSS). The light is located in the instrument panel switch pod, just to the right of the cluster. The indicator light is controlled by the Cab Compartment Node (CCN), via the Controller Area Network (CAN) data bus based upon messages it receives from the Sentry Key Remote Entry Module (SKREEM) on the CAN data bus, and is hard wired to the cluster.

### OPERATION

The VTSS/SKREES lamp is controlled according to Sentry Key Remote Entry (SKREEM) messages. Then, the SKREEM sends messages to the Cab Compartment Node (CCN) to operate the light based upon the results of the SKREES self tests. The light may be actuated in two possible ways, flashing or on solid. If the light comes on and stays on solid after a power-up test, this indicates that the SKREEM has detected a system malfunction. If the SKREEM detects an invalid key when the ignition switch is moved to the ON position, it sends a message on the CAN bus to the CCN, to flash the light. The SKREEM can also send a message to flash the light and generate a single audible chime at the same time. These two events occurring simultaneously indicate that the SKREES has been placed into the "Customer Learn" mode (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/TRANSPONDER KEY - STANDARD PROCEDURE). If the light comes on and stays on after the power-up test, diagnosis of the SKREES should be performed using a scan tool and the appropriate diagnostic information. The light is not a serviceable component.

# WIPERS/WASHERS

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## WIPERS/WASHERS - ELECTRICAL DIAGNOSTICS

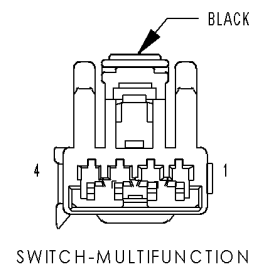
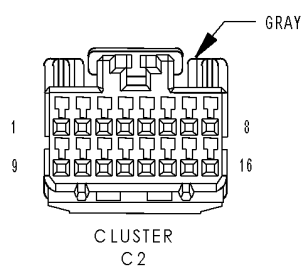
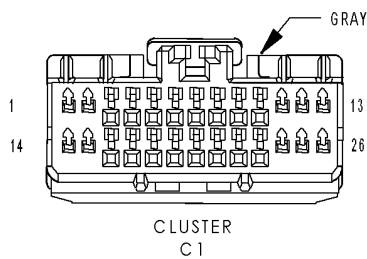
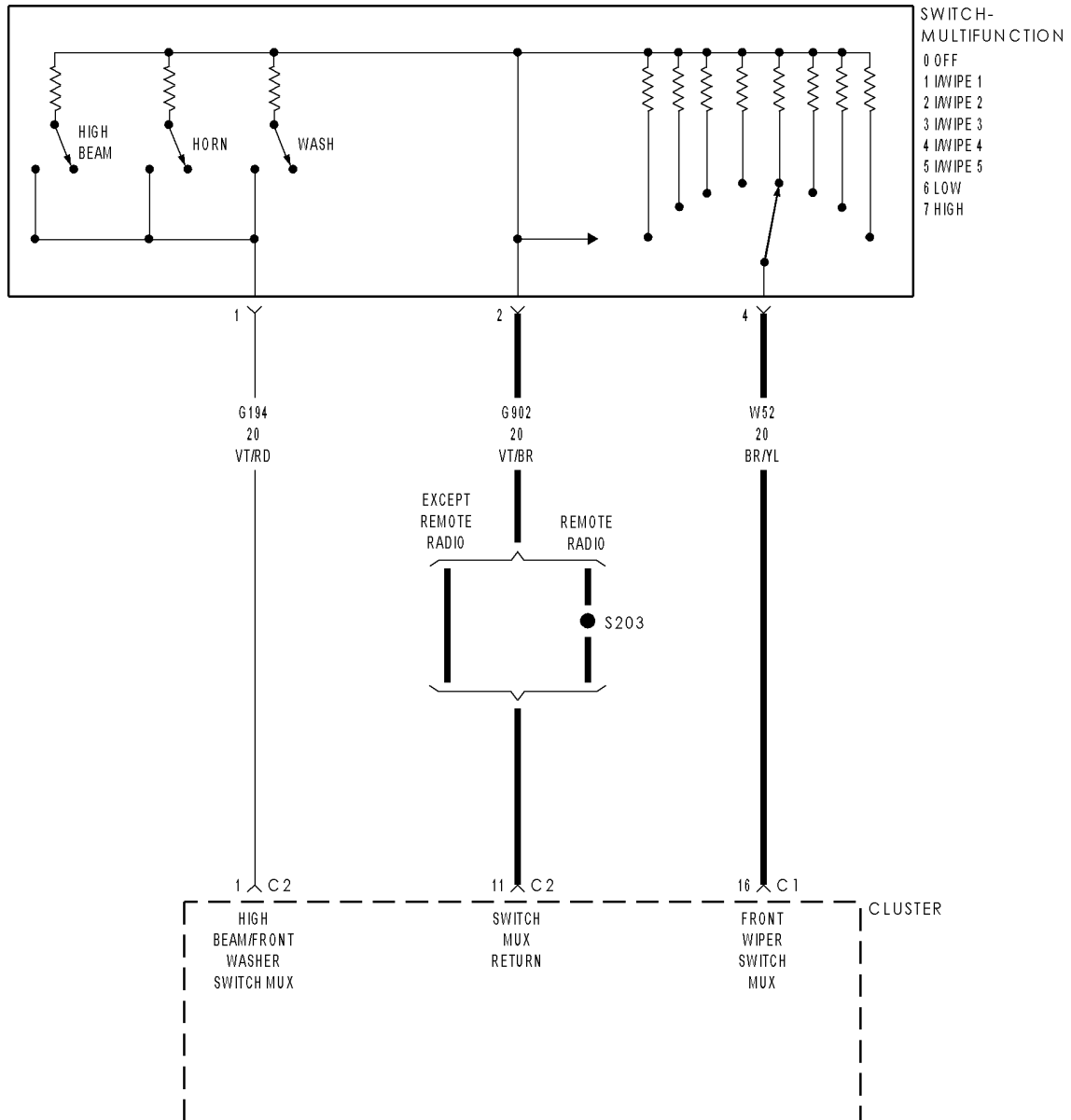
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## WIPERS/WASHERS - ELECTRICAL DIAGNOSTICS

### DIAGNOSIS AND TESTING



**B2301-WIPER MODE SWITCH INPUT CIRCUIT LOW**

**B2301-WIPER MODE SWITCH INPUT CIRCUIT LOW (CONTINUED)**

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the Instrument Cluster detects a short/LOW condition.

Possible Causes
MULTIFUNCTION SWITCH SENSE CIRCUIT SHORTED LOW INSTRUMENT CLUSTER

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all CCN DTC's.

Turn the Wipers ON then OFF.

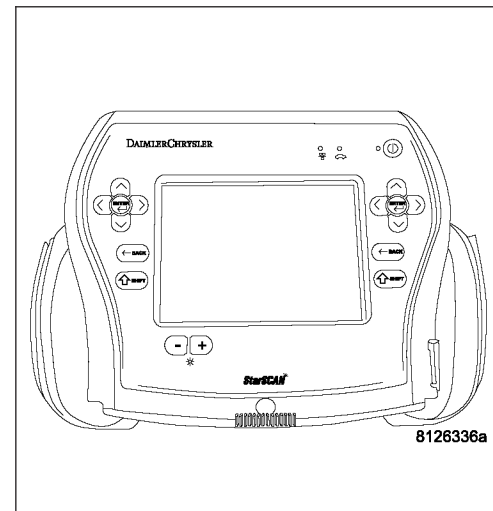
With the Scan Tool, read the Wiper DTC's.

**Does the Scan Tool read: B2301-WIPER MODE SWITCH INPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST — VER 1.

**2. MULTIFUNCTION SWITCH**

Turn the ignition off.

Disconnect the Multifunction Switch harness connector.

Ensure the switch is in the OFF position.

Measure the internal resistance of the Multifunction Switch between the G902 and W52 circuits.

**Does the Switch measure more than 5.0 ohms?**

**Yes** >> Replace the Multifunction Switch in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Go To 3

**B2301-WIPER MODE SWITCH INPUT CIRCUIT LOW (CONTINUED)****3. INSTRUMENT CLUSTER**

Turn the ignition off.

Disconnect the Multifunction Switch connector.

Disconnect the Instrument Cluster C1 harness connector.

Measure the resistance of the (W2) MUX circuit to ground.

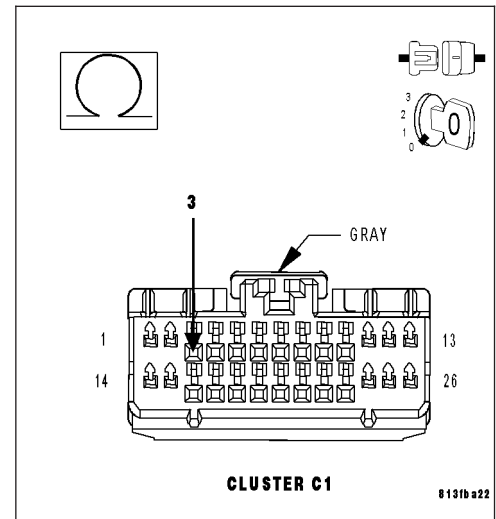
**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (W2) MUX circuit for a short to ground condition.

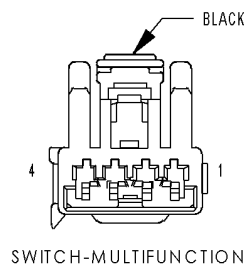
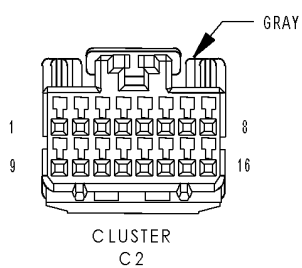
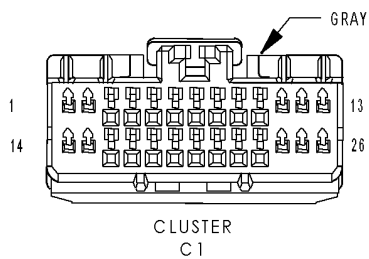
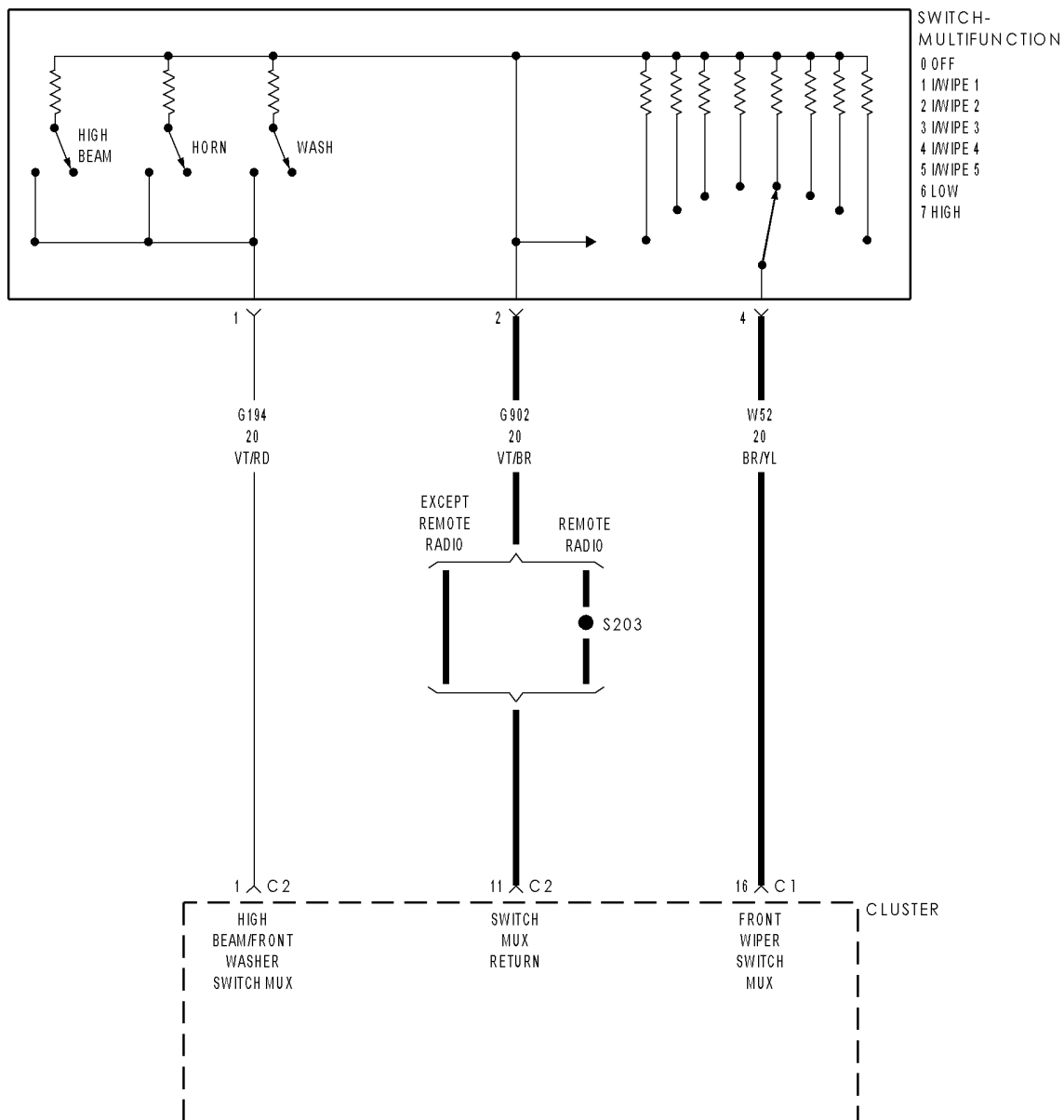
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Replace the Instrument Cluster in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.



# B2302-WIPER MODE SWITCH INPUT CIRCUIT HIGH



**B2302-WIPER MODE SWITCH INPUT CIRCUIT HIGH (CONTINUED)**

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the Instrument Cluster detects a short/HIGH condition.

Possible Causes
MULTIFUNCTION SWITCH SENSE CIRCUIT OPEN INSTRUMENT CLUSTER

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

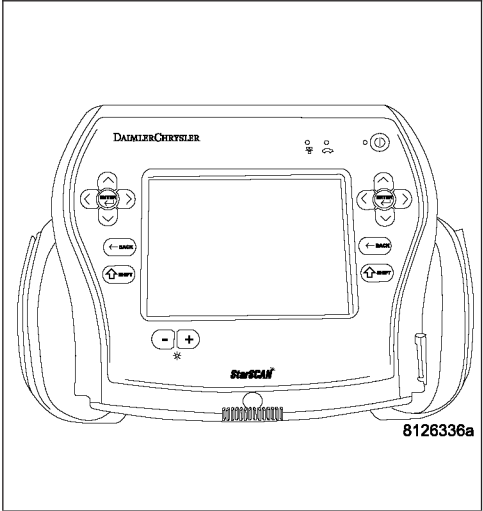
**Diagnostic Test**

**1. INTERMITTENT CONDITION**

Turn the ignition on.  
With the Scan Tool, clear all CCN DTC's.  
Turn the Wipers ON then OFF.  
With the Scan Tool, read the Wiper DTC's.

**Does the Scan Tool read: B2302-WIPER MODE SWITCH INPUT CIRCUIT HIGH?**

- Yes**    >> Go To 2
- No**    >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.



**2. MULTIFUNCTION SWITCH**

Turn the ignition off.  
Disconnect the Multifunction Switch harness connector.  
Ensure the switch is in the OFF position.  
Measure the internal resistance of the Multifunction Switch between the G902 and W52 circuits.

**Does the Switch measure more than 5.0 ohms?**

- Yes**    >> Replace the Multifunction Switch in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.
- No**    >> Go To 3

**B2302-WIPER MODE SWITCH INPUT CIRCUIT HIGH (CONTINUED)****3. INSTRUMENT CLUSTER**

Turn the ignition off.

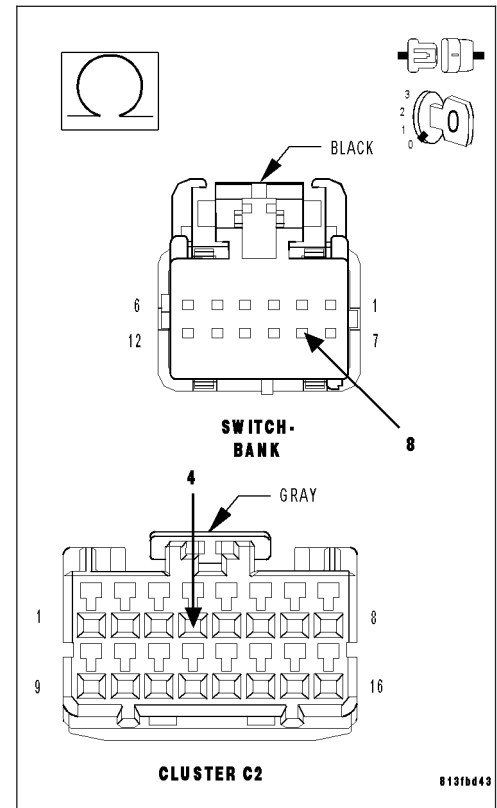
Disconnect the Multifunction Switch connector.

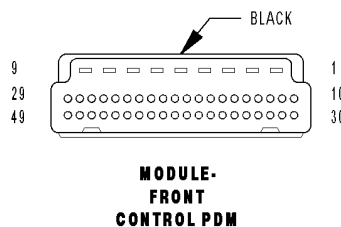
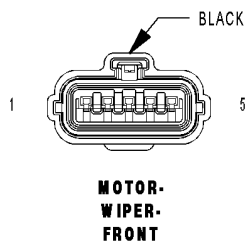
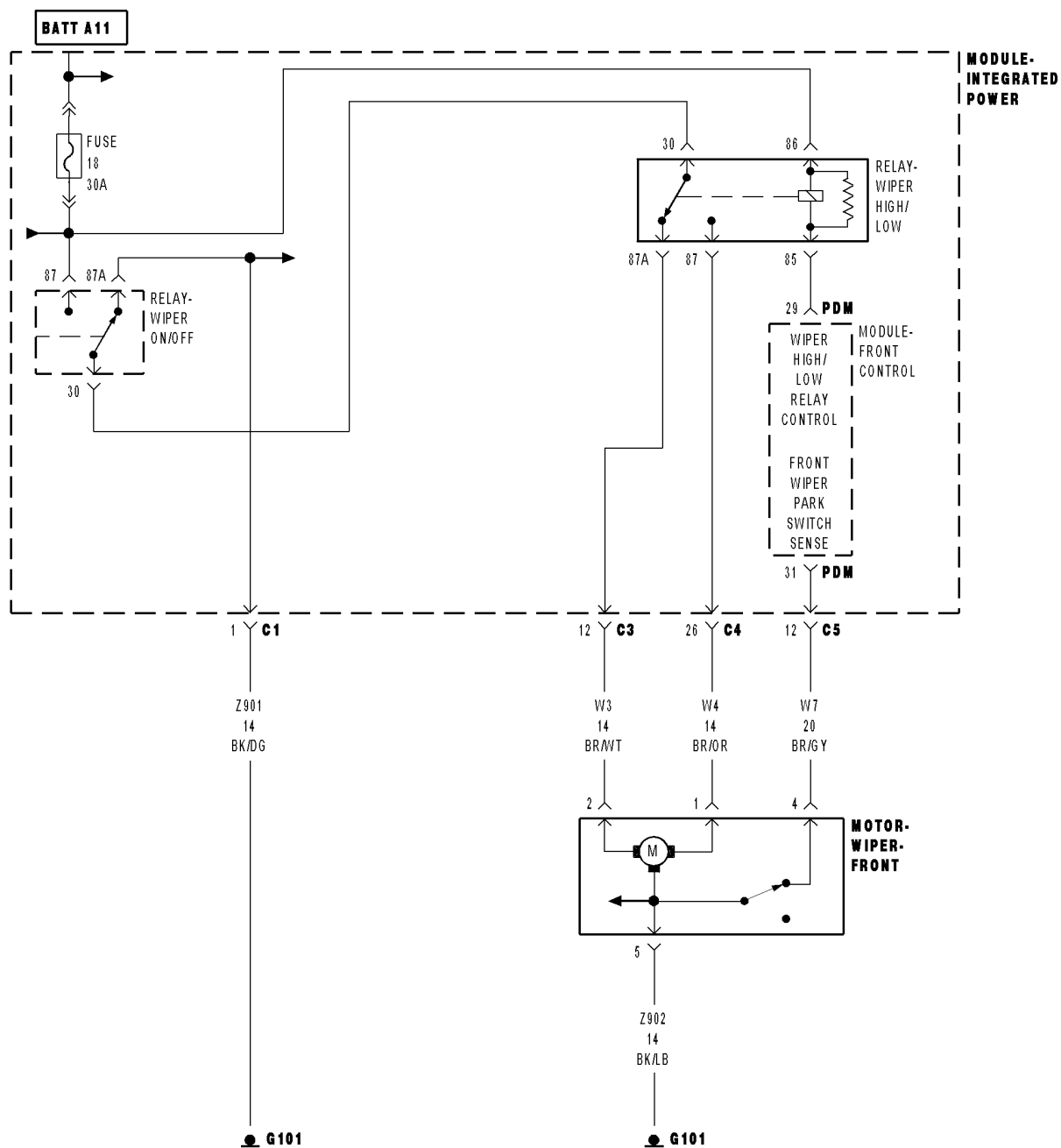
Disconnect the Instrument Cluster C1 harness connector.

Measure the resistance of the (W2) MUX circuit.

**Is the resistance above 5.0 ohms?**

- Yes** >> Repair the (W2) MUX circuit for an open condition.  
Perform the BODY VERIFICATION TEST — VER 1.
- No** >> Replace the Instrument Cluster in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.



**B2304-WIPER PARK SWITCH INPUT CIRCUIT LOW**

**B2304-WIPER PARK SWITCH INPUT CIRCUIT LOW (CONTINUED)**

For the Front/Rear Wipers/Washers circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
MULTIFUNCTION SWITCH (W7) FRONT WIPER PARK SWITCH SENSE CIRCUIT LOW FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

Turn the Wipers on.

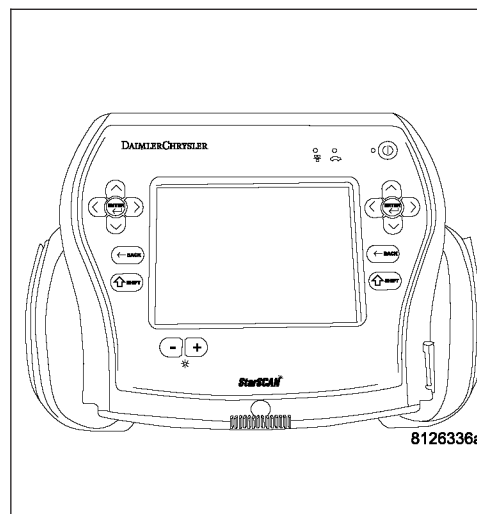
With the Scan Tool, read the Wiper DTC's.

**Does the Scan Tool read: B2304-WIPER PARK SWITCH INPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.

Perform the BODY VERIFICATION TEST — VER 1.

**2. MULTIFUNCTION SWITCH**

Turn the ignition off.

Disconnect the Multifunction Switch connector.

Measure the internal resistance of the Multifunction Switch between cavity 1 and 4 of the switch.

**Is the resistance above 5.0 ohms?**

**Yes** >> Replace the Multifunction Switch in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Go To 3



**B2304-WIPER PARK SWITCH INPUT CIRCUIT LOW (CONTINUED)****3. FRONT CONTROL MODULE**

Turn the ignition off.

Disconnect the Multifunction Switch connector.

Disconnect the FCM C1 harness connector.

Measure the resistance between ground and the (W7) Front Wiper Park Switch Sense circuit.

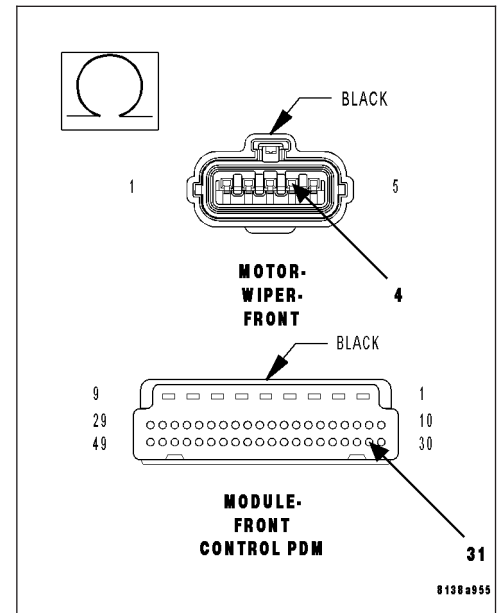
**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (W7) Front Wiper Park Switch Sense circuit for a short condition.

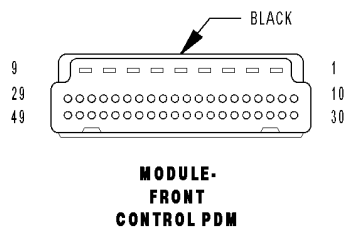
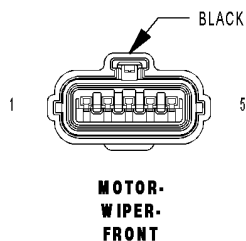
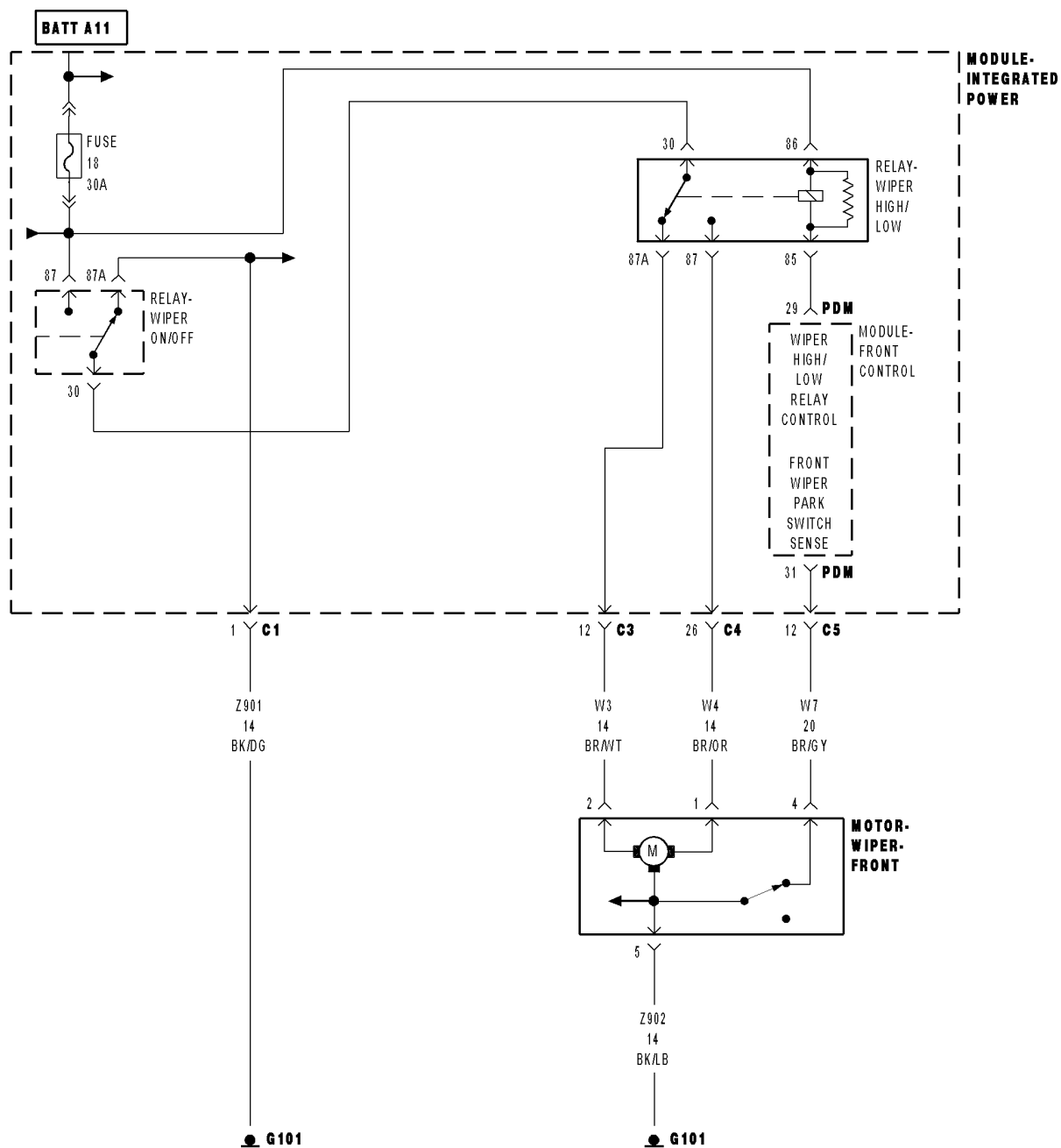
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Replace the Front Control Module in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.



# B2305-WIPER PARK SWITCH INPUT CIRCUIT HIGH



**B2305-WIPER PARK SWITCH INPUT CIRCUIT HIGH (CONTINUED)**

For the Rear Wipers/Washers circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
MULTIFUNCTION SWITCH (W7) FRONT WIPER PARK SWITCH SENSE CIRCUIT HIGH FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

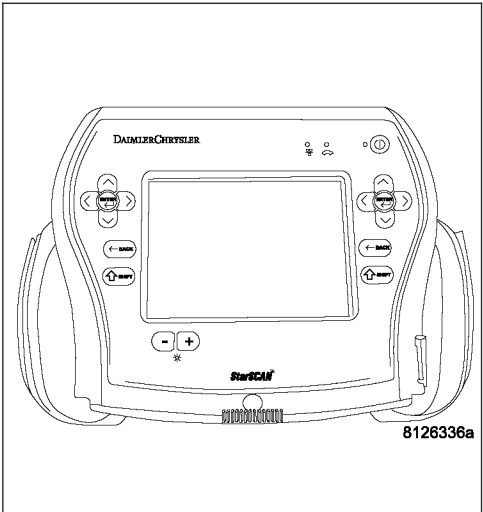
**Diagnostic Test**

**1. INTERMITTENT CONDITION**

Turn the ignition on.  
With the Scan Tool, clear all FCM DTC's.  
Turn the Front Wipers on.  
With the Scan Tool, read the Front Wiper DTC's.

**Does the Scan Tool read: B2305-WIPER PARK SWITCH INPUT CIRCUIT HIGH?**

- Yes**    >> Go To 2
- No**    >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.



**2. MULTIFUNCTION SWITCH**

Turn the ignition off.  
Disconnect the Multifunction Switch connector.  
Measure the internal resistance of the Multifunction Switch between cavity 2 and 4 of the switch.

**Is the resistance above 5.0 ohms?**

- Yes**    >> Replace the Multifunction Switch in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.
- No**    >> Go To 3

**B2305-WIPER PARK SWITCH INPUT CIRCUIT HIGH (CONTINUED)****3. FRONT CONTROL MODULE**

Turn the ignition off.

Disconnect the Multifunction Switch connector.

Disconnect the FCM C1 harness connector.

Measure the resistance of the (W7) Front Wiper Park Switch Sense circuit.

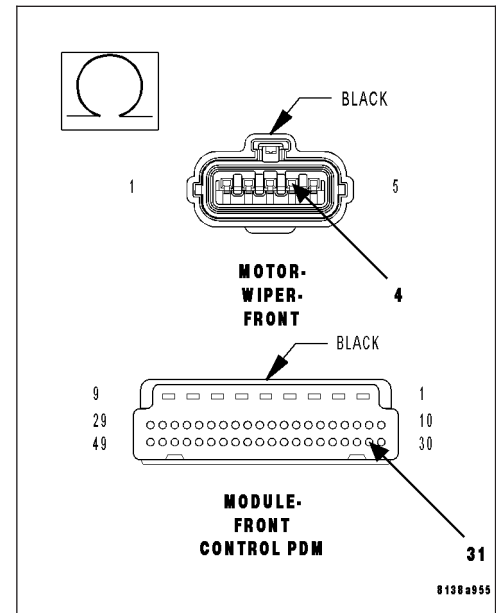
**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (W7) Front Wiper Park Switch Sense circuit for an open condition.

Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Replace the Front Control Module in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.



**SWITCH-MULTIFUNCTION**

- 0 OFF
- 1 W/ WIPE 1
- 2 W/ WIPE 2
- 3 W/ WIPE 3
- 4 W/ WIPE 4
- 5 W/ WIPE 5
- 6 LOW
- 7 HIGH

**CLUSTER C2**

1 HIGH BEAM/FRONT WASHER SWITCH MUX

11 SWITCH MUX RETURN

16 FRONT WIPER SWITCH MUX

Wiring components and labels:

- G194 20 VT/RD
- G902 20 VT/BR
- W52 20 BR/YL
- S203
- C2
- C1

Physical components and labels:

- BLACK
- GRAY
- 1, 4, 16
- 1, 8, 9, 16

SWITCH-MULTIFUNCTION

CLUSTER C2

812cfe9

**B2307-WASHER SWITCH INPUT CIRCUIT LOW (CONTINUED)**

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the Instrument Cluster detects a short condition.

Possible Causes
MULTIFUNCTION SWITCH (G194) SWITCH MUX CIRCUIT OPEN INSTRUMENT CLUSTER

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all CCN DTC's.

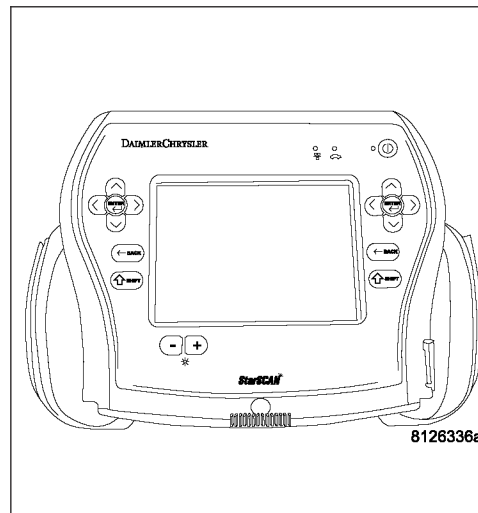
Turn the Washers ON then OFF.

With the Scan Tool, read the Washer DTC's.

**Does the Scan Tool read: B2301-WIPER MODE SWITCH INPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.

**2. MULTIFUNCTION SWITCH**

Turn the ignition off.

Disconnect the Multifunction Switch harness connector.

Ensure the switch is in the OFF position.

Measure the internal resistance of the Multifunction Switch between the G902 and G194 circuits.

**Does the Switch measure more than 5.0 ohms?**

**Yes** >> Replace the Multifunction Switch in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Go To 3

**B2307-WASHER SWITCH INPUT CIRCUIT LOW (CONTINUED)****3. INSTRUMENT CLUSTER**

Turn the ignition off.

Disconnect the Multifunction Switch connector.

Disconnect the Instrument Cluster C2 harness connector.

Measure the resistance of the (G194) MUX circuit to ground.

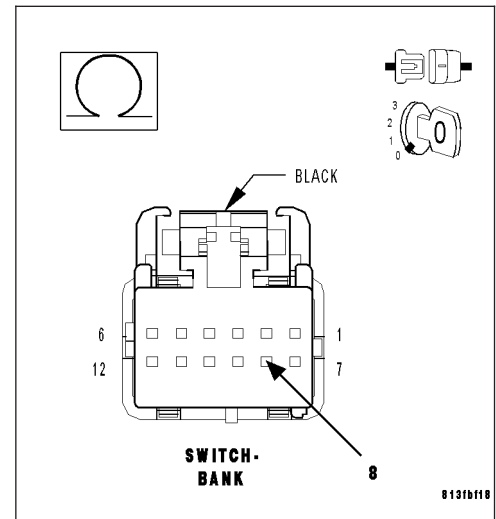
**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (G194) MUX circuit for a short to ground condition.

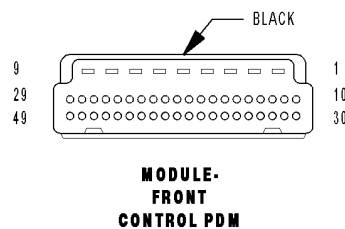
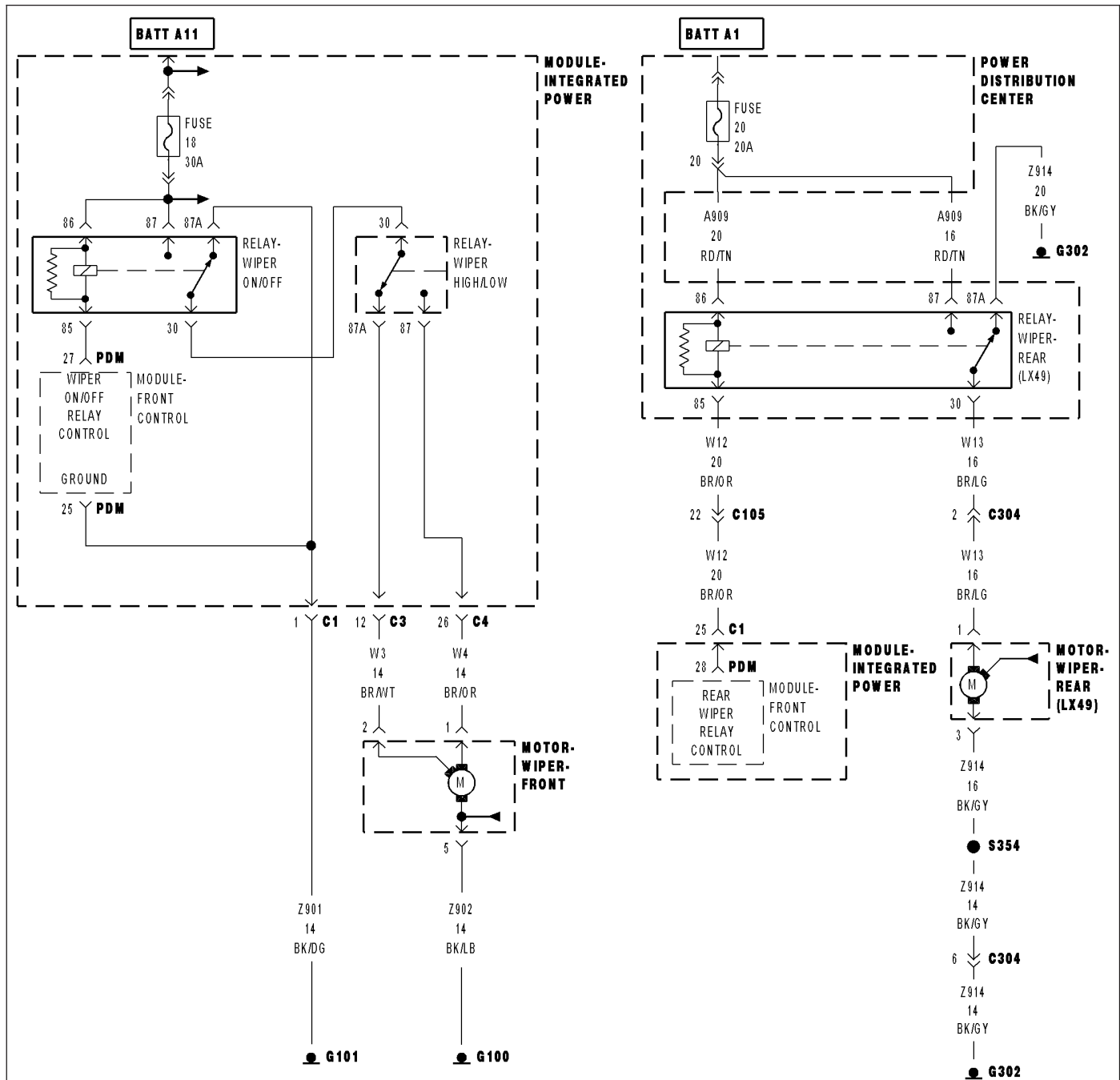
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Replace the Instrument Cluster in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.



## B2313-WIPER ON/OFF CONTROL CIRCUIT LOW





**B2313-WIPER ON/OFF CONTROL CIRCUIT LOW (CONTINUED)**

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the FCM detects a short/low condition.

Possible Causes
WIPER ON/OFF RELAY
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

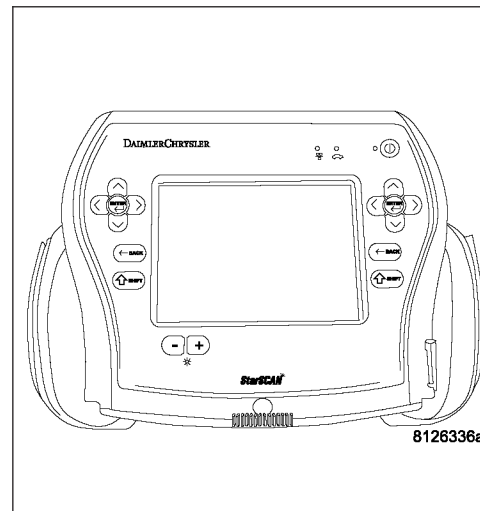
Turn the Wipers ON then OFF.

With the Scan Tool, read the Wiper DTC's.

**Does the Scan Tool read: B2313-WIPER ON/OFF CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.

**2. WIPER ON/OFF RELAY**

Turn the ignition off.

Install a substitute relay in place of the Wiper On/Off Relay.

Turn the ignition on.

With the Scan Tool, read the DTC's.

**Does the Scan Tool read: B2313-WIPER ON/OFF CONTROL CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the Wiper On/Off Relay in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

**B2313-WIPER ON/OFF CONTROL CIRCUIT LOW (CONTINUED)****3. Front Control Module**

Turn the ignition off.

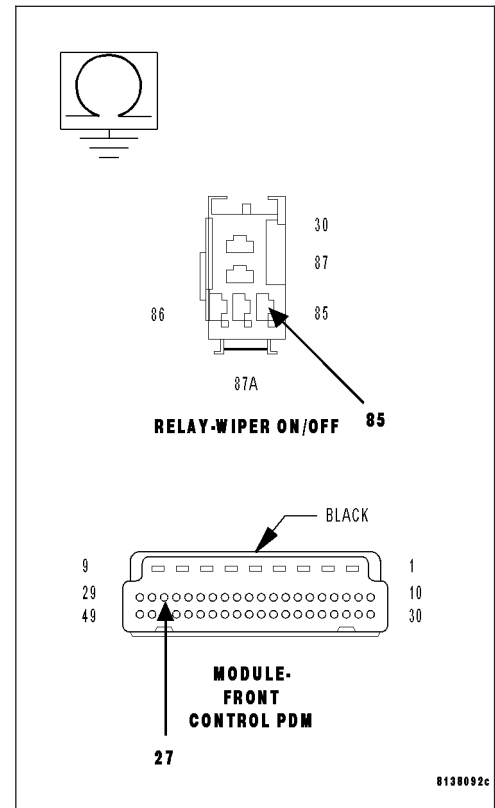
Remove the Wiper On/Off Relay.

Disconnect the FCM C3 harness connector.

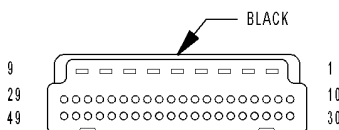
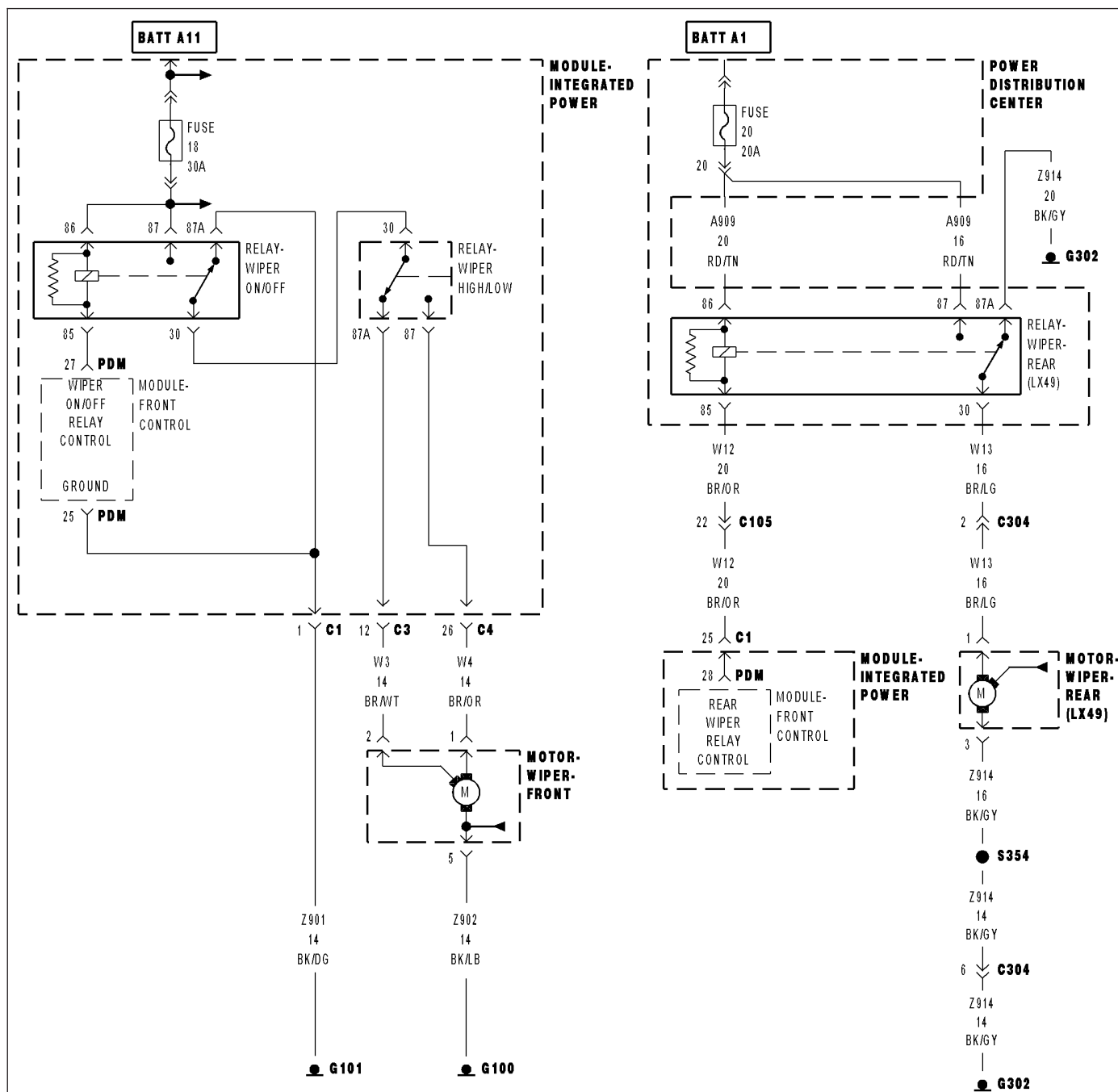
Measure the resistance between ground and the Wiper On/Off Relay Control circuit in the PDC.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Power Distribution Center in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.
- No** >> Replace the Front Control Module in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.



## B2314-WIPER ON/OFF CONTROL CIRCUIT HIGH



MODULE-FRONT CONTROL PDM

**B2314-WIPER ON/OFF CONTROL CIRCUIT HIGH (CONTINUED)**

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the FCM detects a short/HIGH condition.

Possible Causes
WIPER ON/OFF RELAY
POWER DISTRIBUTION CENTER
FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

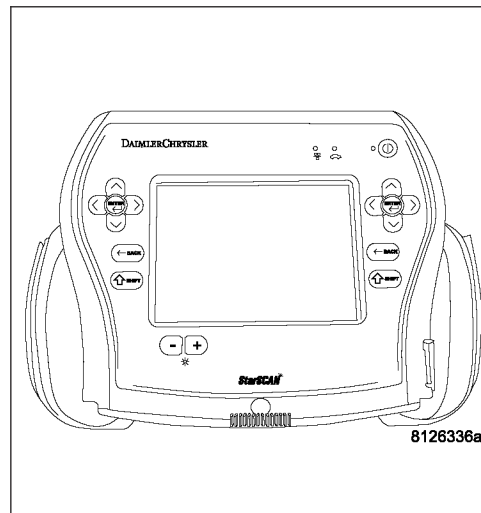
Turn the Wipers ON then OFF.

With the Scan Tool, read the Wiper DTC's.

**Does the Scan Tool read: B2314-WIPER ON/OFF CONTROL CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.

**2. WIPER ON/OFF RELAY**

Turn the ignition off.

Remove the Wiper On/Off Relay.

Turn the ignition on.

Activate the Wiper Switch to all speed positions.

With the Scan Tool, read the DTC's.

**Does the Scan Tool read: B2314-WIPER ON/OFF CONTROL CIRCUIT HIGH?**

**Yes** >> Replace the Wiper On/Off Relay in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Go To 3

**B2314-WIPER ON/OFF CONTROL CIRCUIT HIGH (CONTINUED)****3. FRONT CONTROL MODULE**

Turn the ignition off.

Remove the Wiper On/Off Relay.

Disconnect the FCM C3 harness connector.

Measure the voltage between ground and the Wiper On/Off Relay Control circuit in the PDC.

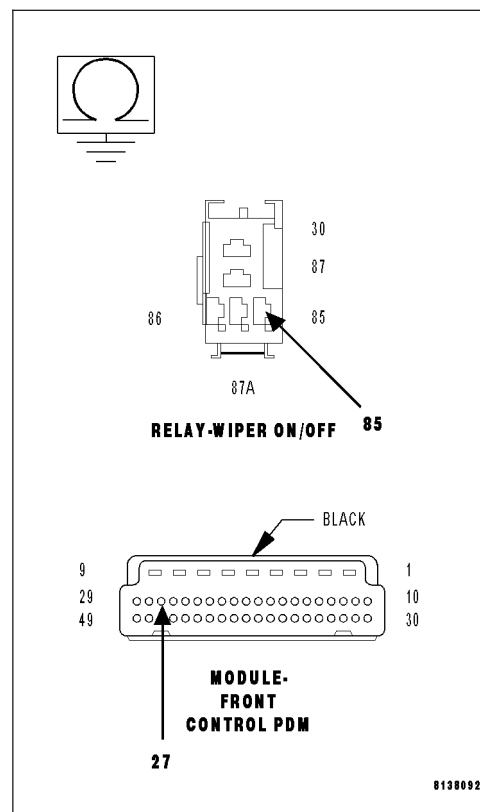
**Is there any voltage present?**

**Yes** >> Replace the Power Distribution Center in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Replace the Front Control Module in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.





**B2317-WIPER HI/LOW CONTROL CIRCUIT LOW (CONTINUED)**

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the FCM detects a short/low condition.

Possible Causes
WIPER HIGH/LOW RELAY POWER DISTRIBUTION CENTER FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

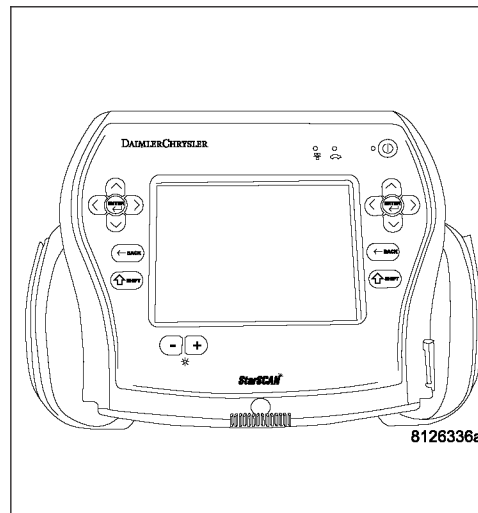
Turn the Wipers from High to Low.

With the Scan Tool, read the Wiper DTC's.

**Does the Scan Tool read: B2317-WIPER HI/LOW CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.

**2. WIPER HI/LOW RELAY**

Turn the ignition off.

Install a substitute relay in place of the Wiper Hi/Low Relay.

Turn the ignition on.

With the Scan Tool, read the DTC's.

**Does the Scan Tool read: B2317-WIPER HI/LOW CONTROL CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the Wiper Hi/Low Relay in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

**B2317-WIPER HI/LOW CONTROL CIRCUIT LOW (CONTINUED)****3. FRONT CONTROL MODULE**

Turn the ignition off.

Remove the Wiper Hi/Low Relay.

Disconnect the FCM C3 harness connector.

Measure the resistance between ground and the Wiper Hi/Low Relay Control circuit in the PDC.

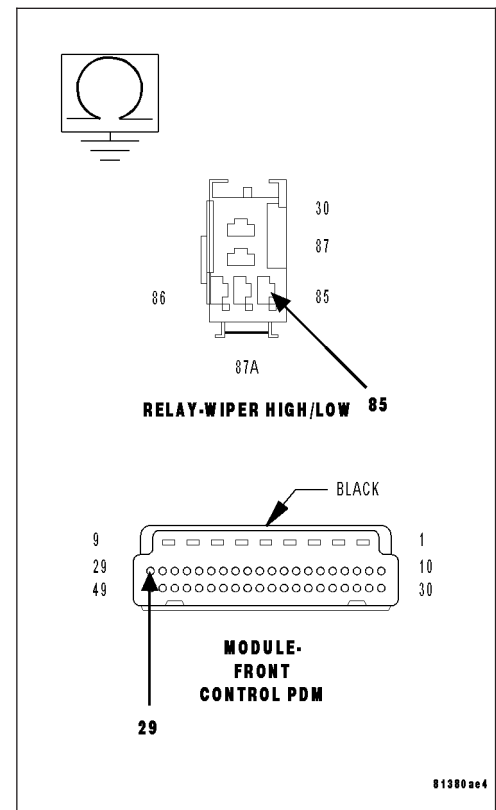
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Power Distribution Center in accordance with the service information.

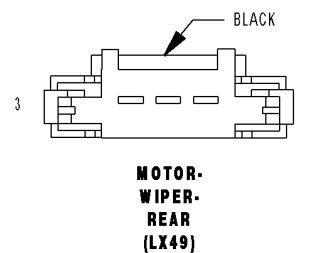
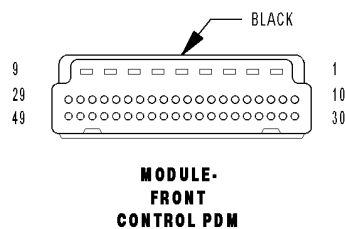
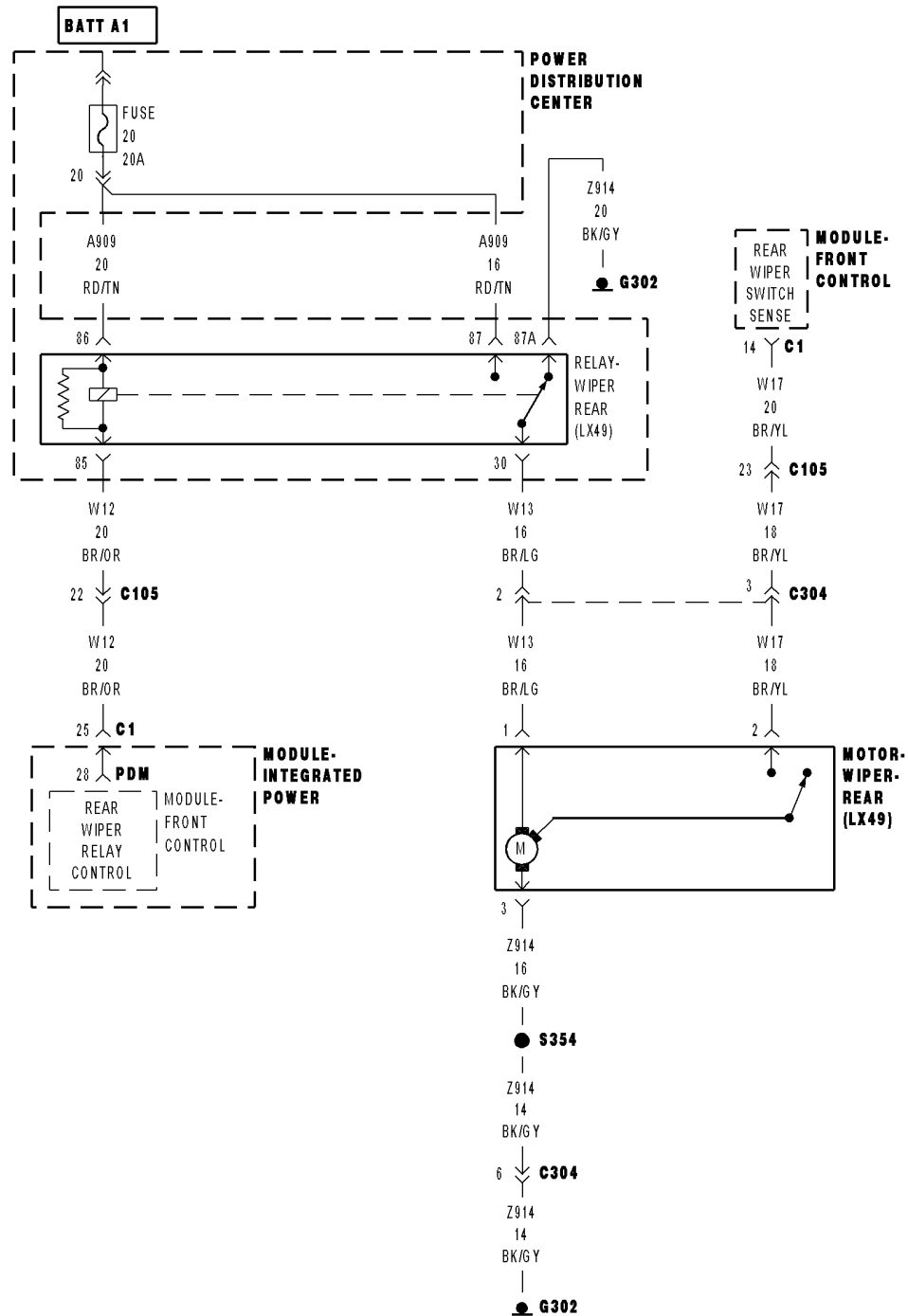
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Replace the Front Control Module in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.





**B2318-WIPER HI/LOW CONTROL CIRCUIT HIGH**

**B2318-WIPER HI/LOW CONTROL CIRCUIT HIGH (CONTINUED)**

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the FCM detects a short/HIGH condition.

Possible Causes
WIPER HIGH/LOW RELAY POWER DISTRIBUTION CENTER FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

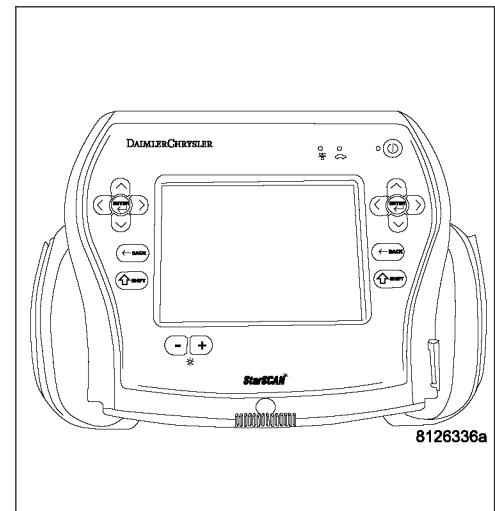
Turn the Wipers to Low then High.

With the Scan Tool, read the Wiper DTC's.

**Does the Scan Tool read: B2318-WIPER HI/LOW CONTROL CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.

**2. WIPER HIGH/LOW RELAY**

Turn the ignition off.

Remove the Wiper Hi/Low Relay.

Turn the ignition on.

Activate the Wiper Switch to all speed positions.

With the Scan Tool, read the DTC's.

**Does the Scan Tool read: B2318-WIPER HI/LOW CONTROL CIRCUIT HIGH?**

**Yes** >> Replace the Wiper Hi/Low Relay in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Go To 3

**B2318-WIPER HI/LOW CONTROL CIRCUIT HIGH (CONTINUED)****3. FRONT CONTROL MODULE**

Turn the ignition off.

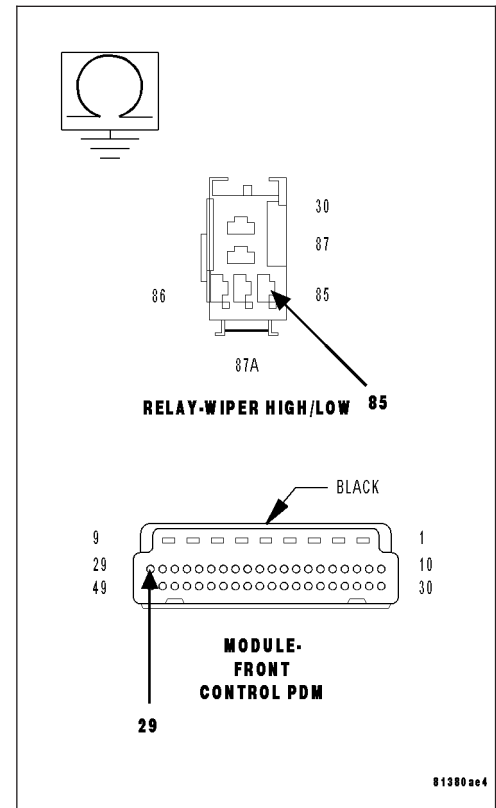
Remove the Wiper Hi/Low Relay.

Disconnect the FCM C3 harness connector.

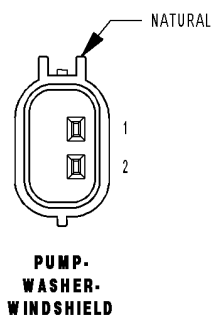
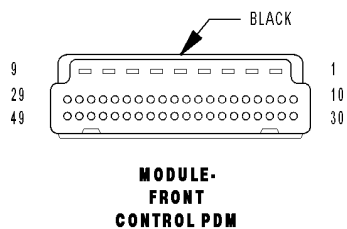
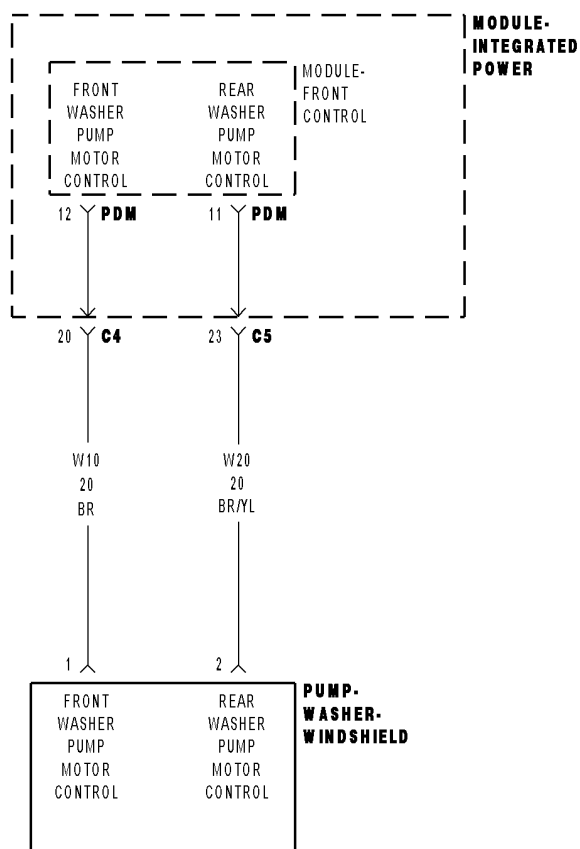
Measure the voltage between ground and the (W2) Wiper Hi/Low Relay Control circuit in the PDC.

**Is there any voltage present?**

- Yes** >> Replace the Power Distribution Center in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.
- No** >> Replace the Front Control Module in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.



## B231F-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT LOW



**B231F-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT LOW (CONTINUED)**

For the Wiper/Washer system circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- With the ignition on.
- **Set Condition:**
- When the FCM detects a short/low condition on the washer Pump Motor Control circuit.

Possible Causes
(W10)/(W20) WASHER PUMP MOTOR CONTROL CIRCUIT WIPER WASHER PUMP POWER DISTRIBUTION CENTER FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

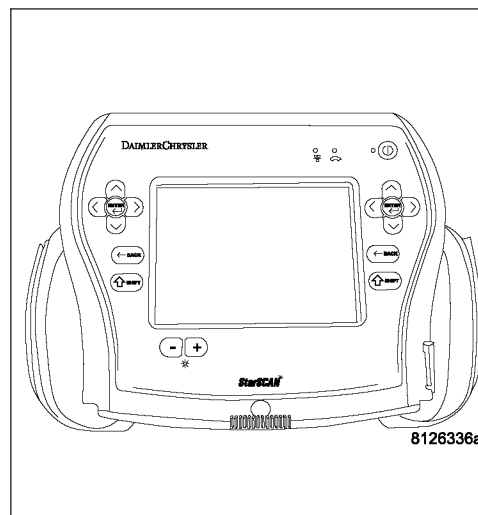
Turn the Washers on.

With the Scan Tool, read the Wiper/Washers DTC's.

**Does the Scan Tool read: B231F-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.

**2. WASHER PUMP MOTOR**

Turn the ignition off.

Disconnect the Washer Pump Motor connector.

Turn the ignition on.

With the Scan Tool, read the DTC's.

**Does the Scan Tool read: B231F-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT LOW?**

**Yes** >> Replace the Washer Pump Motor in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Go To 3

**B231F-FRONT/REAR WASHER MOTOR CONTROL CIRCUIT LOW (CONTINUED)****3. WASHER PUMP MOTOR CONTROL CIRCUIT**

Turn the ignition off.

Disconnect the Washer Pump Motor harness connector.

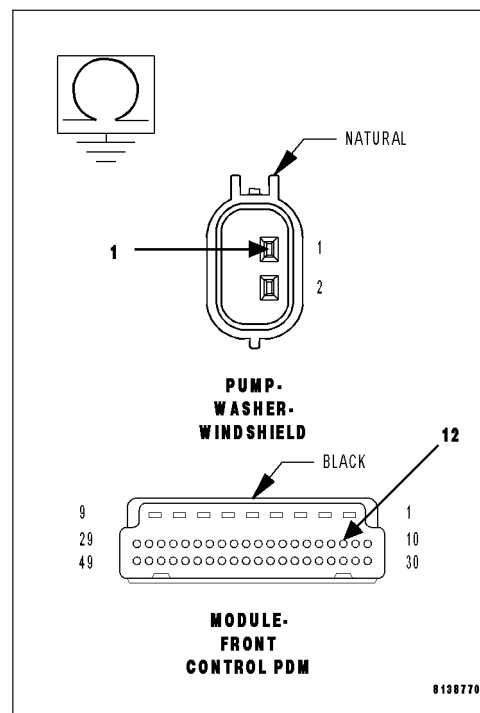
Disconnect the FCM C3 harness connector.

Measure the resistance between ground and the (W10) Washer Pump Motor Control circuit in the.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the Washer Pump Motor Control circuit.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Go To 4

**4. FRONT CONTROL MODULE**

Turn the ignition off.

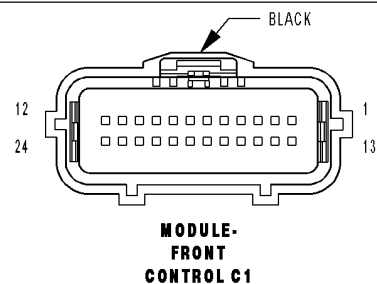
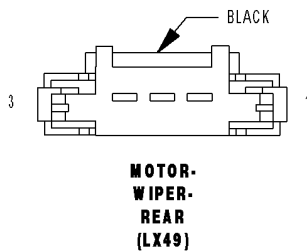
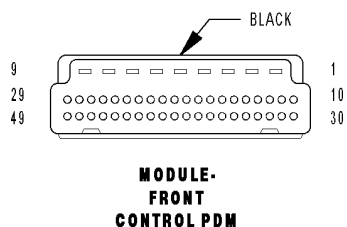
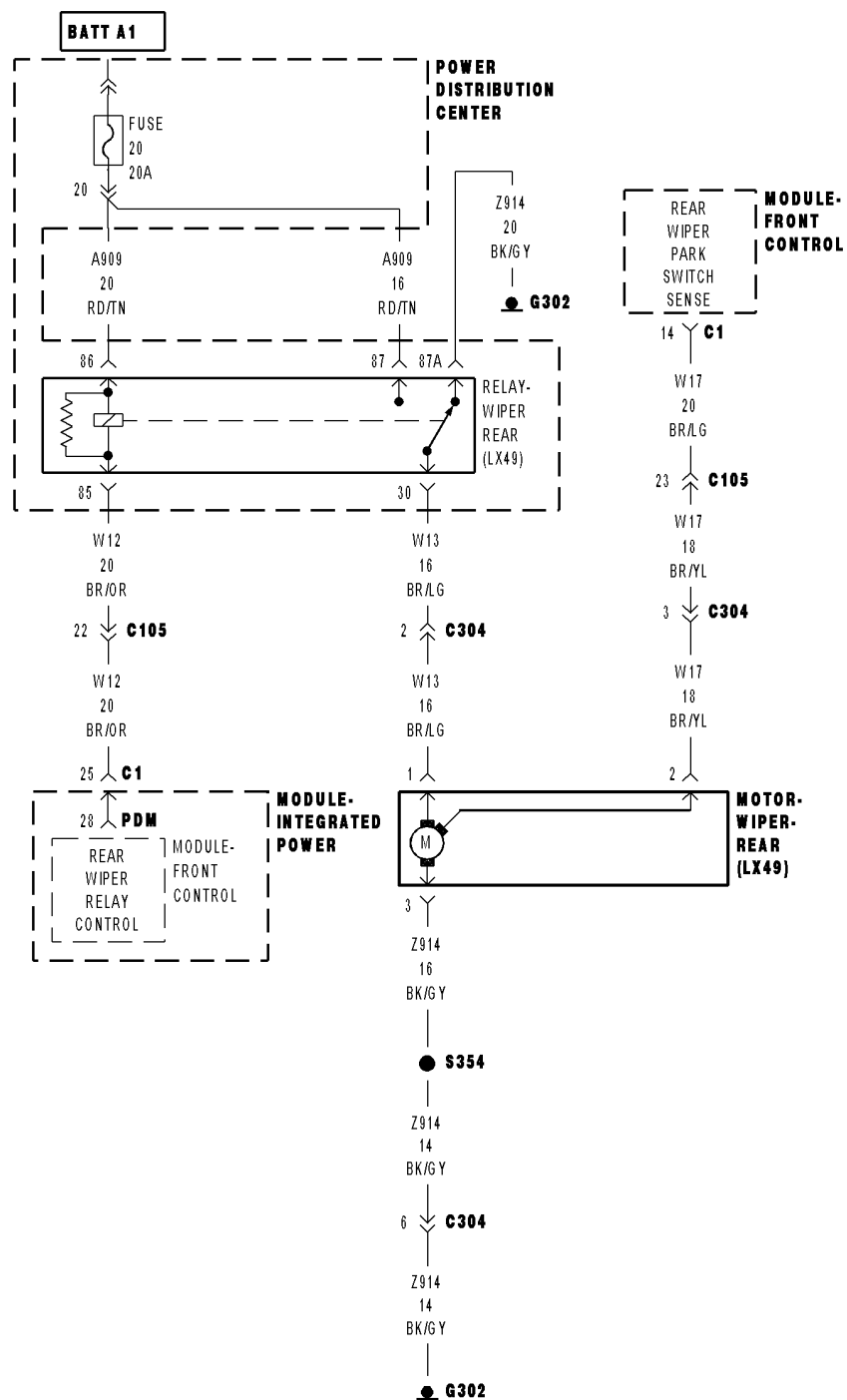
Disconnect the FCM from the PDC.

Measure the resistance between ground and the (W10) Washer Pump Motor Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Power Distribution Center in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Replace the Front Control Module in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

**B230D-REAR WIPER PARK SWITCH INPUT CIRCUIT LOW**

**B230D-REAR WIPER PARK SWITCH INPUT CIRCUIT LOW (CONTINUED)**

For the Rear Wipers/Washers circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
WIPER/WASHER SWITCH (W17) REAR WIPER PARK SWITCH SENSE CIRCUIT LOW FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

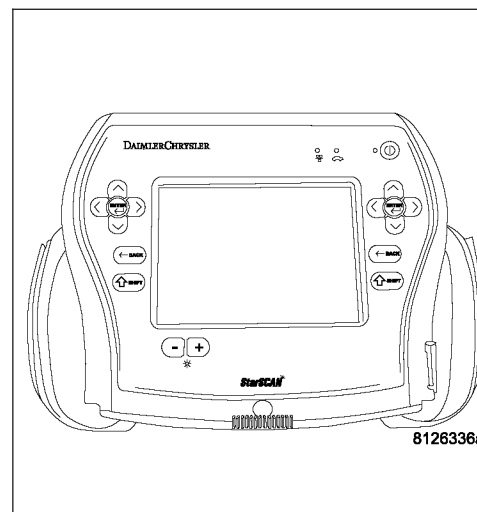
Turn the Rear Wipers on.

With the Scan Tool, read the Rear Wiper DTC's.

**Does the Scan Tool read: B230D-REAR WIPER PARK SWITCH INPUT CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.

**2. WIPER/WASHER SWITCH**

Turn the ignition off.

Disconnect the Rear Wiper/Washer Switch connector.

Measure the internal resistance of the Wiper/Washer Switch between cavity 1 and 2 of the switch.

**Is the resistance above 5.0 ohms?**

**Yes** >> Replace the Rear Wiper/Washer Switch in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Go To 3



**B230D-REAR WIPER PARK SWITCH INPUT CIRCUIT LOW (CONTINUED)****3. FRONT CONTROL MODULE**

Turn the ignition off.

Disconnect the Rear Wiper/Washer Switch connector.

Disconnect the FCM C1 harness connector.

Measure the resistance between ground and the (W17) Rear Wiper Park Switch Sense circuit.

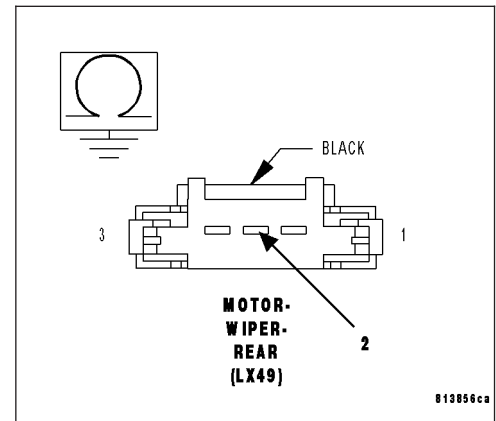
**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (W17) Rear Wiper Park Switch Sense circuit for a short condition.

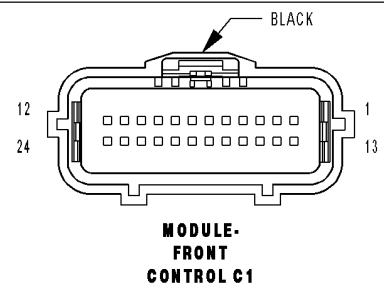
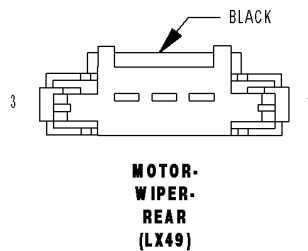
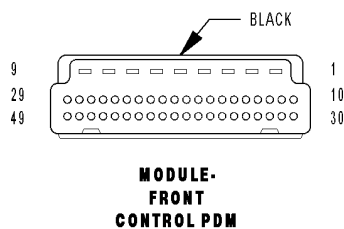
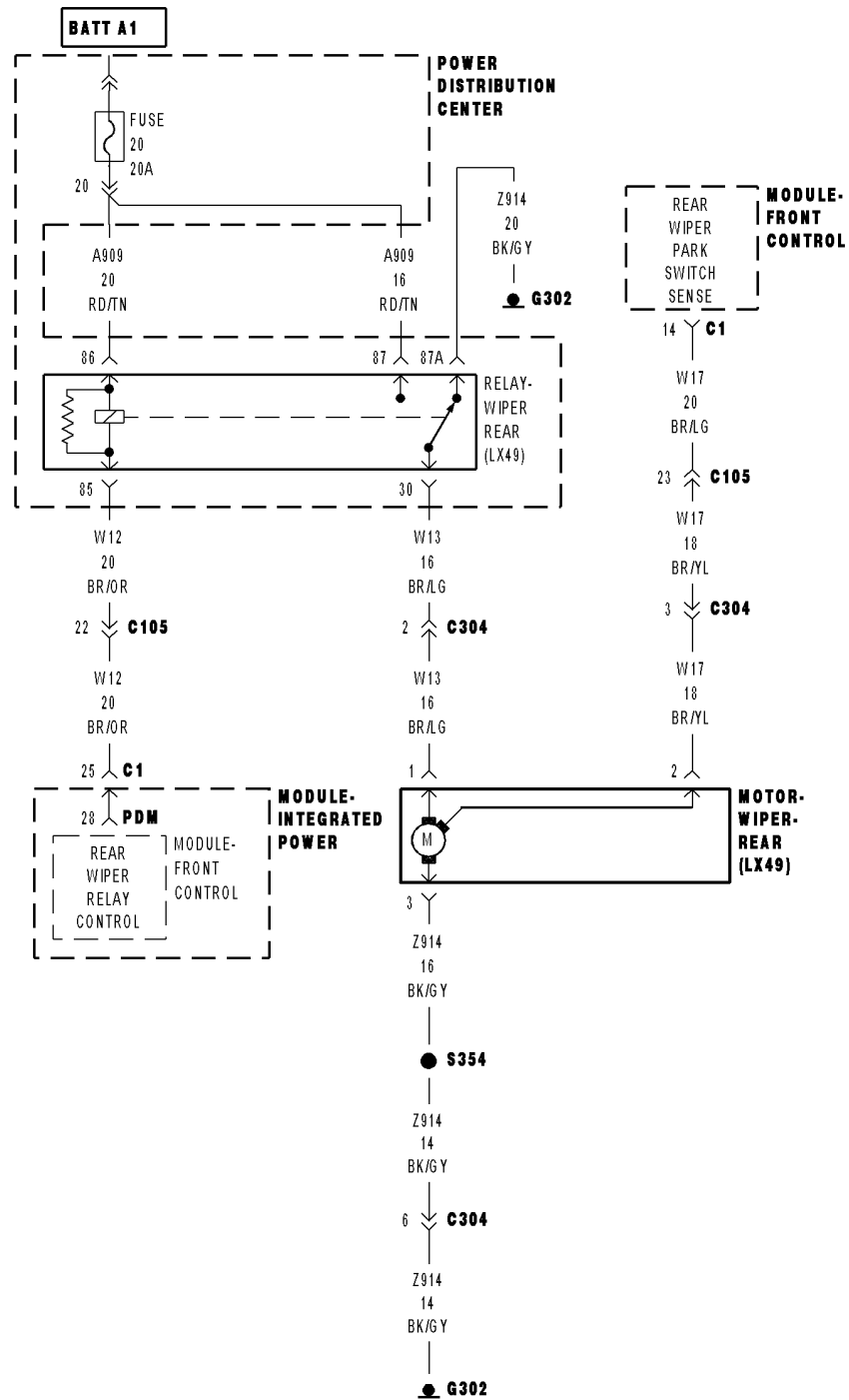
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Replace the Front Control Module in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.



## B230E-REAR WIPER PARK SWITCH INPUT CIRCUIT OPEN



**B230E-REAR WIPER PARK SWITCH INPUT CIRCUIT OPEN (CONTINUED)**

For the Rear Wipers/Washers circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
WIPER/WASHER SWITCH (W17) REAR WIPER PARK SWITCH SENSE CIRCUIT HIGH FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

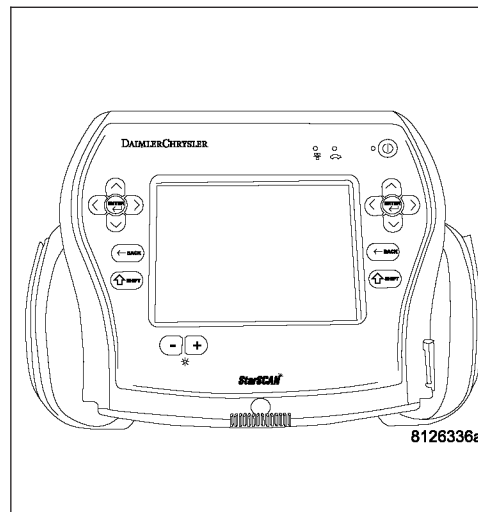
Turn the Rear Wipers on.

With the Scan Tool, read the Rear Wiper DTC's.

**Does the Scan Tool read: B230E-REAR WIPER PARK SWITCH INPUT CIRCUIT OPEN?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.

**2. WIPER/WASHER SWITCH**

Turn the ignition off.

Disconnect the Rear Wiper/Washer Switch connector.

Measure the internal resistance of the Wiper/Washer Switch between cavity 1 and 2 of the switch.

**Is the resistance above 5.0 ohms?**

**Yes** >> Replace the Rear Wiper/Washer Switch in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Go To 3

**B230E-REAR WIPER PARK SWITCH INPUT CIRCUIT OPEN (CONTINUED)****3. FRONT CONTROL MODULE**

Turn the ignition off.

Disconnect the Wiper/Washer Switch connector.

Disconnect the FCM C1 harness connector.

Measure the resistance of the (W17) Rear Wiper Park Switch Sense circuit.

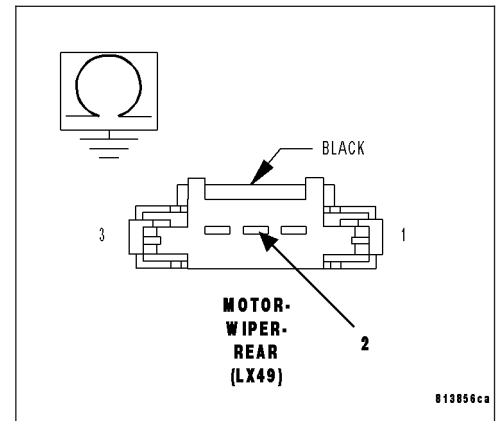
**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (W17) Rear Wiper Park Switch Sense circuit for an open condition.

Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Replace the Front Control Module in accordance with the service information.

Perform the BODY VERIFICATION TEST — VER 1.



The diagram illustrates the electrical circuit for the rear wiper system. It begins with **BATT A1**, which passes through a **FUSE 20 20A** to a **POWER DISTRIBUTION CENTER**. From the PDC, a **Z914 20 BK/GY** wire leads to a **G302** ground point. The circuit then splits into two main paths:

- Module-Front Control Path:** This path includes a **REAR WIPER PARK SWITCH SENSE** connected to **C1** (pin 14, W17 20 BR/YL). This is followed by a **C105** connector (pin 23, W17 18 BR/YL) and another **C105** (pin 22, W12 20 BR/OR). The circuit then passes through a **C1** connector (pin 25, W12 20 BR/OR) to a **PDM** (pin 28, W12 20 BR/OR). The PDM is labeled as **MODULE-FRONT CONTROL** and includes **REAR WIPER RELAY CONTROL**.
- Motor-Wiper-Rear (LX49) Path:** This path starts from the PDC, passing through a **RELAY-WIPER-REAR (LX49)** and a **G302** ground point. It then goes through a **C304** connector (pin 3, W13 16 BR/LG) and another **C304** (pin 2, W13 16 BR/LG). The circuit then passes through a **S354** switch (pin 3, Z914 16 BK/GY) and another **C304** (pin 6, Z914 14 BK/GY) to a final **G302** ground point. The motor is labeled **MOTOR-WIPER-REAR (LX49)**.

At the bottom of the page, two connector diagrams are shown:

- MODULE-FRONT CONTROL PDM:** A 28-pin connector with pins 9, 29, 49 on the left and 1, 10, 30 on the right. A **BLACK** wire is connected to pin 1.
- MOTOR-WIPER-REAR (LX49):** A 30-pin connector with pins 3, 1, 30 on the left and 1, 30 on the right. A **BLACK** wire is connected to pin 1.

**B231B-REAR WIPER MOTOR CONTROL CIRCUIT LOW (CONTINUED)**

For the Rear Wipers/Washers circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
WIPER MOTOR MODULE POWER DISTRIBUTION (W13) REAR WIPER CONTROL CIRCUIT LOW FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

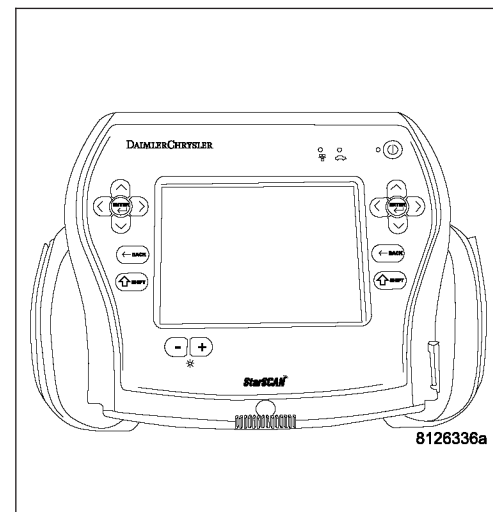
Turn the Rear Wipers on.

With the Scan Tool, read the Rear Wiper DTC's.

**Does the Scan Tool read: B231B-REAR WIPER MOTOR CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.

**2. WIPER MOTOR REAR**

Turn the ignition off.

Disconnect the Rear Wiper Motor connector.

Measure the internal resistance of the Wiper Motor between cavity 1 and 2 of the Motor.

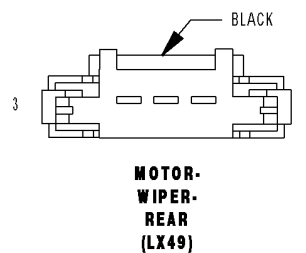
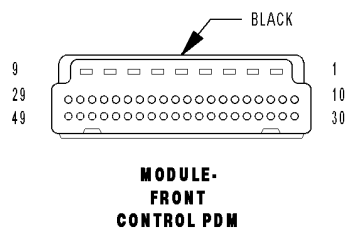
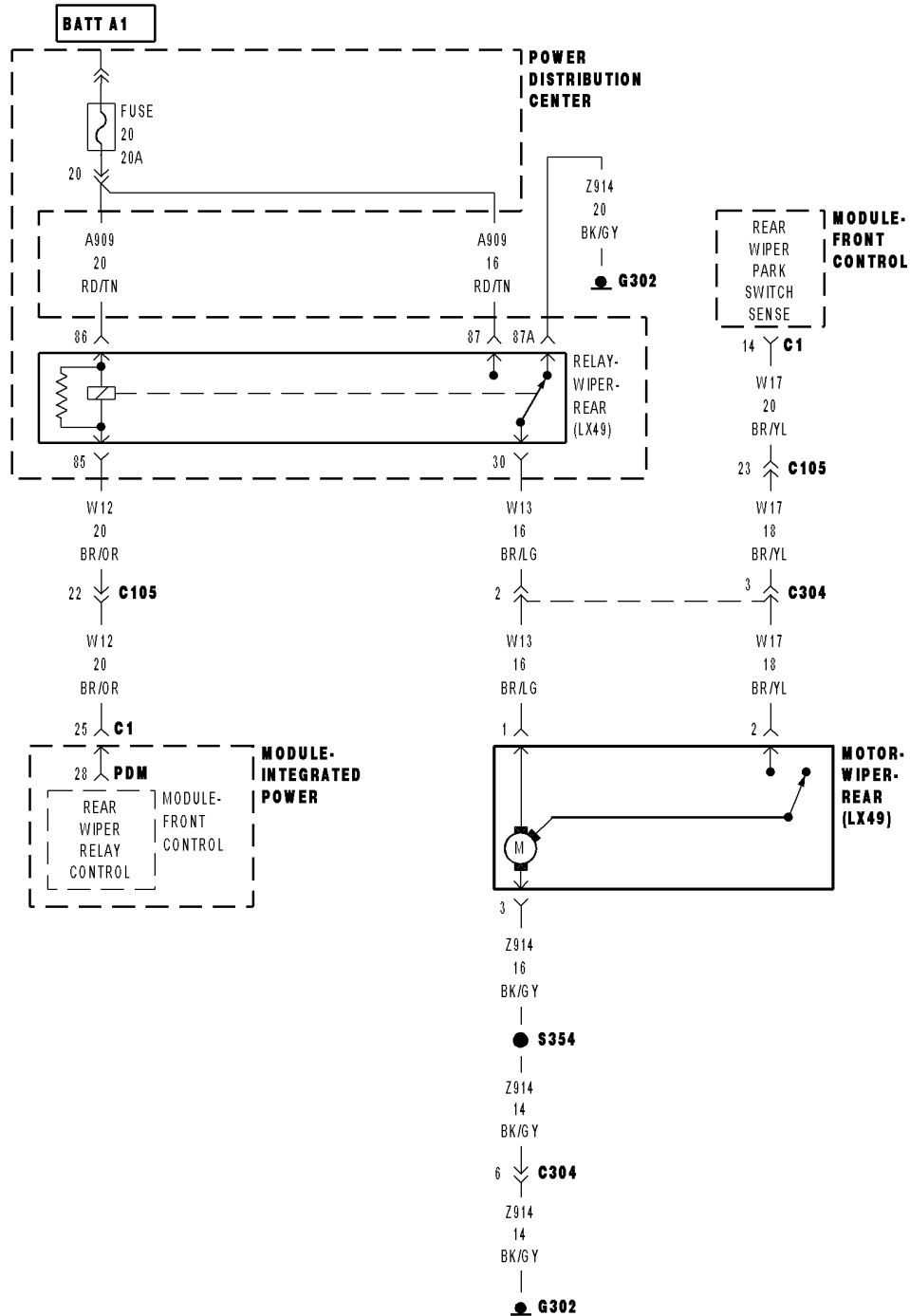
**Is the resistance above 5.0 ohms?**

**Yes** >> Replace the Rear Wiper Motor in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Go To 3

**No**      >> Replace the Front Control Module in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

## B231C-REAR WIPER MOTOR CONTROL CIRCUIT HIGH





**B231C-REAR WIPER MOTOR CONTROL CIRCUIT HIGH (CONTINUED)**

For the Rear Wipers/Washers circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
- **Set Condition:**

Possible Causes
WIPER MOTOR (Z914) GROUND CIRCUIT MODULE POWER DISTRIBUTION (W13) REAR WIPER CONTROL CIRCUIT LOW FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

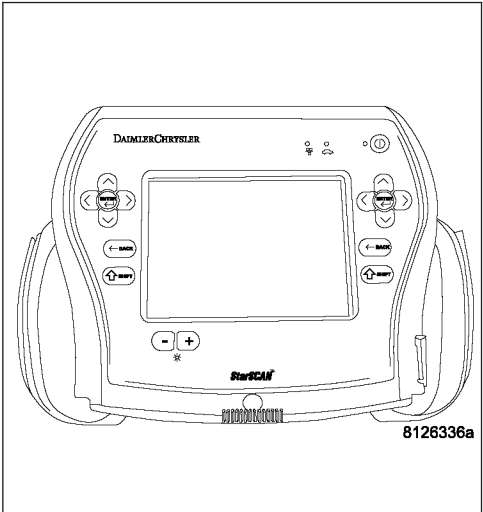
**Diagnostic Test**

**1. INTERMITTENT CONDITION**

Turn the ignition on.  
With the Scan Tool, clear all FCM DTC's.  
Turn the Rear Wipers on.  
With the Scan Tool, read the Rear Wiper DTC's.

**Does the Scan Tool read: B231C-REAR WIPER MOTOR CONTROL CIRCUIT HIGH?**

- Yes**    >> Go To 2
- No**    >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.



**2. WIPER MOTOR REAR**

Turn the ignition off.  
Disconnect the Rear Wiper Motor connector.  
Measure the internal resistance of the Wiper Motor between cavity 1 and 2 of the Motor.

**Is the resistance above 5.0 ohms?**

- Yes**    >> Replace the Rear Wiper Motor in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.
- No**    >> Go To 3

**B231C-REAR WIPER MOTOR CONTROL CIRCUIT HIGH (CONTINUED)****3. Z914 WIPER MOTOR GROUND CIRCUIT**

Turn the ignition off.

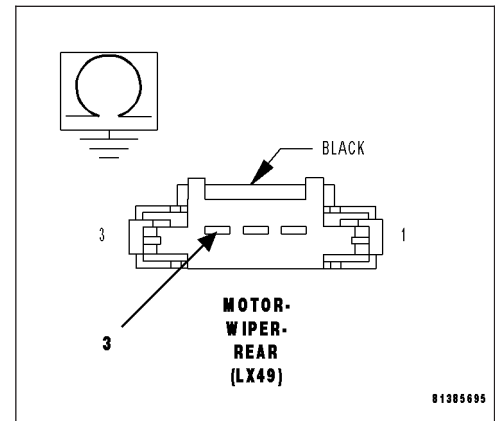
Disconnect the Rear Wiper Motor connector.

Measure the resistance between ground and the (Z914) Rear Wiper Motor ground circuit.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (Z914) Rear Wiper Motor Ground circuit for a short condition.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Go To 4

**4. W13 MOTOR CONTROL CIRCUIT**

Turn the ignition off.

Disconnect the Rear Wiper Motor connector.

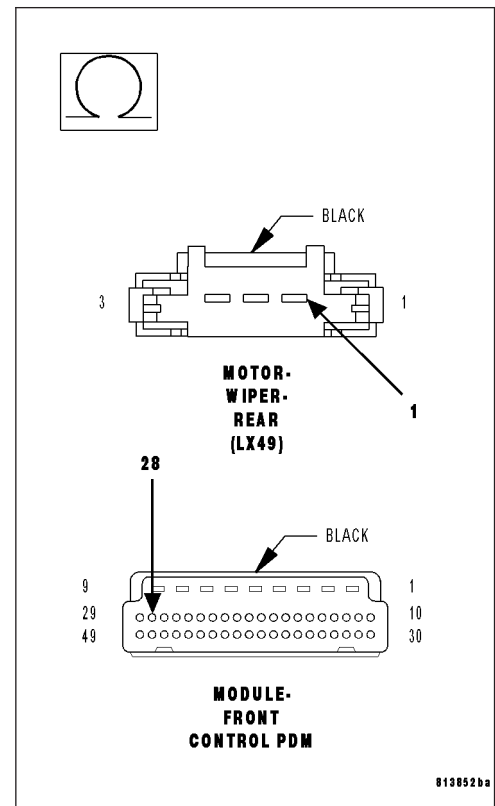
Disconnect the Module Power Distribution C2 connector.

Measure the resistance of the wiper Motor Control circuit.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (W13) Wiper Motor Control circuit.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Go To 5



## **B231C-REAR WIPER MOTOR CONTROL CIRCUIT HIGH (CONTINUED)**

### **5. FRONT CONTROL MODULE**

Turn the ignition off.

Disconnect the FCM from the PDC.

Disconnect the Module Power Distribution.

Measure the internal resistance of the PDC (W13) Wiper Motor Control circuit.

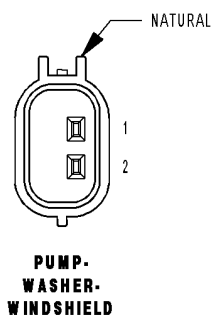
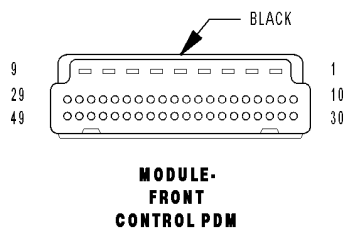
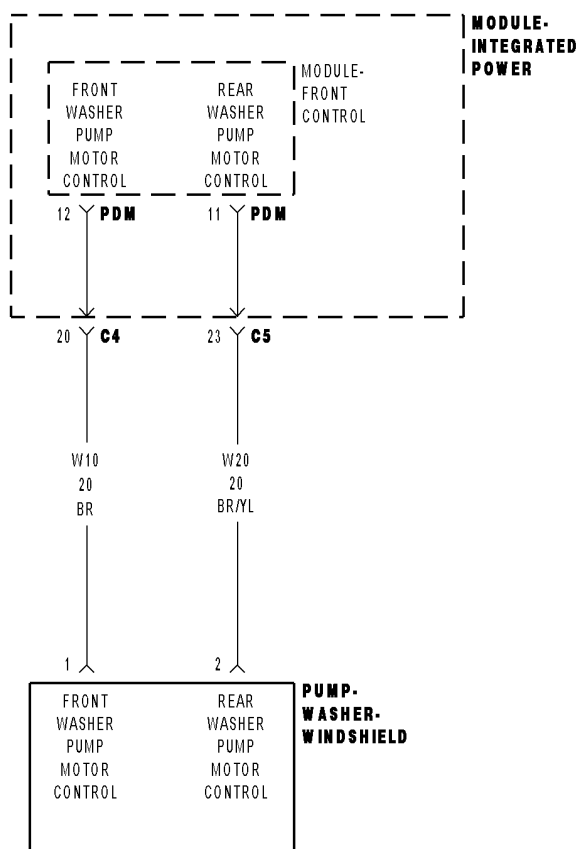
**Is the resistance above 5.0 ohms?**

**Yes**     >> Replace the Module Power Distribution in accordance with the service information.  
             Perform the BODY VERIFICATION TEST — VER 1.

**No**       >> Replace the Front Control Module in accordance with the service information.  
             Perform the BODY VERIFICATION TEST — VER 1.

---

## B2328-WASHER FLUID LEVEL SENSOR INPUT CIRCUIT HIGH



**B2328-WASHER FLUID LEVEL SENSOR INPUT CIRCUIT HIGH (CONTINUED)**

For the Rear Wipers/Washers circuit diagram (Refer to 8 - ELECTRICAL/WIPERS/WASHERS - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:** With the ignition on.
- **Set Condition:** When the FCM detects a High condition.

Possible Causes
WASHER FLUID LEVEL SENSOR (Z901) GROUND CIRCUIT (W1) WASHER FLUID LEVEL SWITCH SENSE FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding.**

**Diagnostic Test****1. INTERMITTENT CONDITION**

Turn the ignition on.

With the Scan Tool, clear all FCM DTC's.

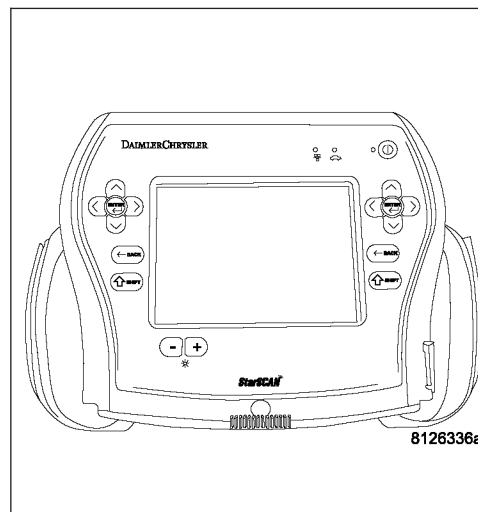
Turn the Wiper Washers on.

With the Scan Tool, read the Wiper DTC's.

**Does the Scan Tool read: B2328-WASHER FLUID LEVEL SENSOR INPUT CIRCUIT HIGH?**

**Yes** >> Go To 2

**No** >> The condition that caused the symptom is currently not present. Inspect the related wiring for a possible intermittent condition. Look for any chafed, pierced, pinched, or partially broken wires.  
Perform the BODY VERIFICATION TEST — VER 1.

**2. WASHER FLUID LEVEL SENSOR**

Turn the ignition off.

Disconnect the Wiper Washer Fluid Level Sensor connector.

Measure the internal resistance of the Washer Fluid Level Sensor between cavity 1 and 2 of the sensor.

**Is the resistance above 5.0 ohms?**

**Yes** >> Replace the Washer Fluid Level Sensor in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Go To 3

**B2328-WASHER FLUID LEVEL SENSOR INPUT CIRCUIT HIGH (CONTINUED)****3. Z901 WASHER FLUID LEVEL SENSOR GROUND CIRCUIT**

Turn the ignition off.

Disconnect the Washer Fluid Level Sensor connector.

Measure the resistance between ground and the (Z901) ground circuit.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (Z901) Ground circuit for a short condition.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Go To 4

---

**4. W1 WASHER FLUID LEVEL SENSOR CONTROL CIRCUIT**

Turn the ignition off.

Disconnect the Washer Fluid Level Sensor connector.

Disconnect the Front Control Module C1 connector.

Measure the resistance of the (W1) Washer Fluid Level Sensor control circuit.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (W1) Washer Fluid Level Sensor control circuit.  
Perform the BODY VERIFICATION TEST — VER 1.

**No** >> Replace the Front Control Module in accordance with the service information.  
Perform the BODY VERIFICATION TEST — VER 1.

---



## WIPERS/WASHERS - SERVICE INFORMATION

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## WIPERS/WASHERS - SERVICE INFORMATION

## DESCRIPTION

## FRONT WIPER/WASHER SYSTEM

The wiper and washer system includes the following major components:

- **Front Control Module** - The Front Control Module (FCM) is integral to the Integrated Power Module (IPM). The FCM/IPM is located in the engine compartment, near the right shock tower.(Refer to 8 - ELECTRICAL/ POWER DISTRIBUTION - DESCRIPTION).
- **Front Washer Nozzle** - Two washer nozzles with integral check valves are secured to the hood panel near the base of the windshield.
- **Front Washer Plumbing** - The plumbing for the washer system consists of nylon hoses and molded plastic fittings. The plumbing is routed within the engine compartment from the washer reservoir. The front washer hose is routed across the underside of the hood panel to the washer nozzles.
- **Front Wiper Arms** - The two wiper arms are secured with nuts to the threaded ends of the two wiper pivot shafts, which extend through the cowl panel located near the base of the windshield.
- **Front Wiper Blade** - The two wiper blades are secured to the two wiper arms with an integral latch, and are parked on the glass near the bottom of the windshield when the wiper system is not in operation.
- **Front Wiper Module** - The wiper pivot shafts are the only visible components of the front wiper module. The remainder of the module is concealed within the engine compartment beneath the cowl panel. The wiper module includes a cast aluminum wiper module bracket, two rubber-isolated wiper module mounts, one dowel on the underside of the wiper motor, the wiper motor crank arm, the two wiper drive links, the two powered wiper pivots.



- **Instrument Cluster** - The ElectroMechanical Instrument Cluster (EMIC) is also known as the Cab Compartment Node (CCN). The EMIC/CCN is located in the instrument panel above the steering column opening, directly in front of the driver. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DESCRIPTION).
- **Multi-Function Switch** - The multi-function switch is located on the steering column, just behind the steering wheel. A control stalk that extends from the left side of the switch that is dedicated to providing all of the driver controls for the front wiper and washer systems, turn signal, and high and low beam functions (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - DESCRIPTION).
- **Rain Sensor** - Vehicles equipped with the automatic wiper feature have a Rain Sensor located just below the inside rear view mirror button. The sensor bracket is bonded to the inside surface of the windshield glass.
- **Washer Fluid Level Switch** - The washer fluid level switch is located in a dedicated hole on the lower portion of the washer reservoir, ahead of the right front wheel house splash shield.
- **Washer Pump/Motor** - The reversible electric washer pump/motor is located in the lower portion of the washer reservoir, ahead of the right front wheel house splash shield. The washer pump/motor is a reversible motor (wagon only) and provides washer fluid to either the front or rear (wagon only) washer system plumbing, depending upon the direction of the pump motor rotation.
- **Washer Reservoir** - The washer reservoir is mounted just in front of the right front wheel splash shield. The filler neck is located in the right front corner of the engine compartment.
- **Wiper High/Low Relay** - The wiper high/low relay is an International Standards Organization (ISO) micro relay located in the Power Distribution Center (PDC) in the engine compartment.
- **Wiper On/Off Relay** - The wiper on/off relay is an International Standards Organization (ISO) micro relay located in the Power Distribution Center (PDC) in the engine compartment.

## HEADLAMP WASHERS

The headlamp washers on this vehicle (if equipped) work in conjunction with the windshield washers. The headlamp washers are enabled with the headlamps "ON" and the windshield washers activated. With the windshield washers activated the headlamp washers will spray once for a predetermined amount of time.

## REAR WIPER/WASHER SYSTEM - WAGON ONLY

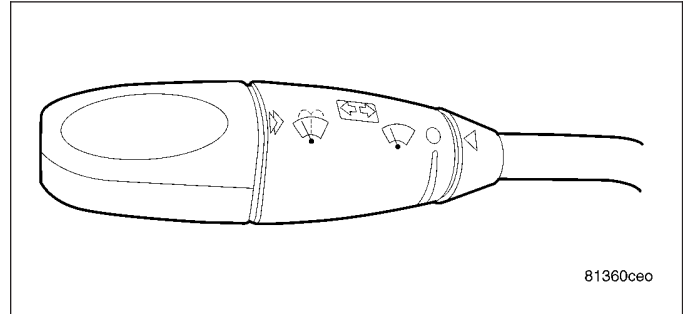
The rear wiper and washer system includes the following major components:

- **Front Control Module** - The Front Control Module (FCM) is integral to the Integrated Power Module (IPM). The FCM/IPM is located on the side of engine compartment.(Refer to 8 - ELECTRICAL/POWER DISTRIBUTION - DESCRIPTION).
- **Instrument Panel Switch Pod** - The rear wiper/washer switch is part of the instrument panel switch pod. The pod contains the rear wipe/wash switch, the hazard switch, the passenger airbag disabled (PAD) indicator, and the electronic stability program (ESP) off switch. The instrument panel switch pod is located in the instrument panel center bezel, just above the radio and in between the A/C outlets.
- **Instrument Cluster** - The ElectroMechanical Instrument Cluster (EMIC) is also known as the Cab Compartment Node (CCN). The EMIC/CCN is located in the instrument panel above the steering column opening, directly in front of the driver. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DESCRIPTION).
- **Rear Washer Nozzle** - A rear washer nozzle is secured to a mounting hole in the liftgate panel
- **Rear Washer Plumbing** - The plumbing for the washer system consists of nylon hoses and molded plastic fittings. The rear washer hose is routed through the dash panel from the engine compartment into the passenger compartment, along the right side body harness, then up the c-pillar and into the liftgate.
- **Rear Wiper Arm** - The single rear wiper arm is secured by a nut directly to the rear wiper motor output shaft, which extends through the center of the liftgate outer panel near the base of the liftgate glass.
- **Rear Wiper Blade** - The single rear wiper blade is secured to the rear wiper arm with an integral latch, and is parked near the bottom of the liftgate glass when the rear wiper system is not in operation.
- **Rear Wiper Motor** - The rear wiper motor output shaft is the only visible component of the rear wiper motor. The remainder of the motor is concealed within the liftgate beneath the liftgate. The rear wiper motor includes the motor bracket, the rear wiper motor, and the rear wiper motor park switch.
- **Rear Wiper Relay** - The rear wiper relay is located in the Power Distribution Center (PDC) in the engine compartment near the battery.
- **Washer Reservoir** - The rear washer system shares a single reservoir and reversible pump with the front washer system, but has its own dedicated plumbing.

## OPERATION

### FRONT WIPER/WASHER SYSTEM

All front wiper and washer system functions are initiated with the control knob on the end of the multi-function switch control stalk that extends from the left side of the steering column, just behind the steering wheel. Rotating the control knob on the end of the control stalk, selects the Off, Intermittent, Auto (on models equipped with automatic wipers), Low, or High front wiper system operating modes. In the Intermittent mode, the control knob also allows the vehicle operator to select from one of six intermittent wipe intervals. In the Auto mode, the control knob also allows the vehicle operator to select from one of six automatic wiper sensitivity levels. Pressing in on the end of the control stalk momentarily activates the Mist Wipe. Pressing it in all the way will activate the windshield washers. In the Auto mode, as you increase the sensitivity of the wipers (less delay between wipes), the result will be a corresponding acknowledgment wipe to let you know you made an adjustment to the system. The multi-function switch provides hard wired resistor multiplexed inputs to the Steering Column Control Module (SCCM), for all of the wiper and washer system functions. The SCCM then sends electronic messages to the Front Control Module (FCM) over the Controller Area Network (CAN) data bus requesting the appropriate front wiper and washer system operating modes.



All the front wiper and washer system operation is controlled by the FCM logic circuits, and that logic will only allow these systems to operate when the ignition switch is in the Accessory or On positions. Battery current is directed from a B(+) fuse in the Integrated Power Module (IPM) to the wiper on/off relay and the wiper high/low relay in the PDC through a fused B(+) circuit. The FCM uses low side drivers to control wiper system operation by energizing or de-energizing the wiper high/low and wiper on/off relays. The FCM uses both high side and low side drivers to control the operation of the washer pump/motor unit. The multi-function switch circuitry receives a clean ground output from the SCCM on a multi-function switch return circuit, then provides resistor multiplexed inputs to the SCCM on an intermittent wipe mux circuit to indicate the selected wiper system mode and on a wash/beam select mux circuit to indicate the selected washer system mode.

### AUTOMATIC WIPE MODE

In models equipped with the automatic wiper feature, the internal circuitry of both the multi-function switch, the rain sensor, and the CCN work in concert to provide an automatic wiper mode with five sensitivity selections. When selected, this switch position will automatically operate the front wipers at the designated sensitivity setting and maintain visibility through the windshield glass at that predetermined sensitivity setting.

With automatic wipers, when the control knob on the control stalk of the multi-function switch is moved to one of the six Auto sensitivity positions, the SCCM sends an electronic message to the Rain Sensor over the Controller Area Network (CAN) data bus network indicating the selected position. The sensor monitors an area within the wipe pattern of the windshield glass for the accumulation of moisture. Based upon internal programming and the selected sensitivity level, when sufficient moisture has accumulated the rain sensor sends the appropriate electronic wipe command messages to the FCM over the CAN data bus and the FCM operates the front wiper system accordingly.

As the sensitivity level is set higher, the rain sensor is more sensitive to moisture accumulation and will send wipe commands more frequently. The SCCM logic is also programmed to provide an immediate wipe cycle each time the control knob on the multi-function switch is moved from a non-automatic wipe position to one of the six Auto sensitivity positions, and another immediate wipe cycle each time the control knob is moved from a lower Auto sensitivity position to a higher Auto sensitivity position.

### CONTINUOUS WIPE MODE

When the Low position of the control knob on the control stalk of the multi-function switch is selected, the SCCM sends an electronic wiper switch low message to the FCM, then the FCM energizes the wiper on/off relay. This directs battery current through the normally open contacts of the energized wiper on/off relay and the normally closed contacts of the de-energized wiper high/low relay to the low speed brush of the wiper motor, causing the wipers to cycle at low speed.

When the High position of the control knob is selected, the SCCM sends an electronic wiper switch high message to the FCM, then the FCM energizes both the wiper on/off relay and the wiper high/low relay. This directs battery current through the normally open contacts of the energized wiper on/off relay and the normally open contacts of the energized wiper high/low relay to the high speed brush of the wiper motor, causing the wipers to cycle at high speed.

When the Off position of the multi-function switch control knob is selected, the SCCM sends an electronic wiper switch off message to the FCM. If the wiper motor was operating at high speed, the FCM immediately de-energizes the wiper high/low relay causing the wiper motor to return to low speed operation. Then one of two events will occur. The event that occurs depends upon the position of the wiper blades on the windshield at the moment that the control knob Off position is selected.

If the wiper blades are in the down position on the windshield when the Off position is selected, the park switch that is integral to the wiper motor is closed to ground and provides a hard wired park switch sense input to the FCM. The FCM then de-energizes the wiper on/off relay and the wiper motor ceases to operate. If the wiper blades are not in the down position on the windshield at the moment the Off position is selected, the park switch is an open circuit and the FCM keeps the wiper on/off relay energized, which causes the wiper motor to continue running at low speed until the wiper blades are in the down position on the windshield and the park switch input to the FCM is again closed to ground.

### HEADLAMPS ON WITH WIPERS MODE

The CCN provides an automatic headlamps on with wipers feature for models equipped automatic headlamps. This is a customer programmable feature. If this feature is enabled, the headlamps will turn on automatically whenever the windshield wipers are turned on; and, if the headlamps were turned on automatically when the wipers were turned on, they will also turn off automatically when the wipers are turned off. If this feature is enabled, when the automatic wiper mode is selected the headlamps will turn on automatically only after the wipers complete a minimum of five automatic wipe cycles within about sixty seconds, and they will turn off automatically after four minutes elapse without any wipe cycles.

### INTERMITTENT WIPE MODE

When the control knob on the control stalk of the multi-function switch is moved to one of the Intermittent interval positions the SCCM sends an electronic wiper switch delay message to the FCM, then the FCM electronic intermittent wipe logic circuit responds by calculating the correct length of time between wiper sweeps based upon the selected delay interval input. The FCM monitors the changing state of the wiper motor park switch through a hard wired park switch sense input. This input allows the FCM to determine the proper intervals at which to energize and de-energize the wiper on/off relay to operate the wiper motor intermittently for one low speed cycle at a time.

The FCM logic is also programmed to provide vehicle speed sensitivity to the selected intermittent wipe delay intervals. In order to provide this feature the FCM monitors electronic vehicle speed messages from the Powertrain Control Module (PCM) and doubles the selected delay interval whenever the vehicle speed is approximately sixteen kilometers-per-hour (ten miles-per-hour) or less.

### PULSE WIPE MODE

When the control knob on the control stalk of the multi-function switch is depressed to the momentary pulse wipe position for less than about one-half second, the SCCM sends an electronic switch message to the FCM, then the FCM energizes the wiper on/off relay for one complete wipe cycle. The FCM de-energizes the relay when the state of the park switch sense changes to ground, parking the wiper blades near the base of the windshield.

### WASH MODE

When the control knob on the control stalk of the multi-function switch is depressed to the momentary Wash position for more than about one-half second, the SCCM sends an electronic washer switch message to the FCM, then the FCM directs battery current and ground to the washer pump/motor unit. This will cause the washer pump/motor unit to be energized for as long as the Wash switch is held closed up to about ten seconds, and to de-energize when the front Wash switch is released.

When the control knob is depressed to the momentary Wash position while the wiper system is operating in one of the intermittent interval positions, the washer pump/motor operation is the same. However, the FCM also energizes the wiper on/off relay to override the selected delay interval and operate the wiper motor in a continuous low speed mode for as long as the control knob is held depressed, then de-energizes the relay and reverts to the selected

delay mode interval several wipe cycles after the control knob is released. If the control knob is held depressed for more than about ten seconds, the FCM will suspend washer pump/motor operation until the knob is released. then cycled back to the Wash position if so desired.

The headlamp washer system (if equipped) utilizes a separate high pressure pump that is attached to the windshield washer reservoir. The headlamp washer pump feeds nozzles that are mounted in the front fascia of the vehicle. The nozzle bodies spray the headlamps with high pressure washer solvent when the system is activated.

To activate the headlamp washers, turn ON the headlamps and then press the windshield washer control knob. This will operate the windshield washers and direct two timed high pressure sprays onto the headlamp lens.

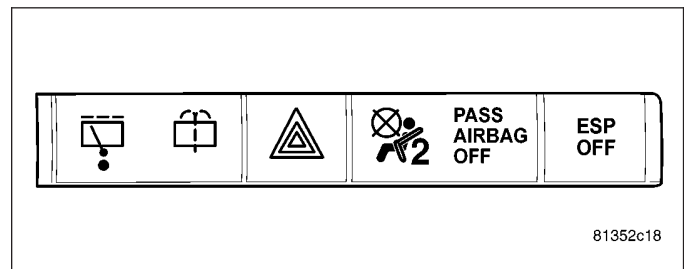
### WIPE-AFTER-WASH MODE

When the control knob on the control stalk of the multi-function switch is depressed to the momentary Wash position for more than about one-half second while the wiper system is not operating, the instrument cluster sends an electronic washer switch message to the FCM, then the FCM directs battery current and ground to the washer pump/motor unit and energizes the wiper on/off relay. This will cause the washer pump/motor unit to be energized and operate the wiper motor in a continuous low speed mode for as long as the Wash switch is held closed up to about ten seconds. When the control knob is released, the FCM de-energizes the washer pump/motor unit, but allows the wiper motor to operate for several additional wipe cycles before it de-energizes the wiper on/off relay and parks the wiper blades near the base of the windshield.

If the control knob is held depressed for more than about thirty seconds, the FCM will suspend washer pump/motor operation until the knob is released, then cycled back to the Wash position; however, the wipers will continue to operate for as long as the Wash switch is held closed. The FCM monitors the changing state of the wiper motor park switch through a hard wired wiper park switch sense circuit input. This input allows the FCM to count the number of wipe cycles that occur after the Wash switch is released, and to determine the proper interval at which to de-energize the wiper on/off relay to complete the wipe-after-wash mode cycle.

### REAR WIPER/WASHER SYSTEM - WAGON ONLY

All rear wiper and washer system functions are initiated with the rear wiper and washer switch in the instrument panel switch pod located on the instrument panel center bezel, just above the radio and below the a/c outlets (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER/INSTRUMENT PANEL SWITCH POD - REMOVAL). Pushing the left side of the wiper/washer switch selects the rear wiper system operating mode (intermittent). it has fixed 10 seconds delay between wipe (not adjustable). indicator at bottom of the WIPE graphic will light up when the wipe switch is ON and goes away when the wipe is OFF. Depressing the momentary contact switch activates the rear washer system. When a rear wiper or washer mode is selected, the circuitry within the instrument panel switch pod sends an electronic rear wiper/washer switch status message over the Controller Area Network (CAN) data bus to the ElectroMechanical Instrument Cluster (EMIC) also referred to as the Cab Compartment Node (CCN). The CCN then sends electronic messages to the Front Control Module (FCM) over the CAN data bus requesting the appropriate rear wiper and washer system operating modes.



### INTERMITTENT WIPE MODE

When the rear wiper switch is pressed to the left, the instrument cluster sends an electronic wiper switch message to the FCM, then the FCM electronic wipe logic circuit responds by selecting a predetermined length of time between wiper sweeps.

### WASH MODE

When the rear washer control switch is depressed to the right in the momentary Wash position, the instrument cluster sends an electronic washer switch message to the FCM, then the FCM directs battery current and ground to the washer pump/motor. This will cause the washer pump/motor to be energized for as long as the Wash switch is held closed up to about ten seconds, and to de-energize when the rear wiper/washer switch is released.

## WIPE-AFTER-WASH MODE

When the rear washer switch is released from the momentary Wash position, the instrument cluster sends an electronic washer switch message to the FCM. The FCM de-energizes the washer pump/motor, but allows the rear wiper motor to operate for several wipe cycles before it de-energizes the rear wiper relay.

## OFF MODE

When the Off position of the rear wiper switch is selected, one of three events is possible. The event that will occur depends upon the position of the wiper blade on the liftgate glass and the mode the wiper motor is operating under at the moment that the Off position is selected. If the wiper blade is in the down position on the glass and the rear wiper system is operating in the intermittent cycle mode when the Off position is selected, the park switch is open and the FCM de-energizes the rear wiper relay control coil causing the rear wiper motor to cease to operate.

If the wiper blade is not in the down position on the glass and is operating in the intermittent cycle mode when the Off position is selected, the park switch is closed to ground and the FCM keeps the rear wiper relay control coil energized to operate the rear wiper motor until the rear wiper blade is in the down position on the glass and the park switch input is an open circuit.

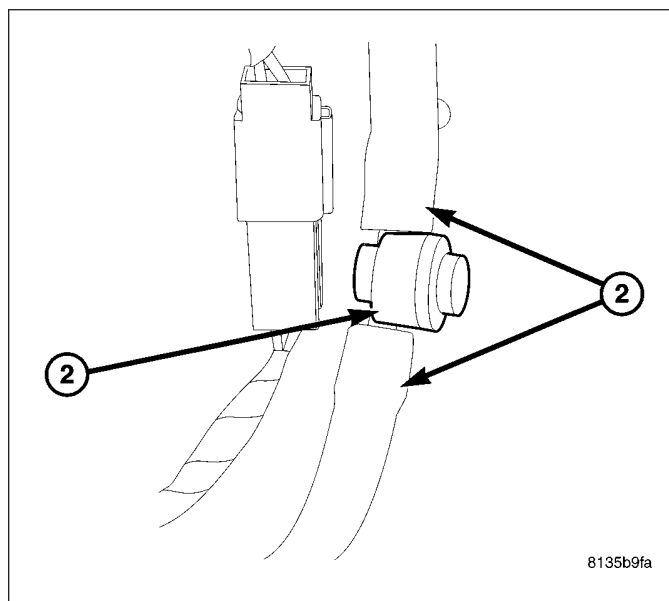
The third event occurs with the rear wiper operating in the wipe-after-wash mode when the Off position is selected, in which case the FCM will continue to run the wiper motor until the completion of two wipes after wash before the rear wiper blade is parked. The FCM will also run the rear wiper motor to park the rear wiper blade if the ignition switch is turned to the Off position while the rear wiper system is still operating.

## CHECK VALVE

### REMOVAL

The rear washer check valve is located on the lower liftgate.

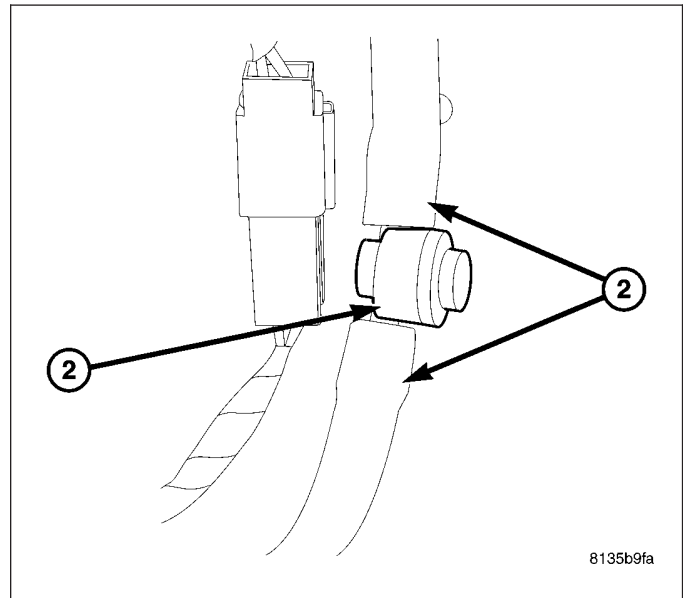
1. Disconnect and isolate the battery negative cable.
2. Remove the lower liftgate trim panel (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - REMOVAL).
3. Remove check valve by twisting washer hose at each end.





## INSTALLATION

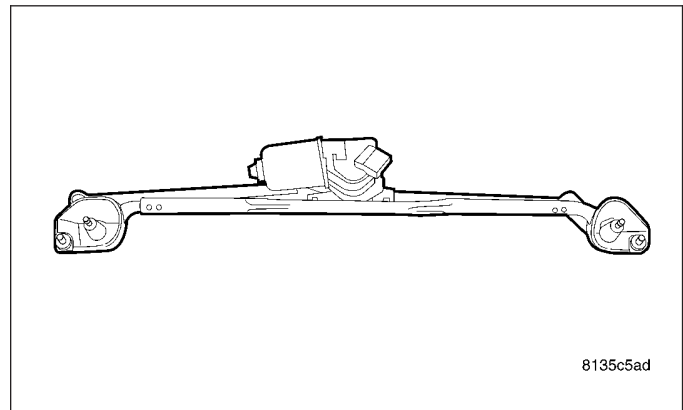
1. Insert check valve into washer hose.
2. Install lower liftgate trim panel (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - INSTALLATION).
3. Connect battery negative cable.



## FRONT WIPER MODULE

### DESCRIPTION

The front wiper module is secured with screws through two rubber grommet-type insulators to the cowl plenum panel. The module is located in the rear of the engine compartment where it is concealed beneath the molded plastic cowl plenum grille panel. The ends of the pivot shafts protruding through openings in the cowl plenum cover/grille panel are the only visible components of the wiper module. The wiper module consists of the following major components:



- **Crank Arm** - The wiper motor crank arm is a stamped steel unit with an internally splined hole on the driven end that is secured to the wiper motor output shaft with a nut, and a long ball stud secured to the drive end to accept the wiper linkage.
- **Linkage** - The two wiper linkage members are each constructed of stamped steel. A driver side drive link with a plastic socket-type bushing in the left end, and a plastic sleeve-type bushing in the right end. The socket bushing is snap-fit over the pivot ball stud on the left pivot lever arm, while the sleeve bushing is fit over the longer pivot stud on the wiper motor crank arm. The passenger side drive link has a plastic socket-type bushing on each end. One end of this drive link is snap-fit over the ball stud on the right pivot lever arm, while the other end is snap-fit over the top of the driver side drive link on the ball stud of the wiper motor crank arm.
- **Motor** - The wiper motor is secured on the underside of the module bracket near the center with three screws. The wiper motor output shaft passes through a hole in the module bracket, where a nut secures the wiper motor crank arm to the motor output shaft. The two-speed permanent magnet wiper motor features an integral transmission, an internal park switch, and an internal Positive Temperature Coefficient (PTC) circuit breaker.
- **Pivots** - This module features two pivots. The two wiper pivot shafts have lever arms with ball studs at their base to accept the wiper linkage. The upper end of all three pivot shafts has a threaded stud with a tapered and serrated area just below the threads to accept the left wiper arm or the right wiper arm links.

The front wiper module cannot be adjusted or repaired. The front wiper motor is available for separate service replacement. If any other component of the module is inoperative or damaged, the entire front wiper module unit must be replaced.

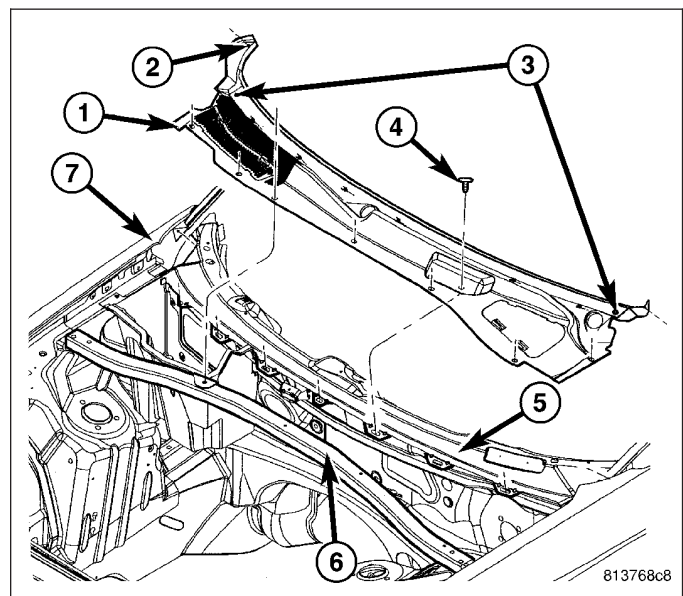
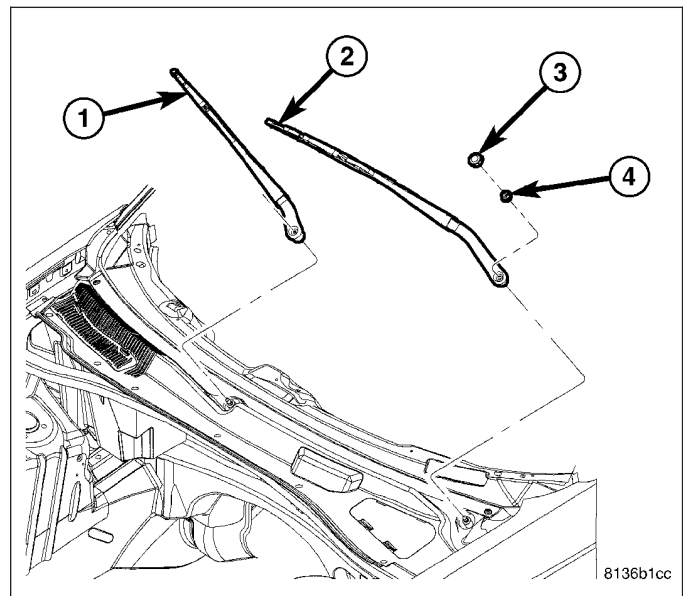
## OPERATION

The front wiper module operation is controlled by the battery current inputs received by the wiper motor through the wiper on/off and wiper high/low relays. The wiper motor speed is controlled by current flow to either the low speed or the high speed set of brushes. The park switch is a single pole, single throw, momentary switch within the wiper motor that is mechanically actuated by the wiper motor transmission components. The park switch alternately opens and closes the wiper park switch sense circuit to ground, depending upon the position of the wipers on the glass. This feature allows the motor to complete its current wipe cycle after the wiper system has been turned Off, and to park the wiper blades in the lowest portion of the wipe pattern. The automatic resetting circuit breaker protects the motor from overloads.

The wiper motor crank arm, the two wiper linkage members, and the two wiper pivots mechanically convert the rotary output of the wiper motor to the back and forth wiping motion of the wiper arms and blades on the glass.

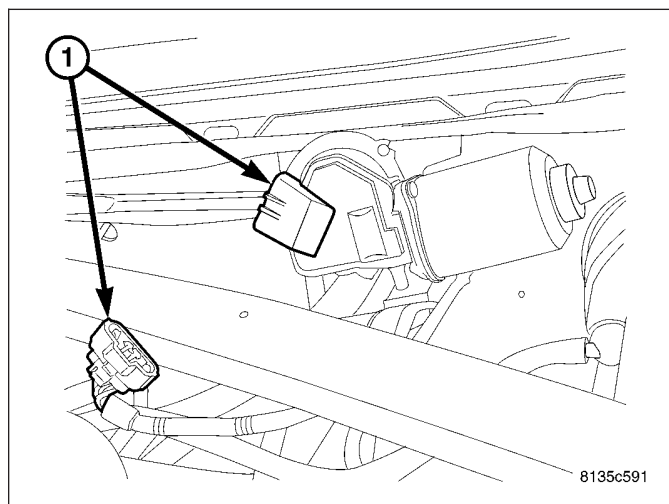
## REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the wiper arms (1) and (2) (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - REMOVAL).

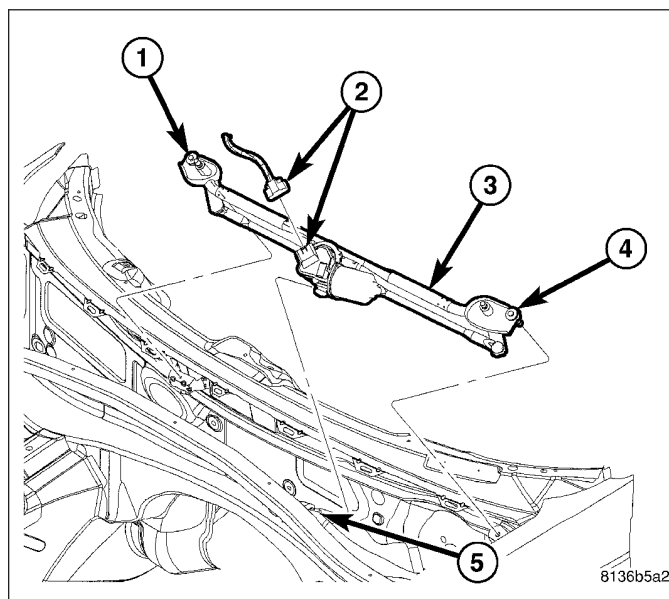


3. Remove the cowl panel (1) (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - REMOVAL).

4. Disconnect the wiper motor electrical connector (1).



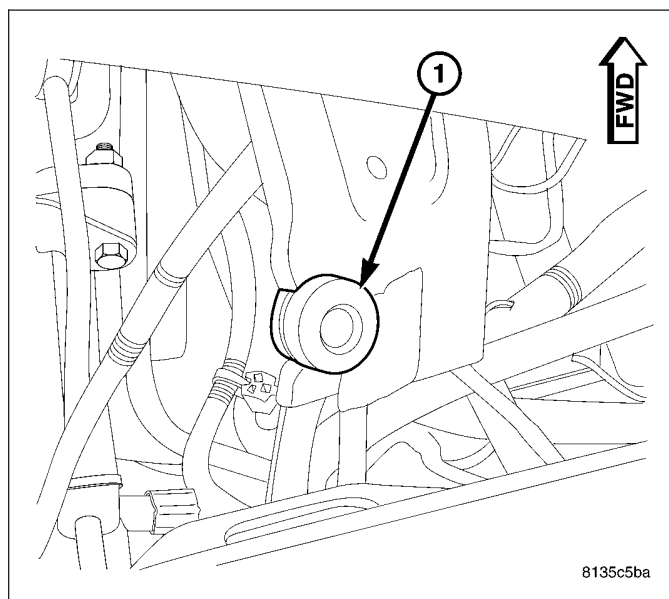
5. Remove the two retaining bolts (1 and 4) and remove wiper module (3) from vehicle.



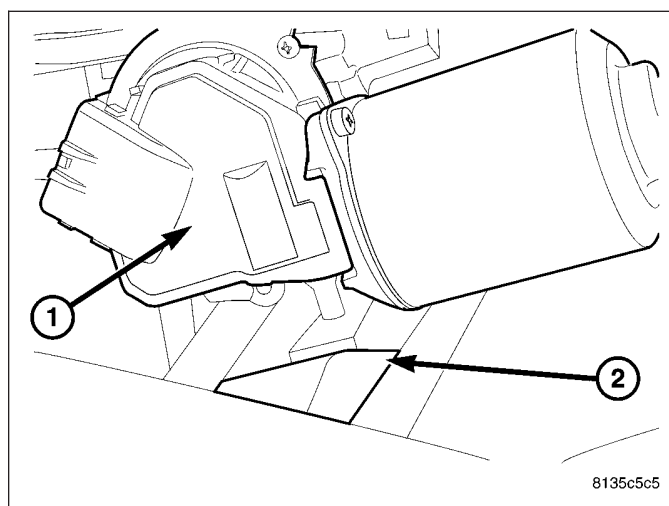


## INSTALLATION

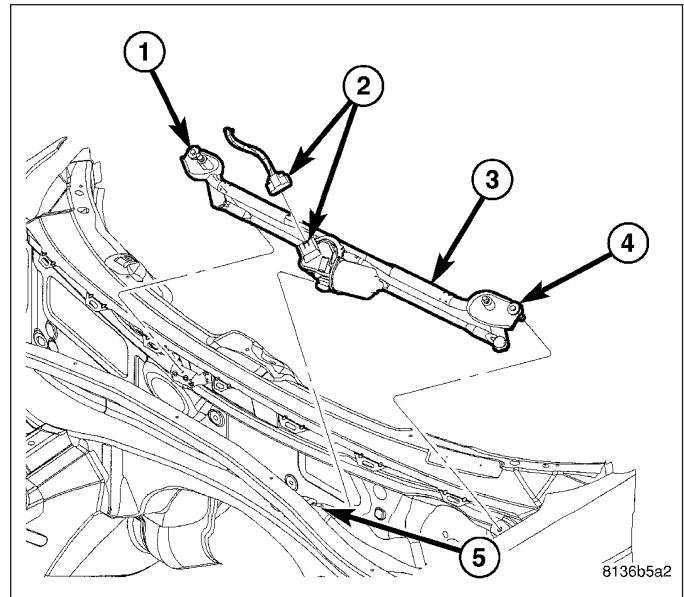
1. Inspect the grommet (1) that the wiper motor sits in. If cracked, brittle, or damaged, replace the grommet (1).



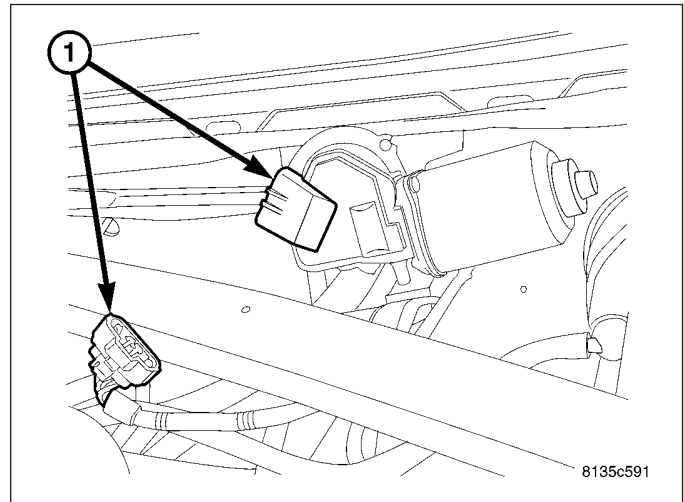
2. While positioning the wiper module in its mounting location, make sure that the dowel on the bottom of the wiper motor (1) slides into the mounting grommet (2) correctly.



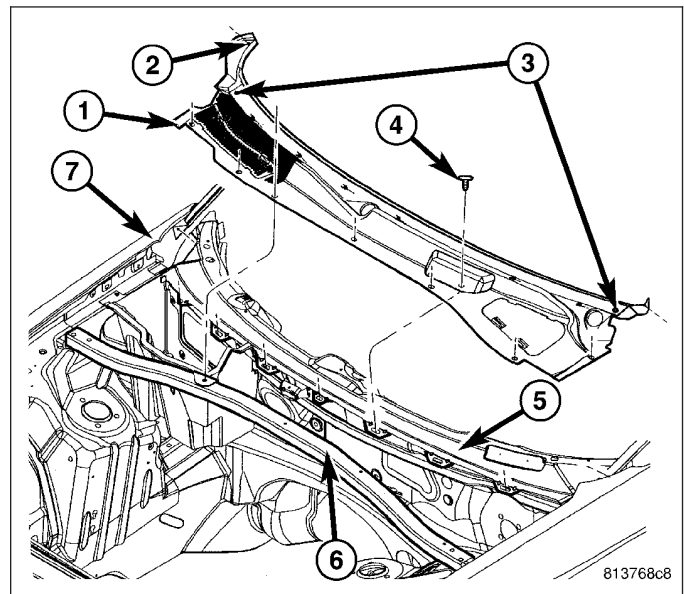
3. Install the two retaining bolts (1 and 4). Torque bolts to 8 N·m (70 in. lbs.).



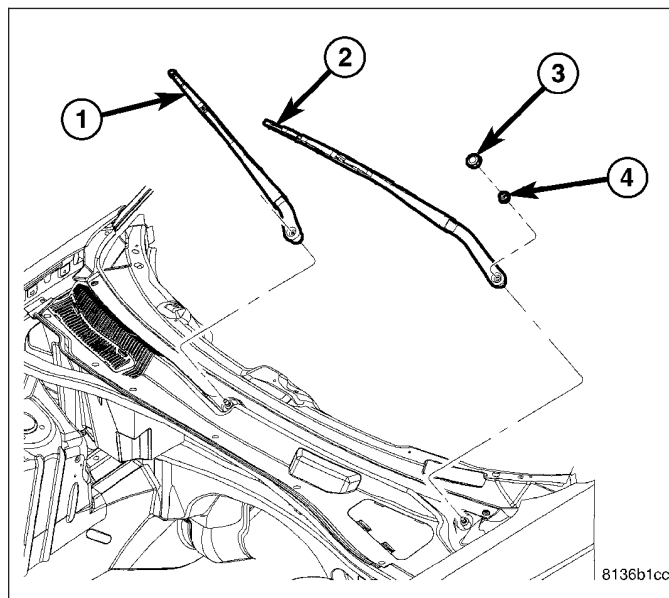
4. Connect the wiper motor electrical connector (1).



5. Install the cowl panel (1) (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - INSTALLATION).



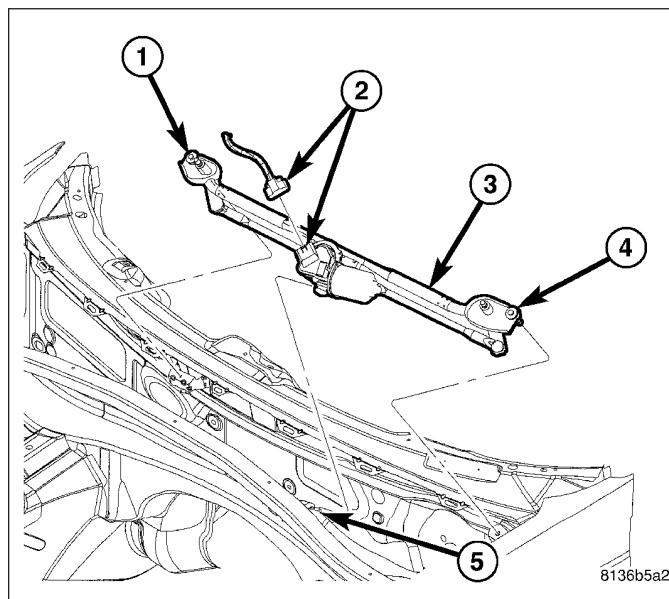
6. Install the wiper arms (1) and (2) (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - INSTALLATION). Torque nuts to 18 N·m (150 in. lbs.).
7. Connect the battery negative cable.



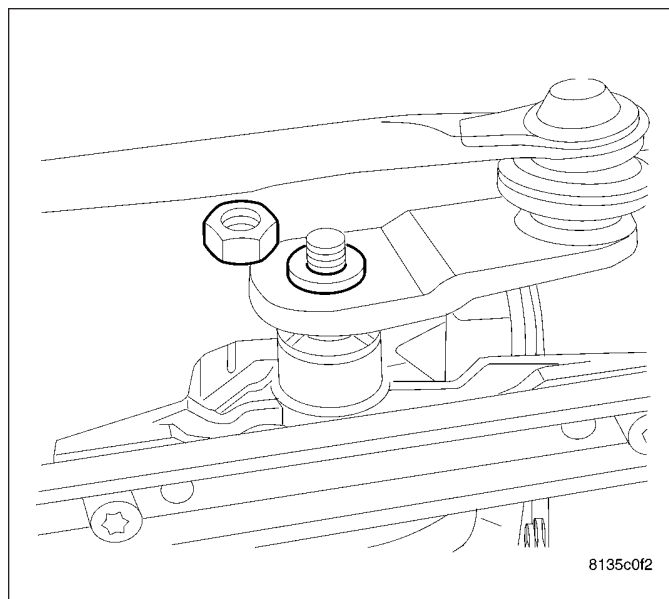
## FRONT WIPER MOTOR

### REMOVAL

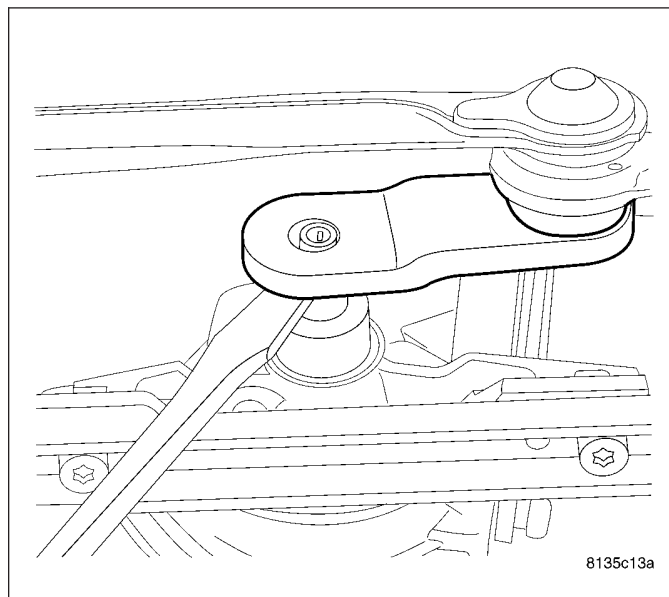
1. Disconnect and isolate the battery negative cable.
2. Remove the front wiper module (3) (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - REMOVAL).



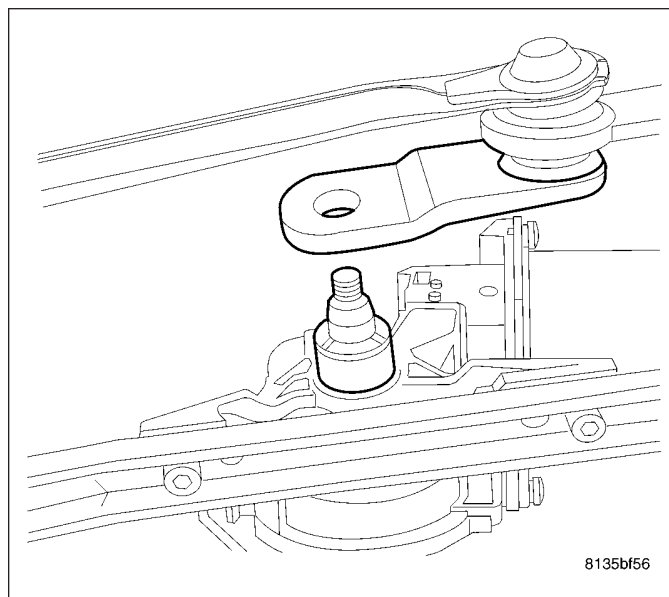
3. With front wiper module on bench or in vise, remove the one nut attaching the bellcrank to the motor shaft.



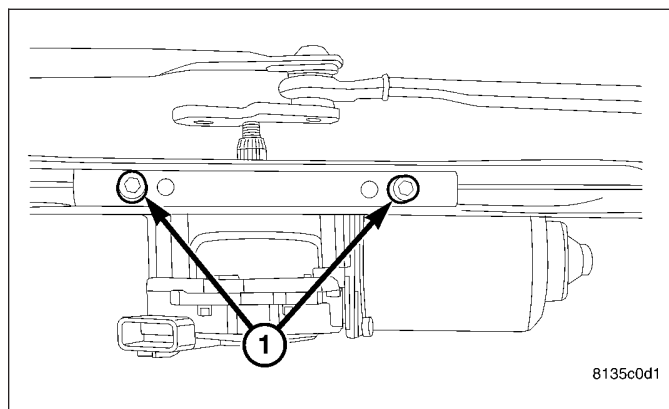
4. Using a flat bladed tool, carefully pry the bellcrank from the wiper motor shaft.



5. Separate the bellcrank from the wiper motor shaft.

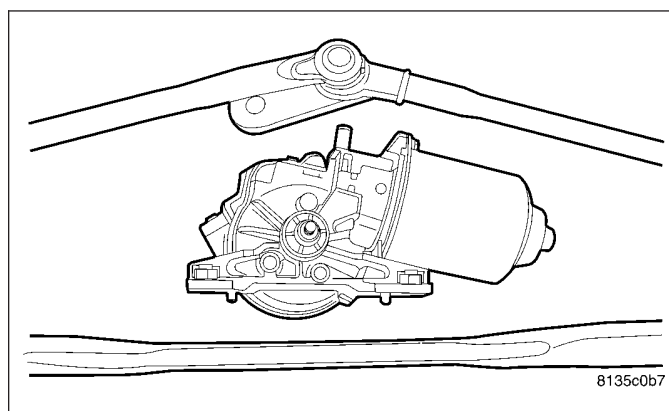


6. Remove the two motor mounting bolts (1).



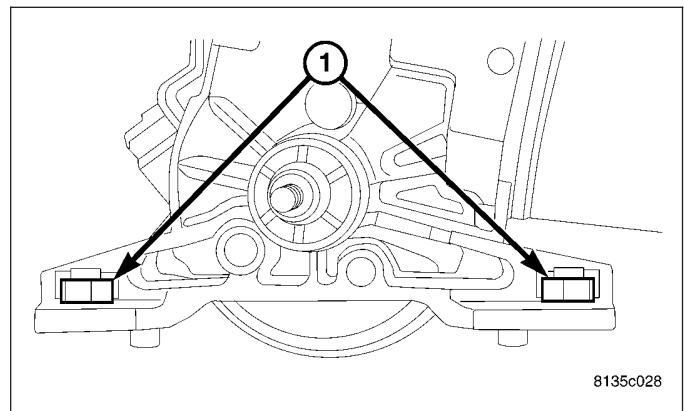
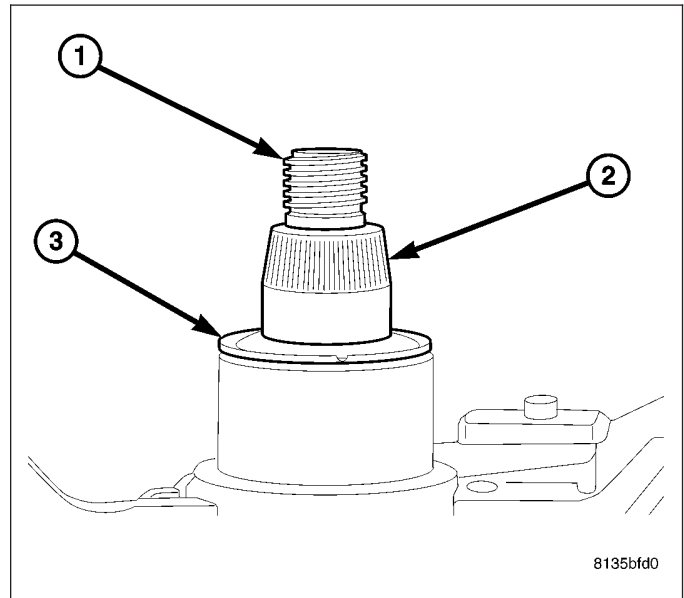
**Note:** When separating the motor from the linkage, there are two pocket nuts that may fall out. Take care to keep these and reinstall them during installation.

7. Separate the wiper motor from the wiper module/linkage.



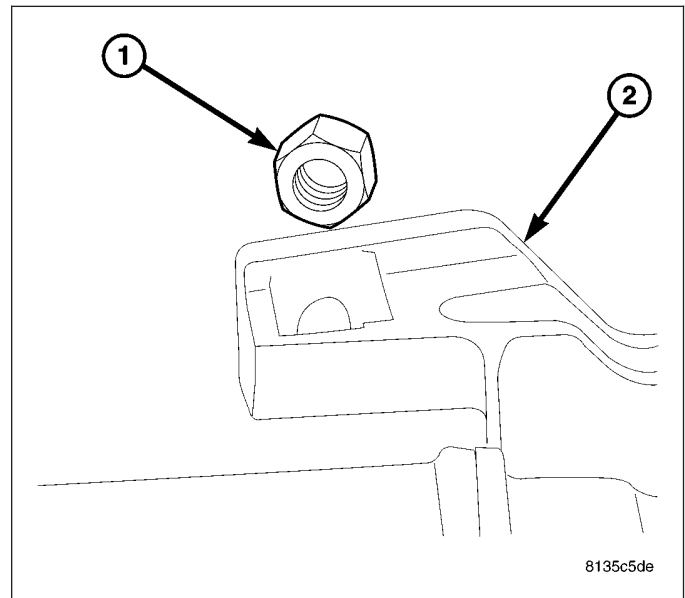
## INSTALLATION

1. Ensure that the shaft seal (3) is on the new motor shaft. If necessary, transfer the one on the old motor. If transferred, make sure the seal is in good shape (not brittle, free from cracks, and not damaged).

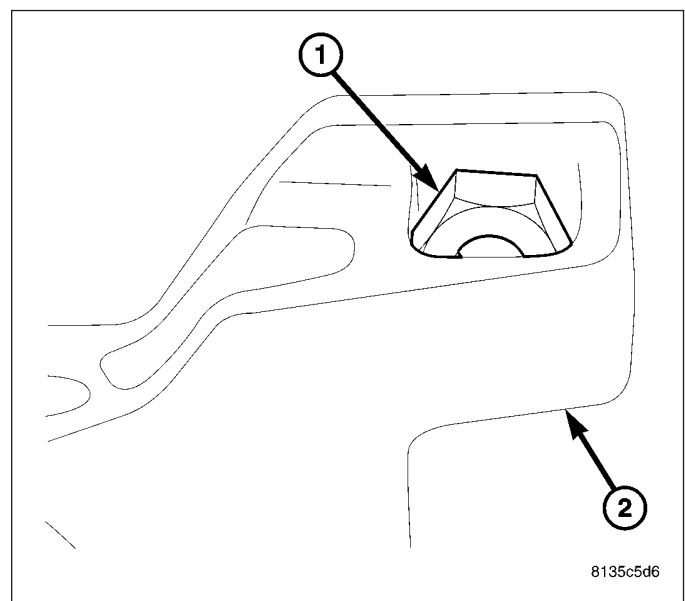


2. Ensure that the pocket nuts (1) are in place in the motor before assembly.

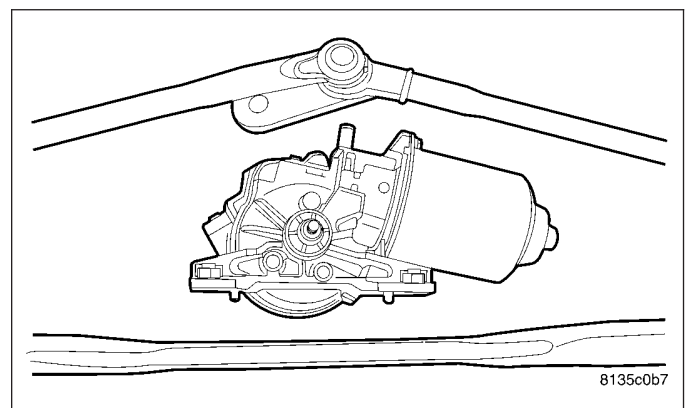
3. If needed to install pocket nut (1), align the nut with the pocket.



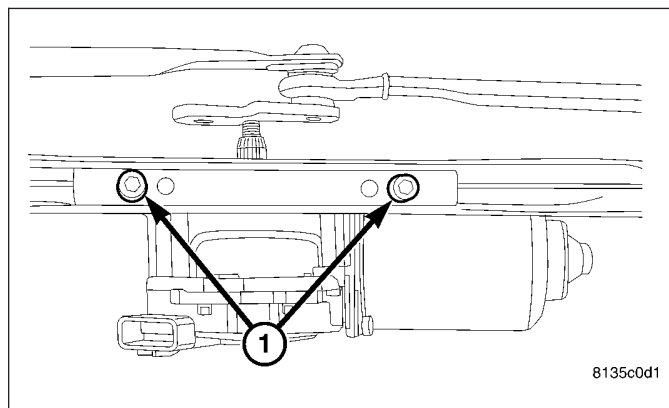
4. Drop nut (1) into pocket.



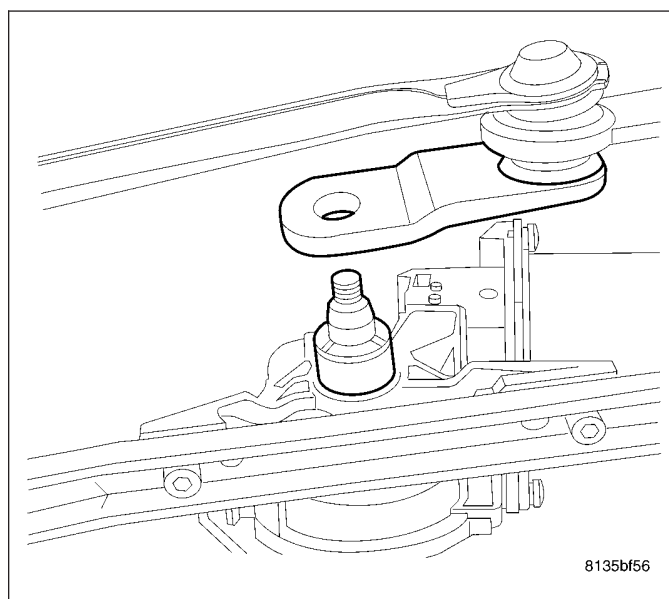
5. Place wiper motor in its mounting location making sure that the pocket nuts are in place.



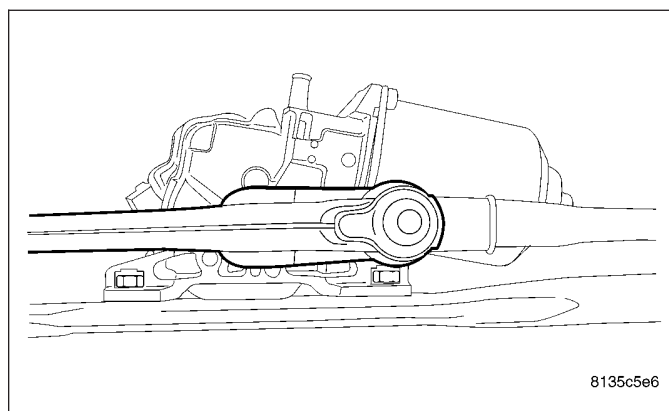
6. Install and tighten the mounting bolts (1).



7. Position the bellcrank on the wiper motor shaft.

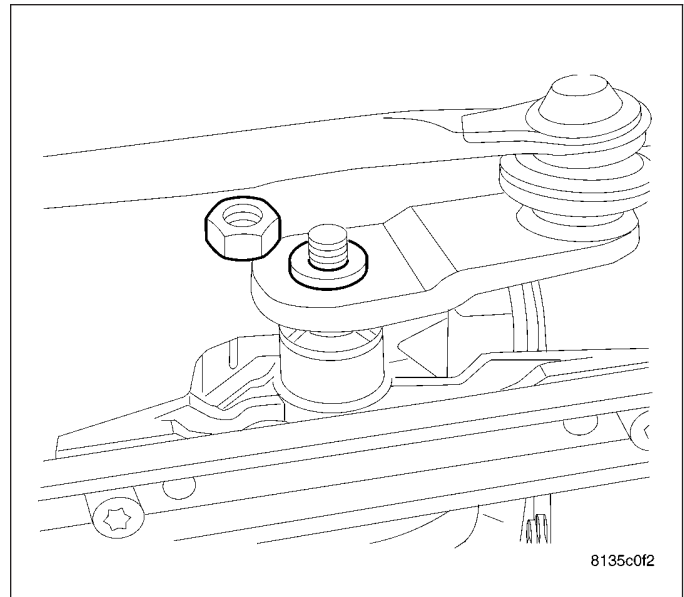


8. Align the bellcrank with the linkage arms.



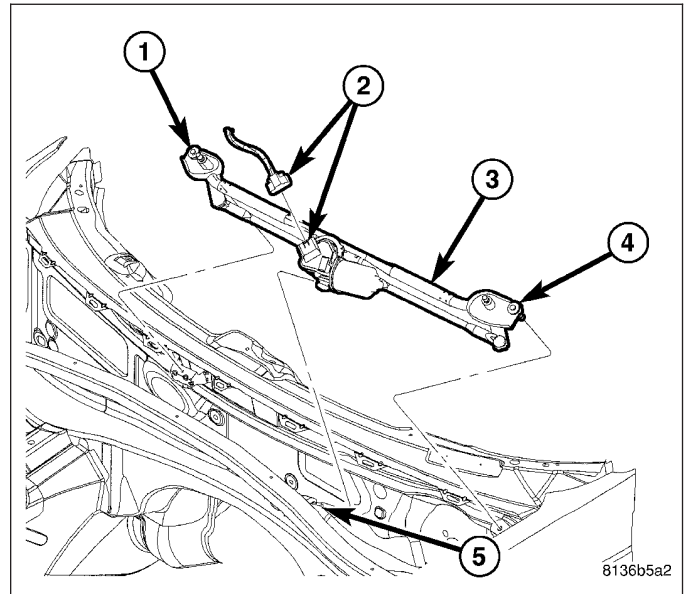


9. Install and tighten the nut to the bellcrank.



10. Install the front wiper module (3) (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - INSTALLATION).

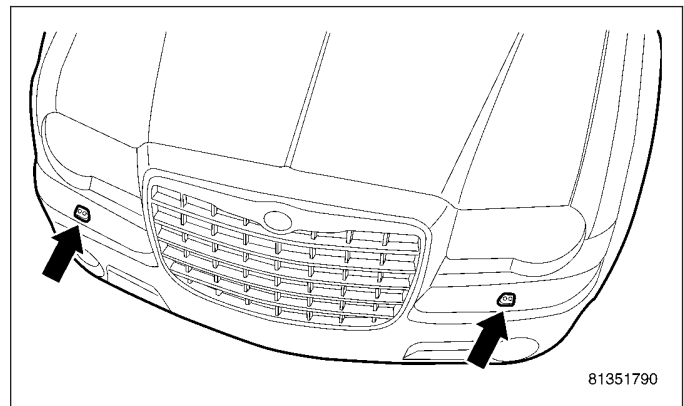
11. Connect the battery negative cable.



## HEADLAMP WASHER

### DESCRIPTION

The headlamp washers work in conjunction with the windshield washers. The headlamp washers are enabled with the headlamps "ON" and the front windshield washers activated. With the windshield washers activated the headlamp washers will spray twice for a predetermined amount of time.



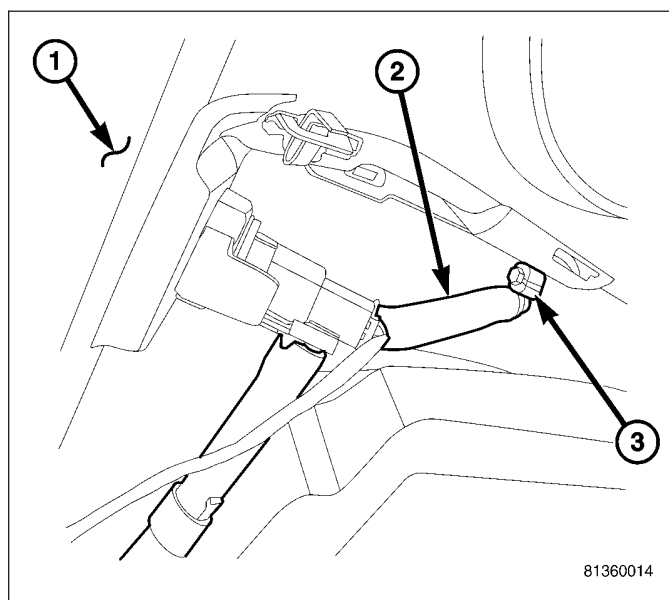
## OPERATION

The headlamp washer system utilizes a separate high pressure pump that is attached to the windshield washer reservoir. The headlamp washer pump feeds nozzles that are mounted in the front fascia of the vehicle. The nozzles are aimed in front of the headlamp assembly. These nozzles spray the headlamps when the system is activated.

To activate the headlamp washers, turn ON the headlamps and then press the front windshield washer control knob. This will operate the windshield washers and direct one, timed high pressure sprays onto the headlamp lens.

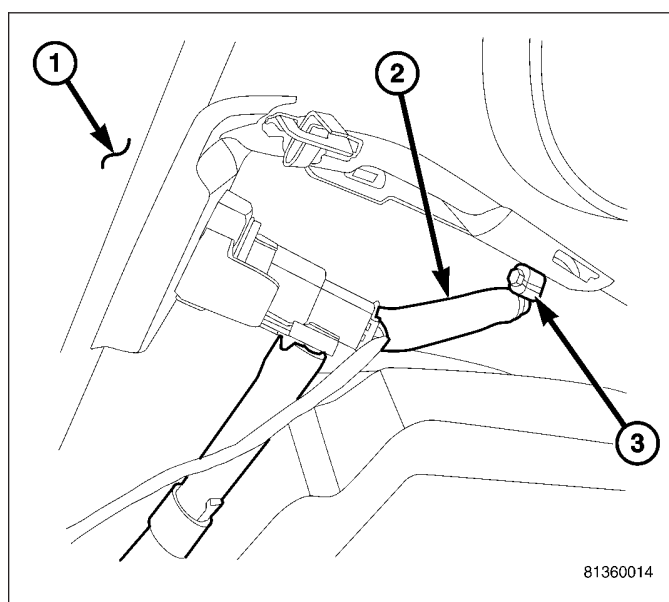
## REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Loosen front fascia as necessary on the side to be removed (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).
3. Disconnect washer hose (2) from headlamp washer.
4. Remove headlamp washer from front fascia (1).



## INSTALLATION

1. Install headlamp washer to front fascia (1).
2. Attach washer hose (3) to headlamp washer.
3. Install front fascia (1) (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).
4. Connect battery negative cable.

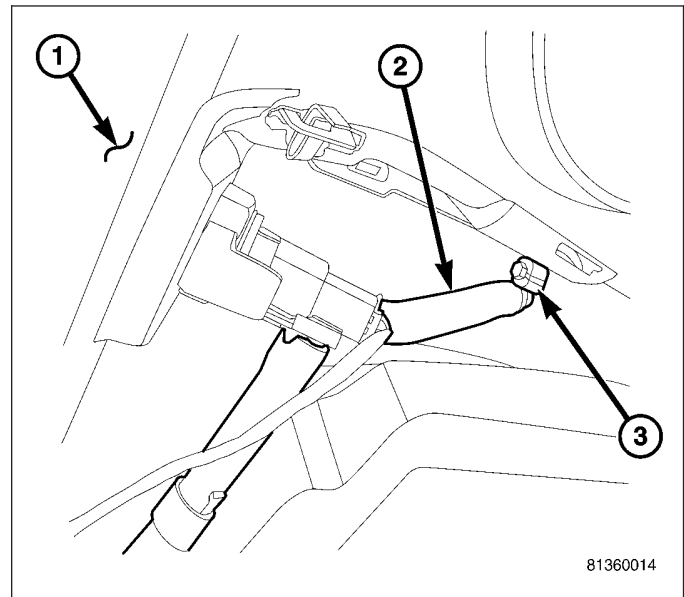


## HEADLAMP WASHER HOSE

### REMOVAL

The headlamp washer hose (2) is a special high pressure hose with specific fittings (3), and must be replaced as a unit.

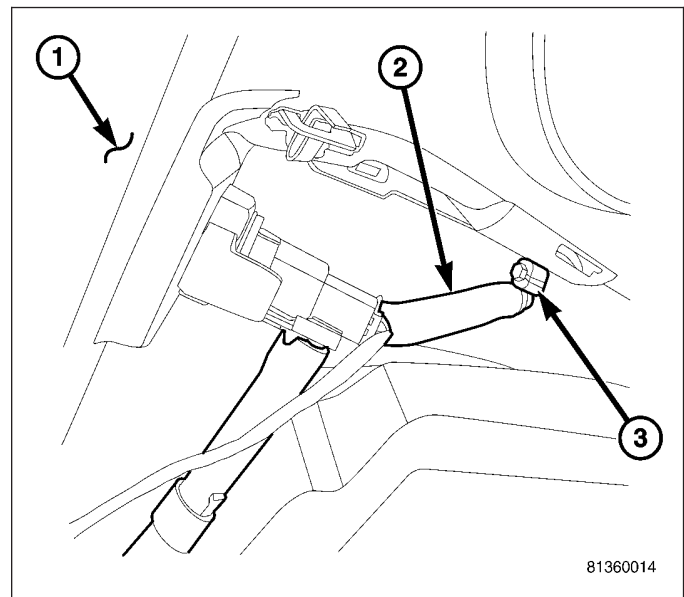
1. Disconnect and isolate the battery negative cable.
2. Loosen up the fascia (1) on the side of the vehicle in which hose needs replacing (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).
3. When disconnecting hose (2) , press down firmly on latch at headlamp washer pump motor and washer assembly (3) and pull apart.



### INSTALLATION

The headlamp washer hose is a special high pressure hose with specific fittings, and must be replaced as a unit.

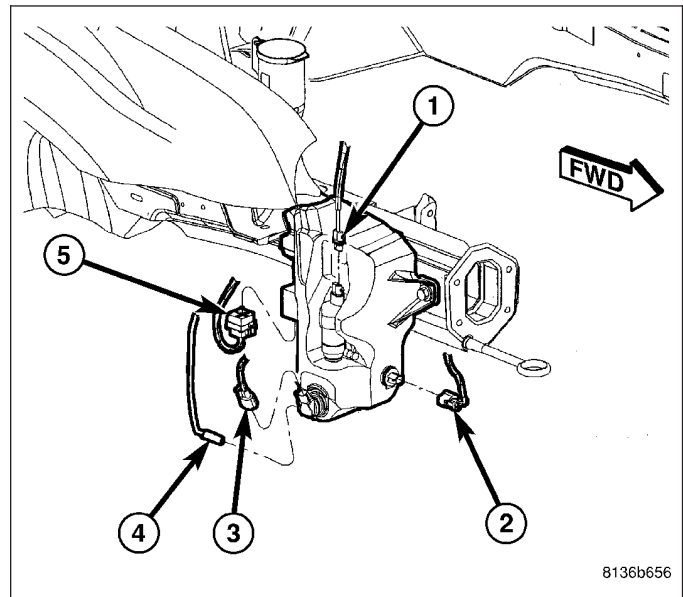
1. Install the new high pressure headlamp washer hose (2) assembly. Push fitting (3) on until a snap is heard.
2. Install the fascia (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).
3. Connect the battery negative cable.



## HEADLAMP WASHER PUMP MOTOR

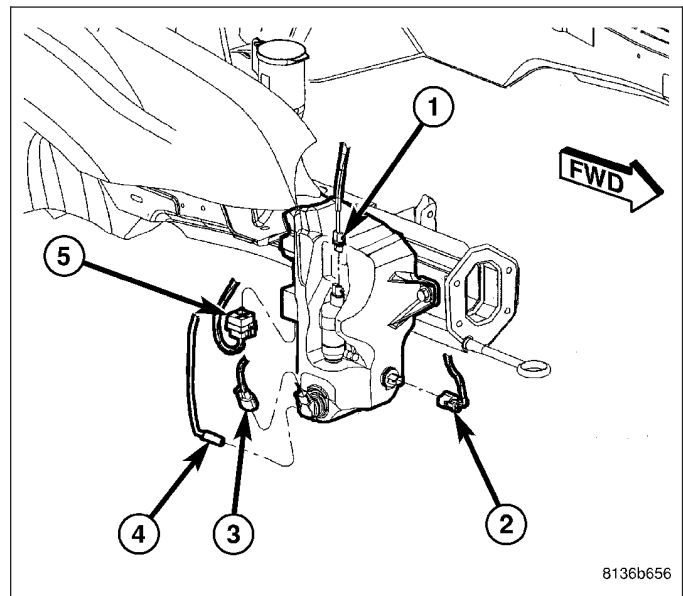
### REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Drain washer fluid from the reservoir and into a suitable clean container. This can be done by disconnecting the windshield washer hose from the front (outboard) washer pump and allowing the washer fluid to drain into a container through a temporary jumper hose connected to the front washer pump.
3. Remove the washer reservoir (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER RESERVOIR - REMOVAL).
4. Disconnect the high pressure headlamp washer pump hose by pressing down firmly on latch and pulling hose off.
5. Disconnect the high pressure headlamp washer pump motor electrical connector (1).
6. Remove pump from reservoir by pulling pump up and away from reservoir cavity and out of mounting grommet. Do not damage reservoir/pump sealing surface or puncture reservoir during removal.
7. Remove pump grommet and discard.



### INSTALLATION

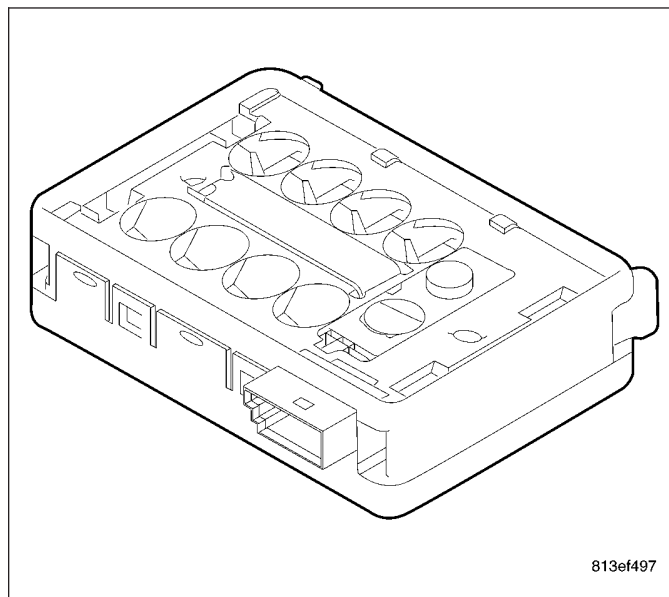
1. Use new grommet when installing a new pump assembly.
2. Assure that the pump is aligned to and fully seated in the reservoir cavity.
3. Install the washer reservoir (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER RESERVOIR - INSTALLATION).
4. Connect the electrical harness connectors to the washer pump motors and the fluid level sensor.
5. Connect the high pressure headlamp washer hose by firmly pushing hose onto inlet until a snap is heard.
6. Refill the reservoir with fluid drained previously.
7. Connect the battery negative cable.



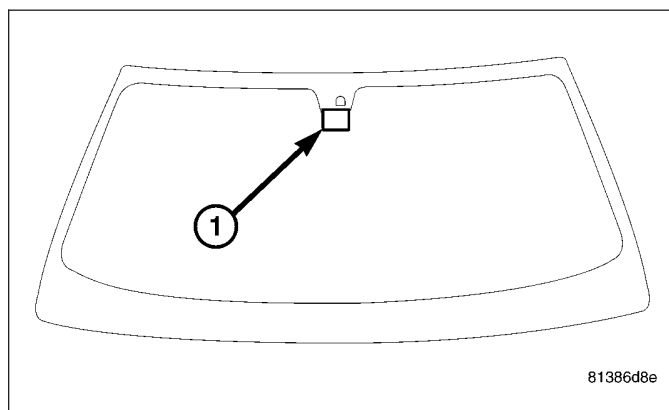
## SENSOR-RAIN

### DESCRIPTION

The Rain Sensor is the primary component of the automatic wiper system.

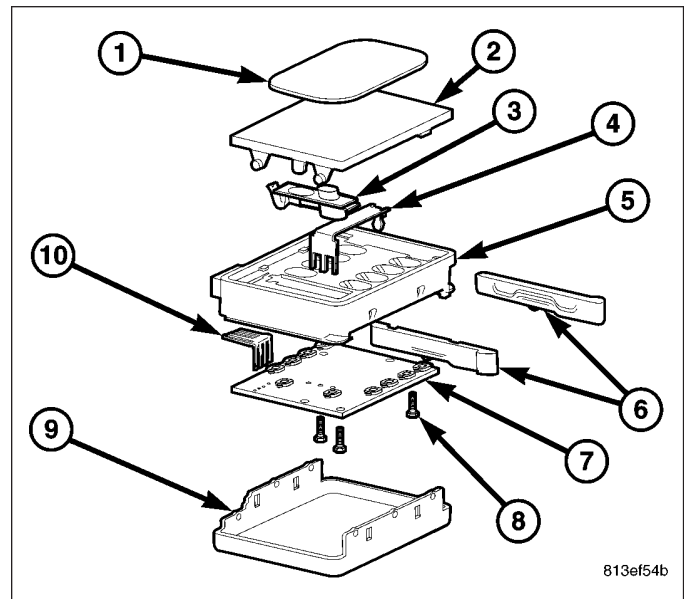


The rain sensor is located on the inside of the windshield, just below the rear view mirror mounting button (1).



Sliding cam locks (6) on each side of the top sides of the sensor (either side of the connector) secures the sensor to the mounting bracket (9) that is bonded (1) to the windshield glass. A small screwdriver can be used to push in the tabs until the slider protrudes from the opposing side of the sensor case (5). Concealed within the sensor housing (5) is the electronic circuitry (7) of the module, which includes four Infrared diodes, four photocells, and a microprocessor.

The rain sensor software is Flash compatible, which means it can be reprogrammed using Flash reprogramming procedures. However, if any of the hardware of the sensor is damaged or faulty, the entire rain sensor must be replaced. The rain sensor bracket (9) is serviced as a unit with the windshield glass. If the bracket is faulty, damaged, or separated from the windshield glass, the windshield must be replaced.



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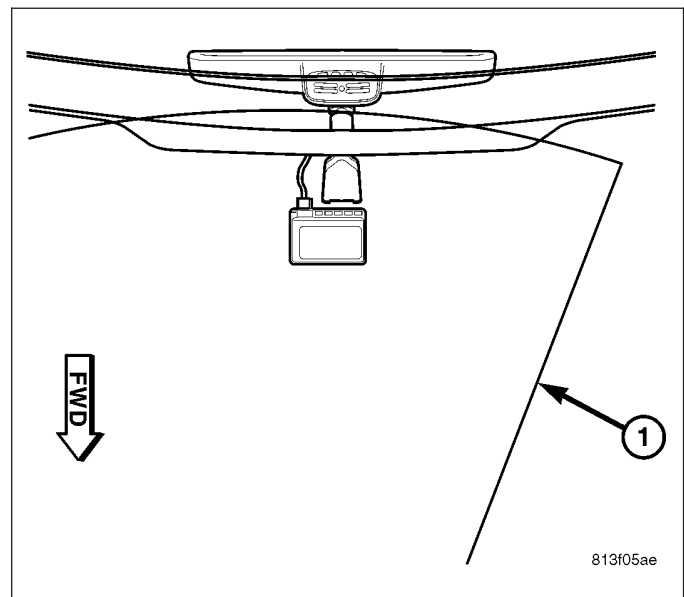
## OPERATION

The microprocessor-based Rain Sensor senses moisture in the wipe pattern (1) on the outside of the windshield glass and sends wipe commands to the Front Control Module (FCM). Four Infrared diodes within the sensor generate infrared light beams that are aimed by four of the convex optical lenses near the base of the sensor through the windshield glass. Four additional convex optical lenses near the top of the sensor are focused on the infrared light beams on the outside of the windshield glass and allow the four photocells within the sensor to sense changes in the intensity of these infrared light beams. When sufficient moisture accumulates within the wipe pattern (1) of the windshield glass, the sensor detects a change in the monitored infrared light beam intensity.

The internal programming of the sensor then sends the appropriate electronic wipe command messages to the FCM over the Controller Area Network (CAN) data bus. The FCM responds by activating or deactivating the front wiper system. The CCN sends electronic sensitivity level messages to the rain sensor over the CAN data bus based upon the driver-selected sensitivity setting of the control knob on the control stalk of the multi-function switch. The higher the selected sensitivity setting the more sensitive the rain sensor is to the accumulated moisture on the windshield glass, and the more frequently the sensor will send wipe commands to the FCM to operate the front wiper system.

The rain sensor operates on battery current received through a fuse in the Power Distribution Center (PDC) on a fused B+ circuit. The rain sensor receives ground at all times through the body wire harness. It is important to note that the default condition of the automatic wiper system is low. Therefore, if no message is received by the FCM from the rain sensor for more than about five seconds when in the Auto sensitivity wipe mode, the wipers will default to a constant low wipe state.

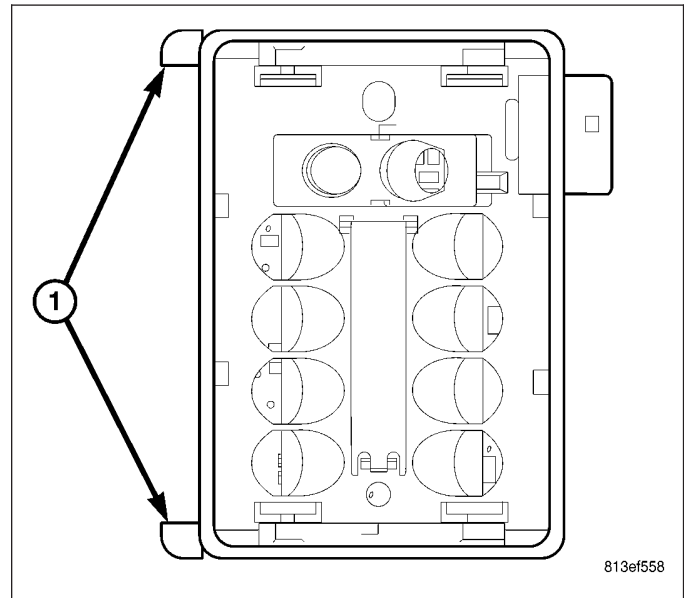
The rain sensor ground and battery current inputs may be diagnosed using conventional diagnostic tools and methods. The most reliable, efficient, and accurate means to diagnose the rain sensor requires the use of a scan tool and the appropriate diagnostic information.



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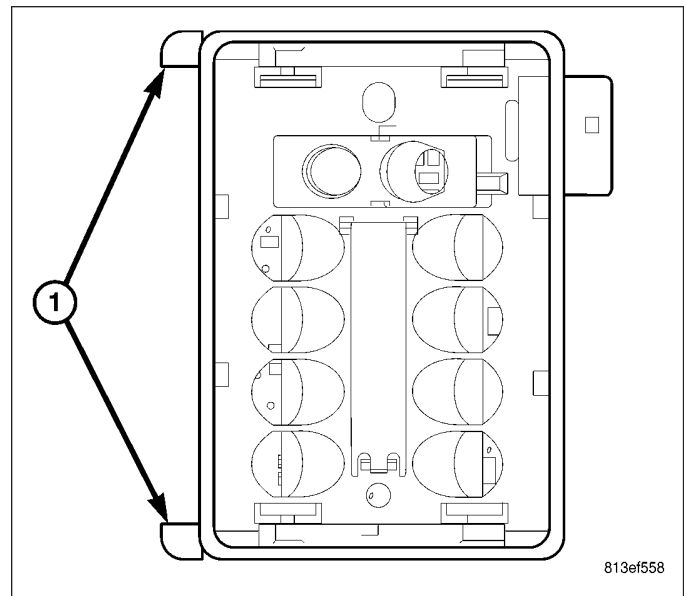
## REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Disconnect the electrical connector.
3. Using a small screwdriver or equivalent, from the top (connector side) push in the tabs until the slider protrudes from the opposing (bottom) side of the sensor case.
4. Gently pull each slider (1) slightly more until the cam lock releases the sensor.



## INSTALLATION

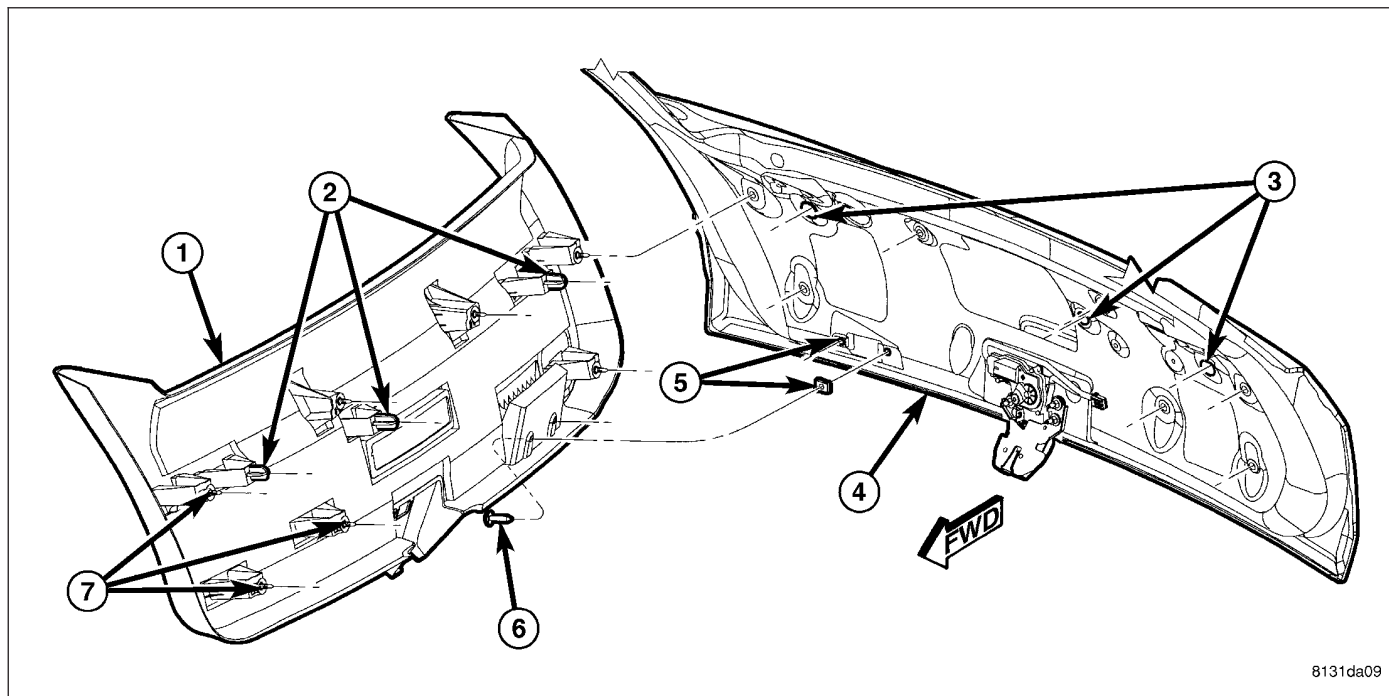
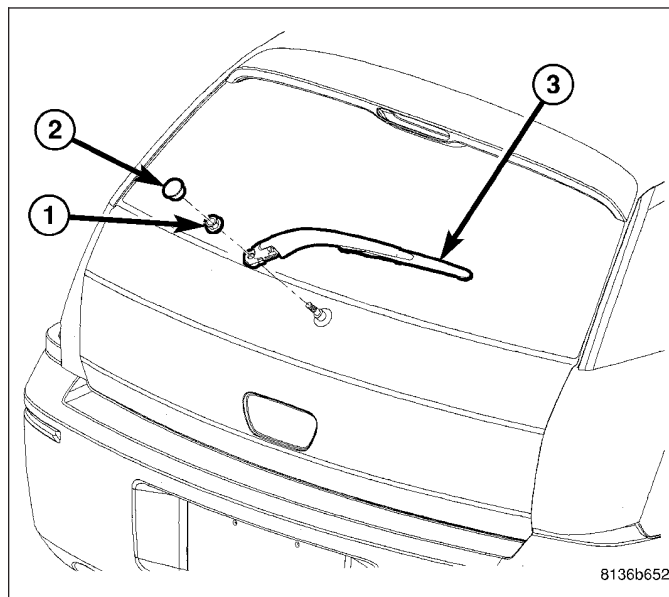
1. Make sure that the slider locks are positioned correctly in the downward position, sticking out of the side opposite the connector.
2. Position the rain sensor below the inside rear view mirror, over the bracket and gently push down to seat it on the bracket.
3. Push the slider cam locks (1) inward until they are flush with the side of the sensor case.
4. Connect the wire harness connector to the sensor.
5. Connect the battery negative cable.



## REAR WIPER MOTOR - WAGON ONLY

### REMOVAL

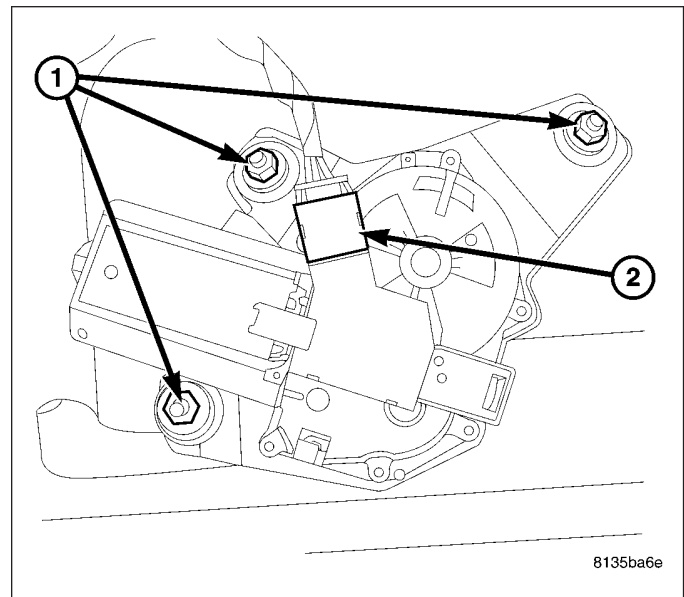
1. Disconnect and isolate the battery negative cable.
2. Remove the rear wiper arm (3) (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - REMOVAL).



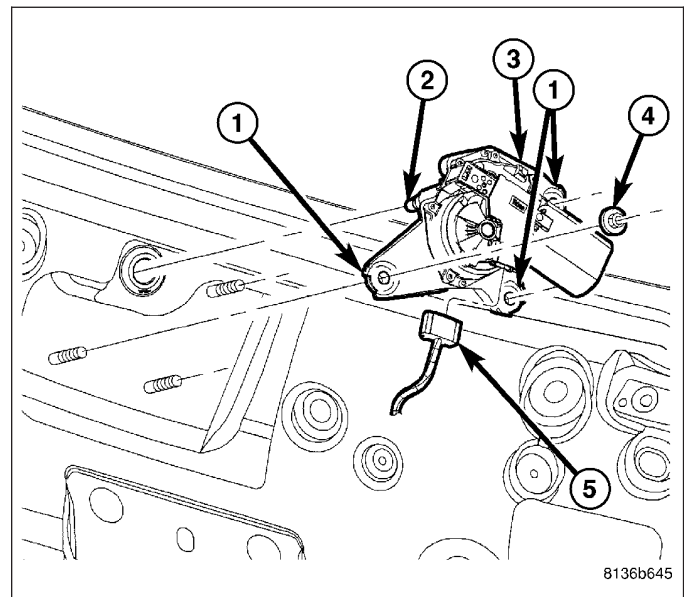
3. Remove the liftgate trim panel (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - REMOVAL).



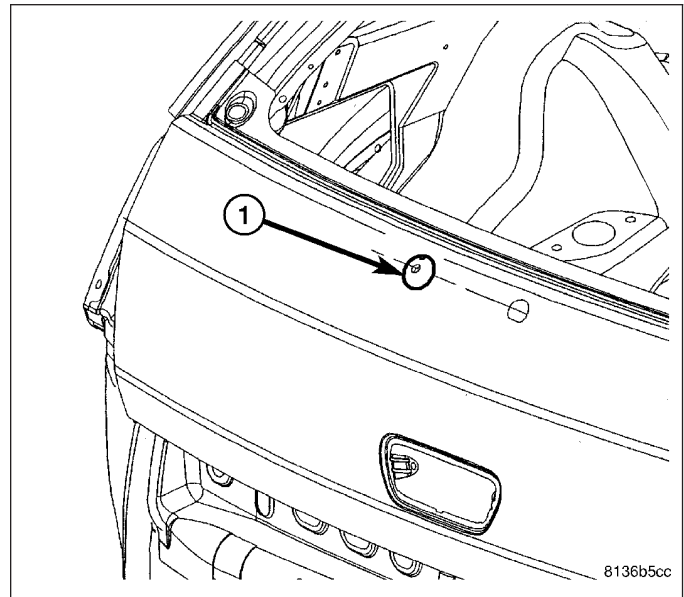
4. Remove the three mounting fasteners (1).



5. Disconnect the electrical harness connector (5).  
6. Separate the wiper motor (3) from the liftgate.

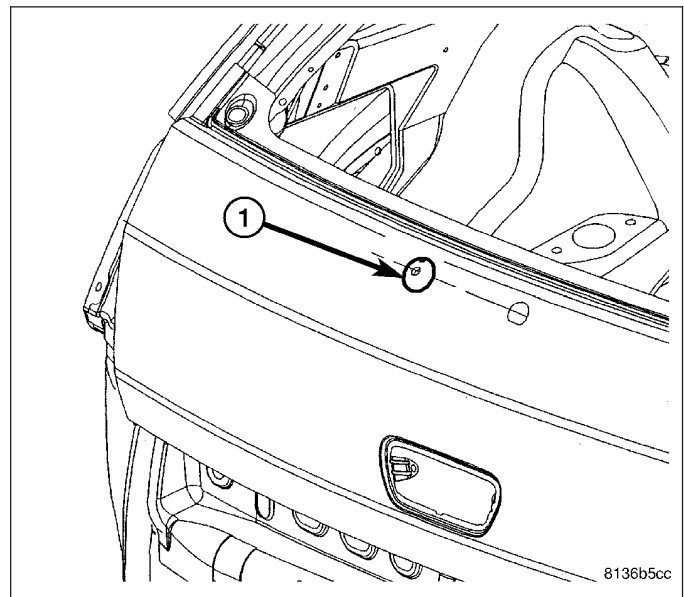


7. Inspect the wiper motor shaft to liftgate seal (1).

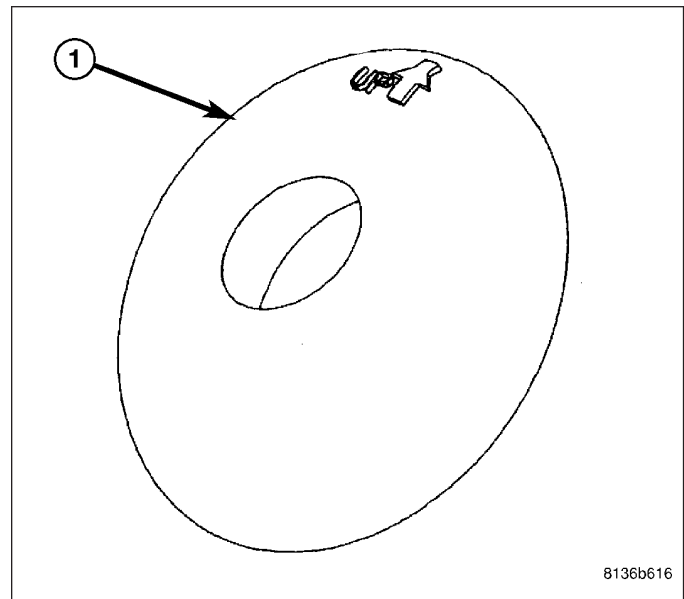


## INSTALLATION

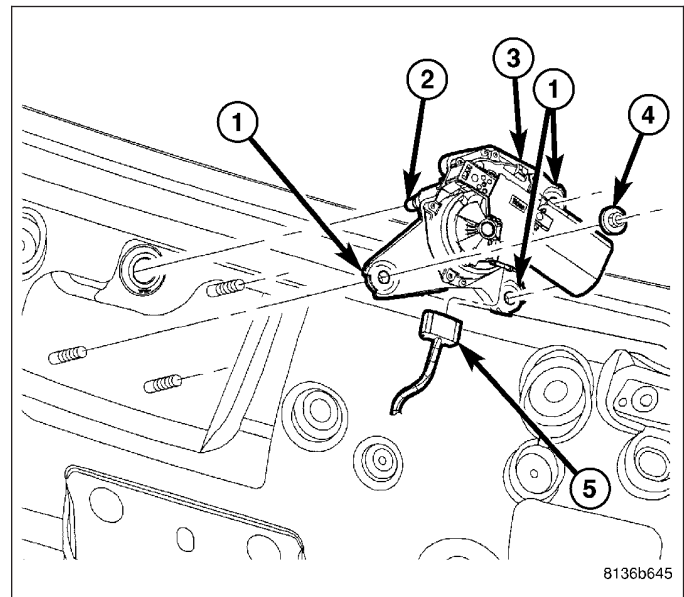
1. Inspect the shaft-to-liftgate seal (1) in liftgate.



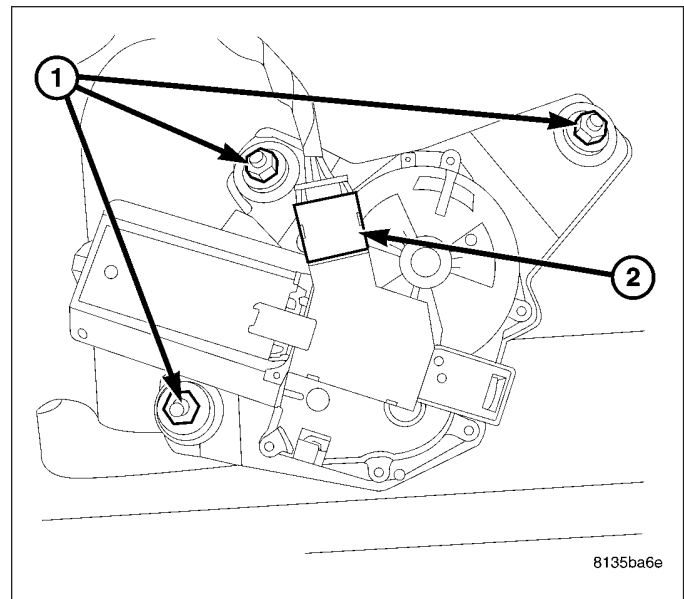
2. If seal is damaged, brittle, or deformed in any way replace. Position shaft seal (1) with the arrow in the UP position.



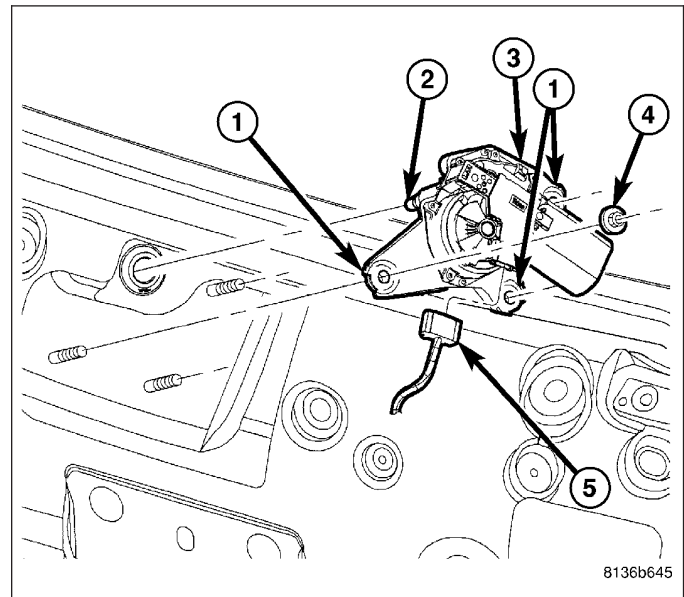
3. Position wiper motor (3) in liftgate.

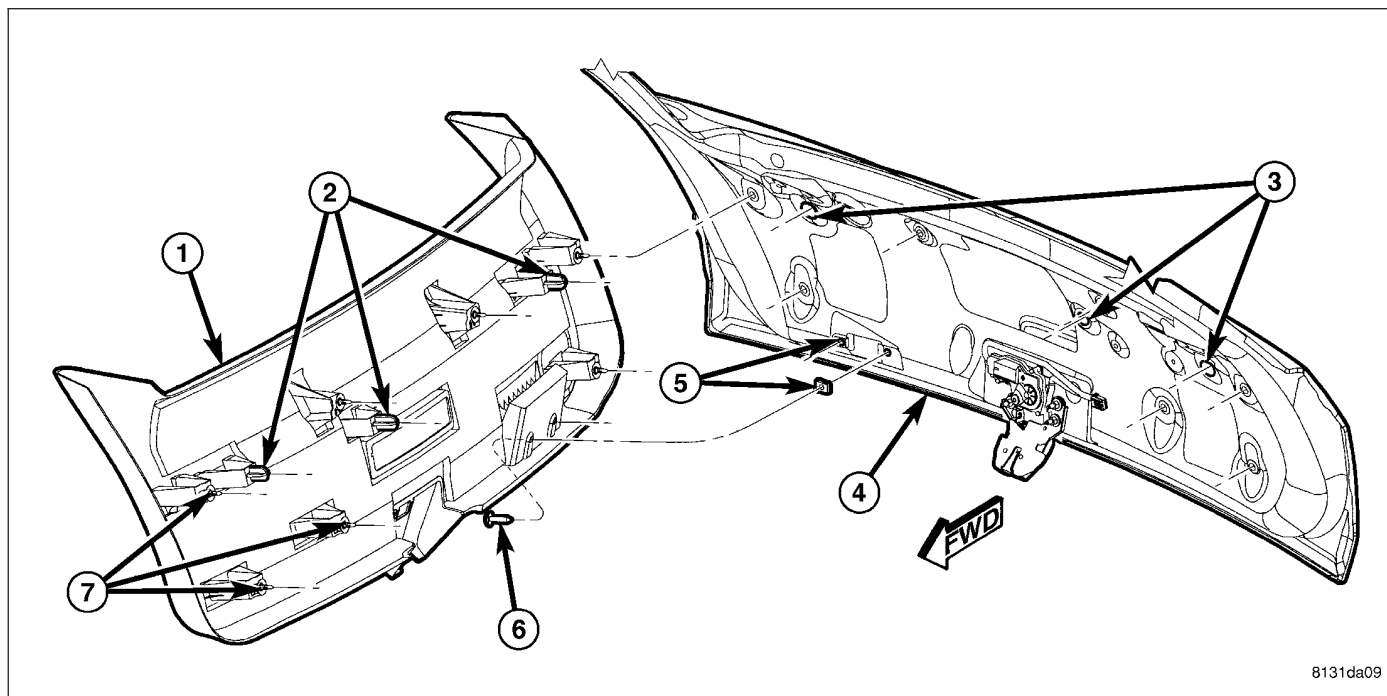


4. Install the mounting nuts (1). Torque nuts to 8 N·m (70 in. lbs).



5. Connect the electrical harness connector (5).

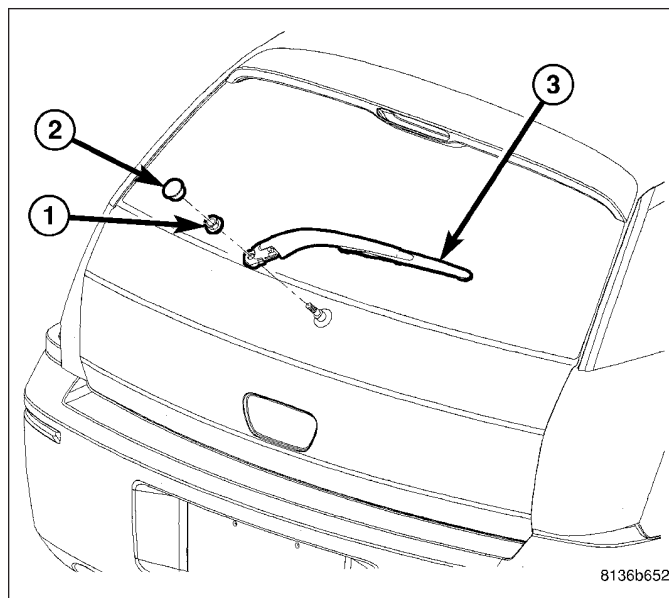




6. Install lower liftgate trim panel (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - INSTALLATION).

7. Install the rear wiper arm (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - INSTALLATION). Torque nut to 18 N·m (13 ft. lbs.).

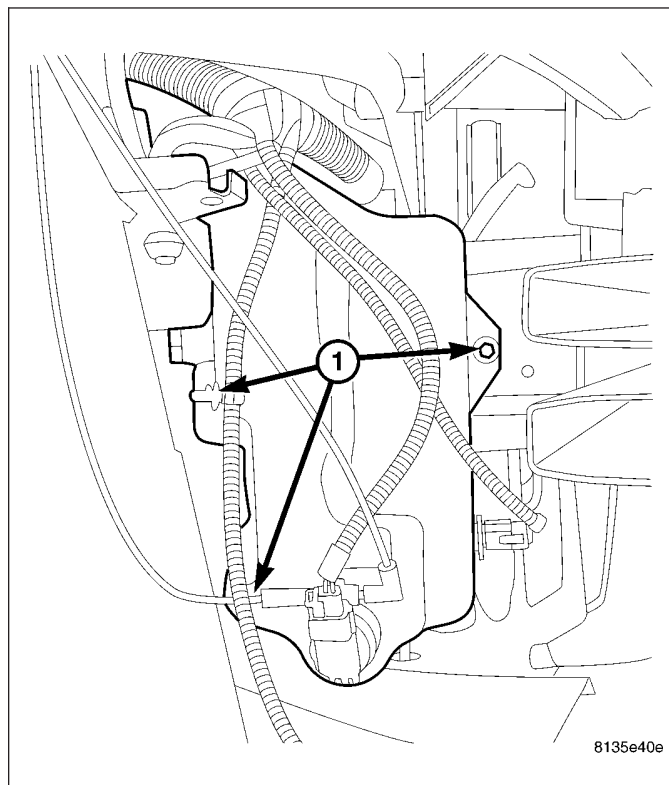
8. Connect the battery negative cable.



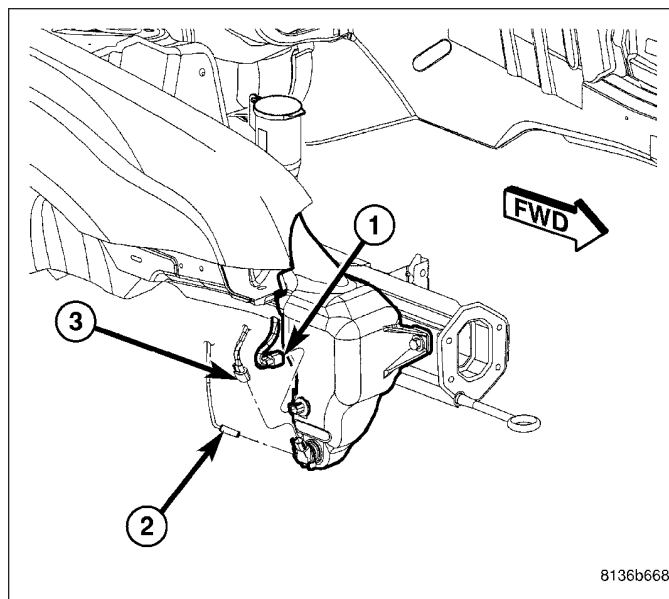
## WASHER FLUID LEVEL SWITCH

### REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Drain washer fluid from the reservoir and into a suitable clean container. This can be done by disconnecting the windshield washer hose from the front (outboard) washer pump and allowing the washer fluid to drain into a container through a temporary jumper hose connected to the front washer pump.
3. Remove the washer reservoir (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER RESERVOIR - REMOVAL).

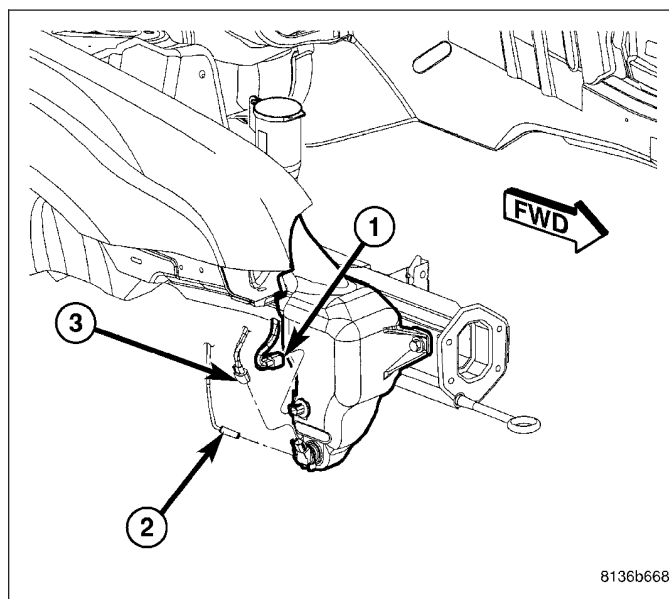


4. Remove the washer fluid level switch by pulling out of reservoir. Inspect the grommet and if installing a new switch, always use a new grommet.

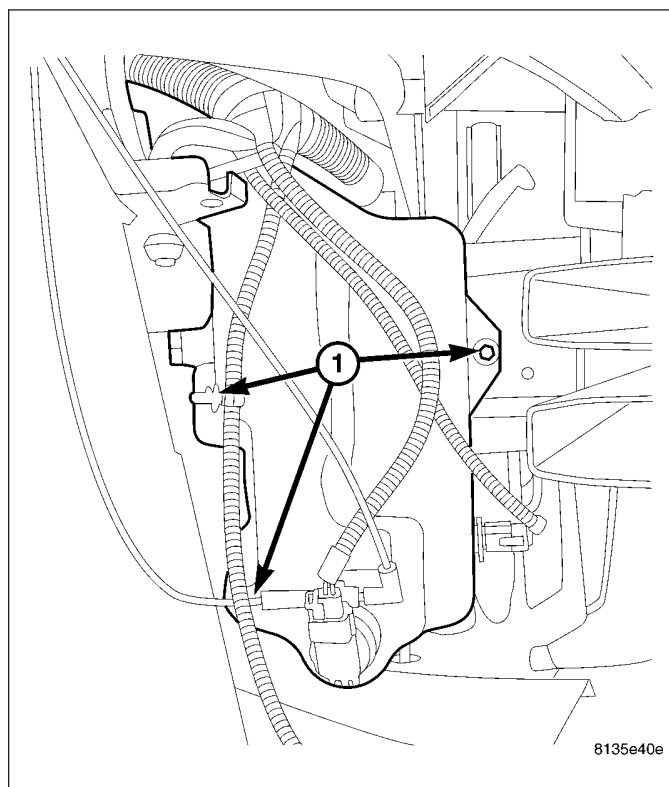


## INSTALLATION

1. Inspect grommet and if installing new switch, use a new grommet. Position the switch into opening and firmly press into place.



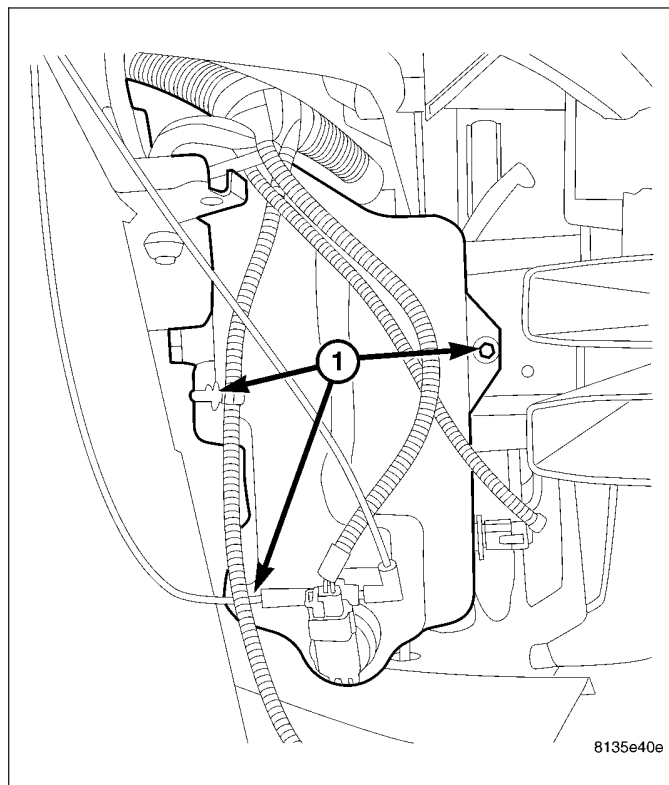
2. Install the washer reservoir (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER RESERVOIR - INSTALLATION).
3. Refill the reservoir with fluid drained previously.
4. Connect the battery negative cable.



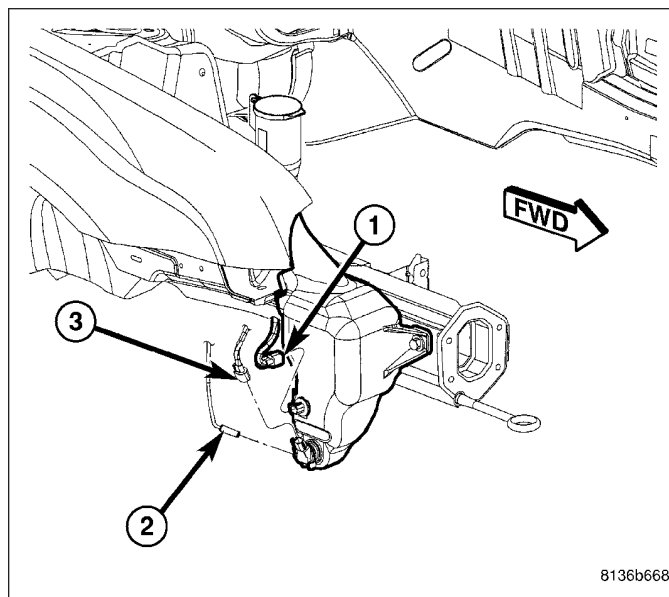
## WASHER PUMP MOTOR

### REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Drain washer fluid from the reservoir and into a suitable clean container. This can be done by disconnecting the windshield washer hose from the front (outboard) washer pump and allowing the washer fluid to drain into a container through a temporary jumper hose connected to the front washer pump.
3. Remove the washer reservoir (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER RESERVOIR - REMOVAL).



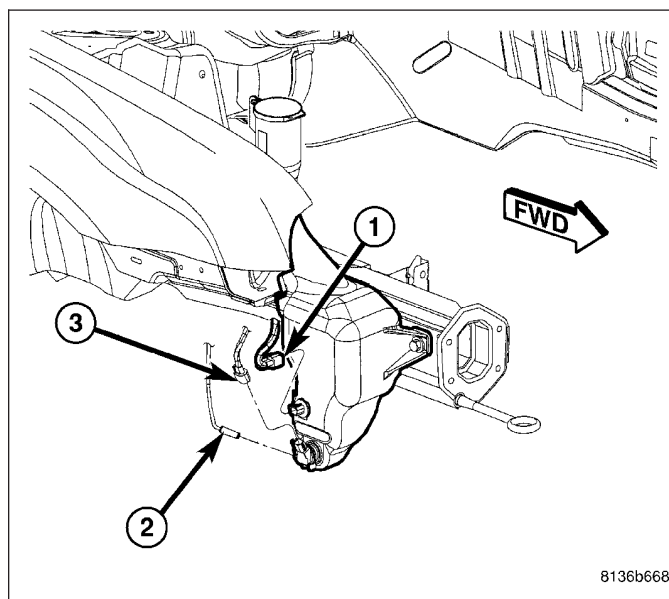
4. Remove the washer pump motor by pulling out of reservoir. Inspect the grommet and if installing a new motor, always use a new grommet.



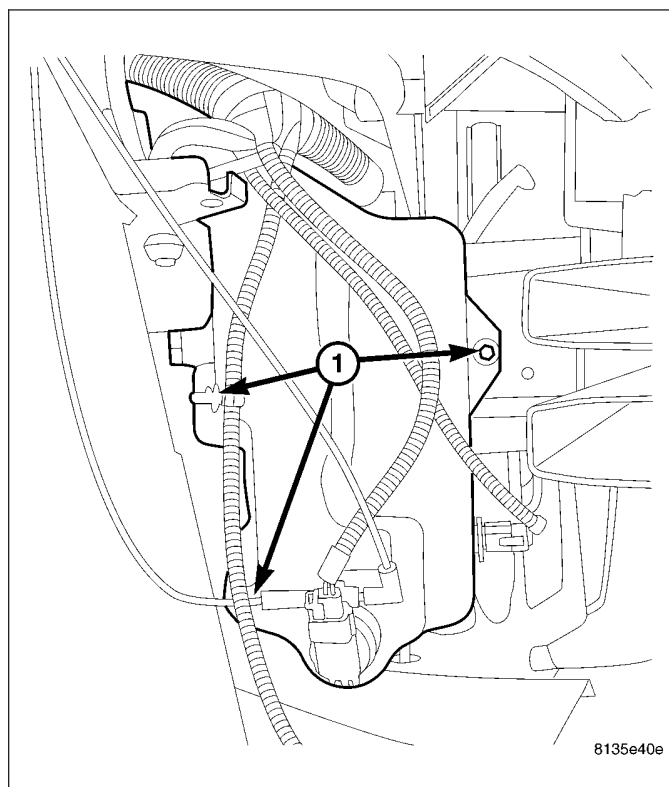


## INSTALLATION

1. Inspect grommet and if installing new motor, use a new grommet. Position the motor into opening and firmly press into place.

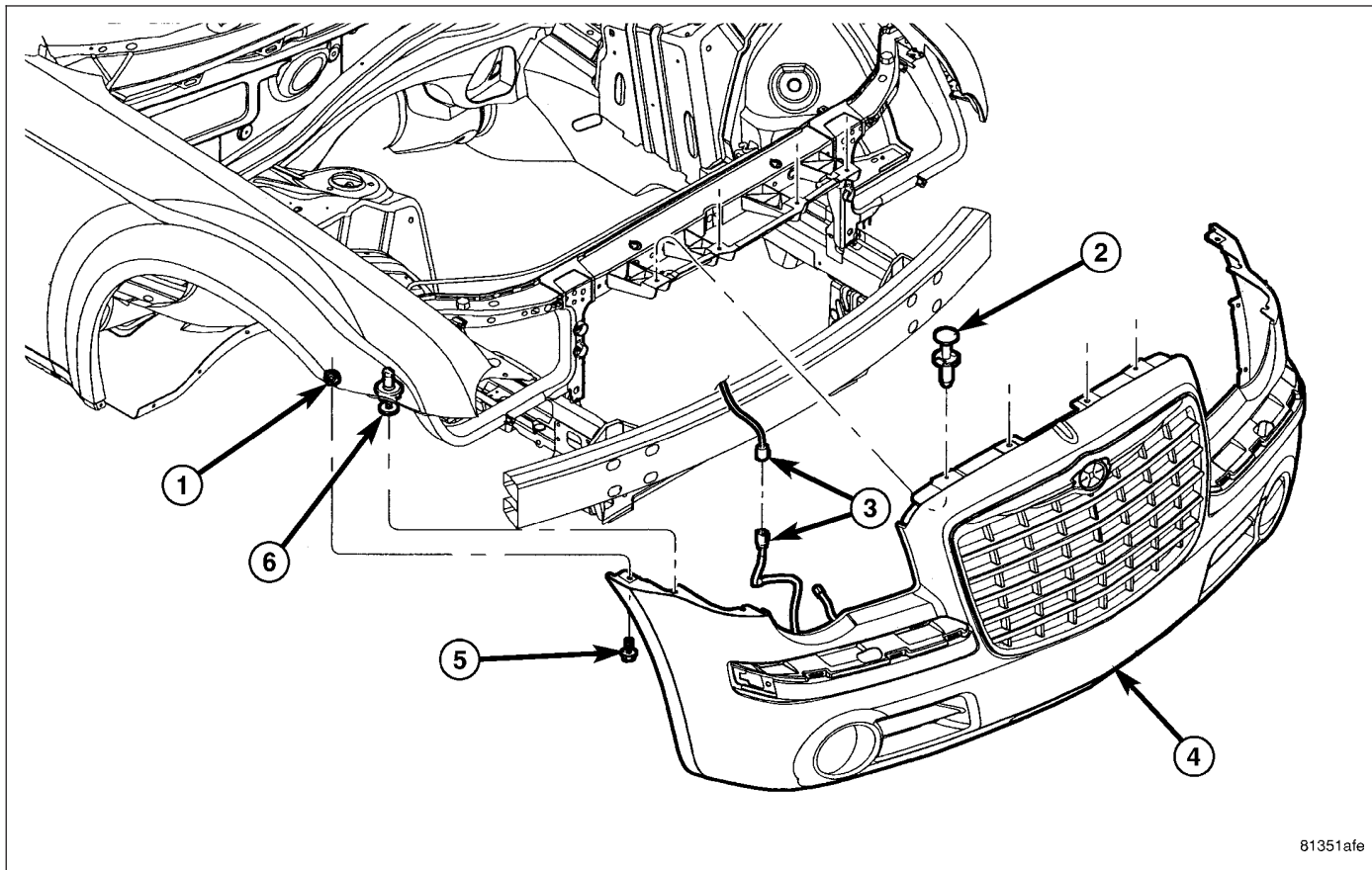


2. Install the washer reservoir (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER RESERVOIR - INSTALLATION).
3. Refill the reservoir with fluid drained previously.
4. Connect the battery negative cable.

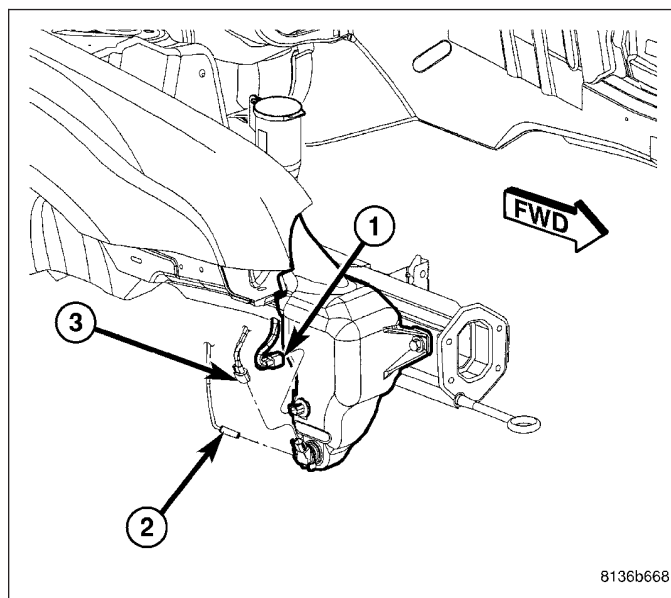


## WASHER RESERVOIR

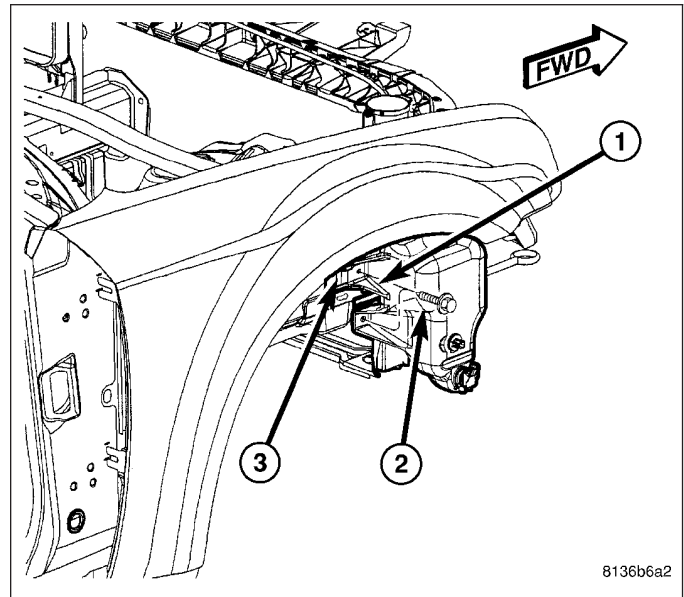
### REMOVAL



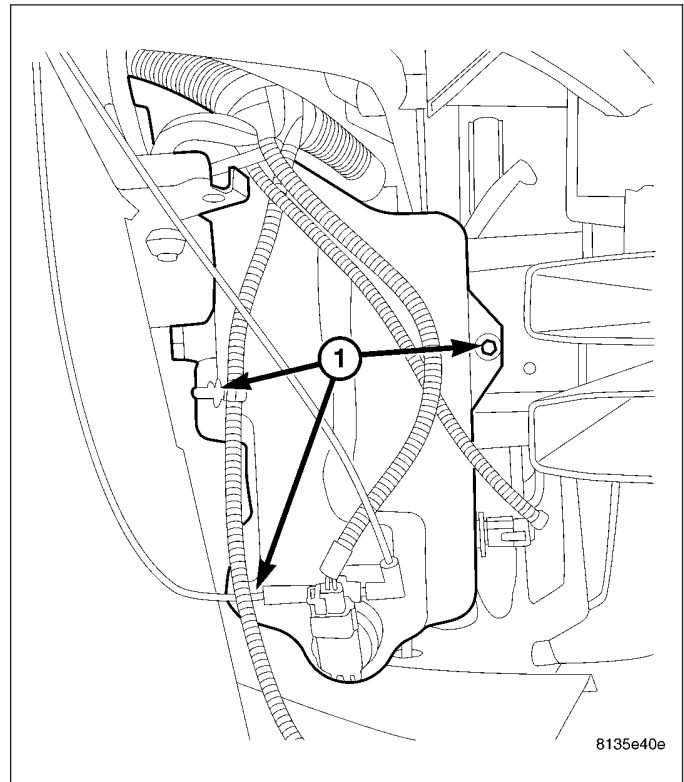
1. Disconnect and isolate the battery negative cable.
2. Remove the front fascia (4) (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).
3. Disconnect electrical harness connectors (1 and 3) from reservoir.
4. Disconnect hose from reservoir (2) and drain fluid into container.



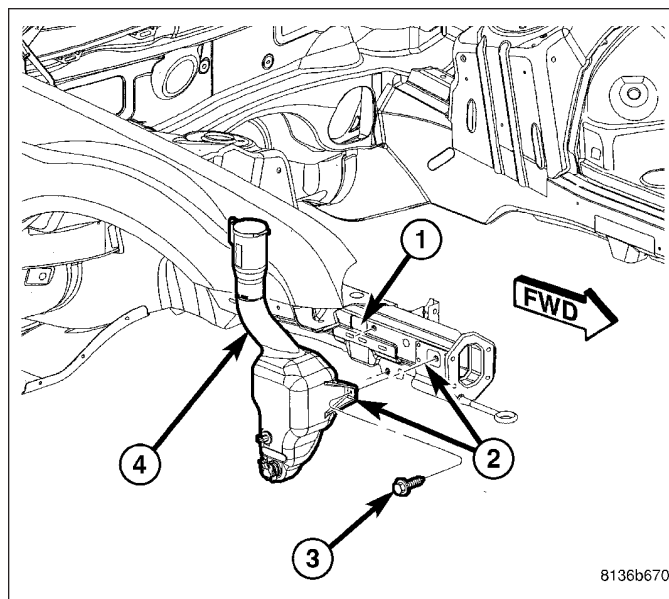
5. Remove the rear mounting fastener (2).



6. Remove the remaining fasteners (1).

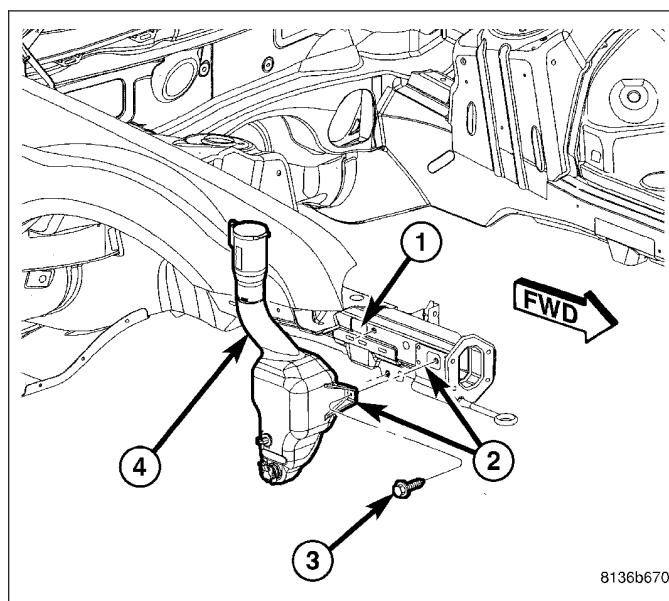


7. Remove the reservoir (4) from the vehicle.

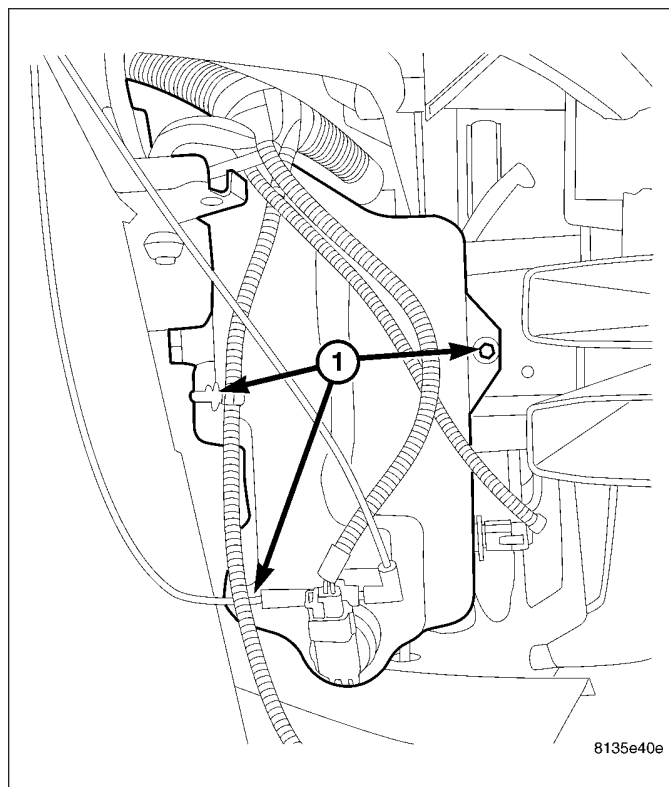


## INSTALLATION

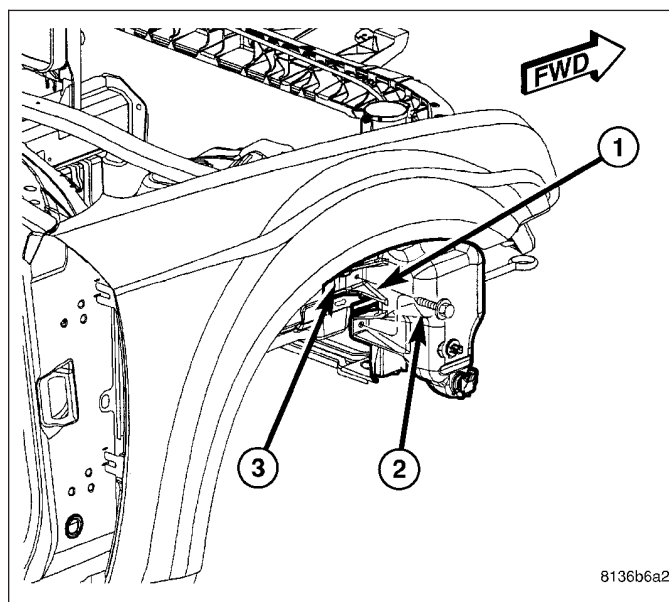
1. Position reservoir (4) in vehicle.



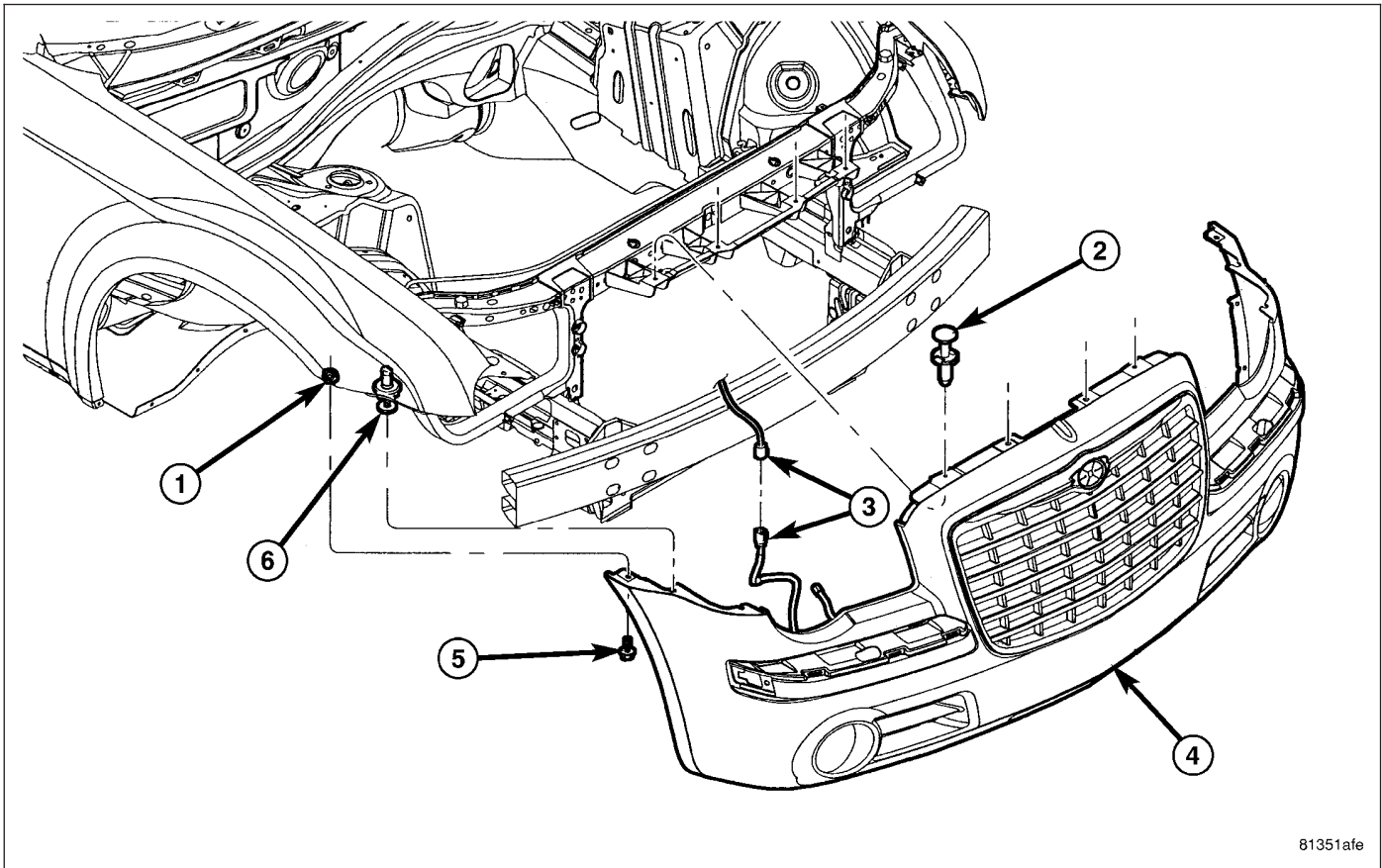
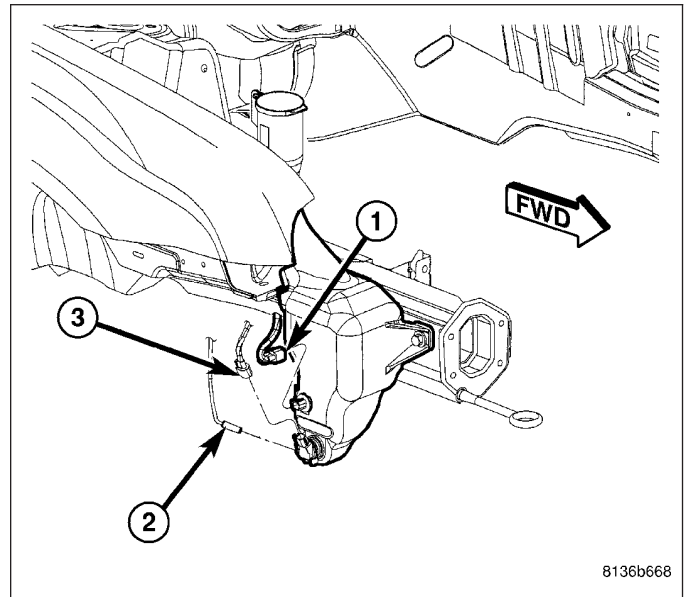
2. Install mounting fasteners (1). Torque fasteners to 7 N·m (62 in. lbs).



3. Install rear mounting fastener (2). Torque fastener to 7 N·m (62 in. lbs).



4. Connect electrical harness connectors (1 and 3) and hoses (2) to reservoir.



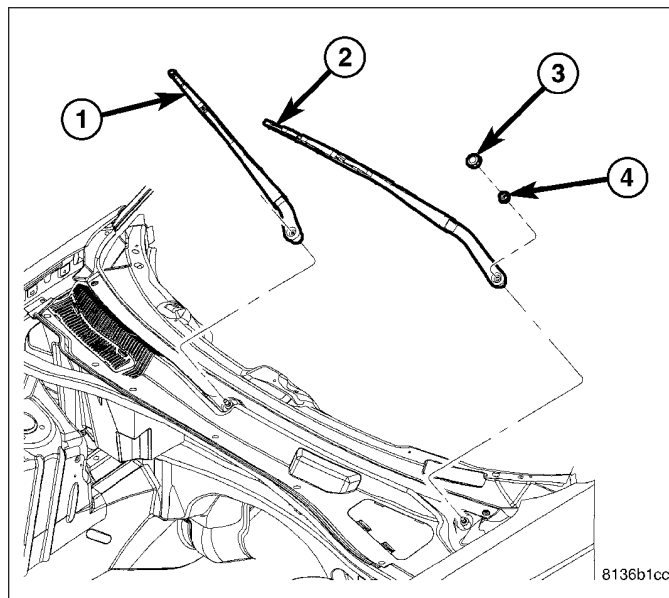
5. Install front fascia (4) (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).
6. Connect the battery negative cable.
7. Fill reservoir.

## WIPER ARMS

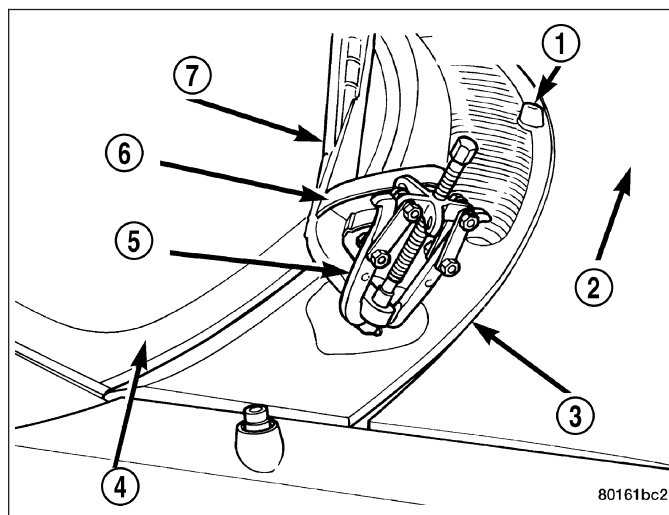
### REMOVAL

#### FRONT WIPER ARM

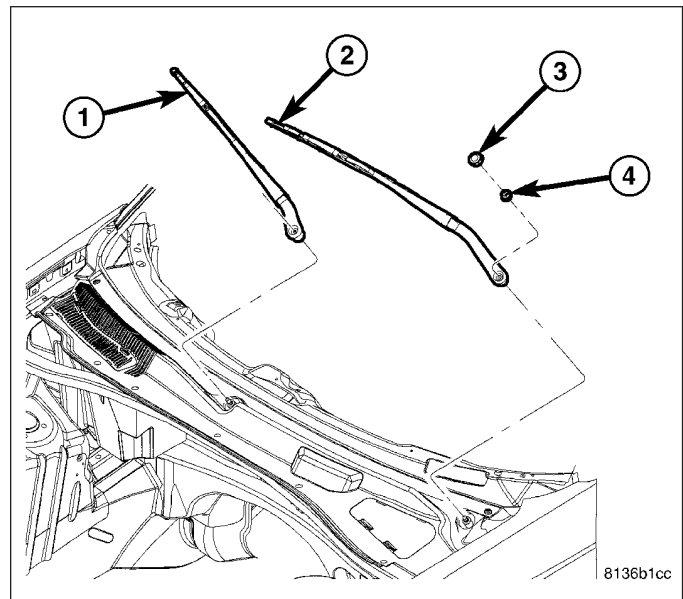
1. Remove the nut caps (3).
2. Remove the retaining nuts (4).



3. Using a suitable two jaw puller (5), separate the wiper arm (7) from the wiper pivot.

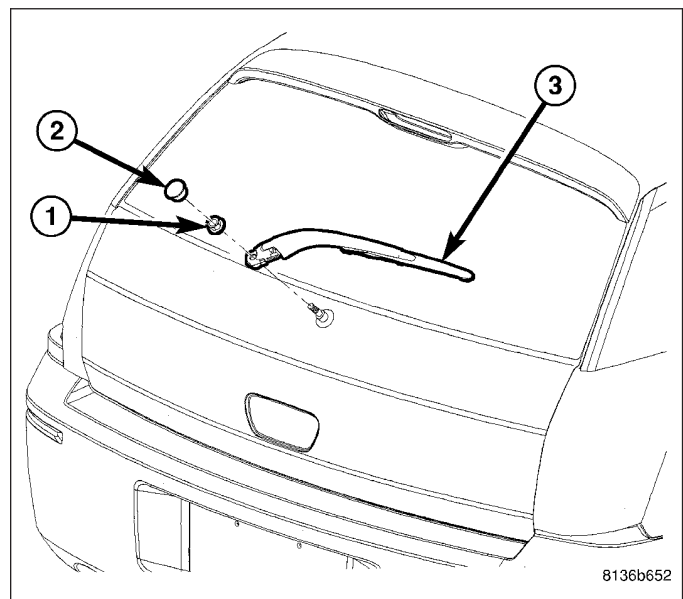


4. Remove the wiper arms (1 and 2).



## REAR WIPER ARM - WAGON

1. Remove the nut cap (2).
2. Remove the retaining nut (1).
3. Gently rock the wiper arm from side to side to loosen it from the shaft.
4. Remove the wiper arm (3).

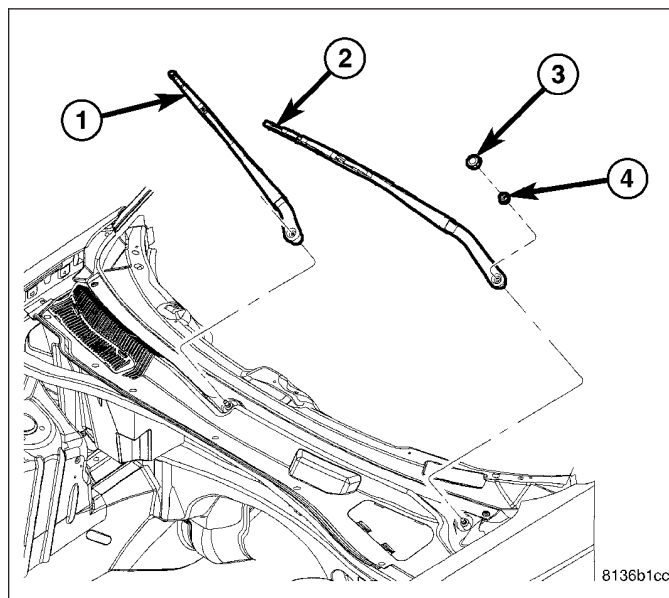




## INSTALLATION

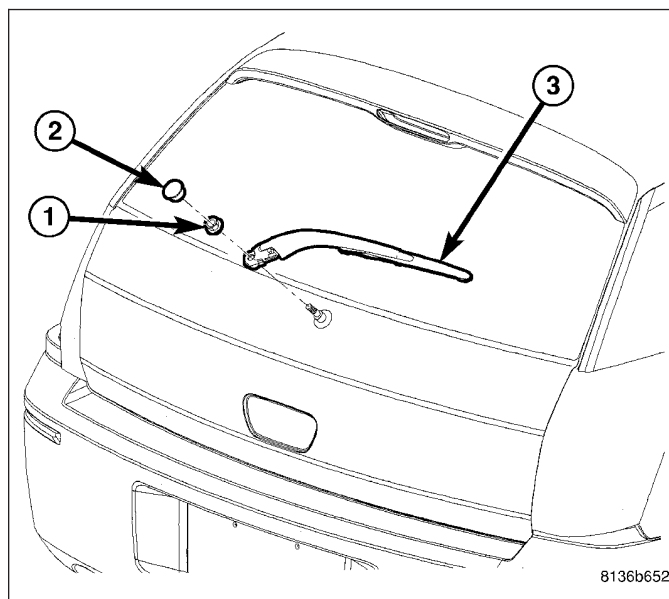
### FRONT WIPER ARM

1. Install wiper arms (1) on wiper arm pivots.
2. Install retaining nuts (4). Torque nuts to 18 N·m (13 ft. lbs.).
3. Install nut caps (3).



### REAR WIPER ARM - WAGON

1. Install wiper arm (3).
2. Install retaining nut (1). Torque nut to 18 N·m (13 ft. lbs.).
3. install nut cap (2).



# NAVIGATION/TELECOMMUNICATION - ELECTRICAL DIAGNOSTICS

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## NAVIGATION/TELECOMMUNICATION - ELECTRICAL DIAGNOSTICS

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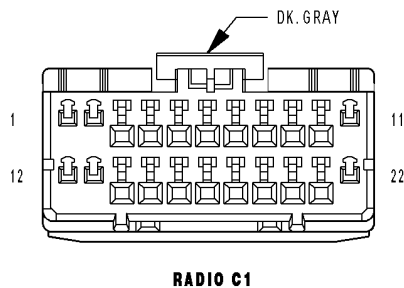
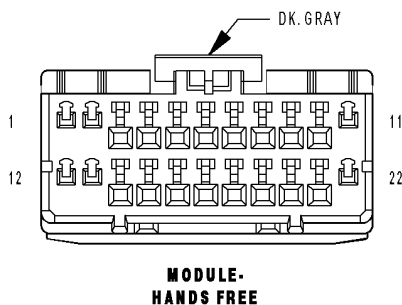
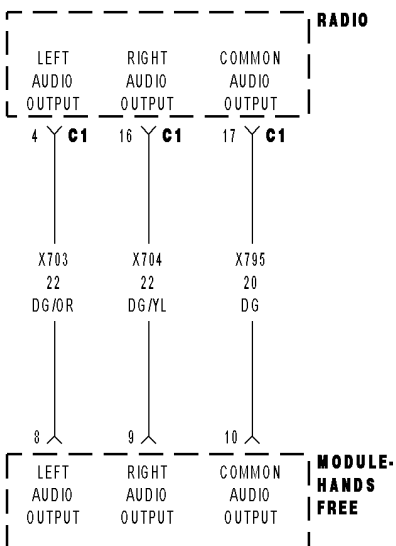
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NAVIGATION/TELECOMMUNICATION - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

## B1411-HFM LEFT AUDIO OUTPUT CIRCUIT LOW



**B1411-HFM LEFT AUDIO OUTPUT CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects low voltage on the (X703) Left Audio Output circuit.

Possible Causes
(X703) LEFT AUDIO OUTPUT CIRCUIT OPEN (X703) LEFT AUDIO OUTPUT CIRCUIT SHORT TO GROUND (X795) COMMON AUDIO OUTPUT CIRCUIT OPEN (X703) LEFT AUDIO OUTPUT CIRCUIT SHORT TO (X795) COMMON AUDIO OUTPUT CIRCUIT HANDS FREE MODULE

**Diagnostic Test**

**1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.  
Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.  
With the scan tool, read the active DTC's.

- Does the scan tool display this DTC as active?**
- Yes**    >> Go To 2
- No**    >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
-

**B1411-HFM LEFT AUDIO OUTPUT CIRCUIT LOW (CONTINUED)****2. (X703) LEFT AUDIO OUTPUT CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

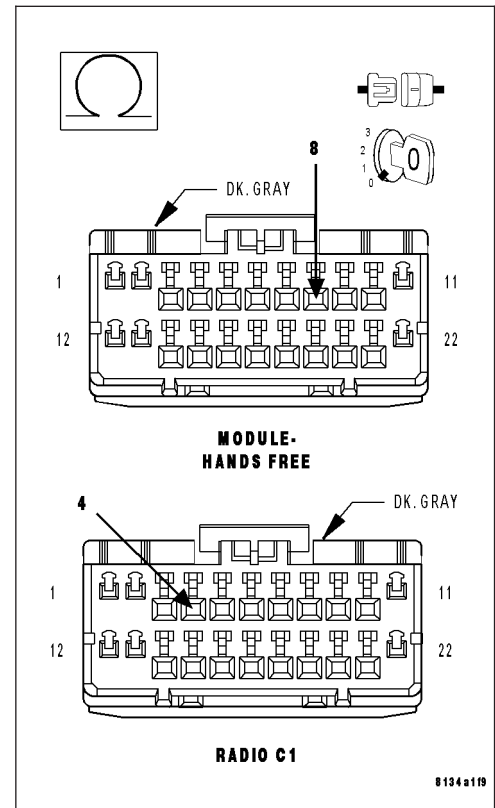
Disconnect the Radio C1 harness connector.

Measure the resistance of the (X703) Left Audio Output circuit between the HFM connector and the radio connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (X703) Left Audio Output circuit for an open  
Perform BODY VERIFICATION TEST – VER 1. (Refer to  
BODY VERIFICATION TEST – VER 1).

**3. (X703) LEFT AUDIO OUTPUT CIRCUIT SHORT TO GROUND**

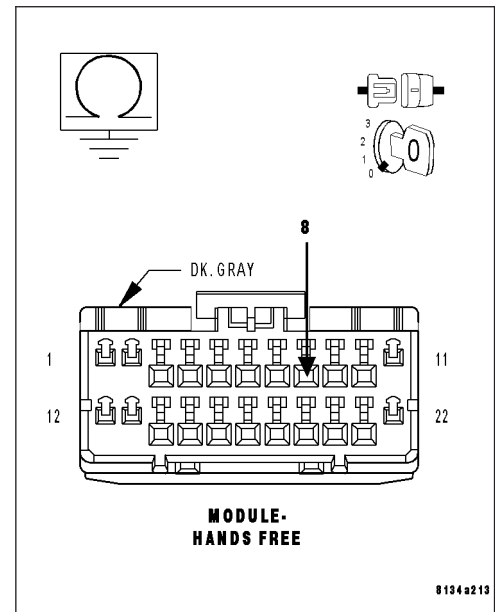
Measure the resistance between ground and the (X703) Left Audio Output circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (X703) Left Audio Output circuit for short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to  
BODY VERIFICATION TEST – VER 1).

**No** >> Go To 4



**B1411-HFM LEFT AUDIO OUTPUT CIRCUIT LOW (CONTINUED)****4. (X795) COMMON AUDIO OUTPUT CIRCUIT OPEN**

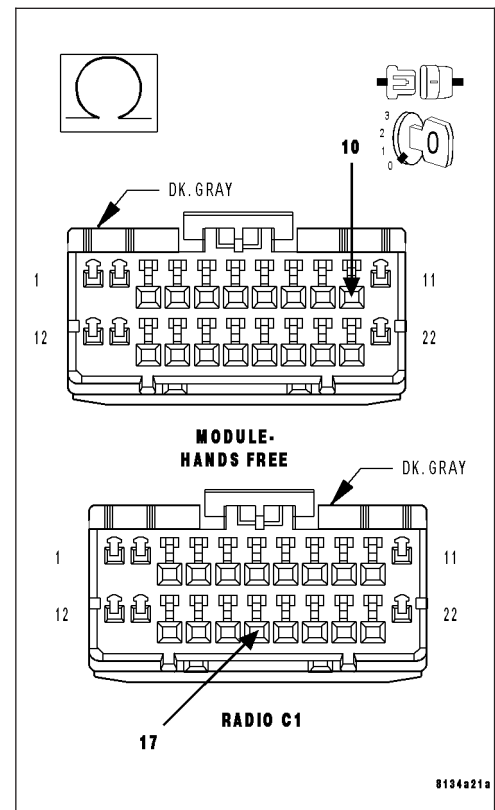
Measure the resistance of the (X795) Common Audio Output circuit between the HFM connector and the radio connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the (X795) Common Audio Output circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**5. (X703) LEFT AUDIO OUTPUT CIRCUIT SHORT TO (X795) COMMON AUDIO OUTPUT CIRCUIT**

Measure the resistance between the (X703) Left Audio Output circuit and the (X795) Common Audio Output circuit.

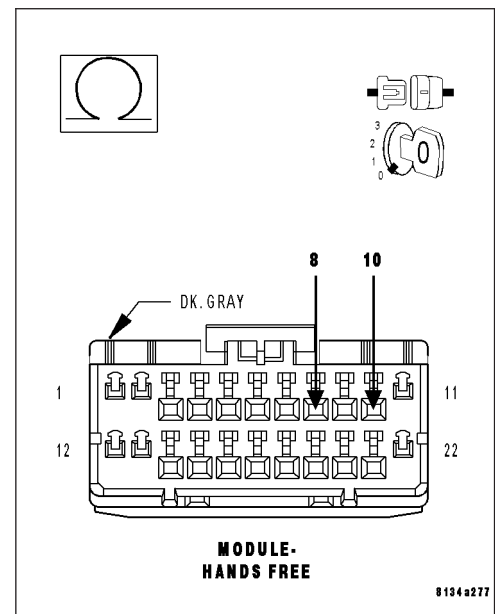
**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (X703) Left Audio Output circuit for a short to the (X795) Common Audio Output circuit.

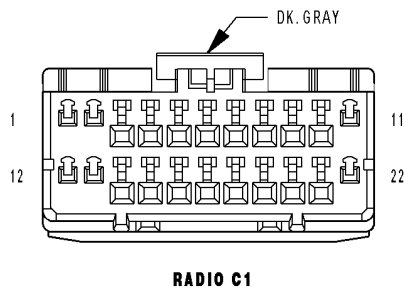
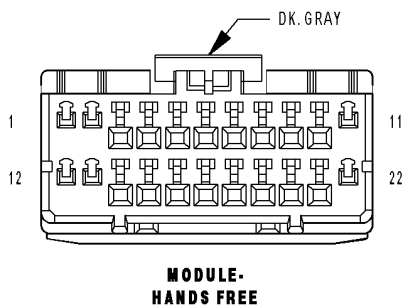
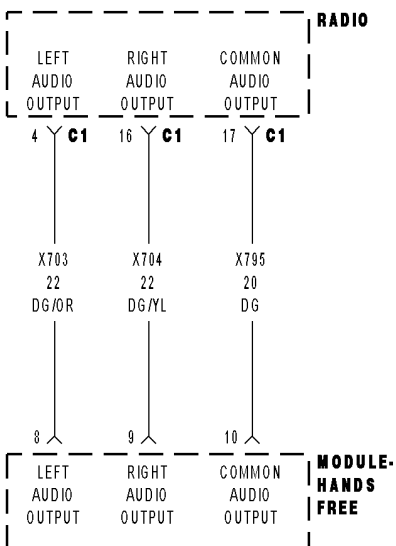
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



## B1412-HFM LEFT AUDIO OUTPUT CIRCUIT HIGH





**B1412-HFM LEFT AUDIO OUTPUT CIRCUIT HIGH (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects high voltage on the (X703) Left Audio Output circuit.

Possible Causes
(X703) LEFT AUDIO OUTPUT CIRCUIT OPEN
(X795) COMMON AUDIO OUTPUT CIRCUIT OPEN
(X703) LEFT AUDIO OUTPUT CIRCUIT SHORT TO VOLTAGE
HANDS FREE MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**2. (X703) LEFT AUDIO OUTPUT CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

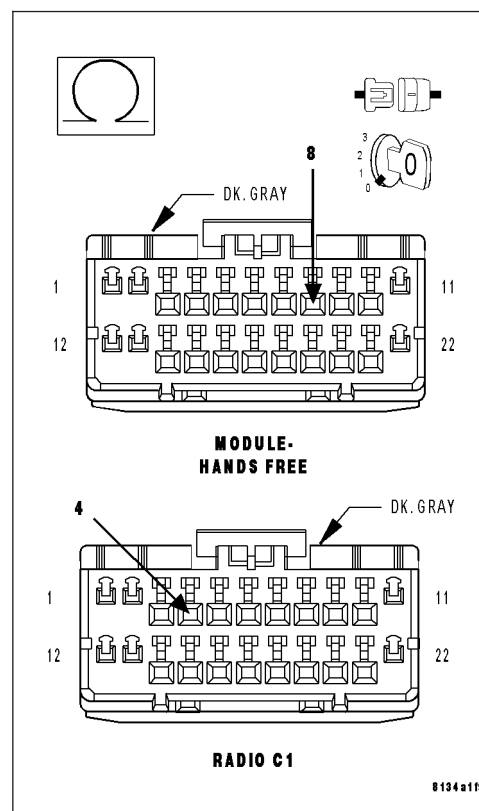
Disconnect the Radio C1 harness connector.

Measure the resistance of the (X703) Left Audio Output circuit between the HFM connector and the radio connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (X703) Left Audio Output circuit for an open  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**B1412-HFM LEFT AUDIO OUTPUT CIRCUIT HIGH (CONTINUED)****3. (X795) COMMON AUDIO OUTPUT CIRCUIT OPEN**

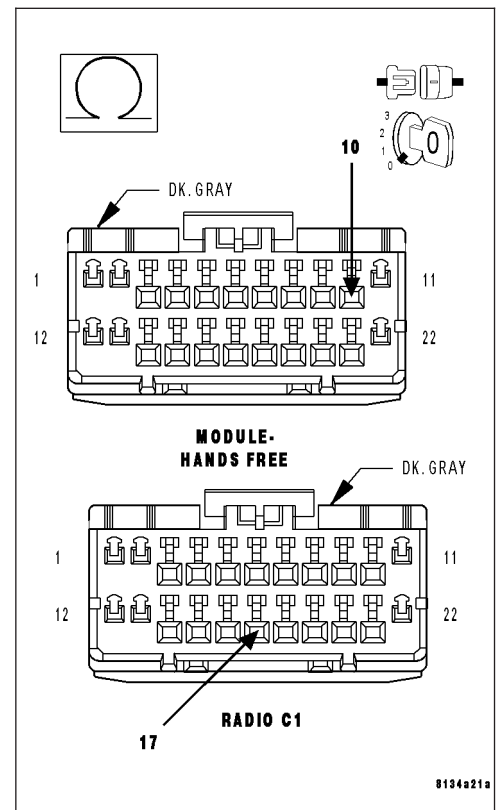
Measure the resistance of the (X795) Common Audio Output circuit between the HFM connector and the radio connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (X795) Common Audio Output circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**4. (X703) LEFT AUDIO OUTPUT CIRCUIT SHORT TO VOLTAGE**

Turn the ignition on.

Measure the voltage of the (X703) Left Audio Output circuit.

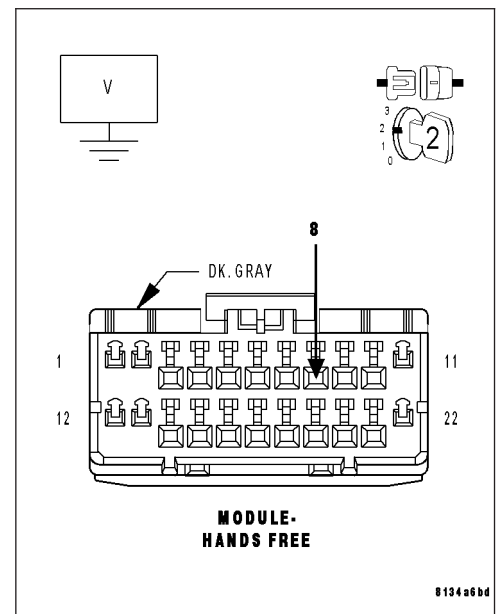
**Is the voltage above 1.0 volts?**

**Yes** >> Repair the (X703) Left Audio Output circuit for a short to voltage.

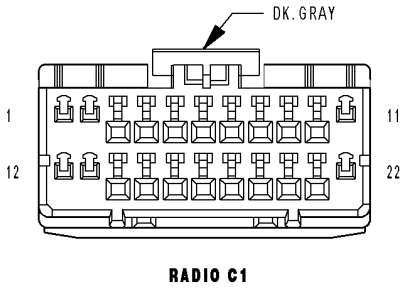
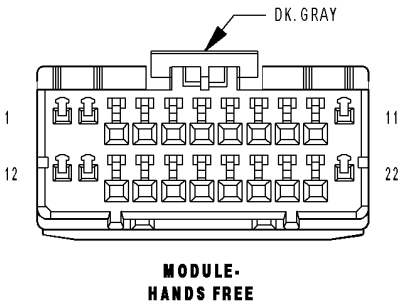
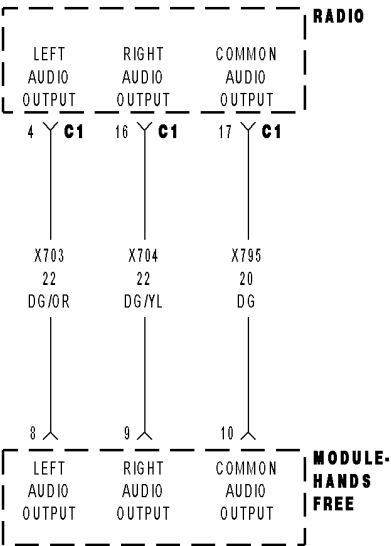
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



B1415-HFM RIGHT AUDIO OUTPUT CIRCUIT LOW



**B1415-HFM RIGHT AUDIO OUTPUT CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects low voltage on the (X704) Right Audio Output circuit.

Possible Causes
(X704) RIGHT AUDIO OUTPUT CIRCUIT OPEN (X704) RIGHT AUDIO OUTPUT CIRCUIT SHORT TO GROUND (X795) COMMON AUDIO OUTPUT CIRCUIT OPEN (X704) RIGHT AUDIO OUTPUT CIRCUIT SHORT TO (X795) COMMON AUDIO OUTPUT CIRCUIT HANDS FREE MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**B1415-HFM RIGHT AUDIO OUTPUT CIRCUIT LOW (CONTINUED)****2. (X704) RIGHT AUDIO OUTPUT CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

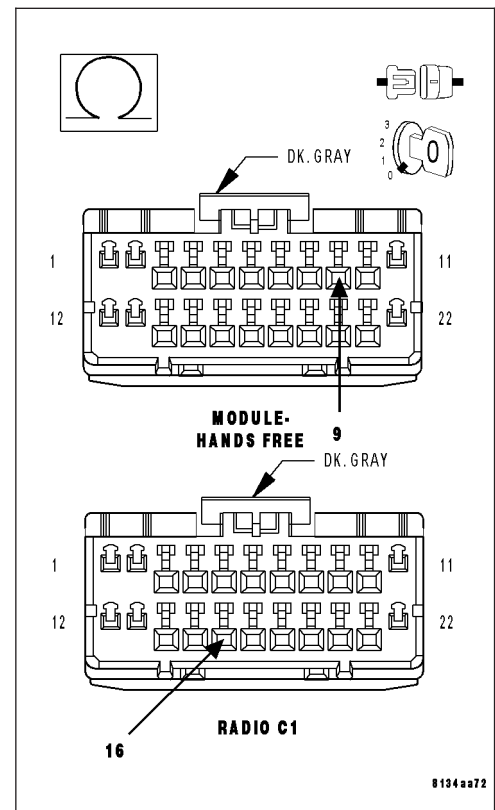
Disconnect the Radio C1 harness connector.

Measure the resistance of the (X704) Right Audio Output circuit between the HFM connector and the radio connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (X704) Right Audio Output circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**3. (X704) RIGHT AUDIO OUTPUT CIRCUIT SHORT TO GROUND**

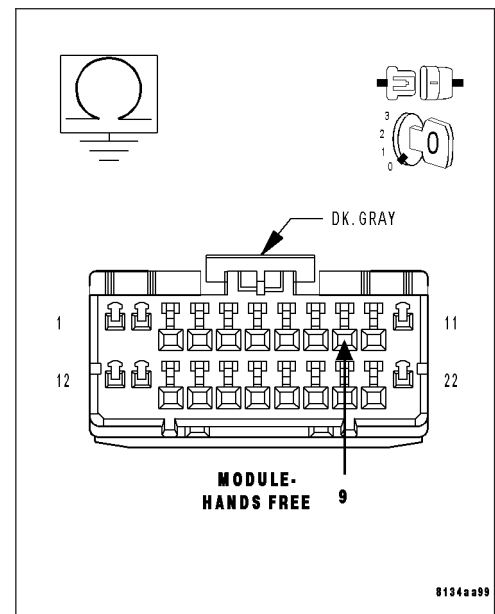
Measure the resistance between ground and the (X704) Right Audio Output circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (X704) Right Audio Output circuit for short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 4



**B1415-HFM RIGHT AUDIO OUTPUT CIRCUIT LOW (CONTINUED)****4. (X795) COMMON AUDIO OUTPUT CIRCUIT OPEN**

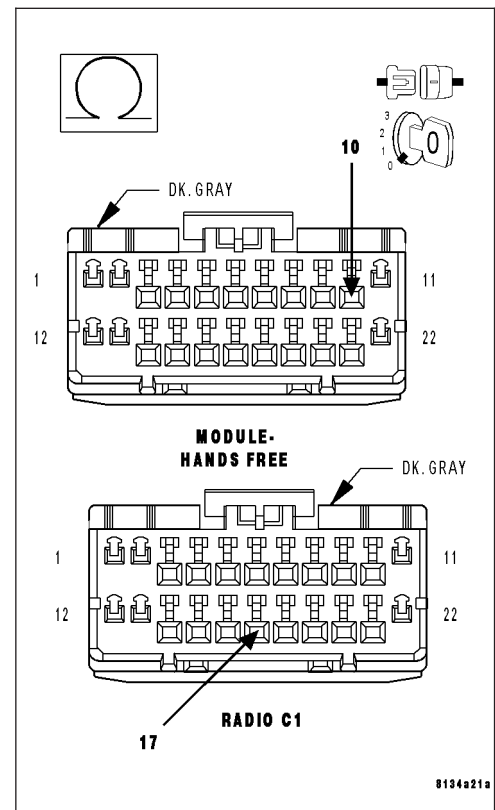
Measure the resistance of the (X795) Common Audio Output circuit between the HFM connector and the radio connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the (X795) Common Audio Output circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**5. (X704) RIGHT AUDIO OUTPUT CIRCUIT SHORT TO (X795) COMMON AUDIO OUTPUT CIRCUIT**

Measure the resistance between the (X704) Right Audio Output circuit and the (X795) Common Audio Output circuit.

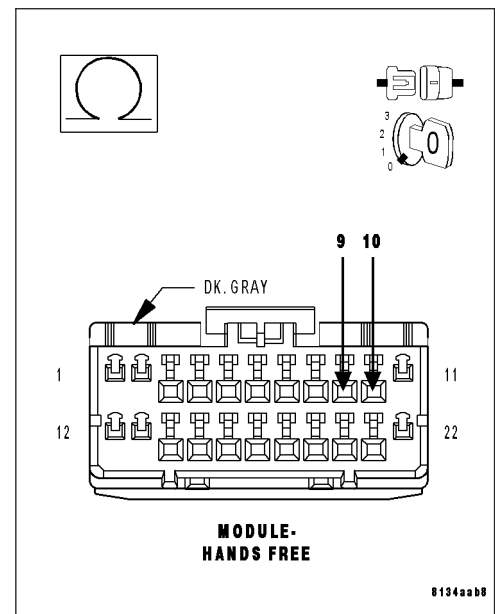
**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (X704) Right Audio Output circuit for a short to the (X795) Common Audio Output circuit.

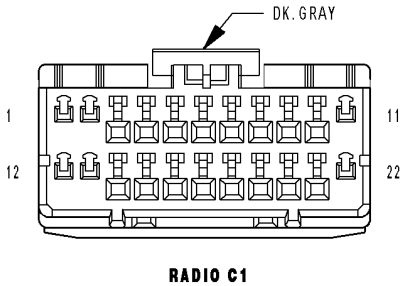
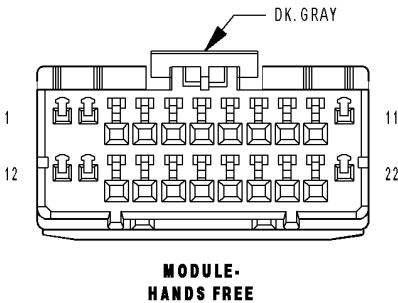
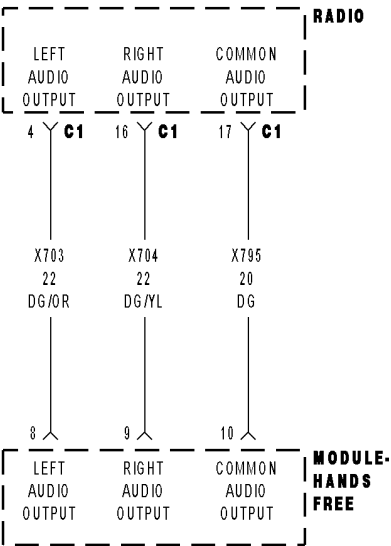
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



B1416-HFM RIGHT AUDIO OUTPUT CIRCUIT HIGH



**B1416-HFM RIGHT AUDIO OUTPUT CIRCUIT HIGH (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects high voltage on the (X704) Right Audio Output circuit.

Possible Causes
(X704) RIGHT AUDIO OUTPUT CIRCUIT OPEN
(X795) COMMON AUDIO OUTPUT CIRCUIT OPEN
(X704) RIGHT AUDIO OUTPUT CIRCUIT SHORT TO VOLTAGE
HANDS FREE MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**2. (X704) RIGHT AUDIO OUTPUT CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

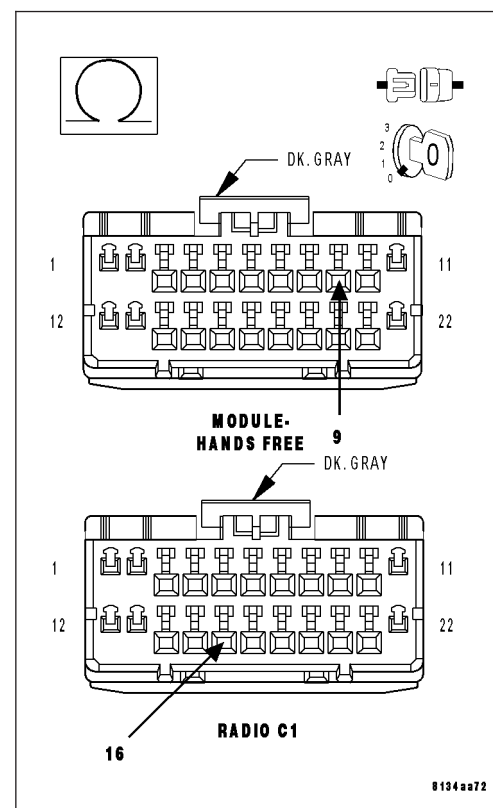
Disconnect the Radio C1 harness connector.

Measure the resistance of the (X704) Right Audio Output circuit between the HFM connector and the radio connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (X704) Right Audio Output circuit for an open  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).





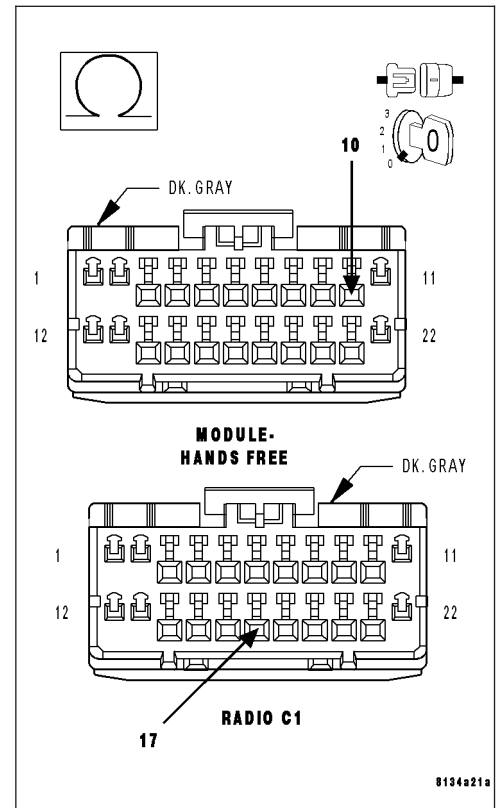
**B1416-HFM RIGHT AUDIO OUTPUT CIRCUIT HIGH (CONTINUED)****3. (X795) COMMON AUDIO OUTPUT CIRCUIT OPEN**

Measure the resistance of the (X795) Common Audio Output circuit between the HFM connector and the radio connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (X795) Common Audio Output circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**4. (X704) RIGHT AUDIO OUTPUT CIRCUIT SHORT TO VOLTAGE**

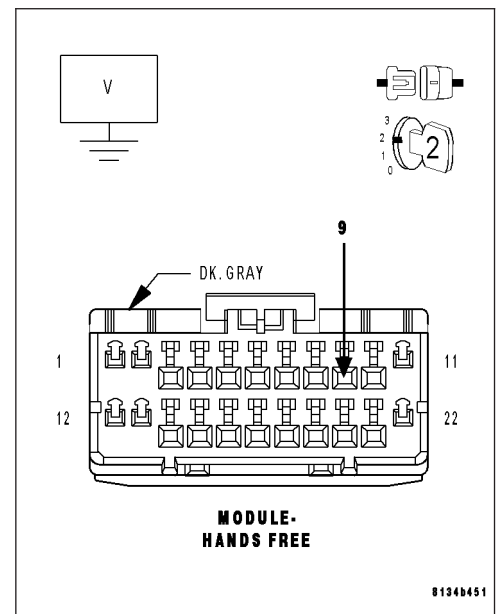
Turn the ignition on.

Measure the voltage of the (X704) Right Audio Output circuit.

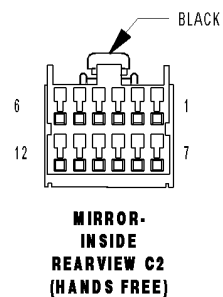
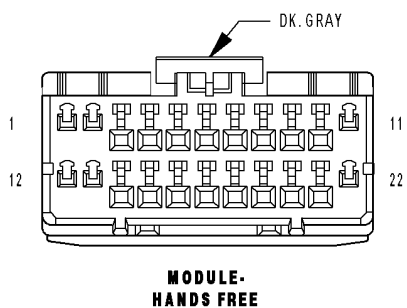
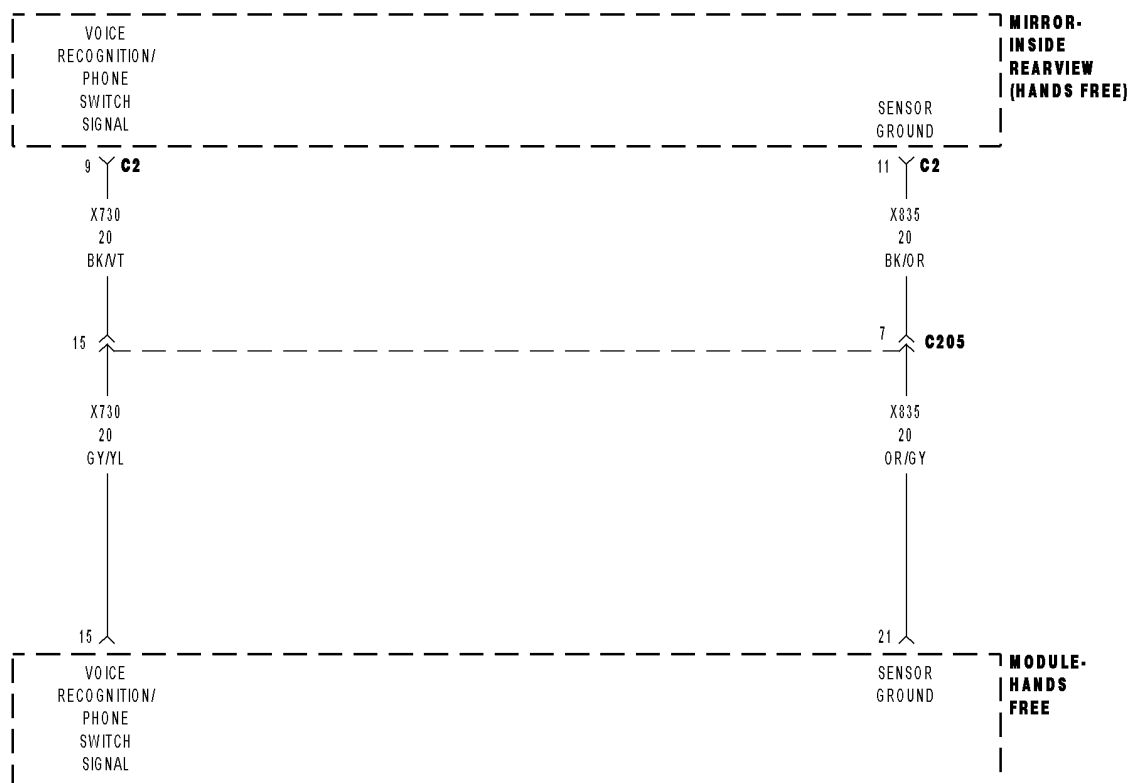
**Is the voltage above 1.0 volts?**

**Yes** >> Repair the (X704) Right Audio Output circuit for a short to voltage.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



## B1435-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT PERFORMANCE



**B1435-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT PERFORMANCE (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects an invalid voltage signal on the (X730) Voice Recognition/Phone Switch Signal circuit.

Possible Causes
INSIDE REAR VIEW MIRROR
HANDS FREE MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**2. CHECK THE VOLTAGE OF THE (X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL**

Turn the ignition off.

Disconnect the Inside Rear View Mirror C2 harness connector.

Turn the ignition on.

With the scan tool, monitor the VR Phone Switch voltage.

While monitoring the VR Phone Switch voltage, momentarily connect a jumper wire between the (X730) Voice Recognition/Phone Switch Signal circuit and ground.

**Note:** The scan tool sensor voltage should switch from above 4.7 volts when the jumper is not connected to below 0.6 volts when the jumper is connected.

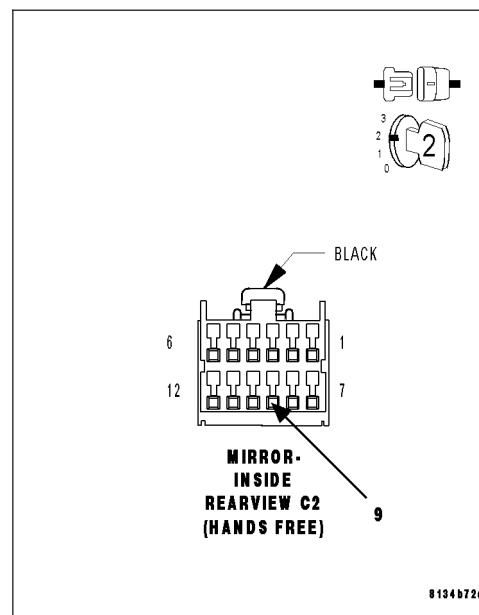
**Does the sensor voltage switch from above 4.7 volts to below 0.6 volt as described?**

**Yes** >> Replace the Inside Rear View Mirror in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

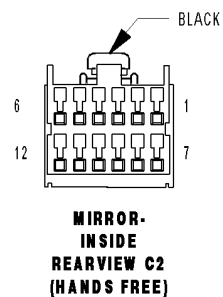
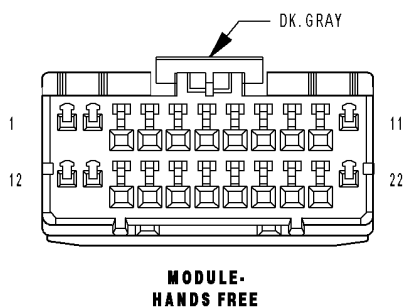
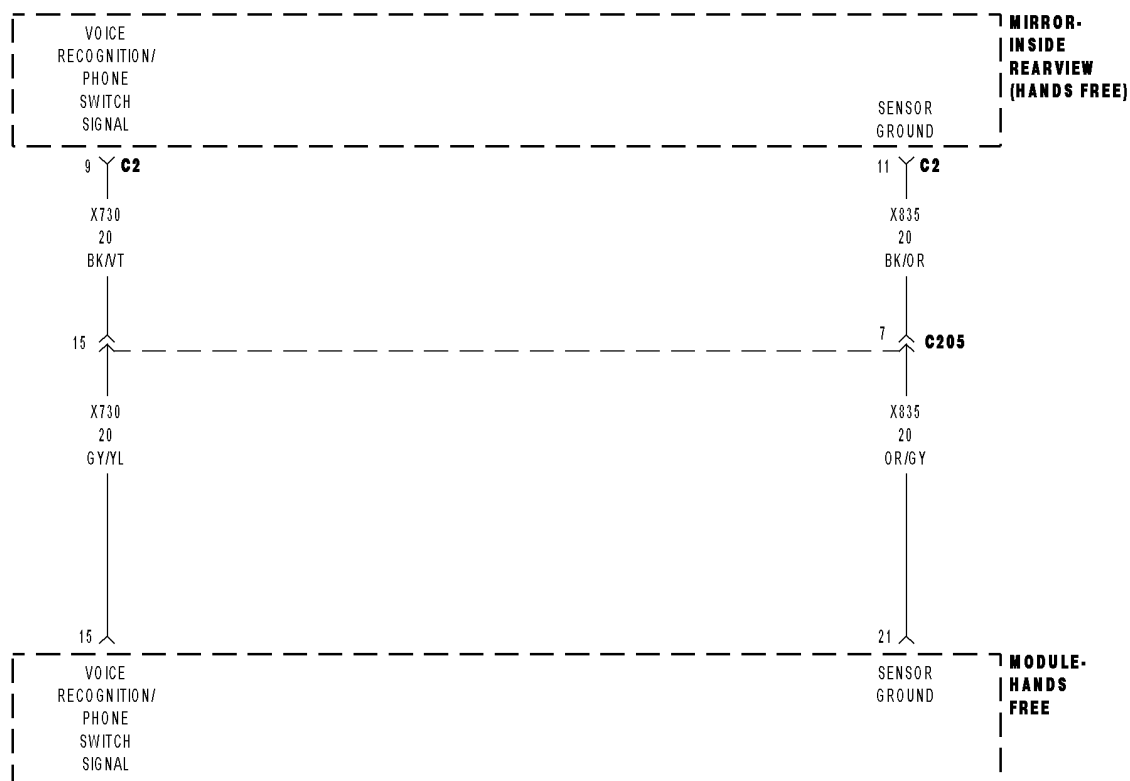
**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



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## B1436-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT LOW



**B1436-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects voltage below 0.6 volts on the (X730) Voice Recognition/Phone Switch Signal circuit.

Possible Causes
INSIDE REAR VIEW MIRROR (X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT SHORT TO (X835) SENSOR GROUND CIRCUIT (X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT SHORT TO GROUND HANDS FREE MODULE

**Diagnostic Test****1. Check for active DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**2. CHECK THE VOLTAGE OF THE (X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL**

Turn the ignition off.

Disconnect the Inside Rear View Mirror C2 harness connector.

Turn the ignition on.

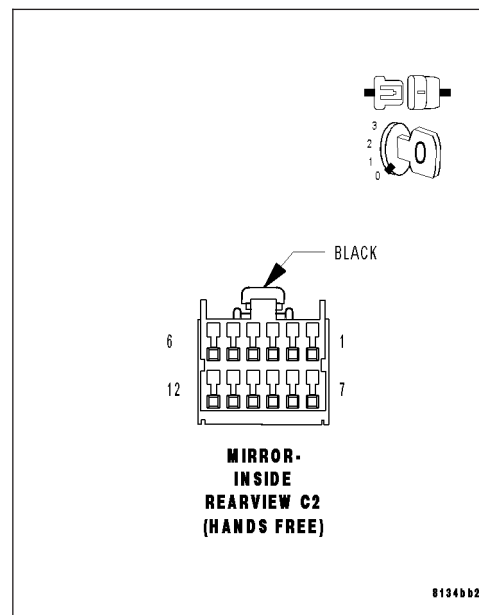
With the scan tool, monitor the VR Phone Switch voltage.

**Is the voltage above 4.7 volts?**

**Yes** >> Replace the Inside Rear View Mirror in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 3



**B1436-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT LOW (CONTINUED)****3. (X730) VOICE/RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT SHORTED TO THE (X835) SENSOR GROUND CIRCUIT**

Turn the ignition off.

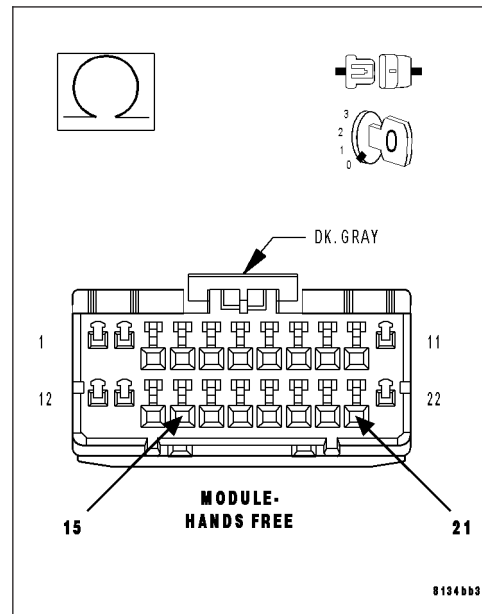
Disconnect the Hands Free Module harness connector.

Measure the resistance between the (X730) Voice Recognition/Phone Switch Signal circuit and the (X835) Sensor Ground circuit.

**Is the resistance below 100.0 ohms?**

**Yes** >> Repair the (X730) Voice Recognition/Phone Switch Signal circuit for a short to the (X835) Sensor Ground circuit.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 4

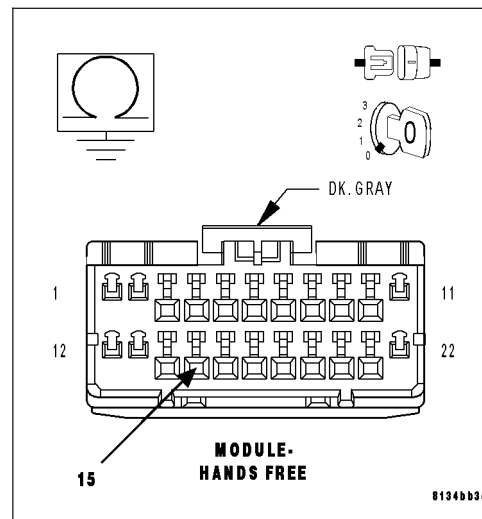
**4. (X730) VOICE/RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT SHORTED TO GROUND**

Measure the resistance between ground and the (X730) Voice Recognition/Phone Switch Signal circuit.

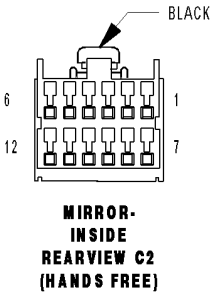
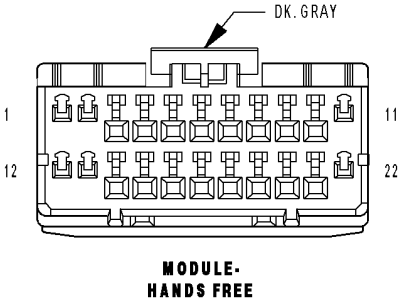
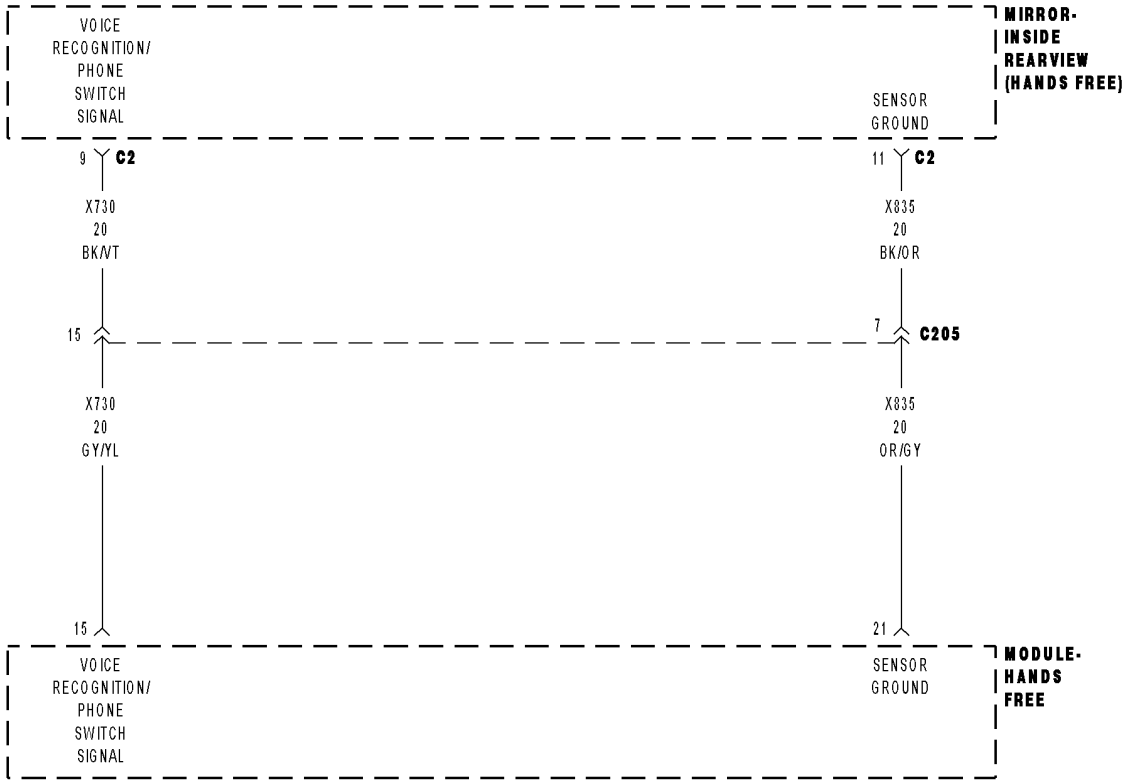
**Is the resistance below 100.0 ohms?**

**Yes** >> Repair the (X730) Voice Recognition/Phone Switch Signal circuit for a short to ground.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



B1437-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT HIGH



**B1437-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT HIGH (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects voltage above 4.7 volts on the (X730) Voice Recognition/Phone Switch Signal circuit.

Possible Causes
(X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT SHORT TO VOLTAGE
(X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT OPEN
(X835) SENSOR GROUND CIRCUIT OPEN
INSIDE REAR VIEW MIRROR
HANDS FREE MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**2. CHECK THE VOLTAGE OF THE (X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL**

Turn the ignition off.

Disconnect the Inside Rear View Mirror C2 harness connector.

Turn the ignition on.

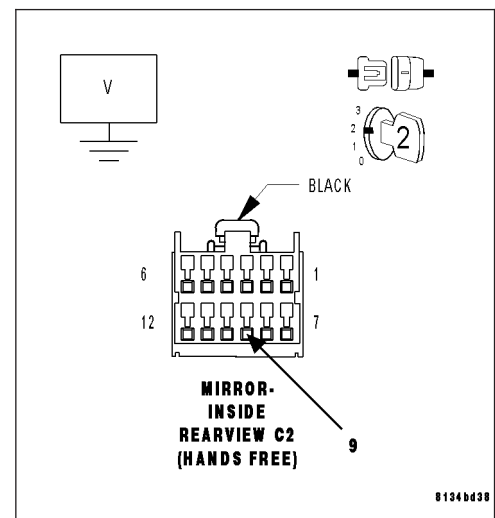
Measure the voltage of the (X730) Voice Recognition/Phone Switch Signal circuit.

**Is the voltage above 5.3 volts?**

**Yes** >> Repair the (X730) Voice Recognition/Phone Switch Signal circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 3





**B1437-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT HIGH (CONTINUED)****3. INSIDE REAR VIEW MIRROR**

Turn the ignition off.

Connect a jumper wire between (X730) Voice Recognition/Phone Switch Signal circuit and the (X835) Sensor Ground circuit.

Turn the ignition on.

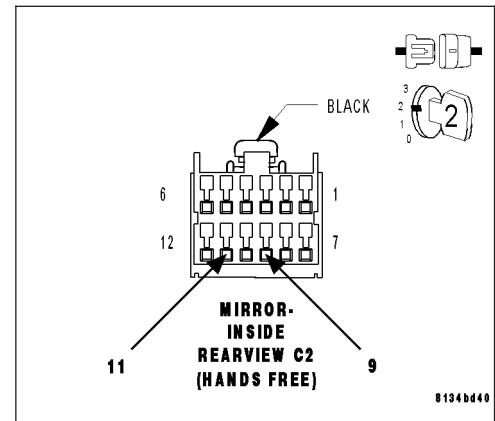
With the scan tool, monitor the VR Phone Switch Voltage.

**Is the voltage approximately 0 volts?**

**Yes** >> Replace the Inside Rear View Mirror in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 4

**4. (X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

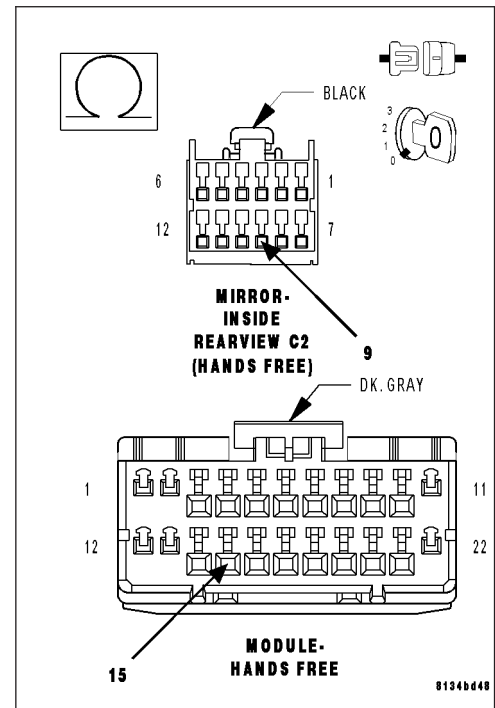
Measure the resistance of the (X730) Voice Recognition/Phone Switch Signal circuit between the HFM connector and the inside rear view mirror connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the (X730) Voice Recognition/Phone Switch Signal circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

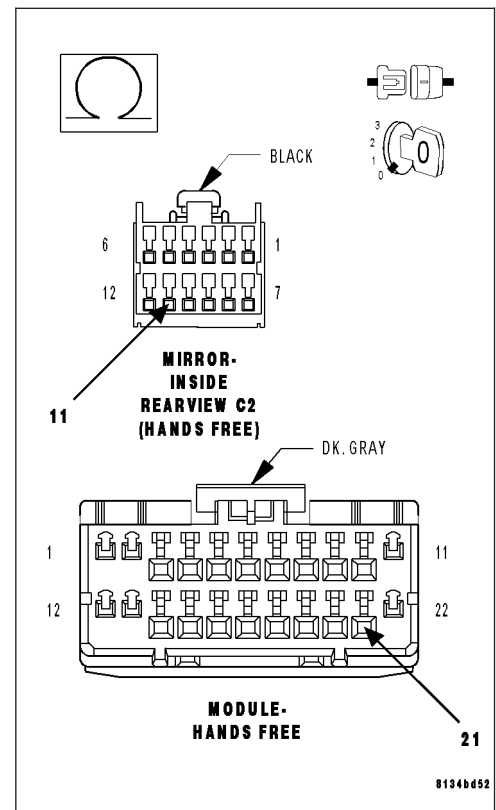


**B1437-VOICE RECOGNITION/PHONE SWITCH INPUT CIRCUIT HIGH (CONTINUED)****5. (X835) SENSOR GROUND CIRCUIT OPEN**

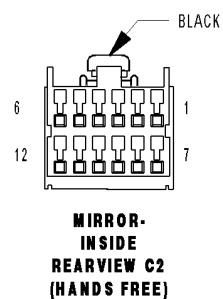
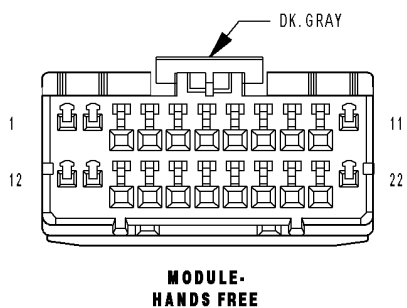
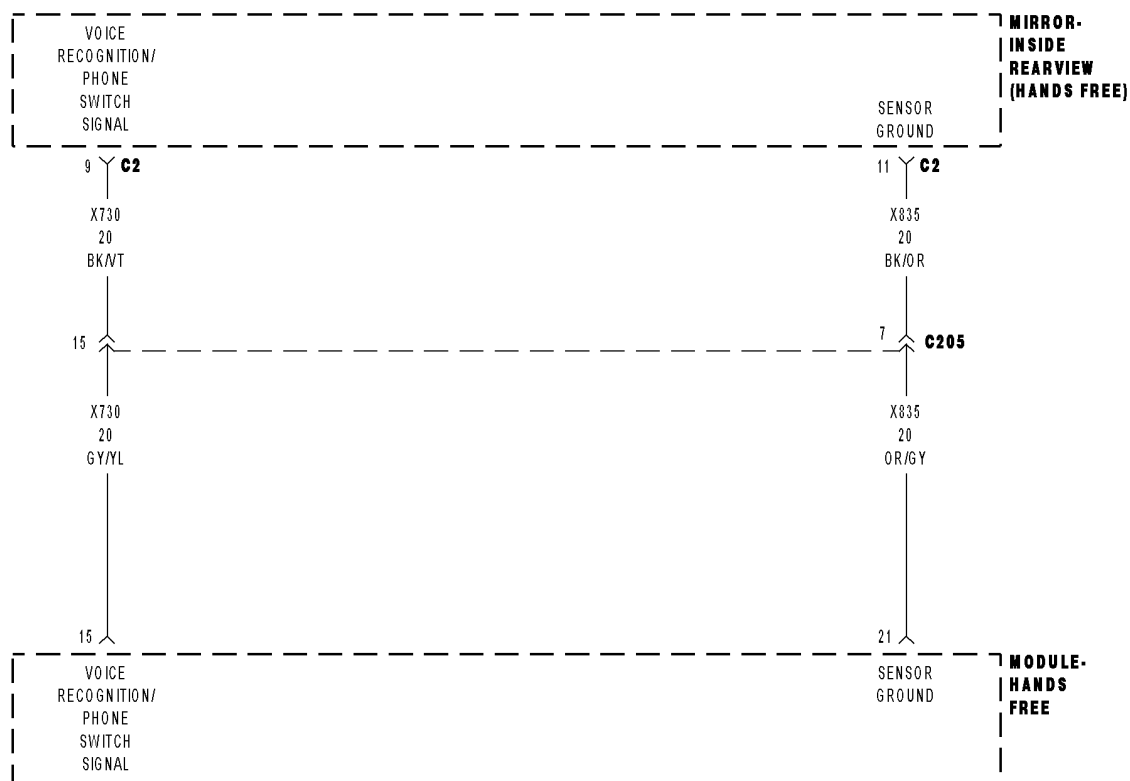
Measure the resistance of the (X835) Sensor Ground circuit between the HFM connector and the inside rear view mirror connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Repair the (X835) Sensor Ground circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



## B1438-VOICE RECOGNITION SWITCH STUCK



**B1438–VOICE RECOGNITION SWITCH STUCK (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects voltage between 3.5 volts and 4.0 volts on the (X730) Voice Recognition/Phone Switch Signal circuit for more than 30 seconds.

Possible Causes
INSIDE REAR VIEW MIRROR
HANDS FREE MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTCS**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**2. CHECK THE VOLTAGE OF THE (X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL**

Turn the ignition off.

Disconnect the Inside Rear View Mirror C2 harness connector.

Turn the ignition on.

With the scan tool, monitor the VR Phone Switch voltage.

While monitoring the VR Phone Switch voltage, momentarily connect a jumper wire between (X730) Voice Recognition/Phone Switch Signal circuit and ground.

**Note:** The scan tool sensor voltage should switch from above 4.7 volts when the jumper is not connected to below 0.6 volts when the jumper is connected.

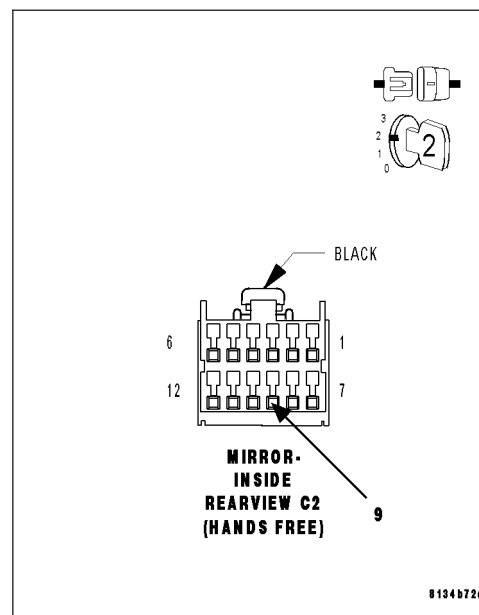
**Does the sensor voltage switch from above 4.7 volts to below 0.6 volt as described?**

**Yes** >> Replace the Inside Rear View Mirror in accordance with the service information.

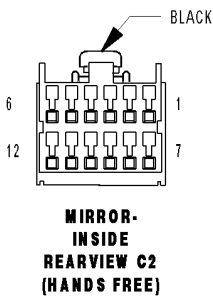
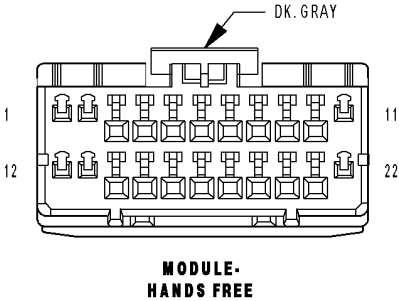
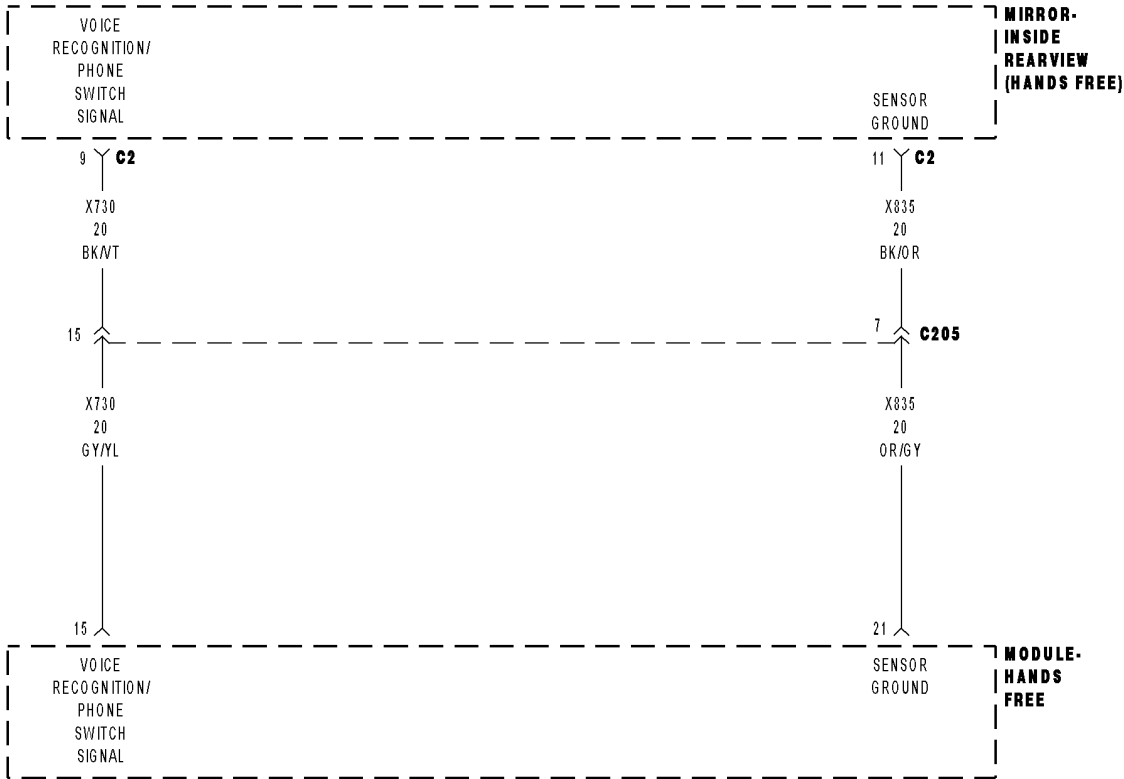
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



B1439-PHONE SWITCH STUCK



**B1439-PHONE SWITCH STUCK (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects voltage between 2.8 volts and 3.3 volts on the (X730) Voice Recognition/Phone Switch Signal circuit for more than 30 seconds.

Possible Causes
INSIDE REAR VIEW MIRROR
HANDS FREE MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTCS**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

**2. CHECK THE VOLTAGE OF THE (X730) VOICE RECOGNITION/PHONE SWITCH SIGNAL**

Turn the ignition off.

Disconnect the Inside Rear View Mirror C2 harness connector.

Turn the ignition on.

With the scan tool, monitor the VR Phone Switch voltage.

While monitoring the VR Phone Switch voltage, momentarily connect a jumper wire between (X730) Voice Recognition/Phone Switch Signal circuit and ground.

**Note:** The scan tool sensor voltage should switch from above 4.7 volts when the jumper is not connected to below 0.6 volts when the jumper is connected.

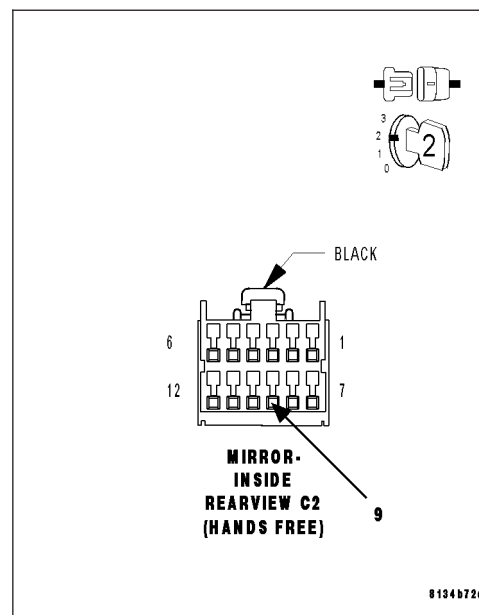
**Does the sensor voltage switch from above 4.7 volts to below 0.6 volt as described?**

**Yes** >> Replace the Inside Rear View Mirror in accordance with the service information.

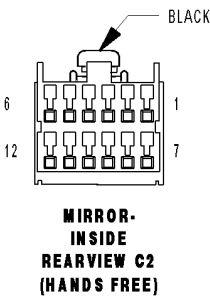
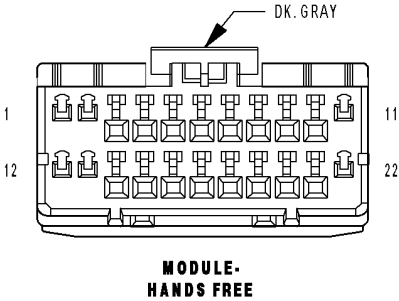
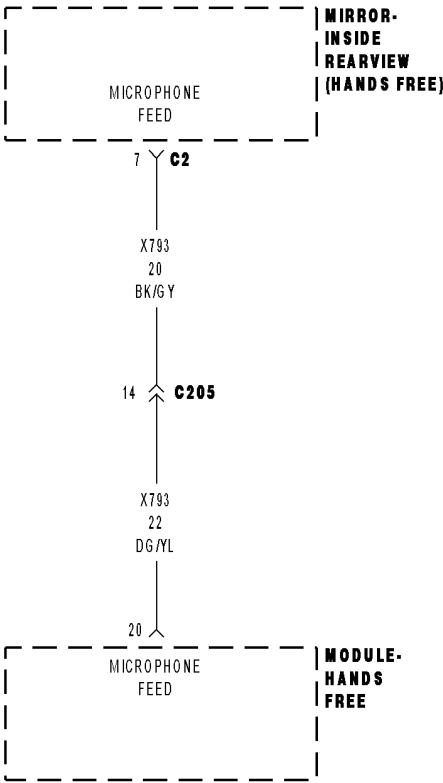
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**B145A-TELEMATICS MIRROR CONTROL CIRCUIT HIGH**



**B145A-TELEMATICS MIRROR CONTROL CIRCUIT HIGH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects high voltage on the (X793) Microphone Feed circuit.

Possible Causes
(X793) MICROPHONE FEED CIRCUIT OPEN (X793) MICROPHONE FEED CIRCUIT SHORT TO VOLTAGE INSIDE REAR VIEW MIRROR HANDS FREE MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---



**B145A-TELEMATICS MIRROR CONTROL CIRCUIT HIGH (CONTINUED)****2. (X793) MICROPHONE FEED CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

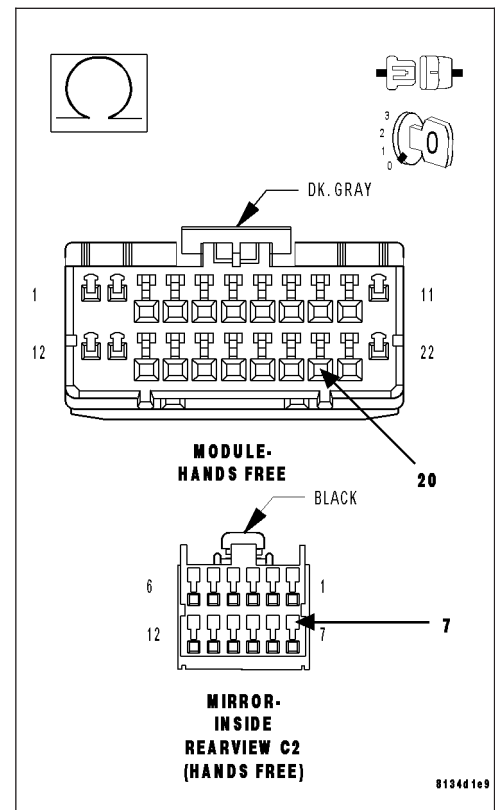
Disconnect the Inside Rear View Mirror C2 harness connector.

Measure the resistance of the (X793) Microphone Feed circuit between the HFM connector and the inside rear view mirror connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (X793) Microphone Feed circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**3. (X793) MICROPHONE FEED CIRCUIT SHORT TO VOLTAGE**

Turn the ignition on.

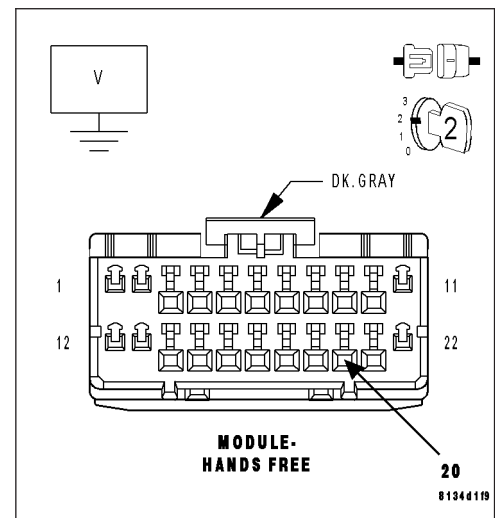
Measure the voltage of the (X793) Microphone Feed circuit.

**Is the voltage above 1.0 volt?**

**Yes** >> Repair the (X793) Microphone Feed circuit for short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 4



**B145A-TELEMATICS MIRROR CONTROL CIRCUIT HIGH (CONTINUED)****4. INSIDE REAR VIEW MIRROR**

Replace the Inside Rear View Mirror in accordance with the service information.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

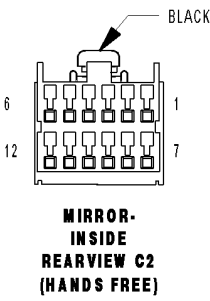
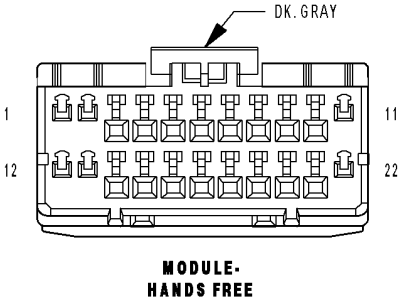
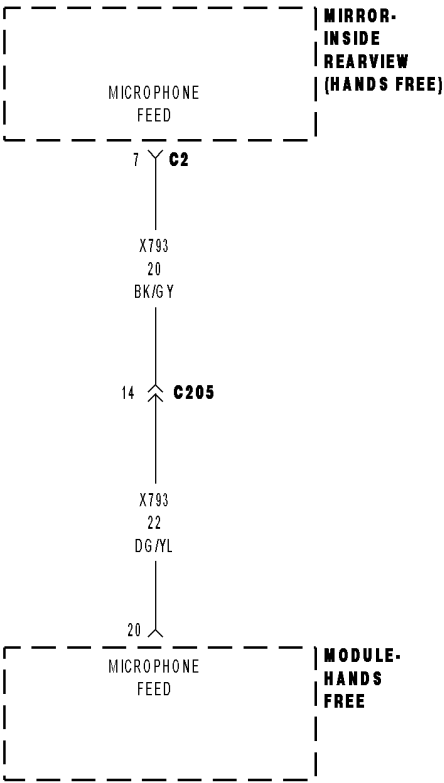
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair is complete.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

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B1459-TELEMATICS MIRROR CONTROL CIRCUIT LOW



**B1459-TELEMATICS MIRROR CONTROL CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects low voltage on the (X793) Microphone Feed circuit.

Possible Causes
(X793) MICROPHONE FEED CIRCUIT OPEN (X793) MICROPHONE FEED CIRCUIT SHORT TO GROUND INSIDE REAR VIEW MIRROR HANDS FREE MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**B1459-TELEMATICS MIRROR CONTROL CIRCUIT LOW (CONTINUED)****2. (X793) MICROPHONE FEED CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

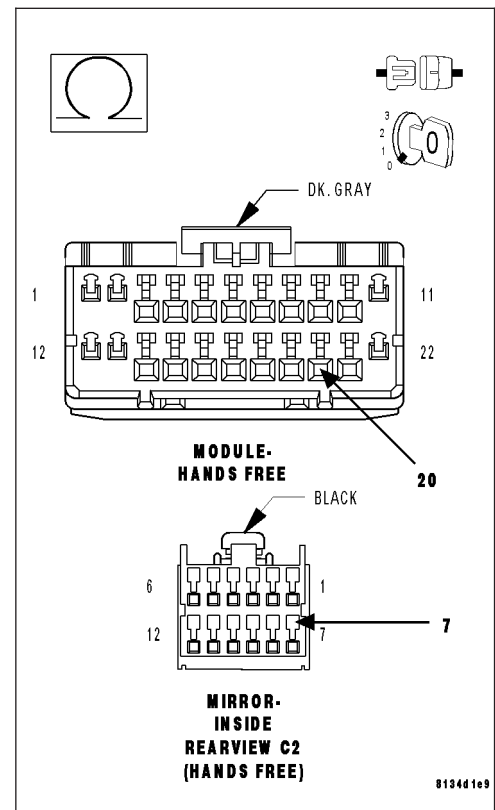
Disconnect the Inside Rear View Mirror C2 harness connector.

Measure the resistance of the (X793) Microphone Feed circuit between the HFM connector and the inside rear view mirror connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (X793) Microphone Feed circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**3. (X793) MICROPHONE FEED CIRCUIT SHORT TO GROUND**

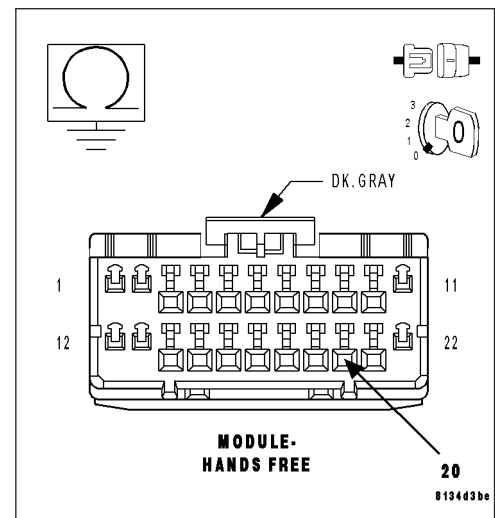
Measure the resistance between ground and the (X793) Microphone Feed circuit

**Is the resistance below 100.0 ohms?**

**Yes** >> Repair the (X793) Microphone Feed circuit for short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 4



**B1459-TELEMATICS MIRROR CONTROL CIRCUIT LOW (CONTINUED)****4. INSIDE REAR VIEW MIRROR**

Replace the Inside Rear View Mirror in accordance with the service information.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

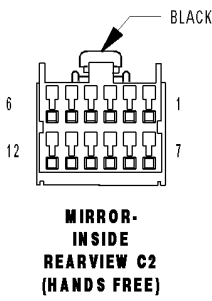
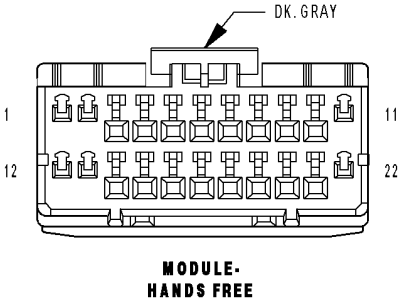
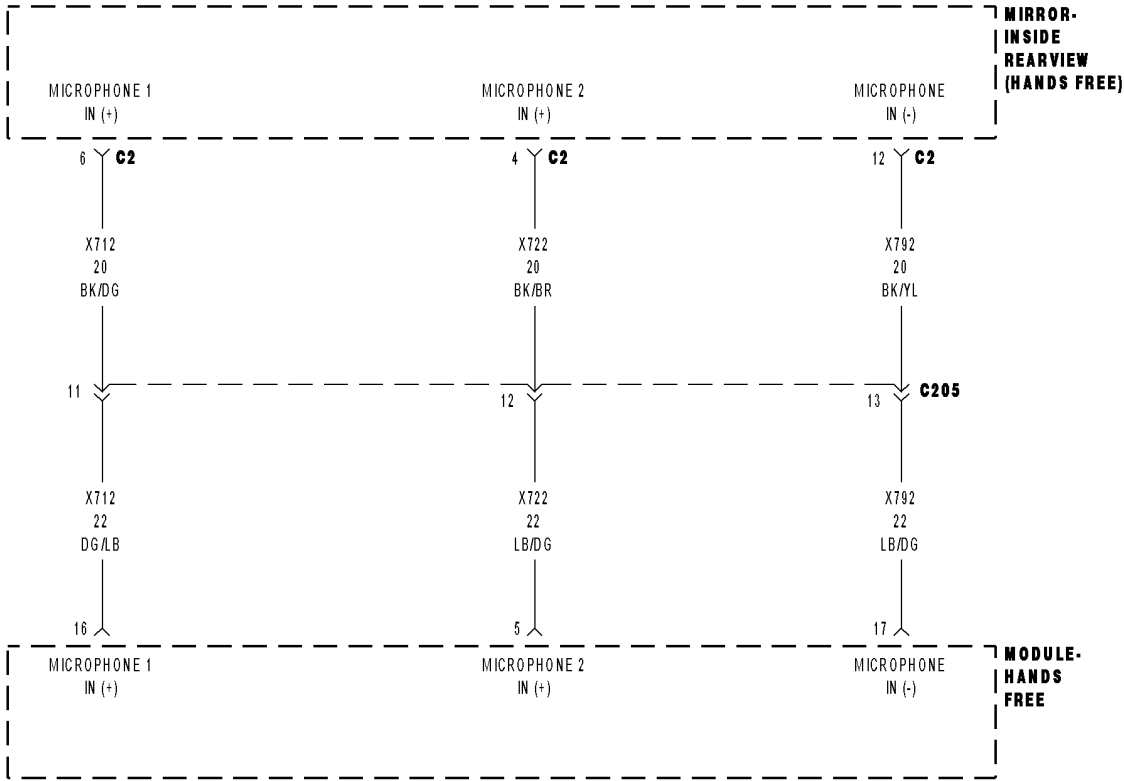
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair is complete.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

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B1492-GENERAL MICROPHONE PERFORMANCE



**B1492–GENERAL MICROPHONE PERFORMANCE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects a fault in any of the microphone circuits.

Possible Causes
(X712) MICROPHONE 1 IN (+) CIRCUIT OPEN (X722) MICROPHONE 2 IN (+) CIRCUIT OPEN (X792) MICROPHONE IN (-) CIRCUIT OPEN (X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TO GROUND (X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TO VOLTAGE (X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TOGETHER INSIDE REAR VIEW MIRROR HANDS FREE MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTC**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---



**B1492-GENERAL MICROPHONE PERFORMANCE (CONTINUED)****2. (X712) MICROPHONE 1 IN (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Hands Free Module harness connector.

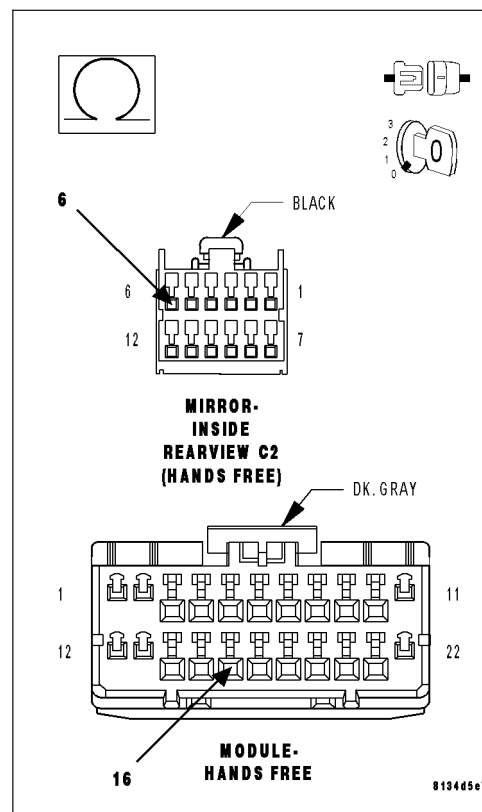
Disconnect the Inside Rear View Mirror C2 harness connector.

Measure the resistance of the (X712) Microphone 1 IN (+) circuit between the HFM connector and the inside rear view mirror connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (X712) Microphone 1 IN (+) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

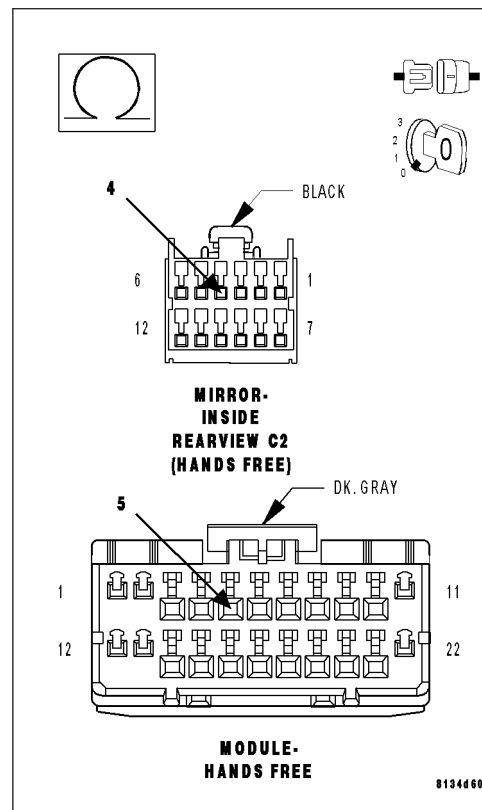
**3. (X722) MICROPHONE 2 IN (+) CIRCUIT OPEN**

Measure the resistance of the (X722) Microphone 2 IN (+) circuit between the HFM connector and the inside rear view mirror connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (X722) Microphone 2 IN (+) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



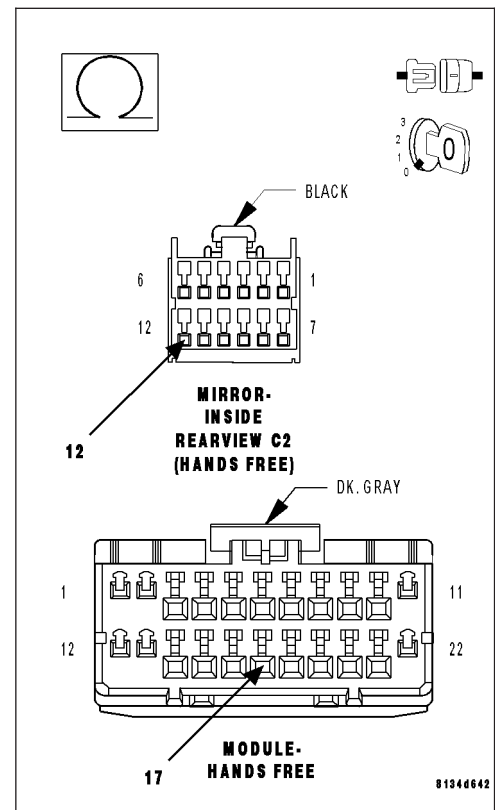
**B1492-GENERAL MICROPHONE PERFORMANCE (CONTINUED)****4. (X792) MICROPHONE IN (-) CIRCUIT OPEN**

Measure the resistance of the (X792) Microphone IN (-) circuit between the HFM connector and the inside rear view mirror connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the (X792) Microphone IN (-) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**5. (X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TO GROUND**

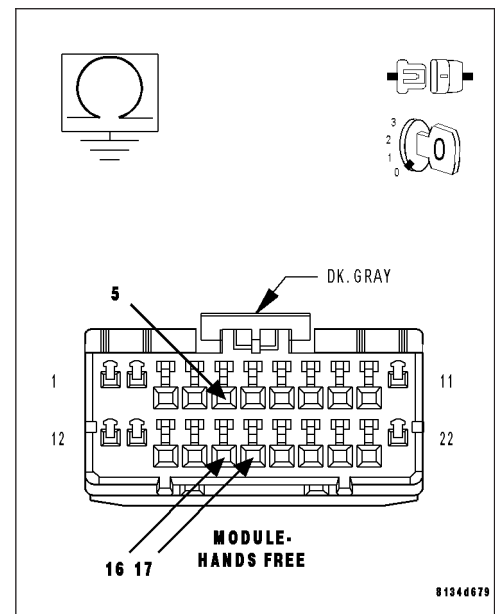
Measure the resistance between ground and each (X712) (X722) (X792) Microphone circuit.

**Is the resistance below 100.0 ohms?**

**Yes** >> Repair the Microphone circuit that measured below 100.0 ohms for short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 6



**B1492-GENERAL MICROPHONE PERFORMANCE (CONTINUED)****6. (X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TO VOLTAGE**

Turn the ignition on.

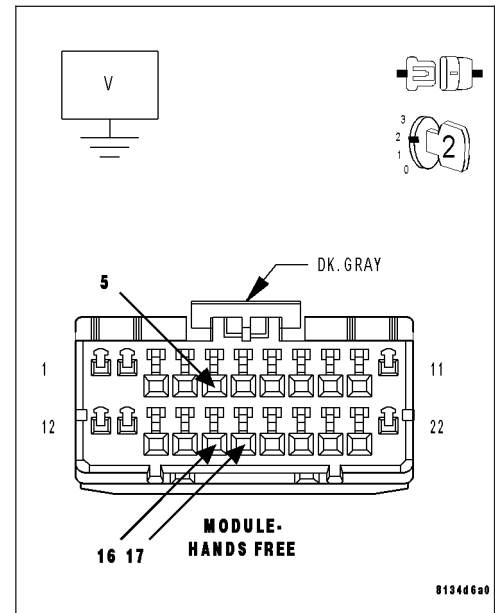
Measure the voltage of each (X712) (X722) (X792) Microphone circuit.

**Is the voltage above 1.0 volt?**

**Yes** >> Repair the Microphone circuit that measured above 1.0 volt for short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 7

**7. (X712) (X722) (X792) MICROPHONE CIRCUITS SHORTED TOGETHER**

Turn the ignition off.

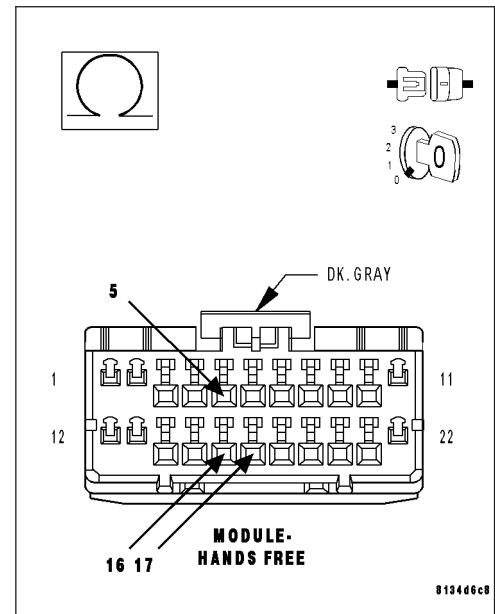
Measure the resistance between each (X712) (X722) (X792) Microphone circuit.

**Is the resistance below 100.0 ohms?**

**Yes** >> Repair the Microphone circuit that measured below 100.0 ohms for a short together.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 8



**B1492-GENERAL MICROPHONE PERFORMANCE (CONTINUED)****8. INSIDE REAR VIEW MIRROR**

Replace the Inside Rear View Mirror in accordance with the service information.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

Attempt to make a phone call with the system.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair is complete.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

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**B2203—ROM CHECKSUM PERFORMANCE**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
HANDS FREE MODULE

**Diagnostic Test****1. REPLACE THE HANDS FREE MODULE IF DTC IS ACTIVE**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

- Yes** >> Replace and program the Hands Free Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
-

## B222A-VEHICLE LINE MISMATCH

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module will receive and monitor the vehicle line message from the PCM and record the vehicle line if different from the last vehicle line.

Possible Causes
INCORRECT PCM
HANDS FREE MODULE

### Diagnostic Test

#### 1. CHECK FOR ACTIVE DTC

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

#### 2. CHECK VEHICLE LINE IN PCM

With the scan tool compare the vehicle line that is programmed into the PCM to the vehicle line of the vehicle.

**Does the vehicle line programmed into the PCM match the vehicle?**

**Yes** >> Inspect the wiring and connectors for damage or shorted circuits. If ok, replace and program the Hands Free Module in accordance with the service information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Replace and program the Powertrain Control Module in accordance with the service information. Ensure the PCM is replaced with the correct vehicle line PCM.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

---

**B222E–FLASH CHECKSUM PERFORMANCE**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
HANDS FREE MODULE

**Diagnostic Test**

**1. REPLACE THE HANDS FREE MODULE IF DTC IS ACTIVE**

With the scan tool, read the active DTC's.  
Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.  
With the scan tool, read the active DTC's.

- Does the scan tool display this DTC as active?**
- Yes**    >> Replace and program the Hands Free Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No**    >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
-

**B222F–FLASH WRITE PERFORMANCE**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
HANDS FREE MODULE

**Diagnostic Test****1. REPLACE THE HANDS FREE MODULE IF DTC IS ACTIVE**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

- Yes** >> Replace and program the Hands Free Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
-



**B2223-(HFM) HANDS FREE PHONE INTERNAL**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
HANDS FREE MODULE

**Diagnostic Test**

**1. REPLACE THE HANDS FREE MODULE IF DTC IS ACTIVE**

With the scan tool, read the active DTC's.  
Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.  
With the scan tool, read the active DTC's.

- Does the scan tool display this DTC as active?**
- Yes**    >> Replace and program the Hands Free Module in accordance with the service information.  
          Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No**      >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
-

**B2230—RAM WRITE PERFORMANCE**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
The Hands Free Module detects a fault during an internal diagnostic check.

Possible Causes
HANDS FREE MODULE

**Diagnostic Test****1. REPLACE THE HANDS FREE MODULE IF DTC IS ACTIVE**

With the scan tool, read the active DTC's.

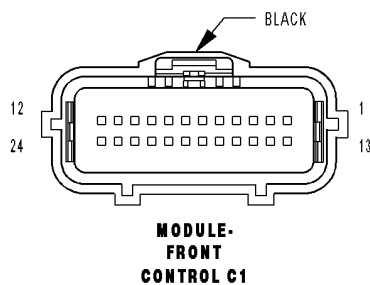
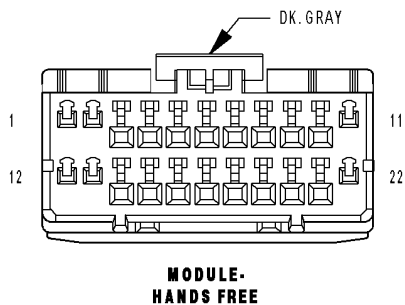
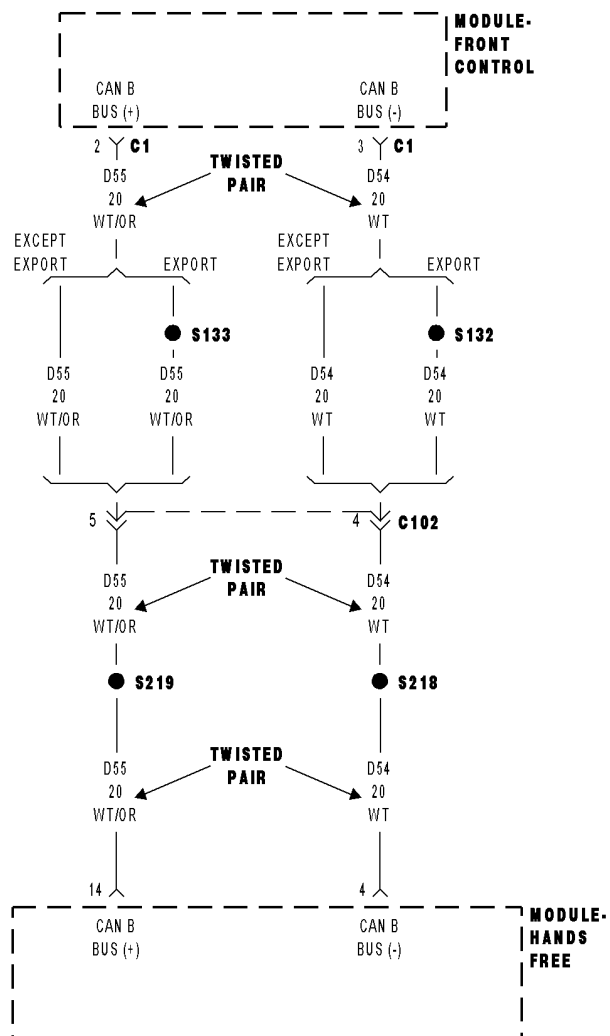
Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

- Yes** >> Replace and program the Hands Free Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
-

# U0019—CAN B BUS



**U0019–CAN B BUS (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
Whenever the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage or shorted to ground.

Possible Causes
CAN B BUS DTC's IN FRONT CONTROL MODULE (D55) CAN B BUS (+) CIRCUIT OPEN (D54) CAN B BUS (-) CIRCUIT OPEN HANDS FREE MODULE

**Diagnostic Test****1. CHECK FOR ACTIVE DTCs**

With the scan tool, read the active DTC's.

Cycle the ignition switch from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the scan tool, read the active DTC's.

**Does the scan tool display this DTC as active?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

---

**2. CHECK FRONT CONTROL MODULE DTC's**

With the scan tool, read Front Control Module active DTC's

**Does the scan tool display any CAN B BUS DTC's – ACTIVE?**

**Yes** >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**U0019-CAN B BUS (CONTINUED)****3. (D55) CAN B BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the Hands Free Module connector.

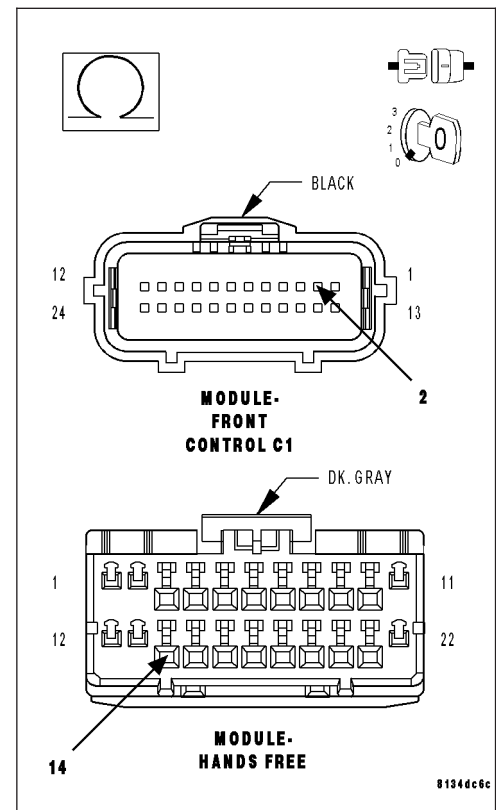
Disconnect the Front Control Module C1 connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 connector and the Hands Free Module connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (D55) CAN B Bus (+) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

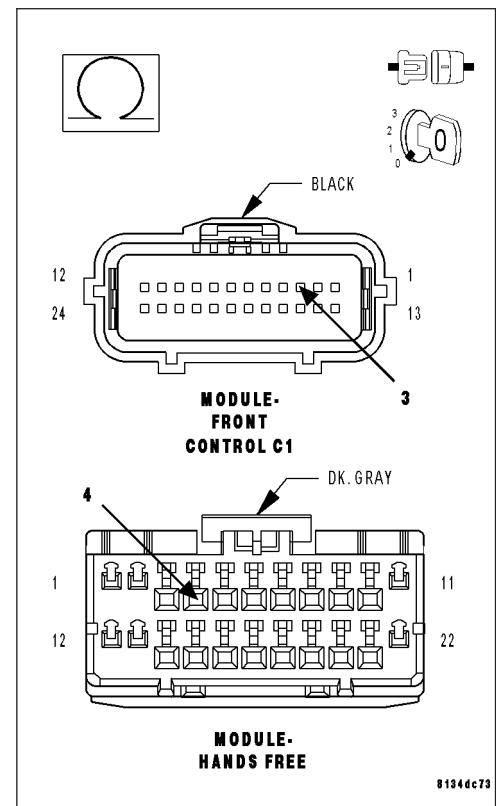
**4. (D54) CAN B BUS (–) CIRCUIT OPEN**

Measure the resistance of the (D54) CAN B Bus (–) circuit between the Front Control Module C1 connector and the Hands Free Module connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Replace the Hands Free Module in accordance with the service information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair the (D54) CAN B Bus (–) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0151-LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0154-LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0155-LOST COMMUNICATION WITH CLUSTER/CCN**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0156-LOST COMMUNICATION WITH EOM**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0159-LOST COMMUNICATION WITH PARKING ASSIST CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0169-LOST COMMUNICATION WITH SUNROOF CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0181-LOST COMMUNICATION WITH HEADLAMP LEVELING TRANSLATOR**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0184-LOST COMMUNICATION WITH RADIO**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0186-LOST COMMUNICATION WITH AUDIO AMPLIFIER**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0195-LOST COMMUNICATION WITH SDARS**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0199-LOST COMMUNICATION WITH DRIVER DOOR MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0200-LOST COMMUNICATION WITH PASSENGER DOOR MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0208-LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0209-LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0212-LOST COMMUNICATION WITH SCCM - CAN B**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

## **U0231-LOST COMMUNICATION WITH RAIN SENSING MODULE**

For a complete wiring diagram Refer to Section 8W.

(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic test procedure.

# NAVIGATION/TELECOMMUNICATION - SERVICE INFORMATION

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## NAVIGATION/TELECOMMUNICATION - SERVICE INFORMATION

### DESCRIPTION

#### TELECOMMUNICATIONS

The hands-free cellular system uses Bluetooth™ technology to provide wireless communication between the operator's compatible cellular telephone and the vehicle's on-board receiver.

The system uses voice recognition technology to control operation. The incoming voice is broadcast through the vehicle's radio speakers, automatically overriding any other audio signals on the front speakers when the hands-free system is in use. A microphone in the rear view mirror receives the vehicle occupant's voices. If a call is in progress when the ignition is switched off, the hands-free system will continue to operate for up to 45 seconds as part of the Accessory Relay Delay function. Thereafter, the call can continue on the hand-held telephone.

The system will communicate with a telephone that is anywhere within the vehicle. However, covering the hand held phone or the hands-free phone module with a metal object may block the signal. The system will recognize up to seven telephones, each of which is given a spoken identification by the user during the setup process. The system includes Spanish and French voice recognition in addition to English.

Two buttons on the rearview mirror, identified with ISO icons, control the system: A "phone" button turns the system on and off; a "voice recognition" (or voice command) button prompts the hands-free system to listen for a voice command.

### OPERATION

#### TELECOMMUNICATION

Two buttons on the rearview mirror, identified with ISO icons, control the system: A "phone" button turns the system on and off; a "voice recognition" (or voice command) button prompts the hands-free system to listen for a voice command. The system includes the following features:

- Phonebook - Stores telephone numbers for later recall by name or other verbal identification, called a voice tag, and memory location.
- Four memory locations - Home, Work, Cellular and Pager. A maximum of 32 unique names or voice tags may be stored at the same time, with a different number in each of the four memory locations.
- Voice tag dialing - Dials the number associated with a voice tag and memory location.
- Digit dialing - Dials the telephone number by recognizing the names of the digits as they are spoken.
- Receiving calls - A voice prompt notifies the user of an incoming call. A voice response accepts or rejects the call without manual intervention.
- Privacy Mode - Switches the call to the handheld telephone and the hands-free system and back again using the "voice recognition" (or "voice command") button and a voice command, if desired.



## DIAGNOSIS AND TESTING - TELECOMMUNICATION

Any diagnosis of the Telecommunication system should begin with the use of scan tool. For information on the use of the scan tool, refer to the appropriate Diagnostic Service information.

For complete circuit diagrams, refer to the appropriate wiring information.

**WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

### TELECOMMUNICATION SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSE	CORRECTION
Phone Not Available	1. Bluetooth phone not paired to the system.	1. Ensure that phone(s) are paired to the system.
	2. Bluetooth phone not present or turned OFF.	2. Make sure paired phone is present, turned ON and that the Bluetooth option is enabled on the phone.
	3. Bluetooth phone has low battery.	3. At low battery levels, some phones will turn off Bluetooth functionality. Ensure cellular phone is charged to an adequate level.
Phone Pairing Failed	1. Phone does not support Hands Free Profile	1. The Telecommunication system requires the cellular phone to be Bluetooth™ enabled, as well as supporting the Hands Free Profile. The customer will have to upgrade their phone to one supporting Hands Free Profile. A list of suggested phones is available at: <a href="http://www.chrysler.com/uconnect">http://www.chrysler.com/uconnect</a> .
	2. Phone not Bluetooth enabled.	2. The Telecommunication system requires the cellular phone to be Bluetooth™ enabled. A list of suggested phones is available at: <a href="http://www.chrysler.com/uconnect">http://www.chrysler.com/uconnect</a> .
	3. PIN entered on the phone is not the same as PIN spoken to the system.	3. The PIN spoken to the system must be the same PIN entered into the phone.
	4. Phone has reached maximum number of allowed devices paired.	4. Remove one of the previously paired devices from it's list.
Poor Voice Recognition	1. Microphone failure	1. Using a scan tool, check for microphone fault codes.
	2. Customer not waiting for the beep before speaking.	2. Ensure customer is waiting for the system "beep" prior to beginning the speech to be recognized.
	3. Customer not speaking in a smooth normal manner.	3. Verify that the customer is attempting to use the system with a smooth consistent voice. The system is designed to accept normal speech spoken at a normal tone, some people tend to speak to a computer loud and slow, which results in reduced performance.
	4. Rear view mirror not properly attached to mounting.	4. Mirror must be firmly mounted to the mounting location. Ensure that mirror is tightened to the specified torque.
	5. High levels of noise in vehicle compartment	5. System performance is increased when noise conditions in the vehicle are lowered. Ideal conditions include windows closed.
	6. Object interfering with microphone input	6. Verify that there is no object, hanging from the mirror, that could be obstructing the microphone.

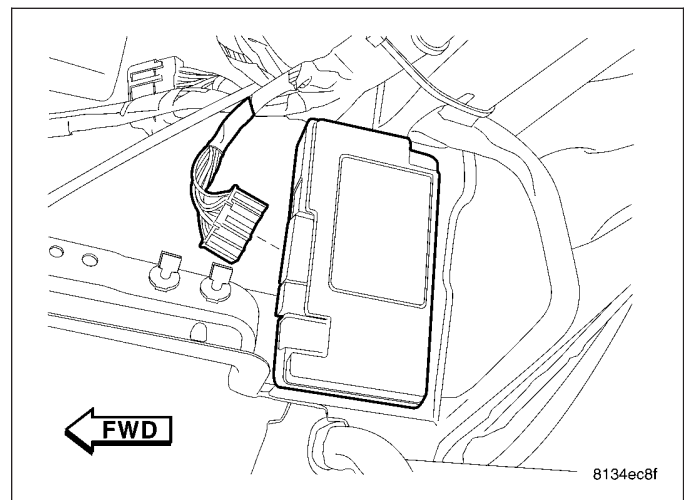
CONDITION	POSSIBLE CAUSE	CORRECTION
	7. User not saying "send" after a pager dialing request	7. User must say "send" at the end of a Pager Dialing request.
	8. Other passengers talking while customer is attempting to use the system	8. Although designed for primary use by the driver, the microphone will pick up passengers in any seat of the vehicle. System performance is increased in low noise environments.
Phonebook names not recognized consistently	1. Phonebook names recorded in high noise conditions	1. For increased system performance, it is recommended that the phone book entries are recorded in a low noise environment. That is, vehicle in park, with windows up.
	2. Phonebook name(s) short	2. For increased performance it is recommended that the user use both first and last name as a phonebook entry. Example "James Johnson" as opposed to "James".
	3. Phonebook names recorded by another user	3. It is recommended that each user of the system record their own phonebook entries. This will increase the recognition performance.
	4. Similar names in phonebook	4. For increased system performance it is recommended that the user do not enter similar sounding names in the phonebook.
	5. Object interfering with microphone input	5. Object interfering with microphone input.
Poor Phone audio quality.	1. Microphone failure	1. Use a scan tool, and check for Microphone faults.
	2. Rear view mirror not properly fixed to mounting button	2. Mirror must be firmly mounted to the mounting location. Tighten mirror to the specified torque.
	3. System being used in high noise conditions	3. System performance is increased when noise conditions in the vehicle are lowered. Ideal conditions include windows closed.
No Phone Audio	1. Phone setting cause phone audio to be routed to handset.	1. Route audio to "Hands free" device.

## HANDS FREE MODULE

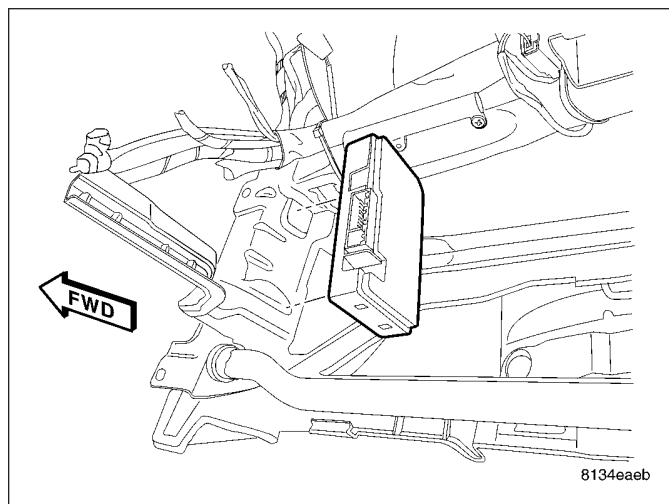
### REMOVAL

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Disconnect and isolate the battery negative cable.
2. Remove the glove box.
3. Disconnect the electrical harness connector.



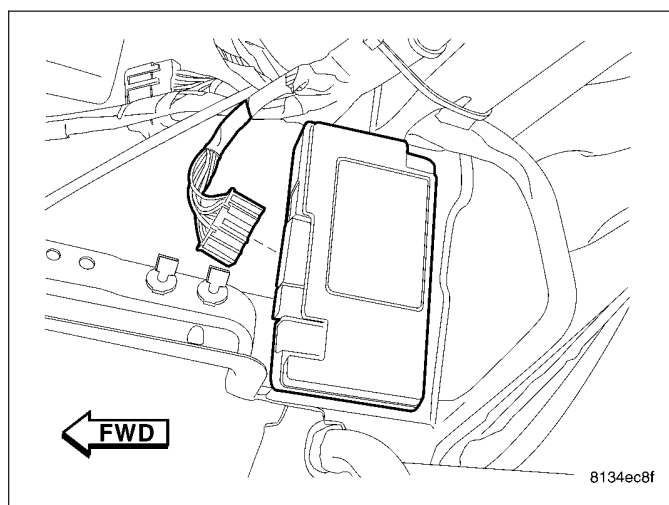
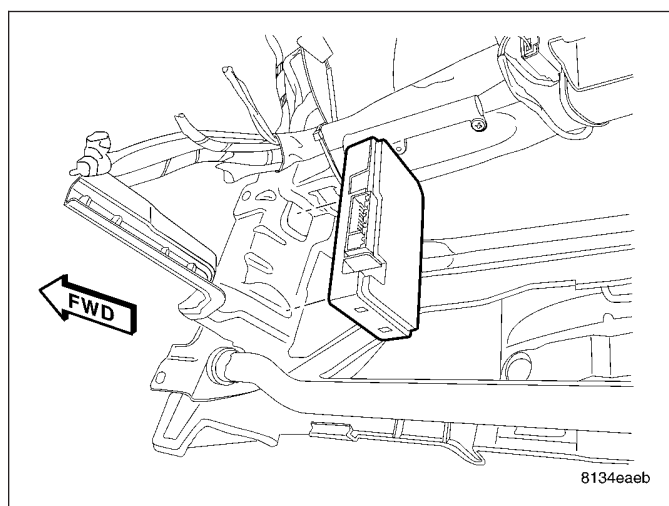
4. Remove the mounting fasteners
5. Remove the hands free module.



## INSTALLATION

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

1. Position hands free module. Install and tighten mounting fasteners.
2. Connect wire harness connector.
3. Install glove box.
4. Connect battery negative cable.



# WIRING

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## WIRING DIAGRAM INFORMATION

## DESCRIPTION

## DESCRIPTION - HOW TO USE WIRING DIAGRAMS

DaimlerChrysler Corporation wiring diagrams are designed to provide information regarding the vehicles wiring content. In order to effectively use the wiring diagrams to diagnose and repair DaimlerChrysler Corporation vehicles, it is important to understand all of their features and characteristics.

Diagrams are arranged such that the power (B+) side of the circuit is placed near the top of the page, and the ground (B-) side of the circuit is placed near the bottom of the page.

All switches, components, and modules are shown in the at rest position with the doors closed and the key removed from the ignition.

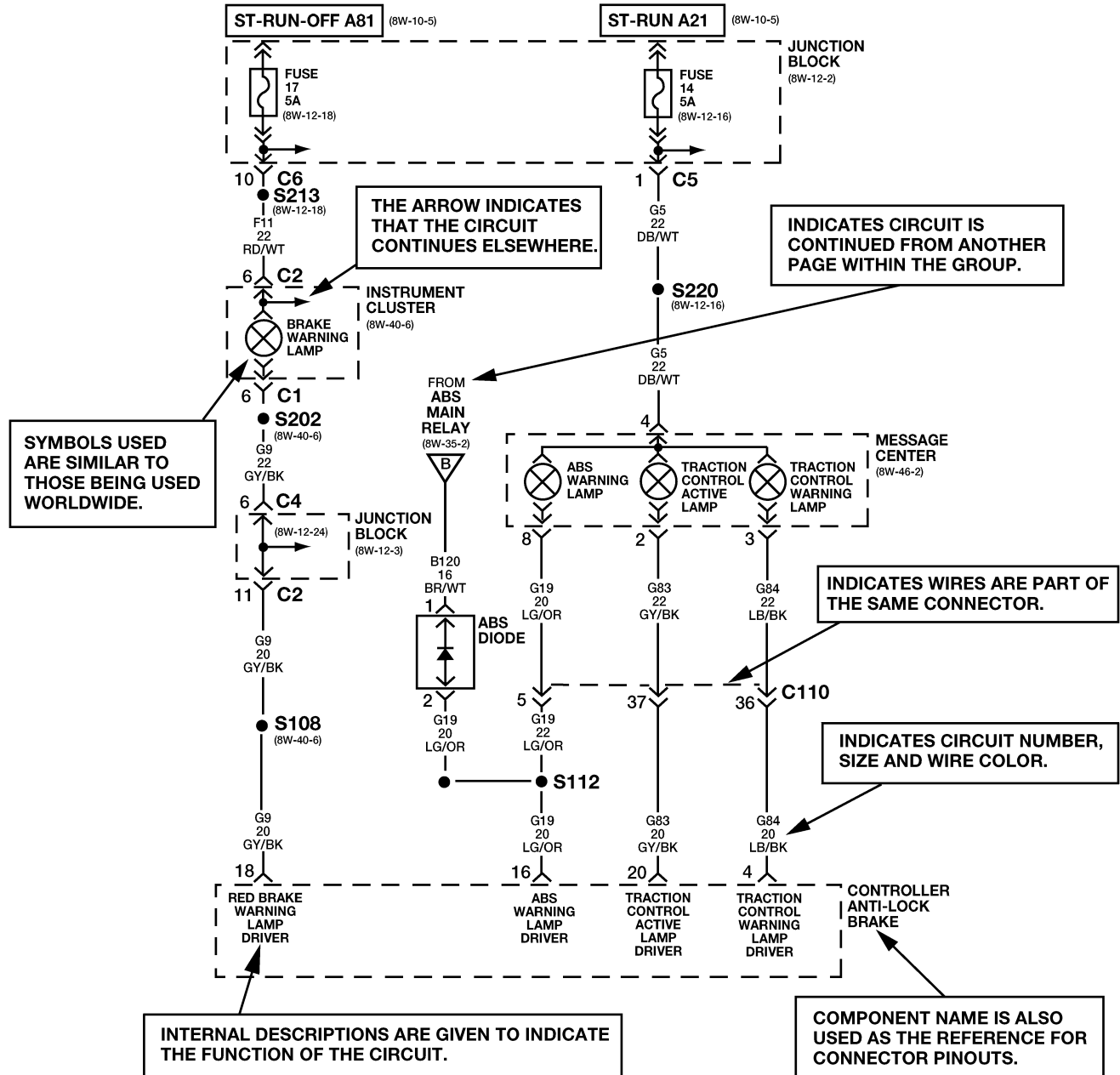
Components are shown two ways. A solid line around a component indicates that the component is complete. A dashed line around the component indicates that the component is being shown is not complete. Incomplete components have a reference number to indicate the page where the component is shown complete.

It is important to realize that no attempt is made on the diagrams to represent components and wiring as they appear on the vehicle. For example, a short piece of wire is treated the same as a long one. In addition, switches and other components are shown as simply as possible, with regard to function only.

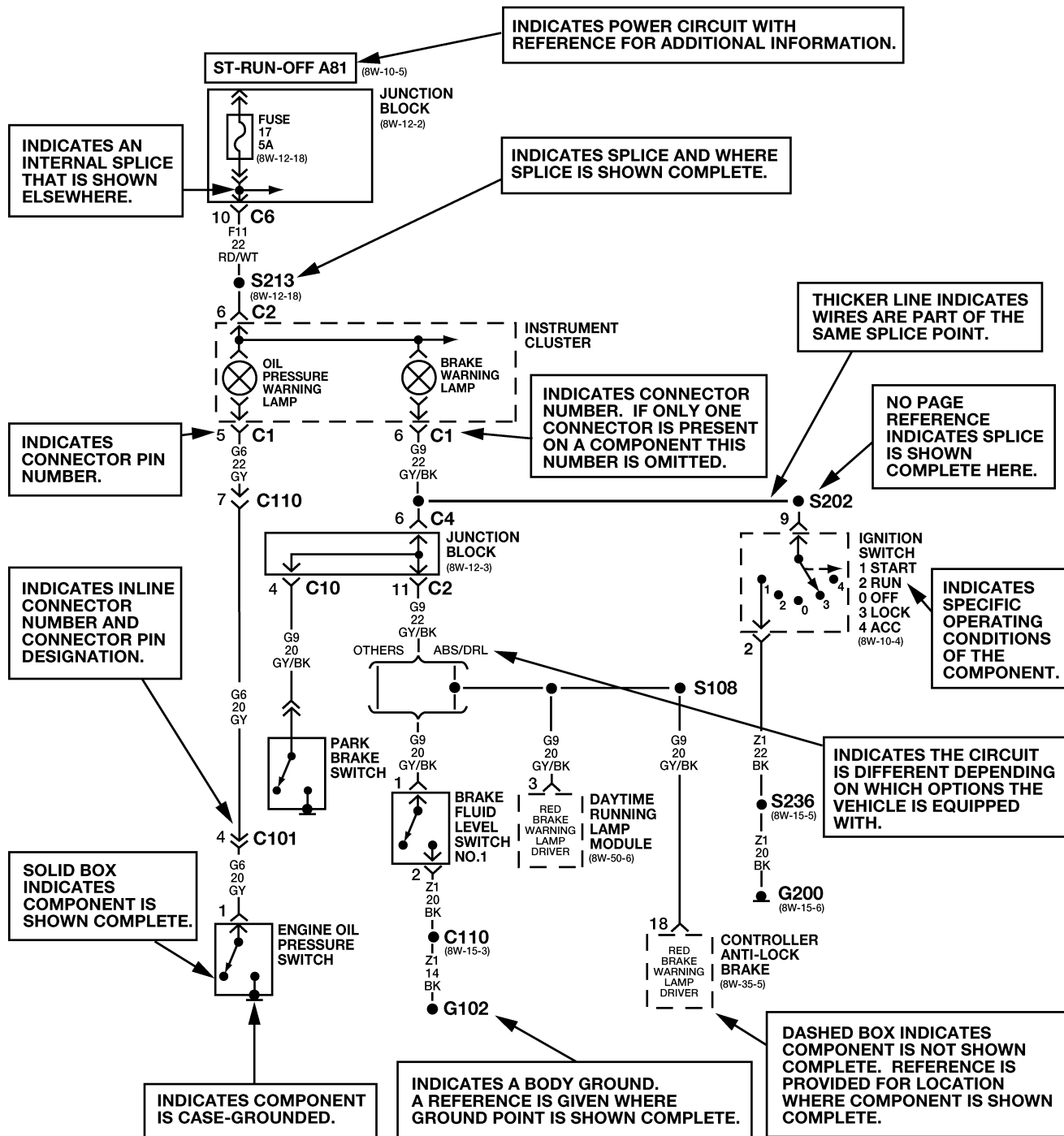
## SYMBOLS

International symbols are used throughout the wiring diagrams. These symbols are consistent with those being used around the world.

DIAGRAMS ARE ARRANGED WITH THE POWER B+ SIDE OF THE CIRCUIT NEAR THE TOP OF THE PAGE, AND THE GROUND SIDE OF THE CIRCUIT NEAR THE BOTTOM OF THE PAGE.





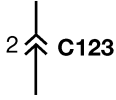
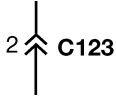
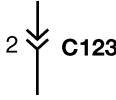


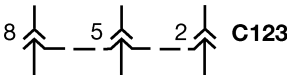






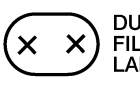

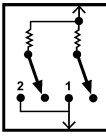


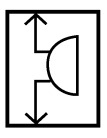
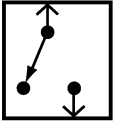
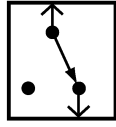
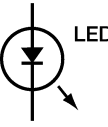
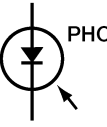


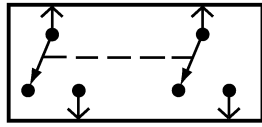
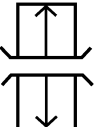

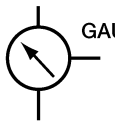

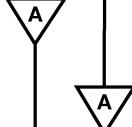
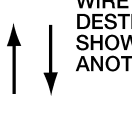

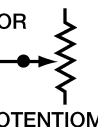


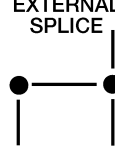
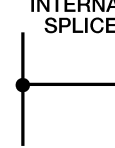
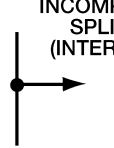
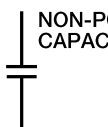
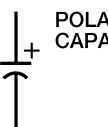
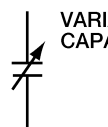

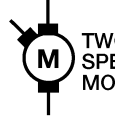

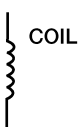
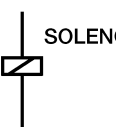
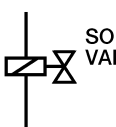


The System shown here is an **EXAMPLE ONLY**. It does not represent the actual circuit shown in the **WIRING DIAGRAM SECTION**.



**The System shown here is an EXAMPLE ONLY. It does not represent the actual circuit shown in the WIRING DIAGRAM SECTION.**



 FUSIBLE LINK  FUSE  CIRCUIT BREAKER OR PTC PROTECTION DEVICE	 BATTERY  IN-LINE CONNECTORS  2 C123  2 C123
 BATT A0 HOT BAR  CHOICE BRACKET         (8W-30-10) PAGE REFERENCE	 MULTIPLE CONNECTOR 8 C123  MALE CONNECTOR 4 C1  FEMALE CONNECTOR 6 C3
 CLOCKSPrING  GROUND G101  SCREW TERMINAL	 SINGLE FILAMENT LAMP  DUAL FILAMENT LAMP  ANTENNA
 RESISTIVE MULTIPLEX SWITCH	 NPN TRANSISTOR  PNP TRANSISTOR  TONE GENERATOR
 OPEN SWITCH  CLOSED SWITCH	 LED  PHOTODIODE  DIODE  ZENER DIODE
 GANGED SWITCH  SLIDING DOOR CONTACT	 OXYGEN SENSOR  GAUGE  PIEZOELECTRIC CELL
 WIRE ORIGIN & DESTINATION SHOWN WITHIN CELL  WIRE DESTINATION SHOWN IN ANOTHER CELL	 RESISTOR  POTENTIOMETER  VARIABLE RESISTOR OR THERMISTOR  HEATER ELEMENT
 EXTERNAL SPLICE S350  INTERNAL SPLICE  INCOMPLETE SPLICE (INTERNAL)	 NON-POLARIZED CAPACITOR  POLARIZED CAPACITOR  VARIABLE CAPACITOR
 ONE SPEED MOTOR  TWO SPEED MOTOR  REVERSIBLE MOTOR	 COIL  SOLENOID  SOLENOID VALVE

## TERMINOLOGY

This is a list of terms and definitions used in the wiring diagrams.

LHD .....	Left Hand Drive Vehicles
RHD .....	Right Hand Drive Vehicles
ATX .....	Automatic Transmissions-Front Wheel Drive
MTX .....	Manual Transmissions-Front Wheel Drive
AT .....	Automatic Transmissions-Rear Wheel Drive
MT .....	Manual Transmissions-Rear Wheel Drive
SOHC .....	Single Over Head Cam Engine
DOHC .....	Double Over Head Cam Engine
Export .....	Vehicles Built For Sale In Markets Other Than North America
Except Export .....	Vehicles Built For Sale In North America

## DESCRIPTION - CIRCUIT INFORMATION

Each wire shown in the diagrams contains a code which identifies the main circuit, a specific part of the main circuit, gage of wire, and color. An example would be **A 2 18 LB/YL**. This is a Battery Feed circuit, level two, eighteen gauge, light blue with a yellow tracer.

## WIRE COLOR CODE CHART

COLOR CODE	COLOR
BL	BLUE
BK	BLACK
BR	BROWN
DB	DARK BLUE
DG	DARK GREEN
GY	GRAY
LB	LIGHT BLUE
LG	LIGHT GREEN
OR	ORANGE
PK	PINK
RD	RED
TN	TAN
VT	VIOLET
WT	WHITE
YL	YELLOW
*	WITH TRACER

## DESCRIPTION - CIRCUIT FUNCTIONS

All circuits in the diagrams use an alpha/numeric code to identify the wire and it's function. To identify which circuit code applies to a system, refer to the Circuit Identification Code Chart. This chart shows the main circuits only and does not show the secondary codes that may apply to some models.

### CIRCUIT IDENTIFICATION CODE CHART

CIRCUIT	FUNCTION
A	BATTERY FEED
B	BRAKE CONTROLS
C	CLIMATE CONTROLS
D	DIAGNOSTIC CIRCUITS
E	DIMMING ILLUMINATION CIRCUITS
F	FUSED CIRCUITS
G	MONITORING CIRCUITS (GAUGES)
H	MULTIPLE
I	NOT USED
J	OPEN
K	POWERTRAIN CONTROL MODULE
L	EXTERIOR LIGHTING
M	INTERIOR LIGHTING
N	MULTIPLE
O	NOT USED
P	POWER OPTION (BATTERY FEED)
Q	POWER OPTIONS (IGNITION FEED)
R	PASSIVE RESTRAINT
S	SUSPENSION/STEERING
T	TRANSMISSION/TRANSAXLE/TRANSFER CASE
U	OPEN
V	SPEED CONTROL, WIPER/WASHER
W	WIPERS
X	AUDIO SYSTEMS
Y	TEMPORARY
Z	GROUND

## DESCRIPTION - SECTION IDENTIFICATION AND INFORMATION

The wiring diagrams are grouped into individual sections. If a component is most likely found in a particular group, it will be shown complete (all wires, connectors, and pins) within that group. For example, the Auto Shutdown Relay is most likely to be found in Group 30, so it is shown there complete. It can, however, be shown partially in another group if it contains some associated wiring.

Splice diagrams in Section 8W-70 show the entire splice and provide references to other sections the splices serves. Section 8W-70 only contains splice diagrams that are not shown in their entirety somewhere else in the wiring diagrams.

Section 8W-80 shows each connector and the circuits involved with that connector. The connectors are identified using the name/number on the diagram pages.

## DESCRIPTION - CONNECTOR, GROUND AND SPLICE INFORMATION

**CAUTION:** Not all connectors are serviced. Some connectors are serviced only with a harness. A typical example might be the Supplemental Restraint System connectors. Always check parts availability before attempting a repair.

## IDENTIFICATION

In-line connectors are identified by a number, as follows:

- In-line connectors located in the engine compartment are C100 series numbers.
- In-line connectors located in the instrument panel area are C200 series numbers.
- In-line connectors located in the body are C300 series numbers.
- Jumper harness connectors are C400 series numbers.
- Grounds and ground connectors are identified with a "G" and follow the same series numbering as the in-line connectors.
- Splices are identified with an "S" and follow the same series numbering as the in-line connectors.
- Component connectors are identified by the component name instead of a number. Multiple connectors on a component use a C1, C2, etc. identifier.

## LOCATIONS

Section 8W-91 contains connector/ground/splice location illustrations. The illustrations contain the connector name (or number)/ground number/splice number and component identification. Connector/ground/splice location charts in section 8W-91 reference the figure numbers of the illustrations.

The abbreviation T/O is used in the component location section to indicate a point in which the wiring harness branches out to a component. The abbreviation N/S means Not Shown in the illustrations

## WARNING

### WARNINGS - GENERAL

**WARNINGS** provide information to prevent personal injury and vehicle damage. Below is a list of general warnings that should be followed any time a vehicle is being serviced.

**WARNING:** Always wear safety glasses for eye protection.

**WARNING:** Use safety stands anytime a procedure requires being under a vehicle.

**WARNING:** Be sure that the ignition switch always is in the off position, unless the procedure requires it to be on.

**WARNING:** Set the parking brake when working on any vehicle. An automatic transmission should be in park. A manual transmission should be in neutral.

**WARNING:** Operate the engine only in a well-ventilated area.

**WARNING:** Keep away from moving parts when the engine is running, especially the fan and belts.

**WARNING:** To prevent serious burns, avoid contact with hot parts such as the radiator, exhaust manifold(s), tail pipe, catalytic converter and muffler.

**WARNING:** Do not allow flame or sparks near the battery. Gases are always present in and around the battery.

**WARNING:** Always remove rings, watches, loose hanging jewelry and avoid loose clothing.

## DIAGNOSIS AND TESTING - WIRING HARNESS

### TROUBLESHOOTING TOOLS

When diagnosing a problem in an electrical circuit there are several common tools necessary. These tools are listed and explained below.

- Jumper Wire - This is a test wire used to connect two points of a circuit. It can be used to bypass an open in a circuit.

**WARNING:** Never use a jumper wire across a load, such as a motor, connected between a battery feed and ground.

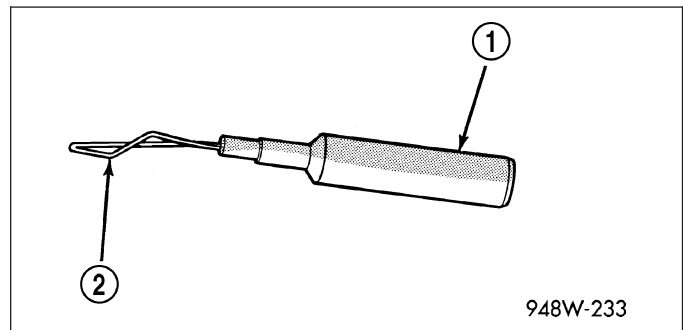
- Voltmeter - Used to check for voltage on a circuit. Always connect the black lead to a known good ground and the red lead to the positive side of the circuit.

**CAUTION:** Most of the electrical components used in today's vehicles are Solid State. When checking voltages in these circuits, use a meter with a 10 - megohm or greater impedance rating.

- Ohmmeter - Used to check the resistance between two points of a circuit. Low or no resistance in a circuit means good continuity.

**CAUTION:** Most of the electrical components used in today's vehicles are Solid State. When checking resistance in these circuits use a meter with a 10 - megohm or greater impedance rating. In addition, make sure the power is disconnected from the circuit. Circuits that are powered up by the vehicle's electrical system can cause damage to the equipment and provide false readings.

- Probing Tools - These tools are used for probing terminals in connectors. Select the proper size tool from Special Tool Package 6807, and insert the probing end (2) into the terminal being tested. Use the other end of the tool (1) to insert the meter probe.



### INTERMITTENT AND POOR CONNECTIONS

Most intermittent electrical problems are caused by faulty electrical connections or wiring. It is also possible for a sticking component or relay to cause a problem. Before condemning a component or wiring assembly, check the following items.

- Connectors are fully seated
- Spread terminals, or terminal push out
- Terminals in the wiring assembly are fully seated into the connector/component and locked into position
- Dirt or corrosion on the terminals. Any amount of corrosion or dirt could cause an intermittent problem
- Damaged connector/component casing exposing the item to dirt or moisture
- Wire insulation that has rubbed through causing a short to ground
- Some or all of the wiring strands broken inside of the insulation
- Wiring broken inside of the insulation

## TROUBLESHOOTING WIRING PROBLEMS

When troubleshooting wiring problems there are six steps which can aid in the procedure. The steps are listed and explained below. Always check for non-factory items added to the vehicle before doing any diagnosis. If the vehicle is equipped with these items, disconnect them to verify these add-on items are not the cause of the problem.

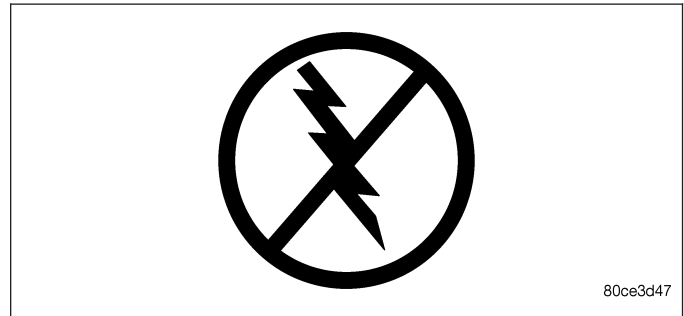
1. Verify the problem.
2. Verify any related symptoms. Do this by performing operational checks on components that are in the same circuit. Refer to the wiring diagrams.
3. Analyze the symptoms. Use the wiring diagrams to determine what the circuit is doing, where the problem most likely is occurring and where the diagnosis will continue.
4. Isolate the problem area.
5. Repair the problem area.
6. Verify the proper operation. For this step, check for proper operation of all items on the repaired circuit. Refer to the wiring diagrams.

## STANDARD PROCEDURE

### STANDARD PROCEDURE - ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES

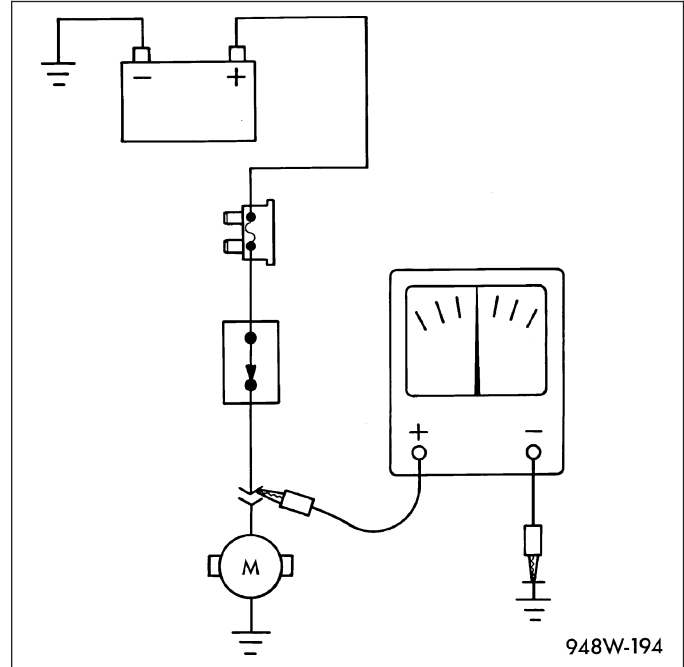
All ESD sensitive components are solid state and a symbol is used to indicate this. When handling any component with this symbol, comply with the following procedures to reduce the possibility of electrostatic charge build up on the body and inadvertent discharge into the component. If it is not known whether the part is ESD sensitive, assume that it is.

1. Always touch a known good ground before handling the part. This should be repeated while handling the part and more frequently after sliding across a seat, sitting down from a standing position, or walking a distance.
2. Avoid touching electrical terminals of the part, unless instructed to do so by a written procedure.
3. When using a voltmeter, be sure to connect the ground lead first.
4. Do not remove the part from its protective packing until it is time to install the part.
5. Before removing the part from its package, ground the package to a known good ground on the vehicle.



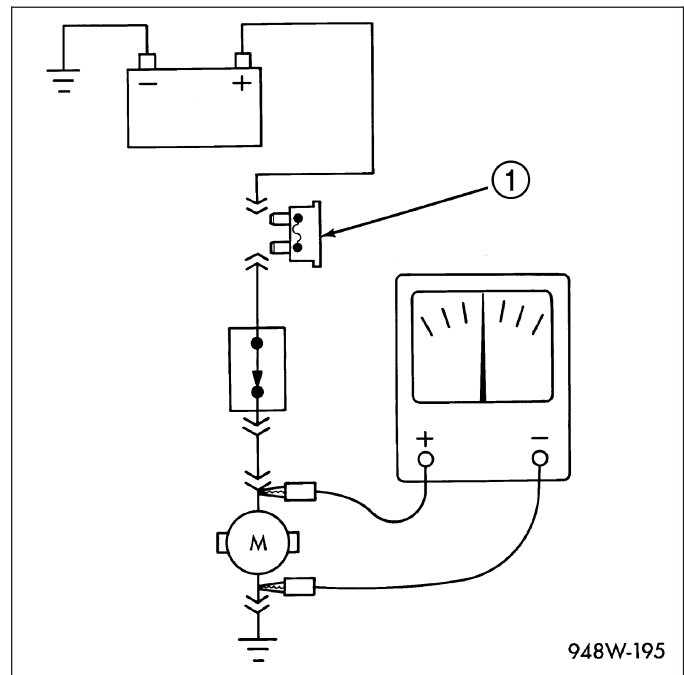
## STANDARD PROCEDURE - TESTING OF VOLTAGE POTENTIAL

1. Connect the ground lead of a voltmeter to a known good ground.
2. Connect the other lead of the voltmeter to the selected test point. The vehicle ignition may need to be turned ON to check voltage. Refer to the appropriate test procedure.



## STANDARD PROCEDURE - TESTING FOR CONTINUITY

1. Remove the fuse (1) for the circuit being checked or, disconnect the battery.
2. Connect one lead of the ohmmeter to one side of the circuit being tested
3. Connect the other lead to the other end of the circuit being tested. Low or no resistance means good continuity.



## STANDARD PROCEDURE - TESTING FOR A SHORT TO GROUND

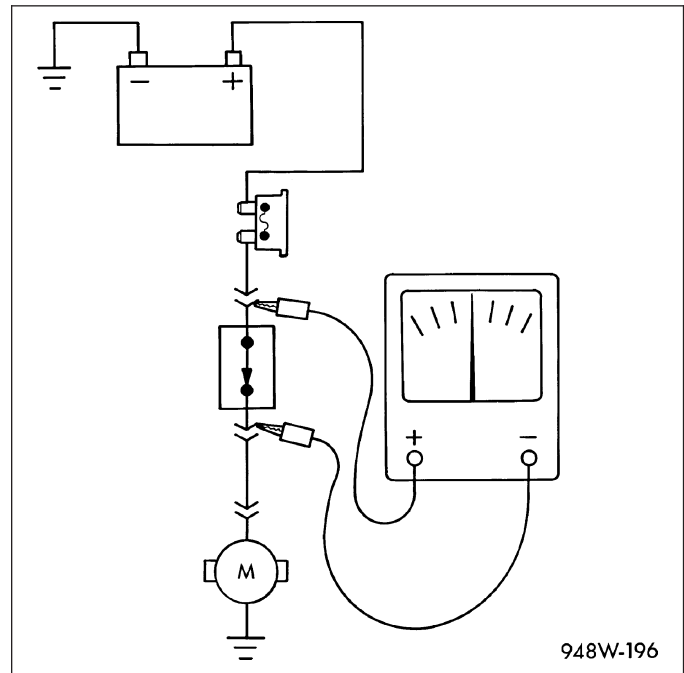
1. Remove the fuse and disconnect all items involved with the fuse.
2. Connect a test light or a voltmeter across the terminals of the fuse.
3. Starting at the fuse block, wiggle the wiring harness about six to eight inches apart and watch the voltmeter/test lamp.
4. If the voltmeter registers voltage or the test lamp glows, there is a short to ground in that general area of the wiring harness.

## STANDARD PROCEDURE - TESTING FOR A SHORT TO GROUND ON FUSES POWERING SEVERAL LOADS

1. Refer to the wiring diagrams and disconnect or isolate all items on the suspected fused circuits.
2. Replace the blown fuse.
3. Supply power to the fuse by turning ON the ignition switch or re-connecting the battery.
4. Start connecting or energizing the items in the fuse circuit one at a time. When the fuse blows the circuit with the short to ground has been isolated.

## STANDARD PROCEDURE - TESTING FOR A VOLTAGE DROP

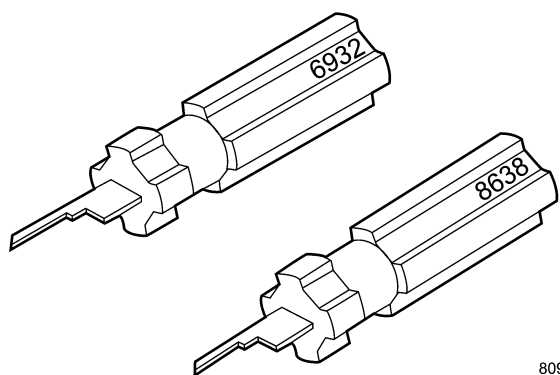
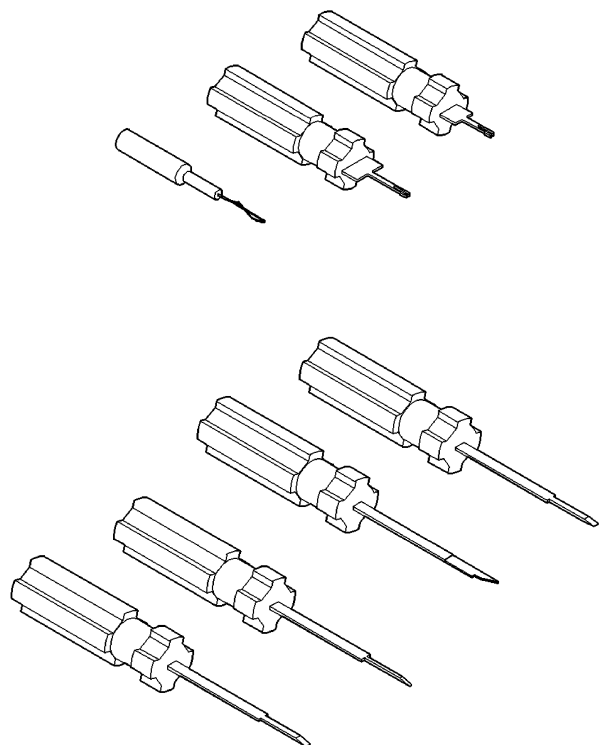
1. Connect the positive lead of the voltmeter to the side of the circuit closest to the battery.
2. Connect the other lead of the voltmeter to the other side of the switch, component or circuit.
3. Operate the item.
4. The voltmeter will show the difference in voltage between the two points.



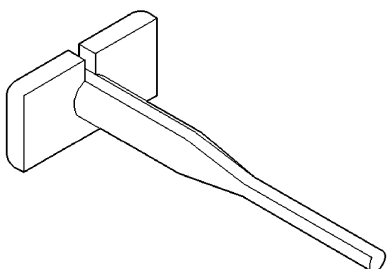


## SPECIAL TOOLS

### WIRING/TERMINAL



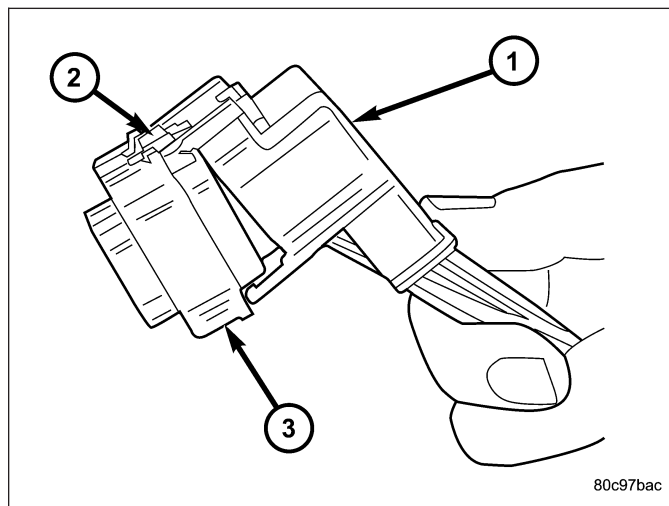
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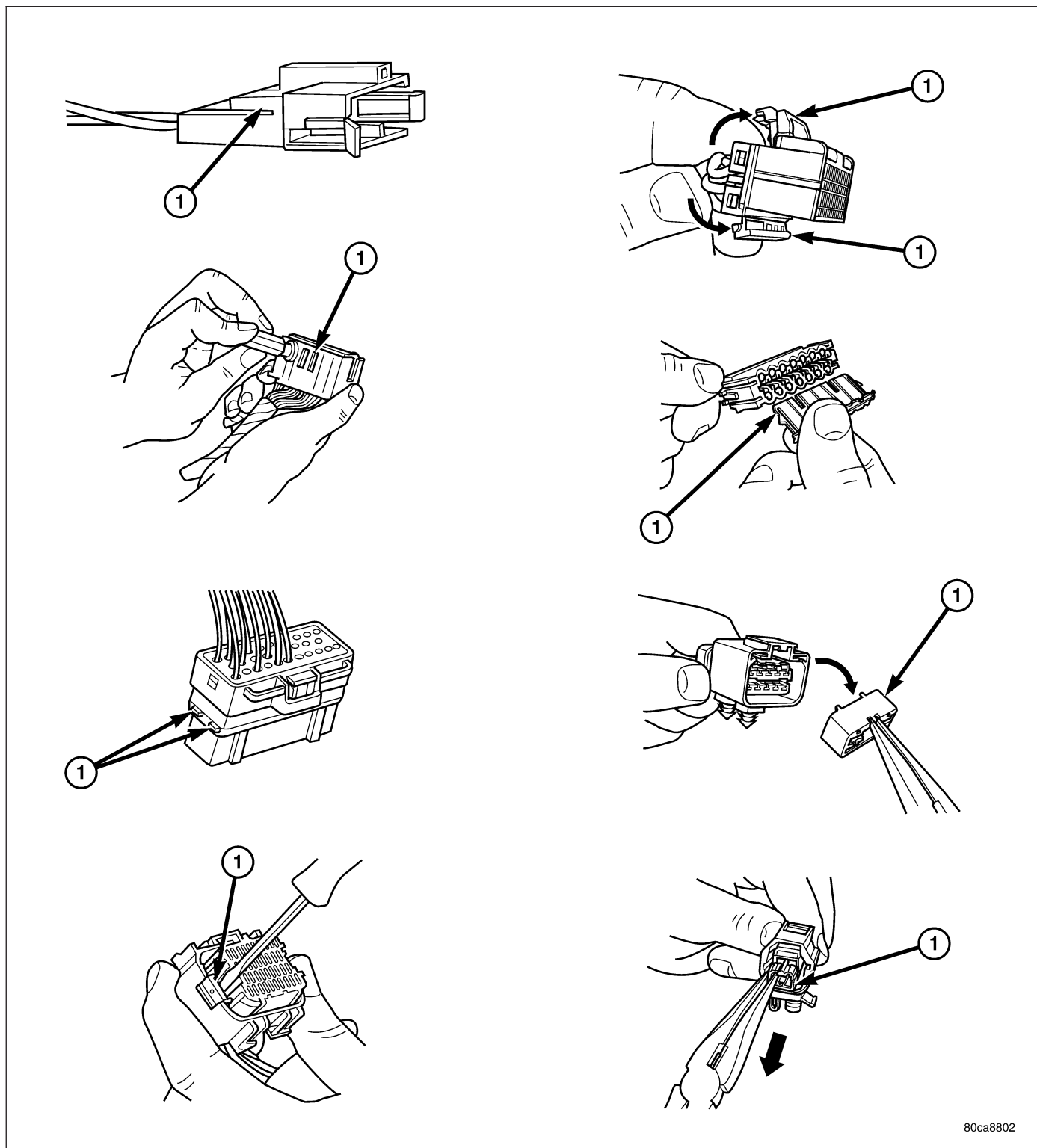


## CONNECTOR

### REMOVAL

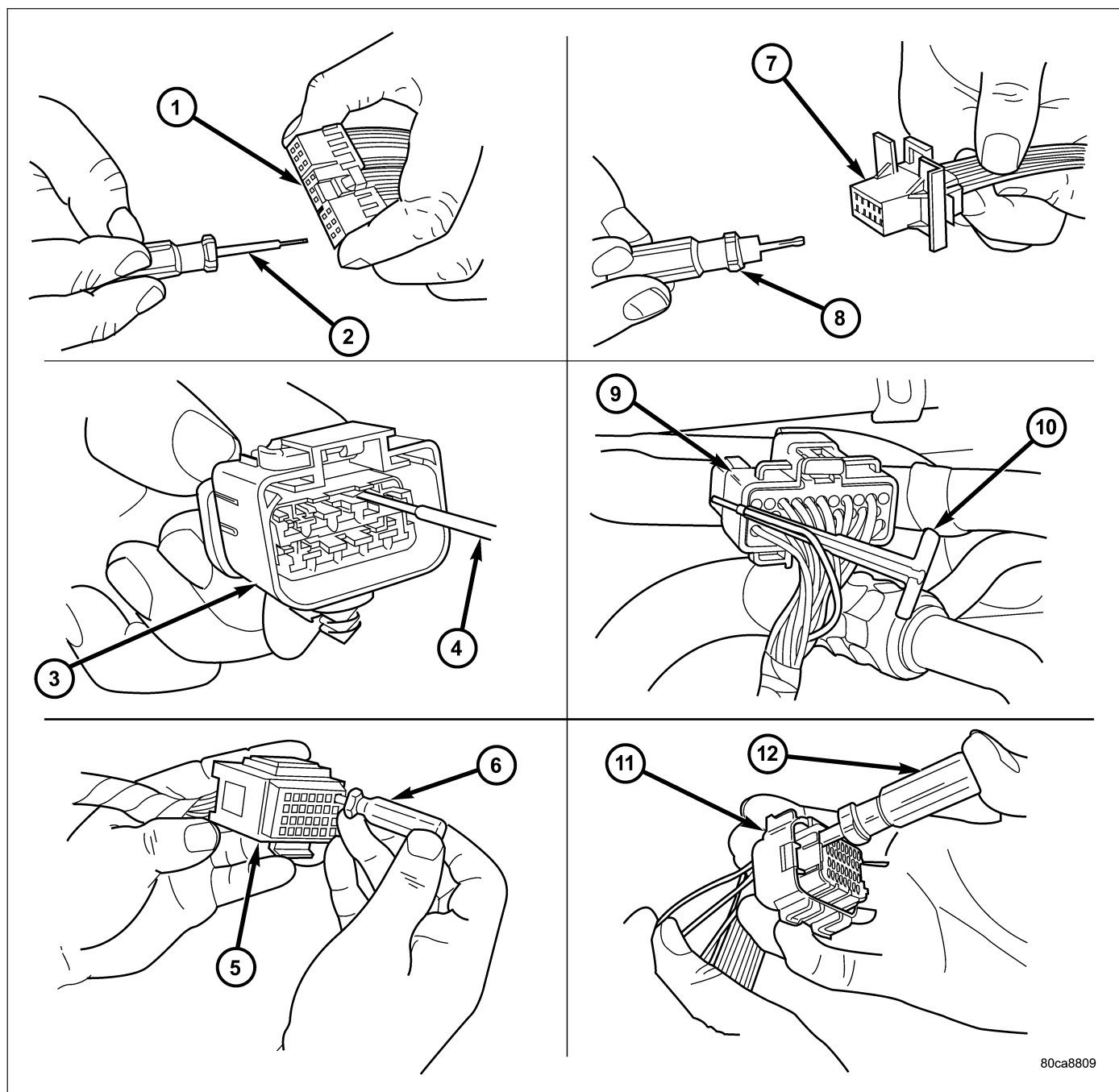
1. Disconnect battery.
2. Release Connector Lock (2).
3. Disconnect the connector (3) being repaired from its mating half/component.
4. Remove the dress cover (if applicable) (1).





80ca8802

5. Release the Secondary Terminal Lock, if required (1).



80ca8809

- 1 - TYPICAL CONNECTOR
- 2 - PICK FROM SPECIAL TOOL KIT 6680
- 3 - APEX CONNECTOR
- 4 - PICK FROM SPECIAL TOOL KIT 6680
- 5 - AUGAT CONNECTOR
- 6 - SPECIAL TOOL 6932

- 7 - MOLEX CONNECTOR
- 8 - SPECIAL TOOL 6742
- 9 - THOMAS AND BETTS CONNECTOR
- 10 - SPECIAL TOOL 6934
- 11 - TYCO CONNECTOR
- 12 - SPECIAL TOOL 8638

6. Position the connector locking finger away from the terminal using the proper special tool. Pull on the wire to remove the terminal from the connector.

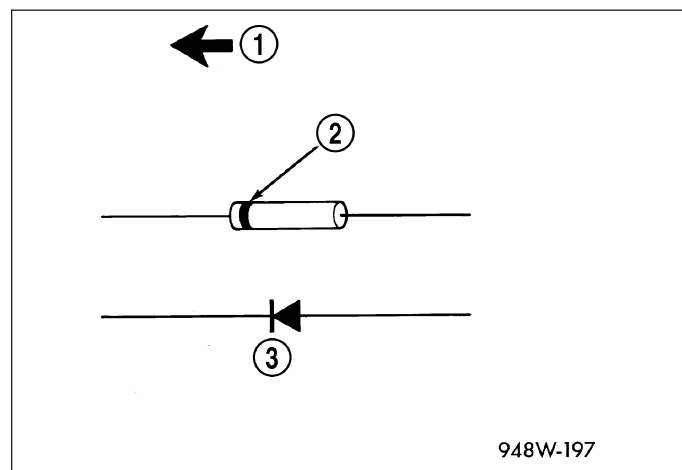
## INSTALLATION

1. Insert the removed terminal in the same cavity on the repair connector.
2. Repeat steps for each terminal in the connector, being sure that all wires are inserted into the proper cavities. For additional connector pin-out identification, refer to the wiring diagrams.
3. When the connector is re-assembled, the secondary terminal lock must be placed in the locked position to prevent terminal push out.
4. Replace dress cover (if applicable).
5. Connect connector to its mating half/component.
6. Connect battery and test all affected systems.

## DIODE

### REMOVAL

1. Disconnect the battery.
2. Locate the diode in the harness, and remove the protective covering.
3. Remove the diode from the harness, pay attention to the current flow direction (1) (2) (3).



### INSTALLATION

1. Remove the insulation from the wires in the harness. Only remove enough insulation to solder in the new diode.
2. Install the new diode in the harness, making sure current flow is correct. If necessary, refer to the appropriate wiring diagram for current flow.
3. Solder the connection together using rosin core type solder only. **Do not use acid core solder.**
4. Tape the diode to the harness using electrical tape. Make sure the diode is completely sealed from the elements.
5. Re-connect the battery and test affected systems.

## TERMINAL

### REMOVAL

1. Follow steps for removing terminals described in the connector removal section.
2. Cut the wire 6 inches from the back of the connector.

### INSTALLATION

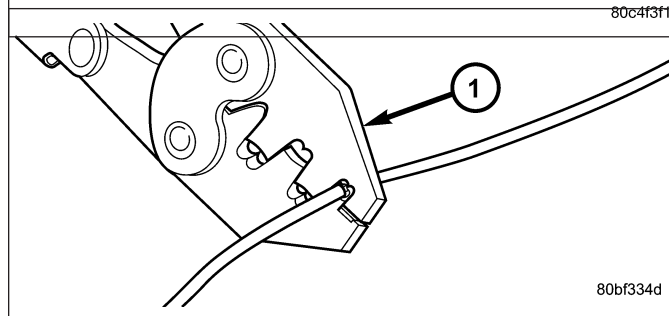
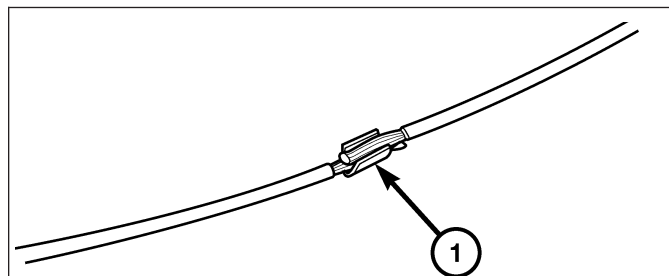
1. Select a wire from the terminal repair kit that best matches the color and gage of the wire being repaired.
2. Cut the repair wire to the proper length and remove one-half (1/2) inch of insulation.
3. Splice the repair wire to the wire harness (see wire splicing procedure).
4. Insert the repaired wire into the connector.
5. Install the connector locking wedge, if required, and reconnect the connector to its mating half/component.
6. Re-tape the wire harness starting at 1-1/2 inches behind the connector and 2 inches past the repair.
7. Connect battery and test all affected systems.

## WIRE

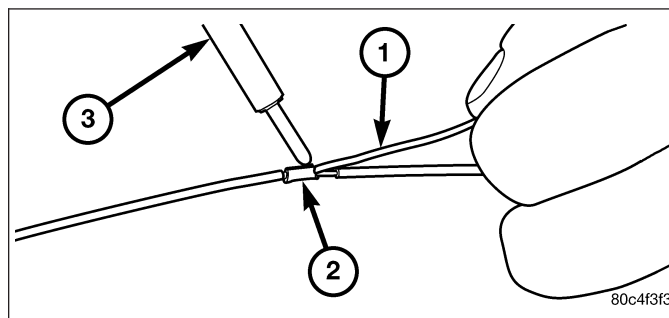
### STANDARD PROCEDURE - WIRE SPLICING

When splicing a wire, it is important that the correct gage be used as shown in the wiring diagrams.

1. Remove one-half (1/2) inch of insulation from each wire that needs to be spliced.
2. Place a piece of adhesive lined heat shrink tubing on one side of the wire. Make sure the tubing will be long enough to cover and seal the entire repair area.
3. Place the strands of wire overlapping each other inside of the splice clip (1).
4. Using crimping tool (1), Mopar p/n 05019912AA, crimp the splice clip and wires together.

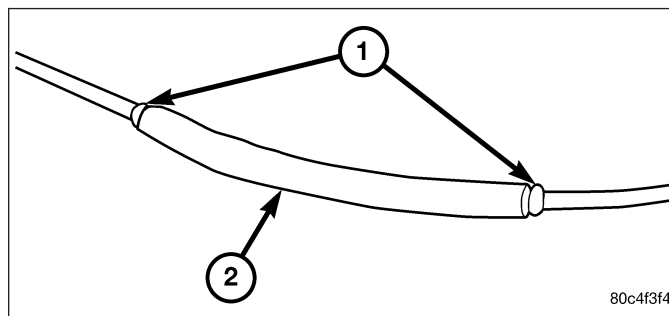


5. Solder (3) the connection (2) together using rosin core type solder (1) only.



### CAUTION: DO NOT USE ACID CORE SOLDER.

6. Center the heat shrink tubing (2) over the joint and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant (1) comes out of both ends of the tubing.





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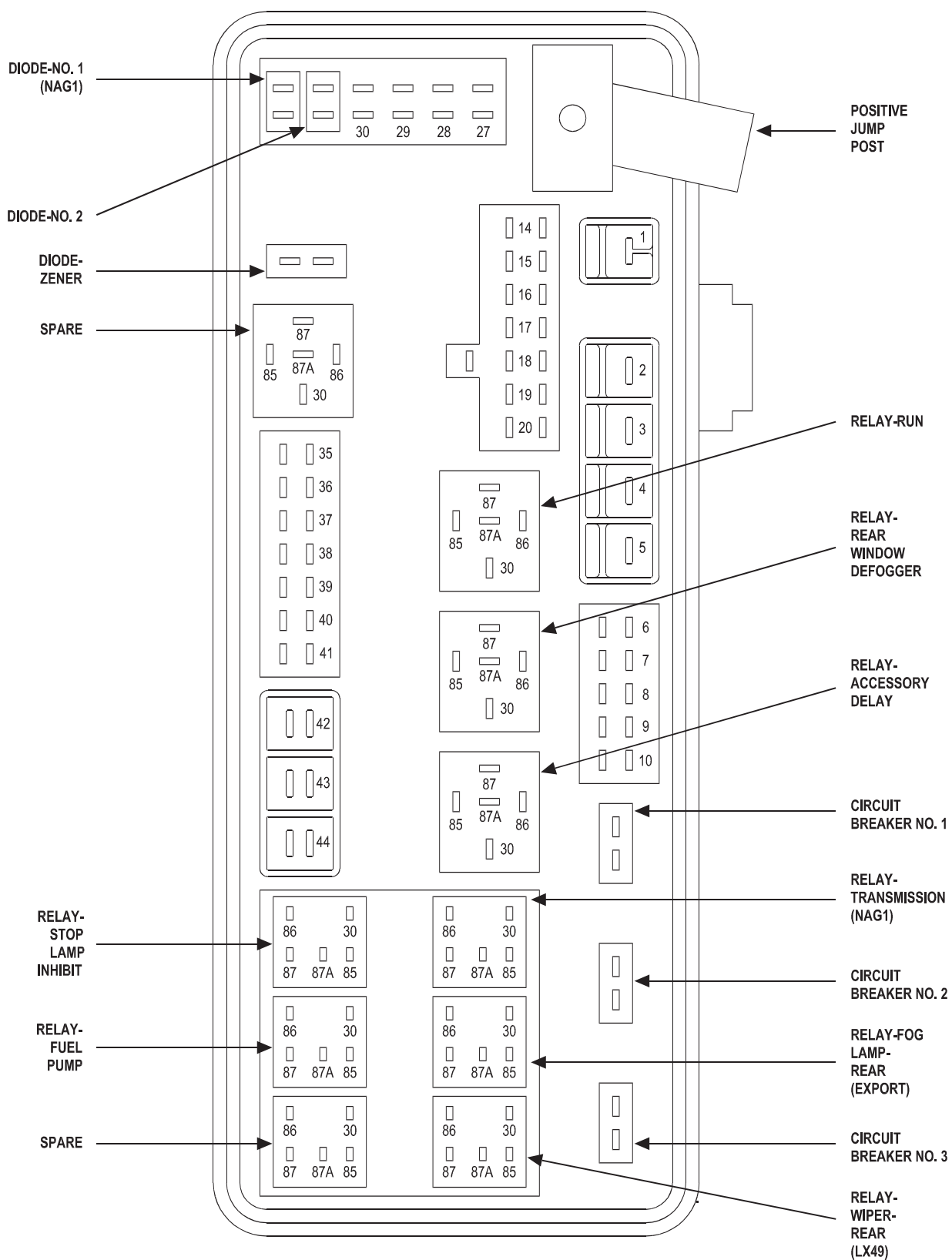
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## POWER DISTRIBUTION CENTER



**FUSES  
(PDC)**

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	60A	A114 10RD/BK	B(+) (I.O.D.)
2	40A	A22 12RD/WT	FUSED B(+)
3	-	-	-
4	40A	A22 12RD/WT	FUSED B(+)
5	30A	A33 14RD/YL	FUSED B(+)
6	20A	A109 16RD/DG	FUSED B(+)
7	-	-	-
8	15A	A106 20LB/RD	FUSED B(+)
9	20A	A305 16RD/LB	FUSED B(+)
10	10A	A35 20RD/DB ▲▲	FUSED B(+)
		A35 20RD/DB ▲▲	FUSED B(+)
14	10A	A23 20RD/YL	FUSED B(+) (I.O.D.)
15	20A	A914 16RD ◆◆◆◆	FUSED B(+)
16	20A	A105 16DB/RD ▼▼	FUSED B(+)
17	-	-	-
18	20A	A205 16RD/OR	FUSED B(+)
19	10A	A103 20PK/DB	FUSED B(+)
		A103 20PK/DB ■■	FUSED B(+)
20	20A	A909 20RD/TN ▼▼	FUSED B(+)
		A909 16RD/TN ▼▼	FUSED B(+)
27	10A	F201 20PK/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
28	10A	F214 20PK/LG	FUSED RUN RELAY OUTPUT
29	5A	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
30	10A	A913 20RD/GY	FUSED B(+)
35	5A	F880 20PK/DG	FUSED ACCESSORY DELAY RELAY OUTPUT
36	20A	A300 16GY/LG	FUSED B(+) (I.O.D.)
37	15A	F942 18PK/BK ###	FUSED TRANSMISSION RELAY OUTPUT
38	5A	A117 20RD/DG	FUSED B(+) (I.O.D.)
		A117 20RD/DG ▼	FUSED B(+) (I.O.D.)
39	10A	C16 20DB/GY	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
40	5A	F23 20RD/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
41	10A	F500 20DG/PK	FUSED RUN RELAY OUTPUT
42	30A	C7 12DB	FUSED RUN RELAY OUTPUT
43	30A	C15 12DB/WT	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
44	20A	X13 16DG/GY	FUSED B(+) (I.O.D.)

▼ LX48  
▼▼ LX49  
▲▲ EXPORT  
■■ ESP  
### NAG1  
◆◆◆◆ TRAILER TOW

CIRCUIT BREAKERS  
(PDC)

CB	AMPS	FUSED CIRCUIT	FUNCTION
1	25A	A110 16OR/RD	FUSED B(+)
2	25A	A916 14RD	FUSED B(+)
3	30A	F881 14PK	FUSED ACCESSORY DELAY RELAY OUTPUT

RELAYS  
(PDC)RELAY-  
ACCESSORY  
DELAY

CAVITY	CIRCUIT	FUNCTION
30	A1 6RD	B(+)
85	P307 20LG/GY	ACCESSORY DELAY RELAY CONTROL
86	A1 6RD	B(+)
87	F981 12RD/BR	ACCESSORY DELAY RELAY OUTPUT
87A	-	-

RELAY-FOG  
LAMP-  
REAR  
(EXPORT)

CAVITY	CIRCUIT	FUNCTION
30	A35 20RD/DB	FUSED B(+)
85	A35 20RD/DB	FUSED B(+)
86	L239 20WT/DG	REAR FOG LAMP RELAY CONTROL
87	L90 20WT/OR	REAR FOG LAMP RELAY OUTPUT
87A	-	-

RELAY-  
FUEL  
PUMP

CAVITY	CIRCUIT	FUNCTION
30	A109 16RD	FUSED B(+)
85	F20 20PK/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
86	K31 20BR	FUEL PUMP RELAY CONTROL
87	N1 16DB/OR	FUEL PUMP RELAY OUTPUT
87A	-	-

RELAYS  
(PDC)  
(CONTINUED)



RELAY-  
REAR  
WINDOW  
DEFOGGER

CAVITY	CIRCUIT	FUNCTION
30	A1 6RD	B(+)
85	C115 20DB	REAR WINDOW DEFOGGER RELAY CONTROL
86	A1 6RD	B(+)
87	C515 12RD/GY	REAR WINDOW DEFOGGER RELAY OUTPUT
87A	-	-

RELAY-RUN

CAVITY	CIRCUIT	FUNCTION
30	A1 6RD	B(+)
85	F921 20PK/WT	RUN RELAY CONTROL
86	A1 6RD	B(+)
87	F922 12RD/LB	RUN RELAY OUTPUT
87A	-	-

RELAY-  
STOP  
LAMP  
INHIBIT

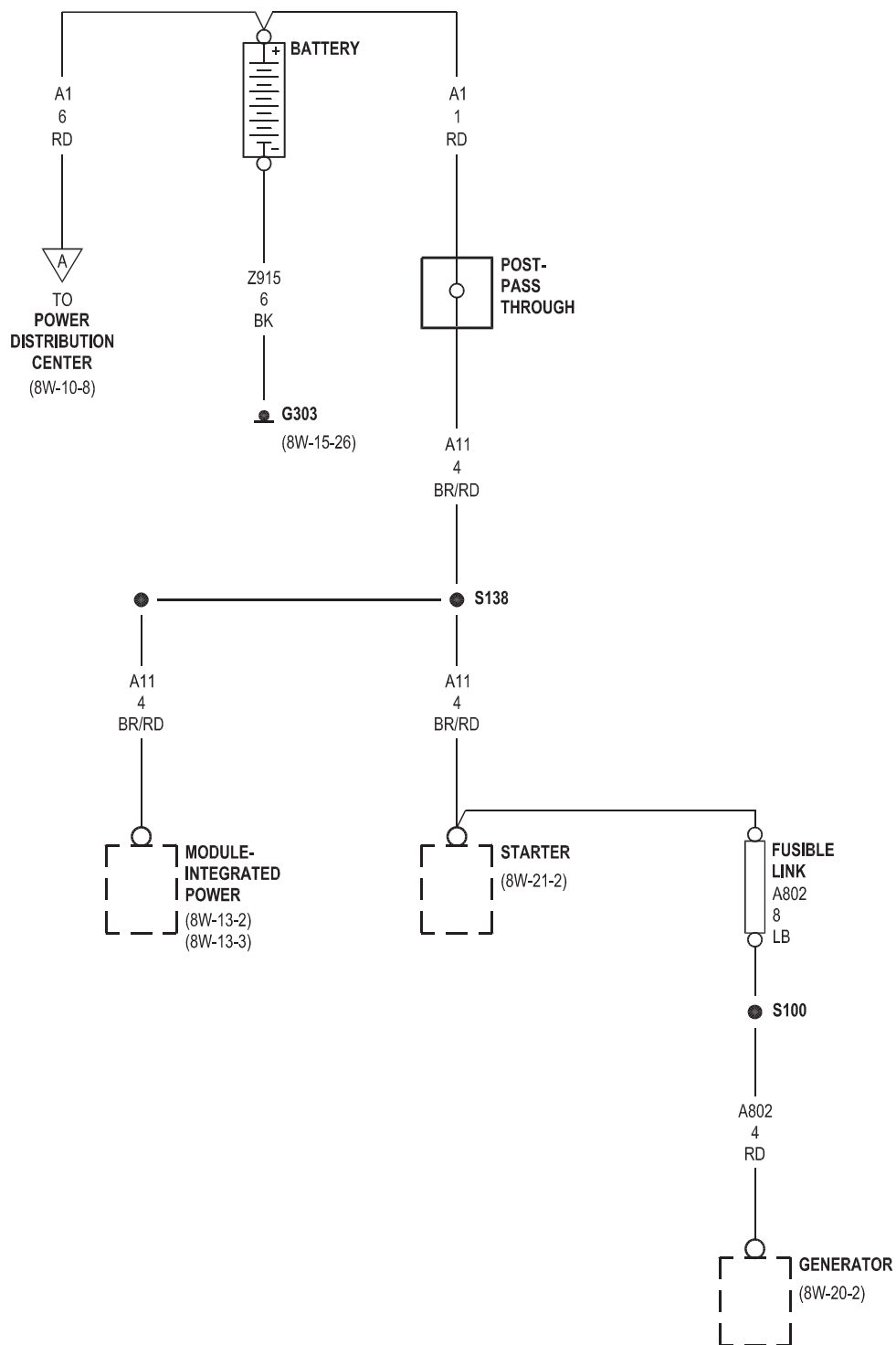
CAVITY	CIRCUIT	FUNCTION
30	B29 20DG/WT	BRAKE SWITCH SIGNAL
85	A103 20PK/DB 	FUSED B(+)
86	B121 20DG/DB 	STOP LAMP INHIBIT RELAY CONTROL
87	-	-
87A	L53 20DG/WT	STOP LAMP INHIBIT RELAY OUTPUT

RELAYS  
(PDC)  
(CONTINUED)RELAY-  
TRANSMISSION  
(NAG1)

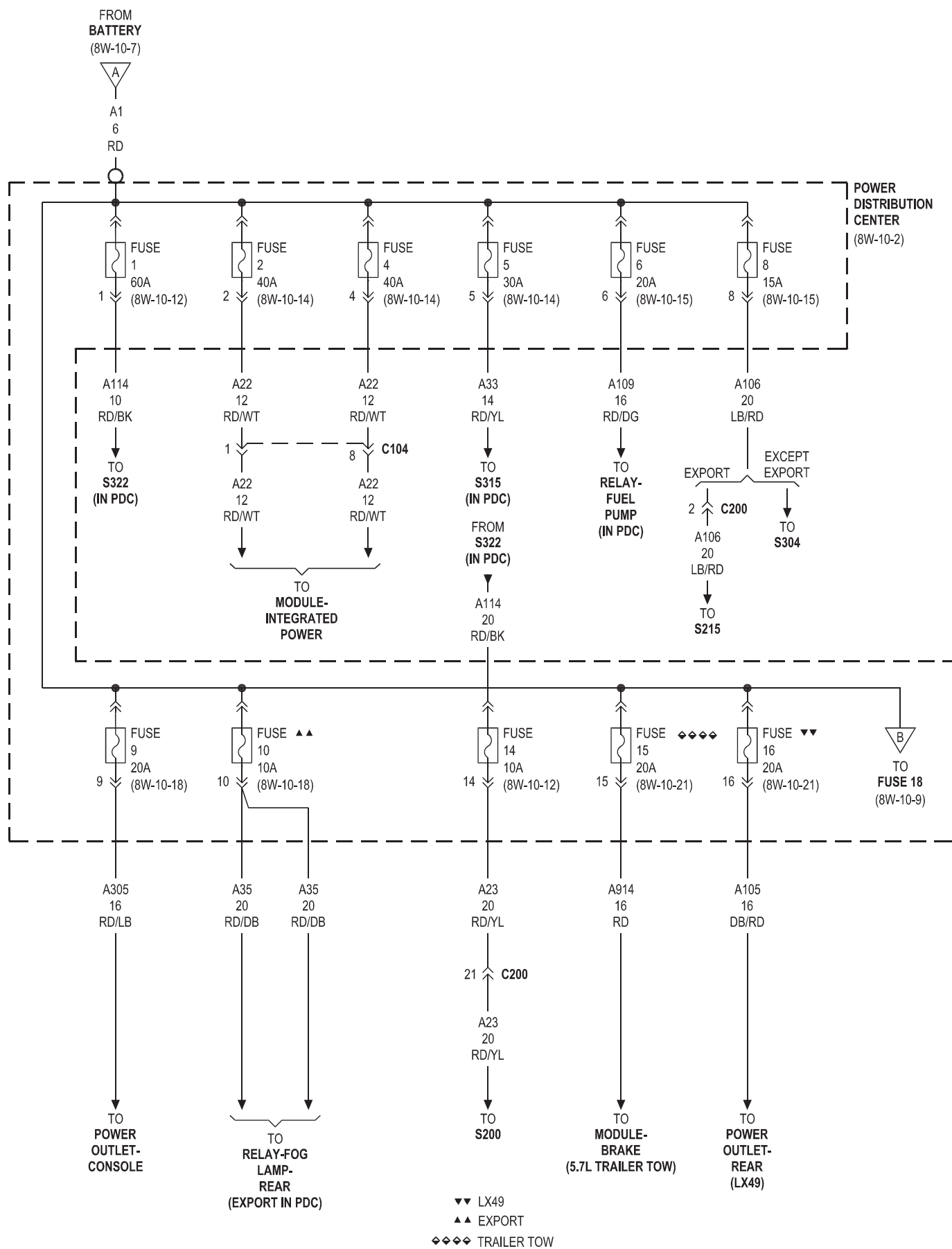
CAVITY	CIRCUIT	FUNCTION
30	A1 6RD	B(+)
85	F941 20PK/BR	IGNITION SWITCH OUTPUT (RUN-START)
86	Z914 20BK/GY	GROUND
87	F2 18PK/YL	TRANSMISSION RELAY OUTPUT
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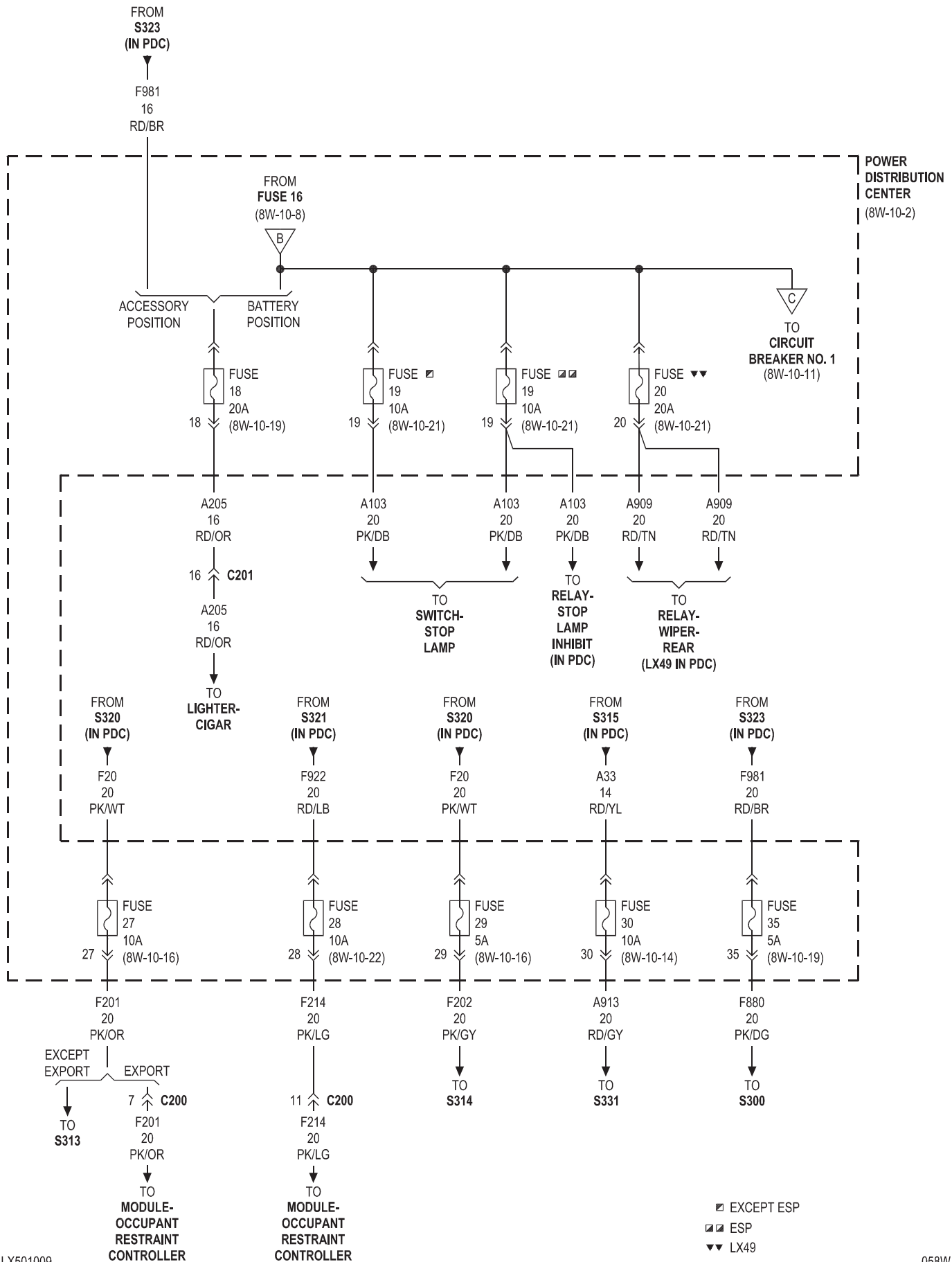
RELAY-  
WIPER-  
REAR  
(LX49)

CAVITY	CIRCUIT	FUNCTION
30	W13 16BR/LG	REAR WIPER MOTOR CONTROL
85	W12 20BR/OR	REAR WIPER RELAY CONTROL
86	A909 20RD/TN	FUSED B(+)
87	A909 16RD/TN	FUSED B(+)
87A	Z914 20BK/GY	GROUND

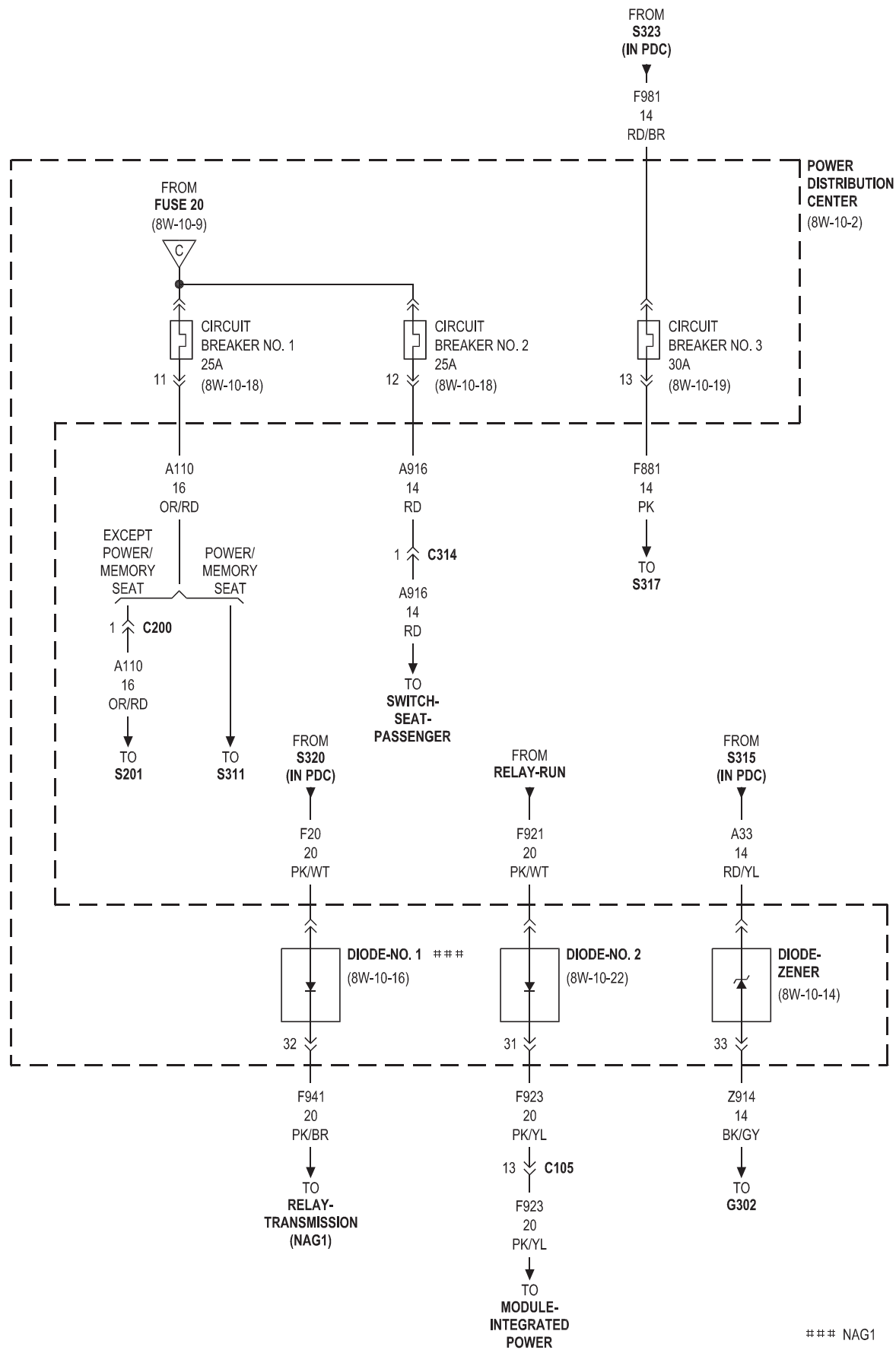




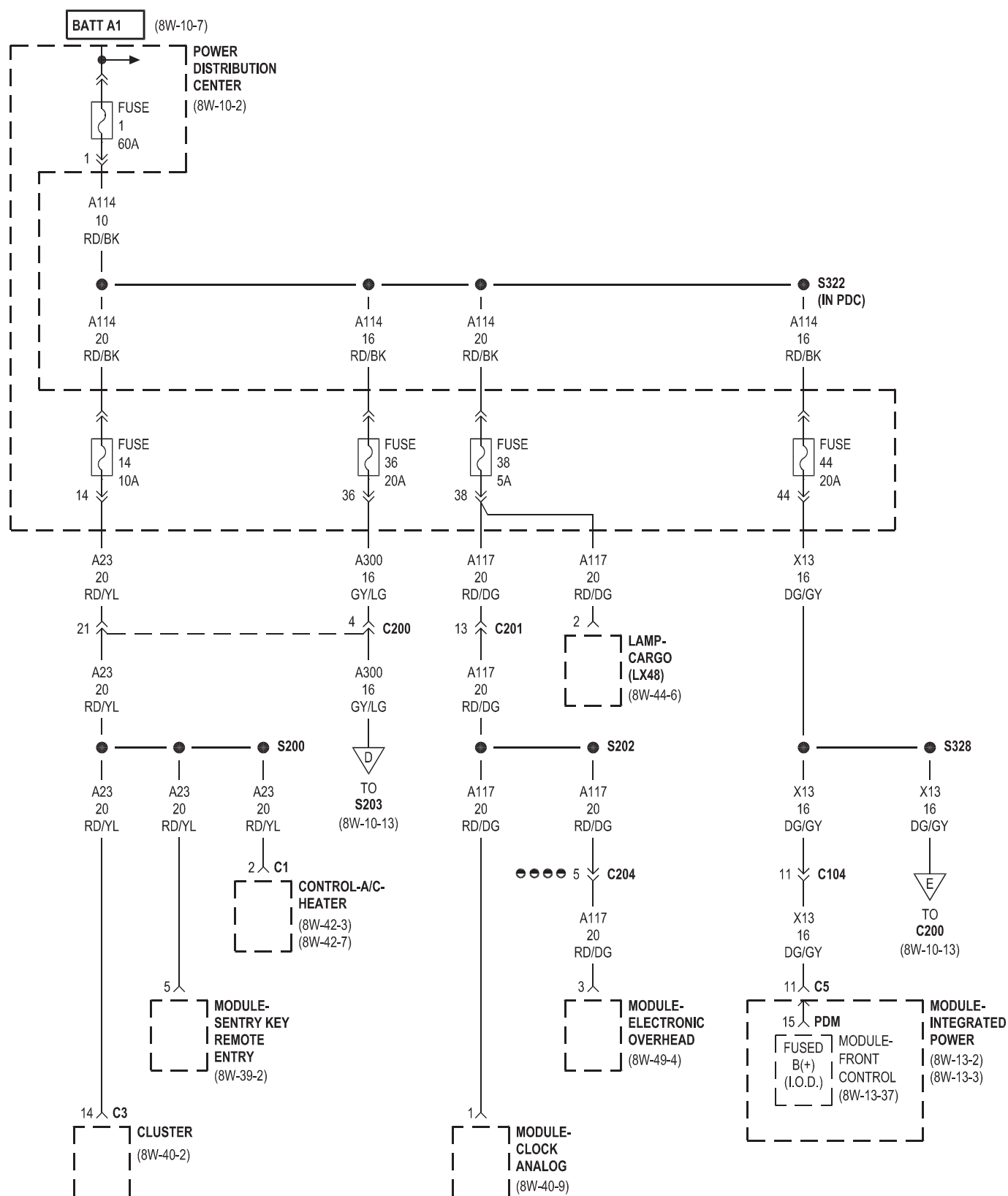


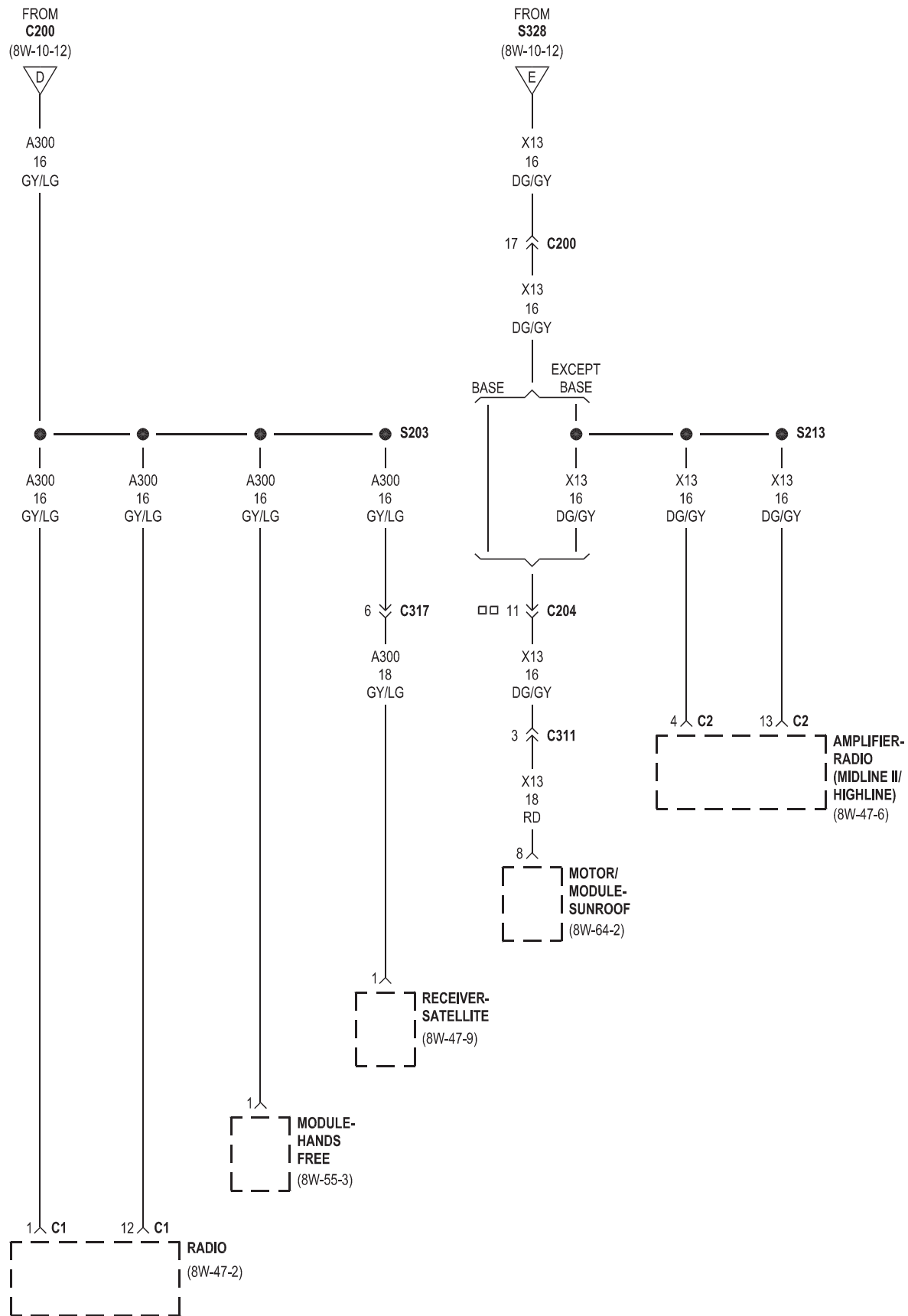




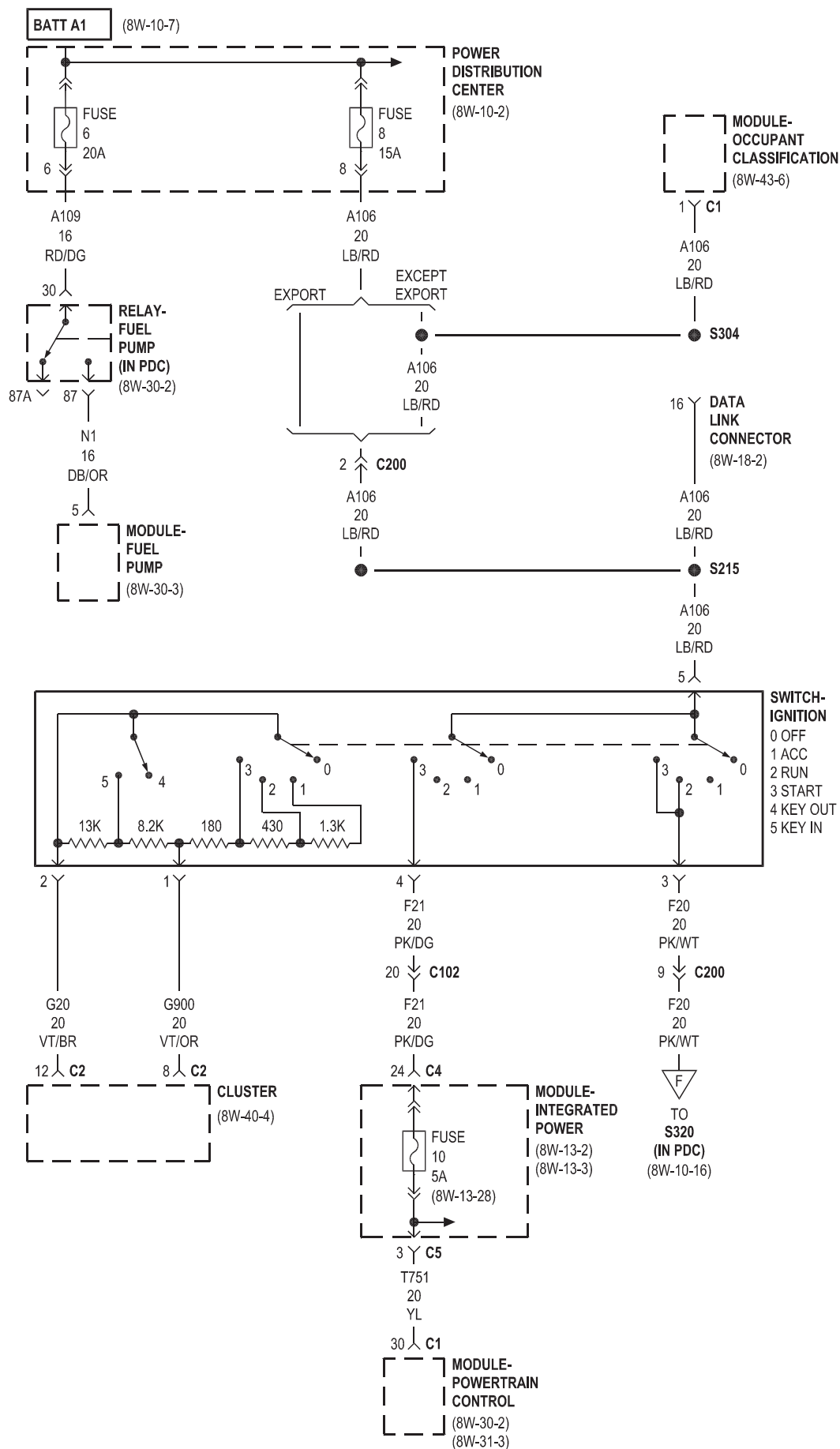


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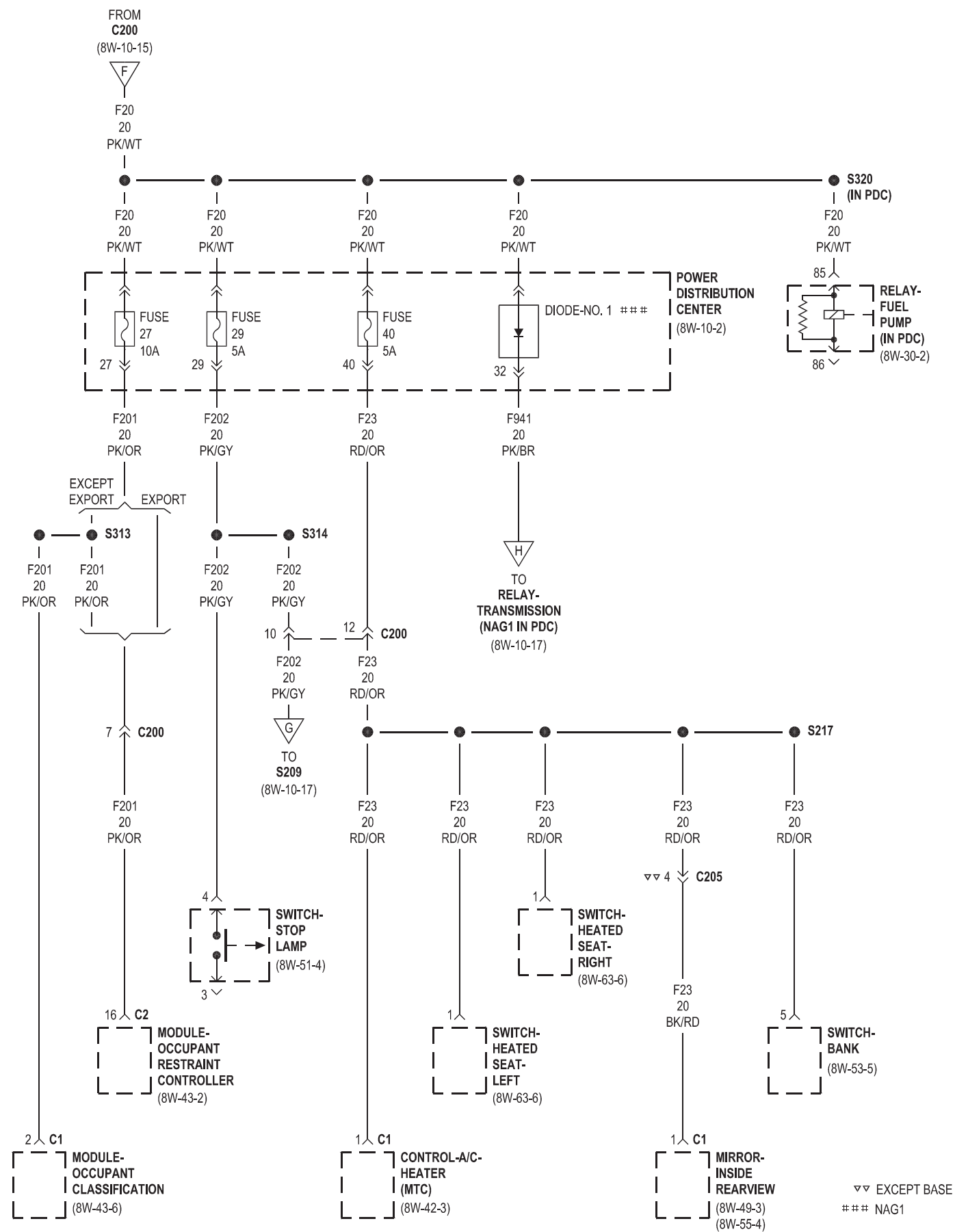


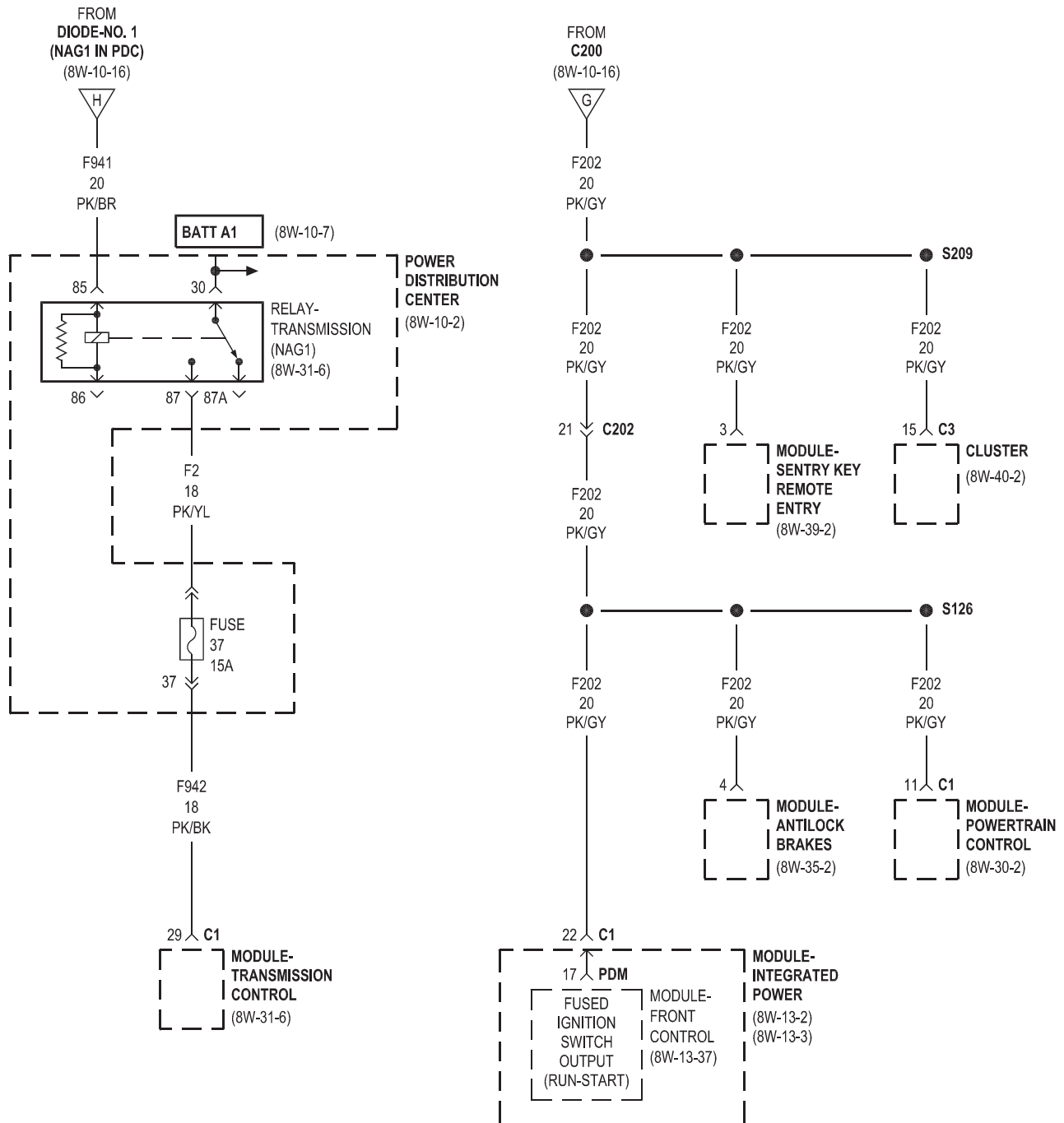


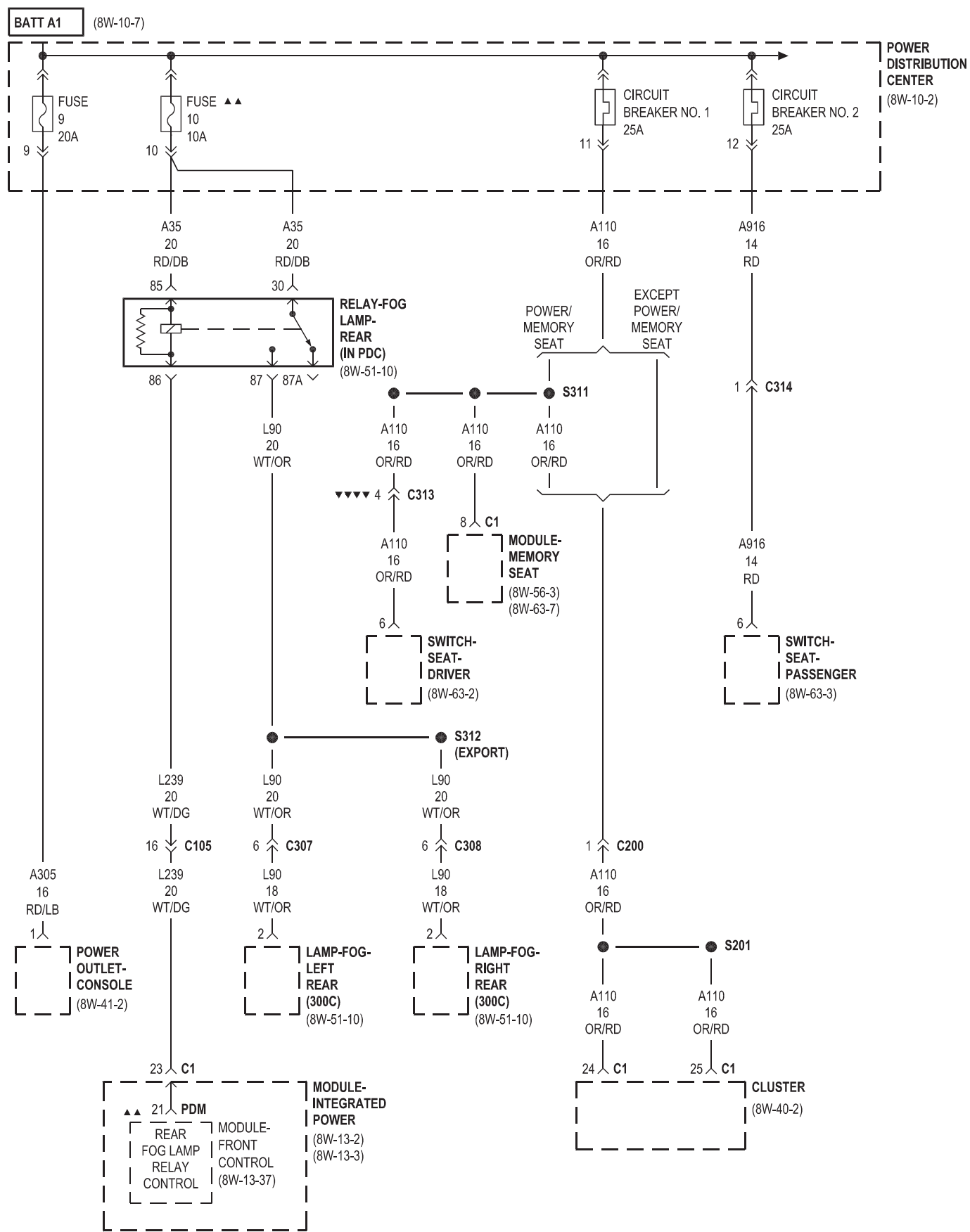




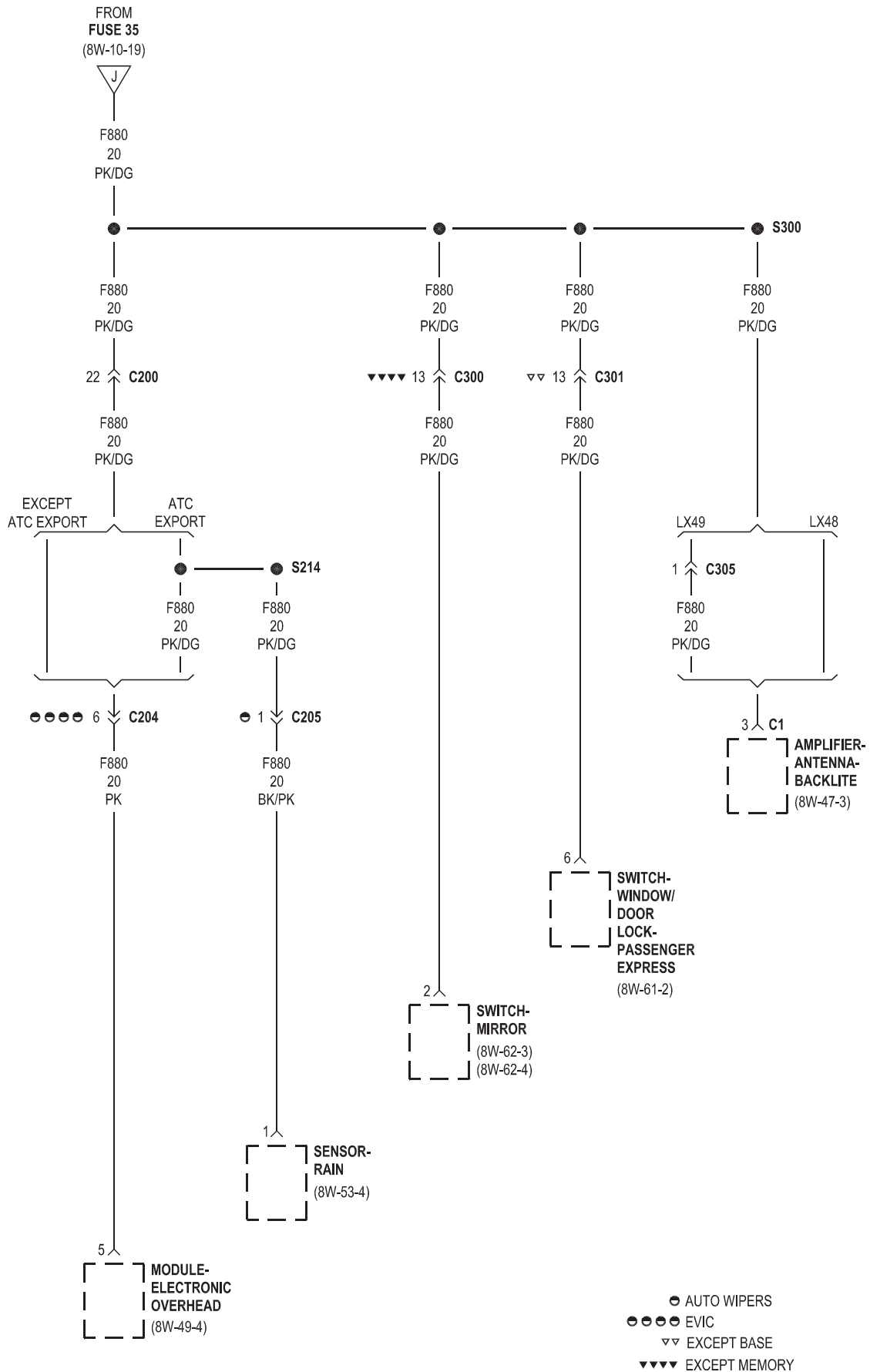


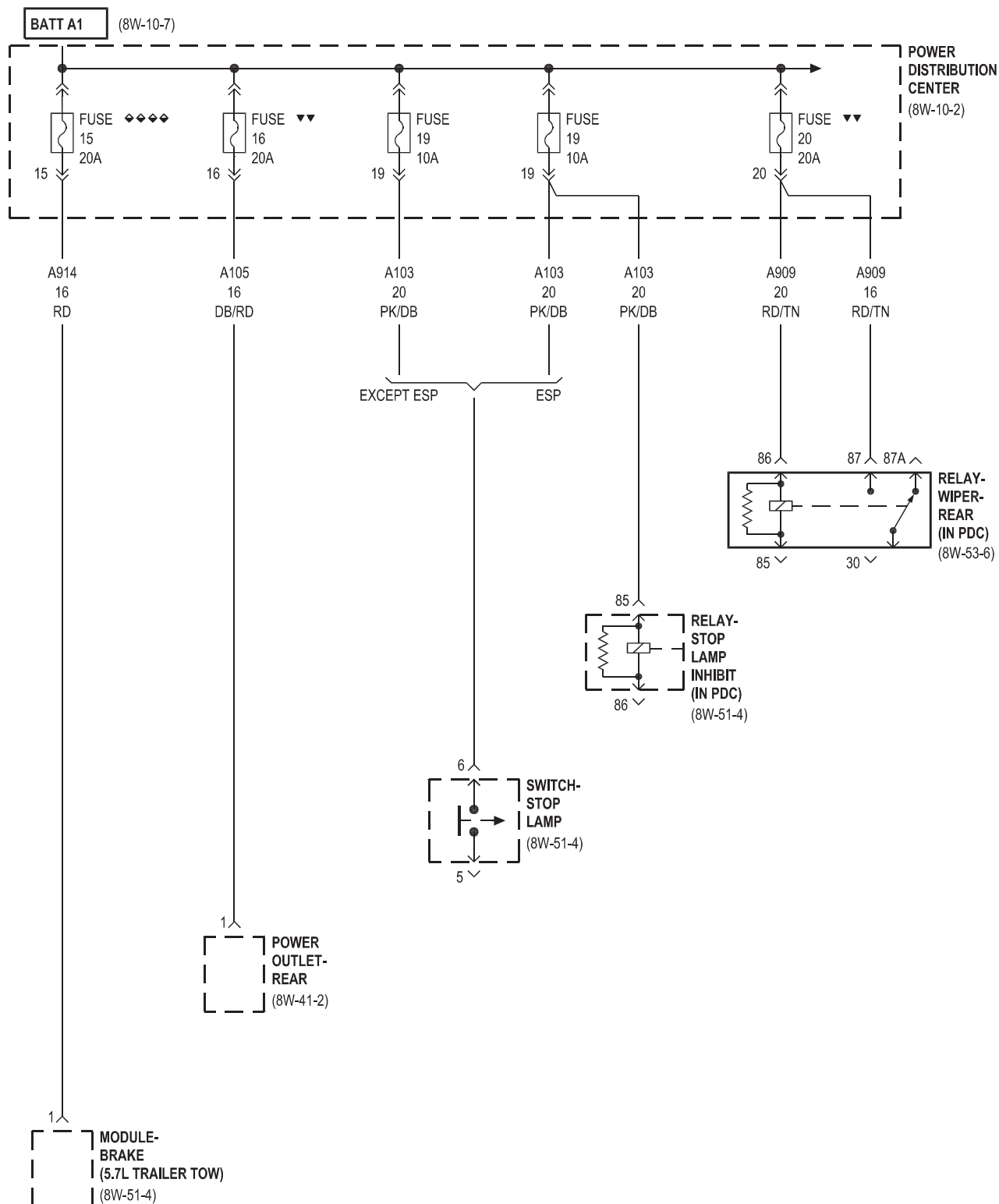


















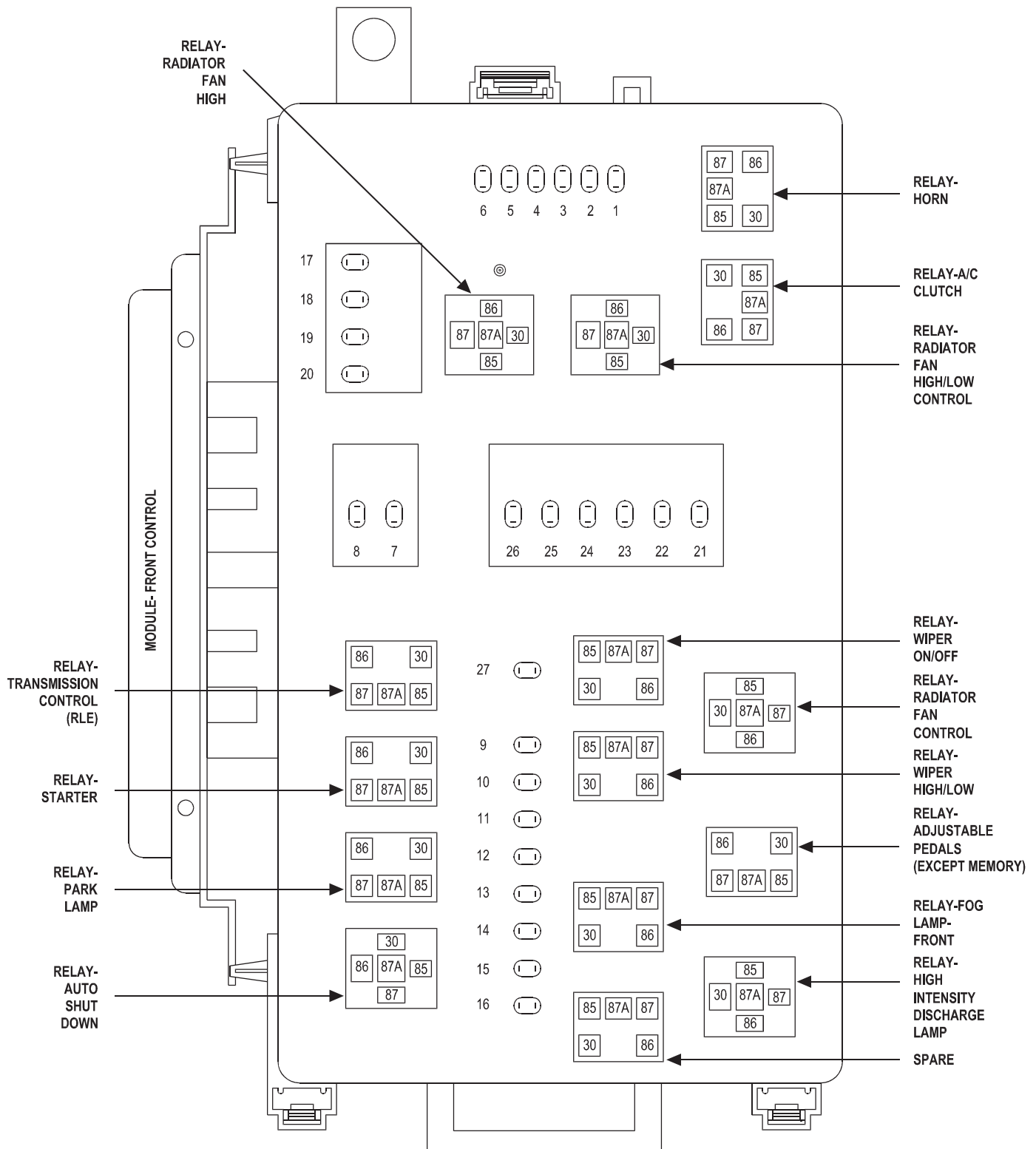


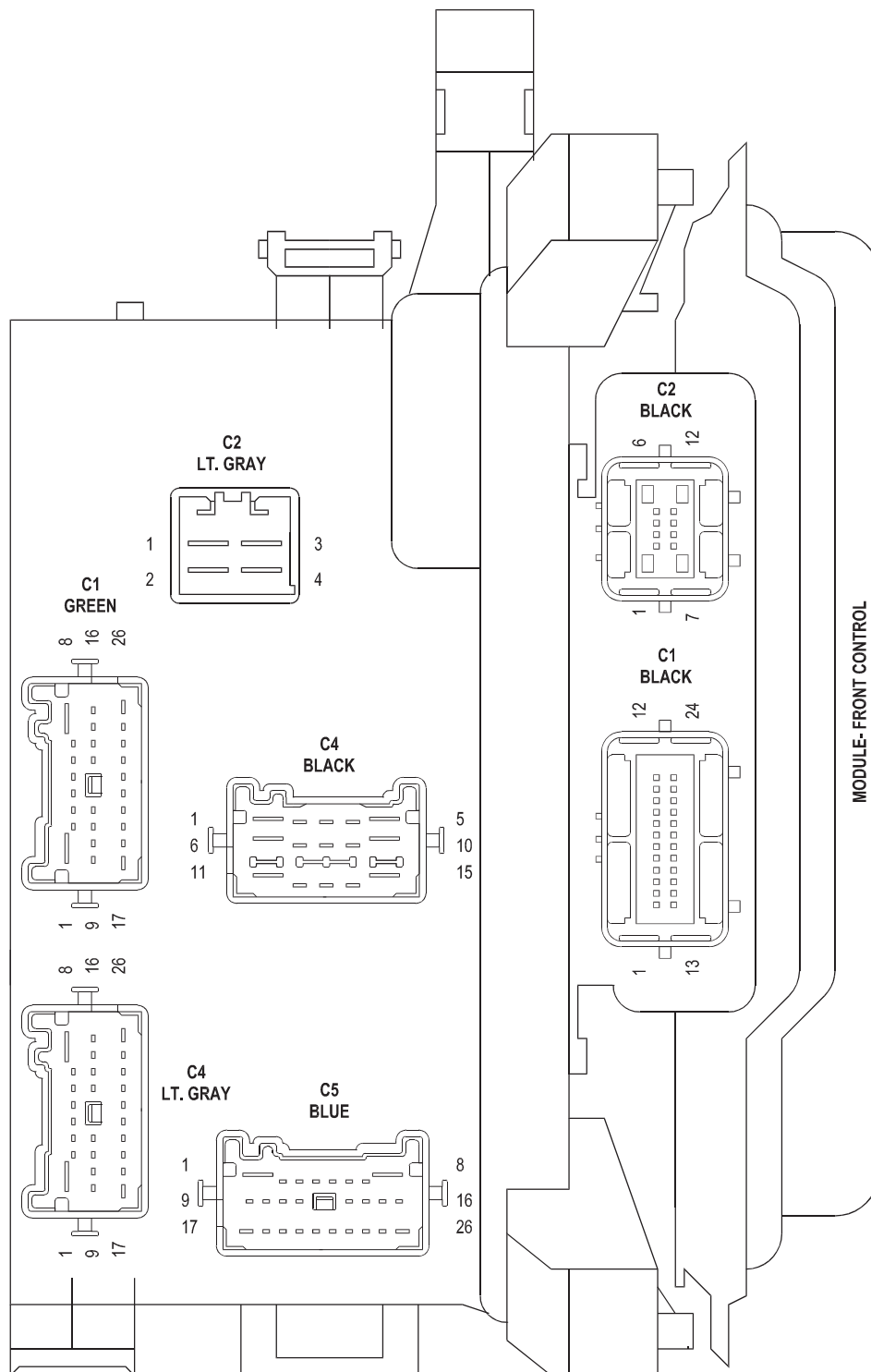
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MODULE-INTEGRATED POWER  
(FRONT VIEW)



MODULE-INTEGRATED POWER  
(REAR VIEW)

**FUSES  
(IPM)**

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	20A	L303 18WT/OR ▼▼▼	LEFT HID LAMP DRIVER
2	20A	L304 18OR/WT ▼▼▼	RIGHT HID LAMP DRIVER
3	15A	INTERNAL	FUSED B(+)
4	20A	INTERNAL	FUSED B(+)
5	25A	A904 16RD	FUSED B(+)
6	15A	A903	FUSED B(+)
7	20A	INTERNAL ○○○	FUSED B(+)
8	15A	INTERNAL	FUSED B(+)
9	15A	A906	FUSED B(+)
10	5A	T751 20YL	FUSED IGNITION SWITCH OUTPUT (START)
11	15A	INTERNAL	FUSED B(+)
12	-	-	-
13	-	-	-
14	20A	K342 18BR/WT	FUSED AUTO SHUT DOWN RELAY OUTPUT 1
15	20A	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
16	20A	K344 18BR/GY	FUSED AUTO SHUT DOWN RELAY OUTPUT 3
17	30A	A111 14DG/RD ◇◇◇	FUSED B(+)
18	30A	INTERNAL	FUSED B(+)
19	50A	INTERNAL	FUSED B(+)
20	20A	INTERNAL	FUSED B(+)
21	50A	A107 10TN/RD ◇◇◇	FUSED B(+)
22	40A	INTERNAL	FUSED B(+)
23	50A	INTERNAL ▼▼▼	FUSED B(+)
24	-	-	-
25	30A	A901	FUSED B(+)
26	20A	INTERNAL ##	FUSED B(+)
27	30A	A902	FUSED B(+)

## RLE

○○○ FOG LAMPS

▼▼▼ HID LAMPS

◇◇◇ ABS

RELAYS  
(IPM)

RELAY-A/C  
CLUTCH

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	C13 20LB/OR	A/C CLUTCH RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	C3 18DB/YL	A/C CLUTCH RELAY OUTPUT
87A	-	-

RELAY-  
ADJUSTABLE  
PEDALS  
(EXCEPT MEMORY)

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	P201	ADJUSTABLE PEDALS RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	-	-
87A	A72 20RD/OR	ADJUSTABLE PEDALS RELAY OUTPUT

RELAY-  
AUTO  
SHUT  
DOWN

CAVITY	CIRCUIT	FUNCTION
30	A22 12RD/WT	FUSED B(+)
85	K51 20BR/WT	AUTO SHUT DOWN RELAY CONTROL
86	A209 18RD	FUSED B(+)
87	K542	AUTO SHUT DOWN RELAY OUTPUT
87A	-	-

RELAY-FOG  
LAMP-  
FRONT

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	L139	FRONT FOG LAMP RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	L89 18 WT/YL	FRONT FOG LAMP RELAY OUTPUT
87A	-	-

RELAYS  
(IPM)  
(CONTINUED)

RELAY-  
HIGH  
INTENSITY  
DISCHARGE  
LAMP

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	L44 18WT/TN	RIGHT LOW BEAM DRIVER
86	Z904 20BK/BR	GROUND
87	INTERNAL	HIGH INTENSITY DISCHARGE LAMP RELAY OUTPUT
87A	-	-

RELAY-  
HORN

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	X4	HORN RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	X2 18DG/OR	HORN RELAY OUTPUT
87A	-	-

RELAY-  
PARK  
LAMP

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	L177	PARK LAMP RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	L777 20WT/V/T	PARK LAMP RELAY OUTPUT
87A	-	-

RELAY-  
RADIATOR  
FAN CONTROL

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	FUSED B(+)
86	N201	RADIATOR FAN CONTROL RELAY CONTROL
87	N24 12DG/DB	RADIATOR FAN CONTROL RELAY OUTPUT
87A	-	-

RELAYS  
(IPM)  
(CONTINUED)

RELAY-  
RADIATOR FAN HIGH

CAVITY	CIRCUIT	FUNCTION
30	N23 10DB/DG	RADIATOR FAN HIGH RELAY OUTPUT
85	N112	RADIATOR FAN HIGH RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	INTERNAL	FUSED B(+)
87A	INTERNAL	RADIATOR FAN HIGH/LOW CONTROL OUTPUT

RELAY-  
RADIATOR FAN  
HIGH/LOW  
CONTROL

CAVITY	CIRCUIT	FUNCTION
30	N210 12DB/DG	RADIATOR FAN HIGH/LOW CONTROL FEED
85	INTERNAL	FUSED B(+)
86	N112	RADIATOR FAN HIGH RELAY CONTROL
87	Z901	GROUND
87A	INTERNAL	RADIATOR FAN HIGH/LOW CONTROL OUTPUT

RELAY-  
STARTER

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	T751 20YL	FUSED IGNITION SWITCH OUTPUT (START)
86	T752 20DG/OR	STARTER RELAY CONTROL
87	T750 16YL/GY	STARTER RELAY OUTPUT
87A	-	-

RELAY-  
TRANSMISSION  
CONTROL  
(RLE)

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	Z901	GROUND
86	T15 20YL/BR	TRANSMISSION CONTROL RELAY CONTROL
87	T16 16YL/OR	TRANSMISSION CONTROL RELAY OUTPUT
87A	-	-



RELAYS  
(IPM)  
(CONTINUED)

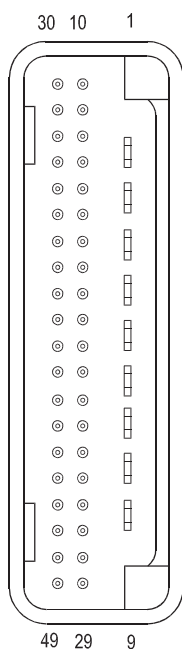
RELAY-  
WIPER  
HIGH/LOW

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	WIPER ON/OFF MUX SENSE
85	W2	WIPER HIGH/LOW RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	W4 14BR/OR	FRONT WIPER HIGH/LOW RELAY HIGH SPEED OUTPUT
87A	W3 14BR/WT	FRONT WIPER HIGH/LOW RELAY LOW SPEED OUTPUT

RELAY-  
WIPER  
ON/OFF

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	WIPER ON/OFF MUX SENSE
85	W5	WIPER ON/OFF RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	INTERNAL	FUSED B(+)
87A	Z901	GROUND

## MODULE- FRONT CONTROL PDM



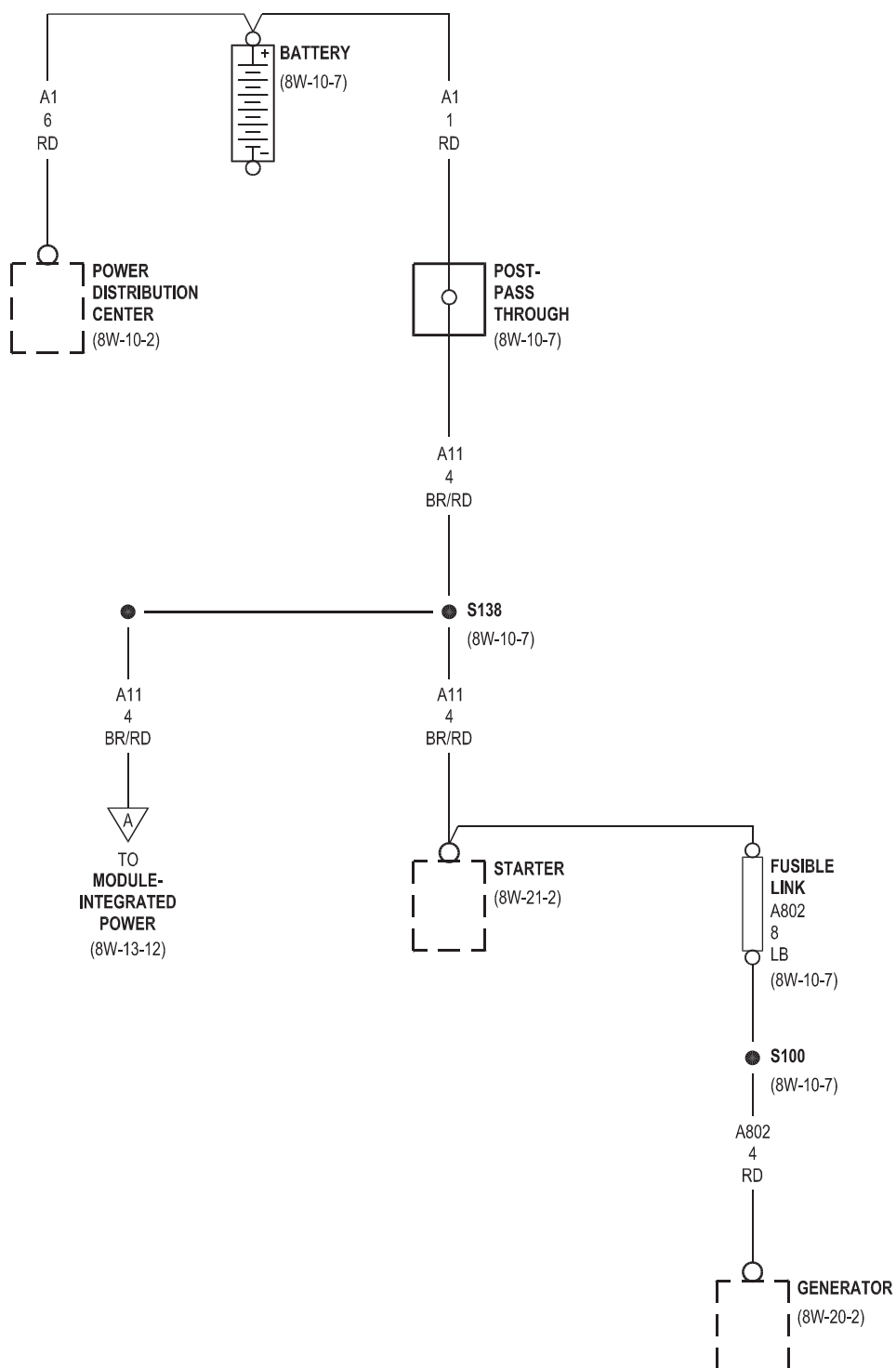
CAVITY	CIRCUIT	FUNCTION
1	-	-
2	A908	FUSED B(+)
3	A902	FUSED B(+)
4	A901	FUSED B(+)
5	A903	FUSED B(+)
6	-	-
7	L1	BACK-UP LAMP FEED
8	-	-
9	-	-
10	W24 ▼▼▼	HEADLAMP WASHER RELAY CONTROL
11	W20	REAR WASHER PUMP MOTOR CONTROL
12	W10	FRONT WASHER PUMP MOTOR CONTROL
13	F902	IGNITION UNLOCK-RUN-START
14	-	-
15	X13	FUSED B(+) (I.O.D.)
16	-	-
17	F202	FUSED IGNITION SWITCH OUTPUT (RUN-START)
18	Z901	GROUND
19	-	-
20	-	-
21	L239 ▲▲	REAR FOG LAMP RELAY CONTROL
22	F923	RUN RELAY CONTROL
23	-	-
24	-	-
25	Z901	GROUND
26	L139	FRONT FOG LAMP RELAY CONTROL

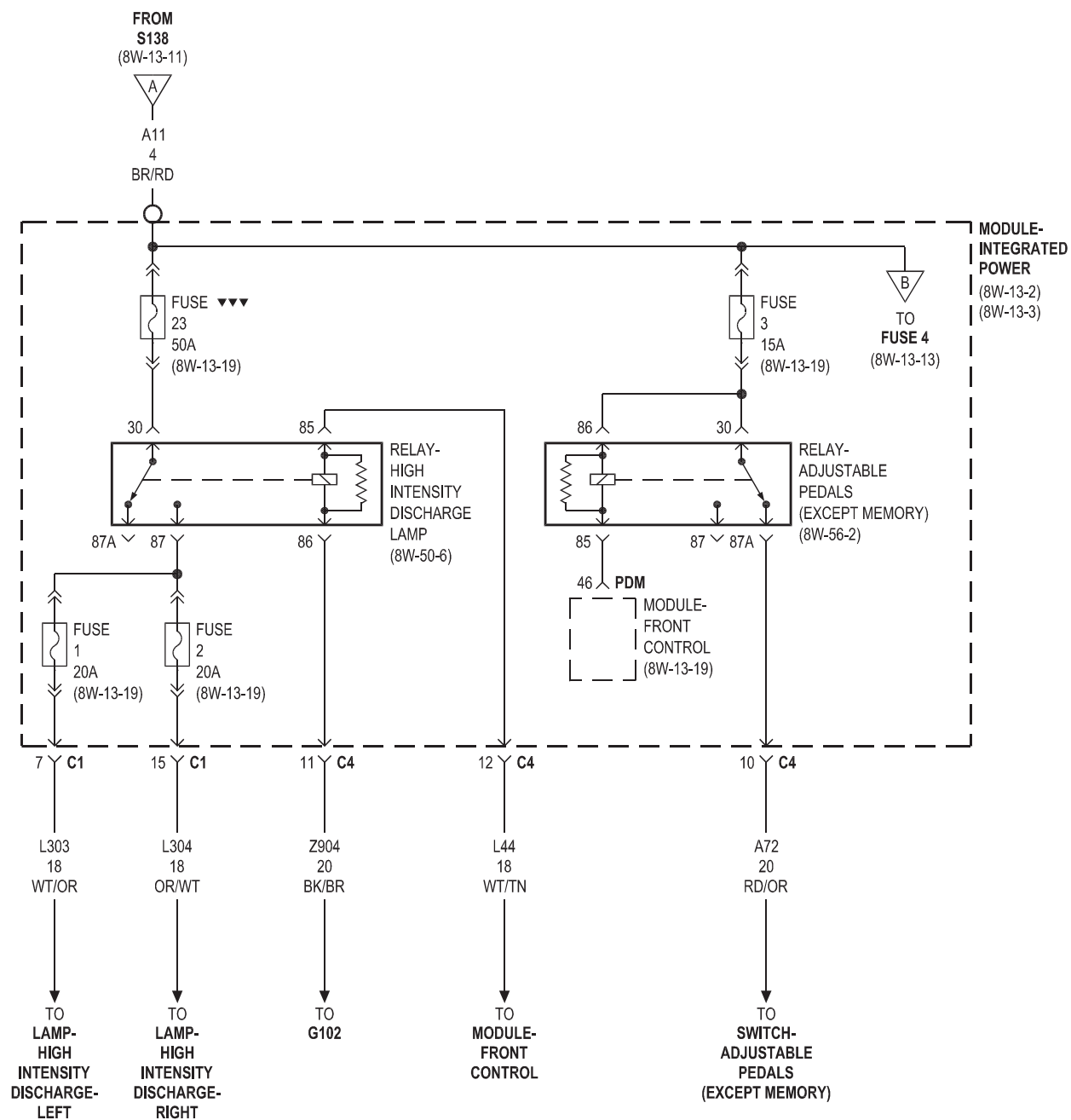
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MODULE- FRONT CONTROL PDM  
(CONTINUED)

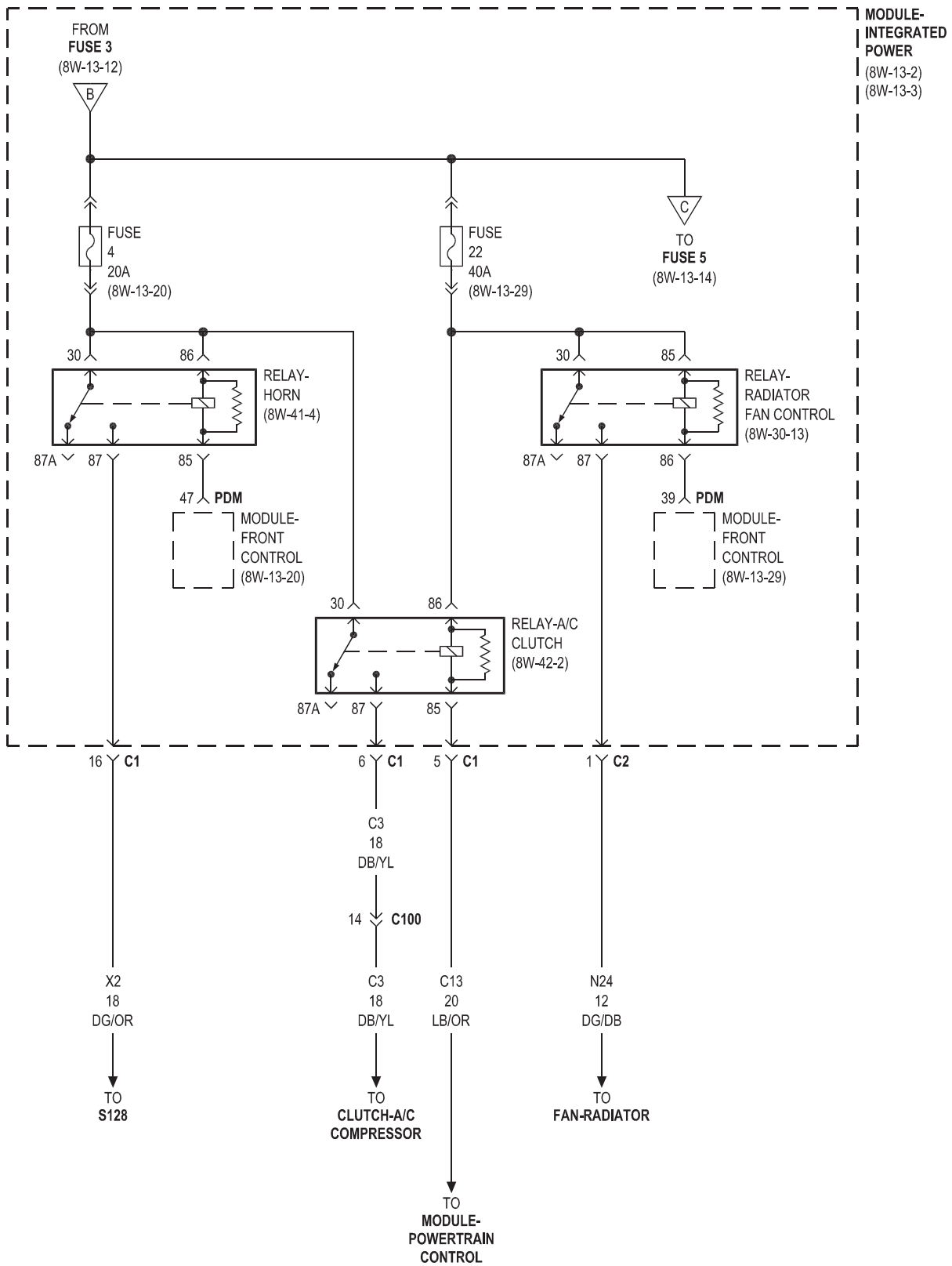
CAVITY	CIRCUIT	FUNCTION
27	W5	WIPER ON/OFF RELAY CONTROL
28	W12 ▼▼	REAR WIPER RELAY CONTROL
29	W2	WIPER HIGH/LOW RELAY CONTROL
30	K542	AUTO SHUT DOWN RELAY OUTPUT
31	W7	FRONT WIPER PARK SWITCH SENSE
32	-	-
33	Z901	GROUND
34	L62	RIGHT REAR TURN SIGNAL CONTROL
35	C918	A/C PRESSURE SENSOR GROUND
36	-	-
37	-	-
38	P307	ACCESSORY DELAY RELAY CONTROL
39	N201	RADIATOR FAN CONTROL RELAY CONTROL
40	-	-
41	Z901	GROUND
42	-	-
43	L63	LEFT REAR TURN SIGNAL CONTROL
44	-	-
45	N112	RADIATOR FAN HIGH RELAY CONTROL
46	P201 ▼▼▼▼	ADJUSTABLE PEDALS RELAY CONTROL
47	X4	HORN RELAY CONTROL
48	L177	PARK LAMP RELAY CONTROL
49	-	-

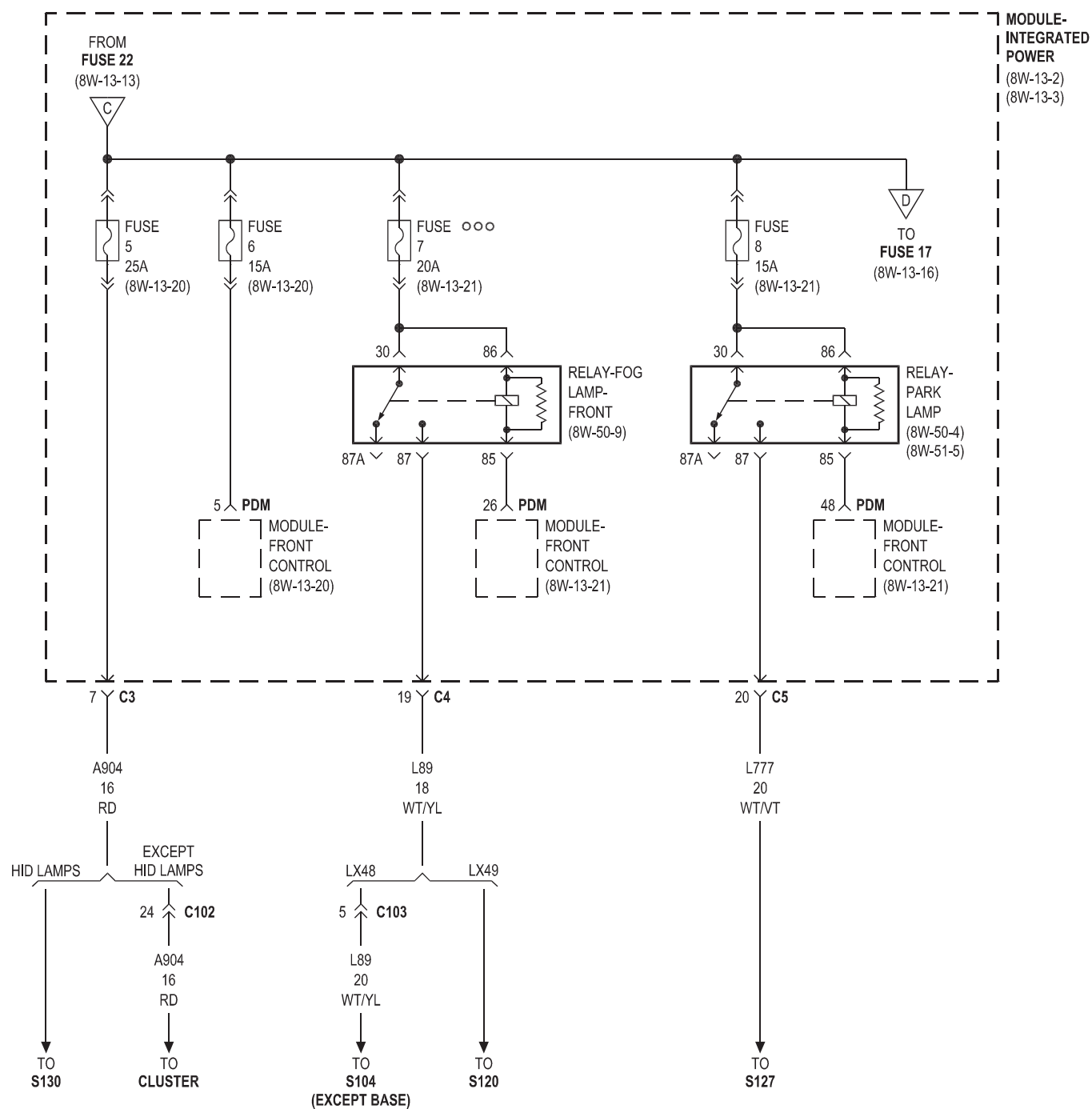
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▼▼▼▼ EXCEPT MEMORY

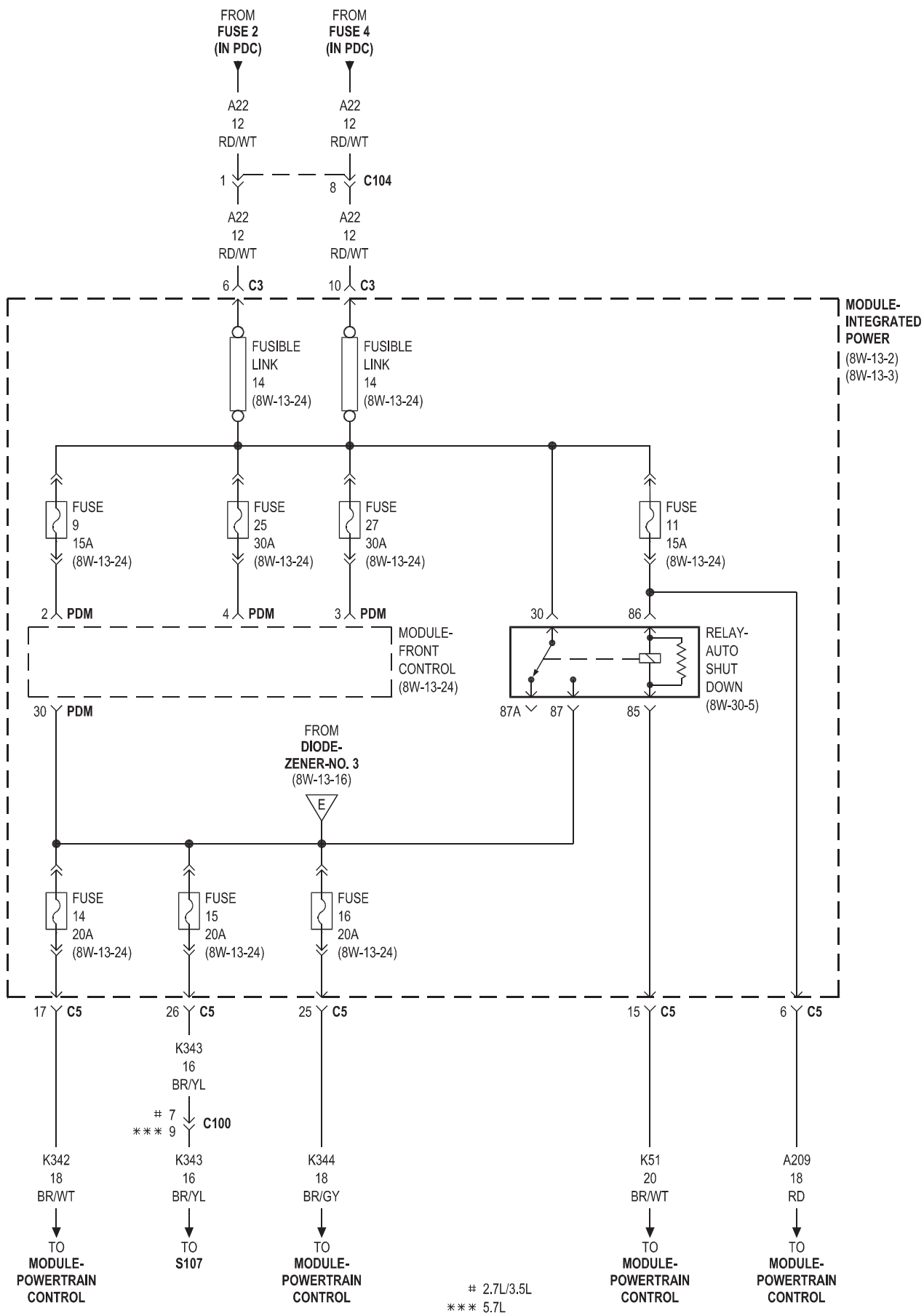




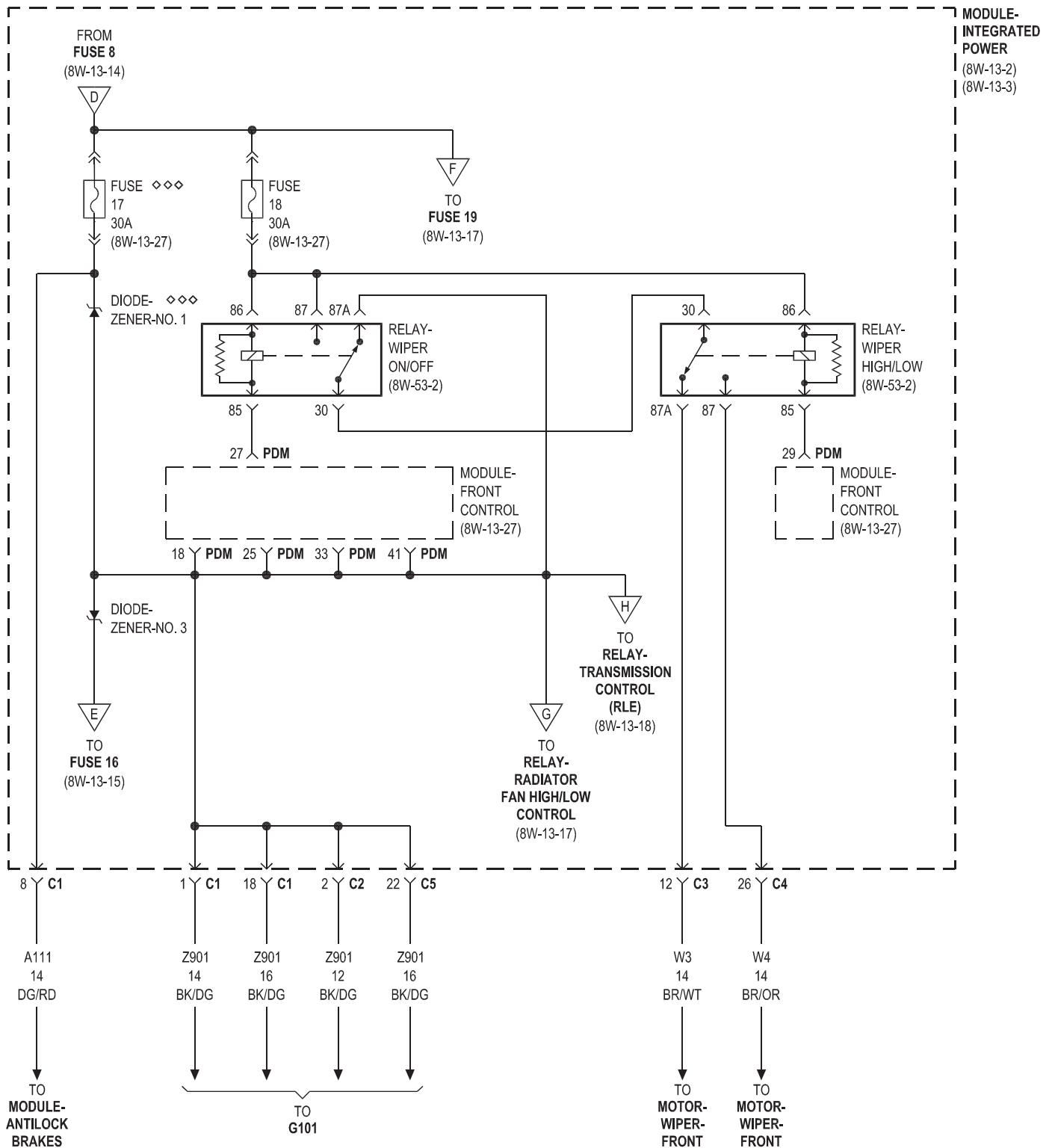
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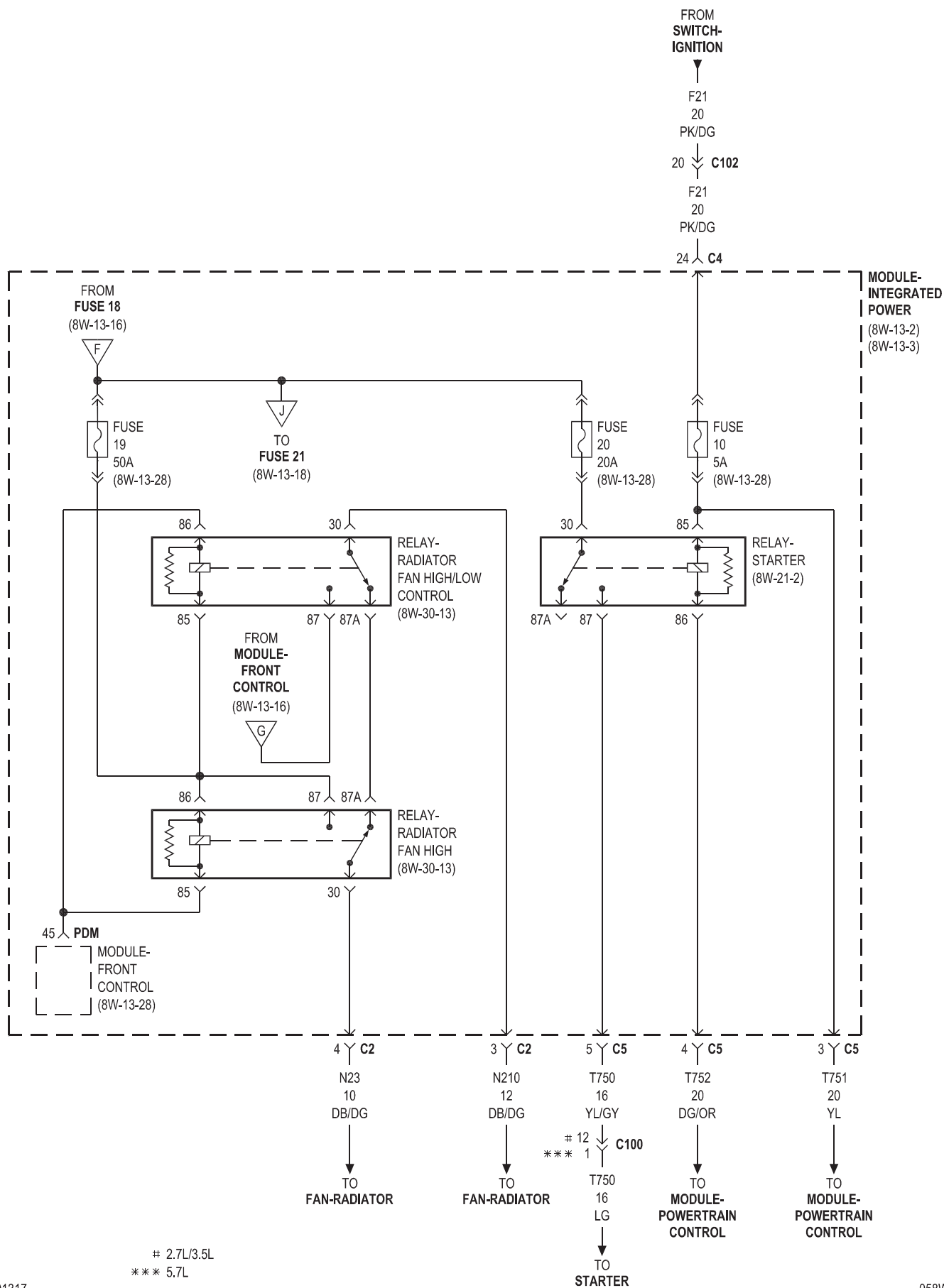


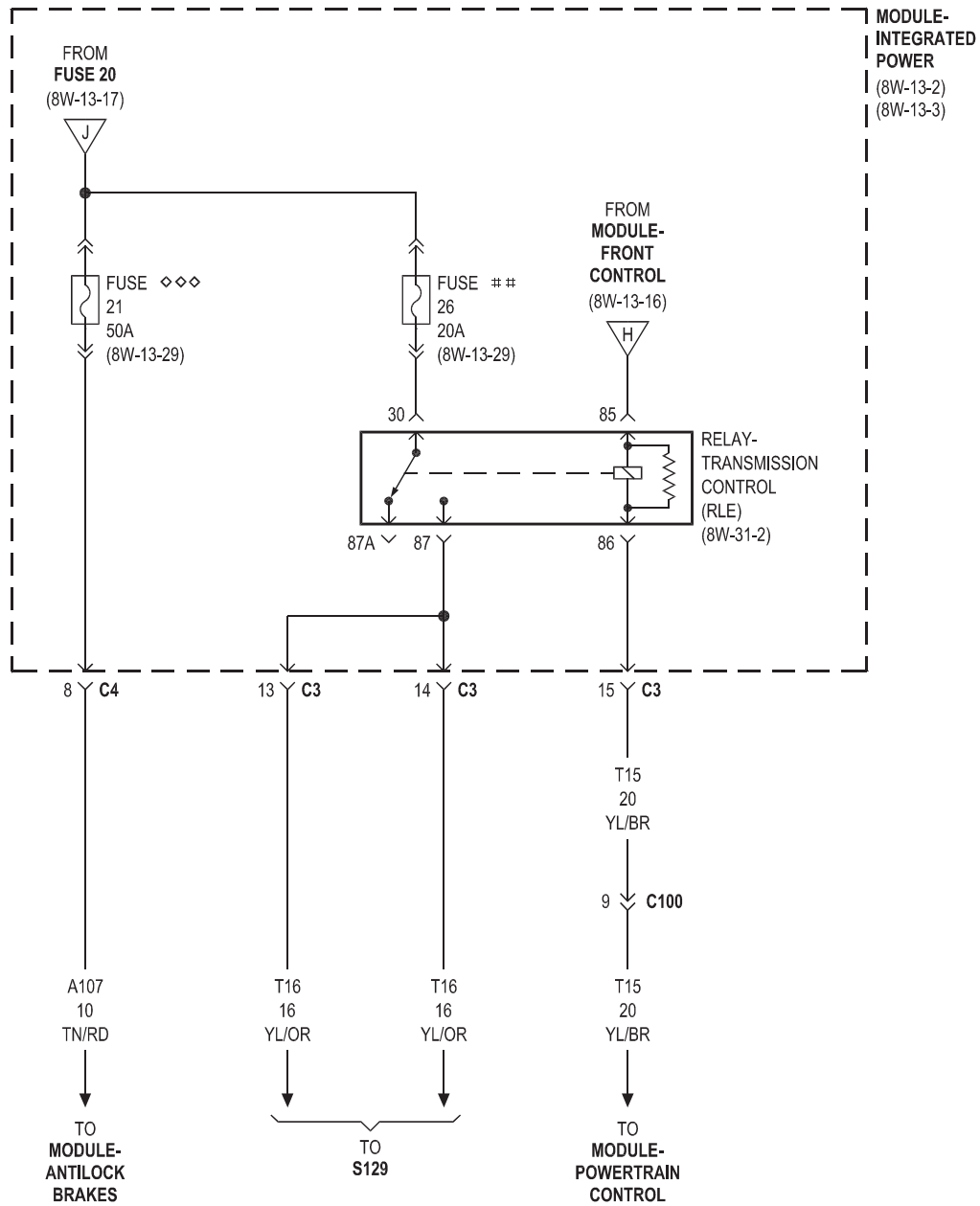


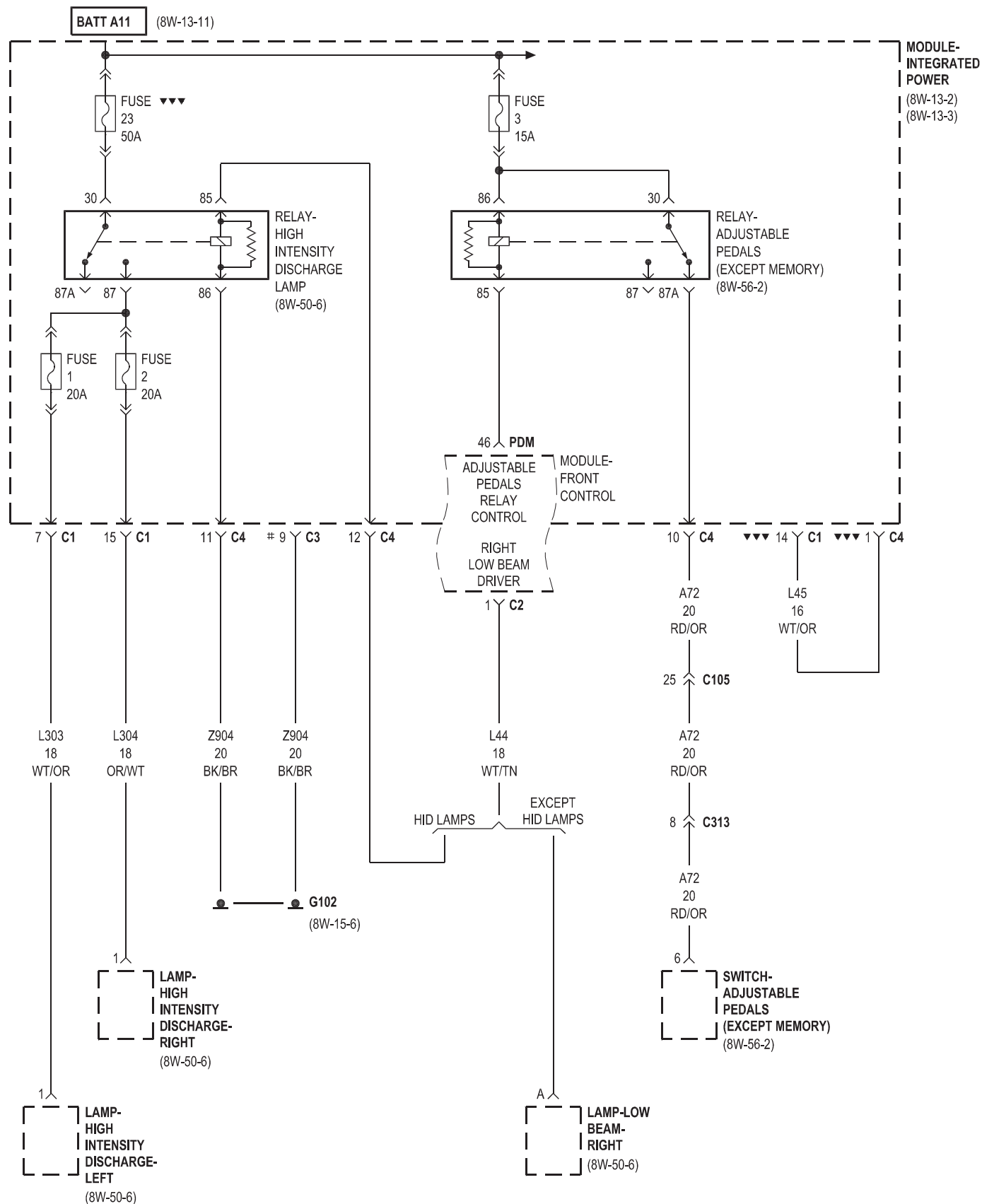




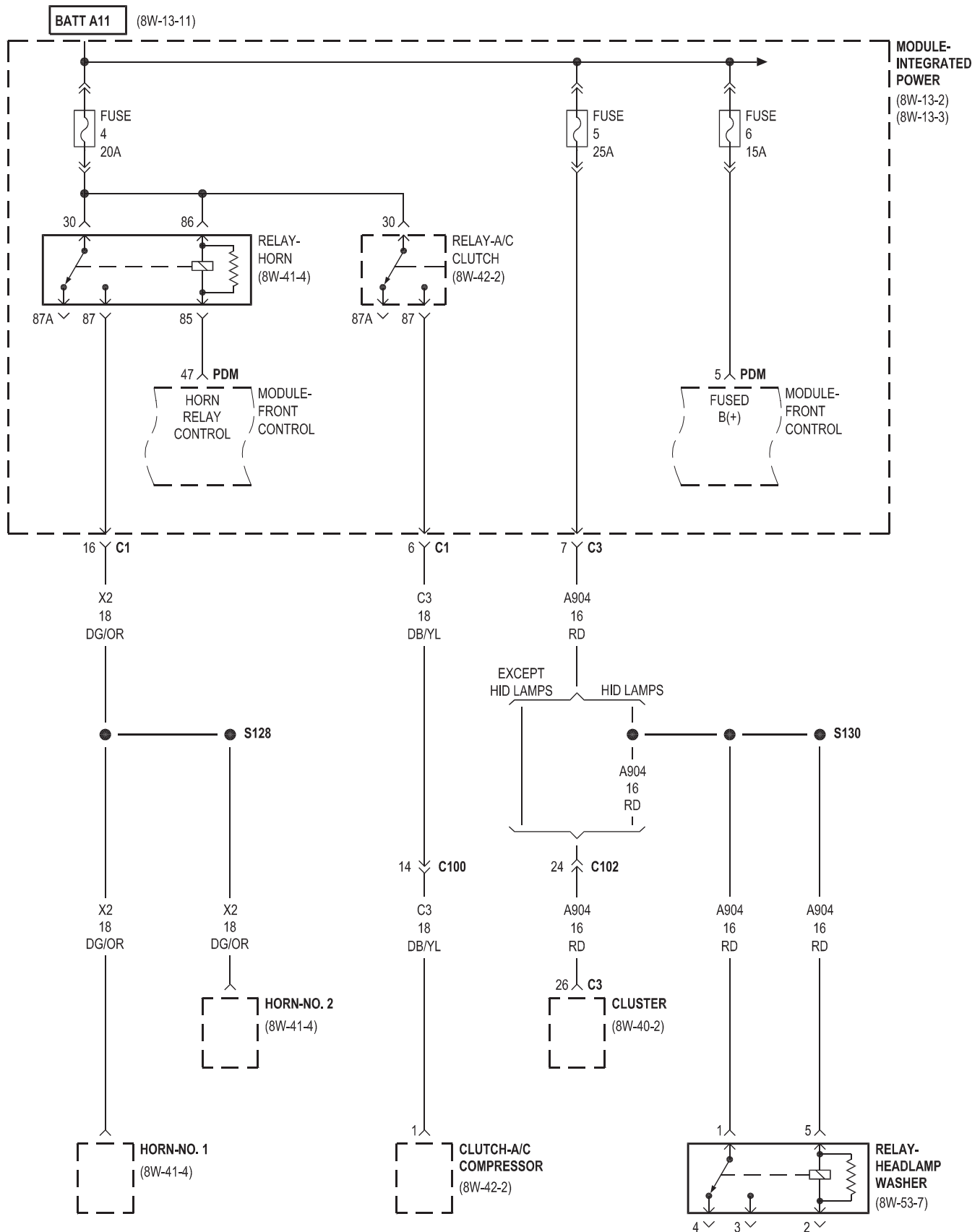


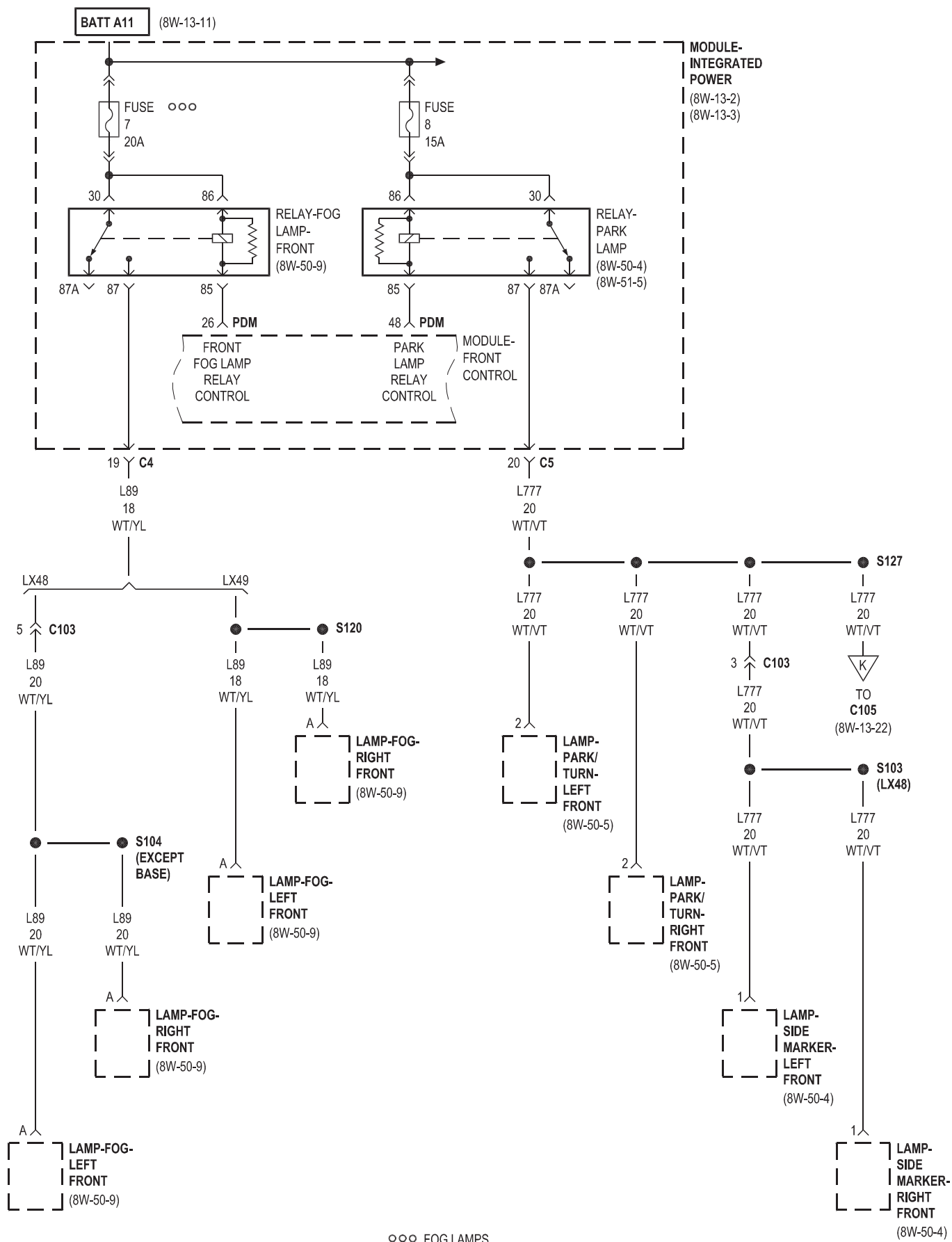


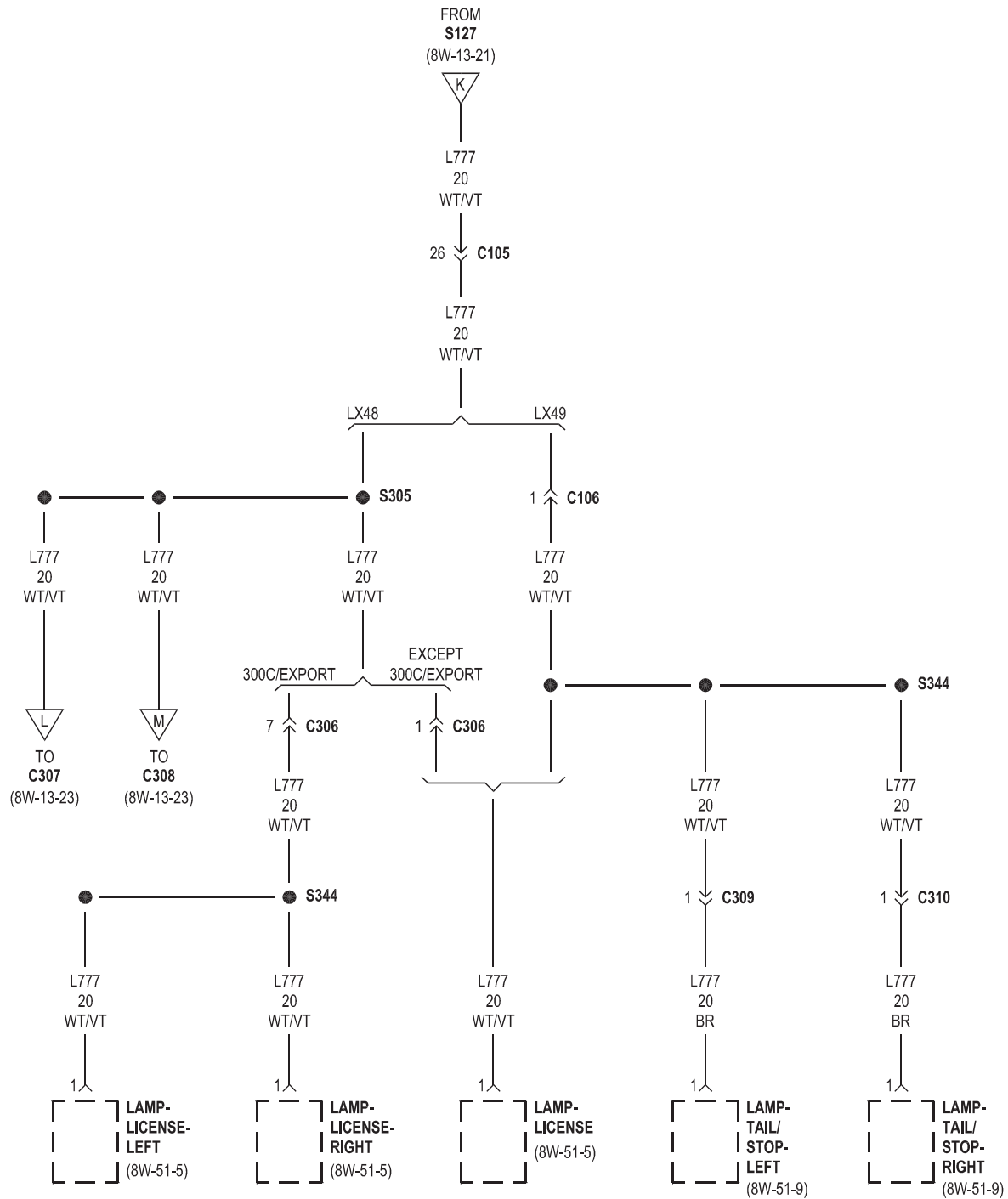


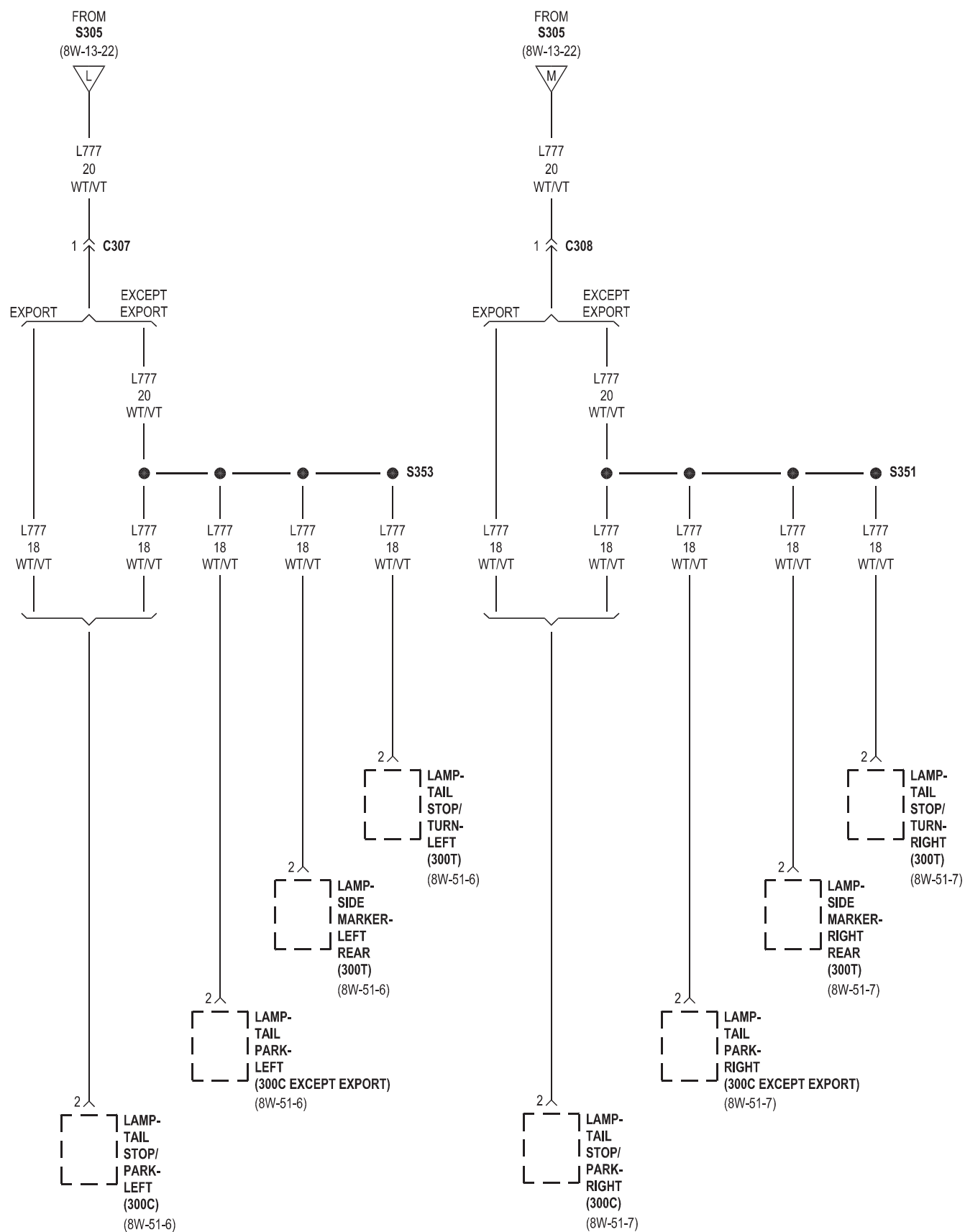


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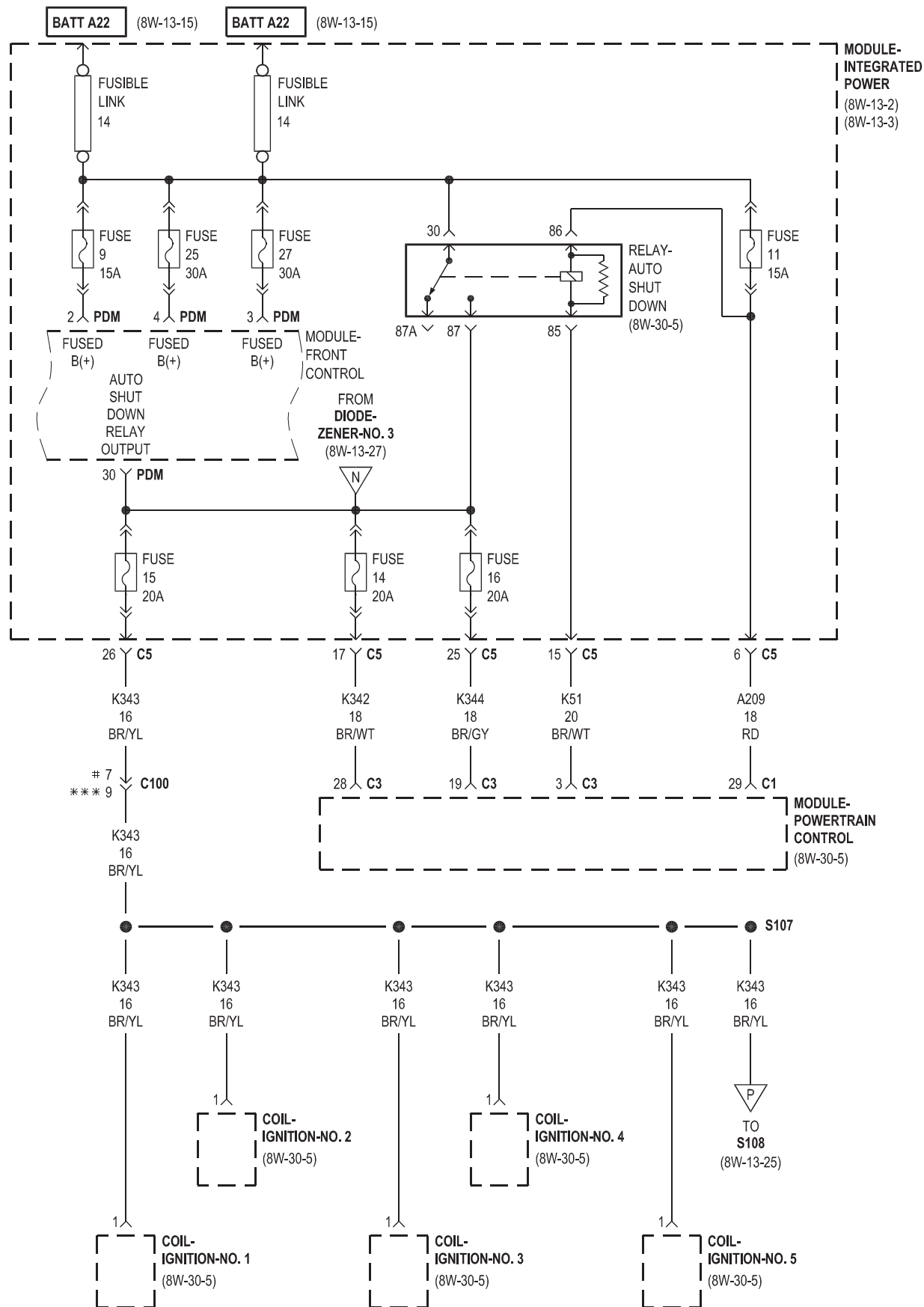






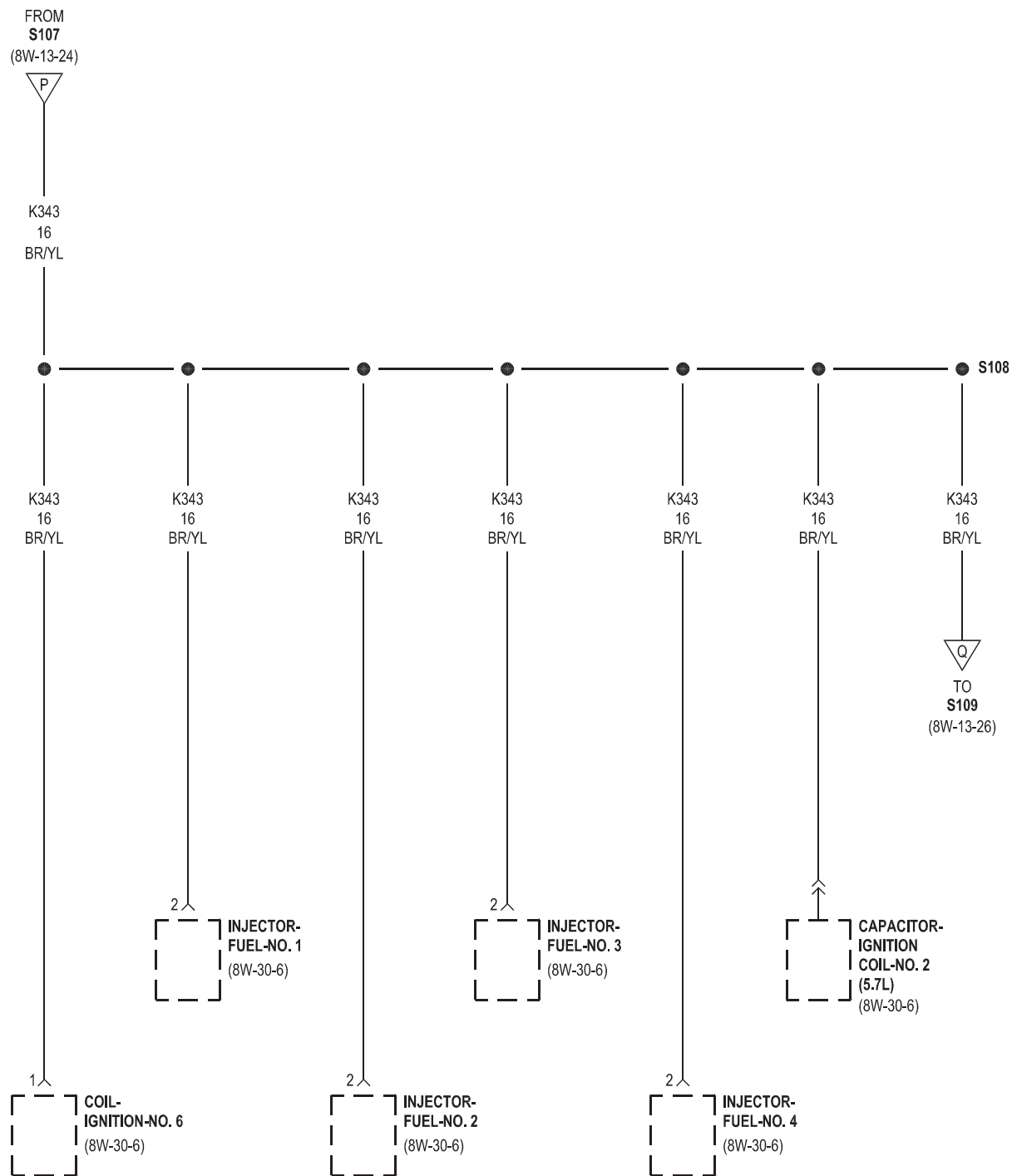




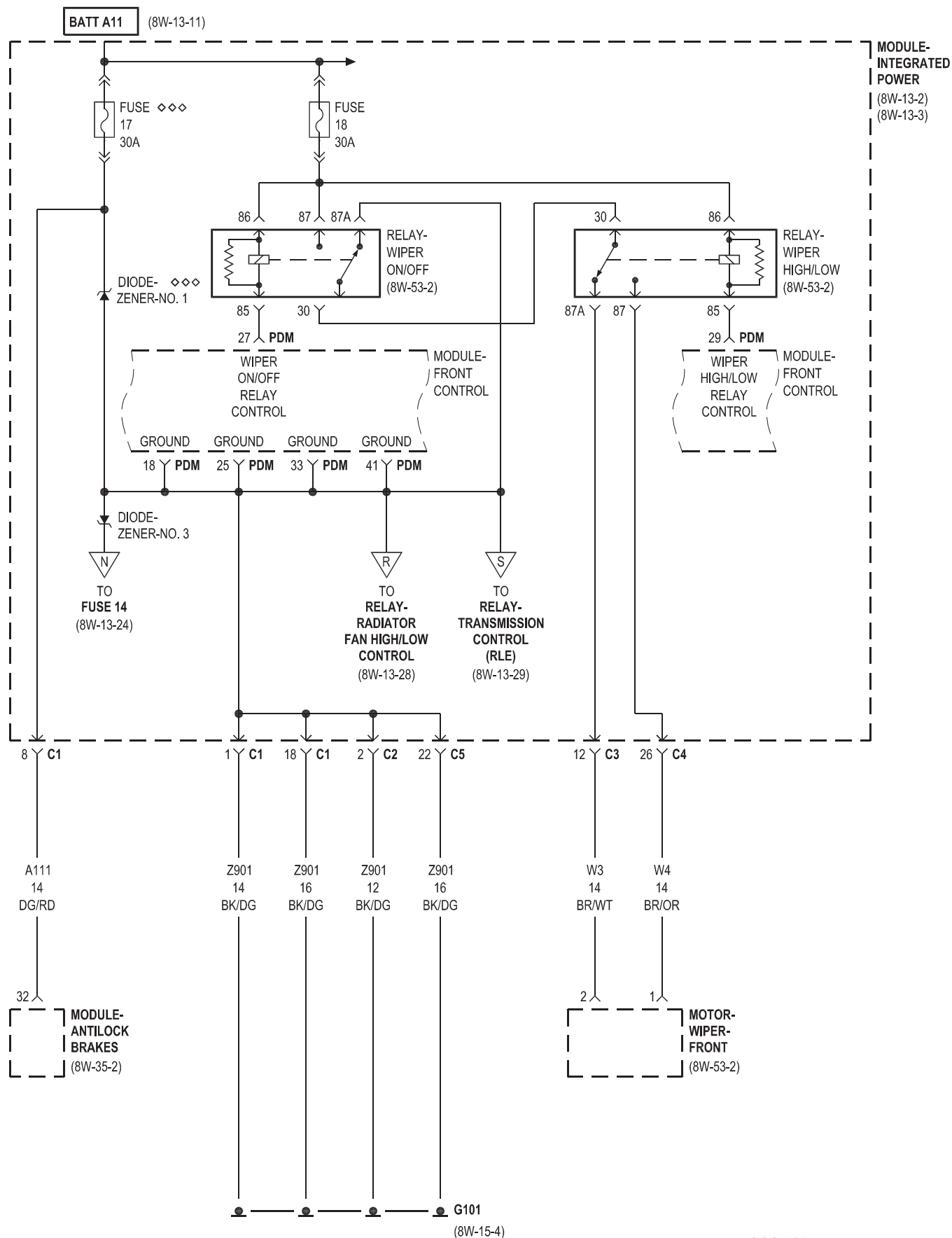


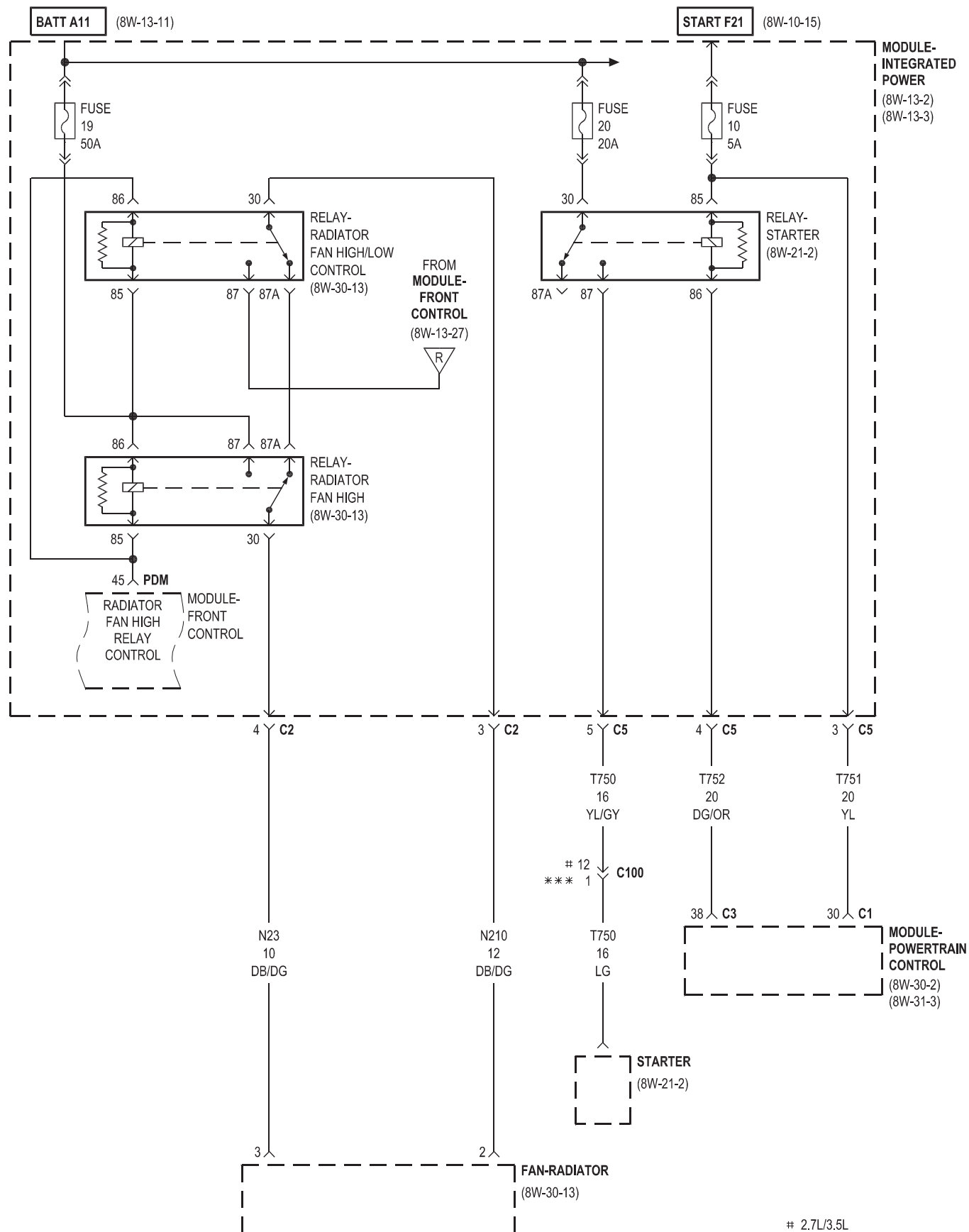
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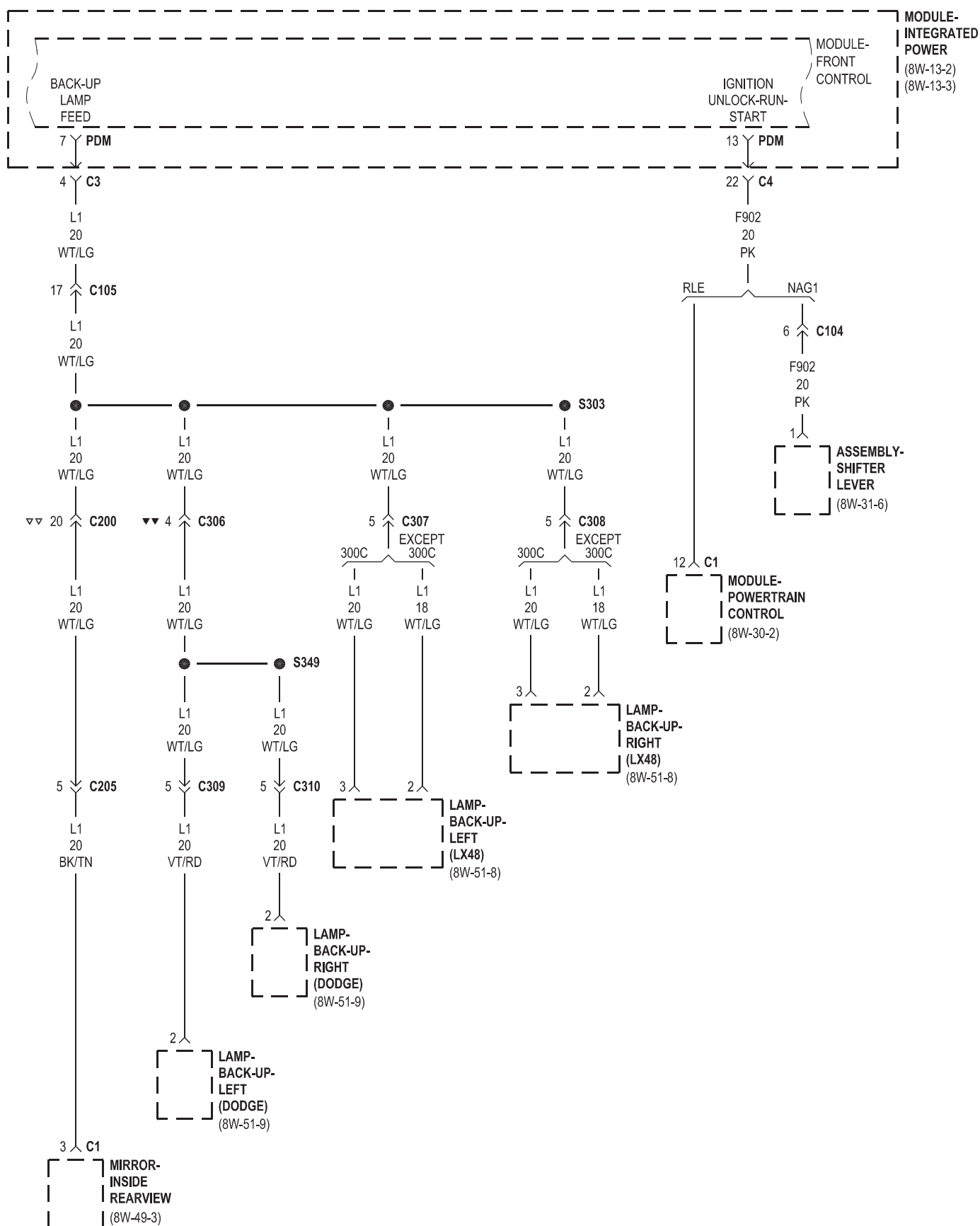


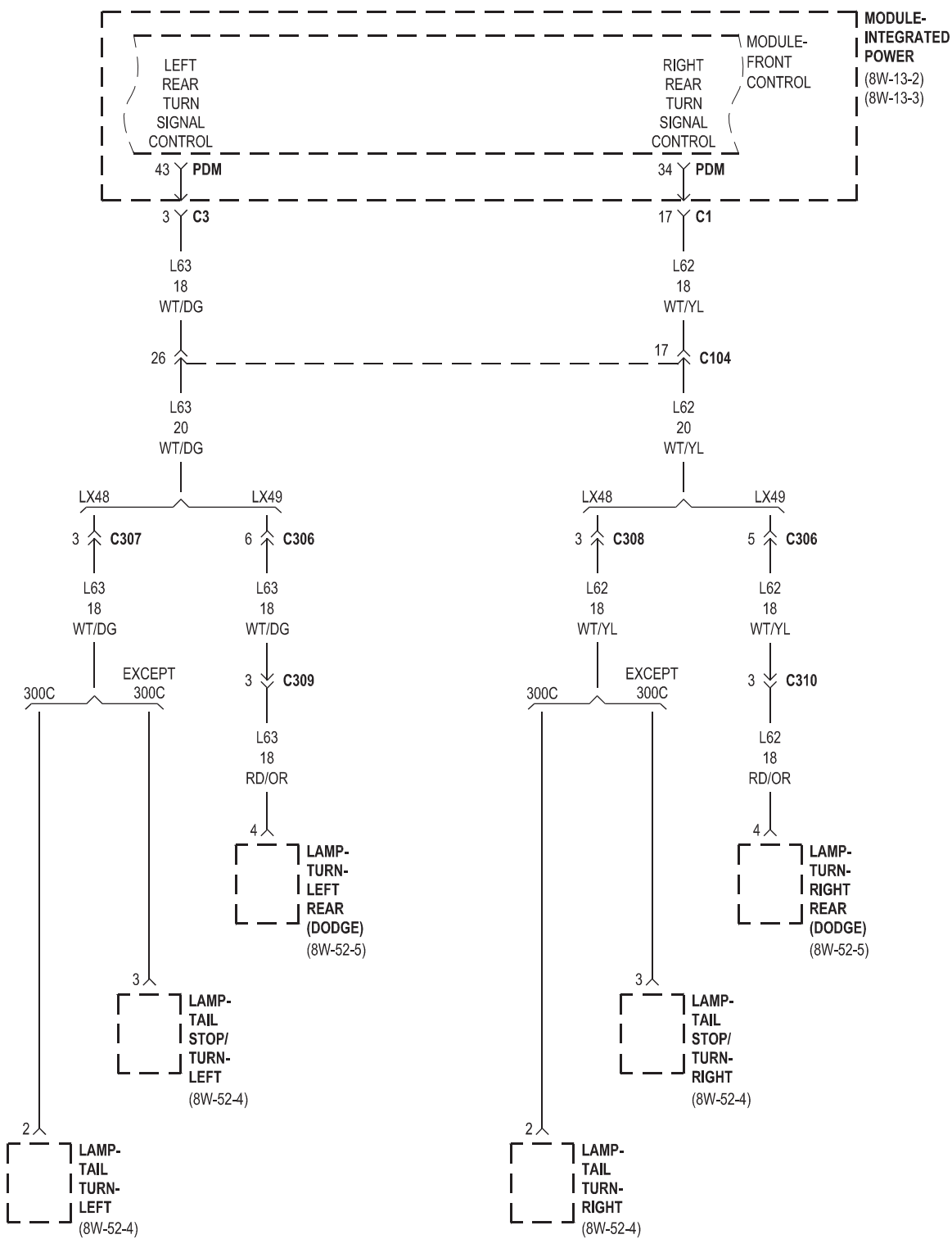


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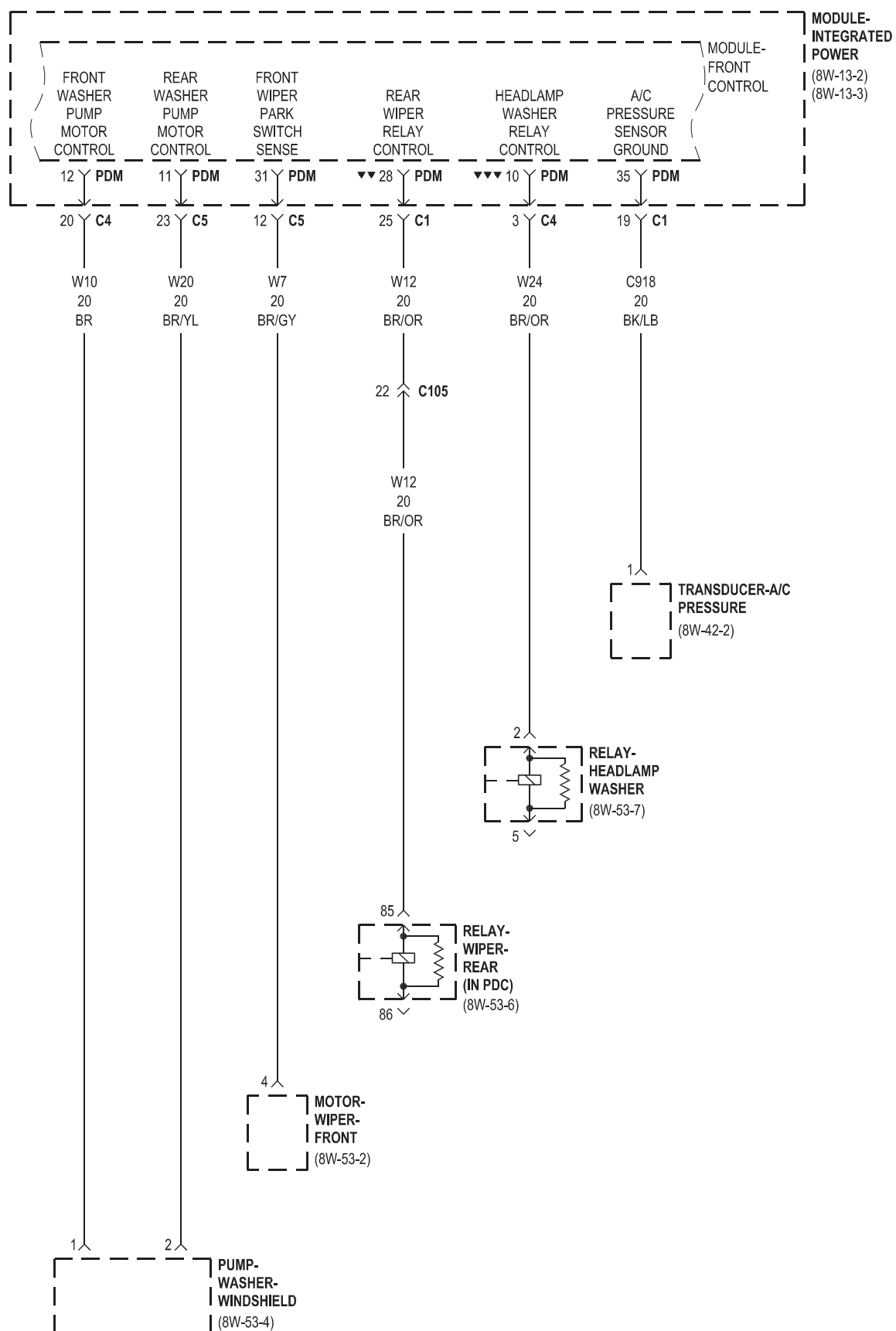
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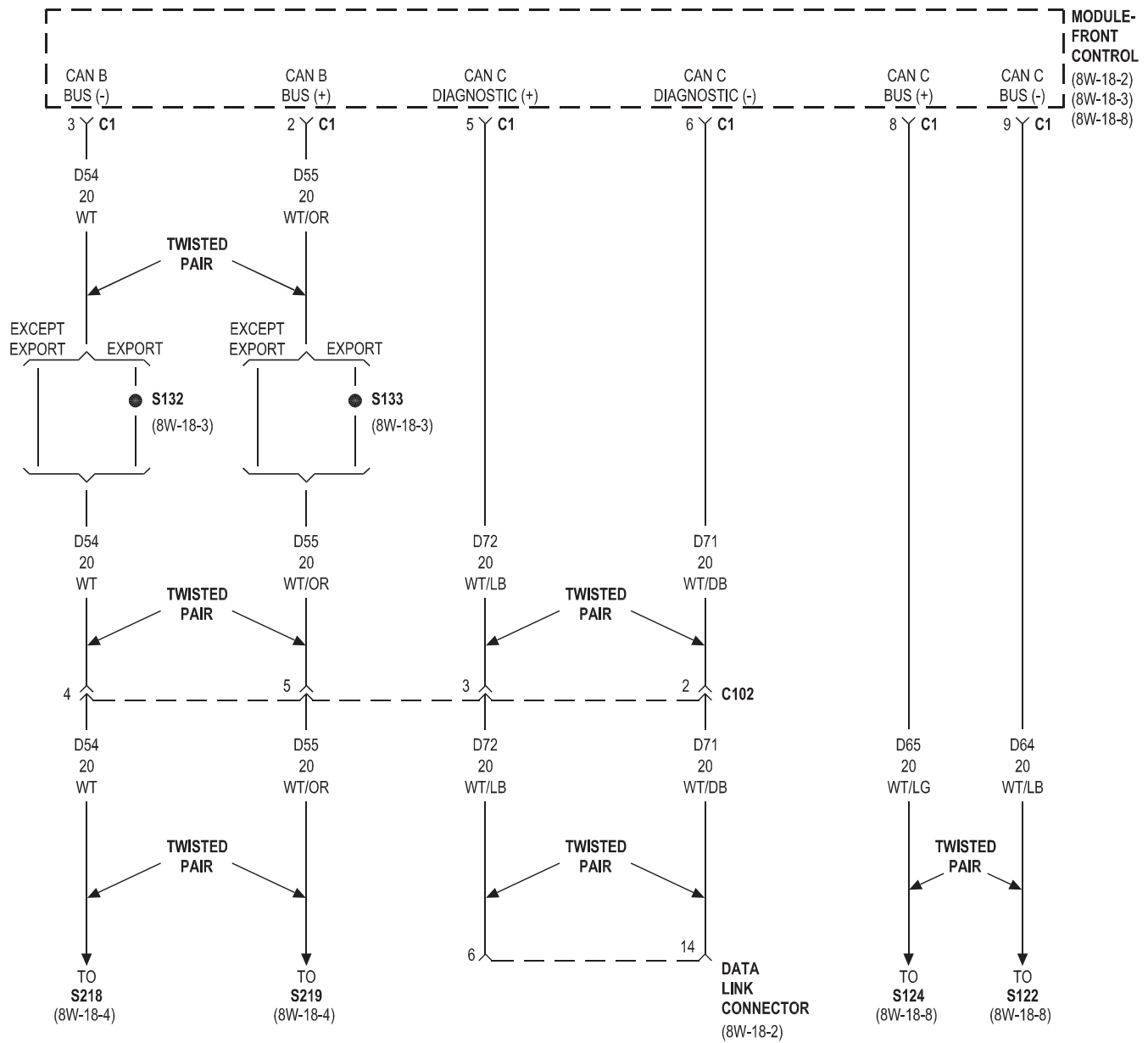


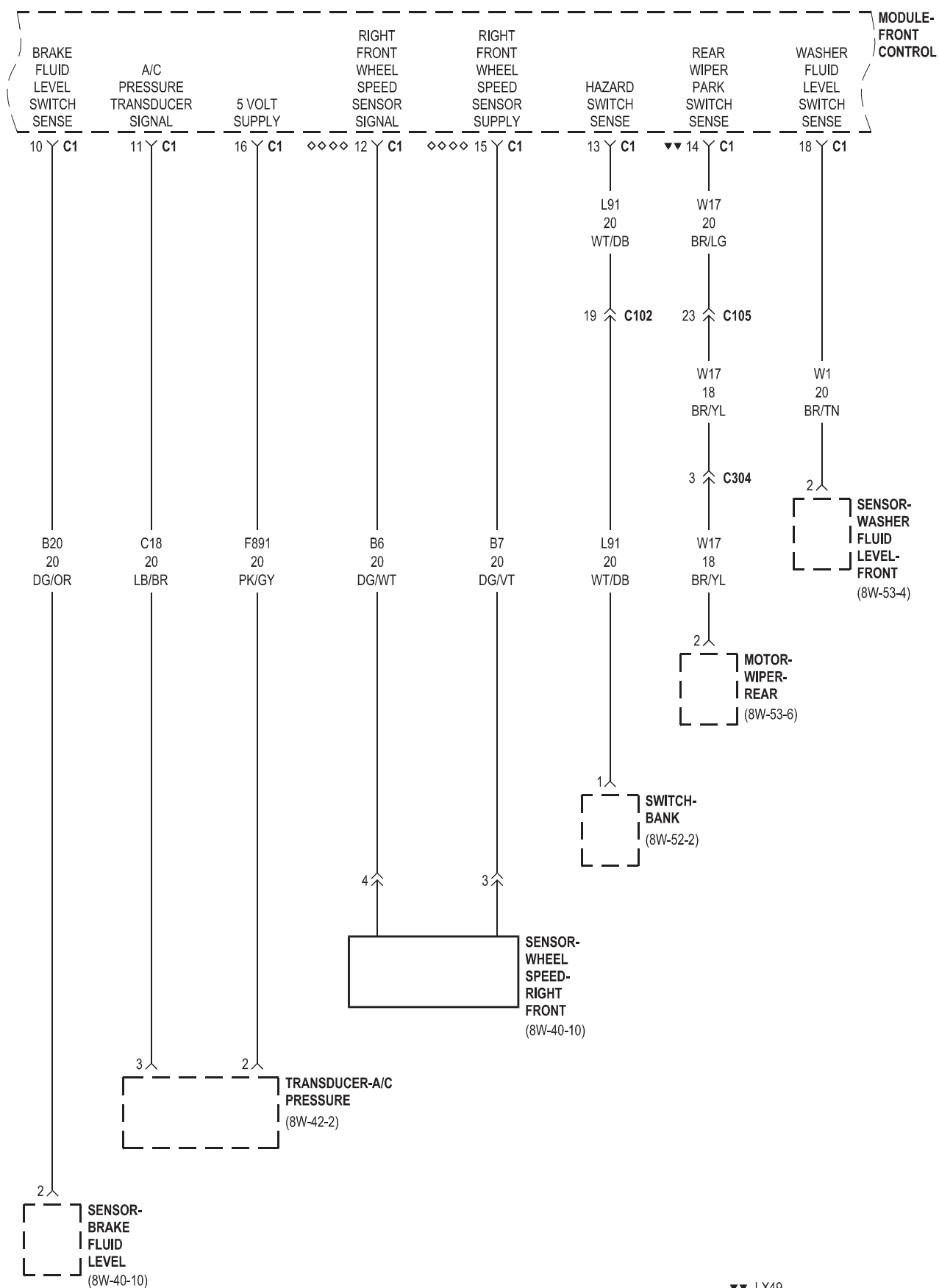


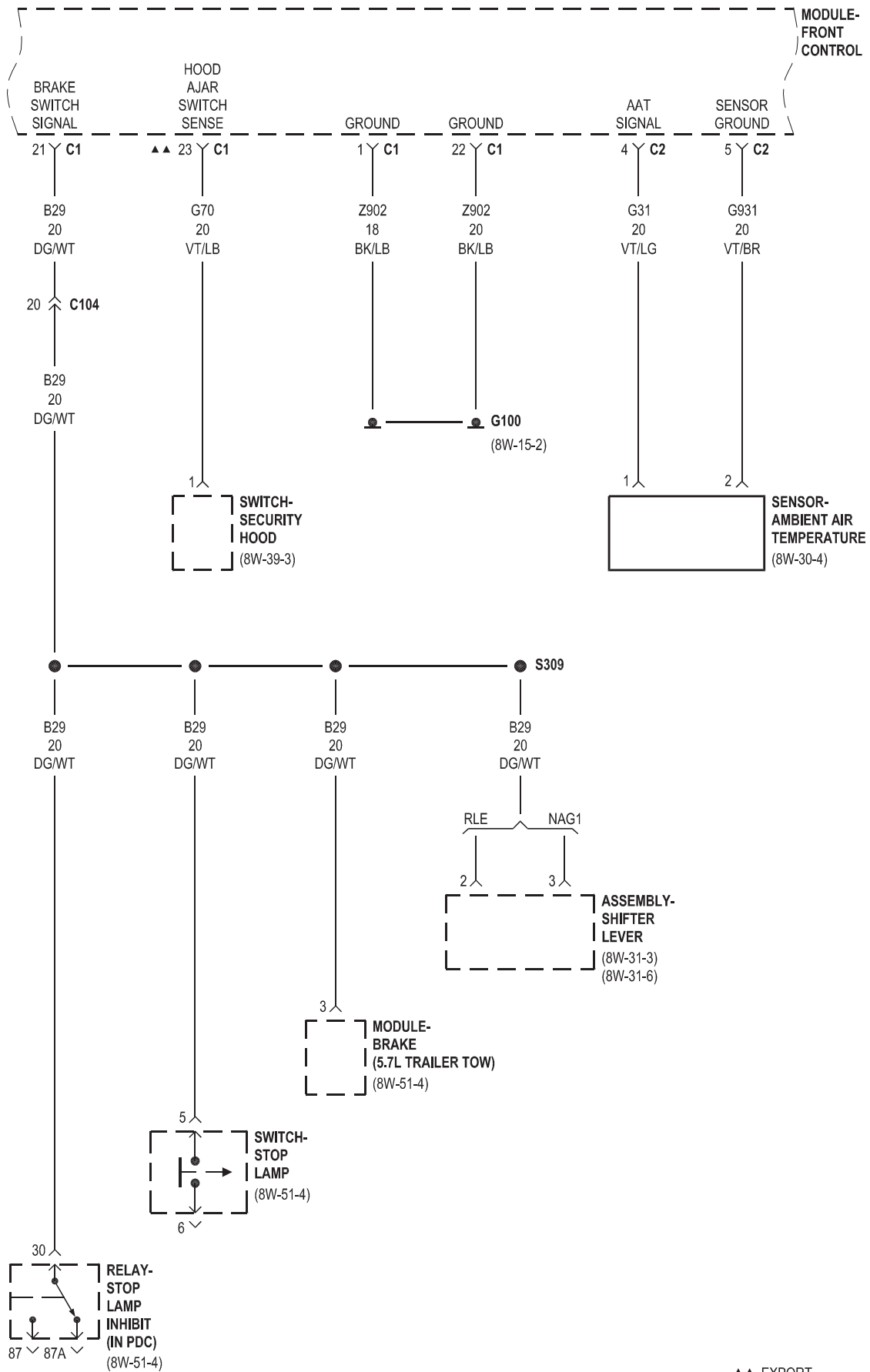


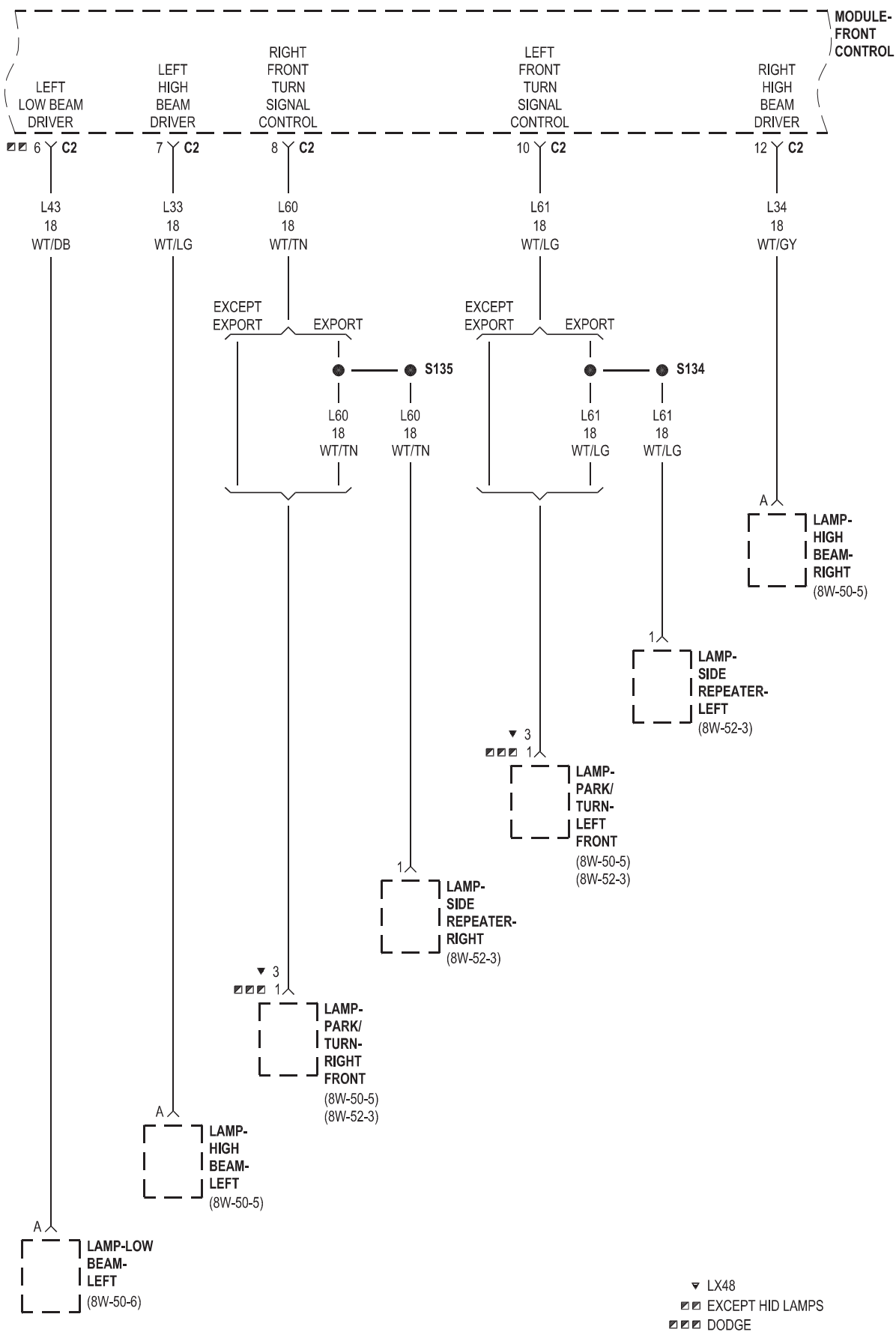


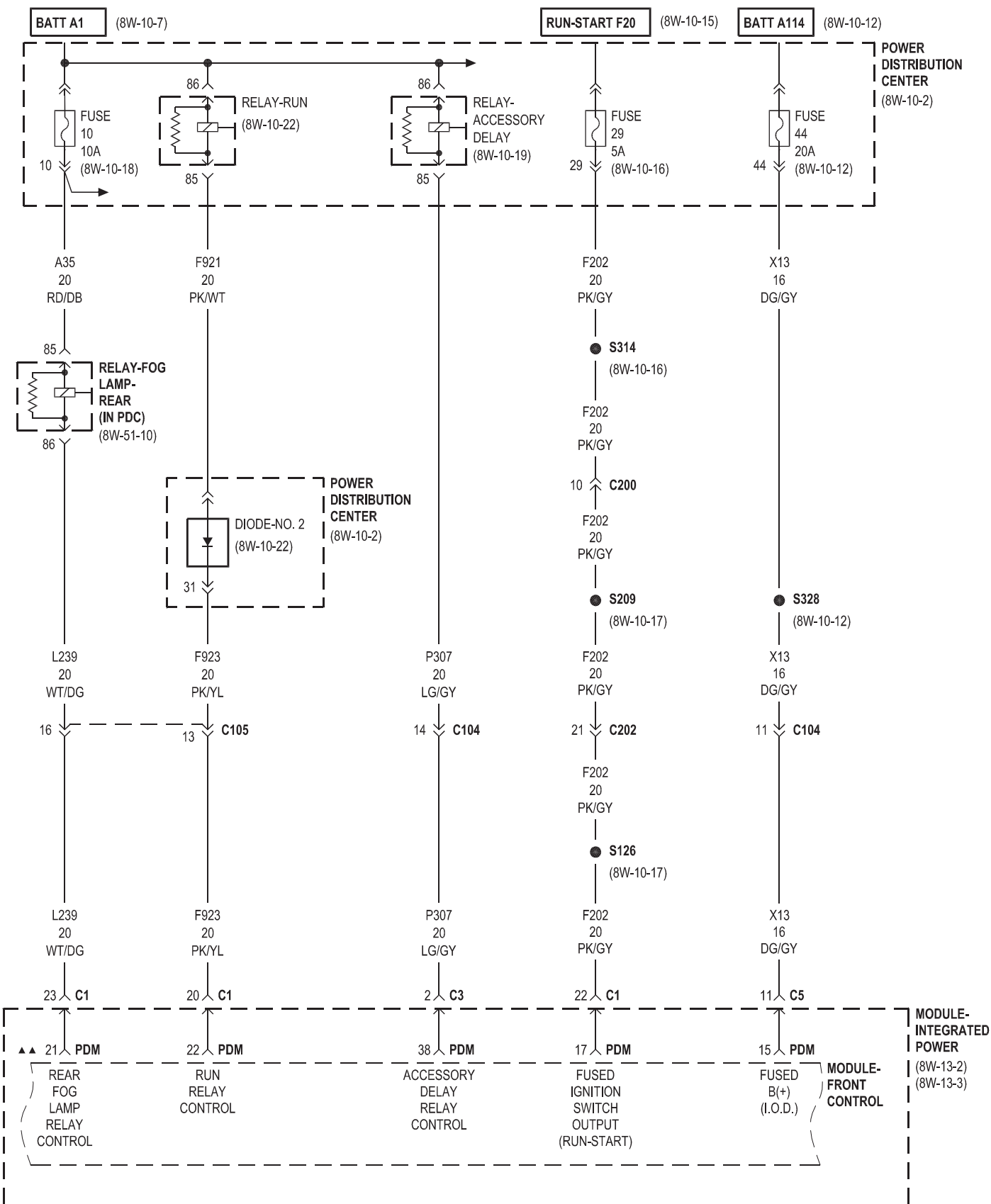










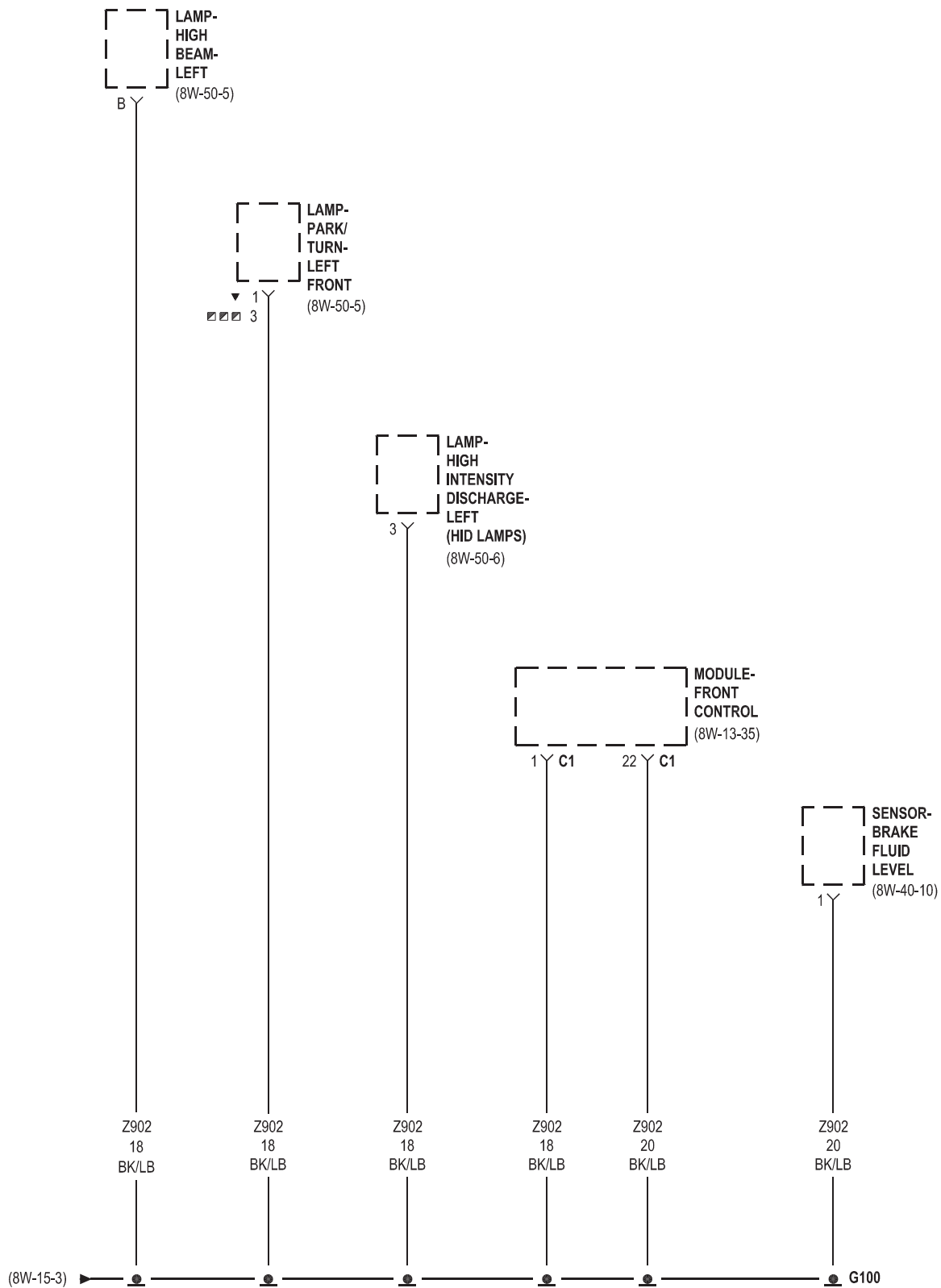




## 8W-15 GROUND DISTRIBUTION

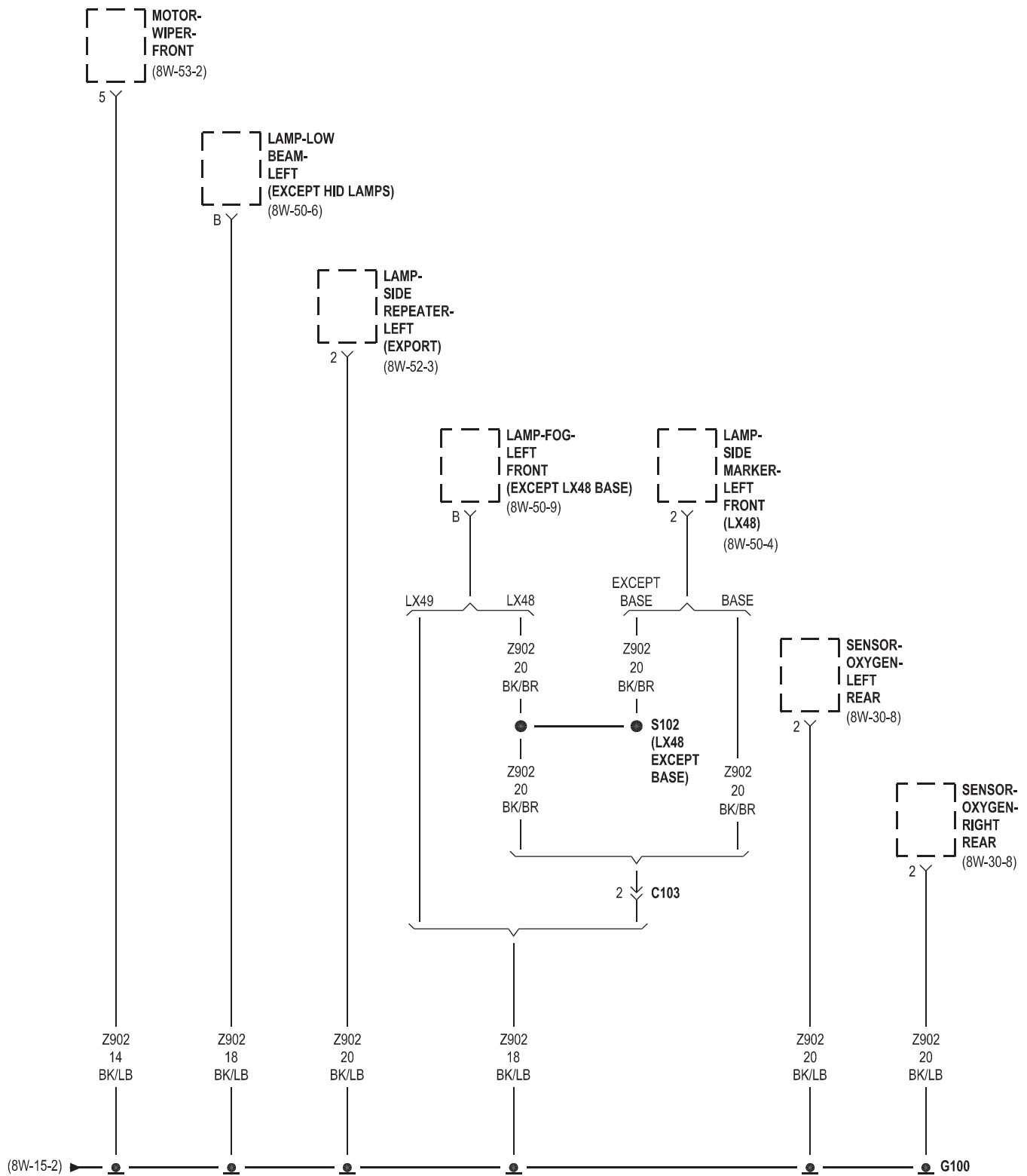
<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Amplifier-Radio	8W-15-15	Lamp-Turn-Left Rear	8W-15-26
Assembly-Exhaust Gas Recirculation Valve	8W-15-7, 8	Lamp-Turn-Right Rear	8W-15-26
Assembly-Natural Vacuum Leak Detection	8W-15-21	Lamp-Vanity-Left	8W-15-13
Assembly-Shifter Lever	8W-15-19	Lamp-Vanity-Right	8W-15-13
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Control-A/C-Heater	8W-15-11, 14	Latch-Door-Right Front	8W-15-20
Data Link Connector	8W-15-15	Latch-Door-Right Rear	8W-15-19
Diode-Zener	8W-15-21	Lighter-Cigar	8W-15-14
Fan-Radiator	8W-15-6	Mirror-Inside Rearview	8W-15-12
G100	8W-15-2, 3	Mirror-Outside Rearview-Driver	8W-15-18
G101	8W-15-4, 5	Mirror-Outside Rearview-Passenger	8W-15-20
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G103	8W-15-10	Module-Brake	8W-15-21
G104	8W-15-10	Module-Clock Analog	8W-15-11
G105	8W-15-10	Module-Door-Driver	8W-15-18
G106	8W-15-10	Module-Door-Passenger	8W-15-20
G107	8W-15-10	Module-Electronic Overhead	8W-15-13
G108	8W-15-10	Module-Front Blower Power	8W-15-14
G109	8W-15-10	Module-Front Control	8W-15-2
G200	8W-15-11, 12	Module-Fuel Pump	8W-15-16
G201	8W-15-14	Module-Hands Free	8W-15-11
G202	8W-15-14, 15	Module-Headlamp Leveling	8W-15-5
G300	8W-15-16, 17, 18	Module-Heated Seats	8W-15-19
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Heater-Seat Back-Right	8W-15-20	Module-Powertrain Control	8W-15-6, 7
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Heater-Seat Cushion-Right	8W-15-20	Module-Steering Control	8W-15-14
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Lamp-Center High Mounted Stop	8W-15-19, 20	Motor-Wiper-Rear	8W-15-22
Lamp-Courtesy-Left Front Door	8W-15-18	Motor/Module-Sunroof	8W-15-13
Lamp-Courtesy-Left Rear	8W-15-13	Power Outlet-Console	8W-15-16
Lamp-Courtesy-Right Front Door	8W-15-20	Power Outlet-Rear	8W-15-22
Lamp-Courtesy-Right Rear	8W-15-13	Radio	8W-15-12
Lamp-Fog-Left Front	8W-15-3	Receiver-Satellite	8W-15-12
Lamp-Fog-Left Rear	8W-15-23	Relay-High Intensity Discharge Lamp	8W-15-6
Lamp-Fog-Right Front	8W-15-5	Relay-Transmission	8W-15-21
Lamp-Fog-Right Rear	8W-15-24	Relay-Wiper-Rear	8W-15-21
Lamp-Glove Box	8W-15-11	Sensor-Brake Fluid Level	8W-15-2
Lamp-High Beam-Left	8W-15-2	Sensor-Headlamp Level-Left	8W-15-5
Lamp-High Beam-Right	8W-15-4	Sensor-Headlamp Level-Right	8W-15-22
Lamp-High Intensity Discharge-Left	8W-15-2	Sensor-Oxygen-Left Front	8W-15-10
Lamp-High Intensity Discharge-Right	8W-15-4	Sensor-Oxygen-Left Rear	8W-15-3
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Lamp-Low Beam-Right	8W-15-4	Solenoid-Manifold Tuning Valve	8W-15-7
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Lamp-Prndl	8W-15-16	Solenoid-Multi Displacement System Cyl 6	8W-15-9
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Lamp-Side Marker-Left Rear	8W-15-23	Switch-Bank	8W-15-11
Lamp-Side Marker-Right Front	8W-15-5	Switch-Decklid Release	8W-15-15
Lamp-Side Marker-Right Rear	8W-15-24	Switch-Headlamp	8W-15-14
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Lamp-Side Repeater-Right	8W-15-6	Switch-Heated Seat-Right	8W-15-11
Lamp-Tail Park-Left	8W-15-23	Switch-Liftgate Release	8W-15-22
Lamp-Tail Park-Right	8W-15-24	Switch-Mirror	8W-15-18
Lamp-Tail Stop/Park-Left	8W-15-23	Switch-Seat Belt-Driver	8W-15-17
Lamp-Tail Stop/Park-Right	8W-15-24	Switch-Seat-Driver	8W-15-17
Lamp-Tail Stop/Turn-Left	8W-15-23	Switch-Seat-Passenger	8W-15-20
Lamp-Tail Stop/Turn-Right	8W-15-24	Switch-Security Hood	8W-15-6
Lamp-Tail Turn-Left	8W-15-23	Switch-Stop Lamp	8W-15-16
Lamp-Tail Turn-Right	8W-15-24	Switch-Window/Door Lock-Driver	8W-15-18
Lamp-Tail/Stop-Left	8W-15-26	Switch-Window/Door Lock-Driver Express	8W-15-18
Lamp-Tail/Stop-Right	8W-15-26		

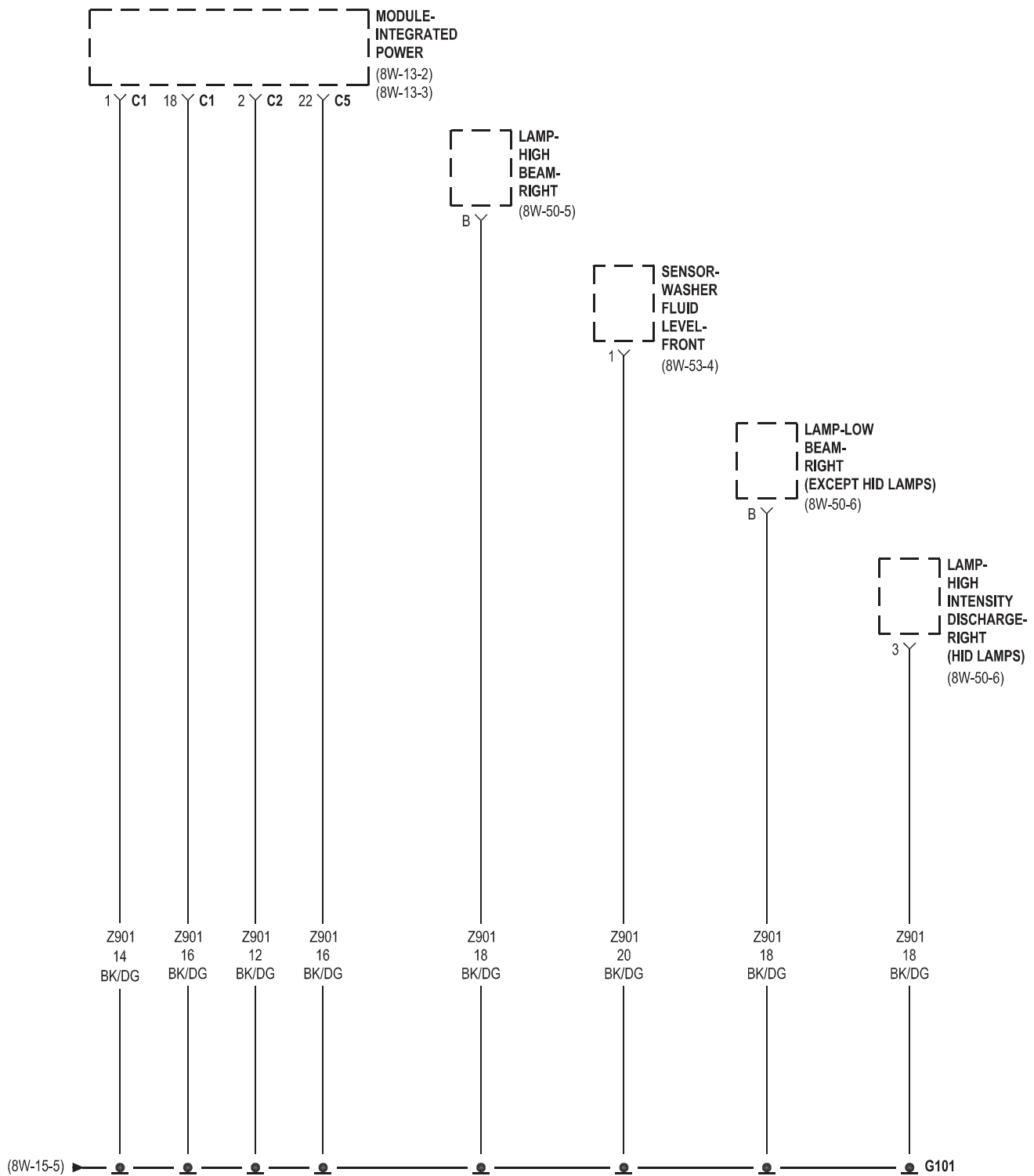


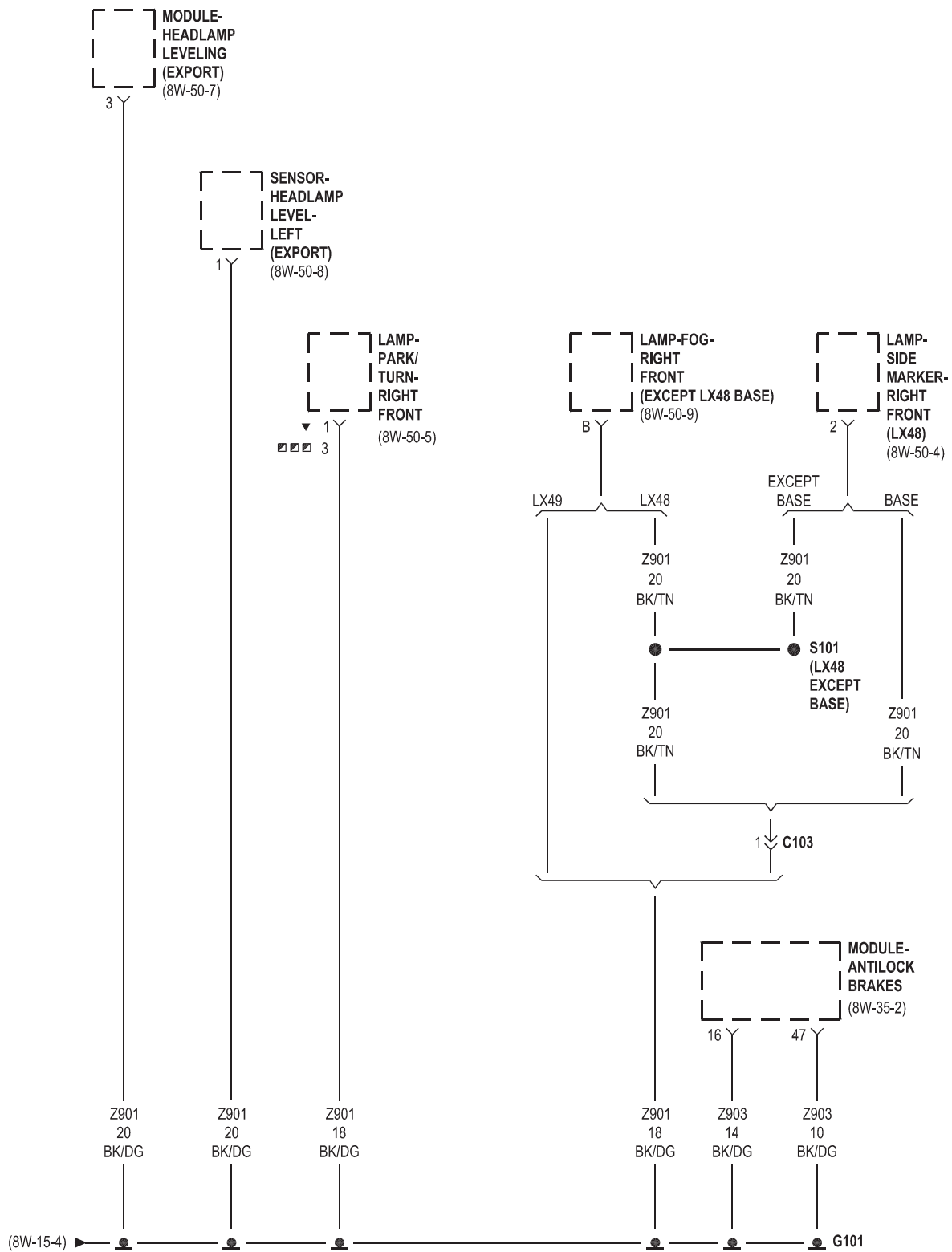


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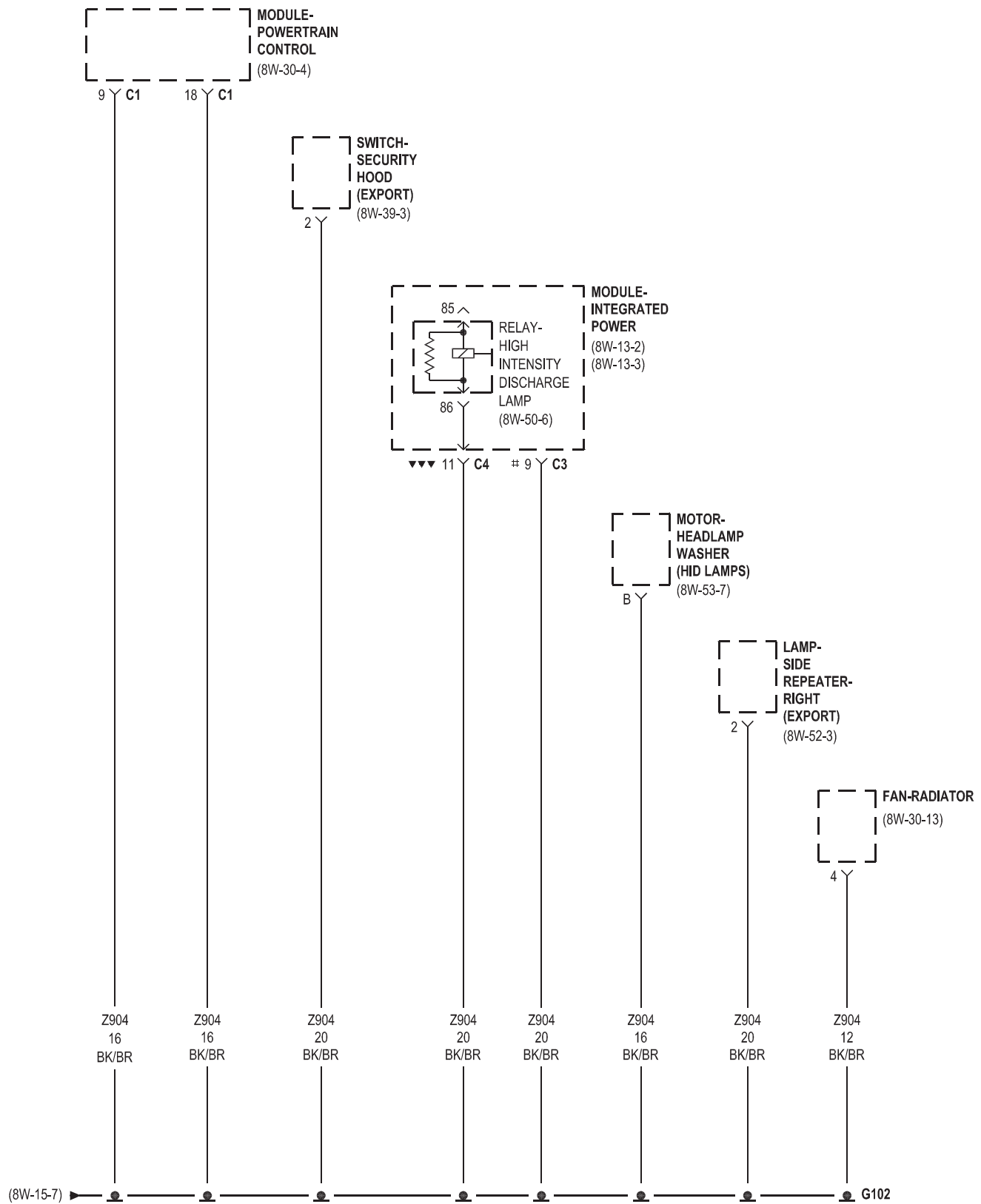
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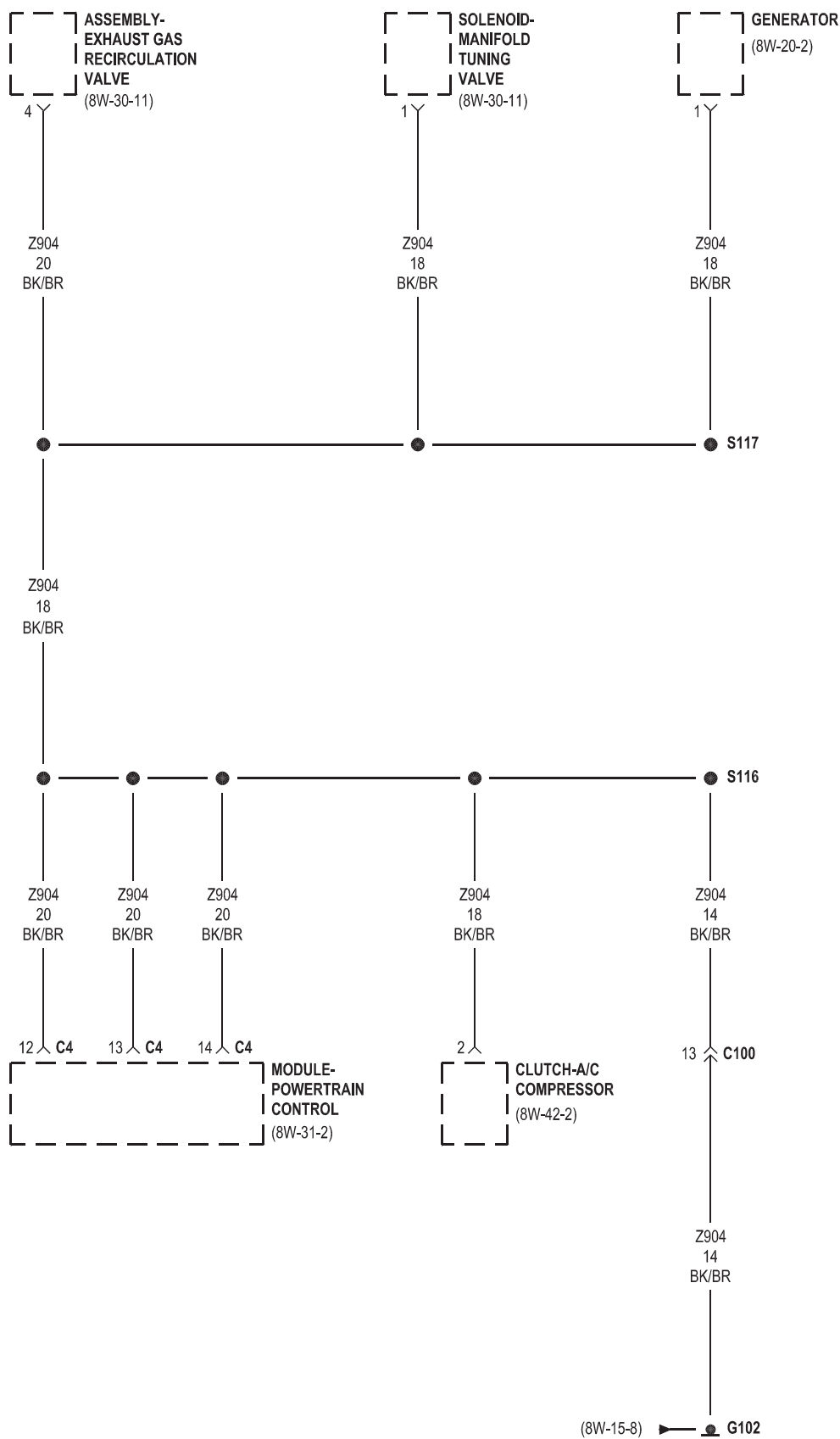


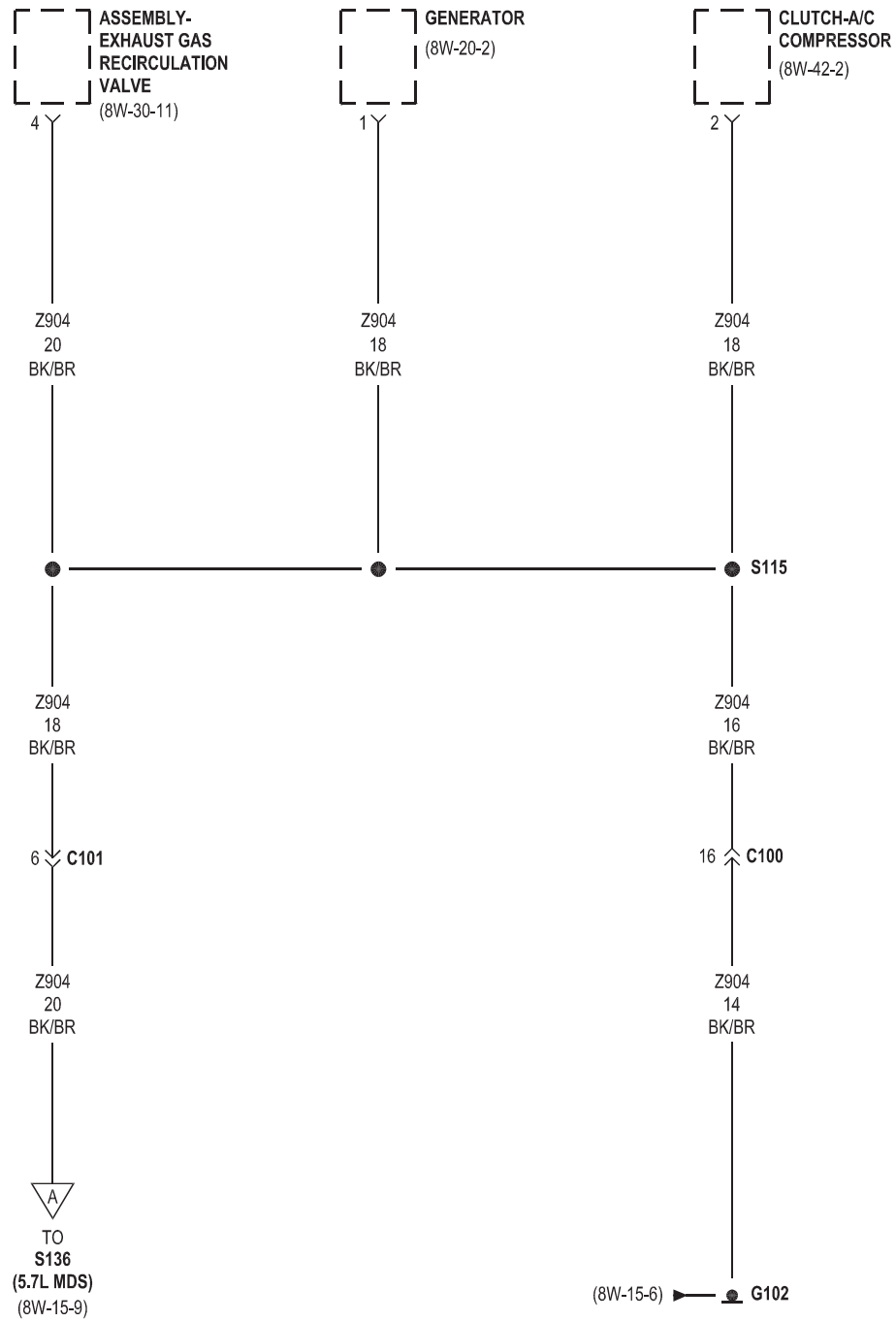


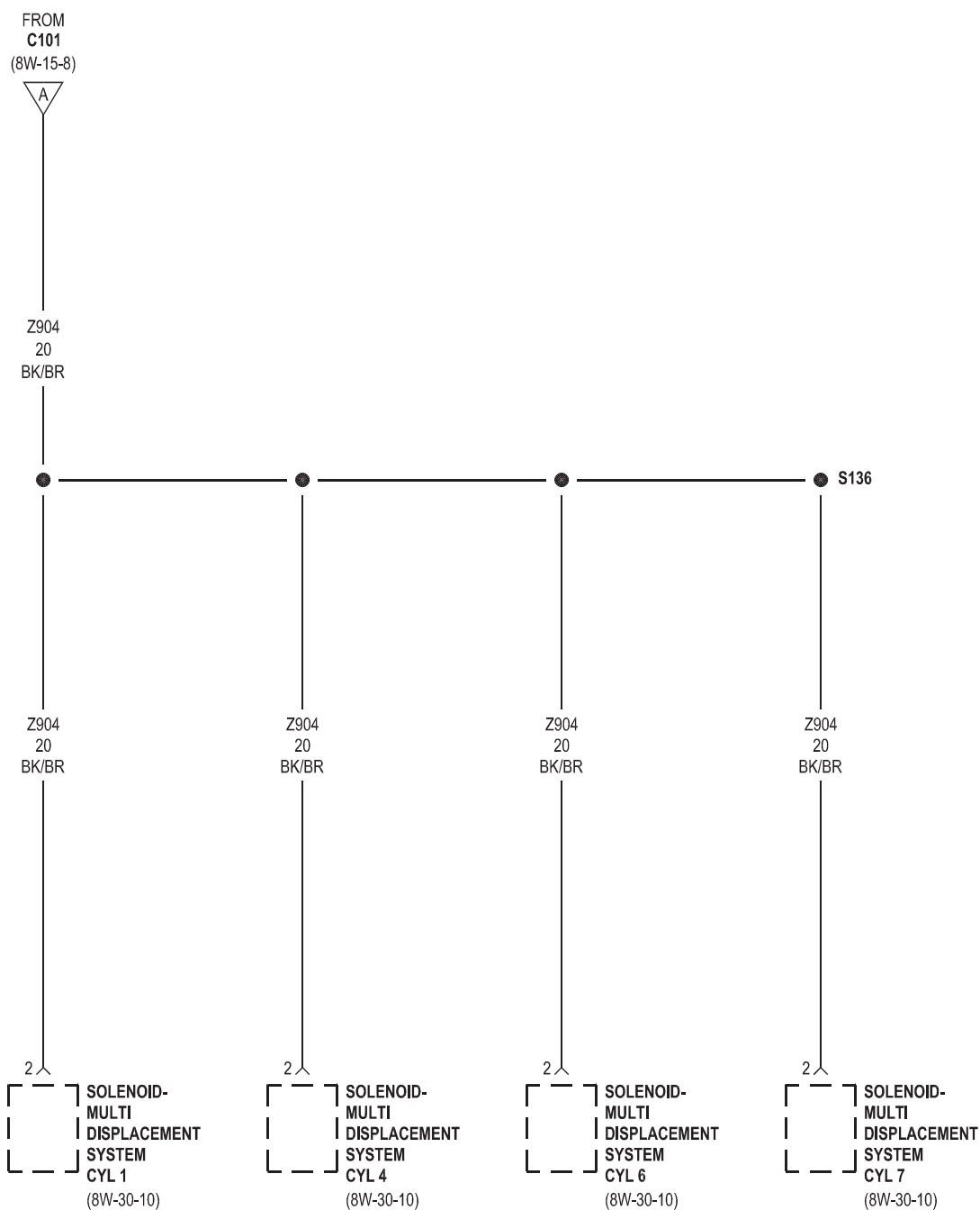


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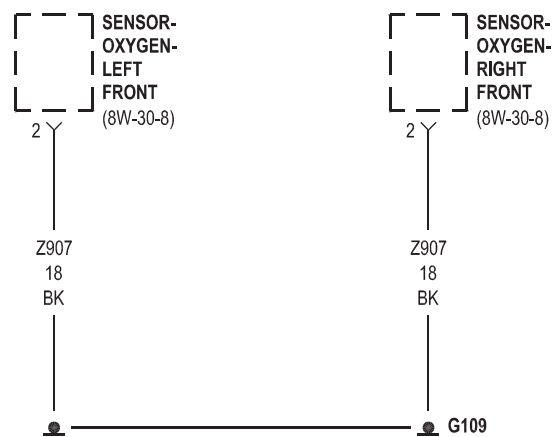
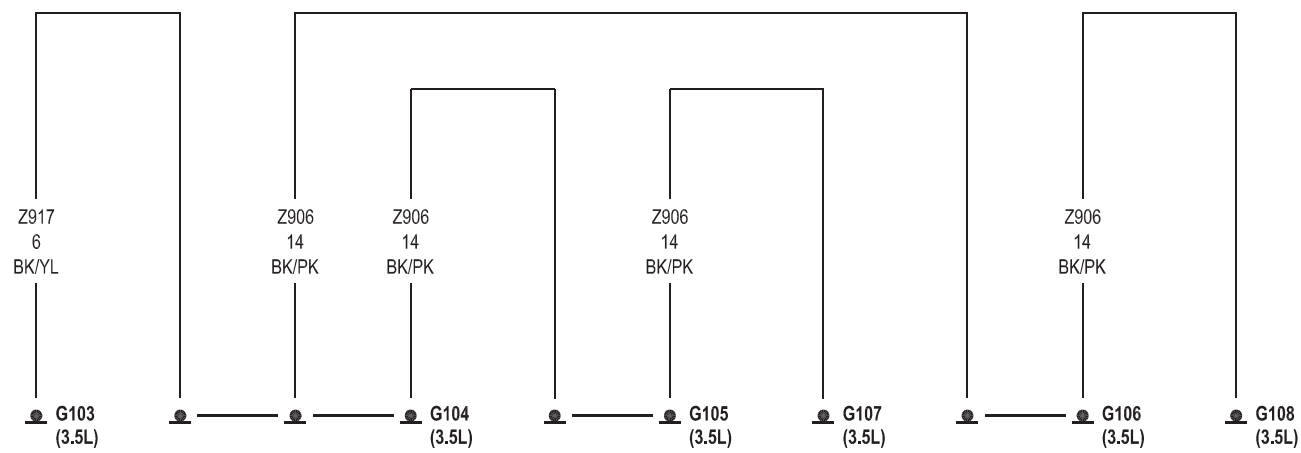
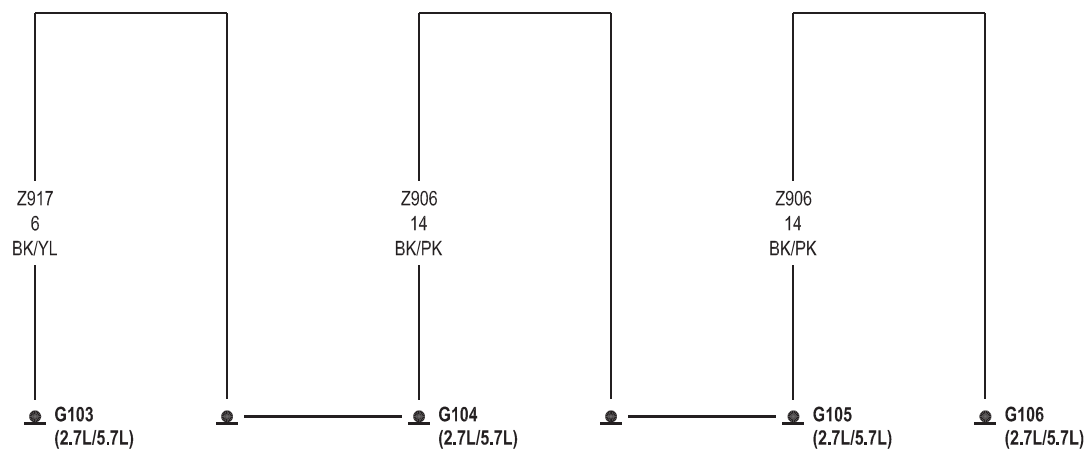


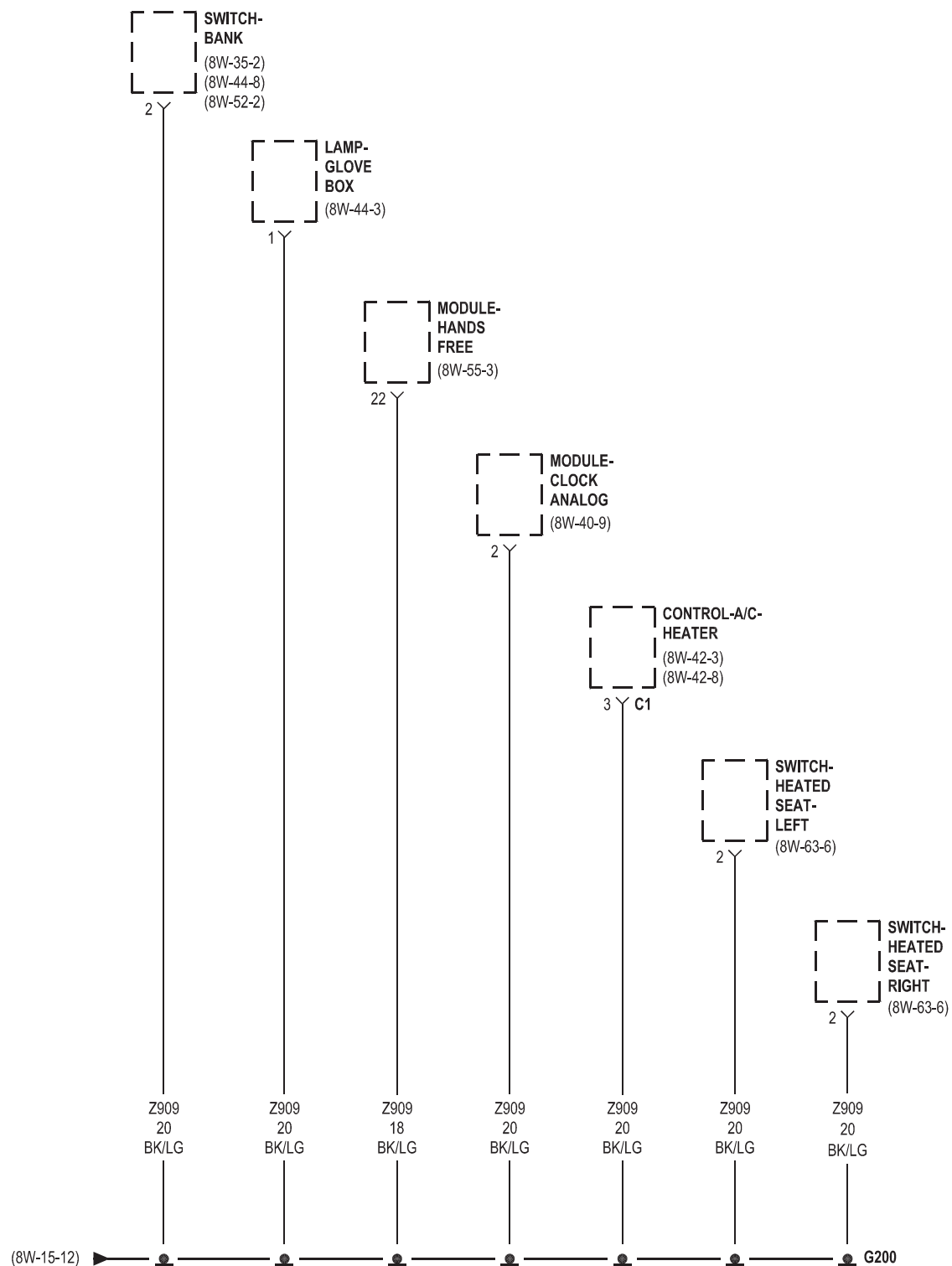


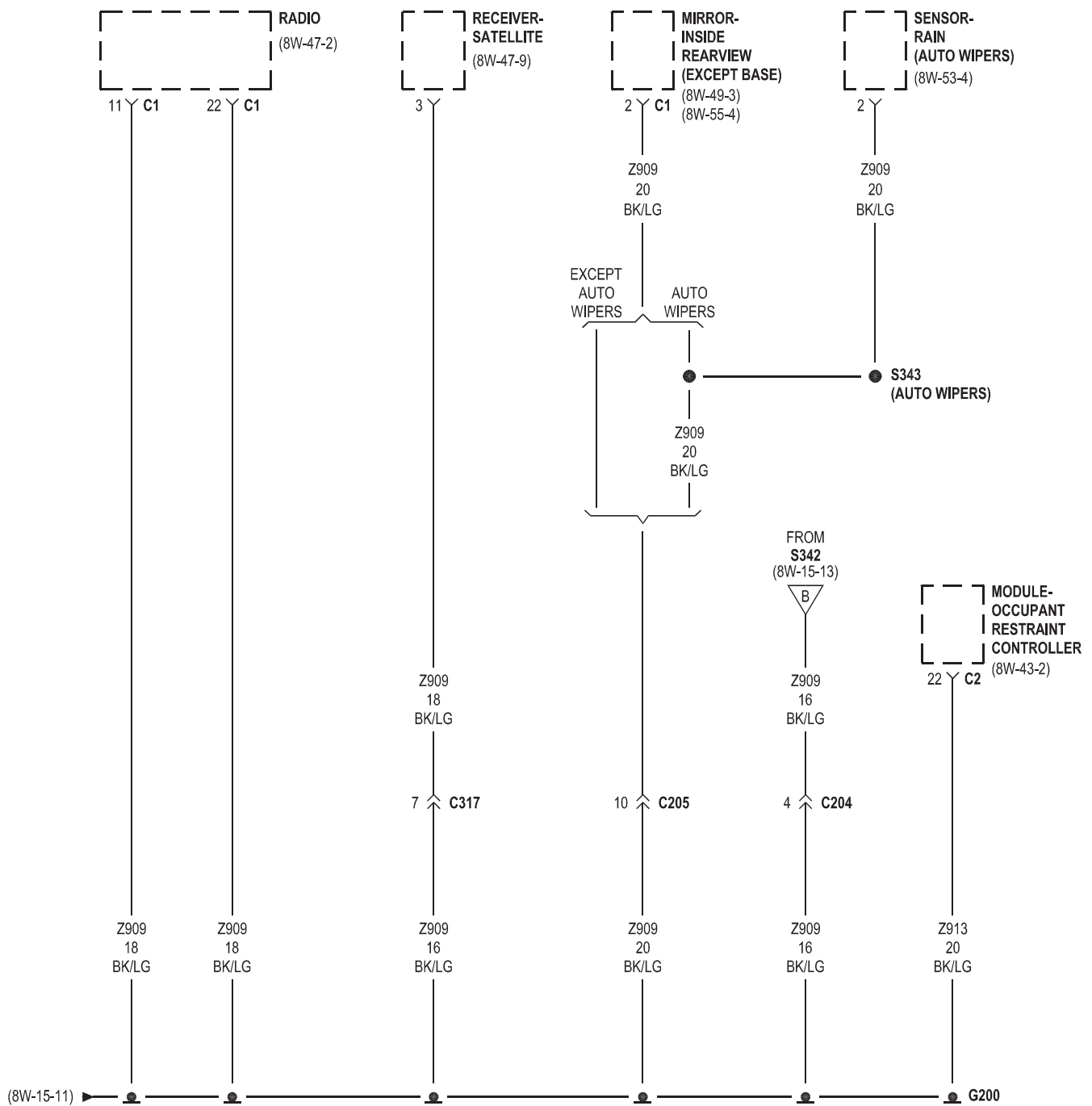


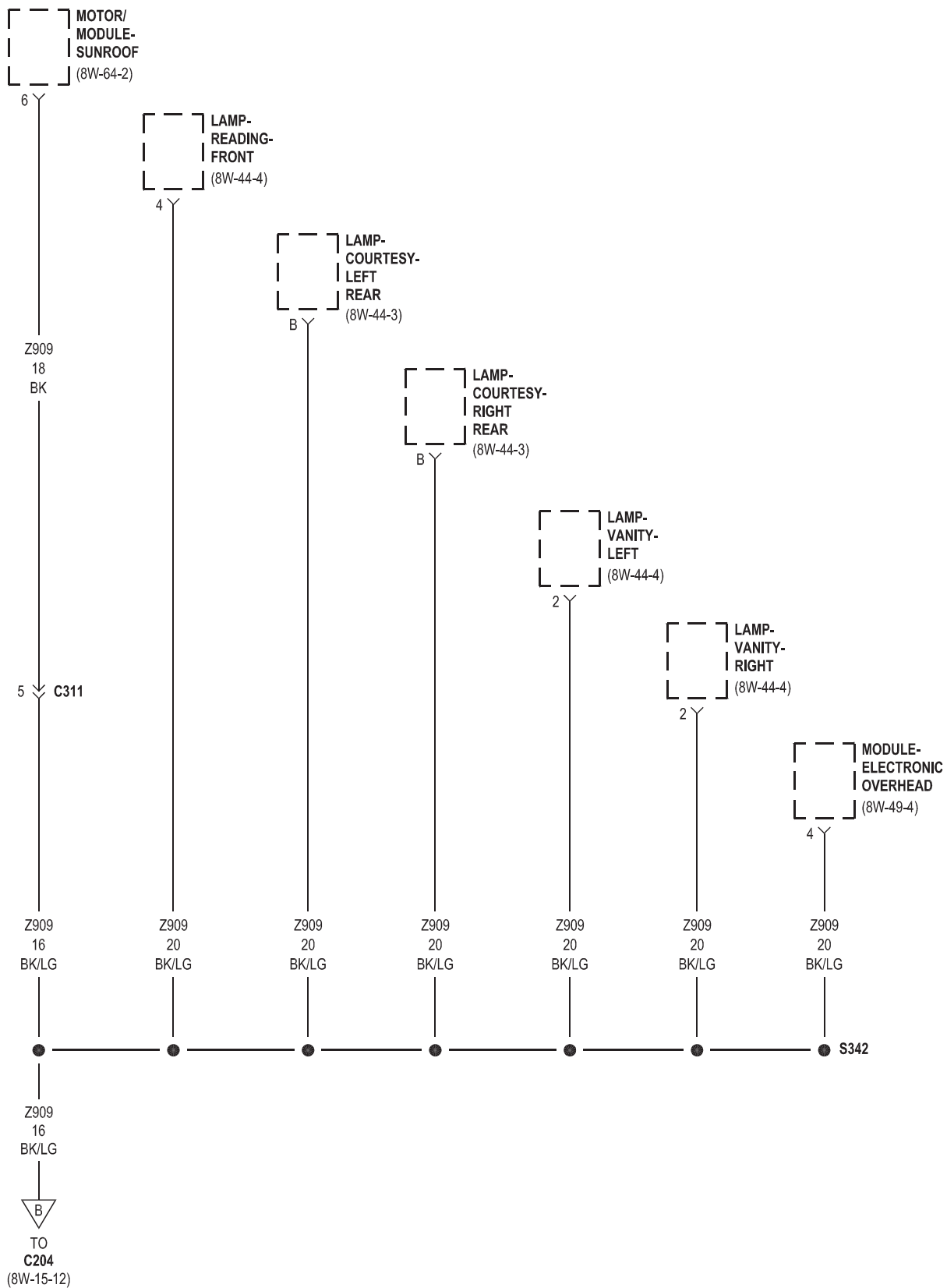


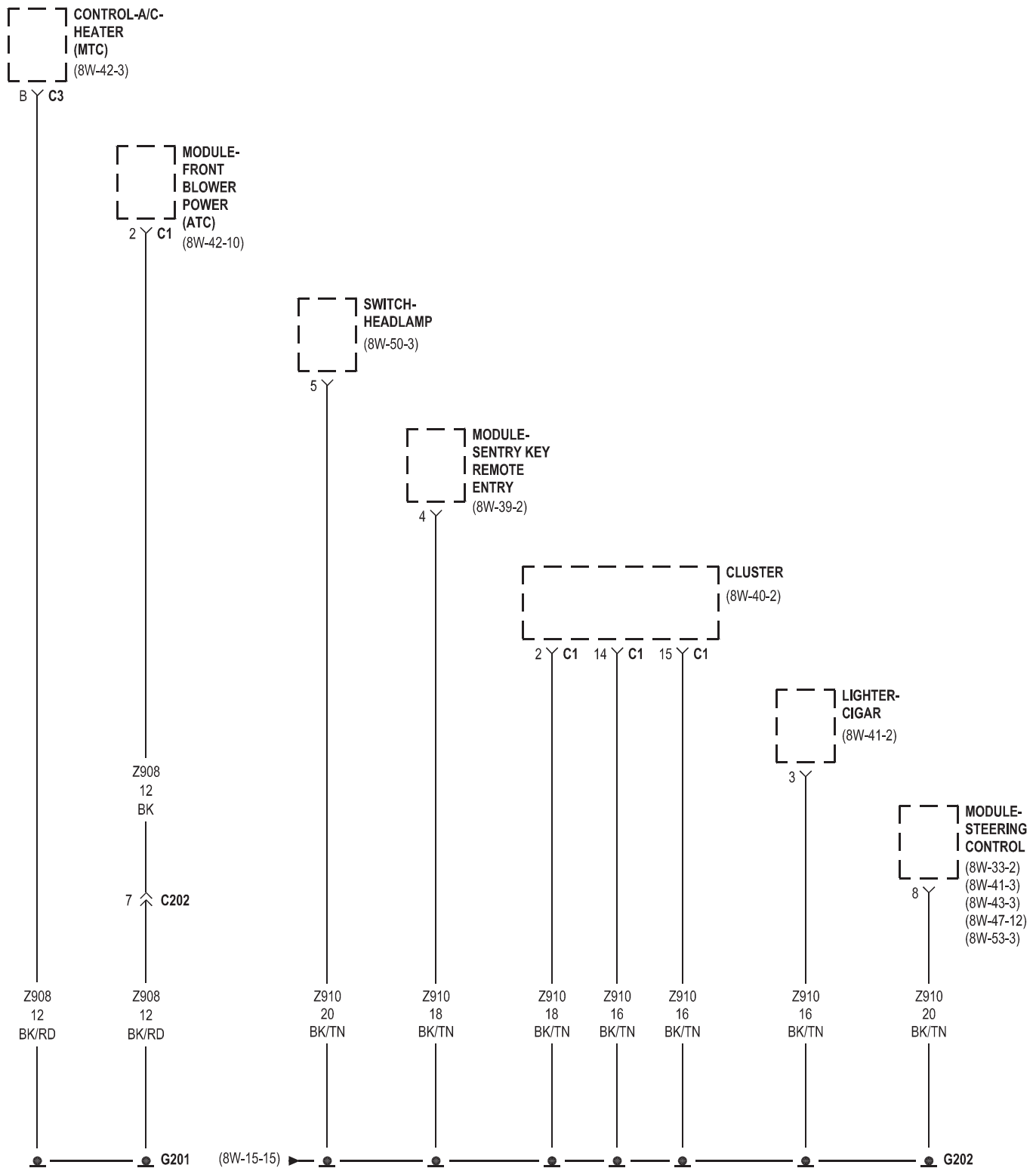


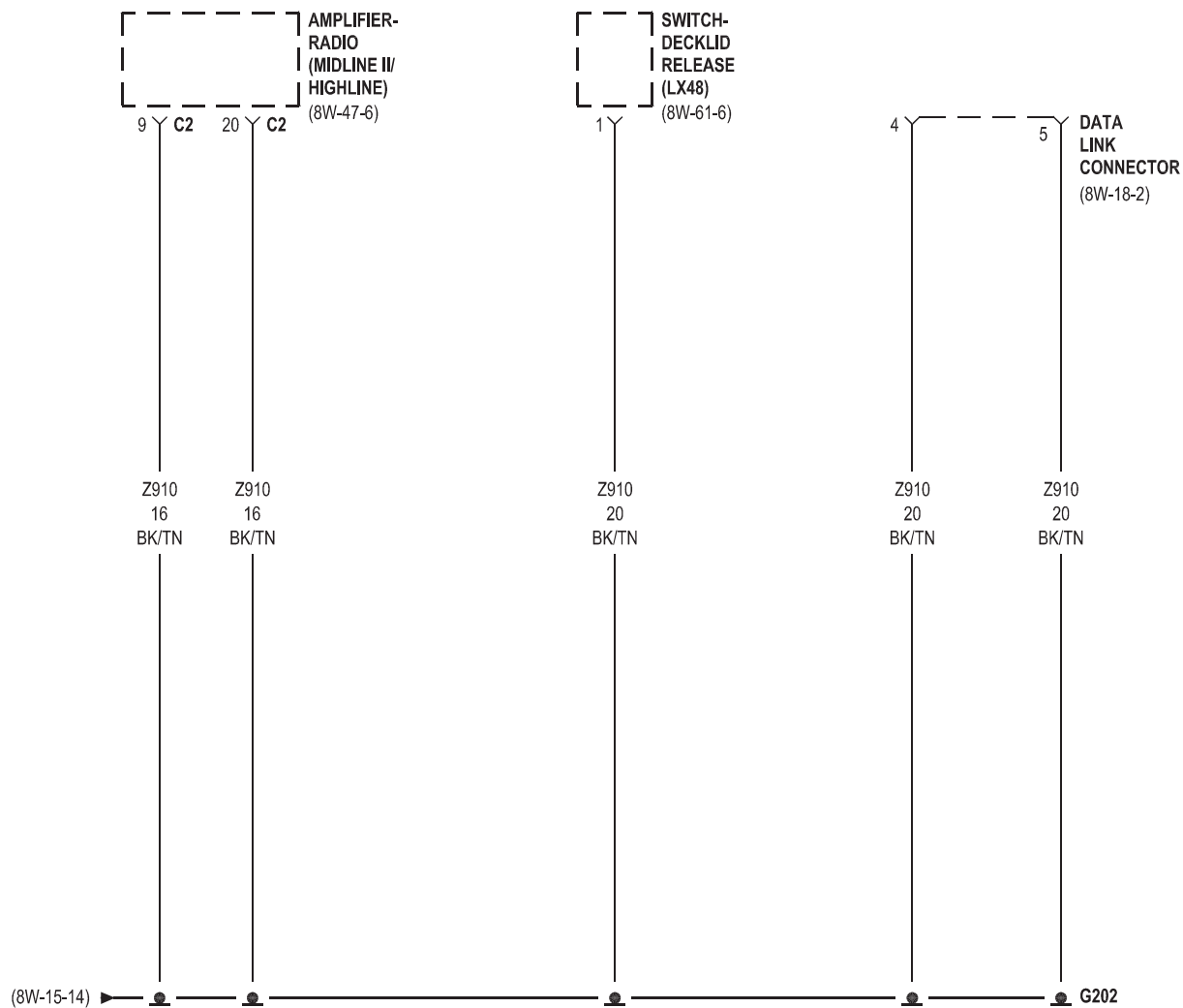


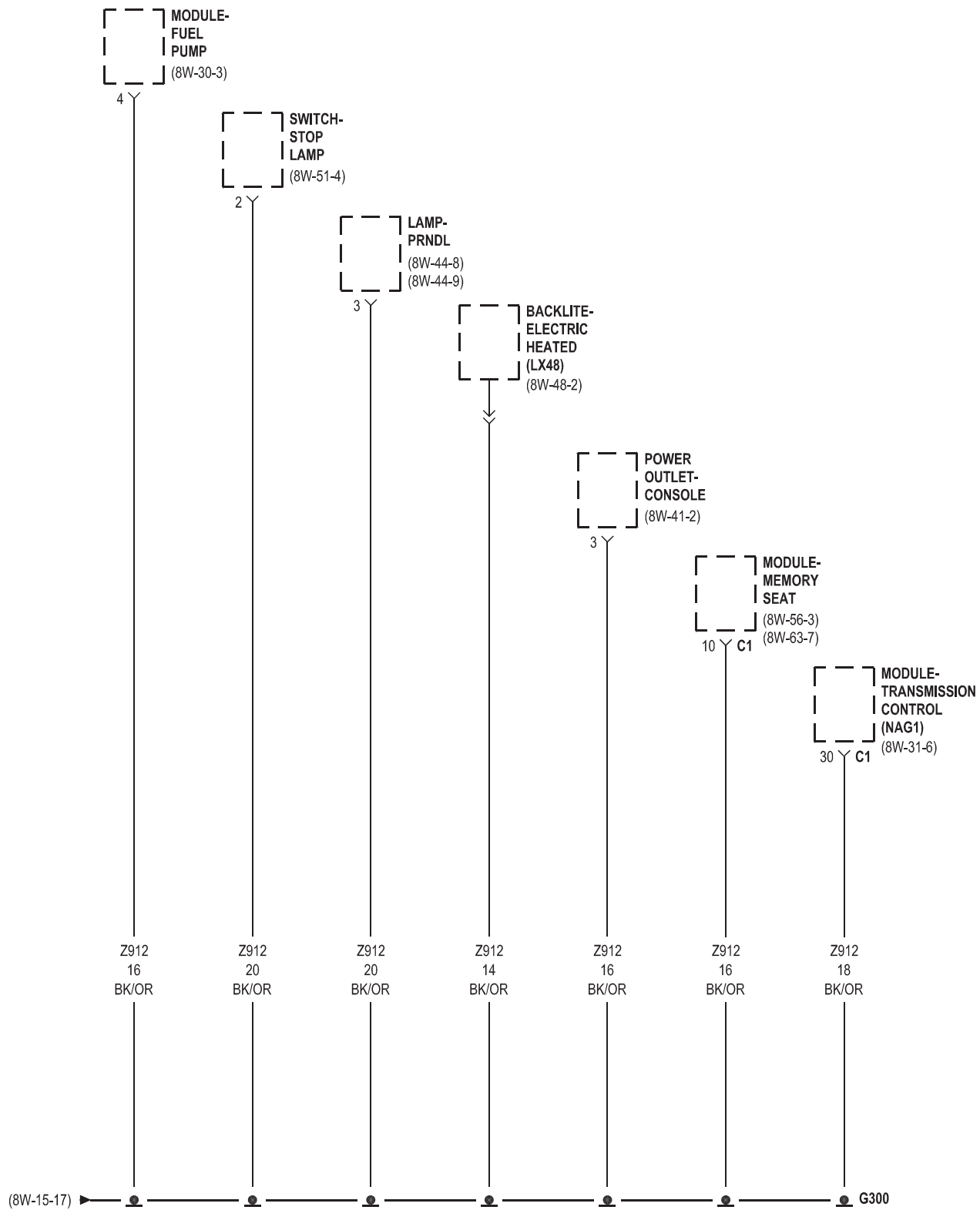


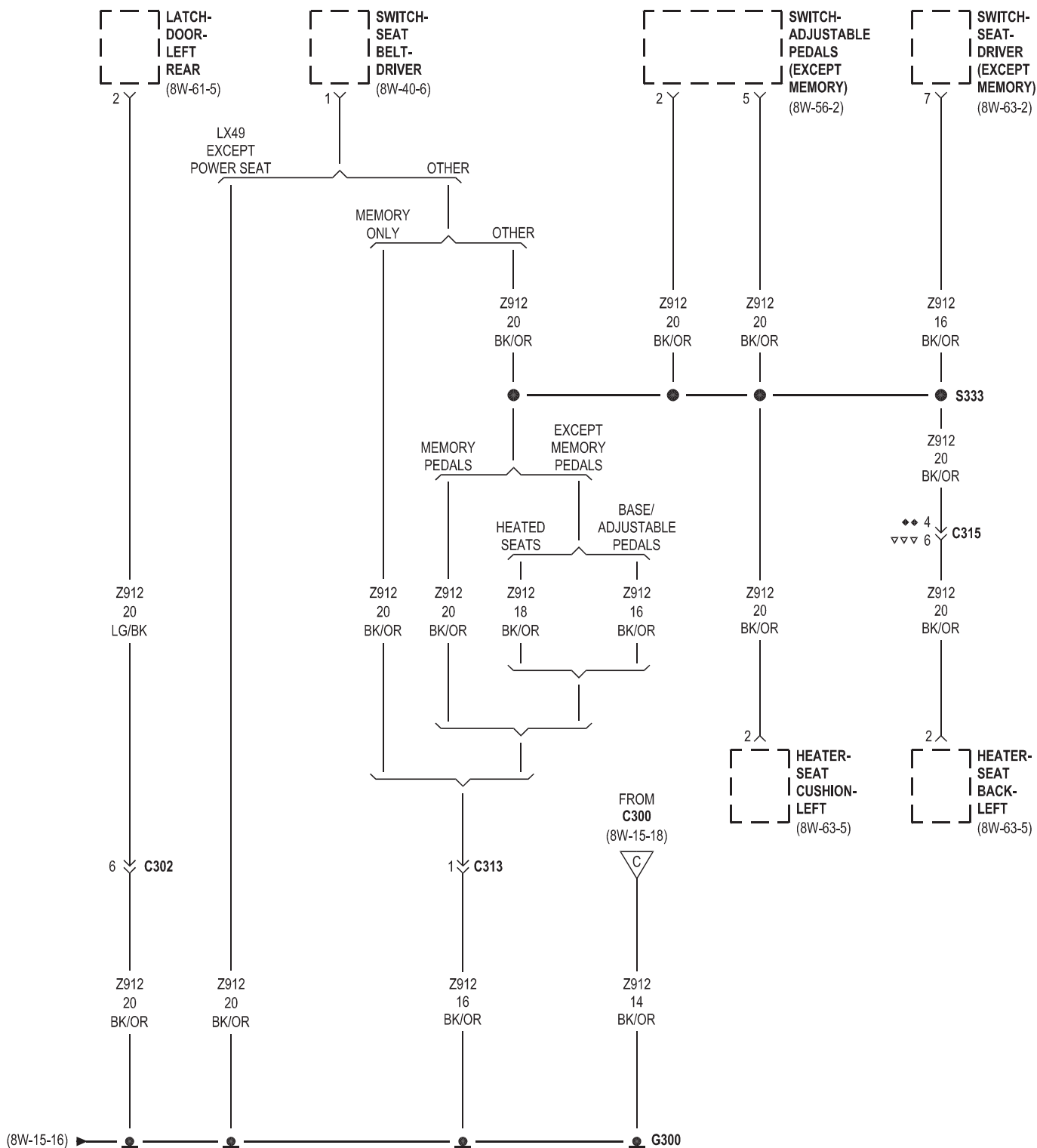




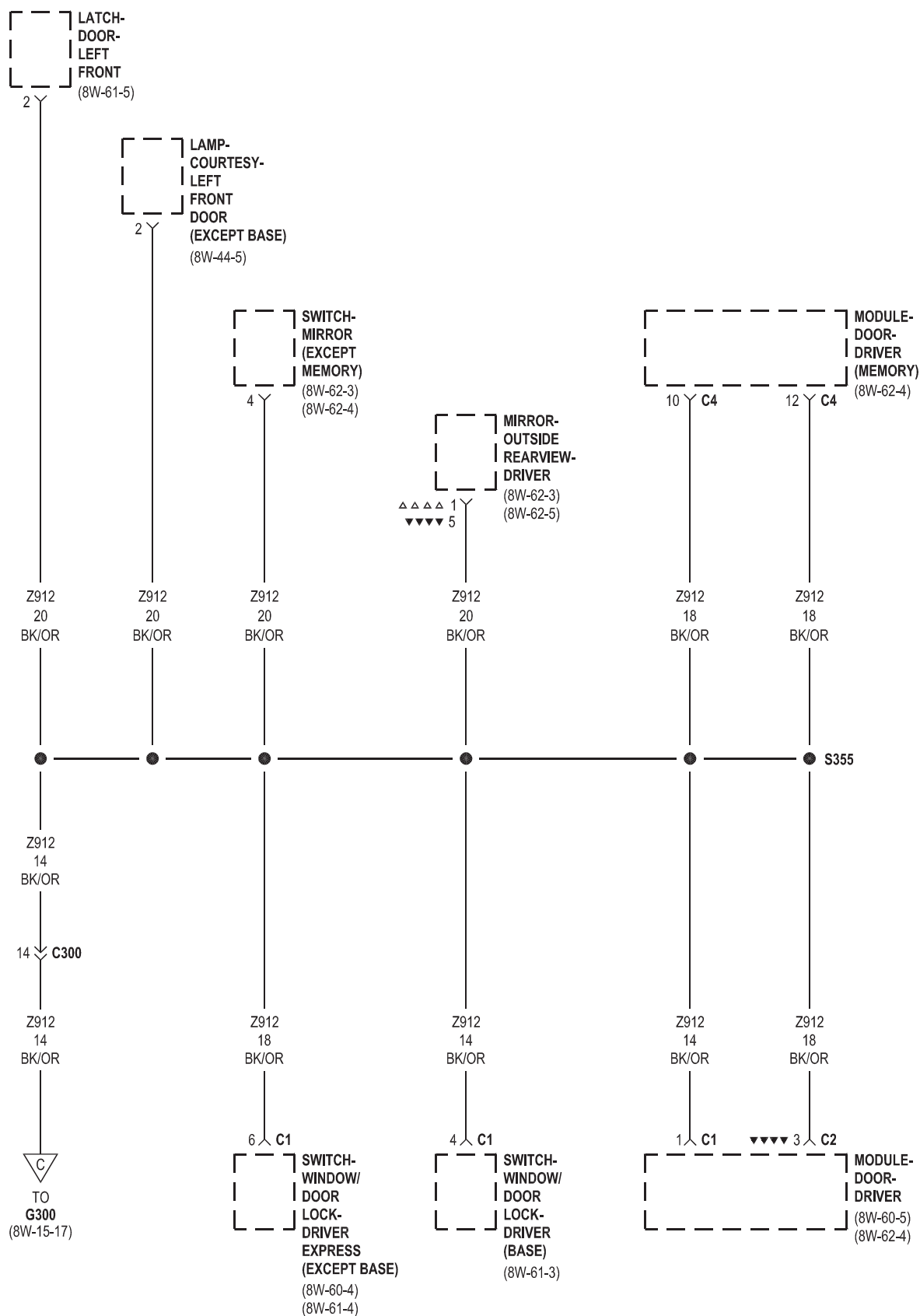


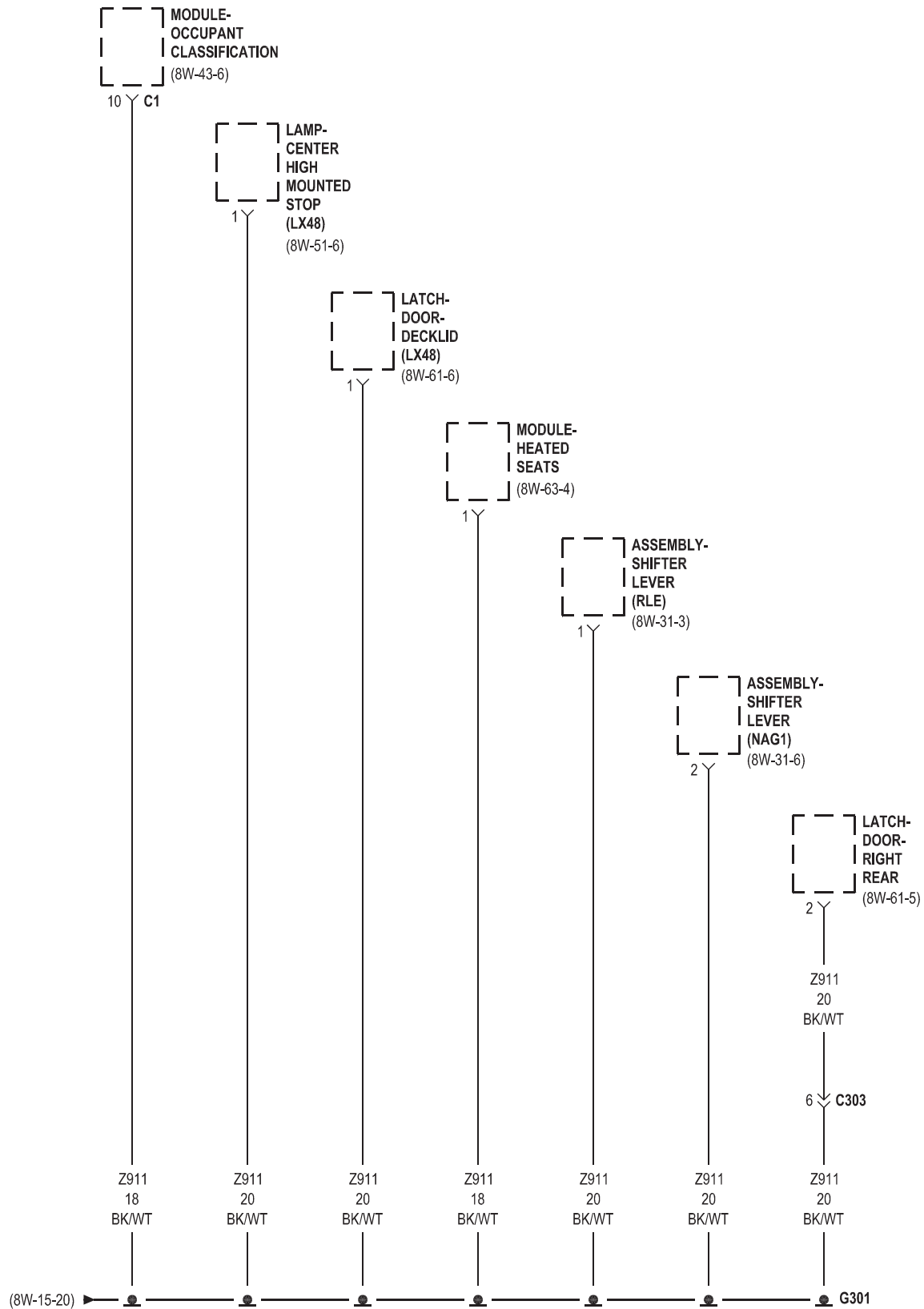


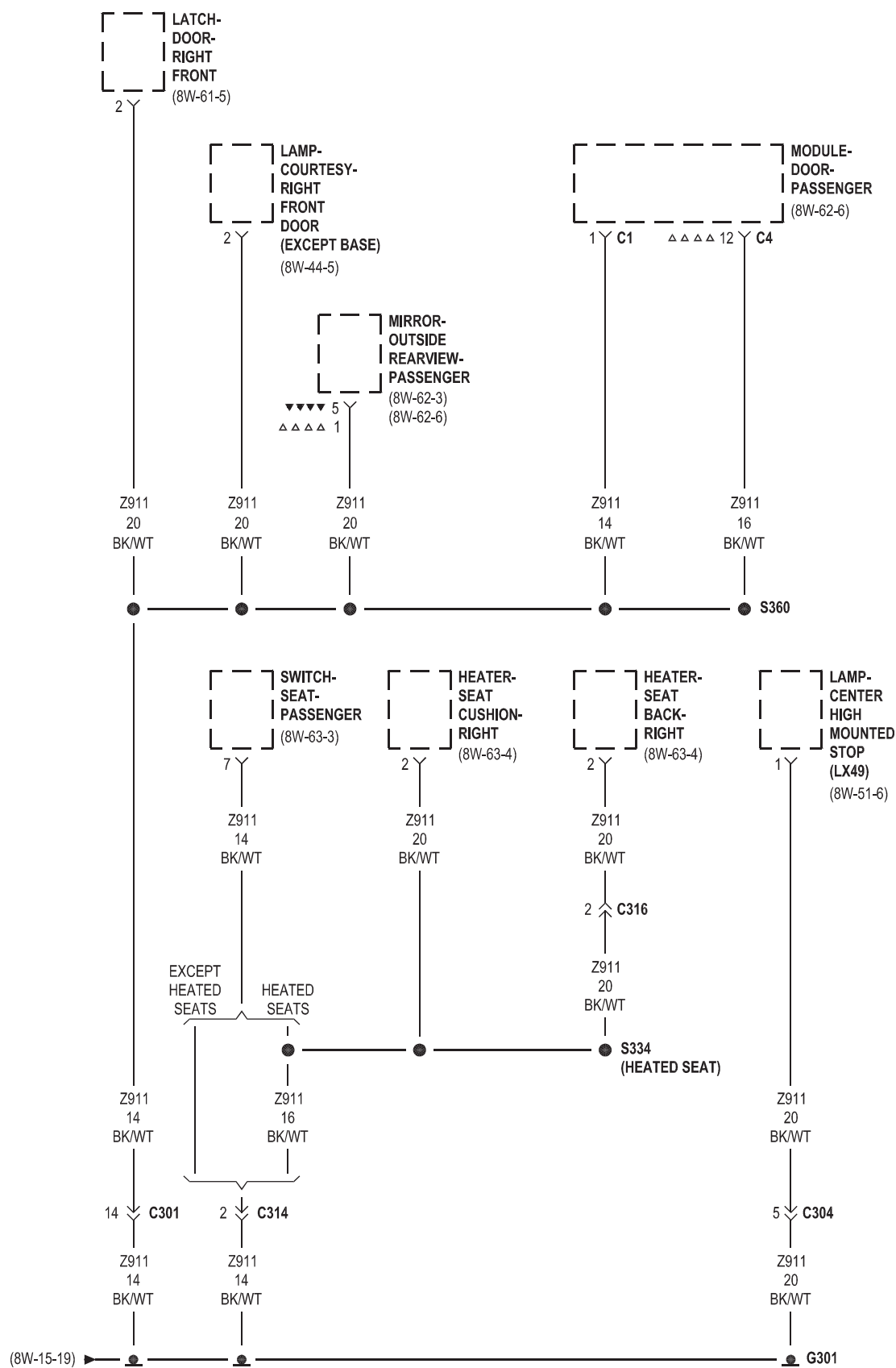


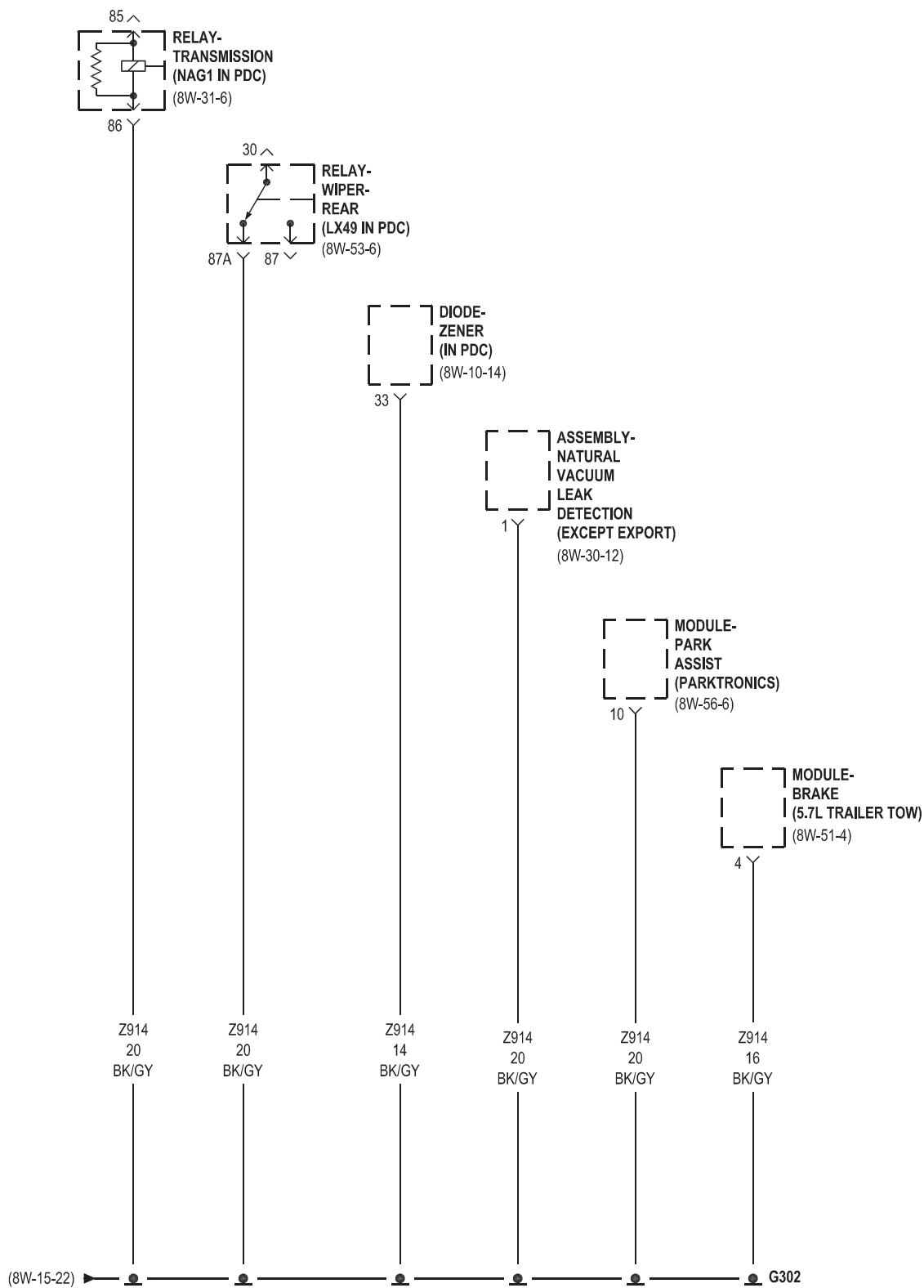


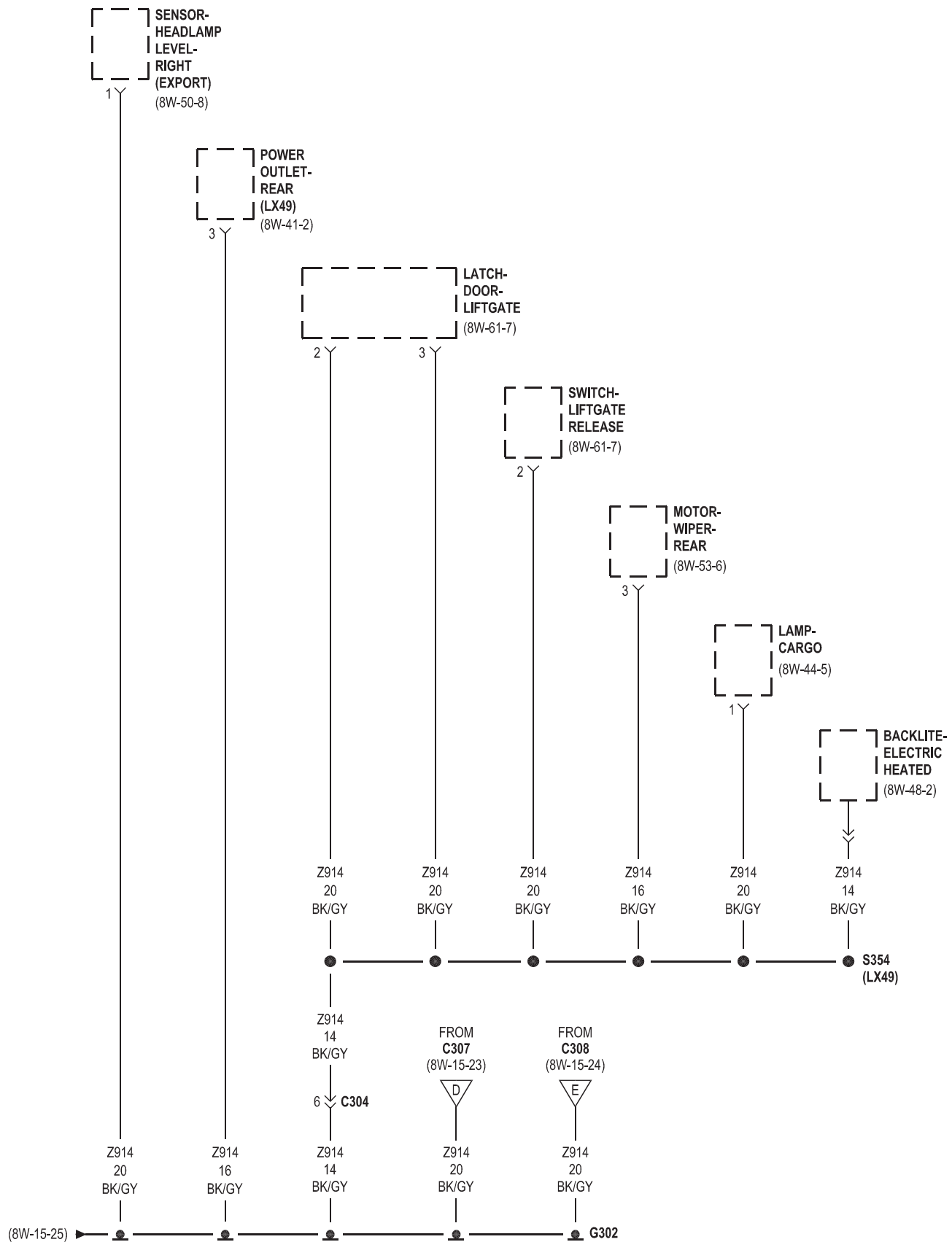


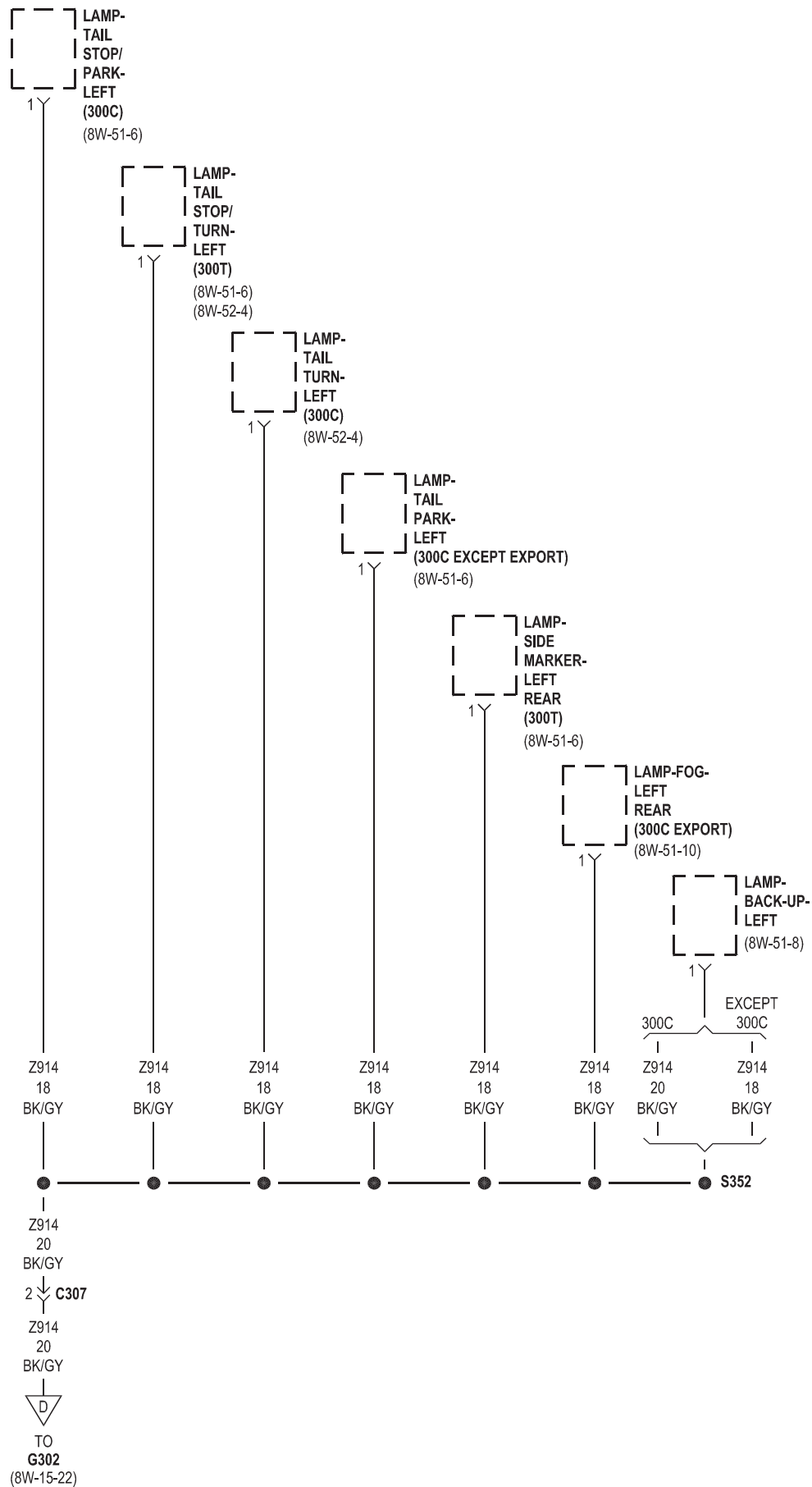


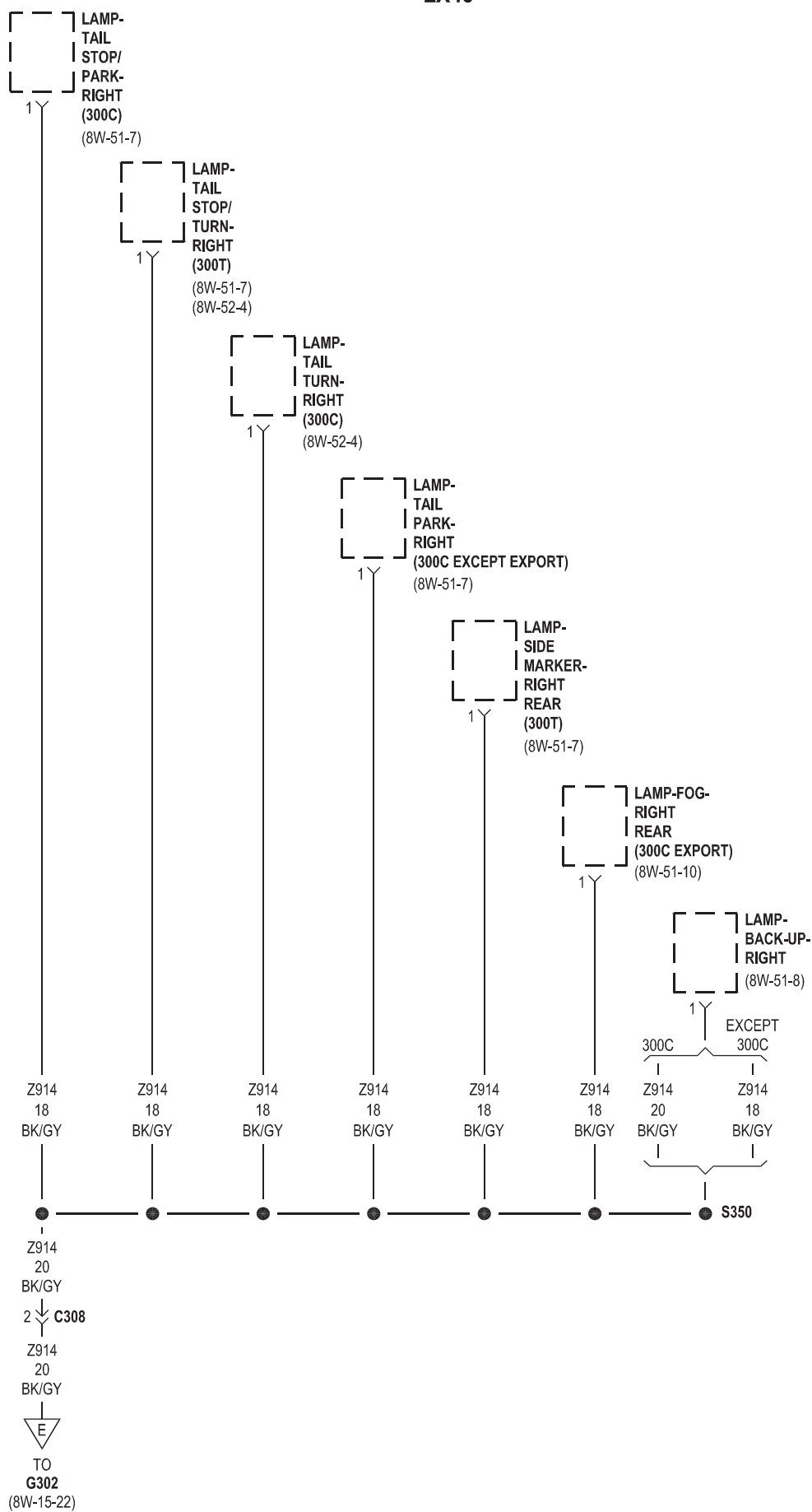






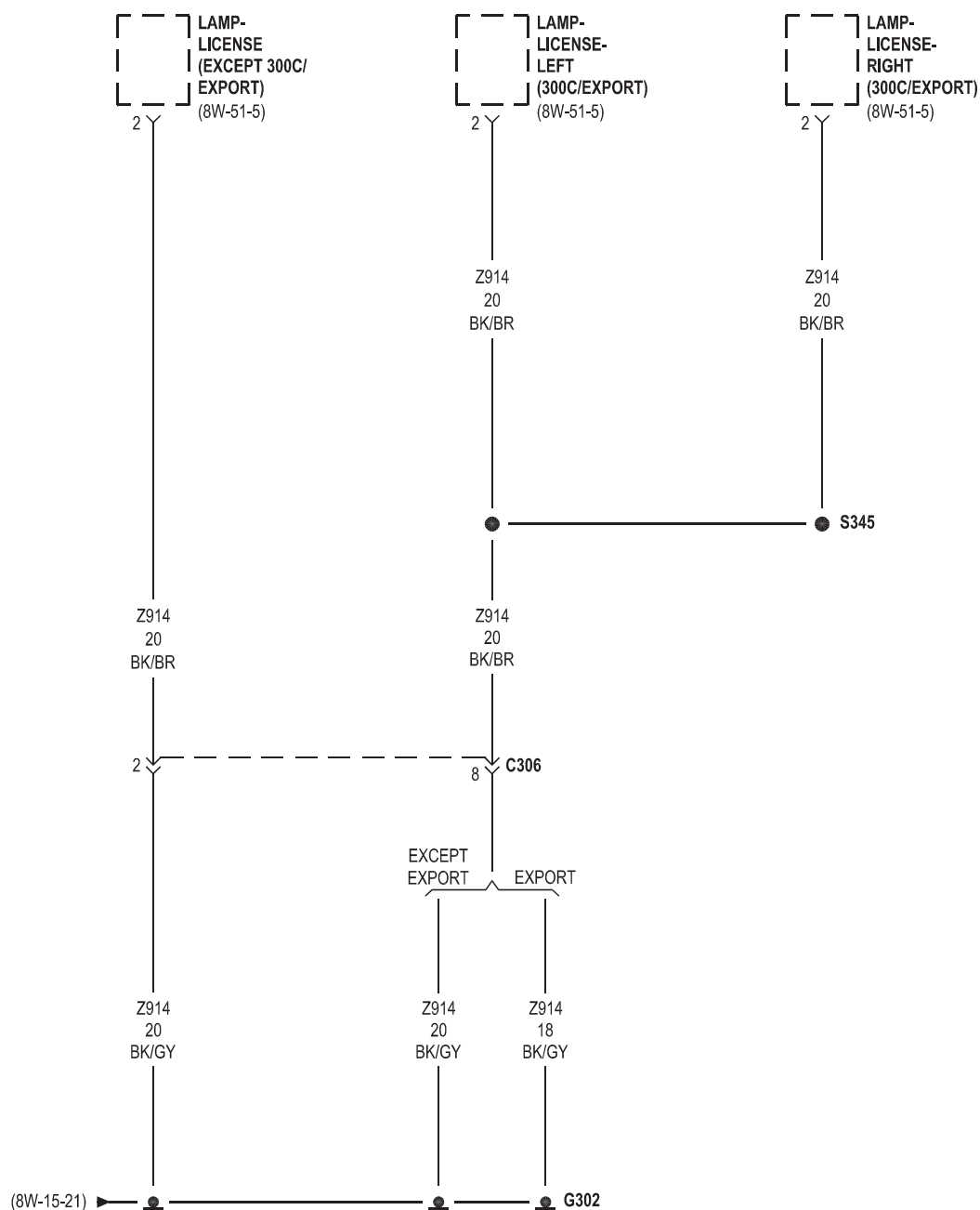




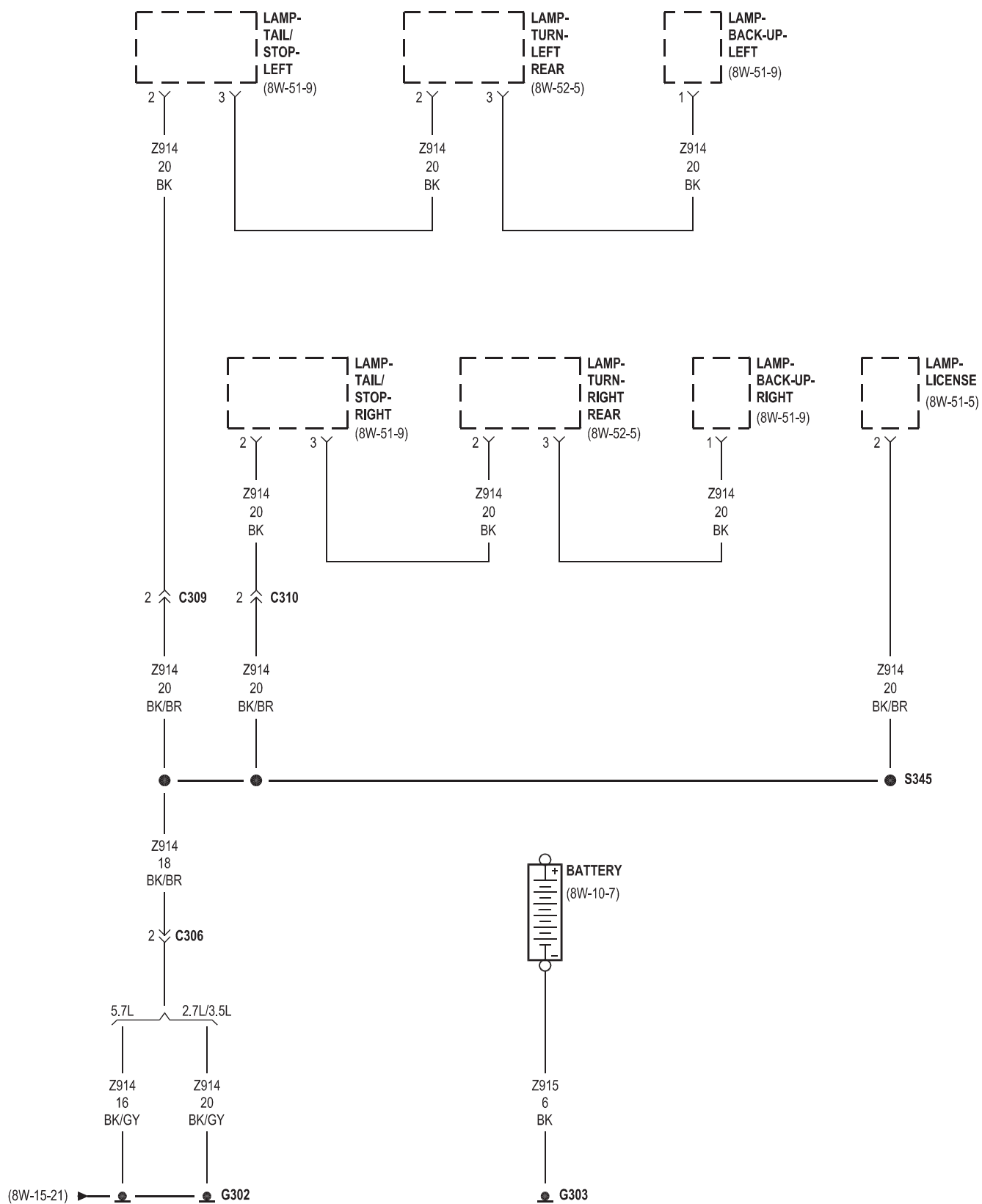


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8W-15 GROUND DISTRIBUTION
8W - 15 - 25

## LX48



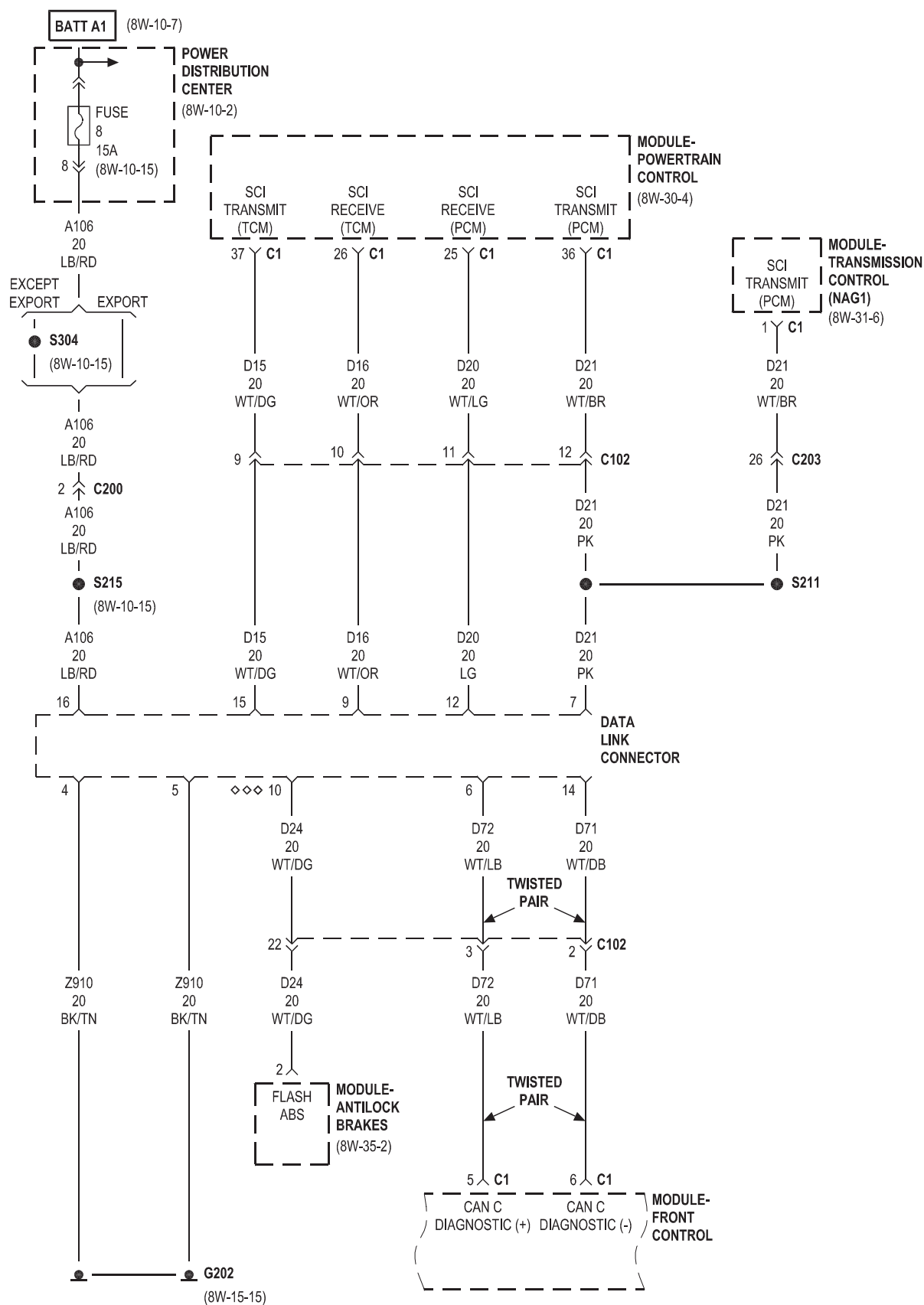


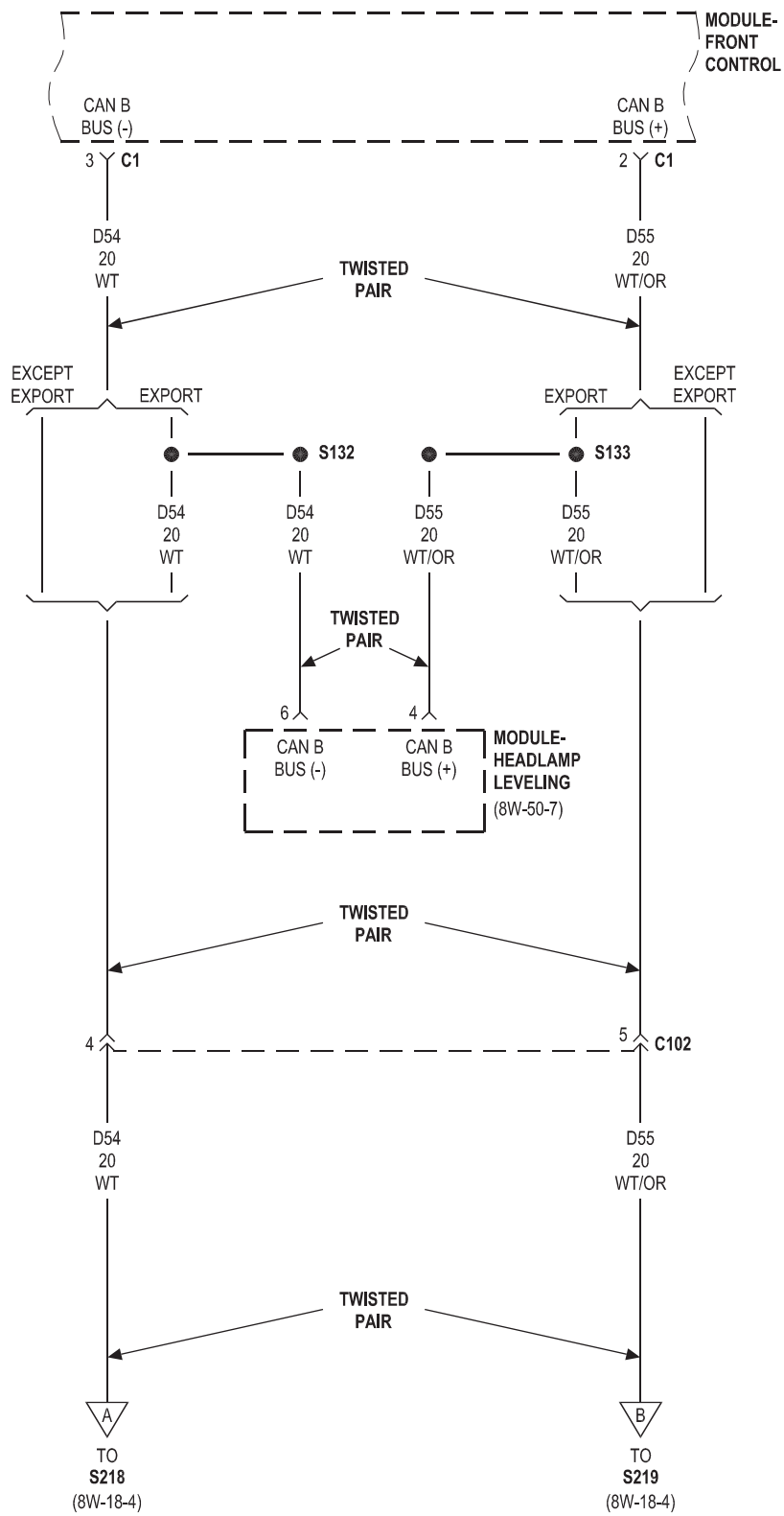


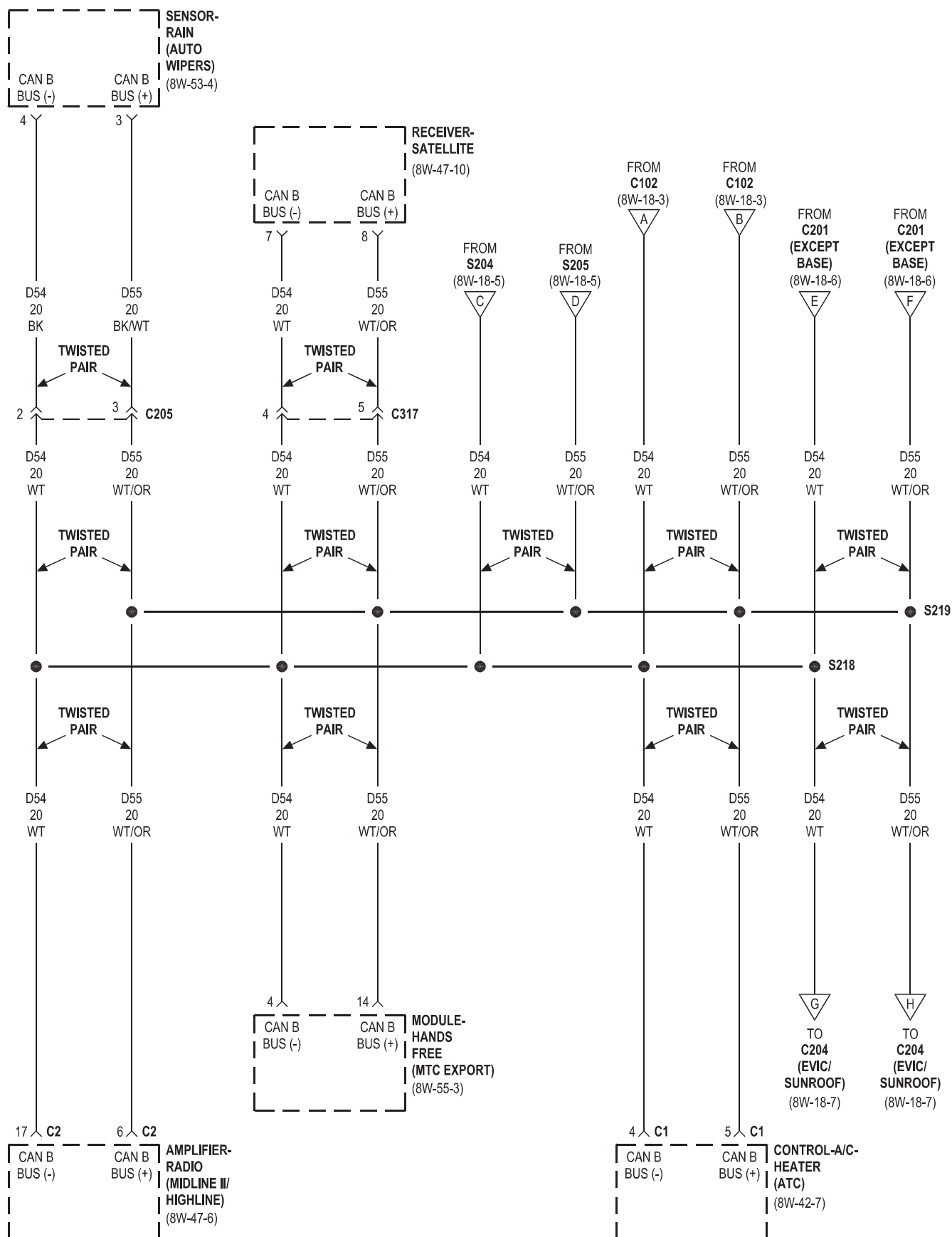
## 8W-18 BUS COMMUNICATIONS

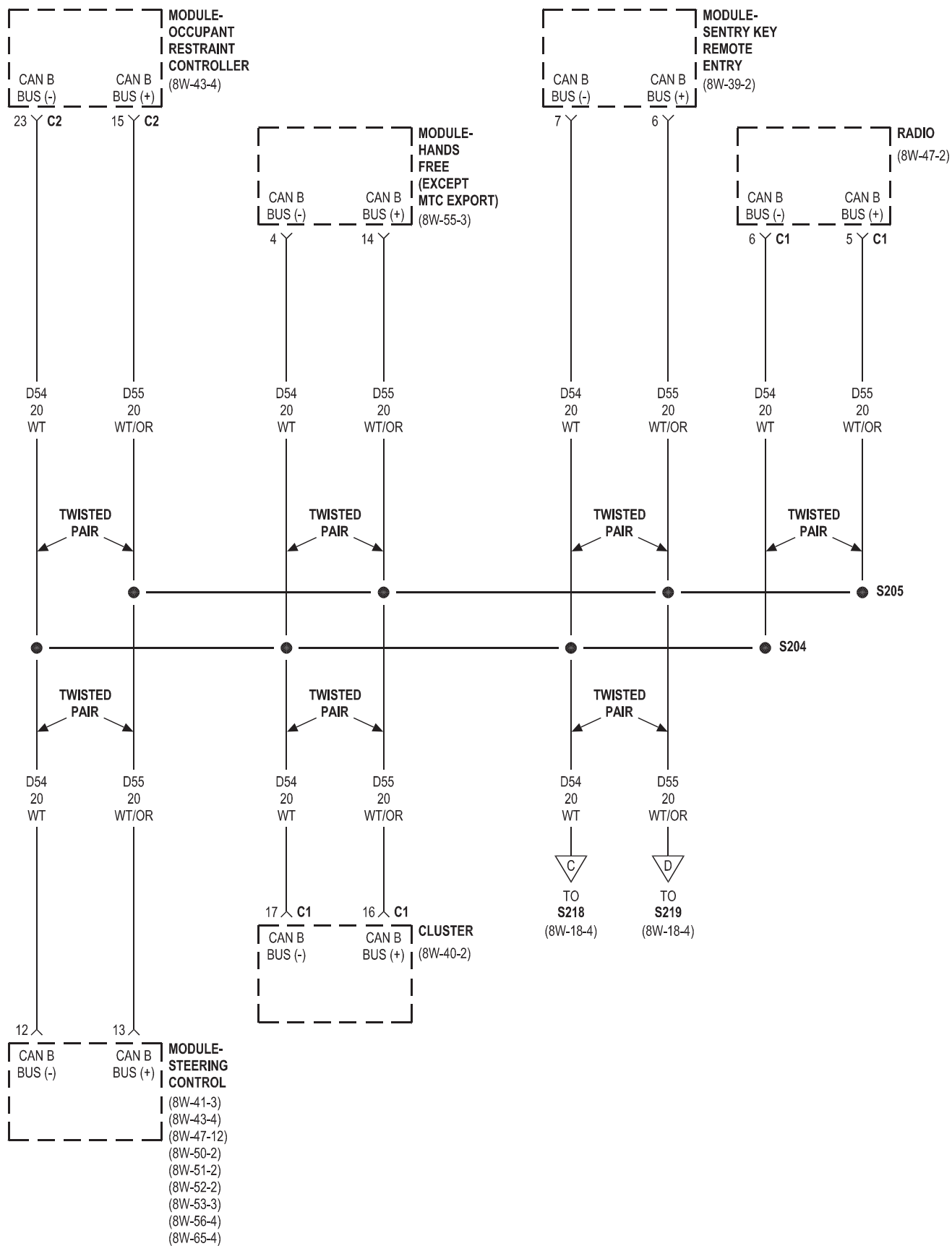
<b>Component</b>	<b>Page</b>
Amplifier-Radio . . . . .	8W-18-4
Assembly-Shifter Lever . . . . .	8W-18-9
Cluster . . . . .	8W-18-5
Control-A/C-Heater . . . . .	8W-18-4
Data Link Connector . . . . .	8W-18-2
Fuse 8 . . . . .	8W-18-2
G202 . . . . .	8W-18-2
Module-Antilock Brakes . . . . .	8W-18-2, 8
Module-Door-Driver . . . . .	8W-18-6
Module-Door-Passenger . . . . .	8W-18-6
Module-Electronic Overhead . . . . .	8W-18-7
Module-Front Control . . . . .	8W-18-2, 3, 8
Module-Hands Free . . . . .	8W-18-4, 5
Module-Headlamp Leveling . . . . .	8W-18-3
Module-Heated Seats . . . . .	8W-18-6

<b>Component</b>	<b>Page</b>
Module-Memory Seat . . . . .	8W-18-6
Module-Occupant Classification . . . . .	8W-18-6
Module-Occupant Restraint Controller . . . . .	8W-18-5
Module-Park Assist . . . . .	8W-18-6
Module-Powertrain Control . . . . .	8W-18-2, 8
Module-Sentry Key Remote Entry . . . . .	8W-18-5
Module-Steering Control . . . . .	8W-18-5, 9
Module-Transmission Control . . . . .	8W-18-2, 9
Motor/Module-Sunroof . . . . .	8W-18-7
Power Distribution Center . . . . .	8W-18-2
Radio . . . . .	8W-18-5
Receiver-Satellite . . . . .	8W-18-4
Sensor-Dynamics . . . . .	8W-18-8
Sensor-Rain . . . . .	8W-18-4







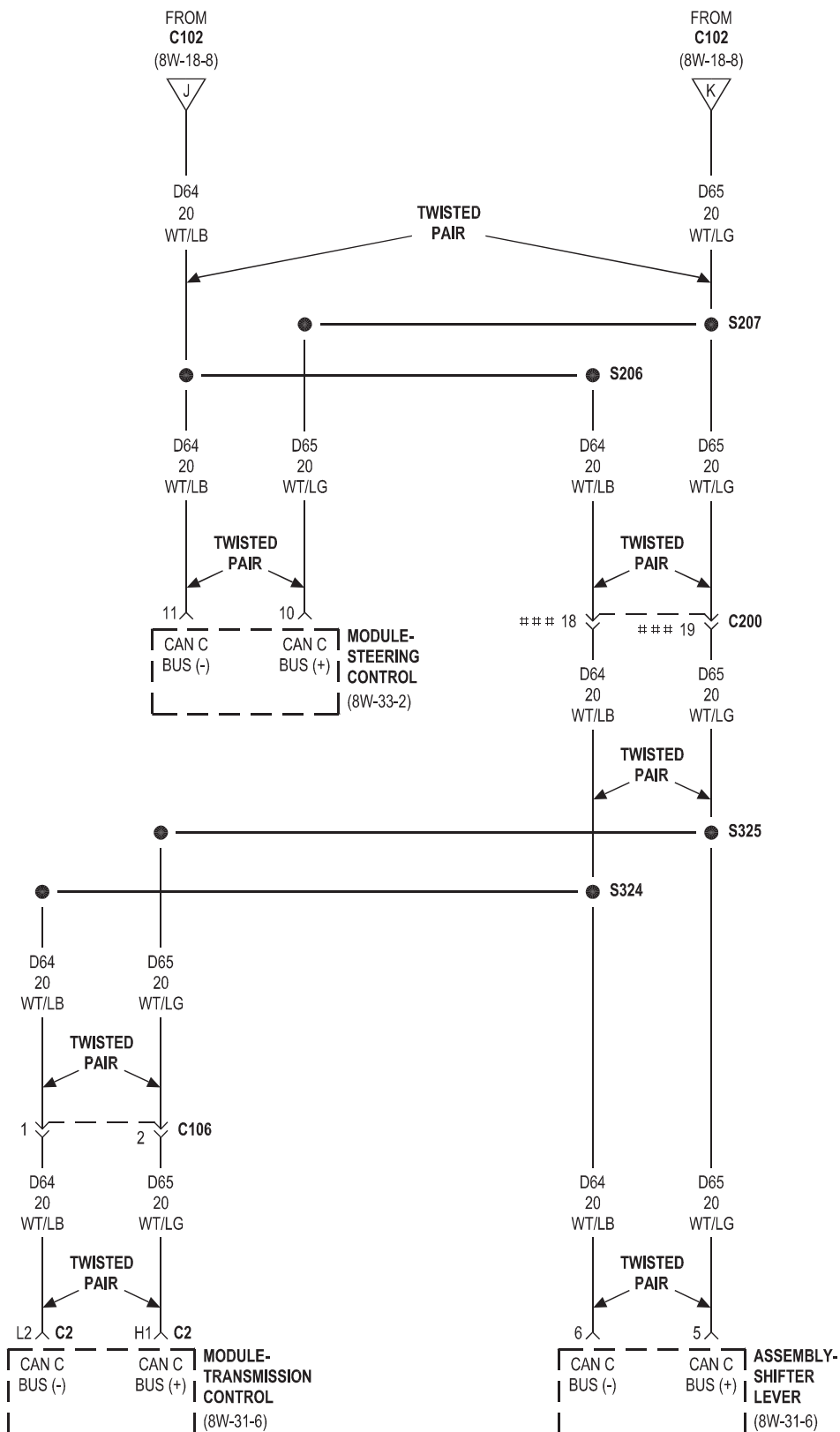








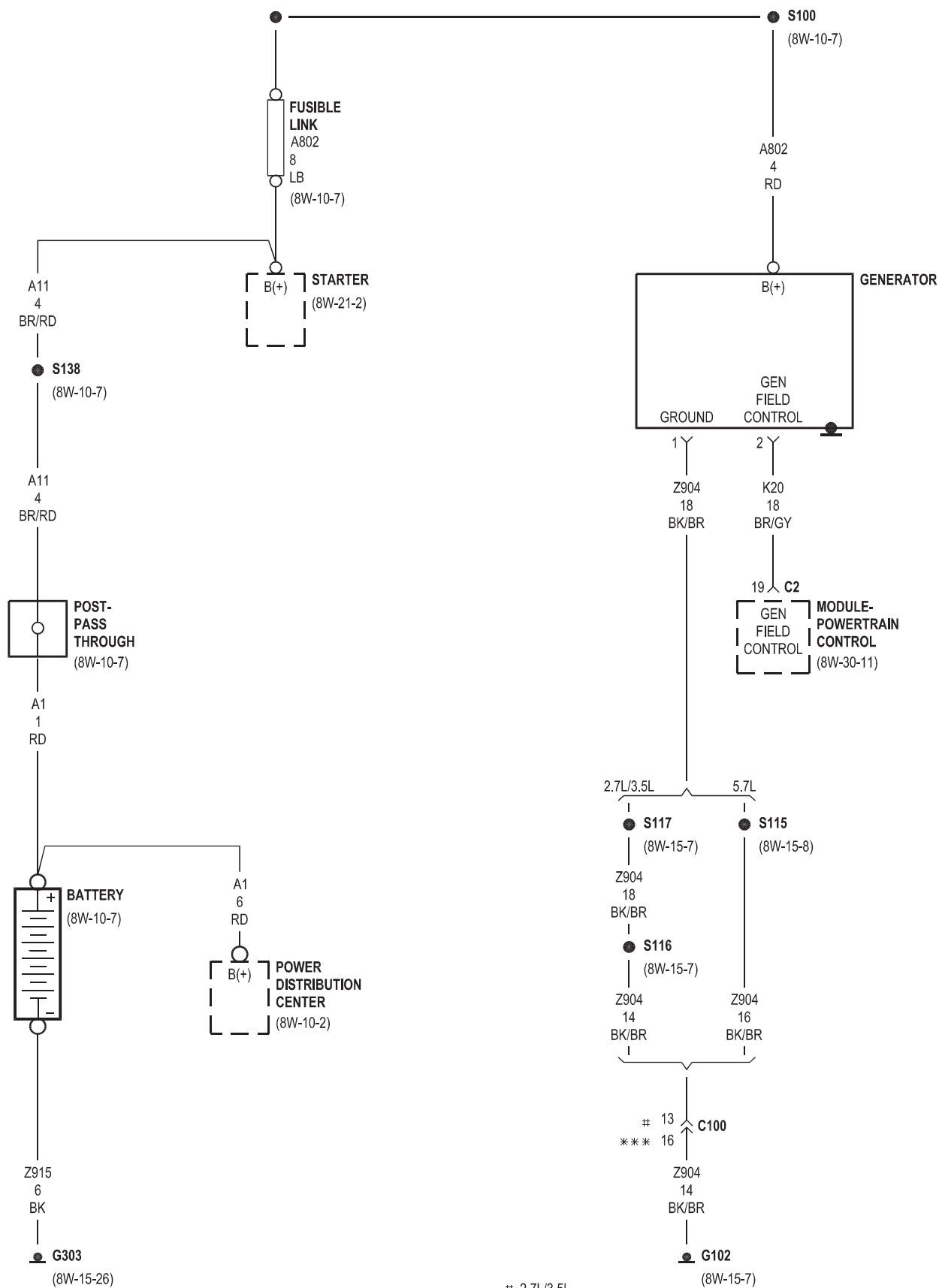






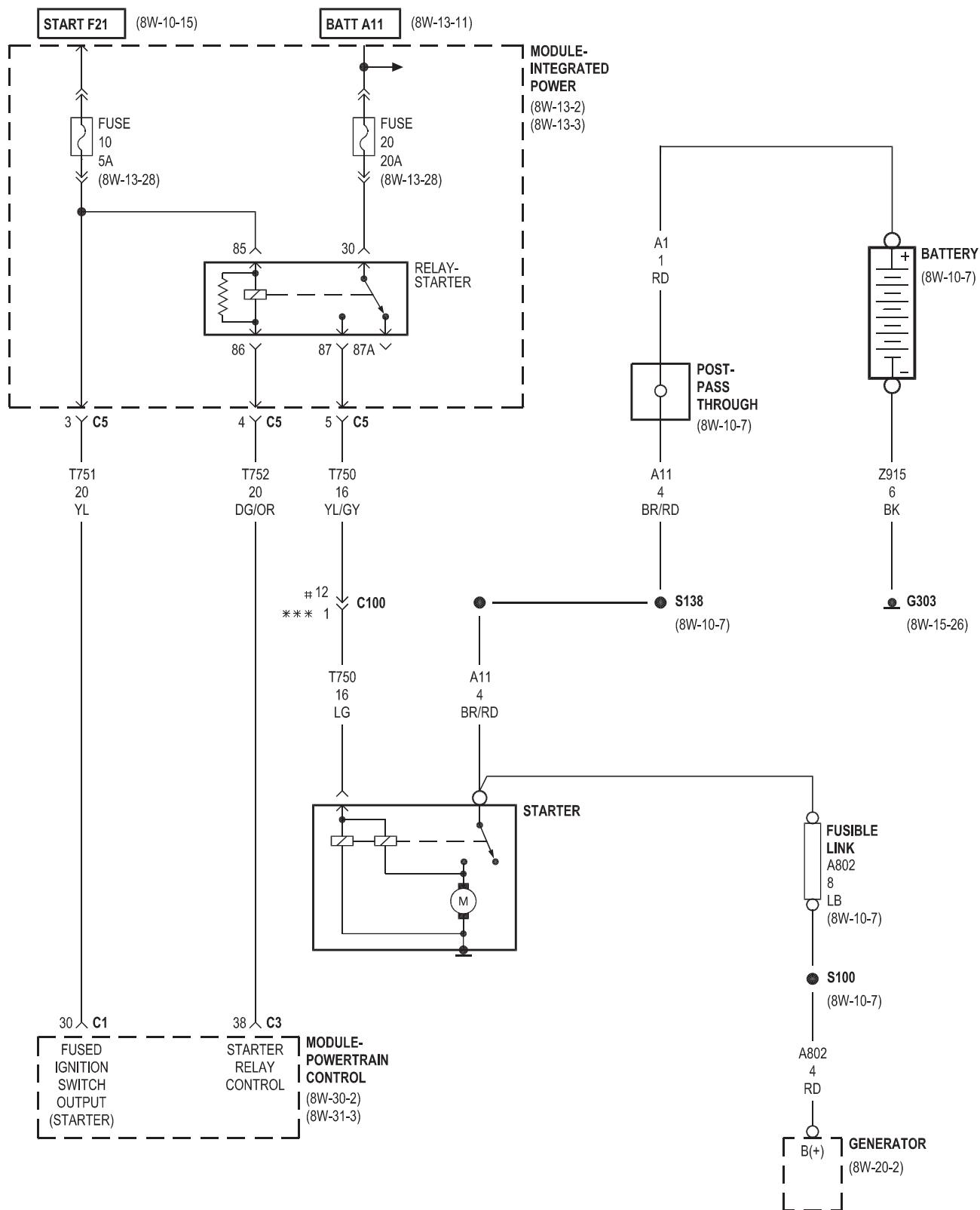
## 8W-20 CHARGING SYSTEM

<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Battery . . . . .	8W-20-2	Module-Powertrain Control . . . . .	8W-20-2
Fusible Link . . . . .	8W-20-2	Post-Pass Through . . . . .	8W-20-2
G102 . . . . .	8W-20-2	Power Distribution Center . . . . .	8W-20-2
G303 . . . . .	8W-20-2	Starter . . . . .	8W-20-2
Generator . . . . .	8W-20-2		



## 8W-21 STARTING SYSTEM

<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Battery . . . . .	8W-21-2	Module-Integrated Power . . . . .	8W-21-2
Fuse 10 . . . . .	8W-21-2	Module-Powertrain Control . . . . .	8W-21-2
Fuse 20 . . . . .	8W-21-2	Post-Pass Through . . . . .	8W-21-2
Fusible Link . . . . .	8W-21-2	Relay-Starter . . . . .	8W-21-2
G303 . . . . .	8W-21-2	Starter . . . . .	8W-21-2
Generator . . . . .	8W-21-2		



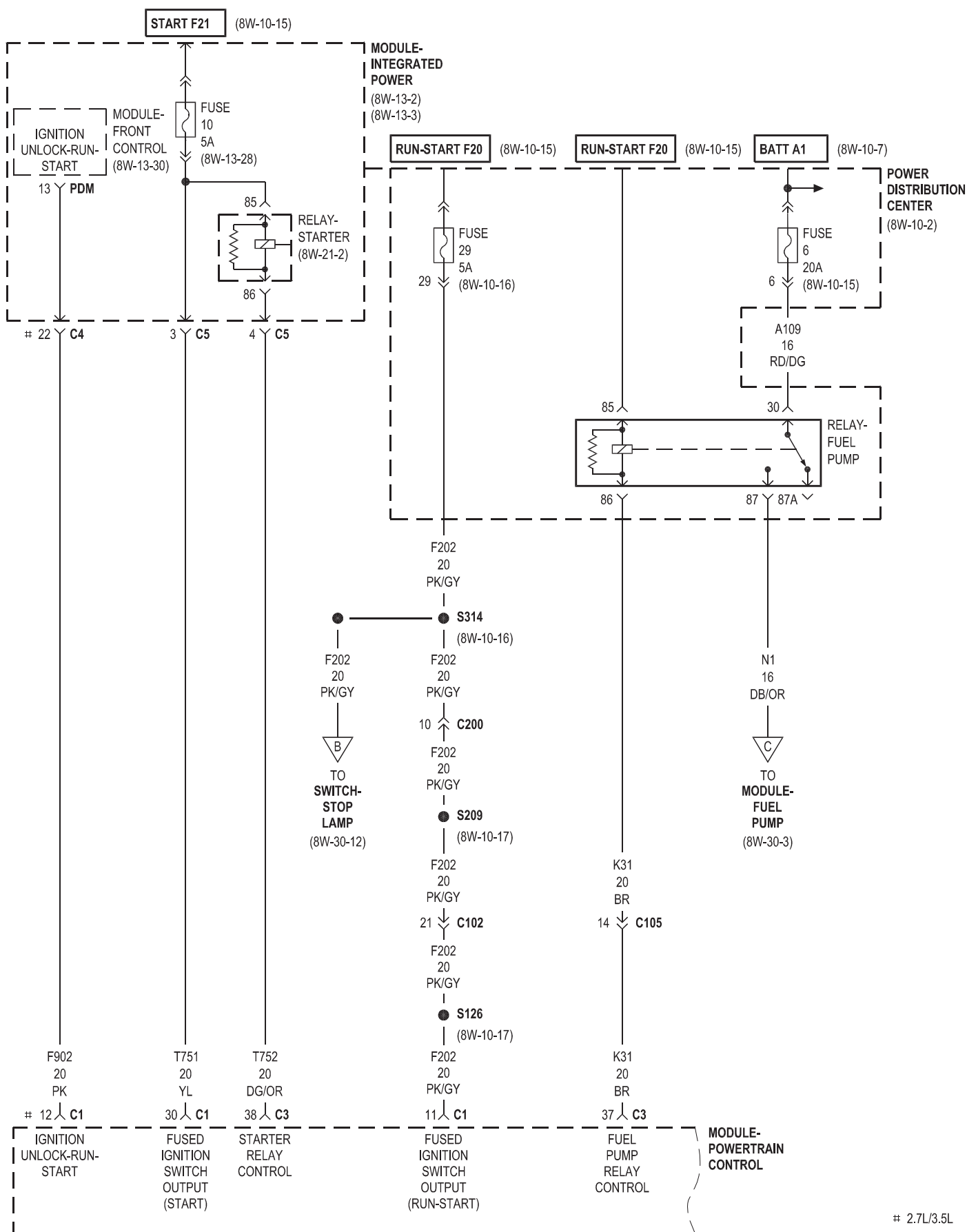
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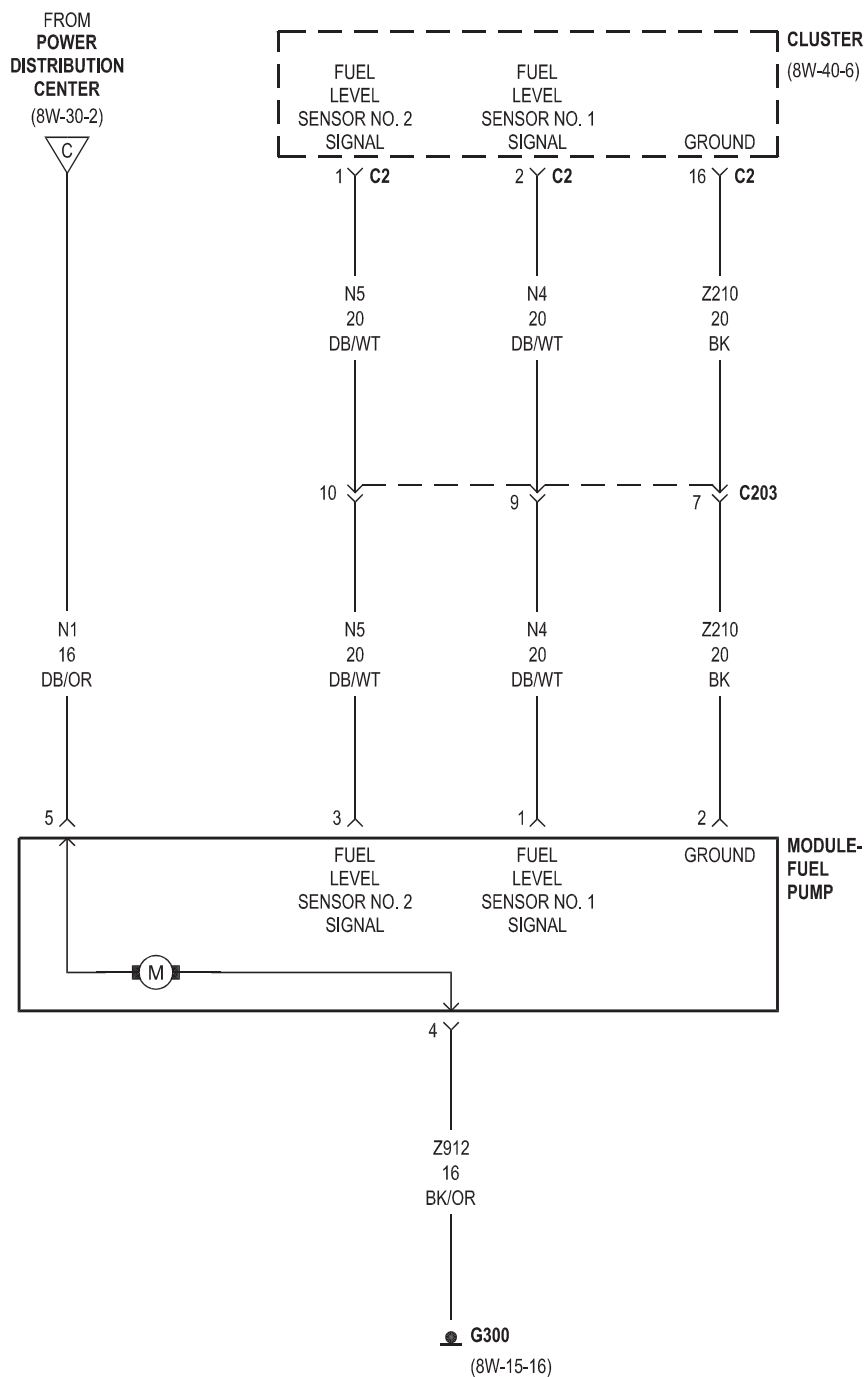
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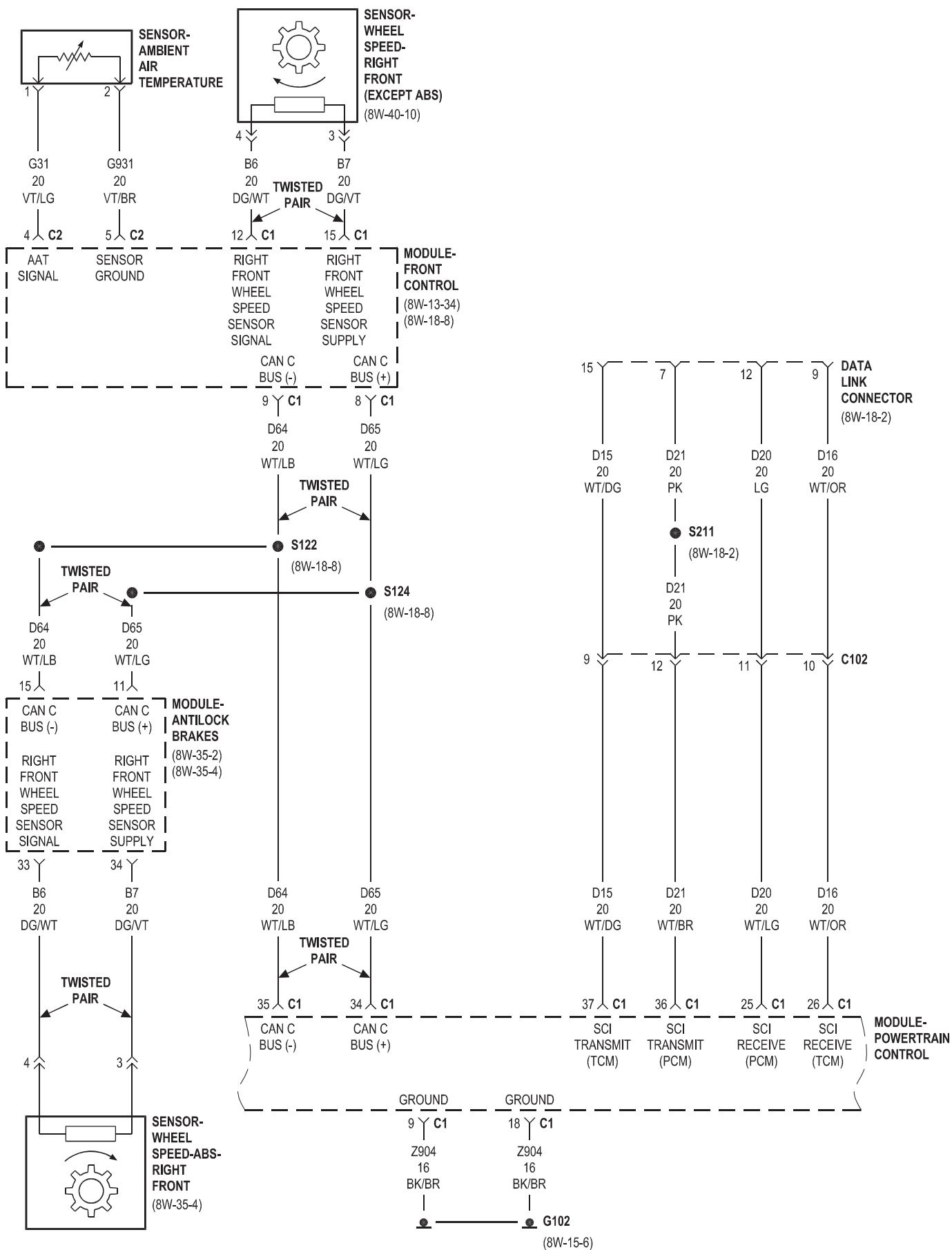
## 8W-30 FUEL/IGNITION SYSTEM

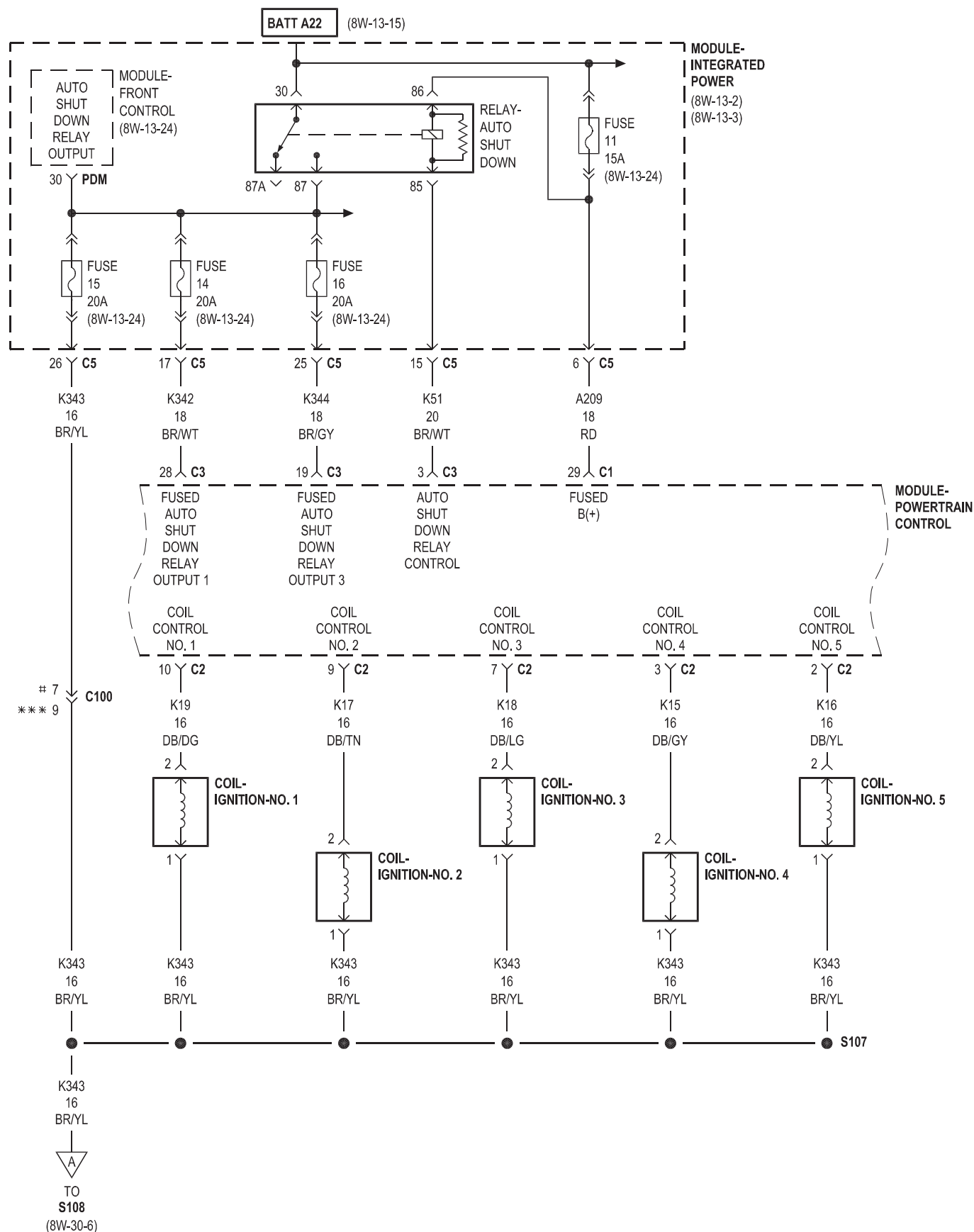
<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Assembly-Exhaust Gas Recirculation Valve . . . . .	8W-30-11	Module-Integrated Power . . . . .	8W-30-2, 5, 13
Assembly-Natural Vacuum Leak Detection . . . . .	8W-30-12	Module-Powertrain Control . . . . .	8W-30-2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Capacitor-Ignition Coil-No. 1 . . . . .	8W-30-6	Power Distribution Center . . . . .	8W-30-2, 3
Capacitor-Ignition Coil-No. 2 . . . . .	8W-30-6	Relay-A/C Clutch . . . . .	8W-30-13
Cluster . . . . .	8W-30-3	Relay-Auto Shut Down . . . . .	8W-30-5
Coil-Ignition-No. 1 . . . . .	8W-30-5	Relay-Fuel Pump . . . . .	8W-30-2
Coil-Ignition-No. 2 . . . . .	8W-30-5	Relay-Radiator Fan Control . . . . .	8W-30-13
Coil-Ignition-No. 3 . . . . .	8W-30-5	Relay-Radiator Fan High . . . . .	8W-30-13
Coil-Ignition-No. 4 . . . . .	8W-30-5	Relay-Radiator Fan High/Low Control . . . . .	8W-30-13
Coil-Ignition-No. 5 . . . . .	8W-30-5	Relay-Starter . . . . .	8W-30-2
Coil-Ignition-No. 6 . . . . .	8W-30-6	Sensor-Accelerator Pedal Position . . . . .	8W-30-11
Coil-Ignition-No. 7 . . . . .	8W-30-6	Sensor-Ambient Air Temperature . . . . .	8W-30-4
Coil-Ignition-No. 8 . . . . .	8W-30-6	Sensor-Camshaft Position . . . . .	8W-30-7
Data Link Connector . . . . .	8W-30-4	Sensor-Crankshaft Position . . . . .	8W-30-7
Fan-Radiator . . . . .	8W-30-13	Sensor-Engine Coolant Temperature . . . . .	8W-30-9
Fuse 6 . . . . .	8W-30-2	Sensor-Inlet Air Temperature . . . . .	8W-30-9
Fuse 10 . . . . .	8W-30-2	Sensor-Knock No. 1 . . . . .	8W-30-9
Fuse 11 . . . . .	8W-30-5	Sensor-Knock No. 2 . . . . .	8W-30-9
Fuse 14 . . . . .	8W-30-5	Sensor-Manifold Absolute Pressure . . . . .	8W-30-7
Fuse 15 . . . . .	8W-30-5	Sensor-Oil Pressure . . . . .	8W-30-10
Fuse 16 . . . . .	8W-30-5	Sensor-Oil Temperature . . . . .	8W-30-10
Fuse 19 . . . . .	8W-30-13	Sensor-Oxygen-Left Front . . . . .	8W-30-8
Fuse 22 . . . . .	8W-30-13	Sensor-Oxygen-Left Rear . . . . .	8W-30-8
Fuse 29 . . . . .	8W-30-2	Sensor-Oxygen-Right Front . . . . .	8W-30-8
G100 . . . . .	8W-30-8	Sensor-Oxygen-Right Rear . . . . .	8W-30-8
G102 . . . . .	8W-30-4, 10, 11, 13	Sensor-Wheel Speed-Abs-Right Front . . . . .	8W-30-4
G109 . . . . .	8W-30-8	Sensor-Wheel Speed-Right Front . . . . .	8W-30-4
G300 . . . . .	8W-30-3, 12	Solenoid-Manifold Tuning Valve . . . . .	8W-30-11
G302 . . . . .	8W-30-12	Solenoid-Multi Displacement System Cyl 1 . . . . .	8W-30-10
Generator . . . . .	8W-30-11	Solenoid-Multi Displacement System Cyl 4 . . . . .	8W-30-10
Injector-Fuel-No. 1 . . . . .	8W-30-6	Solenoid-Multi Displacement System Cyl 6 . . . . .	8W-30-10
Injector-Fuel-No. 2 . . . . .	8W-30-6	Solenoid-Multi Displacement System Cyl 7 . . . . .	8W-30-10
Injector-Fuel-No. 3 . . . . .	8W-30-6	Solenoid-Proportional Purge . . . . .	8W-30-12
Injector-Fuel-No. 4 . . . . .	8W-30-6	Solenoid-Short Runner Valve . . . . .	8W-30-6
Injector-Fuel-No. 5 . . . . .	8W-30-6	Switch-Oil Pressure . . . . .	8W-30-9
Injector-Fuel-No. 6 . . . . .	8W-30-6	Switch-Stop Lamp . . . . .	8W-30-2, 12
Injector-Fuel-No. 7 . . . . .	8W-30-6	Throttle Body . . . . .	8W-30-7
Injector-Fuel-No. 8 . . . . .	8W-30-6		
Module-Antilock Brakes . . . . .	8W-30-4, 12		
Module-Front Control . . . . .	8W-30-2, 4, 5, 13		
Module-Fuel Pump . . . . .	8W-30-2, 3		

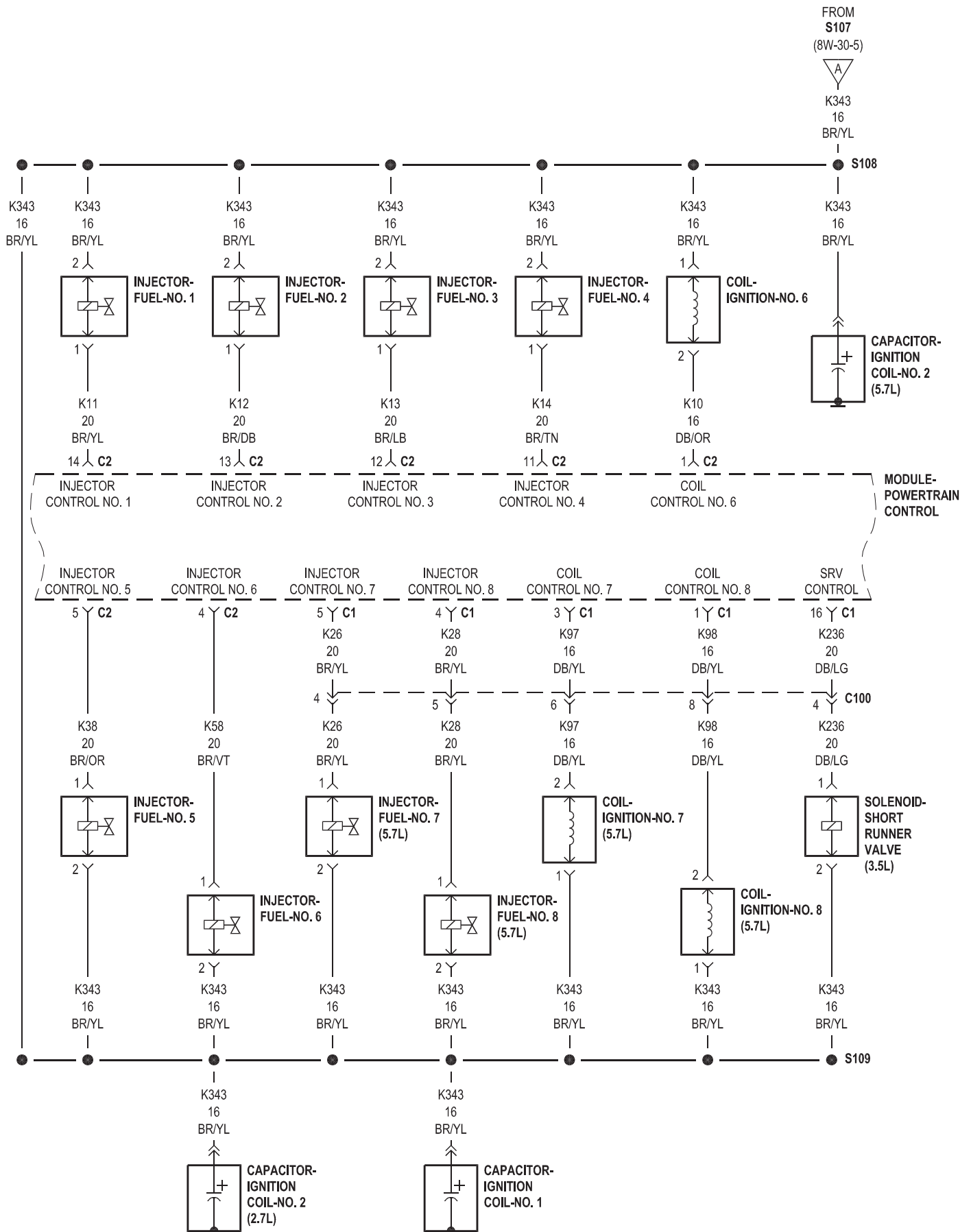


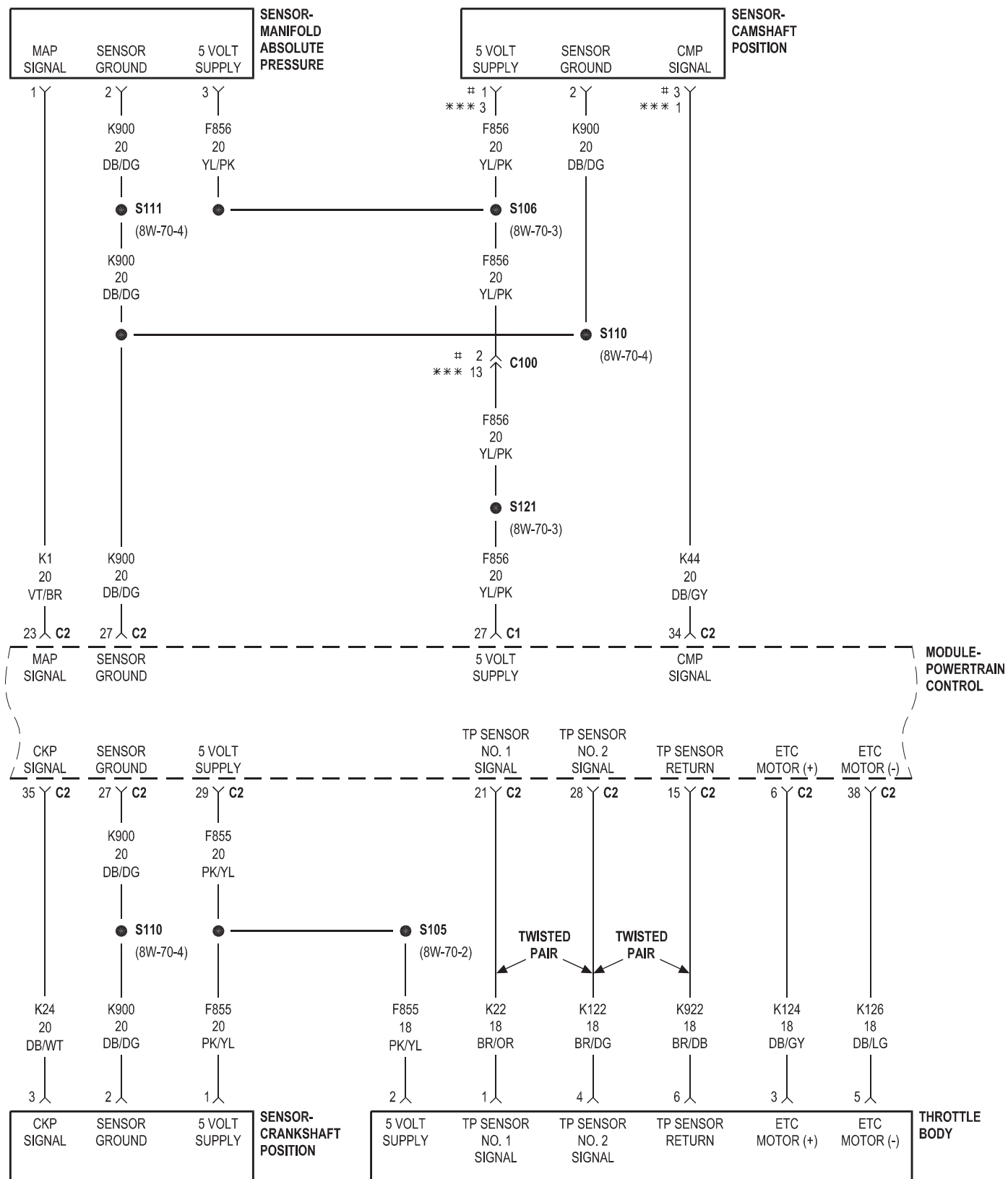


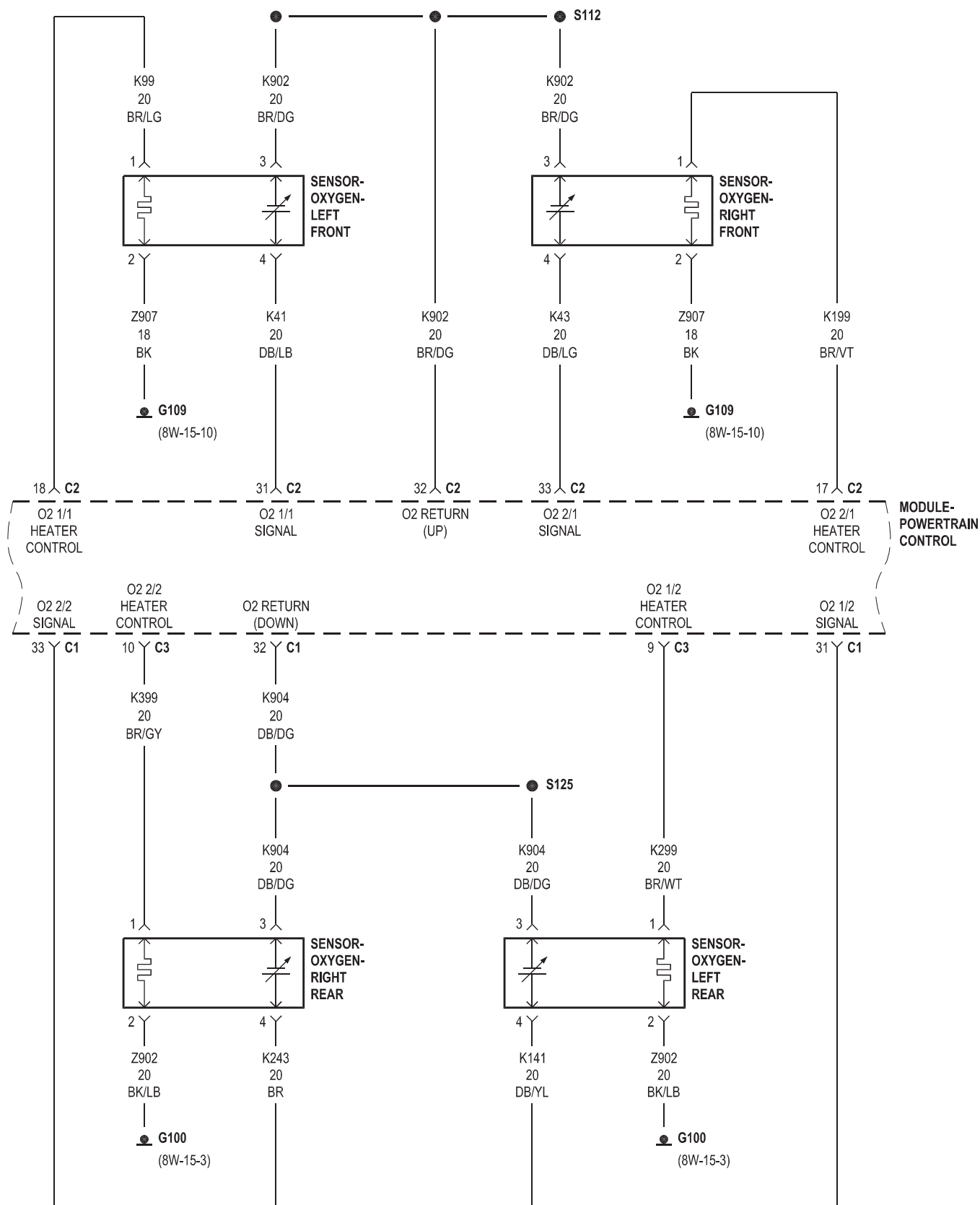


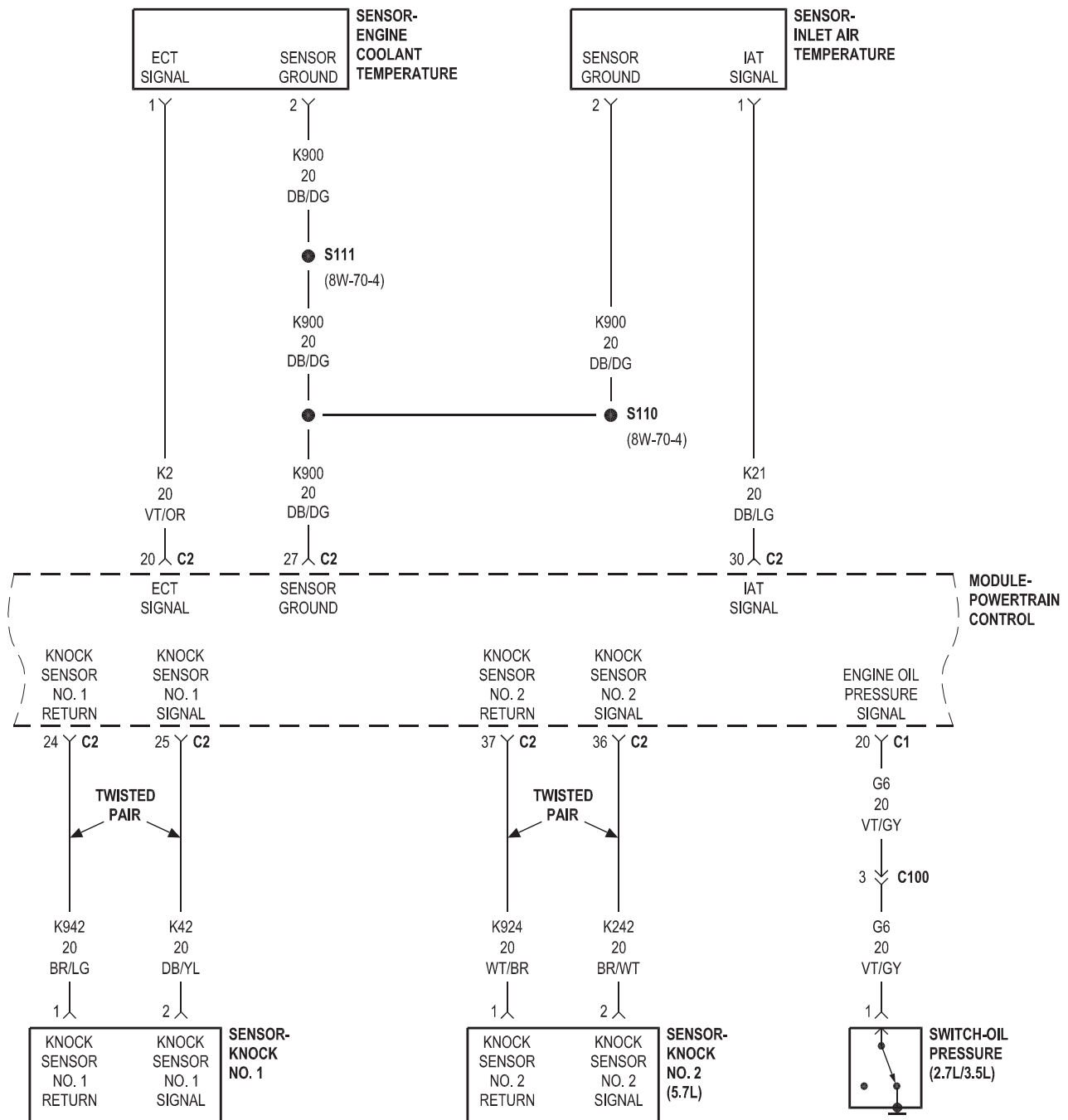






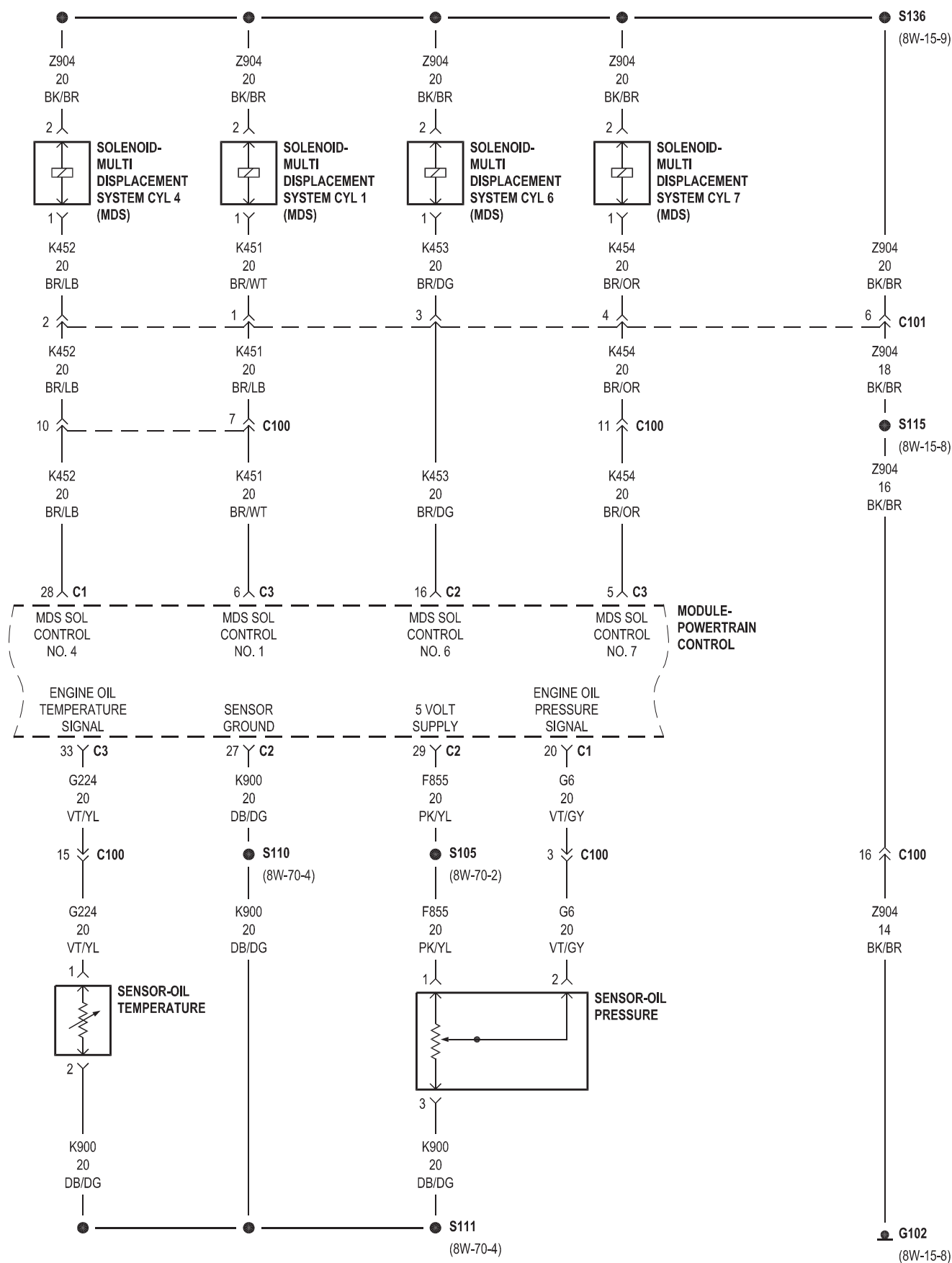


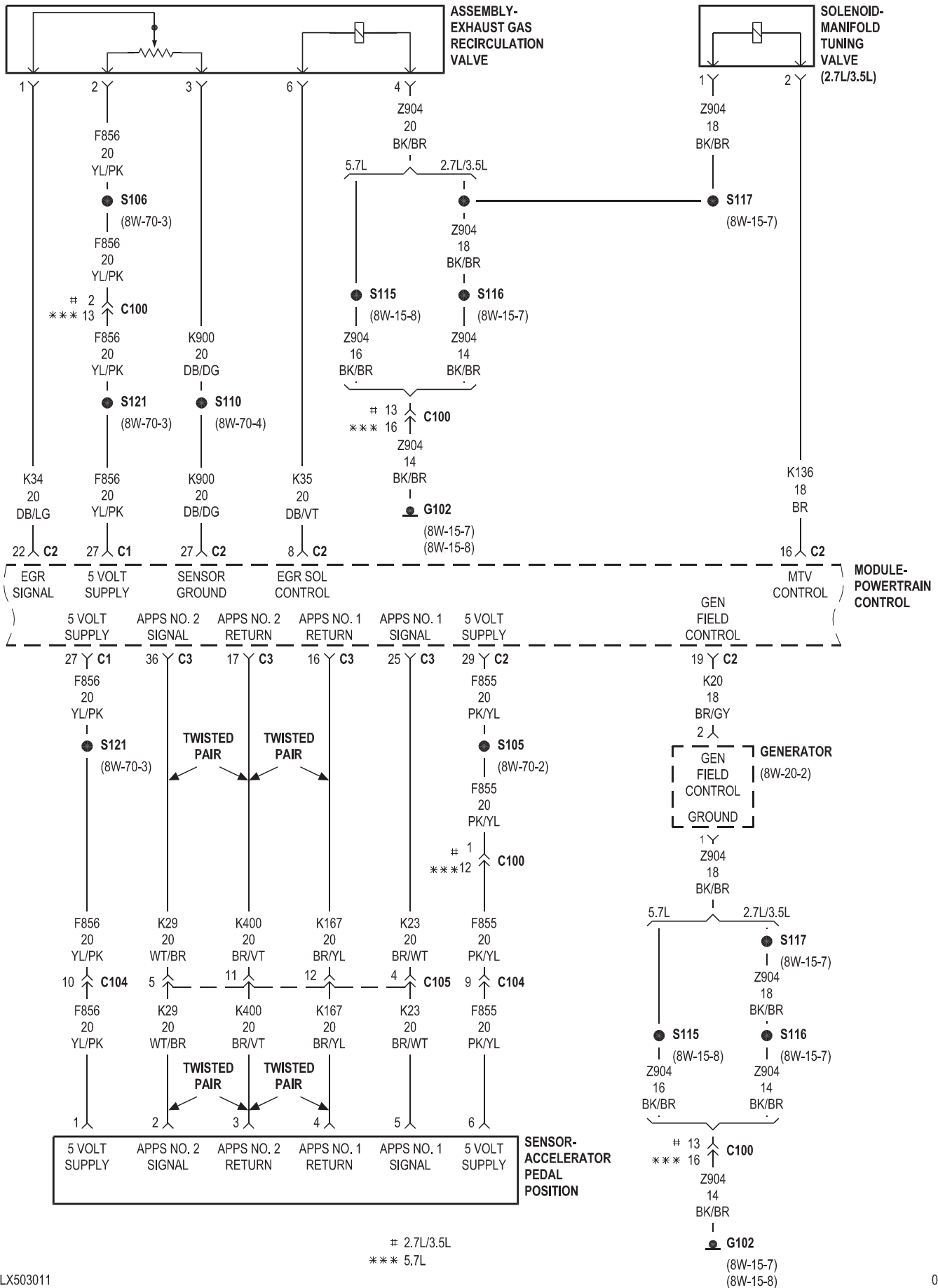


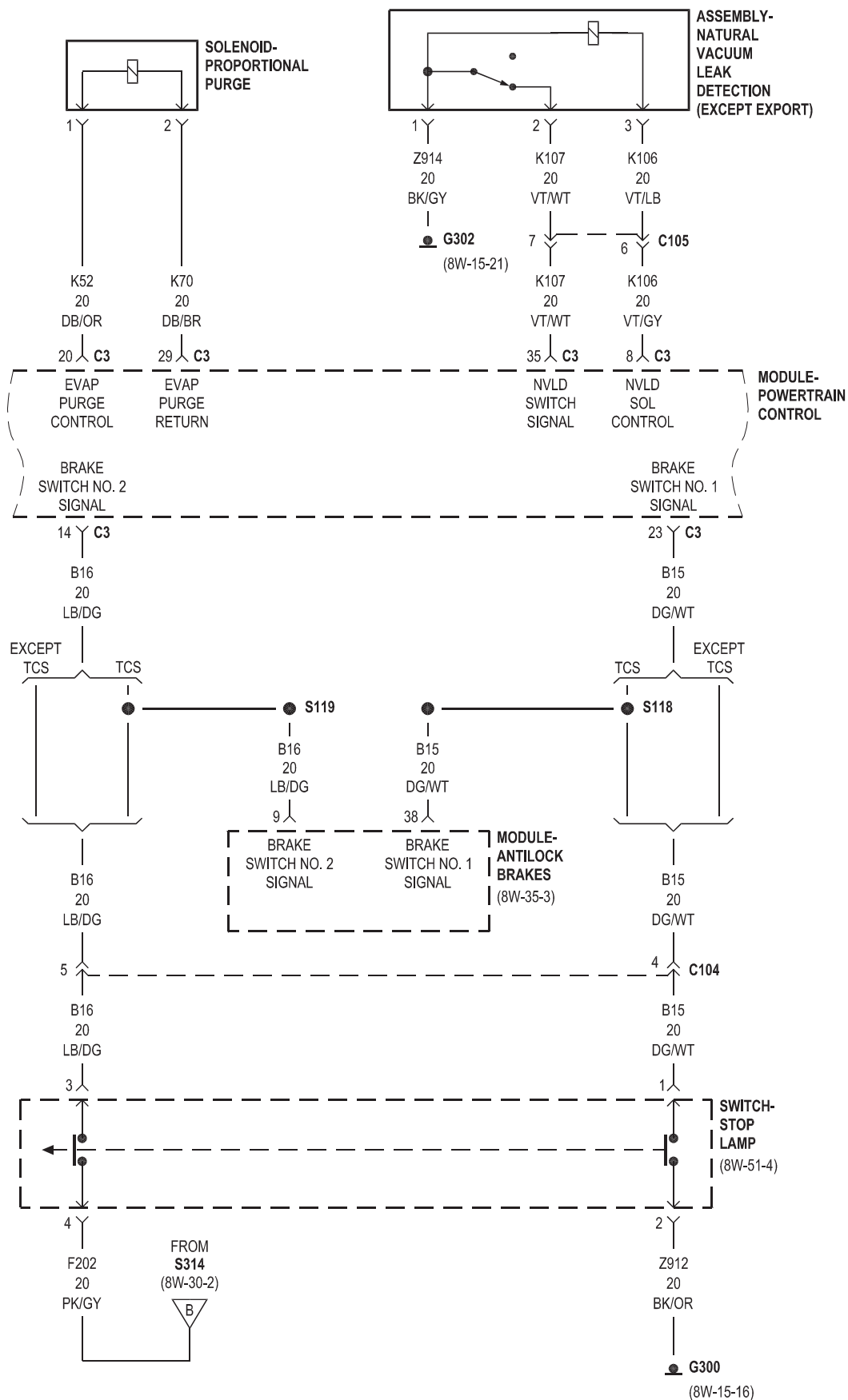


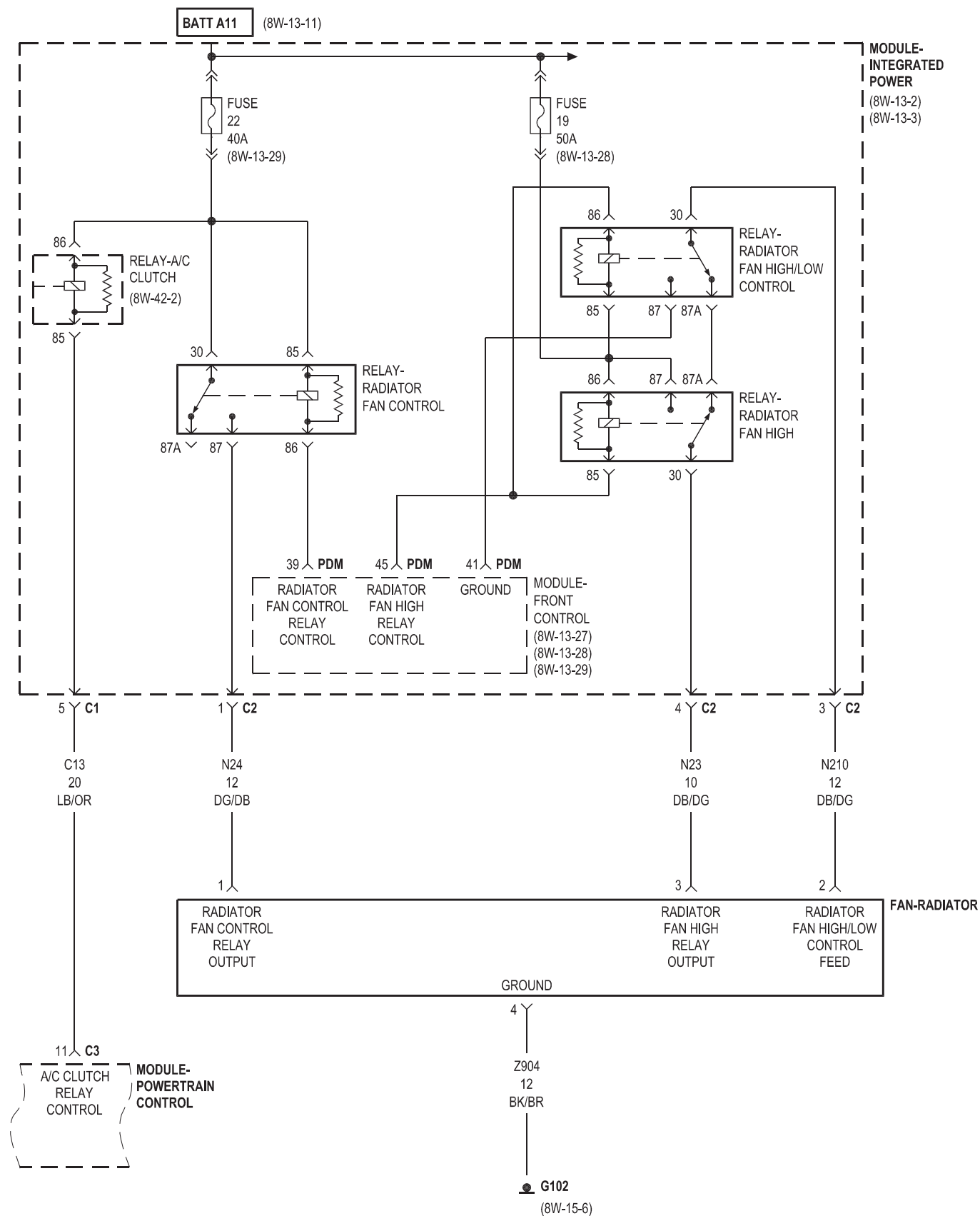


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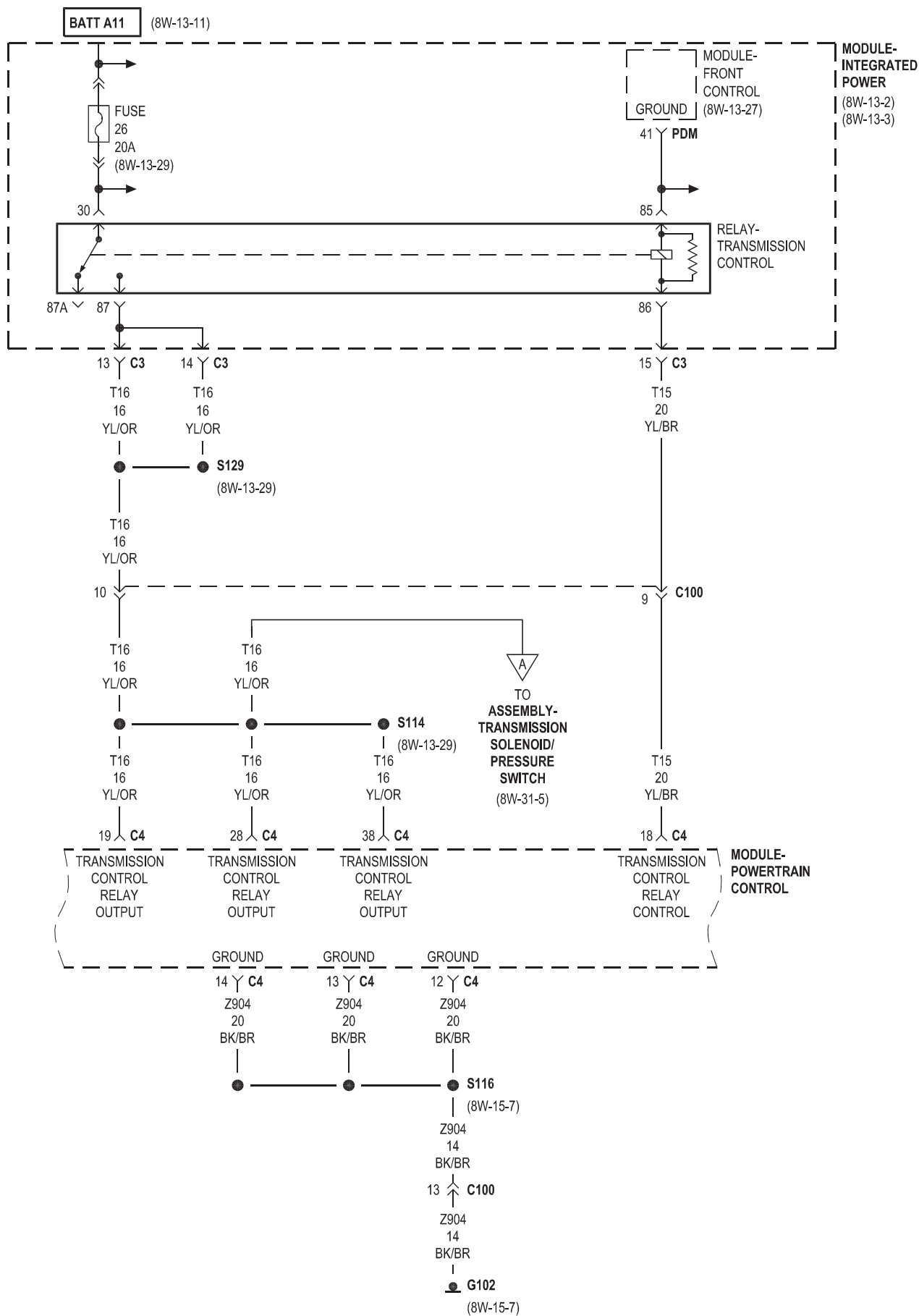


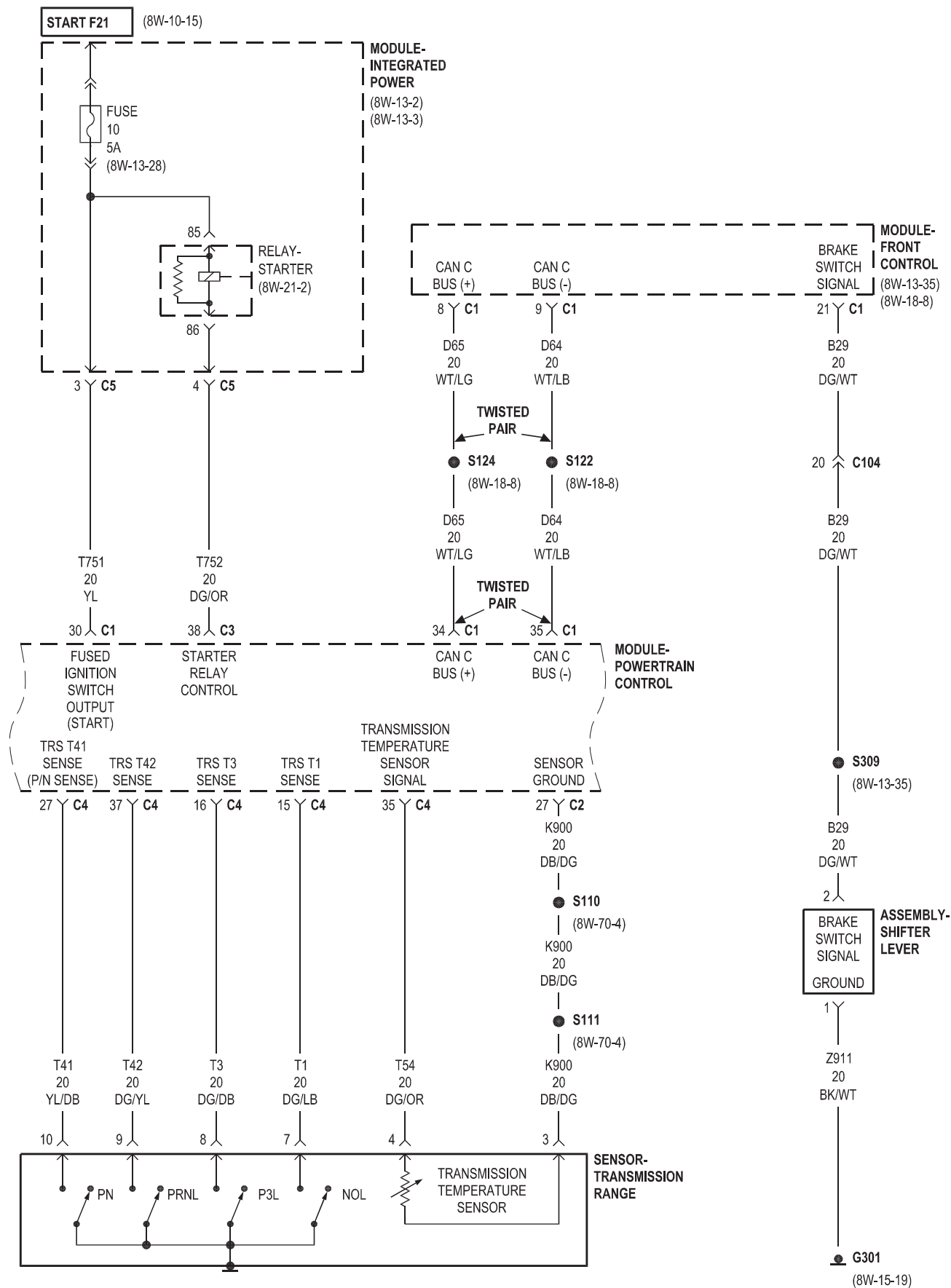




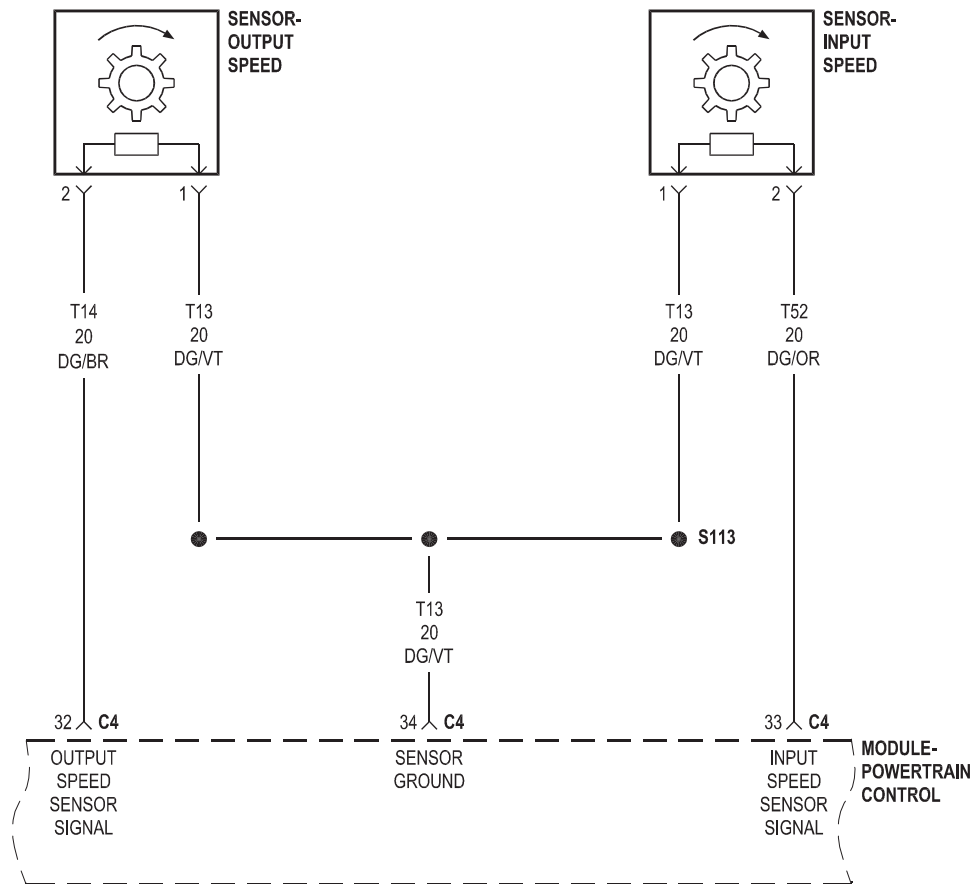
## 8W-31 TRANSMISSION CONTROL SYSTEM

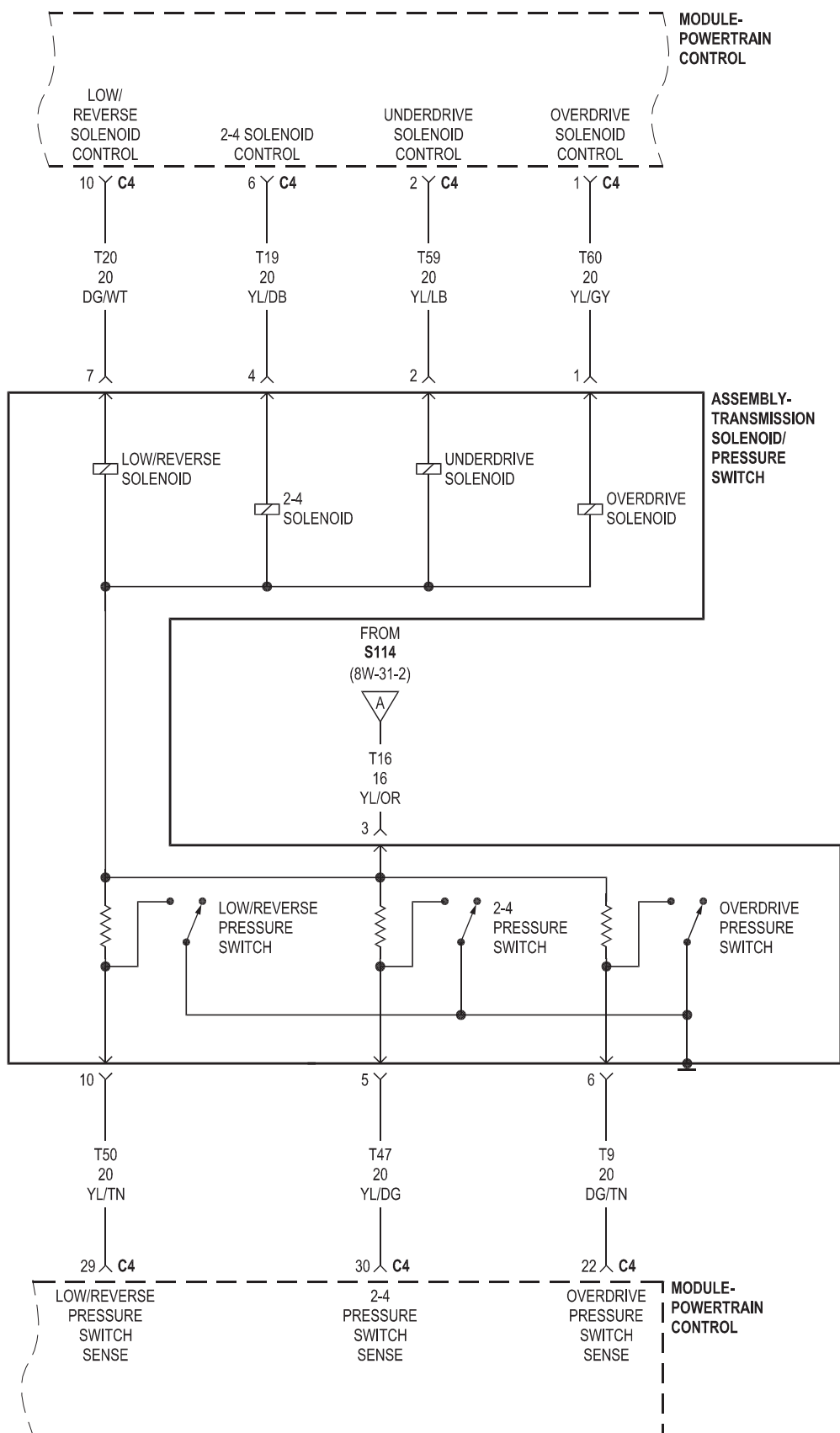
<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Assembly-Electrohydraulic Control Unit . .	8W-31-7	Module-Front Control . . . . .	8W-31-2, 3, 6
Assembly-Shifter Lever . . . . .	8W-31-3, 6	Module-Integrated Power . . . . .	8W-31-2, 3, 6
Assembly-Transmission Solenoid/Pressure		Module-Powertrain Control . . . . .	8W-31-2, 3, 4, 5
Switch . . . . .	8W-31-2, 5	Module-Transmission Control . . . . .	8W-31-6, 7
Data Link Connector . . . . .	8W-31-6	Power Distribution Center . . . . .	8W-31-6
Fuse 10 . . . . .	8W-31-3	Relay-Starter . . . . .	8W-31-3
Fuse 26 . . . . .	8W-31-2	Relay-Transmission . . . . .	8W-31-6
Fuse 37 . . . . .	8W-31-6	Relay-Transmission Control . . . . .	8W-31-2
G102 . . . . .	8W-31-2	Sensor-Input Speed . . . . .	8W-31-4
G300 . . . . .	8W-31-6	Sensor-Output Speed . . . . .	8W-31-4
G301 . . . . .	8W-31-3, 6	Sensor-Transmission Range . . . . .	8W-31-3
G302 . . . . .	8W-31-6		

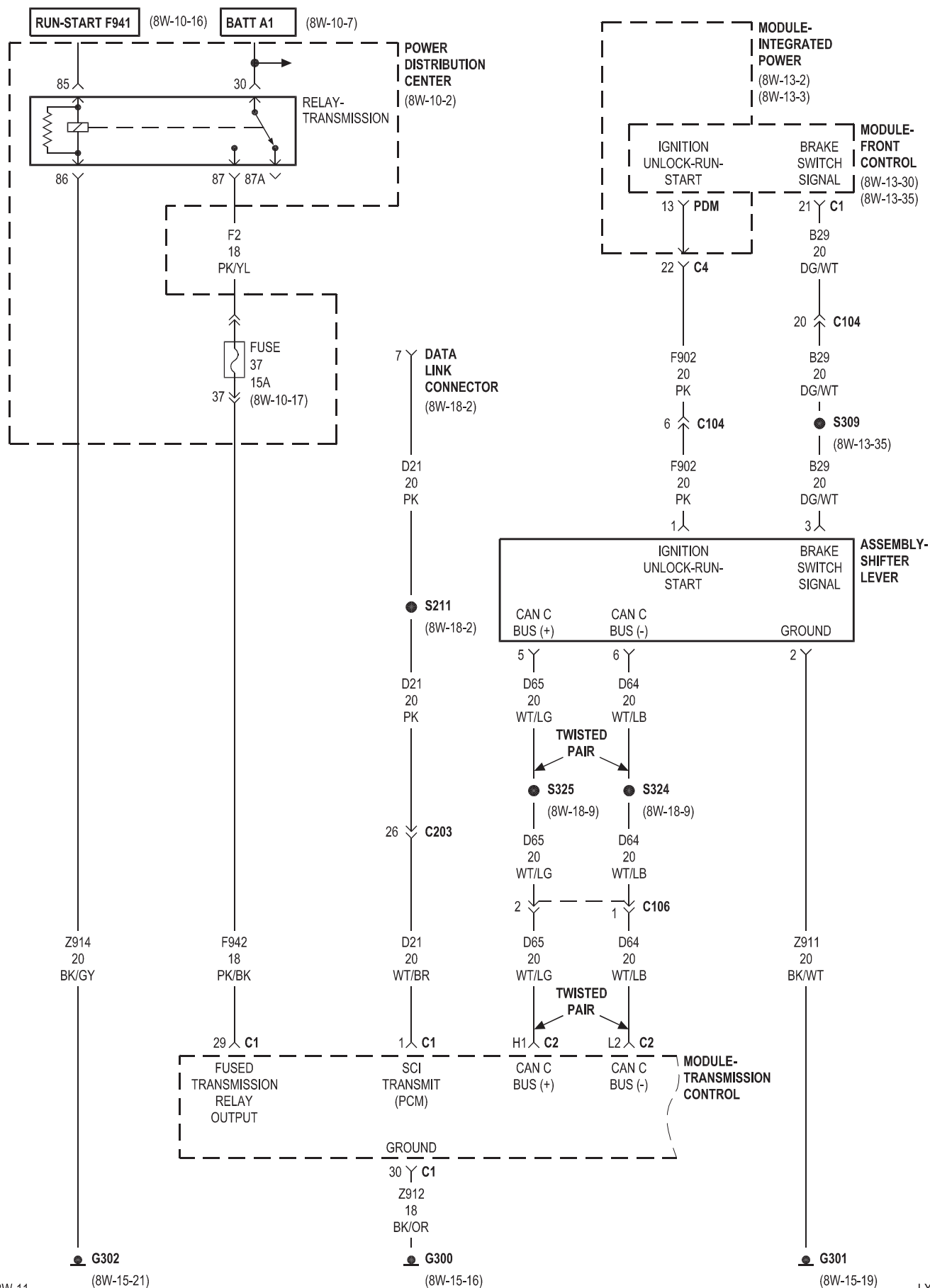


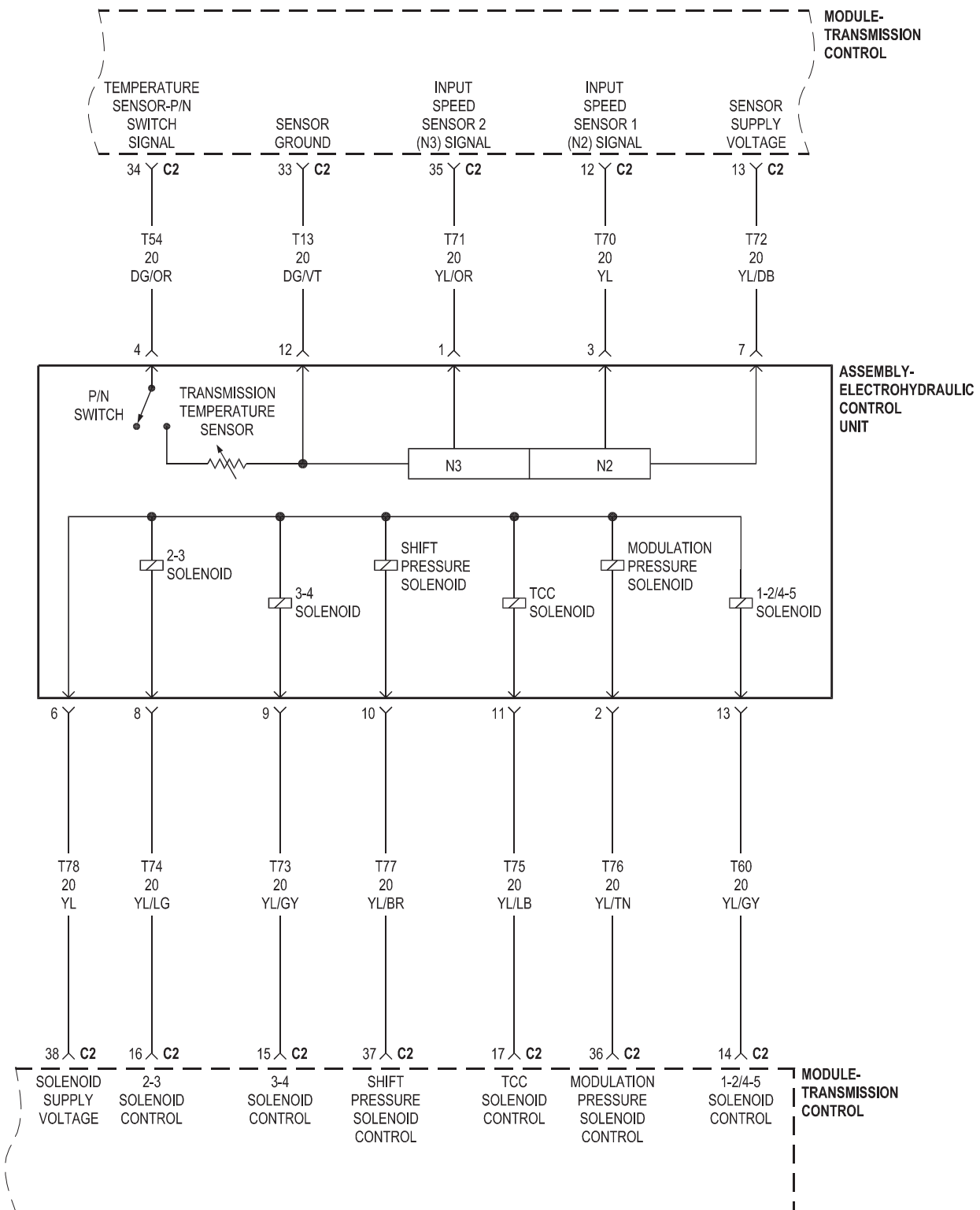








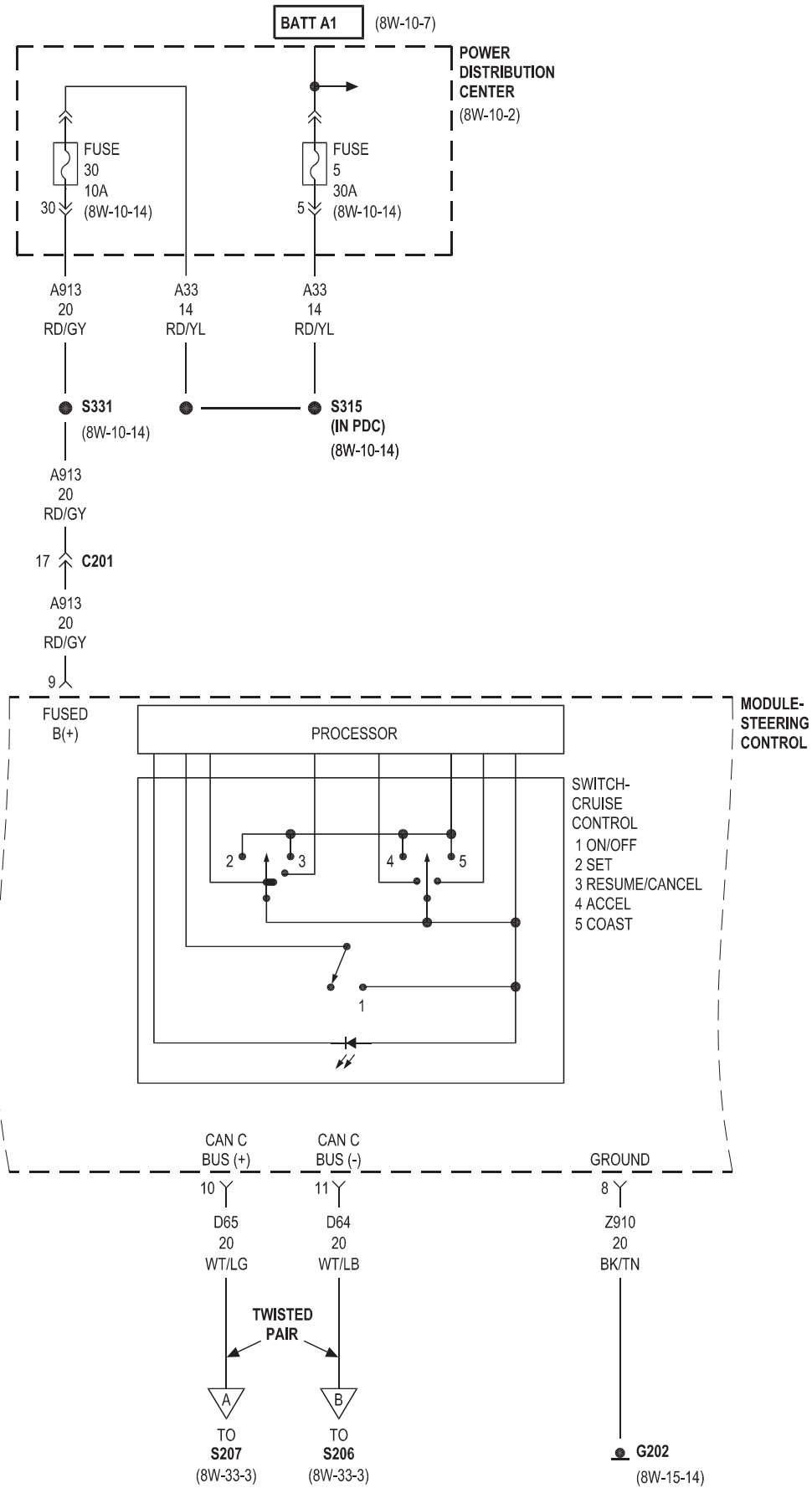


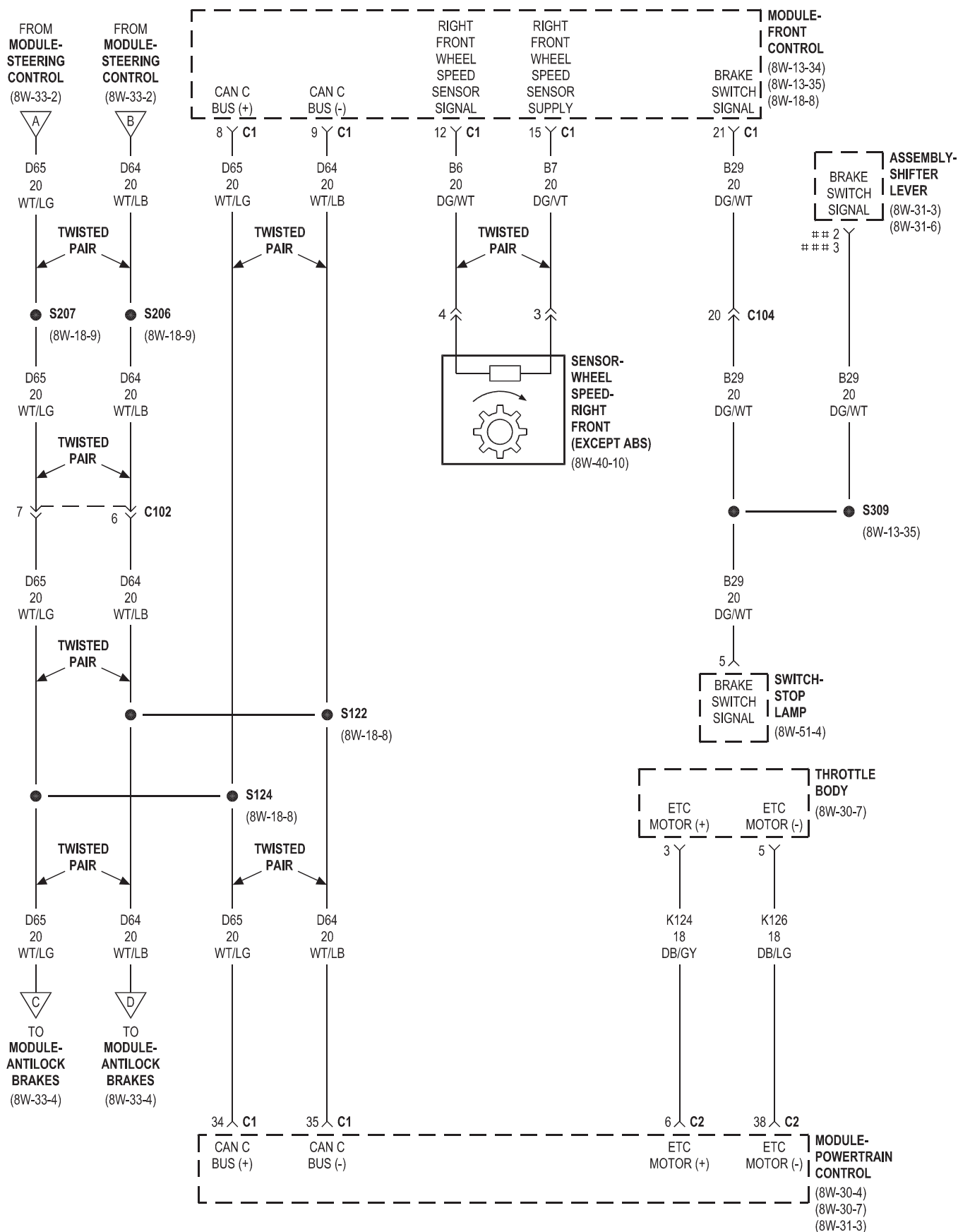




## 8W-33 VEHICLE SPEED CONTROL

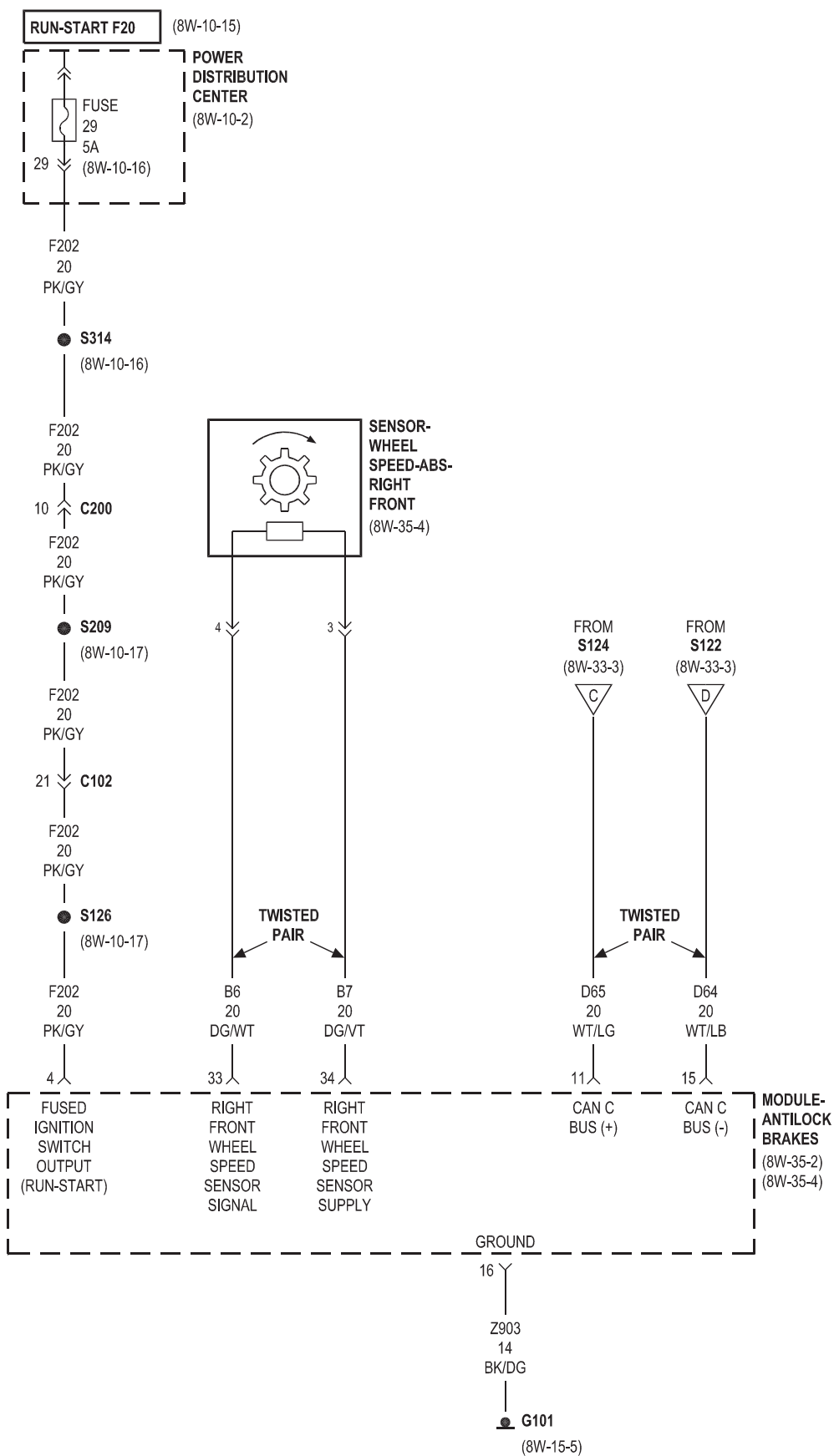
<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Assembly-Shifter Lever . . . . .	8W-33-3	Module-Powertrain Control . . . . .	8W-33-3
Fuse 5 . . . . .	8W-33-2	Module-Steering Control . . . . .	8W-33-2, 3
Fuse 29 . . . . .	8W-33-4	Power Distribution Center . . . . .	8W-33-2, 4
Fuse 30 . . . . .	8W-33-2	Sensor-Wheel Speed-Abs-Right Front . . . . .	8W-33-4
G101 . . . . .	8W-33-4	Sensor-Wheel Speed-Right Front . . . . .	8W-33-3
G202 . . . . .	8W-33-2	Switch-Stop Lamp . . . . .	8W-33-3
Module-Antilock Brakes . . . . .	8W-33-3, 4	Throttle Body . . . . .	8W-33-3
Module-Front Control . . . . .	8W-33-3		





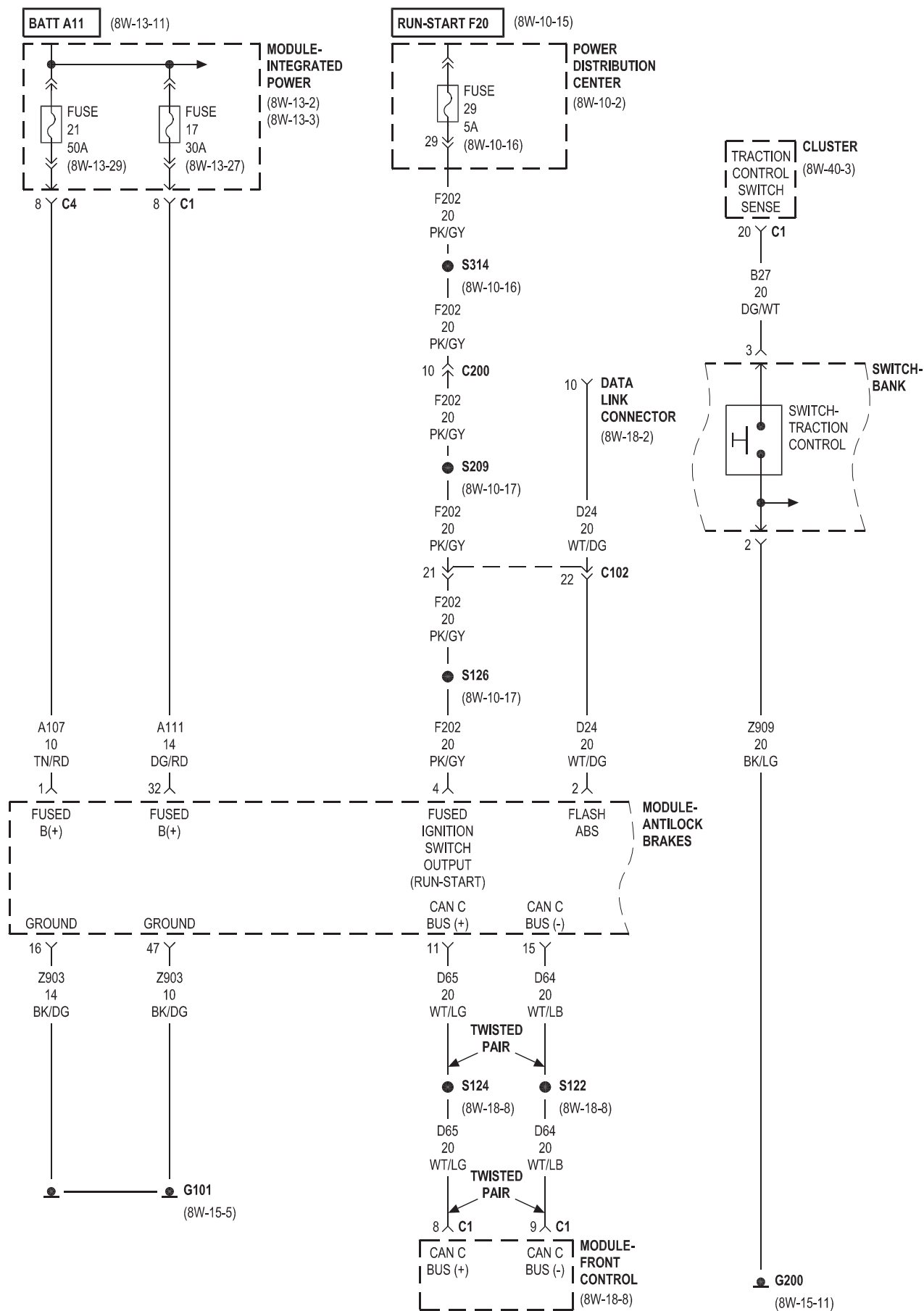
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 ### NAG1

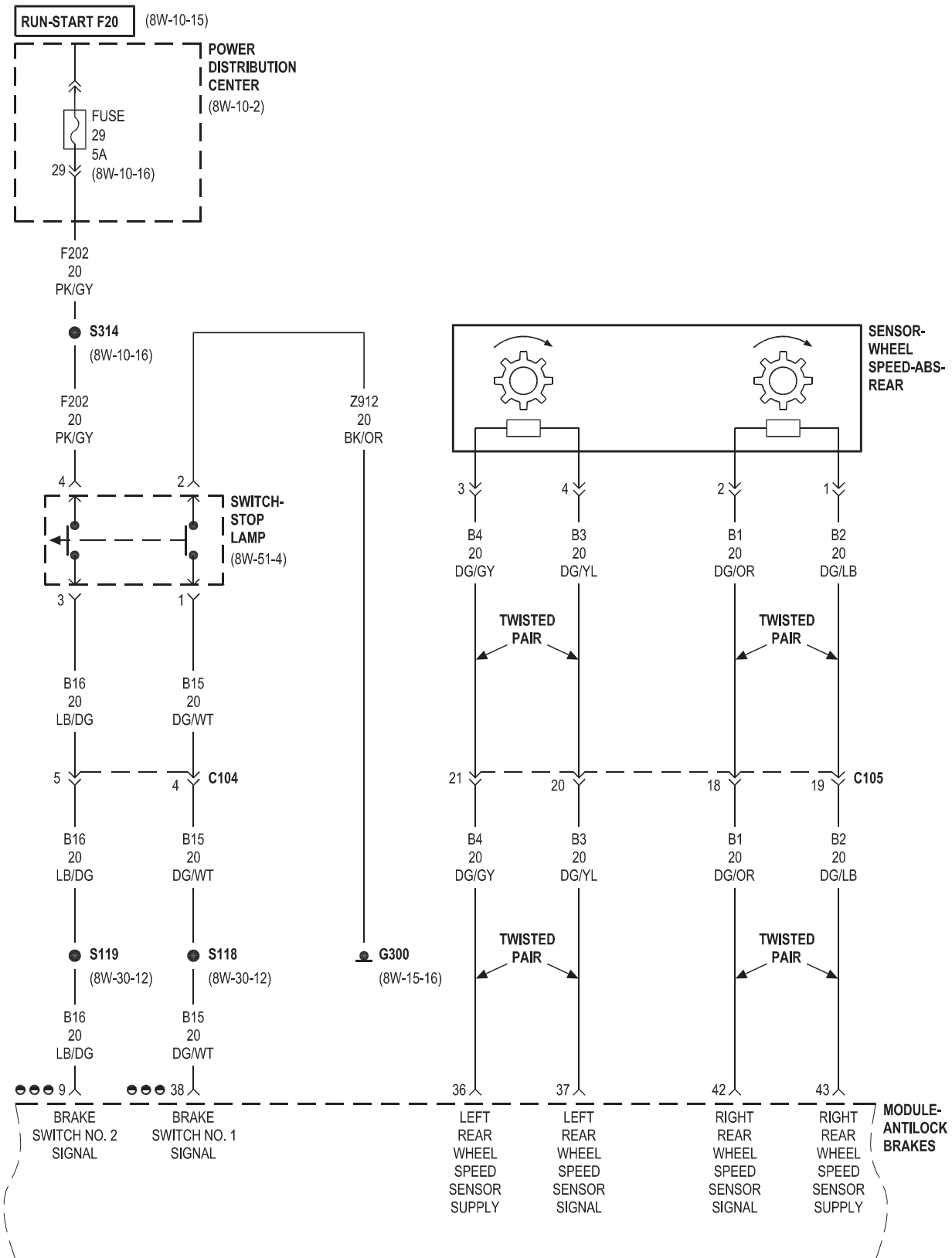


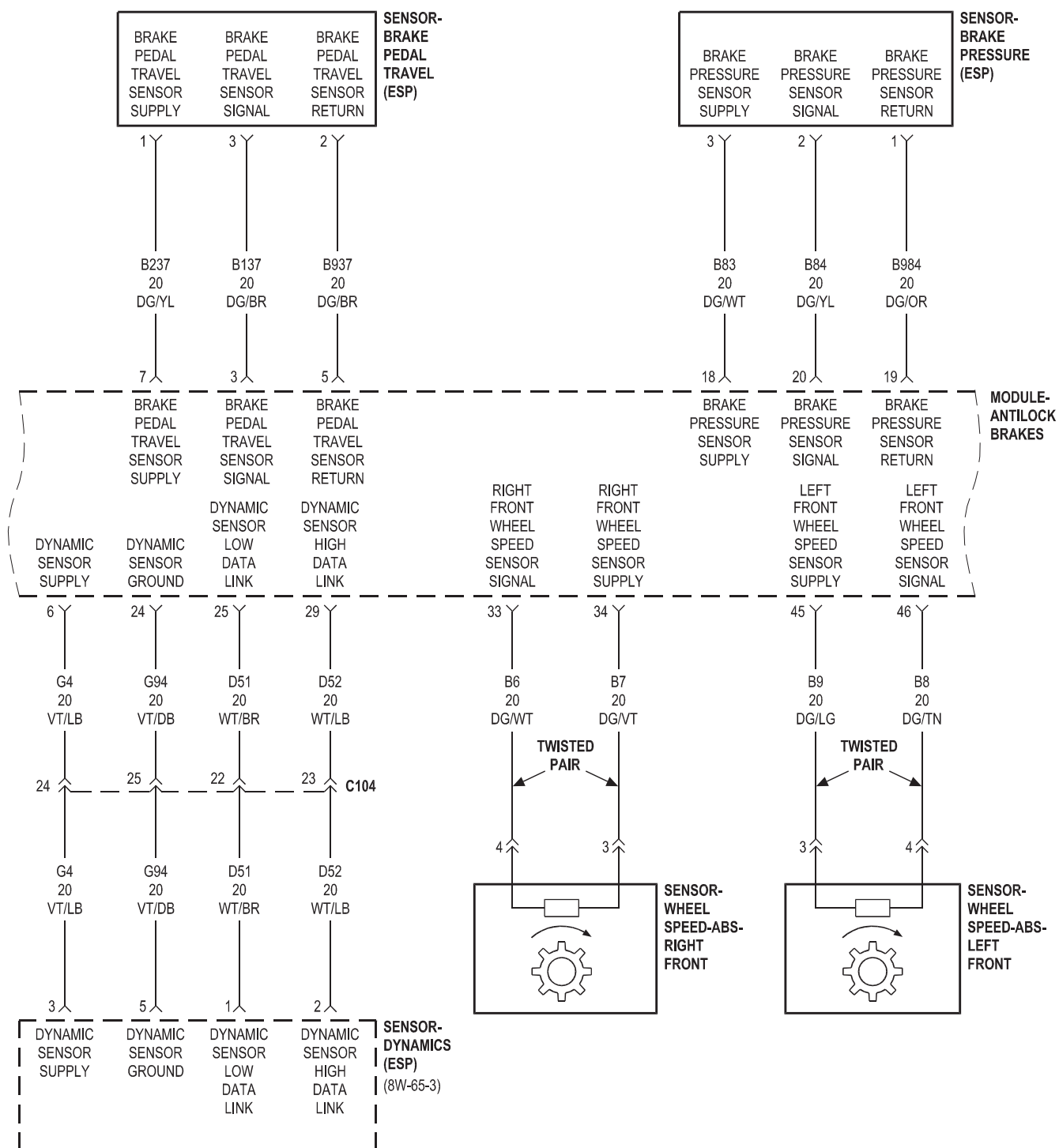


## 8W-35 ANTILOCK BRAKES

<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Booster-Active Brake . . . . .	8W-35-5	Module-Integrated Power . . . . .	8W-35-2
Cluster . . . . .	8W-35-2	Module-Powertrain Control . . . . .	8W-35-5
Data Link Connector . . . . .	8W-35-2	Power Distribution Center . . . . .	8W-35-2, 3, 5
Fuse 17 . . . . .	8W-35-2	Relay-Stop Lamp Inhibit . . . . .	8W-35-5
Fuse 19 . . . . .	8W-35-5	Sensor-Brake Pedal Travel . . . . .	8W-35-4
Fuse 21 . . . . .	8W-35-2	Sensor-Brake Pressure . . . . .	8W-35-4
Fuse 29 . . . . .	8W-35-2, 3	Sensor-Dynamics . . . . .	8W-35-4
G101 . . . . .	8W-35-2	Sensor-Wheel Speed-ABS-Left Front . . . . .	8W-35-4
G200 . . . . .	8W-35-2	Sensor-Wheel Speed-ABS-Rear . . . . .	8W-35-3
G300 . . . . .	8W-35-3	Sensor-Wheel Speed-ABS-Right Front . . . . .	8W-35-4
Module-Antilock Brakes . . . . .	8W-35-2, 3, 4, 5	Switch-Bank . . . . .	8W-35-2
Module-Front Control . . . . .	8W-35-2, 5	Switch-Stop Lamp . . . . .	8W-35-3









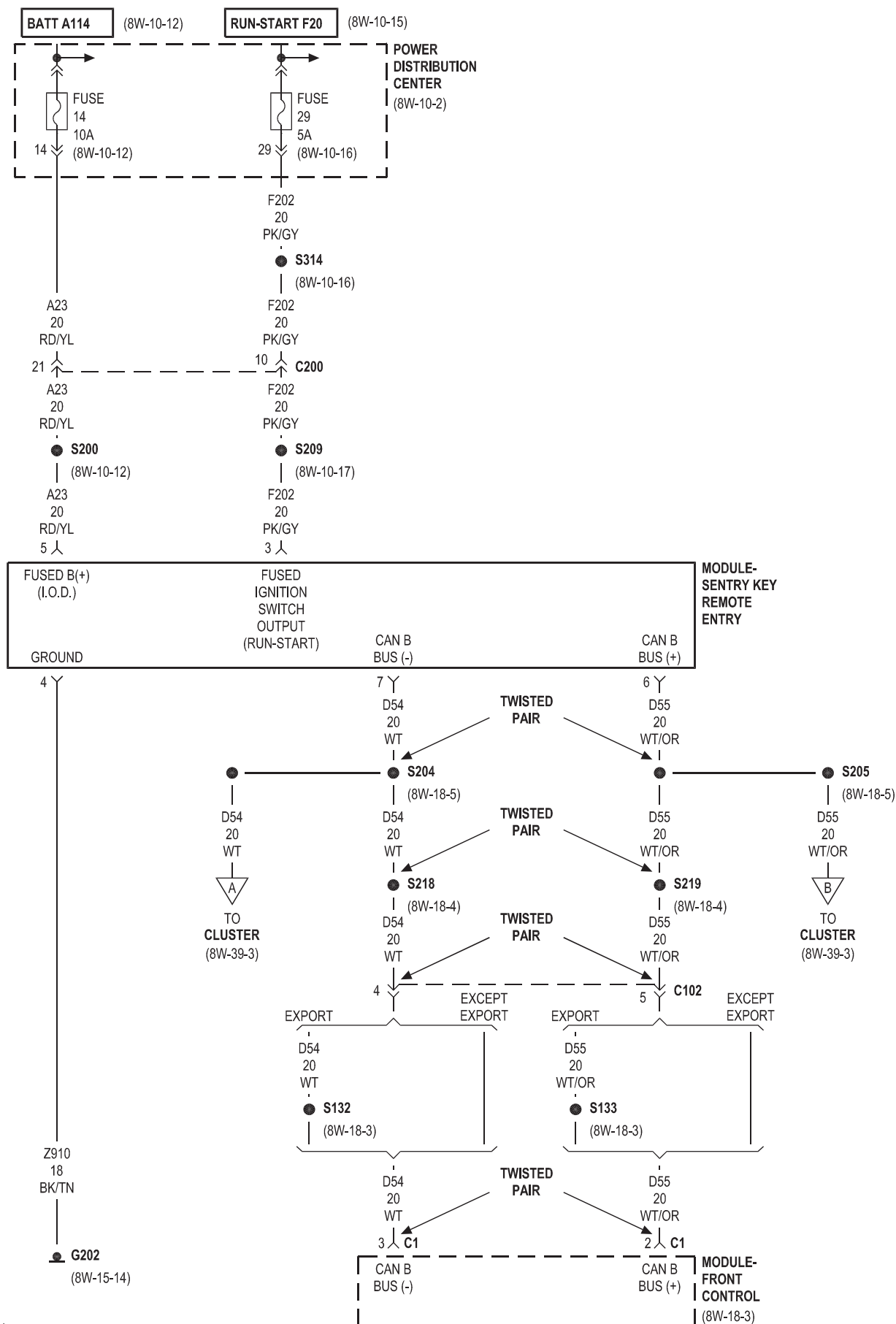


## 8W-39 VEHICLE THEFT SECURITY SYSTEM

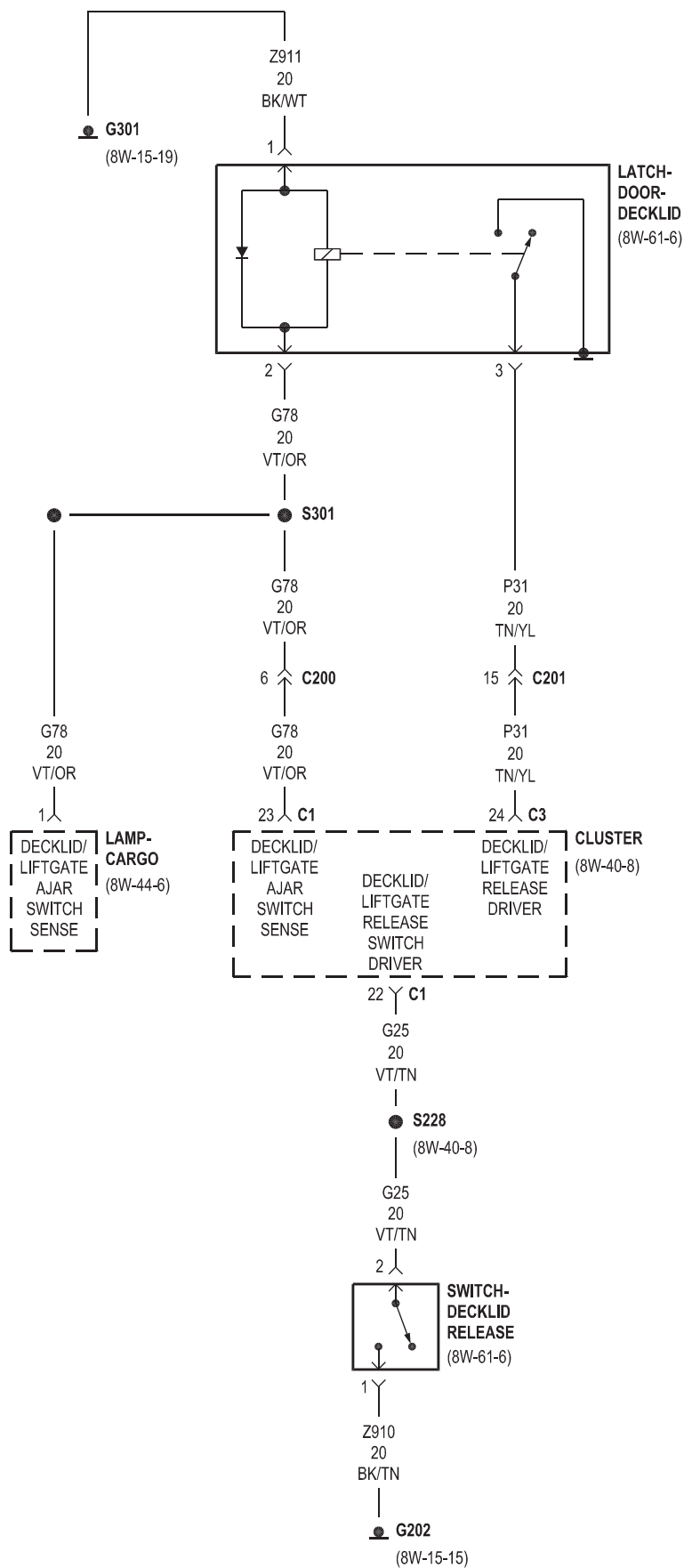
<b>Component</b>	<b>Page</b>
Cluster . . . . .	8W-39-2, 3, 4, 5
Fuse 14 . . . . .	8W-39-2
Fuse 29 . . . . .	8W-39-2
G102 . . . . .	8W-39-3
G202 . . . . .	8W-39-2, 4
G301 . . . . .	8W-39-4
G302 . . . . .	8W-39-5
Lamp-Cargo . . . . .	8W-39-4
Latch-Door-Decklid . . . . .	8W-39-4
Latch-Door-Left Front . . . . .	8W-39-3

<b>Component</b>	<b>Page</b>
Latch-Door-Left Rear . . . . .	8W-39-3
Latch-Door-Liftgate . . . . .	8W-39-5
Latch-Door-Right Front . . . . .	8W-39-3
Latch-Door-Right Rear . . . . .	8W-39-3
Module-Front Control . . . . .	8W-39-2, 3
Module-Sentry Key Remote Entry . . . . .	8W-39-2
Power Distribution Center . . . . .	8W-39-2
Switch-Decklid Release . . . . .	8W-39-4
Switch-Liftgate Release . . . . .	8W-39-5
Switch-Security Hood . . . . .	8W-39-3

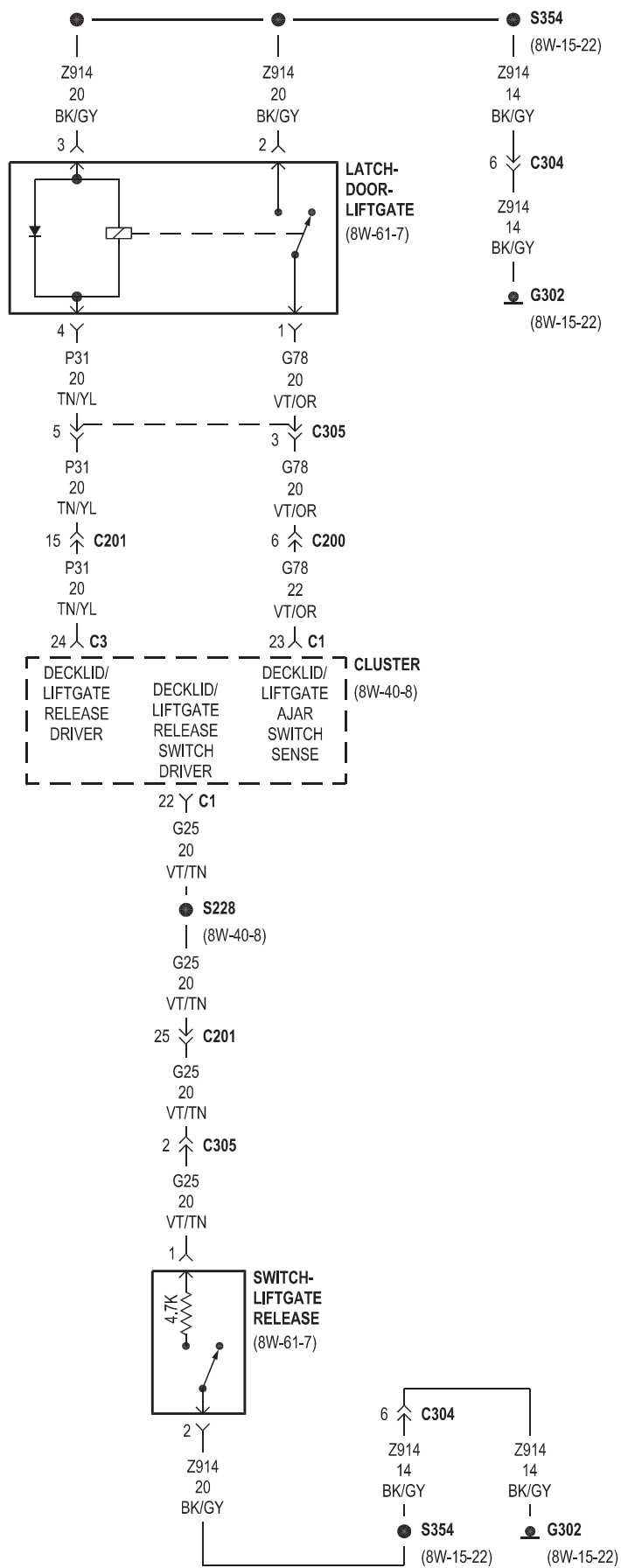








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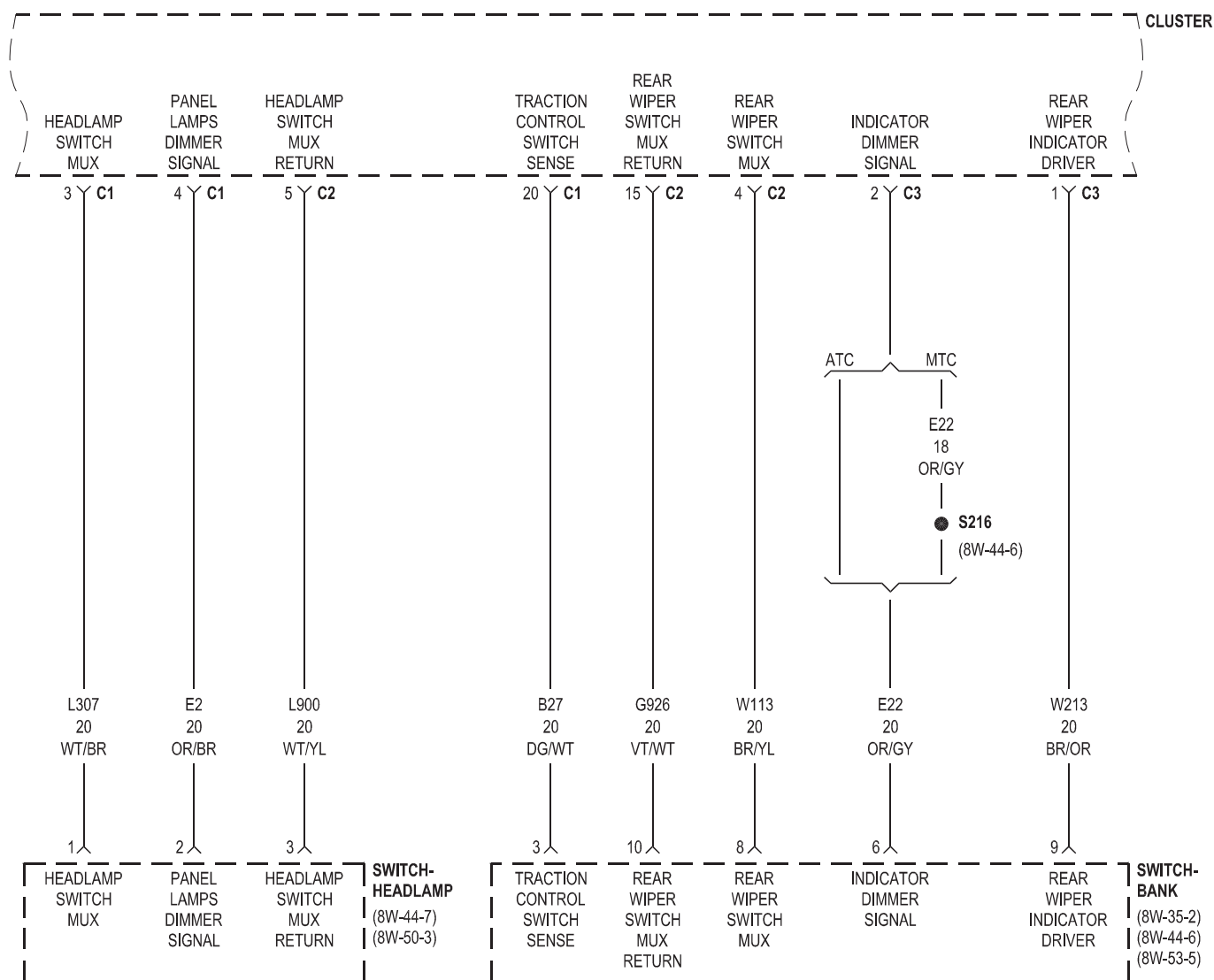




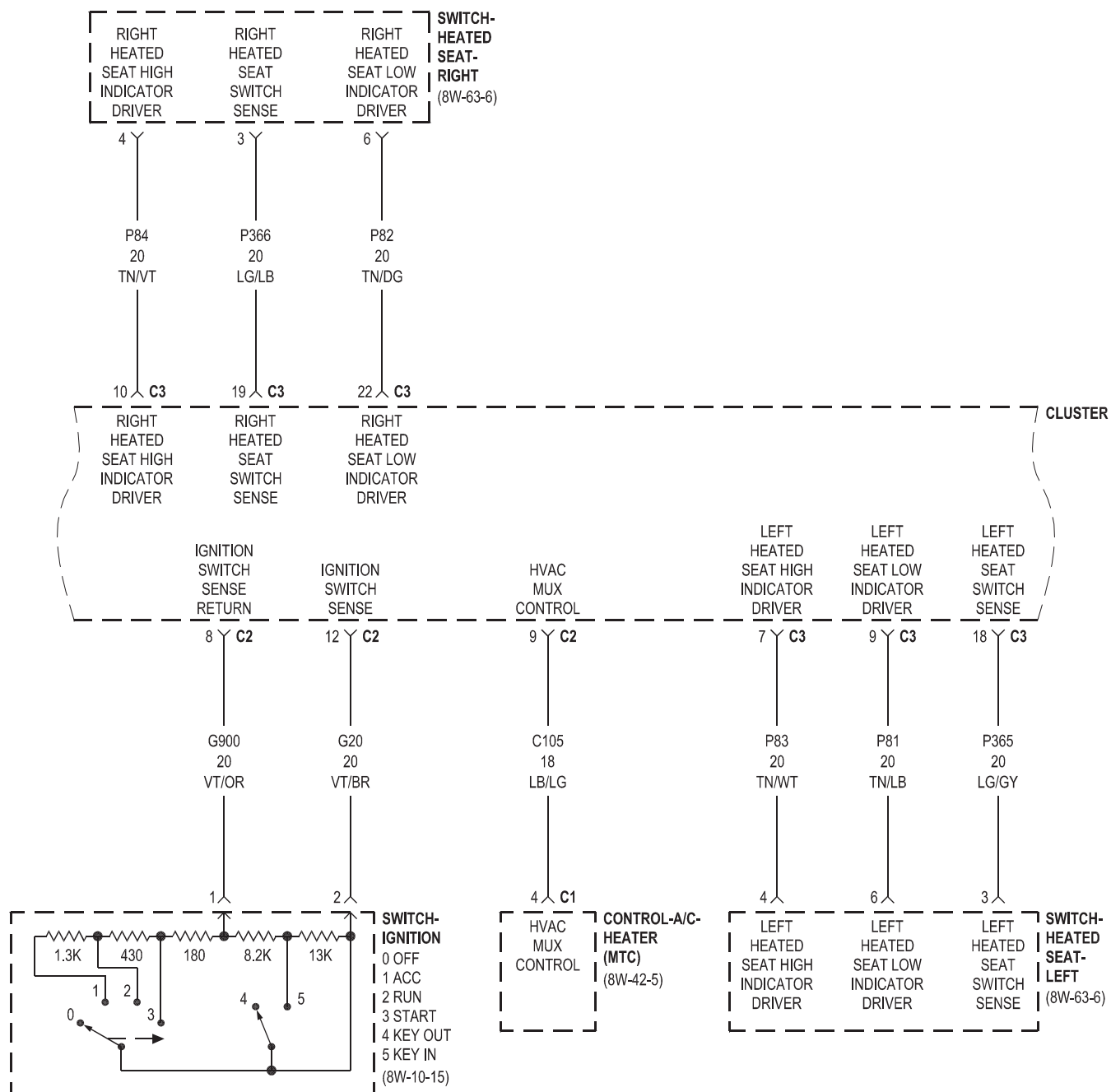
## 8W-40 INSTRUMENT CLUSTER

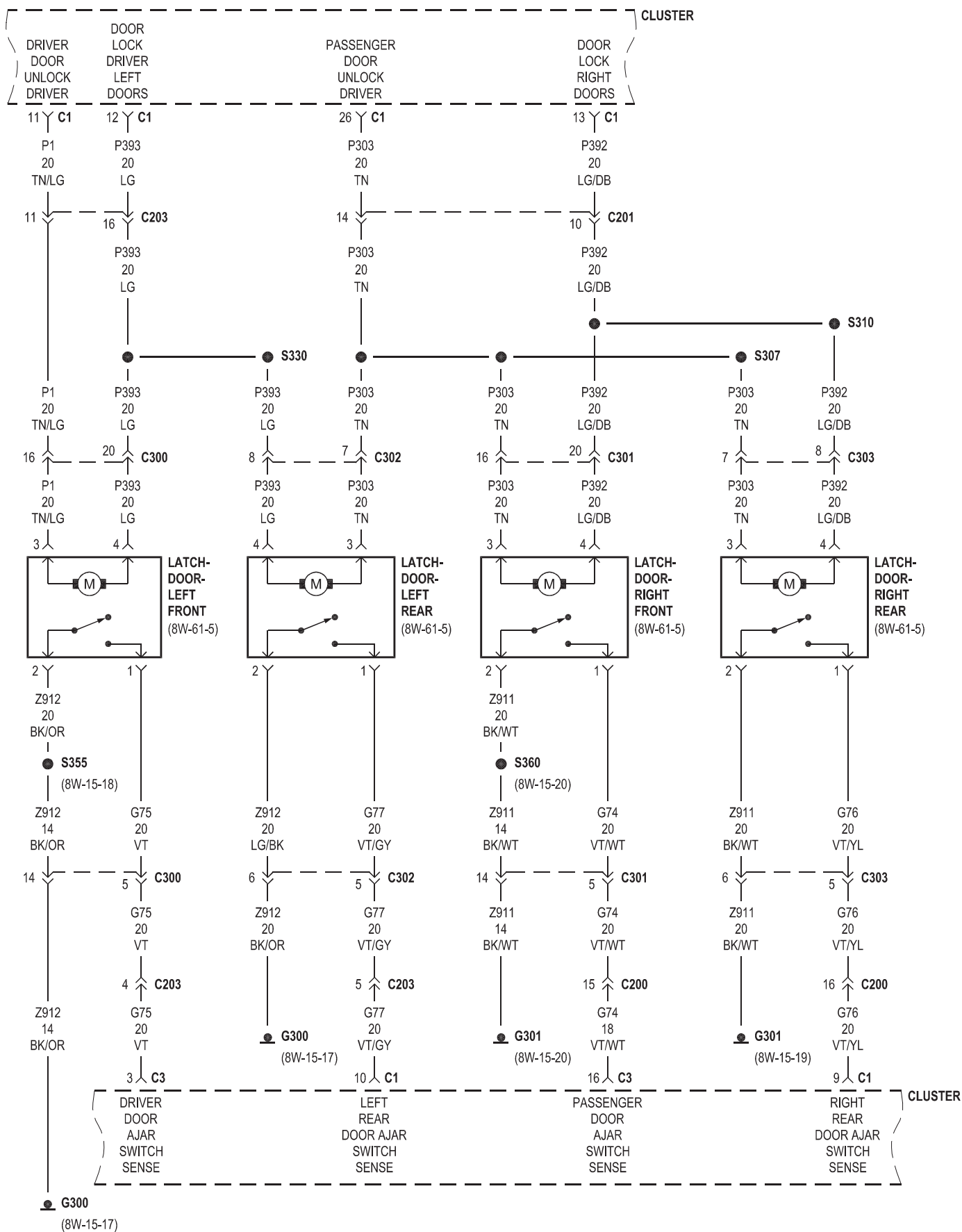
<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Circuit Breaker No. 1 . . . . .	8W-40-2	Latch-Door-Right Rear . . . . .	8W-40-5
Cluster . . . . .	8W-40-2, 3, 4, 5, 6, 7, 8, 9	Module-Antilock Brakes . . . . .	8W-40-10
Control-A/C-Heater . . . . .	8W-40-4, 8, 9	Module-Clock Analog . . . . .	8W-40-8, 9
Fuse 5 . . . . .	8W-40-2	Module-Front Control . . . . .	8W-40-2, 10
Fuse 14 . . . . .	8W-40-2	Module-Fuel Pump . . . . .	8W-40-6
Fuse 29 . . . . .	8W-40-2	Module-Integrated Power . . . . .	8W-40-2
Fuse 38 . . . . .	8W-40-9	Power Distribution Center . . . . .	8W-40-2, 9
G100 . . . . .	8W-40-10	Sensor-Ambient Air Temperature . . . . .	8W-40-10
G200 . . . . .	8W-40-9	Sensor-Brake Fluid Level . . . . .	8W-40-10
G202 . . . . .	8W-40-2	Sensor-Wheel Speed-Abs-Right Front . . . . .	8W-40-10
G300 . . . . .	8W-40-5, 6	Sensor-Wheel Speed-Right Front . . . . .	8W-40-10
G301 . . . . .	8W-40-5	Switch-Bank . . . . .	8W-40-3, 8, 9
Lamp-Cargo . . . . .	8W-40-7	Switch-Decklid Release . . . . .	8W-40-8
Lamp-Courtesy-Left Front Door . . . . .	8W-40-7	Switch-Headlamp . . . . .	8W-40-3, 8, 9
Lamp-Courtesy-Left Rear . . . . .	8W-40-7	Switch-Heated Seat-Left . . . . .	8W-40-4, 8, 9
Lamp-Courtesy-Right Front Door . . . . .	8W-40-7	Switch-Heated Seat-Right . . . . .	8W-40-4, 8, 9
Lamp-Courtesy-Right Rear . . . . .	8W-40-7	Switch-Ignition . . . . .	8W-40-4
Lamp-Glove Box . . . . .	8W-40-7	Switch-Liftgate Release . . . . .	8W-40-8
Lamp-Prndl . . . . .	8W-40-9	Switch-Parking Brake . . . . .	8W-40-6
Lamp-Reading-Front . . . . .	8W-40-7	Switch-Seat Belt-Driver . . . . .	8W-40-6
Lamp-Vanity-Left . . . . .	8W-40-7	Switch-Window/Door Lock-Driver . . . . .	8W-40-6
Lamp-Vanity-Right . . . . .	8W-40-7	Switch-Window/Door Lock-Driver Express . . . . .	8W-40-6
Latch-Door-Decklid . . . . .	8W-40-8	Switch-Window/Door Lock-Passenger . . . . .	8W-40-6, 7
Latch-Door-Left Front . . . . .	8W-40-5	Switch-Window/Door Lock-Passenger	
Latch-Door-Left Rear . . . . .	8W-40-5	Express . . . . .	8W-40-6, 7
Latch-Door-Liftgate . . . . .	8W-40-8		
Latch-Door-Right Front . . . . .	8W-40-5		

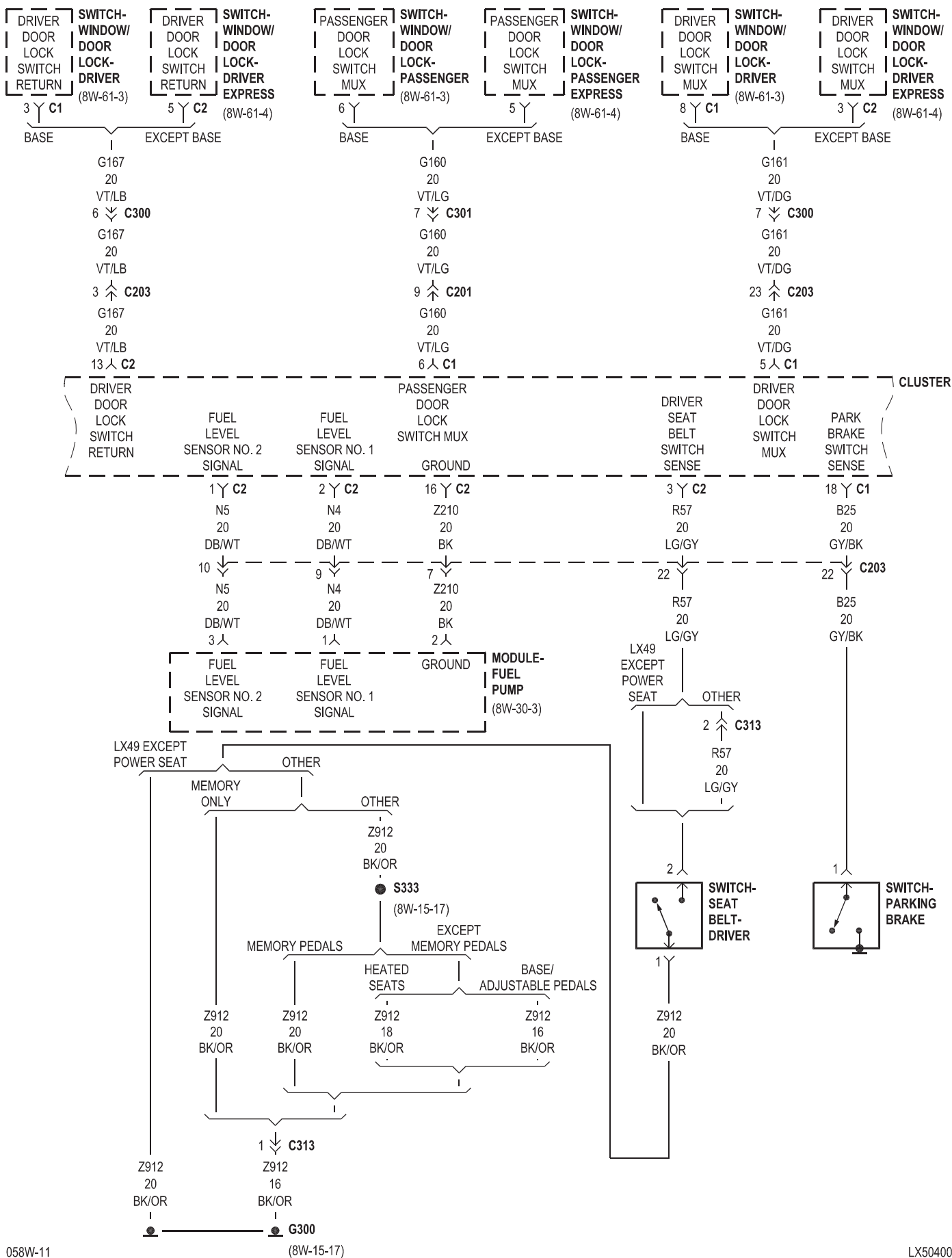


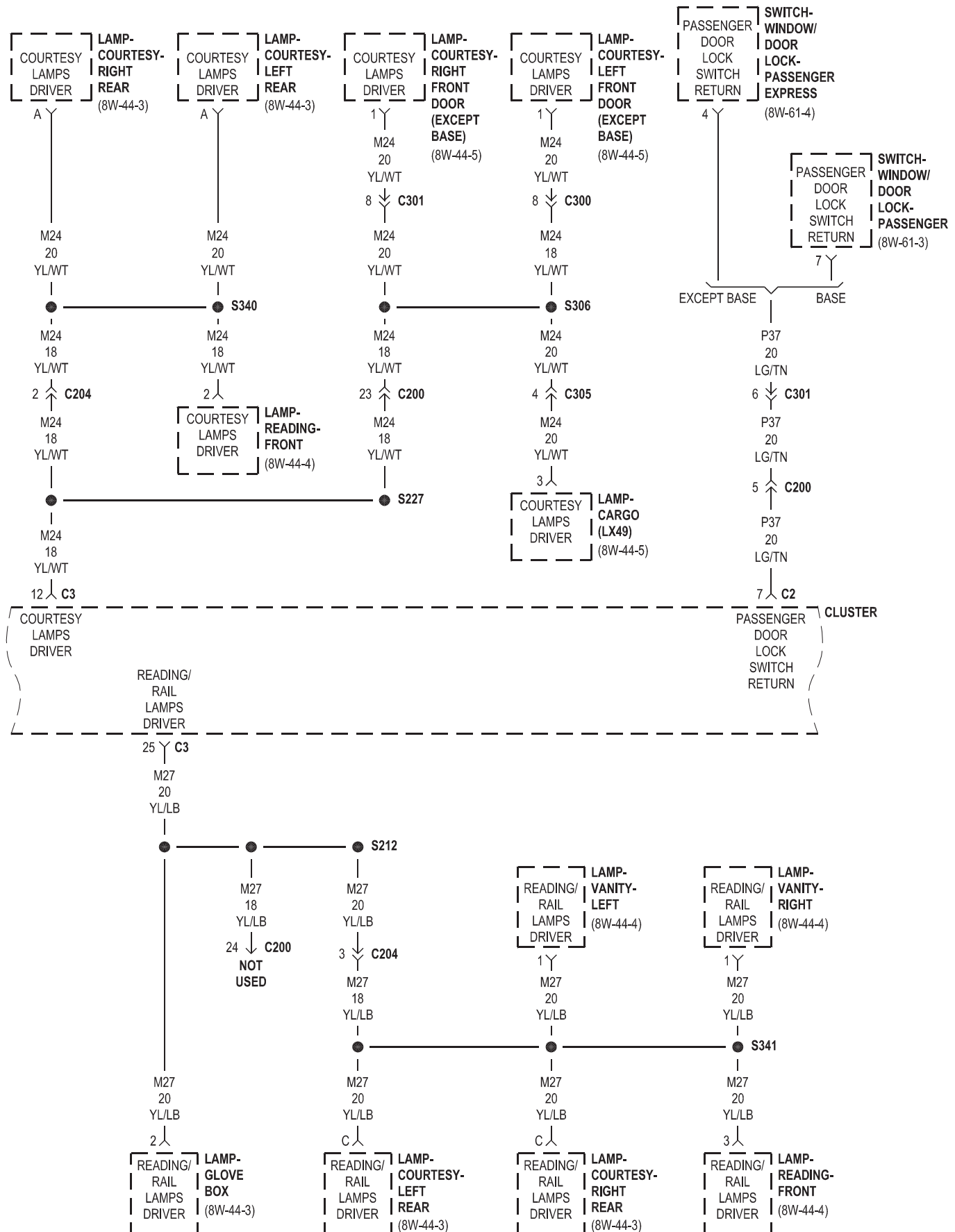


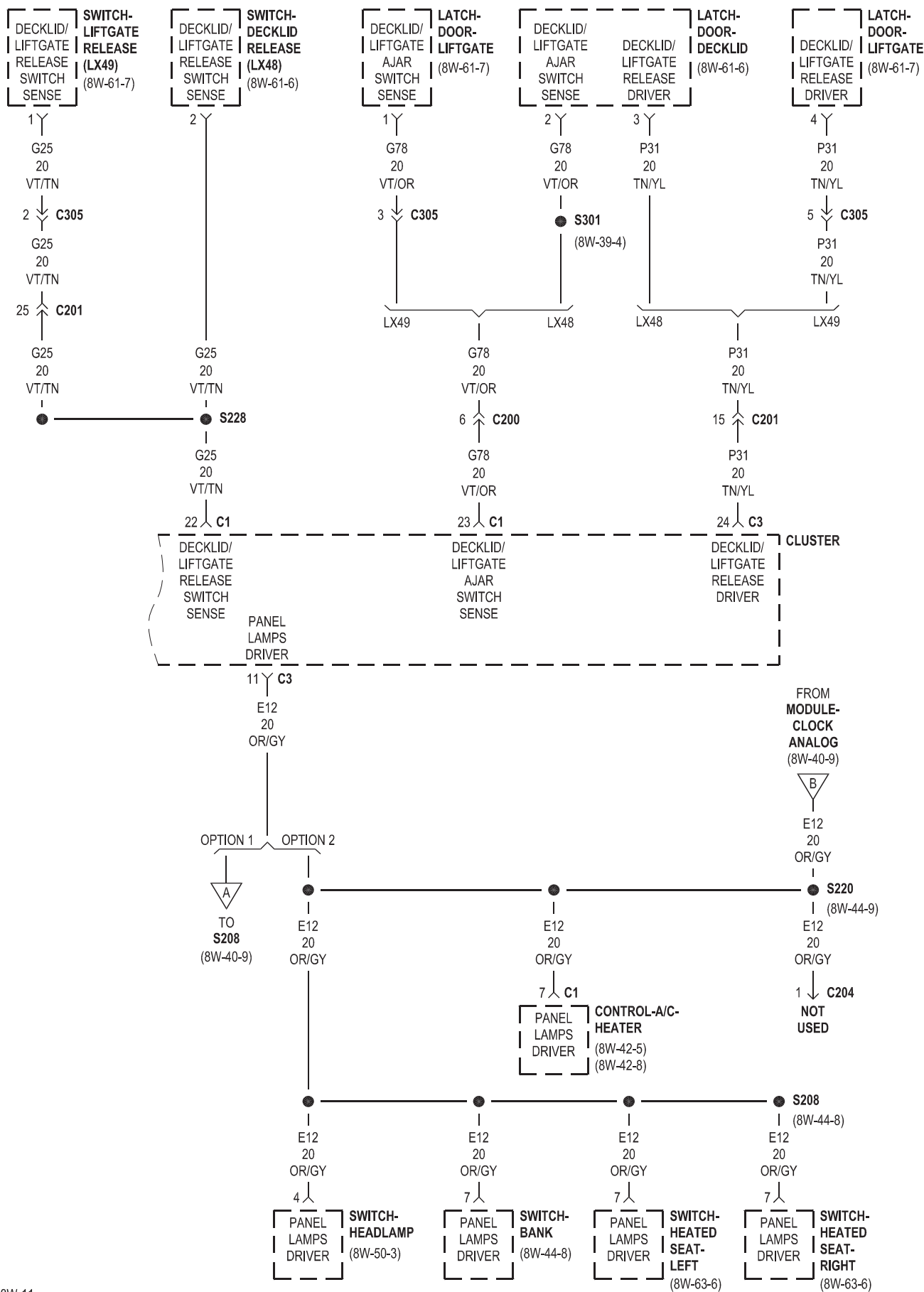


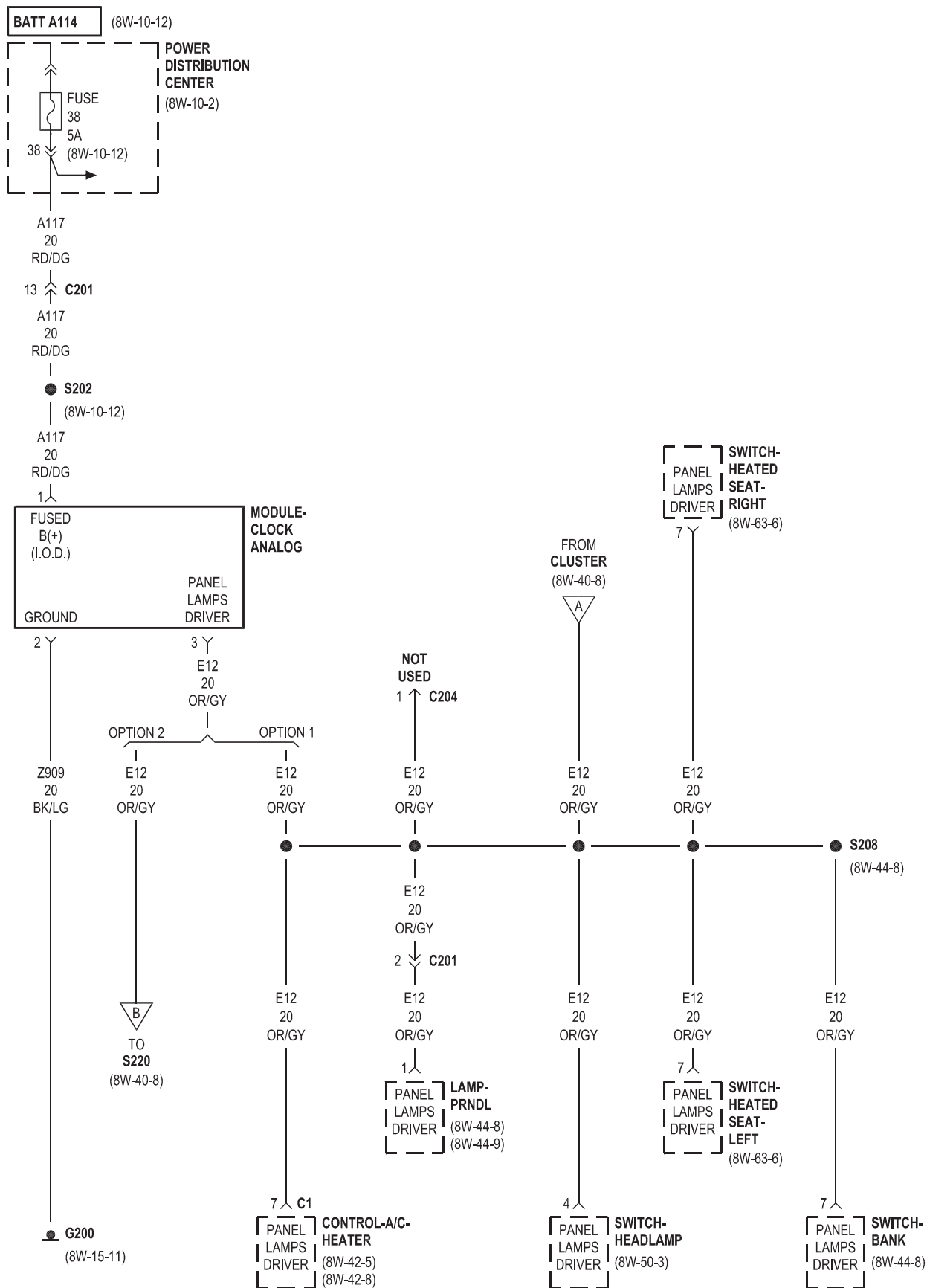


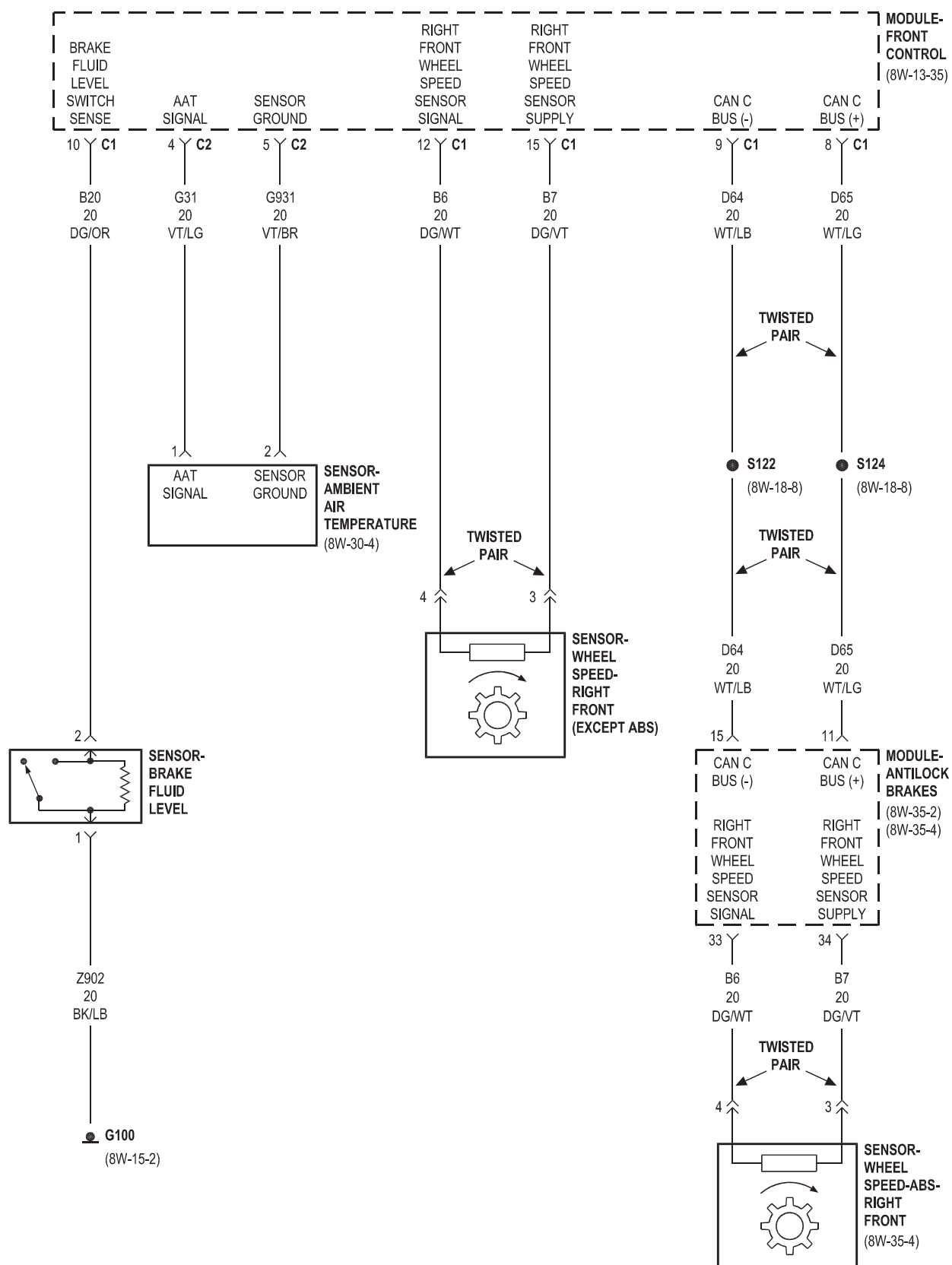








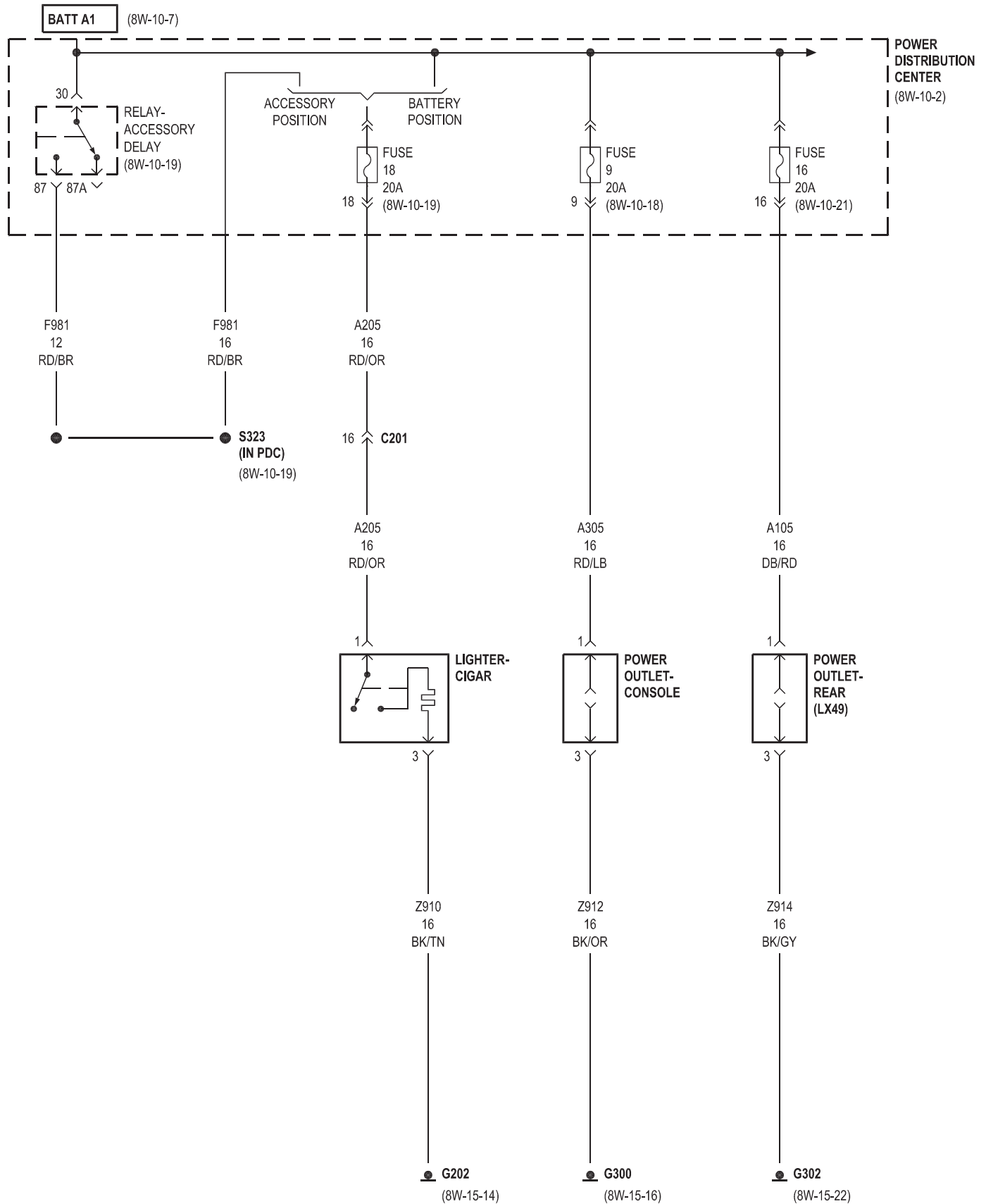


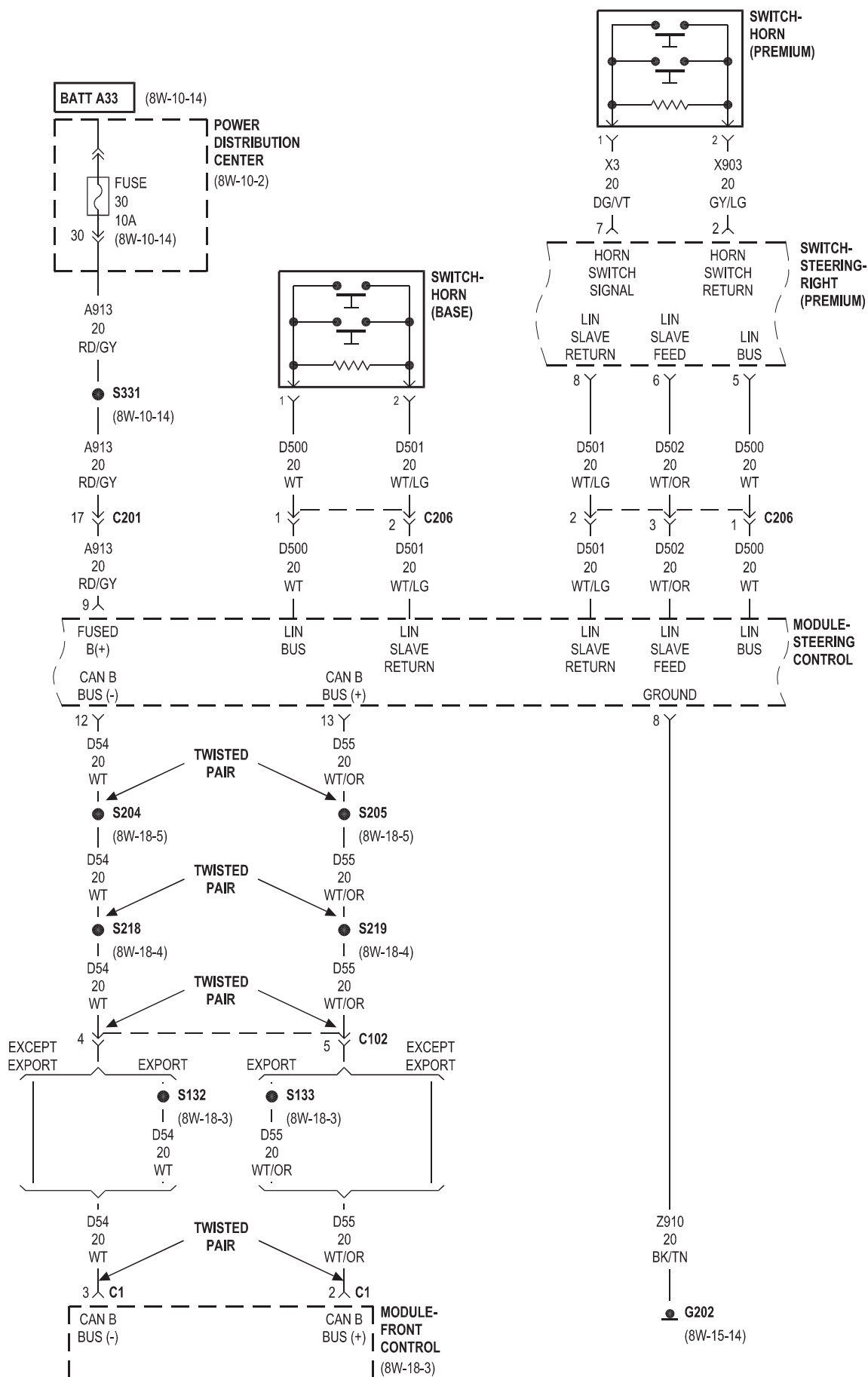


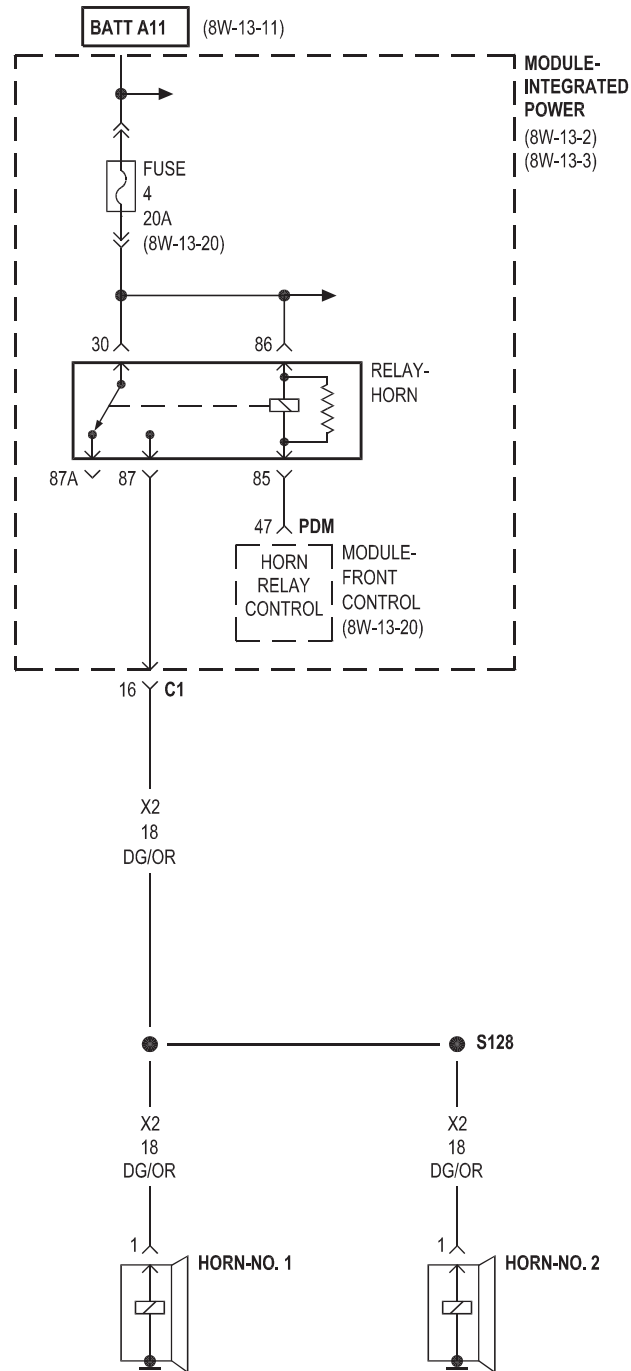
## 8W-41 HORN/CIGAR LIGHTER/POWER OUTLET

<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Fuse 4 . . . . .	8W-41-4	Module-Front Control . . . . .	8W-41-3, 4
Fuse 9 . . . . .	8W-41-2	Module-Integrated Power . . . . .	8W-41-4
Fuse 16 . . . . .	8W-41-2	Module-Steering Control . . . . .	8W-41-3
Fuse 18 . . . . .	8W-41-2	Power Distribution Center . . . . .	8W-41-2, 3
Fuse 30 . . . . .	8W-41-3	Power Outlet-Console . . . . .	8W-41-2
G202 . . . . .	8W-41-2, 3	Power Outlet-Rear . . . . .	8W-41-2
G300 . . . . .	8W-41-2	Relay-Accessory Delay . . . . .	8W-41-2
G302 . . . . .	8W-41-2	Relay-Horn . . . . .	8W-41-4
Horn-No. 1 . . . . .	8W-41-4	Switch-Horn . . . . .	8W-41-3
Horn-No. 2 . . . . .	8W-41-4	Switch-Steering-Right . . . . .	8W-41-3
Lighter-Cigar . . . . .	8W-41-2		



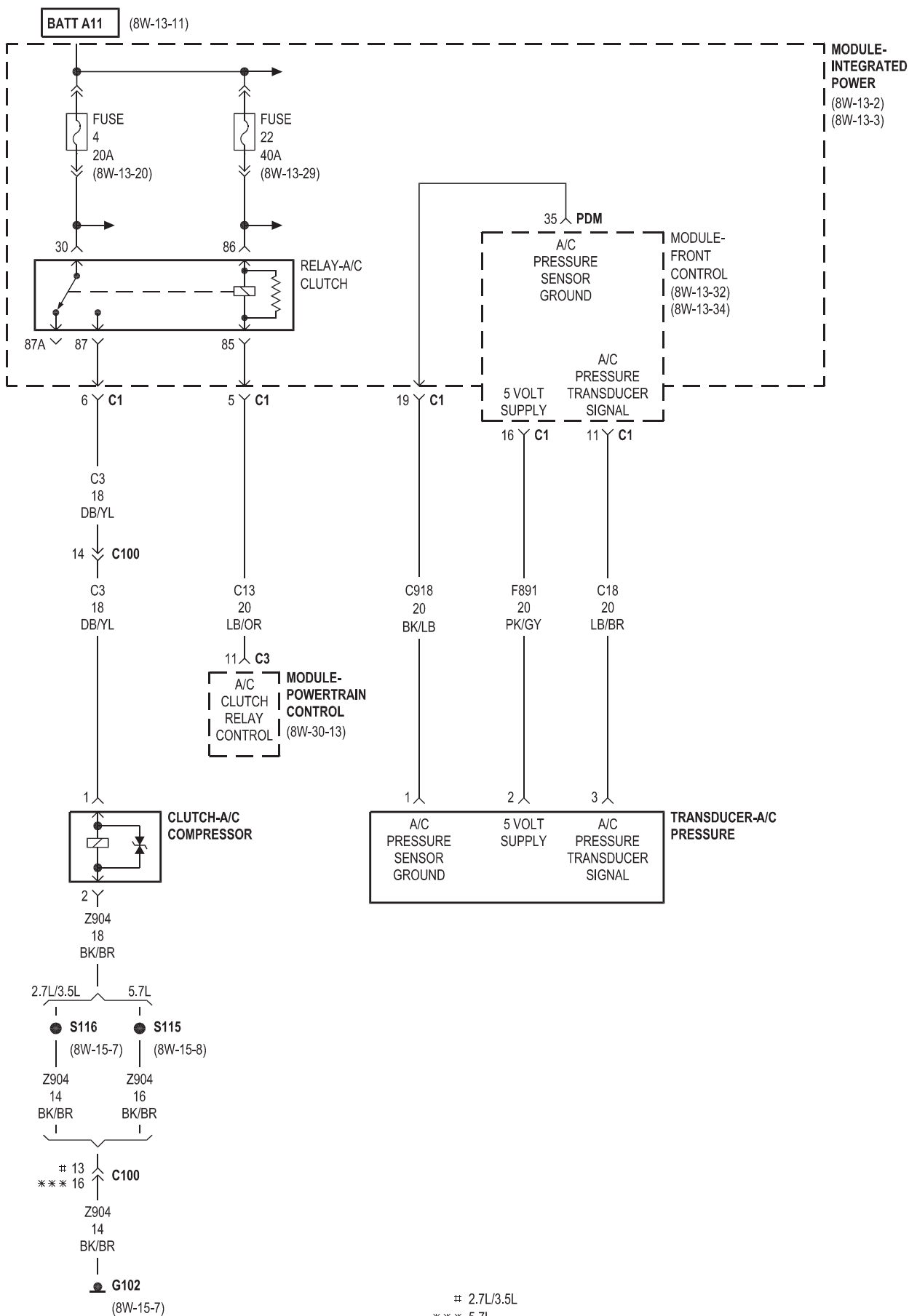


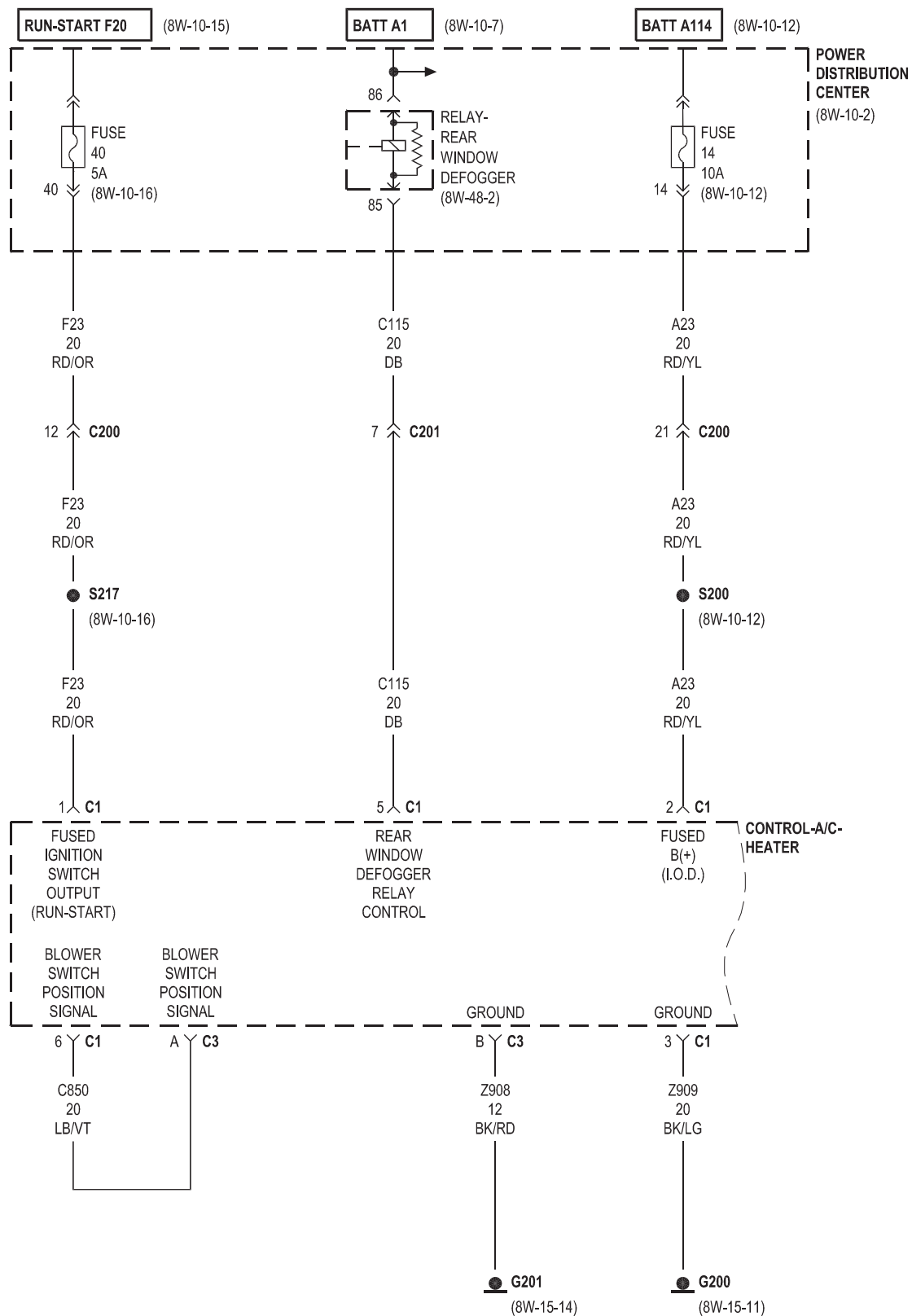


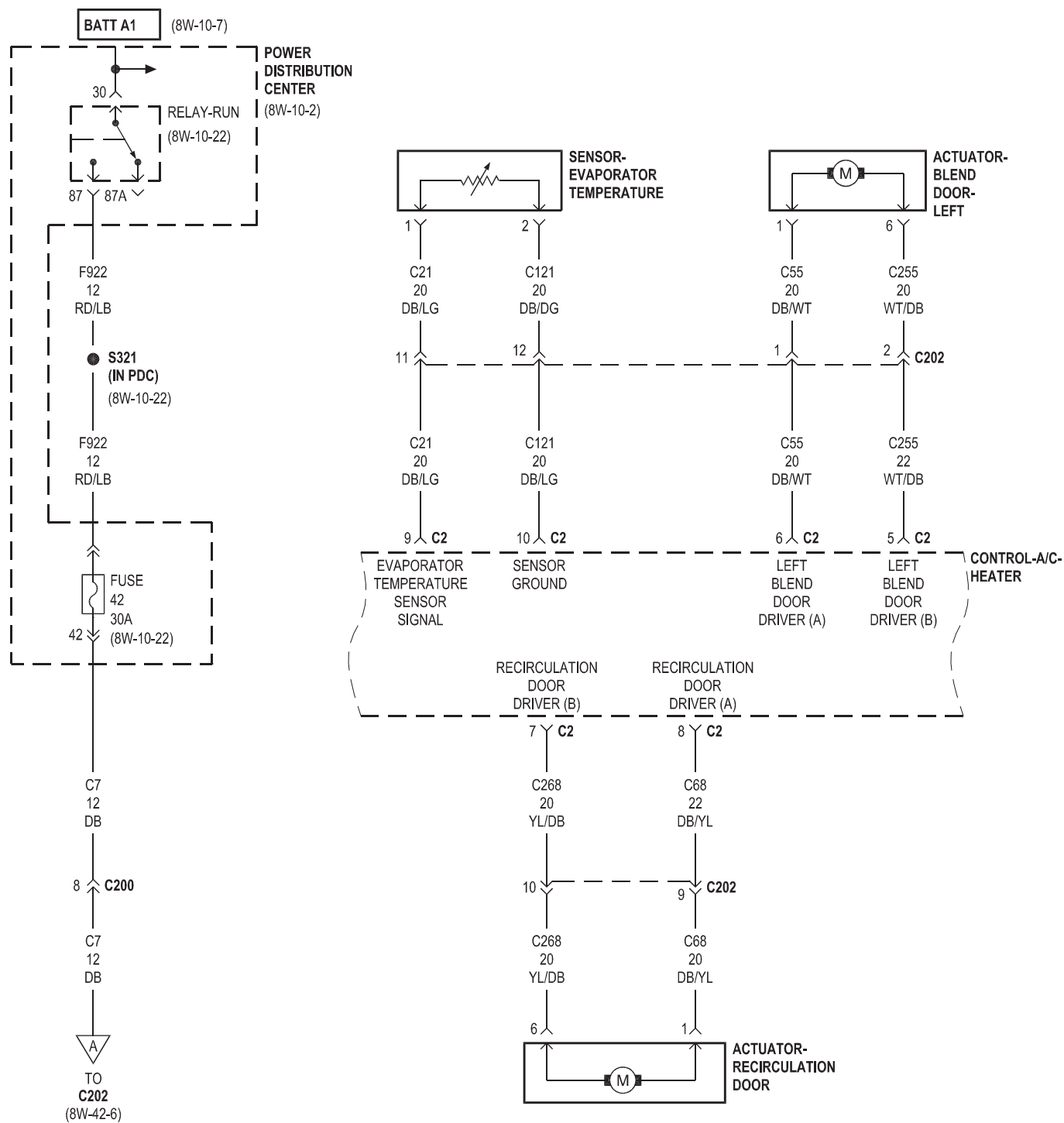


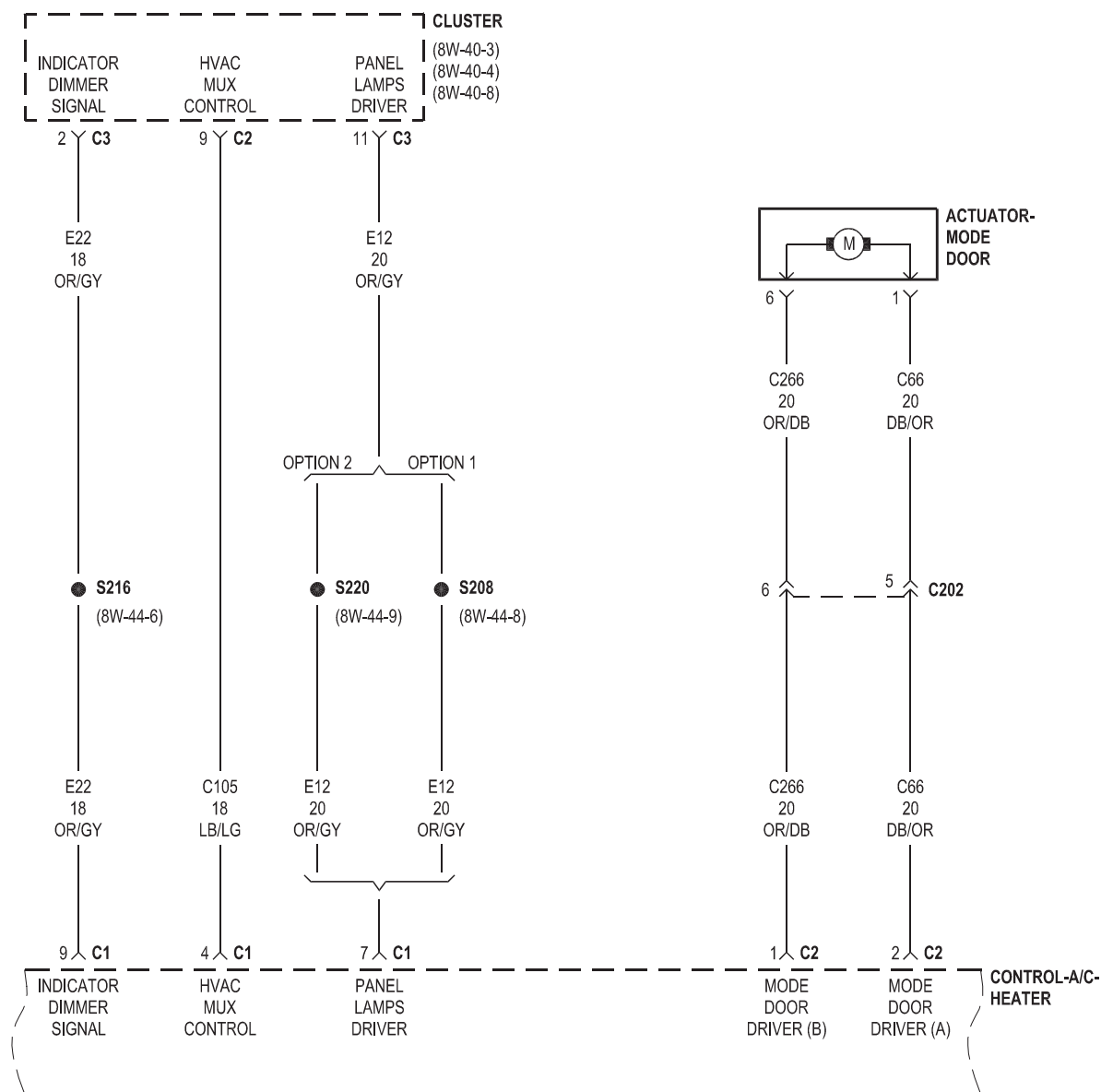
## 8W-42 AIR CONDITIONING/ HEATER

<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Actuator-Blend Door-Left . . . . .	8W-42-4, 9	G201 . . . . .	8W-42-3, 10
Actuator-Blend Door-Right . . . . .	8W-42-9	Lamp-Prndl . . . . .	8W-42-8
Actuator-Mode Door . . . . .	8W-42-5, 9	Module-Front Blower Power . . . . .	8W-42-10
Actuator-Recirculation Door . . . . .	8W-42-4, 9	Module-Front Control . . . . .	8W-42-2, 7
Cluster . . . . .	8W-42-5, 7, 8	Module-Integrated Power . . . . .	8W-42-2
Clutch-A/C Compressor . . . . .	8W-42-2	Module-Powertrain Control . . . . .	8W-42-2
Control-A/C-Heater . . . . .	8W-42-3, 4, 5, 6, 7, 8, 9, 10	Motor-Blower-Front . . . . .	8W-42-6, 10
Fuse 4 . . . . .	8W-42-2	Power Distribution Center . . . . .	8W-42-3, 4, 7, 10
Fuse 14 . . . . .	8W-42-3, 7	Relay-A/C Clutch . . . . .	8W-42-2
Fuse 22 . . . . .	8W-42-2	Relay-Rear Window Defogger . . . . .	8W-42-3, 7
Fuse 40 . . . . .	8W-42-3	Relay-Run . . . . .	8W-42-4, 7, 10
Fuse 41 . . . . .	8W-42-7	Resistor Block-Blower Motor-Front . . . . .	8W-42-6
Fuse 42 . . . . .	8W-42-4, 10	Sensor-Evaporator Temperature . . . . .	8W-42-4, 10
G102 . . . . .	8W-42-2	Sensor-Sun . . . . .	8W-42-8
G200 . . . . .	8W-42-3, 8	Transducer-A/C Pressure . . . . .	8W-42-2

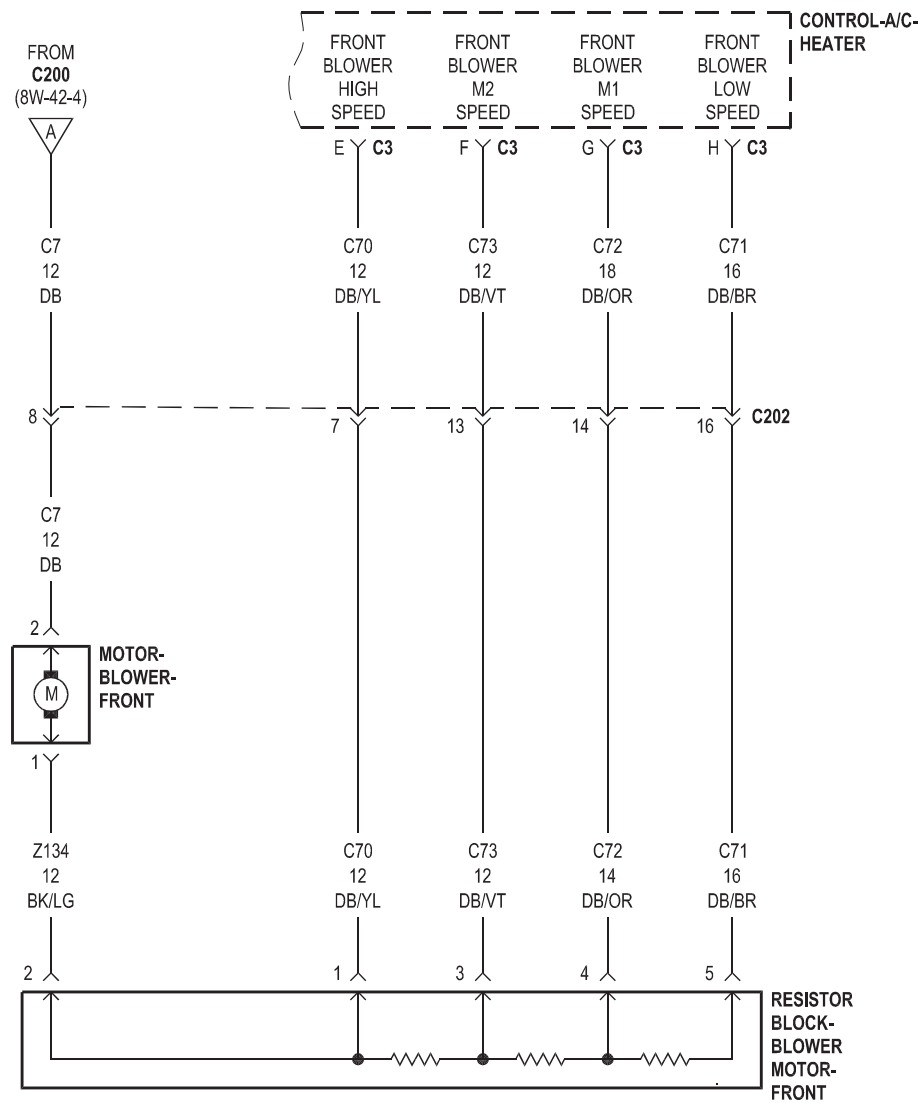




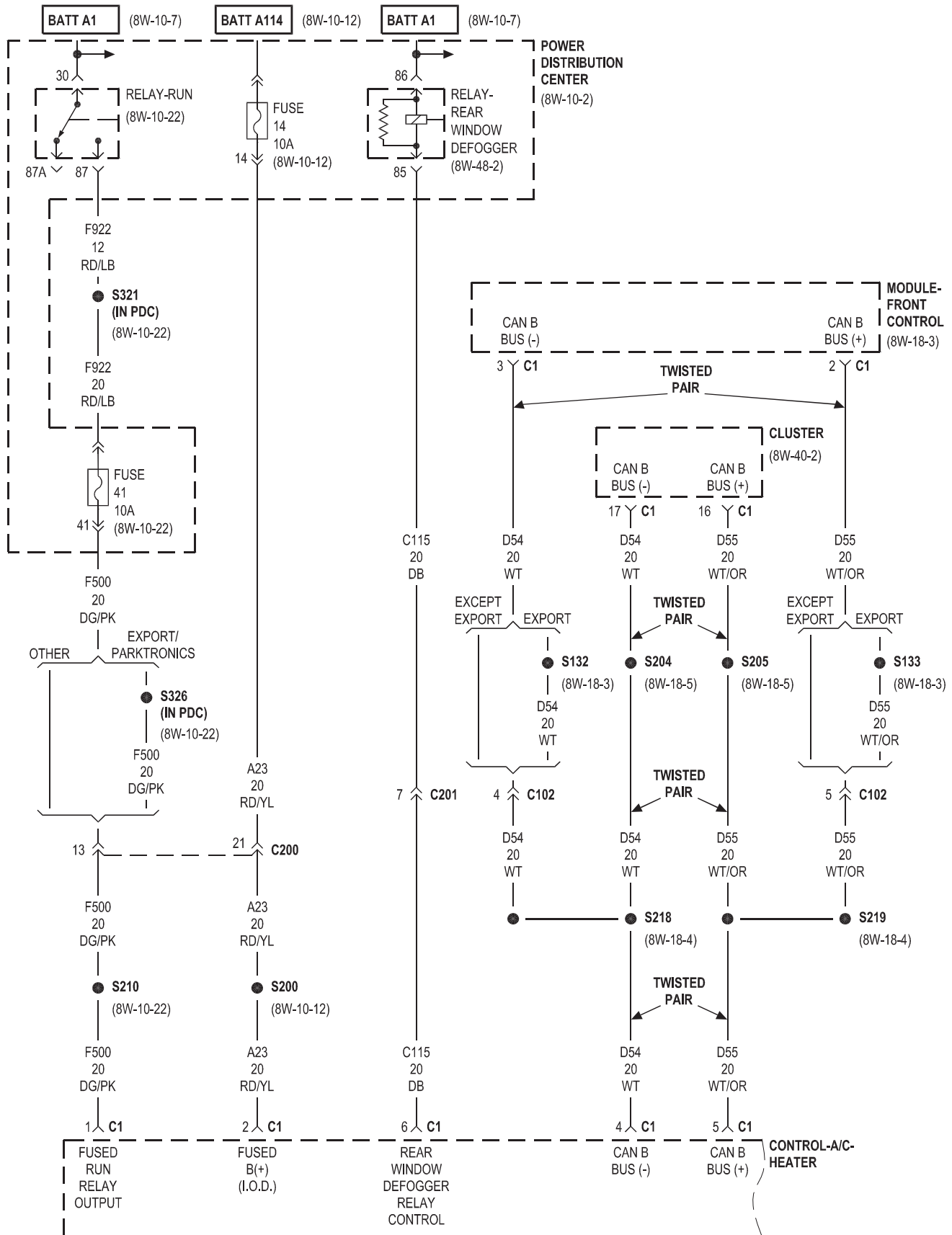


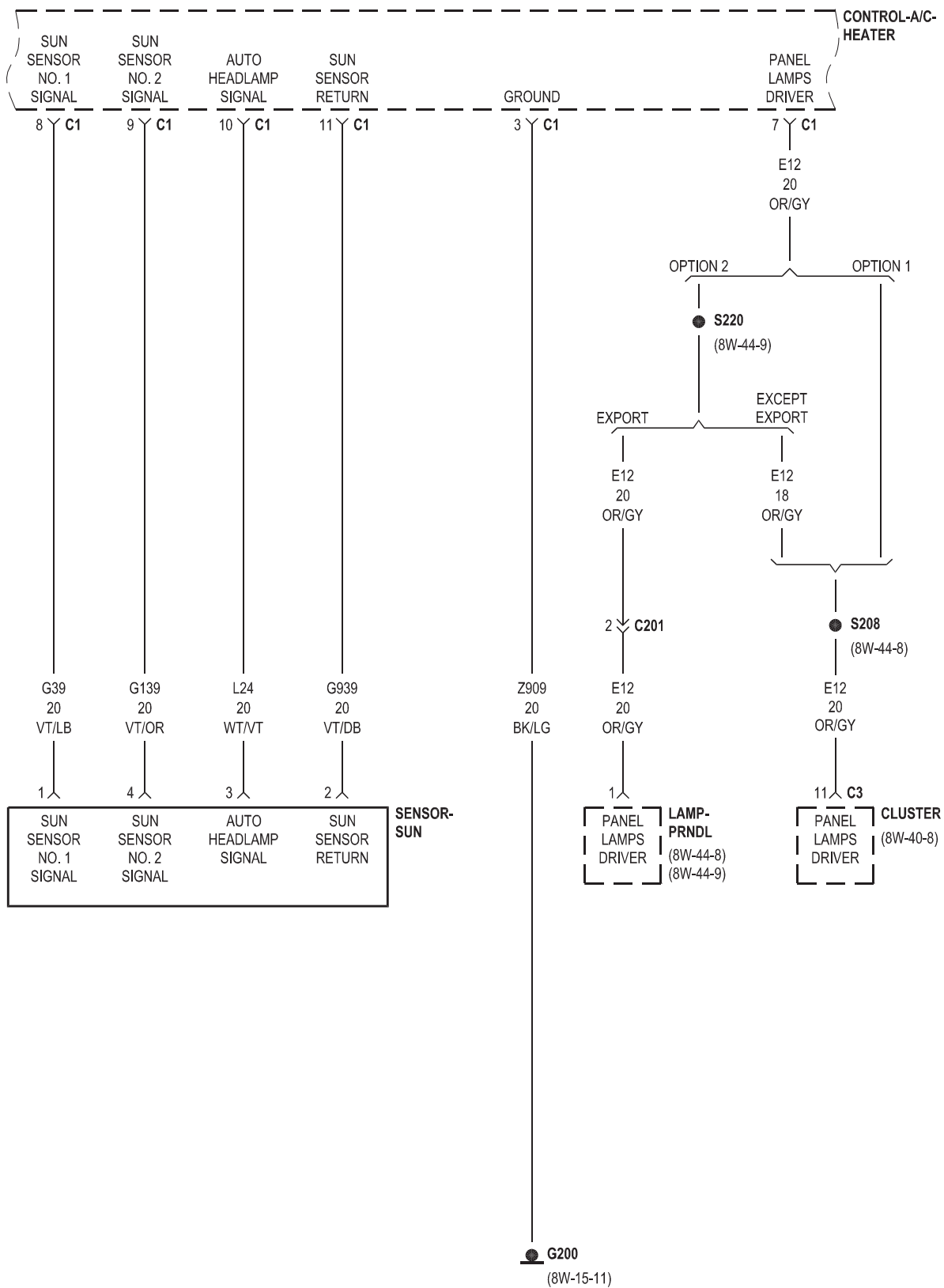


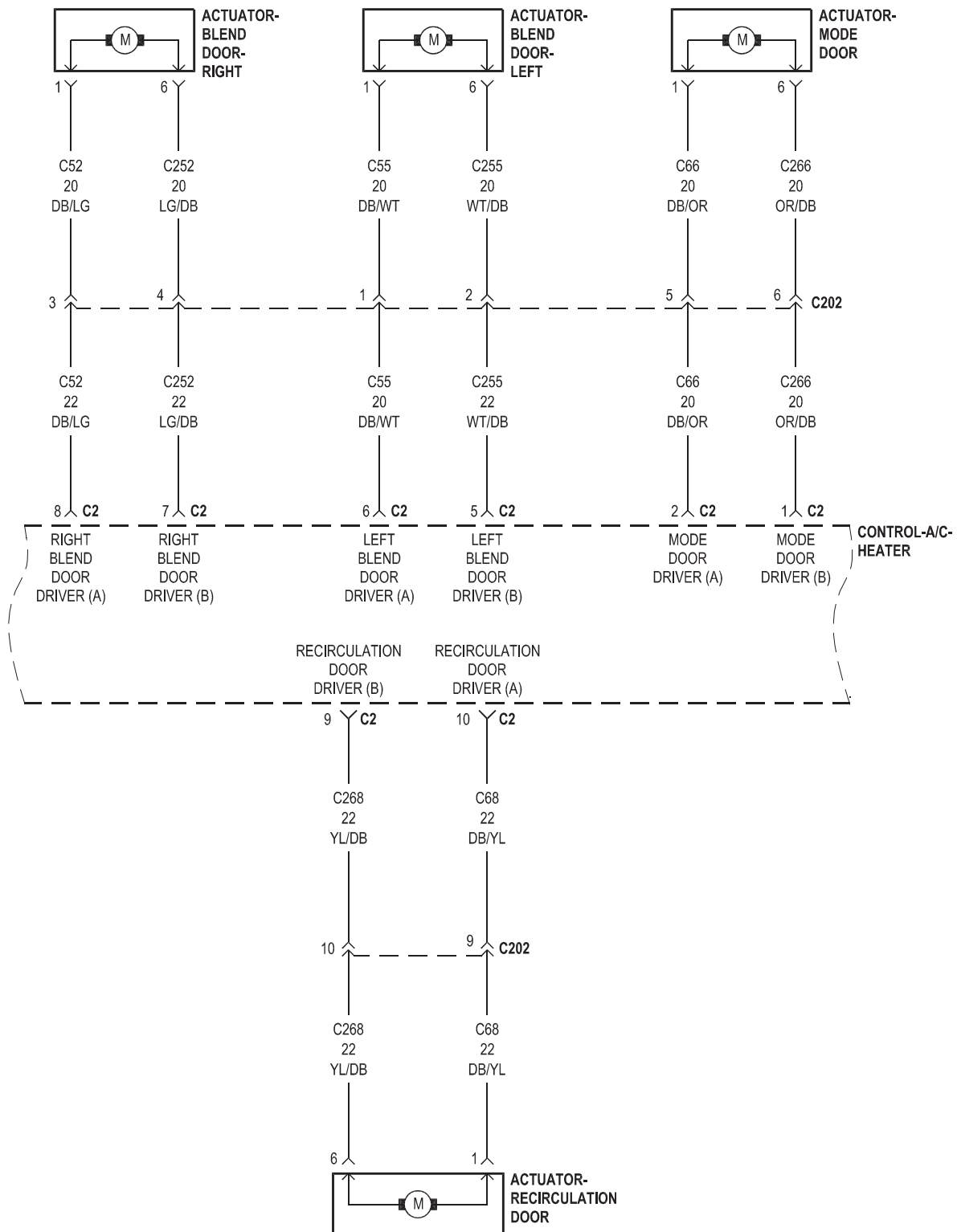




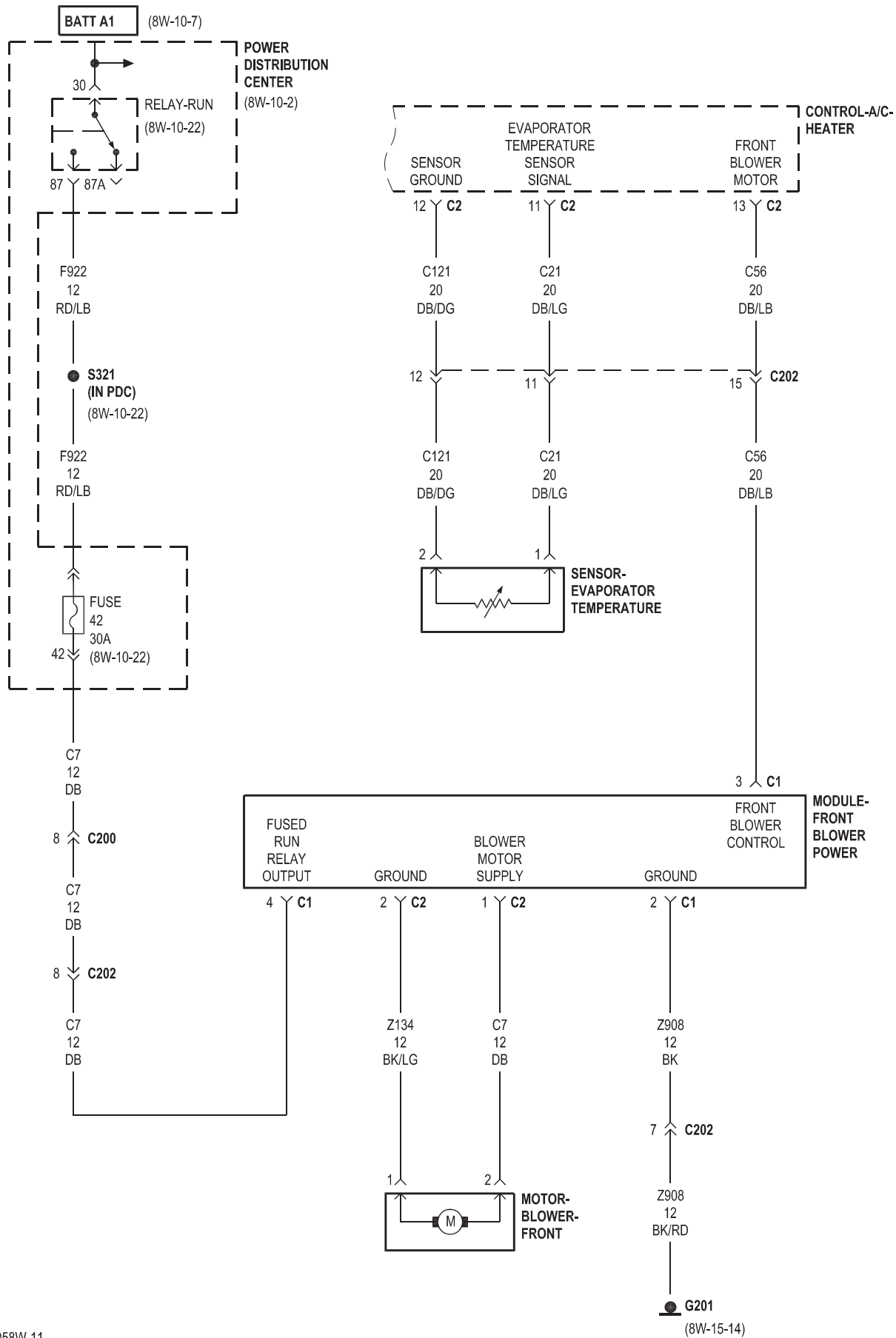
# ATC





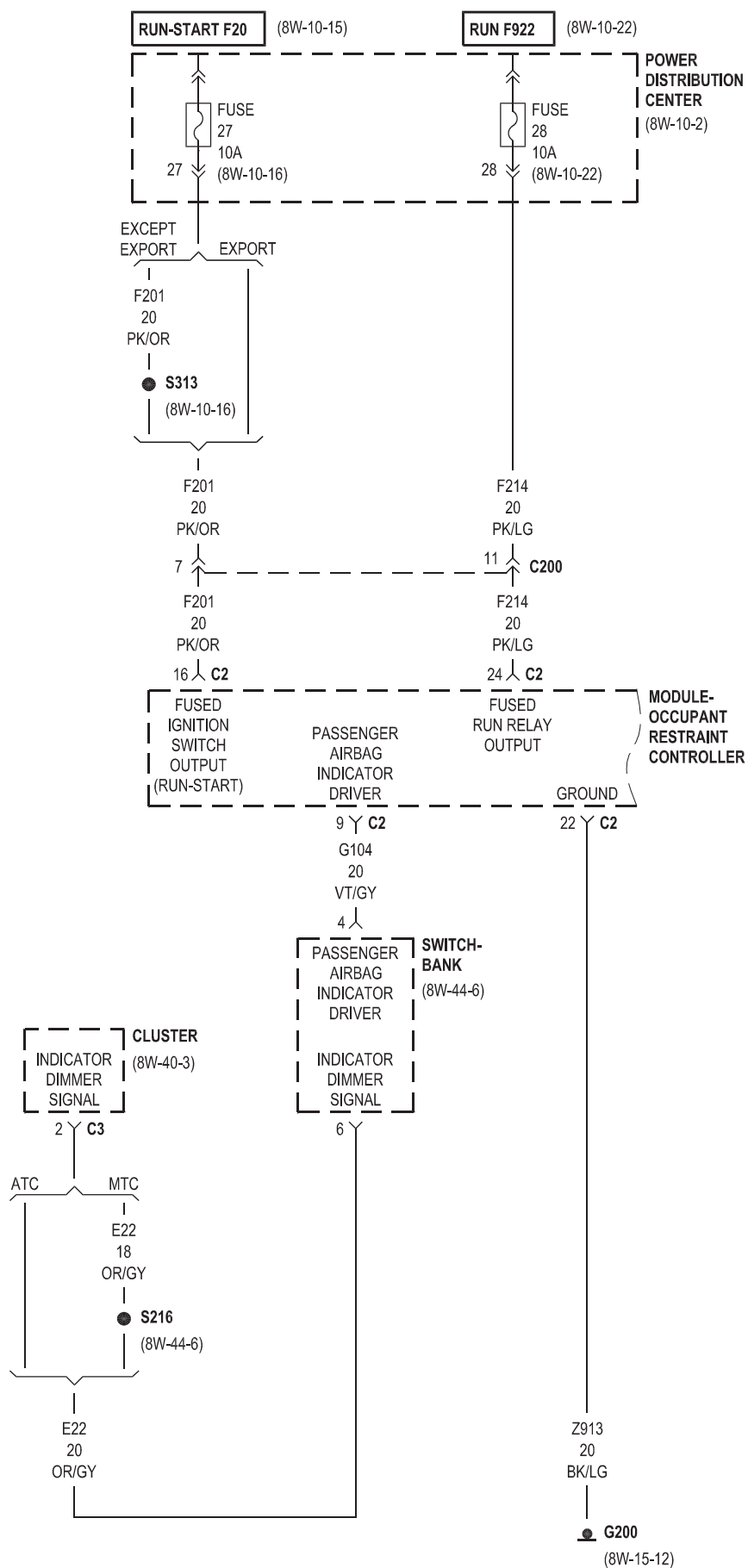


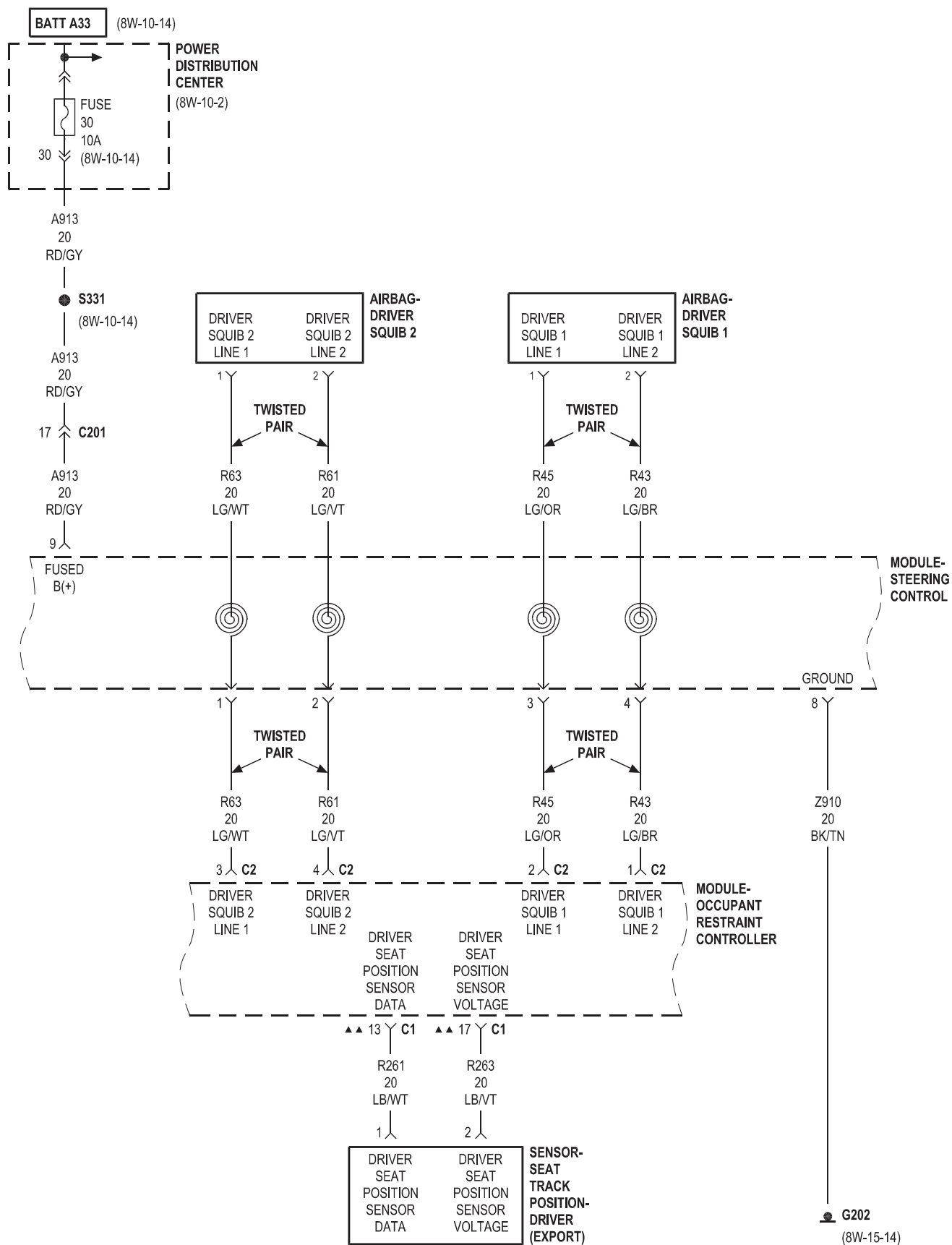
## ATC



## 8W-43 OCCUPANT RESTRAINT SYSTEM

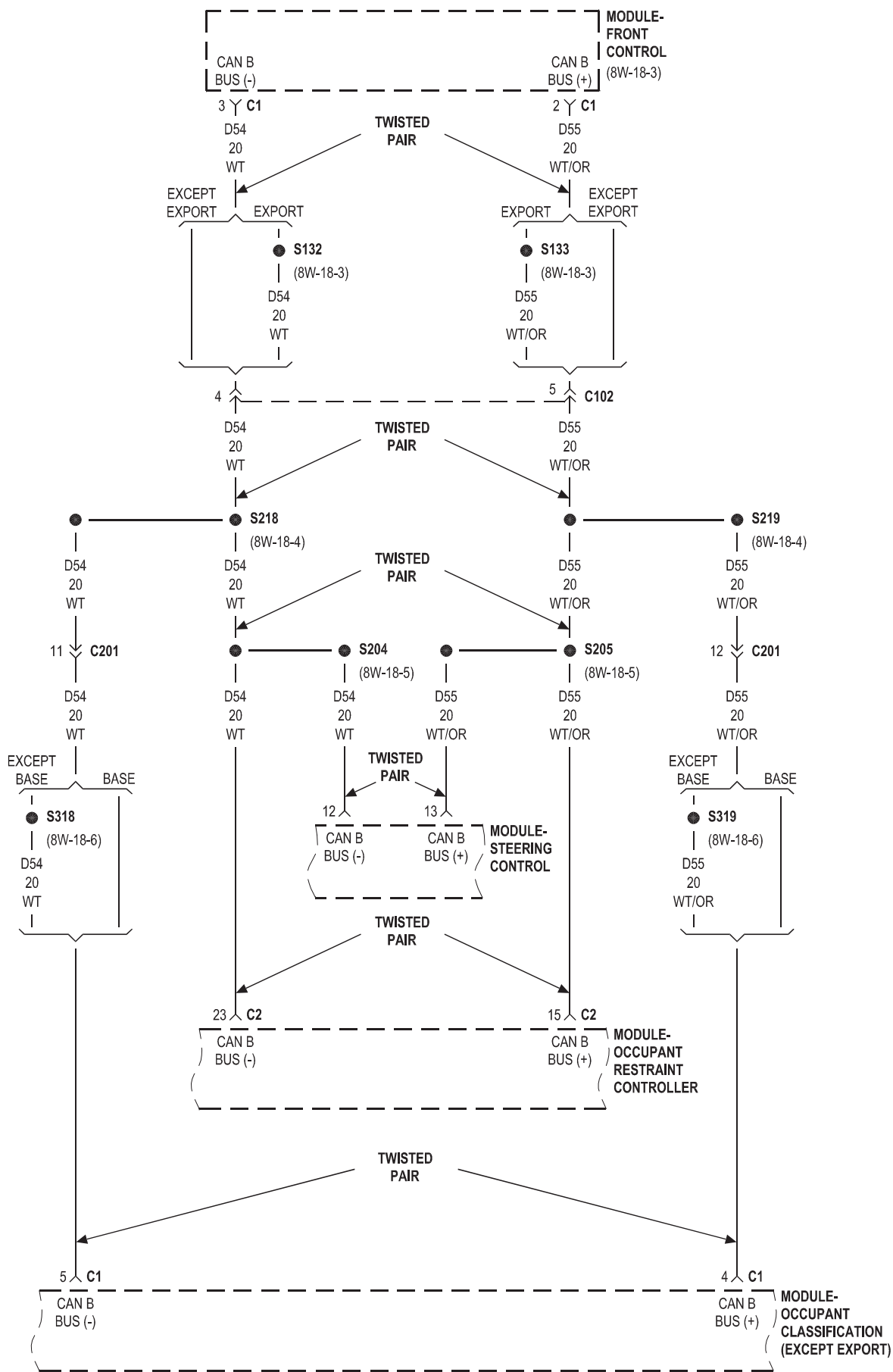
<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Airbag-Driver Squib 1 . . . . .	8W-43-3	Module-Steering Control . . . . .	8W-43-3, 4
Airbag-Driver Squib 2 . . . . .	8W-43-3	Power Distribution Center . . . . .	8W-43-2, 3, 6
Airbag-Passenger Squib . . . . .	8W-43-5	Seat Belt-Pretensioner-Driver . . . . .	8W-43-5
Airbag-Side Curtain-Left . . . . .	8W-43-7	Seat Belt-Pretensioner-Passenger . . . . .	8W-43-5
Airbag-Side Curtain-Right . . . . .	8W-43-7	Sensor-Front Impact-Left . . . . .	8W-43-5
Cluster . . . . .	8W-43-2	Sensor-Front Impact-Right . . . . .	8W-43-5
Fuse 8 . . . . .	8W-43-6	Sensor-Seat Track Position-Driver . . . . .	8W-43-3, 6
Fuse 27 . . . . .	8W-43-2, 6	Sensor-Seat Weight-Left Front . . . . .	8W-43-6
Fuse 28 . . . . .	8W-43-2	Sensor-Seat Weight-Left Rear . . . . .	8W-43-6
Fuse 30 . . . . .	8W-43-3	Sensor-Seat Weight-Right Front . . . . .	8W-43-6
G200 . . . . .	8W-43-2	Sensor-Seat Weight-Right Rear . . . . .	8W-43-6
G202 . . . . .	8W-43-3	Sensor-Side Impact-Left 1 . . . . .	8W-43-7
G301 . . . . .	8W-43-6	Sensor-Side Impact-Left 2 . . . . .	8W-43-7
Module-Front Control . . . . .	8W-43-4	Sensor-Side Impact-Right 1 . . . . .	8W-43-7
Module-Occupant Classification . . . . .	8W-43-4, 6	Sensor-Side Impact-Right 2 . . . . .	8W-43-7
Module-Occupant Restraint Controller . . . . .	8W-43-2, 3, 4, 5, 7	Switch-Bank . . . . .	8W-43-2

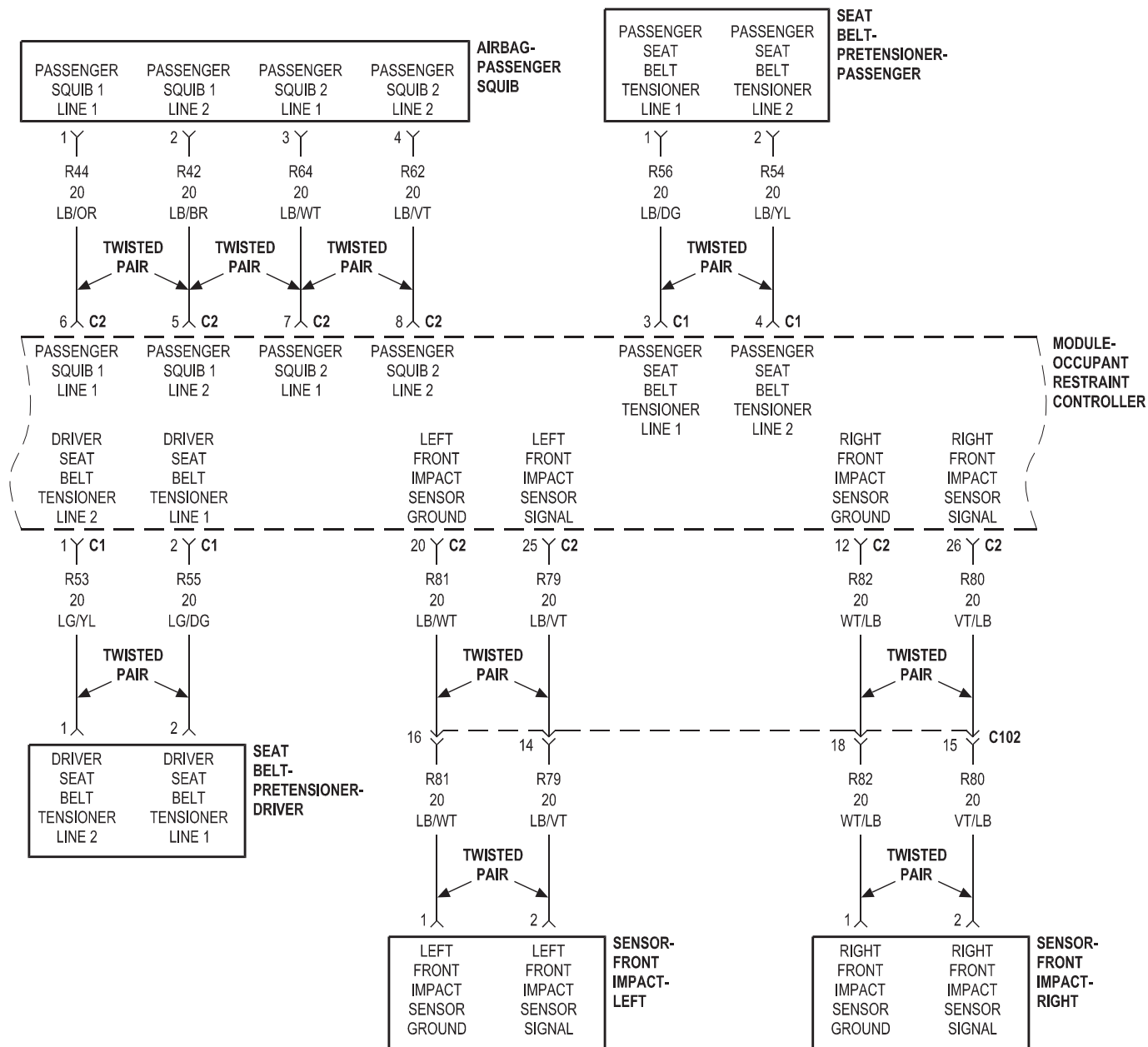


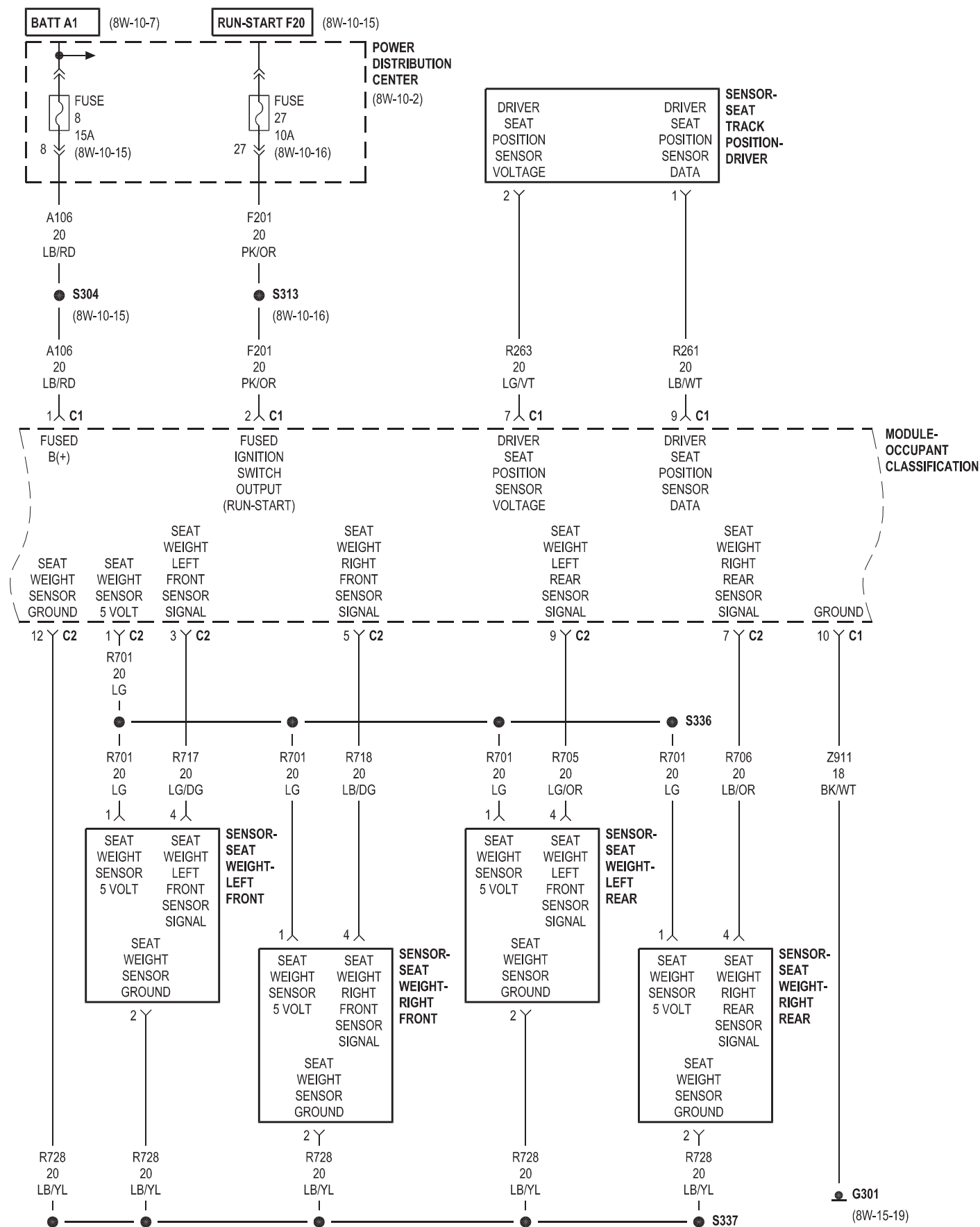


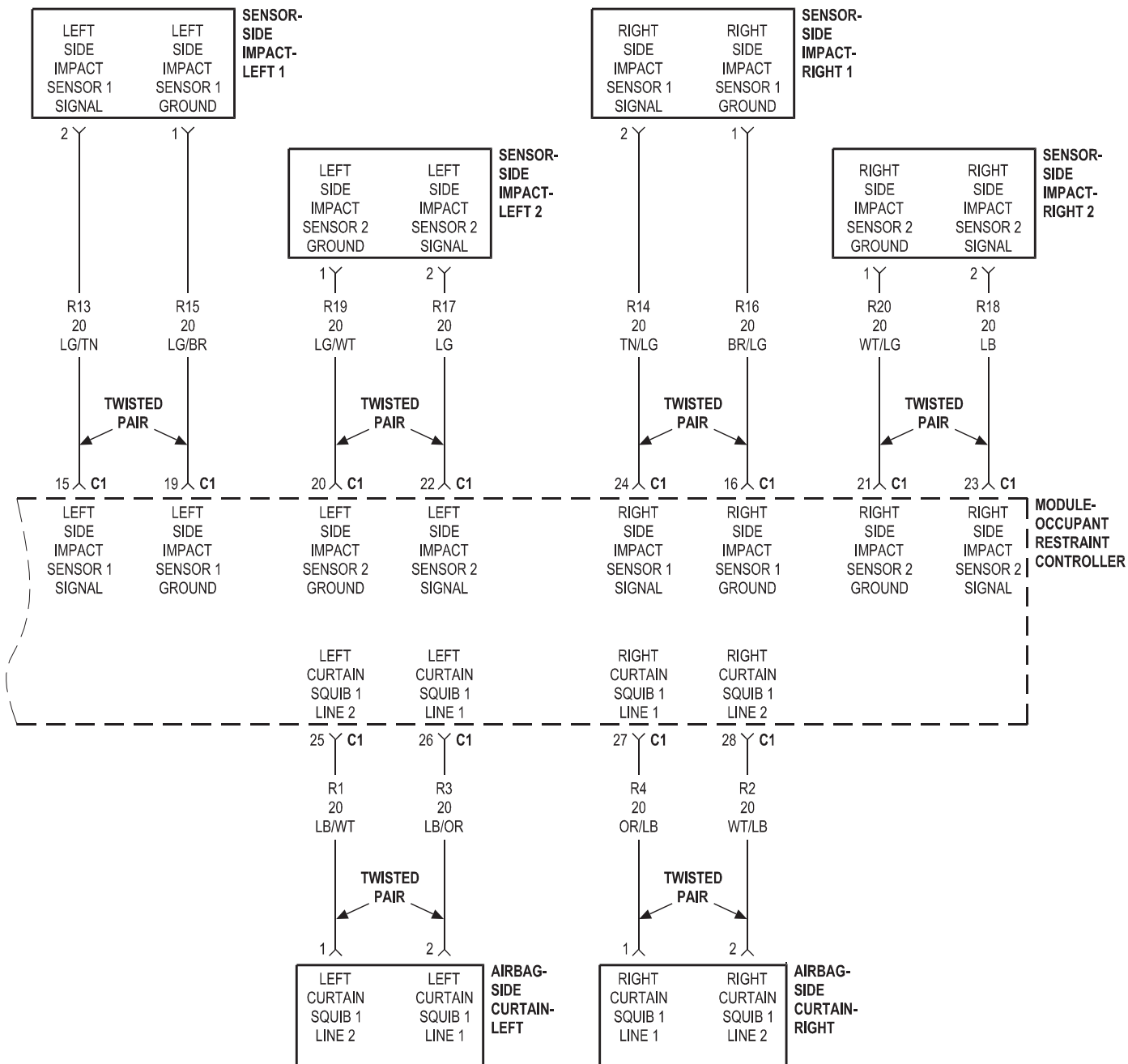
▲▲ EXPORT









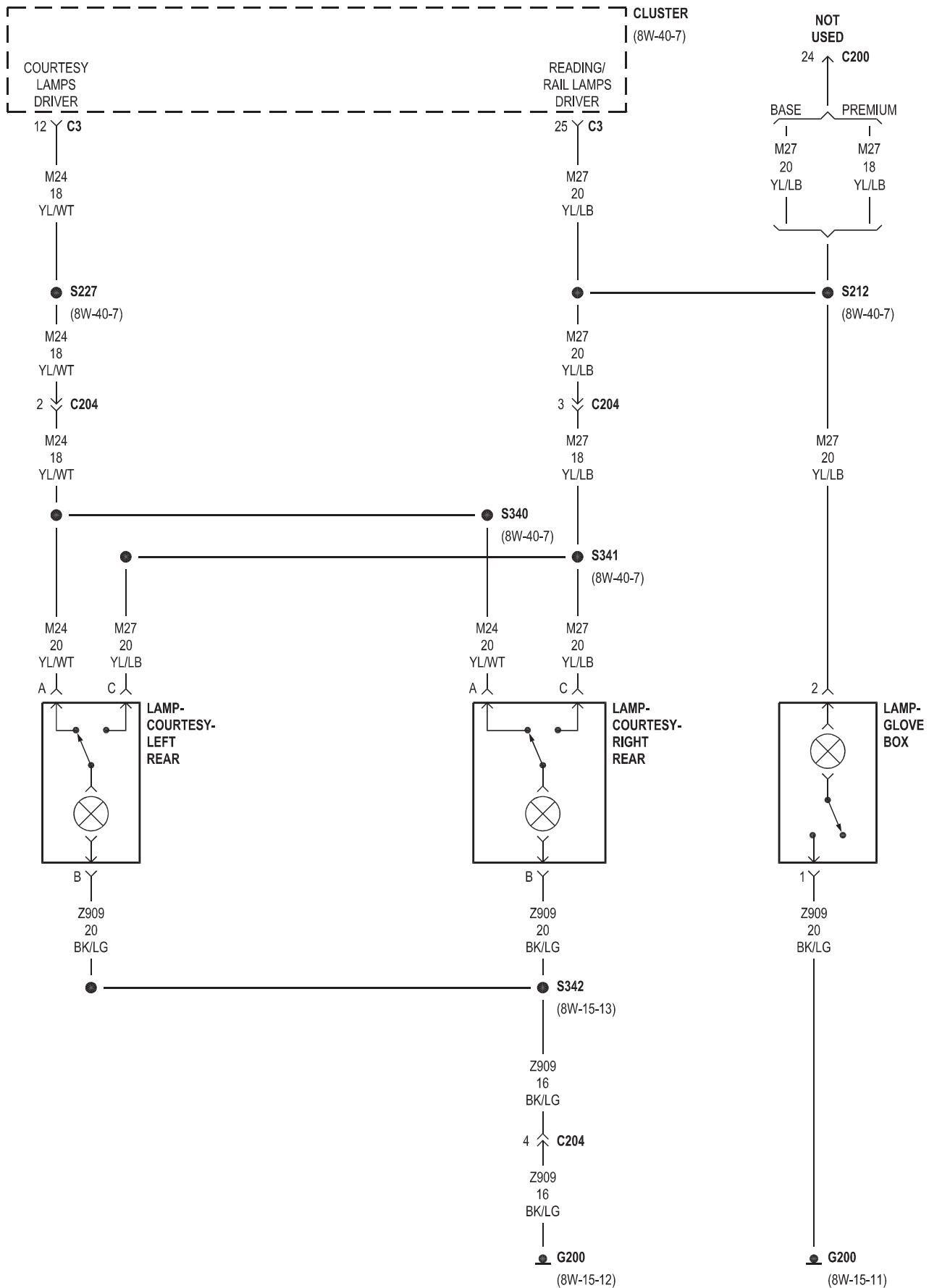




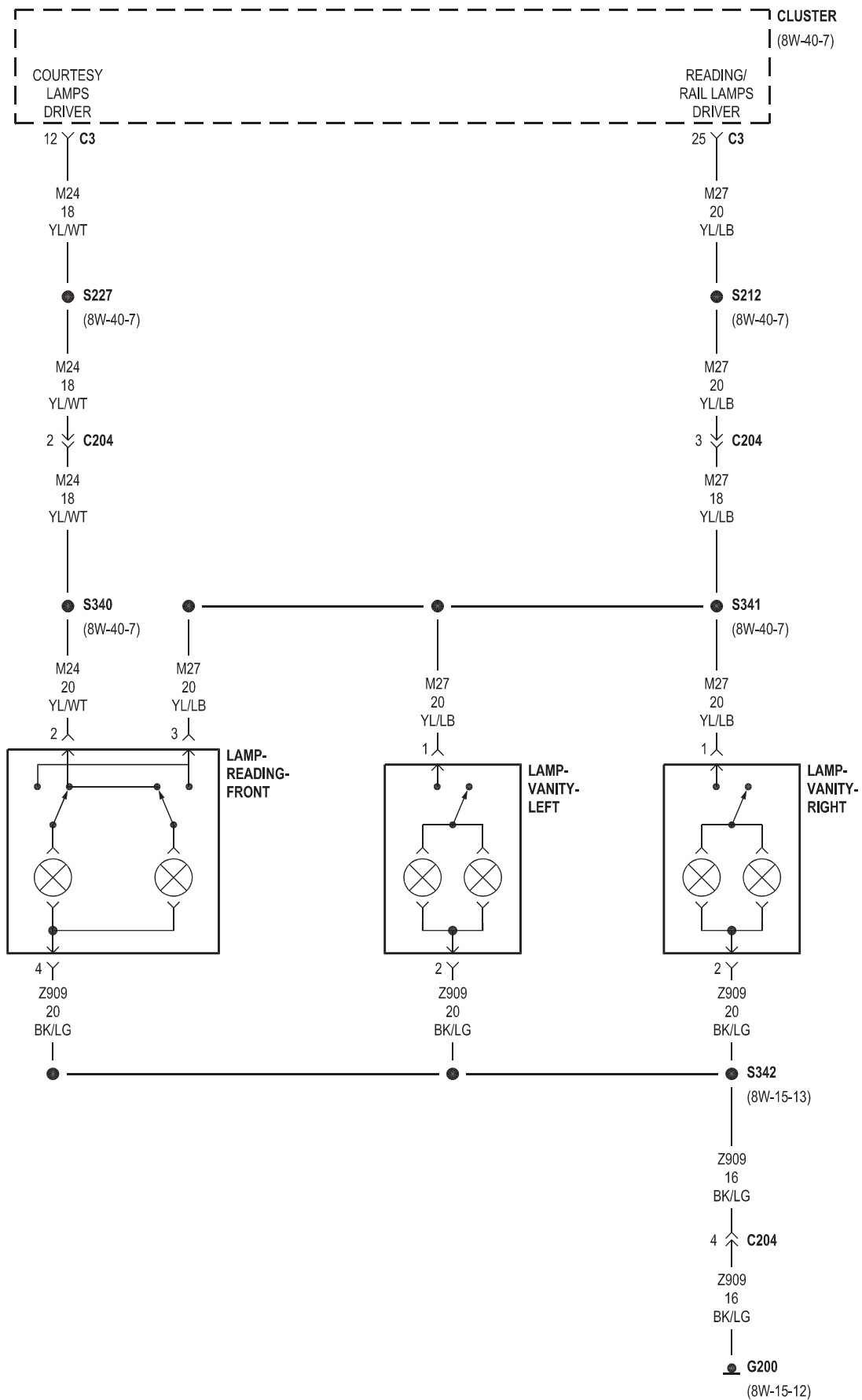
## 8W-44 INTERIOR LIGHTING

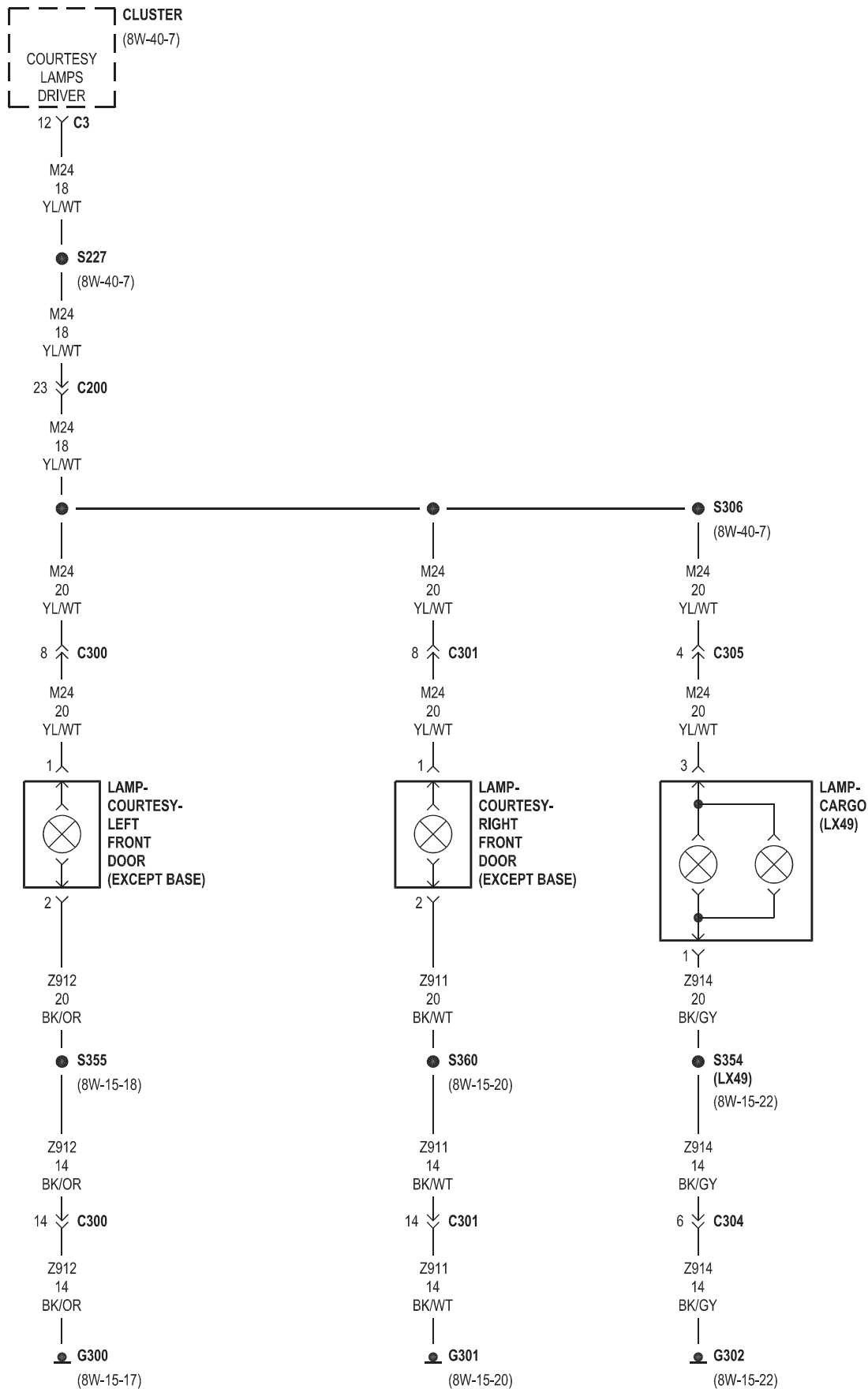
<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Circuit Breaker No. 1 . . . . .	8W-44-2	Lamp-Courtesy-Right Rear . . . . .	8W-44-3
Cluster . . . . .	8W-44-2, 3, 4, 5, 6, 7, 8, 9	Lamp-Glove Box . . . . .	8W-44-3
Control-A/C-Heater . . . . .	8W-44-6, 8, 9	Lamp-PRNDL . . . . .	8W-44-8, 9
Fuse 5 . . . . .	8W-44-2	Lamp-Reading-Front . . . . .	8W-44-4
Fuse 29 . . . . .	8W-44-2	Lamp-Vanity-Left . . . . .	8W-44-4
Fuse 38 . . . . .	8W-44-6	Lamp-Vanity-Right . . . . .	8W-44-4
G200 . . . . .	8W-44-3, 4, 8	Module-Clock Analog . . . . .	8W-44-8, 9
G202 . . . . .	8W-44-2, 8	Module-Front Control . . . . .	8W-44-2
G300 . . . . .	8W-44-5, 8, 9	Module-Integrated Power . . . . .	8W-44-2
G301 . . . . .	8W-44-5	Module-Occupant Restraint Controller . . . . .	8W-44-6
G302 . . . . .	8W-44-5	Power Distribution Center . . . . .	8W-44-2, 6
Lamp-Cargo . . . . .	8W-44-5, 6	Switch-Bank . . . . .	8W-44-6, 8
Lamp-Courtesy-Left Front Door . . . . .	8W-44-5	Switch-Headlamp . . . . .	8W-44-7, 8
Lamp-Courtesy-Left Rear . . . . .	8W-44-3	Switch-Heated Seat-Left . . . . .	8W-44-8
Lamp-Courtesy-Right Front Door . . . . .	8W-44-5	Switch-Heated Seat-Right . . . . .	8W-44-8

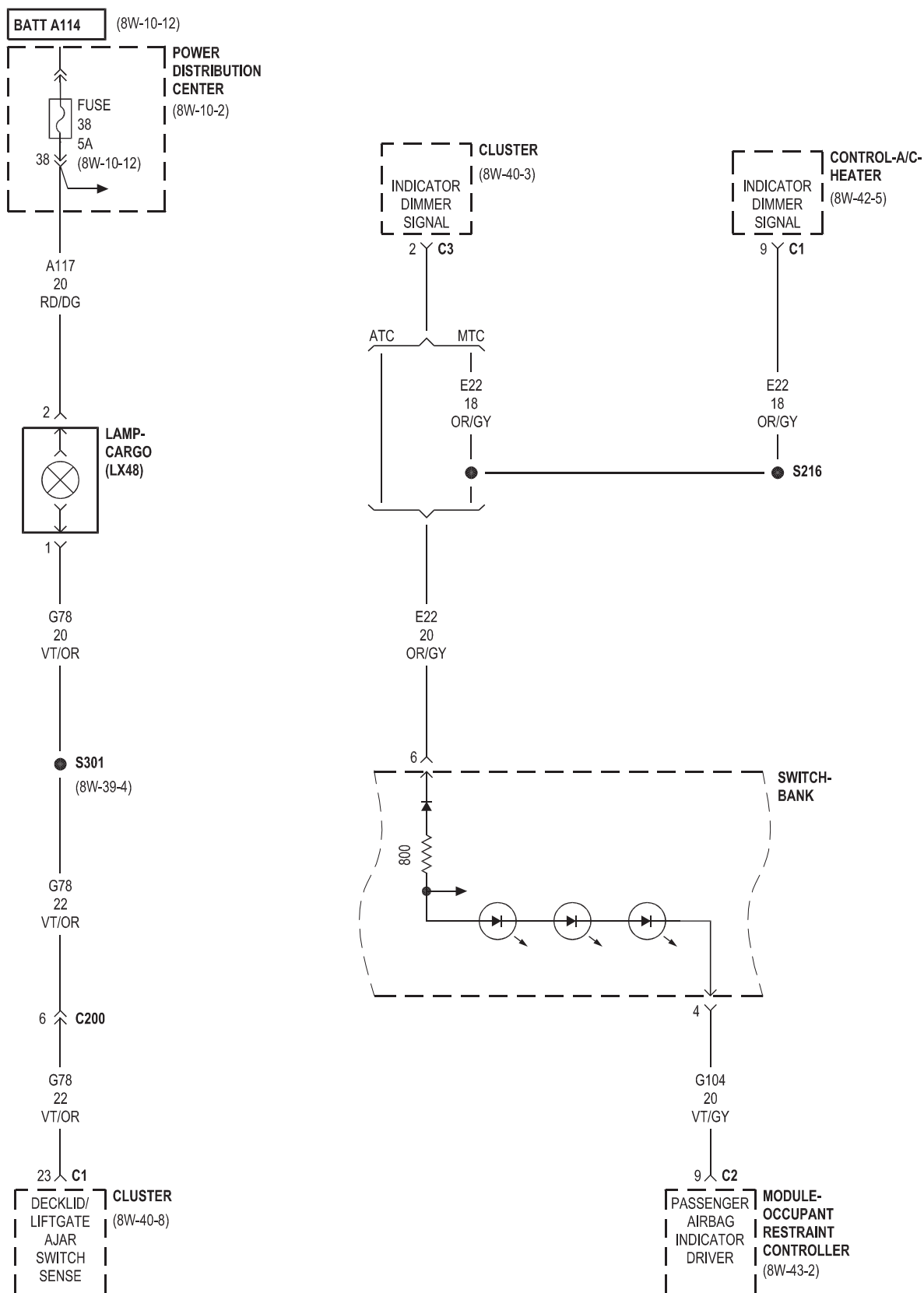


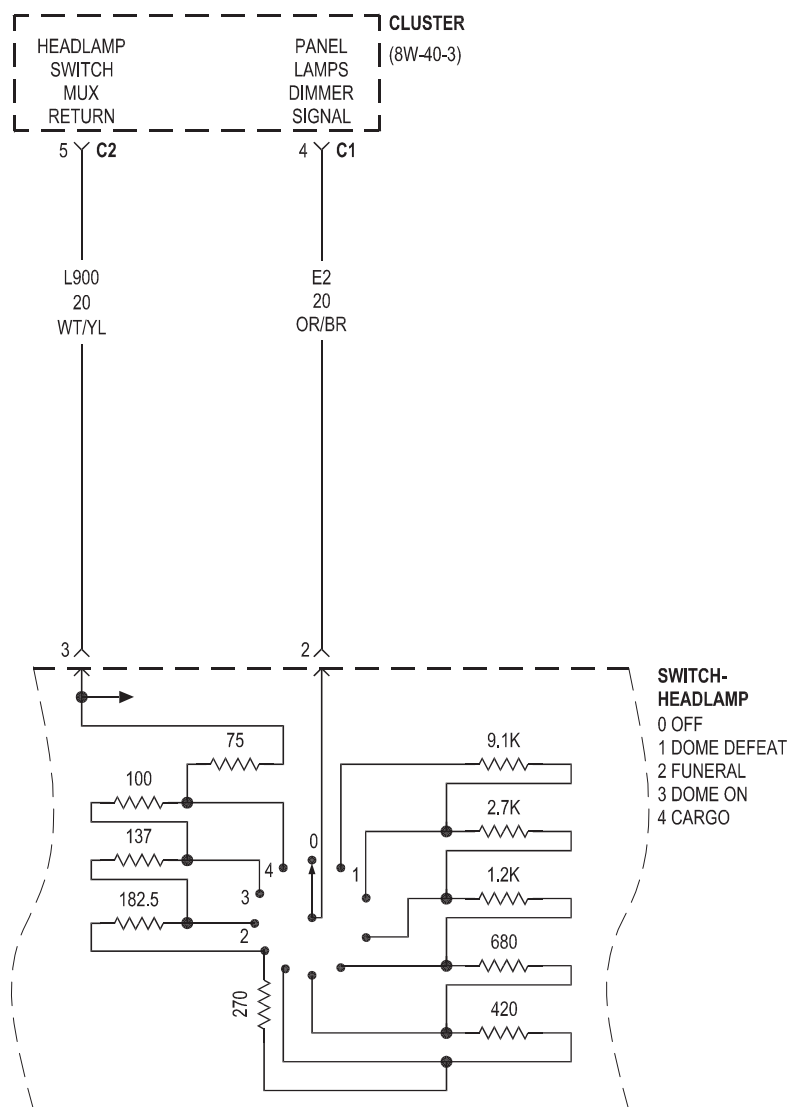


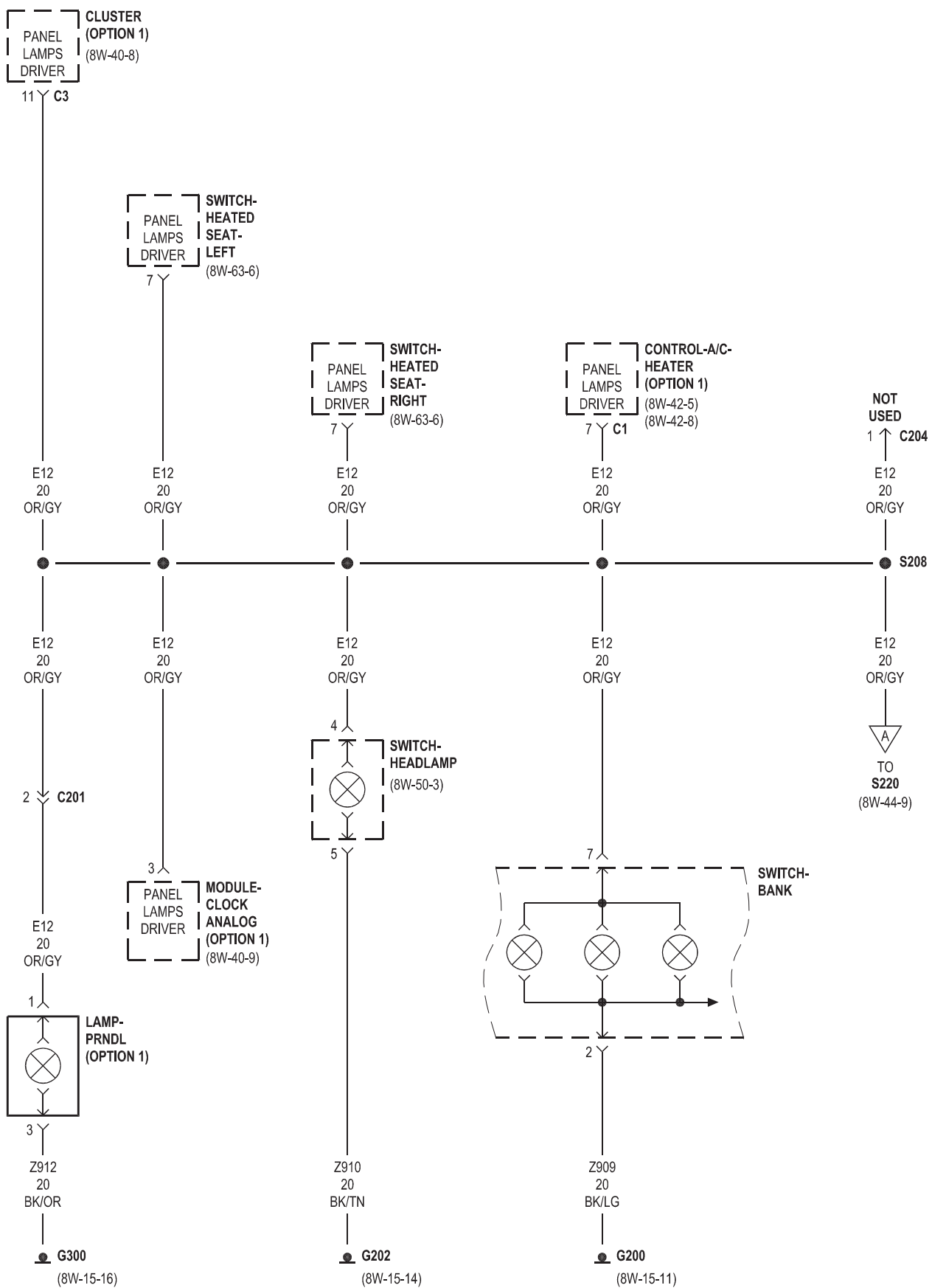


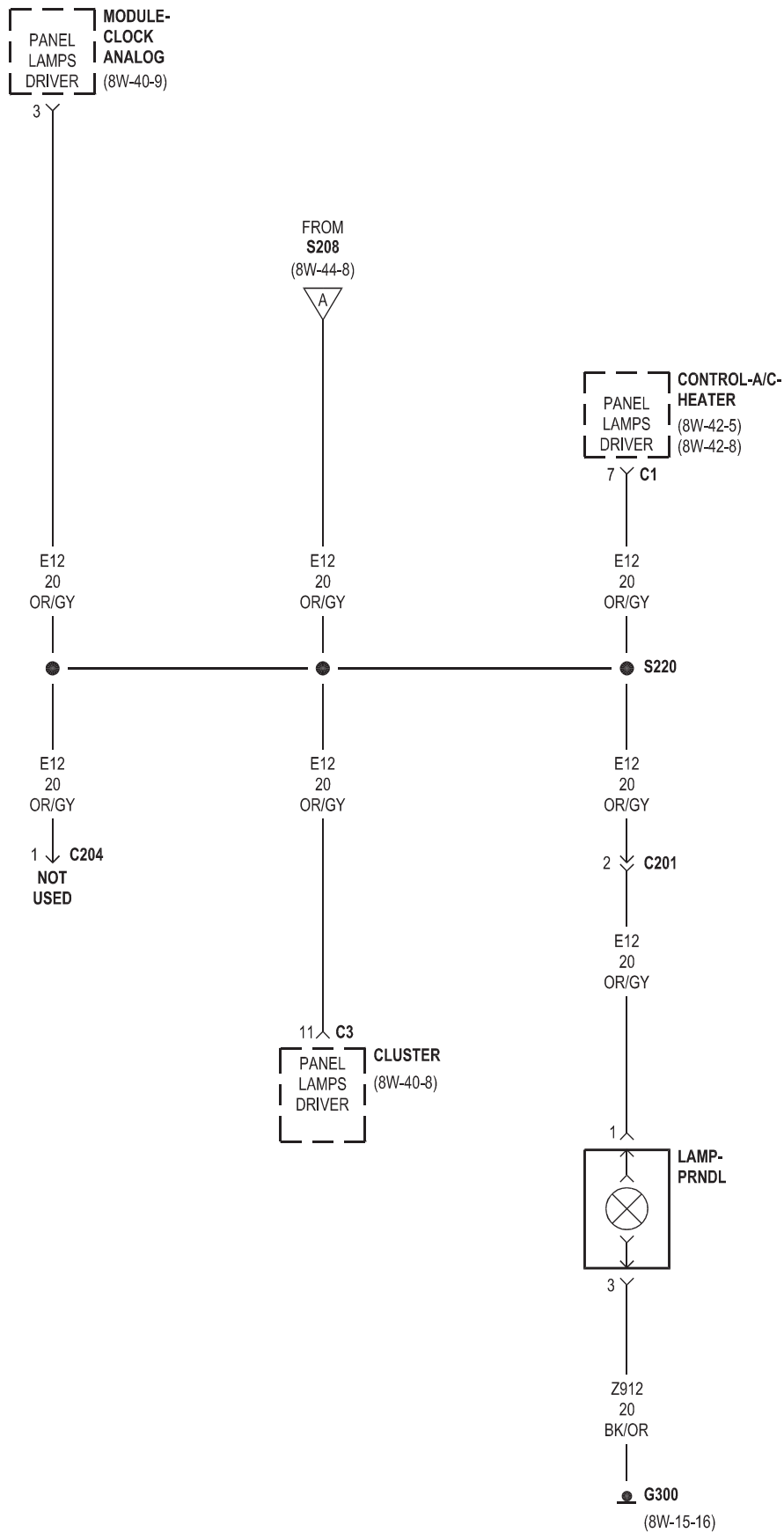










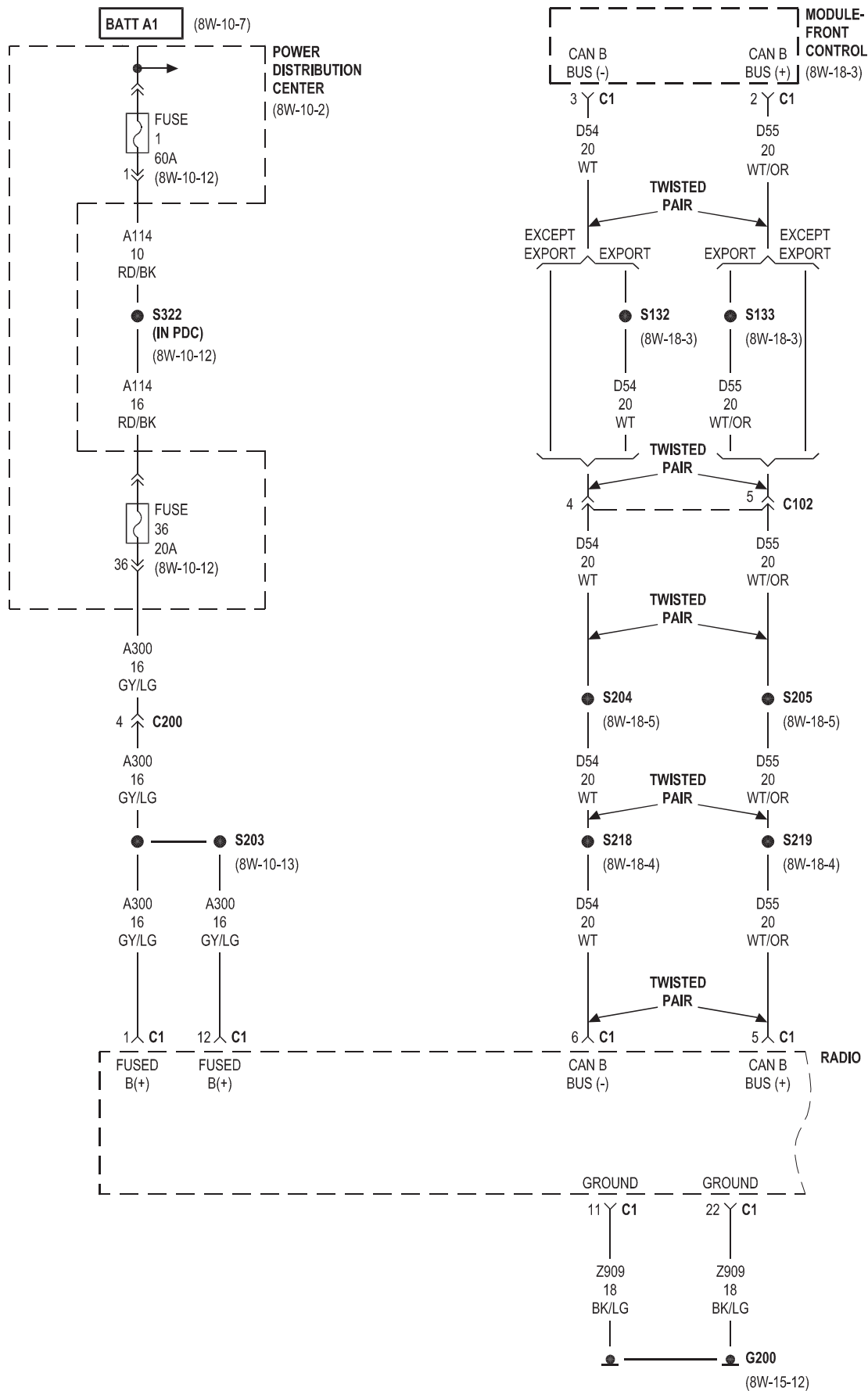


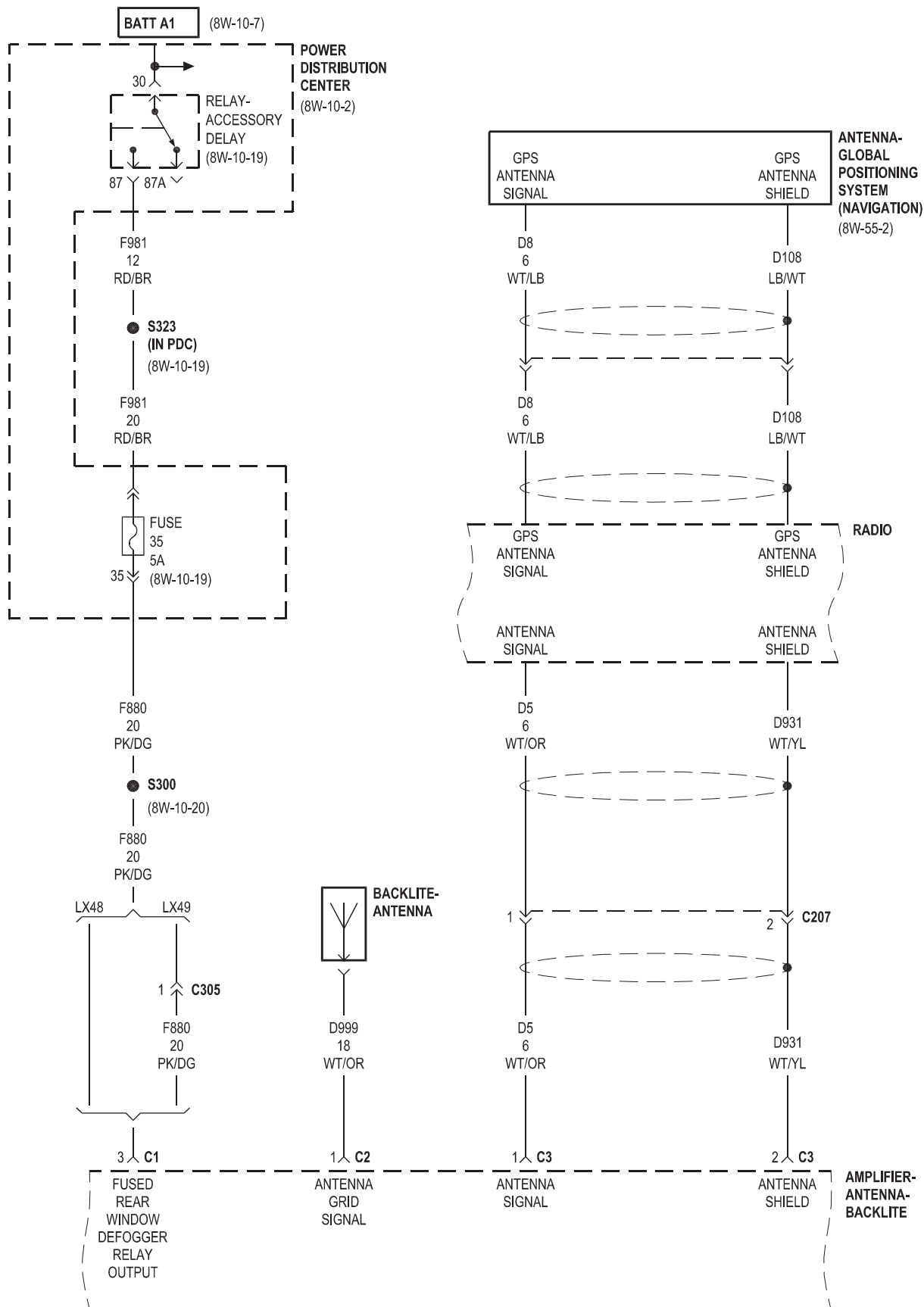


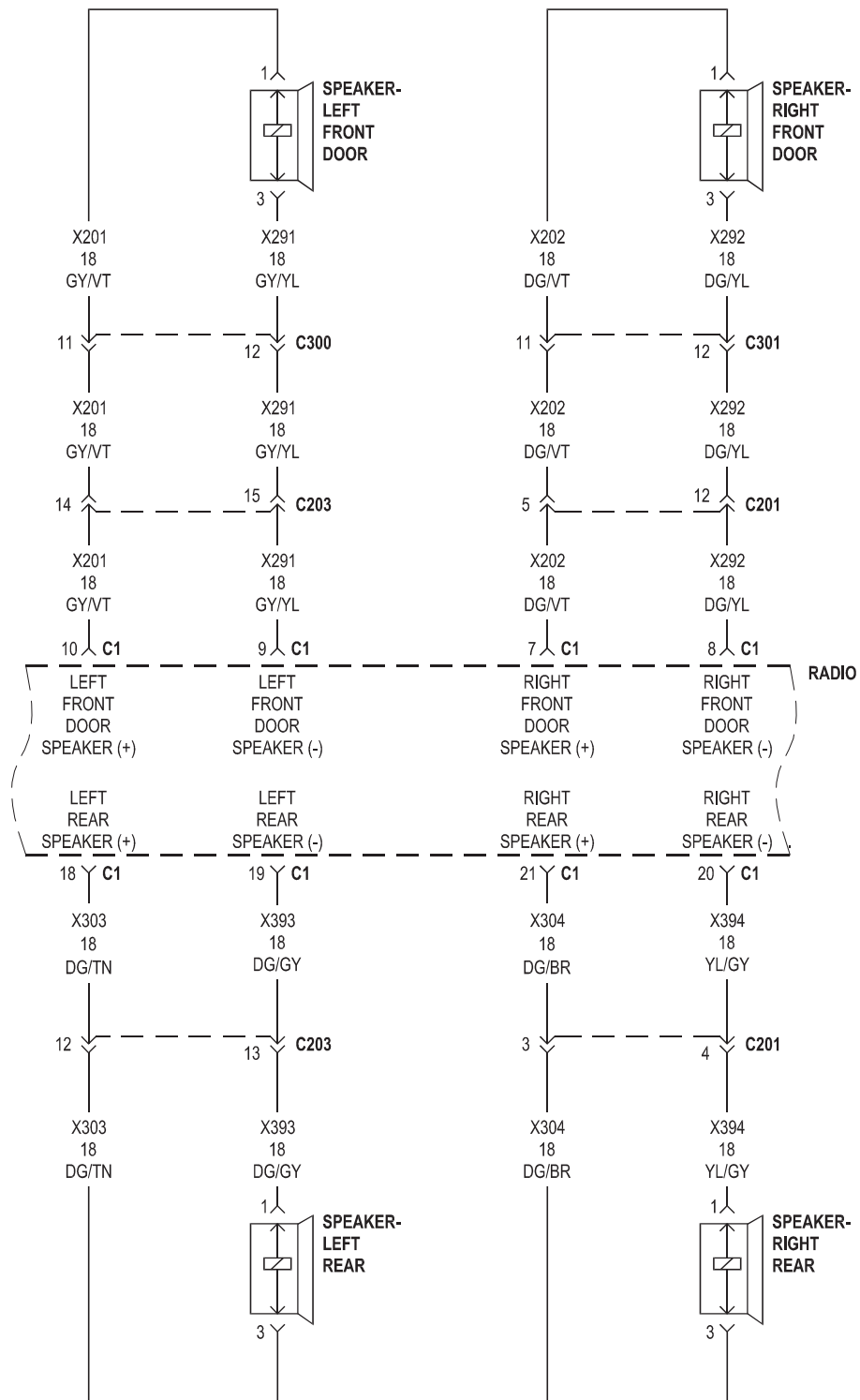
## 8W-47 AUDIO SYSTEM

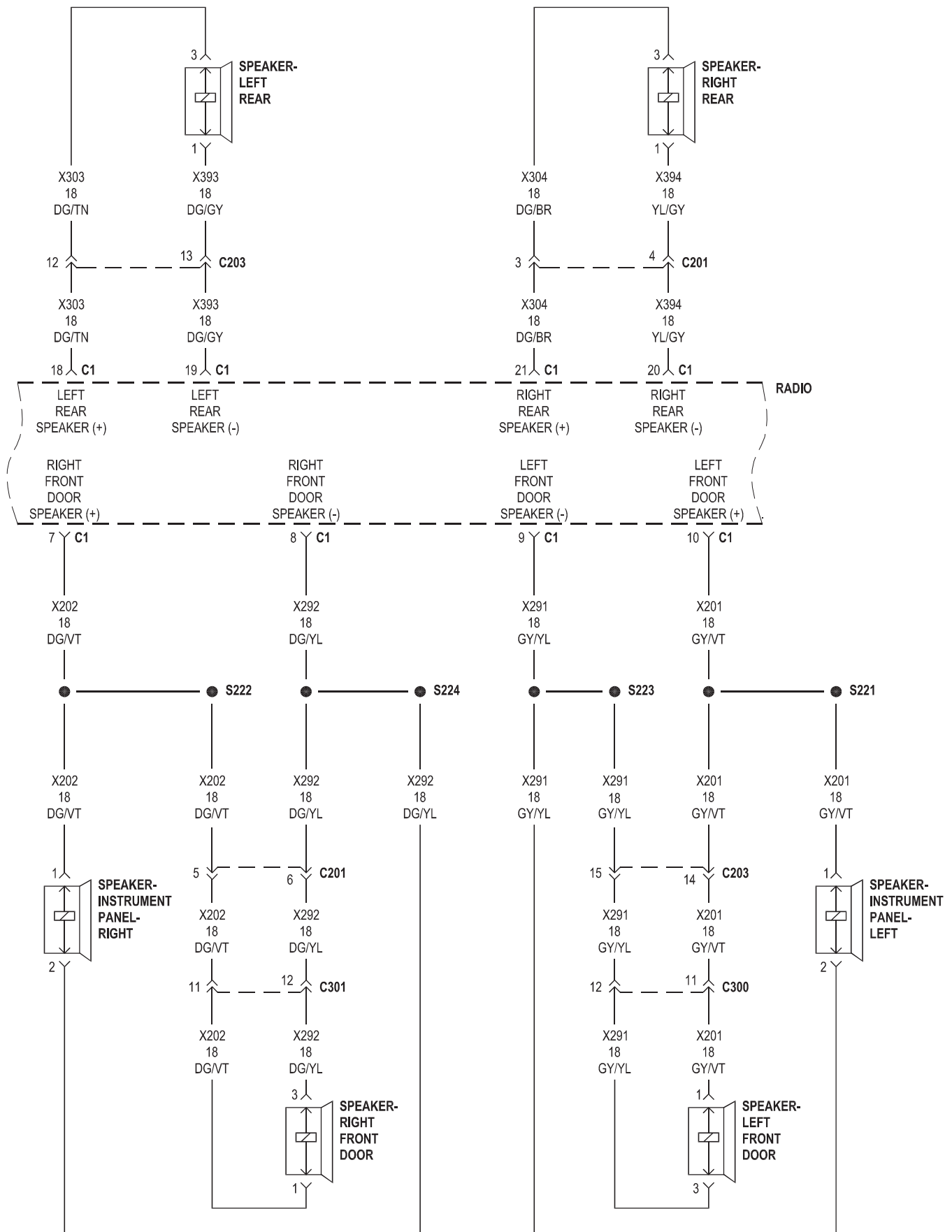
<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Amplifier-Antenna-Backlite . . . . .	8W-47-3	Module-Steering Control . . . . .	8W-47-12
Amplifier-Radio . . . . .	8W-47-6, 7, 8	Power Distribution Center . . . . .	8W-47-2, 3, 6, 9, 11, 12
Antenna-Global Positioning System . . . . .	8W-47-3	Radio . . . . .	8W-47-2, 3, 4, 5, 6, 10, 11
Antenna-Satellite No. 1 . . . . .	8W-47-9	Receiver-Satellite . . . . .	8W-47-9, 10
Antenna-Satellite No. 2 . . . . .	8W-47-9	Relay-Accessory Delay . . . . .	8W-47-3
Backlite-Antenna . . . . .	8W-47-3	Speaker-Instrument Panel-Center . . . . .	8W-47-8
Fuse 1 . . . . .	8W-47-2, 6, 9, 11	Speaker-Instrument Panel-Left . . . . .	8W-47-5, 8
Fuse 30 . . . . .	8W-47-12	Speaker-Instrument Panel-Right . . . . .	8W-47-5, 8
Fuse 35 . . . . .	8W-47-3	Speaker-Left Front Door . . . . .	8W-47-4, 5, 7
Fuse 36 . . . . .	8W-47-2, 9, 11	Speaker-Left Rear . . . . .	8W-47-4, 5, 7
Fuse 44 . . . . .	8W-47-6	Speaker-Right Front Door . . . . .	8W-47-4, 5, 7
G200 . . . . .	8W-47-2, 9, 11	Speaker-Right Rear . . . . .	8W-47-4, 5, 7
G202 . . . . .	8W-47-6, 12	Speaker-Subwoofer . . . . .	8W-47-8
Module-Front Control . . . . .	8W-47-2, 6, 10, 12	Switch-Steering-Left . . . . .	8W-47-12
Module-Hands Free . . . . .	8W-47-11	Switch-Steering-Right . . . . .	8W-47-12

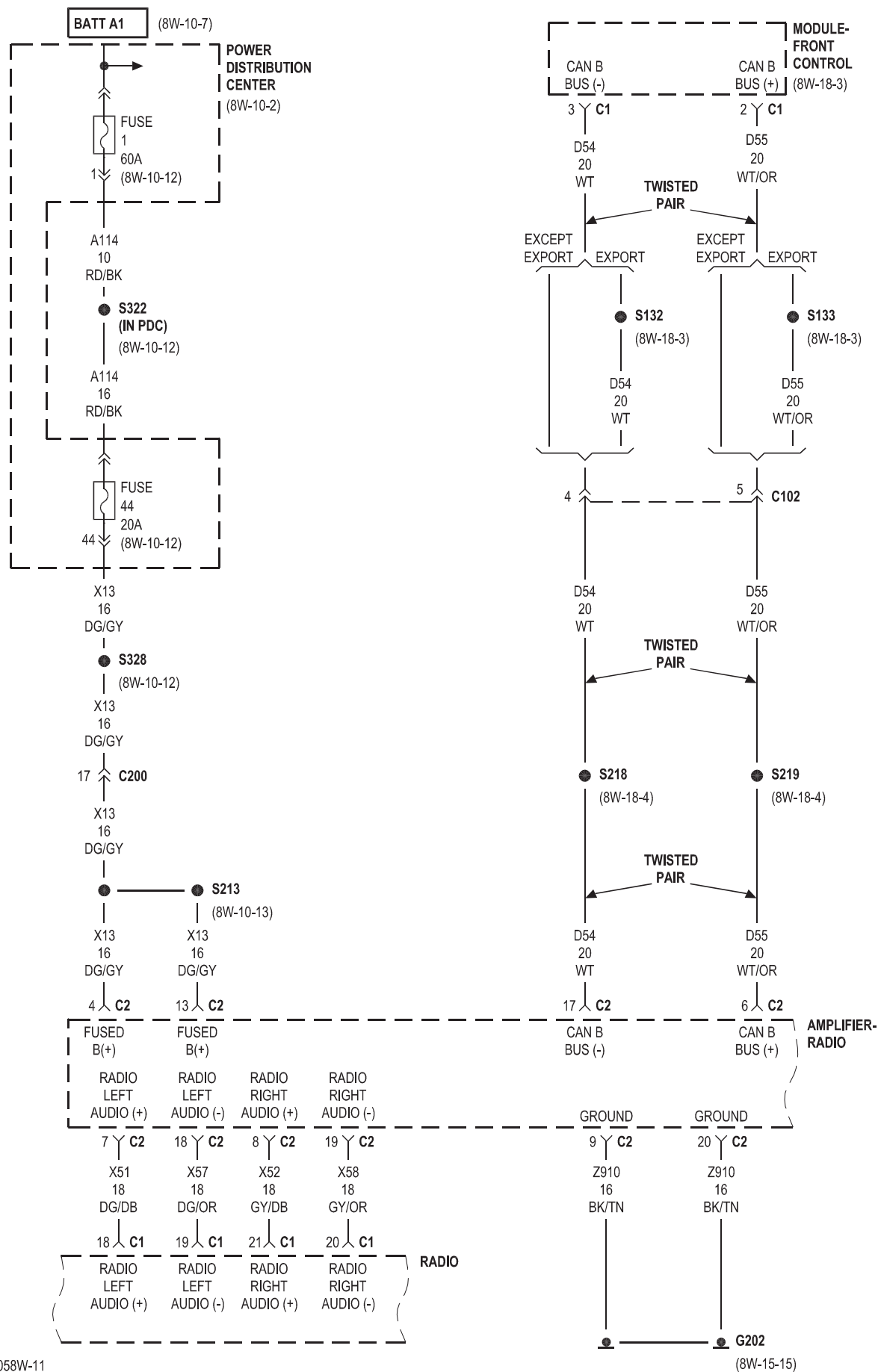


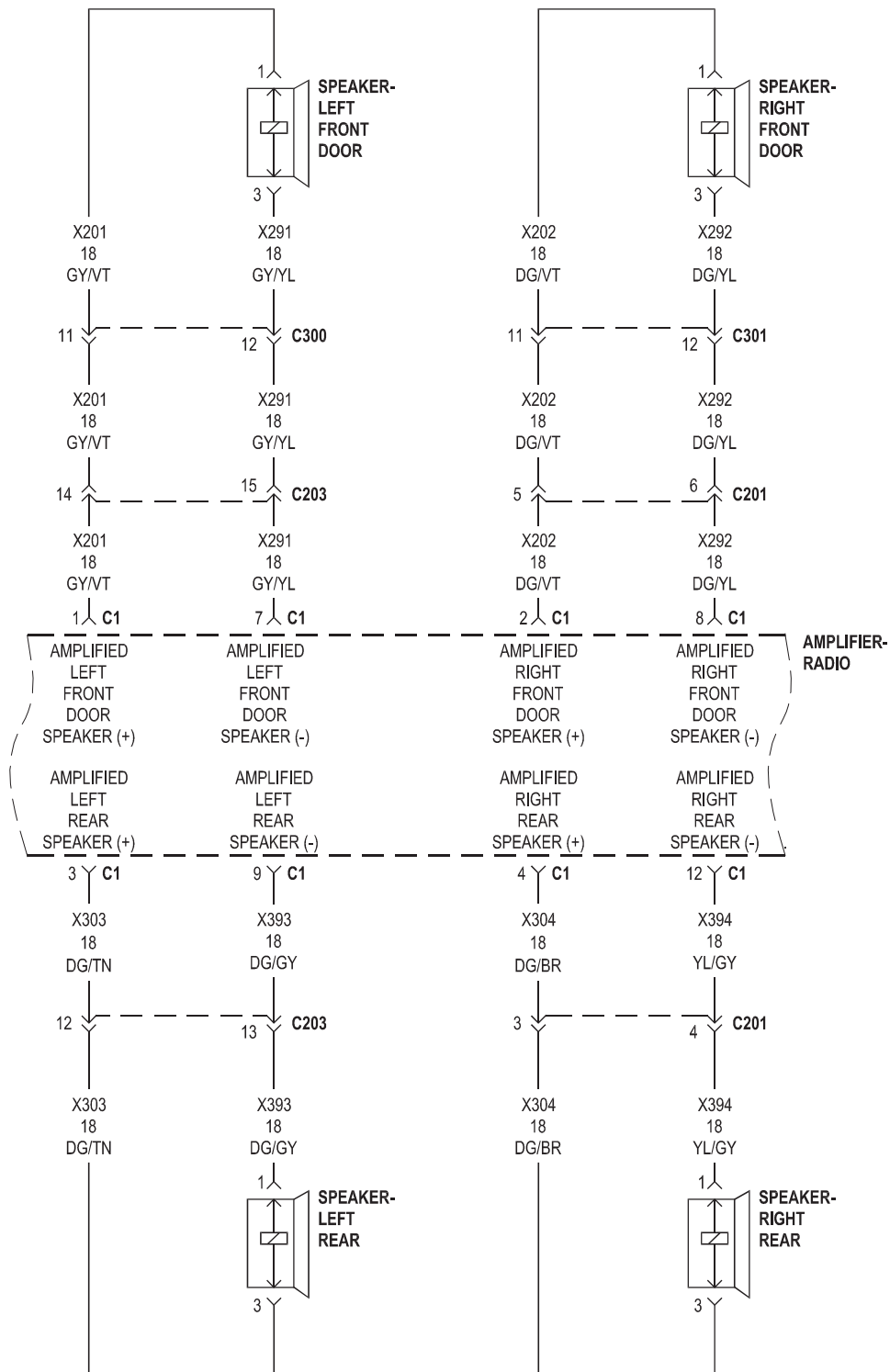


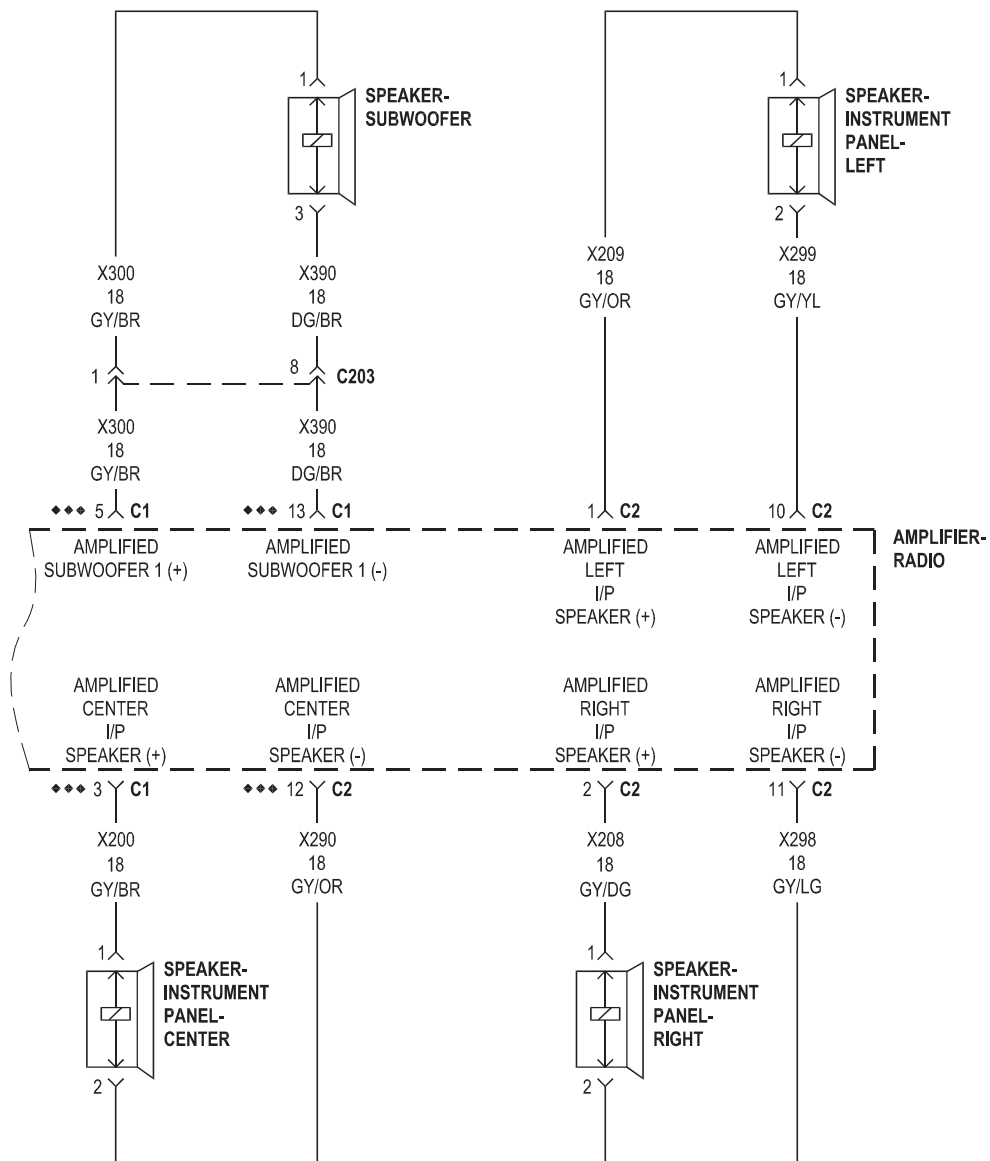


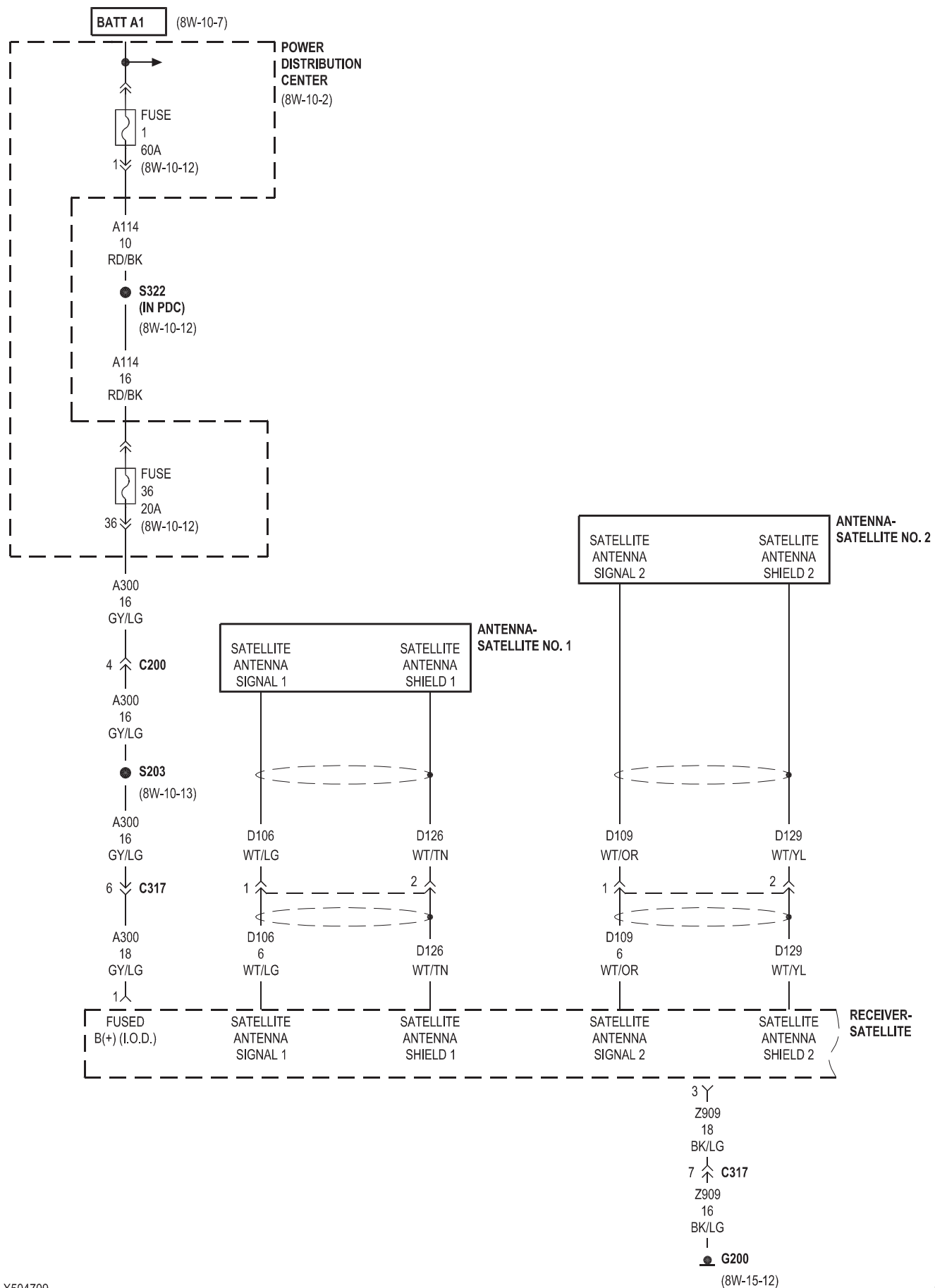




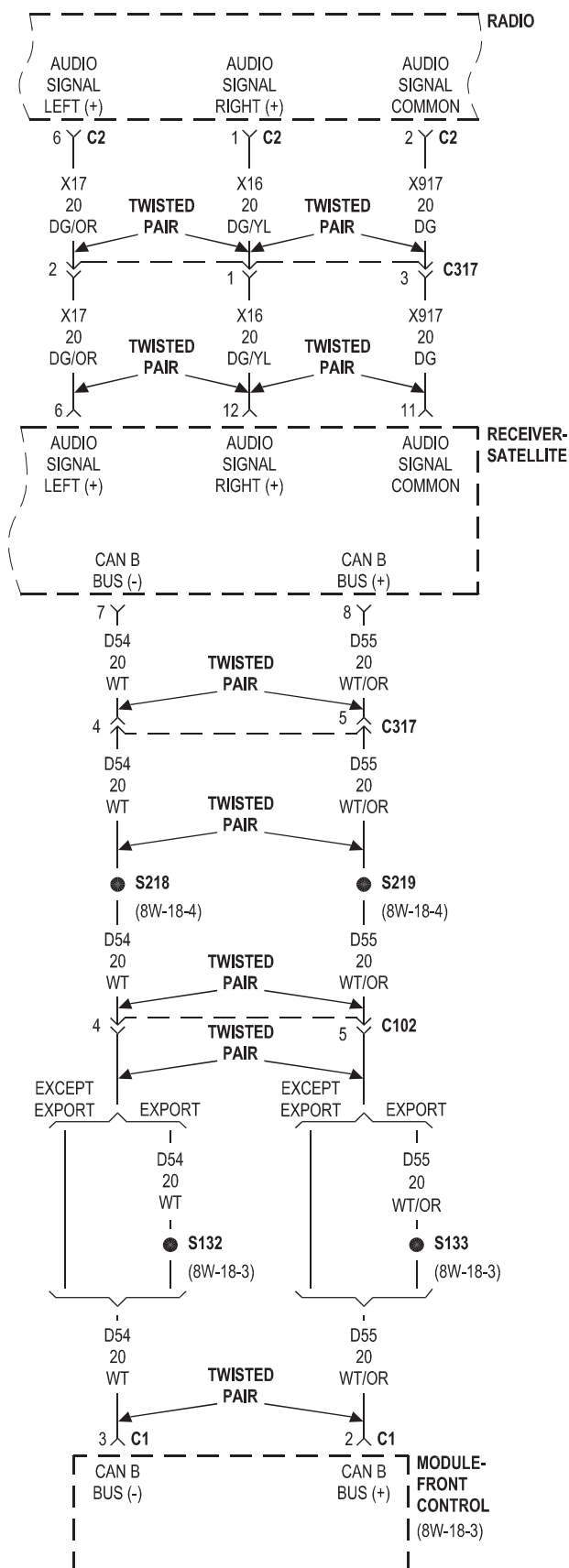


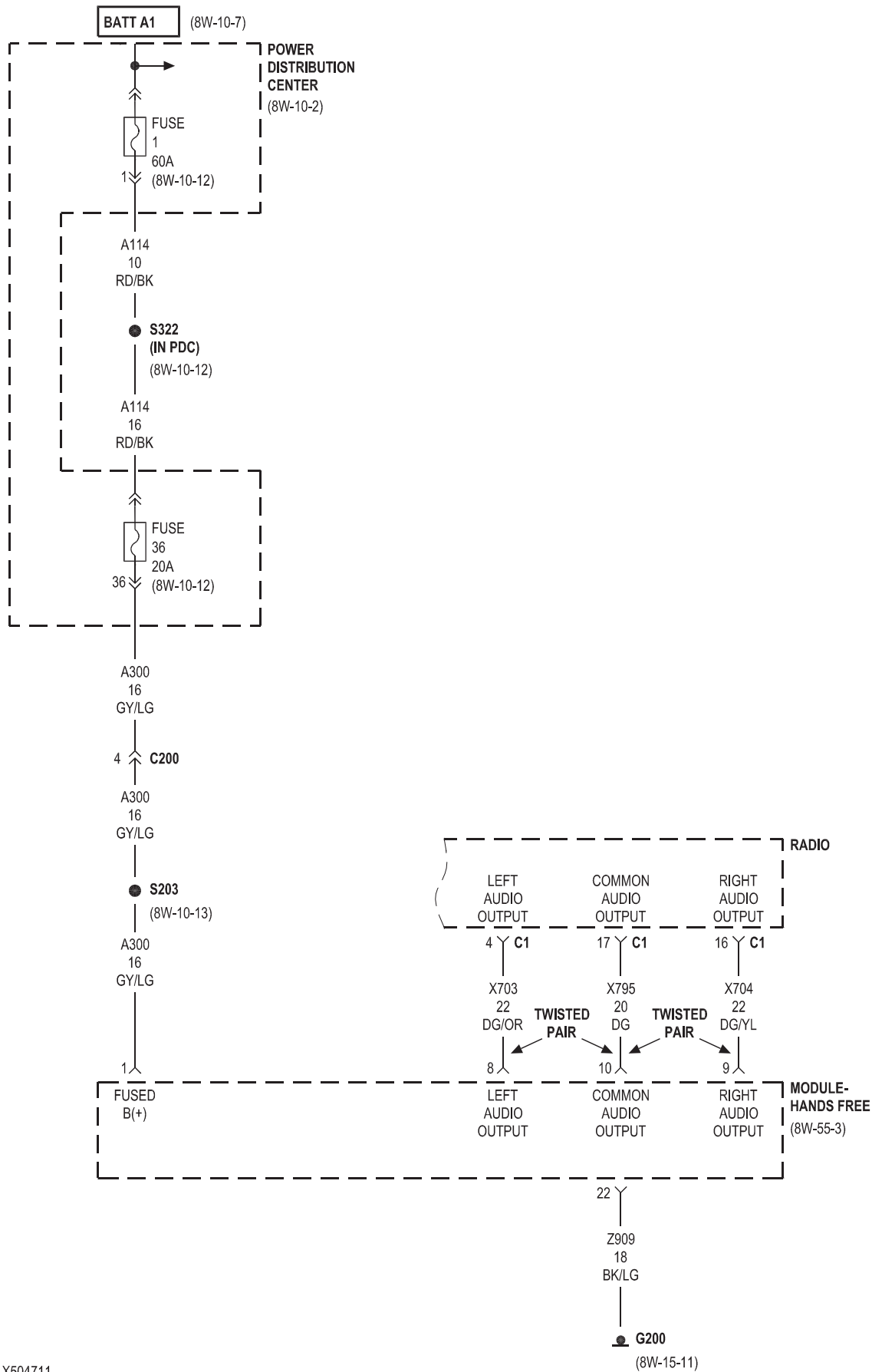


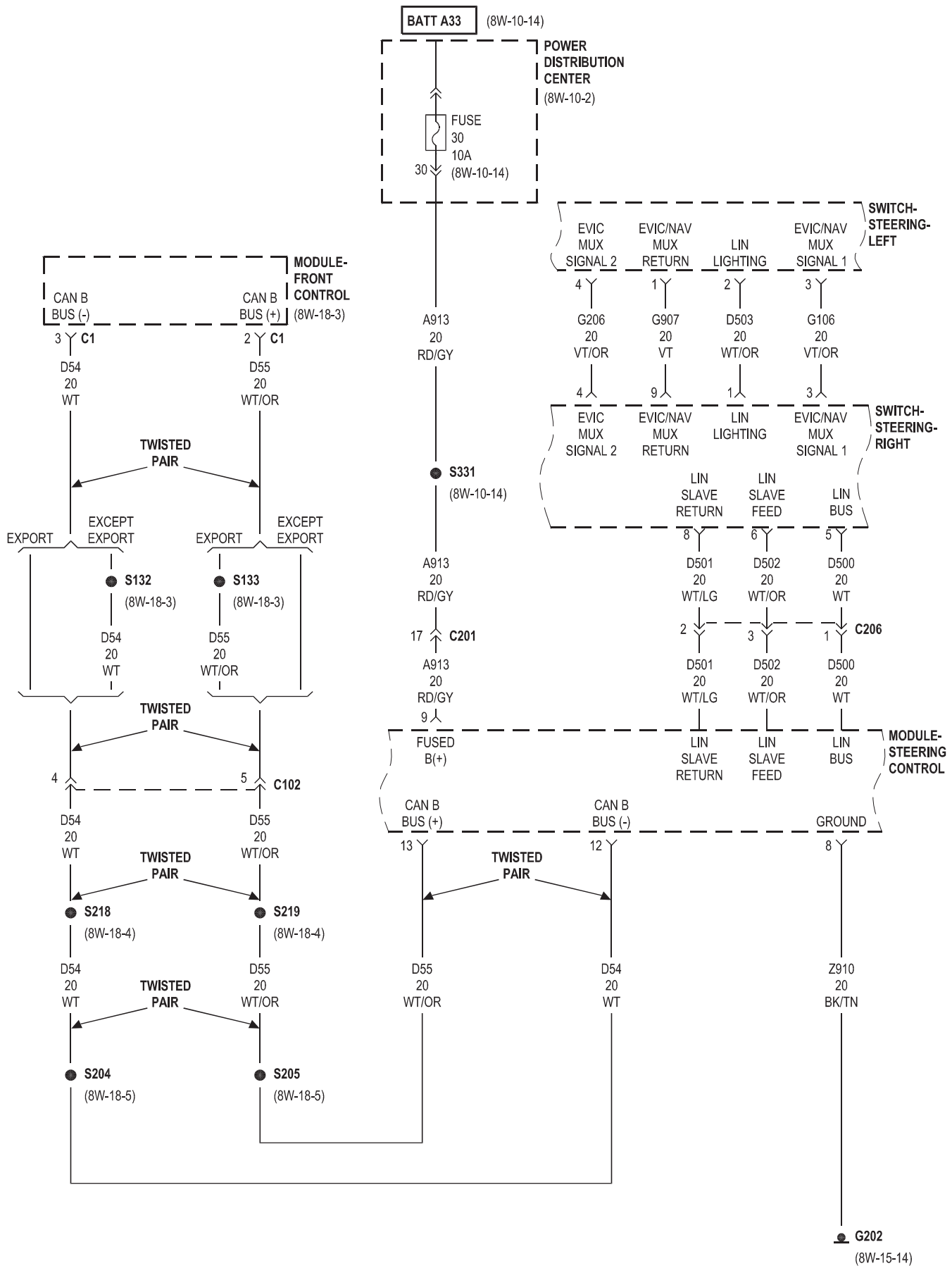






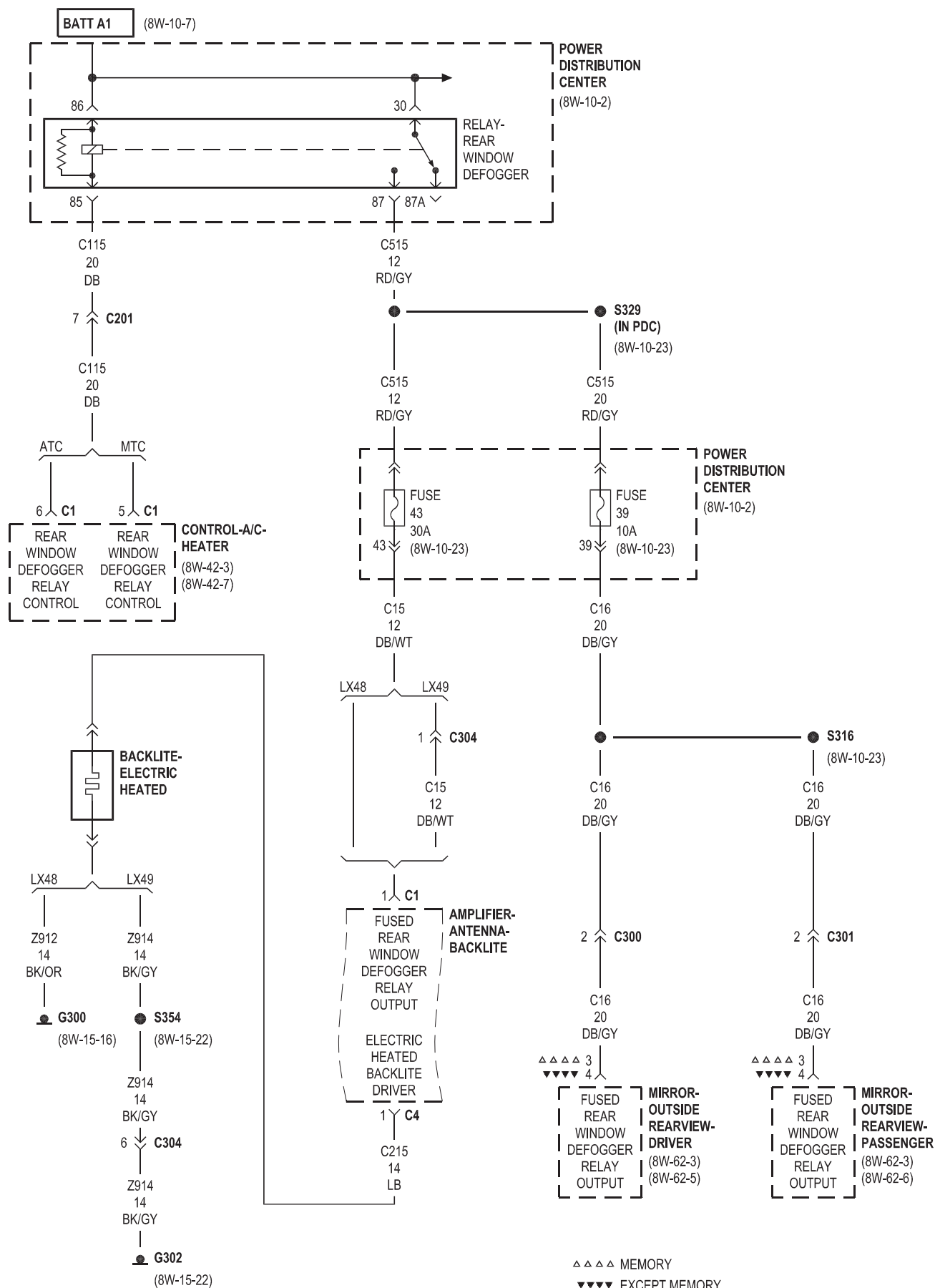






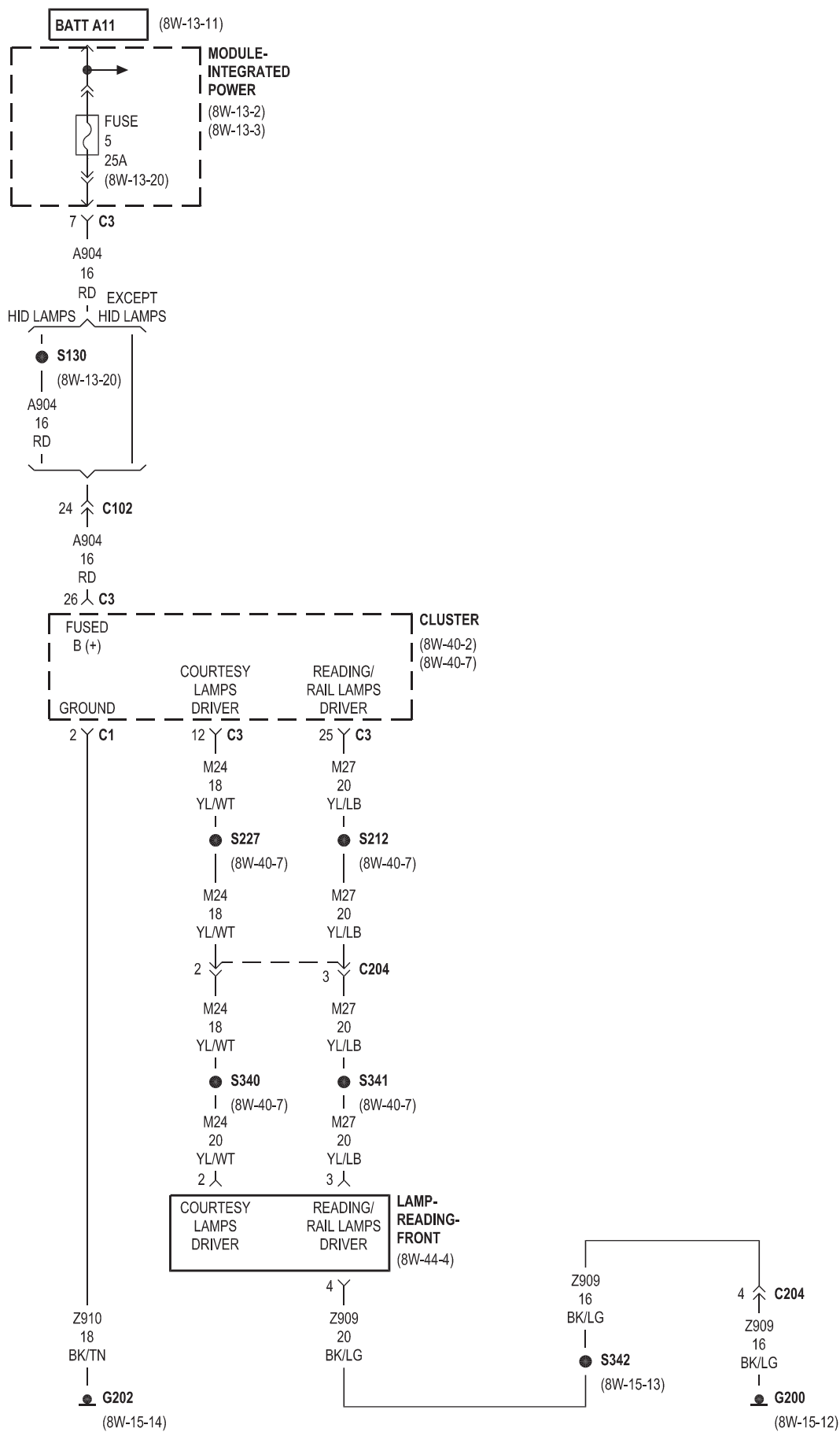
## 8W-48 REAR WINDOW DEFOGGER

<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Amplifier-Antenna-Backlite . . . . .	8W-48-2	G302 . . . . .	8W-48-2
Backlite-Electric Heated . . . . .	8W-48-2	Mirror-Outside Rearview-Driver . . . . .	8W-48-2
Control-A/C-Heater . . . . .	8W-48-2	Mirror-Outside Rearview-Passenger . . . . .	8W-48-2
Fuse 39 . . . . .	8W-48-2	Power Distribution Center . . . . .	8W-48-2
Fuse 43 . . . . .	8W-48-2	Relay-Rear Window Defogger . . . . .	8W-48-2
G300 . . . . .	8W-48-2		



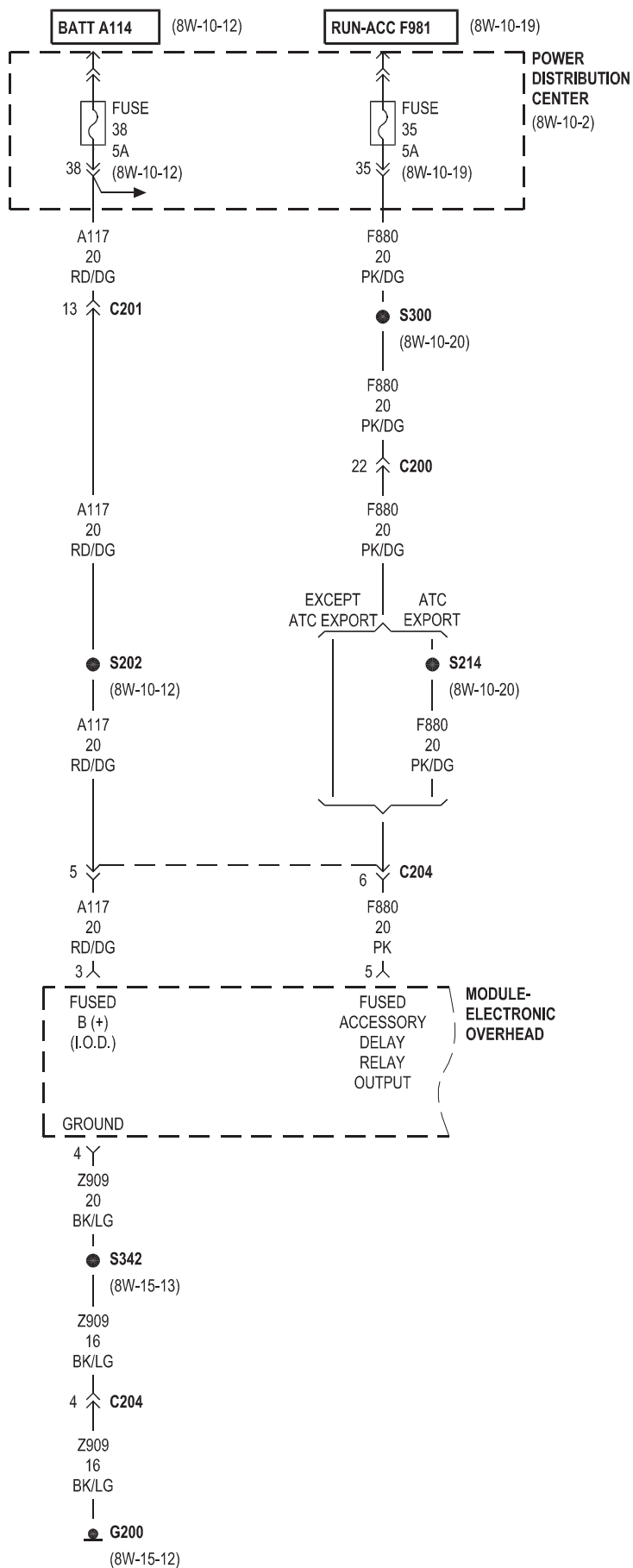
## 8W-49 OVERHEAD CONSOLE

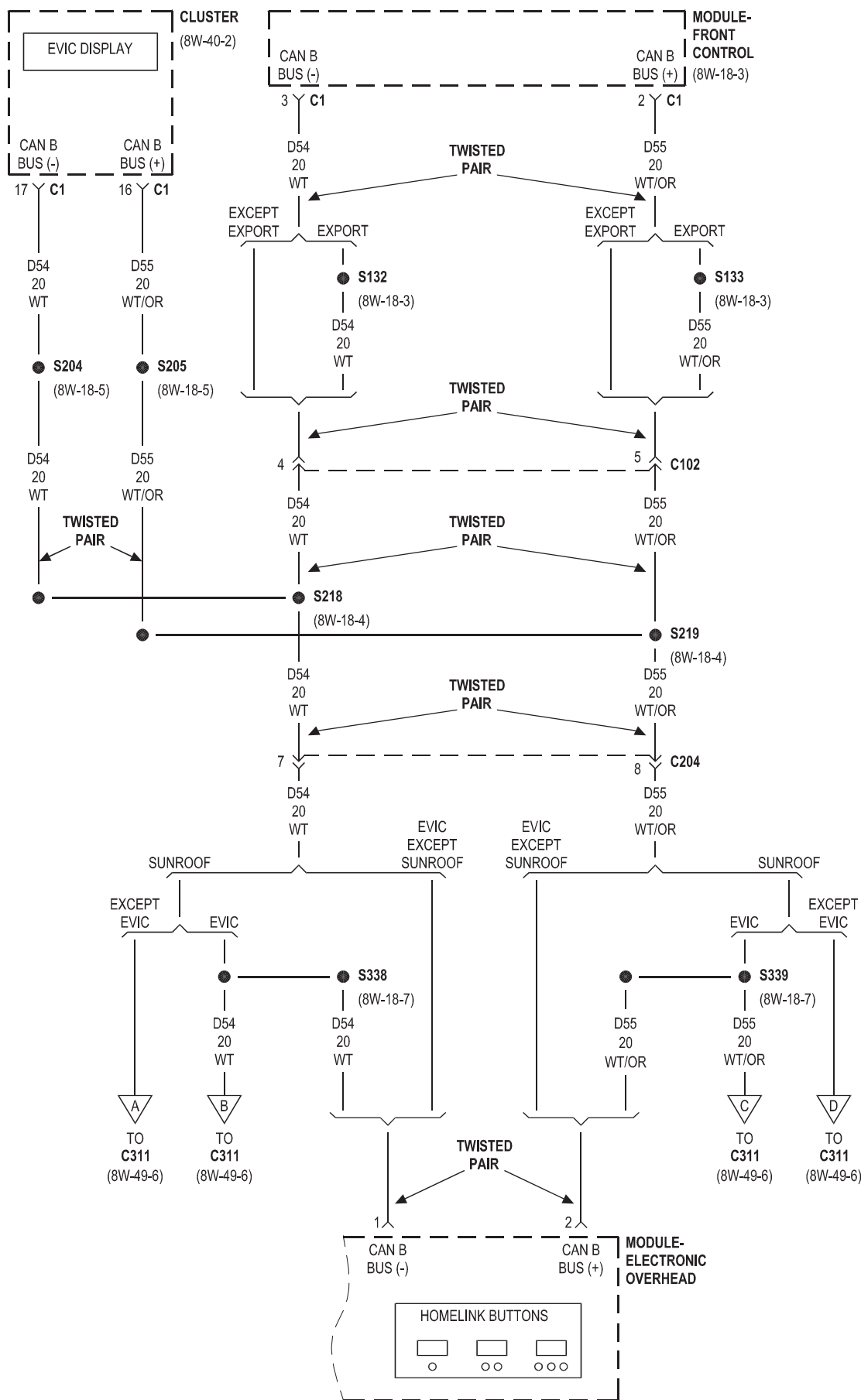
<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Cluster . . . . .	8W-49-2, 5	Mirror-Inside Rearview . . . . .	8W-49-3
Fuse 5 . . . . .	8W-49-2	Mirror-Outside Rearview-Driver . . . . .	8W-49-3
Fuse 35 . . . . .	8W-49-4	Module-Electronic Overhead . . . . .	8W-49-4, 5
Fuse 38 . . . . .	8W-49-4	Module-Front Control . . . . .	8W-49-3, 5
Fuse 40 . . . . .	8W-49-3	Module-Integrated Power . . . . .	8W-49-2, 3
G200 . . . . .	8W-49-2, 3, 4	Motor/Module-Sunroof . . . . .	8W-49-6
G202 . . . . .	8W-49-2	Power Distribution Center . . . . .	8W-49-3, 4
Lamp-Reading-Front . . . . .	8W-49-2	Switch-Sunroof . . . . .	8W-49-6

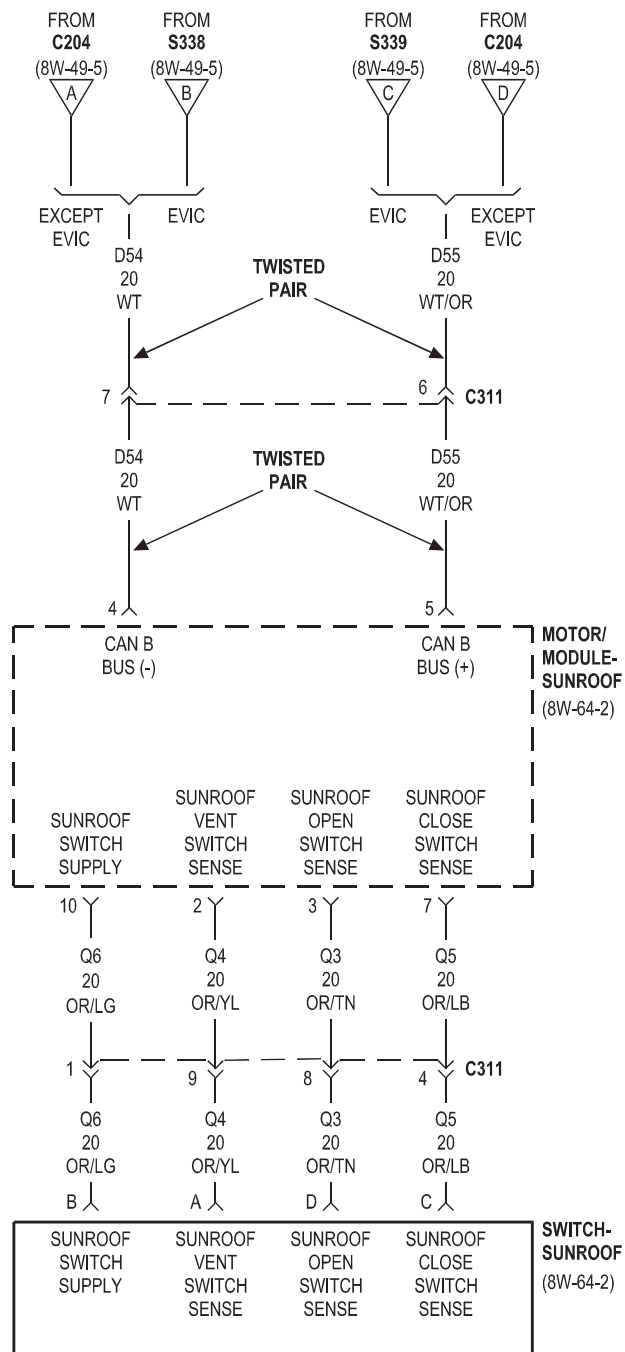






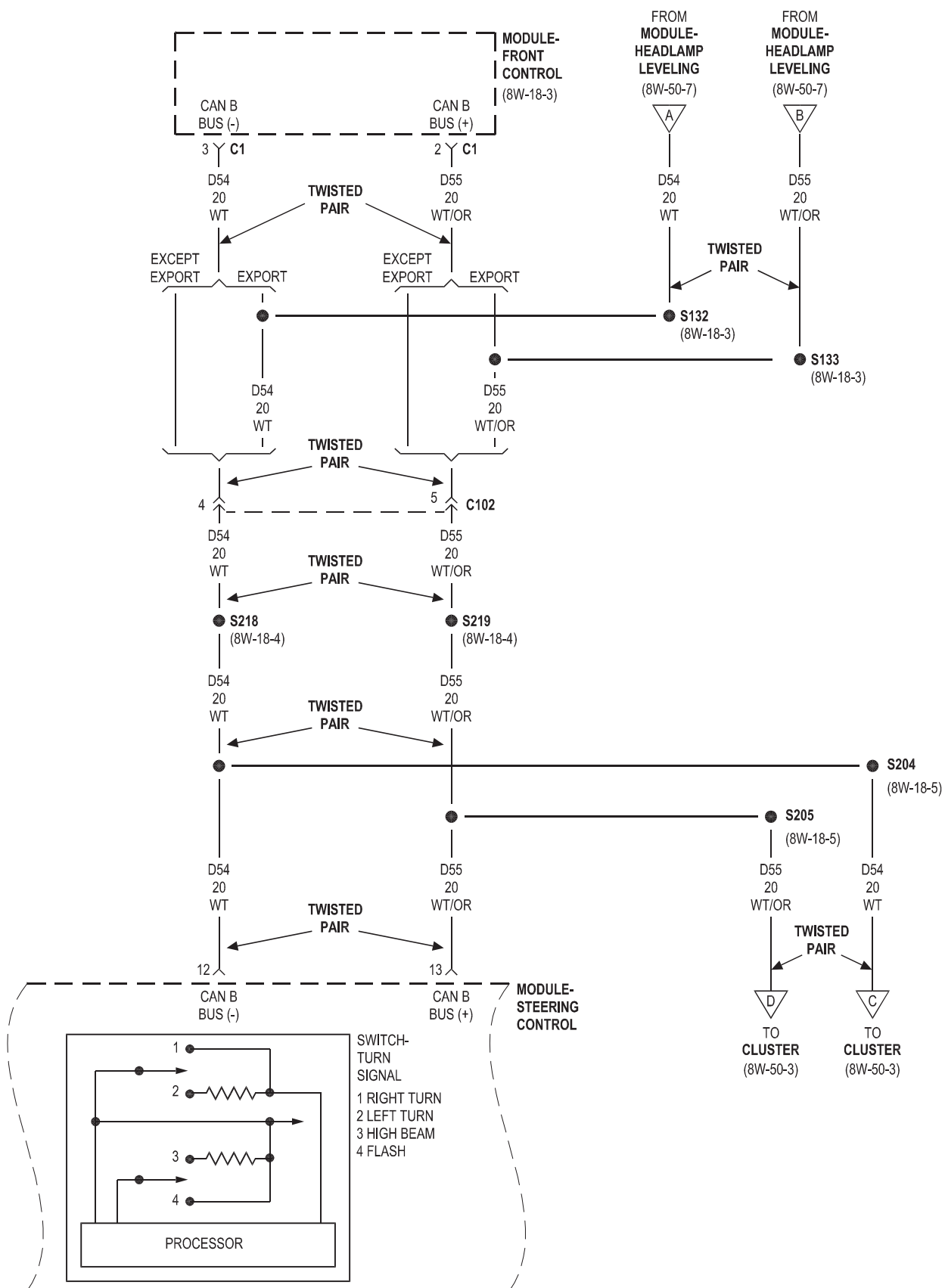


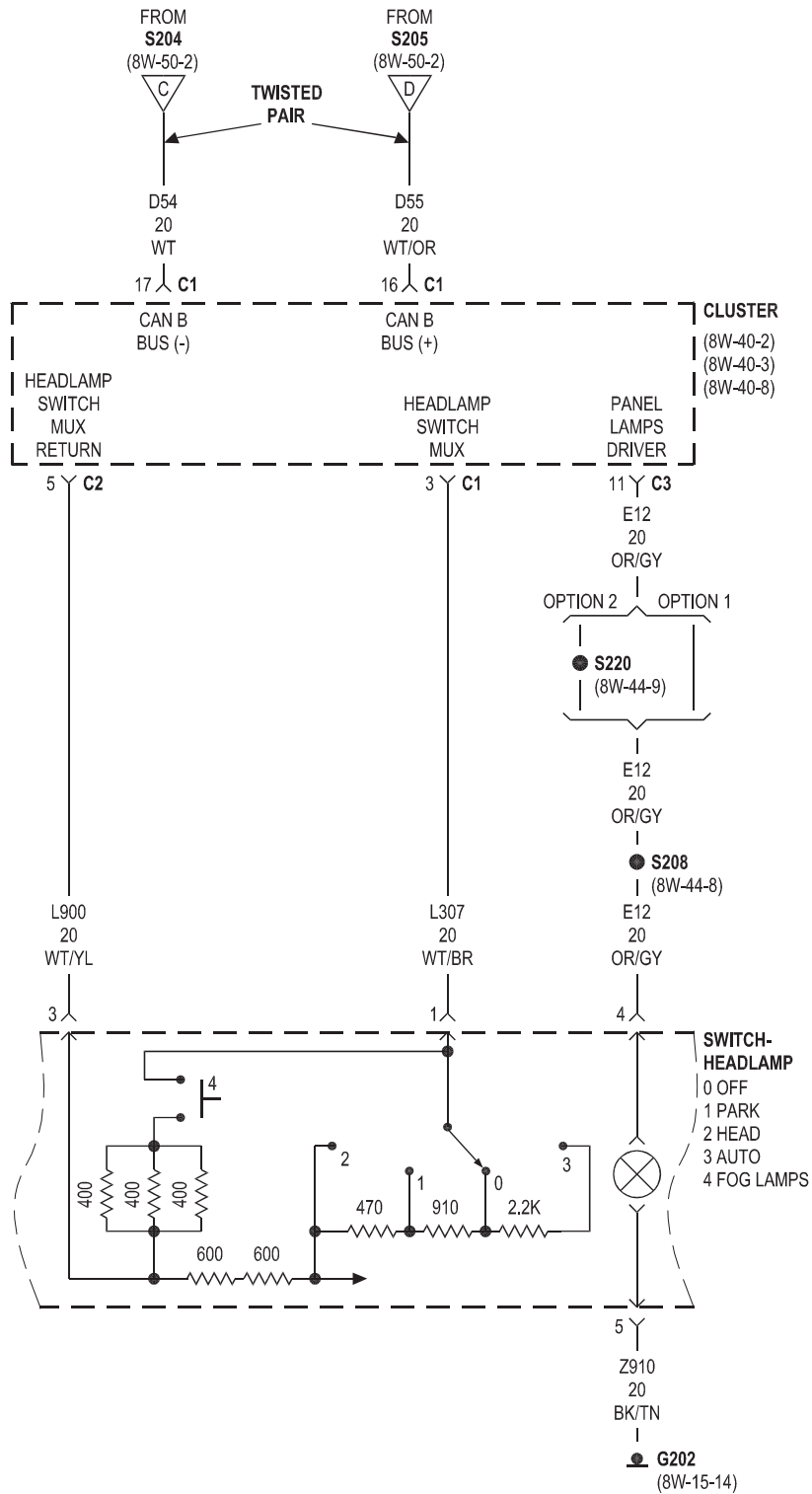


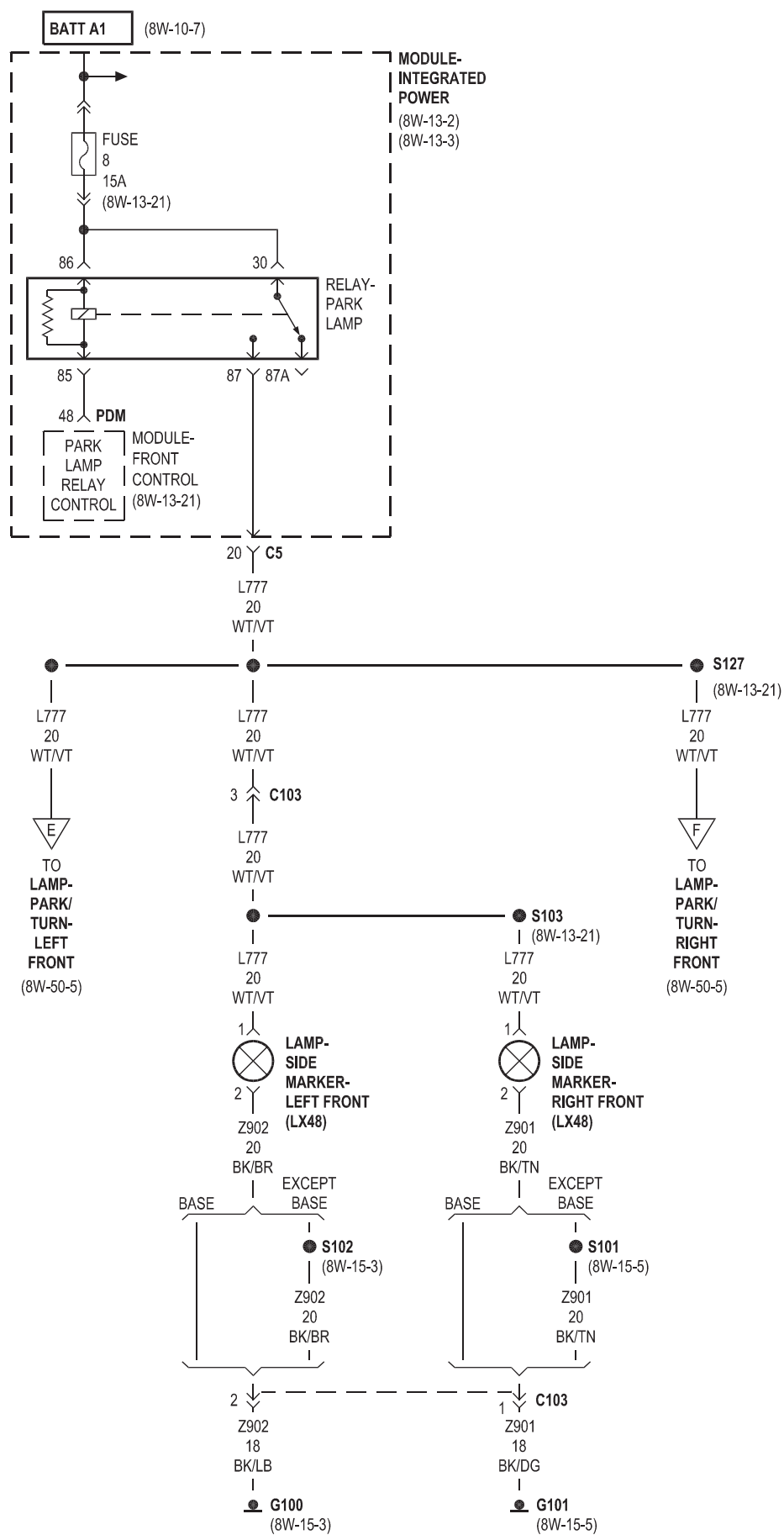


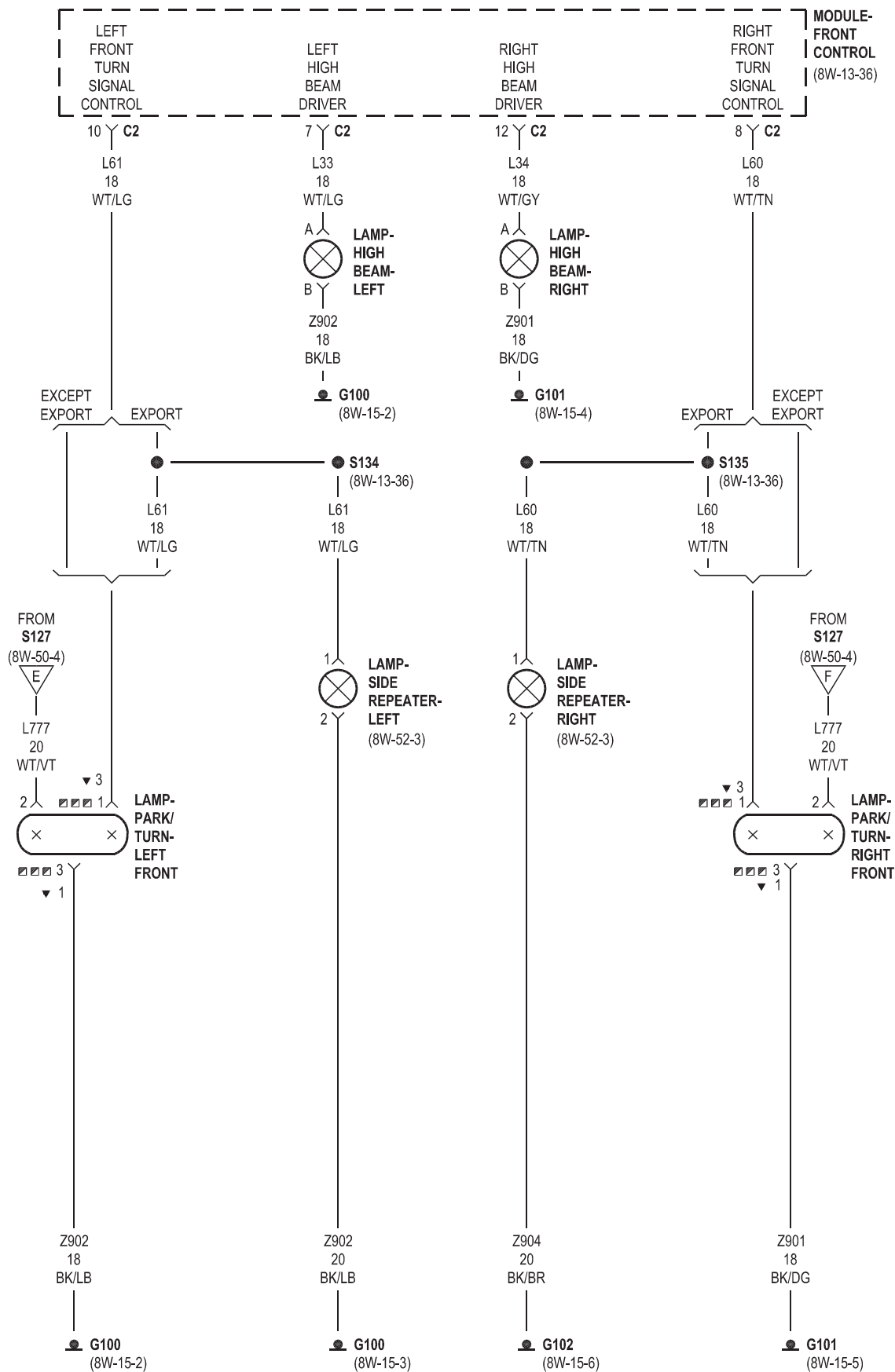
## 8W-50 FRONT LIGHTING

<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Cluster . . . . .	8W-50-2, 3	Lamp-Low Beam-Right . . . . .	8W-50-6
Fuse 1 . . . . .	8W-50-6	Lamp-Park/Turn-Left Front . . . . .	8W-50-4, 5
Fuse 2 . . . . .	8W-50-6	Lamp-Park/Turn-Right Front . . . . .	8W-50-4, 5
Fuse 7 . . . . .	8W-50-9	Lamp-Side Marker-Left Front . . . . .	8W-50-4
Fuse 8 . . . . .	8W-50-4	Lamp-Side Marker-Right Front . . . . .	8W-50-4
Fuse 23 . . . . .	8W-50-6	Lamp-Side Repeater-Left . . . . .	8W-50-5
Fuse 41 . . . . .	8W-50-7	Lamp-Side Repeater-Right . . . . .	8W-50-5
G100 . . . . .	8W-50-4, 5, 6, 9	Module-Front Control . . . . .	8W-50-2, 4, 5, 6, 9
G101 . . . . .	8W-50-4, 5, 6, 7, 8, 9	Module-Headlamp Leveling . . . . .	8W-50-2, 7
G102 . . . . .	8W-50-5, 6	Module-Integrated Power . . . . .	8W-50-4, 6, 9
G202 . . . . .	8W-50-3	Module-Steering Control . . . . .	8W-50-2
G302 . . . . .	8W-50-8	Power Distribution Center . . . . .	8W-50-7
Lamp-Fog-Left Front . . . . .	8W-50-9	Relay-Fog Lamp-Front . . . . .	8W-50-9
Lamp-Fog-Right Front . . . . .	8W-50-9	Relay-High Intensity Discharge Lamp . . . .	8W-50-6
Lamp-High Beam-Left . . . . .	8W-50-5	Relay-Park Lamp . . . . .	8W-50-4
Lamp-High Beam-Right . . . . .	8W-50-5	Sensor-Headlamp Level-Left . . . . .	8W-50-7, 8
Lamp-High Intensity Discharge-Left . . .	8W-50-6, 7	Sensor-Headlamp Level-Right . . . . .	8W-50-7, 8
Lamp-High Intensity Discharge-Right . .	8W-50-6, 7	Switch-Headlamp . . . . .	8W-50-3
Lamp-Low Beam-Left . . . . .	8W-50-6		

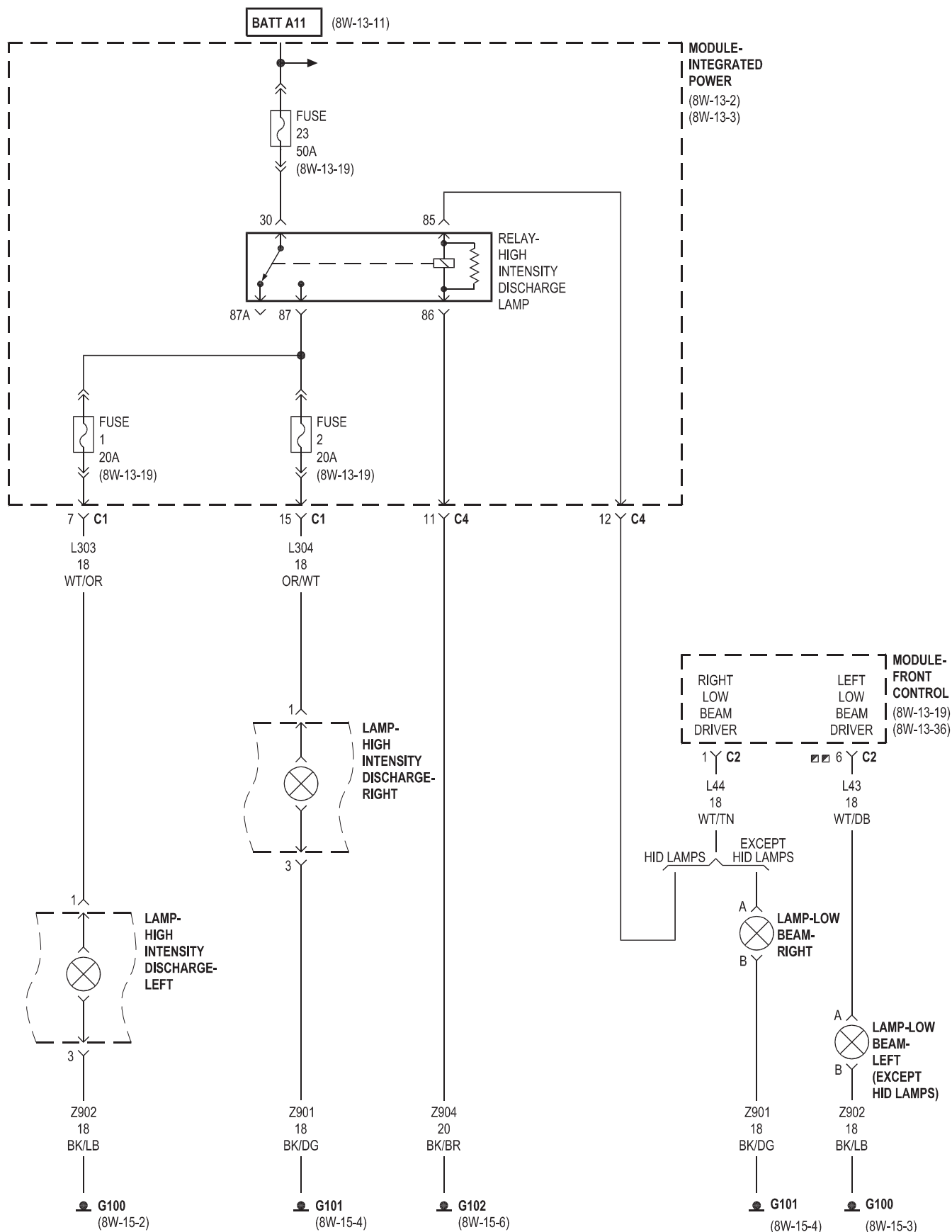


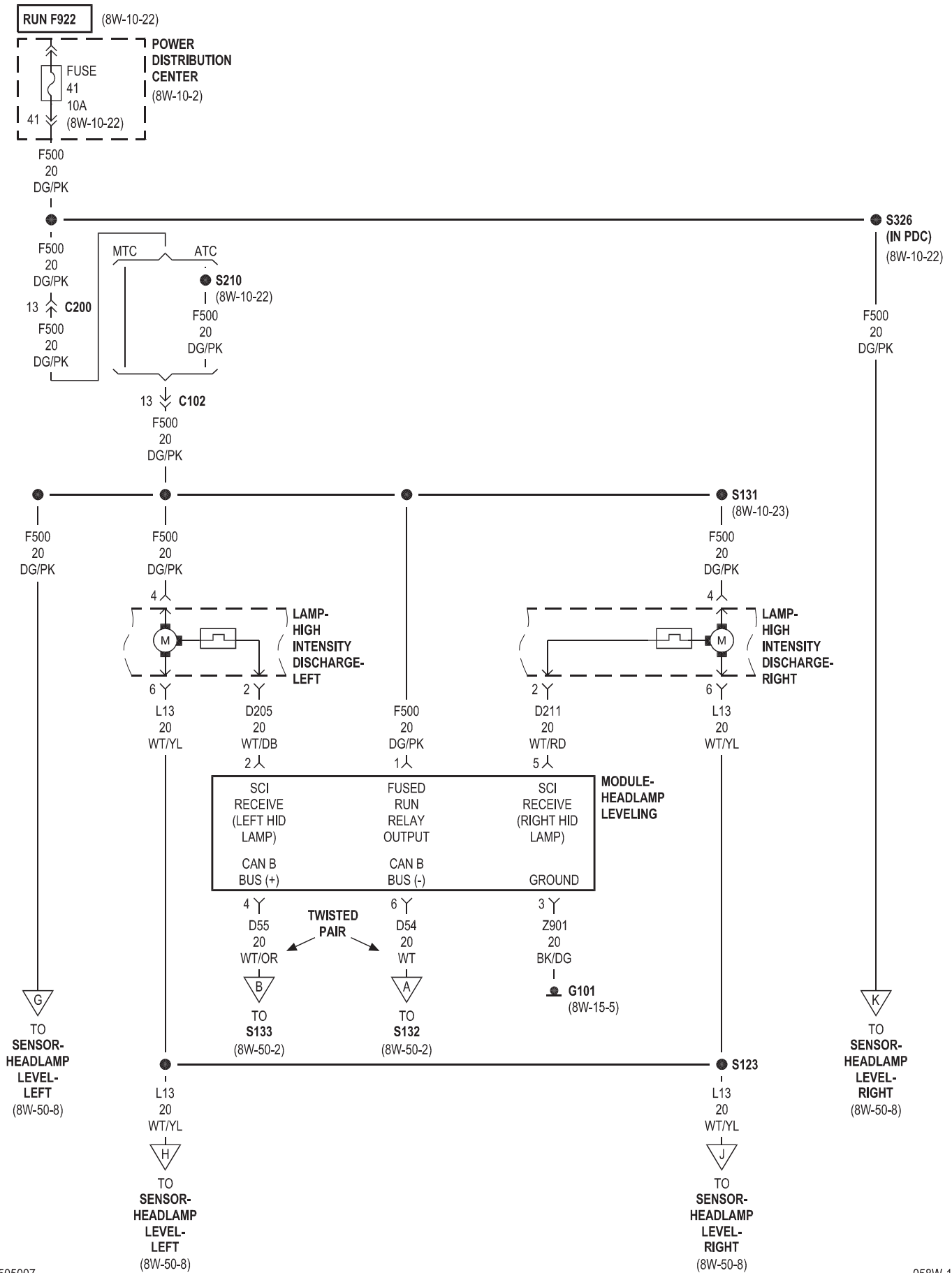


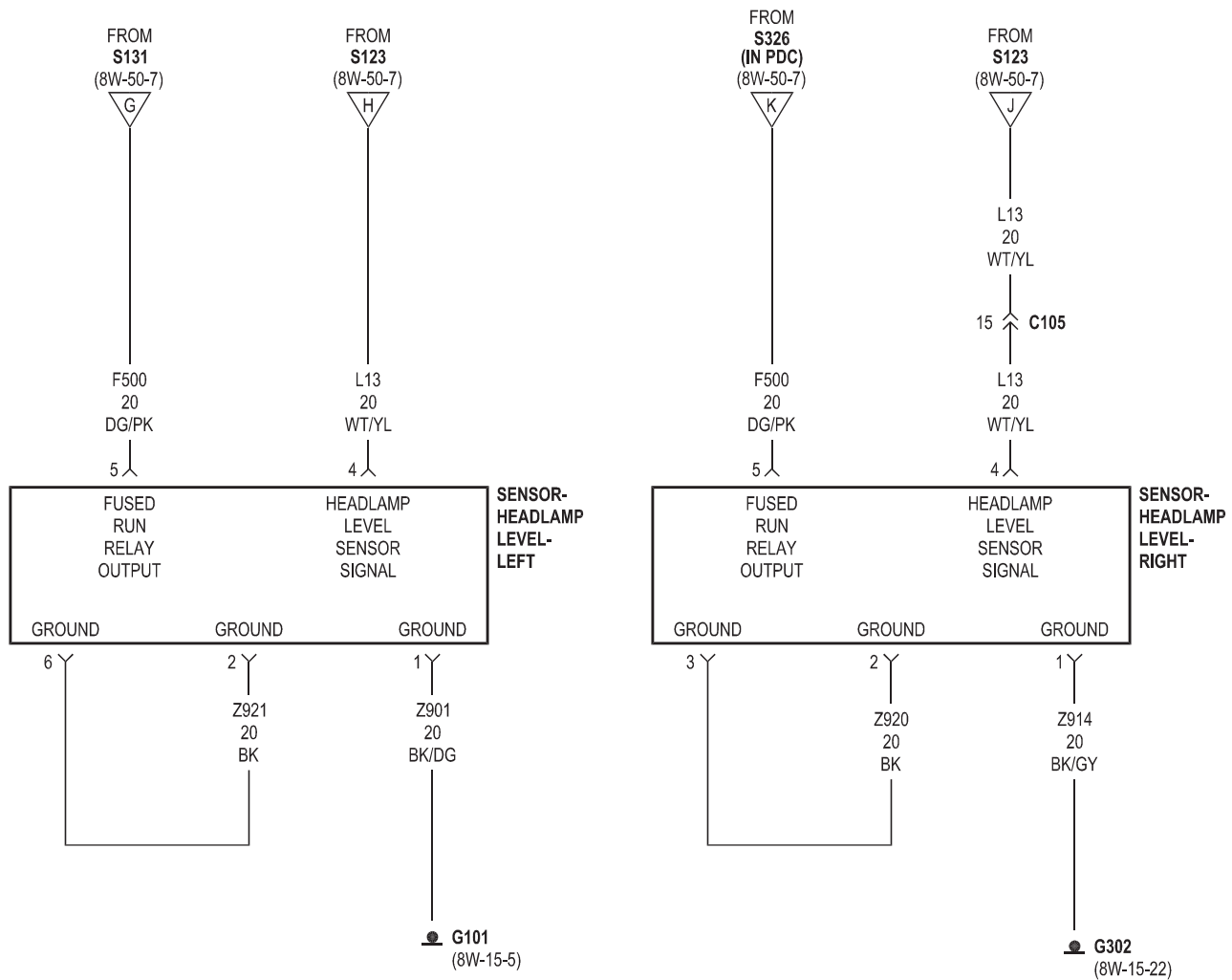


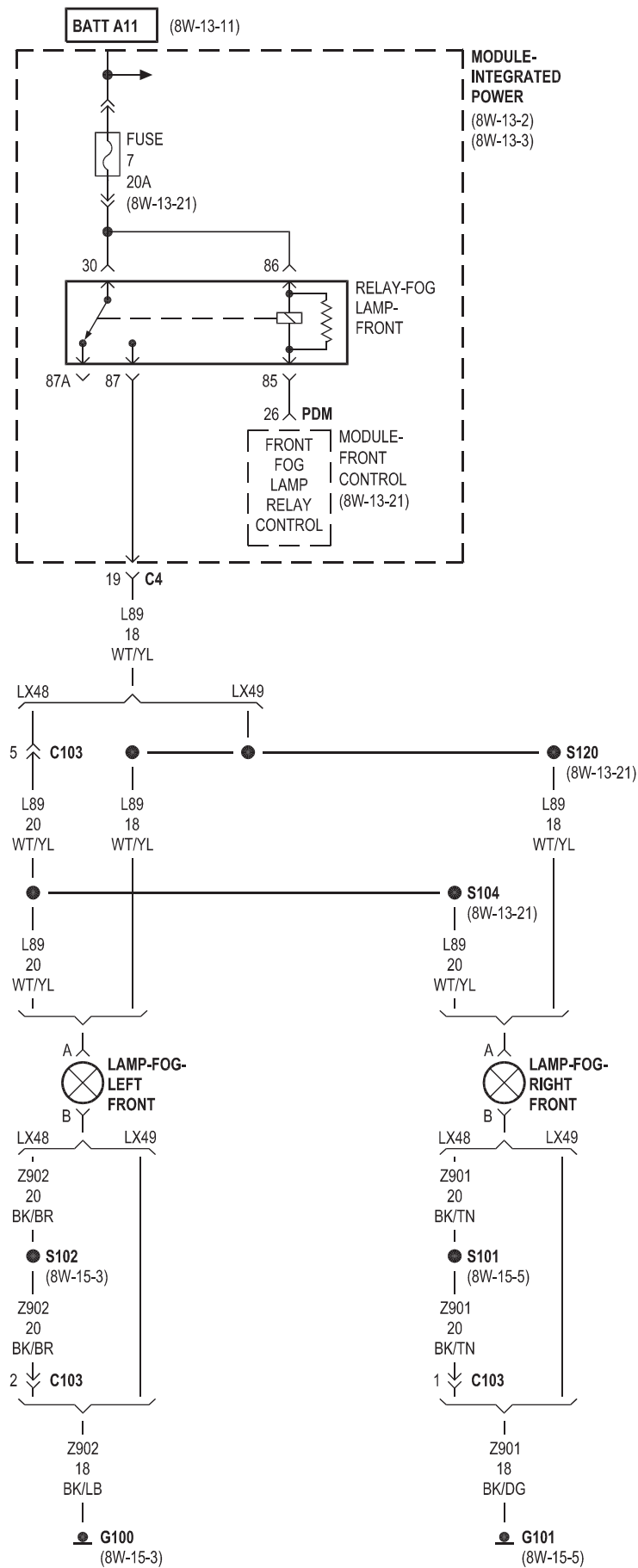








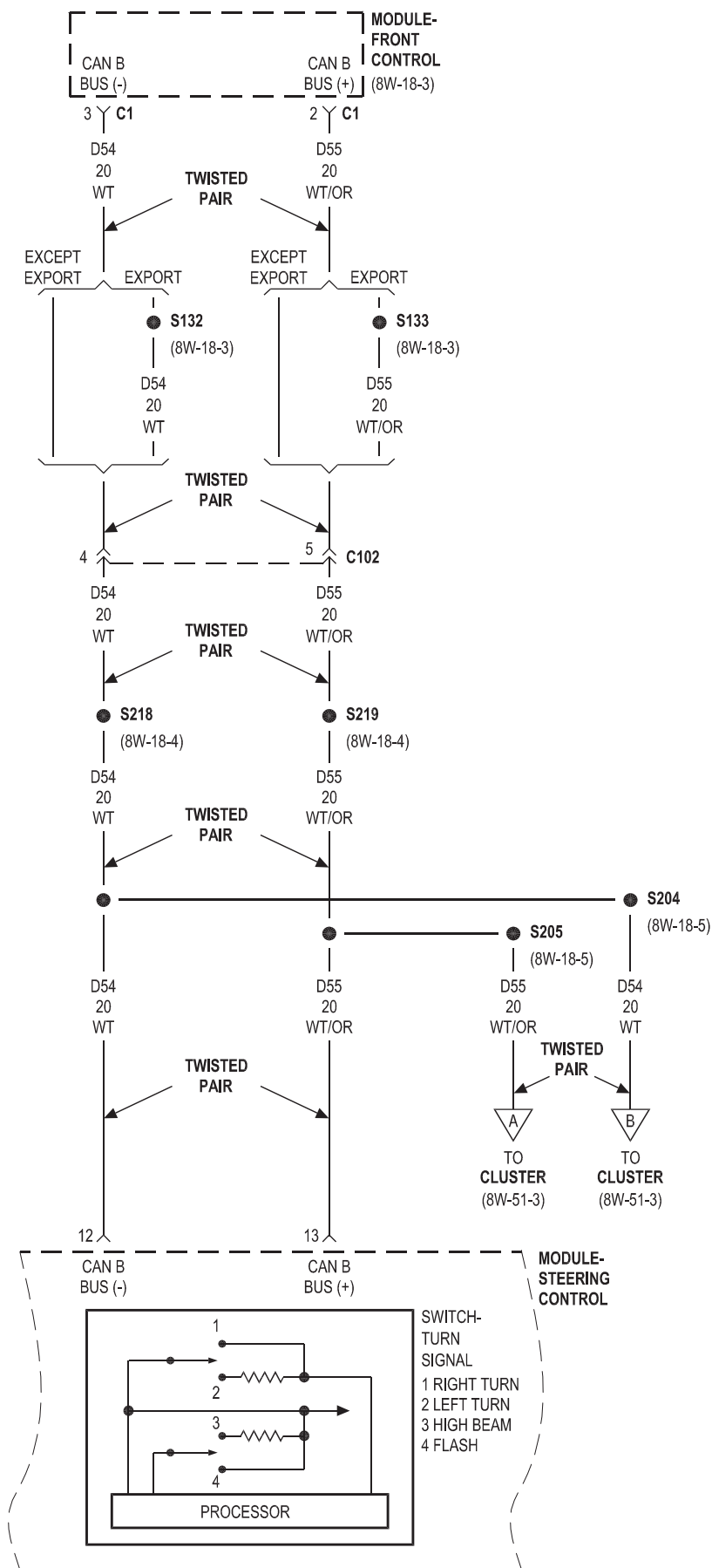


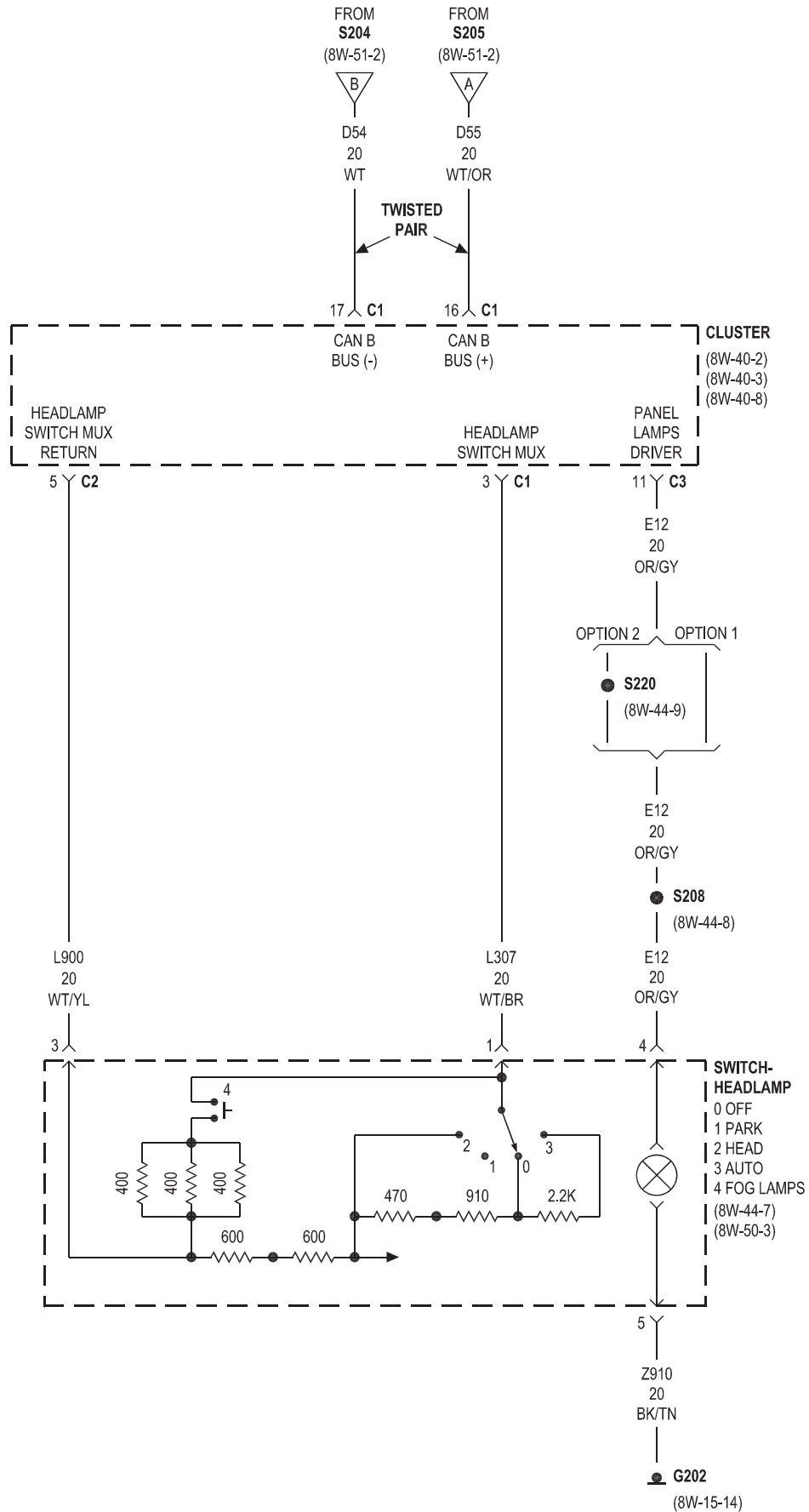




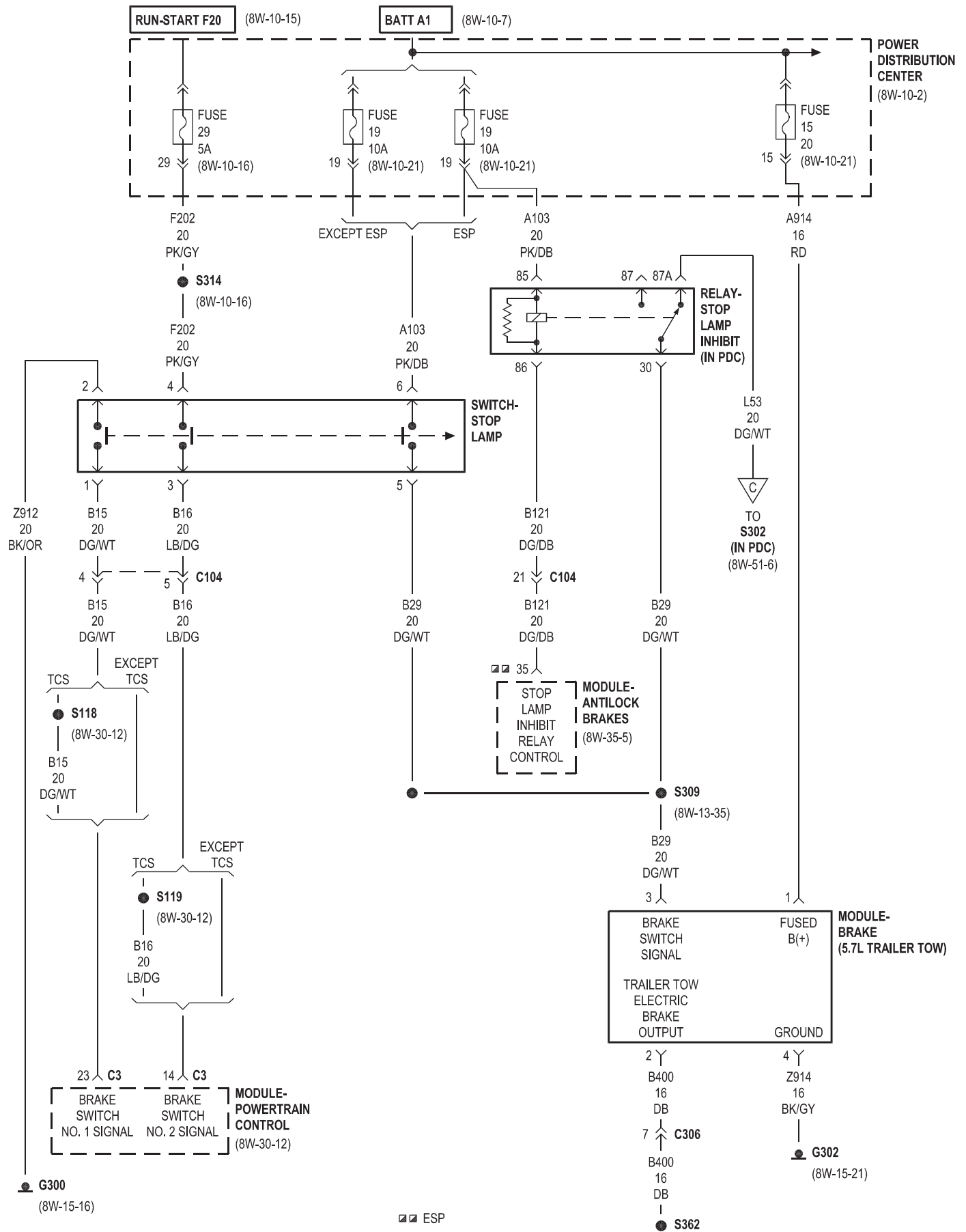
## 8W-51 REAR LIGHTING

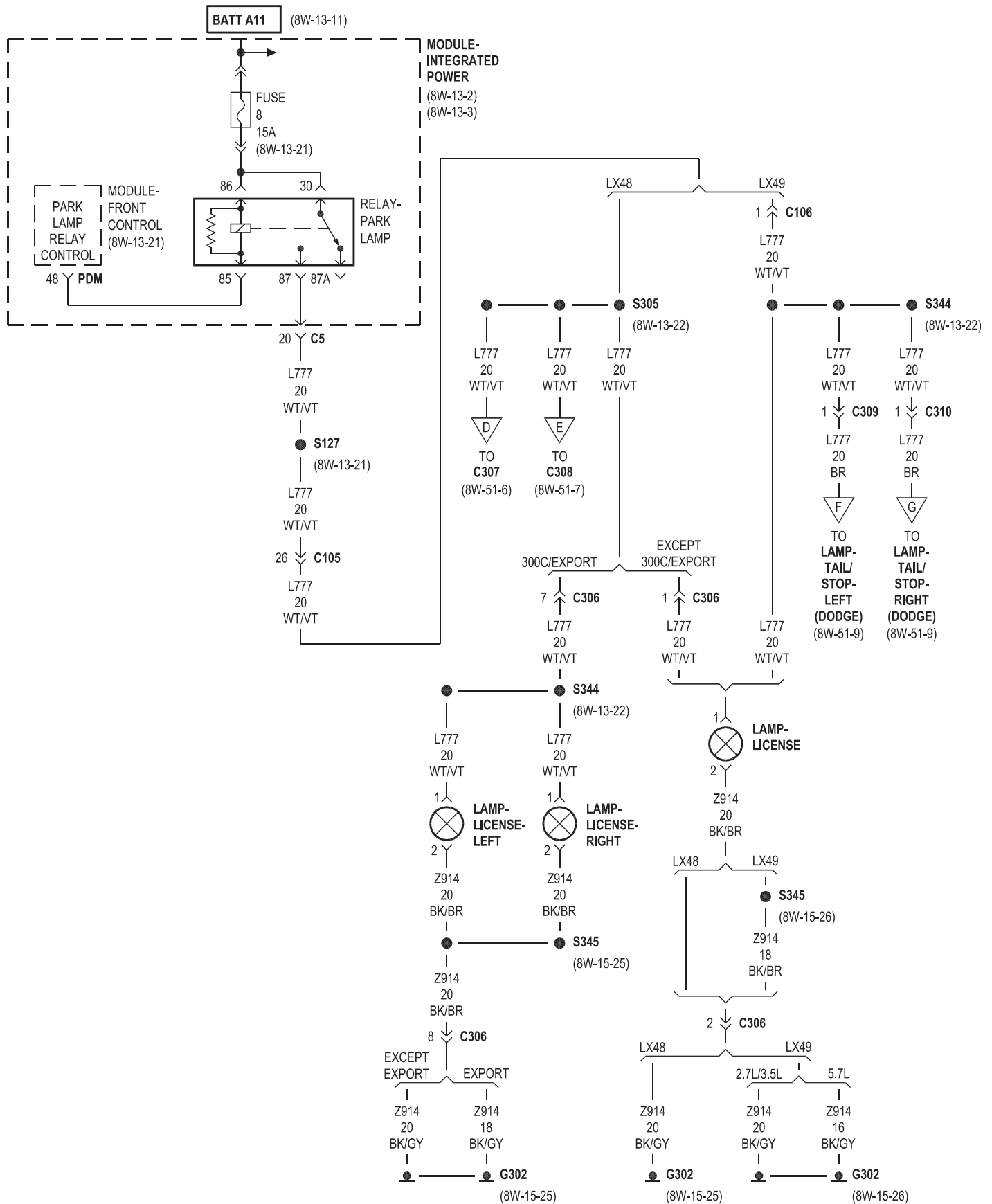
<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Cluster .....	8W-51-2, 3	Lamp-Tail Park-Right .....	8W-51-7
Fuse 8 .....	8W-51-5	Lamp-Tail Stop/Park-Left .....	8W-51-6
Fuse 10 .....	8W-51-10	Lamp-Tail Stop/Park-Right .....	8W-51-7
Fuse 15 .....	8W-51-4	Lamp-Tail Stop/Turn-Left .....	8W-51-6
Fuse 19 .....	8W-51-4	Lamp-Tail Stop/Turn-Right .....	8W-51-7
Fuse 29 .....	8W-51-4	Lamp-Tail/Stop-Left .....	8W-51-5, 9
G202 .....	8W-51-3	Lamp-Tail/Stop-Right .....	8W-51-5, 9
G300 .....	8W-51-4	Lamp-Turn-Left Rear .....	8W-51-9
G301 .....	8W-51-6	Lamp-Turn-Right Rear .....	8W-51-9
G302 .....	8W-51-4, 5, 6, 7, 8, 9, 10	Module-Antilock Brakes .....	8W-51-4
Lamp-Back-Up-Left .....	8W-51-8, 9	Module-Brake .....	8W-51-4
Lamp-Back-Up-Right .....	8W-51-8, 9	Module-Front Control .....	8W-51-2, 5, 8, 10
Lamp-Center High Mounted Stop .....	8W-51-6	Module-Integrated Power .....	8W-51-5, 8, 10
Lamp-Fog-Left Rear .....	8W-51-10	Module-Powertrain Control .....	8W-51-4
Lamp-Fog-Right Rear .....	8W-51-10	Module-Steering Control .....	8W-51-2
Lamp-License .....	8W-51-5	Power Distribution Center .....	8W-51-4, 10
Lamp-License-Left .....	8W-51-5	Relay-Fog Lamp-Rear .....	8W-51-10
Lamp-License-Right .....	8W-51-5	Relay-Park Lamp .....	8W-51-5
Lamp-Side Marker-Left Rear .....	8W-51-6	Relay-Stop Lamp Inhibit .....	8W-51-4, 6
Lamp-Side Marker-Right Rear .....	8W-51-7	Switch-Headlamp .....	8W-51-3
Lamp-Tail Park-Left .....	8W-51-6	Switch-Stop Lamp .....	8W-51-4

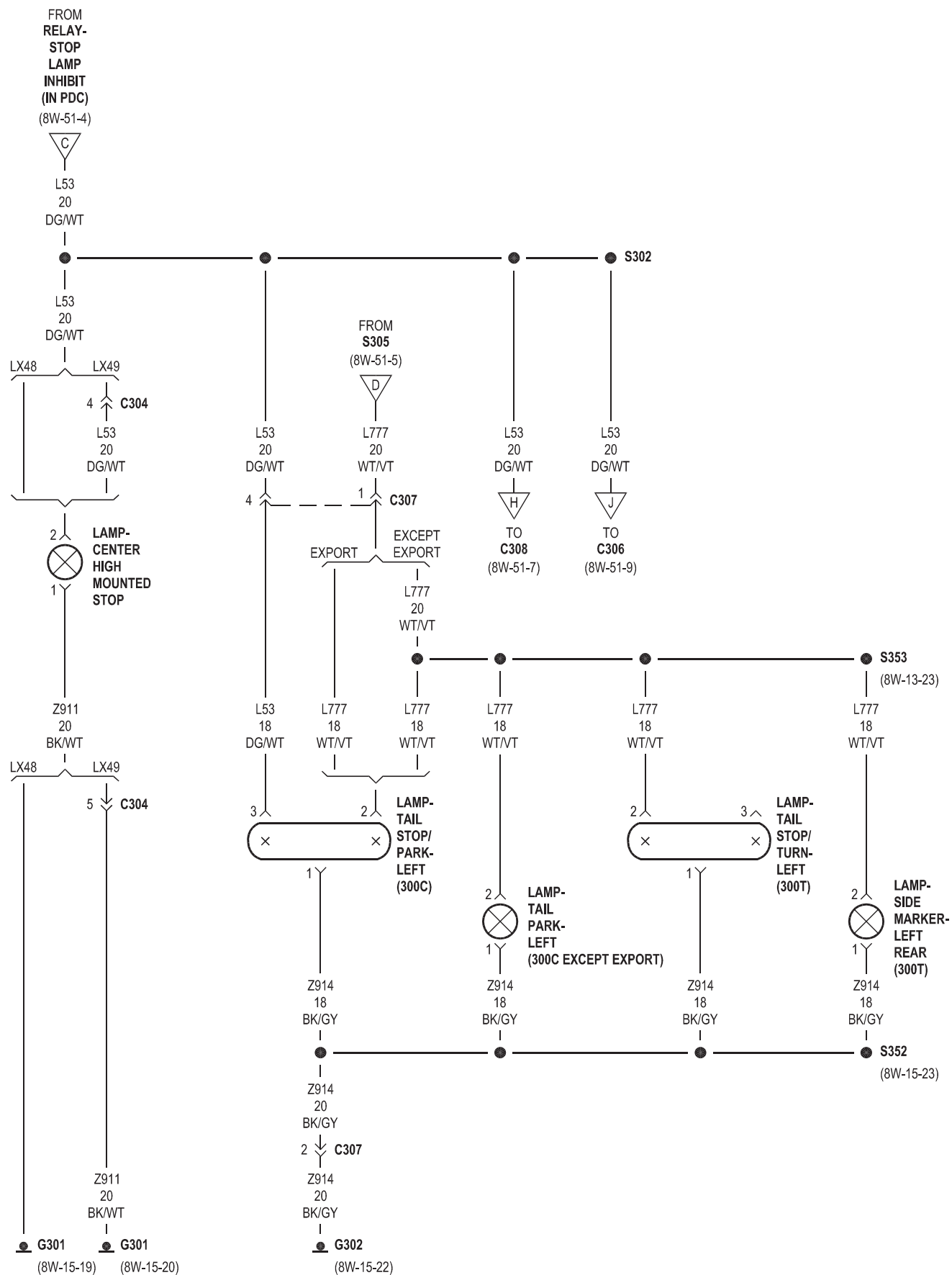






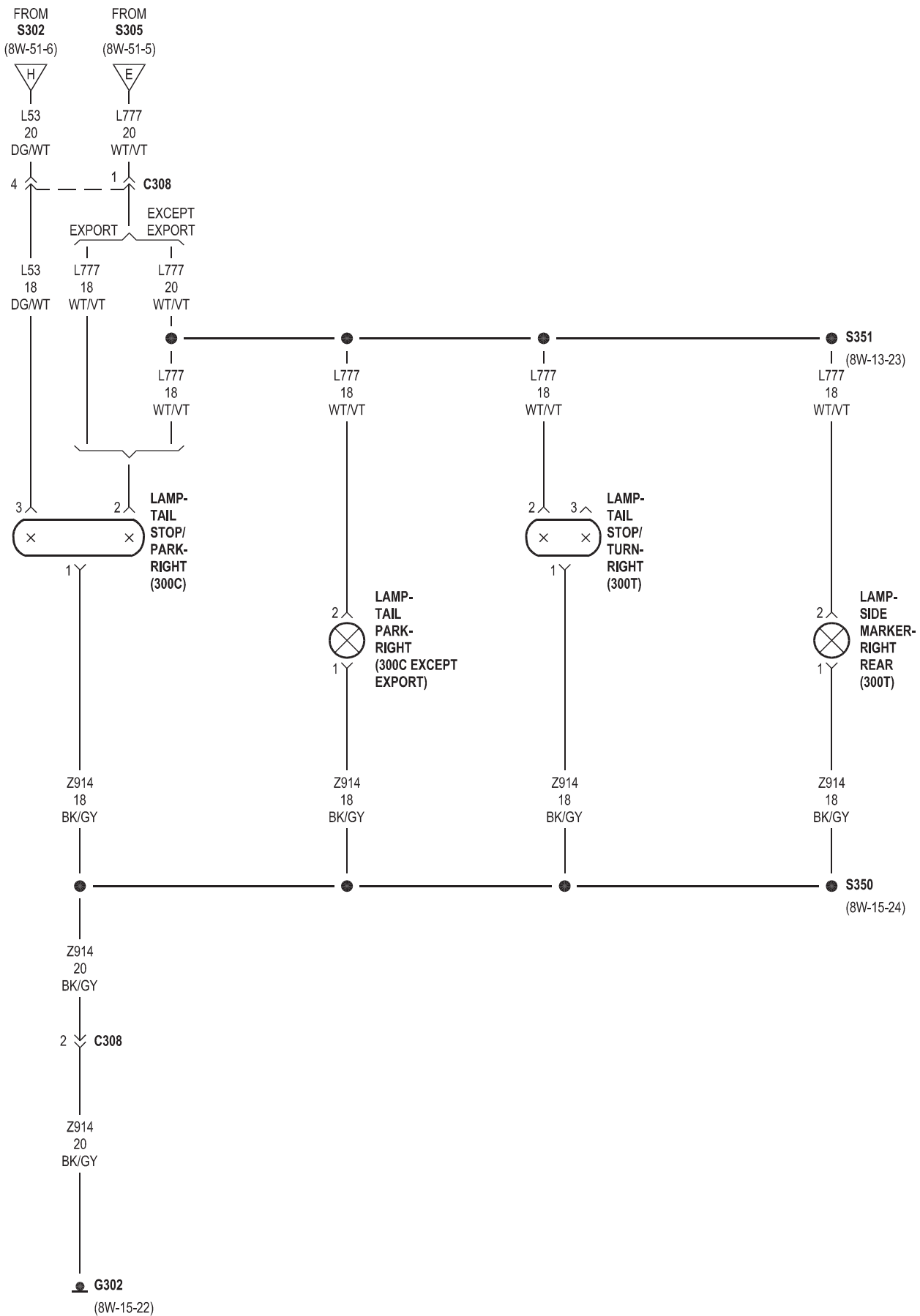


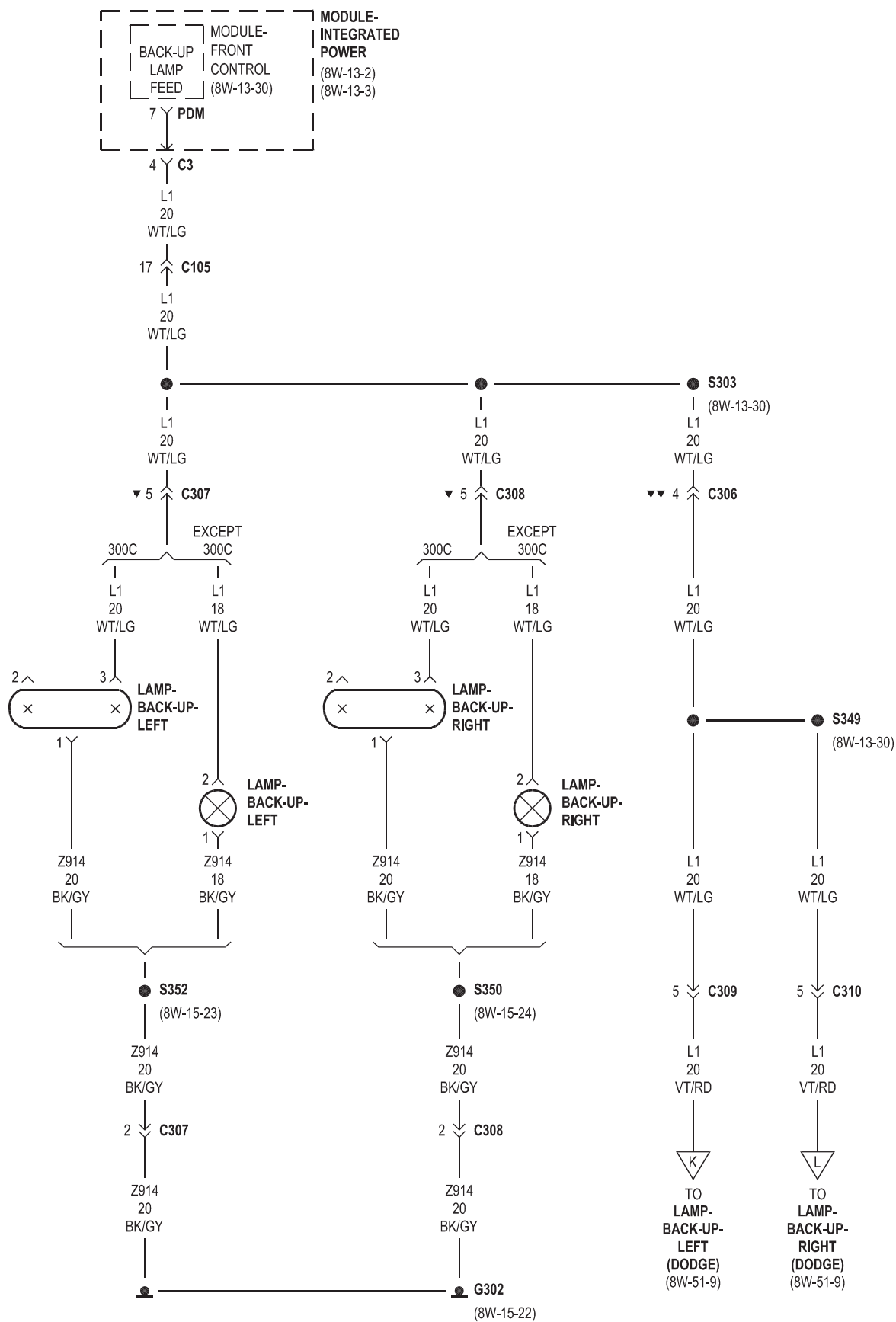


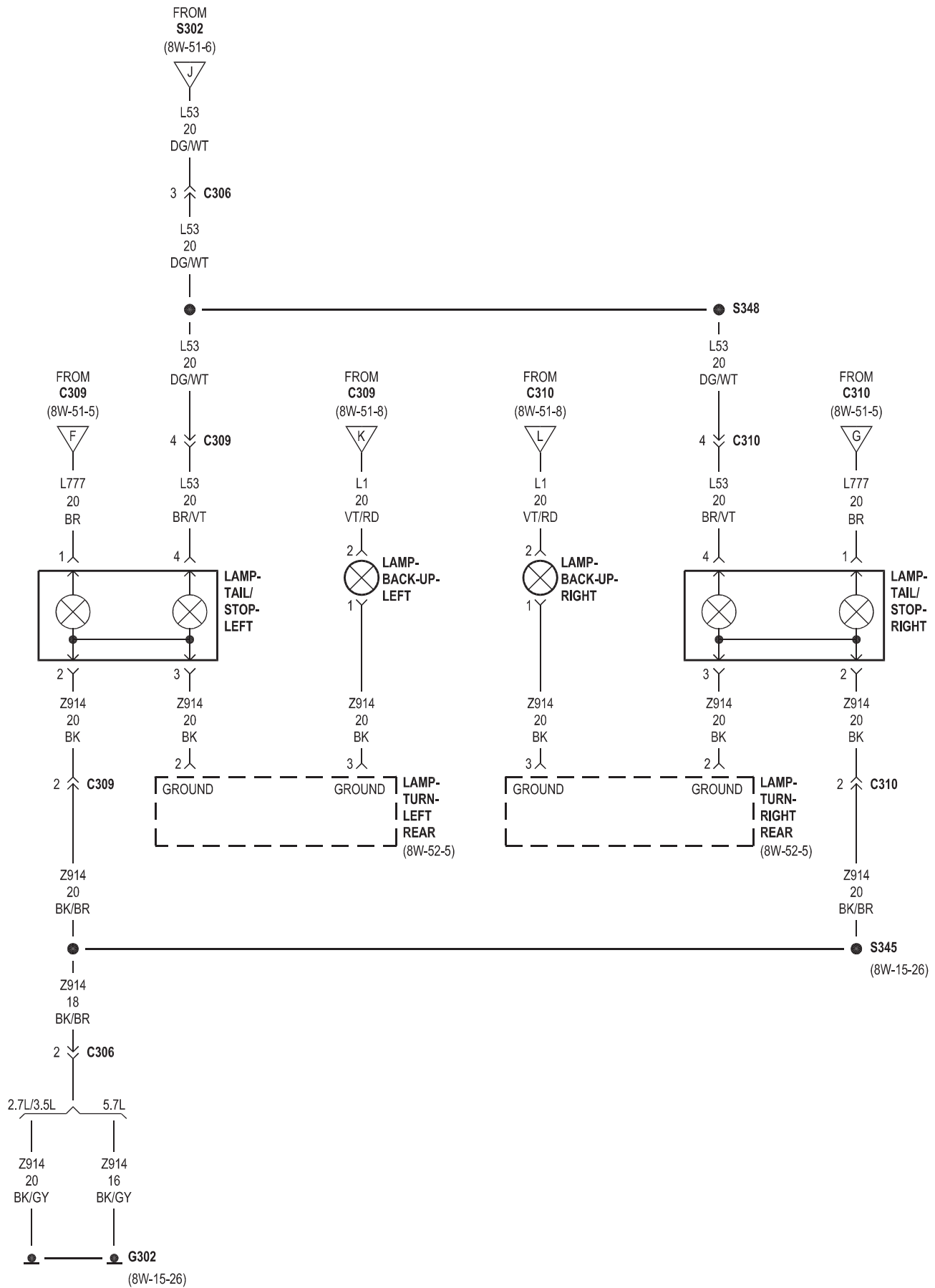


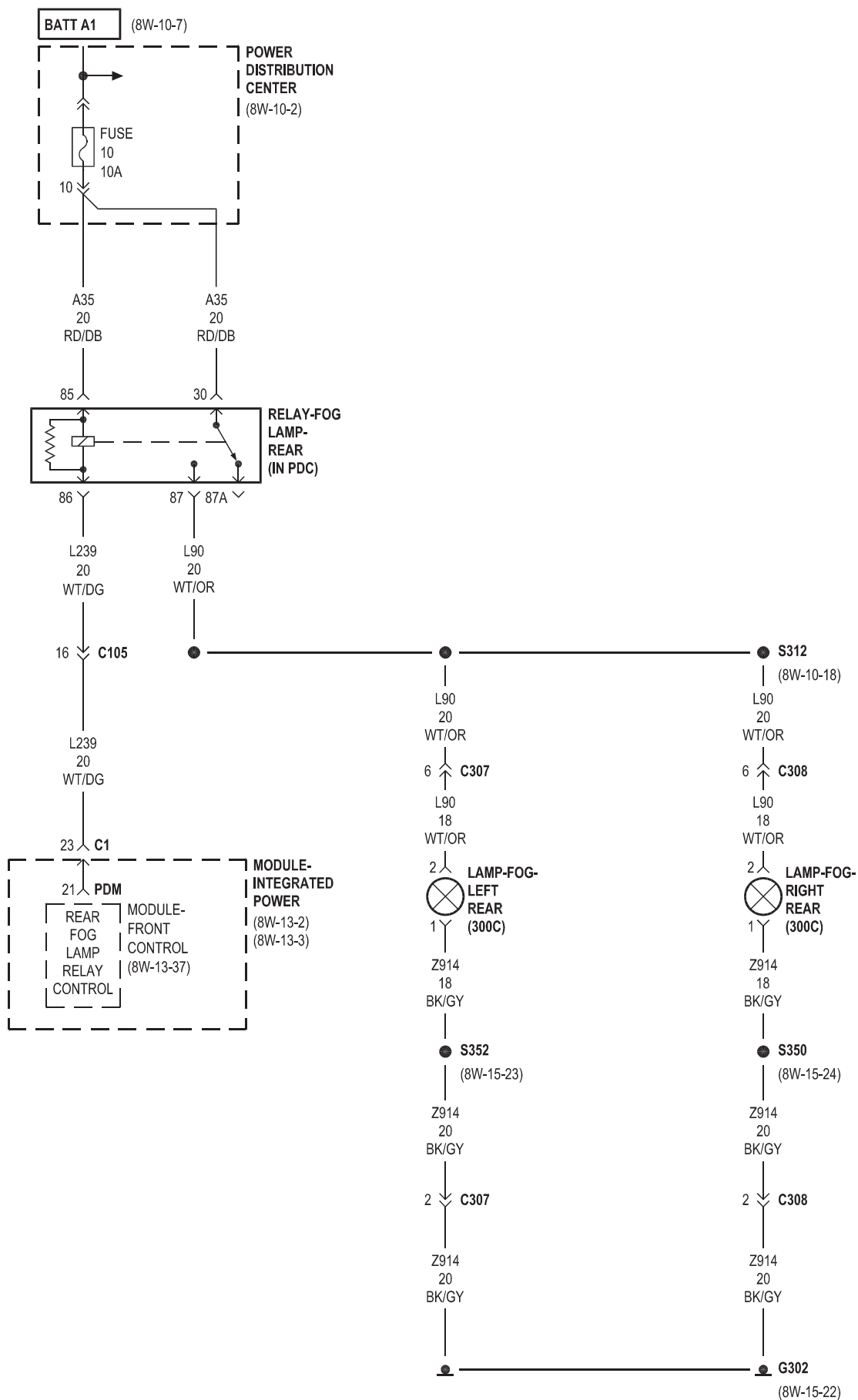
**LX**
**8W-51 REAR LIGHTING**
**8W - 51 - 7**

**LX48**





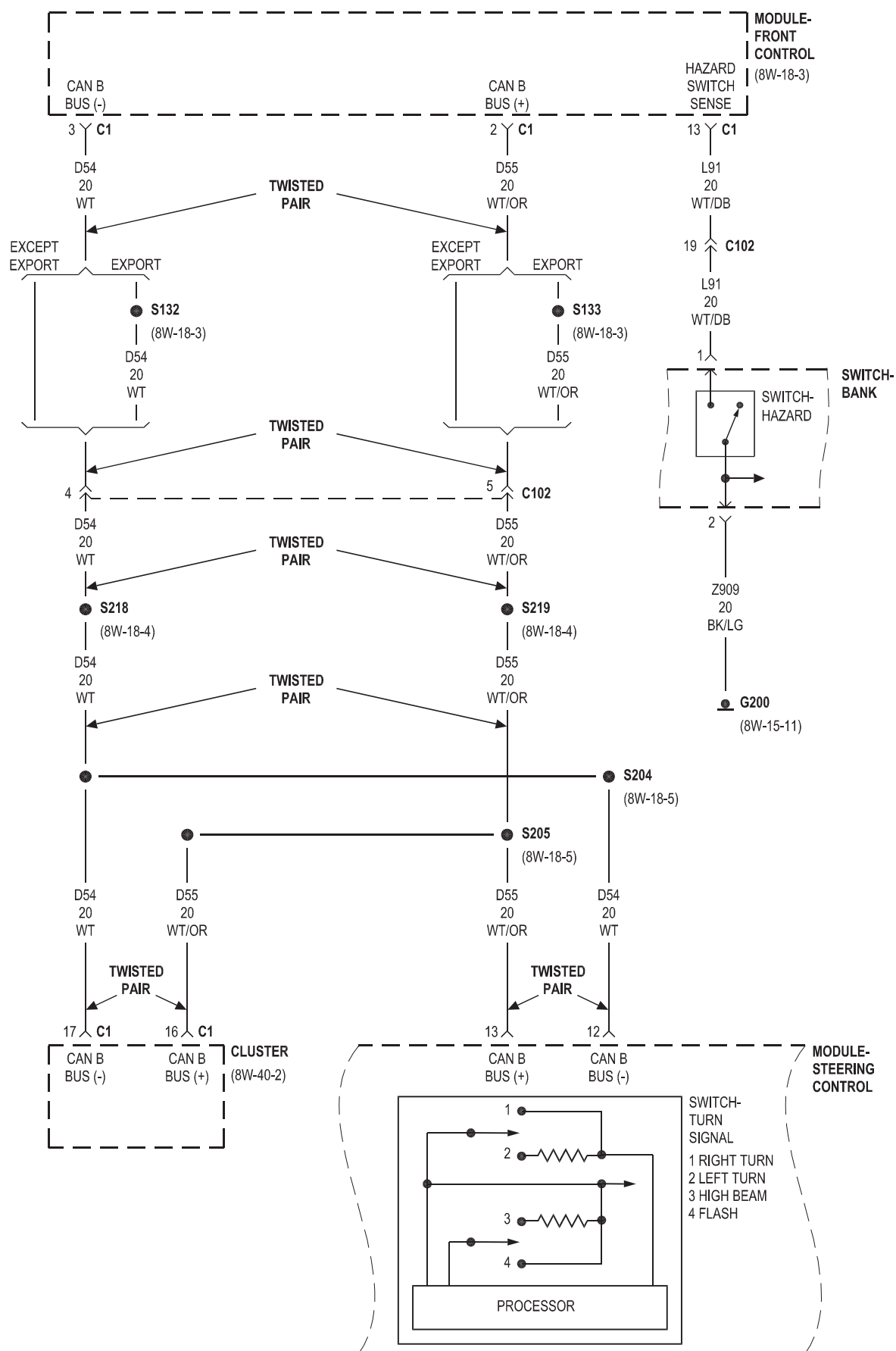


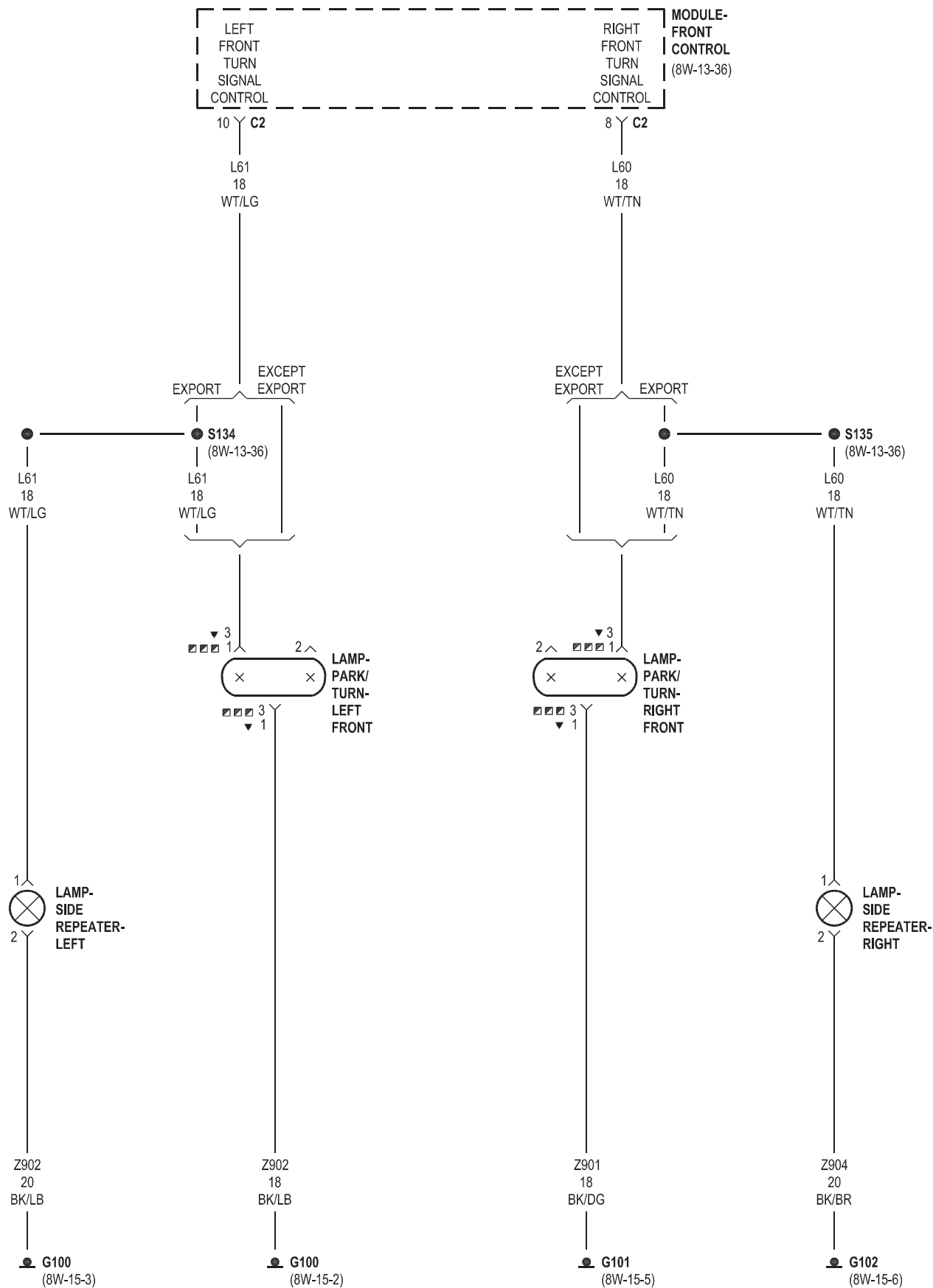


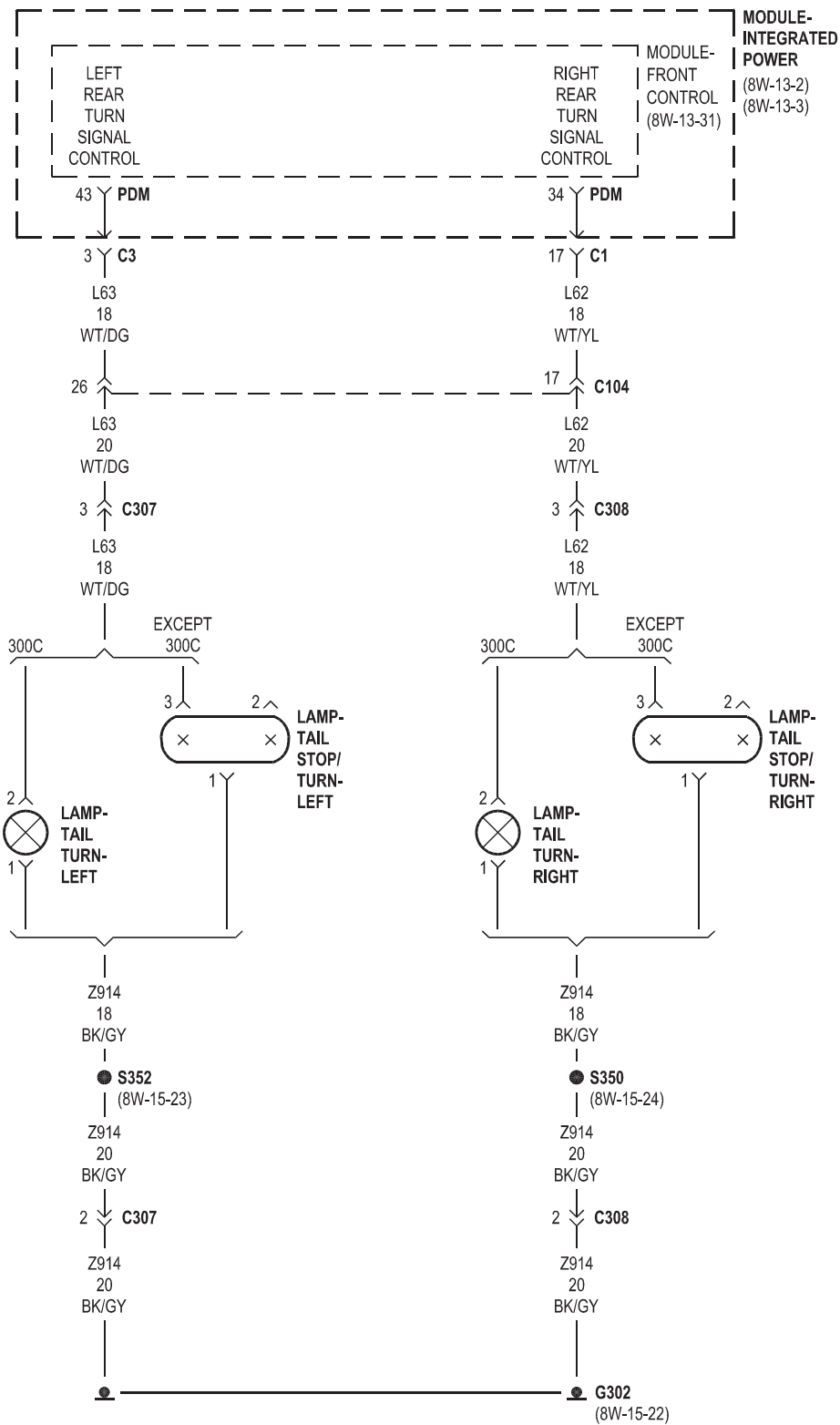
## 8W-52 TURN SIGNALS

<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Cluster . . . . .	8W-52-2	Lamp-Tail Stop/Turn-Left . . . . .	8W-52-4
G100 . . . . .	8W-52-3	Lamp-Tail Stop/Turn-Right . . . . .	8W-52-4
G101 . . . . .	8W-52-3	Lamp-Tail Turn-Left . . . . .	8W-52-4
G102 . . . . .	8W-52-3	Lamp-Tail Turn-Right . . . . .	8W-52-4
G200 . . . . .	8W-52-2	Lamp-Tail/Stop-Left . . . . .	8W-52-5
G302 . . . . .	8W-52-4, 5	Lamp-Tail/Stop-Right . . . . .	8W-52-5
Lamp-Back-Up-Left . . . . .	8W-52-5	Lamp-Turn-Left Rear . . . . .	8W-52-5
Lamp-Back-Up-Right . . . . .	8W-52-5	Lamp-Turn-Right Rear . . . . .	8W-52-5
Lamp-Park/Turn-Left Front . . . . .	8W-52-3	Module-Front Control . . . . .	8W-52-2, 3, 4, 5
Lamp-Park/Turn-Right Front . . . . .	8W-52-3	Module-Integrated Power . . . . .	8W-52-4, 5
Lamp-Side Repeater-Left . . . . .	8W-52-3	Module-Steering Control . . . . .	8W-52-2
Lamp-Side Repeater-Right . . . . .	8W-52-3	Switch-Bank . . . . .	8W-52-2

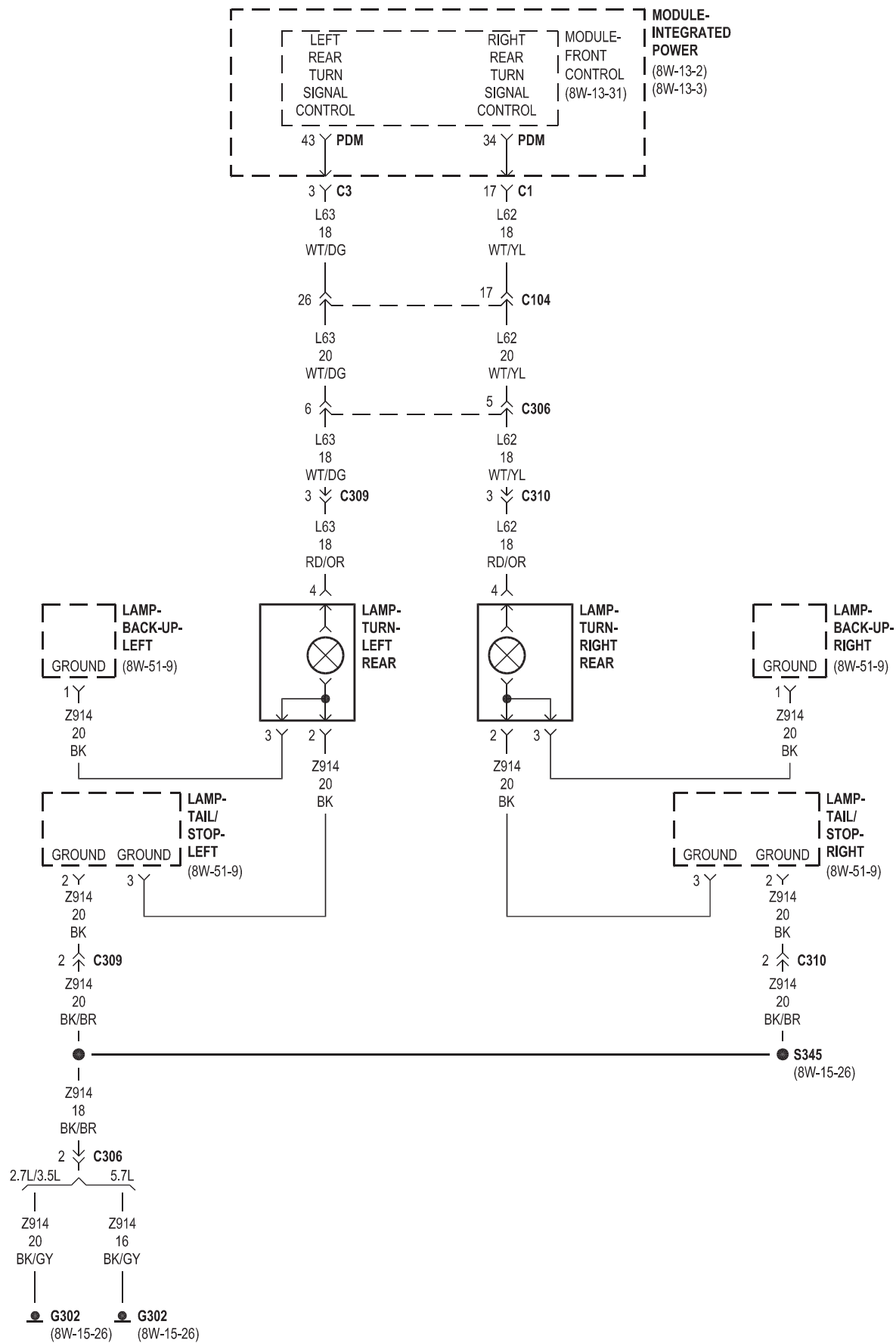








# DODGE

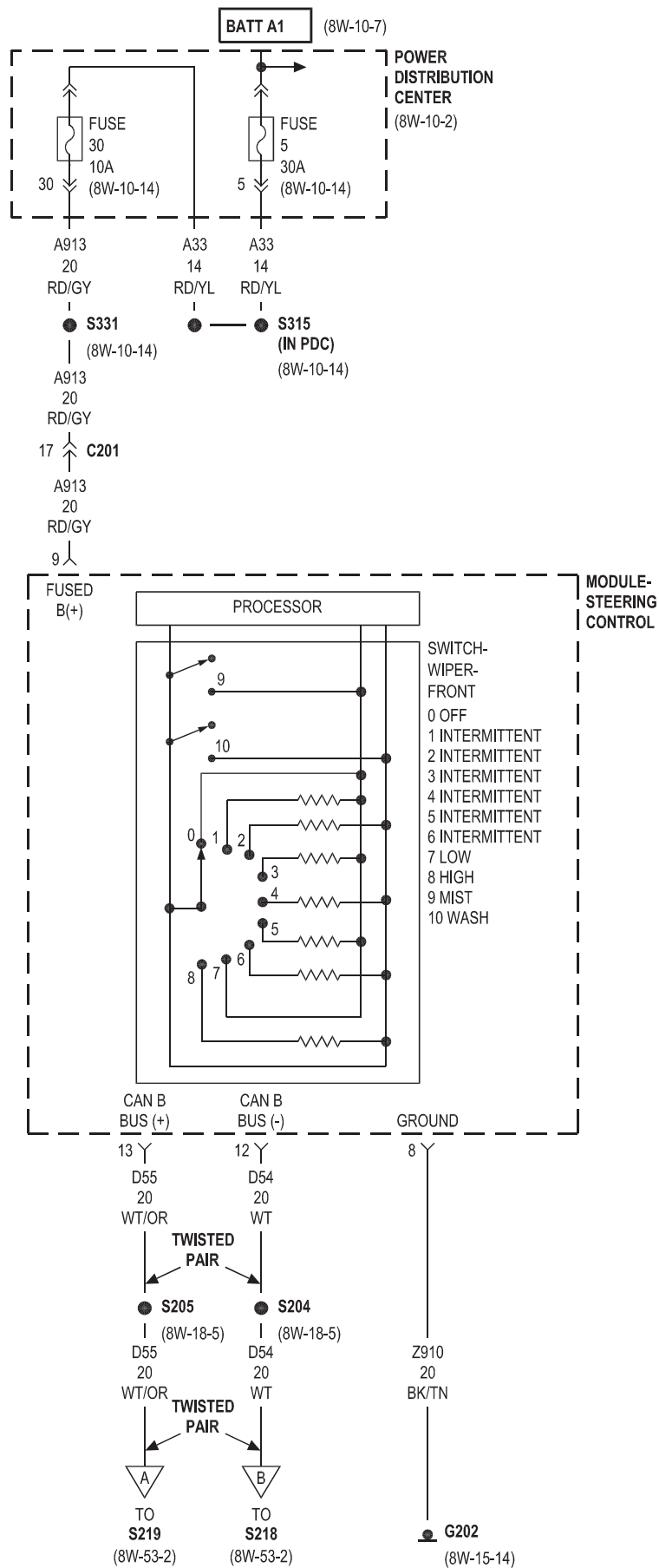




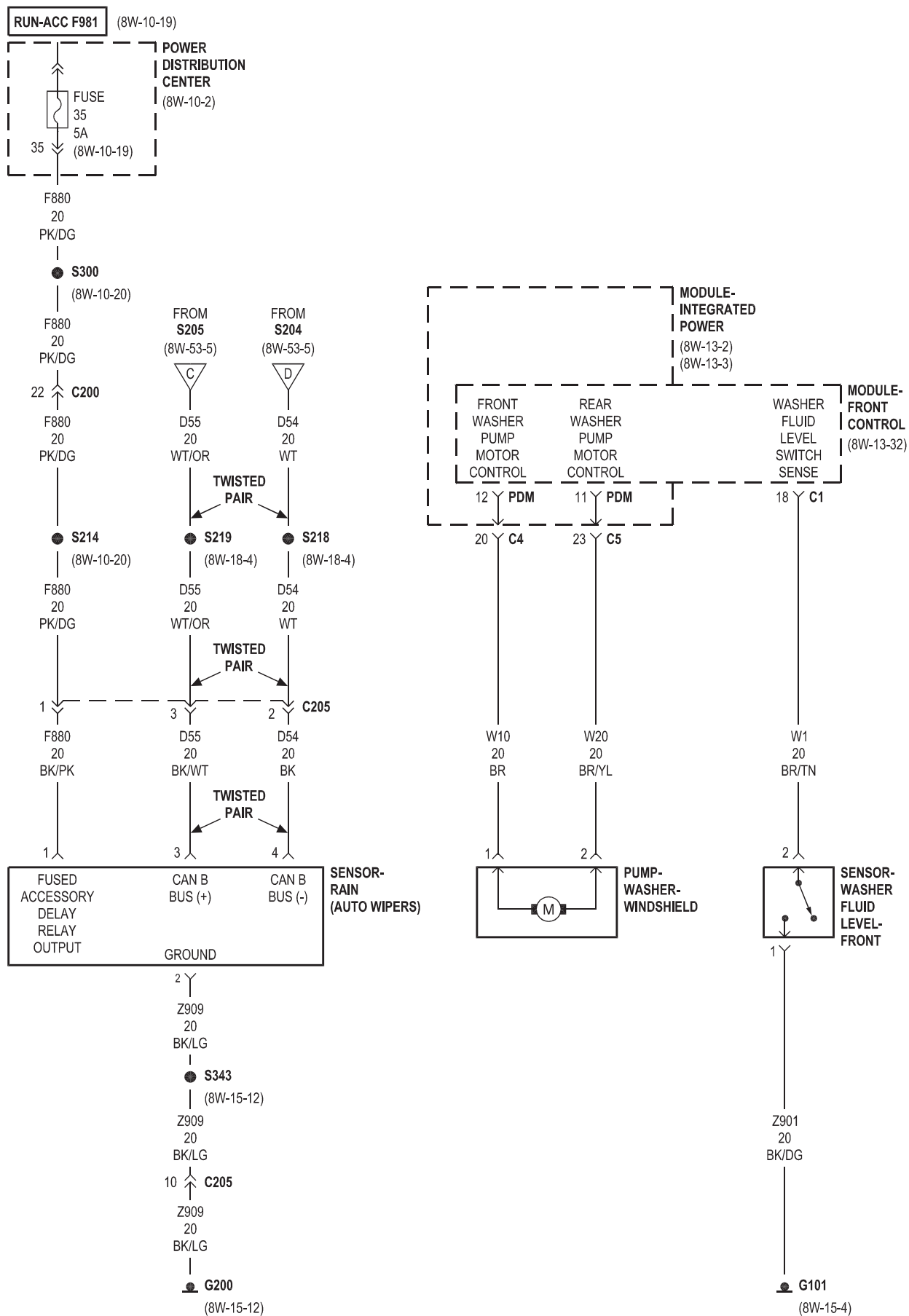
## 8W-53 WIPERS

<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Cluster . . . . .	8W-53-5	Module-Integrated Power . . . . .	8W-53-2, 4, 5, 6, 7
Fuse 5 . . . . .	8W-53-3, 5, 7	Module-Steering Control . . . . .	8W-53-3
Fuse 18 . . . . .	8W-53-2	Motor-Headlamp Washer . . . . .	8W-53-7
Fuse 20 . . . . .	8W-53-6	Motor-Wiper-Front . . . . .	8W-53-2
Fuse 30 . . . . .	8W-53-3	Motor-Wiper-Rear . . . . .	8W-53-6
Fuse 35 . . . . .	8W-53-4	Power Distribution Center . . . . .	8W-53-3, 4, 5, 6
Fuse 40 . . . . .	8W-53-5	Pump-Washer-Windshield . . . . .	8W-53-4
G100 . . . . .	8W-53-2	Relay-Headlamp Washer . . . . .	8W-53-7
G101 . . . . .	8W-53-2, 4	Relay-Wiper High/Low . . . . .	8W-53-2
G102 . . . . .	8W-53-7	Relay-Wiper On/Off . . . . .	8W-53-2
G200 . . . . .	8W-53-4	Relay-Wiper-Rear . . . . .	8W-53-6
G202 . . . . .	8W-53-3, 5	Sensor-Rain . . . . .	8W-53-4
G302 . . . . .	8W-53-6	Sensor-Washer Fluid Level-Front . . . . .	8W-53-4
Module-Front Control . . . . .	8W-53-2, 4, 6, 7	Switch-Bank . . . . .	8W-53-5

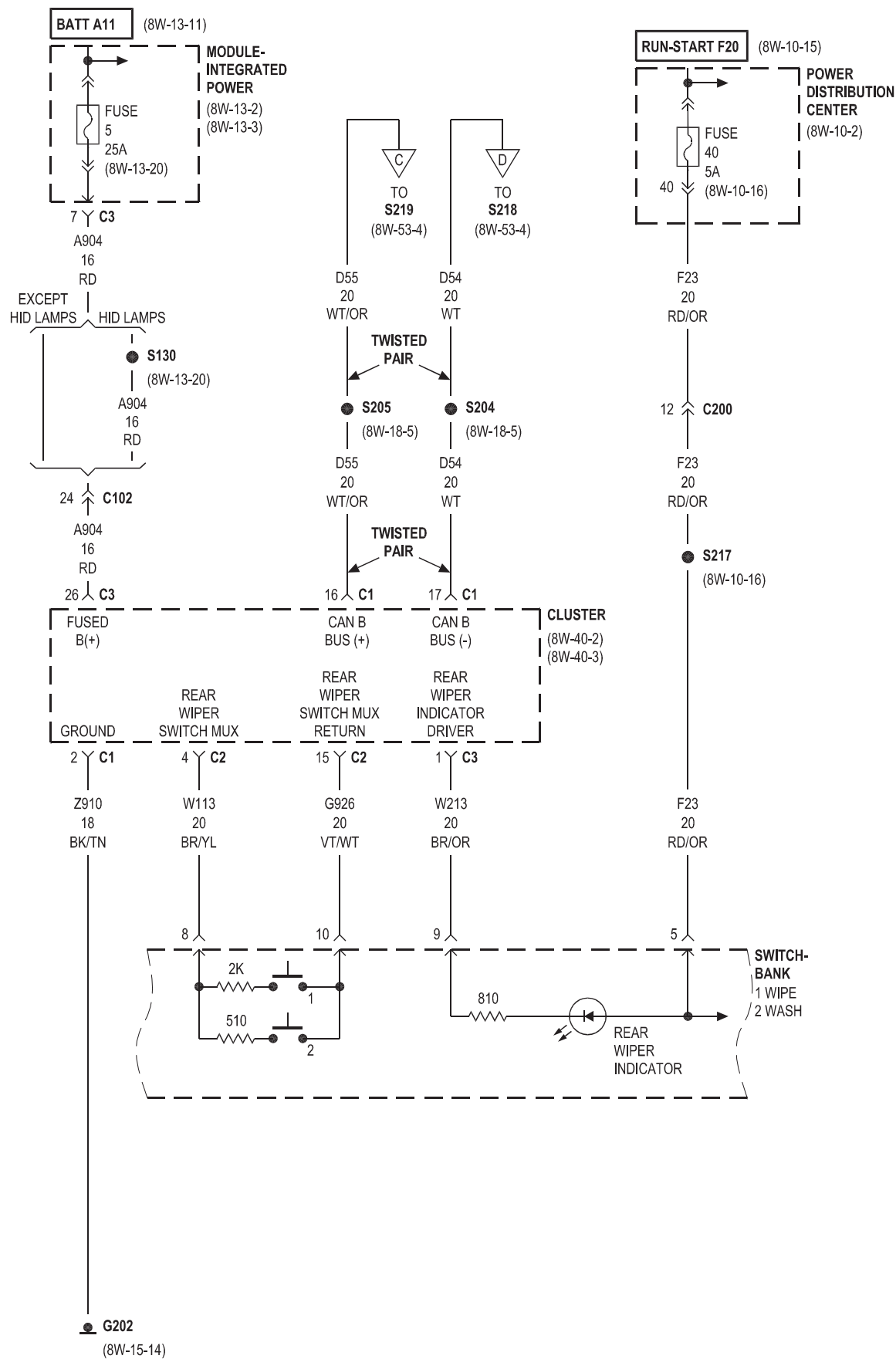


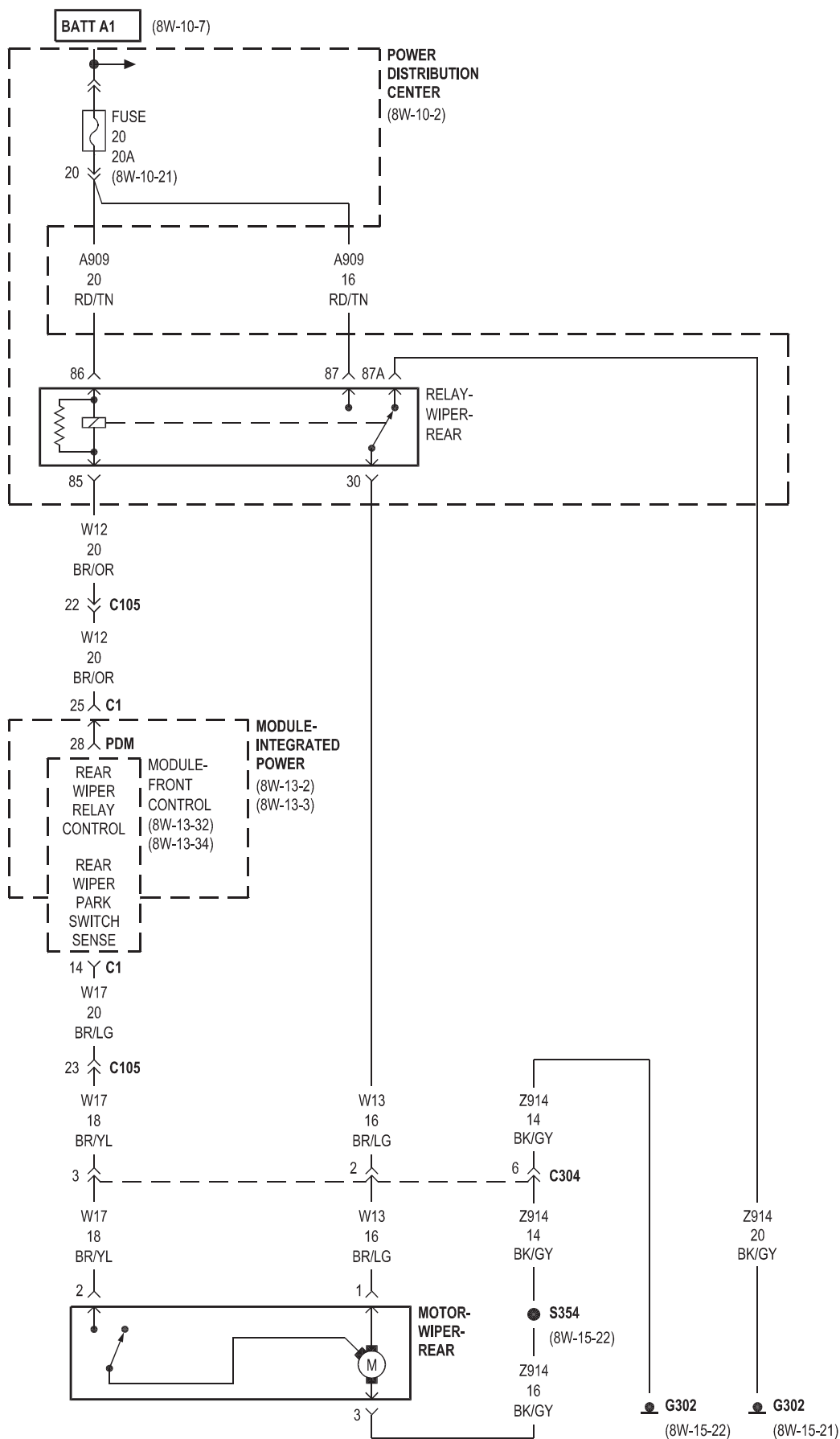


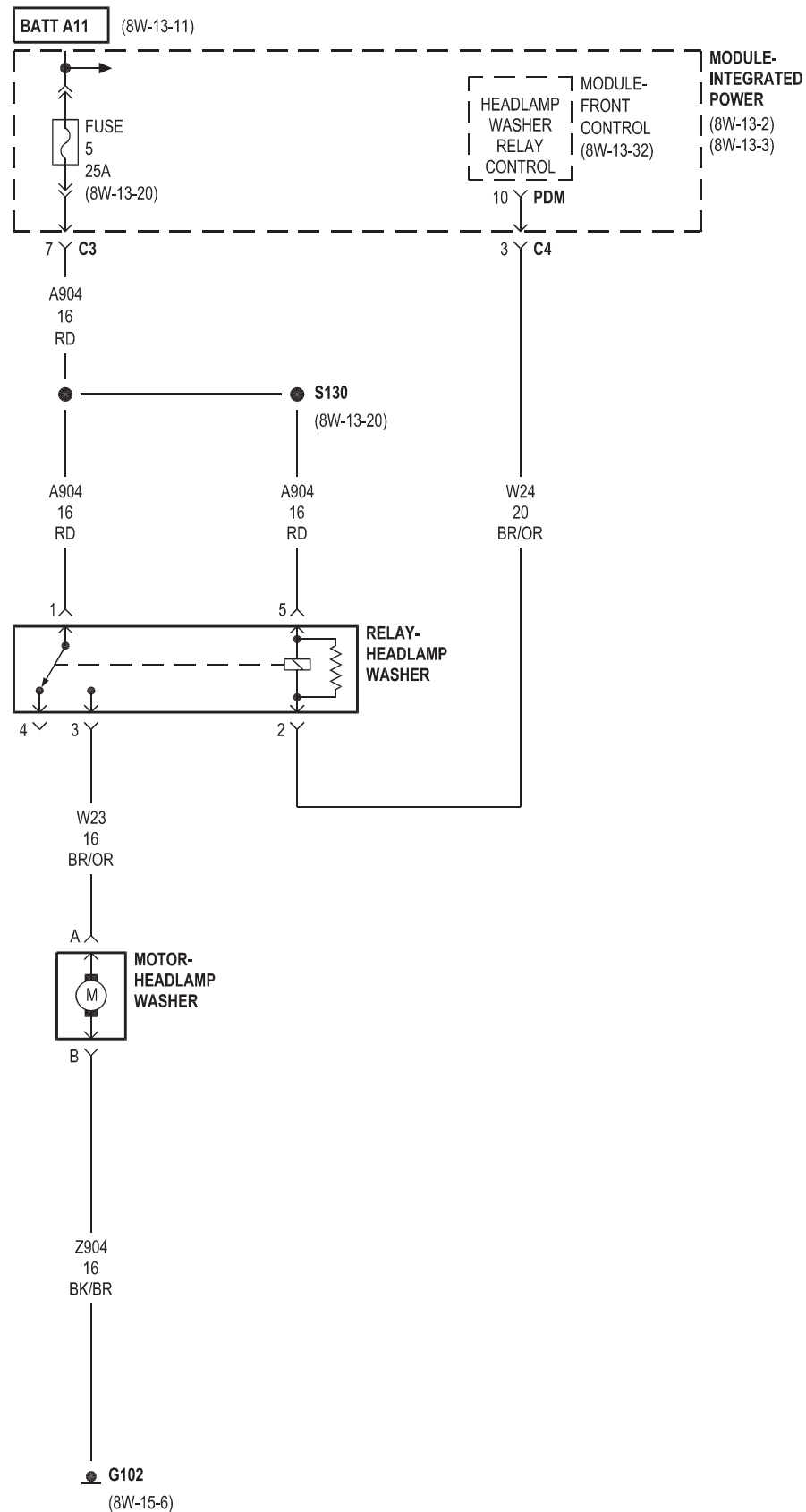




## LX49



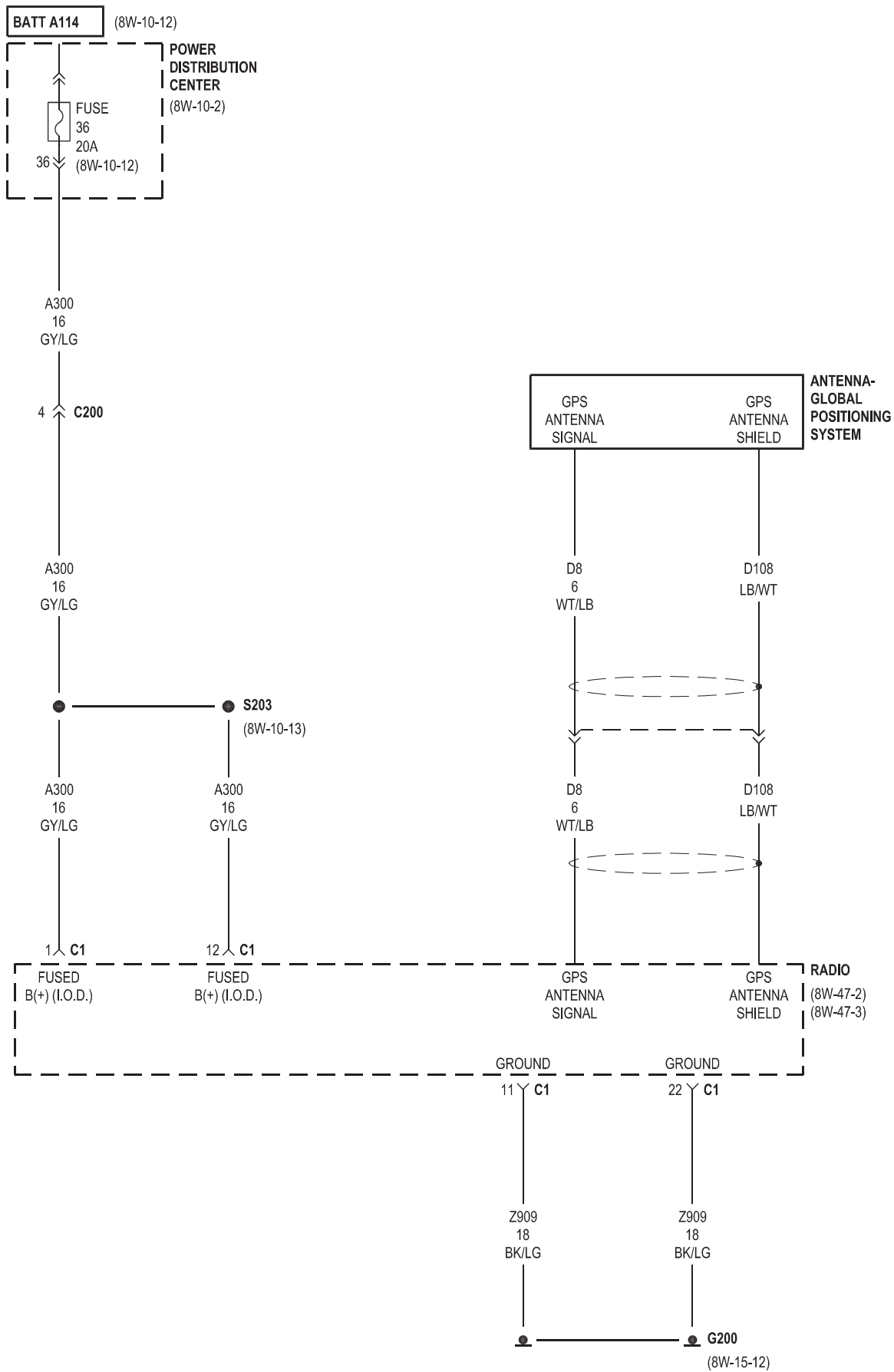


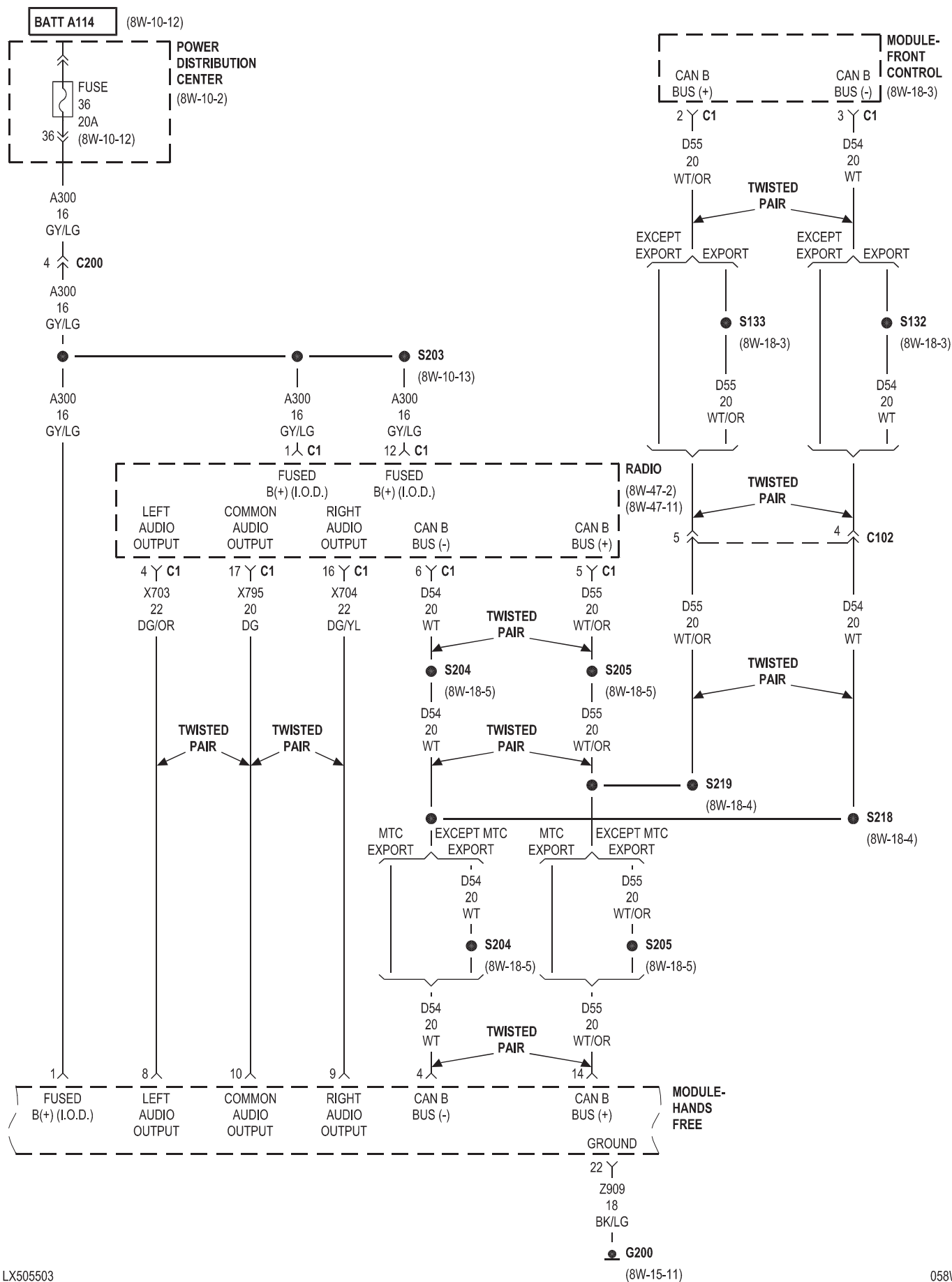




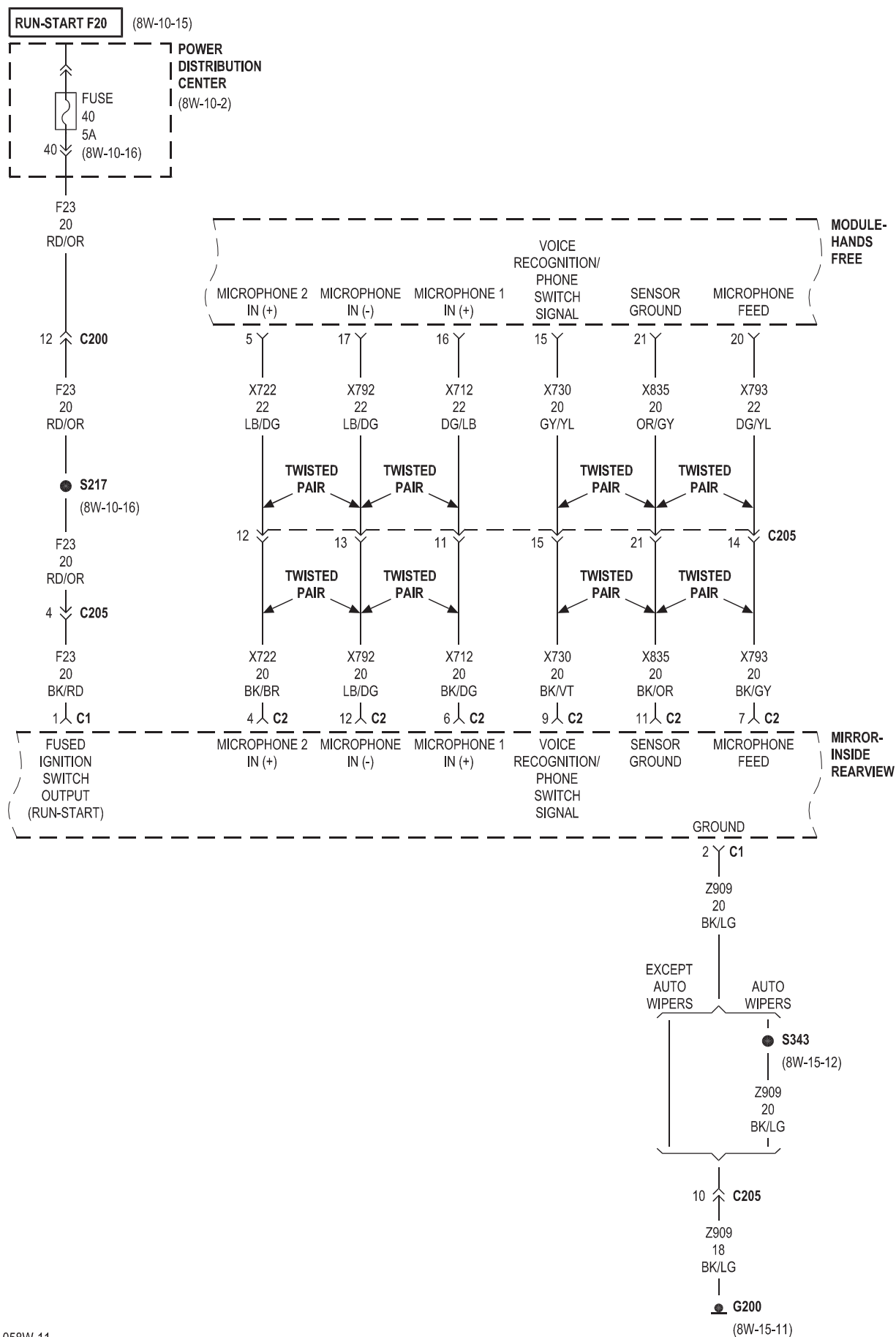
## 8W-55 NAVIGATION/TELECOMMUNICATIONS

<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Antenna-Global Positioning System . . . . .	8W-55-2	Module-Front Control . . . . .	8W-55-3
Fuse 36 . . . . .	8W-55-2, 3	Module-Hands Free . . . . .	8W-55-3, 4
Fuse 40 . . . . .	8W-55-4	Power Distribution Center . . . . .	8W-55-2, 3, 4
G200 . . . . .	8W-55-2, 3, 4	Radio . . . . .	8W-55-2, 3
Mirror-Inside Rearview . . . . .	8W-55-4		





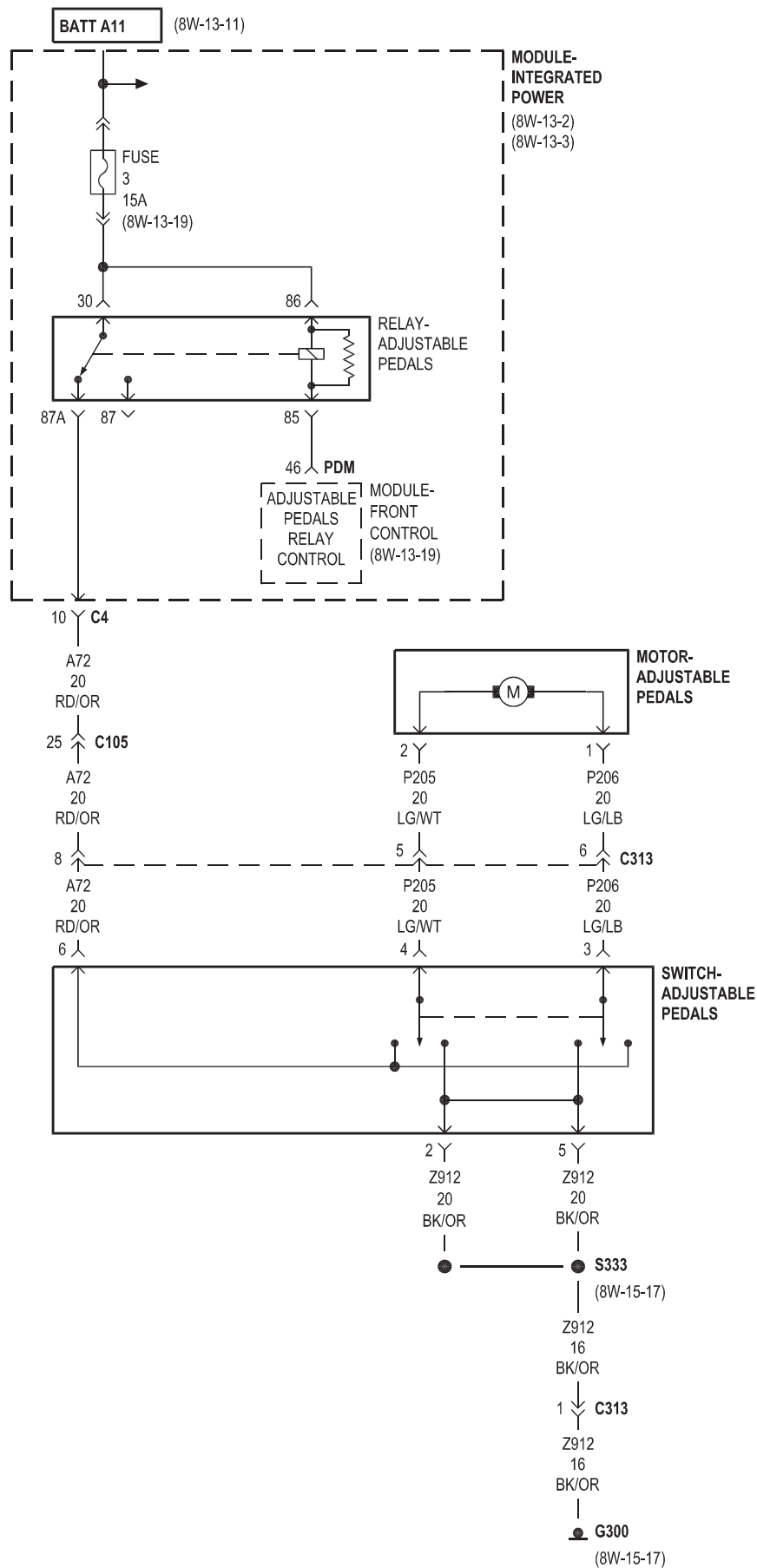


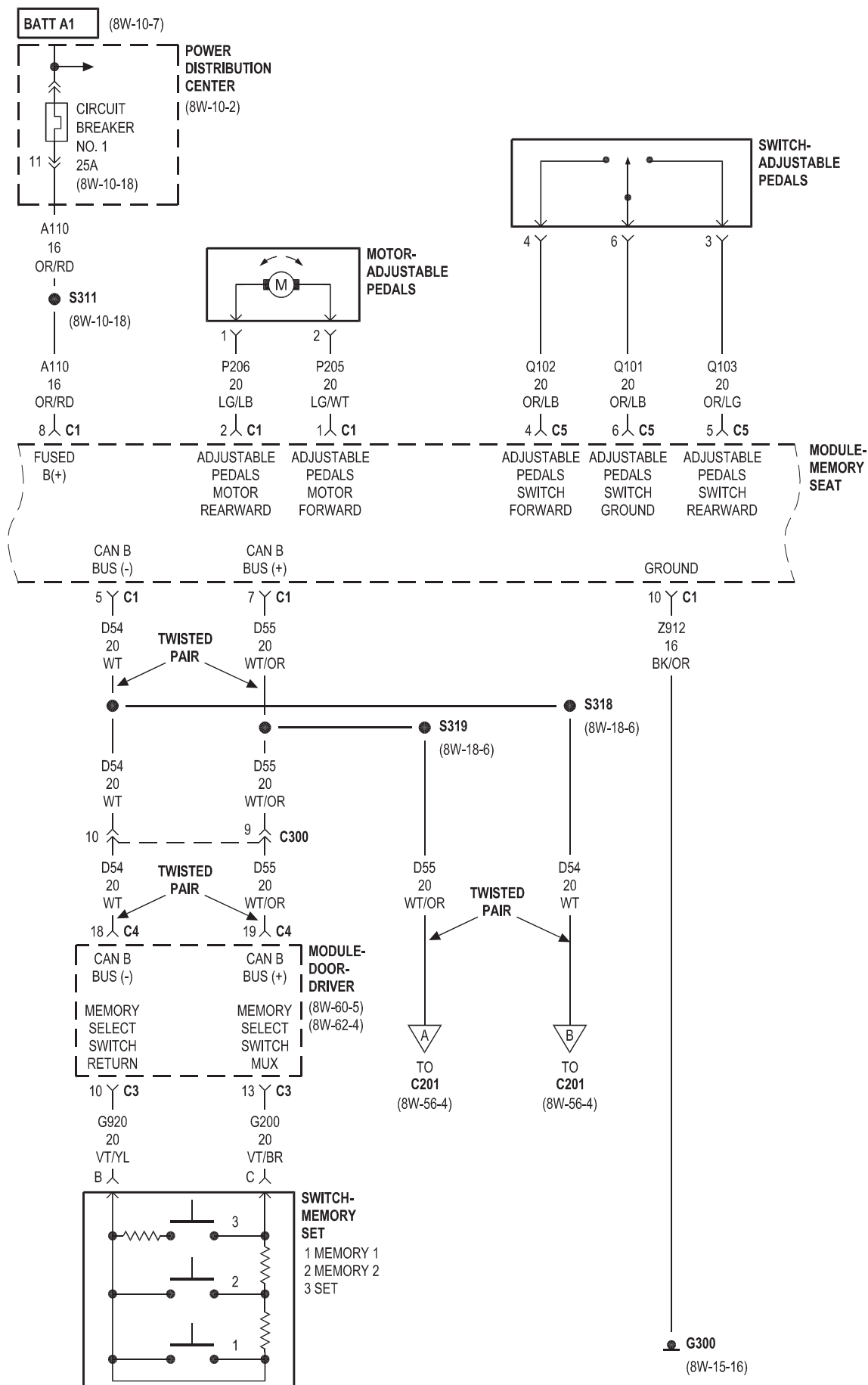


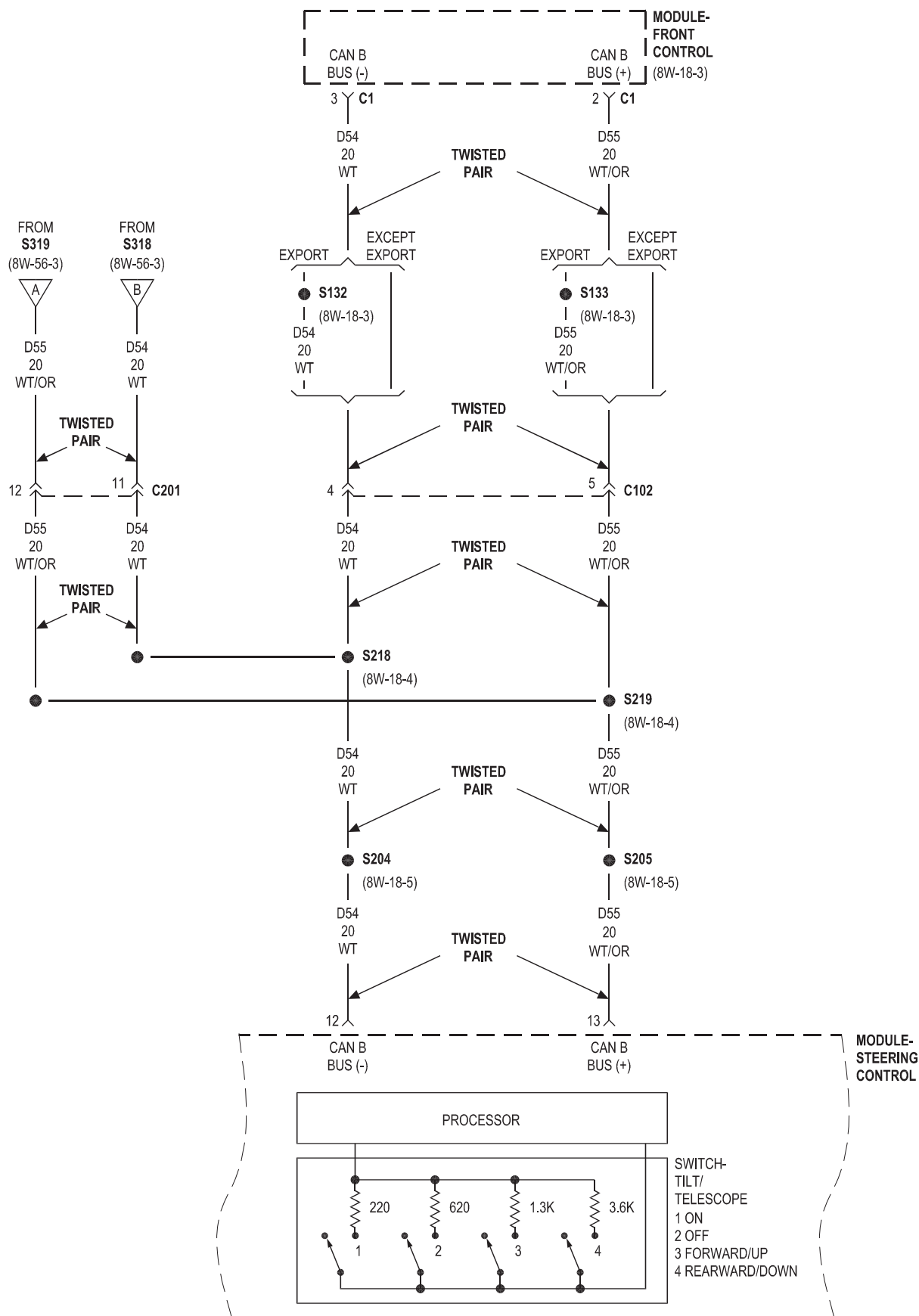
## 8W-56 CONVENIENCE SYSTEMS

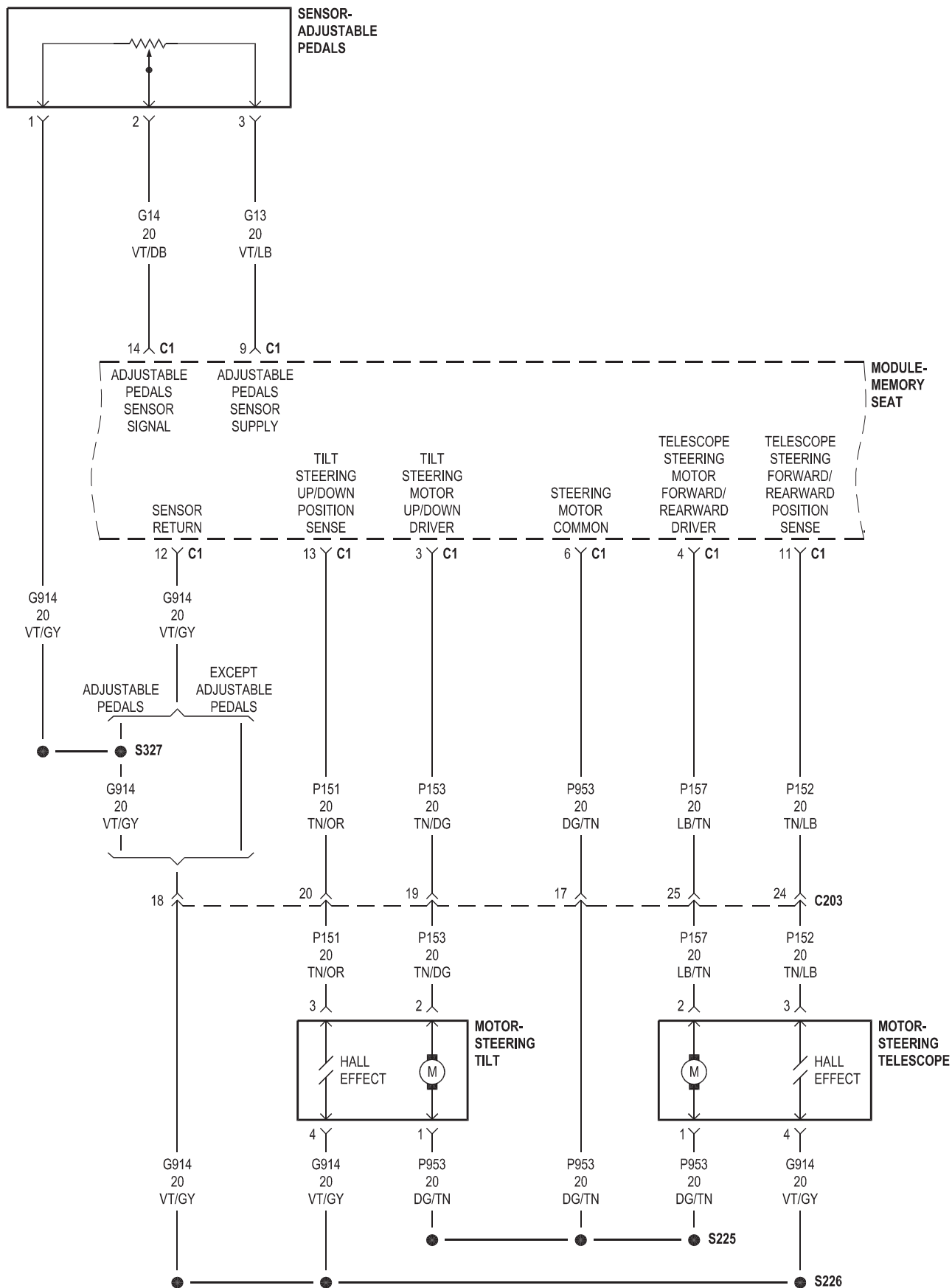
<b>Component</b>	<b>Page</b>
Circuit Breaker No. 1 . . . . .	8W-56-3
Display-Park Assist . . . . .	8W-56-6
Fuse 3 . . . . .	8W-56-2
Fuse 41 . . . . .	8W-56-6
G300 . . . . .	8W-56-2, 3
G302 . . . . .	8W-56-6
Module-Door-Driver . . . . .	8W-56-3
Module-Front Control . . . . .	8W-56-2, 4, 6
Module-Integrated Power . . . . .	8W-56-2
Module-Memory Seat . . . . .	8W-56-3, 5
Module-Park Assist . . . . .	8W-56-6, 7, 8
Module-Steering Control . . . . .	8W-56-4
Motor-Adjustable Pedals . . . . .	8W-56-2, 3

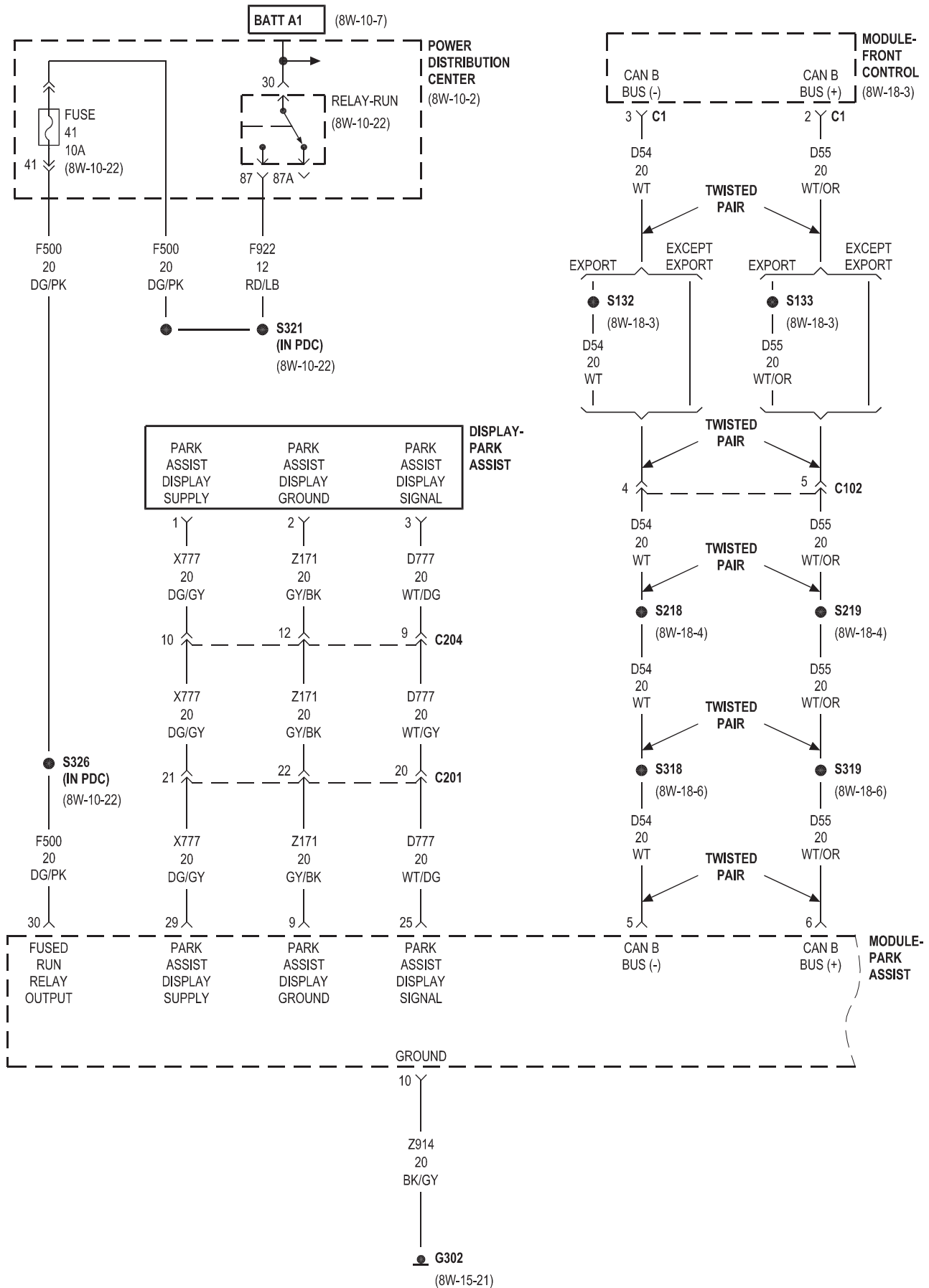
<b>Component</b>	<b>Page</b>
Motor-Steering Telescope . . . . .	8W-56-5
Motor-Steering Tilt . . . . .	8W-56-5
Power Distribution Center . . . . .	8W-56-3, 6
Relay-Adjustable Pedals . . . . .	8W-56-2
Relay-Run . . . . .	8W-56-6
Sensor-Adjustable Pedals . . . . .	8W-56-5
Sensor-Park Assist-No. 7 . . . . .	8W-56-7, 8
Sensor-Park Assist-No. 8 . . . . .	8W-56-7, 8
Sensor-Park Assist-No. 9 . . . . .	8W-56-7, 8
Sensor-Park Assist-No. 10 . . . . .	8W-56-7, 8
Switch-Adjustable Pedals . . . . .	8W-56-2, 3
Switch-Memory Set . . . . .	8W-56-3

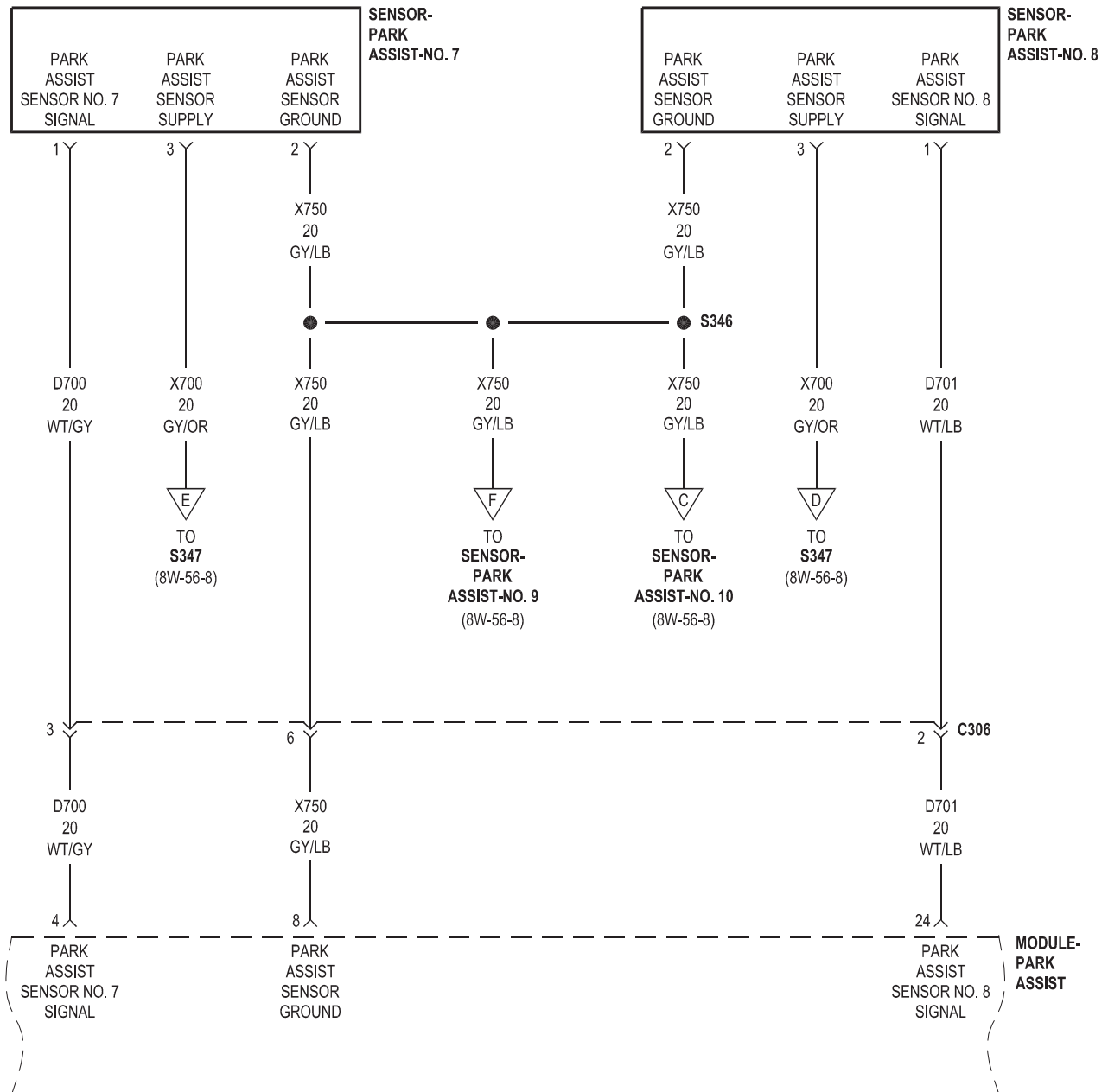




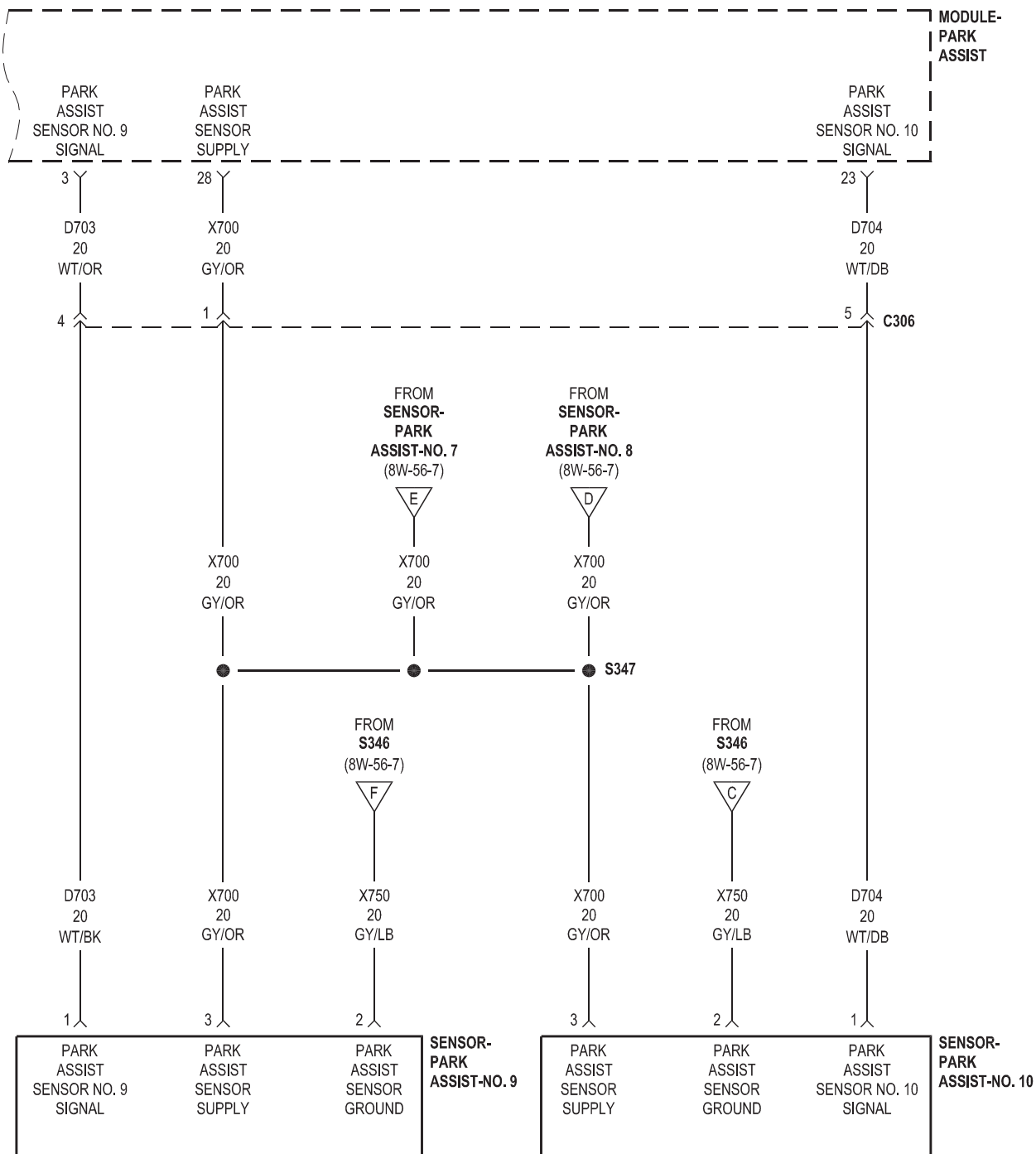








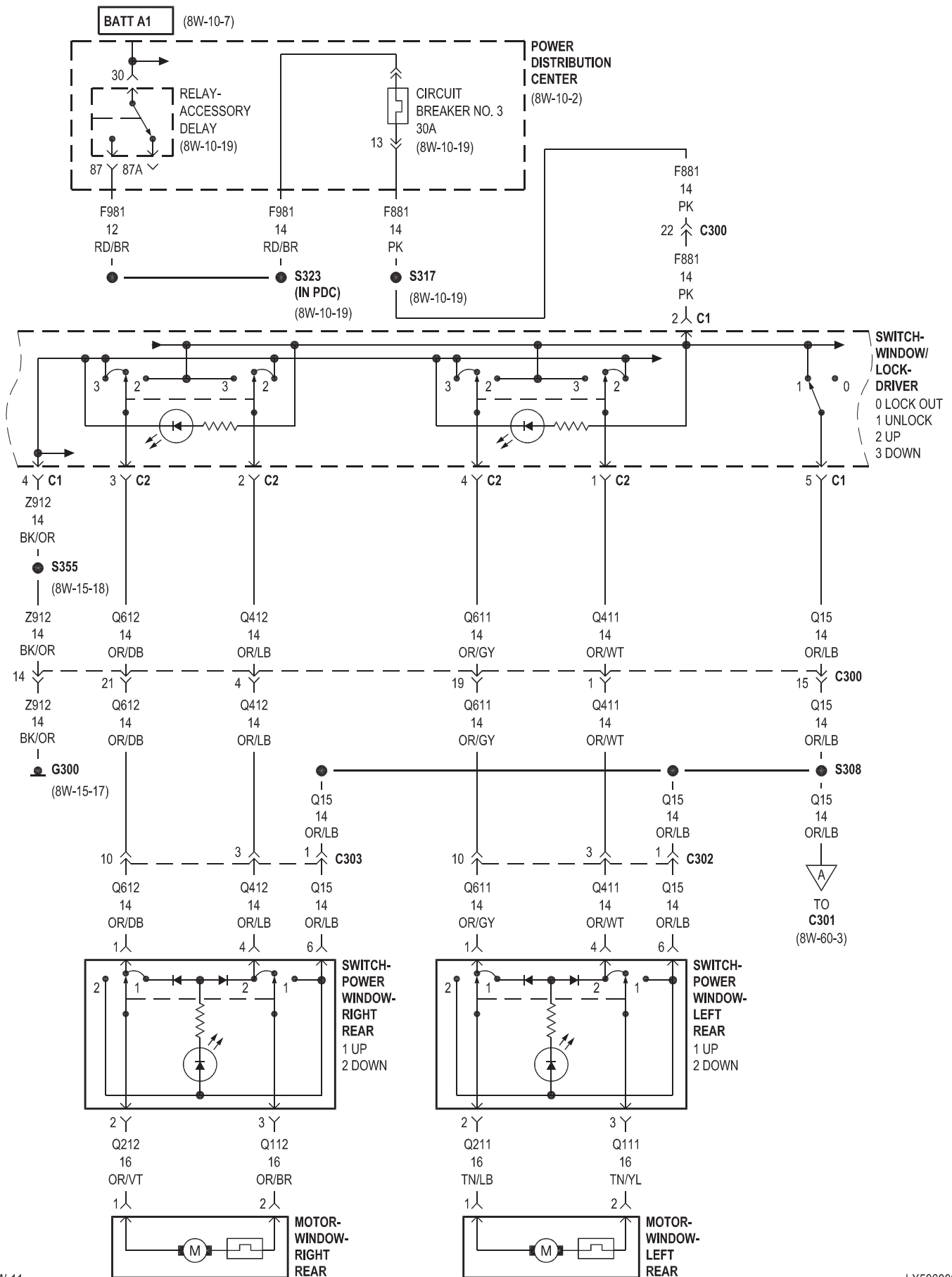


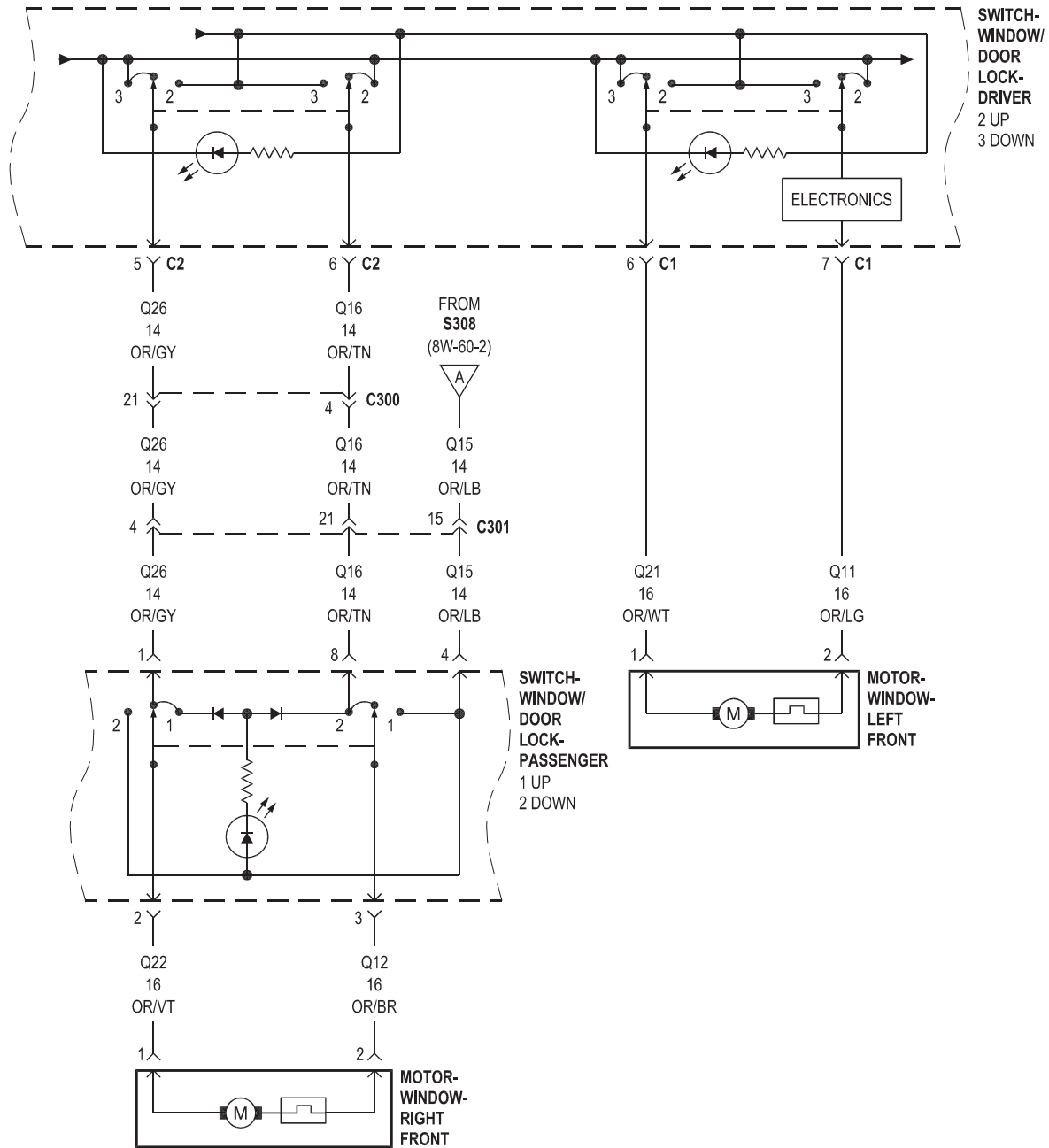


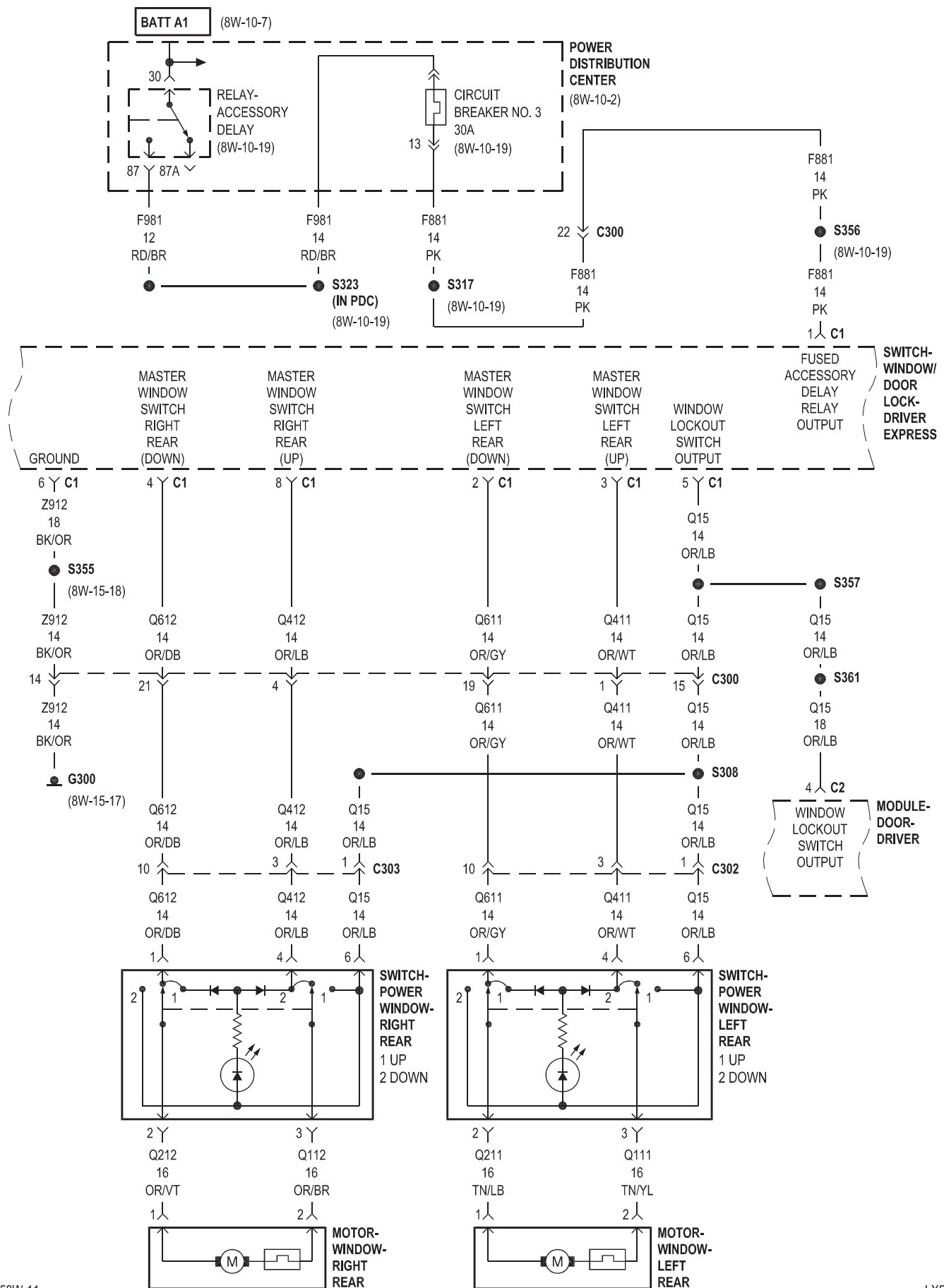
## 8W-60 POWER WINDOWS

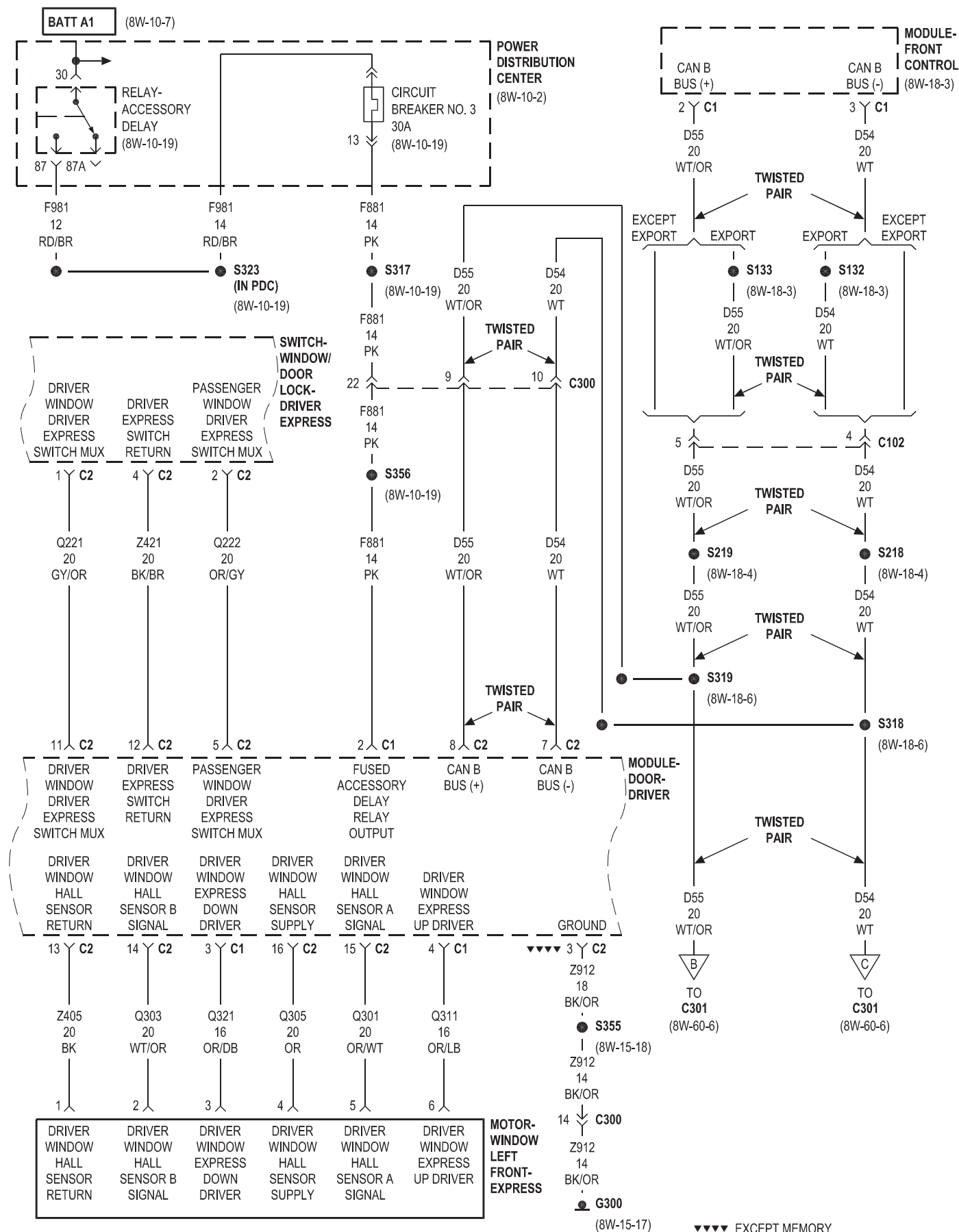
<b>Component</b>	<b>Page</b>
Circuit Breaker No. 3 . . . . .	8W-60-2, 4, 5, 6
G300 . . . . .	8W-60-2, 4, 5
Module-Door-Driver . . . . .	8W-60-4, 5
Module-Door-Passenger . . . . .	8W-60-6
Module-Front Control . . . . .	8W-60-5
Motor-Window Left Front-Express . . . . .	8W-60-5
Motor-Window Right Front-Express . . . . .	8W-60-6
Motor-Window-Left Front . . . . .	8W-60-3
Motor-Window-Left Rear . . . . .	8W-60-2, 4
Motor-Window-Right Front . . . . .	8W-60-3
Motor-Window-Right Rear . . . . .	8W-60-2, 4

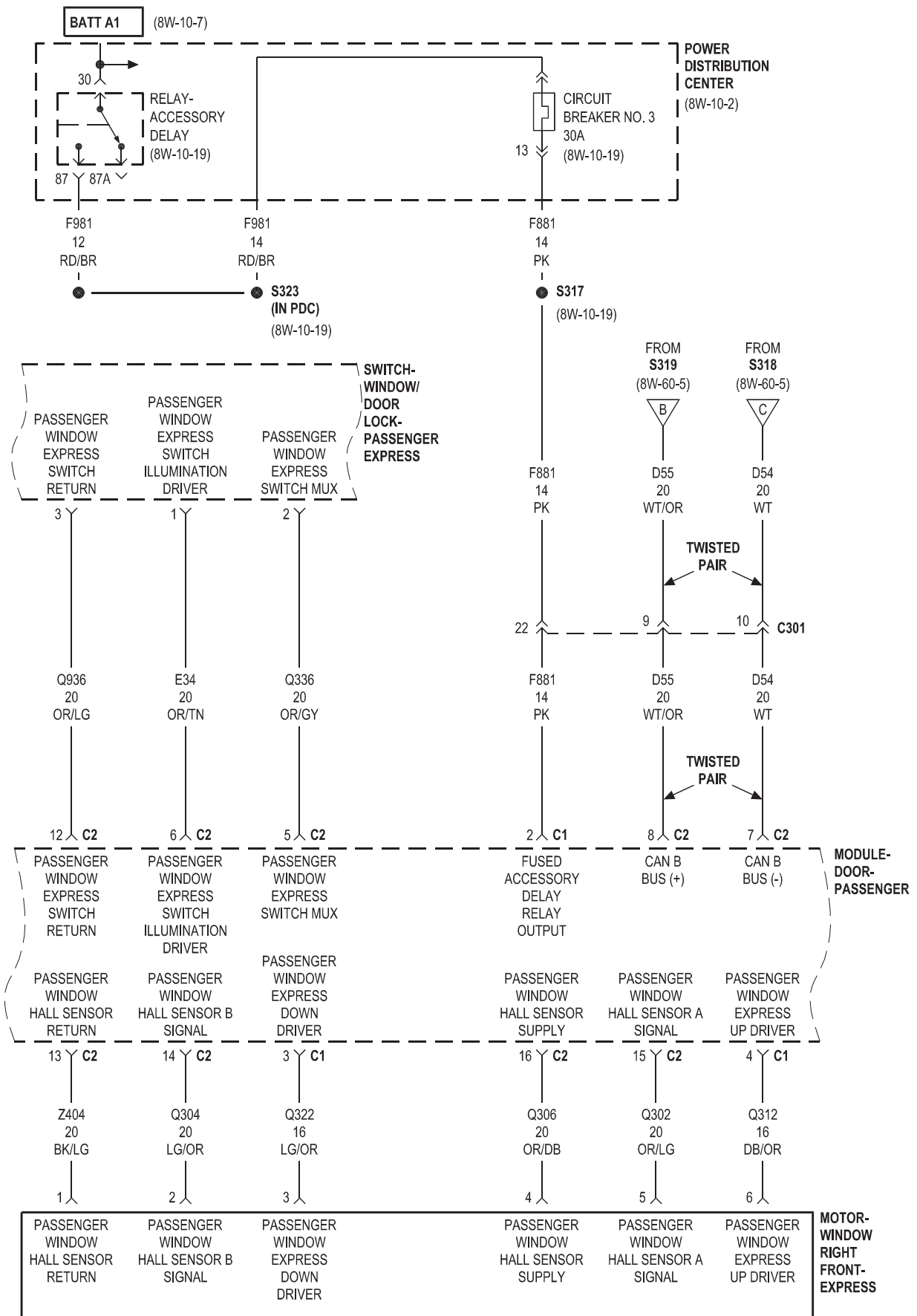
<b>Component</b>	<b>Page</b>
Power Distribution Center . . . . .	8W-60-2, 4, 5, 6
Relay-Accessory Delay . . . . .	8W-60-2, 4, 5, 6
Switch-Power Window-Left Rear . . . . .	8W-60-2, 4
Switch-Power Window-Right Rear . . . . .	8W-60-2, 4
Switch-Window/Door Lock-Driver . . . . .	8W-60-3
Switch-Window/Door Lock-Driver Express . . . . .	8W-60-4, 5
Switch-Window/Door Lock-Passenger . . . . .	8W-60-3
Switch-Window/Door Lock-Passenger Express . . . . .	8W-60-6
Switch-Window/Lock-Driver . . . . .	8W-60-2









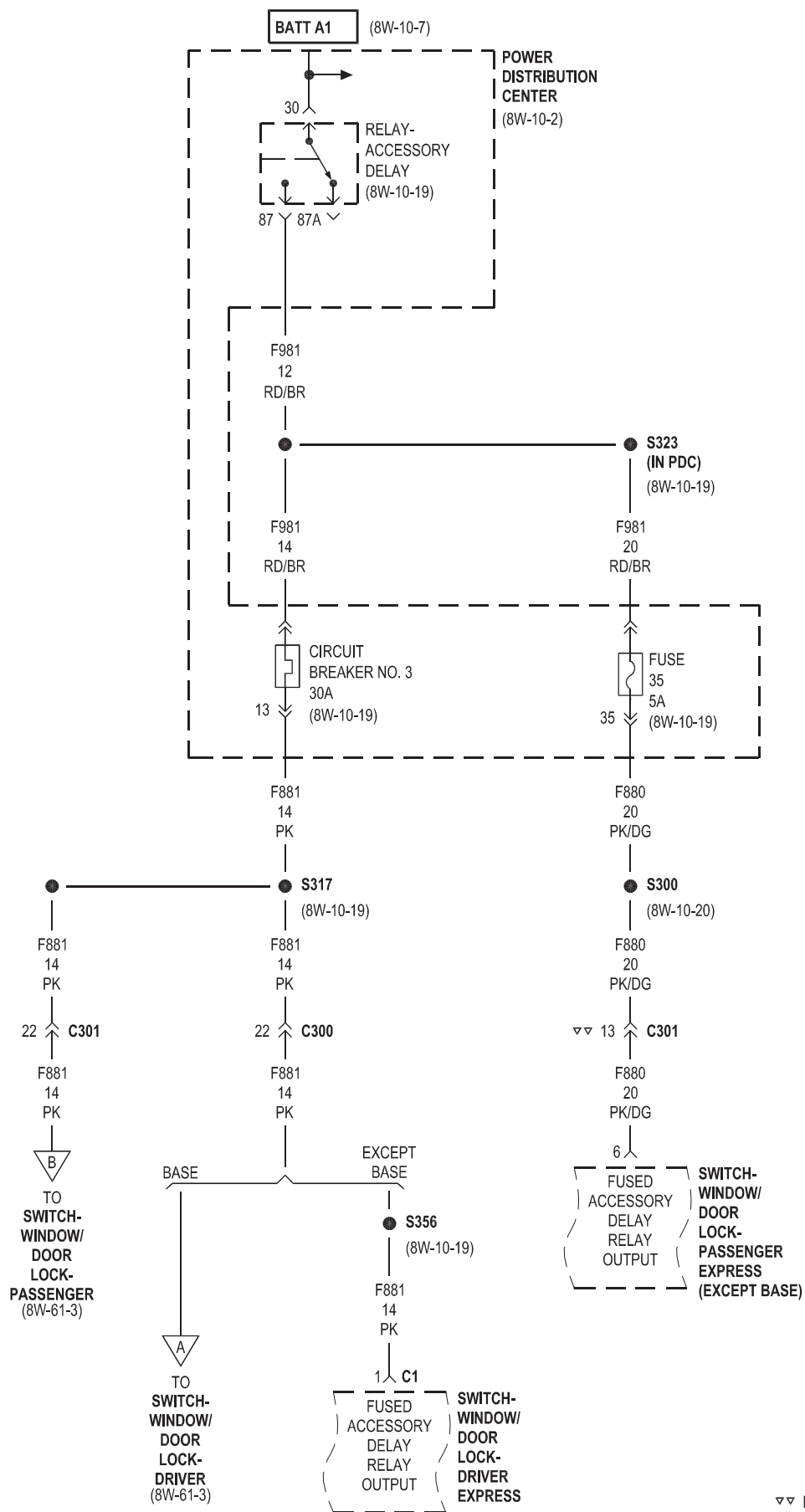


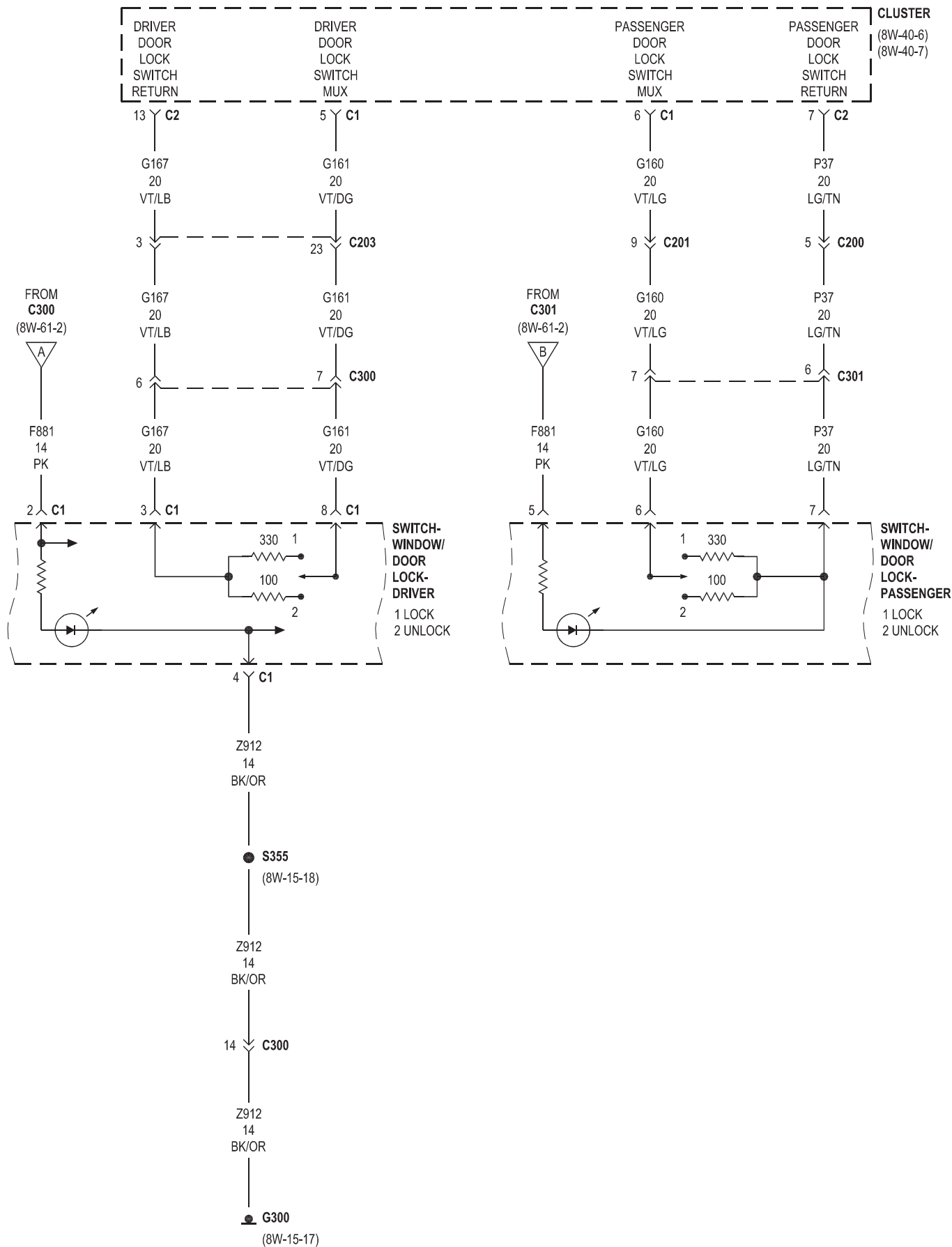
## 8W-61 POWER DOOR LOCKS

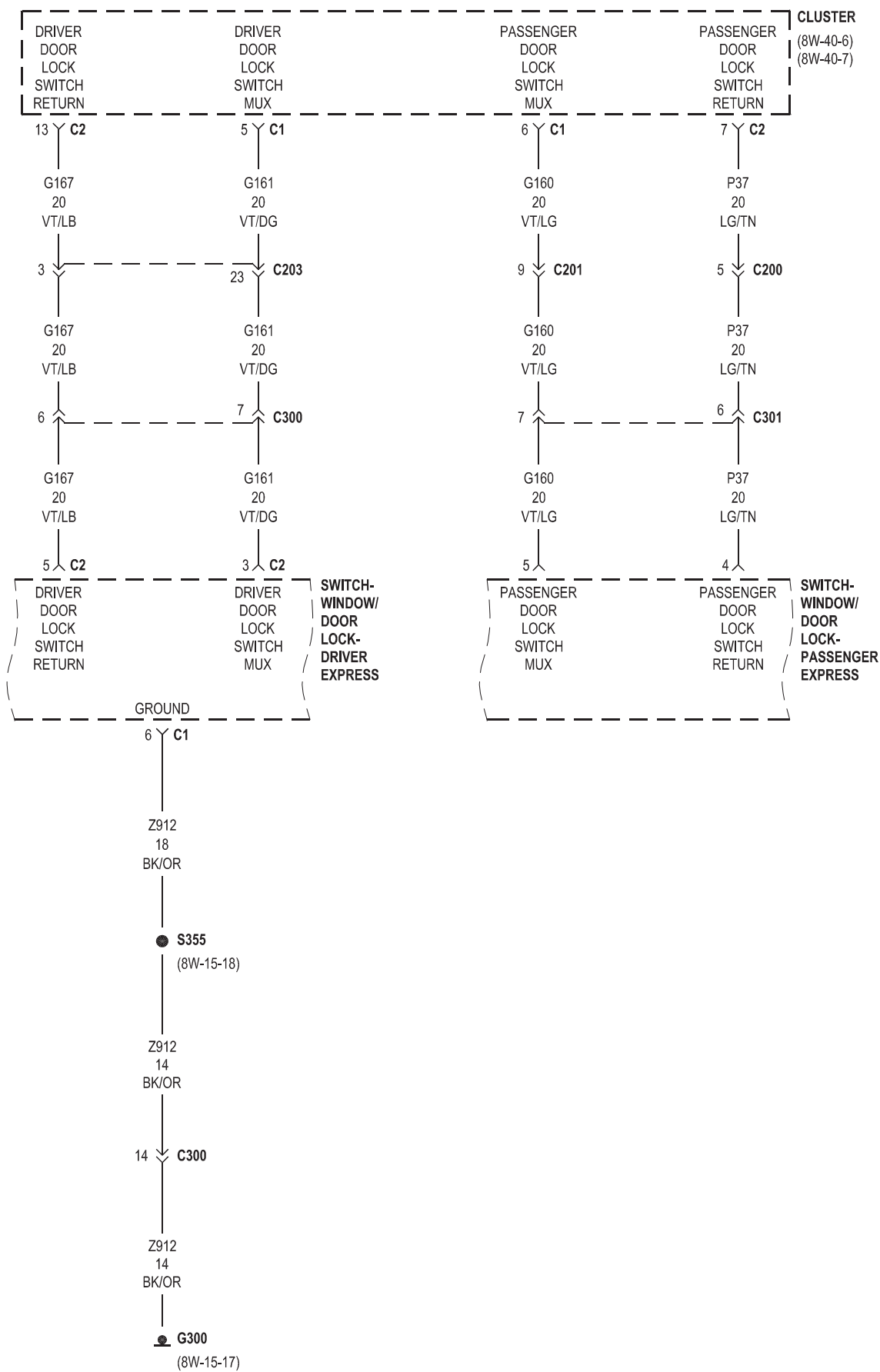
<b>Component</b>	<b>Page</b>
Circuit Breaker No. 3 . . . . .	8W-61-2
Cluster . . . . .	8W-61-3, 4, 5, 6, 7
Fuse 35 . . . . .	8W-61-2
G202 . . . . .	8W-61-6
G300 . . . . .	8W-61-3, 4, 5
G301 . . . . .	8W-61-5, 6
G302 . . . . .	8W-61-7
Latch-Door-Decklid . . . . .	8W-61-6
Latch-Door-Left Front . . . . .	8W-61-5
Latch-Door-Left Rear . . . . .	8W-61-5
Latch-Door-Liftgate . . . . .	8W-61-7
Latch-Door-Right Front . . . . .	8W-61-5

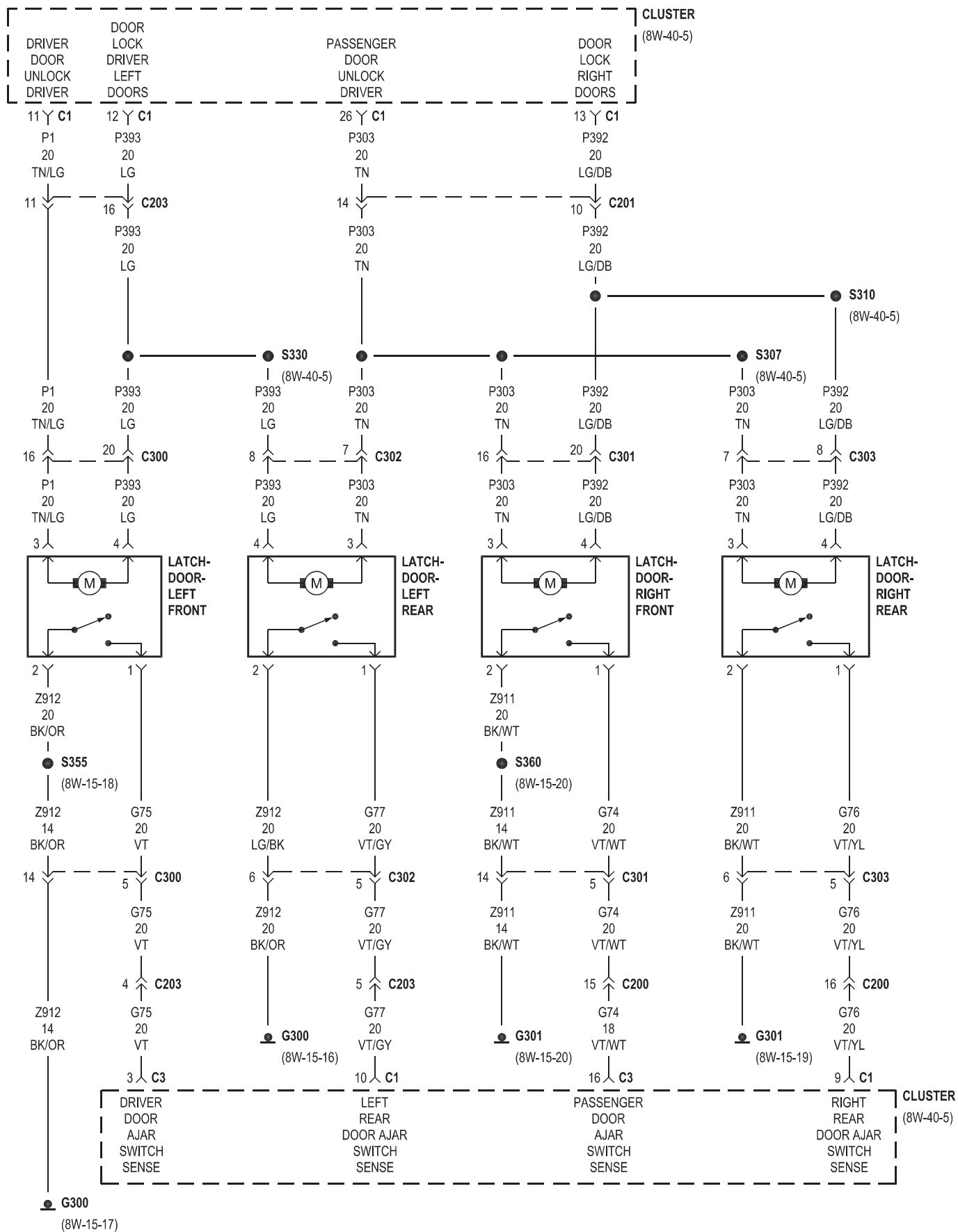
<b>Component</b>	<b>Page</b>
Latch-Door-Right Rear . . . . .	8W-61-5
Power Distribution Center . . . . .	8W-61-2
Relay-Accessory Delay . . . . .	8W-61-2
Switch-Decklid Release . . . . .	8W-61-6
Switch-Liftgate Release . . . . .	8W-61-7
Switch-Window/Door Lock-Driver . . . . .	8W-61-2, 3
Switch-Window/Door Lock-Driver Express . . . . .	8W-61-2, 4
Switch-Window/Door Lock-Passenger . . . . .	8W-61-2, 3
Switch-Window/Door Lock-Passenger Express . . . . .	8W-61-2, 4

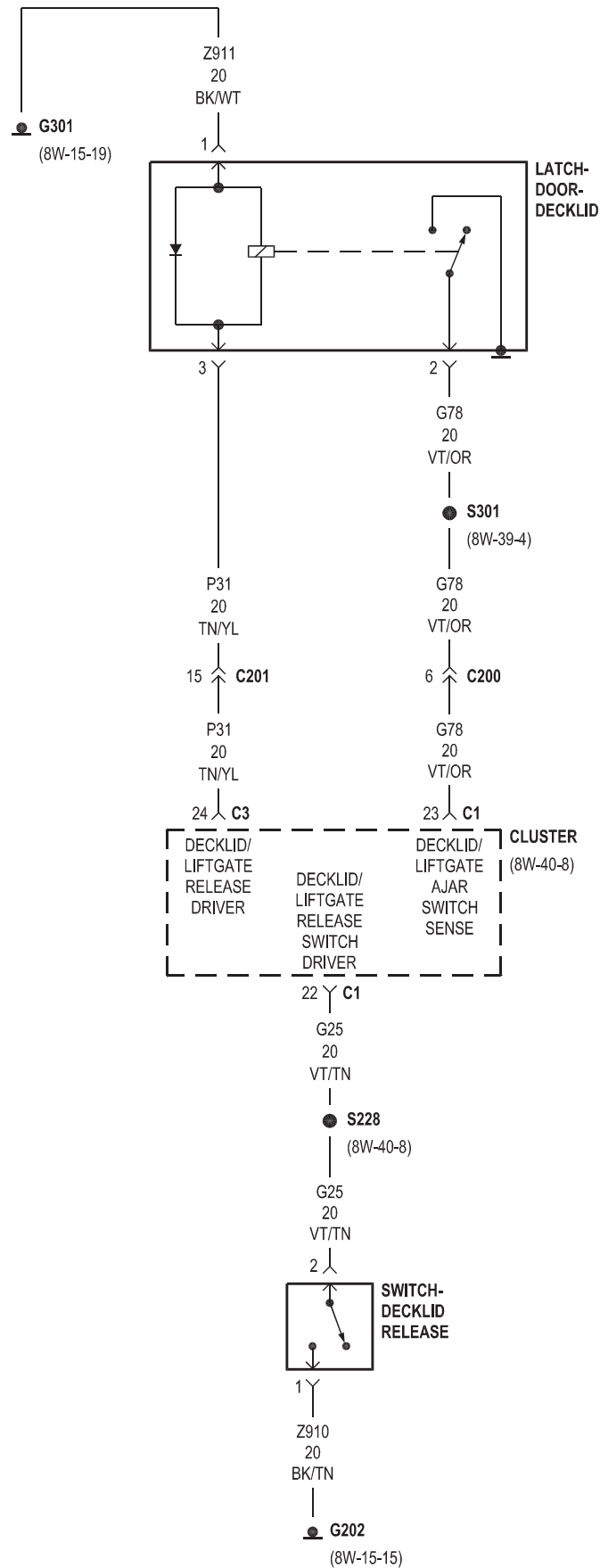


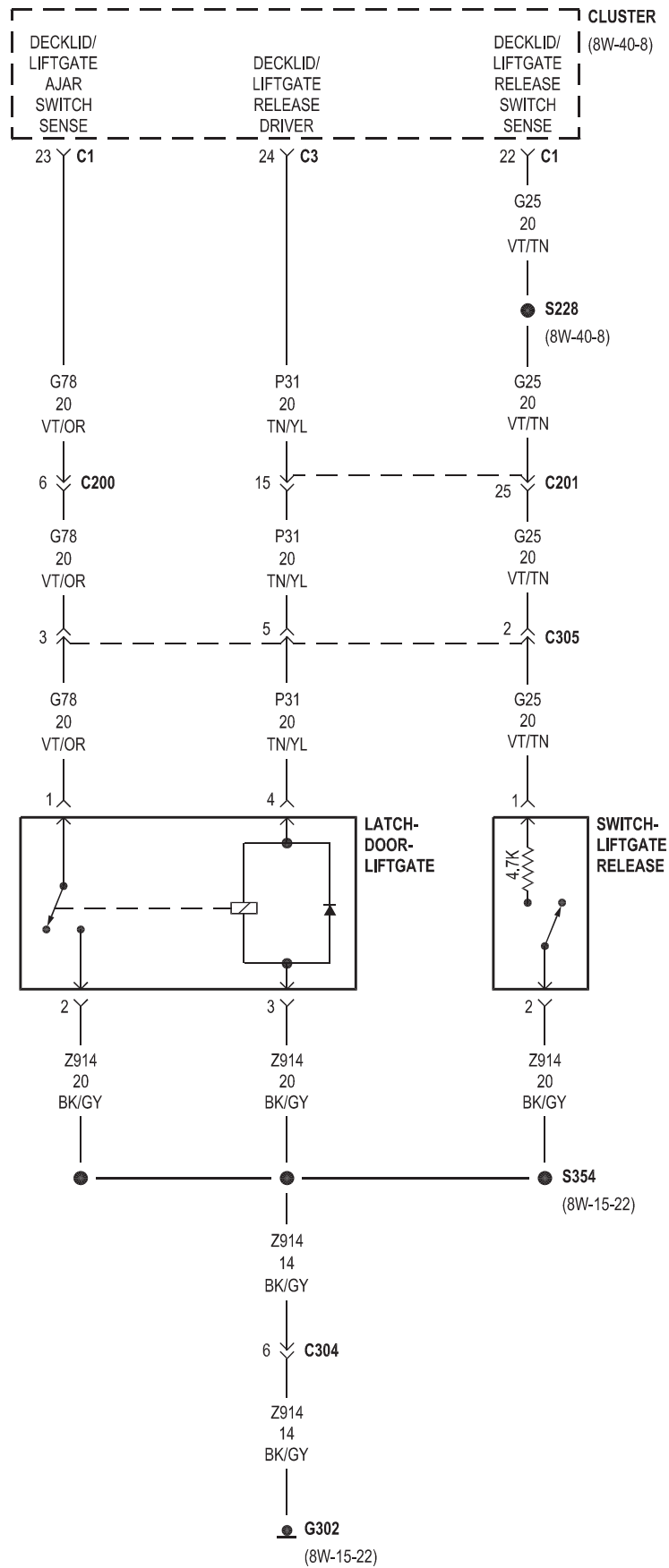














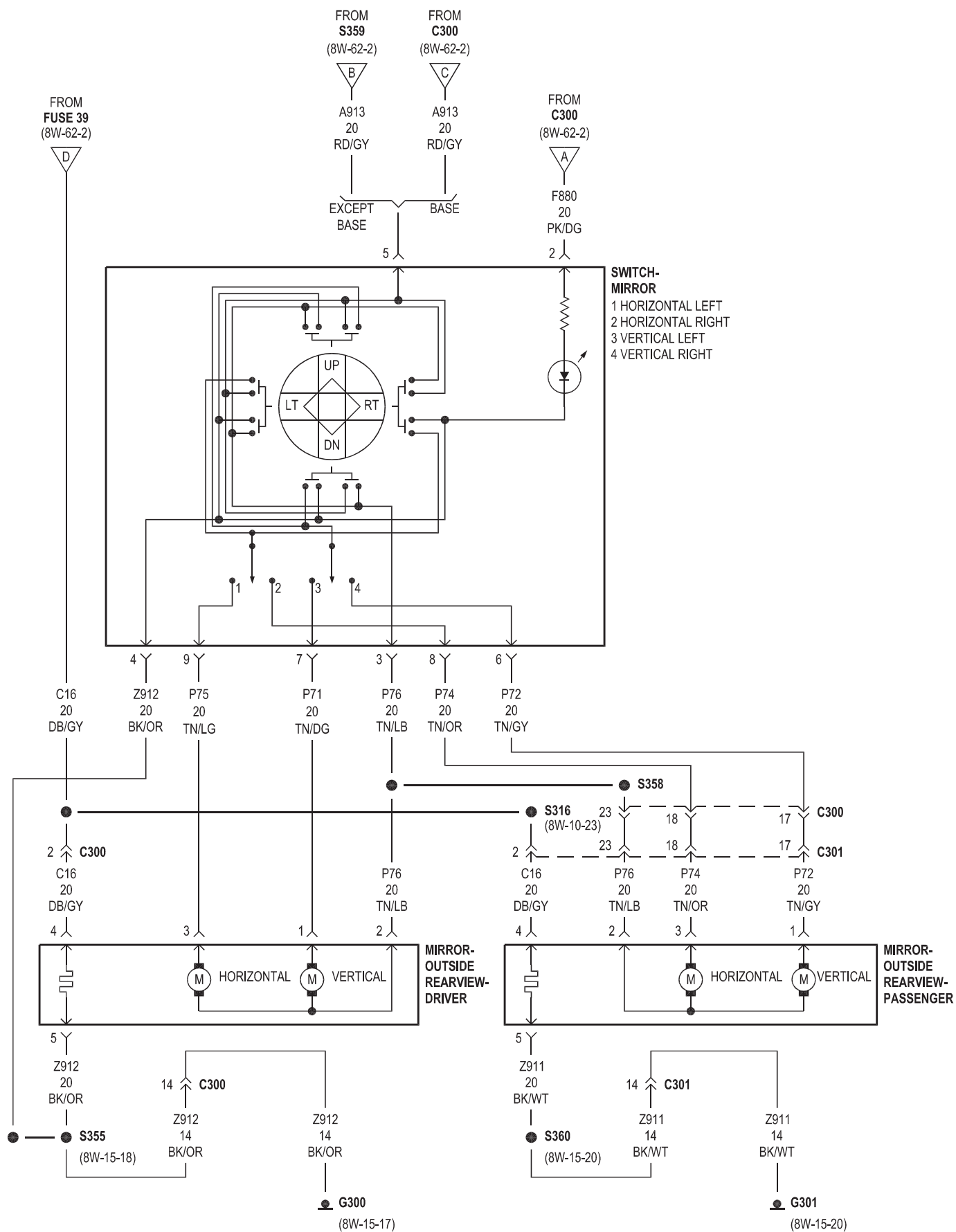
## 8W-62 POWER MIRRORS

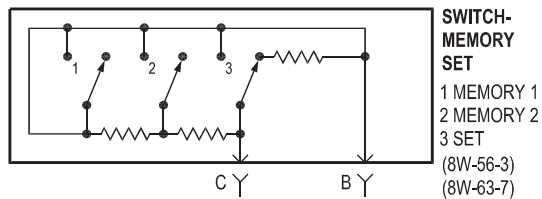
<b>Component</b>	<b>Page</b>
Circuit Breaker No. 3 . . . . .	8W-62-2
Control-A/C-Heater . . . . .	8W-62-2
Fuse 30 . . . . .	8W-62-2
Fuse 35 . . . . .	8W-62-2
Fuse 39 . . . . .	8W-62-2, 3, 5, 6
G300 . . . . .	8W-62-2, 3, 4, 5
G301 . . . . .	8W-62-3, 6
Mirror-Inside Rearview . . . . .	8W-62-5
Mirror-Outside Rearview-Driver . . . . .	8W-62-3, 5

<b>Component</b>	<b>Page</b>
Mirror-Outside Rearview-Passenger . . . .	8W-62-3, 6
Module-Door-Driver . . . . .	8W-62-2, 4, 5
Module-Door-Passenger . . . . .	8W-62-2, 6
Power Distribution Center . . . . .	8W-62-2
Relay-Accessory Delay . . . . .	8W-62-2
Relay-Rear Window Defogger . . . . .	8W-62-2
Switch-Memory Set . . . . .	8W-62-4
Switch-Mirror . . . . .	8W-62-2, 3, 4









C Y  
 G200  
 20  
 VT/BR  
 13 C3

B Y  
 G920  
 20  
 VT/YL  
 10 C3

MEMORY  
 SELECT  
 SWITCH  
 MUX

MEMORY  
 SELECT  
 SWITCH  
 RETURN

MODULE-  
DOOR-  
DRIVER

MIRROR  
 SWITCH  
 SUPPLY

MIRROR  
 SWITCH  
 ILLUMINATION  
 DRIVER

CAN B  
 BUS (-)

CAN B  
 BUS (+)

1 C3  
 P550  
 20  
 TN/LG  
 5

2 C3  
 E55  
 20  
 OR/DG  
 2

D54  
 20  
 WT  
 10

D55  
 20  
 WT/OR  
 9

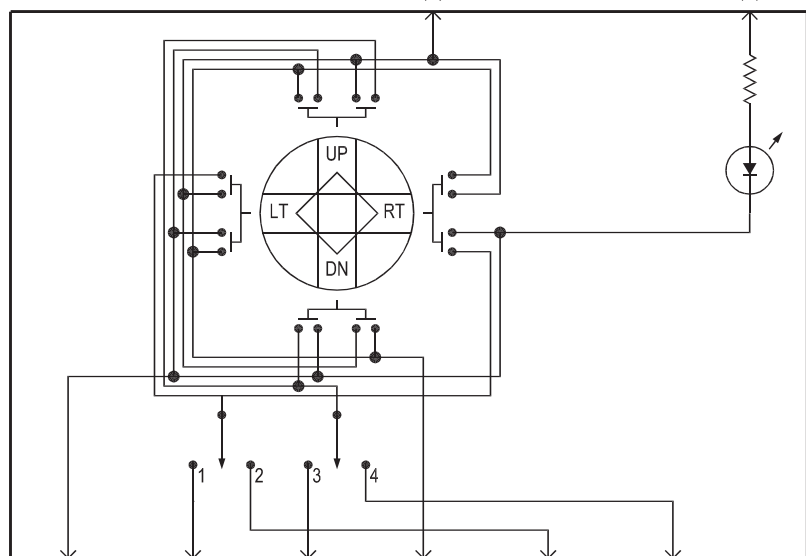
D54  
 20  
 WT  
 10

D55  
 20  
 WT/OR  
 9

TO  
 S318  
 (8W-18-6)

TO  
 S319  
 (8W-18-6)

**SWITCH-MIRROR**  
 1 HORIZONTAL LEFT  
 2 HORIZONTAL RIGHT  
 3 VERTICAL LEFT  
 4 VERTICAL RIGHT



4 Y  
 P950  
 20  
 TN/GY  
 9 C3

9 Y  
 P703  
 20  
 DB/LG  
 4 C3

7 Y  
 P705  
 20  
 LG/OR  
 7 C3

3 Y  
 P710  
 20  
 LG  
 6 C3

8 Y  
 P704  
 20  
 LG/TN  
 15 C3

6 Y  
 P706  
 20  
 LG/GY  
 16 C3

MIRROR  
 SWITCH  
 RETURN

MIRROR  
 HORIZONTAL  
 LEFT  
 SWITCH  
 SENSE

MIRROR  
 VERTICAL  
 LEFT  
 SWITCH  
 SENSE

MIRROR  
 COMMON  
 SWITCH  
 SENSE

MIRROR  
 HORIZONTAL  
 RIGHT  
 SWITCH  
 SENSE

MIRROR  
 VERTICAL  
 RIGHT  
 SWITCH  
 SENSE

MODULE-  
DOOR-  
DRIVER

GROUND  
 (DRIVER  
 SIDE  
 IDENTIFIER  
 LHD/RHD)

GROUND

GROUND

10 C4  
 Z912  
 18  
 BK/OR

12 C4  
 Z912  
 18  
 BK/OR

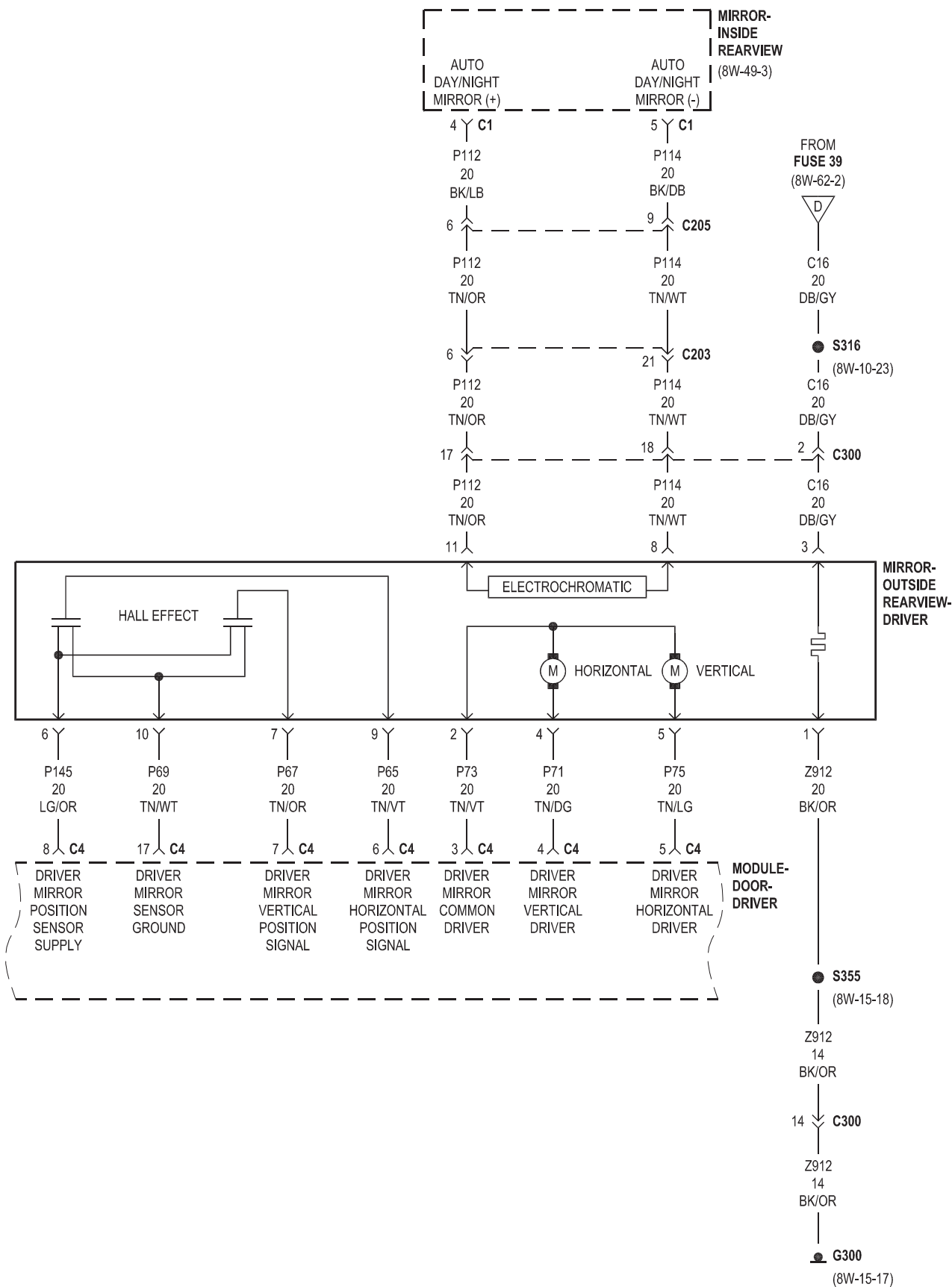
1 C1  
 Z912  
 14  
 BK/OR

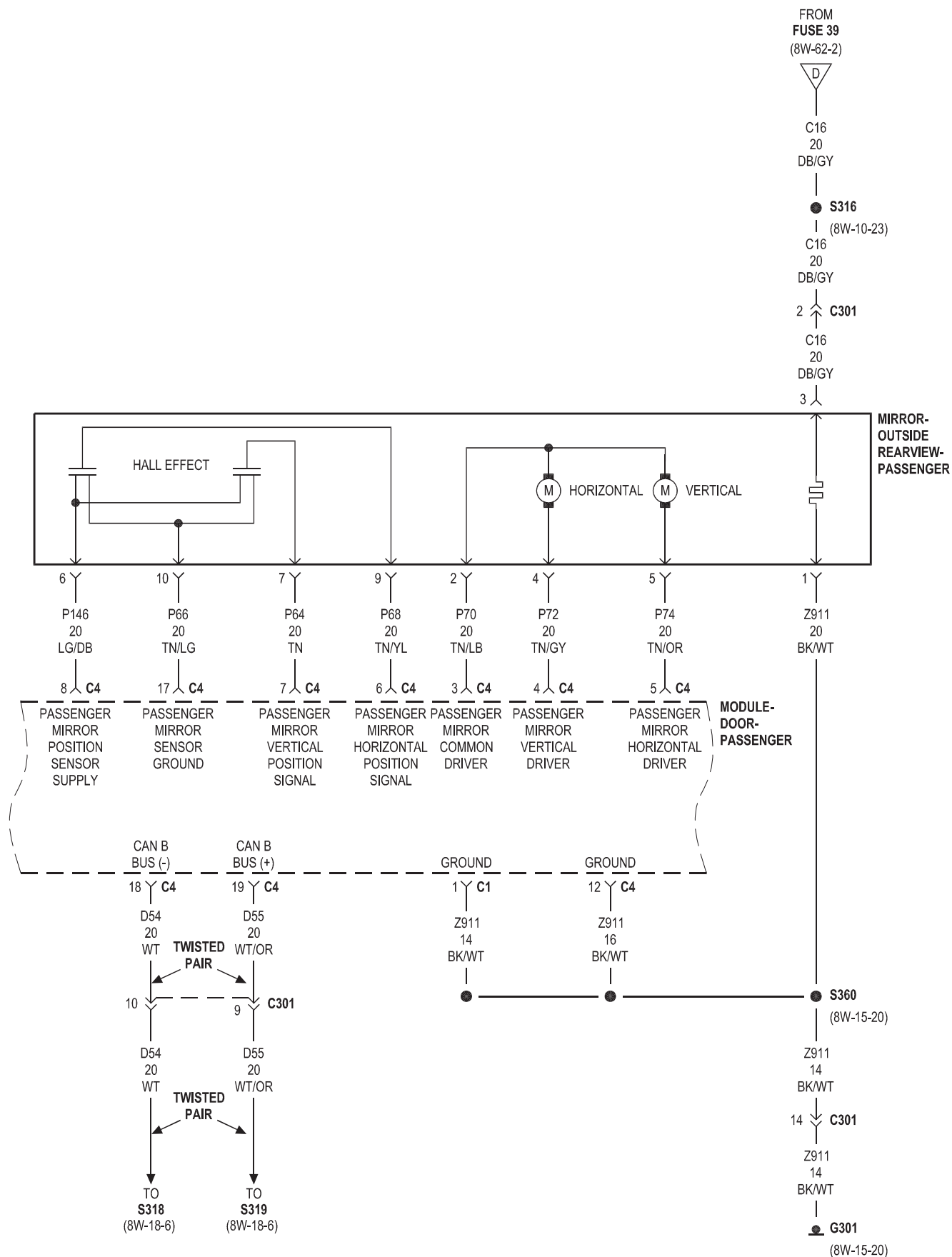
Z912  
 14  
 BK/OR

14 C300  
 Z912  
 14  
 BK/OR

S355  
 (8W-15-18)

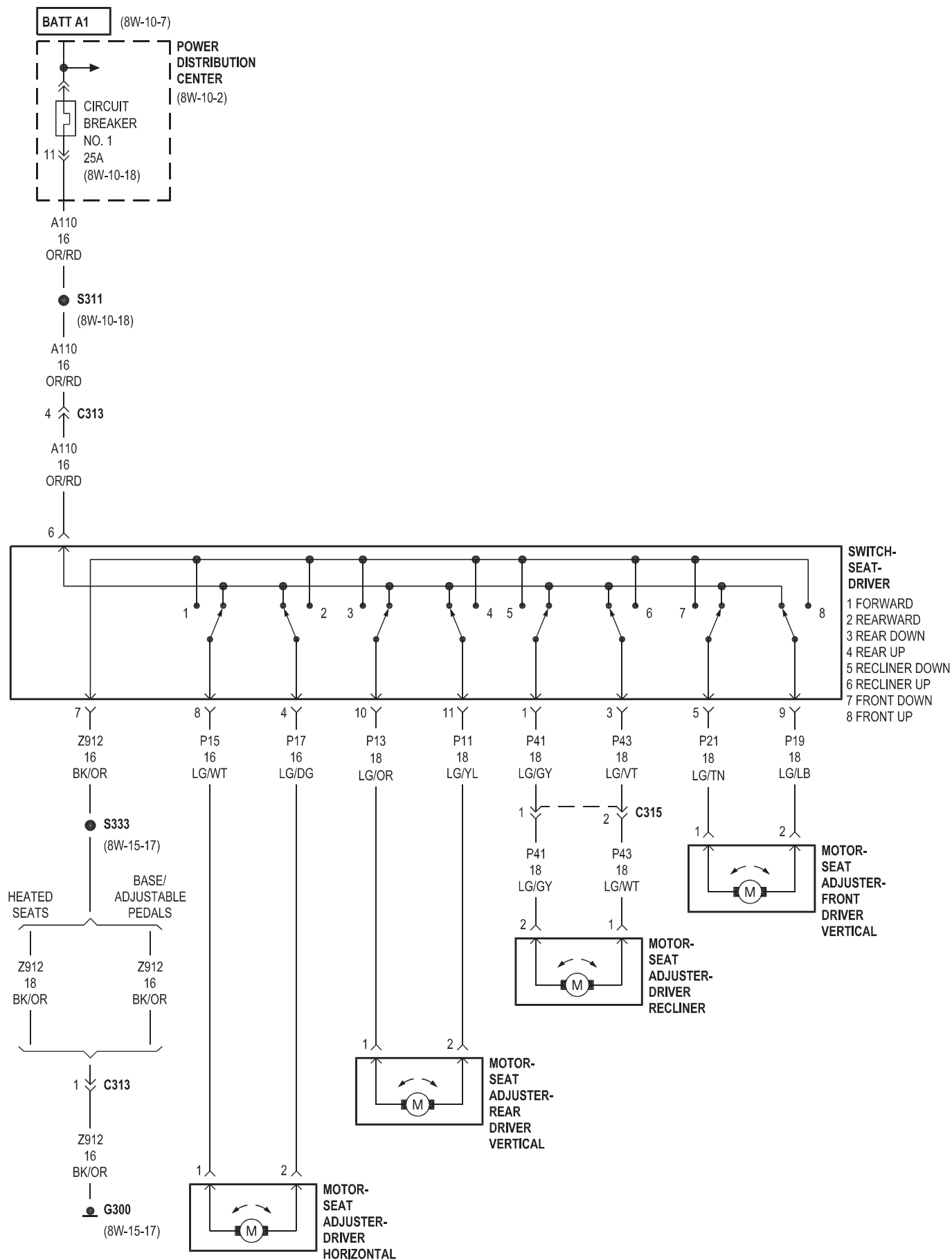
G300  
 (8W-15-17)

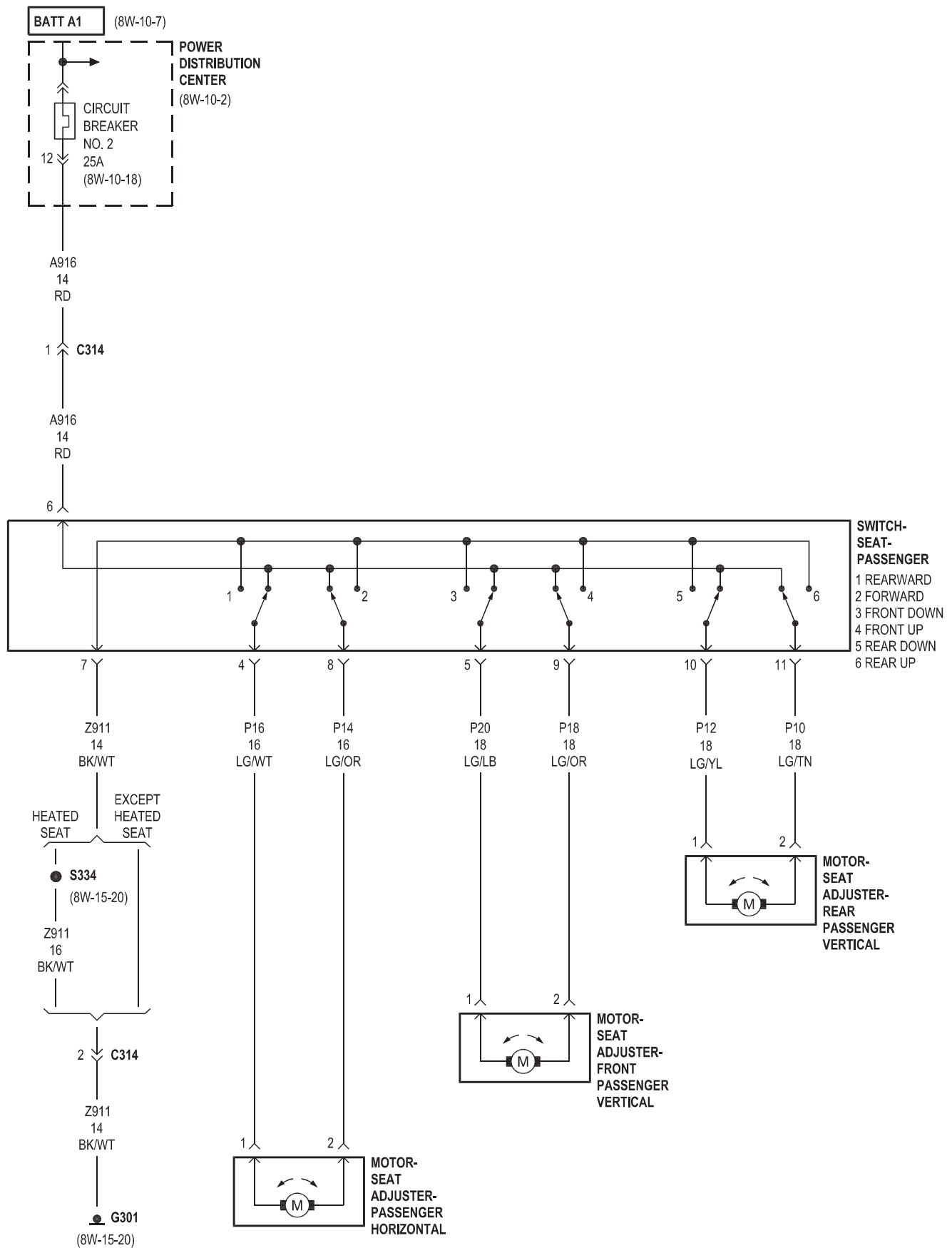




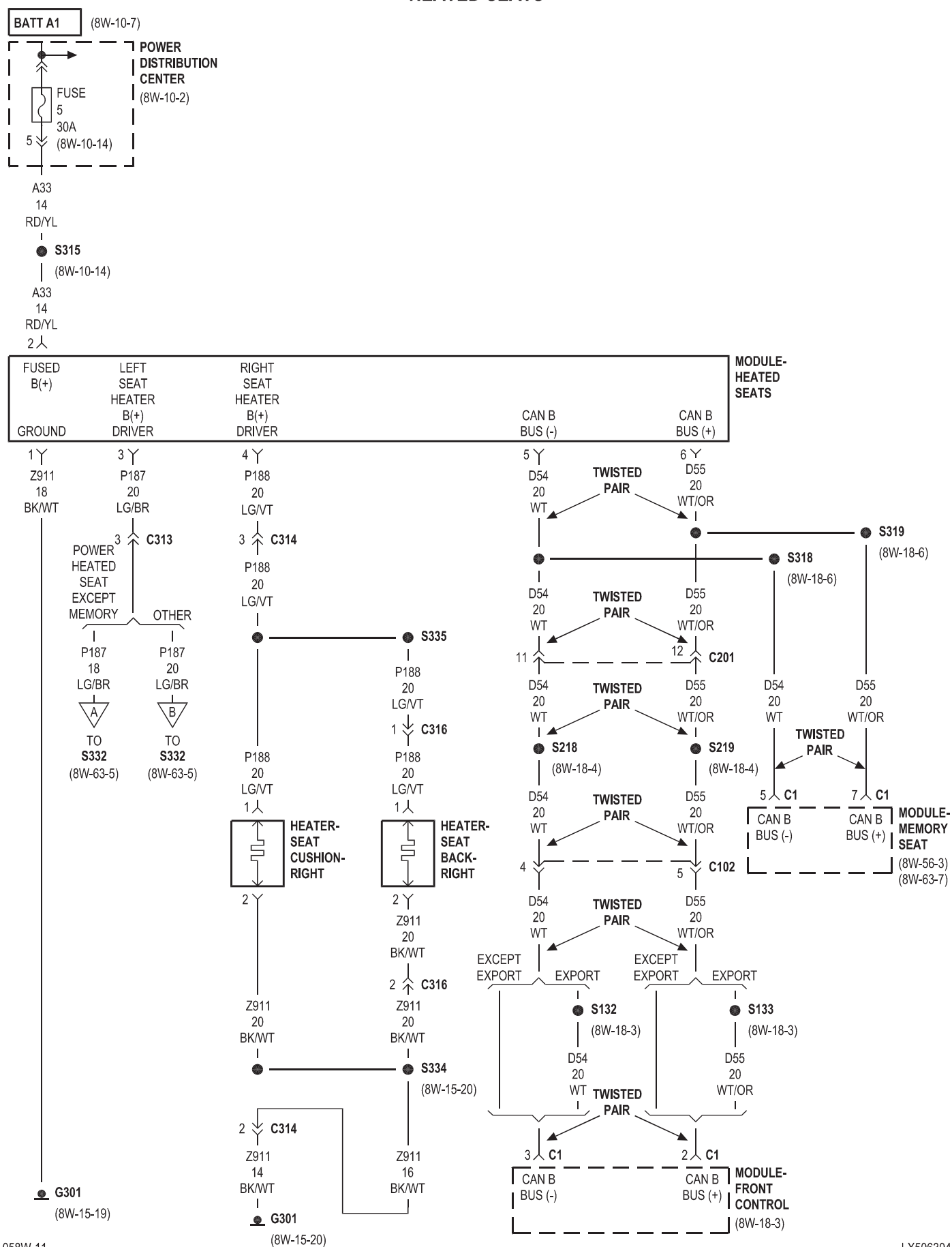
## 8W-63 POWER SEATS

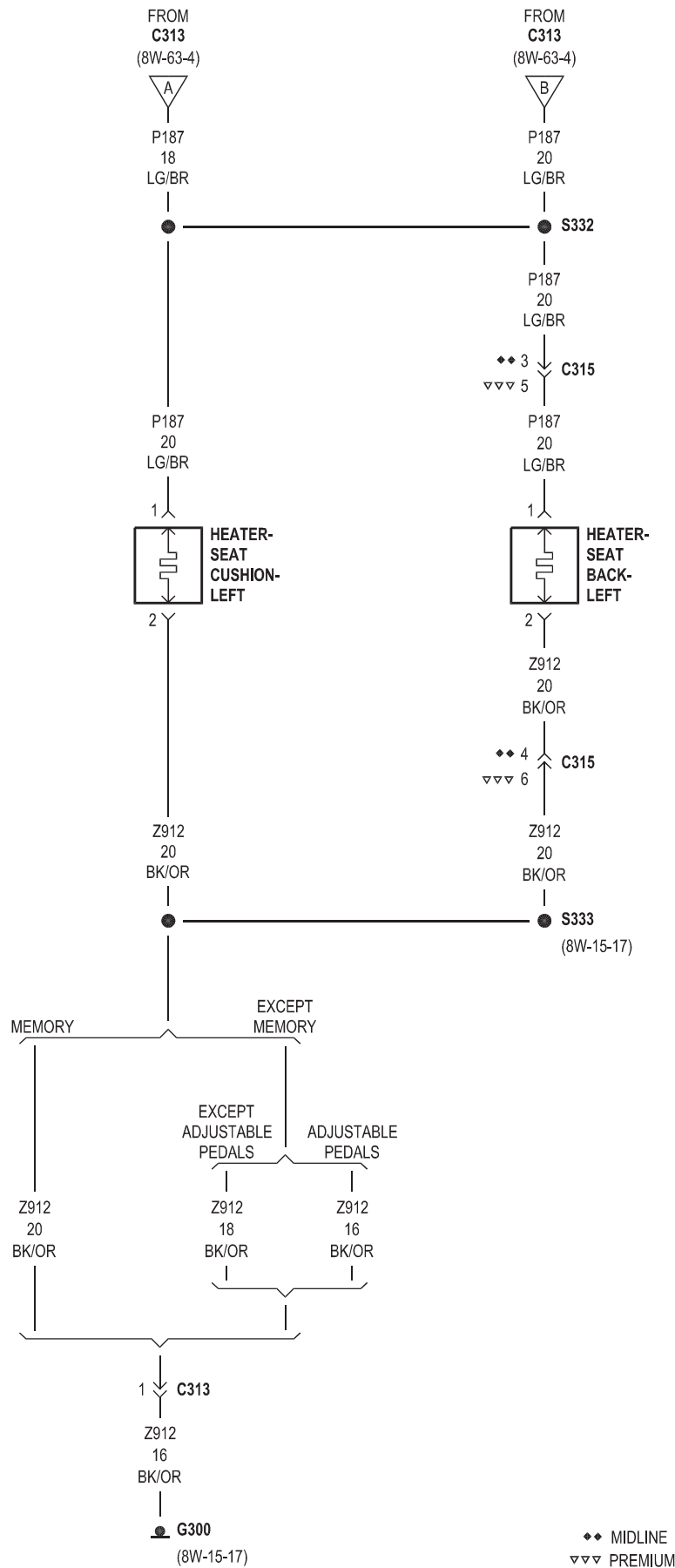
<b>Component</b>	<b>Page</b>	<b>Component</b>	<b>Page</b>
Circuit Breaker No. 1 . . . . .	8W-63-2, 7	Motor-Seat Adjuster-Driver Horizontal . . . .	8W-63-2
Circuit Breaker No. 2 . . . . .	8W-63-3	Motor-Seat Adjuster-Driver Recliner . . .	8W-63-2, 8
Cluster . . . . .	8W-63-6	Motor-Seat Adjuster-Front Driver	
Driver Horizontal . . . . .	8W-63-8	Vertical . . . . .	8W-63-2, 8
Fuse 5 . . . . .	8W-63-4	Motor-Seat Adjuster-Front Passenger	
Fuse 40 . . . . .	8W-63-6	Vertical . . . . .	8W-63-3
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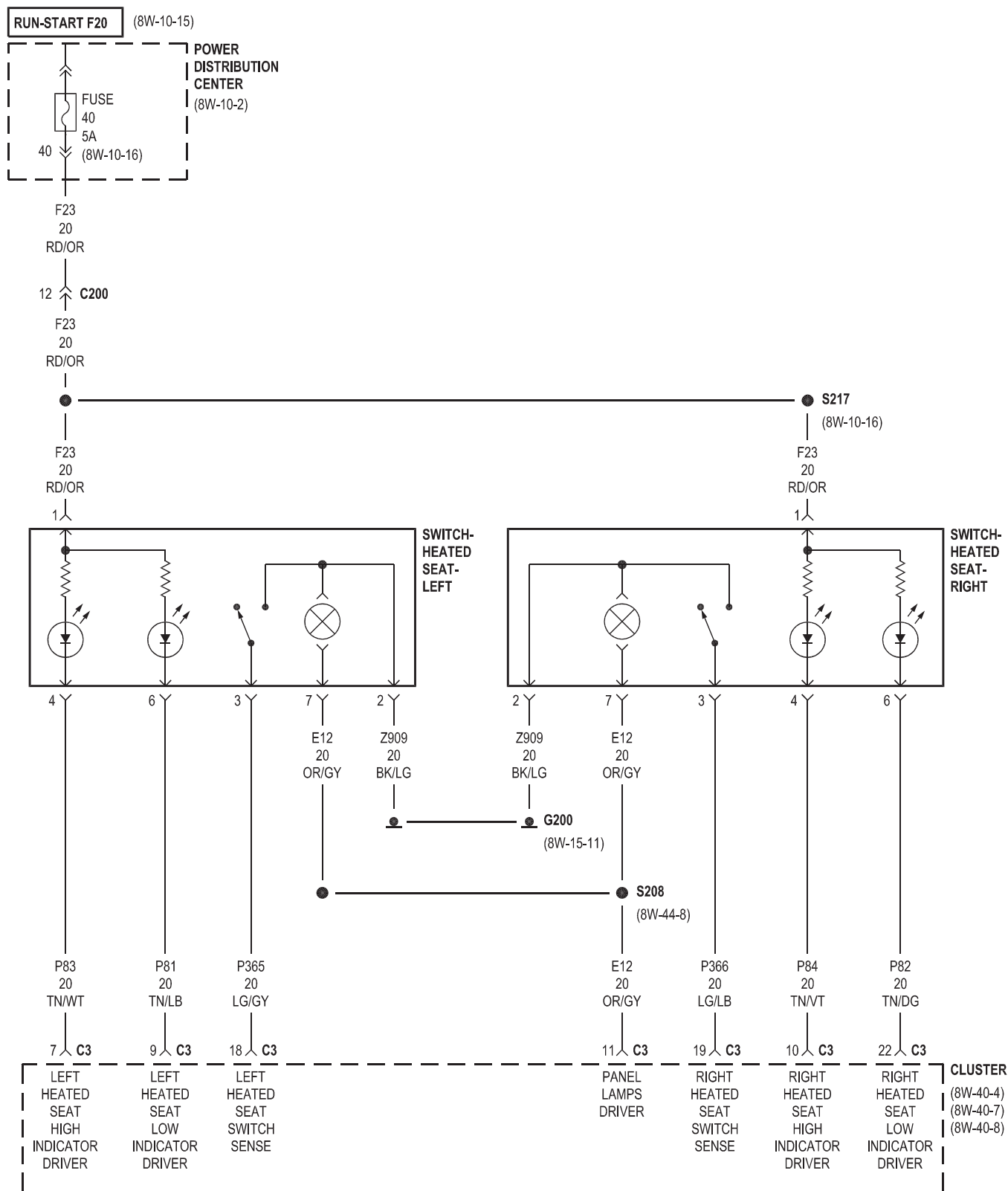


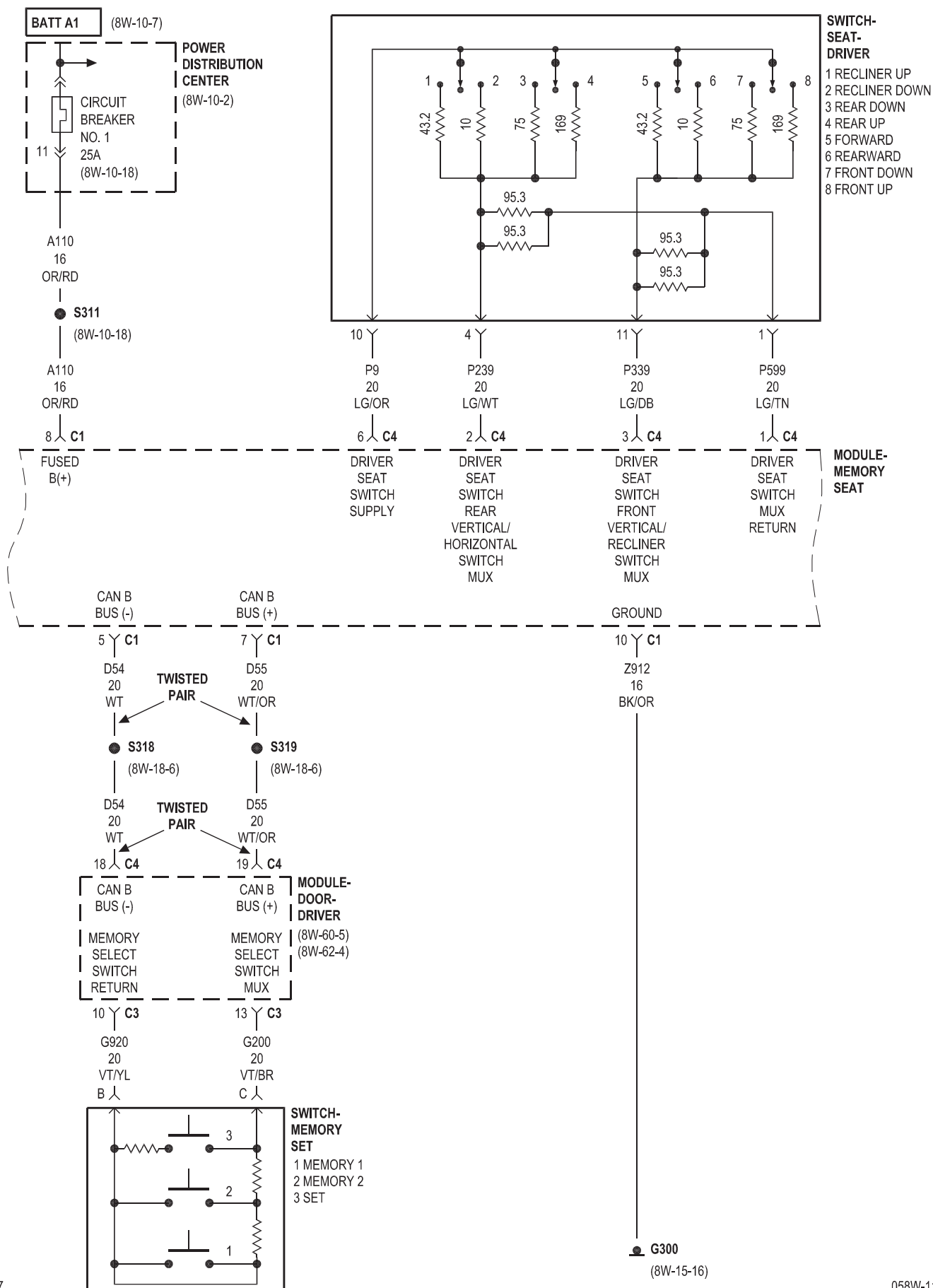


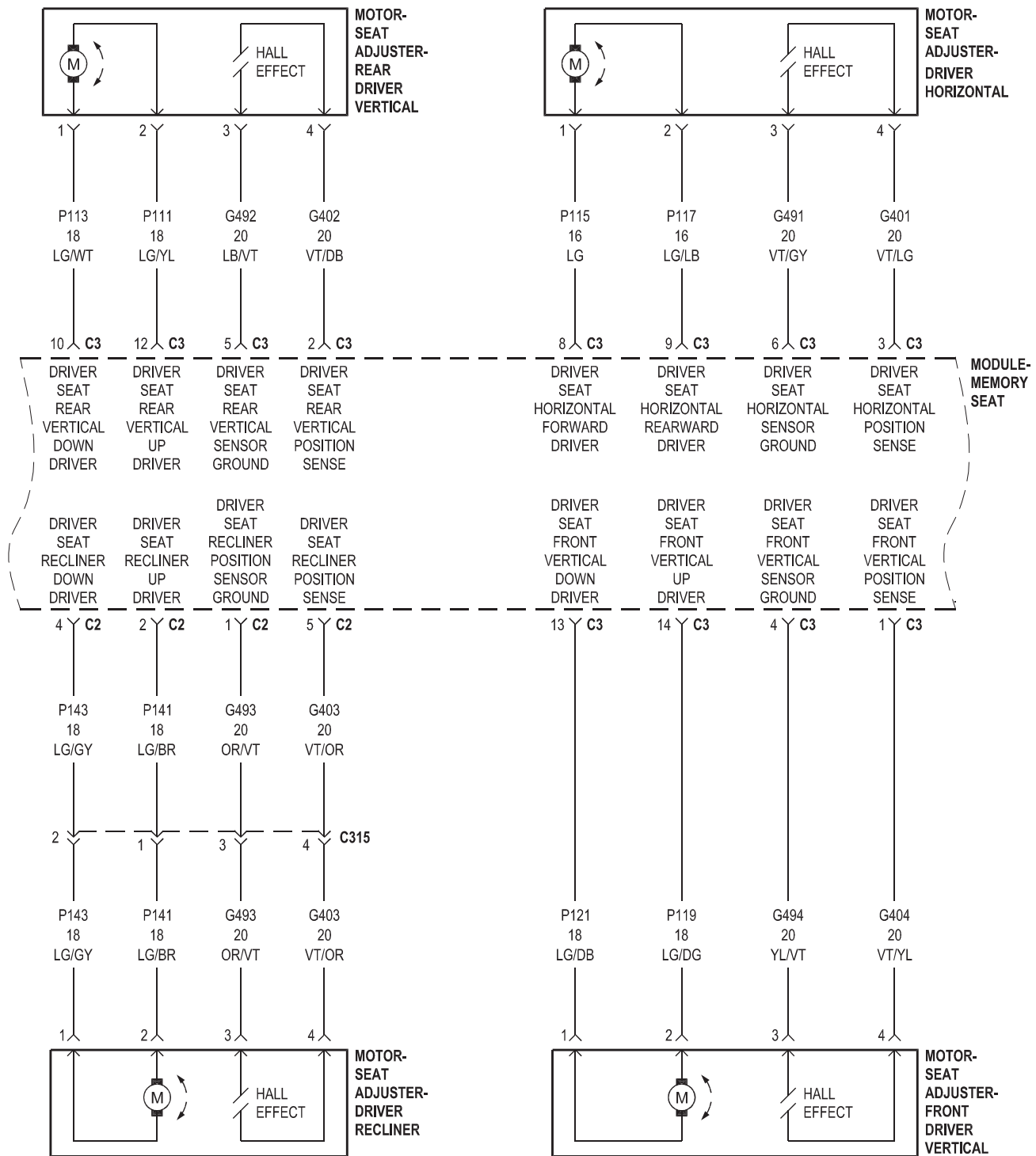






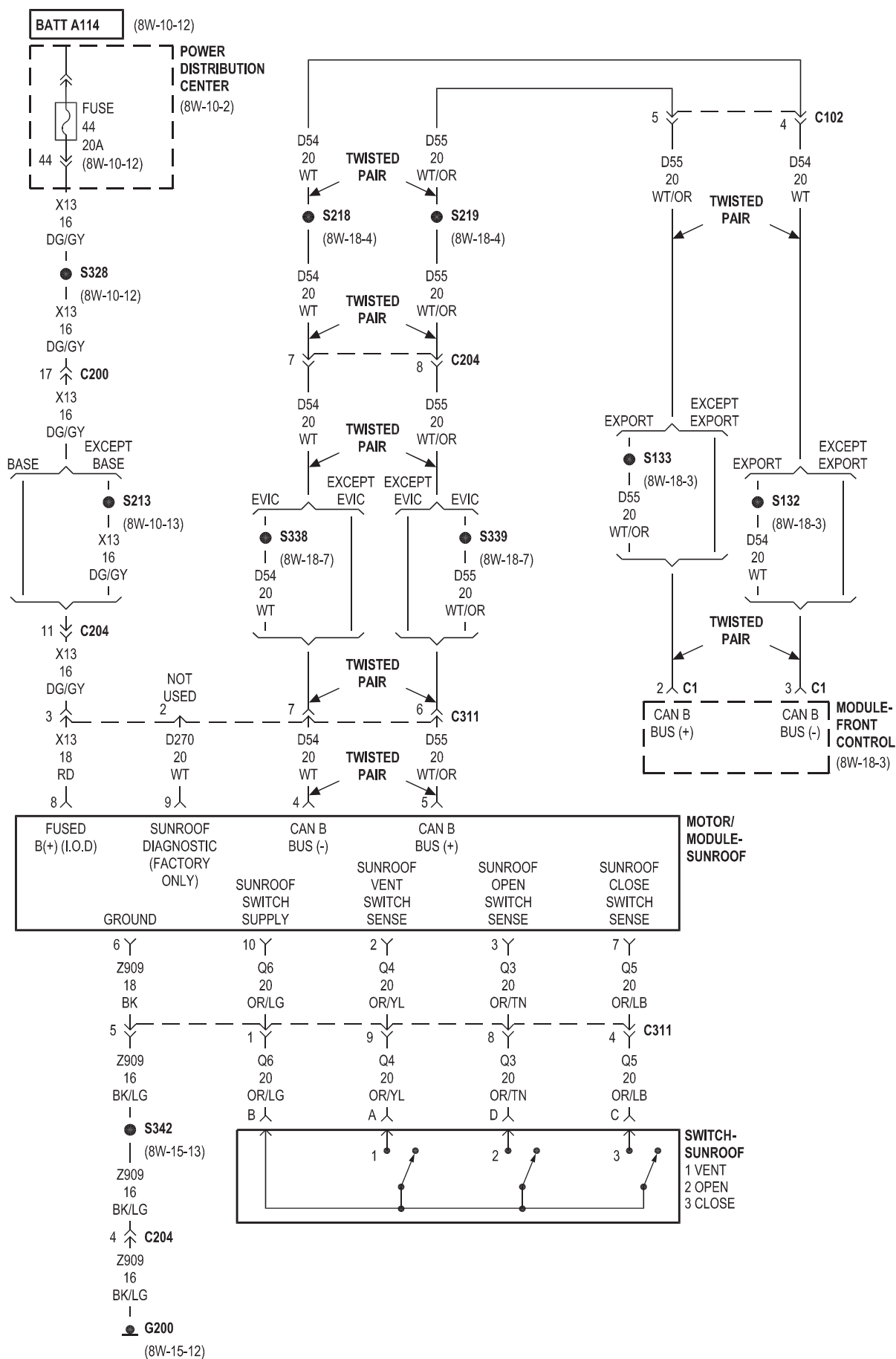






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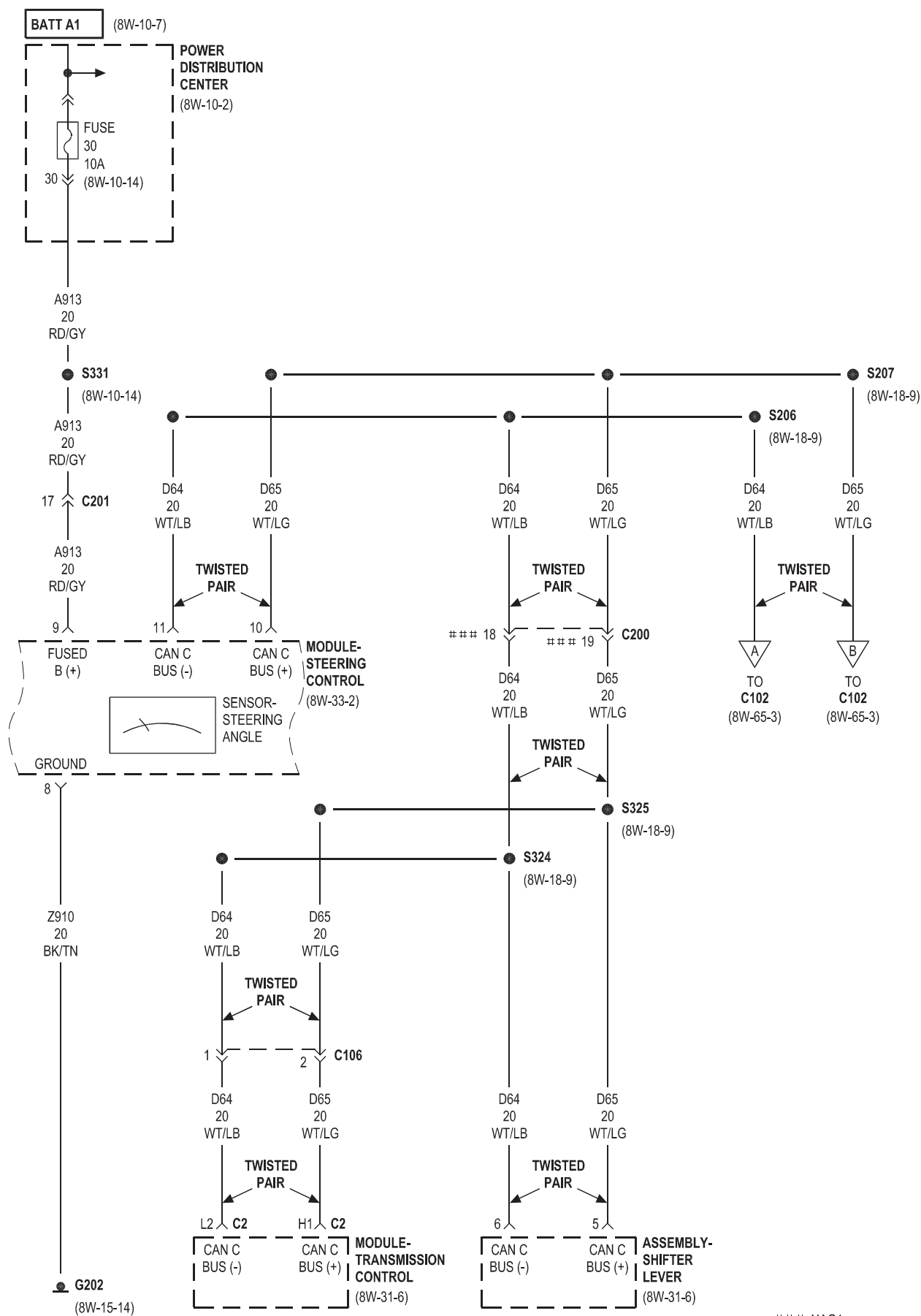
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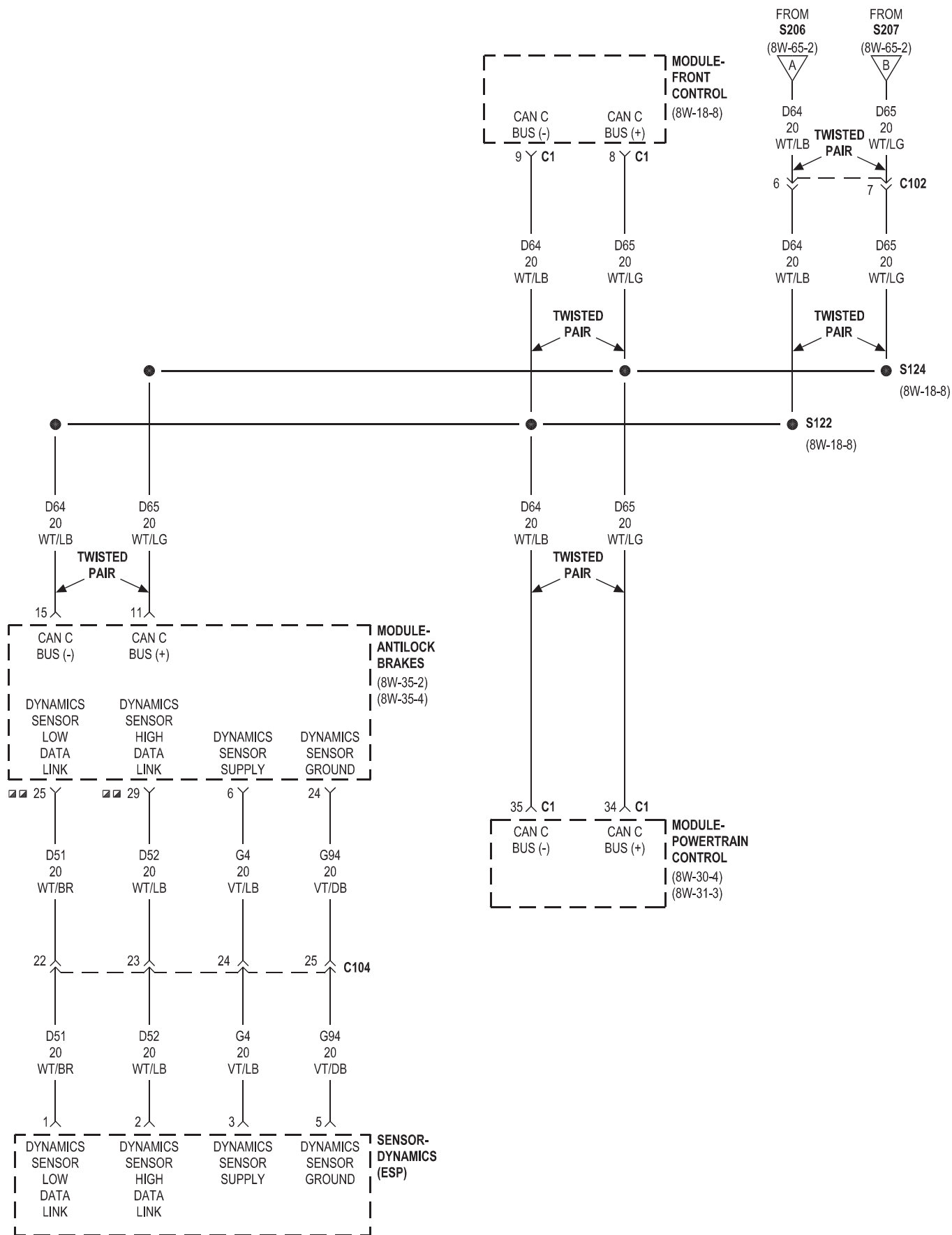
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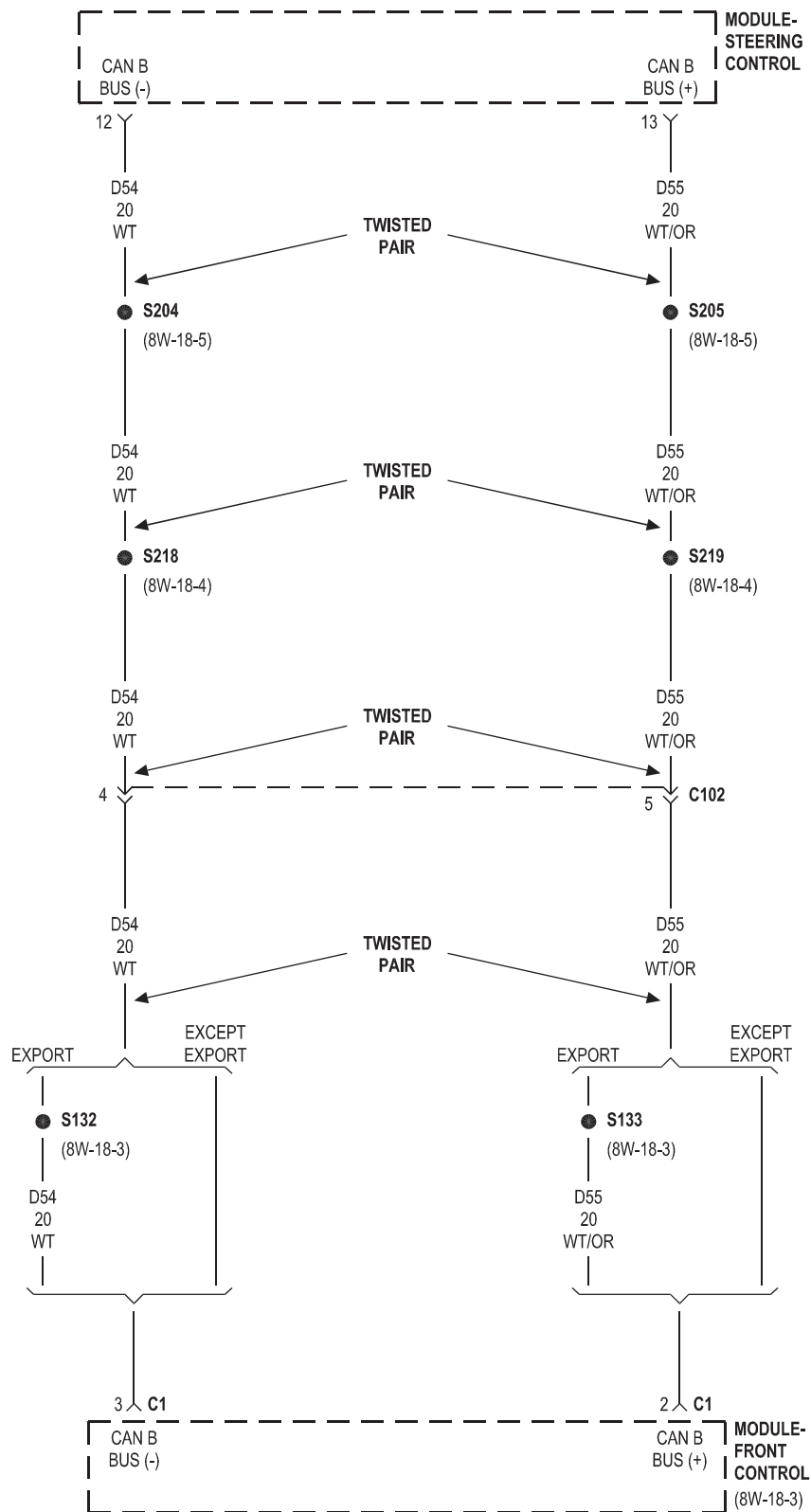
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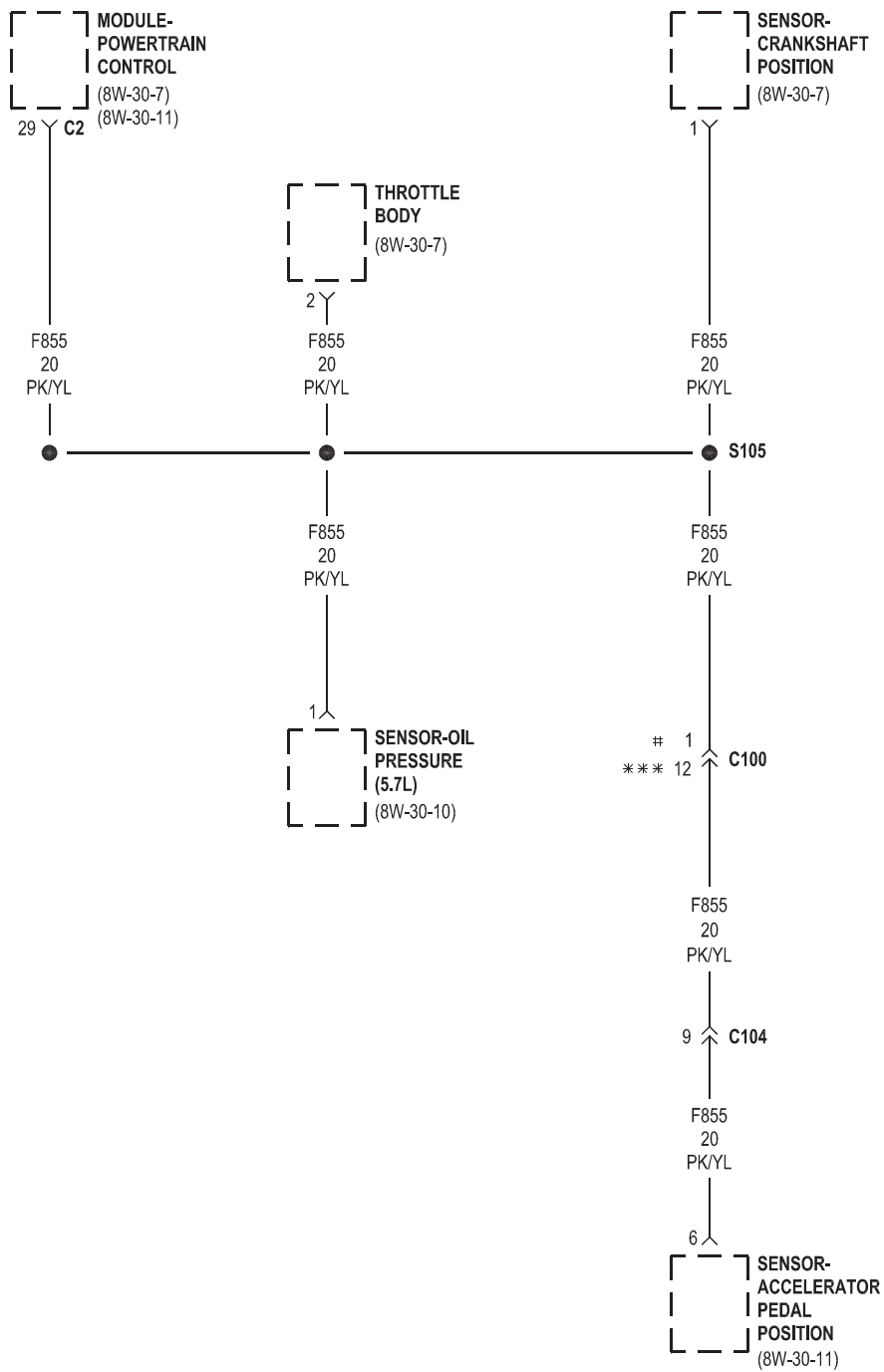
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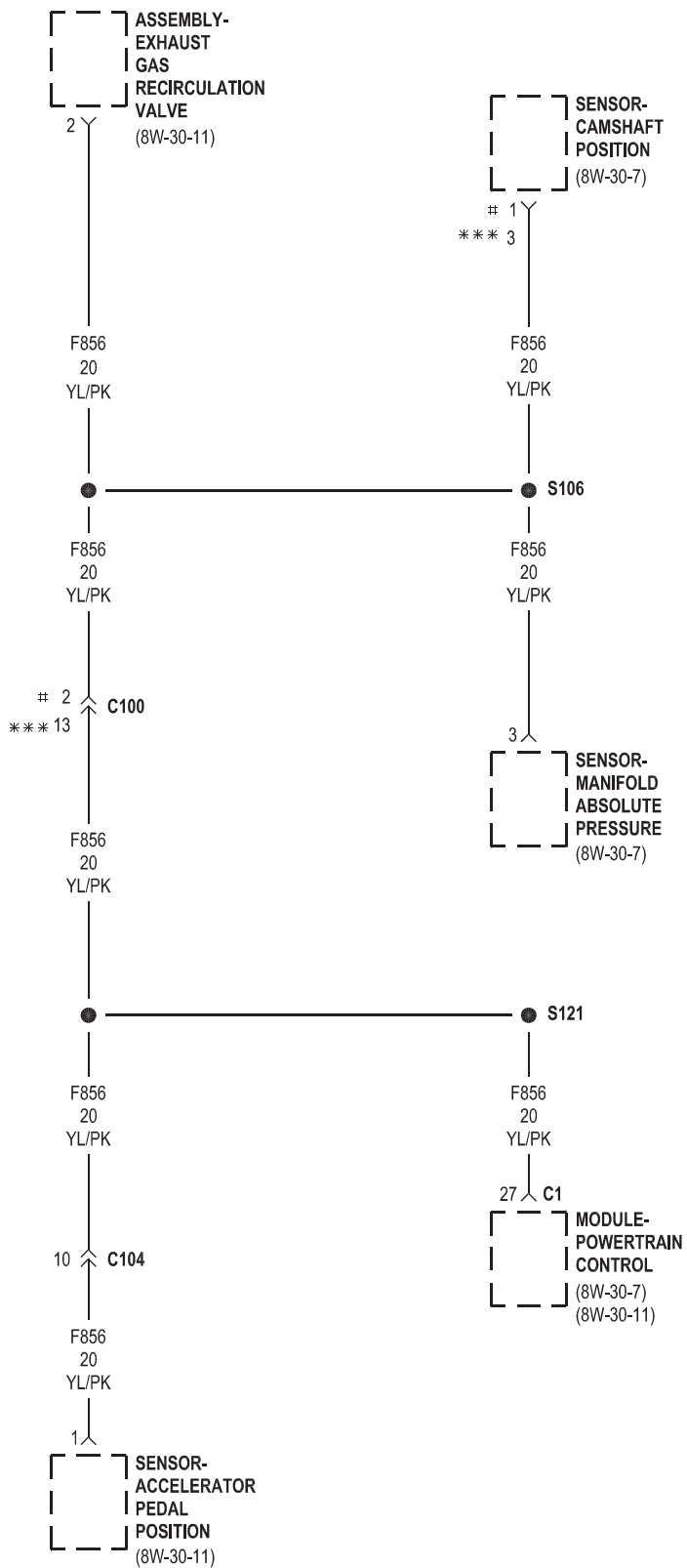




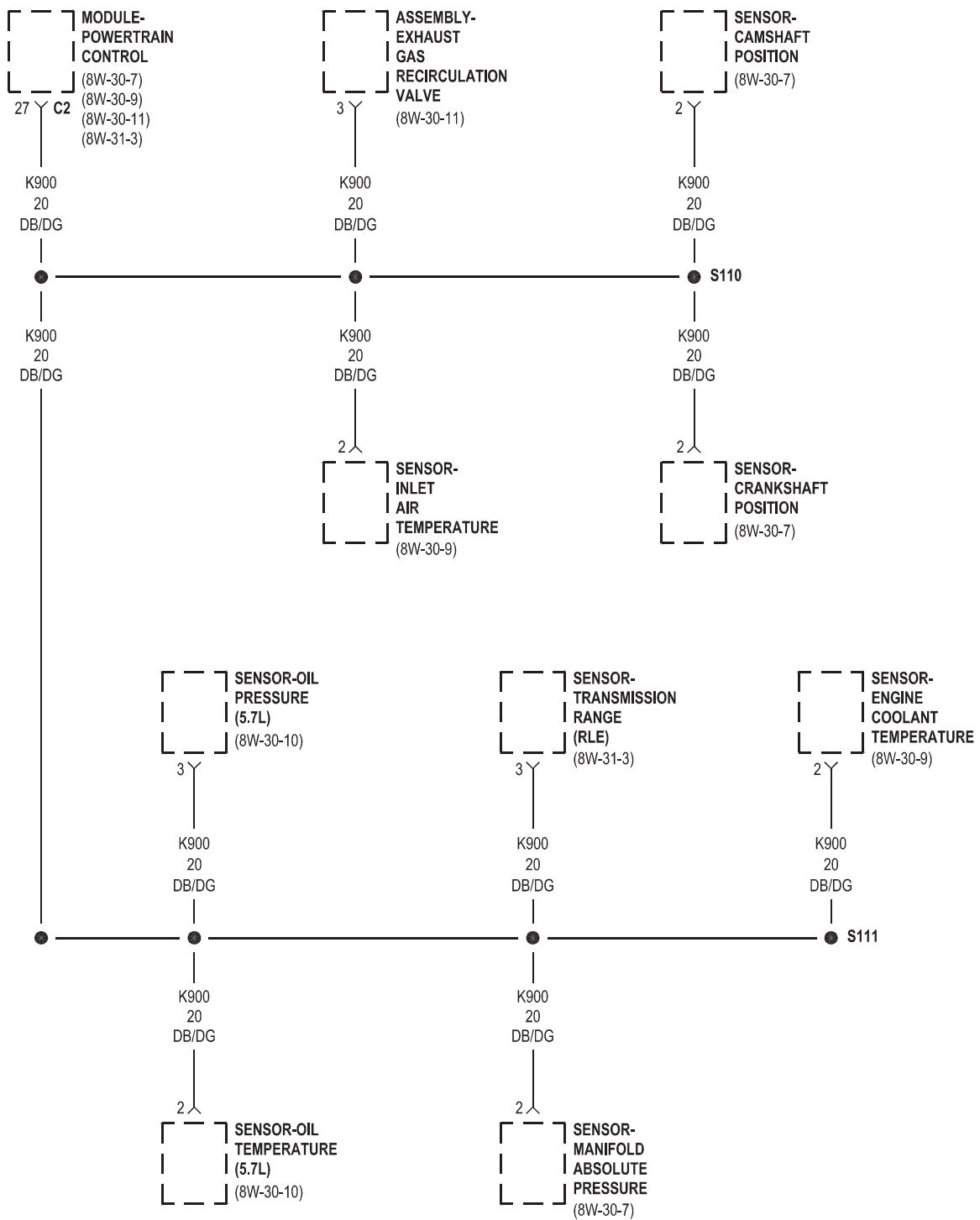
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# 2.7L/3.5L  
\*\*\* 5.7L



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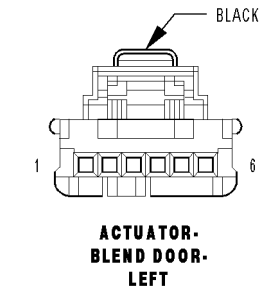
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Lamp-Turn-Right Rear (Dodge) . . . . .	8W-80-65	Module-Occupant Classification C2 . . . . .	8W-80-81
Lamp-Vanity-Left . . . . .	8W-80-65	Module-Occupant Restraint Controller C1 . . . . .	8W-80-82
Lamp-Vanity-Right . . . . .	8W-80-65	Module-Occupant Restraint Controller C2 . . . . .	8W-80-83
Latch-Door-Decklid (LX48) . . . . .	8W-80-65	Module-Park Assist (Parktronics) . . . . .	8W-80-83
Latch-Door-Left Front . . . . .	8W-80-66	Module-Powertrain Control C1 . . . . .	8W-80-84
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Latch-Door-Liftgate (LX49) . . . . .	8W-80-66	Module-Powertrain Control C3 . . . . .	8W-80-86
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Latch-Door-Right Rear . . . . .	8W-80-67	Module-Sentry Key Remote Entry . . . . .	8W-80-88
Lighter-Cigar . . . . .	8W-80-67	Module-Steering Control . . . . .	8W-80-88
Mirror-Inside Rearview C1 (Except Base) . . . . .	8W-80-68	Module-Transmission Control C1 (NAG1) . . . . .	8W-80-88
Mirror-Inside Rearview C2 (Hands Free) . . . . .	8W-80-68	Module-Transmission Control C2 (NAG1) . . . . .	8W-80-89
Mirror-Outside Rearview-Driver (Memory) . . . . .	8W-80-68	Motor-Adjustable Pedals . . . . .	8W-80-89
Mirror-Outside Rearview-Driver (Except Memory) . . . . .	8W-80-69	Motor-Blower-Front . . . . .	8W-80-89
Mirror-Outside Rearview-Passenger (Except Memory) . . . . .	8W-80-69	Motor-Headlamp Washer (Hid Lamps) . . . . .	8W-80-89
Mirror-Outside Rearview-Passenger (Memory) . . . . .	8W-80-69	Motor-Seat Adjuster-Driver Horizontal . . . . .	8W-80-90
Module-Antilock Brakes . . . . .	8W-80-70	Motor-Seat Adjuster-Driver Recliner (Memory) . . . . .	8W-80-90
Module-Brake (5.7L Trailer Tow) . . . . .	8W-80-71	Motor-Seat Adjuster-Driver Recliner (Except Memory) . . . . .	8W-80-90
Module-Clock Analog . . . . .	8W-80-71	Motor-Seat Adjuster-Front Driver Vertical . . . . .	8W-80-91
Module-Door-Driver C1 . . . . .	8W-80-71	Motor-Seat Adjuster-Front Passenger Vertical . . . . .	8W-80-91
Module-Door-Driver C2 . . . . .	8W-80-71	Motor-Seat Adjuster-Passenger Horizontal . . . . .	8W-80-91
Module-Door-Driver C3 (Memory) . . . . .	8W-80-72	Motor-Seat Adjuster-Rear Driver Vertical . . . . .	8W-80-92
Module-Door-Driver C4 (Memory) . . . . .	8W-80-72	Motor-Seat Adjuster-Rear Passenger Vertical . . . . .	8W-80-92
Module-Door-Passenger C1 . . . . .	8W-80-73	Motor-Steering Telescope (Memory) . . . . .	8W-80-92
Module-Door-Passenger C2 . . . . .	8W-80-73	Motor-Steering Tilt (Memory) . . . . .	8W-80-92
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Post-Pass Through-Eyelet . . . . .	8W-80-95
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Sensor-Camshaft Position (5.7L) . . . . .	8W-80-100
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Switch-Memory Set . . . . .	8W-80-119
Switch-Mirror . . . . .	8W-80-119
Switch-Oil Pressure (2.7L/3.5L) . . . . .	8W-80-120

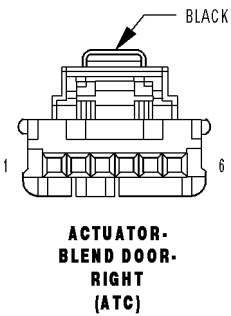
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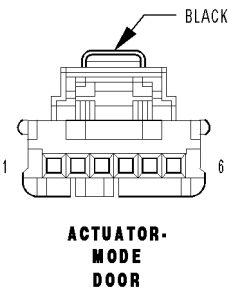
ACTUATOR-BLEND DOOR-LEFT - BLACK 6 WAY

CAV	CIRCUIT	FUNCTION
1	C55 20DB/WT	LEFT BLEND DOOR DRIVER (A)
2	-	-
3	-	-
4	-	-
5	-	-
6	C255 20WT/DB	LEFT BLEND DOOR DRIVER (B)



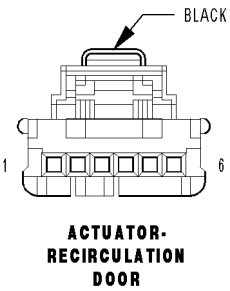
ACTUATOR-BLEND DOOR-RIGHT (ATC) - BLACK 6 WAY

CAV	CIRCUIT	FUNCTION
1	C52 20DB/LG	RIGHT BLEND DOOR DRIVER (A)
2	-	-
3	-	-
4	-	-
5	-	-
6	C252 20LG/DB	RIGHT BLEND DOOR DRIVER (B)



ACTUATOR-MODE DOOR - BLACK 6 WAY

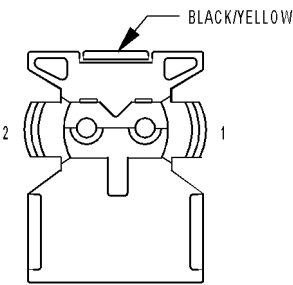
CAV	CIRCUIT	FUNCTION
1	C66 20DB/OR	MODE DOOR DRIVER (A)
2	-	-
3	-	-
4	-	-
5	-	-
6	C266 20OR/DB	MODE DOOR DRIVER (B)



ACTUATOR-RECIRCULATION DOOR - BLACK 6 WAY

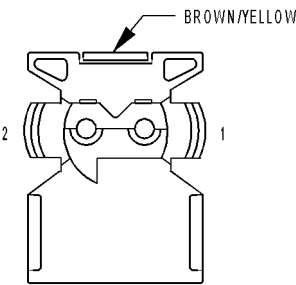
CAV	CIRCUIT	FUNCTION
1	C68 20DB/YL	RECIRCULATION DOOR DRIVER (A)
2	-	-
3	-	-
4	-	-
5	-	-
6	C268 20YL/DB	RECIRCULATION DOOR DRIVER (B)





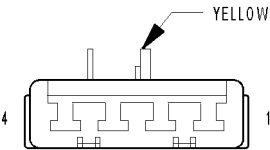
AIRBAG-  
DRIVER  
SQUIB 1

AIRBAG-DRIVER SQUIB 1 - BLACK/YELLOW 2 WAY		
CAV	CIRCUIT	FUNCTION
1	R45 20LG/OR	DRIVER SQUIB 1 LINE 1
2	R43 20LG/BR	DRIVER SQUIB 1 LINE 2



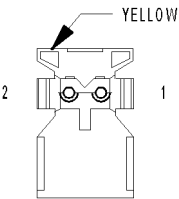
AIRBAG-  
DRIVER  
SQUIB 2

AIRBAG-DRIVER SQUIB 2 - BROWN/YELLOW 2 WAY		
CAV	CIRCUIT	FUNCTION
1	R63 20LG/WT	DRIVER SQUIB 2 LINE 1
2	R61 20LG/VT	DRIVER SQUIB 2 LINE 2



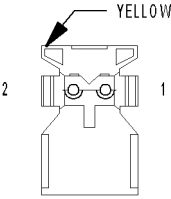
AIRBAG-  
PASSENGER  
SQUIB

AIRBAG-PASSENGER SQUIB - YELLOW 4 WAY		
CAV	CIRCUIT	FUNCTION
1	R44 20LB/OR	PASSENGER SQUIB 1 LINE 1
2	R42 20LB/BR	PASSENGER SQUIB 1 LINE 2
3	R64 20LB/WT	PASSENGER SQUIB 2 LINE 1
4	R62 20LB/VT	PASSENGER SQUIB 2 LINE 2



AIRBAG-  
SIDE CURTAIN-  
LEFT

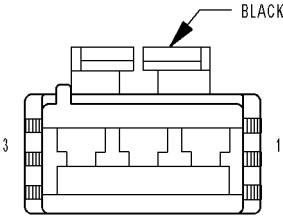
AIRBAG-SIDE CURTAIN-LEFT - YELLOW 2 WAY		
CAV	CIRCUIT	FUNCTION
1	R1 20LB/WT	LEFT CURTAIN SQUIB 1 LINE 2
2	R3 20LB/OR	LEFT CURTAIN SQUIB 1 LINE 1



AIRBAG-SIDE CURTAIN-RIGHT

AIRBAG-SIDE CURTAIN-RIGHT - YELLOW 2 WAY

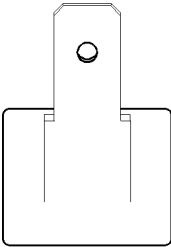
CAV	CIRCUIT	FUNCTION
1	R4 200R/LB	RIGHT CURTAIN SQUIB 1 LINE 1
2	R2 20WT/LB	RIGHT CURTAIN SQUIB 1 LINE 2



AMPLIFIER-ANTENNA-BACKLITE C1

AMPLIFIER-ANTENNA-BACKLITE C1 - BLACK 3 WAY

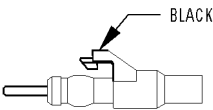
CAV	CIRCUIT	FUNCTION
1	C15 12DB/WT	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
2	-	-
3	F880 20PK/DG	FUSED ACCESSORY DELAY RELAY OUTPUT



AMPLIFIER-ANTENNA-BACKLITE C2

AMPLIFIER-ANTENNA-BACKLITE C2 - 1 WAY

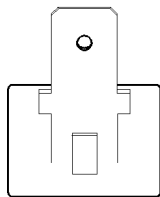
CAV	CIRCUIT	FUNCTION
1	D999 18WT/OR	ANTENNA GRID SIGNAL



AMPLIFIER-ANTENNA-BACKLITE C3

AMPLIFIER-ANTENNA-BACKLITE C3 - BLACK 2 WAY

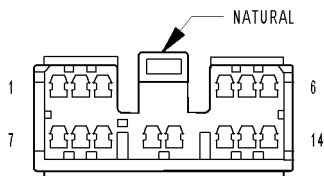
CAV	CIRCUIT	FUNCTION
1	D5 6WT/OR	ANTENNA SIGNAL
2	D931 WT/YL	ANTENNA SHIELD



**AMPLIFIER-  
ANTENNA-  
BACKLITE C4**

AMPLIFIER-ANTENNA-BACKLITE C4 - 1 WAY

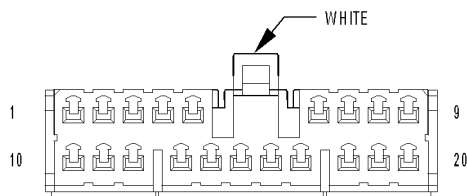
CAV	CIRCUIT	FUNCTION
1	C215 14LB	ELECTRIC HEATED BACKLITE DRIVER



**AMPLIFIER-  
RADIO C1  
(MIDLINE II/HIGHLINE)**

AMPLIFIER-RADIO C1 (MIDLINE II/HIGHLINE) - NATURAL 14 WAY

CAV	CIRCUIT	FUNCTION
1	X201 18GY/VT	AMPLIFIED LEFT FRONT DOOR SPEAKER (+)
2	X202 18DG/VT	AMPLIFIED RIGHT FRONT DOOR SPEAKER (+)
3	X303 18DG/TN	AMPLIFIED LEFT REAR SPEAKER (+)
4	X304 18DG/BR	AMPLIFIED RIGHT REAR SPEAKER (+)
5	X300 18GY/BR (HIGHLINE)	AMPLIFIED SUBWOOFER 1 (+)
6	-	-
7	X291 18GY/YL	AMPLIFIED LEFT FRONT DOOR SPEAKER (-)
8	X292 18DG/YL	AMPLIFIED RIGHT FRONT DOOR SPEAKER (-)
9	X393 18DG/GY	AMPLIFIED LEFT REAR SPEAKER (-)
10	-	-
11	-	-
12	X394 18YL/GY	AMPLIFIED RIGHT REAR SPEAKER (-)
13	X390 18DG/BR (HIGHLINE)	AMPLIFIED SUBWOOFER 1 (-)
14	-	-

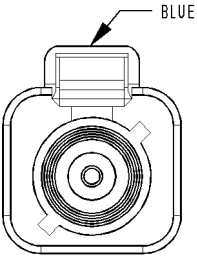


**AMPLIFIER-  
RADIO C2  
(MIDLINE II/HIGHLINE)**

AMPLIFIER-RADIO C2 (MIDLINE II/HIGHLINE) - WHITE 20 WAY

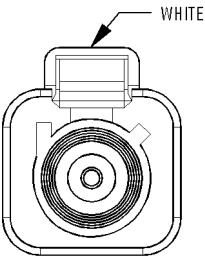
CAV	CIRCUIT	FUNCTION
1	X209 18GY/OR	AMPLIFIED LEFT I/P SPEAKER (+)
2	X208 18GY/DG	AMPLIFIED RIGHT I/P SPEAKER (+)
3	X200 18GY/BR (HIGHLINE)	AMPLIFIED CENTER I/P SPEAKER (+)
4	X13 16DG/GY	FUSED B(+) (I.O.D.)
5	-	-
6	D55 20WT/OR	CAN B BUS (+)
7	X51 18DG/DB	RADIO LEFT AUDIO (+)
8	X52 18GY/DB	RADIO RIGHT AUDIO (+)
9	Z910 16BK/TN	GROUND
10	X299 18GY/YL	AMPLIFIED LEFT I/P SPEAKER (-)
11	X298 18GY/LG	AMPLIFIED RIGHT I/P SPEAKER (-)
12	X290 18GY/OR (HIGHLINE)	AMPLIFIED CENTER I/P SPEAKER (-)
13	X13 16DG/GY	FUSED B(+) (I.O.D.)
14	-	-
15	-	-
16	-	-
17	D54 20WT	CAN B BUS (-)
18	X57 18DG/OR	RADIO LEFT AUDIO (-)
19	X58 18GY/OR	RADIO RIGHT AUDIO (-)
20	Z910 16BK/TN	GROUND





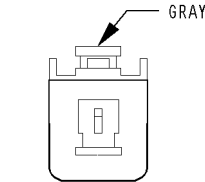
ANTENNA  
CABLE-  
SATELLITE  
RADIO NO. 1

ANTENNA CABLE-SATELLITE RADIO NO. 1 - BLUE 2 WAY		
CAV	CIRCUIT	FUNCTION
1	D106 6WT/LG	SATELLITE ANTENNA SIGNAL 1
2	D126 WT/TN	SATELLITE ANTENNA SHIELD 1



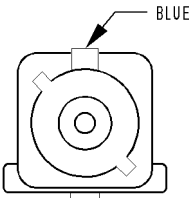
ANTENNA  
CABLE-  
SATELLITE  
RADIO NO. 2

ANTENNA CABLE-SATELLITE RADIO NO. 2 - WHITE 2 WAY		
CAV	CIRCUIT	FUNCTION
1	D109 6WT/OR	SATELLITE ANTENNA SIGNAL 2
2	D129 WT/YL	SATELLITE ANTENNA SHIELD 2



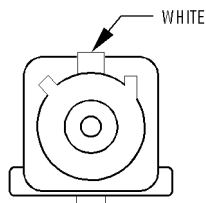
ANTENNA-  
GLOBAL POSITIONING  
SYSTEM  
(NAVIGATION)

ANTENNA-GLOBAL POSITIONING SYSTEM (NAVIGATION) - GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	D8 6WT/LB	GPS ANTENNA SIGNAL
2	D108 LB/WT	GPS ANTENNA SHIELD



ANTENNA-  
SATELLITE NO. 1

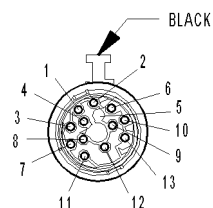
ANTENNA-SATELLITE NO. 1 - BLUE 2 WAY		
CAV	CIRCUIT	FUNCTION
1	D106 WT/LG	SATELLITE ANTENNA SIGNAL 1
2	D126 WT/TN	SATELLITE ANTENNA SHIELD 1



**ANTENNA-SATELLITE NO. 2**

ANTENNA-SATELLITE NO. 2 - WHITE 2 WAY

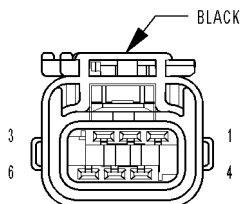
CAV	CIRCUIT	FUNCTION
1	D109 WT/OR	SATELLITE ANTENNA SIGNAL 2
2	D129 WT/YL	SATELLITE ANTENNA SHIELD 2



**ASSEMBLY-ELECTROHYDRAULIC CONTROL UNIT (NAG1)**

ASSEMBLY-ELECTROHYDRAULIC CONTROL UNIT (NAG1) - BLACK 13 WAY

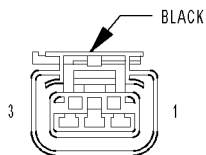
CAV	CIRCUIT	FUNCTION
1	T71 20YL/OR	INPUT SPEED SENSOR 2 (N3) SIGNAL
2	T76 20YL/TN	MODULATION PRESSURE SOLENOID CONTROL
3	T70 20YL	INPUT SPEED SENSOR 1 (N2) SIGNAL
4	T54 20DG/OR	TEMPERATURE SENSOR-P/N SWITCH SIGNAL
5	-	-
6	T78 20YL	SOLENOID SUPPLY VOLTAGE
7	T72 20YL/DB	SENSOR SUPPLY VOLTAGE
8	T74 20YL/LG	2-3 SOLENOID CONTROL
9	T73 20YL/GY	3-4 SOLENOID CONTROL
10	T77 20YL/BR	SHIFT PRESSURE SOLENOID CONTROL
11	T75 20YL/LB	TCC SOLENOID CONTROL
12	T13 20DG/VT	SENSOR GROUND
13	T60 20YL/GY	1-2/4-5 SOLENOID CONTROL



**ASSEMBLY-EXHAUST GAS RECIRCULATION VALVE**

ASSEMBLY-EXHAUST GAS RECIRCULATION VALVE - BLACK 6 WAY

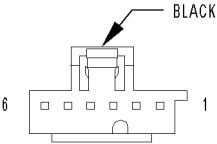
CAV	CIRCUIT	FUNCTION
1	K34 20DB/LG	EGR SIGNAL
2	F856 20YL/PK	5 VOLT SUPPLY
3	K900 20DB/DG	SENSOR GROUND
4	Z904 20BK/BR	GROUND
5	-	-
6	K35 20DB/VT	EGR SOL CONTROL



**ASSEMBLY-NATURAL VACUUM LEAK DETECTION (EXCEPT EXPORT)**

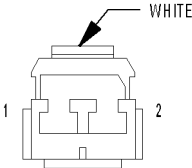
ASSEMBLY-NATURAL VACUUM LEAK DETECTION (EXCEPT EXPORT) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	Z914 20BK/GY	GROUND
2	K107 20VT/WT	NVLD SWITCH SIGNAL
3	K106 20VT/LB	NVLD SOL CONTROL



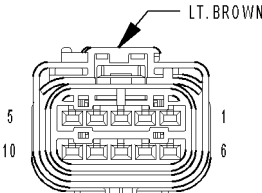
ASSEMBLY-SHIFTER LEVER (NAG1)

ASSEMBLY-SHIFTER LEVER (NAG1) - BLACK 6 WAY		
CAV	CIRCUIT	FUNCTION
1	F902 20PK	IGNITION UNLOCK-RUN-START
2	Z911 20BK/WT	GROUND
3	B29 20DG/WT	BRAKE SWITCH SIGNAL
4	-	-
5	D65 20WT/LG	CAN C BUS (+)
6	D64 20WT/LB	CAN C BUS (-)



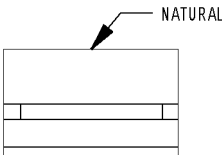
ASSEMBLY-SHIFTER LEVER (RLE)

ASSEMBLY-SHIFTER LEVER (RLE) - WHITE 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z911 20BK/WT	GROUND
2	B29 20DG/WT	BRAKE SWITCH SIGNAL



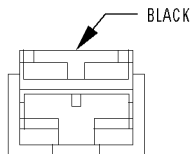
ASSEMBLY-TRANSMISSION SOLENOID/PRESSURE SWITCH (RLE)

ASSEMBLY-TRANSMISSION SOLENOID/PRESSURE SWITCH (RLE) - LT. BROWN 10 WAY		
CAV	CIRCUIT	FUNCTION
1	T60 20YL/GY	OVERDRIVE SOLENOID CONTROL
2	T59 20YL/LB	UNDERDRIVE SOLENOID CONTROL
3	T16 16YL/OR	TRANSMISSION CONTROL RELAY OUTPUT
4	T19 20YL/DB	2-4 SOLENOID CONTROL
5	T47 20YL/DG	2-4 PRESSURE SWITCH SENSE
6	T9 20DG/TN	OVERDRIVE PRESSURE SWITCH SENSE
7	T20 20DG/WT	LOW/REVERSE SOLENOID CONTROL
8	-	-
9	-	-
10	T50 20YL/TN	LOW/REVERSE PRESSURE SWITCH SENSE

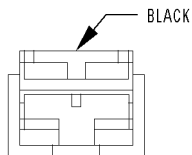


BACKLITE-ANTENNA

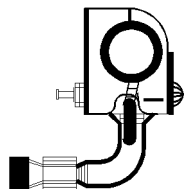
BACKLITE-ANTENNA - NATURAL 1 WAY		
CAV	CIRCUIT	FUNCTION
1	D999 18WT/OR	ANTENNA GRID SIGNAL



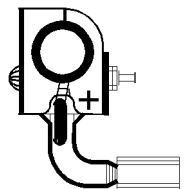
**BACKLITE-  
ELECTRIC HEATED  
(GROUND)**



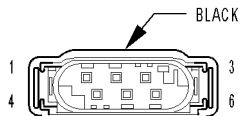
**BACKLITE-  
ELECTRIC HEATED  
(POWER)**



**BATTERY-  
NEGATIVE**



**BATTERY-  
POSITIVE**



**BOOSTER-  
ACTIVE BRAKE  
(ESP)**

BACKLITE-ELECTRIC HEATED (GROUND) - BLACK 1 WAY

CAV	CIRCUIT	FUNCTION
1	Z912 14BK/OR (LX48)	GROUND
1	Z914 14BK/GY (LX49)	GROUND

BACKLITE-ELECTRIC HEATED (POWER) - BLACK 1 WAY

CAV	CIRCUIT	FUNCTION
1	C215 14LB	ELECTRIC HEATED BACKLITE DRIVER

BATTERY-NEGATIVE - 1 WAY

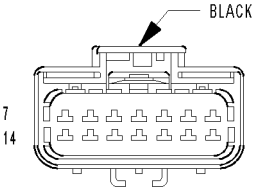
CAV	CIRCUIT	FUNCTION
1	Z915 6BK	GROUND

BATTERY-POSITIVE - 1 WAY

CAV	CIRCUIT	FUNCTION
1	A1 1RD	B(+)
1	A1 6RD	B(+)

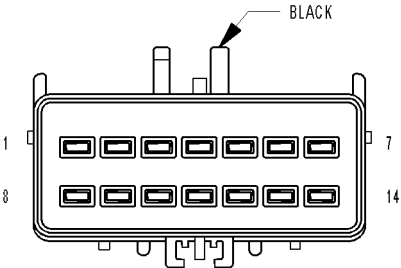
BOOSTER-ACTIVE BRAKE (ESP) - BLACK 6 WAY

CAV	CIRCUIT	FUNCTION
1	B135 20DG/LG	BRAKE PEDAL FORCE SWITCH OPEN
2	B134 20DG/YL	BRAKE PEDAL FORCE SWITCH CLOSE
3	B132 20DG/LB	ACTIVE BRAKE BOOSTER SOLENOID(-)
4	B131 20DG/YL	ACTIVE BRAKE BOOSTER SOLENOID(+)
5	B136 20DG/LB	BRAKE PEDAL FORCE SWITCH SIGNAL
6	-	-



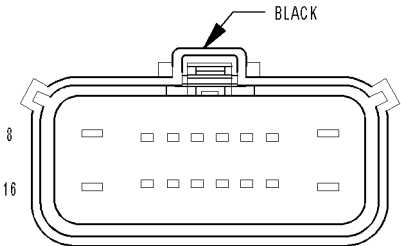
C100  
(2.7L/3.5L)

C100 (2.7L/3.5L) - BLACK (ENGINE SIDE)	
CAV	CIRCUIT
1	F855 20PK/YL
2	F856 20YL/PK
3	G6 20VT/GY
4	K236 20DB/LG (3.5L)
5	-
6	-
7	K343 16BR/YL
8	-
9	T15 20YL/BR
10	T16 16YL/OR
11	-
12	T750 16LG
13	Z904 14BK/BR
14	C3 18DB/YL



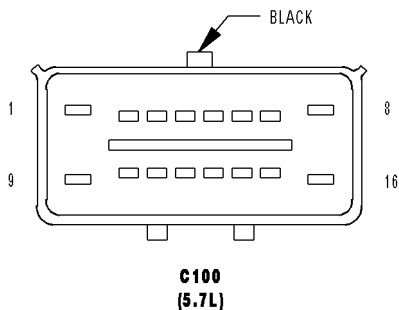
C100  
(2.7L/3.5L)

C100 (2.7L/3.5L) - BLACK (HEADLAMP AND DASH SIDE)	
CAV	CIRCUIT
1	F855 20PK/YL
2	F856 20YL/PK
3	G6 20VT/GY
4	K236 20DB/LG
5	-
6	-
7	K343 16BR/YL
8	-
9	T15 20YL/BR
10	T16 16YL/OR
11	-
12	T750 16YL/GY
13	Z904 14BK/BR
14	C3 18DB/YL



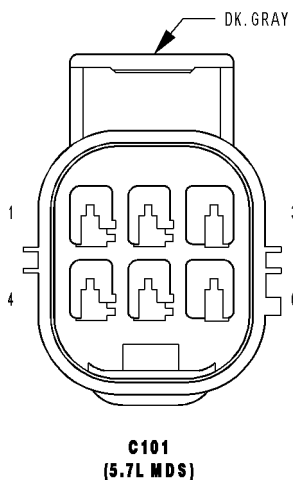
C100  
(5.7L)

C100 (5.7L) - BLACK (ENGINE SIDE)	
CAV	CIRCUIT
1	T750 16LG
2	-
3	G6 20VT/GY
4	K26 20BR/YL
5	K28 20BR/LB
6	K97 16DB/YL
7	K451 20BR/LB
8	K98 16DB/YL
9	K343 16BR/YL
10	K452 20BR/LB
11	K454 20BR/OR
12	F855 20PK/YL
13	F856 20YL/PK
14	C3 18DB/YL
15	G224 20VT/YL
16	Z904 16BK/BR



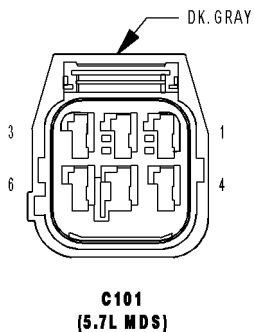
C100 (5.7L) - BLACK (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
1	T750 16YL/GY
2	-
3	G6 20VT/GY
4	K26 20BR/YL
5	K28 20BR/LB
6	K97 16DB/YL
7	K451 20BR/WT
8	K98 16DB/YL
9	K343 16BR/YL
10	K452 20BR/LB
11	K454 20BR/OR
12	F855 20PK/YL
13	F856 20YL/PK
14	C3 18DB/YL
15	G224 20VT/YL
16	Z904 14BK/BR



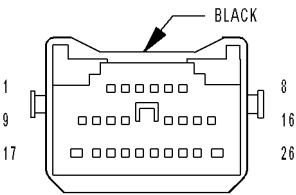
C101 (5.7L MDS) - DK. GRAY (ENGINE SIDE)

CAV	CIRCUIT
1	K451 20BR/LB
2	K452 20BR/LB
3	K453 20BR/DG
4	K454 20BR/OR
5	-
6	Z904 18BK/BR



C101 (5.7L MDS) - DK. GRAY (MULTI DIS-PLACEMENT SOLENOID SIDE)

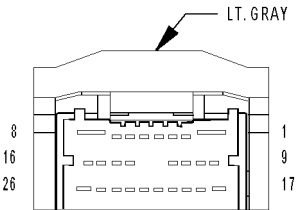
CAV	CIRCUIT
1	K451 20BR/WT
2	K452 20BR/LB
3	K453 20BR/DG
4	K454 20BR/OR
5	-
6	Z904 20BK/BR



C102

C102 - BLACK (INSTRUMENT PANEL SIDE)

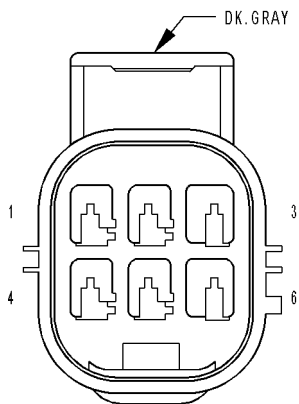
CAV	CIRCUIT
1	-
2	D71 20WT/DB
3	D72 20WT/LB
4	D54 20WT
5	D55 20WT/OR
6	D64 20WT/LB
7	D65 20WT/LG
8	-
9	D15 20WT/DG
10	D16 20WT/OR
11	D20 20LG
12	D21 20PK
13	F500 20DG/PK
14	R79 20LB/VT
15	R80 20VT/LB
16	R81 20LB/WT
17	-
18	R82 20WT/LB
19	L91 20WT/DB
20	F21 20PK/DG
21	F202 20PK/GY
22	D24 20WT/DG
23	-
24	A904 16RD
25	-
26	-



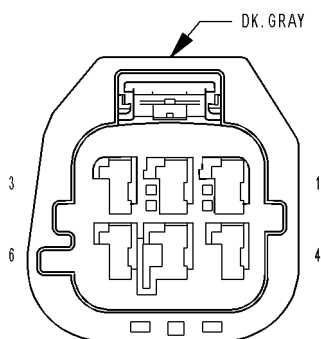
C102

C102 - LT. GRAY (HEADLAMP AND DASH SIDE)

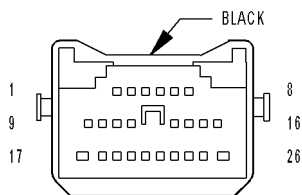
CAV	CIRCUIT
1	-
2	D71 20WT/DB
3	D72 20WT/LB
4	D54 20WT
5	D55 20WT/OR
6	D64 20WT/LB
7	D65 20WT/LG
8	-
9	D15 20WT/DG
10	D16 20WT/OR
11	D20 20WT/LG
12	D21 20WT/BR
13	F500 20DG/PK (EXPORT)
14	R79 20LB/VT
15	R80 20VT/LB
16	R81 20LB/WT
17	-
18	R82 20WT/LB
19	L91 20WT/DB
20	F21 20PK/DG
21	F202 20PK/GY
22	D24 20WT/DG (ABS)
23	-
24	A904 16RD
25	-
26	-



**C103  
(LX48)**



**C103  
(LX48)**



**C104**

C103 (LX48) - DK. GRAY (FRONT END LIGHT-  
ING SIDE)

CAV	CIRCUIT
1	Z901 20BK/TN
2	Z902 20BK/BR
3	L777 20WT/VT
4	-
5	L89 20WT/YL (EXCEPT BASE)
6	-

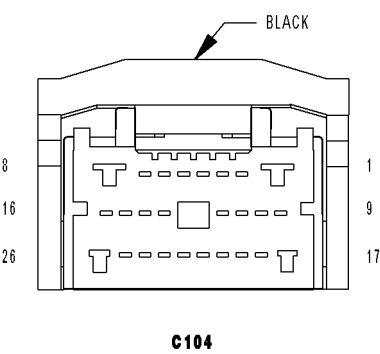
C103 (LX48) - DK. GRAY (HEADLAMP AND  
DASH SIDE)

CAV	CIRCUIT
1	Z901 18BK/DG
2	Z902 18BK/LB
3	L777 20WT/VT
4	-
5	L89 18WT/YL (EXCEPT BASE)
6	-

C104 - BLACK (BODY SIDE)

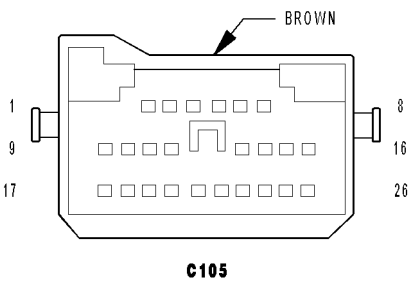
CAV	CIRCUIT
1	A22 12RD/WT
2	-
3	-
4	B15 20DG/WT
5	B16 20LB/DG
6	F902 20PK (NAG1)
7	-
8	A22 12RD/WT
9	F855 20PK/YL
10	F856 20YL/PK
11	X13 16DG/GY
12	-
13	-
14	P307 20LG/GY
15	-
16	-
17	L62 20WT/YL
18	-
19	-
20	B29 20DG/WT
21	B121 20DG/DB (ESP)
22	D51 20WT/BR (ESP)
23	D52 20WT/LB (ESP)
24	G4 20VT/LB (ESP)
25	G94 20VT/DB (ESP)
26	L63 20WT/DG





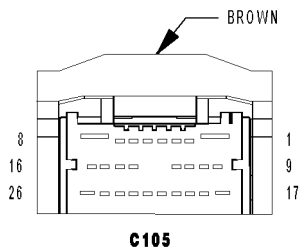
C104 - BLACK (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
1	A22 12RD/WT
2	-
3	-
4	B15 20DG/WT
5	B16 20LB/DG
6	F902 20PK (NAG1)
7	-
8	A22 12RD/WT
9	F855 20PK/YL
10	F856 20YL/PK
11	X13 16DG/GY
12	-
13	-
14	P307 20LG/GY
15	-
16	-
17	L62 18WT/YL
18	-
19	-
20	B29 20DG/WT
21	B121 20DG/DB (ESP)
22	D51 20WT/BR (ESP)
23	D52 20WT/LB (ESP)
24	G4 20VT/LB (ESP)
25	G94 20VT/DB (ESP)
26	L63 18WT/DG



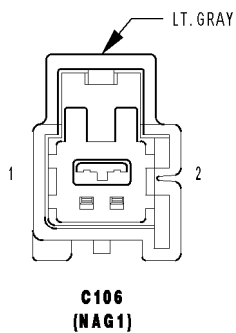
C105 - BROWN (BODY SIDE)

CAV	CIRCUIT
1	-
2	-
3	-
4	K23 20BR/WT
5	K29 20WT/BR
6	K106 20VT/LB (EXCEPT EXPORT)
7	K107 20VT/WT (EXCEPT EXPORT)
8	-
9	-
10	-
11	K400 20BR/VT
12	K167 20BR/YL
13	F923 20PK/YL
14	K31 20BR
15	L13 20WT/YL (EXPORT)
16	L239 20WT/DG (EXPORT)
17	L1 20WT/LG
18	B1 20DG/OR (ABS)
19	B2 20DG/LB (ABS)
20	B3 20DG/YL (ABS)
21	B4 20DG/GY (ABS)
22	W12 20BR/OR (LX49)
23	W17 18BR/YL (LX49)
24	-
25	A72 20RD/OR (EXCEPT MEMORY)
26	L777 20WT/VT



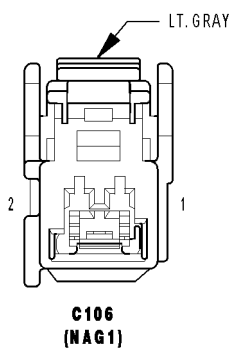
C105 - BROWN (HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
1	-
2	-
3	-
4	K23 20BR/WT
5	K29 20WT/BR
6	K106 20VT/GY
7	K107 20VT/WT
8	-
9	-
10	-
11	K400 20BR/VT
12	K167 20BR/YL
13	F923 20PK/YL
14	K31 20BR
15	L13 20WT/YL (EXPORT)
16	L239 20WT/DG (EXPORT)
17	L1 20WT/LG
18	B1 20DG/OR (ABS)
19	B2 20DG/LB (ABS)
20	B3 20DG/YL (ABS)
21	B4 20DG/GY (ABS)
22	W12 20BR/OR (LX49)
23	W17 20BR/LG (LX49)
24	-
25	A72 20RD/OR
26	L777 20WT/VT



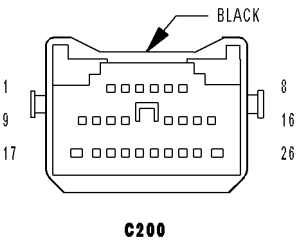
C106 (NAG1) - LT. GRAY (BODY SIDE)

CAV	CIRCUIT
1	D64 20WT/LB
2	D65 20WT/LG



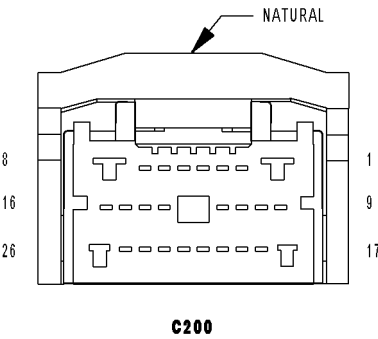
C106 (NAG1) - LT. GRAY (TRANSMISSION SIDE)

CAV	CIRCUIT
1	D64 20WT/LB
2	D65 20WT/LG



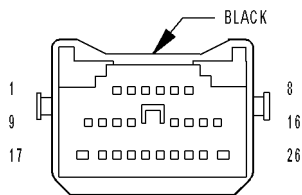
C200 - BLACK (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
1	A110 16OR/RD
2	A106 20LB/RD
3	-
4	A300 16GY/LG
5	P37 20LG/TN
6	G78 22VT/OR
7	F201 20PK/OR
8	C7 12DB
9	F20 20PK/WT
10	F202 20PK/GY
11	F214 20PK/LG
12	F23 20RD/OR
13	F500 20DG/PK
14	-
15	G74 18VT/WT
16	G76 20VT/YL
17	X13 16DG/GY
18	D64 20WT/LB
19	D65 20WT/LG
20	L1 20WT/LG (AUTO DAY/NIGHT MIRROR)
21	A23 20RD/YL
22	F880 20PK/DG
23	M24 18YL/WT
24	M27 20YL/LB (BASE)
24	M27 18YL/LB (PREMIUM)
25	-
26	-



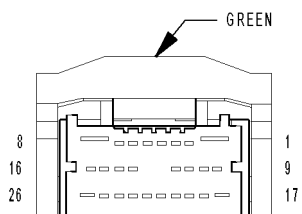
C200 - NATURAL (BODY SIDE)

CAV	CIRCUIT
1	A110 16OR/RD
2	A106 20LB/RD
3	-
4	A300 16GY/LG
5	P37 20LG/TN
6	G78 20VT/OR
7	F201 20PK/OR
8	C7 12DB
9	F20 20PK/WT
10	F202 20PK/GY
11	F214 20PK/LG
12	F23 20RD/OR
13	F500 20DG/PK
14	-
15	G74 20VT/WT
16	G76 20VT/YL
17	X13 16DG/GY
18	D64 20WT/LB (NAG1)
19	D65 20WT/LG (NAG1)
20	L1 20WT/LG
21	A23 20RD/YL
22	F880 20PK/DG
23	M24 18YL/WT
24	-
25	-
26	-


**C201**

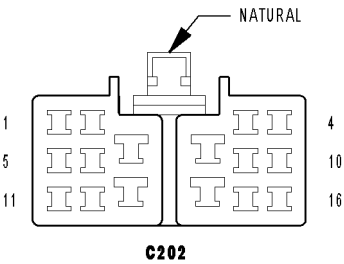
C201 - BLACK (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
1	-
2	E12 20OR/GY
3	X304 18DG/BR
4	X394 18YL/GY
5	X202 18DG/VT
6	X292 18DG/YL
7	C115 20DB
8	-
9	G160 20VT/LG
10	P392 20LG/DB
11	D54 20WT
12	D55 20WT/OR
13	A117 20RD/DG
14	P303 20TN
15	P31 20TN/YL
16	A205 16RD/OR
17	A913 20RD/GY
18	-
19	-
20	D777 20WT/GY (PARKTRONICS)
21	X777 20DG/GY (PARKTRONICS)
22	Z171 20GY/BK (PARKTRONICS)
23	-
24	-
25	G25 20VT/TN
26	-

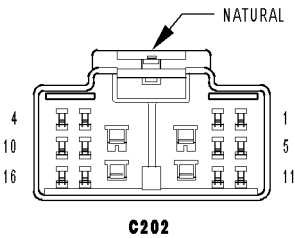

**C201**

C201 - GREEN (BODY SIDE)

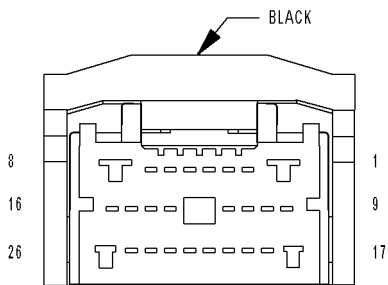
CAV	CIRCUIT
1	-
2	E12 20OR/GY
3	X304 18DG/BR
4	X394 18YL/GY
5	X202 18DG/VT
6	X292 18DG/YL
7	C115 20DB
8	-
9	G160 20VT/LG
10	P392 20LG/DB
11	D54 20WT
12	D55 20WT/OR
13	A117 20RD/DG
14	P303 20TN
15	P31 20TN/YL
16	A205 16RD/OR
17	A913 20RD/GY
18	-
19	-
20	D777 20WT/DG (PARKTRONICS)
21	X777 20DG/GY (PARKTRONICS)
22	Z171 20GY/BK (PARKTRONICS)
23	-
24	-
25	G25 20VT/TN (LX49)
26	-



C202 - NATURAL (HVAC SIDE)	
CAV	CIRCUIT
1	C55 20DB/WT
2	C255 20WT/DB
3	C52 20DB/LG (ATC)
4	C252 20LG/DB (ATC)
5	C66 20DB/OR
6	C266 20OR/DB
7	Z908 12BK (ATC)
7	C70 12DB/YL (MTC)
8	C7 12DB
9	C68 20DB/YL
10	C268 20YL/DB
11	C21 20DB/LG
12	C121 20DB/DG
13	C73 14DB/VT (MTC)
14	C72 14DB/OR (MTC)
15	C56 20DB/LB (ATC)
16	C71 16DB/BR (MTC)

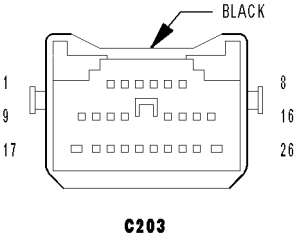


C202 - NATURAL (INSTRUMENT PANEL SIDE)	
CAV	CIRCUIT
1	C55 20DB/WT
2	C255 22WT/DB
3	C52 22DB/LG (ATC)
4	C252 22LG/DB (ATC)
5	C66 20DB/OR
6	C266 20OR/DB
7	Z908 12BK/RD (ATC)
7	C70 12DB/YL (MTC)
8	C7 12DB
9	C68 22DB/YL
10	C268 22YL/DB (ATC)
10	C268 20YL/DB (MTC)
11	C21 20DB/LG
12	C121 20DB/DG
13	C73 12DB/VT (MTC)
14	C72 18DB/OR (MTC)
15	C56 20DB/LB (ATC)
16	C71 16DB/BR (MTC)



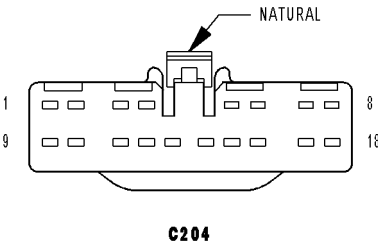
C203

C203 - BLACK (BODY SIDE)	
CAV	CIRCUIT
1	X300 18GY/BR (HIGHLINE)
2	B25 20GY/BK
3	G167 20VT/LB
4	G75 20VT
5	G77 20VT/GY
6	P112 20TN/OR (AUTO DAY/NIGHT MIRROR)
7	Z210 20BK
8	X390 18DG/BR (HIGHLINE)
9	N4 20DB/WT
10	N5 20DB/WT
11	P1 20TN/LG
12	X303 18DG/TN
13	X393 18DG/GY
14	X201 18GY/VT
15	X291 18GY/YL
16	P393 20LG
17	P953 20DG/TN (MEMORY)
18	G914 20VT/GY (MEMORY)
19	P153 20TN/DG (MEMORY)
20	P151 20TN/OR (MEMORY)
21	P114 20TN/WT (AUTO DAY/NIGHT MIRROR)
22	R57 20LG/GY
23	G161 20VT/DG
24	P152 20TN/LB (MEMORY)
25	P157 20LB/TN (MEMORY)
26	D21 20WT/BR (NAG1)



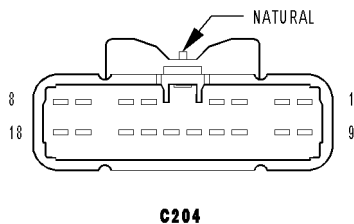
C203 - BLACK (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
1	X300 18GY/BR (HIGHLINE)
2	B25 20GY/BK
3	G167 20VT/LB
4	G75 20VT
5	G77 20VT/GY
6	P112 20TN/OR (AUTO DAY/NIGHT MIRROR)
7	Z210 20BK
8	X390 18DG/BR (HIGHLINE)
9	N4 20DB/WT
10	N5 20DB/WT
11	P1 20TN/LG
12	X303 18DG/TN
13	X393 18DG/GY
14	X201 18GY/VT
15	X291 18GY/YL
16	P393 20LG
17	P953 20DG/TN (MEMORY)
18	G914 20VT/GY (MEMORY)
19	P153 20TN/DG (MEMORY)
20	P151 20TN/OR (MEMORY)
21	P114 20TN/WT (AUTO DAY/NIGHT MIRROR)
22	R57 20LG/GY
23	G161 20VT/DG
24	P152 20TN/LB (MEMORY)
25	P157 20LB/TN (MEMORY)
26	D21 20PK



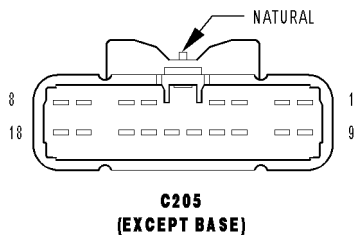
C204 - NATURAL (DOME SIDE)

CAV	CIRCUIT
1	-
2	M24 18YL/WT
3	M27 18YL/LB
4	Z909 16BK/LG
5	A117 20RD/DG (EVIC)
6	F880 20PK (EVIC)
7	D54 20WT (EVIC/SUNROOF)
8	D55 20WT/OR (EVIC/SUNROOF)
9	D777 20WT/DG (PARKTRONICS)
10	X777 20DG/GY (PARKTRONICS)
11	X13 16DG/GY (SUNROOF)
12	Z171 20GY/BK (PARKTRONICS)
13	-
14	-
15	-
16	-
17	-
18	-



C204 - NATURAL (INSTRUMENT PANEL SIDE)

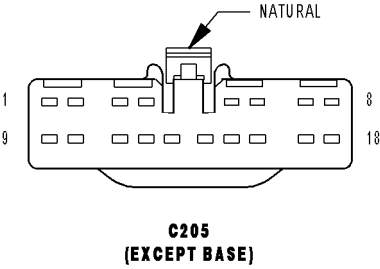
CAV	CIRCUIT
1	E12 20OR/GY
2	M24 18YL/WT
3	M27 20YL/LB
4	Z909 16BK/LG
5	A117 20RD/DG
6	F880 20PK/DG
7	D54 20WT
8	D55 20WT/OR
9	D777 20WT/GY (PARKTRONICS)
10	X777 20DG/GY (PARKTRONICS)
11	X13 16DG/GY
12	Z171 20GY/BK (PARKTRONICS)
13	-
14	-
15	-
16	-
17	-
18	-



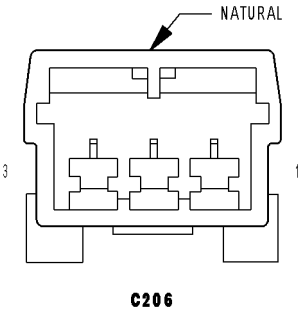
C205 (EXCEPT BASE) - NATURAL (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
1	F880 20PK/DG (AUTO WIPERS)
2	D54 20WT (AUTO WIPERS)
3	D55 20WT/OR (AUTO WIPERS)
4	F23 20RD/OR (AUTO DAY/NIGHT MIRROR)
5	L1 20WT/LG (AUTO DAY/NIGHT MIRROR)
6	P112 20TN/OR (AUTO DAY/NIGHT MIRROR)
7	X835 20OR/GY (HANDS FREE)
8	-
9	P114 20TN/WT (AUTO DAY/NIGHT MIRROR)
10	Z909 20BK/LG (AUTO DAY/NIGHT MIRROR)
11	X712 22DG/LB (HANDS FREE)
12	X722 22LB/DG (HANDS FREE)
13	X792 22LB/DG (HANDS FREE)
14	X793 22DG/YL (HANDS FREE)
15	X730 20GY/YL (HANDS FREE)
16	-
17	-
18	-

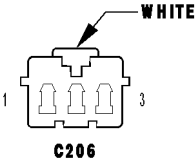




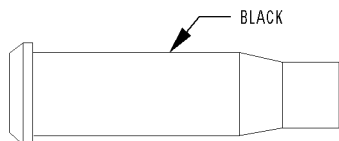
C205 (EXCEPT BASE) - NATURAL (INTERIOR MIRROR JUMPER SIDE)	
CAV	CIRCUIT
1	F880 20BK/PK (AUTO WIPERS)
2	D54 20BK (AUTO WIPERS)
3	D55 20BK/WT (AUTO WIPERS)
4	F23 20BK/RD (AUTO DAY/NIGHT MIRROR)
5	L1 20BK/TN (AUTO DAY/NIGHT MIRROR)
6	P112 20BK/LB (AUTO DAY/NIGHT MIRROR)
7	X835 20BK/OR (HANDS FREE)
8	-
9	P114 20BK/DB (AUTO DAY/NIGHT MIRROR)
10	Z909 20BK/LG (AUTO DAY/NIGHT MIRROR)
11	X712 20BK/DG (HANDS FREE)
12	X722 20BK/BR (HANDS FREE)
13	X792 20BK/YL (HANDS FREE)
14	X793 20BK/GY (HANDS FREE)
15	X730 20BK/VT (HANDS FREE)
16	-
17	-
18	-



C206 - NATURAL (STEERING PAD SIDE)	
CAV	CIRCUIT
1	D500 20WT
2	D501 20WT/LG
3	D502 20WT/OR (PREMIUM)

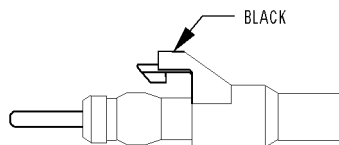


C206 - WHITE (CLOCKSPRING SIDE)	
CAV	CIRCUIT
1	D500 20WT
2	D501 20WT/LG
3	D502 20WT/OR (PREMIUM)


**C207**

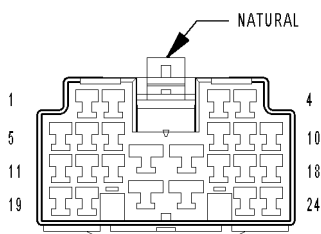
C207 - BLACK (BODY SIDE)

CAV	CIRCUIT
1	D5 6WT/OR
2	D931 WT/YL


**C207**

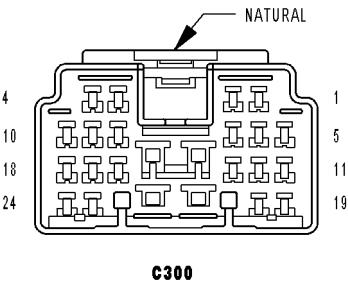
C207 - BLACK (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
1	D5 6WT/OR
2	D931 WT/YL


**C300**

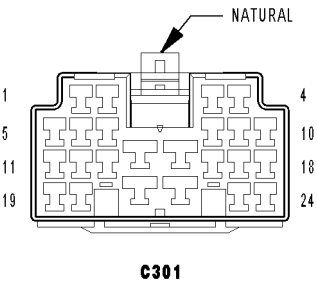
C300 - NATURAL (BODY SIDE)

CAV	CIRCUIT
1	Q411 14OR/WT
2	C16 20DB/GY
3	A913 20RD/GY
4	Q412 14OR/LB
5	G75 20VT
6	G167 20VT/LB
7	G161 20VT/DG
8	M24 18YL/WT
9	D55 20WT/OR (EXCEPT BASE)
10	Q26 14OR/GY (BASE)
10	D54 20WT (EXCEPT BASE)
11	X201 18GY/VT
12	X291 18GY/YL
13	F880 20PK/DG (EXCEPT MEMORY)
14	Z912 14BK/OR
15	Q15 14OR/LB
16	P1 20TN/LG
17	P72 20TN/GY (EXCEPT MEMORY)
17	P112 20TN/OR (MEMORY)
18	P74 20TN/OR (EXCEPT MEMORY)
18	P114 20TN/WT (MEMORY)
19	Q611 14OR/GY
20	P393 20LG
21	Q612 14OR/DB
22	F881 14PK
23	P76 22TN/LB (EXCEPT MEMORY)
24	Q16 14OR/TN (BASE)



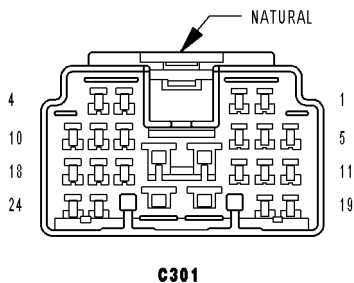
C300 - NATURAL (DRIVER DOOR SIDE)

CAV	CIRCUIT
1	Q411 14OR/WT
2	C16 20DB/GY
3	A913 20RD/GY
4	Q412 14OR/LB
5	G75 20VT
6	G167 20VT/LB
7	G161 20VT/DG
8	M24 20YL/WT (EXCEPT BASE)
9	D55 20WT/OR (EXCEPT BASE)
10	Q26 14OR/GY (BASE)
10	D54 20WT (EXCEPT BASE)
11	X201 18GY/VT
12	X291 18GY/YL
13	F880 20PK/DG (EXCEPT MEMORY)
14	Z912 14BK/OR
15	Q15 14OR/LB
16	P1 20TN/LG
17	P72 20TN/GY (EXCEPT MEMORY)
17	P112 20TN/OR (MEMORY)
18	P74 20TN/OR (EXCEPT MEMORY)
18	P114 20TN/WT (MEMORY)
19	Q611 14OR/GY
20	P393 20LG
21	Q612 14OR/DB
22	F881 14PK
23	P76 20TN/LB (EXCEPT MEMORY)
24	Q16 14OR/TN (BASE)

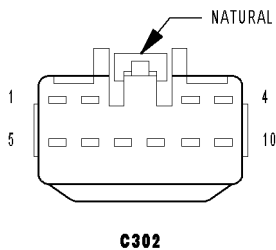


C301 - NATURAL (BODY SIDE)

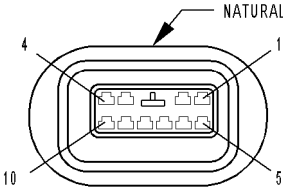
CAV	CIRCUIT
1	-
2	C16 20DB/GY
3	A913 20RD/GY (EXCEPT BASE)
4	Q26 14OR/GY (BASE)
5	G74 20VT/WT
6	P37 20LG/TN
7	G160 20VT/LG
8	M24 20YL/WT
9	D55 20WT/OR (EXCEPT BASE)
10	D54 20WT (EXCEPT BASE)
11	X202 18DG/VT
12	X292 18DG/YL
13	F880 20PK/DG (EXCEPT BASE)
14	Z911 14BK/WT
15	Q15 14OR/LB (BASE)
16	P303 20TN
17	P72 20TN/GY (EXCEPT MEMORY)
18	P74 20TN/OR (EXCEPT MEMORY)
19	-
20	P392 20LG/DB
21	Q16 14OR/TN (BASE)
22	F881 14PK
23	P76 22TN/LB (EXCEPT MEMORY)
24	-



C301 - NATURAL (PASSENGER DOOR SIDE)	
CAV	CIRCUIT
1	-
2	C16 20DB/GY
3	A913 20RD/GY (EXCEPT BASE)
4	Q26 14OR/GY (BASE)
5	G74 20VT/WT
6	P37 20LG/TN
7	G160 20VT/LG
8	M24 20YL/WT (EXCEPT BASE)
9	D55 20WT/OR (EXCEPT BASE)
10	D54 20WT (EXCEPT BASE)
11	X202 18DG/VT
12	X292 18DG/YL
13	F880 20PK/DG (EXCEPT BASE)
14	Z911 14BK/WT
15	Q15 14OR/LB (BASE)
16	P303 20TN
17	P72 20TN/GY (EXCEPT MEMORY)
18	P74 20TN/OR (EXCEPT MEMORY)
19	-
20	P392 20LG/DB
21	Q16 14OR/TN (BASE)
22	F881 14PK
23	P76 20TN/LB (EXCEPT MEMORY)
24	-



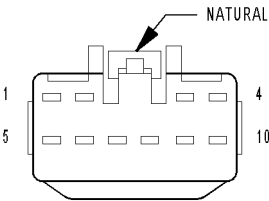
C302 - NATURAL (BODY SIDE)	
CAV	CIRCUIT
1	Q15 14OR/LB
2	-
3	Q411 14OR/WT
4	-
5	G77 20VT/GY
6	Z912 20BK/OR
7	P303 20TN
8	P393 20LG
9	-
10	Q611 14OR/GY



C302

C302 - NATURAL (LEFT REAR DOOR SIDE)

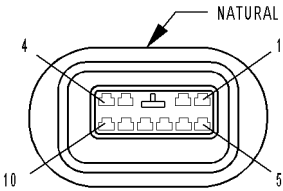
CAV	CIRCUIT
1	Q15 14OR/LB
2	-
3	Q411 14OR/WT
4	-
5	G77 20VT/GY
6	Z912 20LG/BK
7	P303 20TN
8	P393 20LG
9	-
10	Q611 14OR/GY



C303

C303 - NATURAL (BODY SIDE)

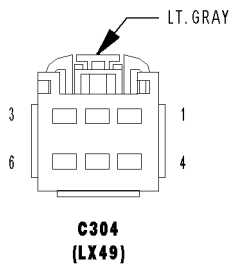
CAV	CIRCUIT
1	Q15 14OR/LB
2	-
3	Q412 14OR/LB
4	-
5	G76 20VT/YL
6	Z911 20BK/WT
7	P303 20TN
8	P392 20LG/DB
9	-
10	Q612 14OR/DB



C303

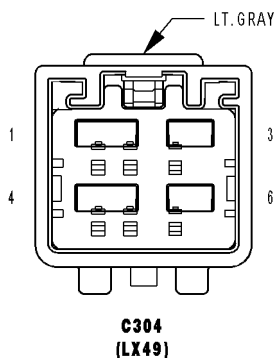
C303 - NATURAL (RIGHT REAR DOOR SIDE)

CAV	CIRCUIT
1	Q15 14OR/LB
2	-
3	Q412 14OR/LB
4	-
5	G76 20VT/YL
6	Z911 20BK/WT
7	P303 20TN
8	P392 20LG/DB
9	-
10	Q612 14OR/DB



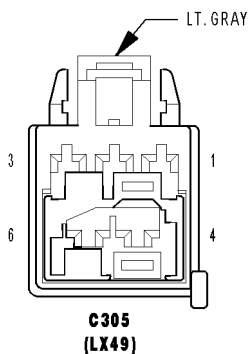
C304 (LX49) - LT. GRAY (BODY SIDE)

CAV	CIRCUIT
1	C15 12DB/WT
2	W13 16BR/LG
3	W17 18BR/YL
4	L53 20DG/WT
5	Z911 20BK/WT
6	Z914 14BK/GY



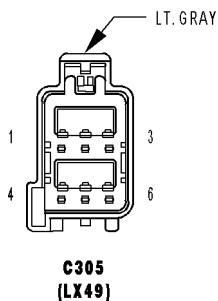
C304 (LX49) - LT. GRAY (LIFTGATE SIDE)

CAV	CIRCUIT
1	C15 12DB/WT
2	W13 16BR/LG
3	W17 18BR/YL
4	L53 20DG/WT
5	Z911 20BK/WT
6	Z914 14BK/GY



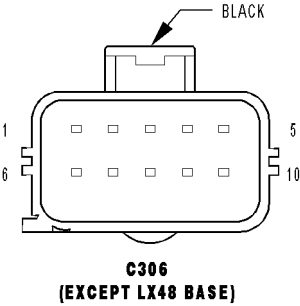
C305 (LX49) - LT. GRAY (BODY SIDE)

CAV	CIRCUIT
1	F880 20PK/DG
2	G25 20VT/TN
3	G78 20VT/OR
4	M24 20YL/WT
5	P31 20TN/YL
6	-



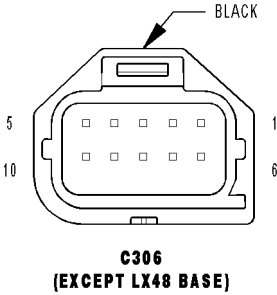
C305 (LX49) - LT. GRAY (LIFTGATE SIDE)

CAV	CIRCUIT
1	F880 20PK/DG
2	G25 20VT/TN
3	G78 20VT/OR
4	M24 20YL/WT
5	P31 20TN/YL
6	-



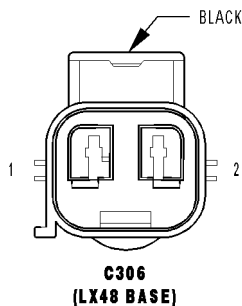
C306 (EXCEPT LX48 BASE) - BLACK (BODY SIDE)

CAV	CIRCUIT
1	X700 20GY/OR (LX48 PARKTRONICS)
1	L777 20WT/VT (LX49)
2	Z914 20BK/GY (2.7L/3.5L LX49)
2	Z914 16BK/GY (5.7L LX49)
2	D701 20WT/LB (LX48 PARKTRONICS)
3	D700 20WT/GY (LX48 PARKTRONICS)
3	L53 20DG/WT (LX49)
4	D703 20WT/BK (LX48 PARKTRONICS)
4	L1 20WT/LG (LX49)
5	D704 20WT/DB (LX48 PARKTRONICS)
5	L62 20WT/YL (LX49)
6	X750 20GY/LB (LX48 PARKTRONICS)
6	L63 20WT/DG (LX49)
7	B400 16DB (5.7L LX49 TRAILER TOW)
7	L777 20WT/VT (LX48 PARKTRONICS)
8	Z914 20BK/GY (LX48 EXCEPT EXPORT)
8	Z914 18BK/GY (LX48 EXPORT)
9	B400 16DB (5.7L LX48 TRAILER TOW)
10	-



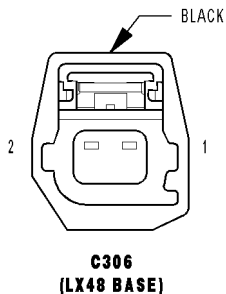
C306 (EXCEPT LX48 BASE) - BLACK (REAR END LIGHTING SIDE)

CAV	CIRCUIT
1	X700 20GY/OR (LX48 PARKTRONICS)
1	L777 20WT/VT (LX49)
2	D701 20WT/LB (LX48 PARKTRONICS)
2	Z914 18BK/BR (LX49)
3	D700 20WT/GY (LX48 PARKTRONICS)
3	L53 20DG/WT (LX49)
4	D703 20WT/BK (LX48 PARKTRONICS)
4	L1 20WT/LG (LX49)
5	D704 20WT/DB (LX48 PARKTRONICS)
5	L62 18WT/YL (LX49)
6	X750 20GY/LB (LX48 PARKTRONICS)
6	L63 18WT/DG (LX49)
7	B400 16DB (5.7L LX49 TRAILER TOW)
7	L777 20WT/VT (LX48 PARKTRONICS)
8	Z914 20BK/BR (LX48 PARKTRONICS)
9	-
10	-



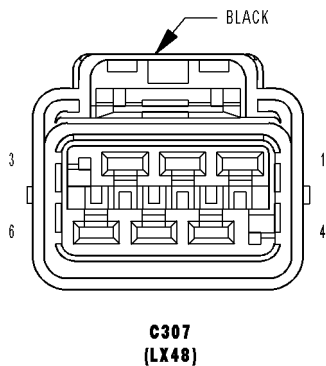
C306 (LX48 BASE) - BLACK (BODY SIDE)

CAV	CIRCUIT
1	L777 20WT/VT
2	Z914 20BK/GY



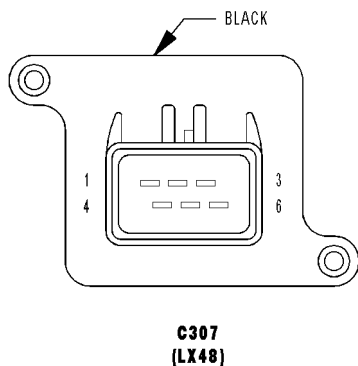
C306 (LX48 BASE) - BLACK (REAR END LIGHTING SIDE)

CAV	CIRCUIT
1	L777 20WT/VT
2	Z914 20BK/BR



C307 (LX48) - BLACK (BODY SIDE)

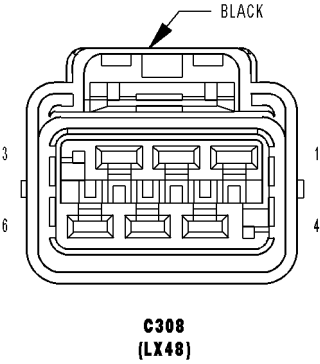
CAV	CIRCUIT
1	L777 20WT/VT
2	Z914 20BK/GY
3	L63 20WT/DG
4	L53 20DG/WT
5	L1 20WT/LG
6	L90 20WT/OR (EXPORT)



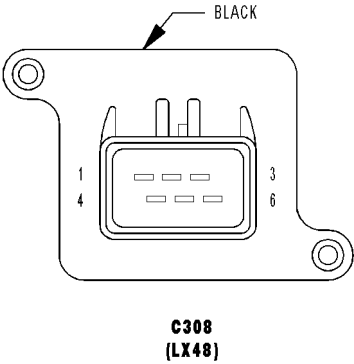
C307 (LX48) - BLACK (LEFT TAIL LAMP SIDE)

CAV	CIRCUIT
1	L777 20WT/VT (EXCEPT EXPORT)
1	L777 18WT/VT (EXPORT)
2	Z914 20BK/GY
3	L63 18WT/DG
4	L53 18DG/WT (300C)
5	L1 20WT/LG (300C)
5	L1 18WT/LG (EXCEPT 300C)
6	L90 18WT/OR (EXPORT)

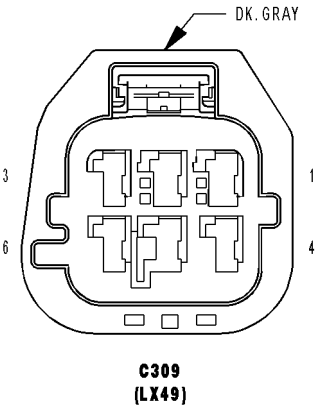




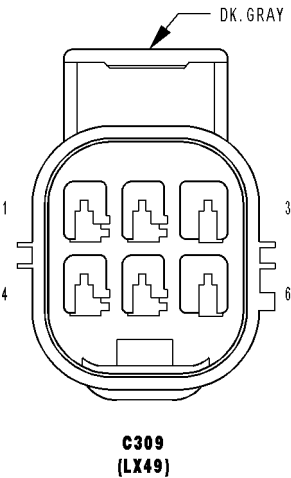
C308 (LX48) - BLACK (BODY SIDE)	
CAV	CIRCUIT
1	L777 20WT/VT
2	Z914 20BK/GY
3	L62 20WT/YL
4	L53 20DG/WT
5	L1 20WT/LG
6	L90 20WT/OR (EXPORT)



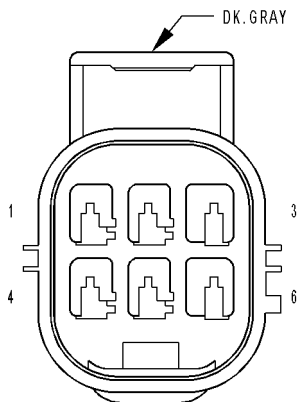
C308 (LX48) - BLACK (RIGHT TAIL LAMP SIDE)	
CAV	CIRCUIT
1	L777 20WT/VT (EXCEPT EXPORT)
1	L777 18WT/VT (EXPORT)
2	Z914 20BK/GY
3	L62 18WT/YL
4	L53 18DG/WT (300C)
5	L1 20WT/LG (300C)
5	L1 18WT/LG (EXCEPT 300C)
6	L90 18WT/OR (EXPORT)



C309 (LX49) - DK. GRAY (LEFT TAIL LAMP SIDE)	
CAV	CIRCUIT
1	L777 20BR
2	Z914 20BK
3	L63 18RD/OR
4	L53 20BR/VT
5	L1 20VT/RD
6	-



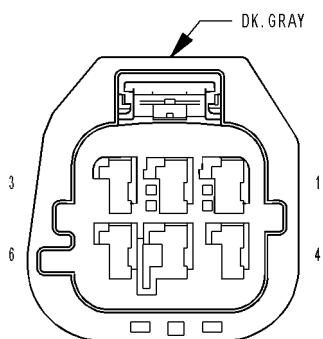
C309 (LX49) - DK. GRAY (REAR END LIGHTING SIDE)	
CAV	CIRCUIT
1	L777 20WT/VT
2	Z914 20BK/BR
3	L63 18WT/DG
4	L53 20DG/WT
5	L1 20WT/LG
6	-



**C310  
(LX49)**

C310 (LX49) - DK. GRAY (REAR END LIGHTING SIDE)

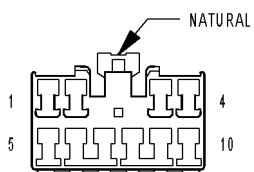
CAV	CIRCUIT
1	L777 20WT/VT
2	Z914 20BK/BR
3	L62 18WT/YL
4	L53 20DG/WT
5	L1 20WT/LG
6	-



**C310  
(LX49)**

C310 (LX49) - DK. GRAY (RIGHT TAIL LAMP SIDE)

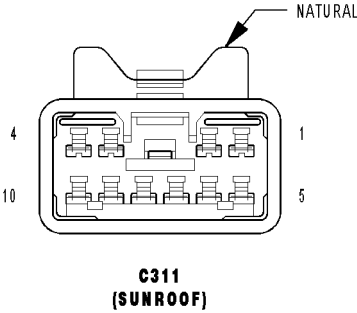
CAV	CIRCUIT
1	L777 20BR
2	Z914 20BK
3	L62 18RD/OR
4	L53 20BR/VT
5	L1 20VT/RD
6	-



**C311  
(SUNROOF)**

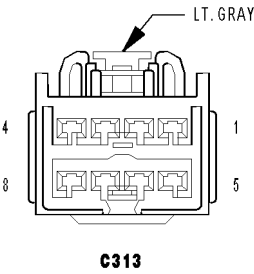
C311 (SUNROOF) - NATURAL (DOME SIDE)

CAV	CIRCUIT
1	Q6 200R/LG
2	-
3	X13 16DG/GY
4	Q5 200R/LB
5	Z909 16BK/LG
6	D55 20WT/OR
7	D54 20WT
8	Q3 200R/TN
9	Q4 200R/YL
10	-



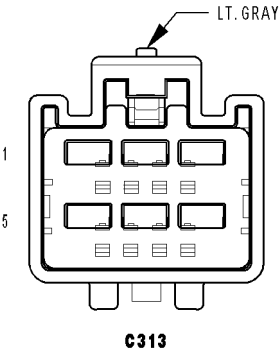
C311 (SUNROOF) - NATURAL (SUNROOF SIDE)

CAV	CIRCUIT
1	Q6 200R/LG
2	D270 20WT (FACTORY ONLY)
3	X13 18RD
4	Q5 200R/LB
5	Z909 18BK
6	D55 20WT/OR
7	D54 20WT
8	Q3 200R/TN
9	Q4 200R/YL
10	-



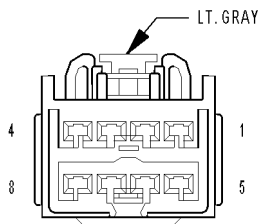
C313 - LT. GRAY (BODY SIDE)

CAV	CIRCUIT
1	Z912 16BK/OR
2	R57 20LG/GY
3	P187 20LG/BR (HEATED SEAT)
4	A110 16OR/RD (EXCEPT MEMORY)
5	P205 20LG/WT (ADJUSTABLE PEDALS EXCEPT MEMORY)
6	P206 20LG/LB (ADJUSTABLE PEDALS EXCEPT MEMORY)
7	-
8	A72 20RD/OR (ADJUSTABLE PEDALS EXCEPT MEMORY)



C313 - LT. GRAY (DRIVER SEAT SIDE)

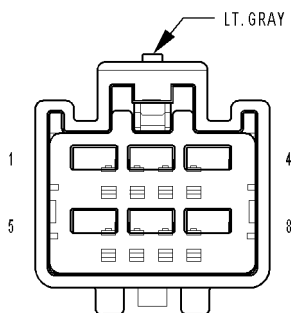
CAV	CIRCUIT
1	Z912 20BK/OR (MEMORY)
1	Z912 18BK/OR (POWER HEATED SEAT EXCEPT MEMORY)
1	Z912 16BK/OR (POWER SEAT/ADJUSTABLE PEDALS EXCEPT MEMORY)
2	R57 20LG/GY
3	P187 20LG/BR (HEATED SEAT)
3	P187 18LG/BR (POWER HEATED SEAT EXCEPT MEMORY)
4	A110 16OR/RD (EXCEPT MEMORY)
5	P205 20LG/WT (ADJUSTABLE PEDALS EXCEPT MEMORY)
6	P206 20LG/LB (ADJUSTABLE PEDALS EXCEPT MEMORY)
7	-
8	A72 20RD/OR (ADJUSTABLE PEDALS EXCEPT MEMORY)



**C314**

C314 - LT. GRAY (BODY SIDE)

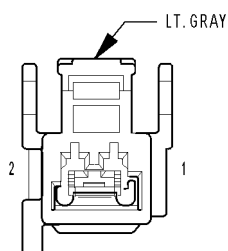
CAV	CIRCUIT
1	A916 14RD
2	Z911 14BK/WT
3	P188 20LG/VT (HEATED SEAT)
4	-
5	-
6	-
7	-
8	-



**C314**

C314 - LT. GRAY (PASSENGER SEAT SIDE)

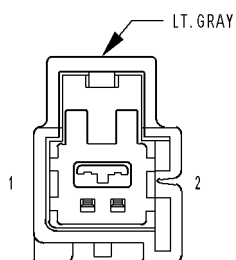
CAV	CIRCUIT
1	A916 14RD
2	Z911 14BK/WT (BASE)
2	Z911 16BK/WT (HEATED SEAT)
3	P188 20LG/VT (HEATED SEAT)
4	-
5	-
6	-
7	-
8	-



**C315  
(BASE)**

C315 (BASE) - LT. GRAY (DRIVER SEAT BACK JUMPER SIDE)

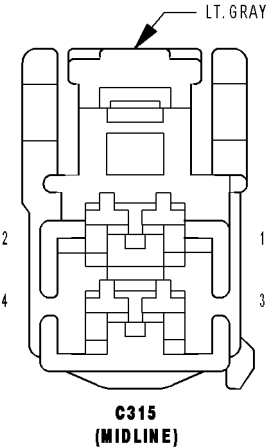
CAV	CIRCUIT
1	P41 18LG/GY
2	P43 18LG/VT



**C315  
(BASE)**

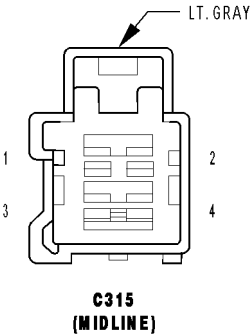
C315 (BASE) - LT. GRAY (DRIVER SEAT SIDE)

CAV	CIRCUIT
1	P41 18LG/GY
2	P43 18LG/VT



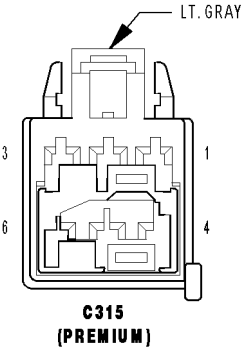
C315 (MIDLINE) - LT. GRAY (DRIVER SEAT  
BACK JUMPER SIDE)

CAV	CIRCUIT
1	P41 18LG/GY (HEATED SEAT)
1	P141 18LG/BR (MEMORY)
2	P43 18LG/VT (HEATED SEAT)
2	P143 18LG/GY (MEMORY)
3	P187 20LG/BR (HEATED SEAT)
3	G493 20OR/VT (MEMORY)
4	Z912 20BK/OR (HEATED SEAT)
4	G403 20VT/OR (MEMORY)



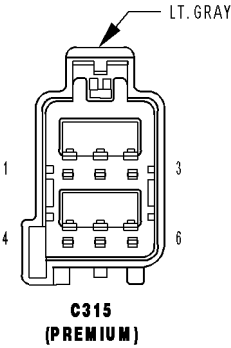
C315 (MIDLINE) - LT. GRAY (DRIVER SEAT  
SIDE)

CAV	CIRCUIT
1	P41 18LG/GY (HEATED SEAT)
1	P141 18LG/BR (MEMORY)
2	P43 18LG/VT (HEATED SEAT)
2	P143 18LG/GY (MEMORY)
3	P187 20LG/BR (HEATED SEAT)
3	G493 20OR/VT (MEMORY)
4	Z912 20BK/OR (HEATED SEAT)
4	G403 20VT/OR (MEMORY)



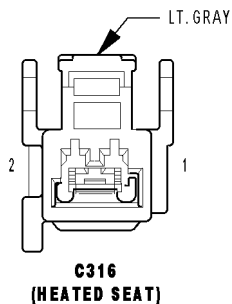
C315 (PREMIUM) - LT. GRAY (DRIVER SEAT  
BACK JUMPER SIDE)

CAV	CIRCUIT
1	P141 18LG/BR
2	P143 18LG/GY
3	G493 20OR/VT
4	G403 20VT/OR
5	P187 20LG/BR
6	Z912 20BK/OR



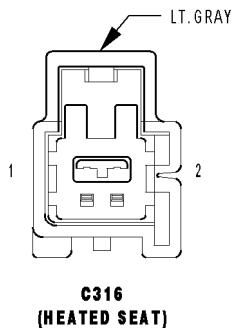
C315 (PREMIUM) - LT. GRAY (DRIVER SEAT  
SIDE)

CAV	CIRCUIT
1	P141 18LG/BR
2	P143 18LG/GY
3	G493 20OR/VT
4	G403 20VT/OR
5	P187 20LG/BR
6	Z912 20BK/OR



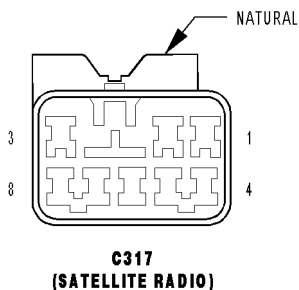
C316 (HEATED SEAT) - LT. GRAY (PASSENGER SEAT BACK JUMPER SIDE)

CAV	CIRCUIT
1	P188 20LG/VT
2	Z911 20BK/WT



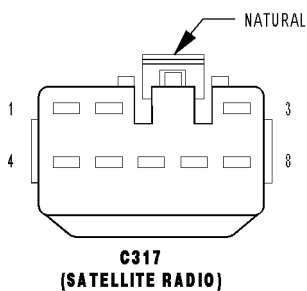
C316 (HEATED SEAT) - LT. GRAY (PASSENGER SEAT SIDE)

CAV	CIRCUIT
1	P188 20LG/VT
2	Z911 20BK/WT



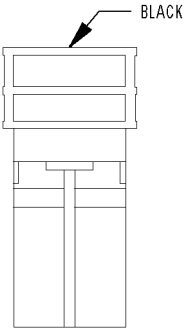
C317 (SATELLITE RADIO) - NATURAL (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
1	X16 20DG/YL
2	X17 20DG/OR
3	X917 20DG
4	D54 20WT
5	D55 20WT/OR
6	A300 16GY/LG
7	Z909 16BK/LG
8	-



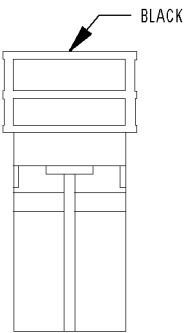
C317 (SATELLITE RADIO) - NATURAL (SATELLITE RADIO JUMPER SIDE)

CAV	CIRCUIT
1	X16 20DG/YL
2	X17 20DG/OR
3	X917 20DG
4	D54 20WT
5	D55 20WT/OR
6	A300 18GY/LG
7	Z909 18BK/LG
8	-



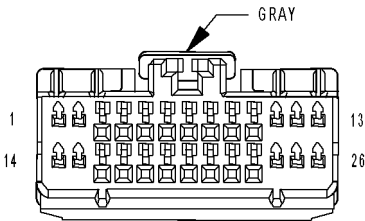
CAPACITOR-  
IGNITION  
COIL-NO. 1

CAPACITOR-IGNITION COIL-NO. 1 - BLACK 1 WAY		
CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2



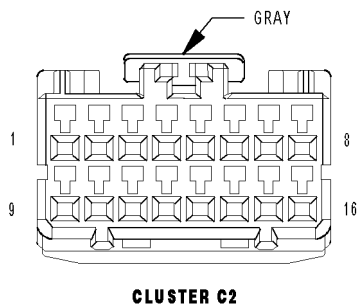
CAPACITOR-  
IGNITION  
COIL-NO. 2  
(2.7L/5.7L)

CAPACITOR-IGNITION COIL-NO. 2 (2.7L/5.7L) - BLACK 1 WAY		
CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2



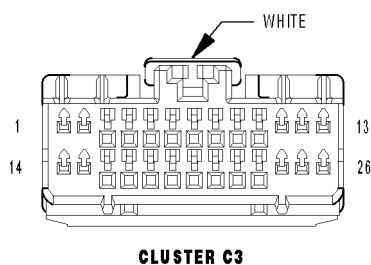
CLUSTER C1

CLUSTER C1 - GRAY 26 WAY		
CAV	CIRCUIT	FUNCTION
1	-	-
2	Z910 18BK/TN	GROUND
3	L307 20WT/BR	HEADLAMP SWITCH MUX
4	E2 20OR/BR	PANEL LAMPS DIMMER SIGNAL
5	G161 20VT/DG	DRIVER DOOR LOCK SWITCH MUX
6	G160 20VT/LG	PASSENGER DOOR LOCK SWITCH MUX
7	-	-
8	-	-
9	G76 20VT/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
10	G77 20VT/GY	LEFT REAR DOOR AJAR SWITCH SENSE
11	P1 20TN/LG	DRIVER DOOR UNLOCK DRIVER
12	P393 20LG	DOOR LOCK DRIVER LEFT DOORS
13	P392 20LG/DB	DOOR LOCK DRIVER RIGHT DOORS
14	Z910 16BK/TN	GROUND
15	Z910 16BK/TN	GROUND
16	D55 20WT/OR	CAN B BUS (+)
17	D54 20WT	CAN B BUS (-)
18	B25 20GY/BK	PARK BRAKE SWITCH SENSE
19	-	-
20	B27 20DG/WT	TRACTION CONTROL SWITCH SENSE
21	-	-
22	G25 20VT/TN	DECKLID/LIFTGATE RELEASE SWITCH SENSE
23	G78 22VT/OR	DECKLID/LIFTGATE AJAR SWITCH SENSE
24	A110 16OR/RD	FUSED B(+)
25	A110 16OR/RD	FUSED B(+)
26	P303 20TN	PASSENGER DOORS UNLOCK DRIVER



CLUSTER C2 - GRAY 16 WAY

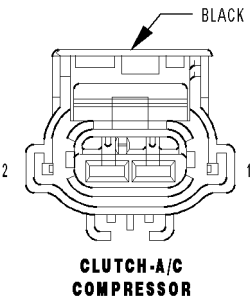
CAV	CIRCUIT	FUNCTION
1	N5 20DB/WT	FUEL LEVEL SENSOR NO. 2 SIGNAL
2	N4 20DB/WT	FUEL LEVEL SENSOR NO. 1 SIGNAL
3	R57 20LG/GY	DRIVER SEAT BELT SWITCH SENSE
4	W113 20BR/YL	REAR WIPER SWITCH MUX
5	L900 20WT/YL	HEADLAMP SWITCH MUX RETURN
6	-	-
7	P37 20LG/TN	PASSENGER DOOR LOCK SWITCH RETURN
8	G900 20VT/OR	IGNITION SWITCH SENSE RETURN
9	C105 18LB/LG (MTC)	HVAC MUX CONTROL
10	-	-
11	-	-
12	G20 20VT/BR	IGNITION SWITCH SENSE
13	G167 20VT/LB	DRIVER DOOR LOCK SWITCH RETURN
14	-	-
15	G926 20VT/WT	REAR WIPER SWITCH MUX RETURN
16	Z210 20BK	GROUND



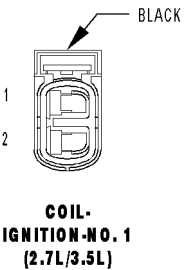
CLUSTER C3 - WHITE 26 WAY

CAV	CIRCUIT	FUNCTION
1	W213 20BR/OR	REAR WIPER INDICATOR DRIVER
2	E22 20OR/GY (ATC)	INDICATOR DIMMER SIGNAL
2	E22 18OR/GY (MTC)	INDICATOR DIMMER SIGNAL
3	G75 20VT	DRIVER DOOR AJAR SWITCH SENSE
4	-	-
5	-	-
6	-	-
7	P83 20TN/WT (HEATED SEATS)	LEFT HEATED SEAT HIGH INDICATOR DRIVER
8	-	-
9	P81 20TN/LB (HEATED SEATS)	LEFT HEATED SEAT LOW INDICATOR DRIVER
10	P84 20TN/VT (HEATED SEATS)	RIGHT HEATED SEAT HIGH INDICATOR DRIVER
11	E12 20OR/GY	PANEL LAMPS DRIVER
12	M24 18YL/WT	COURTESY LAMPS DRIVER
13	-	-
14	A23 20RD/YL	FUSED B(+) (I.O.D.)
15	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
16	G74 18VT/WT	PASSENGER DOOR AJAR SWITCH SENSE
17	-	-
18	P365 20LG/GY (HEATED SEATS)	LEFT HEATED SEAT SWITCH SENSE
19	P366 20LG/LB (HEATED SEATS)	RIGHT HEATED SEAT SWITCH SENSE
20	-	-
21	-	-
22	P82 20TN/DG (HEATED SEATS)	RIGHT HEATED SEAT LOW INDICATOR DRIVER
23	-	-
24	P31 20TN/YL	DECKLID/LIFTGATE RELEASE DRIVER
25	M27 20YL/LB	READING/RAIL LAMPS DRIVER
26	A904 16RD	FUSED B(+)

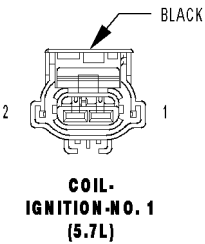




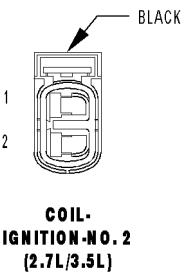
CLUTCH-A/C COMPRESSOR - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	C3 18DB/YL	A/C CLUTCH RELAY OUTPUT
2	Z904 18BK/BR	GROUND



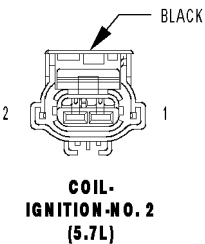
COIL-IGNITION-NO. 1 (2.7L/3.5L) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
2	K19 16DB/DG	COIL CONTROL NO. 1



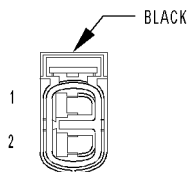
COIL-IGNITION-NO. 1 (5.7L) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
2	K19 16DB/DG	COIL CONTROL NO. 1



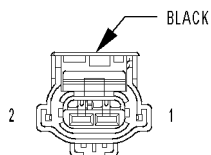
COIL-IGNITION-NO. 2 (2.7L/3.5L) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
2	K17 16DB/TN	COIL CONTROL NO. 2



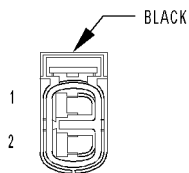
COIL-IGNITION-NO. 2 (5.7L) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
2	K17 16DB/TN	COIL CONTROL NO. 2



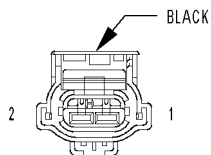
**COIL-  
IGNITION-NO. 3**  
**(2.7L/3.5L)**



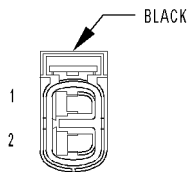
**COIL-  
IGNITION-NO. 3**  
**(5.7L)**



**COIL-  
IGNITION-NO. 4**  
**(2.7L/3.5L)**



**COIL-  
IGNITION-NO. 4**  
**(5.7L)**



**COIL-  
IGNITION-NO. 5**  
**(2.7L/3.5L)**

COIL-IGNITION-NO. 3 (2.7L/3.5L) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
2	K18 16DB/LG	COIL CONTROL NO. 3

COIL-IGNITION-NO. 3 (5.7L) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
2	K18 16DB/LG	COIL CONTROL NO. 3

COIL-IGNITION-NO. 4 (2.7L/3.5L) - BLACK 2 WAY

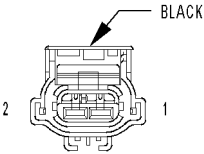
CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
2	K15 16DB/GY	COIL CONTROL NO. 4

COIL-IGNITION-NO. 4 (5.7L) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
2	K15 16DB/GY	COIL CONTROL NO. 4

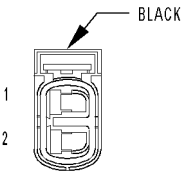
COIL-IGNITION-NO. 5 (2.7L/3.5L) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
2	K16 16DB/YL	COIL CONTROL NO. 5



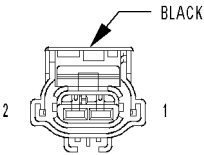
COIL-  
IGNITION-NO. 5  
(5.7L)

COIL-IGNITION-NO. 5 (5.7L) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
2	K16 16DB/YL	COIL CONTROL NO. 5



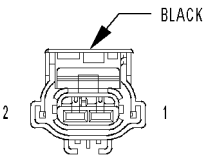
COIL-  
IGNITION-NO. 6  
(2.7L/3.5L)

COIL-IGNITION-NO. 6 (2.7L/3.5L) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
2	K10 16DB/OR	COIL CONTROL NO. 6



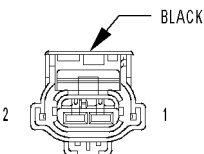
COIL-  
IGNITION-NO. 6  
(5.7L)

COIL-IGNITION-NO. 6 (5.7L) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
2	K10 16DB/OR	COIL CONTROL NO. 6



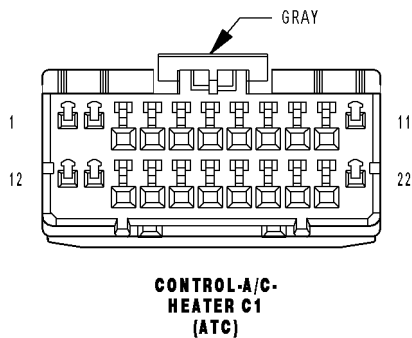
COIL-  
IGNITION-NO. 7  
(5.7L)

COIL-IGNITION-NO. 7 (5.7L) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
2	K97 16DB/YL	COIL CONTROL NO. 7



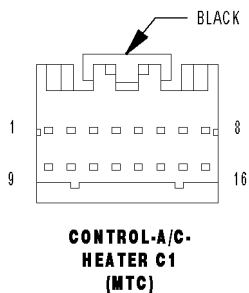
COIL-  
IGNITION-NO. 8  
(5.7L)

COIL-IGNITION-NO. 8 (5.7L) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2
2	K98 16DB/YL	COIL CONTROL NO. 8



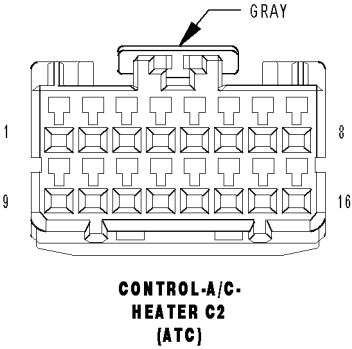
CONTROL-A/C-HEATER C1 (ATC) - GRAY 22 WAY

CAV	CIRCUIT	FUNCTION
1	F500 20DG/PK	FUSED RUN RELAY OUTPUT
2	A23 20RD/YL	FUSED B(+) (I.O.D.)
3	Z909 20BK/LG	GROUND
4	D54 20WT	CAN B BUS (-)
5	D55 20WT/OR	CAN B BUS (+)
6	C115 20DB	REAR WINDOW DEFOGGER RELAY CONTROL
7	E12 20OR/GY	PANEL LAMPS DRIVER
8	G39 20VT/LB	SUN SENSOR NO. 1 SIGNAL
9	G139 20VT/OR	SUN SENSOR NO. 2 SIGNAL
10	L24 20WT/VT	AUTO HEADLAMPS SIGNAL
11	G939 20VT/DB	SUN SENSOR RETURN
12	-	-
13	-	-
14	-	-
15	-	-
16	-	-
17	-	-
18	-	-
19	-	-
20	-	-
21	-	-
22	-	-



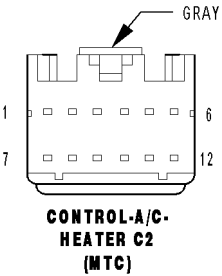
CONTROL-A/C-HEATER C1 (MTC) - BLACK 16 WAY

CAV	CIRCUIT	FUNCTION
1	F23 20RD/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	A23 20RD/YL	FUSED B(+) (I.O.D.)
3	Z909 20BK/LG	GROUND
4	C105 18LB/LG	HVAC MUX CONTROL
5	C115 20DB	REAR WINDOW DEFOGGER RELAY CONTROL
6	C850 20LB/VT	BLOWER SWITCH POSITION SIGNAL
7	E12 20OR/GY	PANEL LAMPS DRIVER
8	-	-
9	E22 18OR/GY	INDICATOR DIMMER SIGNAL
10	-	-
11	-	-
12	-	-
13	-	-
14	-	-
15	-	-
16	-	-



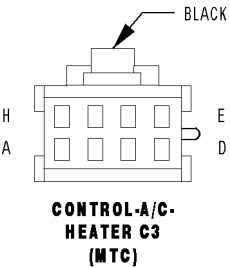
CONTROL-A/C-HEATER C2 (ATC) - GRAY 16 WAY

CAV	CIRCUIT	FUNCTION
1	C266 20OR/DB	MODE DOOR DRIVER (B)
2	C66 20DB/OR	MODE DOOR DRIVER (A)
3	-	-
4	-	-
5	C255 22WT/DB	LEFT BLEND DOOR DRIVER (B)
6	C55 20DB/WT	LEFT BLEND DOOR DRIVER (A)
7	C252 22LG/DB	RIGHT BLEND DOOR DRIVER (B)
8	C52 22DB/LG	RIGHT BLEND DOOR DRIVER (A)
9	C268 22YL/DB	RECIRCULATION DOOR DRIVER (B)
10	C68 22DB/YL	RECIRCULATION DOOR DRIVER (A)
11	C21 20DB/LG	EVAPORATOR TEMPERATURE SENSOR SIGNAL
12	C121 20DB/DG	SENSOR GROUND
13	C56 20DB/LB	FRONT BLOWER CONTROL
14	-	-
15	-	-
16	-	-



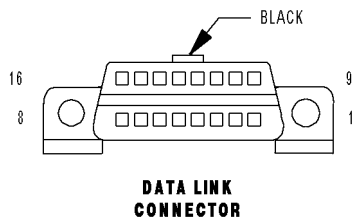
CONTROL-A/C-HEATER C2 (MTC) - GRAY 12 WAY

CAV	CIRCUIT	FUNCTION
1	C266 20OR/DB	MODE DOOR DRIVER (B)
2	C66 20DB/OR	MODE DOOR DRIVER (A)
3	-	-
4	-	-
5	C255 22WT/DB	LEFT BLEND DOOR DRIVER (B)
6	C55 20DB/WT	LEFT BLEND DOOR DRIVER (A)
7	C268 20YL/DB	RECIRCULATION DOOR DRIVER (B)
8	C68 22DB/YL	RECIRCULATION DOOR DRIVER (A)
9	C21 20DB/LG	EVAPORATOR TEMPERATURE SENSOR SIGNAL
10	C121 20DB/DG	SENSOR GROUND
11	-	-
12	-	-



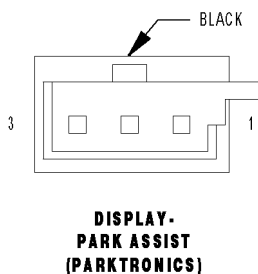
CONTROL-A/C-HEATER C3 (MTC) - BLACK 8 WAY

CAV	CIRCUIT	FUNCTION
A	C850 20LB/VT	BLOWER SWITCH POSITION SIGNAL
B	Z908 12BK/RD	GROUND
C	-	-
D	-	-
E	C70 12DB/YL	FRONT BLOWER HIGH SPEED
F	C73 12DB/VT	FRONT BLOWER M2 SPEED
G	C72 18DB/OR	FRONT BLOWER M1 SPEED
H	C71 16DB/BR	FRONT BLOWER LOW SPEED



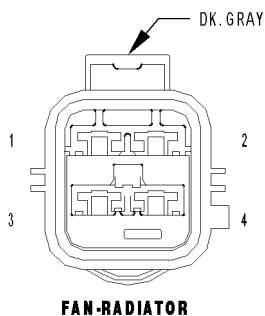
DATA LINK CONNECTOR - BLACK 16 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	Z910 20BK/TN	GROUND
5	Z910 20BK/TN	GROUND
6	D72 20WT/LB	CAN C DIAGNOSTIC (+)
7	D21 20PK	SCI TRANSMIT (PCM)
8	-	-
9	D16 20WT/OR	SCI RECEIVE (TCM)
10	D24 20WT/DG (ABS)	FLASH ABS
11	-	-
12	D20 20LG	SCI RECEIVE (PCM)
13	-	-
14	D71 20WT/DB	CAN C DIAGNOSTIC (-)
15	D15 20WT/DG	SCI TRANSMIT (TCM)
16	A106 20LB/RD	FUSED B(+)



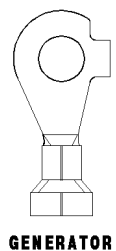
DISPLAY-PARK ASSIST (PARKTRONICS) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	X777 20DG/GY	PARK ASSIST DISPLAY SUPPLY
2	Z171 20GY/BK	PARK ASSIST DISPLAY GROUND
3	D777 20WT/DG	PARK ASSIST DISPLAY SIGNAL



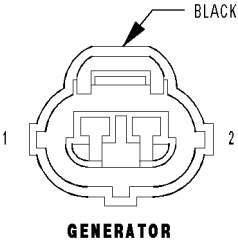
FAN-RADIATOR - DK. GRAY 4 WAY

CAV	CIRCUIT	FUNCTION
1	N24 12DG/DB	RADIATOR FAN CONTROL RELAY OUTPUT
2	N210 12DB/DG	RADIATOR FAN HIGH/LOW CONTROL FEED
3	N23 10DB/DG	RADIATOR FAN HIGH RELAY OUTPUT
4	Z904 12BK/BR	GROUND

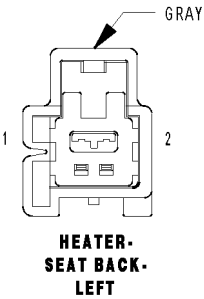


GENERATOR - 1 WAY

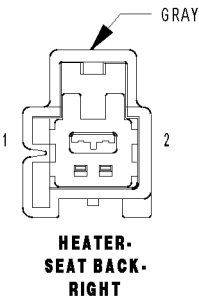
CAV	CIRCUIT	FUNCTION
1	A802 4RD	B(+)



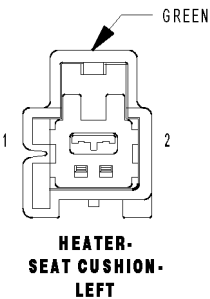
GENERATOR - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z904 18BK/BR	GROUND
2	K20 18BR/GY	GEN FIELD CONTROL



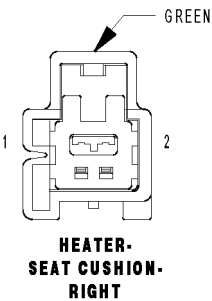
HEATER-SEAT BACK-LEFT - GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	P187 20LG/BR	LEFT SEAT HEATER B(+) DRIVER
2	Z912 20BK/OR	GROUND



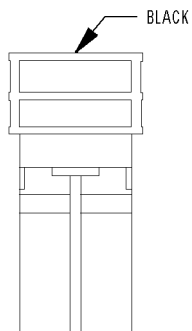
HEATER-SEAT BACK-RIGHT - GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	P188 20LG/VT	RIGHT SEAT HEATER B(+) DRIVER
2	Z911 20BK/WT	GROUND



HEATER-SEAT CUSHION-LEFT - GREEN 2 WAY		
CAV	CIRCUIT	FUNCTION
1	P187 20LG/BR	LEFT SEAT HEATER B(+) DRIVER
2	Z912 20BK/OR	GROUND



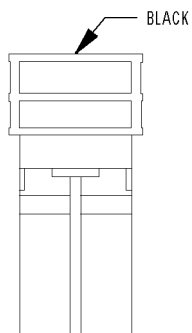
HEATER-SEAT CUSHION-RIGHT - GREEN 2 WAY		
CAV	CIRCUIT	FUNCTION
1	P188 20LG/VT	RIGHT SEAT HEATER B(+) DRIVER
2	Z911 20BK/WT	GROUND



**HORN-NO. 1**

HORN-NO. 1 - BLACK 1 WAY

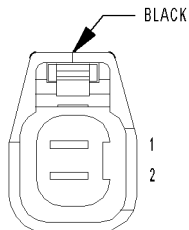
CAV	CIRCUIT	FUNCTION
1	X2 18DG/OR	HORN RELAY OUTPUT



**HORN-NO. 2**

HORN-NO. 2 - BLACK 1 WAY

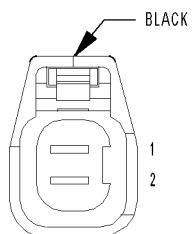
CAV	CIRCUIT	FUNCTION
1	X2 18DG/OR	HORN RELAY OUTPUT



**INJECTOR-FUEL-NO. 1**

INJECTOR-FUEL-NO. 1 - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K11 20BR/YL	INJECTOR CONTROL NO. 1
2	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2

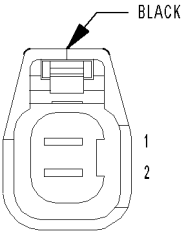


**INJECTOR-FUEL-NO. 2**

INJECTOR-FUEL-NO. 2 - BLACK 2 WAY

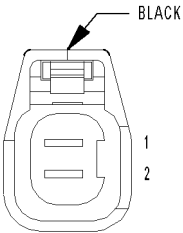
CAV	CIRCUIT	FUNCTION
1	K12 20BR/DB	INJECTOR CONTROL NO. 2
2	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2





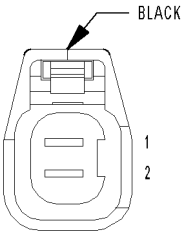
INJECTOR-FUEL-NO. 3

INJECTOR-FUEL-NO. 3 - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K13 20BR/LB	INJECTOR CONTROL NO. 3
2	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2



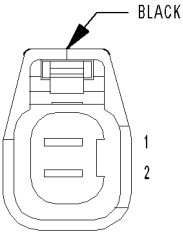
INJECTOR-FUEL-NO. 4

INJECTOR-FUEL-NO. 4 - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K14 20BR/TN	INJECTOR CONTROL NO. 4
2	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2



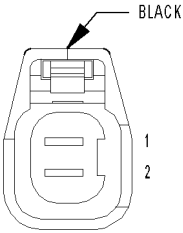
INJECTOR-FUEL-NO. 5

INJECTOR-FUEL-NO. 5 - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K38 20BR/OR	INJECTOR CONTROL NO. 5
2	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2



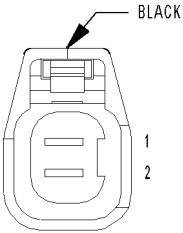
INJECTOR-FUEL-NO. 6

INJECTOR-FUEL-NO. 6 - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K58 20BR/VT	INJECTOR CONTROL NO. 6
2	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2



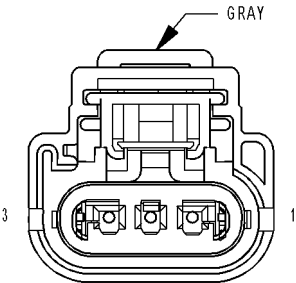
INJECTOR-FUEL-NO. 7 (5.7L)

INJECTOR-FUEL-NO. 7 (5.7L) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K26 20BR/YL	INJECTOR CONTROL NO. 7
2	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2



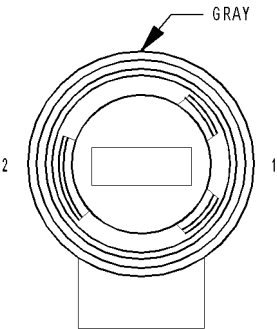
INJECTOR-  
FUEL-NO. 8  
(5.7L)

INJECTOR-FUEL-NO. 8 (5.7L) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K28 20BR/LB	INJECTOR CONTROL NO. 8
2	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2



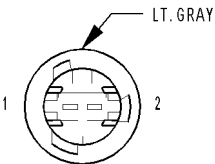
LAMP-  
BACK-UP-  
LEFT  
(300C)

LAMP-BACK-UP-LEFT (300C) - GRAY 3 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 20BK/GY	GROUND
2	-	-
3	L1 20WT/LG	BACK-UP LAMP FEED



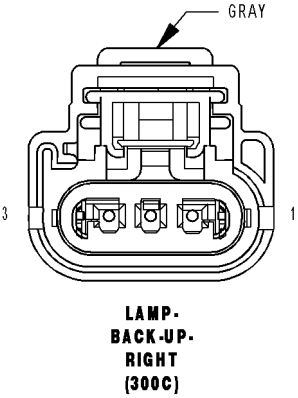
LAMP-  
BACK-UP-  
LEFT  
(300T)

LAMP-BACK-UP-LEFT (300T) - GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L1 18WT/LG	BACK-UP LAMP FEED

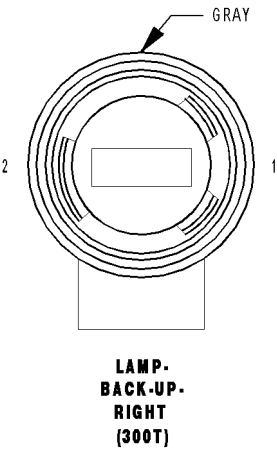


LAMP-  
BACK-UP-  
LEFT  
(DODGE)

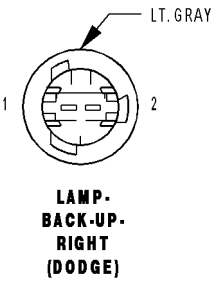
LAMP-BACK-UP-LEFT (DODGE) - LT. GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 20BK	GROUND
2	L1 20VT/RD	BACK-UP LAMP FEED



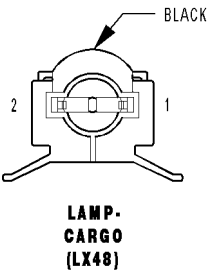
LAMP-BACK-UP-RIGHT (300C) - GRAY 3 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 20BK/GY	GROUND
2	-	-
3	L1 20WT/LG	BACK-UP LAMP FEED



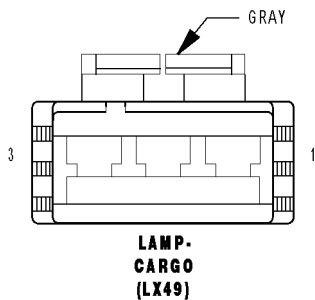
LAMP-BACK-UP-RIGHT (300T) - GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L1 18WT/LG	BACK-UP LAMP FEED



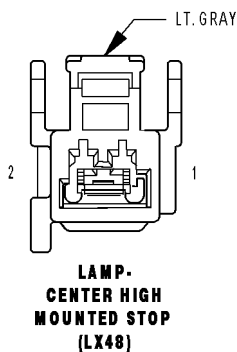
LAMP-BACK-UP-RIGHT (DODGE) - LT. GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 20BK	GROUND
2	L1 20VT/RD	BACK-UP LAMP FEED



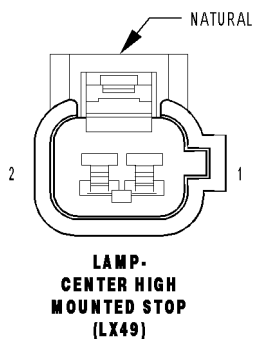
LAMP-CARGO (LX48) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	G78 20VT/OR	DECKLID/LIFTGATE AJAR SWITCH SENSE
2	A117 20RD/DG	FUSED B(+) (I.O.D.)



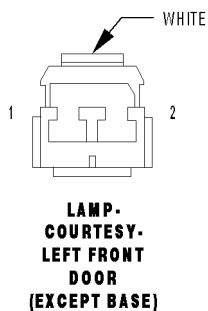
LAMP-CARGO (LX49) - GRAY 3 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 20BK/GY	GROUND
2	-	-
3	M24 20YL/WT	COURTESY LAMPS DRIVER



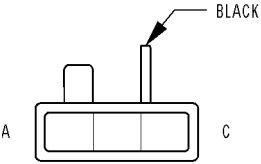
LAMP-CENTER HIGH MOUNTED STOP (LX48) - LT. GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z911 20BK/WT	GROUND
2	L53 20DG/WT	STOP LAMP INHIBIT RELAY OUTPUT



LAMP-CENTER HIGH MOUNTED STOP (LX49) - NATURAL 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z911 20BK/WT	GROUND
2	L53 20DG/WT	STOP LAMP INHIBIT RELAY OUTPUT

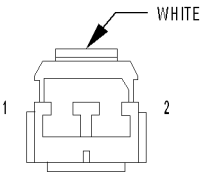


LAMP-COURTESY-LEFT FRONT DOOR (EXCEPT BASE) - WHITE 2 WAY		
CAV	CIRCUIT	FUNCTION
1	M24 20YL/WT	COURTESY LAMPS DRIVER
2	Z912 20BK/OR	GROUND



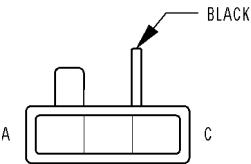
LAMP-  
COURTESY-  
LEFT REAR

LAMP-COURTESY-LEFT REAR - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
A	M24 20YL/WT	COURTESY LAMPS DRIVER
B	Z909 20BK/LG	GROUND
C	M27 20YL/LB	READING/RAIL LAMPS DRIVER



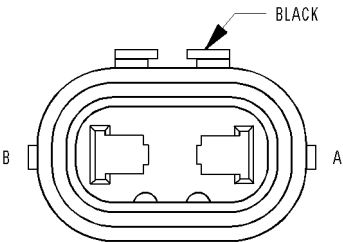
LAMP-  
COURTESY-  
RIGHT FRONT  
DOOR  
(EXCEPT BASE)

LAMP-COURTESY-RIGHT FRONT DOOR (EXCEPT BASE) - WHITE 2 WAY		
CAV	CIRCUIT	FUNCTION
1	M24 20YL/WT	COURTESY LAMPS DRIVER
2	Z911 20BK/WT	GROUND



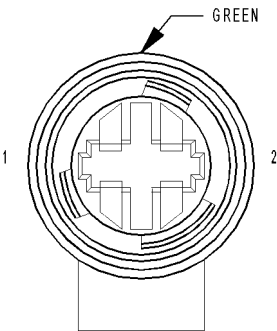
LAMP-  
COURTESY-  
RIGHT REAR

LAMP-COURTESY-RIGHT REAR - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
A	M24 20YL/WT	COURTESY LAMPS DRIVER
B	Z909 20BK/LG	GROUND
C	M27 20YL/LB	READING/RAIL LAMPS DRIVER



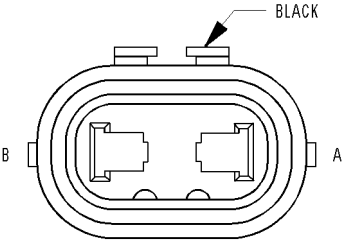
LAMP-FOG-  
LEFT FRONT

LAMP-FOG-LEFT FRONT - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
A	L89 20WT/YL (LX48 EXCEPT BASE)	FRONT FOG LAMP RELAY OUTPUT
A	L89 18WT/YL (LX49)	FRONT FOG LAMP RELAY OUTPUT
B	Z902 20BK/BR (LX48 EXCEPT BASE)	GROUND
B	Z902 18BK/LB (LX49)	GROUND



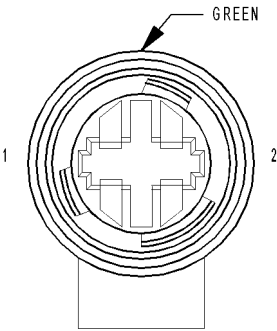
LAMP-FOG-  
LEFT REAR  
(300C EXPORT)

LAMP-FOG-LEFT REAR (300C EXPORT) - GREEN 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L90 18WT/OR	REAR FOG LAMP RELAY OUTPUT



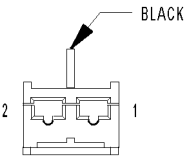
LAMP-FOG-  
RIGHT FRONT

LAMP-FOG-RIGHT FRONT - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
A	L89 20WT/YL (LX48 EXCEPT BASE)	FRONT FOG LAMP RELAY OUTPUT
A	L89 18WT/YL (LX49)	FRONT FOG LAMP RELAY OUTPUT
B	Z901 20BK/TN (LX48 EXCEPT BASE)	GROUND
B	Z901 18BK/DG (LX49)	GROUND



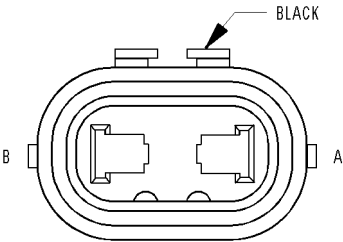
LAMP-FOG-  
RIGHT REAR  
(300C EXPORT)

LAMP-FOG-RIGHT REAR (300C EXPORT) - GREEN 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L90 18WT/OR	REAR FOG LAMP RELAY OUTPUT



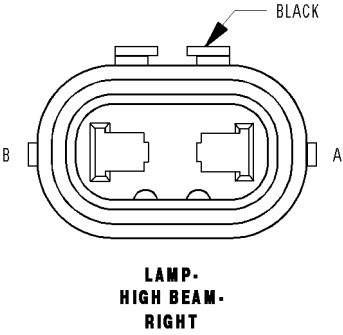
LAMP-  
GLOVE BOX

LAMP-GLOVE BOX - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z909 20BK/LG	GROUND
2	M27 20YL/LB	READING/RAIL LAMPS DRIVER

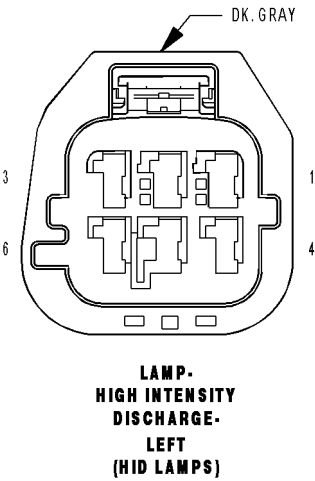


LAMP-  
HIGH BEAM-  
LEFT

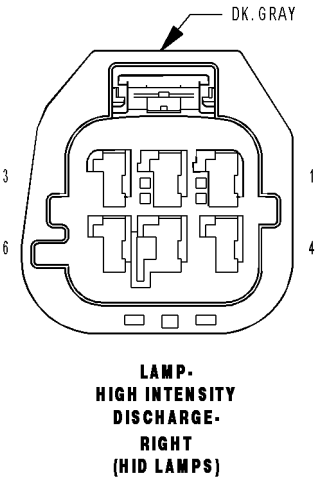
LAMP-HIGH BEAM-LEFT - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
A	L33 18WT/LG	LEFT HIGH BEAM DRIVER
B	Z902 18BK/LB	GROUND



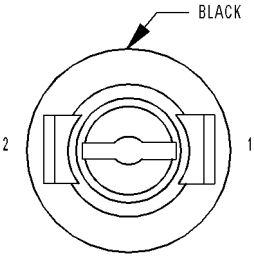
LAMP-HIGH BEAM-RIGHT - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
A	L34 18WT/GY	RIGHT HIGH BEAM DRIVER
B	Z901 18BK/DG	GROUND



LAMP-HIGH INTENSITY DISCHARGE-LEFT (HID LAMPS) - DK. GRAY 6 WAY		
CAV	CIRCUIT	FUNCTION
1	L303 18WT/OR	LEFT HID LAMP DRIVER
2	D205 20WT/DB (EXPORT)	SCI RECEIVE (LEFT HID LAMP)
3	Z902 18BK/LB	GROUND
4	F500 20DG/PK (EXPORT)	FUSED RUN RELAY OUTPUT
5	-	-
6	L13 20WT/YL (EXPORT)	HEADLAMP LEVEL SENSOR SIGNAL

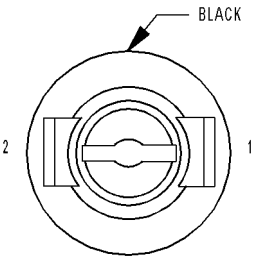


LAMP-HIGH INTENSITY DISCHARGE-RIGHT (HID LAMPS) - DK. GRAY 6 WAY		
CAV	CIRCUIT	FUNCTION
1	L304 18OR/WT	RIGHT HID LAMP DRIVER
2	D211 20WT/RD (EXPORT)	SCI RECEIVE (RIGHT HID LAMP)
3	Z901 18BK/DG	GROUND
4	F500 20DG/PK (EXPORT)	FUSED RUN RELAY OUTPUT
5	-	-
6	L13 20WT/YL (EXPORT)	HEADLAMP LEVEL SENSOR SIGNAL



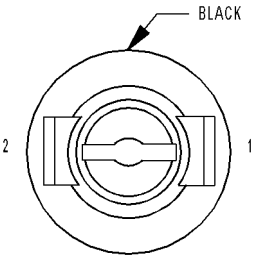
LAMP-  
LICENSE  
(EXCEPT 300C/  
EXPORT)

LAMP-LICENSE (EXCEPT 300C/EXPORT) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	L777 20WT/VT	PARK LAMP RELAY OUTPUT
2	Z914 20BK/BR	GROUND



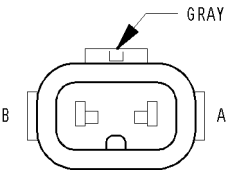
LAMP-  
LICENSE-  
LEFT  
(300C/  
EXPORT)

LAMP-LICENSE-LEFT (300C/EXPORT) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	L777 20WT/VT	PARK LAMP RELAY OUTPUT
2	Z914 20BK/BR	GROUND



LAMP-  
LICENSE-  
RIGHT  
(300C/  
EXPORT)

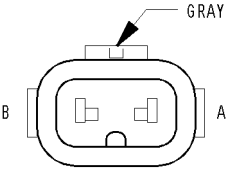
LAMP-LICENSE-RIGHT (300C/EXPORT) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	L777 20WT/VT	PARK LAMP RELAY OUTPUT
2	Z914 20BK/BR	GROUND



LAMP-LOW  
BEAM-  
LEFT  
(EXCEPT HID LAMPS)

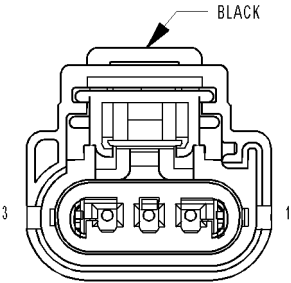
LAMP-LOW BEAM-LEFT (EXCEPT HID LAMPS) - GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
A	L43 18WT/DB	LEFT LOW BEAM DRIVER
B	Z902 18BK/LB	GROUND





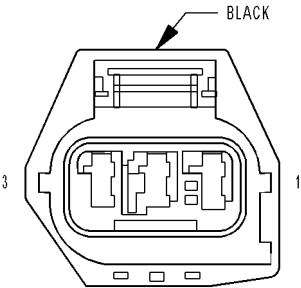
LAMP-LOW  
BEAM-  
RIGHT  
(EXCEPT HID LAMPS)

LAMP-LOW BEAM-RIGHT (EXCEPT HID LAMPS) - GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
A	L44 18WT/TN	RIGHT LOW BEAM DRIVER
B	Z901 18BK/DG	GROUND



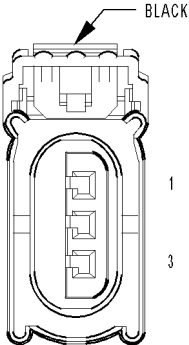
LAMP-  
PARK/  
TURN-  
LEFT FRONT  
(300C EXCEPT EXPORT)

LAMP-PARK/TURN-LEFT FRONT (300C EXCEPT EXPORT) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	Z902 18BK/LB	GROUND
2	L777 20WT/VT	PARK LAMP RELAY OUTPUT
3	L61 18WT/LG	LEFT FRONT TURN SIGNAL CONTROL



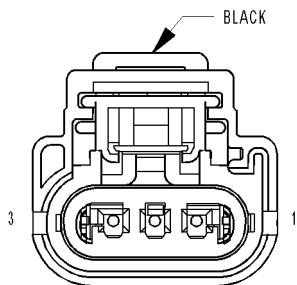
LAMP-  
PARK/  
TURN-  
LEFT FRONT  
(300T/  
EXPORT)

LAMP-PARK/TURN-LEFT FRONT (300T/EXPORT) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	Z902 18BK/LB	GROUND
2	L777 20WT/VT	PARK LAMP RELAY OUTPUT
3	L61 18WT/LG	LEFT FRONT TURN SIGNAL CONTROL



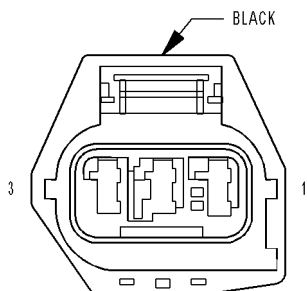
LAMP-  
PARK/  
TURN-  
LEFT FRONT  
(DODGE)

LAMP-PARK/TURN-LEFT FRONT (DODGE) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	L61 18WT/LG	LEFT FRONT TURN SIGNAL CONTROL
2	L777 20WT/VT	PARK LAMP RELAY OUTPUT
3	Z902 18BK/LB	GROUND



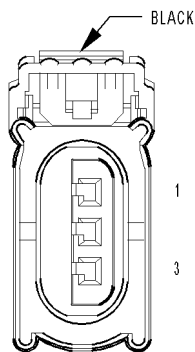
**LAMP-  
PARK/  
TURN-  
RIGHT FRONT  
(300C EXCEPT EXPORT)**

LAMP-PARK/TURN-RIGHT FRONT (300C EXCEPT EXPORT) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	Z901 18BK/DG	GROUND
2	L777 20WT/VT	PARK LAMP RELAY OUTPUT
3	L60 18WT/TN	RIGHT FRONT TURN SIGNAL CONTROL



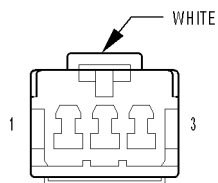
**LAMP-  
PARK/  
TURN-  
RIGHT FRONT  
(300T/  
EXPORT)**

LAMP-PARK/TURN-RIGHT FRONT (300T/EXPORT) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	Z901 18BK/DG	GROUND
2	L777 20WT/VT	PARK LAMP RELAY OUTPUT
3	L60 18WT/TN	RIGHT FRONT TURN SIGNAL CONTROL



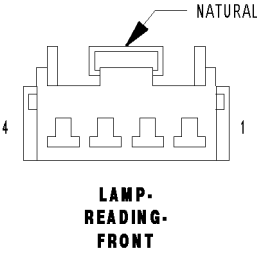
**LAMP-  
PARK/  
TURN-  
RIGHT FRONT  
(DODGE)**

LAMP-PARK/TURN-RIGHT FRONT (DODGE) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	L60 18WT/TN	RIGHT FRONT TURN SIGNAL CONTROL
2	L777 20WT/VT	PARK LAMP RELAY OUTPUT
3	Z901 18BK/DG	GROUND

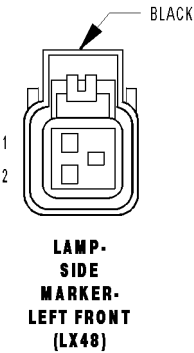


**LAMP-  
PRNDL**

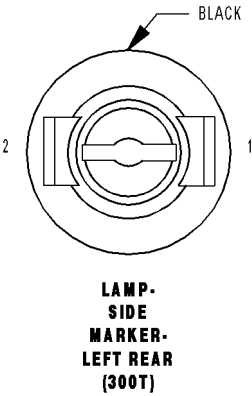
LAMP-PRNDL - WHITE 3 WAY		
CAV	CIRCUIT	FUNCTION
1	E12 20OR/GY	PANEL LAMPS DRIVER
2	-	-
3	Z912 20BK/OR	GROUND



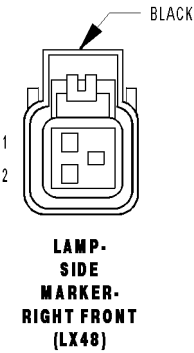
LAMP-READING-FRONT - NATURAL 4 WAY		
CAV	CIRCUIT	FUNCTION
1	-	-
2	M24 20YL/WT	COURTESY LAMPS DRIVER
3	M27 20YL/LB	READING/RAIL LAMPS DRIVER
4	Z909 20BK/LG	GROUND



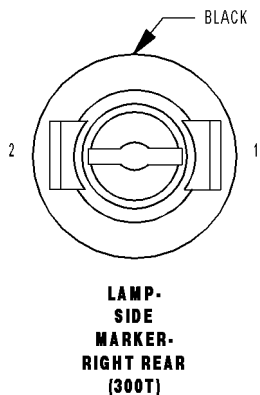
LAMP-SIDE MARKER-LEFT FRONT (LX48) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	L777 20WT/VT	PARK LAMP RELAY OUTPUT
2	Z902 20BK/BR	GROUND



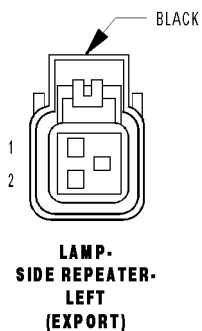
LAMP-SIDE MARKER-LEFT REAR (300T) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L777 18WT/VT	PARK LAMP RELAY OUTPUT



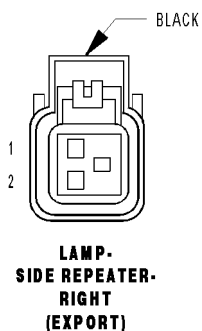
LAMP-SIDE MARKER-RIGHT FRONT (LX48) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	L777 20WT/VT	PARK LAMP RELAY OUTPUT
2	Z901 20BK/TN	GROUND



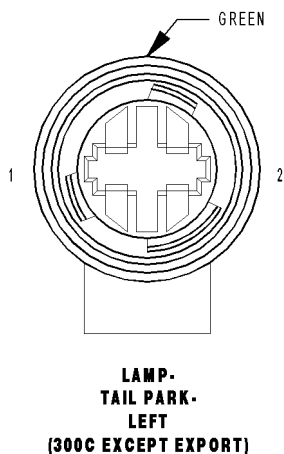
LAMP-SIDE MARKER-RIGHT REAR (300T) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L777 18WT/VT	PARK LAMP RELAY OUTPUT



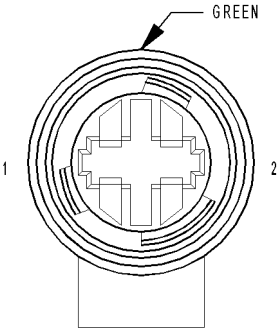
LAMP-SIDE REPEATER-LEFT (EXPORT) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	L61 18WT/LG	LEFT FRONT TURN SIGNAL CONTROL
2	Z902 20BK/LB	GROUND



LAMP-SIDE REPEATER-RIGHT (EXPORT) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	L60 18WT/TN	RIGHT FRONT TURN SIGNAL CONTROL
2	Z904 20BK/BR	GROUND

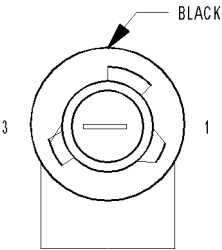


LAMP-TAIL PARK-LEFT (300C EXCEPT EXPORT) - GREEN 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L777 18WT/VT	PARK LAMP RELAY OUTPUT



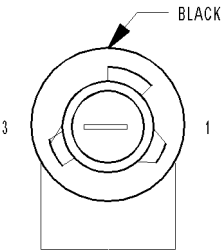
LAMP-TAIL PARK-RIGHT  
(300C EXCEPT EXPORT)

LAMP-TAIL PARK-RIGHT (300C EXCEPT EXPORT) - GREEN 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L777 18WT/VT	PARK LAMP RELAY OUTPUT



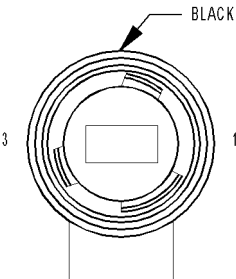
LAMP-TAIL STOP/  
PARK-LEFT  
(300C)

LAMP-TAIL STOP/PARK-LEFT (300C) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L777 18WT/VT	PARK LAMP RELAY OUTPUT
3	L53 18DG/WT	STOP LAMP INHIBIT RELAY OUTPUT



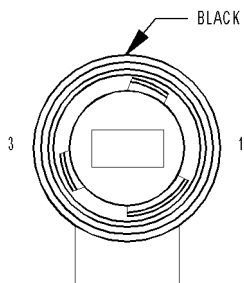
LAMP-TAIL STOP/  
PARK-RIGHT  
(300C)

LAMP-TAIL STOP/PARK-RIGHT (300C) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L777 18WT/VT	PARK LAMP RELAY OUTPUT
3	L53 18DG/WT	STOP LAMP INHIBIT RELAY OUTPUT



LAMP-TAIL STOP/  
TURN-LEFT  
(300T)

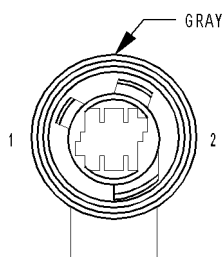
LAMP-TAIL STOP/TURN-LEFT (300T) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L777 18WT/VT	PARK LAMP RELAY OUTPUT
3	L63 18WT/DG	LEFT REAR TURN SIGNAL CONTROL



**LAMP-TAIL STOP/TURN-RIGHT (300T)**

LAMP-TAIL STOP/TURN-RIGHT (300T) - BLACK 3 WAY

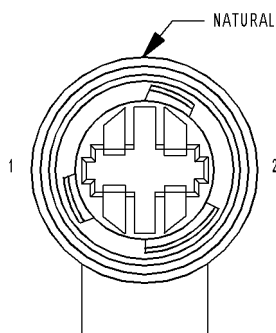
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L777 18WT/VT	PARK LAMP RELAY OUTPUT
3	L62 18WT/YL	RIGHT REAR TURN SIGNAL CONTROL



**LAMP-TAIL TURN-LEFT (300C EXCEPT EXPORT)**

LAMP-TAIL TURN-LEFT (300C EXCEPT EXPORT) - GRAY 2 WAY

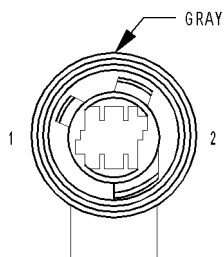
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L63 18WT/DG	LEFT REAR TURN SIGNAL CONTROL



**LAMP-TAIL TURN-LEFT (300C EXPORT)**

LAMP-TAIL TURN-LEFT (300C EXPORT) - NATURAL 2 WAY

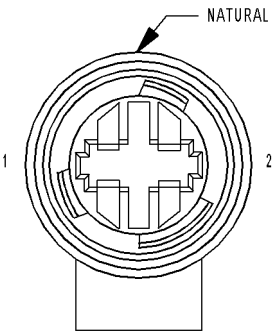
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L63 18WT/DG	LEFT REAR TURN SIGNAL CONTROL



**LAMP-TAIL TURN-RIGHT (300C EXCEPT EXPORT)**

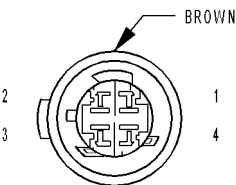
LAMP-TAIL TURN-RIGHT (300C EXCEPT EXPORT) - GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L62 18WT/YL	RIGHT REAR TURN SIGNAL CONTROL



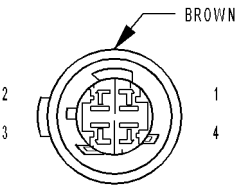
LAMP-TAIL TURN-RIGHT  
(300C EXPORT)

LAMP-TAIL TURN-RIGHT (300C EXPORT) - NATURAL 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 18BK/GY	GROUND
2	L62 18WT/YL	RIGHT REAR TURN SIGNAL CONTROL



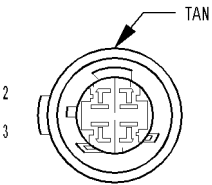
LAMP-TAIL/STOP-LEFT  
(DODGE)

LAMP-TAIL/STOP-LEFT (DODGE) - BROWN 4 WAY		
CAV	CIRCUIT	FUNCTION
1	L777 20BR	PARK LAMP RELAY OUTPUT
2	Z914 20BK	GROUND
3	Z914 20BK	GROUND
4	L53 20BR/VT	STOP LAMP INHIBIT RELAY OUTPUT



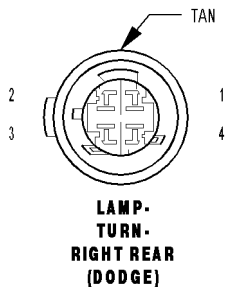
LAMP-TAIL/STOP-RIGHT  
(DODGE)

LAMP-TAIL/STOP-RIGHT (DODGE) - BROWN 4 WAY		
CAV	CIRCUIT	FUNCTION
1	L777 20BR	PARK LAMP RELAY OUTPUT
2	Z914 20BK	GROUND
3	Z914 20BK	GROUND
4	L53 20BR/VT	STOP LAMP INHIBIT RELAY OUTPUT

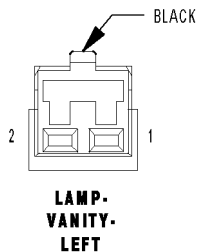


LAMP-TURN-LEFT REAR  
(DODGE)

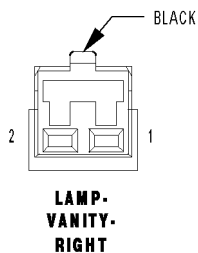
LAMP-TURN-LEFT REAR (DODGE) - TAN 4 WAY		
CAV	CIRCUIT	FUNCTION
1	-	-
2	Z914 20BK	GROUND
3	Z914 20BK	GROUND
4	L63 18RD/OR	LEFT REAR TURN SIGNAL CONTROL



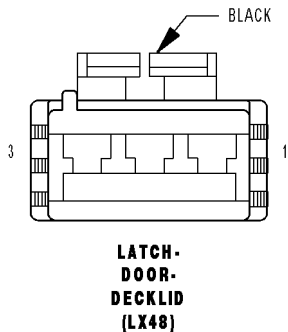
LAMP-TURN-RIGHT REAR (DODGE) - TAN 4 WAY		
CAV	CIRCUIT	FUNCTION
1	-	-
2	Z914 20BK	GROUND
3	Z914 20BK	GROUND
4	L62 18RD/OR	RIGHT REAR TURN SIGNAL CONTROL



LAMP-VANITY-LEFT - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	M27 20YL/LB	READING/RAIL LAMPS DRIVER
2	Z909 20BK/LG	GROUND

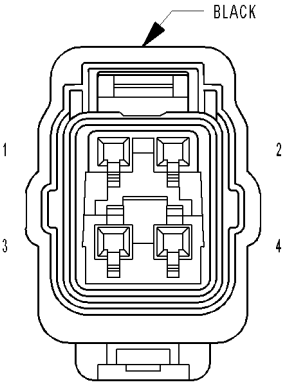


LAMP-VANITY-RIGHT - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	M27 20YL/LB	READING/RAIL LAMPS DRIVER
2	Z909 20BK/LG	GROUND



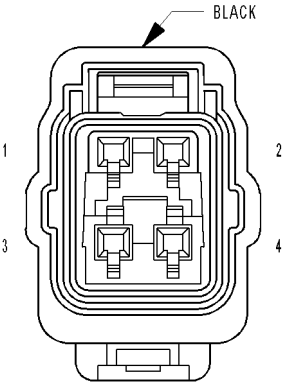
LATCH-DOOR-DECKLID (LX48) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	Z911 20BK/WT	GROUND
2	G78 20VT/OR	DECKLID/LIFTGATE AJAR SWITCH SENSE
3	P31 20TN/YL	DECKLID/LIFTGATE RELEASE DRIVER





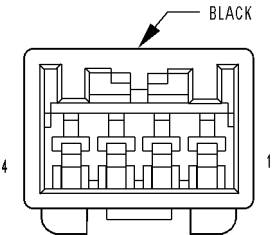
LATCH-  
DOOR-  
LEFT FRONT

LATCH-DOOR-LEFT FRONT - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	G75 20VT	DRIVER DOOR AJAR SWITCH SENSE
2	Z912 20BK/OR	GROUND
3	P1 20TN/LG	DRIVER DOOR UNLOCK DRIVER
4	P393 20LG	DOOR LOCK DRIVER LEFT DOORS



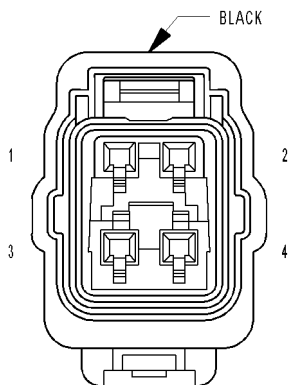
LATCH-  
DOOR-  
LEFT REAR

LATCH-DOOR-LEFT REAR - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	G77 20VT/GY	LEFT REAR DOOR AJAR SWITCH SENSE
2	Z912 20LG/BK	GROUND
3	P303 20TN	PASSENGER DOORS UNLOCK DRIVER
4	P393 20LG	DOOR LOCK DRIVER LEFT DOORS



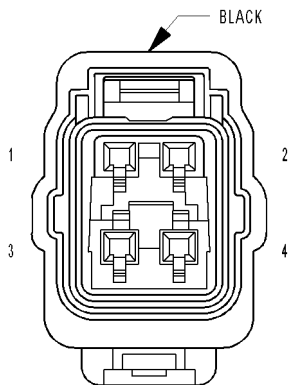
LATCH-  
DOOR-  
LIFTGATE  
(LX49)

LATCH-DOOR-LIFTGATE (LX49) - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	G78 20VT/OR	DECKLID/LIFTGATE AJAR SWITCH SENSE
2	Z914 20BK/GY	GROUND
3	Z914 20BK/GY	GROUND
4	P31 20TN/YL	DECKLID/LIFTGATE RELEASE DRIVER



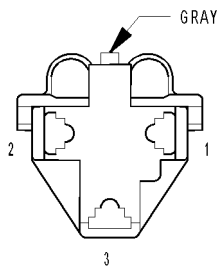
**LATCH-  
DOOR-  
RIGHT FRONT**

LATCH-DOOR-RIGHT FRONT - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	G74 20VT/WT	PASSENGER DOOR AJAR SWITCH SENSE
2	Z911 20BK/WT	GROUND
3	P303 20TN	PASSENGER DOORS UNLOCK DRIVER
4	P392 20LG/DB	DOOR LOCK DRIVER RIGHT DOORS



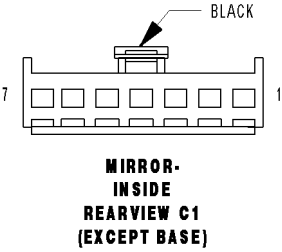
**LATCH-  
DOOR-  
RIGHT REAR**

LATCH-DOOR-RIGHT REAR - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	G76 20VT/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
2	Z911 20BK/WT	GROUND
3	P303 20TN	PASSENGER DOORS UNLOCK DRIVER
4	P392 20LG/DB	DOOR LOCK DRIVER RIGHT DOORS

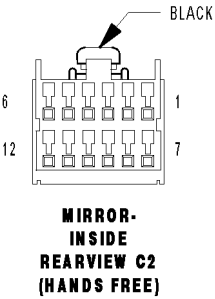


**LIGHTER-  
CIGAR**

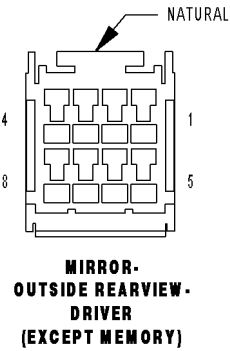
LIGHTER-CIGAR - GRAY 3 WAY		
CAV	CIRCUIT	FUNCTION
1	A205 16RD/OR	FUSED B(+)
2	-	-
3	Z910 16BK/TN	GROUND



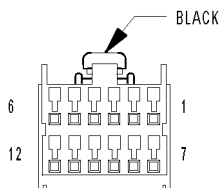
MIRROR-INSIDE REARVIEW C1 (EXCEPT BASE) - BLACK 7 WAY		
CAV	CIRCUIT	FUNCTION
1	F23 20BK/RD	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	Z909 20BK/LG	GROUND
3	L1 20BK/TN	BACK-UP LAMP FEED
4	P112 20BK/LB	AUTO DAY/NIGHT MIRROR (+)
5	P114 20BK/DB	AUTO DAY/NIGHT MIRROR (-)
6	-	-
7	-	-



MIRROR-INSIDE REARVIEW C2 (HANDS FREE) - BLACK 12 WAY		
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	X722 20BK/BR	MICROPHONE 2 IN (+)
5	-	-
6	X712 20BK/DG	MICROPHONE 1 IN (+)
7	X793 20BK/GY	MICROPHONE FEED
8	-	-
9	X730 20BK/VT	VOICE RECOGNITION/PHONE SWITCH SIGNAL
10	-	-
11	X835 20BK/OR	SENSOR GROUND
12	X792 20BK/YL	MICROPHONE IN (-)



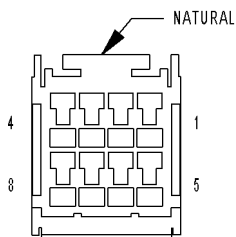
MIRROR-OUTSIDE REARVIEW-DRIVER (EXCEPT MEMORY) - NATURAL 8 WAY		
CAV	CIRCUIT	FUNCTION
1	P71 20TN/DG	DRIVER MIRROR VERTICAL DRIVER
2	P76 20TN/LB	MIRROR COMMON DRIVER
3	P75 20TN/LG	DRIVER MIRROR HORIZONTAL DRIVER
4	C16 20DB/GY	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
5	Z912 20BK/OR	GROUND
6	-	-
7	-	-
8	-	-



**MIRROR-  
OUTSIDE REARVIEW-  
DRIVER  
(MEMORY)**

MIRROR-OUTSIDE REARVIEW-DRIVER (MEMORY) - BLACK 12 WAY

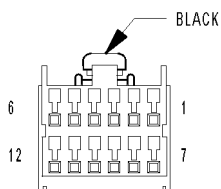
CAV	CIRCUIT	FUNCTION
1	Z912 20BK/OR	GROUND
2	P73 20TN/VT	DRIVER MIRROR COMMON DRIVER
3	C16 20DB/GY	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
4	P71 20TN/DG	DRIVER MIRROR VERTICAL DRIVER
5	P75 20TN/LG	DRIVER MIRROR HORIZONTAL DRIVER
6	P145 20LG/OR	DRIVER MIRROR POSITION SENSOR SUPPLY
7	P67 20TN/OR	DRIVER MIRROR VERTICAL POSITION SIGNAL
8	P114 20TN/WT	AUTO DAY/NIGHT MIRROR (-)
9	P65 20TN/VT	DRIVER MIRROR HORIZONTAL POSITION SIGNAL
10	P69 20TN/WT	DRIVER MIRROR SENSOR GROUND
11	P112 20TN/OR	AUTO DAY/NIGHT MIRROR (+)
12	-	-



**MIRROR-  
OUTSIDE REARVIEW-  
PASSENGER  
(EXCEPT MEMORY)**

MIRROR-OUTSIDE REARVIEW-PASSENGER (EXCEPT MEMORY) - NATURAL 8 WAY

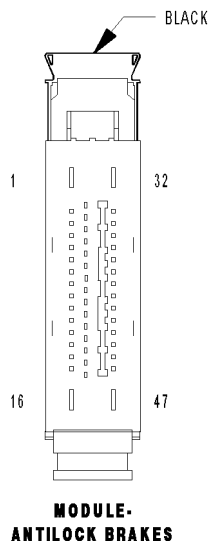
CAV	CIRCUIT	FUNCTION
1	P72 20TN/GY	PASSENGER MIRROR VERTICAL DRIVER
2	P76 20TN/LB	MIRROR COMMON DRIVER
3	P74 20TN/OR	PASSENGER MIRROR HORIZONTAL DRIVER
4	C16 20DB/GY	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
5	Z911 20BK/WT	GROUND
6	-	-
7	-	-
8	-	-



**MIRROR-  
OUTSIDE REARVIEW-  
PASSENGER  
(MEMORY)**

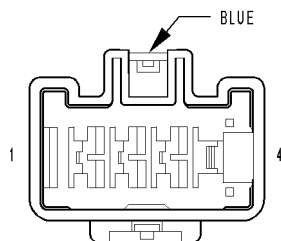
MIRROR-OUTSIDE REARVIEW-PASSENGER (MEMORY) - BLACK 12 WAY

CAV	CIRCUIT	FUNCTION
1	Z911 20BK/WT	GROUND
2	P70 20TN/LB	PASSENGER MIRROR COMMON DRIVER
3	C16 20DB/GY	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
4	P72 20TN/GY	PASSENGER MIRROR VERTICAL DRIVER
5	P74 20TN/OR	PASSENGER MIRROR HORIZONTAL DRIVER
6	P146 20LG/DB	PASSENGER MIRROR POSITION SENSOR SUPPLY
7	P64 20TN	PASSENGER MIRROR VERTICAL POSITION SIGNAL
8	-	-
9	P68 20TN/YL	PASSENGER MIRROR HORIZONTAL POSITION SIGNAL
10	P66 20TN/LG	PASSENGER MIRROR SENSOR GROUND
11	-	-
12	-	-



MODULE-ANTILOCK BRAKES - BLACK 47 WAY

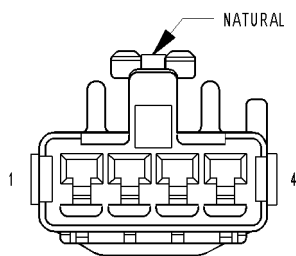
CAV	CIRCUIT	FUNCTION
1	A107 10TN/RD	FUSED B(+)
2	D24 20WT/DG	FLASH ABS
3	B137 20DG/BR (ESP)	BRAKE PEDAL TRAVEL SENSOR SIGNAL
4	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
5	B937 20DG/BR (ESP)	BRAKE PEDAL TRAVEL SENSOR RETURN
6	G4 20VT/LB (ESP)	DYNAMICS SENSOR SUPPLY
7	B237 20DG/YL (ESP)	BRAKE PEDAL TRAVEL SENSOR SUPPLY
8	-	-
9	B16 20LB/DG (TCS)	BRAKE SWITCH NO. 2 SIGNAL
10	-	-
11	D65 20WT/LG	CAN C BUS (+)
12	-	-
13	-	-
14	-	-
15	D64 20WT/LB	CAN C BUS (-)
16	Z903 14BK/DG	GROUND
17	B131 20DG/YL (ESP)	ACTIVE BRAKE BOOSTER SOLENOID(+)
18	B83 20DG/WT (ESP)	BRAKE PRESSURE SENSOR SUPPLY
19	B984 20DG/OR (ESP)	BRAKE PRESSURE SENSOR RETURN
20	B84 20DG/YL (ESP)	BRAKE PRESSURE SENSOR SIGNAL
21	-	-
22	-	-
23	-	-
24	G94 20VT/DB (ESP)	DYNAMICS SENSOR GROUND
25	D51 20WT/BR (ESP)	DYNAMICS SENSOR LOW DATA LINK
26	-	-
27	B135 20DG/LG (ESP)	BRAKE PEDAL FORCE SWITCH OPEN
28	B136 20DG/LB (ESP)	BRAKE PEDAL FORCE SWITCH SIGNAL
29	D52 20WT/LB (ESP)	DYNAMICS SENSOR HIGH DATA LINK
30	B134 20DG/YL (ESP)	BRAKE PEDAL FORCE SWITCH CLOSE
31	B132 20DG/LB (ESP)	ACTIVE BRAKE BOOSTER SOLENOID(-)
32	A111 14DG/RD	FUSED B(+)
33	B6 20DG/WT	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL
34	B7 20DG/VT	RIGHT FRONT WHEEL SPEED SENSOR SUPPLY
35	B121 20DG/DB (ESP)	STOP LAMP INHIBIT RELAY CONTROL
36	B4 20DG/GY	LEFT REAR WHEEL SPEED SENSOR SUPPLY
37	B3 20DG/YL	LEFT REAR WHEEL SPEED SENSOR SIGNAL
38	B15 20DG/WT (TCS)	BRAKE SWITCH NO. 1 SIGNAL
39	-	-
40	-	-
41	-	-
42	B1 20DG/OR	RIGHT REAR WHEEL SPEED SENSOR SIGNAL
43	B2 20DG/LB	RIGHT REAR WHEEL SPEED SENSOR SUPPLY
44	-	-
45	B9 20DG/LG	LEFT FRONT WHEEL SPEED SENSOR SUPPLY
46	B8 20DG/TN	LEFT FRONT WHEEL SPEED SENSOR SIGNAL
47	Z903 10BK/DG	GROUND



**MODULE-  
BRAKE  
(5.7L TRAILER TOW)**

MODULE-BRAKE (5.7L TRAILER TOW) - BLUE 4 WAY

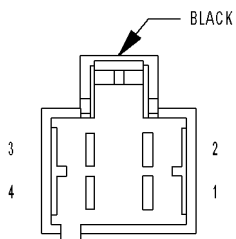
CAV	CIRCUIT	FUNCTION
1	A914 16RD	FUSED B(+)
2	B400 16DB	TRAILER TOW ELECTRIC BRAKE OUTPUT
3	B29 20DG/WT	BRAKE SWITCH SIGNAL
4	Z914 16BK/GY	GROUND



**MODULE-  
CLOCK ANALOG**

MODULE-CLOCK ANALOG - NATURAL 4 WAY

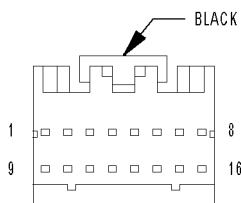
CAV	CIRCUIT	FUNCTION
1	A117 20RD/DG	FUSED B(+) (I.O.D.)
2	Z909 20BK/LG	GROUND
3	E12 20OR/GY	PANEL LAMPS DRIVER
4	-	-



**MODULE-  
DOOR-  
DRIVER C1**

MODULE-DOOR-DRIVER C1 - BLACK 4 WAY

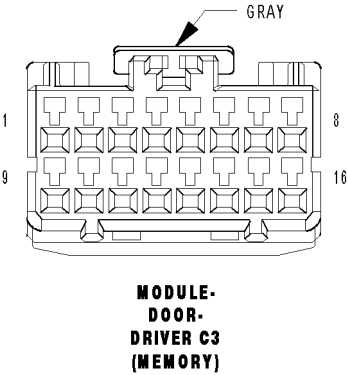
CAV	CIRCUIT	FUNCTION
1	Z912 14BK/OR	GROUND
2	F881 14PK	FUSED ACCESSORY DELAY RELAY OUTPUT
3	Q321 16OR/DB	DRIVER WINDOW EXPRESS DOWN DRIVER
4	Q311 16OR/LB	DRIVER WINDOW EXPRESS UP DRIVER



**MODULE-  
DOOR-  
DRIVER C2**

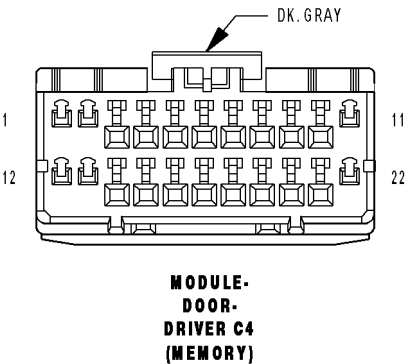
MODULE-DOOR-DRIVER C2 - BLACK 16 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	A913 20RD/GY (EXCEPT MEMORY)	FUSED B(+)
3	Z912 18BK/OR (EXCEPT MEMORY)	GROUND
4	Q15 18OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
5	Q222 20OR/GY	PASSENGER WINDOW DRIVER EXPRESS SWITCH MUX
6	-	-
7	D54 20WT (EXCEPT MEMORY)	CAN B BUS (-)
8	D55 20WT/OR (EXCEPT MEMORY)	CAN B BUS (+)
9	-	-
10	-	-
11	Q221 20GY/OR	DRIVER WINDOW DRIVER EXPRESS SWITCH MUX
12	Z421 20BK/BR	DRIVER EXPRESS SWITCH RETURN
13	Z405 20BK	DRIVER WINDOW HALL SENSOR RETURN
14	Q303 20WT/OR	DRIVER WINDOW HALL SENSOR B SIGNAL
15	Q301 20OR/WT	DRIVER WINDOW HALL SENSOR A SIGNAL
16	Q305 20OR	DRIVER WINDOW HALL SENSOR SUPPLY



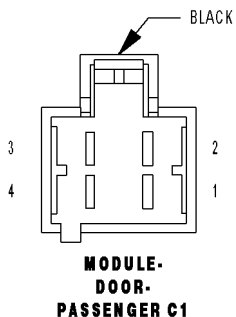
MODULE-DOOR-DRIVER C3 (MEMORY) - GRAY 16 WAY

CAV	CIRCUIT	FUNCTION
1	P550 20TN/LG	MIRROR SWITCH SUPPLY
2	E55 20OR/DG	MIRROR SWITCH ILLUMINATION DRIVER
3	-	-
4	P703 20DB/LG	MIRROR HORIZONTAL LEFT SWITCH SENSE
5	-	-
6	P710 20LG	MIRROR COMMON SWITCH SENSE
7	P705 20LG/OR	MIRROR VERTICAL DOWN SWITCH SENSE
8	-	-
9	P950 20TN/GY	MIRROR SWITCH RETURN
10	G920 20VT/YL	MEMORY SELECT SWITCH RETURN
11	-	-
12	-	-
13	G200 20VT/BR	MEMORY SELECT SWITCH MUX
14	-	-
15	P704 20LG/TN	MIRROR HORIZONTAL RIGHT SWITCH SENSE
16	P706 20LG/GY	MIRROR VERTICAL UP SWITCH SENSE



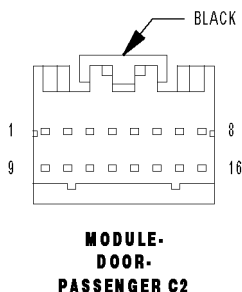
MODULE-DOOR-DRIVER C4 (MEMORY) - DK. GRAY 22 WAY

CAV	CIRCUIT	FUNCTION
1	A913 20RD/GY	FUSED B(+)
2	-	-
3	P73 20TN/VT	DRIVER MIRROR COMMON DRIVER
4	P71 20TN/DG	DRIVER MIRROR VERTICAL DRIVER
5	P75 20TN/LG	DRIVER MIRROR HORIZONTAL DRIVER
6	P65 20TN/VT	DRIVER MIRROR HORIZONTAL POSITION SIGNAL
7	P67 20TN/OR	DRIVER MIRROR VERTICAL POSITION SIGNAL
8	P145 20LG/OR	DRIVER MIRROR POSITION SENSOR SUPPLY
9	-	-
10	Z912 18BK/OR	GROUND (DRIVER SIDE IDENTIFIER LHD/RHD)
11	-	-
12	Z912 18BK/OR	GROUND
13	-	-
14	-	-
15	-	-
16	-	-
17	P69 20TN/WT	DRIVER MIRROR SENSOR GROUND
18	D54 20WT	CAN B BUS (-)
19	D55 20WT/OR	CAN B BUS (+)
20	-	-
21	-	-
22	-	-



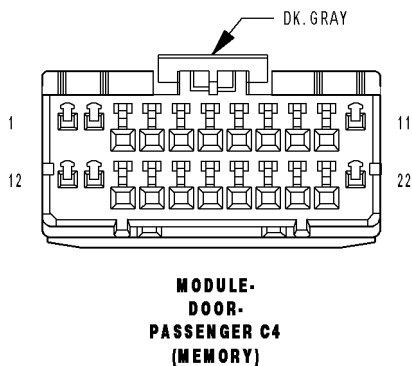
MODULE-DOOR-PASSENGER C1 - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	Z911 14BK/WT	GROUND
2	F881 14PK	FUSED ACCESSORY DELAY RELAY OUTPUT
3	Q322 16LG/OR	PASSENGER WINDOW EXPRESS DOWN DRIVER
4	Q312 16DB/OR	PASSENGER WINDOW EXPRESS UP DRIVER



MODULE-DOOR-PASSENGER C2 - BLACK 16 WAY

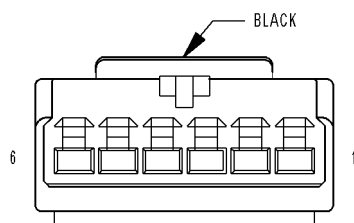
CAV	CIRCUIT	FUNCTION
1	-	-
2	A913 20RD/GY (EXCEPT MEMORY)	FUSED B(+)
3	-	-
4	-	-
5	Q336 20OR/GY	PASSENGER WINDOW EXPRESS SWITCH MUX
6	E34 20OR/TN	PASSENGER WINDOW EXPRESS SWITCH ILLUMINATION DRIVER
7	D54 20WT (EXCEPT MEMORY)	CAN B BUS (-)
8	D55 20WT/OR (EXCEPT MEMORY)	CAN B BUS (+)
9	-	-
10	-	-
11	-	-
12	Q936 20OR/LG	PASSENGER WINDOW EXPRESS SWITCH RETURN
13	Z404 20BK/LG	PASSENGER WINDOW HALL SENSOR RETURN
14	Q304 20LG/OR	PASSENGER WINDOW HALL SENSOR B SIGNAL
15	Q302 20OR/LG	PASSENGER WINDOW HALL SENSOR A SIGNAL
16	Q306 20OR/DB	PASSENGER WINDOW HALL SENSOR SUPPLY



MODULE-DOOR-PASSENGER C4 (MEMORY) - DK. GRAY 22 WAY

CAV	CIRCUIT	FUNCTION
1	A913 20RD/GY	FUSED B(+)
2	-	-
3	P70 20TN/LB	PASSENGER MIRROR COMMON DRIVER
4	P72 20TN/GY	PASSENGER MIRROR VERTICAL DRIVER
5	P74 20TN/OR	PASSENGER MIRROR HORIZONTAL DRIVER
6	P68 20TN/YL	PASSENGER MIRROR HORIZONTAL POSITION SIGNAL
7	P64 20TN	PASSENGER MIRROR VERTICAL POSITION SIGNAL
8	P146 20LG/DB	PASSENGER MIRROR POSITION SENSOR SUPPLY
9	-	-
10	-	-
11	-	-
12	Z911 16BK/WT	GROUND
13	-	-
14	-	-
15	-	-
16	-	-
17	P66 20TN/LG	PASSENGER MIRROR SENSOR GROUND
18	D54 20WT	CAN B BUS (-)
19	D55 20WT/OR	CAN B BUS (+)
20	-	-
21	-	-
22	-	-

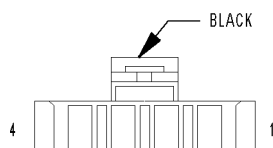




**MODULE-  
ELECTRONIC OVERHEAD**

MODULE-ELECTRONIC OVERHEAD - BLACK 6 WAY

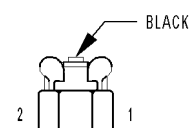
CAV	CIRCUIT	FUNCTION
1	D55 20WT/OR	CAN B BUS (+)
2	D54 20WT	CAN B BUS (-)
3	A117 20RD/DG	FUSED B(+) (I.O.D.)
4	Z909 20BK/LG	GROUND
5	F880 20PK	FUSED ACCESSORY DELAY RELAY OUTPUT
6	-	-



**MODULE-  
FRONT BLOWER  
POWER C1  
(ATC)**

MODULE-FRONT BLOWER POWER C1 (ATC) - BLACK 4 WAY

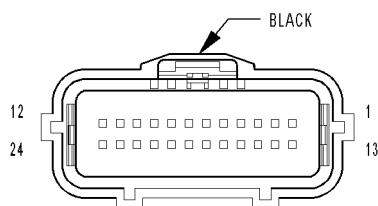
CAV	CIRCUIT	FUNCTION
1	-	-
2	Z908 12BK	GROUND
3	C56 20DB/LB	FRONT BLOWER CONTROL
4	C7 12DB	FUSED RUN RELAY OUTPUT



**MODULE-  
FRONT BLOWER  
POWER C2  
(ATC)**

MODULE-FRONT BLOWER POWER C2 (ATC) - BLACK 2 WAY

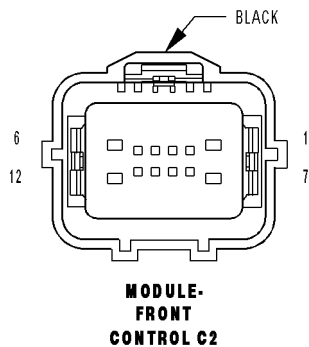
CAV	CIRCUIT	FUNCTION
1	C7 12DB	BLOWER MOTOR SUPPLY
2	Z134 12BK/LG	GROUND



**MODULE-  
FRONT  
CONTROL C1**

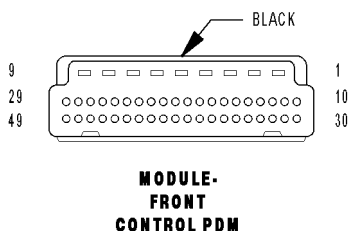
MODULE-FRONT CONTROL C1 - BLACK 24 WAY

CAV	CIRCUIT	FUNCTION
1	Z902 18BK/LB	GROUND
2	D55 20WT/OR	CAN B BUS (+)
3	D54 20WT	CAN B BUS (-)
4	-	-
5	D72 20WT/LB	CAN C DIAGNOSTIC (+)
6	D71 20WT/DB	CAN C DIAGNOSTIC (-)
7	-	-
8	D65 20WT/LG	CAN C BUS (+)
9	D64 20WT/LB	CAN C BUS (-)
10	B20 20DG/OR	BRAKE FLUID LEVEL SWITCH SENSE
11	C18 20LB/BR	A/C PRESSURE TRANSDUCER SIGNAL
12	B6 20DG/WT (EXCEPT ABS)	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL
13	L91 20WT/DB	HAZARD SWITCH SENSE
14	W17 20BR/LG (LX49)	REAR WIPER PARK SWITCH SENSE
15	B7 20DG/VT (EXCEPT ABS)	RIGHT FRONT WHEEL SPEED SENSOR SUPPLY
16	F891 20PK/GY	5 VOLT SUPPLY
17	-	-
18	W1 20BR/TN	WASHER FLUID LEVEL SWITCH SENSE
19	-	-
20	-	-
21	B29 20DG/WT	BRAKE SWITCH SIGNAL
22	Z902 20BK/LB	GROUND
23	G70 20VT/LB (EXPORT)	HOOD AJAR SWITCH SENSE
24	-	-



MODULE-FRONT CONTROL C2 - BLACK 12 WAY

CAV	CIRCUIT	FUNCTION
1	L44 18WT/TN	RIGHT LOW BEAM DRIVER
2	-	-
3	-	-
4	G31 20VT/LG	AAT SIGNAL
5	G931 20VT/BR	SENSOR GROUND
6	L43 18WT/DB (EXCEPT HID LAMPS)	LEFT LOW BEAM DRIVER
7	L33 18WT/LG	LEFT HIGH BEAM DRIVER
8	L60 18WT/TN	RIGHT FRONT TURN SIGNAL CONTROL
9	-	-
10	L61 18WT/LG	LEFT FRONT TURN SIGNAL CONTROL
11	-	-
12	L34 18WT/GY	RIGHT HIGH BEAM DRIVER

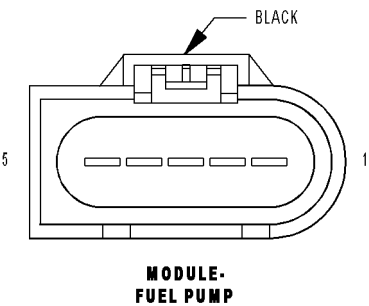


MODULE-FRONT CONTROL PDM - BLACK 49 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	A906	FUSED B(+)
3	A902	FUSED B(+)
4	A901	FUSED B(+)
5	A903	FUSED B(+)
6	-	-
7	L1	BACK-UP LAMP FEED
8	-	-
9	-	-
10	W24 (HID LAMPS)	HEADLAMP WASHER RELAY CONTROL
11	W20	REAR WASHER PUMP MOTOR CONTROL
12	W10	FRONT WASHER PUMP MOTOR CONTROL
13	F902	IGNITION UNLOCK-RUN-START
14	-	-
15	X13	FUSED B(+) (I.O.D.)
16	-	-
17	F202	FUSED IGNITION SWITCH OUTPUT (RUN-START)
18	Z901	GROUND
19	-	-
20	-	-
21	L239 (EXPORT)	REAR FOG LAMP RELAY CONTROL
22	F923	RUN RELAY CONTROL
23	-	-
24	-	-
25	Z901	GROUND
26	L139	FRONT FOG LAMP RELAY CONTROL
27	W5	WIPER ON/OFF RELAY CONTROL
28	W12 (LX49)	REAR WIPER RELAY CONTROL
29	W2	WIPER HIGH/LOW RELAY CONTROL
30	K542	AUTO SHUT DOWN RELAY OUTPUT
31	W7	FRONT WIPER PARK SWITCH SENSE
32	-	-
33	Z901	GROUND
34	L62	RIGHT REAR TURN SIGNAL CONTROL
35	C918	A/C PRESSURE SENSOR GROUND
36	-	-
37	-	-

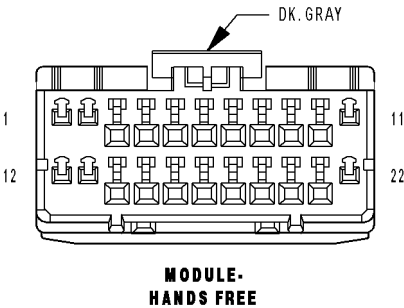
MODULE-FRONT CONTROL PDM - BLACK 49 WAY

CAV	CIRCUIT	FUNCTION
38	P307	ACCESSORY DELAY RELAY CONTROL
39	N201	RADIATOR FAN CONTROL RELAY CONTROL
40	-	-
41	Z901	GROUND
42	-	-
43	L63	LEFT REAR TURN SIGNAL CONTROL
44	-	-
45	N112	RADIATOR FAN HIGH RELAY CONTROL
46	P201 (EXCEPT MEMORY)	ADJUSTABLE PEDALS RELAY CONTROL
47	X4	HORN RELAY CONTROL
48	L177	PARK LAMP RELAY CONTROL
49	-	-



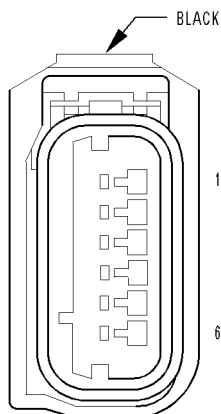
MODULE-FUEL PUMP - BLACK 5 WAY

CAV	CIRCUIT	FUNCTION
1	N4 20DB/WT	FUEL LEVEL SENSOR NO. 1 SIGNAL
2	Z210 20BK	GROUND
3	N5 20DB/WT	FUEL LEVEL SENSOR NO. 2 SIGNAL
4	Z912 16BK/OR	GROUND
5	N1 16DB/OR	FUEL PUMP RELAY OUTPUT

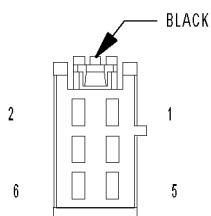


MODULE-HANDS FREE - DK. GRAY 22 WAY

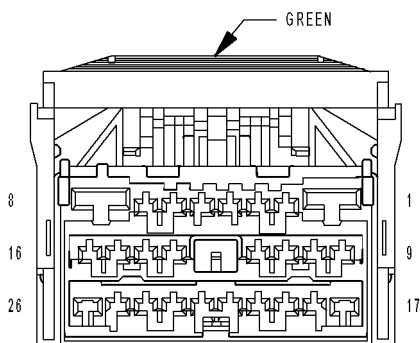
CAV	CIRCUIT	FUNCTION
1	A300 16GY/LG	FUSED B(+) (I.O.D.)
2	-	-
3	-	-
4	D54 20WT	CAN B BUS (-)
5	X722 22LB/DG	MICROPHONE 2 IN (+)
6	-	-
7	-	-
8	X703 22DG/OR	LEFT AUDIO OUTPUT
9	X704 22DG/YL	RIGHT AUDIO OUTPUT
10	X795 20DG	COMMON AUDIO OUTPUT
11	-	-
12	-	-
13	-	-
14	D55 20WT/OR	CAN B BUS (+)
15	X730 20GY/YL	VOICE RECOGNITION/PHONE SWITCH SIGNAL
16	X712 22DG/LB	MICROPHONE 1 IN (+)
17	X792 22LB/DG	MICROPHONE IN (-)
18	-	-
19	-	-
20	X793 22DG/YL	MICROPHONE FEED
21	X835 20OR/GY	SENSOR GROUND
22	Z909 18BK/LG	GROUND



**MODULE-  
HEADLAMP  
LEVELING  
(EXPORT)**



**MODULE-  
HEATED SEATS**



**MODULE-  
INTEGRATED  
POWER C1**

MODULE-HEADLAMP LEVELING (EXPORT) - BLACK 6 WAY

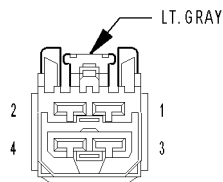
CAV	CIRCUIT	FUNCTION
1	F500 20DG/PK	FUSED RUN RELAY OUTPUT
2	D205 20WT/DB	SCI RECEIVE (LEFT HID LAMP)
3	Z901 20BK/DG	GROUND
4	D55 20WT/OR	CAN B BUS (+)
5	D211 20WT/RD	SCI RECEIVE (RIGHT HID LAMP)
6	D54 20WT	CAN B BUS (-)

MODULE-HEATED SEATS - BLACK 6 WAY

CAV	CIRCUIT	FUNCTION
1	Z911 18BK/WT	GROUND
2	A33 14RD/YL	FUSED B(+)
3	P187 20LG/BR	LEFT SEAT HEATER B(+) DRIVER
4	P188 20LG/VT	RIGHT SEAT HEATER B(+) DRIVER
5	D54 20WT	CAN B BUS (-)
6	D55 20WT/OR	CAN B BUS (+)

MODULE-INTEGRATED POWER C1 - GREEN 26 WAY

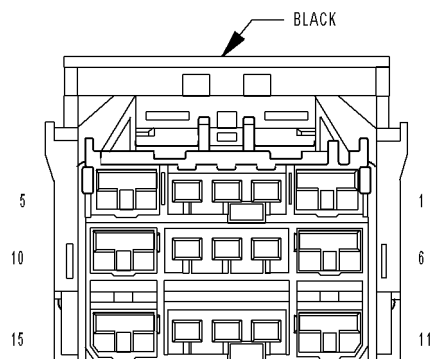
CAV	CIRCUIT	FUNCTION
1	Z901 14BK/DG	GROUND
2	-	-
3	-	-
4	-	-
5	C13 20LB/OR	A/C CLUTCH RELAY CONTROL
6	C3 18DB/YL	A/C CLUTCH RELAY OUTPUT
7	L303 18WT/OR (HID LAMPS)	LEFT HID LAMP DRIVER
8	A111 14DG/RD (ABS)	FUSED B(+)
9	-	-
10	-	-
11	-	-
12	-	-
13	-	-
14	L45 16WT/OR (HID LAMPS)	FUSED B(+)
15	L304 18OR/WT (HID LAMPS)	RIGHT HID LAMP DRIVER
16	X2 18DG/OR	HORN RELAY OUTPUT
17	L62 18WT/YL	RIGHT REAR TURN SIGNAL CONTROL
18	Z901 16BK/DG	GROUND
19	C918 20BK/LB	A/C PRESSURE SENSOR GROUND
20	F923 20PK/YL	RUN RELAY CONTROL
21	-	-
22	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
23	L239 20WT/DG (EXPORT)	REAR FOG LAMP RELAY CONTROL
24	-	-
25	W12 20BR/OR (LX49)	REAR WIPER RELAY CONTROL
26	-	-



**MODULE-  
INTEGRATED  
POWER C2**

MODULE-INTEGRATED POWER C2 - LT. GRAY 4 WAY

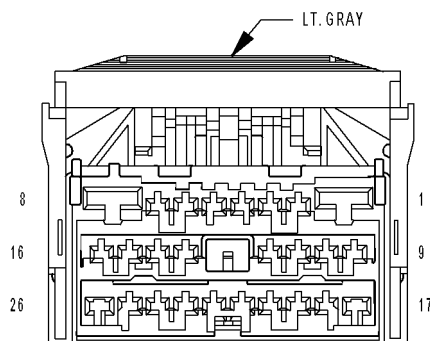
CAV	CIRCUIT	FUNCTION
1	N24 12DG/DB	RADIATOR FAN CONTROL RELAY OUTPUT
2	Z901 12BK/DG	GROUND
3	N210 12DB/DG	RADIATOR FAN HIGH/LOW CONTROL FEED
4	N23 10DB/DG	RADIATOR FAN HIGH RELAY OUTPUT



**MODULE-  
INTEGRATED  
POWER C3**

MODULE-INTEGRATED POWER C3 - BLACK 15 WAY

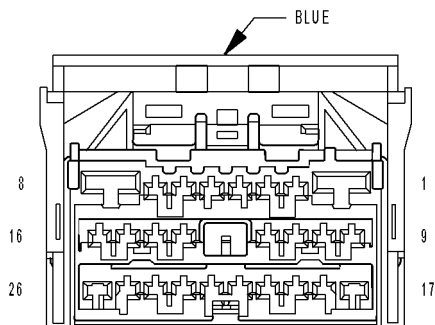
CAV	CIRCUIT	FUNCTION
1	-	-
2	P307 20LG/GY	ACCESSORY DELAY RELAY CONTROL
3	L63 18WT/DG	LEFT REAR TURN SIGNAL CONTROL
4	L1 20WT/LG	BACK-UP LAMP FEED
5	-	-
6	A22 12RD/WT	FUSED B(+)
7	A904 16RD	FUSED B(+)
8	-	-
9	Z904 20BK/BR (2.7L/3.5L)	GROUND
10	A22 12RD/WT	FUSED B(+)
11	-	-
12	W3 14BR/WT	FRONT WIPER HIGH/LOW RELAY LOW SPEED OUTPUT
13	T16 16YL/OR (RLE)	TRANSMISSION CONTROL RELAY OUTPUT
14	T16 16YL/OR (RLE)	TRANSMISSION CONTROL RELAY OUTPUT
15	T15 20YL/BR (RLE)	TRANSMISSION CONTROL RELAY CONTROL



**MODULE-  
INTEGRATED  
POWER C4**

MODULE-INTEGRATED POWER C4 - LT. GRAY 26 WAY

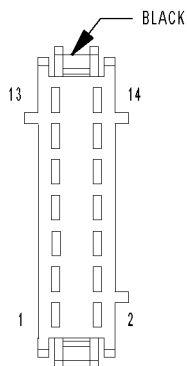
CAV	CIRCUIT	FUNCTION
1	L45 16WT/OR (HID LAMPS)	FUSED B(+)
2	-	-
3	W24 20BR/OR (HID LAMPS)	HEADLAMP WASHER RELAY CONTROL
4	-	-
5	-	-
6	-	-
7	-	-
8	A107 10TN/RD (ABS)	FUSED B(+)
9	-	-
10	A72 20RD/OR (EXCEPT MEMORY)	ADJUSTABLE PEDALS RELAY OUTPUT
11	Z904 20BK/BR (HID LAMPS)	GROUND
12	L44 18WT/TN (HID LAMPS)	RIGHT LOW BEAM DRIVER
13	-	-
14	-	-
15	-	-
16	-	-
17	-	-
18	-	-
19	L89 18WT/YL (FOG LAMPS)	FRONT FOG LAMP RELAY OUTPUT
20	W10 20BR	FRONT WASHER PUMP MOTOR CONTROL
21	-	-
22	F902 20PK	IGNITION UNLOCK-RUN-START
23	-	-
24	F21 20PK/DG	FUSED IGNITION SWITCH OUTPUT (START)
25	-	-
26	W4 14BR/OR	FRONT WIPER HIGH/LOW RELAY HIGH SPEED OUTPUT



**MODULE-  
INTEGRATED  
POWER C5**

MODULE-INTEGRATED POWER C5 - BLUE 26 WAY

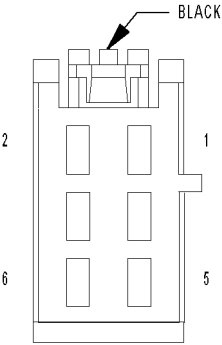
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	T751 20YL	FUSED IGNITION SWITCH OUTPUT (START)
4	T752 20DG/OR	STARTER RELAY CONTROL
5	T750 16YL/GY	STARTER RELAY OUTPUT
6	A209 18RD	FUSED B(+)
7	-	-
8	-	-
9	-	-
10	-	-
11	X13 16DG/GY	FUSED B(+) (I.O.D.)
12	W7 20BR/GY	FRONT WIPER PARK SWITCH SENSE
13	-	-
14	-	-
15	K51 20BR/WT	AUTO SHUT DOWN RELAY CONTROL
16	-	-
17	K342 18BR/WT	FUSED AUTO SHUT DOWN RELAY OUTPUT 1
18	-	-
19	-	-
20	L777 20WT/VT	PARK LAMP RELAY OUTPUT
21	-	-
22	Z901 16BK/DG	GROUND
23	W20 20BR/YL	REAR WASHER PUMP MOTOR CONTROL
24	-	-
25	K344 18BR/GY	FUSED AUTO SHUT DOWN RELAY OUTPUT 3
26	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2



**MODULE-  
MEMORY  
SEAT C1**

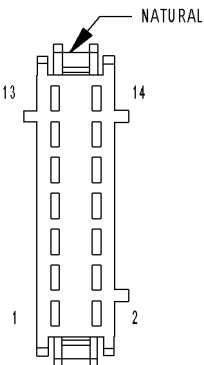
MODULE-MEMORY SEAT C1 - BLACK 14 WAY

CAV	CIRCUIT	FUNCTION
1	P205 20LG/WT (ADJUSTABLE PED-ALS)	ADJUSTABLE PEDALS MOTOR FORWARD
2	P206 20LG/LB (ADJUSTABLE PEDALS)	ADJUSTABLE PEDALS MOTOR REARWARD
3	P153 20TN/DG	TILT STEERING MOTOR UP/DOWN DRIVER
4	P157 20LB/TN	TELESCOPE STEERING MOTOR FORWARD/REAR-WARD DRIVER
5	D54 20WT	CAN B BUS (-)
6	P953 20DG/TN	STEERING MOTOR COMMON
7	D55 20WT/OR	CAN B BUS (+)
8	A110 16OR/RD	FUSED B(+)
9	G13 20VT/LB (ADJUSTABLE PEDALS)	ADJUSTABLE PEDALS SENSOR SUPPLY
10	Z912 16BK/OR	GROUND
11	P152 20TN/LB	TELESCOPE STEERING FORWARD/REARWARD POSI-TION SENSE
12	G914 20VT/GY	SENSOR RETURN
13	P151 20TN/OR	TILT STEERING UP/DOWN POSITION SENSE
14	G14 20VT/DB (ADJUSTABLE PEDALS)	ADJUSTABLE PEDALS SENSOR SIGNAL



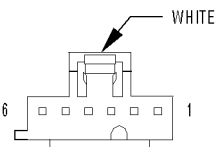
MODULE-MEMORY  
SEAT C2

MODULE-MEMORY SEAT C2 - BLACK 6 WAY		
CAV	CIRCUIT	FUNCTION
1	G493 20OR/VT	DRIVER SEAT RECLINER POSITION SENSOR GROUND
2	P141 18LG/BR	DRIVER SEAT RECLINER UP DRIVER
3	-	-
4	P143 18LG/GY	DRIVER SEAT RECLINER DOWN DRIVER
5	G403 20VT/OR	DRIVER SEAT RECLINER POSITION SENSE
6	-	-



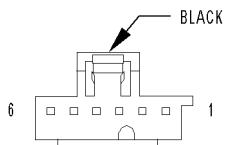
MODULE-MEMORY  
SEAT C3

MODULE-MEMORY SEAT C3 - NATURAL 14 WAY		
CAV	CIRCUIT	FUNCTION
1	G404 20VT/YL	DRIVER SEAT FRONT VERTICAL POSITION SENSE
2	G402 20VT/DB	DRIVER SEAT REAR VERTICAL POSITION SENSE
3	G401 20VT/LG	DRIVER SEAT HORIZONTAL POSITION SENSE
4	G494 20YL/VT	DRIVER SEAT FRONT VERTICAL SENSOR GROUND
5	G492 20LB/VT	DRIVER SEAT REAR VERTICAL SENSOR GROUND
6	G491 20VT/GY	DRIVER SEAT HORIZONTAL SENSOR GROUND
7	-	-
8	P115 16LG	DRIVER SEAT HORIZONTAL FORWARD DRIVER
9	P117 16LG/LB	DRIVER SEAT HORIZONTAL REARWARD DRIVER
10	P113 18LG/WT	DRIVER SEAT REAR VERTICAL DOWN DRIVER
11	-	-
12	P111 18LG/YL	DRIVER SEAT REAR VERTICAL UP DRIVER
13	P121 18LG/DB	DRIVER SEAT FRONT VERTICAL DOWN DRIVER
14	P119 18LG/DG	DRIVER SEAT FRONT VERTICAL UP DRIVER



MODULE-MEMORY  
SEAT C4

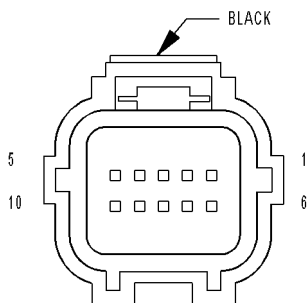
MODULE-MEMORY SEAT C4 - WHITE 6 WAY		
CAV	CIRCUIT	FUNCTION
1	P599 20LG/TN	DRIVER SEAT SWITCH MUX RETURN
2	P239 20LG/WT	DRIVER SEAT SWITCH REAR VERTICAL/HORIZONTAL SWITCH MUX
3	P339 20LG/DB	DRIVER SEAT SWITCH FRONT VERTICAL/RECLINER SWITCH MUX
4	-	-
5	-	-
6	P9 20LG/OR	DRIVER SEAT SWITCH SUPPLY



**MODULE-  
MEMORY  
SEAT C5  
(ADJUSTABLE PEDALS)**

MODULE-MEMORY SEAT C5 (ADJUSTABLE PEDALS) - BLACK 6 WAY

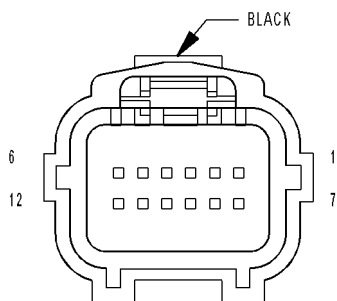
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	Q102 200R/LB	ADJUSTABLE PEDALS SWITCH FORWARD
5	Q103 200R/LG	ADJUSTABLE PEDALS SWITCH REARWARD
6	Q101 200R/LB	ADJUSTABLE PEDALS SWITCH GROUND



**MODULE-  
OCCUPANT  
CLASSIFICATION C1**

MODULE-OCCUPANT CLASSIFICATION C1 - BLACK 10 WAY

CAV	CIRCUIT	FUNCTION
1	A106 20LB/RD	FUSED B(+)
2	F201 20PK/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
3	-	-
4	D55 20WT/OR	CAN B BUS (+)
5	D54 20WT	CAN B BUS (-)
6	-	-
7	R263 20LB/VT (EXCEPT EXPORT)	DRIVER SEAT POSITION SENSOR VOLTAGE
8	-	-
9	R261 20LB/WT (EXCEPT EXPORT)	DRIVER SEAT POSITION SENSOR DATA
10	Z911 18BK/WT	GROUND

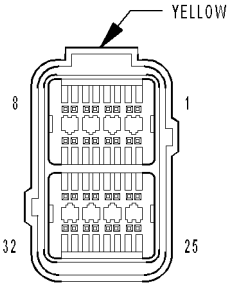


**MODULE-  
OCCUPANT  
CLASSIFICATION C2**

MODULE-OCCUPANT CLASSIFICATION C2 - BLACK 12 WAY

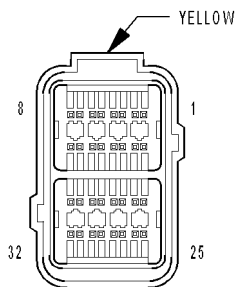
CAV	CIRCUIT	FUNCTION
1	R701 20LG	SEAT WEIGHT SENSOR 5 VOLT
2	-	-
3	R717 20LG/DG	SEAT WEIGHT LEFT FRONT SENSOR SIGNAL
4	-	-
5	R718 20LB/DG	SEAT WEIGHT RIGHT FRONT SENSOR SIGNAL
6	-	-
7	R706 20LB/OR	SEAT WEIGHT RIGHT REAR SENSOR SIGNAL
8	-	-
9	R705 20LG/OR	SEAT WEIGHT LEFT REAR SENSOR SIGNAL
10	-	-
11	-	-
12	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND





MODULE-  
OCCUPANT  
RESTRAINT  
CONTROLLER C1

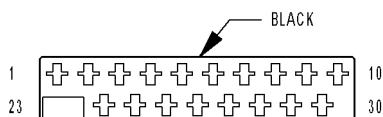
MODULE-OCCUPANT RESTRAINT CONTROLLER C1 - YELLOW 32 WAY		
CAV	CIRCUIT	FUNCTION
1	R53 20LG/YL	DRIVER SEAT BELT TENSIONER LINE 2
2	R55 20LG/DG	DRIVER SEAT BELT TENSIONER LINE 1
3	R56 20LB/DG	PASSENGER SEAT BELT TENSIONER LINE 1
4	R54 20LB/YL	PASSENGER SEAT BELT TENSIONER LINE 2
5	-	-
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-
11	-	-
12	-	-
13	R261 20LB/WT (EXPORT)	DRIVER SEAT POSITION SENSOR DATA
14	-	-
15	R13 20LG/TN (SIDE AIRBAGS)	LEFT SIDE IMPACT SENSOR 1 SIGNAL
16	R16 20BR/LG (SIDE AIRBAGS)	RIGHT SIDE IMPACT SENSOR 1 GROUND
17	R263 20LB/VT (EXPORT)	DRIVER SEAT POSITION SENSOR VOLTAGE
18	-	-
19	R15 20LG/BR (SIDE AIRBAGS)	LEFT SIDE IMPACT SENSOR 1 GROUND
20	R19 20LG/WT (SIDE AIRBAGS)	LEFT SIDE IMPACT SENSOR 2 GROUND
21	R20 20WT/LG (SIDE AIRBAGS)	RIGHT SIDE IMPACT SENSOR 2 GROUND
22	R17 20LG (SIDE AIRBAGS)	LEFT SIDE IMPACT SENSOR 2 SIGNAL
23	R18 20LB (SIDE AIRBAGS)	RIGHT SIDE IMPACT SENSOR 2 SIGNAL
24	R14 20TN/LG (SIDE AIRBAGS)	RIGHT SIDE IMPACT SENSOR 1 SIGNAL
25	R1 20LB/WT (SIDE AIRBAGS)	LEFT CURTAIN SQUIB 1 LINE 2
26	R3 20LB/OR (SIDE AIRBAGS)	LEFT CURTAIN SQUIB 1 LINE 1
27	R4 20OR/LB (SIDE AIRBAGS)	RIGHT CURTAIN SQUIB 1 LINE 1
28	R2 20WT/LB (SIDE AIRBAGS)	RIGHT CURTAIN SQUIB 1 LINE 2
29	-	-
30	-	-
31	-	-
32	-	-



**MODULE-  
OCCUPANT  
RESTRAINT  
CONTROLLER C2**

MODULE-OCCUPANT RESTRAINT CONTROLLER C2 - YELLOW 32 WAY

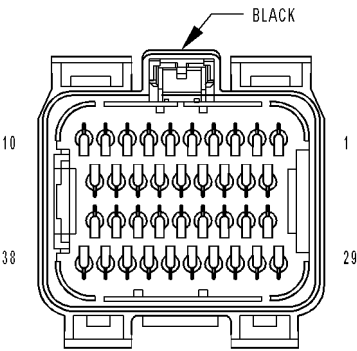
CAV	CIRCUIT	FUNCTION
1	R43 20LG/BR	DRIVER SQUIB 1 LINE 2
2	R45 20LG/OR	DRIVER SQUIB 1 LINE 1
3	R63 20LG/WT	DRIVER SQUIB 2 LINE 1
4	R61 20LG/VT	DRIVER SQUIB 2 LINE 2
5	R42 20LB/BR	PASSENGER SQUIB 1 LINE 2
6	R44 20LB/OR	PASSENGER SQUIB 1 LINE 1
7	R64 20LB/WT	PASSENGER SQUIB 2 LINE 1
8	R62 20LB/VT	PASSENGER SQUIB 2 LINE 2
9	G104 20VT/GY	PASSENGER AIRBAG INDICATOR DRIVER
10	-	-
11	-	-
12	R82 20WT/LB	RIGHT FRONT IMPACT SENSOR GROUND
13	-	-
14	-	-
15	D55 20WT/OR	CAN B BUS (+)
16	F201 20PK/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
17	-	-
18	-	-
19	-	-
20	R81 20LB/WT	LEFT FRONT IMPACT SENSOR GROUND
21	-	-
22	Z913 20BK/LG	GROUND
23	D54 20WT	CAN B BUS (-)
24	F214 20PK/LG	FUSED RUN RELAY OUTPUT
25	R79 20LB/VT	LEFT FRONT IMPACT SENSOR SIGNAL
26	R80 20VT/LB	RIGHT FRONT IMPACT SENSOR SIGNAL
27	-	-
28	-	-
29	-	-
30	-	-
31	-	-
32	-	-



**MODULE-  
PARK ASSIST  
(PARKTRONICS)**

MODULE-PARK ASSIST (PARKTRONICS) - BLACK 18 WAY

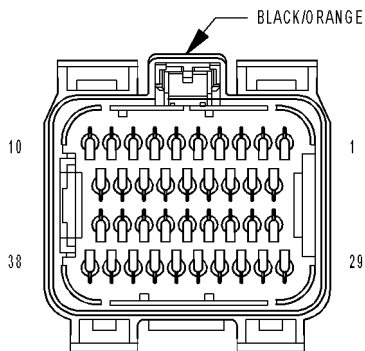
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	D703 20WT/BK	PARK ASSIST SENSOR NO. 9 SIGNAL
4	D700 20WT/GY	PARK ASSIST SENSOR NO. 7 SIGNAL
5	D54 20WT	CAN B BUS (-)
6	D55 20WT/OR	CAN B BUS (+)
7	-	-
8	X750 20GY/LB	PARK ASSIST SENSOR GROUND
9	Z171 20GY/BK	PARK ASSIST DISPLAY GROUND
10	Z914 20BK/GY	GROUND
23	D704 20WT/DB	PARK ASSIST SENSOR NO. 10 SIGNAL
24	D701 20WT/LB	PARK ASSIST SENSOR NO. 8 SIGNAL
25	D777 20WT/DG	PARK ASSIST DISPLAY SIGNAL
26	-	-
27	-	-
28	X700 20GY/OR	PARK ASSIST SENSOR SUPPLY
29	X777 20DG/GY	PARK ASSIST DISPLAY SUPPLY
30	F500 20DG/PK	FUSED RUN RELAY OUTPUT



MODULE-  
POWERTRAIN  
CONTROL C1

MODULE-POWERTRAIN CONTROL C1 - BLACK 38 WAY

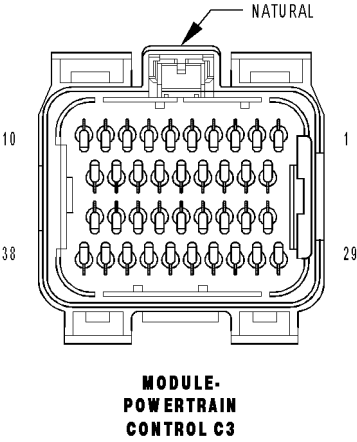
CAV	CIRCUIT	FUNCTION
1	K98 16DB/YL (5.7L)	COIL CONTROL NO. 8
2	-	-
3	K97 16DB/YL (5.7L)	COIL CONTROL NO. 7
4	K28 20BR/LB (5.7L)	INJECTOR CONTROL NO. 8
5	K26 20BR/YL (5.7L)	INJECTOR CONTROL NO. 7
6	-	-
7	-	-
8	-	-
9	Z904 16BK/BR	GROUND
10	-	-
11	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
12	F902 20PK (2.7L/3.5L)	IGNITION UNLOCK-RUN-START
13	-	-
14	-	-
15	-	-
16	K236 20DB/LG (3.5L)	SRV CONTROL
17	-	-
18	Z904 16BK/BR	GROUND
19	-	-
20	G6 20VT/GY	ENGINE OIL PRESSURE SIGNAL
21	-	-
22	-	-
23	-	-
24	-	-
25	D20 20WT/LG	SCI RECEIVE (PCM)
26	D16 20WT/OR	SCI RECEIVE (TCM)
27	F856 20YL/PK	5 VOLT SUPPLY
28	K452 20BR/LB (5.7L MDS)	MDS SOL CONTROL NO. 4
29	A209 18RD	FUSED B(+)
30	T751 20YL	FUSED IGNITION SWITCH OUTPUT (START)
31	K141 20DB/YL	O2 1/2 SIGNAL
32	K904 20DB/DG	O2 RETURN (DOWN)
33	K243 20BR	O2 2/2 SIGNAL
34	D65 20WT/LG	CAN C BUS (+)
35	D64 20WT/LB	CAN C BUS (-)
36	D21 20WT/BR	SCI TRANSMIT (PCM)
37	D15 20WT/DG	SCI TRANSMIT (TCM)
38	-	-



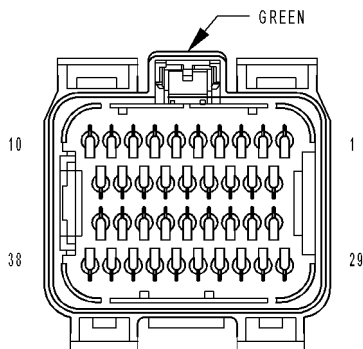
**MODULE-  
POWERTRAIN  
CONTROL C2**

MODULE-POWERTRAIN CONTROL C2 - BLACK/ORANGE 38 WAY

CAV	CIRCUIT	FUNCTION
1	K10 16DB/OR	COIL CONTROL NO. 6
2	K16 16DB/YL	COIL CONTROL NO. 5
3	K15 16DB/GY	COIL CONTROL NO. 4
4	K58 20BR/VT	INJECTOR CONTROL NO. 6
5	K38 20BR/OR	INJECTOR CONTROL NO. 5
6	K124 18DB/GY	ETC MOTOR (+)
7	K18 16DB/LG	COIL CONTROL NO. 3
8	K35 20DB/VT	EGR SOL CONTROL
9	K17 16DB/TN	COIL CONTROL NO. 2
10	K19 16DB/DG	COIL CONTROL NO. 1
11	K14 20BR/TN	INJECTOR CONTROL NO. 4
12	K13 20BR/LB	INJECTOR CONTROL NO. 3
13	K12 20BR/DB	INJECTOR CONTROL NO. 2
14	K11 20BR/YL	INJECTOR CONTROL NO. 1
15	K922 18BR/DB	TP SENSOR RETURN
16	K136 18BR (2.7L/3.5L)	MTV CONTROL
16	K453 20BR/DG (5.7L MDS)	MDS SOL CONTROL NO. 6
17	K199 20BR/VT	O2 2/1 HEATER CONTROL
18	K99 20BR/LG	O2 1/1 HEATER CONTROL
19	K20 18BR/GY	GEN FIELD CONTROL
20	K2 20VT/OR	ECT SIGNAL
21	K22 18BR/OR	TP SENSOR NO. 1 SIGNAL
22	K34 20DB/LG	EGR SIGNAL
23	K1 20VT/BR	MAP SIGNAL
24	K942 20BR/LG	KNOCK SENSOR NO. 1 RETURN
25	K42 20DB/YL	KNOCK SENSOR NO. 1 SIGNAL
26	-	-
27	K900 20DB/DG	SENSOR GROUND
28	K122 18BR/DG	TP SENSOR NO. 2 SIGNAL
29	F855 20PK/YL	5 VOLT SUPPLY
30	K21 20DB/LG	IAT SIGNAL
31	K41 20DB/LB	O2 1/1 SIGNAL
32	K902 20BR/DG	O2 RETURN (UP)
33	K43 20DB/LG	O2 2/1 SIGNAL
34	K44 20DB/GY	CMP SIGNAL
35	K24 20DB/WT	CKP SIGNAL
36	K242 20BR/WT (5.7L)	KNOCK SENSOR NO. 2 SIGNAL
37	K924 20WT/BR (5.7L)	KNOCK SENSOR NO. 2 RETURN
38	K126 18DB/LG	ETC MOTOR (-)



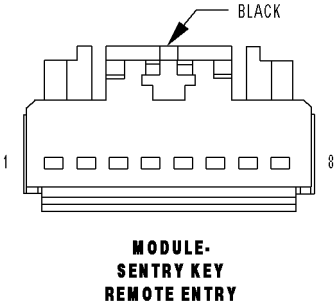
MODULE-POWERTRAIN CONTROL C3 - NATURAL 38 WAY		
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	K51 20BR/WT	AUTO SHUT DOWN RELAY CONTROL
4	-	-
5	K454 20BR/OR (5.7L MDS)	MDS SOL CONTROL NO. 7
6	K451 20BR/WT (5.7L MDS)	MDS SOL CONTROL NO. 1
7	-	-
8	K106 20VT/GY	NVLD SOL CONTROL
9	K299 20BR/WT	O2 1/2 HEATER CONTROL
10	K399 20BR/GY	O2 2/2 HEATER CONTROL
11	C13 20LB/OR	A/C CLUTCH RELAY CONTROL
12	-	-
13	-	-
14	B16 20LB/DG	BRAKE SWITCH NO. 2 SIGNAL
15	-	-
16	K167 20BR/YL	APPS NO. 1 RETURN
17	K400 20BR/VT	APPS NO. 2 RETURN
18	-	-
19	K344 18BR/GY	FUSED AUTO SHUT DOWN RELAY OUTPUT 3
20	K52 20DB/OR	EVAP PURGE CONTROL
21	-	-
22	-	-
23	B15 20DG/WT	BRAKE SWITCH NO. 1 SIGNAL
24	-	-
25	K23 20BR/WT	APPS NO. 1 SIGNAL
26	-	-
27	-	-
28	K342 18BR/WT	FUSED AUTO SHUT DOWN RELAY OUTPUT 1
29	K70 20DB/BR	EVAP PURGE RETURN
30	-	-
31	-	-
32	-	-
33	G224 20VT/YL (5.7L)	ENGINE OIL TEMPERATURE SIGNAL
34	-	-
35	K107 20VT/WT	NVLD SWITCH SIGNAL
36	K29 20WT/BR	APPS NO. 2 SIGNAL
37	K31 20BR	FUEL PUMP RELAY CONTROL
38	T752 20DG/OR	STARTER RELAY CONTROL



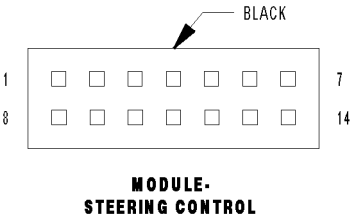
**MODULE-  
POWERTRAIN  
CONTROL C4  
(RLE)**

MODULE-POWERTRAIN CONTROL C4 (RLE) - GREEN 38 WAY

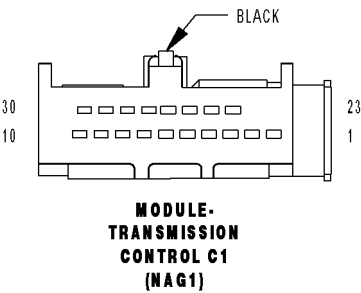
CAV	CIRCUIT	FUNCTION
1	T60 20YL/GY	OVERDRIVE SOLENOID CONTROL
2	T59 20YL/LB	UNDERDRIVE SOLENOID CONTROL
3	-	-
4	-	-
5	-	-
6	T19 20YL/DB	2-4 SOLENOID CONTROL
7	-	-
8	-	-
9	-	-
10	T20 20DG/WT	LOW/REVERSE SOLENOID CONTROL
11	-	-
12	Z904 20BK/BR	GROUND
13	Z904 20BK/BR	GROUND
14	Z904 20BK/BR	GROUND
15	T1 20DG/LB	TRS T1 SENSE
16	T3 20DG/DB	TRS T3 SENSE
17	-	-
18	T15 20YL/BR	TRANSMISSION CONTROL RELAY CONTROL
19	T16 16YL/OR	TRANSMISSION CONTROL RELAY OUTPUT
20	-	-
21	-	-
22	T9 20DG/TN	OVERDRIVE PRESSURE SWITCH SENSE
23	-	-
24	-	-
25	-	-
26	-	-
27	T41 20YL/DB	TRS T41 SENSE (P/N SENSE)
28	T16 16YL/OR	TRANSMISSION CONTROL RELAY OUTPUT
29	T50 20YL/TN	LOW/REVERSE PRESSURE SWITCH SENSE
30	T47 20YL/DG	2-4 PRESSURE SWITCH SENSE
31	-	-
32	T14 20DG/BR	OUTPUT SPEED SENSOR SIGNAL
33	T52 20DG/OR	INPUT SPEED SENSOR SIGNAL
34	T13 20DG/VT	SENSOR GROUND
35	T54 20DG/OR	TRANSMISSION TEMPERATURE SENSOR SIGNAL
36	-	-
37	T42 20DG/YL	TRS T42 SENSE
38	T16 16YL/OR	TRANSMISSION CONTROL RELAY OUTPUT



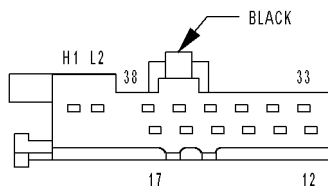
MODULE-SENTRY KEY REMOTE ENTRY - BLACK 8 WAY		
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
4	Z910 18BK/TN	GROUND
5	A23 20RD/YL	FUSED B(+) (I.O.D.)
6	D55 20WT/OR	CAN B BUS (+)
7	D54 20WT	CAN B BUS (-)
8	-	-



MODULE-STEERING CONTROL - BLACK 14 WAY		
CAV	CIRCUIT	FUNCTION
1	R63 20LG/WT	DRIVER SQUIB 2 LINE 1
2	R61 20LG/VT	DRIVER SQUIB 2 LINE 2
3	R45 20LG/OR	DRIVER SQUIB 1 LINE 1
4	R43 20LG/BR	DRIVER SQUIB 1 LINE 2
5	-	-
6	-	-
7	-	-
8	Z910 20BK/TN	GROUND
9	A913 20RD/GY	FUSED B(+)
10	D65 20WT/LG	CAN C BUS (+)
11	D64 20WT/LB	CAN C BUS (-)
12	D54 20WT	CAN B BUS (-)
13	D55 20WT/OR	CAN B BUS (+)
14	-	-



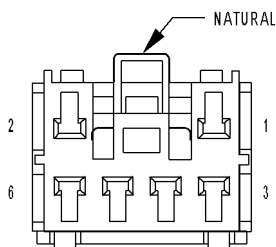
MODULE-TRANSMISSION CONTROL C1 (NAG1) - BLACK 18 WAY		
CAV	CIRCUIT	FUNCTION
1	D21 20WT/BR	SCI TRANSMIT (PCM)
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-
23	-	-
24	-	-
25	-	-
26	-	-
27	-	-
28	-	-
29	F942 18PK/BK	FUSED TRANSMISSION RELAY OUTPUT
30	Z912 18BK/OR	GROUND



**MODULE-  
TRANSMISSION  
CONTROL C2  
(NAG1)**

MODULE-TRANSMISSION CONTROL C2 (NAG1) - BLACK 14 WAY

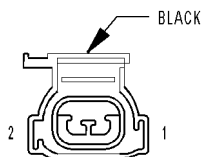
CAV	CIRCUIT	FUNCTION
12	T70 20YL	INPUT SPEED SENSOR 1 (N2) SIGNAL
13	T72 20YL/DB	SENSOR SUPPLY VOLTAGE
14	T60 20YL/GY	1-2/4-5 SOLENOID CONTROL
15	T73 20YL/GY	3-4 SOLENOID CONTROL
16	T74 20YL/LG	2-3 SOLENOID CONTROL
17	T75 20YL/LB	TCC SOLENOID CONTROL
33	T13 20DG/VT	SENSOR GROUND
34	T54 20DG/OR	TEMPERATURE SENSOR-P/N SWITCH SIGNAL
35	T71 20YL/OR	INPUT SPEED SENSOR 2 (N3) SIGNAL
36	T76 20YL/TN	MODULATION PRESSURE SOLENOID CONTROL
37	T77 20YL/BR	SHIFT PRESSURE SOLENOID CONTROL
38	T78 20YL	SOLENOID SUPPLY VOLTAGE
H1	D65 20WT/LG	CAN C BUS (+)
L2	D64 20WT/LB	CAN C BUS (-)



**MOTOR-  
ADJUSTABLE  
PEDALS**

MOTOR-ADJUSTABLE PEDALS - NATURAL 6 WAY

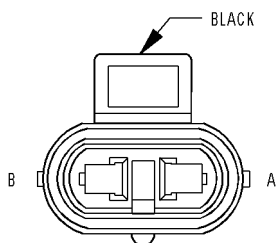
CAV	CIRCUIT	FUNCTION
1	P206 20LG/LB	ADJUSTABLE PEDALS MOTOR REARWARD
2	P205 20LG/WT	ADJUSTABLE PEDALS MOTOR FORWARD
3	-	-
4	-	-
5	-	-
6	-	-



**MOTOR-  
BLOWER-  
FRONT**

MOTOR-BLOWER-FRONT - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z134 12BK/LG	GROUND
2	C7 12DB (ATC)	BLOWER MOTOR SUPPLY
2	C7 12DB (MTC)	FUSED RUN RELAY OUTPUT

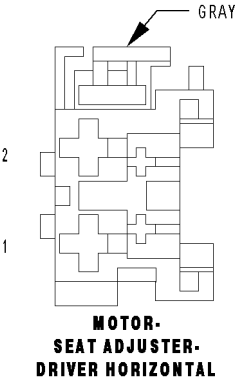


**MOTOR-  
HEADLAMP WASHER  
(HID LAMPS)**

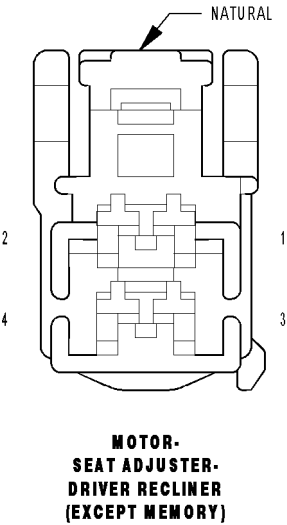
MOTOR-HEADLAMP WASHER (HID LAMPS) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
A	W23 16BR/OR	HEADLAMP WASHER RELAY OUTPUT
B	Z904 16BK/BR	GROUND

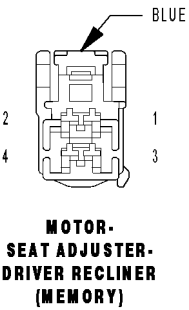




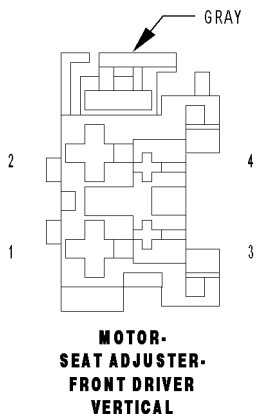
MOTOR-SEAT ADJUSTER-DRIVER HORIZONTAL - GRAY 4 WAY		
CAV	CIRCUIT	FUNCTION
1	P15 16LG/WT (EXCEPT MEMORY)	DRIVER SEAT HORIZONTAL FORWARD DRIVER
1	P115 16LG (MEMORY)	DRIVER SEAT HORIZONTAL FORWARD DRIVER
2	P17 16LG/DG (EXCEPT MEMORY)	DRIVER SEAT HORIZONTAL REARWARD DRIVER
2	P117 16LG/LB (MEMORY)	DRIVER SEAT HORIZONTAL REARWARD DRIVER
3	G491 20VT/GY (MEMORY)	DRIVER SEAT HORIZONTAL SENSOR GROUND
4	G401 20VT/LG (MEMORY)	DRIVER SEAT HORIZONTAL POSITION SENSE



MOTOR-SEAT ADJUSTER-DRIVER RECLINER (EXCEPT MEMORY) - NATURAL 4 WAY		
CAV	CIRCUIT	FUNCTION
1	P43 18LG/VT	DRIVER SEAT RECLINER UP DRIVER
2	P41 18LG/GY	DRIVER SEAT RECLINER DOWN DRIVER
3	-	-
4	-	-

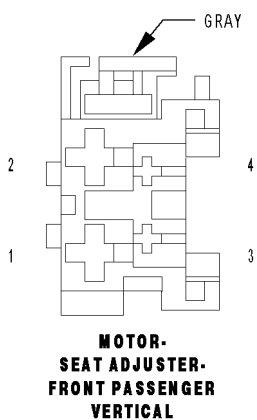


MOTOR-SEAT ADJUSTER-DRIVER RECLINER (MEMORY) - BLUE 4 WAY		
CAV	CIRCUIT	FUNCTION
1	P143 18LG/GY	DRIVER SEAT RECLINER DOWN DRIVER
2	P141 18LG/BR	DRIVER SEAT RECLINER UP DRIVER
3	G493 20OR/VT	DRIVER SEAT RECLINER POSITION SENSOR GROUND
4	G403 20VT/OR	DRIVER SEAT RECLINER POSITION SENSE



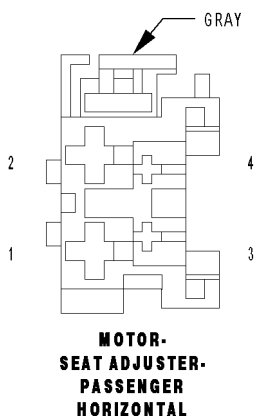
MOTOR-SEAT ADJUSTER-FRONT DRIVER VERTICAL - GRAY 4 WAY

CAV	CIRCUIT	FUNCTION
1	P21 18LG/TN (EXCEPT MEMORY)	DRIVER SEAT FRONT RISER DOWN DRIVER
1	P121 18LG/DB (MEMORY)	DRIVER SEAT FRONT VERTICAL DOWN DRIVER
2	P19 18LG/LB (EXCEPT MEMORY)	DRIVER SEAT FRONT RISER UP DRIVER
2	P119 18LG/DG (MEMORY)	DRIVER SEAT FRONT VERTICAL UP DRIVER
3	G494 20YL/VT (MEMORY)	DRIVER SEAT FRONT VERTICAL SENSOR GROUND
4	G404 20VT/YL (MEMORY)	DRIVER SEAT FRONT VERTICAL POSITION SENSE



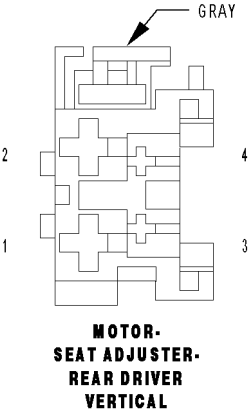
MOTOR-SEAT ADJUSTER-FRONT PASSENGER VERTICAL - GRAY 4 WAY

CAV	CIRCUIT	FUNCTION
1	P20 18LG/LB	PASSENGER SEAT FRONT RISER DOWN DRIVER
2	P18 18LG/OR	PASSENGER SEAT FRONT RISER UP DRIVER
3	-	-
4	-	-

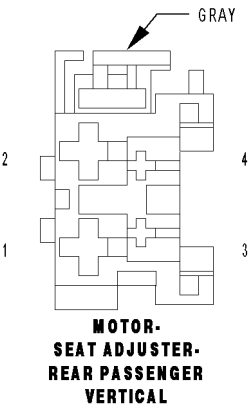


MOTOR-SEAT ADJUSTER-PASSENGER HORIZONTAL - GRAY 4 WAY

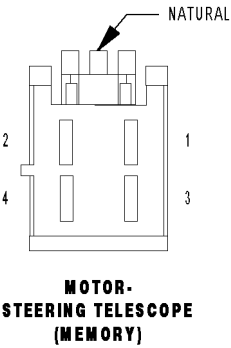
CAV	CIRCUIT	FUNCTION
1	P16 16LG/WT	PASSENGER SEAT HORIZONTAL REARWARD DRIVER
2	P14 16LG/OR	PASSENGER SEAT HORIZONTAL FORWARD DRIVER
3	-	-
4	-	-



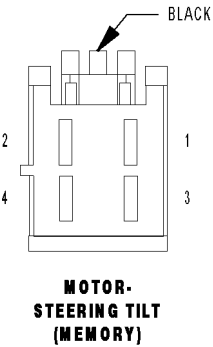
MOTOR-SEAT ADJUSTER-REAR DRIVER VERTICAL - GRAY 4 WAY		
CAV	CIRCUIT	FUNCTION
1	P13 18LG/OR (EXCEPT MEMORY)	DRIVER SEAT REAR RISER DOWN DRIVER
1	P113 18LG/WT (MEMORY)	DRIVER SEAT REAR VERTICAL DOWN DRIVER
2	P11 18LG/YL (EXCEPT MEMORY)	DRIVER SEAT REAR RISER UP DRIVER
2	P111 18LG/YL (MEMORY)	DRIVER SEAT REAR VERTICAL UP DRIVER
3	G492 20LB/VT (MEMORY)	DRIVER SEAT REAR VERTICAL SENSOR GROUND
4	G402 20VT/DB (MEMORY)	DRIVER SEAT REAR VERTICAL POSITION SENSE



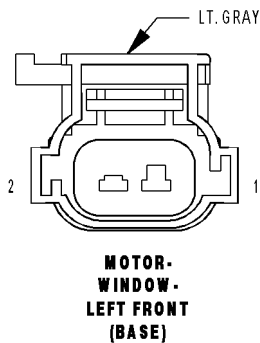
MOTOR-SEAT ADJUSTER-REAR PASSENGER VERTICAL - GRAY 4 WAY		
CAV	CIRCUIT	FUNCTION
1	P12 18LG/YL	PASSENGER SEAT REAR RISER DOWN DRIVER
2	P10 18LG/TN	PASSENGER SEAT REAR RISER UP DRIVER
3	-	-
4	-	-



MOTOR-STEERING TELESCOPE (MEMORY) - NATURAL 4 WAY		
CAV	CIRCUIT	FUNCTION
1	P953 20DG/TN	STEERING MOTOR COMMON
2	P157 20LB/TN	TELESCOPE STEERING MOTOR FORWARD/REAR- WARD DRIVER
3	P152 20TN/LB	TELESCOPE STEERING FORWARD/REARWARD POSI- TION SENSE
4	G914 20VT/GY	SENSOR RETURN

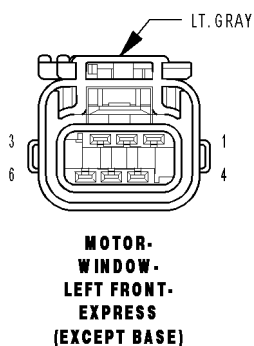


MOTOR-STEERING TILT (MEMORY) - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	P953 20DG/TN	STEERING MOTOR COMMON
2	P153 20TN/DG	TILT STEERING MOTOR UP/DOWN DRIVER
3	P151 20TN/OR	TILT STEERING UP/DOWN POSITION SENSE
4	G914 20VT/GY	SENSOR RETURN



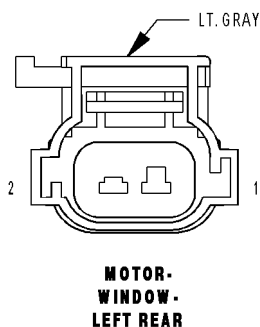
MOTOR-WINDOW-LEFT FRONT (BASE) - LT. GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	Q21 16OR/WT	DRIVER WINDOW DRIVER DOWN
2	Q11 16OR/LG	DRIVER WINDOW DRIVER UP



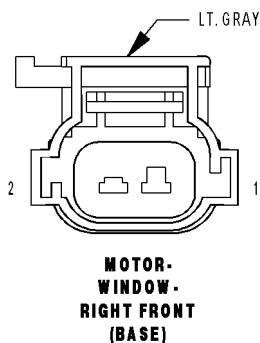
MOTOR-WINDOW-LEFT FRONT-EXPRESS (EXCEPT BASE) - LT. GRAY 6 WAY

CAV	CIRCUIT	FUNCTION
1	Z405 20BK	DRIVER WINDOW HALL SENSOR RETURN
2	Q303 20WT/OR	DRIVER WINDOW HALL SENSOR B SIGNAL
3	Q321 16OR/DB	DRIVER WINDOW EXPRESS DOWN DRIVER
4	Q305 20OR	DRIVER WINDOW HALL SENSOR SUPPLY
5	Q301 20OR/WT	DRIVER WINDOW HALL SENSOR A SIGNAL
6	Q311 16OR/LB	DRIVER WINDOW EXPRESS UP DRIVER



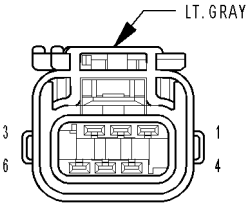
MOTOR-WINDOW-LEFT REAR - LT. GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	Q211 16TN/LB	LEFT REAR WINDOW DRIVER (DOWN)
2	Q111 16TN/YL	LEFT REAR WINDOW DRIVER (UP)



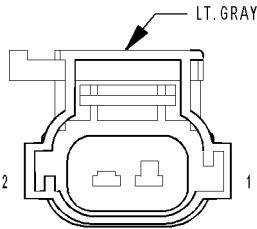
MOTOR-WINDOW-RIGHT FRONT (BASE) - LT. GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	Q22 16OR/VT	PASSENGER WINDOW DRIVER DOWN
2	Q12 16OR/BR	PASSENGER WINDOW DRIVER UP



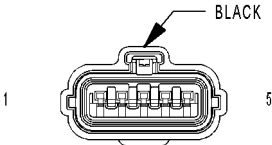
**MOTOR-  
WINDOW-  
RIGHT FRONT-  
EXPRESS  
(EXCEPT BASE)**

MOTOR-WINDOW-RIGHT FRONT-EXPRESS (EXCEPT BASE) - LT. GRAY 6 WAY		
CAV	CIRCUIT	FUNCTION
1	Z404 20BK/LG	PASSENGER WINDOW HALL SENSOR RETURN
2	Q304 20LG/OR	PASSENGER WINDOW HALL SENSOR B SIGNAL
3	Q322 16LG/OR	PASSENGER WINDOW EXPRESS DOWN DRIVER
4	Q306 20OR/DB	PASSENGER WINDOW HALL SENSOR SUPPLY
5	Q302 20OR/LG	PASSENGER WINDOW HALL SENSOR A SIGNAL
6	Q312 16DB/OR	PASSENGER WINDOW EXPRESS UP DRIVER



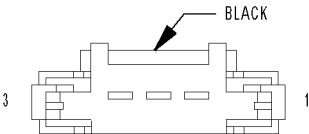
**MOTOR-  
WINDOW-  
RIGHT REAR**

MOTOR-WINDOW-RIGHT REAR - LT. GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Q212 16OR/VT	RIGHT REAR WINDOW DRIVER (DOWN)
2	Q112 16OR/BR	RIGHT REAR WINDOW DRIVER (UP)



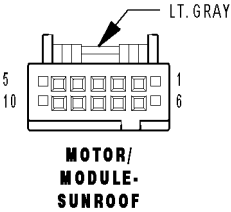
**MOTOR-  
WIPER-  
FRONT**

MOTOR-WIPER-FRONT - BLACK 5 WAY		
CAV	CIRCUIT	FUNCTION
1	W4 14BR/OR	FRONT WIPER HIGH/LOW RELAY HIGH SPEED OUT-PUT
2	W3 14BR/WT	FRONT WIPER HIGH/LOW RELAY LOW SPEED OUT-PUT
3	-	-
4	W7 20BR/GY	FRONT WIPER PARK SWITCH SENSE
5	Z902 14BK/LB	GROUND



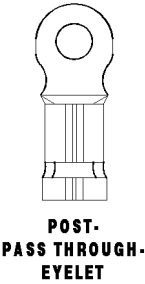
**MOTOR-  
WIPER-  
REAR  
(LX49)**

MOTOR-WIPER-REAR (LX49) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	W13 16BR/LG	REAR WIPER MOTOR CONTROL
2	W17 18BR/YL	REAR WIPER PARK SWITCH SENSE
3	Z914 16BK/GY	GROUND



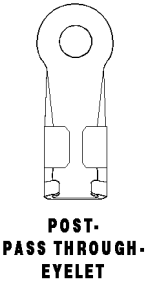
MOTOR/MODULE-SUNROOF - LT. GRAY 10 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	Q4 200R/YL	SUNROOF VENT SWITCH SENSE
3	Q3 200R/TN	SUNROOF OPEN SWITCH SENSE
4	D54 20WT	CAN B BUS (-)
5	D55 20WT/OR	CAN B BUS (+)
6	Z909 18BK	GROUND
7	Q5 200R/LB	SUNROOF CLOSE SWITCH SENSE
8	X13 18RD	FUSED B(+) (I.O.D.)
9	D270 20WT (FACTORY ONLY)	SUNROOF DIAGNOSTIC
10	Q6 200R/LG	SUNROOF SWITCH SUPPLY



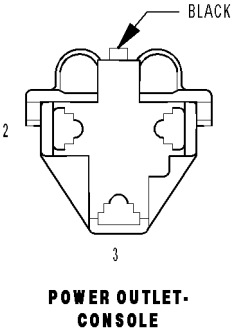
POST-PASS THROUGH-EYELET - (BATTERY SIDE) 1 WAY

CAV	CIRCUIT	FUNCTION
1	A1 1RD	B(+)



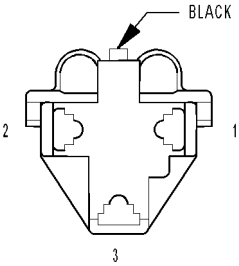
POST-PASS THROUGH-EYELET - (STARTER SIDE) 1 WAY

CAV	CIRCUIT	FUNCTION
1	A11 4BR/RD	B(+)

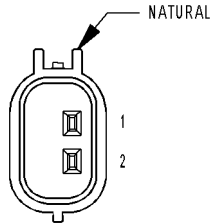


POWER OUTLET-CONSOLE - BLACK 3 WAY

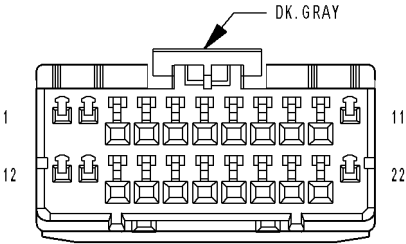
CAV	CIRCUIT	FUNCTION
1	A305 16RD/LB	FUSED B(+)
2	-	-
3	Z912 16BK/OR	GROUND



POWER OUTLET-  
REAR  
(LX49)



PUMP-  
WASHER-  
WINDSHIELD



RADIO C1

POWER OUTLET-REAR (LX49) - BLACK 3 WAY

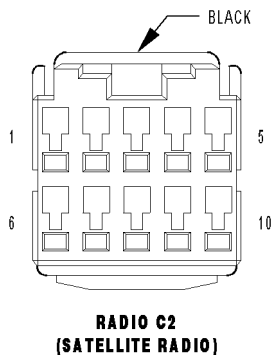
CAV	CIRCUIT	FUNCTION
1	A105 16DB/RD	FUSED B(+)
2	-	-
3	Z914 16BK/GY	GROUND

PUMP-WASHER-WINDSHIELD - NATURAL 2 WAY

CAV	CIRCUIT	FUNCTION
1	W10 20BR	FRONT WASHER PUMP MOTOR CONTROL
2	W20 20BR/YL	REAR WASHER PUMP MOTOR CONTROL

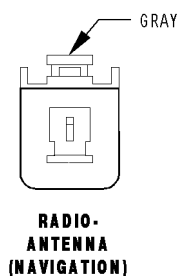
RADIO C1 - DK. GRAY 22 WAY

CAV	CIRCUIT	FUNCTION
1	A300 16GY/LG	FUSED B(+) (I.O.D.)
2	-	-
3	-	-
4	X703 22DG/OR (HANDS FREE)	LEFT AUDIO OUTPUT
5	D55 20WT/OR	CAN B BUS (+)
6	D54 20WT	CAN B BUS (-)
7	X202 18DG/VT (LOWLINE/MIDLINE I)	RIGHT FRONT DOOR SPEAKER (+)
8	X292 18DG/YL (LOWLINE/MIDLINE I)	RIGHT FRONT DOOR SPEAKER (-)
9	X291 18GY/YL (LOWLINE/MIDLINE I)	LEFT FRONT DOOR SPEAKER (-)
10	X201 18GY/VT (LOWLINE/MIDLINE I)	LEFT FRONT DOOR SPEAKER (+)
11	Z909 18BK/LG	GROUND
12	A300 16GY/LG	FUSED B(+) (I.O.D.)
13	-	-
14	-	-
15	-	-
16	X704 22DG/YL (HANDS FREE)	RIGHT AUDIO OUTPUT
17	X795 20DG (HANDS FREE)	COMMON AUDIO OUTPUT
18	X303 18DG/TN (LOWLINE/MIDLINE I)	LEFT REAR SPEAKER (+)
18	X51 18DG/DB (MIDLINE II/HIGHLINE)	RADIO LEFT AUDIO (+)
19	X393 18DG/GY (LOWLINE/MIDLINE I)	LEFT REAR SPEAKER (-)
19	X57 18DG/OR (MIDLINE II/HIGHLINE)	RADIO LEFT AUDIO (-)
20	X394 18YL/GY (LOWLINE/MIDLINE I)	RIGHT REAR SPEAKER (-)
20	X58 18GY/OR (MIDLINE II/HIGHLINE)	RADIO RIGHT AUDIO (-)
21	X304 18DG/BR (LOWLINE/MIDLINE I)	RIGHT REAR SPEAKER (+)
21	X52 18GY/DB (MIDLINE II/HIGHLINE)	RADIO RIGHT AUDIO (+)
22	Z909 18BK/LG	GROUND



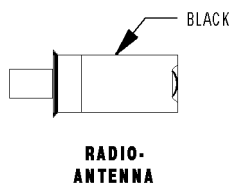
RADIO C2 (SATELLITE RADIO) - BLACK 10 WAY

CAV	CIRCUIT	FUNCTION
1	X16 20DG/YL	AUDIO SIGNAL RIGHT (+)
2	X917 20DG	AUDIO SIGNAL COMMON
3	-	-
4	-	-
5	-	-
6	X17 20DG/OR	AUDIO SIGNAL LEFT (+)
7	-	-
8	-	-
9	-	-
10	-	-



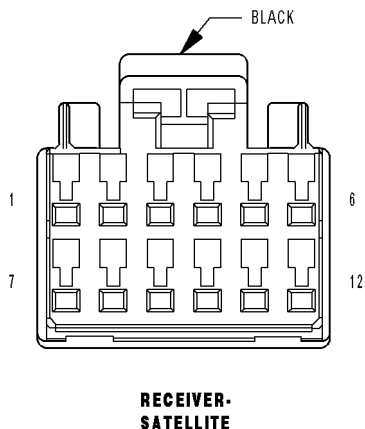
RADIO-ANTENNA (NAVIGATION) - GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	D8 WT/LB	GPS ANTENNA SIGNAL
2	D108 LB/WT	GPS ANTENNA SHIELD



RADIO-ANTENNA - BLACK 2 WAY

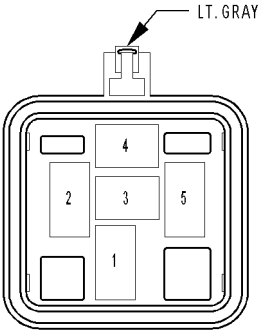
CAV	CIRCUIT	FUNCTION
1	D5 6WT/OR	ANTENNA SIGNAL
2	D931 WT/YL	ANTENNA SHIELD



RECEIVER-SATELLITE - BLACK 12 WAY

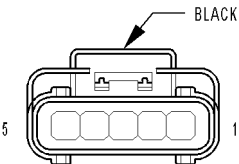
CAV	CIRCUIT	FUNCTION
1	A300 18GY/LG	FUSED B(+) (I.O.D.)
2	-	-
3	Z909 18BK/LG	GROUND
4	-	-
5	-	-
6	X17 20DG/OR	AUDIO SIGNAL LEFT (+)
7	D54 20WT	CAN B BUS (-)
8	D55 20WT/OR	CAN B BUS (+)
9	-	-
10	-	-
11	X917 20DG	AUDIO SIGNAL COMMON
12	X16 20DG/YL	AUDIO SIGNAL RIGHT (+)





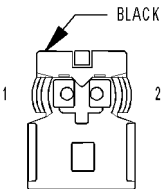
RELAY-  
HEADLAMP WASHER  
(HID LAMPS)

RELAY-HEADLAMP WASHER (HID LAMPS) - LT. GRAY 5 WAY		
CAV	CIRCUIT	FUNCTION
1	A904 16RD	FUSED B(+)
2	W24 20BR/OR	HEADLAMP WASHER RELAY CONTROL
3	-	-
4	W23 16BR/OR	HEADLAMP WASHER RELAY OUTPUT
5	A904 16RD	FUSED B(+)



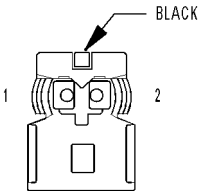
RESISTOR BLOCK-  
BLOWER MOTOR-  
FRONT  
(MTC)

RESISTOR BLOCK-BLOWER MOTOR-FRONT (MTC) - BLACK 5 WAY		
CAV	CIRCUIT	FUNCTION
1	C70 12DB/YL	FRONT BLOWER HIGH SPEED
2	Z134 12BK/LG	GROUND
3	C73 14DB/VT	FRONT BLOWER M2 SPEED
4	C72 14DB/OR	FRONT BLOWER M1 SPEED
5	C71 16DB/BR	FRONT BLOWER LOW SPEED



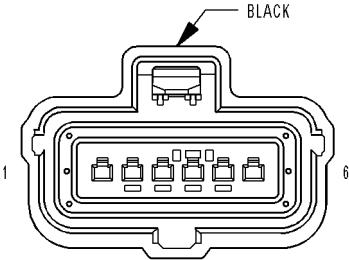
SEAT BELT-  
PRETENSIONER-  
DRIVER

SEAT BELT-PRETENSIONER-DRIVER - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	R53 20LG/YL	DRIVER SEAT BELT TENSIONER LINE 2
2	R55 20LG/DG	DRIVER SEAT BELT TENSIONER LINE 1



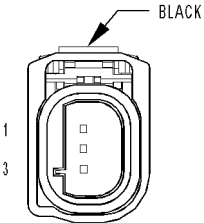
SEAT BELT-  
PRETENSIONER-  
PASSENGER

SEAT BELT-PRETENSIONER-PASSENGER - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	R56 20LB/DG	PASSENGER SEAT BELT TENSIONER LINE 1
2	R54 20LB/YL	PASSENGER SEAT BELT TENSIONER LINE 2



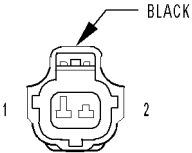
**SENSOR-  
ACCELERATOR  
PEDAL POSITION**

SENSOR-ACCELERATOR PEDAL POSITION - BLACK 6 WAY		
CAV	CIRCUIT	FUNCTION
1	F856 20YL/PK	5 VOLT SUPPLY
2	K29 20WT/BR	APPS NO. 2 SIGNAL
3	K400 20BR/VT	APPS NO. 2 RETURN
4	K167 20BR/YL	APPS NO. 1 RETURN
5	K23 20BR/WT	APPS NO. 1 SIGNAL
6	F855 20PK/YL	5 VOLT SUPPLY



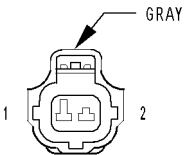
**SENSOR-  
ADJUSTABLE  
PEDALS  
(MEMORY)**

SENSOR-ADJUSTABLE PEDALS (MEMORY) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	G914 20VT/GY	SENSOR RETURN
2	G14 20VT/DB	ADJUSTABLE PEDALS SENSOR SIGNAL
3	G13 20VT/LB	ADJUSTABLE PEDALS SENSOR SUPPLY



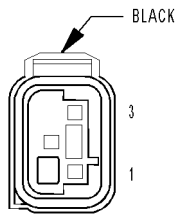
**SENSOR-  
AMBIENT AIR  
TEMPERATURE**

SENSOR-AMBIENT AIR TEMPERATURE - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	G31 20VT/LG	AAT SIGNAL
2	G931 20VT/BR	SENSOR GROUND



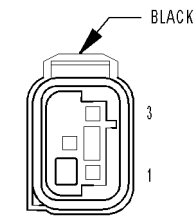
**SENSOR-  
BRAKE FLUID  
LEVEL**

SENSOR-BRAKE FLUID LEVEL - GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z902 20BK/LB	GROUND
2	B20 20DG/OR	BRAKE FLUID LEVEL SWITCH SENSE



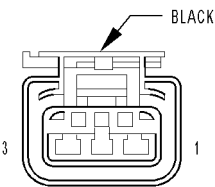
**SENSOR-  
BRAKE PEDAL  
TRAVEL  
(ESP)**

SENSOR-BRAKE PEDAL TRAVEL (ESP) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	B237 20DG/YL	BRAKE PEDAL TRAVEL SENSOR SUPPLY
2	B937 20DG/BR	BRAKE PEDAL TRAVEL SENSOR RETURN
3	B137 20DG/BR	BRAKE PEDAL TRAVEL SENSOR SIGNAL



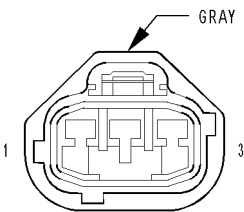
**SENSOR-  
BRAKE PRESSURE  
(ESP)**

SENSOR-BRAKE PRESSURE (ESP) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	B984 20DG/OR	BRAKE PRESSURE SENSOR RETURN
2	B84 20DG/YL	BRAKE PRESSURE SENSOR SIGNAL
3	B83 20DG/WT	BRAKE PRESSURE SENSOR SUPPLY



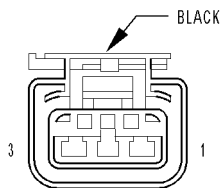
**SENSOR-  
CAMSHAFT POSITION  
(2.7L/3.5L)**

SENSOR-CAMSHAFT POSITION (2.7L/3.5L) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	F856 20YL/PK	5 VOLT SUPPLY
2	K900 20DB/DG	SENSOR GROUND
3	K44 20DB/GY	CMP SIGNAL



**SENSOR-  
CAMSHAFT POSITION  
(5.7L)**

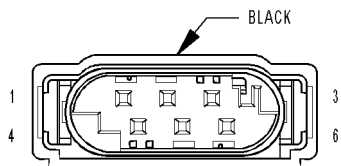
SENSOR-CAMSHAFT POSITION (5.7L) - GRAY 3 WAY		
CAV	CIRCUIT	FUNCTION
1	K44 20DB/GY	CMP SIGNAL
2	K900 20DB/DG	SENSOR GROUND
3	F856 20YL/PK	5 VOLT SUPPLY



**SENSOR-  
CRANKSHAFT  
POSITION**

SENSOR-CRANKSHAFT POSITION - BLACK 3 WAY

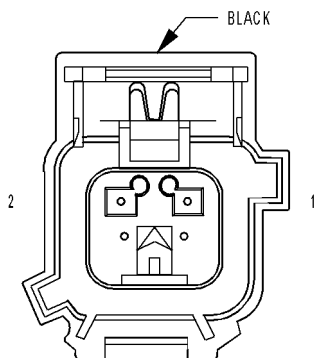
CAV	CIRCUIT	FUNCTION
1	F855 20PK/YL	5 VOLT SUPPLY
2	K900 20DB/DG	SENSOR GROUND
3	K24 20DB/WT	CKP SIGNAL



**SENSOR-  
DYNAMICS  
(ESP)**

SENSOR-DYNAMICS (ESP) - BLACK 6 WAY

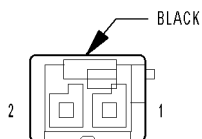
CAV	CIRCUIT	FUNCTION
1	D51 20WT/BR	DYNAMICS SENSOR LOW DATA LINK
2	D52 20WT/LB	DYNAMICS SENSOR HIGH DATA LINK
3	G4 20VT/LB	DYNAMICS SENSOR SUPPLY
4	-	-
5	G94 20VT/DB	DYNAMICS SENSOR GROUND
6	-	-



**SENSOR-  
ENGINE COOLANT  
TEMPERATURE**

SENSOR-ENGINE COOLANT TEMPERATURE - BLACK 2 WAY

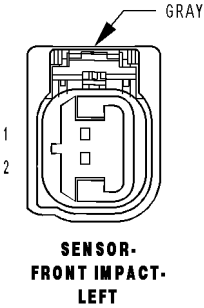
CAV	CIRCUIT	FUNCTION
1	K2 20VT/OR	ECT SIGNAL
2	K900 20DB/DG	SENSOR GROUND



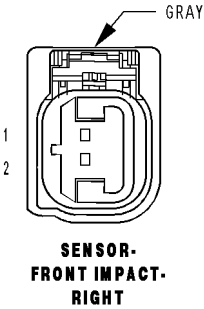
**SENSOR-  
EVAPORATOR  
TEMPERATURE**

SENSOR-EVAPORATOR TEMPERATURE - BLACK 2 WAY

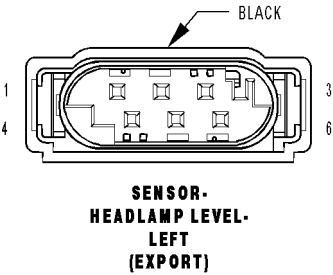
CAV	CIRCUIT	FUNCTION
1	C21 20DB/LG	EVAPORATOR TEMPERATURE SENSOR SIGNAL
2	C121 20DB/DG	SENSOR GROUND



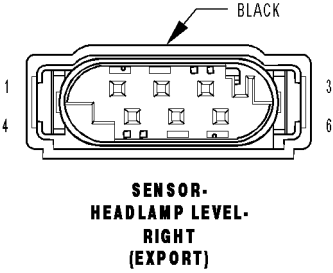
SENSOR-FRONT IMPACT-LEFT - GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	R81 20LB/WT	LEFT FRONT IMPACT SENSOR GROUND
2	R79 20LB/VT	LEFT FRONT IMPACT SENSOR SIGNAL



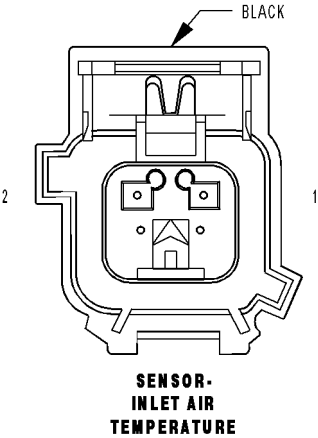
SENSOR-FRONT IMPACT-RIGHT - GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	R82 20WT/LB	RIGHT FRONT IMPACT SENSOR GROUND
2	R80 20VT/LB	RIGHT FRONT IMPACT SENSOR SIGNAL



SENSOR-HEADLAMP LEVEL-LEFT (EXPORT) - BLACK 6 WAY		
CAV	CIRCUIT	FUNCTION
1	Z901 20BK/DG	GROUND
2	Z921 20BK	GROUND
3	-	-
4	L13 20WT/YL	HEADLAMP LEVEL SENSOR SIGNAL
5	F500 20DG/PK	FUSED RUN RELAY OUTPUT
6	Z921 20BK	GROUND

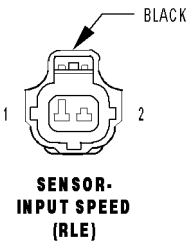


SENSOR-HEADLAMP LEVEL-RIGHT (EXPORT) - BLACK 6 WAY		
CAV	CIRCUIT	FUNCTION
1	Z914 20BK/GY	GROUND
2	Z920 20BK	GROUND
3	Z920 20BK	GROUND
4	L13 20WT/YL	HEADLAMP LEVEL SENSOR SIGNAL
5	F500 20DG/PK	FUSED RUN RELAY OUTPUT
6	-	-



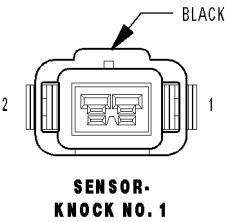
SENSOR-INLET AIR TEMPERATURE - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K21 20DB/LG	IAT SIGNAL
2	K900 20DB/DG	SENSOR GROUND



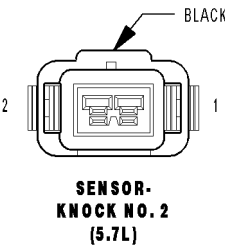
SENSOR-INPUT SPEED (RLE) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	T13 20DG/VT	SENSOR GROUND
2	T52 20DG/OR	INPUT SPEED SENSOR SIGNAL



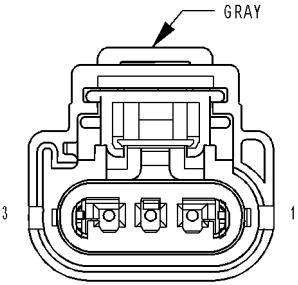
SENSOR-KNOCK NO. 1 - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K942 20BR/LG	KNOCK SENSOR NO. 1 RETURN
2	K42 20DB/YL	KNOCK SENSOR NO. 1 SIGNAL



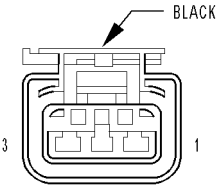
SENSOR-KNOCK NO. 2 (5.7L) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K924 20WT/BR	KNOCK SENSOR NO. 2 RETURN
2	K242 20BR/WT	KNOCK SENSOR NO. 2 SIGNAL



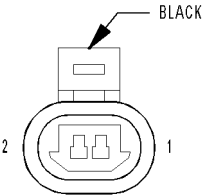
SENSOR-  
MANIFOLD ABSOLUTE  
PRESSURE

SENSOR-MANIFOLD ABSOLUTE PRESSURE - GRAY 3 WAY		
CAV	CIRCUIT	FUNCTION
1	K1 20VT/BR	MAP SIGNAL
2	K900 20DB/DG	SENSOR GROUND
3	F856 20YL/PK	5 VOLT SUPPLY



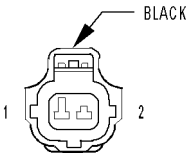
SENSOR-OIL  
PRESSURE  
(5.7L)

SENSOR-OIL PRESSURE (5.7L) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	F855 20PK/YL	5 VOLT SUPPLY
2	G6 20VT/GY	ENGINE OIL PRESSURE SIGNAL
3	K900 20DB/DG	SENSOR GROUND



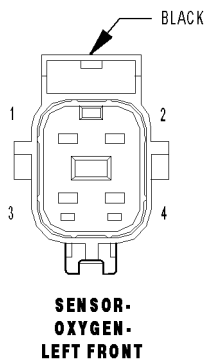
SENSOR-OIL  
TEMPERATURE  
(5.7L)

SENSOR-OIL TEMPERATURE (5.7L) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	G224 20VT/YL	ENGINE OIL TEMPERATURE SIGNAL
2	K900 20DB/DG	SENSOR GROUND



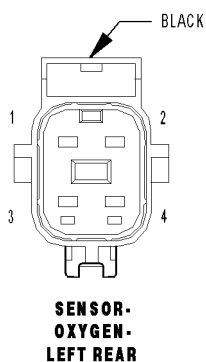
SENSOR-  
OUTPUT SPEED  
(RLE)

SENSOR-OUTPUT SPEED (RLE) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	T13 20DG/VT	SENSOR GROUND
2	T14 20DG/BR	OUTPUT SPEED SENSOR SIGNAL



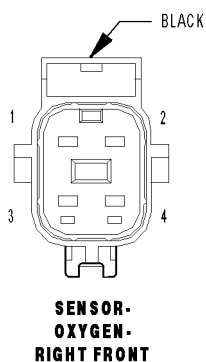
SENSOR-OXYGEN-LEFT FRONT - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	K99 20BR/LG	O2 1/1 HEATER CONTROL
2	Z907 18BK	GROUND
3	K902 20BR/DG	O2 RETURN (UP)
4	K41 20DB/LB	O2 1/1 SIGNAL



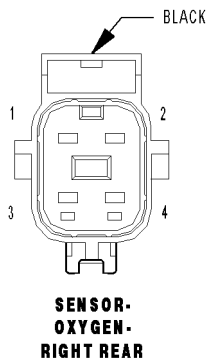
SENSOR-OXYGEN-LEFT REAR - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	K299 20BR/WT	O2 1/2 HEATER CONTROL
2	Z902 20BK/LB	GROUND
3	K904 20DB/DG	O2 RETURN (DOWN)
4	K141 20DB/YL	O2 1/2 SIGNAL



SENSOR-OXYGEN-RIGHT FRONT - BLACK 4 WAY

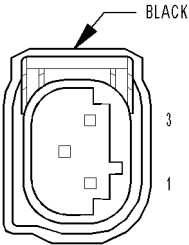
CAV	CIRCUIT	FUNCTION
1	K199 20BR/VT	O2 2/1 HEATER CONTROL
2	Z907 18BK	GROUND
3	K902 20BR/DG	O2 RETURN (UP)
4	K43 20DB/LG	O2 2/1 SIGNAL



SENSOR-OXYGEN-RIGHT REAR - BLACK 4 WAY

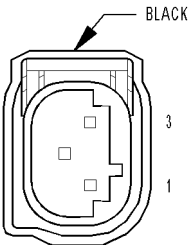
CAV	CIRCUIT	FUNCTION
1	K399 20BR/GY	O2 2/2 HEATER CONTROL
2	Z902 20BK/LB	GROUND
3	K904 20DB/DG	O2 RETURN (DOWN)
4	K243 20BR	O2 2/2 SIGNAL





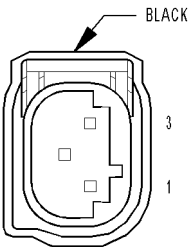
SENSOR-  
PARK  
ASSIST-NO. 7  
(PARKTRONICS)

SENSOR-PARK ASSIST-NO. 7 (PARKTRONICS) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	D700 20WT/GY	PARK ASSIST SENSOR NO. 7 SIGNAL
2	X750 20GY/LB	PARK ASSIST SENSOR GROUND
3	X700 20GY/OR	PARK ASSIST SENSOR SUPPLY



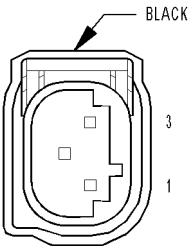
SENSOR-  
PARK  
ASSIST-NO. 8  
(PARKTRONICS)

SENSOR-PARK ASSIST-NO. 8 (PARKTRONICS) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	D701 20WT/LB	PARK ASSIST SENSOR NO. 8 SIGNAL
2	X750 20GY/LB	PARK ASSIST SENSOR GROUND
3	X700 20GY/OR	PARK ASSIST SENSOR SUPPLY



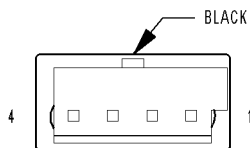
SENSOR-  
PARK  
ASSIST-NO. 9  
(PARKTRONICS)

SENSOR-PARK ASSIST-NO. 9 (PARKTRONICS) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	D703 20WT/BK	PARK ASSIST SENSOR NO. 9 SIGNAL
2	X750 20GY/LB	PARK ASSIST SENSOR GROUND
3	X700 20GY/OR	PARK ASSIST SENSOR SUPPLY



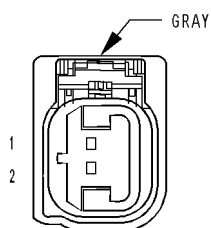
SENSOR-  
PARK  
ASSIST-NO. 10  
(PARKTRONICS)

SENSOR-PARK ASSIST-NO. 10 (PARKTRONICS) - BLACK 3 WAY		
CAV	CIRCUIT	FUNCTION
1	D704 20WT/DB	PARK ASSIST SENSOR NO. 10 SIGNAL
2	X750 20GY/LB	PARK ASSIST SENSOR GROUND
3	X700 20GY/OR	PARK ASSIST SENSOR SUPPLY



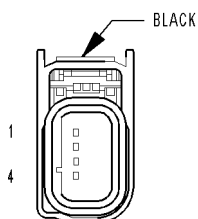
**SENSOR-  
RAIN  
(AUTO WIPERS)**

SENSOR-RAIN (AUTO WIPERS) - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	F880 20BK/PK	FUSED ACCESSORY DELAY RELAY OUTPUT
2	Z909 20BK/LG	GROUND
3	D55 20BK/WT	CAN B BUS (+)
4	D54 20BK	CAN B BUS (-)



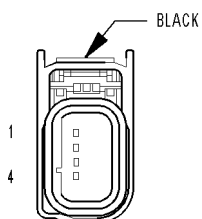
**SENSOR-  
SEAT TRACK  
POSITION-  
DRIVER**

SENSOR-SEAT TRACK POSITION-DRIVER - GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	R261 20LB/WT	DRIVER SEAT POSITION SENSOR DATA
2	R263 20LB/VT	DRIVER SEAT POSITION SENSOR VOLTAGE



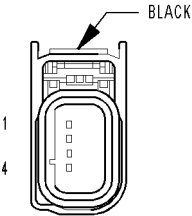
**SENSOR-  
SEAT WEIGHT-  
LEFT FRONT**

SENSOR-SEAT WEIGHT-LEFT FRONT - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	R701 20LG	SEAT WEIGHT SENSOR 5 VOLT
2	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND
3	-	-
4	R717 20LG/DG	SEAT WEIGHT LEFT FRONT SENSOR SIGNAL



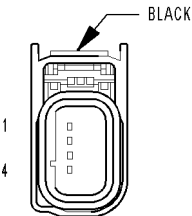
**SENSOR-  
SEAT WEIGHT-  
LEFT REAR**

SENSOR-SEAT WEIGHT-LEFT REAR - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	R701 20LG	SEAT WEIGHT SENSOR 5 VOLT
2	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND
3	-	-
4	R705 20LG/OR	SEAT WEIGHT LEFT REAR SENSOR SIGNAL



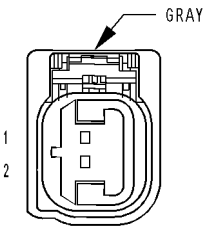
SENSOR-  
SEAT WEIGHT-  
RIGHT FRONT

SENSOR-SEAT WEIGHT-RIGHT FRONT - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	R701 20LG	SEAT WEIGHT SENSOR 5 VOLT
2	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND
3	-	-
4	R718 20LB/DG	SEAT WEIGHT RIGHT FRONT SENSOR SIGNAL



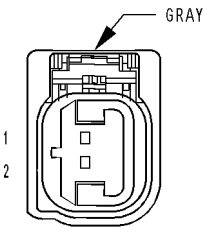
SENSOR-  
SEAT WEIGHT-  
RIGHT REAR

SENSOR-SEAT WEIGHT-RIGHT REAR - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	R701 20LG	SEAT WEIGHT SENSOR 5 VOLT
2	R728 20LB/YL	SEAT WEIGHT SENSOR GROUND
3	-	-
4	R706 20LB/OR	SEAT WEIGHT RIGHT REAR SENSOR SIGNAL



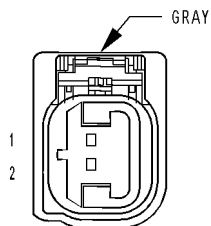
SENSOR-  
SIDE IMPACT-  
LEFT 1

SENSOR-SIDE IMPACT-LEFT 1 - GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	R15 20LG/BR	LEFT SIDE IMPACT SENSOR 1 GROUND
2	R13 20LG/TN	LEFT SIDE IMPACT SENSOR 1 SIGNAL



SENSOR-  
SIDE IMPACT-  
LEFT 2

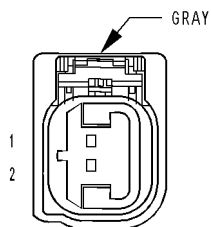
SENSOR-SIDE IMPACT-LEFT 2 - GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	R19 20LG/WT	LEFT SIDE IMPACT SENSOR 2 GROUND
2	R17 20LG	LEFT SIDE IMPACT SENSOR 2 SIGNAL



**SENSOR-  
SIDE IMPACT-  
RIGHT 1**

SENSOR-SIDE IMPACT-RIGHT 1 - GRAY 2 WAY

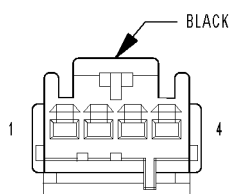
CAV	CIRCUIT	FUNCTION
1	R16 20BR/LG	RIGHT SIDE IMPACT SENSOR 1 GROUND
2	R14 20TN/LG	RIGHT SIDE IMPACT SENSOR 1 SIGNAL



**SENSOR-  
SIDE IMPACT-  
RIGHT 2**

SENSOR-SIDE IMPACT-RIGHT 2 - GRAY 2 WAY

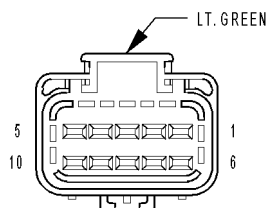
CAV	CIRCUIT	FUNCTION
1	R20 20WT/LG	RIGHT SIDE IMPACT SENSOR 2 GROUND
2	R18 20LB	RIGHT SIDE IMPACT SENSOR 2 SIGNAL



**SENSOR-SUN  
(ATC)**

SENSOR-SUN (ATC) - BLACK 4 WAY

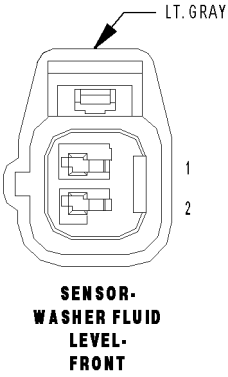
CAV	CIRCUIT	FUNCTION
1	G39 20VT/LB	SUN SENSOR NO. 1 SIGNAL
2	G939 20VT/DB	SUN SENSOR RETURN
3	L24 20WT/VT	AUTO HEADLAMPS SIGNAL
4	G139 20VT/OR	SUN SENSOR NO. 2 SIGNAL



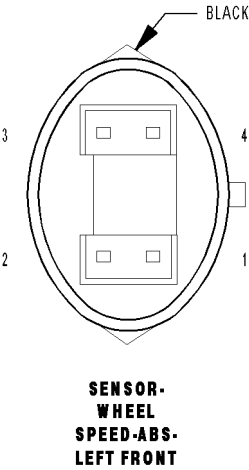
**SENSOR-  
TRANSMISSION  
RANGE  
(RLE)**

SENSOR-TRANSMISSION RANGE (RLE) - LT. GREEN 10 WAY

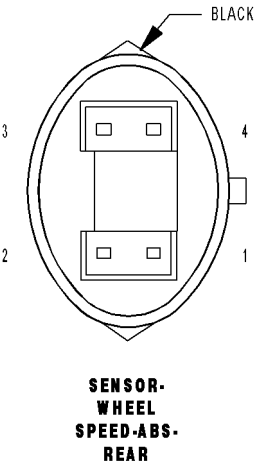
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	K900 20DB/DG	SENSOR GROUND
4	T54 20DG/OR	TRANSMISSION TEMPERATURE SENSOR SIGNAL
5	-	-
6	-	-
7	T1 20DG/LB	TRS T1 SENSE
8	T3 20DG/DB	TRS T3 SENSE
9	T42 20DG/YL	TRS T42 SENSE
10	T41 20YL/DB	TRS T41 SENSE (P/N SENSE)



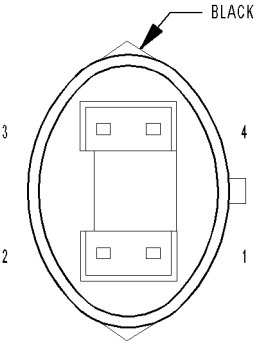
SENSOR-WASHER FLUID LEVEL-FRONT - LT. GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z901 20BK/DG	GROUND
2	W1 20BR/TN	WASHER FLUID LEVEL SWITCH SENSE



SENSOR-WHEEL SPEED-ABS-LEFT FRONT - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	B9 20DG/LG	LEFT FRONT WHEEL SPEED SENSOR SUPPLY
4	B8 20DG/TN	LEFT FRONT WHEEL SPEED SENSOR SIGNAL

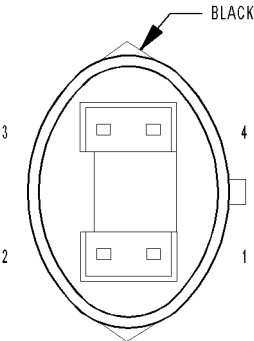


SENSOR-WHEEL SPEED-ABS-REAR - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	B2 20DG/LB	RIGHT REAR WHEEL SPEED SENSOR SUPPLY
2	B1 20DG/OR	RIGHT REAR WHEEL SPEED SENSOR SIGNAL
3	B4 20DG/GY	LEFT REAR WHEEL SPEED SENSOR SUPPLY
4	B3 20DG/YL	LEFT REAR WHEEL SPEED SENSOR SIGNAL



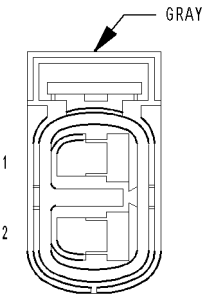
SENSOR-  
WHEEL  
SPEED-ABS-  
RIGHT FRONT

SENSOR-WHEEL SPEED-ABS-RIGHT FRONT - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	B7 20DG/VT	RIGHT FRONT WHEEL SPEED SENSOR SUPPLY
4	B6 20DG/WT	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL



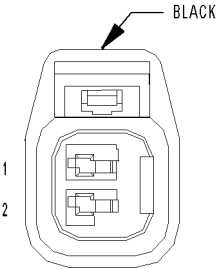
SENSOR-  
WHEEL  
SPEED-  
RIGHT FRONT  
(EXCEPT ABS)

SENSOR-WHEEL SPEED-RIGHT FRONT (EXCEPT ABS) - BLACK 4 WAY		
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	B7 20DG/VT	RIGHT FRONT WHEEL SPEED SENSOR SUPPLY
4	B6 20DG/WT	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL



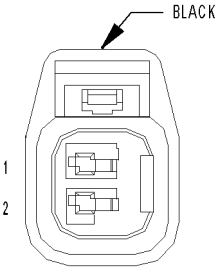
SOLENOID-  
MANIFOLD  
TUNING VALVE  
(2.7L/3.5L)

SOLENOID-MANIFOLD TUNING VALVE (2.7L/3.5L) - GRAY 2 WAY		
CAV	CIRCUIT	FUNCTION
1	Z904 18BK/BR	GROUND
2	K136 18BR	MTV CONTROL



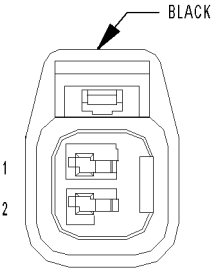
**SOLENOID-  
MULTI DISPLACEMENT  
SYSTEM CYL 1  
(5.7L MDS)**

SOLENOID-MULTI DISPLACEMENT SYSTEM CYL 1 (5.7L MDS) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K451 20BR/WT	MDS SOL CONTROL NO. 1
2	Z904 20BK/BR	GROUND



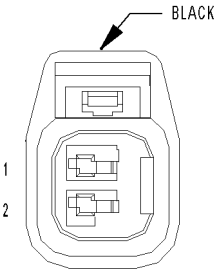
**SOLENOID-  
MULTI DISPLACEMENT  
SYSTEM CYL 4  
(5.7L MDS)**

SOLENOID-MULTI DISPLACEMENT SYSTEM CYL 4 (5.7L MDS) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K452 20BR/LB	MDS SOL CONTROL NO. 4
2	Z904 20BK/BR	GROUND



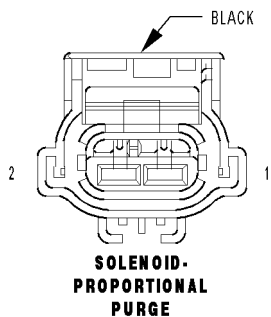
**SOLENOID-  
MULTI DISPLACEMENT  
SYSTEM CYL 6  
(5.7L MDS)**

SOLENOID-MULTI DISPLACEMENT SYSTEM CYL 6 (5.7L MDS) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K453 20BR/DG	MDS SOL CONTROL NO. 6
2	Z904 20BK/BR	GROUND



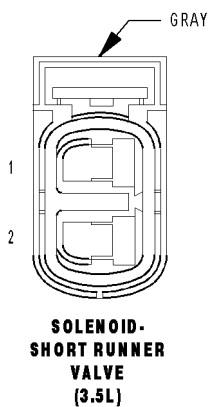
**SOLENOID-  
MULTI DISPLACEMENT  
SYSTEM CYL 7  
(5.7L MDS)**

SOLENOID-MULTI DISPLACEMENT SYSTEM CYL 7 (5.7L MDS) - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	K454 20BR/OR	MDS SOL CONTROL NO. 7
2	Z904 20BK/BR	GROUND



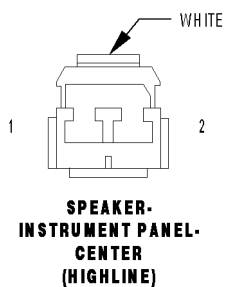
SOLENOID-PROPORTIONAL PURGE - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K52 20DB/OR	EVAP PURGE CONTROL
2	K70 20DB/BR	EVAP PURGE RETURN



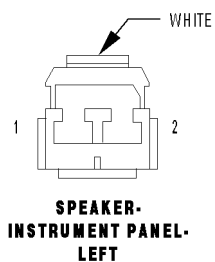
SOLENOID-SHORT RUNNER VALVE (3.5L) - GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	K236 20DB/LG	SRV CONTROL
2	K343 16BR/YL	FUSED AUTO SHUT DOWN RELAY OUTPUT 2



SPEAKER-INSTRUMENT PANEL-CENTER (HIGHLINE) - WHITE 2 WAY

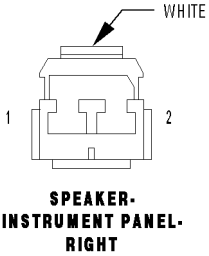
CAV	CIRCUIT	FUNCTION
1	X200 18GY/BR	AMPLIFIED CENTER I/P SPEAKER (+)
2	X290 18GY/OR	AMPLIFIED CENTER I/P SPEAKER (-)



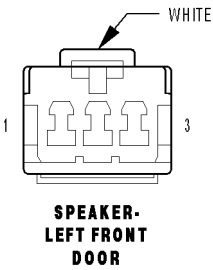
SPEAKER-INSTRUMENT PANEL-LEFT - WHITE 2 WAY

CAV	CIRCUIT	FUNCTION
1	X201 18GY/VT (MIDLINE I)	LEFT FRONT DOOR SPEAKER (+)
1	X209 18GY/OR (MIDLINE II/HIGHLINE)	AMPLIFIED LEFT I/P SPEAKER (+)
2	X291 18GY/YL (MIDLINE I)	LEFT FRONT DOOR SPEAKER (-)
2	X299 18GY/YL (MIDLINE II/HIGHLINE)	AMPLIFIED LEFT I/P SPEAKER (-)

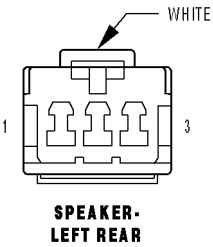




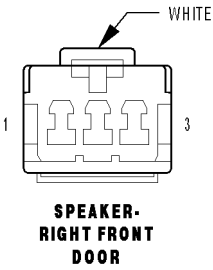
SPEAKER-INSTRUMENT PANEL-RIGHT - WHITE 2 WAY		
CAV	CIRCUIT	FUNCTION
1	X202 18DG/VT (MIDLINE I)	RIGHT FRONT DOOR SPEAKER (+)
1	X208 18GY/DG (MIDLINE II/HIGHLINE)	AMPLIFIED RIGHT I/P SPEAKER (+)
2	X292 18DG/YL (MIDLINE I)	RIGHT FRONT DOOR SPEAKER (-)
2	X298 18GY/LG (MIDLINE II/HIGHLINE)	AMPLIFIED RIGHT I/P SPEAKER (-)



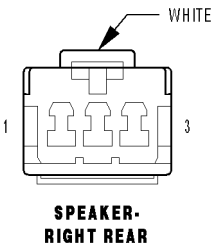
SPEAKER-LEFT FRONT DOOR - WHITE 3 WAY		
CAV	CIRCUIT	FUNCTION
1	X201 18GY/VT (LOWLINE/MIDLINE I)	LEFT FRONT DOOR SPEAKER (+)
1	X201 18GY/VT (MIDLINE II/HIGHLINE)	AMPLIFIED LEFT FRONT DOOR SPEAKER (+)
2	-	-
3	X291 18GY/YL (LOWLINE/MIDLINE I)	LEFT FRONT DOOR SPEAKER (-)
3	X291 18GY/YL (MIDLINE II/HIGHLINE)	AMPLIFIED LEFT FRONT DOOR SPEAKER (-)



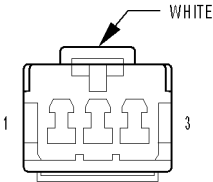
SPEAKER-LEFT REAR - WHITE 3 WAY		
CAV	CIRCUIT	FUNCTION
1	X393 18DG/GY (LOWLINE/MIDLINE I)	LEFT REAR SPEAKER (-)
1	X393 18DG/GY (MIDLINE II/HIGHLINE)	AMPLIFIED LEFT REAR SPEAKER (-)
2	-	-
3	X303 18DG/TN (LOWLINE/MIDLINE I)	LEFT REAR SPEAKER (+)
3	X303 18DG/TN (MIDLINE II/HIGHLINE)	AMPLIFIED LEFT REAR SPEAKER (+)



SPEAKER-RIGHT FRONT DOOR - WHITE 3 WAY		
CAV	CIRCUIT	FUNCTION
1	X202 18DG/VT (LOWLINE/MIDLINE I)	RIGHT FRONT DOOR SPEAKER (+)
1	X202 18DG/VT (MIDLINE II/HIGHLINE)	AMPLIFIED RIGHT FRONT DOOR SPEAKER (+)
2	-	-
3	X292 18DG/YL (LOWLINE I)	RIGHT FRONT DOOR SPEAKER (-)
3	X292 18DG/YL (MIDLINE II/HIGHLINE)	AMPLIFIED RIGHT FRONT DOOR SPEAKER (-)

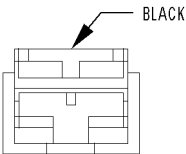


SPEAKER-RIGHT REAR - WHITE 3 WAY		
CAV	CIRCUIT	FUNCTION
1	X394 18YL/GY (LOWLINE/MIDLINE I)	RIGHT REAR SPEAKER (-)
1	X394 18YL/GY (MIDLINE II/HIGHLINE)	AMPLIFIED RIGHT REAR SPEAKER (-)
2	-	-
3	X304 18DG/BR (LOWLINE/MIDLINE I)	RIGHT REAR SPEAKER (+)
3	X304 18DG/BR (MIDLINE II/HIGHLINE)	AMPLIFIED RIGHT REAR SPEAKER (+)



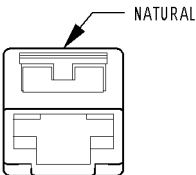
**SPEAKER-SUBWOOFER (HIGHLINE)**

SPEAKER-SUBWOOFER (HIGHLINE) - WHITE 3 WAY		
CAV	CIRCUIT	FUNCTION
1	X300 18GY/BR	AMPLIFIED SUBWOOFER 1 (+)
2	-	-
3	X390 18DG/BR	AMPLIFIED SUBWOOFER 1 (-)



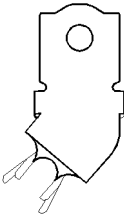
**STARTER (2.7L/3.5L)**

STARTER (2.7L/3.5L) - BLACK 1 WAY		
CAV	CIRCUIT	FUNCTION
1	T750 16LG	STARTER RELAY OUTPUT



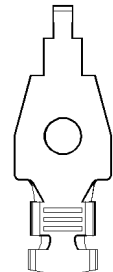
**STARTER (5.7L)**

STARTER (5.7L) - NATURAL 1 WAY		
CAV	CIRCUIT	FUNCTION
1	T750 16LG	STARTER RELAY OUTPUT



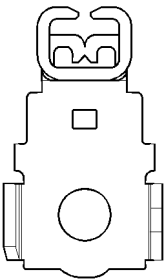
**STARTER-FUSIBLE LINK-EYELET (2.7L/3.5L)**

STARTER-FUSIBLE LINK-EYELET (2.7L/3.5L) - 1 WAY		
CAV	CIRCUIT	FUNCTION
1	A802 8LB	B(+)



**STARTER-FUSIBLE LINK-EYELET (5.7L)**

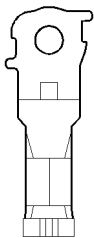
STARTER-FUSIBLE LINK-EYELET (5.7L) - 1 WAY		
CAV	CIRCUIT	FUNCTION
1	A802 8LB	B(+)



STARTER-  
POST-  
PASS THROUGH-  
EYELET  
(2.7L/3.5L)

STARTER-POST-PASS THROUGH-EYELET (2.7L/3.5L) - 1 WAY

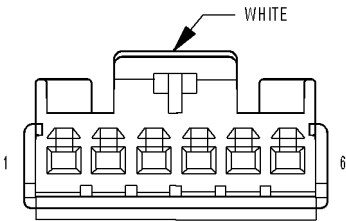
CAV	CIRCUIT	FUNCTION
1	A11 4BR/RD	B(+)



STARTER-  
POST-  
PASS THROUGH-  
EYELET  
(5.7L)

STARTER-POST-PASS THROUGH-EYELET (5.7L) - 1 WAY

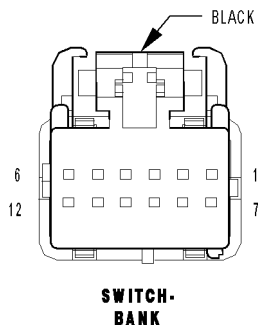
CAV	CIRCUIT	FUNCTION
1	A11 4BR/RD	B(+)



SWITCH-  
ADJUSTABLE PEDALS

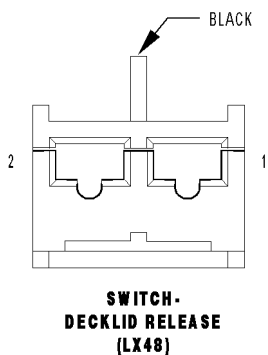
SWITCH-ADJUSTABLE PEDALS - WHITE 6 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	Z912 20BK/OR (EXCEPT MEMORY)	GROUND
3	P206 20LG/LB (EXCEPT MEMORY)	ADJUSTABLE PEDALS MOTOR REARWARD
3	Q103 20OR/LG (MEMORY)	ADJUSTABLE PEDALS SWITCH REARWARD
4	P205 20LG/WT (EXCEPT MEMORY)	ADJUSTABLE PEDALS MOTOR FORWARD
4	Q102 20OR/LB (MEMORY)	ADJUSTABLE PEDALS SWITCH FORWARD
5	Z912 20BK/OR (EXCEPT MEMORY)	GROUND
6	A72 20RD/OR (EXCEPT MEMORY)	ADJUSTABLE PEDALS RELAY OUTPUT
6	Q101 20OR/LB (MEMORY)	ADJUSTABLE PEDALS SWITCH GROUND



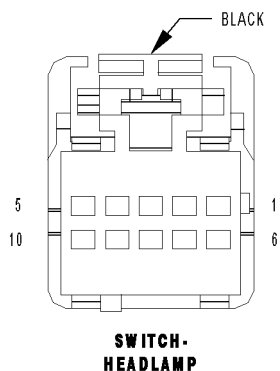
SWITCH-BANK - BLACK 12 WAY

CAV	CIRCUIT	FUNCTION
1	L91 20WT/DB	HAZARD SWITCH SENSE
2	Z909 20BK/LG	GROUND
3	B27 20DG/WT	TRACTION CONTROL SWITCH SENSE
4	G104 20VT/GY	PASSENGER AIRBAG INDICATOR DRIVER
5	F23 20RD/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
6	E22 20OR/GY	INDICATOR DIMMER SIGNAL
7	E12 20OR/GY	PANEL LAMPS DRIVER
8	W113 20BR/YL	REAR WIPER SWITCH MUX
9	W213 20BR/OR	REAR WIPER INDICATOR DRIVER
10	G926 20VT/WT	REAR WIPER SWITCH MUX RETURN
11	-	-
12	-	-



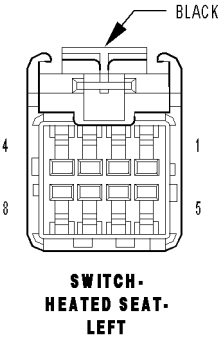
SWITCH-DECKLID RELEASE (LX48) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z910 20BK/TN	GROUND
2	G25 20VT/TN	DECKLID/LIFTGATE RELEASE SWITCH SENSE

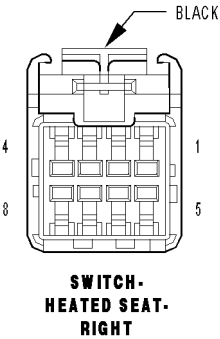


SWITCH-HEADLAMP - BLACK 10 WAY

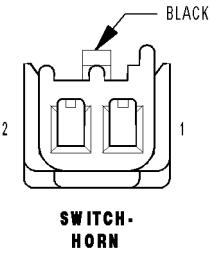
CAV	CIRCUIT	FUNCTION
1	L307 20WT/BR	HEADLAMP SWITCH MUX
2	E2 20OR/BR	PANEL LAMPS DIMMER SIGNAL
3	L900 20WT/YL	HEADLAMP SWITCH MUX RETURN
4	E12 20OR/GY	PANEL LAMPS DRIVER
5	Z910 20BK/TN	GROUND
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-



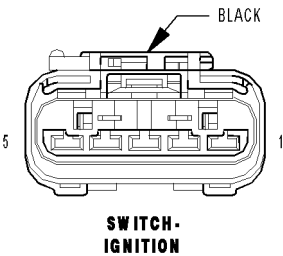
SWITCH-HEATED SEAT-LEFT - BLACK 8 WAY		
CAV	CIRCUIT	FUNCTION
1	F23 20RD/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	Z909 20BK/LG	GROUND
3	P365 20LG/GY	LEFT HEATED SEAT SWITCH SENSE
4	P83 20TN/WT	LEFT HEATED SEAT HIGH INDICATOR DRIVER
5	-	-
6	P81 20TN/LB	LEFT HEATED SEAT LOW INDICATOR DRIVER
7	E12 20OR/GY	PANEL LAMPS DRIVER
8	-	-



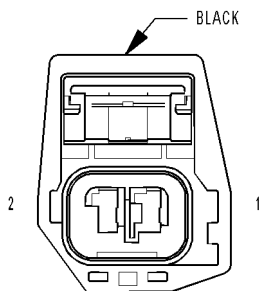
SWITCH-HEATED SEAT-RIGHT - BLACK 8 WAY		
CAV	CIRCUIT	FUNCTION
1	F23 20RD/OR	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	Z909 20BK/LG	GROUND
3	P366 20LG/LB	RIGHT HEATED SEAT SWITCH SENSE
4	P84 20TN/VT	RIGHT HEATED SEAT HIGH INDICATOR DRIVER
5	-	-
6	P82 20TN/DG	RIGHT HEATED SEAT LOW INDICATOR DRIVER
7	E12 20OR/GY	PANEL LAMPS DRIVER
8	-	-



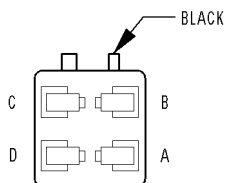
SWITCH-HORN - BLACK 2 WAY		
CAV	CIRCUIT	FUNCTION
1	D500 20WT (BASE)	LIN BUS
1	X3 20DG/VT (PREMIUM)	HORN SWITCH SIGNAL
2	D501 20WT/LG (BASE)	LIN SLAVE RETURN
2	X903 20GY/LG (PREMIUM)	HORN SWITCH RETURN



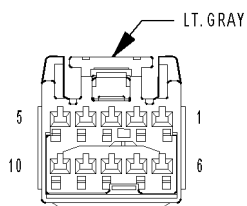
SWITCH-IGNITION - BLACK 5 WAY		
CAV	CIRCUIT	FUNCTION
1	G900 20VT/OR	IGNITION SWITCH SENSE RETURN
2	G20 20VT/BR	IGNITION SWITCH SENSE
3	F20 20PK/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
4	F21 20PK/DG	FUSED IGNITION SWITCH OUTPUT (START)
5	A106 20LB/RD	FUSED B(+)



**SWITCH-  
LIFTGATE RELEASE  
(LX49)**



**SWITCH-  
MEMORY SET**



**SWITCH-  
MIRROR**

SWITCH-LIFTGATE RELEASE (LX49) - BLACK 2 WAY

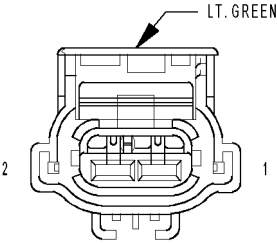
CAV	CIRCUIT	FUNCTION
1	G25 20VT/TN	DECKLID/LIFTGATE RELEASE SWITCH SENSE
2	Z914 20BK/GY	GROUND

SWITCH-MEMORY SET - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
A	-	-
B	G920 20VT/YL	MEMORY SELECT SWITCH RETURN
C	G200 20VT/BR	MEMORY SELECT SWITCH MUX
D	-	-

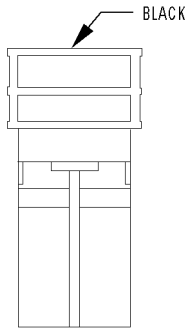
SWITCH-MIRROR - LT. GRAY 10 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	F880 20PK/DG (EXCEPT MEMORY)	FUSED ACCESSORY DELAY RELAY OUTPUT
2	E55 20OR/DG (MEMORY)	MIRROR SWITCH ILLUMINATION DRIVER
3	P76 20TN/LB (EXCEPT MEMORY)	MIRROR COMMON DRIVER
3	P710 20LG (MEMORY)	MIRROR COMMON SWITCH SENSE
4	Z912 20BK/OR (EXCEPT MEMORY)	GROUND
4	P950 20TN/GY (MEMORY)	MIRROR SWITCH RETURN
5	A913 20RD/GY (EXCEPT MEMORY)	FUSED B(+)
5	P550 20TN/LG (MEMORY)	MIRROR SWITCH SUPPLY
6	P72 20TN/GY (EXCEPT MEMORY)	PASSENGER MIRROR VERTICAL DRIVER
6	P706 20LG/GY (MEMORY)	MIRROR VERTICAL UP SWITCH SENSE
7	P71 20TN/DG (EXCEPT MEMORY)	DRIVER MIRROR VERTICAL DRIVER
7	P705 20LG/OR (MEMORY)	MIRROR VERTICAL DOWN SWITCH SENSE
8	P74 20TN/OR (EXCEPT MEMORY)	PASSENGER MIRROR HORIZONTAL DRIVER
8	P704 20LG/TN (MEMORY)	MIRROR HORIZONTAL RIGHT SWITCH SENSE
9	P75 20TN/LG (EXCEPT MEMORY)	DRIVER MIRROR HORIZONTAL DRIVER
9	P703 20DB/LG (MEMORY)	MIRROR HORIZONTAL LEFT SWITCH SENSE
10	-	-



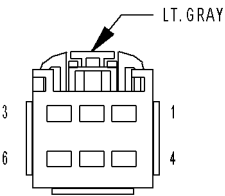
**SWITCH-OIL  
PRESSURE  
(2.7L/3.5L)**

SWITCH-OIL PRESSURE (2.7L/3.5L) - LT. GREEN 2 WAY		
CAV	CIRCUIT	FUNCTION
1	G6 20VT/GY	ENGINE OIL PRESSURE SIGNAL
2	-	-



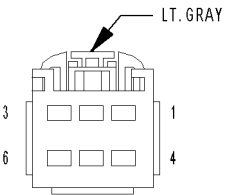
**SWITCH-  
PARKING BRAKE**

SWITCH-PARKING BRAKE - BLACK 1 WAY		
CAV	CIRCUIT	FUNCTION
1	B25 20GY/BK	PARK BRAKE SWITCH SENSE



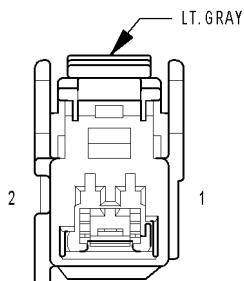
**SWITCH-  
POWER WINDOW-  
LEFT REAR**

SWITCH-POWER WINDOW-LEFT REAR - LT. GRAY 6 WAY		
CAV	CIRCUIT	FUNCTION
1	Q611 14OR/GY	MASTER WINDOW SWITCH LEFT REAR (DOWN)
2	Q211 16TN/LB	LEFT REAR WINDOW DRIVER (DOWN)
3	Q111 16TN/YL	LEFT REAR WINDOW DRIVER (UP)
4	Q411 14OR/WT	MASTER WINDOW SWITCH LEFT REAR (UP)
5	-	-
6	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT

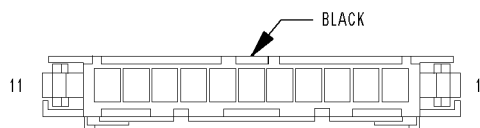


**SWITCH-  
POWER WINDOW-  
RIGHT REAR**

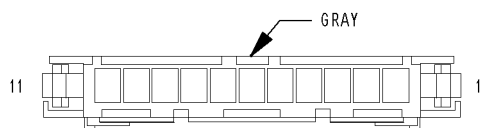
SWITCH-POWER WINDOW-RIGHT REAR - LT. GRAY 6 WAY		
CAV	CIRCUIT	FUNCTION
1	Q612 14OR/DB	MASTER WINDOW SWITCH RIGHT REAR (DOWN)
2	Q212 16OR/VT	RIGHT REAR WINDOW DRIVER (DOWN)
3	Q112 16OR/BR	RIGHT REAR WINDOW DRIVER (UP)
4	Q412 14OR/LB	MASTER WINDOW SWITCH RIGHT REAR (UP)
5	-	-
6	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT



**SWITCH-  
SEAT BELT-  
DRIVER**



**SWITCH-  
SEAT-  
DRIVER  
(EXCEPT MEMORY)**



**SWITCH-  
SEAT-  
DRIVER  
(MEMORY)**

SWITCH-SEAT BELT-DRIVER - LT. GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z912 20BK/OR	GROUND
2	R57 20LG/GY	DRIVER SEAT BELT SWITCH SENSE

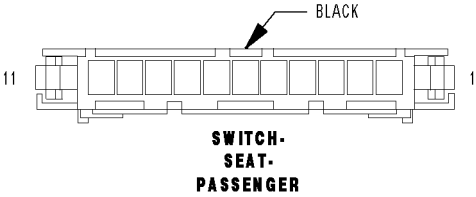
SWITCH-SEAT-DRIVER (EXCEPT MEMORY) - BLACK 11 WAY

CAV	CIRCUIT	FUNCTION
1	P41 18LG/GY	DRIVER SEAT RECLINER DOWN DRIVER
2	-	-
3	P43 18LG/VT	DRIVER SEAT RECLINER UP DRIVER
4	P17 16LG/DG	DRIVER SEAT HORIZONTAL REARWARD DRIVER
5	P21 18LG/TN	DRIVER SEAT FRONT RISER DOWN DRIVER
6	A110 16OR/RD	FUSED B(+)
7	Z912 16BK/OR	GROUND
8	P15 16LG/WT	DRIVER SEAT HORIZONTAL FORWARD DRIVER
9	P19 18LG/LB	DRIVER SEAT FRONT RISER UP DRIVER
10	P13 18LG/OR	DRIVER SEAT REAR RISER DOWN DRIVER
11	P11 18LG/YL	DRIVER SEAT REAR RISER UP DRIVER

SWITCH-SEAT-DRIVER (MEMORY) - GRAY 11 WAY

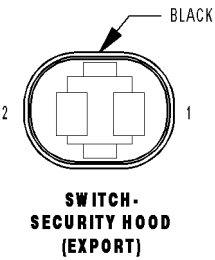
CAV	CIRCUIT	FUNCTION
1	P599 20LG/TN	DRIVER SEAT SWITCH MUX RETURN
2	-	-
3	-	-
4	P239 20LG/WT	DRIVER SEAT SWITCH REAR VERTICAL/HORIZONTAL SWITCH MUX
5	-	-
6	-	-
7	-	-
8	-	-
9	-	-
10	P9 20LG/OR	DRIVER SEAT SWITCH SUPPLY
11	P339 20LG/DB	DRIVER SEAT SWITCH FRONT VERTICAL/RECLINER SWITCH MUX





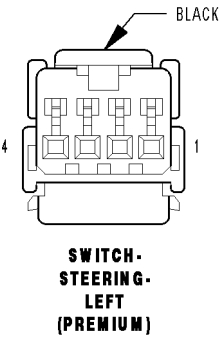
SWITCH-SEAT-PASSENGER - BLACK 11 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	P16 16LG/WT	PASSENGER SEAT HORIZONTAL REARWARD DRIVER
5	P20 18LG/LB	PASSENGER SEAT FRONT RISER DOWN DRIVER
6	A916 14RD	FUSED B(+)
7	Z911 14BK/WT	GROUND
8	P14 16LG/OR	PASSENGER SEAT HORIZONTAL FORWARD DRIVER
9	P18 18LG/OR	PASSENGER SEAT FRONT RISER UP DRIVER
10	P12 18LG/YL	PASSENGER SEAT REAR RISER DOWN DRIVER
11	P10 18LG/TN	PASSENGER SEAT REAR RISER UP DRIVER



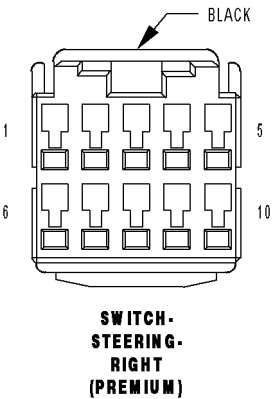
SWITCH-SECURITY HOOD (EXPORT) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	G70 20VT/LB	HOOD AJAR SWITCH SENSE
2	Z904 20BK/BR	GROUND



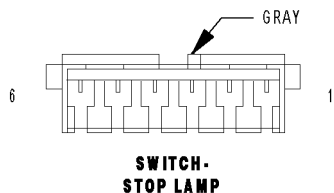
SWITCH-STEERING-LEFT (PREMIUM) - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	G907 20VT	EVIC/NAV MUX RETURN
2	D503 20WT/OR	LIN LIGHTING
3	G106 20VT/OR	EVIC MUX SIGNAL 1
4	G206 20VT/OR	EVIC MUX SIGNAL 2



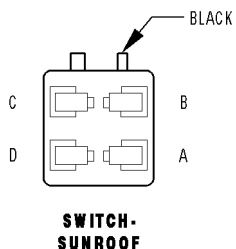
SWITCH-STEERING-RIGHT (PREMIUM) - BLACK 10 WAY

CAV	CIRCUIT	FUNCTION
1	D503 20WT/OR	LIN LIGHTING
2	X903 20GY/LG	HORN SWITCH RETURN
3	G106 20VT/OR	EVIC MUX SIGNAL 1
4	G206 20VT/OR	EVIC MUX SIGNAL 2
5	D500 20WT	LIN BUS
6	D502 20WT/OR	LIN SLAVE FEED
7	X3 20DG/VT	HORN SWITCH SIGNAL
8	D501 20WT/LG	LIN SLAVE RETURN
9	G907 20VT	EVIC/NAV MUX RETURN
10	-	-



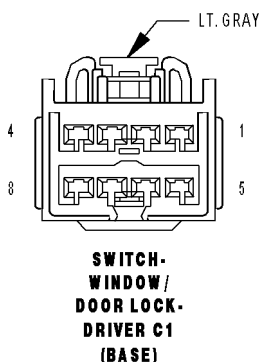
SWITCH-STOP LAMP - GRAY 6 WAY

CAV	CIRCUIT	FUNCTION
1	B15 20DG/WT	BRAKE SWITCH NO. 1 SIGNAL
2	Z912 20BK/OR	GROUND
3	B16 20LB/DG	BRAKE SWITCH NO. 2 SIGNAL
4	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
5	B29 20DG/WT	BRAKE SWITCH SIGNAL
6	A103 20PK/DB	FUSED B(+)



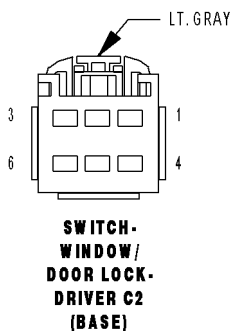
SWITCH-SUNROOF - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
A	Q4 200R/YL	SUNROOF VENT SWITCH SENSE
B	Q6 200R/LG	SUNROOF SWITCH SUPPLY
C	Q5 200R/LB	SUNROOF CLOSE SWITCH SENSE
D	Q3 200R/TN	SUNROOF OPEN SWITCH SENSE



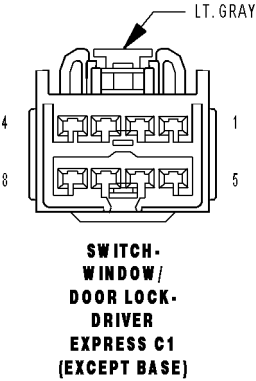
SWITCH-WINDOW/DOOR LOCK-DRIVER C1 (BASE) - LT. GRAY 8 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	F881 14PK	FUSED ACCESSORY DELAY RELAY OUTPUT
3	G167 20VT/LB	DRIVER DOOR LOCK SWITCH RETURN
4	Z912 14BK/OR	GROUND
5	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
6	Q21 16OR/WT	DRIVER WINDOW DRIVER DOWN
7	Q11 16OR/LG	DRIVER WINDOW DRIVER UP
8	G161 20VT/DG	DRIVER DOOR LOCK SWITCH MUX

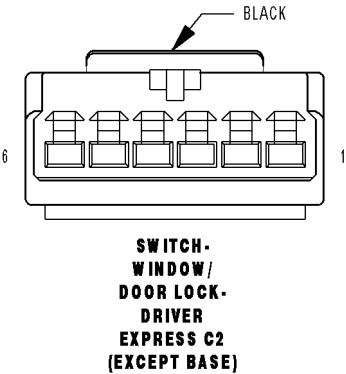


SWITCH-WINDOW/DOOR LOCK-DRIVER C2 (BASE) - LT. GRAY 6 WAY

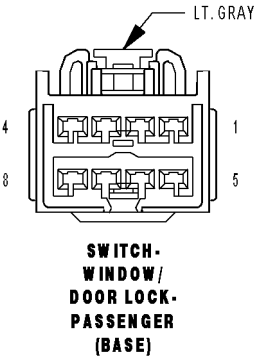
CAV	CIRCUIT	FUNCTION
1	Q411 14OR/WT	MASTER WINDOW SWITCH LEFT REAR (UP)
2	Q412 14OR/LB	MASTER WINDOW SWITCH RIGHT REAR (UP)
3	Q612 14OR/DB	MASTER WINDOW SWITCH RIGHT REAR (DOWN)
4	Q611 14OR/GY	MASTER WINDOW SWITCH LEFT REAR (DOWN)
5	Q26 14OR/GY	MASTER WINDOW SWITCH PASSENGER DOWN
6	Q16 14OR/TN	MASTER WINDOW SWITCH PASSENGER UP



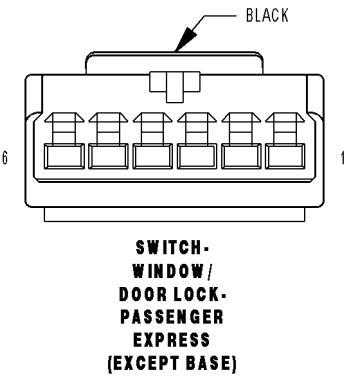
SWITCH-WINDOW/DOOR LOCK-DRIVER EXPRESS C1 (EXCEPT BASE) - LT. GRAY 8 WAY		
CAV	CIRCUIT	FUNCTION
1	F881 14PK	FUSED ACCESSORY DELAY RELAY OUTPUT
2	Q611 14OR/GY	MASTER WINDOW SWITCH LEFT REAR (DOWN)
3	Q411 14OR/WT	MASTER WINDOW SWITCH LEFT REAR (UP)
4	Q612 14OR/DB	MASTER WINDOW SWITCH RIGHT REAR (DOWN)
5	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
6	Z912 18BK/OR	GROUND
7	-	-
8	Q412 14OR/LB	MASTER WINDOW SWITCH RIGHT REAR (UP)



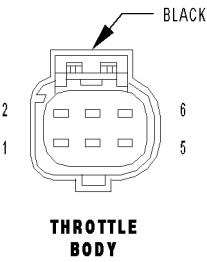
SWITCH-WINDOW/DOOR LOCK-DRIVER EXPRESS C2 (EXCEPT BASE) - BLACK 6 WAY		
CAV	CIRCUIT	FUNCTION
1	Q221 20GY/OR	DRIVER WINDOW DRIVER EXPRESS SWITCH MUX
2	Q222 20OR/GY	PASSENGER WINDOW DRIVER EXPRESS SWITCH MUX
3	G161 20VT/DG	DRIVER DOOR LOCK SWITCH MUX
4	Z421 20BK/BR	DRIVER EXPRESS SWITCH RETURN
5	G167 20VT/LB	DRIVER DOOR LOCK SWITCH RETURN
6	-	-



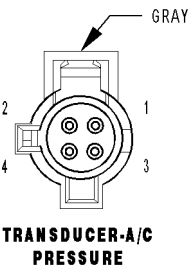
SWITCH-WINDOW/DOOR LOCK-PASSENGER (BASE) - LT. GRAY 8 WAY		
CAV	CIRCUIT	FUNCTION
1	Q26 14OR/GY	MASTER WINDOW SWITCH PASSENGER DOWN
2	Q22 16OR/VT	PASSENGER WINDOW DRIVER DOWN
3	Q12 16OR/BR	PASSENGER WINDOW DRIVER UP
4	Q15 14OR/LB	WINDOW LOCK OUT SWITCH OUTPUT
5	F881 14PK	FUSED ACCESSORY DELAY RELAY OUTPUT
6	G160 20VT/LG	PASSENGER DOOR LOCK SWITCH MUX
7	P37 20LG/TN	PASSENGER DOOR LOCK SWITCH RETURN
8	Q16 14OR/TN	MASTER WINDOW SWITCH PASSENGER UP



SWITCH-WINDOW/DOOR LOCK-PASSENGER EXPRESS (EXCEPT BASE) - BLACK 6 WAY		
CAV	CIRCUIT	FUNCTION
1	E34 200R/TN	PASSENGER WINDOW EXPRESS SWITCH ILLUMINATION DRIVER
2	Q336 200R/GY	PASSENGER WINDOW EXPRESS SWITCH MUX
3	Q936 200R/LG	PASSENGER WINDOW EXPRESS SWITCH RETURN
4	P37 20LG/TN	PASSENGER DOOR LOCK SWITCH RETURN
5	G160 20VT/LG	PASSENGER DOOR LOCK SWITCH MUX
6	F880 20PK/DG	FUSED ACCESSORY DELAY RELAY OUTPUT



THROTTLE BODY - BLACK 6 WAY		
CAV	CIRCUIT	FUNCTION
1	K22 18BR/OR	TP SENSOR NO. 1 SIGNAL
2	F855 18PK/YL	5 VOLT SUPPLY
3	K124 18DB/GY	ETC MOTOR (+)
4	K122 18BR/DG	TP SENSOR NO. 2 SIGNAL
5	K126 18DB/LG	ETC MOTOR (-)
6	K922 18BR/DB	TP SENSOR NO. 1 RETURN



TRANSDUCER-A/C PRESSURE - GRAY 4 WAY		
CAV	CIRCUIT	FUNCTION
1	C918 20BK/LB	A/C PRESSURE SENSOR GROUND
2	F891 20PK/GY	5 VOLT SUPPLY
3	C18 20LB/BR	A/C PRESSURE TRANSDUCER SIGNAL
4	-	-



## 8W-91 CONNECTOR/GROUND/SPLICE LOCATION

## TABLE OF CONTENTS

page

**CONNECTOR/GROUND/SPLICE LOCATION**

DESCRIPTION ..... 1

**CONNECTOR/GROUND/SPLICE LOCATION****DESCRIPTION**

This section provides illustrations identifying connector, ground and splice locations in the vehicle. Connector, ground and splice indexes are provided. Use the wiring diagrams in each section for connector, ground and splice identification. Refer to the appropriate index for the proper figure number. For items that are not shown in this section N/S is placed in the Fig. column.

**CONNECTORS**

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Actuator-Blend Door-Left	BK	Left Side of HVAC Unit	26
Actuator-Blend Door-Right (ATC)	BK	Center of HVAC Unit	24
Actuator-Mode Door	BK	Left Side of HVAC Unit	26
Actuator-Recirculation Door	BK	Right Side of HVAC Unit	25
Airbag-Driver Squib 1	BR/YL	At Steering Wheel	29
Airbag-Driver Squib 2	BK/YL	At Steering Wheel	29
Airbag-Passenger Squib	YL	Right Instrument Panel	35
Airbag-Side Curtain-Left	YL	Body Behind Left Rear Seat	46, 47
Airbag-Side Curtain-Right	YL	Body Behind Right Rear Seat	48, 56
Amplifier-Antenna-Backlite C1	BK	Upper Right Backlite	48, 55, 60
Amplifier-Antenna-Backlite C2			N/S
Amplifier-Antenna-Backlite C3	BK	Upper Right Backlite	48, 55, 60
Amplifier-Antenna-Backlite C4			N/S
Amplifier-Radio C1 (Midline/ Highline)	NAT	Left Side Instrument Panel	27
Amplifier-Radio C2 (Midline/ Highline)	WT	Left Side Instrument Panel	27
Antenna-Cable-Satellite Radio No. 1	BL	Rear Center Headliner	53, 54
Antenna-Cable-Satellite Radio No. 2	WT	Rear Center Headliner	53, 54
Antenna-Global Positioning System (Navigation)	GY		N/S
Antenna-Satellite No. 1	BL	Left Rear Trunk	53, 54

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Antenna-Satellite No. 2	WT	Left Rear Trunk	53, 54
Assembly-Electrohydraulic Control Unit (NAG1)	BK	Right Side Transmission	23
Assembly-Exhaust Gas Recirculation valve (2.7L)	BK	Rear of Engine	12
Assembly-Exhaust Gas Recirculation valve (3.5L)	BK	Rear of Engine	15
Assembly-Exhaust Gas Recirculation valve (5.7L)	BK	Right Front Engine	19
Assembly-Natural Vacuum Leak Detaction (Except Export)	BK	In Right Rear Wheel Well	48
Assembly-Shifter Lever	BK	Below Center Console	38
Assembly-Transmission Solenoid/Pressure Switch (RLE)	BR	At Top of Transmission	12, 15
Backlite-Antenna	NAT	Right Backlite	55
Backlite-Electric Heated	BK	Right Backlite	55
Backlite-Electric Heated-Ground	BK	Left Backlite	46, 60
Battery-Negative		Right Rear Trunk	62, 63
Battery-Positive		Right Rear Trunk	63, 64
Booster-Active Brake (ESP)	BK	Left Rear Engine Compartment	8
C100 (2.7L/3.5L)	BK	Right Engine Compartment	6, 7, 12, 15
C100 (5.7L)	BK	Right Engine Compartment	7
C101 (5.7L MDS)	DK GY	Left Rear Engine Compartment	21
C102	LT GY	Right Side Instrument Panel	34, 38
C103	DK GY	Right Front Engine Compartment	3
C104	BK	Right Side Instrument Panel	34
C105	BR	Right Side Instrument Panel	38
C106 (NAG1)	LT GY	Left Kick Panel	37
C200	NAT	Right Side Instrument Panel	34, 38
C201	GN	Right Side Instrument Panel	34, 38
C202	NAT	Right Side of HVAC Unit	24, 25, 34
C203	BK	Left Kick Panel	27, 30, 37
C204	NAT	Right Side Instrument Panel	35, 50
C205	NAT	Left Instrument Panel	26, 36
C206	NAT	At Steering Wheel	29
C207	BK	Right Side Instrument Panel	34, 38
C300	NAT	Front of Driver Door	37, 44
C301	NAT	Front of Passenger Door	44
C302	NAT	Front of Left Rear Door	41, 45
C303	NAT	Front of Right Rear Door	45
C303	NAT	At Right B-Pillar	42

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
C304	LT GY	Top Front of Liftgate	60
C305	LT GY	Top Front of Liftgate	60
C306	BK	Right Rear Body	57, 58, 68
C307	BK	Left Rear Taillamp Assembly	58, 65
C308	BK	Right Rear Taillamp Assembly	58, 65
C309	DK GY	Left Rear Fascia	68
C310	DK GY	Right Rear Fascia	68
C311	NAT	Rear of Sunroof	50, 52
C313	LT GY	Below Driver Seat	37, 39
C314	LT GY	Below Passenger Seat	38
C315	LT GY	Rear Driver Seat	N/S
C316	LT GY	Passenger Seat	40
C317 (Satellite Radio)	NAT	Left Kick Panel	27, 30, 43
Capacitor-Ignition Coil-No. 1	BK	Right Side Engine Near T/O for Ignition Coil No. 5	N/S
Capacitor-Ignition Coil-No. 2	BK	Top Left of Engine	13
Cluster C1	GY	Rear of Instrment Cluster	31
Cluster C2	GY	Rear of Instrment Cluster	31
Cluster C3	WT	Rear of Instrment Cluster	31
Clutch-A/C Compressor	BK	Front of Engine	13
Coil-Ignition-No. 1 (2.7L/3.5L)	BK	Top Right Front of Engine	N/S
Coil-Ignition-No. 1 (5.7L)	BK	Top Left Front of Engine	21
Coil-Ignition-No. 2 (2.7L/3.5L)	BK	Top Left Front of Engine	13, 17
Coil-Ignition-No. 2 (5.7L)	BK	Top Right Front of Engine	20
Coil-Ignition-No. 3 (2.7L/3.5L)	BK	Top Right of Engine	N/S
Coil-Ignition-No. 3 (5.7L)	BK	Top Left of Engine	21
Coil-Ignition-No. 4 (2.7L/3.5L)	BK	Top Left of Engine	13, 17
Coil-Ignition-No. 4 (5.7L)	BK	Top Right of Engine	20
Coil-Ignition-No. 5 (2.7L/3.5L)	BK	Top Right Rear of Engine	N/S
Coil-Ignition-No. 5 (5.7L)	BK	Top Left Rear of Engine	21
Coil-Ignition-No. 6 (2.7L/3.5L)	BK	Top Left Rear of Engine	13, 17
Coil-Ignition-No. 6 (5.7L)	BK	Top Right Rear of Engine	20
Coil-Ignition-No. 7 (5.7L)	BK	Top Left Rear of Engine	21
Coil-Ignition-No. 8 (5.7L)	BK	Top Right Rear of Engine	20
Control-A/C-Heater C1 (ATC)	GY		33
Control-A/C-Heater C1 (MTC)	BK	At Center Stack	33
Control-A/C-Heater C2 (ATC)	GY	At Center Stack	33
Control-A/C-Heater C2 (MTC)	BK	At Center Stack	33
Control-A/C-Heater C3 (MTC)	BK	At Center Stack	33
Data Link Connector	BK	Left Instrument Panel Above Pedals	27, 30
Diode-No. 1 (NAG1)			N/S
Diode-No. 2			N/S



CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Diode-Zener			N/S
Fan-Radiator	DK GY	Right Front of Engine Compartment	3, 4
Generator	BK	Right Front of Engine	12, 15, 20
Heater-Seat Back-Driver	GY	Near Driver Seat Back Pivot	N/S
Heater-Seat Back-Passenger	GY	Near Passenger Seat Back Pivot	40
Heater-Seat Cushion-Driver	GN	Under Driver Seat	39
Heater-Seat Cushion-Passenger	GN	Under Passenger Seat	40
Horn-No. 1	BK	Right Front of Engine Compartment	3
Horn-No. 2	BK	Right Front of Engine Compartment	3
Injector-Fuel-No.1 (2.7L/3.5L)	BK	Top Right Front of Engine	N/S
Injector-Fuel-No.1 (5.7L)	BK	Top Left Front of Engine	21
Injector-Fuel-No.2 (2.7L/3.5L)	BK	Top Left Front of Engine	13
Injector-Fuel-No.2 (5.7L)	BK	Top Right Front of Engine	20
Injector-Fuel-No.3 (2.7L/3.5L)	BK	Top Right of Engine	N/S
Injector-Fuel-No.3 (5.7L)	BK	Top Left of Engine	21
Injector-Fuel-No.4 (2.7L/3.5L)	BK	Top Left of Engine	13
Injector-Fuel-No.4 (5.7L)	BK	Top Right of Engine	20
Injector-Fuel-No.5 (2.7L/3.5L)	BK	Top Right Rear of Engine	N/S
Injector-Fuel-No.5 (5.7L)	BK	Top Left Rear of Engine	21
Injector-Fuel-No.6 (2.7L/3.5L)	BK	Top Left Rear of Engine	13
Injector-Fuel-No.6 (5.7L)	BK	Top Right Rear of Engine	20
Injector-Fuel-No.7 (5.7L)	BK	Top Left Rear of Engine	21
Injector-Fuel-No.8 (5.7L)	BK	Top Right Rear of Engine	20
Junction Post-Fusible Link Eyelet		Right Front Kick Panel	9, 61
Lamp-Back-Up-Left (300C)	GY	Right Tail Lamp Assembly	67
Lamp-Back-Up-Left (300L)	GY	Left Tail Lamp Assembly	65
Lamp-Back-Up-Left (Dodge)	LT GY	Left Tail Lamp Assembly	66
Lamp-Back-Up-Right (300C)	GY	Right Tail Lamp Assembly	67
Lamp-Back-Up-Right (300L)	GY	Right Tail Lamp Assembly	65
Lamp-Back-Up-Right (Dodge)	LT GY	Right Tail Lamp Assembly	66
Lamp-Cargo (LX48)	BK	Bottom Center of Backlite	48
Lamp-Cargo (LX49)	GY	Rear of Liftgate	60
Lamp-Center High Mounted Stop (LX48)	LT GY	Bottom Center of Backlite	48
Lamp-Center High Mounted Stop (LX49)	NAT	Right of Liftgate	60
Lamp-Courtesy-Left Front Door (LX48)	WT	At Bottom of Door	44
Lamp-Courtesy-Left Rear	BK	Left Rear of Headliner	50
Lamp-Courtesy-Right Front Door (LX48)	WT	At Bottom of Door	44

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Lamp-Courtesy-Right Rear	BK	Right Rear of Headliner	50
Lamp-Fog-Left Front	BK	Inside of Left Front Fascia	4
Lamp-Fog-Left Rear (300C Export)	GN	Left Rear Taillamp Assembly	67
Lamp-Fog-Left Rear (LX49)	GN	Left Rear Fascia	68
Lamp-Fog-Right Front	BK	Inside of Right Front Fascia	2
Lamp-Fog-Right Rear (300C Export)	GN	Right Rear Taillamp Assembly	67
Lamp-Fog-Right Rear (LX49 Export)	GN	Right Rear Fascia	68
Lamp-Glove Box	BK	Right Instrument Panel	35
Lamp-High Beam-Left	BK	Left Front Lamp Assembly	1, 4
Lamp-High Beam-Right	BK	Right Front Lamp Assembly	1, 2
Lamp-High Intensity Discharge-Left (300C HID)	DK GY	Left Front Lamp Assembly	1
Lamp-High Intensity Discharge-Right (300C HID)	DK GY	Right Front Lamp Assembly	1
Lamp-License (Except Export)	BK	Center of Rear Fascia	68
Lamp-License-Left (300C/ Export)	BK	Center of Rear Fascia	68
Lamp-License-Right (Export)	BK	Center of Rear Fascia	68
Lamp-Low Beam-Left (Except HID)	GY	Left Front Lamp Assembly	1, 4
Lamp-Low Beam-Right (Except HID)	GY	Right Front Lamp Assembly	1, 2
Lamp-Park Turn-Left Front (300C)	BK	Left Front Lamp Assembly	1, 4
Lamp-Park Turn-Left Front (300L/Dodge)	BK	Left Front Lamp Assembly	1, 4
Lamp-Park Turn-Right Front (300C)	BK	Right Front Lamp Assembly	1, 2
Lamp-Park Turn-Right Front (300L/Dodge)	BK	Right Front Lamp Assembly	1
Lamp-PRNDL	WT	Below Center Console	38
Lamp-Reading-Front	NAT	Overhead Console	51
Lamp-Side Marker-Left Front	BK	Behind Left Front Fender	5
Lamp-Side Marker-Left Rear (300T)	BK	Left Tail Lamp Assembly	65
Lamp-Side Marker-Right Front (LX48)	BK	Behind Right Front Fender	5
Lamp-Side Marker-Right Rear (300T)	BK	Right Tail Lamp Assembly	65
Lamp-Side Repeater Left (Export)	BK	Behind Left Front Fender	5

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Lamp-Side Repeater Right (Export)	BK	Behind Right Front Fender	5
Lamp-Tail Park-Left (300C)	GN	Right Tail Lamp Assembly	67
Lamp-Tail Park-Right (300C)	GN	Right Tail Lamp Assembly	67
Lamp-Tail Stop/Park-Left (300C)	BK	Left Tail Lamp Assembly	67
Lamp-Tail Stop/Park-Right (300C)	BK	Right Tail Lamp Assembly	67
Lamp-Tail Stop/Turn-Left (300L)	BK	Left Tail Lamp Assembly	65
Lamp-Tail Stop/Turn-Right (300L)	BK	Right Tail Lamp Assembly	65
Lamp-Tail Turn-Left (300C)	NAT	Left Tail Lamp Assembly	67
Lamp-Tail Turn-Right (300C)	NAT	Right Tail Lamp Assembly	67
Lamp-Tail Stop-Left (Dodge)	BR	Left Tail Lamp Assembly	66
Lamp-Tail Stop-Right (Dodge)	BR	Right Tail Lamp Assembly	66
Lamp-Turn-Left (Dodge)	TN	Left Tail Lamp Assembly	66
Lamp-Turn-Right (Dodge)	TN	Right Tail Lamp Assembly	66
Lamp-Vanity-Left	BK	Left Visor	50
Lamp-Vanity-Right	BK	Right Visor	50
Latch-Door-Decklid (LX48)	BK	At Decklid Latch	59
Latch-Door-Left Front	BK	Left Front Door	44
Latch-Door-Left Rear	BK	Rear of Left Rear Door	45
Latch-Liftgate (LX49)	BK	At Liftgate Latch	60
Latch-Door-Right Front	BK	Right Front Door	44
Latch-Door-Right Rear	BK	Rear of Right Rear Door	45
Lighter-Cigar	GY	Center Stack	34
Mirror-Inside Rearview C1	BK	Center Top of Windshield	36
Mirror-Inside Rearview C2 (Hands Free)	BK	Center Top of Windshield	36
Mirror-Outside Rearview-Driver	BK	Driver Door	44
Mirror-Outside Rearview-Passenger	NAT	Passenger Door	44
Module-Antilock Brakes	BK	Right Front Engine Compartment	6
Module-Brake (5.7L Trailer Tow)	BL	Left Kick Panel	37
Module-Clock Analog	NAT	Top Center Instrument Panel	33
Module-Door-Driver C1	BK	Middle of Driver Door	44
Module-Door-Driver C2	BK	Middle of Driver Door	44
Module-Door-Driver C3 (Memory)	GY	Middle of Driver Door	44
Module-Door-Driver C4 (Memory)	DK GY	Middle of Driver Door	44

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Module-Door-Passenger C1	BK		44
Module-Door-Passenger C2	BK		44
Module-Door-Passenger C4 (Memory)	DK GY		44
Module-Electronic Overhead	BK	Overhead Console	50, 51
Module-Front Blower Power C1 (ATC)	BK	Center HVAC Unit	24
Module-Front Blower Power C2 (ATC)	BK	Center HVAC Unit	24
Module-Front Control C1	BL	Right Engine Compartment	6
Module-Front Control C2	BK	Right Engine Compartment	6
Module-Front Control PDM		At End of IPM	N/S
Module-Fuel Pump	BK	Top of Fuel Tank	41
Module-Hands Free	DK GY	Right Side Instrument Panel	34
Module-Headlamp Leveling	BK	Right Front Engine Compartment	2
Module-Heated Seats	BK	Below Passenger Seat	38
Module-Integrated Power C1	GN	Right Engine Compartment	6
Module-Integrated Power C2	LT GY	Right Engine Compartment	6
Module-Integrated Power C3	BK	Right Engine Compartment	6
Module-Integrated Power C4	LT GY	Right Engine Compartment	6
Module-Integrated Power C5	BL	Right Engine Compartment	6
Module-Integrated Power Eyelet		Right Engine Compartment	11
Module-Memory Seat C1	BK	Below Driver Seat	37, 39
Module-Memory Seat C2	BK	Below Driver Seat	39
Module-Memory Seat C3	BK	Below Driver Seat	39
Module-Memory Seat C4	WT	Below Driver Seat	39
Module-Memory Seat C5 (Adjustable Pedals)	BK	Below Driver Seat	39
Module-Occupant Classification C1	BK	Below Passenger Seat	38
Module-Occupant Classification C2	BK	Below Passenger Seat	40
Module-Occupant Restraint Controller C1	YL	In Center Console	38
Module-Occupant Restraint Controller C2	YL	In Center Console	30
Module-Park Assist (Parktronics)	BK	Behind Right Rear Seat	58
Module-Park-Display (Parktronics)	BK	Center Rear Headliner, Above Backlite	50
Module-Powertrain Control C1	BK	Right Engine Compartment	7
Module-Powertrain Control C2	BK/OR	Right Engine Compartment	7, 12, 15, 20

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Module-Powertrain Control C3	NAT	Right Engine Compartment	7
Module-Powertrain Control C4 (RLE)	GN	Right Engine Compartment	7, 12, 15
Module-Sentry Key Remote Entry	BK	Steering Column	27
Module-Steering Control	BK	Steering Column	28, 31
Module-Traction (ABS)		Right Engine Compartment	6
Module-Transmission Control C1 (NAG1)	BK	Below Steering Column	30, 37
Module-Transmission Control C2 (NAG1)	BK	Below Steering Column	30, 37
Motor-Adjustable Pedals	NAT	At Adjustable Pedal Assembly	38
Motor-Blower-Front	BK	Right Side HVAC Unit	24
Motor-Headlamp Washer (HID)	BK	Behind Right Front Bumper	2
Motor-Seat Adjuster-Driver Horizontal	BK	Below Driver Seat	39
Motor-Seat Adjuster-Driver Recliner (Except Memory)	NAT	Driver Seat Back	N/S
Motor-Seat Adjuster-Driver Recliner (Memory)	BL		N/S
Motor-Seat Adjuster-Front Driver Vertical	BK	Below Driver Seat	39
Motor-Seat Adjuster-Front Passenger Vertical	BK	Front Passenger Seat	40
Motor-Seat Adjuster-Passenger Horizontal	BK	Below Passenger Seat	40
Motor-Seat Adjuster-Rear Driver Vertical	BK	Rear Driver Seat	N/S
Motor-Seat Adjuster-Rear Passenger Vertical	BK	Below Passenger Seat	40
Motor-Steering Telescope (Memory)	NAT	Steering Column	27
Motor-Steering Tilt (Memory)	BK	Steering Column	27
Motor-Window-Left Front (Base)	LT GY	Middle of Driver Door	44
Motor-Window-Left Front-Express (Except Base)	LT GY	Middle of Driver Door	44
Motor-Window-Left Rear	LT GY	Middle of Left Rear Door	45
Motor-Window-Right Front (Base)	LT GY	Middle of Passenger Door	44
Motor-Window-Right Front-Express (Except Base)	LT GY	Middle of Passenger Door	44
Motor-Window-Right Rear	LT GY	Middle of Right Rear Door	45
Motor-Wiper Front	BK	Left Rear Engine Compartment	8

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Motor-Wipe Rear (LX49)	BK	Rear Decklid	60
Motor/Module-Sunroof	WT	Rear Center Headliner	52
Post-Pass Through Eyelet (Battery Side)		Right Front Kick Panel	61
Post-Pass Through Eyelet (Starter Side)		Right Wheel Well	9
Power Distribution Center Eyelet		Right Rear Trunk	63
Power Outlet-Console	BK	In Center of Console	38
Power Outlet-Rear (LX49)	BK	Right Rear Cargo Area	49, 56
Pump-Washer-Windshield	NAT	Right Front Engine Compartment	2
Radio C1	DK GY	Rear of Radio	32
Radio C2 (Satellite Radio)	BK	Rear of Radio	32
Radio-Antenna (Navigation)	GY		N/S
Radio-Antenna	BK	Rear of Radio	35
Receiver-Satellite	BK	Left Rear Side Trunk	43
Relay-Headlamp Washer (HID)	LT GY	Below Right Front Lamp Housing	2
Resistor Block-Blower Motor-Front (MTC)	BK	Center HVAC Unit	24
Seat Belt-Pretensioner-Driver	BK	Left B-Pillar	41
Seat Belt-Pretensioner- Passenger	BK	Right B-Pillar	42
Sensor-Accelerator Pedal Position	BK	At Adjustable Pedal Assembly	38
Sensor-Adjustable Pedals (Memory)	BK	At Adjustable Pedal Assembly	37
Sensor-Ambient Air Temperature	BK	Right Front Engine Compartment	3
Sensor-Brake Fluid Level	GY	Left Rear Engine Compartment	8
Sensor-Brake Pedal Travel (ESP)	BK	Left Rear Engine Compartment	8
Sensor-Brake Pressure (ESP)	BK	Left Rear Engine Compartment	8
Sensor-Camshaft Position (2.7L/3/5L)	BK	Top Front of Engine	14
Sensor-Camshaft Position (5.7L)	GY	Top Front of Engine	N/S
Sensor-Crankshaft Position (2.7L)	BK	Right Rear of Engine	12
Sensor-Crankshaft Position (3.5L)	BK	Right Rear of Engine	15
Sensor-Crankshaft Position (5.7L)	BK	Right Rear of Engine	20
Sensor-Dynamics (ESP)	BK	Below Center Console	38
Sensor-Engine Coolant Temperature	BK	Front of Engine	14

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Sensor-Evaporator Temperature	WT	Center HVAC Unit	24
Sensor-Front Impact-Left	GY	Left Front Engine Compartment	4
Sensor-Front Impact-Right	GY	Right Front Engine Compartment	2
Sensor-Headlamp Level-Left (Export)	BK	Right Front Engine Compartment	2
Sensor-Headlamp Level-Right (Export)	BK	Under Right Side Body	48
Sensor-Inlet Air Temperature	BK	Top of Engine	13, 16, 20
Sensor-Input Speed (RLE)	BK	Right Side of Transmission	12, 15
Sensor-Knock No. 1	BK	Rear of Engine	13, 21
Sensor-Knock No. 2 (5.7L)	BK	Right Rear of Engine	20
Sensor-Manifold Absolute Pressure	GY	Top of Engine	13, 16, 1721
Sensor-Oil Pressure (5.7L)	BK	Right Front of Engine	N/S
Sensor-Oil Temperature (5.7L)	BK	Right Front of Engine	20
Sensor-Output Speed (RLE)	BK	Right Side of Transmission	12, 15
Sensor-Oxygen-Left Front(2.7L, 3.5L)	BK	Right Rear Engine Compartment	12, 15
Sensor-Oxygen-Left Front(5.7L)	BK	Left Rear Engine Compartment	20, 21
Sensor-Oxygen-Left Rear	BK	Left Rear Engine Compartment	8, 10
Sensor-Oxygen Right Front (2.7L, 3.5L)	BK	Left Side of Engine	13, 16
Sensor-Oxygen Right Front (5.7L)	BK	Right Side of Engine	20
Sensor-Oxygen Right Rear	BK	Lower Rear of Engine Compartment	8
Sensor-Park Assist No. 1 (Parktronics)	BK	Right Rear Fascia	68
Sensor-Park Assist No. 2 (Parktronics)	BK	Right Rear Fascia	68
Sensor-Park Assist No. 3 (Parktronics)	BK	Left Rear Fascia	68
Sensor-Park Assist No. 4 (Parktronics)	BK	Left Rear Fascia	68
Sensor-Rain (Highline)	BK	At Inside Rearview Mirror	36
Sensor-Seat Track Position-Driver	GY	Below Driver Seat	37, 39
Sensor-Seat Weight-Left Front	BK	Below Passenger Seat	40
Sensor-Seat Weight-Left Rear	BK	Below Passenger Seat	40
Sensor-Seat Weight-Right Front	BK	Below Passenger Seat	40
Sensor-Seat Weight-Right Rear	BK	Below Passenger Seat	40



CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Sensor-Side Impact-Left 1	GY	Left B-Pillar	41
Sensor-Side Impact-Left 2	GY	Rear of Left Rear Door	46, 47
Sensor-Side Impact-Right 1	GY	Right B-Pillar	42
Sensor-Side Impact-Right 2	GY	Rear of Right Rear Door	48, 49
Sensor-Sun (ATC)	BK	Top Center Instrument Panel	32
Sensor-Transmission Range (RLE)	LT GN	Right Side of Transmission	12, 15
Sensor-Washer Fluid Level-Front	LT GY	Right Front of Engine Compartment	2
Sensor-Wheel Speed-ABS-Left Front	BK	Left Front Wheel Well	4
Sensor-Wheel Speed-ABS-Rear	BK	Right Front of Cargo Pan	49
Sensor-Wheel Speed-ABS-Right Front	BK	Right Front Wheel Well	7
Solenoid-Manifold Tuning Valve (2.7L/3.5L)	BK	Front of Engine	14, 16
Solenoid-Multi Displacement System Cyl 1 (5.7L MDS)	BK	In Valley Under Intake	N/S
Solenoid-Multi Displacement System Cyl 4 (5.7L MDS)	BK	In Valley Under Intake	N/S
Solenoid-Multi Displacement System Cyl 6 (5.7L MDS)	BK	In Valley Under Intake	N/S
Solenoid-Multi Displacement System Cyl 7 (5.7L MDS)	BK	In Valley Under Intake	N/S
Solenoid-Short Runner Valve (3.5L)	GY	Top of Engine	14, 16
Speaker-Instrument Panel-Center (Highline)	WT	Top Center Instrument Panel	32
Speaker-Instrument Panel-Left	WT	Top Left Instrument Panel	27
Speaker-Instrument Panel-Right	WT	Right Instrument Panel	35
Speaker-Left Front Door	WT	Bottom of Door	44
Speaker-Left Rear (LX48)	WT	Left Rear Shelf	46
Speaker-Left Rear (LX49)	WT	Body Behind Left Rear Seat	47
Speaker-Right Front Door	WT	Bottom of Door	44
Speaker-Right Rear (LX48)	WT	Right Rear Shelf	48
Speaker-Right Rear (LX49)	WT	Body Behind Right Rear Seat	49
Speaker-Subwoofer (Highline)	WT	Center Rear Shelf	48
Starter (2.7L/3.5L)	BK		16
Starter (5.7L)	NAT		20
Starter-Fusible Link Eyelet (2.7L/3.5L)		Left Side of Engine	13, 16, 18
Starter-Fusible Link Eyelet (5.7L)		Right Side of Engine	20, 22



CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Starter-Post-Pass Through-Eyelet (2.7L/3.5L)		Left Side of Engine	18
Starter-Post-Pass Through-Eyelet (5.7L)		Right Side of Engine	22
Switch-Adjustable Pedals	WT	Right Side of Driver Seat	N/S
Switch-Bank	BK	Top Center Instrument Panel	33
Switch-Decklid Release (LX48)	BK	Left Side Instrument Panel	31
Switch-Headlamp	BK	Left Side Instrument Panel	31
Switch-Heated Seat-Driver	BK	Center Stack	30, 34
Switch-Heated Seat-Passenger	BK	Center Stack	30, 34
Switch-Horn	BK	Steering Wheel	29
Switch-Ignition	BK	Steering Cloumn	27
Switch-Liftgate Release (LX49)	BK	Left Rear Liftgate	60
Switch-Memory Set	BK	Middle of Driver Door	44
Switch-Mirror	LT GY	Middle of Driver Door	44
Switch-Oil Pressure (2.7L/3.5L)	LT GN	Front of Engine	N/S
Switch-Parking Brake	BK	Base of Parking Brake	37
Switch-Power Window-Left Rear	LT GY	Left Rear Door	45
Switch-Power Window-Right Rear	LT GY	Right Rear Door	45
Switch-Seat Belt-Driver (LX48)	LT GY	Below Driver Seat	39
Switch-Seat Belt-Driver (LX49)	LT GY	Below Left B-Pillar	37
Switch-Seat-Driver (Except Memory)	BK	Right Side of Driver Seat	N/S
Switch-Seat-Driver (Memory)	GY	Right Side of Driver Seat	N/S
Switch-Seat-Passenger	BK	Side of Passenger Seat	40
Switch-Security Hood (Export)	BK	Right Engine Compartment	6, 7
Switch-Steering-Left (Premium)	BK	Left Steering Wheel	29
Switch-Switch-Steering-Right (Premium)	BK	Right Steering Wheel	29
Switch-Stop Lamp	GY	Base of Brake Pedal	37
Switch-Sunroof	BK	Overhead Console	51
Switch-Window/Door Lock-Driver C1 (Base)	LT GY	Middle of Driver Door	44
Switch-Window/Door Lock-Driver C2 (Base)	LT GY	Middle of Driver Door	44

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Switch-Window/Door Lock-Driver Express C1 (Except Base)	LT GY	Middle of Driver Door	44
Switch-Switch-Window/Door Lock-Driver Express C2 (Except Base)	LT GY	Middle of Driver Door	44
Switch-Window/Door Lock-Passenger (Base)	LT GY	Middle of Passenger Door	44
Switch-Window/Door Lock-Passenger Express (Except Base)	BK	Middle of Passenger Door	44
Throttle Body	BK	Top of Intake Manifold	13, 16, 21
Transducer-A/C Pressure	GY	Left Rear Engine Compartment	8

**GROUNDS**

GROUND	LOCATION	FIG.
G100	Left Front of Engine Compartment	4
G101	Right Front of Engine Compartment	7
G102	Right of Engine Compartment	6, 7
G104	Right of Engine Compartment	12, 15, 20
G105 (2.7L/3.5L)	On Engine Near T/O for Ignition Coil No. 5	N/S
G105 (5.7L)	Rear of Engine	20
G106 (2.7L/3.5L)	Left Side of Engine	16
G106 (5.7L)	Rear of Engine	20
G107 (3.5L)	Right Side of Engine Near Generator	N/S
G108	Left Side of Engine	16
G200	Left Instrument Panel Near T/O for Ignition Switch	27
G201	Right Instrument Panel	35
G202	Left Instrument Panel Near T/O for Cluster C3	27
G300	Below Left B-Pillar	37
G301	Below Right B-Pillar	38
G302	Right Front of Cargo Pan	49
G303	Right Rear Cargo Pan	62

**SPLICES**

<b>SPLICE</b>	<b>LOCATION</b>	<b>FIG.</b>
S100	Rear of Engine	13, 16, 20
S103	Rear of Engine	13, 21
S105	Right Rear of Engine Compartment	12, 15, 20
S106	Right Rear of Engine Compartment	12, 15, 20
S107 (2.7L)	Top of Engine	13
S107 (3.5L)	Top of Engine Between Take Outs for Fuel Injectors No. 3 and No. 5	N/S
S107 (5.7L)	Top of Engine	20
S108 (2.7L)	Top of Engine Between Take Outs for Fuel Injectors No. 3 and No. 5	N/S
S108 (3.5L)	Between Take Outs for Fuel Injectors No. 4 and No. 6	17
S109	Right Rear of Engine	15, 20
S110	Rear Engine Compartment	12, 16, 20
S111	Left Side of Engine	13, 20
S112	Right Rear Engine Compartment	12, 15, 20
S113	Rear Engine Compartment	12, 15
S114	Right Rear Engine Compartment	12, 15
S115	Right Side of Engine	20
S116	Right Rear Engine Compartment	12, 15
S117	Right Rear Engine Compartment	12
S118	Right Engine Compartment	6
S119	Right Rear Engine Compartment	6
S121	Right Rear Engine Compartment	6
S122	Right Engine Compartment	6
S123	Front Engine Compartment	4
S124	Right Engine Compartment	6
S125	Left Rear Engine Compartment	8
S126	Right Rear Engine Compartment	6
S127	Right Engine Compartment	6
S128	Front Engine Compartment	4
S129	Right Engine Compartment	6
S130 (HID Headlamps)	Front Engine Compartment	4
S131	Front Engine Compartment	4
S132 (Export)	Right Rear Engine Compartment	6
S133 (Export)	Right Rear Engine Compartment	6
S134	Front Engine Compartment	4
S135	Front Engine Compartment	4
S200	Right Instrument Panel	35
S201	Left Instrument Panel	27
S202	Right Instrument Panel	35
S203	Right Instrument Panel	35
S204	Left Instrument Panel	32

SPLICE	LOCATION	FIG.
S205	Left Instrument Panel	32
S206	Left Instrument Panel	32
S207	Left Instrument Panel	32
S208	Left Instrument Panel	27
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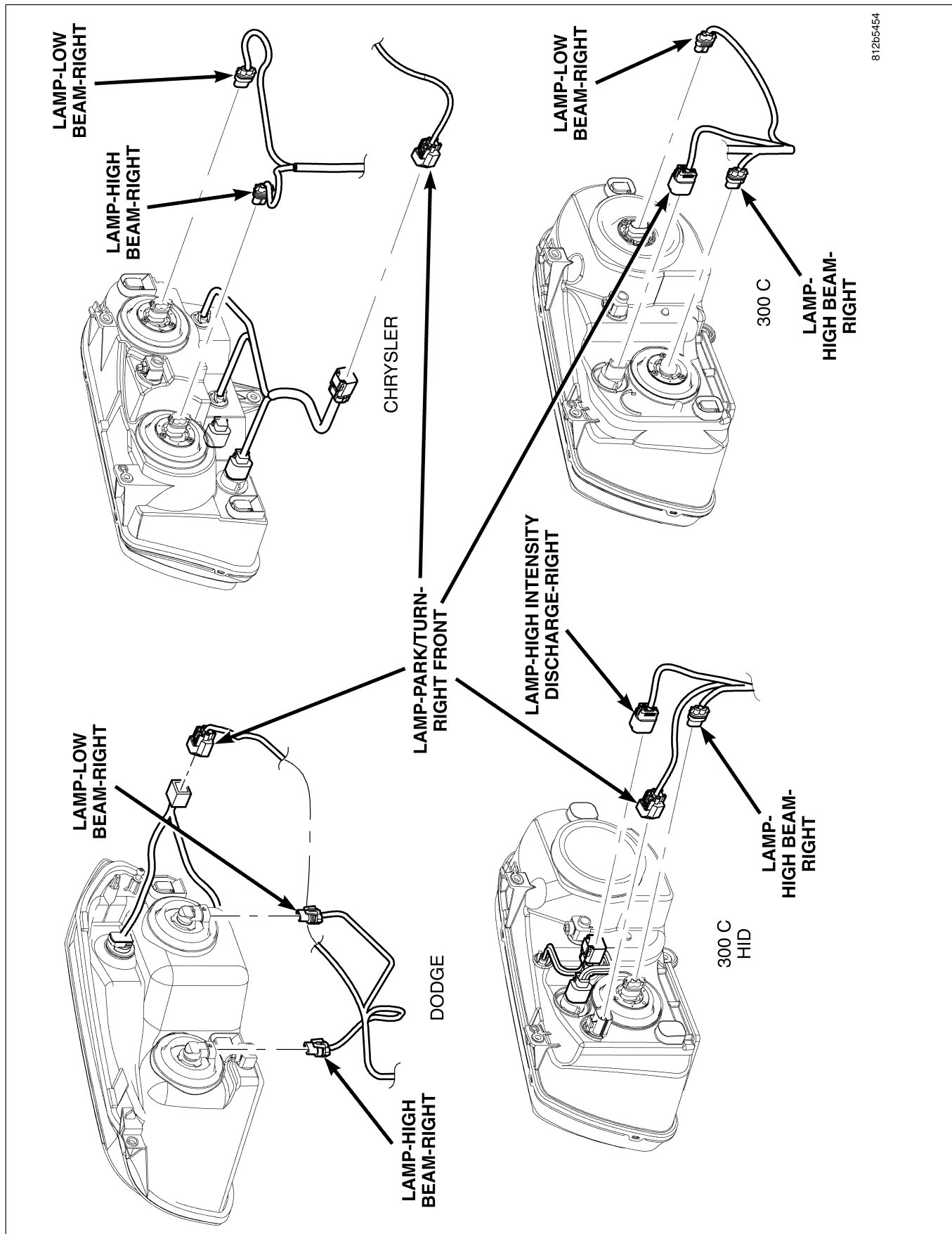


Fig. 1 FRONT LIGHTING

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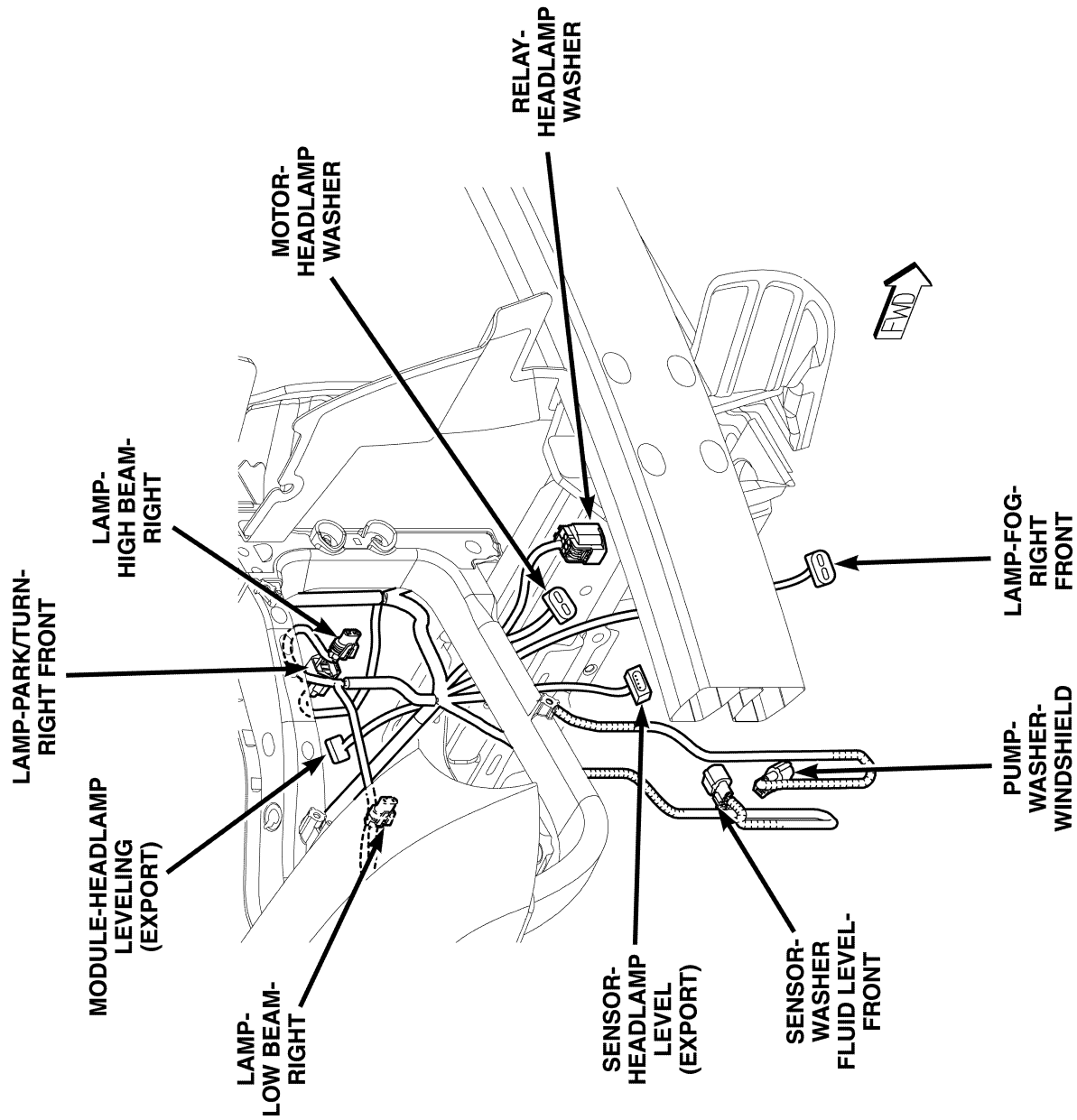


Fig. 2 RIGHT FRONT ENGINE COMPARTMENT

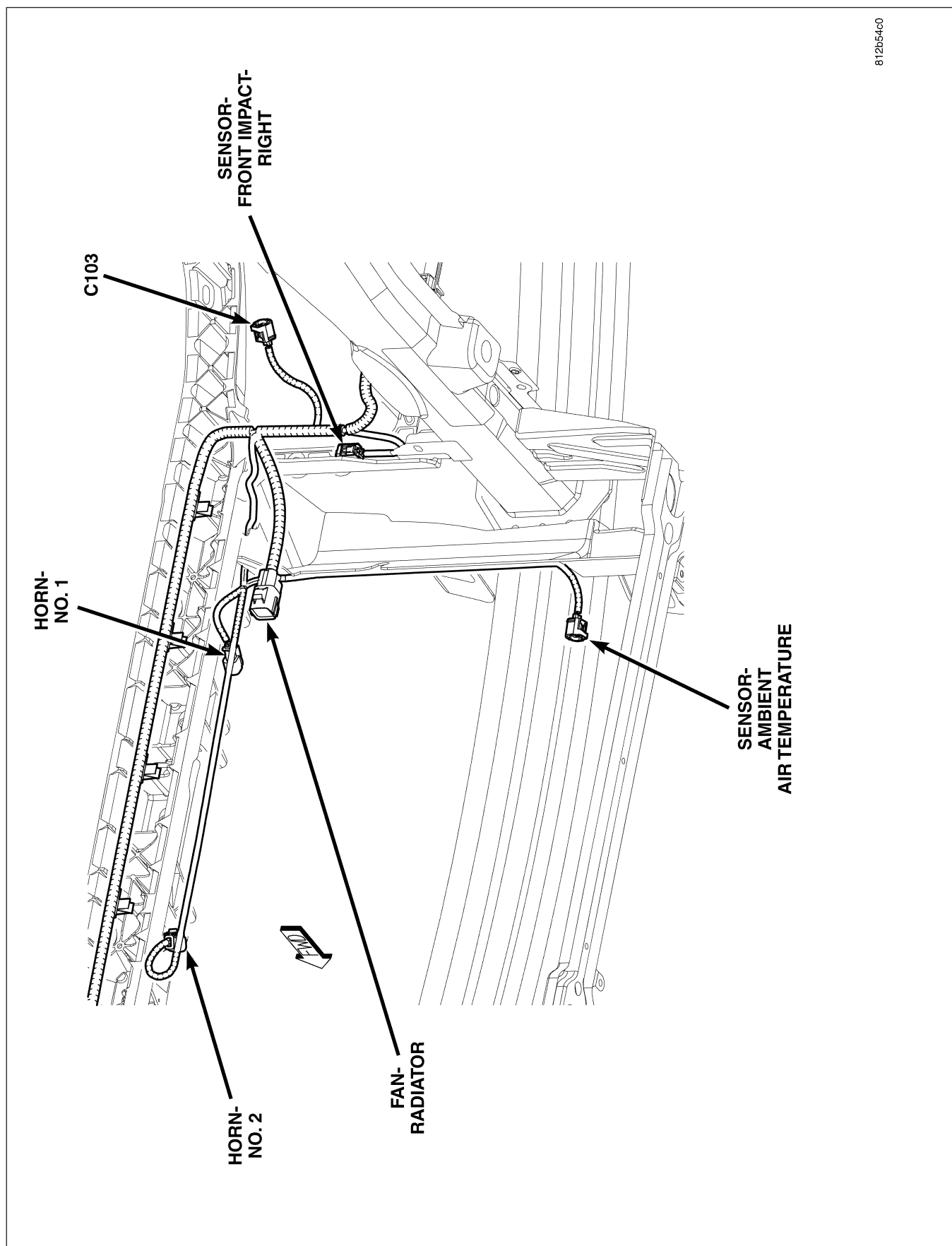
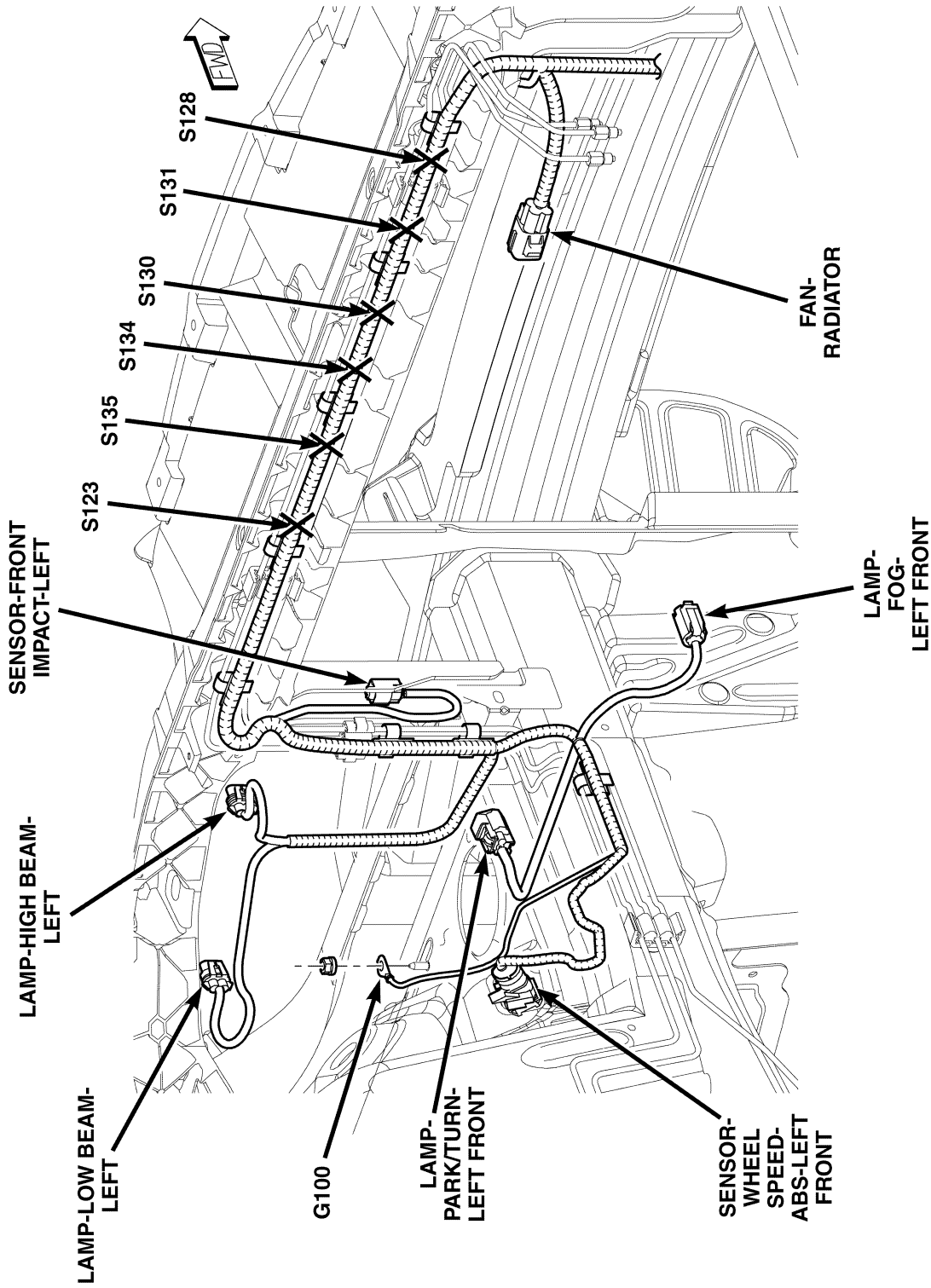


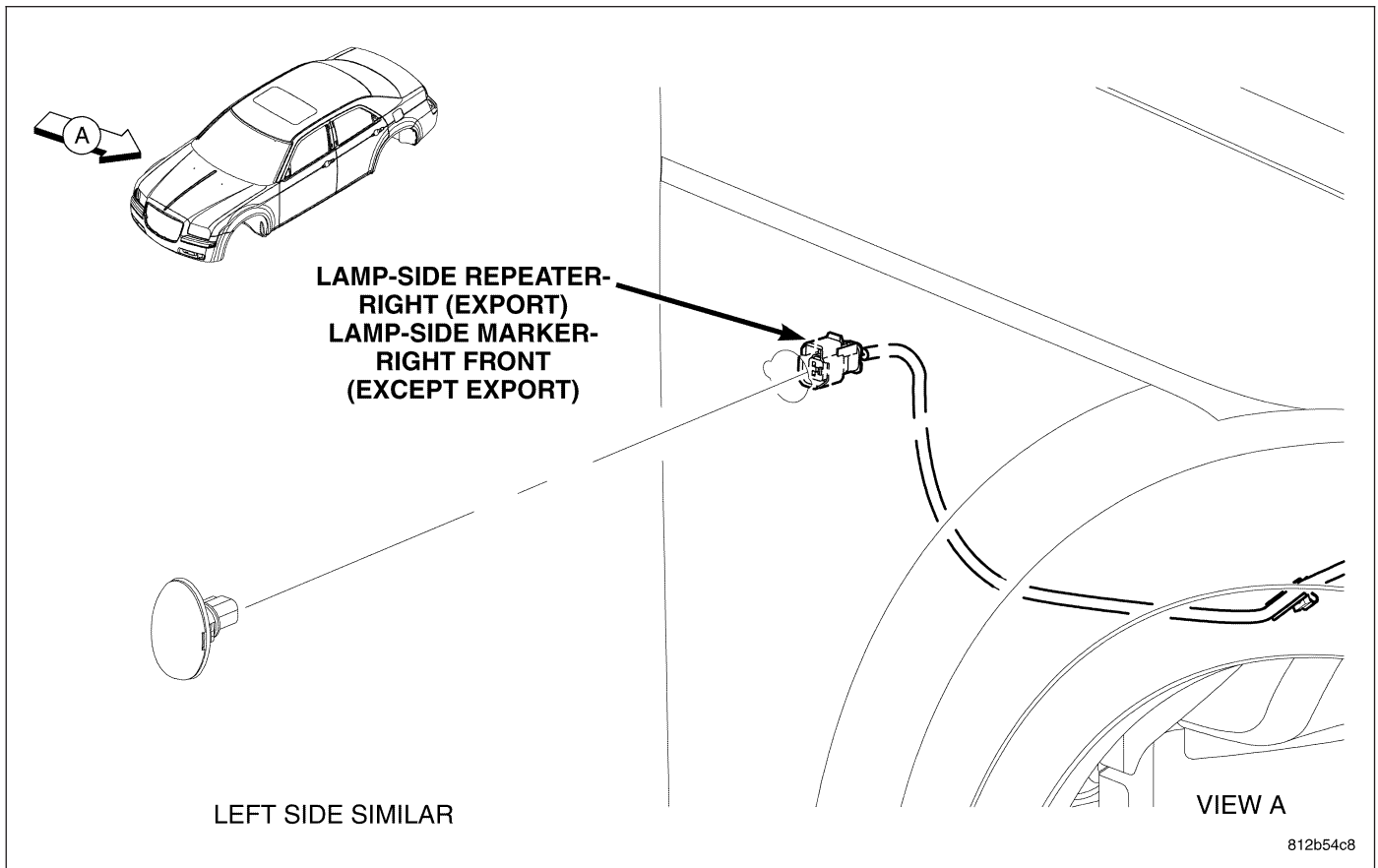
Fig. 3 RIGHT FRONT ENG COMP RAD YOKE





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Fig. 4 FRONT ENGINE COMPARTMENT



**Fig. 5 RIGHT SIDE LIGHTING**

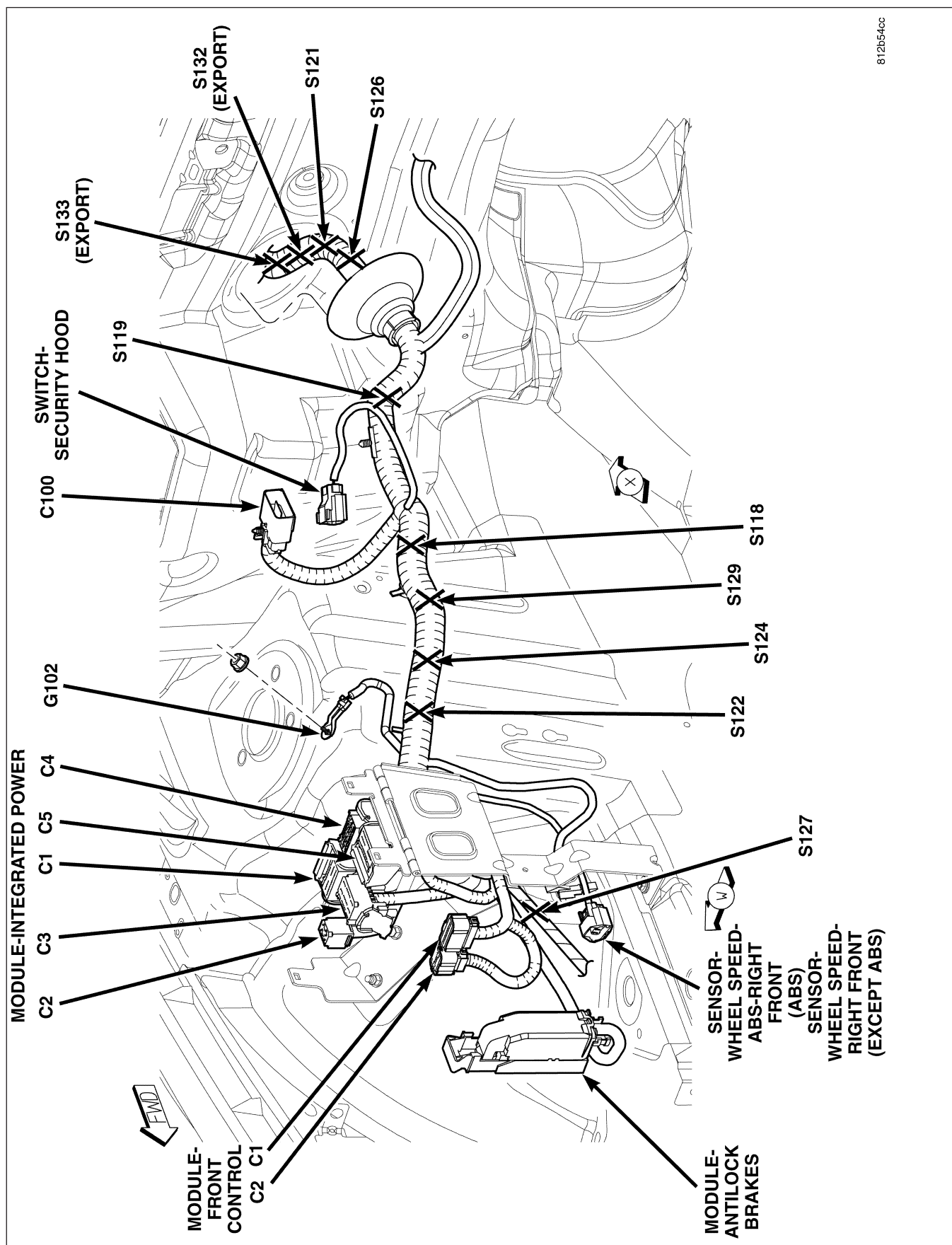


Fig. 6 RIGHT SIDE ENGINE COMPARTMENT

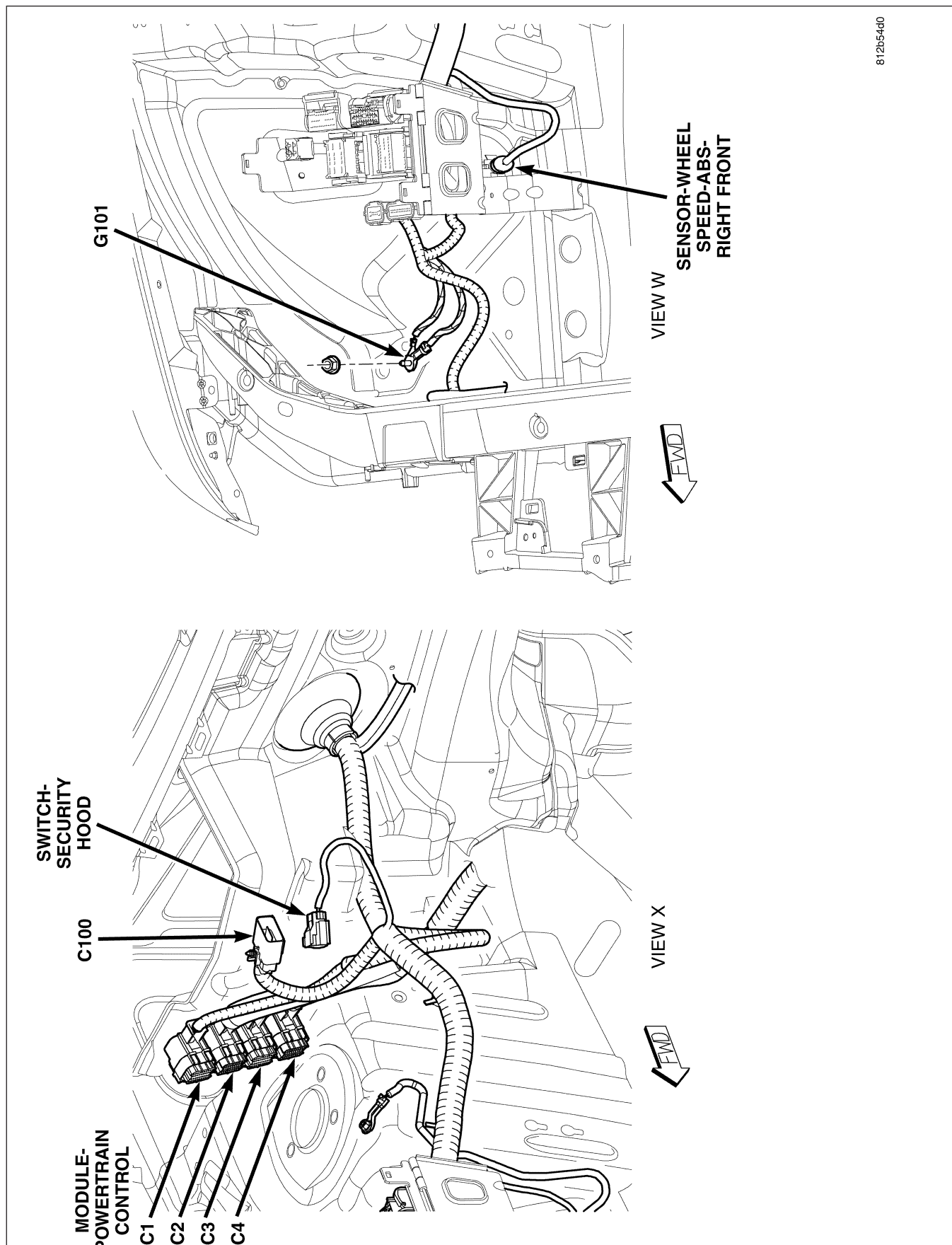


Fig. 7 RIGHT INNER FENDER SHIELD

812b54d4

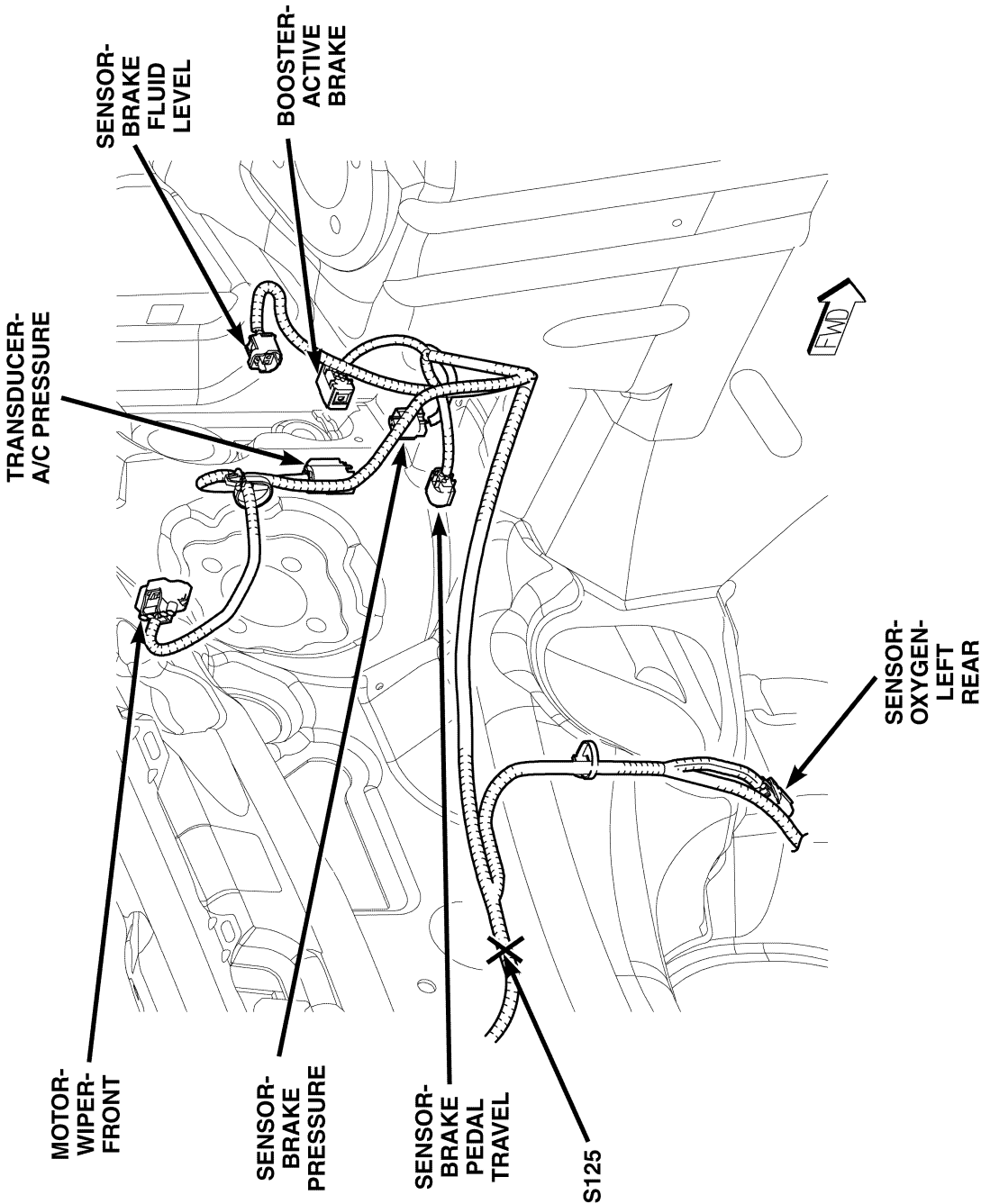
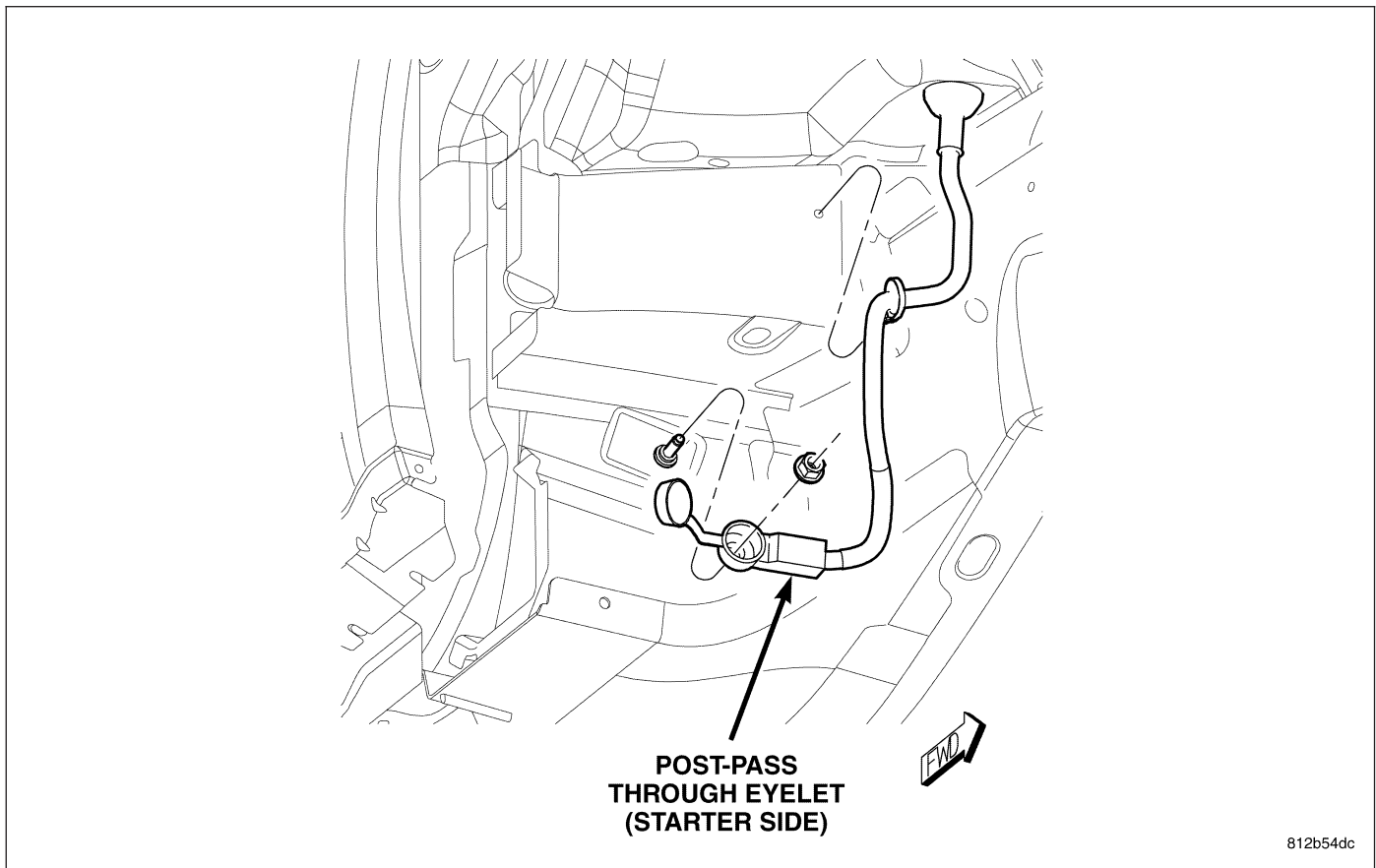
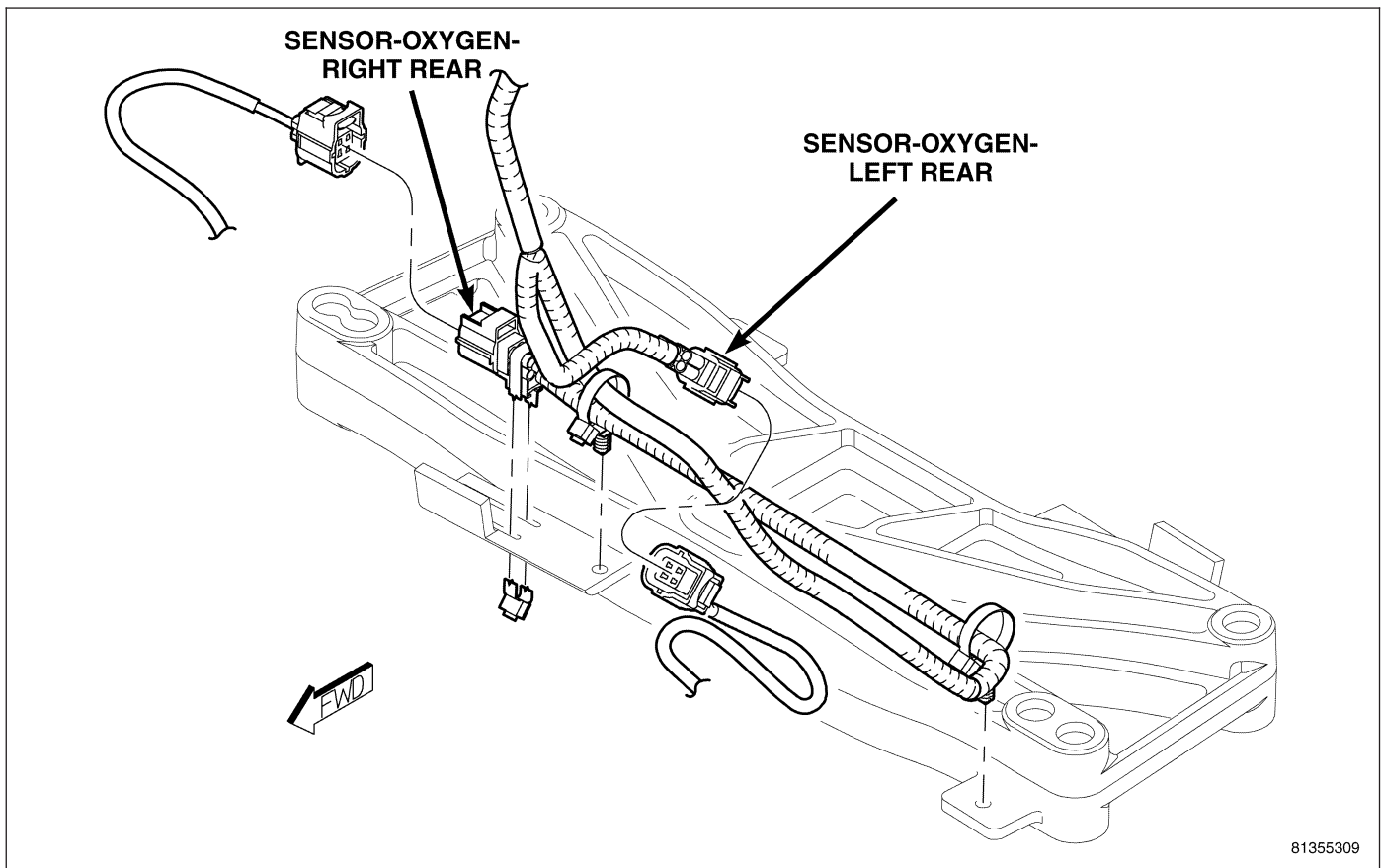


Fig. 8 LEFT REAR ENGINE COMPARTMENT

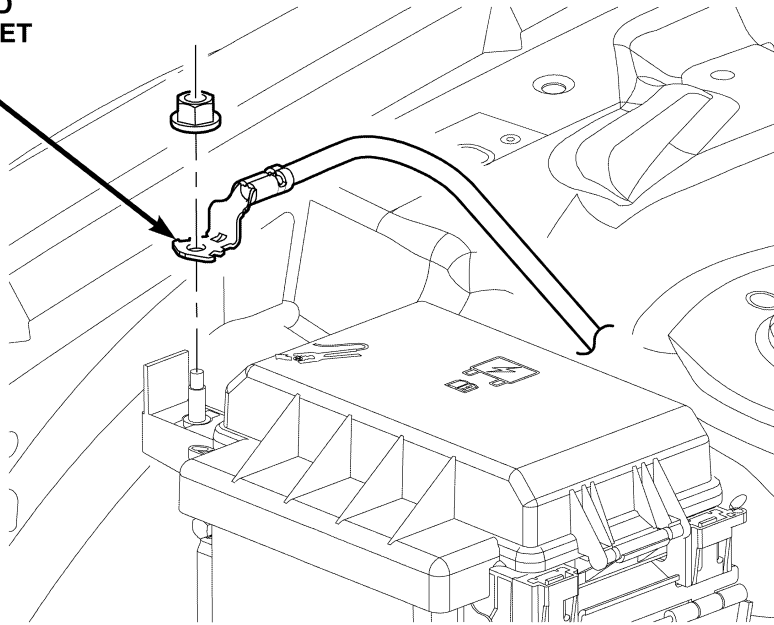


**Fig. 9 RIGHT WHEEL WELL**



**Fig. 10 REAR ENGINE COMPARTMENT**

**MODULE-  
INTEGRATED  
POWER EYELET**



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***Fig. 11 INTEGRATED POWER MODULE***



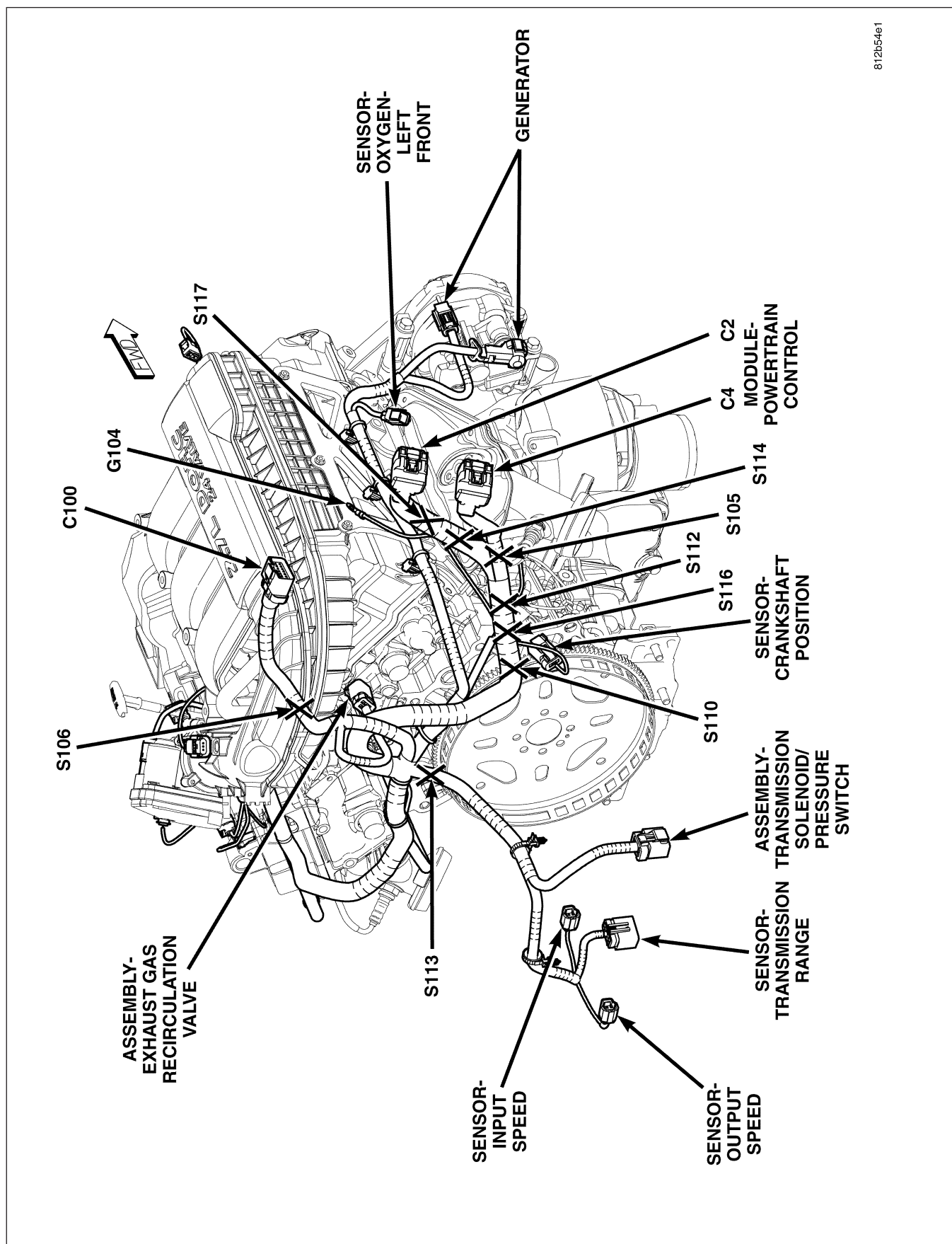


Fig. 12 ENGINE 2.7L RIGHT REAR



813555ec

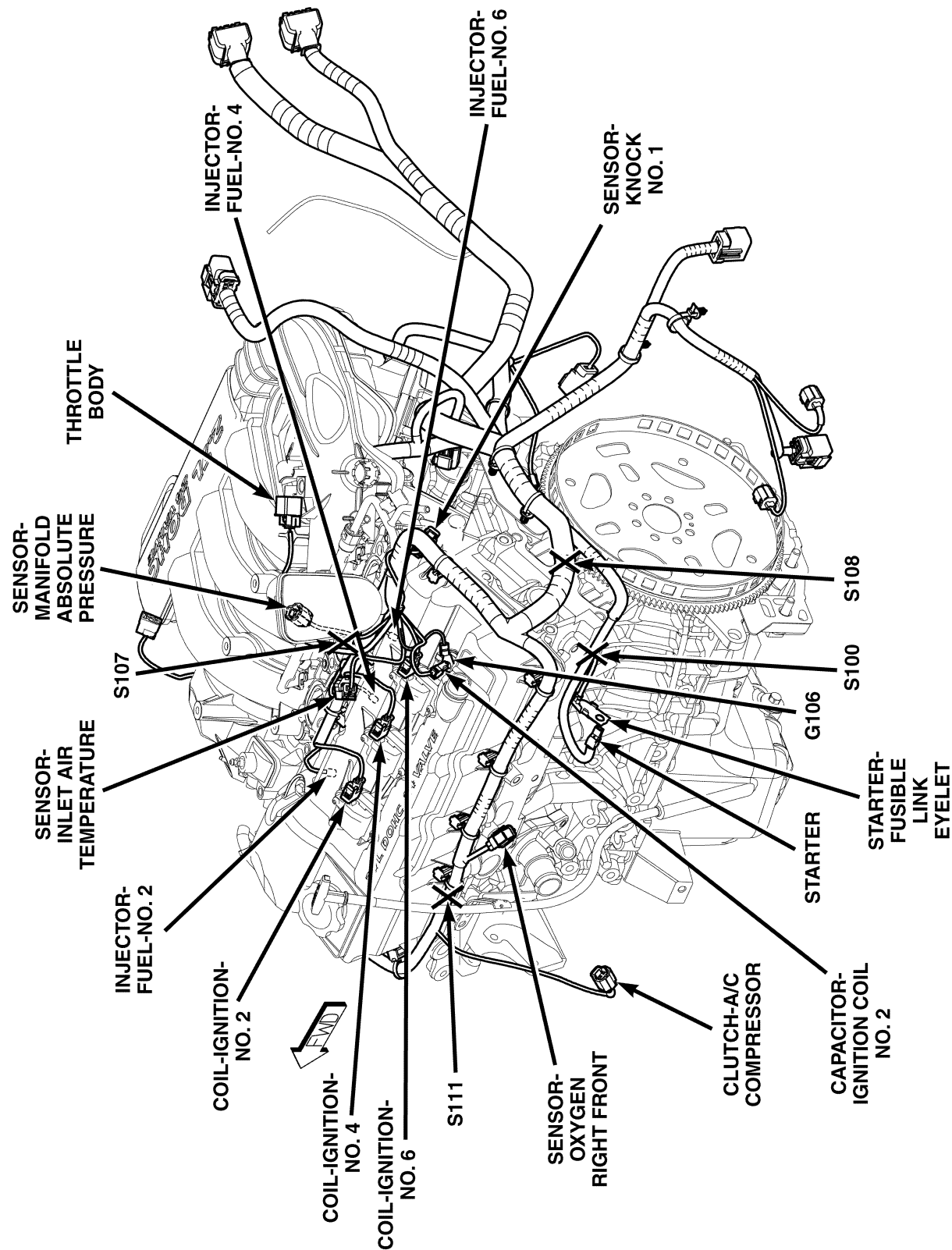
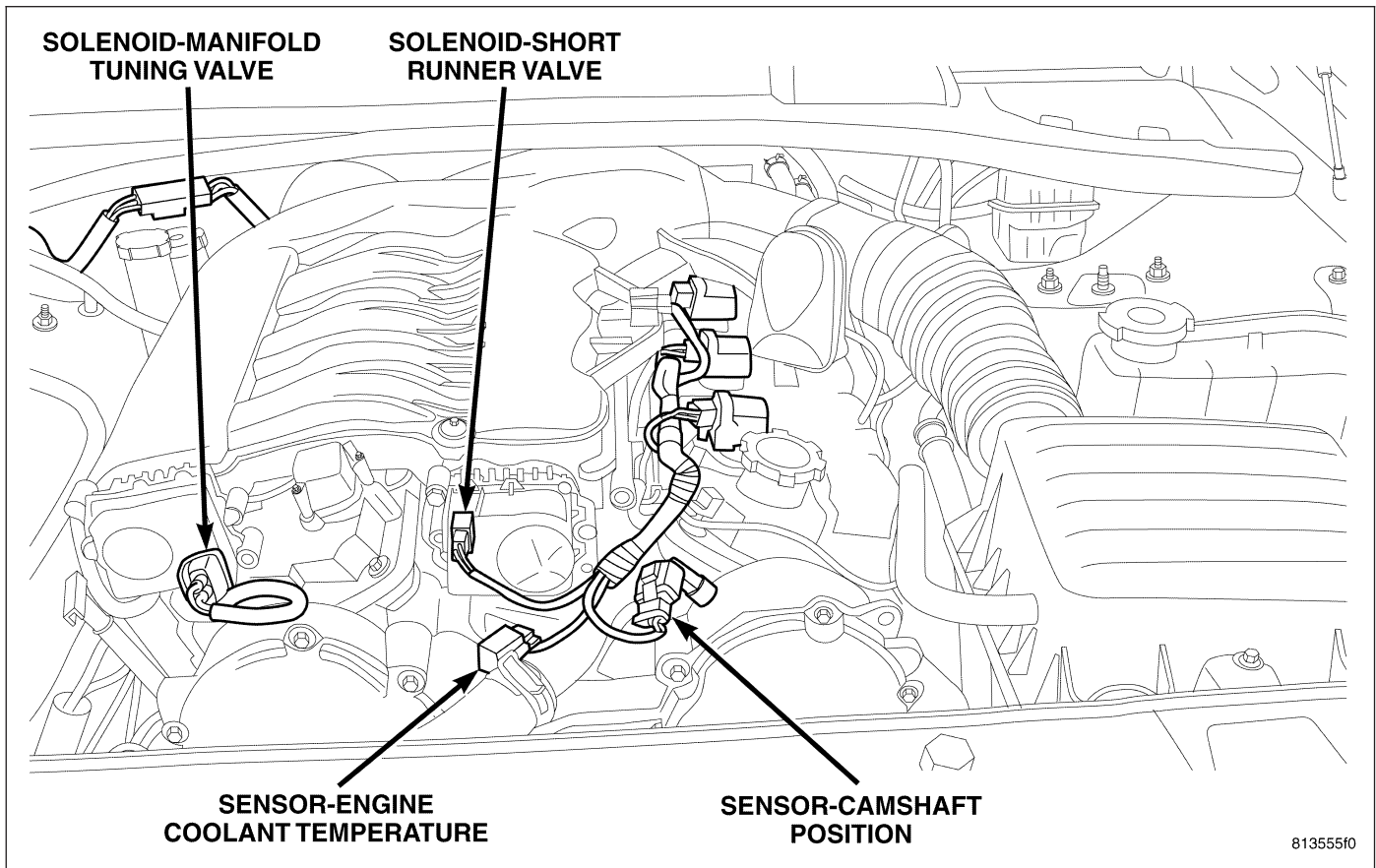


Fig. 13 ENGINE 2.7L LEFT REAR



*Fig. 14 ENGINE 3.5L FRONT*

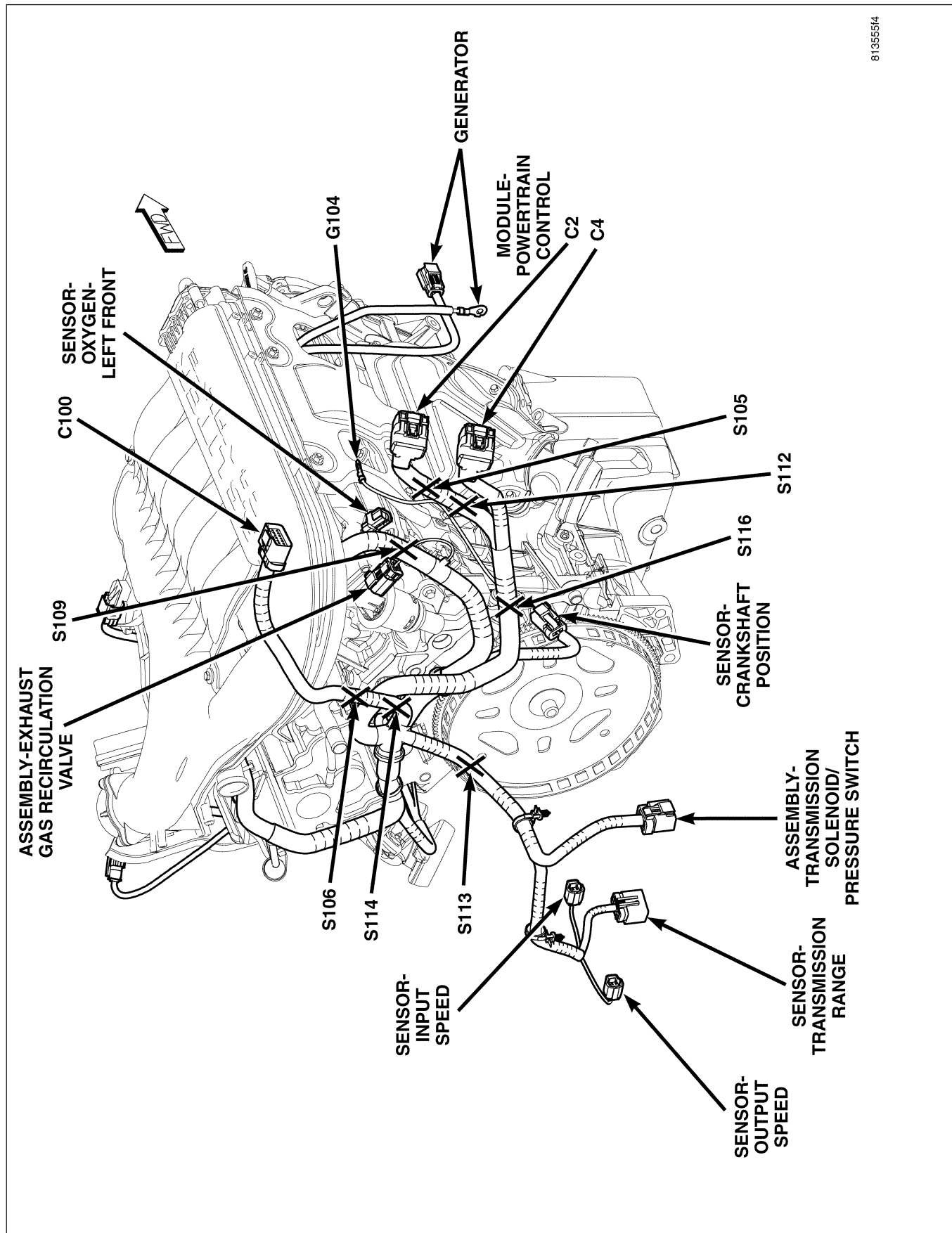
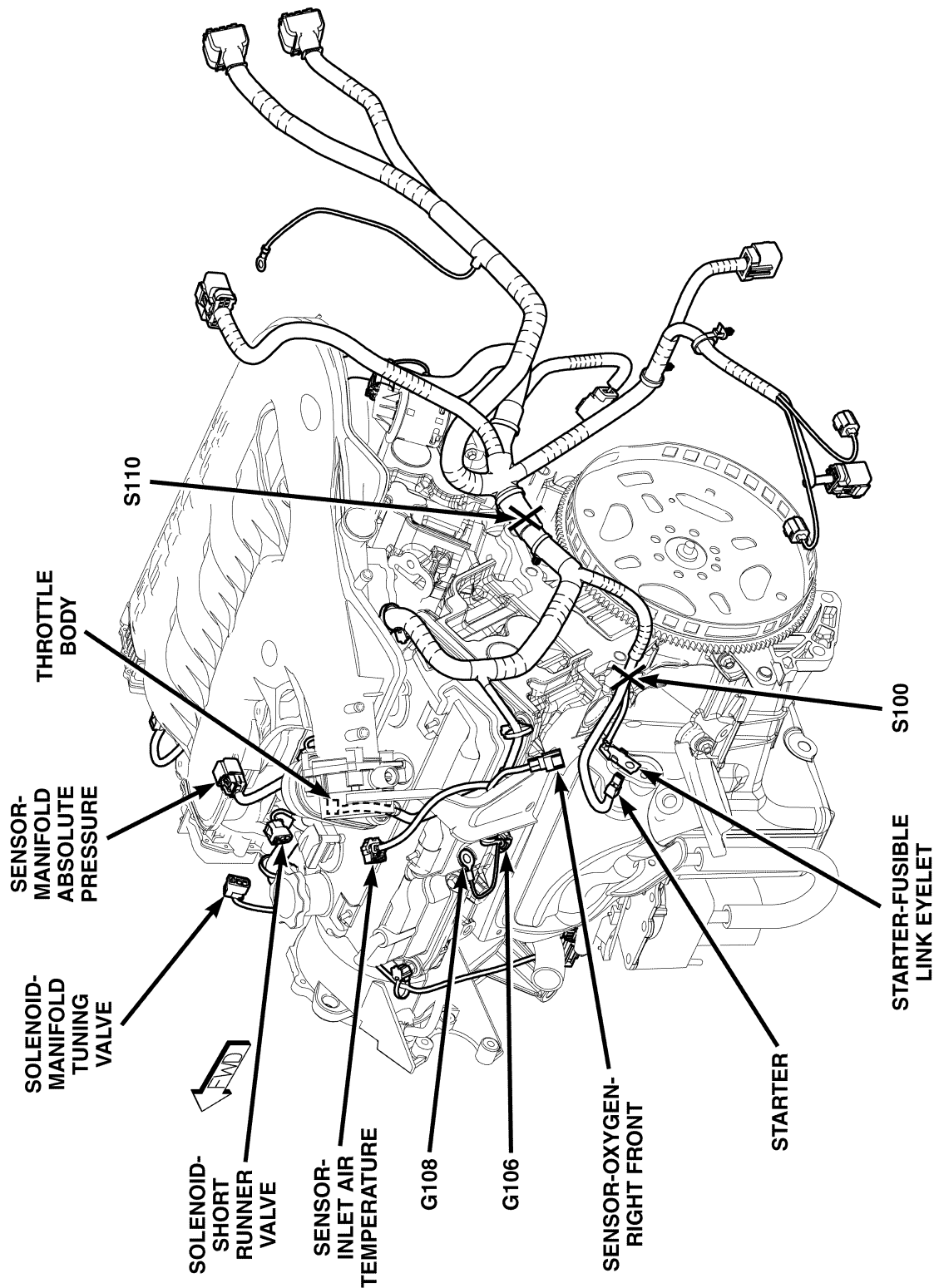
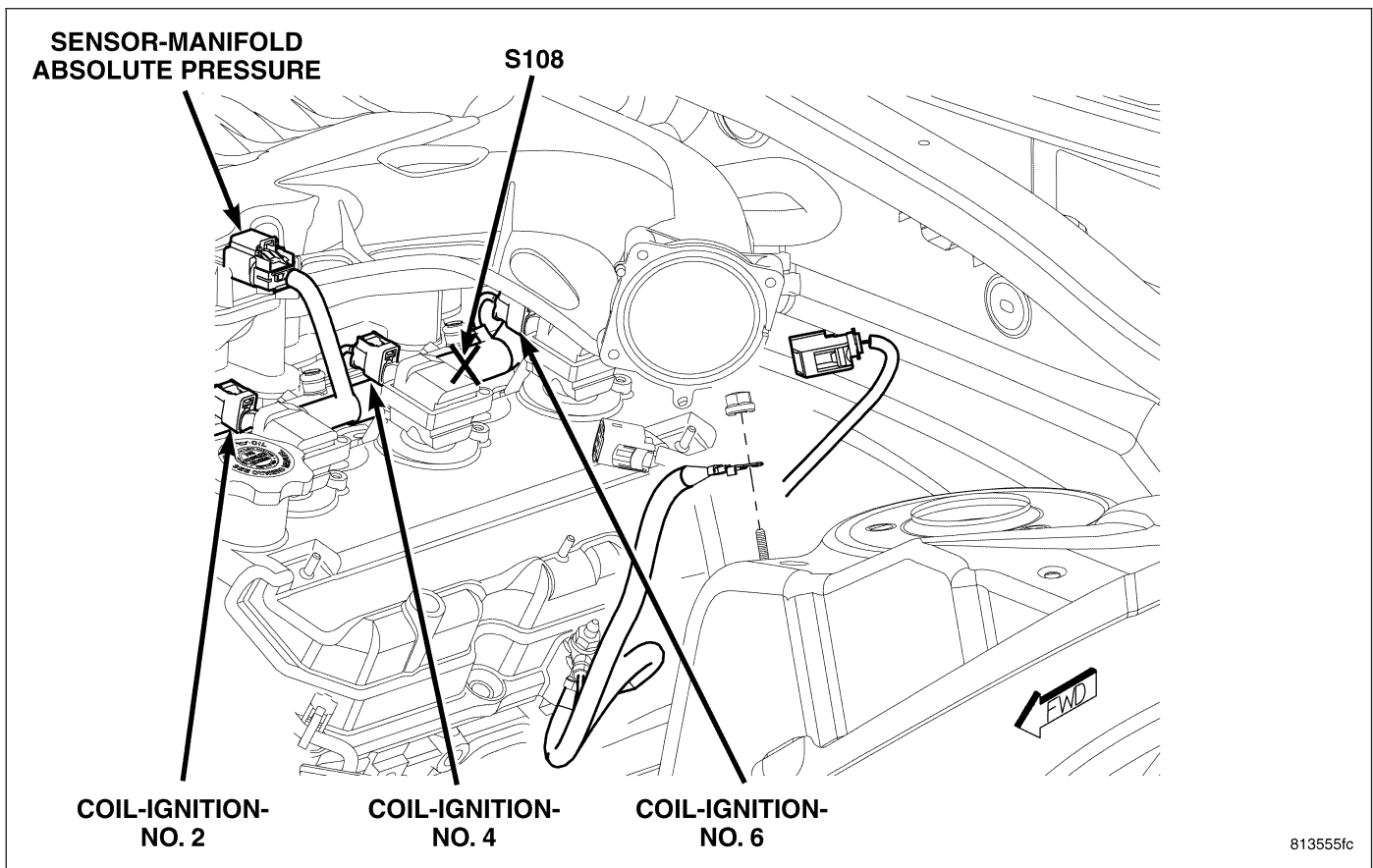


Fig. 15 ENGINE 3.5L RIGHT REAR



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Fig. 16 16 ENGINE 3.5L LEFT REAR



*Fig. 17 ENGINE 3.5L LEFT SIDE*

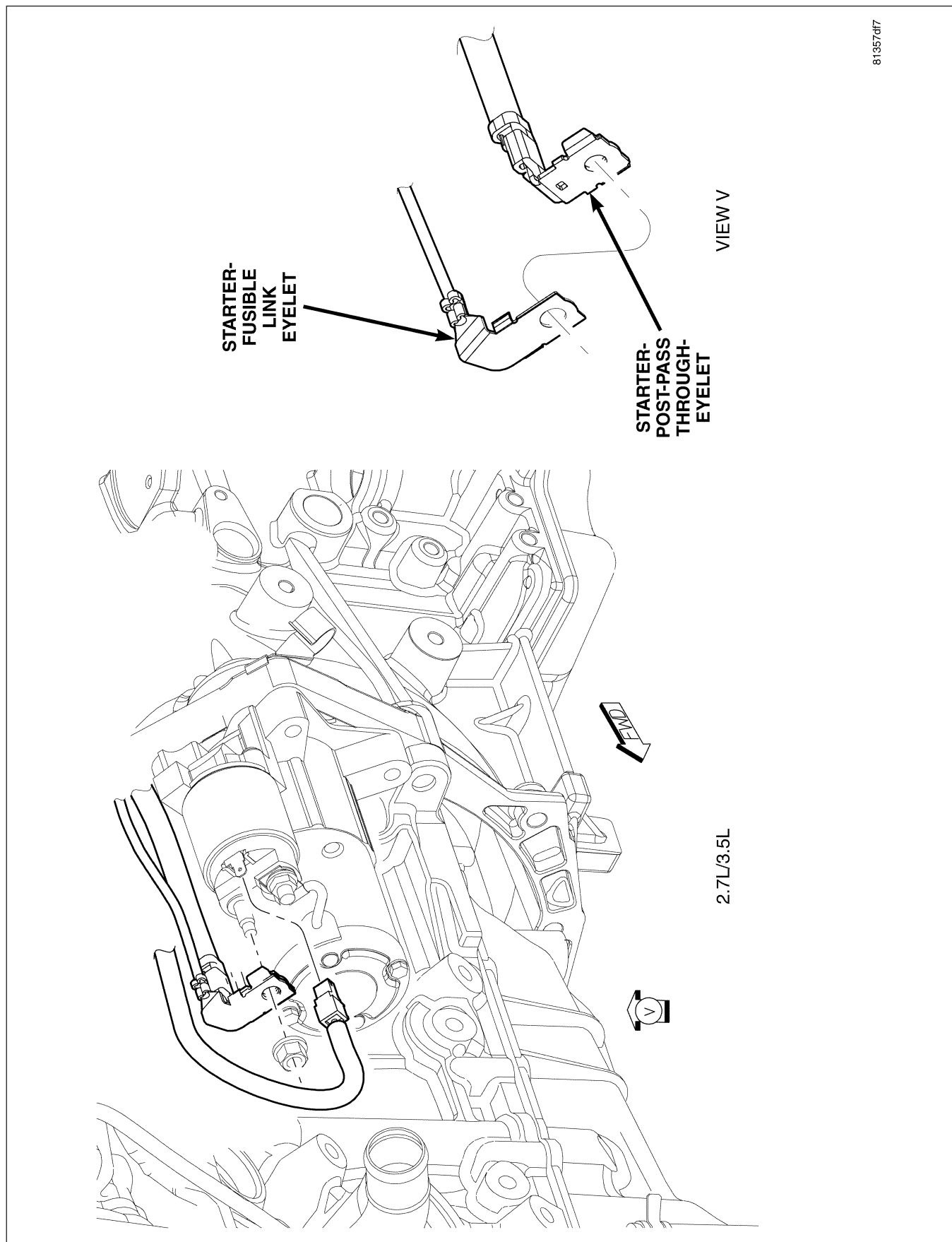
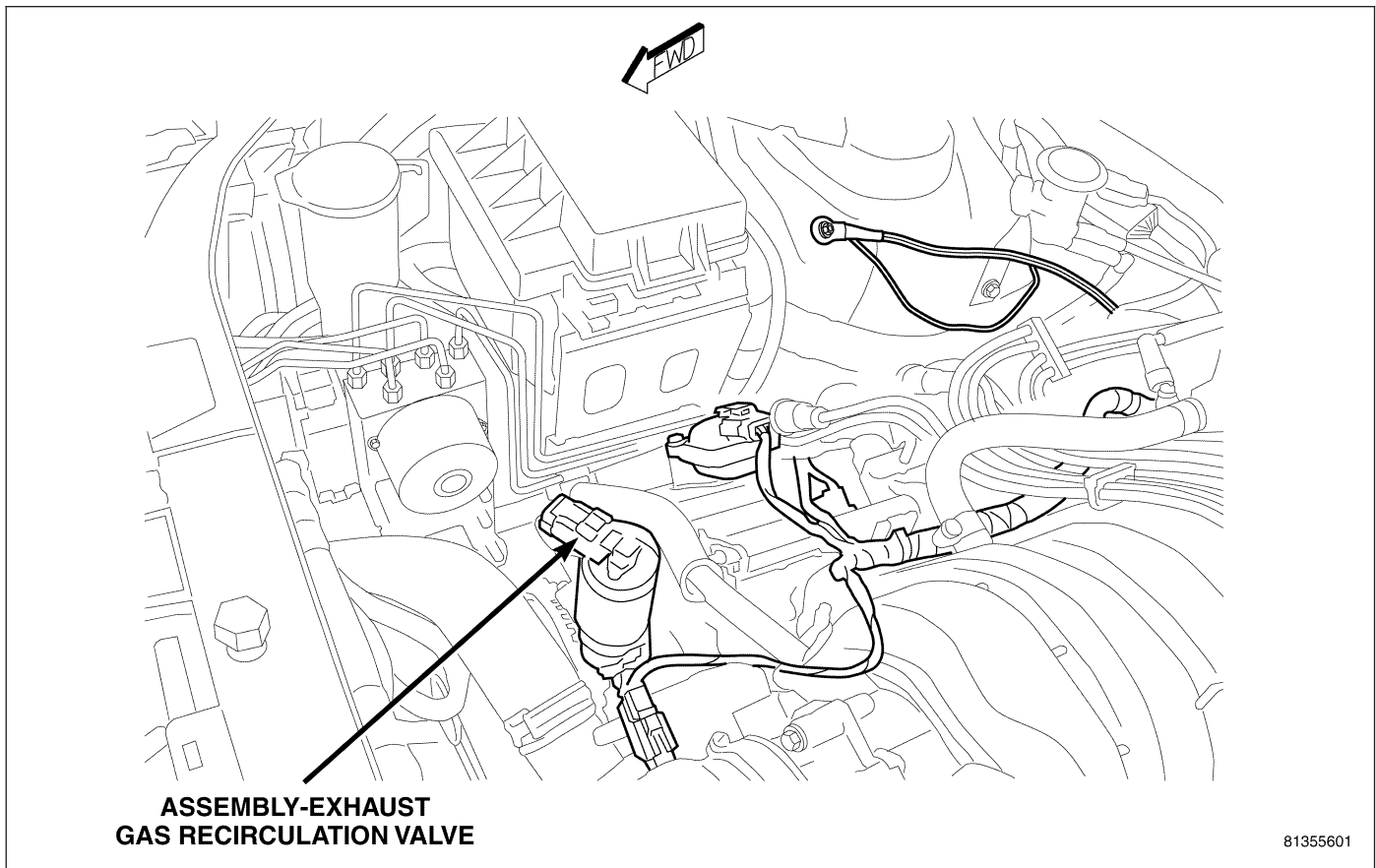


Fig. 18 STARTER CONNECTIONS (2.7L/3.5L)





**Fig. 19 ENGINE 5.7L RIGHT FRONT**

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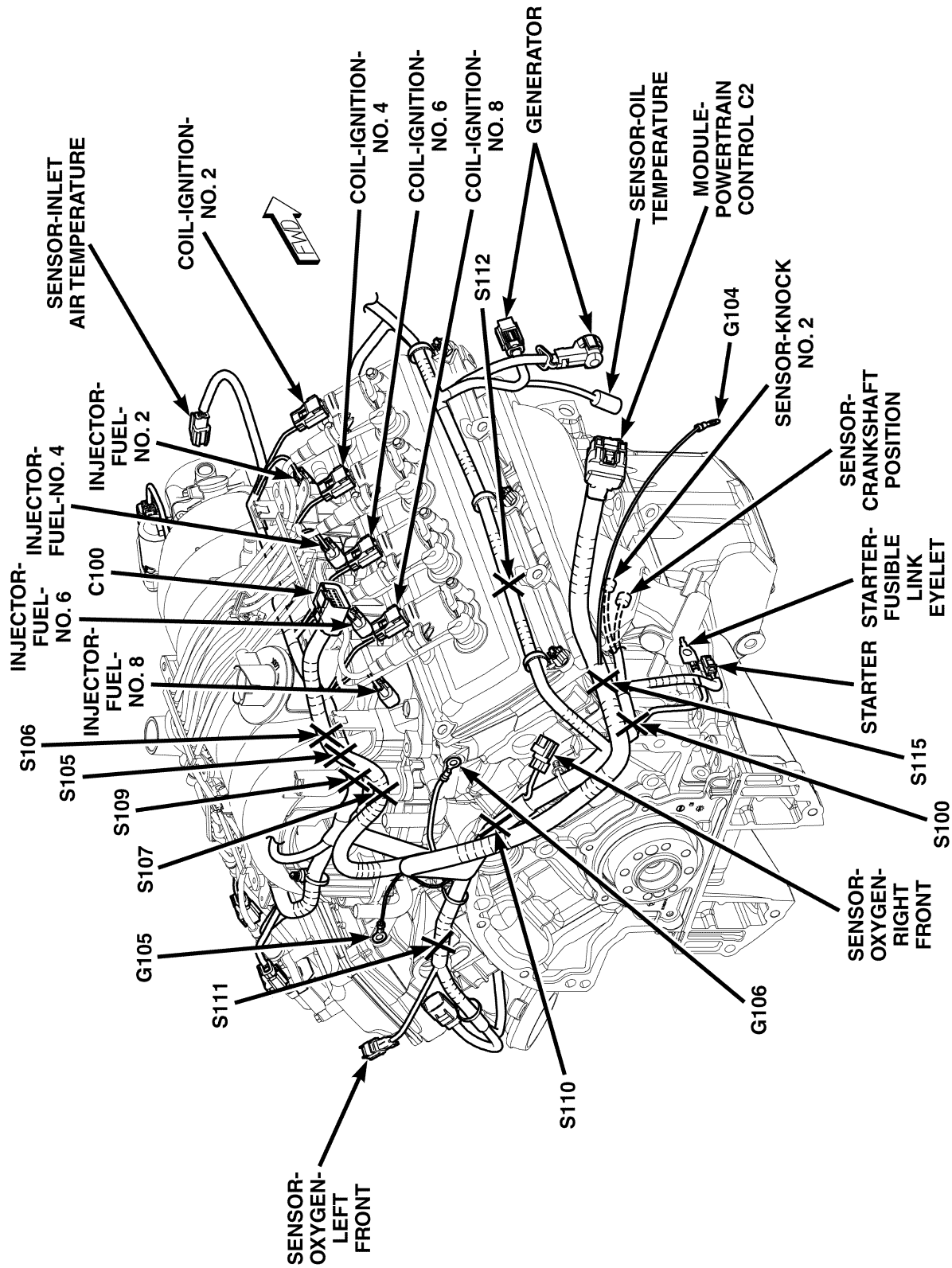
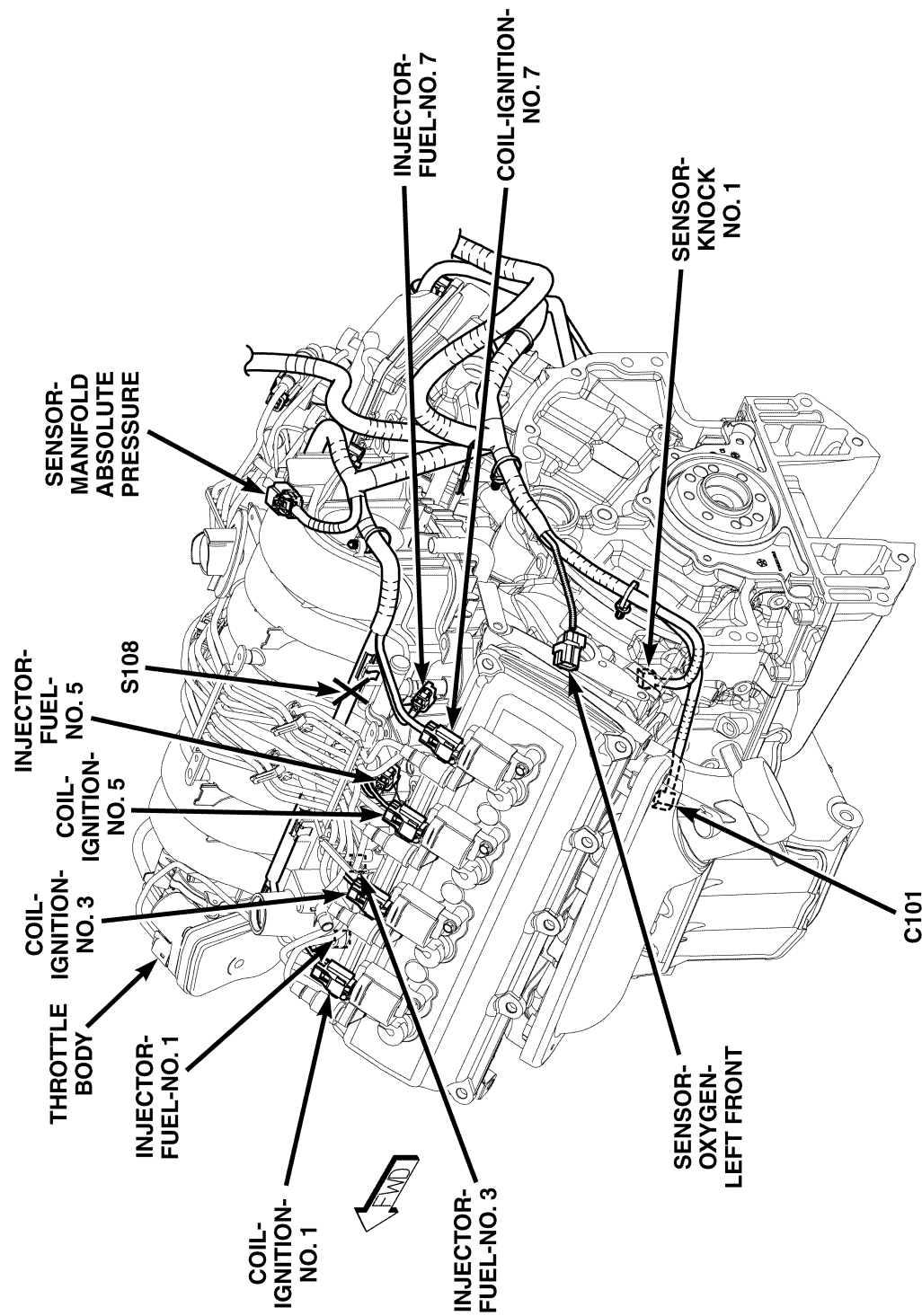


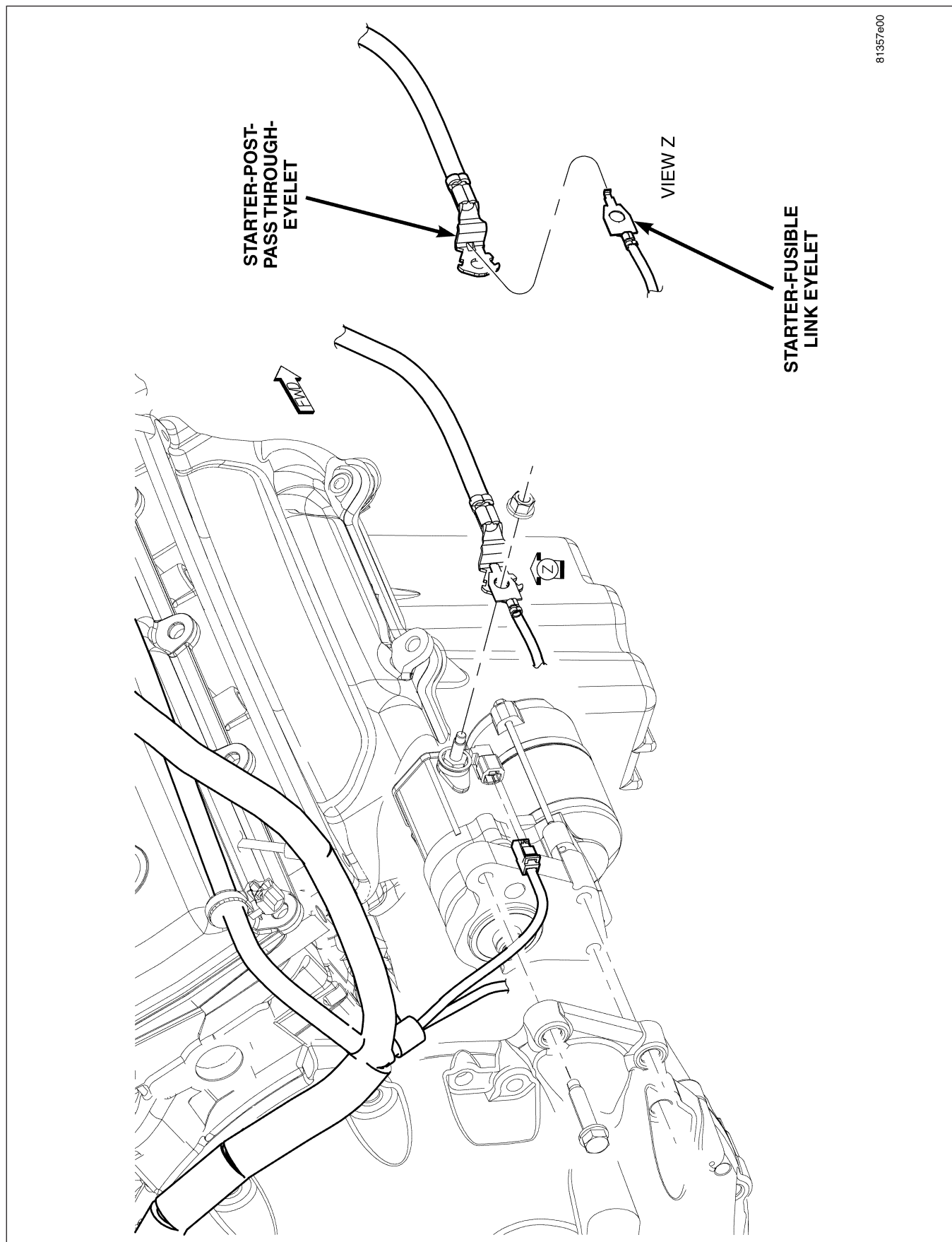
Fig. 20 ENGINE 5.7L RIGHT REAR





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Fig. 21 ENGINE 5.7L LEFT REAR



81357e00

Fig. 22 STARTER CONNECTIONS (5.7L)

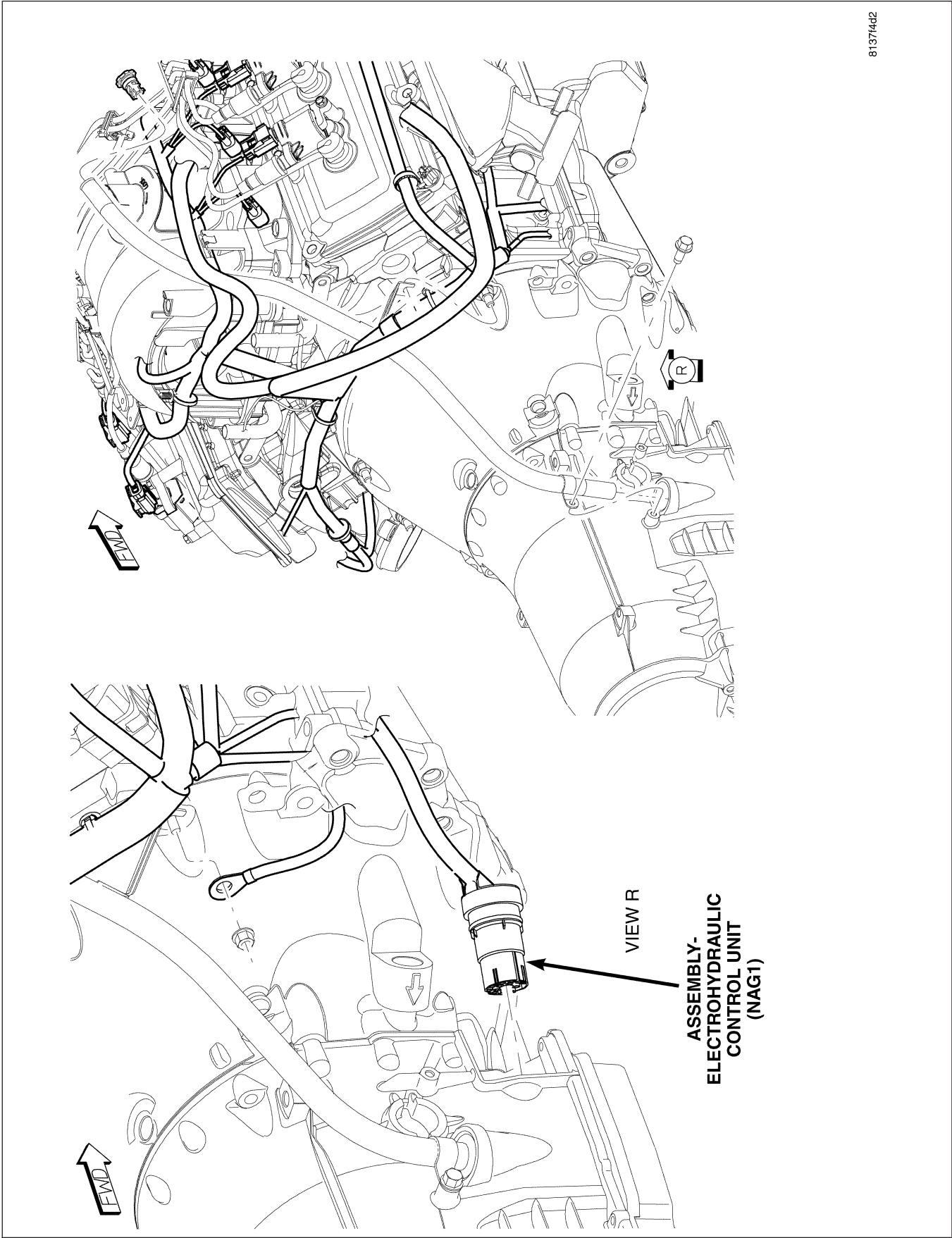
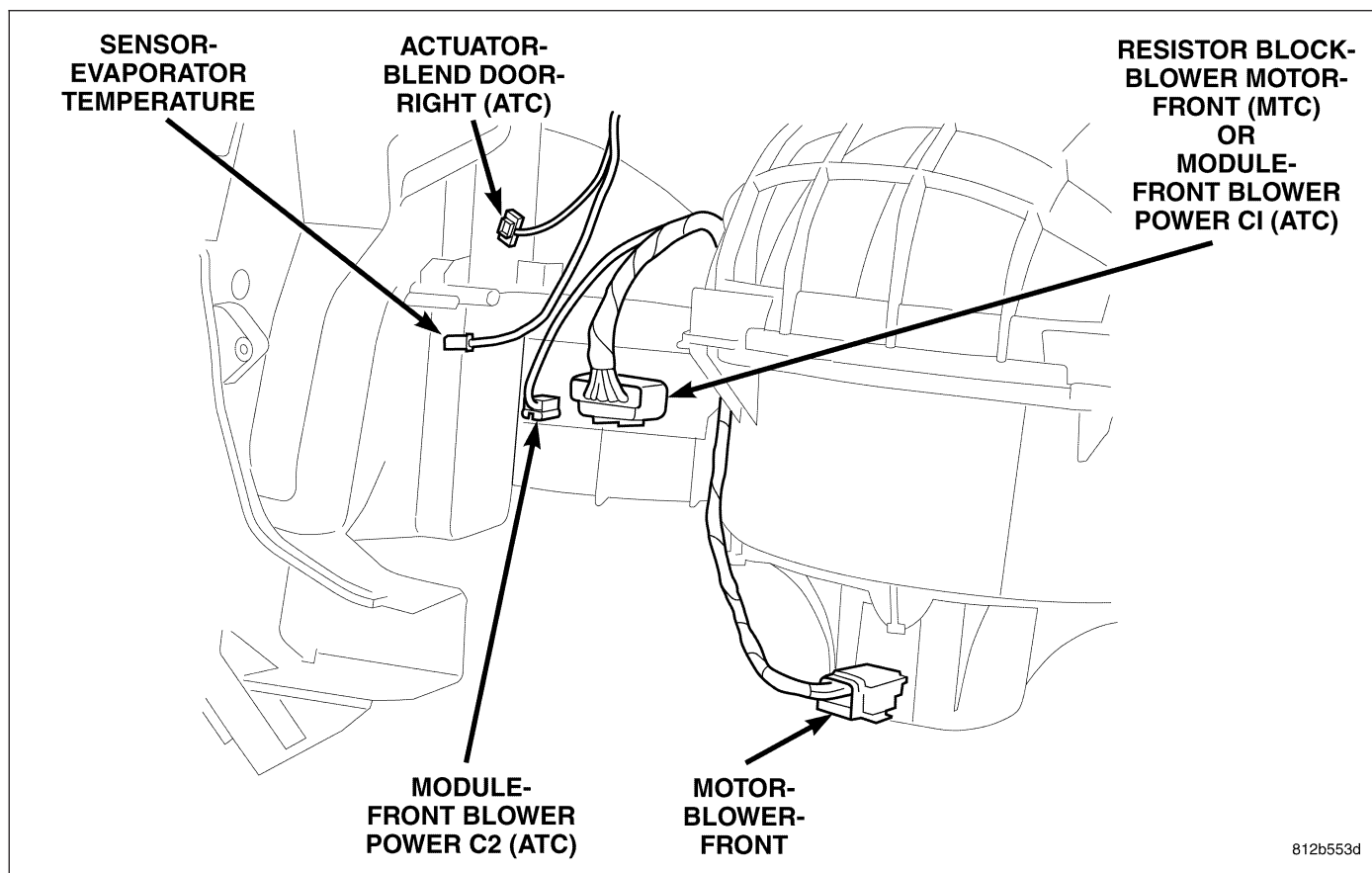
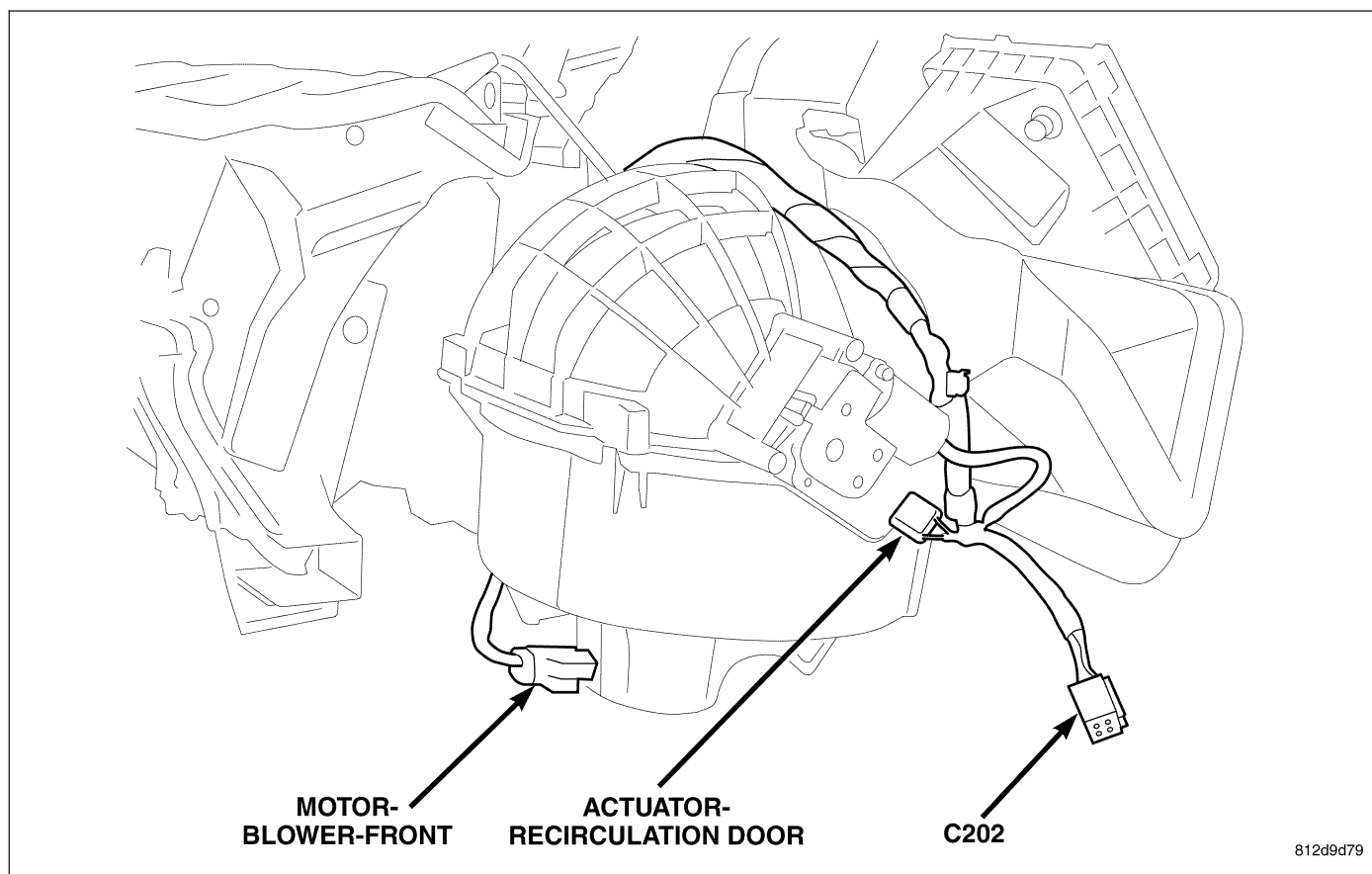


Fig. 23 TRANSMISSION



*Fig. 24 HVAC CENTER*



*Fig. 25 HVAC RIGHT*

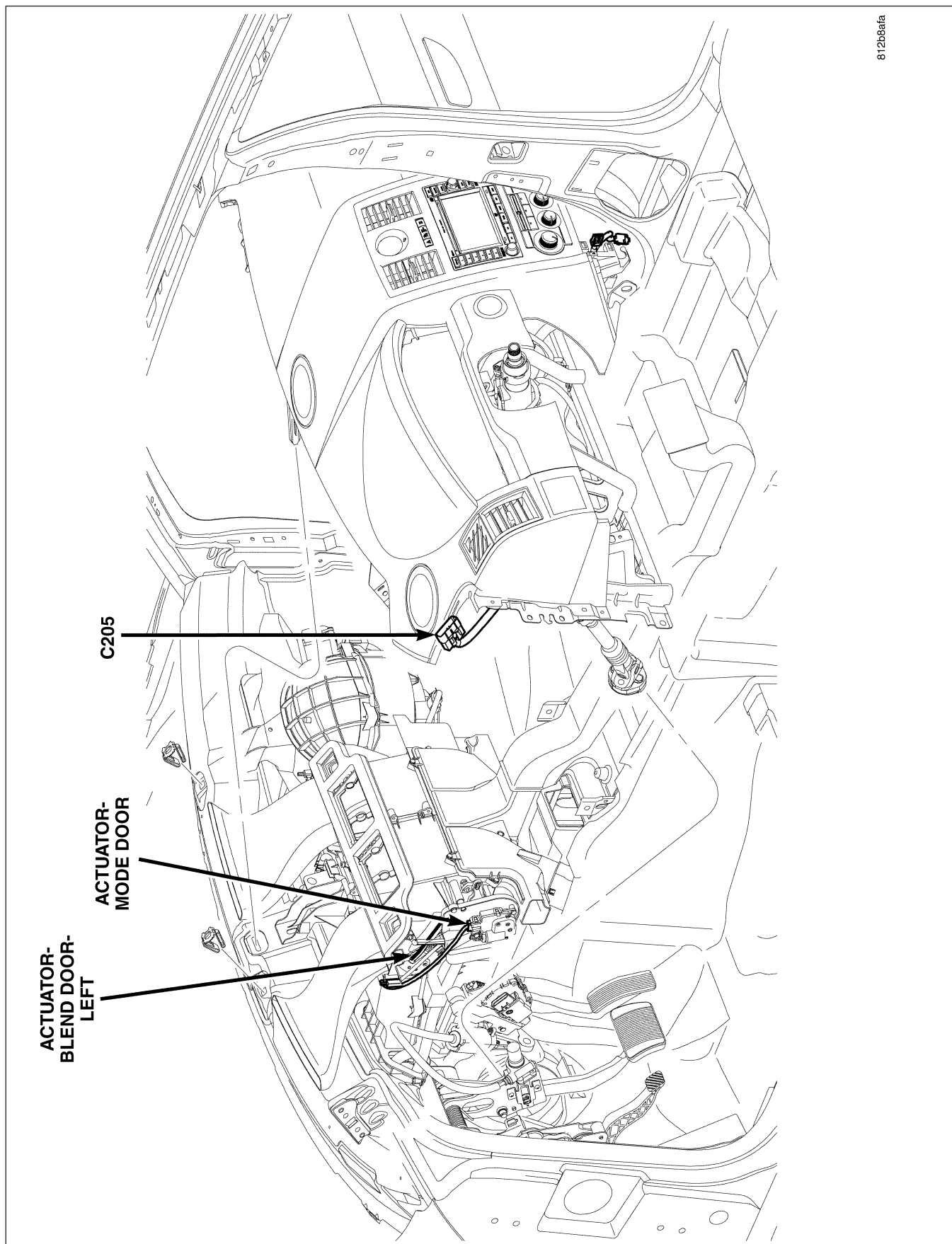
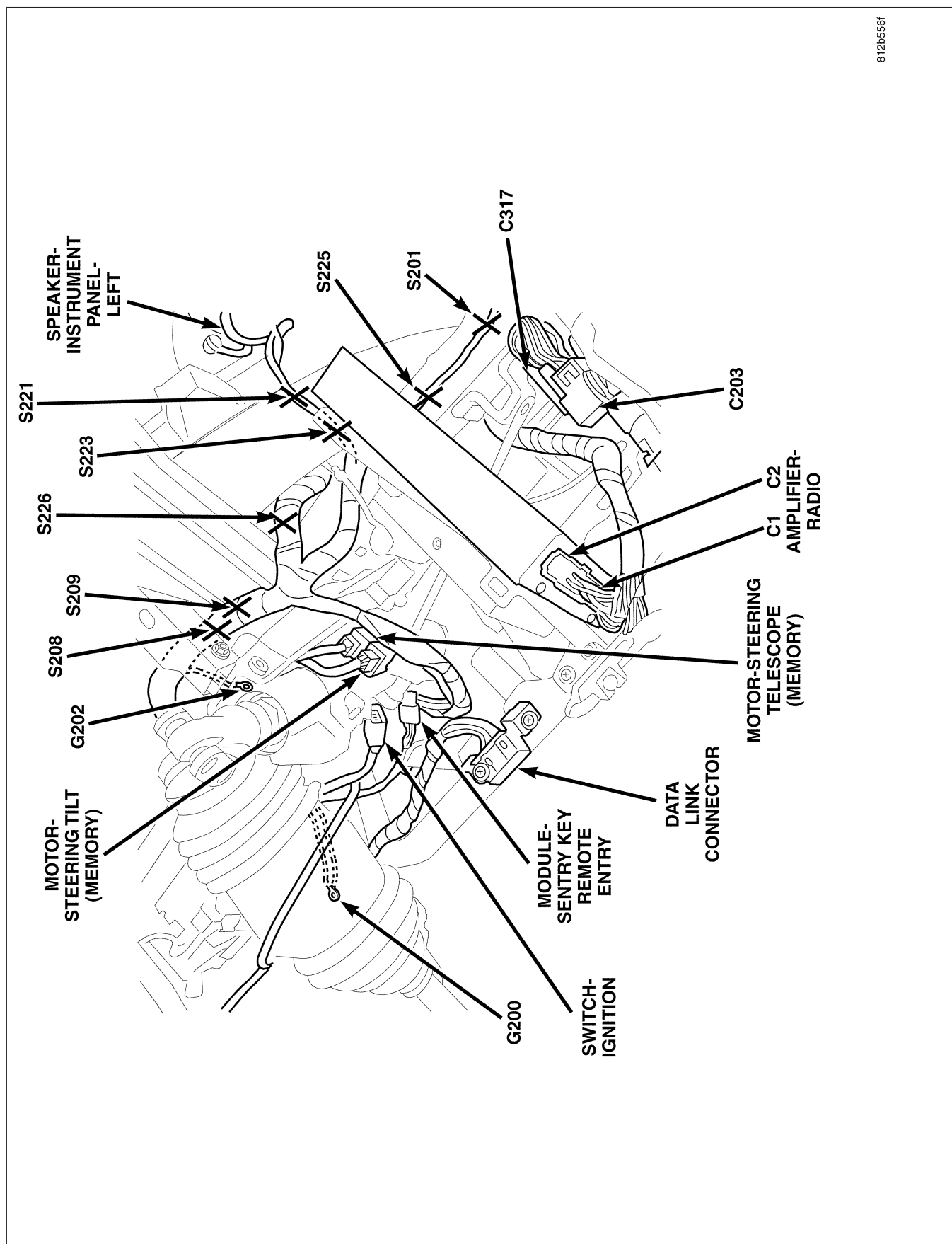


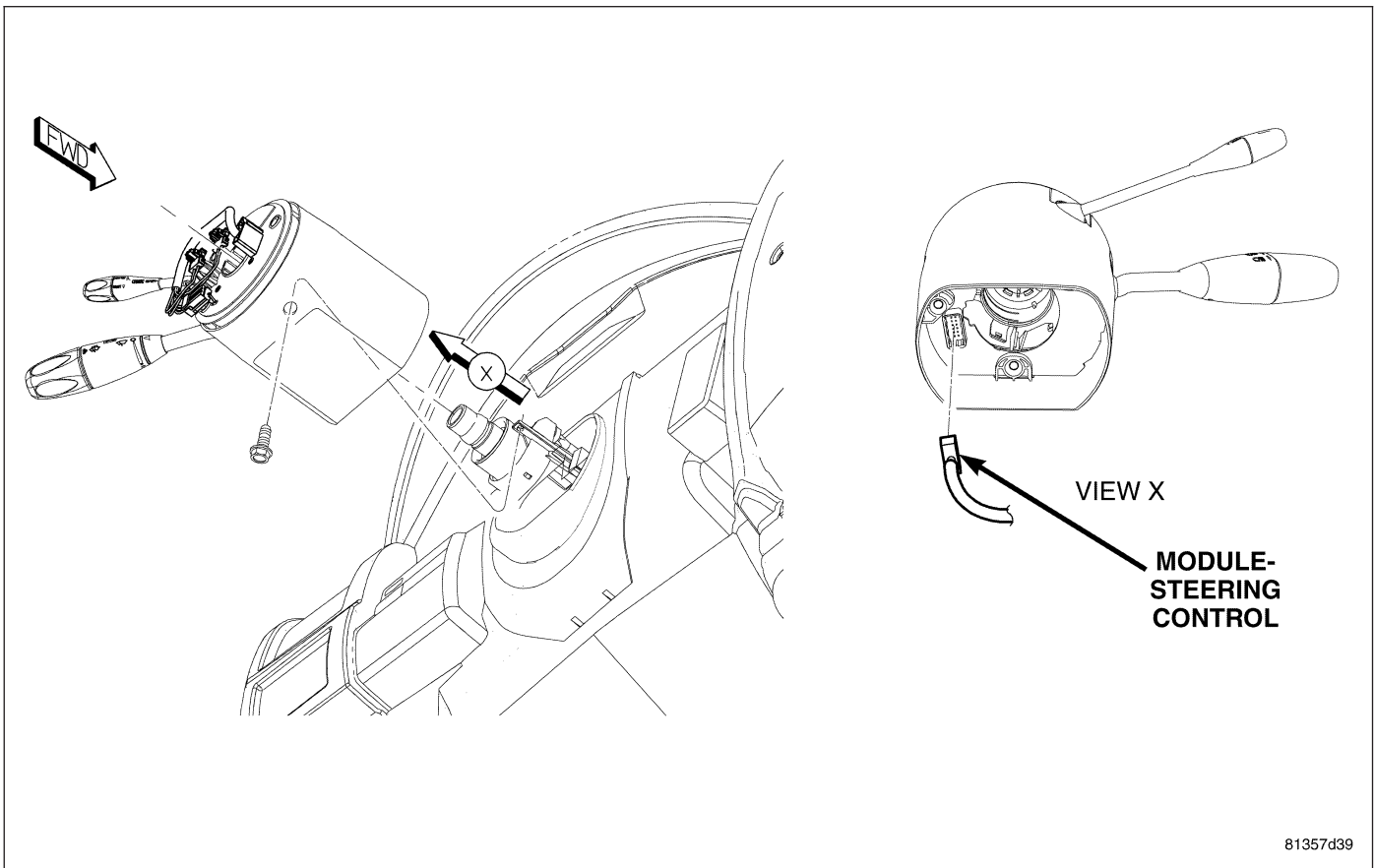
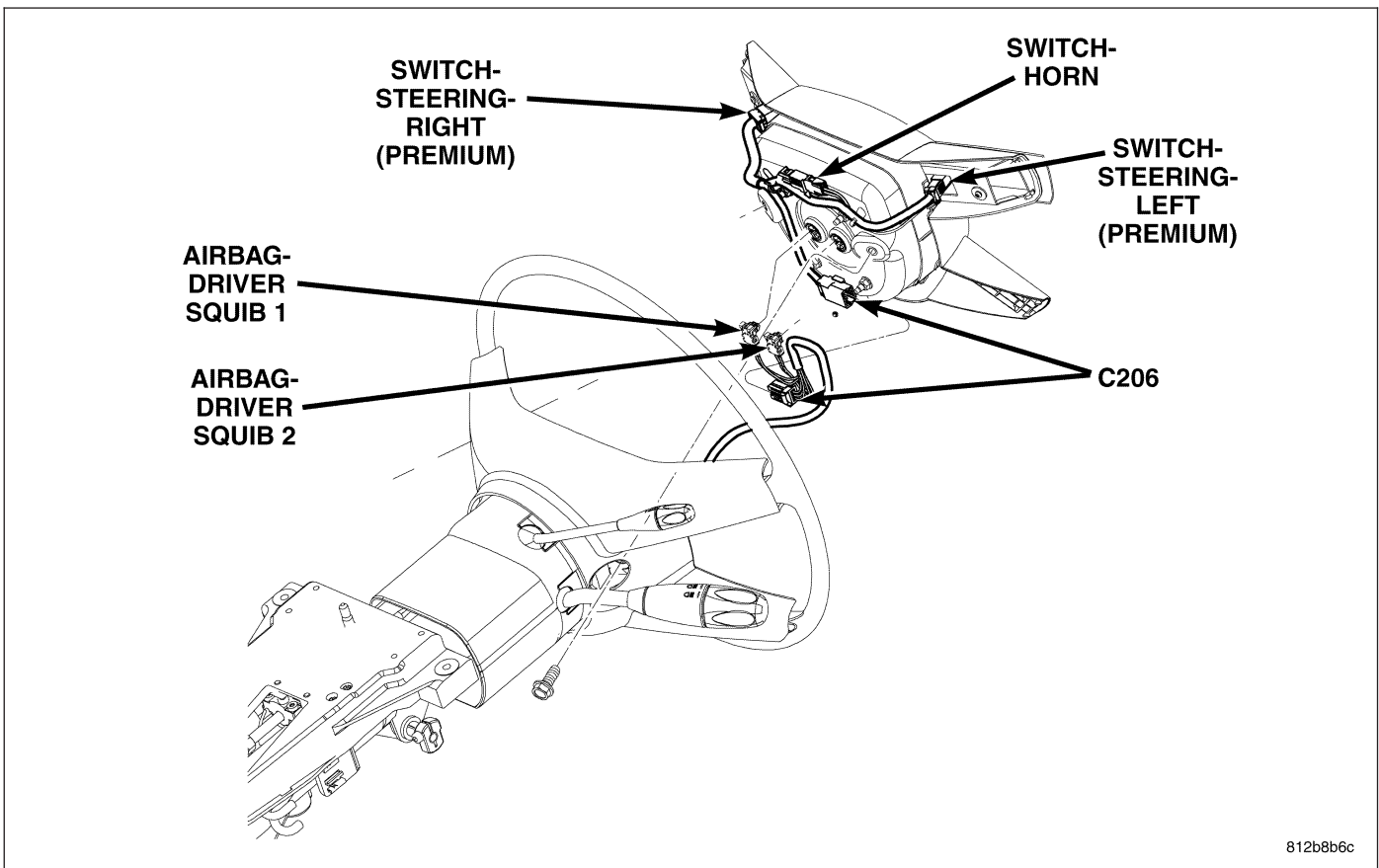
Fig. 26 HVAC AND INSTRUMENT PANEL



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Fig. 27 STEERING COLUMN



**Fig. 28 MULTIFUNCTION SWITCHES****Fig. 29 HORN PAD SWITCHES**

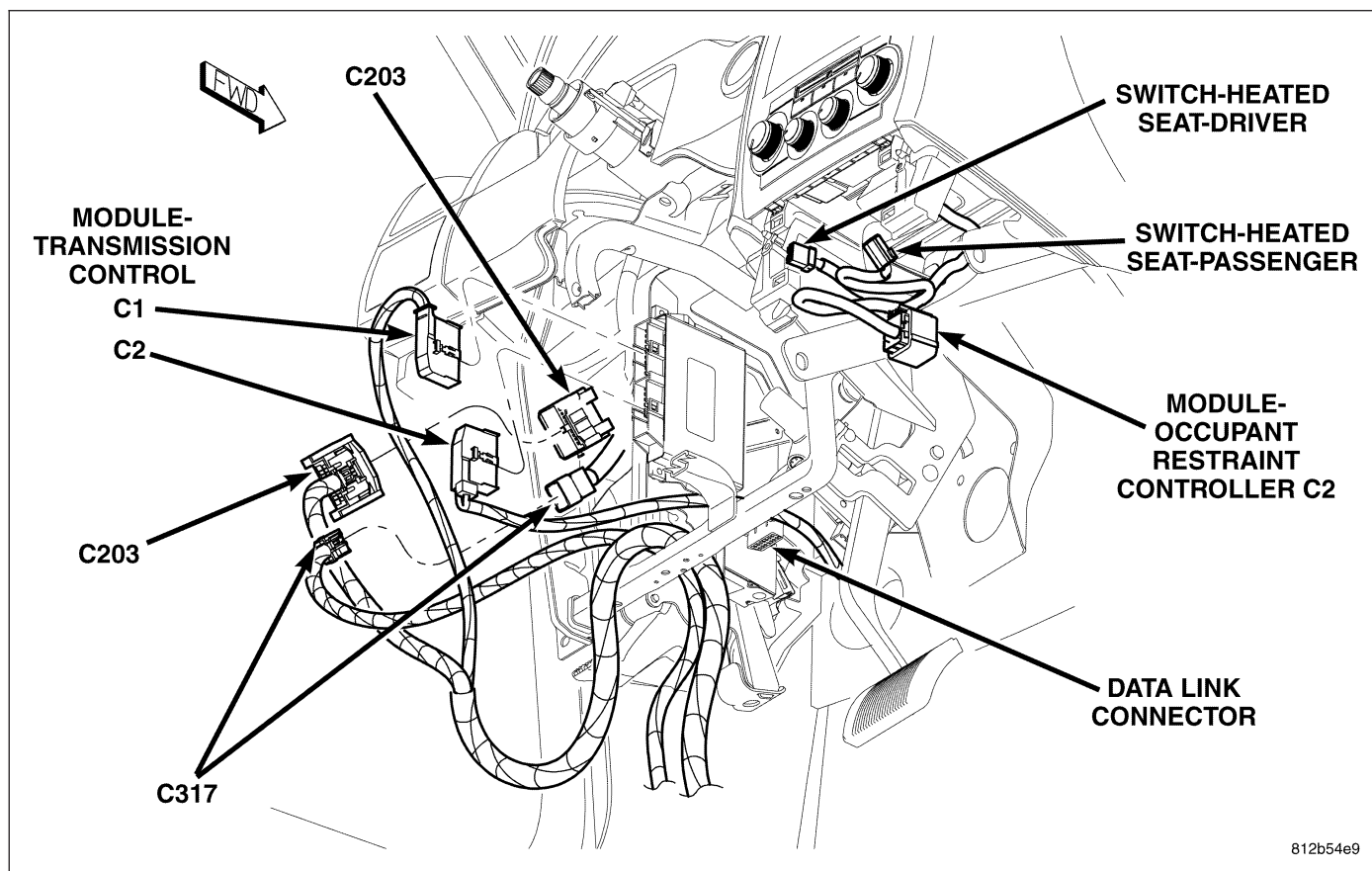


Fig. 30 INSTRUMENT PANEL LEFT

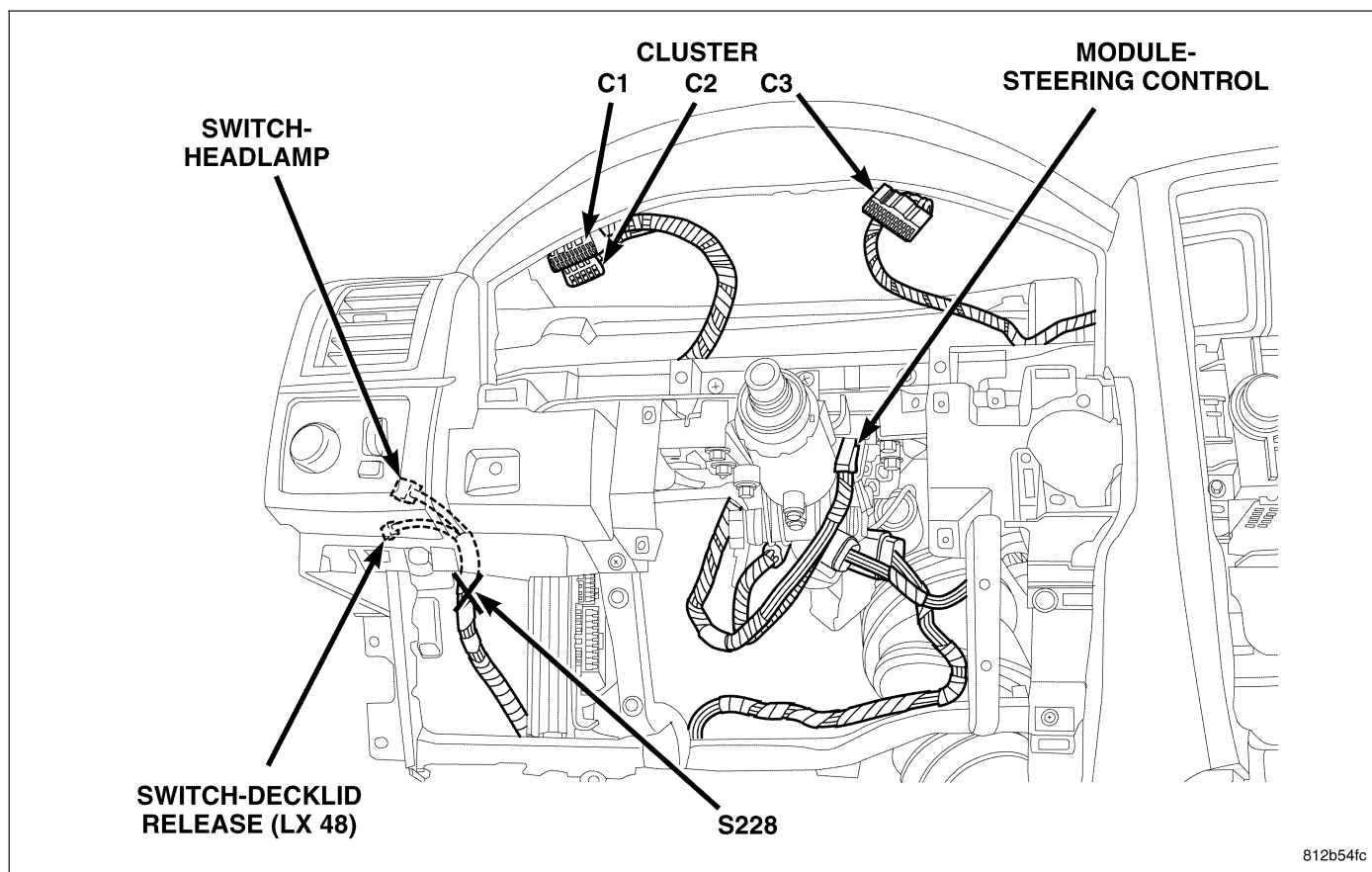


Fig. 31 INSTRUMENT PANEL - COLUMN



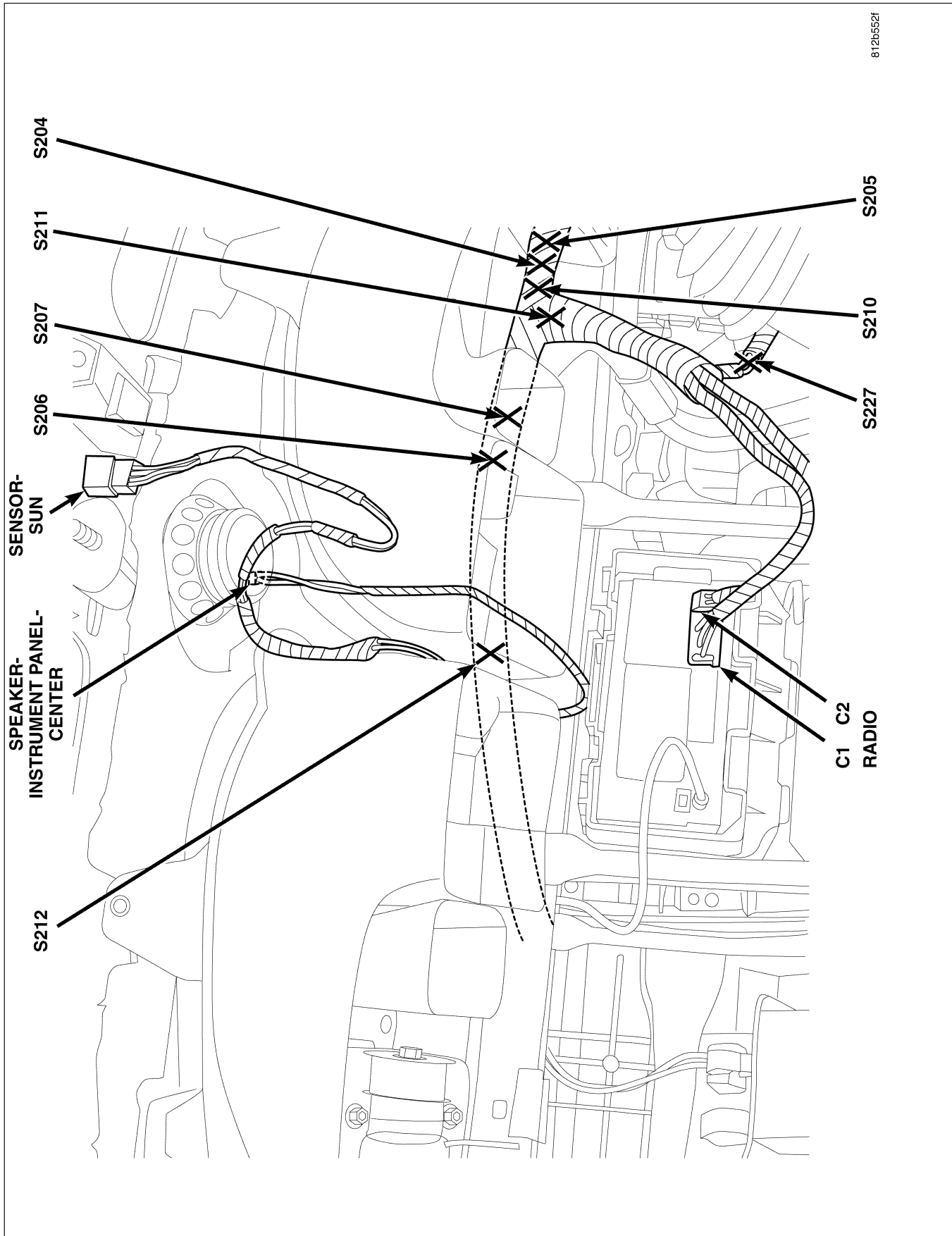
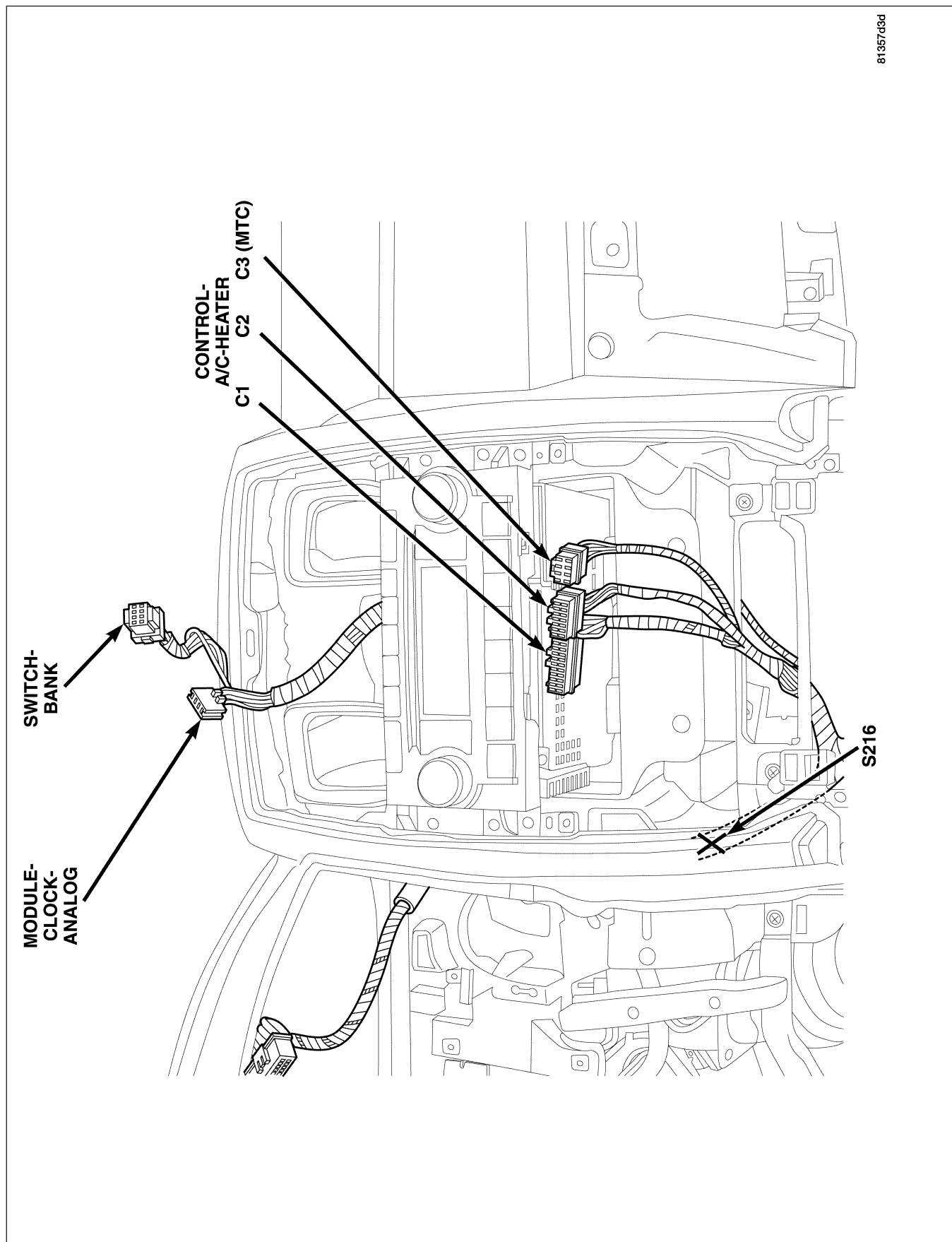


Fig. 32 INSTRUMENT PANEL CENTER FRONT



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Fig. 33 I-P CENTER STACK

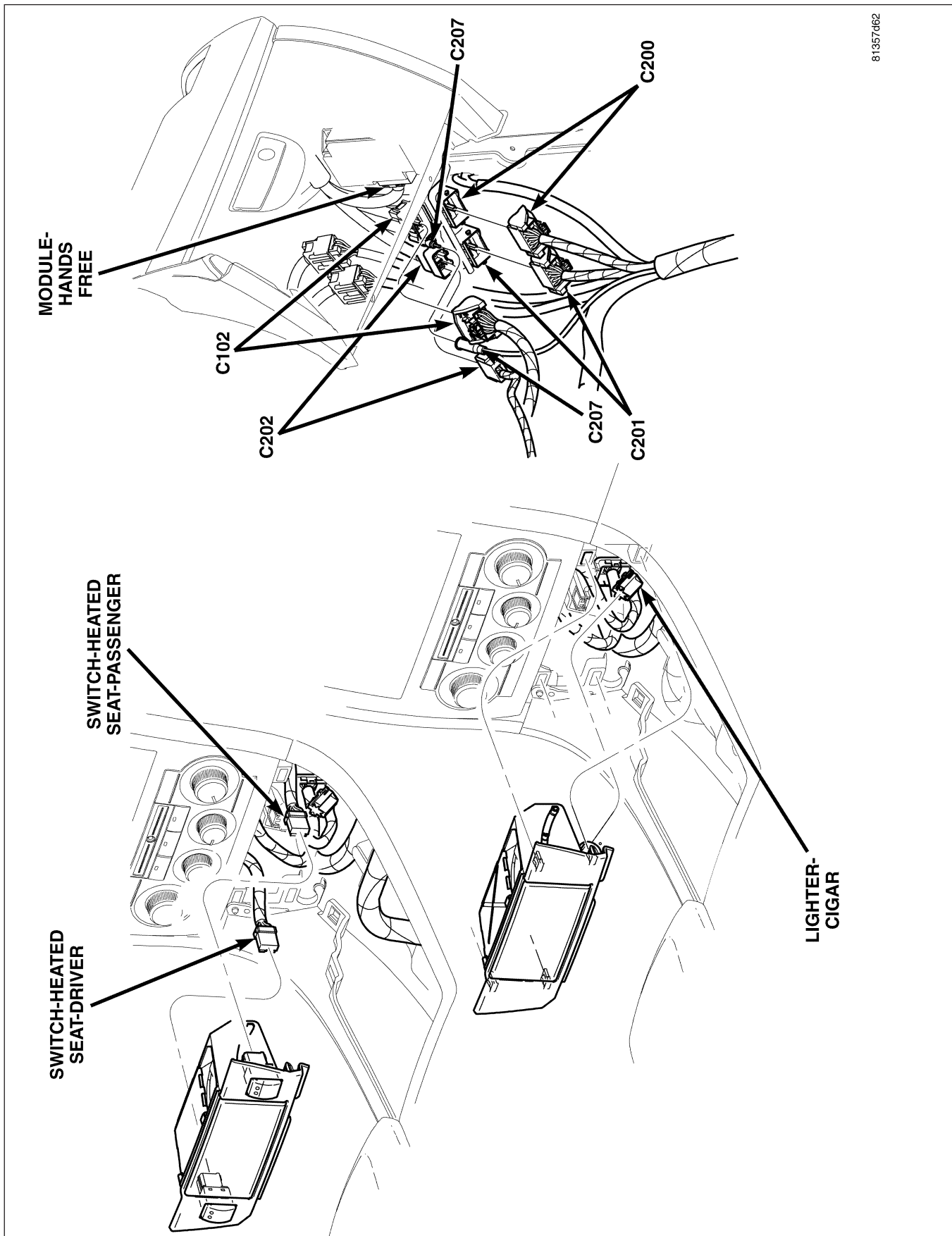
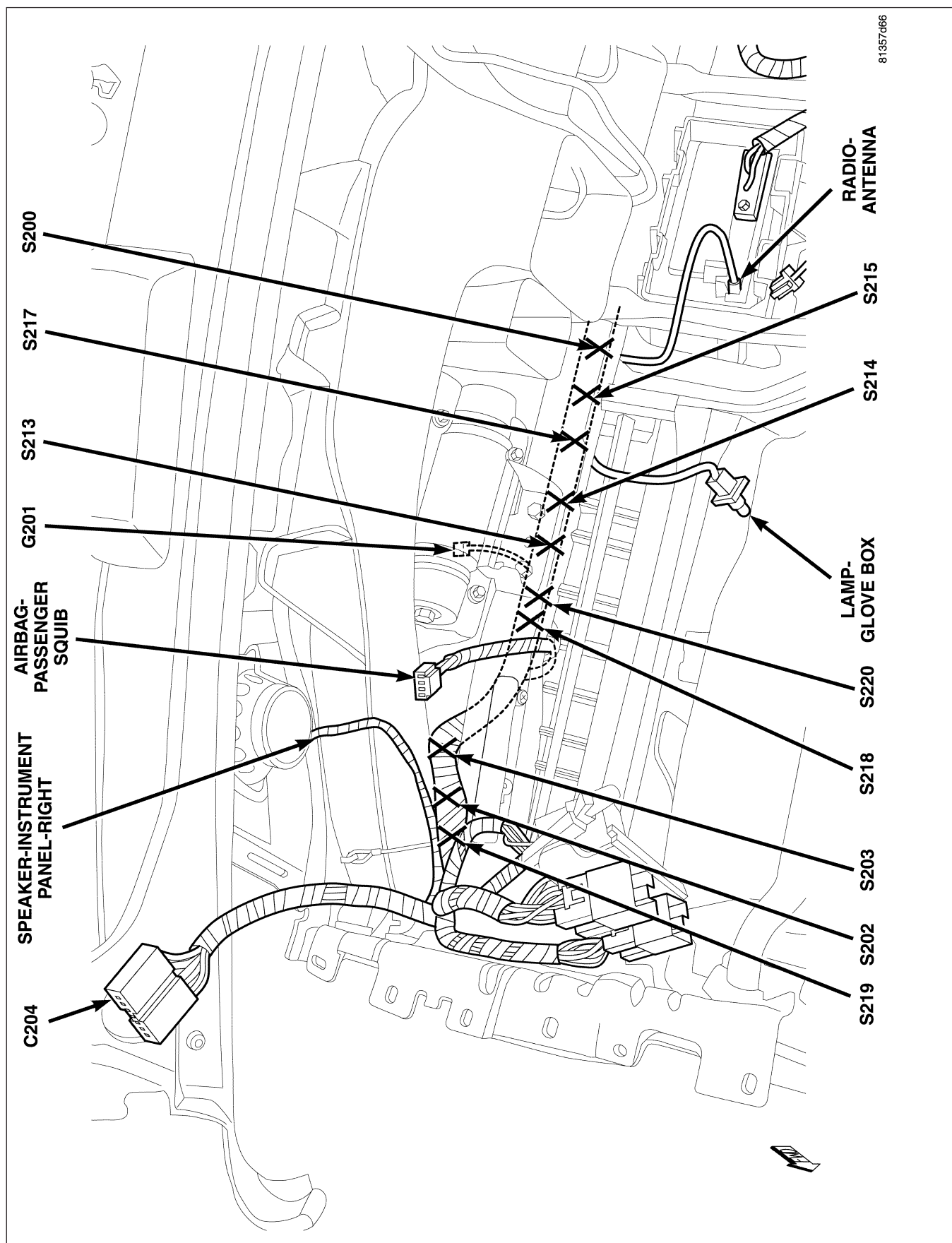
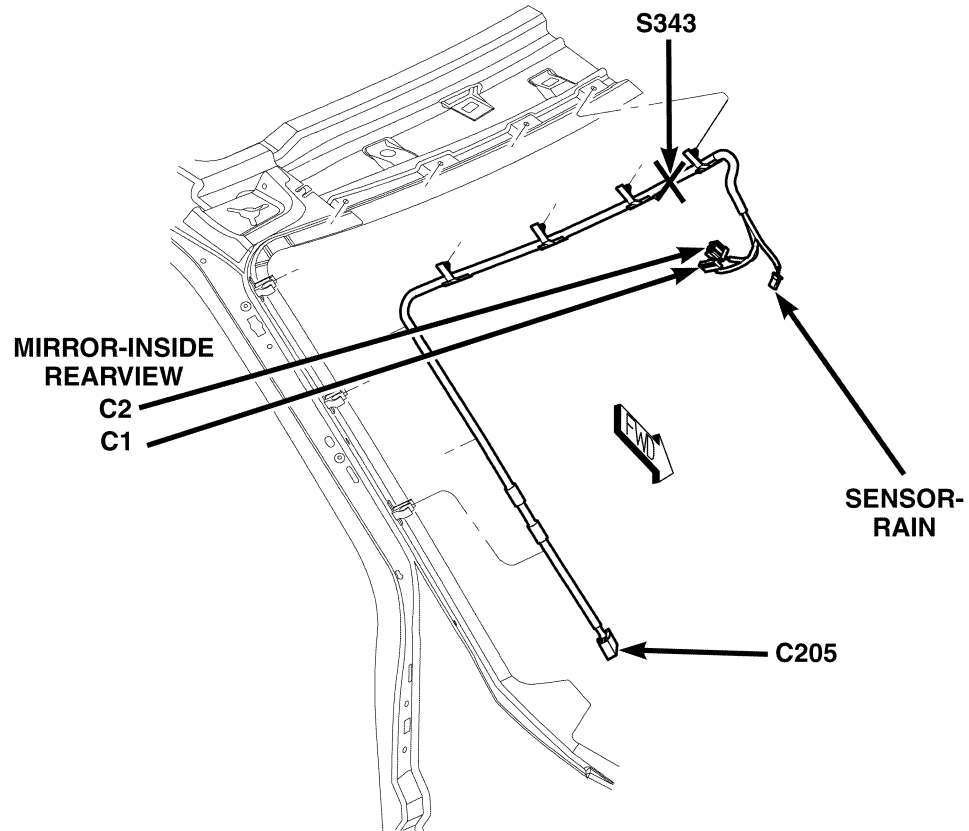


Fig. 34 INSTRUMENT PANEL CENTER AND RIGHT



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Fig. 35 INSTRUMENT PANEL RIGHT



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**Fig. 36 LEFT A-PILLAR**

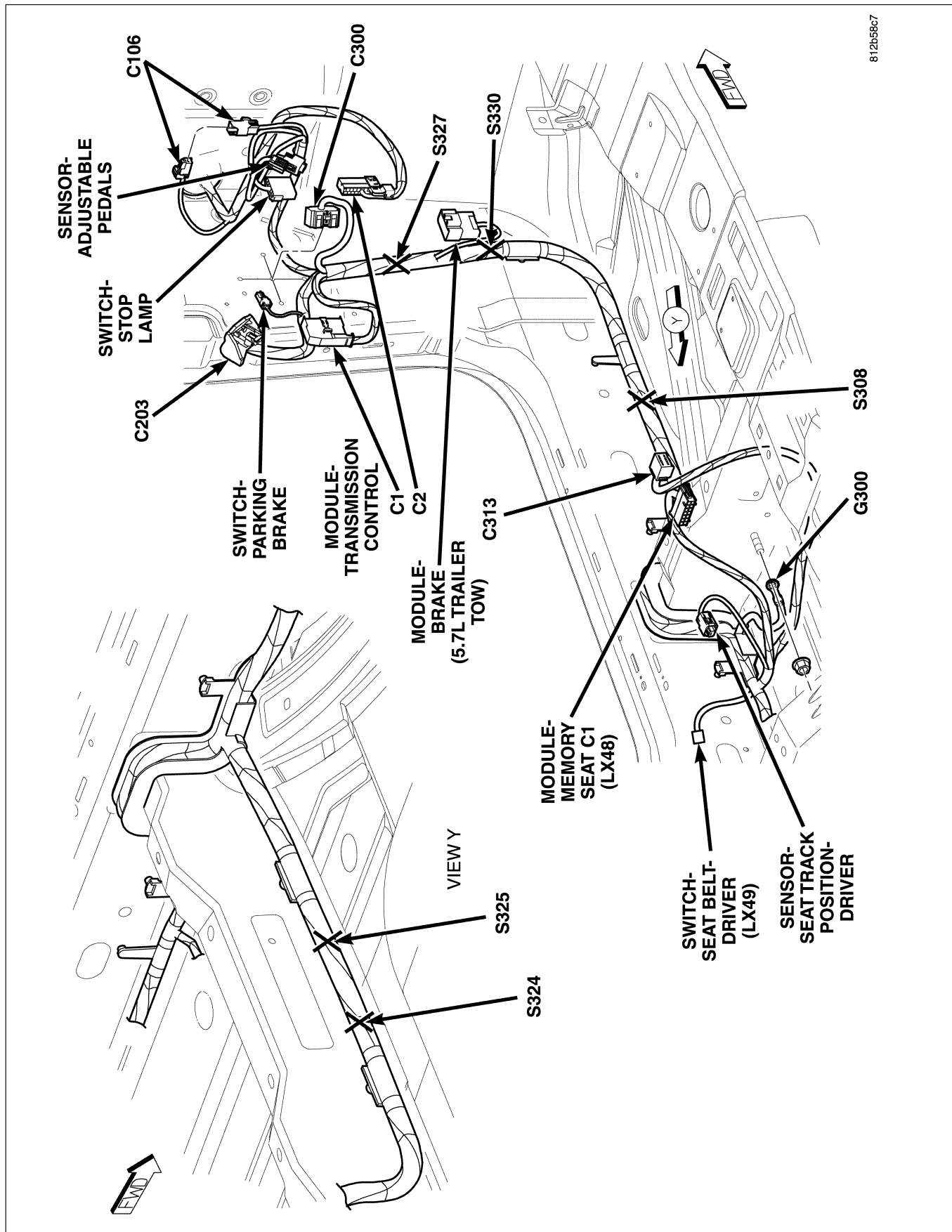


Fig. 37 BODY LEFT FRONT



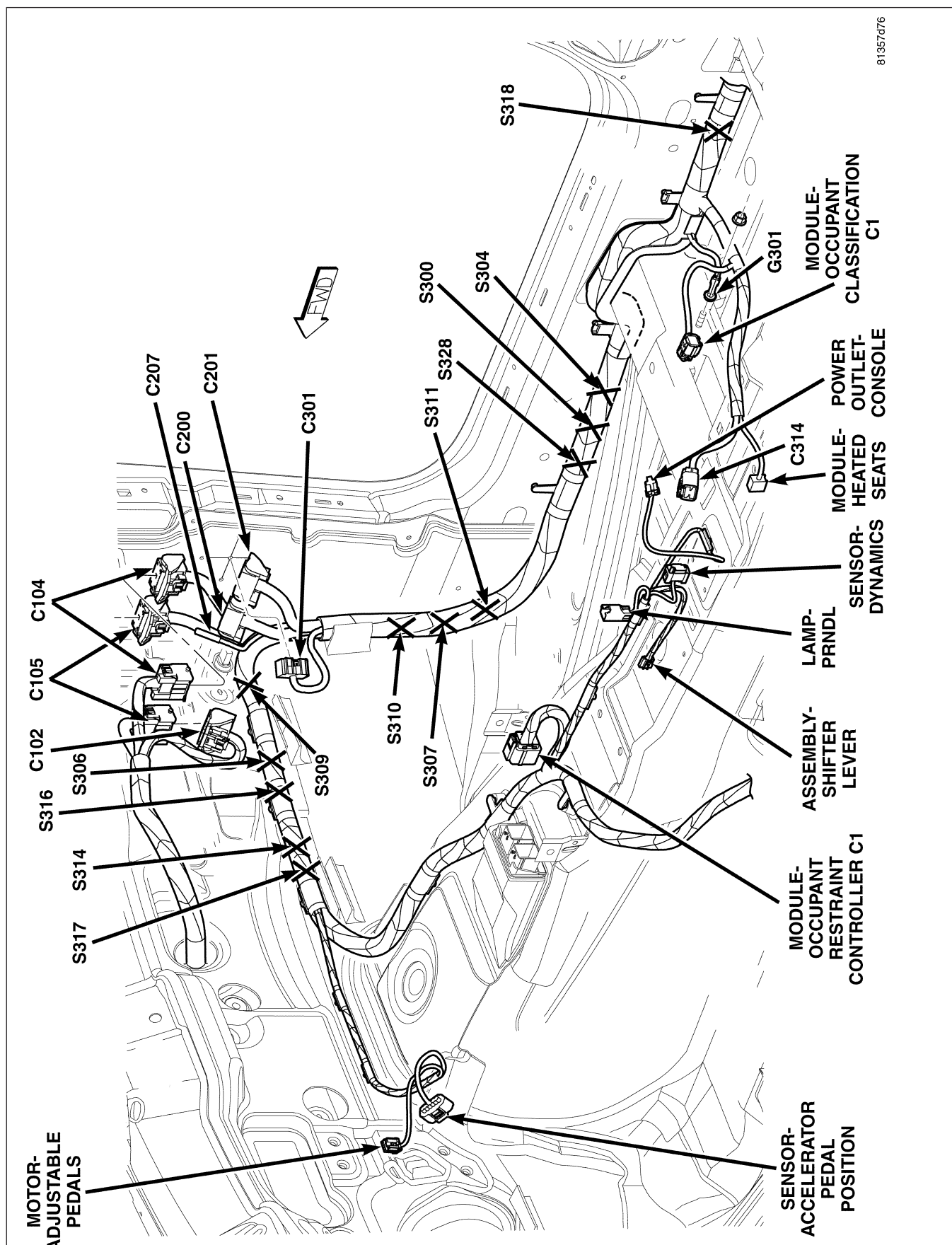


Fig. 38 BODY RIGHT FRONT

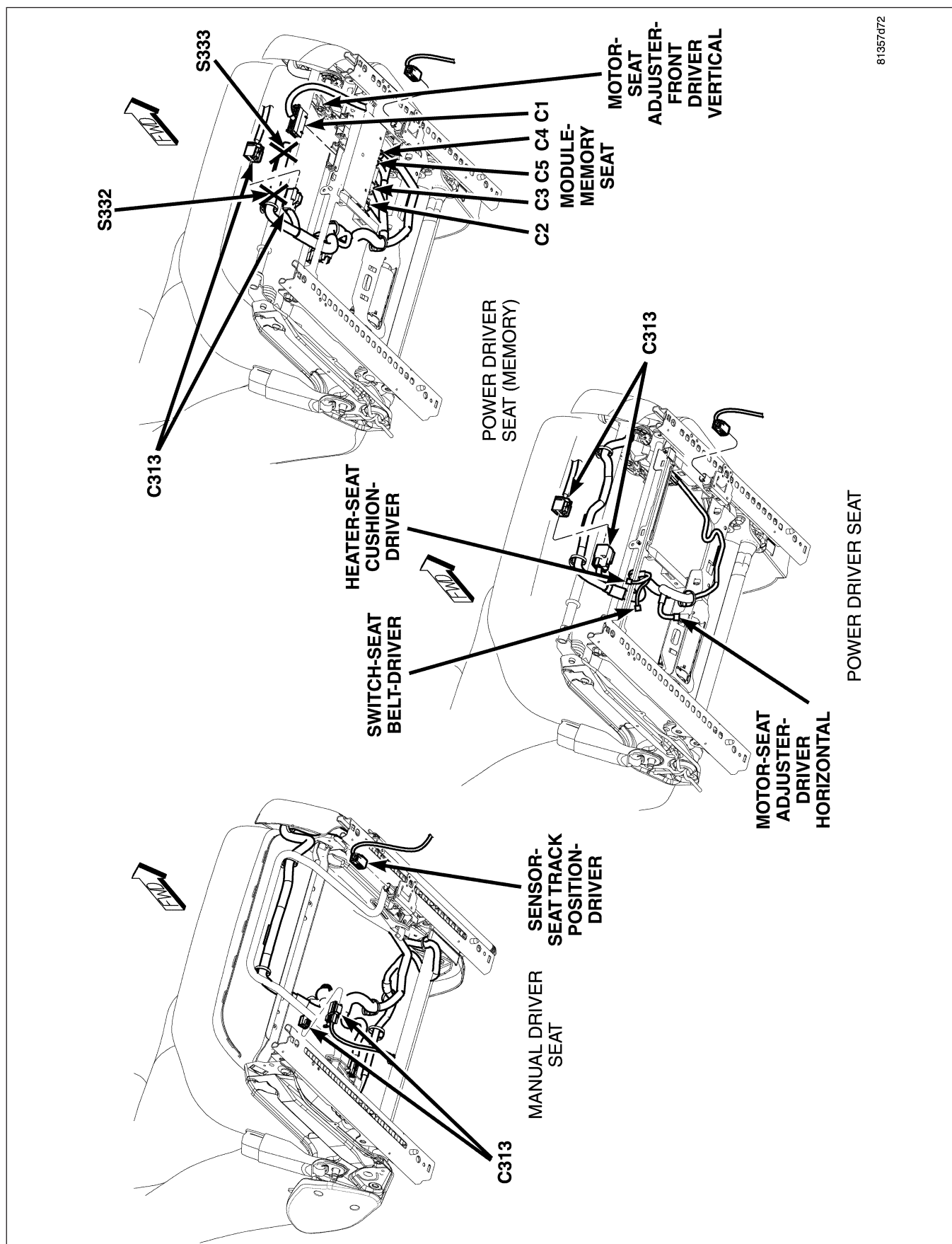


Fig. 39 DRIVER SEAT



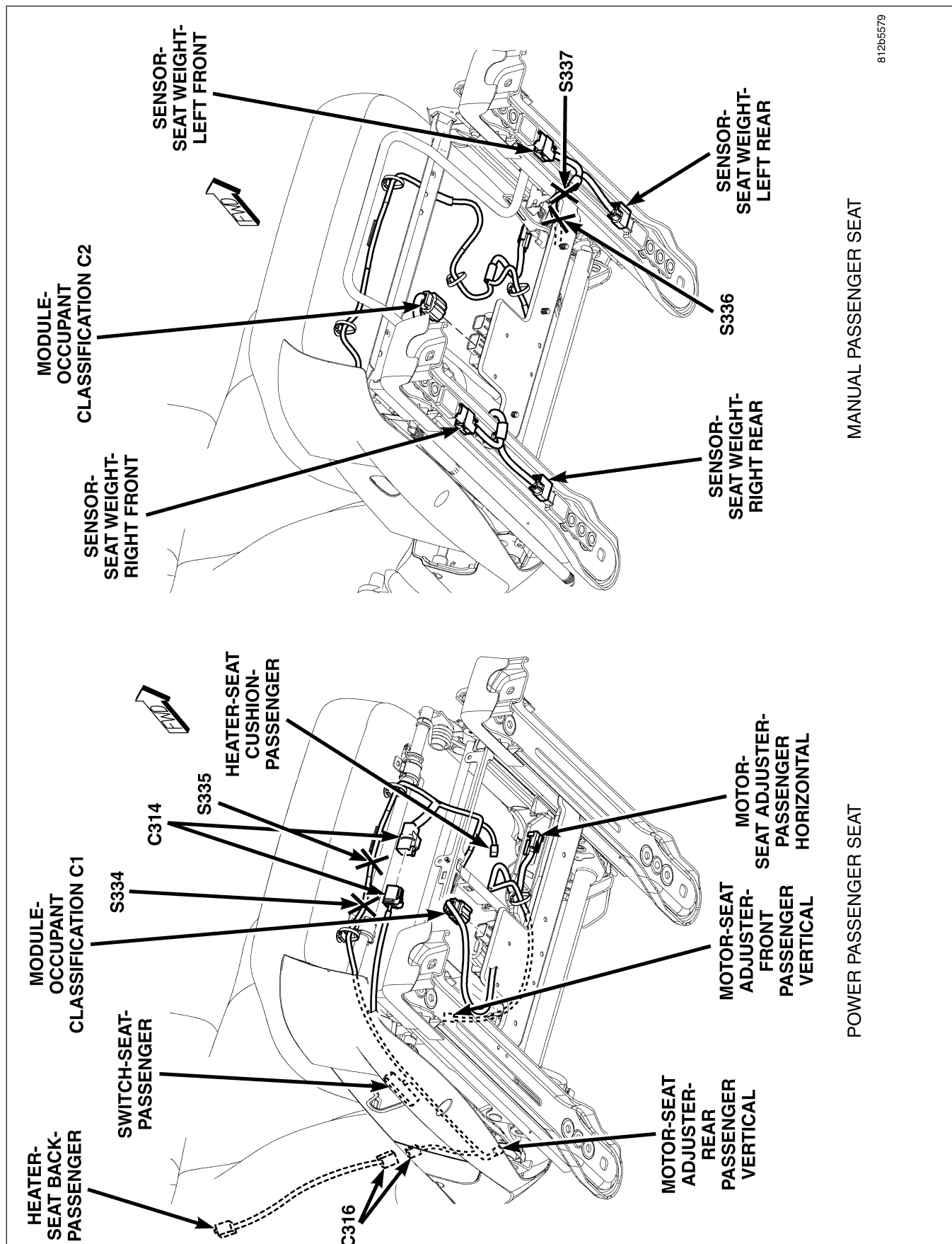
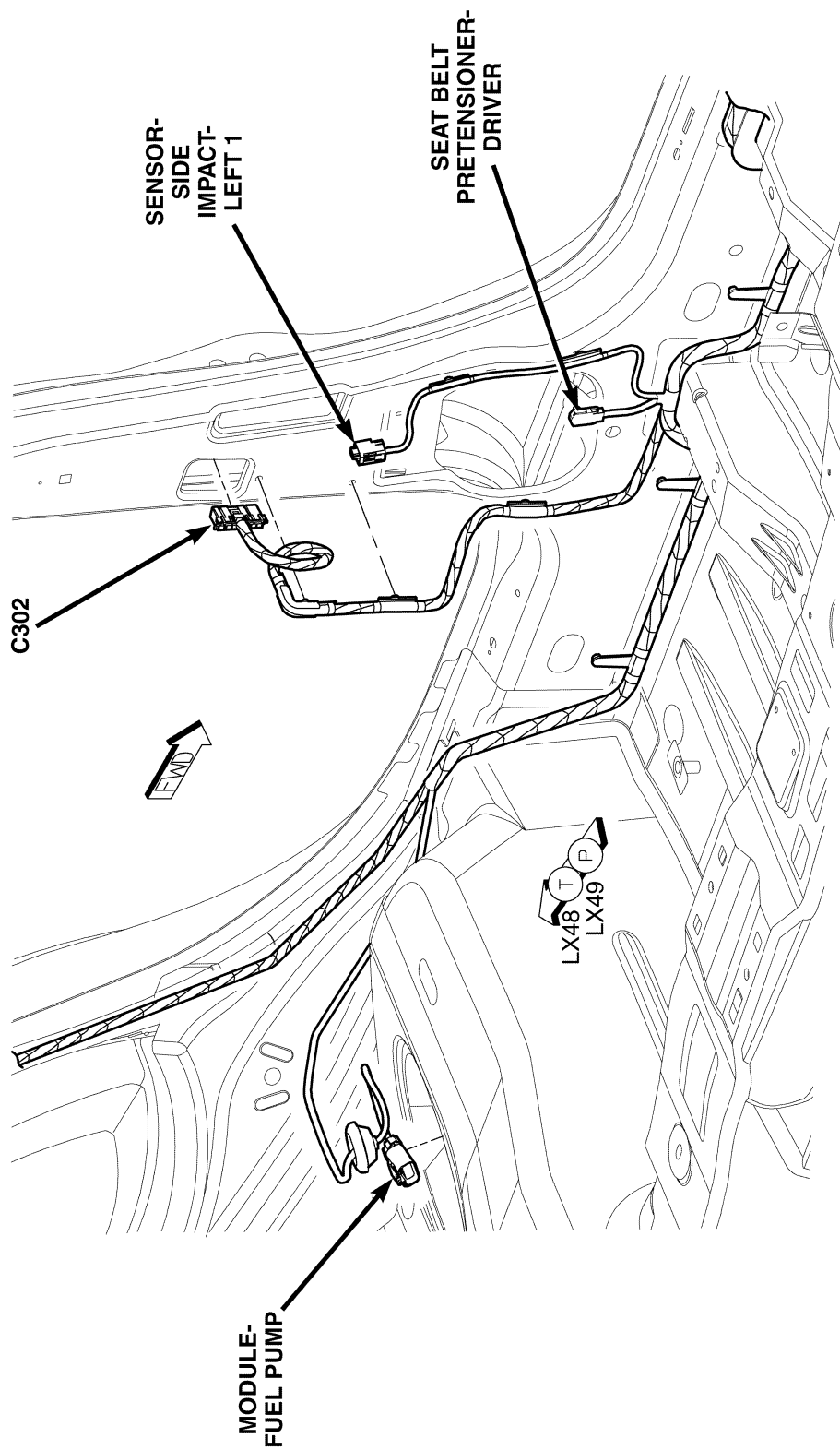


Fig. 40 PASSENGER SEAT



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Fig. 41 BODY LEFT SIDE

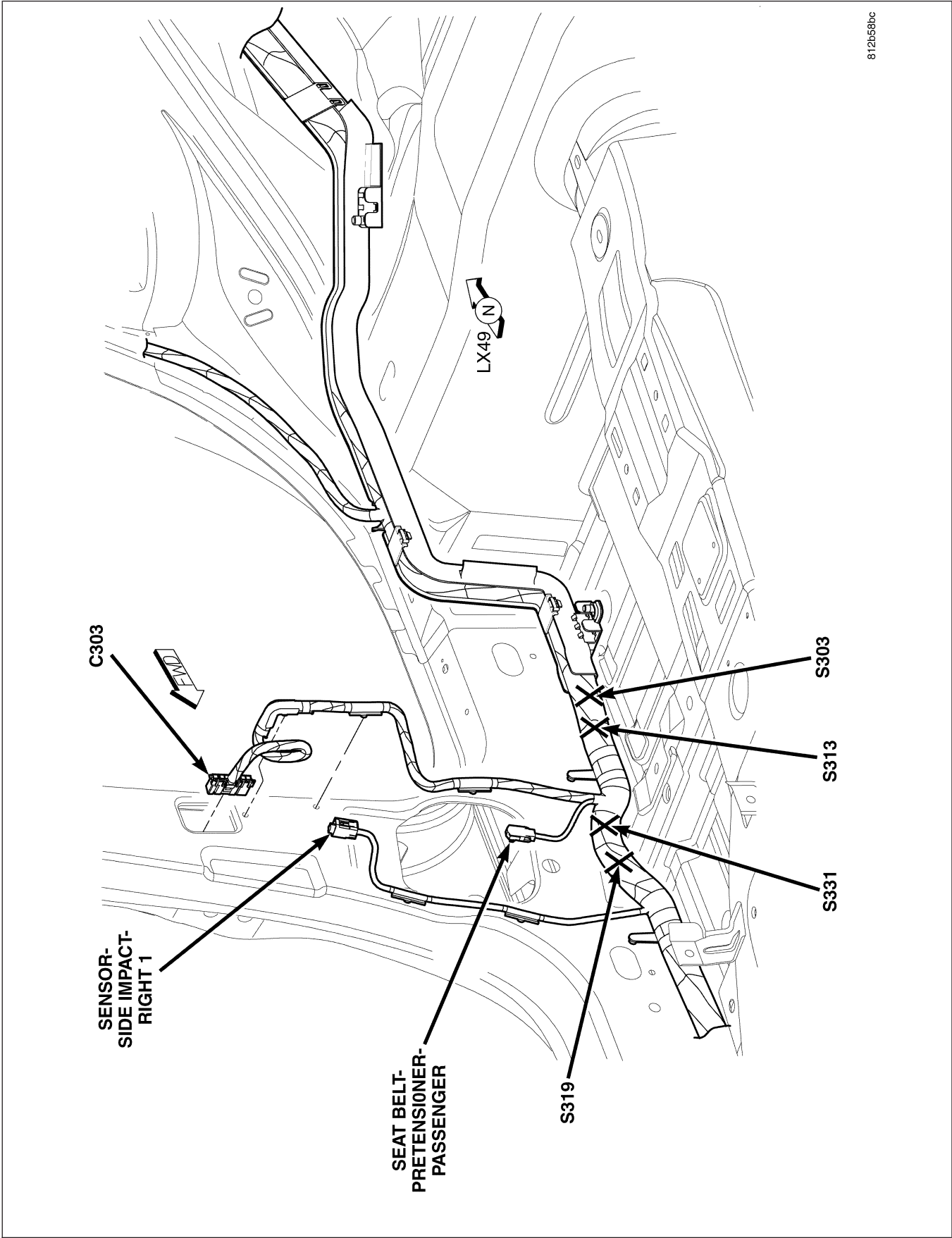


Fig. 42 BODY RIGHT SIDE

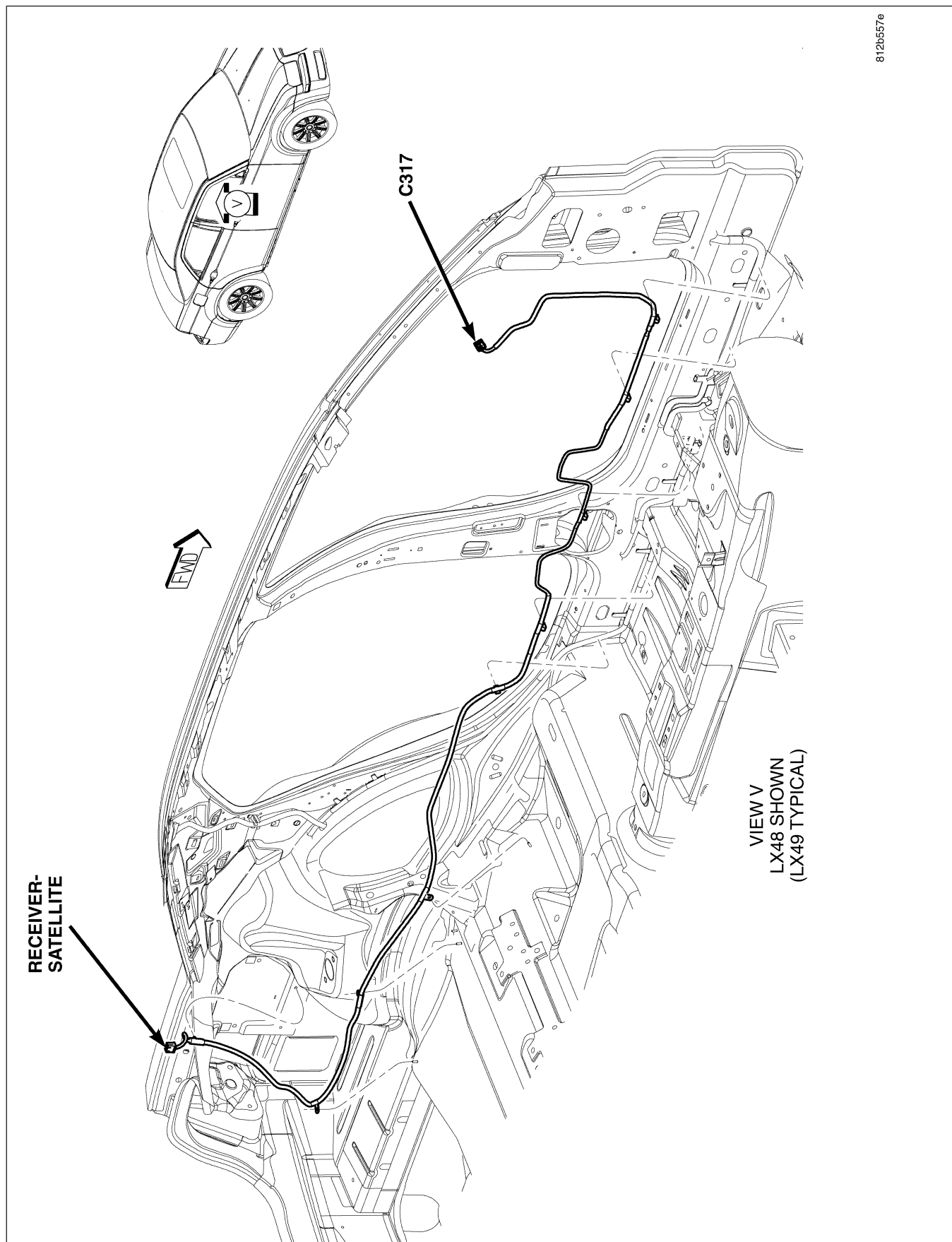
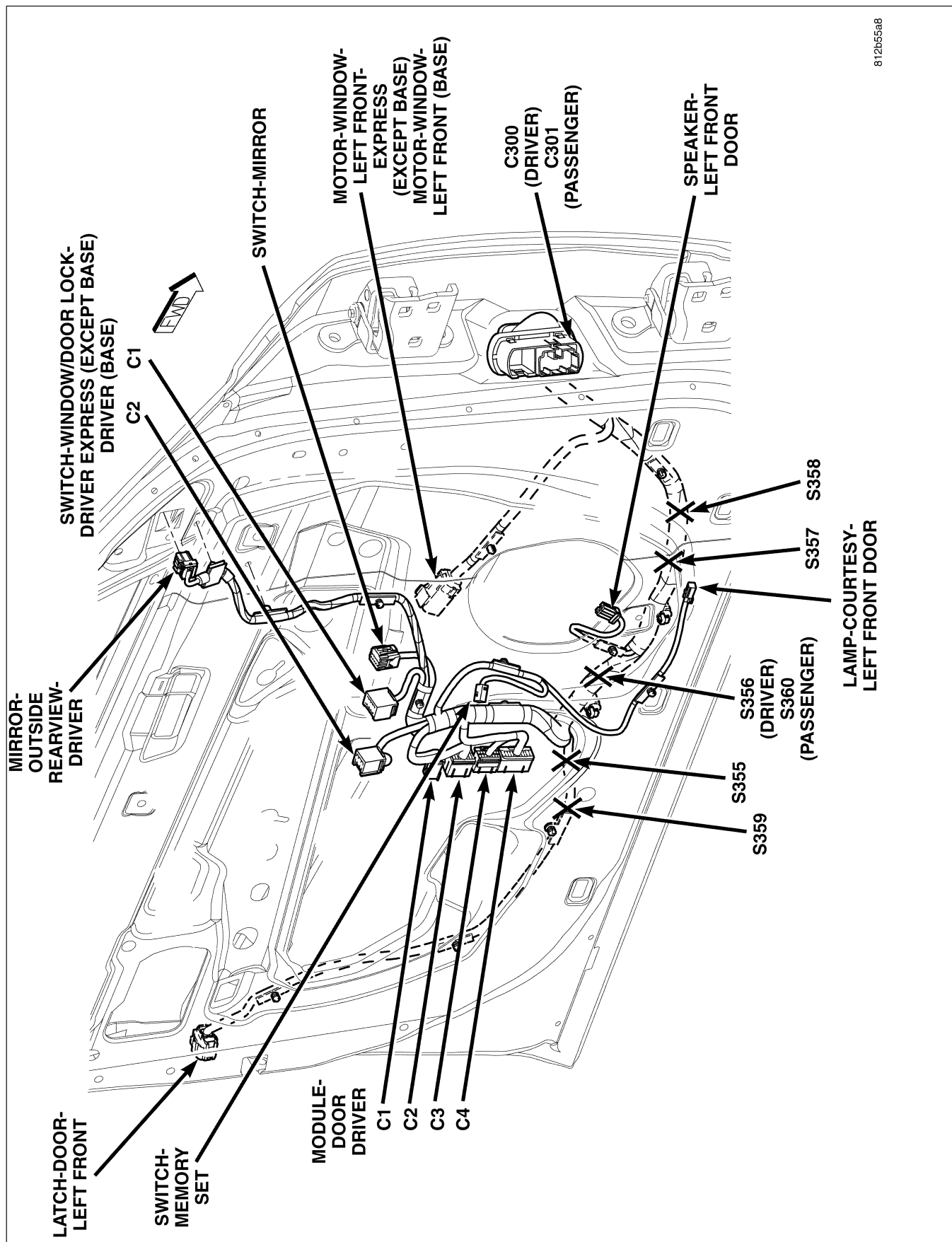


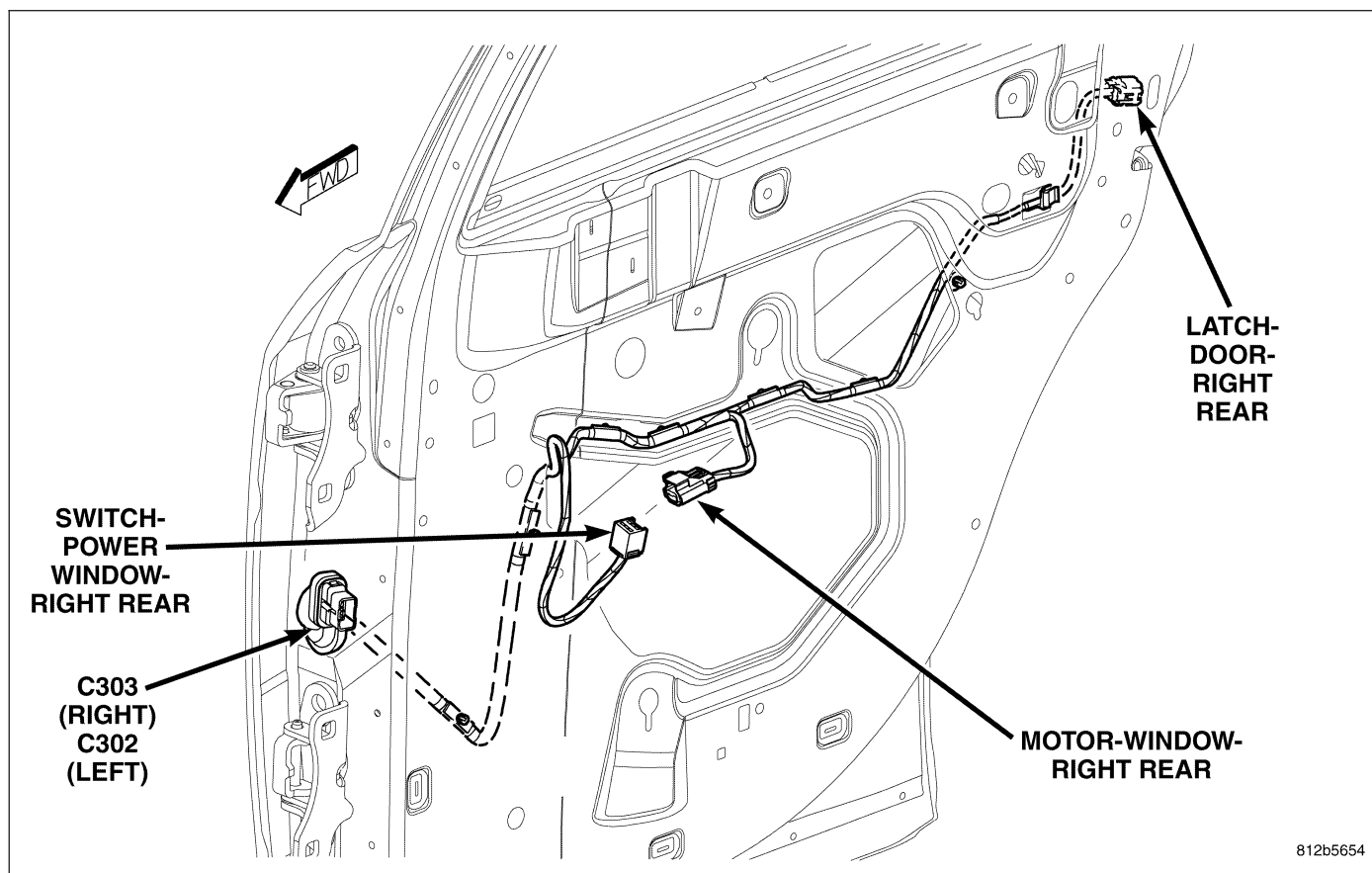
Fig. 43 SATELLITE RADIO JUMPER



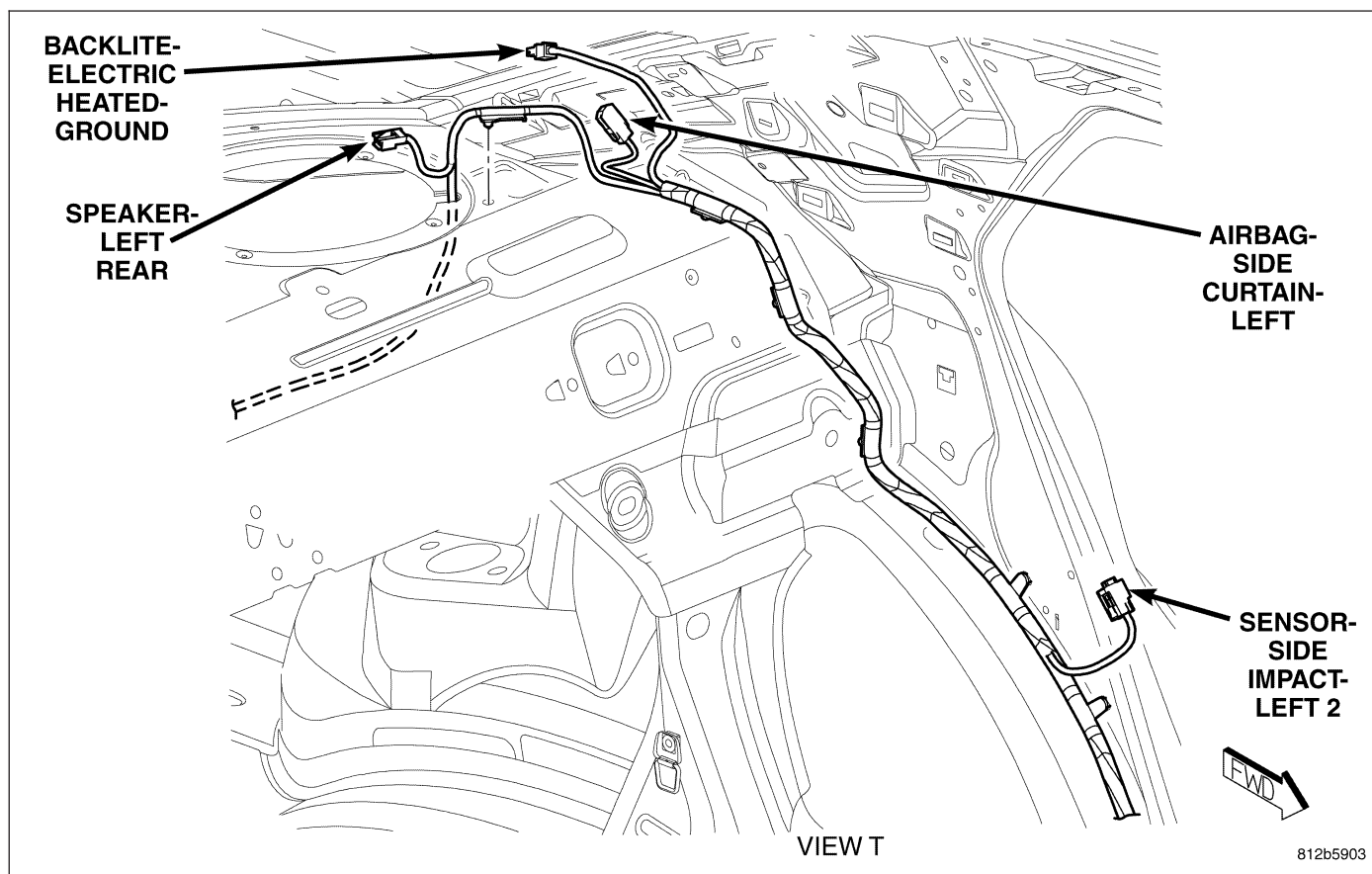
812b55a8

Fig. 44 LEFT FRONT DOOR

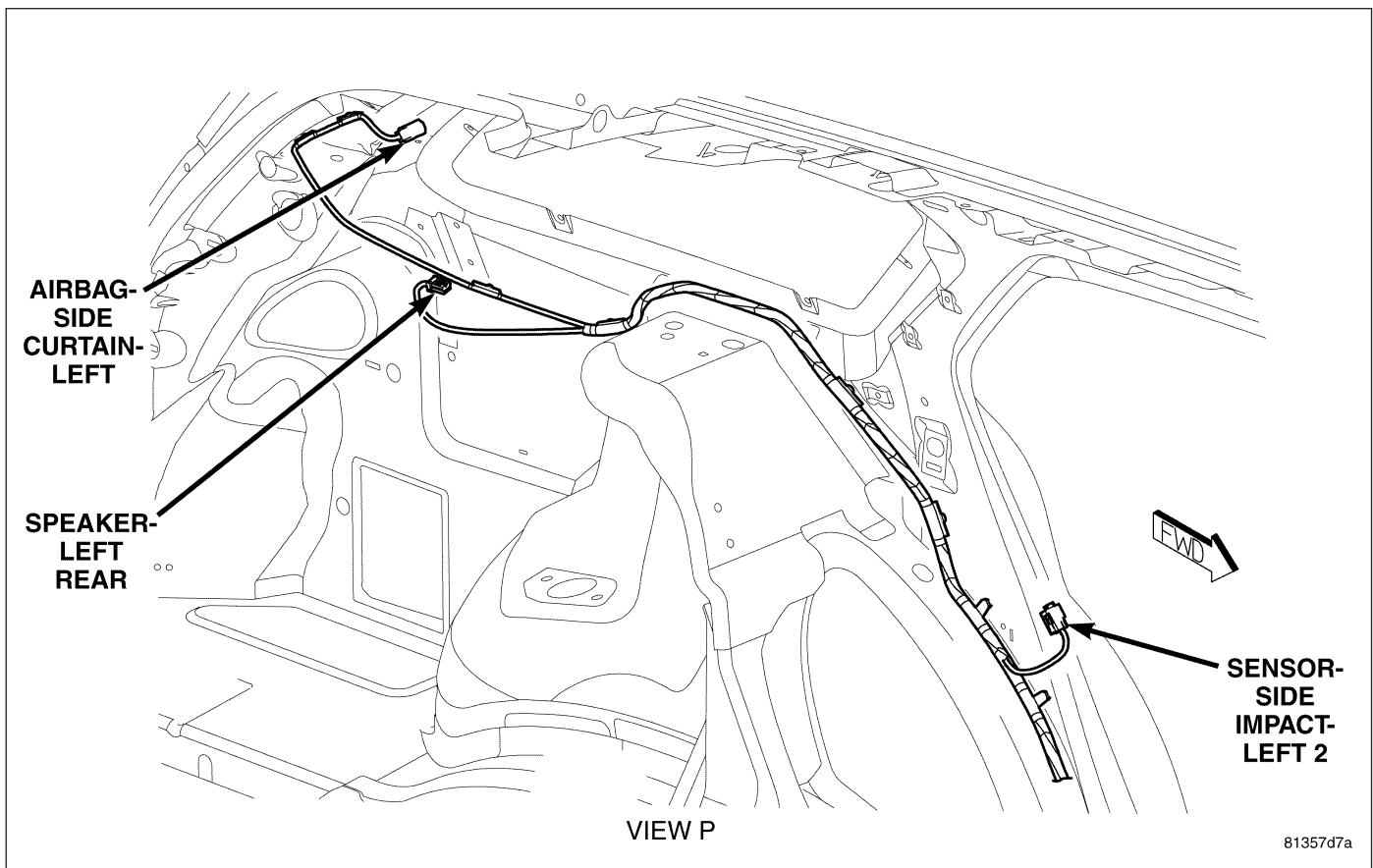




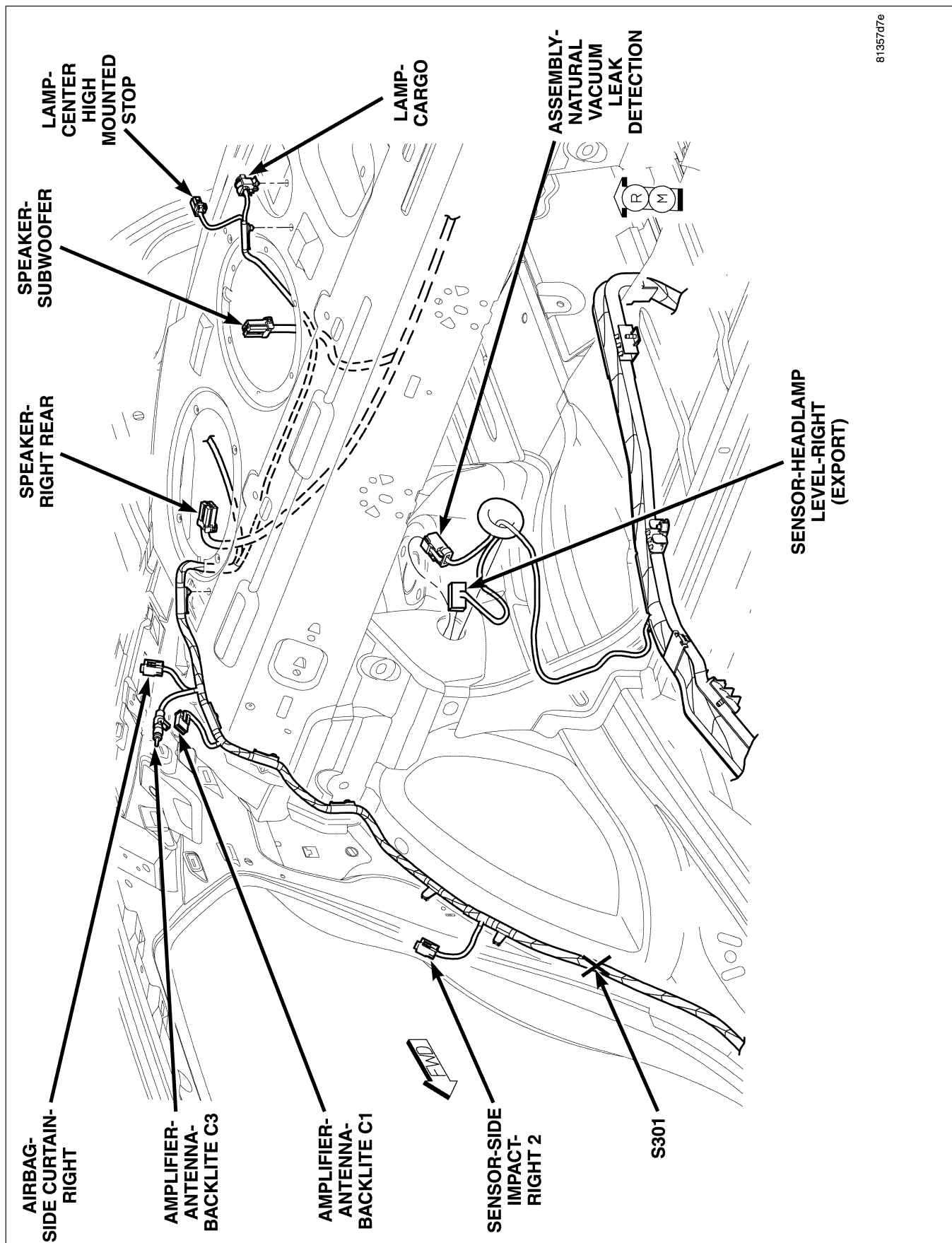
**Fig. 45 RIGHT REAR DOOR(LEFT SIMILAR)**



**Fig. 46 LEFT REAR QUARTER (LX48)**



**Fig. 47 BODY LEFT REAR QUARTER (LX49)**



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Fig. 48 BODY RIGHT REAR QUARTER (LX48)



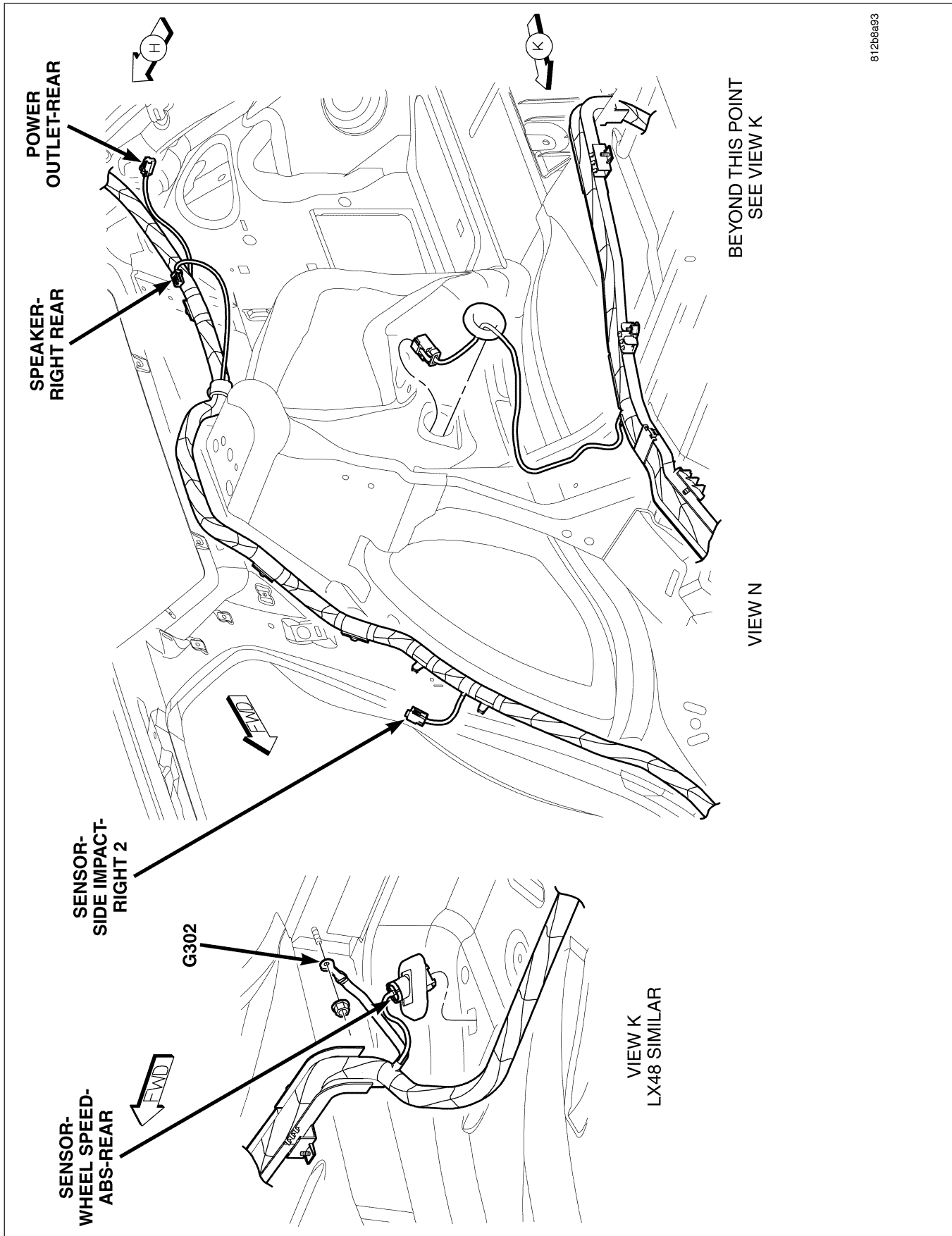


Fig. 49 BODY RIGHT REAR QUARTER (LX49)

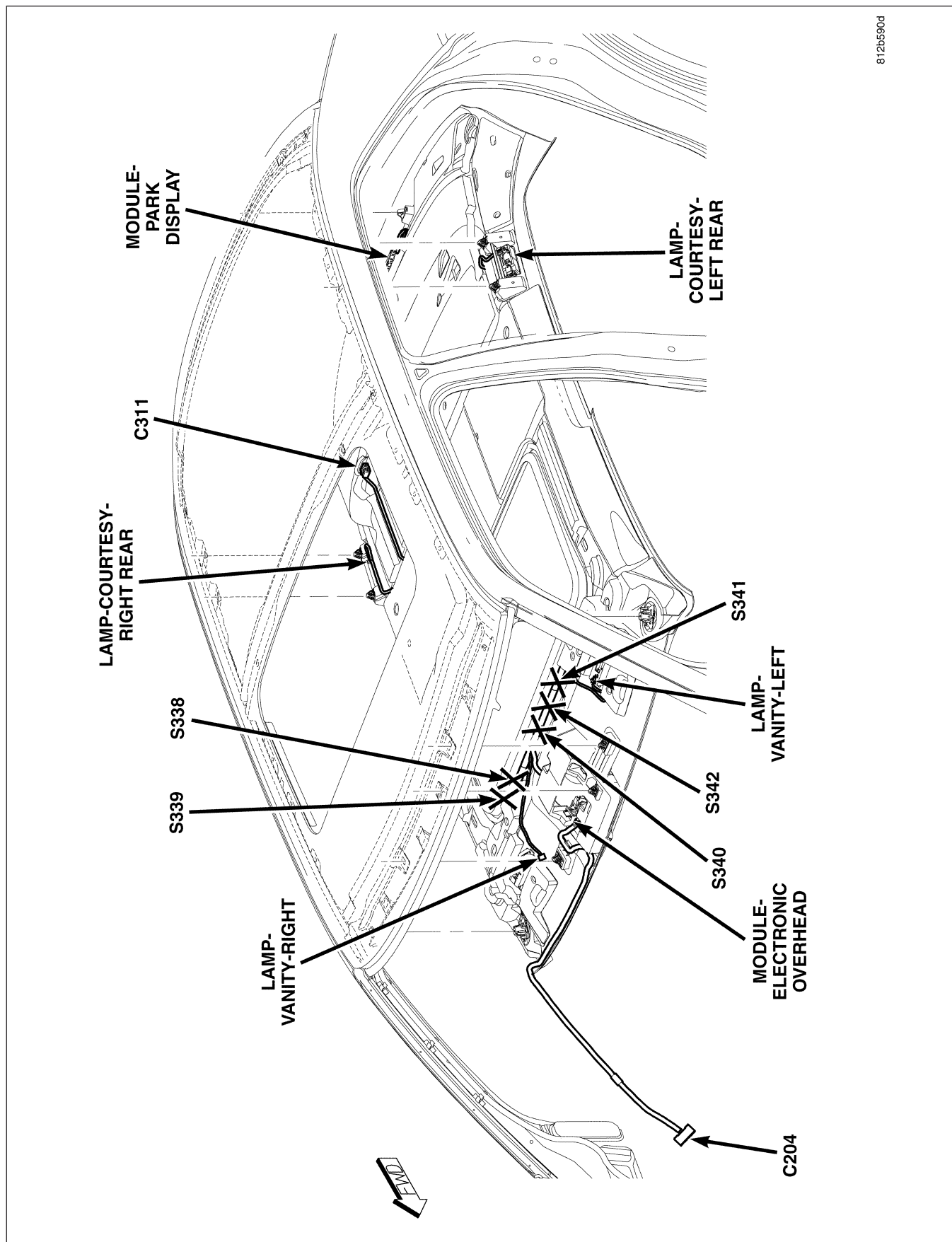
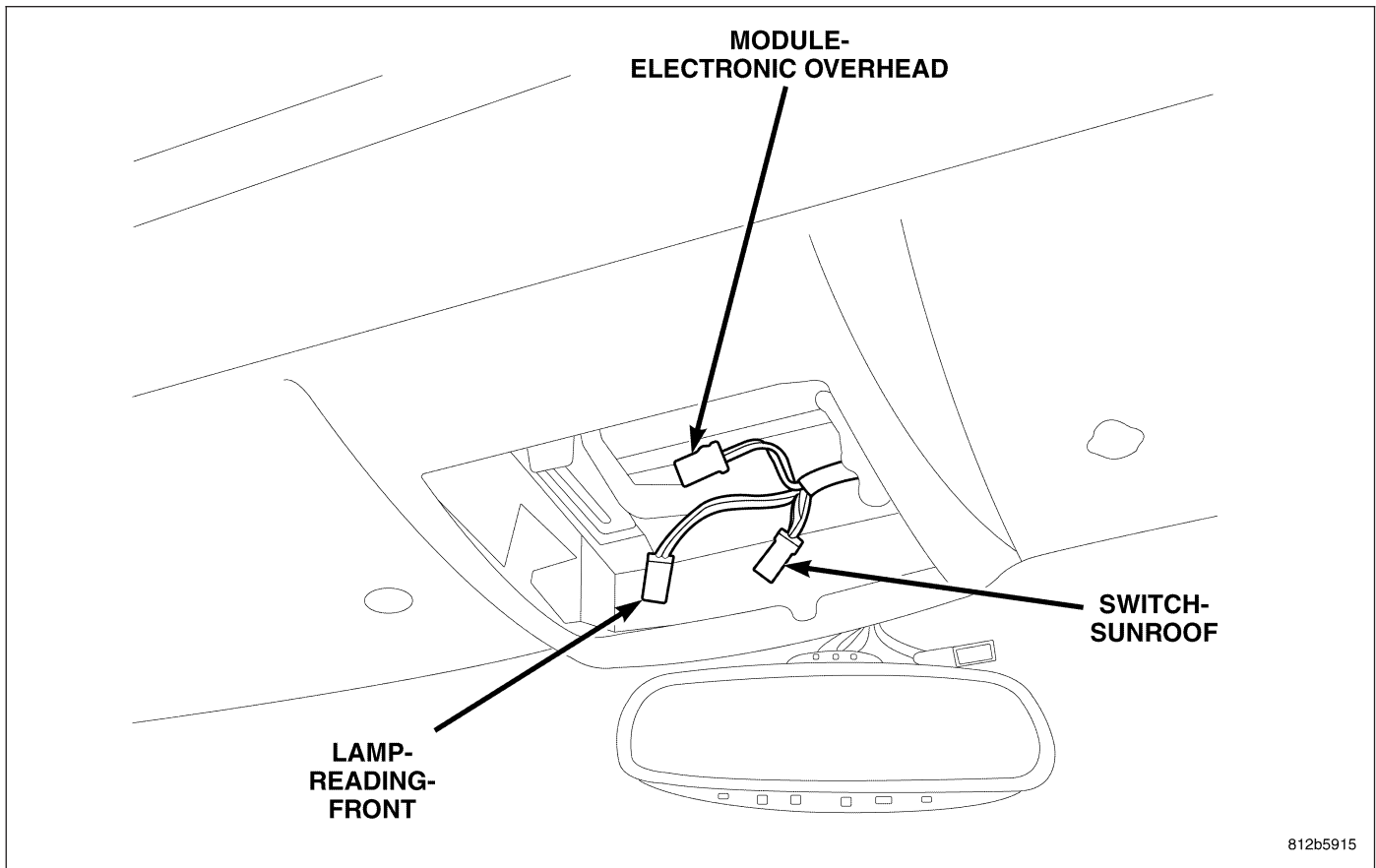
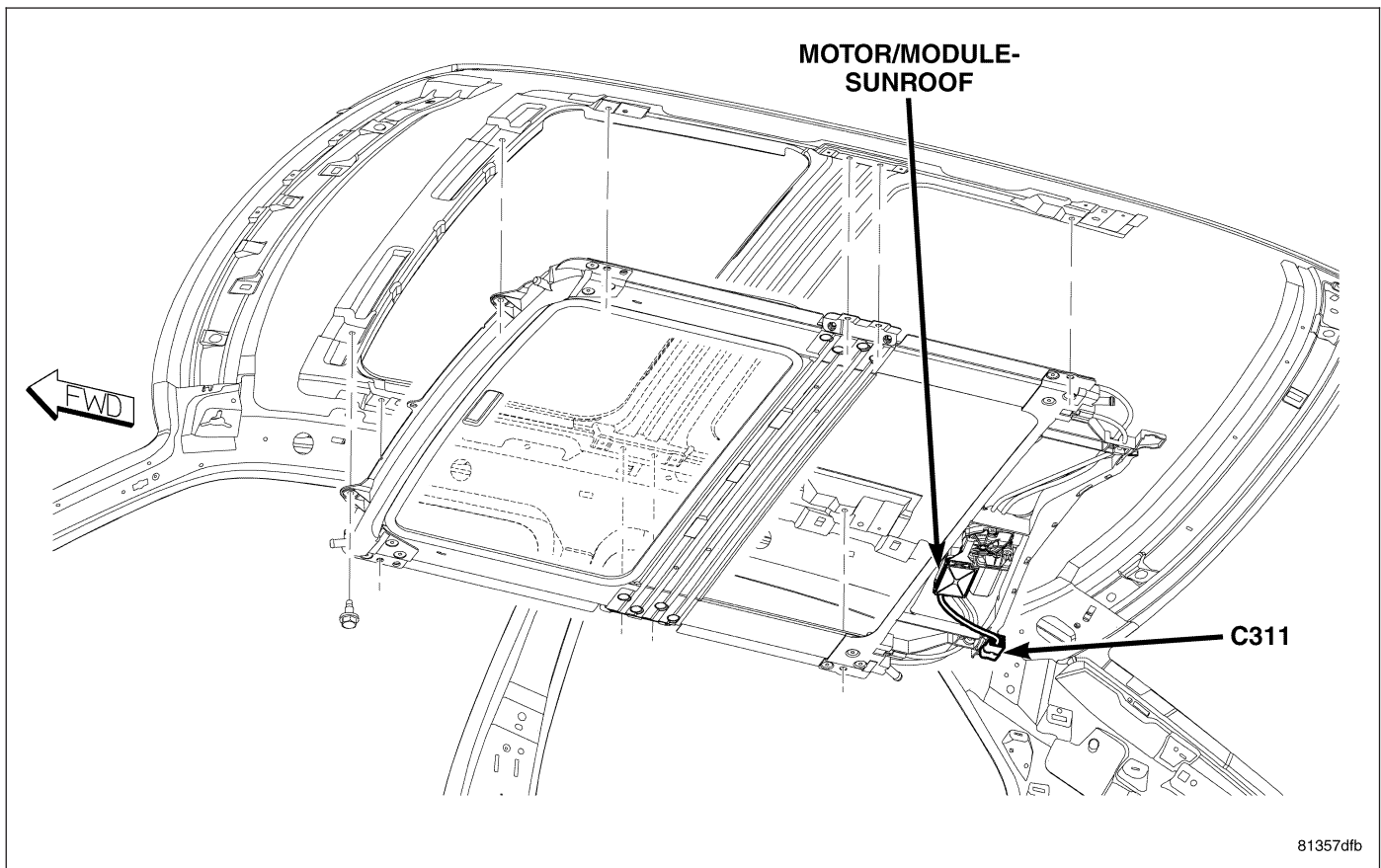


Fig. 50 HEADLINER



**Fig. 51 OVERHEAD CONSOLE**



**Fig. 52 SUNROOF**

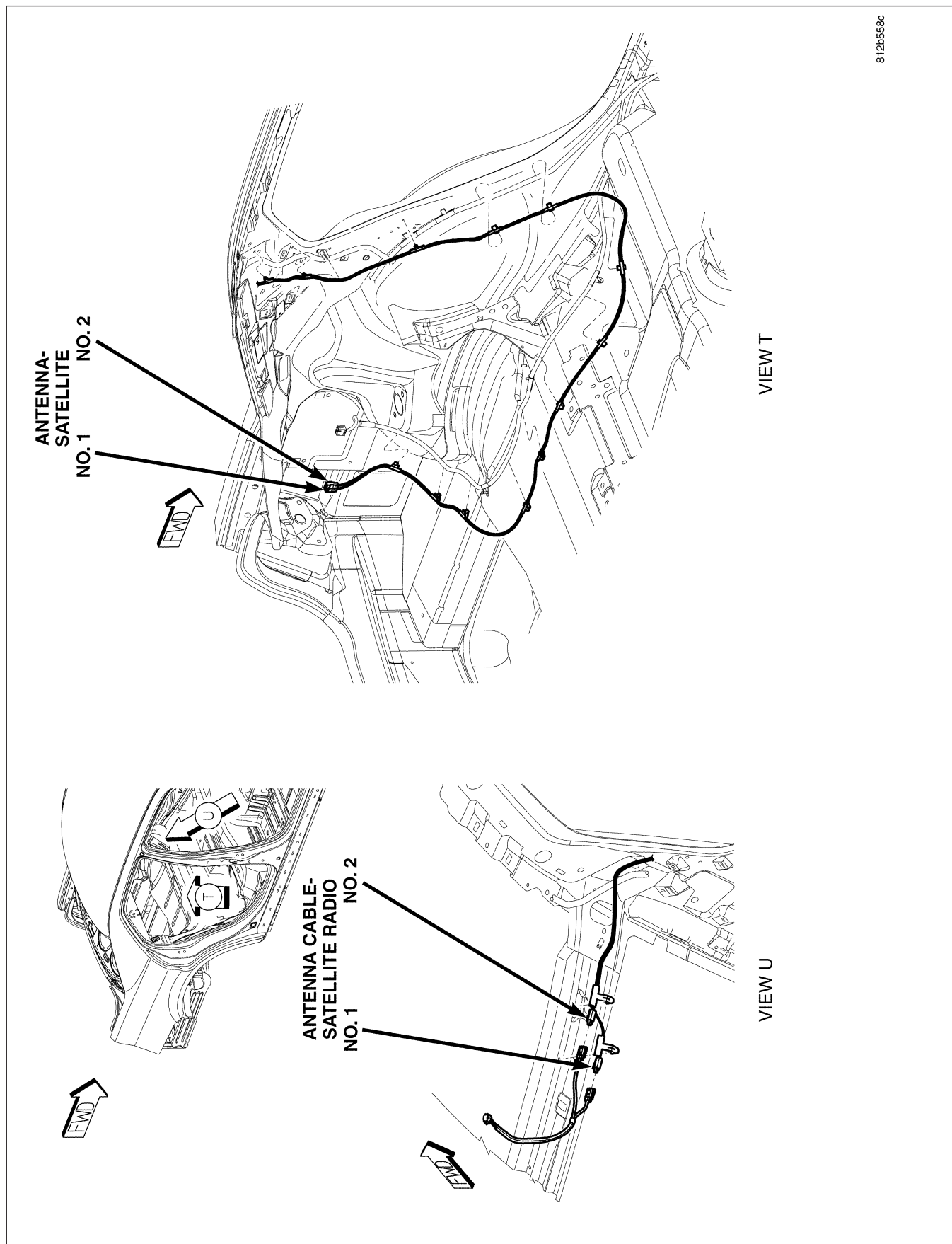


Fig. 53 SATELLITE RADIO ANTENNA CABLES (LX48)

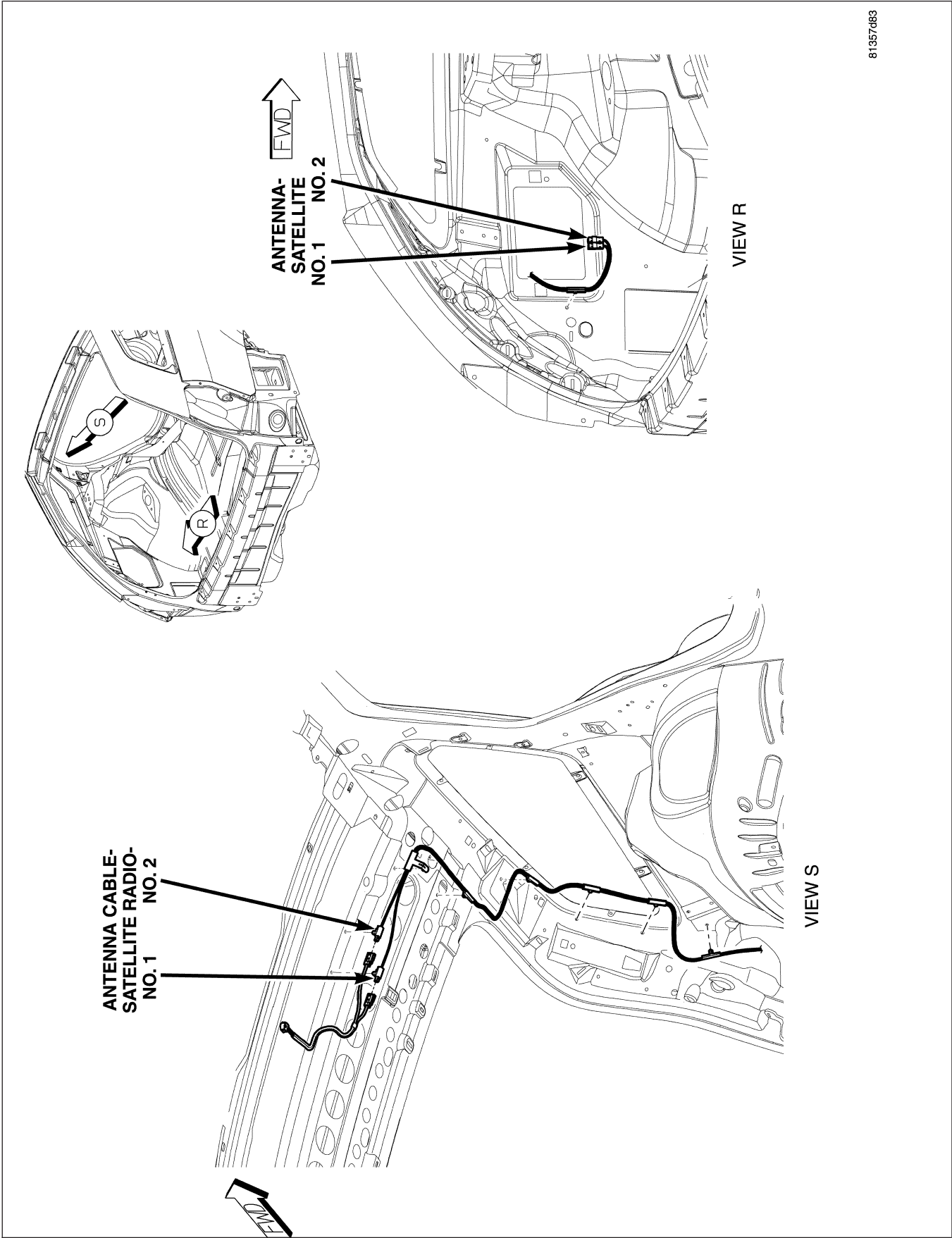


Fig. 54 SATELLITE RADIO ANTENNA CABLES (LX49)

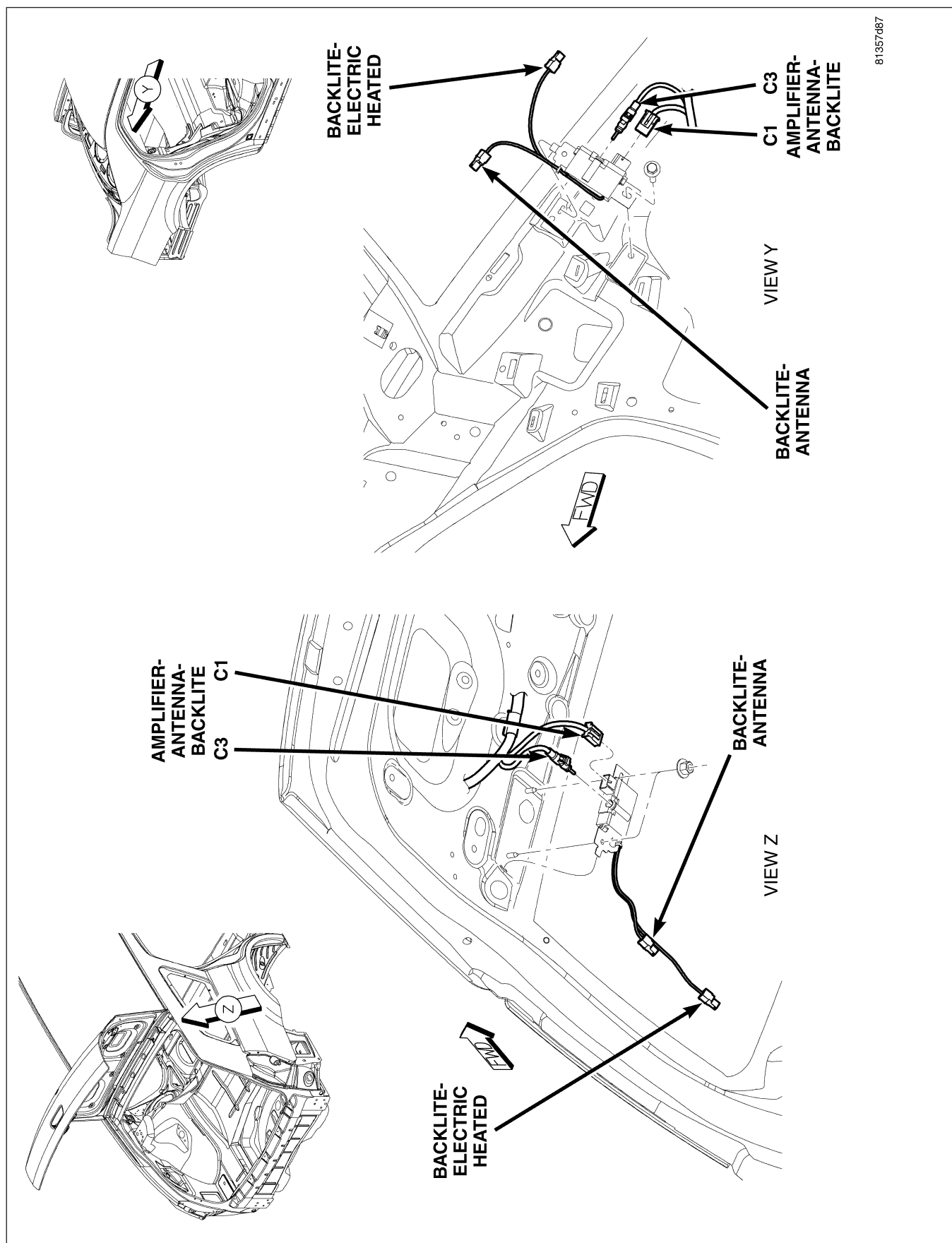
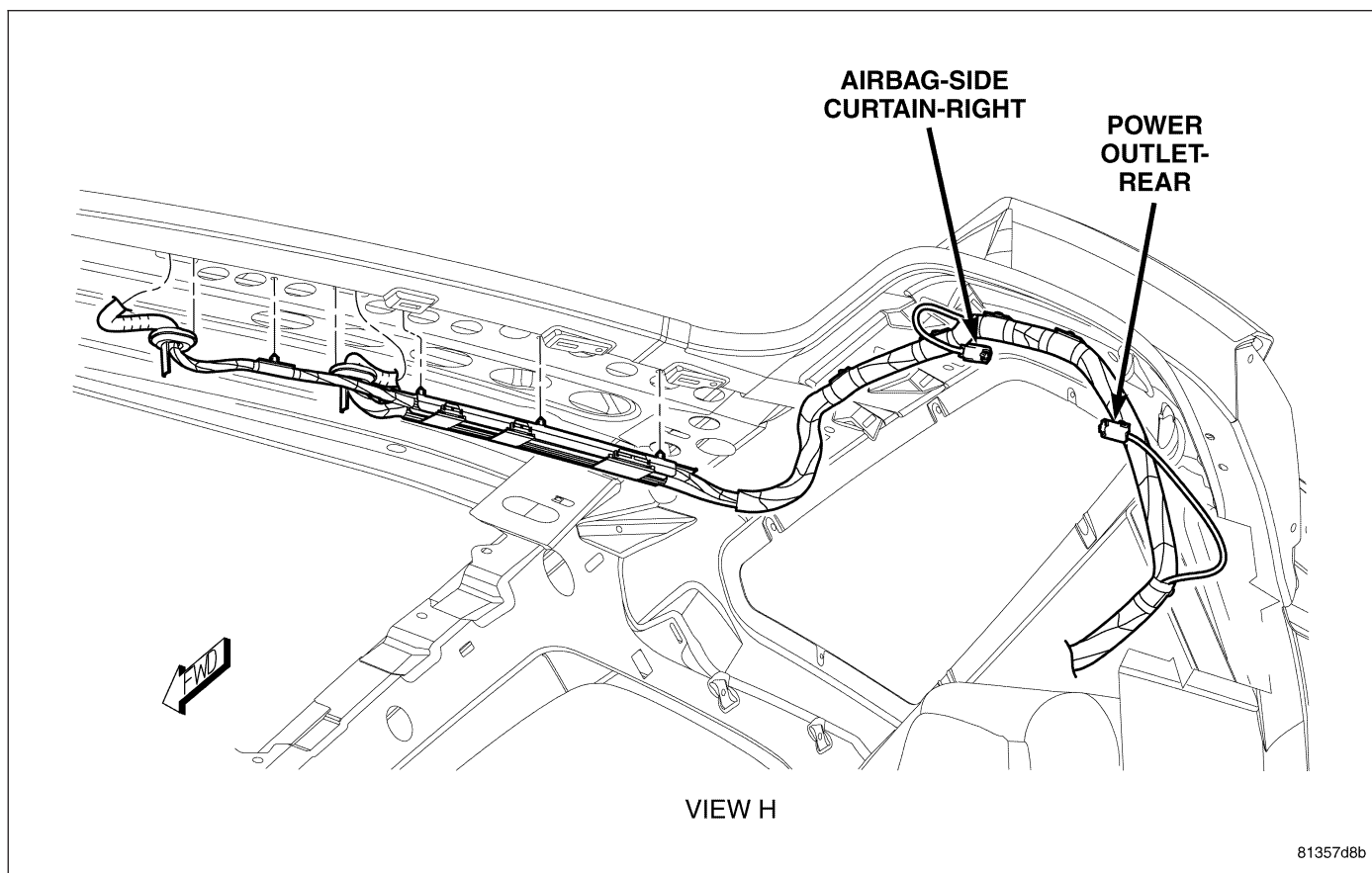
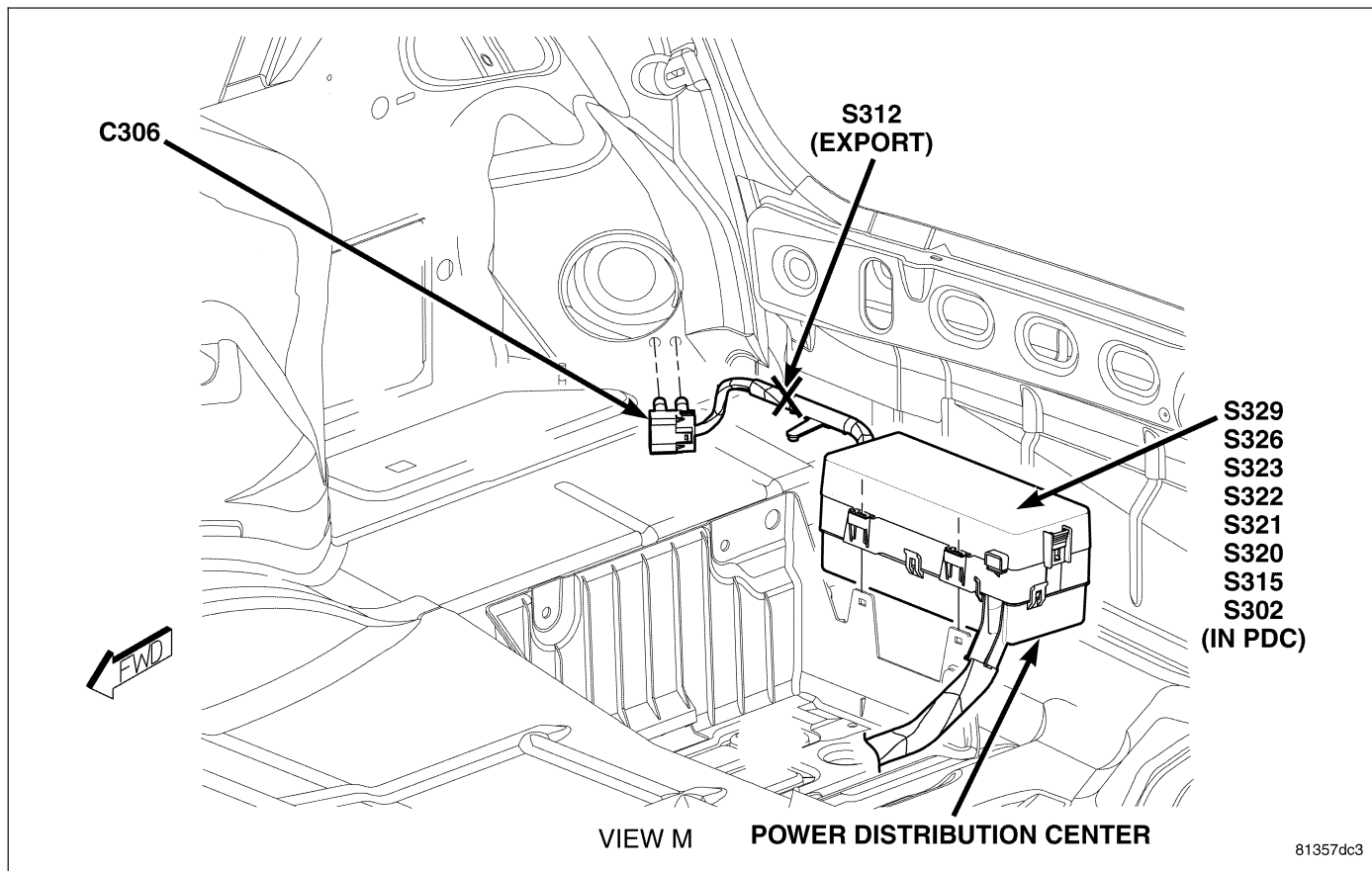


Fig. 55 BACKLITE





**Fig. 56 REAR CARGO RIGHT (LX49)**



**Fig. 57 RIGHT REAR AND PDC (LX49)**

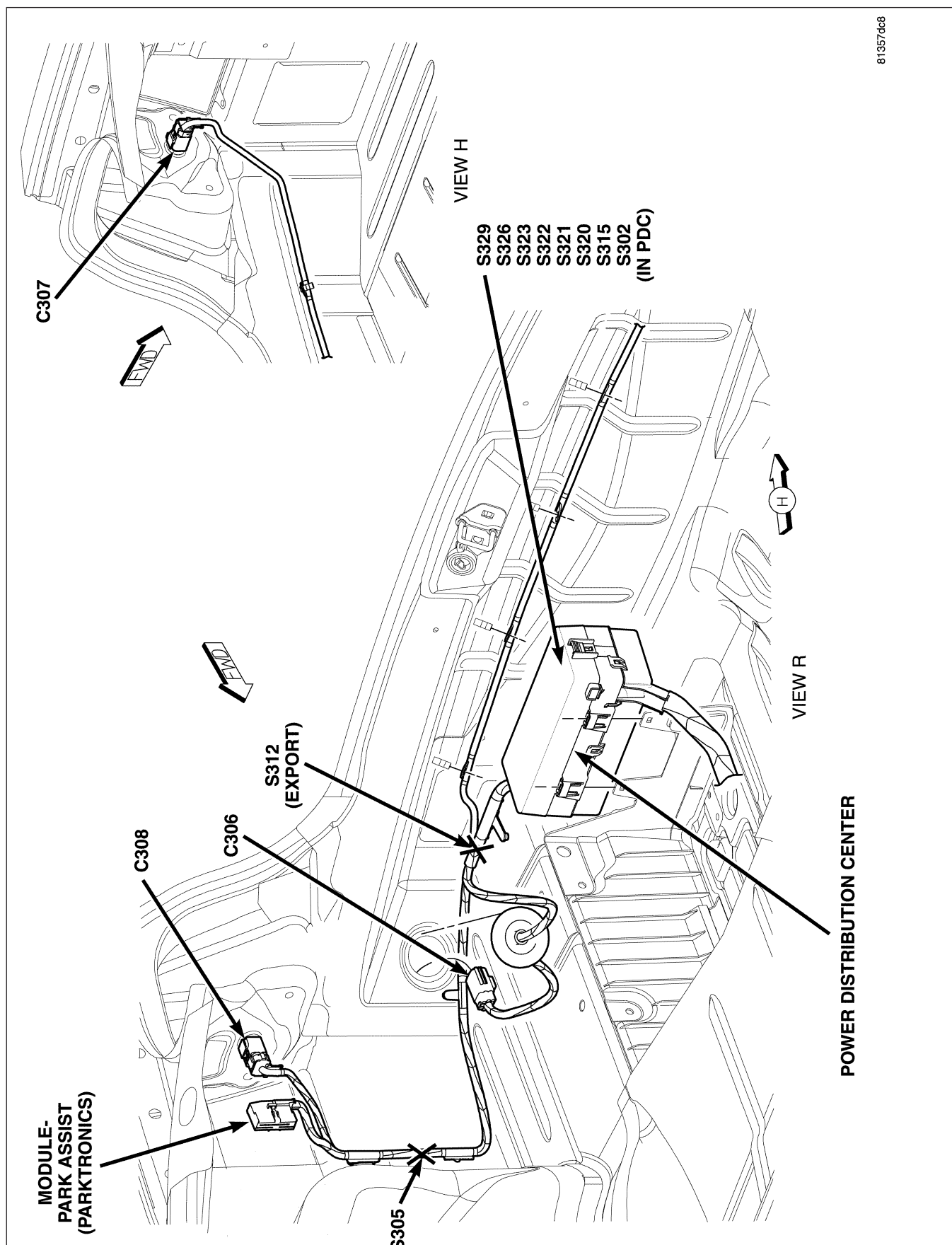
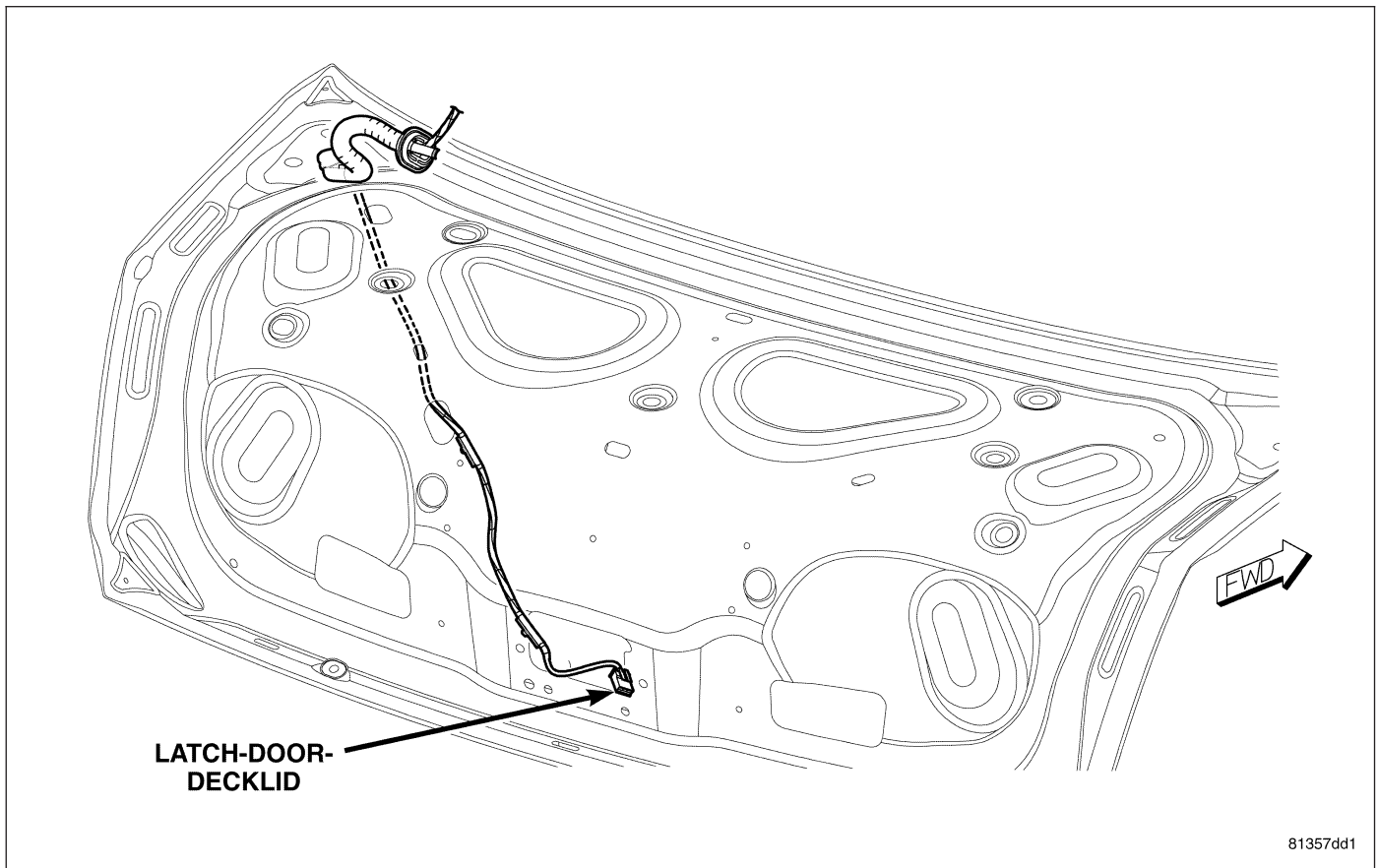


Fig. 58 TRUNK (LX48)





**Fig. 59 DECKLID (LX48)**

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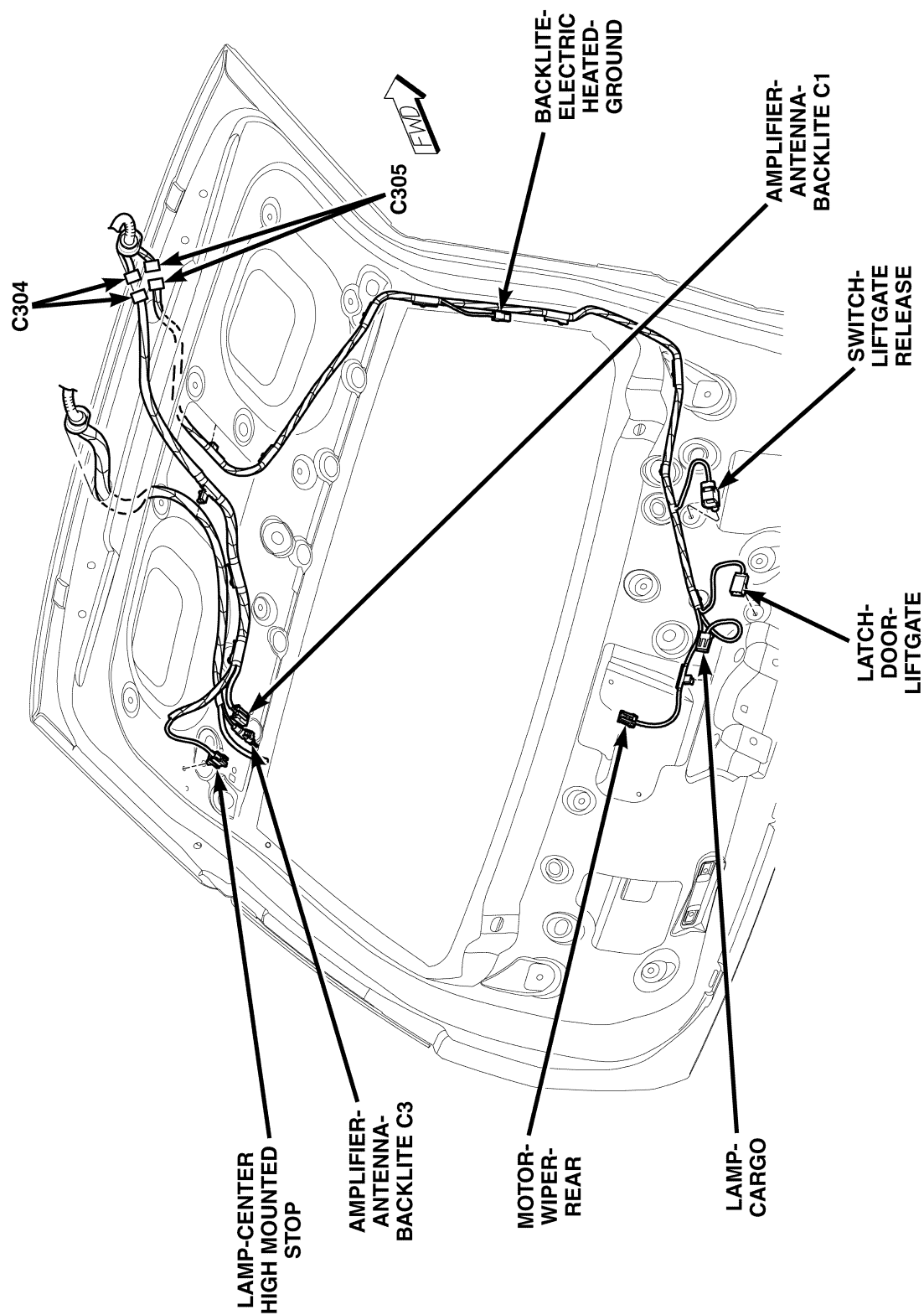
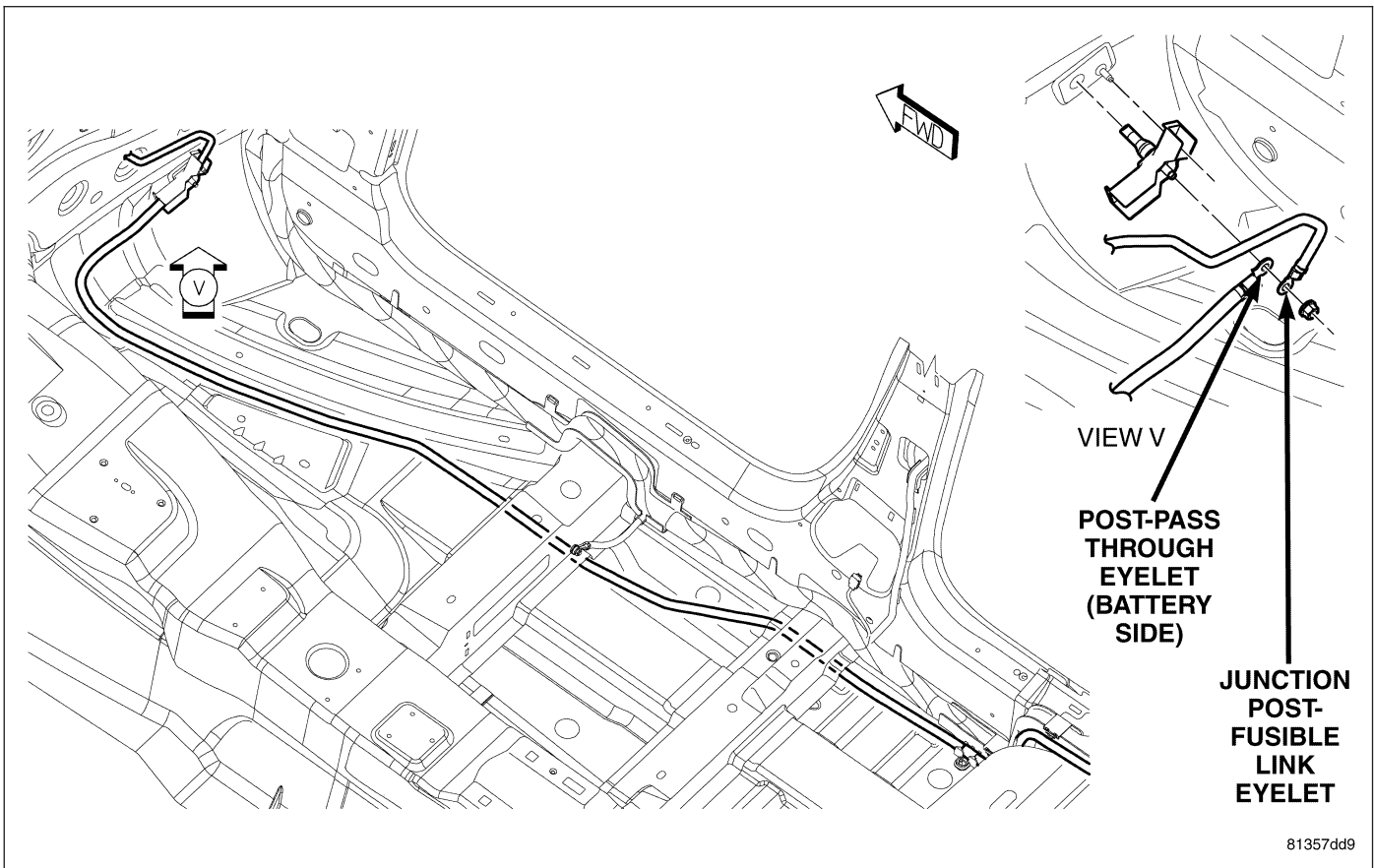
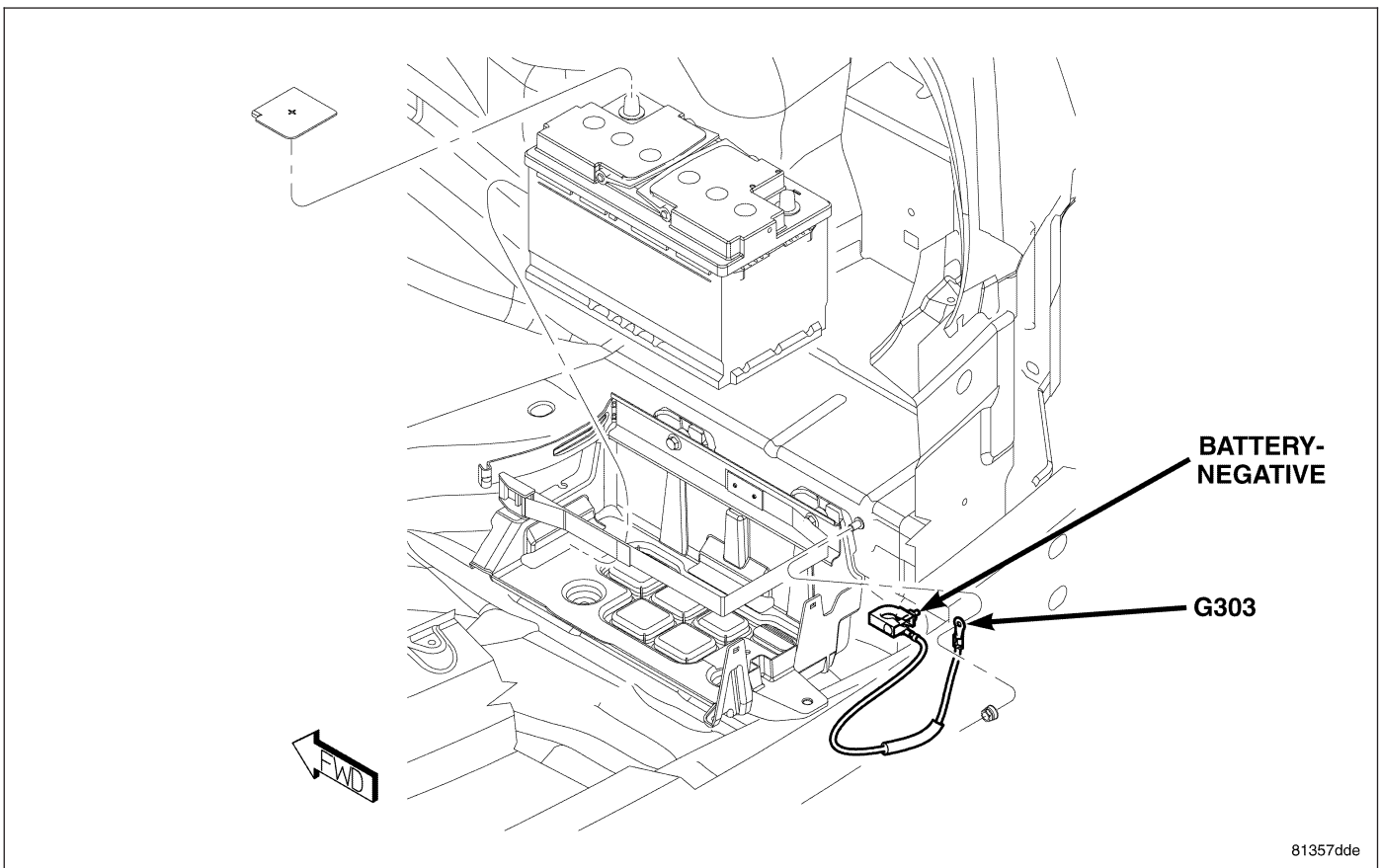


Fig. 60 LIFTGATE (LX49)



**Fig. 61 BODY RIGHT POWER CABLES**



**Fig. 62 TRUNK BATTERY CONNECTIONS**

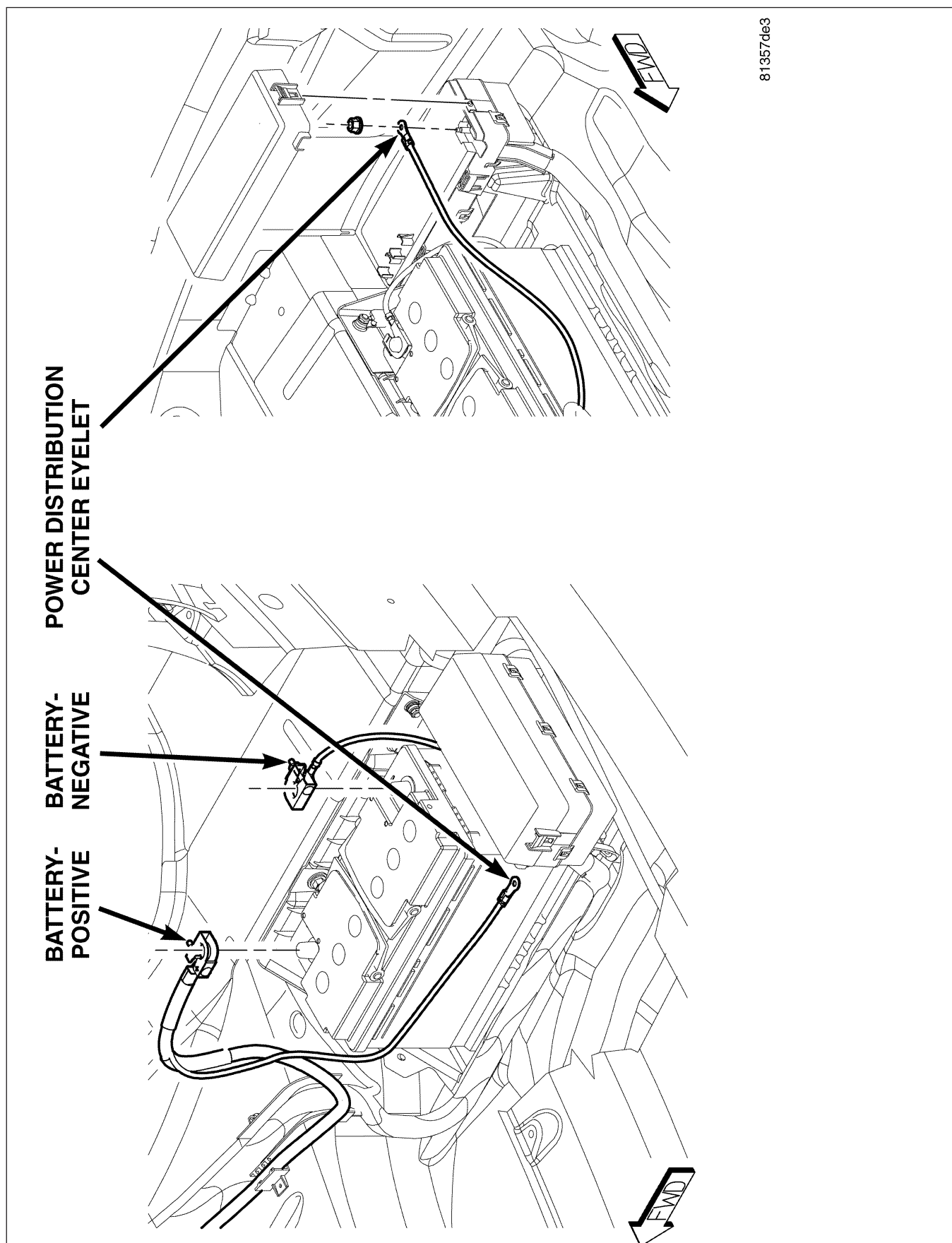
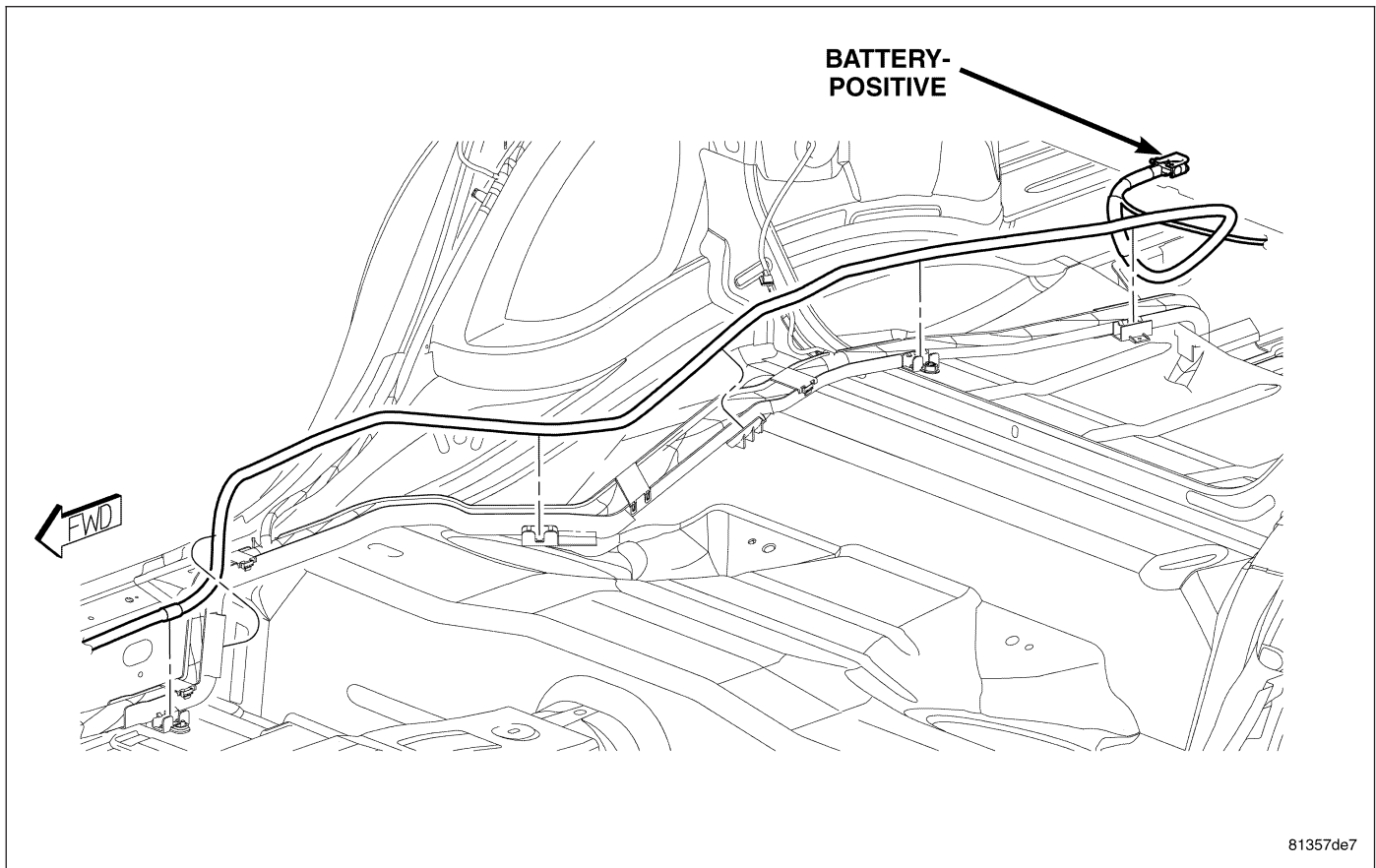


Fig. 63 TRUNK BATTERY AND PDC CONNECTIONS



**Fig. 64 BODY B+ REAR ROUTE**

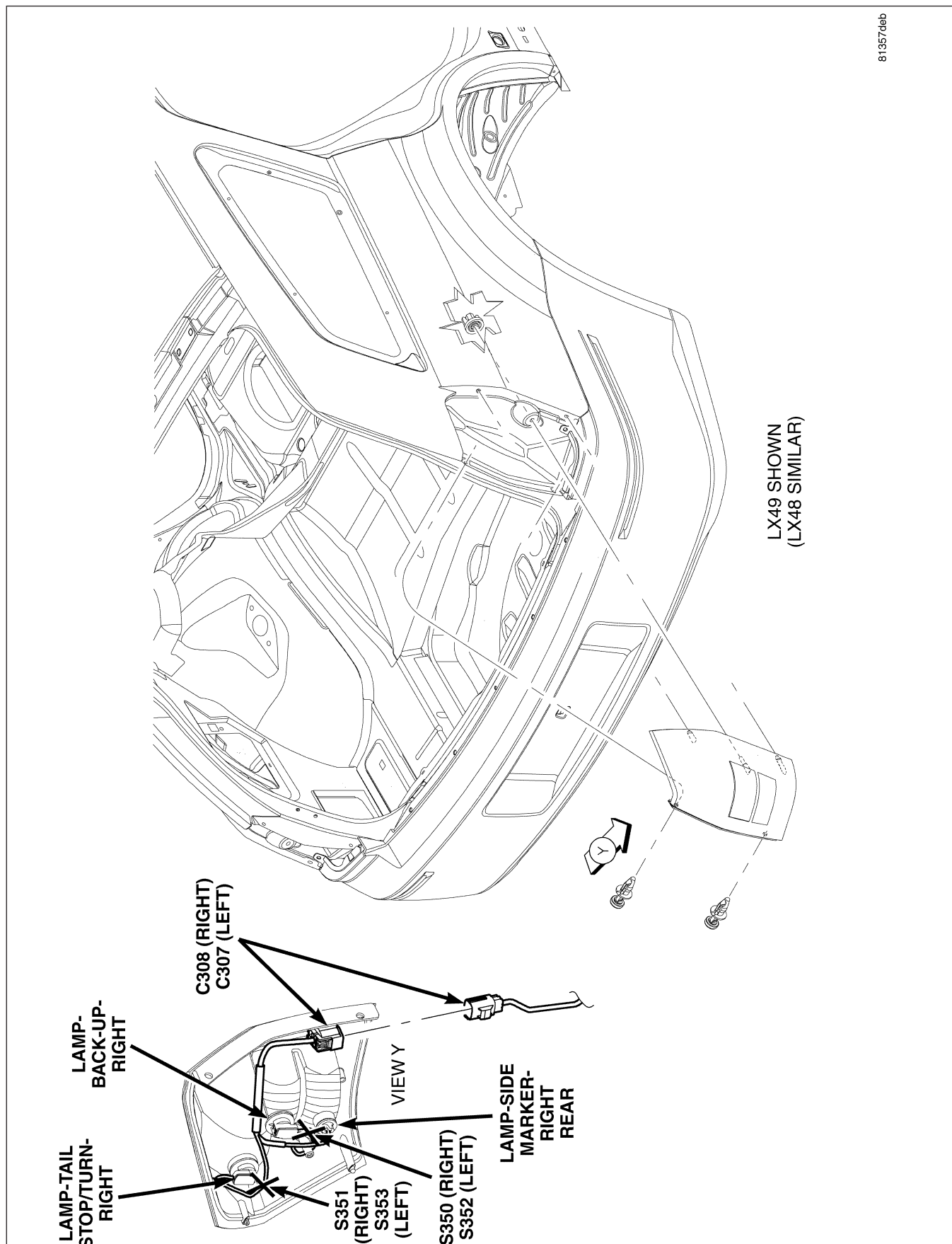
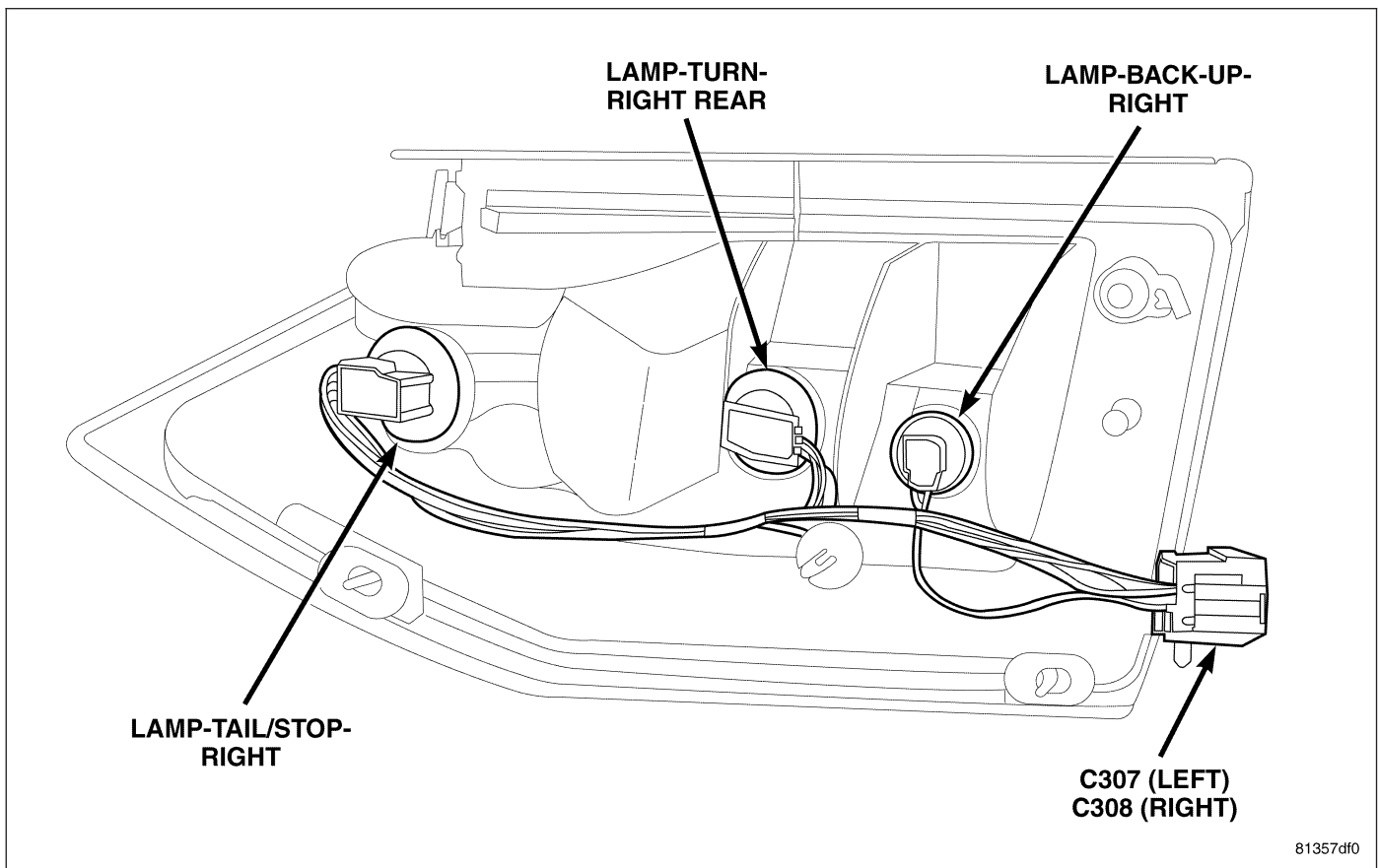
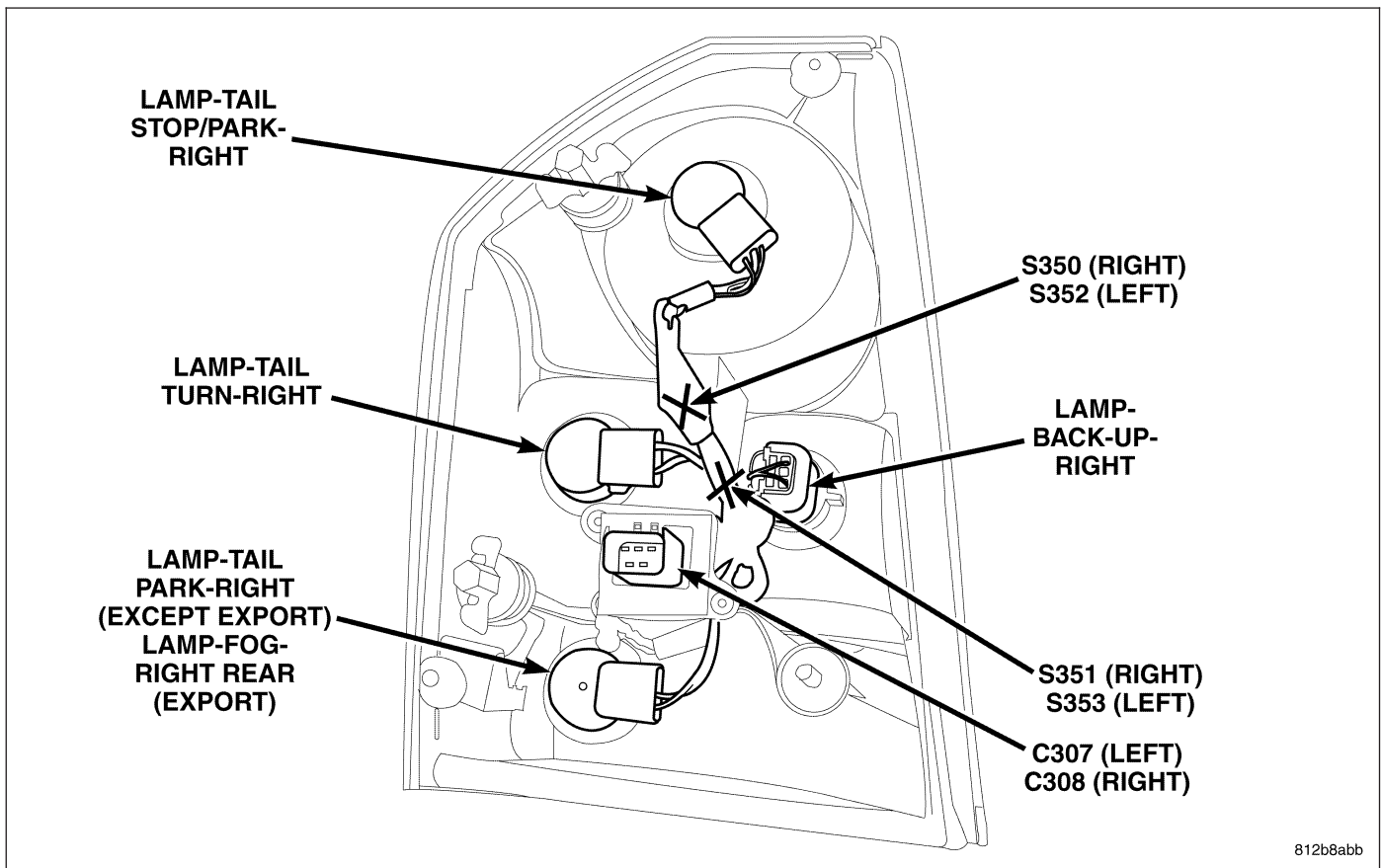


Fig. 65 RIGHT TAIL LAMP (LX49) (LEFT SIMILAR)



**Fig. 66 RIGHT TAIL LAMP (LX49) (LEFT SIMILAR)**



**Fig. 67 RIGHT TAIL LAMPS (LX48)**



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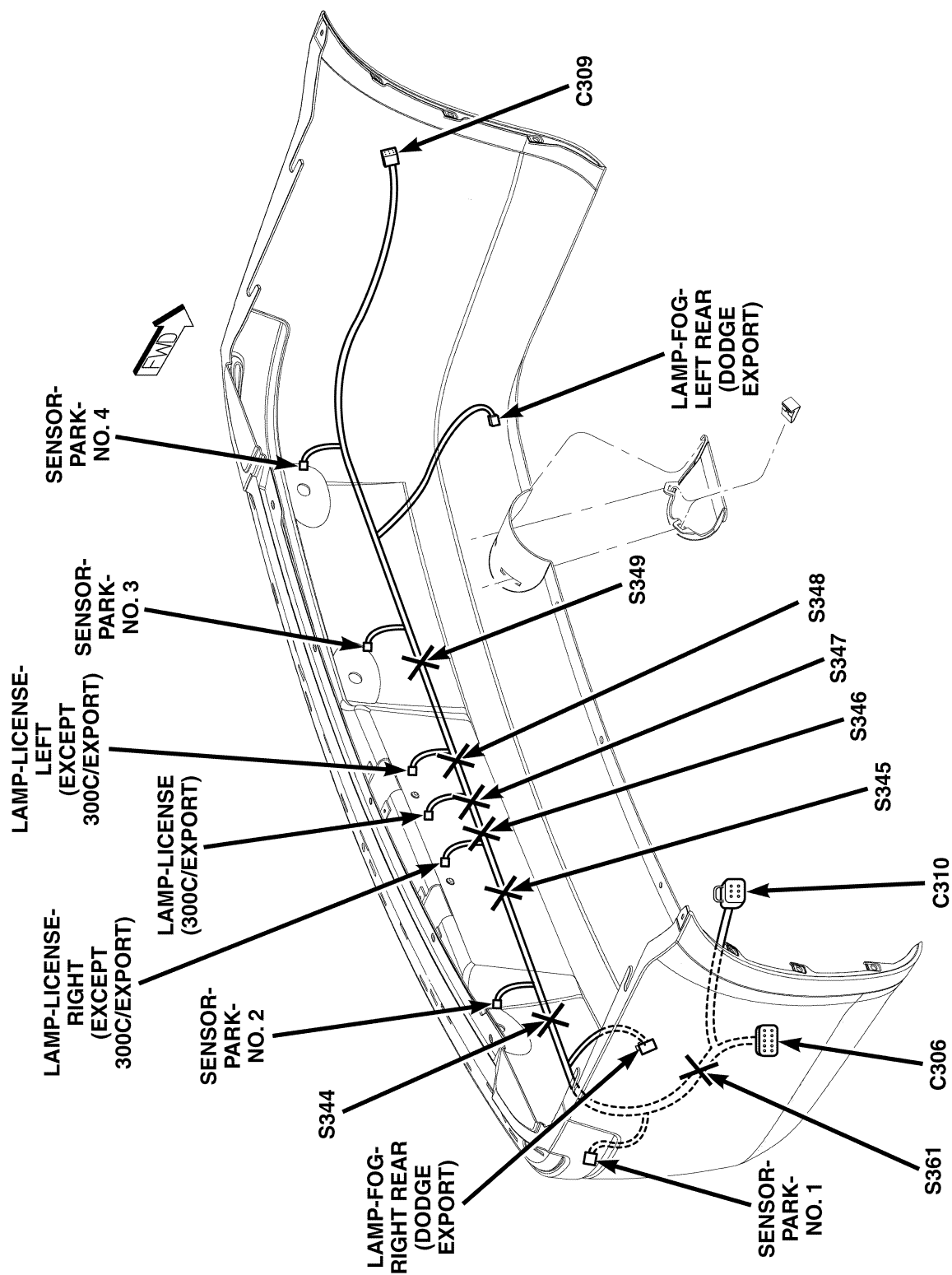


Fig. 68 REAR FACIA





## 8W-97 POWER DISTRIBUTION

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## POWER DISTRIBUTION

### DESCRIPTION

The power distribution system for this vehicle consists of the following components:

- Cigar Lighter Outlet
- Front Control Module (FCM) - located underhood
- Integrated Power Module (IPM) - located underhood
- Power Distribution Center (PDC) - located in trunk
- Power Outlets

Refer to Wiring Diagrams for complete circuit schematics.

The power distribution system also incorporates various types of circuit control and protection features, including:

- Automatic resetting circuit breakers
- Blade-type fuses
- Cartridge fuses
- Relays

### OPERATION

The power distribution system for this vehicle is designed to provide safe, reliable, and centralized distribution points for the electrical current required to operate all of the many standard and optional factory-installed electrical and electronic powertrain, chassis, safety, security, comfort and convenience systems. At the same time, the power distribution system was designed to provide ready access to these electrical distribution points for the technician to use when conducting diagnosis and repair of inoperative circuits. The power distribution system can also prove useful for the sourcing of additional electrical circuits that may be required to provide the electrical current needed to operate many accessories that the vehicle owner may choose to have installed.

## INTEGRATED POWER MODULE

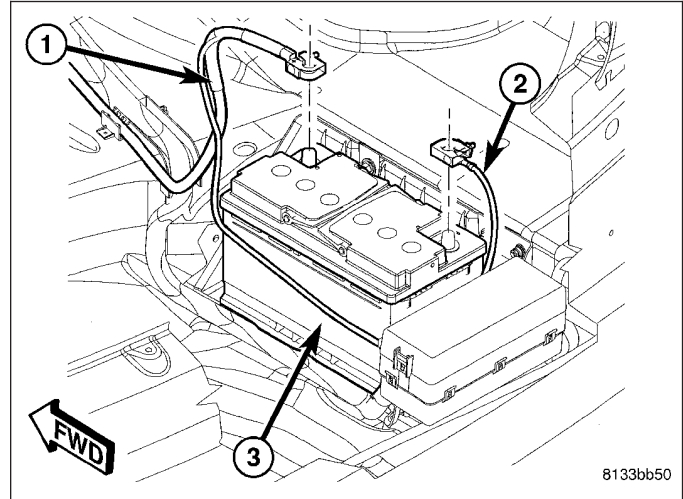
### DESCRIPTION

The majority of electrical system fuses and relays are housed in the two Power Distribution Centers (PDC). One is located in the engine compartment, combined with the Front Control Module (FCM) to form the Integrated Power Module (IPM). The other is next to the battery at the rear of the vehicle.

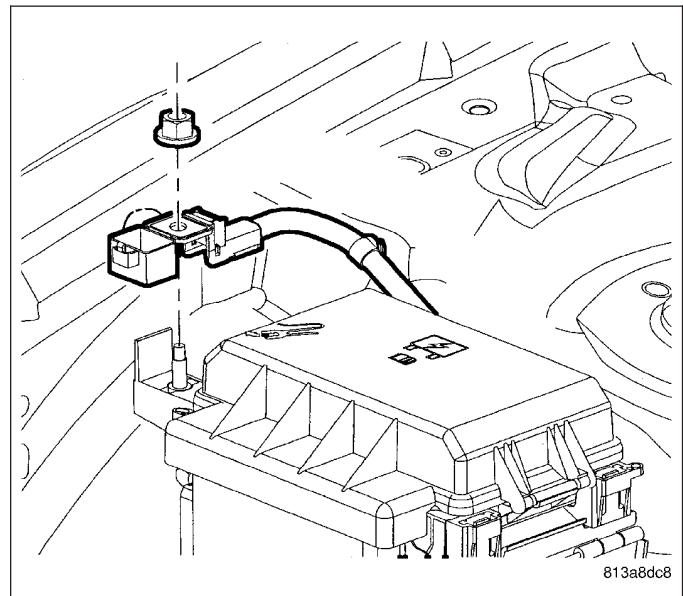
## REMOVAL

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

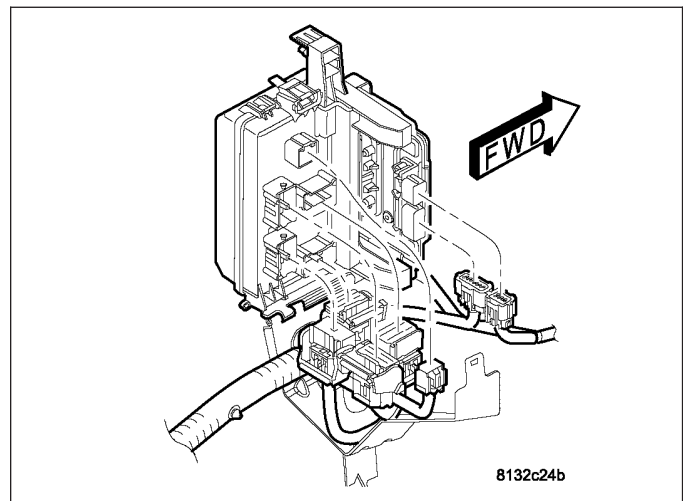
1. Disconnect and isolate the battery negative cable (2).



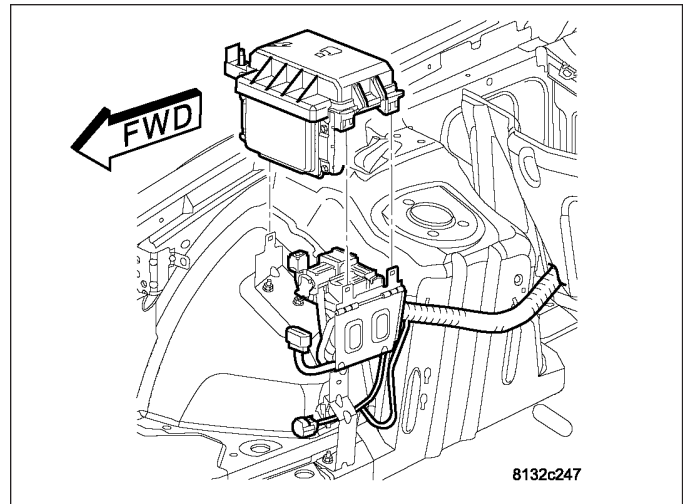
2. Open the battery cable nut cover to expose nut.
3. Remove battery cable nut and battery cable from the Integrated Power Module (IPM).



4. Disengage the outboard retaining clip, and rotate the IPM to access wire harness connectors.
5. Disconnect wire harness connectors from IPM.
6. Disengage the two inboard retaining clips.



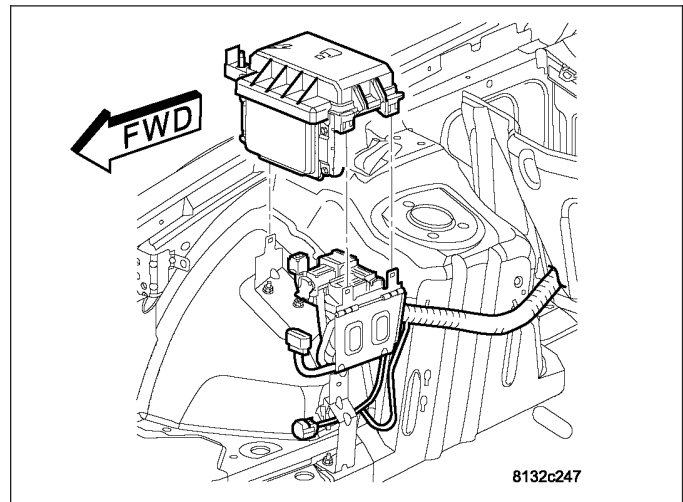
7. Remove IPM from vehicle.



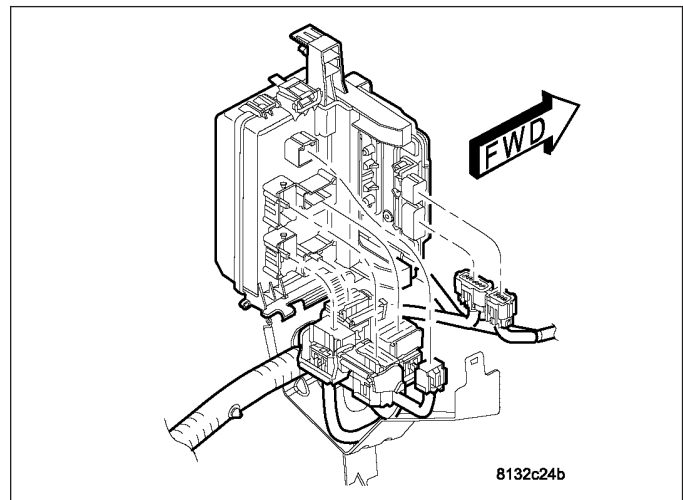
## INSTALLATION

**Note:** A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).

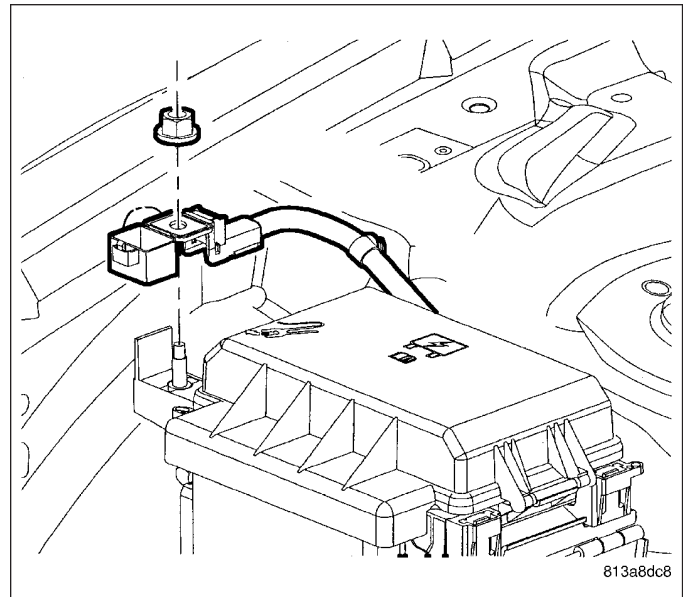
1. Position Integrated Power Module (IPM) to vehicle. Engage the three retaining clips.



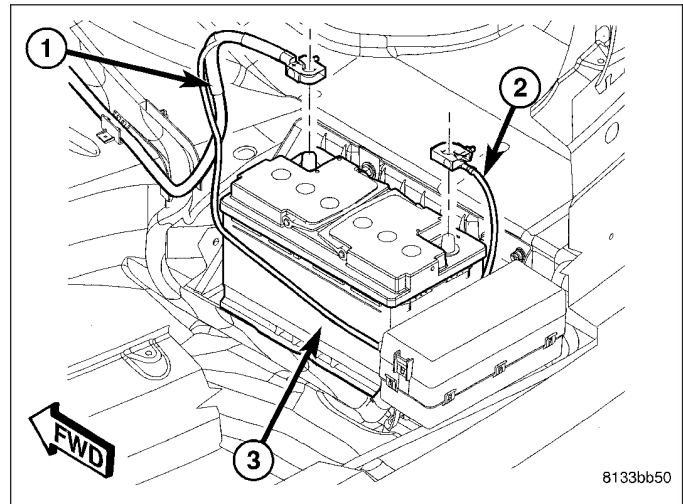
2. Disengage the outboard retaining clip and rotate the IPM to access wire harness connectors.
3. Connect electrical harness connectors to IPM.



4. Connect battery cable to IPM.
5. Install and tighten retaining nut.
6. Close the battery cable nut cover.



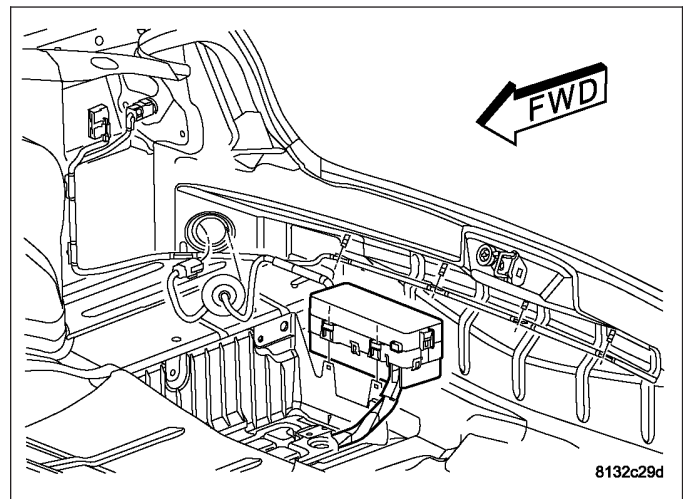
7. Connect battery negative cable (2).



## POWER DISTRIBUTION CENTER

### DESCRIPTION

The majority of electrical system fuses and relays are housed in the two Power Distribution Centers (PDC). One is located in the engine compartment, combined with the Front Control Module (FCM) to form the Integrated Power Module (IPM). The other is next to the battery at the rear of the vehicle. The PDC located next to the battery is replaced only as part of the body wiring harness.



## POWER OUTLET

### DESCRIPTION

Sedans are equipped with two 12-volt electrical outlets. Wagons are equipped with three 12-volt electrical outlets. The outlets are located in the following locations:

- Cargo area right quarter trim panel (wagons only).
- Inside the center console.
- Next to the ash receiver in the center stack.

The outlets in the console and quarter trim panel have power at all times, and include tethered covers. The outlet in the ash receiver tray is shipped with power available only when the ignition is in the ON position. This outlet can be changed to provide power at all times by moving a fuse in the fuse block.

### REMOVAL

**Note: A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).**

1. Disconnect and isolate the battery negative cable.
2. Pull the cigar lighter knob and element out of the cigar lighter receptacle base, or unsnap the protective cap from the power outlet.
3. Look inside the cigar lighter or power outlet and note the position of the rectangular retaining bosses of the mount that secures the receptacle base.
4. Insert a pair of external snap ring pliers into the cigar lighter or power outlet receptacle base and engage the tips of the pliers with the retaining bosses of the mount.
5. Squeeze the pliers to disengage the mount retaining bosses from the receptacle base and, using a gentle rocking motion, pull the pliers and the receptacle base out of the mount.
6. Pull the receptacle base away far enough to access the wire harness connector.
7. Disconnect the wire harness connector from the cigar lighter or power outlet.
8. Remove the cigar lighter or power outlet.

### INSTALLATION

**Note: A battery reconnect procedure must be performed anytime the battery has been disconnected. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE).**

1. Connect the wire harness connector to the cigar lighter or power outlet receptacle base connector receptacle.
2. Install the cigar lighter or power outlet mount into position.
3. Align the splines on the outside of the cigar lighter or power outlet receptacle base connector receptacle with the grooves on the inside of the mount.
4. Press firmly on the cigar lighter or power outlet receptacle base until the retaining bosses of the mount are fully engaged in their receptacles.
5. Install the cigar lighter knob and element into the cigar lighter receptacle base, or the protective cap into the power outlet receptacle base.
6. Connect the battery negative cable.



# ENGINE

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## **ENGINE ELECTRICAL DIAGNOSTICS**

### **DIAGNOSIS AND TESTING**

## PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

### Diagnostic Test

#### 1. NO RESPONSE

Make sure the scan tool will communicate with the appropriate modules.

**Are you currently experiencing a NO RESPONSE condition?**

**Yes** >> The NO RESPONSE condition must be properly diagnosed before continuing.  
Refer to the appropriate BUS Communication test in Section 8 ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS.

**No** >> Go To 2

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#### 2. NO START

**Is the customer complaint a NO START condition?**

**Yes** >> Check the vehicle for any NO START related PCM DTC(s) or Vehicle Theft Security related DTC(s).  
If no Theft related DTC(s) are present, refer to the Non DTC Diagnostic Procedures that relate to Fuel and Starting.

**No** >> Go To 3

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#### 3. VEHICLE HISTORY AND TSB(s)

Continue by reading PCM DTC(s) and record the related Freeze Frame data if any DTC(s) are present.

Whether or not any DTC(s) are present you will want to check the following items which may assist in repairing the customers complaint successfully.

Check the vehicles repair history.

If the vehicle has a repair history that pertains to the customer's current complaint, review the repair.

Inspect the vehicle for any aftermarket accessories that may have been installed incorrectly.

Check for any TSB(s) related to the customer's complaint or DTC(s).

If a TSB applies, follow the instructions per the TSB.

**Choose the following scenario that best applies.**

**The TSB repaired the customers complaint.**

Testing complete.

**A DTC is present, no TSB applies, or the TSB didn't repair the customers complaint.**

Go To 4

**No DTC(s) are present.**

Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

---

**PRE-DIAGNOSTIC TROUBLESHOOTING PROCEDURE (CONTINUED)****4. WIRE HARNESS INSPECTION**

Clear the DTC(s).

Attempt to duplicate the customer complaint.

Whether the customer complaint can be duplicated or not, make a quick wire harness inspection related to the DTC(s) that were previously cleared.

Check the Powertrain Control Module connectors, the suspected component connection, in-line connectors, wire harness splices, PCM power and ground circuits, and any related fuses.

If the DTC(s) are fuel or air related, check the fuel level, quality and the air duct system.

**Were any repairs made that fixed the customer's complaint?**

**Yes** >> Testing complete.

**No** >> Refer to the diagnostic test procedure related to the DTC.

---

## INTERMITTENT CONDITION

For the Engine circuit diagrams (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

POSSIBLE CAUSES
INTERMITTENT CONDITION

### Diagnostic Test

#### 1. INTERMITTENT CONDITION

**Note:** The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Refer to any Technical Service Bulletins (TSBs) that may apply.

Review the scan tool Freeze Frame information. If possible, try to duplicate the conditions under which the DTC set. With the engine running at normal operating temperature, monitor the scan tool parameters related to the DTC while wiggling the wire harness. Look for parameter values to change and/or a DTC to set.

Turn the ignition off.

Visually inspect the related wire harness. Disconnect all the related harness connectors. Look for any chafed, pierced, pinched, partially broken wires and broken, bent, pushed out, or corroded terminals.

Perform a voltage drop test on the related circuits between the suspected faulty component and the PCM.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Inspect and clean all PCM, engine, and chassis grounds that are related to the most current DTC.

If numerous trouble codes were set, use a wire schematic and look for any common ground or supply circuits.

For any Relay DTCs, actuate the Relay with the scan tool and wiggle the related wire harness to try to interrupt the actuation.

For intermittent Evaporative Emission trouble codes perform a visual and physical inspection of the related parts including hoses and the Fuel Filler cap.

For intermittent Misfire DTC's check for restrictions in the Intake and Exhaust system, proper installation of Sensors, vacuum leaks, and binding components that are run by the accessory drive belt.

Use the scan tool to perform a System Test if one applies to the failing component.

A co-pilot, data recorder, and/or lab scope should be used to help diagnose intermittent conditions.

#### Were any problems found during the above inspections?

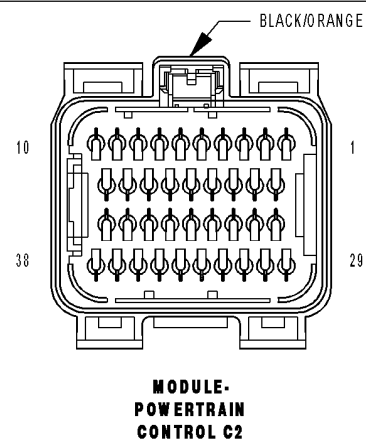
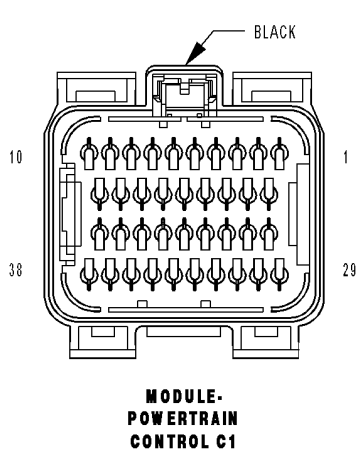
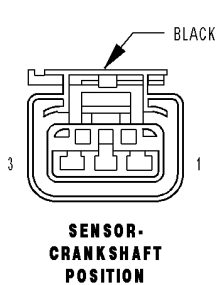
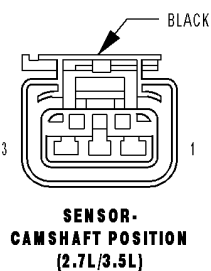
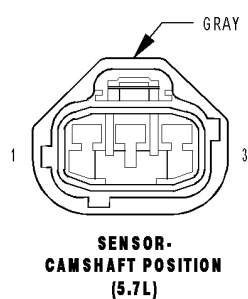
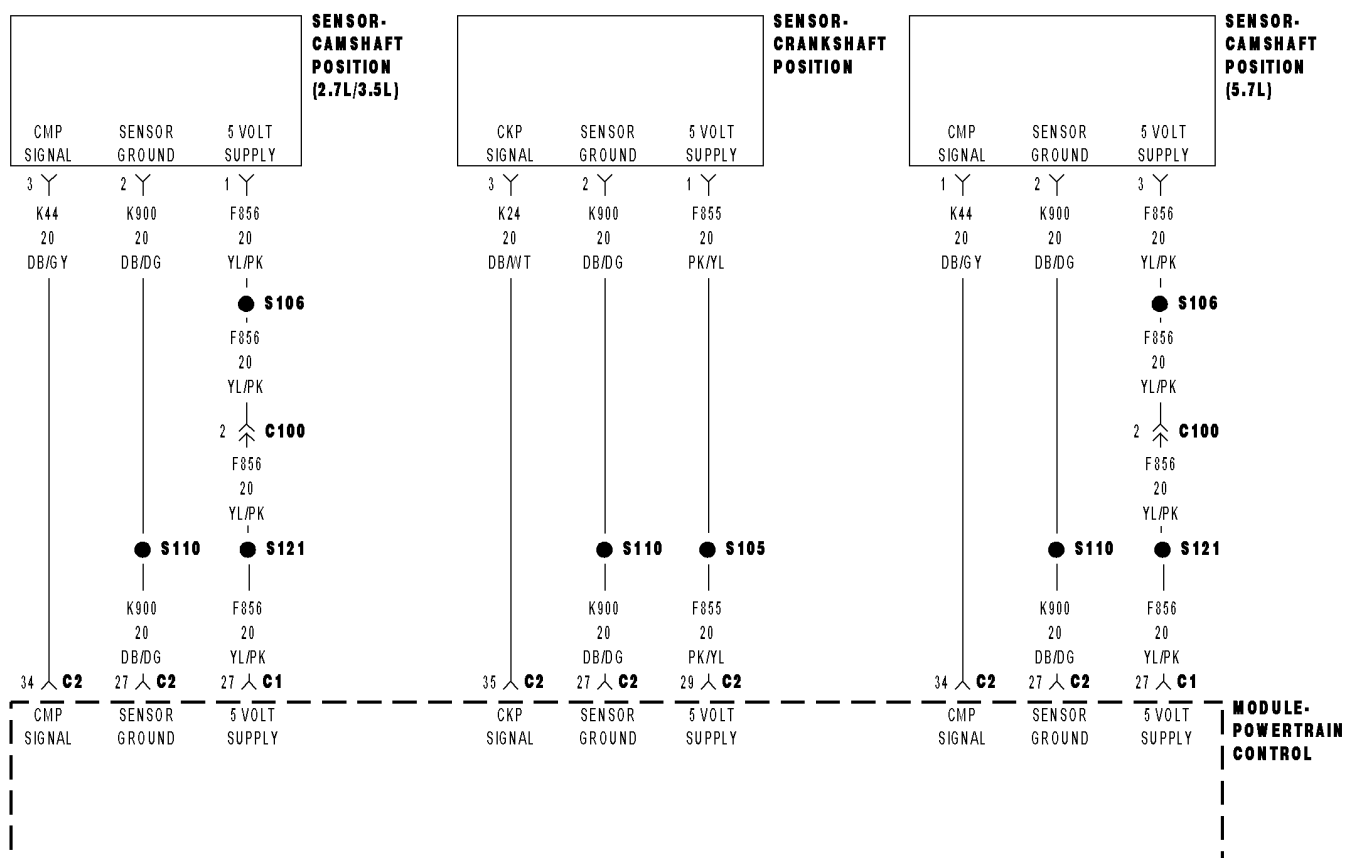
**Yes** >> Perform the necessary repairs.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Test Complete.



## P0016-CRANKSHAFT / CAMSHAFT TIMING MISALIGNMENT





**P0016–CRANKSHAFT / CAMSHAFT TIMING MISALIGNMENT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine cranking and Engine running

- **Set Condition:**

Powertrain Control Module detects an error when the camshaft position is out of phase with the crankshaft position. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
ERRATIC CAM POSITION SENSOR SIGNAL
CAMSHAFT POSITION SENSOR TONE WHEEL/PULSE RING
ERRATIC CRANKSHAFT POSITION SENSOR SIGNAL
CRANKSHAFT POSITION SENSOR TONE WHEEL/PULSE RING
CAMSHAFT POSITION SENSOR
CRANKSHAFT POSITION SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. ACTIVE DTC

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

With the scan tool clear the DTC(s).

Start the engine and run until operating temp is reached. (Closed Loop)

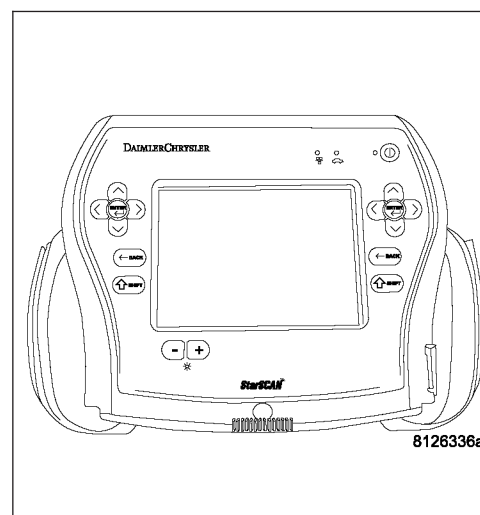
If the DTC does not reset it may be necessary to test drive the vehicle.

#### Does the P0016 return?

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0016–CRANKSHAFT / CAMSHAFT TIMING MISALIGNMENT (CONTINUED)****2. CHECKING THE CMP SIGNAL WITH A LAB SCOPE**

With a lab scope, backprobe the (K44) CMP Signal circuit at the CMP Sensor harness connector.

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

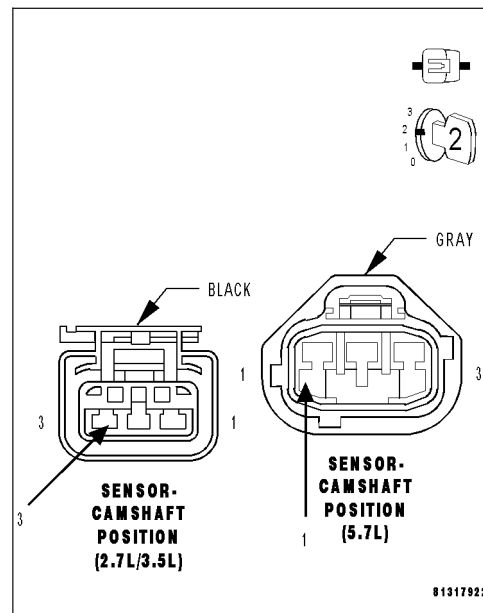
Start the engine.

Observe the lab scope screen.

**Are there any irregular or missing signals?**

**Yes** >> Go To 3

**No** >> Go To 6

**3. CMP WIRE HARNESS INSPECTION**

Turn the ignition off.

Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Make sure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) are torqued to their proper specification.

Refer to any TSBs that may apply.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. TONE WHEEL/PULSE RING INSPECTION**

Remove the Camshaft Position Sensor.

Inspect the Tone Wheel/Pulse Ring for damage, foreign material, or excessive movement.

**Were any problems found?**

**Yes** >> Repair or replace the Tone Wheel/Pulse Ring as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**P0016–CRANKSHAFT / CAMSHAFT TIMING MISALIGNMENT (CONTINUED)****5. CAMSHAFT POSITION SENSOR**

If there are no possible causes remaining, view repair.

**Repair**

Replace the Camshaft Position Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**6. ERRATIC CMP SIGNAL**

Turn the ignition off.

Remove the lab scope probe.

**WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.**

Ignition on, engine not running.

With scan tool, erase DTCs.

Start the engine.

Gently tap on and wiggle the Cam Position Sensor.

Ignition on, engine not running.

Inspect the Sensor connector and harness connector, and inspect the PCM connector and harness connector for loose, bent, corroded, or pushed out pins/terminals.

Inspect the related wire harness and the splices in the CMP circuit.

**Does the P0016 return?**

**Yes** >> Repair the wiring/connector concerns as needed or replace the Camshaft Position Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. CHECKING THE CKP SIGNAL WITH A LAB SCOPE**

Turn the ignition off.

With a lab scope, backprobe the (K24) CKP Signal circuit at the CKP harness connector.

**WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.**

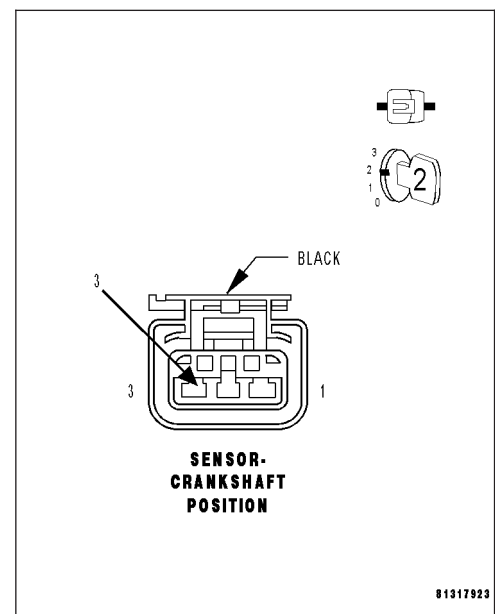
Start the engine.

Observe the lab scope screen.

**Are there any irregular or missing signals?**

**Yes** >> Go To 8

**No** >> Go To 10



**P0016–CRANKSHAFT / CAMSHAFT TIMING MISALIGNMENT (CONTINUED)****8. CKP WIRE HARNESS INSPECTION**

Turn the ignition off.

Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Make sure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) are torqued to their proper specification.

Refer to any TSBs that may apply.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 9

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**9. TONE WHEEL/FLEX PLATE INSPECTION**

Remove the Crankshaft Position Sensor.

Inspect the Tone Wheel/Flex Plate slots for damage, foreign material, or excessive movement.

**Were any problems found?**

**Yes** >> Repair or replace the Tone Wheel/Flex Plate as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace the Crankshaft Position Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**10. ERRATIC CKP SIGNAL**

**Note:** The conditions that set this DTC are not present at this time. The following test may help in identifying the intermittent condition.

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Start the engine.

Gently tap on and wiggle the Crank Position Sensor.

Turn the ignition off.

Inspect the Sensor connector and harness connector, and inspect the PCM connector and harness connector for loose, bent, corroded, or pushed out pins/terminals.

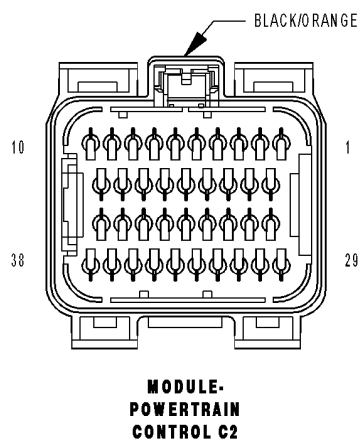
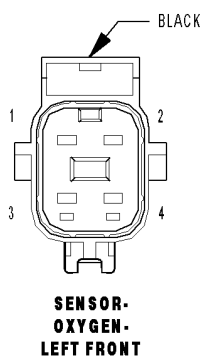
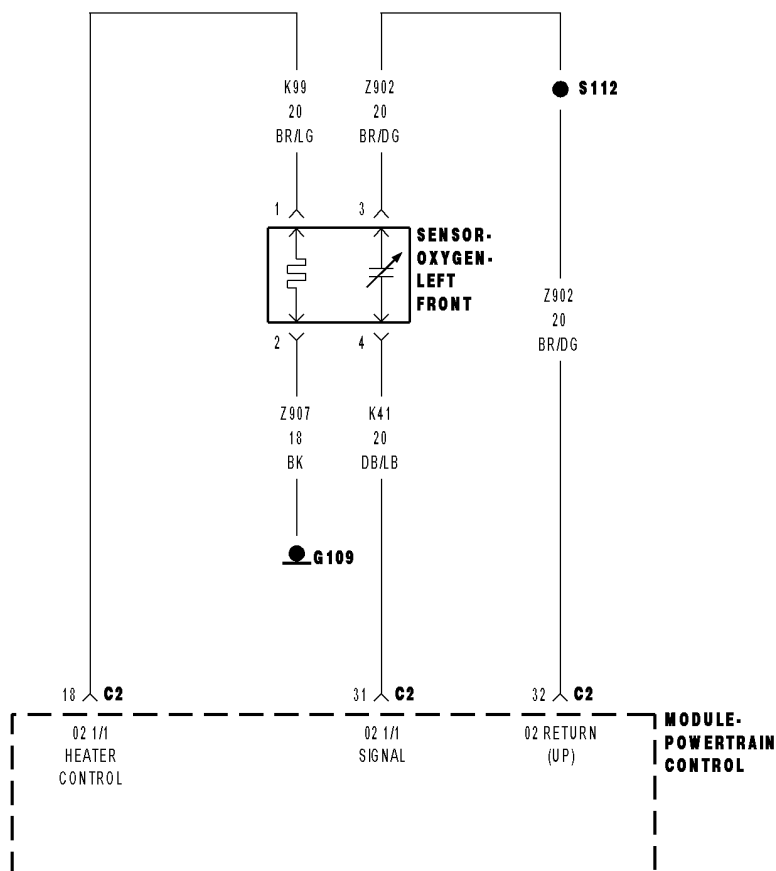
Inspect the related wire harness and the splices in the CKP circuits.

**Were any problems found?**

**Yes** >> Repair the wiring/connector concerns as needed or replace the Crankshaft Position Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Test Complete.

---

**P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW**

**P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is powered.

- **Set Condition:**

Desired state does not match Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K99) O2 SENSOR 1/1 HEATER CONTROL CIRCUIT SHORTED TO GROUND O2 SENSOR PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

**Note:** Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test.

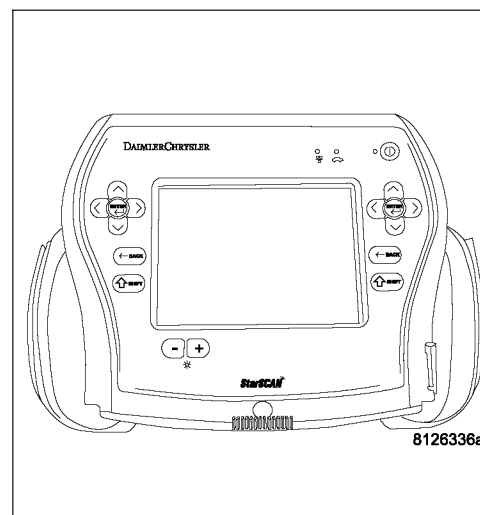
With the scan tool, monitor 1/1 O2 Sensor voltage for at least 2 minutes.

**Does the O2 Sensor voltage stay above 4.5 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



### 2. O2 HEATER ELEMENT

Turn the ignition off.

**Note:** Allow the O2 Sensor to cool down to room temperature.

Disconnect the 1/1 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element, between the Heater Control terminal and the Heater ground terminal at the component.

**Note:** O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

**Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?**

**Yes** >> Go To 3

**No** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW (CONTINUED)****3. O2 SENSOR**

Ignition on, engine not running.

With a scan tool, actuate the O2 1/1 Heater Test with the O2 Sensor harness connector still disconnected.

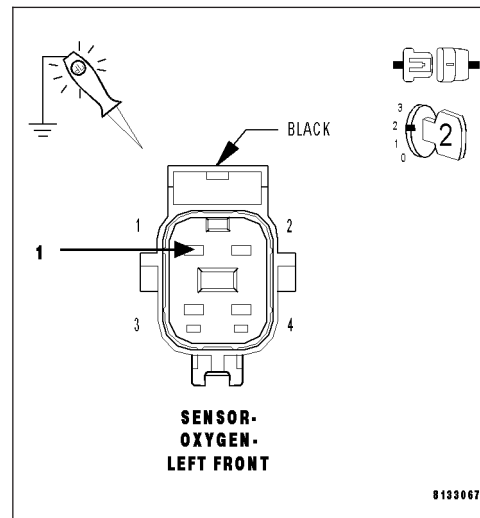
Using a 12-volt test light connected to ground, probe the (K99) O2 1/1 Heater Control circuit in the O2 Sensor harness connector.

**Does the test light illuminate brightly and flash on and off during the actuation?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (K99) O2 1/1 HEATER CONTROL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

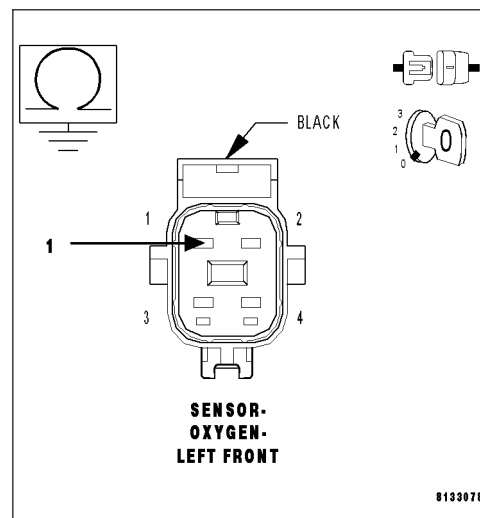
Measure the resistance between ground and the (K99) O2 1/1 Heater Control circuit in the O2 Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short to ground in the (K99) O2 1/1 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

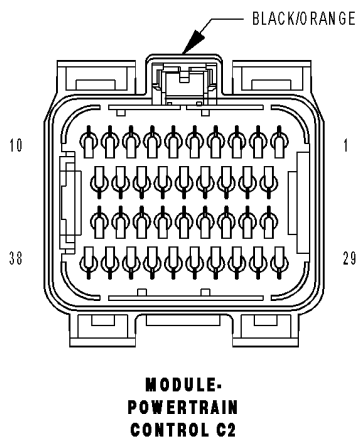
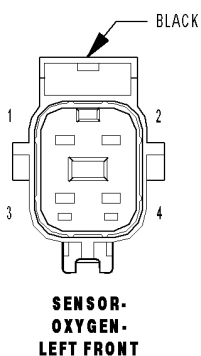
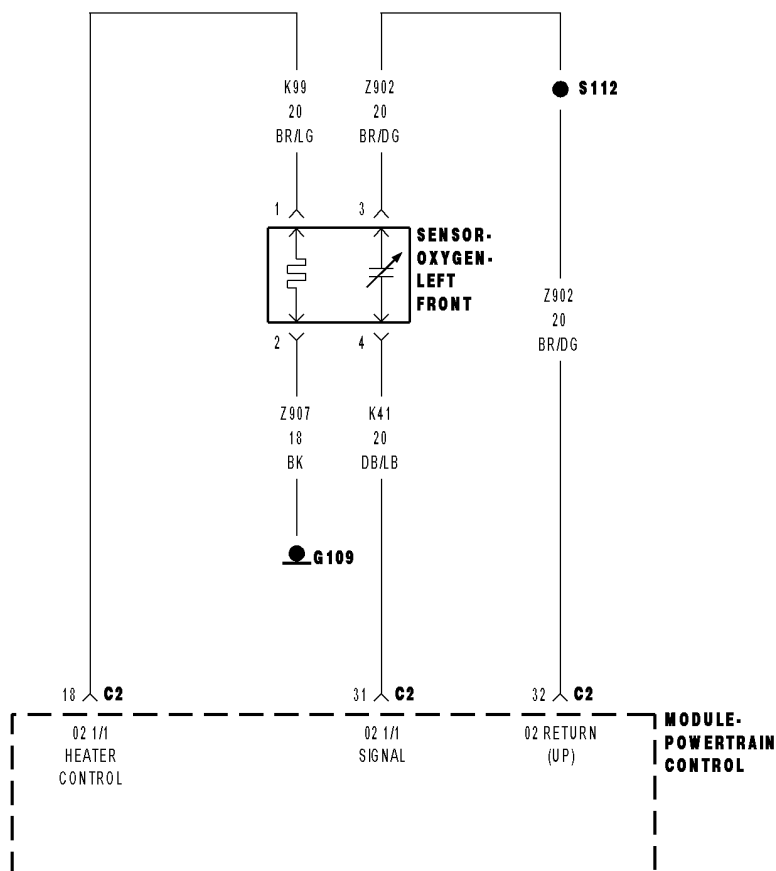
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P0032-O2 SENSOR 1/1 HEATER CIRCUIT HIGH





P0032-O2 SENSOR 1/1 HEATER CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is off.
- **Set Condition:**  
Desired state does not equal Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K99) O2 1/1 HEATER CONTROL CIRCUIT OPEN (Z904) O2 1/1 HEATER GROUND CIRCUIT OPEN (K99) O2 1/1 HEATER CONTROL SHORTED TO BATTERY VOLTAGE O2 SENSOR PCM

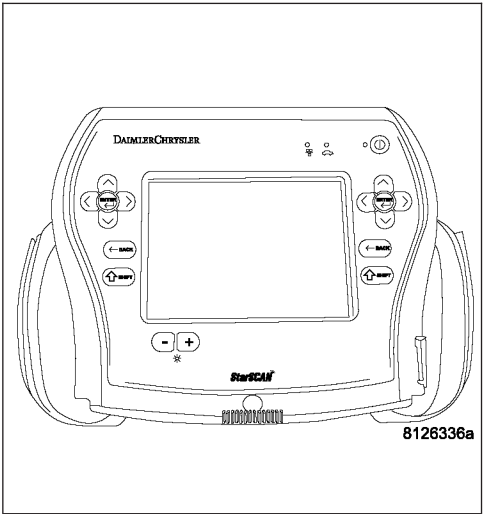
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.  
With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0032-O2 SENSOR 1/1 HEATER CIRCUIT HIGH (CONTINUED)****2. O2 HEATER ELEMENT**

Turn the ignition off.

**Note: Allow the O2 Sensor to cool down to room temperature.**

Disconnect the 1/1 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element between the O2 Heater Control terminal and the O2 Heater ground terminal at the component.

**Note: O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.**

**Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?**

**Yes** >> Go To 3

**No** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**3. (K99) O2 1/1 HEATER CONTROL CIRCUIT**

Ignition on, engine not running.

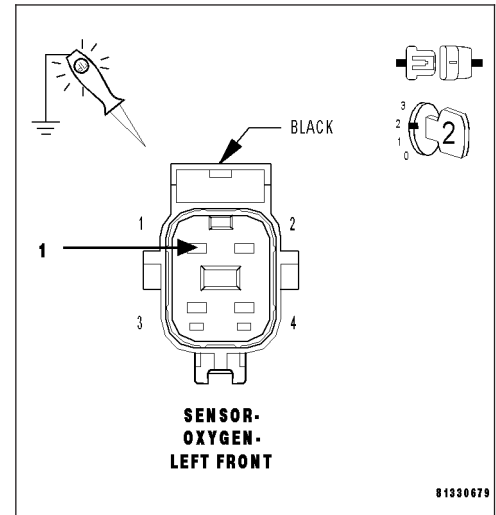
With a scan tool, actuate the O2 1/1 Heater Test with the Sensor harness connector still disconnected.

Using a 12-volt test light connected to ground, probe the (K99) O2 1/1 Heater Control circuit in the O2 Sensor harness connector.

**Does the test light illuminate brightly and flash on and off during the actuation?**

**Yes** >> Go To 4

**No** >> Go To 5



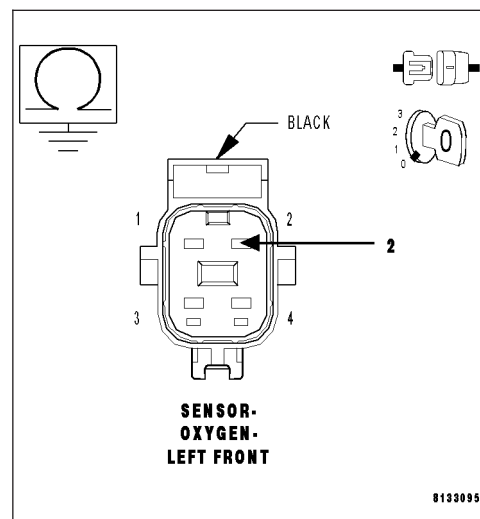
**P0032-O2 SENSOR 1/1 HEATER CIRCUIT HIGH (CONTINUED)****4. (Z904) O2 HEATER GROUND CIRCUIT OPEN**

Turn the ignition off.

Measure the resistance between an engine ground and the (Z904) O2 1/1 Heater ground circuit in the O2 Sensor harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the O2 Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.
- No** >> Repair the open in the (Z904) O2 1/1 Heater ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. (K99) O2 1/1 HEATER CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

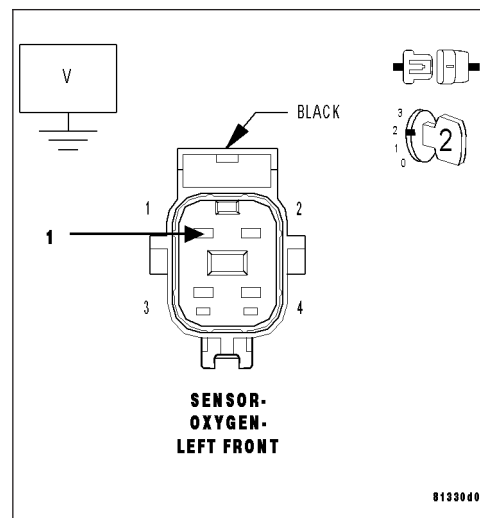
Disconnect the PCM harness connectors.

Ignition on, engine not running.

Measure the voltage on the (K99) O2 1/1 Heater Control circuit in the O2 Sensor harness connector.

**Does the voltmeter indicate any voltage present?**

- Yes** >> Repair the short to battery voltage in the (K99) O2 1/1 Heater Control circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Go To 6



**P0032-O2 SENSOR 1/1 HEATER CIRCUIT HIGH (CONTINUED)****6. (K99) O2 1/1 HEATER CONTROL CIRCUIT OPEN**

Turn the ignition off.

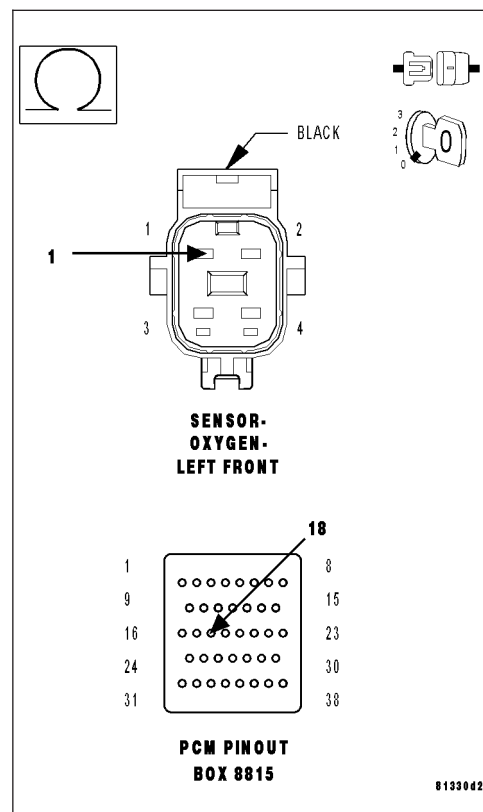
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K99) O2 1/1 Heater Control circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K99) O2 1/1 Heater Control circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

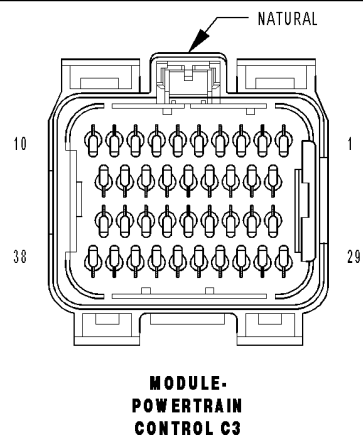
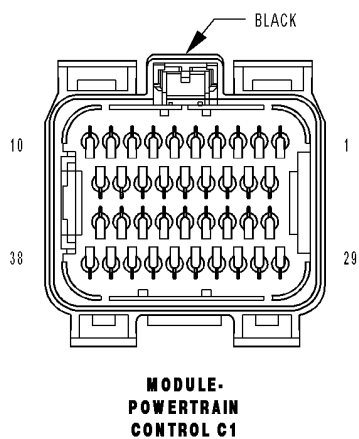
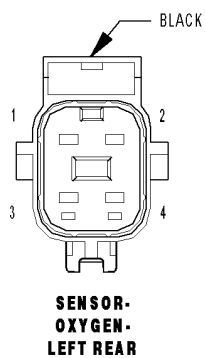
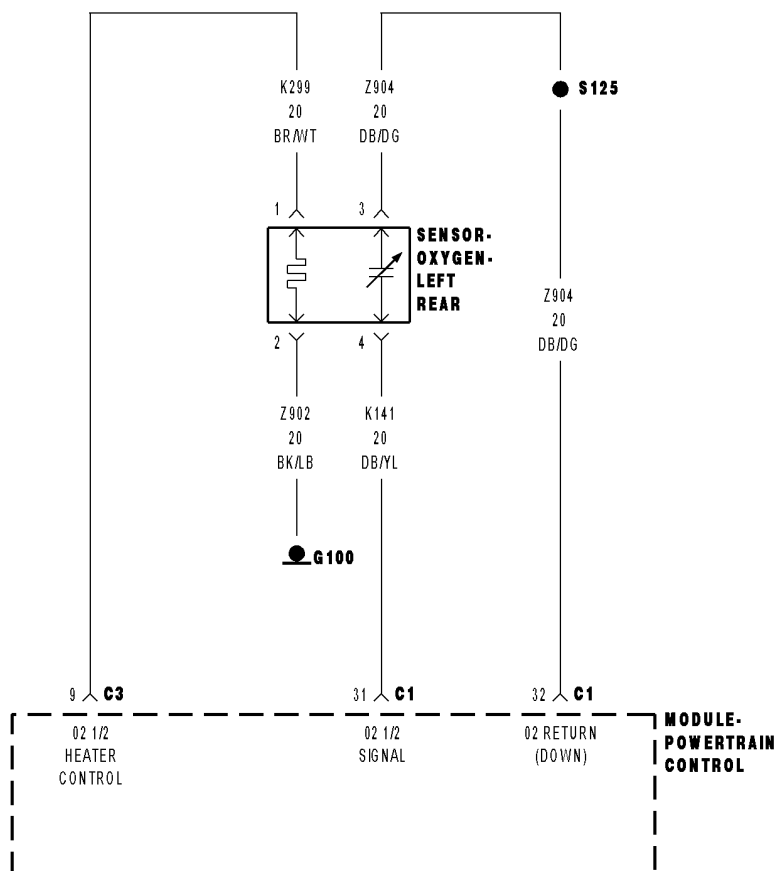
**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P0037-O2 SENSOR 1/2 HEATER CIRCUIT LOW**

**P0037-O2 SENSOR 1/2 HEATER CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagrams (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is on.

- **Set Condition:**

Desired state does not match Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K299) O2 1/2 HEATER CONTROL CIRCUIT SHORTED TO GROUND O2 SENSOR PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

**Note:** Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the O2 1/2 Heater Test.

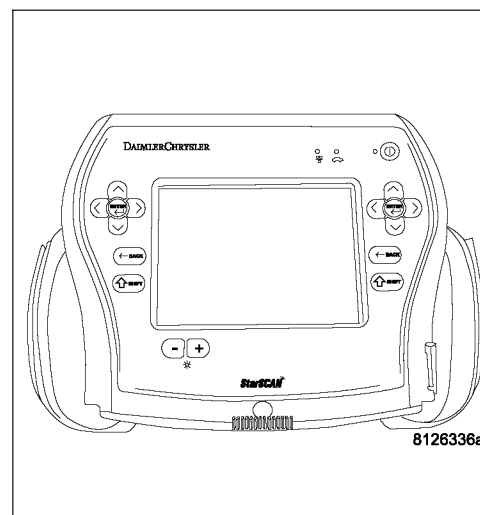
With the scan tool, monitor 1/2 O2 Sensor voltage for at least 2 minutes.

**Does the O2 Sensor voltage stay above 4.5 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



### 2. O2 HEATER ELEMENT

Turn the ignition off.

**Note:** Allow the O2 Sensor to cool down to room temperature.

Disconnect the 1/2 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element, between the O2 Heater Control terminal and the O2 Heater ground terminal at the component.

**Note:** O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

**Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?**

**Yes** >> Go To 3

**No** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P0037-O2 SENSOR 1/2 HEATER CIRCUIT LOW (CONTINUED)

### 3. O2 SENSOR

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test with the 1/2 O2 Sensor harness connector still disconnected.

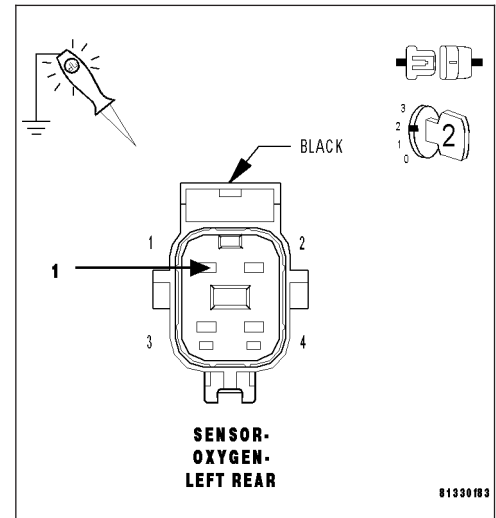
Using a 12-volt test light connected to ground, probe the (K299) O2 1/2 Heater Control circuit in the O2 Sensor harness connector.

**Does the test light illuminate brightly and flash on and off during the actuation?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4



#### 4. (K299) O2 1/2 HEATER CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the PCM harness connectors.

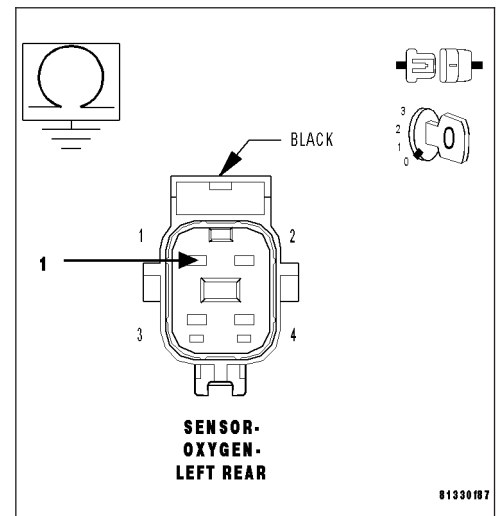
Measure the resistance between ground and the (K299) O2 1/2 Heater Control circuit in the O2 Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short to ground in the (K299) O2 1/2 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



## 5. PCM

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

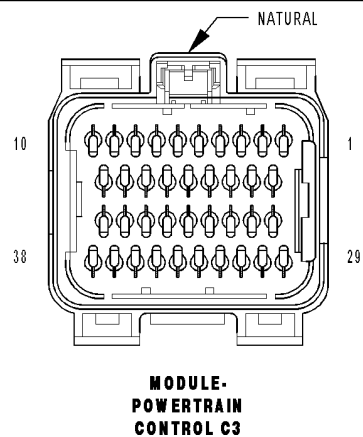
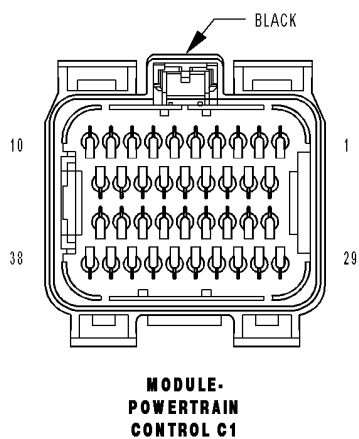
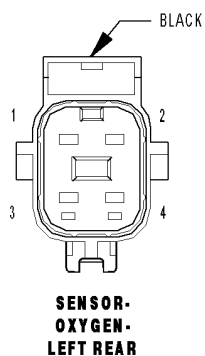
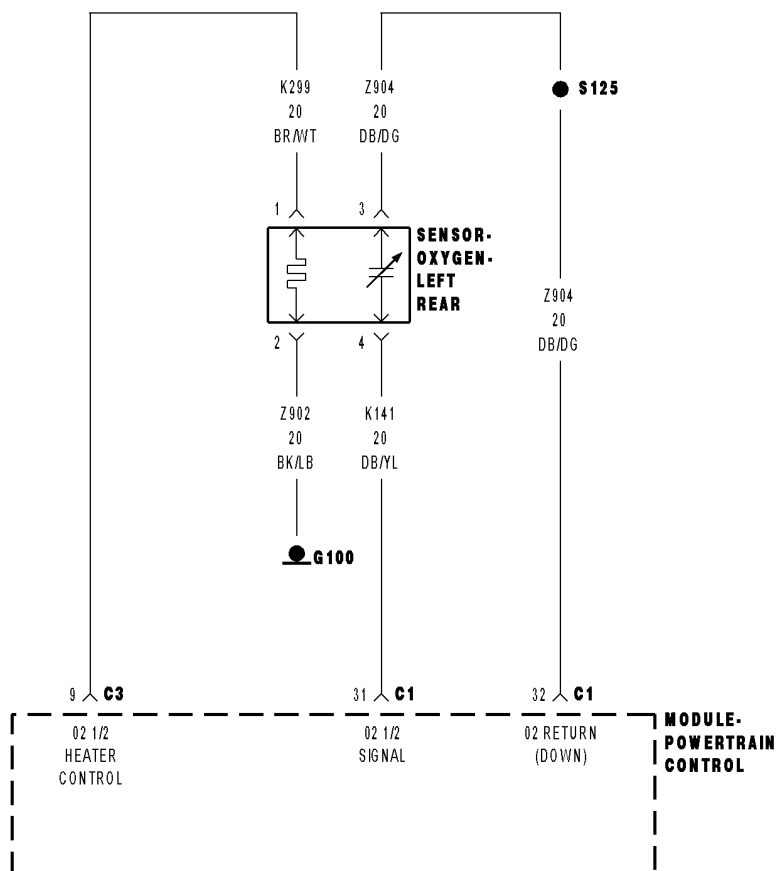
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

# P0038-O2 SENSOR 1/2 HEATER CIRCUIT HIGH





**P0038-O2 SENSOR 1/2 HEATER CIRCUIT HIGH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is off.
- **Set Condition:**  
Desired state does not equal Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K299) O2 1/2 HEATER CONTROL CIRCUIT OPEN
(Z902) O2 1/2 HEATER GROUND CIRCUIT OPEN
(K299) O2 SENSOR 1/2 HEATER CONTROL SHORTED TO BATTERY VOLTAGE
O2 SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

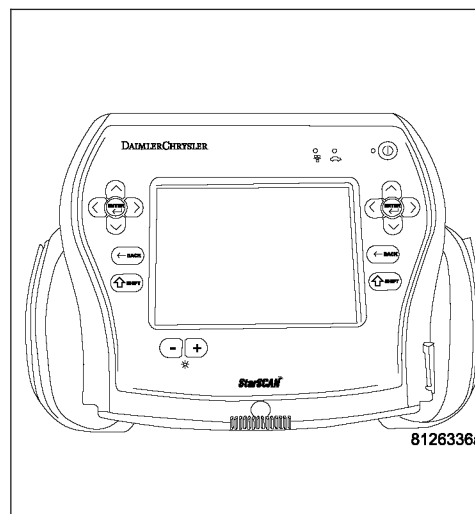
**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0038-O2 SENSOR 1/2 HEATER CIRCUIT HIGH (CONTINUED)****2. O2 HEATER ELEMENT**

Turn the ignition off.

**Note:** Allow the O2 Sensor to cool down to room temperature.

Disconnect the 1/2 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element, between the Heater Control terminal and the Heater ground terminal at the component.

**Note:** O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

**Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?**

**Yes** >> Go To 3

**No** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**3. (K299) O2 1/2 HEATER CONTROL CIRCUIT**

Ignition on, engine not running.

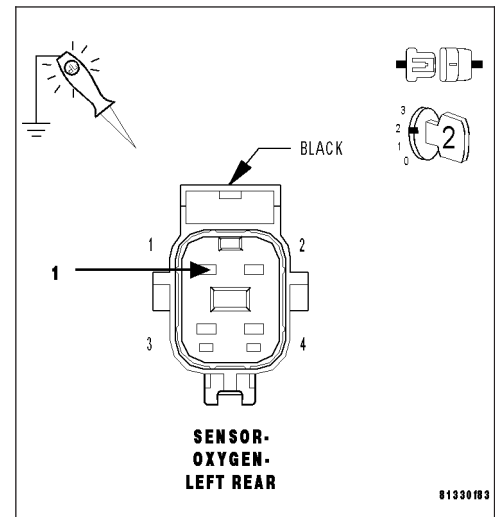
With a scan tool, actuate the O2 1/2 Heater Test with the O2 Sensor harness connector still disconnected.

Using a 12-volt test light connected to ground, probe the (K299) O2 1/2 Heater Control circuit in the O2 Sensor harness connector.

**Does the test light illuminate brightly and flash on and off during the actuation?**

**Yes** >> Go To 4

**No** >> Go To 5



**P0038-O2 SENSOR 1/2 HEATER CIRCUIT HIGH (CONTINUED)****4. (Z902) O2 HEATER GROUND CIRCUIT OPEN**

Turn the ignition off.

Measure the resistance between an engine ground and the (Z902) O2 1/2 Heater ground circuit in the O2 Sensor harness connector.

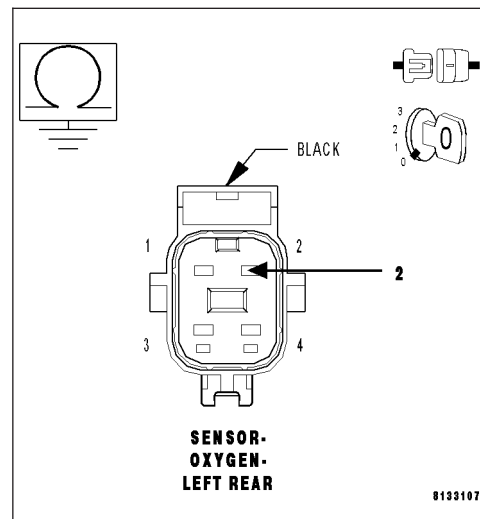
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Repair the open in the (Z902) O2 1/2 Heater ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. (K299) O2 1/2 HEATER CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

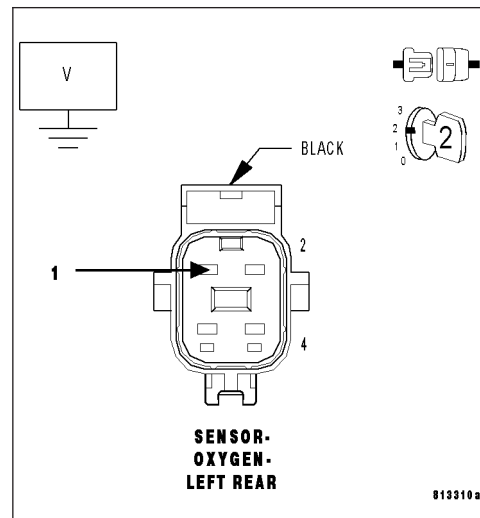
Measure the voltage on the (K299) O2 1/2 Heater Control circuit in the O2 Sensor harness connector.

**Does the voltmeter indicate any voltage present?**

**Yes** >> Repair the short to battery voltage in the (K299) O2 1/2 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P0038-O2 SENSOR 1/2 HEATER CIRCUIT HIGH (CONTINUED)****6. (K299) O2 1/2 HEATER CONTROL CIRCUIT OPEN**

Turn the ignition off.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

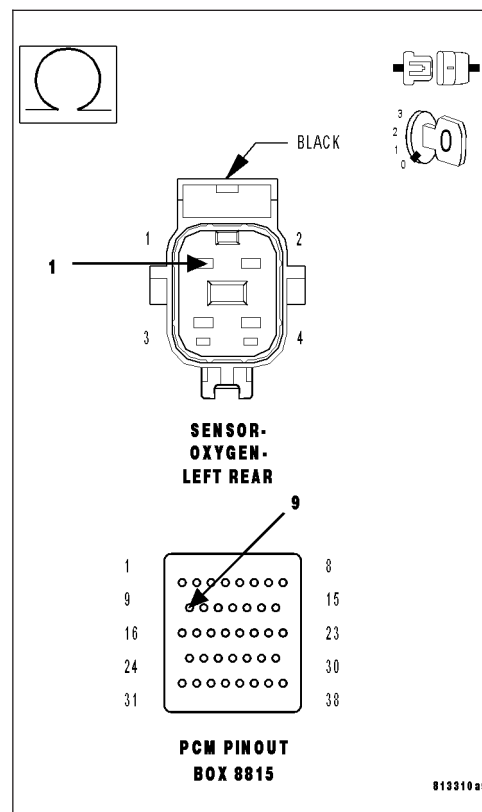
Measure the resistance of the (K299) O2 1/2 Heater Control circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K299) O2 1/2 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

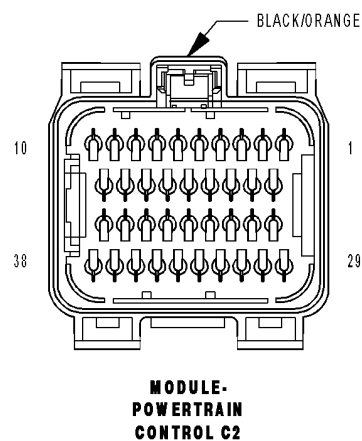
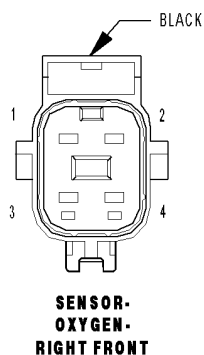
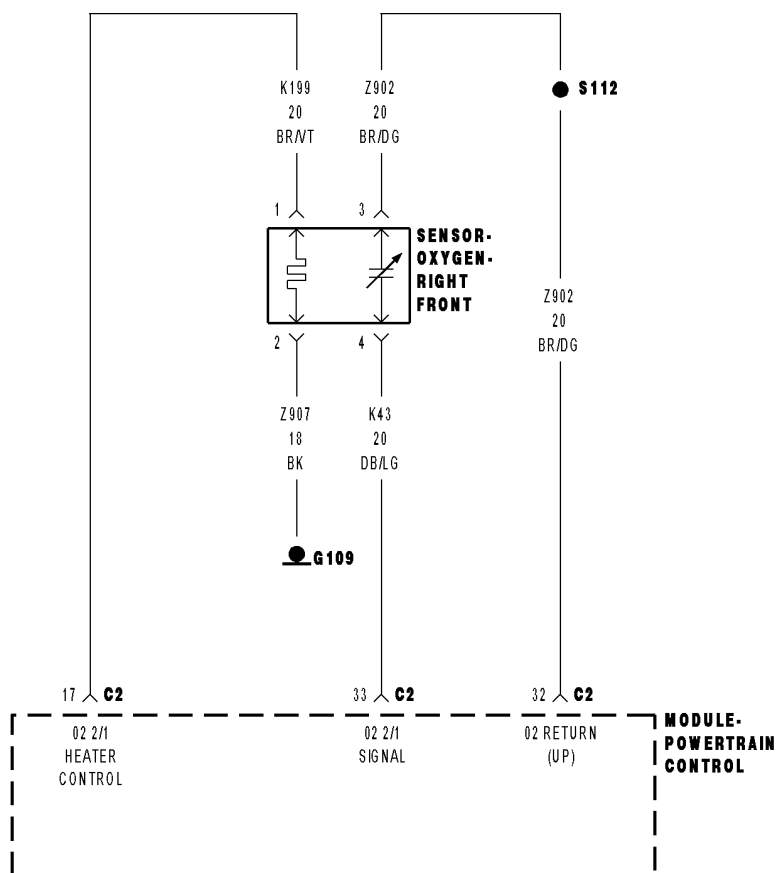
**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P0051-O2 SENSOR 2/1 HEATER CIRCUIT LOW**

**P0051-O2 SENSOR 2/1 HEATER CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is on.
- **Set Condition:**  
Desired state does not match Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K199) O2 2/1 HEATER CONTROL CIRCUIT SHORTED TO GROUND O2 SENSOR PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test****1. O2 SENSOR HEATER OPERATION**

Turn the ignition off.

**Note:** Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

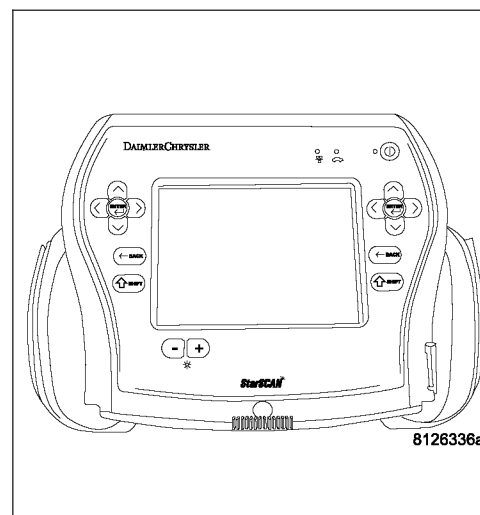
With a scan tool, actuate the O2 Heater Test.

With a scan tool, monitor 2/1 O2 Sensor voltage for at least 2 minutes.

**Does the O2 Sensor voltage stay above 4.5 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**2. O2 HEATER ELEMENT**

Turn the ignition off.

**Note:** Allow the O2 Sensor to cool down to room temperature.

Disconnect the 2/1 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element, between the Heater Control terminal and the Heater ground terminal at the component.

**Note:** O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

**Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?**

**Yes** >> Go To 3

**No** >> Replace the O2 Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P0051-O2 SENSOR 2/1 HEATER CIRCUIT LOW (CONTINUED)****3. O2 SENSOR**

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test with the O2 Sensor harness connector still disconnected.

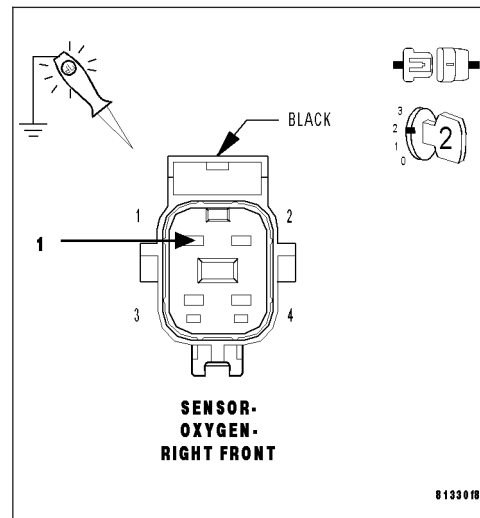
Using a 12-volt test light connected to ground, probe the (K199) O2 2/1 Heater Control circuit in the O2 Sensor harness connector.

**Does the test light illuminate brightly and flash on and off during the actuation?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (K199) O2 2/1 HEATER CONTROL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

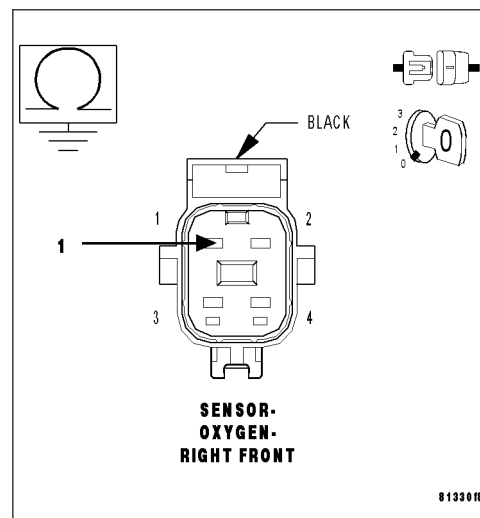
Measure the resistance between ground and the (K199) O2 2/1 Heater Control circuit in the O2 Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short to ground in the (K199) O2 2/1 Sensor Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

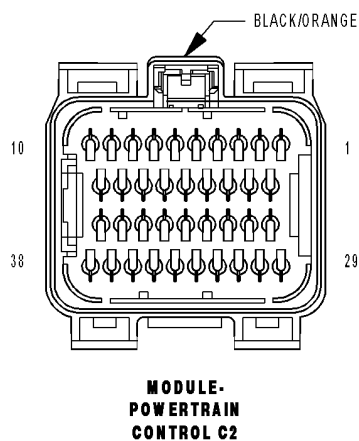
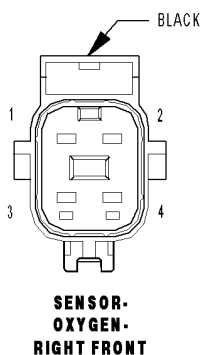
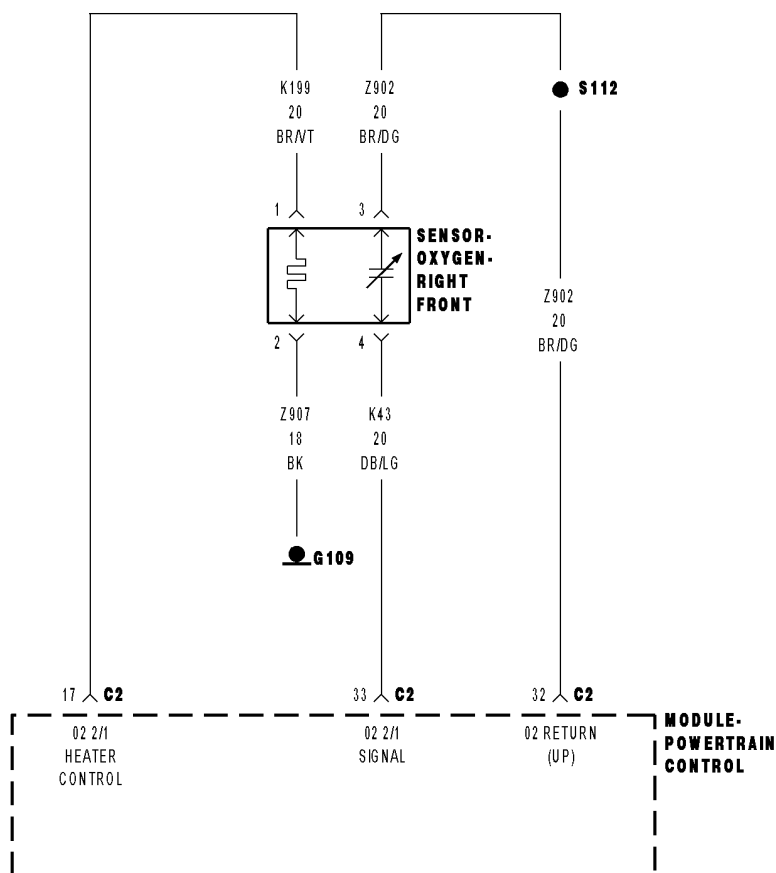
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

# P0052-O2 SENSOR 2/1 HEATER CIRCUIT HIGH





**P0052-O2 SENSOR 2/1 HEATER CIRCUIT HIGH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is off.
- **Set Condition:**  
Desired state does not equal Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K199) O2 2/1 HEATER CONTROL CIRCUIT OPEN (Z904) O2 2/1 HEATER GROUND CIRCUIT OPEN (K199) O2 2/1 HEATER CONTROL SHORTED TO BATTERY VOLTAGE O2 SENSOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

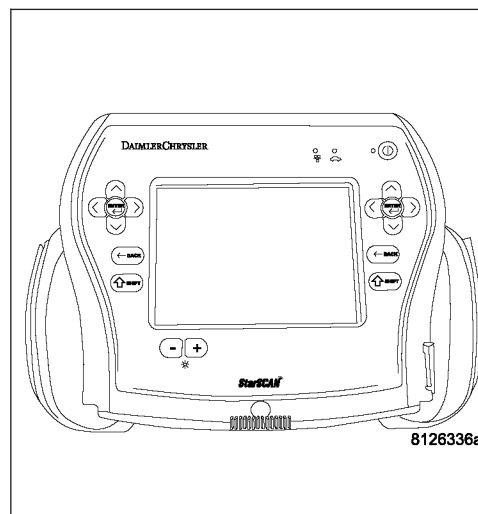
**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0052-O2 SENSOR 2/1 HEATER CIRCUIT HIGH (CONTINUED)****2. O2 HEATER ELEMENT**

Turn the ignition off.

**Note:** Allow the O2 Sensor to cool down to room temperature.

Disconnect the 2/1 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element, between the O2 Heater Control terminal and the Heater ground terminal at the component connector.

**Note:** O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

**Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?**

**Yes** >> Go To 3

**No** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**3. (K199) O2 2/1 HEATER CONTROL CIRCUIT**

Ignition on, engine not running.

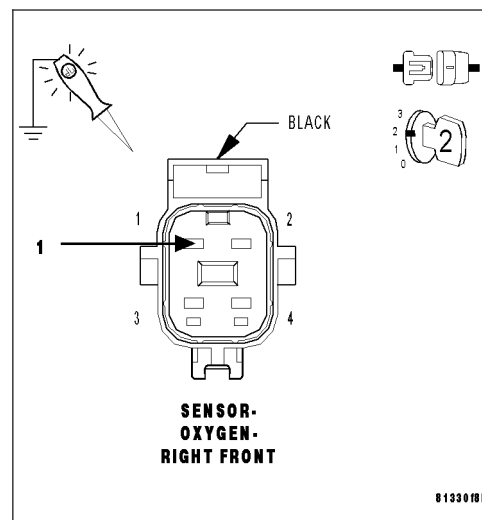
With the scan tool, actuate the O2 Heater Test with the Sensor harness connector still disconnected.

Using a 12-volt test light connected to ground, probe the (K199) O2 2/1 Heater Control circuit in the O2 Sensor harness connector.

**Does the test light illuminate brightly and flash on and off during the actuation?**

**Yes** >> Go To 4

**No** >> Go To 5

**4. (Z904) O2 2/1 HEATER GROUND CIRCUIT OPEN**

Turn the ignition off.

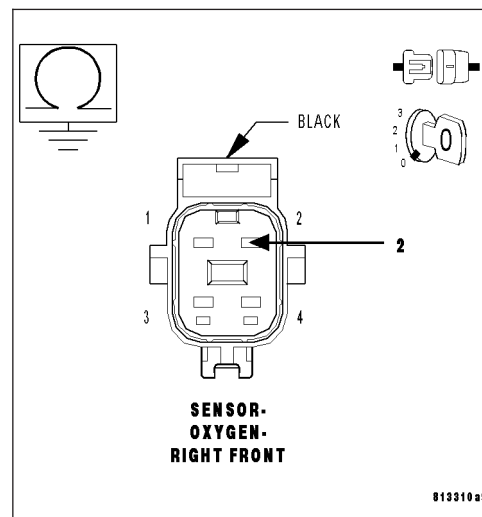
Measure the resistance between an engine ground and the (Z904) O2 2/1 Heater ground circuit in the O2 Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Repair the open in the (Z904) O2 2/1 Heater ground circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0052-O2 SENSOR 2/1 HEATER CIRCUIT HIGH (CONTINUED)****5. (K199) O2 2/1 HEATER CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

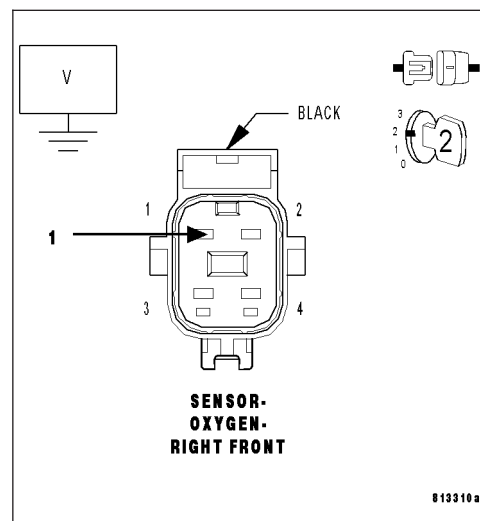
Measure the voltage on the (K199) O2 2/1 Heater Control circuit in the O2 Sensor harness connector.

**Does the voltmeter indicate any voltage present?**

**Yes** >> Repair the short to battery voltage in the (K199) O2 2/1 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**6. (K199) O2 2/1 HEATER CONTROL CIRCUIT OPEN**

Turn the ignition off.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

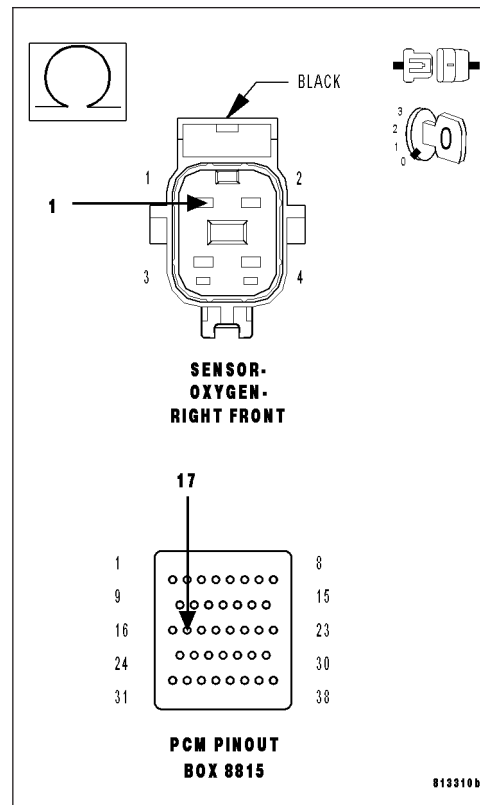
Measure the resistance of the (K199) O2 2/1 Heater Control circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K199) O2 2/1 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0052-02 SENSOR 2/1 HEATER CIRCUIT HIGH (CONTINUED)****7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

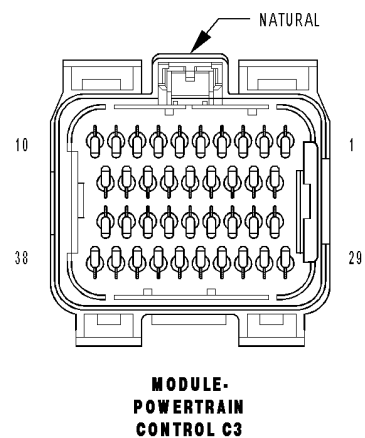
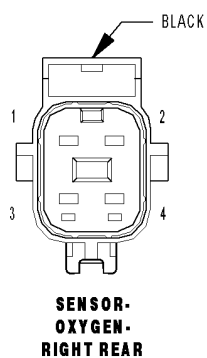
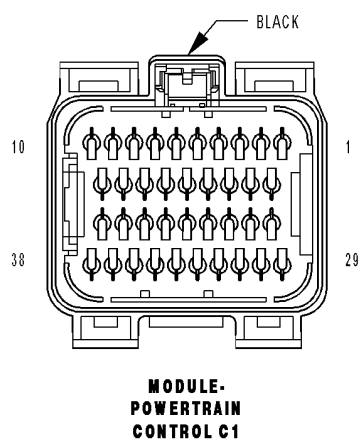
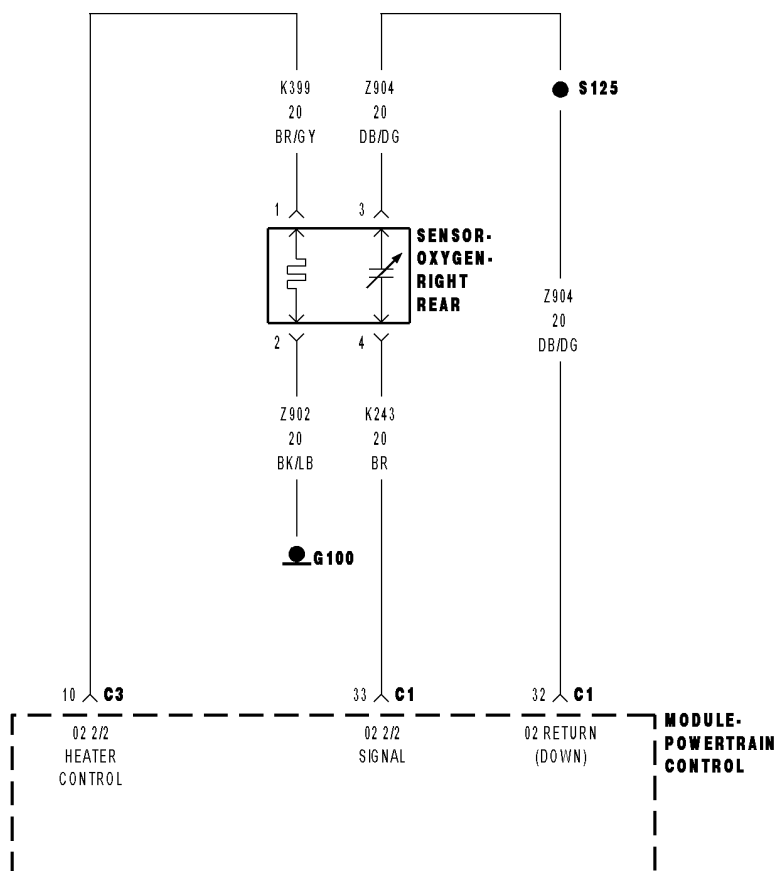
**If there are no possible causes remaining, view repair.**

**Repair**

Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**P0057-O2 SENSOR 2/2 HEATER CIRCUIT LOW**

**P0057-O2 SENSOR 2/2 HEATER CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagrams (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is on.

- **Set Condition:**

Desired state does not match Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K399) O2 SENSOR 2/2 HEATER CONTROL CIRCUIT SHORTED TO GROUND
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

**Note:** Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

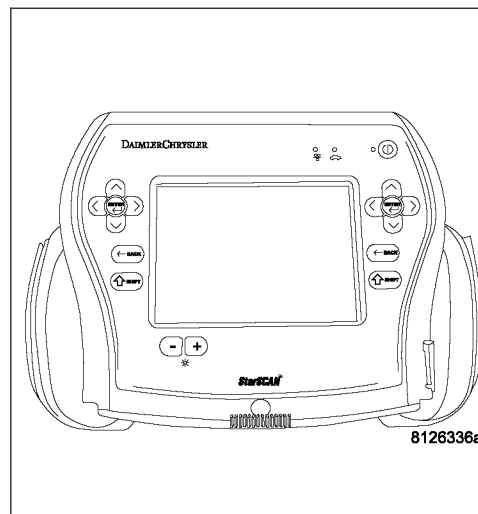
With a scan tool, actuate the O2 Heater Test.

With the scan tool, monitor 2/2 O2 Sensor voltage for at least 2 minutes.

**Does the O2 Sensor voltage stay above 4.5 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 2. O2 HEATER ELEMENT

Turn the ignition off.

**Note:** Allow the O2 Sensor to cool down to room temperature.

Disconnect the 2/2 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element, between the O2 Heater Control terminal and the O2 Heater ground terminal in the component connector.

**Note:** O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

**Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?**

**Yes** >> Go To 3

**No** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**P0057-O2 SENSOR 2/2 HEATER CIRCUIT LOW (CONTINUED)****3. O2 SENSOR**

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test with the O2 Sensor harness connector still disconnected.

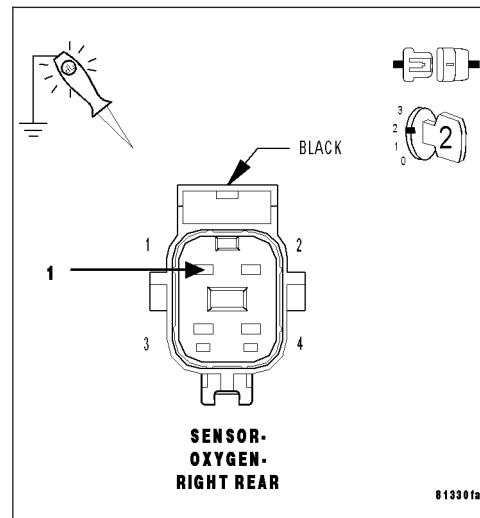
Using a 12-volt test light connected to ground, probe the (K399) O2 2/2 Heater Control circuit in the O2 Sensor harness connector.

**Does the test light illuminate brightly and flash on and off during the actuation?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (K399) O2 2/2 HEATER CONTROL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

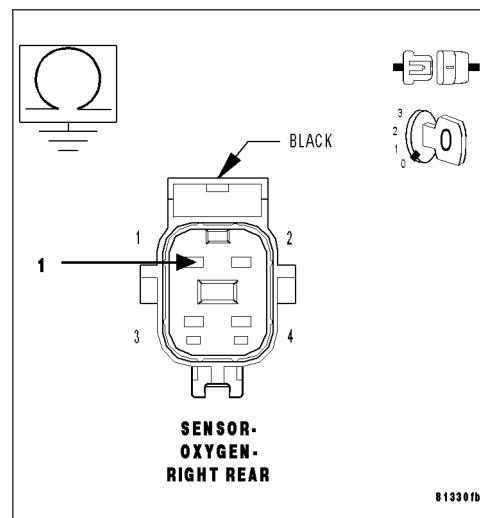
Measure the resistance between ground and the (K399) O2 2/2 Heater Control circuit in the O2 Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short to ground in the (K399) O2 2/2 Sensor Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

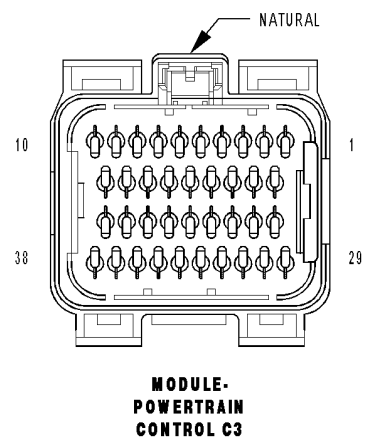
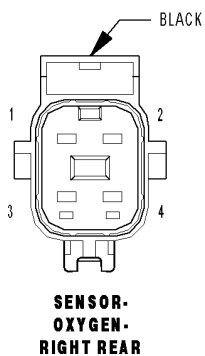
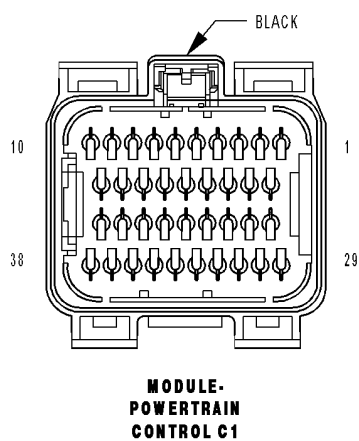
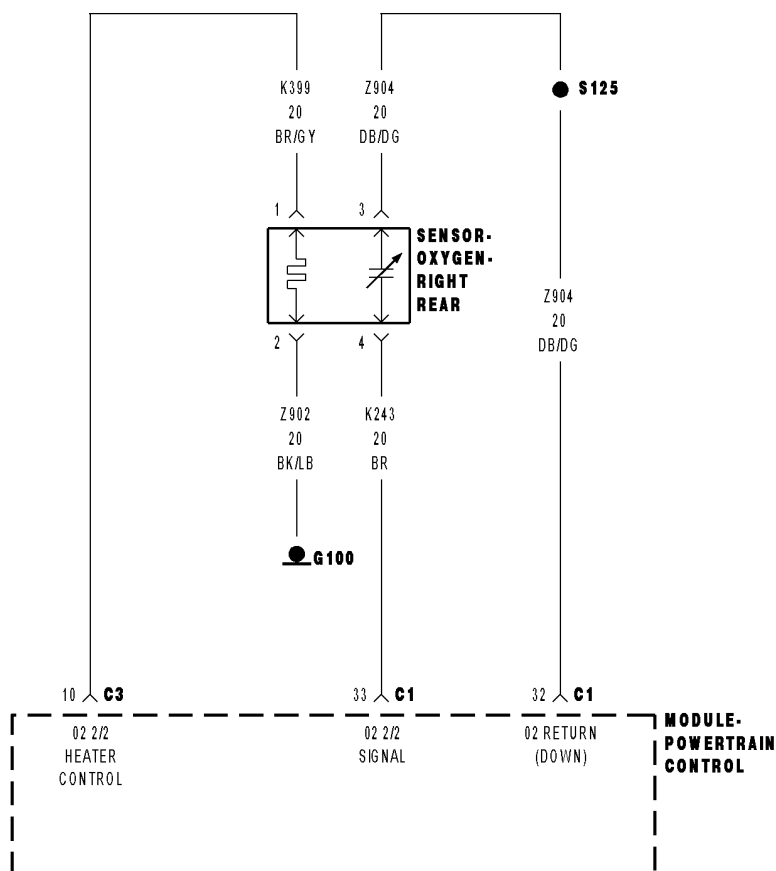
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0058-O2 SENSOR 2/2 HEATER CIRCUIT HIGH





P0058-O2 SENSOR 2/2 HEATER CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is off.
- **Set Condition:**  
Desired state does not equal Actual state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K399) O2 2/2 HEATER CONTROL CIRCUIT OPEN (Z902) O2 2/2 HEATER GROUND CIRCUIT OPEN (K399) O2 2/2 HEATER CONTROL SHORTED TO BATTERY VOLTAGE O2 SENSOR PCM

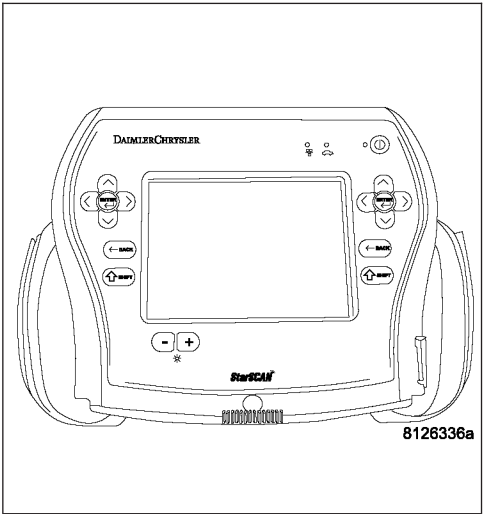
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.  
With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0058-O2 SENSOR 2/2 HEATER CIRCUIT HIGH (CONTINUED)****2. O2 HEATER ELEMENT**

Turn the ignition off.

**Note:** Allow the O2 Sensor to cool down to room temperature.

Disconnect the 2/2 O2 Sensor harness connector.

Measure the resistance across the O2 Sensor Heater element, between the O2 Heater Control terminal and the O2 Heater ground terminal in the component connector.

**Note:** O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

**Is the O2 Sensor Heater Element resistance between 2.0 and 30.0 ohms?**

**Yes** >> Go To 3

**No** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**3. (K399) O2 2/2 HEATER CONTROL CIRCUIT**

Ignition on, engine not running.

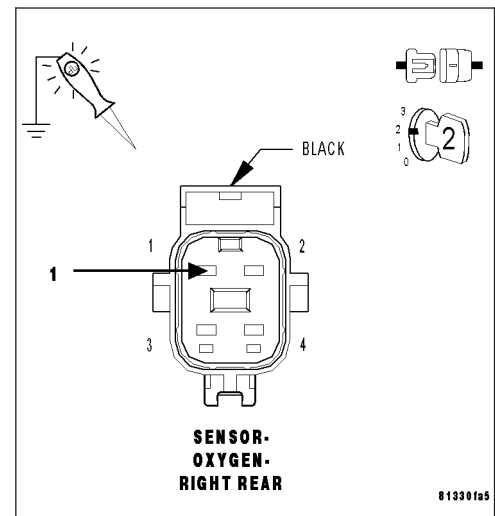
With a scan tool, actuate the O2 2/2 Heater Test with the Sensor harness connector still disconnected.

Using a 12-volt test light connected to ground, probe the (K399) O2 2/2 Heater Control circuit in the O2 Sensor harness connector.

**Does the test light illuminate brightly and flash on and off during the actuation?**

**Yes** >> Go To 4

**No** >> Go To 5

**4. (Z902) O2 HEATER GROUND CIRCUIT OPEN**

Turn the ignition off.

Measure the resistance between an engine ground and the (Z902) O2 2/2 Heater ground circuit in the O2 Sensor harness connector.

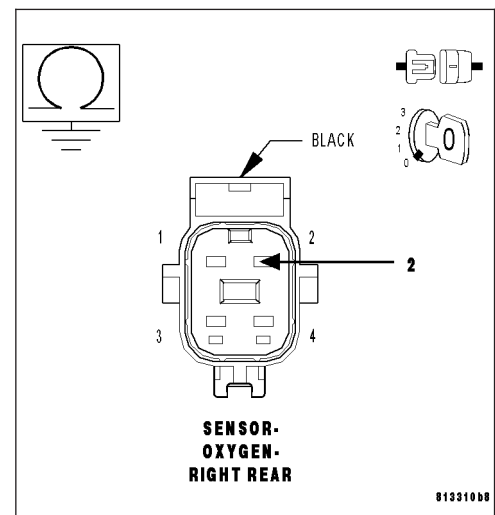
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Repair the open in the (Z902) O2 2/2 Heater ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



**P0058-O2 SENSOR 2/2 HEATER CIRCUIT HIGH (CONTINUED)****5. (K399) O2 2/2 HEATER CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

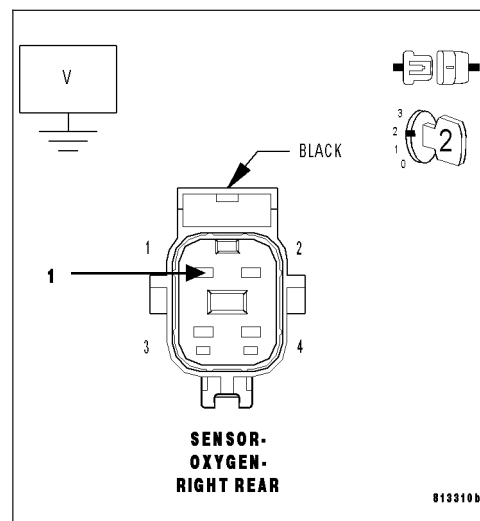
Measure the voltage on the (K399) O2 Heater 2/2 Control circuit in the O2 Sensor harness connector.

**Does the voltmeter indicate any voltage present?**

**Yes** >> Repair the short to battery voltage in the (K399) O2 2/2 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**6. (K399) O2 2/2 HEATER CONTROL CIRCUIT OPEN**

Turn the ignition off.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

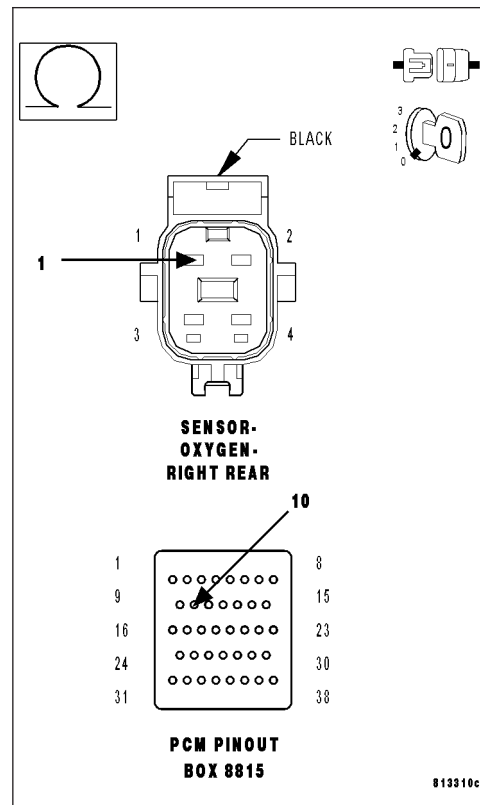
Measure the resistance of the (K399) O2 2/2 Heater Control circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K399) O2 2/2 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0058-02 SENSOR 2/2 HEATER CIRCUIT HIGH (CONTINUED)****7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

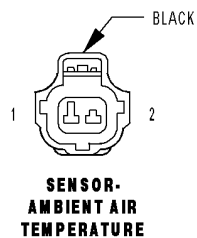
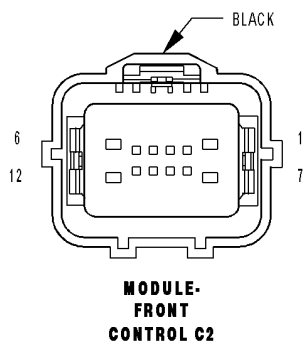
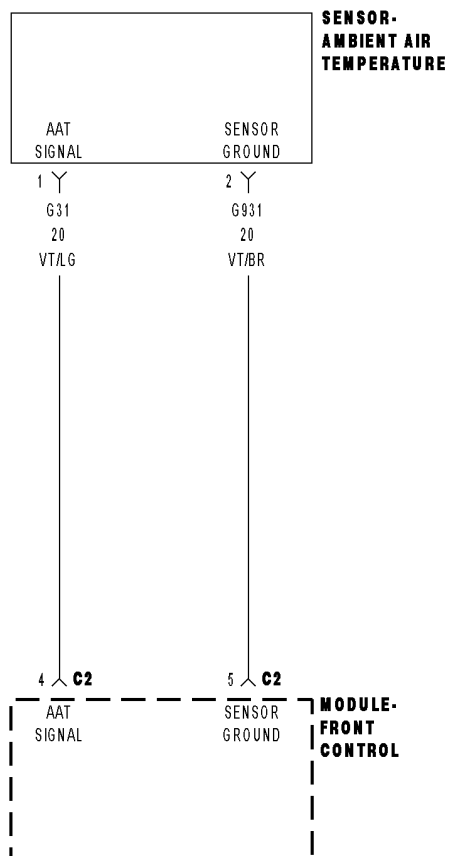
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**P0071-AMBIENT AIR TEMPERATURE SENSOR PERFORMANCE**

**P0071-AMBIENT AIR TEMPERATURE SENSOR PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine off time is greater than 480 minutes. Ambient temperature is greater than 4 deg C (38 deg F).

- **Set Condition:**

After a calibrated amount of cool down time, the PCM compares the ECT Sensor, IAT Sensor and the Ambient Air Temperature Sensor values. If the Ambient Air Temperature Sensor value is not within a calibrated temperature amount of the other two temperature sensors an error is detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(G31) AAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(G31) AAT SIGNAL CIRCUIT OPEN
(G931) SENSOR GROUND CIRCUIT OPEN
(G31) AAT SIGNAL CIRCUIT SHORTED TO GROUND
(G31) AAT SIGNAL CIRCUIT SHORTED TO THE (G931) SENSOR GROUND CIRCUIT
AMBIENT AIR TEMPERATURE SENSOR
FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Diagnose any CAN - C Communication DTCs before continuing.

Ignition on, engine not running.

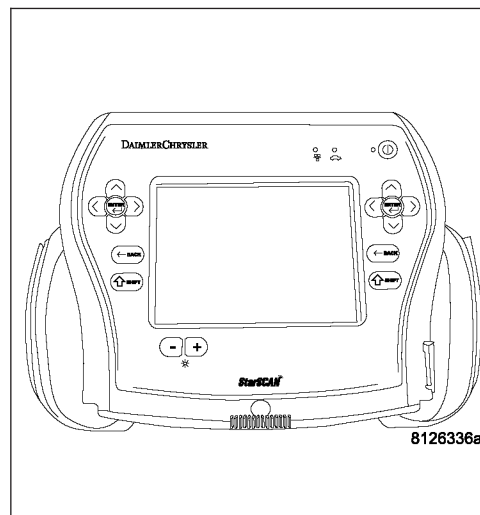
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



**P0071-AMBIENT AIR TEMPERATURE SENSOR PERFORMANCE (CONTINUED)****2. (G31) AAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the C2 FCM harness connector.

Disconnect the AAT Sensor harness connector.

**Note: Visually inspect both the component and the FCM connectors. Look for damaged, partially broken wires, and backed out or corroded terminals.**

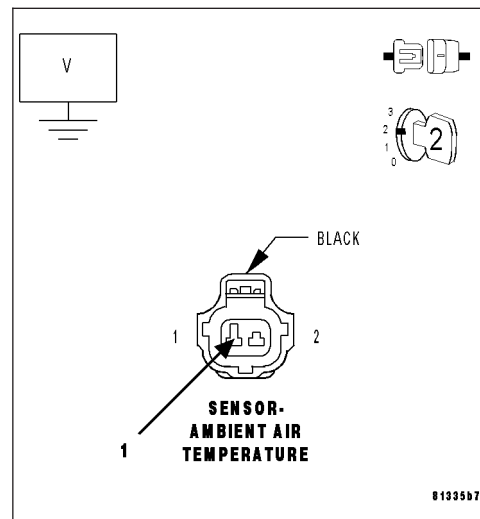
Ignition on, engine not running.

Measure the voltage on the (G31) AAT Signal circuit in the AAT Sensor harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to voltage in the (G31) AAT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Go To 3

**3. AAT SENSOR VOLTAGE ABOVE 4.6 VOLTS**

Turn the ignition off.

Connect the C2 FCM harness connectors.

Ignition on, engine not running.

With a scan tool, read the AAT voltage.

**Is the voltage above 4.6 volts?**

**Yes** >> Go To 4

**No** >> Go To 7

**4. AAT SENSOR**

Connect a jumper wire between the (G31) AAT Signal circuit and the (G931) Sensor ground circuit in the AAT Sensor harness connector.

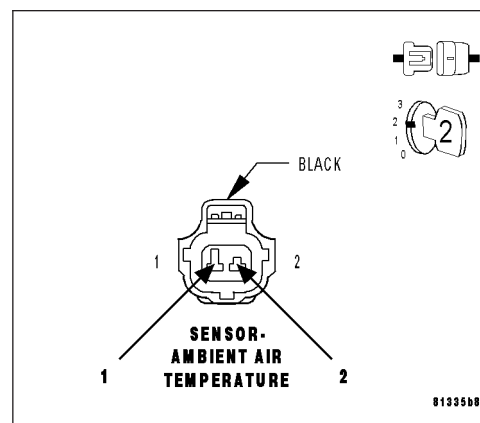
With a scan tool, read the AAT voltage.

**Is the voltage below 1.0 volt with the jumper wire installed?**

**Yes** >> Replace the AAT Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Go To 5

**Note: Remove the jumper wire before continuing.**



**P0071-AMBIENT AIR TEMPERATURE SENSOR PERFORMANCE (CONTINUED)****5. (G31) AAT SIGNAL CIRCUIT OPEN**

Turn the ignition off.

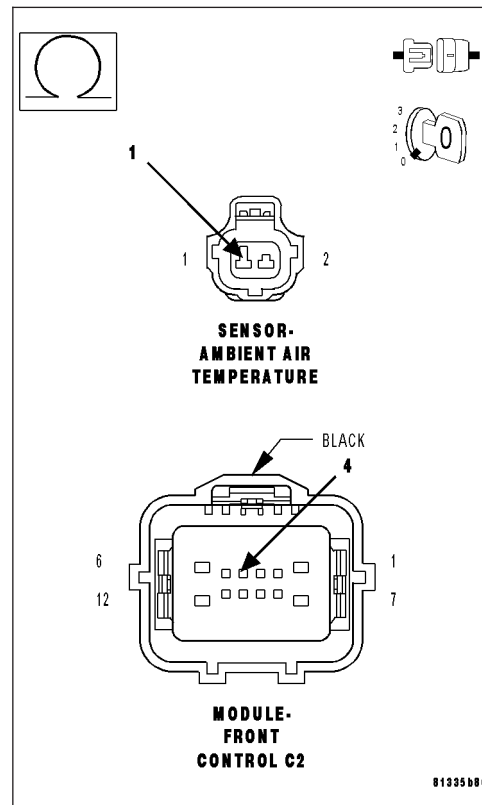
Disconnect the C2 FCM harness connector.

Measure the resistance of the (G31) AAT Signal circuit from the AAT Sensor harness connector to the C2 FCM harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (G31) AAT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

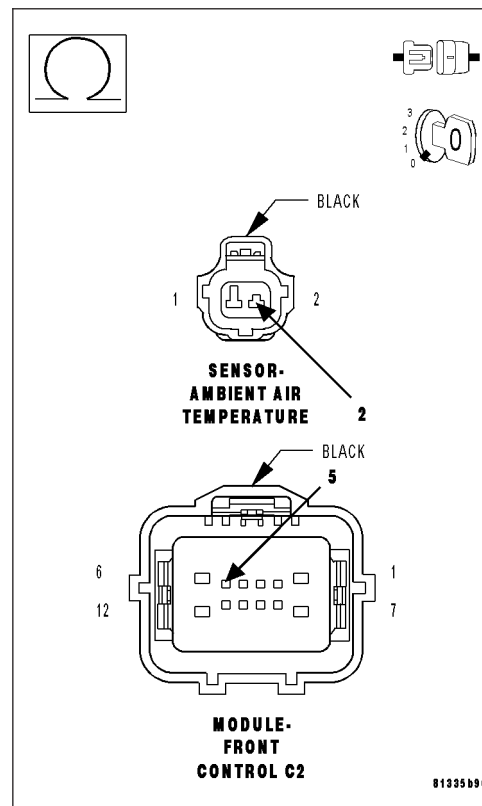
**6. (G931) SENSOR GROUND CIRCUIT OPEN**

Measure the resistance of the (G931) Sensor ground circuit from the AAT Sensor harness connector to the C2 FCM harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the open in the (G931) Sensor ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.





**P0071-AMBIENT AIR TEMPERATURE SENSOR PERFORMANCE (CONTINUED)****7. (G31) AAT SIGNAL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

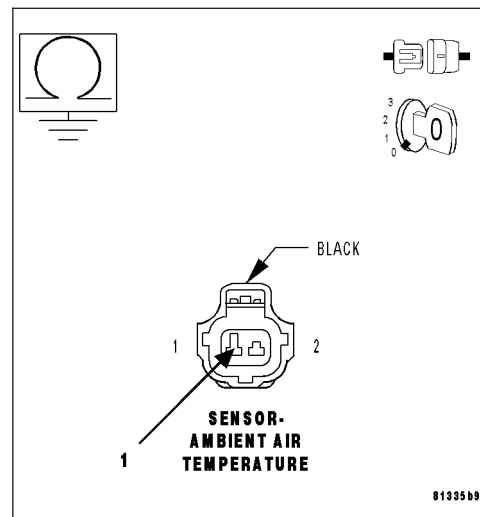
Disconnect the C2 FCM harness connector.

Measure the resistance between ground and the (G31) AAT Signal circuit in the AAT Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (G31) AAT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Go To 8

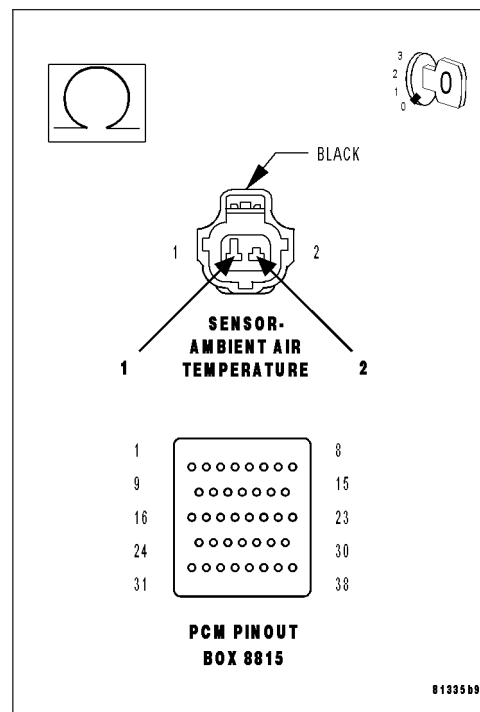
**8. (G31) AAT SIGNAL SHORTED TO THE (G931) SENSOR GROUND CIRCUIT**

Measure the resistance between the (G31) AAT Signal circuit and the (G931) Sensor ground circuit in the AAT Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (G931) Sensor ground circuit and the (G31) AAT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Go To 9



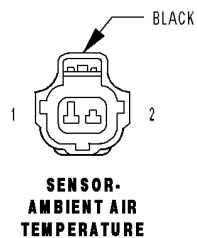
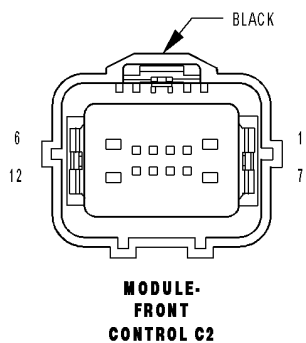
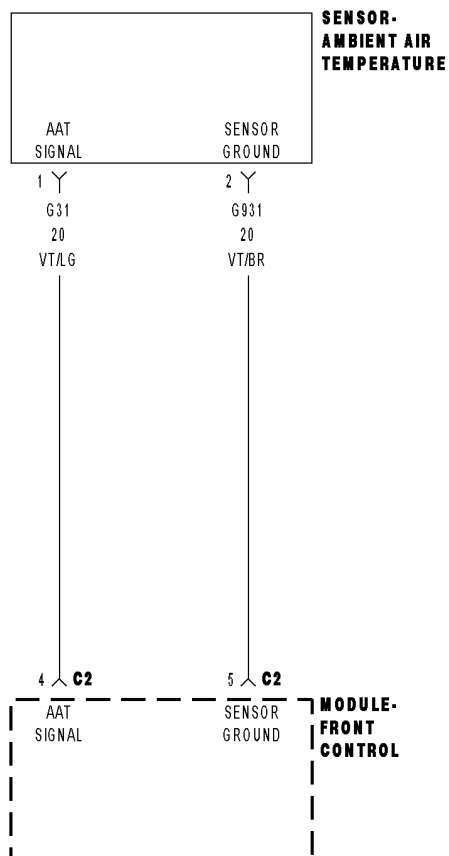
**P0071-AMBIENT AIR TEMPERATURE SENSOR PERFORMANCE (CONTINUED)****9. FRONT CONTROL MODULE**

**Note:** Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform BODY VERIFICATION TEST VER - 1.
- No** >> Replace the Front Control Module per Service Information.  
Perform BODY VERIFICATION TEST VER - 1.
-

**P0072-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT LOW**

**P0072-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
The ignition key on.
- **Set Condition:**  
Ambient Temperature Sensor is less than 0.078 of a volt at the PCM for 2.8 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(G31) AAT SIGNAL CIRCUIT SHORTED TO GROUND (G31) AAT SIGNAL CIRCUIT SHORTED TO THE (G931) SENSOR GROUND CIRCUIT AMBIENT AIR TEMPERATURE SENSOR FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. AAT SENSOR VOLTAGE BELOW 0.078 OF A VOLT**

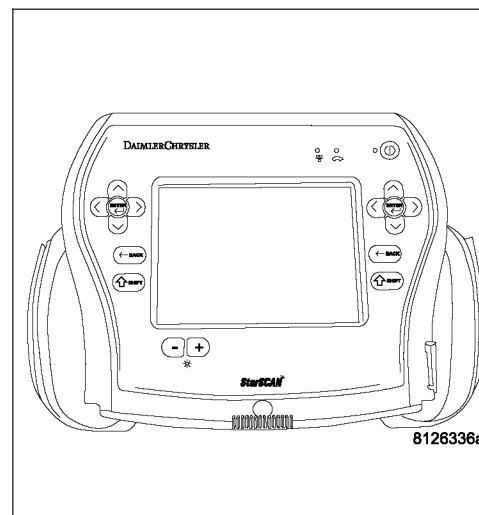
**Note:** Diagnose any CAN - C Communication DTCs before continuing.

Ignition on, engine not running.

With a scan tool, read the Ambient Air Temperature Sensor voltage.

**Is the voltage below 0.078 of a volt?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**2. CHECKING AAT SENSOR**

Turn the ignition off.

Disconnect the Ambient Air Temperature Sensor harness connector.

Ignition on, engine not running.

With a scan tool, read the AAT Sensor voltage.

**Is the voltage above 4.6 volts?**

- Yes** >> Replace the Ambient Temperature Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.
- No** >> Go To 3

**P0072-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)****3. (G31) AAT SIGNAL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

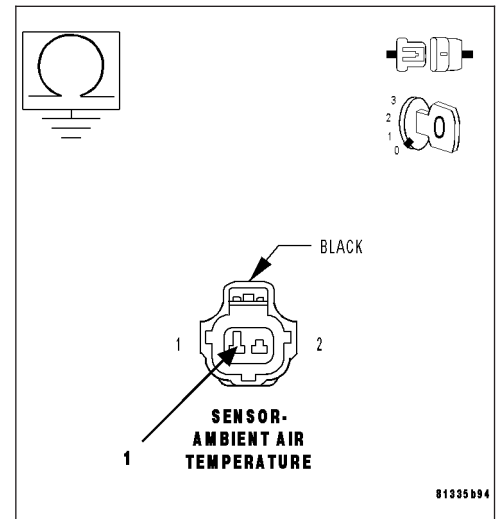
Disconnect the C2 FCM harness connectors.

Measure the resistance between ground and the (G31) AAT Signal circuit in the AAT Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (G31) AAT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Go To 4

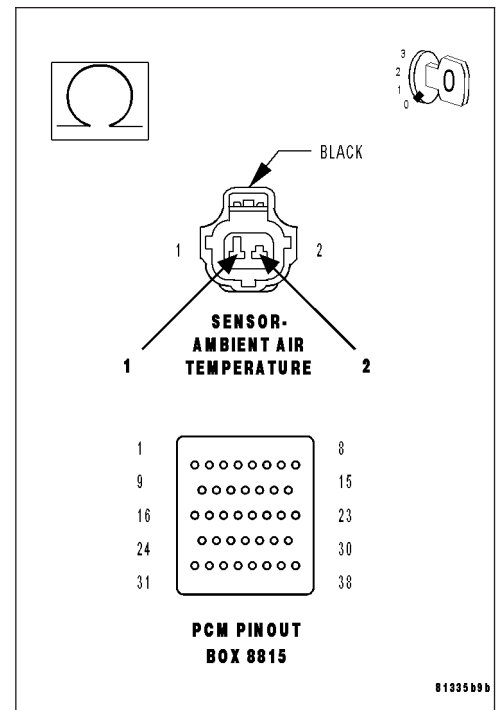
**4. (G31) AAT SIGNAL CIRCUIT SHORTED TO THE (G931) SENSOR GROUND CIRCUIT**

Measure the resistance between the (G931) Sensor ground circuit and the (G31) AAT Signal circuit in the AAT Sensor harness connector.

**Is the resistance below 5.0ohms?**

**Yes** >> Repair the short between the (G931) Sensor ground circuit and the (G31) AAT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Go To 5



**P0072-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)****5. FRONT CONTROL MODULE**

**Note:** Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

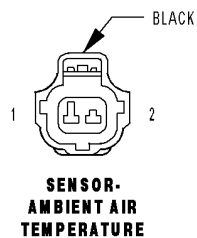
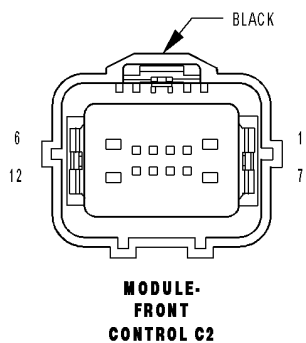
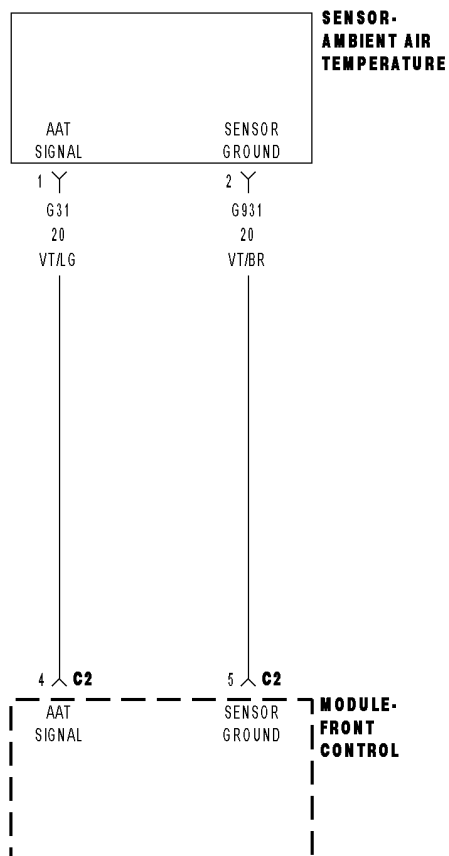
**Yes** >> Repair as necessary.

Perform BODY VERIFICATION TEST VER - 1.

**No** >> Replace and program the Front Control Module per Service Information.

Perform BODY VERIFICATION TEST VER - 1.

---

**P0073—AMBIENT AIR TEMPERATURE SENSOR CIRCUIT HIGH**

**P0073–AMBIENT AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on. Battery voltage greater than 10 volts.

- **Set Condition:**

The Ambient Temperature Sensor voltage is greater than 4.98 volts at the PCM for 2.8 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(G31) AAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(G31) AAT SIGNAL CIRCUIT OPEN
(G931) SENSOR GROUND CIRCUIT OPEN
AMBIENT AIR TEMPERATURE SENSOR
FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. AAT SENSOR VOLTAGE ABOVE 4.98 VOLTS

Ignition on, engine not running.

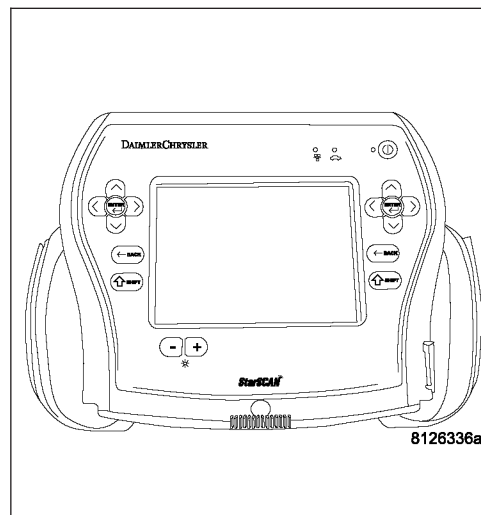
With a scan tool, read the Ambient Air Temperature Sensor voltage.

**Is the voltage above 4.98 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.





**P0073-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)****2. AAT SENSOR**

Turn the ignition off.

Disconnect the Ambient Air Temperature Sensor harness connector.

Connect a jumper wire between the (G31) AAT Signal circuit and the (G931) Sensor ground circuit in the AAT Sensor harness connector.

Ignition on, engine not running.

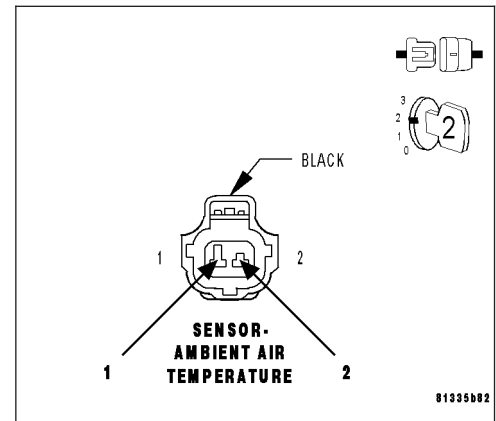
With a scan tool, read AAT Sensor voltage.

**Is the voltage below 1.0 volt with the jumper wire installed?**

**Yes** >> Replace the Ambient Air Temperature Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Go To 3

**Note:** Remove the jumper wire before continuing.

**3. (G31) AAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Disconnect the C2 FCM harness connector.

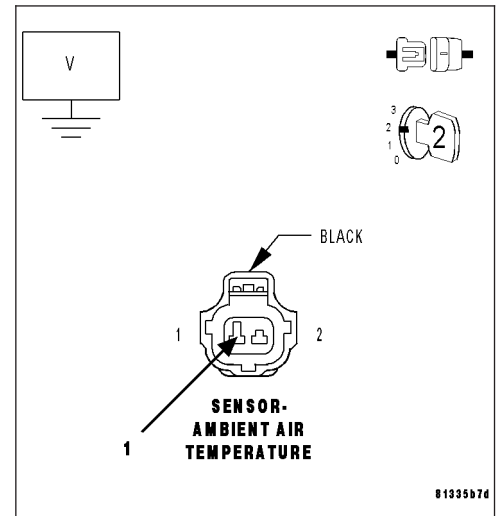
Ignition on, engine not running.

Measure the voltage on the (G31) AAT Signal circuit in the AAT Sensor harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (G31) AAT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Go To 4



**P0073-AMBIENT AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)****4. (G31) AAT SIGNAL CIRCUIT OPEN**

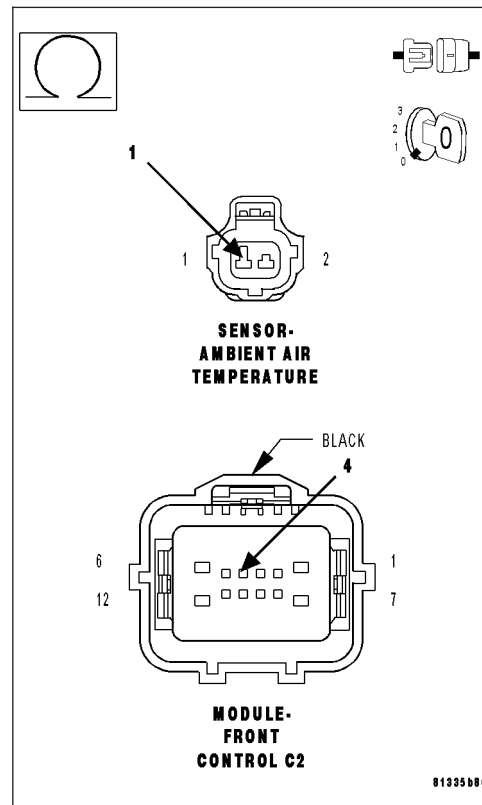
Turn the ignition off.

Measure the resistance of the (G31) AAT Signal circuit from the AAT Sensor harness connector to the C2 FCM harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (G31) AAT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

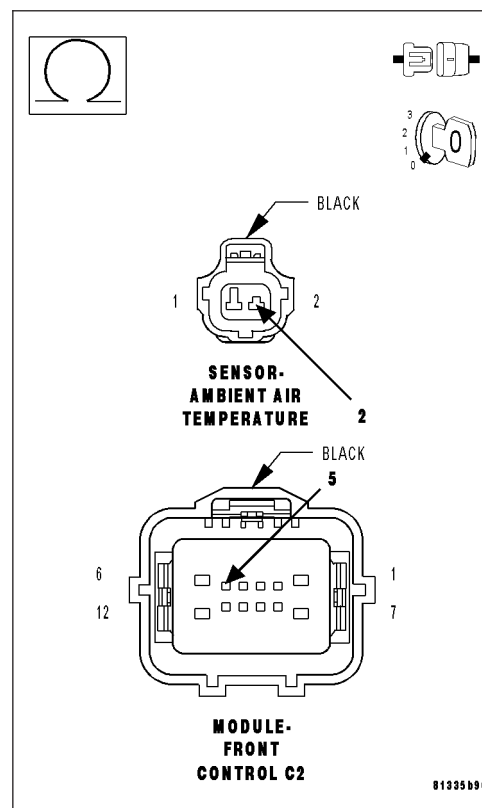
**5. (G931) SENSOR GROUND CIRCUIT OPEN**

Measure the resistance of the (G931) Sensor ground circuit from the AAT Sensor harness connector to the C2 FCM harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (G931) Sensor ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



**P0073–AMBIENT AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)****6. FRONT CONTROL MODULE**

**Note:** Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
            Perform BODY VERIFICATION TEST VER - 1.
- No**      >> Replace the Front Control Module per Service Information.  
            Perform BODY VERIFICATION TEST VER - 1.
-



**P0107-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine speed between 600 to 3500 RPM. Battery voltage greater than 10 volts.

- **Set Condition:**

The MAP sensor signal voltage is below 0.0782 of a volt for 1.7 seconds. One Trip Fault. Three good trips to turn off the MIL, (ETC light will flash.)

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT OPEN (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND (K1) MAP SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT MAP SENSOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. MAP SENSOR VOLTAGE BELOW 0.0782 OF A VOLT

Ignition on, engine not running.

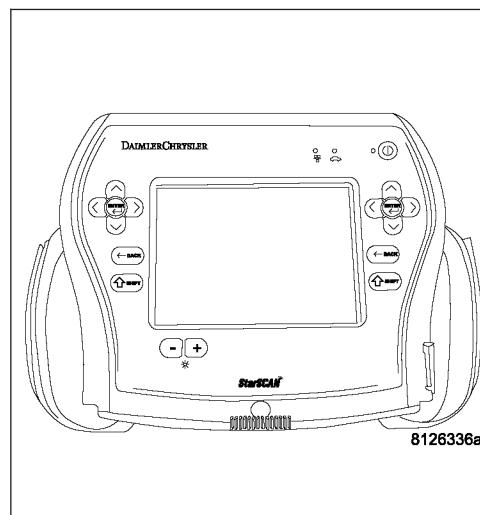
With a scan tool, read the MAP Sensor voltage.

**Is the voltage below 0.0782 of a volt?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0107-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)****2. (F856) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

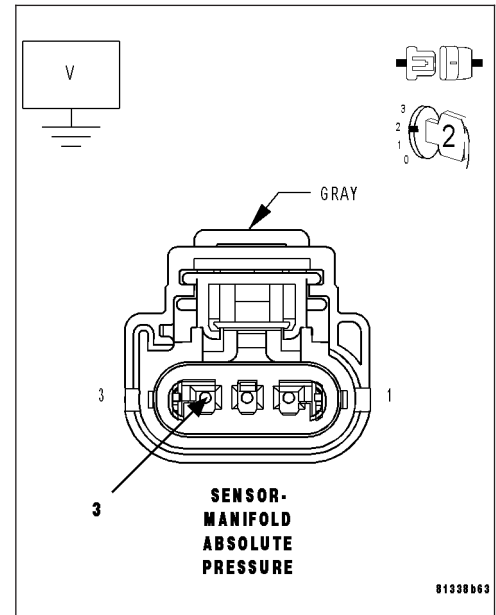
Ignition on, engine not running.

Measure the voltage on the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.

**Is the voltage between 4.5 to 5.2 volts?**

**Yes** >> Go To 3

**No** >> Go To 6

**3. MAP SENSOR**

With a scan tool, monitor the MAP Sensor voltage with the Sensor harness connector disconnected.

**Is the voltage above 4.5 volts?**

**Yes** >> Replace the MAP Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

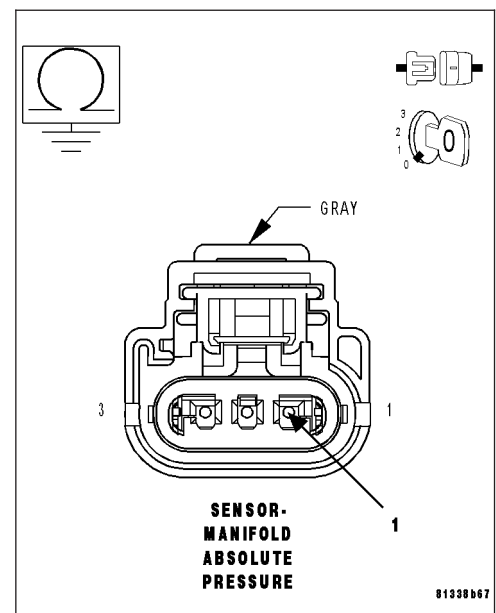
Disconnect the PCM harness connectors.

Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K1) MAP Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5



**P0107-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)****5. (K1) MAP SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT**

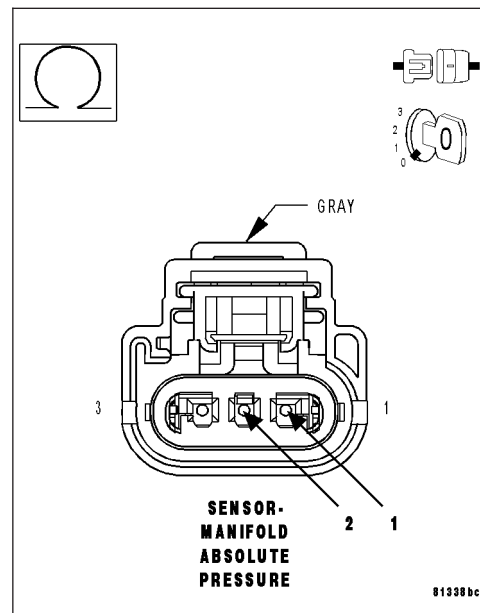
Measure the resistance between the (K1) MAP Signal circuit and the (K900) Sensor ground circuit in the MAP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K900) Sensor ground and the (K1) MAP Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

**6. (F856) 5-VOLT SUPPLY CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

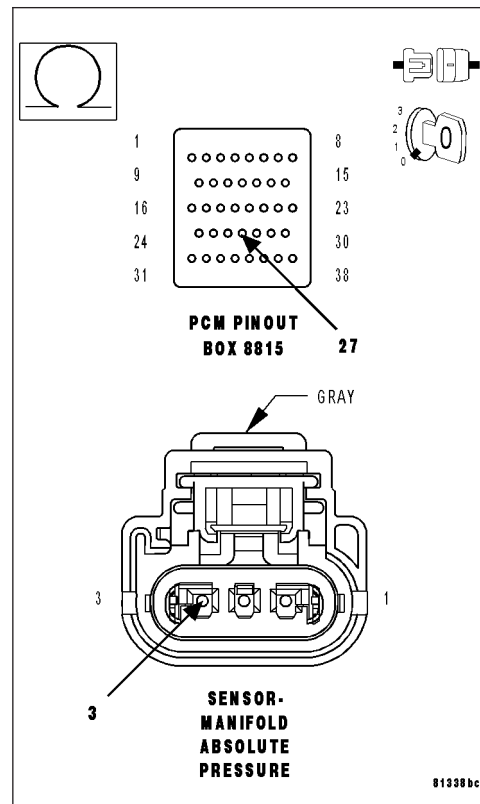
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (F856) 5-volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (F856) 5-volt Supply circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0107-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)****7. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

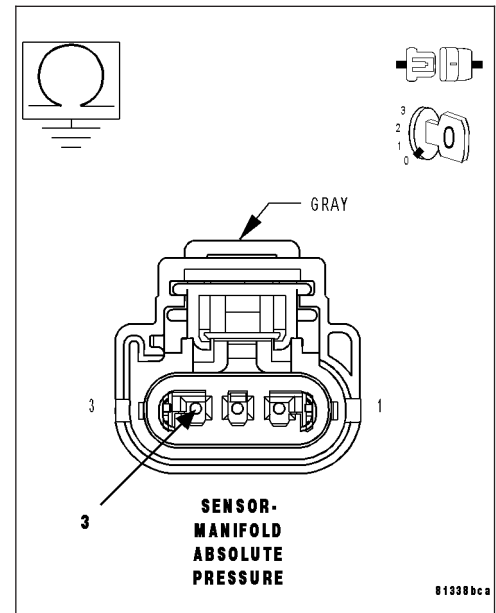
Measure the resistance between ground and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

**8. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

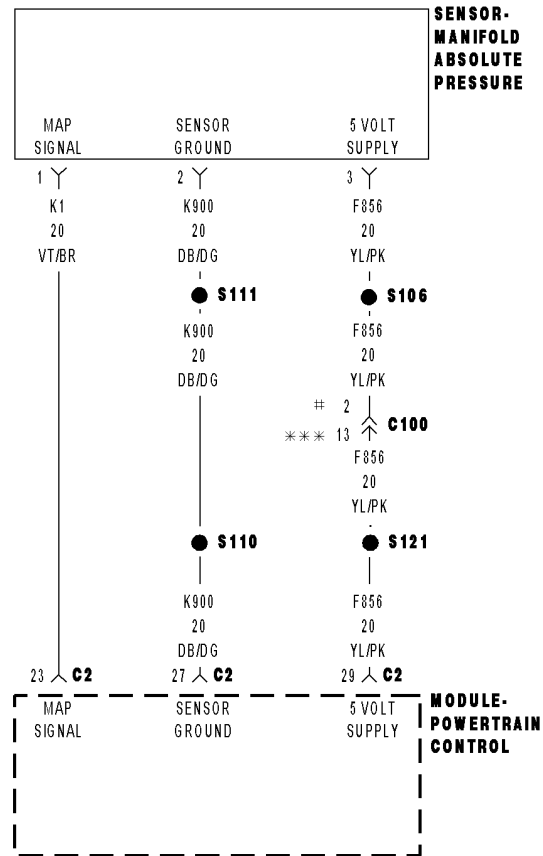
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

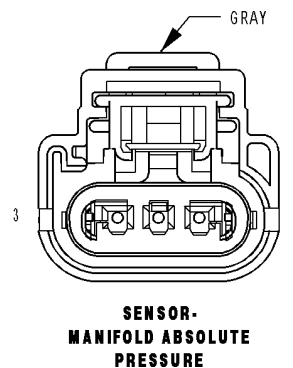
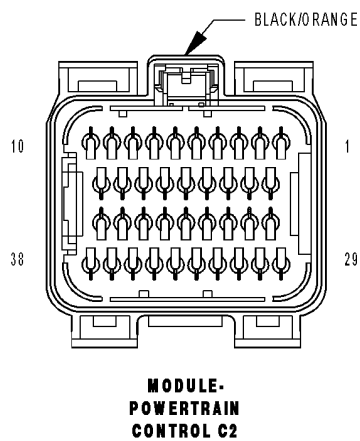
**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0108-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH**

2.7L/3.5L  
\*\*\* 5.7L



**P0108-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine speed between 600 to 3500 RPM. Battery voltage greater than 10.37 volts.

- **Set Condition:**

The MAP sensor signal voltage is greater than 4.92 volts for 3.0 seconds. One trip fault. Three good trips to turn off the MIL. (ETC light will flash).

Possible Causes
(K1) MAP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K1) MAP SIGNAL CIRCUIT OPEN
(K1) MAP SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT
(K900) SENSOR GROUND CIRCUIT OPEN
MAP SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. MAP SENSOR VOLTAGE ABOVE 4.92 VOLTS

Start the engine.

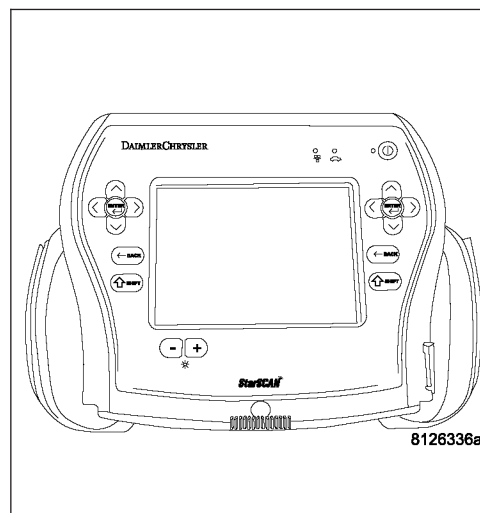
With a scan tool, read the MAP Sensor voltage.

**Is the voltage above 4.92 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0108-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)****2. MAP SENSOR**

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Connect a jumper wire between the (K1) MAP Signal circuit and the (K900) Sensor ground circuit in the Sensor harness connector.

Ignition on, engine not running.

With a scan tool, monitor the MAP Sensor voltage.

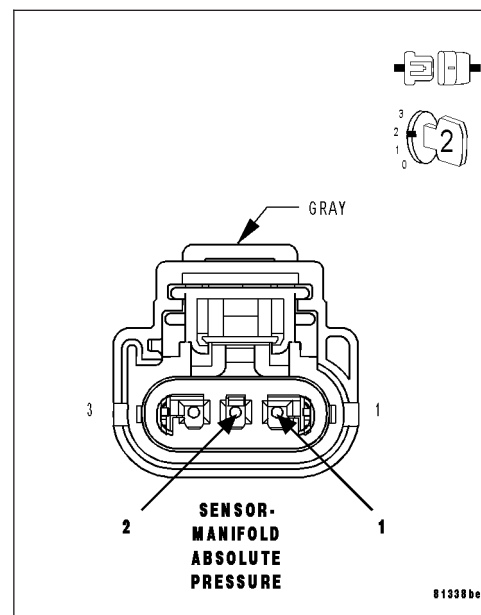
**Is the voltage below 1.0 volt with the jumper wire installed?**

**Yes** >> Replace the MAP Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**Note:** Remove the jumper wire before continuing.

**3. (K1) MAP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

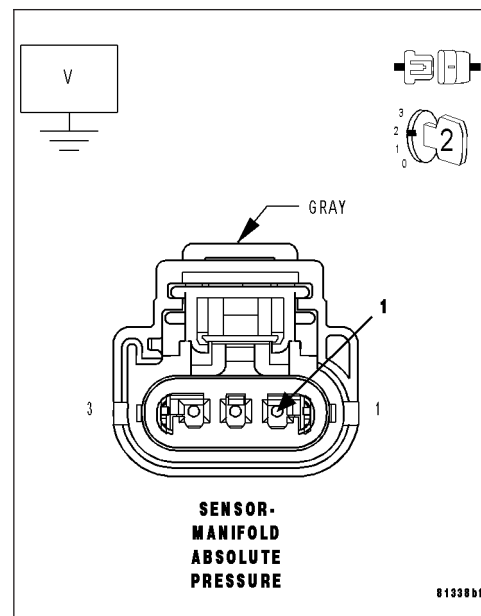
Measure the voltage on the (K1) MAP Signal circuit in the MAP Sensor harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (K1) MAP Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



## P0108-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

### 4. (K1) MAP SIGNAL CIRCUIT OPEN

Turn the ignition off.

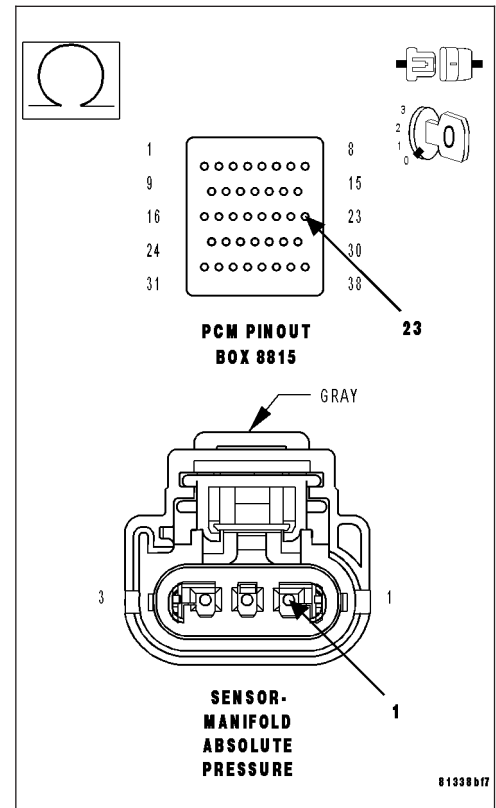
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K1) MAP Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



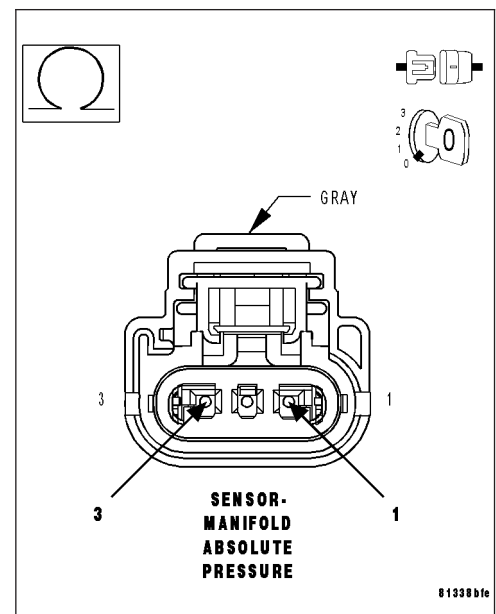
### 5. (K1) MAP SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT

Measure the resistance between the (K1) MAP Signal circuit and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (F856) 5-volt Supply circuit and the (K1) MAP Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



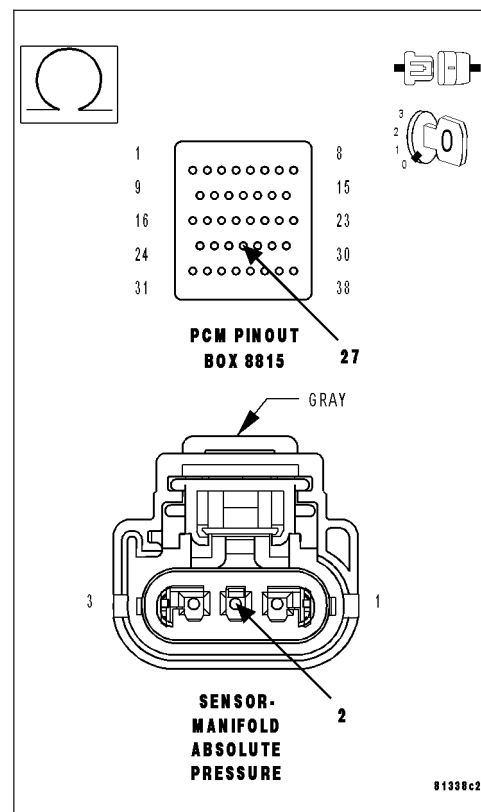
**P0108-MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)****6. (K900) SENSOR GROUND CIRCUIT OPEN**

Measure the resistance of the (K900) Sensor ground circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K900) Sensor ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

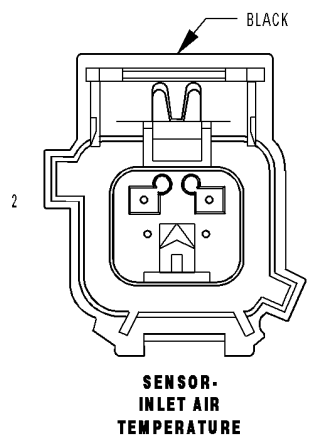
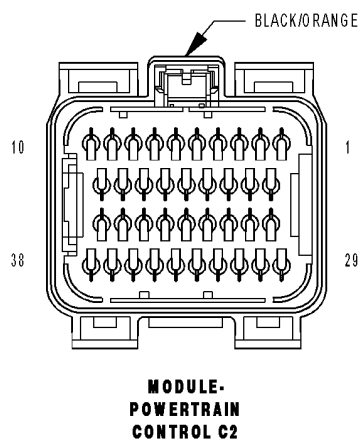
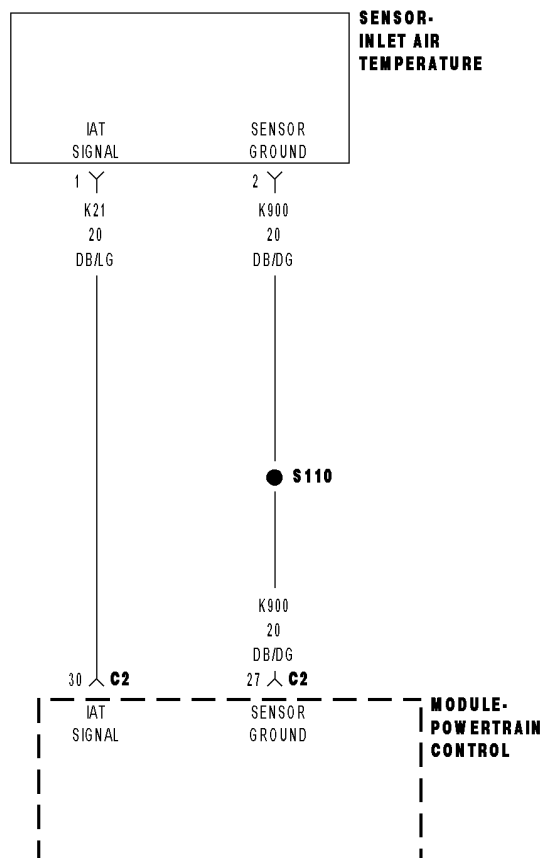
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0111-INTAKE AIR TEMPERATURE SENSOR RATIONALITY



**P0111-INTAKE AIR TEMPERATURE SENSOR RATIONALITY (CONTINUED)**

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The engine off time is greater than 480 minutes. Ambient Temperature if greater than 4 deg C (38 deg F).

- **Set Condition:**

After a calibrated amount of cool down time, the PCM compares the ECT Sensor, IAT Sensor and the Ambient Air Temperature Sensor values. If the IAT Sensor value is not within calibrated temperature amount of the other two temperature sensors an error is detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K21) IAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K21) IAT SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
(K21) IAT SIGNAL CIRCUIT SHORTED TO GROUND
(K21) IAT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND
INTAKE AIR TEMPERATURE SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

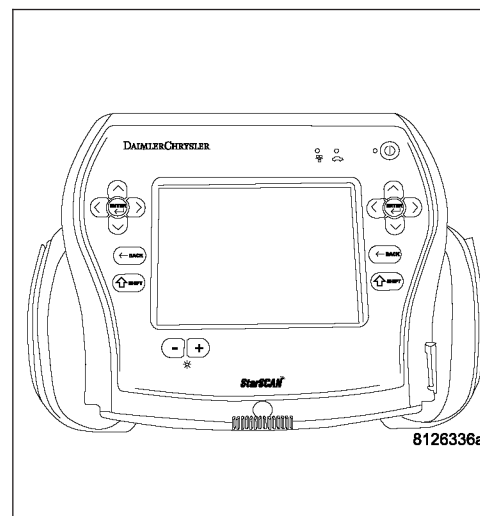
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0111-INTAKE AIR TEMPERATURE SENSOR RATIONALITY (CONTINUED)****2. (K21) IAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect the IAT Sensor harness connector.

**Note: Visually inspect both the component and the PCM connectors. Look for damaged, partially broken wires, and backed out or corroded terminals.**

Ignition on, engine not running.

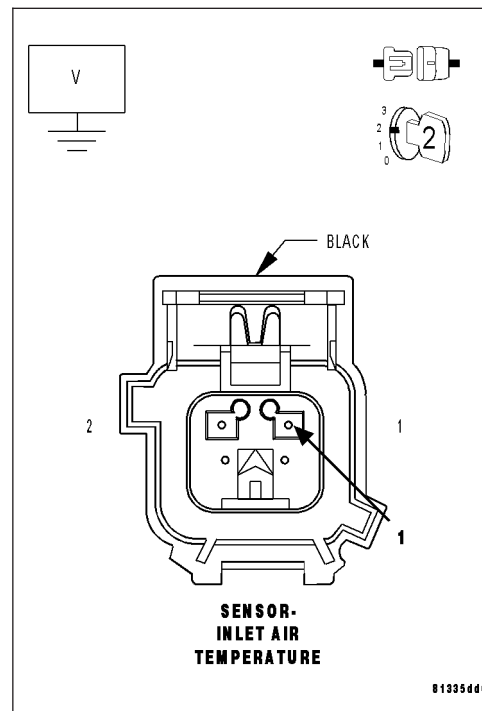
Measure the voltage on the (K21) IAT Signal circuit in the IAT Sensor harness connector.

**Is voltage present?**

**Yes** >> Repair the short to battery voltage in the (K21) IAT Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. IAT SENSOR VOLTAGE ABOVE 4.6 VOLTS**

Turn the ignition off.

Connect the PCM harness connectors.

Ignition on, engine not running.

With a scan tool, read the IAT voltage.

**Is the voltage above 4.6 volts?**

**Yes** >> Go To 4

**No** >> Go To 7



**P0111-INTAKE AIR TEMPERATURE SENSOR RATIONALITY (CONTINUED)****4. IAT SENSOR**

Connect a jumper wire between the (K21) IAT Signal circuit and the (K900) Sensor ground circuit in the IAT Sensor harness connector. With a scan tool, read the IAT voltage.

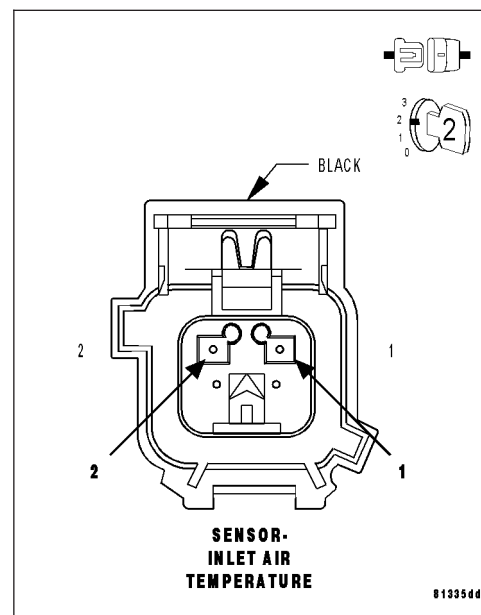
**Is the voltage below 1.0 volt with the jumper wire installed?**

**Yes** >> Replace the IAT Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**Note:** Remove the jumper wire before continuing.

**5. (K21) IAT SIGNAL CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

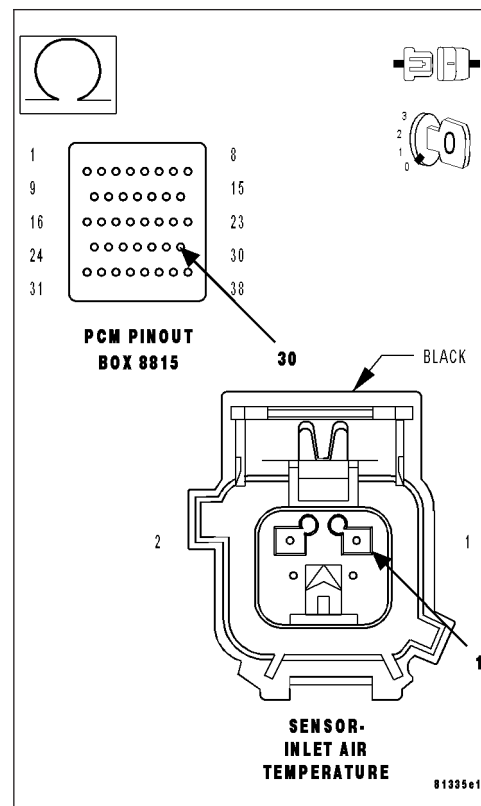
Measure the resistance of the (K21) IAT Signal circuit from the IAT Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K21) IAT Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0111-INTAKE AIR TEMPERATURE SENSOR RATIONALITY (CONTINUED)

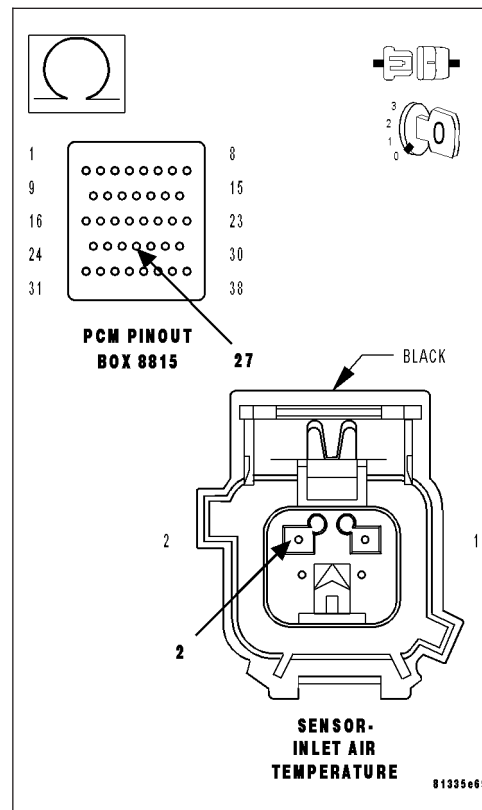
### 6. (K900) SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (K900) Sensor ground circuit from the IAT Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the open in the (K900) Sensor ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 7. (K21) IAT SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

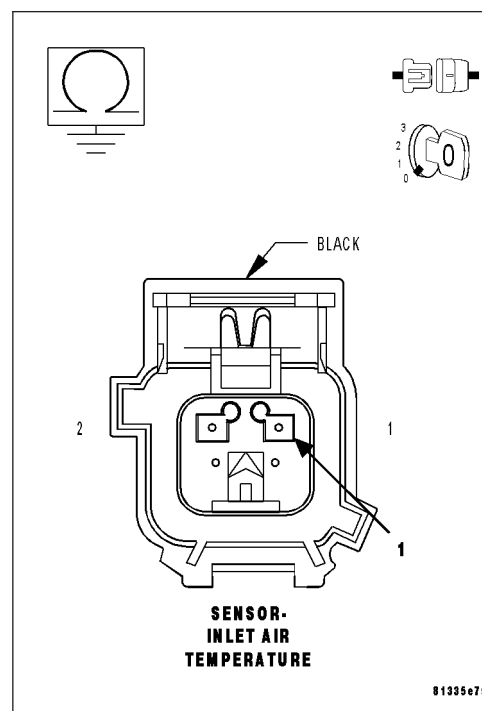
Disconnect the PCM harness connectors.

Measure the resistance between ground and the (K21) IAT Signal circuit in the IAT Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K21) IAT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P0111-INTAKE AIR TEMPERATURE SENSOR RATIONALITY (CONTINUED)****8. (K21) IAT SIGNAL SHORTED TO THE (K900) SENSOR GROUND**

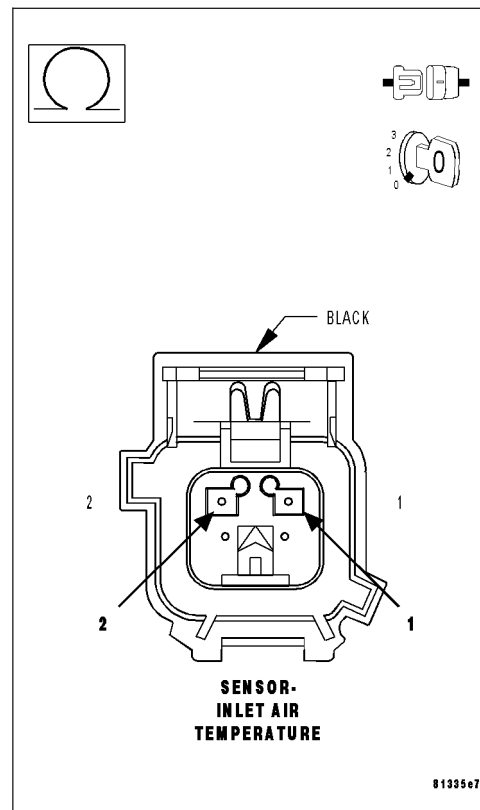
Measure the resistance between the (K21) IAT Signal circuit and the (K900) Sensor ground circuit in the IAT Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (K900) Sensor ground and the (K21) IAT Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 9

**9. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

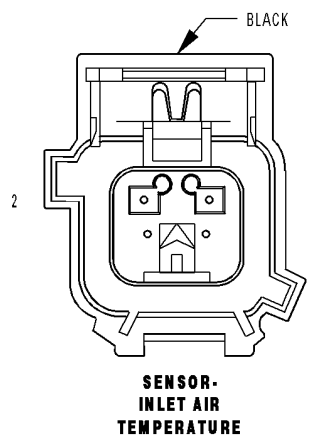
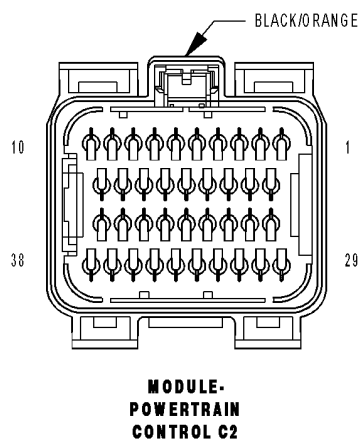
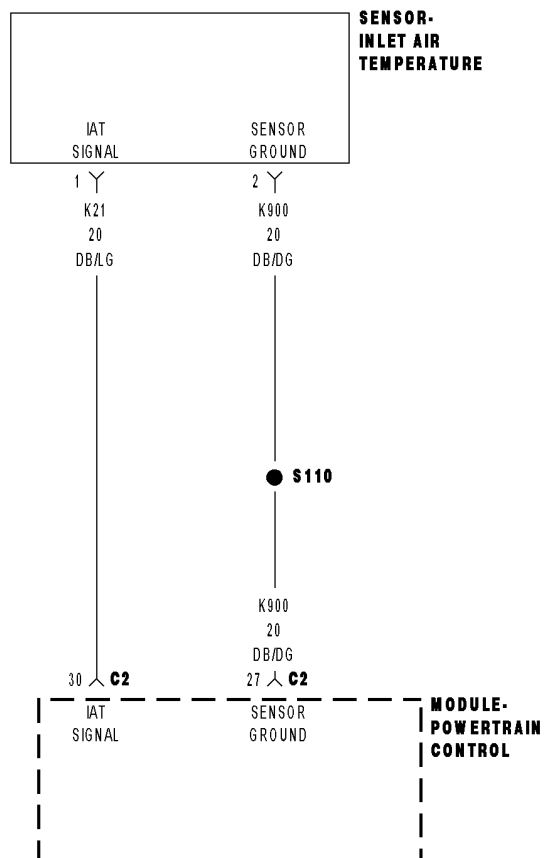
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0112-INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW



**P0112-INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)**

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on and battery voltage greater than 10.4 volts.

- **Set Condition:**

When the Inlet Air Temp Sensor Signal circuit voltage is less than .078 volt for more than 2.8 seconds. One trip failure. Three good trips to clear the MIL.

Possible Causes
(K21) IAT SENSOR SIGNAL SHORTED TO GROUND (K21) IAT SENSOR SIGNAL SHORTED TO (K900) SENSOR GROUND CIRCUIT INTAKE AIR TEMPERATURE SENSOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. IAT SENSOR VOLTAGE BELOW 0.078 OF A VOLT

Ignition on, engine not running.

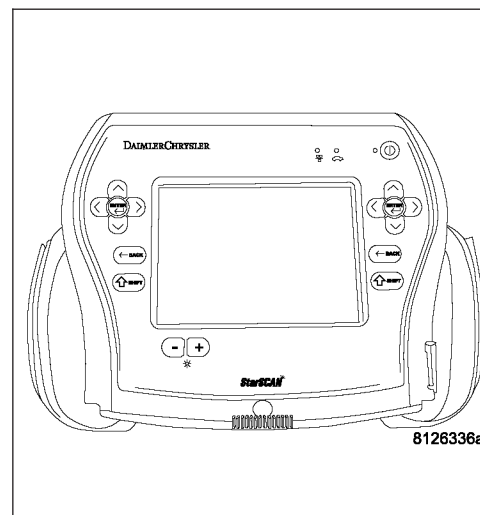
With a scan tool, read the IAT voltage.

**Is the voltage below 0.078 of a volt?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 2. IAT SENSOR

Turn the ignition off.

Disconnect the IAT Sensor harness connector.

Ignition on, engine not running.

With a scan tool, read IAT voltage.

**Is the voltage above 4.5 of a volts?**

**Yes** >> Replace the Intake Air Temperature Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**P0112-INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)****3. (K21) IAT SENSOR SIGNAL SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

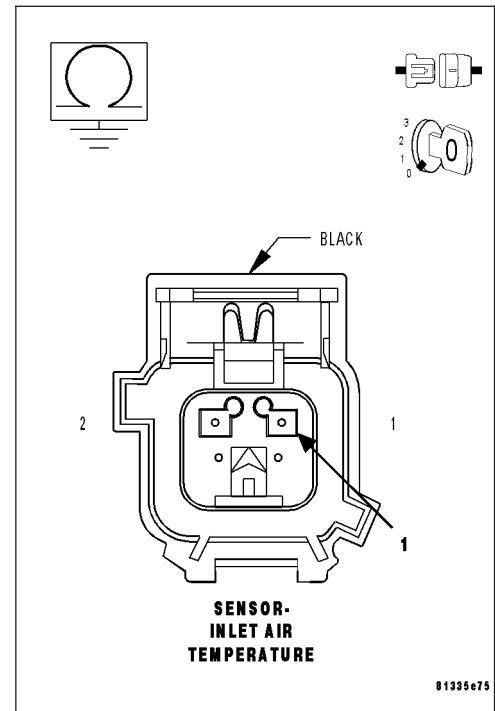
Measure the resistance between ground and the (K21) IAT Sensor Signal circuit in the IAT Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K21) IAT Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (K21) IAT SENSOR SIGNAL SHORTED TO THE (K900) SENSOR GROUND CIRCUIT**

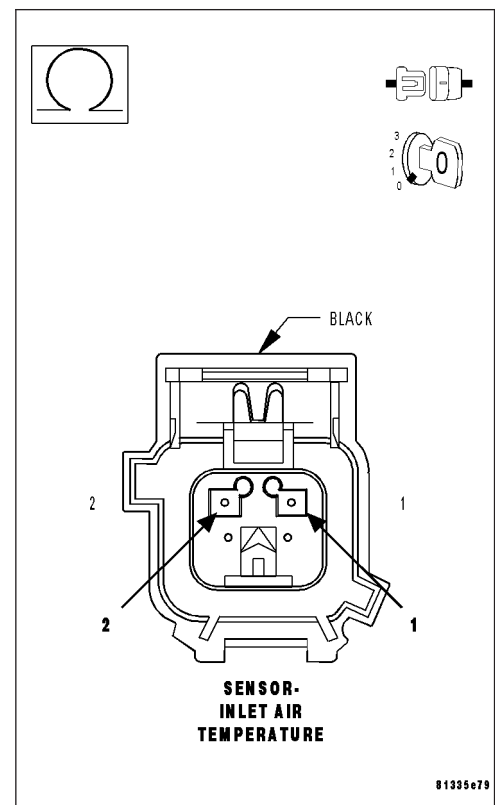
Measure the resistance between the (K21) IAT Sensor Signal circuit and the (K900) Sensor ground circuit in the IAT Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K900) Sensor ground circuit and the (K21) IAT Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5



**P0112-INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)****5. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

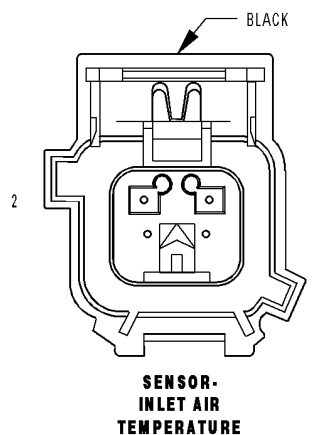
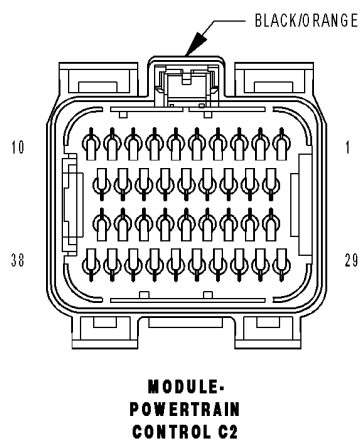
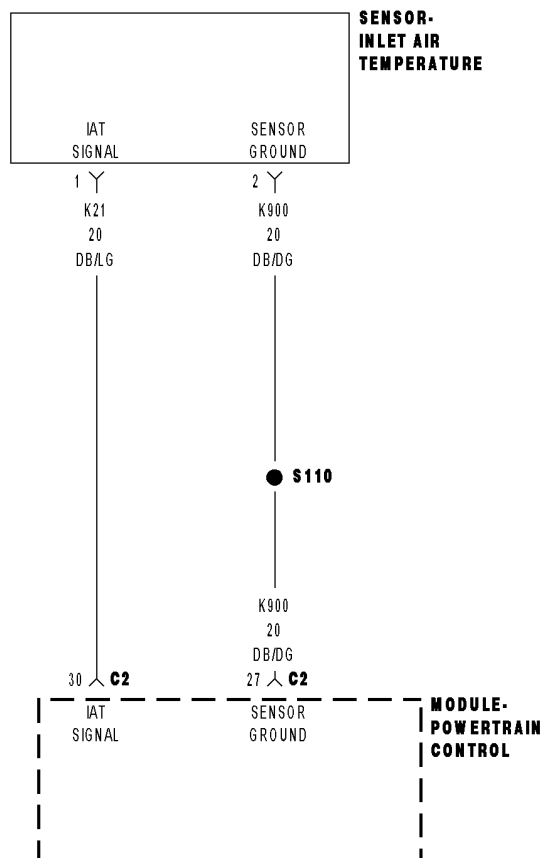
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0113-INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH





P0113-INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

For the Engine System Schematic circuit diagram. (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**  
The Intake Air Temperature (IAT) sensor circuit voltage at the PCM goes above 4.98 volts for 2.8 seconds.  
One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K21) IAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE (K21) IAT SIGNAL CIRCUIT OPEN (K900) SENSOR GROUND CIRCUIT OPEN IAT SENSOR PCM

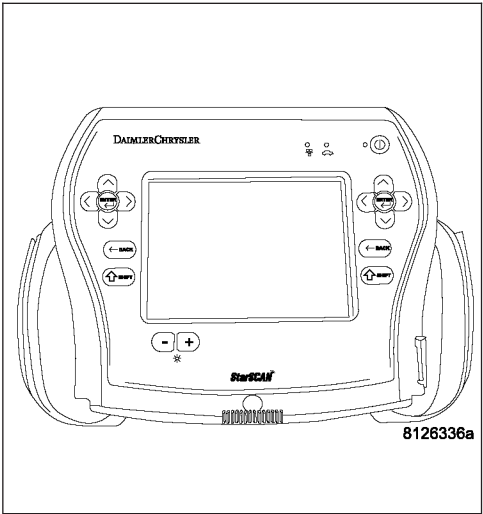
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. IAT SENSOR VOLTAGE ABOVE 4.98 VOLTS

Ignition on, engine not running.  
With a scan tool, read the Intake Air Temperature Sensor voltage.

- Is the voltage above 4.98 volts?
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0113-INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)****2. IAT SENSOR**

Turn the ignition off.

Disconnect the Intake Air Temperature Sensor harness connector.

Connect a jumper wire between the (K21) IAT Signal circuit and the (K900) Sensor ground circuit in the IAT Sensor harness connector.

Ignition on, engine not running.

With a scan tool, read the IAT Sensor voltage.

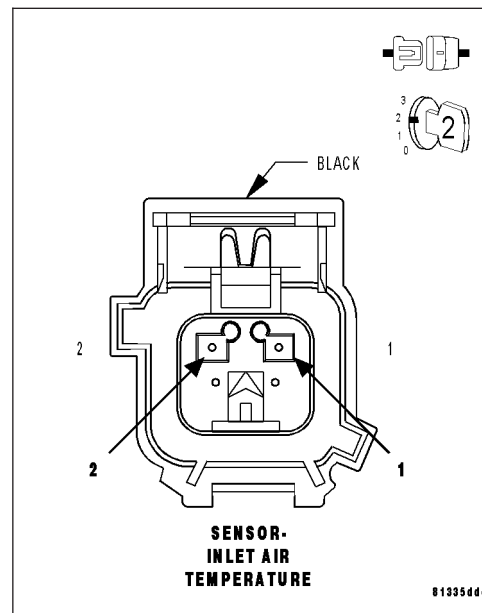
**Is the voltage below 1.0 volt with the jumper wire installed?**

**Yes** >> Replace the IAT Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**Note:** Remove the jumper wire before continuing.

**3. (K21) IAT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Ignition on, engine not running.

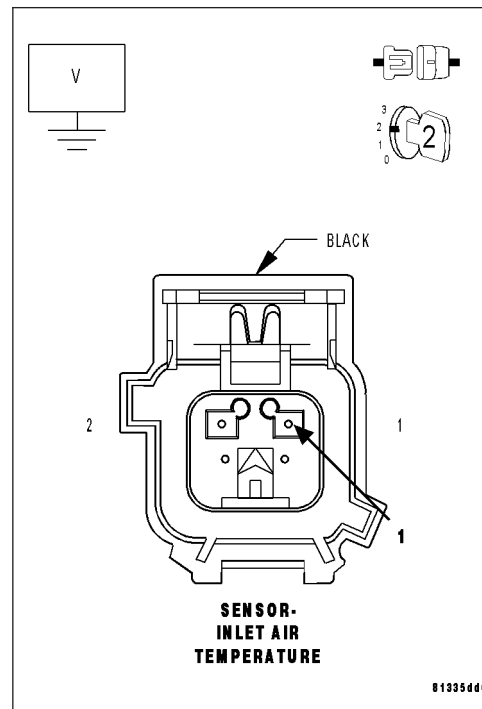
Measure the voltage on the (K21) IAT Signal circuit in the IAT Sensor harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (K21) IAT Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P0113-INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)****4. (K21) IAT SIGNAL CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connector.

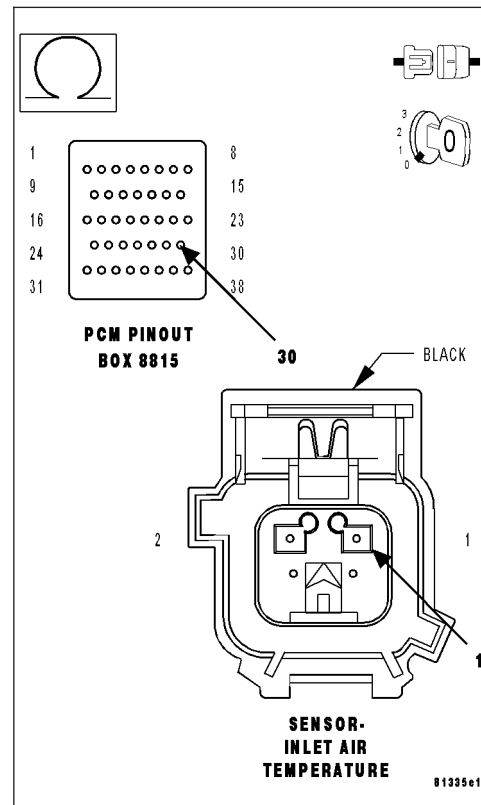
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K21) IAT Signal circuit from the IAT Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K21) IAT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

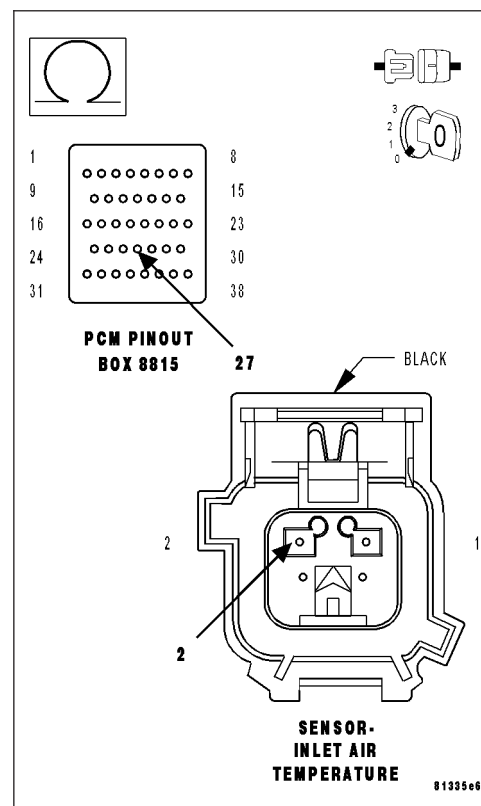
**5. (K900) SENSOR GROUND CIRCUIT OPEN**

Measure the resistance of the (K900) Sensor ground circuit from the IAT Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K900) Sensor ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0113-INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)****6. PCM**

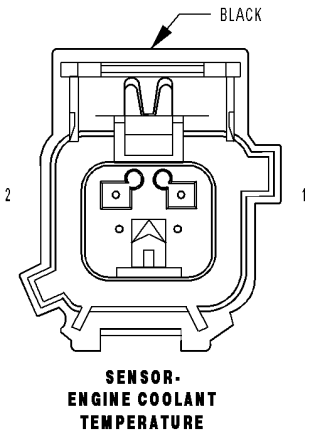
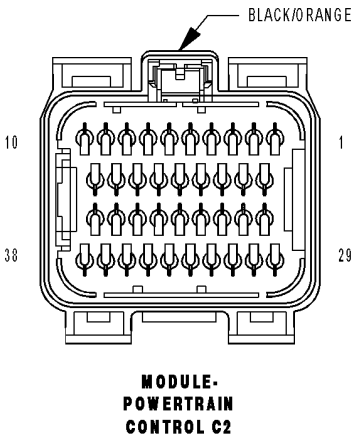
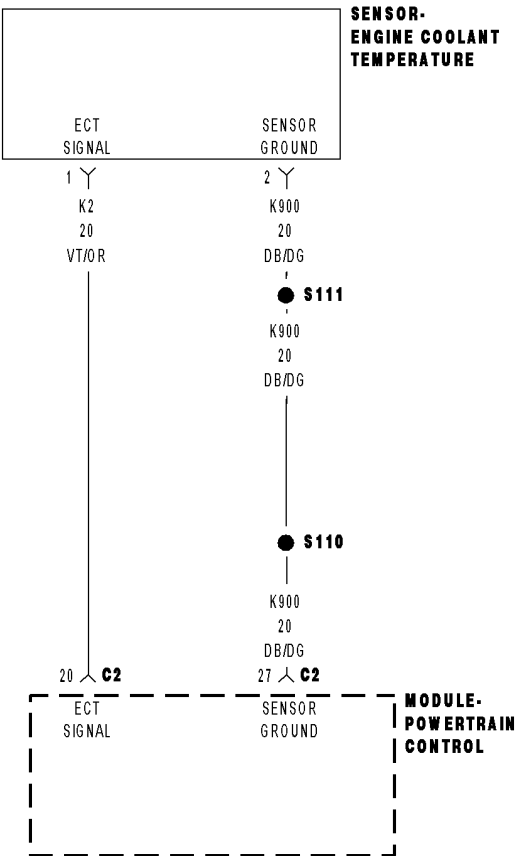
**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
-

P0116-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT PERFORMANCE



## P0116-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT PERFORMANCE (CONTINUED)

For the Engine System Schematic circuit diagram. (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Engine off time is greater than 480 minutes. Ambient temperature is greater than 4 deg C (38 deg F).
- **Set Condition:**  
After a calibrated amount of cool down time, the PCM compares the ECT Sensor, IAT Sensor and the Ambient Air Temperature Sensor values. If the ECT Sensor value is not within calibrated temperature amount of the other two temperature sensors an error is detected. Two Trip Fault. Three good trips to turn off the MIL. (ETC lamp will illuminate with the MIL.)

Possible Causes
(K2) ECT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE (K2) ECT SIGNAL CIRCUIT OPEN (K900) SENSOR GROUND CIRCUIT OPEN (K2) ECT SIGNAL CIRCUIT SHORTED TO GROUND (K2) ECT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND ECT SENSOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

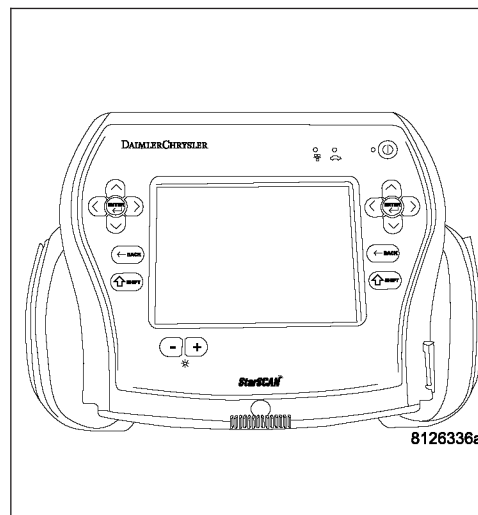
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0116-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT PERFORMANCE (CONTINUED)****2. (K2) ECT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect the ECT Sensor harness connector.

**Note: Visually inspect both the component and the PCM connectors. Look for damaged, partially broken wires, and backed out or corroded terminals.**

Ignition on, engine not running.

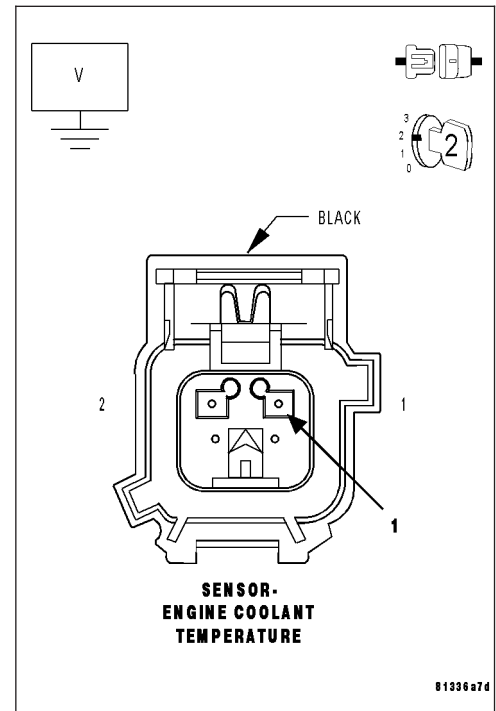
Measure the voltage on the (K2) ECT Signal circuit in the ECT Sensor harness connector.

**Is voltage present?**

**Yes** >> Repair the short to battery voltage in the (K2) ECT Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. ECT SENSOR VOLTAGE ABOVE 4.6 VOLTS**

Turn the ignition off.

Connect the PCM harness connectors.

Ignition on, engine not running.

With a scan tool, read the ECT voltage.

**Is the voltage above 4.6 volts?**

**Yes** >> Go To 4

**No** >> Go To 7

## P0116-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT PERFORMANCE (CONTINUED)

### 4. ECT SENSOR

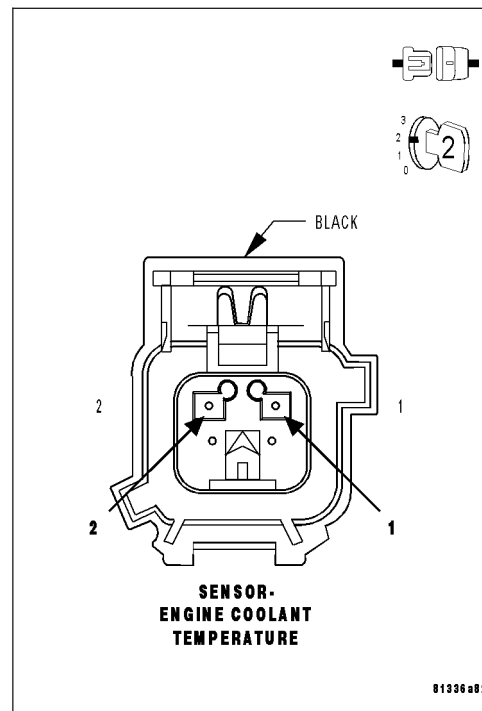
Connect a jumper wire between the (K2) ECT Signal circuit and the (K900) Sensor ground circuit in the ECT Sensor harness connector. With a scan tool, read the ECT voltage.

**Is the voltage below 1.0 volt with the jumper wire installed?**

**Yes** >> Replace the ECT Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5



**Note:** Remove the jumper wire before continuing.

### 5. (K2) ECT SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

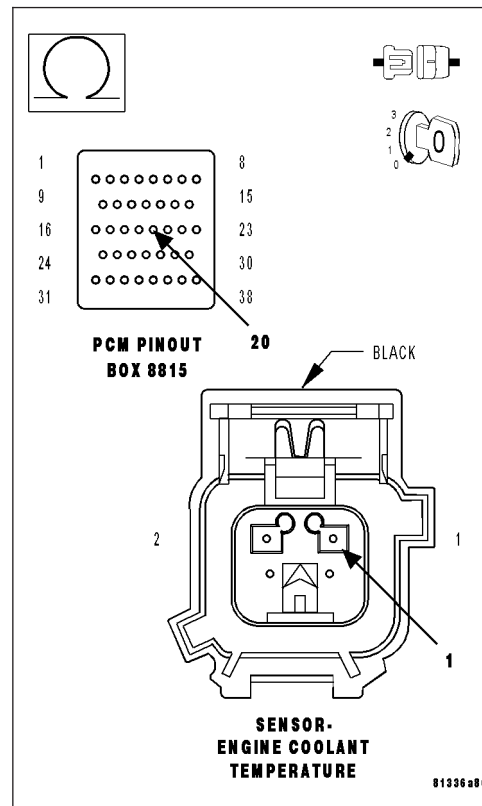
Measure the resistance of the (K2) ECT Signal circuit from the ECT Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K2) ECT Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





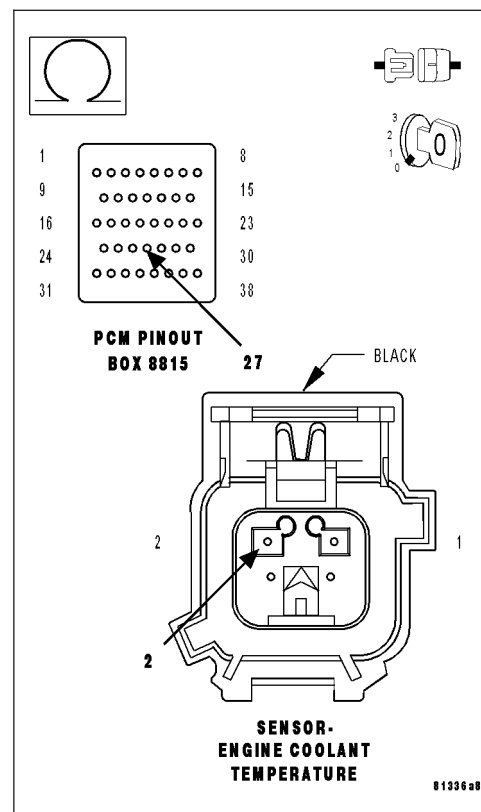
**P0116-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT PERFORMANCE (CONTINUED)****6. (K900) SENSOR GROUND CIRCUIT OPEN**

Measure the resistance of the (K900) Sensor ground circuit from the ECT Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the open in the (K900) Sensor ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. (K2) ECT SIGNAL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

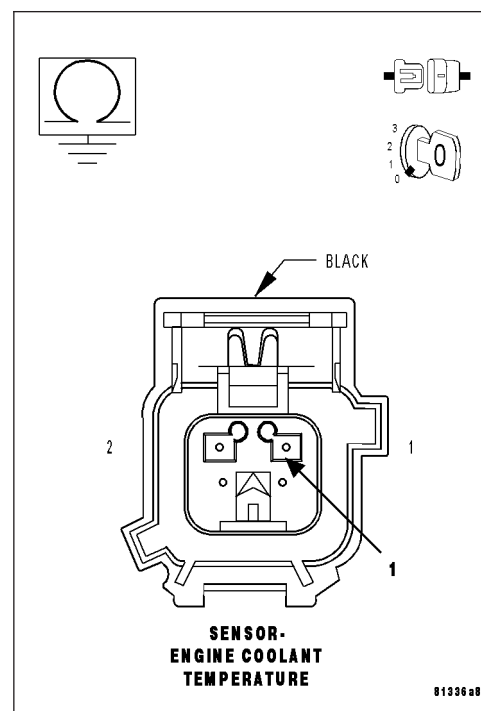
Disconnect the PCM harness connectors.

Measure the resistance between ground and the (K2) ECT Signal circuit in the ECT Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K2) ECT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P0116-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT PERFORMANCE (CONTINUED)****8. (K2) ECT SIGNAL SHORTED TO THE (K900) SENSOR GROUND**

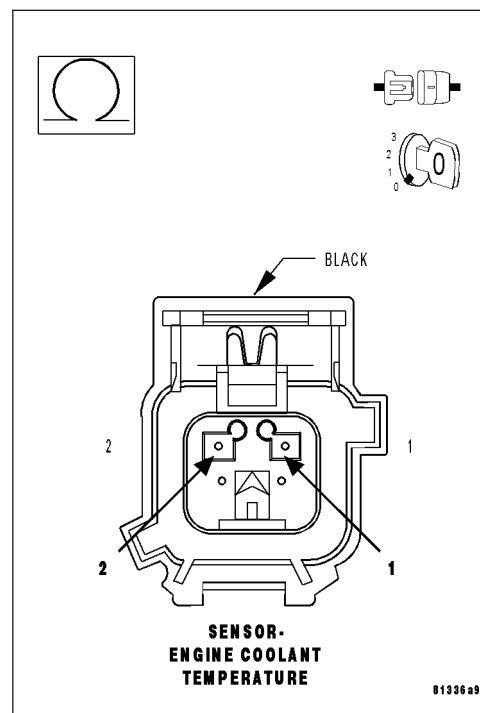
Measure the resistance between the (K2) ECT Signal circuit and the (K900) Sensor ground circuit in the ECT Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (K900) Sensor ground and the (K2) ECT Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 9

**9. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

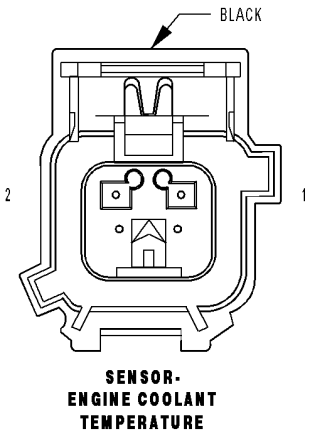
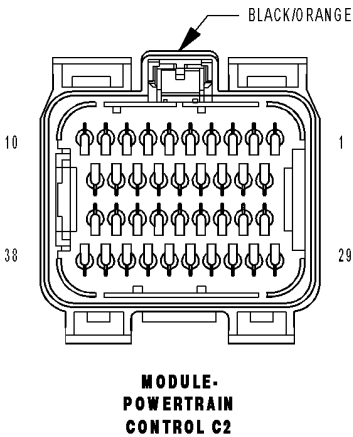
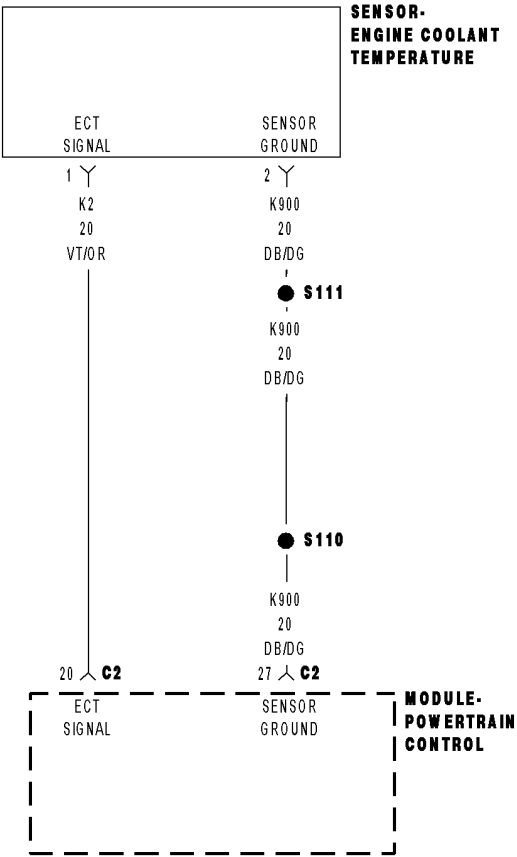
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

P0117-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW



## P0117-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**  
The Engine Coolant Temperature (ECT) sensor circuit voltage at the PCM is less than 0.078 of a volt for more than 2.8 seconds. One Trip Fault. Three good trips to clear the MIL.

Possible Causes
(K2) ECT SIGNAL CIRCUIT SHORTED TO GROUND (K2) ECT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND ECT SENSOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

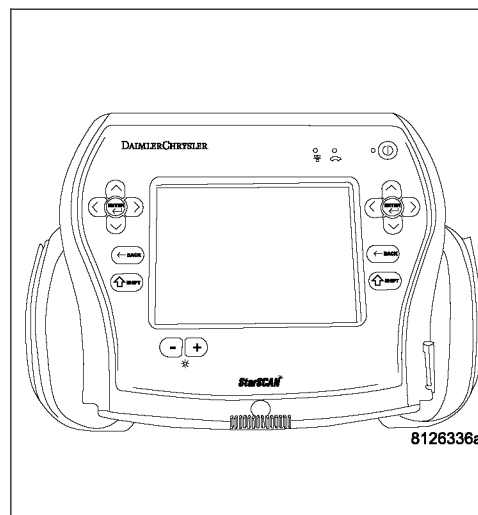
### 1. ECT SENSOR VOLTAGE BELOW 0.078 OF A VOLT

Ignition on, engine not running.

With a scan tool, read the ECT voltage.

**Is the voltage below 0.078 of a volt?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 2. ECT SENSOR

Turn the ignition off.

Disconnect the ECT harness connector.

Ignition on, engine not running.

With a scan tool, read ECT voltage.

**Is the voltage above 1.0 volt?**

- Yes** >> Replace the ECT Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 3

**P0117-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)****3. (K2) ECT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

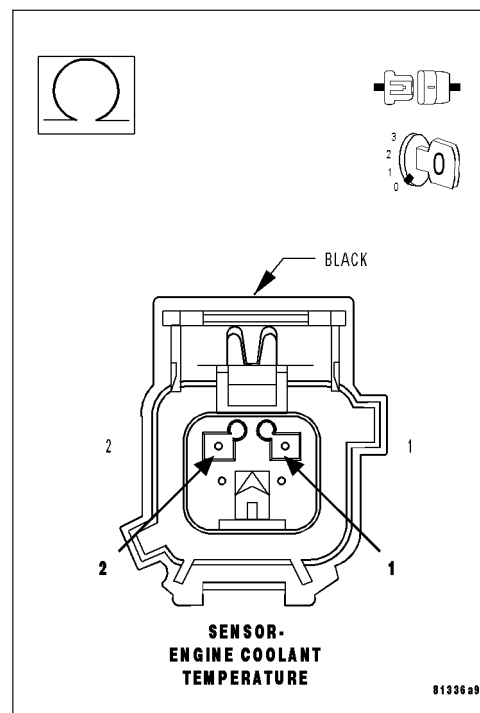
Measure the resistance between the (K900) Sensor ground circuit and the (K2) ECT Signal circuit in the ECT Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short to between the (K900) Sensor ground circuit and the (K2) ECT Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

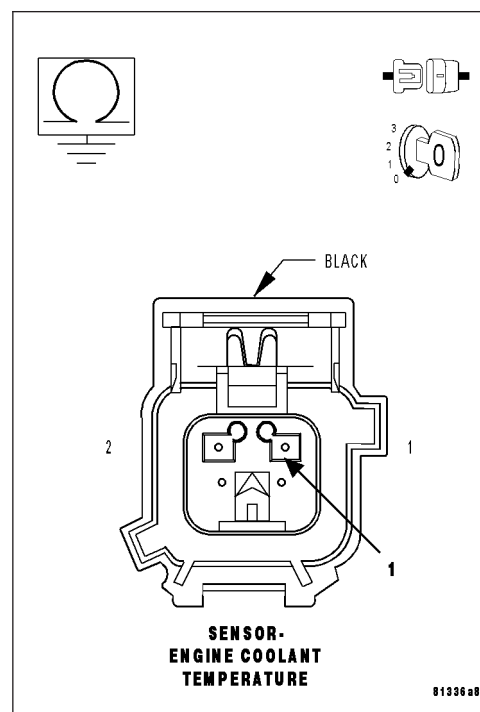
**4. (K2) ECT SIGNAL CIRCUIT SHORTED GROUND**

Measure the resistance between ground and the (K2) ECT Signal circuit in the ECT Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K2) ECT Signal circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5



**P0117-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)****5. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

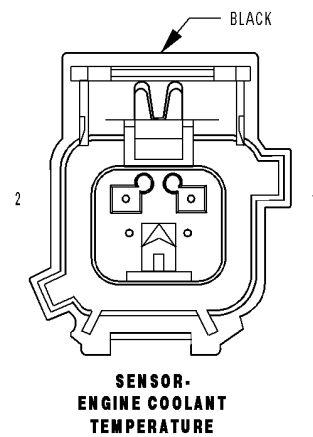
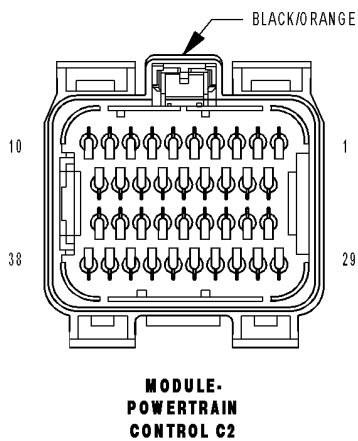
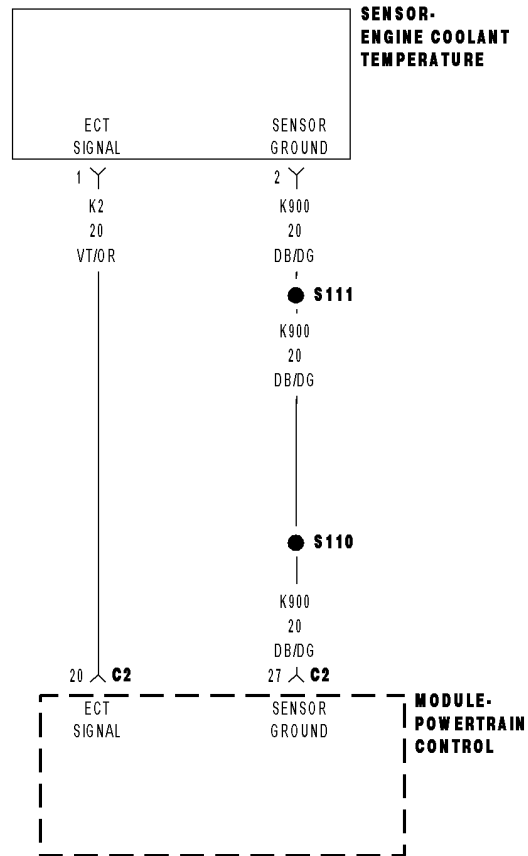
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**P0118-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH**

**P0118-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)**

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on. Battery voltage greater than 10.4 volts.

- **Set Condition:**

The Engine Coolant Temperature (ECT) sensor circuit voltage at the PCM is greater than 4.98 volts for more than 2.8 seconds. One Trip Fault. Three good trips to turn off the MIL. (ETC lamp will illuminate with the MIL.)

Possible Causes
(K2) ECT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K2) ECT SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
ECT SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. ECT SENSOR VOLTAGE ABOVE 4.98 VOLTS

Ignition on, engine not running.

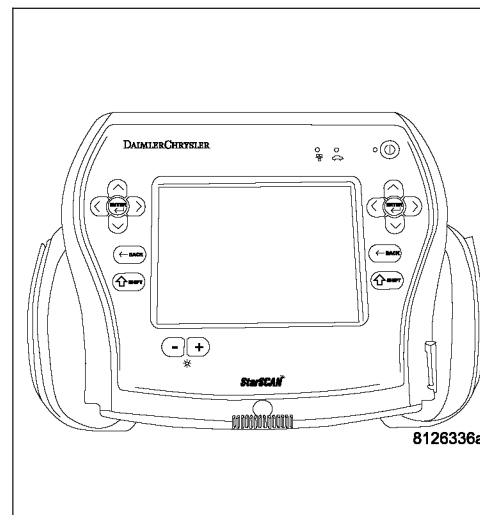
With a scan tool, read the ECT voltage.

**Is the voltage above 4.98 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





**P0118-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)****2. ECT SENSOR**

Turn the ignition off.

Disconnect the ECT harness connector.

Connect a jumper wire between the (K2) ECT Signal circuit and the (K900) Sensor ground circuit in the ECT harness connector.

Ignition on, engine not running.

With a scan tool, read ECT voltage.

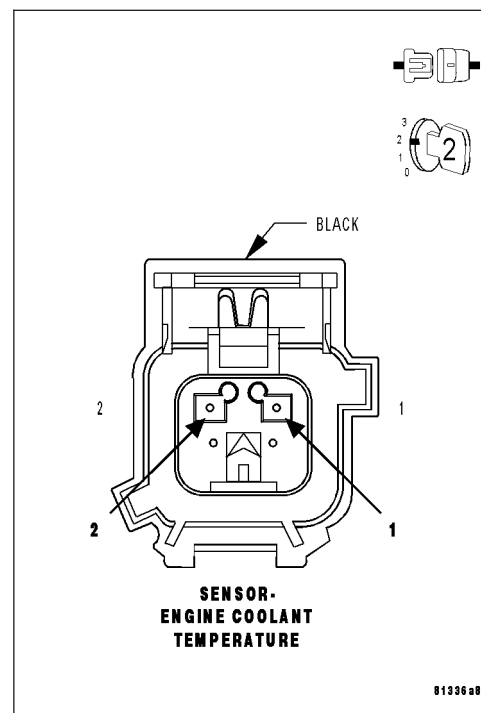
**Is the voltage below 1.0 volt with the jumper wire installed?**

**Yes** >> Replace the ECT Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**Note:** Remove the jumper wire before continuing.

**3. (K2) ECT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

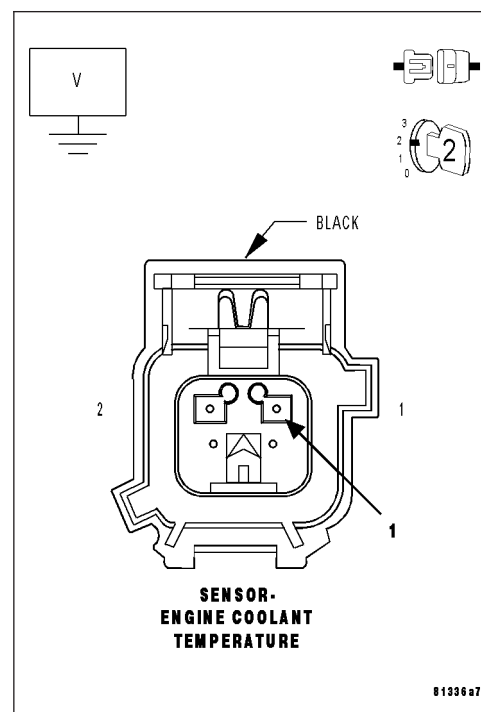
Measure the voltage on the (K2) ECT Signal circuit in the ECT Sensor harness connector.

**Is voltage present?**

**Yes** >> Repair the short to battery voltage in the (K2) ECT Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



## P0118-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)

### 4. (K2) ECT SIGNAL CIRCUIT OPEN

Turn the ignition off.

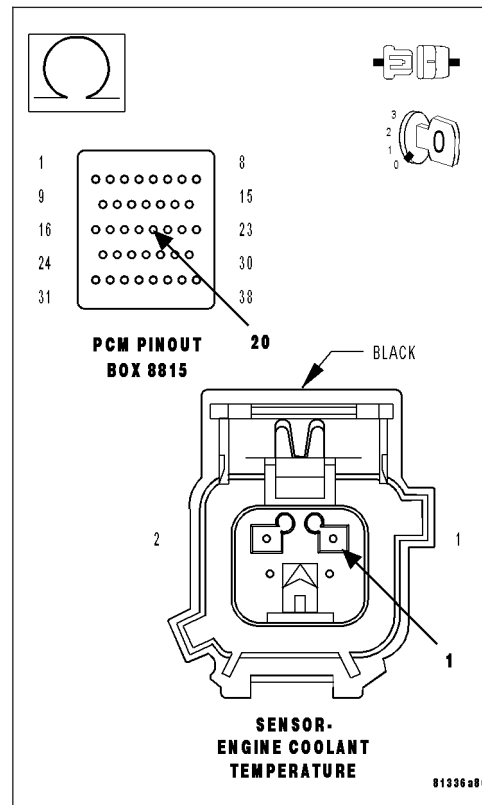
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K2) ECT Signal circuit from the ECT Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K2) ECT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



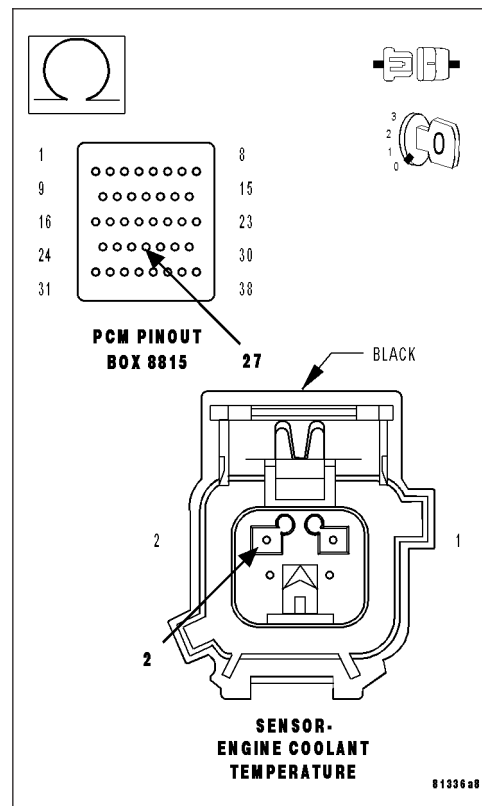
### 5. (K900) SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (K900) Sensor ground circuit from the ECT Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K900) Sensor ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0118-ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)****6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

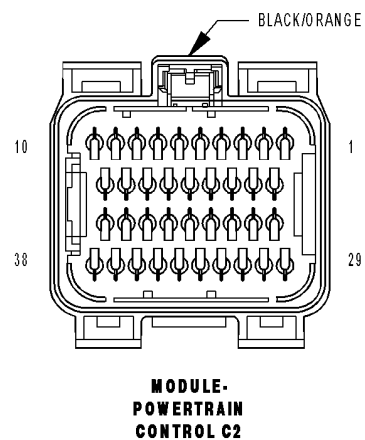
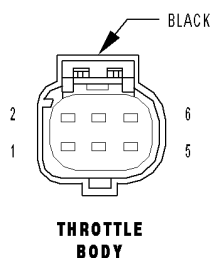
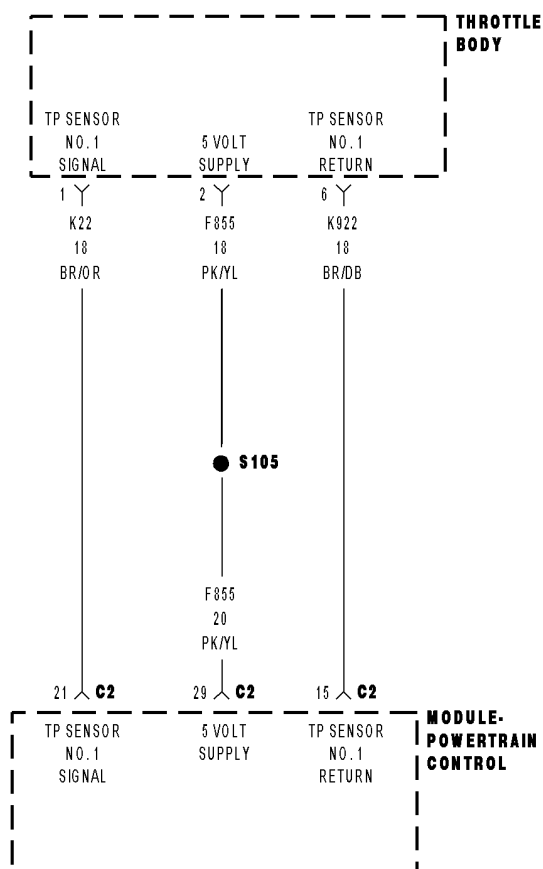
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE



P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Ignition on and No MAP Sensor DTCs set.
- **Set Condition:**  
TP Sensor signals do not correlate to the MAP Sensor signal. One Trip Fault. ETC light will illuminate. P2135 should set with this code also.

Possible Causes
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE RESISTANCE IN THE (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND RESISTANCE IN (F855) 5-VOLT SUPPLY CIRCUIT (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO (K122) TP SENSOR NO.2 SIGNAL CIRCUIT THROTTLE POSITION SENSOR/THROTTLE BODY PCM

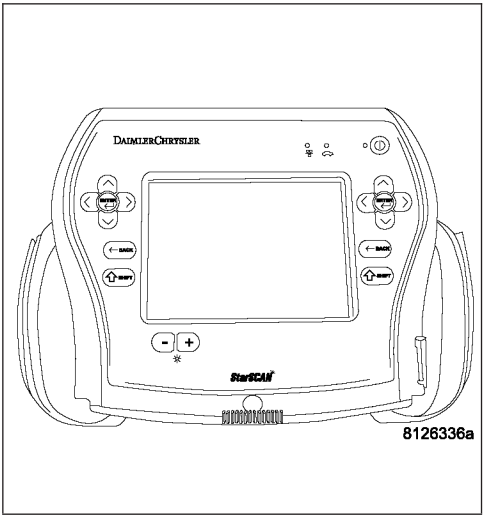
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

- Note:** Diagnose any other TP Sensor DTC(s) before continuing.
- Note:** The throttle plate should be free from binding and carbon build up, make sure the throttle plate is at the idle position.  
Ignition on, engine not running.
- Note:** Inspect the engine for vacuum leaks, repair before continuing.
- With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes**    >> Go To 2
- No**     >> Go To 11



**P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)****2. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect the Throttle Body harness connector.

Ignition on, engine not running.

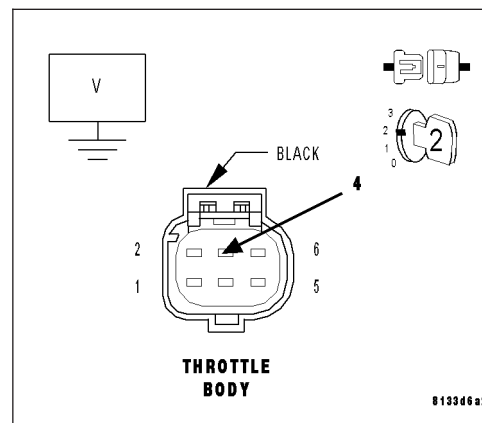
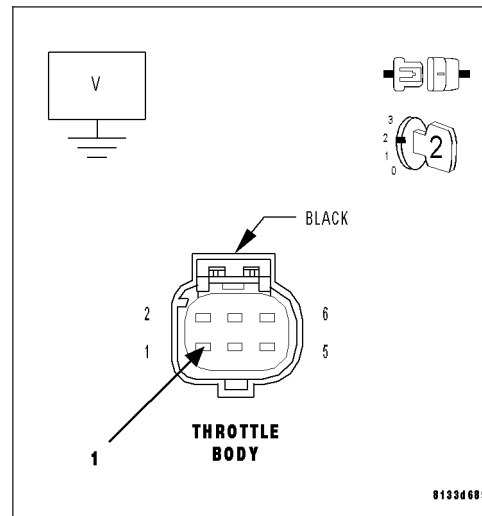
Measure the voltage on the (K22) TP No.1 Signal and the (K122) TP No.2 Signal circuits in the Throttle Body harness connector.

**Is the voltage above 0 volts?**

**Yes** >> Repair the short to battery voltage in the (K22) TP Sensor No.1 or (K122) TP Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3



**P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)****3. THROTTLE POSITION SENSOR**

Turn the ignition off.

Connect the PCM harness connectors.

Ignition on, engine not running.

With a scan tool, monitor the TP Sensor No.1 and No.2 voltage.

Connect a jumper wire between the (K922) Sensor Return circuit and the (K22) TP Sensor No.1 Signal circuit.

**Note: TP Sensor No.1 voltage should change from approximately 4.5 volts to less than 0.5 of a volt.**

For TP Sensor No.2, connect a jumper wire between (F855) 5-volt supply circuit and the (K122) TP Sensor No.2 signal circuit.

**Note: TP Sensor No.2 voltage should change from approximately 0 volts to 5.0 volts?**

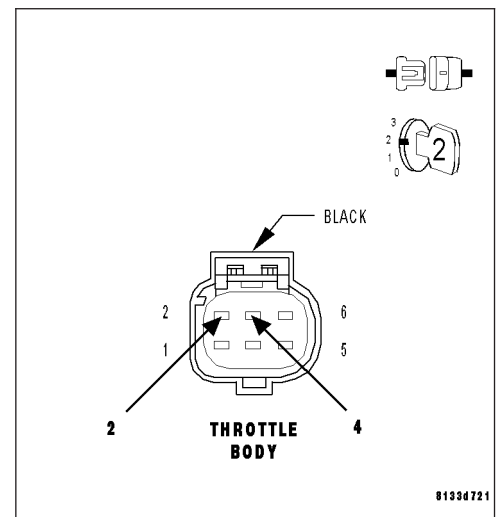
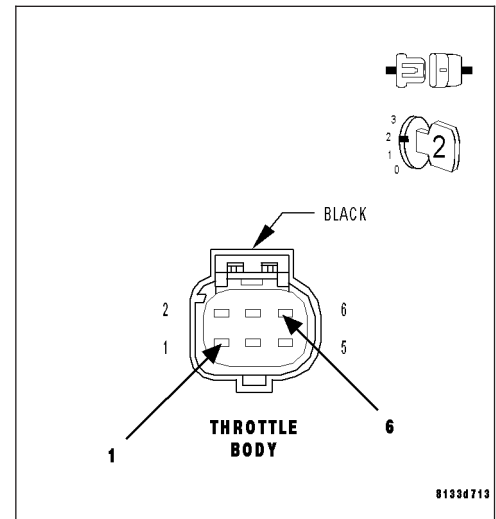
**Is the voltage reading within the listed specification when the jumper wire is installed?**

**Yes** >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**Note: Remove the jumper wire before continuing.**



## P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)

### 4. EXCESSIVE RESISTANCE IN THE (K22) TP SENSOR NO.1 SIGNAL CIRCUIT AND (K122) TP SENSOR NO.2 SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K22) TP Sensor No.1 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

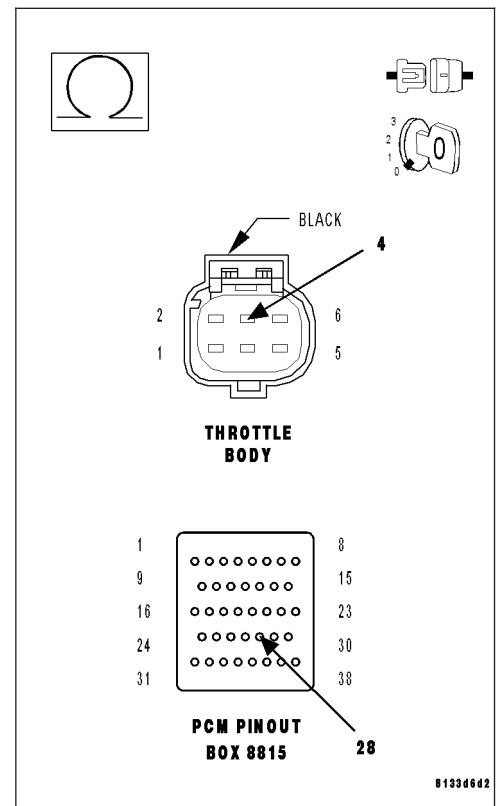
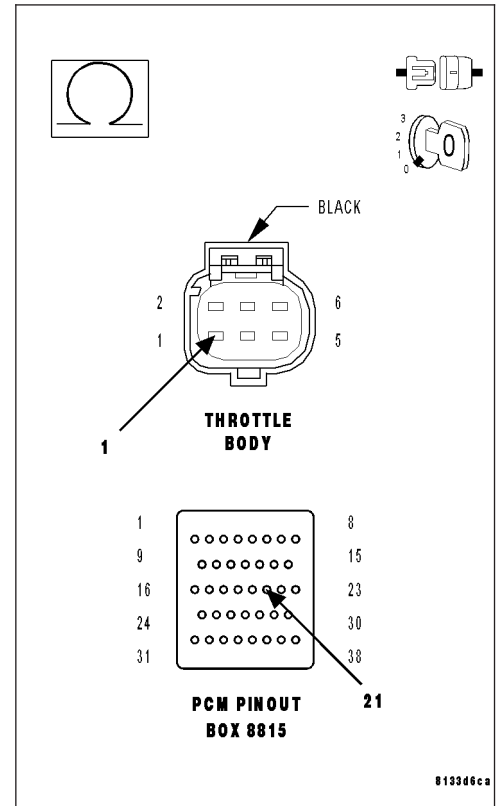
Measure the resistance of the (K122) TP Sensor No.2 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms for each circuit?**

**Yes** >> Go To 5

**No** >> Repair the excessive resistance in the (K22) TP Sensor No.1 Signal circuit or the (K122) TP Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





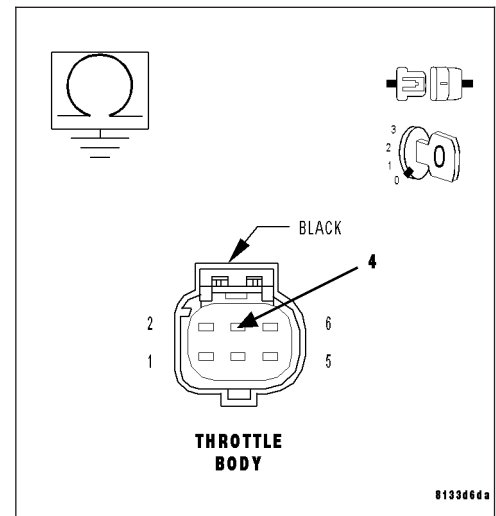
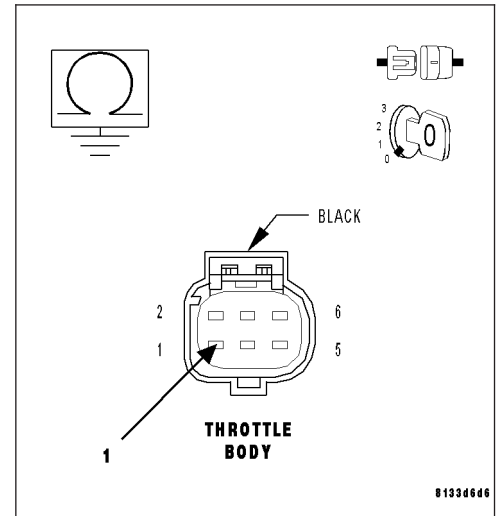
**P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)****5. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO GROUND**

Measure the resistance between ground and the (K22) TP Sensor No.1 Signal circuit, and the (K122) TP Sensor No.2 Signal circuit in Throttle Body harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K22) TP Sensor No.1 Signal circuit or the (K122) TP Sensor No.2 Signal circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



## P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)

### 6. EXCESSIVE RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT

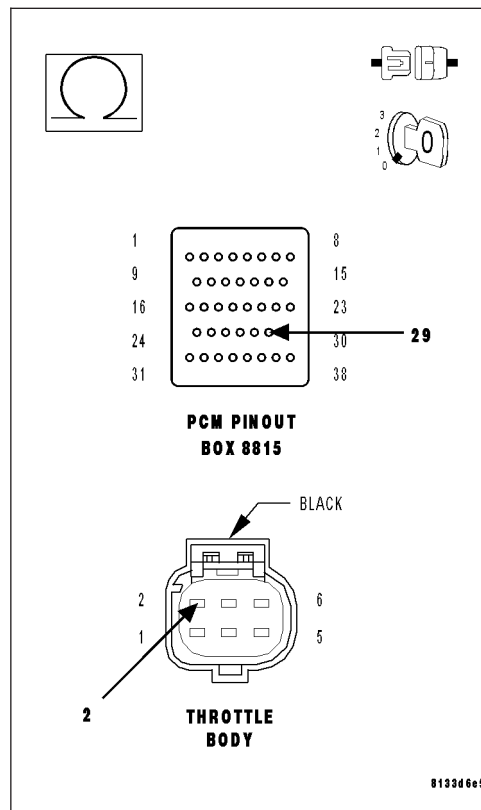
Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 7. (F855) 5-VOLT SUPPLY SHORTED TO GROUND

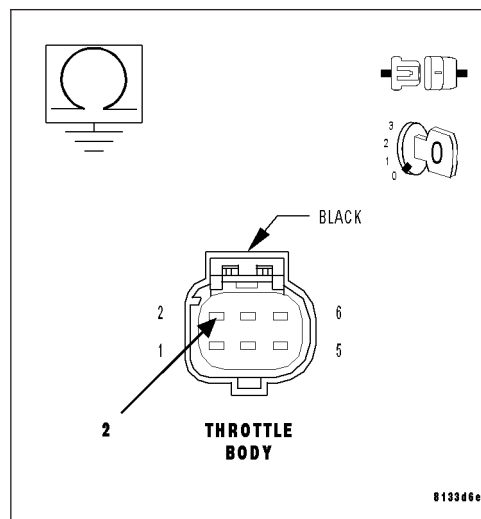
Measure the resistance between ground and the (F855) 5-volt Supply circuit in the Throttle Body harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)****8. EXCESSIVE RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT**

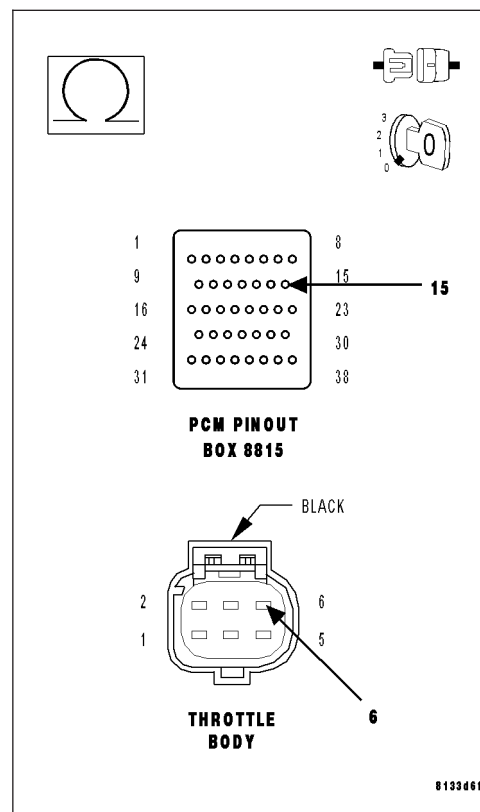
Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the excessive resistance in the (K922) Sensor Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**9. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO (K122) TP SENSOR NO.2 SIGNAL CIRCUIT**

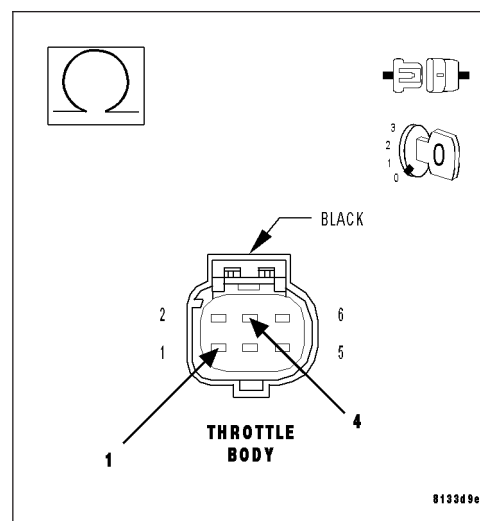
Measure the resistance between the (K22) TP Sensor No.1 Signal circuit and the (K122) TP Sensor No.2 Signal circuit in the Throttle Body harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (K122) TP Sensor No.2 Signal circuit and the (K22) TP Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 10



**P0121-THROTTLE POSITION SENSOR 1 PERFORMANCE (CONTINUED)****10. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**11. THROTTLE FOLLOWER TEST**

Ignition on, engine not running.

With a scan tool, perform the Throttle Follower Test and monitor the TP Sensor No.1 or No.2 voltage.

Slowly press the throttle pedal down.

The voltage for TP Sensor No.1 should start at approximately 0.3 of a volt and increase to above 4.7 volts.

The voltage for TP Sensor No.2 should start at approximately 4.7 volts and decrease to approximately 0.3 of a volt.

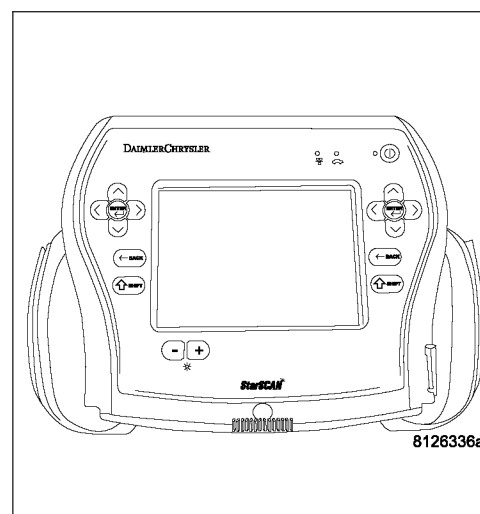
**Is the voltage within the range of the listed specification for the appropriate Sensor?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

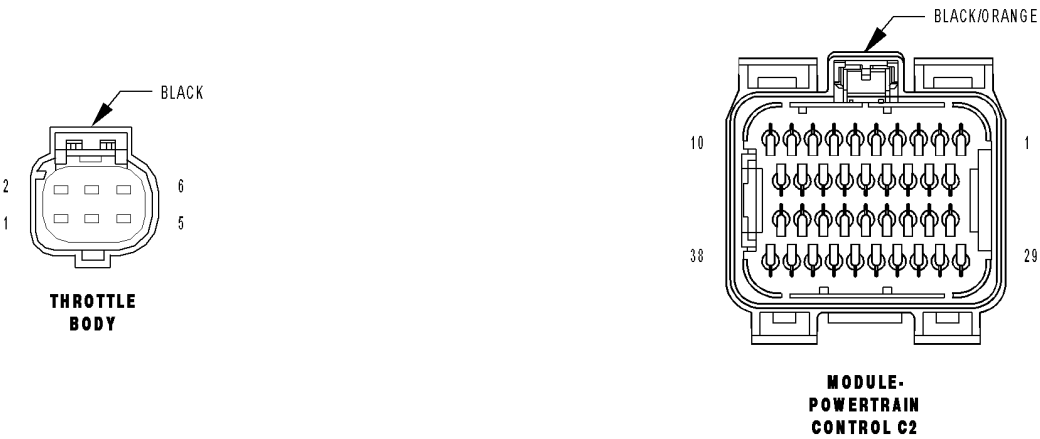
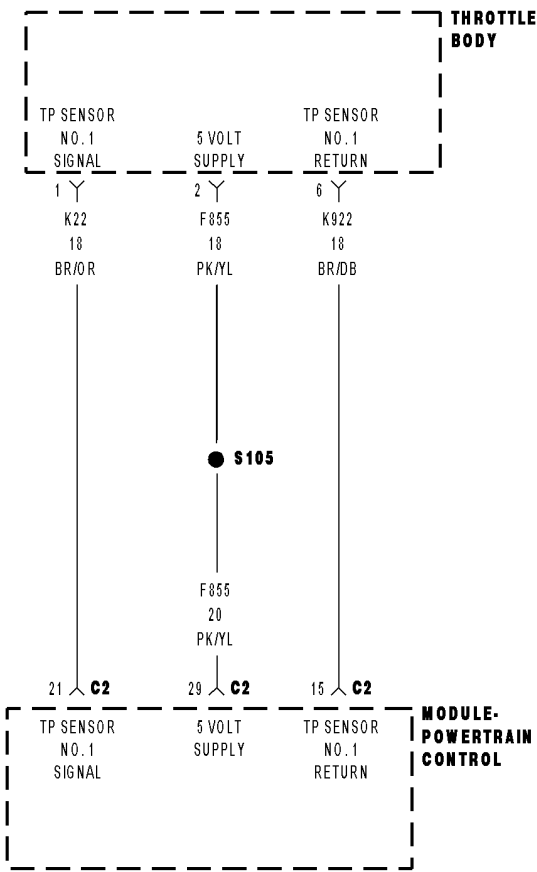
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW



**P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)**

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on. Battery voltage greater than 10 volts.

- **Set Condition:**

Throttle Position Sensor voltage at the PCM is less than 0.16 of a volt for 0.7 of a second. One Trip Fault.

Three good trips to turn off the MIL. ETC light will illuminate.

Possible Causes
(F855) 5-VOLT SUPPLY CIRCUIT OPEN
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K922) SENSOR RETURN CIRCUIT
THROTTLE POSITION SENSOR/THROTTLE BODY
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** If a 5-Volt Supply DTC has also set, diagnose the 5-Volt DTC before continuing.

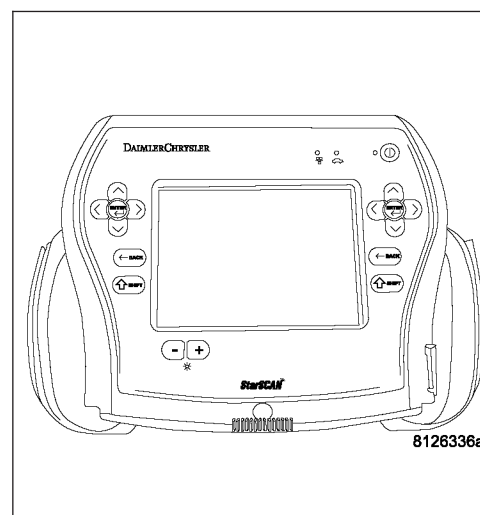
Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Go To 10

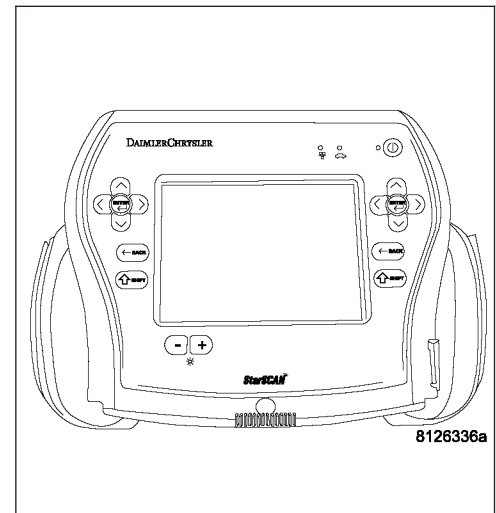


**P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)****2. P0222 ALSO SET**

**Was the P0222-TP SENSOR NO.2 VOLTAGE LOW DTC set along with the P0122?**

**Yes** >> Go To 3

**No** >> Go To 4

**3. (F855) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Throttle Body harness connector.

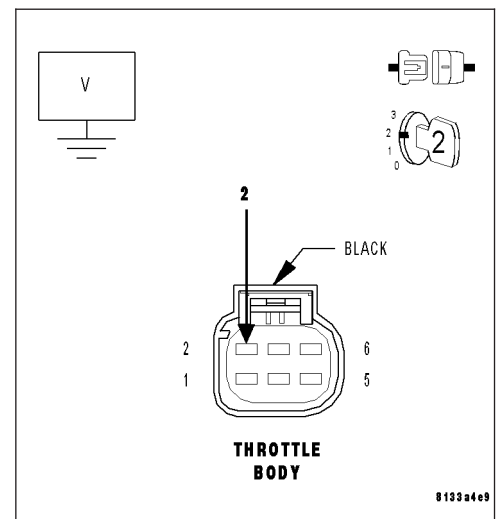
Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit in the Throttle Body harness connector.

**Is the voltage between 4.8 to 5.2 volts?**

**Yes** >> Go To 4

**No** >> Go To 7



## P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)

### 4. THROTTLE POSITION SENSOR

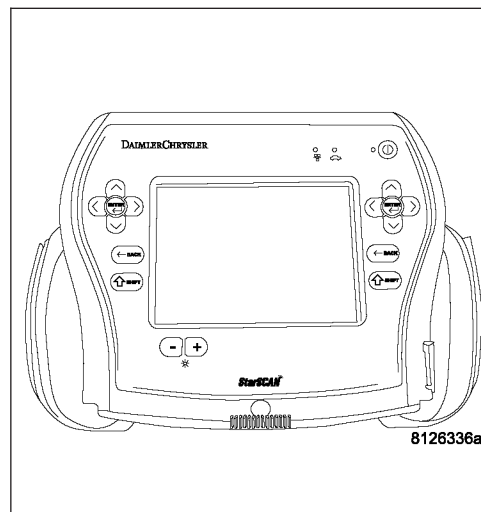
With a scan tool, monitor the TP Sensor No.1 voltage with the Sensor harness connector disconnected.

**Is the voltage above 4.5 volts?**

**Yes** >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, using a scan tool select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5



### 5. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the PCM harness connectors.

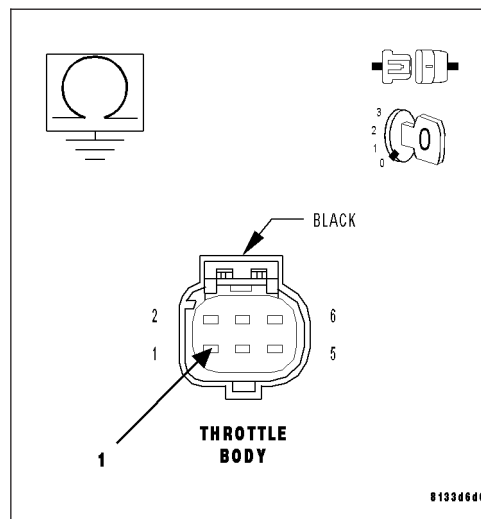
Measure the resistance between ground and the (K22) TP Sensor No.1 Signal circuit in the Throttle Body harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K22) TP Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6





**P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)****6. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K922) SENSOR RETURN CIRCUIT**

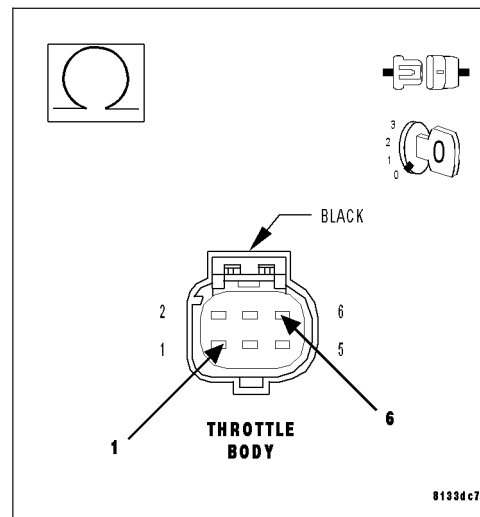
Measure the resistance between the (K22) TP Sensor No.1 Signal circuit and the (K922) Sensor Return circuit in the Throttle Body harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K922) Sensor Return circuit and the (K22) TP Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 9

**7. (F855) 5-VOLT SUPPLY CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

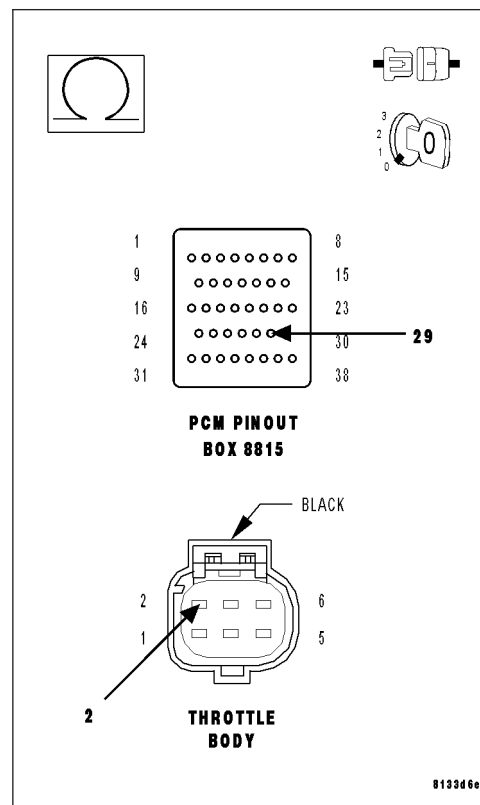
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnostics.**

Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (F855) 5-volt Supply circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0122-THROTTLE POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)

### 8. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

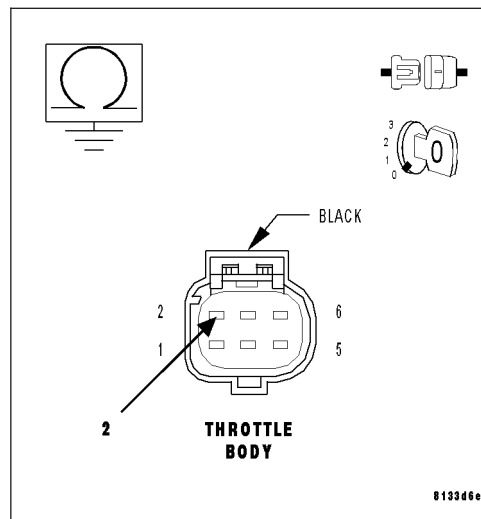
Measure the resistance between ground and the (F855) 5-volt Supply circuit in the Throttle Body harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 9



## 9. PCM

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## 10. THROTTLE FOLLOWER TEST

With a scan tool, perform the Throttle Follower Test.

Monitor the TP Sensor No.1 voltage.

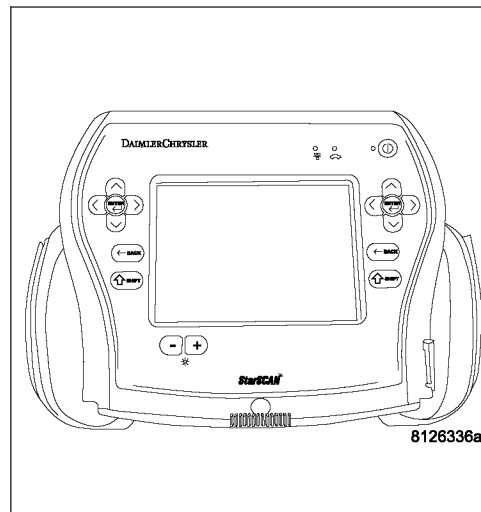
**Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition?**

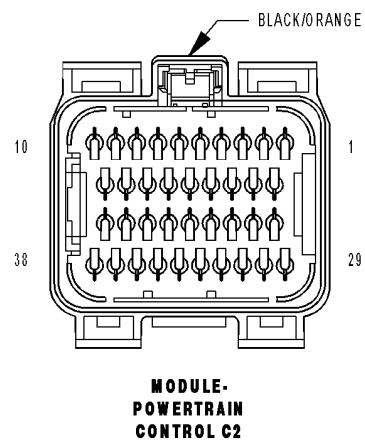
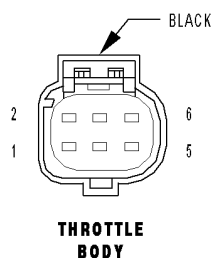
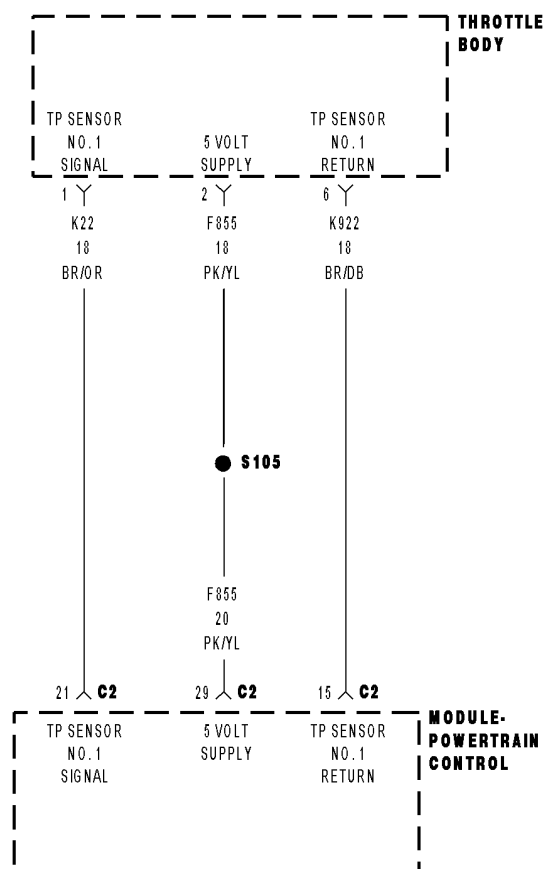
**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, using a scan tool select ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



**P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH**

**P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (CONTINUED)**

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on. Battery voltage greater than 10 volts.

- **Set Condition:**

Throttle Position Sensor No.1 voltage is greater than 4.8 volts for 25 ms. One Trip Fault. ETC light will illuminate.

Possible Causes
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT OPEN
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT
(K922) SENSOR RETURN CIRCUIT OPEN
THROTTLE POSITION SENSOR/THROTTLE BODY
THROTTLE PLATE JAMMED AGAINST THE MAXIMUM STOP
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. TP SENSOR NO.1 VOLTAGE ABOVE 4.8 VOLTS

**Note:** Make sure the throttle is fully closed and free from binding or carbon build up.

**Note:** If a 5-Volt Supply DTC has also set, diagnose the 5-Volt DTC before continuing.

**Note:** If P2101 is also set, then make sure that the blade moves freely and does not hang up near Wide Open Throttle before trying to repair P0123.

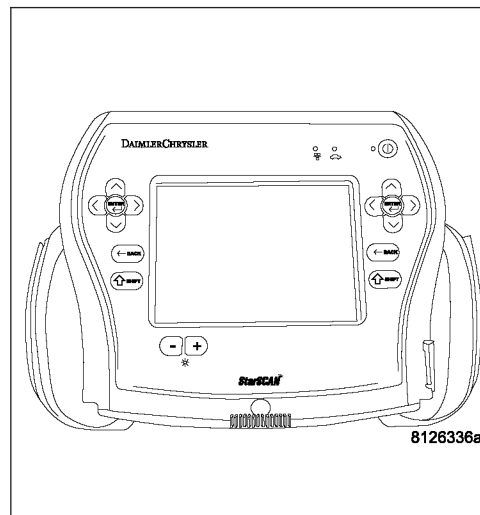
Start the engine.

With a scan tool, read the TP Sensor No.1 voltage.

**Is the voltage above 4.8 volts?**

**Yes** >> Go To 2

**No** >> Go To 8



**P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (CONTINUED)****2. THROTTLE POSITION SENSOR**

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Connect a jumper wire between the (K22) TP Sensor No.1 Signal circuit and the (K922) Sensor Return circuit in the Throttle Body harness connector.

With a scan tool, monitor the TP Sensor No.1 voltage.

Ignition on, engine not running.

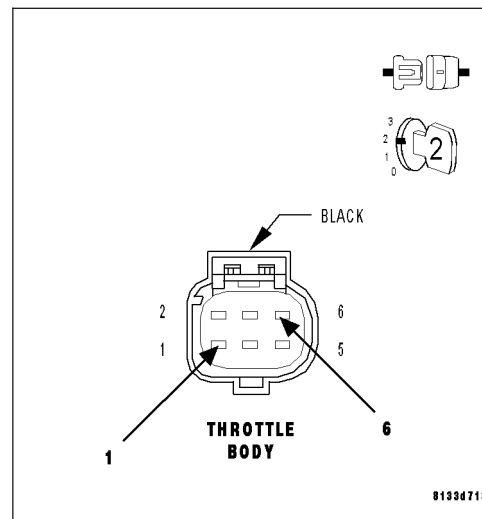
**Is the voltage below 0.5 of a volt with the jumper wire installed?**

**Yes** >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, using a scan tool, select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**Note:** Remove the jumper wire before continuing.

**3. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

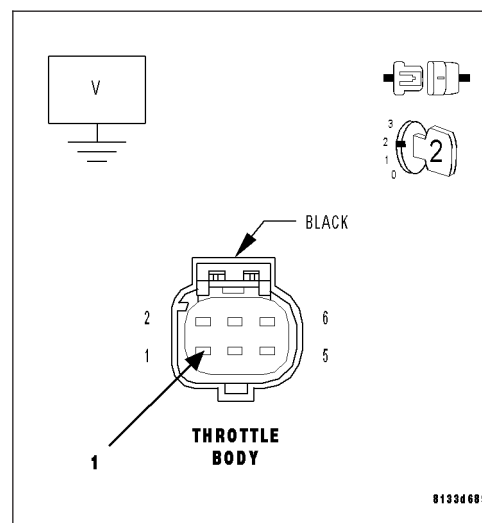
Measure the voltage on the (K22) TP Sensor No.1 Signal circuit in the Throttle Body harness connector.

**Is voltage present?**

**Yes** >> Repair the short to battery voltage in the (K22) TP Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



## P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (CONTINUED)

### 4. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT OPEN

Turn the ignition off.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

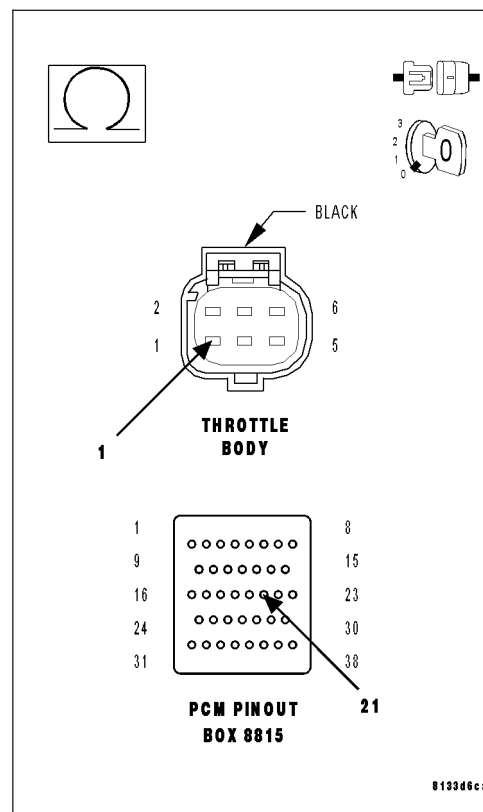
Measure the resistance of the (K22) TP Sensor No.1 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K22) TP Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 5. (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT

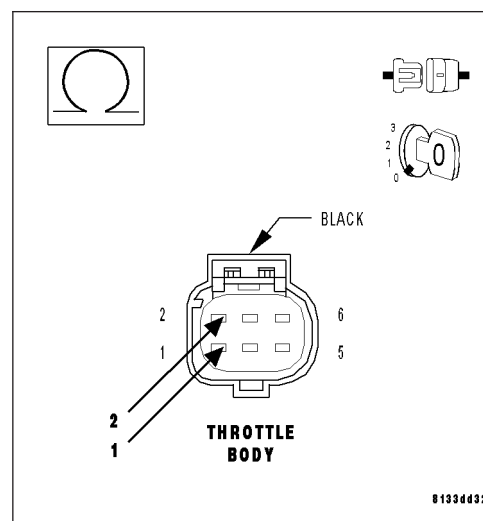
Measure the resistance between the (K22) TP Sensor No.1 Signal circuit and the (F855) 5-volt Supply circuit in the Throttle Body harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (F855) 5-volt Supply circuit and the (K22) TP Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



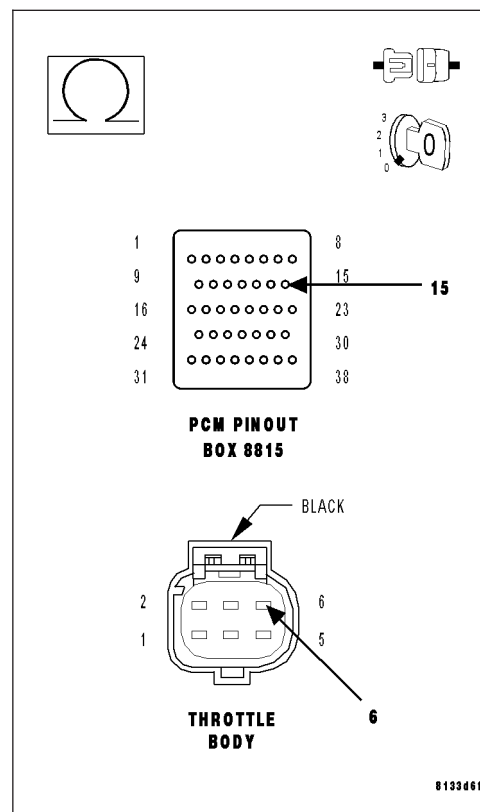
**P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (CONTINUED)****6. (K922) SENSOR RETURN CIRCUIT OPEN**

Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K922) Sensor Return circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**P0123-THROTTLE POSITION SENSOR 1 CIRCUIT HIGH (CONTINUED)****8. THROTTLE FOLLOWER TEST**

With a scan tool, perform the Throttle Follower Test.

Monitor the TP Sensor No.1 voltage.

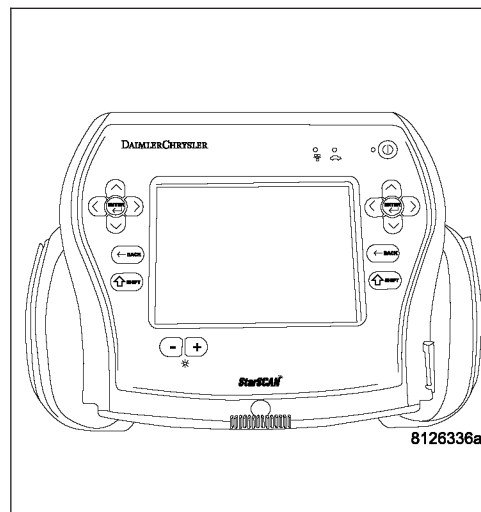
**Does voltage start at approximately 0.3 of a volt and go above 4.7 volts with a smooth transition?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

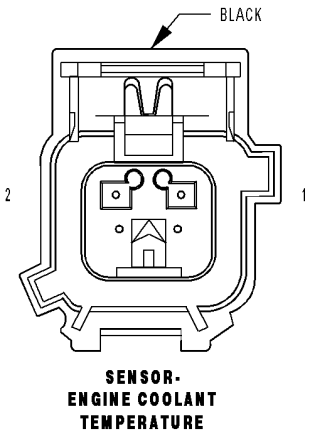
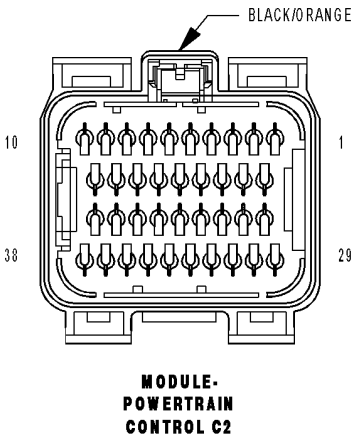
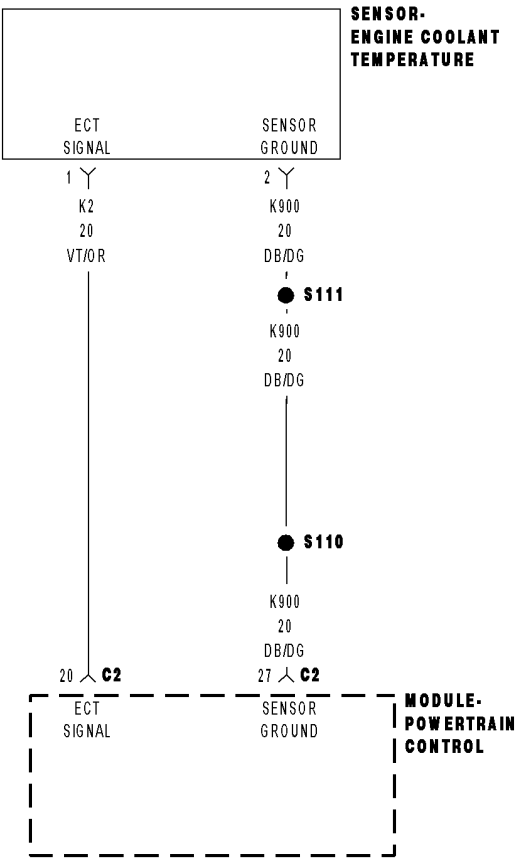
**No** >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, using a scan tool select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.





P0125-INSUFFICIENT COOLANT TEMP FOR CLOSED-LOOP FUEL CONTROL



## P0125-INSUFFICIENT COOLANT TEMP FOR CLOSED-LOOP FUEL CONTROL (CONTINUED)

For the Engine System circuit diagrams Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With battery voltage greater than 10.4 volts and after engine is started.
- **Set Condition:**  
The engine temperature does not enable closed loop. Failure time depends on start-up coolant temperature and ambient temperature. (i.e. 2 minutes for a start temp of 10°C (50°F) or up to 10 minutes for a vehicle with a start-up temp of -28°C (19°F). Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
LOW COOLANT LEVEL THERMOSTAT ECT SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. CHECKING COOLANT LEVEL AND CONDITION

Ignition on, engine not running.

With a scan tool, read DTCs.

**Note:** If an Engine Coolant Temperature (ECT) DTC is set along with this code, diagnose the ECT DTC first.

**Note:** Inspect the ECT terminals and related PCM terminals. Make sure the terminals are free from corrosion and damage.

**Note:** The best way to diagnose this DTC is to allow the vehicle to sit overnight outside in order to have a totally cold soaked engine.

**Note:** Extremely cold outside ambient temperatures may have caused this DTC to set.

**WARNING:** Never open the cooling system when the engine is hot. The system is under pressure. Extreme burns or scalding may result. Failure to follow these instructions can result in personal injury or death. Allow the engine to cool before opening the cooling system.

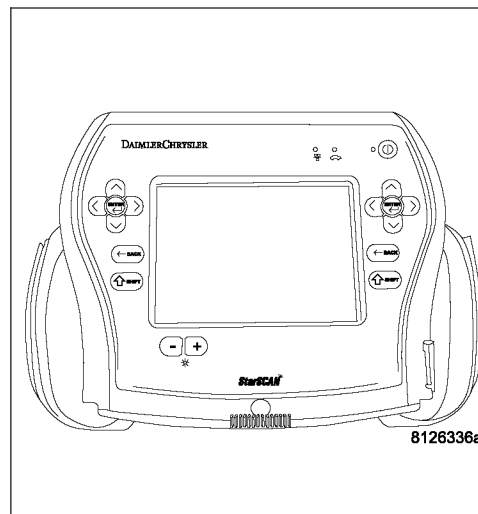
Inspect the coolant system for proper level and condition.

**Is the coolant level and condition OK?**

**Yes** >> Go To 2

**No** >> Inspect the vehicle for a coolant leak, make the appropriate repairs, and add the correct amount of coolant.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0125-INSUFFICIENT COOLANT TEMP FOR CLOSED-LOOP FUEL CONTROL (CONTINUED)****2. THERMOSTAT OPERATION**

**Note:** This test works best if performed on a cold engine (cold soak)

Ignition on, engine not running.

With a scan tool, read the Eng Coolant Temp Deg value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

**Note:** If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.

Start the Engine.

During engine warm-up monitor the Eng Coolant Temp Deg value. The temp deg value change should be a smooth transition from start up to normal operating temp 82°C (180°F). Also monitor the actual coolant temperature with a thermometer.

**Note:** As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the scan tool Eng Coolant Temp Deg values should stay relatively close to each other.

Using the appropriate service information, determine the proper opening temperature of the thermostat.

**Did the thermostat open at the proper temperature?**

**Yes** >> Go To 3

**No** >> Replace the thermostat.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**3. ECT SENSOR OPERATION**

Ignition on, engine not running.

With a scan tool, read the Eng Coolant Temp Deg value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

**Note:** If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.

Start the Engine.

During engine warm-up monitor the Eng Coolant Temp Deg value. The temp deg value change should be a smooth transition from start up to normal operating temp 82°C (180°F). Also monitor the actual coolant temperature with a thermometer.

**Note:** As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the scan tools Eng Coolant Temp Deg value should stay relatively close to each other.

**Is the thermometer reading relatively close to the scan tool ECT reading?**

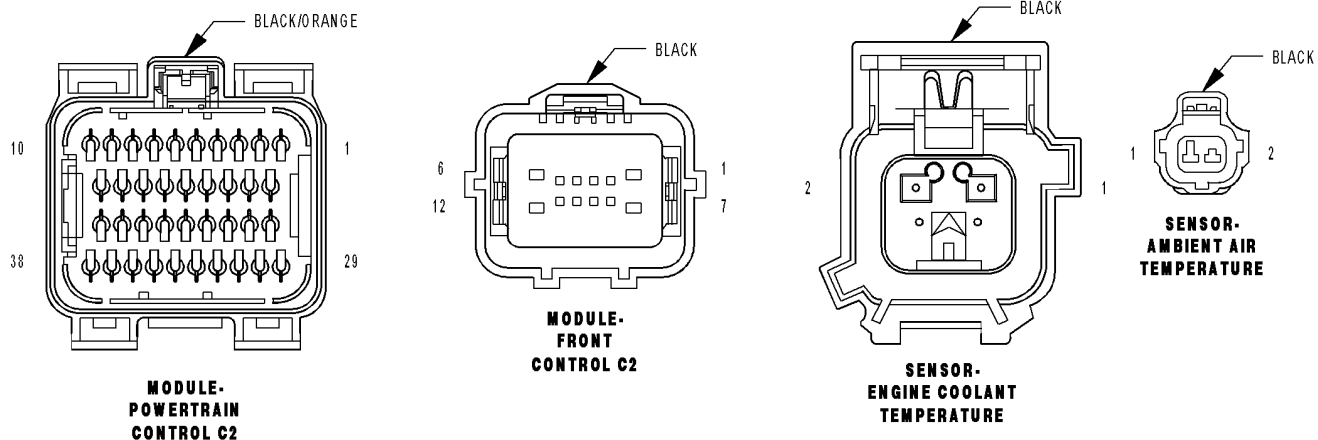
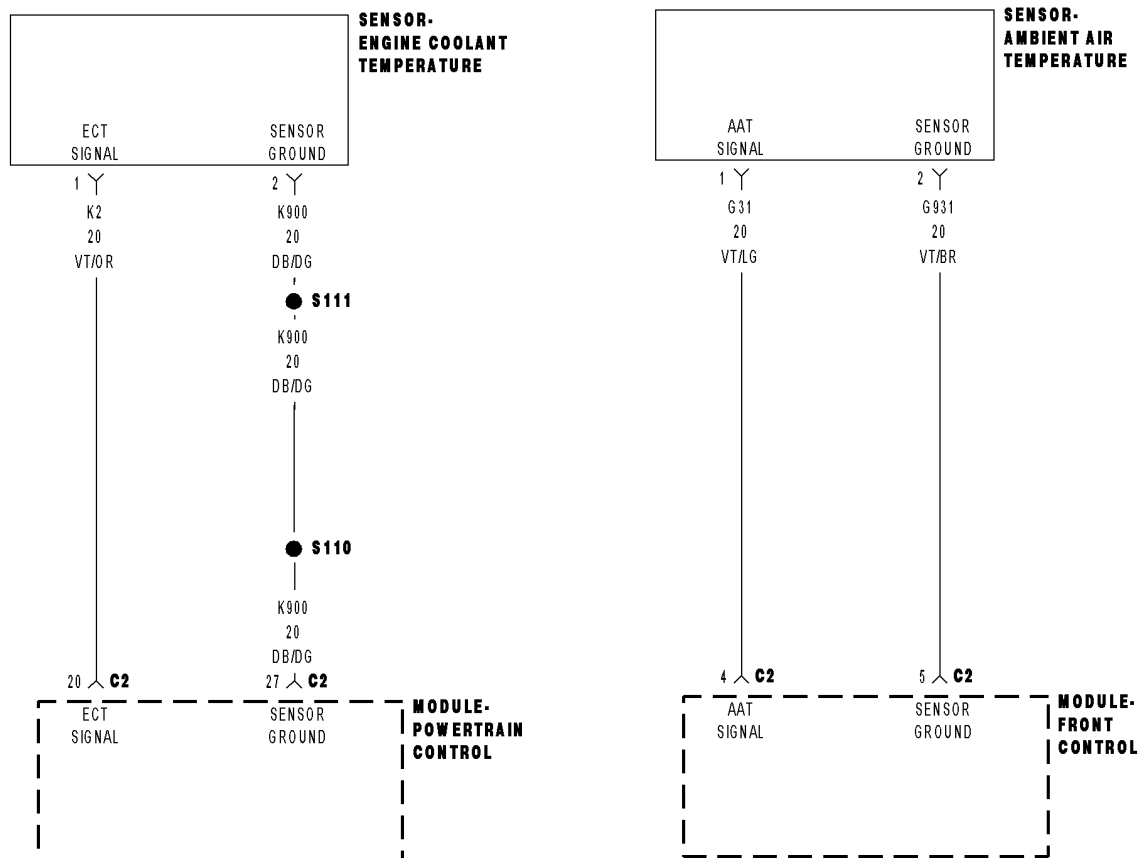
**Yes** >> Test Complete.

**No** >> Replace the Engine Coolant Temperature Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0128-THERMOSTAT RATIONALITY



**P0128-THERMOSTAT RATIONALITY (CONTINUED)**

For the Engine circuit diagrams (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running.

- **Set Condition:**

The PCM predicts a coolant temperature value that it will compare to the actual coolant temperature. A significant difference results in an error. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
LOW COOLANT LEVEL THERMOSTAT OPERATION SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN (K900) SENSOR GROUND CIRCUIT OPEN SIGNAL CIRCUIT SHORTED TO GROUND SIGNAL CIRCUIT SHORTED TO (K900), (G931) SENSOR GROUND OTHER POSSIBLE CAUSES PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** If any ECT, AAT, CMP or CKP sensor DTCs have set along with P0128, diagnose them before continuing.

**Note:** Make sure that the Pinion Factor has been programmed correctly into the PCM.

Ignition on, engine not running.

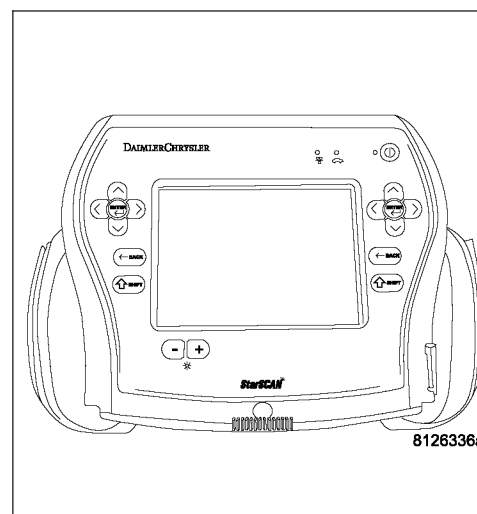
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0128-THERMOSTAT RATIONALITY (CONTINUED)****2. LOW COOLANT LEVEL**

**Note:** If an Engine Coolant Temperature (ECT) DTC is set along with this code, diagnose the ECT DTC first.

**Note:** Inspect the ECT terminals and related PCM terminals. Make sure the terminals are free from corrosion and damage.

**Note:** The best way to diagnose this DTC is to allow the vehicle to sit overnight outside in order to have a totally cold soaked engine.

**Note:** Extremely cold outside ambient temperatures may have caused this DTC to set.

**WARNING:** Never open the cooling system when the engine is hot. The system is under pressure. Failure to follow these instructions can result in personal injury including extreme burns, scalding, or death. Allow the engine to cool before opening the cooling system.

Check the coolant system to make sure that the coolant is in good condition and at the proper level.

**Is the coolant level and condition OK?**

**Yes** >> Go To 3

**No** >> Inspect the vehicle for a coolant leak and add the necessary amount of coolant.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**3. THERMOSTAT OPERATION**

**Note:** This test works best if performed on a cold engine (cold soak).

Ignition on, engine not running.

With a scan tool, read the ECT Deg value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

**Note:** If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.

Start the Engine.

During engine warm-up, monitor the ECT Deg value. The temp deg value change should be a smooth transition from start up to normal operating temp 82°C (180°F). Also monitor the actual coolant temperature with a thermometer.

**Note:** As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the scan tool, ECT Temperature value should stay relatively close to each other.

Using the appropriate service information, determine the proper opening temperature of the thermostat.

**Did the thermostat open at the proper temperature?**

**Yes** >> Go To 4

**No** >> Replace the thermostat.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**4. AMBIENT AIR TEMP SENSOR OPERATION**

Ignition on, engine not running.

With a scan tool, read and record the AAT Sensor Temperature value.

Using the DRB Temperature Probe #CH7050, or an equivalent temperature measuring tool, measure the ambient air temperature near the AAT Sensor.

**Is the AAT Sensor value with -15°C (5°F) of the temperature probe reading?**

**Yes** >> Go To 5

**No** >> Go To 7

---

**P0128-THERMOSTAT RATIONALITY (CONTINUED)****5. ECT SENSOR OPERATION**

**WARNING:** Make sure the engine cooling system is cool before removing the pressure cap or any hose. The cooling system is pressurized when hot. Failure to follow these instructions can result in personal injury including extreme burns, scalding, or death.

With a scan tool, read and record the ECT Sensor Temperature value.

Use the DRB Temperature Probe #CH7050, or an equivalent temperature measuring tool, measure the engine coolant temperature.

**Is the ECT Sensor value with -15°C (5°F) of the temperature probe reading?**

**Yes** >> Go To 6

**No** >> Go To 7

---

**6. OTHER POSSIBLE CAUSES**

Inspect the Temperature Sensors for any physical damage.

Inspect the engine coolant. Make sure the coolant is at the proper level. Refer to the Service Information COOLING.

Make sure the Temperature Sensors are properly installed.

Make sure the CMP and CKP sensors are installed properly. Check the connectors for any signs of damage.

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Refer to any Technical Service Bulletins (TSBs) that may apply.

With the engine running at normal operating temperature, monitor the Temperature sensor parameters while wiggling the wire harness. Look for parameter values to change.

Visually inspect the related wire harness. Look for any chafed, pierced, pinched, partially broken wires and broken, bent, pushed out, or corroded terminals.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Inspect and clean all PCM, engine, and chassis grounds.

**Were any problems found during the above inspections?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Test Complete.

---

**P0128-THERMOSTAT RATIONALITY (CONTINUED)****7. SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

**Note:** Visually inspect both the component and the PCM/FCM connectors. Look for damage, partially broken wires and backed out or corroded terminals

Turn the ignition off.

Disconnect the applicable Temperature Sensor harness connector.

Disconnect the applicable controller harness connectors.

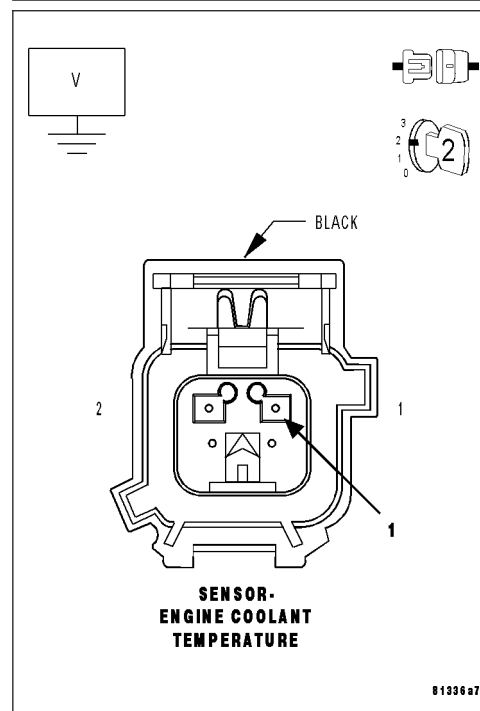
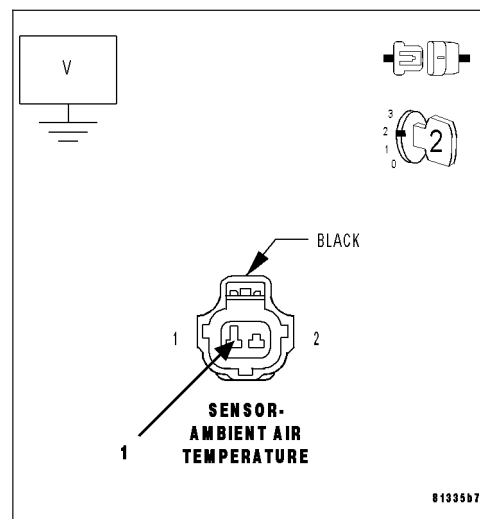
Ignition on, engine not running.

Measure the voltage on the Signal circuit at the Temperature Sensor harness connector.

**Is voltage present?**

**Yes** >> Repair the short to battery voltage in the Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8





**P0128-THERMOSTAT RATIONALITY (CONTINUED)****8. TEMPERATURE SENSOR**

Turn the ignition off.

Connect the controller harness connectors.

Connect a jumper wire across Sensor harness connectors.

Ignition on, engine not running.

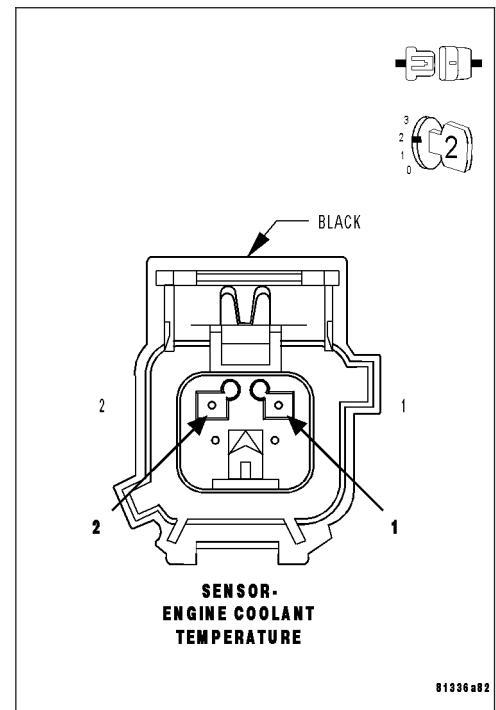
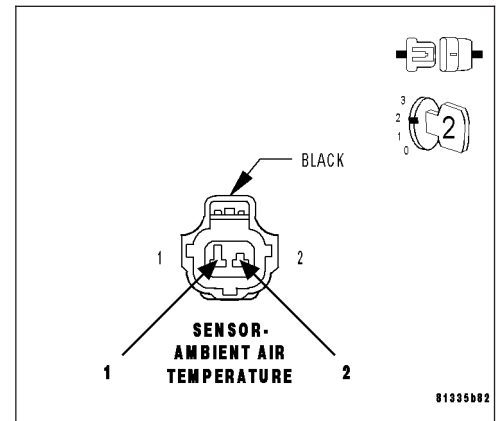
With a scan tool, read the Temperature Sensor voltage.

**Does the voltage start at 5.0 volts and drop below 1.0 volt when the jumper wire is installed?**

**Yes** >> Replace the appropriate Temperature Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 9

**Note: Disconnect the jumper wire before continuing.**



## P0128-THERMOSTAT RATIONALITY (CONTINUED)

### 9. SIGNAL CIRCUIT OPEN

Turn the ignition off.

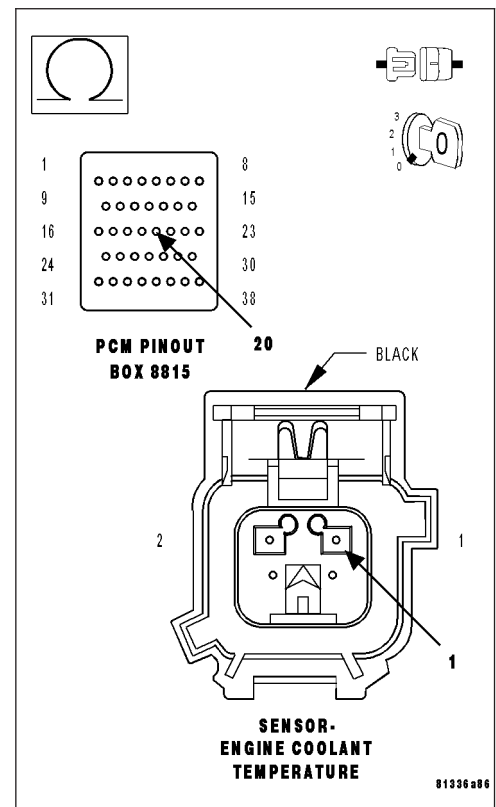
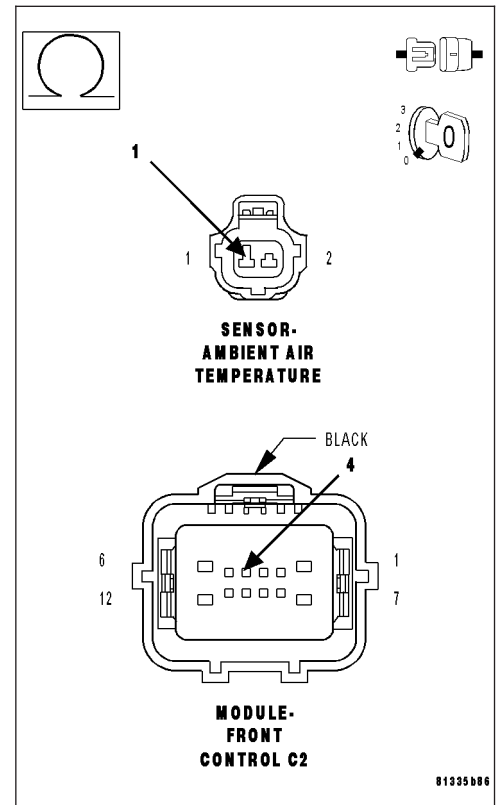
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the Sensor Signal circuit Sensor harness connector to the appropriate terminal of special tool #8815 or the FCM.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 10

**No** >> Repair the open in the Sensor Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0128-THERMOSTAT RATIONALITY (CONTINUED)

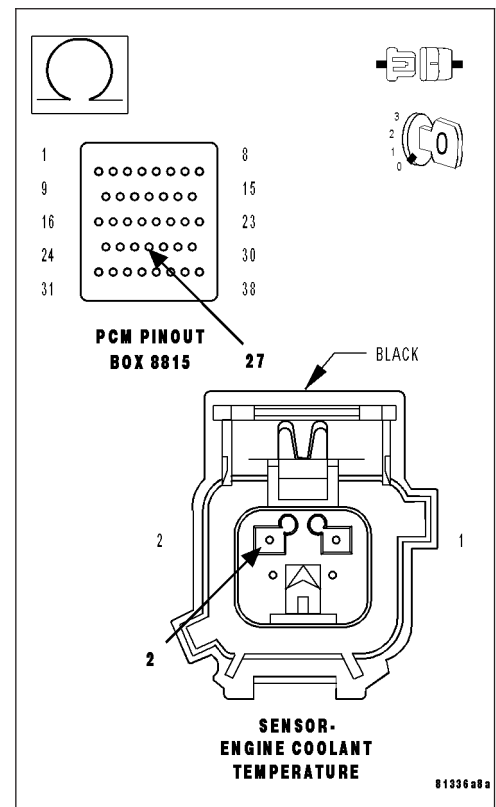
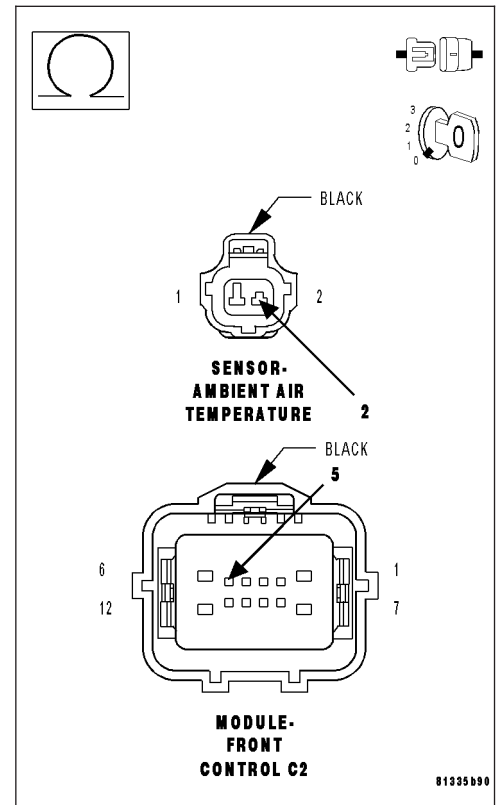
## 10. SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the Sensor ground circuit from the appropriate Temperature Sensor harness connector to the appropriate terminal of special tool #8815 or the FCM.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 11

**No** >> Repair the open in the Sensor ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



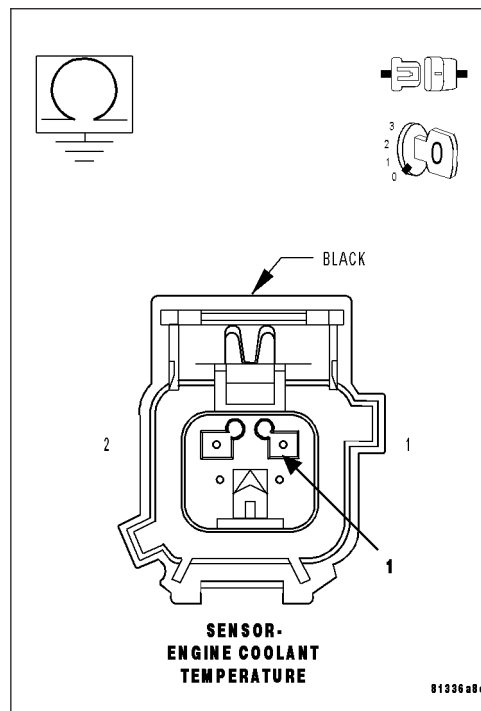
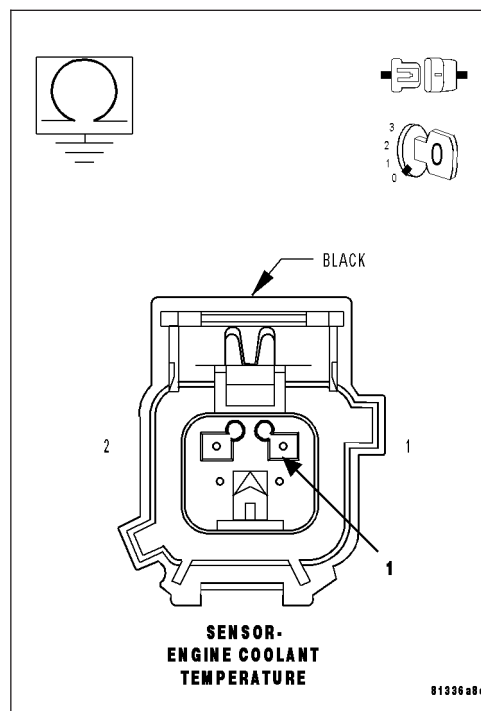
**P0128-THERMOSTAT RATIONALITY (CONTINUED)****11. SIGNAL CIRCUIT SHORTED TO GROUND**

Measure the resistance between ground and the Sensor Signal circuit in the Temperature Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 12



## P0128-THERMOSTAT RATIONALITY (CONTINUED)

**12. SIGNAL CIRCUIT SHORTED TO SENSOR GROUND CIRCUIT**

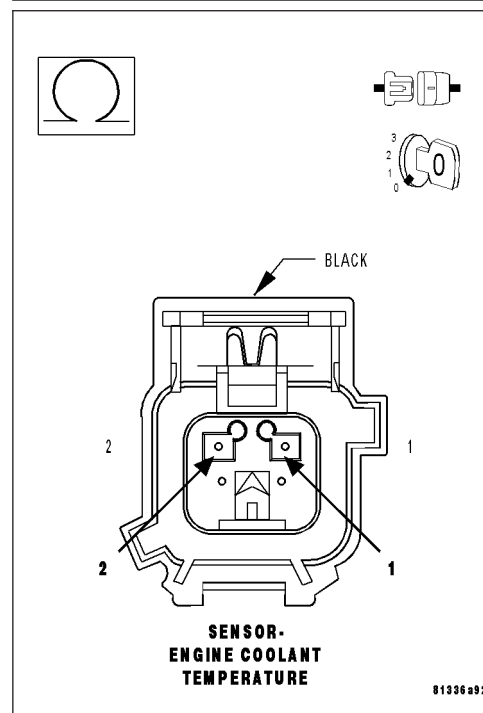
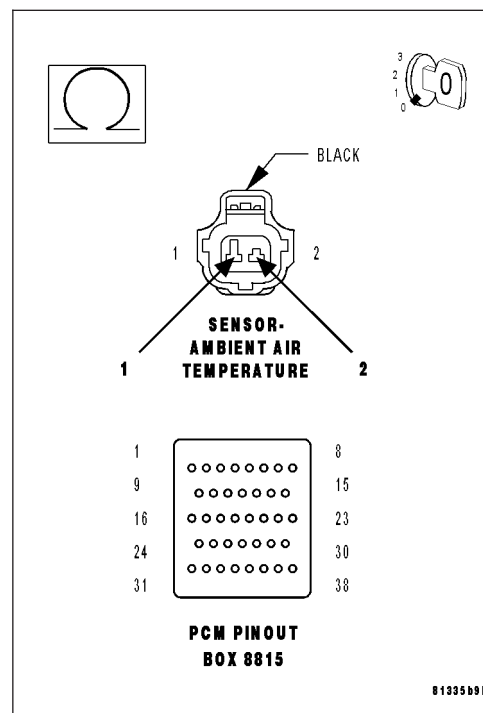
Measure the resistance between the Signal circuit and the Sensor ground circuit in the Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the Sensor ground circuit and the Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 13



**P0128-THERMOSTAT RATIONALITY (CONTINUED)****13. FCM/PCM**

**Note:** Before continuing, check the FCM/PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

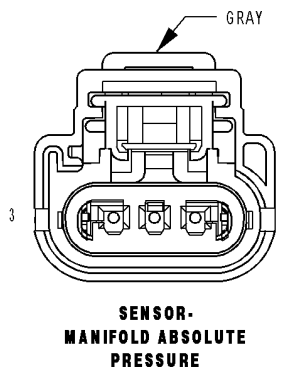
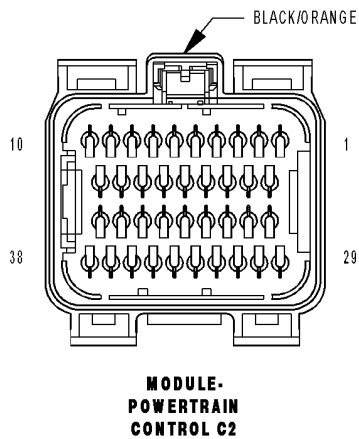
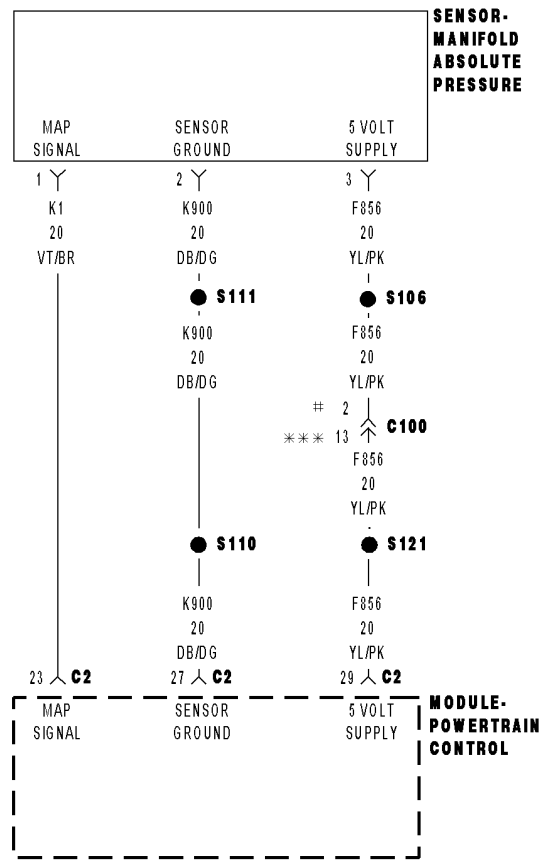
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace applicable Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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P0129-BAROMETRIC PRESSURE OUT-OF-RANGE LOW



**P0129-BAROMETRIC PRESSURE OUT-OF-RANGE LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition key on. No Cam or Crank signal within 75 ms. Engine speed less than 250 RPM.

- **Set Condition:**

The PCM senses the voltage from the MAP sensor to be less than 2.2 volts but above 0.04 of a volt for 300 milliseconds. One Trip Fault. Three good trips to turn off the MIL. (ETC lamp will flash)

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO BATTERY VOLTAGE
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K1) MAP SIGNAL CIRCUIT OPEN
(K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND
(K1) MAP SIGNAL CIRCUIT SHORTED TO (K900) SENSOR GROUND
MAP SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

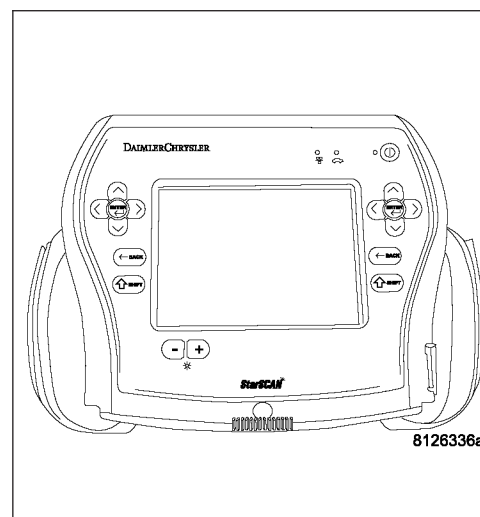
With a scan tool, read DTCs.

**Is the DTC active at this time.**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





**P0129-BAROMETRIC PRESSURE OUT-OF-RANGE LOW (CONTINUED)****2. (F856) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

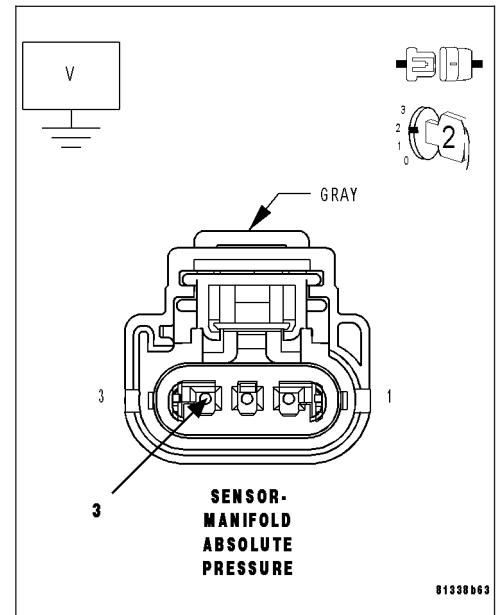
Ignition on, engine not running.

Measure the voltage on the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.

**Is the voltage between 4.5 to 5.2 volts?**

**Yes** >> Go To 3

**No** >> Go To 7

**3. MAP SENSOR**

With a scan tool, monitor the MAP Sensor voltage with the Sensor harness connector disconnected.

**Is the voltage above 2.2 volts?**

**Yes** >> Replace the MAP Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

## P0129-BAROMETRIC PRESSURE OUT-OF-RANGE LOW (CONTINUED)

### 4. (K1) MAP SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the PCM harness connectors.

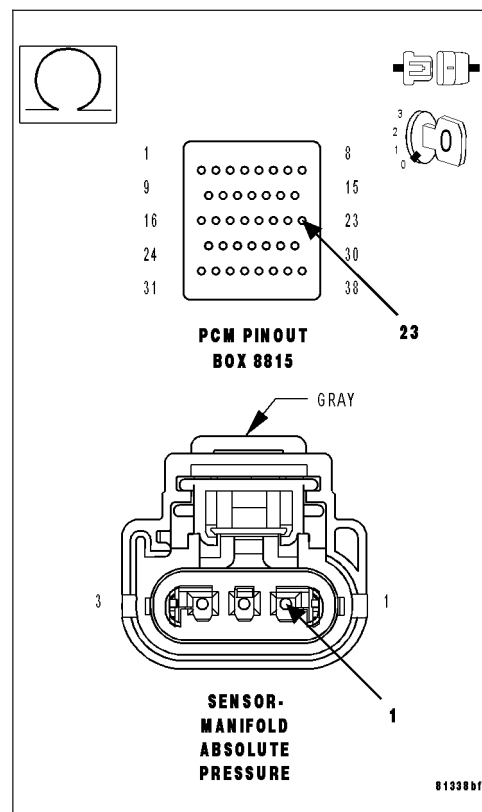
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K1) MAP Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 5. (K1) MAP SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT

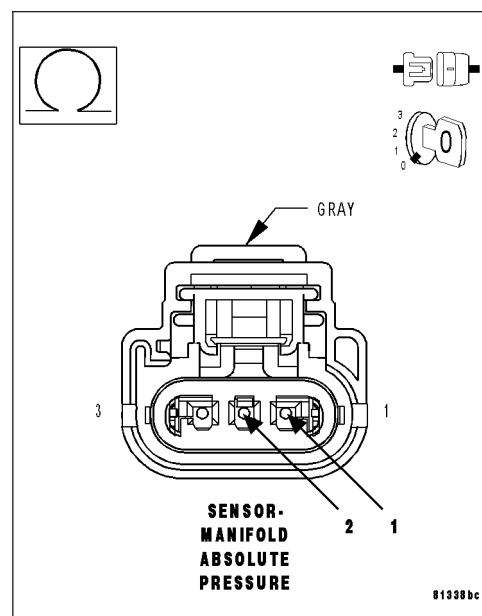
Measure the resistance between the (K900) Sensor ground circuit and the (K1) MAP Signal circuit in the MAP Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (K900) Sensor ground circuit and the (K1) MAP Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

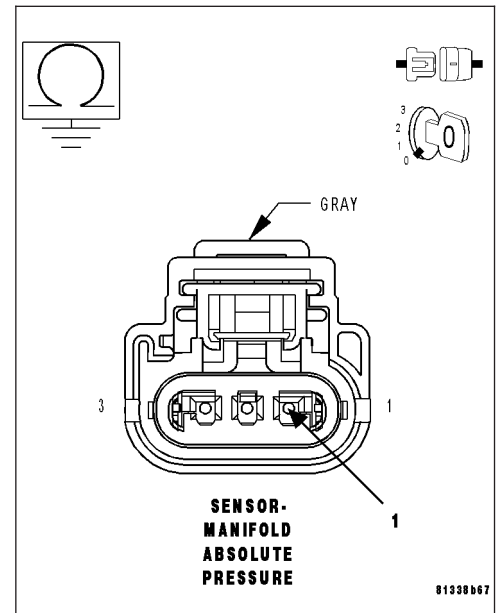


**P0129-BAROMETRIC PRESSURE OUT-OF-RANGE LOW (CONTINUED)****6. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND**

Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.

**Is the resistance below 100 ohms?**

- Yes** >> Repair the short to ground in the (K1) MAP Signal circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.
- No** >> Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

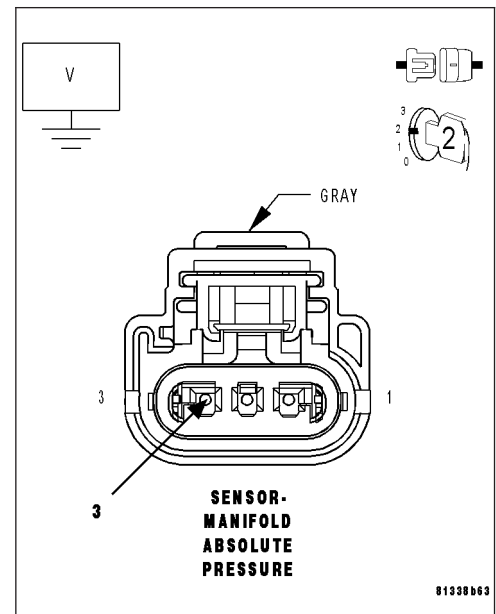
Disconnect the PCM harness connectors.

Ignition on, engine not running.

Measure the voltage on the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.

**Is the voltage above 5.2 volts?**

- Yes** >> Repair the short to battery voltage in the (F856) 5-volt Supply circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 8



**P0129-BAROMETRIC PRESSURE OUT-OF-RANGE LOW (CONTINUED)****8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN**

Turn the ignition off.

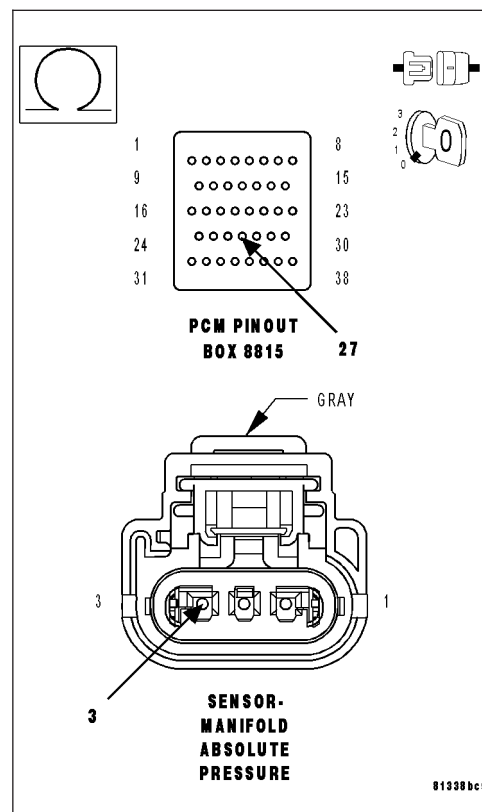
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the open in the (F856) 5-volt Supply circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**9. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

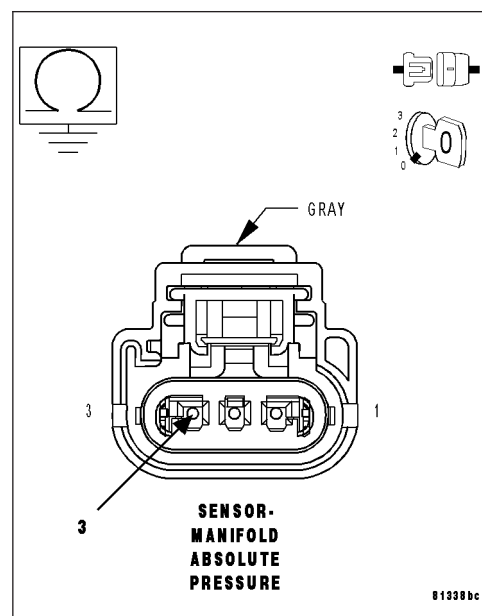
Measure the resistance between ground and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 10



**P0129-BAROMETRIC PRESSURE OUT-OF-RANGE LOW (CONTINUED)****10. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

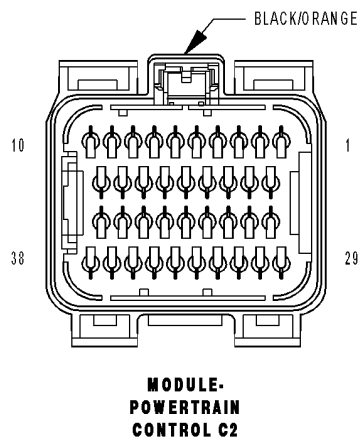
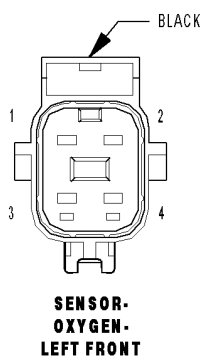
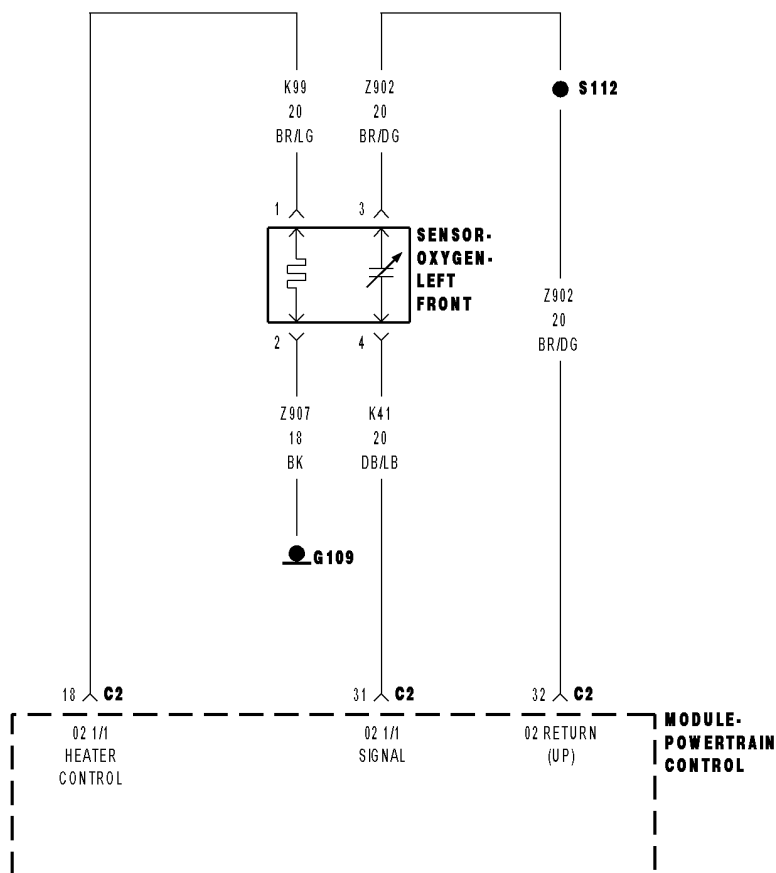
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0131-O2 SENSOR 1/1 CIRCUIT LOW



**P0131-O2 SENSOR 1/1 CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagrams (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running for less than 30 seconds and the O2 Sensor Heater Temperature is less than 251°C (484°F) with battery voltage greater 10.4 volts.

- **Set Condition:**

The oxygen sensor signal voltage is below 1.5 volts for 3 seconds after starting engine. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K902) O2 RETURN UPSTREAM CIRCUIT SHORTED TO GROUND
(K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO GROUND
(K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO (K902) O2 RETURN UPSTREAM CIRCUIT
(K41) O2 1/1 SIGNAL SHORTED TO THE (Z904) O2 1/1 HEATER GROUND CIRCUIT
O2 SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. O2 SENSOR BELOW 1.5 VOLTS**

Start the engine.

Allow the engine to reach normal operating temperature.

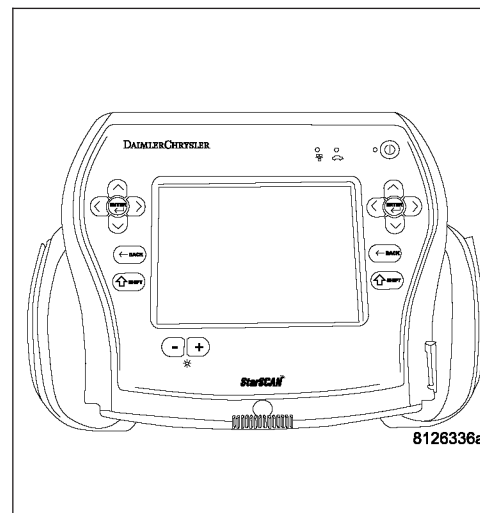
With a scan tool, read the 1/1 O2 Sensor voltage.

**Is the voltage below 1.5 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0131-O2 SENSOR 1/1 CIRCUIT LOW (CONTINUED)

### 2. (K41) O2 SENSOR 1/1 SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the 1/1 O2 Sensor harness connector.

Ignition on, engine not running.

With a scan tool, monitor the O2 Sensor voltage.

**Is the 1/1 O2 Sensor voltage above 4.8 volts?**

**Yes** >> Go To 3

**No** >> Go To 5

### 3. O2 SENSOR

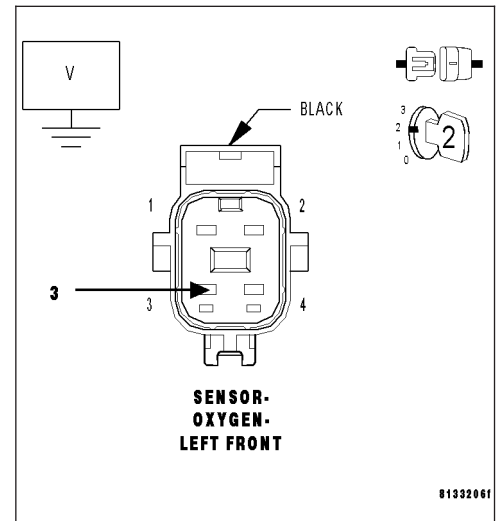
Measure the voltage on the (K902) O2 Return Upstream circuit in the O2 Sensor harness connector.

**Is the voltage at 2.5 volts?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



### 4. (K902) O2 RETURN UPSTREAM CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the PCM harness connectors.

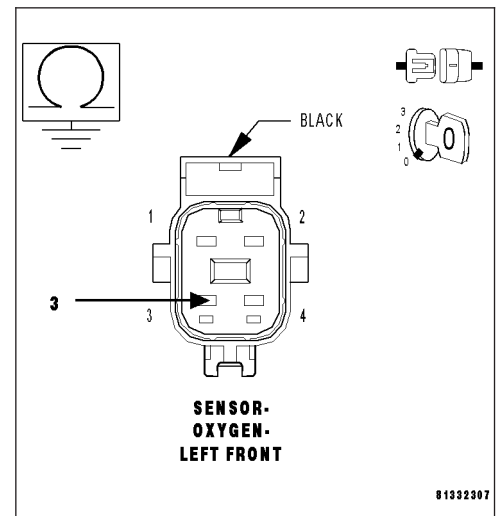
Measure the resistance between ground and the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K902) O2 Return Upstream circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8





**P0131-O2 SENSOR 1/1 CIRCUIT LOW (CONTINUED)****5. (K41) O2 SENSOR 1/1 SIGNAL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

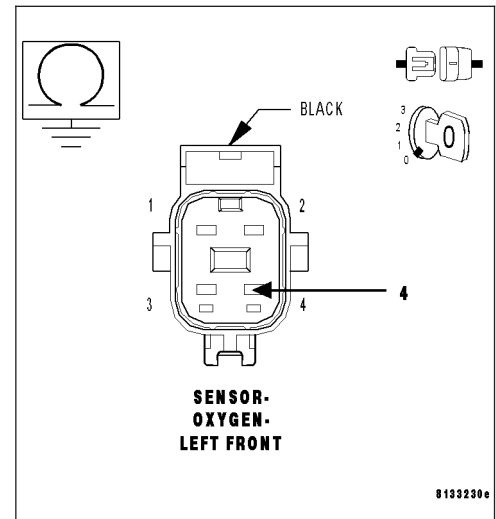
Measure the resistance between ground and the (K41) O2 Sensor 1/1 Signal circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K41) O2 Sensor 1/1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**6. (K41) O2 SENSOR 1/1 SIGNAL CIRCUIT SHORTED TO (K902) O2 RETURN UPSTREAM CIRCUIT**

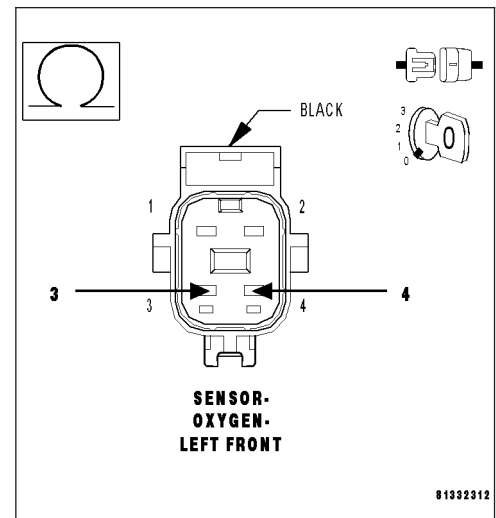
Measure the resistance between the (K41) O2 Sensor 1/1 Signal circuit and the (K902) O2 Return Upstream circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K902) O2 Return Upstream circuit and the (K41) O2 Sensor 1/1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7



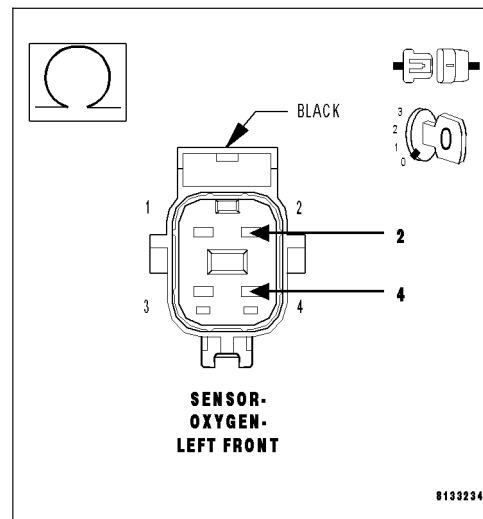
**P0131-O2 SENSOR 1/1 CIRCUIT LOW (CONTINUED)****7. (K41) O2 SENSOR 1/1 SIGNAL CIRCUIT SHORTED TO THE (Z904) O2 1/1 HEATER GROUND CIRCUIT**

Measure the resistance between the (K41) O2 Sensor 1/1 Signal circuit and the (Z904) O2 1/1 Heater ground circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (Z904) O2 1/1 Heater ground circuit and the (K41) O2 Sensor 1/1 Signal circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

**8. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

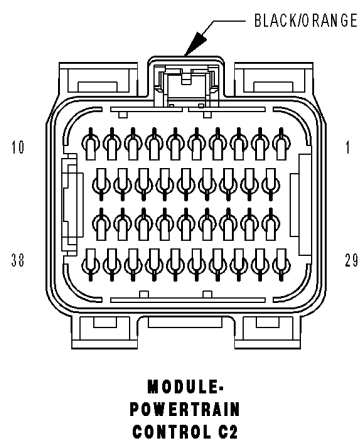
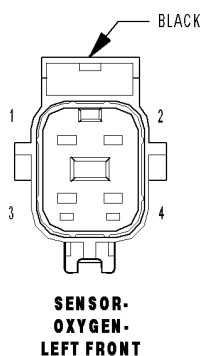
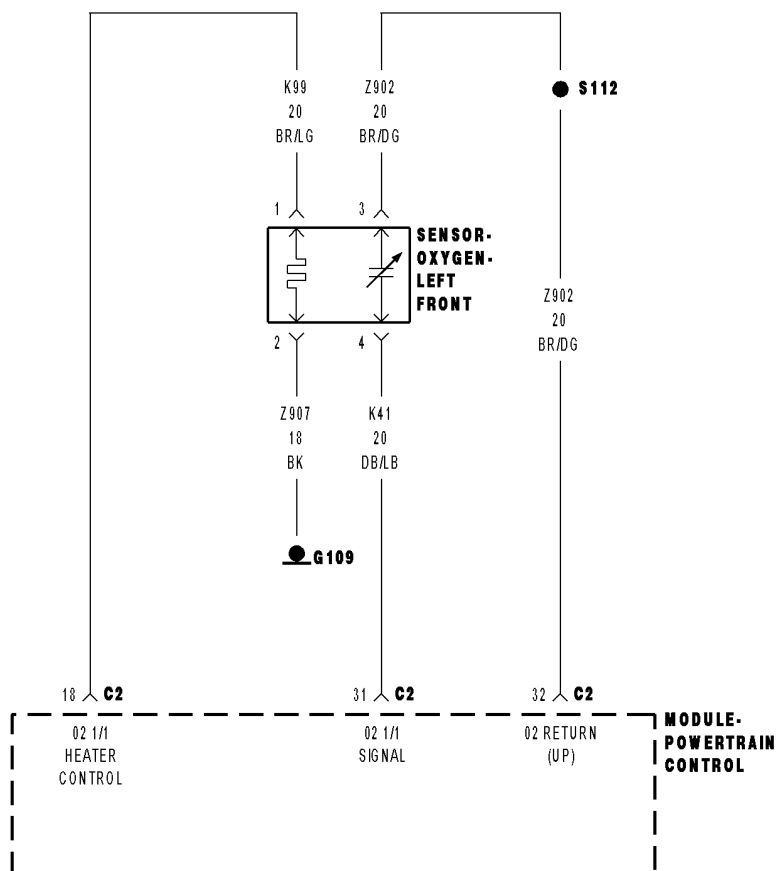
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0132-O2 SENSOR 1/1 CIRCUIT HIGH



### P0132-O2 SENSOR 1/1 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagrams (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:**  
O2 Sensor Heater Temperature is greater than 496°C (925°F) and battery voltage greater than 10.4 volts.
- Set Condition:**  
The Oxygen Sensor voltage is above 3.7 volts for 40 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE (K902) O2 UPSTREAM RETURN CIRCUIT SHORTED TO BATTERY VOLTAGE (K41) O2 1/1 SIGNAL CIRCUIT OPEN (K902) O2 UPSTREAM RETURN CIRCUIT OPEN O2 SENSOR PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

### Diagnostic Test

#### 1. O2 SENSOR ABOVE 3.7 VOLTS

**Note:** When only one O2 Sensor is shorted to voltage, the scan tool will display all O2 Sensor voltage readings at approximately 5.0 volts. When diagnosing this DTC, only diagnose the O2 Sensor that set the DTC.

Start the engine.

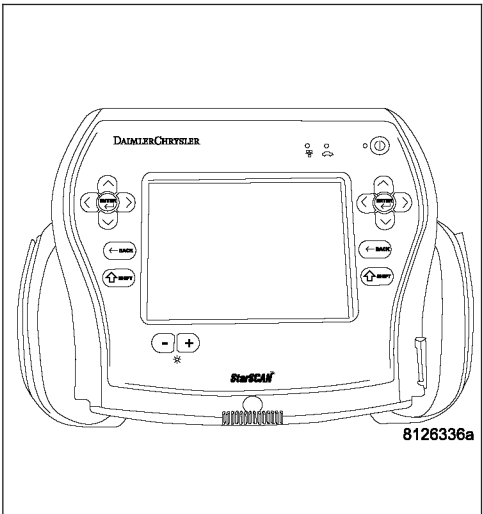
Allow the engine to reach normal operating temperature.

With a scan tool, read the 1/1 O2 Sensor voltage.

**Is the voltage above 3.7 volts?**

**Yes**    >> Go To 2

**No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
 Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0132-O2 SENSOR 1/1 CIRCUIT HIGH (CONTINUED)****2. (K41) O2 1/1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Start the engine and allow the engine to idle.

Disconnect the 1/1 O2 Sensor harness connector.

Measure the voltage on the (K41) O2 Sensor 1/1 Signal circuit in the 1/1 O2 Sensor harness connector.

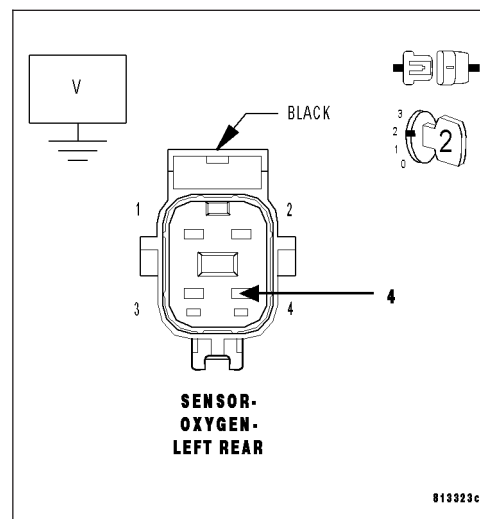
**Note:** Measure the voltage in reference to ground, not the (K902) O2 Upstream Return circuit.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (K41) O2 Sensor 1/1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K902) O2 UPSTREAM RETURN CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

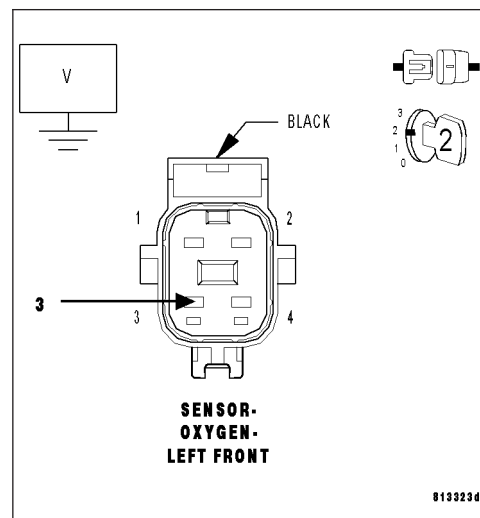
Measure the voltage on the (K902) O2 Upstream Return circuit in the 1/1 O2 Sensor harness connector.

**Is there any voltage present?**

**Yes** >> Repair the short to battery voltage in the (K902) O2 Upstream Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



## P0132-O2 SENSOR 1/1 CIRCUIT HIGH (CONTINUED)

### 4. 1/1 O2 SENSOR

Turn the ignition off.

Connect the PCM harness connectors.

Connect a jumper wire between the (K41) O2 1/1 Signal circuit and the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

Ignition on, engine not running.

With a scan tool, monitor the 1/1 O2 Sensor voltage.

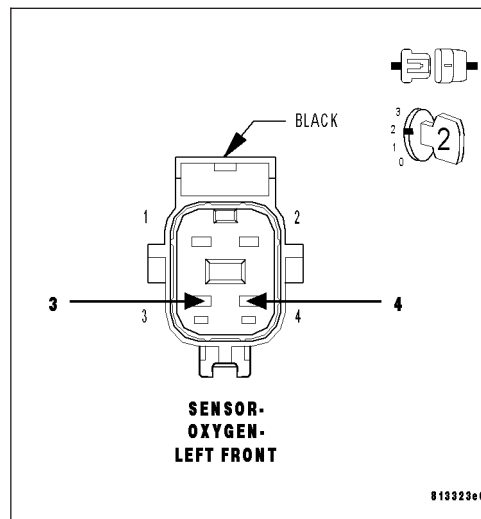
**Is the voltage between 2.3 and 2.7 volts with the jumper wire installed?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**Note:** Remove the jumper wire before continuing.



### 5. (K41) O2 1/1 SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the PCM harness connector.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

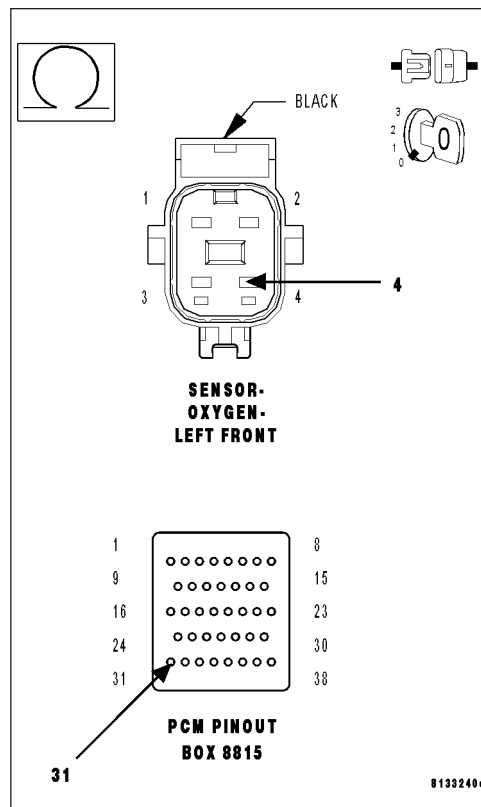
Measure the resistance of the (K41) O2 1/1 Signal circuit from the 1/1 O2 Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K41) O2 1/1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



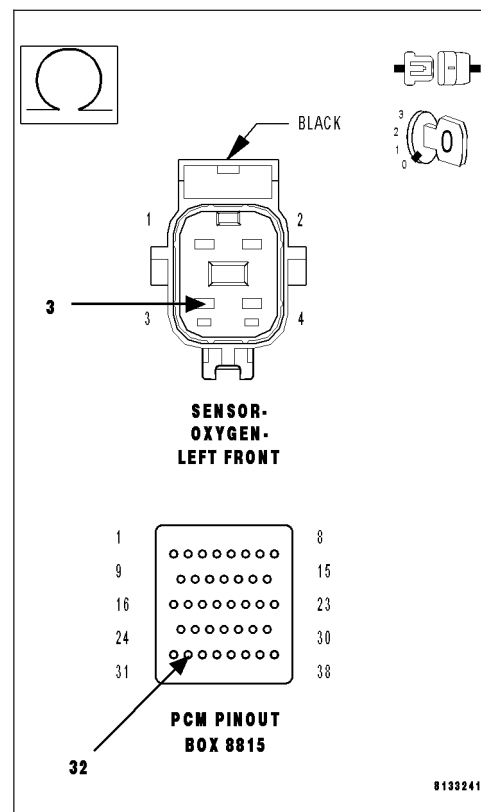
**P0132-O2 SENSOR 1/1 CIRCUIT HIGH (CONTINUED)****6. (K902) O2 UPSTREAM RETURN CIRCUIT OPEN**

Measure the resistance of the (K902) O2 Upstream Return circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K902) O2 Upstream Return circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

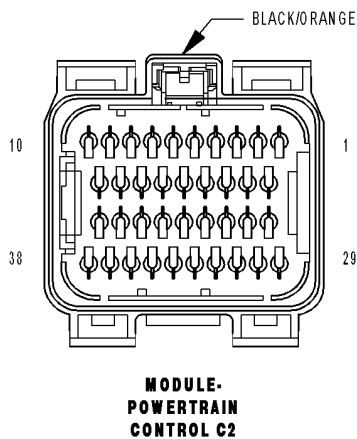
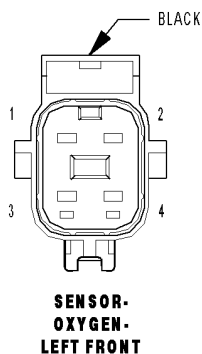
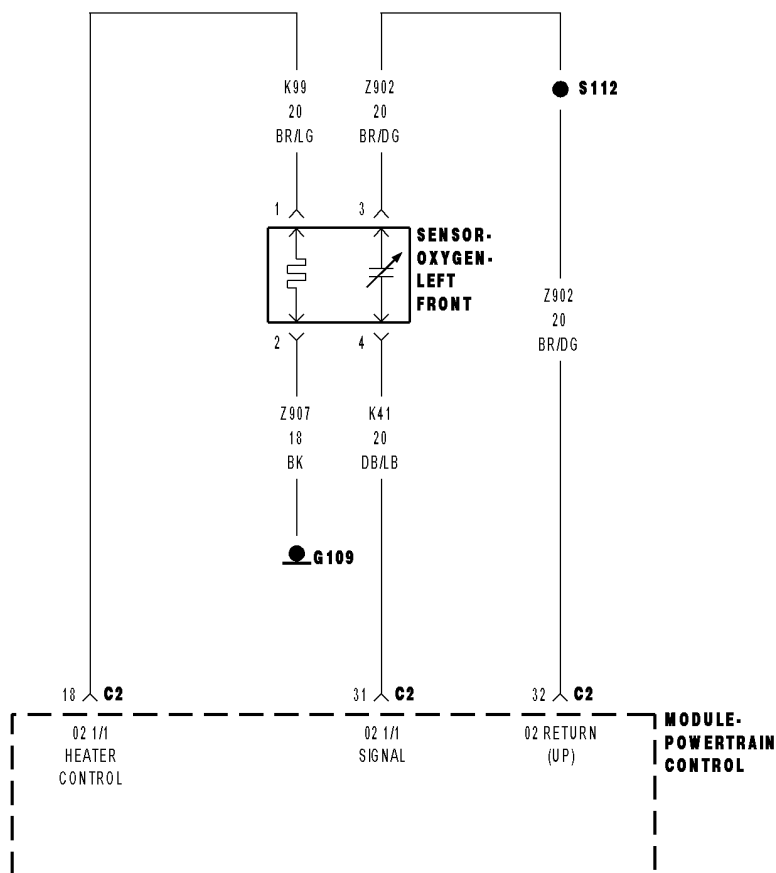
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0133-O2 SENSOR 1/1 SLOW RESPONSE





**P0133-O2 SENSOR 1/1 SLOW RESPONSE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Vehicle is started and driven between 20 and 55 MPH with the Throttle open for a minimum of 120 seconds. Coolant greater than 70°C (158°F). Catalytic Converter Temp greater than 600°C (1112°F) and EVAP Purge is active.

- **Set Condition:**

The oxygen sensor signal voltage switches less than 16 times from lean to rich within 20 seconds during monitoring. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK (K41) O2 1/1 SIGNAL CIRCUIT (K902) O2 RETURN UPSTREAM CIRCUIT O2 SENSOR

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant. Ignition on, engine not running.

**Note:** After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.

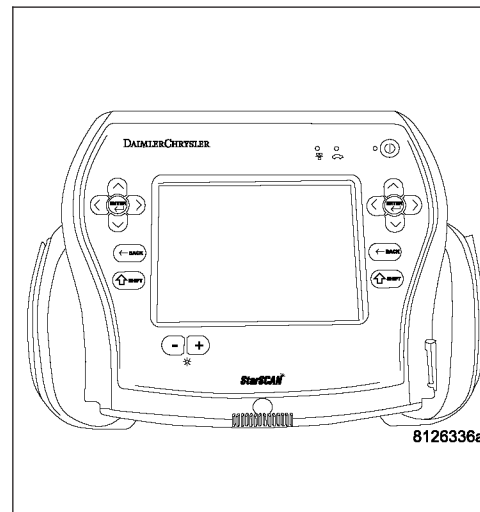
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 2. EXHAUST LEAK

Start the engine.

Inspect the exhaust system for leaks between the engine and the O2 Sensors.

**Are there any exhaust leaks?**

**Yes** >> Repair or replace the leaking exhaust parts as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

## P0133-O2 SENSOR 1/1 SLOW RESPONSE (CONTINUED)

### 3. (K41) O2 1/1 SIGNAL CIRCUIT

Turn the ignition off

Disconnect the 1/1 O2 Sensor harness connector.

Ignition on, engine not running.

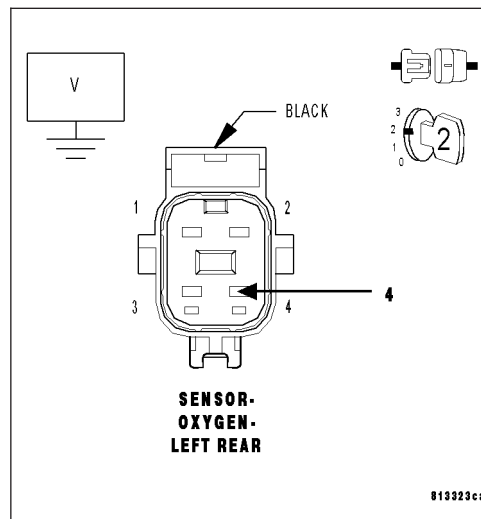
Measure the voltage on the (K41) O2 1/1 Signal circuit in the O2 Sensor harness connector.

**Is the voltage between 4.5 and 5.0 volts?**

**Yes** >> Go To 4

**No** >> Check the (K41) O2 1/1 Signal circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 4. (K902) O2 RETURN UPSTREAM CIRCUIT

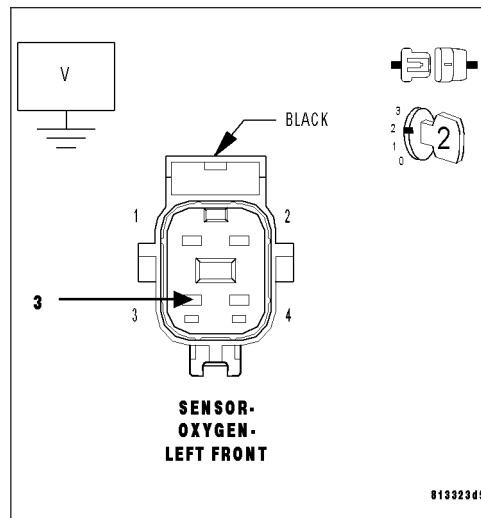
Measure the voltage on the (K902) O2 Return Upstream circuit in the O2 Sensor harness connector.

**Is the voltage at 2.5 volts?**

**Yes** >> Go To 5

**No** >> Check the (K902) O2 Return Upstream circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## 5. O2 SENSOR

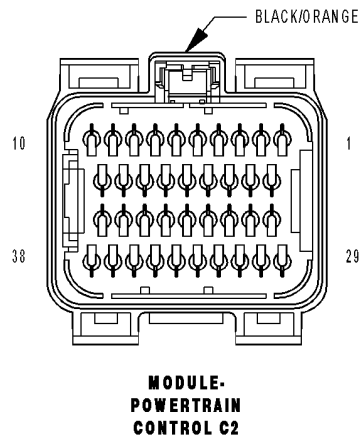
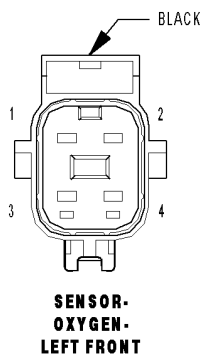
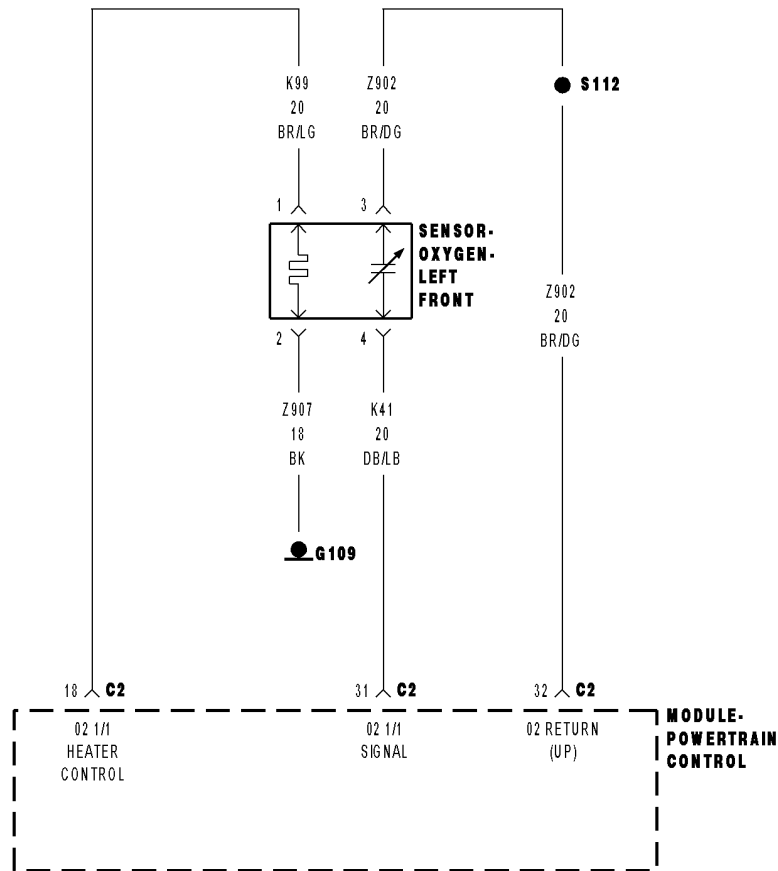
**If there are no possible causes remaining, view repair.**

### Repair

Replace the O2 Sensor

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

# P0135-O2 SENSOR 1/1 HEATER PERFORMANCE



**P0135-O2 SENSOR 1/1 HEATER PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running and heater duty cycle greater than 0%. Battery voltage greater than 11.0 volts.

- **Set Condition:**

No sensor output is received when the PCM powers up the sensor heater. Two trip fault. Three good trips to turn off the MIL.

Possible Causes
(K99) O2 1/1 HEATER CONTROL CIRCUIT OPEN
(Z904) O2 1/1 HEATER GROUND CIRCUIT OPEN
O2 SENSOR HEATER ELEMENT
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

**Note:** Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize between 4.6 and 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test.

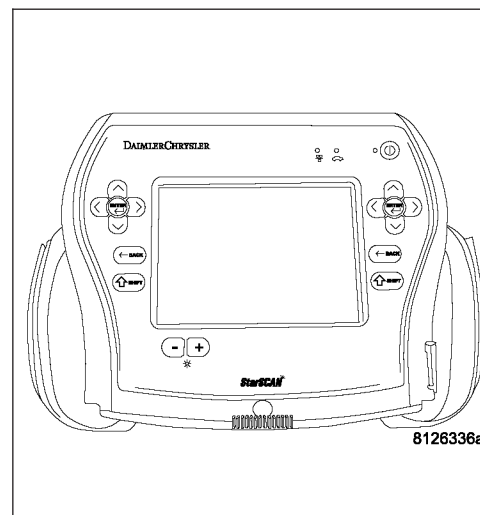
With the scan tool, monitor 1/1 O2 Sensor voltage for at least 2 minutes.

**Does the voltage stay above 4.5 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0135-O2 SENSOR 1/1 HEATER PERFORMANCE (CONTINUED)****2. O2 SENSOR HEATER ELEMENT**

Turn the ignition off.

**Note:** Allow the O2 sensor to cool down to room temperature.

Disconnect the O2 Sensor harness connector.

Measure the resistance of the O2 Heater Element across the 1/1 O2 Sensor connector between the O2 Heater Control terminal and the Heater ground terminal.

**Note:** O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

**Is the resistance of the O2 Sensor Heater Element between 2.0 and 30.0 ohms?**

**Yes** >> Go To 3

**No** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**3. (K99) O2 1/1 HEATER CONTROL CIRCUIT OPEN**

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

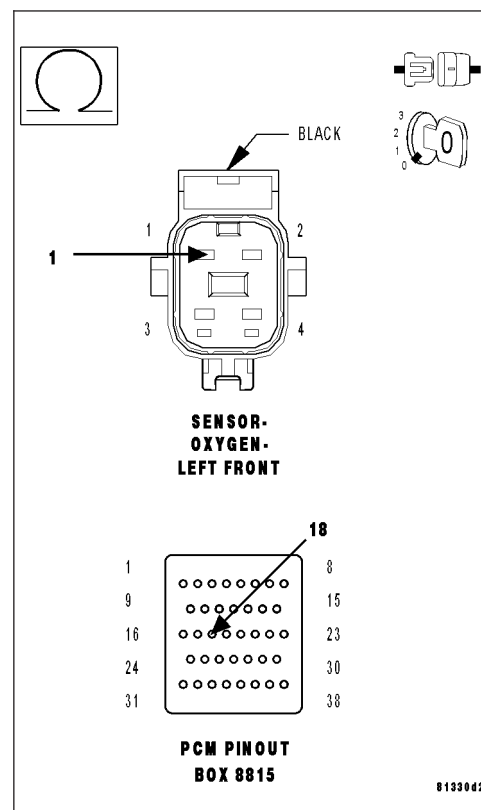
Measure the resistance of the (K99) O2 1/1 Heater Control circuit from the O2 harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 0.5 of an ohm?**

**Yes** >> Go To 4

**No** >> Repair the excessive resistance in the (K99) O2 1/1 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0135-O2 SENSOR 1/1 HEATER PERFORMANCE (CONTINUED)****4. (Z904) O2 1/1 HEATER GROUND CIRCUIT OPEN**

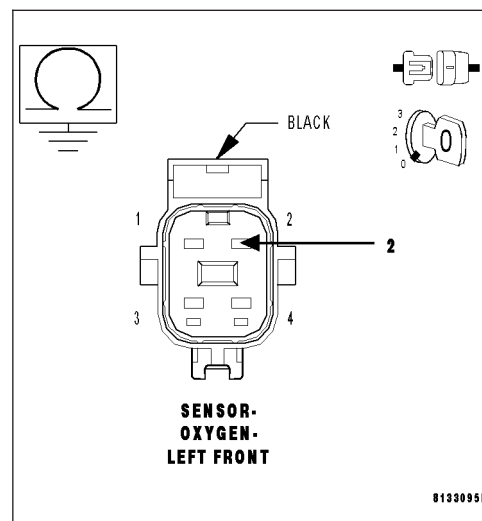
Measure the resistance between ground and the (Z904) O2 1/1 Heater ground circuit in the O2 Sensor harness connector.

**Is the resistance below 0.5 of an ohm?**

**Yes** >> Go To 5

**No** >> Repair the excessive resistance in the (Z904) O2 1/1 Heater ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

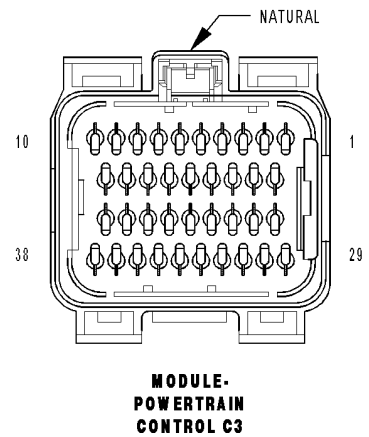
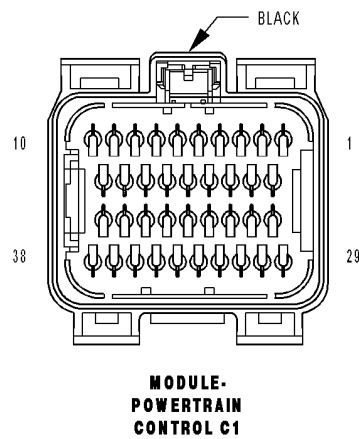
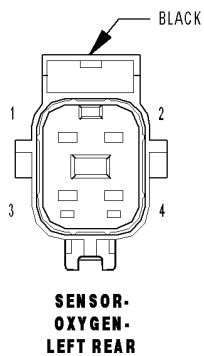
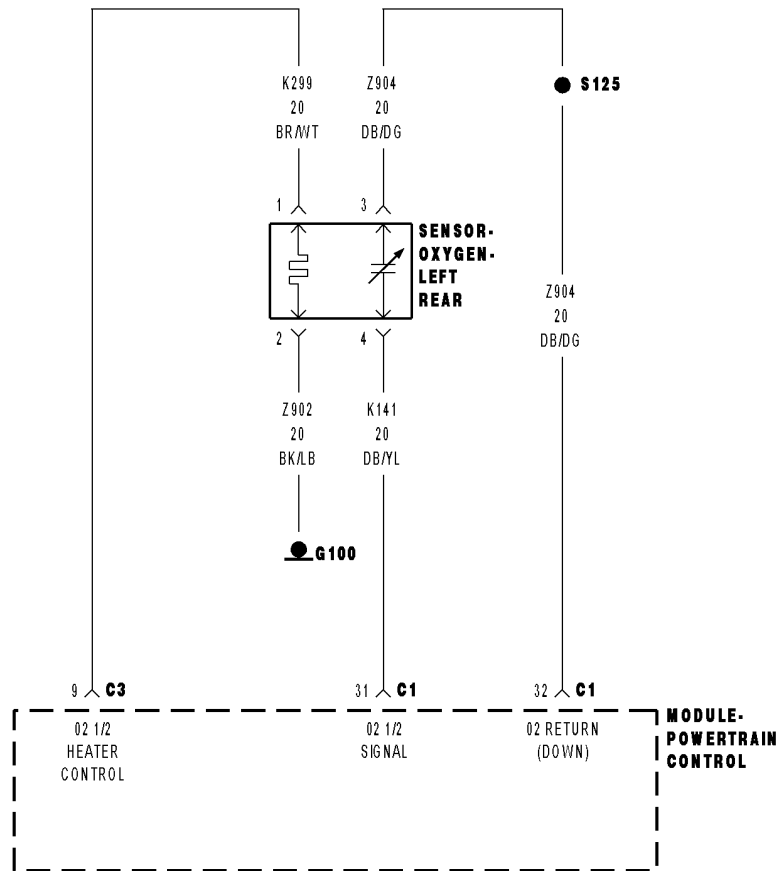
**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**P0137-O2 SENSOR 1/2 CIRCUIT LOW**

**P0137-O2 SENSOR 1/2 CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running for less than 30 seconds and the O2 Sensor Heater Temperature is less than 251°C (484°F) with battery voltage greater 10.99 volts.

- **Set Condition:**

The oxygen sensor signal voltage is below 1.5 volts for 3 seconds after starting engine. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K904) O2 DOWNSTREAM RETURN CIRCUIT SHORTED TO GROUND
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO GROUND
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO (K904) O2 DOWNSTREAM RETURN CIRCUIT
(K141) O2 1/2 SIGNAL SHORTED TO THE (Z902) O2 1/2 HEATER GROUND CIRCUIT
O2 SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. O2 SENSOR BELOW 1.5 VOLTS

Start the engine.

Allow the engine to reach normal operating temperature.

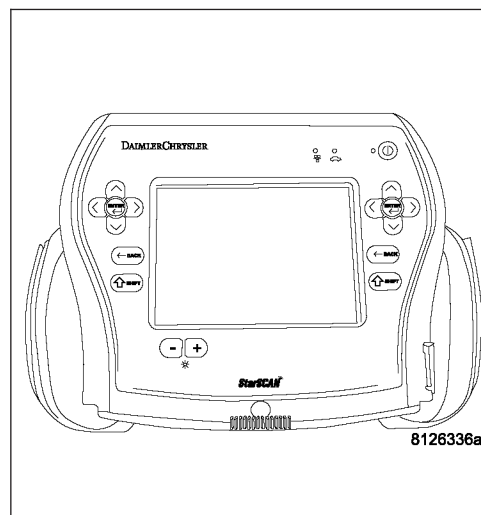
With a scan tool, read the 1/2 O2 Sensor voltage.

**Is the voltage below 1.5 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 2. (K141) O2 1/2 SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the 1/2 O2 Sensor harness connector.

Ignition on, engine not running.

With a scan tool, monitor the 1/2 O2 Sensor voltage.

**Is the O2 Sensor voltage above 4.8 volts?**

**Yes** >> Go To 3

**No** >> Go To 5



**P0137-O2 SENSOR 1/2 CIRCUIT LOW (CONTINUED)****3. O2 SENSOR**

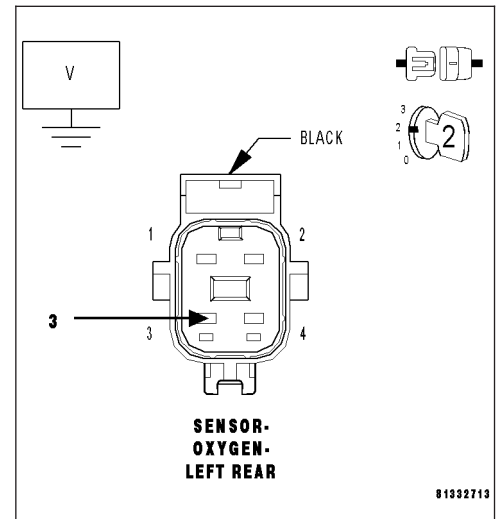
Measure the voltage on the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

**Is the voltage at 2.5 volts?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (K904) O2 DOWNSTREAM RETURN CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

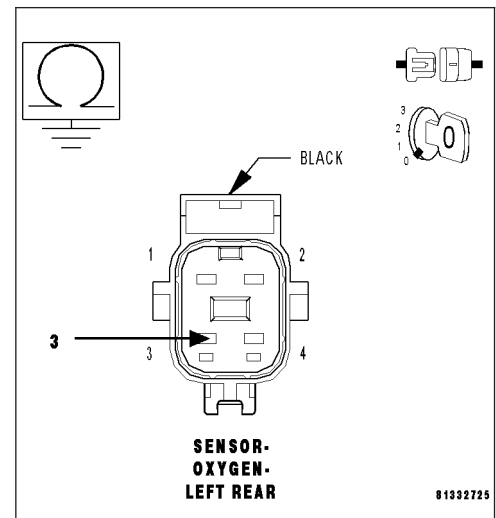
Measure the resistance between ground and the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K904) O2 Downstream Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8



## P0137-O2 SENSOR 1/2 CIRCUIT LOW (CONTINUED)

### 5. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the PCM harness connectors.

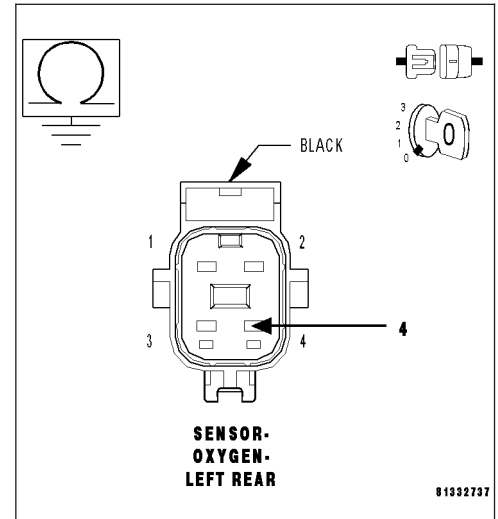
Measure the resistance between ground and the (K141) O2 1/2 Signal circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K141) O2 1/2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



### 6. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO (K904) O2 DOWNSTREAM RETURN CIRCUIT

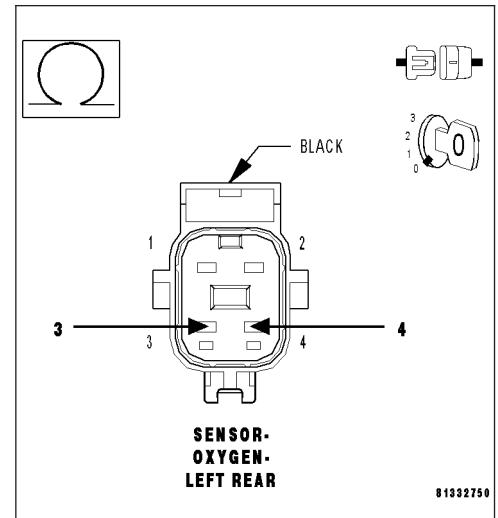
Measure the resistance between the (K141) O2 1/2 Signal circuit and the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K904) O2 Downstream Return circuit and the (K141) O2 1/2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7



## P0137-02 SENSOR 1/2 CIRCUIT LOW (CONTINUED)

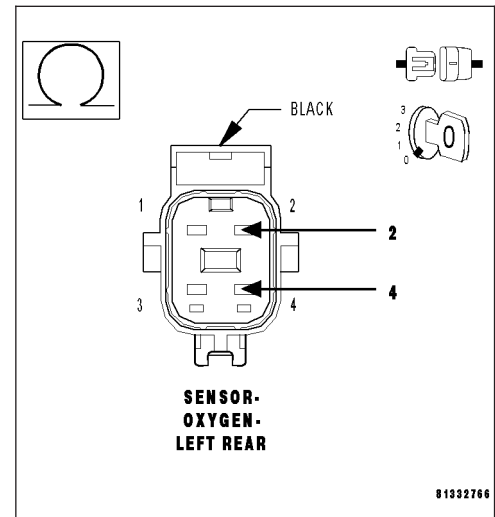
**7. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO (Z902) O2 1/2 HEATER GROUND CIRCUIT**

Measure the resistance between the (K141) O2 1/2 Signal circuit and the (Z902) O2 1/2 Heater ground circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (Z902) O2 1/2 Heater ground circuit and the (K141) O2 1/2 Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8



## 8. PCM

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

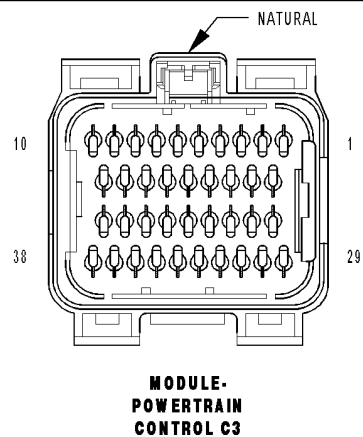
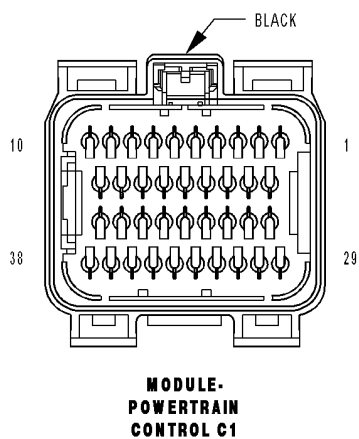
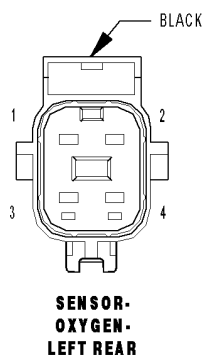
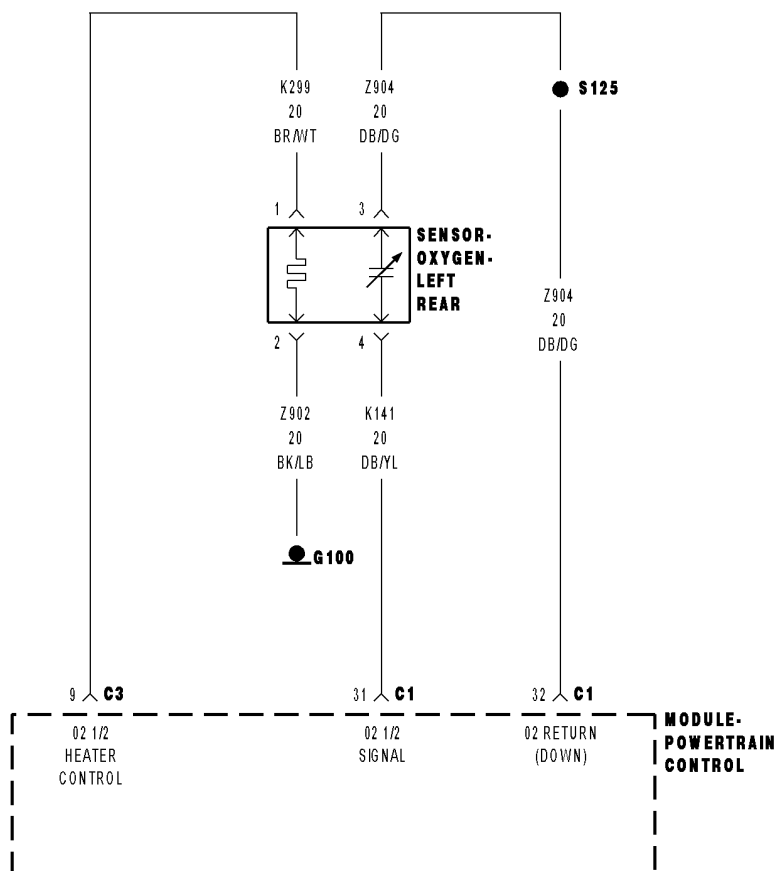
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

### Were there any problems found?

**Yes**    >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

# P0138-O2 SENSOR 1/2 CIRCUIT HIGH



P0138-O2 SENSOR 1/2 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
O2 Sensor Heater Temperature is greater than 496°C (925°F) and battery voltage greater than 10.99 volts.
- **Set Condition:**  
The Oxygen Sensor voltage is above 3.7 volts for 30 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K904) O2 DOWNSTREAM RETURN CIRCUIT SHORTED TO BATTERY VOLTAGE
(K141) O2 1/2 SENSOR SIGNAL CIRCUIT OPEN
(K904) O2 DOWNSTREAM RETURN CIRCUIT OPEN
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR ABOVE 3.7 VOLTS

**Note:** When only one O2 Sensor is shorted to voltage, the scan tool will display all O2 Sensor voltage readings at approximately 5.0 volts. When diagnosing this DTC, only diagnose the O2 Sensor that set the DTC.

Start the engine.

Allow the engine to reach normal operating temperature.

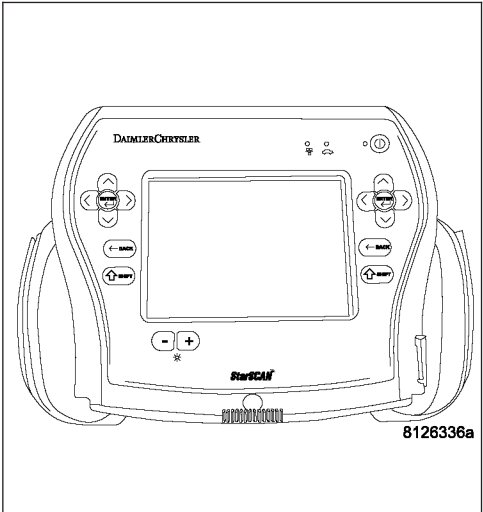
With a scan tool, read the 1/2 O2 Sensor voltage.

Is the voltage above 3.7 volts?

- Yes

>> Go To 2
- No

>> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0138-O2 SENSOR 1/2 CIRCUIT HIGH (CONTINUED)

### 2. (K141) O2 1/2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Start the engine and allow the engine to idle.

Disconnect the 1/2 O2 Sensor harness connector.

Measure the voltage on the (K141) O2 Sensor 1/2 Signal circuit in the O2 Sensor harness connector.

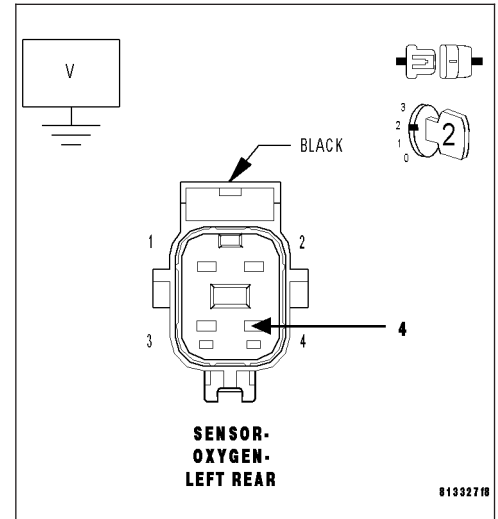
**Note: Measure the voltage in reference to ground, not the (K904) O2 Downstream Return circuit.**

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (K141) O2 Sensor 1/2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3



### 3. (K904) O2 DOWNSTREAM RETURN CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

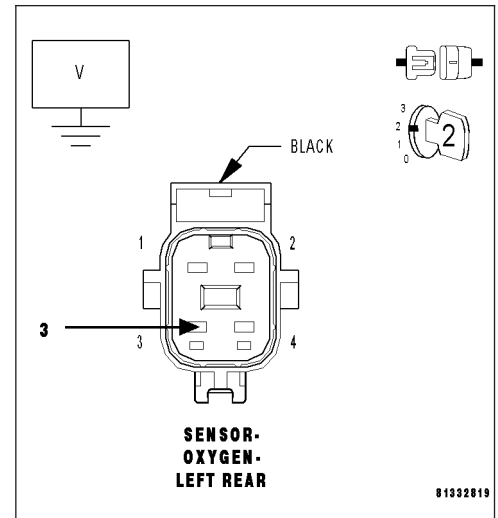
Measure the voltage on the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

**Is there any voltage present?**

**Yes** >> Repair the short to battery voltage in the (K904) O2 Downstream Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P0138-O2 SENSOR 1/2 CIRCUIT HIGH (CONTINUED)****4. O2 SENSOR**

Turn the ignition off.

Connect the PCM harness connectors.

Connect a jumper wire between the (K141) O2 1/2 Signal circuit and the (K904) O2 Downstream Return circuit in the 1/2 O2 Sensor harness connector.

Ignition on, engine not running.

With a scan tool, monitor the 1/2 O2 Sensor voltage.

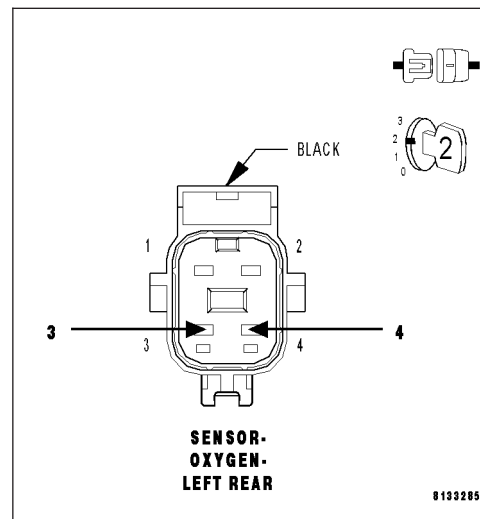
**Is the voltage between 2.3 and 2.7 volts with the jumper wire installed?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**Note:** Remove the jumper wire before continuing.

**5. (K141) O2 1/2 SIGNAL CIRCUIT OPEN**

Turn the ignition off.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

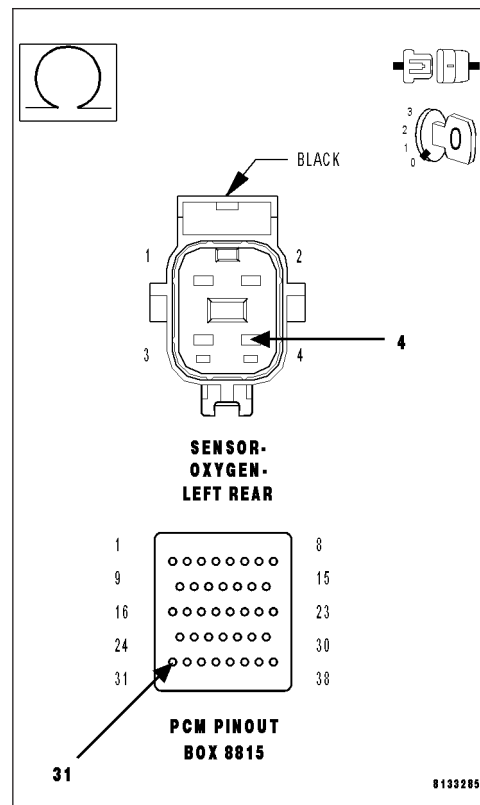
Measure the resistance of the (K141) O2 1/2 Signal circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K141) O2 1/2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



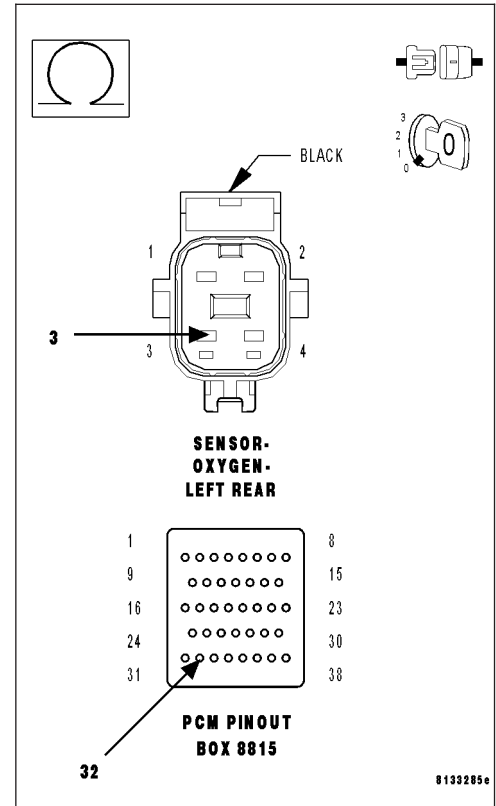
## P0138-O2 SENSOR 1/2 CIRCUIT HIGH (CONTINUED)

### 6. (K904) O2 DOWNSTREAM RETURN CIRCUIT OPEN

Measure the resistance of the (K904) O2 Downstream Return circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

- Yes** >> Go To 7
- No** >> Repair the open in the (K904) O2 Downstream Return circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## 7. PCM

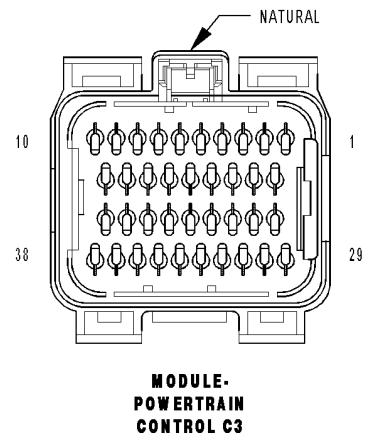
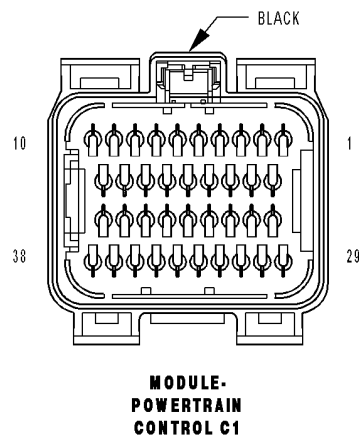
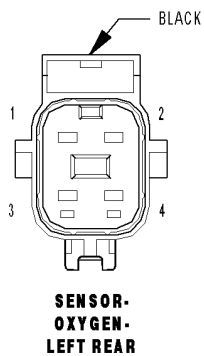
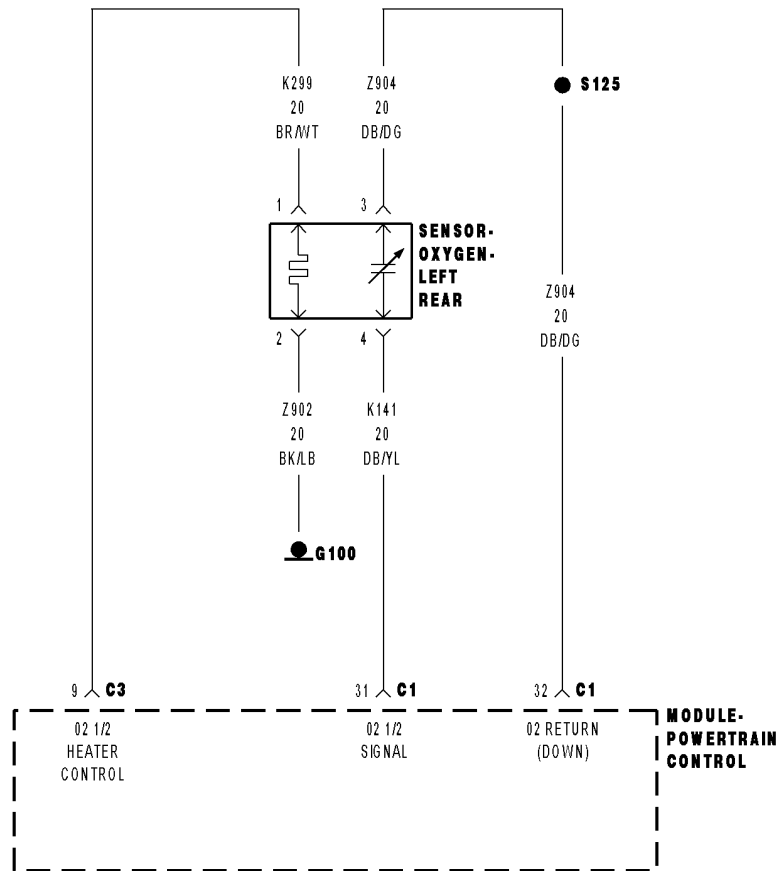
**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0139-O2 SENSOR 1/2 SLOW RESPONSE**

**P0139-O2 SENSOR 1/2 SLOW RESPONSE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Vehicle is started and driven between 20 and 55 MPH with the Throttle open for a minimum of 120 seconds. Coolant greater than 70°C (158°F). Catalytic Converter Temp greater than 600°C (1112°F) and EVAP Purge is active.

- **Set Condition:**

The oxygen sensor signal voltage switches less than 16 times from lean to rich within 20 seconds during monitoring. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK (K141) O2 1/2 SIGNAL CIRCUIT (K904) O2 DOWNSTREAM RETURN CIRCUIT O2 SENSOR

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant. Ignition on, engine not running.

**Note:** After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.

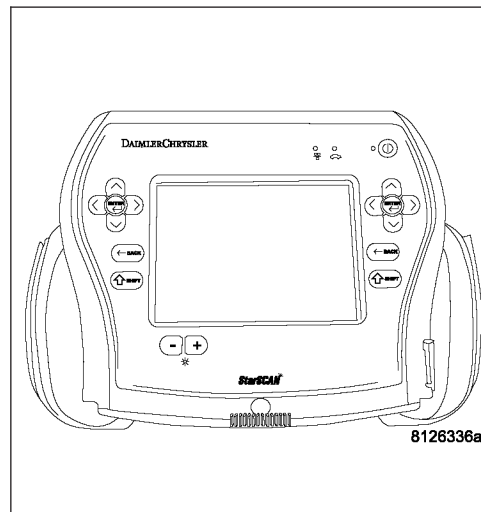
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 2. EXHAUST LEAK

Start the engine.

Inspect the exhaust system for leaks between the engine and the O2 Sensors.

**Are there any exhaust leaks?**

**Yes** >> Repair or replace the leaking exhaust parts as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**P0139-O2 SENSOR 1/2 SLOW RESPONSE (CONTINUED)****3. (K141) O2 1/2 SIGNAL CIRCUIT**

Turn the ignition off

Disconnect the 1/2 O2 Sensor harness connector.

Ignition on, engine not running.

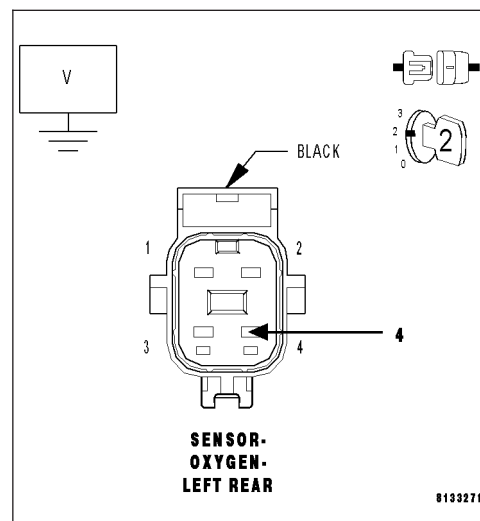
Measure the voltage on the (K141) O2 1/2 Signal circuit in the O2 Sensor harness connector.

**Is the voltage between 4.5 and 5.0 volts?**

**Yes** >> Go To 4

**No** >> Check the (K141) O2 1/2 Signal circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**4. (K904) O2 DOWNSTREAM RETURN CIRCUIT**

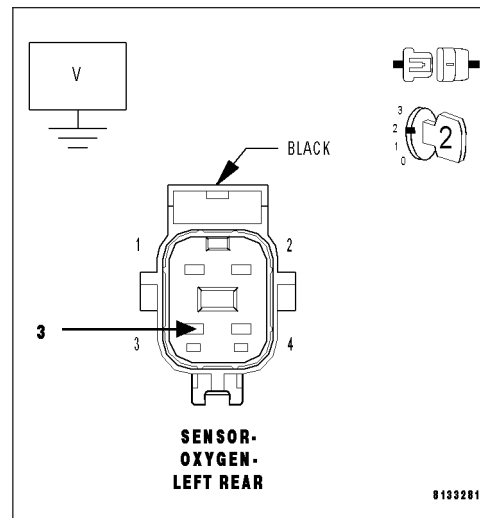
Measure the voltage on the (K904) O2 Downstream Return circuit in the 1/2 O2 Sensor harness connector.

**Is the voltage at 2.5 volts?**

**Yes** >> Go To 5

**No** >> Check the (K904) O2 Downstream Return circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. O2 SENSOR**

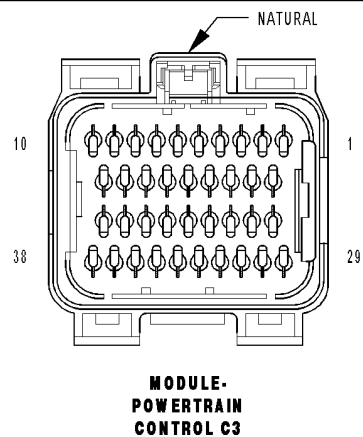
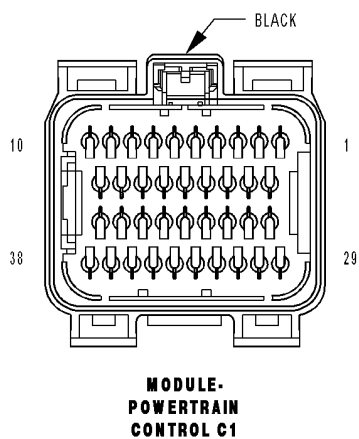
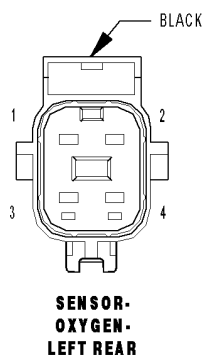
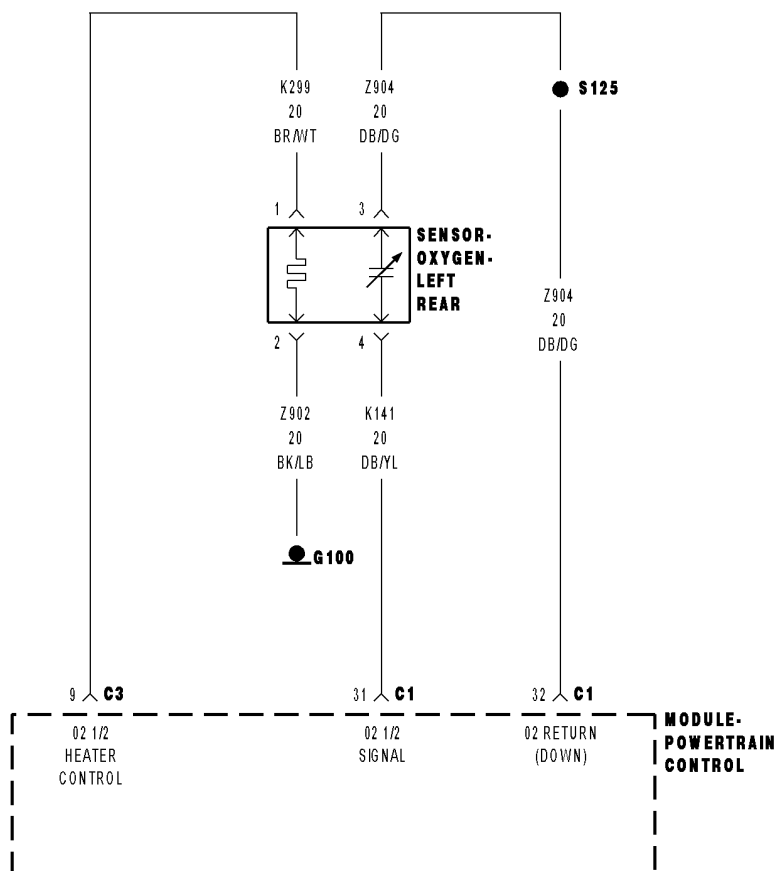
**If there are no possible causes remaining, view repair.**

**Repair**

Replace the O2 Sensor

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0141-O2 SENSOR 1/2 HEATER PERFORMANCE



P0141-O2 SENSOR 1/2 HEATER PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Engine running and heater duty cycle greater than 0%. Battery voltage greater than 11.0 volts.
- **Set Condition:**  
No sensor output is received when the PCM powers up the sensor heater. Two trip fault. Three good trips to turn off the MIL.

Possible Causes
(K299) O2 1/2 HEATER CONTROL CIRCUIT OPEN (Z902) O2 HEATER GROUND CIRCUIT OPEN O2 SENSOR HEATER ELEMENT PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

**Note:** Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize between 4.6 and 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test.

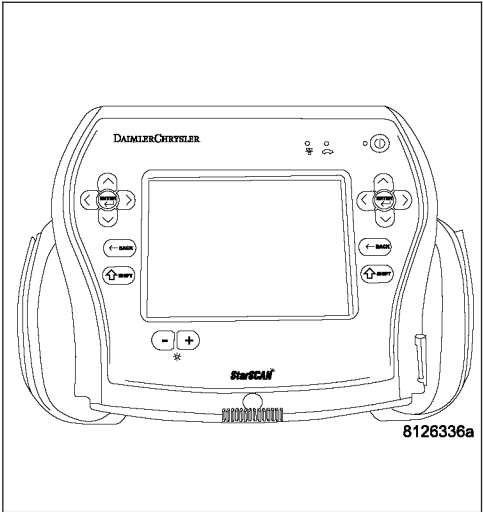
With the scan tool, monitor 1/2 O2 Sensor voltage for at least 2 minutes.

Does the voltage stay above 4.5 volts?

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0141-O2 SENSOR 1/2 HEATER PERFORMANCE (CONTINUED)****2. O2 SENSOR HEATER ELEMENT**

Turn the ignition off.

**Note:** Allow the O2 sensor to cool down to room temperature.

Disconnect the O2 Sensor harness connector.

Measure the resistance of the O2 Heater Element across the O2 Sensor connector between the O2 Heater Control terminal and the Heater ground terminal.

**Note:** O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

**Is the resistance of the O2 Sensor Heater Element between 2.0 and 30.0 ohms?**

**Yes** >> Go To 3

**No** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**3. (K299) O2 1/2 HEATER CONTROL CIRCUIT OPEN**

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

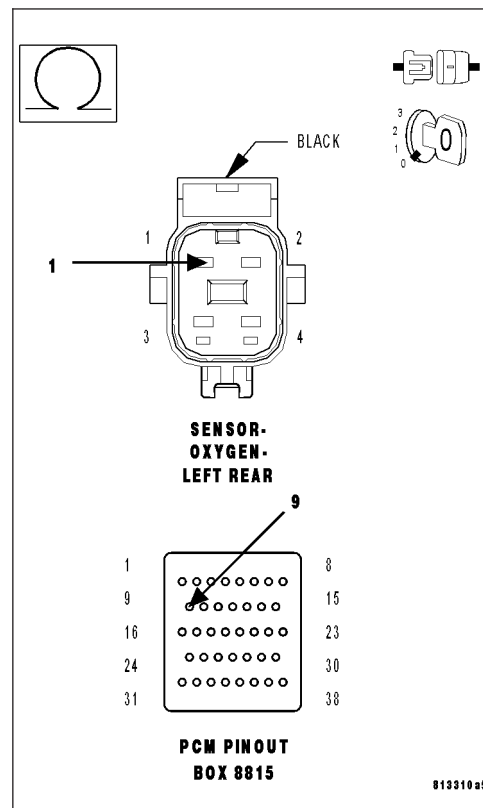
Measure the resistance of the (K299) O2 1/2 Heater Control circuit from the O2 harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 0.5 of an ohm?**

**Yes** >> Go To 4

**No** >> Repair the excessive resistance in the (K299) O2 1/2 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0141-O2 SENSOR 1/2 HEATER PERFORMANCE (CONTINUED)****4. (Z902) O2 1/2 HEATER GROUND CIRCUIT OPEN**

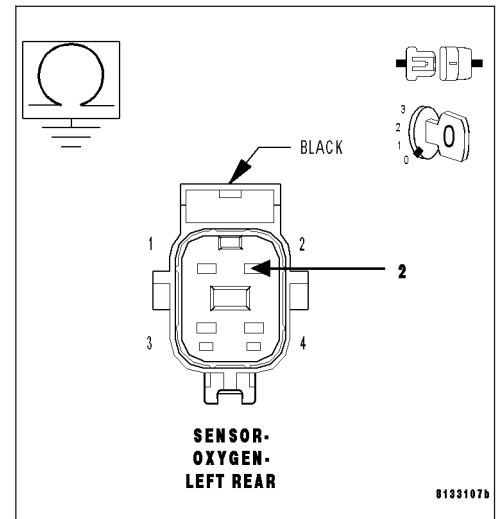
Measure the resistance between ground and the (Z902) O2 1/2 Heater ground circuit in the O2 Sensor harness connector.

**Is the resistance below 0.5 of an ohm?**

**Yes** >> Go To 5

**No** >> Repair the excessive resistance in the (Z902) O2 1/2 Heater ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

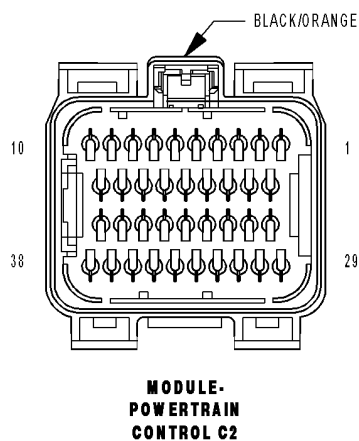
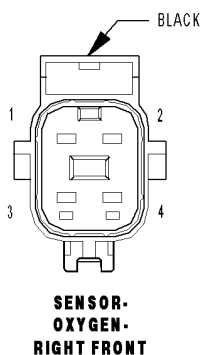
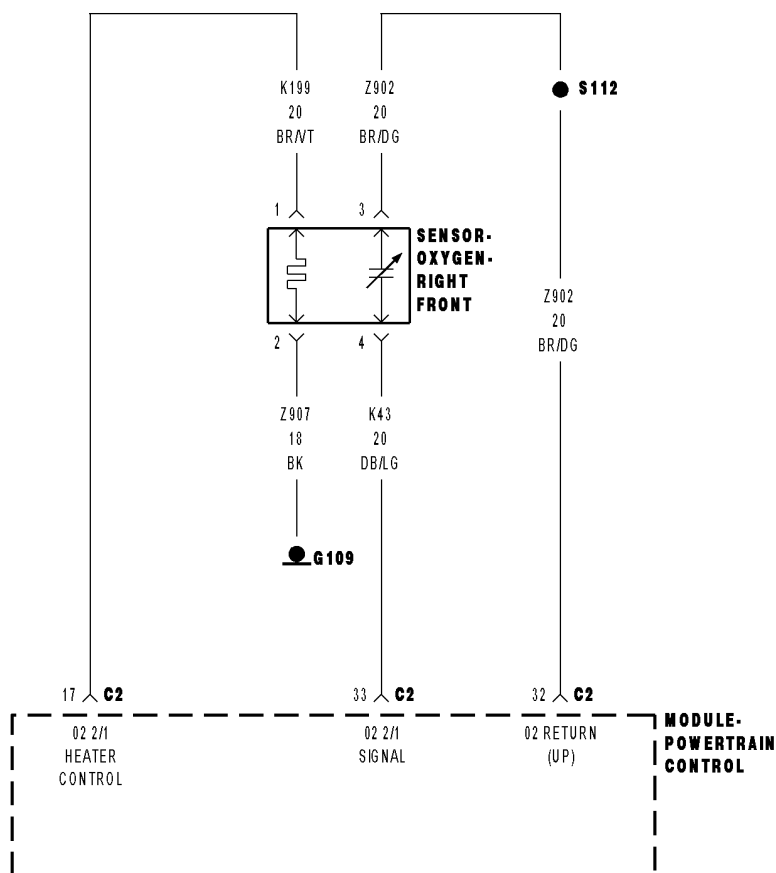
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0151-O2 SENSOR 2/1 CIRCUIT LOW





**P0151-O2 SENSOR 2/1 CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running for less than 30 seconds and the O2 Sensor Heater Temperature is less than 251°C (484°F) with battery voltage greater 10.99 volts.

- **Set Condition:**

The oxygen sensor signal voltage is below 1.5 volts for 3 seconds after starting engine. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K902) O2 UPSTREAM RETURN CIRCUIT SHORTED TO GROUND
(K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO GROUND
(K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO (K902) O2 UPSTREAM RETURN CIRCUIT
(K43) O2 2/1 SIGNAL SHORTED TO THE (Z904) HEATER GROUND CIRCUIT
O2 SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. O2 SENSOR BELOW 1.5 VOLTS

Start the engine.

Allow the engine to reach normal operating temperature.

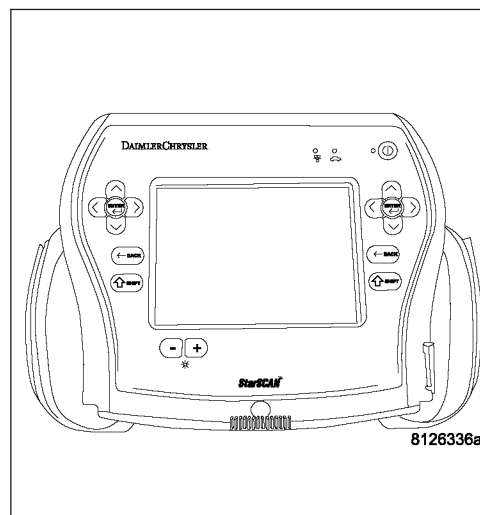
With a scan tool, read the 2/1 O2 Sensor voltage.

**Is the voltage below 1.5 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 2. (K43) O2 2/1 SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the 2/1 O2 Sensor harness connector.

Ignition on, engine not running.

With a scan tool, monitor the 2/1 O2 Sensor voltage.

**Is the O2 Sensor voltage above 4.8 volts?**

**Yes** >> Go To 3

**No** >> Go To 5

**P0151-O2 SENSOR 2/1 CIRCUIT LOW (CONTINUED)****3. O2 SENSOR**

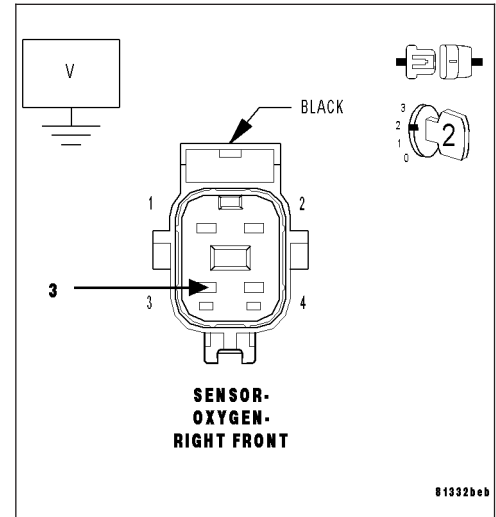
Measure the voltage on the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

**Is the voltage at 2.5 volts?**

**Yes** >> Replace the 2/1 O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (K902) O2 UPSTREAM RETURN CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

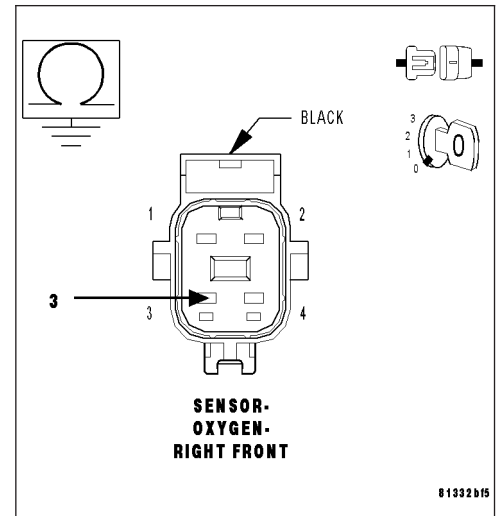
Measure the resistance between ground and the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K902) O2 Upstream Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P0151-O2 SENSOR 2/1 CIRCUIT LOW (CONTINUED)****5. (K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

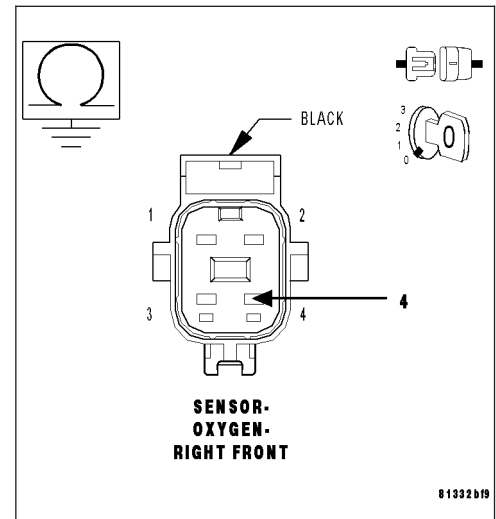
Measure the resistance between ground and the (K43) O2 2/1 Signal circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K43) O2 2/1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**6. (K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO (K902) O2 UPSTREAM RETURN CIRCUIT**

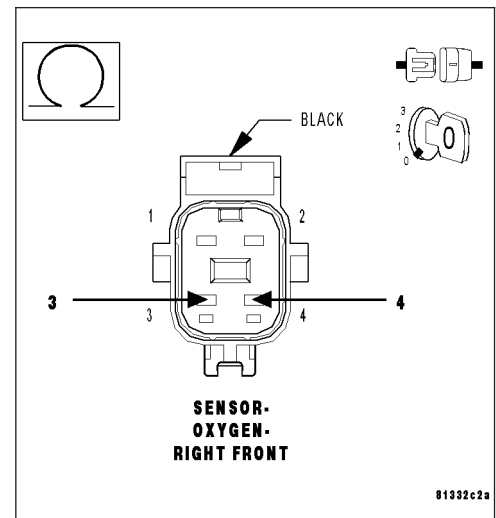
Measure the resistance between the (K43) O2 2/1 Signal circuit and the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K902) O2 Upstream Return circuit and the (K43) O2 2/1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7



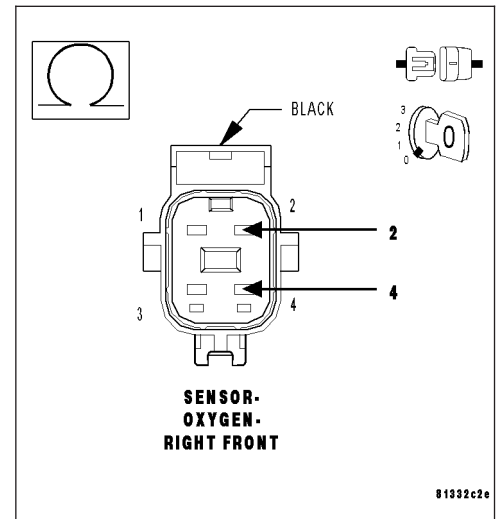
**P0151-O2 SENSOR 2/1 CIRCUIT LOW (CONTINUED)****7. (K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO (Z904) HEATER GROUND CIRCUIT**

Measure the resistance between the (K43) O2 2/1 Signal circuit and the (Z904) O2 Heater ground circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (Z904) O2 Heater ground circuit and the (K43) O2 2/1 Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

**8. PCM**

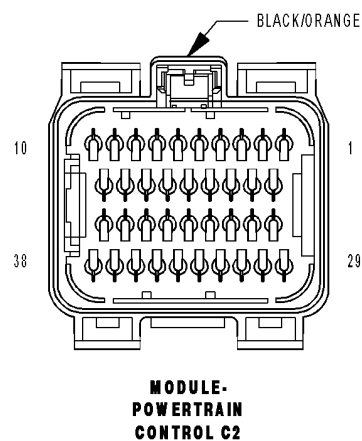
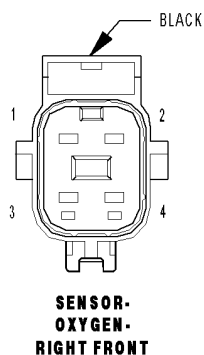
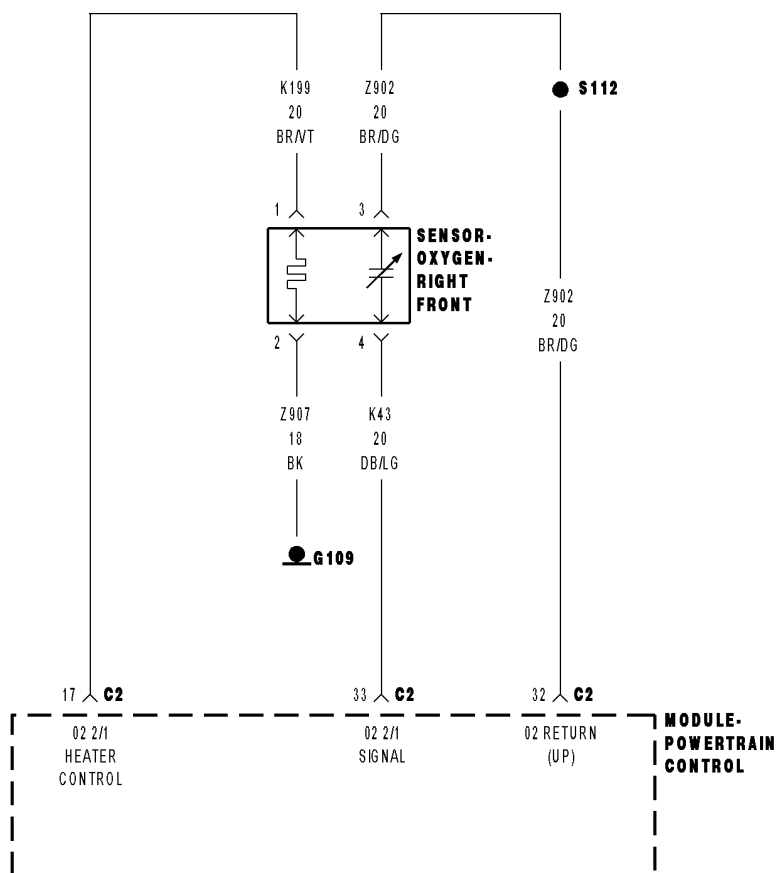
**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**P0152-O2 SENSOR 2/1 CIRCUIT HIGH**

### P0152-O2 SENSOR 2/1 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:**  
O2 Sensor Heater Temperature is greater than 496°C (925°F) and battery voltage greater than 10.99 volts.
- Set Condition:**  
The Oxygen Sensor voltage is above 3.7 volts for 30 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE (K902) O2 UPSTREAM RETURN CIRCUIT SHORTED TO BATTERY VOLTAGE (K43) O2 2/1 SIGNAL CIRCUIT OPEN (K902) O2 UPSTREAM RETURN CIRCUIT OPEN O2 SENSOR PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

### Diagnostic Test

#### 1. O2 SENSOR ABOVE 3.7 VOLTS

**Note:** When only one O2 Sensor is shorted to voltage, the scan tool will display all O2 Sensor voltage readings at approximately 5.0 volts. When diagnosing this DTC, only diagnose the O2 Sensor that set the DTC.

Start the engine.

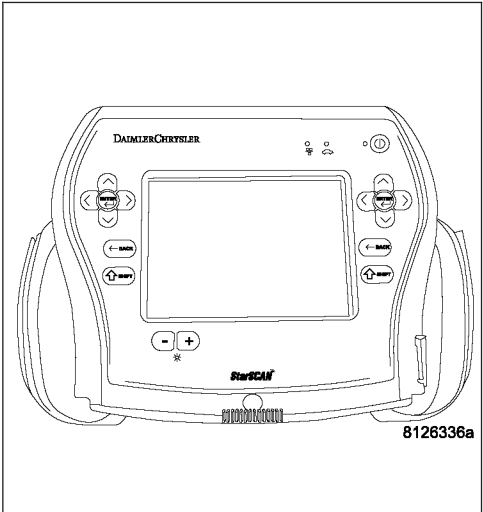
Allow the engine to reach normal operating temperature.

With a scan tool, read the 2/1 O2 Sensor voltage.

**Is the voltage above 3.7 volts?**

**Yes**    >> Go To 2

**No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
 Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0152-O2 SENSOR 2/1 CIRCUIT HIGH (CONTINUED)****2. (K43) O2 2/1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Start the engine and allow the engine to idle.

Disconnect the 2/1 O2 Sensor harness connector.

Measure the voltage on the (K43) O2 Sensor 2/1 Signal circuit in the 2/1 O2 Sensor harness connector.

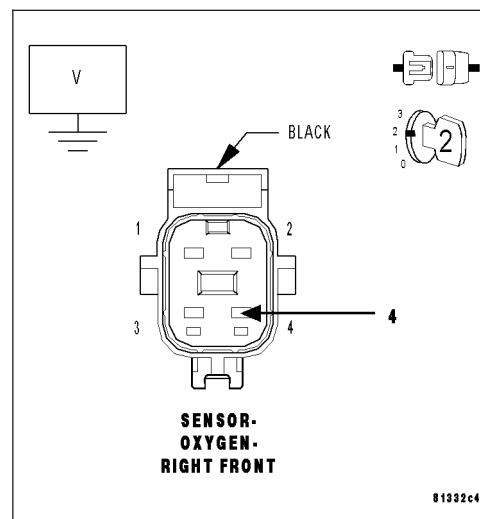
**Note:** Measure the voltage in reference to ground, not the (K902) O2 Upstream Return circuit.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (K43) O2 Sensor 2/1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K902) O2 UPSTREAM RETURN CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

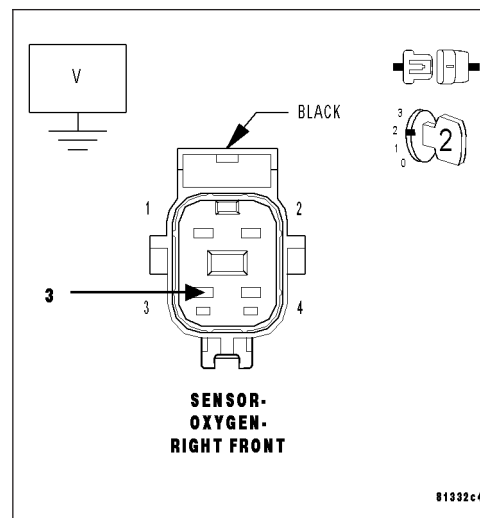
Measure the voltage on the (K902) O2 Upstream Return circuit in the 2/1 O2 Sensor harness connector.

**Is there any voltage present?**

**Yes** >> Repair the short to battery voltage in the (K902) O2 Upstream Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



## P0152-O2 SENSOR 2/1 CIRCUIT HIGH (CONTINUED)

### 4. O2 SENSOR

Turn the ignition off.

Connect the PCM harness connectors.

Connect a jumper wire between the (K43) O2 2/1 Signal circuit and the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

Ignition on, engine not running.

With a scan tool, monitor the 2/1 O2 Sensor voltage.

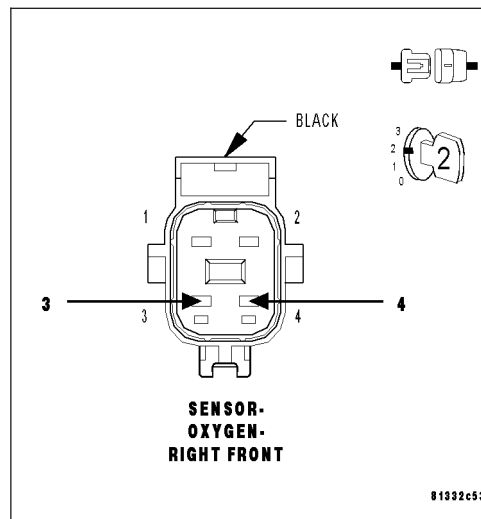
**Is the voltage between 2.3 and 2.7 volts with the jumper wire in place?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**Note:** Remove the jumper wire before continuing.



### 5. (K43) O2 2/1 SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the PCM harness connector.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

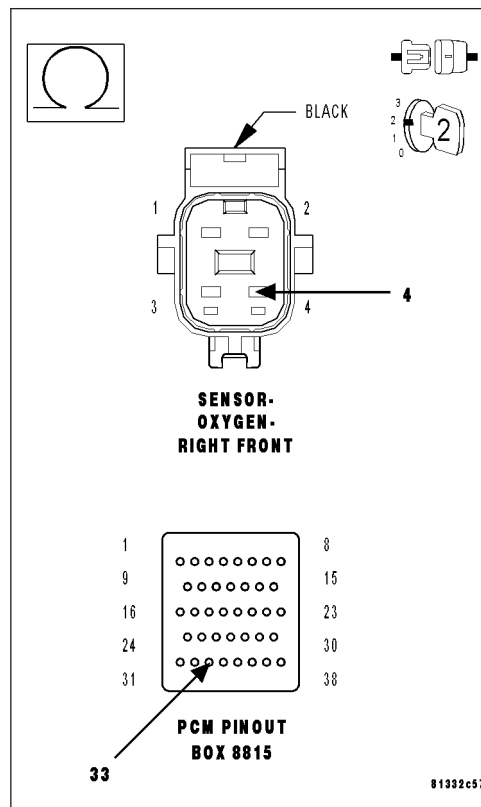
Measure the resistance of the (K43) O2 2/1 Signal circuit from the 2/1 O2 Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K43) O2 2/1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





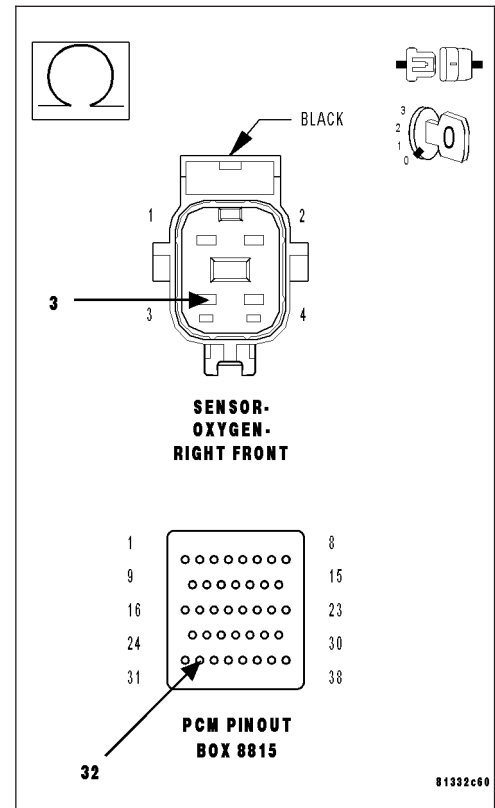
**P0152-O2 SENSOR 2/1 CIRCUIT HIGH (CONTINUED)****6. (K902) O2 UPSTREAM RETURN CIRCUIT OPEN**

Measure the resistance of the (K902) O2 Upstream Return circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K902) O2 Upstream Return circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

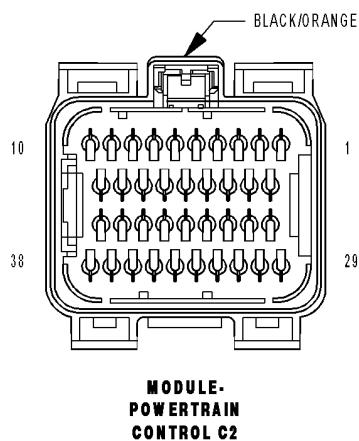
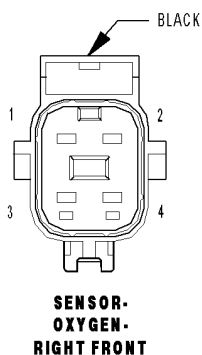
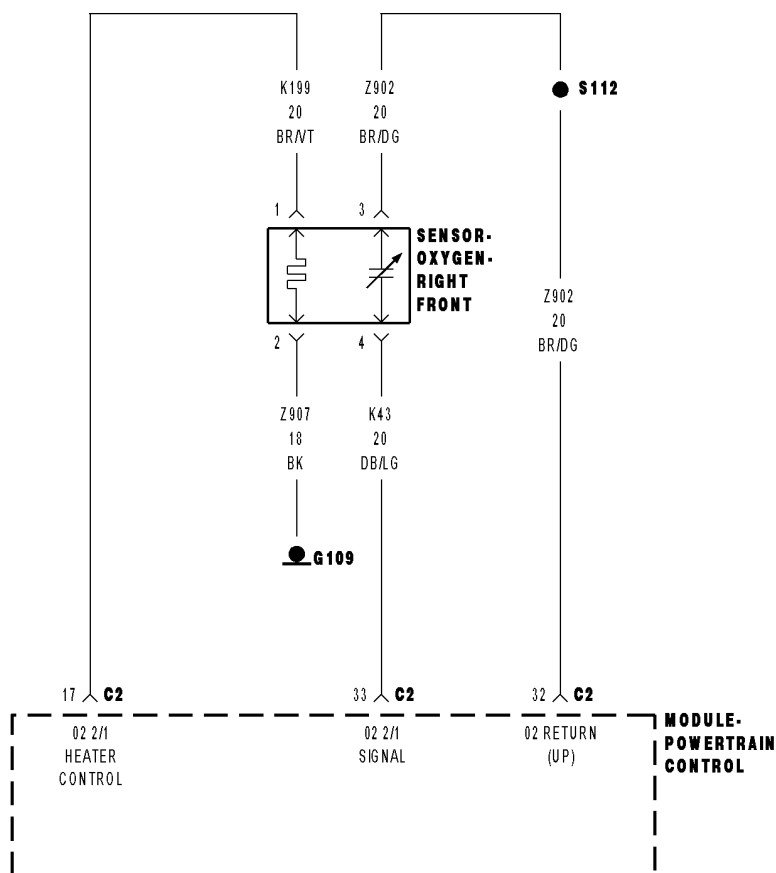
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0153-O2 SENSOR 2/1 SLOW RESPONSE



**P0153-O2 SENSOR 2/1 SLOW RESPONSE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Vehicle is started and driven between 20 and 55 MPH with the Throttle open for a minimum of 120 seconds. Coolant greater than 70°C (158°F). Catalytic Converter Temp greater than 600°C (1112°F) and EVAP Purge is active.

- **Set Condition:**

The oxygen sensor signal voltage switches less than 16 times from lean to rich within 20 seconds during monitoring. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK (K43) O2 2/1 SIGNAL CIRCUIT (K902) O2 UPSTREAM RETURN CIRCUIT O2 SENSOR

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant. Ignition on, engine not running.

**Note:** After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.

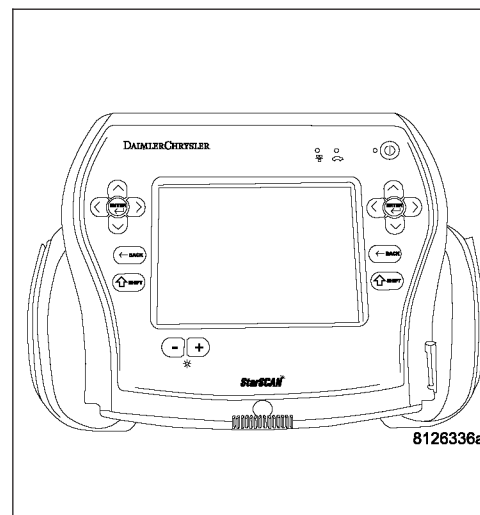
With a scan tool, read DTCs and record the related Freeze Frame data.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 2. EXHAUST LEAK

Start the engine.

Inspect the exhaust system for leaks between the engine and the O2 Sensors.

**Are there any exhaust leaks?**

**Yes** >> Repair or replace the leaking exhaust parts as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**P0153-O2 SENSOR 2/1 SLOW RESPONSE (CONTINUED)****3. (K43) O2 2/1 SIGNAL CIRCUIT**

Turn the ignition off

Disconnect the O2 Sensor harness connector.

Ignition on, engine not running.

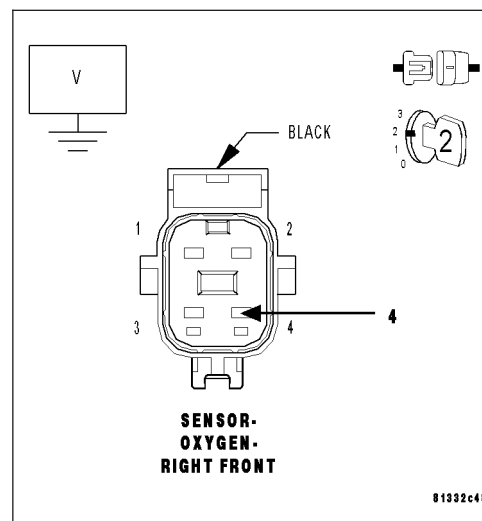
Measure the voltage on the (K43) O2 2/1 Signal circuit in the O2 Sensor harness connector.

**Is the voltage between 4.5 and 5.0 volts?**

**Yes** >> Go To 4

**No** >> Check the (K43) O2 2/1 Signal circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**4. (K902) O2 UPSTREAM RETURN CIRCUIT**

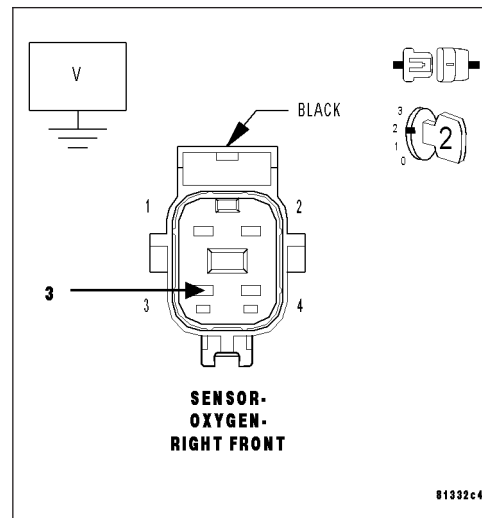
Measure the voltage on the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

**Is the voltage at 2.5 volts?**

**Yes** >> Go To 5

**No** >> Check the (K902) O2 Upstream Return circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. O2 SENSOR**

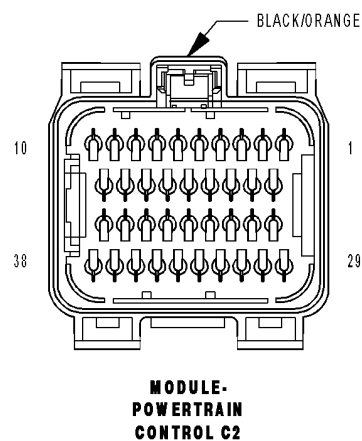
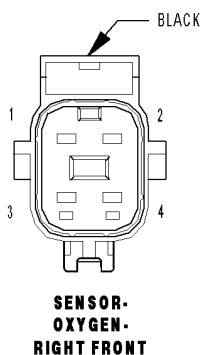
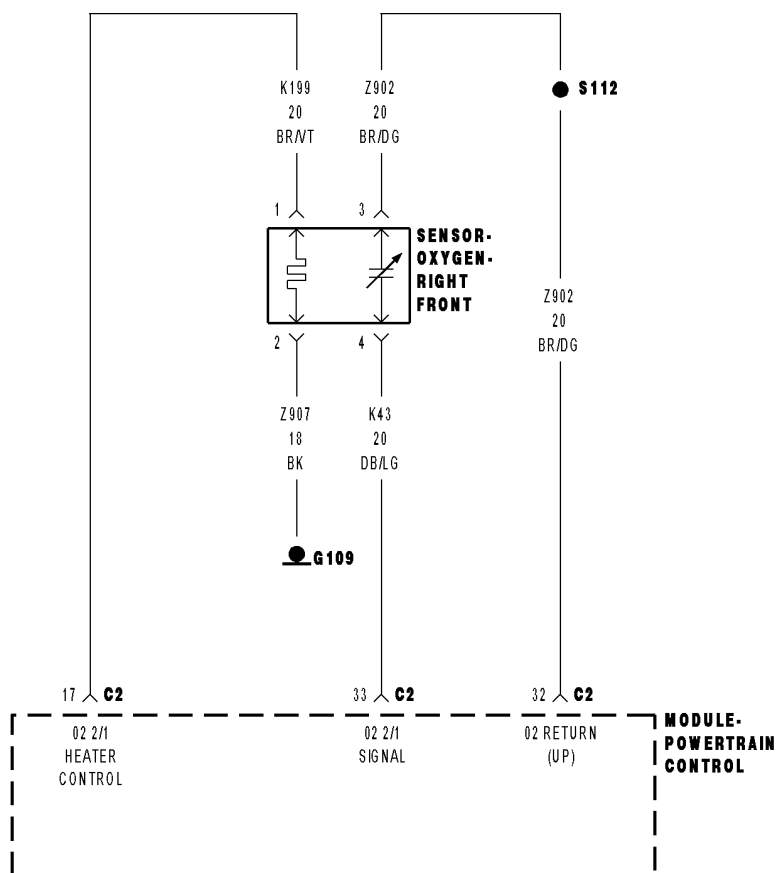
**If there are no possible causes remaining, view repair.**

**Repair**

Replace the O2 Sensor

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0155-O2 SENSOR 2/1 HEATER PERFORMANCE



**P0155-O2 SENSOR 2/1 HEATER PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running and heater duty cycle greater than 0%. Battery voltage greater than 11.0 volts.

- **Set Condition:**

No sensor output is received when the PCM powers up the sensor heater. Two trip fault. Three good trips to turn off the MIL.

Possible Causes
(K199) O2 2/1 HEATER CONTROL CIRCUIT OPEN
(Z904) O2 HEATER GROUND CIRCUIT OPEN
O2 SENSOR HEATER ELEMENT
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

**Note:** Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize between 4.6 and 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test.

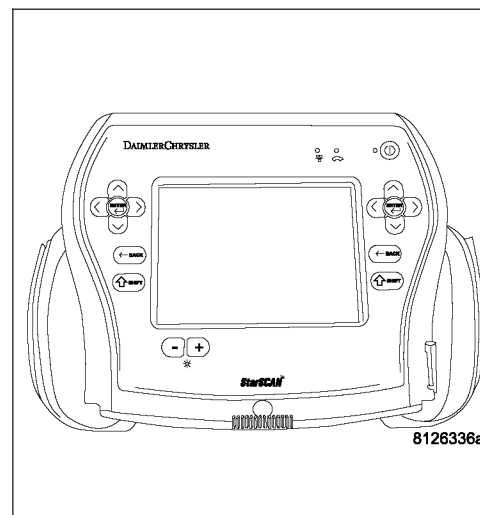
With the scan tool, monitor 2/1 O2 Sensor voltage for at least 2 minutes.

**Does the voltage stay above 4.5 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0155-O2 SENSOR 2/1 HEATER PERFORMANCE (CONTINUED)****2. O2 SENSOR HEATER ELEMENT**

Turn the ignition off.

**Note:** Allow the O2 sensor to cool down to room temperature.

Disconnect the 2/1 O2 Sensor harness connector.

Measure the resistance of the O2 Heater Element across the O2 Sensor connector between the O2 Heater Control terminal and the O2 Heater ground terminal.

**Note:** O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

**Is the resistance of the O2 Sensor Heater Element between 2.0 and 30.0 ohms?**

**Yes** >> Go To 3

**No** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**3. (K199) O2 2/1 HEATER CONTROL CIRCUIT OPEN**

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

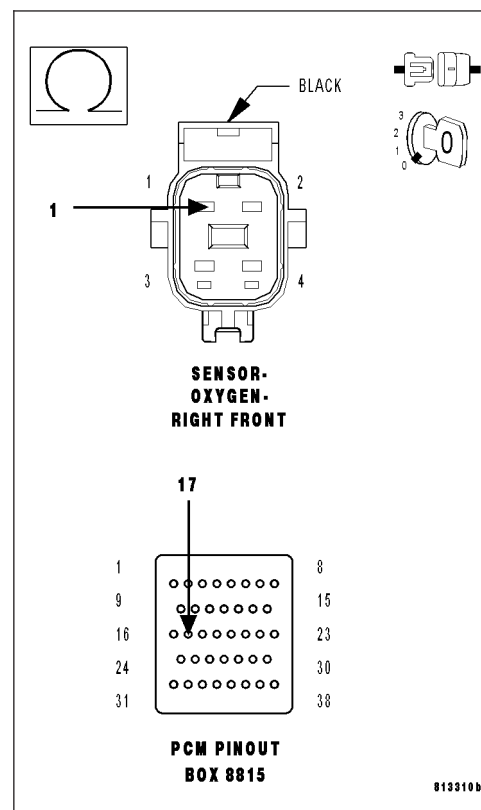
Measure the resistance of the (K199) O2 2/1 Heater Control circuit from the O2 harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 0.5 of an ohm?**

**Yes** >> Go To 4

**No** >> Repair the excessive resistance in the (K199) O2 2/1 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0155-O2 SENSOR 2/1 HEATER PERFORMANCE (CONTINUED)****4. (Z904) O2 SENSOR HEATER GROUND CIRCUIT OPEN**

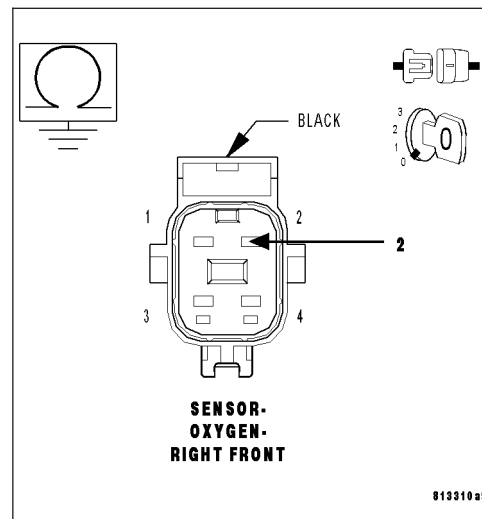
Measure the resistance between ground and the (Z904) O2 Heater ground circuit in the O2 Sensor harness connector.

**Is the resistance below 0.5 of an ohm?**

**Yes** >> Go To 5

**No** >> Repair the excessive resistance in the (Z904) O2 Heater ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**Wiring Diagram:**

- SENSOR-OXYGEN-RIGHT REAR (Z904, DB/DG):**
  - Pin 1: Connected to K399 (20, BR/GY)
  - Pin 3: Connected to Z904 (20, DB/DG)
  - Pin 4: Connected to K243 (20, BR)
- MODULE-POWERTRAIN CONTROL (C1, C3):**
  - Pin 10: 02 2/2 HEATER CONTROL (C3)
  - Pin 33: 02 2/2 SIGNAL (C1)
  - Pin 32: 02 RETURN (DOWN) (C1)
- Fuses:**
  - G100: Connected to Z902 (20, BK/LB)
  - S125: Connected to Z904 (20, DB/DG)

**Connector Views:**

- MODULE-POWERTRAIN CONTROL C1:** Shows a 38-pin connector with a black label.
- SENSOR-OXYGEN-RIGHT REAR:** Shows a 4-pin connector with a black label.
- MODULE-POWERTRAIN CONTROL C3:** Shows a 38-pin connector with a natural label.

**P0157-O2 SENSOR 2/2 CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running for less than 30 seconds and the O2 Sensor Heater Temperature is less than 251°C (484°F) with battery voltage greater 10.99 volts.

- **Set Condition:**

The oxygen sensor signal voltage is below 1.5 volts for 3 seconds after starting engine. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K904) O2 DOWNSTREAM RETURN CIRCUIT SHORTED TO GROUND
(K243) O2 2/2 SIGNAL CIRCUIT SHORTED TO GROUND
(K243) O2 SIGNAL CIRCUIT SHORTED TO (K904) O2 DOWNSTREAM RETURN CIRCUIT
(K243) O2 SIGNAL SHORTED TO THE (Z902) O2 2/2 HEATER GROUND CIRCUIT
O2 SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. O2 SENSOR BELOW 1.5 VOLTS

Start the engine.

Allow the engine to reach normal operating temperature.

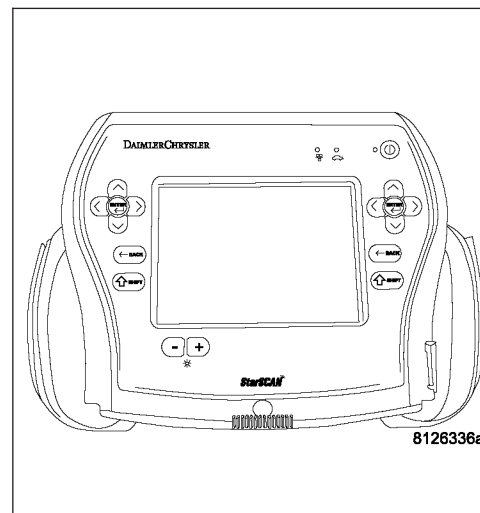
With a scan tool, read the 2/2 O2 Sensor voltage.

**Is the voltage below 1.5 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0157-O2 SENSOR 2/2 CIRCUIT LOW (CONTINUED)****2. (K243) O2 2/2 SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the 2/2 O2 Sensor harness connector.

Ignition on, engine not running.

With a scan tool, monitor the 2/2 O2 Sensor voltage.

**Is the O2 Sensor voltage above 4.8 volts?**

**Yes** >> Go To 3

**No** >> Go To 5

**3. O2 SENSOR**

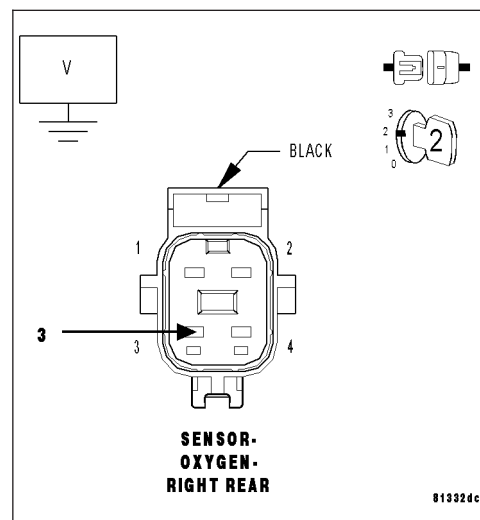
Measure the voltage on the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

**Is the voltage at 2.5 volts?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (K904) O2 DOWNSTREAM RETURN CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

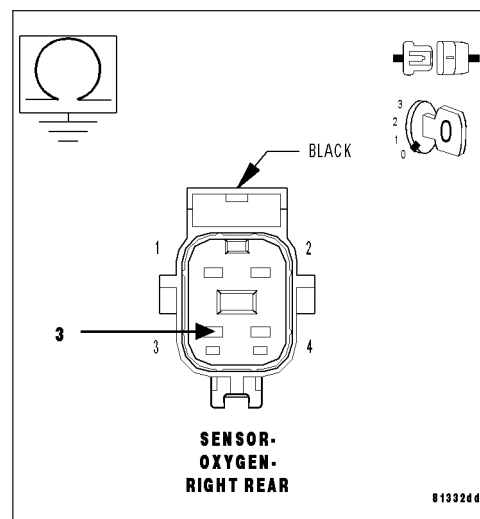
Measure the resistance between ground and the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K904) O2 Downstream Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P0157-O2 SENSOR 2/2 CIRCUIT LOW (CONTINUED)****5. (K243) O2 2/2 SIGNAL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

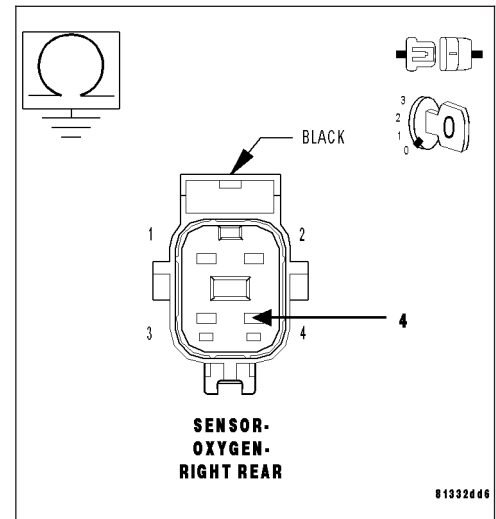
Measure the resistance between ground and the (K243) O2 2/2 Signal circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K243) O2 2/2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**6. (K243) O2 2/2 SIGNAL CIRCUIT SHORTED TO THE (K904) O2 DOWNSTREAM RETURN CIRCUIT**

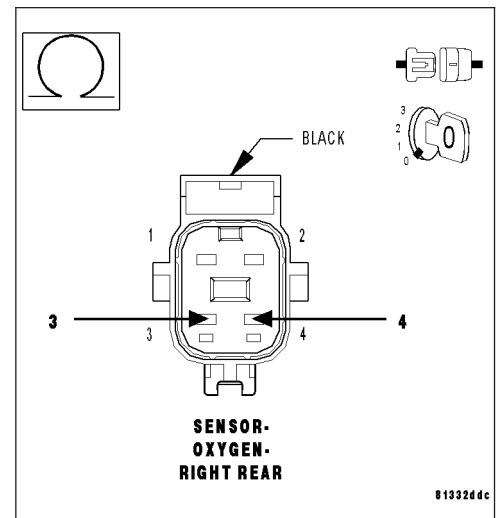
Measure the resistance between the (K243) O2 2/2 Signal circuit and the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K904) O2 Downstream Return circuit and the (K243) O2 2/2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7



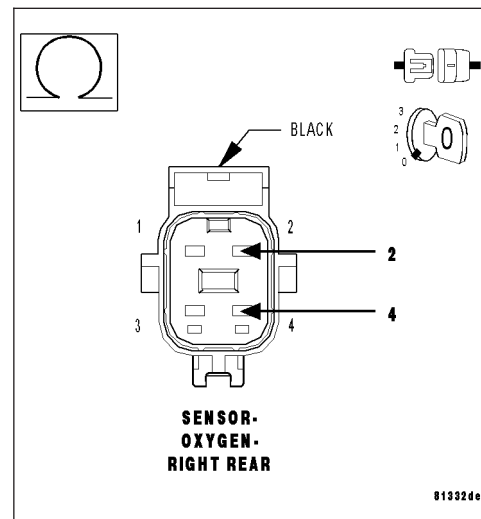
**P0157-O2 SENSOR 2/2 CIRCUIT LOW (CONTINUED)****7. (K243) O2 2/2 SIGNAL CIRCUIT SHORTED TO (Z902) O2 2/2 HEATER GROUND CIRCUIT**

Measure the resistance between the (K243) O2 2/2 Signal circuit and the (Z902) O2 2/2 Heater ground circuit in the O2 Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (Z902) O2 2/2 Heater ground circuit and the (K243) O2 2/2 Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

**8. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

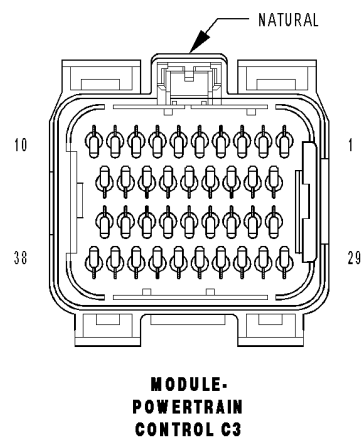
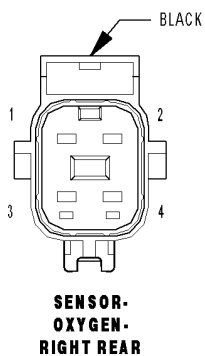
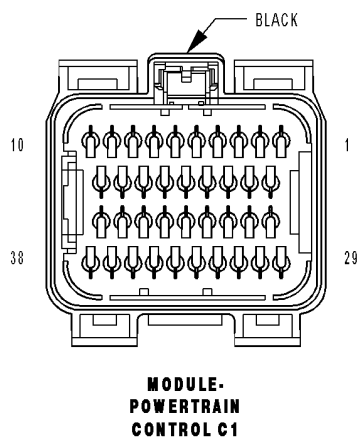
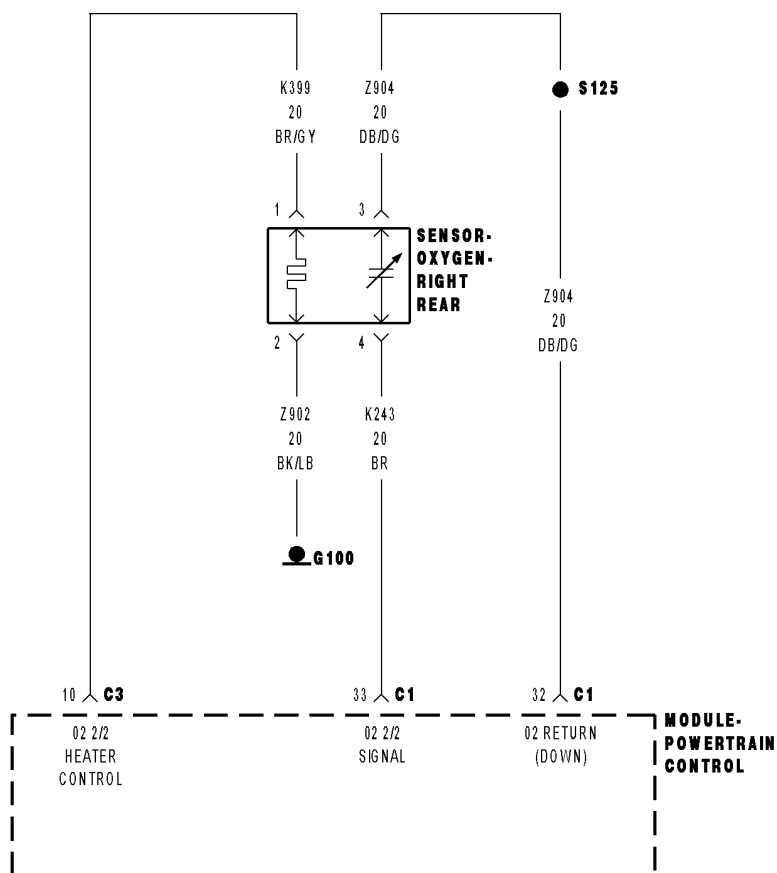
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0158-O2 SENSOR 2/2 CIRCUIT HIGH



P0158-O2 SENSOR 2/2 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
O2 Sensor Heater Temperature is greater than 496°C (925°F) and battery voltage greater than 10.99 volts.
- **Set Condition:**  
The Oxygen Sensor voltage is above 3.7 volts for 30 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K243) O22/2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K904) O2 DOWNSTREAM RETURN CIRCUIT SHORTED TO BATTERY VOLTAGE
(K243) O2 2/2 SIGNAL CIRCUIT OPEN
(K904) O2 DOWNSTREAM RETURN CIRCUIT OPEN
O2 SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. O2 SENSOR ABOVE 3.7 VOLTS

**Note:** When only one O2 Sensor is shorted to voltage, the scan tool will display all O2 Sensor voltage readings at approximately 5.0 volts. When diagnosing this DTC, only diagnose the O2 Sensor that set the DTC.

Start the engine.

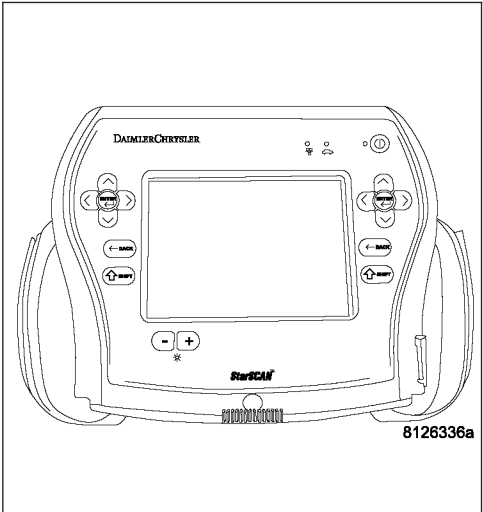
Allow the engine to reach normal operating temperature.

With a scan tool, read the 2/2 O2 Sensor voltage.

**Is the voltage above 3.7 volts?**

**Yes**    >> Go To 2

**No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0158-O2 SENSOR 2/2 CIRCUIT HIGH (CONTINUED)****2. (K243) O2 2/2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Start the engine and allow the engine to idle.

Disconnect the 2/2 O2 Sensor harness connector.

Measure the voltage on the (K243) O2 Sensor 2/2 Signal circuit in the O2 Sensor harness connector.

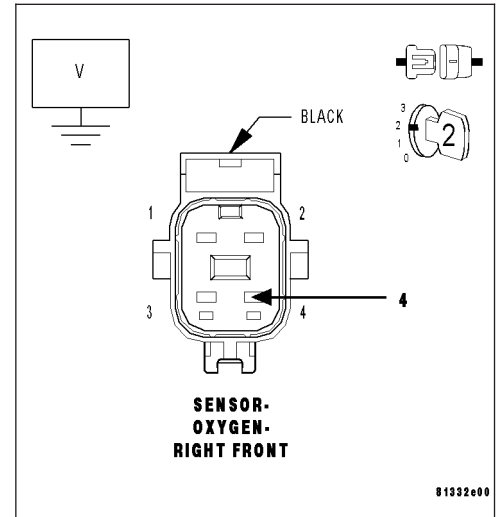
**Note:** Measure the voltage in reference to ground, not the (K904) O2 Downstream Return circuit.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (K243) O2 Sensor 2/2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K904) O2 DOWNSTREAM RETURN CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

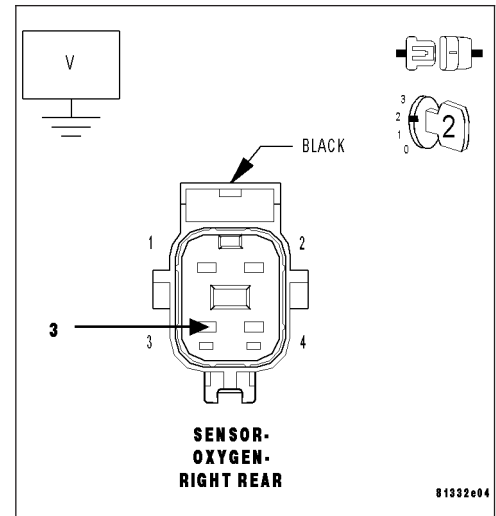
Measure the voltage on the (K904) O2 Downstream Return circuit in the 2/2 O2 Sensor harness connector.

**Is there any voltage present?**

**Yes** >> Repair the short to battery voltage in the (K904) O2 Downstream Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4





**P0158-O2 SENSOR 2/2 CIRCUIT HIGH (CONTINUED)****4. O2 SENSOR**

Turn the ignition off.

Connect the PCM harness connectors.

Connect a jumper wire between the (K243) O2 2/2 Signal circuit and the (K904) O2 Downstream Return circuit in the 2/2 O2 Sensor harness connector.

Ignition on, engine not running.

With a scan tool, monitor the 2/2 O2 Sensor voltage.

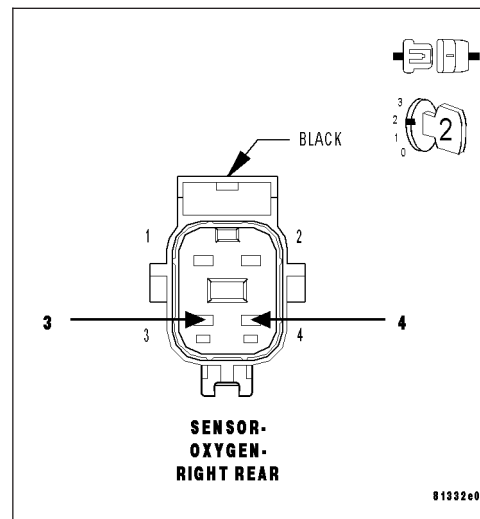
**Is the voltage between 2.3 and 2.7 volts with the jumper wire installed?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**Note:** Remove the jumper wire before continuing.

**5. (K243) O2 2/2 SIGNAL CIRCUIT OPEN**

Turn the ignition off.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

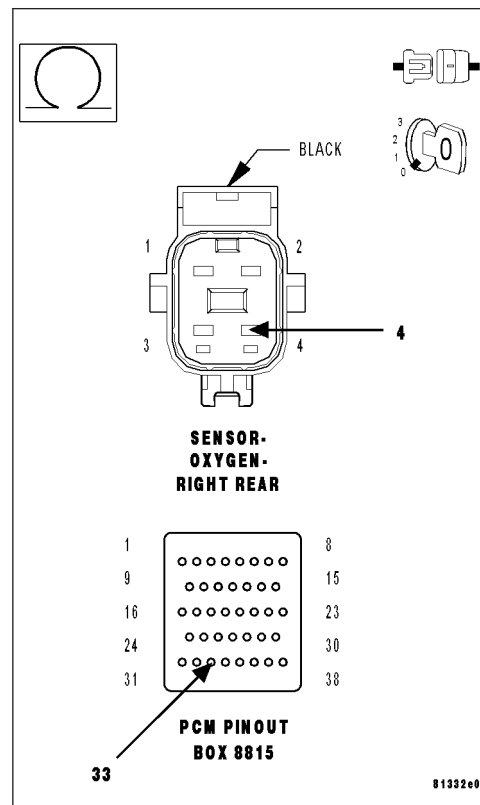
Measure the resistance of the (K243) O2 2/2 Signal circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K243) O2 2/2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



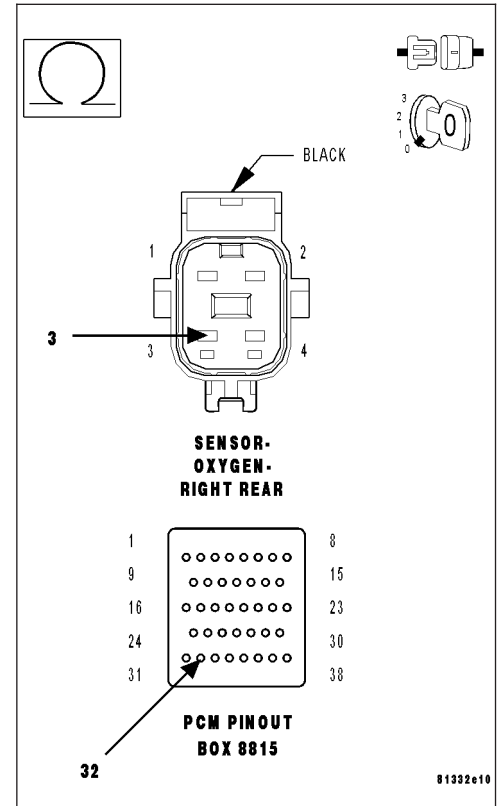
## P0158-O2 SENSOR 2/2 CIRCUIT HIGH (CONTINUED)

### 6. (K904) O2 DOWNSTREAM RETURN CIRCUIT OPEN

Measure the resistance of the (K904) O2 Downstream Return circuit from the O2 Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

- Yes** >> Go To 7
- No** >> Repair the open in the (K904) O2 Downstream Return circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



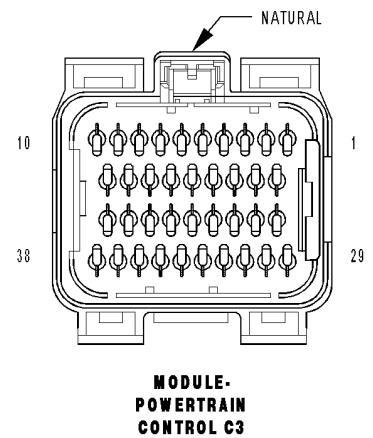
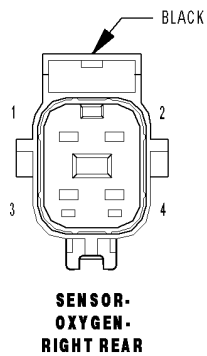
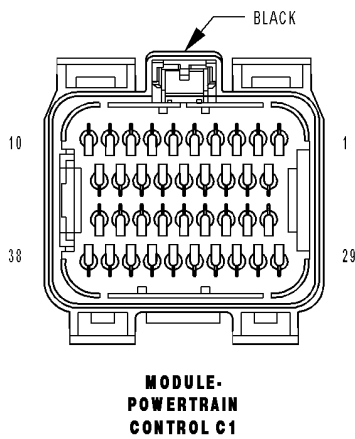
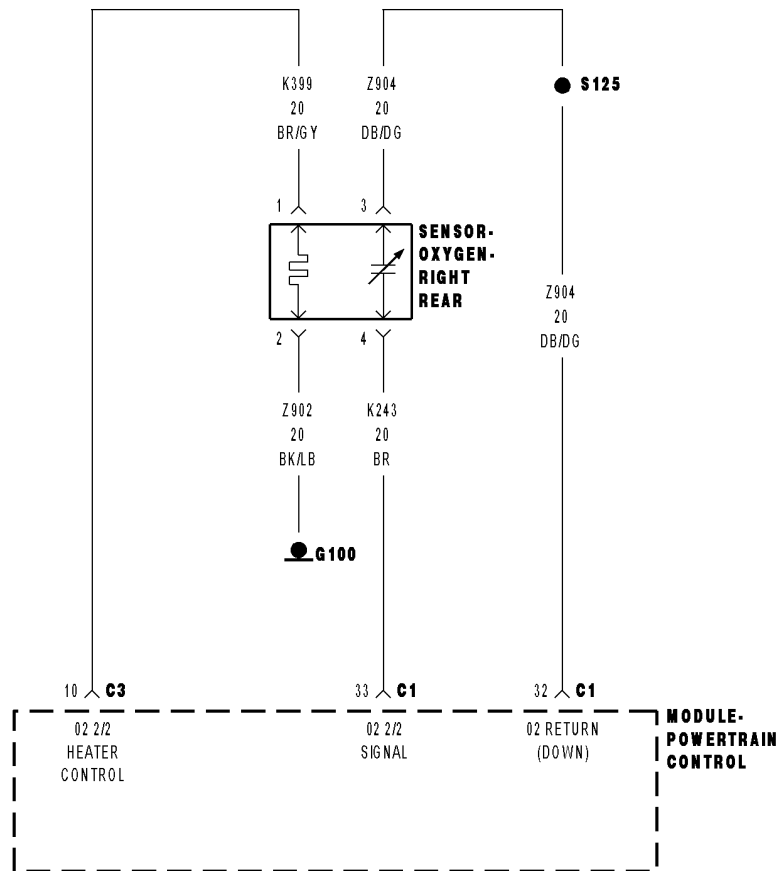
## 7. PCM

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**P0159-O2 SENSOR 2/2 SLOW RESPONSE**

**P0159-O2 SENSOR 2/2 SLOW RESPONSE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Vehicle is started and driven between 20 and 55 MPH with the Throttle open for a minimum of 120 seconds. Coolant greater than 70°C (158°F). Catalytic Converter Temp greater than 600°C (1112°F) and EVAP Purge is active.

- **Set Condition:**

The oxygen sensor signal voltage switches less than 16 times from lean to rich within 20 seconds during monitoring. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK (K243) O2 2/2 SIGNAL CIRCUIT (K904) O2 DOWNSTREAM RETURN CIRCUIT O2 SENSOR

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant. Ignition on, engine not running.

**Note:** After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.

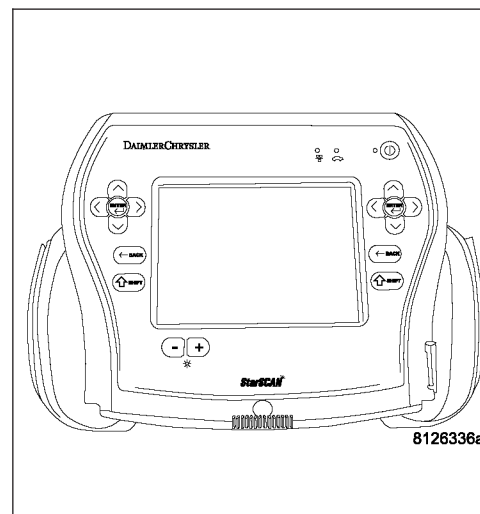
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 2. EXHAUST LEAK

Start the engine.

Inspect the exhaust system for leaks between the engine and the O2 Sensors.

**Are there any exhaust leaks?**

**Yes** >> Repair or replace the leaking exhaust parts as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**P0159-O2 SENSOR 2/2 SLOW RESPONSE (CONTINUED)****3. (K243) O2 2/2 SIGNAL CIRCUIT**

Turn the ignition off

Disconnect the 2/2 O2 Sensor harness connector.

Ignition on, engine not running.

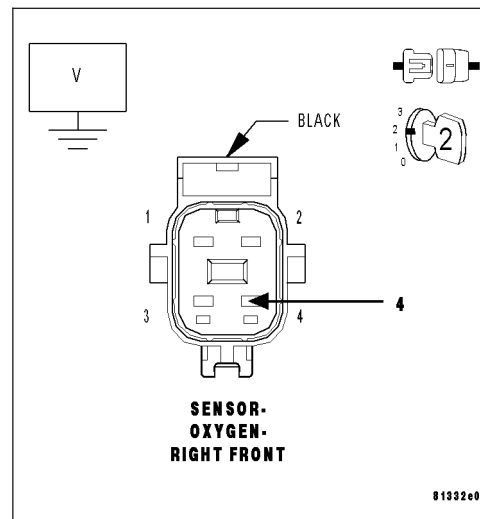
Measure the voltage on the (K243) O2 2/2 Signal circuit in the O2 Sensor harness connector.

**Is the voltage between 4.5 and 5.0 volts?**

**Yes** >> Go To 4

**No** >> Check the (K243) O2 2/2 Signal circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**4. (K904) O2 DOWNSTREAM RETURN CIRCUIT**

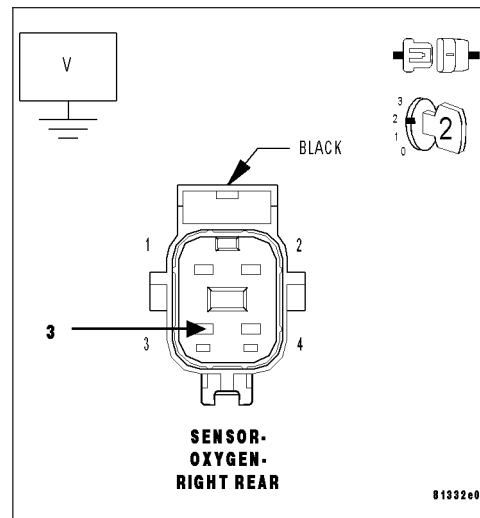
Measure the voltage on the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

**Is the voltage at 2.5 volts?**

**Yes** >> Go To 5

**No** >> Check the (K904) O2 Downstream Return circuit for a short to ground, open, or short to voltage. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. O2 SENSOR**

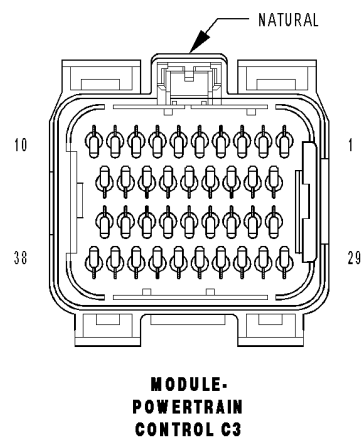
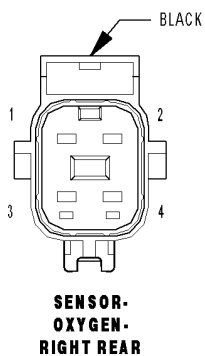
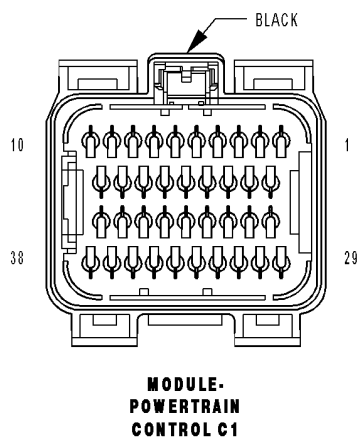
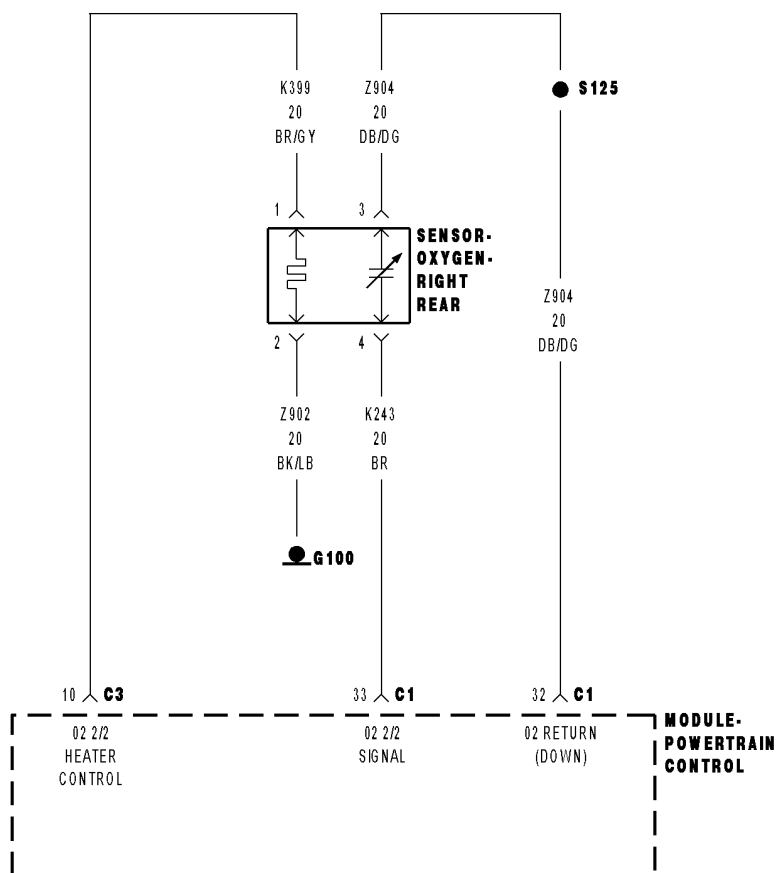
**If there are no possible causes remaining, view repair.**

**Repair**

Replace the O2 Sensor

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

# P0161-O2 SENSOR 2/2 HEATER PERFORMANCE



**P0161-O2 SENSOR 2/2 HEATER PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running and heater duty cycle greater than 0%. Battery voltage greater than 11.0 volts.

- **Set Condition:**

No sensor output is received when the PCM powers up the sensor heater. Two trip fault. Three good trips to turn off the MIL.

Possible Causes
(K399) O2 2/2 HEATER CONTROL CIRCUIT OPEN
(Z902) O2 2/2 HEATER GROUND CIRCUIT OPEN
O2 SENSOR HEATER ELEMENT
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING.**

## Diagnostic Test

### 1. O2 SENSOR HEATER OPERATION

Turn the ignition off.

**Note:** Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize between 4.6 and 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the O2 Heater Test.

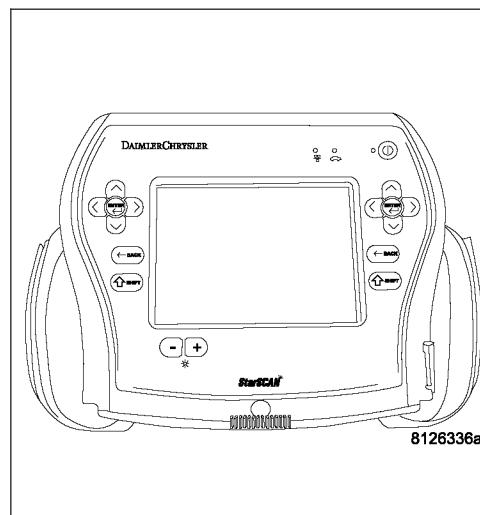
With a scan tool, monitor 2/2 O2 Sensor voltage for at least 2 minutes.

**Does the voltage stay above 4.5 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0161-O2 SENSOR 2/2 HEATER PERFORMANCE (CONTINUED)

### 2. O2 SENSOR HEATER ELEMENT

Turn the ignition off.

**Note:** Allow the O2 sensor to cool down to room temperature.

Disconnect the O2 Sensor harness connector.

Measure the resistance of the 2/2 O2 Heater Element, between the O2 Heater Control terminal and the O2 Heater ground terminal in the O2 Sensor connector.

**Note:** O2 Heater Element resistance values should be measured at 70°F (21.1°C). The resistance value will vary with different temperature values.

**Is the resistance of the O2 Sensor Heater Element between 2.0 and 30.0 ohms?**

**Yes** >> Go To 3

**No** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

### 3. (K399) O2 2/2 HEATER CONTROL CIRCUIT OPEN

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

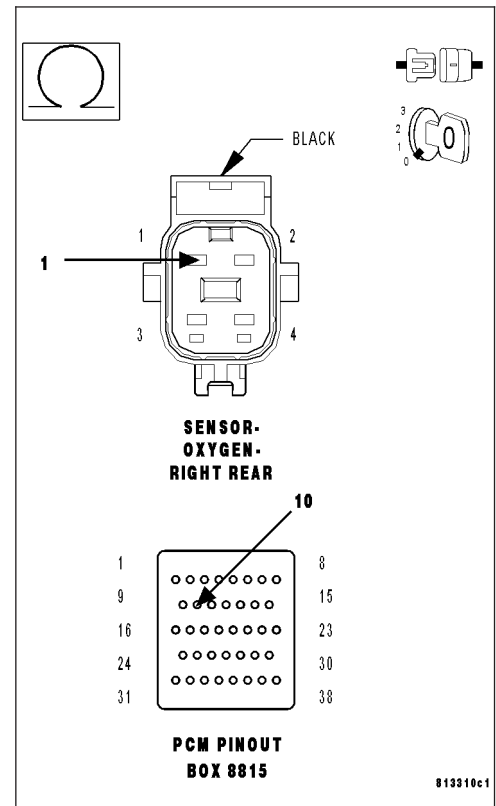
Measure the resistance of the (K399) O2 2/2 Heater Control circuit from the O2 harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 0.5 of an ohm?**

**Yes** >> Go To 4

**No** >> Repair the excessive resistance in the (K399) O2 2/2 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





**P0161-O2 SENSOR 2/2 HEATER PERFORMANCE (CONTINUED)****4. (Z902) O2 2/2 HEATER GROUND CIRCUIT OPEN**

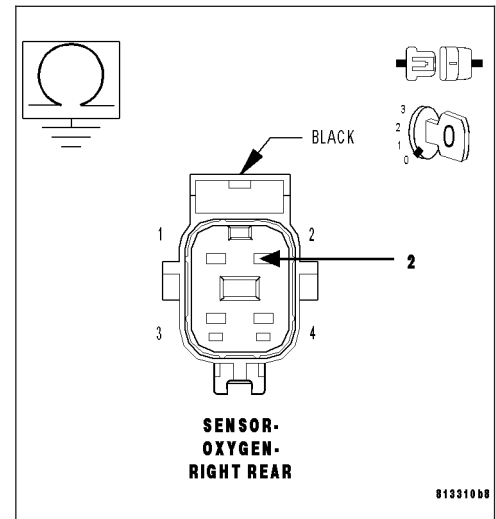
Measure the resistance between ground and the (Z902) O2 2/2 Heater ground circuit in the O2 Sensor harness connector.

**Is the resistance below 0.5 of an ohm?**

**Yes** >> Go To 5

**No** >> Repair the excessive resistance in the (Z902) O2 2/2 Heater ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

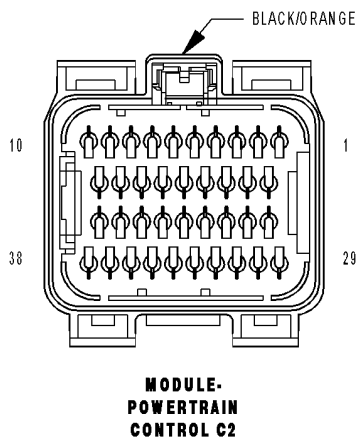
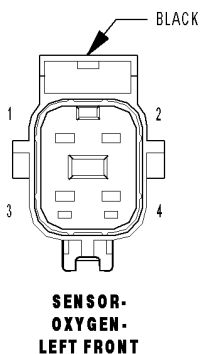
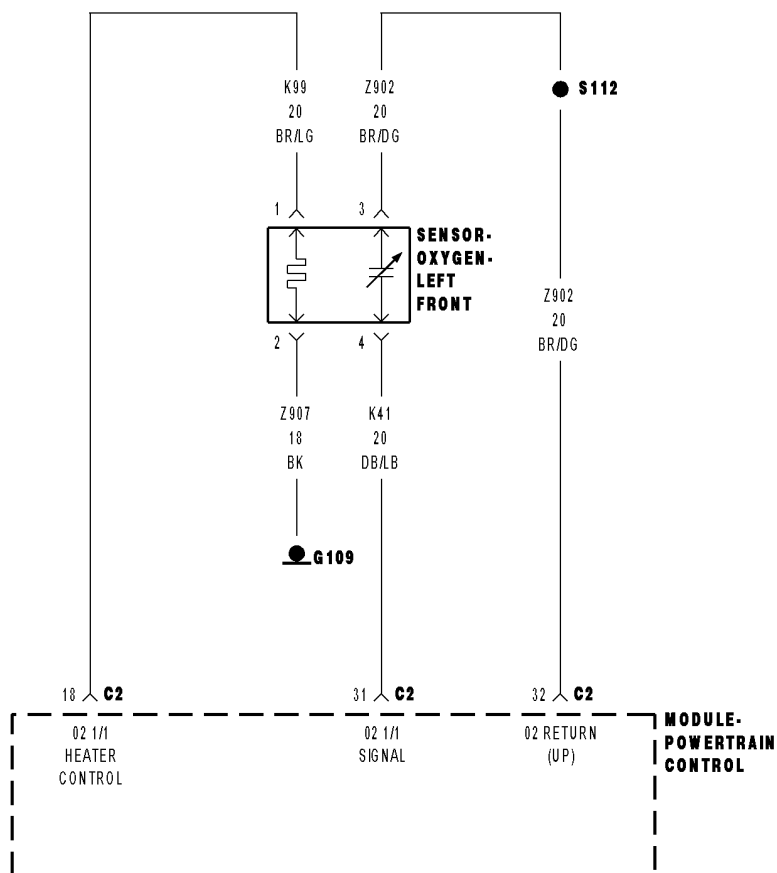
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0171-FUEL SYSTEM 1/1 LEAN



P0171-FUEL SYSTEM 1/1 LEAN (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the engine running in closed loop mode, the ambient/battery temperature above 20 deg. F and altitude below 8500 ft.
- **Set Condition:**  
If the PCM multiplies short term compensation by long term adaptive and a certain percentage is exceeded for two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL

Possible Causes
RESTRICTED FUEL SUPPLY LINE FUEL PUMP INLET STRAINER PLUGGED FUEL PUMP MODULE O2 SIGNAL CIRCUIT O2 RETURN CIRCUIT O2 SENSOR HEATER OPERATION O2 SENSOR MAP SENSOR OPERATION ECT SENSOR OPERATION ENGINE MECHANICAL PROBLEM FUEL FILTER/PRESSURE REGULATOR (HIGH) PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Diagnose all other trouble codes before continuing.

**Note: Check for contaminants that may have damaged an O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.**

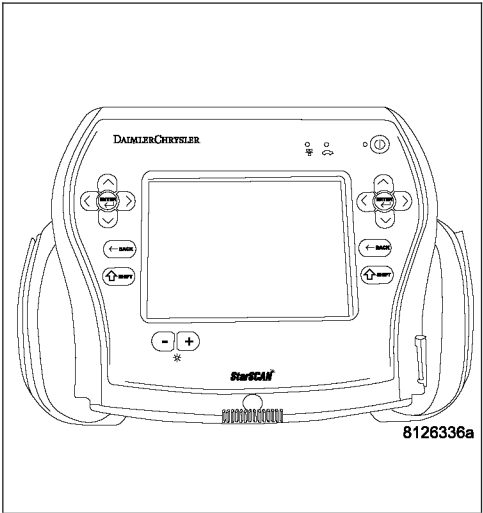
Ignition on, engine not running.

With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes

>> Go To 2
- No

>> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0171-FUEL SYSTEM 1/1 LEAN (CONTINUED)****2. CHECKING FUEL PRESSURE**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Ignition on, engine not running.

With a scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Turn the ignition off.

**CAUTION:** Stop All Actuations.

Choose a conclusion that best matches your fuel pressure reading.

**Within Specification**

Go To 3

**Above Specification**

Replace the fuel filter/pressure regulator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**Below Specification**

Go To 12

---

**3. O2 SENSOR OPERATION**

Start the engine.

Allow the engine to reach normal operating temperature.

**Note:** If one of the O2 Sensor's Signal or Return circuit is shorted to ground the scan tool will display all O2 Sensor voltage readings low. The O2 Sensor that is shorted to ground will display a voltage reading near or at 0 volts.

**Note:** If one of the O2 Sensor Signal or Return circuits are shorted to voltage, the scan tool will display all O2 Sensor voltage readings high.

**Note:** After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.

With a scan tool, monitor all of the O2 Sensor voltage readings.

Is the voltage switching between 2.5 and 3.4 volts for all the O2 Sensors?

**Yes** >> Go To 4

**No** >> Go To 8

---

**P0171-FUEL SYSTEM 1/1 LEAN (CONTINUED)****4. 1/1 O2 SENSOR HEATER OPERATION**

Turn the ignition off.

**Note:** Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

With a scan tool, actuate the 1/1 O2 Heater Test.

With the scan tool, monitor 1/1 O2 Sensor voltage for at least 2 minutes.

**Does the voltage stay above 4.5 volts?**

**Yes** >> Replace the 1/1 O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

---

**5. MAP SENSOR OPERATION**

Turn the ignition off.

Connect a Vacuum Gauge to a Manifold Vacuum source.

Start the engine.

Allow the engine to idle.

**Note:** If engine will not idle, maintain a constant RPM above idle.

With the scan tool, read the MAP Sensor vacuum value.

**Is the scan tool reading within 1" of the Vacuum Gauge reading?**

**Yes** >> Go To 6

**No** >> Replace the MAP Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**6. ECT SENSOR OPERATION**

**Note:** For this test to be valid, the thermostat must be operating correctly.

**Note:** This test works best if performed on a cold engine (cold soak)

Ignition on, engine not running.

With a scan tool, read the Engine Coolant Temperature (ECT) Sensor value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

**Note:** If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.

Start the Engine.

During engine warm-up, monitor the ECT Sensor value. The temperature value change should be a smooth transition from start up to normal operating temperature 82°C (180°F). The value should reach at least 82°C (180°F).

**Did the ECT value increase smoothly and did it reach at least 180°F (82°C)?**

**Yes** >> Go To 7

**No** >> Replace the Engine Coolant Temperature Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**P0171-FUEL SYSTEM 1/1 LEAN (CONTINUED)****7. ENGINE MECHANICAL PROBLEM**

Turn the ignition off.

Check for any of the following conditions/mechanical problems.

AIR INDUCTION SYSTEM - must be free from leaks.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11

**8. 1/1 O2 SENSOR**

Ignition on, engine not running.

Disconnect the 1/1 O2 Sensor harness connector.

With a scan tool, monitor the 1/1 O2 Sensor voltage.

O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.

Connect a jumper wire between the (K41) Signal circuit and the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

**Note: The voltage should drop from 5.0 volts to 2.5 volts with the jumper wire in place.**

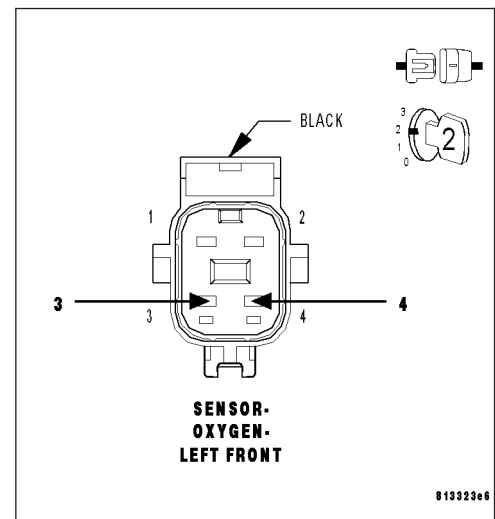
**Did the O2 Sensor voltage change from 5.0 volts to 2.5 volts with the jumper wire installed?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 9

**Note: Remove the jumper wire before continuing.**



## P0171-FUEL SYSTEM 1/1 LEAN (CONTINUED)

## 9. (K41) O2 SENSOR 1/1 SIGNAL CIRCUIT

With a scan tool, monitor the 1/1 O2 Sensor voltage reading with the jumper wire removed.

**Note:** The scan tool will display all O2 Sensor voltage readings approximately 5.0 volts when only one O2 Sensor's Signal circuit is shorted to voltage.

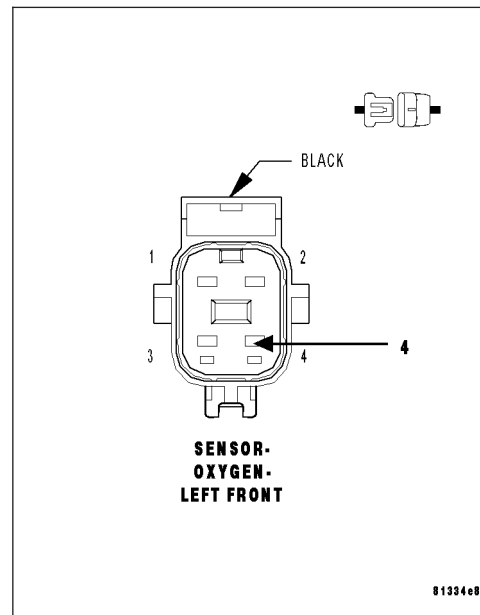
**Note:** The scan tool will display one O2 Sensor voltage close to zero and the others will read lower than normal when one O2 Sensor Signal circuit contains excessive resistance.

**Is the voltage above 4.8 volts?**

**Yes** >> Go To 10

**No** >> Check the (K41) O2 Sensor 1/1 Signal circuit for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## 10. (K902) O2 UPSTREAM RETURN CIRCUIT

Disconnect the 1/1 O2 Sensor harness connector.

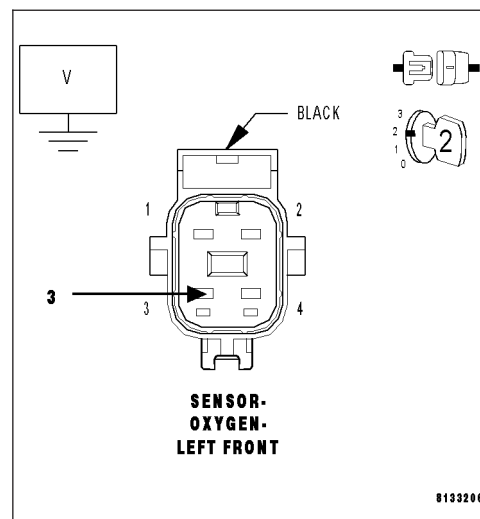
Measure the voltage on the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

**Is the voltage at 2.5 volts?**

**Yes** >> Go To 11

**No** >> Check the O2 Return circuit for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0171-FUEL SYSTEM 1/1 LEAN (CONTINUED)****11. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**12. RESTRICTED FUEL SUPPLY LINE**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special 5/16 fuel line adapter tool #6539 between disconnected fuel line and the fuel pump module.

Attach a fuel pressure test gauge to the T fitting on tool #6539.

Ignition on, engine not running.

With a scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

**CAUTION:** Stop All Actuations.

**Is the fuel pressure within specification?**

- Yes** >> Repair or replace fuel supply line as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 13
-



**P0171-FUEL SYSTEM 1/1 LEAN (CONTINUED)****13. FUEL PUMP INLET STRAINER**

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

**Is the Fuel Inlet Strainer plugged?**

**Yes** >> Replace the Fuel Pump Inlet Strainer.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 14

---

**14. FUEL PUMP MODULE**

**If there are no possible causes remaining, view repair.**

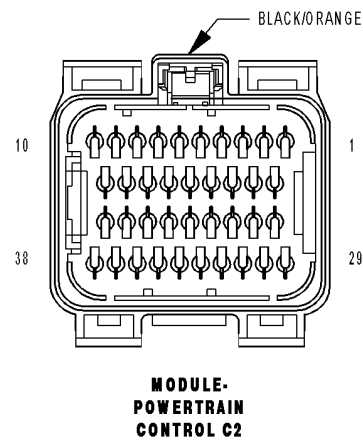
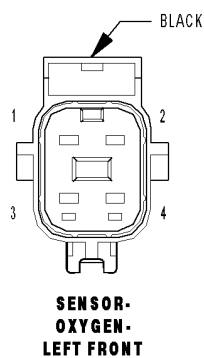
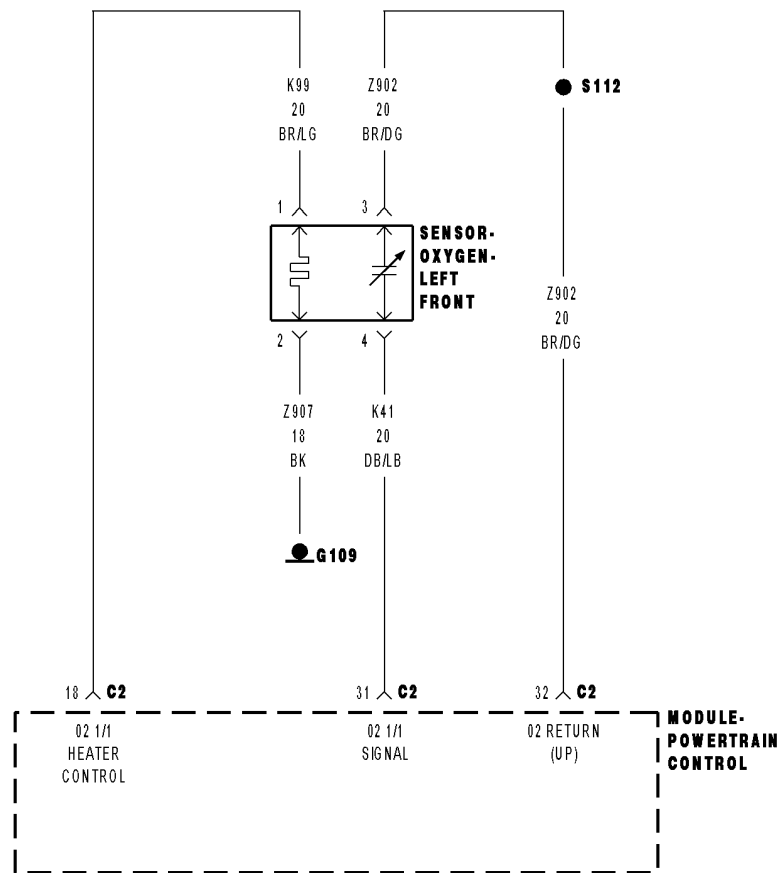
**Repair**

Replace the Fuel Pump Module.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0172-FUEL SYSTEM 1/1 RICH



**P0172-FUEL SYSTEM 1/1 RICH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the engine running in closed loop mode, the ambient/battery temperature above 20 deg. F and altitude below 8500 ft.

- **Set Condition:**

If the PCM multiplies short term compensation by long term adaptive and a purge fuel multiplier and the result is below a certain value for 30 seconds over two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
O2 SENSOR HEATER OPERATION
EVAP PURGE SOLENOID OPERATION
O2 SIGNAL CIRCUIT
O2 RETURN CIRCUIT
O2 SENSOR
MAP SENSOR
ECT SENSOR
ENGINE MECHANICAL PROBLEM
FUEL FILTER/PRESSURE REGULATOR (HIGH)
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note: Check for contaminants that may have damaged an O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.**

Ignition on, engine not running.

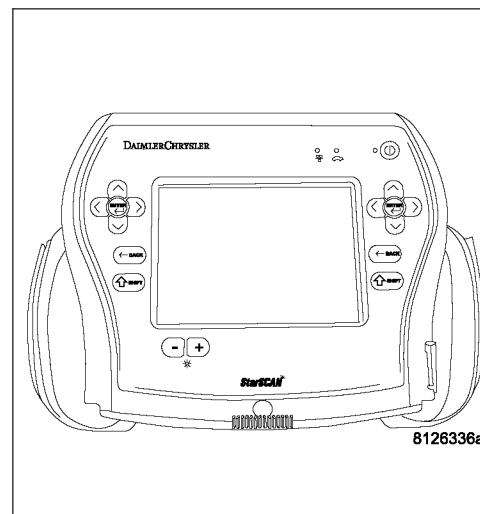
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0172-FUEL SYSTEM 1/1 RICH (CONTINUED)****2. CHECKING FUEL PRESSURE**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Turn the ignition off.

**CAUTION:** Stop All Actuations.

Choose a conclusion that best matches your fuel pressure reading.

**Within Specification**

Go To 3

**Above Specification**

Replace the fuel filter/pressure regulator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**3. O2 SENSOR OPERATION**

Start the engine.

Allow the engine to reach normal operating temperature.

**Note:** If one of the O2 Sensors Signal or Return circuit is shorted to ground or voltage, all the other O2 Sensor voltage readings will be affected.

**Note:** After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.

With the scan tool, monitor the 1/1 O2 Sensor voltage reading.

**Is the voltage switching between 2.5 and 3.4 volts?**

**Yes** >> Go To 4

**No** >> Go To 9

---

**4. 1/1 O2 SENSOR HEATER OPERATION**

Turn the ignition off.

**Note:** Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

With the scan tool, perform the 1/1 O2 Heater Test.

With the scan tool, monitor the O2 Sensor voltage while performing the Heater test for at least 2 minutes.

**Does the voltage stay above 4.5 volts during the Heater test?**

**Yes** >> Replace the O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

---

**P0172-FUEL SYSTEM 1/1 RICH (CONTINUED)****5. MAP SENSOR OPERATION**

Turn the ignition off.

Connect a Vacuum Gauge to a Manifold Vacuum source.

Start the engine.

Allow the engine to idle.

**Note: If engine will not idle, maintain a constant RPM above idle.**

With a scan tool, read the MAP Sensor vacuum value.

**Is the scan tool reading within 1" of the Vacuum Gauge reading?**

**Yes** >> Go To 6

**No** >> Replace the MAP Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**Note: Remove the vacuum gauge before continuing.**

---

**6. ECT SENSOR OPERATION**

**Note: For this test to be valid, the thermostat must be operating correctly.**

**Note: This test works best if performed on a cold engine (cold soak)**

Ignition on, engine not running.

With a scan tool, read the Engine Coolant Temperature Sensor value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

**Note: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.**

Start the Engine.

During engine warm-up, monitor the Engine Coolant Temperature value. The temp value change should be a smooth transition from start up to normal operating temp 82°C (180°F). The value should reach at least 82°C (180°F).

**Did the ECT value increase smoothly and reach at least 180°F (82°C)?**

**Yes** >> Go To 7

**No** >> Replace the Engine Coolant Temperature Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**7. EVAP PURGE SOLENOID OPERATION**

Turn the ignition off.

Disconnect the hoses at the Evap Purge Solenoid.

Using a hand vacuum pump, apply 10 inches of vacuum to the Evap Purge Solenoid vacuum source port on the component side.

**Did the Evap Purge Solenoid hold vacuum?**

**Yes** >> Go To 8

**No** >> Replace the EVAP Purge Solenoid.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**Note: Connect the vacuum hoses before continuing.**

---

**P0172-FUEL SYSTEM 1/1 RICH (CONTINUED)****8. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems.

AIR INDUCTION SYSTEM - must be free from restrictions.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 12

**9. 1/1 O2 SENSOR**

**Note: Perform the following test on the O2 Sensors whose voltage was not switching properly in the previous step.**

Ignition on, engine not running.

Disconnect the 1/1 O2 Sensor harness connector.

With a scan tool, monitor the 1/1 O2 Sensor voltage.

O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.

Connect a jumper wire between the (K41) O2 Sensor 1/1 Signal circuit and the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

**Note: The voltage should drop from 5.0 volts down to 2.5 volts with the jumper wire connected.**

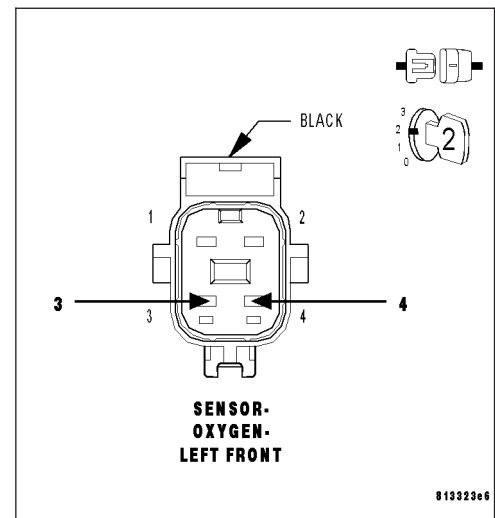
**Did the O2 Sensor voltage drop from 5 volts to 2.5 volts when the jumper wire was installed?**

**Yes** >> Replace the 1/1 O2 Sensor

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 10

**Note: Remove the jumper wire before continuing.**



**P0172-FUEL SYSTEM 1/1 RICH (CONTINUED)****10. (K41) O2 SENSOR 1/1 SIGNAL CIRCUIT**

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Start the engine.

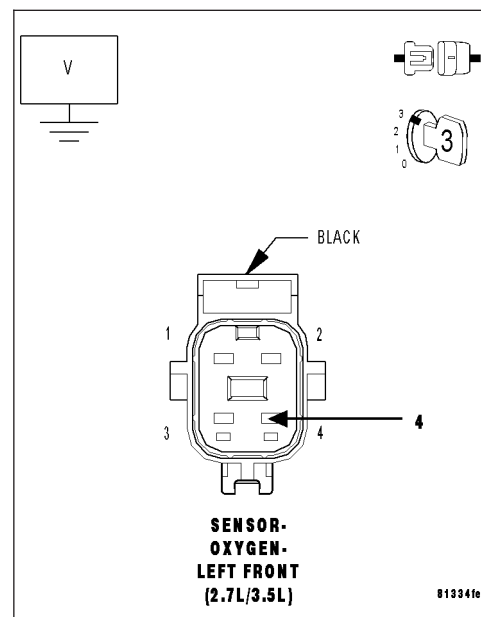
Measure the voltage on the (K41) O2 Sensor 1/1 Signal circuit in the O2 Sensor harness connector.

**Is the voltage above 4.8 volts?**

**Yes** >> Check the (K41) O2 Sensor 1/1 Signal circuit for damage, short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11

**11. (K902) O2 SENSOR UPSTREAM RETURN CIRCUIT**

Engine still running.

Measure the voltage on the (K902) O2 Upstream Return circuit in the 1/1 O2 Sensor harness connector.

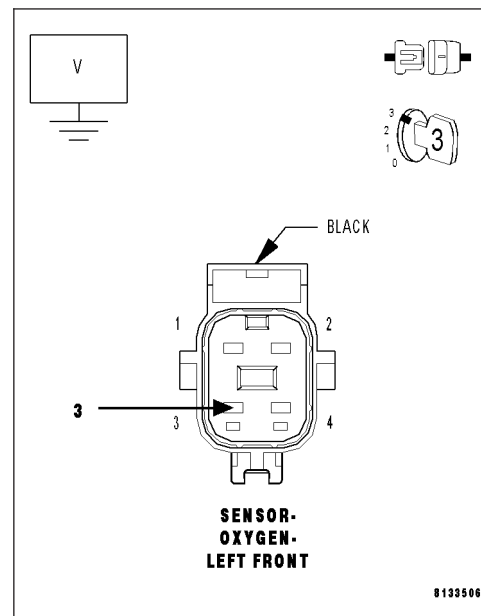
**Is the voltage at 2.5 volts?**

**Yes** >> Go To 12

**No** >> Check the (K902) O2 Upstream Return circuit for damage, short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**Note:** Turn the ignition off before continuing.



**P0172-FUEL SYSTEM 1/1 RICH (CONTINUED)****12. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

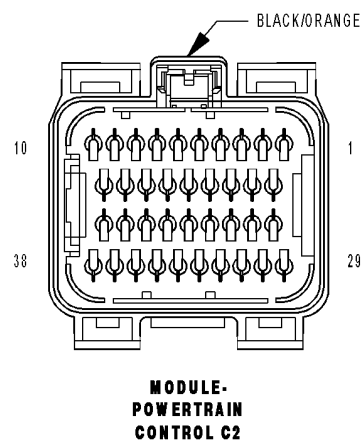
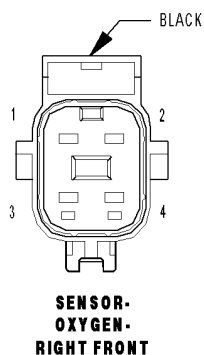
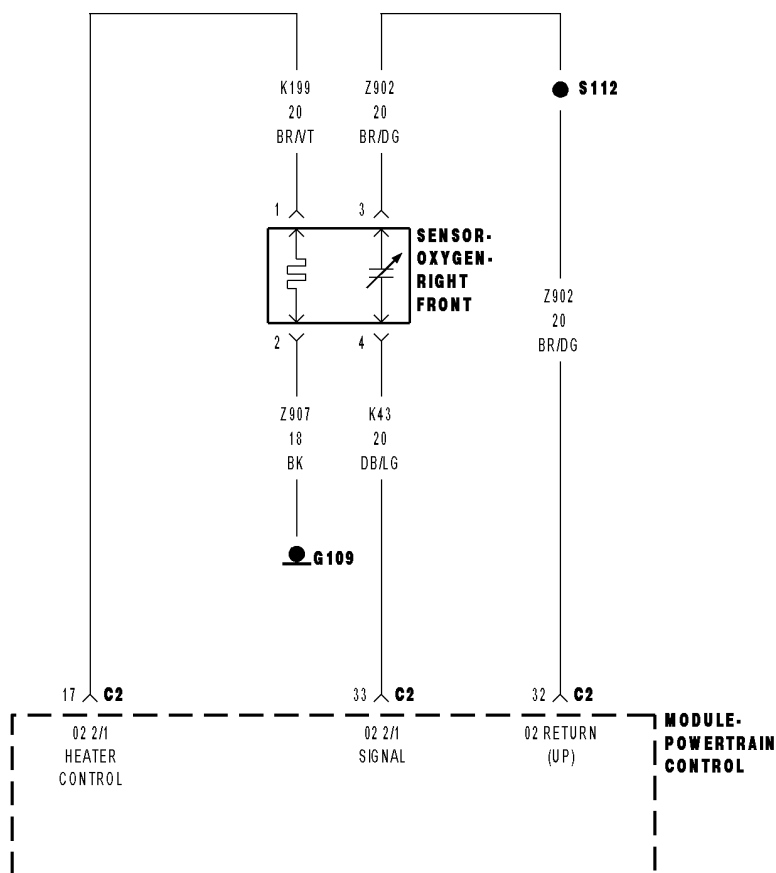
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**P0174-FUEL SYSTEM 2/1 LEAN**

## P0174-FUEL SYSTEM 2/1 LEAN (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the engine running in closed loop mode, the ambient/battery temperature above 20 deg. F and altitude below 8500 ft.

- **Set Condition:**

If the PCM multiplies short term compensation by long term adaptive and a certain percentage is exceeded for two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
FUEL PUMP MODULE
O2 SIGNAL CIRCUIT
O2 RETURN CIRCUIT
O2 SENSOR HEATER OPERATION
O2 SENSOR
MAP SENSOR OPERATION
ECT SENSOR OPERATION
ENGINE MECHANICAL PROBLEM
FUEL FILTER/PRESSURE REGULATOR (HIGH)
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Diagnose all other trouble codes before continuing.

**Note: Check for contaminants that may have damaged an O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.**

Ignition on, engine not running.

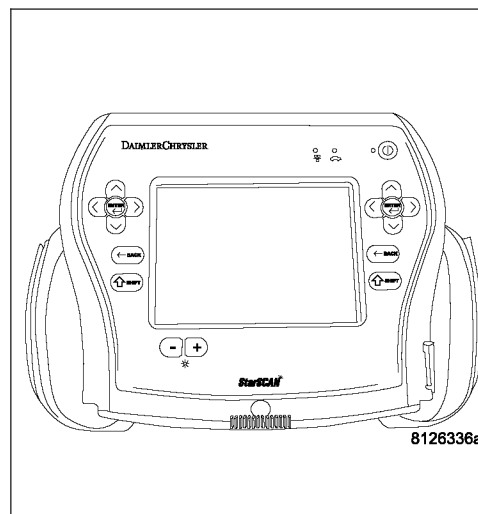
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0174-FUEL SYSTEM 2/1 LEAN (CONTINUED)****2. CHECKING FUEL PRESSURE**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Turn the ignition off.

**CAUTION:** Stop All Actuators.

Choose a conclusion that best matches your fuel pressure reading.

**Within Specification**

Go To 3

**Above Specification**

Replace the fuel filter/pressure regulator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**Below Specification**

Go To 12

---

**3. O2 SENSOR OPERATION**

Start the engine.

Allow the engine to reach normal operating temperature.

**Note:** If one of the O2 Sensor's Signal or Return circuit is shorted to ground the scan tool will display all O2 Sensor voltage readings low. The O2 Sensor that is shorted to ground will display a voltage reading near or at 0 volts.

**Note:** If one of the O2 Sensor Signal or Return circuits are shorted to voltage, the scan tool will display all O2 Sensor voltage readings high.

**Note:** After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.

With the scan tool, monitor the 2/1 O2 Sensor voltage reading.

Is the voltage switching between 2.5 and 3.4 volts?

**Yes** >> Go To 4

**No** >> Go To 8

---

**P0174-FUEL SYSTEM 2/1 LEAN (CONTINUED)****4. 2/1 O2 SENSOR HEATER OPERATION**

Turn the ignition off.

**Note:** Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

**Note:** Perform the following test on all O2 Sensors.

Ignition on, engine not running.

With a scan tool, actuate the 2/1 O2 Heater Test.

With the scan tool, monitor 2/1 O2 Sensor voltage for at least 2 minutes.

**Does the voltage stay above 4.5 volts?**

**Yes** >> Replace the 2/1 O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

---

**5. MAP SENSOR OPERATION**

Turn the ignition off.

Connect a Vacuum Gauge to a Manifold Vacuum source.

Start the engine.

Allow the engine to idle.

**Note:** If engine will not idle, maintain a constant RPM above idle.

With the scan tool, read the MAP Sensor vacuum value.

**Is the scan tool reading within 1" of the Vacuum Gauge reading?**

**Yes** >> Go To 6

**No** >> Replace the MAP Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**6. ECT SENSOR OPERATION**

**Note:** For this test to be valid, the thermostat must be operating correctly.

**Note:** This test works best if performed on a cold engine (cold soak).

Ignition on, engine not running.

With the scan tool, read the Engine Coolant Temperature (ECT) Sensor value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

**Note:** If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.

Start the Engine.

During engine warm-up, monitor the ECT Sensor value. The temperature value change should be a smooth transition from start up to normal operating temperature 82°C (180°F). The value should reach at least 82°C (180°F).

**Did the ECT value increase smoothly and did it reach at least 180°F (82°C)?**

**Yes** >> Go To 7

**No** >> Replace the Engine Coolant Temperature Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**P0174-FUEL SYSTEM 2/1 LEAN (CONTINUED)****7. ENGINE MECHANICAL PROBLEM**

Turn the ignition off.

Check for any of the following conditions/mechanical problems.

AIR INDUCTION SYSTEM - must be free from leaks.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11

**8. O2 SENSOR**

Ignition on, engine not running.

Disconnect the 2/1 O2 Sensor harness connector.

With the scan tool, monitor the 2/1 O2 Sensor voltage.

O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.

Connect a jumper wire between the (K43) O2 Sensor 2/1 Signal circuit and the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

**Note: The voltage should drop from 5.0 volts to 2.5 volts with the jumper wire in place.**

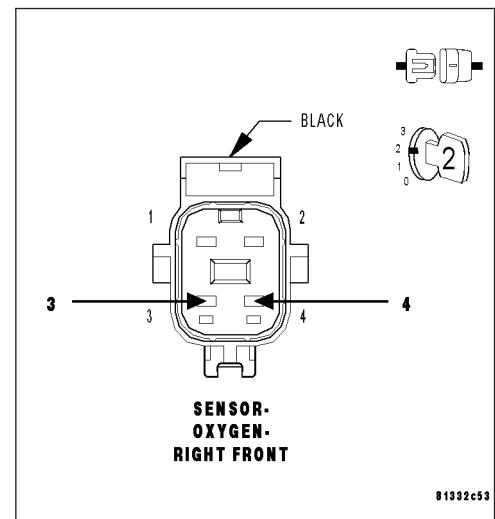
**Did the O2 Sensor voltage change from 5.0 volts to 2.5 volts when the jumper wire was installed?**

**Yes** >> Replace the 2/1 O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 9

**Note: Remove the jumper wire before continuing.**



**P0174-FUEL SYSTEM 2/1 LEAN (CONTINUED)****9. O2 SENSOR SIGNAL CIRCUIT**

With the scan tool, monitor all the O2 Sensor voltage reading with the jumper wire removed.

**Note:** The scan tool will display all O2 Sensor voltage readings approximately 5.0 volts when only one O2 Sensor's Signal circuit is shorted to voltage.

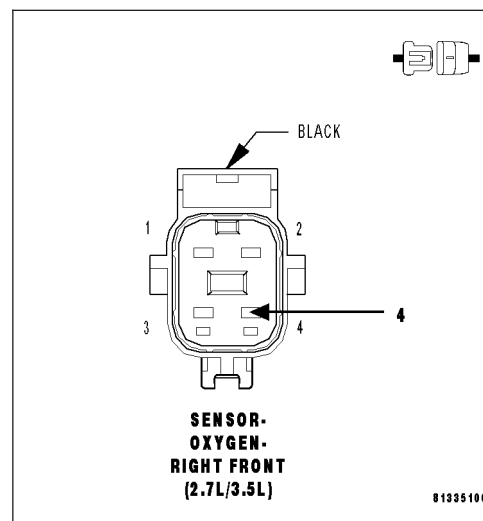
**Note:** The scan tool will display one O2 Sensor voltage close to zero and the others will read lower than normal when one O2 Sensor Signal circuit contains excessive resistance.

**Is the voltage above 4.8 volts?**

**Yes** >> Go To 10

**No** >> Check all the O2 Signal circuits for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**10. (K902) O2 UPSTREAM RETURN CIRCUIT**

Disconnect the 2/1 O2 Sensor harness connector.

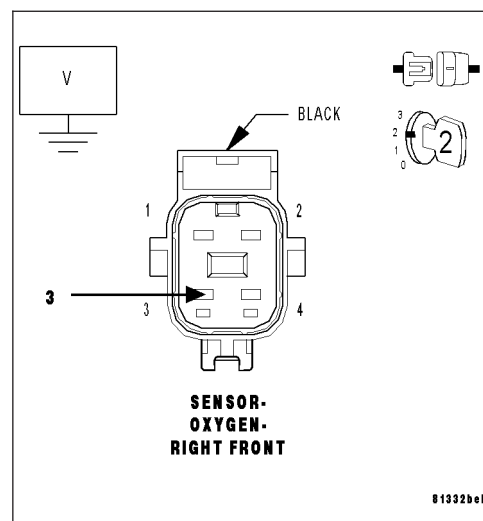
Measure the voltage on the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

**Is the voltage at 2.5 volts?**

**Yes** >> Go To 11

**No** >> Check the (K902) O2 Upstream Return circuit for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0174-FUEL SYSTEM 2/1 LEAN (CONTINUED)****11. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**12. RESTRICTED FUEL SUPPLY LINE**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special 5/16 fuel line adapter tool #6539 between disconnected fuel line and the fuel pump module.

Attach a fuel pressure test gauge to the T fitting on tool #6539.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

**CAUTION:** Stop All Actuations.

**Is the fuel pressure within specification?**

**Yes** >> Repair or replace fuel supply line as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 13

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**13. FUEL PUMP INLET STRAINER**

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

**Is the Fuel Inlet Strainer plugged?**

**Yes** >> Replace the Fuel Pump Inlet Strainer.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 14

---

**P0174-FUEL SYSTEM 2/1 LEAN (CONTINUED)**

**14. FUEL PUMP MODULE**

**If there are no possible causes remaining, view repair.**

**Repair**

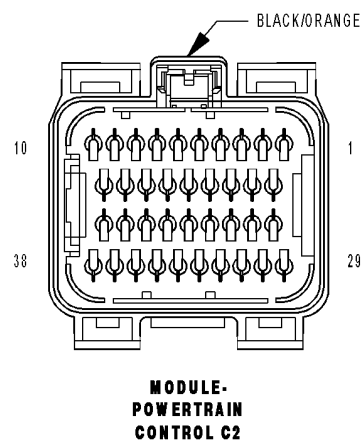
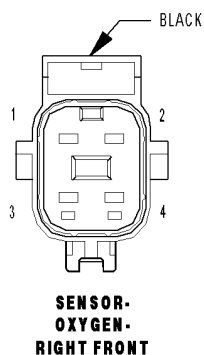
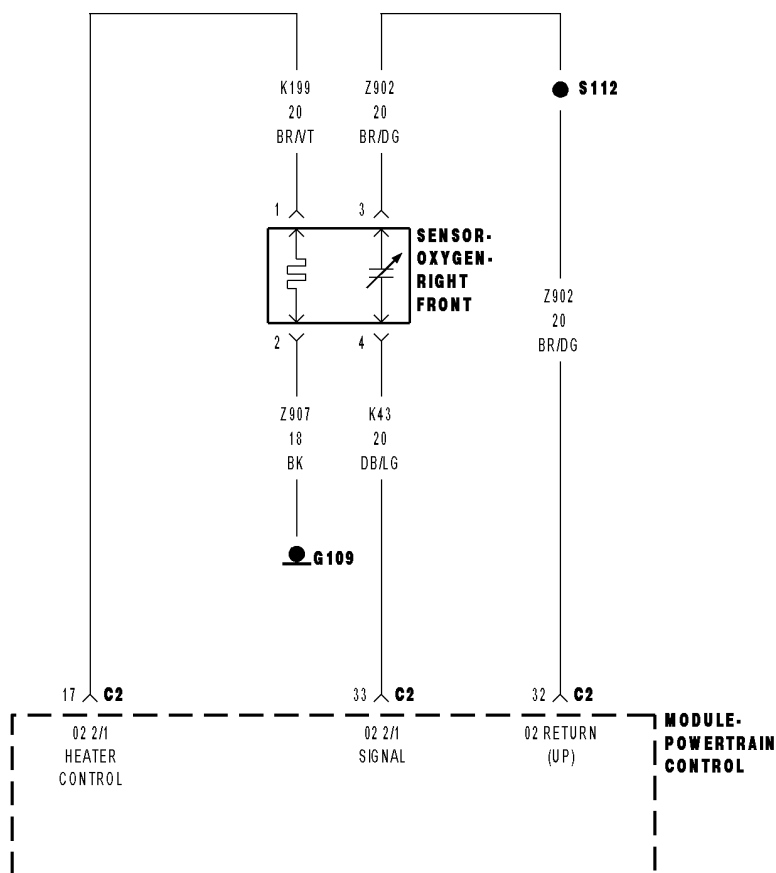
Replace the Fuel Pump Module.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0175-FUEL SYSTEM 2/1 RICH



**P0175-FUEL SYSTEM 2/1 RICH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the engine running in closed loop mode, the ambient/battery temperature above 20 deg. F and altitude below 8500 ft.

- **Set Condition:**

If the PCM multiplies short term compensation by long term adaptive and a purge fuel multiplier and the result is below a certain value for 30 seconds over two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
O2 SENSOR HEATER OPERATION EVAP PURGE SOLENOID OPERATION O2 SIGNAL CIRCUIT O2 RETURN CIRCUIT O2 SENSOR MAP SENSOR ECT SENSOR ENGINE MECHANICAL PROBLEM FUEL FILTER/PRESSURE REGULATOR (HIGH) PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Check for contaminants that may have damaged an O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.

Ignition on, engine not running.

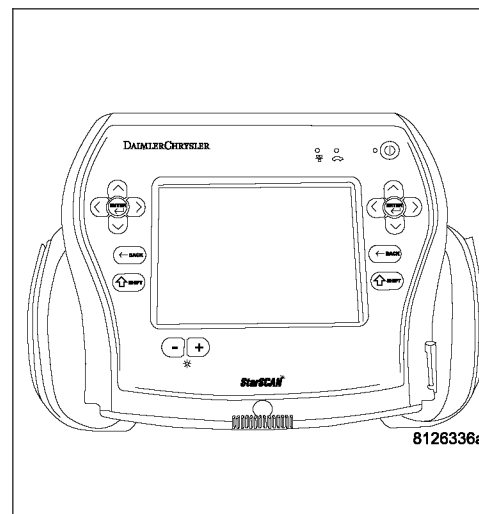
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0175-FUEL SYSTEM 2/1 RICH (CONTINUED)****2. CHECKING FUEL PRESSURE**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Turn the ignition off.

**CAUTION:** Stop All Actuators.

Choose a conclusion that best matches your fuel pressure reading.

**Within Specification**

Go To 3

**Above Specification**

Replace the fuel filter/pressure regulator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**3. O2 SENSOR OPERATION**

Start the engine.

Allow the engine to reach normal operating temperature.

**Note:** If one of the O2 Sensors Signal or Return circuit is shorted to ground or voltage, all the other O2 Sensor voltage readings will be affected.

**Note:** After the repairs have been made, verify proper O2 Sensor operation. If all the O2 Sensor voltage readings have not returned to normal, follow the diagnostic procedure for the remaining O2 Sensors.

With the scan tool, monitor the 2/1 O2 Sensor voltage reading.

**Is the voltage switching between 2.5 and 3.4 volts?**

**Yes** >> Go To 4

**No** >> Go To 9

---

**4. 2/1 O2 SENSOR HEATER OPERATION**

Turn the ignition off.

**Note:** Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize at 5.0 volts.

Ignition on, engine not running.

With the scan tool, perform the 2/1 O2 Heater Test for each O2 Sensor.

With the scan tool, monitor the 2/1 O2 Sensor voltage while performing the Heater test for at least 2 minutes.

**Does the voltage stay above 4.5 volts for each Sensor?**

**Yes** >> Replace the 2/1 O2 Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

---

**P0175-FUEL SYSTEM 2/1 RICH (CONTINUED)****5. MAP SENSOR OPERATION**

Connect a Vacuum Gauge to a Manifold Vacuum source.

Start the engine.

Allow the engine to idle.

**Note: If engine will not idle, maintain a constant RPM above idle.**

With the scan tool, read the MAP Sensor vacuum value.

**Is the scan tool reading within 1" of the Vacuum Gauge reading?**

**Yes** >> Go To 6

**No** >> Replace the MAP Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**Note: Remove the vacuum gauge before continuing.**

---

**6. ECT SENSOR OPERATION**

**Note: For this test to be valid, the thermostat must be operating correctly.**

**Note: This test works best if performed on a cold engine (cold soak).**

Ignition on, engine not running.

With the scan tool, read the Engine Coolant Temperature Sensor value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

**Note: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.**

Start the Engine.

During engine warm-up, monitor the Engine Coolant Temperature value. The temp value change should be a smooth transition from start up to normal operating temp 82°C (180°F). The value should reach at least 82°C (180°F).

**Did the ECT value increase smoothly and reach at least 180°F (82°C)?**

**Yes** >> Go To 7

**No** >> Replace the Engine Coolant Temperature Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**7. EVAP PURGE SOLENOID OPERATION**

Turn the ignition off.

Disconnect the hoses at the Evap Purge Solenoid.

Using a hand vacuum pump, apply 10 inches of vacuum to the Evap Purge Solenoid vacuum source port on the component side.

**Did the Evap Purge Solenoid hold vacuum?**

**Yes** >> Go To 8

**No** >> Replace the EVAP Purge Solenoid.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**Note: Connect the vacuum hoses before continuing.**

---

**P0175-FUEL SYSTEM 2/1 RICH (CONTINUED)****8. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems.

AIR INDUCTION SYSTEM - must be free from restrictions.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 12

**9. 2/1 O2 SENSOR**

Ignition on, engine not running.

Disconnect the 2/1 O2 Sensor harness connector.

With the scan tool, monitor the 2/1 O2 Sensor voltage.

O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.

Connect a jumper wire between the (K43) O2 Sensor 2/1 Signal circuit and the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

**Note: The voltage should drop from 5.0 volts down to 2.5 volts with the jumper wire connected.**

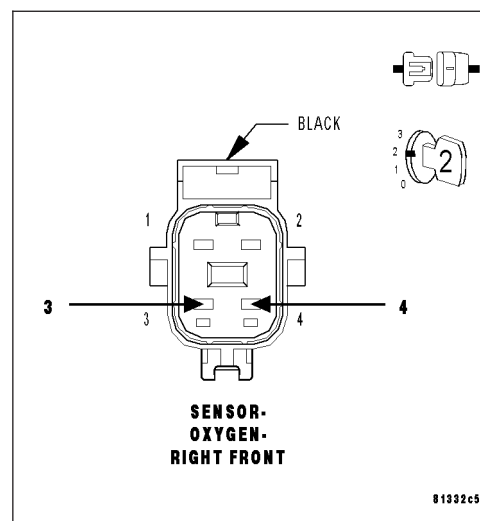
**Did the O2 Sensor voltage drop from 5 volts to 2.5 volts when the jumper wire was installed?**

**Yes** >> Replace the O2 Sensor

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 10

**Note: Remove the jumper wire before continuing.**



## P0175-FUEL SYSTEM 2/1 RICH (CONTINUED)

### 10. O2 SENSOR SIGNAL CIRCUIT

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Start the engine.

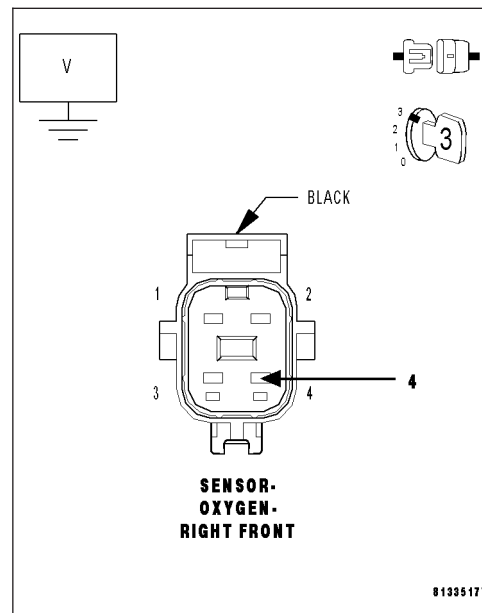
Measure the voltage on the (K43) O2 Sensor 2/1 Signal circuit in the O2 Sensor harness connector.

**Is the voltage above 4.8 volts?**

**Yes** >> Check the (K43) O2 Sensor 2/1 Signal circuit for damage, short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11



### 11. (K902) O2 SENSOR UPSTREAM RETURN CIRCUIT

Engine still running.

Measure the voltage on the (K902) O2 Upstream Return circuit in the O2 Sensor harness connector.

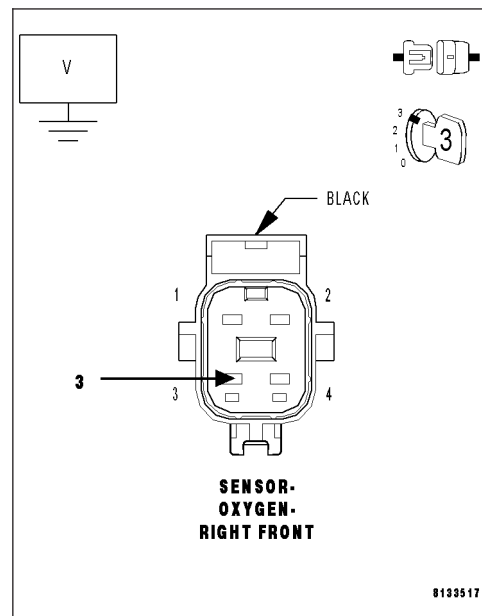
**Is the voltage at 2.5 volts?**

**Yes** >> Go To 12

**No** >> Check the (K902) O2 Upstream Return circuit for damage, short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**Note:** Turn the ignition off before continuing.



**P0175-FUEL SYSTEM 2/1 RICH (CONTINUED)****12. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

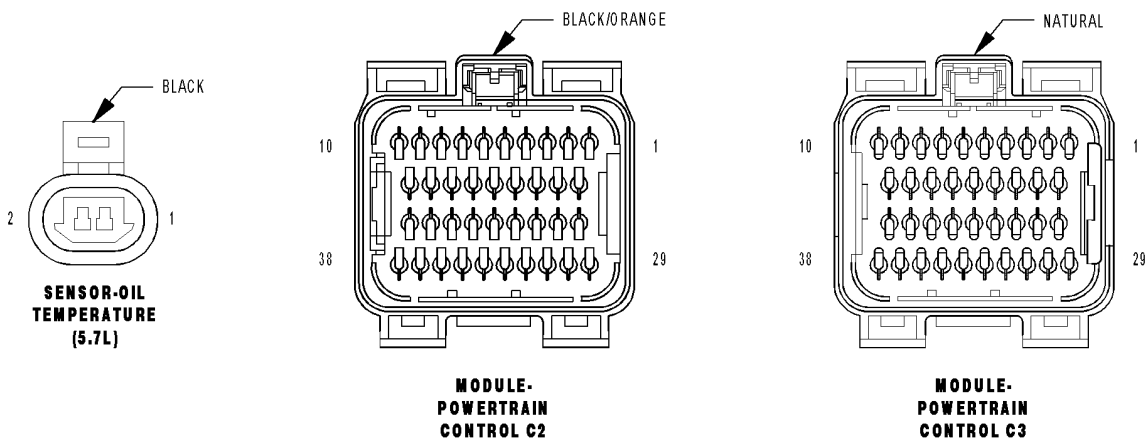
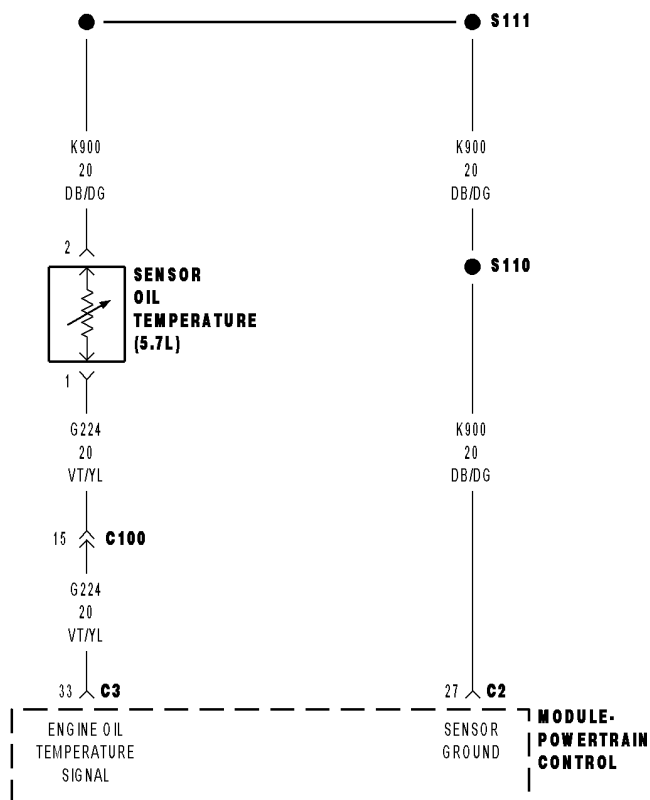
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0196—ENGINE OIL TEMPERATURE SENSOR CIRCUIT PERFORMANCE





**P0196-ENGINE OIL TEMPERATURE SENSOR CIRCUIT PERFORMANCE (CONTINUED)**

For the Engine System Schematic circuit diagram. (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine off time is greater than 480 minutes. Ambient temperature is greater than 4 deg C (38 deg F).

- **Set Condition:**

The PCM detects the Engine Oil Temp value is incorrect by comparing it with the other engine inputs. Three good trips to turn off the MIL.

Possible Causes
(G224) ENGINE OIL TEMP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(G224) ENGINE OIL TEMP SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
(G224) ENGINE OIL TEMP SIGNAL CIRCUIT SHORTED TO GROUND
(G224) ENGINE OIL TEMP SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND
ENGINE OIL TEMPERATURE SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

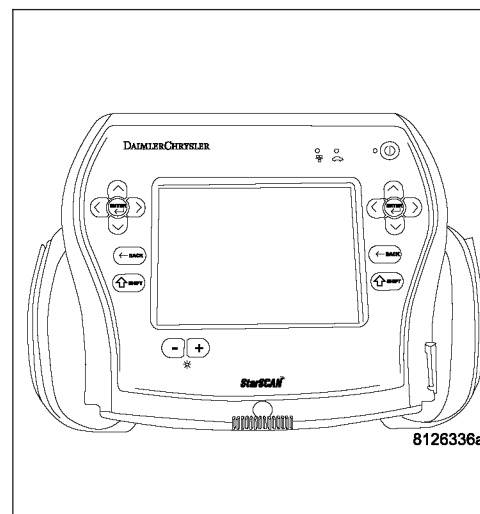
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0196-ENGINE OIL TEMPERATURE SENSOR CIRCUIT PERFORMANCE (CONTINUED)****2. (G224) ENGINE OIL TEMP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect the Engine Oil Temp Sensor harness connector.

**Note: Visually inspect both the component and the PCM connectors. Look for damaged, partially broken wires, and backed out or corroded terminals.**

Ignition on, engine not running.

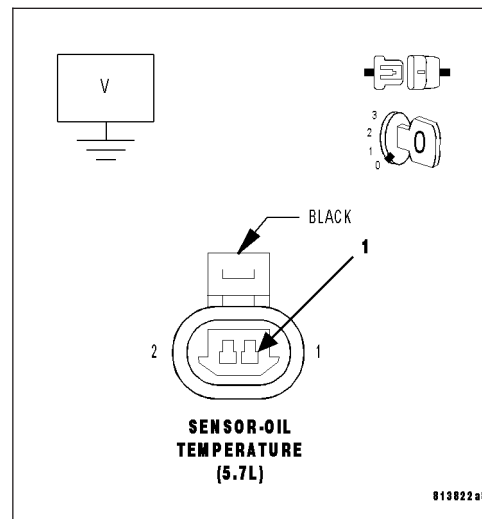
Measure the voltage on the (G224) Engine Oil Temp Signal circuit in the Engine Oil Temp Sensor harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (G224) Engine Oil Temp Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. ENGINE OIL TEMP SENSOR VOLTAGE ABOVE 4.6 VOLTS**

Turn the ignition off.

Connect the PCM harness connectors.

Ignition on, engine not running.

With a scan tool, read the Engine Oil Temp voltage.

**Is the voltage above 4.6 volts?**

**Yes** >> Go To 4

**No** >> Go To 7

**P0196-ENGINE OIL TEMPERATURE SENSOR CIRCUIT PERFORMANCE (CONTINUED)****4. ENGINE OIL TEMP SENSOR**

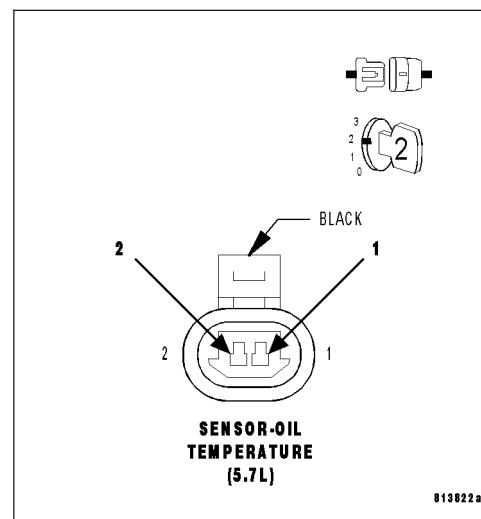
Connect a jumper wire between the (G224) Engine Oil Temp Signal circuit and the (K900) Sensor ground circuit in the Engine Oil Temp Sensor harness connector.

With a scan tool, read the Engine Oil Temp voltage.

**Is the voltage below 1.0 volt with the jumper wire installed?**

**Yes** >> Replace the Engine Oil Temp Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5



**Note:** Remove the jumper wire before continuing.

**5. (G224) ENGINE OIL TEMP SIGNAL CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

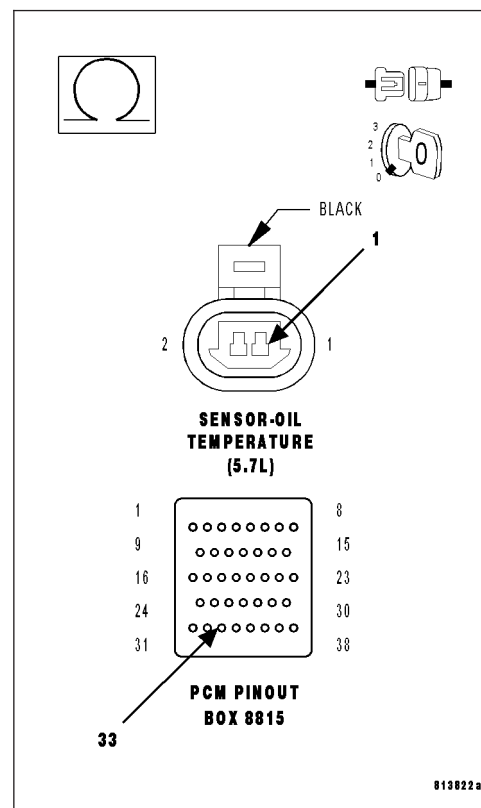
Measure the resistance of the (G224) Engine Oil Temp Signal circuit from the Engine Oil Temp Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (G224) Engine Oil Temp Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



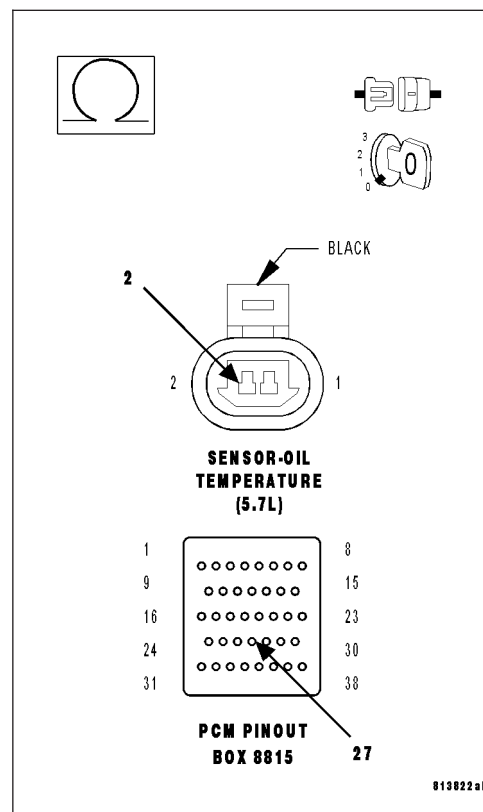
**P0196-ENGINE OIL TEMPERATURE SENSOR CIRCUIT PERFORMANCE (CONTINUED)****6. (K900) SENSOR GROUND CIRCUIT OPEN**

Measure the resistance of the (K900) Sensor ground circuit from the Engine Oil Temp Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the open in the (K900) Sensor ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. (G224) ENGINE OIL TEMP SIGNAL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

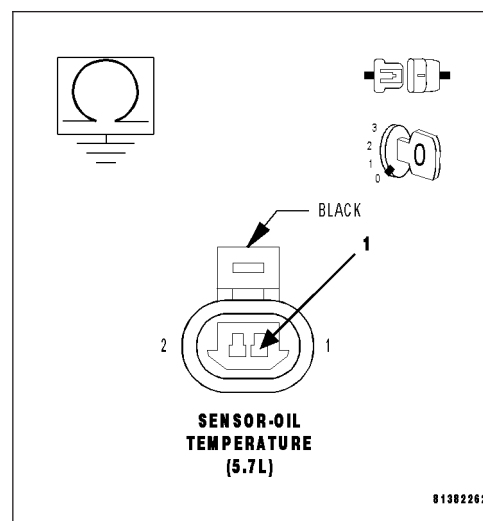
Measure the resistance between ground and the (G224) Engine Oil Temp Signal circuit in the Engine Oil Temp Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (G224) Engine Oil Temp Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8



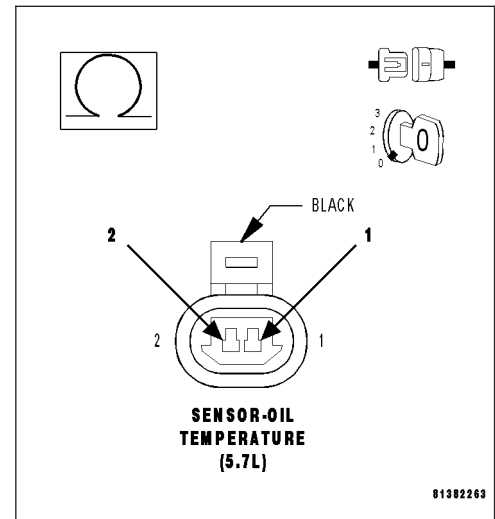
**P0196-ENGINE OIL TEMPERATURE SENSOR CIRCUIT PERFORMANCE (CONTINUED)****8. (G224) ENGINE OIL TEMP SIGNAL SHORTED TO THE (K900) SENSOR GROUND**

Measure the resistance between the (G224) Engine Oil Temp Signal circuit and the (K900) Sensor ground circuit in the Engine Oil Temp Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (K900) Sensor ground and the (G224) Engine Oil Temp Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 9

**9. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

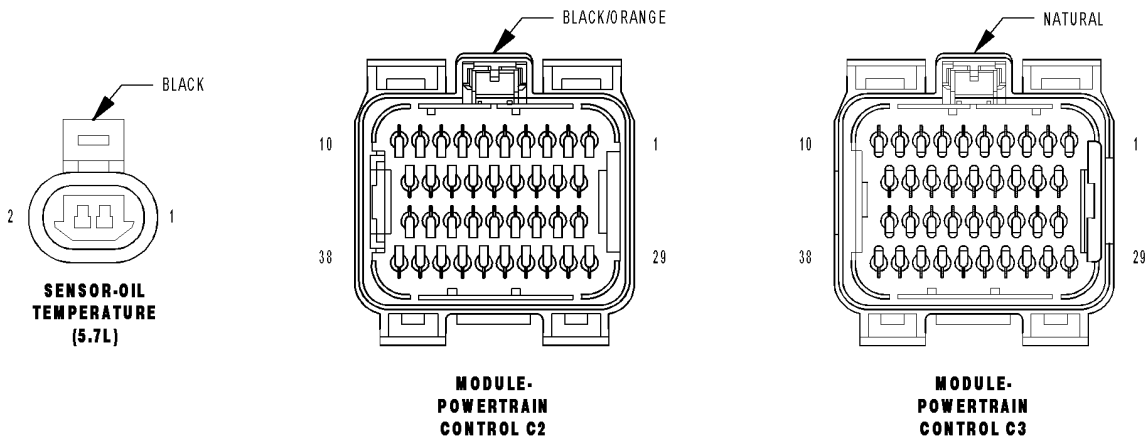
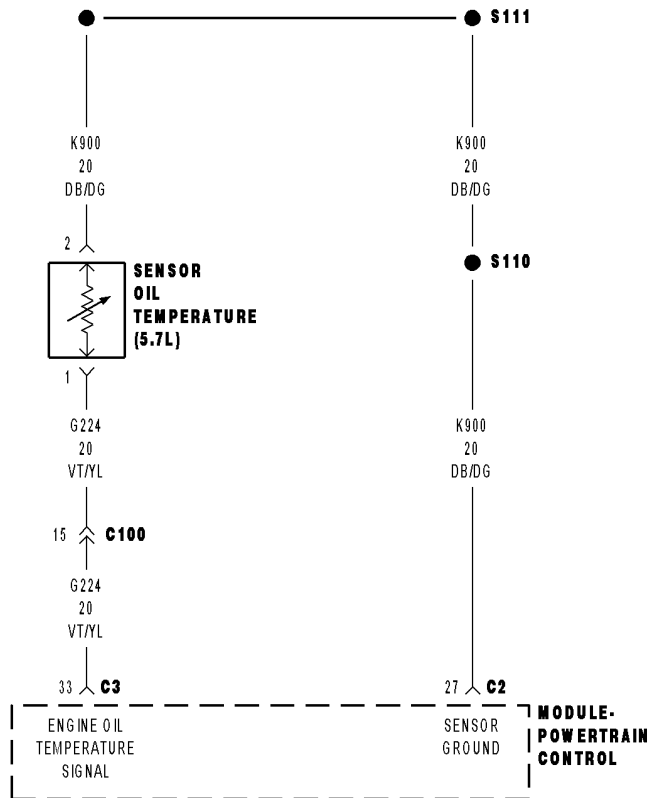
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0197-ENGINE OIL TEMPERATURE SENSOR CIRCUIT LOW



P0197-ENGINE OIL TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**  
The Engine Oil Temperature sensor circuit voltage at the PCM is less than the calibrated amount. One Trip Fault. Three good trips to clear the MIL.

Possible Causes
(G224) ENGINE OIL TEMP SIGNAL CIRCUIT SHORTED TO GROUND (G224) ENGINE OIL TEMP SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND ENGINE OIL TEMPERATURE SENSOR PCM

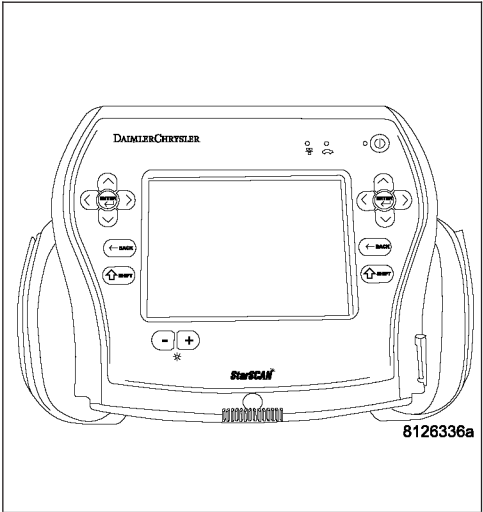
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.  
With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



2. ENGINE OIL TEMPERATURE SENSOR

Turn the ignition off.  
Disconnect the Engine Oil Temp Sensor harness connector.  
Ignition on, engine not running.  
With a scan tool, read Engine Oil Temp voltage.

- Is the voltage above 1.0 volt?
- Yes**    >> Replace the Engine Oil Temp Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No**    >> Go To 3

**P0197-ENGINE OIL TEMPERATURE SENSOR CIRCUIT LOW (CONTINUED)****3. (G224) ENGINE OIL TEMP SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT**

Turn the ignition off.

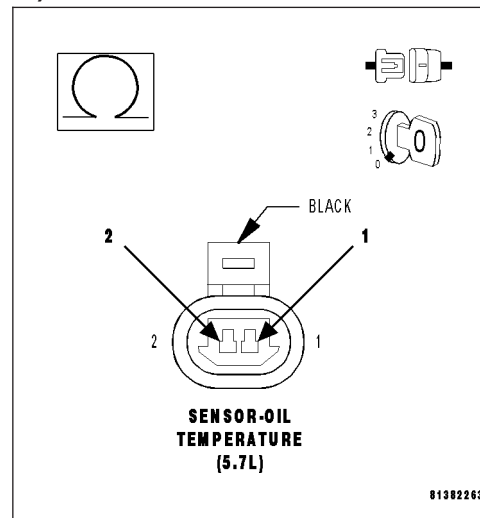
Disconnect the PCM harness connectors.

Measure the resistance between the (K900) Sensor ground circuit and the (G224) Engine Oil Temp Signal circuit in the Engine Oil Temp Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short to between the (K900) Sensor ground circuit and the (G224) Engine Oil Temp Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

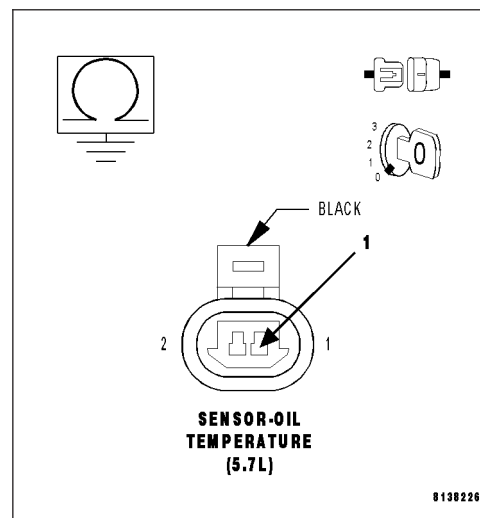
**4. (G224) ENGINE OIL TEMP SIGNAL CIRCUIT SHORTED GROUND**

Measure the resistance between ground and the (G224) Engine Oil Temp Signal circuit in the Engine Oil Temp Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (G224) Engine Oil Temp Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

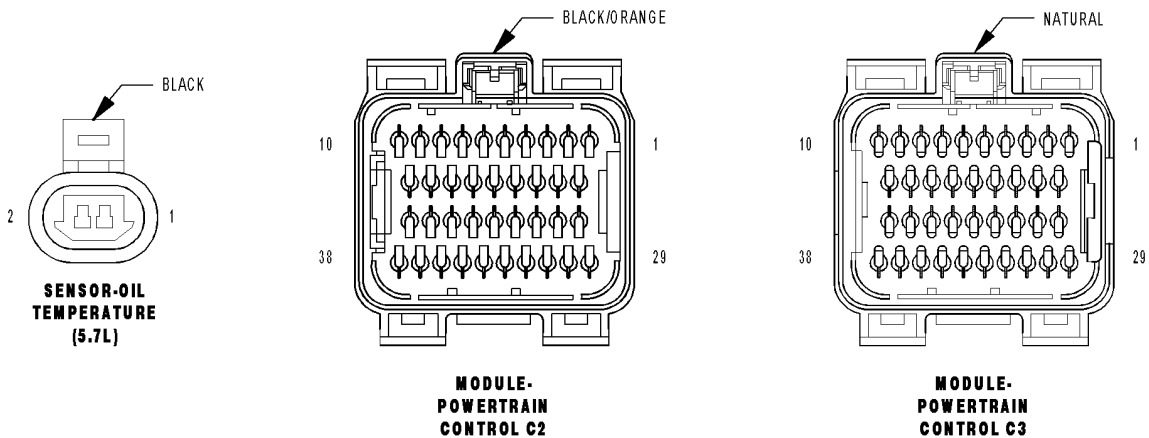
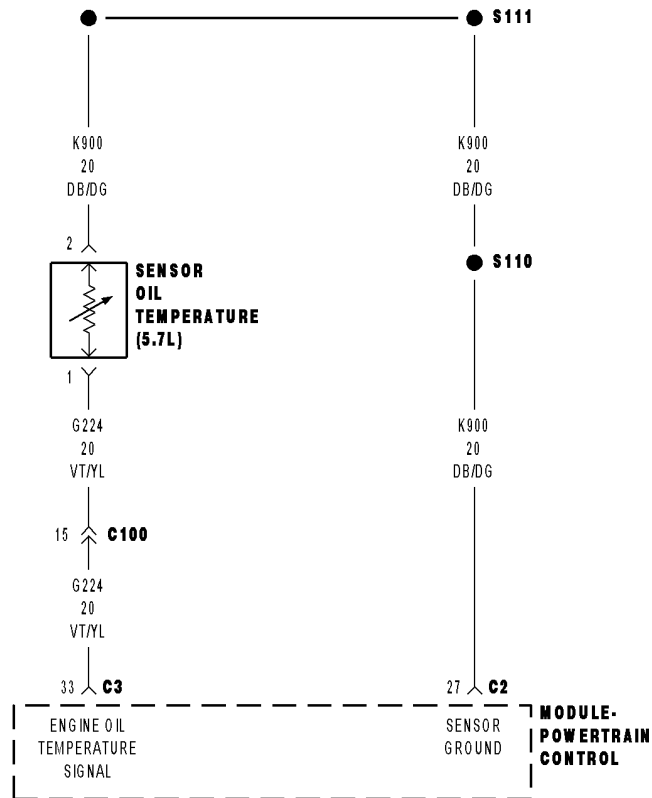
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0198-ENGINE OIL TEMPERATURE SENSOR CIRCUIT HIGH**

**P0198-ENGINE OIL TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)**

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on. Battery voltage greater than 10.4 volts.

- **Set Condition:**

The Engine Oil Temperature sensor circuit voltage at the PCM is greater than the calibrated amount. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(G224) ENGINE OIL TEMP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(G224) ENGINE OIL TEMP SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
ENGINE OIL TEMPERATURE SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

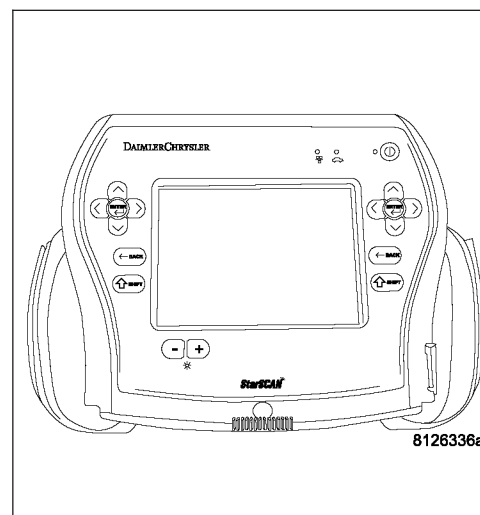
With a scan tool, read DTCs.

**IS the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0198-ENGINE OIL TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)****2. ENGINE OIL TEMP SENSOR**

Turn the ignition off.

Disconnect the Engine Oil Temp Sensor harness connector.

Connect a jumper wire between the (G224) Engine Oil Temp Signal circuit and the (K900) Sensor ground circuit in the Engine Oil Temp Sensor harness connector.

Ignition on, engine not running.

With a scan tool, read Engine Oil Temp voltage.

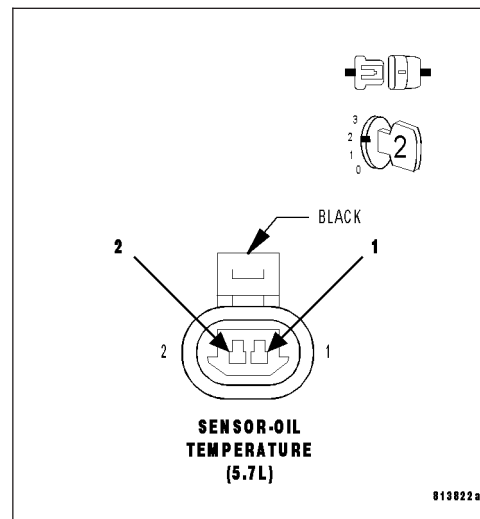
**Is the voltage below 1.0 volt with the jumper wire installed?**

**Yes** >> Replace the Engine Oil Temp Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**Note:** Remove the jumper wire before continuing.

**3. (G224) ENGINE OIL TEMP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

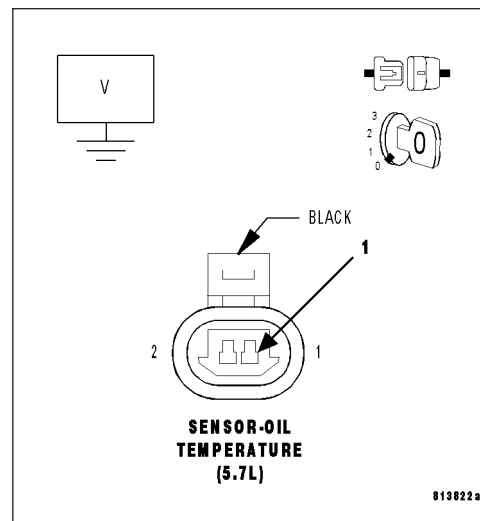
Measure the voltage on the (G224) Engine Oil Temp Signal circuit in the Engine Oil Temp Sensor harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (G224) Engine Oil Temp Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P0198-ENGINE OIL TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)****4. (G224) ENGINE OIL TEMP SIGNAL CIRCUIT OPEN**

Turn the ignition off.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

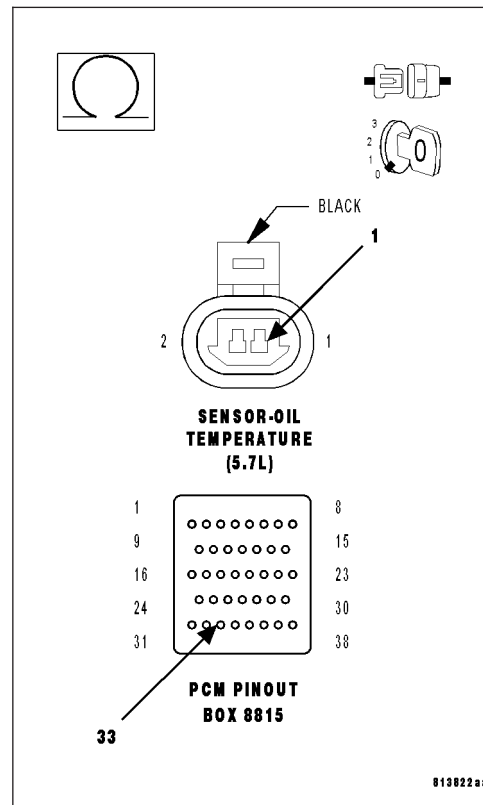
Measure the resistance of the (G224) Engine Oil Temp Signal circuit from the Engine Oil Temp Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (G224) Engine Oil Temp Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. (K900) SENSOR GROUND CIRCUIT OPEN**

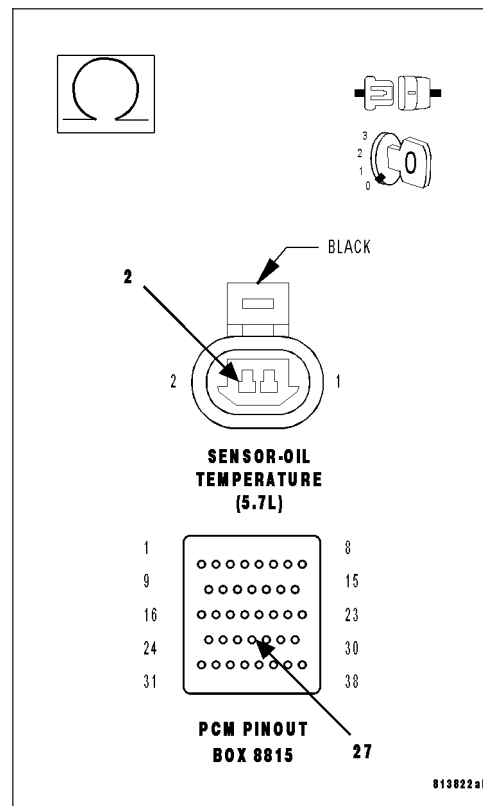
Measure the resistance of the (K900) Sensor ground circuit from the Engine Oil Temp Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K900) Sensor ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0198-ENGINE OIL TEMPERATURE SENSOR CIRCUIT HIGH (CONTINUED)****6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

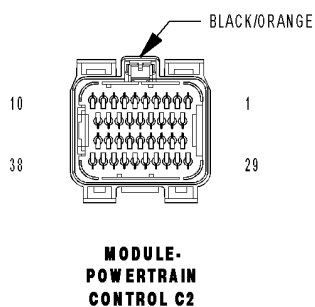
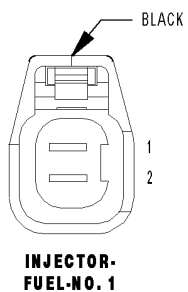
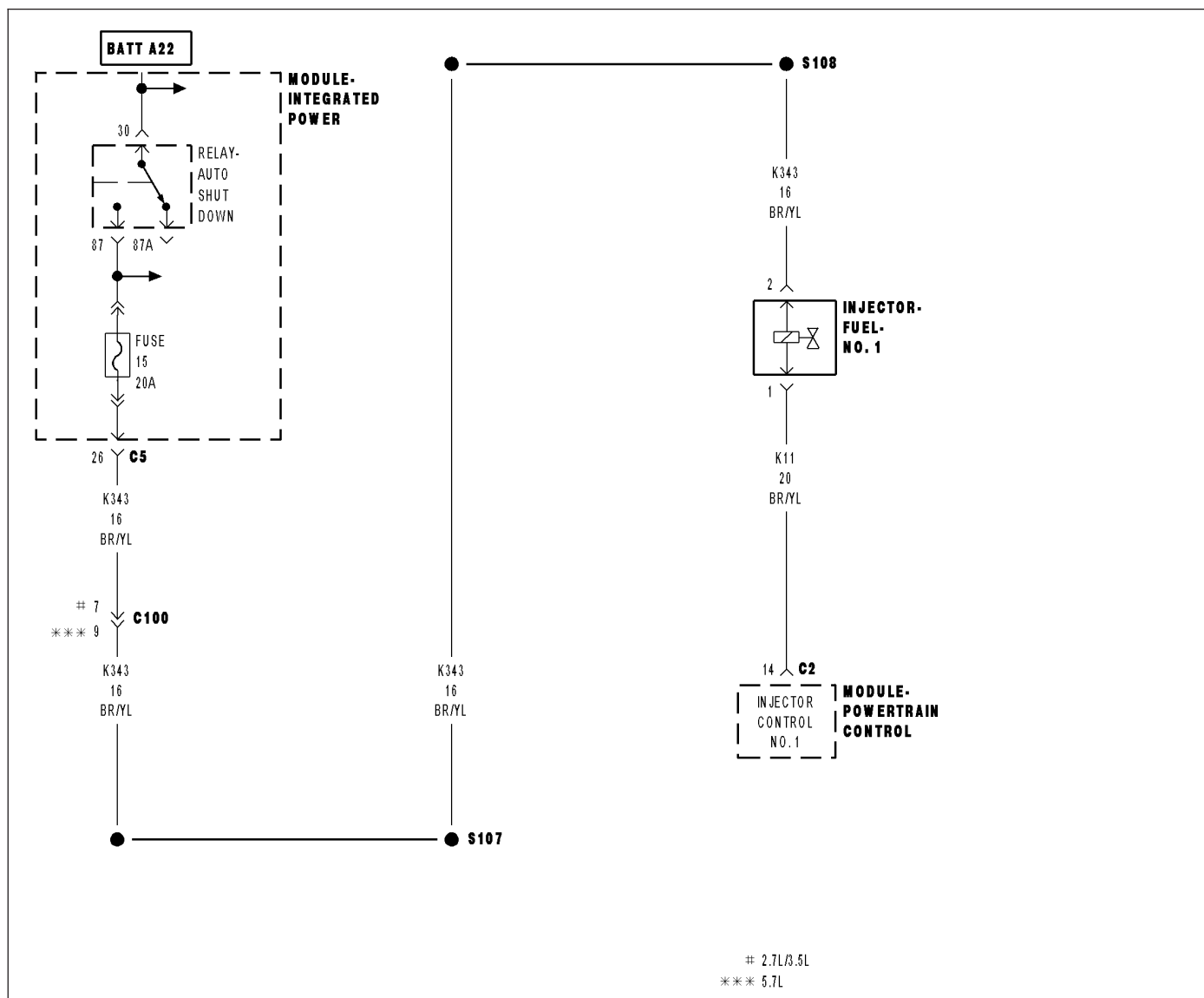
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0201-FUEL INJECTOR 1 CIRCUIT



P0201-FUEL INJECTOR 1 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**  
No inductive spike is detected after injector turn off.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K11) INJECTOR CONTROL NO.1 CIRCUIT OPEN (K11) INJECTOR CONTROL NO.1 CIRCUIT SHORTED TO GROUND FUEL INJECTOR PCM

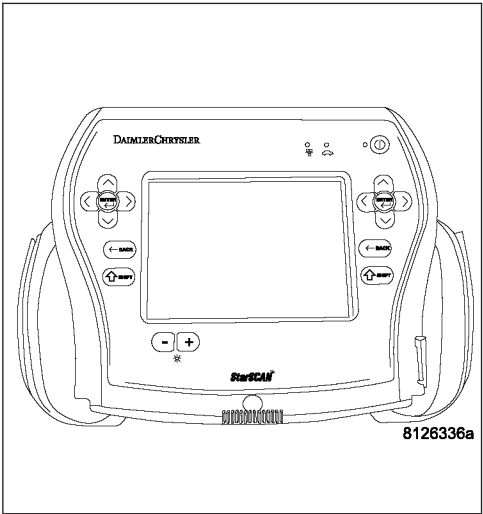
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.  
With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0201-FUEL INJECTOR 1 CIRCUIT (CONTINUED)

### 2. (K33) ASD RELAY OUTPUT 2 CIRCUIT

Turn the ignition off.

Disconnect the No.1 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

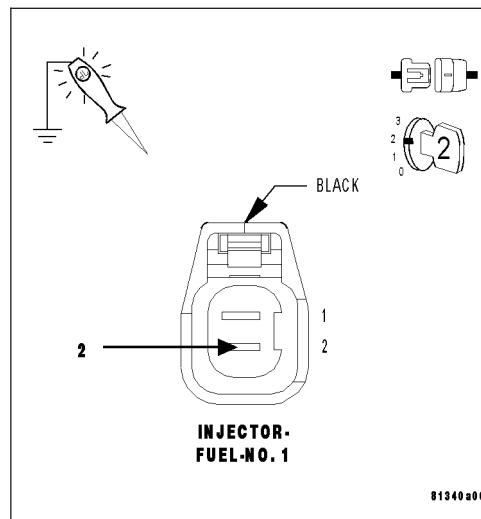
Using a 12-volt test light connected to ground, backprobe the (K343) ASD Relay Output 2 circuit in the Fuel Injector harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 3. FUEL INJECTOR

Using a 12-volt test light connected to 12-volts, backprobe the (K11) Injector Control No.1 circuit.

With the scan tool, actuate the Fuel Injector.

**What is the state of the test light during the actuation?**

**Brightly Blinking.**

Replace the Fuel Injector.

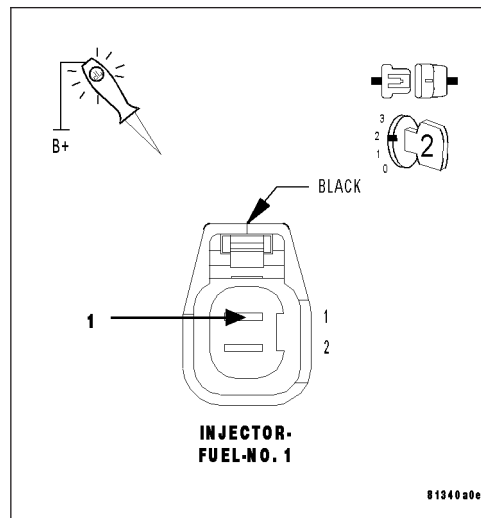
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**ON Constantly.**

Go To 4

**OFF Constantly.**

Go To 5





**P0201-FUEL INJECTOR 1 CIRCUIT (CONTINUED)****4. (K11) INJECTOR CONTROL NO.1 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

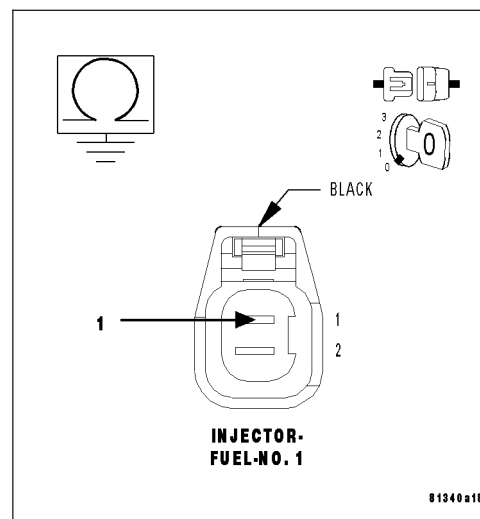
Measure the resistance between ground and the (K11) Injector Control No.1 circuit in the Injector harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K11) Injector Control No.1 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**5. (K11) INJECTOR CONTROL NO.1 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

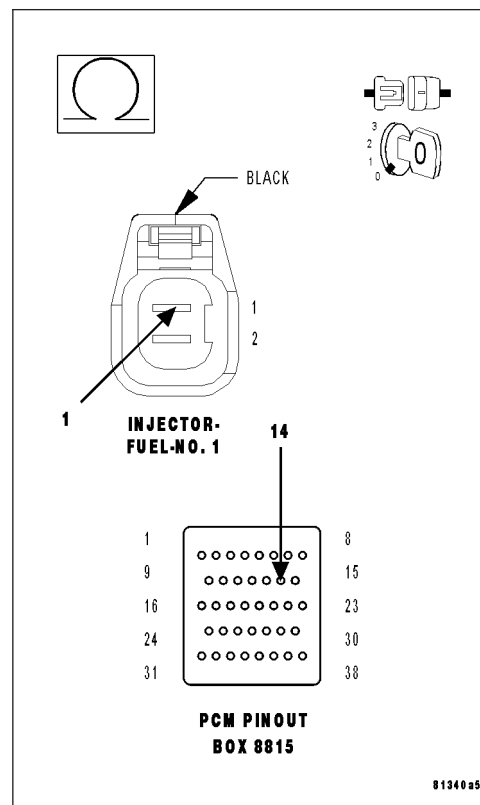
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K11) Injector Control No.1 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K11) Injector Control No.1 circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0201-FUEL INJECTOR 1 CIRCUIT (CONTINUED)****6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

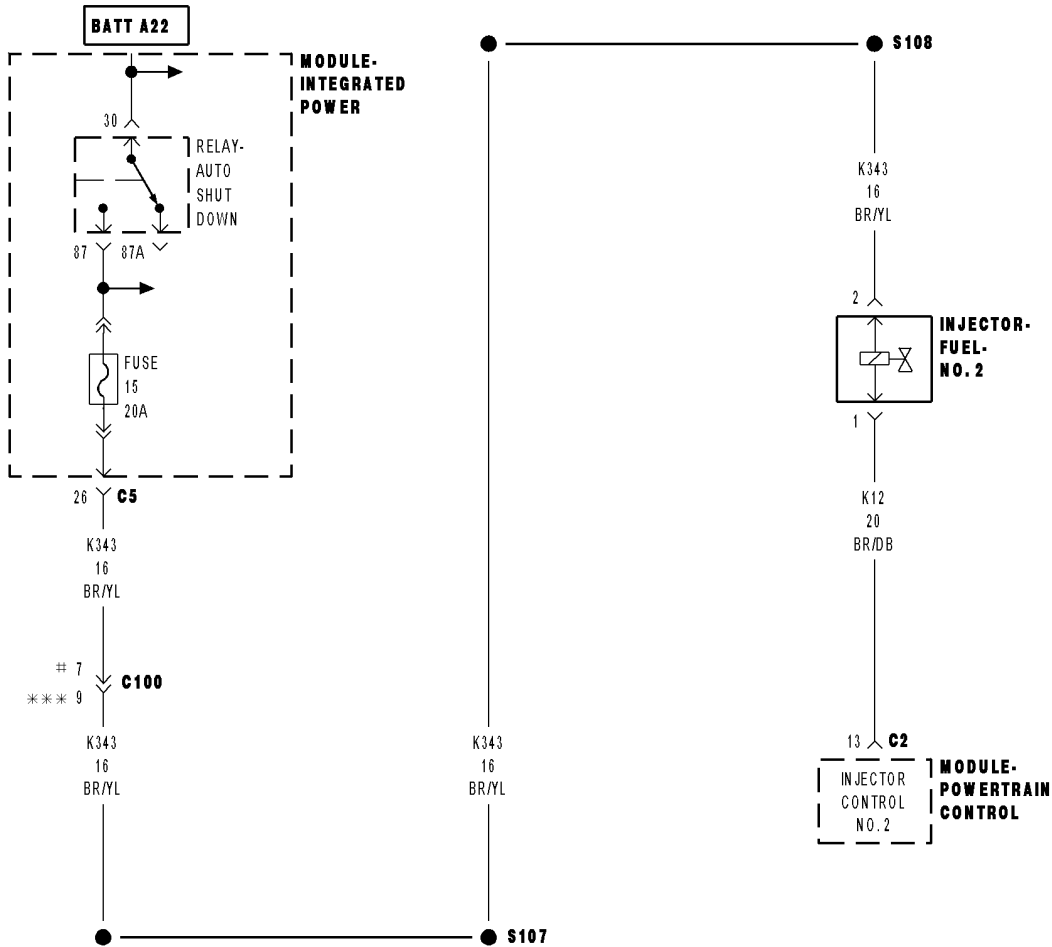
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

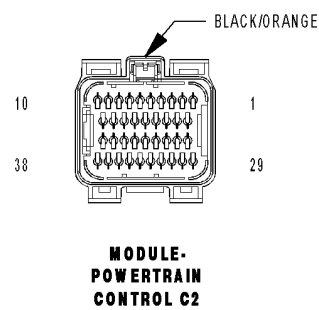
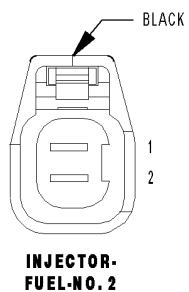
**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**P0202-FUEL INJECTOR 2 CIRCUIT**

# 2.7L/3.5L  
\*\*\* 5.7L



**P0202-FUEL INJECTOR 2 CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**  
No inductive spike is detected after injector turn off.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K12) INJECTOR CONTROL NO.2 CIRCUIT OPEN (K12) INJECTOR CONTROL NO.2 CIRCUIT SHORTED TO GROUND FUEL INJECTOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

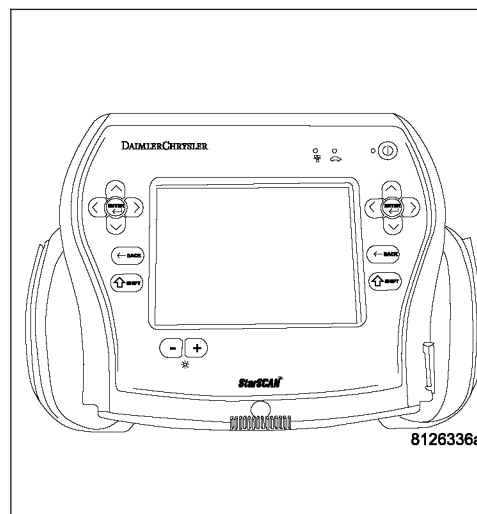
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0202-FUEL INJECTOR 2 CIRCUIT (CONTINUED)****2. (K343) ASD RELAY OUTPUT 2 CIRCUIT**

Turn the ignition off.

Disconnect the No.2 Fuel Injector harness connector.

Ignition on, engine not running.

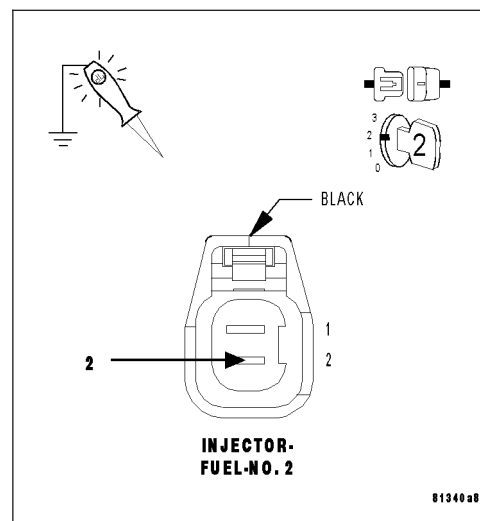
With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, backprobe the (K343) ASD Relay Output 2 circuit in the No.2 Fuel Injector harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**3. FUEL INJECTOR**

Using a 12-volt test light connected to 12-volts, backprobe the (K12) Injector Control No.2 circuit.

With the scan tool, actuate the No.2 Fuel Injector.

**What is the state of the test light during the actuation?****Brightly Blinking.**

Replace the Fuel Injector.

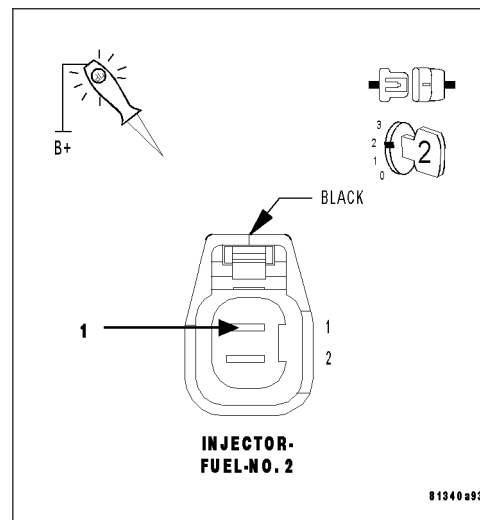
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**ON Constantly.**

Go To 4

**OFF Constantly.**

Go To 5



**P0202-FUEL INJECTOR 2 CIRCUIT (CONTINUED)****4. (K12) INJECTOR CONTROL NO.2 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

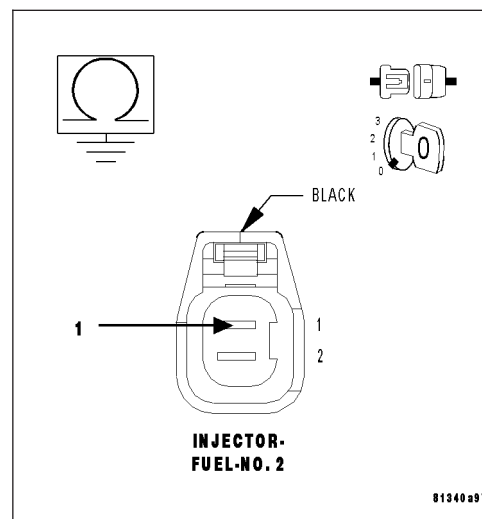
Measure the resistance between ground and the (K12) Injector Control No.2 circuit in the Injector harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K12) Injector Control No.2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**5. (K12) INJECTOR CONTROL NO.2 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

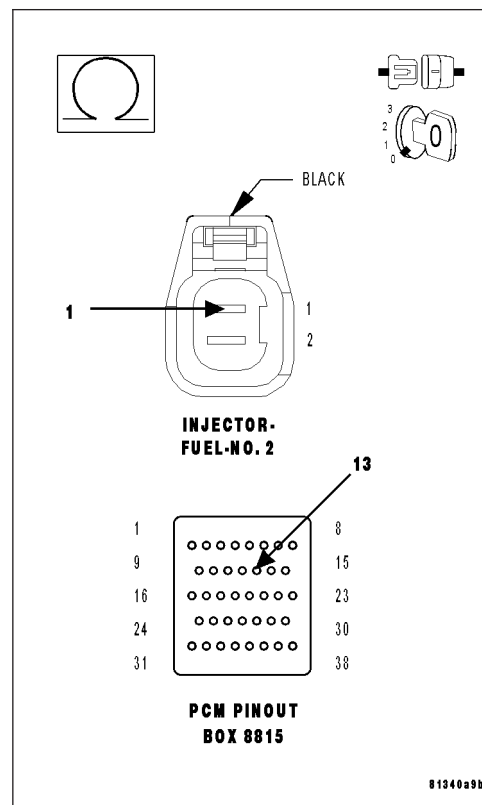
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K12) Injector Control No.2 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K12) Injector Control No.2 circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0202-FUEL INJECTOR 2 CIRCUIT (CONTINUED)****6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

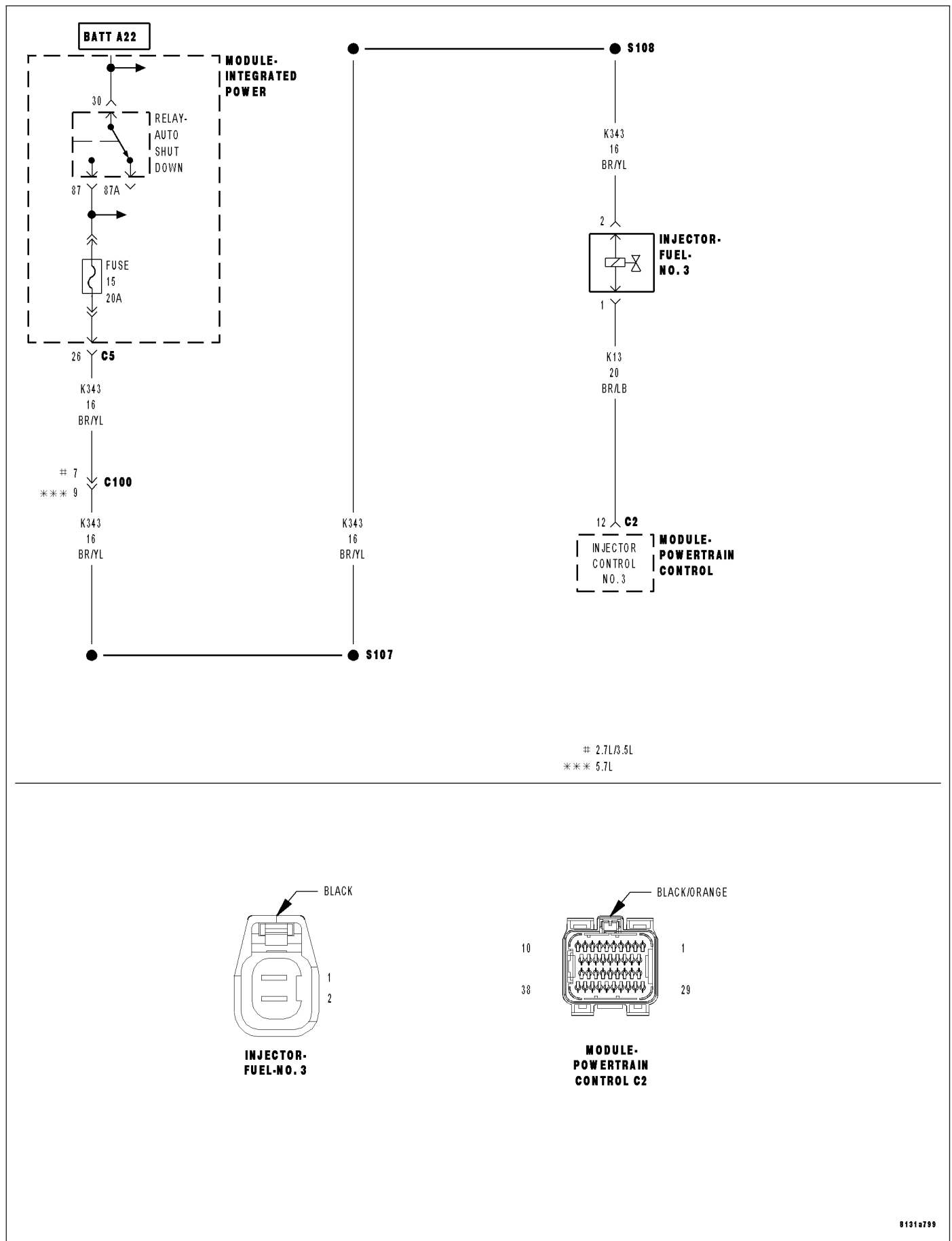
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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# P0203-FUEL INJECTOR 3 CIRCUIT





P0203-FUEL INJECTOR 3 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**  
No inductive spike is detected after injector turn off.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K13) INJECTOR CONTROL NO.3 CIRCUIT OPEN (K13) INJECTOR CONTROL NO.3 CIRCUIT SHORTED TO GROUND FUEL INJECTOR PCM

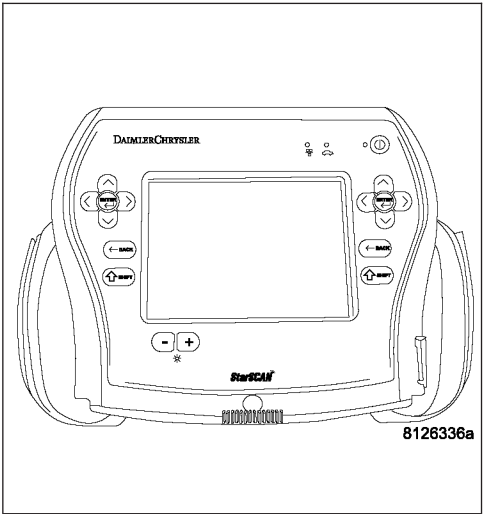
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.  
With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0203-FUEL INJECTOR 3 CIRCUIT (CONTINUED)****2. (K343) ASD RELAY OUTPUT 2 CIRCUIT**

Turn the ignition off.

Disconnect the No.3 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

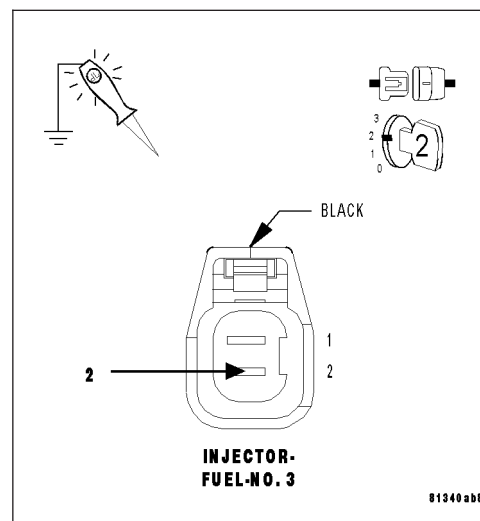
Using a 12-volt test light connected to ground, backprobe the (K343) ASD Relay Output 2circuit in the No.3 Fuel Injector harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**3. FUEL INJECTOR**

Using a 12-volt test light connected to 12-volts, backprobe the (K13) Injector Control No.3 circuit.

With the scan tool, actuate the No.3 Fuel Injector.

**What is the state of the test light during the actuation?**

**Brightly Blinking.**

Replace the Fuel Injector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**ON Constantly.**

Go To 4

**OFF Constantly.**

Go To 5

**4. (K13) INJECTOR CONTROL NO.3 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

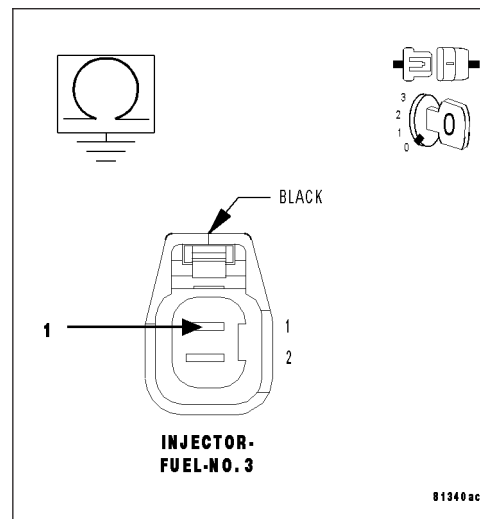
Measure the resistance between ground and the (K13) Injector Control No.3 circuit in the Injector harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K13) Injector Control No.3 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P0203-FUEL INJECTOR 3 CIRCUIT (CONTINUED)****5. (K13) INJECTOR CONTROL NO.3 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

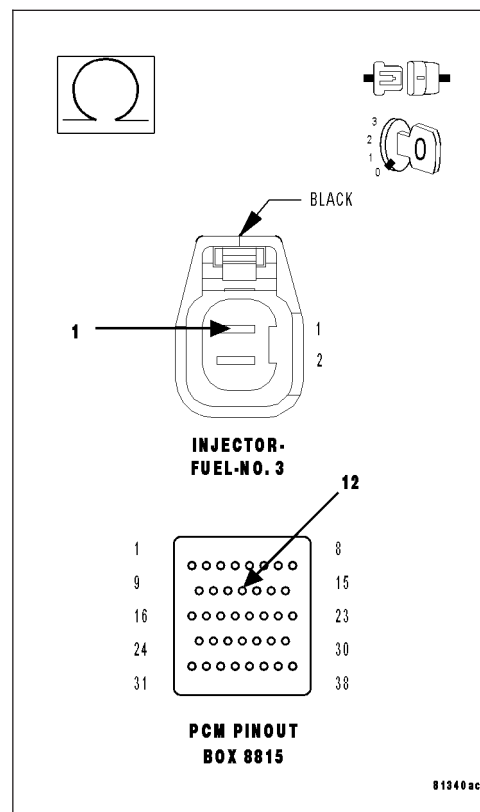
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K13) Injector Control No.3 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K13) Injector Control No.3 circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

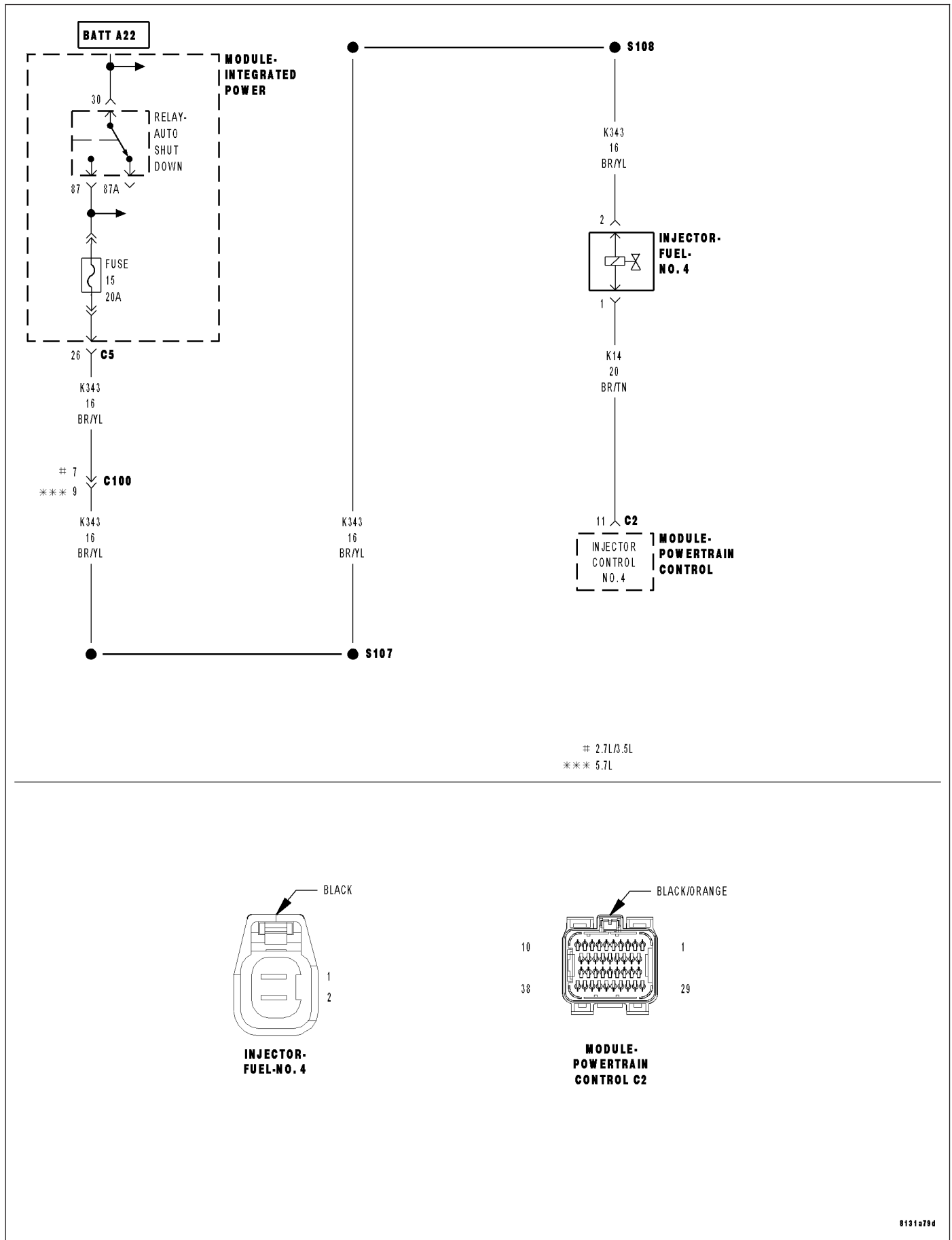
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

# P0204-FUEL INJECTOR 4 CIRCUIT



P0204-FUEL INJECTOR 4 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**  
No inductive spike is detected after injector turn off.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K14) INJECTOR CONTROL NO.4 CIRCUIT OPEN (K14) INJECTOR CONTROL NO.4 CIRCUIT SHORTED TO GROUND FUEL INJECTOR PCM

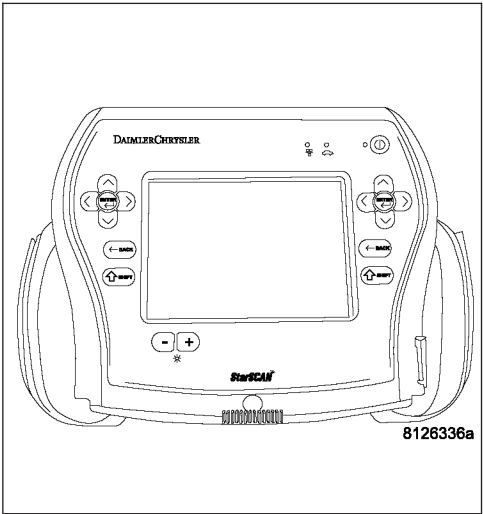
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.  
With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0204-FUEL INJECTOR 4 CIRCUIT (CONTINUED)

### 2. (K343) ASD RELAY OUTPUT 2 CIRCUIT

Turn the ignition off.

Disconnect the No.4 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

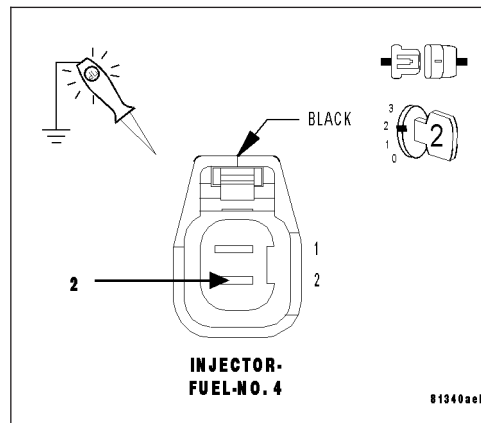
Using a 12-volt test light connected to ground, backprobe the (K343) ASD Relay Output 2 circuit in the No.4 Fuel Injector harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 3. FUEL INJECTOR

Using a 12-volt test light connected to 12-volts, backprobe the (K14) Injector Control No.4 circuit.

With the scan tool, actuate the No.4 Fuel Injector.

**What is the state of the test light during the actuation?**

**Brightly Blinking.**

Replace the Fuel Injector.

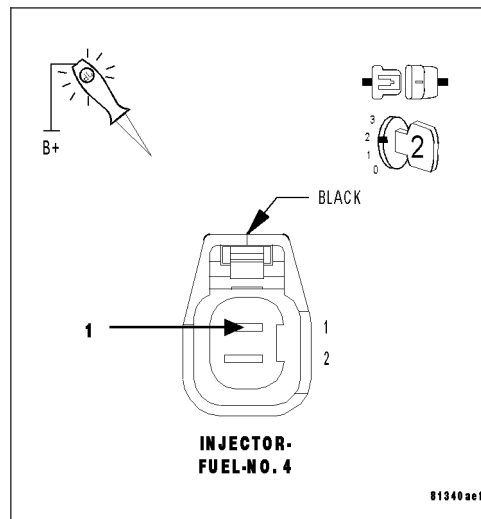
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**ON Constantly.**

Go To 4

**OFF Constantly.**

Go To 5



### 4. (K14) INJECTOR CONTROL NO.4 CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the PCM harness connectors.

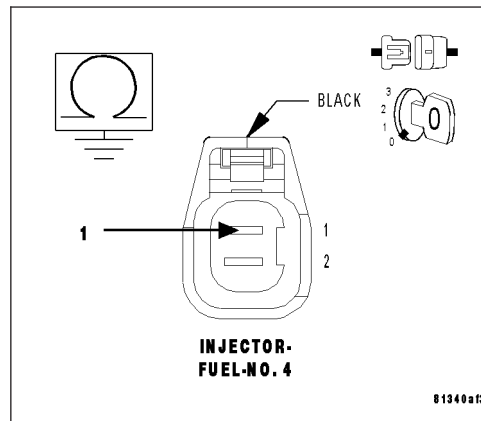
Measure the resistance between ground and the (K14) Injector Control No.4 circuit in the Injector harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K14) Injector Control No.4 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P0204-FUEL INJECTOR 4 CIRCUIT (CONTINUED)****5. (K14) INJECTOR CONTROL NO.4 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

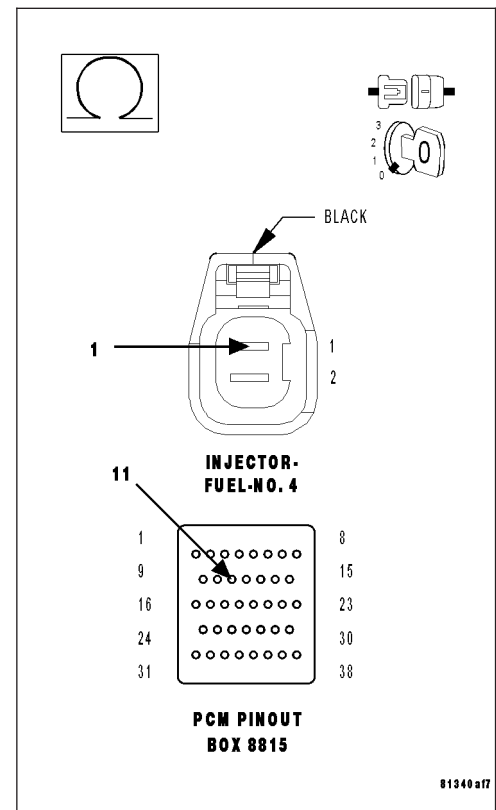
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K14) Injector Control No.4 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K14) Injector Control No.4 circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

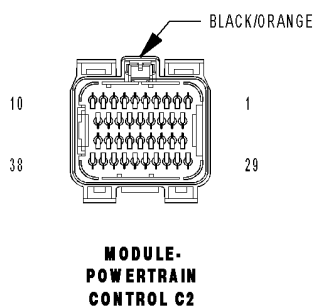
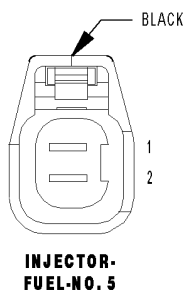
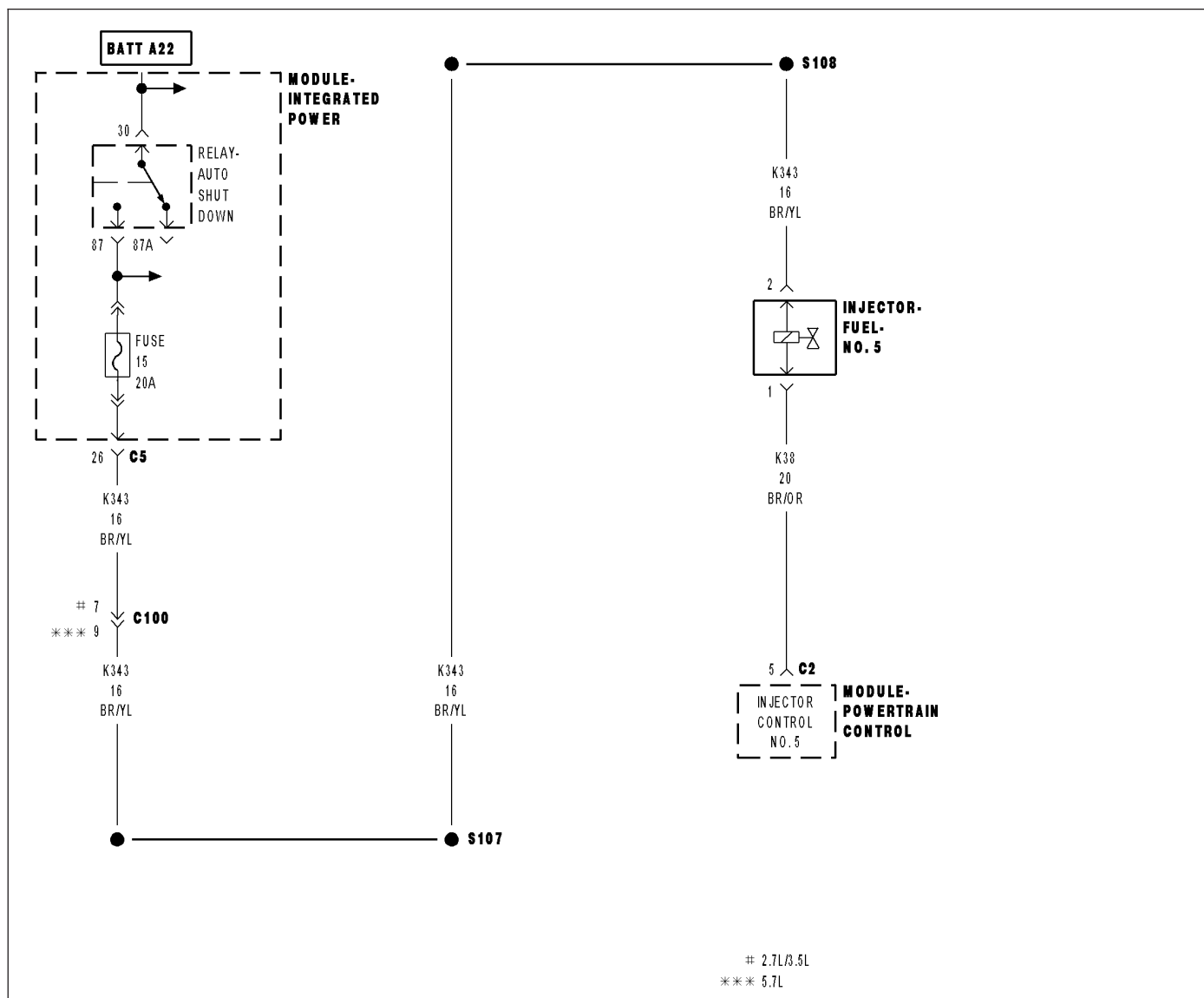
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0205-FUEL INJECTOR 5 CIRCUIT





P0205-FUEL INJECTOR 5 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**  
No inductive spike is detected after injector turn off.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K38) INJECTOR CONTROL NO.5 CIRCUIT OPEN (K38) INJECTOR CONTROL NO.5 CIRCUIT SHORTED TO GROUND FUEL INJECTOR PCM

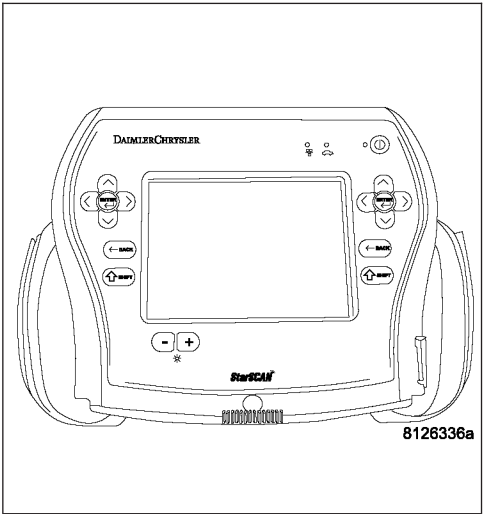
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.  
With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0205-FUEL INJECTOR 5 CIRCUIT (CONTINUED)

### 2. (K343) ASD RELAY OUTPUT 2 CIRCUIT

Turn the ignition off.

Disconnect the No.5 Fuel Injector harness connector.

Ignition on, engine not running.

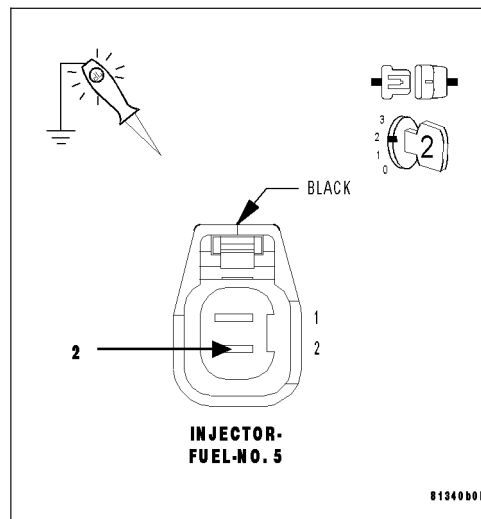
With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, backprobe the (K343) ASD Relay Output 2 circuit in the No.5 Fuel Injector harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 3. FUEL INJECTOR

Using a 12-volt test light connected to 12-volts, backprobe the (K38) Injector Control No.5 circuit.

With the scan tool, actuate the No.5 Fuel Injector.

**What is the state of the test light during the actuation?**

**Brightly Blinking.**

Replace the Fuel Injector.

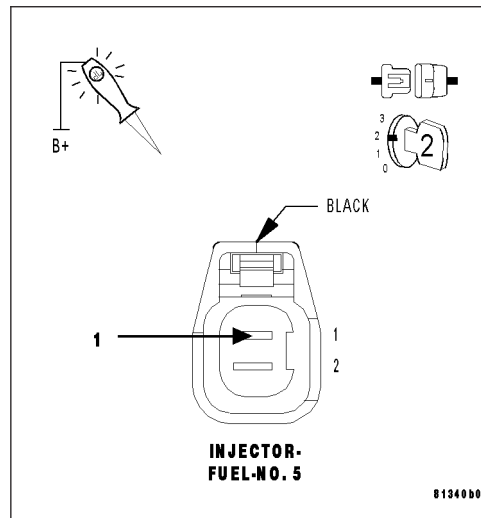
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**ON Constantly.**

Go To 4

**OFF Constantly.**

Go To 5



**P0205-FUEL INJECTOR 5 CIRCUIT (CONTINUED)****4. (K38) INJECTOR CONTROL NO.5 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

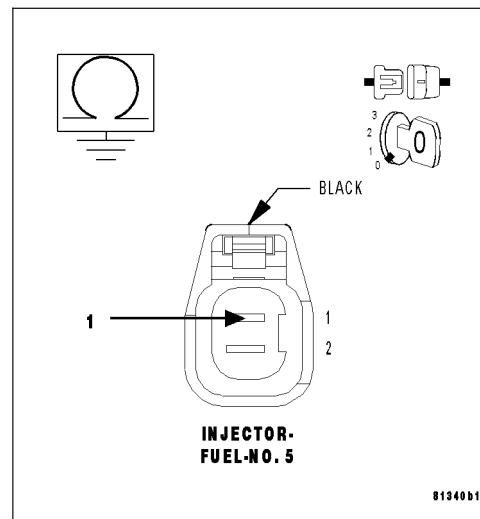
Measure the resistance between ground and the (K38) Injector Control No.5 circuit in the Injector harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K38) Injector Control No.5 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**5. (K38) INJECTOR CONTROL NO.5 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

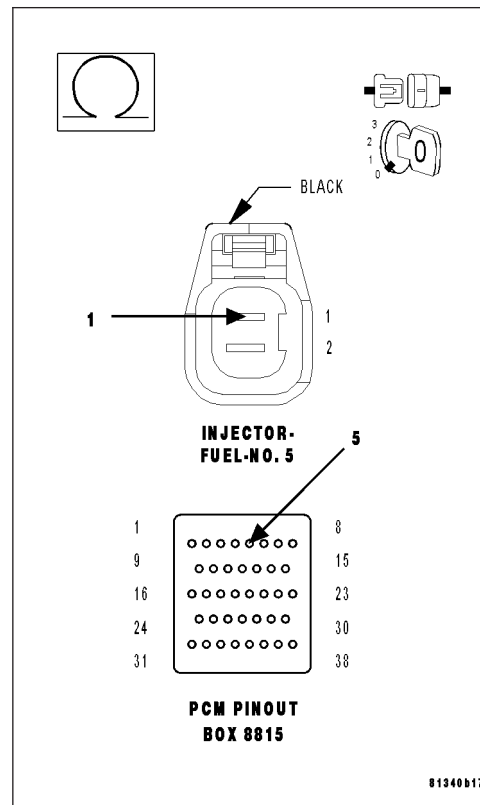
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K38) Injector Control No.5 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K38) Injector Control No.5 circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0205-FUEL INJECTOR 5 CIRCUIT (CONTINUED)****6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

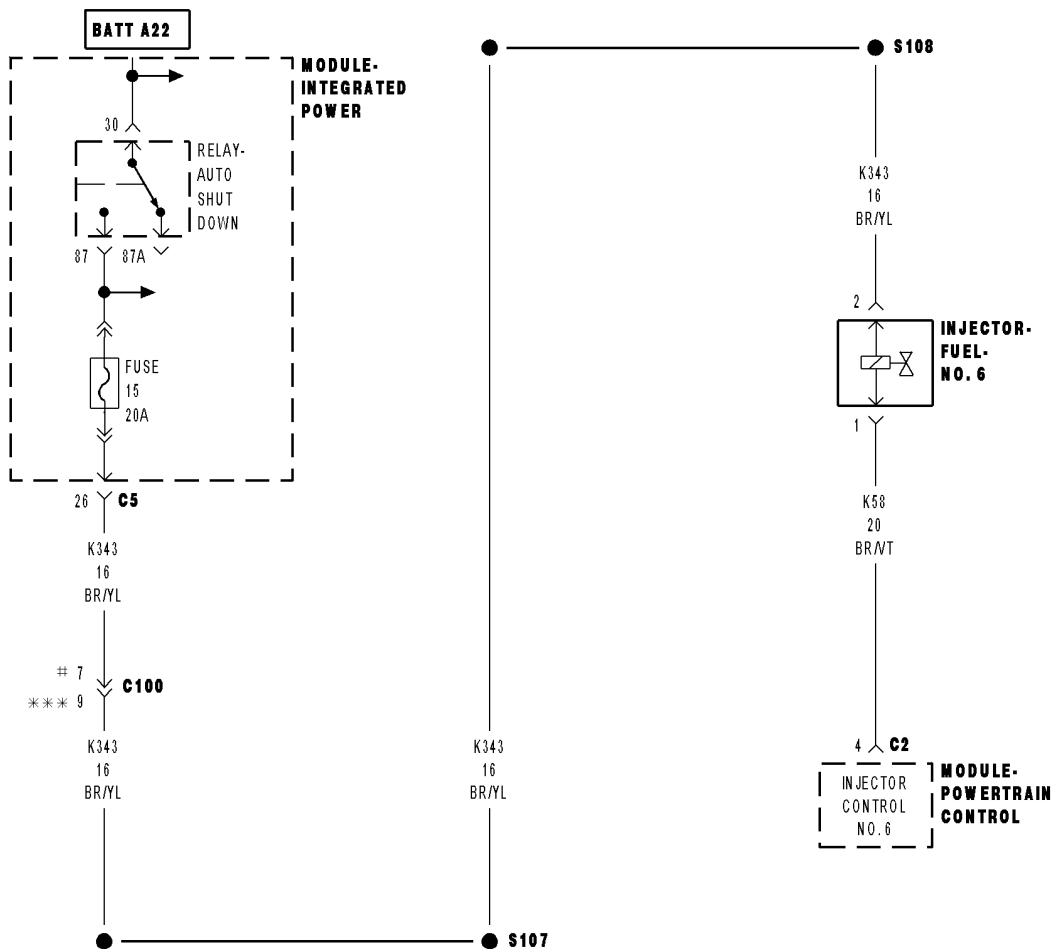
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

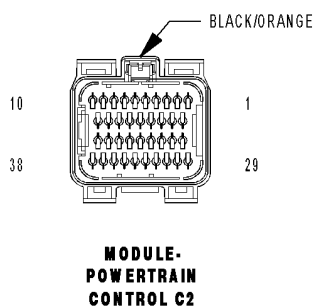
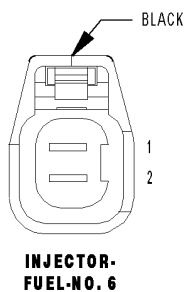
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0206-FUEL INJECTOR 6 CIRCUIT



# 2.7L/3.5L  
\*\*\* 5.7L



**P0206-FUEL INJECTOR 6 CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.

- **Set Condition:**

No inductive spike is detected after injector turn off.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K58) INJECTOR CONTROL NO.6 CIRCUIT OPEN (K58) INJECTOR CONTROL NO.6 CIRCUIT SHORTED TO GROUND FUEL INJECTOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

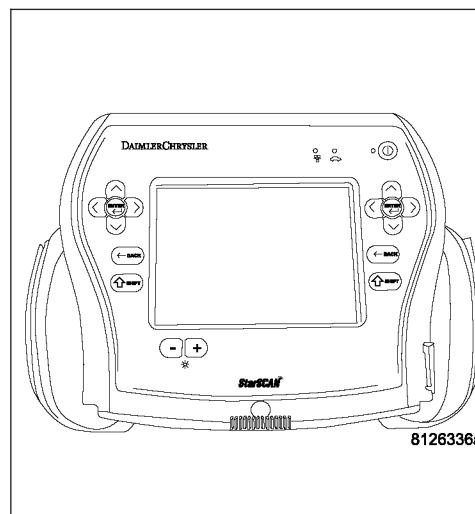
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0206-FUEL INJECTOR 6 CIRCUIT (CONTINUED)****2. (K343) ASD RELAY OUTPUT 2 CIRCUIT**

Turn the ignition off.

Disconnect the No.6 Fuel Injector harness connector.

Ignition on, engine not running.

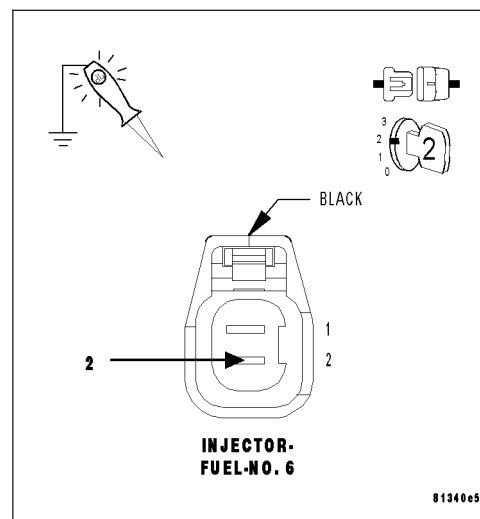
With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, backprobe the (K343) ASD Relay Output 2 circuit in the No.6 Fuel Injector harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**3. FUEL INJECTOR**

Using a 12-volt test light connected to 12-volts, backprobe the (K58) Injector Control No.6 circuit.

With the scan tool, actuate the No.6 Fuel Injector.

**What is the state of the test light during the actuation?****Brightly Blinking.**

Replace the Fuel Injector.

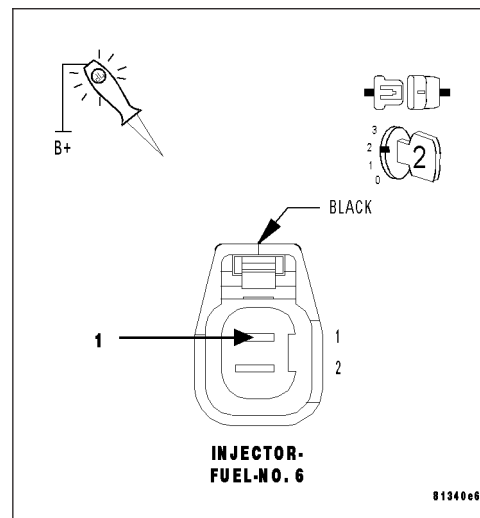
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**ON Constantly.**

Go To 4

**OFF Constantly.**

Go To 5



**P0206-FUEL INJECTOR 6 CIRCUIT (CONTINUED)****4. (K58) INJECTOR CONTROL NO.6 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

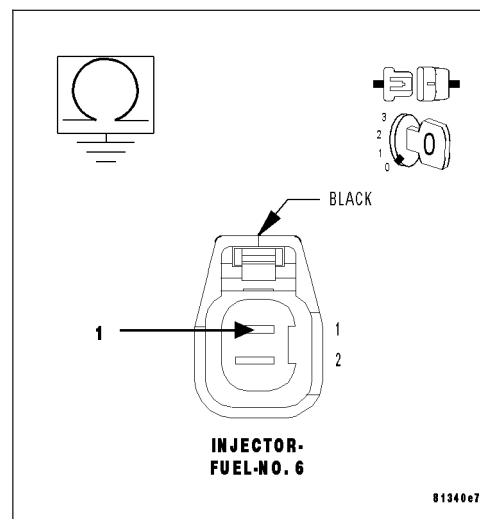
Measure the resistance between ground and the (K58) Injector Control No.6 circuit in the Injector harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K58) Injector Control No.6 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**5. (K58) INJECTOR CONTROL NO.6 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

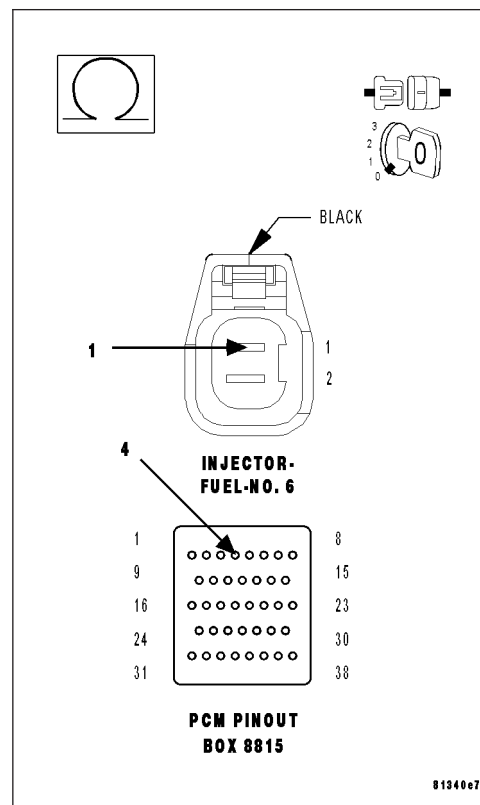
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K58) Injector Control No.6 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K58) Injector Control No.6 circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





**P0206-FUEL INJECTOR 6 CIRCUIT (CONTINUED)****6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

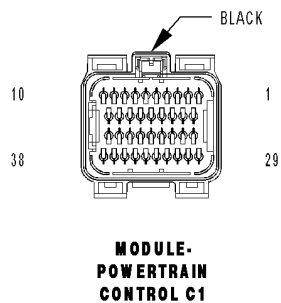
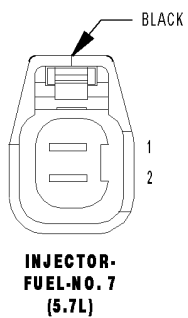
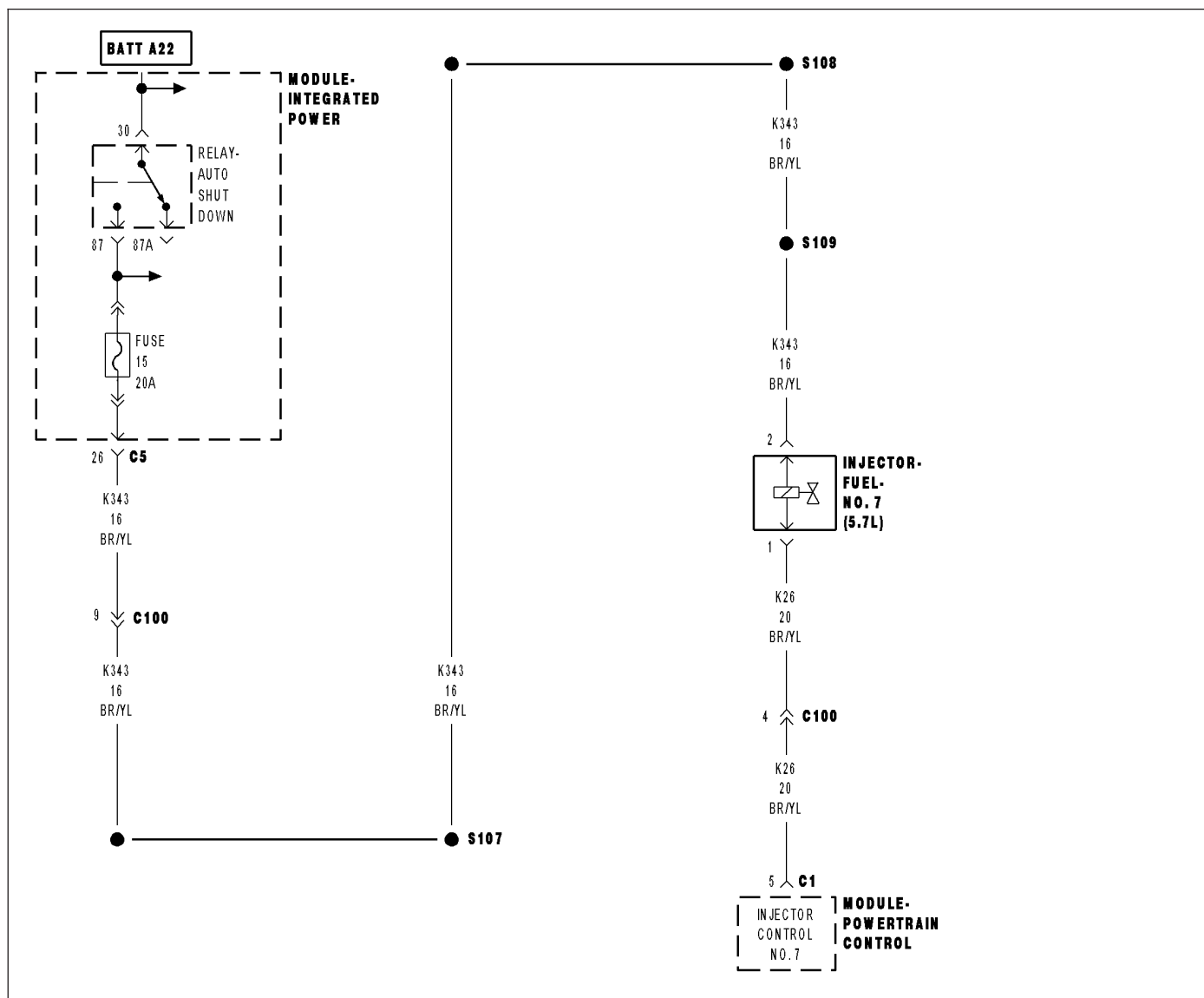
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0207-FUEL INJECTOR 7 CIRCUIT



P0207-FUEL INJECTOR 7 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**  
No inductive spike is detected after injector turn off.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K26) INJECTOR CONTROL NO.7 CIRCUIT OPEN (K26) INJECTOR CONTROL NO.7 CIRCUIT SHORTED TO GROUND FUEL INJECTOR PCM

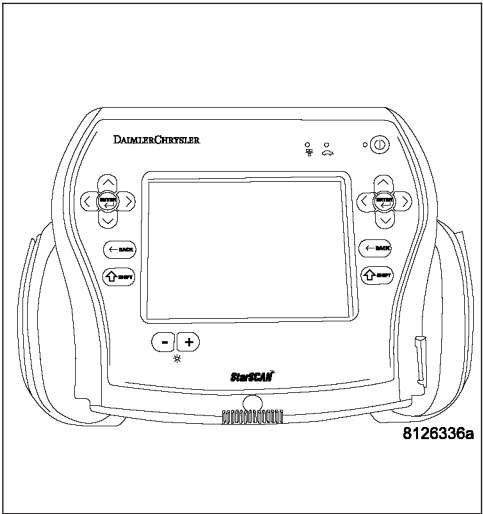
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.  
With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0207-FUEL INJECTOR 7 CIRCUIT (CONTINUED)

### 2. (K343) ASD RELAY OUTPUT 2 CIRCUIT

Turn the ignition off.

Disconnect the No.7 Fuel Injector harness connector.

Ignition on, engine not running.

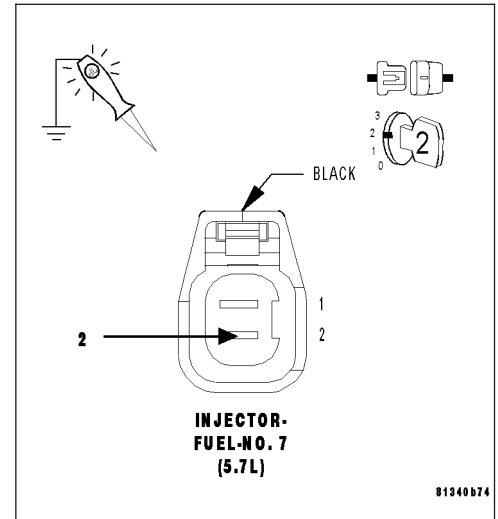
With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, backprobe the (K343) ASD Relay Output 2 circuit in the No.7 Fuel Injector harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 3. FUEL INJECTOR

Using a 12-volt test light connected to 12-volts, backprobe the (K26) Injector Control No.7 circuit.

With the scan tool, actuate the No.7 Fuel Injector.

**What is the state of the test light during the actuation?**

**Brightly Blinking.**

Replace the Fuel Injector.

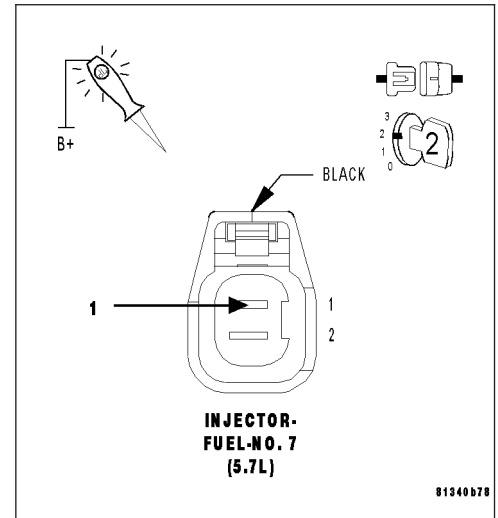
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**ON Constantly.**

Go To 4

**OFF Constantly.**

Go To 5



**P0207-FUEL INJECTOR 7 CIRCUIT (CONTINUED)****4. (K26) INJECTOR CONTROL NO.7 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

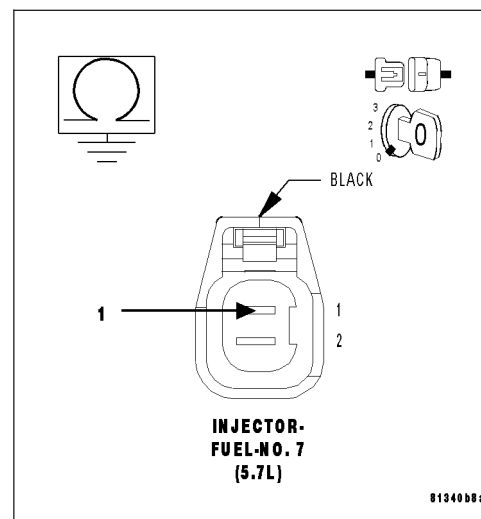
Measure the resistance between ground and the (K26) Injector Control No.7 circuit in the Injector harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K26) Injector Control No.7 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**5. (K26) INJECTOR CONTROL NO.7 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

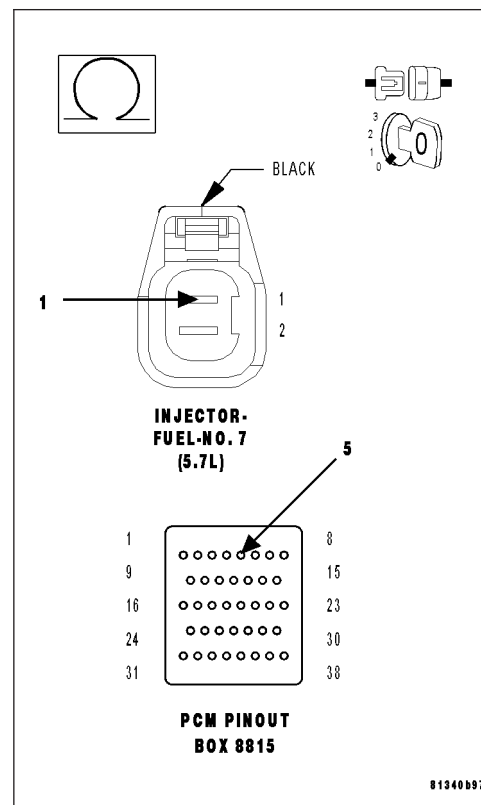
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K26) Injector Control No.7 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K26) Injector Control No.7 circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0207-FUEL INJECTOR 7 CIRCUIT (CONTINUED)****6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

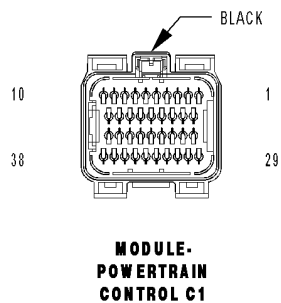
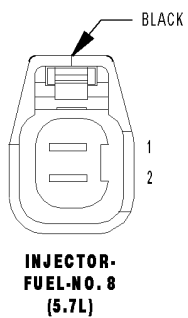
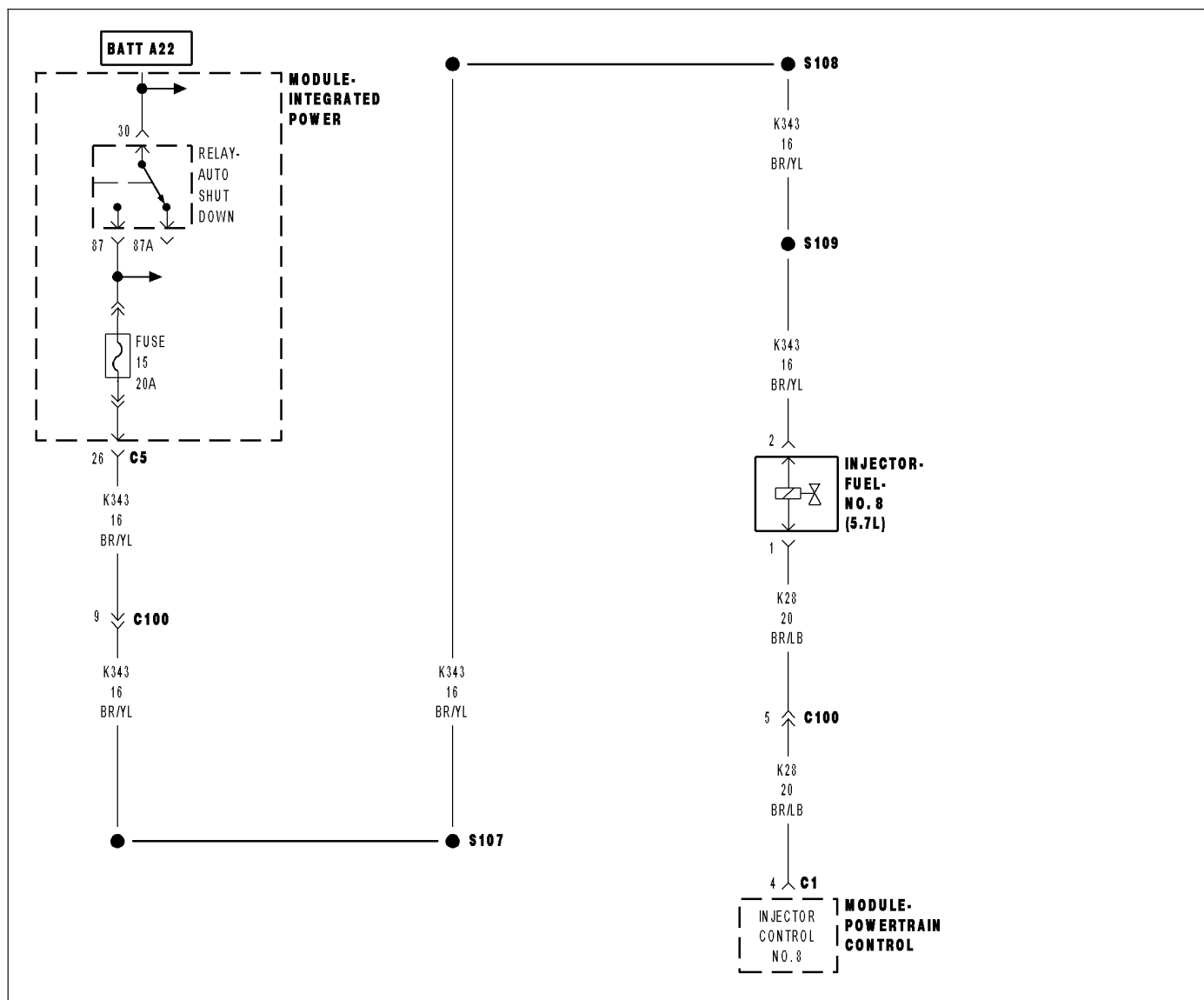
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0208-FUEL INJECTOR 8 CIRCUIT



**P0208-FUEL INJECTOR 8 CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With battery voltage greater than 10 volts. Auto Shutdown Relay energized. Engine speed less than 3000 rpm.
- **Set Condition:**  
No inductive spike is detected after injector turn off.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K28) INJECTOR CONTROL NO.8 CIRCUIT OPEN (K28) INJECTOR CONTROL NO.8 CIRCUIT SHORTED TO GROUND FUEL INJECTOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

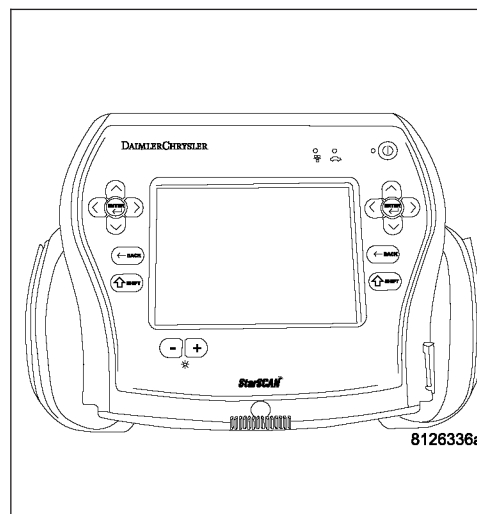
**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

With a scan tool, read DTC.

**Is the DTC active at this time?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
 Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





**P0208-FUEL INJECTOR 8 CIRCUIT (CONTINUED)****2. (K343) ASD RELAY OUTPUT 2 CIRCUIT**

Turn the ignition off.

Disconnect the No.8 Fuel Injector harness connector.

Ignition on, engine not running.

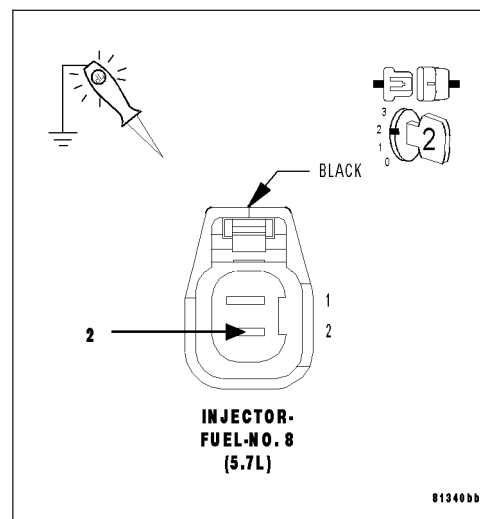
With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, backprobe the (K343) ASD Relay Output 2 circuit in the No.8 Fuel Injector harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**3. FUEL INJECTOR**

Using a 12-volt test light connected to 12-volts, backprobe the (K28) Injector Control No.8 circuit.

With the scan tool, actuate the No.8 Fuel Injector.

**What is the state of the test light during the actuation?****Brightly Blinking.**

Replace the Fuel Injector.

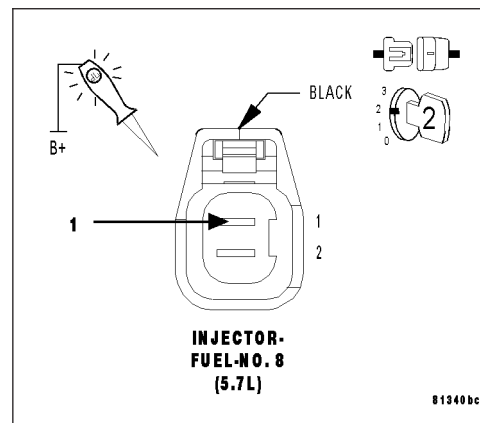
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**ON Constantly.**

Go To 4

**OFF Constantly.**

Go To 5



**P0208-FUEL INJECTOR 8 CIRCUIT (CONTINUED)****4. (K28) INJECTOR CONTROL NO.8 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

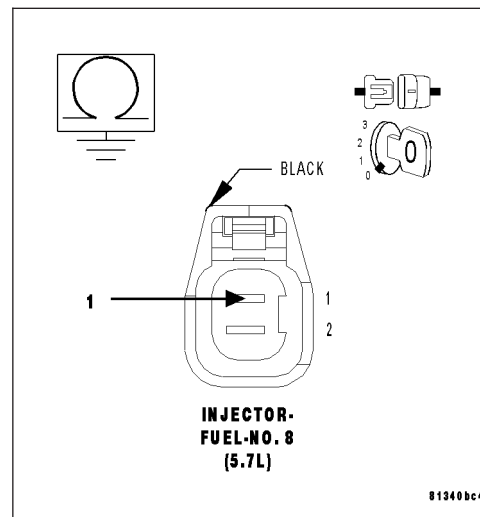
Measure the resistance between ground and the (K28) Injector Control No.8 circuit in the Injector harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K28) Injector Control No.8 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**5. (K28) INJECTOR CONTROL NO.8 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

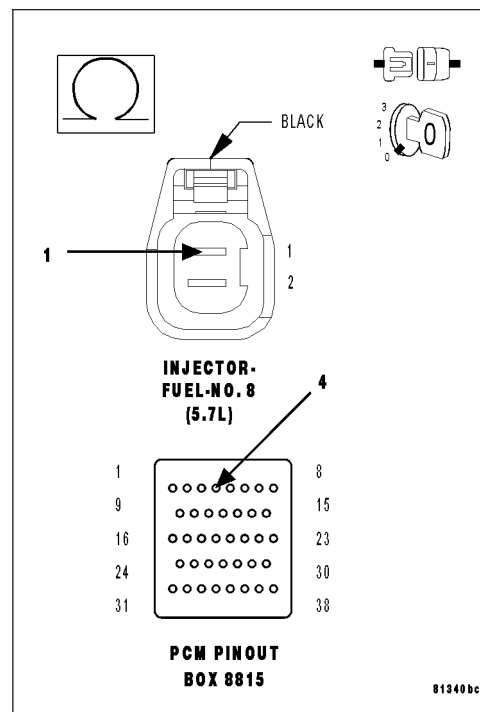
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K28) Injector Control No.8 circuit from the Fuel Injector harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K28) Injector Control No.8 circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0208-FUEL INJECTOR 8 CIRCUIT (CONTINUED)****6. PCM**

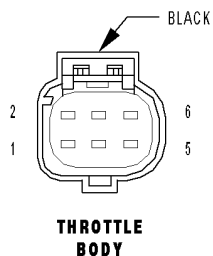
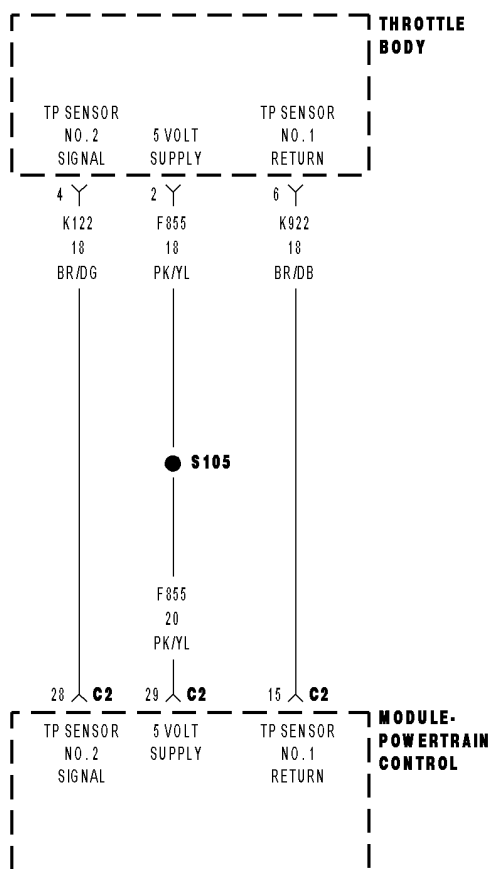
**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

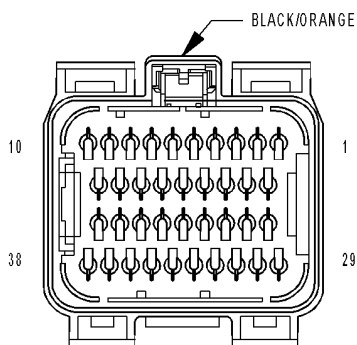
**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No**      >> Replace and program the Powertrain Control Module per Service Information.  
          Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
-

## P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE



**THROTTLE  
BODY**



**MODULE-  
POWERTRAIN  
CONTROL C2**

**P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)**

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on and No MAP Sensor DTCs set.

- **Set Condition:**

TP Sensor signals do not correlate to the MAP Sensor signal. One Trip Fault. ETC light will illuminate. P2135 should set with this code also.

Possible Causes
(K122) TP SENSOR NO.2 SIGNAL CIRCUIT OR (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
RESISTANCE IN THE (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT
(K122) TP SENSOR NO.2 SIGNAL CIRCUIT OR (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN (F855) 5-VOLT SUPPLY CIRCUIT
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO (K122) TP SENSOR NO.2 SIGNAL CIRCUIT
THROTTLE POSITION SENSOR/THROTTLE BODY
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Diagnose any other TP Sensor DTC(s) before continuing.

**Note:** The throttle plate and linkage should be free from binding and carbon build up.

**Note:** Make sure the throttle plate is at the idle position.

Ignition on, engine not running.

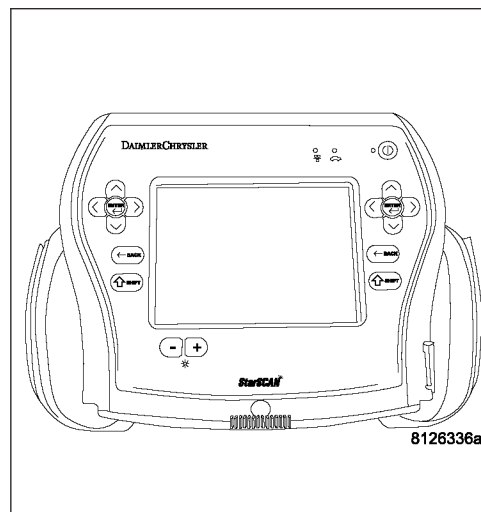
**Note:** Inspect the engine for vacuum leaks.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Go To 11



**P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)****2. (K122) TP SENSOR NO.2 SIGNAL CIRCUIT OR (K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect the Throttle Body harness connector.

Ignition on, engine not running.

Measure the voltage on the (K122) TP No.2 Signal circuit in the Throttle Body harness connector.

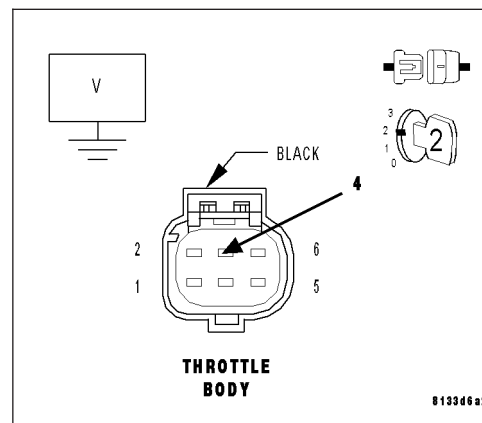
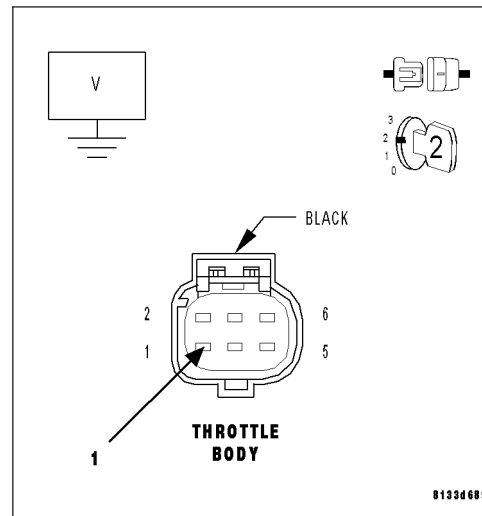
Measure the voltage on the (K22) TP No.1 Signal circuit in the Throttle Body harness connector.

**Is the voltage above 5.2 volts for each reading?**

**Yes** >> Repair the short to battery voltage in the (K122) TP Sensor No.2 Signal circuit or the (K22) TP Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3



**P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)****3. THROTTLE POSITION SENSOR**

Turn the ignition off.

Connect the PCM harness connectors.

Ignition on, engine not running.

With the scan tool, monitor the TP Sensor No.1 and No.2 voltage.

Connect a jumper wire between the (K922) Sensor Return circuit and the (K22) TP Sensor No.1 Signal circuit.

**Note: TP Sensor No.1 voltage should change from approximately 4.7 volts to 0.3 of a volt.**

For TP Sensor No.2, connect a jumper wire between (F855) 5-volt supply circuit and the (K122) TP Sensor No.2 Signal circuit.

**Note: TP Sensor No.2 voltage should change from approximately 0 volts to 5.0 volts.**

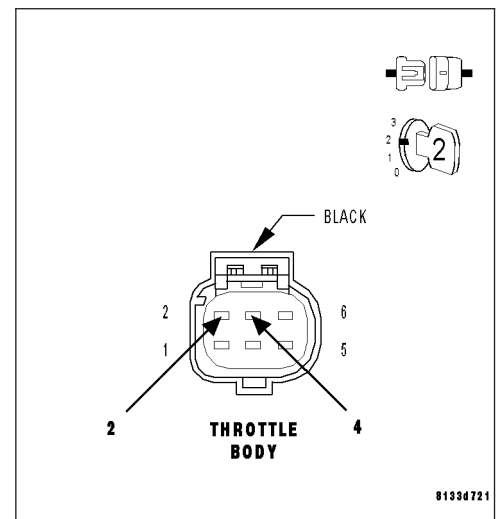
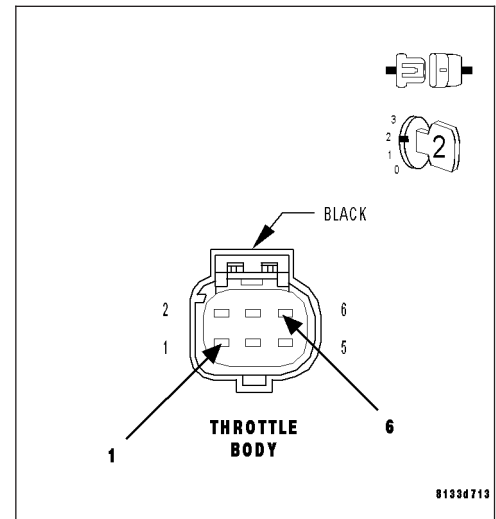
**Is the voltage reading within the listed specification with the jumper wire installed?**

**Yes** >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, using a scan tool, select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**Note: Remove the jumper wire before continuing.**



**P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)****4. EXCESSIVE RESISTANCE IN THE (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

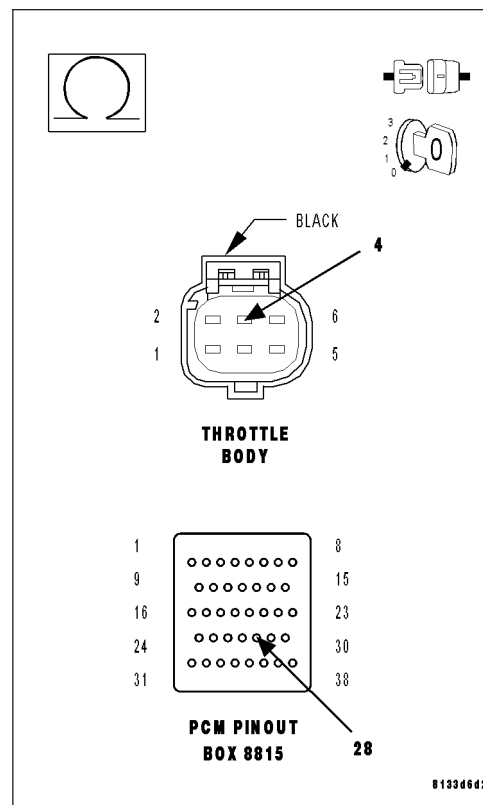
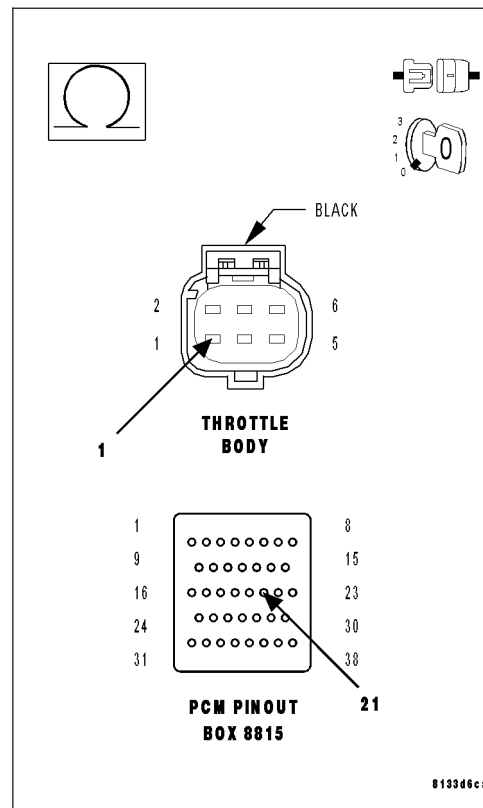
Measure the resistance of the (K22) TP Sensor No.1 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815. Measure the resistance of the (K122) TP Sensor No.2 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms for each circuit?**

**Yes** >> Go To 5

**No** >> Repair the excessive resistance in the (K22) TP Sensor No.1 or (K122) TP Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





**P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)****5. (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND**

Measure the resistance between ground and the (K122) TP Sensor No.2 Signal circuit at the Throttle Body harness connector.

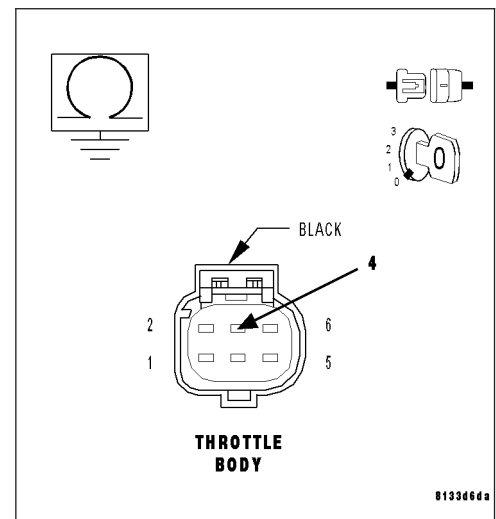
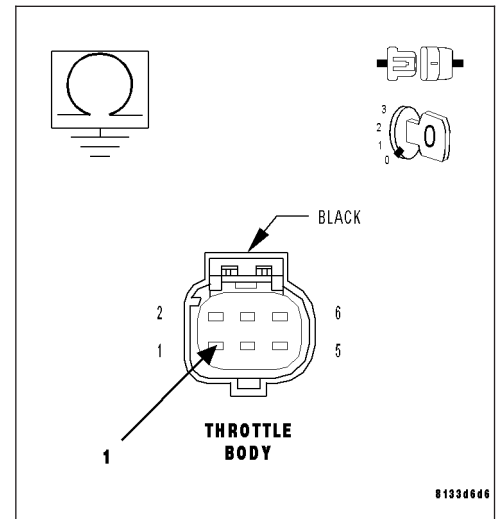
Measure the resistance between ground and the (K22) TP Sensor No.1 Signal circuit at the Throttle Body harness connector.

**Is the resistance below 100 ohms for each circuit?**

**Yes** >> Go To 6

**No** >> Repair the short to ground in the (K122), (K22) TP Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)

### 6. EXCESSIVE RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT

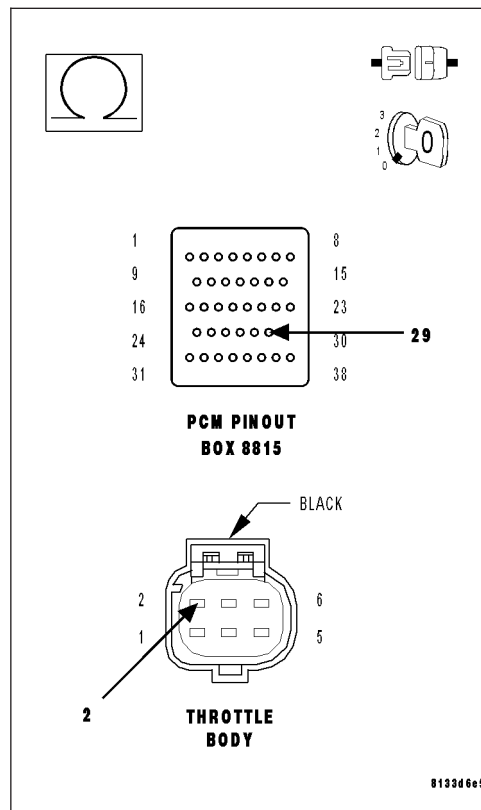
Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 7. (F855) 5-VOLT SUPPLY SHORTED TO GROUND

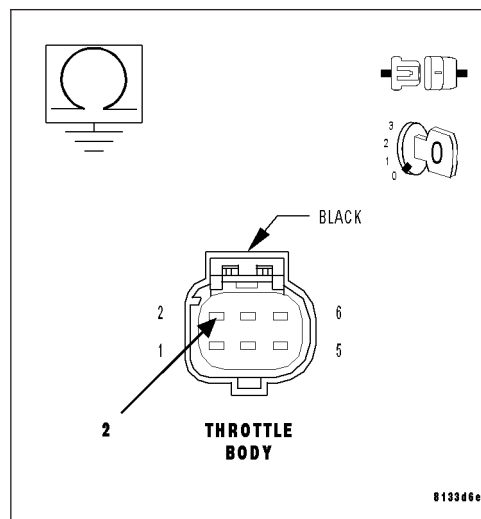
Measure the resistance between ground and the (F855) 5-volt Supply circuit at the Throttle Body harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)****8. EXCESSIVE RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT**

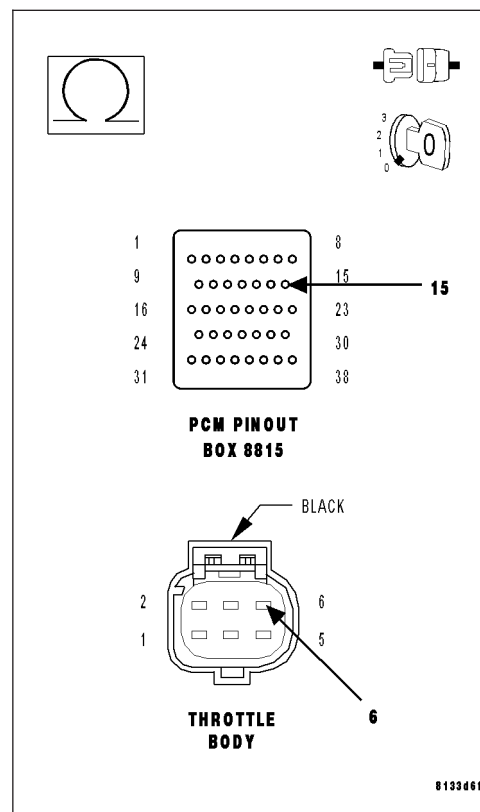
Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the excessive resistance in the (K922) Sensor Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**9. (K22) TP SENSOR NO.1 SIGNAL SHORTED TO (K122) TP SENSOR NO.2 SIGNAL**

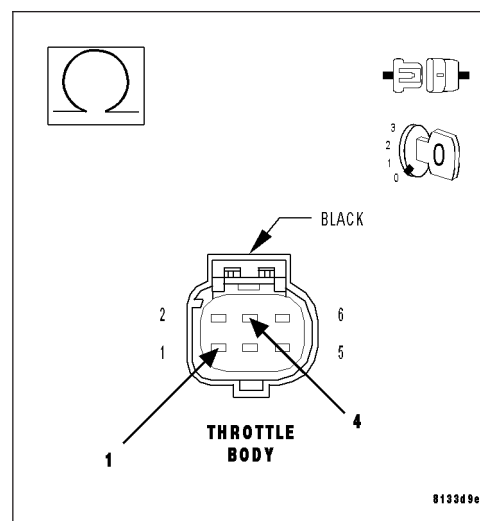
Measure the resistance between the (K22) TP Sensor No.1 Signal circuit and the (K122) TP Sensor No.2 Signal circuit at the Throttle Body harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (K122) TP Sensor No.2 Signal circuit and the (K22) TP Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 10



**P0221-THROTTLE POSITION SENSOR 2 PERFORMANCE (CONTINUED)****10. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**11. THROTTLE FOLLOWER TEST**

Ignition on, engine not running.

With the scan tool, perform the Throttle Follower Test and monitor the TP Sensor No.1 or No.2 voltage.

Slowly press the throttle pedal down.

The voltage for TP Sensor No.1 should start at approximately 0.3 of a volt and increase to above 4.3 volts.

The voltage for TP Sensor No.2 should start at approximately 4.3 volts and decrease to approximately 0.3 of a volt.

**Is the voltage within the range of the listed specification for the appropriate Sensor?**

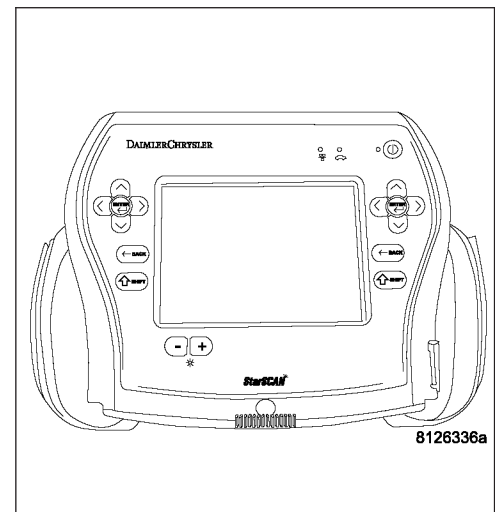
**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

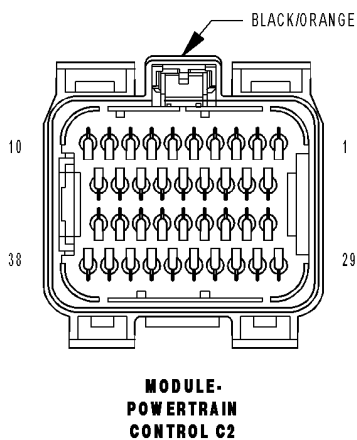
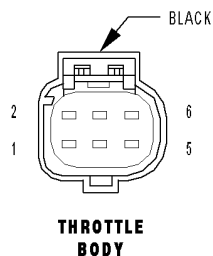
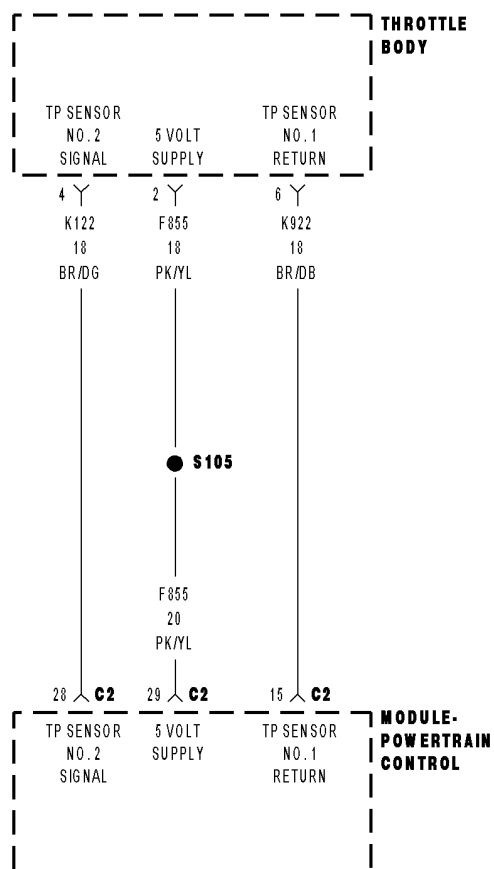
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, using a scan tool select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**P0222-THROTTLE POSITION SENSOR 2 CIRCUIT LOW**

## P0222-THROTTLE POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete Engine wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**  
Throttle Position Sensor voltage at the PCM is less than 0.16 of a volt for 0.7 of a second. One Trip Fault.  
Three good trips to turn off the MIL.

Possible Causes
(F855) 5-VOLT SUPPLY CIRCUIT OPEN (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO GROUND (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO THE (K922) SENSOR RETURN CIRCUIT THROTTLE POSITION SENSOR/THROTTLE BODY THROTTLE PLATE JAMMED AGAINST THE MAXIMUM STOP PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. TP SENSOR NO.2 BELOW 0.35 OF A VOLT

**Note:** If a 5-Volt supply DTC has also set, diagnose the 5-Volt DTC before continuing.

**Note:** Make sure the throttle moves freely and does not hang up at Wide Open Throttle, by performing the Throttle Follower Test

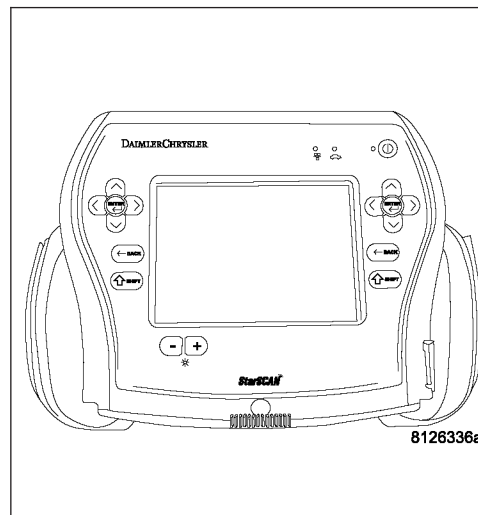
**Note:** If P2101 is also set, then make sure that the blade moves freely and does not hang up near Wide Open Throttle before trying to repair P0222.

Ignition on, engine not running.

With the scan tool, read the TP Sensor voltage.

**Is the voltage below 0.35 of a volt?**

- Yes**    >> Go To 2  
**No**     >> Go To 11

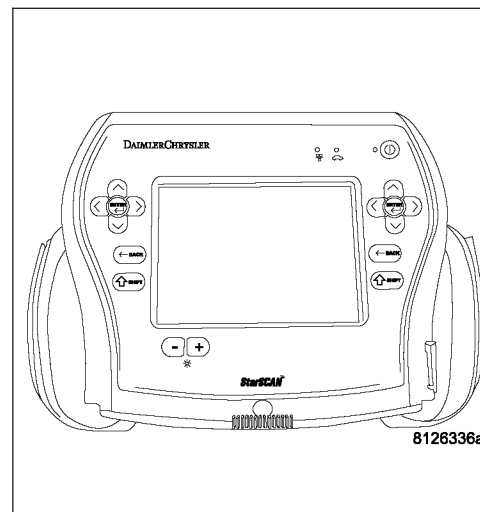


**P0222-THROTTLE POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)****2. P0122 ALSO SET**

**Was the P0122-TP SENSOR NO.1 VOLTAGE LOW DTC set along with the P0222?**

**Yes** >> Go To 3

**No** >> Go To 4

**3. (F855) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Throttle Body harness connector.

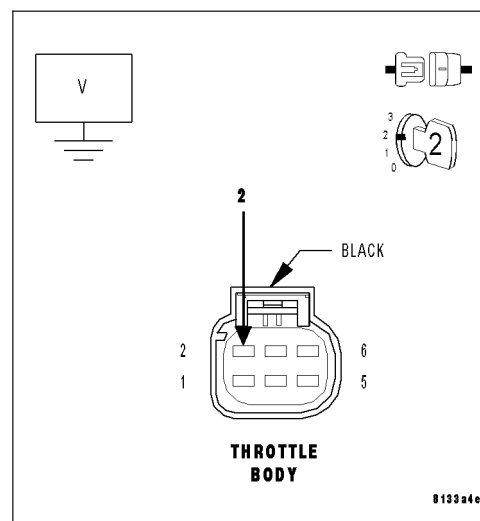
Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit in the Throttle Body harness connector.

**Is the voltage between 4.5 to 5.2 volts?**

**Yes** >> Go To 4

**No** >> Go To 8



## P0222-THROTTLE POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)

### 4. THROTTLE POSITION SENSOR

Connect a jumper wire between the (F855) 5-volt Supply circuit and the (K122) TP Sensor No.2 Signal circuit in the Throttle Body harness connector.

With the scan tool, monitor the TP Sensor No.2 voltage.

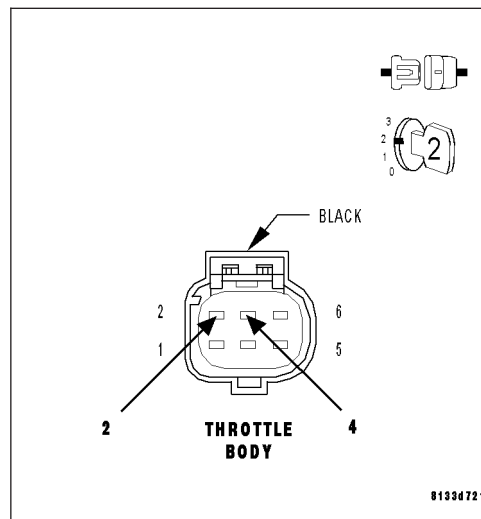
**Is the voltage between 4.8 and 5.2 volts with the jumper wire installed?**

**Yes** >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, with a scan tool select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**Note:** Remove the jumper wire before continuing.



### 5. (K122) TP SENSOR NO.2 SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

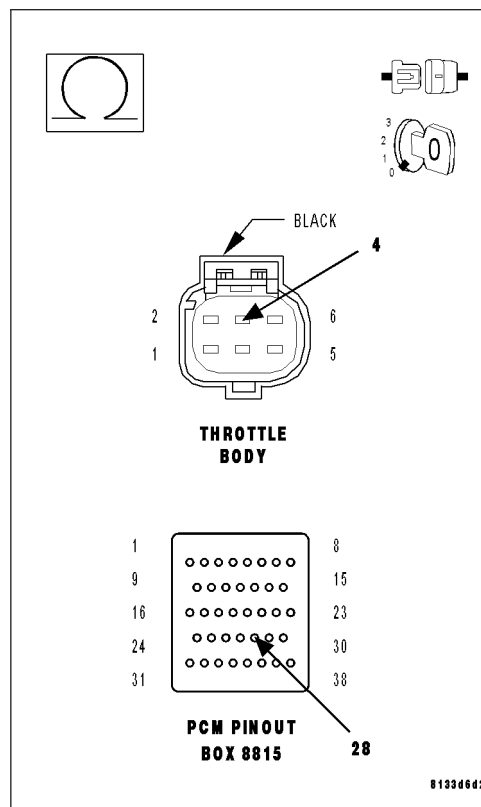
Measure the resistance of the (K122) TP Sensor No.2 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K122) TP Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





**P0222-THROTTLE POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)****6. (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO GROUND**

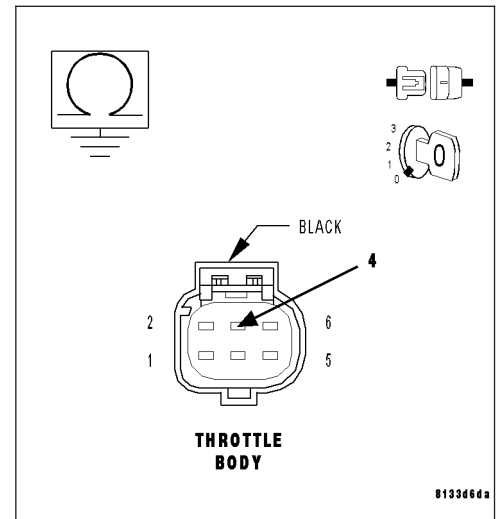
Measure the resistance between ground and the (K122) TP Sensor No.2 Signal circuit at the Throttle Body harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K122) TP Sensor No.2 Signal.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO (K922) SENSOR RETURN CIRCUIT**

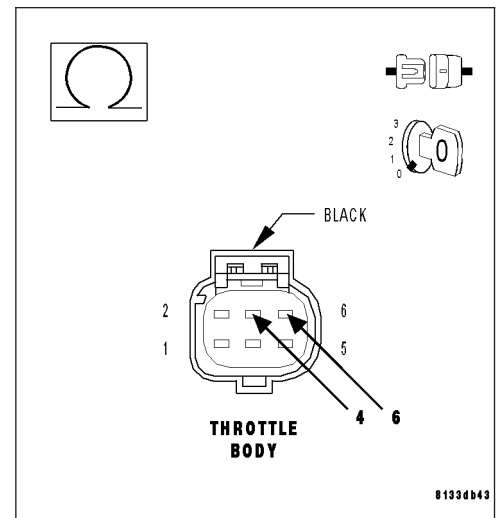
Measure the resistance between the (K122) TP Sensor No.2 Signal circuit and the (K922) TP Sensor Return circuit at the Throttle Body harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K922) Sensor Return circuit and the (K122) TP Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 10



**P0222-THROTTLE POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)****8. (F855) 5-VOLT SUPPLY CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

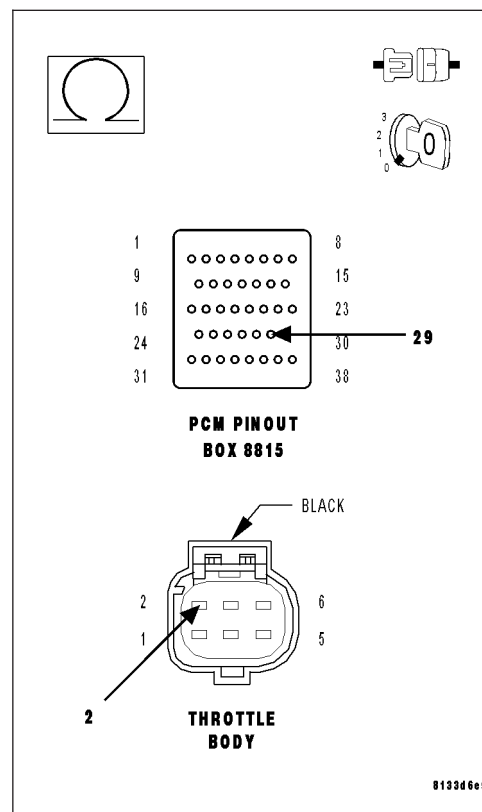
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the open in the (F855) 5-volt Supply circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**9. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

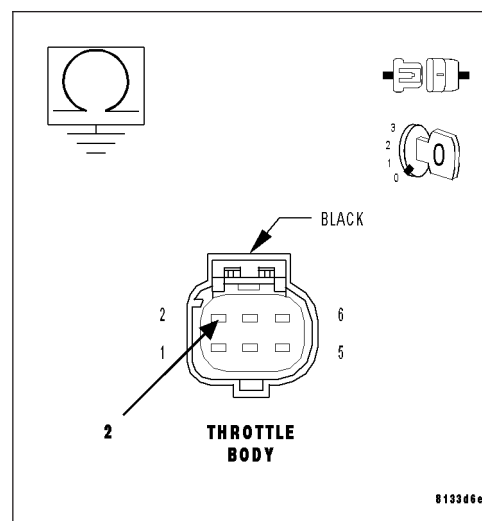
Measure the resistance between ground and the (F855) 5-volt Supply circuit at the Throttle Body harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 10



**P0222-THROTTLE POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)****10. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**11. THROTTLE FOLLOWER TEST**

Ignition on, engine not running.

With the scan tool, perform the Throttle Follower Test.

Monitor the TP Sensor No.2 voltage while slowly pressing the Throttle pedal down.

**Is there a smooth voltage change from high to low?**

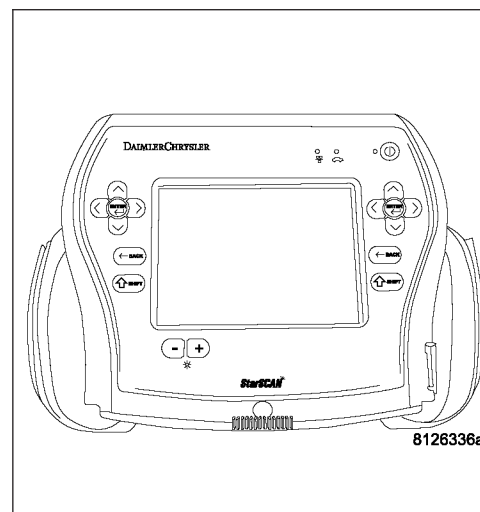
**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

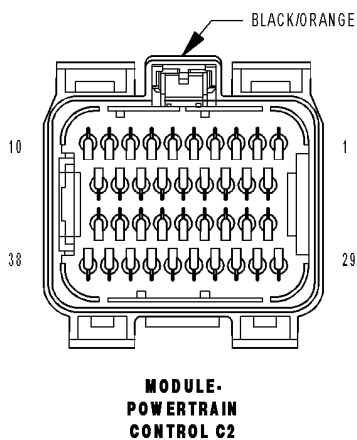
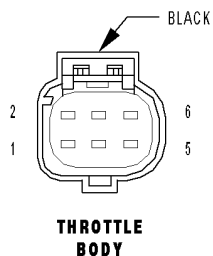
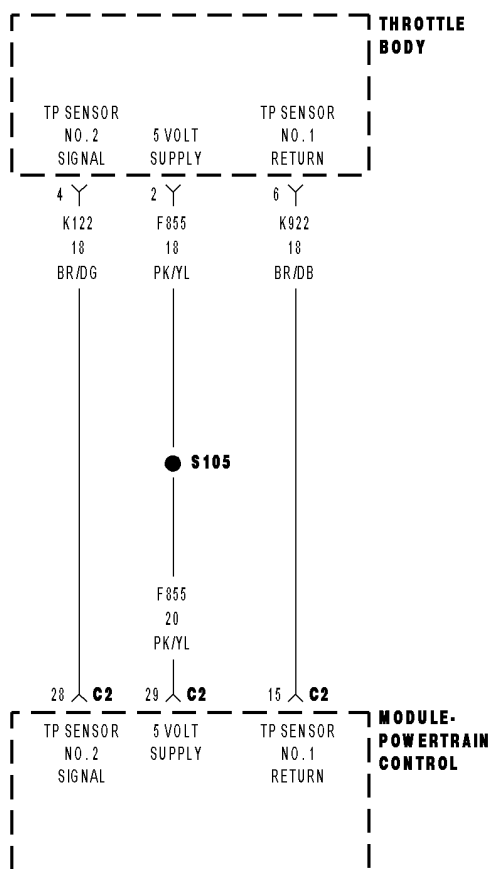
**No** >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, with a scan tool select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0223-THROTTLE POSITION SENSOR 2 CIRCUIT HIGH



**P0223-THROTTLE POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
Throttle Position Sensor No.2 Signal circuit voltage is greater than 4.9 volts for 25 ms. One Trip Fault. ETC light will illuminate.

Possible Causes
(K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO (F855) 5-VOLT SUPPLY CIRCUIT (K922) SENSOR RETURN CIRCUIT OPEN THROTTLE POSITION SENSOR/THROTTLE BODY PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test**

**1. ACTIVE DTC**

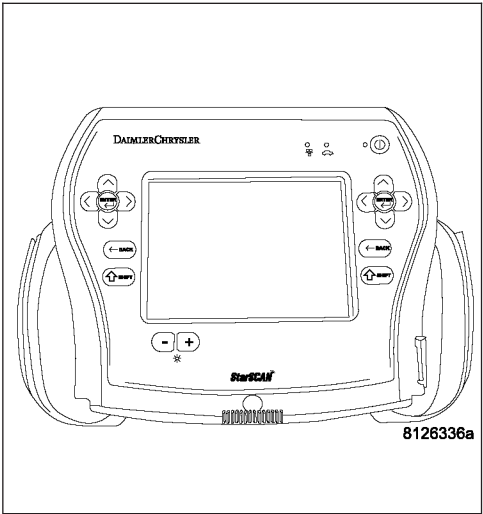
**Note:** If a 5-Volt supply DTC has also set, diagnose the 5-Volt DTC before continuing.

Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

- Yes**    >> Go To 2
- No**    >> Go To 7



**P0223-THROTTLE POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)****2. THROTTLE POSITION SENSOR**

Turn the ignition off.

Disconnect the Throttle Body Assembly harness connector.

Ignition on, engine not running.

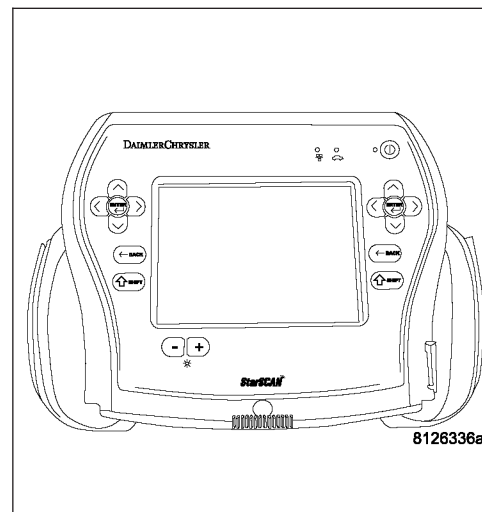
With the scan tool monitor the TP Sensor No.2 voltage.

**Is the voltage below 0.5 volt?**

**Yes** >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, with the scan tool select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

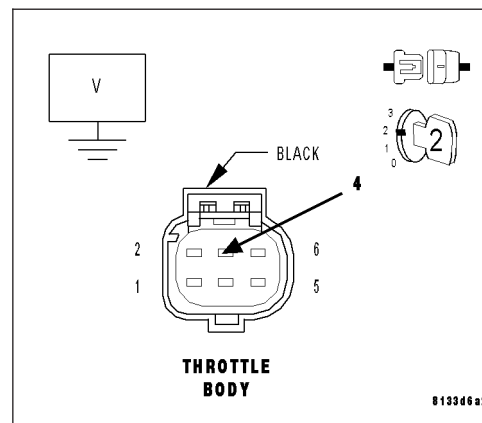
Measure the voltage on the (K122) TP Sensor No.2 Signal circuit at the Throttle Body harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (K122) TP Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P0223-THROTTLE POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)****4. (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO (F855) 5-VOLT SUPPLY CIRCUIT**

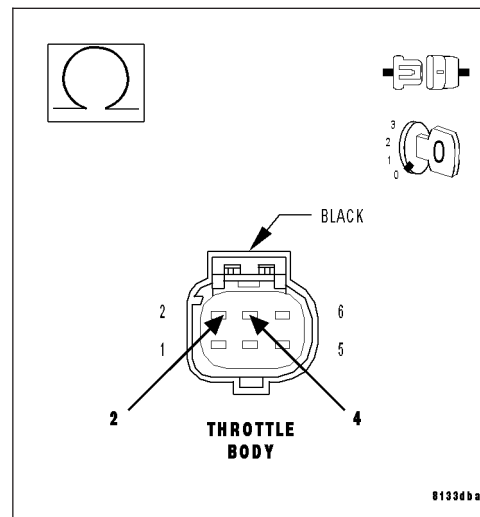
Measure the resistance between the (K122) TP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit at the Throttle Body harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K122) TP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K922) SENSOR RETURN CIRCUIT OPEN**

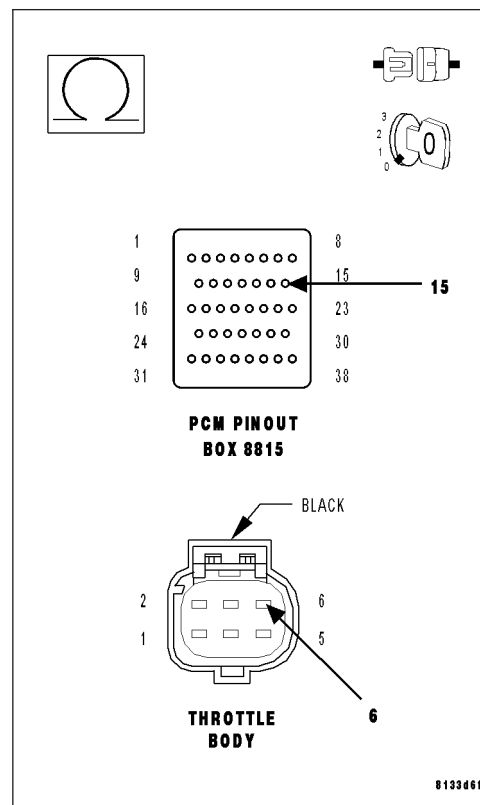
Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K922) Sensor Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0223-THROTTLE POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)****6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**7. THROTTLE FOLLOWER TEST**

With the scan tool, perform the Throttle Follower Test.

Monitor the TP Sensor No.2 voltage while slowly pressing the Throttle pedal down.

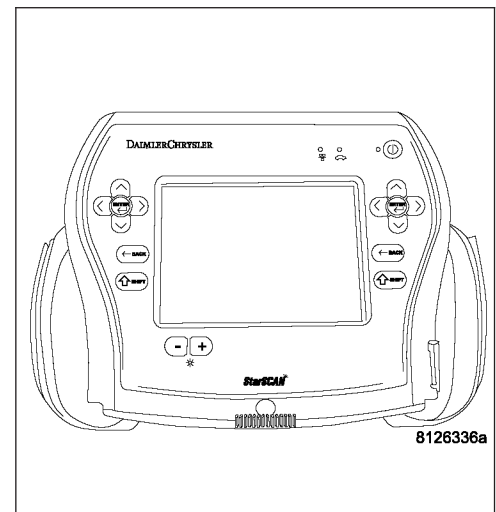
**Is there a smooth voltage change from high to low?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, with the scan tool select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





## P0300- MULTIPLE CYLINDER 1 MISFIRE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Any time the engine is running, and the adaptive numerator has been successfully updated.

- **Set Condition:**

When more than 1.5% misfire rate is measured during two trips. Three good trips to clear the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT INJECTOR CONTROL CIRCUIT COIL CONTROL CIRCUIT IGNITION WIRE SPARK PLUG IGNITION COIL FUEL PUMP INLET STRAINER PLUGGED RESTRICTED FUEL SUPPLY LINE FUEL PUMP MODULE FUEL PRESSURE LEAK DOWN FUEL INJECTOR ENGINE MECHANICAL PROBLEM PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. CYLINDER MIS-FIRE CONDITION ACTIVE

**Note:** Check for any TSB's that apply to a Misfire condition. Review the vehicle repair history for any misfire condition repairs that have been performed.

Engine running.

Observe the WHICH CYLINDER IS MISFIRING screen and identify the cylinders that have a misfire present.

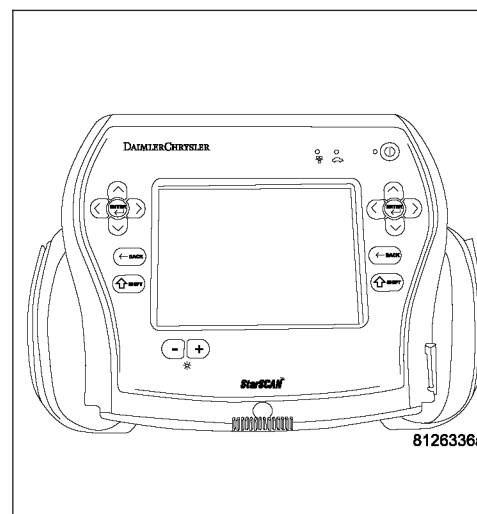
**Is there a misfire present at this time?**

**Yes** >>

**Note:** Repeat the below checks for each cylinder that is indicating a misfire present. Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0300- MULTIPLE CYLINDER 1 MISFIRE (CONTINUED)****2. VISUAL INSPECTION**

**Note:** Anything that affects the speed of the crankshaft can cause a misfire DTC.

**Note:** When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

- Visually inspect the engine for any of the following conditions.
- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. (K343) ASD RELAY OUTPUT 2 CIRCUIT**

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils and the Fuel Injector harness connectors.

Turn the ignition off.

Disconnect the Ignition Coil harness connector.

Disconnect the Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2 circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**P0300- MULTIPLE CYLINDER 1 MISFIRE (CONTINUED)****4. IGNITION SYSTEM OPERATION**

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils. Once the ignition coil has been removed from the cylinder head, the intake must be reinstalled to be able to crank the engine. Move the ignition coil harness connector through the slots in the upper intake and then connect the coil to the harness connector. Secure the upper intake to the lower intake in accordance with the service information.

Turn the ignition off.

Connect the Ignition Coil harness connector.

Remove the Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark present?**

**Yes**     >> Go To 5

**No**      >> Go To 14

**Note:** Connect the Fuel Injector harness connector before continuing.

---

**5. SPARK PLUG**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

**Were any of the above conditions present?**

**Yes**     >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No**      >> Go To 6

---

**P0300- MULTIPLE CYLINDER 1 MISFIRE (CONTINUED)****6. FUEL PRESSURE CHECK**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

**Within Specification**

Go To 7

**Below Specification**

Go To 12

**Above Specification**

Replace the fuel filter/pressure regulator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**7. FUEL PRESSURE LEAK DOWN**

**Note:** Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair/replace as necessary.

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

Install special tool #6539 (5/16") or #6631 (3/8") fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

**Note:** Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

**Note:** The pressure should not fall below 241 KPa (35 psi).

Does the gauge fall below the listed specification?

**Yes** >> Replace the leaking Fuel Injector(s).

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

---

**P0300- MULTIPLE CYLINDER 1 MISFIRE (CONTINUED)****8. FUEL INJECTOR OPERATION**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

**CAUTION:** After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the Fuel Injector.

Monitor the fuel pressure gauge.

**Does the fuel pressure gauge indicate a drop in fuel pressure?**

**Yes** >> Go To 9

**No** >> Go To 10

**Note:** Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

---

**9. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

CAM LOBES - must not be worn excessively

CYLINDER LEAKAGE TEST - must be within specifications

VALVE SPRINGS - cannot be weak or broken

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17

---

**P0300- MULTIPLE CYLINDER 1 MISFIRE (CONTINUED)****10. FUEL INJECTOR**

Turn the ignition off.

Disconnect the Fuel Injector harness connector.

Ignition on, engine not running.

**Note: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.**

With the scan tool, erase DTCs.

Using a 12-volt test light connected to 12-volts, probe the Injector Control circuit.

With the scan tool, actuate the Fuel Injector.

**Does the test light blink/flicker?**

**Yes** >> Replace the Fuel Injector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11

---

**11. INJECTOR CONTROL CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Check the Injector Control circuit for an open, short to ground, and short to voltage.

**Was a problem found with the Injector Control circuit?**

**Yes** >> Repair the excessive resistance or short in the Injector Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17

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**12. FUEL SUPPLY LINE RESTRICTED**

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.**

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16") #6631(3/8") fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).**

**Is the fuel pressure within specification?**

**Yes** >> Repair or replace fuel supply line as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 13

---

**P0300- MULTIPLE CYLINDER 1 MISFIRE (CONTINUED)****13. FUEL PUMP INLET STRAINER**

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

**Is the Fuel Inlet Strainer plugged?**

**Yes** >> Replace the Fuel Pump Inlet Strainer.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is operating properly. Repair as necessary. Replace the Fuel Pump Module.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**14. IGNITION WIRE**

**Note:** If the vehicle being tested does not have an ignition wire answer YES to this test and continue.

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

**Is the resistance below 10K ohms?**

**Yes** >> Go To 15

**No** >> Replace the Ignition Wire.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**15. IGNITION COIL**

Disconnect the Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the Coil Control circuit.

Crank the engine for 5 second while observing the test light.

**Does the test light brightly blink/flicker?**

**Yes** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 16

---

**P0300- MULTIPLE CYLINDER 1 MISFIRE (CONTINUED)****16. COIL CONTROL CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Check the Coil Control circuit for an open, short to ground, and short to voltage.

**Was a problem found with the Coil Control circuit?**

**Yes** >> Repair the Coil Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17

---

**17. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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P0301-CYLINDER 1 MISFIRE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:**  
Any time the engine is running, and the adaptive numerator has been successfully updated.
- Set Condition:**  
When more than 1.5% misfire rate is measured during two trips. Three good trips to clear the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K11) INJECTOR CONTROL NO.1 CIRCUIT (K19) COIL CONTROL NO.1 CIRCUIT IGNITION WIRE SPARK PLUG IGNITION COIL FUEL PUMP INLET STRAINER PLUGGED RESTRICTED FUEL SUPPLY LINE FUEL PUMP MODULE FUEL PRESSURE LEAK DOWN FUEL INJECTOR ENGINE MECHANICAL PROBLEM PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. CYLINDER MIS-FIRE CONDITION ACTIVE

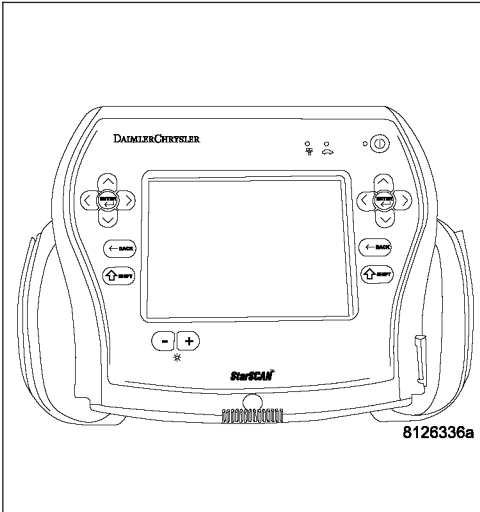
Engine running.

Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute on the scan tool.

- Is there a misfire presen at this time?
- Yes

>> Go To 2
- No

>> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
 Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0301-CYLINDER 1 MISFIRE (CONTINUED)****2. VISUAL INSPECTION**

**Note:** Anything that affects the speed of the crankshaft can cause a misfire DTC.

**Note:** When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

- Visually inspect the engine for any of the following conditions.
- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

## P0301-CYLINDER 1 MISFIRE (CONTINUED)

### 3. (K343) ASD RELAY OUTPUT 2 CIRCUIT

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils and the Fuel Injector harness connectors.

Turn the ignition off.

Disconnect the Ignition Coil No.1 harness connector.

Disconnect the Fuel Injector No.1 harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

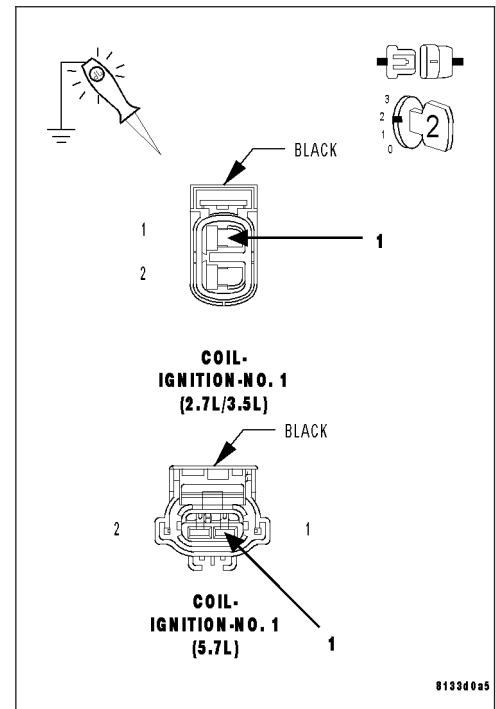
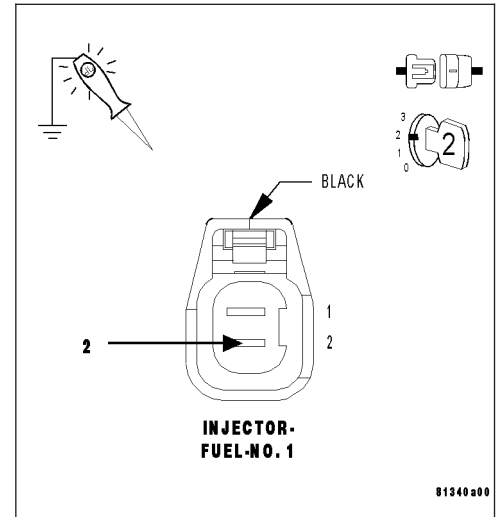
Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.

#### Does the test light illuminate brightly?

**Yes** >> Go To 4

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0301-CYLINDER 1 MISFIRE (CONTINUED)****4. IGNITION SYSTEM OPERATION**

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils. Once the ignition coil has been removed from the cylinder head, the intake must be reinstalled to be able to crank the engine. Move the ignition coil harness connector through the slots in the upper intake and then connect the coil to the harness connector. Secure the upper intake to the lower intake in accordance with the service information.

Turn the ignition off.

Connect the Ignition Coil No.1 harness connector.

Remove the Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark present?**

**Yes** >> Go To 5

**No** >> Go To 14

**Note:** Connect the Fuel Injector harness connector before continuing.

---

**5. SPARK PLUG**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

**Were any of the above conditions present?**

**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

---

**P0301-CYLINDER 1 MISFIRE (CONTINUED)****6. FUEL PRESSURE CHECK**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

**Within Specification**

Go To 7

**Below Specification**

Go To 12

**Above Specification**

Replace the fuel filter/pressure regulator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**7. FUEL PRESSURE LEAK DOWN**

**Note:** Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair /replace as necessary.

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

Install special tool #6539 (5/16") or #6631 (3/8") fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

**Note:** Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

**Note:** The pressure should not fall below 241 KPa (35 psi).

Does the gauge fall below the listed specification?

**Yes** >> Replace the leaking Fuel Injector(s).

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

---

**P0301-CYLINDER 1 MISFIRE (CONTINUED)****8. FUEL INJECTOR OPERATION**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

**CAUTION:** After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the No.1 Fuel Injector.

Monitor the fuel pressure gauge.

**Does the fuel pressure gauge indicate a drop in fuel pressure?**

**Yes** >> Go To 9

**No** >> Go To 10

**Note:** Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

---

**9. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

CAM LOBES - must not be worn excessively

CYLINDER LEAKAGE TEST - must be within specifications

VALVE SPRINGS - cannot be weak or broken

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17

---

## P0301-CYLINDER 1 MISFIRE (CONTINUED)

### 10. FUEL INJECTOR

Turn the ignition off.

Disconnect the No.1 Fuel Injector harness connector.

Ignition on, engine not running.

**Note:** When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

With the scan tool, erase DTCs.

Using a 12-volt test light connected to 12-volts, probe the (K11) Injector Control No.1 circuit.

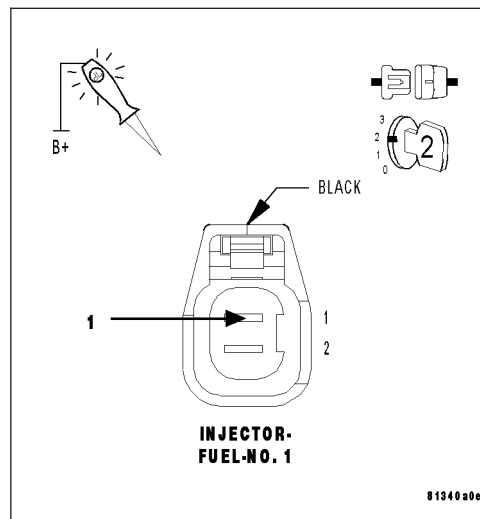
With the scan tool, actuate the Fuel Injector.

#### Does the test light blink/flicker?

**Yes** >> Replace the Fuel Injector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11



### 11. (K11) INJECTOR CONTROL NO.1 CIRCUIT

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

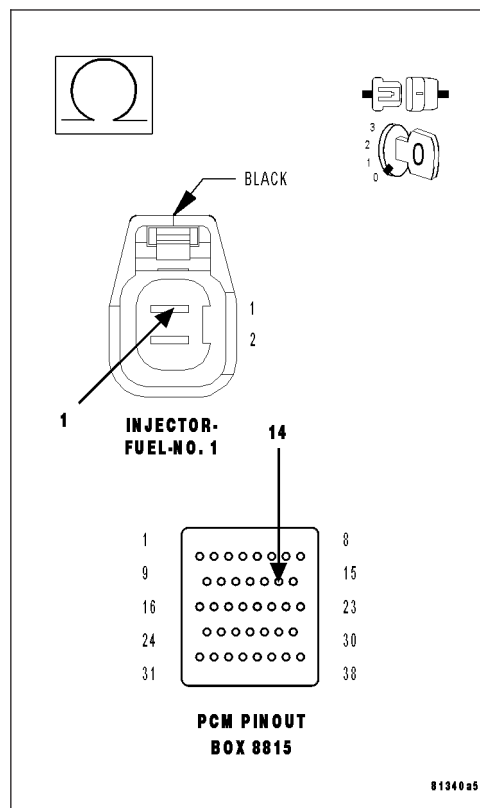
Check the (K11) Injector Control No.1 circuit for an open, short to ground, and short to voltage.

#### Was a problem found with the (K11) Injector Control No.1 circuit?

**Yes** >> Repair the excessive resistance or short in the (K11) Injector Control No.1 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17





**P0301-CYLINDER 1 MISFIRE (CONTINUED)****12. FUEL SUPPLY LINE RESTRICTED**

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.**

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16") #6631(3/8") fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).**

**Is the fuel pressure within specification?**

**Yes** >> Repair or replace fuel supply line as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 13

---

**13. FUEL PUMP INLET STRAINER**

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.**

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

**Is the Fuel Inlet Strainer plugged?**

**Yes** >> Replace the Fuel Pump Inlet Strainer.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is operating properly. Repair as necessary. Replace the Fuel Pump Module.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**14. IGNITION WIRE**

**Note: If the vehicle being tested does not have an ignition wire answer YES to this test and continue.**

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

**Is the resistance below 10K ohms?**

**Yes** >> Go To 15

**No** >> Replace the Ignition Wire.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0301-CYLINDER 1 MISFIRE (CONTINUED)

### 15. IGNITION COIL

Disconnect the Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K19) Coil Control No.1 circuit.

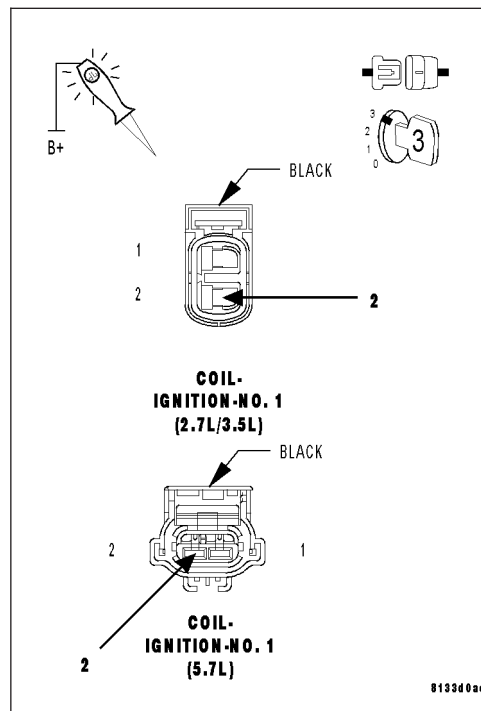
Crank the engine for 5 second while observing the test light.

**Does the test light brightly blink/flicker?**

**Yes** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 16



### 16. (K19) COIL CONTROL NO.1 CIRCUIT

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

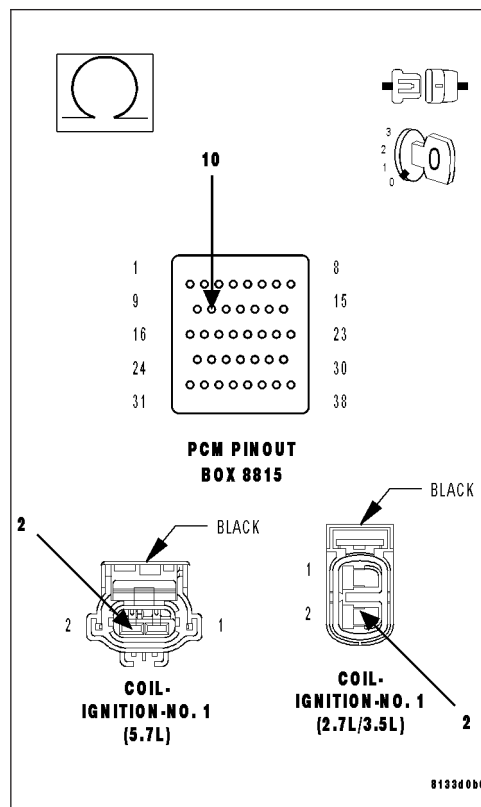
Check the (K19) Coil Control No.1 circuit for an open, short to ground, and short to voltage.

**Was a problem found with the (K19) Coil Control No.1 circuit?**

**Yes** >> Repair the (K19) Coil Control No.1 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17



**P0301-CYLINDER 1 MISFIRE (CONTINUED)****17. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

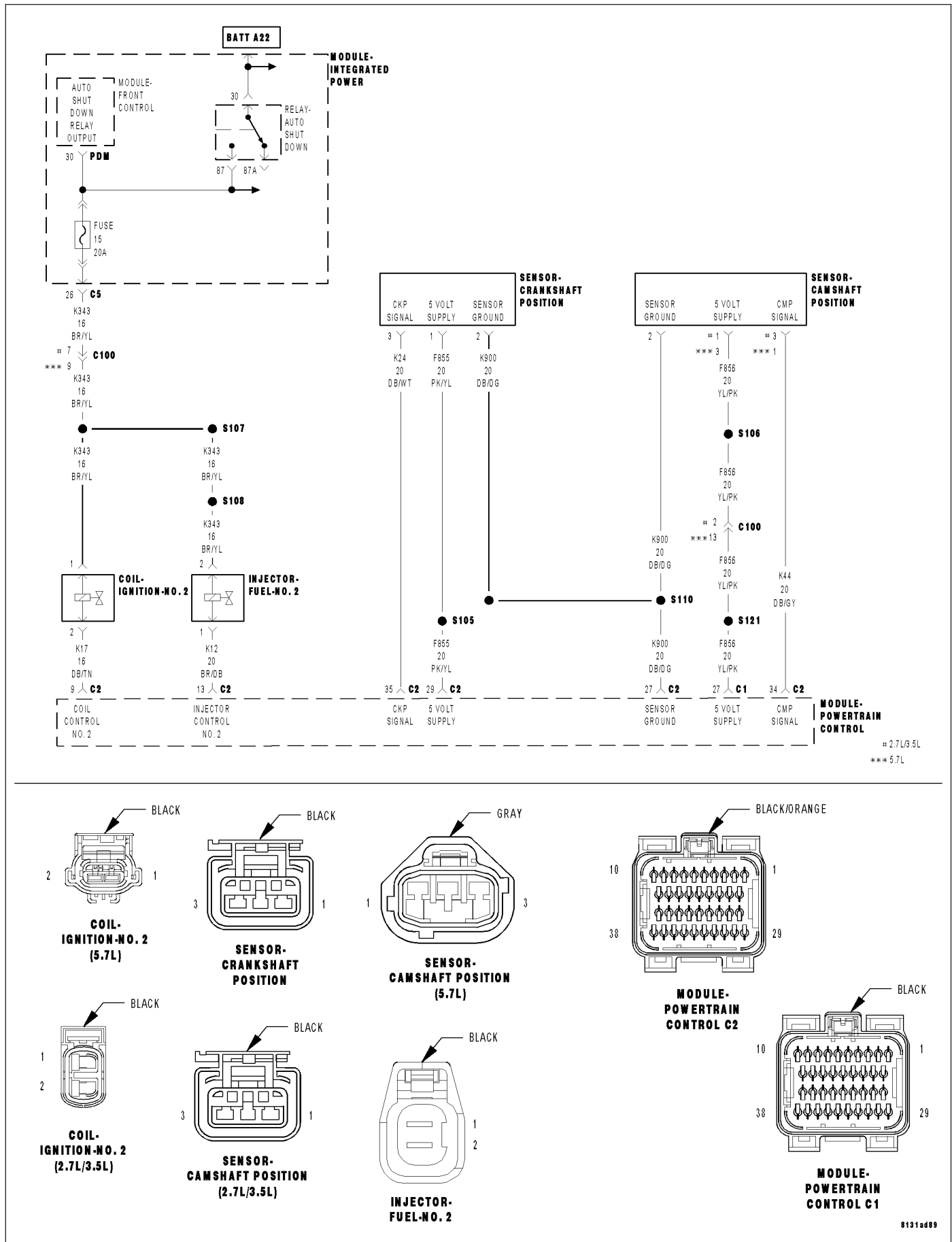
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

# P0302-CYLINDER 2 MISFIRE



**P0302-CYLINDER 2 MISFIRE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Any time the engine is running, and the adaptive numerator has been successfully updated.

- **Set Condition:**

When more than 1.0% misfire rate is measured during two trips, or with 10 % to 30 % misfire rate during one trip. Three good trips to clear the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K12) INJECTOR CONTROL NO.2 CIRCUIT (K17) COIL CONTROL NO.2 CIRCUIT IGNITION WIRE SPARK PLUG IGNITION COIL FUEL PUMP INLET STRAINER PLUGGED RESTRICTED FUEL SUPPLY LINE FUEL PUMP MODULE FUEL PRESSURE LEAK DOWN FUEL INJECTOR ENGINE MECHANICAL PROBLEM PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. CYLINDER MIS-FIRE CONDITION ACTIVE

Engine running.

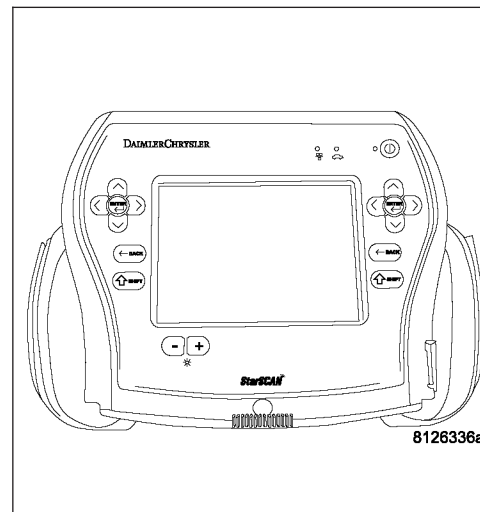
Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute with the scan tool.

**Is there a misfire present?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0302-CYLINDER 2 MISFIRE (CONTINUED)****2. VISUAL INSPECTION**

**Note:** Anything that affects the speed of the crankshaft can cause a misfire DTC.

**Note:** When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

Visually inspect the engine for any of the following conditions.

- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**P0302-CYLINDER 2 MISFIRE (CONTINUED)****3. (K343) ASD RELAY OUTPUT 2 CIRCUIT**

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils and the Fuel Injector harness connectors.

Turn the ignition off.

Disconnect the Ignition Coil No.2 harness connector.

Disconnect the Fuel Injector No.2 harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

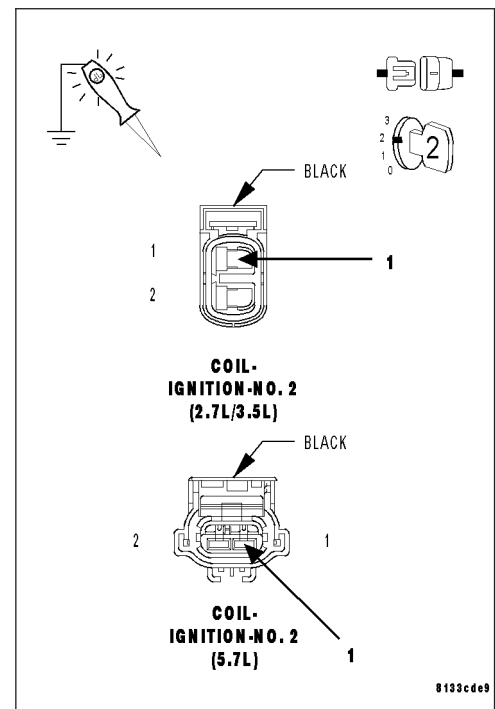
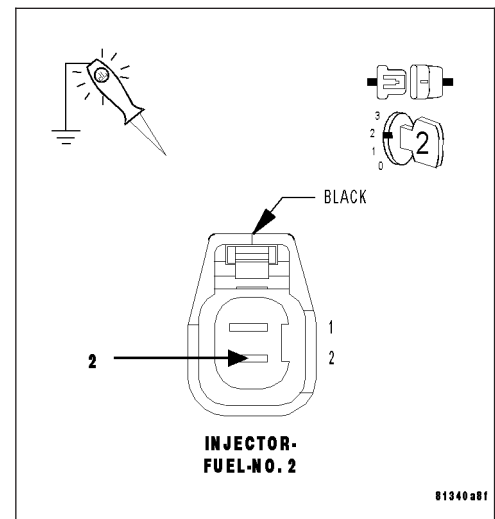
Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2 circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0302-CYLINDER 2 MISFIRE (CONTINUED)****4. IGNITION SYSTEM OPERATION**

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils. Once the ignition coil has been removed from the cylinder head, the intake must be reinstalled to be able to crank the engine. Move the ignition coil harness connector through the slots in the upper intake and then connect the coil to the harness connector. Secure the upper intake to the lower intake in accordance with the service information.

Turn the ignition off.

Connect the Ignition Coil No.2 harness connector.

Remove the Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark present?**

**Yes** >> Go To 5

**No** >> Go To 14

**Note:** Connect the Fuel Injector harness connector before continuing.

---

**5. SPARK PLUG**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

**Were any of the above conditions present?**

**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

---



**P0302-CYLINDER 2 MISFIRE (CONTINUED)****6. FUEL PRESSURE CHECK**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

**Within Specification**

Go To 7

**Below Specification**

Go To 12

**Above Specification**

Replace the fuel filter/pressure regulator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**7. FUEL PRESSURE LEAK DOWN**

**Note:** Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair /replace as necessary.

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install special tool #6539 (5/16") or #6631 (3/8") fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

**Note:** Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

**Note:** The pressure should not fall below 241 KPa (35 psi)

Does the gauge fall below the listed specification?

**Yes** >> Replace the leaking Fuel Injector(s).

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

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**P0302-CYLINDER 2 MISFIRE (CONTINUED)****8. FUEL INJECTOR OPERATION**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

**CAUTION:** After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using scan tool, actuate the No.2 Fuel Injector.

Monitor the fuel pressure gauge.

**Does the fuel pressure gauge indicate a drop in fuel pressure?**

**Yes** >> Go To 9

**No** >> Go To 10

**Note:** Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

---

**9. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

CAM LOBES - must not be worn excessively

CYLINDER LEAKAGE TEST - must be within specifications

VALVE SPRINGS - cannot be weak or broken

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17

---

**P0302-CYLINDER 2 MISFIRE (CONTINUED)****10. FUEL INJECTOR**

Turn the ignition off.

Disconnect the No.2 Fuel Injector harness connector.

Ignition on, engine not running.

**Note:** When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinder's Injector Control circuit.

With the scan tool, erase DTCs.

Using a 12-volt test light connected to 12-volts, probe the (K12) Injector Control No.2 circuit.

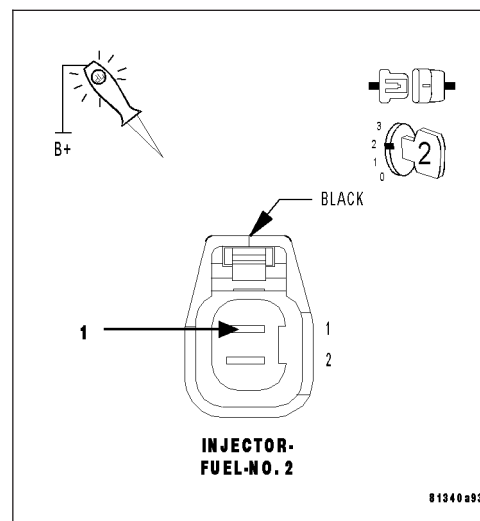
With the scan tool, actuate the Fuel Injector.

**Does the test light blink/flicker?**

**Yes** >> Replace the Fuel Injector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11

**11. (K12) INJECTOR CONTROL NO.2 CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

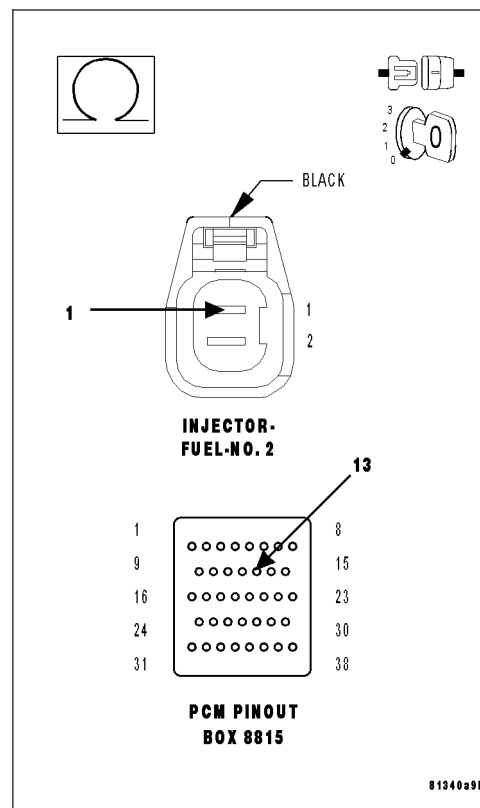
Check the (K12) Injector Control No.2 circuit for an open, short to ground, and short to voltage.

**Was a problem found with the (K12) Injector Control No.2 circuit?**

**Yes** >> Repair the excessive resistance or short in the (K12) Injector Control No.2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17



## P0302-CYLINDER 2 MISFIRE (CONTINUED)

### 12. FUEL SUPPLY LINE RESTRICTED

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.**

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16") #6631(3/8") fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).**

**Is the fuel pressure within specification?**

- Yes** >> Repair or replace fuel supply line as necessary.  
 Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 13

### 13. FUEL PUMP INLET STRAINER

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.**

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

**Is the Fuel Inlet Strainer plugged?**

- Yes** >> Replace the Fuel Pump Inlet Strainer.  
 Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Ensure the ground circuit is operating properly. Repair as necessary. Replace the Fuel Pump Module.  
 Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

### 14. IGNITION WIRE

**Note: If the vehicle being tested does not have an ignition wire answer YES to this test and continue.**

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

**Is the resistance below 10K ohms?**

- Yes** >> Go To 15
- No** >> Replace the Ignition Wire.  
 Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**P0302-CYLINDER 2 MISFIRE (CONTINUED)****15. IGNITION COIL**

Disconnect the Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K17) Coil Control No.2 circuit.

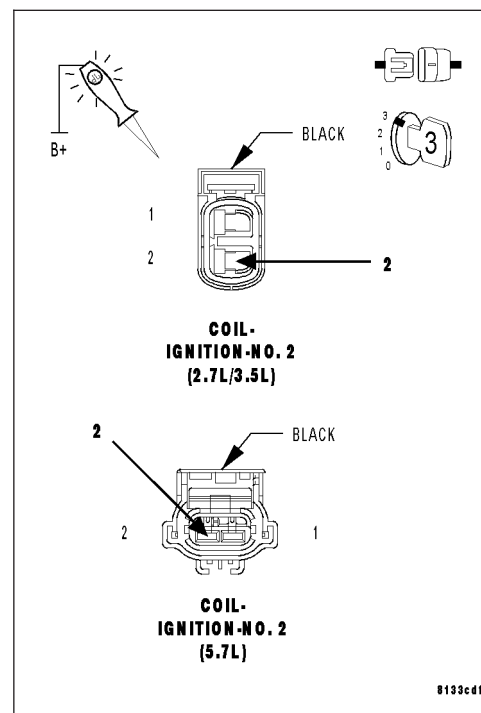
Crank the engine for 5 second while observing the test light.

**Does the test light brightly blink/flicker?**

**Yes** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 16

**16. (K17) COIL CONTROL NO.2 CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

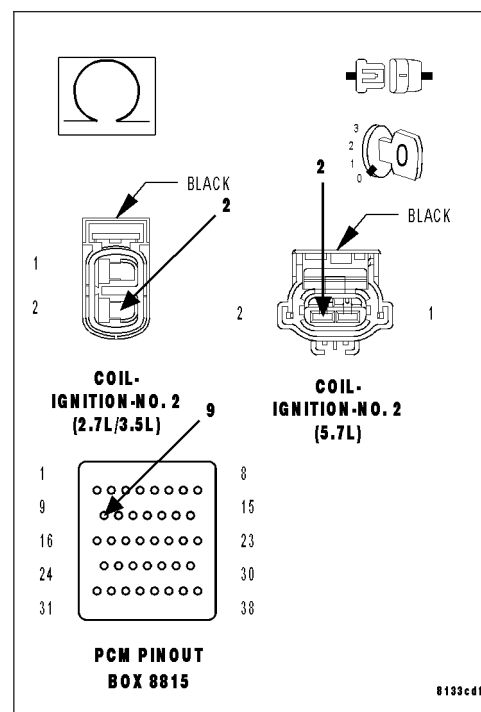
Check the (K17) Coil Control No.2 circuit for an open, short to ground, and short to voltage.

**Was a problem found with the (K17) Coil Control No.2 circuit?**

**Yes** >> Repair the (K17) Coil Control No.2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17



**P0302-CYLINDER 2 MISFIRE (CONTINUED)****17. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

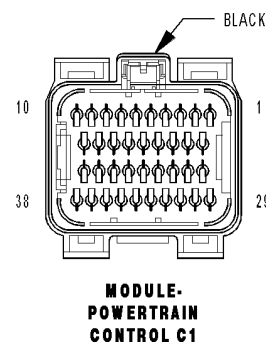
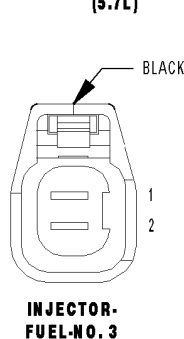
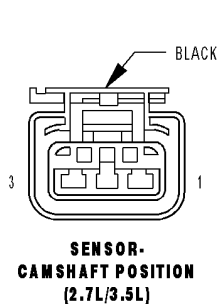
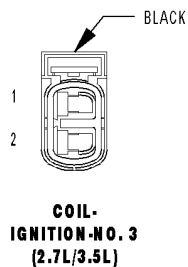
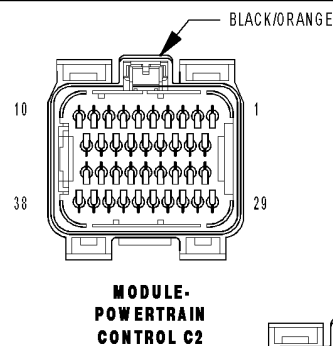
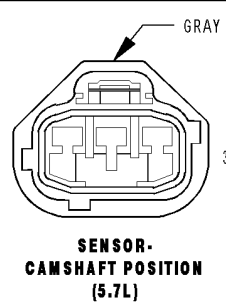
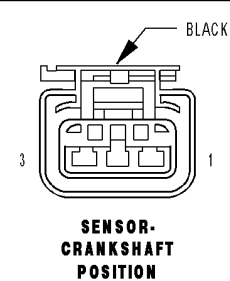
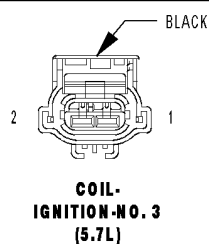
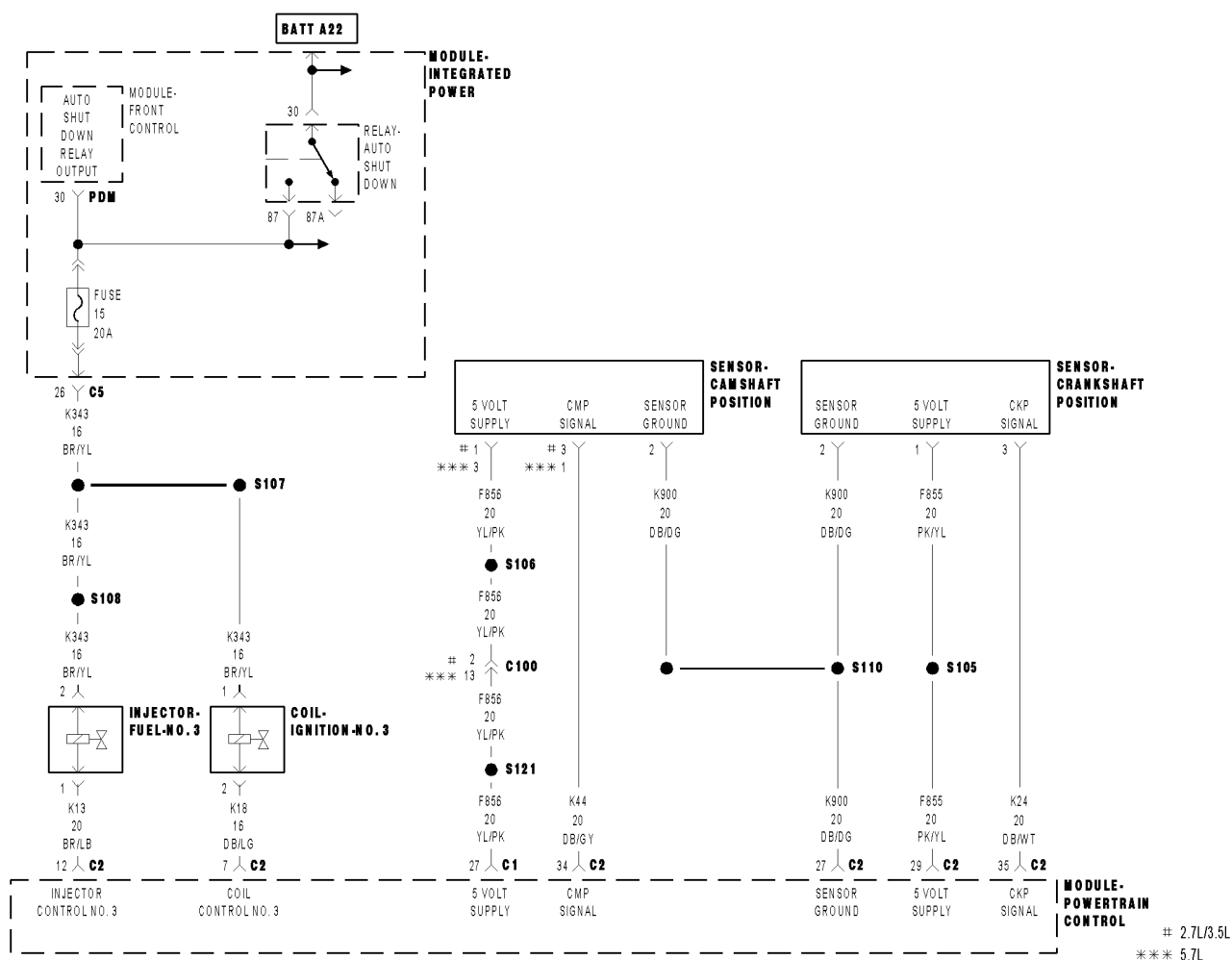
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0303-CYLINDER 3 MISFIRE



**P0303-CYLINDER 3 MISFIRE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Any time the engine is running, and the adaptive numerator has been successfully updated.

- **Set Condition:**

When more than 1.0 % misfire rate is measured during two trips, or with 10% to 30% misfire rate during on trip. Three good trips to clear the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K13) INJECTOR CONTROL NO.3 CIRCUIT (K18) COIL CONTROL NO.3 CIRCUIT IGNITION WIRE SPARK PLUG IGNITION COIL FUEL PUMP INLET STRAINER PLUGGED RESTRICTED FUEL SUPPLY LINE FUEL PUMP MODULE FUEL PRESSURE LEAK DOWN FUEL INJECTOR ENGINE MECHANICAL PROBLEM PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. CYLINDER MIS-FIRE CONDITION ACTIVE

Engine running.

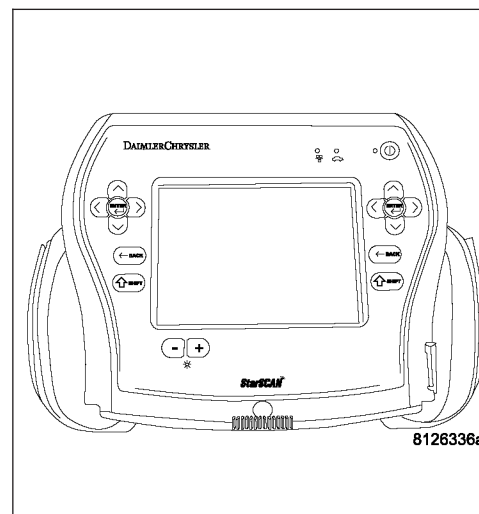
Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute with the scan tool.

**Is there a misfire present at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





**P0303-CYLINDER 3 MISFIRE (CONTINUED)****2. VISUAL INSPECTION**

**Note:** Anything that affects the speed of the crankshaft can cause a misfire DTC.

**Note:** When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

Visually inspect the engine for any of the following conditions.

- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

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## P0303-CYLINDER 3 MISFIRE (CONTINUED)

### 3. (K343) ASD RELAY OUTPUT CIRCUIT

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils and the Fuel Injector harness connectors.

Turn the ignition off.

Disconnect the No.3 Ignition Coil harness connector.

Disconnect the No.3 Fuel Injector harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

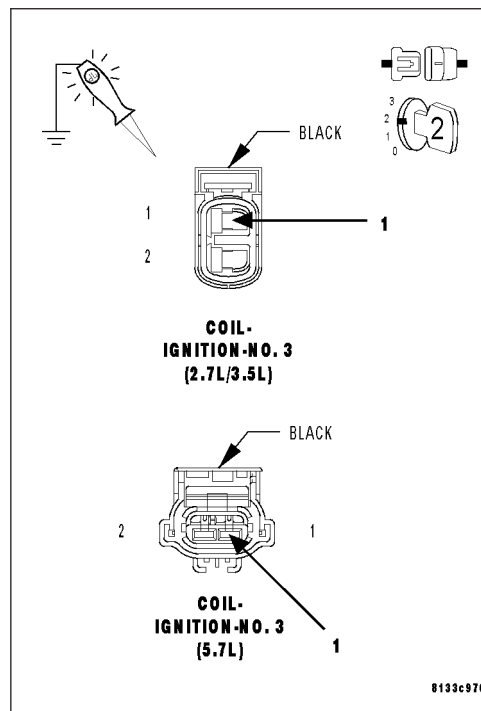
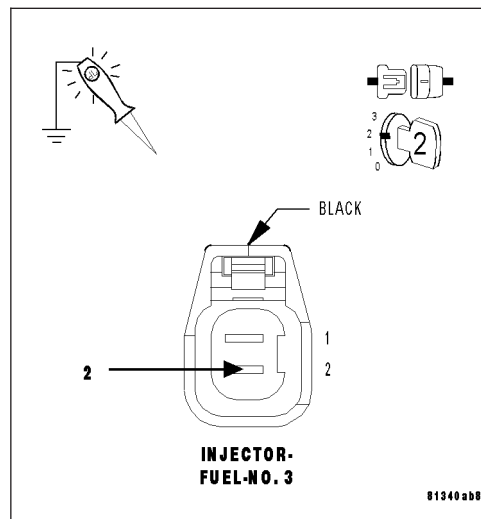
Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.

#### Does the test light illuminate brightly?

**Yes** >> Go To 4

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0303-CYLINDER 3 MISFIRE (CONTINUED)****4. IGNITION SYSTEM OPERATION**

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils. Once the ignition coil has been removed from the cylinder head, the intake must be reinstalled to be able to crank the engine. Move the ignition coil harness connector through the slots in the upper intake and then connect the coil to the harness connector. Secure the upper intake to the lower intake in accordance with the service information.

Turn the ignition off.

Connect the Ignition Coil No.3 harness connector.

Remove the Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark present?**

**Yes** >> Go To 5

**No** >> Go To 14

**Note:** Connect the Fuel Injector harness connector before continuing.

---

**5. SPARK PLUG**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

**Were any of the above conditions present?**

**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

---

**P0303-CYLINDER 3 MISFIRE (CONTINUED)****6. FUEL PRESSURE CHECK**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

**Within Specification**

Go To 7

**Below Specification**

Go To 12

**Above Specification**

Replace the fuel filter/pressure regulator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**7. FUEL PRESSURE LEAK DOWN**

**Note:** Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair /replace as necessary.

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

Install special tool #6539 (5/16") or #6631 (3/8") fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

**Note:** Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

**Note:** The pressure should not fall below 241 KPa (35 psi).

Does the gauge fall below the listed specification?

**Yes** >> Replace the leaking Fuel Injector(s).

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

---

**P0303-CYLINDER 3 MISFIRE (CONTINUED)****8. FUEL INJECTOR OPERATION**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

**CAUTION:** After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using a scan tool, actuate the No.3 Fuel Injector.

Monitor the fuel pressure gauge.

**Does the fuel pressure gauge indicate a drop in fuel pressure?**

**Yes** >> Go To 9

**No** >> Go To 10

**Note:** Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

---

**9. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

CAM LOBES - must not be worn excessively

CYLINDER LEAKAGE TEST - must be within specifications

VALVE SPRINGS - cannot be weak or broken

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17

---

**P0303-CYLINDER 3 MISFIRE (CONTINUED)****10. FUEL INJECTOR**

Turn the ignition off.

Disconnect the No.3 Fuel Injector harness connector.

Ignition on, engine not running.

**Note: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.**

With the scan tool, erase DTCs.

Using a 12-volt test light connected to 12-volts, probe the (K13) Injector Control No.3 circuit.

With the scan tool, actuate the Fuel Injector.

**Does the test light blink/flicker?**

**Yes** >> Replace the Fuel Injector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11

**11. (K13) INJECTOR CONTROL NO.3 CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

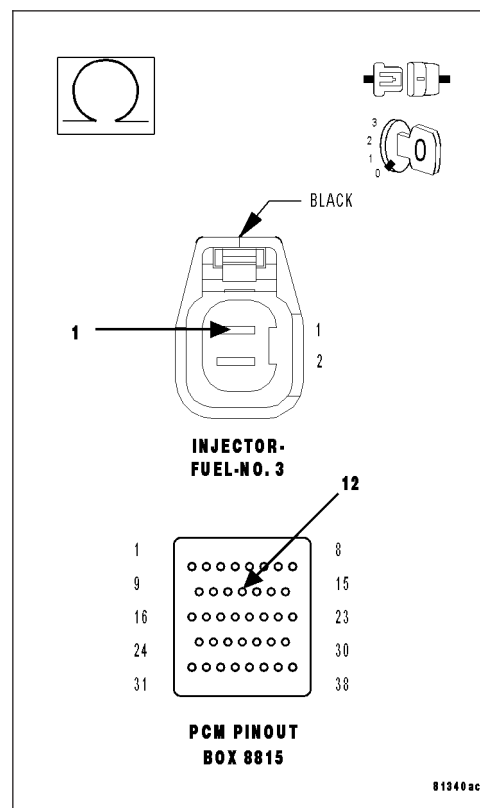
Check the (K13) Injector Control No.3 circuit for an open, short to ground, and short to voltage.

**Was a problem found with the (K13) Injector Control No.3 circuit?**

**Yes** >> Repair the excessive resistance or short in the (K13) Injector Control No.3 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17



**P0303-CYLINDER 3 MISFIRE (CONTINUED)****12. FUEL SUPPLY LINE RESTRICTED**

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.**

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16") #6631(3/8") fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With a scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).**

**Is the fuel pressure within specification?**

**Yes** >> Repair or replace fuel supply line as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 13

---

**13. FUEL PUMP INLET STRAINER**

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.**

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

**Is the Fuel Inlet Strainer plugged?**

**Yes** >> Replace the Fuel Pump Inlet Strainer.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is operating properly. Repair as necessary. Replace the Fuel Pump Module.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**14. IGNITION WIRE**

**Note: If the vehicle being tested does not have an ignition wire answer YES to this test and continue.**

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

**Is the resistance below 10K ohms?**

**Yes** >> Go To 15

**No** >> Replace the Ignition Wire.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0303-CYLINDER 3 MISFIRE (CONTINUED)

### 15. IGNITION COIL

Disconnect the No.3 Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K18) Coil Control No.3 circuit.

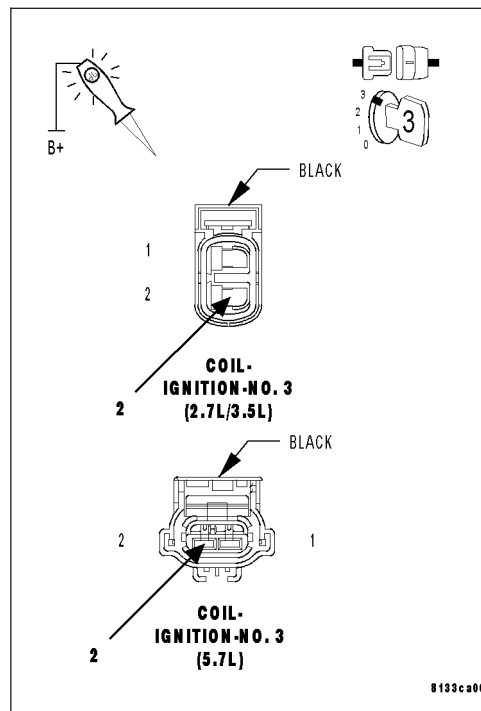
Crank the engine for 5 second while observing the test light.

**Does the test light brightly blink/flicker?**

**Yes** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 16



### 16. (K18) COIL CONTROL NO.3 CIRCUIT

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

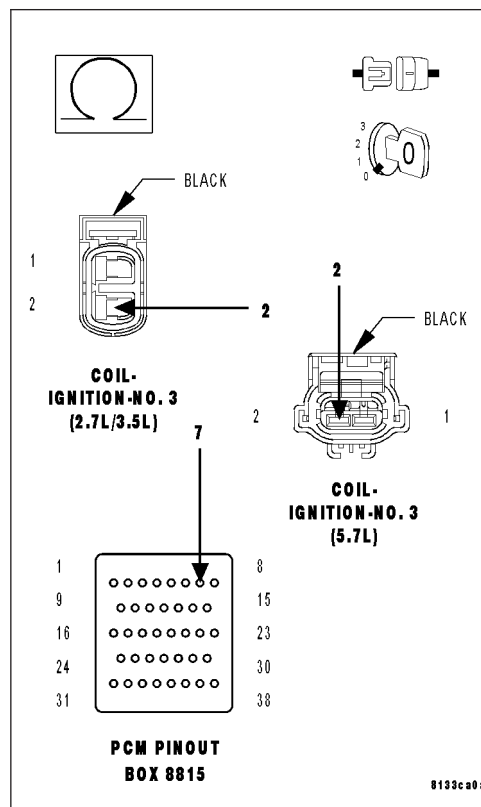
Check the (K18) Coil Control No.3 circuit for an open, short to ground, and short to voltage.

**Was a problem found with the (K18) Coil Control No.3 circuit?**

**Yes** >> Repair the (K18) Coil Control No.3 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17





**P0303-CYLINDER 3 MISFIRE (CONTINUED)****17. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

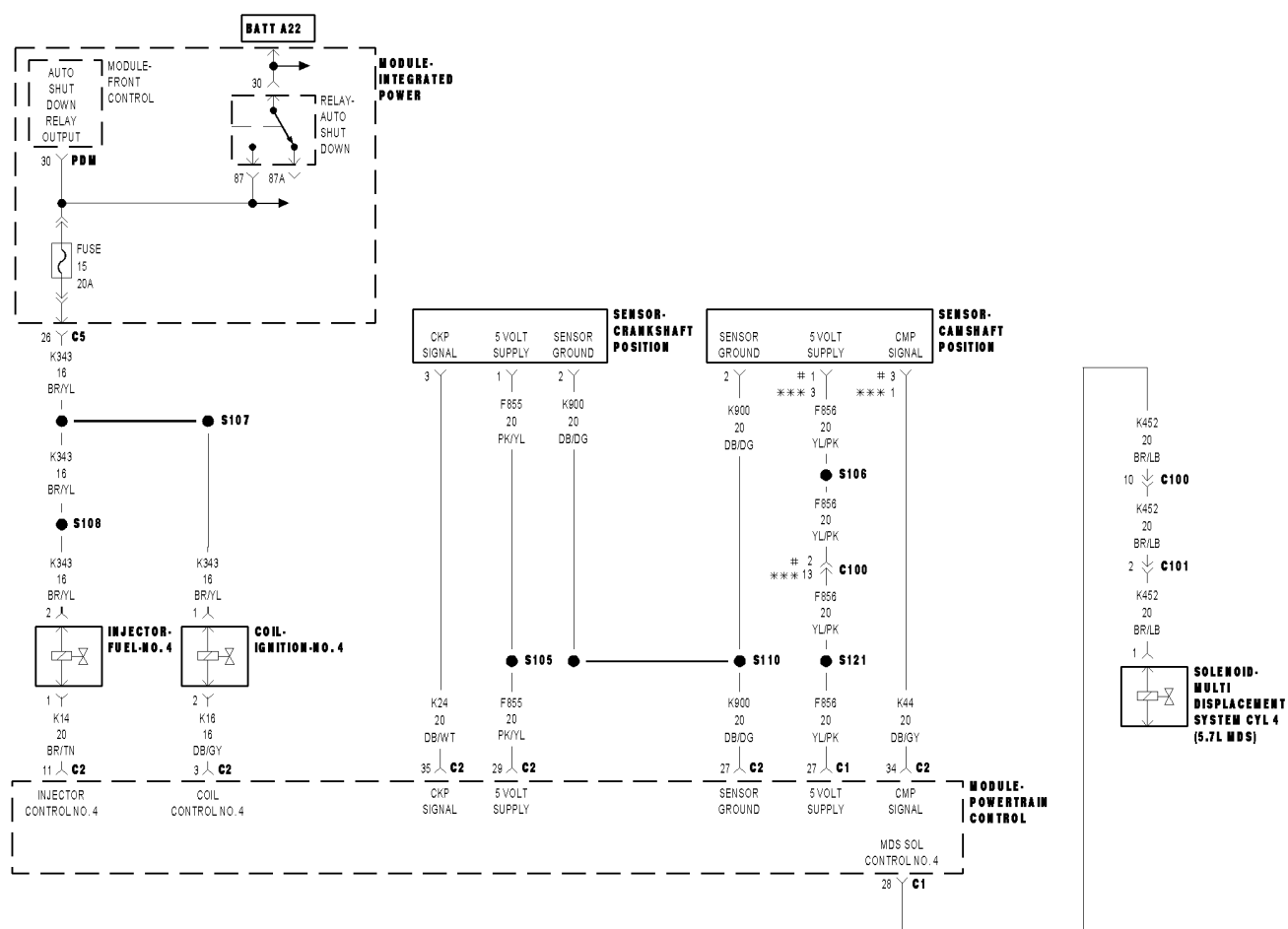
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Replace and program the Powertrain Control Module per Service Information.

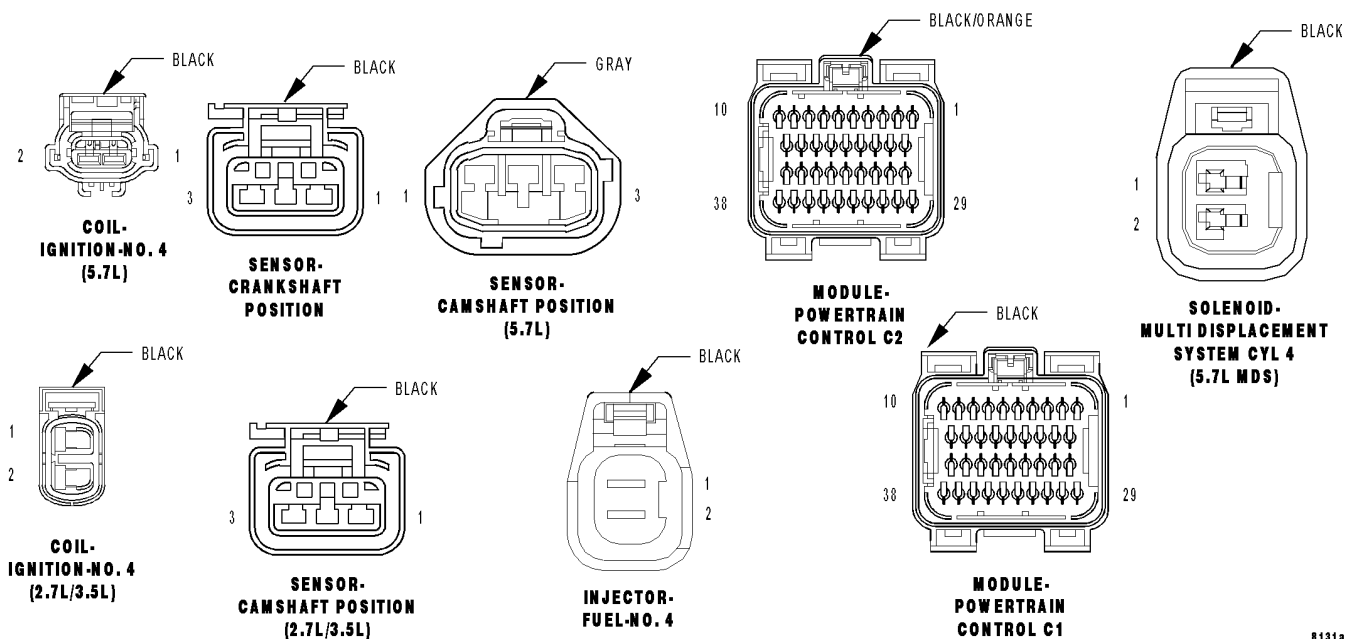
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0304-CYLINDER 4 MISFIRE



※ 2.7L/3.5L  
\*\*\* 5.7L



**P0304-CYLINDER 4 MISFIRE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Any time the engine is running, and the adaptive numerator has been successfully updated.

- **Set Condition:**

When more than 1.0% misfire rate is measured during two trips, or with 10% to 30% misfire rate during on trip.  
Three good trips to clear the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K14) INJECTOR CONTROL NO.4 CIRCUIT (K15) COIL CONTROL NO.4 CIRCUIT IGNITION WIRE SPARK PLUG IGNITION COIL FUEL PUMP INLET STRAINER PLUGGED RESTRICTED FUEL SUPPLY LINE FUEL PUMP MODULE FUEL PRESSURE LEAK DOWN FUEL INJECTOR ENGINE MECHANICAL PROBLEM PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. CYLINDER MIS-FIRE CONDITION ACTIVE

Engine running.

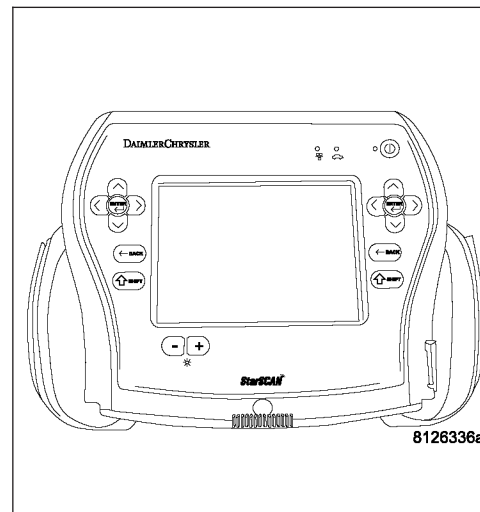
Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute with the scan tool.

**Is there a misfire present at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0304-CYLINDER 4 MISFIRE (CONTINUED)****2. VISUAL INSPECTION**

**Note:** Anything that affects the speed of the crankshaft can cause a misfire DTC.

**Note:** When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

Visually inspect the engine for any of the following conditions.

- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**P0304-CYLINDER 4 MISFIRE (CONTINUED)****3. (K343) ASD RELAY OUTPUT 2 CIRCUIT**

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils and the Fuel Injector harness connectors.

Turn the ignition off.

Disconnect the No.4 Ignition Coil harness connector.

Disconnect the No.4 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

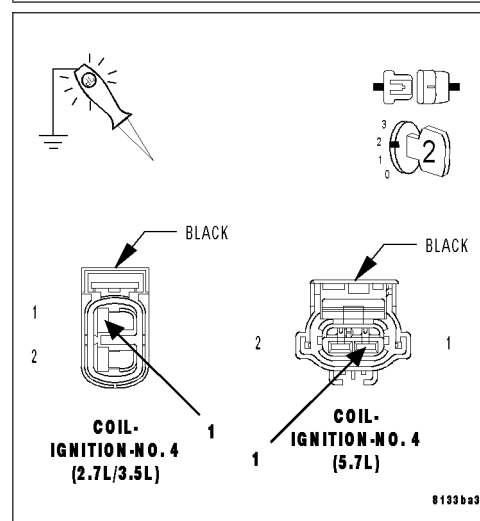
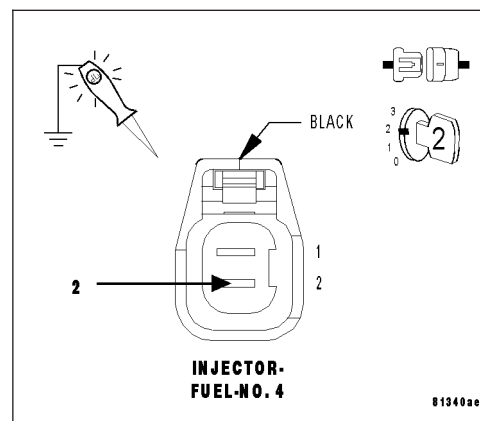
Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**4. IGNITION SYSTEM OPERATION**

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils. Once the ignition coil has been removed from the cylinder head, the intake must be reinstalled to be able to crank the engine. Move the ignition coil harness connector through the slots in the upper intake and then connect the coil to the harness connector. Secure the upper intake to the lower intake in accordance with the service information.

Turn the ignition off.

Connect the No.4 Ignition Coil harness connector.

Remove the No.4 Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark present?**

**Yes** >> Go To 5

**No** >> Go To 14

**Note:** Connect the Fuel Injector harness connector before continuing.

**P0304-CYLINDER 4 MISFIRE (CONTINUED)****5. SPARK PLUG**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

**Were any of the above conditions present?**

**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

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**6. FUEL PRESSURE CHECK**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

**Choose a conclusion that best matches your fuel pressure reading.**

**Within Specification**

Go To 7

**Below Specification**

Go To 12

**Above Specification**

Replace the fuel filter/pressure regulator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**P0304-CYLINDER 4 MISFIRE (CONTINUED)****7. FUEL PRESSURE LEAK DOWN**

**Note:** Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair /replace as necessary.

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

Install special tool #6539 (5/16") or #6631 (3/8") fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

**Note:** Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

**Note:** The pressure should not fall below 241 KPa (35 psi)

**Does the gauge fall below the listed specification?**

**Yes** >> Replace the leaking Fuel Injector(s).

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

---

**8. FUEL INJECTOR OPERATION**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

**CAUTION:** After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the No.4 Fuel Injector.

Monitor the fuel pressure gauge.

**Does the fuel pressure gauge indicate a drop in fuel pressure?**

**Yes** >> Go To 9

**No** >> Go To 10

**Note:** Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

---

**P0304-CYLINDER 4 MISFIRE (CONTINUED)****9. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

CAM LOBES - must not be worn excessively

CYLINDER LEAKAGE TEST - must be within specifications

VALVE SPRINGS - cannot be weak or broken

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17

**10. FUEL INJECTOR**

Turn the ignition off.

Disconnect the No.4 Fuel Injector harness connector.

Ignition on, engine not running.

**Note: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.**

With the scan tool, erase DTCs.

Using a 12-volt test light connected to 12-volts, probe the (K14) Injector Control No.4 circuit.

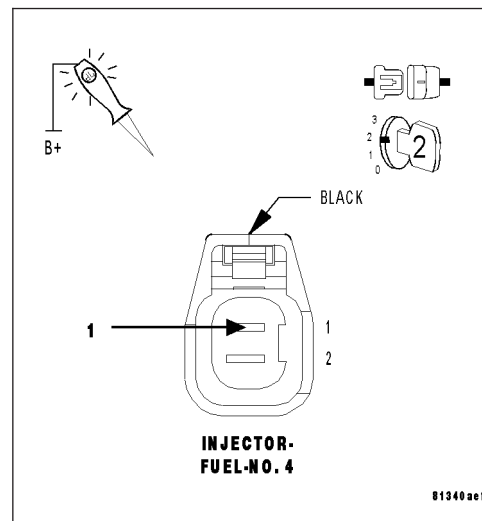
With the scan tool, actuate the Fuel Injector.

**Does the test light blink/flicker?**

**Yes** >> Replace the Fuel Injector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11





**P0304-CYLINDER 4 MISFIRE (CONTINUED)****11. (K14) INJECTOR CONTROL NO.4 CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

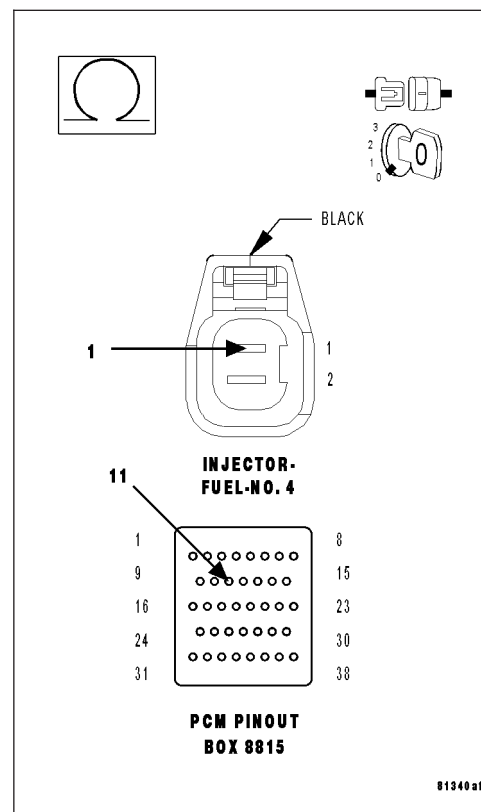
Check the (K14) Injector Control No.4 circuit for an open, short to ground, and short to voltage.

**Was a problem found with the (K14) Injector Control No.4 circuit?**

**Yes** >> Repair the excessive resistance or short in the (K14) Injector Control No.4 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17

**12. FUEL SUPPLY LINE RESTRICTED**

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16") #6631(3/8") fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

**Is the fuel pressure within specification?**

**Yes** >> Repair or replace fuel supply line as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 13

**P0304-CYLINDER 4 MISFIRE (CONTINUED)****13. FUEL PUMP INLET STRAINER**

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

**Is the Fuel Inlet Strainer plugged?**

- Yes** >> Replace the Fuel Pump Inlet Strainer.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is operating properly. Repair as necessary. Replace the Fuel Pump Module.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**14. IGNITION WIRE**

**Note:** If the vehicle being tested does not have an ignition wire answer YES to this test and continue.

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

**Is the resistance below 10K ohms?**

- Yes** >> Go To 15
- No** >> Replace the Ignition Wire.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**15. IGNITION COIL**

Disconnect the No.4 Ignition Coil harness connector.

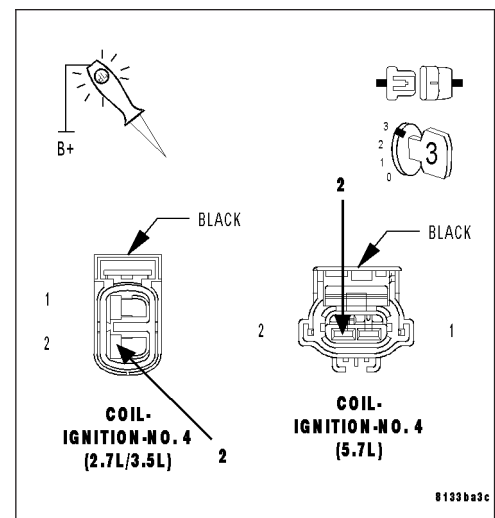
Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K15) Coil Control No.4 circuit.

Crank the engine for 5 second while observing the test light.

**Does the test light brightly blink/flicker?**

- Yes** >> Replace the Ignition Coil.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 16



## P0304-CYLINDER 4 MISFIRE (CONTINUED)

## 16. (K15) COIL CONTROL NO.4 CIRCUIT

Turn the ignition off.

Disconnect the PCM harness connectors.

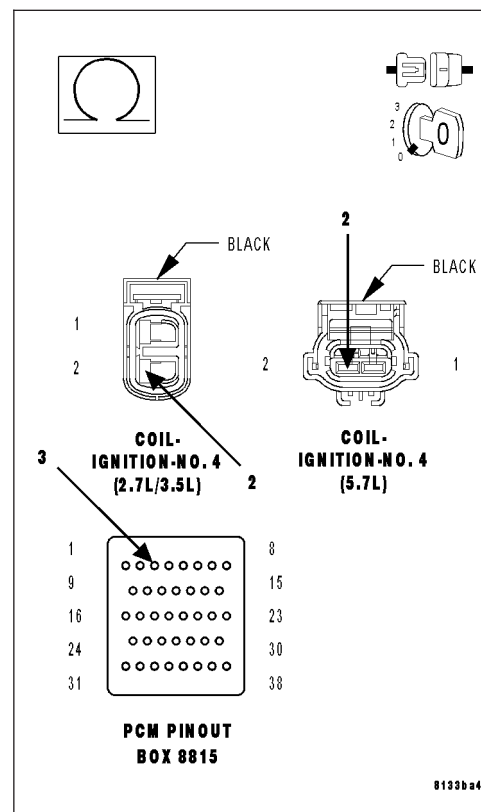
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K15) Coil Control No.4 circuit for an open, short to ground, and short to voltage.

**Was a problem found with the (K15) Coil Control No.4 circuit?**

**Yes** >> Repair the (K15) Coil Control No.4 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17



## 17. PCM

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

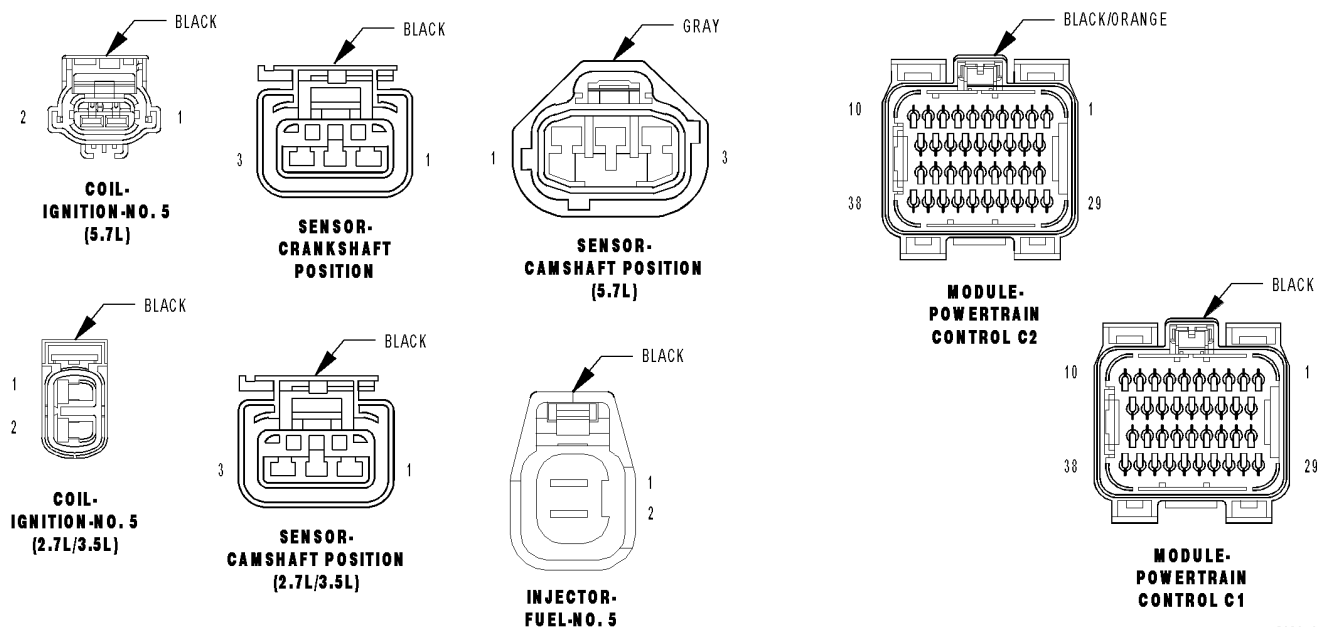
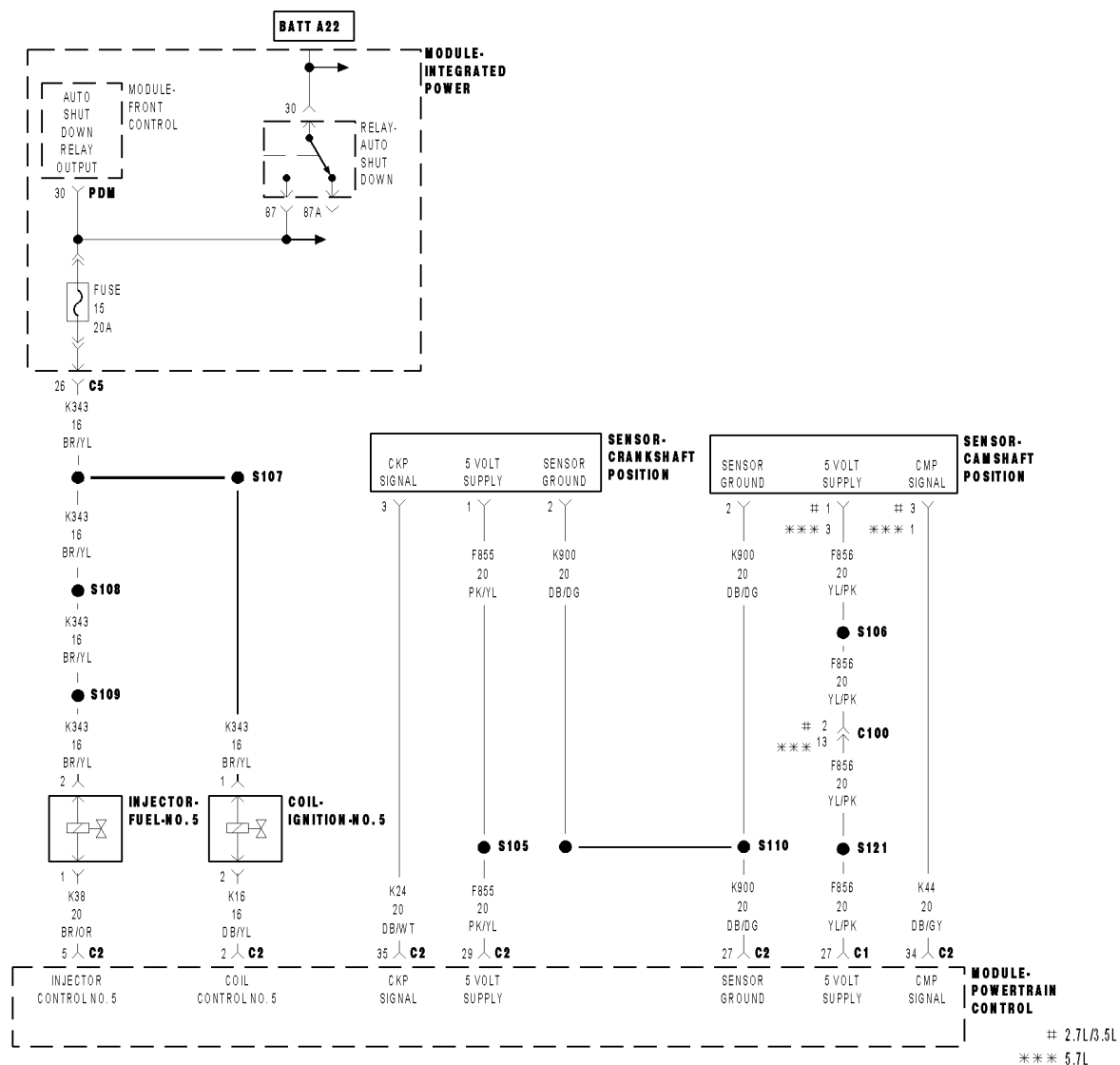
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0305-CYLINDER 5 MISFIRE



**P0305-CYLINDER 5 MISFIRE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Any time the engine is running, and the adaptive numerator has been successfully updated.

- **Set Condition:**

When more than 1.0% misfire rate is measured during two trips, or with 10% to 30% misfire rate during on trip.  
Three good trips to clear the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K38) INJECTOR CONTROL NO.5 CIRCUIT (K16) COIL CONTROL NO.5 CIRCUIT IGNITION WIRE SPARK PLUG IGNITION COIL FUEL PUMP INLET STRAINER PLUGGED RESTRICTED FUEL SUPPLY LINE FUEL PUMP MODULE FUEL PRESSURE LEAK DOWN FUEL INJECTOR ENGINE MECHANICAL PROBLEM PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. CYLINDER MIS-FIRE CONDITION ACTIVE

Engine running.

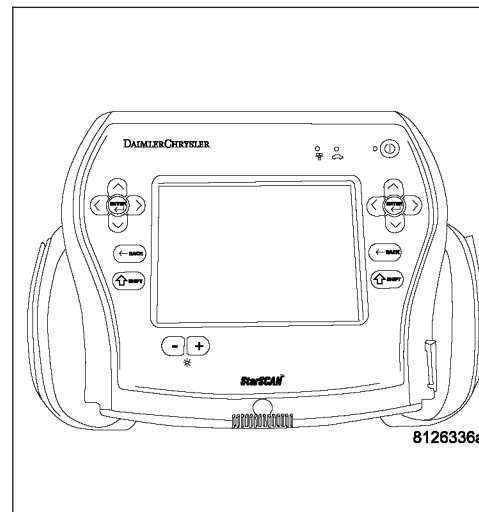
Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute with a scan tool.

**Is there a misfire present at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0305-CYLINDER 5 MISFIRE (CONTINUED)****2. VISUAL INSPECTION**

**Note:** Anything that affects the speed of the crankshaft can cause a misfire DTC.

**Note:** When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

Visually inspect the engine for any of the following conditions.

- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**P0305-CYLINDER 5 MISFIRE (CONTINUED)****3. (K343) ASD RELAY OUTPUT 2 CIRCUIT**

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils and the Fuel Injector harness connectors.

Turn the ignition off.

Disconnect the No.5 Ignition Coil harness connector.

Disconnect the No.5 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

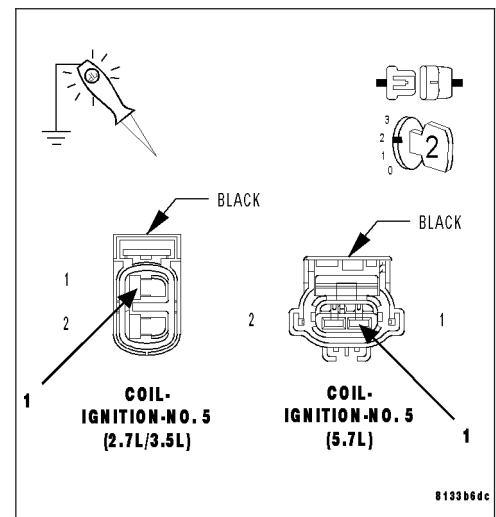
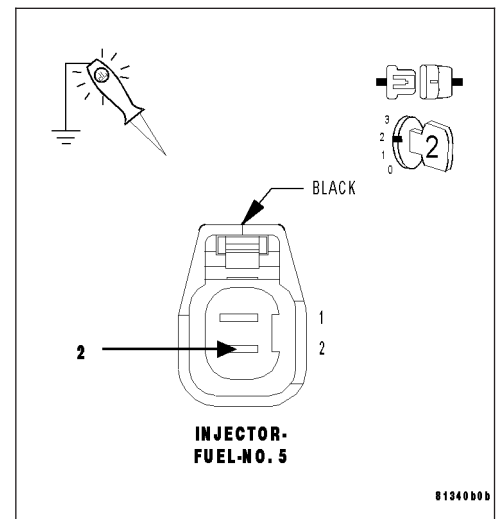
Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2 circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0305-CYLINDER 5 MISFIRE (CONTINUED)****4. IGNITION SYSTEM OPERATION**

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils. Once the ignition coil has been removed from the cylinder head, the intake must be reinstalled to be able to crank the engine. Move the ignition coil harness connector through the slots in the upper intake and then connect the coil to the harness connector. Secure the upper intake to the lower intake in accordance with the service information.

Turn the ignition off.

Connect the Ignition Coil No.5 harness connector.

Remove the Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark present?**

**Yes** >> Go To 5

**No** >> Go To 14

**Note:** Connect the Fuel Injector harness connector before continuing.

---

**5. SPARK PLUG**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

**Were any of the above conditions present?**

**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

---



**P0305-CYLINDER 5 MISFIRE (CONTINUED)****6. FUEL PRESSURE CHECK**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

**Within Specification**

Go To 7

**Below Specification**

Go To 12

**Above Specification**

Replace the fuel filter/pressure regulator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**7. FUEL PRESSURE LEAK DOWN**

**Note:** Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair/replace as necessary.

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install special tool #6539 (5/16") or #6631 (3/8") fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

**Note:** Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

**Note:** The pressure should not fall below 241 KPa (35 psi).

Does the gauge fall below the listed specification?

**Yes** >> Replace the leaking Fuel Injector(s).

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

---

**P0305-CYLINDER 5 MISFIRE (CONTINUED)****8. FUEL INJECTOR OPERATION**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

**CAUTION:** After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the No.5 Fuel Injector.

Monitor the fuel pressure gauge.

**Does the fuel pressure gauge indicate a drop in fuel pressure?**

**Yes** >> Go To 9

**No** >> Go To 10

**Note:** Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

---

**9. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

CAM LOBES - must not be worn excessively

CYLINDER LEAKAGE TEST - must be within specifications

VALVE SPRINGS - cannot be weak or broken

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17

---

**P0305-CYLINDER 5 MISFIRE (CONTINUED)****10. FUEL INJECTOR**

Turn the ignition off.

Disconnect the No.5 Fuel Injector harness connector.

Ignition on, engine not running.

**Note:** When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinder's Injector Control circuit.

With the scan tool, erase DTCs.

Using a 12-volt test light connected to 12-volts, probe the (K38) Injector Control No.5 circuit.

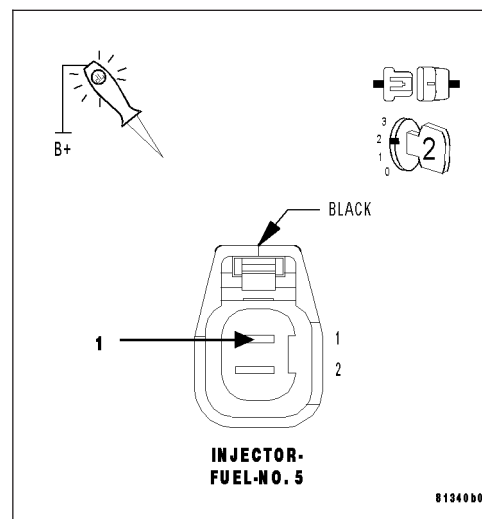
With the scan tool, actuate the Fuel Injector.

**Does the test light blink/flicker?**

**Yes** >> Replace the Fuel Injector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11

**11. (K38) INJECTOR CONTROL NO.5 CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

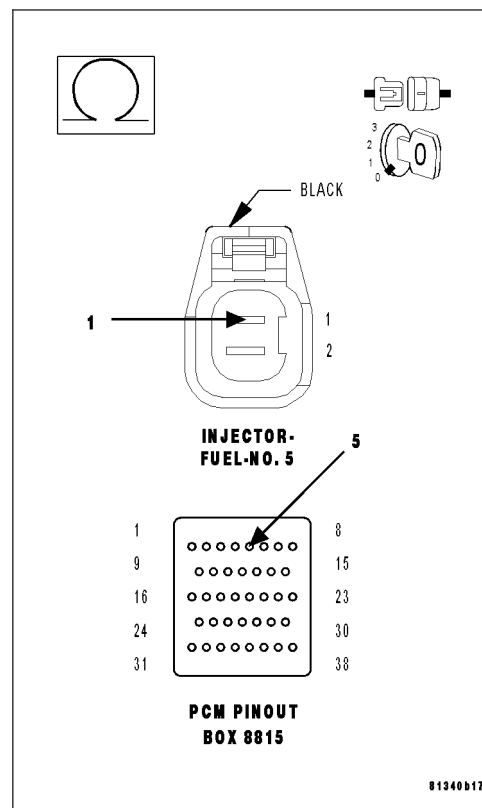
Check the (K38) Injector Control No.5 circuit for an open, short to ground, and short to voltage.

**Was a problem found with the (K38) Injector Control No.5 circuit?**

**Yes** >> Repair the excessive resistance or short in the (K38) Injector Control No.5 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17



**P0305-CYLINDER 5 MISFIRE (CONTINUED)****12. FUEL SUPPLY LINE RESTRICTED**

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.**

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16") #6631(3/8") fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).**

**Is the fuel pressure within specification?**

- Yes** >> Repair or replace fuel supply line as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 13
- 

**13. FUEL PUMP INLET STRAINER**

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.**

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

**Is the Fuel Inlet Strainer plugged?**

- Yes** >> Replace the Fuel Pump Inlet Strainer.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is operating properly. Repair as necessary. Replace the Fuel Pump Module.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- 

**14. IGNITION WIRE**

**Note: If the vehicle being tested does not have an ignition wire answer YES to this test and continue.**

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

**Is the resistance below 10K ohms?**

- Yes** >> Go To 15
- No** >> Replace the Ignition Wire.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
-

**P0305-CYLINDER 5 MISFIRE (CONTINUED)****15. IGNITION COIL**

Disconnect the No.5 Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K16) Coil Control No.5 circuit.

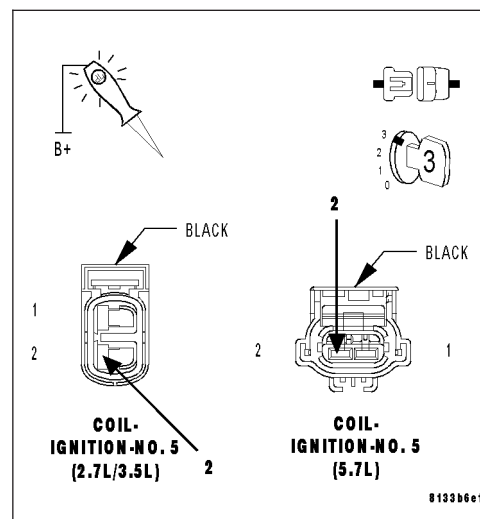
Crank the engine for 5 second while observing the test light.

**Does the test light brightly blink/flicker?**

**Yes** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 16

**16. (K16) COIL CONTROL NO.5 CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

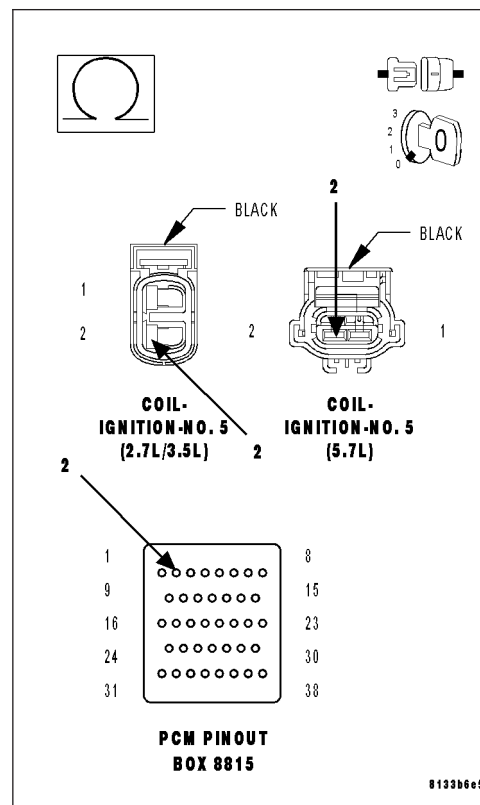
Check the (K16) Coil Control No.5 circuit for an open, short to ground, and short to voltage.

**Was a problem found with the (K16) Coil Control No.5 circuit?**

**Yes** >> Repair the (K16) Coil Control No.5 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17



**P0305-CYLINDER 5 MISFIRE (CONTINUED)****17. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

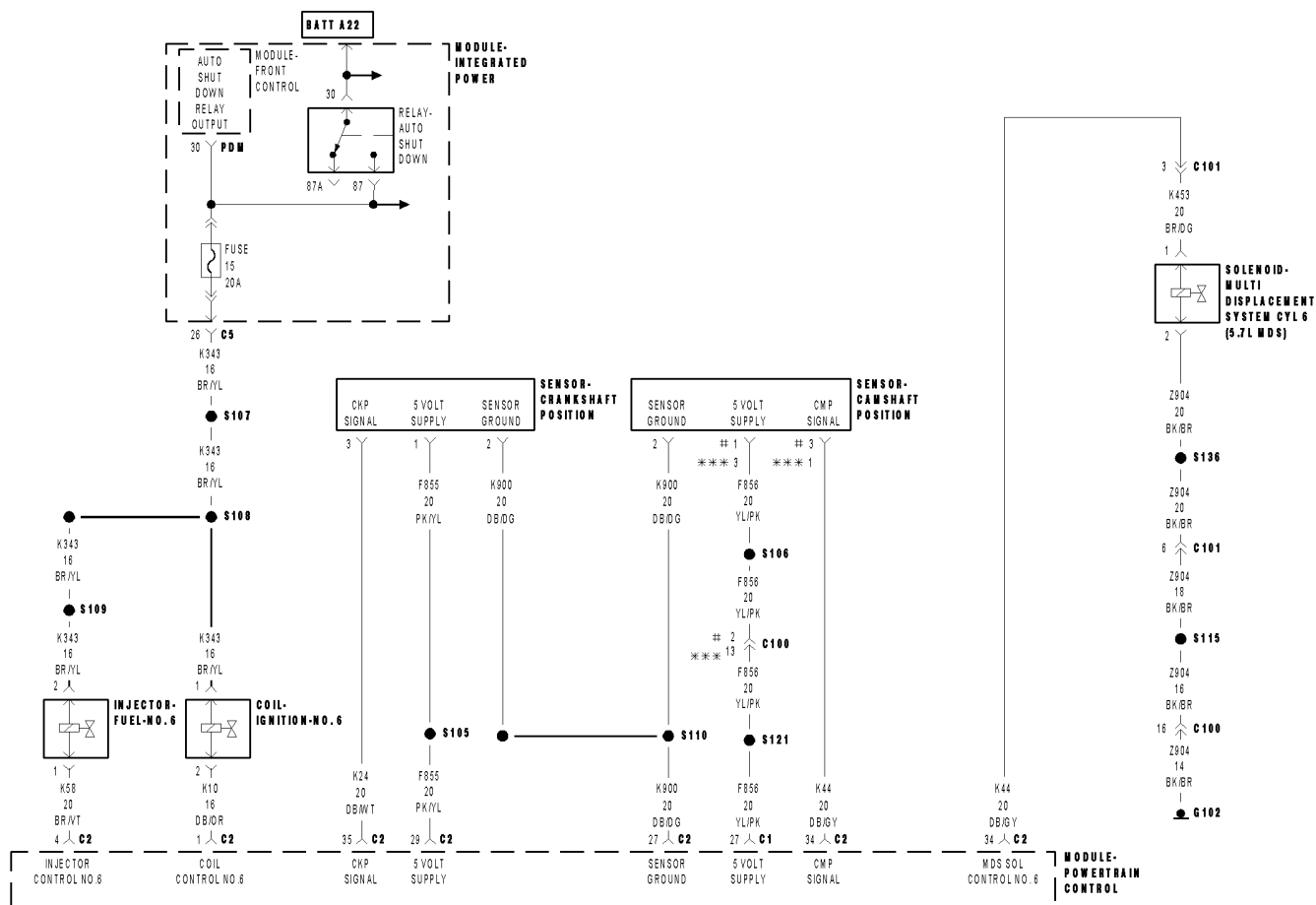
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

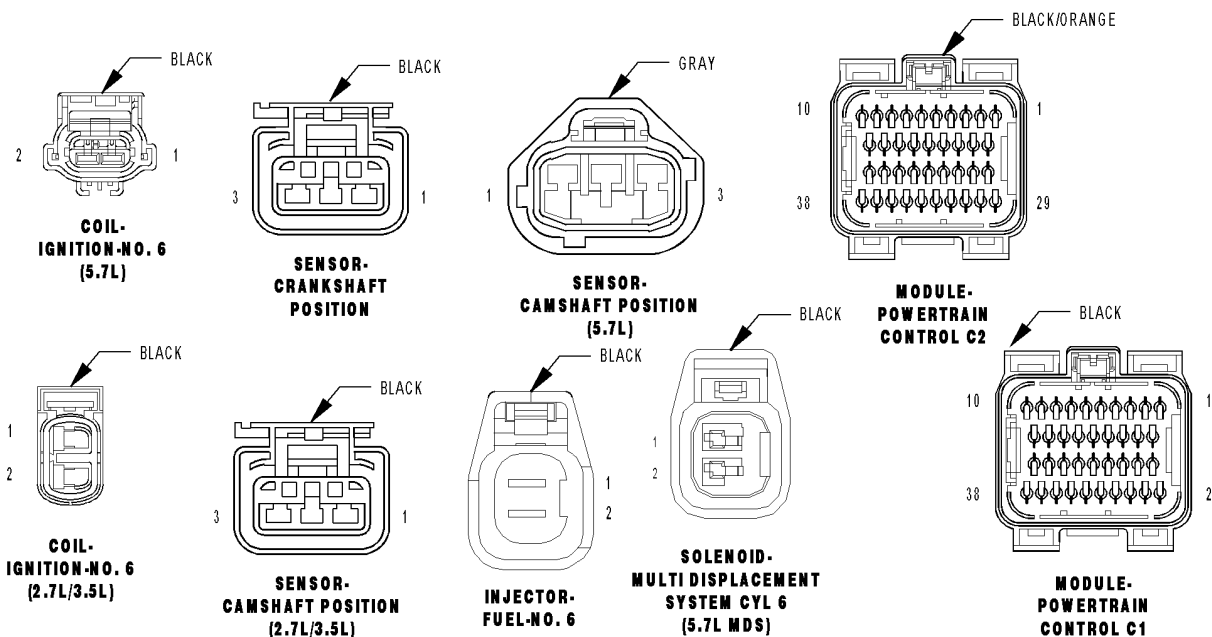
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0306-CYLINDER 6 MISFIRE



# 2.7L/3.5L  
\*\*\* 5.7L



**P0306-CYLINDER 6 MISFIRE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Any time the engine is running, and the adaptive numerator has been successfully updated.

- **Set Condition:**

When more than 1.0% misfire rate is measured during two trips, or with 10% to 30% misfire rate during on trip.

Three good trips to clear the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K58) INJECTOR CONTROL NO.6 CIRCUIT (K10) COIL CONTROL NO.6 CIRCUIT IGNITION WIRE SPARK PLUG IGNITION COIL FUEL PUMP INLET STRAINER PLUGGED RESTRICTED FUEL SUPPLY LINE FUEL PUMP MODULE FUEL PRESSURE LEAK DOWN FUEL INJECTOR ENGINE MECHANICAL PROBLEM PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. CYLINDER MIS-FIRE CONDITION ACTIVE

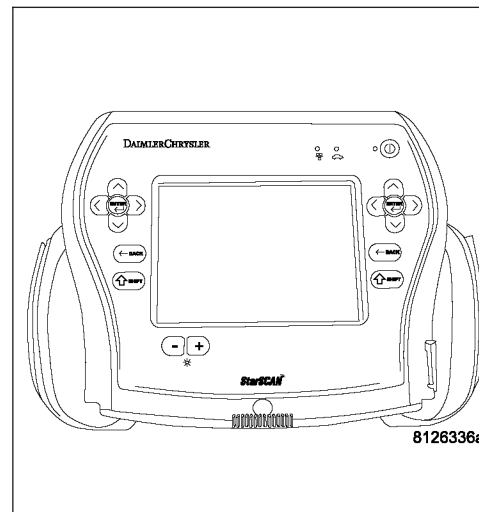
Engine running.

Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute with a scan tool.

**Is there a misfire present at this time?**

**Yes** >> Go To 2

**No** >> Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





**P0306-CYLINDER 6 MISFIRE (CONTINUED)****2. VISUAL INSPECTION**

**Note:** Anything that affects the speed of the crankshaft can cause a misfire DTC.

**Note:** When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

Visually inspect the engine for any of the following conditions.

- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

## P0306-CYLINDER 6 MISFIRE (CONTINUED)

### 3. (K343) ASD RELAY OUTPUT 2 CIRCUIT

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils and the Fuel Injector harness connectors.

Turn the ignition off.

Disconnect the No.6 Ignition Coil harness connector.

Disconnect the No.6 Fuel Injector harness connector.

Ignition on, engine not running.

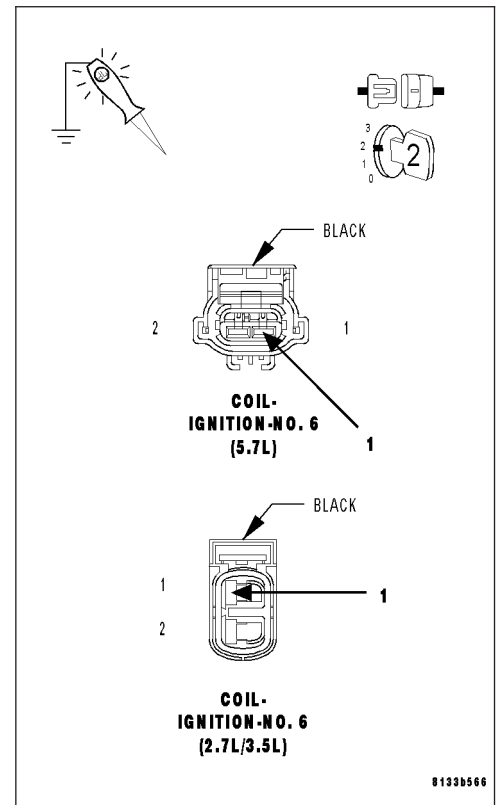
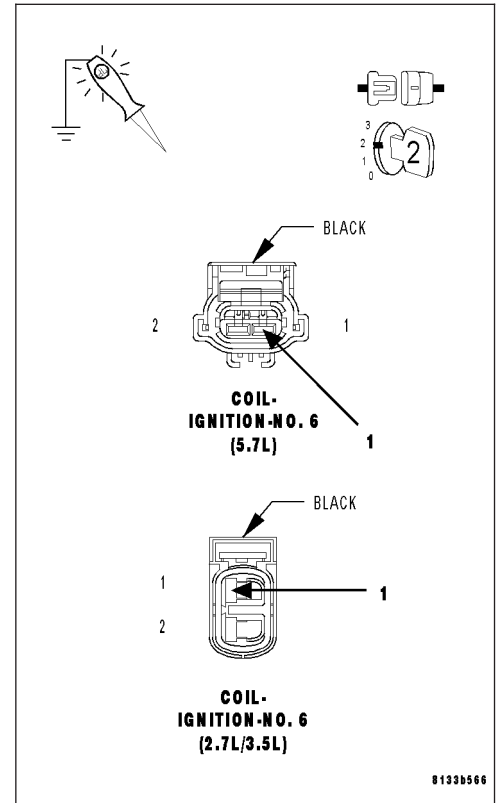
With the scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2 circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0306-CYLINDER 6 MISFIRE (CONTINUED)****4. IGNITION SYSTEM OPERATION**

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils. Once the ignition coil has been removed from the cylinder head, the intake must be reinstalled to be able to crank the engine. Move the ignition coil harness connector through the slots in the upper intake and then connect the coil to the harness connector. Secure the upper intake to the lower intake in accordance with the service information.

Turn the ignition off.

Connect the Ignition Coil No.6 harness connector.

Remove the Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark present?**

**Yes** >> Go To 5

**No** >> Go To 14

**Note:** Connect the Fuel Injector harness connector before continuing.

---

**5. SPARK PLUG**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

**Were any of the above conditions present?**

**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

---

**P0306-CYLINDER 6 MISFIRE (CONTINUED)****6. FUEL PRESSURE CHECK**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

**Choose a conclusion that best matches your fuel pressure reading.**

**Within Specification**

Go To 7

**Below Specification**

Go To 12

**Above Specification**

Replace the fuel filter/pressure regulator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

---

**7. FUEL PRESSURE LEAK DOWN**

**Note:** Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair /replace as necessary.

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death

Install special tool #6539 (5/16") or #6631 (3/8") fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

**Note:** Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

**Note:** The pressure should not fall below 241 KPa (35 psi).

**Does the gauge fall below the listed specification?**

**Yes** >> Replace the leaking Fuel Injector(s).

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

---

**P0306-CYLINDER 6 MISFIRE (CONTINUED)****8. FUEL INJECTOR OPERATION**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

**CAUTION:** After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the No.6 Fuel Injector.

Monitor the fuel pressure gauge.

**Does the fuel pressure gauge indicate a drop in fuel pressure?**

**Yes** >> Go To 9

**No** >> Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**Note:** Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

---

**9. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

CAM LOBES - must not be worn excessively

CYLINDER LEAKAGE TEST - must be within specifications

VALVE SPRINGS - cannot be weak or broken

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17

---

## P0306-CYLINDER 6 MISFIRE (CONTINUED)

### 10. FUEL INJECTOR

Turn the ignition off.

Disconnect the No.6 Fuel Injector harness connector.

Ignition on, engine not running.

**Note:** When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

With the scan tool, erase DTCs.

Using a 12-volt test light connected to 12-volts, probe the (K58) Injector Control No.6 circuit.

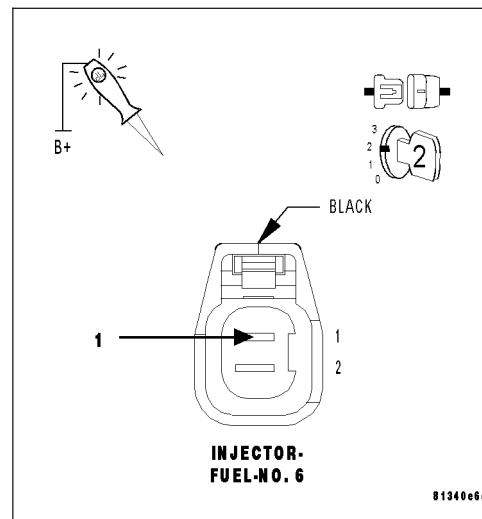
With the scan tool, actuate the Fuel Injector.

#### Does the test light blink/flicker?

**Yes** >> Replace the Fuel Injector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11



### 11. (K58) INJECTOR CONTROL NO.6 CIRCUIT

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

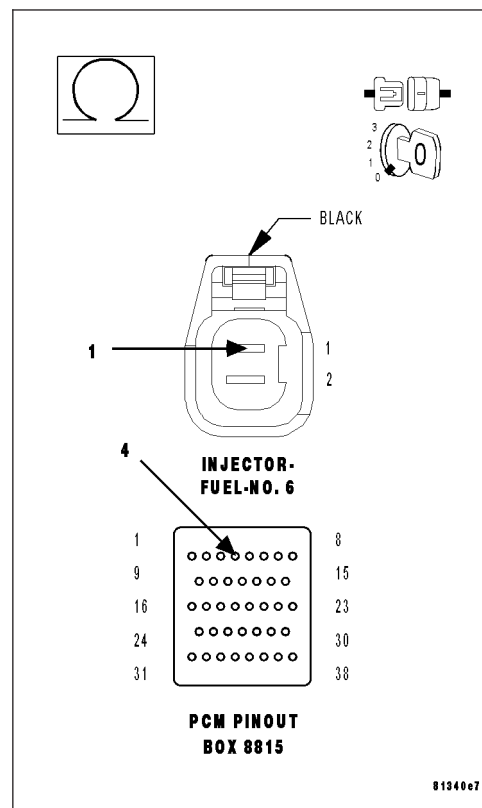
Check the (K58) Injector Control No.6 circuit for an open, short to ground, and short to voltage.

#### Was a problem found with the (K58) Injector Control No.6 circuit?

**Yes** >> Repair the excessive resistance or short in the (K58) Injector Control No.6 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17



**P0306-CYLINDER 6 MISFIRE (CONTINUED)****12. FUEL SUPPLY LINE RESTRICTED**

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.**

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16") #6631(3/8") fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).**

**Is the fuel pressure within specification?**

**Yes** >> Repair or replace fuel supply line as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 13

---

**13. FUEL PUMP INLET STRAINER**

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.**

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

**Is the Fuel Inlet Strainer plugged?**

**Yes** >> Replace the Fuel Pump Inlet Strainer.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is operating properly. Repair as necessary. Replace the Fuel Pump Module.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**14. IGNITION WIRE**

**Note: If the vehicle being tested does not have an ignition wire answer YES to this test and continue.**

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

**Is the resistance below 10K ohms?**

**Yes** >> Go To 15

**No** >> Replace the Ignition Wire.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**P0306-CYLINDER 6 MISFIRE (CONTINUED)****15. IGNITION COIL**

Disconnect the No.6 Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K10) Coil Control No.6 circuit.

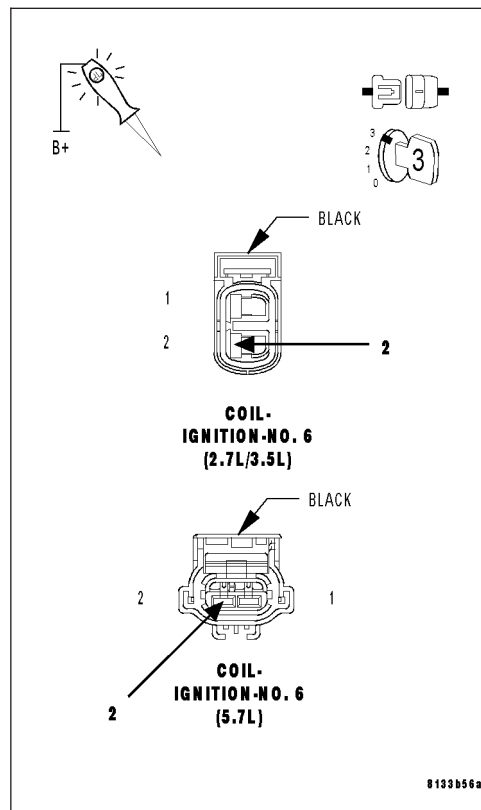
Crank the engine for 5 second while observing the test light.

**Does the test light brightly blink/flicker?**

**Yes** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 16





## P0306-CYLINDER 6 MISFIRE (CONTINUED)

## 16. (K10) COIL CONTROL NO.6 CIRCUIT

Turn the ignition off.

Disconnect the PCM harness connectors.

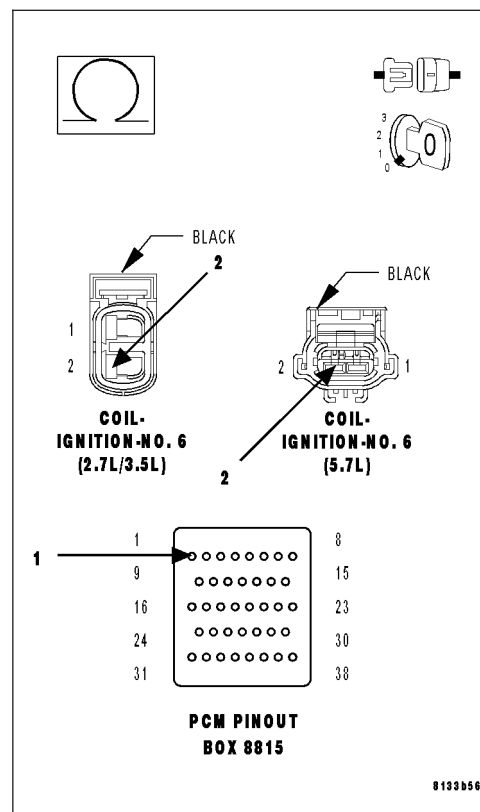
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K10) Coil Control No.6 circuit for an open, short to ground, and short to voltage.

**Was a problem found with the (K10) Coil Control No.6 circuit?**

**Yes** >> Repair the (K10) Coil Control No.6 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17



## 17. PCM

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

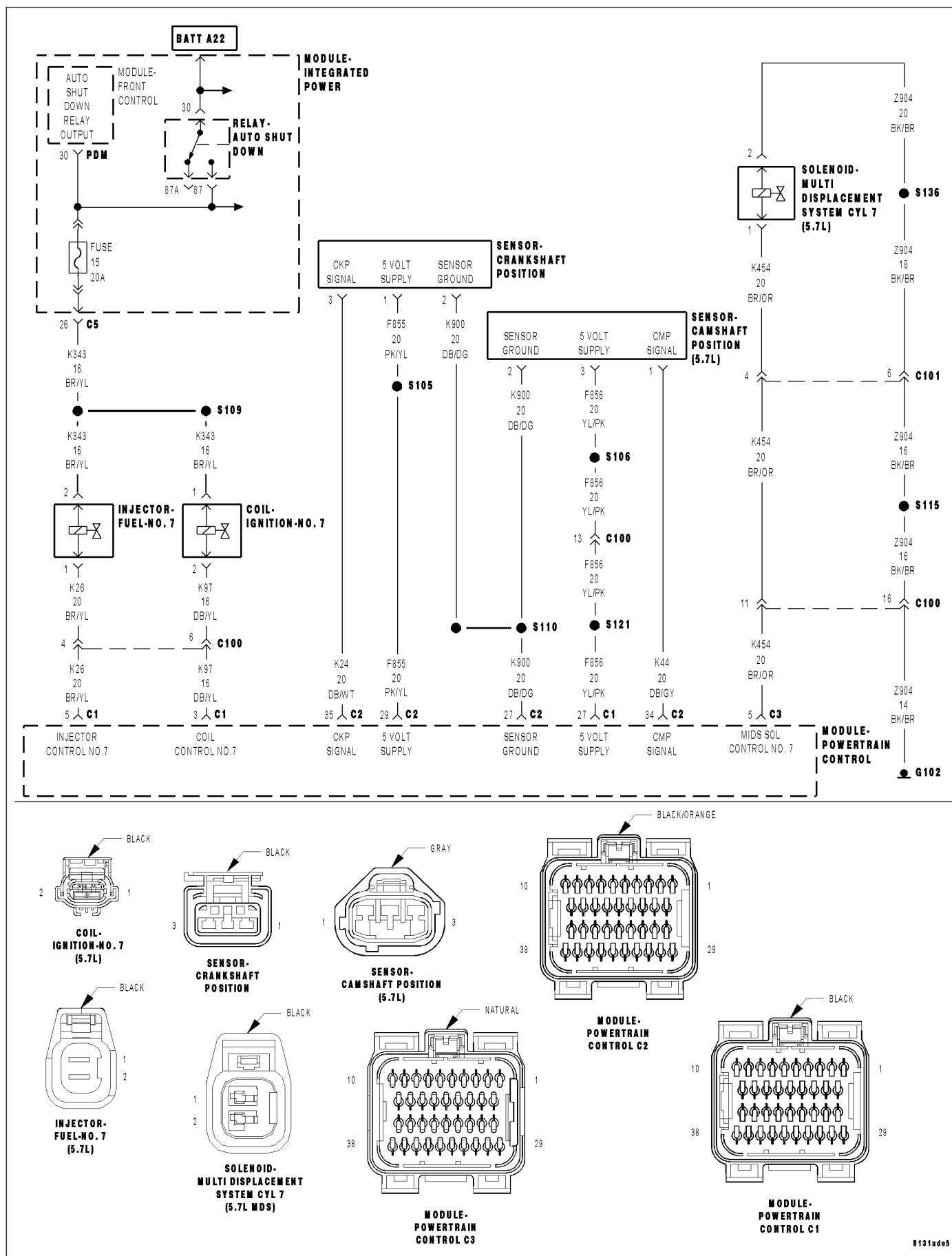
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0307-CYLINDER 7 MISFIRE



**P0307-CYLINDER 7 MISFIRE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Any time the engine is running, and the adaptive numerator has been successfully updated.

- **Set Condition:**

When more than 1.0% misfire rate is measured during two trips, or with 10% to 30% misfire rate during on trip.

Three good trips to clear the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K26) INJECTOR CONTROL NO.7 CIRCUIT (K97) COIL CONTROL NO.7 CIRCUIT IGNITION WIRE SPARK PLUG IGNITION COIL FUEL PUMP INLET STRAINER PLUGGED RESTRICTED FUEL SUPPLY LINE FUEL PUMP MODULE FUEL PRESSURE LEAK DOWN FUEL INJECTOR ENGINE MECHANICAL PROBLEM PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. CYLINDER MIS-FIRE CONDITION ACTIVE

Engine running.

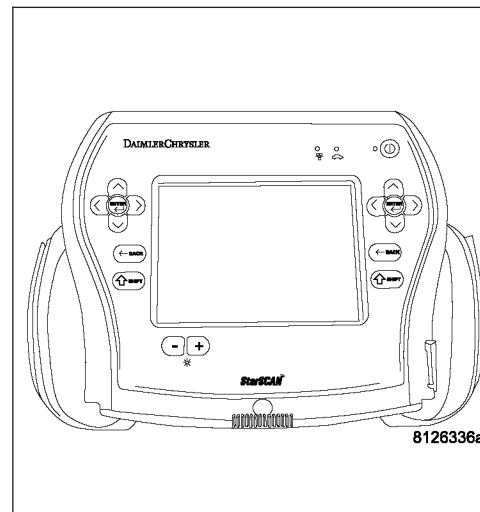
Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute with a scan tool.

**Is there a misfire present at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0307-CYLINDER 7 MISFIRE (CONTINUED)****2. VISUAL INSPECTION**

**Note:** Anything that affects the speed of the crankshaft can cause a misfire DTC.

**Note:** When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

Visually inspect the engine for any of the following conditions.

- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**P0307-CYLINDER 7 MISFIRE (CONTINUED)****3. (K343) ASD RELAY OUTPUT 2 CIRCUIT**

Turn the ignition off.

Disconnect the No.7 Ignition Coil harness connector.

Disconnect the No.7 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

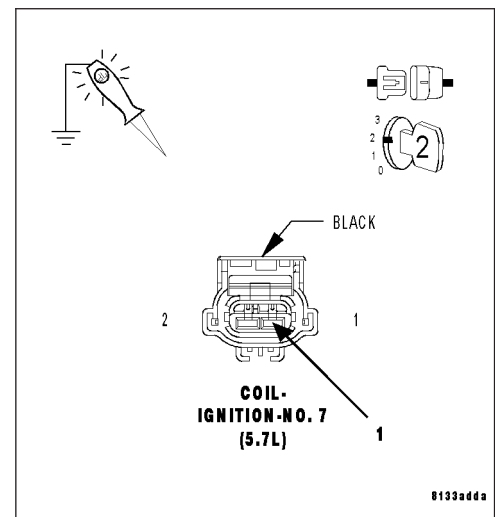
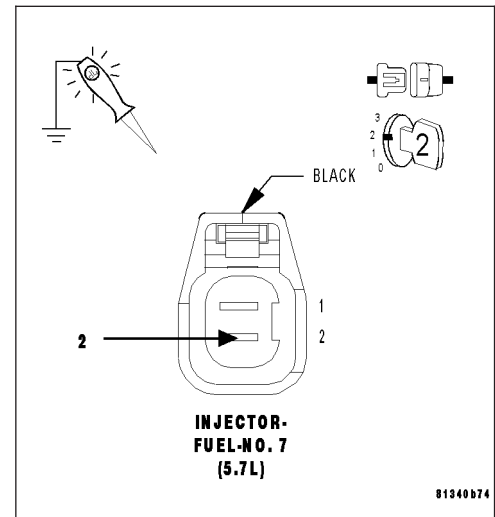
Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2 circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**4. IGNITION SYSTEM OPERATION**

Turn the ignition off.

Connect the Ignition Coil No.7 harness connector.

Remove the Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

**Is good spark present?**

**Yes** >> Go To 5

**No** >> Go To 14

**Note:** Connect the Fuel Injector harness connector before continuing.

**P0307-CYLINDER 7 MISFIRE (CONTINUED)****5. SPARK PLUG**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

**Were any of the above conditions present?**

**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

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**6. FUEL PRESSURE CHECK**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

**Choose a conclusion that best matches your fuel pressure reading.**

**Within Specification**

Go To 7

**Below Specification**

Go To 12

**Above Specification**

Replace the fuel filter/pressure regulator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**P0307-CYLINDER 7 MISFIRE (CONTINUED)****7. FUEL PRESSURE LEAK DOWN**

**Note:** Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair /replace as necessary.

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install special tool #6539 (5/16") or #6631 (3/8") fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

**Note:** Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

**Note:** The pressure should not fall below 241 KPa (35 psi).

**Does the gauge fall below the listed specification?**

**Yes** >> Replace the leaking Fuel Injector(s).

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

---

**8. FUEL INJECTOR OPERATION**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

**CAUTION:** After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the No.7 Fuel Injector.

Monitor the fuel pressure gauge.

**Does the fuel pressure gauge indicate a drop in fuel pressure?**

**Yes** >> Go To 9

**No** >> Go To 10

**Note:** Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

---

**P0307-CYLINDER 7 MISFIRE (CONTINUED)****9. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

CAM LOBES - must not be worn excessively

CYLINDER LEAKAGE TEST - must be within specifications

VALVE SPRINGS - cannot be weak or broken

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17

**10. FUEL INJECTOR**

Turn the ignition off.

Disconnect the No.7 Fuel Injector harness connector.

Ignition on, engine not running.

**Note: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.**

With the scan tool, erase DTCs.

Using a 12-volt test light connected to 12-volts, probe the (K26) Injector Control No.7 circuit.

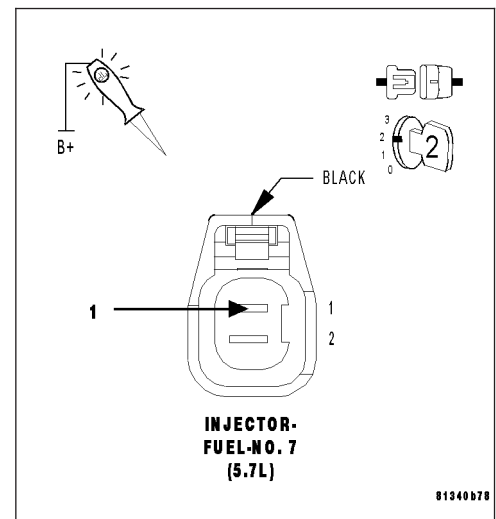
With the scan tool, actuate the Fuel Injector.

**Does the test light blink/flicker?**

**Yes** >> Replace the Fuel Injector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11





**P0307-CYLINDER 7 MISFIRE (CONTINUED)****11. (K26) INJECTOR CONTROL NO.7 CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

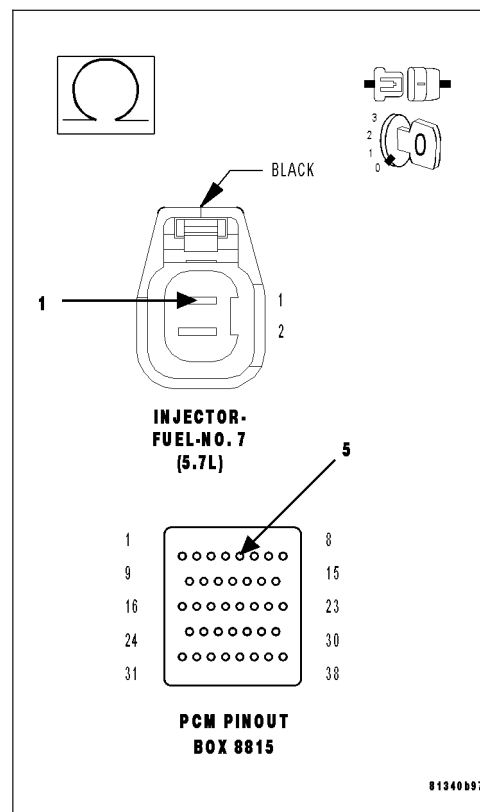
Check the (K26) Injector Control No.7 circuit for an open, short to ground, and short to voltage.

**Was a problem found with the (K26) Injector Control No.7 circuit?**

**Yes** >> Repair the excessive resistance or short in the (K26) Injector Control No.7 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17

**12. FUEL SUPPLY LINE RESTRICTED**

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16") #6631(3/8") fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

**Is the fuel pressure within specification?**

**Yes** >> Repair or replace fuel supply line as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 13

**P0307-CYLINDER 7 MISFIRE (CONTINUED)****13. FUEL PUMP INLET STRAINER**

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

**Is the Fuel Inlet Strainer plugged?**

- Yes** >> Replace the Fuel Pump Inlet Strainer.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is operating properly. Repair as necessary. Replace the Fuel Pump Module.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**14. IGNITION WIRE**

**Note:** If the vehicle being tested does not have an ignition wire answer YES to this test and continue.

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

**Is the resistance below 10K ohms?**

- Yes** >> Go To 15
- No** >> Replace the Ignition Wire.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**15. IGNITION COIL**

Disconnect the No.7 Ignition Coil harness connector.

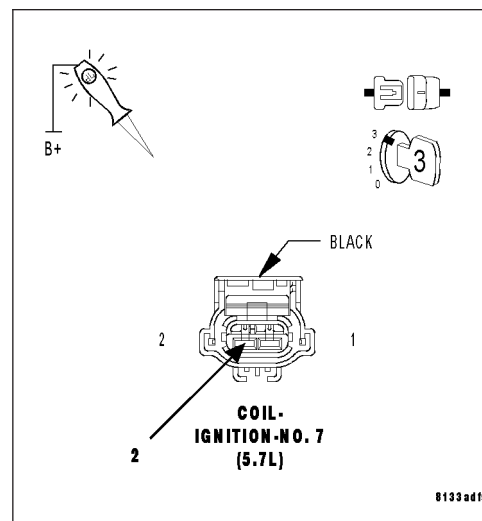
Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K97) Coil Control No.7 circuit.

Crank the engine for 5 second while observing the test light.

**Does the test light brightly blink/flicker?**

- Yes** >> Replace the Ignition Coil.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 16



## P0307-CYLINDER 7 MISFIRE (CONTINUED)

## 16. (K97) COIL CONTROL NO.7 CIRCUIT

Turn the ignition off.

Disconnect the PCM harness connectors.

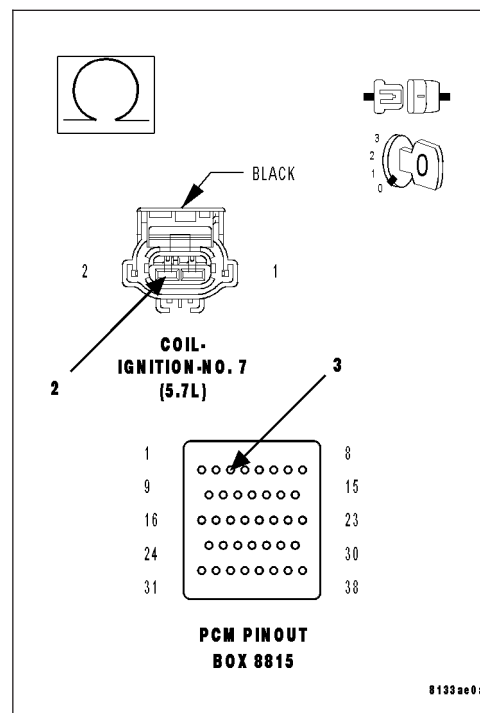
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K97) Coil Control No.7 circuit for an open, short to ground, and short to voltage.

**Was a problem found with the (K97) Coil Control No.7 circuit?**

**Yes** >> Repair the (K97) Coil Control No.7 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17



## 17. PCM

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

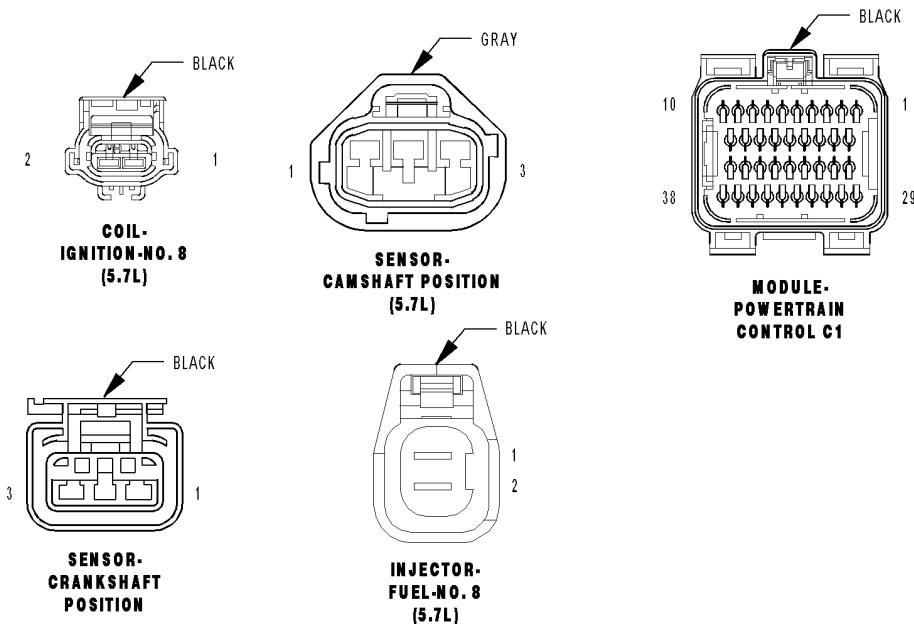
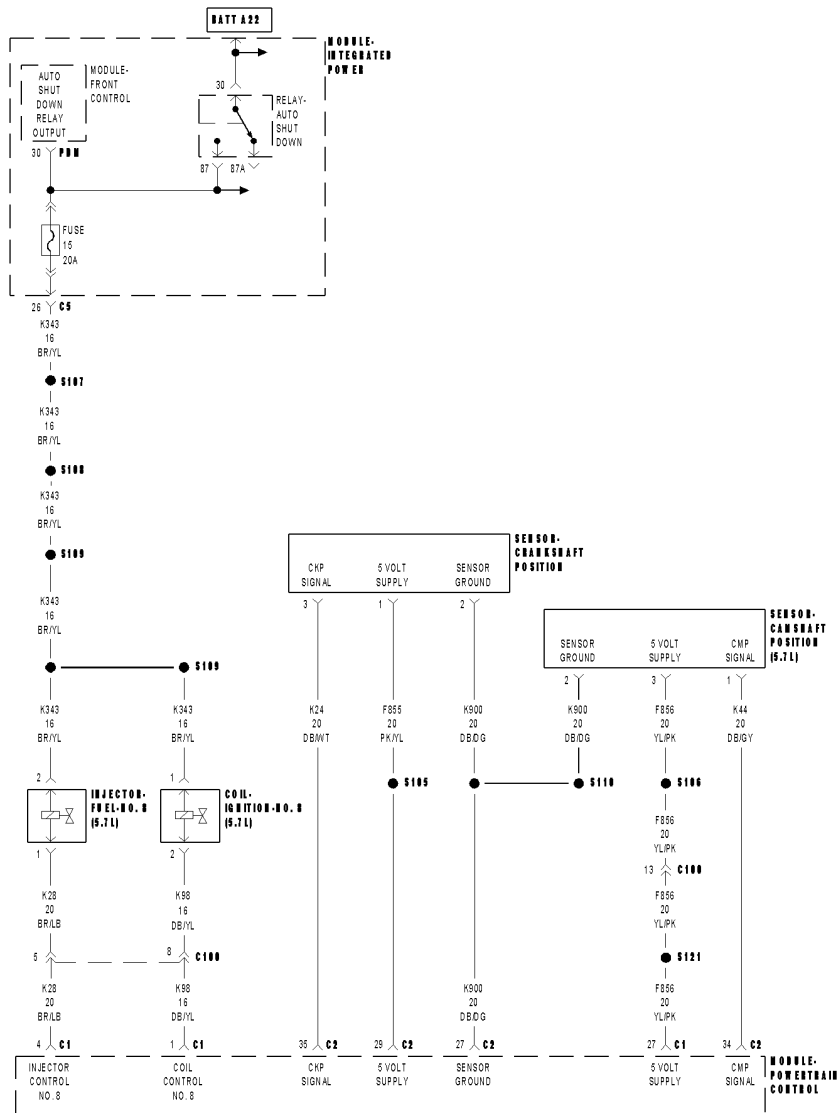
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

# P0308-CYLINDER 8 MISFIRE



**P0308-CYLINDER 8 MISFIRE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Any time the engine is running, and the adaptive numerator has been successfully updated.

- **Set Condition:**

When more than 1.0% misfire rate is measured during two trips, or with 10% to 30% misfire rate during on trip.  
Three good trips to clear the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K28) INJECTOR CONTROL NO.8 CIRCUIT (K98) COIL CONTROL NO.8 CIRCUIT IGNITION WIRE SPARK PLUG IGNITION COIL FUEL PUMP INLET STRAINER PLUGGED RESTRICTED FUEL SUPPLY LINE FUEL PUMP MODULE FUEL PRESSURE LEAK DOWN FUEL INJECTOR ENGINE MECHANICAL PROBLEM PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. CYLINDER MIS-FIRE CONDITION ACTIVE

Engine running.

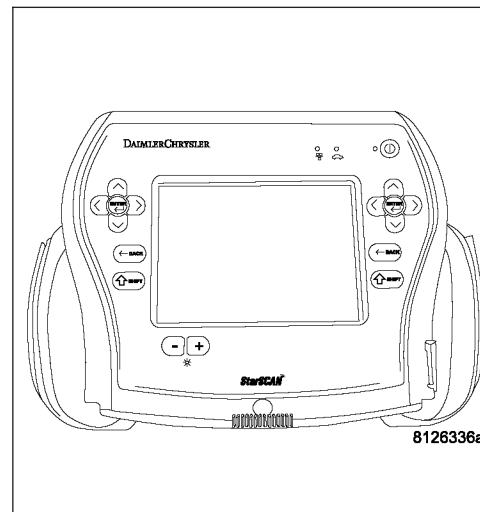
Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute with a scan tool.

**Is there a misfire present at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0308-CYLINDER 8 MISFIRE (CONTINUED)****2. VISUAL INSPECTION**

**Note:** Anything that affects the speed of the crankshaft can cause a misfire DTC.

**Note:** When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.

- Visually inspect the engine for any of the following conditions.
- Worn serpentine belt
- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.
- Misalignment Water pump, P/S Pump and A/C Compressor pulleys
- Corroded PCM power and ground circuits.
- Improper CKP, CMP, MAP, and TP Sensor mounting
- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.
- Vacuum leaks
- Restricted Air Induction system or Exhaust system.
- Internal engine component failures.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**P0308-CYLINDER 8 MISFIRE (CONTINUED)****3. (K343) ASD RELAY OUTPUT 2 CIRCUIT**

Turn the ignition off.

Disconnect the No.8 Ignition Coil harness connector.

Disconnect the No.8 Fuel Injector harness connector.

Ignition on, engine not running.

With the scan tool, actuate the ASD Relay.

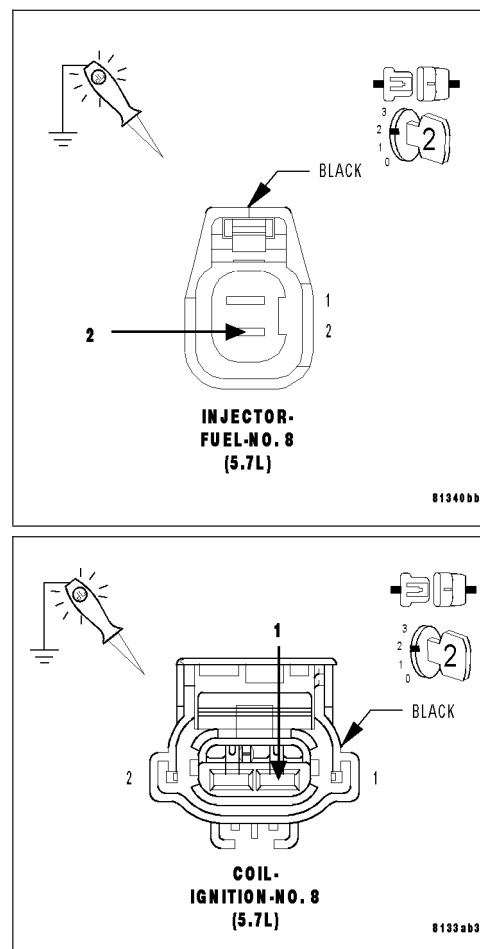
Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2 circuit in the Ignition Coil harness connector and Fuel Injector harness connector while the relay is actuating.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the excessive resistance or short to ground in the (K343) ASD Relay Output 2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**4. IGNITION SYSTEM OPERATION**

Turn the ignition off.

Connect the Ignition Coil No.8 harness connector.

Remove the Ignition Coil.

Leave the Fuel Injector harness connector of the cylinder being tested disconnected.

Install a spark tester on the Ignition Coil.

While cranking the engine observe the spark coming from the spark tester.

**Note: A crisp blue spark that is able to jump the gap of the spark tester should be generated.**

**Is good spark present?**

**Yes** >> Go To 5

**No** >> Go To 14

**Note: Connect the Fuel Injector harness connector before continuing.**

**P0308-CYLINDER 8 MISFIRE (CONTINUED)****5. SPARK PLUG**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broke electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

**Were any of the above conditions present?**

**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

---

**6. FUEL PRESSURE CHECK**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge to the fuel rail.

Start the engine and observe the fuel pressure reading.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

**Choose a conclusion that best matches your fuel pressure reading.**

**Within Specification**

Go To 7

**Below Specification**

Go To 12

**Above Specification**

Replace the fuel filter/pressure regulator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

---



**P0308-CYLINDER 8 MISFIRE (CONTINUED)****7. FUEL PRESSURE LEAK DOWN**

**Note:** Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair /replace as necessary.

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install special tool #6539 (5/16") or #6631 (3/8") fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

**Note:** Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

**Note:** The pressure should not fall below 241 KPa (35 psi).

**Does the gauge fall below the listed specification?**

**Yes** >> Replace the leaking Fuel Injector(s).

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

---

**8. FUEL INJECTOR OPERATION**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

**CAUTION:** After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.

Remove special tool #C4390.

Start the engine and allow the fuel pressure to reach maximum pressure.

Ignition on, engine not running.

Using the scan tool, actuate the No.8 Fuel Injector.

Monitor the fuel pressure gauge.

**Does the fuel pressure gauge indicate a drop in fuel pressure?**

**Yes** >> Go To 9

**No** >> Go To 10

**Note:** Turn the ignition off, remove the Fuel Pressure gauge, and connect the fuel lines before continuing.

---

**P0308-CYLINDER 8 MISFIRE (CONTINUED)****9. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

CAM LOBES - must not be worn excessively

CYLINDER LEAKAGE TEST - must be within specifications

VALVE SPRINGS - cannot be weak or broken

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17

---

**10. FUEL INJECTOR**

Turn the ignition off.

Disconnect the No.8 Fuel Injector harness connector.

Ignition on, engine not running.

**Note: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.**

With the scan tool, erase DTCs.

Using a 12-volt test light connected to 12-volts, probe the (K28) Injector Control No.8 circuit.

With the scan tool, actuate the Fuel Injector.

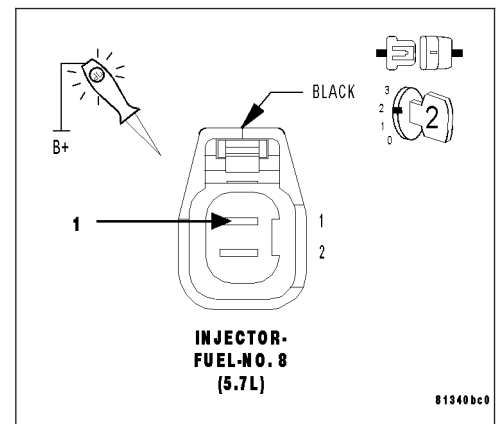
**Does the test light blink/flicker?**

**Yes** >> Replace the Fuel Injector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11

---



**P0308-CYLINDER 8 MISFIRE (CONTINUED)****11. (K28) INJECTOR CONTROL NO.8 CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

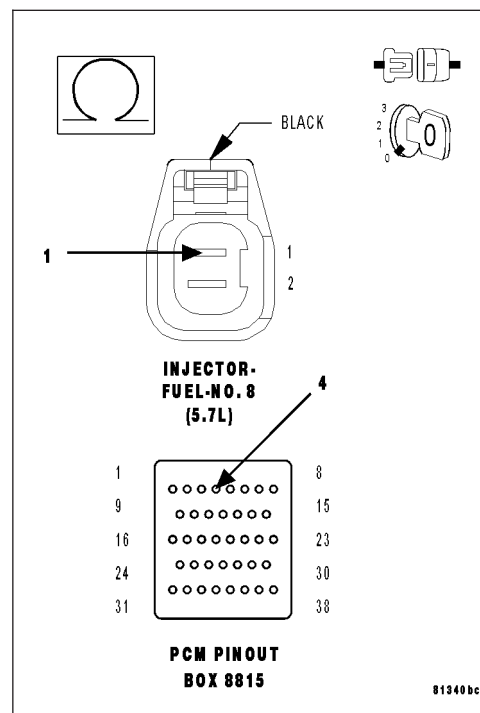
Check the (K28) Injector Control No.8 circuit for an open, short to ground, and short to voltage.

**Was a problem found with the (K28) Injector Control No.8 circuit?**

**Yes** >> Repair the excessive resistance or short in the (K28) Injector Control No.8 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17

**12. FUEL SUPPLY LINE RESTRICTED**

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16") #6631(3/8") fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

**Is the fuel pressure within specification?**

**Yes** >> Repair or replace fuel supply line as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 13

**P0308-CYLINDER 8 MISFIRE (CONTINUED)****13. FUEL PUMP INLET STRAINER**

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

**Is the Fuel Inlet Strainer plugged?**

**Yes** >> Replace the Fuel Pump Inlet Strainer.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Before continuing, check the Fuel Pump Module harness connector terminals for corrosion, damage, or terminal push out. Make sure the ground circuit is operating properly. Repair as necessary. Replace the Fuel Pump Module.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**14. IGNITION WIRE**

**Note:** If the vehicle being tested does not have an ignition wire answer YES to this test and continue.

Turn the ignition off.

Remove the ignition wire.

Measure the resistance of the ignition wire.

**Is the resistance below 10K ohms?**

**Yes** >> Go To 15

**No** >> Replace the Ignition Wire.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**15. IGNITION COIL**

Disconnect the No.8 Ignition Coil harness connector.

Remove the Fuel Pump Relay.

Using a 12-volt test light connected to 12-volts, probe the (K98) Coil Control No.8 circuit.

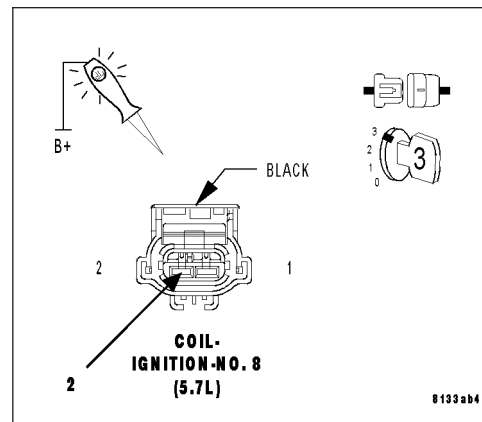
Crank the engine for 5 second while observing the test light.

**Does the test light brightly blink/flicker?**

**Yes** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 16



## P0308-CYLINDER 8 MISFIRE (CONTINUED)

## 16. (K98) COIL CONTROL NO.8 CIRCUIT

Turn the ignition off.

Disconnect the PCM harness connectors.

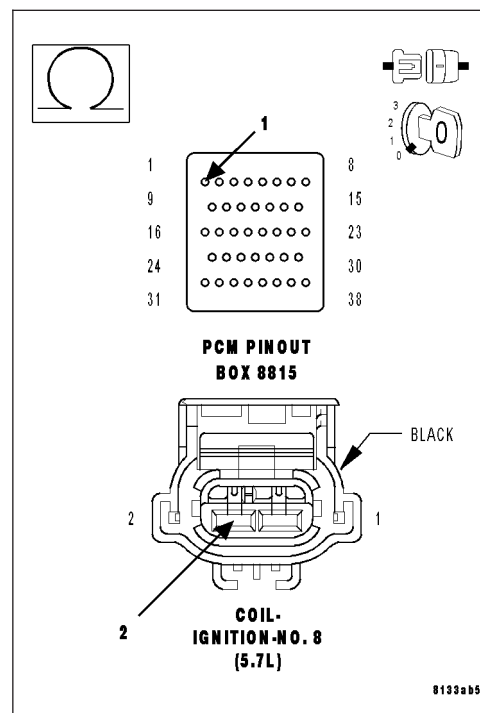
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Check the (K98) Coil Control No.8 circuit for an open, short to ground, and short to voltage.

**Was a problem found with the (K98) Coil Control No.8 circuit?**

**Yes** >> Repair the (K98) Coil Control No.8 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 17



## 17. PCM

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

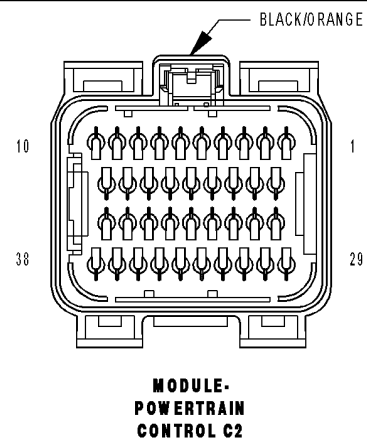
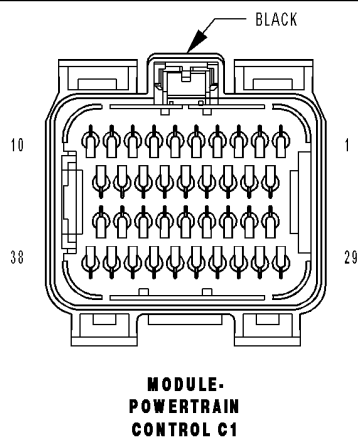
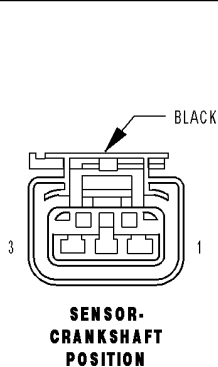
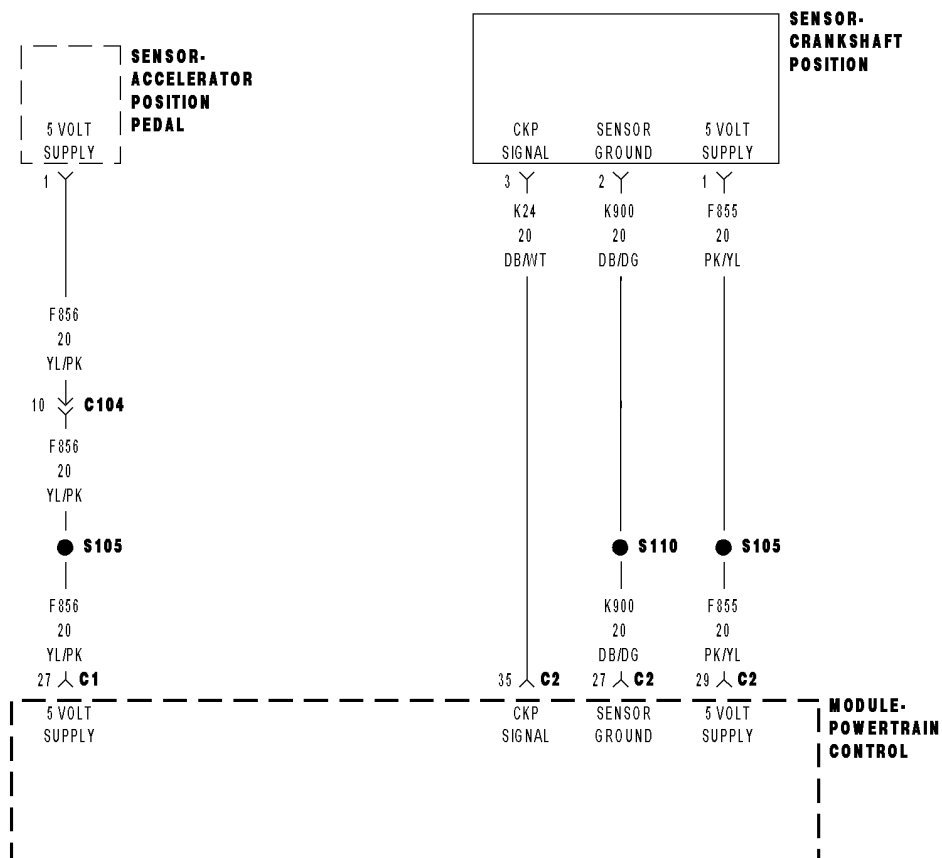
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0315-NO CRANK SENSOR LEARNED



**P0315-NO CRANK SENSOR LEARNED (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Under closed throttle decel and A/C off. ECT above 75°C (167°F). Engine start time is greater than 50 seconds.
- **Set Condition:**  
One of the CKP sensor target windows has more than 2.86% variance from the reference. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
TONE WHEEL/PULSE RING WIRE HARNESS CRANKSHAFT POSITION SENSOR

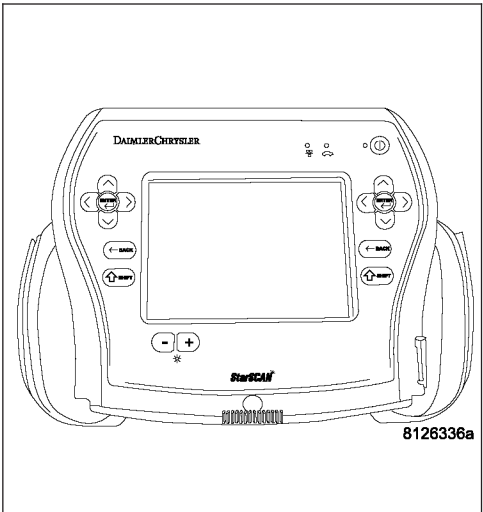
**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test**

**1. ACTIVE DTC**

Ignition on, engine not running.  
With a scan tool, clear DTCs, PCM battery disconnect to reset the PCM.  
Start the engine.  
If the MIL has not yet illuminated, test drive the vehicle to try to get the code to reset.

- Does the code reset while cranking or during the test drive?**
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0315-NO CRANK SENSOR LEARNED (CONTINUED)

### 2. WIRE HARNESS INSPECTION

Turn the ignition off.

Visually inspect the CKP wire harness. Look for any chafed, pierced, pinched, or partially broken wires.

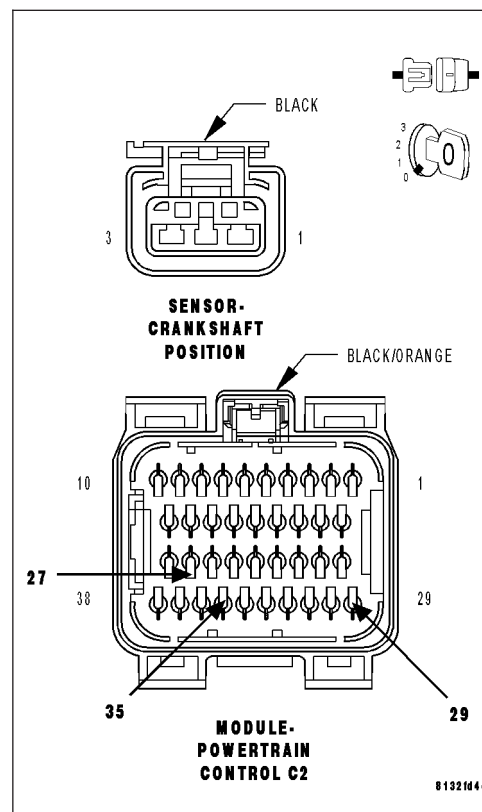
Visually inspect the CKP wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Make sure the Crankshaft Position Sensor is properly installed and the mounting bolt(s) are torqued to the proper specification.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3



### 3. TONE WHEEL/FLEX PLATE INSPECTION

Remove the Crankshaft Position Sensor.

Inspect the Tone Wheel/Flex Plate slots for damage, foreign material, or excessive movement.

**Were any problems found?**

**Yes** >> Repair or replace the Tone Wheel/Flex Plate as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

### 4. CRANKSHAFT POSITION SENSOR

**If there are no possible causes remaining, view repair.**

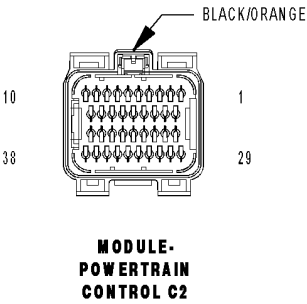
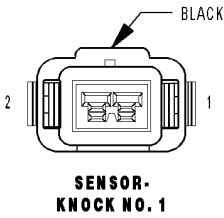
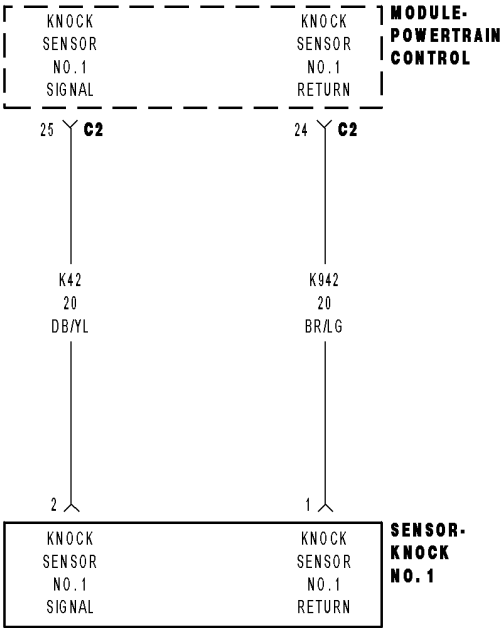
**Repair**

Replace the Crankshaft Position Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



P0325-KNOCK SENSOR 1 CIRCUIT



## P0325-KNOCK SENSOR 1 CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running.

- **Set Condition:**

The Knock Sensor circuit voltage falls below a minimum value at idle or deceleration. The minimum value is from a look-up table internal to the PCM and is based on engine RPM. DTC will also set if the sensor voltage goes above 5.0 volts. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K42) KNOCK SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K42) KNOCK SENSOR NO.1 SIGNAL CIRCUIT OPEN
(K942) KNOCK SENSOR NO.1 RETURN CIRCUIT OPEN
(K42) KNOCK SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO (K942) KNOCK SENSOR NO.1 RETURN CIRCUIT
(K42) KNOCK SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND
KNOCK SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

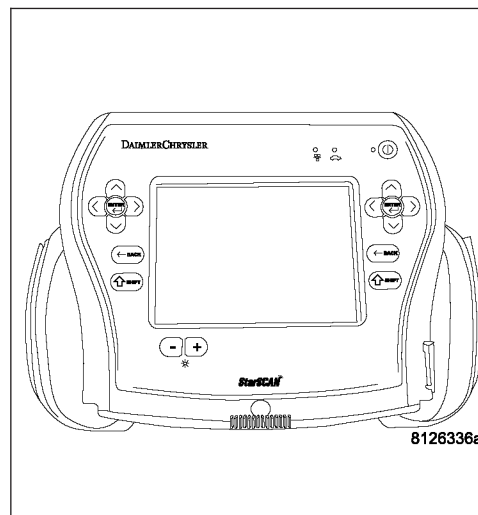
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0325-KNOCK SENSOR 1 CIRCUIT (CONTINUED)****2. (K42) KNOCK SENSOR NO.1 SIGNAL SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the No.1 Knock Sensor harness connector.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

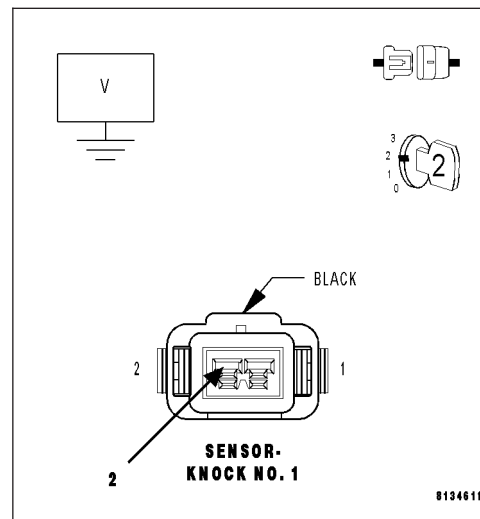
Measure the voltage on the (K42) Knock Sensor No.1 Signal circuit in the Knock Sensor harness connector.

**Does the voltmeter indicate voltage present?**

**Yes** >> Repair the short to battery voltage in the (K42) Knock Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K42) KNOCK SENSOR NO.1 SIGNAL CIRCUIT OPEN**

Turn the ignition off.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

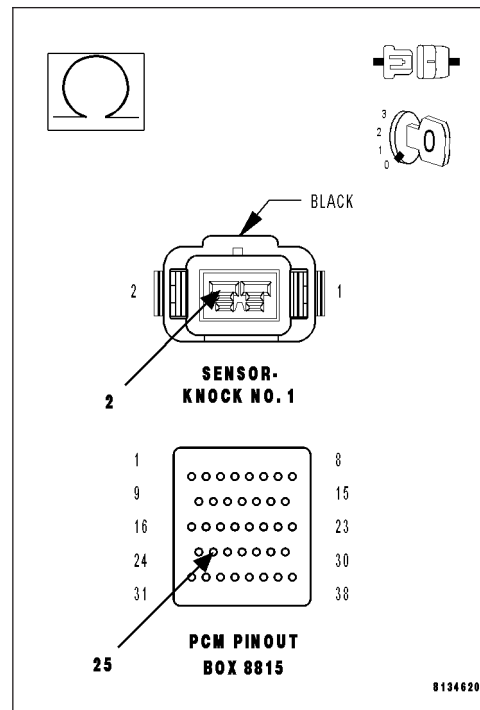
Measure the resistance of the (K42) Knock Sensor No.1 Signal circuit from the Knock Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the open in the (K42) Knock Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0325-KNOCK SENSOR 1 CIRCUIT (CONTINUED)****4. (K942) KNOCK SENSOR NO.1 RETURN CIRCUIT OPEN**

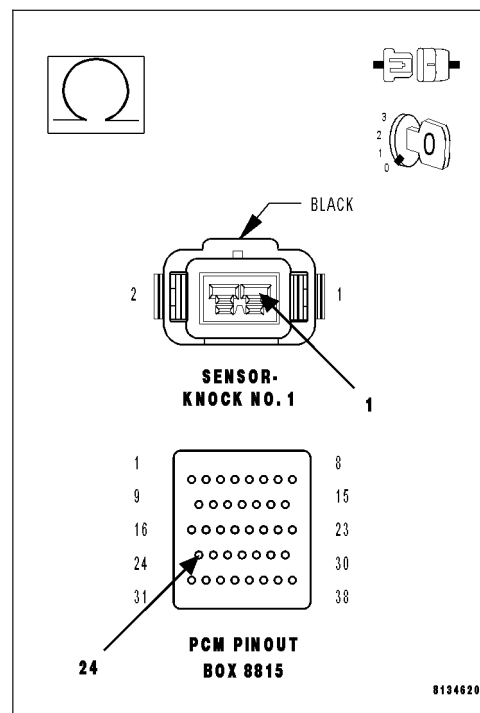
Measure the resistance of the (K942) Knock Sensor No.1 Return circuit from the Knock Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K942) Knock Sensor No.1 Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. (K42) KNOCK SENSOR NO.1 SIGNAL SHORTED TO THE (K942) KNOCK SENSOR NO.1 RETURN CIRCUIT**

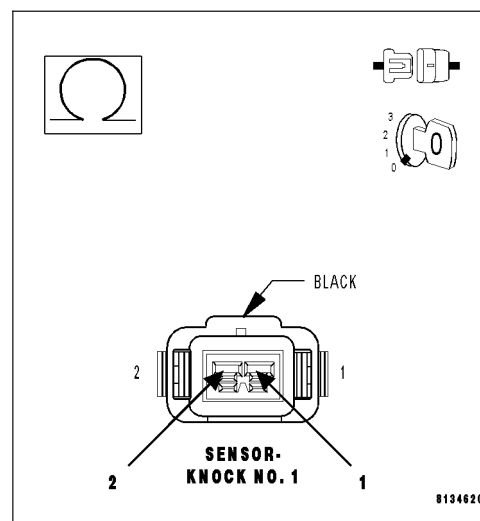
Measure the resistance between the (K42) Knock Sensor No.1 Signal circuit and the (K942) Knock Sensor No.1 Return circuit in the Knock Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K42) Knock Sensor No.1 Signal circuit and the (K942) Knock Sensor No.1 Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P0325-KNOCK SENSOR 1 CIRCUIT (CONTINUED)****6. (K42) KNOCK SENSOR NO.1 SIGNAL SHORTED TO GROUND**

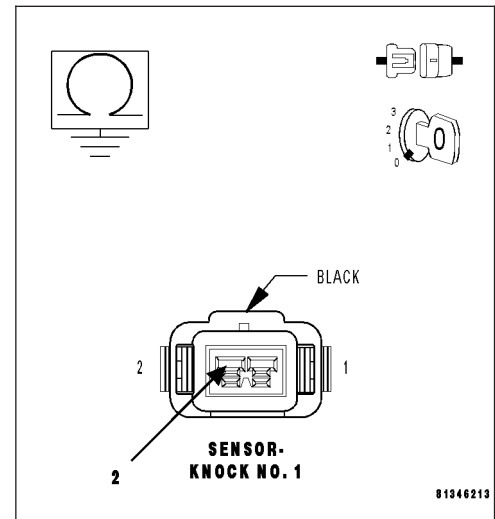
Measure the resistance between ground and the (K42) Knock Sensor No.1 Signal circuit in the Knock Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K42) Knock Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. KNOCK SENSOR**

Replace the Knock Sensor.

Ignition on, engine not running.

With the scan tool, erase DTC.

Attempt to operate the vehicle using the information noted in the Freeze Frame.

With the scan tool, read DTCs.

**Does the scan tool display the DTC that was previously erased?**

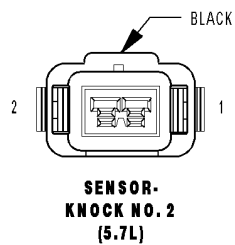
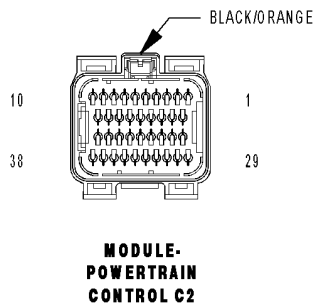
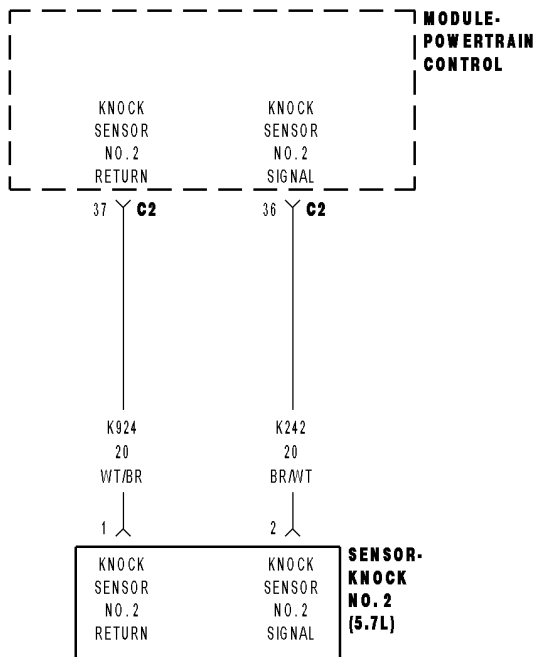
**Yes** >>

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Test Complete.

# P0330-KNOCK SENSOR 2 CIRCUIT



**P0330-KNOCK SENSOR 2 CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running

- **Set Condition:**

The Knock Sensor circuit voltage falls below a minimum value at idle or deceleration. The minimum value is from a look-up table internal to the PCM and is based on engine RPM. DTC will also set if the sensor voltage goes above 5.0 volts. One Trip Fault. Three good trips to turn off the MIL. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K242) KNOCK SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K242) KNOCK SENSOR NO.2 SIGNAL CIRCUIT OPEN
(K924) KNOCK SENSOR NO.2 RETURN CIRCUIT OPEN
(K242) KNOCK SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO (K924) KNOCK SENSOR NO.2 RETURN CIRCUIT
(K242) KNOCK SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO GROUND
KNOCK SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

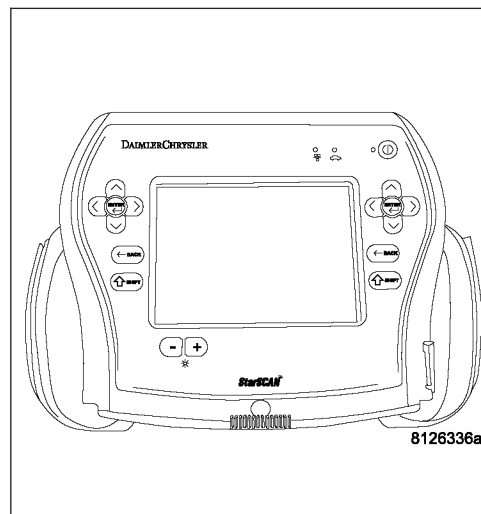
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0330-KNOCK SENSOR 2 CIRCUIT (CONTINUED)****2. (K242) KNOCK SENSOR NO.2 SIGNAL SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the No.2 Knock Sensor harness connector.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

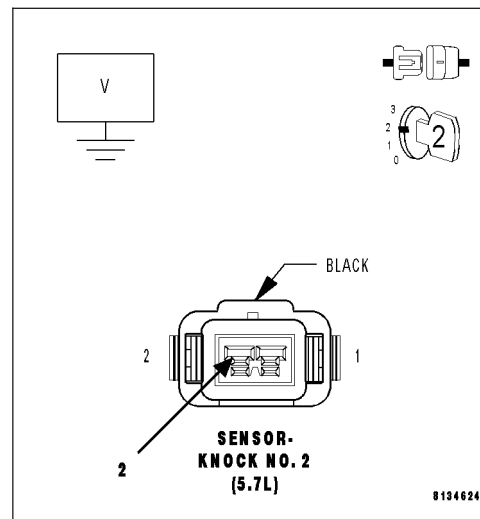
Measure the voltage on the (K242) Knock Sensor No.2 Signal circuit in the Knock Sensor harness connector.

**Does the voltmeter indicate voltage present?**

**Yes** >> Repair the short to battery voltage in the (K242) Knock Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K242) KNOCK SENSOR NO.2 SIGNAL CIRCUIT OPEN**

Turn the ignition off.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

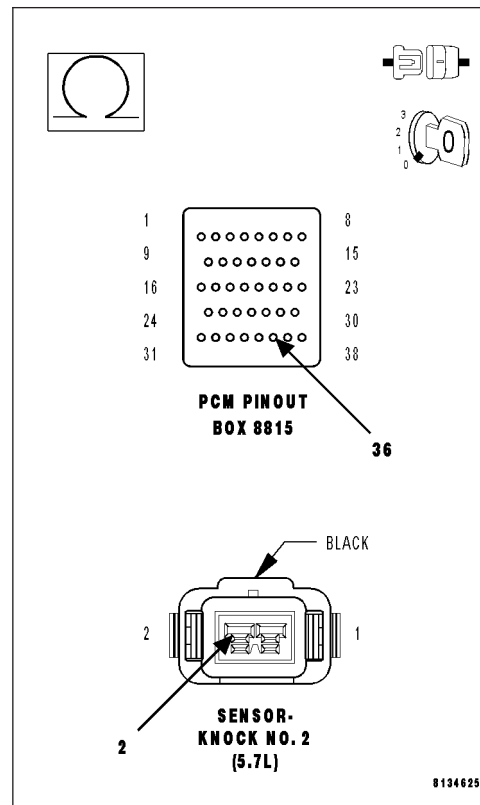
Measure the resistance of the (K242) Knock Sensor No.2 Signal circuit from the Knock Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the open in the (K242) Knock Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





**P0330-KNOCK SENSOR 2 CIRCUIT (CONTINUED)****4. (K924) KNOCK SENSOR NO.2 RETURN CIRCUIT OPEN**

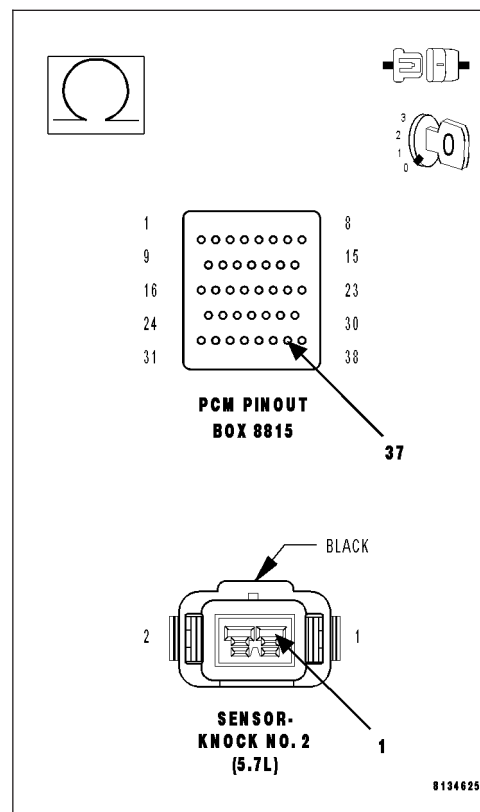
Measure the resistance of the (K924) Knock Sensor No.2 Return circuit from the Knock Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K924) Knock Sensor No.2 Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. (K242) KNOCK SENSOR NO.2 SIGNAL SHORTED TO THE (K924) KNOCK SENSOR NO.2 RETURN CIRCUIT**

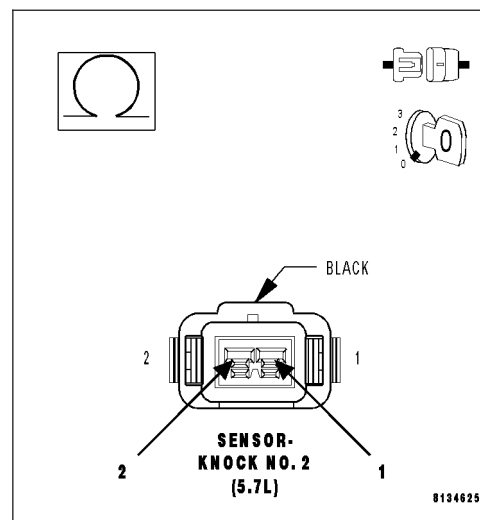
Measure the resistance between the (K242) Knock Sensor No.2 Signal circuit and the (K924) Knock Sensor No.2 Return circuit in the Knock Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K242) Knock Sensor No.2 Signal circuit and the (K924) Knock Sensor No.2 Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P0330-KNOCK SENSOR 2 CIRCUIT (CONTINUED)****6. (K242) KNOCK SENSOR NO.2 SIGNAL SHORTED TO GROUND**

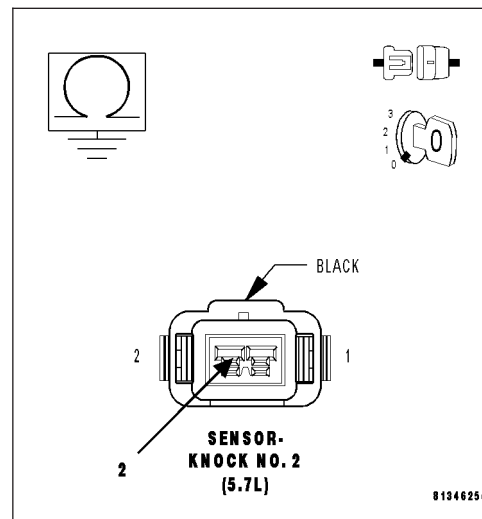
Measure the resistance between ground and the (K242) Knock Sensor No.2 Signal circuit in the Knock Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K242) Knock Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. KNOCK SENSOR**

Replace the Knock Sensor.

Ignition on, engine not running.

With the scan tool, erase DTC.

Attempt to operate the vehicle using the information noted in the Freeze Frame.

With the scan tool, read DTCs.

**Does the scan tool display the DTC that was previously erased?**

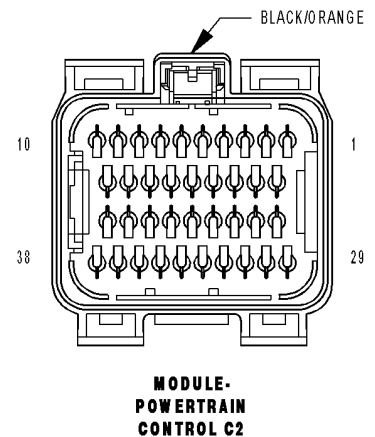
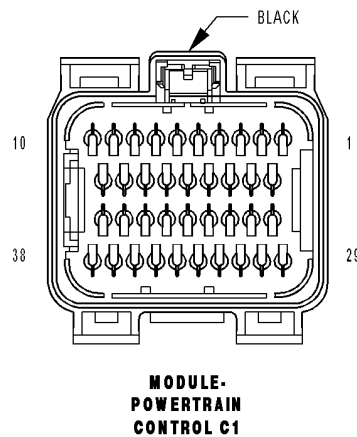
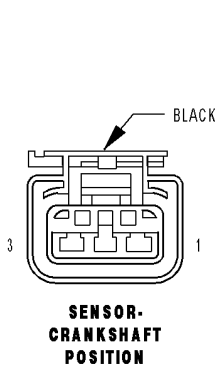
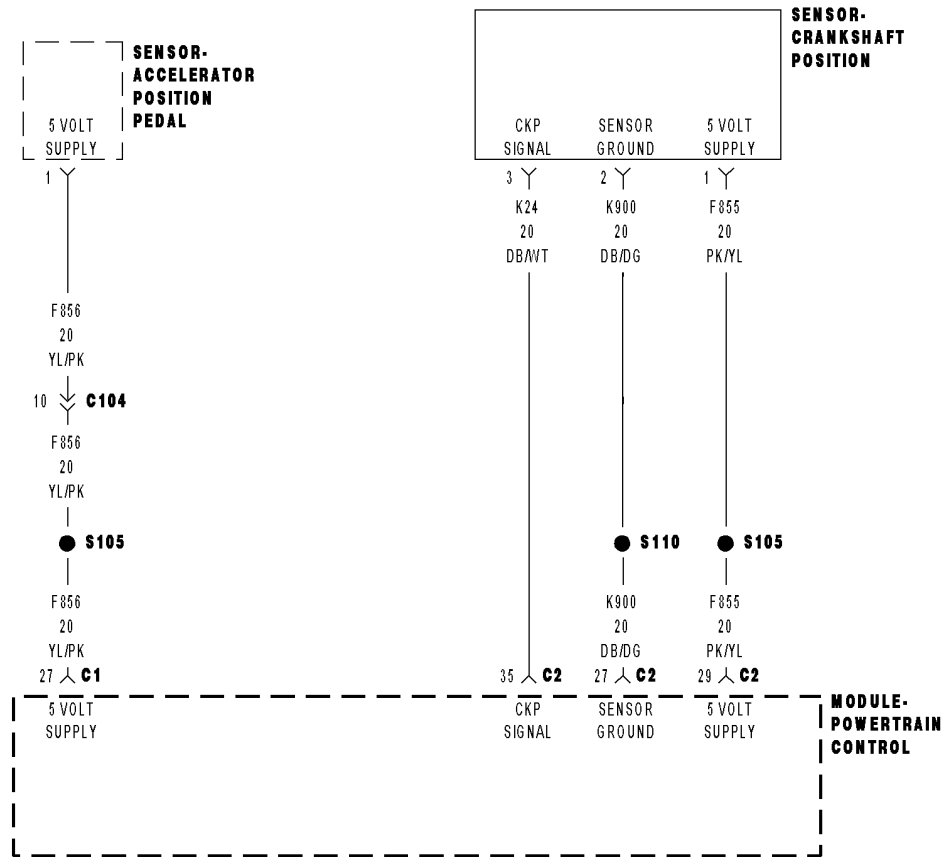
**Yes** >>

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Test Complete.

## P0335-CRANKSHAFT POSITION SENSOR CIRCUIT



**P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Engine cranking.
- **Set Condition:**  
No CKP signal is present during engine cranking, and at least 8 camshaft position sensor signals have occurred. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO BATTERY VOLTAGE
(F855) 5-VOLT SUPPLY CIRCUIT OPEN
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K24) CKP SIGNAL CIRCUIT OPEN
(K24) CKP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K24) CKP SIGNAL CIRCUIT SHORTED GROUND
(K24) CKP SIGNAL CIRCUIT SHORTED TO (F855) 5-VOLT SUPPLY CIRCUIT
(K900) SENSOR GROUND CIRCUIT OPEN
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

Crank the engine.

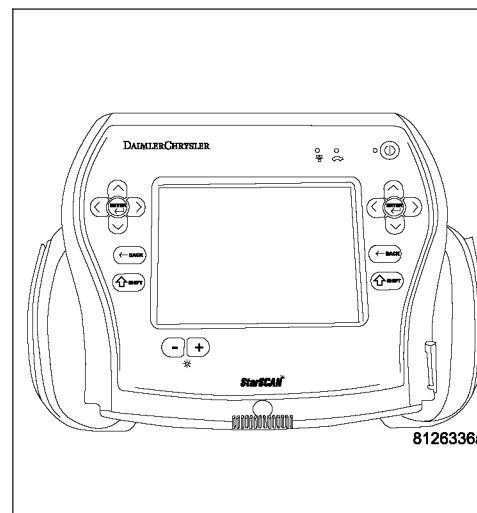
Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Go To 14



**P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)****2. (F855) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the CKP Sensor harness connector.

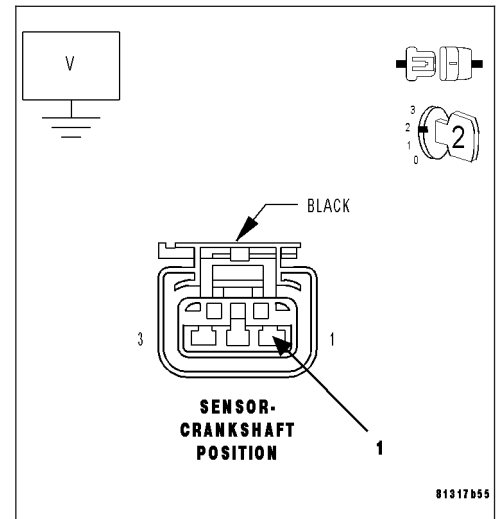
Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit in the CKP Sensor harness connector.

**Is the voltage between 4.5 and 5.2 volts?**

**Yes** >> Go To 3

**No** >> Go To 10

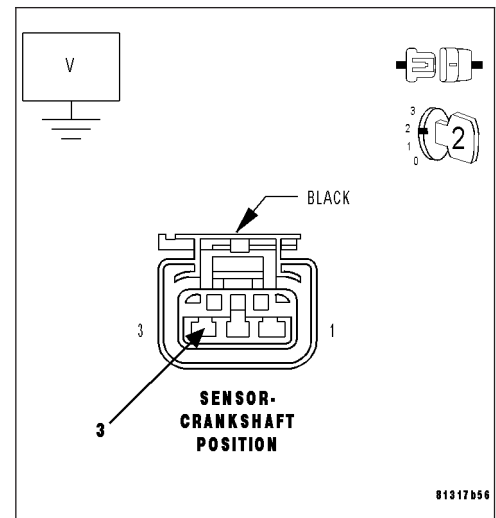
**3. (K24) CKP SIGNAL CIRCUIT**

Measure the voltage on the (K24) CKP Signal circuit in the CKP Sensor harness connector.

**Is the voltage between 4.5 and 5.0 volts?**

**Yes** >> Go To 4

**No** >> Go To 7



## P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

### 4. (K900) SENSOR GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the PCM harness connectors.

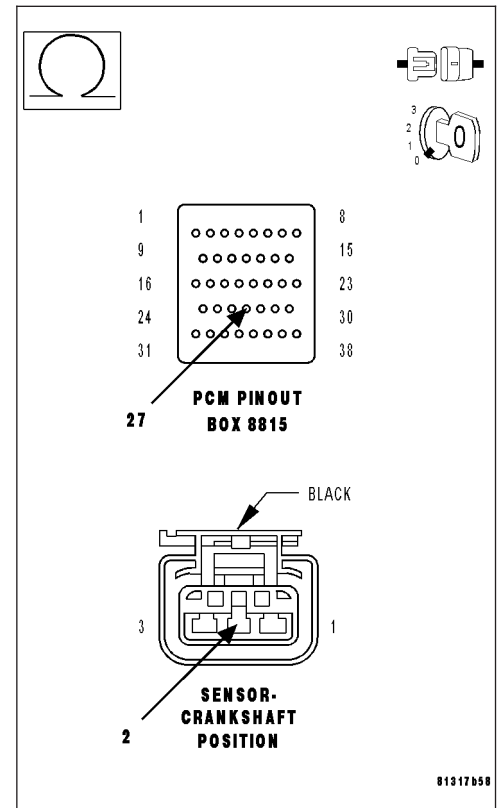
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K900) Sensor ground circuit from the CKP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K900) Sensor ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 5. (K24) CKP SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT

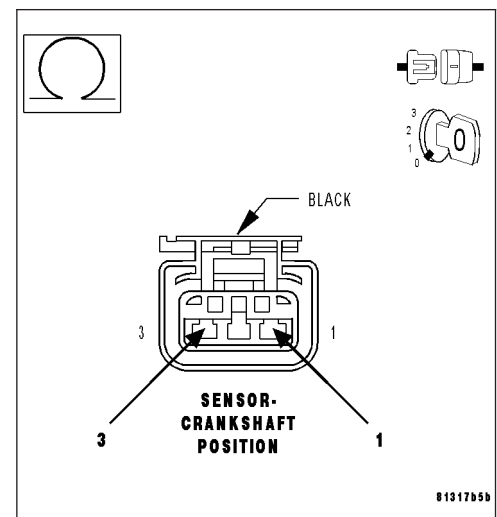
Measure the resistance between the (K24) CKP Signal circuit and the (F855) 5-volt Supply circuit in the CKP Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (K24) CKP Signal circuit and the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)****6. CRANKSHAFT POSITION SENSOR**

**Note:** Inspect the slots on the flywheel for damage. If a problem is found repair as necessary.

If there are no possible causes remaining, view repair.

**Repair**

Replace the Crankshaft Position Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. (K24) CKP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

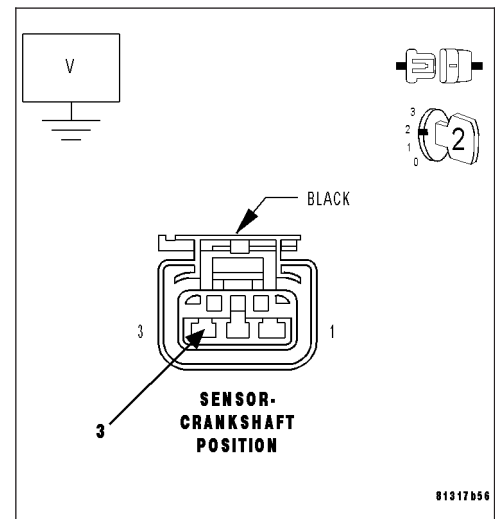
Measure the voltage on the (K24) CKP Signal circuit in the CKP Sensor harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (K24) CKP Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)****8. (K24) CKP SIGNAL CIRCUIT OPEN**

Turn the ignition off.

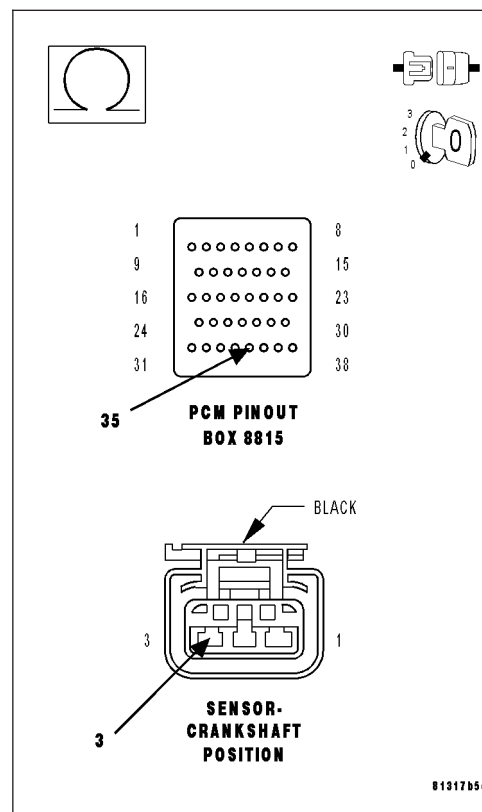
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K24) CKP Signal circuit from the CKP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the open in the (K24) CKP Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

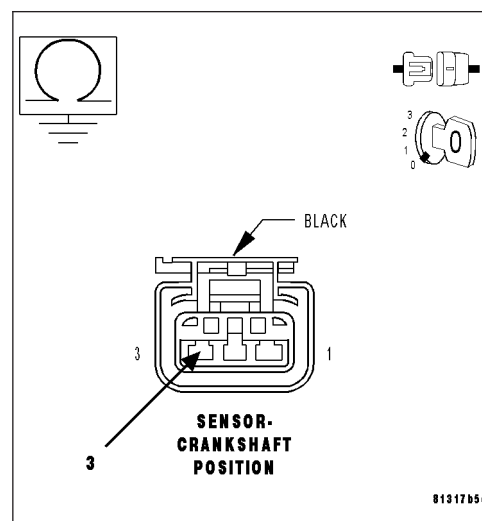
**9. (K24) CKP SIGNAL CIRCUIT SHORTED TO GROUND**

Measure the resistance between ground and the (K24) CKP Signal circuit in the CKP Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short to ground in the (K24) CKP Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 13





**P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)****10. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

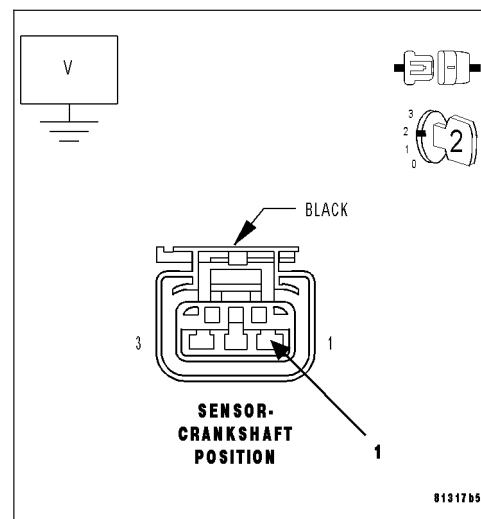
Measure the voltage on the (F855) 5-volt Supply circuit in the CKP Sensor harness connector.

**Is the voltage above 5.5 volts?**

**Yes** >> Repair the short to battery voltage in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11

**11. (F855) 5-VOLT SUPPLY CIRCUIT OPEN**

Turn the ignition off.

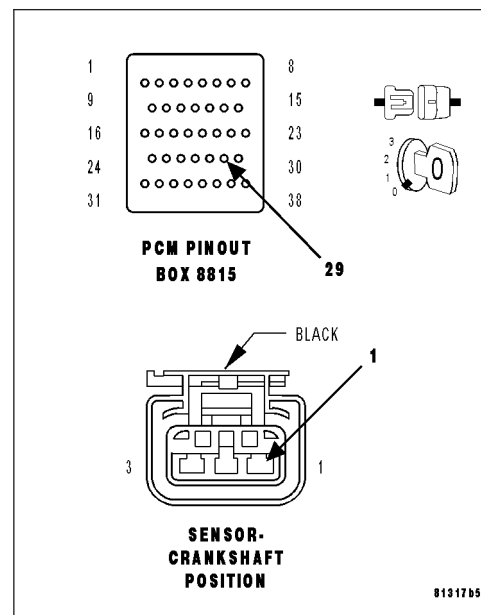
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (F855) 5-volt Supply circuit from the CKP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 12

**No** >> Repair the open in the (F855) 5-volt Supply circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)****12. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

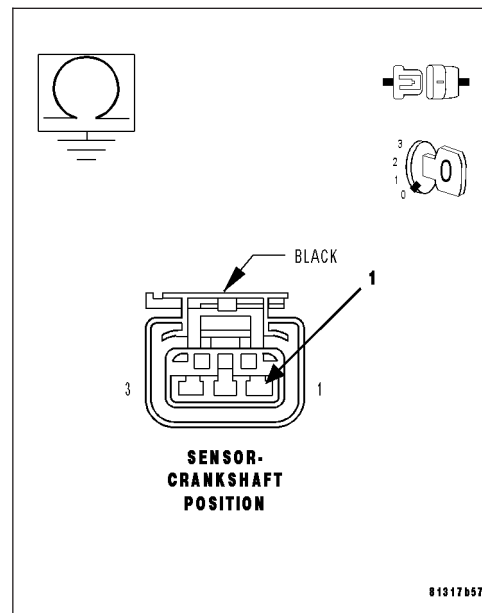
Measure the resistance between ground and the (F855) 5-volt Supply circuit in the CKP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 13

**13. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**P0335-CRANKSHAFT POSITION SENSOR CIRCUIT (CONTINUED)****14. ERRATIC CKP SENSOR SIGNAL**

Turn the ignition off.

With a lab scope probe and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the CKP harness connector.

**WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.**

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Crank Position Sensor.

Observe the lab scope screen.

Look for any pulses generated by the CKP Sensor.

Allow the engine to idle.

Observe the lab scope screen.

**Did the CKP Sensor generate any erratic pulses?**

**Yes** >> Inspect the related wire harness and replace the Crankshaft Position Sensor if no wiring problems were found.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 15

---

**15. ERRATIC CMP SIGNAL**

Turn the ignition off.

With a lab scope probe and the Miller special tool #6801, backprobe the (K44) CMP Signal circuit in the CMP harness connector.

**WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.**

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Cam Position Sensor.

Observe the lab scope screen.

Look for any pulses generated by the CMP Sensor.

Allow the engine to idle.

Observe the lab scope screen.

**Did the CMP Sensor generate any pulses?**

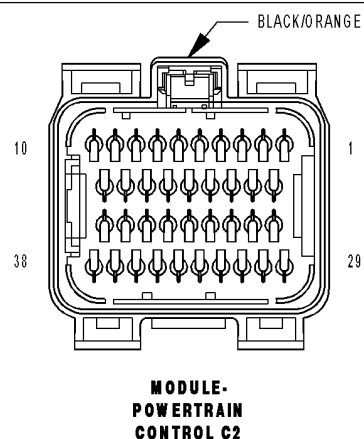
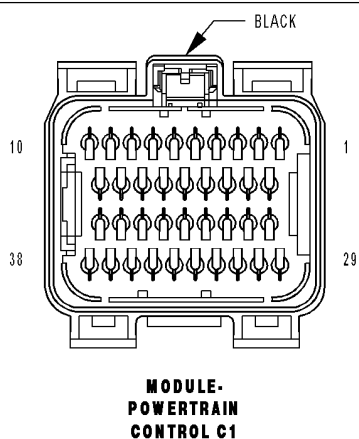
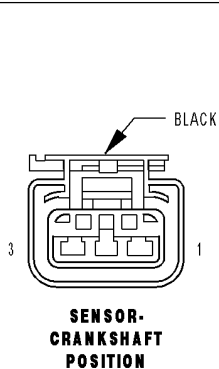
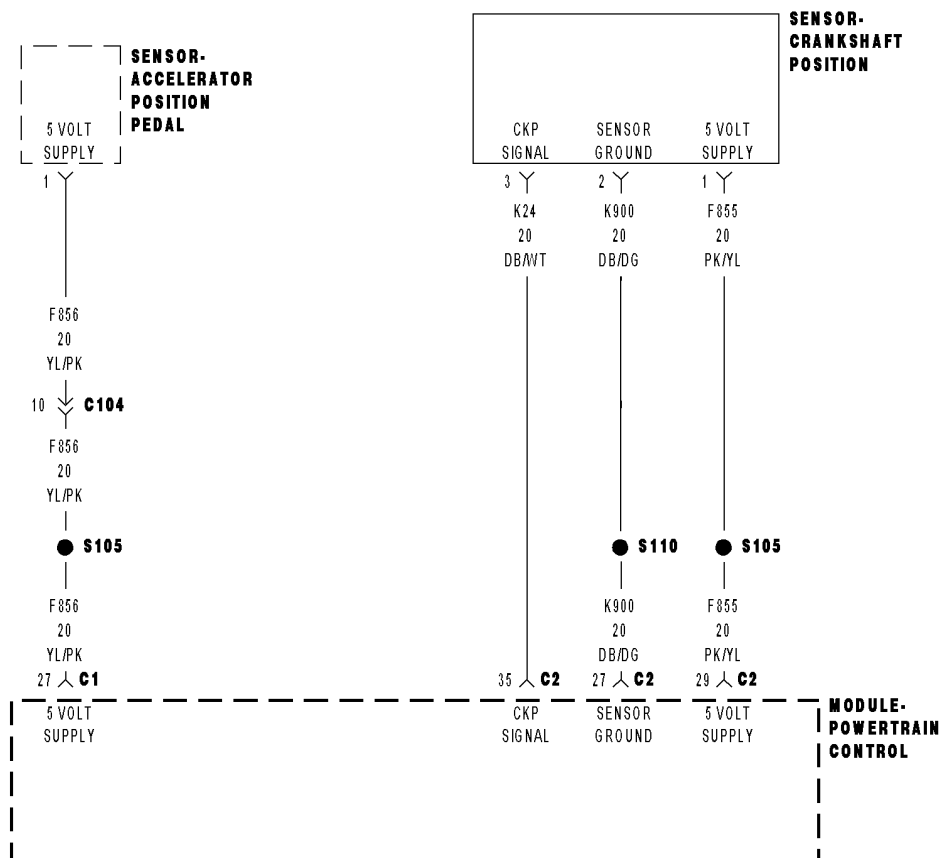
**Yes** >> Inspect the related wire harness and replace the Camshaft Position Sensor if no wiring problems were found.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Test Complete.

---

# P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT



**P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
While cranking the engine and with the engine running.
- **Set Condition:**  
When the CKP Sensor failure counter reaches 20. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(F855) 5-VOLT SUPPLY CIRCUIT OPEN (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND (K24) CKP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE (K24) CKP SIGNAL CIRCUIT OPEN (K24) CKP SIGNAL CIRCUIT SHORTED TO GROUND (K24) CKP SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT CRANKSHAFT POSITION SENSOR TONE WHEEL/PULSE RING PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

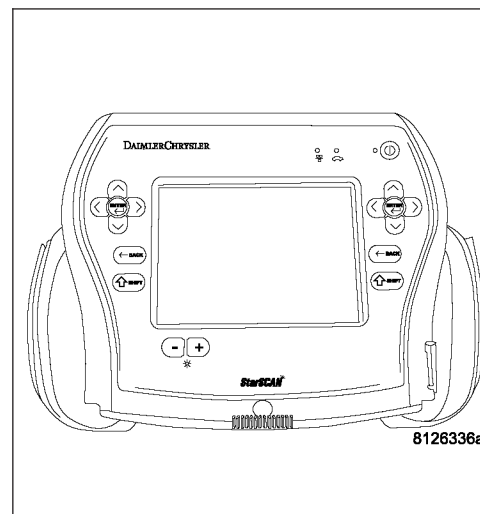
**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

With a scan tool read DTCs.

**Is the DTC active at this time?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.



**P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)****2. CHECKING CRANKSHAFT POSITION SENSOR SIGNAL WITH A LAB SCOPE**

Turn the ignition off.

With a lab scope probe and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the Sensor harness connector.

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

Observe the lab scope screen.

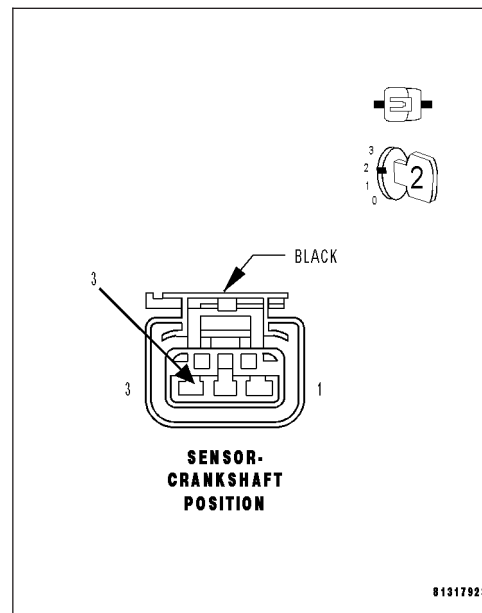
Start the engine.

Observe the lab scope screen.

**Are there any irregular or missing signals?**

**Yes** >> Go To 3

**No** >> Go To 8

**3. WIRE HARNESS INSPECTION**

Turn the ignition off.

Visually inspect the related wire harness including the ground circuit. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Make sure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) are torqued to the proper specification.

Refer to any TSBs that may apply.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)****4. (F855) 5-VOLT SUPPLY CIRCUIT OPEN OR SHORTED TO GROUND**

Disconnect the CKP Sensor connector.

Ignition on, engine not running.

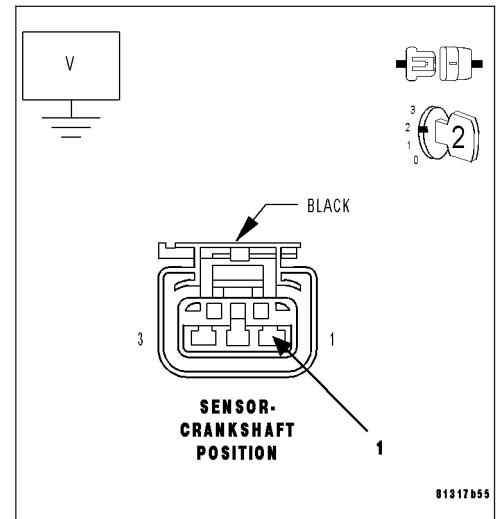
Measure the voltage on the (F855) 5-volt Supply circuit in the Sensor harness connector.

**Is the voltage between 4.5 and 5.2 volts?**

**Yes** >> Go To 5

**No** >> Repair the open or short to ground in the (F855) 5-volt Supply circuit. Use Miller special tool #8815 when checking for an open circuit to prevent PCM harness connector terminal damage.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. TONE WHEEL/FLEX PLATE INSPECTION**

Turn the ignition off.

Carefully disconnect the Negative Battery (Ground) cable.

Remove the Crankshaft Position Sensor.

Inspect the Tone Wheel/Flex Plate slots for damage, foreign material, or excessive movement.

**Were any problems found?**

**Yes** >> Repair or replace the Tone Wheel/Flex Plate as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)****6. CHECKING CAMSHAFT POSITION SENSOR SIGNAL WITH A LAB SCOPE**

Install the CKP Sensor and connect the battery cable.

**Note:** An intermittent condition in the Cam Position Sensor can cause the P0339 to set.

With the a lab scope probe and the Miller special tool #6801, back-probe the (K44) CMP Signal circuit in the Sensor harness connector.

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Cam Position Sensor.

Observe the lab scope screen.

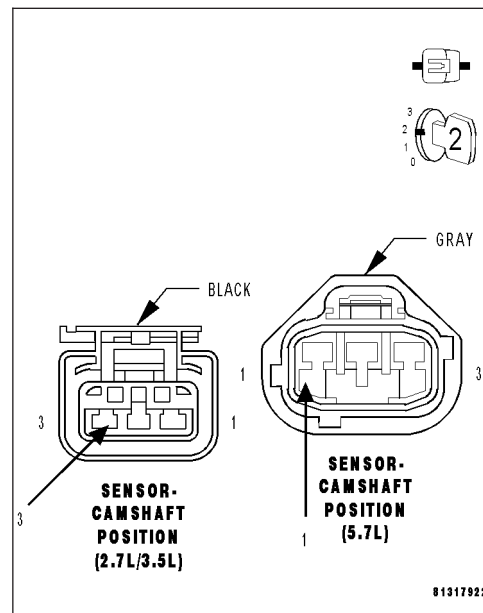
Start the engine.

Observe the lab scope screen.

**Are there any irregular or missing signals?**

**Yes** >> Replace the Cam Position Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. CRANKSHAFT POSITION SENSOR**

If there are no possible causes remaining, view repair.

**Repair**

Replace the Crankshaft Position Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)****8. (K24) CKP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect the CKP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (K24) CKP Signal circuit in the Sensor harness connector.

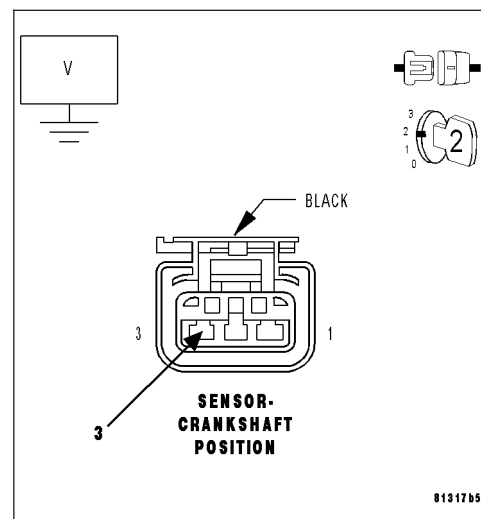
Wiggle the related wire harness while taking this measurement.

**Is the voltage above 1 volt?**

**Yes** >> Repair the short to battery voltage in the (K24) CKP Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 9

**9. (K24) CKP SIGNAL CIRCUIT OPEN**

Turn the ignition off.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance in the (K24) CKP Signal circuit from the CKP harness connector to the appropriate terminal of special tool #8815.

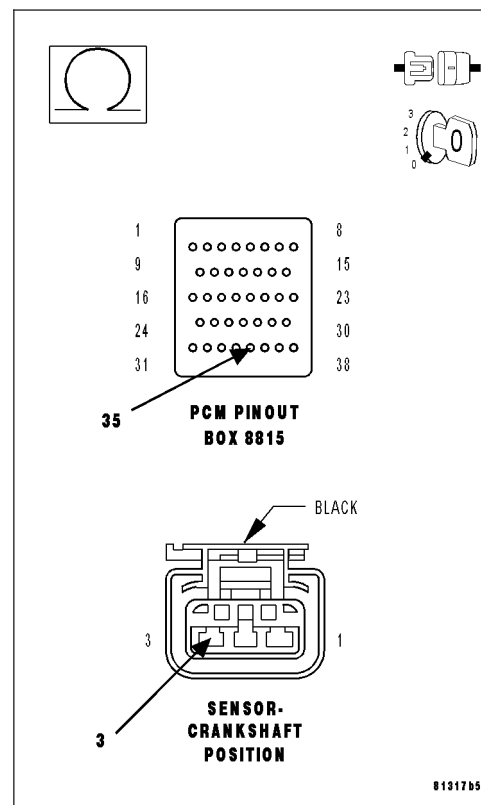
Wiggle the wire harness while taking this measurement.

**Is the resistance below 1.0 ohm?**

**Yes** >> Go To 10

**No** >> Repair the excessive resistance in the (K24) CKP Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0339-CRANKSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)****10. (K24) CKP SIGNAL CIRCUIT SHORTED TO GROUND**

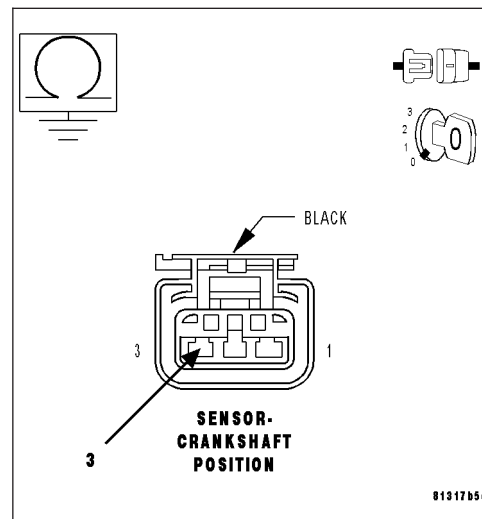
Measure the resistance between ground and the (K24) CKP Signal circuit in the CKP Sensor harness connector.

Wiggle the related wire harness while monitoring the resistance value.

**Does the resistance ever go below 100 ohms?**

**Yes** >> Repair the short to ground in the (K24) Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11

**11. (K24) CKP SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT**

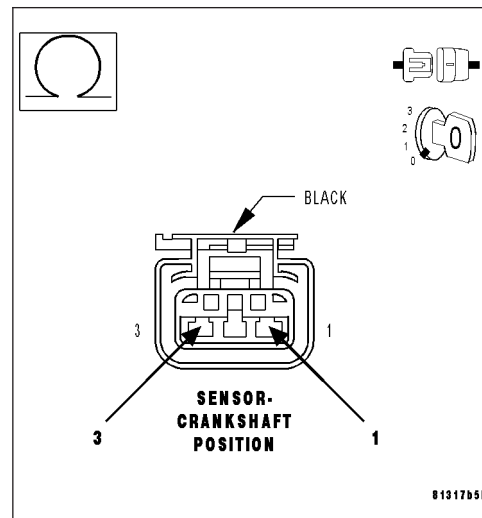
Measure the resistance between the (F855) 5-volt Supply circuit and the (K24) CKP Signal circuit in the CKP harness connector.

Wiggle the related wire harness while taking this measurement.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (F855) 5-volt Supply circuit and the (K24) CKP Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 12

**12. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

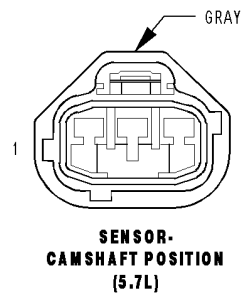
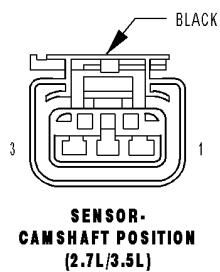
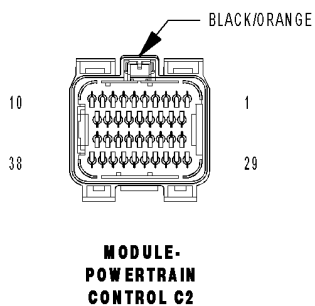
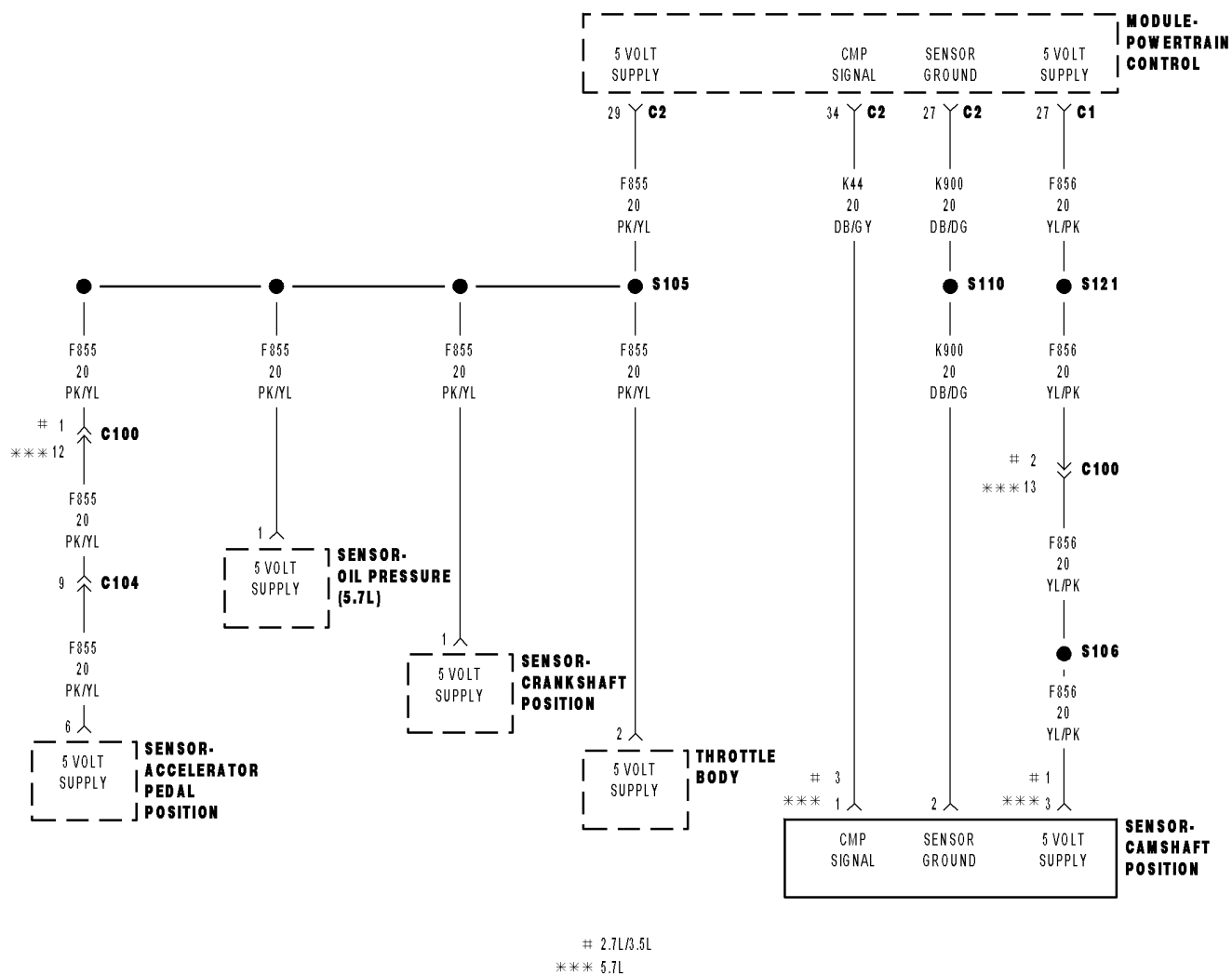
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0340-CAMSHAFT POSITION SENSOR CIRCUIT



### P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:**  
 During engine cranking and with the engine running. Battery voltage greater than 10 volts.
- Set Condition:**  
 At least 5 seconds or 2.5 engine revolutions have elapsed with crankshaft position sensor signals present but no camshaft position sensor signal. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO BATTERY VOLTAGE (F856) 5-VOLT SUPPLY CIRCUIT OPEN (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND (K44) CMP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE (K44) CMP SIGNAL CIRCUIT OPEN (K44) CMP SIGNAL CIRCUIT SHORTED GROUND (K44) CMP SIGNAL SHORTED TO (F856) 5-VOLT SUPPLY CIRCUIT (K900) SENSOR GROUND CIRCUIT OPEN CAMSHAFT POSITION SENSOR CRANKSHAFT POSITION SENSOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

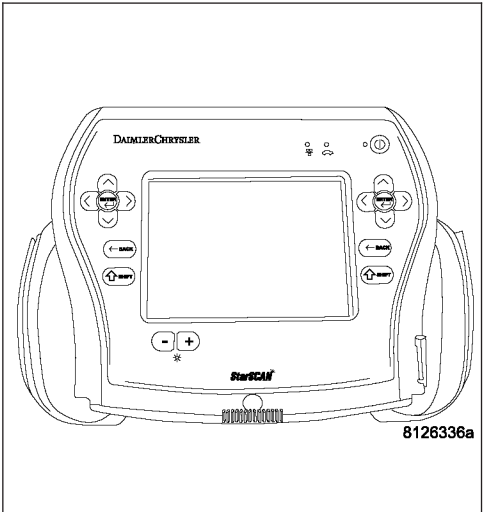
## Diagnostic Test

### 1. ACTIVE DTC

Crank the engine.  
 Ignition on, engine not running.  
 With a scan tool read the DTCs.

**Is the DTC active at this time?**

- Yes**    >> Go To 2
- No**     >> Go To 14



**P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)****2. (F856) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the CMP Sensor harness connector.

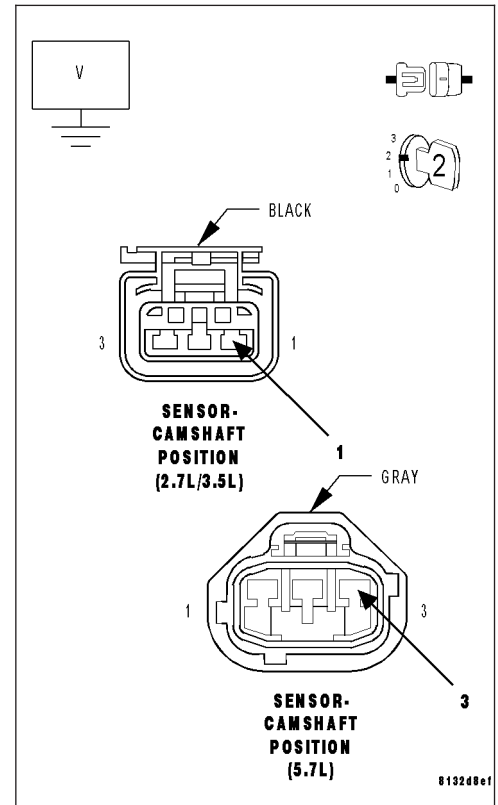
Ignition on, engine not running.

Measure the voltage on the (F856) 5-volt Supply circuit in the CMP Sensor harness connector.

**Is the voltage between 4.5 and 5.2 volts?**

**Yes** >> Go To 3

**No** >> Go To 10

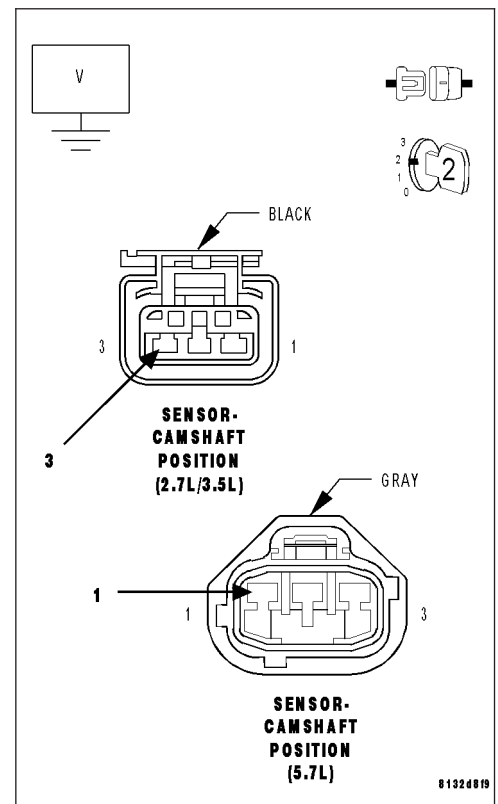
**3. (K44) CMP SIGNAL CIRCUIT**

Measure the voltage on the (K44) CMP Signal circuit in the CMP Sensor harness connector.

**Is the voltage between 4.5 and 5.0 volts?**

**Yes** >> Go To 4

**No** >> Go To 7



## P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

### 4. (K900) SENSOR GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the PCM harness connectors.

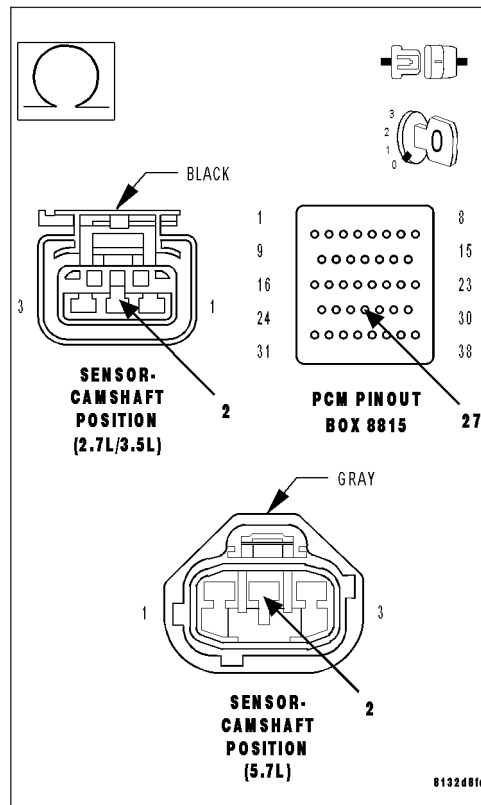
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K900) Sensor ground circuit from the CMP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K900) Sensor ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



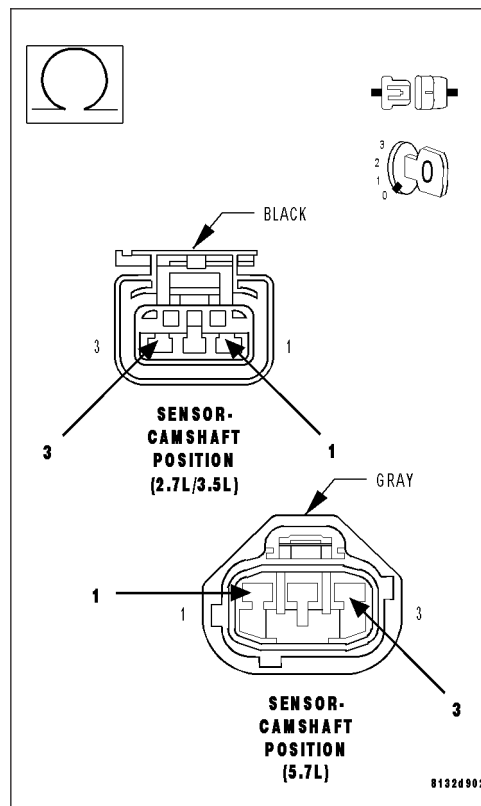
### 5. (K44) CMP SIGNAL SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT

Measure the resistance between the (K44) CMP Signal circuit and the (F856) 5-volt Supply circuit in the CMP Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (K44) CMP Signal circuit and the (F856) 5-volt Supply circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)****6. CAMSHAFT POSITION SENSOR**

**Note:** Inspect the Camshaft sprocket for damage per the Service Information. If a problem is found repair as necessary.

If there are no possible causes remaining, view repair.

**Repair**

Replace the Camshaft Position Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. (K44) CMP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

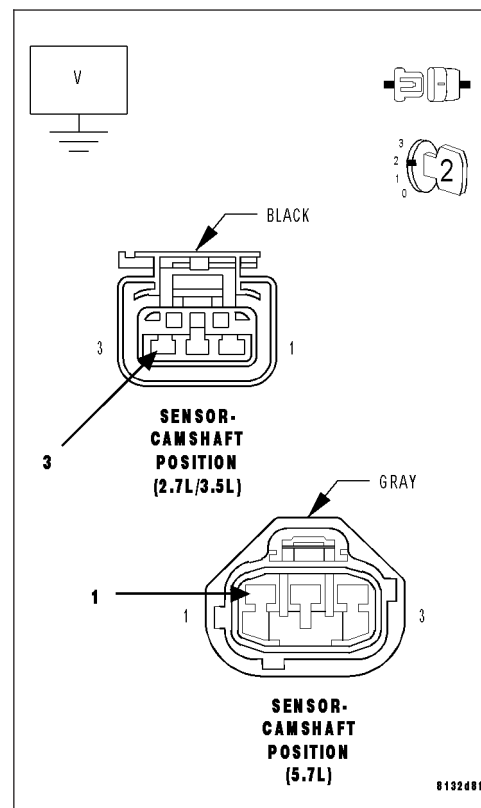
Measure the voltage on the (K44) CMP Signal circuit in the CMP Sensor harness connector.

**Is the voltage above 0 volts?**

**Yes** >> Repair the short to battery voltage in the (K44) CMP Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8



## P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

### 8. (K44) CMP SIGNAL CIRCUIT OPEN

Turn the ignition off.

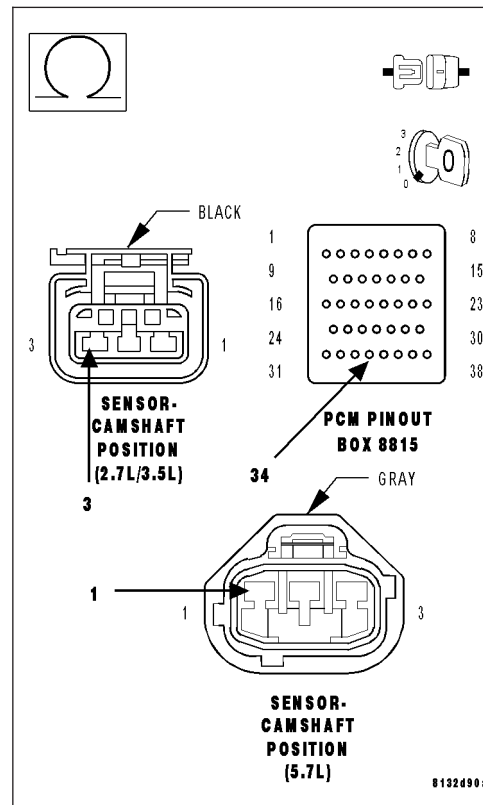
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K44) CMP Signal circuit from the CMP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the open in the (K44) CMP Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



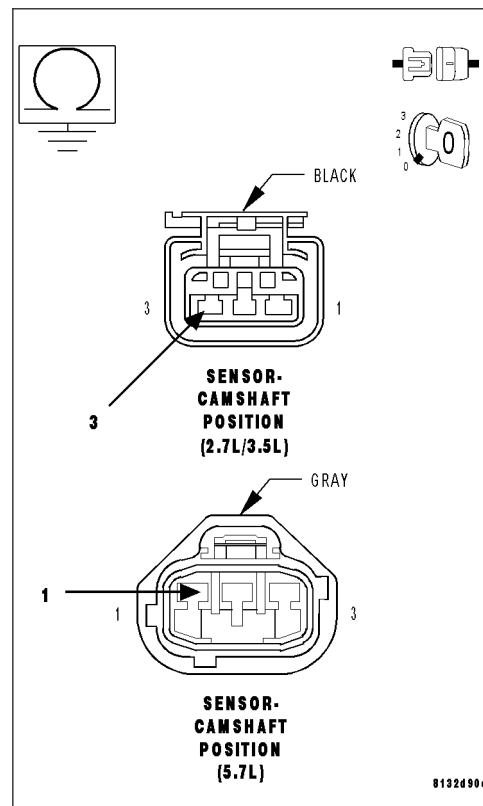
### 9. (K44) CMP SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K44) CMP Signal circuit in the CMP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K44) CMP Signal circuit  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 10





**P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)****10. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

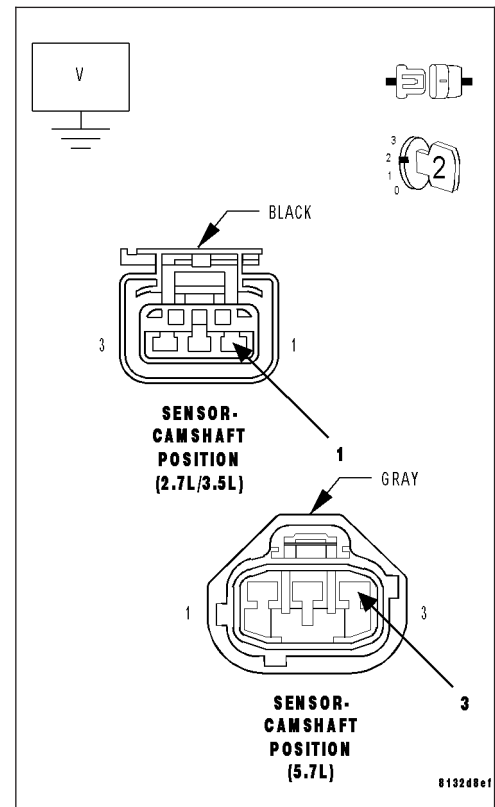
Measure the voltage on the (F856) 5-volt Supply circuit in the CMP Sensor harness connector.

**Is the voltage above 0 volts?**

**Yes** >> Repair the short to battery voltage in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11

**11. (F856) 5-VOLT SUPPLY CIRCUIT OPEN**

Turn the ignition off.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

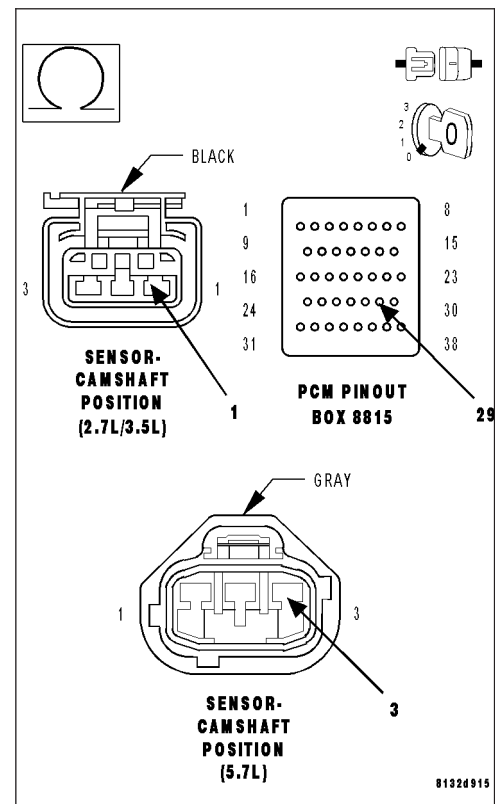
Measure the resistance of the (F856) 5-volt Supply circuit between the CMP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 12

**No** >> Repair the open in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

### 12. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

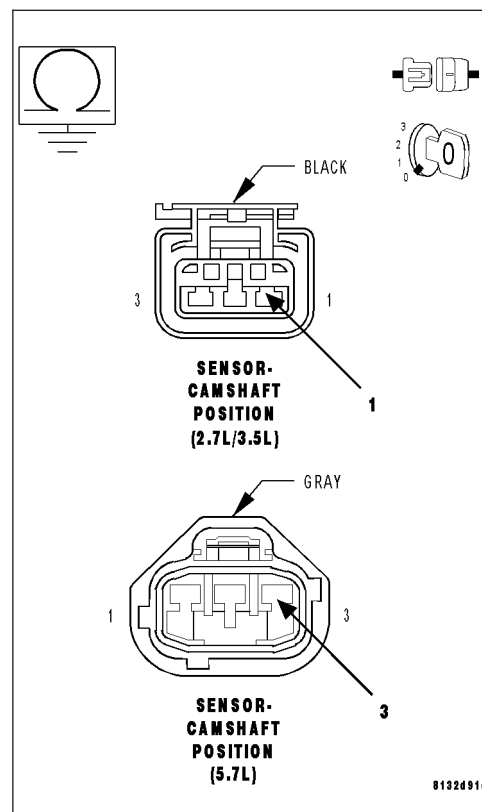
Measure the resistance between ground and the (F856) 5-volt Supply circuit in the CMP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 13



## 13. PCM

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0340-CAMSHAFT POSITION SENSOR CIRCUIT (CONTINUED)

## 14. ERRATIC CMP SIGNAL

With a lab scope probe and the Miller special tool #6801, back probe the (K44) CMP Signal circuit in the CMP harness connector.

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap the Camshaft Position Sensor.

Observe the lab scope screen.

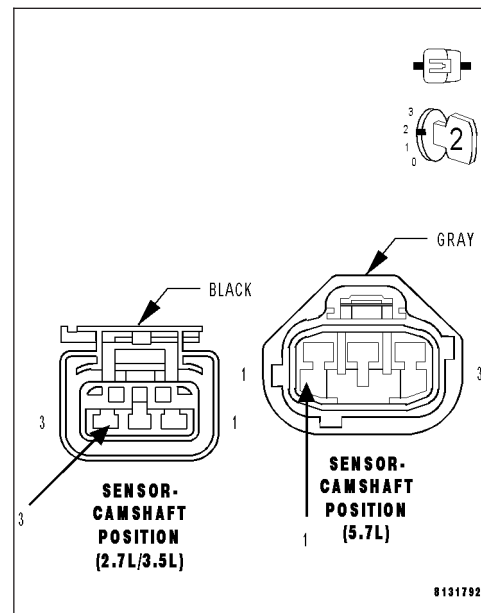
Allow the engine to idle.

Observe the lab scope screen.

**Did the CMP Sensor generate any erratic pulses?**

**Yes** >> Replace the Camshaft Position Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 15



## 15. ERRATIC CKP SIGNAL

Turn the ignition off.

With a lab scope probe and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the CKP harness connector.

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Crankshaft Position Sensor.

Observe the lab scope screen.

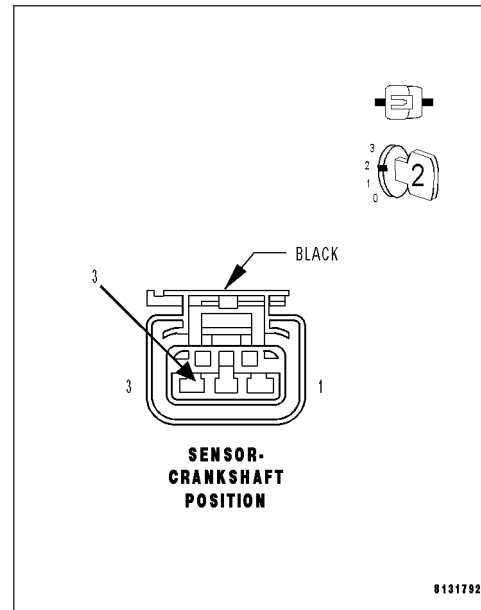
Allow the engine to idle.

Observe the lab scope screen.

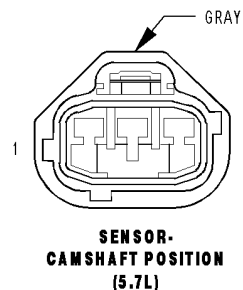
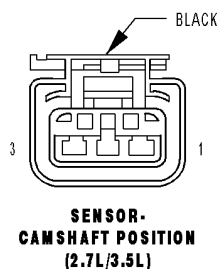
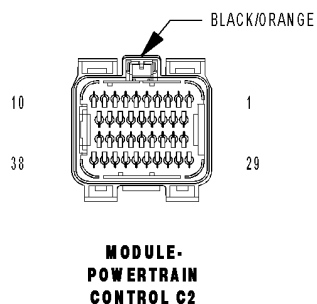
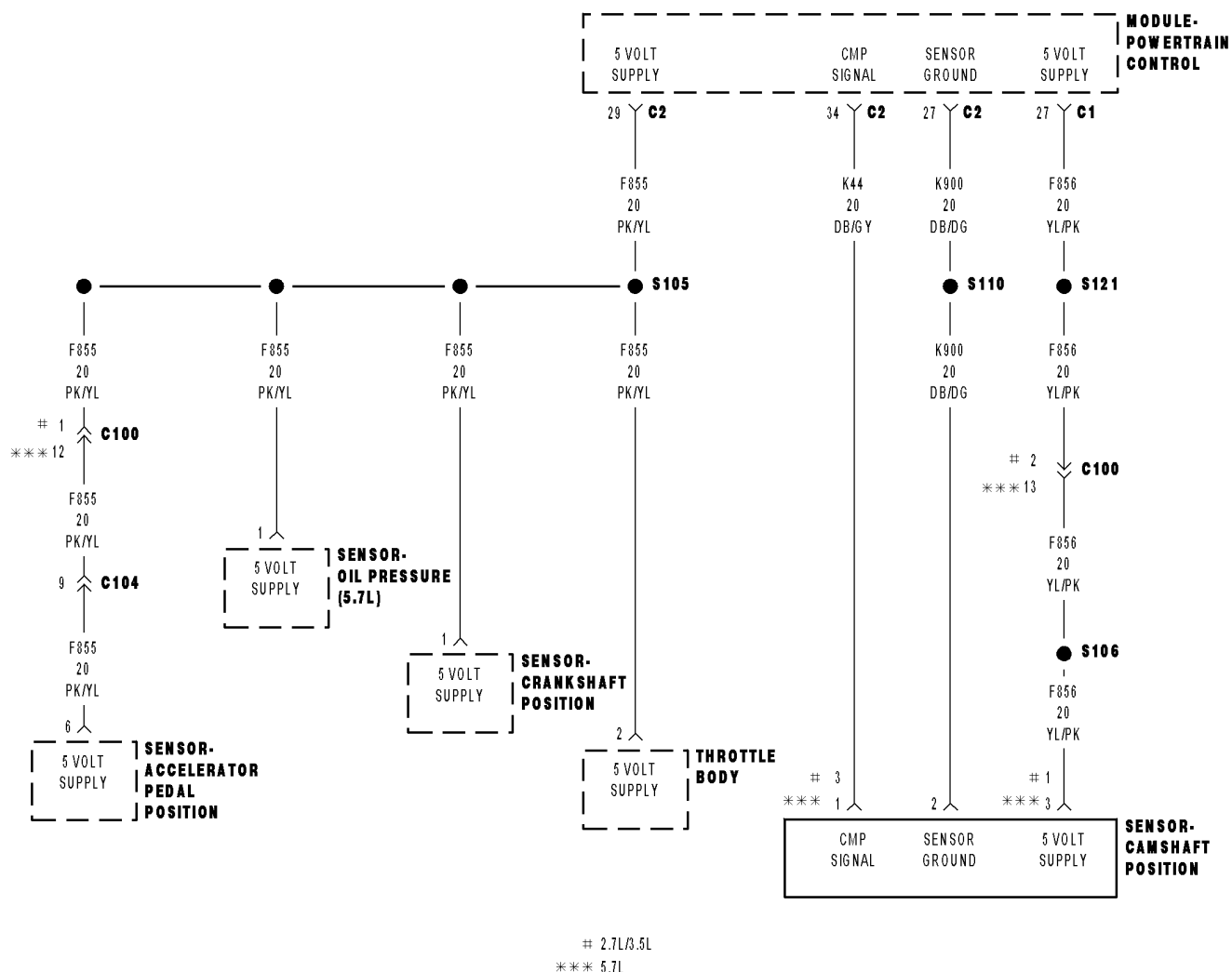
**Did the CKP Sensor generate any erratic pulses?**

**Yes** >> Replace the Crankshaft Position Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Test Complete.



# P0344-CAMSHAFT POSITION SENSOR INTERMITTENT



**P0344-CAMSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

While cranking the engine and engine running.

- **Set Condition:**

When the failure counter reaches 20. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT OPEN (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND (K44) CMP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE (K44) CMP SIGNAL CIRCUIT OPEN (K44) CMP SIGNAL CIRCUIT SHORTED TO GROUND (K44) CMP SIGNAL CIRCUIT SHORTED TO (F856) 5-VOLT SUPPLY TONE WHEEL/PULSE RING CAMSHAFT POSITION SENSOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

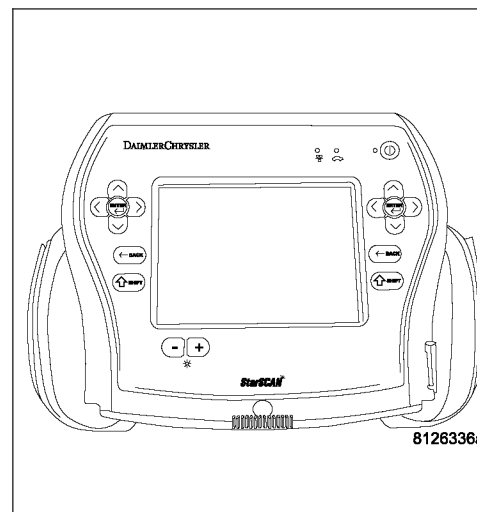
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0344-CAMSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)****2. CHECKING CAMSHAFT POSITION SENSOR SIGNAL WITH A LAB SCOPE**

Turn the ignition off.

With a lab scope probe and the Miller special tool #6801, backprobe the (K44) CMP Signal circuit in the CMP harness connector.

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

Observe the lab scope screen.

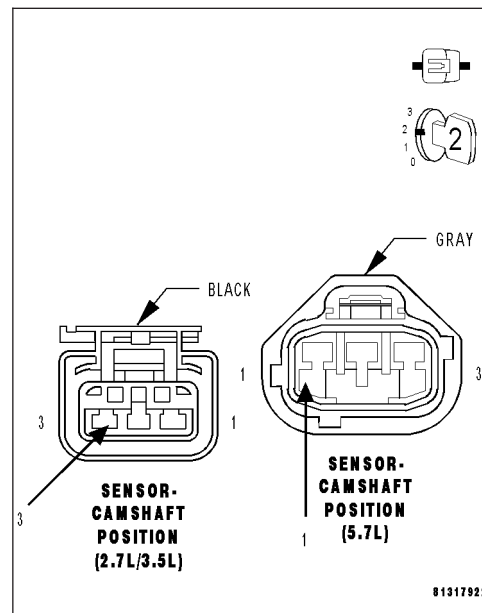
Start the engine.

Observe the lab scope screen.

**Are there any irregular or missing signals?**

**Yes** >> Go To 3

**No** >> Go To 8

**3. WIRE HARNESS INSPECTION**

Turn the ignition off.

Visually inspect the related wire harness including the ground circuit. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Make sure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) are torqued to the proper specification.

Refer to any TSBs that may apply.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**P0344-CAMSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)****4. (F856) 5-VOLT SUPPLY CIRCUIT OPEN OR SHORTED TO GROUND**

Disconnect the CMP Sensor connector.

Ignition on, engine not running.

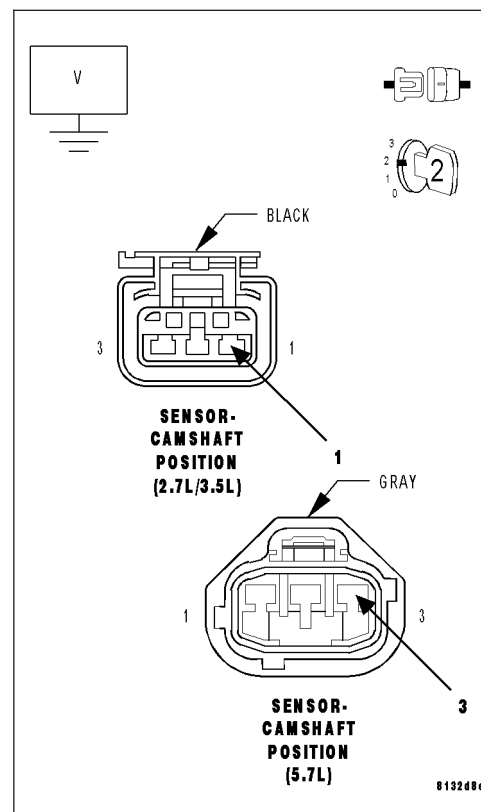
Measure the voltage on the (F856) 5-volt Supply circuit in the CMP harness connector.

**Is the voltage between 4.5 and 5.2 volts?**

**Yes** >> Go To 5

**No** >> Repair the open or short to ground in the (F856) 5-volt Supply circuit. Use Miller special tool #8815 when checking for an open circuit to prevent PCM harness connector terminal damage.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. TONE WHEEL/PULSE RING INSPECTION**

Turn the ignition off.

Carefully disconnect the Battery Ground cable.

Remove the Camshaft Position Sensor.

Inspect the Tone Wheel/Pulse Ring for damage, foreign material, or excessive movement.

**Were any problems found?**

**Yes** >> Repair or replace the Tone Wheel/Pulse Ring as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**P0344-CAMSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)****6. CHECKING CRANKSHAFT POSITION SENSOR SIGNAL WITH A LAB SCOPE**

**Note:** An intermittent condition in the Crank Position Sensor can cause the P0344 to set.

Install the CMP Sensor and connect the Battery cable.

With a lab scope probe and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the CKP harness connector.

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

Wiggle the related wire harness and lightly tap on the Crank Position Sensor.

Observe the lab scope screen.

Start the engine.

Observe the lab scope screen.

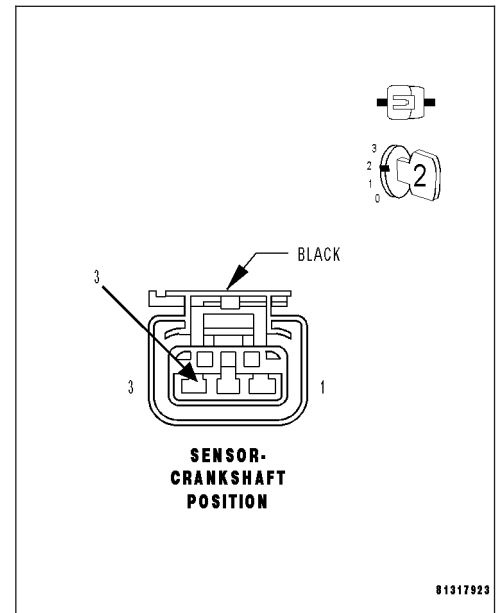
**Are there any irregular or missing signals?**

**Yes** >> Replace the Crank Position Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER

- 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. CAMSHAFT POSITION SENSOR**

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Camshaft Position Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0344-CAMSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)****8. (K44) CMP SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the CMP Sensor connector.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

Measure the voltage on the (K44) CMP Signal circuit.

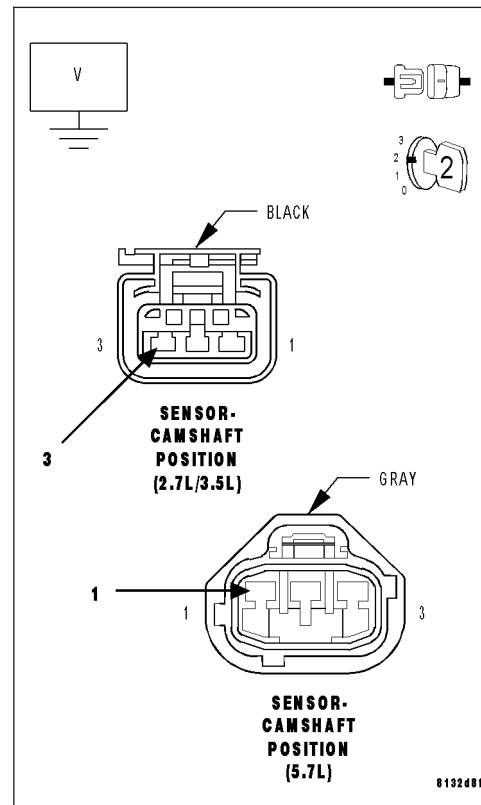
Wiggle the related wire harness while taking this measurement.

**Does the voltage ever increase above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (K44) CMP Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 9

**9. (K44) CMP SIGNAL CIRCUIT OPEN**

Turn the ignition off.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance in the (K44) CMP Signal circuit from the CMP harness connector to the appropriate terminal of special tool #8815.

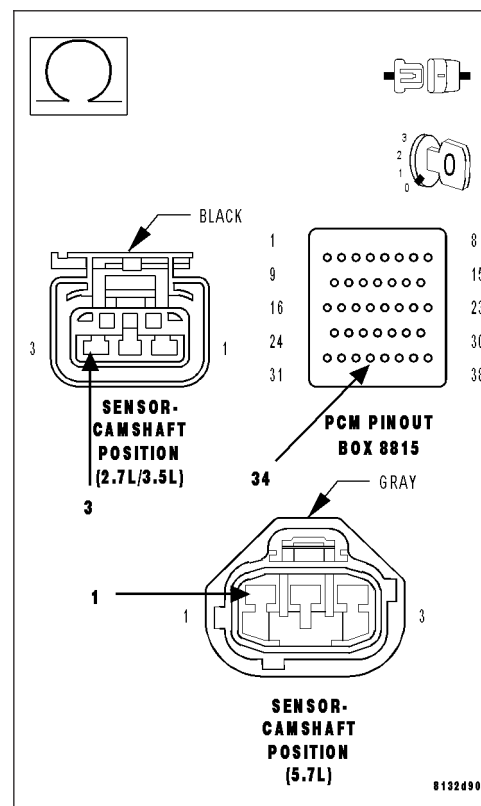
Wiggle the related wire harness while taking this measurement.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 10

**No** >> Repair the excessive resistance in the (K44) CMP Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0344-CAMSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)****10. (K44) CMP SIGNAL CIRCUIT SHORTED TO GROUND**

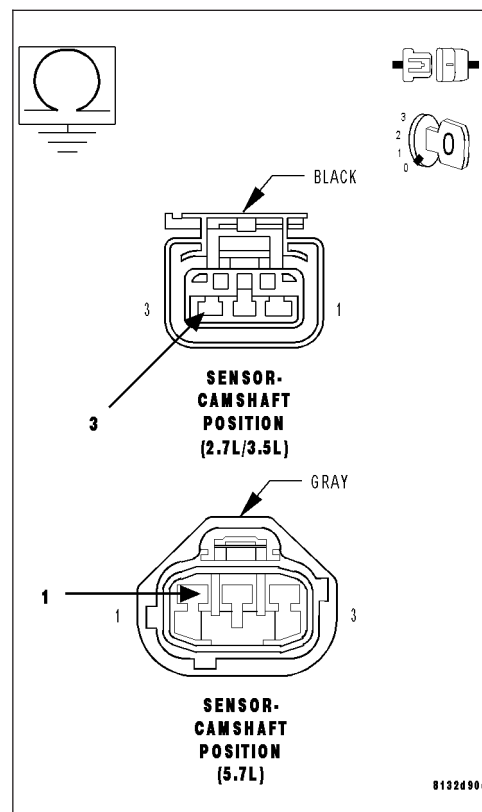
Measure the resistance between ground and the (K44) CMP Signal circuit in the CMP Sensor harness connector.

Wiggle the related wire harness while monitoring the resistance value.

**Does the resistance ever go below 100 ohms?**

**Yes** >> Repair the short to ground in the (K44) CMP Signal circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11



**P0344-CAMSHAFT POSITION SENSOR INTERMITTENT (CONTINUED)****11. (K44) CMP SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT**

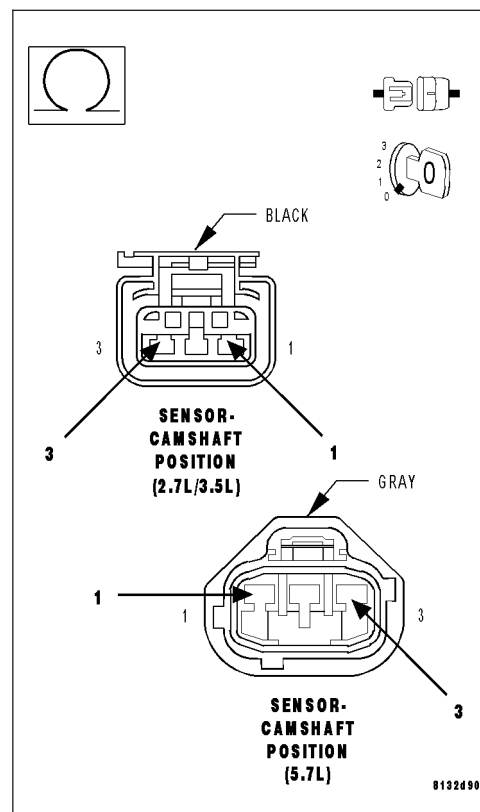
Measure the resistance between the (F856) 5-volt Supply circuit and the (K44) CMP Signal circuit in the CMP harness connector.

Wiggle the related wire harness while taking this measurement.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (F856) 5-volt Supply circuit and the (K44) CMP Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 12

**12. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

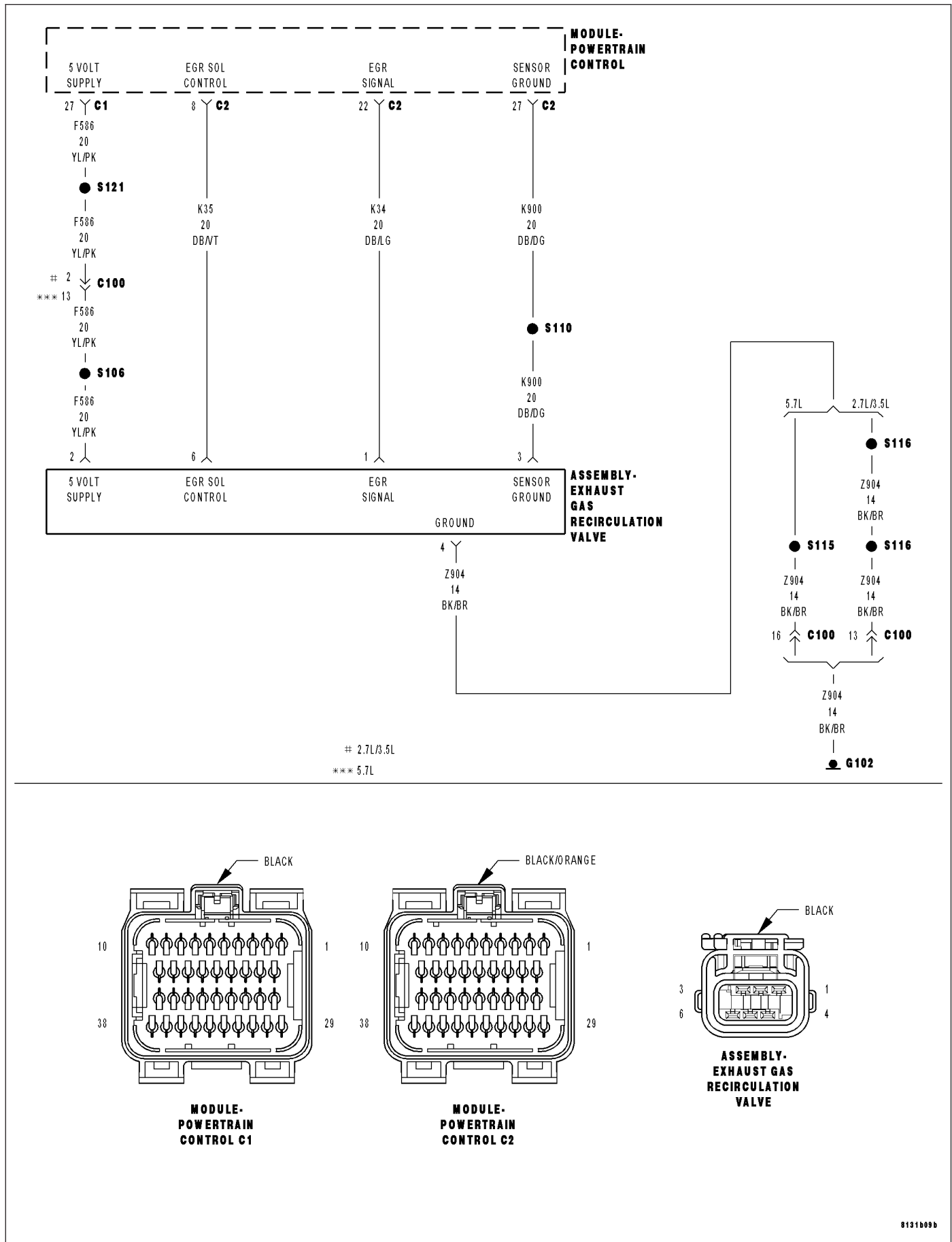
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

# P0401-EGR SYSTEM PERFORMANCE



**P0401-EGR SYSTEM PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running for greater than two minutes with the Engine Coolant Temp greater than 70°C (158°F). EGR active. Less than 8500 feet. Ambient temperature greater than -6°C (20°F).

- **Set Condition:**

The PCM closes the EGR valve while monitoring the O2 Sensor signal. Once a closed EGR fueling sample has been established the PCM then ramps in EGR and additional fueling while monitoring the O2 sensor signal in the open state. A fueling sample is again established. The PCM then compares the different O2 Sensor signal readings (fueling samples). If a larger than expected variation is detected, a soft failure is recorded. Three soft failures set a one trip failure. After two failed trips, a DTC is set and the MIL is illuminated.

Possible Causes
(Z904) EGR SOLENOID GROUND CIRCUIT OPEN
(K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
(K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K35) EGR SOLENOID CONTROL CIRCUIT OPEN
EGR SOLENOID ASSEMBLY
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

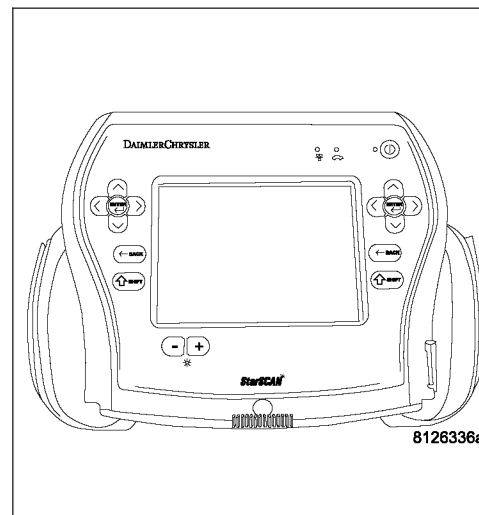
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0401-EGR SYSTEM PERFORMANCE (CONTINUED)****2. EGR OPERATION**

**Note:** If the vehicle is running rough at idle (scan tool not actuating) follow the yes path to continue.

Turn all accessories off.

Start the engine.

Allow the engine to reach normal operating temperature.

With the scan tool, enter Engine System Test, then EGR System Test.

Actuate the FLOW function in the EGR System Test.

**Did the engine run rough or stall?**

**Yes** >> Go To 3

**No** >> Go To 6

---

**3. EGR VALVE OPEN AT IDLE**

Turn the ignition off.

Disconnect the EGR Solenoid Assembly harness connector.

Start engine. Attempt to allow the engine to idle.

**Does the engine run rough or stall?**

**Yes** >> Inspect the EGR tube assembly. If OK, replace the EGR valve.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

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**4. EGR VALVE ASSEMBLY INSPECTION**

Inspect the EGR Assembly for the following.

Gasket(s) for leaking

Damage and/or holes in the EGR tube(s)

Carbon build up on or near the EGR pintle and passage ways.

Obstruction in the EGR tubes.

**Were any problem found?**

**Yes** >> Repair or replace the EGR Assembly as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

---

**P0401-EGR SYSTEM PERFORMANCE (CONTINUED)****5. (K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the EGR Solenoid harness connector.

Ignition on, engine not running.

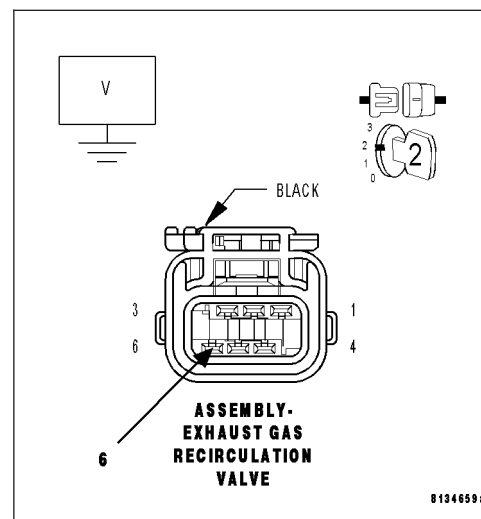
Measure the voltage on the (K35) EGR Solenoid Control circuit in the EGR Solenoid connector.

**Is the voltage above 1.0 volt?**

**Yes** >> Repair the short to battery voltage in the (K35) EGR Solenoid Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 10

**6. EGR SOLENOID ASSEMBLY**

Disconnect the EGR Solenoid harness connector.

Using a 12-volt test light, jump across the (K35) EGR Solenoid Control terminal and the (Z904 Ground terminal in the EGR Solenoid harness connector.

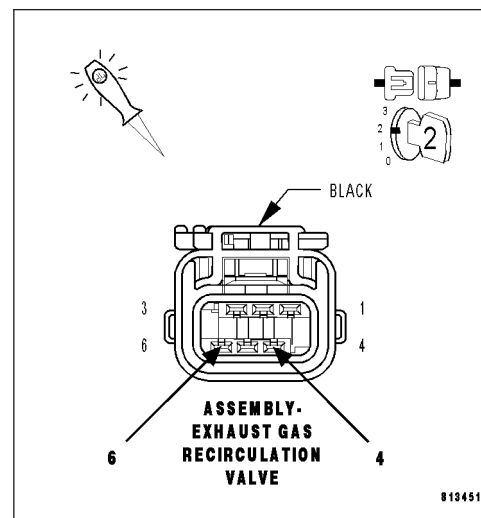
With the scan tool, actuate the EGR solenoid.

**Does the 12-volt test light flash on and off?**

**Yes** >> Inspect the tube(s) for obstructions and damage, repair as necessary. If OK, replace the EGR Solenoid Assembly.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7



## P0401-EGR SYSTEM PERFORMANCE (CONTINUED)

### 7. (Z904) EGR SOLENOID GROUND CIRCUIT OPEN

Turn the ignition off.

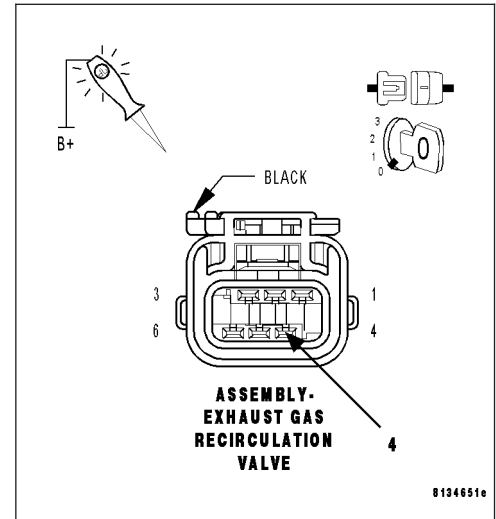
Using a 12-volt test light connected to battery voltage, probe the (Z904) EGR Solenoid ground circuit in the EGR Solenoid harness connector.

**Does the 12-volt test light illuminate brightly?**

**Yes** >> Go To 8

**No** >> Repair the open in the (Z904) EGR Solenoid ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 8. (K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO GROUND

Disconnect the PCM harness connector.

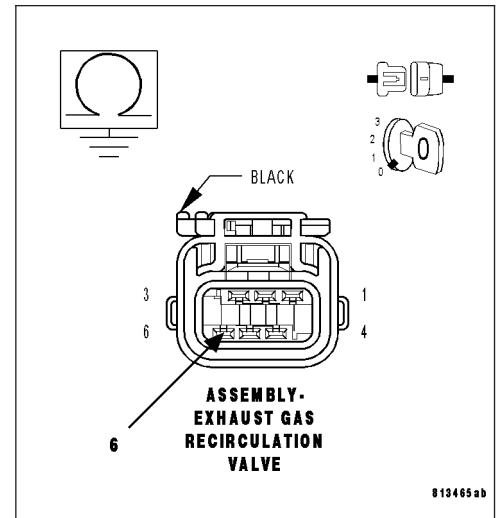
Measure the resistance between ground and the (K35) EGR Solenoid Control circuit in the EGR Solenoid harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K35) EGR Solenoid Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 9





**P0401-EGR SYSTEM PERFORMANCE (CONTINUED)****9. (K35) EGR SOLENOID CONTROL CIRCUIT OPEN**

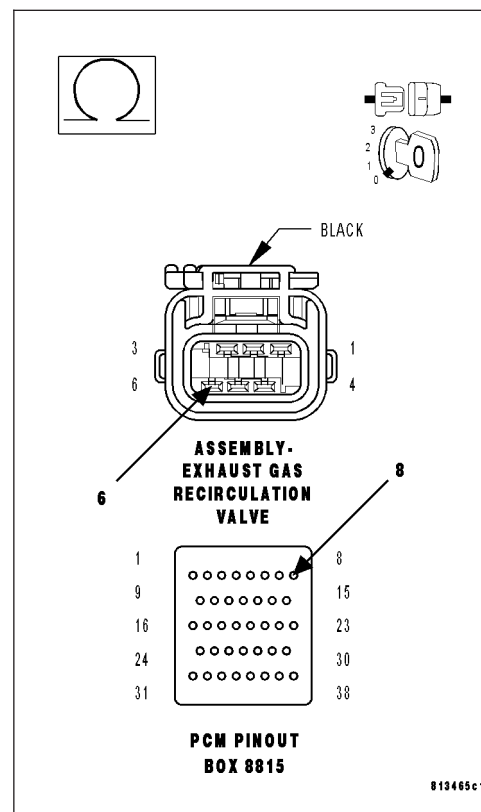
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K35) EGR Solenoid Control circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 10

**No** >> Repair the open in the (K35) EGR Solenoid Control circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**10. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0403-EGR SOLENOID CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running. Battery voltage greater than 10 volts.

- **Set Condition:**

The EGR solenoid control circuit is not in the expected state when requested to operate by the PCM. One Trip Fault.

Possible Causes
(Z904) EGR SOLENOID GROUND CIRCUIT OPEN
(K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
(K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT
(K35) EGR SOLENOID CONTROL CIRCUIT OPEN
EGR SOLENOID ASSEMBLY
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

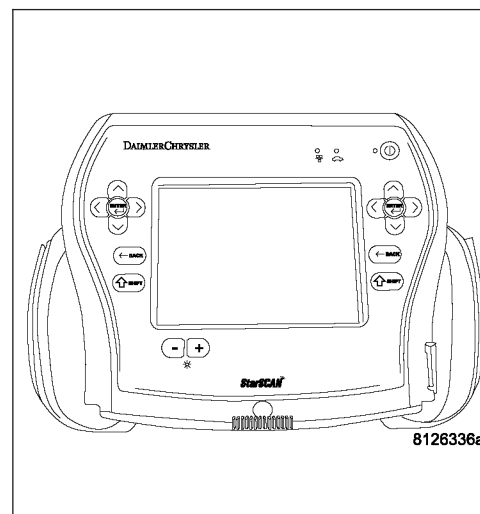
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0403-EGR SOLENOID CIRCUIT (CONTINUED)****2. EGR SOLENOID ASSEMBLY**

Turn the ignition off.

Disconnect the EGR Solenoid harness connector.

Ignition on, engine not running.

Turn off all accessories.

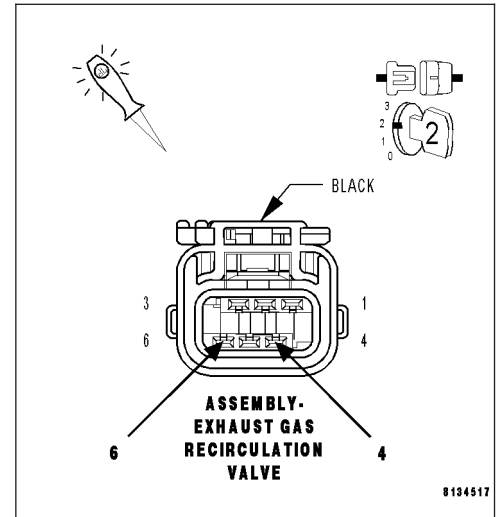
Using a 12-volt test light connected to the (Z904) EGR Solenoid ground circuit, probe the (K34) EGR Solenoid Control circuit.

With a scan tool, actuate the EGR solenoid.

**Does the 12-volt test light flash on and off?**

**Yes** >> Replace the EGR Solenoid Assembly.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (Z9048) EGR SOLENOID GROUND CIRCUIT OPEN**

Turn the ignition off.

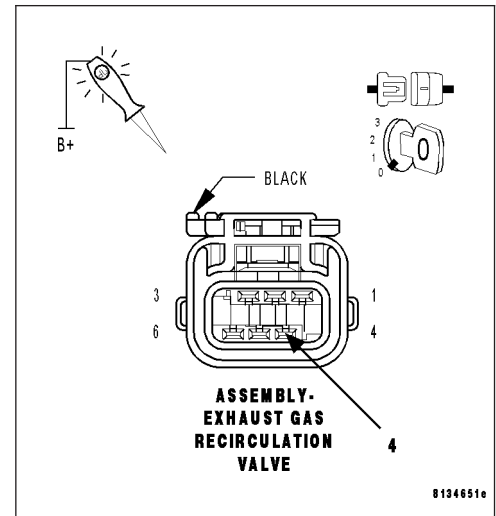
Disconnect the PCM harness connectors.

Using a 12-volt test light connected to the 12-volts, probe the (Z904) EGR Solenoid ground circuit in the EGR Solenoid harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open in the (Z904) EGR Solenoid ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0403-EGR SOLENOID CIRCUIT (CONTINUED)****4. (K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Ignition on, engine not running.

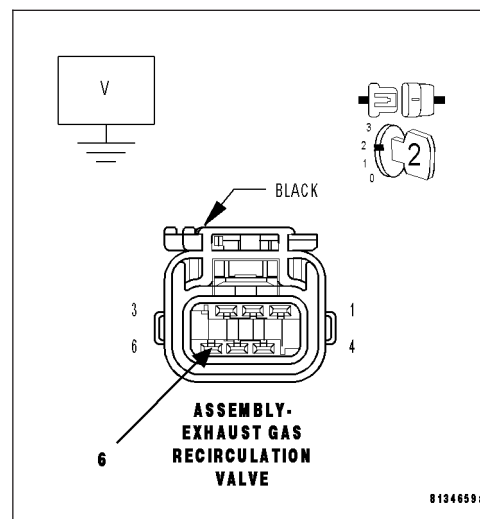
Measure the voltage on the (K35) EGR Solenoid Control circuit in the EGR Solenoid connector.

**Is the voltage above 1.0 volt?**

**Yes** >> Repair the short to battery voltage in the (K35) EGR Solenoid Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

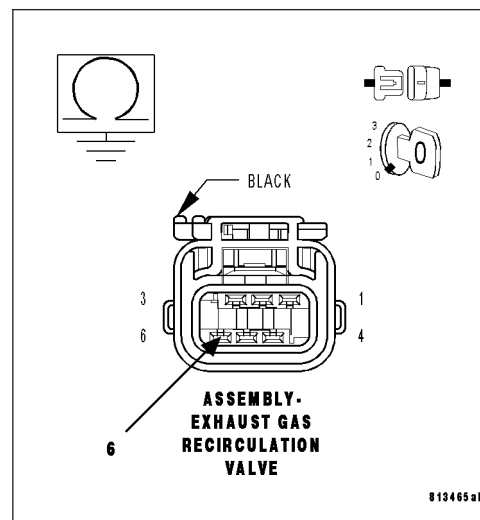
Measure the resistance between ground and the (K35) EGR Solenoid Control circuit in the EGR Solenoid harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K35) EGR Solenoid Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**6. (K35) EGR SOLENOID CONTROL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT**

Measure the resistance between the (K35) EGR Solenoid Control circuit and the (K900) Sensor ground circuit in the EGR Solenoid connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (K900) Sensor ground circuit and the (K35) EGR Solenoid Control circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7

## P0403-EGR SOLENOID CIRCUIT (CONTINUED)

### 7. (K35) EGR SOLENOID CONTROL CIRCUIT OPEN

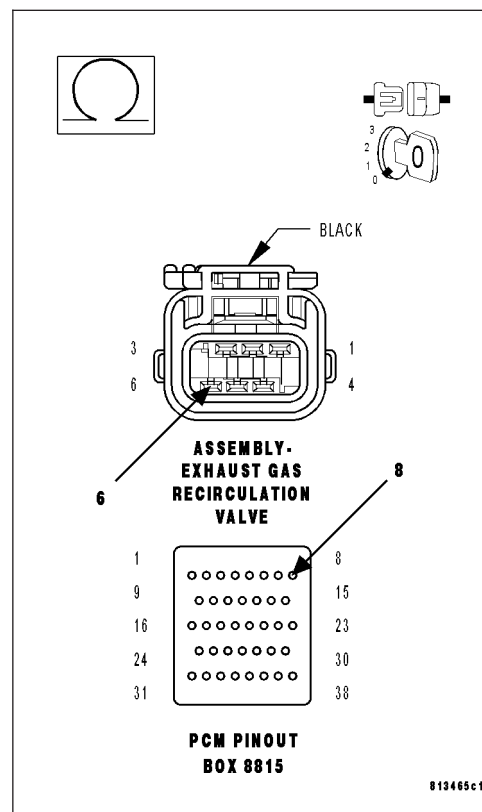
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K35) EGR Solenoid Control circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (K35) EGR Solenoid Control circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## 8. PCM

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

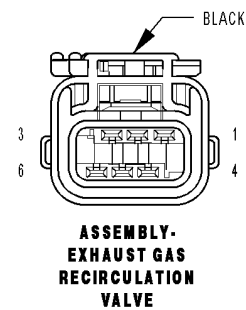
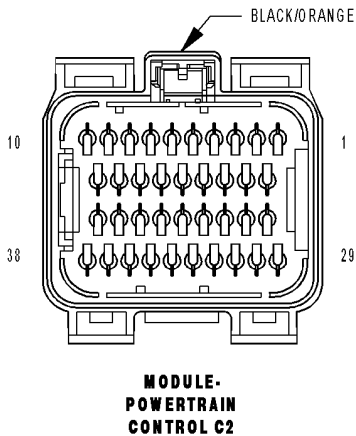
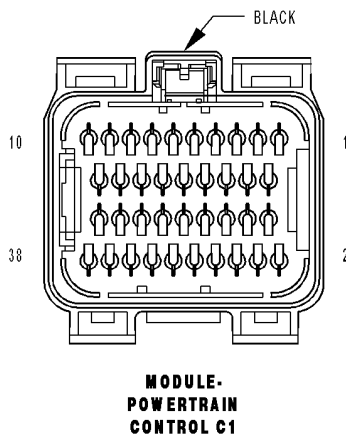
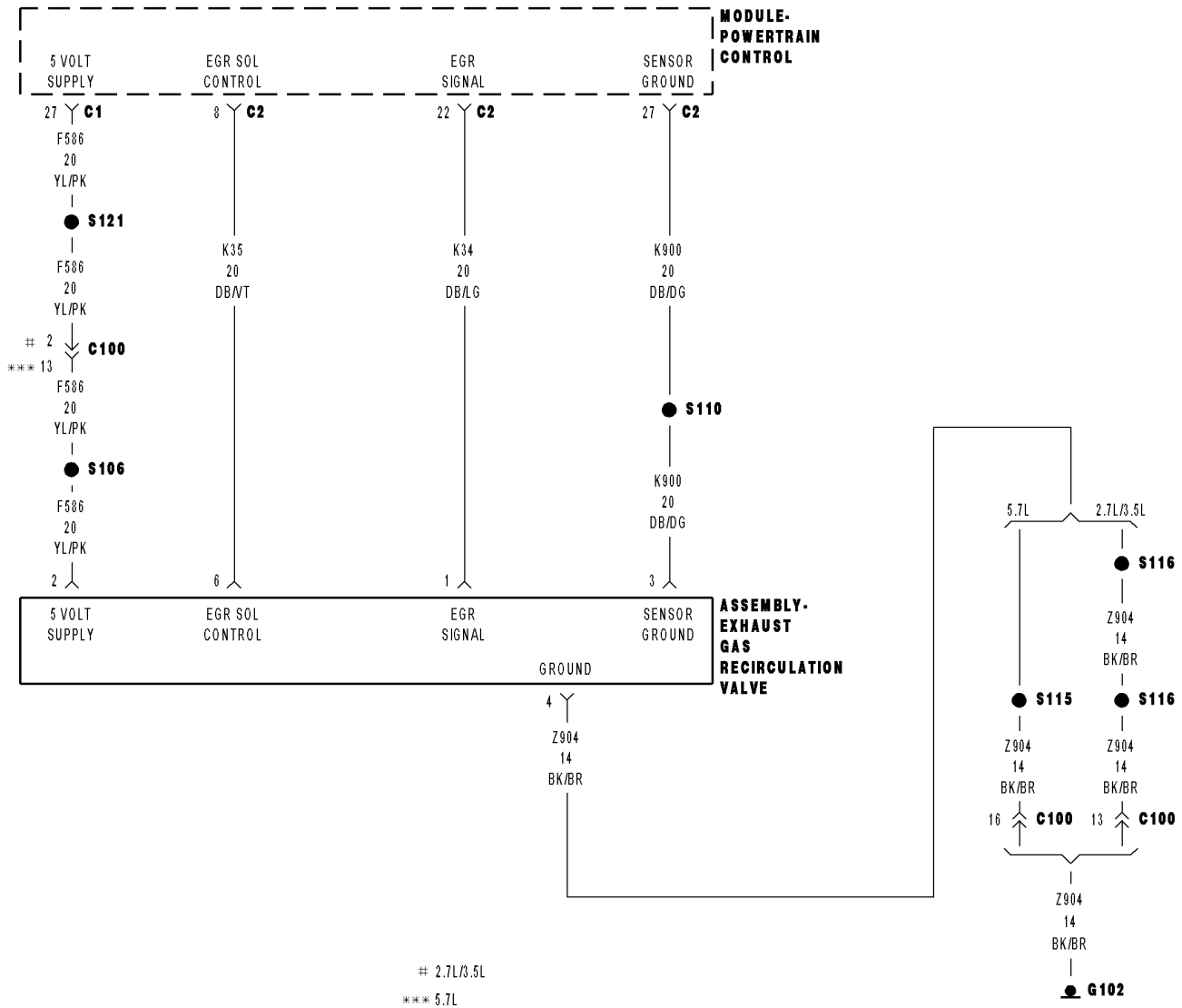
**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**P0404-EGR POSITION SENSOR PERFORMANCE**

**P0404-EGR POSITION SENSOR PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Engine running.
- **Set Condition:**  
The EGR flow or valve movement is not what is expected.

Possible Causes
EXCESSIVE RESISTANCE IN (F856) 5-VOLT SUPPLY (K35) EGR SOLENOID CONTROL CIRCUIT (K34) EGR SENSOR SIGNAL CIRCUIT OPEN (K34) EGR SENSOR SIGNAL CIRCUIT SHORTED TO GROUND (K900) SENSOR GROUND CIRCUIT OPEN EGR SOLENOID ASSEMBLY PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

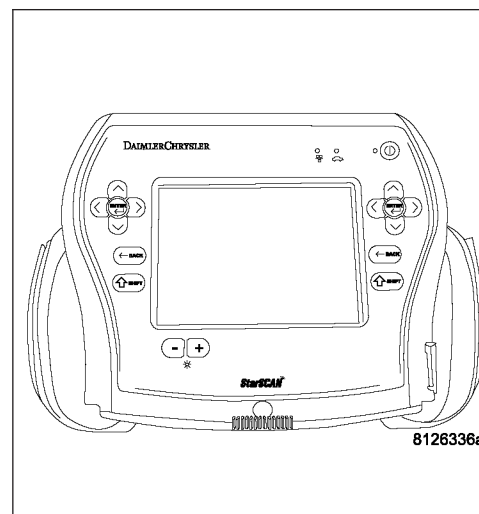
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





**P0404-EGR POSITION SENSOR PERFORMANCE (CONTINUED)****2. EGR POSITION VOLTAGE**

**Note:** Diagnose all other EGR DTC(s) before continuing.

Start the engine.

With a scan tool, read the EGR Position Sensor voltage.

Choose a conclusion that best matches the EGR voltage reading.

**Below 3.5 volts**

Go To 3

**Between 3.5 volts to 4.3 volts**

Go To 5

**Above 4.3 volts**

Go To 6

**3. EXCESSIVE RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the EGR Solenoid harness connector.

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

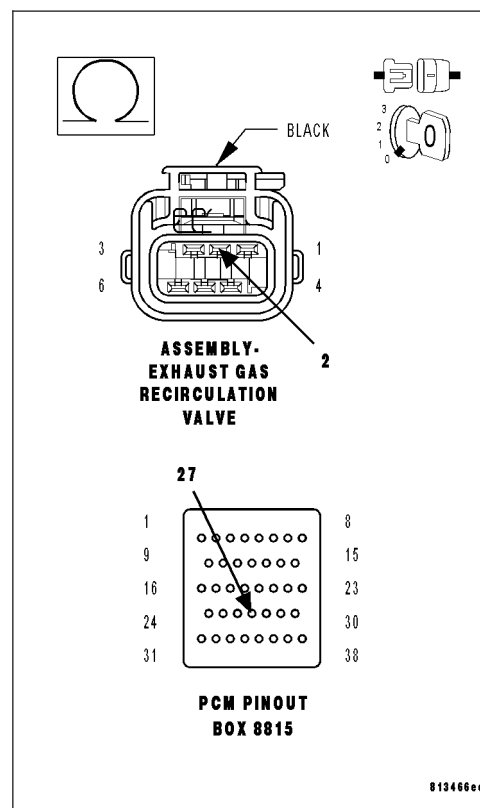
Measure the resistance of the (F856) 5-volt Supply circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

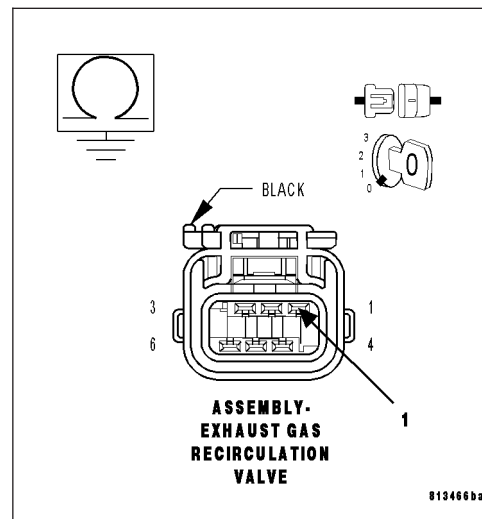


**P0404-EGR POSITION SENSOR PERFORMANCE (CONTINUED)****4. (K34) EGR SENSOR SIGNAL CIRCUIT SHORTED TO GROUND**

Measure the resistance between ground and the (K34) EGR Sensor Signal circuit in the EGR Solenoid harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Repair the short to ground in the (K34) EGR Sensor Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.
- No** >> Replace the EGR Assembly.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. (K35) EGR SOLENOID CONTROL CIRCUIT**

Ignition on, engine not running.

With the scan tool, actuate the EGR Solenoid.

Allow the EGR Solenoid to actuate for at least 15 seconds.

Feel the EGR Solenoid for operation.

Stop actuation.

**Does EGR Solenoid operate while actuating and then turn off when actuation test is stopped?**

- Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.
- No** >> Refer to the P0403-EGR Control Circuit diagnostic procedure and continue.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**P0404-EGR POSITION SENSOR PERFORMANCE (CONTINUED)****6. (K34) EGR SENSOR SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the EGR Solenoid harness connector.

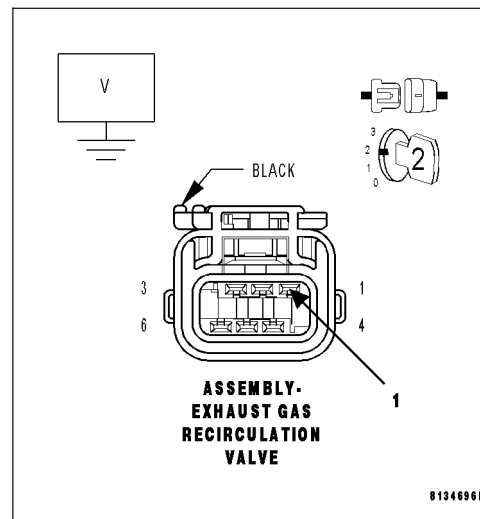
Ignition on, engine not running.

Measure the voltage of the (K34) EGR Sensor Signal circuit in the EGR Solenoid harness connector.

**Is the voltage above 4.30 volts?**

**Yes** >> Go To 7

**No** >> Go To 8

**7. (K900) SENSOR GROUND CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

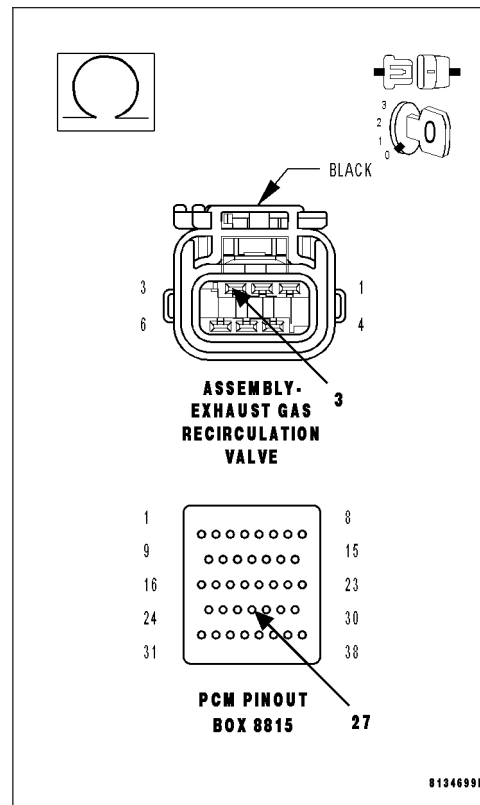
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K900) Sensor ground circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the EGR Assembly.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Repair the open in the (K900) Sensor ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0404-EGR POSITION SENSOR PERFORMANCE (CONTINUED)

### 8. (K34) EGR SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the PCM harness connectors.

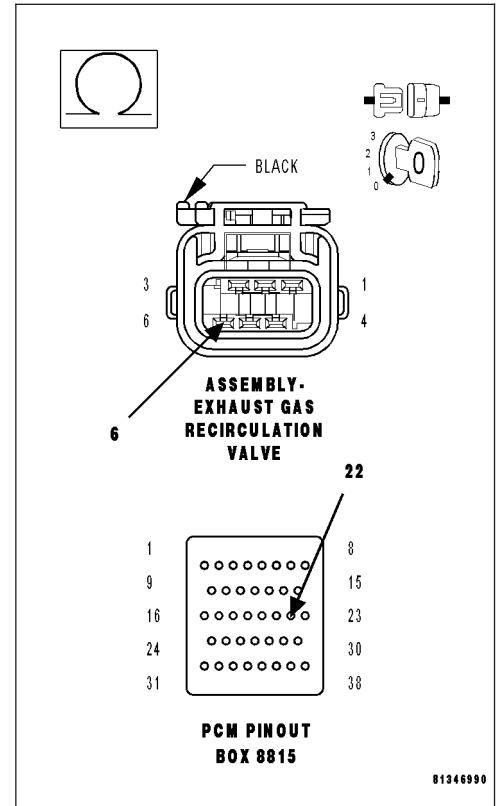
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K34) EGR Sensor Signal circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the open in the (K34) EGR Sensor Signal circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



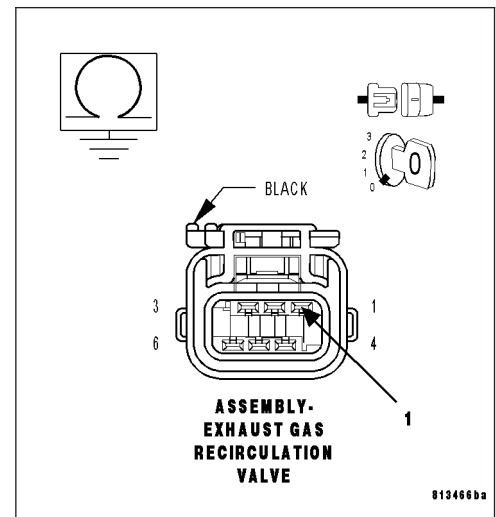
### 9. (K34) EGR SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

Measure the resistance between ground and the (K34) EGR Sensor Signal circuit in the EGR Solenoid harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K34) EGR Sensor Signal circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Go To 10



**P0404-EGR POSITION SENSOR PERFORMANCE (CONTINUED)****10. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

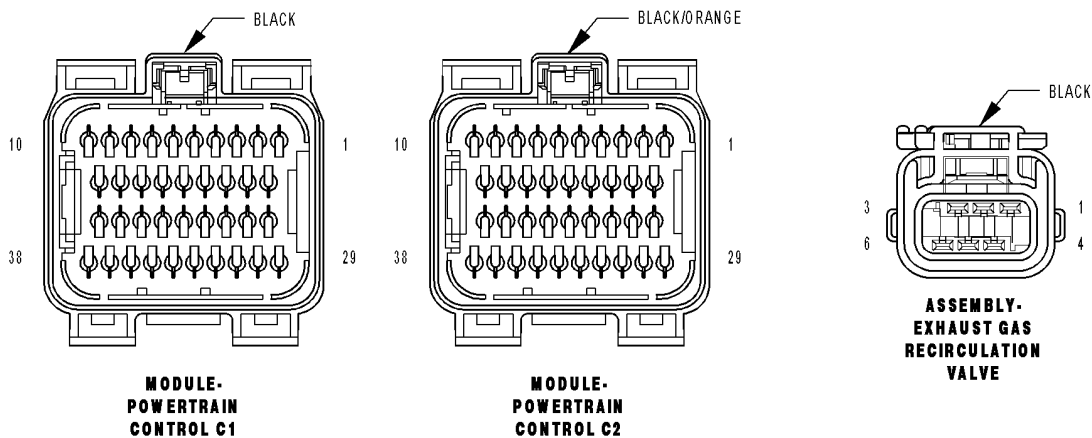
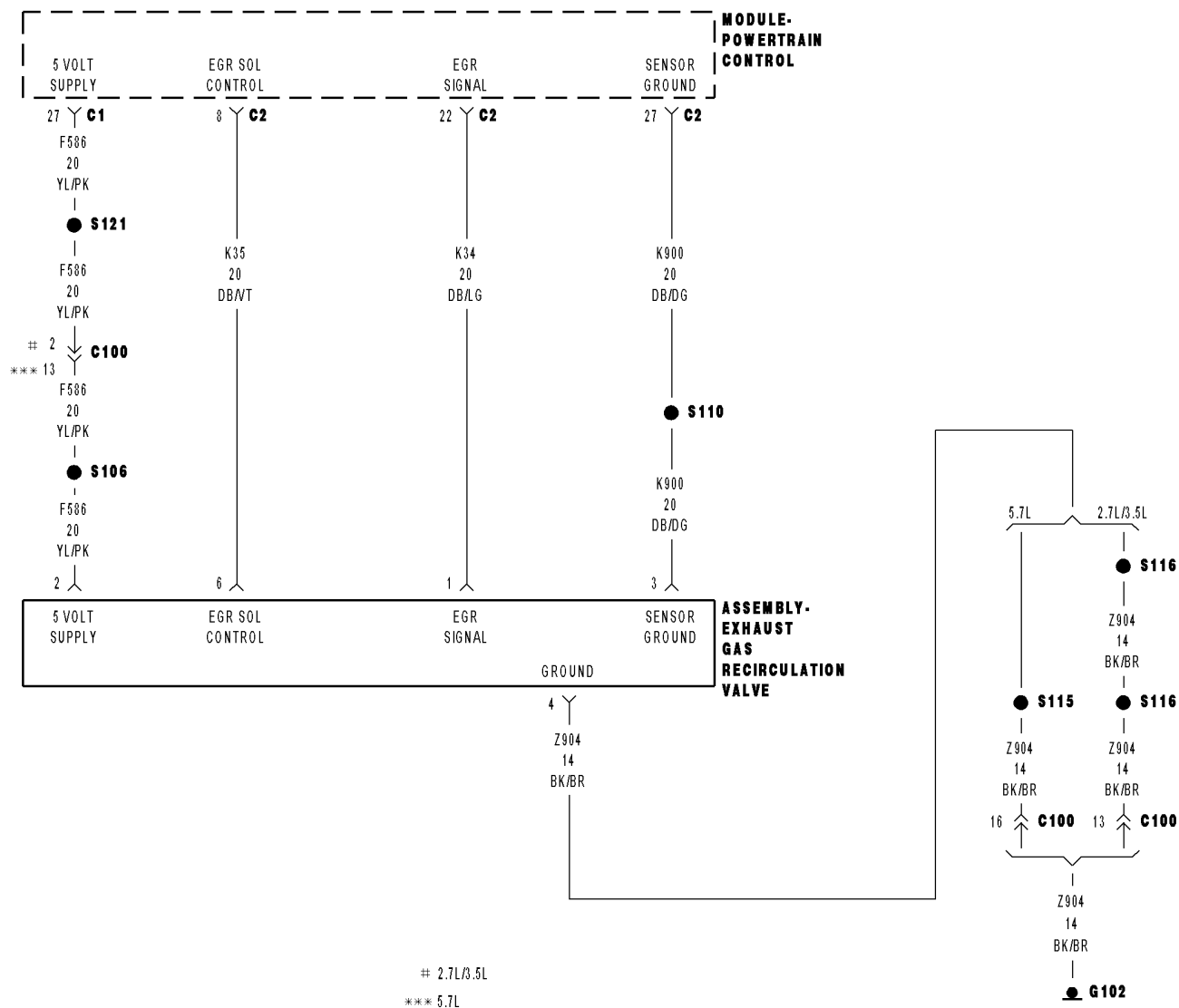
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0405-EGR POSITION SENSOR CIRCUIT LOW



**P0405-EGR POSITION SENSOR CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Battery voltage above 10.0 volts.
- **Set Condition:**  
EGR Position Sensor Signal is less than 0.1 of a volt. One trip Fault.

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND (F856) 5-VOLT SUPPLY CIRCUIT OPEN (K34) EGR POSITION SENSOR SIGNAL CIRCUIT SHORTED TO GROUND (K34) EGR POSITION SENSOR SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT EGR POSITION SENSOR PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test**

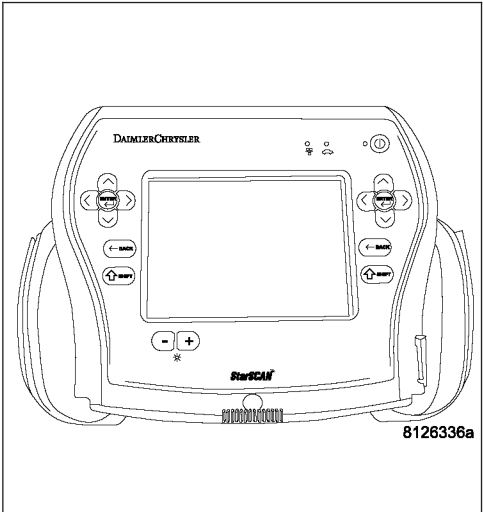
**1. EGR POSITION SENSOR BELOW 0.2 OF A VOLT**

Ignition on, engine not running.

With a scan tool, read the EGR Position Sensor voltage.

**Is the voltage below 0.2 of a volt?**

- Yes**    >> Go To 2
- No**     >> Go To 9



**P0405-EGR POSITION SENSOR CIRCUIT LOW (CONTINUED)****2. (F856) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the EGR Solenoid harness connector.

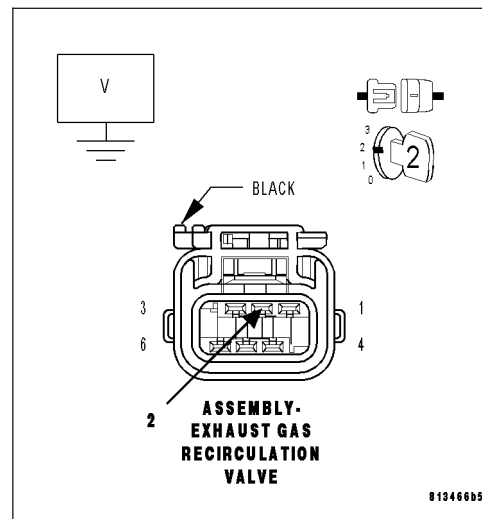
Ignition on, engine not running.

Measure the voltage of the (F856) 5-volt Supply circuit in the EGR Solenoid harness connector.

**Is the voltage between 4.5 to 5.2 volts?**

**Yes** >> Go To 3

**No** >> Go To 6

**3. EGR POSITION**

With the scan tool, monitor the EGR Position Sensor voltage.

**Is the voltage above 4.5 volts?**

**Yes** >> Replace the EGR Solenoid Assembly.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (K34) EGR POSITION SENSOR SIGNAL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connector.

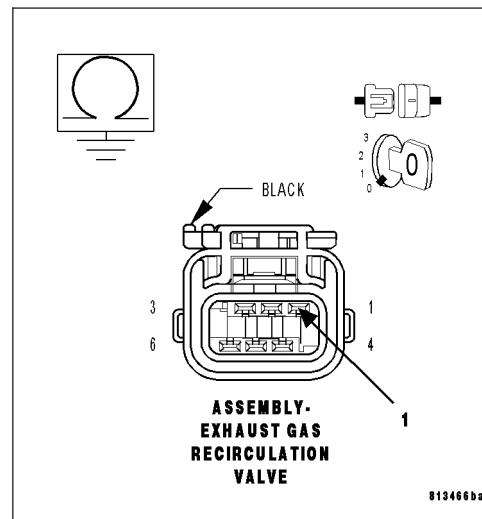
Measure the resistance between ground and the (K34) EGR Position Sensor Signal circuit in the EGR Solenoid harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground circuit in the (K34) EGR Position Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5





**P0405-EGR POSITION SENSOR CIRCUIT LOW (CONTINUED)****5. (K34) EGR SENSOR SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT**

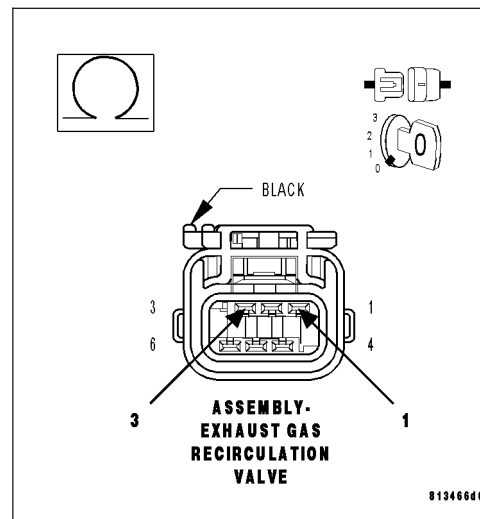
Measure the resistance between the (K34) EGR Position Sensor Signal circuit and (K900) Sensor ground circuit in the EGR Solenoid harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K900) Sensor ground and the (K34) EGR Position Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

**6. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

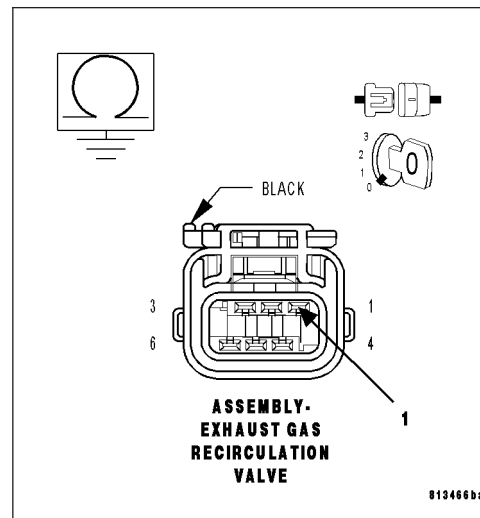
Measure the resistance between ground and the (F856) 5-volt Supply circuit in the EGR Solenoid harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7



## P0405-EGR POSITION SENSOR CIRCUIT LOW (CONTINUED)

### 7. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

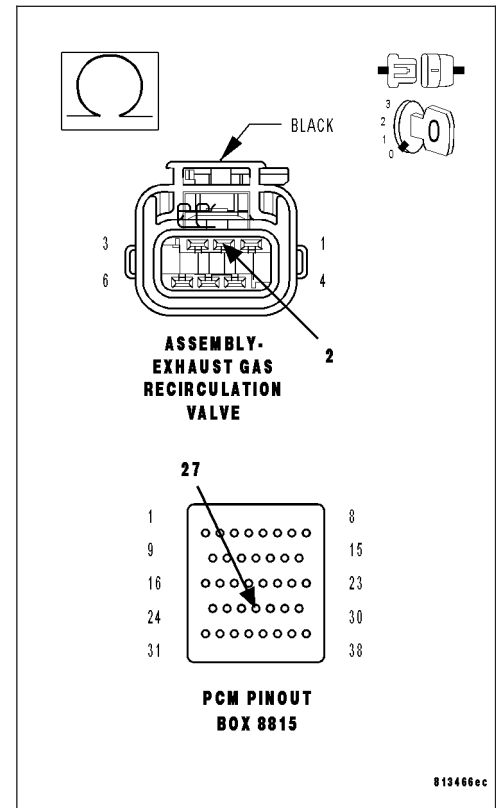
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (F856) 5-volt Supply circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## 8. PCM

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**P0405-EGR POSITION SENSOR CIRCUIT LOW (CONTINUED)****9. EGR POSITION SENSOR SWEEP**

**Note:** The engine will run rough and possibly stall in the following test. Feather the accelerator pedal to keep the engine from stalling.

Start the engine.

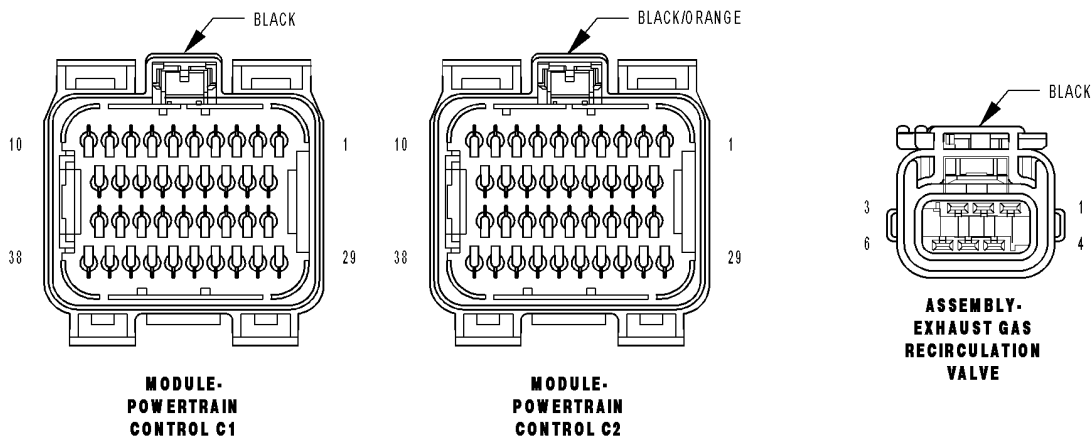
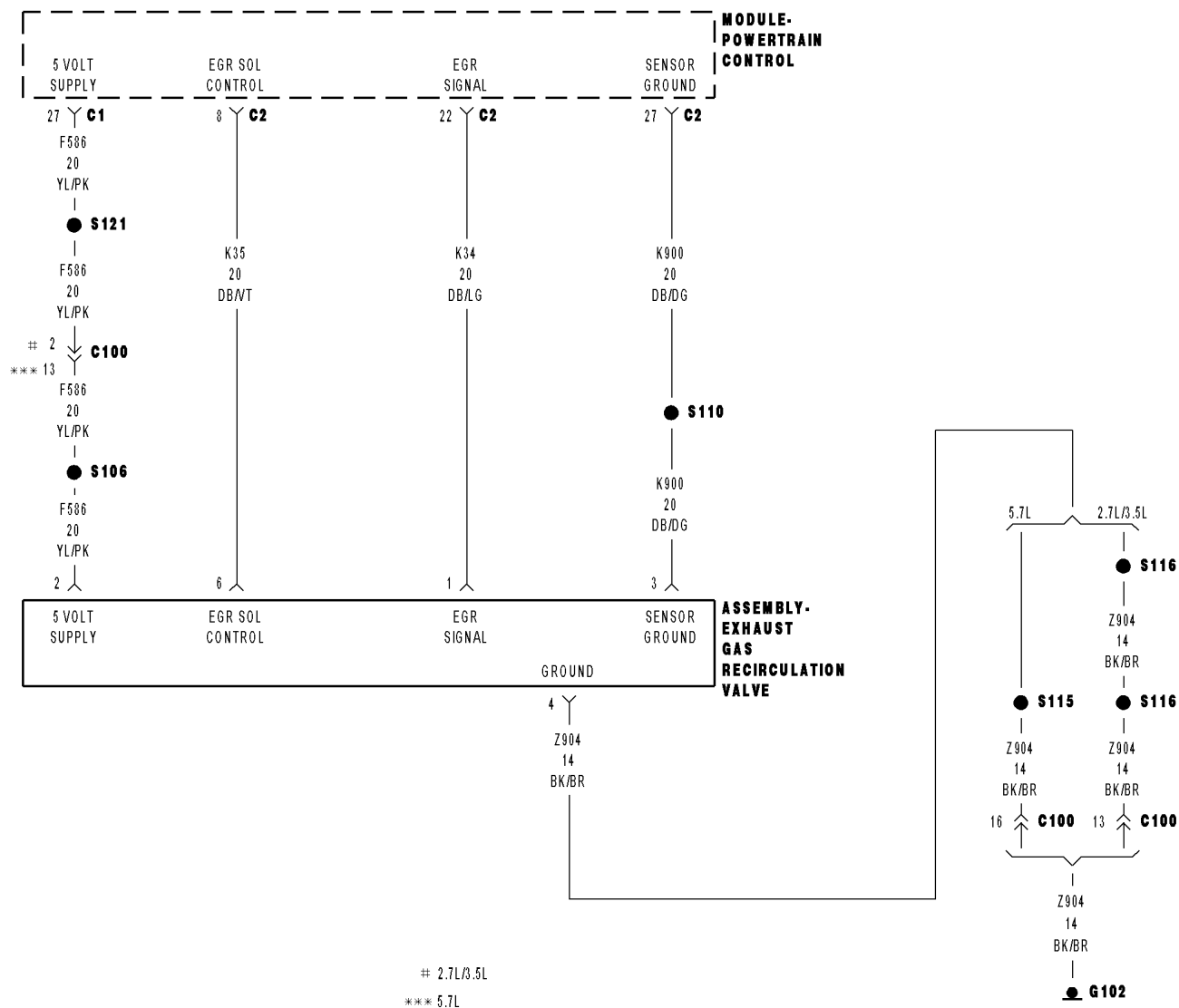
With the scan tool, enter System Test and then EGR System Test. Push the 4=VARIABLE function.

Monitor the EGR voltage while slowly pushing the up arrow.

**Is the voltage change smooth?**

- Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Replace the EGR Solenoid Assembly.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
-

## P0406-EGR POSITION SENSOR CIRCUIT HIGH



**P0406-EGR POSITION SENSOR CIRCUIT HIGH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**  
EGR position sensor signal is greater than 4.89. One trip Fault.

Possible Causes
(K34) EGR POSITION SENSOR SIGNAL CIRCUIT SHORTED TO (F856) 5-VOLT SUPPLY CIRCUIT
(K34) EGR POSITION SENSOR SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K34) EGR POSITION SENSOR SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
EGR SOLENOID ASSEMBLY
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test****1. EGR POSITION SENSOR VOLTAGE ABOVE 4.5 VOLTS**

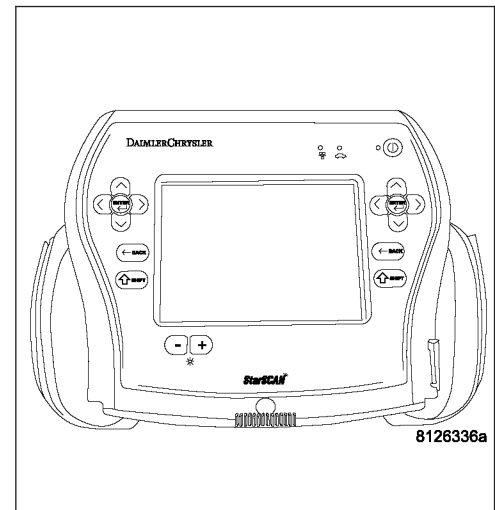
Start the engine.

With the scan tool, read the EGR Position Sensor voltage.

**Is the voltage above 4.5 volts?**

**Yes** >> Go To 2

**No** >> Go To 8



**P0406-EGR POSITION SENSOR CIRCUIT HIGH (CONTINUED)****2. (K34) EGR POSITION SENSOR SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the EGR Solenoid harness connector.

Disconnect the PCM harness connectors.

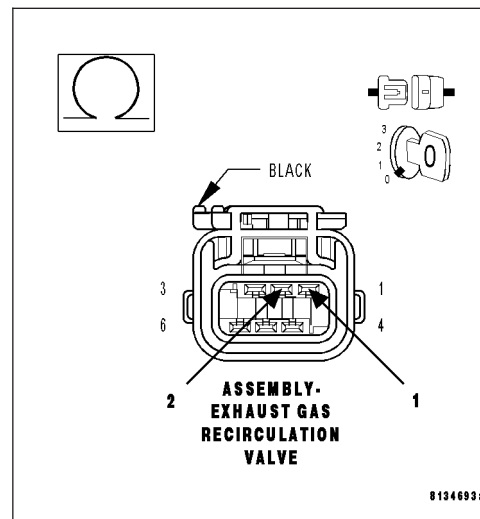
Measure the resistance between the (K34) EGR Position Sensor Signal circuit and the (F856) 5-volt Supply circuit in the EGR Solenoid harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K34) EGR Position Sensor Signal circuit and the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K34) EGR POSITION SENSOR SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Ignition on, engine not running.

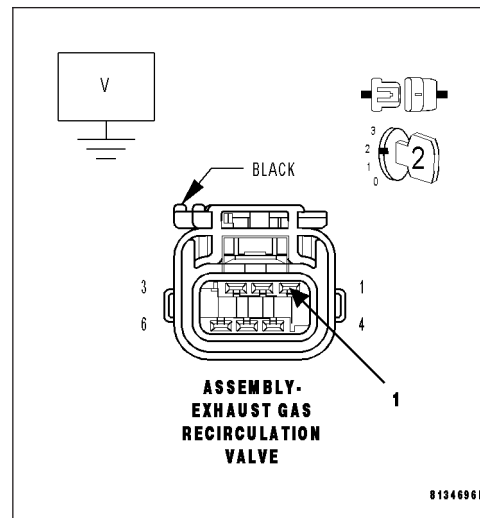
Measure the voltage on the (K34) EGR Sensor Signal circuit in the EGR Solenoid harness connector.

**Is the voltage above 0 volts?**

**Yes** >> Repair the short to battery voltage in the (K34) EGR Position Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P0406-EGR POSITION SENSOR CIRCUIT HIGH (CONTINUED)****4. EGR SOLENOID ASSEMBLY**

Turn the ignition off.

Connect the PCM harness connectors.

Connect a jumper wire between the (K34) EGR Position Sensor Signal circuit and the (K900) Sensor ground circuit.

With the scan tool, monitor the EGR Position Sensor voltage.

Ignition on, engine not running.

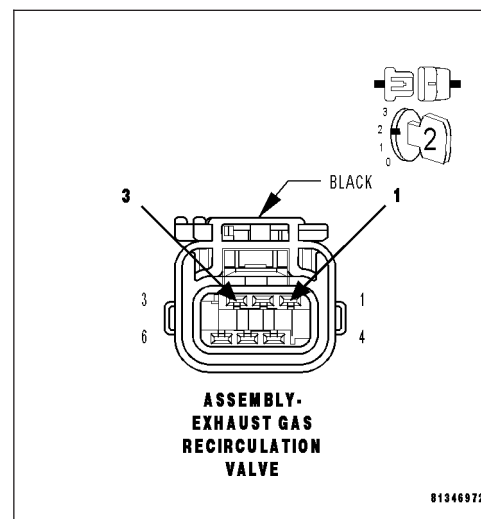
**Is the voltage below 0.5 of a volt?**

**Yes** >> Replace the EGR Solenoid Assembly.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**Note:** Remove the jumper wire before continuing.

**5. (K34) EGR POSITION SENSOR SIGNAL CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

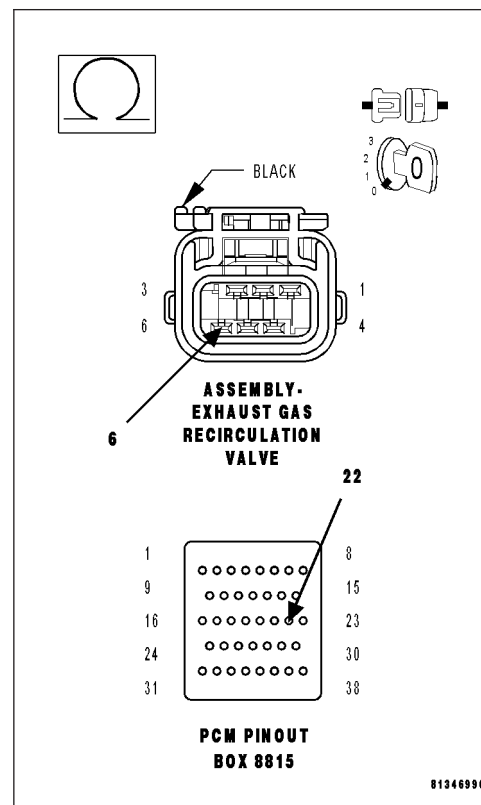
Measure the resistance of the (K34) EGR Position Sensor Signal circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K34) EGR Position Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



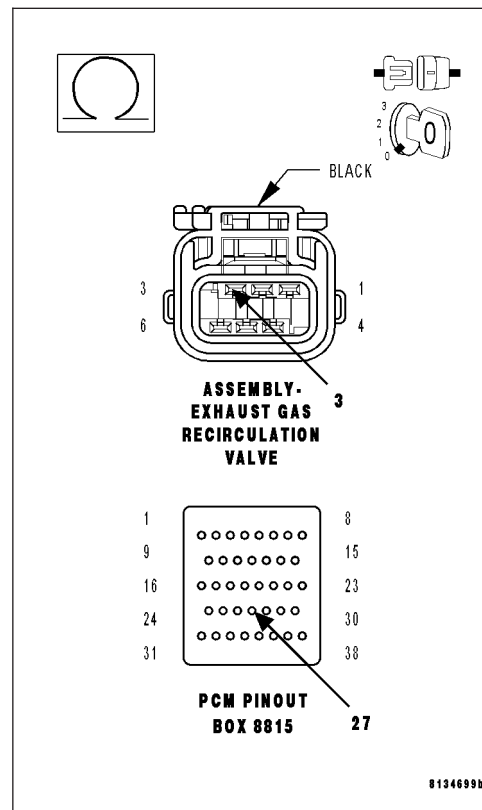
**P0406-EGR POSITION SENSOR CIRCUIT HIGH (CONTINUED)****6. (K900) SENSOR GROUND CIRCUIT OPEN**

Measure the resistance of the (K900) Sensor ground circuit from the EGR Solenoid harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 30 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K900) Sensor ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0406-EGR POSITION SENSOR CIRCUIT HIGH (CONTINUED)****8. EGR POSITION SENSOR SWEEP**

**Note:** The engine will run rough and possibly stall in the following test. Feather the accelerator pedal to keep the engine from stalling.

Start the engine.

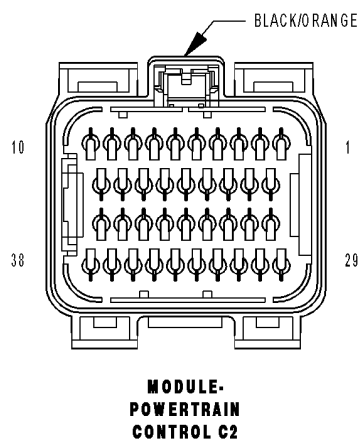
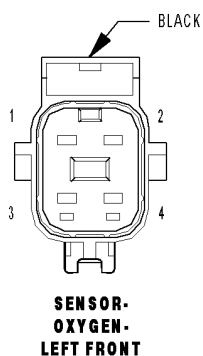
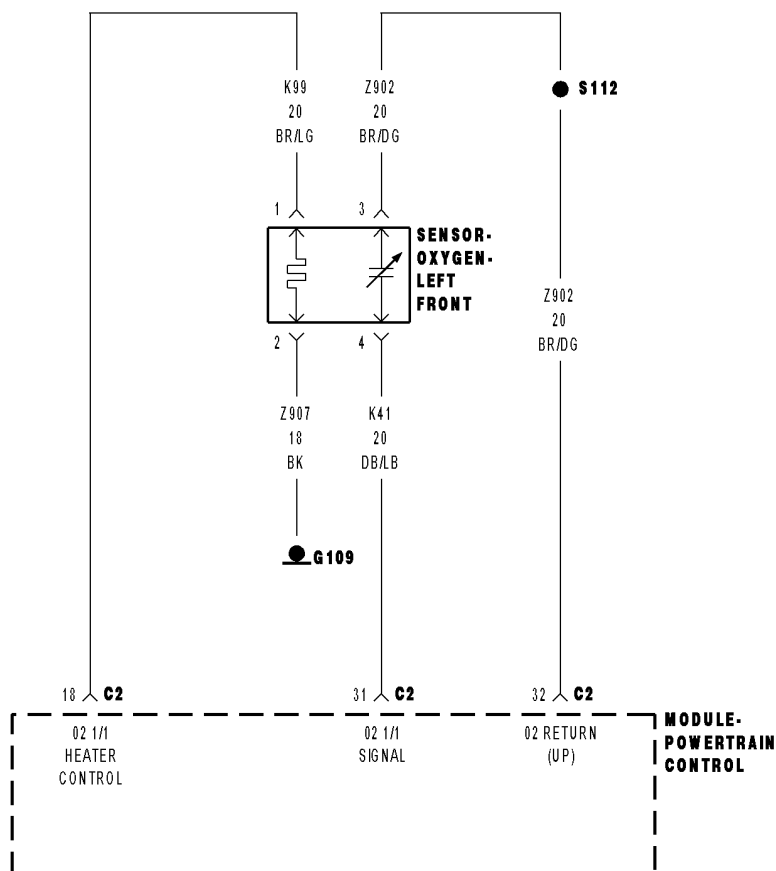
With the scan tool, enter System Test and then EGR System Test. Push the 4=VARIABLE function.

Monitor the EGR voltage while slowly pushing the up arrow.

**Is the voltage change smooth?**

- Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Replace the EGR Solenoid Assembly.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
-

## P0420-CATALYST 1/1 EFFICIENCY



**P0420-CATALYST 1/1 EFFICIENCY (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

After engine warm up to 70°C (158°F), 180 seconds of open throttle operation, at a speed greater than 18 mph and less than 55 mph, with the engine at 1200-1700 rpm and MAP vacuum between 15.0 and 21.0 inches of mercury (Hg).

- **Set Condition:**

As catalyst efficiency deteriorates, the switch rate of the downstream O2 sensor approaches that of the upstream O2 sensor. If at any point during the test the switch ratio reaches a predetermined value a counter is incremented by one. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK
ENGINE MECHANICAL CONDITION
AGING O2 SENSOR
CATALYTIC CONVERTER

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** A new rear O2 Sensor along with an aging front O2 Sensor may cause the DTC to set. Review the repair history of the vehicle before continuing.

**Note:** If an O2 Sensor DTC set along with the Catalytic Converter Efficiency DTC diagnose the O2 Sensor DTC(s) before continuing.

**Note:** Check for contaminants that may have damaged the O2 Sensor and Catalytic Converter: contaminated fuel, unapproved silicone, oil and coolant, repair necessary.

Ignition on, engine not running.

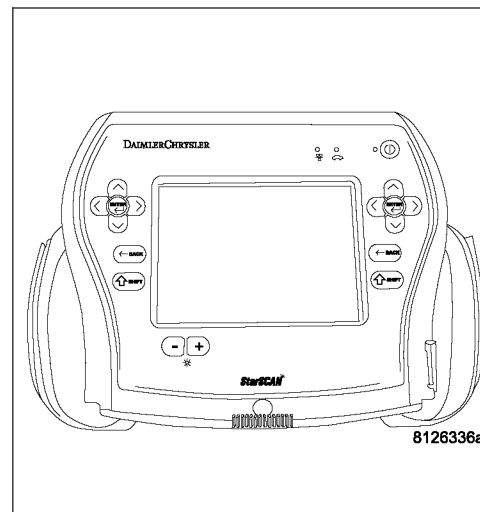
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0420-CATALYST 1/1 EFFICIENCY (CONTINUED)****2. VISUALLY INSPECT CATALYTIC CONVERTER**

Inspect the Catalytic Converter for the following damage.

Damage Catalytic Converter, dents or holes.

Severe discoloration caused by overheating the Catalytic Converter.

Catalytic Converter broke internally.

Leaking Catalytic Converter.

**Were any problems found?**

**Yes** >> Replace the Catalytic Converter. Repair the condition that may have caused the failure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. EXHAUST LEAK**

Start the engine.

Inspect the exhaust for leaks between the engine and the 1/1 O2 Sensor.

Inspect the exhaust for leaks between the engine and the 1/2 O2 Sensor.

**Are there any exhaust leaks?**

**Yes** >> Repair or replace the leaking exhaust parts as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

---

**4. ENGINE MECHANICAL CONDITION**

Check the exhaust for excessive smoke caused by an internal problem in the engine.

**Is an engine mechanical condition present?**

**Yes** >> Repair the engine mechanical condition as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

---

**5. AGING O2 SENSOR**

A new rear O2 Sensor along with an aging front O2 Sensor may cause the DTC to set.

Review the vehicles repair history.

**Has the rear O2 Sensor been replaced without replacing the front O2 Sensor?**

**Yes** >> Replace the Front O2 Sensor as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

---

**P0420-CATALYST 1/1 EFFICIENCY (CONTINUED)**

**6. CATALYTIC CONVERTER**

**If there are no possible cause remaining, view repair.**

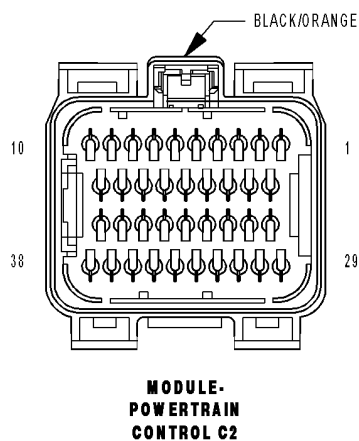
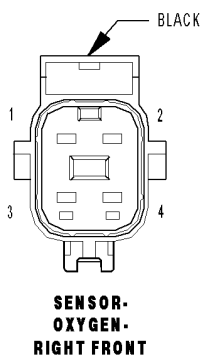
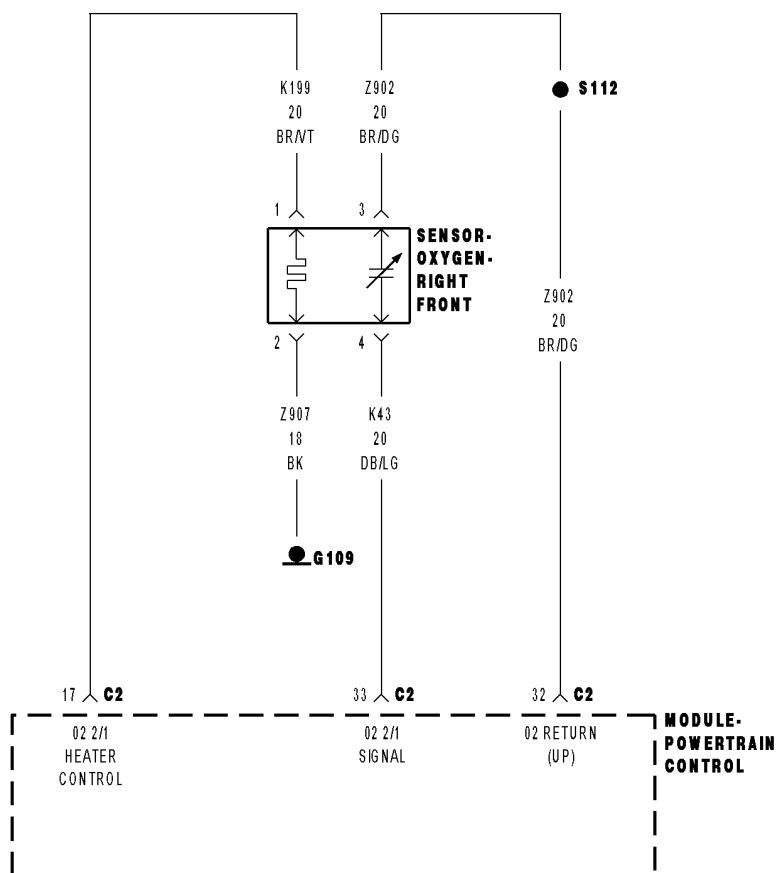
**Repair**

Replace the Catalytic Converter.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

## P0430-CATALYST 2/1 EFFICIENCY



**P0430-CATALYST 2/1 EFFICIENCY (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

After engine warm up to 147 deg. F, 180 seconds of open throttle operation, at a speed greater than 20 mph, with the engine at 1200-1700 rpm and MAP vacuum between 15.0 and 21.0 inches of mercury (Hg).

- **Set Condition:**

As catalyst efficiency deteriorates, the switch rate of the downstream O2 sensor approaches that of the upstream O2 sensor. If at any point during the test the switch ratio reaches a predetermined value a counter is incremented by one. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK
ENGINE MECHANICAL CONDITION
AGING O2 SENSOR
CATALYTIC CONVERTER

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** A new rear O2 Sensor along with an aging front O2 Sensor may cause the DTC to set. Review the repair history of the vehicle before continuing.

**Note:** If an O2 Sensor DTC set along with the Catalytic Converter Efficiency DTC diagnose the O2 Sensor DTC(s) before continuing.

**Note:** Check for contaminants that may have damaged the O2 Sensor and Catalytic Converter: contaminated fuel, unapproved silicone, oil and coolant, repair necessary.

Ignition on, engine not running.

With a scan tool, read DTCs.

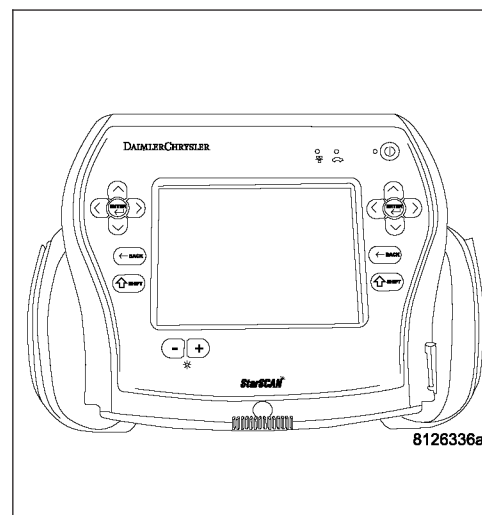
**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER

- 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0430-CATALYST 2/1 EFFICIENCY (CONTINUED)****2. VISUALLY INSPECT CATALYTIC CONVERTER**

Inspect the Catalytic Converter for the following damage.

Damage Catalytic Converter, dents or holes.

Severe discoloration caused by overheating the Catalytic Converter.

Catalytic Converter broke internally.

Leaking Catalytic Converter.

**Were any problems found?**

- Yes** >> Replace the Catalytic Converter. Repair the condition that may have caused the failure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 3
- 

**3. EXHAUST LEAK**

Start the engine.

Inspect the exhaust for leaks between the engine and the 2/1 O2 Sensor.

Inspect the exhaust for leaks between the engine and the 2/2 O2 Sensor.

**Are there any exhaust leaks?**

- Yes** >> Repair or replace the leaking exhaust parts as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 4
- 

**4. ENGINE MECHANICAL CONDITION**

Check the exhaust for excessive smoke caused by an internal problem in the engine.

**Is an engine mechanical condition present?**

- Yes** >> Repair the engine mechanical condition as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 5
- 

**5. AGING O2 SENSOR**

A new rear O2 Sensor along with an aging front O2 Sensor may cause the DTC to set.

Review the vehicles repair history.

**Has the rear O2 Sensor been replaced without replacing the front O2 Sensor?**

- Yes** >> Replace the 2/1 O2 Sensor as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 6
-



**P0430-CATALYST 2/1 EFFICIENCY (CONTINUED)**

**6. CATALYTIC CONVERTER**

**If there are no possible cause remaining, view repair.**

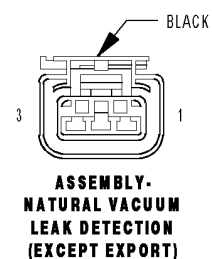
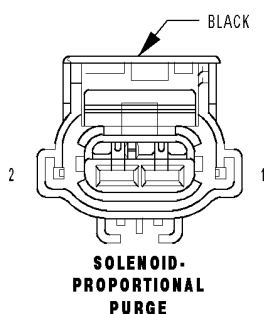
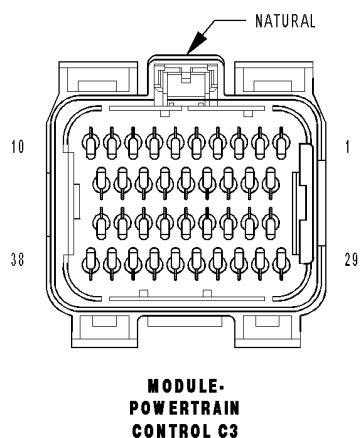
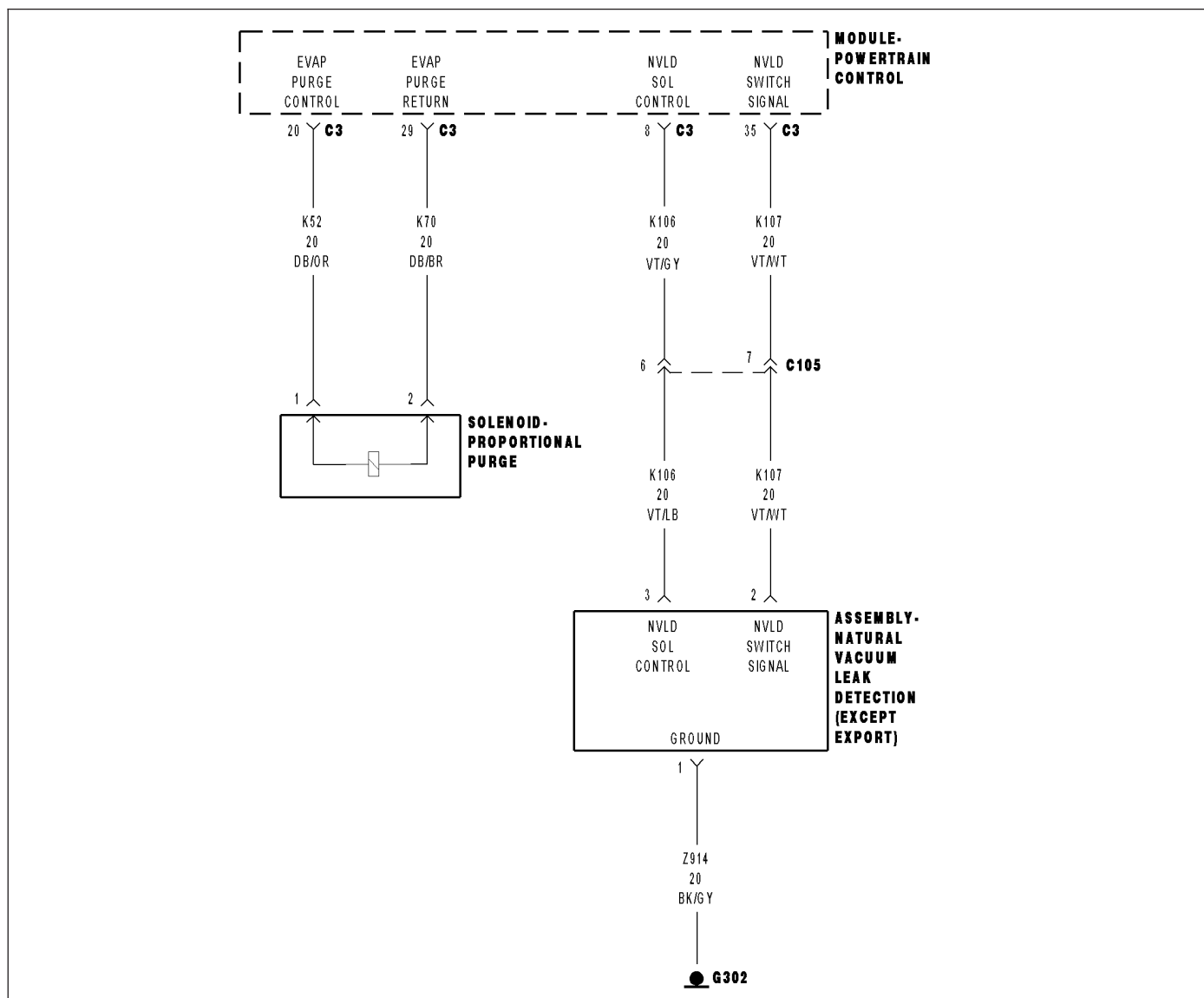
**Repair**

Replace the Catalytic Converter.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

## P0440-GENERAL EVAP SYSTEM FAILURE



**P0440-GENERAL EVAP SYSTEM FAILURE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine Running. Fuel Level greater than 12%. Ambient Temperature between 4°C and 32°C (39°F and 89°F).

- **Set Condition:**

The PCM does not see the NVLD switch close during the medium/large leak test. The PCM then will increase the vacuum supply to the EVAP system by increasing flow through the EVAP Purge valve. If the switch does not close with an increase in vacuum an error is detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EVAP PURGE SOLENOID VACUUM SUPPLY (Z914) GROUND CIRCUIT OPEN (K107) NVLD SWITCH SIGNAL CIRCUIT OPEN EVAPORATIVE EMISSION LEAK DETECTION NVLD ASSEMBLY EVAP PURGE SOLENOID PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

**Note:** If any of the following DTCs are set (P0443, P0452, P0453, P0498 or P0499) diagnose them first before continuing with P0440.

Ignition on, engine not running.

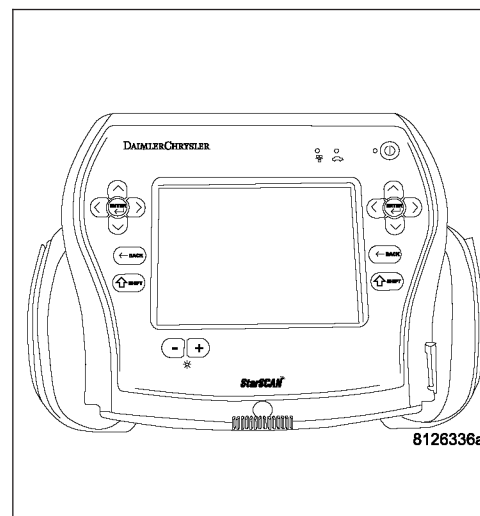
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0440-GENERAL EVAP SYSTEM FAILURE (CONTINUED)****2. VISUAL AND PHYSICAL INSPECTION**

Turn the ignition off.

Perform a visual and physical inspection of the entire Evaporative Emission system.

Check for the following conditions:

- Hoses disconnected or left off
- Holes or cracks
- Loose seal points
- Evidence of damaged components
- Incorrect routing of hoses and tubes
- Fuel Cap left off or bad gasket seal

**Were any of the above conditions found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. EVAP VACUUM SUPPLY HOSE INSPECTION**

Carefully inspect the Evap Purge Solenoid vacuum supply hose for proper routing.

Check for a pinched or plugged hose from the throttle body to the Purge Solenoid.

Make sure the vacuum port at the throttle body is free from any blockage.

**Were any problems found?**

**Yes** >> Repair the vacuum supply, hose/tube as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

---

**4. CHECKING EVAP PURGE SOLENOID FUNCTIONALITY**

Disconnect the vacuum supply hoses from the EVAP Purge Solenoid.

Using a hand vacuum pump, apply 10 in Hg to the "CAN" side of the EVAP Purge Solenoid.

Ignition on, engine not running.

Observe the vacuum gauge.

With the scan tool, actuate the EVAP Purge Solenoid.

**Does the vacuum drop when the solenoid is actuated?**

**Yes** >> Go To 5

**No** >> Replace the Evap Purge Solenoid.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**P0440-GENERAL EVAP SYSTEM FAILURE (CONTINUED)****5. NVLD SWITCH OPERATION**

Connect the previously disconnected vacuum hose.

Start the engine.

Allow the engine to idle.

Using the scan tool, perform the NVLD FORCED MONITOR TEST.

Monitor the NVLD Switch state.

**Note:** As the test runs, the NVLD Switch should go from an OPEN state to a CLOSED state and then return to OPEN when the test is complete.

**Did the NVLD Switch operate as described above?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

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**6. VERIFY EVAPORATIVE EMISSION LEAK**

To continue testing you will need Miller Tool #8404 Evaporative Emission Leak Detector (EELD).

**WARNING:** Keep lit cigarettes, sparks, flames, and other ignition sources away from the test area to prevent the ignition of explosive gases. Keep the test area well ventilated.

**Note:** The fuel tank should have between 20% and 80% of fuel tank capacity to properly test the Evap system.

Connect the red power lead of EELD to the battery positive terminal and the black ground lead to battery negative terminal.

Block the vent hose of the EVAP Canister.

Connect shop air to the EELD.

Set the smoke/air control switch to AIR.

Insert the tester's AIR supply tip (clear hose) into the .040 orifice on the tester's control panel.

Press the remote smoke/air start button.

Position the red flag on the air flow meter so it is aligned with the indicator ball.

When the calibration is complete, release the remote button. The EELD flow meter is now calibrated in liters per minute.

Install the service port adapter #8404-14 on the vehicle's service port (if equipped) or install the #8404-ADP into the filter line.

Connect the Air supply hose from the EELD to the service port (if equipped) or to the #8404-ADP adapter.

Press the remote button to activate AIR flow.

Compare the flow meter indicator ball reading to the red flag.

ABOVE the red flag indicates a leak present.

BELOW the red flag indicates a sealed system.

**Is the indicator ball above the red flag?**

**Yes** >> Go To 7

**No** >> Go To 8

---

**P0440-GENERAL EVAP SYSTEM FAILURE (CONTINUED)****7. EVAPORATIVE EMISSION LEAK DETECTION**

**Note:** A thorough visual inspection of the Evap system hoses, tubes, and connections may save time in your diagnosis. Look for any physical damage or signs of wetness at connections. The strong smell of fuel vapors may aid diagnosis also.

To continue testing, you will need Miller Tool #8404 Evaporative Emissions Leak Detector (EELD).

Remove the Air supply hose from the service port or the #8404-ADP adapter.

Connect the SMOKE supply tip (black hose) to the service port (if equipped) or to the #8404-ADP adapter.

Set the smoke/air control switch to SMOKE.

**Note:** The flow meter indicator ball will not move at this point.

Press the remote smoke/air start button.

**Note:** Make sure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.

**Note:** For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke.

If a leak is concealed from view (i.e., top of fuel tank), release the remote smoke/air start button, and use the ultra-violet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that are left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

**Note:** Carefully inspect the vent side of the EVAP Canister. Due to the filtering system in the canister the smoke or dye may or may not be visible. Introducing smoke into the filtered side of the canister may assist in locating the leak.

**Was a leak found?**

**Yes** >> Repair or replace the leaking component as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 11

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**P0440-GENERAL EVAP SYSTEM FAILURE (CONTINUED)****8. NVLD ASSEMBLY**

Turn the ignition off.

Disconnect the NVLD electrical harness connector.

Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

Connect a jumper wire between the (K107) NVLD Switch Signal circuit and the (Z914) Ground circuit in the NVLD electrical harness connector.

Monitor the NVLD Switch state on the scan tool.

**Note: Remove the jumper wire before continuing.**

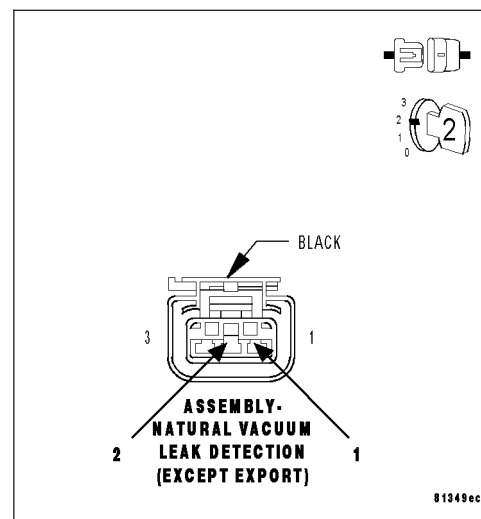
**Does the Switch change from OPEN to CLOSED when the jumper wire is installed?**

**Yes** >> Replace the NVLD Assembly.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 9

**Note: Remove the jumper wire before continuing.**

**9. (Z914) GROUND CIRCUIT OPEN**

Turn the ignition off.

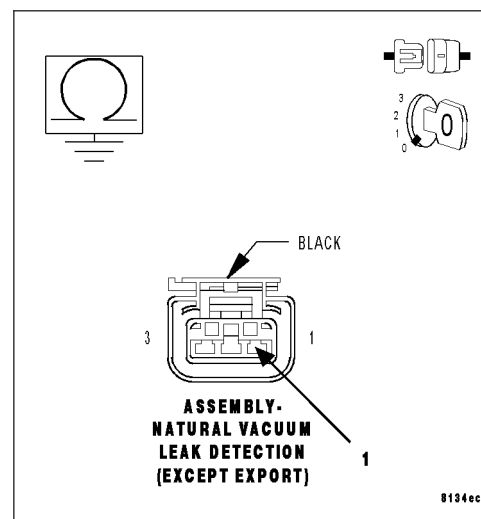
Measure the resistance between the (Z914) Ground circuit and ground.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 10

**No** >> Repair the open in the (Z914) Ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0440-GENERAL EVAP SYSTEM FAILURE (CONTINUED)

### 10. (K107) NVLD SWITCH SIGNAL CIRCUIT OPEN

Disconnect the PCM harness connectors.

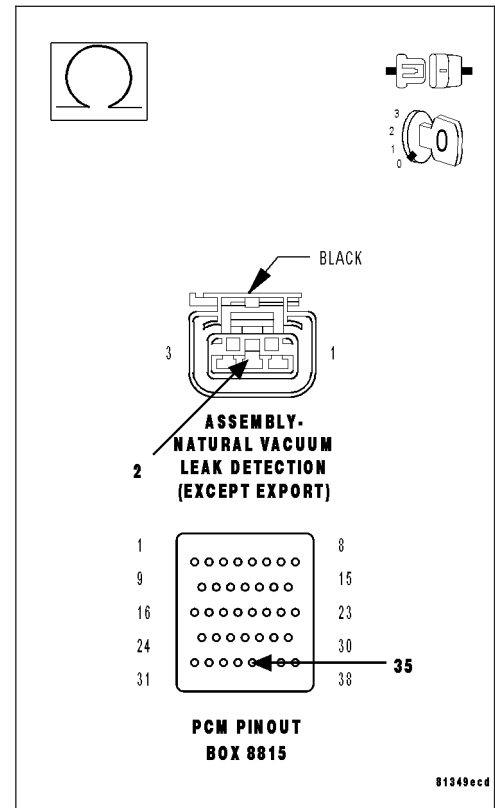
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K107) NVLD Switch Signal circuit from the NVLD electrical harness connector to the appropriate terminal of the special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 11

**No** >> Repair the open in the (K107) Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## 11. PCM

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

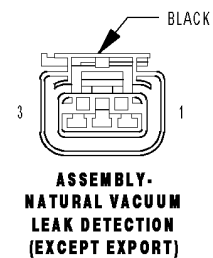
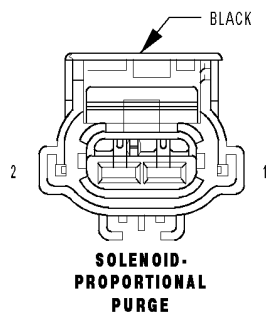
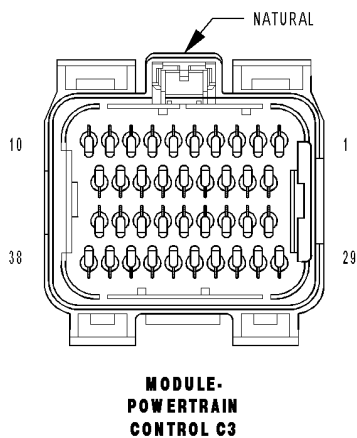
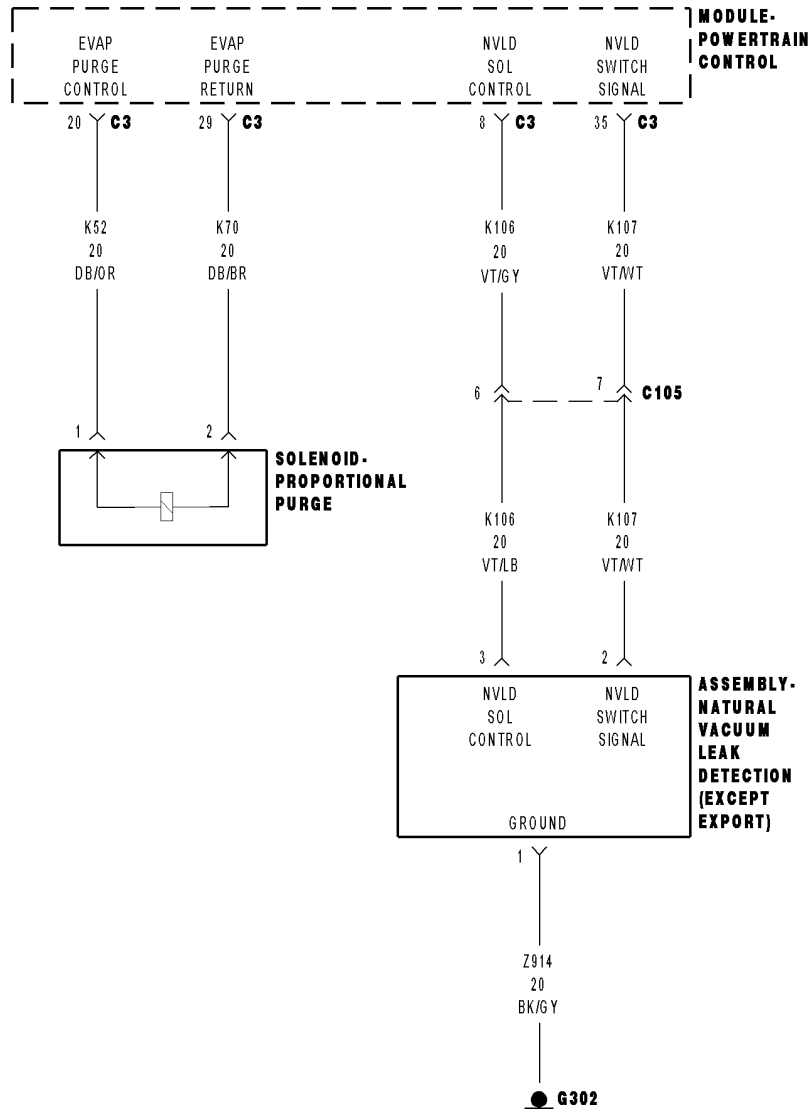
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0441-EVAP PURGE SYSTEM PERFORMANCE



**P0441-EVAP PURGE SYSTEM PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Cold start test. Engine Running. Small Leak Test Passed.

- **Set Condition:**

The PCM activates the EVAP Purge solenoid gradually increases to maximum flow. During flow, the PCM looks for the NVLD switch to close. If the PCM does not see the NVLD switch close at maximum flow an error is detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EVAP PURGE SOLENOID VACUUM SUPPLY
EVAP PURGE SOLENOID

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** If any of the following DTCs are set (P0443, P0452, P0453, P0498 or P0499) diagnose them first before continuing with P0441.

Ignition on, engine not running.

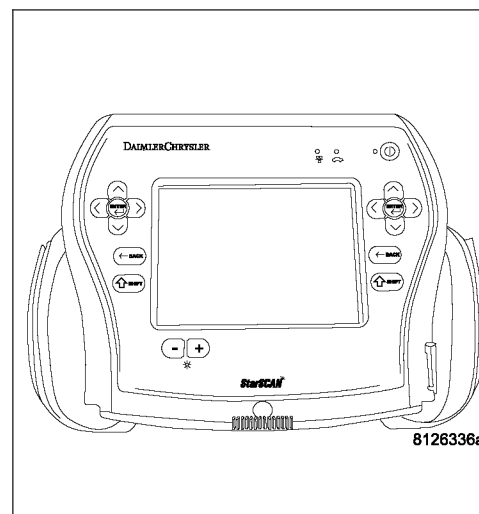
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0441-EVAP PURGE SYSTEM PERFORMANCE (CONTINUED)****2. CHECKING EVAP PURGE SOLENOID FUNCTIONALITY**

**Note:** After disconnecting the Evap Purge vacuum connections, inspect the lines and solenoid for any signs of contamination or foreign materials.

Using a hand vacuum pump, apply 10 in Hg to "CAN" side of the EVAP Purge Solenoid.

Ignition on, engine not running.

Observe the vacuum gauge.

With the scan tool, actuate the EVAP Purge Solenoid.

**Does the vacuum drop when the solenoid is actuated?**

**Yes** >> Go To 3

**No** >> Replace the Evap Purge Solenoid.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**Note:** Remove the vacuum gauge before continuing.

---

**3. EVAP VACUUM SUPPLY HOSE INSPECTION**

Turn the ignition off.

Carefully inspect the Evap Purge Solenoid vacuum supply hose for proper routing.

Check for a pinched or plugged hose from the throttle body to the Purge Solenoid.

Inspect the vacuum port at the throttle body for any damage or plugging.

**Were any problems found?**

**Yes** >> Repair the vacuum supply hose/tube as necessary.

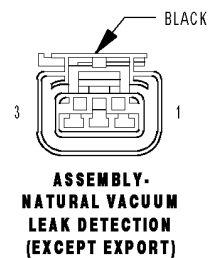
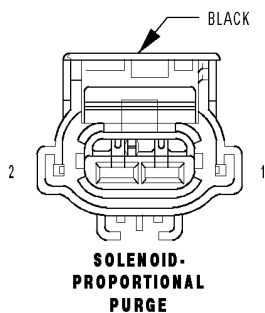
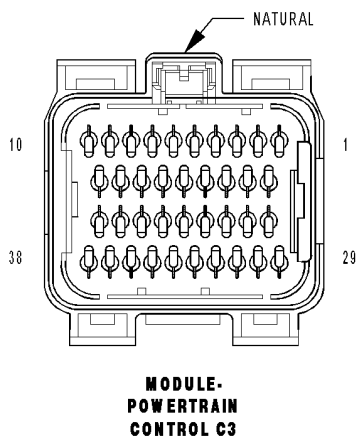
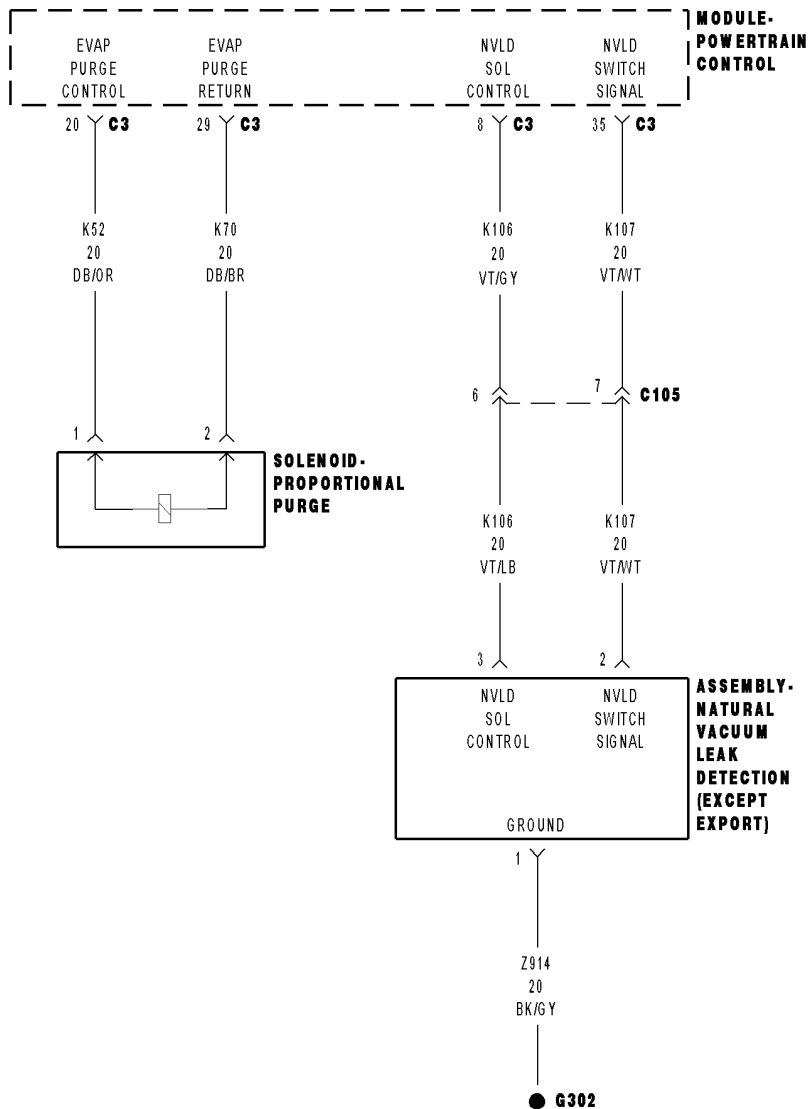
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0442-EVAP PURGE SYSTEM MEDIUM LEAK



**P0442-EVAP PURGE SYSTEM MEDIUM LEAK (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine Running. Cold start test. Fuel Level greater than 12%. Ambient Temperature between 4°C and 32°C (39°F and 89°F) Close Loop fuel system. Test runs when small leak test is maturing.

- **Set Condition:**

The PCM activates the EVAP Purge Solenoid to pull the EVAP system into a vacuum to close the NVLD switch. Once the NVLD switch is closed, the PCM turns the EVAP Purge solenoid off to seal the EVAP system. If the NVLD switch reopens before the calibrated amount of time for a Medium leak an error is detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EVAP PURGE SYSTEM LEAK
EVAP PURGE SOLENOID
NVLD SWITCH

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Since a hot vehicle can conceal a leak, it is best to perform this test at room temperature.

**Note:** A loose gas cap could have caused this DTC to set. Make sure gas cap is tight and in good condition. Make sure the gas cap meets OEM specifications.

Ignition on, engine not running.

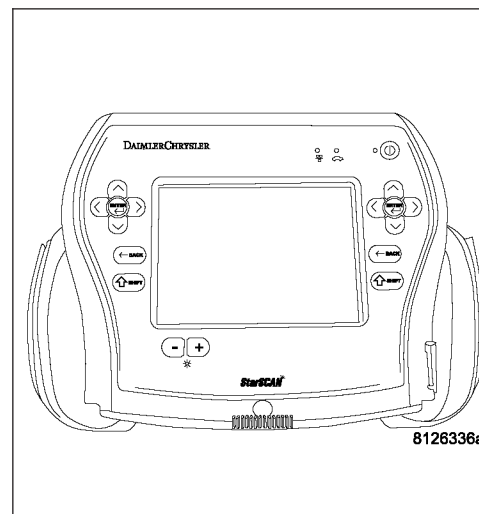
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0442-EVAP PURGE SYSTEM MEDIUM LEAK (CONTINUED)****2. VISUAL AND PHYSICAL INSPECTION**

Perform a visual and physical inspection of the entire Evaporative Emission system.

Check for the follow conditions:

- Holes or cracks
- Loose seal points
- Evidence of damaged components
- Incorrect routing of hoses and tubes
- Fuel Cap gasket seal

**Were any of the above conditions found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. VERIFY EVAPORATIVE EMISSION LEAK**

To continue testing you will need Miller Tool #8404A Evaporative Emission Leak Detector (EELD).

**WARNING: Keep lit cigarettes, sparks, flames, and other ignition sources away from the test area to prevent the ignition of explosive gases. Keep the test area well ventilated.**

**Note: The fuel tank should have between 20% and 80% of fuel tank capacity to properly test the Evap system.**

Connect the red power lead of the EELD to the battery positive terminal and the black ground lead to battery negative terminal.

Block the vent hose of the canister if using the service port.

Connect shop air to the EELD.

Set the smoke/air control switch to AIR.

Insert the tester's AIR supply tip (clear hose) into the appropriate calibration orifice on the tester's control panel (based on DTC leak size).

Press the remote smoke/air start button.

Position the red flag on the air flow meter so it is aligned with the indicator ball.

When the calibration is complete, release the remote button. The EELD flow meter is now calibrated in liters per minute to the size leak indicated by the DTC set in the PCM.

Install the service port adapter #8404-14 on the vehicle's service port and block the vent hose of the EVAP Canister (if equipped) or install the #8404-ADP service adaptor into the filter line.

Connect the Air supply hose from the EELD to the service port (if equipped) or to the #8404-ADP adapter.

Press the remote button to activate AIR flow.

**Note: Larger volume fuel tanks, lower fuel levels or if the vehicle is equipped with a Flow Management Valve may indicate high flow and will require 4 to 5 minutes to fill.**

Compare the flow meter indicator ball reading to the red flag.

ABOVE the red flag indicates a leak present.

BELOW the red flag indicates a sealed system.

**Is the indicator ball above the red flag?**

**Yes** >> Go To 4

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**P0442-EVAP PURGE SYSTEM MEDIUM LEAK (CONTINUED)****4. EVAPORATIVE EMISSION LEAK DETECTION**

**Note:** A thorough visual inspection of the Evap system hoses, tubes, and connections may save time in your diagnosis. Look for any physical damage or signs of wetness at connections. The strong smell of fuel vapors may also aid diagnosis.

To continue testing, you will need Miller Tool #8404A Evaporative Emissions Leak Detector (EELD).

Remove the Air supply hose from the service port (if equipped) or from the #8404-ADP adapter.

Connect the SMOKE supply tip (black hose) to the service port (if equipped) or to the #8404-ADP adapter.

Set the smoke/air control switch to SMOKE.

**Note:** The flow meter indicator ball will not move in the smoke mode.

Press the remote smoke/air start button.

**Note:** Make sure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.

**Note:** For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke.

If a leak is concealed from view (i.e., top of fuel tank), release the remote smoke/air start button, and use the ultra-violet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

**Note:** Carefully inspect the vent side of the EVAP Canister. Due to the filtering system in the canister the smoke may not be as thick. Introducing smoke into the filtered side of the canister may assist in locating the leak.

**Was a leak found?**

**Yes** >> Repair or replace the leaking component as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

---

**5. EVAP PURGE SOLENOID OPERATION**

**Note:** After disconnecting the Evap Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a faulty vent valve. Replace/repair as necessary.

Turn the ignition off.

Disconnect the vacuum hoses at the Evap Purge Solenoid.

Using a hand vacuum pump, apply 10 in Hg to the "CAN" of the EVAP Purge Solenoid.

**Note:** Monitor the vacuum gauge for at least 15 seconds.

**Does the EVAP Purge Solenoid hold vacuum?**

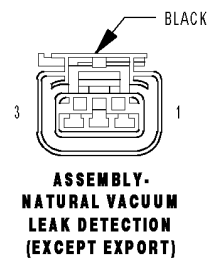
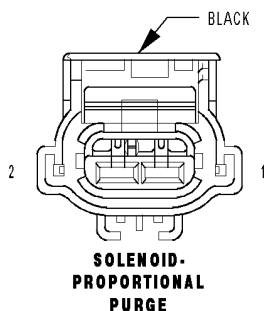
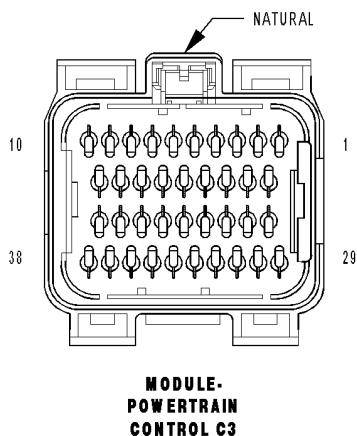
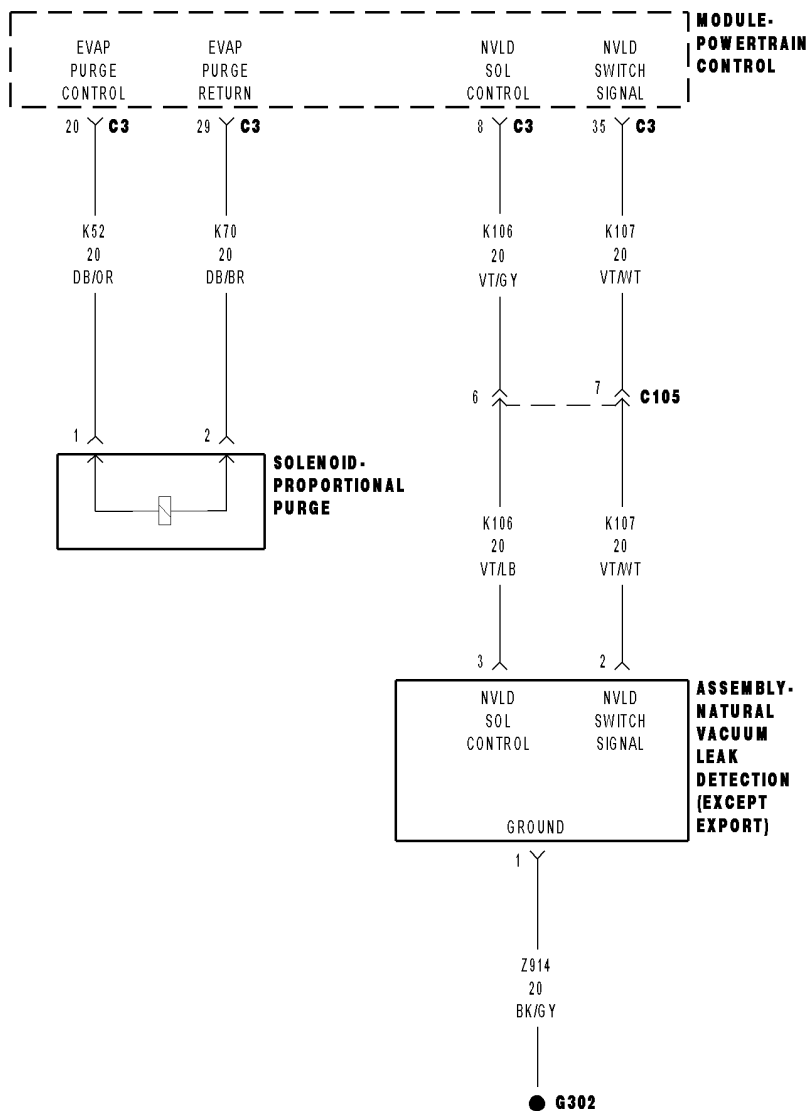
**Yes** >> Test Complete.

**No** >> Replace the Evap Purge Solenoid.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0443-EVAP PURGE SOLENOID CIRCUIT





**P0443-EVAP PURGE SOLENOID CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The ignition on or engine running. Battery voltage greater than 10 volts.

- **Set Condition:**

The PCM will set a trouble code if the actual state of the solenoid does not match the intended state. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K52) EVAP PURGE CONTROL CIRCUIT OPEN
(K52) EVAP PURGE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
(K70) EVAP PURGE SOLENOID SIGNAL CIRCUIT OPEN
(K70) EVAP PURGE SOLENOID SIGNAL CIRCUIT SHORTED TO GROUND
EVAP PURGE SOLENOID
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

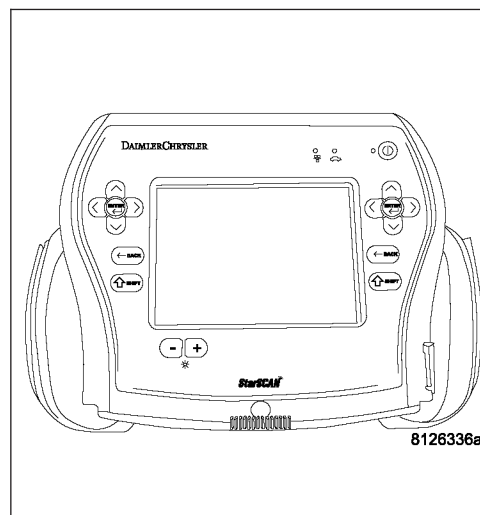
With the scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0443-EVAP PURGE SOLENOID CIRCUIT (CONTINUED)

### 2. EVAP PURGE SOLENOID OPERATION

Turn the ignition off.

Disconnect the EVAP Purge Solenoid harness connector.

Ignition on, engine not running.

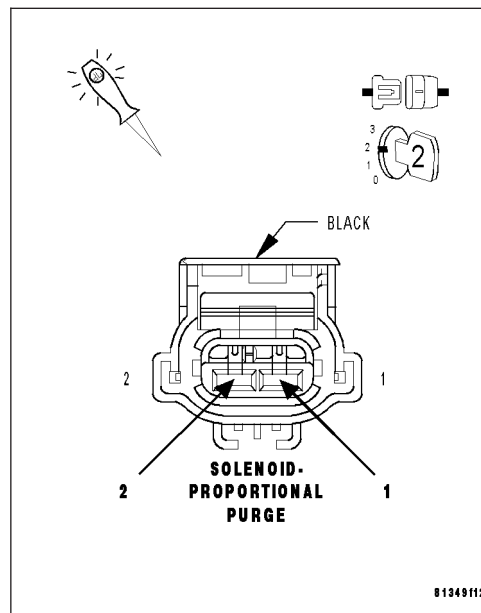
Using a 12-volt test light, jump across the (K52) Evap Purge Solenoid Control circuit and (K70) Evap Purge Solenoid Return circuit in the EVAP Purge Solenoid harness connector.

With a scan tool, actuate the EVAP Purge Solenoid.

**Does the test light flash on and off?**

**Yes** >> Replace the EVAP Purge Solenoid.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3



### 3. (K52) EVAP PURGE SOLENOID CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the PCM harness connectors.

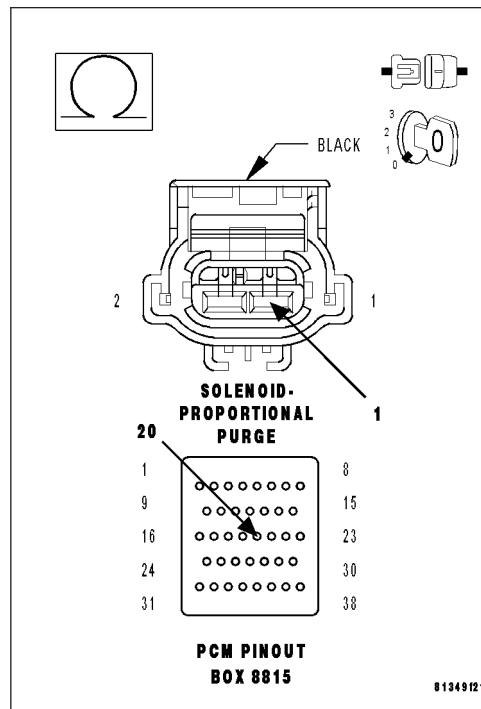
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K52) Evap Purge Solenoid Control circuit from the Evap Purge Solenoid harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the open in the (K52) EVAP Purge Solenoid Control circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0443-EVAP PURGE SOLENOID CIRCUIT (CONTINUED)****4. (K52) EVAP PURGE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND**

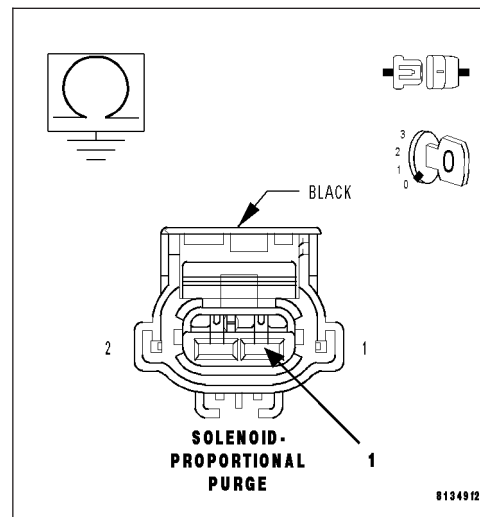
Measure the resistance between ground and the (K52) Evap Purge Solenoid Control circuit in the Evap Purge Solenoid harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K52) EVAP Purge Solenoid Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K70) EVAP PURGE SOLENOID RETURN CIRCUIT OPEN**

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

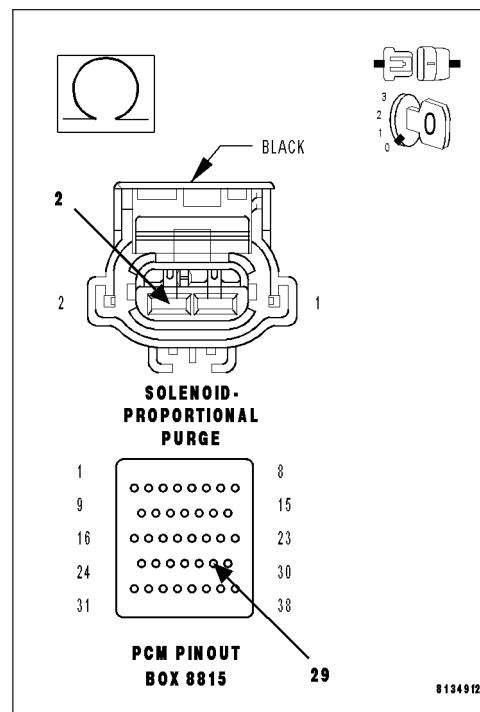
Measure the resistance of the (K70) Evap Purge Solenoid Return circuit from the EVAP Purge Solenoid harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K70) Evap Purge Solenoid Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

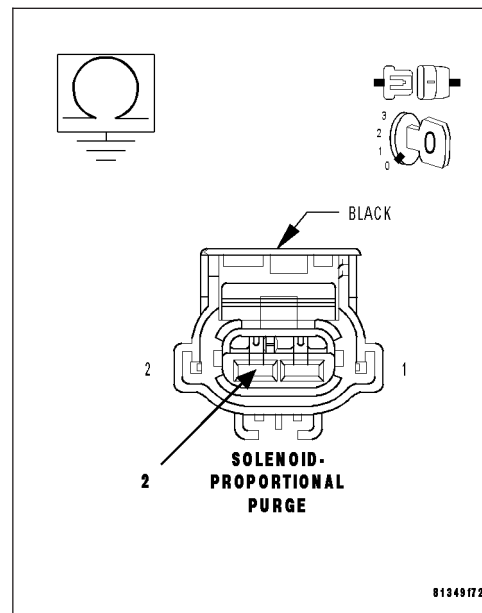


**P0443-EVAP PURGE SOLENOID CIRCUIT (CONTINUED)****6. (K70) EVAP PURGE SOLENOID RETURN CIRCUIT SHORTED TO GROUND**

Measure the resistance between ground and the (K70) Evap Purge Solenoid Return circuit in the Evap Purge Solenoid harness connector.

**Is the resistance below 100 ohms?**

- Yes** >> Repair the short to ground in the (K70) Evap Purge Solenoid Return circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.
- No** >> Go To 7

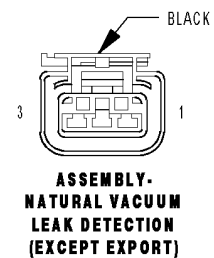
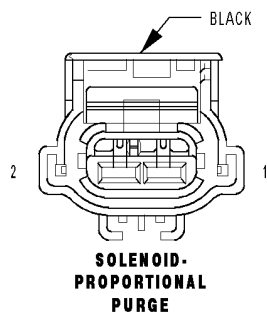
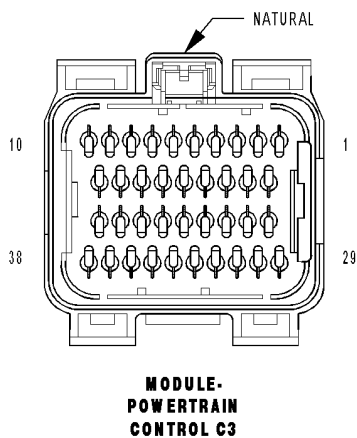
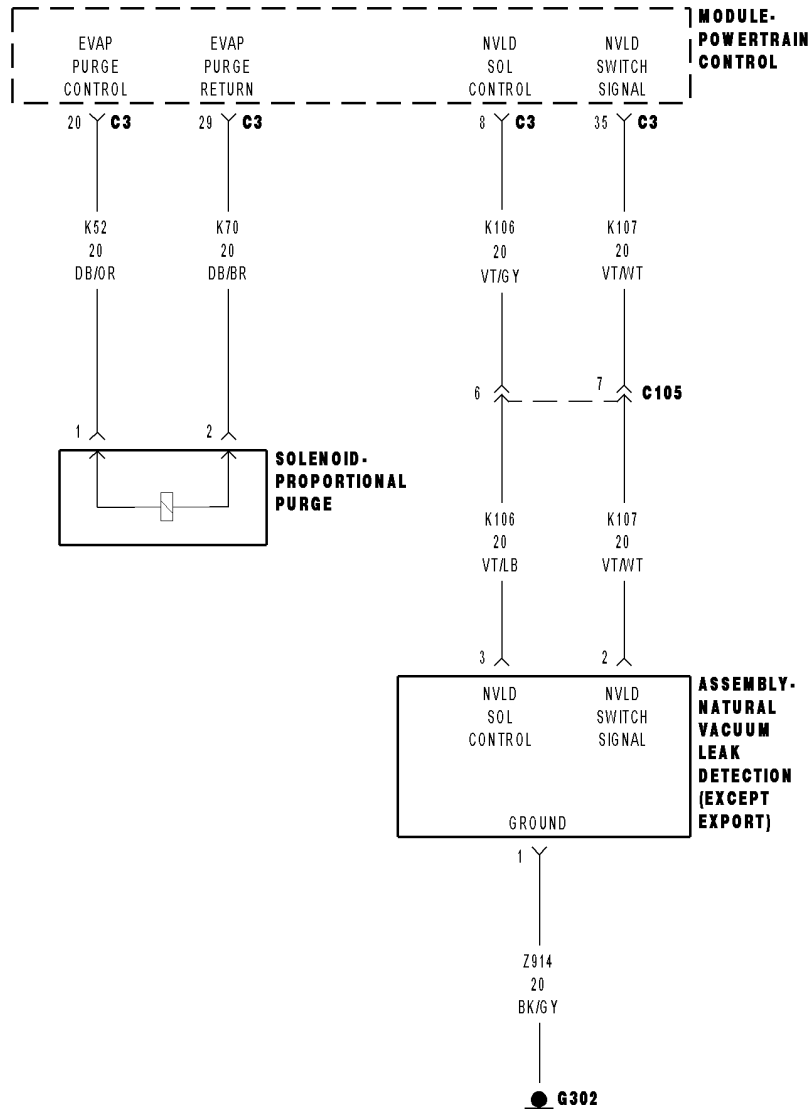
**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**P0452-NVLD PRESSURE SWITCH STUCK CLOSED**

### P0452-NVLD PRESSURE SWITCH STUCK CLOSED (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:**  
 Immediately after the engine has been started.
- Set Condition:**  
 The PCM activates the NLVD Solenoid. If PCM does not see NVLD switch open an error is detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K52) EVAP PURGE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND (K107) NVLD SWITCH SIGNAL CIRCUIT SHORTED TO GROUND NVLD ASSEMBLY EVAP PURGE SOLENOID PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

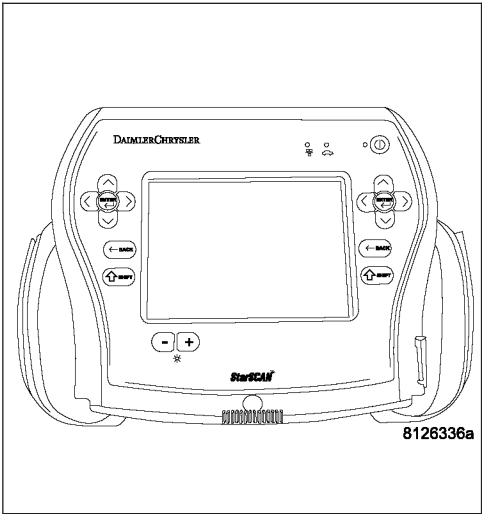
## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.  
 With a scan tool, read DTCs.

**Is the DTC active at this time?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
 Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0452-NVLD PRESSURE SWITCH STUCK CLOSED (CONTINUED)****2. EVAP PURGE SOLENOID OPERATION**

Turn the ignition off.

Disconnect the EVAP Purge Solenoid harness connector.

Ignition on, engine not running.

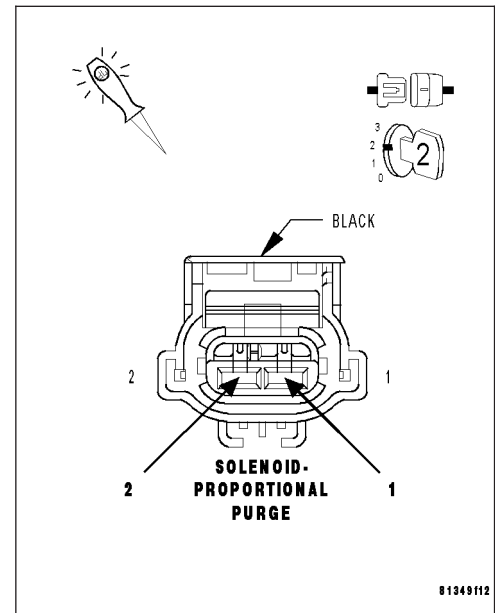
Using a 12-volt test light, jump across the Evap Purge Solenoid harness connector.

With the scan tool, actuate the EVAP Purge Solenoid.

**Does the test light flash on and off?**

**Yes** >> Go To 3

**No** >> Go To 7

**3. EVAP PURGE SOLENOID LEAKS/STUCK OPEN**

Turn the ignition off.

Connect the Evap Purge Solenoid harness connector.

Disconnect the vacuum hoses at the Evap Purge Solenoid.

**Note:** After disconnecting the Evap Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a fault vent valve. Replace/repair as necessary.

Using a hand vacuum pump, apply 10 in Hg to the "CAN" of the EVAP Purge Solenoid.

**Note:** Monitor the vacuum gauge for at least 15 seconds.

**Does the EVAP Purge Solenoid hold vacuum?**

**Yes** >> Go To 4

**No** >> Replace the Evap Purge Solenoid.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**4. NVLD SWITCH OPERATION**

Ignition on, engine not running.

Using the scan tool, monitor the NVLD Switch State with the vacuum pump still installed and holding vacuum.

**Does the scan tool display the NVLD state OPEN?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**Note:** Remove the vacuum pump and connect the vacuum hose before continuing.

**P0452-NVLD PRESSURE SWITCH STUCK CLOSED (CONTINUED)****5. NVLD ASSEMBLY**

Disconnect the NVLD electrical connector.

**Does the Switch change from CLOSED to OPEN?**

**Yes** >> Replace the NVLD Assembly.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6

**6. (K107) NVLD SWITCH SIGNAL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

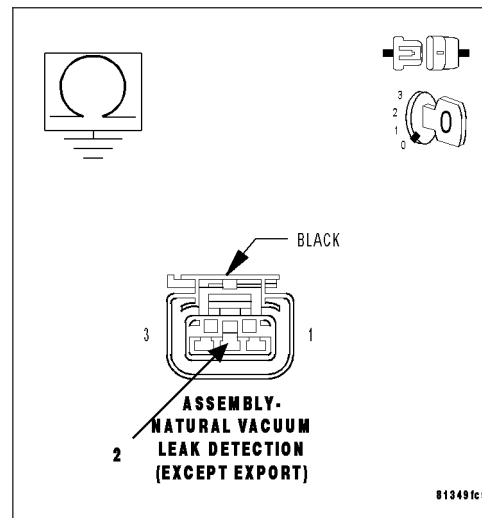
Measure the resistance between ground and the (K107) NVLD Switch Signal circuit in the NVLD Assembly harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K107) NVLD Switch Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

**7. (K52) EVAP PURGE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

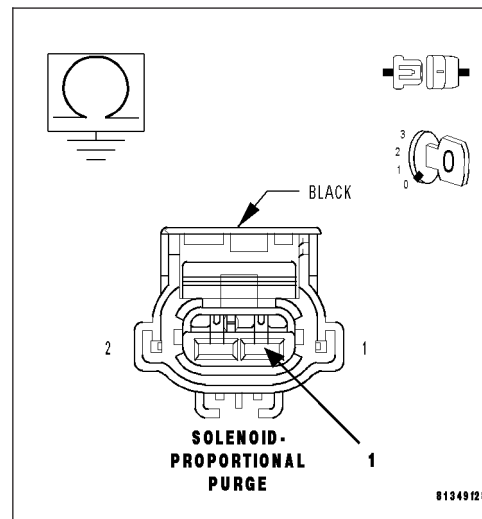
Measure the resistance between ground and the (K52) Evap Purge Solenoid Control circuit in the EVAP Purge Solenoid harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K52) Evap Purge Sol Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8





**P0452-NVLD PRESSURE SWITCH STUCK CLOSED (CONTINUED)****8. PCM**

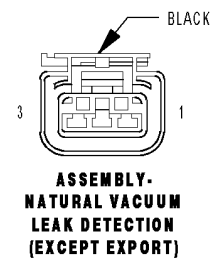
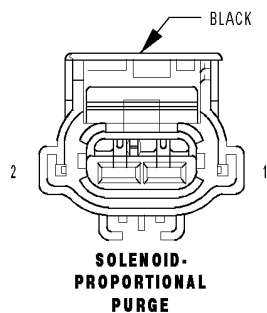
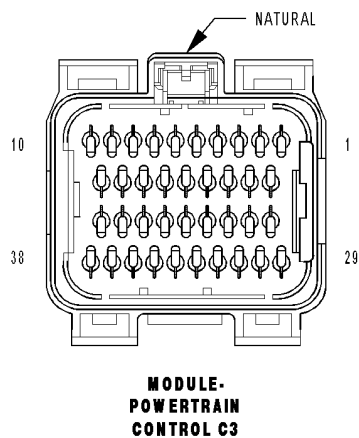
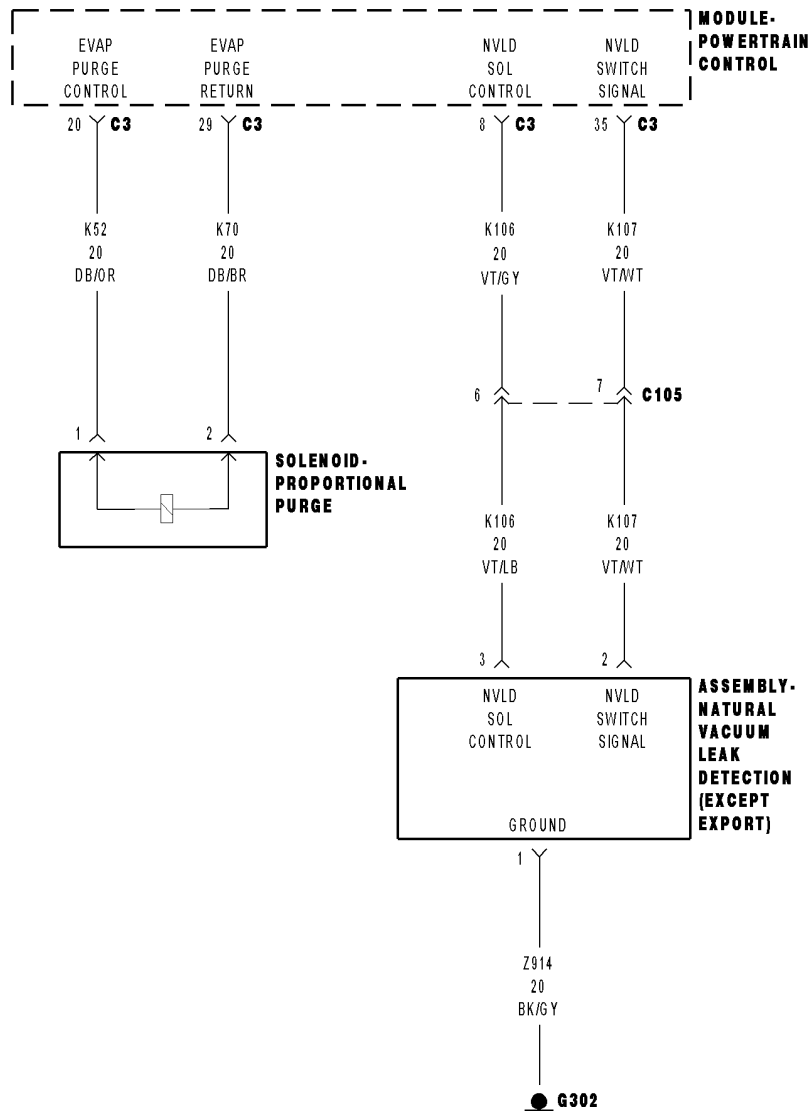
**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No**      >> Replace and program the Powertrain Control Module per Service Information.  
          Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
-

## P0453-NVLD PRESSURE SWITCH STUCK OPEN



**P0453-NVLD PRESSURE SWITCH STUCK OPEN (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running.

- **Set Condition:**

If the PCM does not see the NVLD switch close during test an error is detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K107) NVLD SWITCH SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K107) NVLD SWITCH SIGNAL CIRCUIT OPEN
(K107) NVLD SWITCH SIGNAL CIRCUIT SHORTED TO (K106) NVLD SOLENOID CONTROL CIRCUIT
(Z914) GROUND CIRCUIT OPEN
NVLD ASSEMBLY
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. NVLD SWITCH OPERATION

Start the engine.

Allow the engine to idle.

Using a scan tool, perform the NVLD FORCED MONITOR TEST.

Monitor the NVLD Switch state.

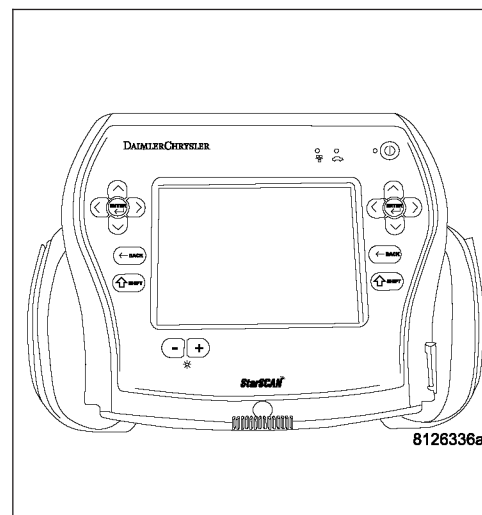
**Note:** As the test runs, the NVLD Switch should go from an **OPEN** state to a **CLOSED** state and then return to **OPEN** when the test is complete.

**Did the NVLD Switch operate as described above?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 2



## P0453-NVLD PRESSURE SWITCH STUCK OPEN (CONTINUED)

### 2. NVLD ASSEMBLY

Turn the ignition off.

Disconnect the NVLD electrical harness connector.

Ignition on, engine not running.

Monitor the NVLD Switch state on the scan tool.

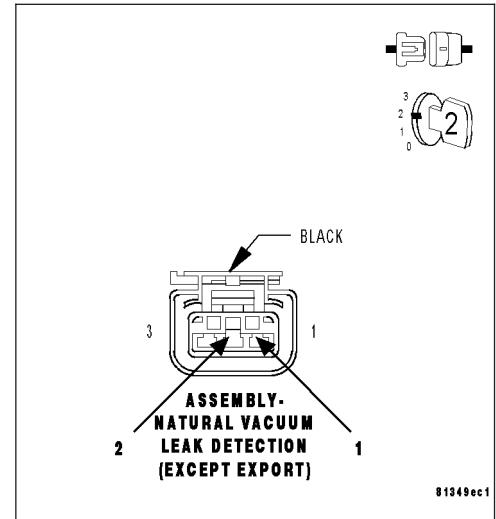
Connect a jumper wire between the (K107) NVLD Switch Signal circuit and the (Z914) Ground circuit in the NVLD harness connector.

**Does the Switch change from OPEN to CLOSED with the jumper wire installed?**

**Yes** >> Replace the NVLD Assembly.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**Note:** Remove the jumper wire before continuing.



### 3. (K107) NVLD SWITCH SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

Disconnect the PCM harness connectors.

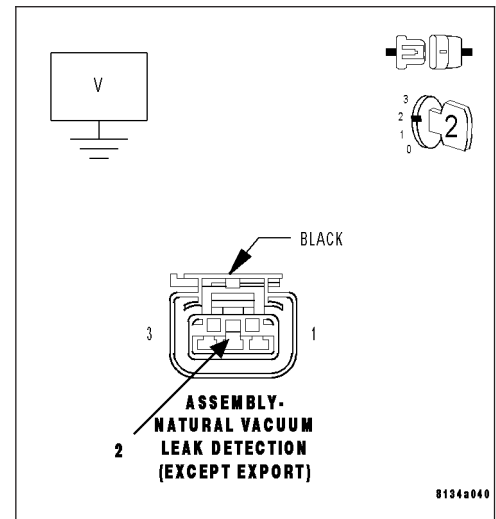
Ignition on, engine not running.

Measure the voltage on the (K107) NVLD Switch Signal circuit in the NVLD electrical harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (K107) NVLD Switch Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P0453-NVLD PRESSURE SWITCH STUCK OPEN (CONTINUED)****4. (K107) NVLD SWITCH SIGNAL CIRCUIT OPEN**

Turn the ignition off.

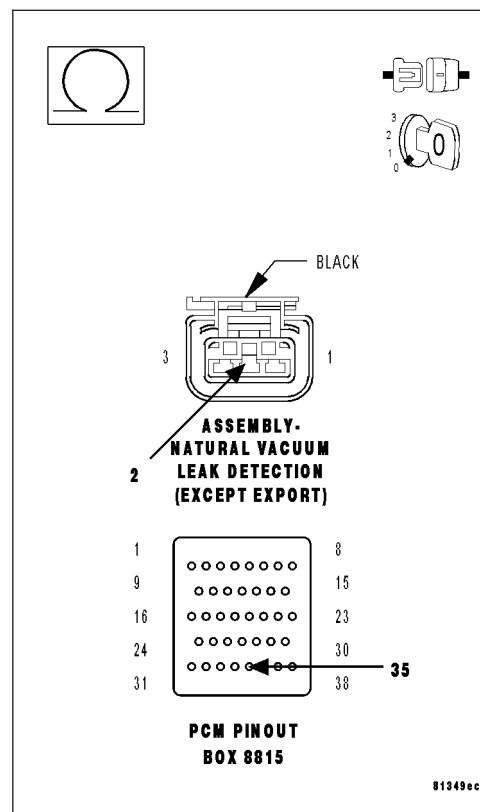
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K107) NVLD Switch Signal circuit from the NVLD electrical harness connector to the appropriate terminal of special tool # 8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K107) NVLD Switch Signal circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

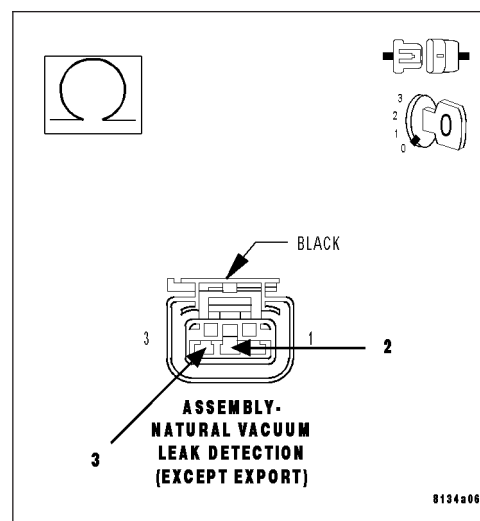
**5. (K107) NVLD SWITCH SIGNAL CIRCUIT SHORTED TO THE (K106) NVLD SOLENOID CONTROL CIRCUIT**

Measure the resistance between the (K107) NVLD Switch Signal circuit and the (K106) NVLD Solenoid Control circuit in the NVLD electrical harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (K107) NVLD Switch Signal circuit and the (K106) NVLD Solenoid Control circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



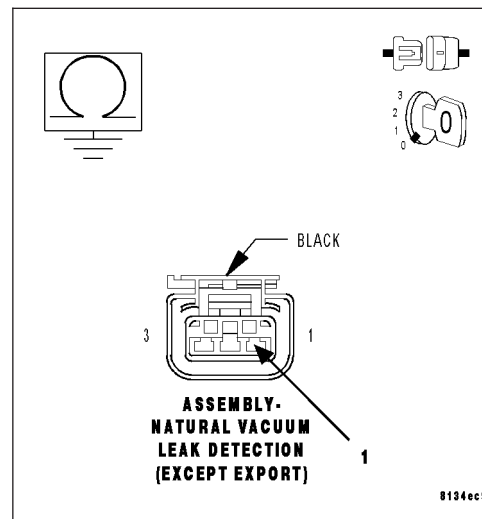
**P0453-NVLD PRESSURE SWITCH STUCK OPEN (CONTINUED)****6. (Z914) GROUND CIRCUIT OPEN**

Measure the resistance between the (Z914) Ground circuit and ground.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (Z914) Ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

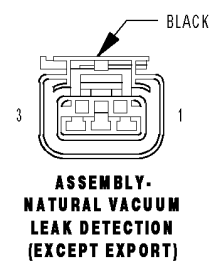
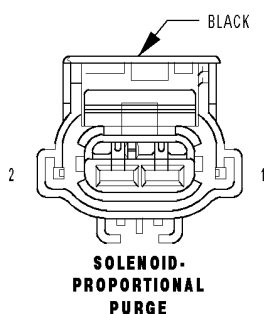
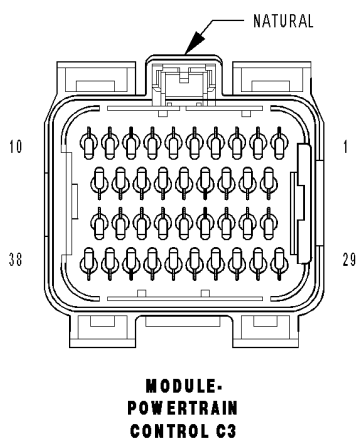
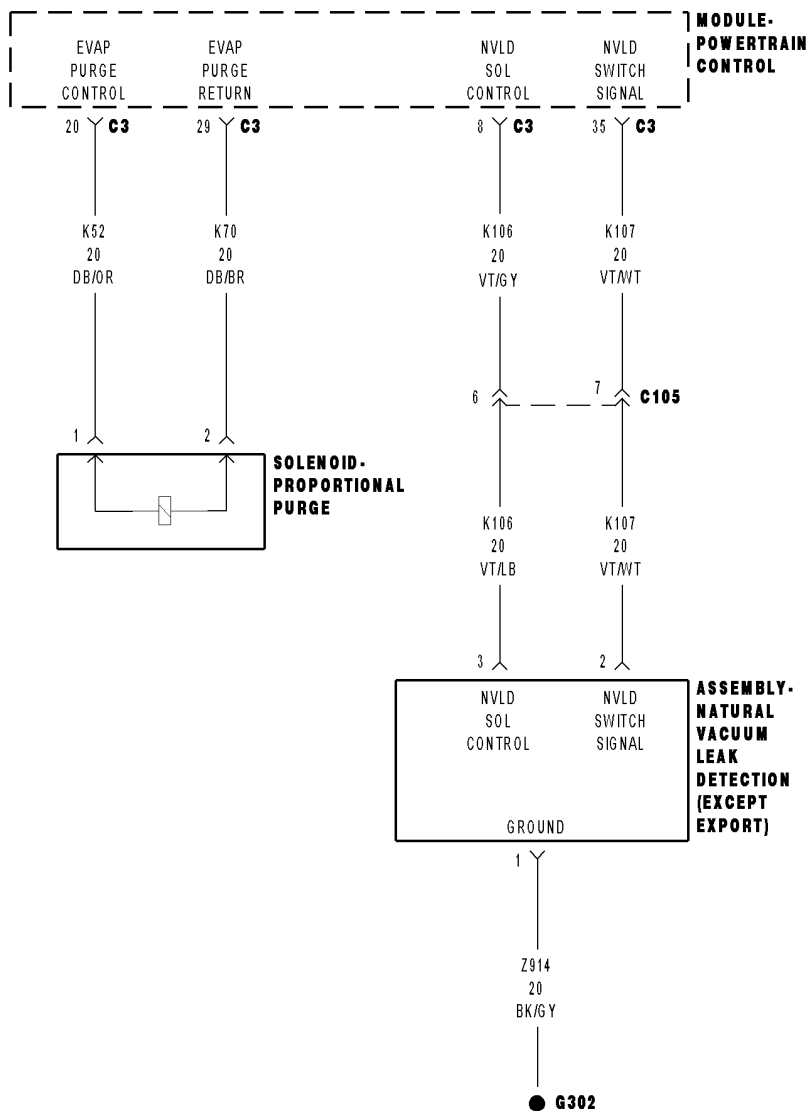
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0455-EVAP PURGE SYSTEM LARGE LEAK



**P0455-EVAP PURGE SYSTEM LARGE LEAK (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine Running. Cold start test. Fuel Level greater than 12%. Ambient Temperature between 4°C and 32°C (39°F and 89°F) Close Loop fuel system. Test runs when small leak test is maturing.

- **Set Condition:**

The PCM activates the EVAP Purge Solenoid to pull the EVAP system into a vacuum to close the NVLD switch. Once the NVLD switch is closed, the PCM turns the EVAP Purge solenoid off to seal the EVAP system. If the NVLD switch reopens before the calibrated amount of time for a Large leak an error is detected. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EVAP PURGE SYSTEM LEAK
EVAP PURGE SOLENOID
NVLD SWITCH

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Check for any related TSBs before continuing.

**Note:** Since a hot vehicle can conceal a leak, it is best to perform this test at room temperature.

**Note:** A loose gas cap could have caused this DTC to set. Make sure gas cap is tight and in good condition. Ensure the gas cap meets OEM specifications.

Ignition on, engine not running.

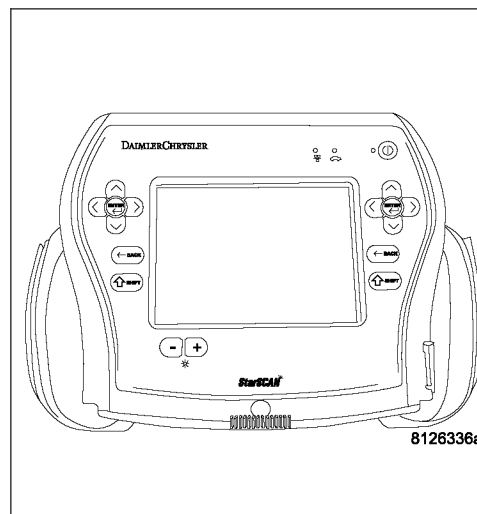
With a scan tool, read DTCs and record the related Freeze Frame data.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





**P0455-EVAP PURGE SYSTEM LARGE LEAK (CONTINUED)****2. VISUAL AND PHYSICAL INSPECTION**

Perform a visual and physical inspection of the entire Evaporative Emission system.

Check for the follow conditions:

- Holes or cracks
- Loose seal points
- Evidence of damaged components
- Incorrect routing of hoses and tubes
- Fuel Cap gasket seal

**Were any of the above conditions found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

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**3. VERIFY EVAPORATIVE EMISSION LEAK**

To continue testing you will need Miller Tool #8404A Evaporative Emission Leak Detector (EELD).

**WARNING: Keep lit cigarettes, sparks, flames, and other ignition sources away from the test area to prevent the ignition of explosive gases. Keep the test area well ventilated.**

**Note: The fuel tank should have between 20% and 80% of fuel tank capacity to properly test the Evap system.**

Connect the red power lead of the EELD to the battery positive terminal and the black ground lead to battery negative terminal.

Block the vent hose of the canister if using the service port.

Connect shop air to the EELD.

Set the smoke/air control switch to AIR.

Insert the tester's AIR supply tip (clear hose) into the appropriate calibration orifice on the tester's control panel (based on DTC leak size).

Press the remote smoke/air start button.

Position the red flag on the air flow meter so it is aligned with the indicator ball.

When the calibration is complete, release the remote button. The EELD flow meter is now calibrated in liters per minute to the size leak indicated by the DTC set in the PCM.

Install the service port adapter #8404-14 on the vehicle's service port and block the vent hose of the EVAP Canister (if equipped) or install the #8404-ADP service adaptor into the filter line.

Connect the Air supply hose from the EELD to the service port (if equipped) or to the #8404-ADP adapter.

Press the remote button to activate AIR flow.

**Note: Larger volume fuel tanks, lower fuel levels or if the vehicle is equipped with a Flow Management Valve may indicate high flow and will require 4 to 5 minutes to fill.**

Compare the flow meter indicator ball reading to the red flag.

ABOVE the red flag indicates a leak present.

BELOW the red flag indicates a sealed system.

**Is the indicator ball above the red flag?**

**Yes** >> Go To 4

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**P0455-EVAP PURGE SYSTEM LARGE LEAK (CONTINUED)****4. EVAPORATIVE EMISSION LEAK DETECTION**

**Note:** A thorough visual inspection of the Evap system hoses, tubes, and connections may save time in your diagnosis. Look for any physical damage or signs of wetness at connections. The strong smell of fuel vapors may aid diagnosis also.

To continue testing, you will need Miller Tool #8404A Evaporative Emissions Leak Detector (EELD).

Remove the Air supply hose from the service port (if equipped) or from the #8404-ADP adapter.

Connect the SMOKE supply tip (black hose) to the service port (if equipped) or to the #8404-ADP adapter.

Set the smoke/air control switch to SMOKE.

**Note:** The flow meter indicator ball will not move in the smoke mode.

Press the remote smoke/air start button.

**Note:** Make sure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.

**Note:** For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke.

If a leak is concealed from view (i.e., top of fuel tank), release the remote smoke/air start button, and use the ultra-violet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

**Note:** Carefully inspect the vent side of the EVAP Canister. Due to the filtering system in the canister the smoke may not be as thick. Introducing smoke into the filtered side of the canister may assist in locating the leak.

**Was a leak found?**

**Yes** >> Repair or replace the leaking component as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

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**5. EVAP PURGE SOLENOID OPERATION**

**Note:** After disconnecting the Evap Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a faulty vent valve. Replace/repair as necessary.

Turn the ignition off.

Disconnect the vacuum hoses at the Evap Purge Solenoid.

Using a hand vacuum pump, apply 10 in Hg to the "CAN" of the EVAP Purge Solenoid.

**Note:** Monitor the vacuum gauge for at least 15 seconds.

**Does the EVAP Purge Solenoid hold vacuum?**

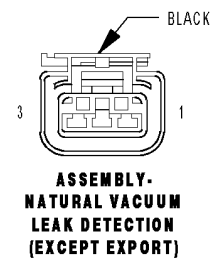
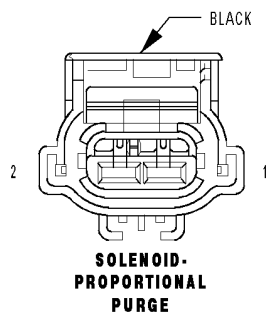
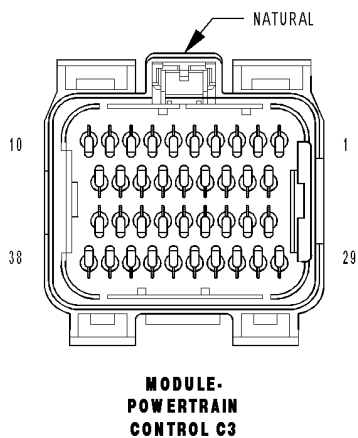
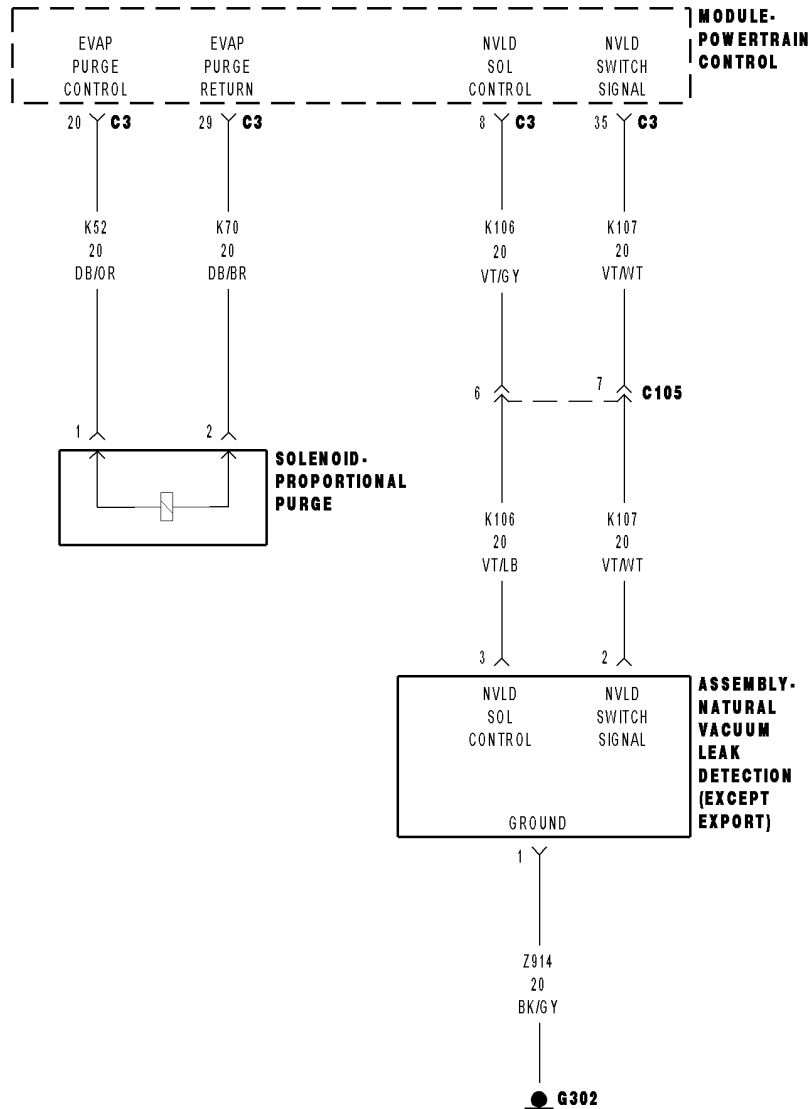
**Yes** >> Test Complete.

**No** >> Replace the Evap Purge Solenoid.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0456-EVAP PURGE SYSTEM SMALL LEAK



P0456-EVAP PURGE SYSTEM SMALL LEAK (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:**  
 Ignition off. Fuel Level less than 88%. Ambient Temperature between 4°C and 43°C (39°F and 109°F) Close Loop fuel system.
- Set Condition:**  
 Due to temperature changes, a vacuum is created in the fuel tank and EVAP system. With the EVAP system sealed, the PCM monitors the NVLD switch. If the NVLD switch does not close within a calibrated time allowance, an error is detected by the PCM. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EVAP PURGE SYSTEM LEAK
EVAP PURGE SOLENOID

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

**Note:** Since a hot vehicle can conceal a leak, it is best to perform this test at room temperature.

**Note:** A loose gas cap could have caused this DTC to set. Make sure gas cap is tight and in good condition. Make sure the gas cap meets OEM specifications.

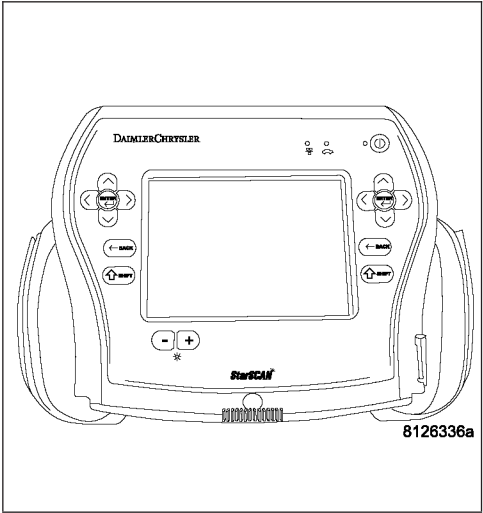
Ignition on, engine not running.

With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes

>> Go To 2
- No

>> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
 Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0456-EVAP PURGE SYSTEM SMALL LEAK (CONTINUED)****2. VISUAL AND PHYSICAL INSPECTION**

Perform a visual and physical inspection of the entire Evaporative Emission system.

Check for the follow conditions:

- Holes or cracks
- Loose seal points
- Evidence of damaged components
- Incorrect routing of hoses and tubes
- Fuel Cap gasket seal

**Were any of the above conditions found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. VERIFY EVAPORATIVE EMISSION LEAK**

To continue testing you will need Miller Tool #8404A Evaporative Emission Leak Detector (EELD).

**WARNING: Keep lit cigarettes, sparks, flames, and other ignition sources away from the test area to prevent the ignition of explosive gases. Keep the test area well ventilated.**

**Note: The fuel tank should have between 20% and 80% of fuel tank capacity to properly test the Evap system.**

Connect the red power lead of the EELD to the battery positive terminal and the black ground lead to battery negative terminal.

Block the vent hose of the canister if using the service port.

Connect shop air to the EELD.

Set the smoke/air control switch to AIR.

Insert the tester's AIR supply tip (clear hose) into the appropriate calibration orifice on the tester's control panel (based on DTC leak size).

Press the remote smoke/air start button.

Position the red flag on the air flow meter so it is aligned with the indicator ball.

When the calibration is complete, release the remote button. The EELD flow meter is now calibrated in liters per minute to the size leak indicated by the DTC set in the PCM.

Install the service port adapter #8404-14 on the vehicle's service port and block the vent hose of the EVAP Canister (if equipped) or install the #8404-ADP service adaptor into the filter line.

Connect the Air supply hose from the EELD to the service port (if equipped) or to the #8404-ADP adapter.

Press the remote button to activate AIR flow.

**Note: Larger volume fuel tanks, lower fuel levels or if the vehicle is equipped with a Flow Management Valve may indicate high flow and will require 4 to 5 minutes to fill.**

Compare the flow meter indicator ball reading to the red flag.

ABOVE the red flag indicates a leak present.

BELOW the red flag indicates a sealed system.

**Is the indicator ball above the red flag?**

**Yes** >> Go To 4

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**P0456-EVAP PURGE SYSTEM SMALL LEAK (CONTINUED)****4. EVAPORATIVE EMISSION LEAK DETECTION**

**Note:** A thorough visual inspection of the Evap system hoses, tubes, and connections may save time in your diagnosis. Look for any physical damage or signs of wetness at connections. The strong smell of fuel vapors may also aid diagnosis.

To continue testing, you will need Miller Tool #8404A Evaporative Emissions Leak Detector (EELD).

Remove the Air supply hose from the service port (if equipped) or from the #8404-ADP adapter.

Connect the SMOKE supply tip (black hose) to the service port (if equipped) or to the #8404-ADP adapter.

Set the smoke/air control switch to SMOKE.

**Note:** The flow meter indicator ball will not move in the smoke mode.

Press the remote smoke/air start button.

**Note:** Make sure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.

**Note:** For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.

While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke.

If a leak is concealed from view (i.e., top of fuel tank), release the remote smoke/air start button, and use the ultra-violet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.

The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.

**Note:** Carefully inspect the vent side of the EVAP Canister. Due to the filtering system in the canister the smoke may not be as thick. Introducing smoke into the filtered side of the canister may assist in locating the leak.

**Was a leak found?**

**Yes** >> Repair or replace the leaking component as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

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**5. EVAP PURGE SOLENOID OPERATION**

**Note:** After disconnecting the Evap Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a faulty vent valve. Replace/repair as necessary.

Turn the ignition off.

Disconnect the vacuum hoses at the Evap Purge Solenoid.

Using a hand vacuum pump, apply 10 in Hg to the "CAN" of the EVAP Purge Solenoid.

**Note:** Monitor the vacuum gauge for at least 15 seconds.

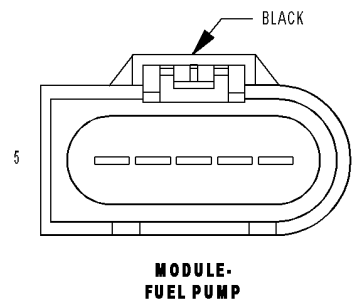
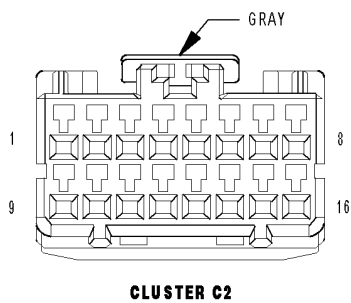
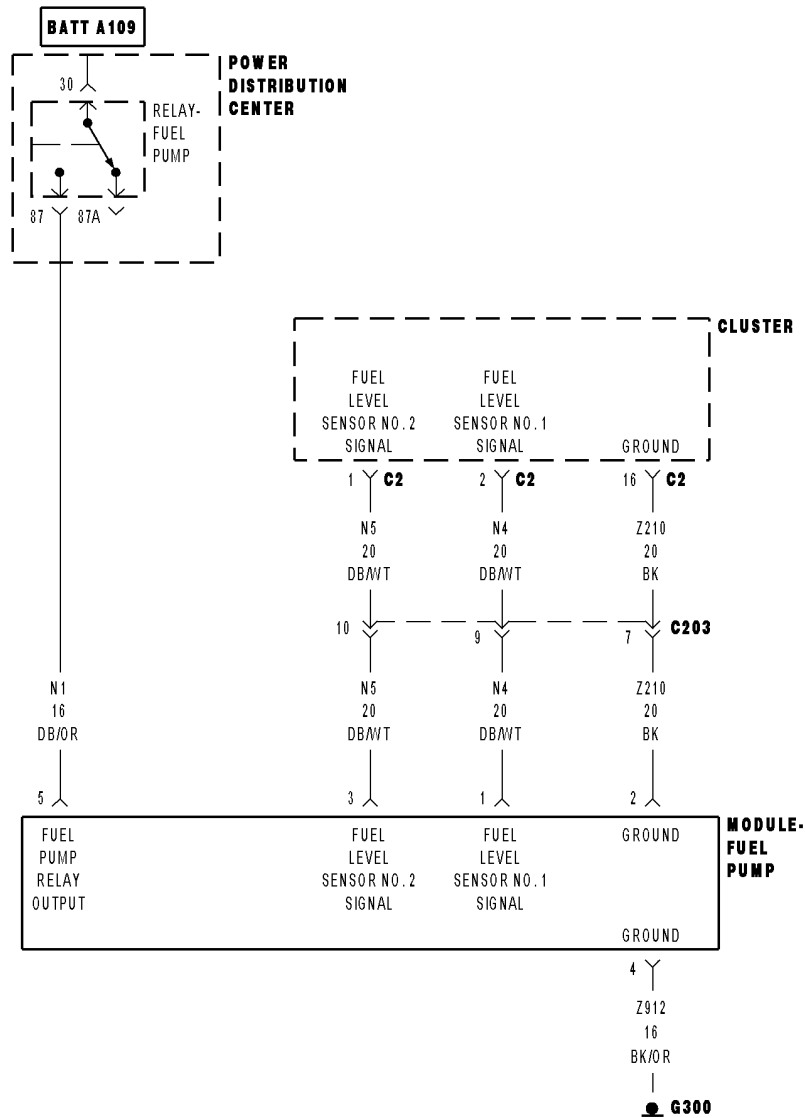
**Does the EVAP Purge Solenoid hold vacuum?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace the Evap Purge Solenoid.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 6.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0461-FUEL LEVEL SENSOR 1 PERFORMANCE



**P0461-FUEL LEVEL SENSOR 1 PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

TEST No.1: With the ignition on, the fuel level is compared to the previous key down after a 20 second delay.

TEST No.2: The PCM monitors the fuel level at ignition on.

- **Set Condition:**

TEST No.1: If the PCM does not see a difference in fuel level of greater than 0.1 volt the test will fail. TEST

No.2: If the PCM does not see a change in the fuel level of .1765 over a set amount of miles the test will fail.

Three good trips to turn off the MIL.

Possible Causes
(N4) FUEL LEVEL SIGNAL CIRCUIT OPEN
(N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO GROUND
(Z210) FUEL LEVEL SENSOR GROUND CIRCUIT OPEN
FUEL TANK
FUEL LEVEL SENSOR

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Diagnose any CAN - C or CAN - B Communication DTCs before continuing.

**Note:** Diagnose P0462 or P0463 first, if set along with P0461.

Ignition on, engine not running.

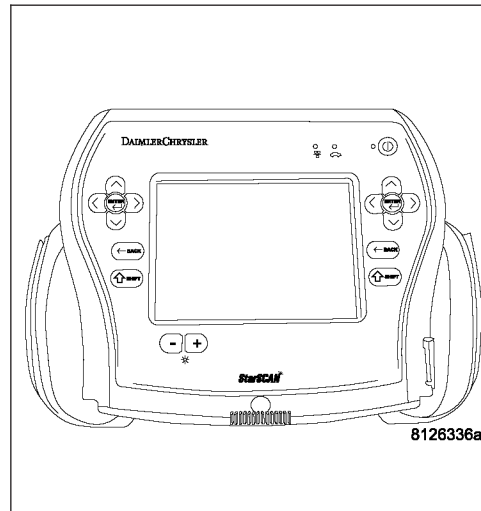
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



### 2. VISUALLY INSPECT FUEL TANK

Visually inspect the Fuel Tank for damage that may restrict the Fuel Sending Unit float from moving.

**Is the Fuel Tank OK?**

**Yes** >> Go To 3

**No** >> Replace the Fuel Tank as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0461-FUEL LEVEL SENSOR 1 PERFORMANCE (CONTINUED)****3. (N4) FUEL LEVEL SIGNAL CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Fuel Pump Module harness connector.

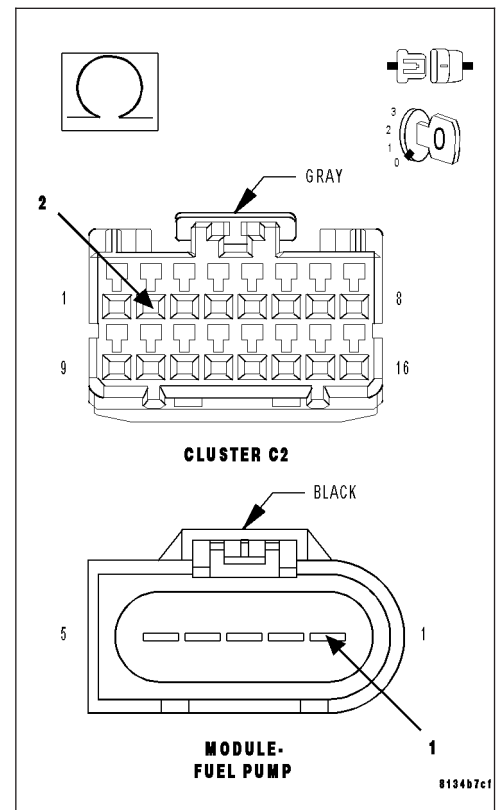
Disconnect the C2 Cluster harness connectors.

Measure the resistance of the (N4) Fuel Level Signal circuit from the Fuel Pump Module harness connector to the C2 Cluster harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the open in the (N4) Fuel Level Signal circuit.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**4. (N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO GROUND**

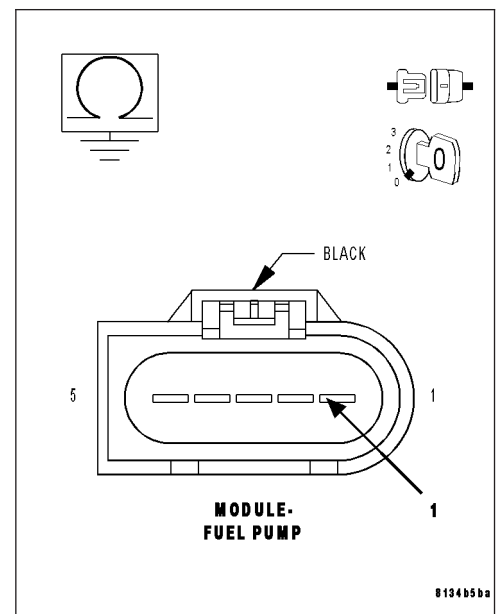
Measure the resistance between ground and the (N4) Fuel Level Signal circuit in the Fuel Pump Module harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (N4) Fuel Level Signal circuit.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



**P0461-FUEL LEVEL SENSOR 1 PERFORMANCE (CONTINUED)****5. (Z210) FUEL LEVEL SENSOR GROUND CIRCUIT OPEN**

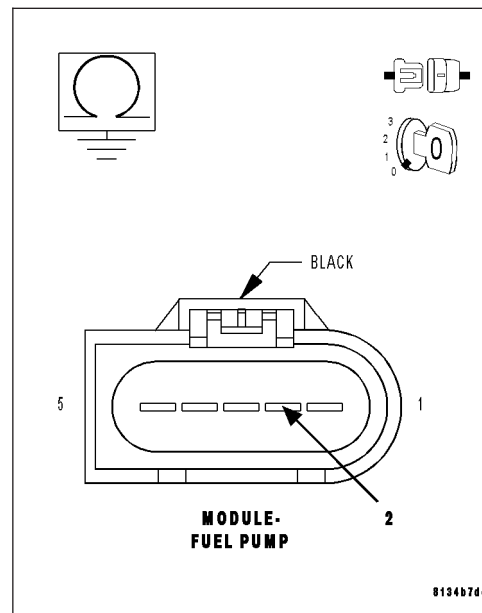
Measure the resistance of the (Z210) Fuel Level Sensor Ground circuit from the Fuel Pump Module harness connector to the C2 Cluster harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (Z210) Fuel Level Sensor Ground circuit.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**6. INTERNAL INSPECTION OF THE FUEL TANK**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Tank per Service Information.

Remove the Fuel Pump Module.

Visually inspect the inside of the Fuel Tank for any obstructions or deformities.

Inspect the Fuel Pump Module Float arm for damage.

**Were any problems found?**

**Yes** >> Repair or replace as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 7

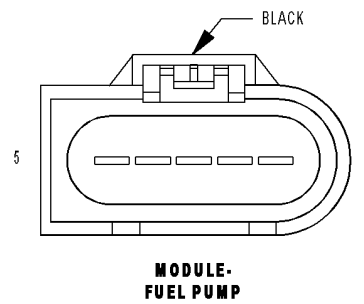
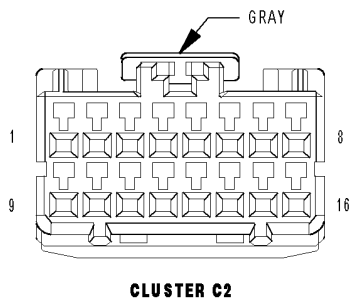
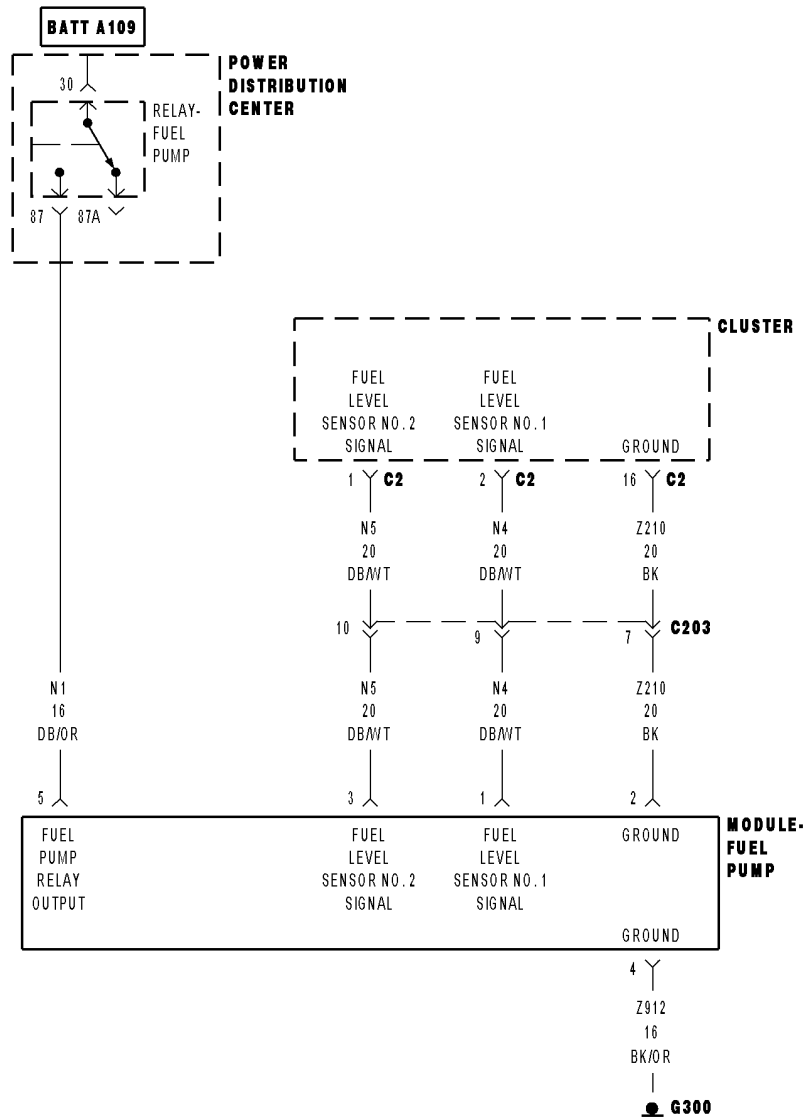
**7. FUEL LEVEL SENSOR**

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Fuel Level Sensor.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**P0462-FUEL LEVEL SENSOR 1 CIRCUIT LOW**

**P0462-FUEL LEVEL SENSOR 1 CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on and battery voltage above 10.4 volts.
- **Set Condition:**  
The fuel level sensor signal voltage goes below 0.4 of a volt for more than 90 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO GROUND (N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO (Z210) FUEL LEVEL SENSOR RETURN CIRCUIT FUEL LEVEL SENSOR INSTRUMENT CLUSTER

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).**

**Diagnostic Test****1. FUEL LEVEL SENSOR VOLTAGE BELOW 0.4 OF A VOLT**

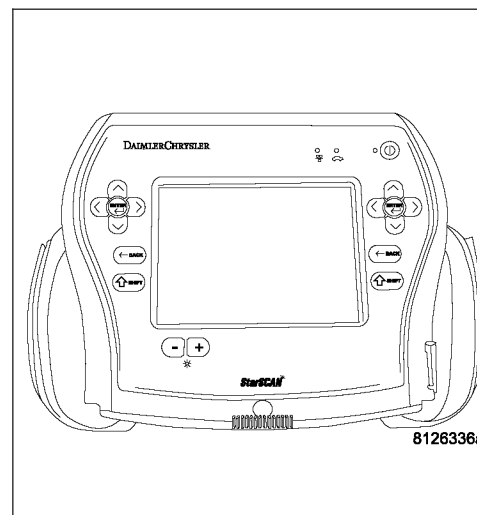
**Note:** Diagnose any CAN - B or CAN -C Communication DTCs before continuing.

Ignition on, engine not running.

With the scan tool, read the Fuel Level Sensor voltage.

**Is the Fuel Level Sensor voltage below 0.4 of a volt?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**2. FUEL LEVEL SENSOR**

Turn the ignition off.

Disconnect the Fuel Pump Module harness connector.

Ignition on, engine not running.

With the scan tool, read the Fuel Level Sensor voltage.

**Did the Fuel Level Sensor voltage change from below 0.4 of a volt to above 4.0 volts?**

- Yes** >> Replace the Fuel Level Sensor.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Go To 3

**P0462-FUEL LEVEL SENSOR 1 CIRCUIT LOW (CONTINUED)****3. (N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the C2 Cluster harness connectors.

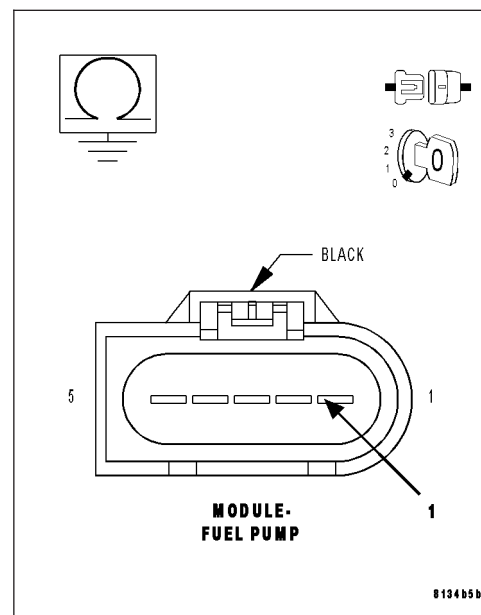
Measure the resistance between ground and the (N4) Fuel Level Signal circuit in the Fuel Pump Module harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (N4) Fuel Level Signal circuit.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO THE (Z210) FUEL LEVEL SENSOR GROUND CIRCUIT**

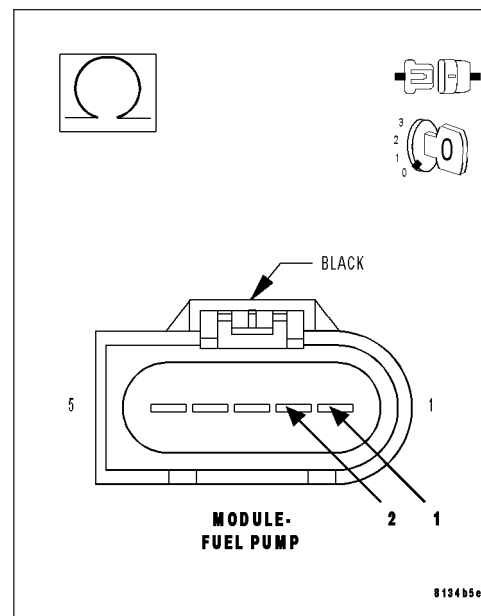
Measure the resistance between the (N4) Fuel Level Signal circuit and the (Z210) Fuel Level Sensor Ground circuit in the Fuel Pump Module harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (Z210) Fuel Level Sensor Ground circuit and the (N4) Fuel Level Signal circuit.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



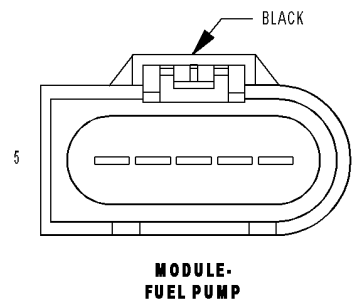
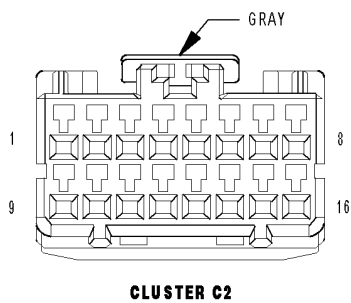
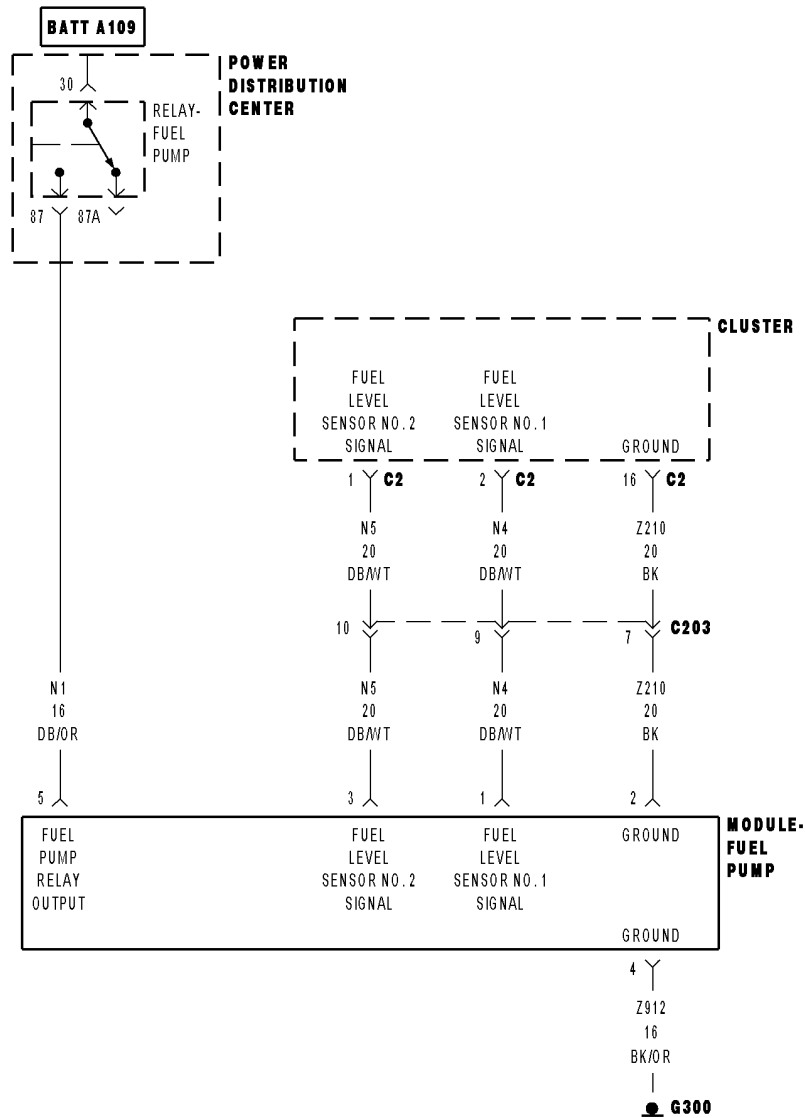
**P0462-FUEL LEVEL SENSOR 1 CIRCUIT LOW (CONTINUED)****5. INSTRUMENT CLUSTER**

**Note:** Before continuing, check the Instrument Cluster harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Replace and program the Instrument Cluster per Service Information.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)
-

**P0463-FUEL LEVEL SENSOR 1 CIRCUIT HIGH**

### P0463-FUEL LEVEL SENSOR 1 CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:**  
 Ignition on and battery voltage above 10.4 volts.
- Set Condition:**  
 The fuel level sensor signal voltage at the PCM goes above 4.9 volts for more than 90 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE (N4) FUEL LEVEL SIGNAL CIRCUIT OPEN (Z210) FUEL LEVEL SENSOR GROUND CIRCUIT OPEN FUEL LEVEL SENSOR INSTRUMENT CLUSTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. FUEL LEVEL SENSOR VOLTS ABOVE 4.9 VOLTS

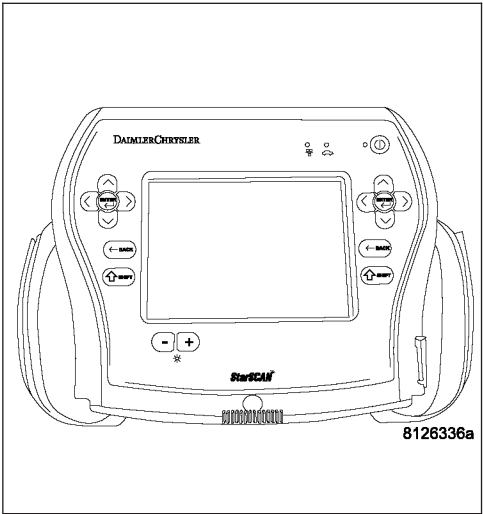
**Note:** Diagnose any CAN - B and CAN - C Communication DTCs before continuing.

Ignition on, engine not running.

With a scan tool, read the Fuel Level Sensor voltage.

**Is the Fuel Level Sensor voltage above 4.9 volts?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
 Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)





**P0463-FUEL LEVEL SENSOR 1 CIRCUIT HIGH (CONTINUED)****2. FUEL LEVEL SENSOR**

Turn the ignition off.

Disconnect the Fuel Pump Module electrical harness connector.

Ignition on, engine not running.

Connect a jumper wire between the (N4) Fuel Level Signal circuit and the (Z210) Fuel Level Sensor Ground circuit in the Fuel Pump Module harness connector.

With the scan tool, read the Fuel Level Sensor voltage.

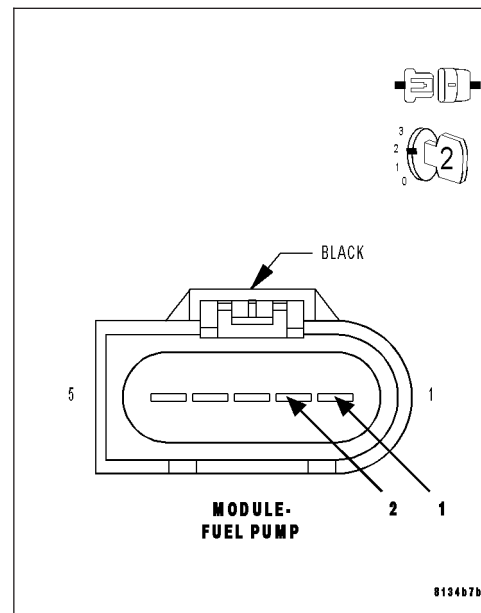
**Did the Fuel Level Sensor voltage change from above 4.8 volts to below 0.4 of a volt with the jumper wire installed?**

**Yes** >> Replace the Fuel Level Sensor.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**Note:** Remove the jumper wire before continuing.

**3. (N4) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the C2 Cluster harness connector.

Ignition on, engine not running.

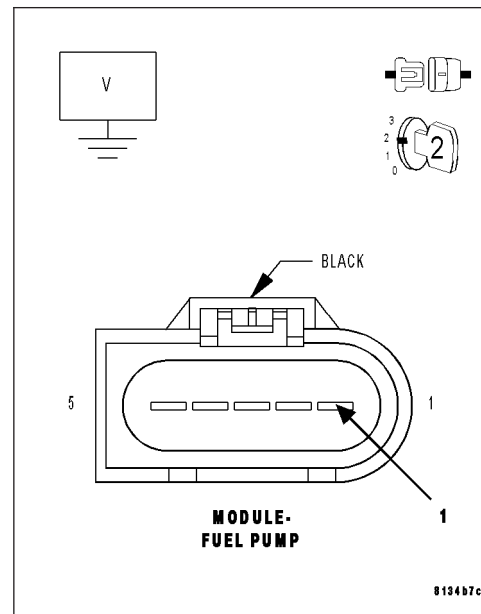
Measure the voltage on the (N4) Fuel Level Signal circuit in the Fuel Pump Module harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (N4) Fuel Level Signal circuit.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P0463-FUEL LEVEL SENSOR 1 CIRCUIT HIGH (CONTINUED)****4. (N4) FUEL LEVEL SIGNAL CIRCUIT OPEN**

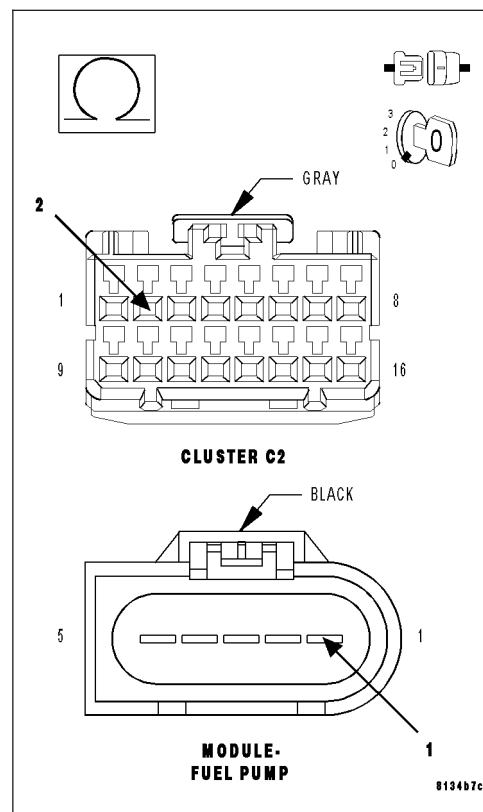
Turn the ignition off.

Measure the resistance of the (N4) Fuel Level Signal circuit from the Fuel Pump Module harness connector to the C2 Cluster harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (N4) Fuel Level Signal circuit.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

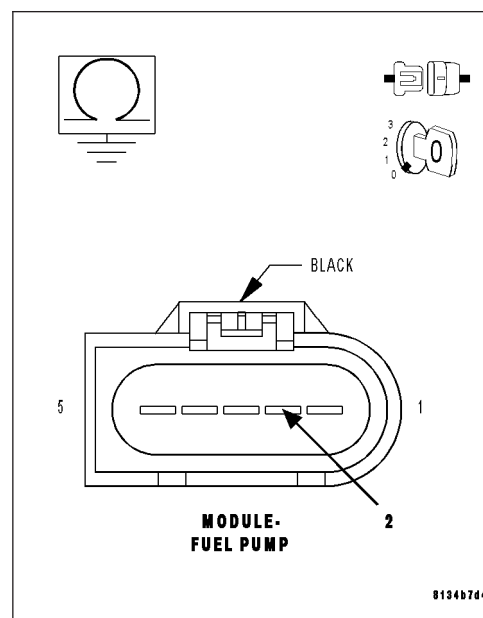
**5. (Z210) FUEL LEVEL SENSOR GROUND CIRCUIT OPEN**

Measure the resistance of the (Z210) Fuel Level Sensor Ground circuit from the Fuel Pump Module harness connector to the C2 Cluster harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (Z210) Fuel Level Sensor Ground circuit.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0463-FUEL LEVEL SENSOR 1 CIRCUIT HIGH (CONTINUED)****6. INSTRUMENT CLUSTER**

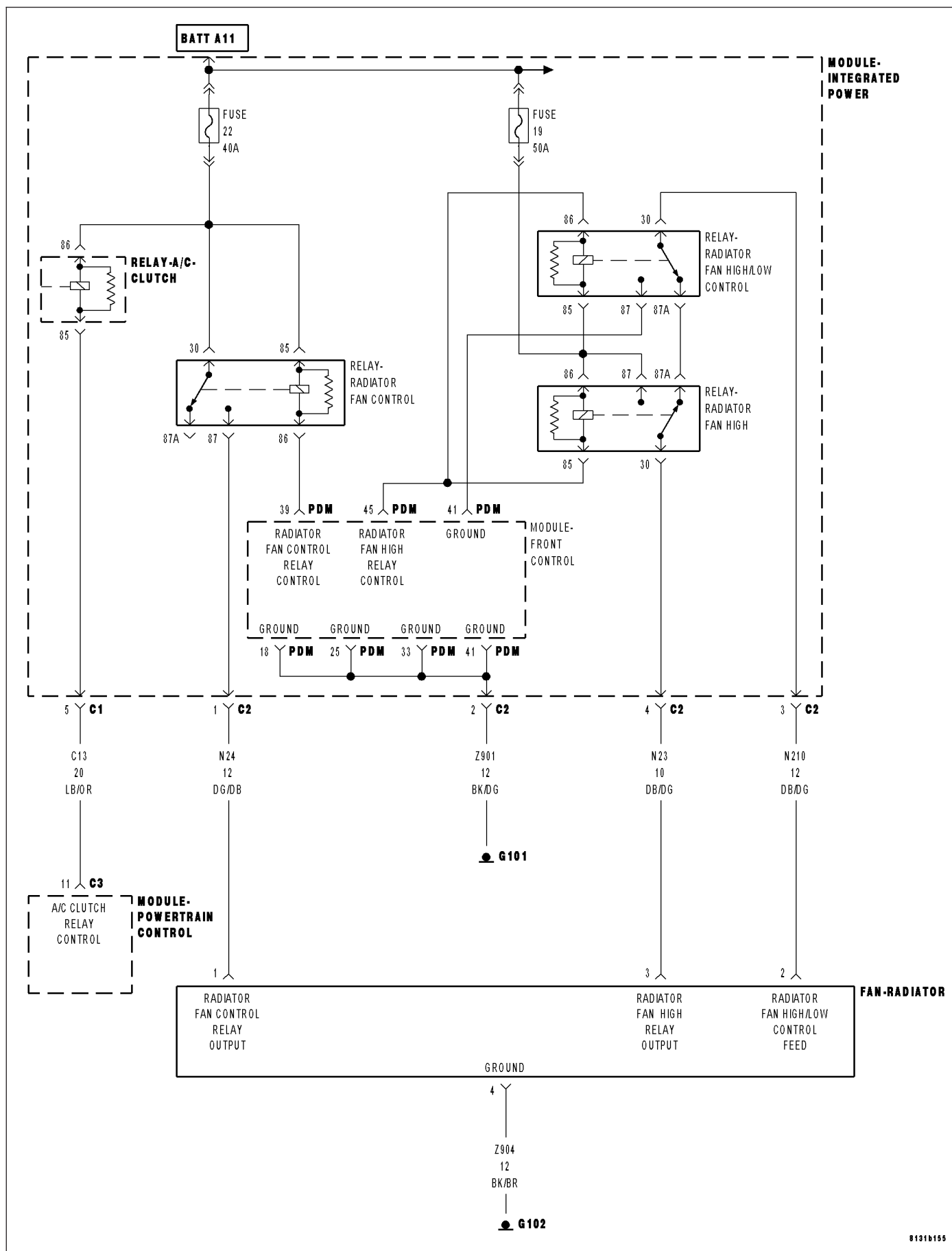
**Note:** Before continuing, check the Instrument Cluster harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)
- No**     >> Replace and program the Instrument Cluster per Service Information.  
          Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)
-

## P0480-COOLING FAN 1 CONTROL CIRCUIT



**P0480-COOLING FAN 1 CONTROL CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**  
An open or shorted circuit is detected in the radiator fan relay control circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A201) FUSED (B+) FEED CIRCUITS (N201) RADIATOR FAN CONTROL RELAY CONTROL CIRCUIT OPEN (N201) RADIATOR FAN CONTROL RELAY CIRCUIT SHORT TO GROUND RADIATOR FAN CONTROL RELAY FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test**

**1. RADIATOR FAN CONTROL RELAY OPERATION**

**Note:** When actuating the radiator fan relays, the Radiator Fan(s) may have a delay in operation and ramp up slowly.

Ignition on, engine not running.

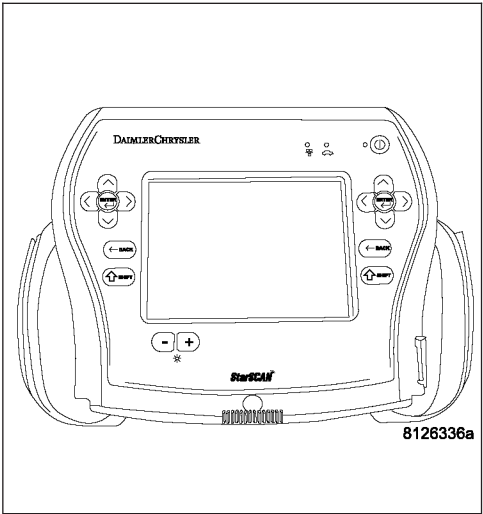
With a scan tool, select Radiator Cooling Fan Relay #1 Control State to actuate the Radiator Fan Control Relay.

**Is the Cooling Fan Relay operating?**

- Yes**

>> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No**

>> Go To 2



## P0480-COOLING FAN 1 CONTROL CIRCUIT (CONTINUED)

### 2. (A201) FUSED B+ CIRCUITS

Turn the ignition off.

Remove the Radiator Fan Control Relay.

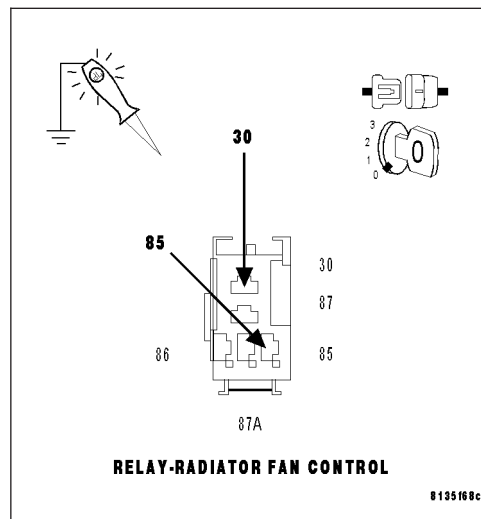
Using a 12-volt test light connected to ground, probe the (A201) Fused B+ circuits.

**Is the voltage above 11.0 volts?**

**Yes** >> Go To 3

**No** >> Repair the open or short to ground in the (A201) Fused B+ circuits. Inspect the related fuse and repair as necessary.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)



### 3. RADIATOR FAN CONTROL RELAY CONTROL CIRCUIT

Turn the ignition on, engine not running.

With a scan tool, select Radiator Cooling Fan Relay #1 Control State, Toggle, to actuate the Radiator Fan Control Relay.

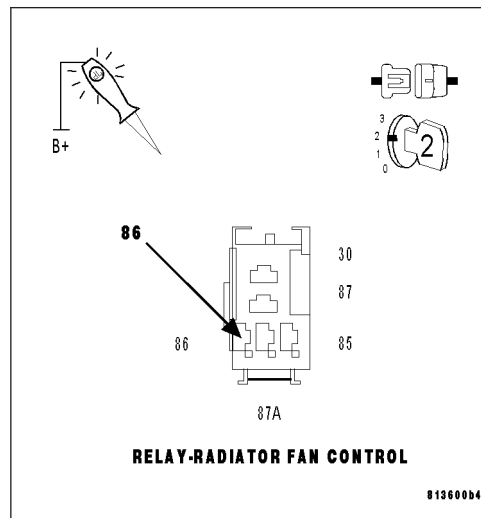
Using a 12-volt test light connected to battery voltage, probe the Radiator Control Relay Control circuit in the PDM.

**Does the test light illuminate and flash on and off?**

**Yes** >> Replace the Radiator Fan Control Relay.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P0480-COOLING FAN 1 CONTROL CIRCUIT (CONTINUED)****4. (N201) RADIATOR FAN CONTROL RELAY CONTROL CIRCUIT OPEN**

Turn the ignition off.

Remove the FCM from the PDM.

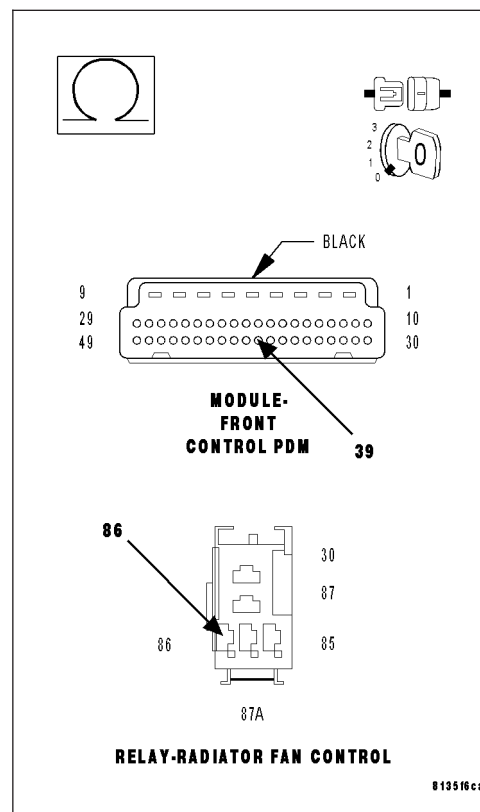
Measure the resistance of the (N201) Radiator Fan Control Relay Control circuit from the Relay to the FCM PDM — 49 way connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Replace the PDM in accordance with the Service information.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. (N201) RADIATOR FAN CONTROL RELAY CONTROL CIRCUIT SHORTED TO GROUND**

Measure the resistance between ground and the (N201) Radiator Fan Control Relay Control circuit at the Relay connection.

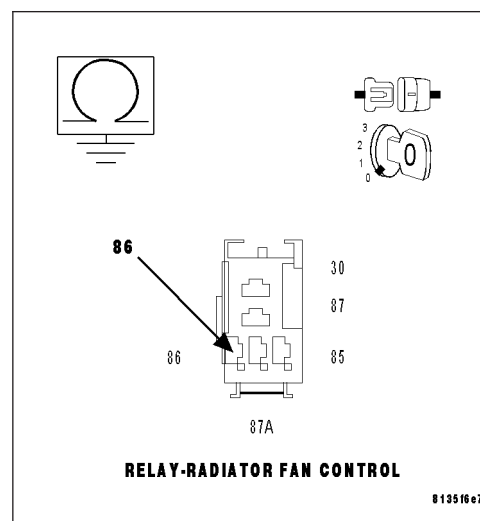
**Is the resistance below 100 ohms?**

**Yes** >> Replace the PDM in accordance with the Service information.

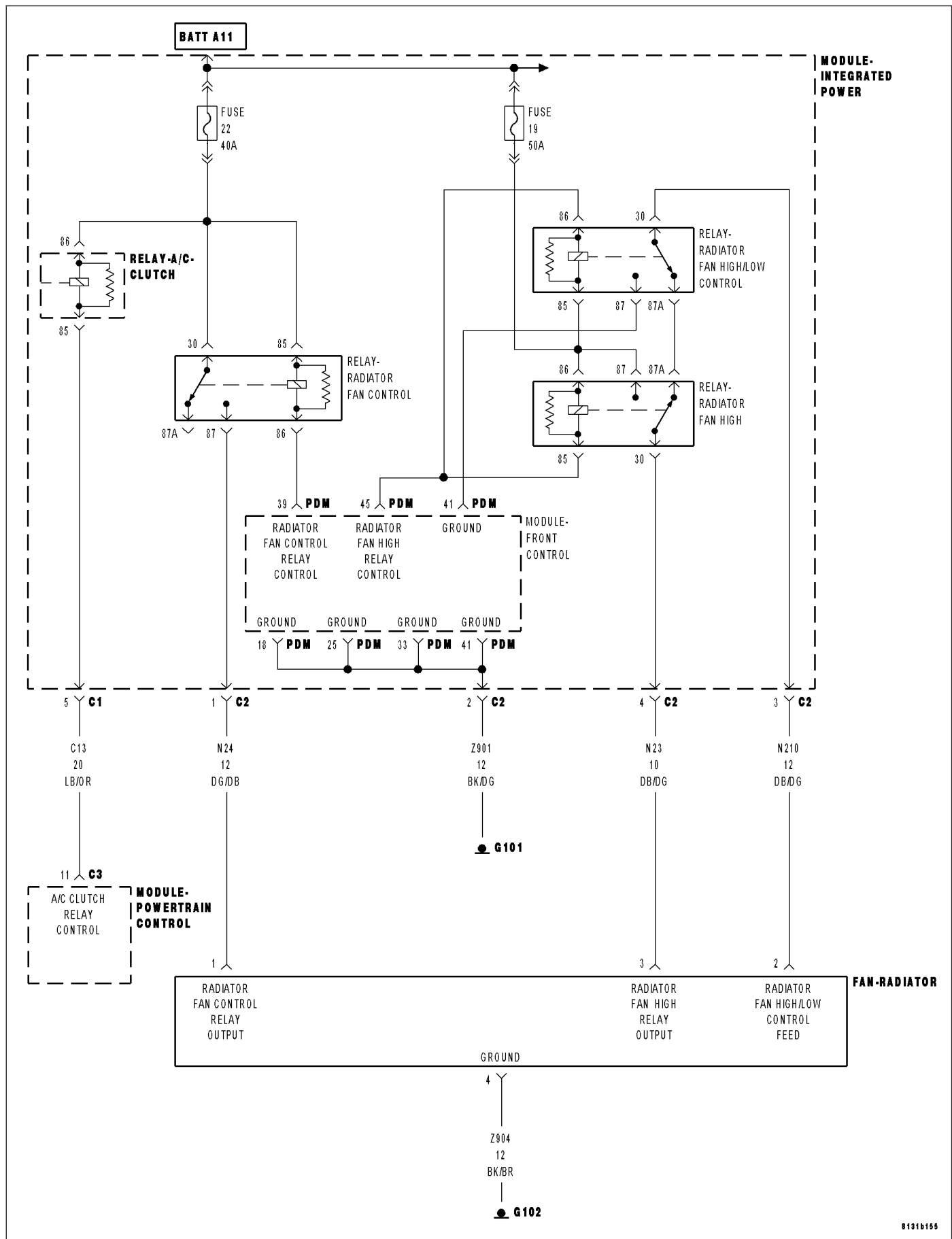
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace Front Control Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)



## P0481-COOLING FAN 2 CONTROL CIRCUIT





P0481-COOLING FAN 2 CONTROL CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**  
An open or shorted circuit is detected in the radiator fan relay control circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A16) FUSED B+ CIRCUITS (N112) RADIATOR FAN HIGH RELAY CONTROL CIRCUIT OPEN (N112) RADIATOR FAN HIGH RELAY CONTROL CIRCUIT SHORTED TO GROUND RADIATOR FAN HIGH RELAY FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

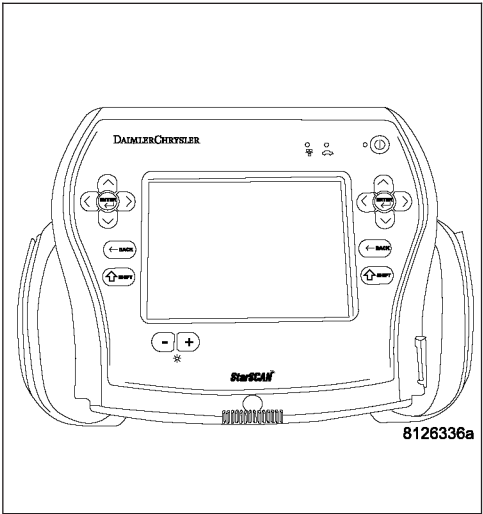
Diagnostic Test

1. RADIATOR FAN HIGH RELAY OPERATION

Ignition on, engine not running.

With a scan tool, select Radiator Cooling Fan Relay #2 Control State, to actuate the Radiator Fan High Relay.

- Is the Cooling Fan Relay operating?**
- Yes**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No**    >> Go To 2



**P0481-COOLING FAN 2 CONTROL CIRCUIT (CONTINUED)****2. (A16) FUSED B+ CIRCUITS**

Turn the ignition off.

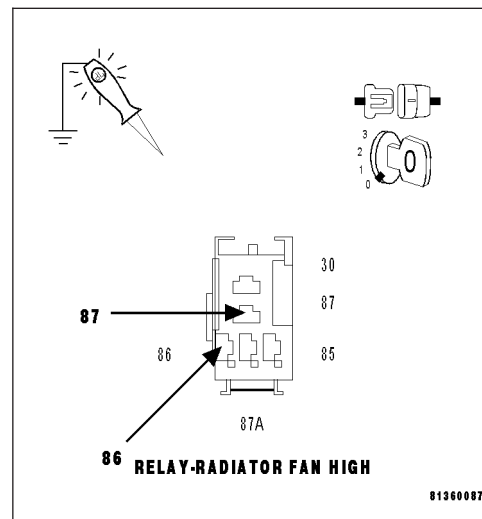
Remove the Radiator High Fan Relay.

Using a 12-volt test light connected to ground, probe the (A16) Fused B+ circuits in the Relay connection.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Go To 3

**3. RADIATOR FAN HI/LO CONTROL RELAY SHORTED INTERNALLY**

With the test light still at the (A16) Fused B+ circuit (Radiator High Fan Relay), remove the Radiator Fan HI/LO Control Relay.

**When the relay is removed, does the test light illuminate brightly?**

**Yes** >> Replace the Radiator Fan HI/LO Control Relay.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Repair the open or short to ground in the (A16) Fused B+ circuits. Inspect the related fuse and repair as necessary.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**4. RADIATOR FAN HIGH RELAY CONTROL CIRCUIT**

Turn the ignition on, engine not running.

With a scan tool, select Radiator Cooling Fan Relay #2 Control State and then Toggle, to actuate the Radiator Fan High Relay.

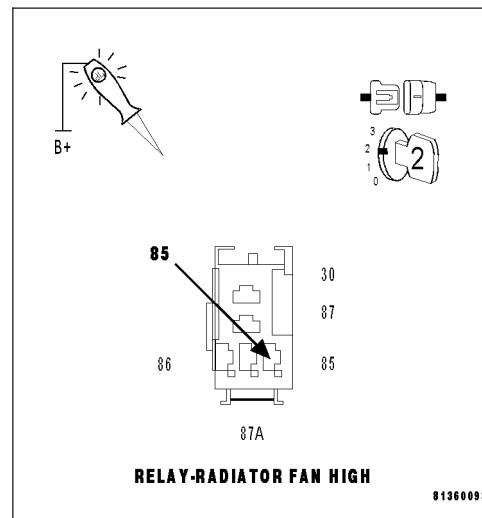
Using a 12-volt test light connected to battery voltage, probe the Radiator Fan High Relay Control circuit in the PDM.

**Does the test light illuminate and flash on and off?**

**Yes** >> Replace the Radiator Fan High Relay.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



**P0481-COOLING FAN 2 CONTROL CIRCUIT (CONTINUED)****5. (N112) RADIATOR FAN HIGH RELAY CONTROL CIRCUIT OPEN**

Remove the FCM from the PDM.

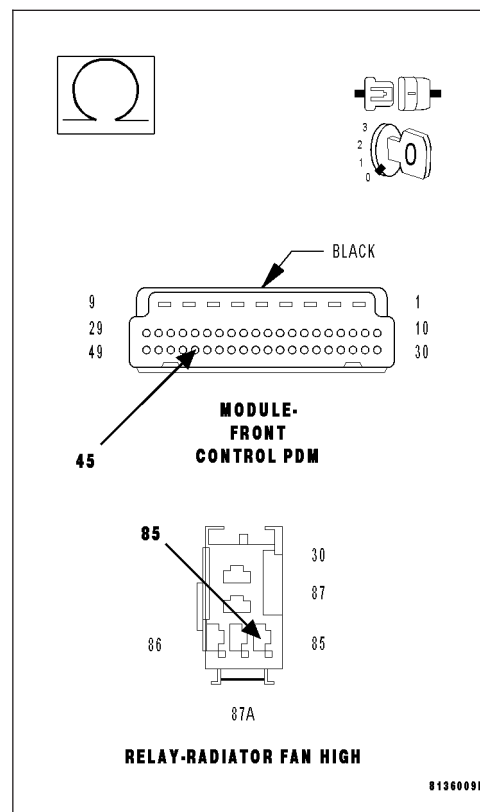
Measure the resistance of the (N112) Radiator Fan High Relay Control circuit from the Relay connection to the FCM PDM — 49 way connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Replace the PDM in accordance with the Service Information.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**6. (N112) RADIATOR FAN HIGH RELAY CONTROL CIRCUIT SHORTED TO GROUND**

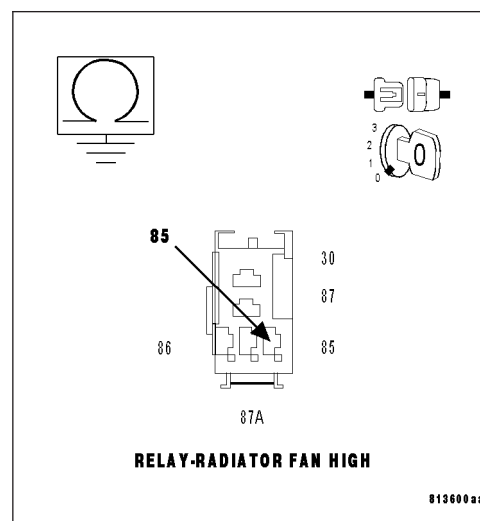
Measure the resistance between ground and the (N112) Radiator Fan High Control circuit at the Relay connection.

**Is the resistance below 100 ohms?**

**Yes** >> Go To 7

**No** >> Replace the Front Control Module in accordance with the Service Information.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

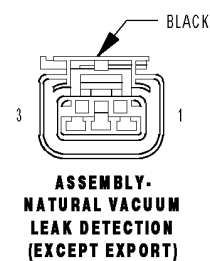
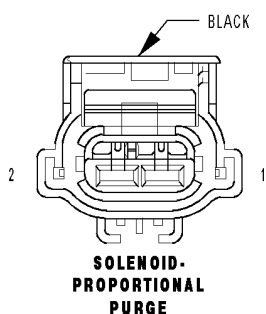
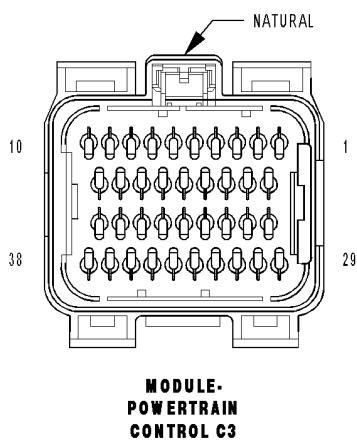
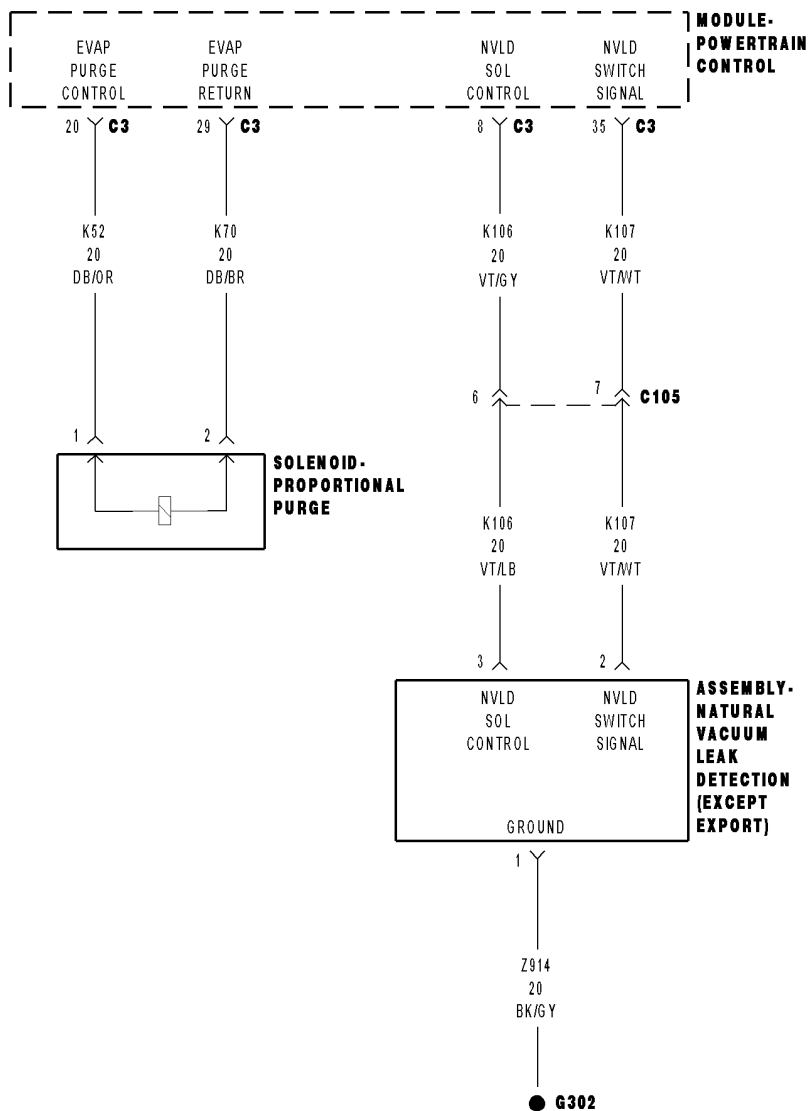


**P0481-COOLING FAN 2 CONTROL CIRCUIT (CONTINUED)****7. RADIATOR FAN HI/LO CONTROL RELAY SHORTED INTERNALLY**

With the probe still at the (N112) Radiator Fan High Control circuit, remove the Radiator Fan HI/LO Control Relay.

**Is the resistance still below 100 ohms?**

- Yes** >> Repair the open or short to ground in the (N112) Radiator Fan High Control circuit.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Replace the Radiator Fan HI/LO Control Relay.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)
-

**P0498-NVLD CANISTER VENT VALVE SOLENOID CIRCUIT LOW**

**P0498-NVLD CANISTER VENT VALVE SOLENOID CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running.

- **Set Condition:**

The PCM detects a short in the NVLD Canister vent solenoid circuits. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K106) NVLD SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
NVLD ASSEMBLY
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

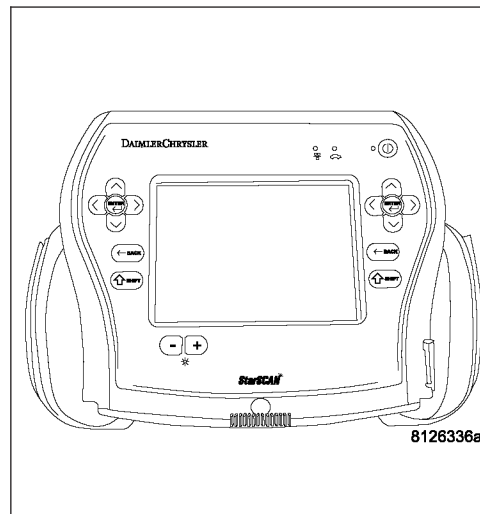
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



### 2. NVLD SOLENOID

Turn the ignition off.

Disconnect the NVLD electrical harness connector.

Measure the resistance of the NVLD Solenoid Coil.

**Is the resistance between 7.5 to 8.5 ohms?**

**Yes** >> Go To 3

**No** >> Replace the NVLD Assembly.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P0498-NVLD CANISTER VENT VALVE SOLENOID CIRCUIT LOW (CONTINUED)****3. (K106) NVLD SOLENOID CONTROL CIRCUIT SHORTED TO GROUND**

Disconnect the PCM harness connectors.

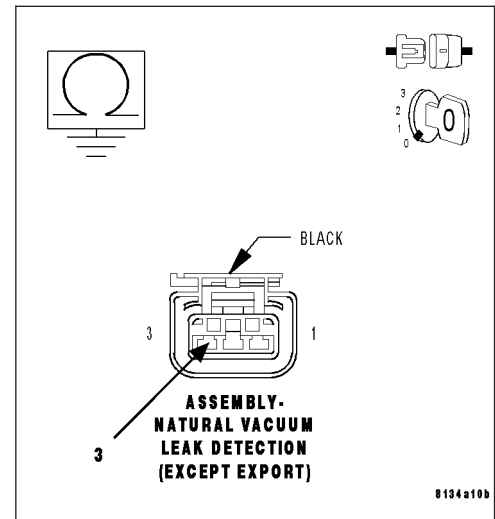
Measure the resistance between ground and the (K106) NVLD Solenoid Control circuit in the NVLD electrical harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K106) NVLD Solenoid Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

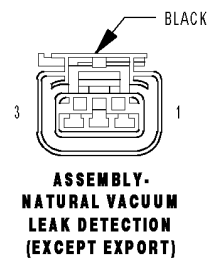
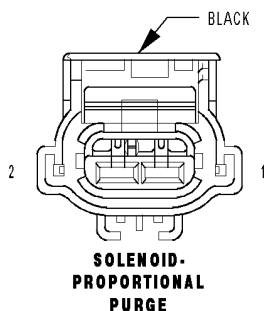
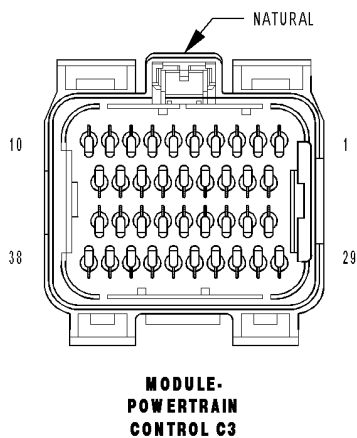
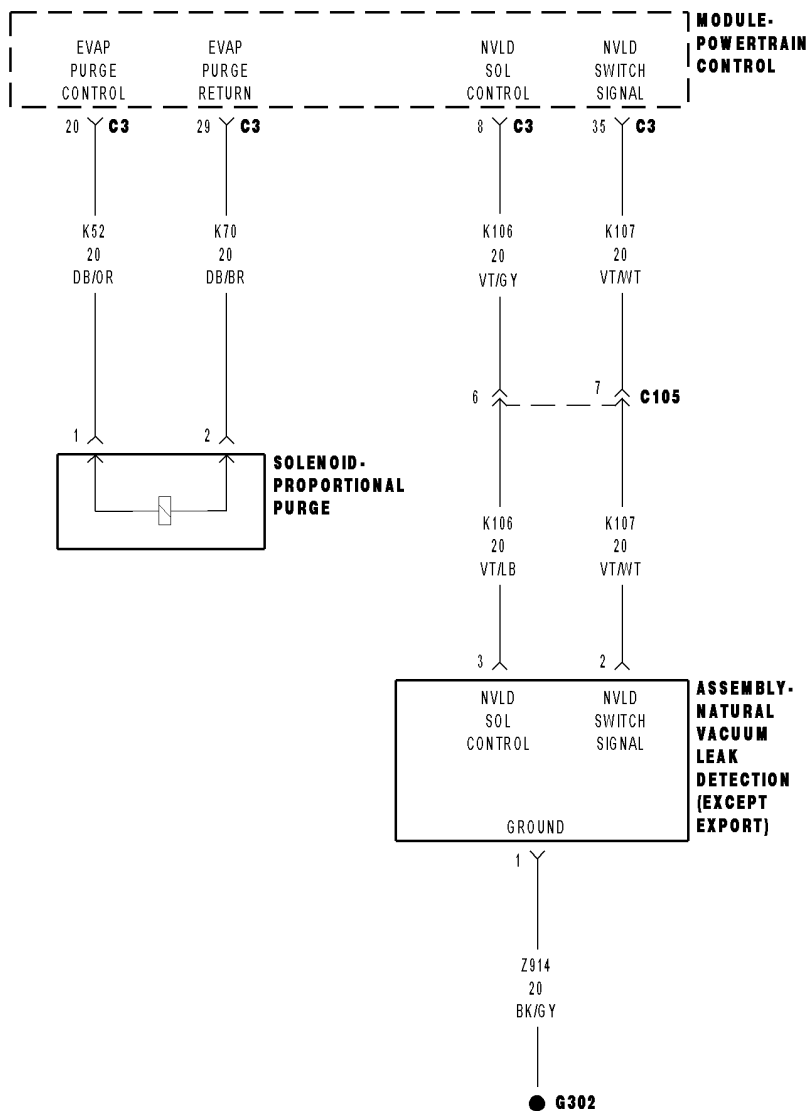
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P0499-NVLD CANISTER VENT VALVE SOLENOID CIRCUIT HIGH





**P0499-NVLD CANISTER VENT VALVE SOLENOID CIRCUIT HIGH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running.

- **Set Condition:**

The PCM detects an open in the NVLD Canister vent solenoid circuits. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K106) NVLD SOLENOID CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K106) NVLD SOLENOID CONTROL CIRCUIT OPEN
(Z914) GROUND CIRCUIT OPEN
NVLD SOLENOID
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

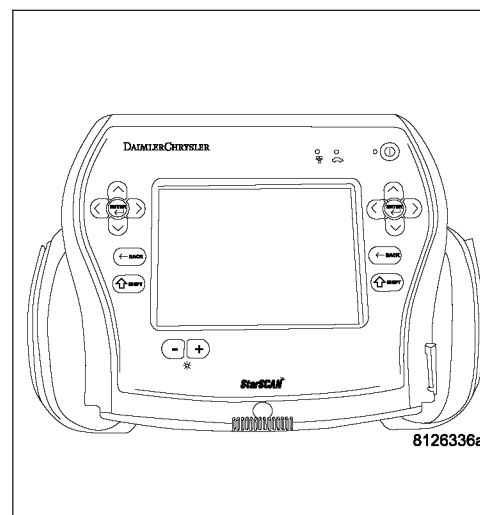
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



### 2. NVLD SOLENOID

Turn the ignition off.

Disconnect the NVLD Assembly harness connector.

Measure the resistance of the NVLD Solenoid coil.

**Is the resistance between 7.5 to 8.5 ohms?**

**Yes** >> Go To 3

**No** >> Replace the NVLD Assembly.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P0499-NVLD CANISTER VENT VALVE SOLENOID CIRCUIT HIGH (CONTINUED)

### 3. (K106) NVLD SOLENOID CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE

Disconnect the PCM harness connectors.

Take this measurement with the Ignition in the off (lock) position and in the Ignition on, engine off position.

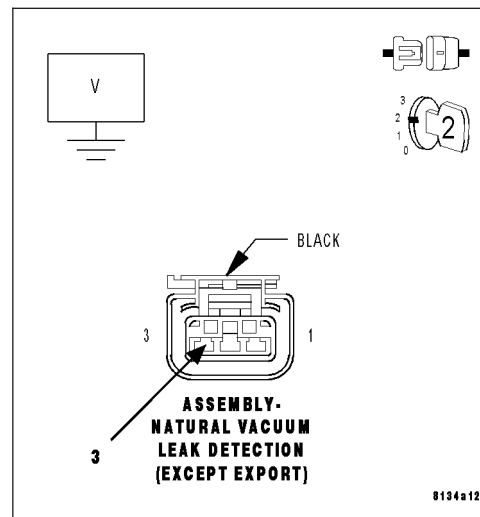
Measure the voltage on the (K106) NVLD Solenoid Control circuit in the NVLD Assembly harness connector.

**Is the voltage above 1.0 volt?**

**Yes** >> Repair the short to battery voltage in the (K106) NVLD Solenoid Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4



### 4. (K106) NVLD SOLENOID CONTROL CIRCUIT OPEN

Turn the ignition off.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

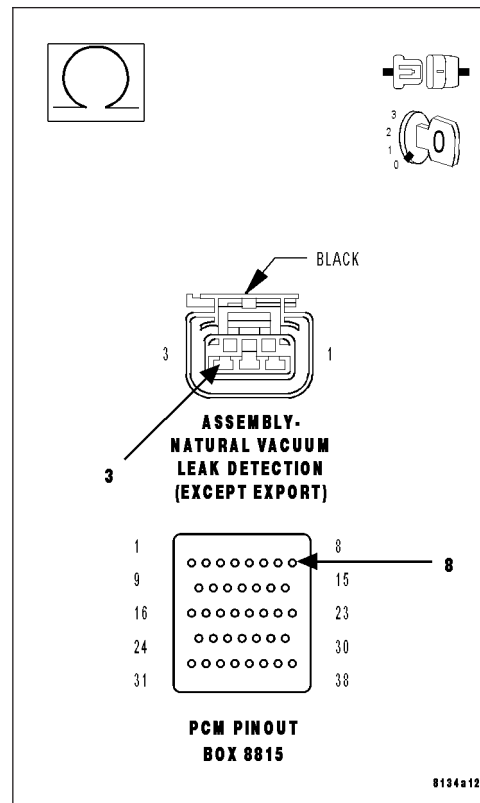
Measure the resistance of the (K106) NVLD Solenoid Control circuit from the NVLD Assembly harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K106) NVLD Solenoid Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



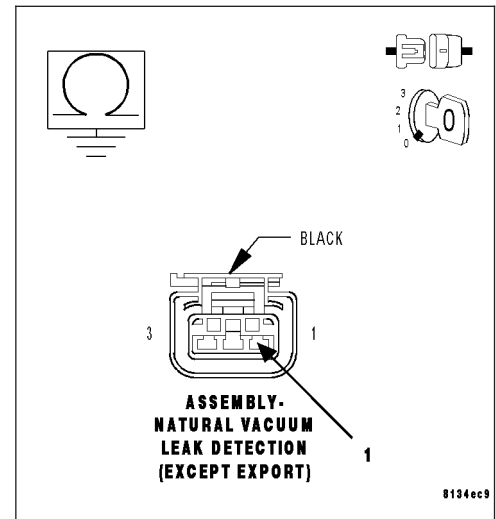
**P0499-NVLD CANISTER VENT VALVE SOLENOID CIRCUIT HIGH (CONTINUED)****5. (Z914) GROUND CIRCUIT OPEN**

Measure the resistance between the (Z914) Ground circuit and ground.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (Z914) Ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

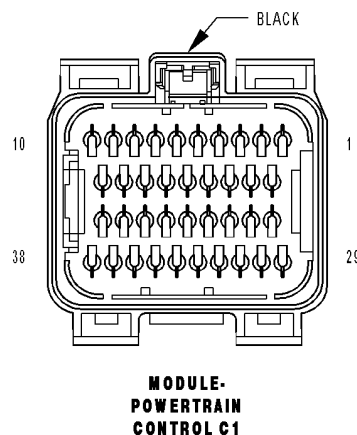
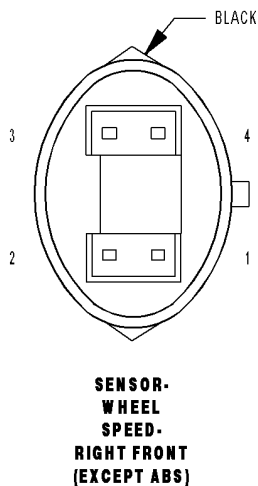
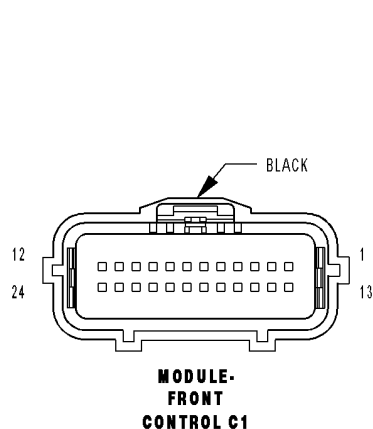
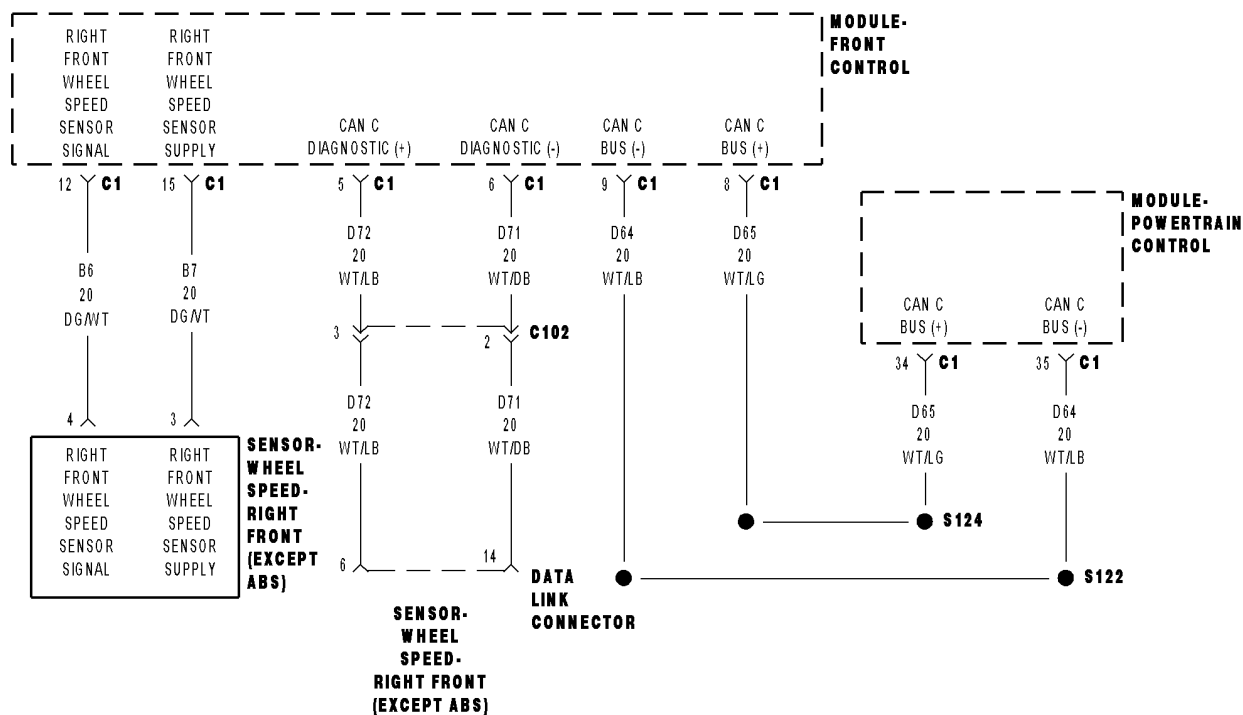
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

# P0501-VEHICLE SPEED SENSOR 1 PERFORMANCE (Not Equipped with ABS)



P0501-VEHICLE SPEED SENSOR 1 PERFORMANCE (Not Equipped with ABS) (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the engine running, transmission not in park or neutral, brakes not applied, and engine rpm greater than 1500.
- **Set Condition:**  
This code will set if no vehicle speed signal is received from the TCM Module for more than 11 seconds for 2 consecutive trips. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCS
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Note: The following items must be check before continuing.

- Pinion Factor and Tire Size MUST be programmed in the Front Control Module.
- All Bus Communication DTCs MUST be diagnosed.
- All Vehicle Speed DTCs that may be active in the Front Control Module or in the Transmission Control Module MUST be diagnosed.

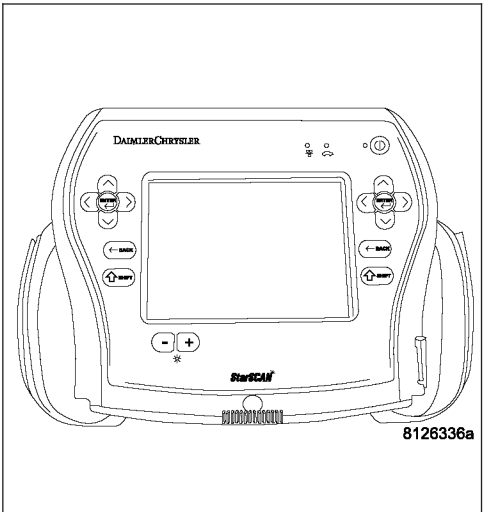
Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0501-VEHICLE SPEED SENSOR 1 PERFORMANCE (Not Equipped with ABS) (CONTINUED)****2. VISUAL INSPECTION**

**Note:** This code can set due following conditions.

- Unequal tire circumference between the tires on the vehicle.
- Front or Rear wheels moving while the opposite wheels are not. (i.e., wheels slipping on loose gravel, ice or hard acceleration)

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

**Were any of the above conditions found?**

**Yes** >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

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**3. PCM**

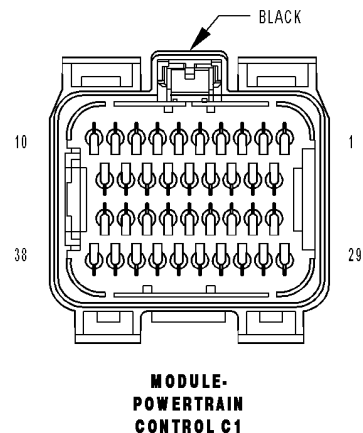
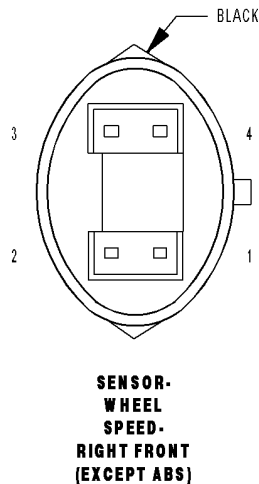
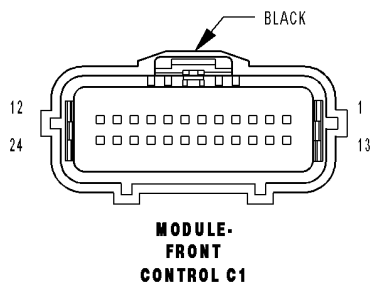
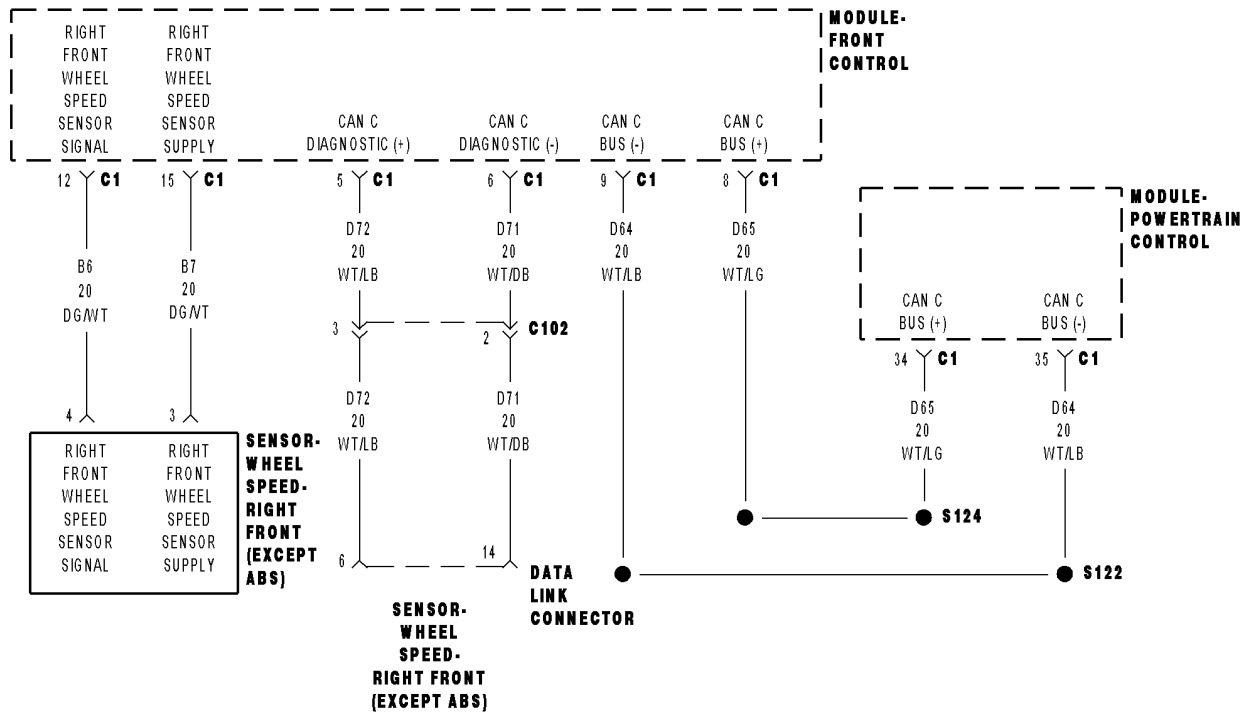
**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**P0503-VEHICLE SPEED SENSOR 1 ERRATIC (Not Equipped with ABS)**

**P0503-VEHICLE SPEED SENSOR 1 ERRATIC (Not Equipped with ABS) (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on and battery voltage greater than 10 volts. Transmission in Drive or Reverse.
- **Set Condition:**  
Vehicle speed signal is erratic during road load conditions. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCs
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test****1. ACTIVE DTC**

**Note:** The following items must be check before continuing.

- Pinion Factor and Tire Size **MUST** be programmed in the Front Control Module.
- All Bus Communication DTCs **MUST** be diagnosed.
- All Vehicle Speed DTCs that may be active in the Front Control Module or in the Transmission Control Module **MUST** be diagnosed.

Ignition on, engine not running.

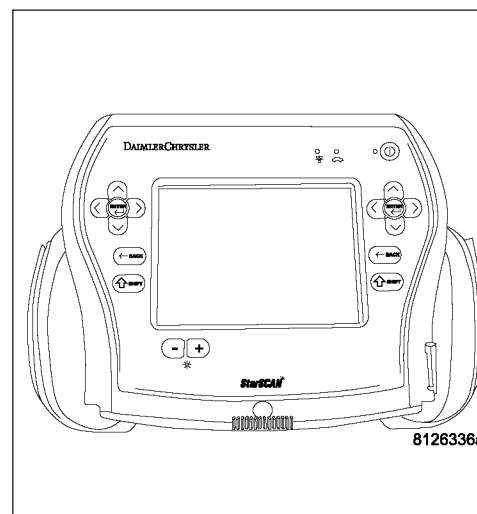
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P0503-VEHICLE SPEED SENSOR 1 ERRATIC (Not Equipped with ABS) (CONTINUED)****2. VISUAL INSPECTION**

**Note:** This code can set due following conditions.

- Unequal tire circumference between the tires on the vehicle.
- Front or Rear wheels moving while the opposite wheels are not. (i.e., wheels slipping on loose gravel, ice or hard acceleration)

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

**Were any of the above conditions found?**

**Yes** >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

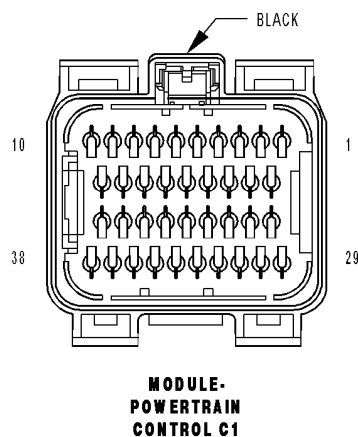
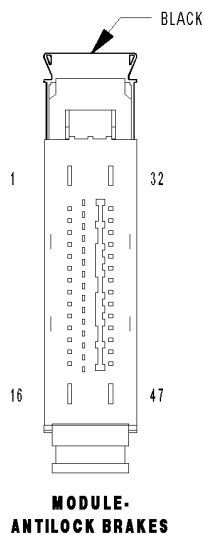
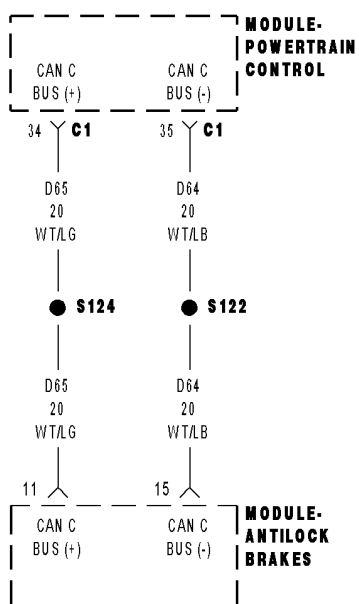
**Were there any problems found?**

**Yes** >> Repair as necessary. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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## P0501-VEHICLE SPEED SENSOR 1 PERFORMANCE (Equipped with ABS)



P0501-VEHICLE SPEED SENSOR 1 PERFORMANCE (Equipped with ABS) (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the engine running, transmission not in park or neutral, brakes not applied, and engine rpm greater than 1500.
- **Set Condition:**  
This code will set if no vehicle speed signal is received from the ABS Module for more than 11 seconds for 2 consecutive trips. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCs
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Note: The following items must be performed before continuing.

- Pinion Factor and Tire Size MUST be programmed in the ABS Module.
- All Bus Communication DTCs MUST be diagnosed.
- All related Vehicle Speed and Wheel Speed DTCs that may be active in the ABS Module MUST be diagnosed. Refer to the ABS diagnostic information for the correct procedure.

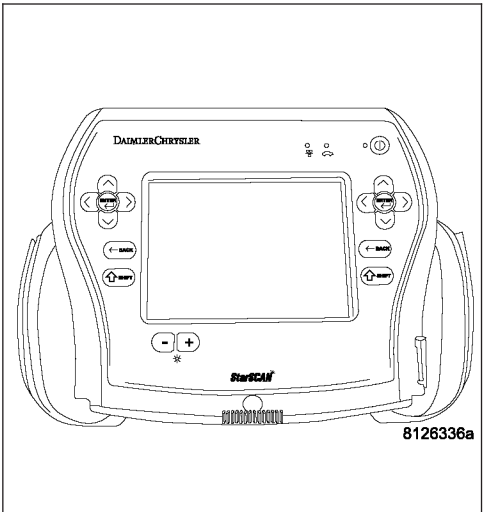
Ignition on, engine not running.

With a scan tool, read DTCs.

Is the DTC active at this time?

Yes >> Go To 2

No >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0501-VEHICLE SPEED SENSOR 1 PERFORMANCE (Equipped with ABS) (CONTINUED)****2. VISUAL INSPECTION**

**Note:** This code can set due following conditions.

- Unequal tire circumference between the tires on the vehicle.
- Front or Rear wheels moving while the opposite wheels are not. (i.e., wheels slipping on loose gravel, ice or hard acceleration)

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

**Were any of the above conditions found?**

**Yes** >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

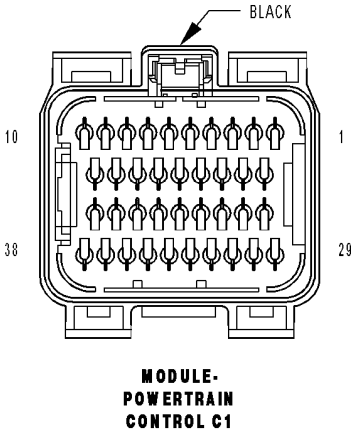
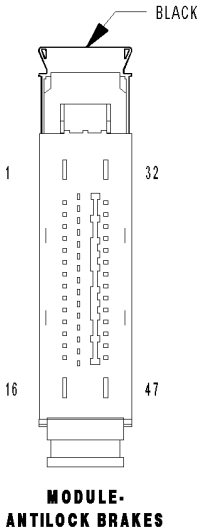
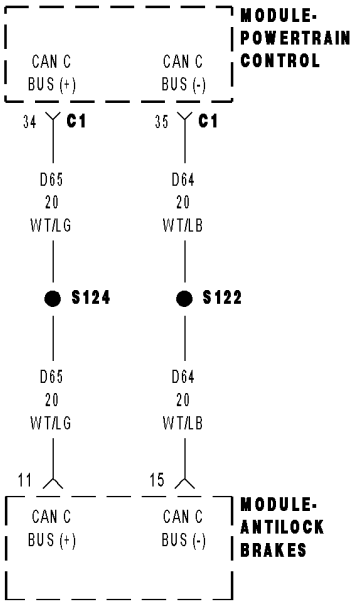
**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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P0503-VEHICLE SPEED SENSOR 1 ERRATIC (Equipped with ABS)



**P0503-VEHICLE SPEED SENSOR 1 ERRATIC (Equipped with ABS) (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on and battery voltage greater than 10 volts. Transmission in Drive or Reverse.
- **Set Condition:**  
Vehicle speed signal is erratic during road load conditions. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCs
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test****1. ACTIVE DTC**

**Note:** The following items must be check before continuing.

- Pinion Factor and Tire Size **MUST** be programmed in the ABS Module.
- All Bus Communication DTCs **MUST** be diagnosed.
- All related Vehicle Speed and Wheel Speed DTCs that may be active in the ABS Module **MUST** be diagnosed. Refer to the ABS diagnostic information for the correct procedure.

Ignition on, engine not running.

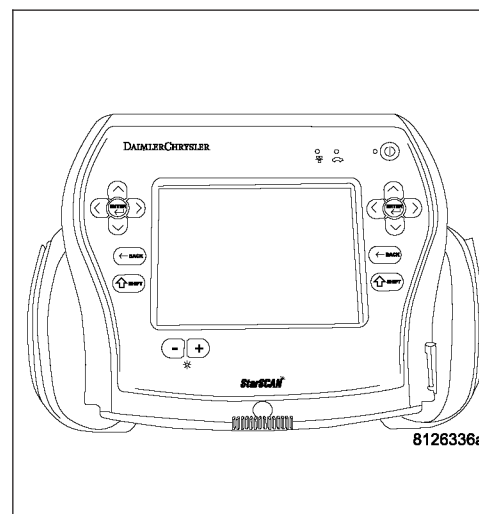
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0503-VEHICLE SPEED SENSOR 1 ERRATIC (Equipped with ABS) (CONTINUED)****2. VISUAL INSPECTION**

**Note:** This code can set due following conditions.

- Unequal tire circumference between the tires on the vehicle.
- Front or Rear wheels moving while the opposite wheels are not. (i.e., wheels slipping on loose gravel, ice or hard acceleration)

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

**Were any of the above conditions found?**

**Yes** >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

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**3. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**P0506-IDLE SPEED PERFORMANCE LOWER THAN EXPECTED**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the engine running at idle, MAF <250 mg/tdc, air temp >-17.8°C (0°F) and <-7°C (19.4°F) enable after coolant temp >70°C (158°F) or air temp >-7°C (19.4°F), coolant temp >-7°C (19.4°F) <130°C (266°F), canister purge <100% duty cycle, and no VSS, MAF/MAP, ECT, TPS, ETC, CRK Sensor DTCs nor any fuel system or injector DTCs.

- **Set Condition:**

Engine speed is 100 RPM or more below idle speed for 7 seconds. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
AIR INDUCTION SYSTEM THROTTLE BODY PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

**Note: If any other DTCs are present, they must be diagnosed and repaired before continuing this test.**

Ignition on, engine not running.

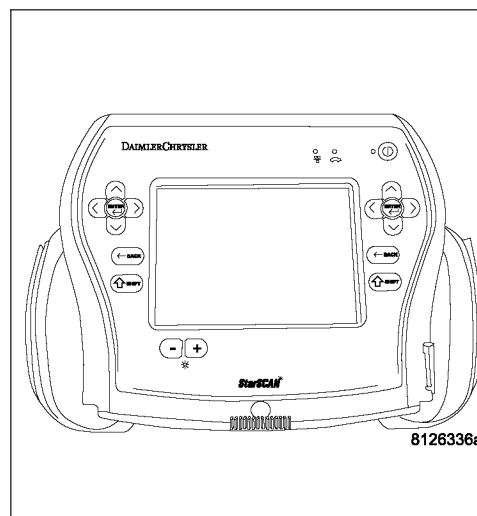
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P0506-IDLE SPEED PERFORMANCE LOWER THAN EXPECTED (CONTINUED)****2. AIR INDUCTION SYSTEM**

Inspect the Air Induction System for the following problems.

Restrictions: Dirty Air Cleaner, Foreign material trapped in the air intake tube, etc.

Leaks: Air Intake tube connection, Air Cleaner housing, etc.

**Were any problems found?**

**Yes** >> Repair or replace as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. THROTTLE BODY OPERATION**

Inspect the throttle body for carbon build up, other restrictions, and a bent throttle plate using a straight edge.

If the throttle plate does not close entirely it may be bent and needs to be replaced.

**WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.**

While the vehicle is running, lightly tap on ETC Motor, with your hand, and listen for idle to raise.

**Were any problems found?**

**Yes** >> Repair or replace as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

---

**4. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

---

**P0507-IDLE SPEED PERFORMANCE HIGHER THAN EXPECTED**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the engine running at idle, MAF <250 mg/tdc, air temp >-17.8°C (0°F) and <-7°C (19.4°F) enable after coolant temp >70°C (158°F) or air temp >-7°C (19.4°F), coolant temp >-7°C (19.4°F) <130°C (266°F), canister purge <100% duty cycle, and no VSS, MAF/MAP, ECT, TPS, ETC, CRK Sensor DTCs nor any fuel system or injector DTCs.

- **Set Condition:**

Engine speed is 200 RPM or more above idle speed for 7 seconds. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
AIR INDUCTION SYSTEM
VACUUM LEAKS
THROTTLE BODY
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** If any other DTCs are present, they must be diagnosed and repaired before continuing this test.

Ignition on, engine not running.

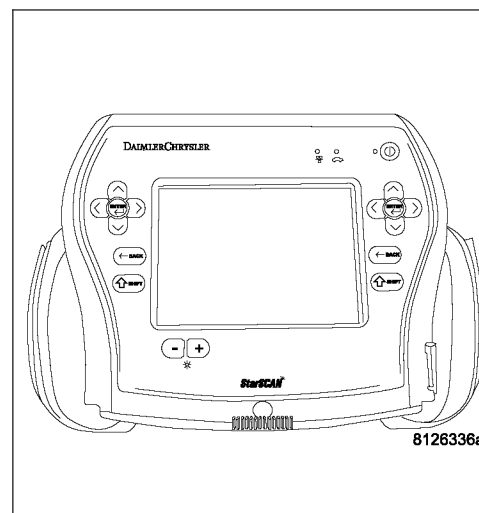
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0507-IDLE SPEED PERFORMANCE HIGHER THAN EXPECTED (CONTINUED)****2. AIR INDUCTION SYSTEM**

Inspect the Air Induction System for the following problems.

Restrictions: Dirty Air Cleaner, Foreign material trapped in the air intake tube, etc.

Leaks: Air Intake tube connection, Air Cleaner housing, etc.

**Were any problems found?**

**Yes** >> Repair or replace as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. VACUUM LEAKS**

Start the engine.

Inspect the vehicle for external vacuum leaks.

Inspect the engine for internal leaks.

**Were any vacuum leaks found?**

**Yes** >> Repair the vacuum leak as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

---

**4. THROTTLE BODY OPERATION**

Inspect the throttle body for carbon build up, other restrictions, and a bent throttle plate using a straight edge.

If the throttle plate does not close entirely it may be bent and needs to be replaced.

**WARNING: When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.**

While the vehicle is running, lightly tap on ETC Motor, with your hand, and listen for idle to raise.

**Were any problems found?**

**Yes** >> Repair or replace as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

---

**P0507-IDLE SPEED PERFORMANCE HIGHER THAN EXPECTED (CONTINUED)****5. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

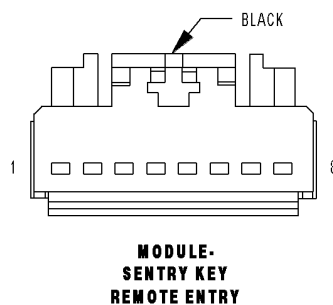
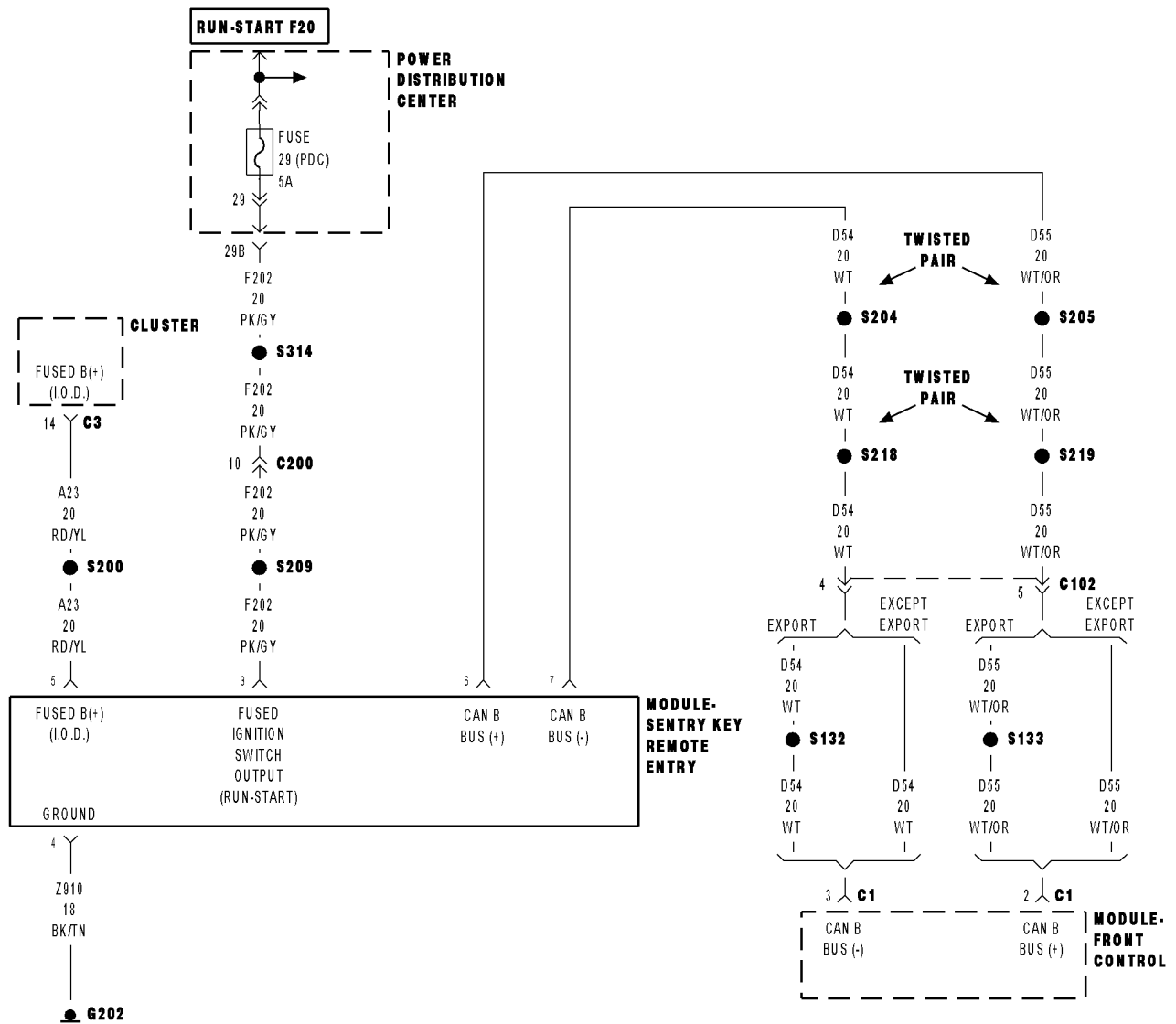
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

---

## P0513-INVALID SKIM KEY



**P0513-INVALID SKIM KEY (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
The PCM detects an invalid SKREEM key. One Trip Fault.

Possible Causes
INCORRECT VIN PROGRAMMED IN THE PCM NO COMMUNICATION WITH SKREEM NO VIN PROGRAMMED IN THE PCM IGNITION KEY PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test****1. ACTIVE DTC**

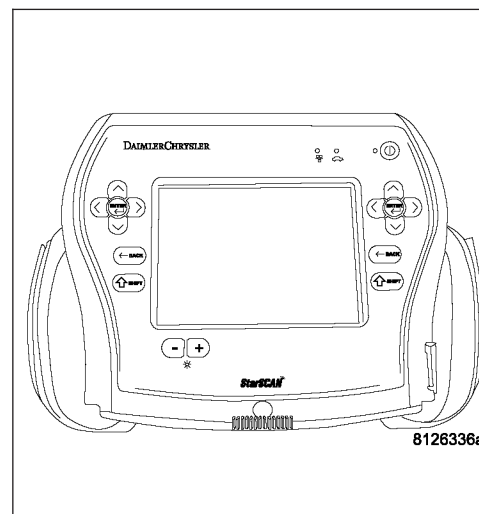
Ignition on, engine not running.

With the scan tool, read the PCM DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Go To 6

**2. NO COMMUNICATION WITH SKREEM**

With the scan tool, attempt to communicate with the SKREEM.

**Can the scan tool communicate with the SKREEM?**

**Yes** >> Go To 3

**No** >> Refer to Section 8 - Electrical VEHICLE THEFT SECURITY - ELECTRICAL DIAGNOSTICS and perform the appropriate Diagnostic Procedure.

Perform SKREEM VERIFICATION(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**P0513-INVALID SKIM KEY (CONTINUED)****3. SKREEM TROUBLE CODES SET**

With the scan tool, check for SKREEM DTCs.

**Are any DTCs present in the SKREEM?**

- Yes** >> Refer to Section 8 - Electrical VEHICLE THEFT SECURITY - ELECTRICAL DIAGNOSTICS and perform the appropriate Diagnostic Procedure.  
Perform SKREEM VERIFICATION(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 4
- 

**4. VIN PROGRAMMED INTO PCM**

With the scan tool, display the VIN that is programmed in the PCM.

**Has a VIN been programmed into the PCM?**

- Yes** >> Go To 5
- No** >> Program the correct VIN into the PCM and retest.  
Perform SKREEM VERIFICATION(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- 

**5. PCM**

Turn the ignition off.

Replace and program the SKREEM per Service Information.

Ignition on, engine not running.

With the scan tool, erase all SKREEM and PCM DTCs.

Attempt to start and idle the engine.

With the scan tool, read the PCM DTCs.

**Does the scan tool display this code?**

- Yes** >> NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Replace and program the Powertrain Control Module per Service Information.  
Perform SKREEM VERIFICATION(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Test Complete.
-

**P0513-INVALID SKIM KEY (CONTINUED)****6. IGNITION KEY**

**Note:** You must obtain the SKREEM pin number.

**Note:** This DTC could have been set if the SKREEM harness connector was disconnected, or if the SKREEM was replaced recently.

**Note:** All keys that the customer uses for this vehicle must be tested to verify they are operating properly. Ignition on, engine not running.

Verify the correct VIN is programmed into the PCM and SKREEM.

Turn the ignition off.

With each customer key, turn the ignition on and crank the engine to start.

With the scan tool, read the PCM DTCs. Look for P0513.

**Note:** If this DTC cannot be reset, it could have been an actual theft attempt.

**Is the Good Trip Counter for DTC P0513 displayed and equal to 0?**

**Yes** >> Replace the Ignition Key.

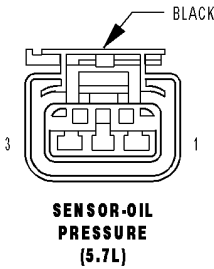
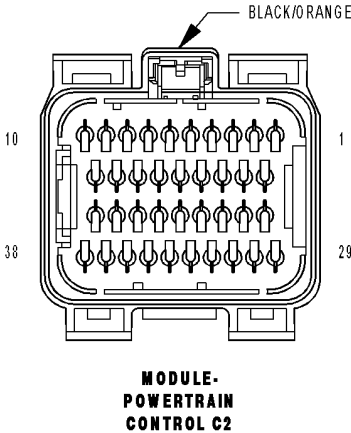
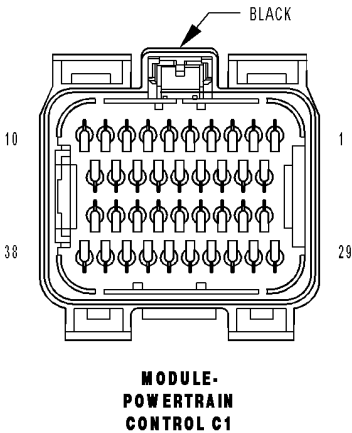
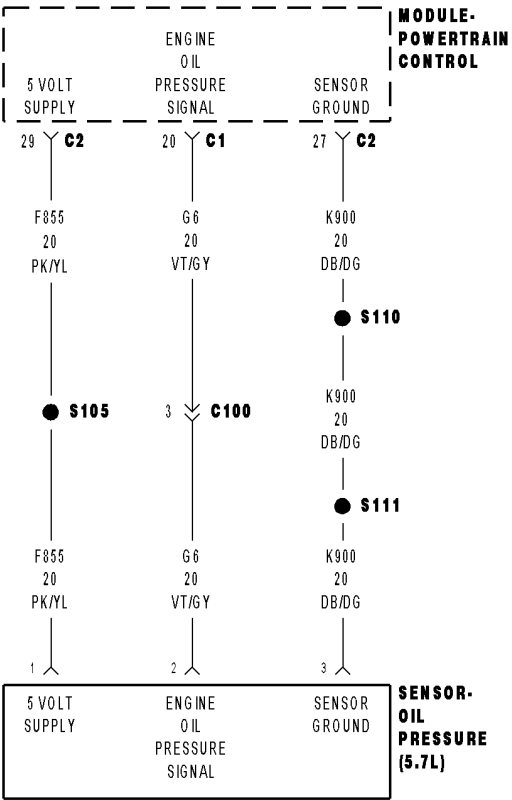
Perform SKREEM VERIFICATION(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/  
POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Test Complete.

---



P0520-ENGINE OIL PRESSURE SENSOR CIRCUIT



## P0520-ENGINE OIL PRESSURE SENSOR CIRCUIT (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on, engine not running.
- **Set Condition:**  
The PCM senses the oil pressure is out of the calibrated range.

Possible Causes
(G6) ENGINE OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE RESISTANCE (G6) ENGINE OIL PRESSURE SENSOR SIGNAL CIRCUIT (G6) ENGINE OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND RESISTANCE IN (F856) 5-VOLT SUPPLY CIRCUIT (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT ENGINE OIL PRESSURE SENSOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

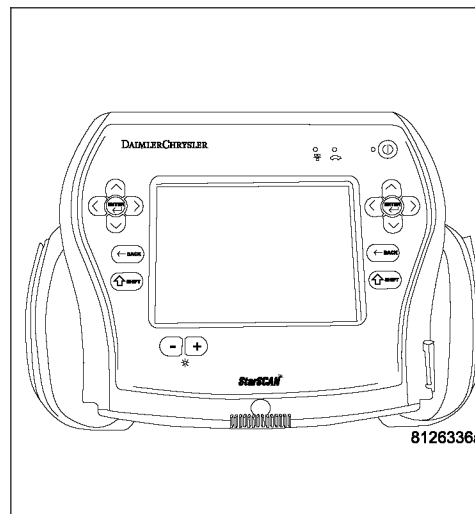
**Note:** Ensure that the engine oil is at the proper level. Also, check the customers oil change history to ensure that the oil is being changed at the correct intervals and that the proper oil viscosity is being used.

Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0520-ENGINE OIL PRESSURE SENSOR CIRCUIT (CONTINUED)****2. (G6) ENGINE OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect the Engine Oil Pressure Sensor harness connector.

Ignition on, engine not running.

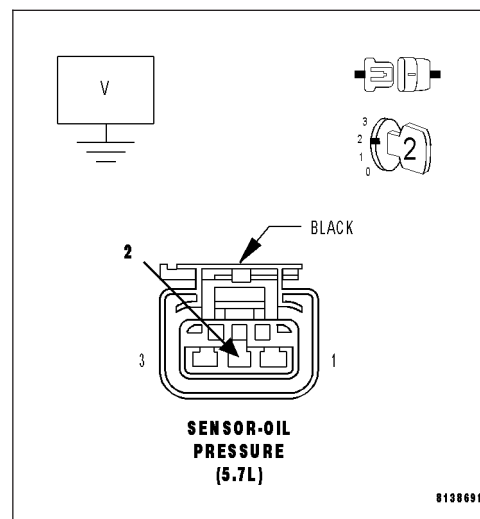
Measure the voltage on the (G6) Engine Oil Pressure Signal circuit in the Engine Oil Pressure Sensor harness connector.

**Is the voltage above 0 volts?**

**Yes** >> Repair the short to battery voltage in the (G6) Engine Oil Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. ENGINE OIL PRESSURE SENSOR**

Turn the ignition off.

Connect the PCM harness connectors.

Ignition on, engine not running.

With a scan tool, monitor the Engine Oil Pressure Sensor voltage.

Connect a jumper wire between the (K900) Sensor Ground circuit and the (G6) Engine Oil Pressure Signal circuit.

**Note: Engine Oil Pressure voltage should change from approximately 4.5 volts to less than 0.5 of a volt.**

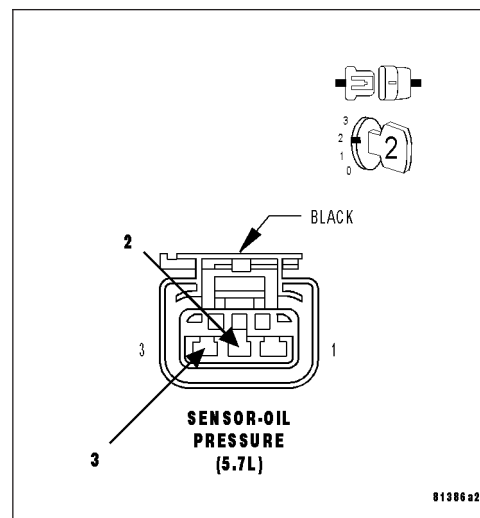
**Is the voltage reading within the listed specification when the jumper wire is installed?**

**Yes** >> Replace the Engine Oil Pressure Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**Note: Remove the jumper wire before continuing.**



**P0520-ENGINE OIL PRESSURE SENSOR CIRCUIT (CONTINUED)****4. EXCESSIVE RESISTANCE IN THE (G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

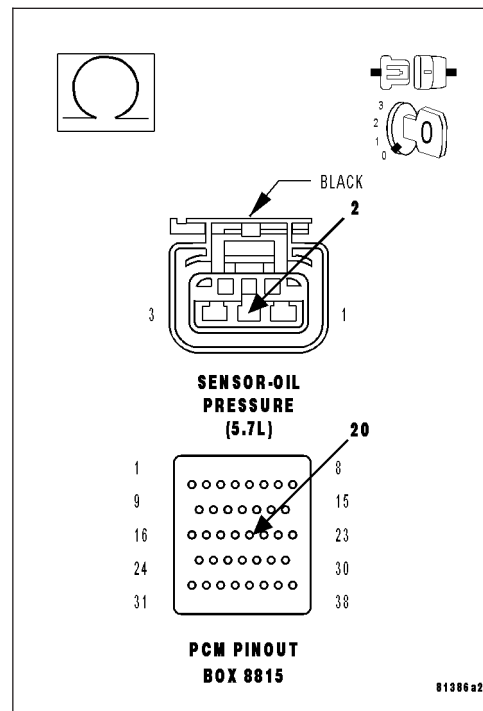
Measure the resistance of the (G6) Engine Oil Pressure Signal circuit from the Engine Oil Pressure Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms for each circuit?**

**Yes** >> Go To 5

**No** >> Repair the excessive resistance in the (G6) Engine Oil Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. (G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND**

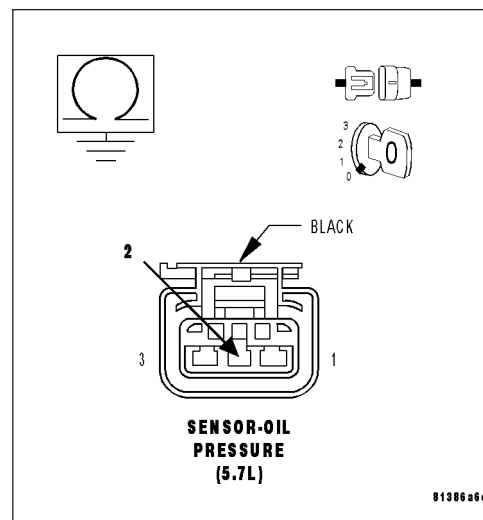
Measure the resistance between ground and the (G6) Engine Oil Pressure Signal circuit Engine Oil Pressure Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (G6) Engine Oil Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P0520-ENGINE OIL PRESSURE SENSOR CIRCUIT (CONTINUED)****6. EXCESSIVE RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT**

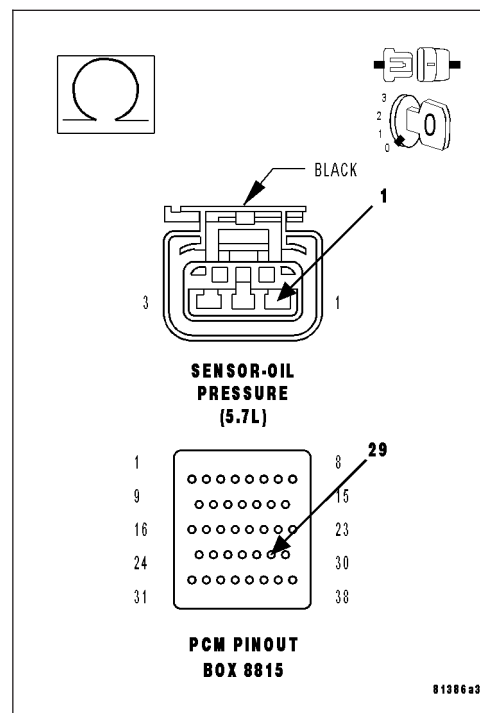
Measure the resistance of the (F856) 5-volt Supply circuit from the Engine Oil Pressure Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. (F856) 5-VOLT SUPPLY SHORTED TO GROUND**

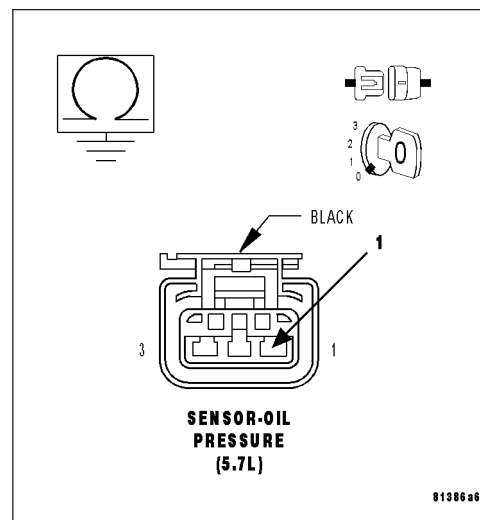
Measure the resistance between ground and the (F856) 5-volt Supply circuit in the Engine Oil Pressure Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8



## P0520-ENGINE OIL PRESSURE SENSOR CIRCUIT (CONTINUED)

### 8. EXCESSIVE RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT

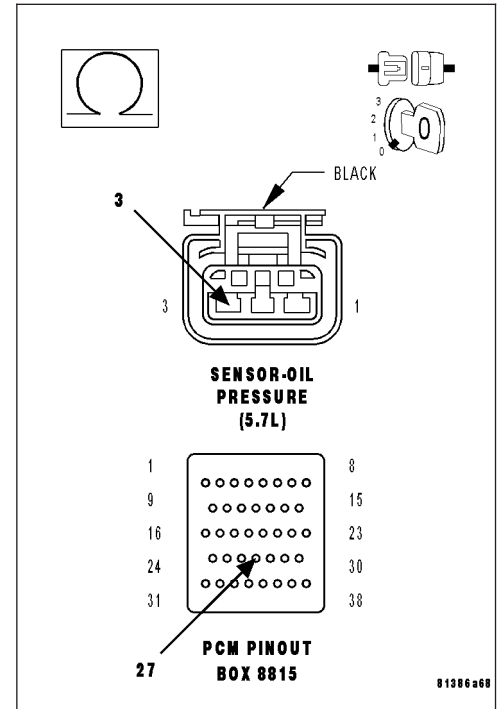
Measure the resistance of the (K900) Sensor Ground circuit from the Engine Oil Pressure Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the excessive resistance in the (K900) Sensor Ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## 9. PCM

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

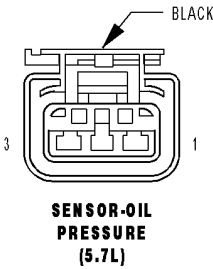
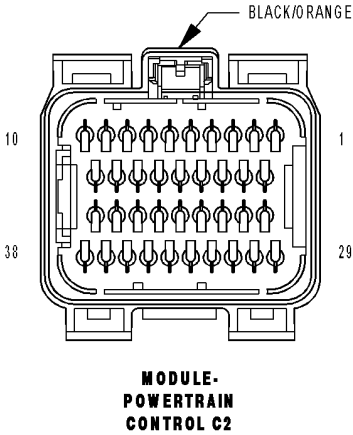
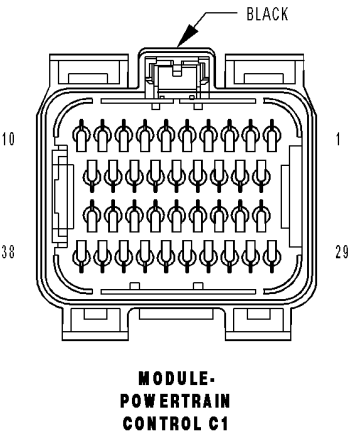
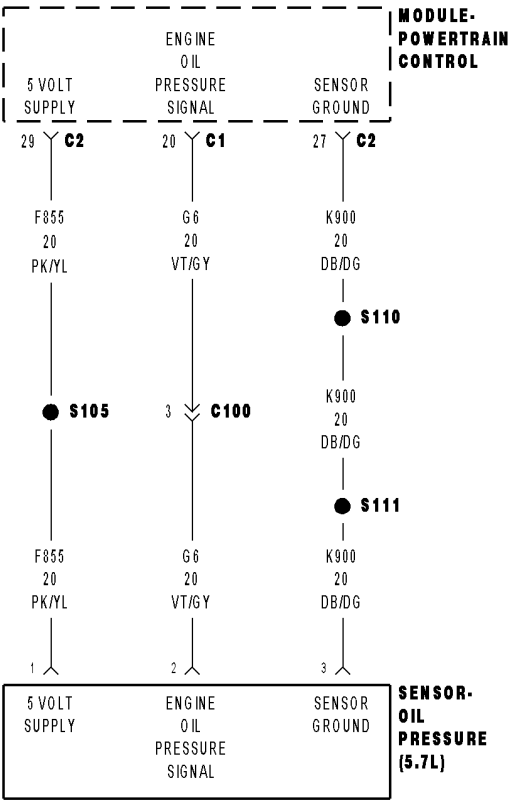
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

P0521-ENGINE OIL PRESSURE SENSOR PERFORMANCE



**P0521-ENGINE OIL PRESSURE SENSOR PERFORMANCE (CONTINUED)**

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Engine running.
- **Set Condition:**  
The engine oil pressure never reaches the calibrated specification with the engine RPM at 1250.

Possible Causes
ENGINE OIL/ENGINE MECHANICAL (G6) ENGINE OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE RESISTANCE (G6) ENGINE OIL PRESSURE SENSOR SIGNAL CIRCUIT (G6) ENGINE OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND RESISTANCE IN (F856) 5-VOLT SUPPLY CIRCUIT (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND RESISTANCE IN THE (K900) SENSOR RETURN CIRCUIT ENGINE OIL PRESSURE SENSOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

**Note:** Ensure that the engine oil is at the proper level. Also, check the customers oil change history to ensure that the oil is being changed at the correct intervals and that the proper oil viscosity is being used.

Ignition on, engine not running.

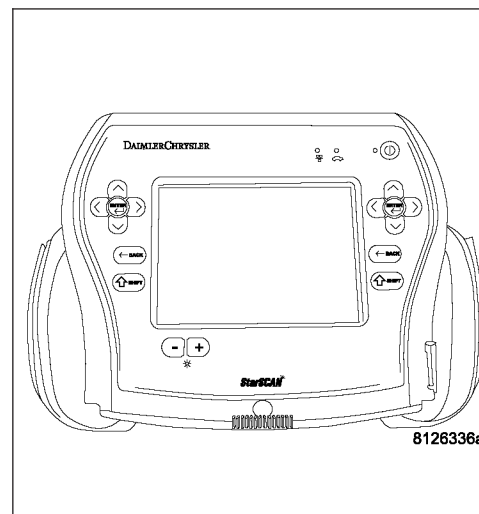
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)





**P0521-ENGINE OIL PRESSURE SENSOR PERFORMANCE (CONTINUED)****2. ENGINE OIL/ENGINE MECHANICAL**

**Note:** The following items must be considered before determining the cause of this DTC. Failure to do so may lead to misdiagnosis.

- **ENGINE MECHANICAL TOLERANCES OUT OF SPECIFICATION**
- **ENGINE OIL PRESSURE OUT OF SPECIFICATION**
- **LOW ENGINE OIL**
- **OIL DIRTY OR DETERIORATED (Lack of scheduled oil changes)**
- **ENGINE OIL CONTAMINATED (i.e., coolant and/or fuel)**

If any of the above conditions are found, repair as necessary.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (G6) ENGINE OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect the Engine Oil Pressure Sensor harness connector.

Ignition on, engine not running.

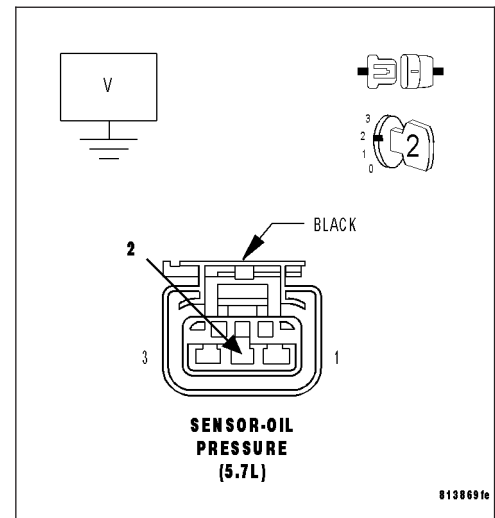
Measure the voltage on the (G6) Engine Oil Pressure Signal circuit in the Engine Oil Pressure Sensor harness connector.

**Is the voltage above 0 volts?**

**Yes** >> Repair the short to battery voltage in the (G6) Engine Oil Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P0521-ENGINE OIL PRESSURE SENSOR PERFORMANCE (CONTINUED)****4. ENGINE OIL PRESSURE SENSOR**

Turn the ignition off.

Connect the PCM harness connectors.

Ignition on, engine not running.

With a scan tool, monitor the Engine Oil Pressure Sensor voltage.

Connect a jumper wire between the (K900) Sensor Ground circuit and the (G6) Engine Oil Pressure Signal circuit.

**Note:** Engine Oil Pressure voltage should change from approximately 4.5 volts to less than 0.5 of a volt.

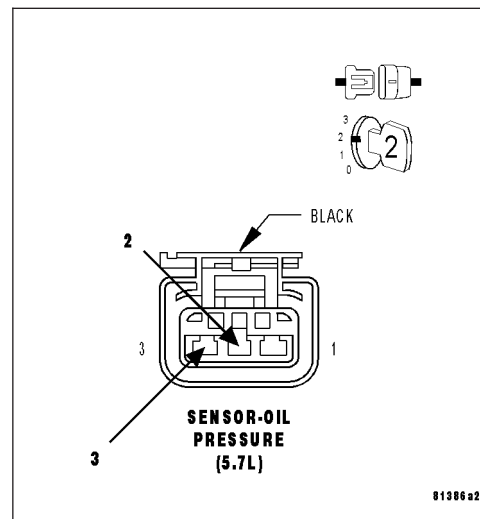
**Is the voltage reading within the listed specification when the jumper wire is installed?**

**Yes** >> Remove the Engine Oil Pressure sensor and ensure the oil passage/port is free from any blockage. If OK, replace the Engine Oil Pressure Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**Note:** Remove the jumper wire before continuing.

**5. EXCESSIVE RESISTANCE IN THE (G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

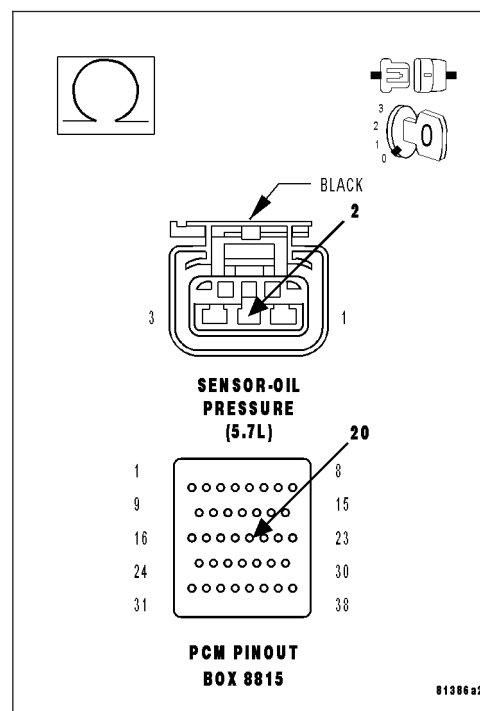
Measure the resistance of the (G6) Engine Oil Pressure Signal circuit from the Engine Oil Pressure Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the excessive resistance in the (G6) Engine Oil Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0521-ENGINE OIL PRESSURE SENSOR PERFORMANCE (CONTINUED)****6. (G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND**

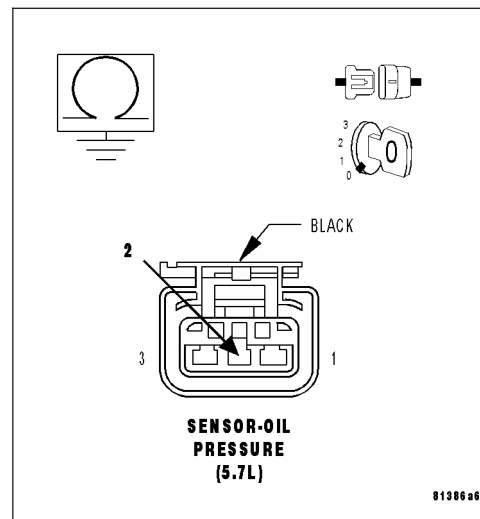
Measure the resistance between ground and the (G6) Engine Oil Pressure Signal circuit Engine Oil Pressure Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (G6) Engine Oil Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. EXCESSIVE RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT**

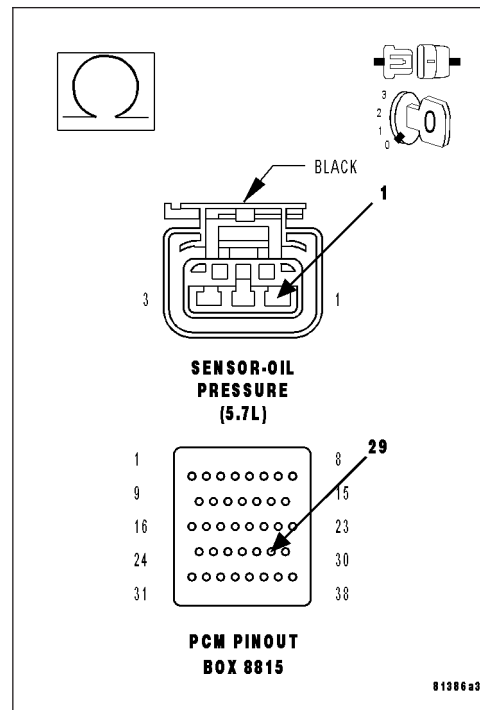
Measure the resistance of the (F856) 5-volt Supply circuit from the Engine Oil Pressure Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0521-ENGINE OIL PRESSURE SENSOR PERFORMANCE (CONTINUED)

### 8. (F856) 5-VOLT SUPPLY SHORTED TO GROUND

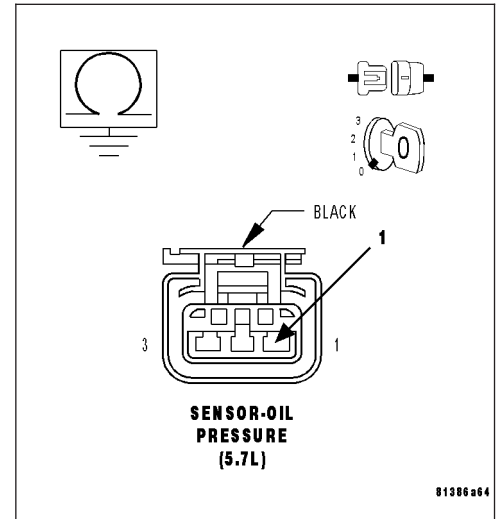
Measure the resistance between ground and the (F856) 5-volt Supply circuit in the Engine Oil Pressure Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 9



### 9. EXCESSIVE RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT

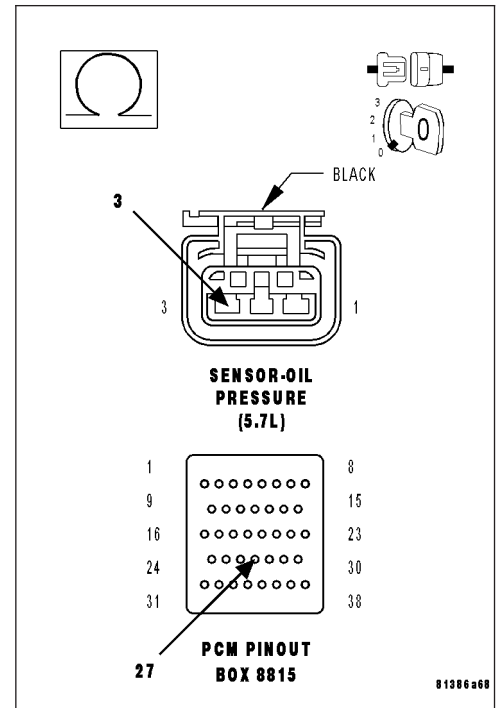
Measure the resistance of the (K900) Sensor Ground circuit from the Engine Oil Pressure Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 10

**No** >> Repair the excessive resistance in the (K900) Sensor Ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0521-ENGINE OIL PRESSURE SENSOR PERFORMANCE (CONTINUED)****10. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

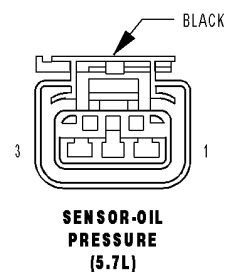
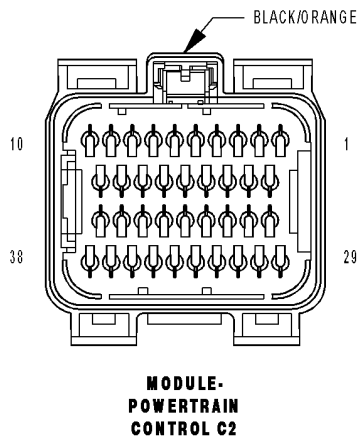
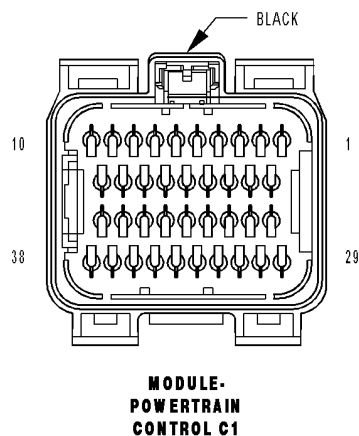
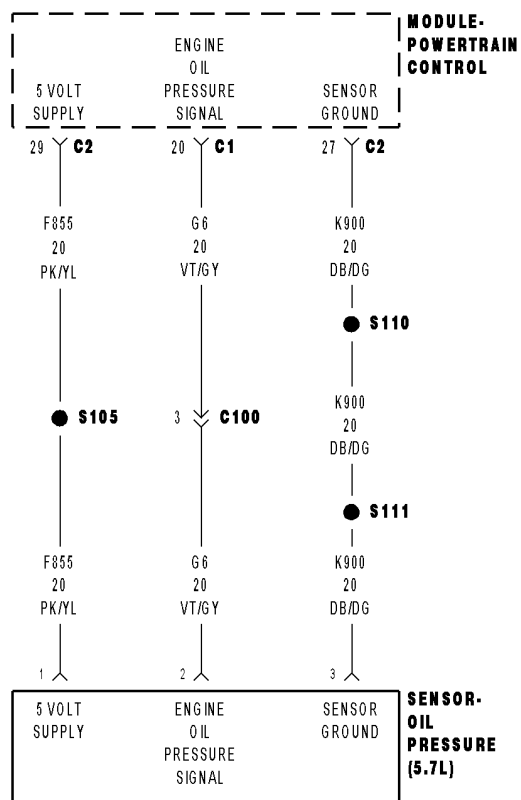
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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# P0522-ENGINE OIL PRESSURE SENSOR CIRCUIT LOW



**P0522-ENGINE OIL PRESSURE SENSOR CIRCUIT LOW (CONTINUED)**

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**  
The Oil pressure signal is below the calibrated amount. One Trip Fault. Three good trips to turn off the MIL.  
ETC light will illuminate.

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT OPEN (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND (G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND (G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT ENGINE OIL PRESSURE SENSOR PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test**

**1. ACTIVE DTC**

**Note:** Ensure that the engine oil is at the proper level. Also, check the customers oil change history to ensure that the oil is being changed at the correct intervals and that the proper oil viscosity is being used.

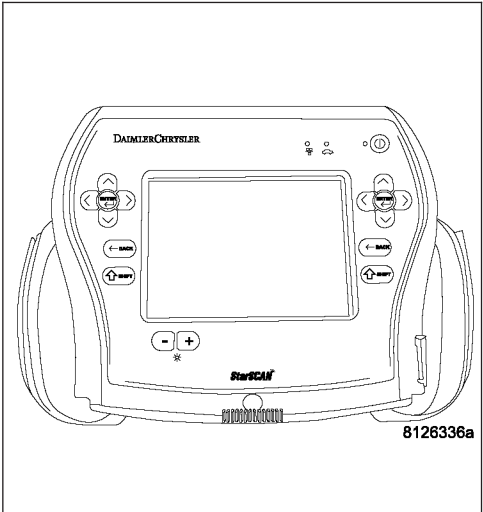
Ignition on, engine not running.

With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes

>> Go To 2
- No

>> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0522-ENGINE OIL PRESSURE SENSOR CIRCUIT LOW (CONTINUED)****2. (F856) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Engine Oil Pressure Sensor harness connector.

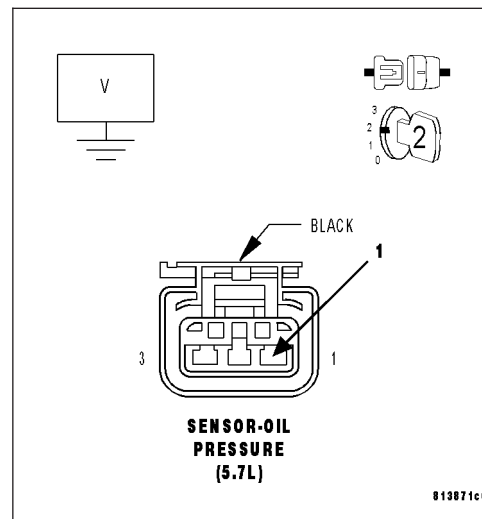
Ignition on, engine not running.

Measure the voltage on the (F856) 5-volt Supply circuit in the Engine Oil Pressure Sensor harness connector.

**Is the voltage between 4.8 to 5.2 volts?**

**Yes** >> Go To 3

**No** >> Go To 6

**3. ENGINE OIL PRESSURE SENSOR**

With a scan tool, monitor the Engine Oil Pressure Sensor voltage with the Sensor harness connector disconnected.

**Is the voltage above 4.5 volts?**

**Yes** >> Replace the Engine Oil Pressure Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

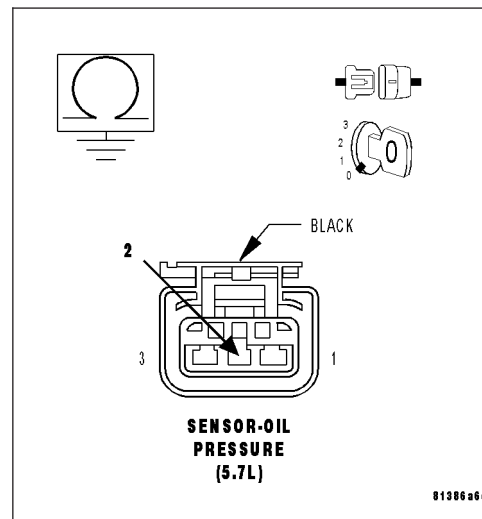
Measure the resistance between ground and the (G6) Engine Oil Pressure Signal circuit in the Engine Oil Pressure Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (G6) Engine Oil Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5





**P0522-ENGINE OIL PRESSURE SENSOR CIRCUIT LOW (CONTINUED)****5. (G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT**

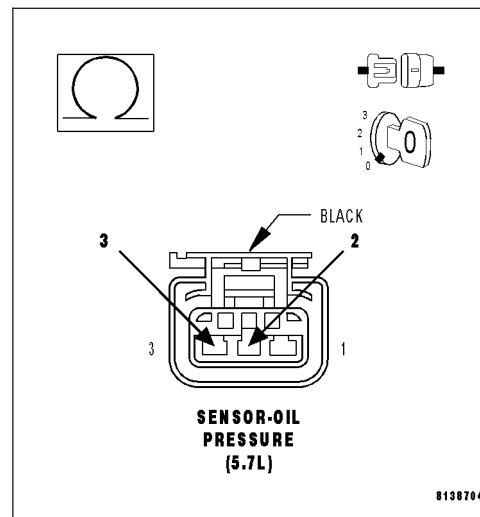
Measure the resistance between the (G6) Engine Oil Pressure Sensor Signal circuit and the (K900) Sensor Ground circuit in the Engine Oil Pressure Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K900) Sensor Ground circuit and the (G6) Engine Oil Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

**6. (F856) 5-VOLT SUPPLY CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnostics.**

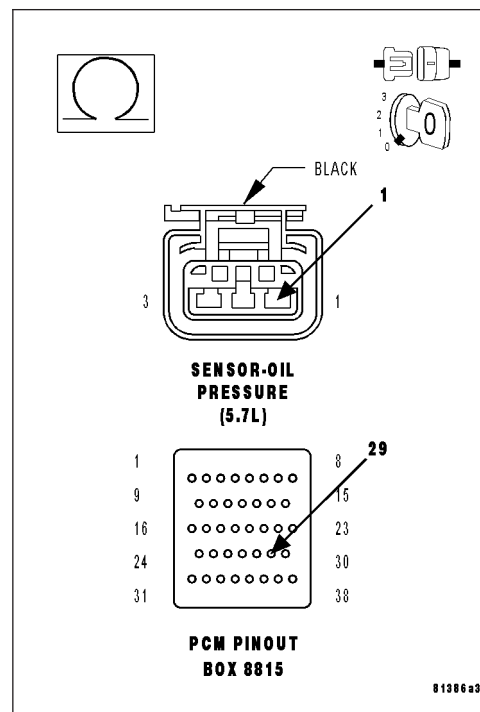
Measure the resistance of the (F856) 5-volt Supply circuit from the Engine Oil Pressure Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0522-ENGINE OIL PRESSURE SENSOR CIRCUIT LOW (CONTINUED)****7. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

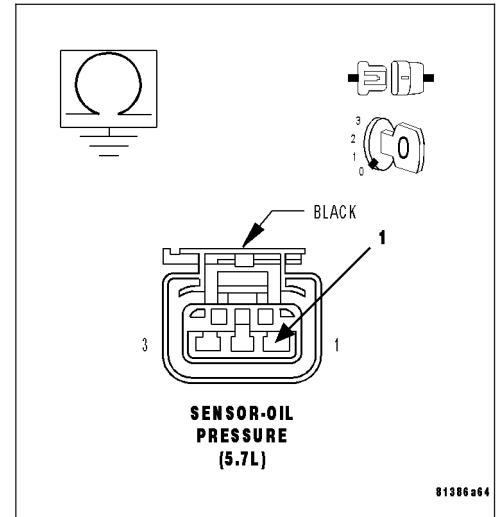
Measure the resistance between ground and the (F856) 5-volt Supply circuit in the Engine Oil Pressure Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

**8. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

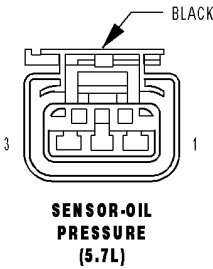
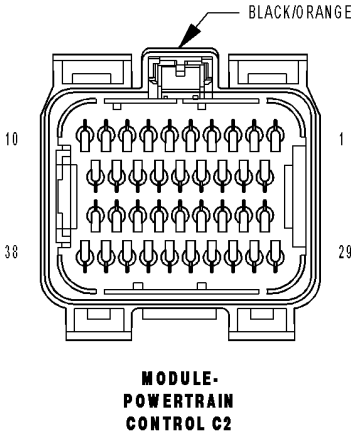
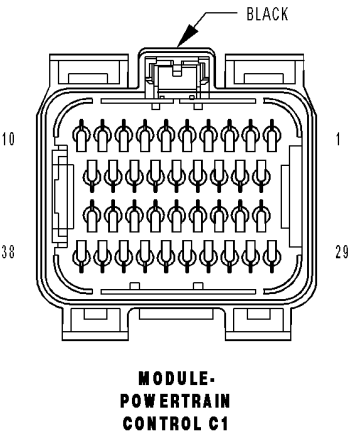
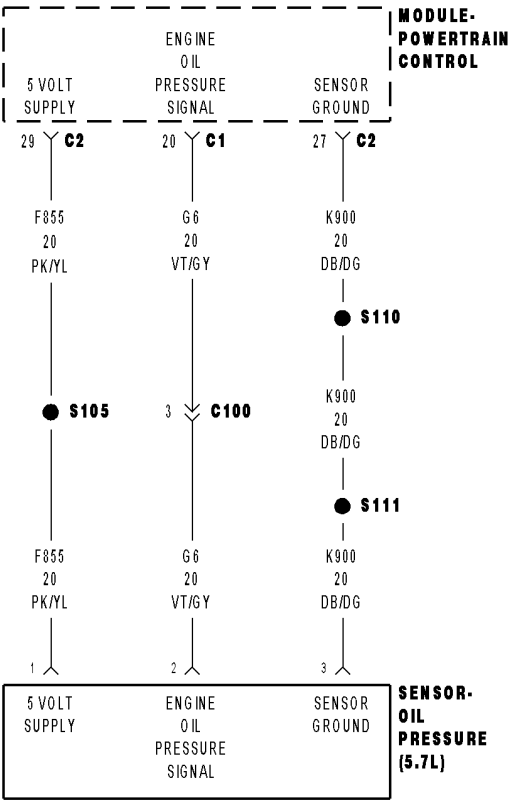
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

P0523-ENGINE OIL PRESSURE SENSOR CIRCUIT HIGH



## P0523-ENGINE OIL PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Battery voltage greater than 10 volts.
- **Set Condition:**  
The Engine Oil pressure signal is greater than the calibrated amount. One Trip Fault.

Possible Causes
(G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT OPEN
(G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT
(K900) SENSOR GROUND CIRCUIT OPEN
ENGINE OIL PRESSURE SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Ensure that the engine oil is at the proper level. Also, check the customers oil change history to ensure that the oil is being changed at the correct intervals and that the proper oil viscosity is being used.

Ignition on, engine not running.

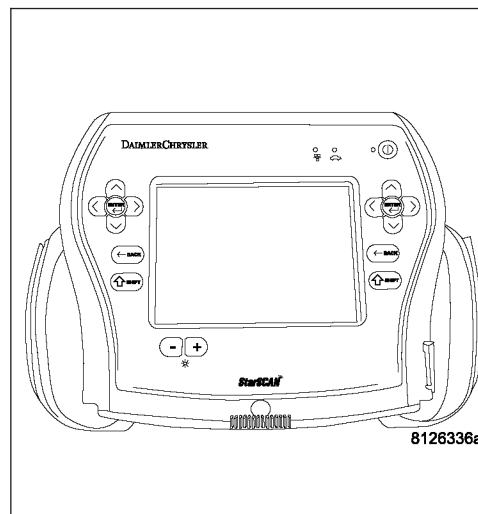
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0523-ENGINE OIL PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)****2. ENGINE OIL PRESSURE SENSOR**

Turn the ignition off.

Disconnect the Engine Oil Pressure Sensor harness connector.

Connect a jumper wire between the (G6) Engine Oil Pressure Signal circuit and the (K900) Sensor Ground circuit in the Engine Oil Pressure Sensor harness connector.

With a scan tool, monitor the Engine Oil Pressure Sensor voltage.

Ignition on, engine not running.

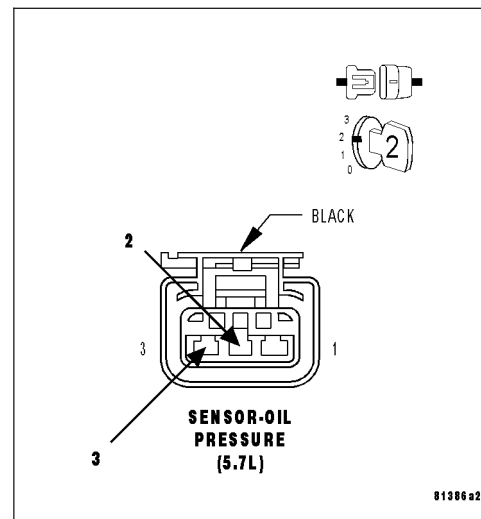
**Is the voltage below 0.5 of a volt with the jumper wire installed?**

**Yes** >> Replace the Engine Oil Pressure Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**Note:** Remove the jumper wire before continuing.

**3. (G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

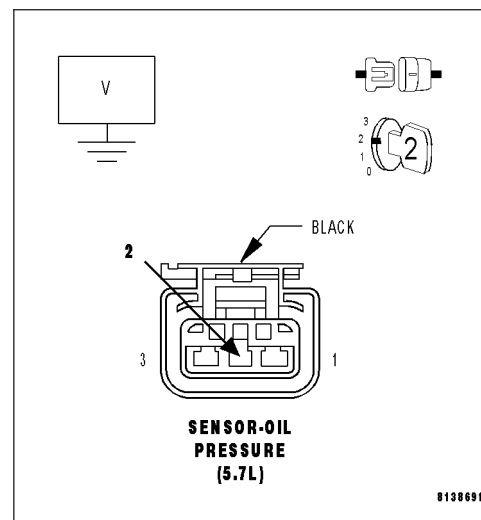
Measure the voltage on the (G6) Engine Oil Pressure Signal circuit in the Engine Oil Pressure Sensor harness connector.

**Is there any voltage present?**

**Yes** >> Repair the short to battery voltage in the (G6) Engine Oil Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P0523-ENGINE OIL PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)****4. (G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT OPEN**

Turn the ignition off.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

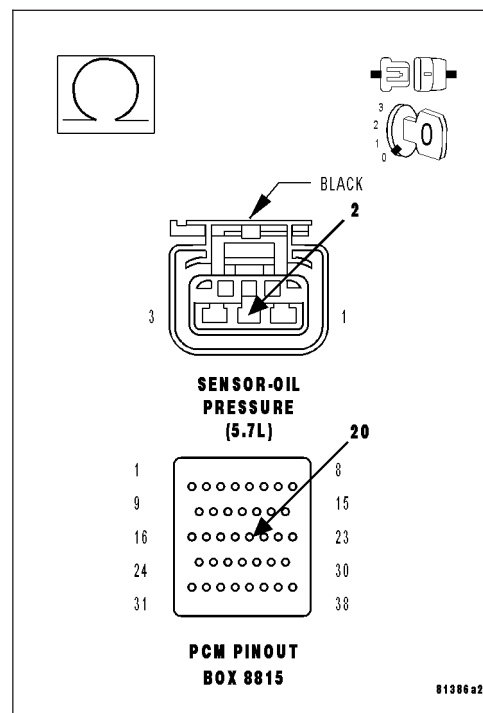
Measure the resistance of the (G6) Engine Oil Pressure Signal circuit from the Engine Oil Pressure Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (G6) Engine Oil Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. (G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT**

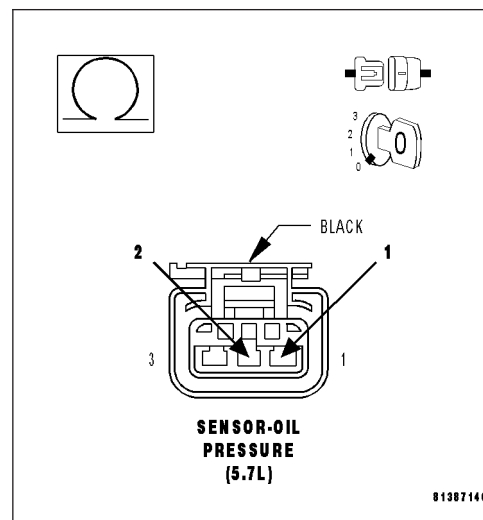
Measure the resistance between the (G6) Engine Oil Pressure Signal circuit and the (F856) 5-volt Supply circuit in the Engine Oil Pressure Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (F856) 5-volt Supply circuit and the (G6) Engine Oil Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



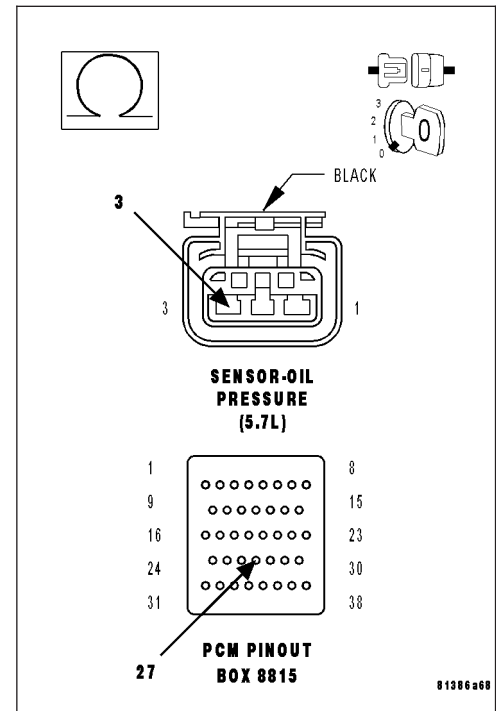
**P0523-ENGINE OIL PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)****6. (K900) SENSOR GROUND CIRCUIT OPEN**

Measure the resistance of the (K900) Sensor Ground circuit from the Engine Oil Pressure Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K900) Sensor Ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

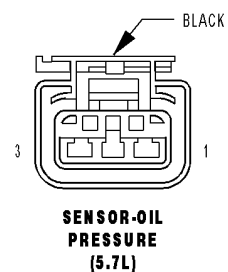
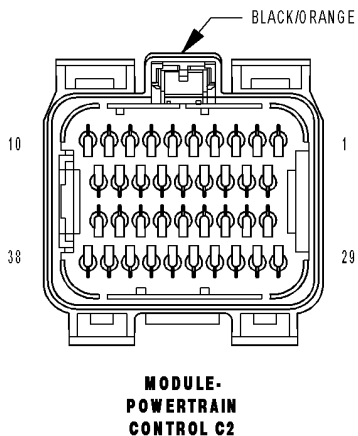
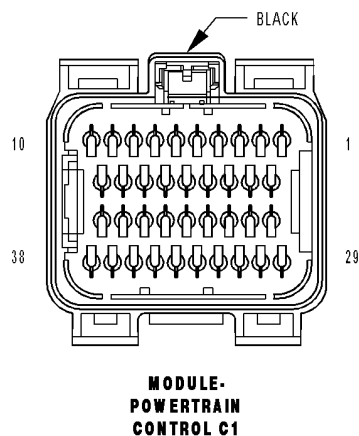
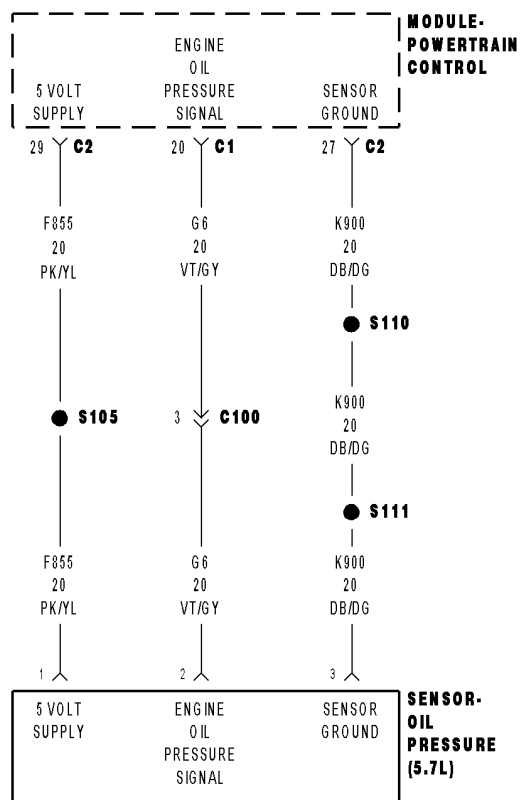
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0524-ENGINE OIL PRESSURE TOO LOW





**P0524-ENGINE OIL PRESSURE TOO LOW (CONTINUED)**

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Engine running.
- **Set Condition:**  
The engine oil pressure never reaches the calibrated specification to allow the MDS activation.

Possible Causes
ENGINE OIL/ENGINE MECHANICAL (G6) ENGINE OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE RESISTANCE (G6) ENGINE OIL PRESSURE SENSOR SIGNAL CIRCUIT (G6) ENGINE OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND RESISTANCE IN (F856) 5-VOLT SUPPLY CIRCUIT (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND RESISTANCE IN THE (K900) SENSOR RETURN CIRCUIT ENGINE OIL PRESSURE SENSOR PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test**

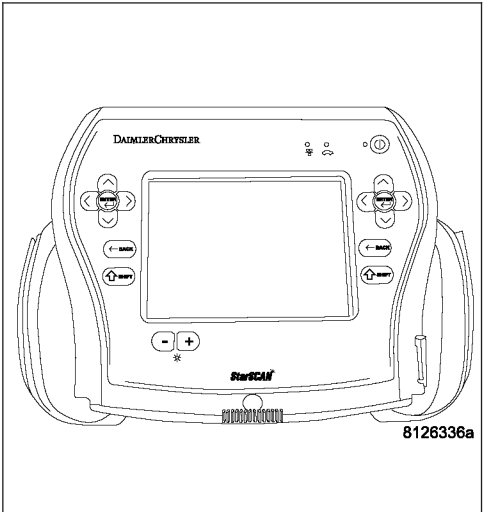
**1. ACTIVE DTC**

**Note:** Ensure that the engine oil is at the proper level. Also, check the customers oil change history to ensure that the oil is being changed at the correct intervals and that the proper oil viscosity is being used.

Ignition on, engine not running.

With a scan tool, read DTCs.

- Is the DTC active at this time?**
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0524-ENGINE OIL PRESSURE TOO LOW (CONTINUED)****2. ENGINE OIL/ENGINE MECHANICAL**

**Note:** The following items must be considered before determining the cause of this DTC. Failure to do so may lead to misdiagnosis.

- **ENGINE MECHANICAL TOLERANCES OUT OF SPECIFICATION**
- **ENGINE OIL PRESSURE OUT OF SPECIFICATION**
- **LOW ENGINE OIL**
- **OIL DIRTY OR DETERIORATED (Lack of scheduled oil changes)**
- **CORRECT VISCOSITY**
- **ENGINE OIL CONTAMINATED (i.e., coolant and/or fuel)**

If any of the above conditions are found, repair as necessary.

**Were any of the above conditions present?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. ENGINE OIL PRESSURE SENSOR**

Turn the ignition off.

Connect the PCM harness connectors.

Ignition on, engine not running.

With a scan tool, monitor the Engine Oil Pressure Sensor voltage.

Connect a jumper wire between the (K900) Sensor Ground circuit and the (G6) Engine Oil Pressure Signal circuit.

**Note:** Engine Oil Pressure voltage should change from approximately 4.5 volts to less than 0.5 of a volt.

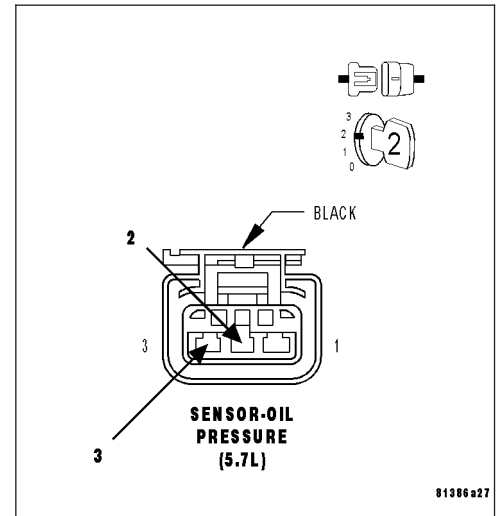
**Is the voltage reading within the listed specification when the jumper wire is installed?**

**Yes** >> Remove the Engine Oil Pressure sensor and ensure the oil passage/port is free from any blockage. If OK, replace the Engine Oil Pressure Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**Note:** Remove the jumper wire before continuing.



**P0524-ENGINE OIL PRESSURE TOO LOW (CONTINUED)****4. EXCESSIVE RESISTANCE IN THE (G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

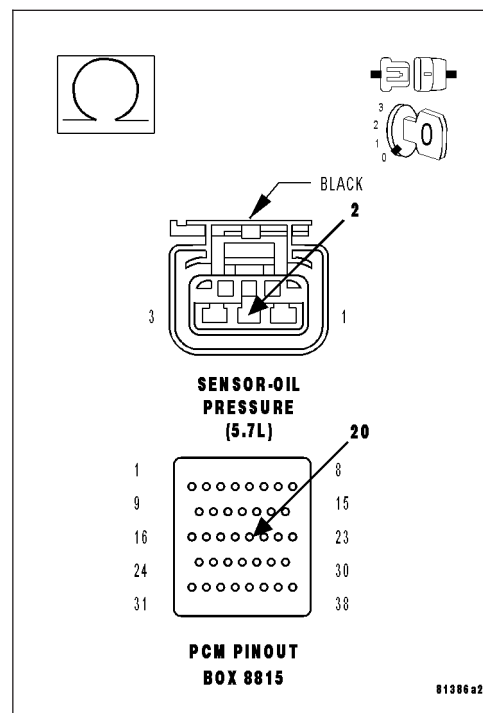
Measure the resistance of the (G6) Engine Oil Pressure Signal circuit from the Engine Oil Pressure Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the excessive resistance in the (G6) Engine Oil Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**5. (G6) ENGINE OIL PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND**

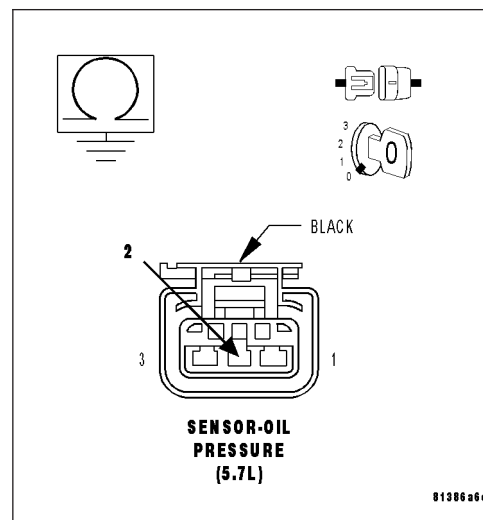
Measure the resistance between ground and the (G6) Engine Oil Pressure Signal circuit in the Engine Oil Pressure Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (G6) Engine Oil Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P0524-ENGINE OIL PRESSURE TOO LOW (CONTINUED)****6. EXCESSIVE RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT**

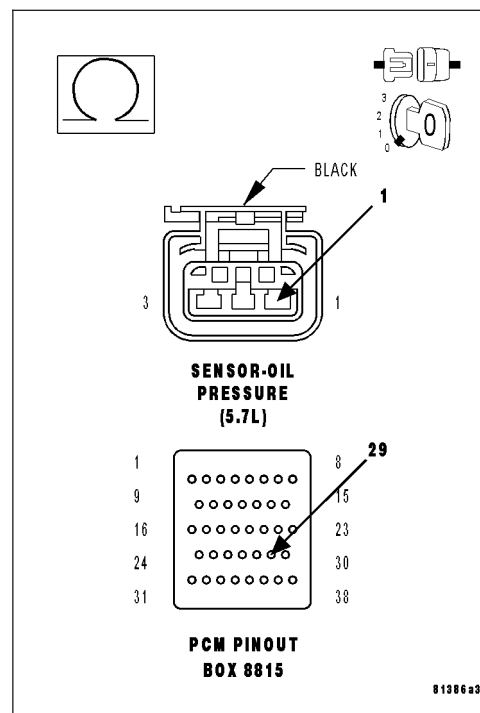
Measure the resistance of the (F856) 5-volt Supply circuit from the Engine Oil Pressure Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. (F856) 5-VOLT SUPPLY SHORTED TO GROUND**

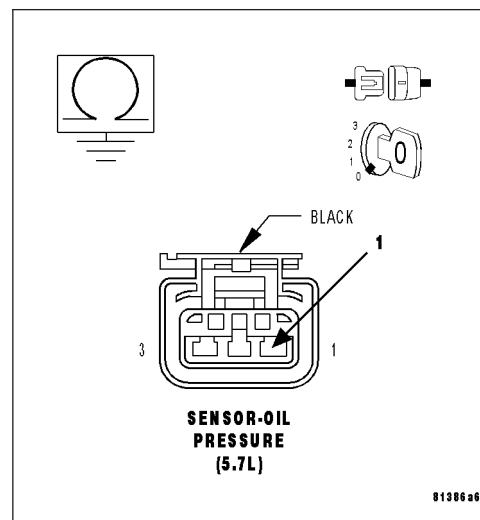
Measure the resistance between ground and the (F856) 5-volt Supply circuit in the Engine Oil Pressure Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P0524-ENGINE OIL PRESSURE TOO LOW (CONTINUED)****8. EXCESSIVE RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT**

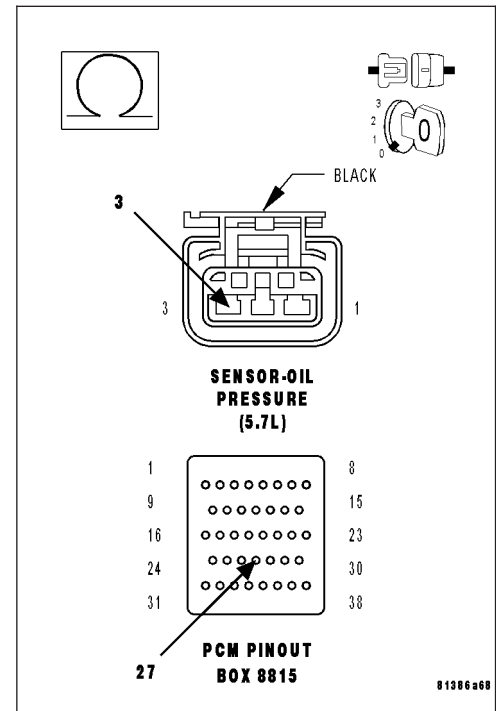
Measure the resistance of the (K900) Sensor Ground circuit from the Engine Oil Pressure Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the excessive resistance in the (K900) Sensor Ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**9. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

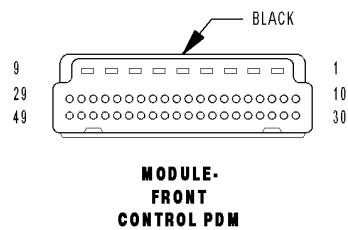
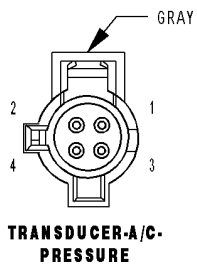
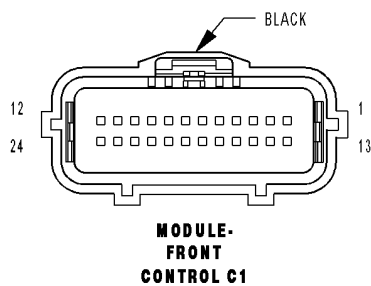
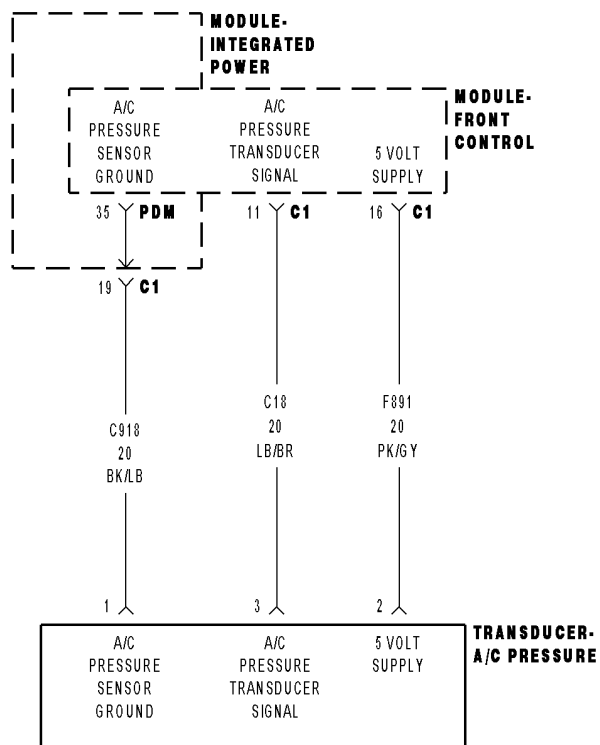
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

## P0532-A/C PRESSURE SENSOR CIRCUIT LOW



**P0532-A/C PRESSURE SENSOR CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running, A/C is learned, and AC Clutch Relay energized.

- **Set Condition:**

The A/C pressure sensor signal voltage at the PCM goes below 0.58 of a volt for 2.6 seconds. One Trip Fault.  
Three good trips to turn off the MIL.

Possible Causes
(F891) 5-VOLT SUPPLY CIRCUIT OPEN
(F891) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
A/C PRESSURE TRANSDUCER
(C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND
(C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO (C918) SENSOR GROUND CIRCUIT
FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. A/C PRESSURE TRANSDUCER VOLTAGE BELOW 0.6 OF A VOLT

**Note:** Make sure the A/C refrigerant System is properly charged per Service Information.

Start the engine.

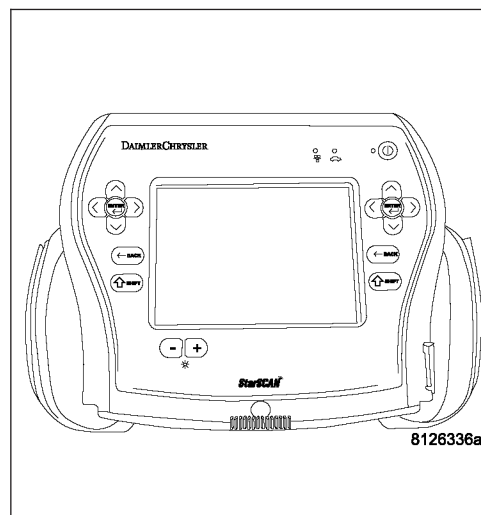
With a scan tool, read the A/C Pressure Sensor voltage.

**Is the voltage below 0.6 of a volt?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0532-A/C PRESSURE SENSOR CIRCUIT LOW (CONTINUED)****2. (F891) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the A/C Pressure Transducer harness connector.

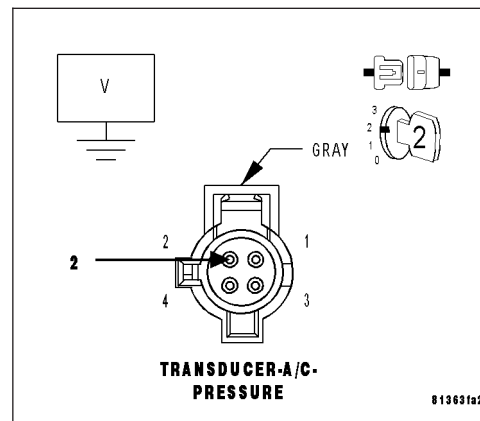
Ignition on, engine not running.

Measure the voltage on the (F891) 5-volt Supply circuit in the A/C Pressure Transducer harness connector.

**Is the voltage between 4.5 to 5.2 volts?**

**Yes** >> Go To 3

**No** >> Go To 6

**3. A/C PRESSURE TRANSDUCER**

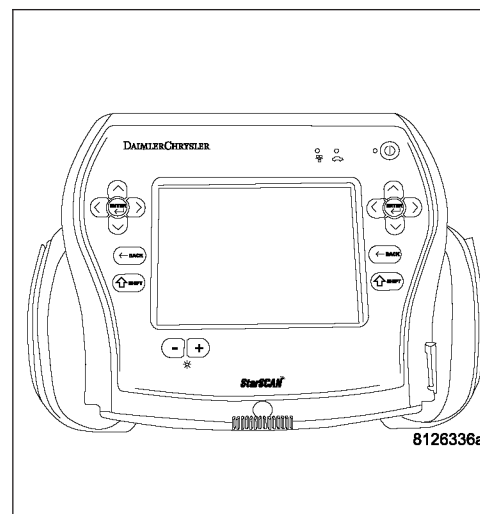
With the scan tool, monitor the A/C Pressure Transducer voltage.

**Is the voltage above 0.6 of a volt?**

**Yes** >> Replace the A/C Pressure Transducer.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the C1 FCM harness connector.

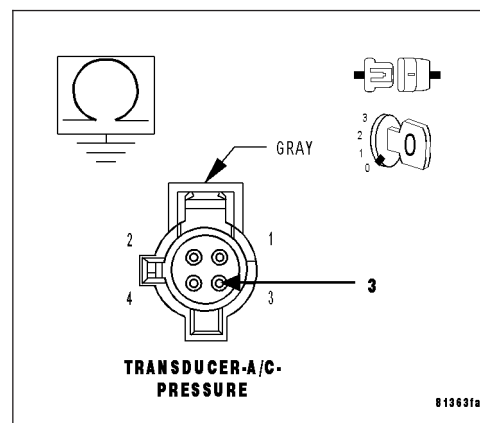
Measure the resistance between the (C18) A/C Pressure Signal circuit in the A/C Pressure Transducer harness connector and ground.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (C18) A/C Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5





**P0532-A/C PRESSURE SENSOR CIRCUIT LOW (CONTINUED)****5. (C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO THE (C918) SENSOR GROUND CIRCUIT**

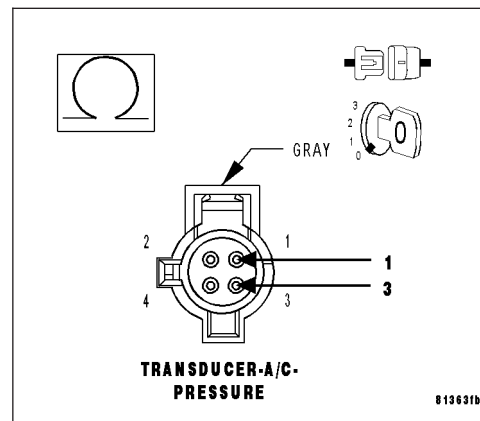
Disconnect the C3 FCM harness connector.

Measure the resistance between the (C18) A/C Pressure Signal circuit and the (C918) Sensor Ground circuit in the A/C Pressure Transducer harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (C918) Sensor Ground circuit and the (C18) A/C Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**No** >> Go To 8

**6. (F891) 5-VOLT SUPPLY CIRCUIT OPEN**

Turn the ignition off.

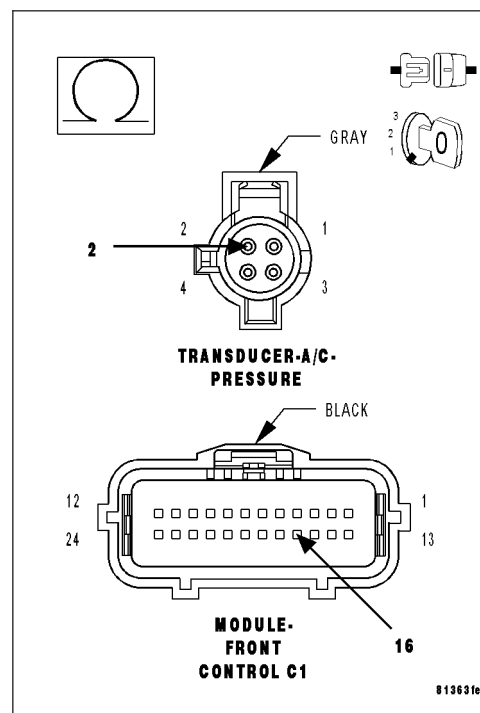
Disconnect the C1 FCM harness connector.

Measure the resistance of the (F891) 5-volt Supply circuit from the A/C Pressure Transducer harness connector to the C1 FCM harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (F891) 5-volt Supply circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0532-A/C PRESSURE SENSOR CIRCUIT LOW (CONTINUED)****7. (F891) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

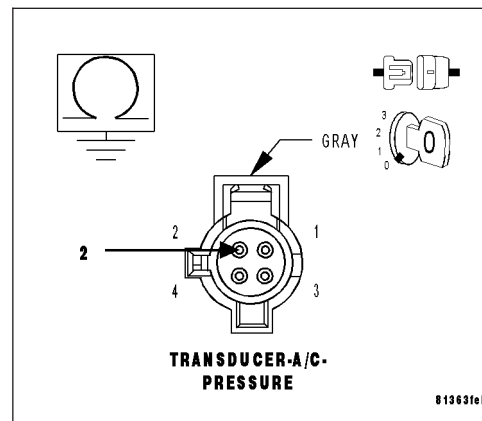
Measure the resistance between the (F891) 5-volt Supply circuit in the A/C Pressure Transducer harness connector and ground.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F891) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

**8. FRONT CONTROL MODULE**

**Note:** Before continuing, check the FCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

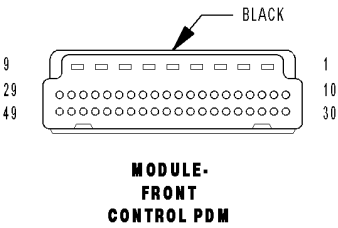
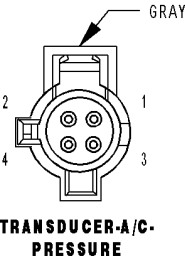
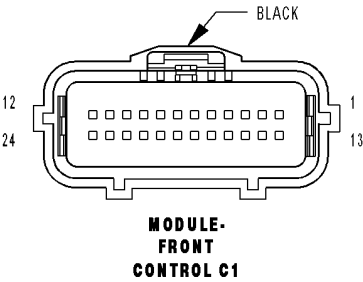
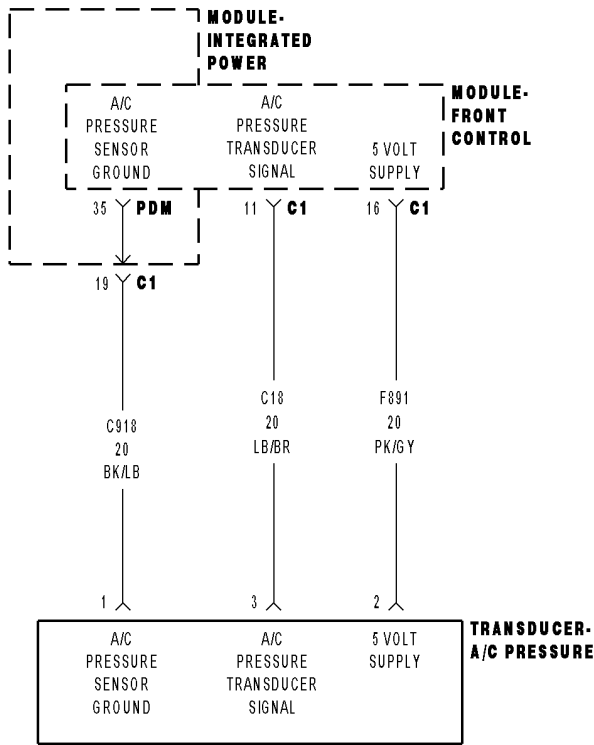
**Yes** >> Repair as necessary.

Perform BODY VERIFICATION TEST-VER 1.

**No** >> Replace and program the Front Control Module per Service Information.

Perform BODY VERIFICATION TEST-VER 1.

P0533-A/C PRESSURE SENSOR CIRCUIT HIGH



## P0533-A/C PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Engine running and the A/C Clutch Relay energized.
- **Set Condition:**  
The A/C pressure transducer signal at the PCM goes above 4.92 volts. One trip Fault. Three good trips to turn off the MIL.

Possible Causes
(C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(C18) A/C PRESSURE SIGNAL CIRCUIT OPEN
(C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO (F891) 5-VOLT SUPPLY CIRCUIT
(C918) SENSOR GROUND CIRCUIT OPEN
A/C PRESSURE TRANSDUCER
FRONT CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. A/C PRESSURE TRANSDUCER VOLTAGE ABOVE 4.9 VOLTS

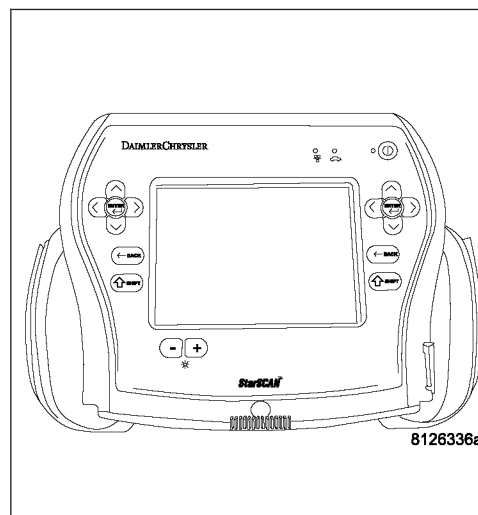
**Note: Make sure the A/C refrigerant system is properly charged per Service Information.**

Start the engine.

With a scan tool, read the A/C Pressure Sensor voltage.

**Is the voltage above 4.9 volts?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0533-A/C PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)****2. A/C PRESSURE TRANSDUCER**

Turn the ignition off.

Disconnect the A/C Pressure Transducer harness connector.

Connect a jumper wire between the (C18) A/C Pressure Signal circuit and the (C918) Sensor Ground circuit in the Transducer harness connector.

Ignition on, engine not running.

With the scan tool, monitor the A/C Pressure Transducer voltage.

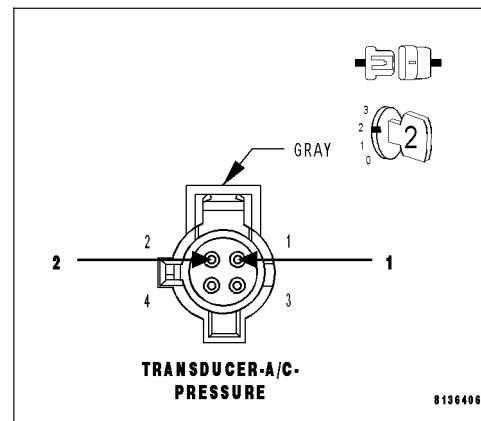
**Is the voltage below 1.0 volt with the jumper wire installed?**

**Yes** >> Replace the A/C Pressure Transducer.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**Note:** Remove the jumper wire before continuing.

**3. (C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the C1 FCM harness connector.

Ignition on, engine not running.

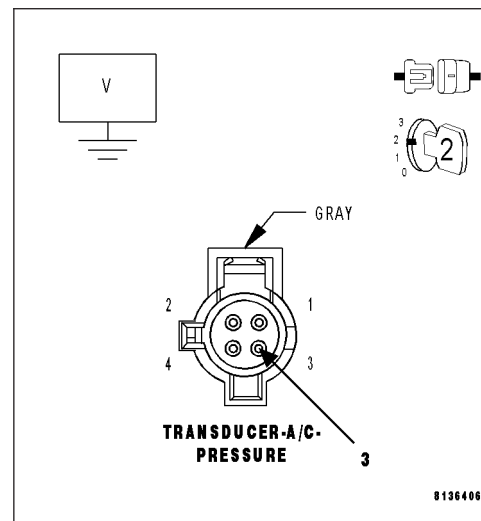
Measure the voltage on the (C18) A/C Pressure Signal circuit in the A/C Pressure Transducer harness connector.

**Is there voltage present?**

**Yes** >> Repair the short to battery voltage in the (C18) A/C Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



## P0533-A/C PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

### 4. (C18) A/C PRESSURE SIGNAL CIRCUIT OPEN

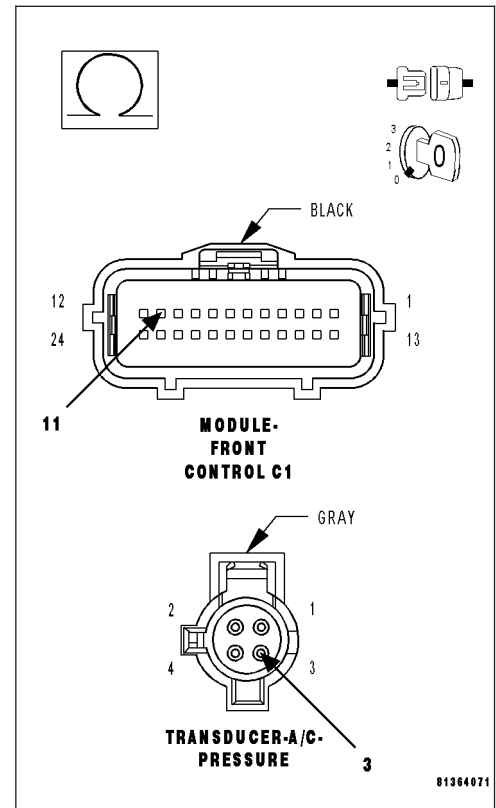
Turn the ignition off.

Measure the resistance of the (C18) A/C Pressure Signal circuit from the A/C Pressure Transducer harness connector to the C1 FCM harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (C18) A/C Pressure Signal circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



### 5. (C18) A/C PRESSURE SIGNAL CIRCUIT SHORTED TO THE (F891) 5-VOLT SUPPLY CIRCUIT

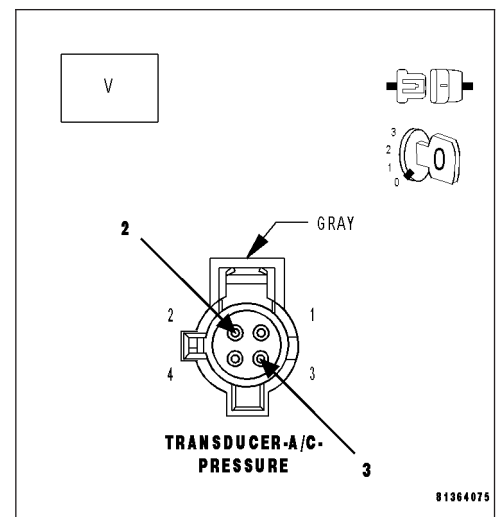
Measure the resistance between the (C18) A/C Pressure Signal circuit and the (F891) 5-volt Supply circuit in the A/C Pressure Transducer harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (F891) 5-volt Supply circuit and the (C18) A/C Pressure Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P0533-A/C PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)****6. (C918) SENSOR GROUND CIRCUIT OPEN**

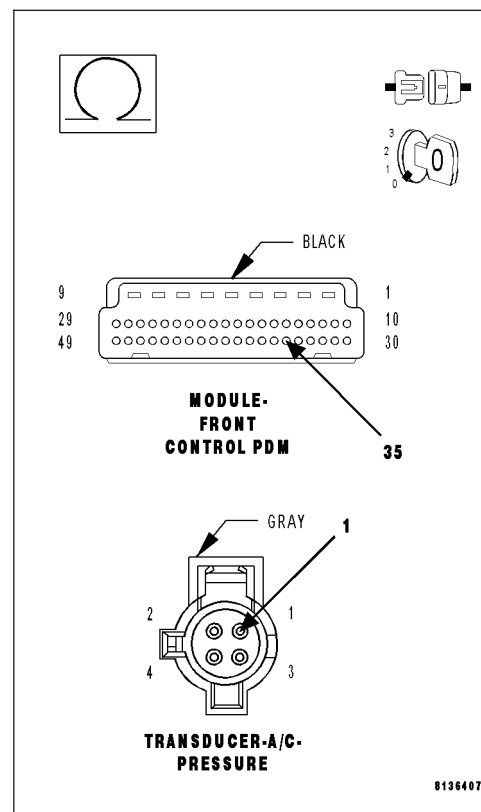
Disconnect the C3 FCM harness connector.

Measure the resistance of the (C918) Sensor Ground circuit from the A/C Pressure Sensor harness connector to the C3 FCM harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (C918) Sensor Ground circuit  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. FRONT CONTROL MODULE**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform BODY VERIFICATION TEST - VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**P0551-POWER STEERING PRESSURE SWITCH PERFORMANCE**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition key on and engine running.
- **Set Condition:**  
With the vehicle above 40 m.p.h. for over 30 seconds, the power steering pressure switch remains open. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K66) P/S SWITCH SIGNAL CIRCUIT OPEN (K66) P/S SWITCH SIGNAL CIRCUIT SHORTED TO GROUND (Z988) GROUND CIRCUIT OPEN POWER STEERING PRESSURE SWITCH PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

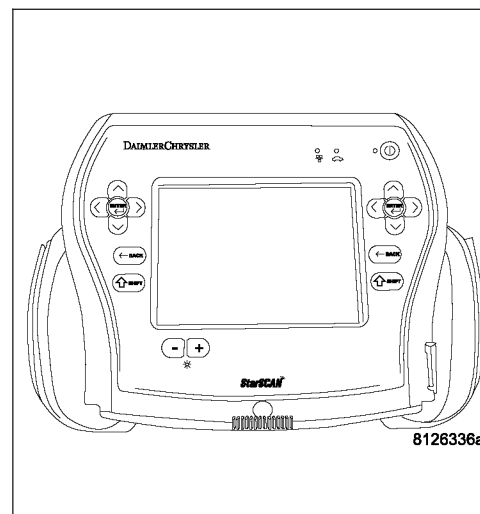
Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.





**P0551-POWER STEERING PRESSURE SWITCH PERFORMANCE (CONTINUED)****2. POWER STEERING PRESSURE SWITCH**

Turn the ignition off.

Disconnect the Power Steering Pressure Switch harness connector.

Ignition on, engine not running.

Connect a jumper wire to the (K66) P/S Switch Signal circuit at the Power Steering Pressure Switch harness connector.

Use the scan tool to monitor the Power Steering Pressure Switch status.

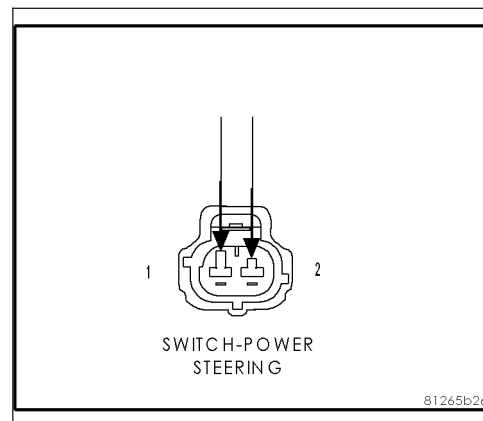
Touch the other end of the jumper wire to the (Z988) Ground circuit at the Power Steering Pressure Switch harness connector several times.

**Did the Power Steering Pressure Switch status change from High to Low when connecting and disconnecting the jumper wire?**

**Yes** >> Replace the Power Steering Pressure Switch.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.

**No** >> Go To 3

**Note:** Remove the jumper wire before continuing.

**3. (K66) P/S SWITCH SIGNAL CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

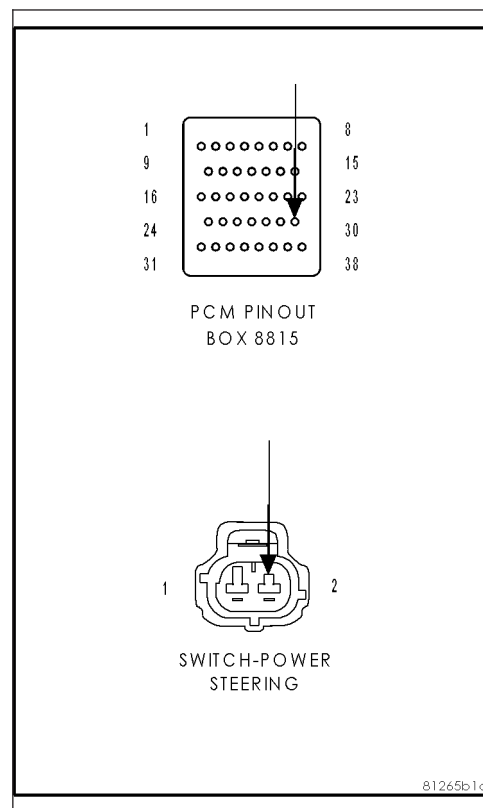
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure resistance of (K66) P/S Switch Signal circuit from the Power Steering Pressure Switch harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the open in the (K66) P/S Switch Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.

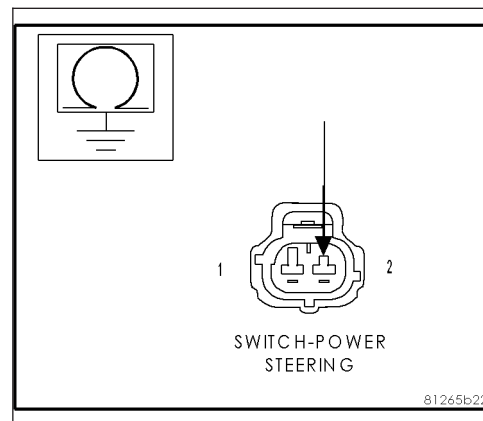


**P0551-POWER STEERING PRESSURE SWITCH PERFORMANCE (CONTINUED)****4. (K66) P/S SWITCH SIGNAL CIRCUIT SHORTED TO GROUND**

Measure the resistance between the (K66) P/S Switch Signal circuit in the Switch connector and ground.

**Is the resistance below 100 ohms?**

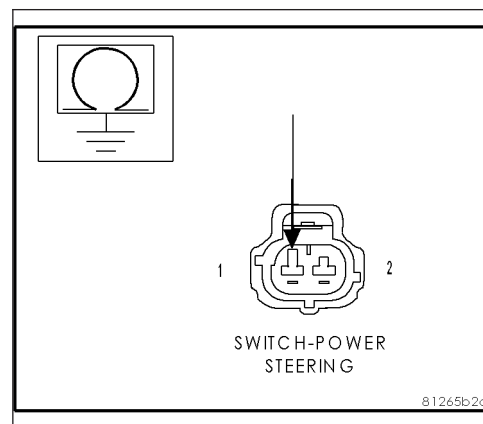
- Yes** >> Repair the short to ground in the (K66) P/S Switch Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.
- No** >> Go To 5

**5. (Z988) GROUND CIRCUIT OPEN**

Measure the resistance between Ground and the (Z988) Ground circuit in the Power Steering Pressure Switch connector.

**Is the resistance below 100 ohms?**

- Yes** >> Go To 6
- No** >> Repair the open in the (Z988) Ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.

**6. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.
- No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.

[illegible]

**P0562-BATTERY VOLTAGE LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The engine running. The engine speed greater than 1000 RPM.

- **Set Condition:**

Battery voltage is 1 volt less than desired voltage for a set period of time. One Trip Fault. ETC light is flashing.

Possible Causes
RESISTANCE IN THE (A1) BATTERY POSITIVE CIRCUIT
RESISTANCE IN THE GENERATOR CASE GROUND
GENERATOR OPERATION
(K20) GENERATOR FIELD CONTROL CIRCUIT OPEN
(K20) GENERATOR FIELD CONTROL CIRCUIT SHORTED TO GROUND
(Z20) GROUND CIRCUIT OPEN
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Make sure the Battery is in good condition. Using the Midtronics Battery Tester, test the Battery before continuing.

**Note:** Inspect the vehicle for after market accessories that may exceed the Generator System output.

Turn the ignition off.

**Note:** Make sure the generator drive belt is in good operating condition.

**Note:** Inspect the fuses in the IPM. If an open fuse is found, use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.

Ignition on, engine not running.

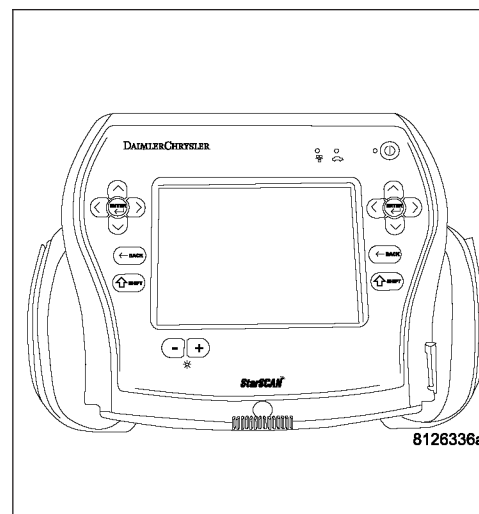
With the scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0562-BATTERY VOLTAGE LOW (CONTINUED)****2. (A1) B+ CIRCUIT HIGH RESISTANCE**

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

**Note:** Make sure all wires are clear of the engine's moving parts. Measure the voltage between the (A1) B+ Terminal at the Generator and the Battery + Post.

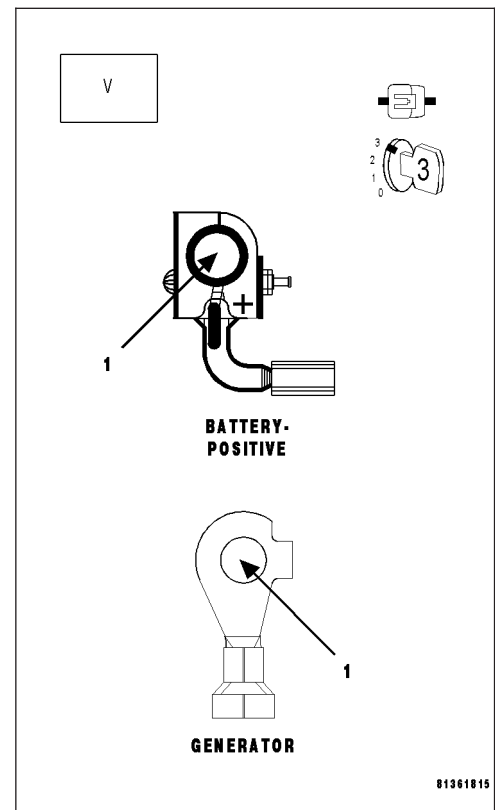
Start the engine.

**Is the voltage above 0.4 of a volt?**

**Yes** >> Repair the excessive resistance in the (A1) B+ circuit between the Generator and Battery.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. GENERATOR CASE GROUND HIGH RESISTANCE**

Ignition on, engine not running.

Start the engine.

Allow the engine to reach normal operating temperature.

**Note:** Make sure all wires are clear of the engine's moving parts.

Measure the voltage between the Generator case and Battery ground post.

**Is the voltage above 0.1 of a volt?**

**Yes** >> Repair excessive resistance in the Generator Ground between the Generator Case and Battery ground side.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

## P0562-BATTERY VOLTAGE LOW (CONTINUED)

### 4. GENERATOR OPERATION

Turn the ignition off.

Disconnect the Generator Field harness connector.

Using a 12-volt test light, jump it across the Generator Field harness connector.

Ignition on, engine not running.

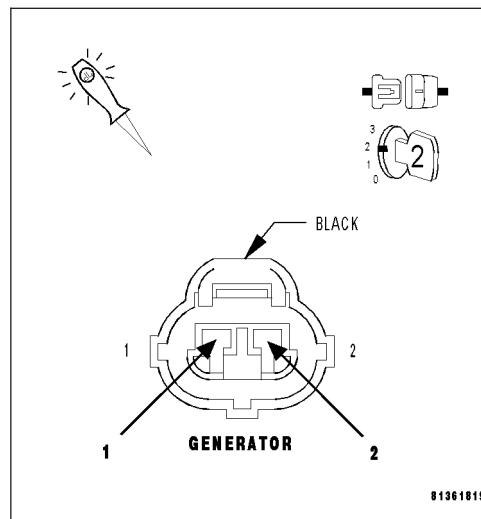
With the scan tool, actuate the Gen Field Control circuit.

**Does the test light illuminate brightly and flash on and off?**

**Yes** >> Replace the Generator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5



### 5. (K20) GENERATOR FIELD CONTROL CIRCUIT OPEN

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

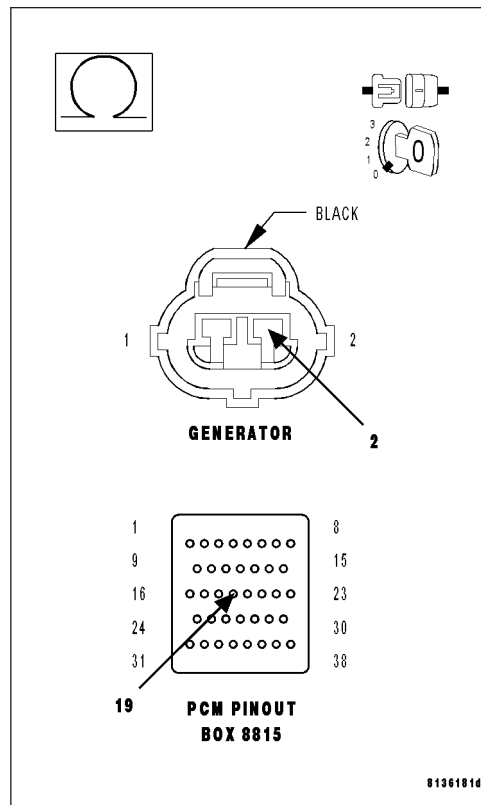
Measure the resistance of the (K20) Gen Field Control circuit from the Generator harness connector to the appropriate terminal of the special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K20) Gen Field Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0562-BATTERY VOLTAGE LOW (CONTINUED)****6. (K20) GENERATOR FIELD CONTROL CIRCUIT SHORTED TO GROUND**

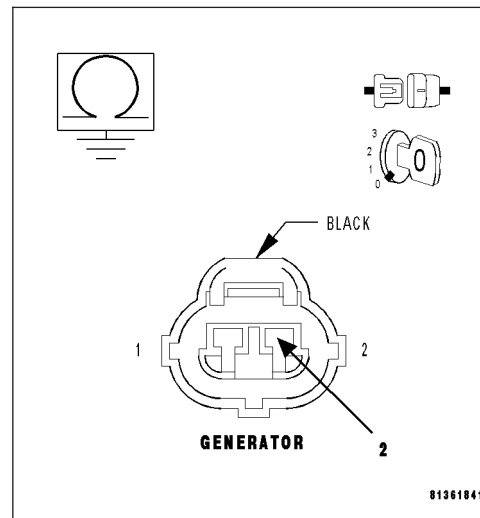
Measure the resistance between the (K20) Gen Field Control circuit in the Generator Field harness connector and ground.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K20) Gen Field Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. (Z20) GROUND CIRCUIT OPEN**

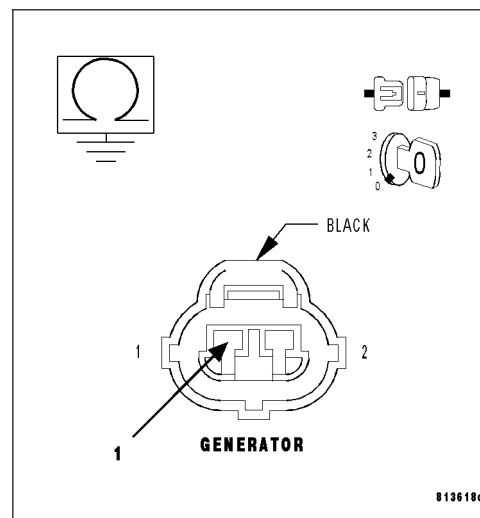
Measure the resistance between the (Z20) Ground circuit in the Generator Field harness connector and ground.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (Z20) Ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**8. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

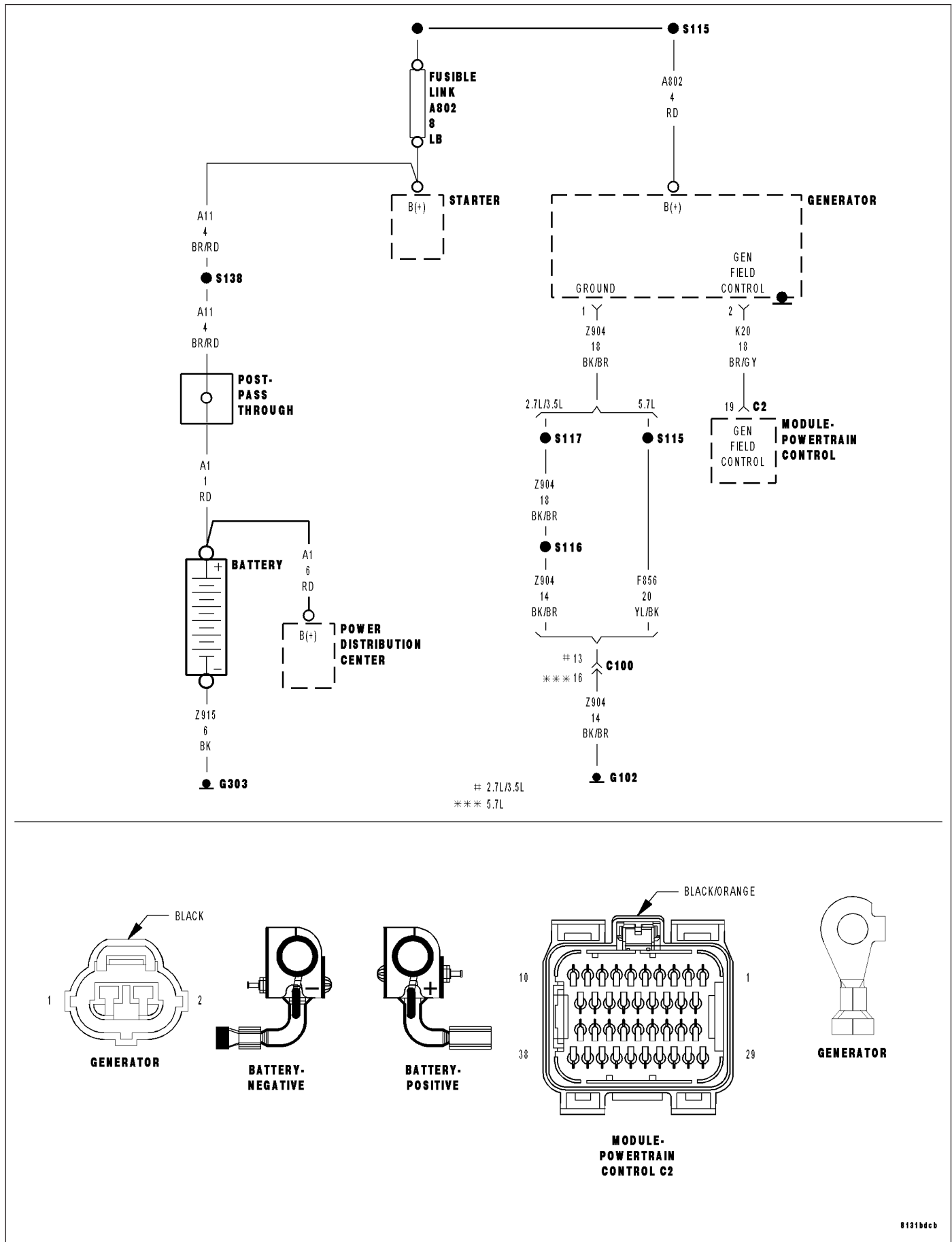
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

# P0563-BATTERY VOLTAGE HIGH





P0563-BATTERY VOLTAGE HIGH (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Engine RPM greater than 1000 RPM. With no other charging system codes set.
- **Set Condition:**  
Battery voltage is 1 volt greater than desired voltage. Battery voltage greater than 15.75 volts. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K20) GENERATOR FIELD CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
GENERATOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

**Note:** Make sure the Battery is in good condition. Using the Midtronics Battery Tester, test the Battery before continuing.

**Note:** Inspect the vehicle for after market accessories that may exceed the Generator System output.

Turn the ignition off.

**Note:** Make sure the generator drive belt is in good operating condition.

**Note:** Inspect the fuses in the IPM. If a fuse is open use the wire diagram/schematic as a guide, inspect the wiring and connectors for damage.

Ignition on, engine not running.

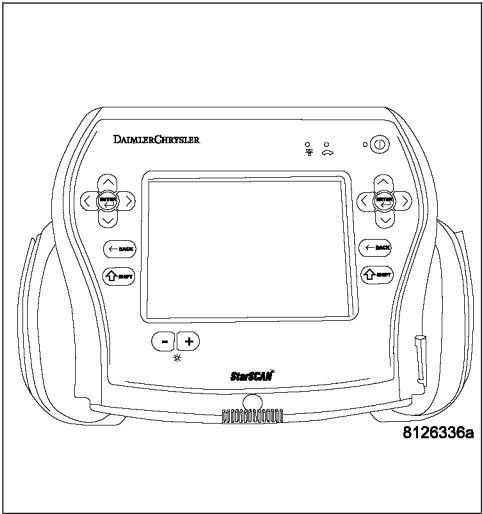
With a scan tool, read DTCs.

Is the DTC active at this time?

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0563-BATTERY VOLTAGE HIGH (CONTINUED)

### 2. GENERATOR OPERATION

Turn the ignition off.

Disconnect the Generator Field harness connector.

Using a 12-volt test light, jump across the Generator Field harness connector.

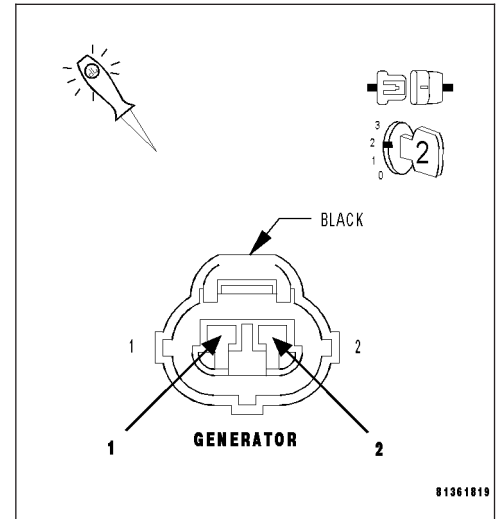
Ignition on, engine not running.

With the scan tool, actuate the Generator Field Driver.

**Does the test light illuminate brightly and flash on and off?**

**Yes** >> Replace the Generator.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3



### 3. (K20) FIELD CIRCUIT SHORTED BATTERY VOLTAGE

Turn the ignition off.

Disconnect the PCM harness connectors.

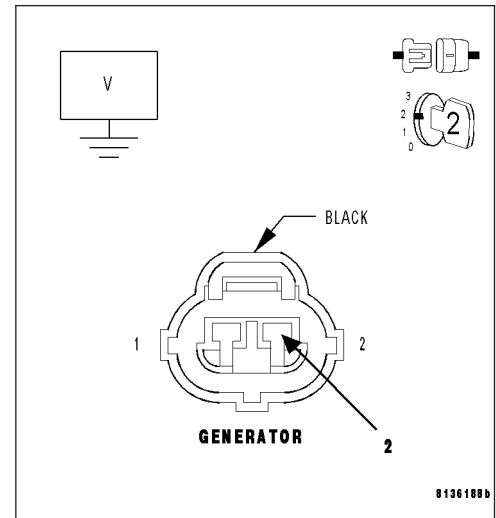
Ignition on, engine not running.

Measure the voltage on the (K20) Gen Field Control circuit at the Generator Field harness connector.

**Is the voltage above 1.0 volt?**

**Yes** >> Repair the short to battery voltage in the (K20) Gen Field Control circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P0563-BATTERY VOLTAGE HIGH (CONTINUED)****4. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

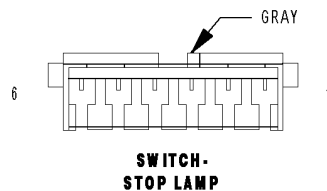
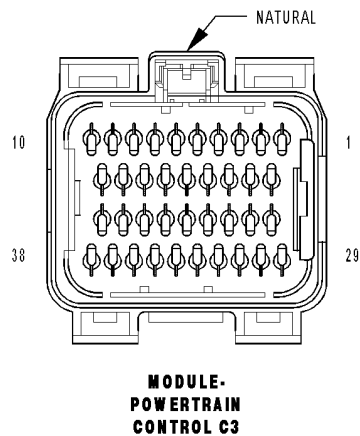
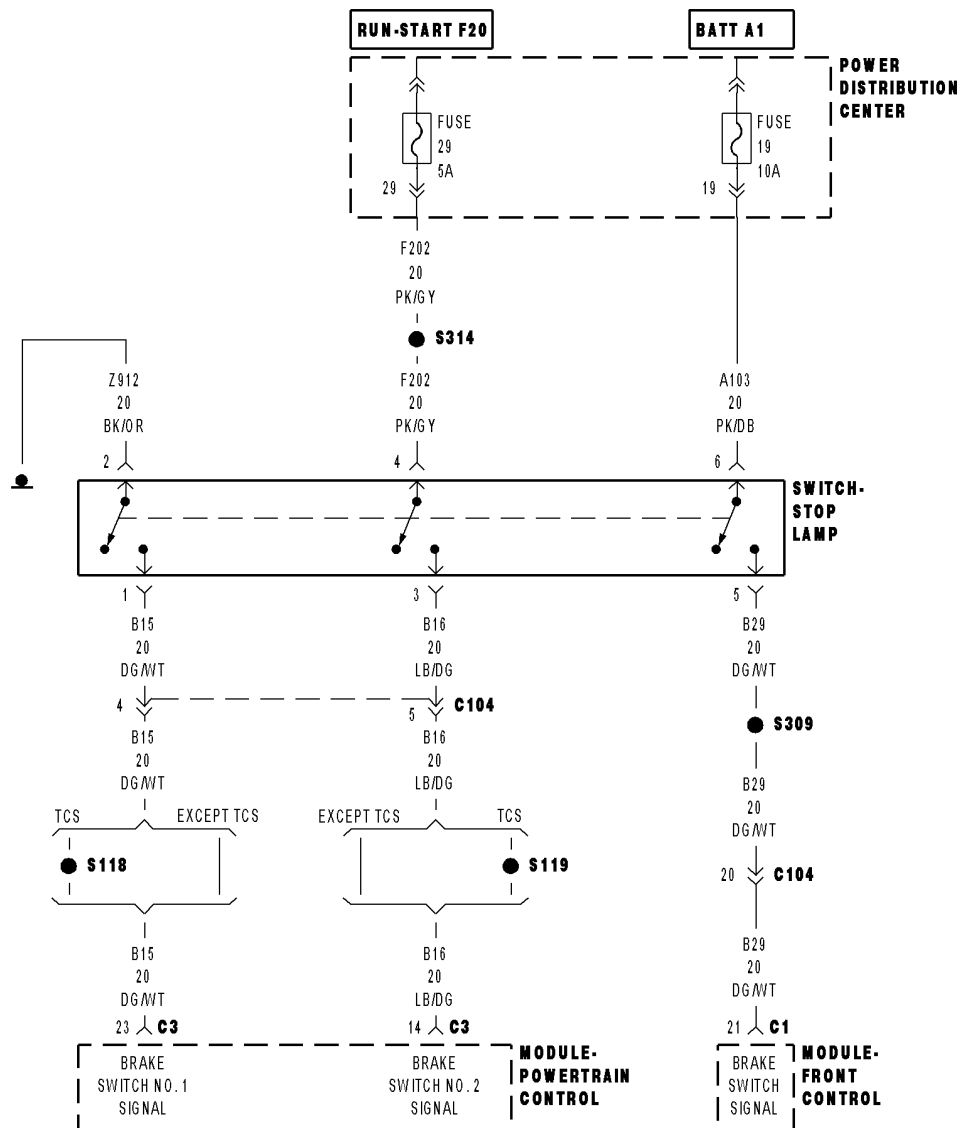
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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## P0571-BRAKE SWITCH 1 PERFORMANCE



P0571-BRAKE SWITCH 1 PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
If the output of Brake Switch No.1 to the PCM looks like it is not applied, while Brake Switch No.2 circuit is applied the fault will mature in 60ms. One Trip Fault.

Possible Causes
(B15) BRAKE SWITCH NO.1 SIGNAL SHORTED TO GROUND (B15) BRAKE SWITCH NO.1 SIGNAL OPEN (B16) BRAKE SWITCH NO.2 SIGNAL SHORTED TO GROUND (B16) BRAKE SWITCH NO.2 SIGNAL OPEN (Z912) GROUND CIRCUIT OPEN (F202) FUSED IGNITION SWITCH OUTPUT OPEN STOP LAMP SWITCH PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

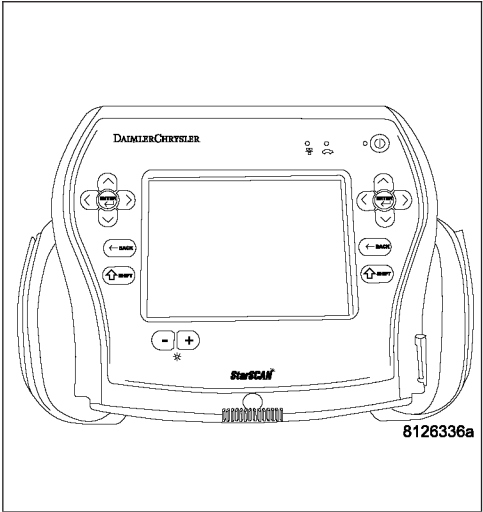
**Note:** Make sure the Stop Lamp Switch is properly adjusted before continuing.

**Note:** Make sure the Stop Lamp Switch is properly wired, such as (B15) Brake Switch No.1 and (B16) Brake Lamp Switch No.2 circuits are not switched at the harness connector.

Ignition on, engine not running.

With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes**    >> Go To 2
- No**      >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0571-BRAKE SWITCH 1 PERFORMANCE (CONTINUED)

### 2. (B15) BRAKE SWITCH NO.1 SIGNAL SHORTED TO GROUND

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Disconnect the PCM harness connectors.

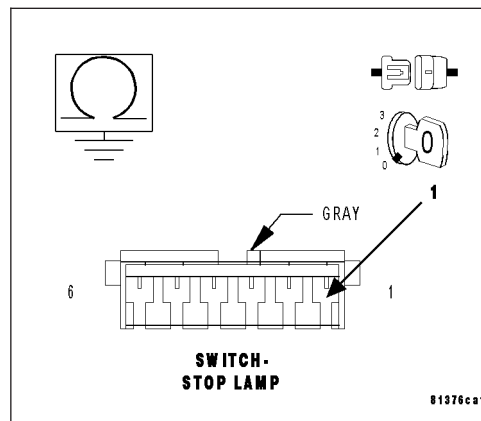
Measure the resistance between the (B15) Brake Switch No.1 Signal circuit in the Stop Lamp Switch harness connector and ground.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (B15) Brake Switch No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3



### 3. (B15) BRAKE SWITCH NO.1 SIGNAL OPEN

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

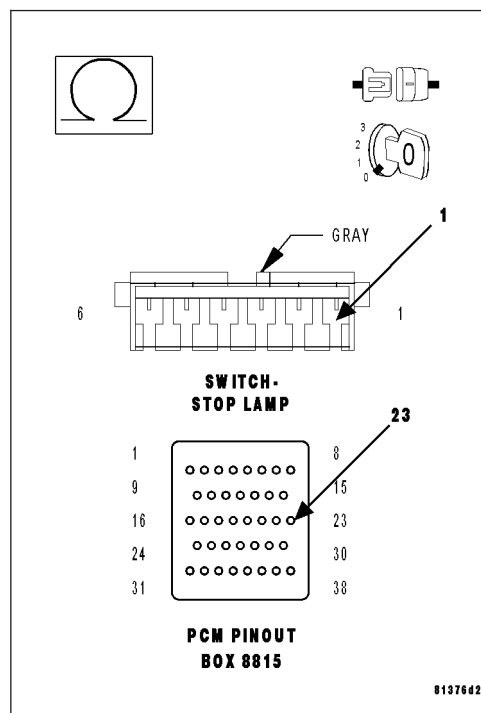
Measure the resistance of the (B15) Brake Switch No.1 Signal circuit between the Stop Lamp Switch harness connector and the appropriate terminal of the special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the open in the (B15) Brake Switch No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0571-BRAKE SWITCH 1 PERFORMANCE (CONTINUED)****4. (B16) BRAKE SWITCH NO.2 SIGNAL SHORTED TO GROUND**

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Disconnect the PCM harness connectors.

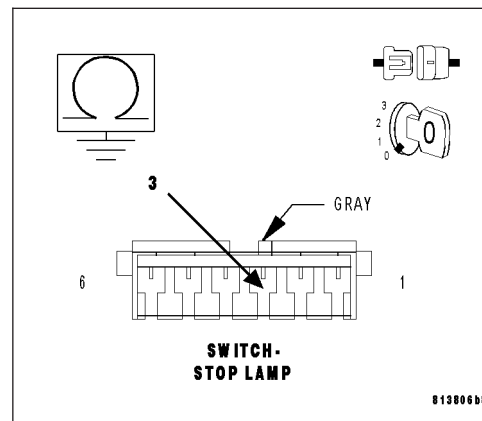
Measure the resistance between the (B16) Brake Switch No.2 Signal circuit in the Stop Lamp Switch harness connector and ground.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (B16) Brake Switch No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (B16) BRAKE SWITCH NO.2 SIGNAL OPEN**

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

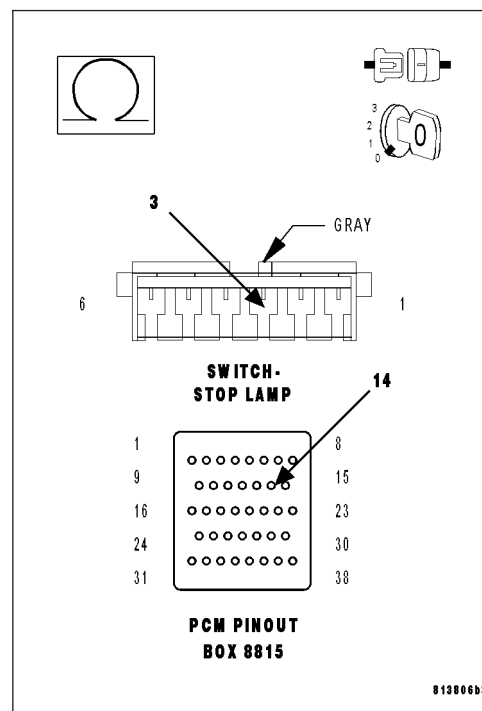
Measure the resistance of the (B16) Brake Switch No.2 Signal circuit between the Stop Lamp Switch harness connector and the appropriate terminal of the special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (B16) Brake Switch No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0571-BRAKE SWITCH 1 PERFORMANCE (CONTINUED)****6. (F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) OPEN**

Reconnect the PCM harness connector.

Turn the ignition on.

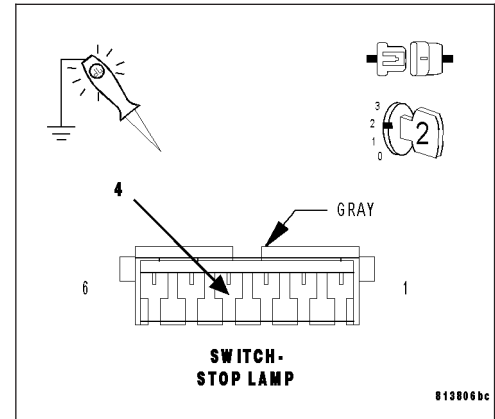
Using a 12-volt test light connected to ground, probe the (F202) Fused Ignition Switch Output circuit in the Stop Lamp Switch harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 7

**No** >> Repair the open in the (F202) Fused Ignition Switch Output circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**7. (Z912) GROUND CIRCUIT OPEN**

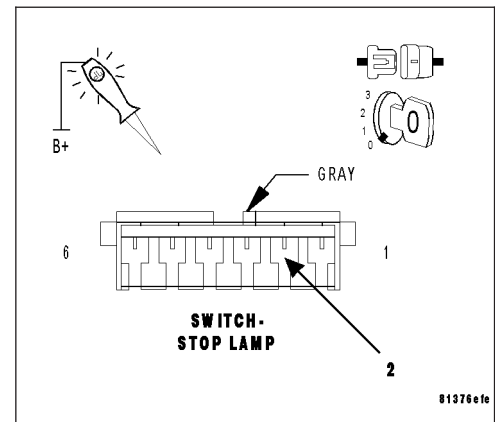
Using the 12-Volt test light connected to battery voltage, probe the (Z912) Ground circuit in the Stop Lamp Switch harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 8

**No** >> Repair the open in the (Z912) Ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**8. STOP LAMP SWITCH**

Remove the Stop Lamp Switch.

Measure the resistance between terminals 1 and 2 of the Stop Lamp Switch.

Next, measure the resistance between terminals 3 and 4 of the Stop Lamp Switch.

Press and release the Stop Lamp Switch while monitoring the ohmmeter during both of the above steps.

**Does the resistance change from below 5.0 ohms to an open circuit for one or both of the measurements taken?**

**Yes** >> Go To 9

**No** >> Replace the Stop Lamp Switch.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0571-BRAKE SWITCH 1 PERFORMANCE (CONTINUED)****9. PCM**

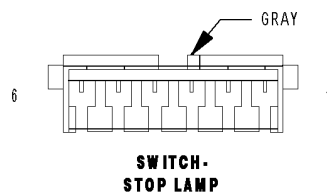
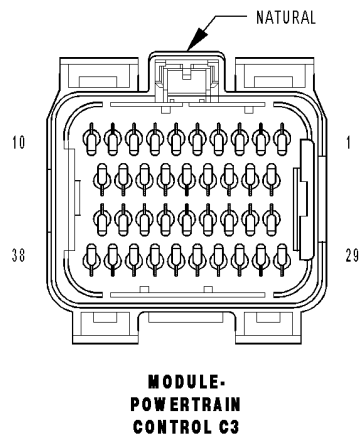
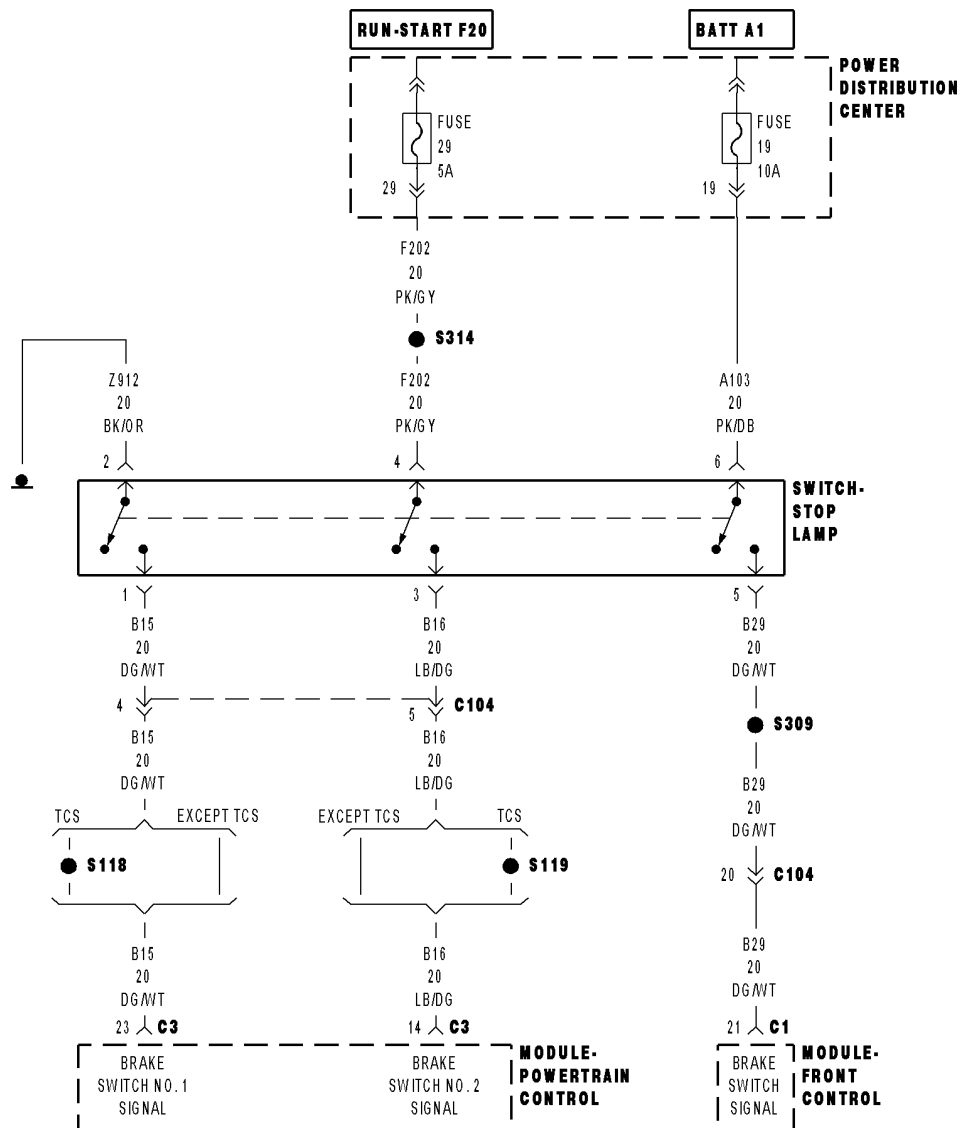
**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No**      >> Replace and program the Powertrain Control Module per Service Information.  
          Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
-

# P0572-BRAKE SWITCH 1 STUCK ON



**P0572-BRAKE SWITCH 1 STUCK ON (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
The PCM recognizes the Brake Switch #1 is mechanically stuck in the low/on position. One Trip Fault.

Possible Causes
(B15) BRAKE SWITCH NO.1 SIGNAL SHORTED TO GROUND (B16) BRAKE SWITCH NO.2 SIGNAL OPEN (F202) FUSED IGNITION SWITCH OUTPUT OPEN STOP LAMP SWITCH PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test**

**1. ACTIVE DTC**

**Note:** Make sure the Stop Lamp Switch is properly adjusted before continuing.

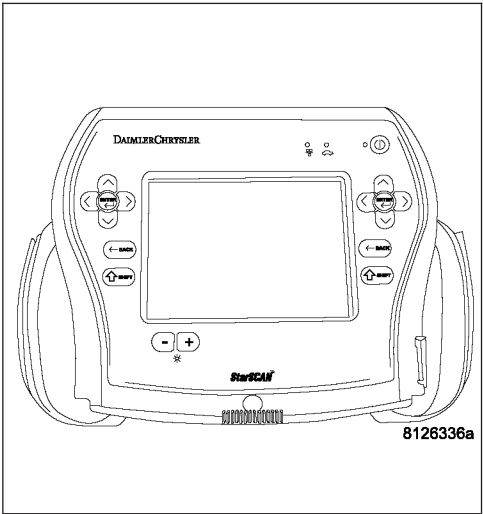
**Note:** Make sure the Stop Lamp Switch is properly wired, such as (B15) Brake Switch No.1 and (B16) Brake Lamp Switch No.2 circuit are not switched at the harness connector.

Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## P0572-BRAKE SWITCH 1 STUCK ON (CONTINUED)

### 2. (B15) BRAKE SWITCH NO.1 SIGNAL SHORTED TO GROUND

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Disconnect the PCM harness connectors.

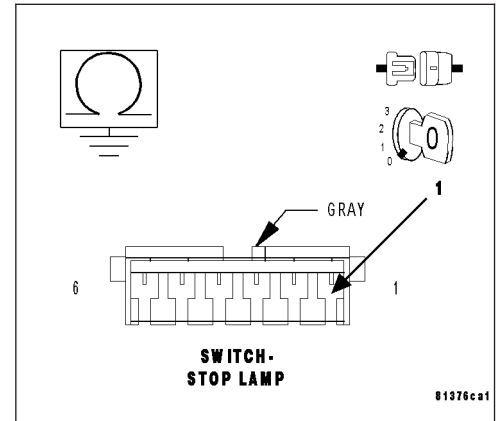
Measure the resistance between ground and the (B15) Brake Switch No.1 Signal circuit in the Stop Lamp Switch harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (B15) Brake Switch No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3



### 3. (B16) BRAKE SWITCH NO.2 SIGNAL OPEN

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

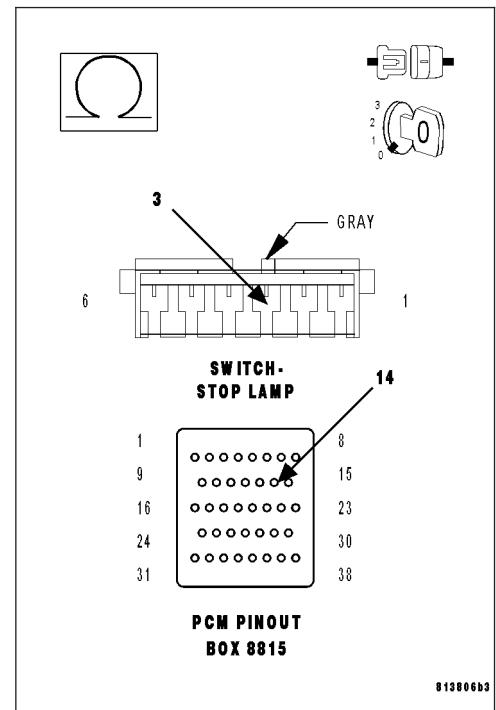
Measure the resistance of the (B16) Brake Switch No.2 Signal circuit from the Stop Lamp Switch harness connector and the appropriate terminal of the special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the open in the (B16) Brake Switch No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**P0572-BRAKE SWITCH 1 STUCK ON (CONTINUED)****4. (B16) BRAKE SWITCH NO.2 SIGNAL SHORT TO VOLTAGE**

Turn the ignition on.

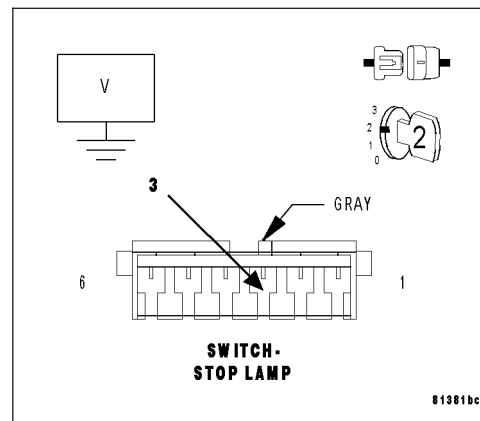
Measure the voltage of the Brake Switch No.2 Signal circuit in the Stop Lamp Switch harness connector.

**Does the voltmeter indicate voltage present?**

**Yes** >> Repair the short to voltage in the (B16) Brake Switch No.2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. STOP LAMP SWITCH**

Remove the Stop Lamp Switch.

Measure the resistance between terminals 1 and 2 of the Stop Lamp Switch.

Next, measure the resistance between terminals 3 and 4 of the Stop Lamp Switch.

Apply and release the brake pedal switch while monitoring the ohmmeter during both of the above steps.

**Does the resistance change from below 5.0 ohms to an open circuit for one or both of the measurements taken?**

**Yes** >> Go To 6

**No** >> Replace the Stop Lamp Switch.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**6. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

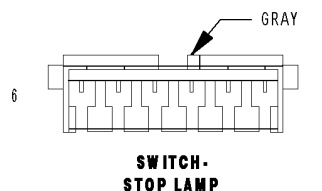
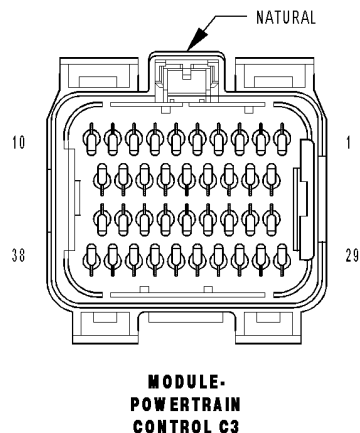
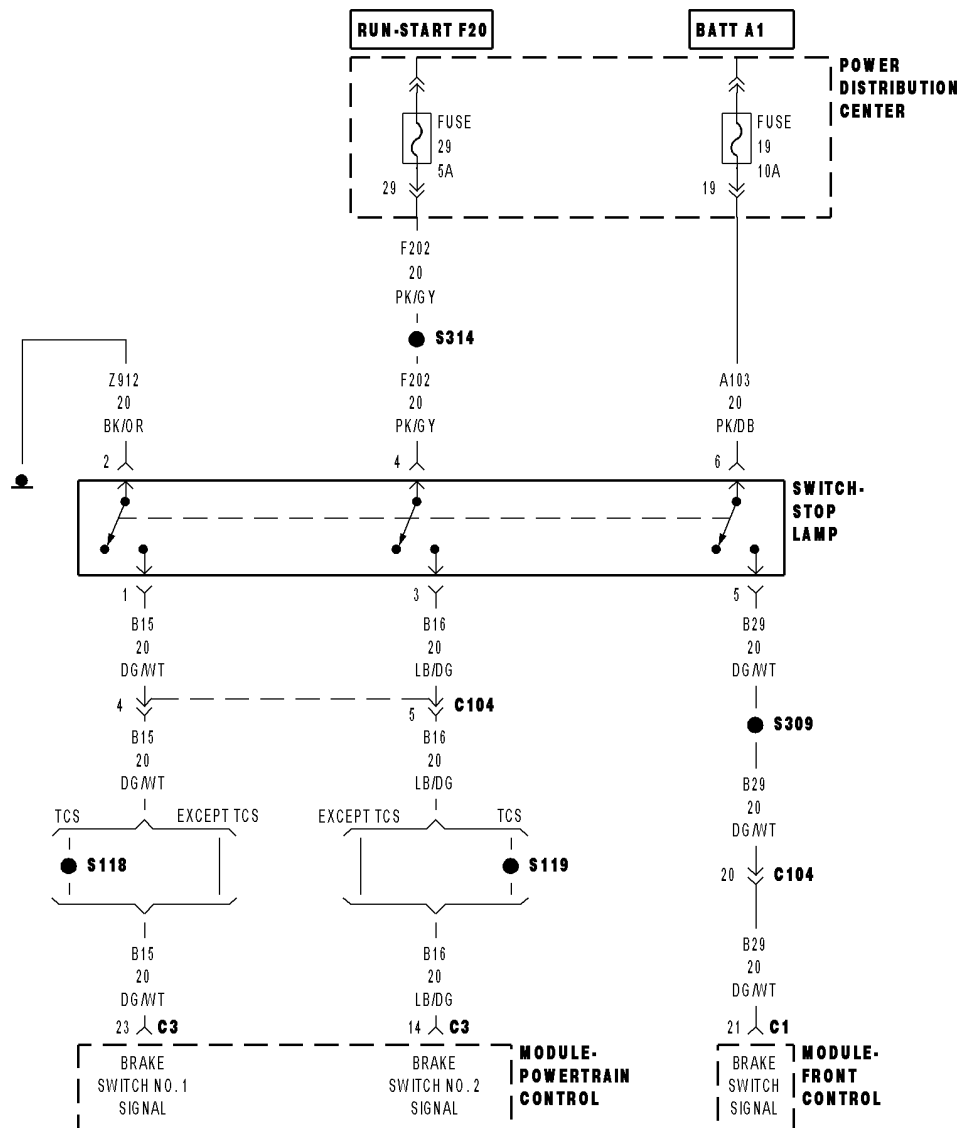
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

# P0573-BRAKE SWITCH 1 STUCK OFF



P0573-BRAKE SWITCH 1 STUCK OFF (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
The PCM recognizes Brake Switch No.1 is stuck in the Off/high position. One Trip Fault.

Possible Causes
(B15) BRAKE SWITCH NO.1 SIGNAL SHORTED TO GROUND (B15) BRAKE SWITCH NO.1 SIGNAL SHORT TO VOLTAGE (B16) BRAKE SWITCH NO.2 SIGNAL SHORTED TO GROUND (B16) BRAKE SWITCH NO.2 SIGNAL OPEN (Z912) GROUND CIRCUIT OPEN (F202) FUSED IGNITION SWITCH OUTPUT OPEN STOP LAMP SWITCH PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

**Note:** Make sure the Stop Lamp Switch is properly adjusted before continuing.

**Note:** Make sure the Stop Lamp Switch is properly wired, such as (B15) Brake Switch No.1 and (B16) Brake Lamp Switch No.2 circuits are not switched at the harness connector.

Ignition on, engine not running.

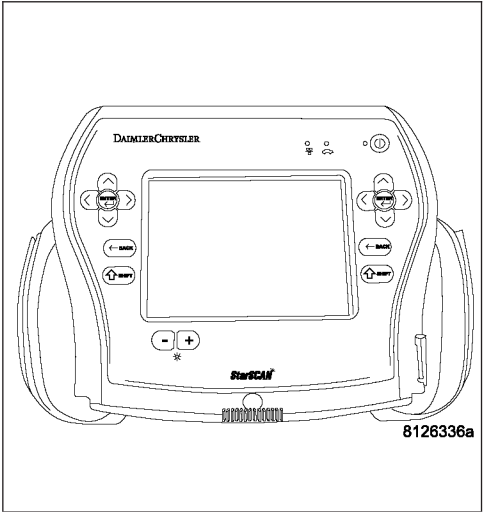
With a scan tool, read DTCs.

Is the DTC active at this time?

- Yes

>> Go To 2
- No

>> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0573-BRAKE SWITCH 1 STUCK OFF (CONTINUED)****2. (B15) BRAKE SWITCH NO.1 SIGNAL SHORTED TO GROUND**

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Disconnect the PCM harness connectors.

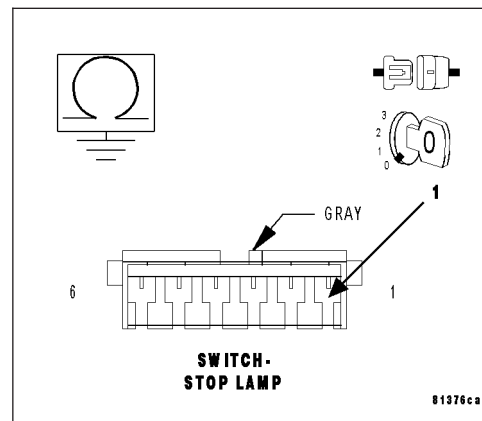
Measure the resistance between ground and the (B15) Brake Switch No.1 Signal circuit in the Stop Lamp Switch harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (B15) Brake Switch No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (B15) BRAKE SWITCH NO.1 SIGNAL SHORT TO VOLTAGE**

Turn the ignition on.

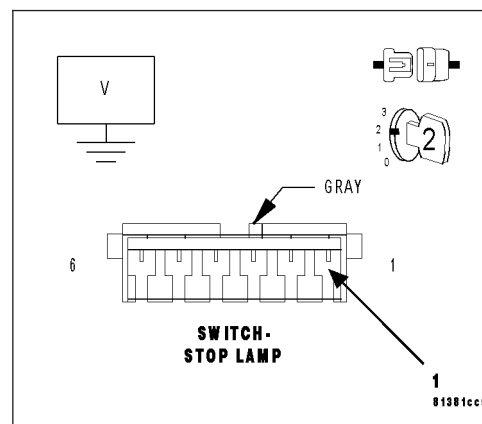
Measure the voltage of the (B15) Brake Switch No.1 Signal circuit in the Stop Lamp Switch harness connector.

**Does the voltmeter indicate voltage present?**

**Yes** >> Repair the short voltage in the (B15) Brake Switch No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (B16) BRAKE SWITCH NO.2 SIGNAL SHORTED TO GROUND**

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Disconnect the PCM harness connectors.

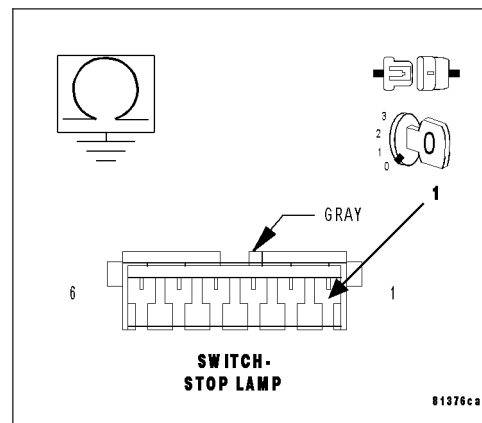
Measure the resistance between ground and the (B16) Brake Switch No.2 Signal circuit in the Stop Lamp Switch harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (B16) Brake Switch No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5





## P0573-BRAKE SWITCH 1 STUCK OFF (CONTINUED)

## 5. (B16) BRAKE SWITCH NO.2 SIGNAL OPEN

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

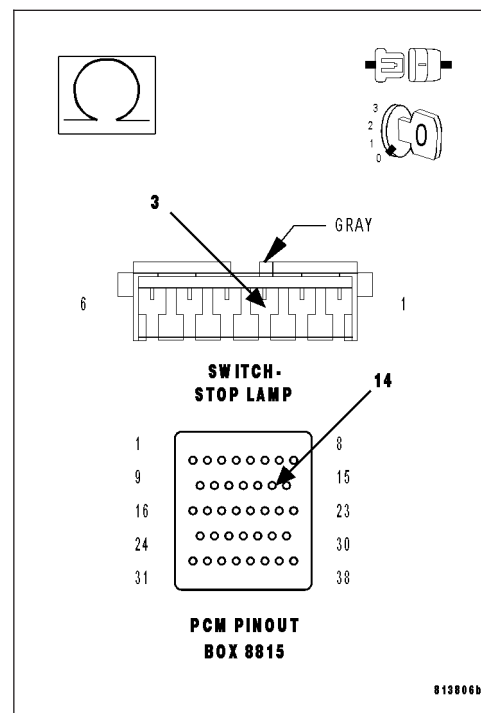
Measure the resistance of the (B16) Brake Switch No.2 Signal circuit from the Stop Lamp Switch harness connector and the appropriate terminal of the special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (B16) Brake Switch No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



## 6. (F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) OPEN

Re connect the PCM harness connector.

Turn the ignition on.

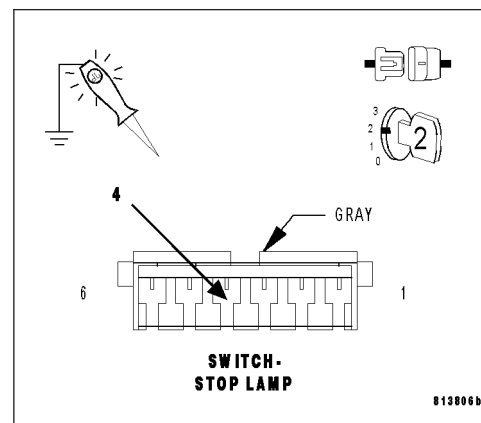
Using a 12-volt test light connected to ground, probe the (F202) Fused Ignition Switch Output circuit in the Stop Lamp Switch harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 7

**No** >> Repair the open in the (F202) Fused Ignition Switch Output circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



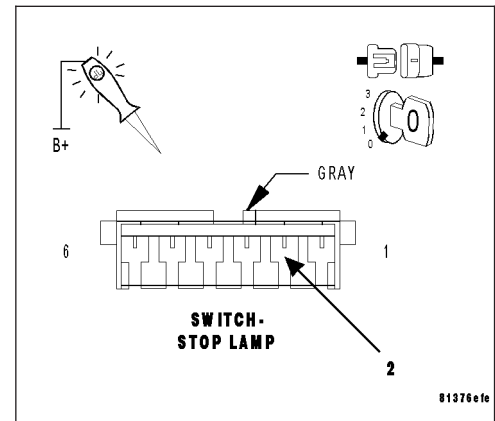
**P0573-BRAKE SWITCH 1 STUCK OFF (CONTINUED)****7. (Z912) GROUND CIRCUIT OPEN**

Using the 12-Volt test light connect to battery voltage, probe the (Z912) Ground circuit in the Stop Lamp Switch harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 8

**No** >> Repair the open in the (Z912) Ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**8. STOP LAMP SWITCH**

Remove the Stop Lamp Switch.

Measure the resistance between terminals 1 and 2 of the Stop Lamp Switch.

Next, measure the resistance between terminals 3 and 4 of the Stop Lamp Switch.

Apply and release the brake pedal switch while monitoring the ohmmeter during both of the above steps.

**Does the resistance change from below 5.0 ohms to an open circuit for one or both of the measurements taken?**

**Yes** >> Go To 9

**No** >> Replace the Stop Lamp Switch.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**9. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

P0600-SERIAL COMMUNICATION LINK

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
Internal Bus communication failure between processors. One Trip Fault. Three Global Good Trips to Clear.

Possible Causes
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PCM

**Note:** Diagnose any CMP or CKP Sensor faults before continuing. Check for intermittent loose CMP or CKP connections.

The Powertrain Control Module is reporting internal errors, view repair to continue.

Repair

- Replace and program the Powertrain Control Module per Service Information.
- Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0601-INTERNAL MEMORY CHECKSUM INVALID**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
Internal checksum for software failed, does not match calculated value. One Trip Fault, Three Good Trips to clear.

Possible Causes
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. PCM**

**Note:** Diagnose any CMP or CKP Sensor faults before continuing. Check for intermittent loose CMP or CKP connections.

**The Powertrain Control Module is reporting internal errors, view repair to continue.**

**Repair**

Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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P0606-INTERNAL ECM PROCESSOR

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Engine running.
- **Set Condition:**  
When the PCM recognizes an internal failure to communicate with the ECM or the CMP and CKP Sensor count periods are too short. One trip fault. ETC light is flashing.

Possible Causes
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PCM

**Note:** Diagnose any CMP or CKP Sensor faults before continuing. Check for intermittent loose CMP or CKP connections.

The Powertrain Control Module is reporting internal errors, view repair to continue.

Repair

- Replace and program the Powertrain Control Module per Service Information.
  - Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
-

## P060B-ETC A/D GROUND PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When the Throttle Motor is powered.
- **Set Condition:**  
When A to D reading does not return to ground within a set period of time of test activation, this fault sets. The test typically runs a couple of times per second, and is the reason why APP2 signal spikes to ground a couple of times per second in normal running. Reprogramming the module may not always fix this fault. ETC lamp will flash.

Possible Causes
PCM NEEDS TO BE PROGRAMMED
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

### Diagnostic Test

#### 1. PROGRAM THE POWERTRAIN CONTROL MODULE

Verify the PCM is at the latest calibration (flash level).

**Note:** An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

**Note:** Diagnose any other DTCs that may have set with the P060B.

Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

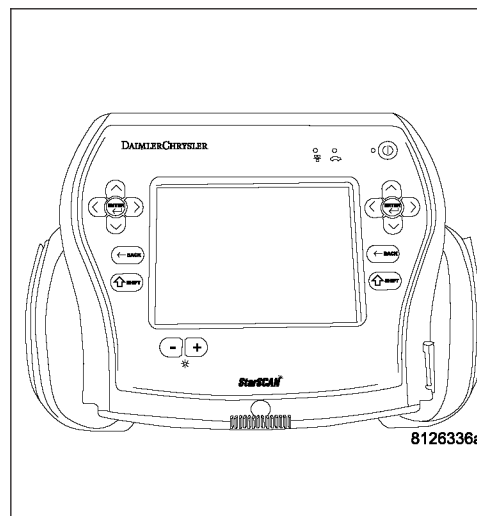
Allow the engine to reach normal operating temperature.

Operate the accelerator pedal. (do not exceed 3500 rpm)

With a scan tool, read DTCs.

#### Does this DTC reset by itself?

- Yes** >> Replace and reprogram the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Test Complete.



P060D-ETC LEVEL 2 APP PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Throttle motor is powered and no matured faults related to APP Sensors.
- **Set Condition:**  
When secondary software determines that APPS 1 and APPS 2 signals do not match for a period of time. ETC lamp will flash

Possible Causes
PCM NEEDS TO BE PROGRAMMED
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PROGRAM THE POWERTRAIN CONTROL MODULE

Verify the PCM is at the latest calibration (flash level).

**Note:** An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

Allow the engine to reach normal operating temperature.

Operate the accelerator pedal. (do not exceed 3500 rpm)

With a scan tool, read DTCs.

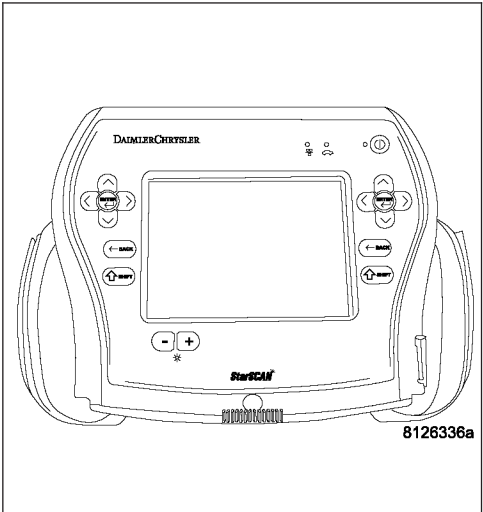
**Note:** Diagnose any other DTCs that may have set with the P060D.

Does this DTC reset by itself?

- Yes

>> Replace and reprogram the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No

>> Test Complete.



## P060E-ETC LEVEL 2 TPS PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Throttle motor is powered and no matured faults related to TP Sensors.
- **Set Condition:**  
When secondary software determines that TPS 1 and TPS 2 signals do not match for a period of time. ETC lamp will flash.

Possible Causes
PCM NEEDS TO BE PROGRAMMED
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

### Diagnostic Test

#### 1. PROGRAM THE POWERTRAIN CONTROL MODULE

Verify the PCM is at the latest calibration (flash level).

**Note: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.**

Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

Allow the engine to reach normal operating temperature.

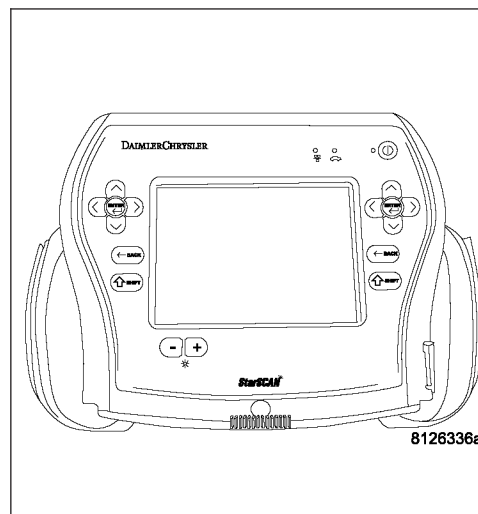
Operate the accelerator pedal. (do not exceed 3500 rpm)

With a scan tool, read DTCs.

**Note: Diagnose any other DTCs that may have set with the P060E.**

**Does this DTC reset by itself?**

- Yes** >> Replace and reprogram the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Test Complete.





P060F-ETC LEVEL 2 ECT PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Throttle motor is powered and no matured faults related to the Engine Coolant Temp Sensor.
- **Set Condition:**  
When secondary software determines that the Coolant Temperature is implausible for a period of time. ETC lamp will flash.

Possible Causes
PCM NEEDS TO BE PROGRAMMED
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. PROGRAM THE POWERTRAIN CONTROL MODULE

**Note:** Diagnose any Engine Coolant Temperature Sensor DTCs before continuing.

Verify the PCM is at the latest calibration (flash level).

**Note:** An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

Allow the engine to reach normal operating temperature.

Operate the accelerator pedal. (do not exceed 3500 rpm)

With a scan tool, read DTCs.

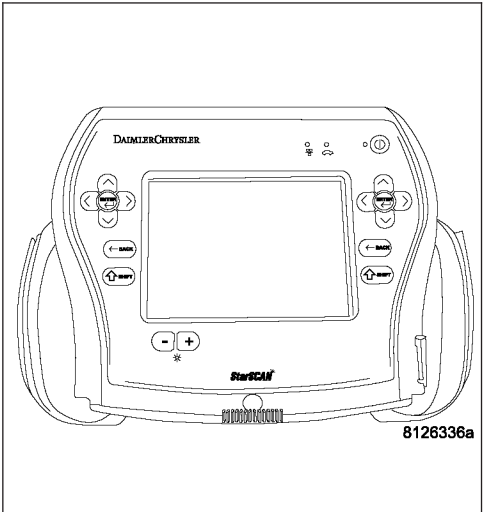
**Note:** Diagnose any other DTCs that may have set with the P060F.

Does this DTC reset by itself?

- Yes

>> Replace and reprogram the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No

>> Test Complete.



## P061A-ETC LEVEL 2 TORQUE PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Throttle motor is powered.
- **Set Condition:**  
When secondary software determines that the customer requested output is not being achieved by the engine for a period of time. ETC lamp will flash

Possible Causes
PCM NEEDS TO BE PROGRAMMED
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

### Diagnostic Test

#### 1. PROGRAM THE POWERTRAIN CONTROL MODULE

**Note:** Check the engine for air/vacuum leaks and diagnose any Fuel System Lean/Rich as well as MAP Sensor DTCs before continuing.

Verify the PCM is at the latest calibration (flash level).

**Note:** An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

Allow the engine to reach normal operating temperature.

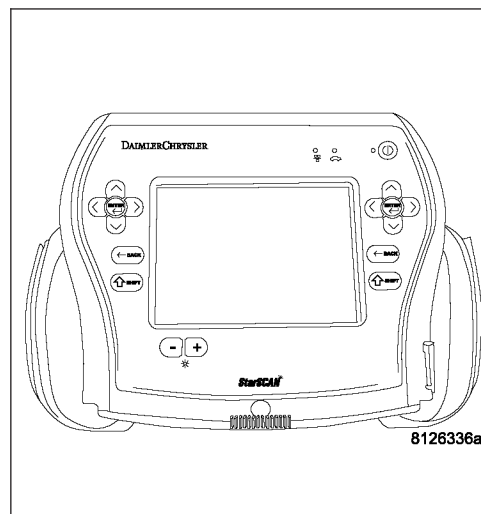
Operate the accelerator pedal. (do not exceed 3500 rpm)

With a scan tool, read DTCs.

**Note:** Diagnose any other DTCs that may have set with the P061A.

**Does this DTC reset by itself?**

- Yes** >> Replace and reprogram the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Test Complete.



## P061C-ETC LEVEL 2 RPM PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Throttle motor is powered and no camshaft or crankshaft electrical signal related DTCs are set.

- **Set Condition:**

When secondary software determines that the engine speed is implausible for a period of time. ETC lamp will flash.

Possible Causes
PCM NEEDS TO BE PROGRAMMED
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. PROGRAM THE POWERTRAIN CONTROL MODULE

**Note:** Diagnose any Camshaft Position and Crankshaft Position Sensor DTCs before continuing.

Verify the PCM is at the latest calibration (flash level).

**Note:** An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.

Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

Allow the engine to reach normal operating temperature.

Operate the accelerator pedal. (do not exceed 3500 rpm)

With a scan tool, read DTCs.

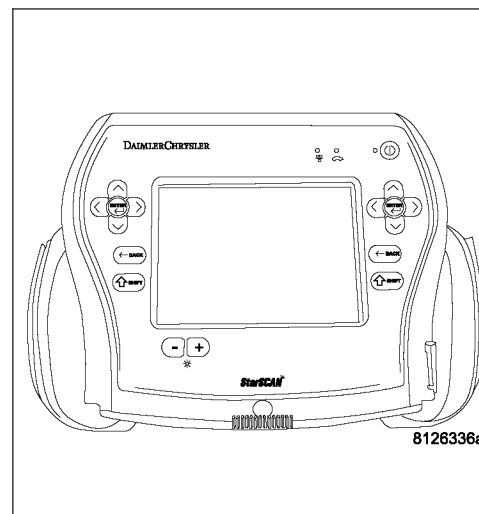
**Note:** Diagnose any other DTCs that may have set with the P061C.

**Does this DTC reset by itself?**

**Yes** >> Replace and reprogram the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Test Complete.





**P0622-GENERATOR FIELD CONTROL CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Engine running.
- **Set Condition:**  
When the PCM tries to regulate the generator field with no result during monitoring. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K20) GEN FIELD CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K20) GEN FIELD CONTROL CIRCUIT OPEN
(K20) GEN FIELD CONTROL CIRCUIT SHORTED TO GROUND
(Z20) GROUND CIRCUIT OPEN
GENERATOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

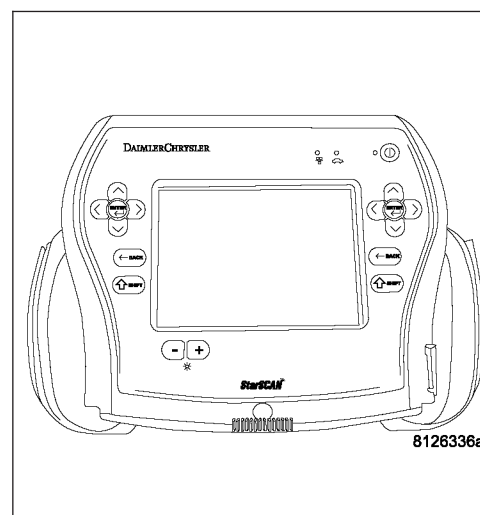
**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0622-GENERATOR FIELD CONTROL CIRCUIT (CONTINUED)****2. GENERATOR OPERATION**

Turn the ignition off.

Disconnect the Generator Field harness connector.

Using a 12-volt test light, jump it across the Generator Field harness connector.

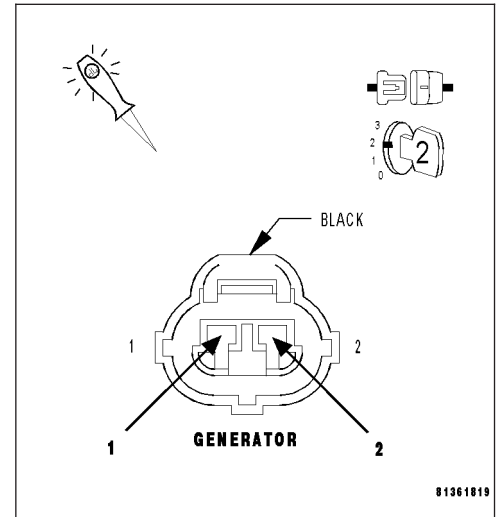
Ignition on, engine not running.

With the scan tool, actuate the Generator Field Control circuit.

**Does the test light illuminate brightly and flash on and off?**

**Yes** >> Replace the Generator.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K20) GEN FIELD CIRCUIT SHORTED BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

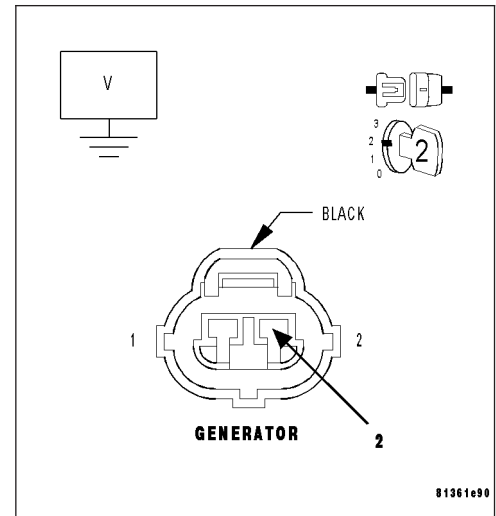
Ignition on, engine not running.

Measure the voltage on the (K20) Gen Field Control circuit in the Generator Field harness connector.

**Is the voltage above 1.0 volt?**

**Yes** >> Repair the short to battery voltage in the (K20) Gen Field Control circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P0622-GENERATOR FIELD CONTROL CIRCUIT (CONTINUED)****4. (K20) GEN FIELD CIRCUIT OPEN**

Turn the ignition off.

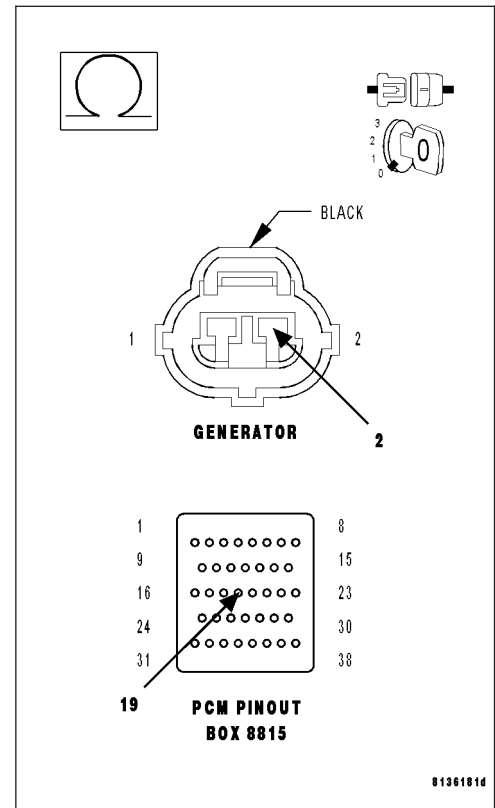
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K20) Gen Field Control circuit from the Generator Field harness connector to appropriate terminal of the special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K20) Gen Field Control circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. (K20) GEN FIELD CIRCUIT SHORTED TO GROUND**

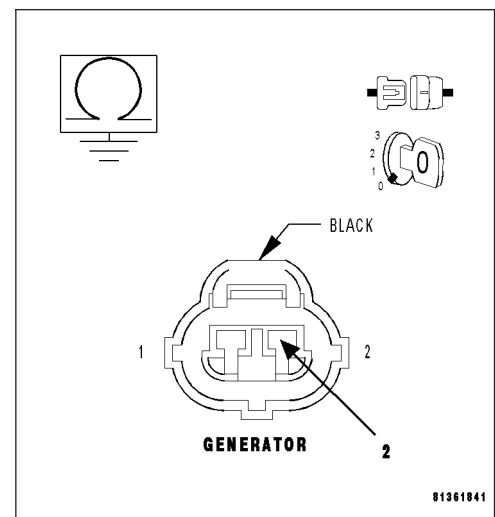
Measure the resistance between ground and the (K20) Gen Field Control circuit in the Generator Field harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K20) Gen Field Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



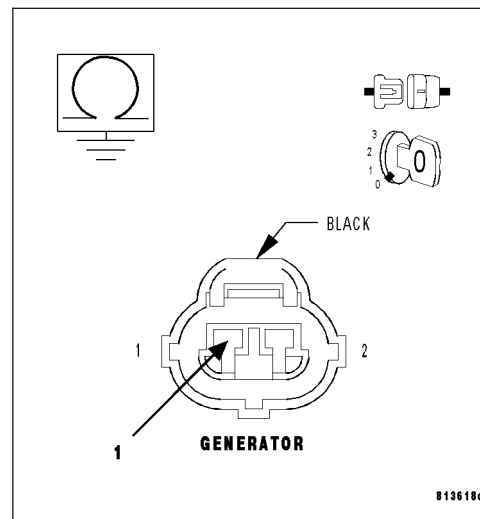
**P0622-GENERATOR FIELD CONTROL CIRCUIT (CONTINUED)****6. (Z20) GROUND CIRCUIT OPEN**

Measure the resistance between the (Z20) Ground circuit in the Gen Field harness connector and ground.

**Does the test light illuminate brightly?**

**Yes** >> Go To 7

**No** >> Repair the open in the (Z20) Ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**Wiring Diagram:**

- POWER DISTRIBUTION CENTER:**
  - FUSE:** 6 20A
  - RELAY-FUEL PUMP:**
    - Terminal 85: RUN-START F20
    - Terminal 30: BATT A1
    - Terminal 86: K31 20 BR → C105
    - Terminal 87A: K31 20 BR → C3
    - Terminal 87: N1 16 DB/OR → FUEL PUMP RELAY OUTPUT
- MODULE-POWERTRAIN CONTROL:**
  - Terminal 37: C3
  - Terminal 38: FUEL PUMP RELAY CONTROL
- MODULE-FUEL PUMP:**
  - Terminal 5: FUEL PUMP RELAY OUTPUT
  - Terminal 4: GROUND
  - Terminal 3: Z912 16 BK/OR → G300

**Physical Layout:**

- MODULE-POWERTRAIN CONTROL:**
  - Terminal 1: BLACK
  - Terminal 5: (Left side)
- MODULE-FUEL PUMP:**
  - Terminal 1: NATURAL
  - Terminal 10: (Top left)
  - Terminal 29: (Right side)
  - Terminal 38: (Bottom left)

## P0627-FUEL PUMP RELAY CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Battery voltage greater than 10.4 volts.
- **Set Condition:**  
An open or shorted condition is detected in the fuel pump relay control circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(F20) FUSED IGNITION SWITCH OUTPUT CIRCUIT (A109) FUSED B+ CIRCUIT (K31) FUEL PUMP RELAY CONTROL CIRCUIT (K31) FUEL PUMP RELAY CONTROL CIRCUIT SHORTED TO GROUND FUEL PUMP RELAY PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

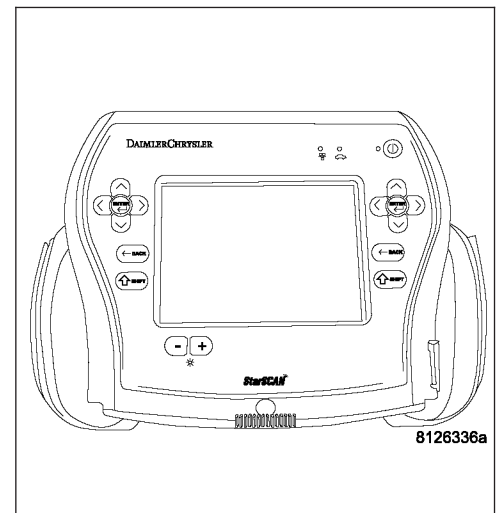
### 1. FUEL PUMP RELAY OPERATION

Ignition on, engine not running.

With a scan tool, actuate the Fuel Pump Relay.

**Is the Fuel Pump Relay operating?**

- Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Go To 2



**P0627-FUEL PUMP RELAY CIRCUIT (CONTINUED)****2. FUEL PUMP RELAY**

Turn the ignition off.

Remove the Fuel Pump Relay from the IPM.

Measure the resistance of the Fuel Pump Relay Coil.

**Is the resistance between 70 to 90 ohms?**

**Yes** >> Go To 3

**No** >> Replace the Fuel Pump Relay.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**3. (F20) FUSED IGNITION SWITCH OUTPUT CIRCUIT**

Ignition on, engine not running.

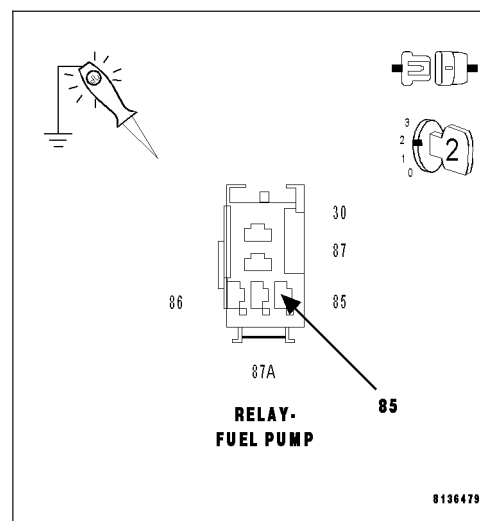
Using a 12-volt test light connected to ground, probe the (F20) Fused Ignition Switch Output circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 5

**No** >> Repair the open or short to ground in the (F20) Fused Ignition Switch Output circuit. Inspect the related fuse and repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**4. (A109) FUSED B+ CIRCUIT**

Ignition on, engine not running.

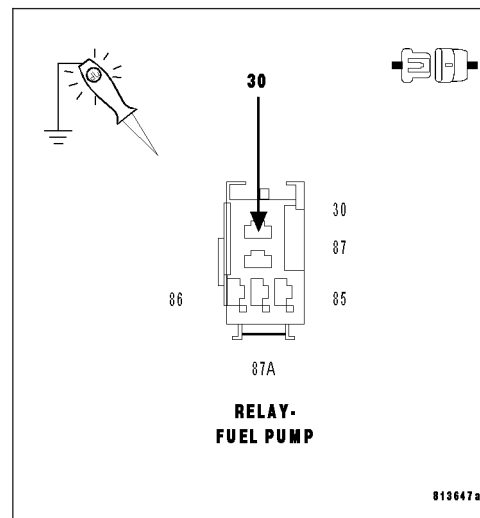
Using a 12-volt test light connected to ground, probe the (A109) Fused B+ circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 5

**No** >> Repair the open or short to ground in the (A109) Fused B+ circuit. Inspect the related fuse and repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0627-FUEL PUMP RELAY CIRCUIT (CONTINUED)****5. (K31) CONTROL CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

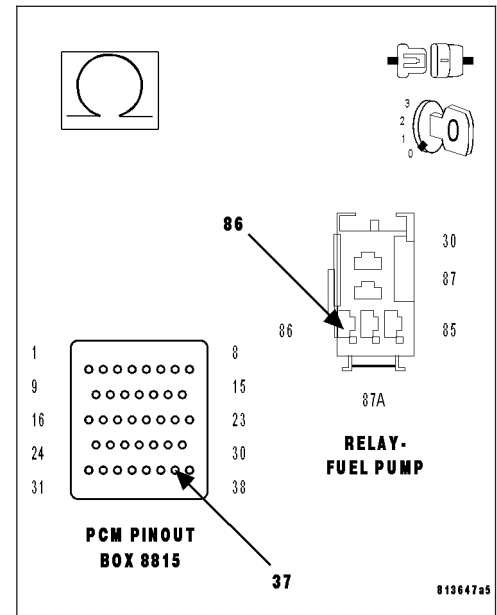
Measure the resistance of the (K31) Fuel Pump Relay Control circuit from the IPM to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K31) Fuel Pump Relay Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**6. (K31) CONTROL CIRCUIT SHORTED TO GROUND**

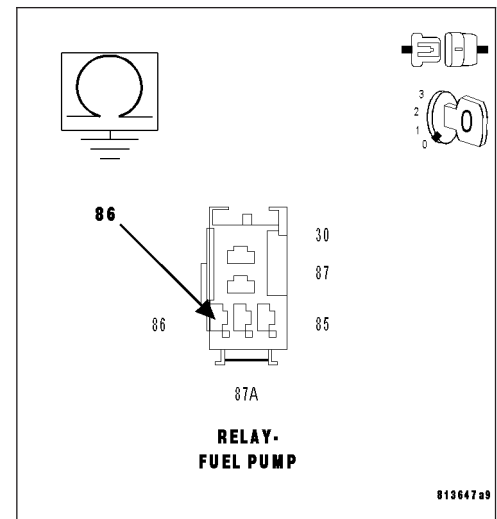
Measure the resistance between ground and the (K31) Fuel Pump Relay Control circuit in the IPM.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K31) Fuel Pump Relay Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 7



**P0627-FUEL PUMP RELAY CIRCUIT (CONTINUED)****7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No**      >> Replace and program the Powertrain Control Module per Service Information.  
          Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
-

## P062C-ETC LEVEL 2 MPH PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Throttle motor is powered and no vehicle speed related DTCs have matured.

- **Set Condition:**

When secondary software determines that the vehicle speed is implausible for a period of time. ETC lamp will flash

Possible Causes
PCM NEEDS TO BE PROGRAMMED
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

### Diagnostic Test

#### 1. PROGRAM THE POWERTRAIN CONTROL MODULE

Verify the PCM is at the latest calibration (flash level).

**Note: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.**

Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

Allow the engine to reach normal operating temperature.

Operate the accelerator pedal. (do not exceed 3500 rpm)

With a scan tool, read DTCs.

**Note: Diagnose any other DTCs that may have set with the P062C.**

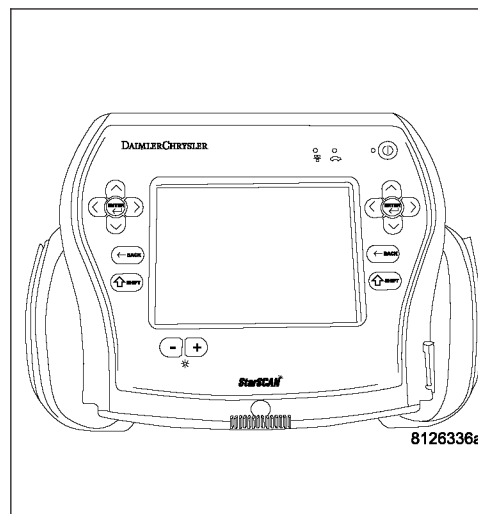
#### Does this DTC reset by itself?

**Yes** >> Replace and reprogram the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER

- 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Test Complete.



## P0630-VIN NOT PROGRAMMED IN PCM

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
The VIN has not been programmed into the PCM. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PROGRAMMING VIN INTO PCM PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. PROGRAMMING VIN INTO THE PCM

Ignition on, engine not running.

Using the scan tool, program VIN into the PCM.

Start the engine.

**Note: If the engine will not start, crank the engine over for 15 seconds. Crank at least 2 times with the ignition switch returning to the off position each time.**

Allow the engine to reach normal operating temperature.

With the scan tool, read DTCs.

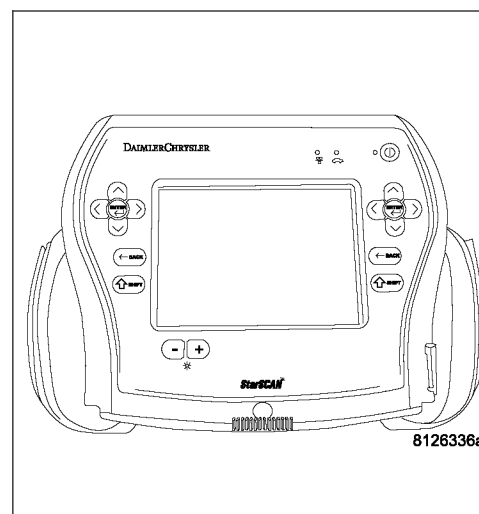
#### Does the DTC reset?

**Yes** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> The VIN has been successfully programmed into the PCM. Test is complete.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P0632-ODOMETER NOT PROGRAMMED IN PCM

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
Odometer is not programed into the PCM. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PROGRAMMING MILEAGE INTO THE PCM PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. PROGRAMMING MILEAGE INTO THE PCM

Ignition on, engine not running.

With the scan tool, erase DTCs.

Using a scan tool, program the mileage into the PCM.

Start the engine.

Allow the engine to reach normal operating temperature.

With a scan tool, read DTCs.

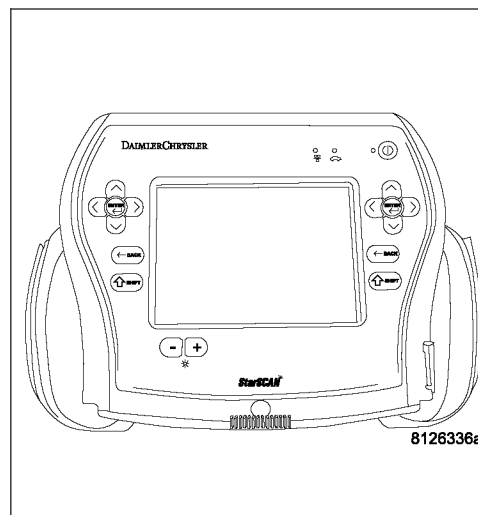
#### Does the DTC reset?

**Yes** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> The mileage has been successfully programmed into the PCM. Test is complete.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P0633-SKIM KEY NOT PROGRAMMED IN PCM**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
The SKIM Key information has not been programmed into the PCM. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PROGRAMMING SKIM KEY INTO THE PCM PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. PROGRAMMING SKIM KEY INTO THE PCM**

Ignition on, engine not running.

With a scan tool, erase DTCs.

Using the scan tool, program the SKIM Key information into the PCM.

Start the engine.

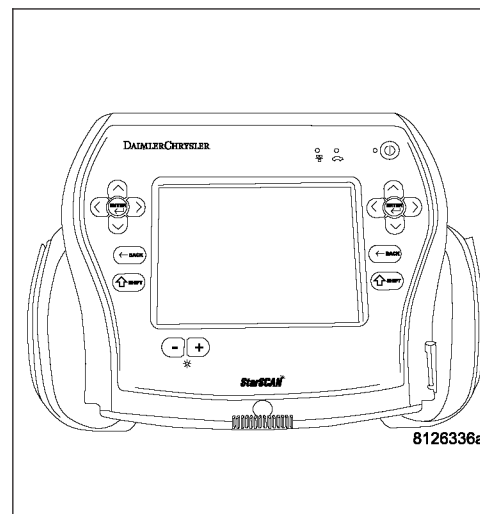
**Note: If the engine will not start, crank the engine over for 15 seconds. Crank at least 2 times with the ignition switch returning to the off position each time.**

Allow the engine to reach normal operating temperature.

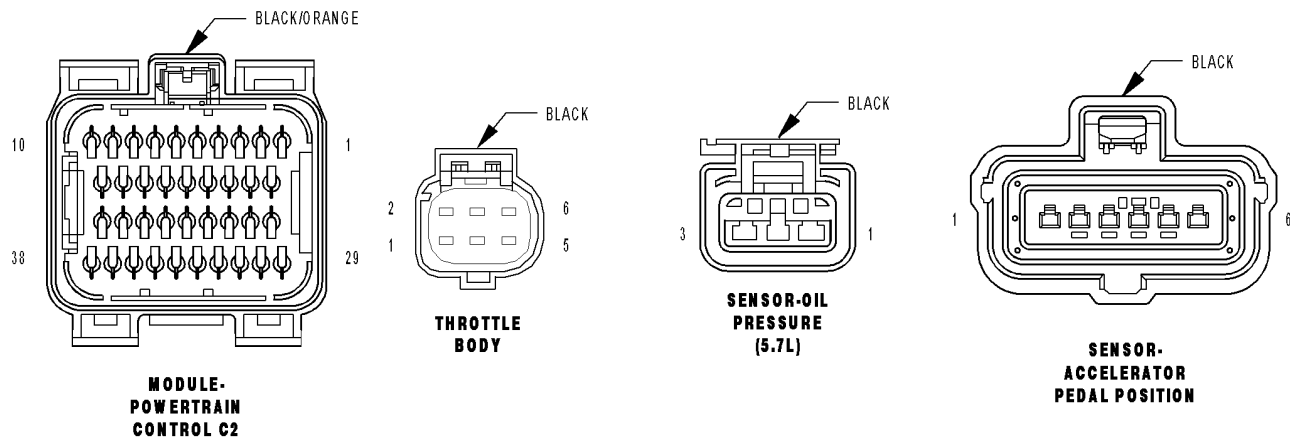
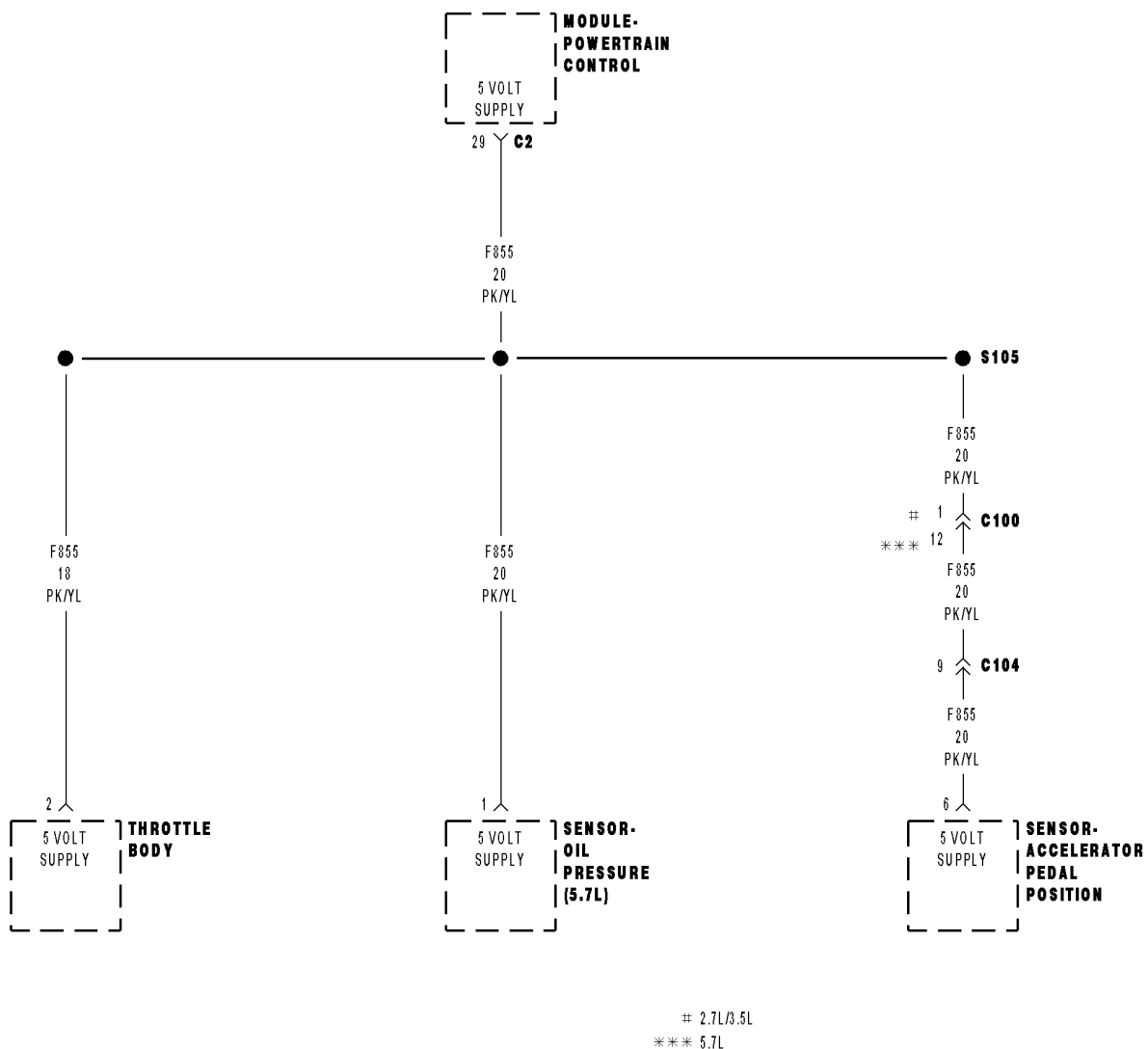
With the scan tool, read DTCs.

**Does the DTC reset?**

- Yes** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> The SKIM KEY information has been successfully programmed into the PCM. Test is complete.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



# P0642-SENSOR REFERENCE VOLTAGE 1 CIRCUIT LOW



P0642-SENSOR REFERENCE VOLTAGE 1 CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
When the PCM recognizes the Primary 5-volt Supply circuit voltage is too low. One Trip Fault. ETC light is flashing.

Possible Causes
(F855) PRIMARY 5-VOLT SUPPLY SHORTED TO GROUND SENSOR SHORTED TO GROUND 5-VOLT SENSOR PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

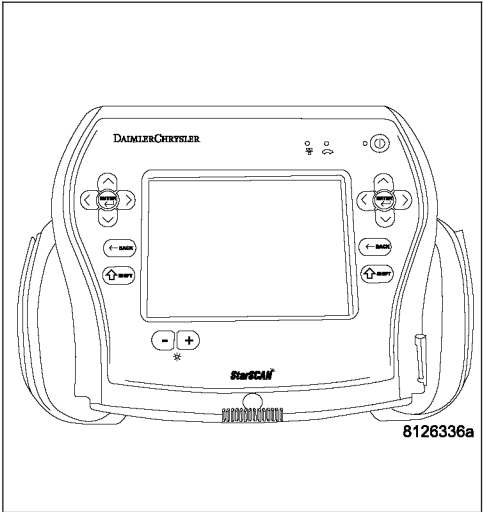
**Note:** Improperly installed aftermarket accessories can cause this DTC to set. Check for wiring added by customer.

Is the DTC active at this time?

- Yes

>> Go To 2
- No

>> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0642-SENSOR REFERENCE VOLTAGE 1 CIRCUIT LOW (CONTINUED)****2. (F855) PRIMARY 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect all the Sensors that share the (F855) Primary 5-volt Supply circuit.

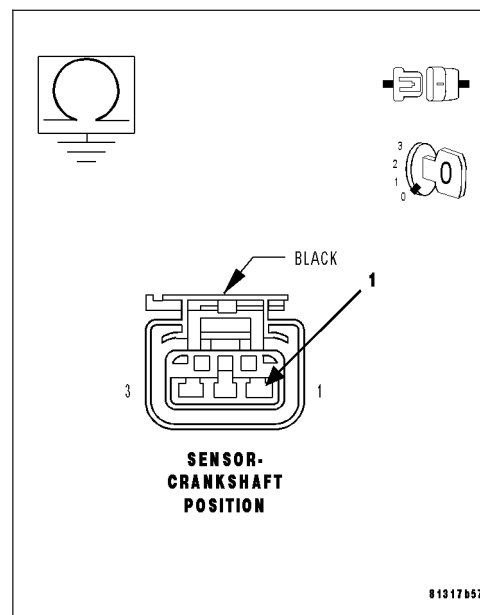
Measure the resistance between ground and the (F855) Primary 5-volt Supply circuit in the CKP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F855) Primary 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. 5-VOLT SENSOR**

Turn the ignition off.

Reconnect all the previously disconnected Sensors except for the CKP Sensor harness connector.

Ignition on, engine not running.

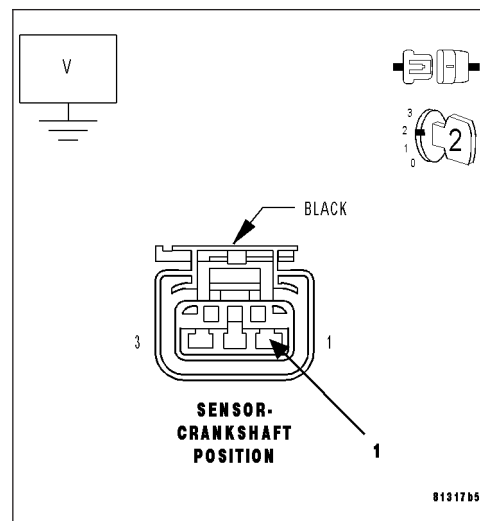
Measure the voltage on the (F855) Primary 5-volt Supply circuit in the CKP Sensor harness connector.

**Is the voltage below 4.5 volts?**

**Yes** >> Go To 4

**No** >> Replace the CKP Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0642-SENSOR REFERENCE VOLTAGE 1 CIRCUIT LOW (CONTINUED)****4. 5-VOLT SENSOR SHORTED TO GROUND**

Measure the voltage on the (F855) Primary 5-volt Supply circuit at the CKP Sensor harness connector.

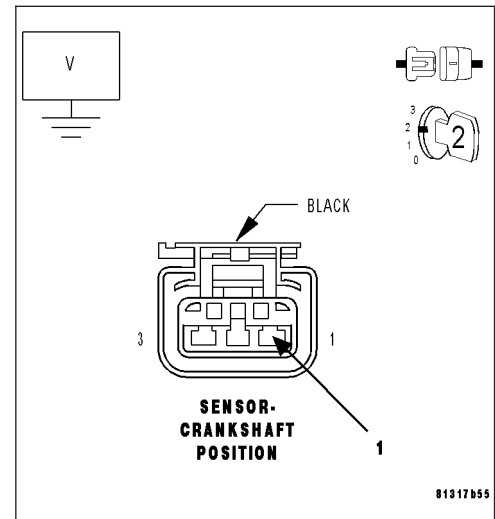
**CAUTION:** You must Turn the Ignition OFF when disconnecting any of the Sensor harness connectors and Turn the Ignition On to check the voltage readings.

While monitoring the voltage, disconnect each Sensor harness connector that shares the (F855) Primary 5-volt Supply circuit, one at a time.

**Note:** Reconnect all the Sensors and clear all trouble codes before continuing.

**Does the voltage increase above 4.5 volts when disconnecting any of the remaining Sensors?**

- Yes** >> Replace the Sensor that causes the (F855) Primary 5-volt Supply circuit voltage to increase when disconnected.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Go To 5

**5. PCM**

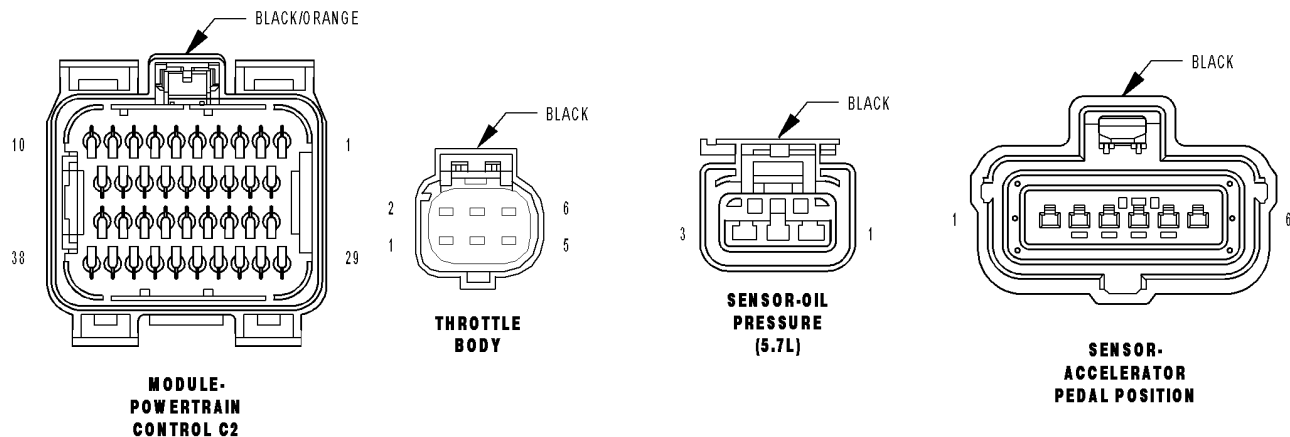
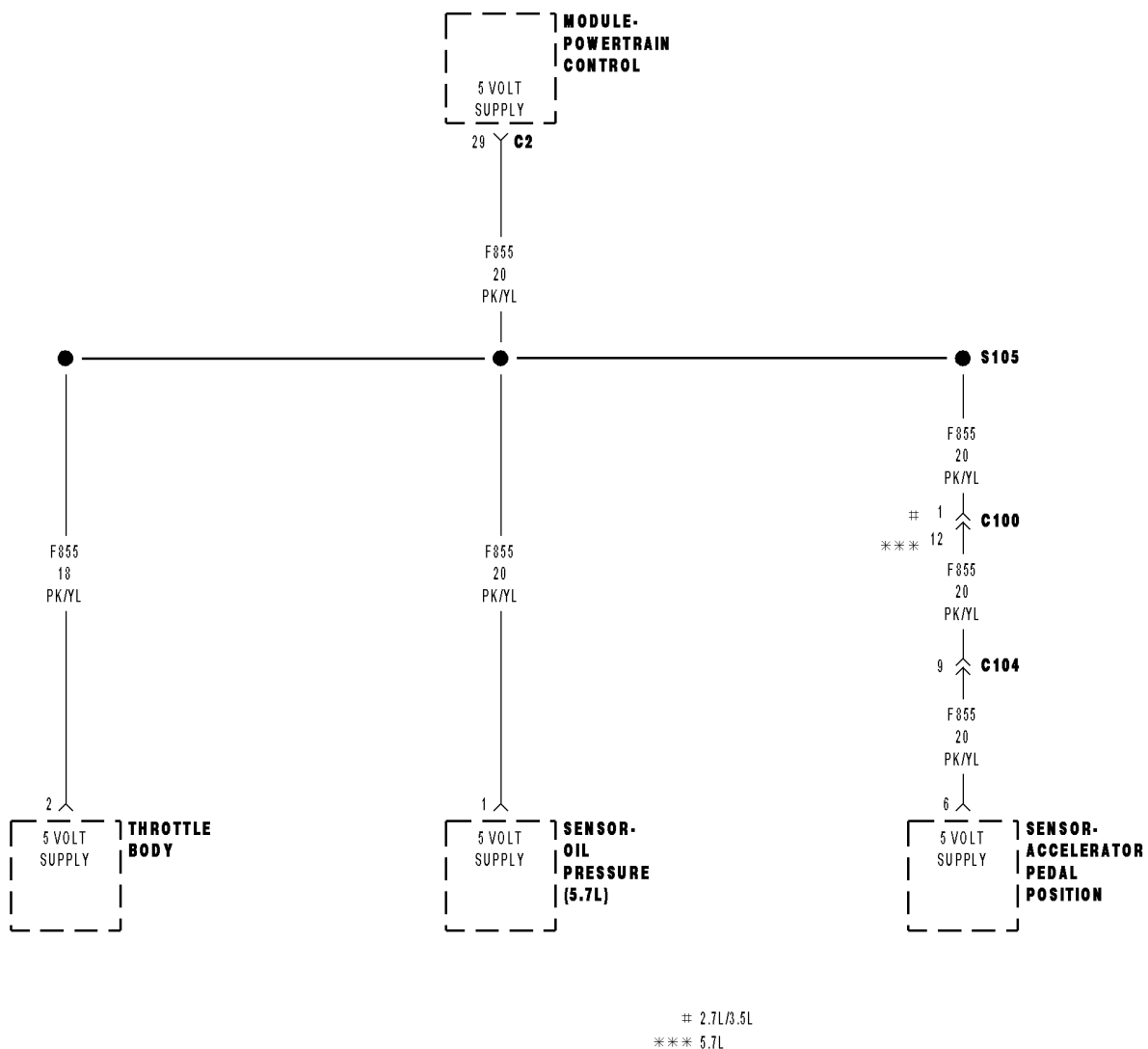
**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

# P0643-PRIMARY 5-VOLT SUPPLY CIRCUIT HIGH



**P0643-PRIMARY 5-VOLT SUPPLY CIRCUIT HIGH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
When the PCM recognizes the Primary 5-volt Supply circuit voltage is too high. One Trip Fault. ETC light is flashing.

Possible Causes
(F855) PRIMARY 5-VOLT SUPPLY SHORTED TO BATTERY VOLTAGE PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

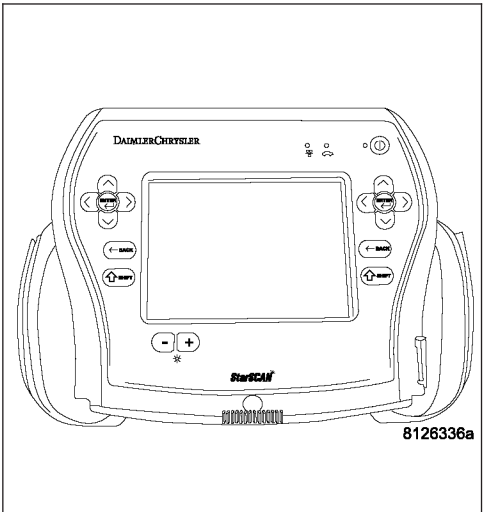
**Diagnostic Test**

**1. ACTIVE DTC**

Ignition on, engine not running.

With a scan tool, read DTCs.

- Is the DTC active at this time?**
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0643-PRIMARY 5-VOLT SUPPLY CIRCUIT HIGH (CONTINUED)****2. (F855) PRIMARY 5-VOLT SUPPLY SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect all the Sensors that share the (F855) Primary 5-volt Supply circuit.

**Note: Improperly installed aftermarket accessories can cause this DTC to set. Check for wiring added by customer.**

Ignition on, engine not running.

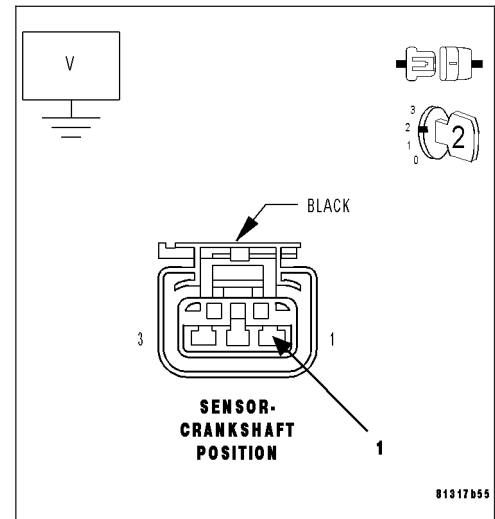
Measure the voltage on the (F855) Primary 5-volt Supply circuit at the CKP Sensor harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (F855) Primary 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

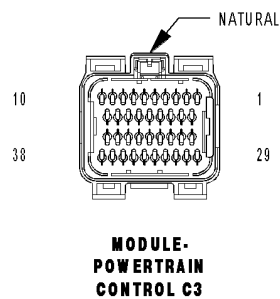
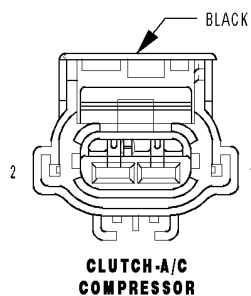
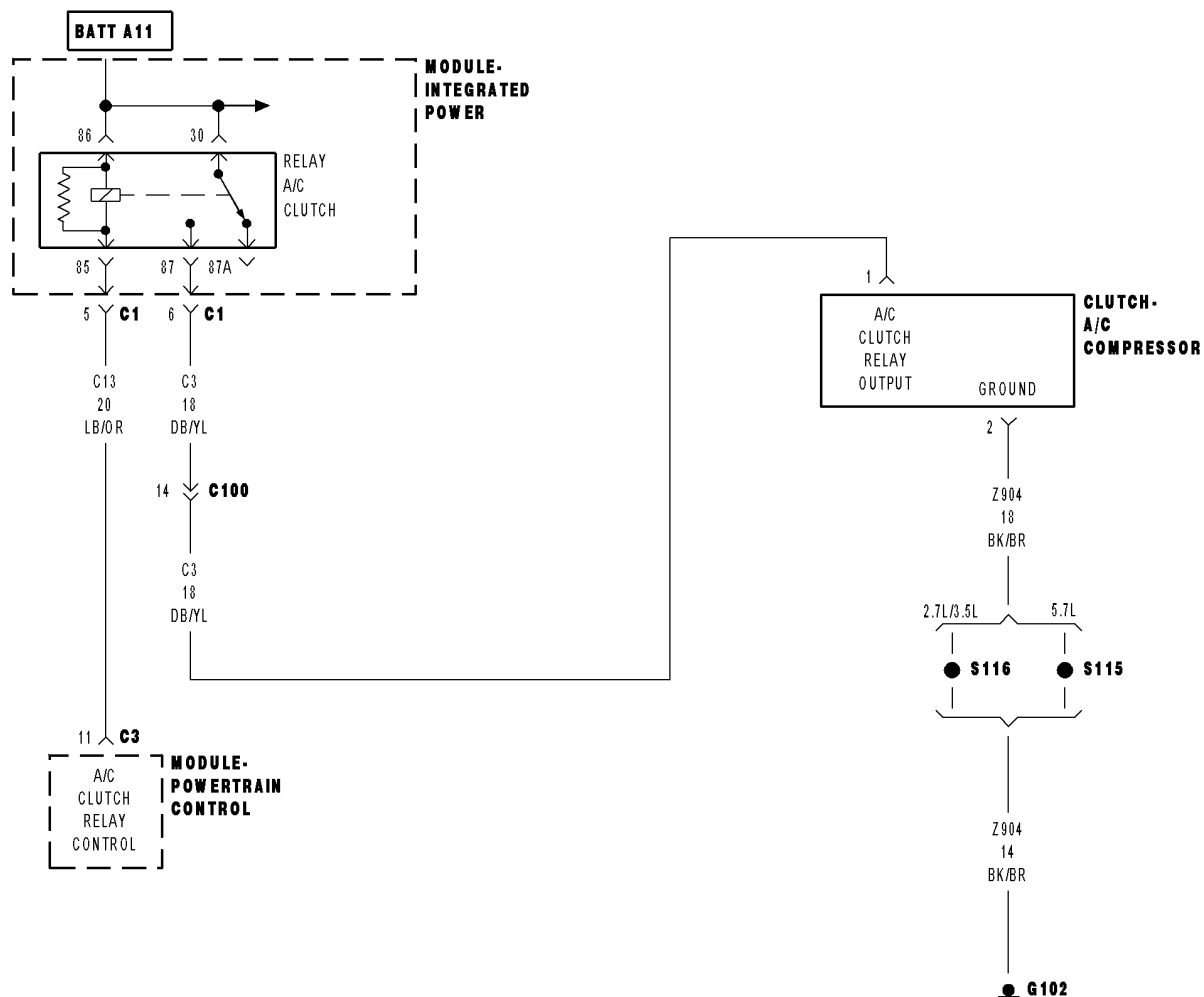
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P0645-A/C CLUTCH RELAY CIRCUIT



## P0645-A/C CLUTCH RELAY CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on. Battery voltage greater than 10 volts. A/C Switch on.
- **Set Condition:**  
An open or shorted condition is detected in the A/C clutch relay control circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
INTERNAL FUSED IGNITION SWITCH OUTPUT CIRCUIT (C13) A/C CLUTCH RELAY CONTROL CIRCUIT OPEN (C13) A/C CLUTCH RELAY CONTROL CIRCUIT SHORTED TO GROUND A/C CLUTCH RELAY PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

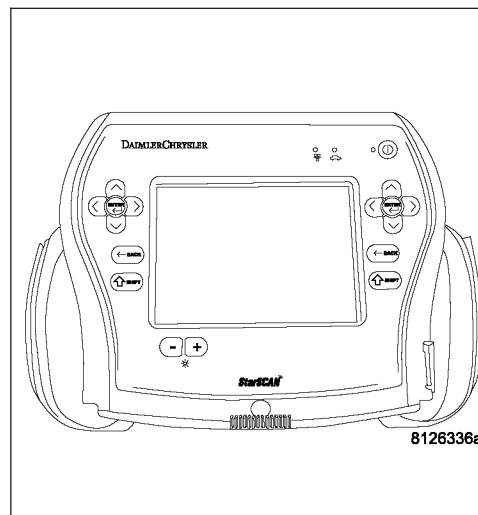
### 1. A/C CLUTCH RELAY OPERATION

Ignition on, engine not running.

With a scan tool, actuate the A/C Clutch Relay.

**Is the A/C Clutch Relay operating?**

- Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Go To 2



### 2. A/C CLUTCH RELAY RESISTANCE

Turn the ignition off.

Remove the A/C Clutch Relay from the IPM.

Measure the resistance of the A/C Clutch Relay Coil.

**Is the resistance between 60 to 80 ohms?**

- Yes** >> Go To 3
- No** >> Replace the A/C Clutch Relay.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P0645-A/C CLUTCH RELAY CIRCUIT (CONTINUED)****3. INTERNAL FUSED B+ CIRCUIT**

Ignition on, engine not running.

Using a 12-volt test light connected to ground, probe the Internal Fused B+ circuit in the connection.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open or short to ground in the Internal Fused B+ circuit. Check and replace any open fuses.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**4. (C13) A/C CLUTCH RELAY CONTROL CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (C13) A/C Clutch Relay Control circuit from the relay connection to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (C13) A/C Clutch Relay Control circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

---

**5. (C13) A/C CLUTCH RELAY CONTROL CIRCUIT SHORTED TO GROUND**

Measure the resistance between ground and the (C13) A/C Clutch Relay Control circuit at the IPM.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short to ground in the (C13) A/C Relay Clutch Control circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6

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**6. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

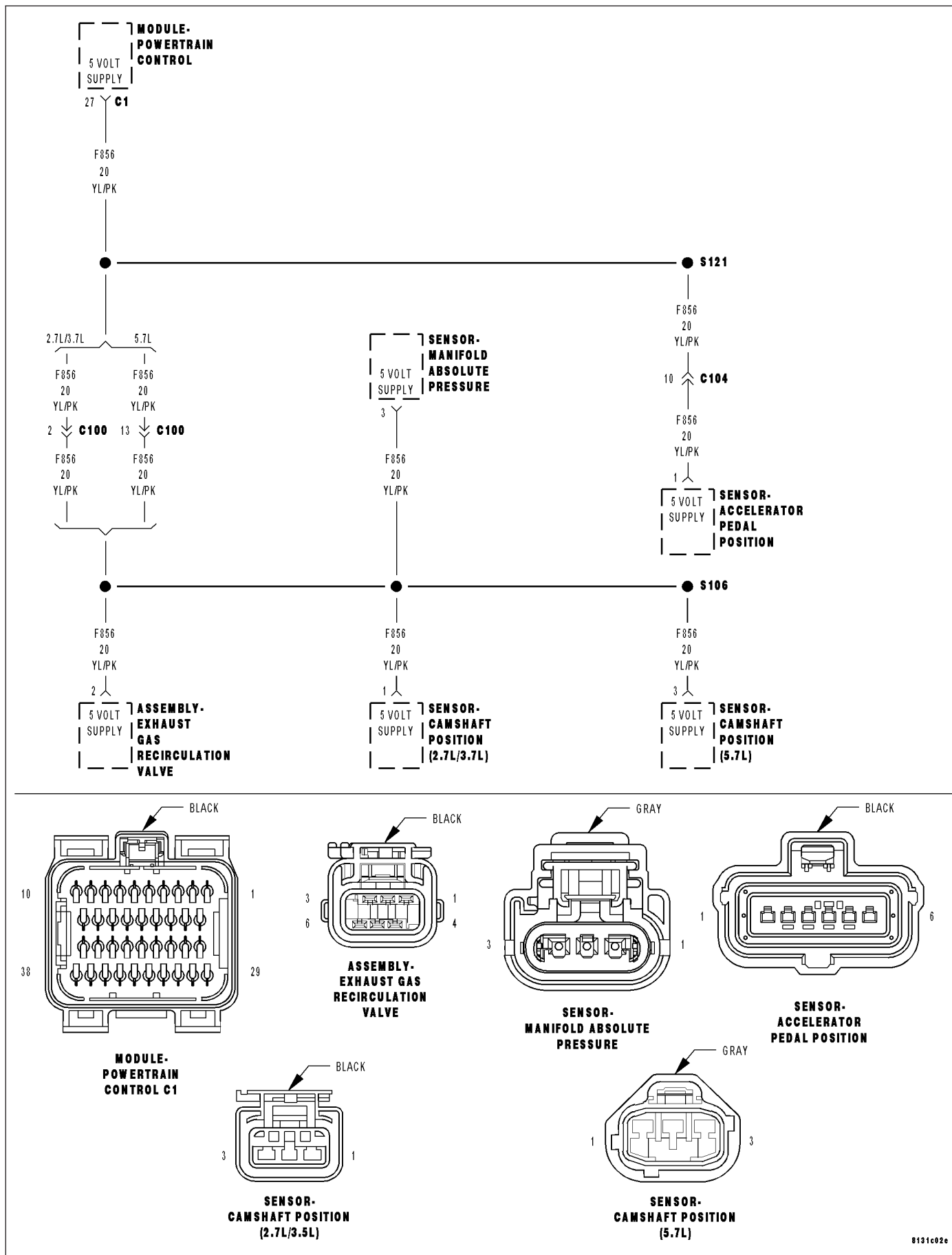
**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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# P0652-SENSOR REFERENCE VOLTAGE 2 CIRCUIT LOW



P0652-SENSOR REFERENCE VOLTAGE 2 CIRCUIT LOW (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
When the PCM recognizes the Auxiliary 5-volt Supply circuit voltage is too low One Trip Fault. ETC light is flashing.

Possible Causes
(F856)AUXILIARY 5-VOLT SUPPLY SHORTED TO GROUND SENSOR SHORTED TO GROUND CAM POSITION SENSOR PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

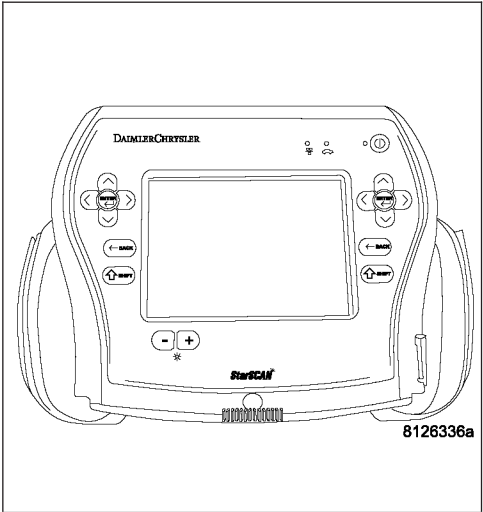
**Note:** Improperly installed aftermarket accessories can cause this DTC to set. Check for wiring added by customer.

Is the DTC active at this time?

- Yes

>> Go To 2
- No

>> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P0652-SENSOR REFERENCE VOLTAGE 2 CIRCUIT LOW (CONTINUED)

### 2. (F856) AUXILIARY 5-VOLT SUPPLY SHORTED TO GROUND

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect all the Sensors that share the (F856) Auxiliary 5-volt Supply circuit.

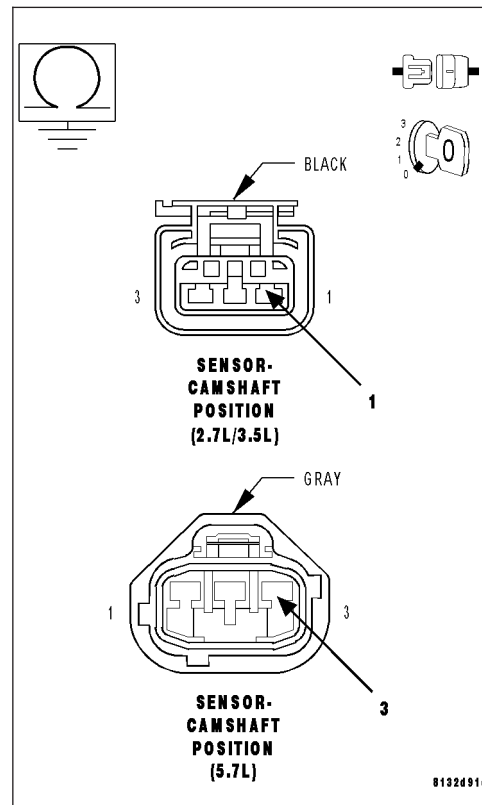
Measure the resistance between ground and the (F856) Auxiliary 5-volt Supply circuit in the CMP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F856) Auxiliary 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3



### 3. CMP SENSOR

Turn the ignition off.

Reconnect all the previously disconnected Sensors except for the CMP Sensor harness connector.

Ignition on, engine not running.

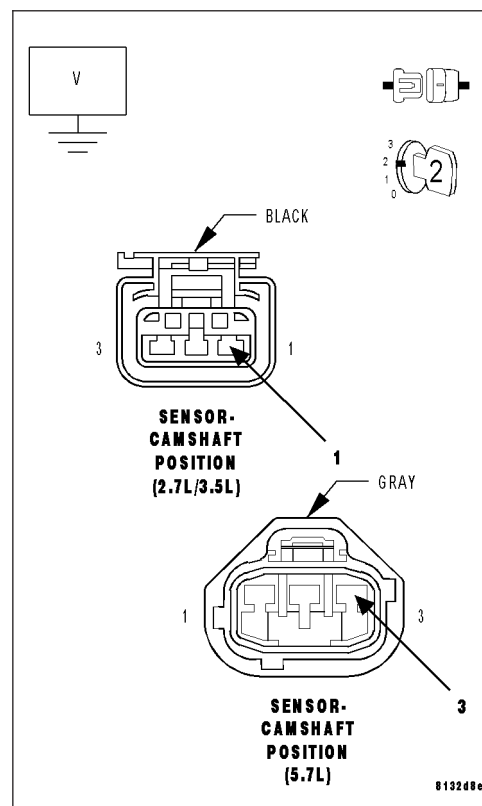
Measure the voltage on the (F856) Auxiliary 5-volt Supply circuit in the CMP Sensor harness connector.

**Is the voltage below 4.5 volts?**

**Yes** >> Go To 4

**No** >> Replace the Cam Position Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0652-SENSOR REFERENCE VOLTAGE 2 CIRCUIT LOW (CONTINUED)****4. INTERNAL SENSOR SHORTED**

Measure the voltage on the (F856) Auxiliary 5-volt Supply circuit at the CMP Sensor harness connector.

**CAUTION:** You must Turn the Ignition OFF when disconnecting any of the Sensor harness connectors and Turn the Ignition On to check the voltage readings.

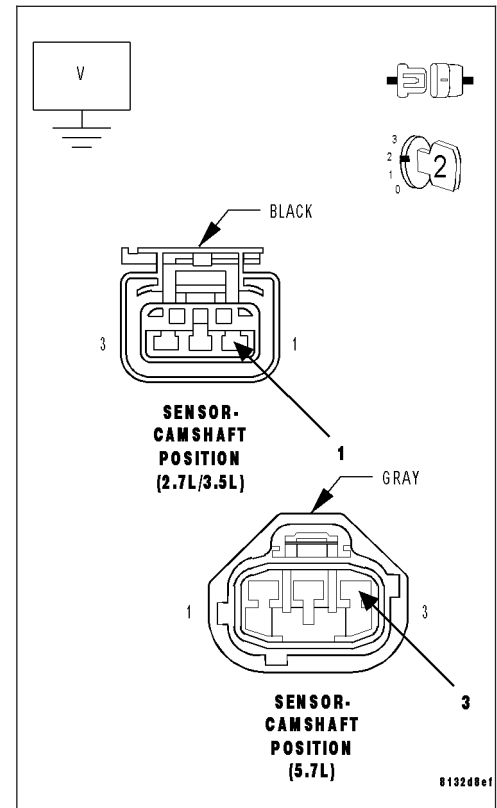
While monitoring the voltage, disconnect each Sensor harness connector that shares the (F856) Auxiliary 5-volt Supply circuit, one at a time.

**Does the voltage increase above 4.5 volts when disconnecting any of the Sensor harness connectors?**

**Yes** >> Replace the Sensor that causes the (F856) Auxiliary 5-volt Supply circuit voltage to increase when disconnected.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

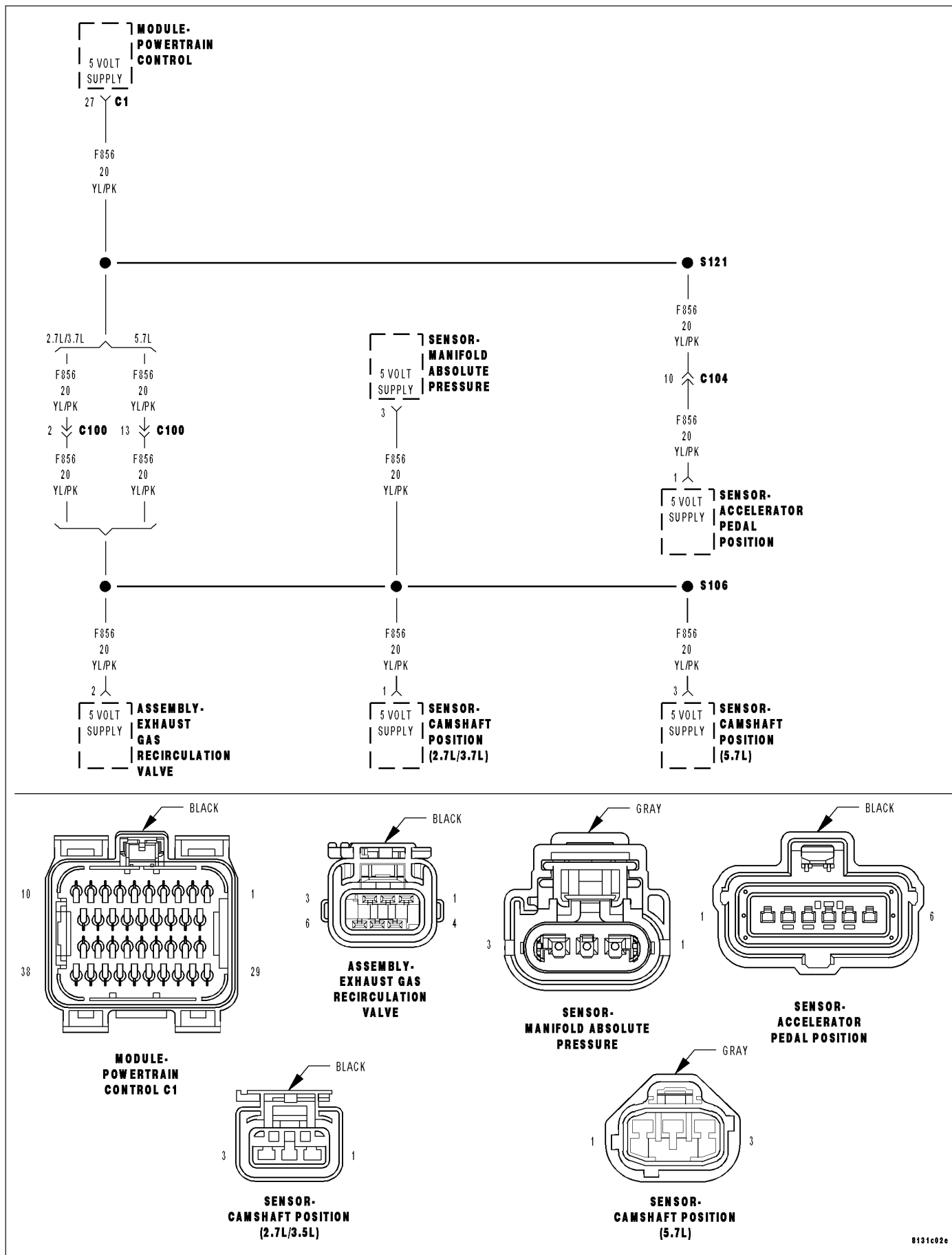
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

# P0653-SENSOR REFERENCE VOLTAGE 2 CIRCUIT HIGH





**P0653-SENSOR REFERENCE VOLTAGE 2 CIRCUIT HIGH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
When the PCM recognizes the Auxiliary 5-volt Supply circuit voltage is too high. One Trip Fault. ETC light is flashing.

Possible Causes
(F856) AUXILIARY 5-VOLT SUPPLY SHORTED TO BATTERY VOLTAGE PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

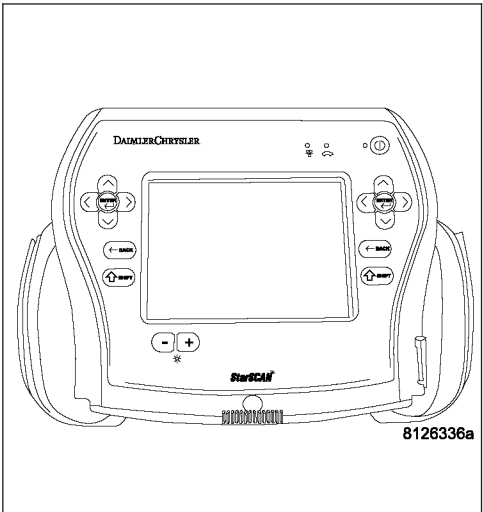
**Diagnostic Test**

**1. ACTIVE DTC**

Ignition on, engine not running.

With a scan tool, read DTCs.

- Is the DTC active at this time?**
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0653-SENSOR REFERENCE VOLTAGE 2 CIRCUIT HIGH (CONTINUED)****2. (F856) AUXILIARY 5-VOLT SUPPLY SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect all the Sensors that share the (F856) Auxiliary 5-volt Supply circuit.

**Note: Improperly installed aftermarket accessories can cause this DTC to set. Check for wiring added by customer.**

Ignition on, engine not running.

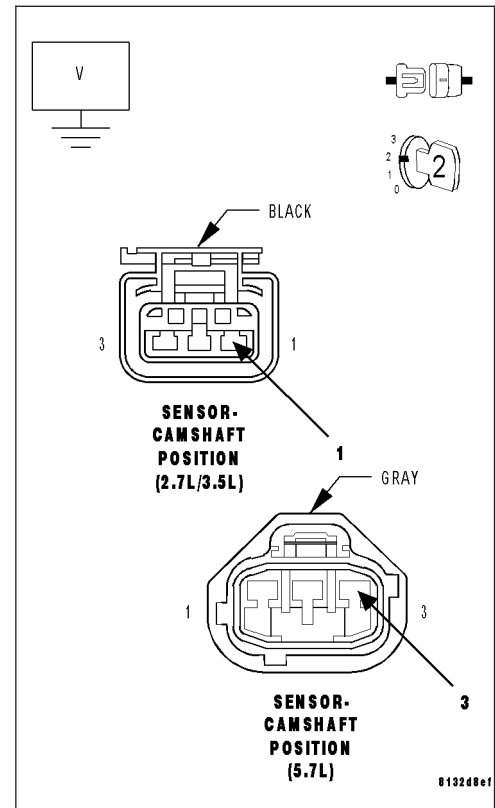
Measure the voltage on the (F856) Auxiliary 5-volt Supply circuit at the CMP Sensor harness connector.

**Is the voltage present?**

**Yes** >> Repair the short to battery voltage in the (F856) Auxiliary 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

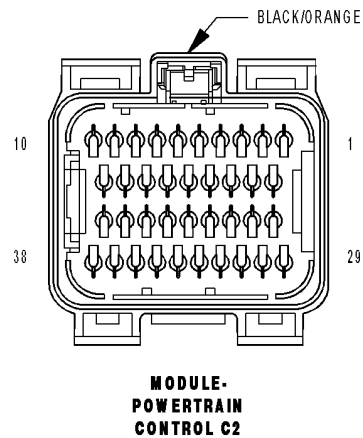
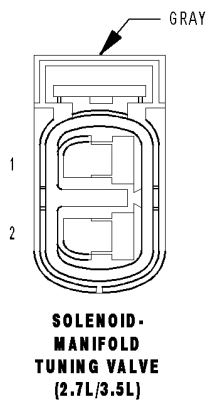
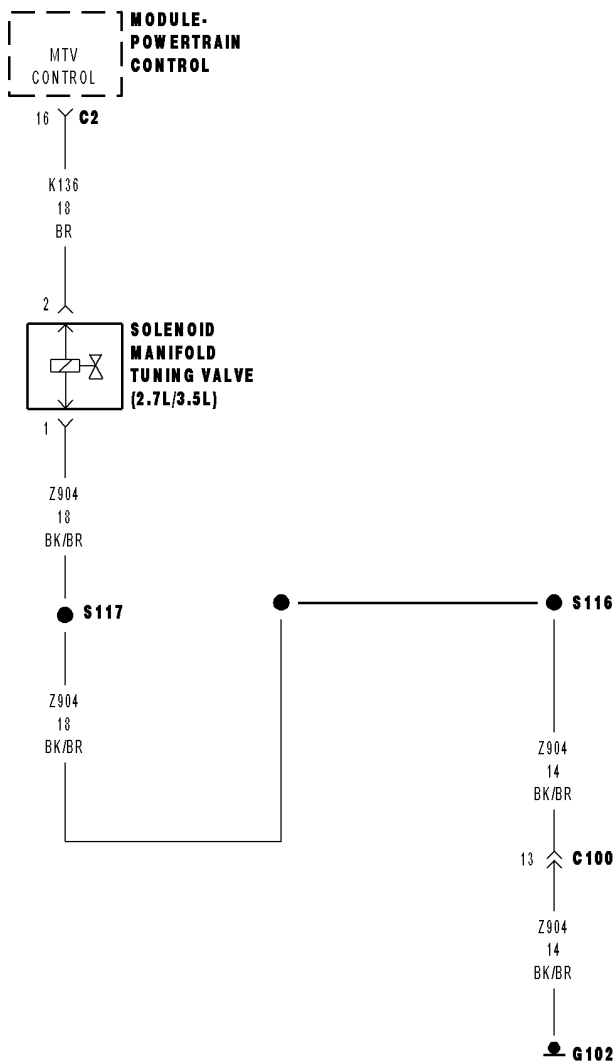
**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P0660—MANIFOLD TUNE VALVE SOLENOID CIRCUIT**

**P0660-MANIFOLD TUNE VALVE SOLENOID CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on. ASD Relay energized. Battery voltage greater than 10 volts.

- **Set Condition:**

The PCM senses the MTV in not at the desired state. One Trip Fault.

Possible Causes
MTV (Z904) GROUND CIRCUIT OPEN (K136) MTV CONTROL CIRCUIT SHORT TO BATTERY VOLTAGE (K136) MTV CONTROL CIRCUIT SHORT TO GROUND (K136) MTV CONTROL CIRCUIT OPEN MANIFOLD TUNED VALVE SOLENOID PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

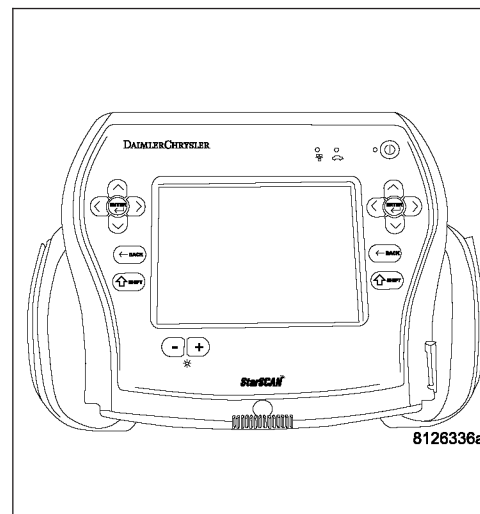
With a scan tool, read DTC.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0660-MANIFOLD TUNE VALVE SOLENOID CIRCUIT (CONTINUED)****2. MANIFOLD TUNE VALVE SOLENOID OPERATION**

Turn the ignition off.

Disconnect the MTV Solenoid harness connector.

Ignition on, engine not running.

Using a 12-volt test light, connect one end to the (K136) MTV Control circuit and the other end the (Z904) Ground circuit in the MTV Solenoid harness connector.

With the scan tool, actuate (Toggle) the MTV Solenoid.

**Does the test light illuminate brightly and flash on and off?**

**Yes** >> Replace the Manifold Tune Valve Solenoid.

Perform POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

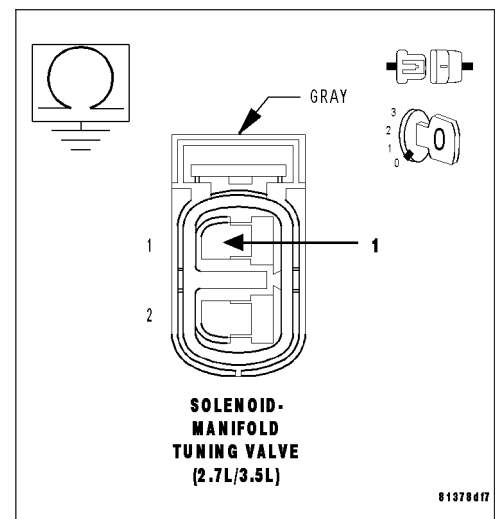
**3. MTV SOLENOID (Z904) GROUND CIRCUIT OPEN**

Measure the resistance between the Ground circuit in the MTV Solenoid harness connector and ground.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the open in the MTV Solenoid Ground circuit.  
Perform POWERTRAIN VERIFICATION TEST VER — 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0660-MANIFOLD TUNE VALVE SOLENOID CIRCUIT (CONTINUED)****4. (K136) MTV CONTROL CIRCUIT SHORT TO BATTERY VOLTAGE**

Turn the ignition off

Disconnect the PCM harness connectors.

Turn the ignition on.

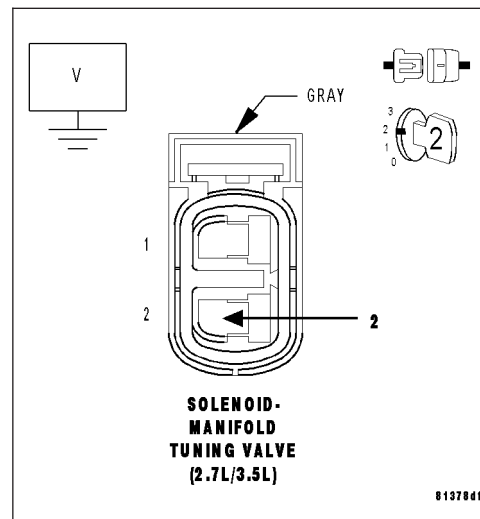
Measure the voltage of the (K136) MTV Control circuit in the MTV Solenoid harness connector.

**Does the voltage indicate voltage present?**

**Yes** >> Repair the short to voltage in the (K136) MTV Control circuit.

Perform POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K136) MTV CONTROL CIRCUIT SHORT TO GROUND**

Turn the ignition off.

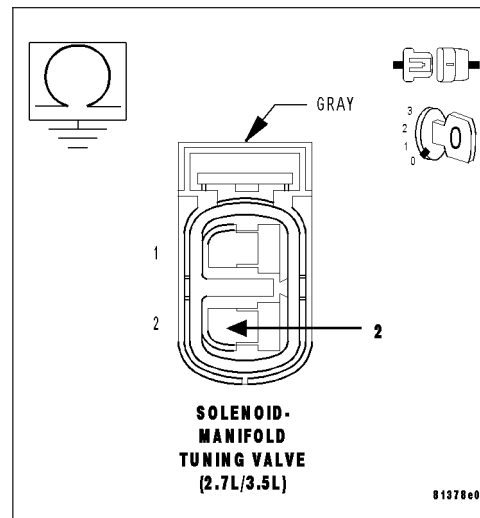
Measure the resistance between the (K136) MTV Control circuit in the MTV Solenoid harness connector and ground.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short to ground in the (K136) MTV Control circuit.

Perform POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P0660-MANIFOLD TUNE VALVE SOLENOID CIRCUIT (CONTINUED)****6. (K136) MTV CONTROL CIRCUIT OPEN**

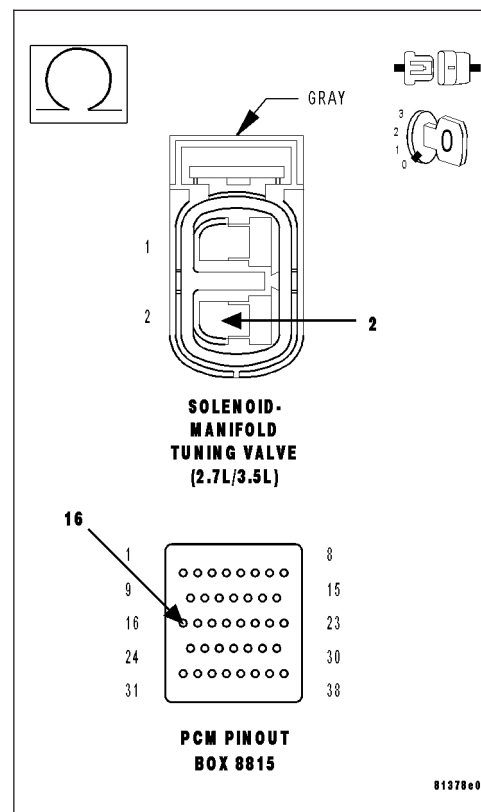
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K136) MTV Control circuit between from the MTV Solenoid harness connector to the appropriate terminal of the special tool.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K136) MTV Control circuit.  
Perform POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)  
Go To 7

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

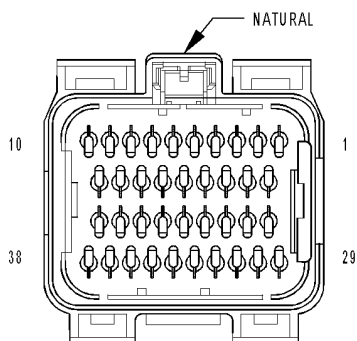
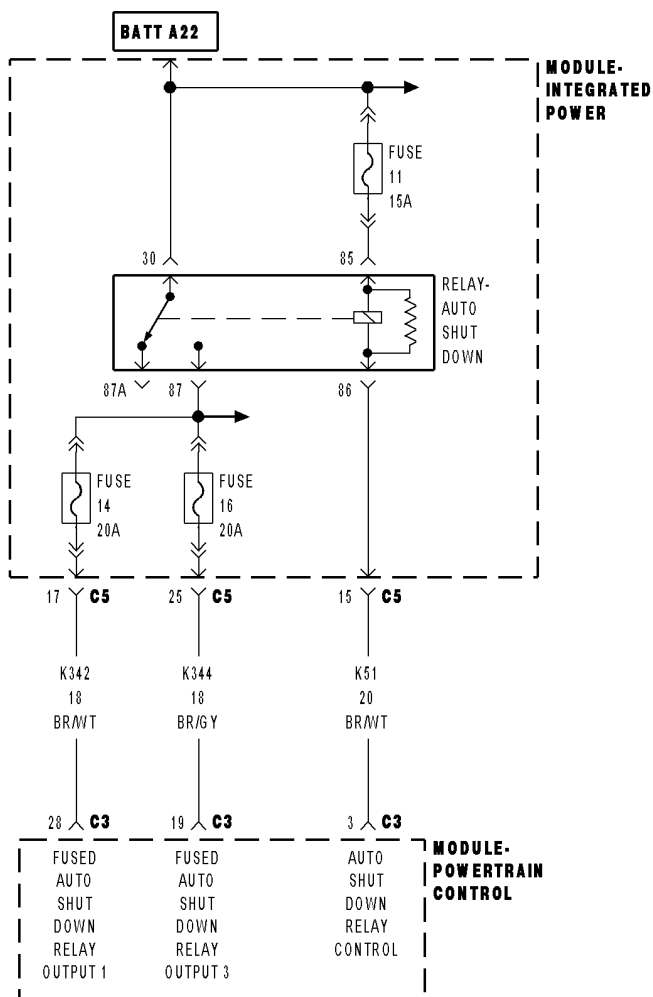
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P0685-AUTO SHUTDOWN RELAY CONTROL CIRCUIT



**MODULE-  
POWERTRAIN  
CONTROL C3**



P0685-AUTO SHUTDOWN RELAY CONTROL CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With ignition on. Battery voltage above 10 volts.
- **Set Condition:**  
An open or shorted condition is detected in the ASD relay control circuit. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A922) FUSED B+ CIRCUITS (K51) ASD RELAY CONTROL CIRCUIT OPEN (K51) ASD RELAY CONTROL CIRCUIT SHORTED TO GROUND ASD RELAY PCM

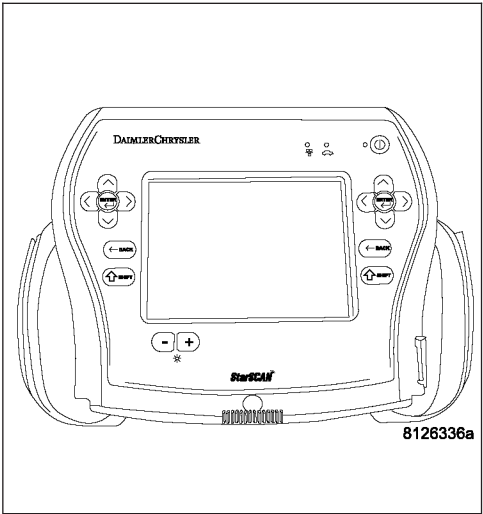
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ASD RELAY OPERATION

Ignition on, engine not running.  
With a scan tool, actuate the ASD Relay.

- Is the ASD Relay operating?**
- Yes**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No**    >> Go To 2



**P0685-AUTO SHUTDOWN RELAY CONTROL CIRCUIT (CONTINUED)****2. (A922) FUSED B+ CIRCUITS**

Turn the ignition off.

Remove the ASD Relay from the IPM.

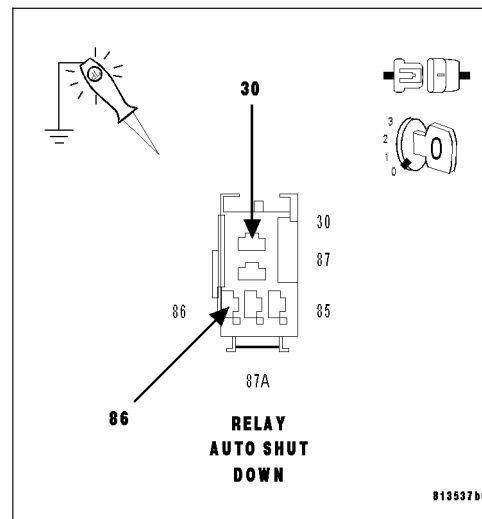
Using a 12-volt test light connected to ground, probe the (A922) Fused B+ circuits in the IPM.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the open or short to ground in the (A922) Fused B+ circuits. Inspect and replace any open fuses.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**3. ASD RELAY**

Measure the resistance of the ASD Relay Coil.

**Is the resistance between 60 to 80 ohms?**

**Yes** >> Go To 4

**No** >> Replace the ASD Relay.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P0685-AUTO SHUTDOWN RELAY CONTROL CIRCUIT (CONTINUED)****4. (K51) ASD RELAY CONTROL CIRCUIT OPEN**

Disconnect the PCM harness connectors.

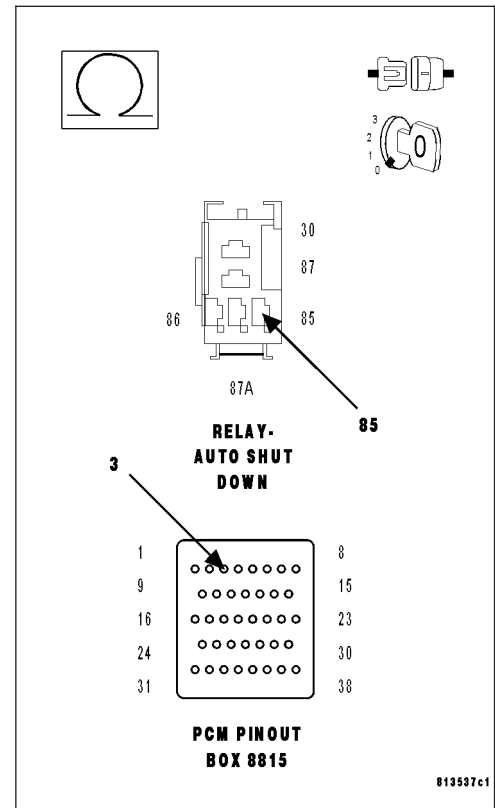
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K51) ASD Relay Control circuit from the IPM to the appropriate terminals of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K51) ASD Relay Control circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. (K51) ASD RELAY CONTROL CIRCUIT SHORTED TO GROUND**

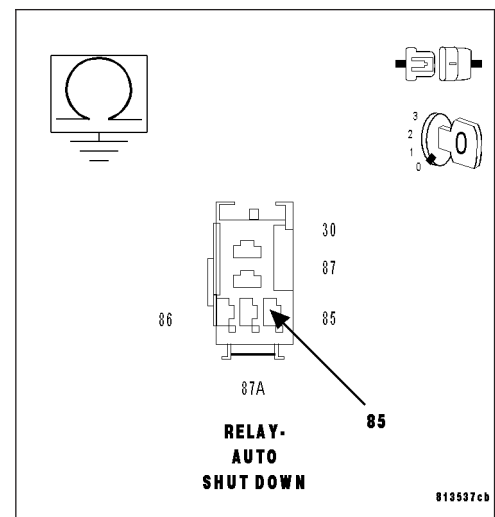
Measure the resistance between ground and the (K51) ASD Relay Control circuit in the IPM.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K51) ASD Relay Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P0685-AUTO SHUTDOWN RELAY CONTROL CIRCUIT (CONTINUED)****6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

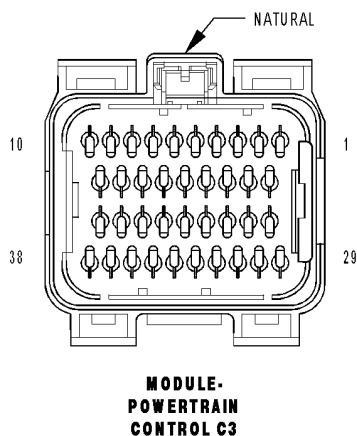
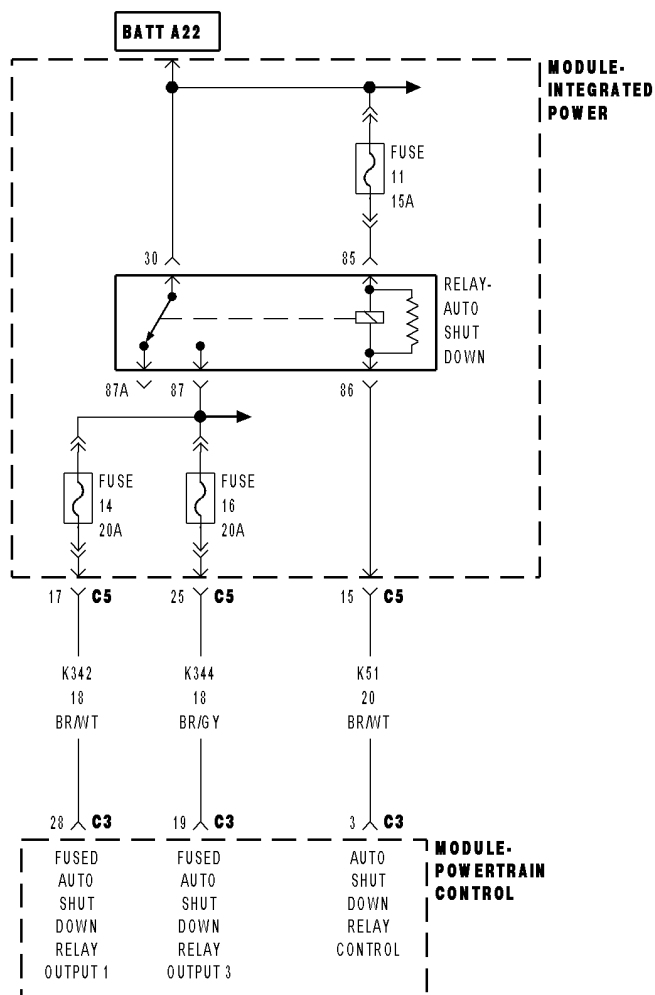
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

---

**P0688-AUTO SHUTDOWN RELAY SENSE CIRCUIT LOW**

**P0688-AUTO SHUTDOWN RELAY SENSE CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With ignition key on. Battery voltage greater than 10 volts.
- **Set Condition:**  
No voltage sensed at the PCM when the ASD relay is energized. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(A922) FUSED B+ CIRCUITS (A955) ASD RELAY OUTPUT CIRCUIT OPEN ASD RELAY PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. VERIFY ASD DTC**

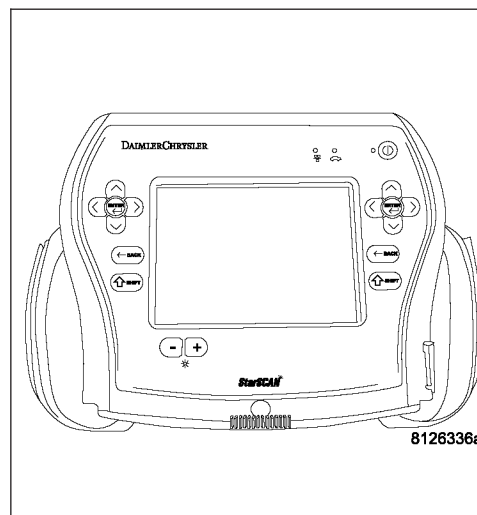
**Note: Diagnose P0685 - Auto Shutdown Relay Control Circuit first if it set along with this DTC.**

With a scan tool, erase the DTC.

Attempt to start the engine. If the engine will not start, crank the engine for at least 15 seconds. It may be necessary to repeat several times.

**Does the DTC reset?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**2. ENGINE OPERATION**

Attempt to start the engine.

**Does the engine start?**

- Yes** >> Go To 3
- No** >> Go To 4

**P0688-AUTO SHUTDOWN RELAY SENSE CIRCUIT LOW (CONTINUED)****3. (A955) ASD RELAY OUTPUT CIRCUIT OPEN**

Turn the ignition off.

Remove the ASD Relay.

Disconnect the PCM harness connectors.

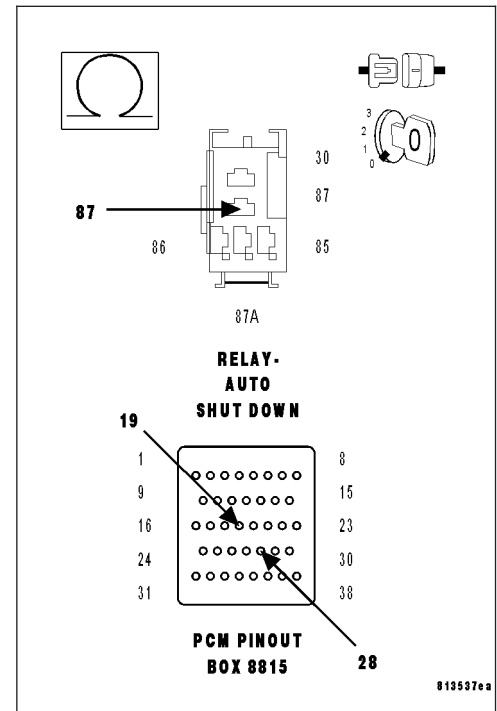
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (A955) ASD Relay Output circuit from the Relay connection to the appropriate terminals of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (A955) ASD Relay Output circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**4. ASD RELAY**

Turn the ignition off.

Install a substitute relay in place of the ASD Relay.

Ignition on, engine not running.

With a scan tool, erase DTCs.

Attempt to start the engine.

With a scan tool, read DTCs.

**Does the DTC reset?**

**Yes** >> Go To 5

**No** >> Replace the ASD Relay.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P0688-AUTO SHUTDOWN RELAY SENSE CIRCUIT LOW (CONTINUED)

### 5. (A922) FUSED B+ CIRCUITS

Turn the ignition off.

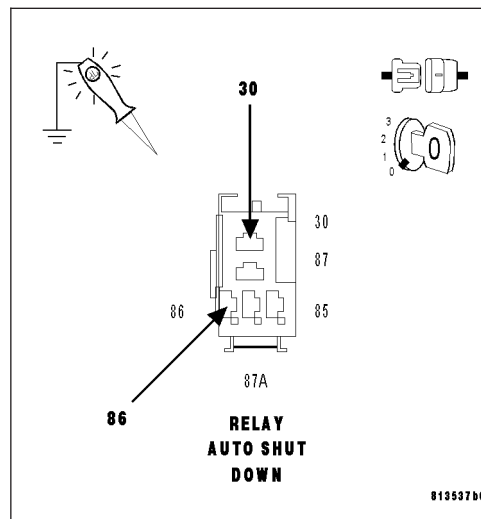
Using a 12-volt test light connected to ground, probe the (A922) Fused B+ circuits at the Relay connection.

**Does the test light illuminate brightly?**

**Yes** >> Go To 6

**No** >> Repair the open or short to ground in the (A922) Fused B+ circuits. Inspect the related fuse and repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



### 6. (A955) RELAY OUTPUT CIRCUIT OPEN

Disconnect the PCM harness connectors.

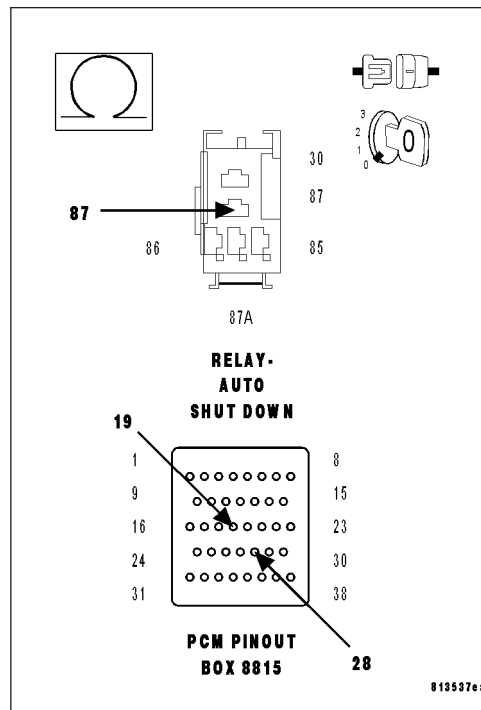
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (A955) ASD Relay Output circuit from the Relay connection to the appropriate terminals of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (A955) ASD Relay Output circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P0688-AUTO SHUTDOWN RELAY SENSE CIRCUIT LOW (CONTINUED)****7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No**      >> Replace and program the Powertrain Control Module per Service Information.  
          Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
-

## P0700-TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**  
An active DTC is stored in the TCM. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
DTC PRESENT IN THE TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

### Diagnostic Test

#### 1. DTC PRESENT IN EATX CONTROLLER

This is an informational DTC letting you know that a DTC(s) is stored in the Transmission Control Module.

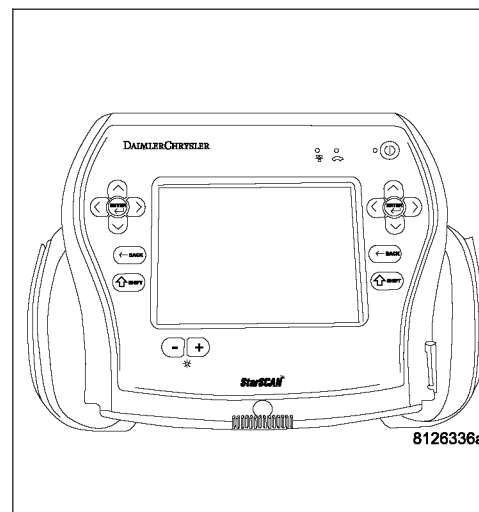
Erase this DTC from the PCM after all Transmission DTC(s) have been repaired.

Using a scan tool, read the Transmission Controller DTC and refer to the Transmission Category and perform the appropriate symptom.

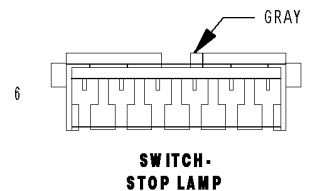
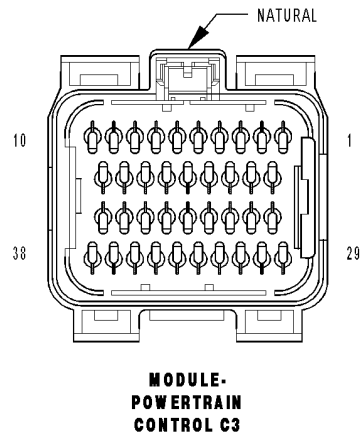
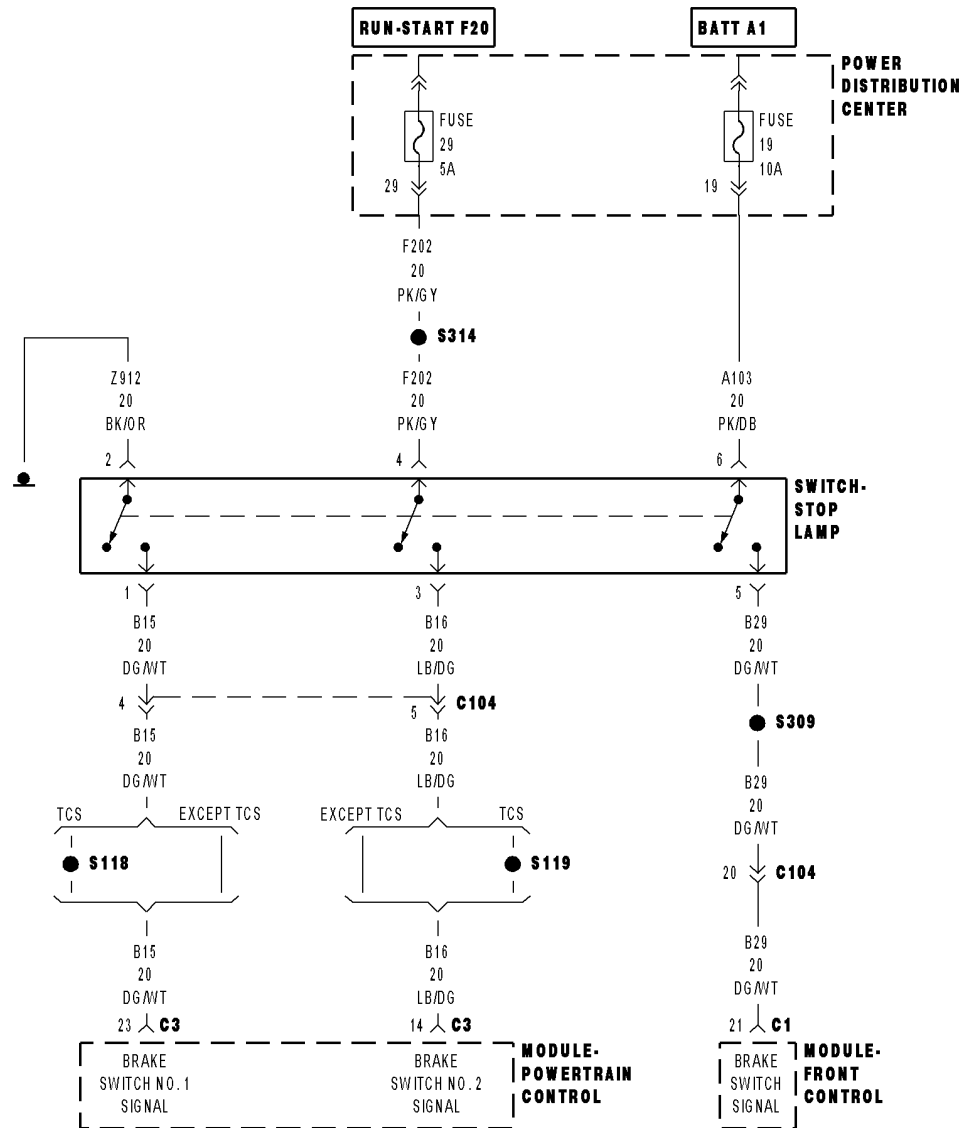
**PCM Diagnostic Information complete.**

**Continue**

Test Complete.



## P0703-BRAKE SWITCH 2 PERFORMANCE



**P0703-BRAKE SWITCH 2 PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on.

- **Set Condition:**

When the PCM recognizes Brake Switch No.2 voltage is not equal to the applied value at the PCM when Brake Switch No.1 is applied. This could be a normal condition. If this condition is seen repeatedly by the PCM the fault is set. Cruise will not work for the rest of the key cycle.

Possible Causes
(A103) FUSED B+ CIRCUIT
(L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT OPEN
(L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE
(L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO GROUND
(B29) BRAKE SWITCH NO.1 SIGNAL CIRCUIT OPEN
STOP LAMP SWITCH
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Make sure the Stop Lamp Switch is adjusted properly before continuing.

**Note:** Make sure the Stop Lamp Switch is properly wired, such as (B29) Brake Switch No.1 and (L50) Brake Lamp Switch Output are not switched at the harness connector.

Ignition on, engine not running.

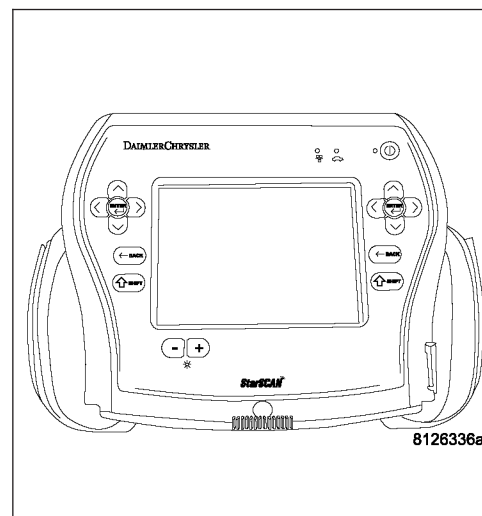
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0703-BRAKE SWITCH 2 PERFORMANCE (CONTINUED)****2. (A103) FUSED B+ CIRCUIT**

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

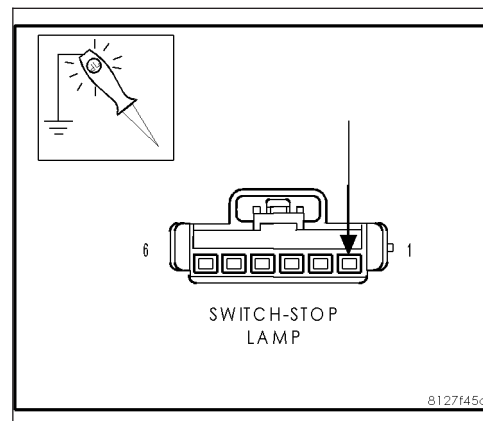
Using a 12-volt test light connected to ground, probe the (A103) Fused B+ circuit in the Stop Lamp Switch harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the open or short to ground in the (A103) Fused B+ circuit. Inspect the related fuse and repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**3. STOP LAMP SWITCH**

Turn the ignition off.

Measure the resistance between the (A103) Fused B+ circuit terminal and the (L50) Brake Lamp Switch Output terminal in the Stop Lamp Switch.

Measure the resistance between the (Z429) Ground circuit terminal and the (K29) Brake Switch No.1 Signal terminal in the Stop Lamp Switch.

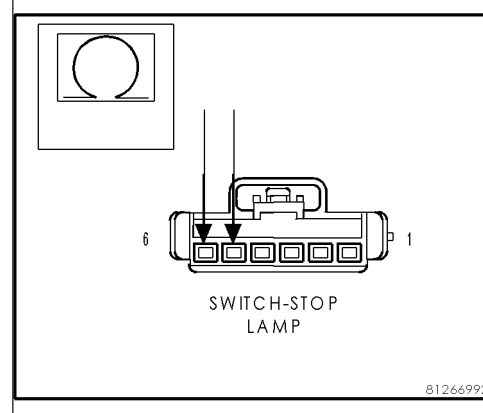
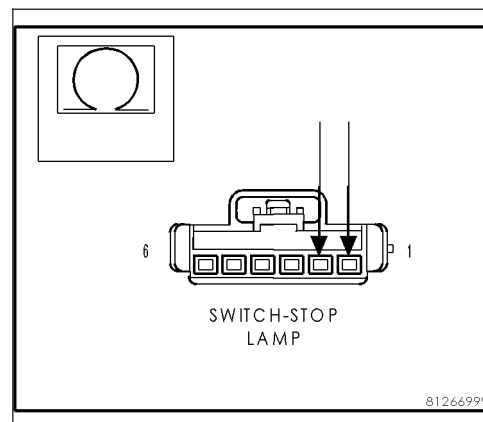
Apply and release the brake pedal while monitoring the ohmmeter.

**Does the resistance change from below 5.0 ohms to open circuit for each circuit check?**

**Yes** >> Go To 4

**No** >> Replace the Stop Lamp Switch.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0703-BRAKE SWITCH 2 PERFORMANCE (CONTINUED)****4. (L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO BATTERY VOLTAGE**

Disconnect the PCM harness connectors.

Measure the voltage on the (L50) Brake Lamp Switch Output circuit in the Stop Lamp Switch harness connector.

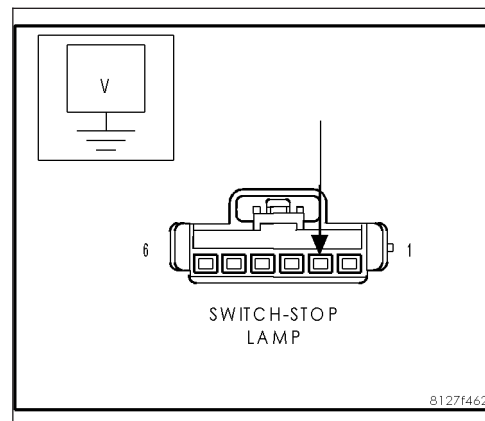
Ignition on, engine not running.

**Is the voltage above 1.0 volt?**

**Yes** >> Repair the short to battery voltage in the (L50) Brake Lamp Switch Output circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT OPEN**

Turn the ignition off.

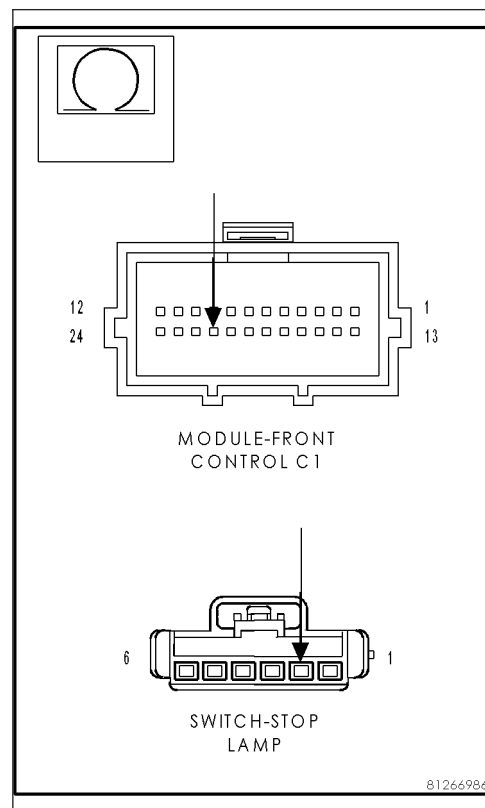
Measure the resistance of the (L50) Brake Lamp Switch Output circuit from the Stop Lamp Switch harness connector to the C1 FCM harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (L50) Brake Lamp Switch Output circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0703-BRAKE SWITCH 2 PERFORMANCE (CONTINUED)****6. (L50) BRAKE LAMP SWITCH OUTPUT CIRCUIT SHORTED TO GROUND**

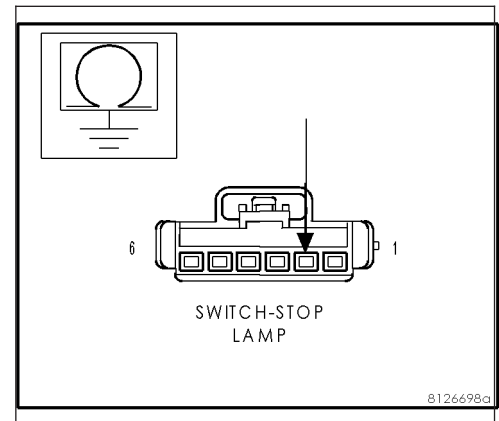
Measure the resistance between ground and the (L50) Brake Lamp Switch Output circuit in the Stop Lamp Switch harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short to ground in the (L50) Brake Lamp Switch Output circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. (B29) BRAKE SWITCH NO.1 SIGNAL CIRCUIT OPEN**

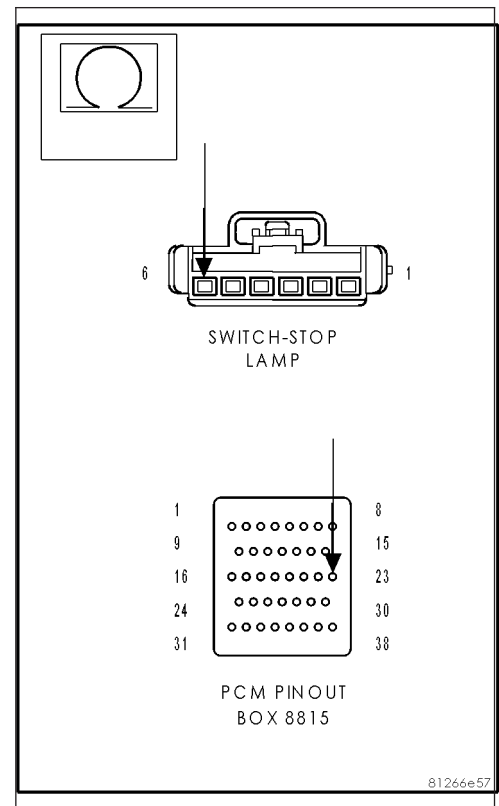
Measure the resistance of the (B29) Brake Switch No.1 Signal circuit from the Stop Lamp Switch harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (B29) Brake Switch No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P0703-BRAKE SWITCH 2 PERFORMANCE (CONTINUED)****8. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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## P0850-PARK/NEUTRAL SWITCH PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously with the transmission in Park, Neutral, or Drive and NOT in Limp-in mode.
- **Set Condition:**  
This code will set if the PCM detects an incorrect Park/Neutral switch state for a given mode of vehicle operation. One trip fault. Three good trips to turn off the MIL.

Possible Causes
TCM/COMMUNICATION
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

### Diagnostic Test

#### 1. P/N & D/R NOT IN CORRECT POSITION

**Note:** Before continuing, ensure communication can be established with the TCM. If the scan tool is unable to communicate with the TCM or if there are related communication DTCs present refer to the Communication Category and perform the appropriate symptom.

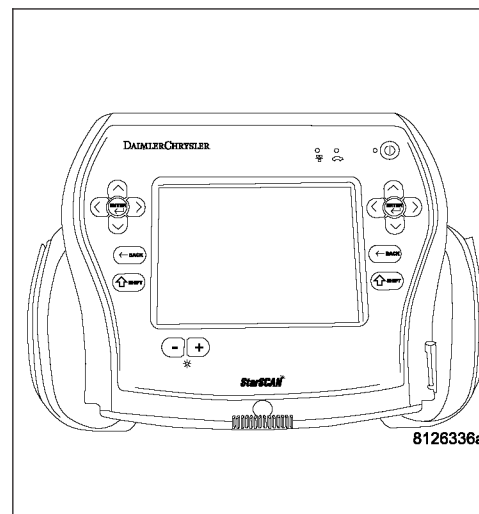
Ignition on, engine not running.

With the scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2 (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING).



#### 2. CHECKING TCM DTC(S)

Turn the ignition off.

With the scan tool, read TCM DTCs.

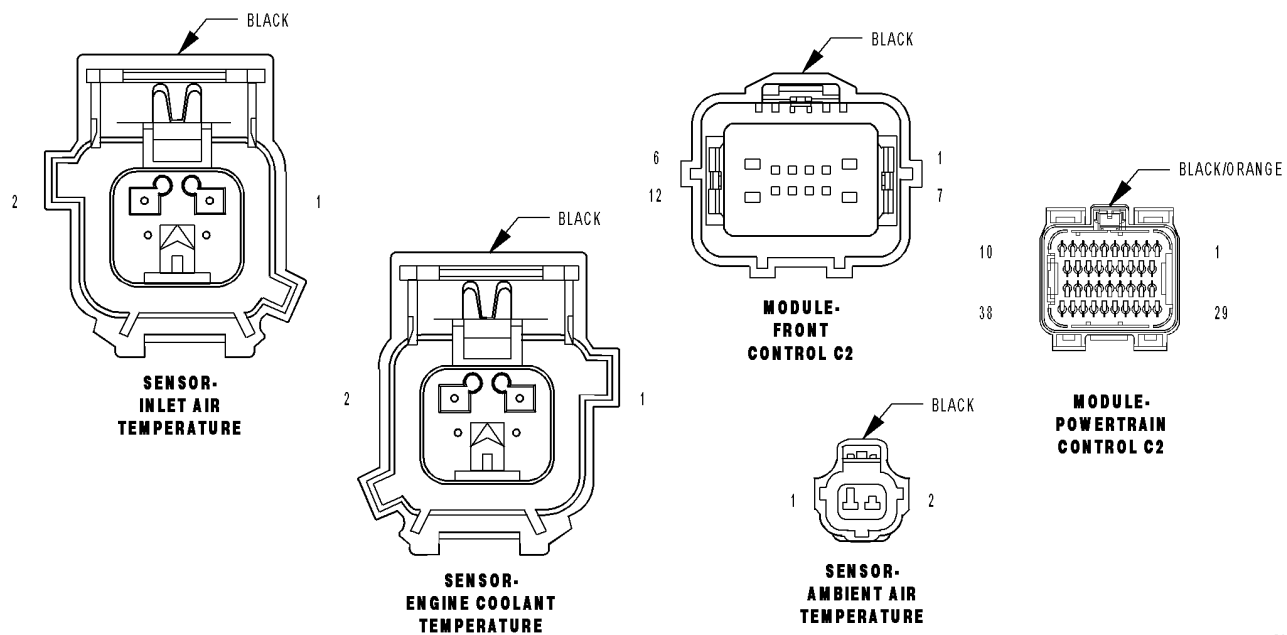
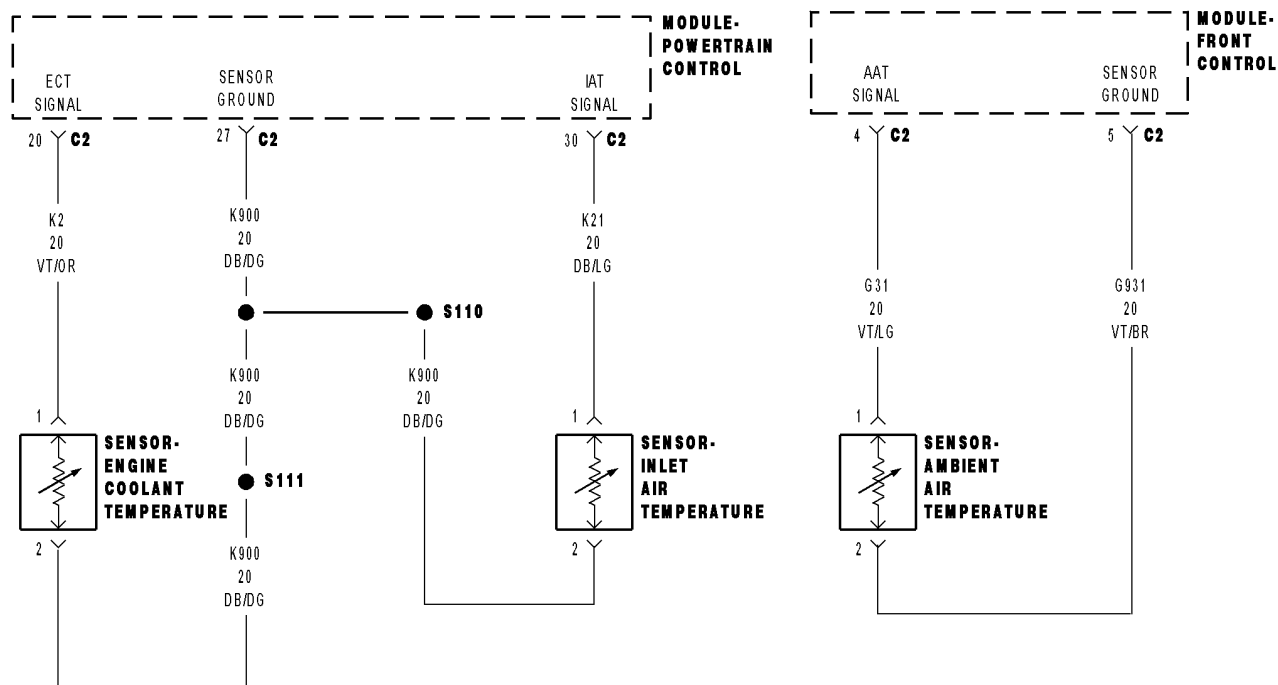
**Is there any there Transmission DTC(s) present?**

**Yes** >> Refer to the appropriate Transmission symptom in the Transmission category.

**No** >> Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Replace and program the Powertrain Module in accordance with the Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P1115-GENERAL TEMPERATURE RATIONALITY



**P1115-GENERAL TEMPERATURE RATIONALITY (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on and battery voltage greater than 10 volts.

- **Set Condition:**

Ambient Air, Engine Coolant, and Intake Air Temp sensor inputs are compared under cold start conditions. After start up the temp readings are monitored. If two of the three readings agree and the third doesn't, a DTC is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXCESSIVE RESISTANCE IN THE SENSOR SIGNAL CIRCUIT
EXCESSIVE RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT
TEMPERATURE SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read the DTCs.

**Note:** All ECT, Intake Air, and Ambient Air Temperature Sensor codes must be diagnosed and repaired before continuing.

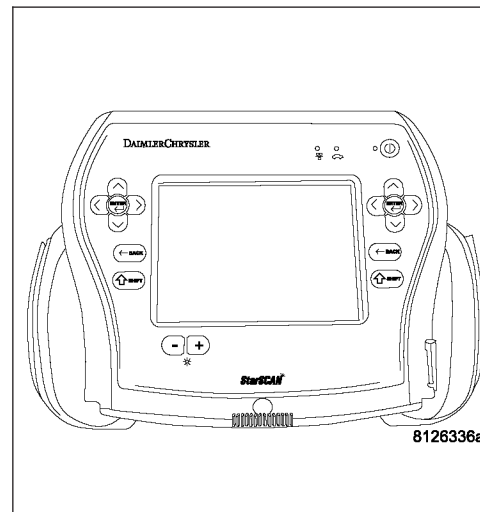
**Note:** In cold weather, this DTC could be set by a non-OEM approved block heater and no repair would be required.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



### 2. TEMPERATURE SENSOR CIRCUIT

With a scan tool, read the ECT, Ambient Air Temp, and Intake Air Temp Sensor temp values.

Start the engine.

Allow the engine to reach normal operating temperature while monitoring the three Sensor temperature values.

**Is the temperature for each of the Sensors increasing properly?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**P1115-GENERAL TEMPERATURE RATIONALITY (CONTINUED)****3. TEMPERATURE SENSOR**

Ignition on, engine not running.

Disconnect the suspected faulty sensor.

Connect a jumper wire between the Sensor Signal circuit and the (K900) Sensor ground circuit.

With the scan tool, read the voltage of the suspected Sensor.

**Note:** Remove the jumper wire before continuing.

**Did the voltage reading start at 4.8 to 5.0 volts and decrease to 0 volts when the jumper wire was installed?**

**Yes** >> Replace the faulty Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. EXCESSIVE RESISTANCE IN THE TEMPERATURE SENSOR SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

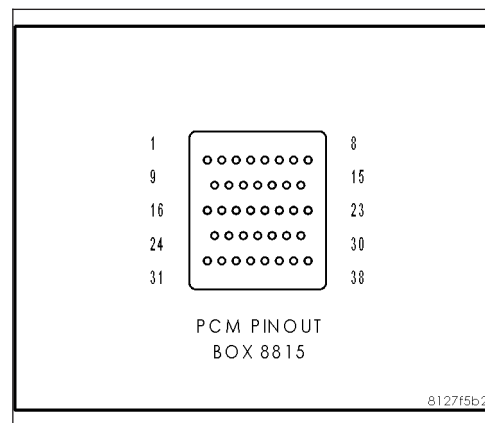
Measure the resistance of the Sensor Signal circuit from the Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance above 5.0 ohms.**

**Yes** >> Repair the excessive resistance in the Temperature Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. EXCESSIVE RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT**

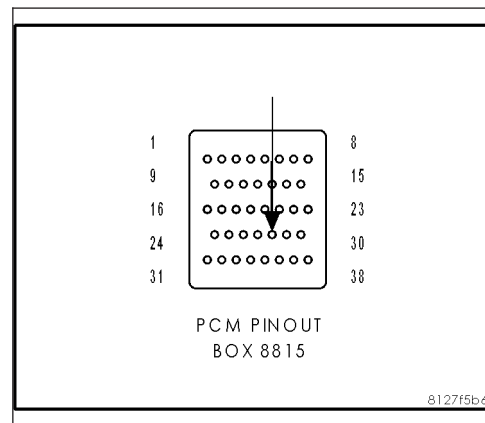
Measure the resistance of the (K900) Sensor ground circuit from the Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance above 5.0 ohms.**

**Yes** >> Repair the excessive resistance in the (K900) Sensor ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P1115-GENERAL TEMPERATURE RATIONALITY (CONTINUED)****6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

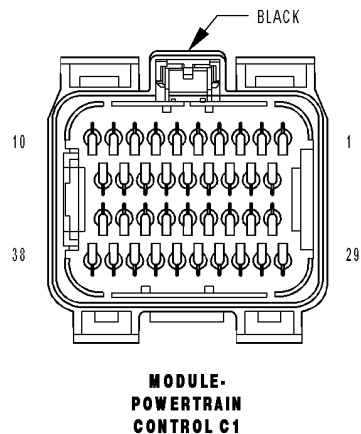
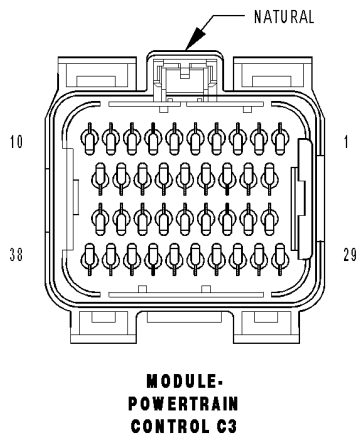
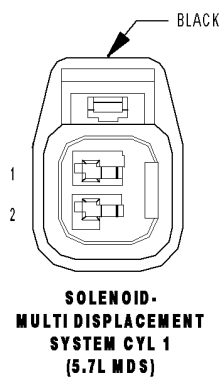
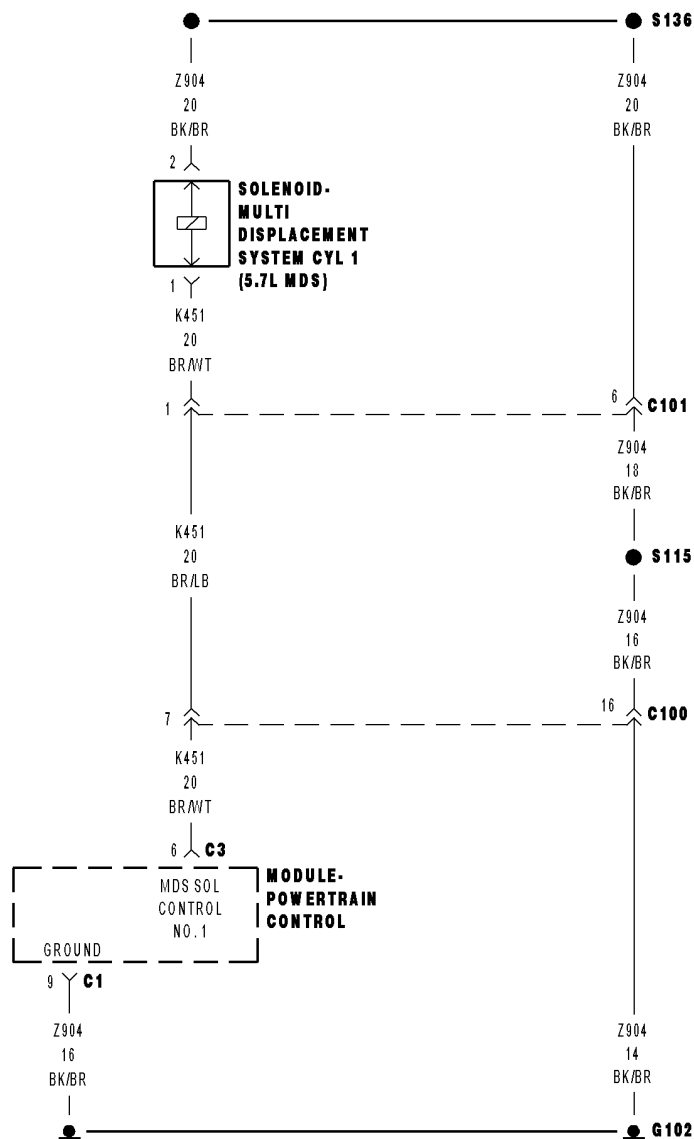
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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## P1411–CYLINDER 1 REACTIVATION CONTROL PERFORMANCE



**P1411-CYLINDER 1 REACTIVATION CONTROL PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

When all criteria has been met, power is supplied to each MDS Solenoid when the engine is making a transition from 8 cylinder mode to 4 cylinder mode. By actuating the solenoid, oil pressure is raised to the pair of lifters that coincide with each particular solenoid. The oil pressure pushes in the locking pins that allows the lifter to collapse, decoupling the valves and camshaft.

- **When Monitored:**  
Transition from 8 to 4 cylinder mode.
- **Set Condition:**  
The MDS fails to active and take place for cylinder 1.

Possible Causes
(K451) MDS SOLENOID NO.1 CONTROL SHORT TO GROUND (K451) MDS SOLENOID NO.1 CONTROL OPEN (Z904) GROUND CIRCUIT OPEN INSUFFICIENT OIL PRESSURE ACTING ON THE LIFTER LOCKING PINS OIL PASSAGES RESTRICTED LIFTER MDS SOLENOID NO.1 PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

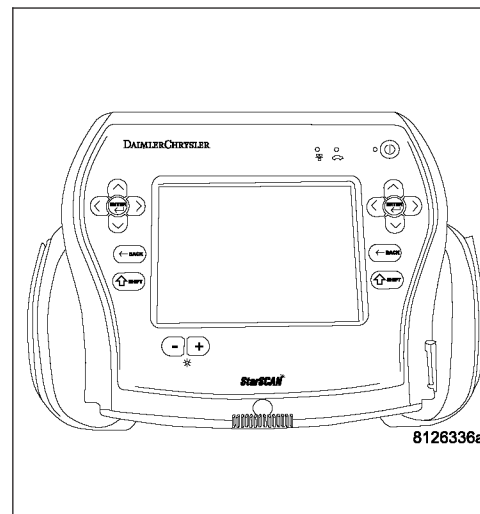
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1411-CYLINDER 1 REACTIVATION CONTROL PERFORMANCE (CONTINUED)****2. MDS SOLENOID NO.1**

Turn the ignition off.

Gain access to the MDS Solenoid No.1.

Disconnect the MDS Solenoid No.1 harness connector.

Ignition on, engine not running.

Turn off all accessories.

Using a 12-volt test light connected to the (Z904) Ground circuit, probe the (K451) MDS Solenoid No.1 Control circuit.

With a scan tool, actuate the MDS Solenoid 1.

**Does the 12-volt test light flash on and off?**

**Yes** >> Go To 7

**No** >> Go To 3

**3. (Z904) GROUND CIRCUIT OPEN**

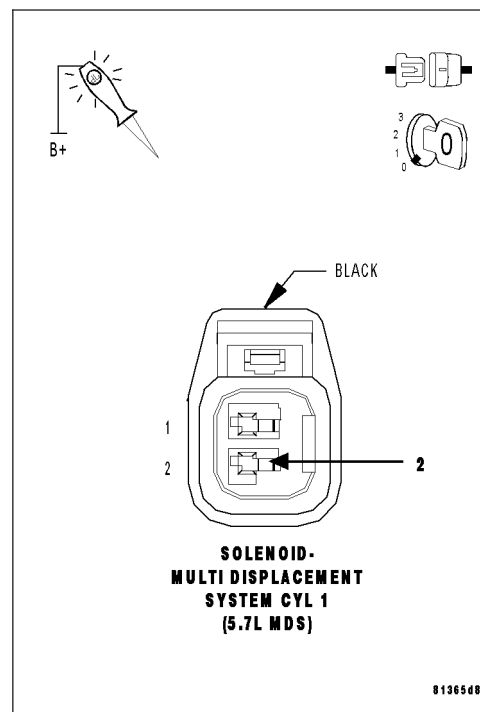
Turn the ignition off.

Using a 12-volt test light connected to the 12-volts, probe the (Z904) Ground circuit in the MDS Solenoid No.1 harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open in the (Z904) Ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P1411-CYLINDER 1 REACTIVATION CONTROL PERFORMANCE (CONTINUED)****4. (K451) MDS SOLENOID NO.1 CONTROL CIRCUIT SHORTED TO GROUND**

Disconnect the PCM harness connector.

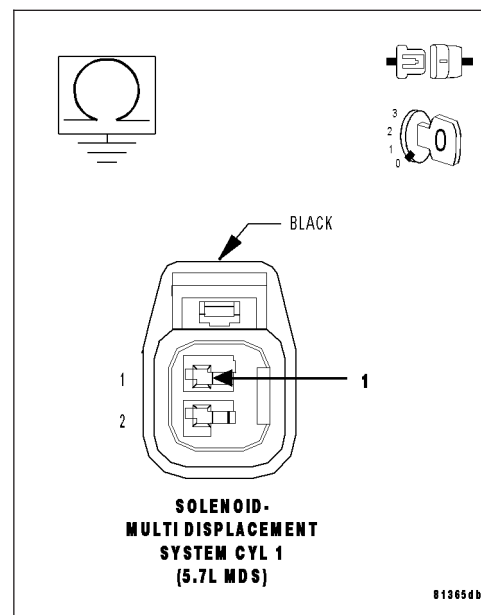
Measure the resistance between ground and the (K451) MDS Solenoid No.1 Control circuit in the MDS Solenoid No.1 harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K451) MDS Solenoid No.1 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K451) MDS SOLENOID NO.1 CONTROL CIRCUIT OPEN**

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

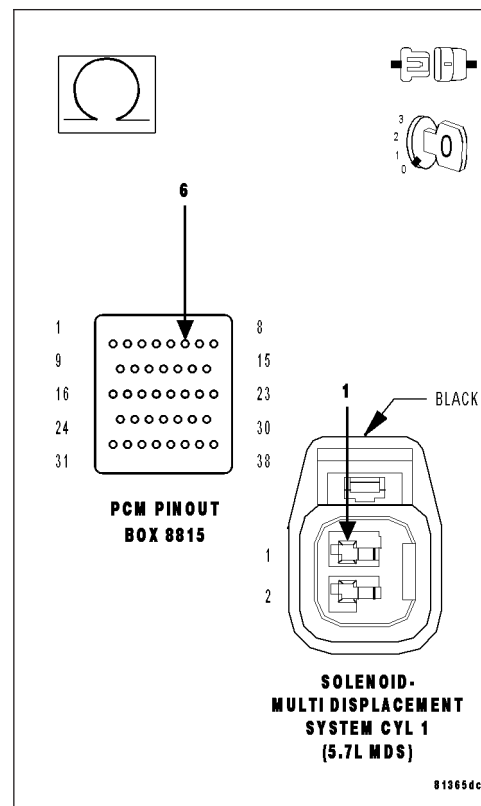
Measure the resistance of the (K451) MDS Solenoid No.1 Control circuit from the MDS Solenoid No.1 harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K451) MDS Solenoid No.1 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1411-CYLINDER 1 REACTIVATION CONTROL PERFORMANCE (CONTINUED)****6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**7. MDS SOLENOID 1**

Turn the ignition off.

Remove the Intake Manifold per Service Information.

Reconnect the Solenoid connector.

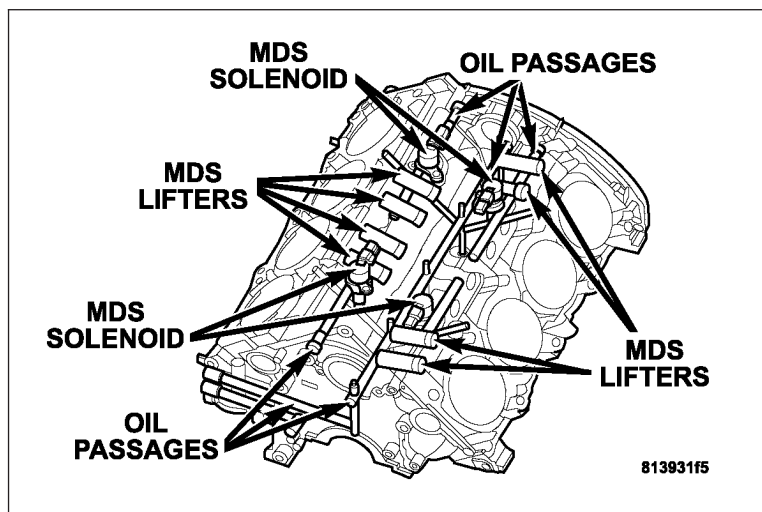
Turn the ignition on.

With the scan tool actuate the MDS Solenoid 1.

**Can you feel and hear the Solenoid Actuating?**

**Yes** >> Go To 8

**No** >> Remove the Solenoid and check for any debris that may be blocking the oil passages to the Solenoid. If the passages are clogged, clean the passages and replace the MDS Solenoid 1. If the passages are not clogged with debris, replace the MDS Solenoid 1.



---

**8. OIL PASSAGES RESTRICTED**

Turn the ignition off.

Remove both Solenoids on Bank 1 of the engine block.

Remove the Bank 1 Cylinder Head per Service Information.

Remove the Lifters from the left engine bank.

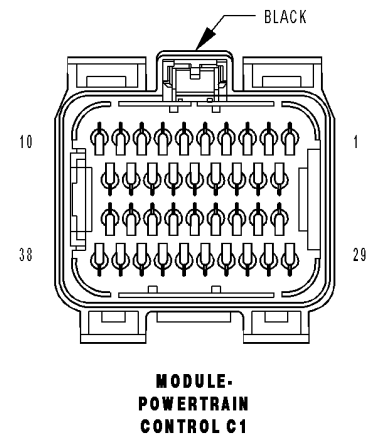
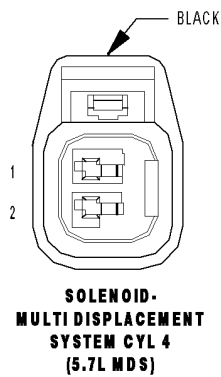
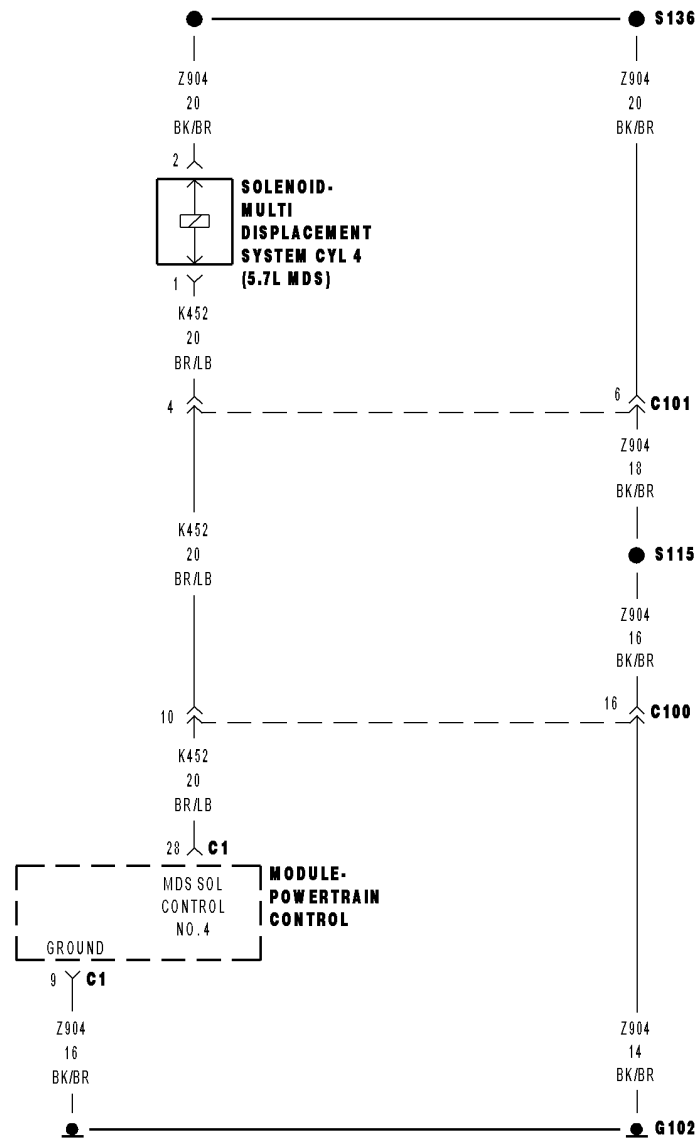
Inspect the oil passages to the Solenoids and from the Solenoids to the lifters.

**Are the passages blocked?**

**Yes** >> Clean the oil passages as necessary. If the entire engine is restricted disassembly of the entire engine block may be necessary.

**No** >> Replace both sets of lifters if no other possible causes remain.

---

**P1414—CYLINDER 4 REACTIVATION CONTROL PERFORMANCE**

## P1414-CYLINDER 4 REACTIVATION CONTROL PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

### Theory of Operation

When all criteria has been met, power is supplied to each MDS Solenoid when the engine is making a transition from 8 cylinder mode to 4 cylinder mode. By actuating the solenoid, oil pressure is raised to the pair of lifters that coincide with each particular solenoid. The oil pressure pushes in the locking pins that allows the lifter to collapse, decoupling the valves and camshaft.

- **When Monitored:**  
Transition from 8 to 4 cylinder mode.
- **Set Condition:**  
The MDS fails to active and take place for cylinder 4.

Possible Causes
(K452) MDS SOLENOID NO.4 CONTROL SHORT TO GROUND (K452) MDS SOLENOID NO.4 CONTROL OPEN (Z904) GROUND CIRCUIT OPEN INSUFFICIENT OIL PRESSURE ACTING ON THE LIFTER LOCKING PINS OIL PASSAGES RESTRICTED LIFTER MDS SOLENOID NO.4 PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

### Diagnostic Test

#### 1. ACTIVE DTC

Ignition on, engine not running.

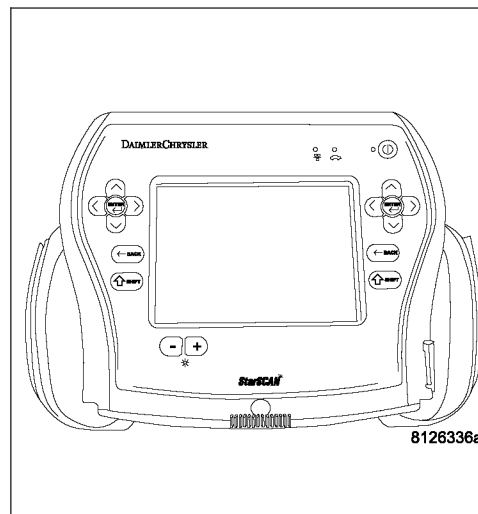
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1414-CYLINDER 4 REACTIVATION CONTROL PERFORMANCE (CONTINUED)****2. MDS SOLENOID NO.4**

Turn the ignition off.

Gain access to the MDS Solenoid No.4.

Disconnect the MDS Solenoid No.4 harness connector.

Ignition on, engine not running.

Turn off all accessories.

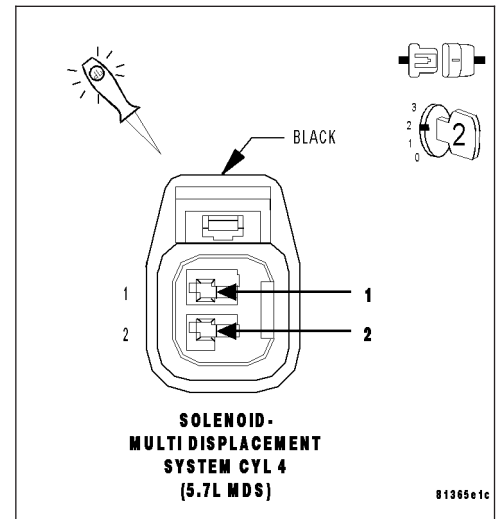
Using a 12-volt test light connected to the (Z904) Ground circuit, probe the (K452) MDS Solenoid No.4 Control circuit.

With a scan tool, actuate the MDS Solenoid 4.

**Does the 12-volt test light flash on and off?**

**Yes** >> Go To 7

**No** >> Go To 3

**3. (Z904) GROUND CIRCUIT OPEN**

Turn the ignition off.

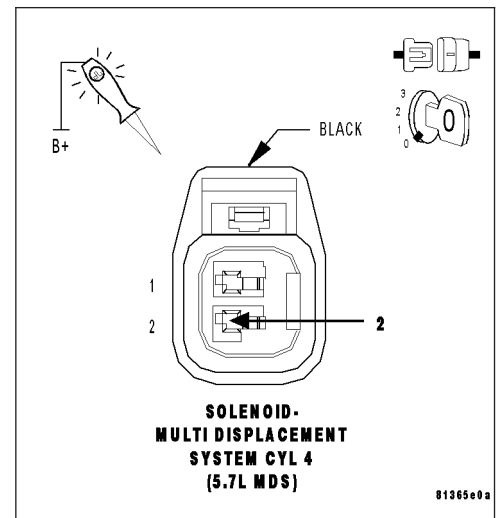
Using a 12-volt test light connected to the 12-volts, probe the (Z904) Ground circuit in the MDS Solenoid No.4 harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open in the (Z904) Ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1414-CYLINDER 4 REACTIVATION CONTROL PERFORMANCE (CONTINUED)****4. (K452) MDS SOLENOID NO.4 CONTROL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connector.

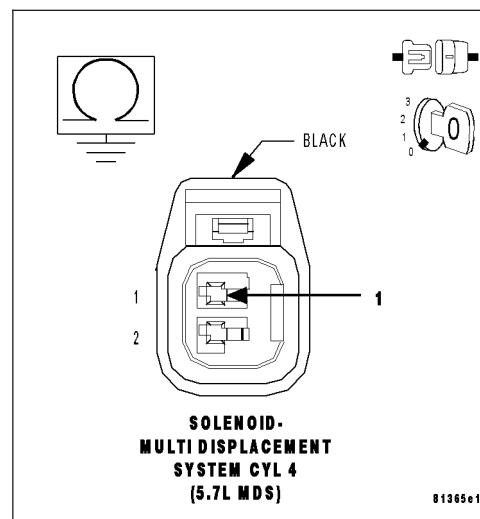
Measure the resistance between ground and the (K452) MDS Solenoid No.4 Control circuit in the MDS Solenoid No.4 harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K452) MDS Solenoid No.4 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K452) MDS SOLENOID NO.4 CONTROL CIRCUIT OPEN**

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

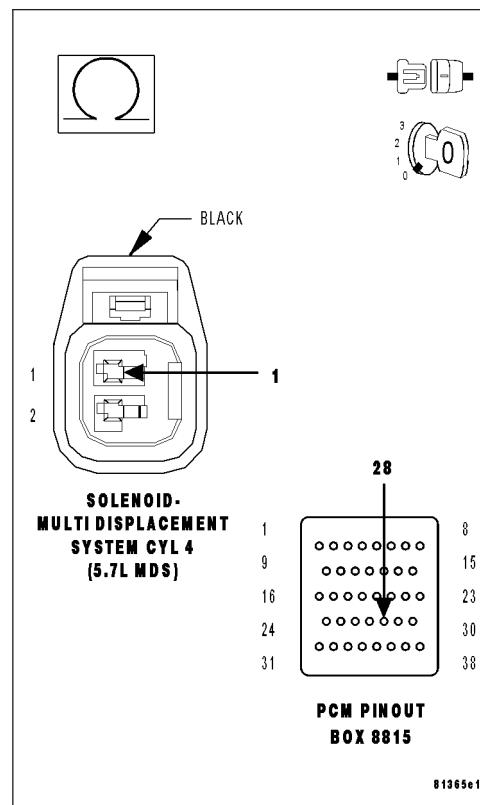
Measure the resistance of the (K452) MDS Solenoid No.4 Control circuit from the MDS Solenoid No.4 harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K452) MDS Solenoid No.4 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1414-CYLINDER 4 REACTIVATION CONTROL PERFORMANCE (CONTINUED)****6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. MDS SOLENOID 4**

Turn the ignition off.

Remove the Intake Manifold per Service Information.

Reconnect the Solenoid harness connector.

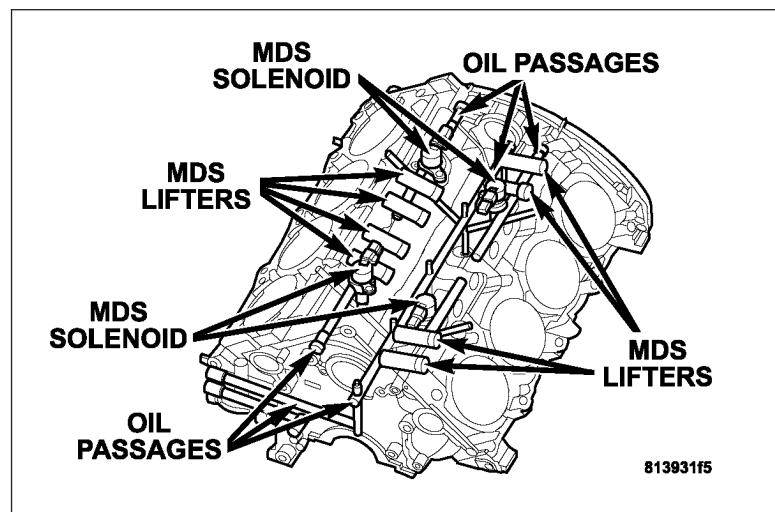
Turn the ignition on.

With the scan tool actuate the MDS Solenoid 4.

**Can you feel and hear the Solenoid Actuating?**

**Yes** >> Go To 8

**No** >> Remove the Solenoid and check for any debris that may be blocking the oil passages to the Solenoid. If the passages are clogged, clean the passages and replace the MDS Solenoid 4. If the passages are not clogged with debris, replace the MDS Solenoid 4.

**8. OIL PASSAGES RESTRICTED**

Turn the ignition off.

Remove both Solenoids on Bank 2 of the engine block.

Remove the Bank 2 Cylinder Head per Service Information.

Remove the Lifters from the right engine bank.

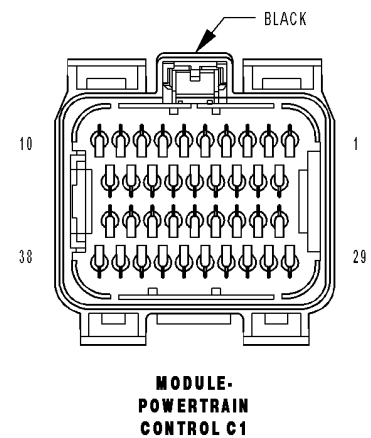
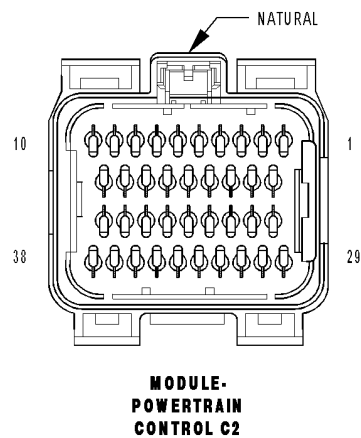
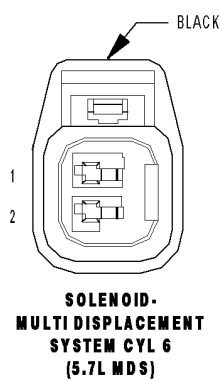
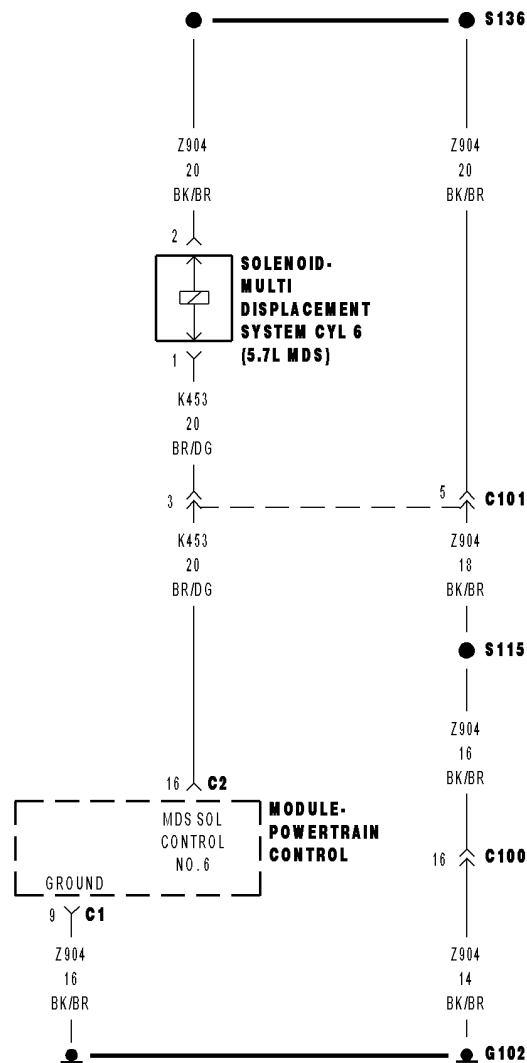
Inspect the oil passages to the Solenoids and from the Solenoids to the lifters.

**Are the passages blocked?**

**Yes** >> Clean the oil passages as necessary. If the entire engine is restricted disassembly of the entire engine block may be necessary.

**No** >> Replace both sets of lifters if no other possible causes remain.

## P1416-CYLINDER 6 REACTIVATION CONTROL PERFORMANCE





**P1416–CYLINDER 6 REACTIVATION CONTROL PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

When all criteria has been met, power is supplied to each MDS Solenoid when the engine is making a transition from 8 cylinder mode to 4 cylinder mode. By actuating the solenoid, oil pressure is raised to the pair of lifters that coincide with each particular solenoid. The oil pressure pushes in the locking pins that allows the lifter to collapse, decoupling the valves and camshaft.

- **When Monitored:**  
Transition from 8 to 4 cylinder mode.
- **Set Condition:**  
The MDS fails to active and take place for cylinder 6.

Possible Causes
(K453) MDS SOLENOID NO.6 CONTROL SHORT TO GROUND (K453) MDS SOLENOID NO.6 CONTROL OPEN (Z904) GROUND CIRCUIT OPEN INSUFFICIENT OIL PRESSURE ACTING ON THE LIFTER LOCKING PINS OIL PASSAGES RESTRICTED LIFTER MDS SOLENOID NO.6 PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test**

**1. ACTIVE DTC**

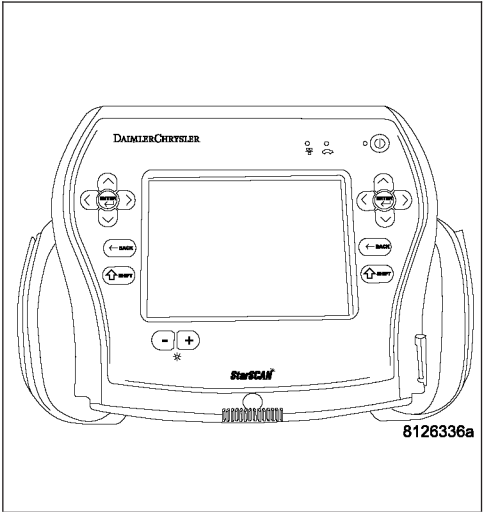
Ignition on, engine not running.

With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes

>> Go To 2
- No

>> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1416-CYLINDER 6 REACTIVATION CONTROL PERFORMANCE (CONTINUED)****2. MDS SOLENOID NO.6**

Turn the ignition off.

Gain access to the MDS Solenoid No.6.

Disconnect the MDS Solenoid No.6 harness connector.

Ignition on, engine not running.

Turn off all accessories.

Using a 12-volt test light connected to the (Z904) Ground circuit, probe the (K453) MDS Solenoid No.6 Control circuit.

With a scan tool, actuate the MDS Solenoid 6.

**Does the 12-volt test light flash on and off?**

**Yes** >> Go To 7

**No** >> Go To 3

**3. (Z904) GROUND CIRCUIT OPEN**

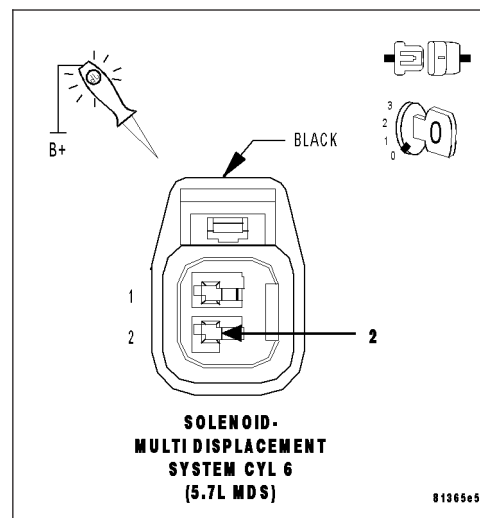
Turn the ignition off.

Using a 12-volt test light connected to the 12-volts, probe the (Z904) Ground circuit in the MDS Solenoid No.6 harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open in the (Z904) Ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1416-CYLINDER 6 REACTIVATION CONTROL PERFORMANCE (CONTINUED)****4. (K453) MDS SOLENOID NO.6 CONTROL CIRCUIT SHORTED TO GROUND**

Disconnect the PCM harness connector.

Turn the ignition off.

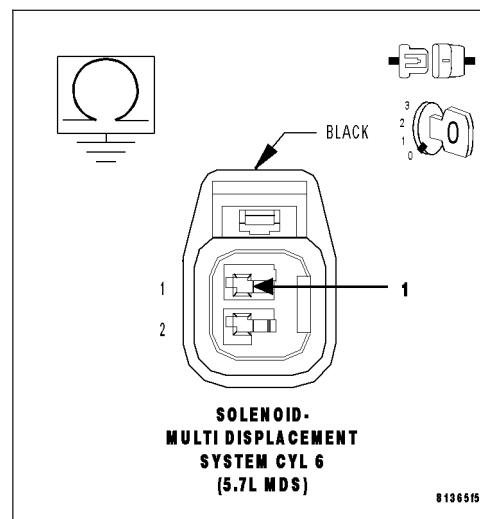
Measure the resistance between ground and the (K453) MDS Solenoid No.6 Control circuit in the MDS Solenoid No.6 harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K453) MDS Solenoid No.6 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K453) MDS SOLENOID NO.6 CONTROL CIRCUIT OPEN**

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

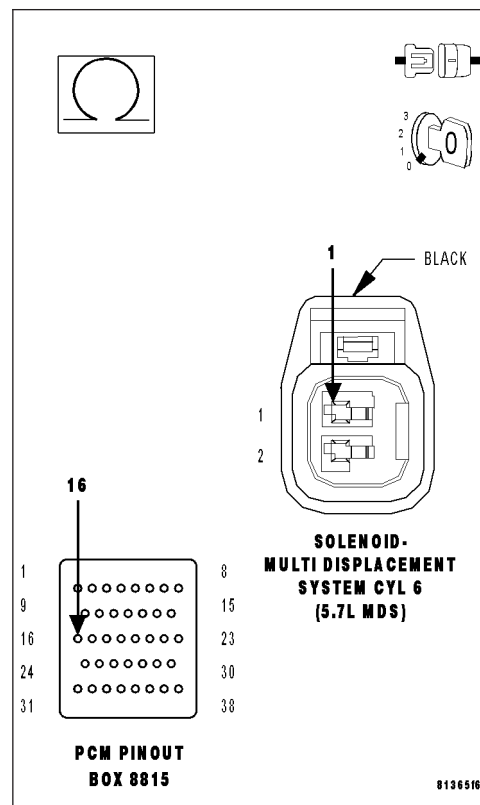
Measure the resistance of the (K453) MDS Solenoid No.6 Control circuit from the MDS Solenoid No.6 harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K453) MDS Solenoid No.6 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1416-CYLINDER 6 REACTIVATION CONTROL PERFORMANCE (CONTINUED)****6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. MDS SOLENOID 6**

Turn the ignition off.

Remove the Intake Manifold per Service Information.

Reconnect the Solenoid connector.

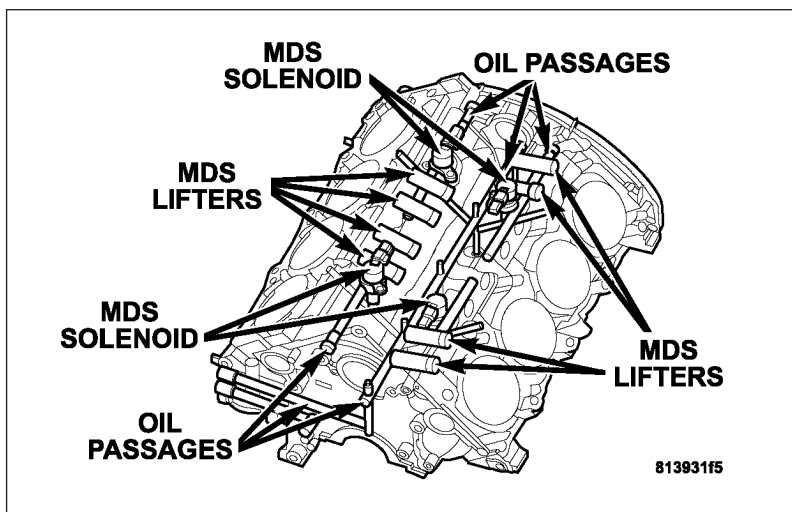
Turn the ignition on.

With the scan tool actuate the MDS Solenoid 6.

**Can you feel and hear the Solenoid Actuating?**

**Yes** >> Go To 8

**No** >> Remove the Solenoid and check for any debris that may be blocking the oil passages to the Solenoid. If the passages are clogged, clean the passages and replace the MDS Solenoid 6. If the passages are not clogged with debris, replace the MDS Solenoid 6.

**8. OIL PASSAGES RESTRICTED**

Turn the ignition off.

Remove both Solenoids on Bank 2 of the engine block.

Remove the Bank 2 Cylinder Head per Service Information.

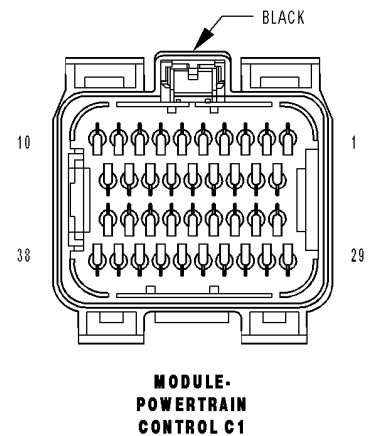
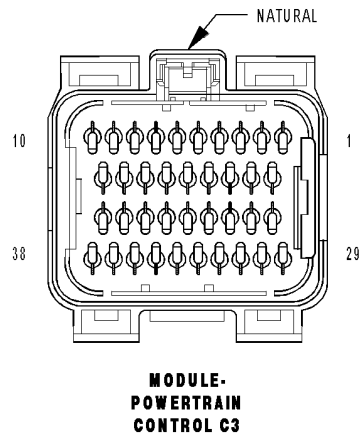
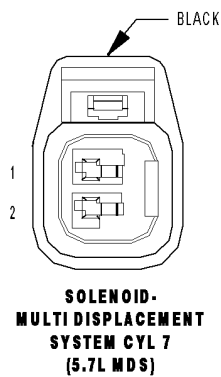
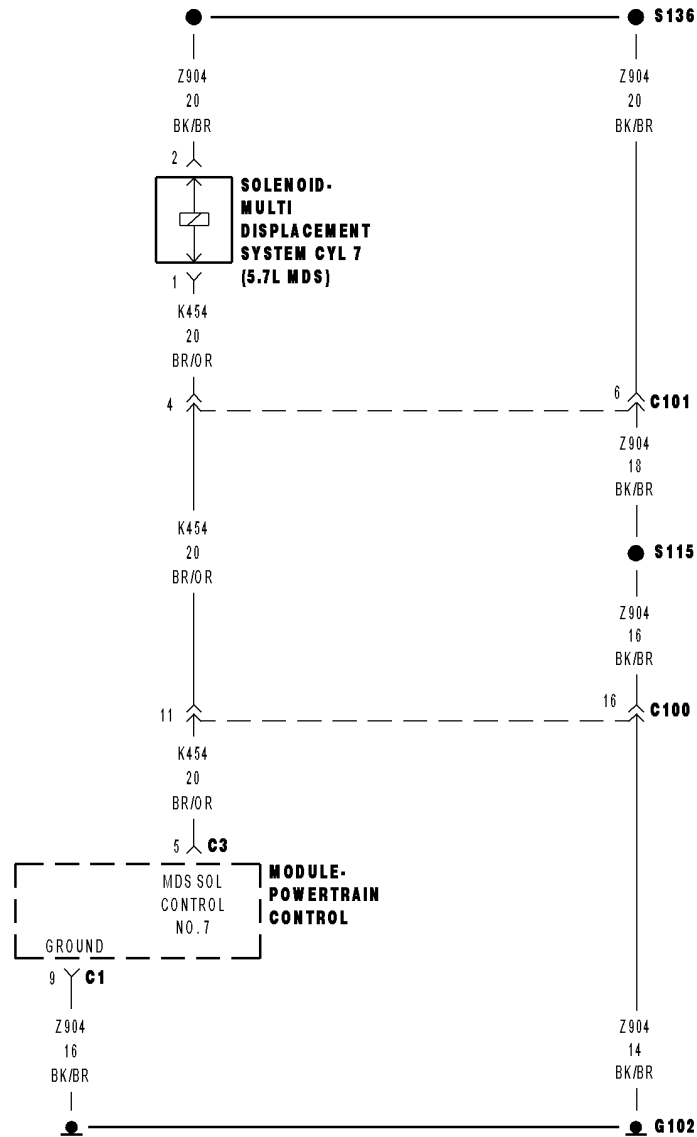
Remove the Lifters from the right engine bank.

Inspect the oil passages to the Solenoids and from the Solenoids to the lifters.

**Are the passages blocked?**

**Yes** >> Clean the oil passages as necessary. If the entire engine is restricted disassembly of the entire engine block may be necessary.

**No** >> Replace both sets of lifters if no other possible causes remain.

**P1417–CYLINDER 7 REACTIVATION CONTROL PERFORMANCE**

**P1417-CYLINDER 7 REACTIVATION CONTROL PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

When all criteria has been met, power is supplied to each MDS Solenoid when the engine is making a transition from 8 cylinder mode to 4 cylinder mode. By actuating the solenoid, oil pressure is raised to the pair of lifters that coincide with each particular solenoid. The oil pressure pushes in the locking pins that allows the lifter to collapse, decoupling the valves and camshaft.

- **When Monitored:**  
Transition from 8 to 4 cylinder mode.
- **Set Condition:**  
The MDS fails to active and take place for cylinder 7.

Possible Causes
(K454) MDS SOLENOID NO.7 CONTROL SHORT TO GROUND (K454) MDS SOLENOID NO.7 CONTROL OPEN (Z904) GROUND CIRCUIT OPEN INSUFFICIENT OIL PRESSURE ACTING ON THE LIFTER LOCKING PINS OIL PASSAGES RESTRICTED LIFTER MDS SOLENOID NO.7 PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

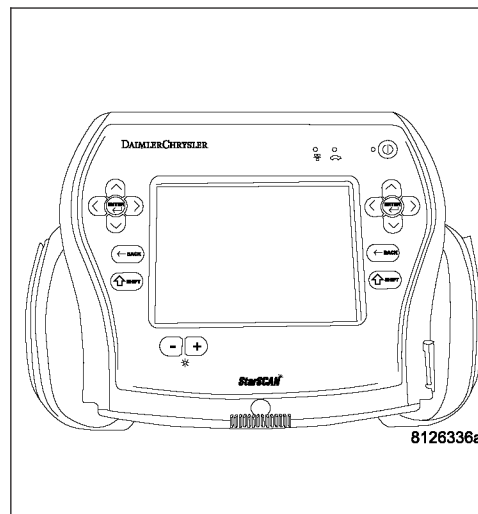
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1417-CYLINDER 7 REACTIVATION CONTROL PERFORMANCE (CONTINUED)****2. MDS SOLENOID NO.7**

Turn the ignition off.

Gain access to the MDS Solenoid No.7.

Disconnect the MDS Solenoid No.7 harness connector.

Ignition on, engine not running.

Turn off all accessories.

Using a 12-volt test light connected to the (Z904) Ground circuit, probe the (K454) MDS Solenoid No.7 Control circuit.

With a scan tool, actuate the MDS Solenoid 7.

**Does the 12-volt test light flash on and off?**

**Yes** >> Go To 7

**No** >> Go To 3

**3. (Z904) GROUND CIRCUIT OPEN**

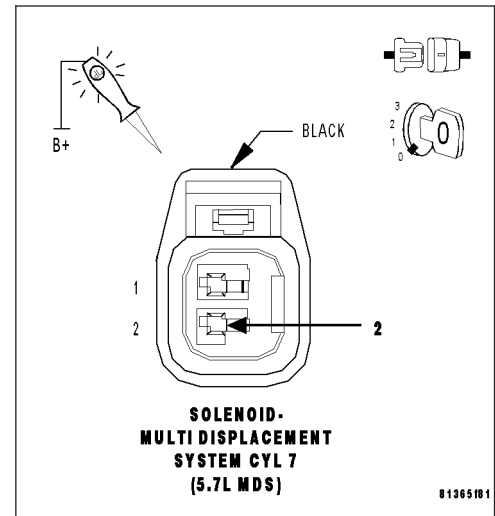
Turn the ignition off.

Using a 12-volt test light connected to the 12-volts, probe the (Z904) Ground circuit in the MDS Solenoid No.7 harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open in the (Z904) Ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P1417-CYLINDER 7 REACTIVATION CONTROL PERFORMANCE (CONTINUED)

### 4. (K454) MDS SOLENOID NO.7 CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the PCM harness connector.

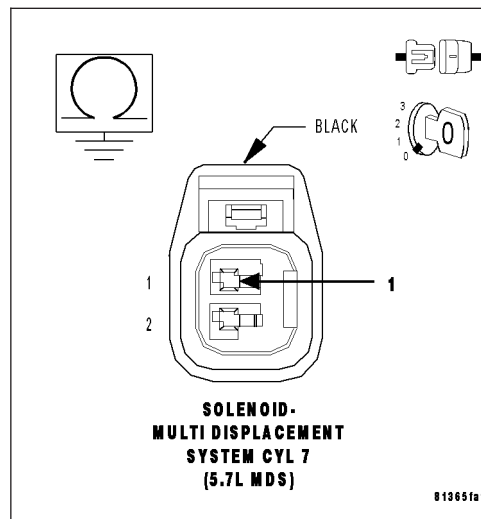
Measure the resistance between ground and the (K454) MDS Solenoid No.7 Control circuit in the MDS Solenoid No.7 harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K454) MDS Solenoid No.7 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



### 5. (K454) MDS SOLENOID NO.7 CONTROL CIRCUIT OPEN

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

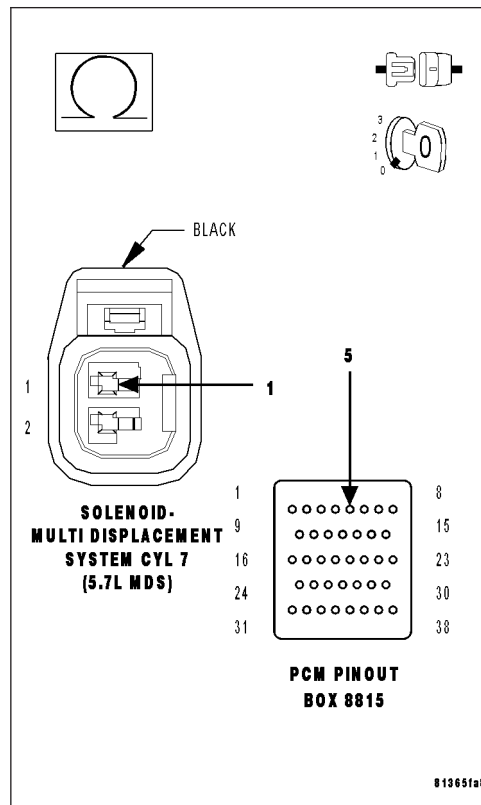
Measure the resistance of the (K454) MDS Solenoid No.7 Control circuit from the MDS Solenoid No.7 harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K454) MDS Solenoid No.7 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P1417-CYLINDER 7 REACTIVATION CONTROL PERFORMANCE (CONTINUED)****6. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. MDS SOLENOID 7**

Turn the ignition off.

Remove the Intake Manifold per Service Information.

Reconnect the Solenoid harness connector.

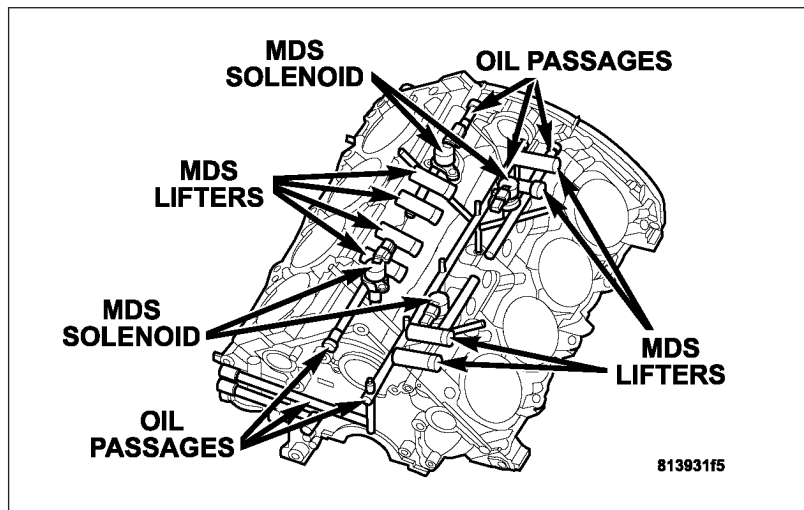
Turn the ignition on.

With the scan tool actuate the MDS Solenoid 7.

**Can you feel and hear the Solenoid Actuating?**

**Yes** >> Go To 8

**No** >> Remove the Solenoid and check for any debris that may be blocking the oil passages to the Solenoid. If the passages are clogged, clean the passages and replace the MDS Solenoid 7. If the passages are not clogged with debris, replace the MDS Solenoid 7.

**8. OIL PASSAGES RESTRICTED**

Turn the ignition off.

Remove both Solenoids on Bank 1 of the engine block.

Remove the Bank 1 Cylinder Head per Service Information.

Remove the Lifters from the left engine bank.

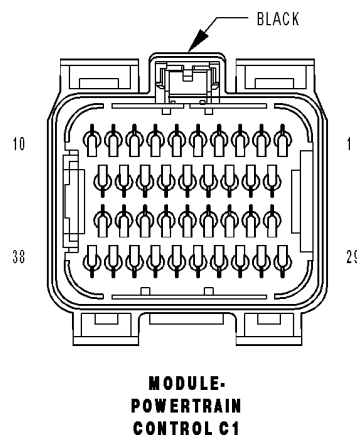
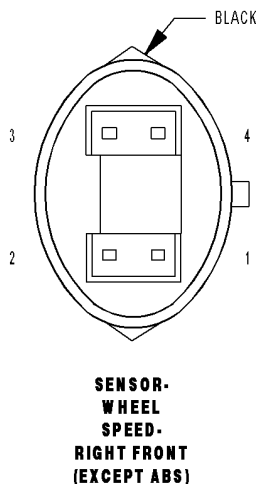
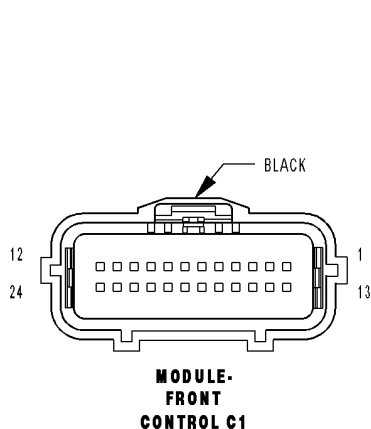
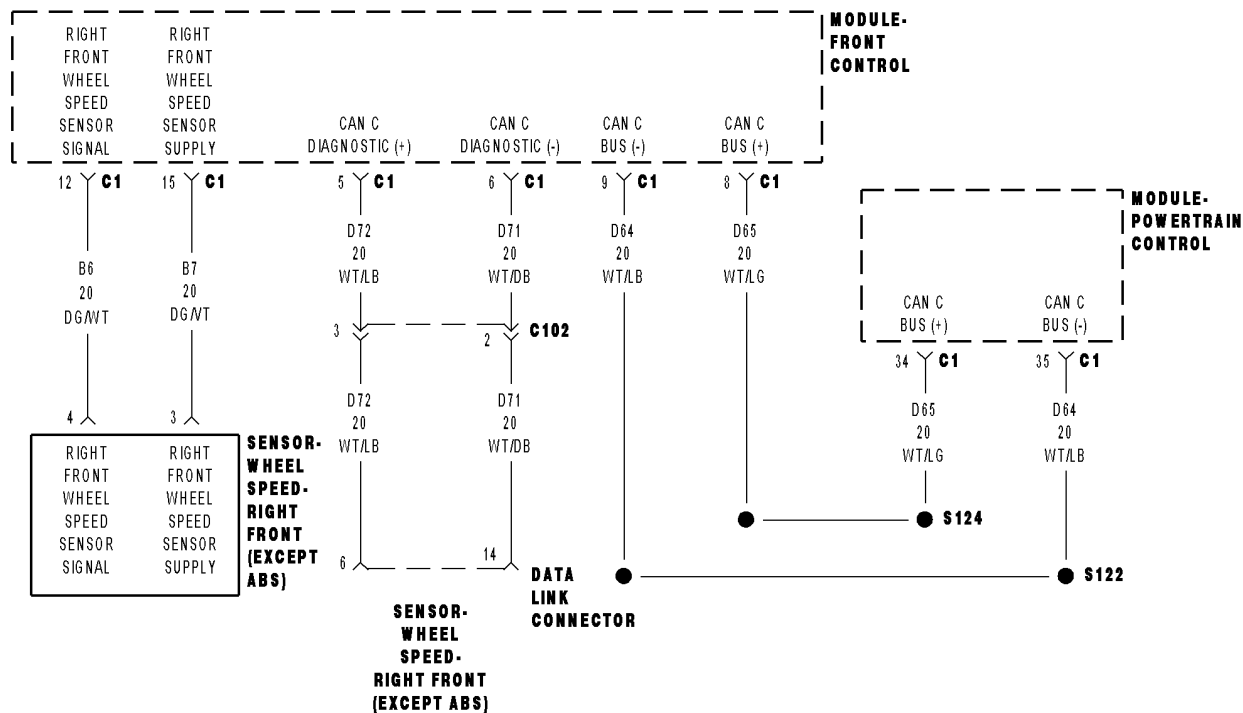
Inspect the oil passages to the Solenoids and from the Solenoids to the lifters.

**Are the passages blocked?**

**Yes** >> Clean the oil passages as necessary. If the entire engine is restricted disassembly of the entire engine block may be necessary.

**No** >> Replace both sets of lifters if no other possible causes remain.

# P1501-VEHICLE SPEED SENSOR 1/2 CORRELATION — DRIVE WHEELS (Not Equipped with ABS)



**P1501-VEHICLE SPEED SENSOR 1/2 CORRELATION — DRIVE WHEELS (Not Equipped with ABS) (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on, vehicle moving. Speed control is learned and the speed control is trying to be activated.
- **Set Condition:**  
The PCM recognizes rear wheel speed is greater than the front wheel speed.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCS
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test****1. ACTIVE DTC**

**Note:** The following items must be checked before continuing.

- Pinion Factor and Tire Size **MUST** be programmed in the Front Control Module.
- All Bus Communication DTCs **MUST** be diagnosed.
- All Vehicle Speed DTCs that may be active in the Front Control Module or in the Transmission Control Module **MUST** be diagnosed.

Ignition on, engine not running.

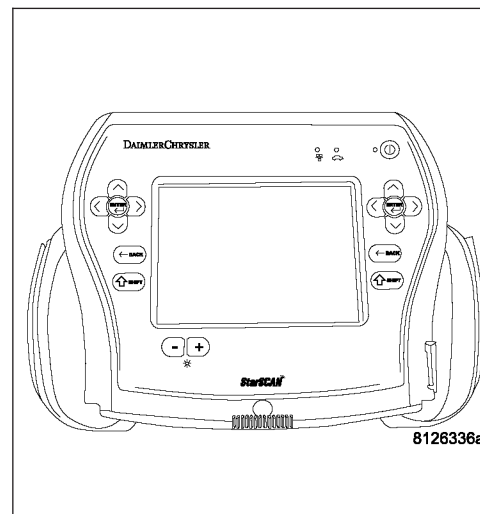
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**2. VISUAL INSPECTION**

**Note:** This code can set due to the following conditions.

- Unequal tire circumference between the tires on the vehicle.
- Front or Rear wheels moving while the opposite wheels are not. (i.e., wheels slipping on loose gravel, ice or hard acceleration)

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

**Were any of the above conditions found?**

**Yes** >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P1501–VEHICLE SPEED SENSOR 1/2 CORRELATION — DRIVE WHEELS (Not Equipped with ABS) (CONTINUED)****No** >> Go To 3

---

**3. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

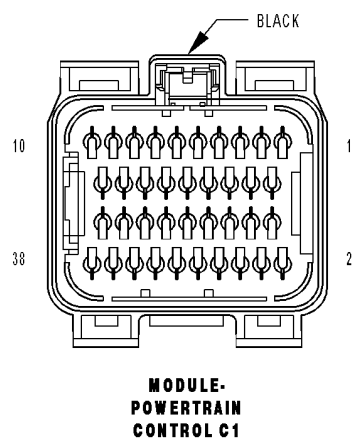
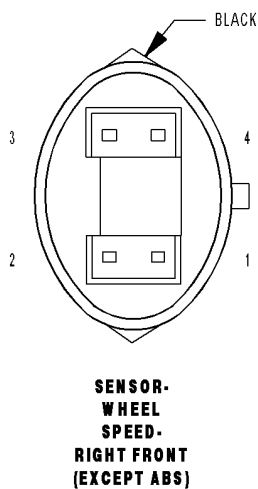
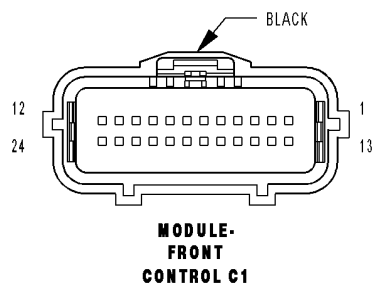
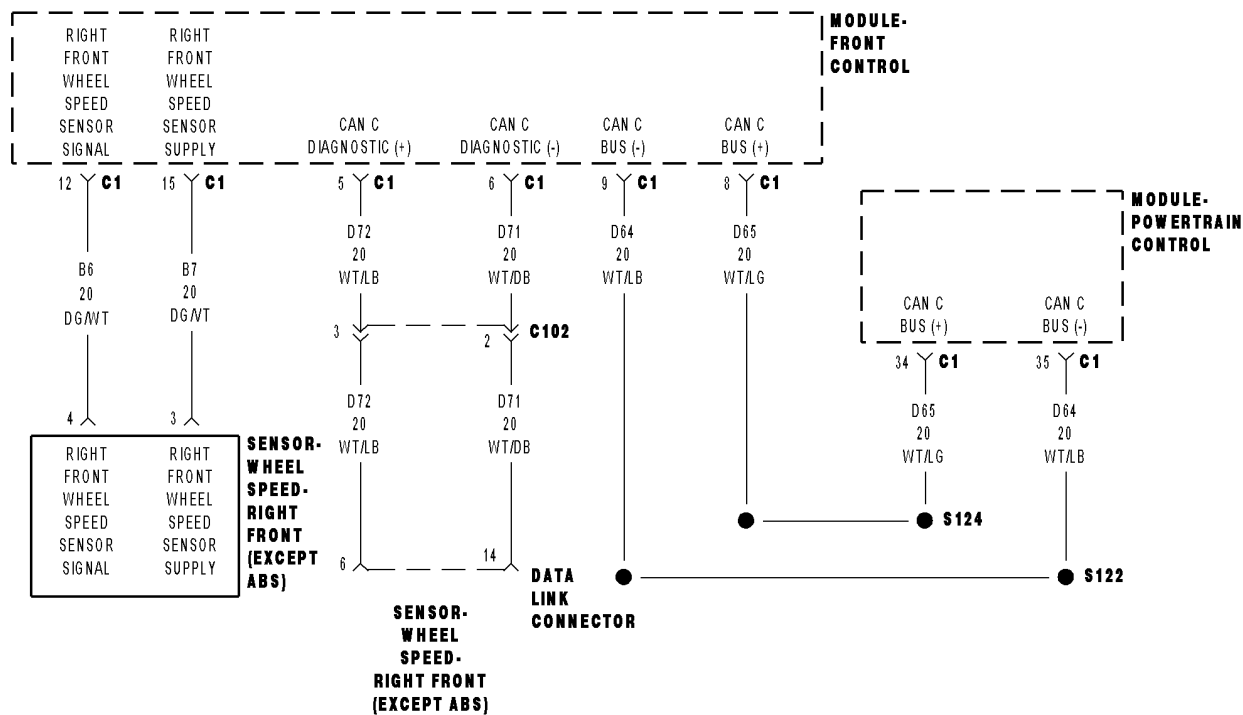
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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## P1502-VEHICLE SPEED SENSOR 1/2 CORRELATION — NON DRIVE WHEELS (Not Equipped with ABS)



**P1502-VEHICLE SPEED SENSOR 1/2 CORRELATION — NON DRIVE WHEELS****(Not Equipped with ABS) (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on and vehicle moving. Brake pedal must not be applied.
- **Set Condition:**  
The PCM recognizes the front wheel speed is greater than the rear wheel speed.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCS
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test****1. ACTIVE DTC**

**Note:** The following items must be checked before continuing.

- Pinion Factor and Tire Size **MUST** be programmed in the Front Control Module.
- All Bus Communication DTCs **MUST** be diagnosed.
- All Vehicle Speed DTCs that may be active in the Front Control Module or in the Transmission Control Module **MUST** be diagnosed.

Ignition on, engine not running.

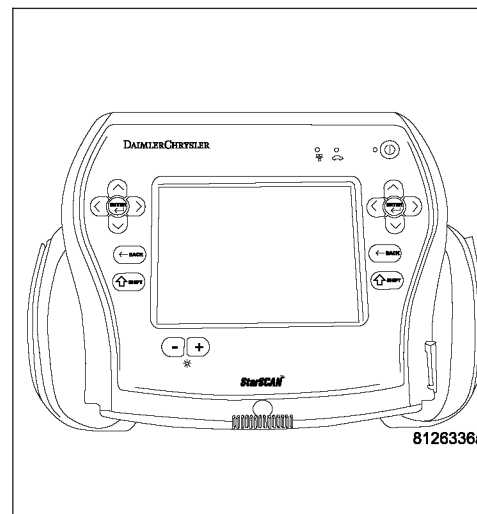
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1502-VEHICLE SPEED SENSOR 1/2 CORRELATION — NON DRIVE WHEELS  
(Not Equipped with ABS) (CONTINUED)****2. VISUAL INSPECTION**

**Note:** This code can set due to the following conditions.

- Unequal tire circumference between the tires on the vehicle.
- Front or Rear wheels moving while the opposite wheels are not. (i.e., wheels slipping on loose gravel, ice or hard acceleration)

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

**Were any of the above conditions found?**

**Yes** >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

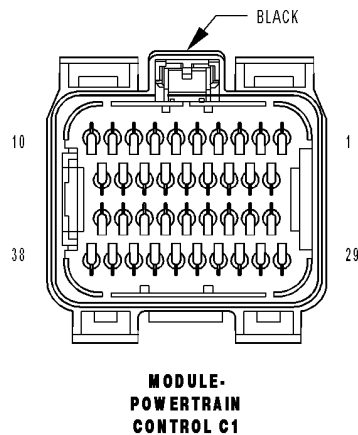
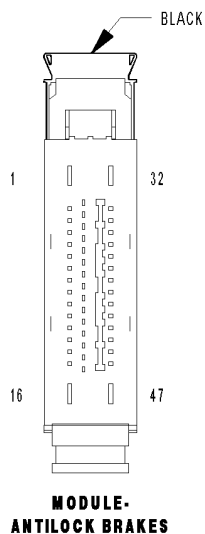
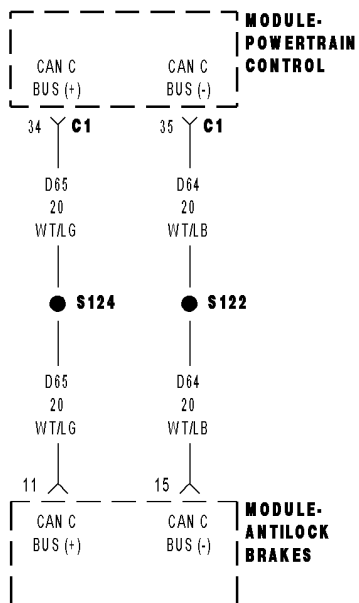
**Were there any problems found?**

**Yes** >> Repair as necessary. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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## P1501-VEHICLE SPEED SENSOR 1/2 CORRELATION — DRIVE WHEELS (Equipped with ABS)





**P1501-VEHICLE SPEED SENSOR 1/2 CORRELATION — DRIVE WHEELS**  
**(Equipped with ABS) (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on and the vehicle moving. Speed control is learned and the speed control is trying to be activated.
- **Set Condition:**  
The PCM recognizes the rear wheel speed is greater than the front wheel speed.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCS
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test**

**1. ACTIVE DTC**

**Note:** The following items must be performed before continuing.

- Pinion Factor and Tire Size **MUST** be programmed in the ABS Module.
- All Bus Communication DTCs **MUST** be diagnosed.
- All related Vehicle Speed and Wheel Speed DTCs that may be active in the ABS Module **MUST** be diagnosed. Refer to the ABS diagnostic information for the correct procedure.

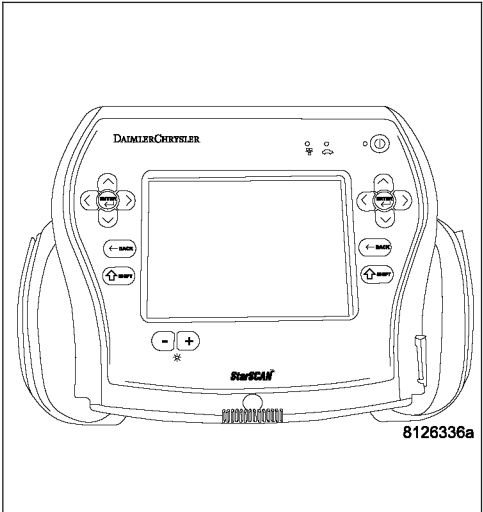
Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes**    >> Go To 2

**No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1501-VEHICLE SPEED SENSOR 1/2 CORRELATION — DRIVE WHEELS**  
**(Equipped with ABS) (CONTINUED)****2. VISUAL INSPECTION**

**Note:** This code can set due to the following conditions.

- Unequal tire circumference between the tires on the vehicle.
- Front or Rear wheels moving while the opposite wheels are not. (i.e., wheels slipping on loose gravel, ice or hard acceleration)

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

**Were any of the above conditions found?**

**Yes** >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

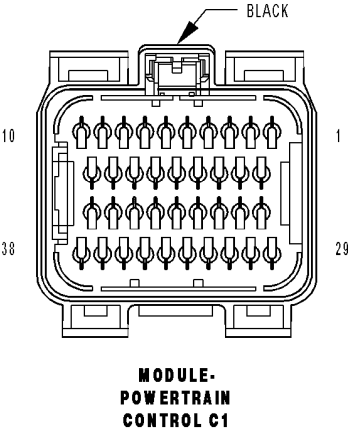
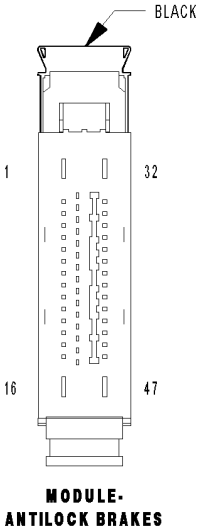
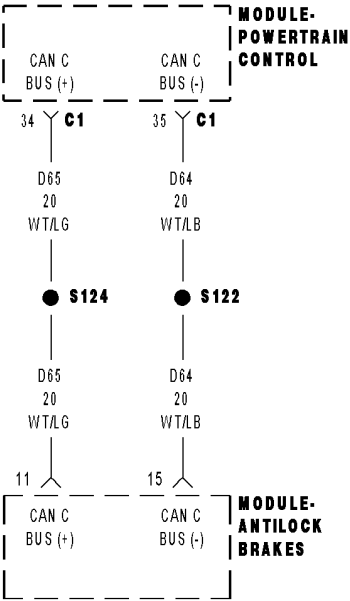
**Were there any problems found?**

**Yes** >> Repair as necessary. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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P1502-VEHICLE SPEED SENSOR 1/2 CORRELATION — NON DRIVE WHEELS  
(Equipped with ABS)



**P1502-VEHICLE SPEED SENSOR 1/2 CORRELATION — NON DRIVE WHEELS****(Equipped with ABS) (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on and the vehicle moving. Brake pedal must not be applied

- **Set Condition:**

The PCM recognizes the front axle speed is greater than the rear wheel speed.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCS
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** The following items must be performed before continuing.

- Pinion Factor and Tire Size **MUST** be programmed in the ABS Module.
- All Bus Communication DTCs **MUST** be diagnosed.
- All related Vehicle Speed and Wheel Speed DTCs that may be active in the ABS Module **MUST** be diagnosed. Refer to the ABS diagnostic information for the correct procedure.

Ignition on, engine not running.

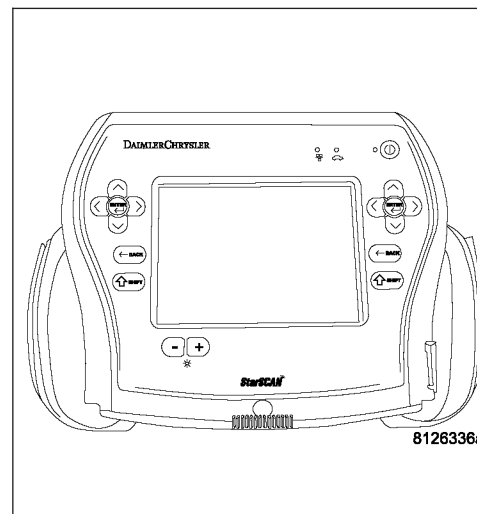
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1502-VEHICLE SPEED SENSOR 1/2 CORRELATION — NON DRIVE WHEELS**  
**(Equipped with ABS) (CONTINUED)****2. VISUAL INSPECTION**

**Note:** This code can set due to the following conditions.

- Unequal tire circumference between the tires on the vehicle.
- Front or Rear wheels moving while the opposite wheels are not. (i.e., wheels slipping on loose gravel, ice or hard acceleration)

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

**Were any of the above conditions found?**

**Yes** >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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## P1521—INCORRECT ENGINE OIL TYPE

- **When Monitored:**

Engine Running.

- **Set Condition:**

Using the oil pressure, oil temperature and other vital engine inputs the PCM can determine the engine oil viscosity. Incorrect viscosity will effect the operation of the MDS by delaying cylinder activation.

Possible Causes
INCORRECT ENGINE OIL TYPE ENGINE OIL CONTAMINATION ENGINE OIL

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

### Diagnostic Test

#### 1. ACTIVE DTC

**Note:** Review the customers oil change history. Ensure the customers is using the correct engine oil viscosity. If the incorrect oil is being used, change the oil, using the correct engine oil viscosity.

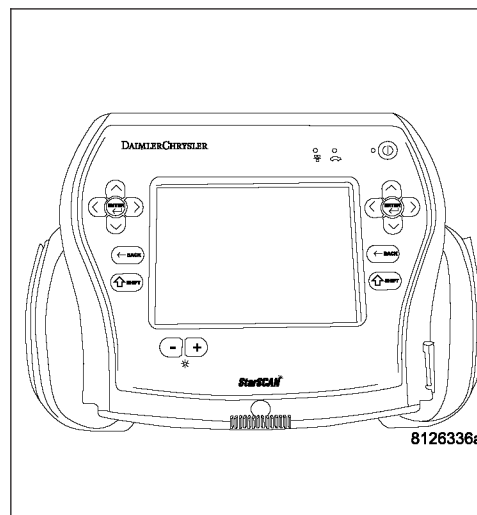
Ignition on, engine off.

With the scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go to 2

**No** >> Test Complete.



#### 2. ENGINE OIL

**Note:** If set along with P1521, repair any engine oil pressure or temperature DTCs first before continuing.

The following conditions must be checked.

- OEM recommended oil viscosity is being used.
- Customer is following the oil change schedule.
- Check the engine oil for contamination. (i.e., fuel and/or engine coolant)
- Internal engine condition that may effect oil pressure.

**Were any of the above condition found?**

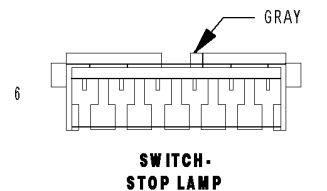
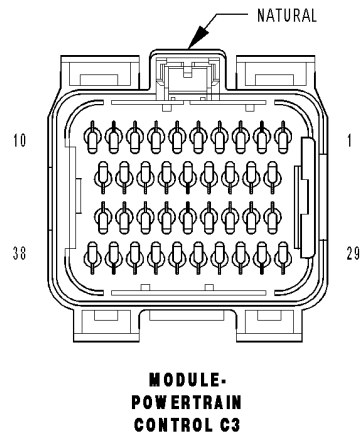
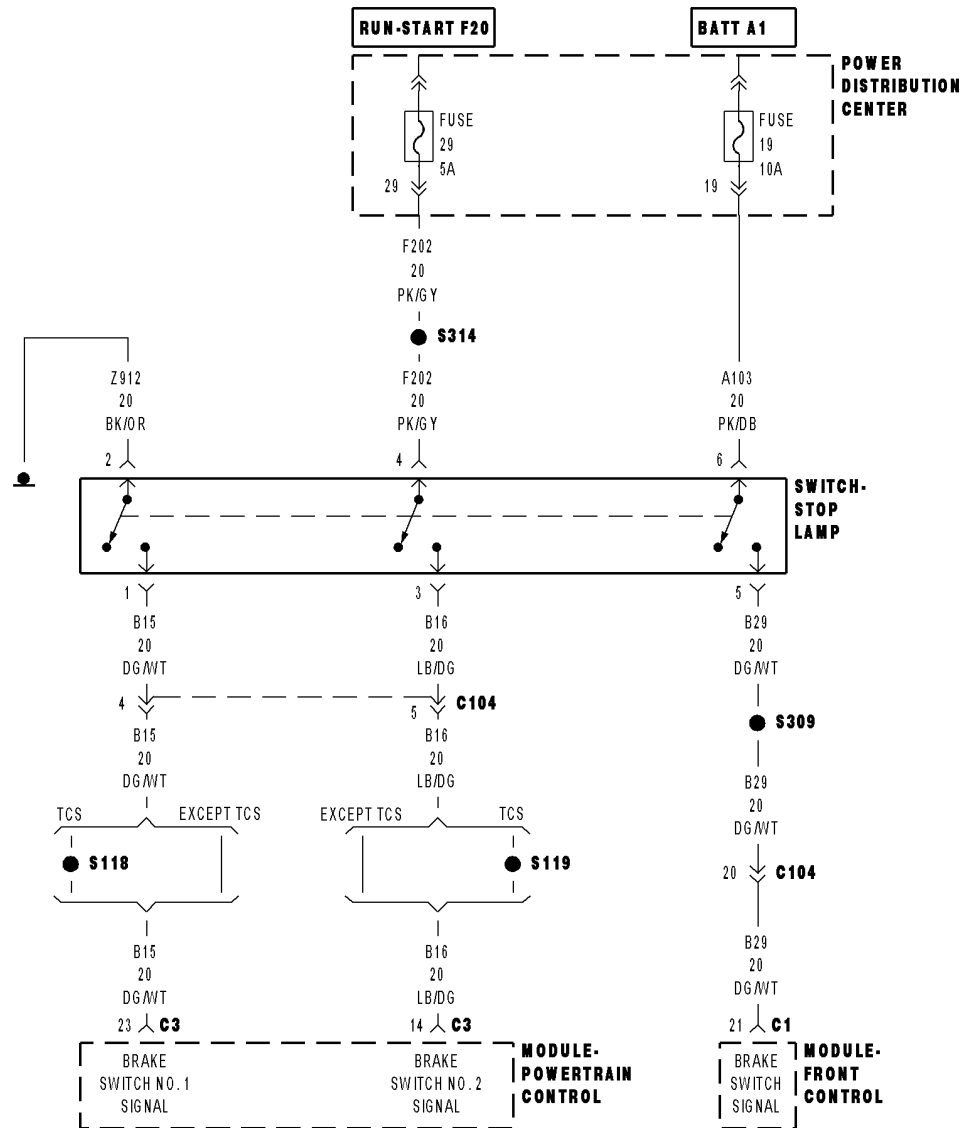
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER — 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Change the engine oil using the correct oil viscosity.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER — 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P1572-BRAKE SWITCH STUCK ON



### P1572-BRAKE SWITCH STUCK ON (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:**  
 Ignition on.
- Set Condition:**  
 The PCM recognizes the Brake Switch #1 is mechanically stuck in the low/on position. One Trip Fault.

Possible Causes
(B15) BRAKE SWITCH NO.1 SIGNAL SHORTED TO GROUND (B16) BRAKE SWITCH NO.2 SIGNAL OPEN (F202) FUSED IGNITION SWITCH OUTPUT OPEN STOP LAMP SWITCH PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Make sure the Stop Lamp Switch is properly adjusted before continuing.

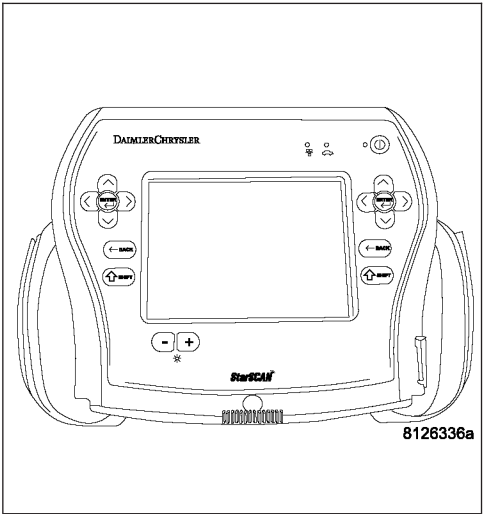
**Note:** Make sure the Stop Lamp Switch is properly wired, such as (B15) Brake Switch No.1 and (B16) Brake Lamp Switch No.2 circuit are not switched at the harness connector.

Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
          Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.





**P1572-BRAKE SWITCH STUCK ON (CONTINUED)****2. (B15) BRAKE SWITCH NO.1 SIGNAL SHORTED TO GROUND**

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Disconnect the PCM harness connectors.

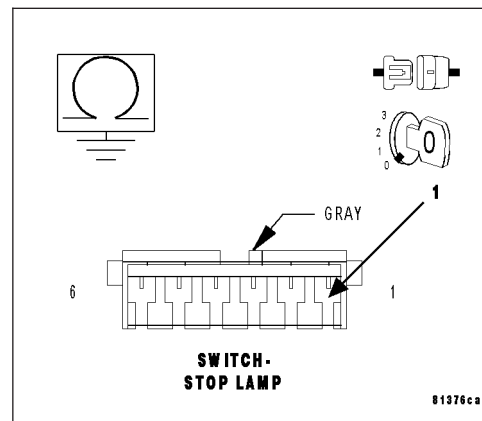
Measure the resistance between ground and the (B15) Brake Switch No.1 Signal circuit in the Stop Lamp Switch harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (B15) Brake Switch No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.

**No** >> Go To 3

**3. (B16) BRAKE SWITCH NO.2 SIGNAL OPEN**

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

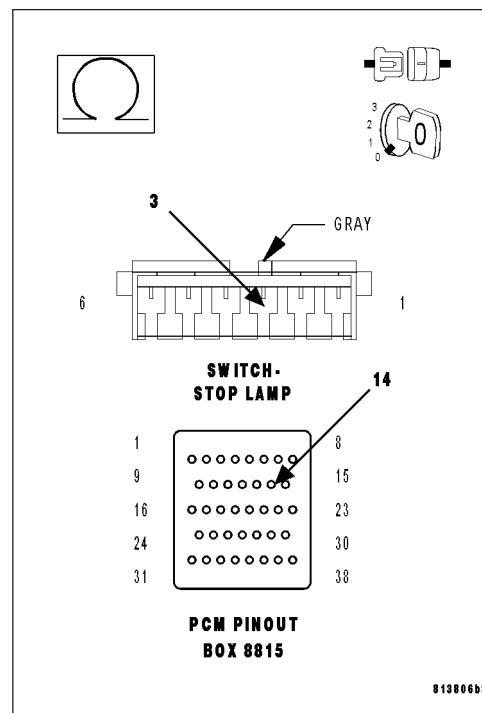
Measure the resistance of the (B16) Brake Switch No.2 Signal circuit from the Stop Lamp Switch harness connector and the appropriate terminal of the special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the open in the (B16) Brake Switch No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.



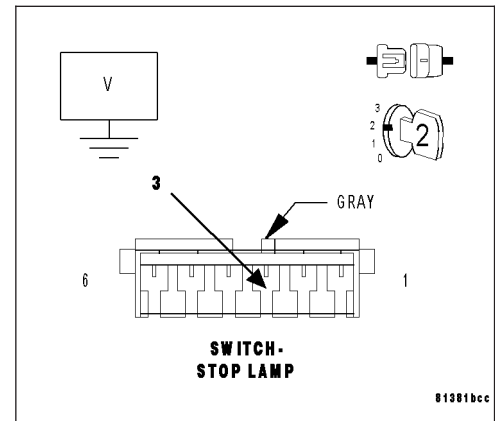
**P1572-BRAKE SWITCH STUCK ON (CONTINUED)****4. (B16) BRAKE SWITCH NO.2 SIGNAL SHORT TO VOLTAGE**

Turn the ignition on.

Measure the voltage of the Brake Switch No.2 Signal circuit in the Stop Lamp Switch harness connector.

**Does the voltmeter indicate voltage present?**

- Yes** >> Repair the short to voltage in the (B16) Brake Switch No.2 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.
- No** >> Go To 5

**5. STOP LAMP SWITCH**

Remove the Stop Lamp Switch.

Measure the resistance between terminals 1 and 2 of the Stop Lamp Switch.

Next, measure the resistance between terminals 3 and 4 of the Stop Lamp Switch.

Apply and release the brake pedal while monitoring the ohmmeter during both of the above steps.

**Does the resistance change from below 5.0 ohms to an open circuit for one or both of the measurements taken?**

- Yes** >> Go To 6
- No** >> Replace the Stop Lamp Switch.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.

**6. PCM**

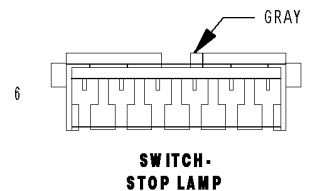
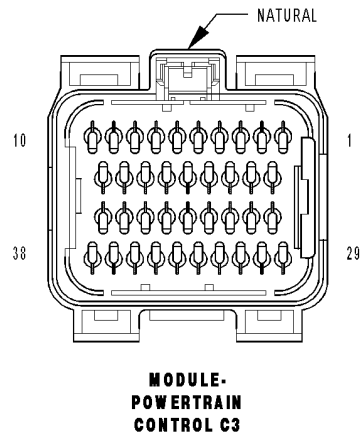
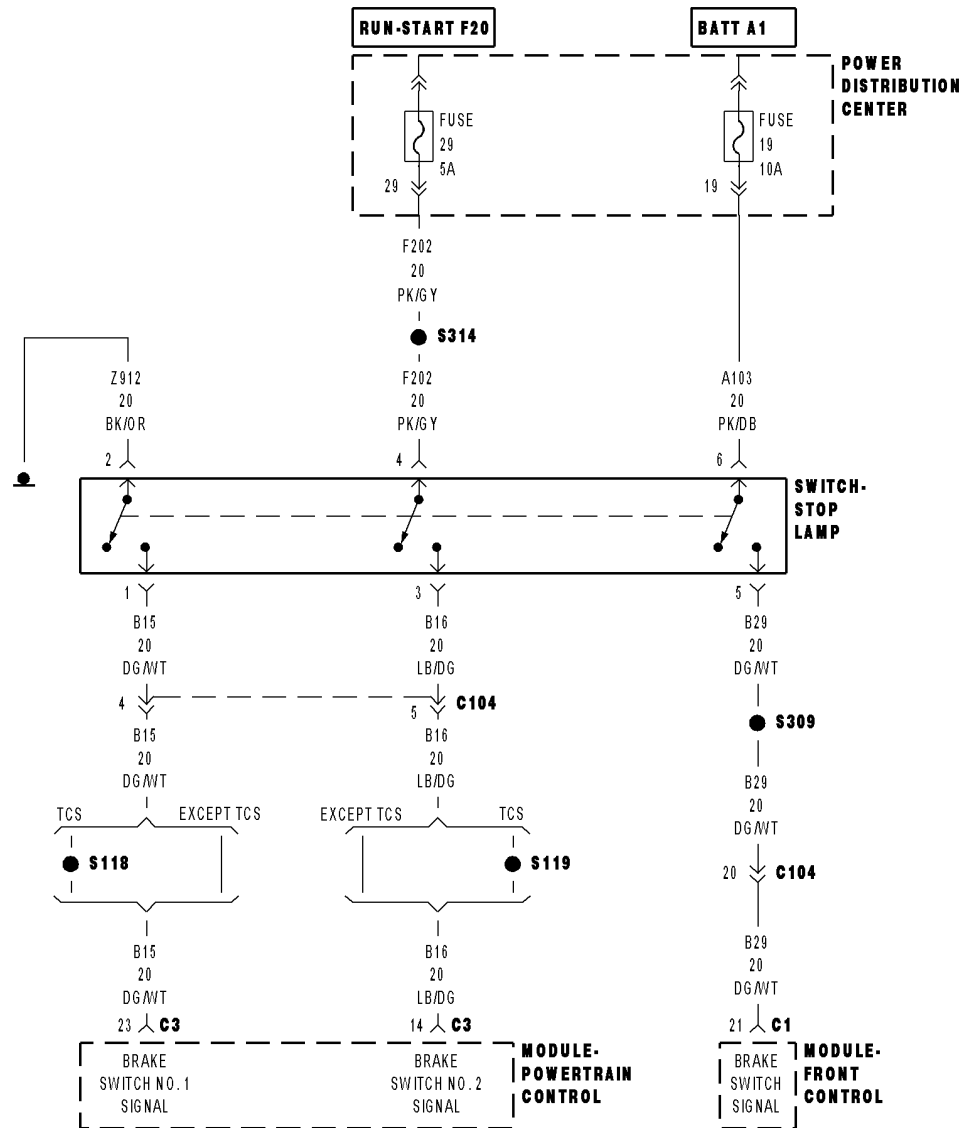
**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.
- No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.

## P1573-BRAKE SWITCH STUCK OFF



## P1573-BRAKE SWITCH STUCK OFF (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
The PCM recognizes Brake Switch No.1 is stuck in the Off/high position. One Trip Fault.

Possible Causes
(B15) BRAKE SWITCH NO.1 SIGNAL SHORTED TO GROUND (B15) BRAKE SWITCH NO.1 SIGNAL SHORT TO VOLTAGE (B16) BRAKE SWITCH NO.2 SIGNAL SHORTED TO GROUND (B16) BRAKE SWITCH NO.2 SIGNAL OPEN (Z912) GROUND CIRCUIT OPEN (F202) FUSED IGNITION SWITCH OUTPUT OPEN STOP LAMP SWITCH PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Make sure the Stop Lamp Switch is properly adjusted before continuing.

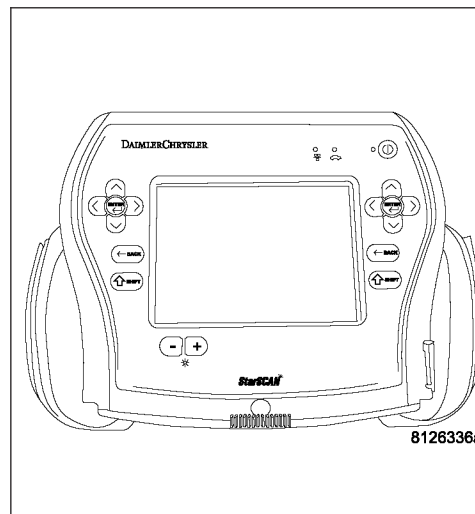
**Note:** Make sure the Stop Lamp Switch is properly wired, such as (B15) Brake Switch No.1 and (B16) Brake Lamp Switch No.2 circuits are not switched at the harness connector.

Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1573-BRAKE SWITCH STUCK OFF (CONTINUED)****2. (B15) BRAKE SWITCH NO.1 SIGNAL SHORTED TO GROUND**

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Disconnect the PCM harness connectors.

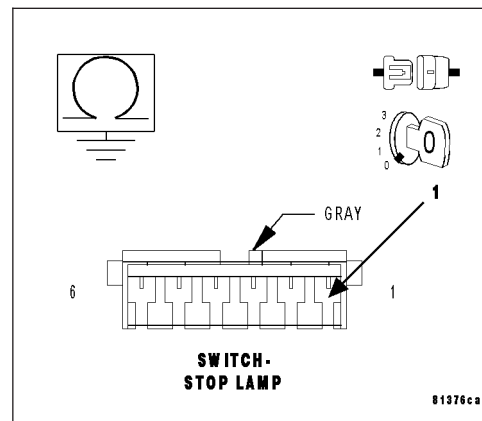
Measure the resistance between ground and the (B15) Brake Switch No.1 Signal circuit in the Stop Lamp Switch harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (B15) Brake Switch No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (B15) BRAKE SWITCH NO.1 SIGNAL SHORT TO VOLTAGE**

Turn the ignition on.

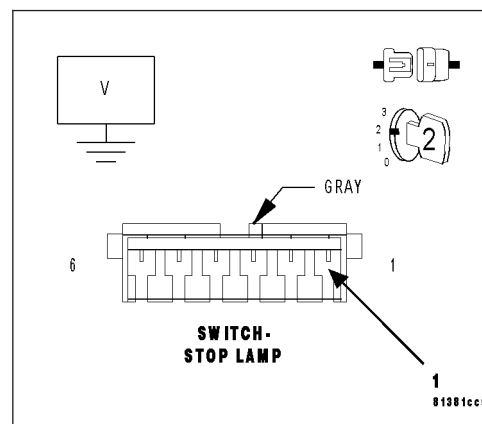
Measure the voltage of the (B15) Brake Switch No.1 Signal circuit in the Stop Lamp Switch harness connector.

**Does the voltmeter indicate voltage present?**

**Yes** >> Repair the short voltage in the (B15) Brake Switch No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (B16) BRAKE SWITCH NO.2 SIGNAL SHORTED TO GROUND**

Turn the ignition off.

Disconnect the Stop Lamp Switch harness connector.

Disconnect the PCM harness connectors.

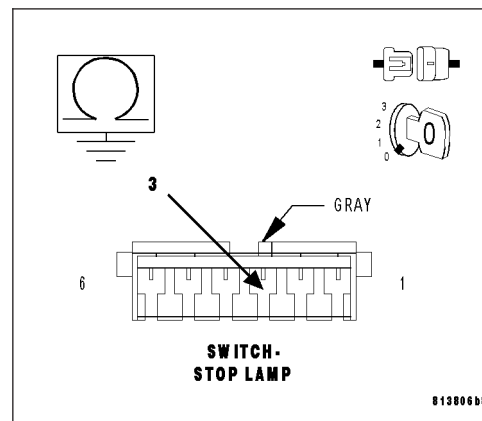
Measure the resistance between ground and the (B16) Brake Switch No.2 Signal circuit in the Stop Lamp Switch harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (B16) Brake Switch No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



## P1573-BRAKE SWITCH STUCK OFF (CONTINUED)

### 5. (B16) BRAKE SWITCH NO.2 SIGNAL OPEN

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

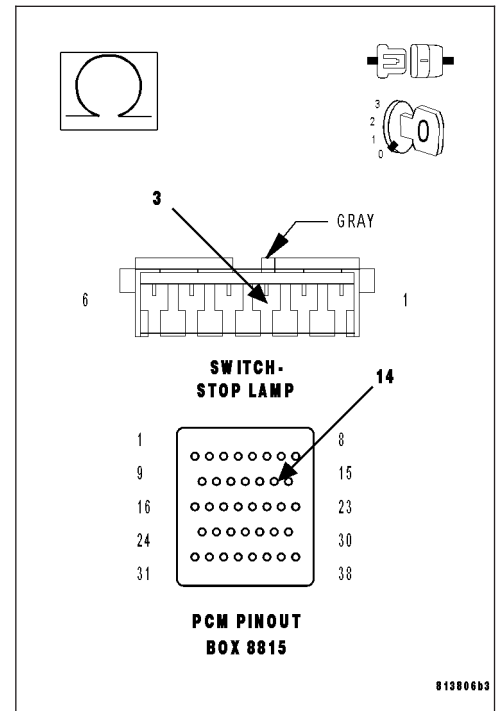
Measure the resistance of the (B16) Brake Switch No.2 Signal circuit from the Stop Lamp Switch harness connector and the appropriate terminal of the special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (B16) Brake Switch No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



### 6. (F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) OPEN

Re connect the PCM harness connector.

Turn the ignition on.

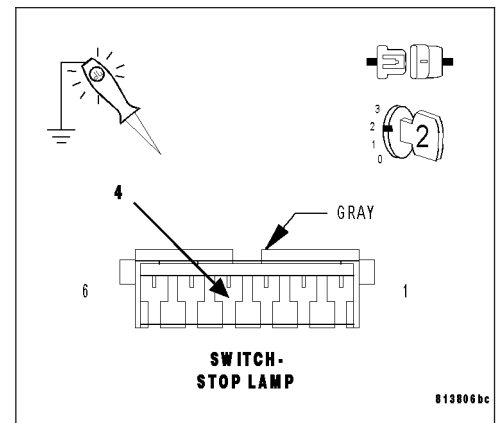
Using a 12-volt test light connected to ground, probe the (F202) Fused Ignition Switch Output circuit in the Stop Lamp Switch harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 7

**No** >> Repair the open in the (F202) Fused Ignition Switch Output circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



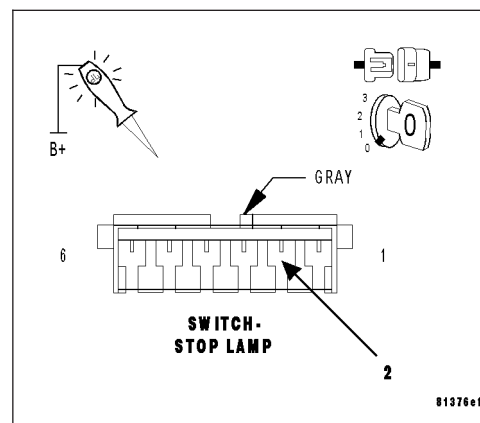
**P1573-BRAKE SWITCH STUCK OFF (CONTINUED)****7. (Z912) GROUND CIRCUIT OPEN**

Using the 12-Volt test light connect to battery voltage, probe the (Z912) Ground circuit in the Stop Lamp Switch harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 8

**No** >> Repair the open in the (Z912) Ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**8. STOP LAMP SWITCH**

Remove the Stop Lamp Switch.

Measure the resistance between terminals 1 and 2 of the Stop Lamp Switch.

Next, measure the resistance between terminals 3 and 4 of the Stop Lamp Switch.

Apply and release the brake pedal while monitoring the ohmmeter during both of the above steps.

**Does the resistance change from below 5.0 ohms to an open circuit for one or both of the measurements taken?**

**Yes** >> Go To 9

**No** >> Replace the Stop Lamp Switch.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**9. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

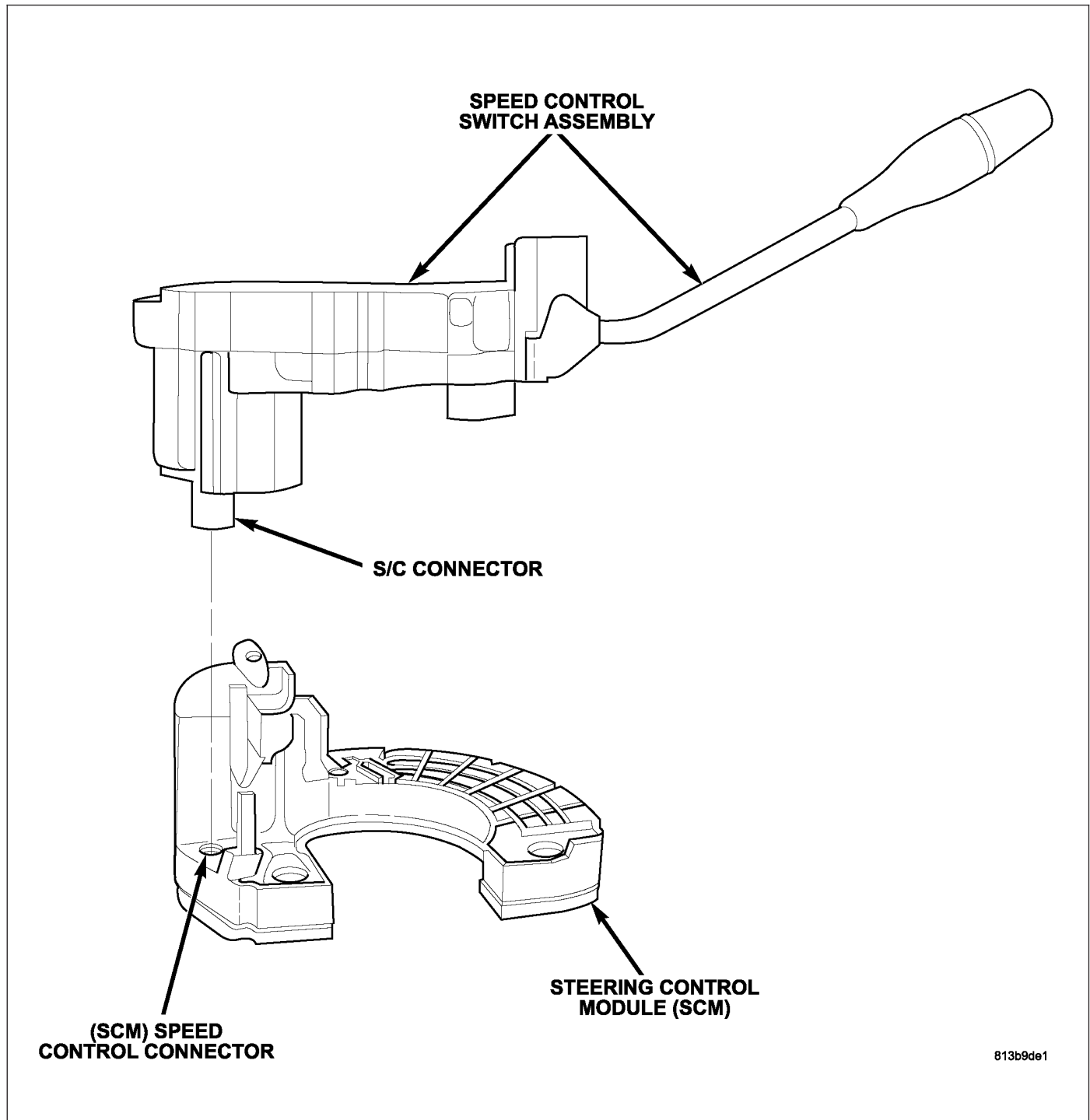
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 4.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P1593—SPEED CONTROL SWITCH 1/2 STUCK





**P1593–SPEED CONTROL SWITCH 1/2 STUCK (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The Steering Column Control Module (SCCM) has detected that the Speed Control Switches are not operating properly.

Possible Causes
INTERMITTENT SPEED CONTROL SWITCH 1/2 STUCK DTC SPEED CONTROL SWITCH STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC IS ACTIVE**

**Note:** If **P0562–BATTERY VOLTAGE LOW** or **P0563–BATTERY VOLTAGE HIGH** is set along with this DTC, diagnose the battery voltage DTC first.

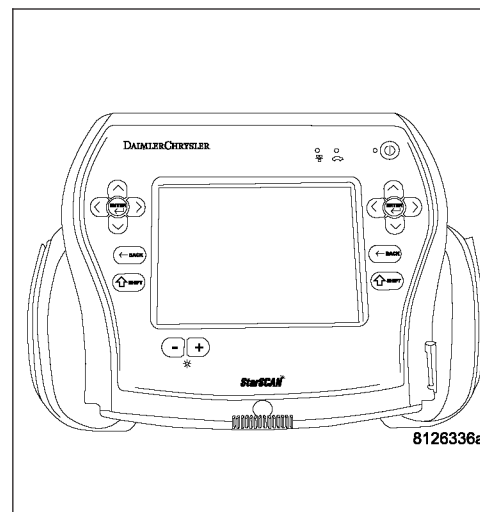
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 4

**2. SPEED CONTROL SWITCH**

Turn the ignition off.

Replace the Speed Control Switch in accordance with the Service Information.

Turn the ignition on.

Move the Speed Control Switch to each position several times.

With the Scan Tool, Clear Stored DTCs in the Steering Column Control Module.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

Move the Speed Control Switch to each position several times while monitoring the Scan Tool.

**Does this DTC reset?**

**Yes** >> Go To 3

**No** >> Test Complete.

**P1593-SPEED CONTROL SWITCH 1/2 STUCK (CONTINUED)****3. STEERING COLUMN CONTROL MODULE (SCCM)**

View repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

---

**4. INTERMITTENT SPEED CONTROL SWITCH 1/2 STUCK DTC**

The conditions necessary to set this DTC are not present at this time.

While monitoring the scan tool data relative to this circuit, move the Speed Control Switch to each position several times.

Look for the DTC to reset while the switch is being moved to each position.

**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

## P1603-PCM INTERNAL DUAL-PORT RAM COMMUNICATION FAILURE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**  
Internal PCM failure detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PCM FUSED IGNITION SWITCH CIRCUIT
PCM INTERNAL

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

### Diagnostic Test

#### 1. PCM IGNITION CIRCUITS

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

With a 12-volt test light connected to ground and with special tool #8815 installed, probe the (F202) and (F924) Fused Ignition Switch circuits.

Perform the above check with the Ignition key in the off lock position, Ignition on, engine not running position, and during cranking.

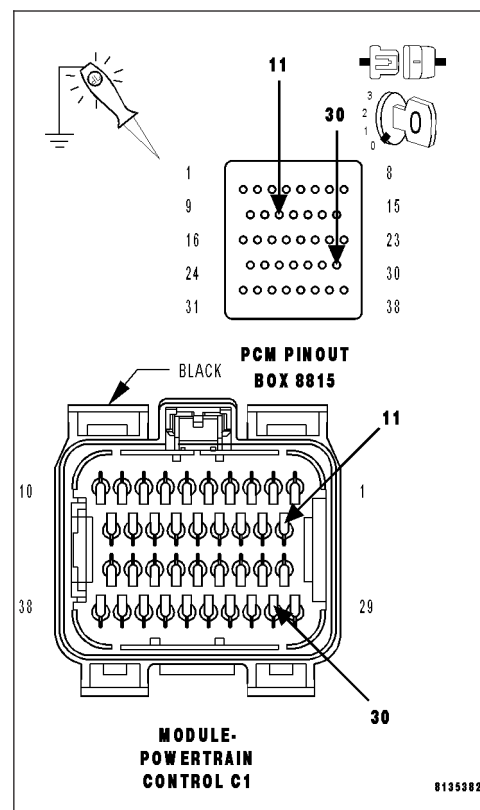
Wiggle the related wire harness while probing the special tool with the test light to try to interrupt the circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 2

**No** >> Repair the open or excessive resistance in the (F202) and (F924) Fused Ignition Switch (Off, Run, Start) circuits. Inspect the related fuse, if the fuse is open check the circuits for a short to ground.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1603-PCM INTERNAL DUAL-PORT RAM COMMUNICATION FAILURE (CONTINUED)****2. PCM**

The Powertrain Control Module is reporting internal errors.

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
-

## P1604-PCM INTERNAL DUAL-PORT RAM READ/WRITE INTEGRITY FAILURE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**  
Internal PCM failure detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PCM FUSED IGNITION SWITCH CIRCUIT
PCM INTERNAL

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

### Diagnostic Test

#### 1. PCM IGNITION CIRCUITS

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

With a 12-volt test light connected to ground and with special tool #8815 installed, probe the (F202) and (F924) Fused Ignition Switch circuits.

Perform the above check with the Ignition key in the off lock position, Ignition on, engine not running position, and during cranking.

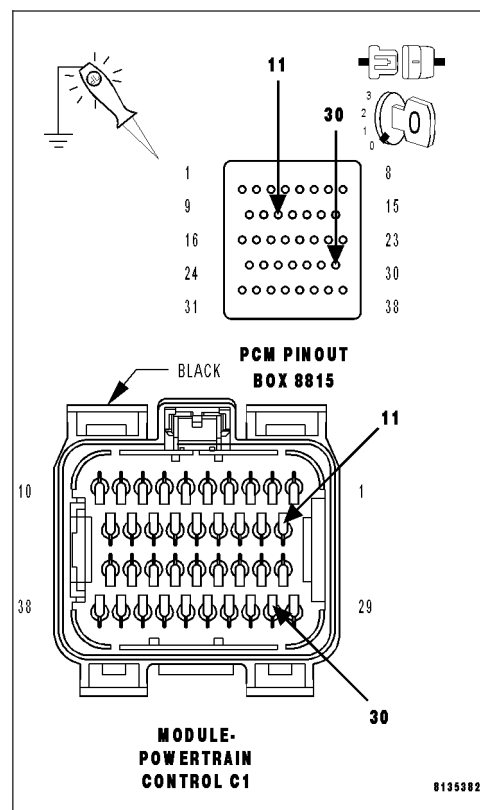
Wiggle the related wire harness while probing the special tool with the test light to try to interrupt the circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 2

**No** >> Repair the open or excessive resistance in the (F202) and (F924) Fused Ignition Switch (Off, Run, Start) circuits. Inspect the related fuse, if the fuse is open check the circuits for a short to ground.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1604-PCM INTERNAL DUAL-PORT RAM READ/WRITE INTEGRITY FAILURE (CONTINUED)****2. PCM**

The Powertrain Control Module is reporting internal errors.

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
-

## P1607-PCM INTERNAL SHUTDOWN TIMER RATIONALITY

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on and battery voltage greater than 10 volts.
- **Set Condition:**  
Internal PCM failure detected. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PCM FUSED IGNITION SWITCH CIRCUIT
PCM INTERNAL

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

### Diagnostic Test

#### 1. PCM IGNITION CIRCUITS

Turn the ignition off.

Disconnect the PCM harness connectors.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

With a 12-volt test light connected to ground and with special tool #8815 installed, probe the (F202) and (F924) Fused Ignition Switch circuits.

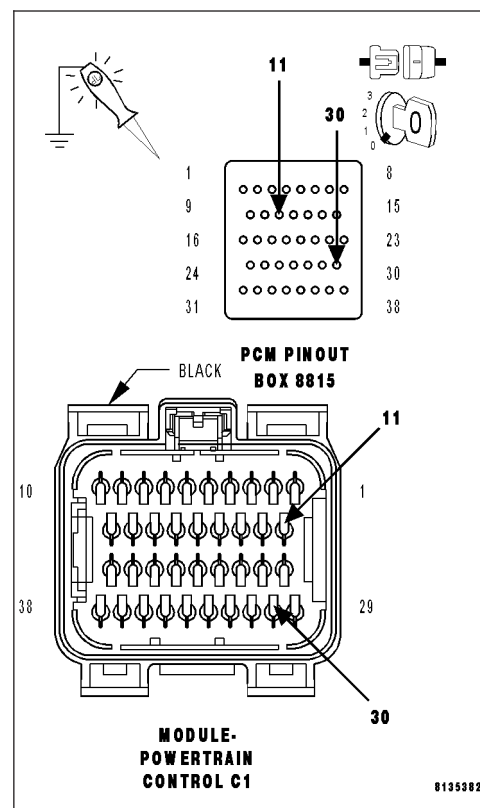
Perform the above check with the Ignition key in the off lock position, Ignition on, engine not running position, and during cranking.

Wiggle the related wire harness while probing the special tool with the test light to try to interrupt the circuit.

**Does the test light illuminate brightly?**

**Yes** >> Go To 2

**No** >> Repair the open or excessive resistance in the (F202) and (F924) Fused Ignition Switch (Off, Run, Start) circuits. Inspect the related fuse, if the fuse is open check the circuits for a short to ground.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1607-PCM INTERNAL SHUTDOWN TIMER RATIONALITY (CONTINUED)****2. PCM**

The Powertrain Control Module is reporting internal errors.

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

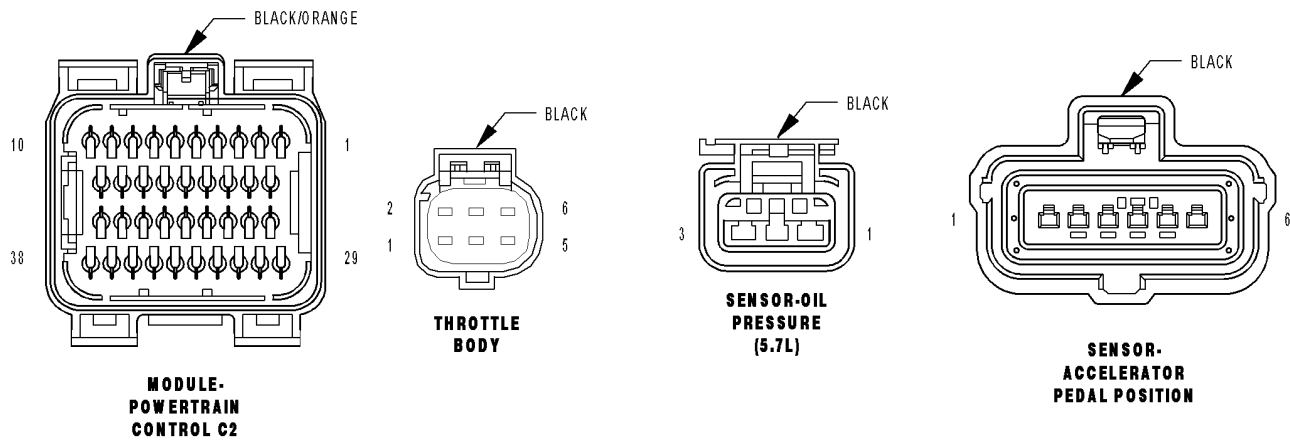
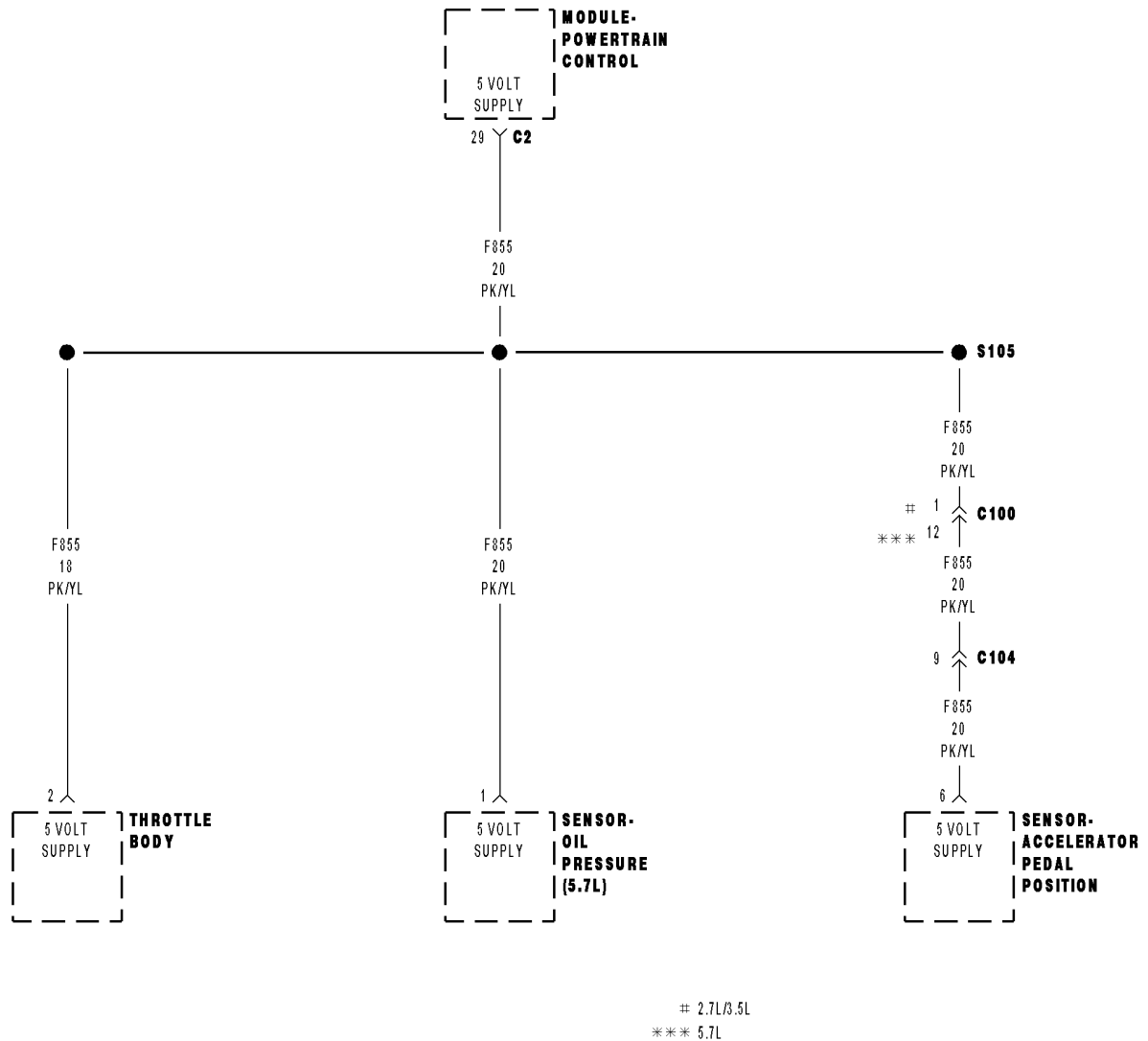
Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
-



## P1618-SENSOR REFERENCE VOLTAGE 1 CIRCUIT ERRATIC



**P1618-SENSOR REFERENCE VOLTAGE 1 CIRCUIT ERRATIC (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on.

- **Set Condition:**

When the PCM recognizes the Primary 5-volt Supply circuit voltage is varying too much too quickly. One Trip Fault. ETC light is flashing.

Possible Causes
(F855) PRIMARY 5-VOLT SUPPLY SHORTED TO GROUND
(F855) PRIMARY 5-VOLT SUPPLY SHORTED TO BATTERY VOLTAGE
(F855) PRIMARY 5-VOLT SUPPLY CIRCUIT OPEN
5-VOLT SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

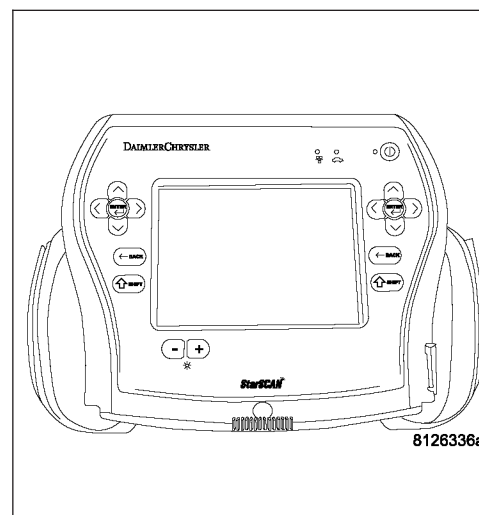
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1618-SENSOR REFERENCE VOLTAGE 1 CIRCUIT ERRATIC (CONTINUED)****2. (F855) PRIMARY 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect all the Sensors that share the (F855) Primary 5-volt Supply circuit.

**Note:** This code can be caused by the improper installation of after market accessories that may be causing excessive noise on the (F855) 5-volt Supply circuit.

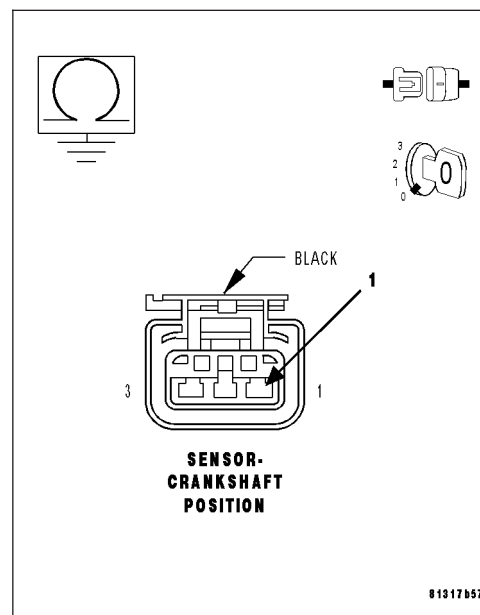
Measure the resistance between ground and the (F855) Primary 5-volt Supply circuit in the CKP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F855) Primary 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. SENSOR SHORTED TO GROUND**

Connect the PCM harness connectors and all the previously disconnected Sensor except for the CKP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F855) Primary 5-volt Supply circuit at the Throttle Body harness connector.

**CAUTION:** You must Turn the Ignition Off when disconnecting any of the Sensor harness connectors and Turn the Ignition On to check the voltage readings.

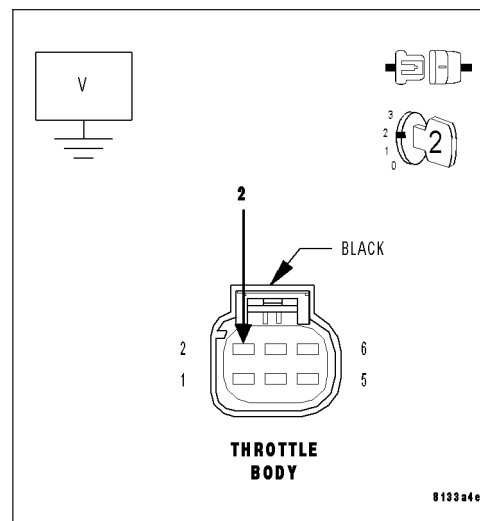
While monitoring the voltage, disconnect each Sensor harness connector that shares the (F855) Primary 5-volt Supply circuit, one at a time.

**Does the voltage increase above 4.5 volts when disconnecting any of the Sensor harness connectors?**

**Yes** >> Replace the Sensor that causes the (F855) Primary 5-volt Supply circuit voltage to increase when disconnected.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P1618-SENSOR REFERENCE VOLTAGE 1 CIRCUIT ERRATIC (CONTINUED)****4. 5-VOLT SENSOR**

Turn the ignition off.

Connect all the previously disconnected Sensors except for the CKP Sensor harness connector.

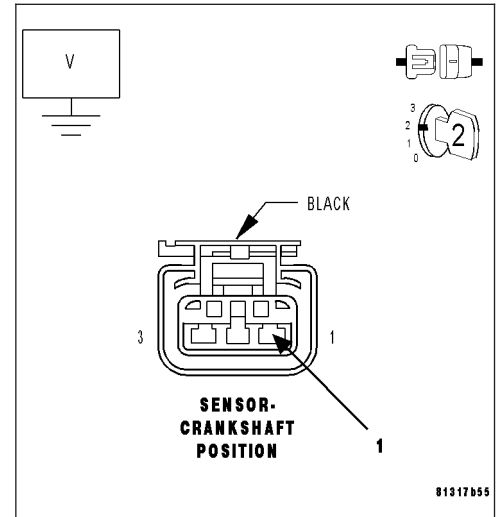
Ignition on, engine not running.

Measure the voltage on the (F855) Primary 5-volt Supply circuit at the CKP Sensor harness connector.

**Is the voltage between 4.8 and 5.2 volts?**

**Yes** >> Replace the Crank Position Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (F855) PRIMARY 5-VOLT SUPPLY SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect all the Sensors that share the (F855) Primary 5-volt Supply circuit.

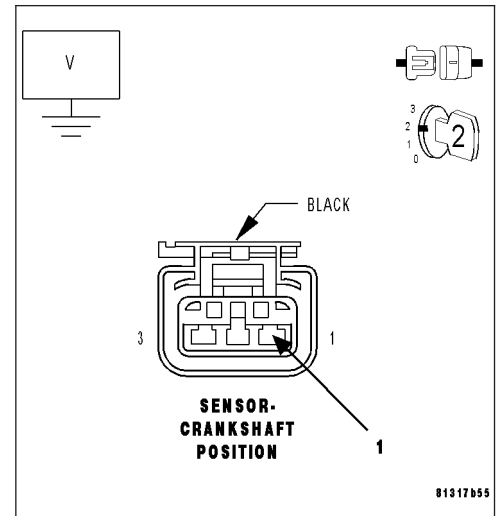
Ignition on, engine not running.

Measure the voltage on the (F855) Primary 5-volt Supply circuit in the CKP Sensor harness connector.

**Is the voltage present?**

**Yes** >> Repair the short to battery voltage in the (F855) Primary 5-volt Supply circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P1618-SENSOR REFERENCE VOLTAGE 1 CIRCUIT ERRATIC (CONTINUED)****6. (F855) PRIMARY 5-VOLT SUPPLY CIRCUIT OPEN**

Turn the ignition off.

Reconnect all the sensors that were disconnected in the previous step except for the CKP Sensor harness connector.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance in the (F855) Primary 5-volt Supply circuit from the Sensor harness connector to the appropriate terminal of special tool #8815.

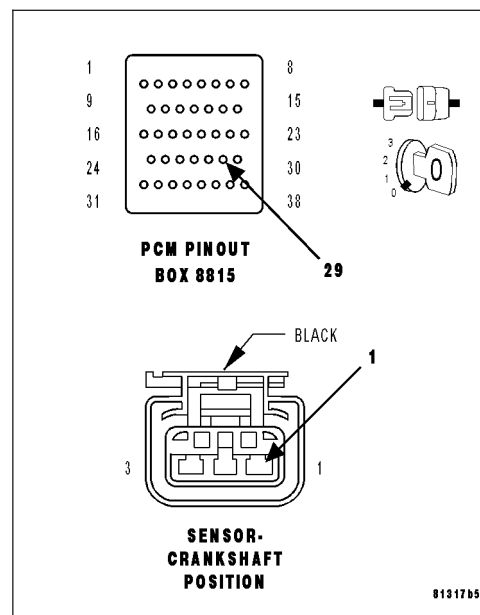
It may be necessary to perform this test from every sensor that uses the (F855) Primary 5-volt Supply circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (F855) Primary 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

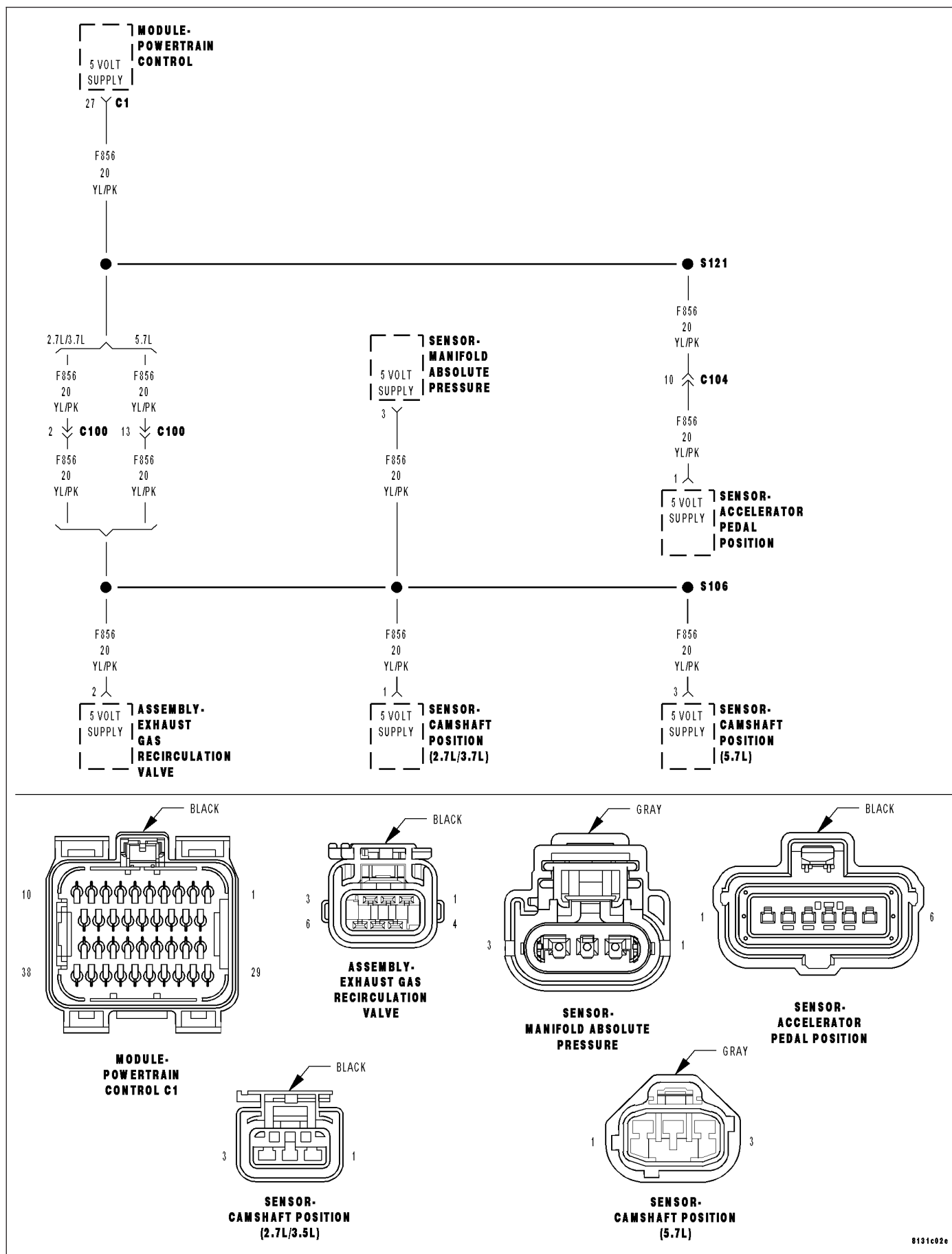
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

# P1628-SENSOR REFERENCE VOLTAGE 2 CIRCUIT ERRATIC



P1628-SENSOR REFERENCE VOLTAGE 2 CIRCUIT ERRATIC (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
When the PCM recognizes the Auxiliary 5-volt Supply circuit voltage is varying too much to quickly. One Trip Fault. ETC light is flashing.

Possible Causes
(F856) AUXILIARY 5-VOLT SUPPLY SHORTED TO GROUND (F856) AUXILIARY 5-VOLT SUPPLY SHORTED TO BATTERY VOLTAGE (F856) AUXILIARY 5-VOLT SUPPLY CIRCUIT OPEN 5-VOLT SENSOR PCM

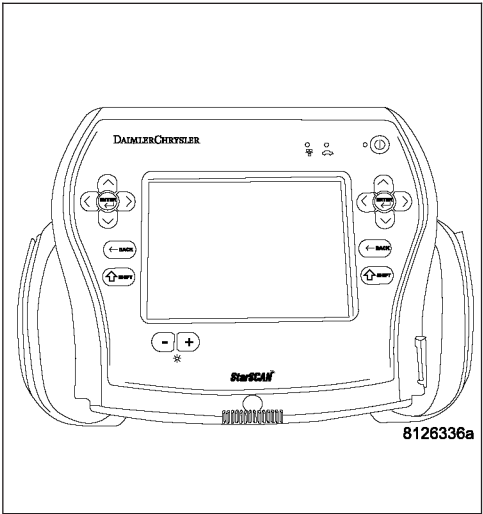
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.  
With a scan tool, read DTCs.

- Is the DTC active at this time?
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P1628-SENSOR REFERENCE VOLTAGE 2 CIRCUIT ERRATIC (CONTINUED)****2. (F856) AUXILIARY 5-VOLT SUPPLY SHORTED TO GROUND**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect all the Sensors that share the (F856) Auxiliary 5-volt Supply circuit.

**Note:** This code can be caused by the improper installation of after market accessories that may be causing excessive noise on the (F856) 5-volt Supply circuit.

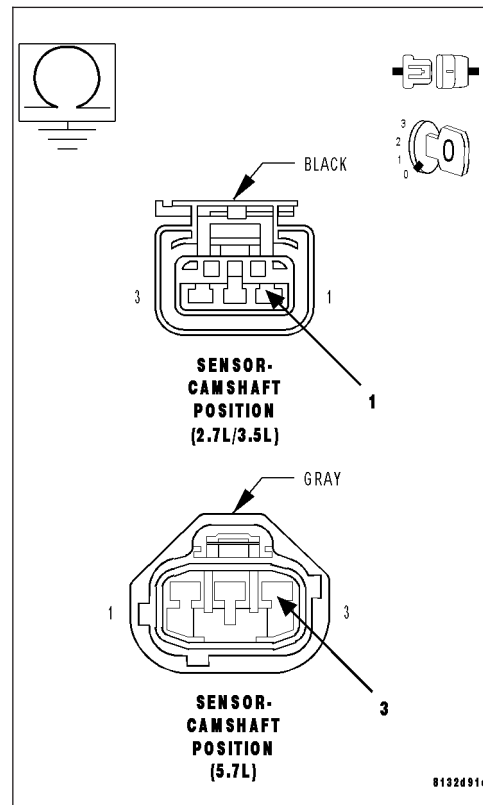
Measure the resistance between ground and the (F856) Auxiliary 5-volt Supply circuit at the CMP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F856) Auxiliary 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. SENSOR SHORTED TO GROUND**

Connect the PCM harness connectors and all the previously disconnected Sensor except for the CMP Sensor harness connector.

Ignition on, engine not running.

Measure the voltage on the (F856) Auxiliary 5-volt Supply circuit in the CMP Sensor harness connector.

**CAUTION:** You must Turn the Ignition OFF when disconnecting any of the Sensor harness connectors and Turn the Ignition On to check the voltage readings.

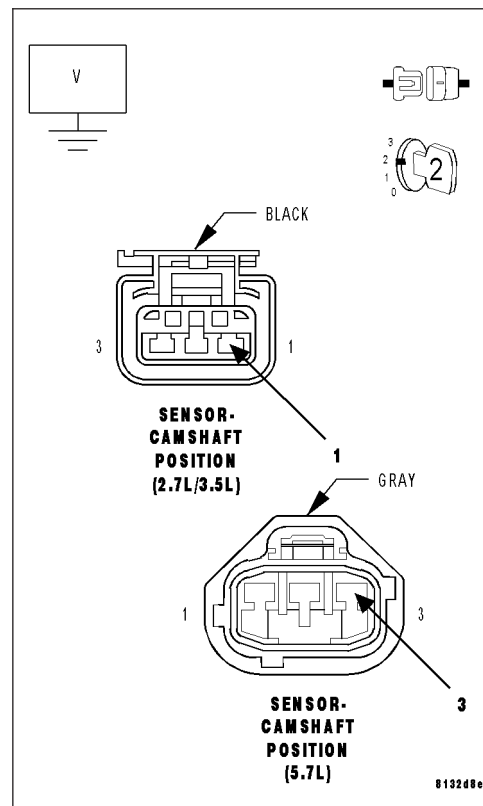
While monitoring the voltage, disconnect each Sensor harness connector that shares the (F856) Auxiliary 5-volt Supply circuit, one at a time.

**Does the voltage increase above 4.5 volts when disconnecting any of the Sensor harness connectors?**

**Yes** >> Replace the Sensor that causes the (F856) Auxiliary 5-volt Supply circuit voltage to increase when disconnected.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4





**P1628-SENSOR REFERENCE VOLTAGE 2 CIRCUIT ERRATIC (CONTINUED)****4. 5-VOLT SENSOR**

Turn the ignition off.

Connect all the previously disconnected Sensors except for the CMP Sensor harness connector.

Ignition on, engine not running.

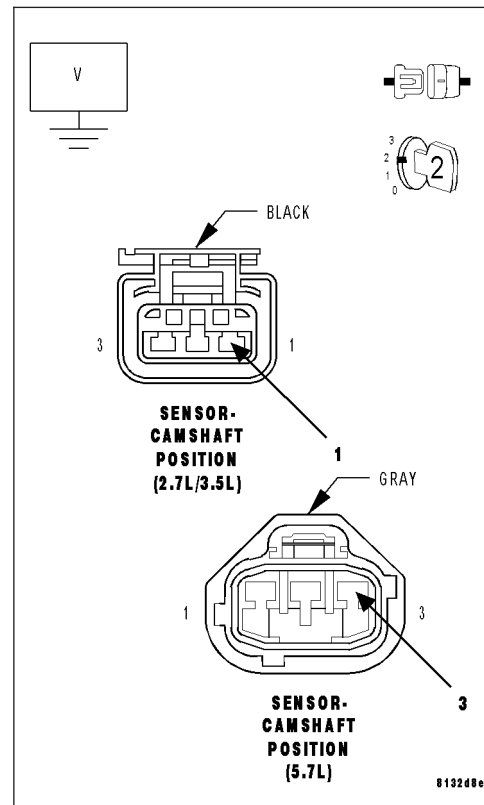
Measure the voltage on the (F856) Auxiliary 5-volt Supply circuit in the CMP Sensor harness connector.

**Is the voltage below 4.5 volts?**

**Yes** >> Go To 5

**No** >> Replace the Cam Position Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. (F856) AUXILIARY 5-VOLT SUPPLY SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Disconnect all the Sensors that share the (F856) Auxiliary 5-volt Supply circuit.

Ignition on, engine not running.

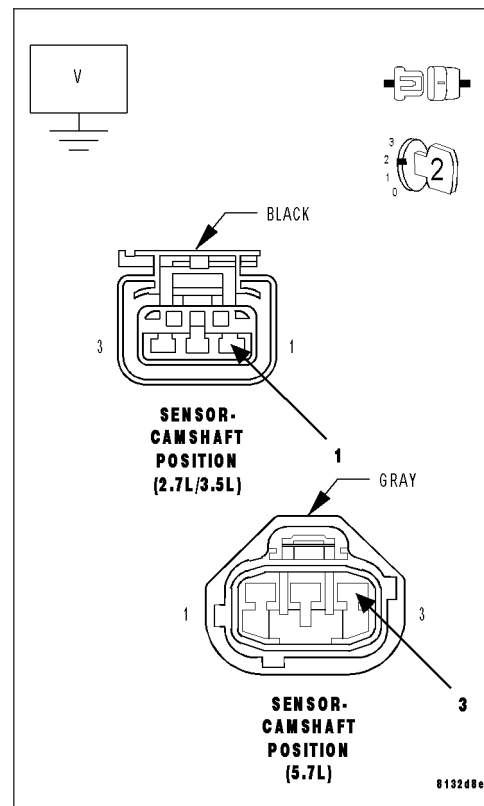
Measure the voltage on the (F856) Auxiliary 5-volt Supply circuit at the CMP Sensor harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (F856) Auxiliary 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P1628-SENSOR REFERENCE VOLTAGE 2 CIRCUIT ERRATIC (CONTINUED)****6. (F856) AUXILIARY 5-VOLT SUPPLY CIRCUIT OPEN**

Turn the ignition off.

Reconnect all the sensors that were disconnected in the previous step except the CMP Sensor harness connector.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance in the (F856) Auxiliary 5-volt Supply circuit from the Sensor harness connector to the appropriate terminal of special tool #8815.

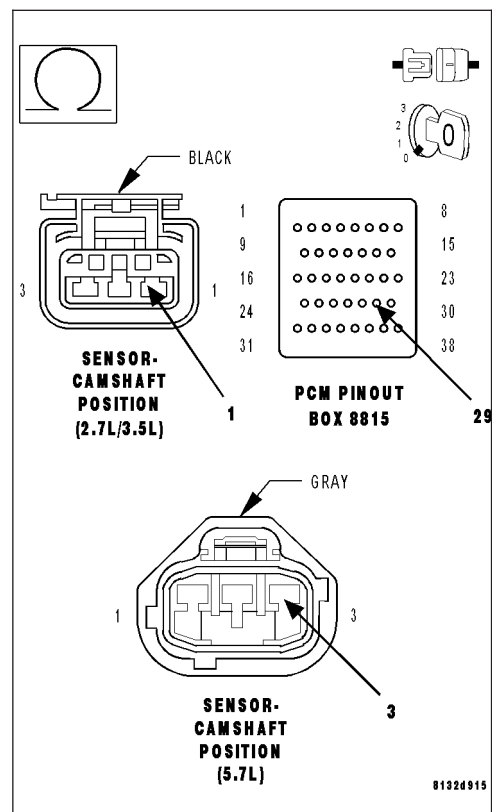
It may be necessary to perform this test from every sensor that uses the (F856) Auxiliary 5-volt Supply circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (F856) Auxiliary 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P1696-EEPROM MEMORY WRITE DENIED/INVALID

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
An attempt to program/write to the internal EEPROM failed, Also checks at powerdown. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

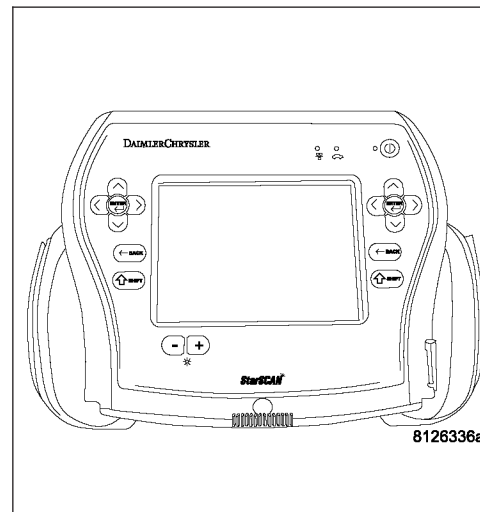
### Diagnostic Test

#### 1. SCAN TOOL DISPLAYS A WRITE FAILURE

With a scan tool, perform the SRI Memory Test.

##### Does scan tool display Write Failure?

- Yes**    >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No**    >> Go To 2



#### 2. SCAN TOOL DISPLAYS A WRITE REFUSED

With the a scan tool, perform the SRI Memory Test.

##### Does the scan tool display Write Refused?

- Yes**    >> Go To 3
- No**    >> Go To 4

**P1696-EEPROM MEMORY WRITE DENIED/INVALID (CONTINUED)****3. PCM REFUSED 2ND TEST**

With a scan tool, perform the SRI Memory Test a third time.

**Note:** Retest the SRI Memory two more times.

**Does the scan tool display Write Refused again?**

- Yes** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Test Complete.
- 

**4. SCAN TOOL DISPLAYS SRI MILEAGE INVALID**

With a scan tool, perform the SRI Memory Test.

**Does the scan tool display SRI Mileage Invalid?**

- Yes** >> Update the mileage and retest the SRI Memory.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Go To 5
- 

**5. COMPARE SRI MILEAGE WITH ODOMETER**

Compare the SRI Mileage stored with the Instrument Panel Odometer.

**Is the mileage within the specified range displayed on the scan tool?**

- Yes** >> Test Complete.
- No** >> Update the mileage and retest the SRI Memory.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
-

## P1697-EMR (SRI) MILEAGE NOT STORED

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
An attempt to program/write to the internal EEPROM failed, Also checks at powerdown. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

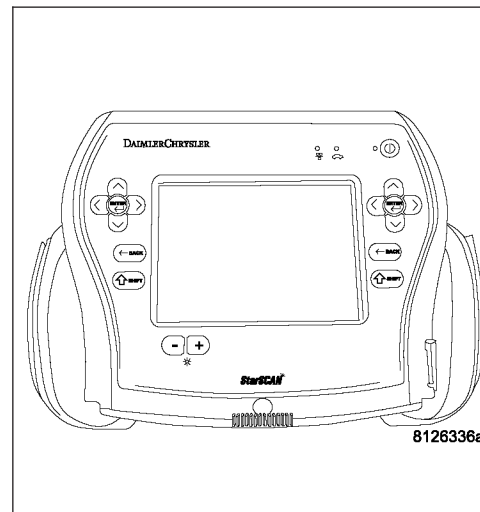
### Diagnostic Test

#### 1. SCAN TOOL DISPLAYS A WRITE FAILURE

With a scan tool, perform the SRI Memory Test.

##### Does scan tool display Write Failure?

- Yes**    >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No**    >> Go To 2



#### 2. SCAN TOOL DISPLAYS A WRITE REFUSED

With the a scan tool, perform the SRI Memory Test.

##### Does the scan tool display Write Refused?

- Yes**    >> Go To 3
- No**    >> Go To 4

**P1697-EMR (SRI) MILEAGE NOT STORED (CONTINUED)****3. PCM REFUSED 2ND TEST**

With a scan tool, perform the SRI Memory Test a third time.

**Note:** Retest the SRI Memory two more times.

**Does the scan tool display Write Refused again?**

- Yes** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Test Complete.
- 

**4. SCAN TOOL DISPLAYS SRI MILEAGE INVALID**

With a scan tool, perform the SRI Memory Test.

**Does the scan tool display SRI Mileage Invalid?**

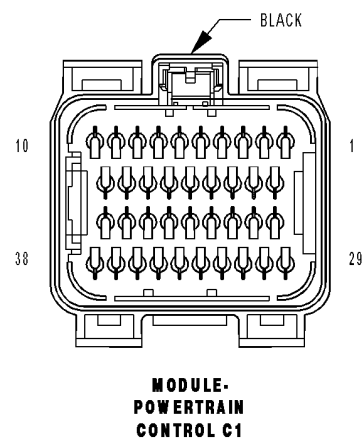
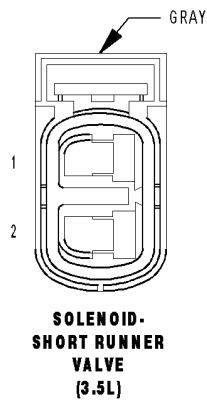
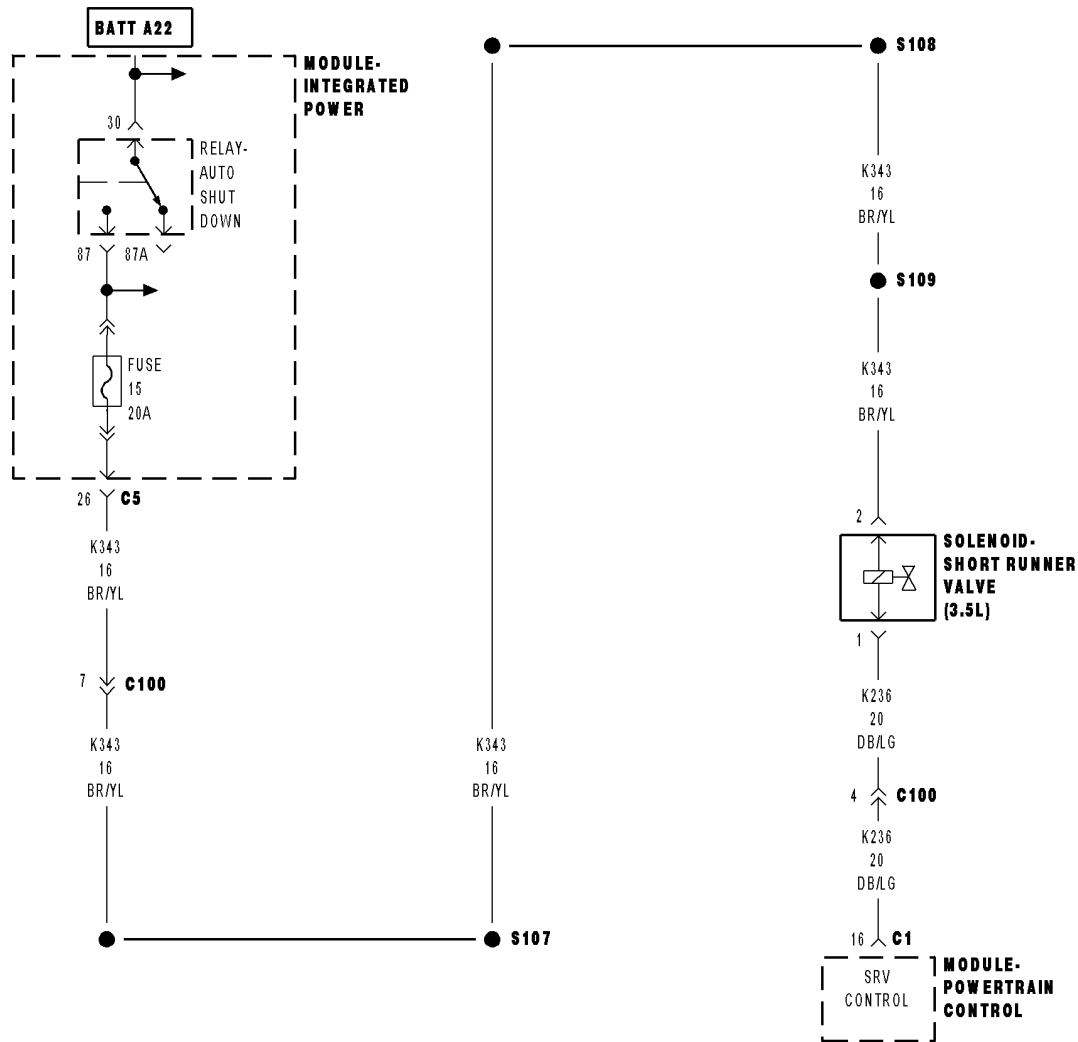
- Yes** >> Update the mileage and retest the SRI Memory.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Go To 5
- 

**5. COMPARE SRI MILEAGE WITH ODOMETER**

Compare the SRI Mileage stored with the Instrument Panel Odometer.

**Is the mileage within the specified range displayed on the scan tool?**

- Yes** >> Test Complete.
- No** >> Update the mileage and retest the SRI Memory.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
-

**P2008—SHORT RUNNER VALVE SOLENOID CIRCUIT**

**P2008–SHORT RUNNER VALVE SOLENOID CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on. ASD Relay energized. Battery voltage greater than 10 volts.

- **Set Condition:**

The PCM senses the SRV is not at the desired state. One Trip Fault.

Possible Causes
(K343) FUSED AUTO SHUT DOWN RELAY OUTPUT OPEN
(K236) SRV CONTROL CIRCUIT SHORT TO BATTERY VOLTAGE
(K236) SRV CONTROL CIRCUIT SHORT TO GROUND
(K236) SRV CONTROL CIRCUIT OPEN
SHORT RUNNER VALVE SOLENOID
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

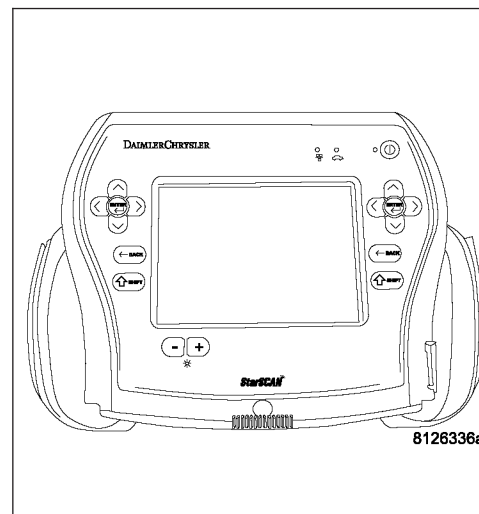
With a scan tool, read DTC.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P2008–SHORT RUNNER VALVE SOLENOID CIRCUIT (CONTINUED)****2. SHORT RUNNER VALVE SOLENOID OPERATION**

Turn the ignition off.

Disconnect the SRV Solenoid harness connector.

Ignition on, engine not running.

Using a 12-volt test light, connect one end to the (K236) SRV Control circuit and the other end the (Z904) Ground circuit in the SRV Solenoid harness connector.

With the scan tool, actuate (Toggle) the SRV Solenoid.

**Does the test light illuminate brightly and flash on and off?**

**Yes** >> Replace the Short Runner Valve Solenoid.

Perform POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K343) FUSED AUTO SHUT DOWN RELAY OUTPUT2 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Short Runner Valve Solenoid harness connector.

Turn the ignition on.

Using the scan tool, actuate (Toggle) the ASD Relay.

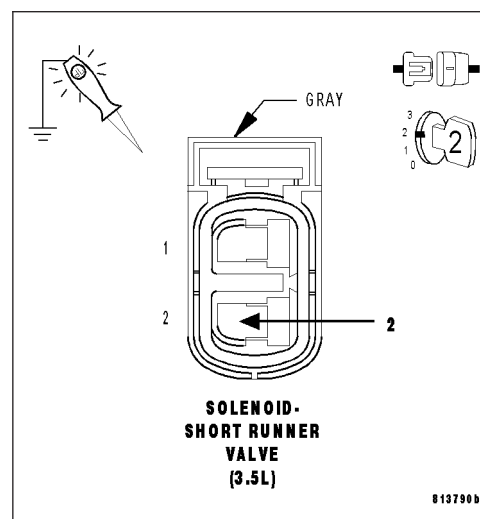
Using a 12-volt test light connected ground, probe the Fused ASD Relay Output circuit in the SRV Solenoid harness connector.

**Does the test light illuminate brightly and flash on and off?**

**Yes** >> Go To 4

**No** >> Repair the (K343) Fused ASD Relay Output circuit.

Perform POWERTRAIN VERIFICATION TEST VER — 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**4. (K236) SRV CONTROL CIRCUIT SHORT TO BATTERY VOLTAGE**

Turn the ignition off

Disconnect the PCM harness connectors.

Turn the ignition on.

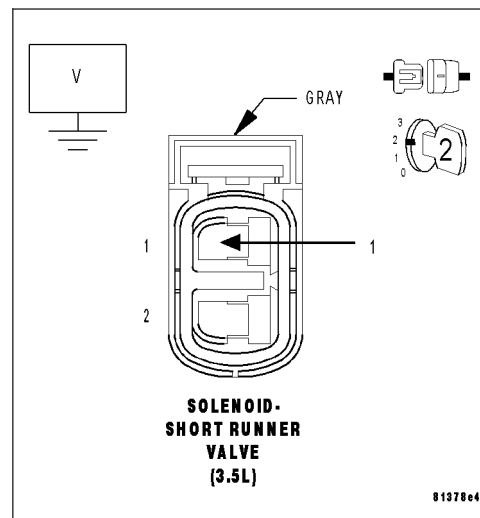
Measure the voltage of the (K236) SRV Control circuit in the SRV Solenoid harness connector.

**Does the voltage indicate voltage present?**

**Yes** >> Repair the short to voltage in the SRV Control circuit.

Perform POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



## P2008-SHORT RUNNER VALVE SOLENOID CIRCUIT (CONTINUED)

### 5. (K236) SRV CONTROL CIRCUIT SHORT TO GROUND

Turn the ignition off.

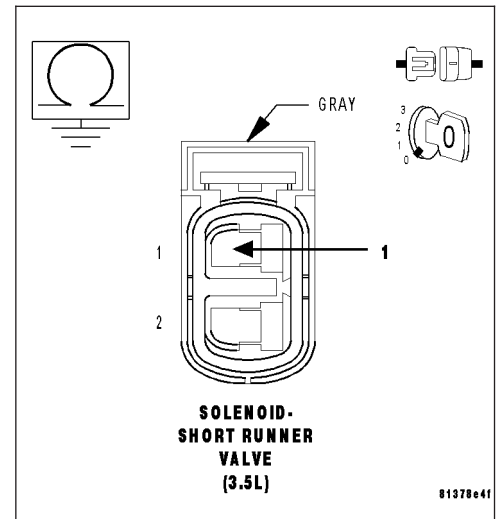
Measure the resistance between the (K236) SRV Control circuit in the SRV Solenoid harness connector and ground.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K236) SRV Control circuit.

Perform POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



### 6. (K236) SRV CONTROL CIRCUIT OPEN

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K236) SRV Control circuit between from the SRV Solenoid harness connector to the appropriate terminal of the special tool.

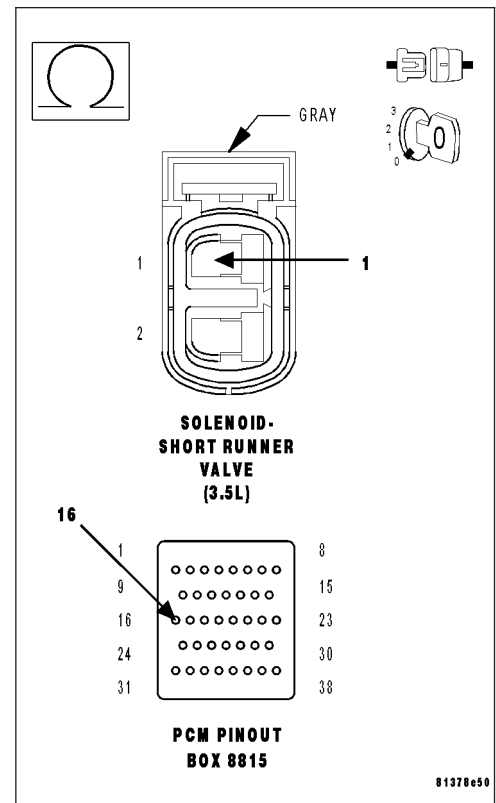
**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K236) SRV Control circuit.

Perform POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

Go To 7



**P2008-SHORT RUNNER VALVE SOLENOID CIRCUIT (CONTINUED)****7. PCM**

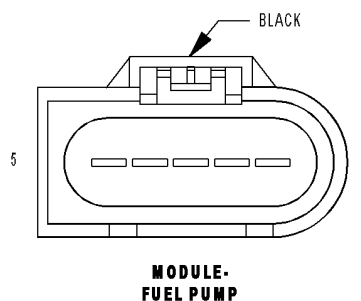
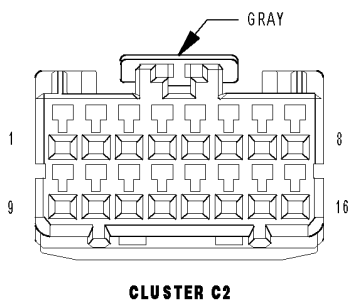
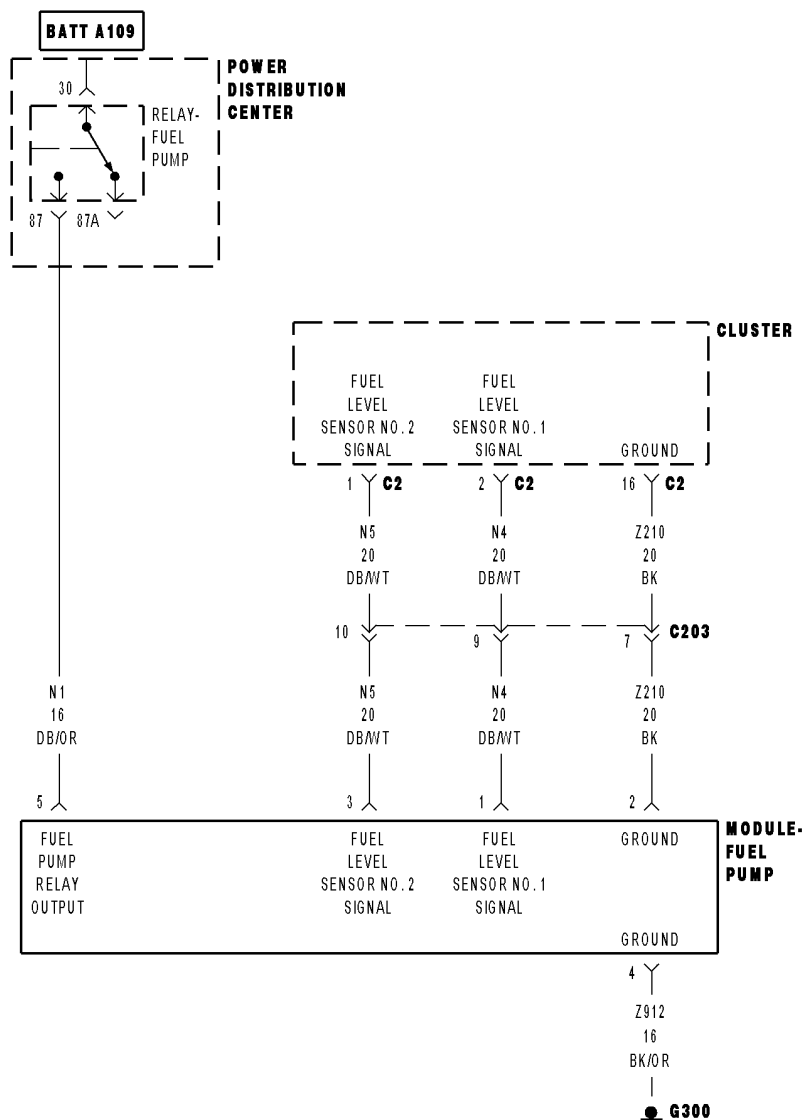
**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No**      >> Replace and program the Powertrain Control Module per Service Information.  
          Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
-

## P2066-FUEL LEVEL SENSOR 2 PERFORMANCE



**P2066-FUEL LEVEL SENSOR 2 PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

TEST No.1: With the ignition on, the fuel level is compared to the previous key down after a 20 second delay.

TEST No.2: The PCM monitors the fuel level at ignition on.

- **Set Condition:**

TEST No.1: If the PCM does not see a difference in fuel level of greater than 0.1 volt the test will fail. TEST

No.2: If the PCM does not see a change in the fuel level of .1765 over a set amount of miles the test will fail.

Three good trips to turn off the MIL.

Possible Causes
(N5) FUEL LEVEL SIGNAL CIRCUIT OPEN
(N5) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO GROUND
(Z210) FUEL LEVEL SENSOR GROUND CIRCUIT OPEN
FUEL TANK
FUEL LEVEL SENSOR

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Diagnose any CAN - C or CAN - B Communication DTCs before continuing.

**Note:** Diagnose P2067 or P2068 first, if set along with P2066.

Ignition on, engine not running.

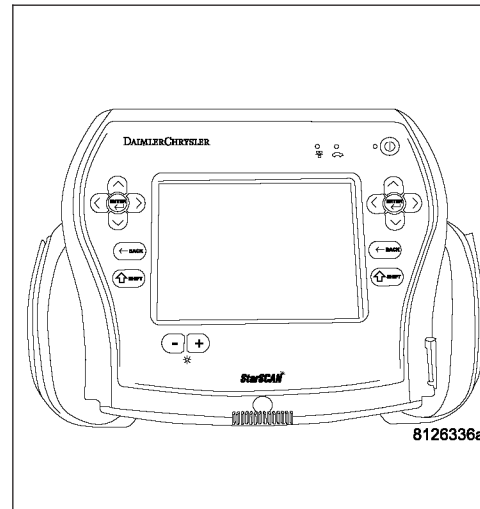
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



### 2. VISUALLY INSPECT FUEL TANK

Visually inspect the Fuel Tank for damage that may restrict the Fuel Sending Unit float from moving.

**Is the Fuel Tank OK?**

**Yes** >> Go To 3

**No** >> Replace the Fuel Tank as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P2066-FUEL LEVEL SENSOR 2 PERFORMANCE (CONTINUED)

### 3. (N5) FUEL LEVEL SIGNAL CIRCUIT OPEN

Turn the ignition off.

Disconnect the Fuel Pump Module harness connector.

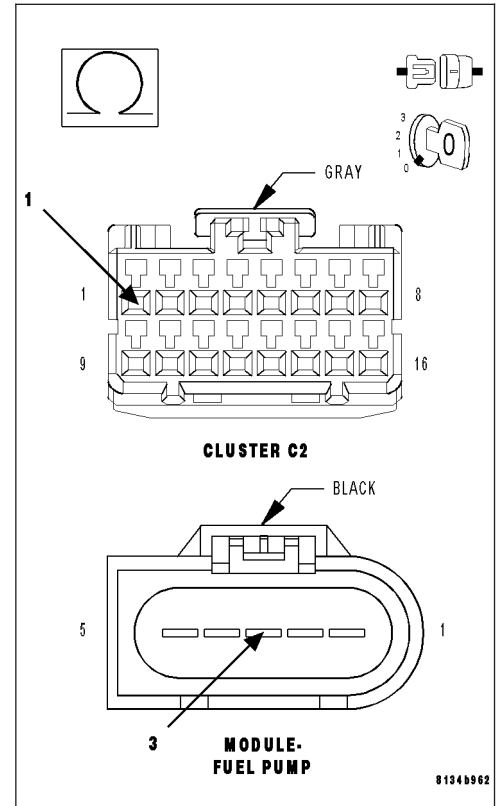
Disconnect the C2 Cluster harness connectors.

Measure the resistance of the (N5) Fuel Level Signal circuit from the Fuel Pump Module harness connector to the C2 Cluster harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the open in the (N5) Fuel Level Signal circuit.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)



### 4. (N5) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO GROUND

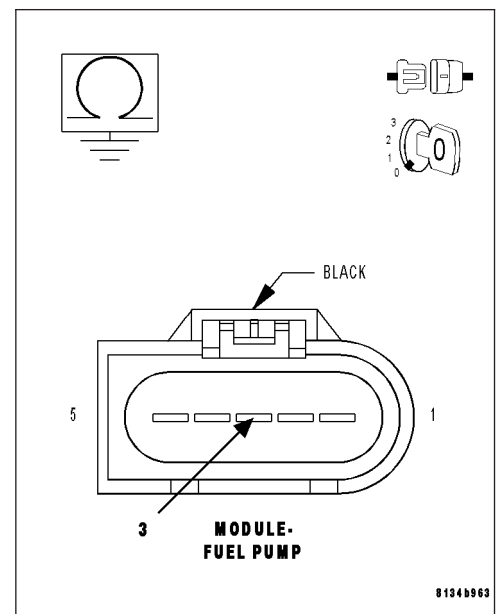
Measure the resistance between ground and the (N5) Fuel Level Signal circuit in the Fuel Pump Module harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (N5) Fuel Level Signal circuit.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



**P2066-FUEL LEVEL SENSOR 2 PERFORMANCE (CONTINUED)****5. (Z210) FUEL LEVEL SENSOR GROUND CIRCUIT OPEN**

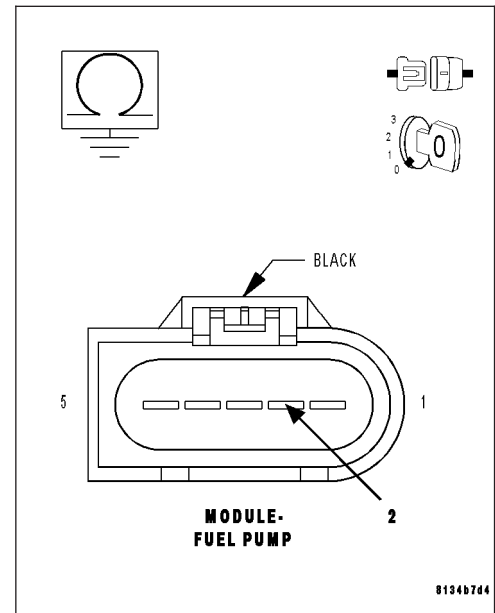
Measure the resistance of the (Z210) Fuel Level Sensor Ground circuit from the Fuel Pump Module harness connector to the C2 Cluster harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (Z210) Fuel Level Sensor Ground circuit.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**6. INTERNAL INSPECTION OF THE FUEL TANK**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Tank per Service Information.

Remove the Fuel Pump Module.

Visually inspect the inside of the Fuel Tank for any obstructions or deformities.

Inspect the Fuel Pump Module Float arm for damage.

**Were any problems found?**

**Yes** >> Repair or replace as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. FUEL LEVEL SENSOR**

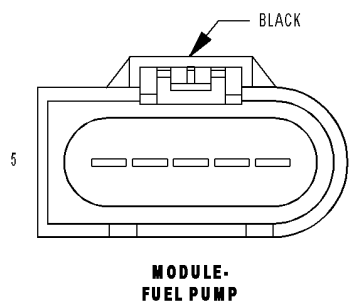
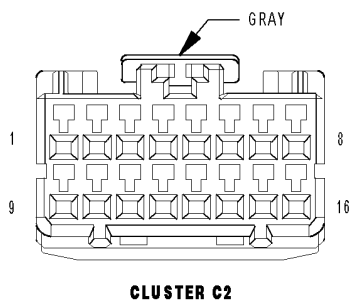
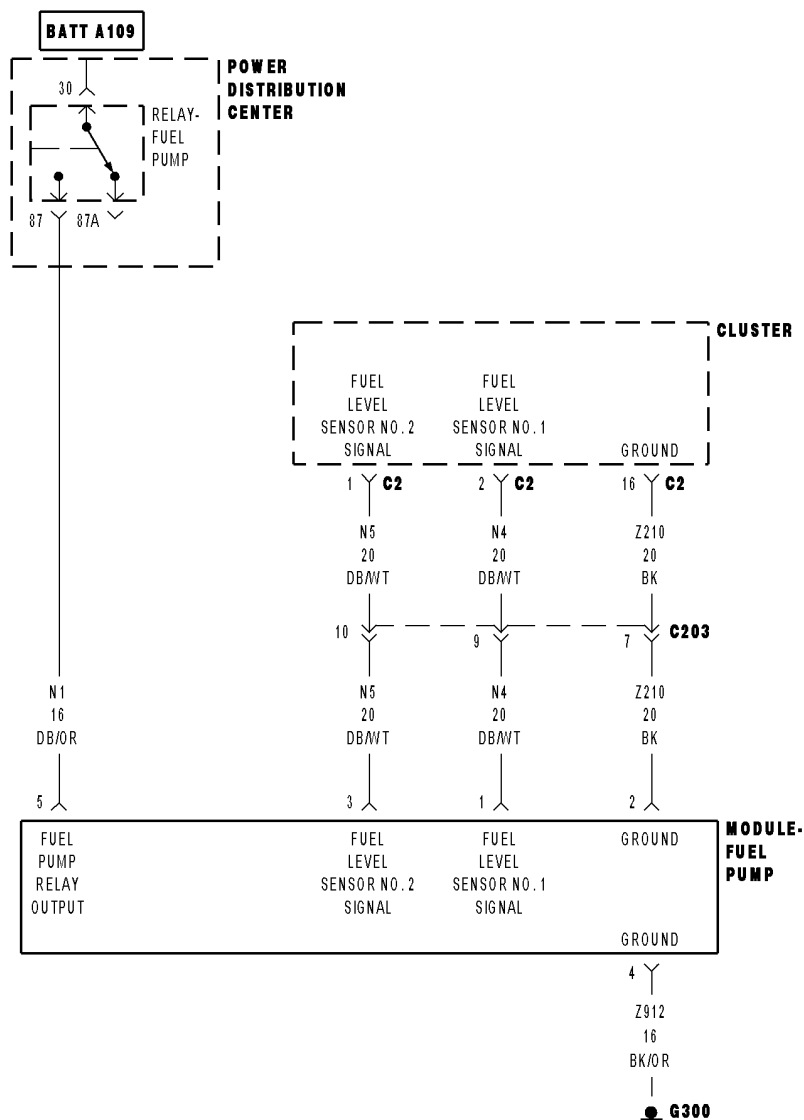
**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Fuel Level Sensor.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

# P2067-FUEL LEVEL SENSOR 2 CIRCUIT LOW





**P2067-FUEL LEVEL SENSOR 2 CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on and battery voltage above 10.4 volts.
- **Set Condition:**  
The fuel level sensor signal voltage goes below 0.4 of a volt for more than 90 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(N5) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO GROUND (N5) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO (Z210) FUEL LEVEL SENSOR RETURN CIRCUIT FUEL LEVEL SENSOR INSTRUMENT CLUSTER

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).**

**Diagnostic Test****1. FUEL LEVEL SENSOR VOLTAGE BELOW 0.4 OF A VOLT**

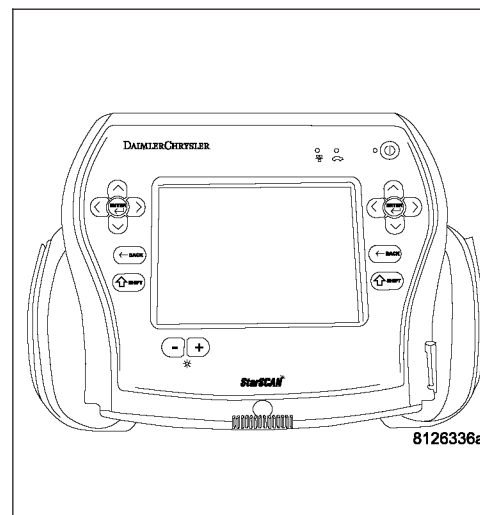
**Note:** Diagnose any CAN - B or CAN -C Communication DTCs before continuing.

Ignition on, engine not running.

With the scan tool, read the Fuel Level Sensor voltage.

**Is the Fuel Level Sensor voltage below 0.4 of a volt?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**2. FUEL LEVEL SENSOR**

Turn the ignition off.

Disconnect the Fuel Pump Module harness connector.

Ignition on, engine not running.

With the scan tool, read the Fuel Level Sensor voltage.

**Did the Fuel Level Sensor voltage change from below 0.4 of a volt to above 4.0 volts?**

- Yes** >> Replace the Fuel Level Sensor.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Go To 3

**P2067-FUEL LEVEL SENSOR 2 CIRCUIT LOW (CONTINUED)****3. (N5) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the C2 Cluster harness connectors.

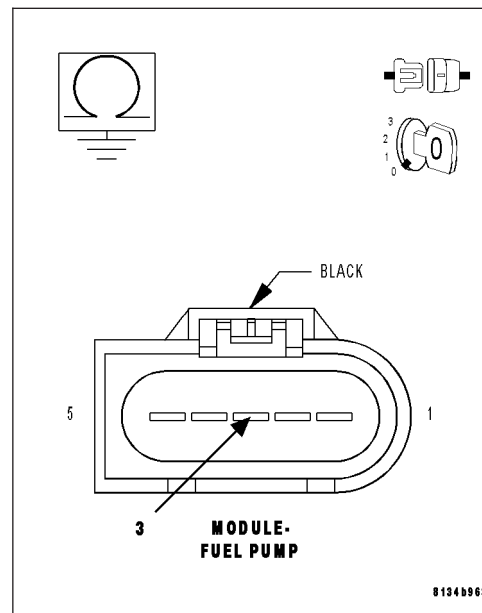
Measure the resistance between ground and the (N5) Fuel Level Signal circuit in the Fuel Pump Module harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (N5) Fuel Level Signal circuit.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (N5) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO THE (Z210) FUEL LEVEL SENSOR GROUND CIRCUIT**

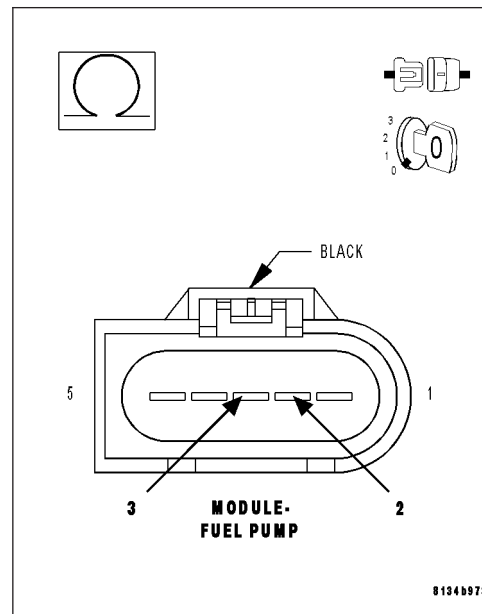
Measure the resistance between the (N5) Fuel Level Signal circuit and the (Z210) Fuel Level Sensor Ground circuit in the Fuel Pump Module harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (Z210) Fuel Level Sensor Ground circuit and the (N5) Fuel Level Signal circuit.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



**P2067-FUEL LEVEL SENSOR 2 CIRCUIT LOW (CONTINUED)****5. INSTRUMENT CLUSTER**

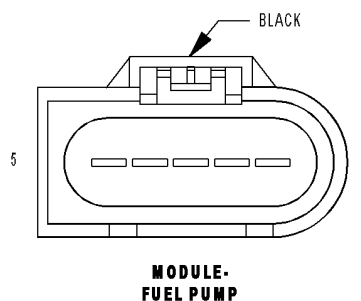
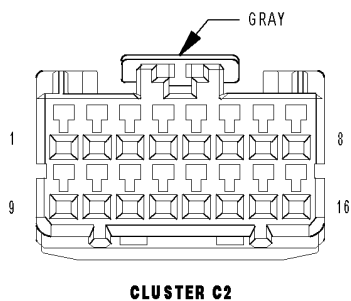
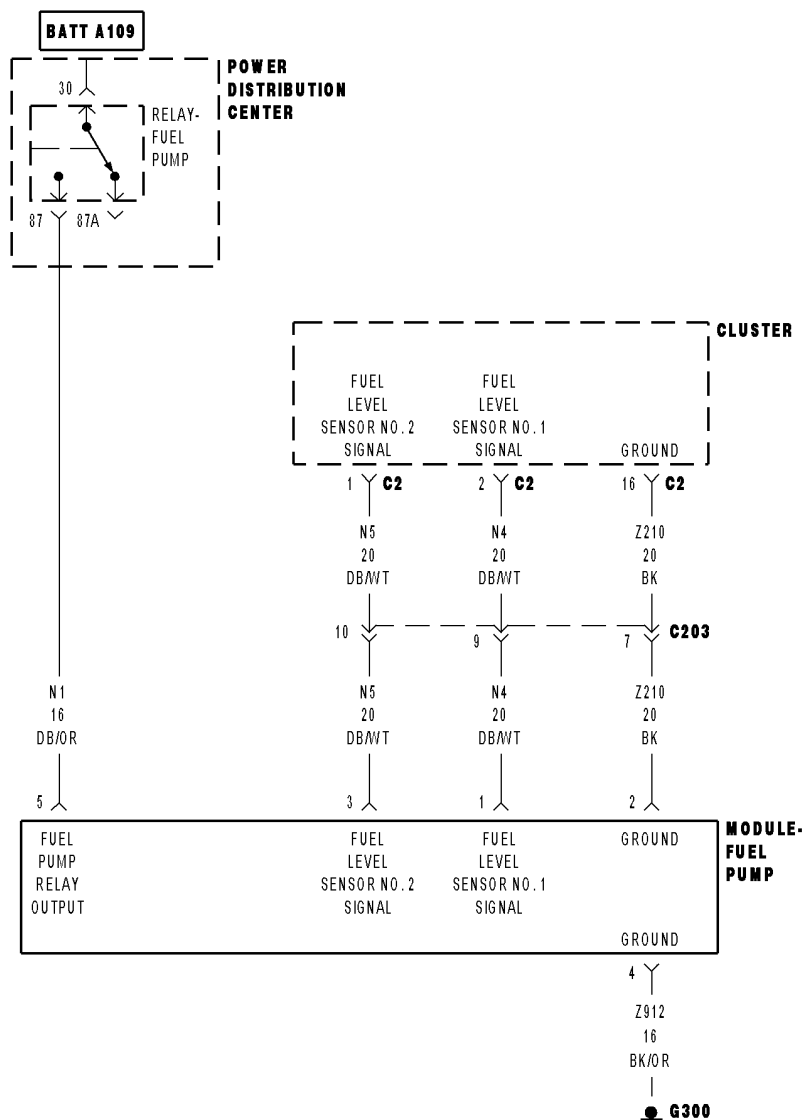
**Note:** Before continuing, check the Instrument Cluster harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)
- No**     >> Replace and program the Instrument Cluster per Service Information.  
          Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)
-

## P2068-FUEL LEVEL SENSOR 2 CIRCUIT HIGH



**P2068-FUEL LEVEL SENSOR 2 CIRCUIT HIGH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on and battery voltage above 10.4 volts.

- **Set Condition:**

The fuel level sensor signal voltage at the PCM goes above 4.9 volts for more than 90 seconds. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(N5) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(N5) FUEL LEVEL SIGNAL CIRCUIT OPEN
(Z210) FUEL LEVEL SENSOR GROUND CIRCUIT OPEN
FUEL LEVEL SENSOR
INSTRUMENT CLUSTER

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. FUEL LEVEL SENSOR VOLTS ABOVE 4.9 VOLTS

**Note:** Diagnose any CAN - B and CAN - C Communication DTCs before continuing.

Ignition on, engine not running.

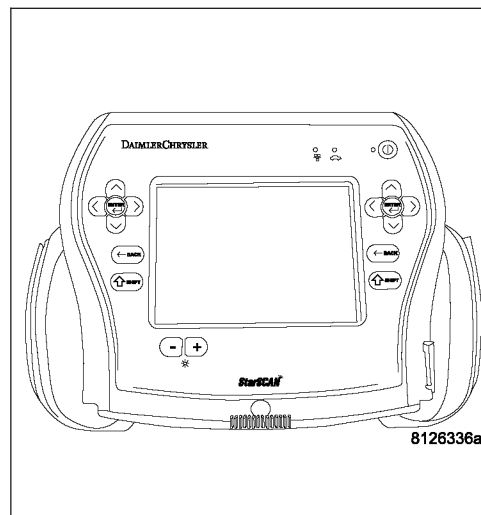
With a scan tool, read the Fuel Level Sensor voltage.

**Is the Fuel Level Sensor voltage above 4.9 volts?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2068-FUEL LEVEL SENSOR 2 CIRCUIT HIGH (CONTINUED)****2. FUEL LEVEL SENSOR**

Turn the ignition off.

Disconnect the Fuel Pump Module electrical harness connector.

Ignition on, engine not running.

Connect a jumper wire between the (N5) Fuel Level Signal circuit and the (Z210) Fuel Level Sensor Ground circuit in the Fuel Pump Module harness connector.

With the scan tool, read the Fuel Level Sensor voltage.

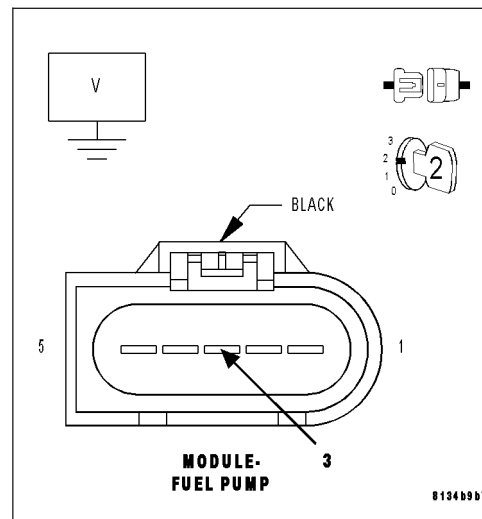
**Did the Fuel Level Sensor voltage change from above 4.8 volts to below 0.4 of a volt with the jumper wire installed?**

**Yes** >> Replace the Fuel Level Sensor.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**Note:** Remove the jumper wire before continuing.

**3. (N5) FUEL LEVEL SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the C2 Cluster harness connector.

Ignition on, engine not running.

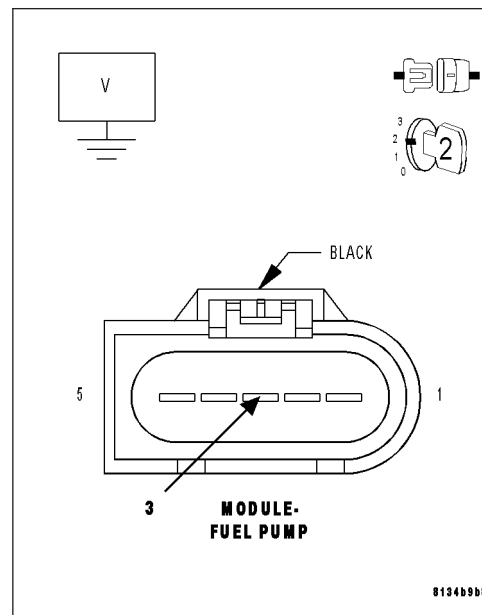
Measure the voltage on the (N5) Fuel Level Signal circuit in the Fuel Pump Module harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (N5) Fuel Level Signal circuit.

Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P2068-FUEL LEVEL SENSOR 2 CIRCUIT HIGH (CONTINUED)****4. (N5) FUEL LEVEL SIGNAL CIRCUIT OPEN**

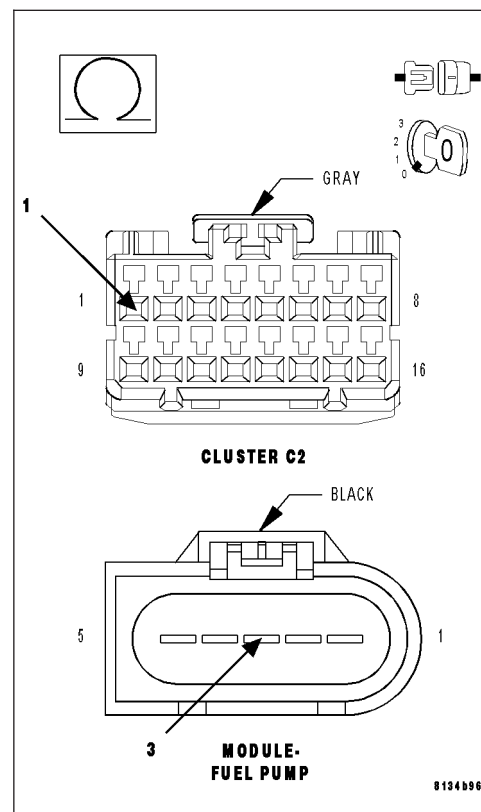
Turn the ignition off.

Measure the resistance of the (N5) Fuel Level Signal circuit from the Fuel Pump Module harness connector to the C2 Cluster harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (N5) Fuel Level Signal circuit.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)

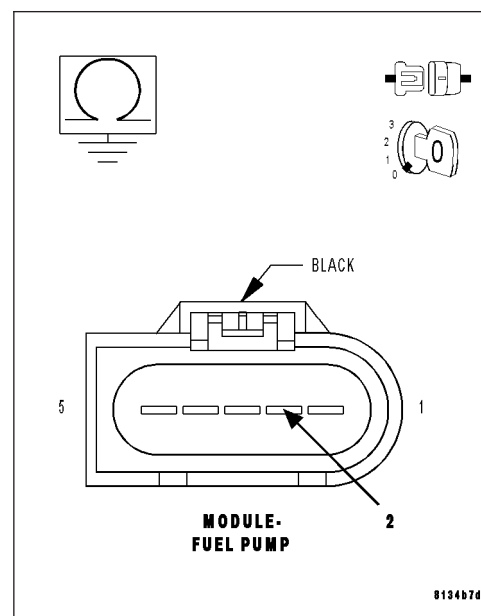
**5. (Z210) FUEL LEVEL SENSOR GROUND CIRCUIT OPEN**

Measure the resistance of the (Z210) Fuel Level Sensor Ground circuit from the Fuel Pump Module harness connector to the C2 Cluster harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (Z210) Fuel Level Sensor Ground circuit.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2068-FUEL LEVEL SENSOR 2 CIRCUIT HIGH (CONTINUED)****6. INSTRUMENT CLUSTER**

**Note:** Before continuing, check the Instrument Cluster harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Replace and program the Instrument Cluster per Service Information.  
Perform BODY VERIFICATION TEST-VER 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/FRONT CONTROL MODULE - DIAGNOSIS AND TESTING)
-



## P2072-ELECTRONIC THROTTLE CONTROL SYSTEM - ICE BLOCKAGE

For the Engine circuit diagram (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on.

- **Set Condition:**

The PCM recognizes the Throttle plate is stuck during extremely cold Ambient Temperature operation. The throttle plate goes through a de-icing procedure. If the throttle blade still doesn't move this fault sets. The MIL will not illuminate. The vehicle will be in Limp home condition, limiting rpm and vehicle speed.

Possible Causes
THROTTLE PLATE FROZEN

### Diagnostic Test

#### 1. THROTTLE BODY INSPECTION

Ignition on, engine not running.

With a scan tool, read DTCs and record the related Freeze Frame data.

**Note:** This DTC sets in extreme cold Ambient Temperatures with the throttle plate stuck. By the time the vehicle gets to the dealership the condition may be corrected.

**Note:** Diagnose any other DTCs that may also be set before continuing.

Turn the ignition off.

Remove the Air Cleaner Assembly from the Throttle Body.

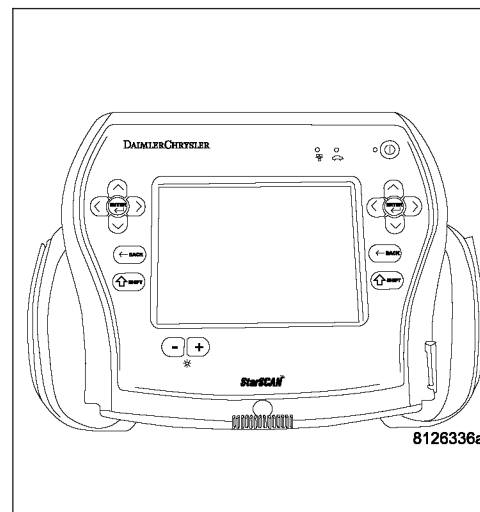
Check for any signs of a foreign material (ice or dirt) on the Throttle Plate or in the bore causing the Throttle Plate to stick.

**Is the throttle blade still stuck because it is frozen?**

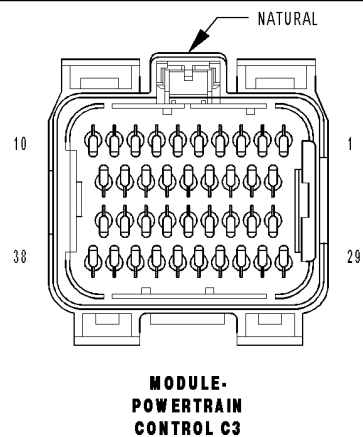
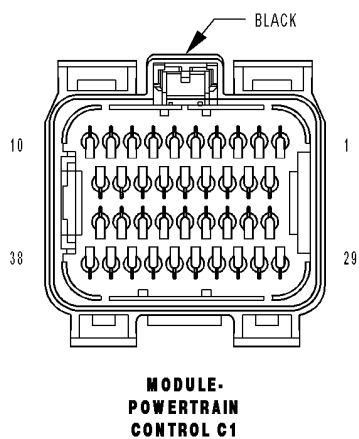
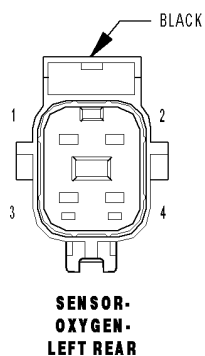
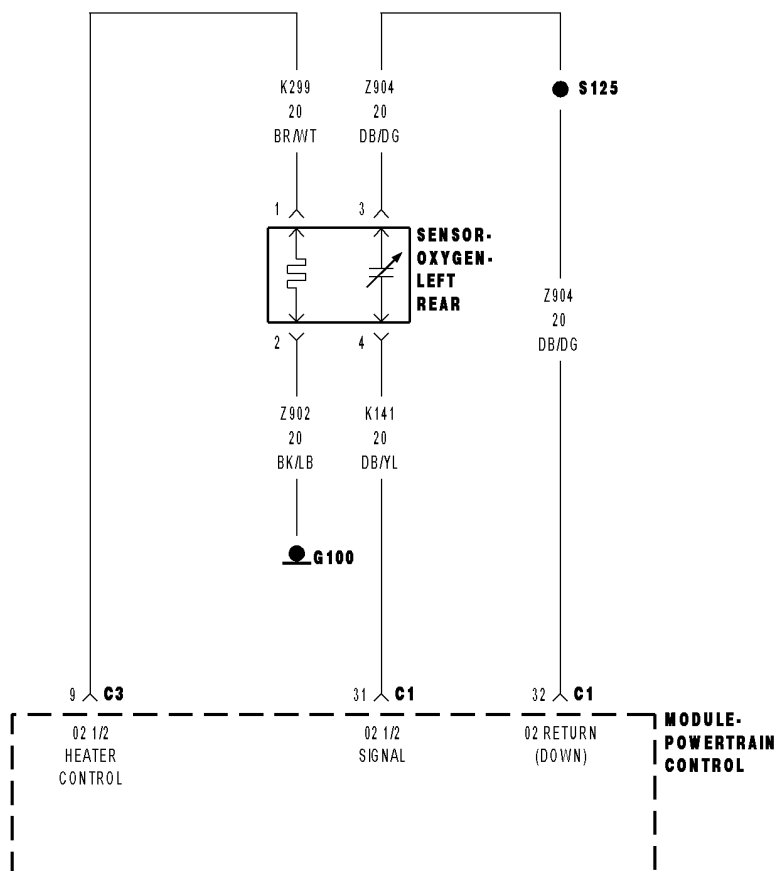
**Yes** >> Allow the Throttle Body to thaw naturally in a room temperature climate.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Test Complete.



## P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN



**P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the engine running in closed loop mode, the ambient/battery temperature above (-7°C) 20°F, altitude below 8500 ft.

- **Set Condition:**

If the PCM multiplies short term compensation by long term adaptive as well as a purge fuel multiplier and the result is below a certain value for 30 seconds over two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK ENGINE MECHANICAL PROBLEM 1/2 O2 SENSOR (K141) O2 SENSOR 1/2 SIGNAL CIRCUIT (K299) O2 1/2 HEATER CONTROL CIRCUIT (K904) O2 DOWNSTREAM RETURN CIRCUIT FUEL CONTAMINATION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Check the vehicle repair history. If the 1/2 O2 has been replace make sure that the O2 sensor was properly installed and meets OEM specification.

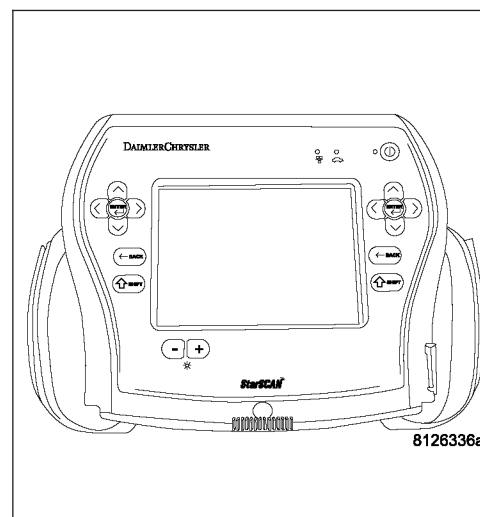
**Note:** Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant. Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
 Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN (CONTINUED)****2. EXHAUST LEAK**

Turn the ignition off.

**WARNING: To avoid personal injury from the exhaust system being hot, allow the exhaust to cool down to a safe temperature before performing a physical inspection. Failure to follow these instructions can result in personal injury or death.**

Visually and Physically inspect for holes, cracks and blockage in the exhaust system.

**Is the exhaust system in good condition?**

**Yes** >> Go To 3

**No** >> Repair or Replace as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**3. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems.

AIR INDUCTION SYSTEM - must be free from leaks

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

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**P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN (CONTINUED)****4. O2 SENSOR**

Ignition on, engine not running.

Disconnect the 1/2 O2 Sensor harness connector.

With the scan tool, monitor the 1/2 O2 Sensor voltage.

The O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.

Using a jumper wire, jump the (K141) O2 Sensor 1/2 Signal circuit to the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

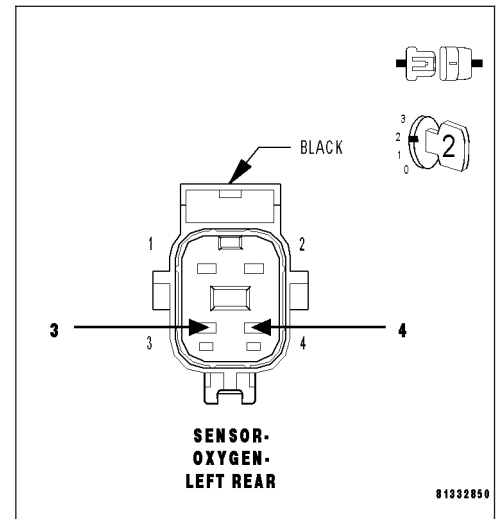
**Note:** The voltage should drop from 5.0 volts to 2.5 volts with the jumper wire in place.

**Did the O2 Sensor volts change from 5.0 volts to 2.5 volts?**

**Yes** >> Replace the O2 Sensor

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



**P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN (CONTINUED)****5. (K141) O2 SENSOR 1/2 SIGNAL CIRCUIT**

Remove the jump wire.

Ignition on, engine not running.

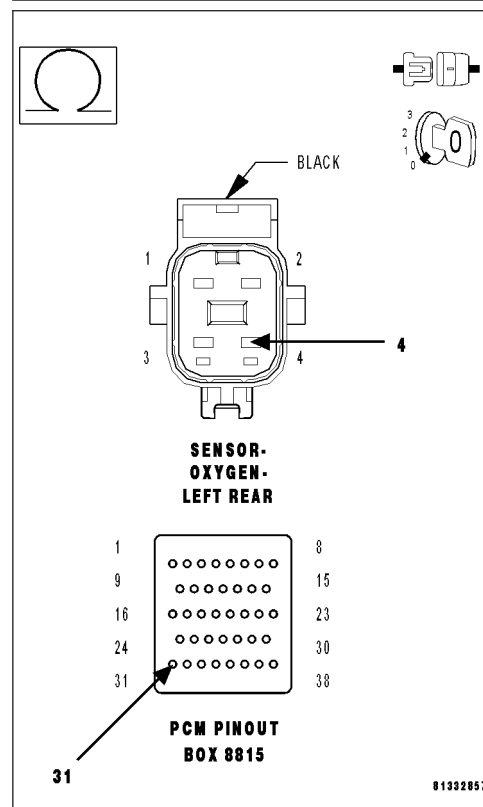
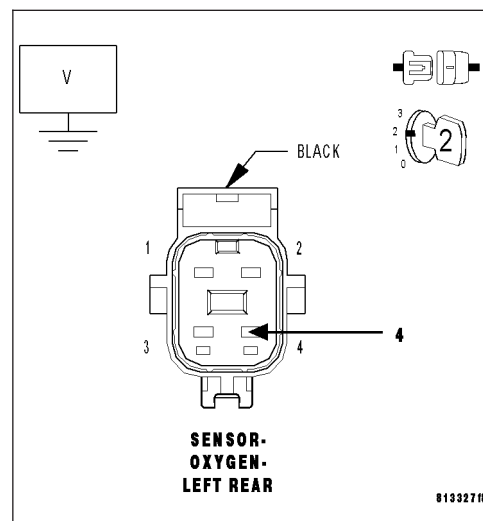
With the scan tool, monitor the 1/2 O2 Sensor voltage.

**Is the voltage above 4.8 volts?**

**Yes** >> Go To 6

**No** >> Check the (K141) O2 Sensor 1/2 Signal circuit for an open or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN (CONTINUED)****6. (K299) O2 SENSOR 1/2 HEATER CONTROL CIRCUIT**

Turn the ignition off.

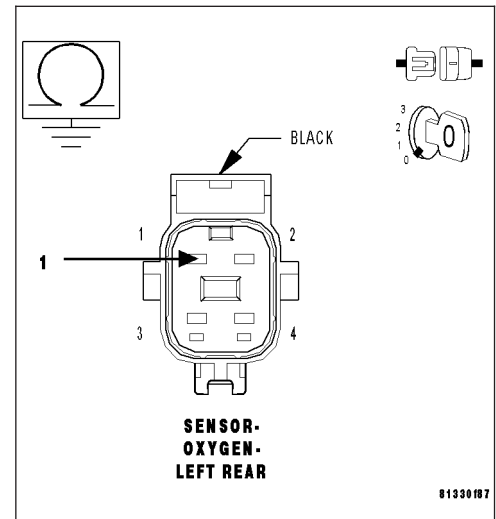
Measure the resistance between ground and the (K299) O2 Sensor 1/2 Heater Control circuit in the O2 Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short to ground in the (K299) O2 Sensor 1/2 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 7



P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 LEAN (CONTINUED)

7. (K904) O2 DOWNSTREAM RETURN CIRCUIT

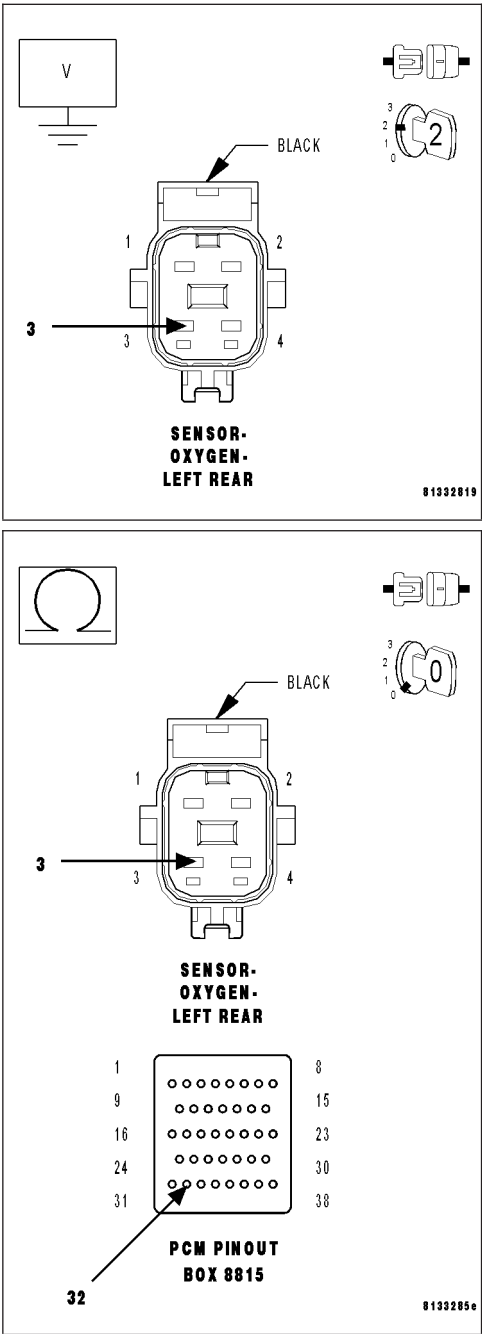
Measure the voltage on the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

Is the voltage at 2.5 volts?

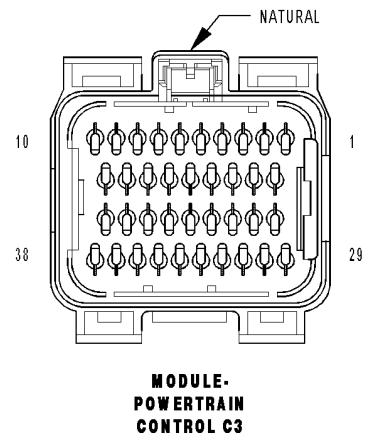
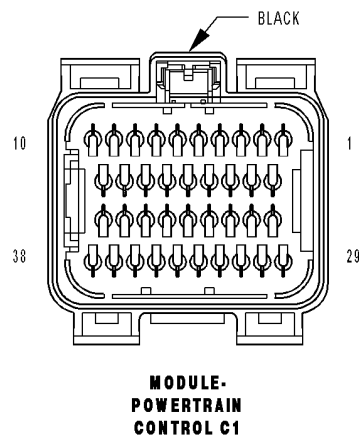
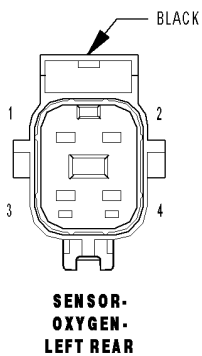
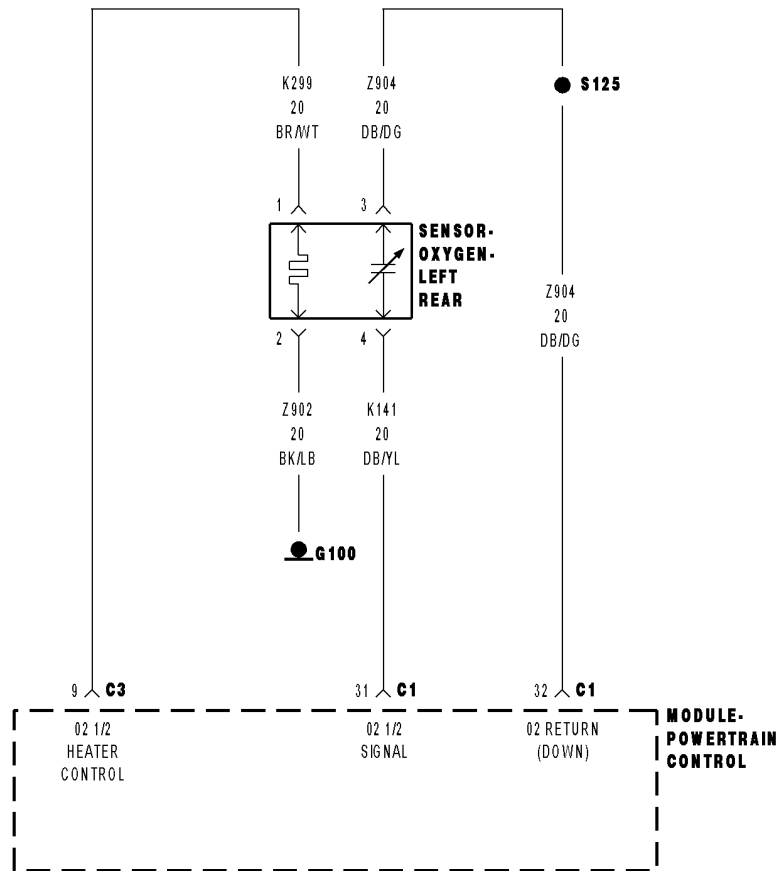
- Yes

>> Check the fuel system for contaminants.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No

>> Check the (K904) O2 Downstream Return circuit for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH**

**P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the engine running in closed loop mode, the ambient/battery temperature above (-7°C) 20°F, altitude below 8500 ft.

- **Set Condition:**

If the PCM multiplies short term compensation by long term adaptive as well as a purge fuel multiplier and the result is below a certain value for 30 seconds over two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK ENGINE MECHANICAL PROBLEM 1/2 O2 SENSOR (K141) O2 SENSOR 1/2 SIGNAL CIRCUIT (K299) O2 HEATER 1/2 CONTROL CIRCUIT (K904) O2 DOWNSTREAM RETURN CIRCUIT FUEL CONTAMINATION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Check the vehicle repair history. If the 1/2 O2 has been replaced make sure that the O2 sensor was properly installed and meets OEM specification.

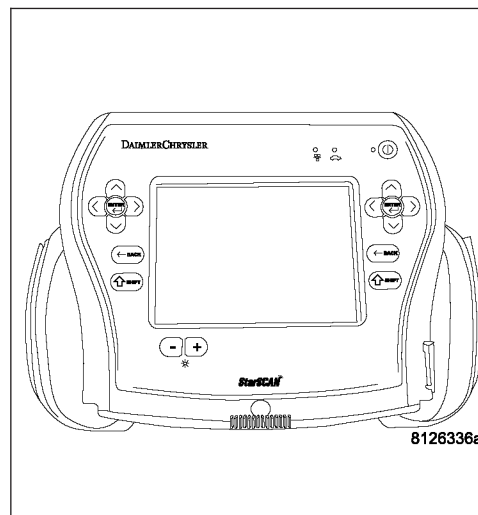
**Note:** Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant. Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
 Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH (CONTINUED)****2. EXHAUST LEAK**

Turn the ignition off.

**WARNING: To avoid personal injury from the exhaust system being hot, allow the exhaust to cool down to a safe temperature before performing a physical inspection. Failure to follow these instructions can result in personal injury or death.**

Visually and Physically inspect for holes, cracks and blockage in the exhaust system.

**Is the exhaust system in good condition?**

**Yes** >> Go To 3

**No** >> Repair or Replace as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**3. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems

AIR INDUCTION SYSTEM - must be free from leaks.

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

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**P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH (CONTINUED)****4. O2 SENSOR**

Ignition on, engine not running.

Disconnect the 1/2 O2 Sensor harness connector.

With the scan tool, monitor the 1/2 O2 Sensor voltage.

The O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.

Using a jumper wire, jump the (K141) O2 Sensor 1/2 Signal circuit to the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

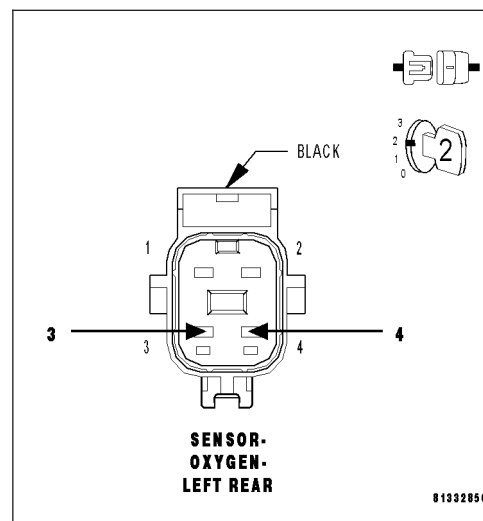
**Note: The voltage should drop from 5.0 volts to 2.5 volts with the jumper wire in place.**

**Did the O2 Sensor volts change from 5.0 volts to 2.5 volts?**

**Yes** >> Replace the O2 Sensor

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



**P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH (CONTINUED)****5. (K141) O2 SENSOR 1/2 SIGNAL CIRCUIT**

Remove the jump wire.

Ignition on, engine not running.

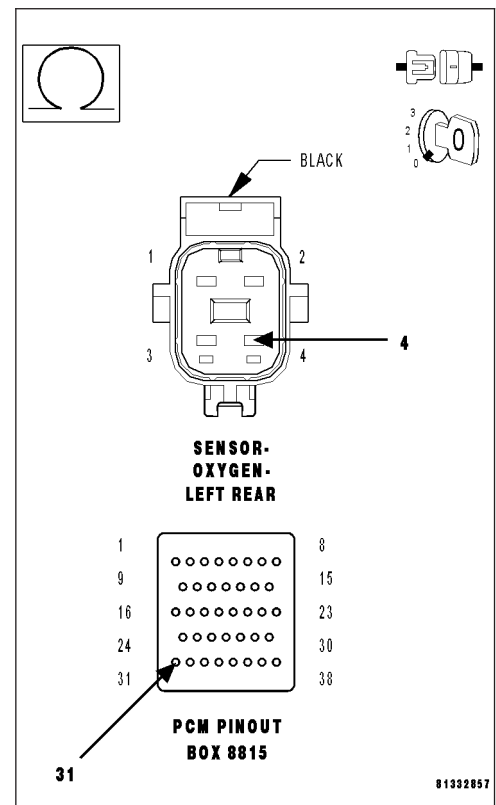
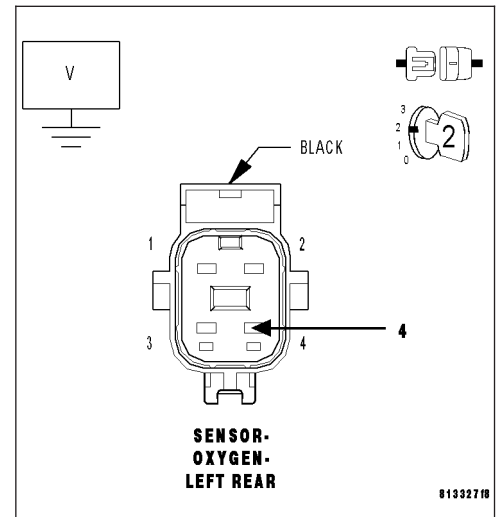
With the scan tool, monitor the 1/2 O2 Sensor voltage.

**Is the voltage above 4.8 volts?**

**Yes** >> Go To 6

**No** >> Check the (K141) O2 Sensor 1/2 Signal circuit for an open or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH (CONTINUED)****6. (K299) O2 SENSOR 1/2 HEATER CONTROL CIRCUIT**

Turn the ignition off.

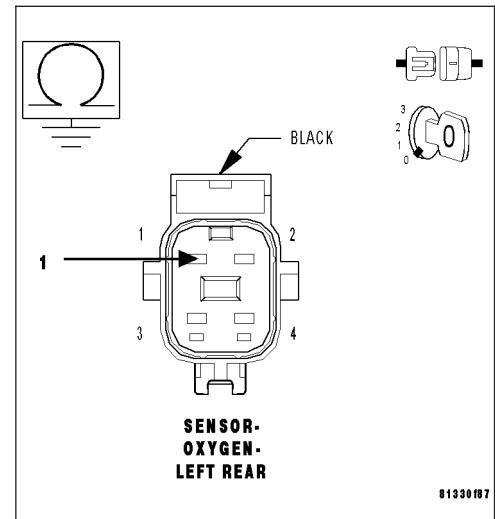
Measure the resistance between ground and the (K299) O2 Sensor 1/2 Heater Control circuit in the O2 Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short to ground in the (K299) O2 Sensor 1/2 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 7

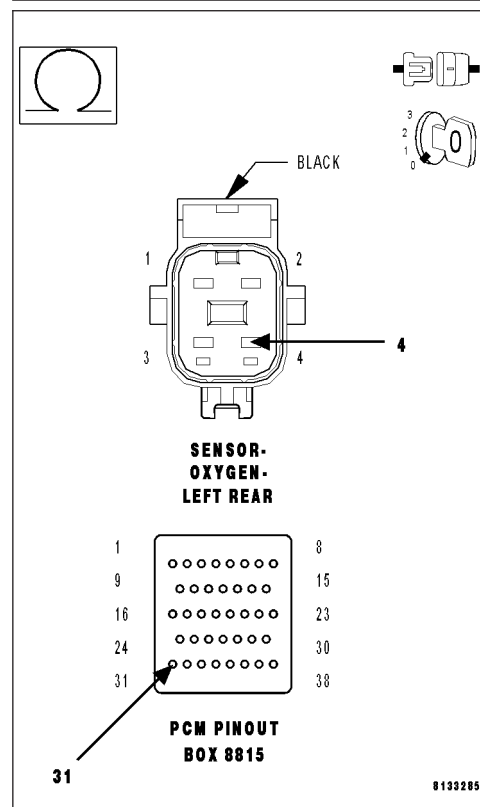
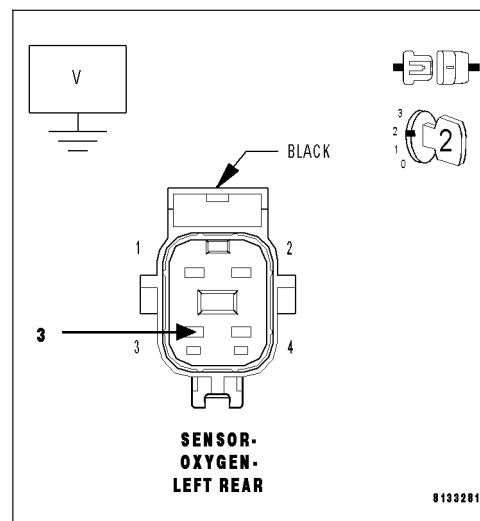


**P2097-DOWNSTREAM FUEL TRIM SYSTEM 1 RICH (CONTINUED)****7. (K904) O2 DOWN STREAM RETURN CIRCUIT**

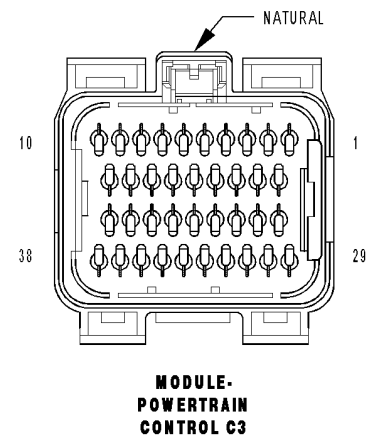
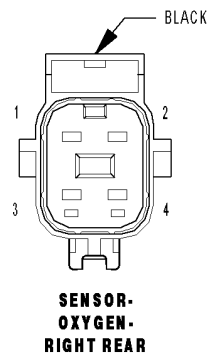
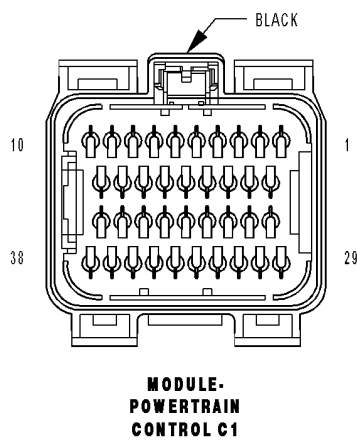
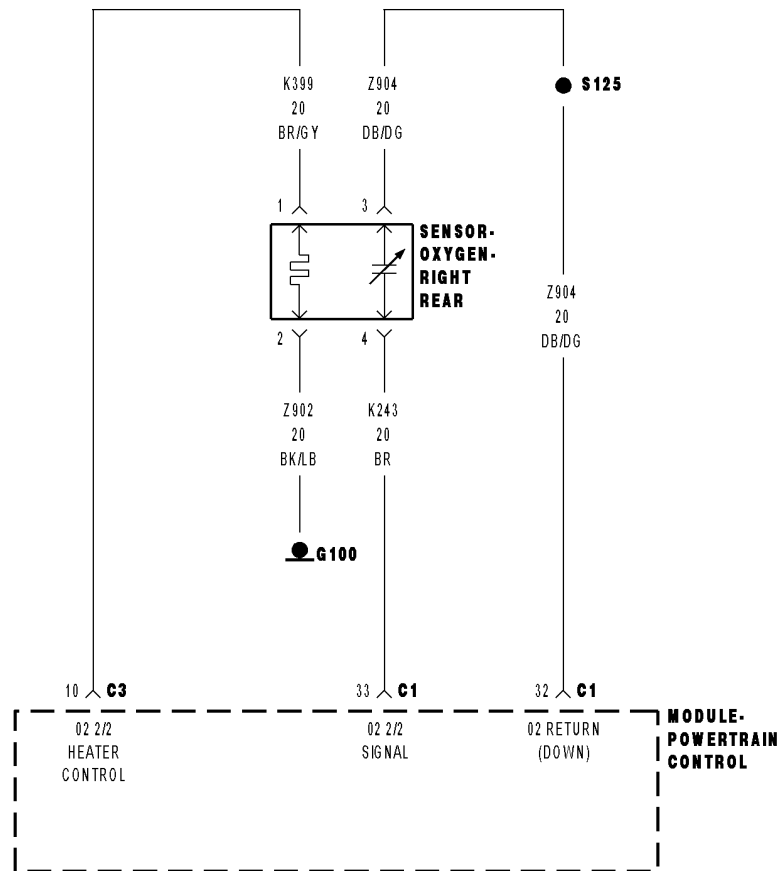
Measure the voltage on the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

**Is the voltage at 2.5 volts?**

- Yes** >> Check the fuel system for contaminants.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Check the (K904) O2 Downstream Return circuit for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P2098-DOWNSTREAM FUEL TRIM SYSTEM 2 LEAN





**P2098-DOWNSTREAM FUEL TRIM SYSTEM 2 LEAN (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the engine running in closed loop mode, the ambient/battery temperature above (-7°C) 20°F, altitude below 8500 ft and fuel level greater than 15%.

- **Set Condition:**

If the PCM multiplies short term compensation by long term adaptive and a certain percentage is exceeded for two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK ENGINE MECHANICAL PROBLEM 2/2 O2 SENSOR (K243) O2 2/2 SIGNAL CIRCUIT (K399) O2 HEATER 2/2 CONTROL CIRCUIT (K904) O2 DOWNSTREAM RETURN CIRCUIT FUEL CONTAMINATION

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Check the vehicle repair history. If the 2/2 O2 has been replace make sure that the O2 sensor was properly installed and meets OEM specification.

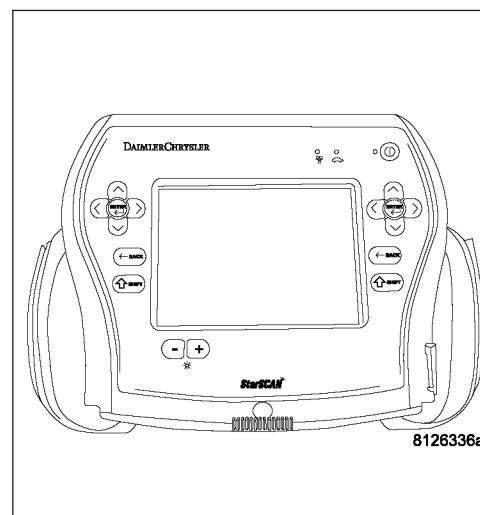
**Note:** Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant. Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2098-DOWNSTREAM FUEL TRIM SYSTEM 2 LEAN (CONTINUED)****2. EXHAUST LEAK**

Turn the ignition off.

**WARNING: To avoid personal injury from the exhaust system being hot, allow the exhaust to cool down to a safe temperature before performing a physical inspection. Failure to follow these instructions can result in personal injury or death.**

Visually and Physically inspect for holes, cracks and blockage in the exhaust system.

**Is the exhaust system in good condition?**

**Yes** >> Go To 3

**No** >> Repair or Replace as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**3. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems.

AIR INDUCTION SYSTEM - must be free from leaks

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

---

**P2098-DOWNSTREAM FUEL TRIM SYSTEM 2 LEAN (CONTINUED)****4. O2 SENSOR**

Ignition on, engine not running.

Disconnect the 2/2 O2 Sensor harness connector.

With the scan tool, monitor the 2/2 O2 Sensor voltage.

The O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.

Using a jumper wire, jump the (K243) O2 Sensor 2/2 Signal circuit to the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

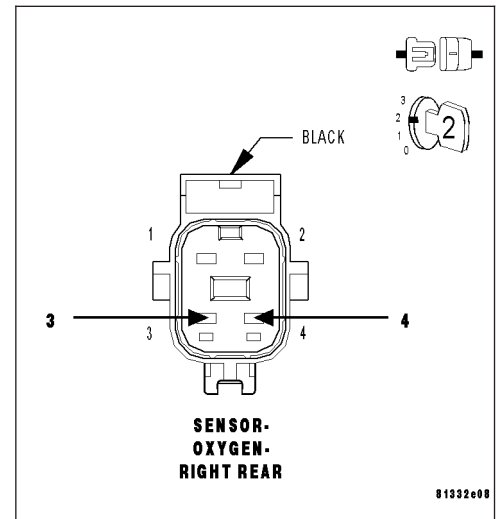
**Note:** The voltage should drop from 5.0 volts to 2.5 volts with the jumper wire in place.

**Did the O2 Sensor volts change from 5.0 volts to 2.5 volts?**

**Yes** >> Replace the O2 Sensor

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



**P2098-DOWNSTREAM FUEL TRIM SYSTEM 2 LEAN (CONTINUED)****5. (K243) O2 SENSOR 2/2 SIGNAL CIRCUIT**

Remove the jump wire.

Ignition on, engine not running.

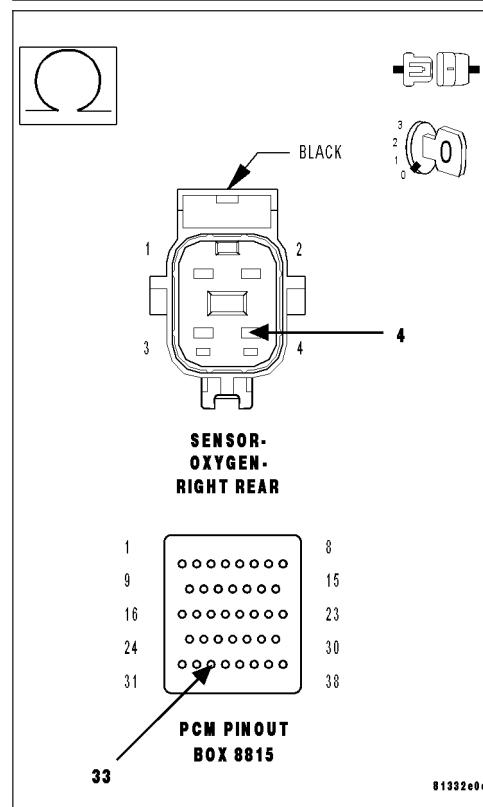
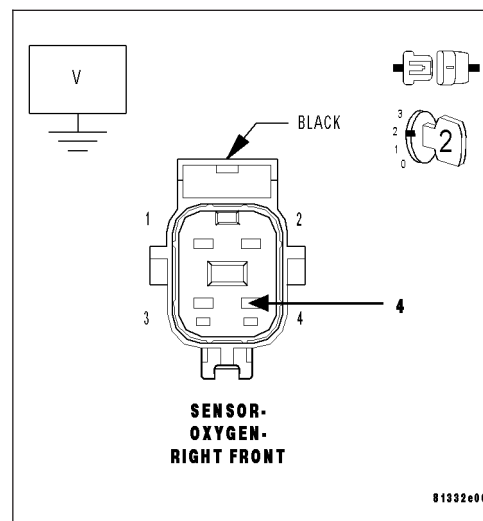
With the scan tool, monitor the O2 Sensor voltage.

**Is the voltage above 4.8 volts?**

**Yes** >> Go To 6

**No** >> Check the (K243) O2 Sensor 2/2 Signal circuit for a open or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2098-DOWNSTREAM FUEL TRIM SYSTEM 2 LEAN (CONTINUED)****6. (K399) O2 SENSOR 2/2 HEATER CONTROL CIRCUIT**

Turn the ignition off.

Measure the resistance between ground and the (K399) O2 Sensor 2/2 Heater Control circuit in the O2 Sensor harness connector.

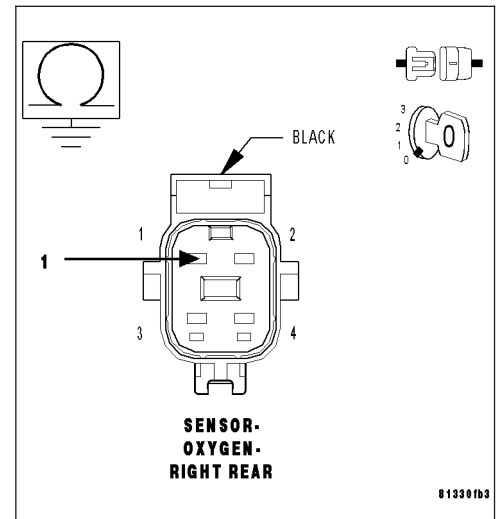
**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short to ground in the (K399) O2 Sensor 2/2 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 7

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

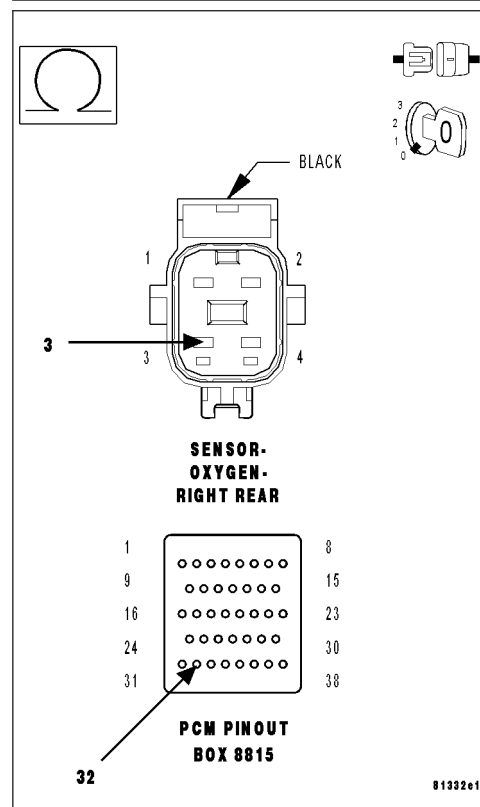
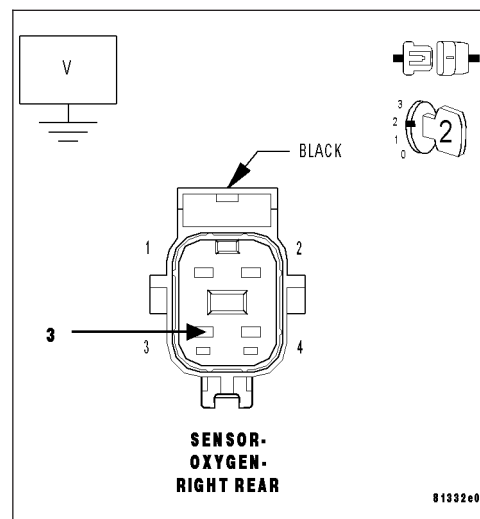


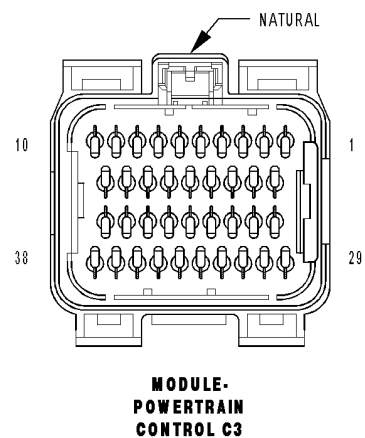
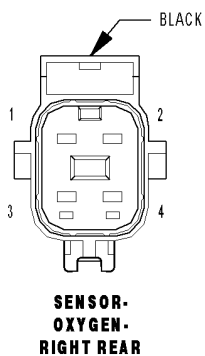
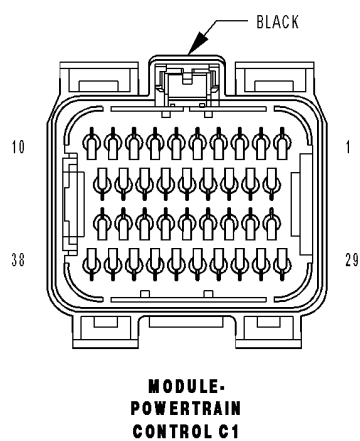
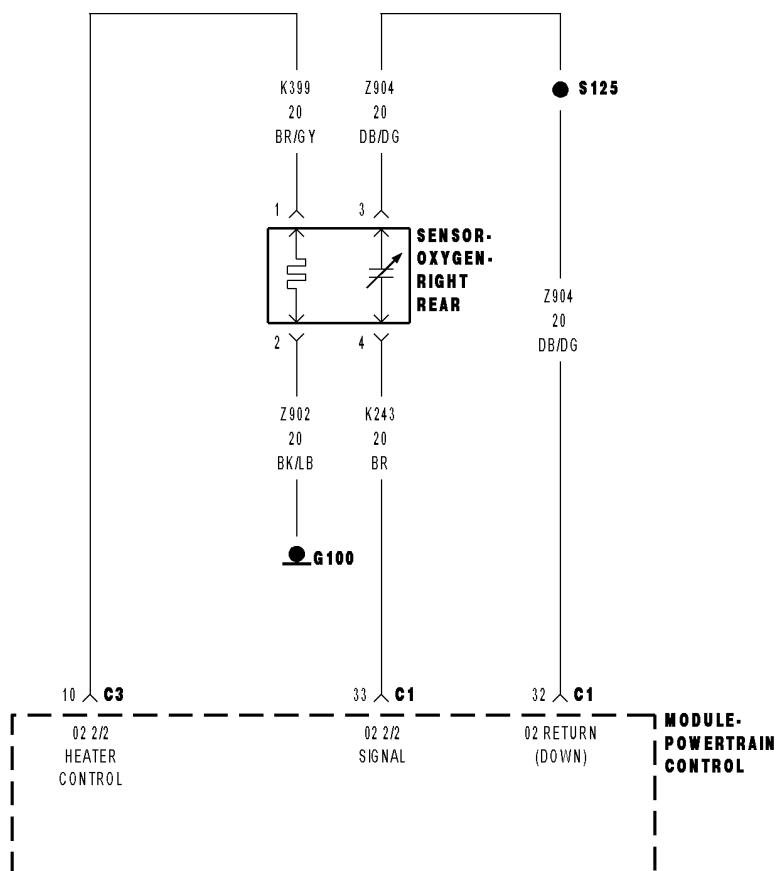
**P2098-DOWNSTREAM FUEL TRIM SYSTEM 2 LEAN (CONTINUED)****7. (K904) O2 DOWNSTREAM RETURN CIRCUIT**

Measure the voltage on the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

**Is the voltage at 2.5 volts?**

- Yes** >> Check the fuel system for contaminants.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Check the (K904) O2 Downstream Return circuit for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2099-DOWNSTREAM FUEL TRIM SYSTEM 2 RICH**

**P2099-DOWNSTREAM FUEL TRIM SYSTEM 2 RICH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the engine running in closed loop mode, the ambient/battery temperature above (-7°C) 20°F, altitude below 8500 ft.

- **Set Condition:**

If the PCM multiplies short term compensation by long term adaptive as well as a purge fuel multiplier and the result is below a certain value for 30 seconds over two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored. Two Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXHAUST LEAK ENGINE MECHANICAL PROBLEM 2/2 O2 SENSOR (K342) O2 SENSOR 2/2 SIGNAL CIRCUIT (K399) O2 SENSOR 2/2 HEATER CONTROL CIRCUIT (K904) O2 DOWNSTREAM RETURN CIRCUIT FUEL CONTAMINATION

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Check the vehicle repair history. If the 2/2 O2 has been replace make sure that the O2 sensor was properly installed and meets OEM specification.

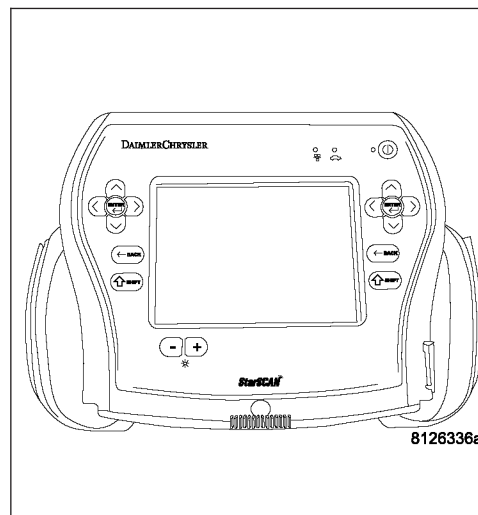
**Note:** Check for contaminants that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant. Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P2099-DOWNSTREAM FUEL TRIM SYSTEM 2 RICH (CONTINUED)****2. EXHAUST LEAK**

Turn the ignition off.

**WARNING: To avoid personal injury from the exhaust system being hot, allow the exhaust to cool down to a safe temperature before performing a physical inspection. Failure to follow these instructions can result in personal injury or death.**

Visually and Physically inspect for holes, cracks and blockage in the exhaust system.

**Is the exhaust system in good condition?**

**Yes** >> Go To 3

**No** >> Repair or Replace as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**3. ENGINE MECHANICAL PROBLEM**

Check for any of the following conditions/mechanical problems.

AIR INDUCTION SYSTEM - must be free from leaks

ENGINE VACUUM - must be at least 13 inches in neutral

ENGINE VALVE TIMING - must be within specifications

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks

ENGINE PCV SYSTEM - must flow freely

TORQUE CONVERTER STALL SPEED - must be within specifications

POWER BRAKE BOOSTER - no internal vacuum leaks

FUEL - must be free of contamination

FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector

**Are there any engine mechanical problems?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

---

**P2099-DOWNSTREAM FUEL TRIM SYSTEM 2 RICH (CONTINUED)****4. O2 SENSOR**

Ignition on, engine not running.

Disconnect the 2/2 O2 Sensor harness connector.

With the scan tool, monitor the 2/2 O2 Sensor voltage.

The O2 Sensor voltage should read 5.0 volts on the scan tool with the connector disconnected.

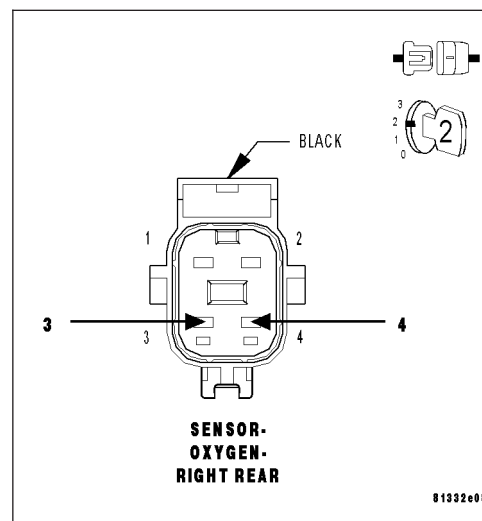
Using a jumper wire, jump the (K243) O2 Signal 2/2 circuit to the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

**Note: The voltage should drop from 5.0 volts to 2.5 volts with the jumper wire in place.**

**Did the O2 Sensor volts change from 5.0 volts to 2.5 volts?**

**Yes** >> Replace the O2 Sensor  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



**P2099-DOWNSTREAM FUEL TRIM SYSTEM 2 RICH (CONTINUED)****5. (K243) O2 SENSOR 2/2 SIGNAL CIRCUIT**

Remove the jump wire.

Ignition on, engine not running.

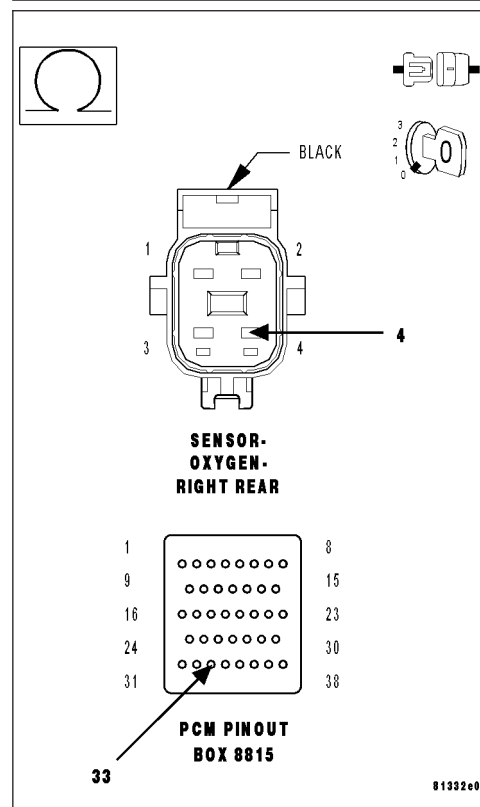
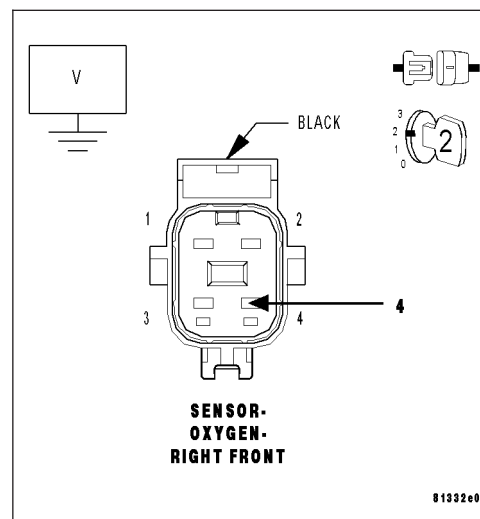
With the scan tool, monitor the 2/2 O2 Sensor voltage.

**Is the voltage above 4.8 volts?**

**Yes** >> Check the (K243) O2 Sensor 2/2 Signal circuit for an open or short to battery voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.

**No** >> Go To 6

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2099-DOWNSTREAM FUEL TRIM SYSTEM 2 RICH (CONTINUED)****6. (K399) O2 SENSOR 2/2 HEATER CONTROL CIRCUIT OPEN**

Turn the ignition off.

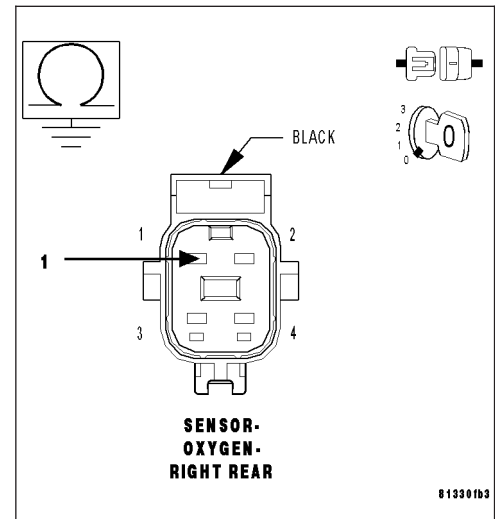
Measure the resistance between ground and the (K399) O2 Sensor 2/2 Heater Control circuit in the O2 Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short to ground in the (K399) O2 Sensor 2/2 Heater Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 7

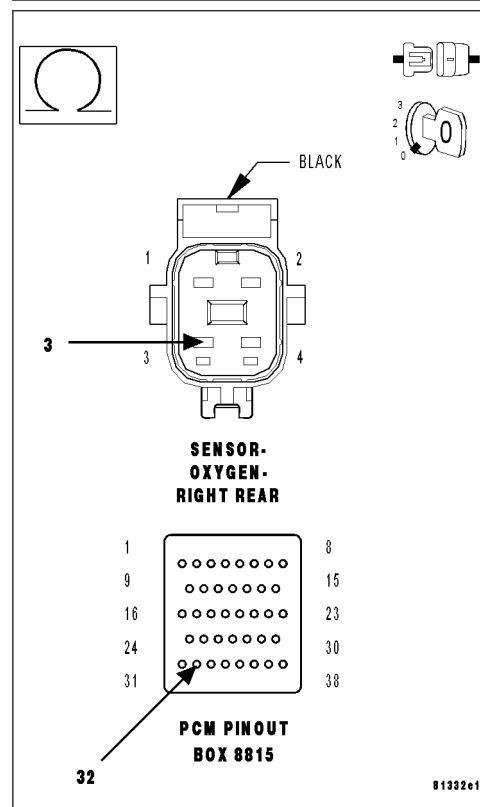
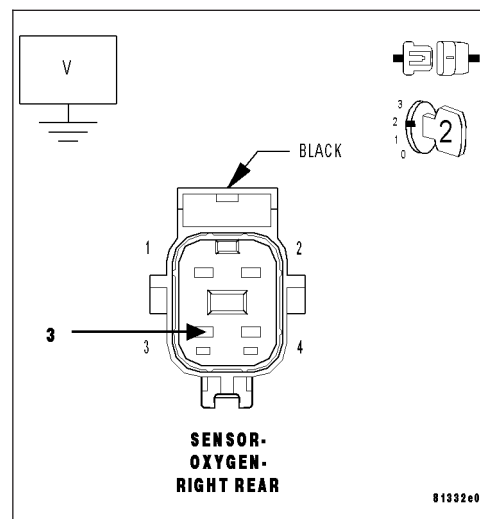


**P2099-DOWNSTREAM FUEL TRIM SYSTEM 2 RICH (CONTINUED)****7. (K904) O2 DOWNSTREAM RETURN CIRCUIT**

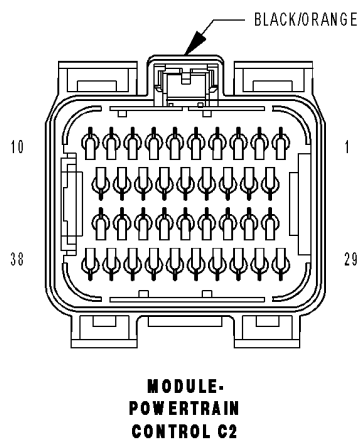
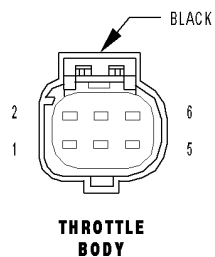
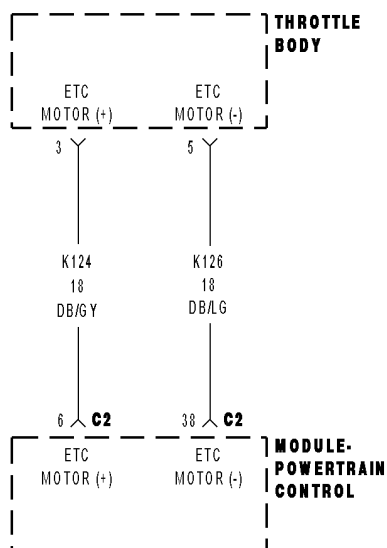
Measure the voltage on the (K904) O2 Downstream Return circuit in the O2 Sensor harness connector.

**Is the voltage at 2.5 volts?**

- Yes** >> Check the fuel system for contaminants.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Check the (K904) O2 Downstream Return circuit for a short to ground, open, or short to voltage. Inspect the O2 Sensor connector and the PCM harness connector. If OK, replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P2100-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT



**P2100-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on and the ETC Motor is not in Limp Home mode.

- **Set Condition:**

When the PCM detects an internal error or a short between the ETC Motor- and ETC Motor + circuits in the ETC Motor Driver. One trip fault. ETC light is flashing.

Possible Causes
THROTTLE PLATE / BORE INSPECTION (K124) ETC POSITIVE CIRCUIT SHORTED TO BATTERY VOLTAGE (K126) ETC NEGATIVE CIRCUIT SHORTED TO BATTERY VOLTAGE (K124) ETC POSITIVE CIRCUIT SHORTED TO (K126) ETC NEGATIVE CIRCUIT (K124) ETC POSITIVE CIRCUIT OPEN (K124) ETC POSITIVE CIRCUIT SHORTED TO GROUND (K126) ETC NEGATIVE CIRCUIT OPEN (K126) ETC NEGATIVE CIRCUIT SHORTED TO GROUND LOW BATTERY VOLTAGE ETC MOTOR/THROTTLE BODY PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

**Note:** If the P2100 is intermittent, it is possible that the controller is overheating in extreme hot temperatures, and this is considered a normal protection operation. No repair is necessary.

**Note:** Low battery voltage can also cause excessive current draw, in very hot and very cold ambient temperatures. Make sure the battery can pass a Load test before continuing.

With a scan tool, read DTCs.

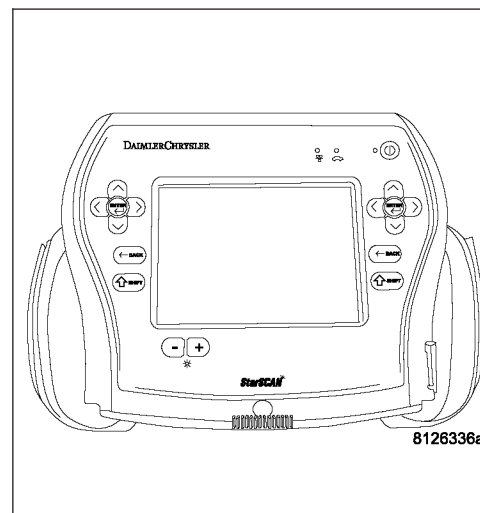
Look closely at the temperatures at which this DTC set.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2100-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)****2. THROTTLE PLATE INSPECTION**

Turn the ignition off.

Remove the Air Cleaner Assembly from the Throttle Body.

Check for any signs of a foreign material (ice or dirt) on the Throttle Plate or in the bore causing the Throttle Plate to stick.

**Were any signs of foreign material or scoring of the throttle plate or bore found?**

**Yes** >> Remove the debris if possible or replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K124) ETC POSITIVE CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

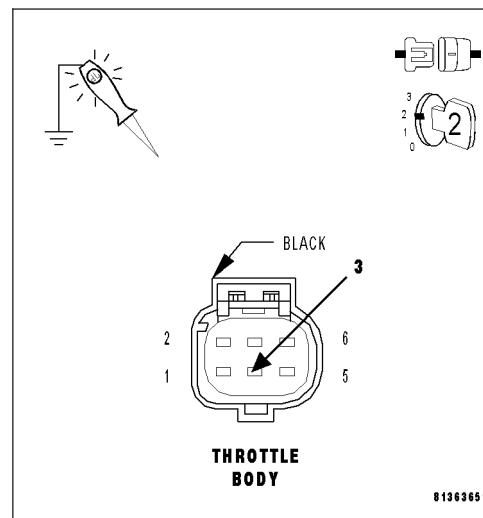
With a 12-volt test light connected to ground, probe the (K124) ETC Positive circuit at the appropriate terminal of the special tool #8815.

**Does the test light illuminate brightly?**

**Yes** >> Repair the short to battery voltage on the (K124) ETC Positive circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. (K126) ETC NEGATIVE CIRCUIT SHORTED TO BATTERY VOLTAGE**

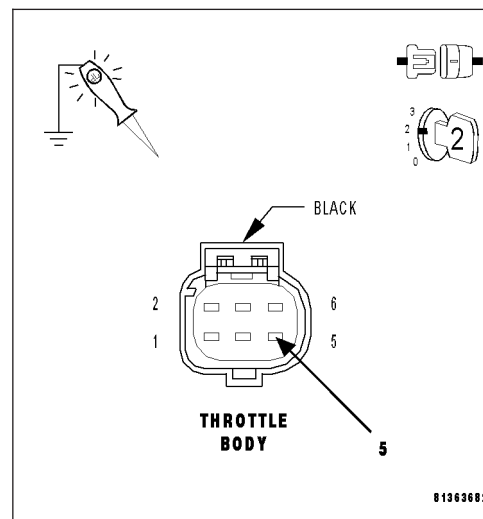
Using a 12-volt test light connected to ground, probe the (K126) ETC Negative circuit at the appropriate terminal of the special tool #8815.

**Does the test light illuminate brightly?**

**Yes** >> Repair the short to battery voltage in the (K126) ETC Negative circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5





**P2100-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)****5. (K124) ETC POSITIVE CIRCUIT SHORTED TO THE (K126) ETC NEGATIVE CIRCUIT**

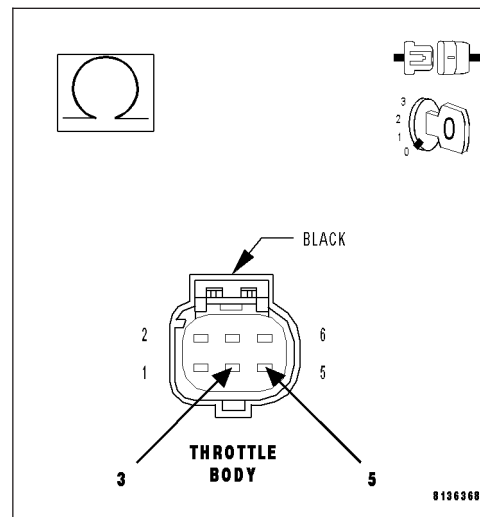
Measure the resistance between the (K124) ETC Positive circuit and the (K126) ETC Negative circuit at the appropriate terminal of the special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to between the (K124) ETC Positive circuit and the (K126) ETC Negative circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6

**6. (K124) ETC POSITIVE CIRCUIT OPEN**

Turn the ignition off.

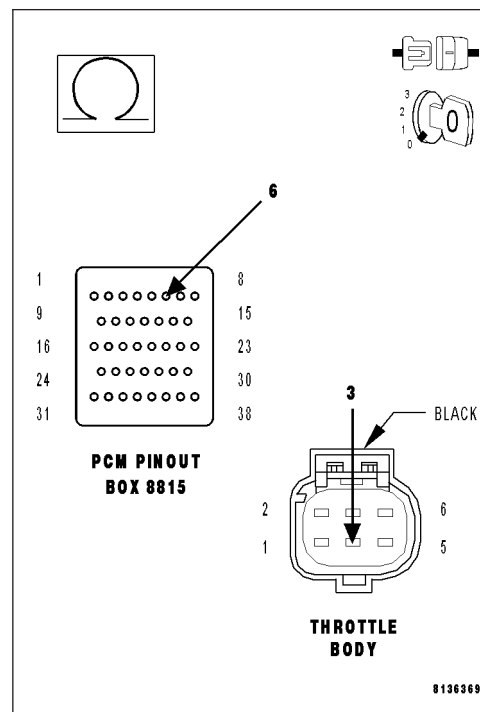
Measure the resistance of the (K124) ETC Positive circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K124) ETC Positive circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P2100-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)

### 7. (K124) ETC POSITIVE CIRCUIT SHORTED TO GROUND

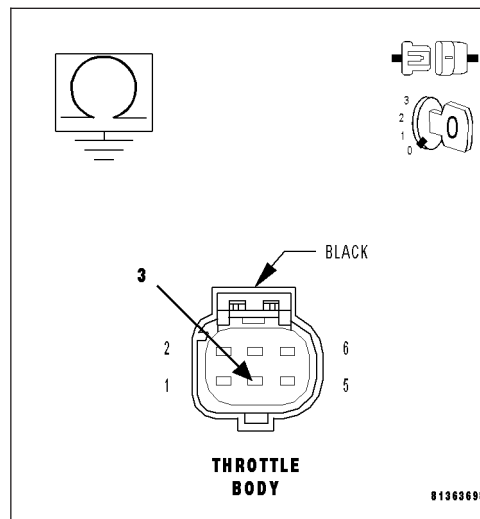
Measure the resistance between ground and the (K124) ETC Positive circuit at the appropriate terminal of the special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K124) ETC Positive circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8



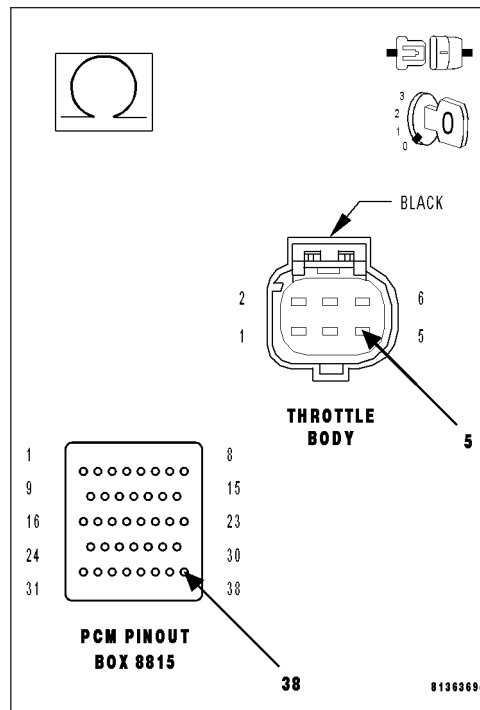
### 8. (K126) ETC NEGATIVE CIRCUIT OPEN

Measure the resistance of the (K126) ETC Negative circuit between the Throttle Body harness connector and the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the open in the (K126) ETC Negative circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2100-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)****9. (K126) ETC NEGATIVE CIRCUIT SHORTED TO GROUND**

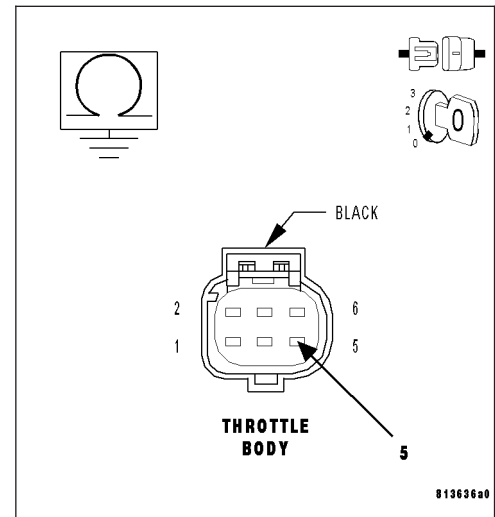
Measure the resistance between ground and the (K126) ETC Negative circuit at the appropriate terminal of the special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K126) ETC Negative circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 10

**10. ETC MOTOR**

Reconnect the the Throttle Body harness connector.

**Note: Take the following measurement using special tool #8815 to avoid possible damage to the Throttle Body harness connector.**

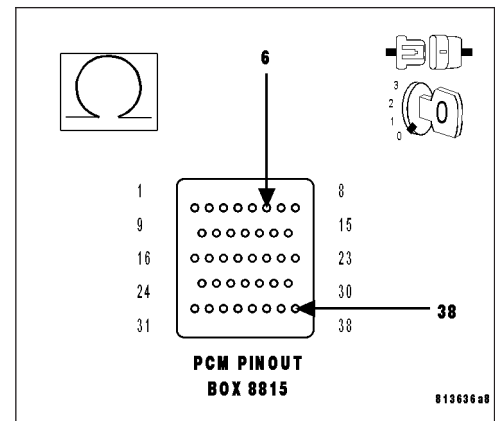
Measure the resistance of the ETC Motor between the (K447) ETC Positive circuit and the (K448) ETC Negative circuit at the appropriate terminals of special tool #8815.

**Is the resistance between 2.5 and 25 ohms at closed throttle?**

**Yes** >> Go To 11

**No** >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**11. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P2101-ELECTRONIC THROTTLE CONTROL MOTOR PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the vehicle running, ETC Motor not in Limp Home mode, and the TPS adaptation is complete.
- **Set Condition:**  
The PCM recognizes too large of an error between the actual position of the Throttle Plate and the Set Point position. One trip fault and the code will set within 5 seconds. Three good trips to turn off the MIL ETC light is flashing.

Possible Causes
THROTTLE BODY ASSEMBLY LOW BATTERY VOLTAGE PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

### Diagnostic Test

#### 1. ACTIVE DTC

**Note:** Before continuing visually inspect the throttle blade and bore for any obstructions. Icing of the throttle body may have caused this code to set.

**Note:** Low battery voltage can also cause excessive current draw, in very hot and very cold ambient temperatures. Make sure the battery can pass a Load test before continuing.

**Note:** Diagnose any 5-Volt Supply, Battery, and TP Sensor DTCs before continuing.

Ignition on, engine not running.

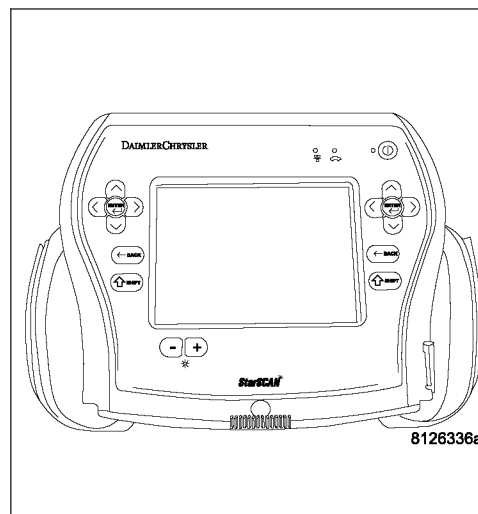
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2101-ELECTRONIC THROTTLE CONTROL MOTOR PERFORMANCE (CONTINUED)****2. THROTTLE PLATE INSPECTION**

Turn the ignition off.

Remove the Air Cleaner Assembly from the Throttle Body.

Check for any signs of a foreign material (ice or dirt) on the Throttle Plate or in the bore causing the Throttle Plate to stick.

Manually open and close the throttle plate using your hands.

**Does the Throttle Plate move?**

**Yes** >> Go To 3

**No** >> Remove the debris if possible or replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**3. THROTTLE POSITION WITHIN 2° DEGREES OF DESIRED THROTTLE POSITION**

Start the engine.

Allow the engine to reach normal operating temperature.

With a scan tool, monitor the Actual Throttle Position and Desired Throttle Position.

Compare the Actual Throttle Position and the Set Point Throttle Position.

**Is the Actual Throttle Position within 2° degrees of the Desired Throttle Position?**

**Yes** >> Go To 4

**No** >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**4. ETC OPERATION**

Ignition on, engine not running.

With a scan tool, actuate the Electronic Throttle Control Motor.

**Note: It may be necessary to use a mirror to see the throttle blade.**

Observe the throttle blade.

**Note: Make sure the motion of the throttle blade is smooth and that it opens and closes.**

**Did the ETC motor operate properly?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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## P2107-ELECTRONIC THROTTLE CONTROL MODULE PROCESSOR

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
Internal PCM failure. Module will attempt to reset, so you will be able to hear the throttle relearning. If the condition is continuous, the vehicle may not be driveable. One trip fault. ETC light is flashing.

Possible Causes
POWERTRAIN CONTROL MODULE NEEDS TO BE REPROGRAMMED

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) .**

### Diagnostic Test

#### 1. REPROGRAM THE POWERTRAIN CONTROL MODULE

Check for any related TSBs.

Verify the PCM is at the latest calibration (flash level).

**Note: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.**

Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

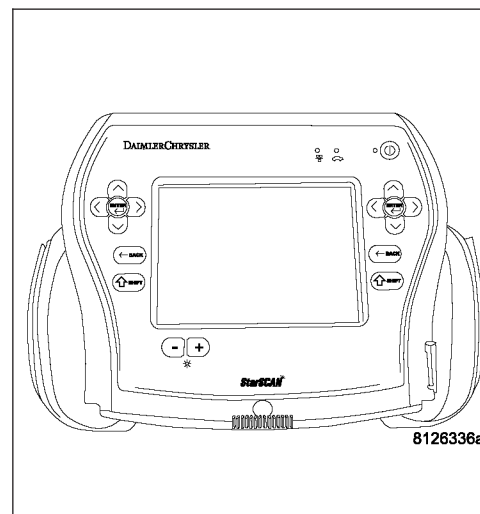
Allow the engine to reach normal operating temperature.

Operate the accelerator pedal. (do not exceed 3500 rpm)

Test drive the vehicle for 10 miles on a flat road surface.

#### Does this DTC reset?

- Yes** >> Replace and reprogram the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Test Complete.



P2108-ELECTRONIC THROTTLE CONTROL MODULE PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
Internal PCM failure. Customer may experience an extended cranking condition with limited driving and a rough idle. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
POWERTRAIN CONTROL MODULE NEEDS TO BE REPROGRAMMED

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

Diagnostic Test

1. REPROGRAM THE POWERTRAIN CONTROL MODULE

Check for any related TSBs.

Verify the PCM is at the latest calibration (flash level).

**Note: Inspect the Intake Manifold components for vacuum leaks, repair as necessary**

**Note: An intermittent loss of power to the PCM without performing an ETC Relearn procedure may cause this DTC to set.**

**Note: Diagnose any other DTCs that may have set with the P2108.**  
Flash the Powertrain Control Module per Service Information if any updates are available.

Start the engine.

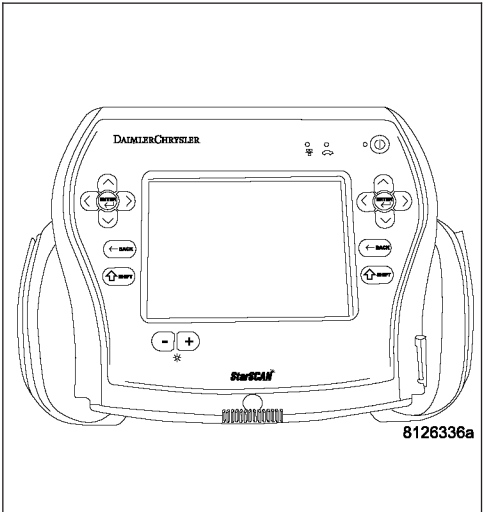
Allow the engine to reach normal operating temperature.

Operate the accelerator pedal. (do not exceed 3500 rpm)

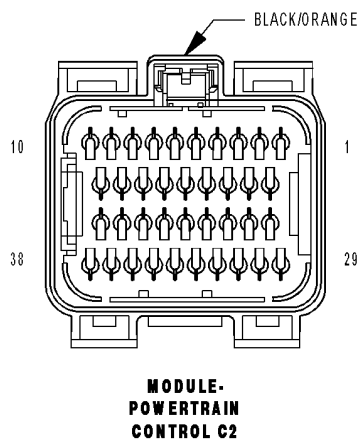
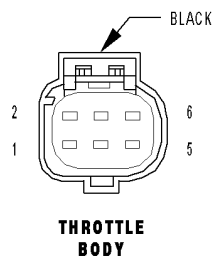
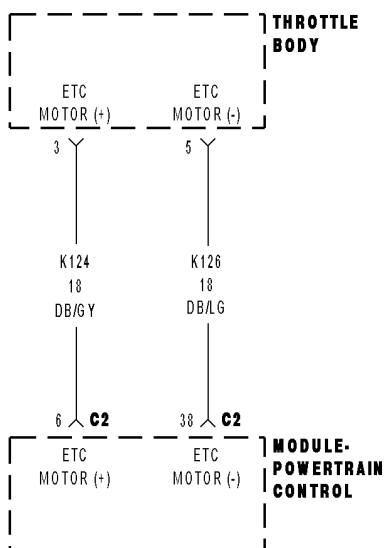
Test drive the vehicle for 10 miles on a flat road surface.

**Does this DTC reset by itself?**

- Yes**
- >> Replace and reprogram the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No**
- >> Test Complete.



## P2110-ELECTRONIC THROTTLE CONTROL - FORCED LIMITED RPM





**P2110-ELECTRONIC THROTTLE CONTROL - FORCED LIMITED RPM (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on and ETC motor is working.

- **Set Condition:**

When the PCM requests to limit engine speed if PWM is too high for 20.5 seconds and before P2118 sets. One trip fault and the code will set within 5 seconds. ETC light is illuminated.

Possible Causes
THROTTLE PLATE STUCK (K124) ETC POSITIVE CIRCUIT OPEN (K126) ETC NEGATIVE CIRCUIT OPEN (K124) ETC POSITIVE CIRCUIT SHORTED TO GROUND (K126) ETC NEGATIVE CIRCUIT SHORTED TO GROUND ETC MOTOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool read DTCs.

In the Freeze Frame data, look at the temperature at which the fault occurred. If it occurred in extreme cold temperatures, Icing of the throttle body may have caused this code to set.

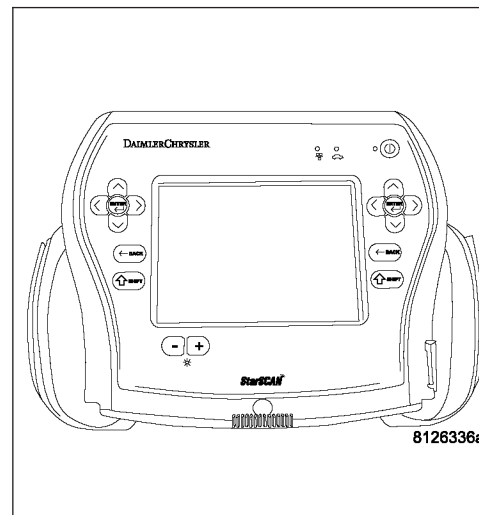
**Note: Diagnose any TP Sensor faults, 5-Volt Supply faults, and Battery Voltage High or Low DTCs before continuing.**

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2110-ELECTRONIC THROTTLE CONTROL - FORCED LIMITED RPM (CONTINUED)****2. THROTTLE PLATE STUCK**

Turn the ignition off.

Remove the Air Cleaner Assembly from the Throttle Body.

Check for any signs of a foreign material (ice or dirt) causing the Throttle to stick.

Manually open and close the throttle plate using your hands.

**Does the Throttle Plate move?**

**Yes** >> Go To 3

**No** >> Remove the debris if possible or replace the Throttle Body Assembly if signs of physical damage are present. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**3. (K124) ETC POSITIVE CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the C3/C PCM harness connector.

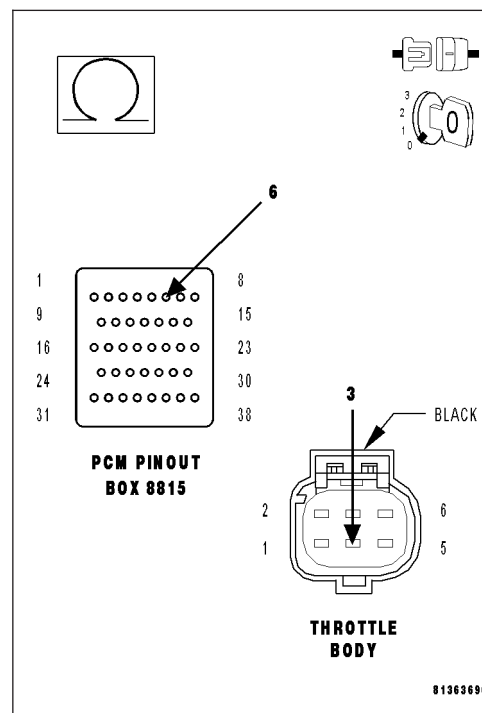
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K124) ETC Positive circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the open in the (K124) ETC Positive circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



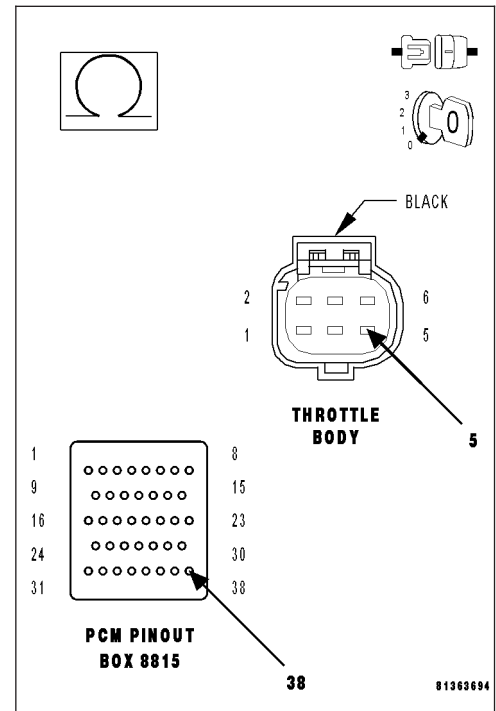
**P2110-ELECTRONIC THROTTLE CONTROL - FORCED LIMITED RPM (CONTINUED)****4. (K126) ETC NEGATIVE CIRCUIT OPEN**

Measure the resistance of the (K126) ETC Negative circuit between the Throttle Body harness connector and the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K126) ETC Negative circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. (K124) ETC POSITIVE CIRCUIT SHORTED TO GROUND**

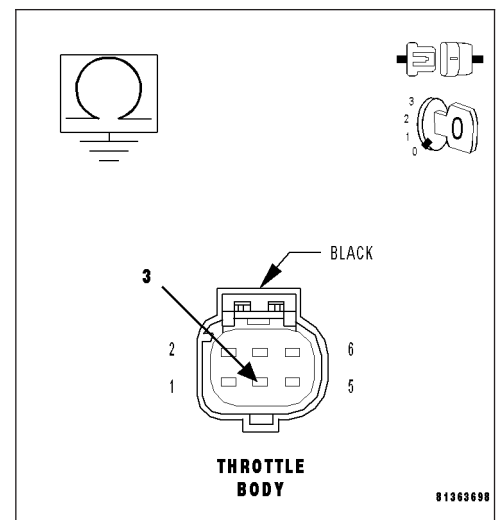
Measure the resistance between a known good ground and the (K124) ETC Positive circuit at the appropriate terminal of the special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K124) ETC Positive circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P2110-ELECTRONIC THROTTLE CONTROL - FORCED LIMITED RPM (CONTINUED)****6. (K126) ETC NEGATIVE CIRCUIT SHORTED TO GROUND**

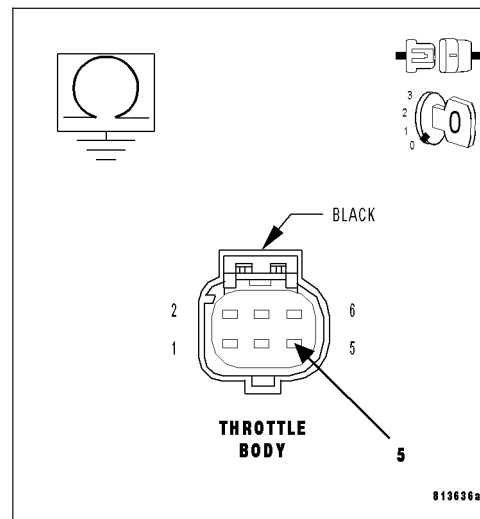
Measure the resistance between a known good ground and the (K126) ETC Negative circuit at the appropriate terminal of the special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K126) ETC Negative circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. ETC MOTOR**

**Note: Take the following measurement using special tool #8815 to avoid possible damage to the Throttle Body harness connector.**

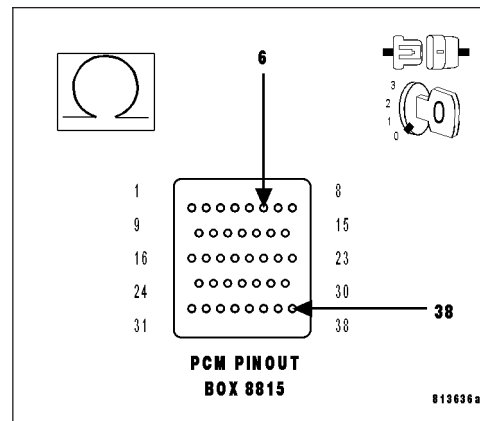
Measure the resistance of the ETC Motor between the (K124) ETC Positive circuit and the (K126) ETC Negative circuit at the appropriate terminals of special tool #8815.

**Is the resistance between 2.5 and 25 ohms at closed throttle?**

**Yes** >> Go To 8

**No** >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**8. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

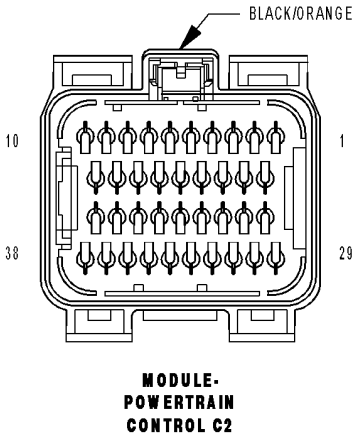
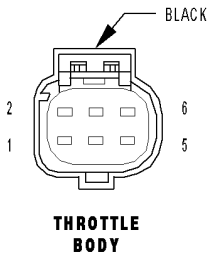
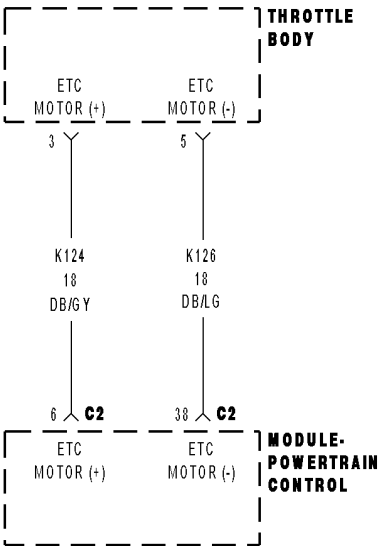
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

P2111-ELECTRONIC THROTTLE CONTROL - UNABLE TO CLOSE



**P2111-ELECTRONIC THROTTLE CONTROL - UNABLE TO CLOSE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on and battery voltage greater than 10 volts.

- **Set Condition:**

Just after key on, the throttle is opened and closed to test the system. If the TP Sensor does not return to Limp Home Position at the end of this test, this DTC will set. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
THROTTLE PLATE STUCK ABOVE LIMP HOME POSITION TP SENSOR NO.1 AND TP SENSOR NO.2 BOTH READ 2.5 VOLTS (K124) ETC POSITIVE CIRCUIT SHORTED TO BATTERY VOLTAGE (K124) ETC POSITIVE CIRCUIT OPEN (K126) ETC NEGATIVE CIRCUIT OPEN (K124) ETC POSITIVE CIRCUIT SHORTED TO GROUND (K126) ETC NEGATIVE CIRCUIT SHORTED TO GROUND PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Maximum engine speed could be reduced while this fault is active, it just depends where the throttle gets stuck.

Ignition on, engine not running.

**Note:** The PCM tests the ETC Motor by opening and closing the Throttle Plate before starting the engine. If during this test the Throttle plate does not return to the closed position this DTC sets.

With a scan tool read DTCs.

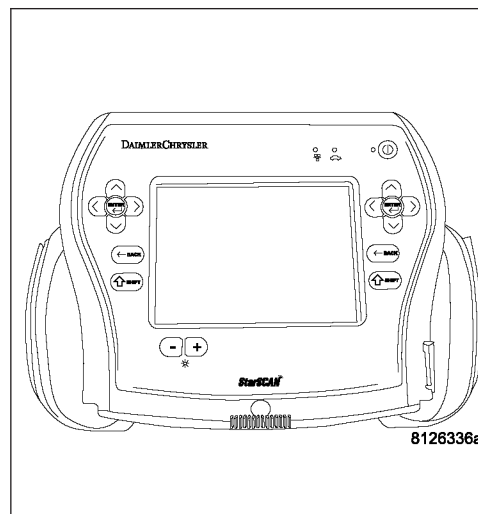
**Note:** Diagnose any TP Sensor or 5-Volt Supply DTCs before continuing.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2111-ELECTRONIC THROTTLE CONTROL - UNABLE TO CLOSE (CONTINUED)****2. THROTTLE PLATE STUCK OPEN**

Turn the ignition off.

**Note:** The PCM tests the ETC Motor by opening and closing the Throttle Plate before starting the engine. If during this test the Throttle plate does not return to the closed position this DTC sets.

Remove the Air Cleaner Assembly from the Throttle Body.

Check for any signs of a foreign material causing the Throttle to remain open.

Using a scan tool actuate the ETC Motor.

**Does the Throttle Plate move?**

**Yes** >> Go To 3

**No** >> Remove the debris if possible or replace the Throttle Body Assembly if signs of physical damage are present. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and perform the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**3. TP SENSOR NO.1 AND TP SENSOR NO.2 BOTH EQUAL 2.5 VOLTS**

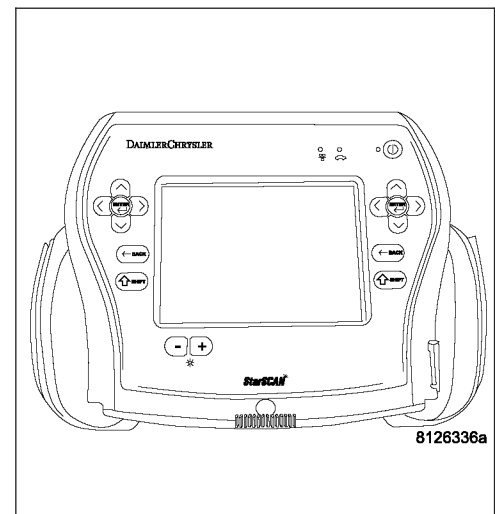
With a scan tool, perform the Throttle Follower test while reading both TP Sensor voltage readings.

**Are both TP Sensor readings stuck at 2.5 volts?**

**Yes** >> Check the TP Sensor Signal circuits for excessive resistance, being shorted to each other, or shorted to the Sensor Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P2111-ELECTRONIC THROTTLE CONTROL - UNABLE TO CLOSE (CONTINUED)****4. (K124) ETC POSITIVE CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the C3/C PCM harness connector.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform the diagnostics.**

Ignition on, engine not running.

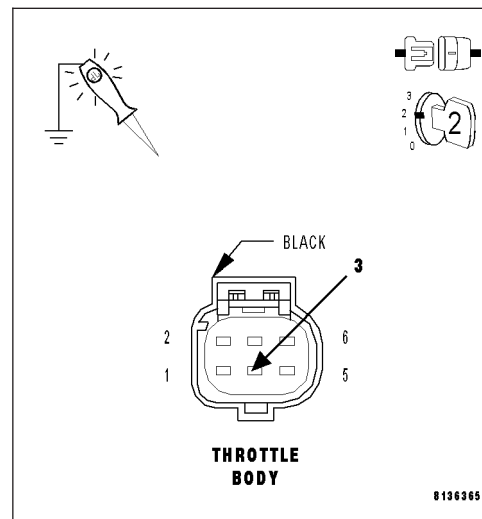
With a 12-volt test light connected to ground, probe the (K124) ETC Positive circuit at the appropriate terminal of the special tool #8815..

**Does the test light illuminate brightly?**

**Yes** >> Repair the short to battery voltage on the (K124) ETC Positive circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K124) ETC POSITIVE CIRCUIT OPEN**

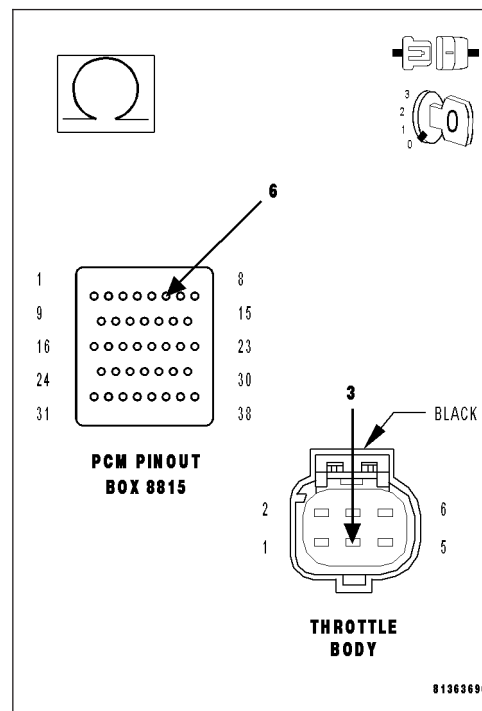
Turn the ignition off.

Measure the resistance of the (K124) ETC Positive circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K124) ETC Positive circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





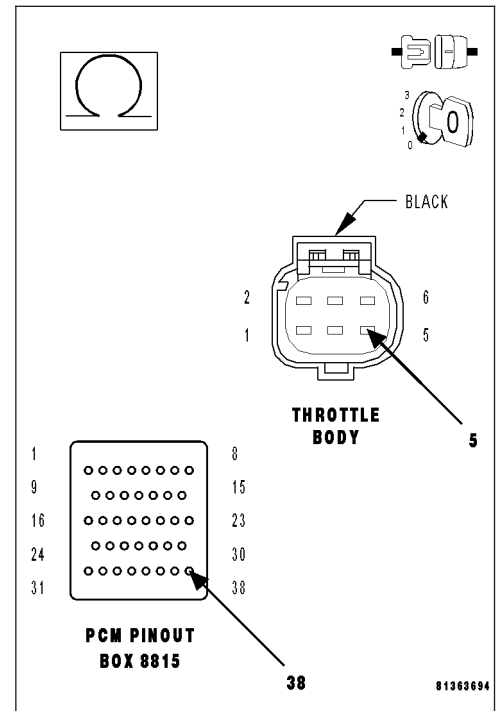
**P2111-ELECTRONIC THROTTLE CONTROL - UNABLE TO CLOSE (CONTINUED)****6. (K126) ETC NEGATIVE CIRCUIT OPEN**

Measure the resistance of the (K126) ETC Negative circuit between the Throttle Body harness connector and the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K126) ETC Negative circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. (K124) ETC POSITIVE CIRCUIT SHORTED TO GROUND**

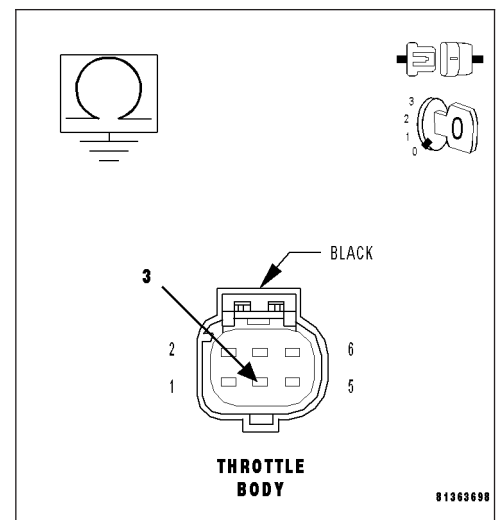
Measure the resistance between a known good ground and the (K124) ETC Positive circuit at the appropriate terminal of special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K124) ETC Positive circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P2111-ELECTRONIC THROTTLE CONTROL - UNABLE TO CLOSE (CONTINUED)****8. (K126) ETC NEGATIVE CIRCUIT SHORTED TO GROUND**

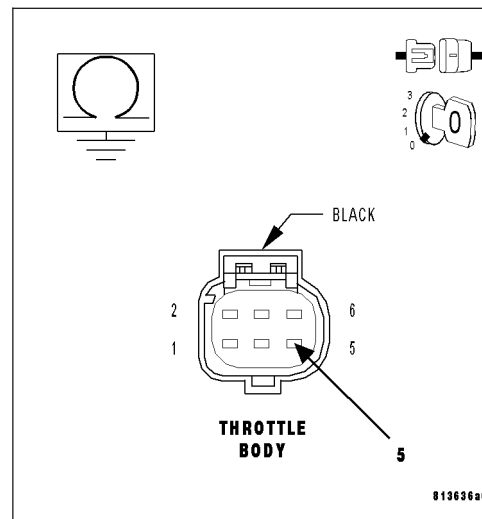
Measure the resistance between a known good ground and the (K126) ETC Negative circuit at the appropriate terminal of the special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K126) ETC Negative circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 9

**9. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

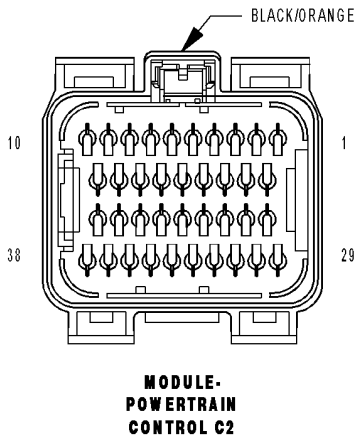
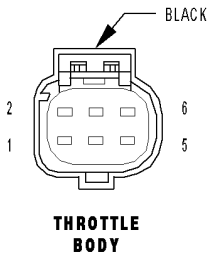
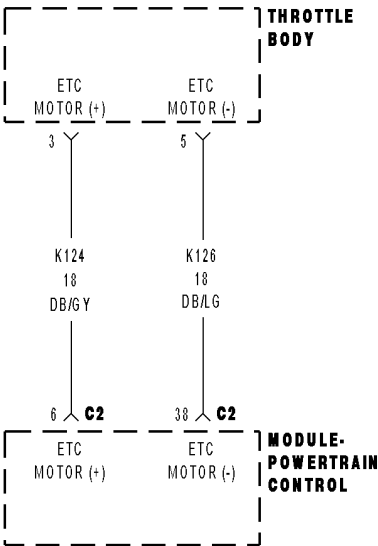
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

P2112-ELECTRONIC THROTTLE CONTROL - UNABLE TO OPEN



**P2112-ELECTRONIC THROTTLE CONTROL - UNABLE TO OPEN (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on and battery voltage greater than 10 volts.

- **Set Condition:**

Just after key on, the throttle is opened and closed to test the system. If the TP Sensor does not return to Limp Home Position at the end of this test, this DTC will set. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
THROTTLE PLATE STUCK AT OR BELOW LIMP HOME POSITION (K126) ETC NEGATIVE CIRCUIT SHORTED TO BATTERY VOLTAGE (K124) ETC POSITIVE CIRCUIT OPEN (K126) ETC NEGATIVE CIRCUIT OPEN (K124) ETC POSITIVE CIRCUIT SHORTED TO GROUND (K126) ETC NEGATIVE CIRCUIT SHORTED TO GROUND PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

**Note: The PCM tests the ETC Motor by opening and closing the Throttle Plate before starting the engine. If during this test the Throttle plate does not return to the closed position this DTC sets.**

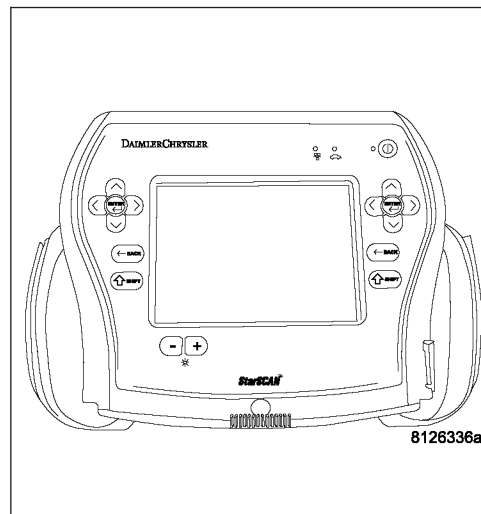
With a scan tool read DTCs.

**Note: Diagnose any TP Sensor, Battery Voltage, and 5-Volt Supply DTCs before continuing.**

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2112-ELECTRONIC THROTTLE CONTROL - UNABLE TO OPEN (CONTINUED)****2. THROTTLE PLATE STUCK OPEN**

Turn the ignition off.

**Note:** The PCM tests the ETC Motor by opening and closing the Throttle Plate before starting the engine. If during this test the Throttle plate does not open this DTC sets.

Remove the Air Cleaner Assembly from the Throttle Body.

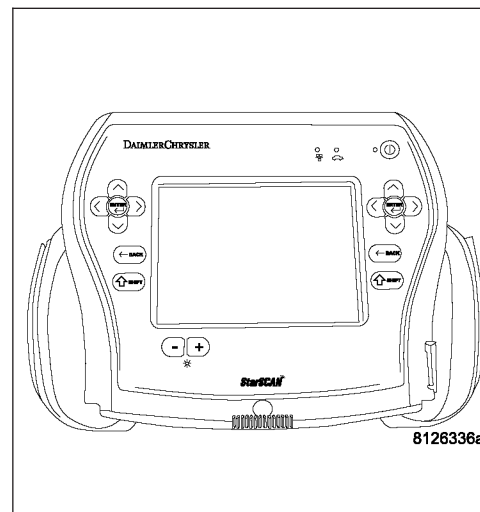
Check for any signs of a foreign material causing the Throttle to remain open.

Using a scan tool actuate the ETC Motor.

**Does the Throttle Plate move?**

**Yes** >> Go To 3

**No** >> Remove the debris if possible or replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**3. (K126) ETC NEGATIVE CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the C3 PCM harness connector.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Ignition on, engine not running.

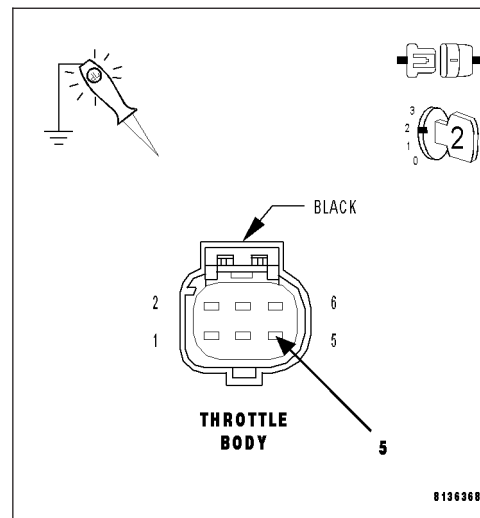
With a 12-volt test light connected to ground, probe the (K126) ETC Negative circuit at the appropriate terminal of the special tool #8815.

**Does the test light illuminate brightly?**

**Yes** >> Repair the short to battery voltage on the (K126) ETC Negative circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P2112-ELECTRONIC THROTTLE CONTROL - UNABLE TO OPEN (CONTINUED)****4. (K124) ETC POSITIVE CIRCUIT OPEN**

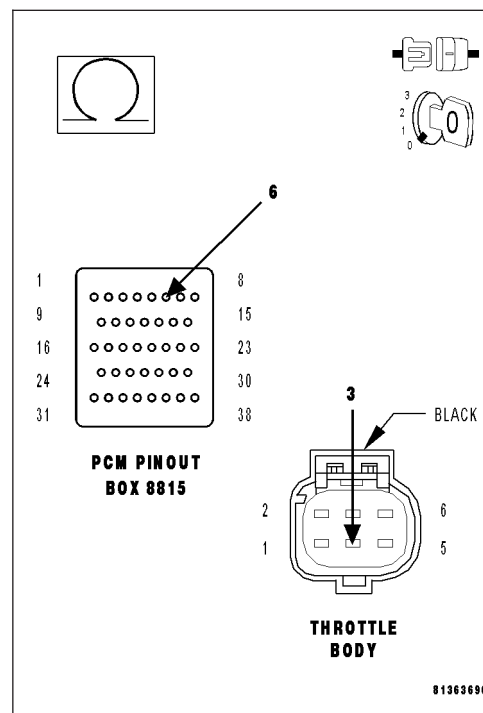
Turn the ignition off.

Measure the resistance of the (K124) ETC Positive circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K124) ETC Positive circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

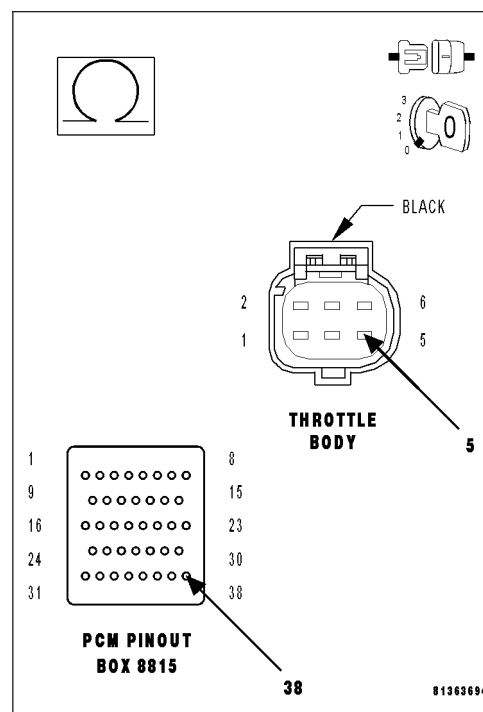
**5. (K126) ETC NEGATIVE CIRCUIT OPEN**

Measure the resistance of the (K126) ETC Negative circuit between the Throttle Body harness connector and the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K126) ETC Negative circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2112-ELECTRONIC THROTTLE CONTROL - UNABLE TO OPEN (CONTINUED)****6. (K124) ETC POSITIVE CIRCUIT SHORTED TO GROUND**

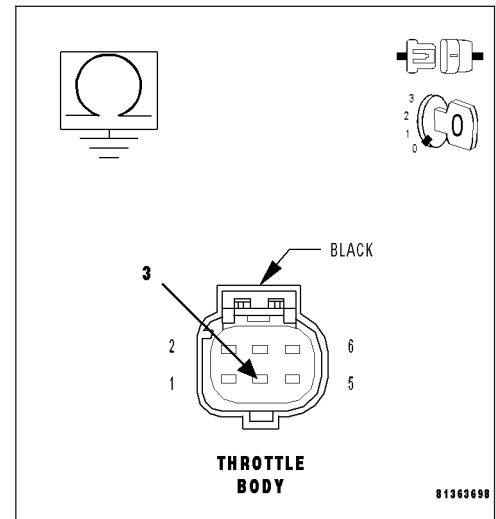
Measure the resistance between a known good ground and the (K124) ETC Positive circuit at the appropriate terminal of the special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K124) ETC Positive circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. (K126) ETC NEGATIVE CIRCUIT SHORTED TO GROUND**

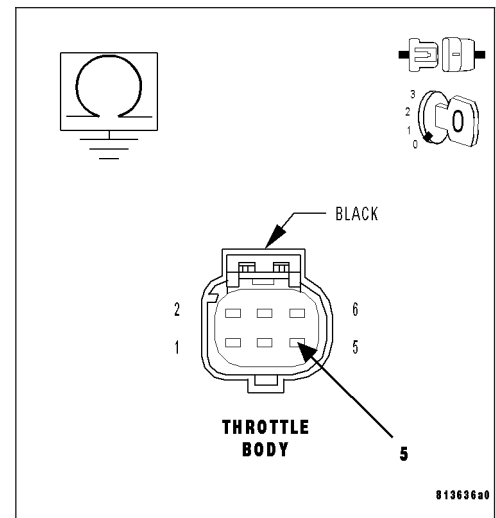
Measure the resistance between a known good ground and the (K126) ETC Negative circuit at the appropriate terminal of the special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K126) ETC Negative circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P2112-ELECTRONIC THROTTLE CONTROL - UNABLE TO OPEN (CONTINUED)****8. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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## P2115-ACCELERATOR PEDAL POSITION SENSOR 1 MINIMUM STOP PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Igniting on. During in plant mode the APP Sensors need to be checked to make sure that idle and full pedal travel can be reached on both sensors. The test for P2115 is only enabled once test for P2166 has passed.

- **Set Condition:**

APPS No.1 has failed to achieve the required minimum value during In Plant testing. One trip fault and the code will set within 5 seconds. Engine will only idle.

Possible Causes
IN PLANT TEST FAILURE
APPS RELEARN

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

### Diagnostic Test

#### 1. IN PLANT TEST FAILURE

Ignition on, engine not running.

**Note: This DTC is set when the APP Sensors are learned in plant but do not reach the Minimum or Maximum voltage range.**

With a scan tool read DTCs.

With the scan tool, erase DTCs.

Start the engine.

With the scan tool, read DTCs.

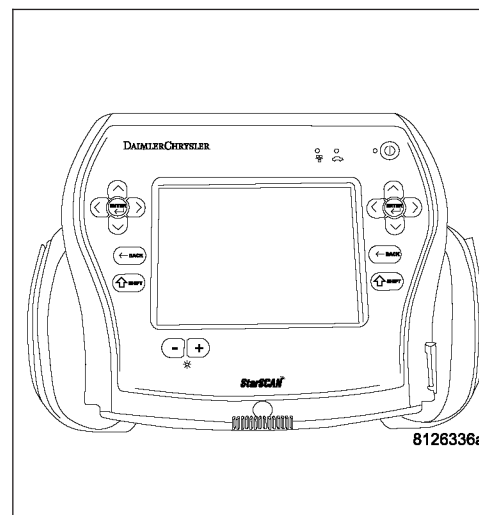
**Note: Diagnose any APPS out of Range and 5-Volt Supply DTCs before continuing.**

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



#### 2. APPS RELEARN

With a scan tool select the ETC RELEARN function.

Next, erase DTCs.

Start the engine.

**Does the DTC return?**

**Yes** >> Replace the APPS Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Test Complete.

## P2116-ACCELERATOR PEDAL POSITION SENSOR 2 MINIMUM STOP PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Igniting on. During in plant mode the APP Sensors need to be checked to make sure that idle and full pedal travel can be reached on both sensors. The test for P2116 is only enabled once test for P2167 has passed.

- **Set Condition:**

APPS No.2 has failed to achieve the required minimum value during In Plant testing. One trip fault and the code will be stored within 5 seconds. Engine will only idle.

Possible Causes
IN PLANT TEST FAILURE
APPS RELEARN

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

### Diagnostic Test

#### 1. IN PLANT TEST FAILURE

Ignition on, engine not running.

**Note: This DTC is set when the APP Sensors are learned in plant but do not reach the Minimum or Maximum voltage range.**

With a scan tool read DTCs and record the related Freeze Frame data.

With a scan tool, erase DTCs.

Start the engine.

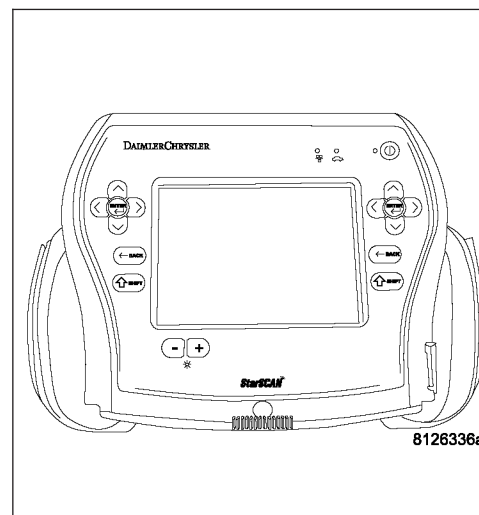
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



#### 2. APPS RELEARN

With a scan tool select the ETC RELEARN function.

Next, erase DTCs.

Start the engine.

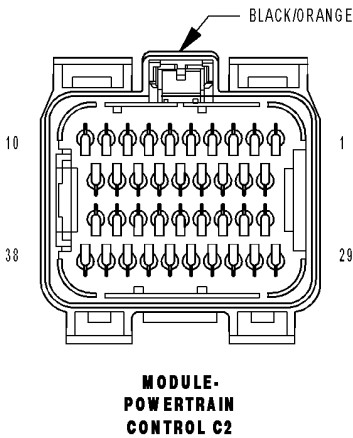
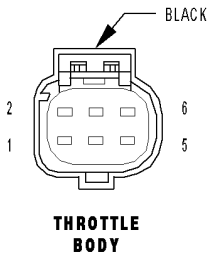
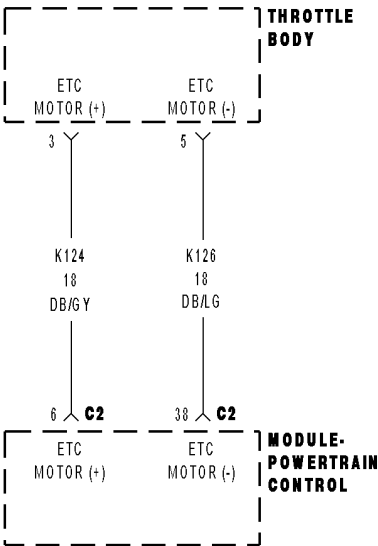
**Does the DTC return?**

**Yes** >> Replace the APPS Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Test Complete.

P2118-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT



## P2118-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on and the ETC Motor is not in Limp Home mode.

- **Set Condition:**

When the PCM detects an internal error or a short between the ETC Motor- and ETC Motor + circuits in the ETC Motor Driver. One trip fault. ETC light is flashing.

Possible Causes
THROTTLE PLATE / BORE INSPECTION (K124) ETC POSITIVE CIRCUIT SHORTED TO BATTERY VOLTAGE (K126) ETC NEGATIVE CIRCUIT SHORTED TO BATTERY VOLTAGE (K124) ETC POSITIVE CIRCUIT SHORTED TO (K126) ETC NEGATIVE CIRCUIT (K124) ETC POSITIVE CIRCUIT OPEN (K124) ETC POSITIVE CIRCUIT SHORTED TO GROUND (K126) ETC NEGATIVE CIRCUIT OPEN (K126) ETC NEGATIVE CIRCUIT SHORTED TO GROUND ETC MOTOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

**Note: If the P2118 is intermittent, it is possible that the controller is overheating in extreme hot temperatures, and this is considered a normal protection operation. No repair is necessary.**

With a scan tool, read DTCs.

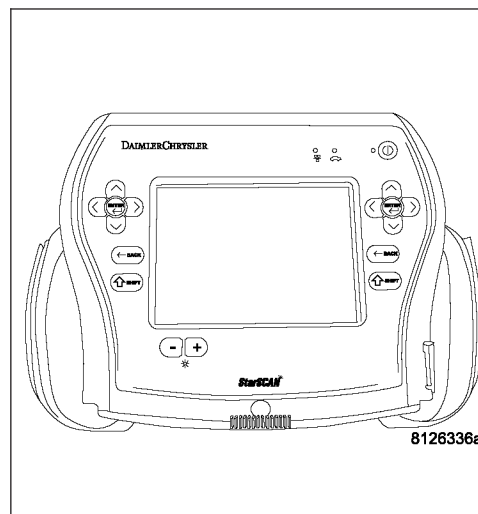
Look closely at the temperatures at which this DTC set.

#### Is the DTC active at this time?

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2118-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)****2. THROTTLE PLATE INSPECTION**

Turn the ignition off.

Remove the Air Cleaner Assembly from the Throttle Body.

Check for any signs of a foreign material (ice or dirt) on the Throttle Plate or in the bore causing the Throttle Plate to stick.

**Were any signs of foreign material or scoring of the throttle plate or bore found?**

**Yes** >> Remove the debris if possible or replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K124) ETC POSITIVE CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the C3/C PCM harness connector.

Ignition on, engine not running.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

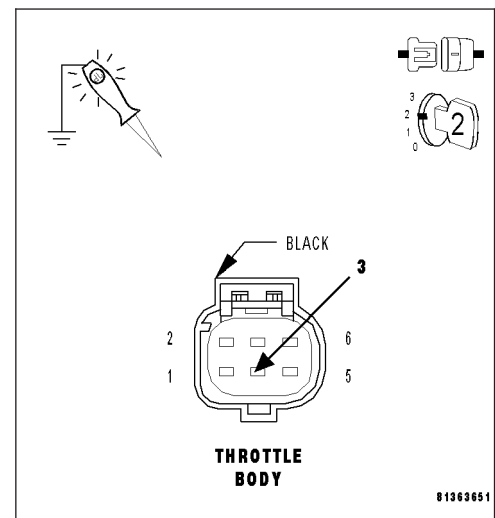
With a 12-volt test light connected to ground, probe the (K124) ETC Positive circuit at the appropriate terminal of the special tool #8815.

**Does the test light illuminate brightly?**

**Yes** >> Repair the short to battery voltage on the (K124) ETC Positive circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P2118-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)****4. (K126) ETC NEGATIVE CIRCUIT SHORTED TO BATTERY VOLTAGE**

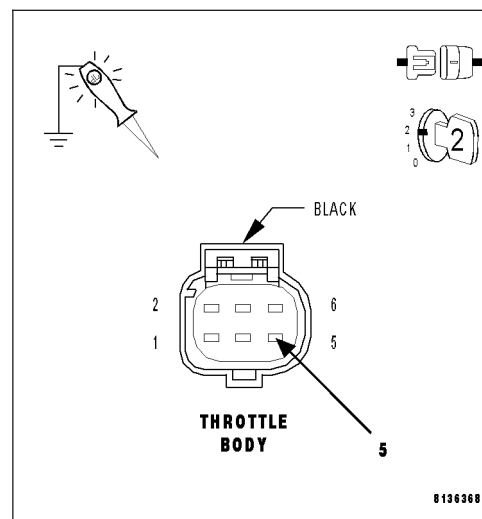
Using a 12-volt test light connected to ground, probe the (K126) ETC Negative circuit at the appropriate terminal of the special tool #8815.

**Does the test light illuminate brightly?**

**Yes** >> Repair the short to battery voltage in the (K126) ETC Negative circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K124) ETC POSITIVE CIRCUIT SHORTED TO THE (K126) ETC NEGATIVE CIRCUIT**

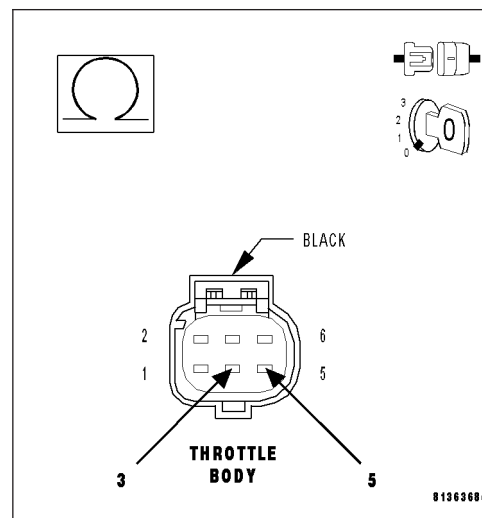
Measure the resistance between the (K124) ETC Positive circuit and the (K126) ETC Negative circuit at the appropriate terminal of the special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to between the (K124) ETC Positive circuit and the (K126) ETC Negative circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P2118-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)****6. (K124) ETC POSITIVE CIRCUIT OPEN**

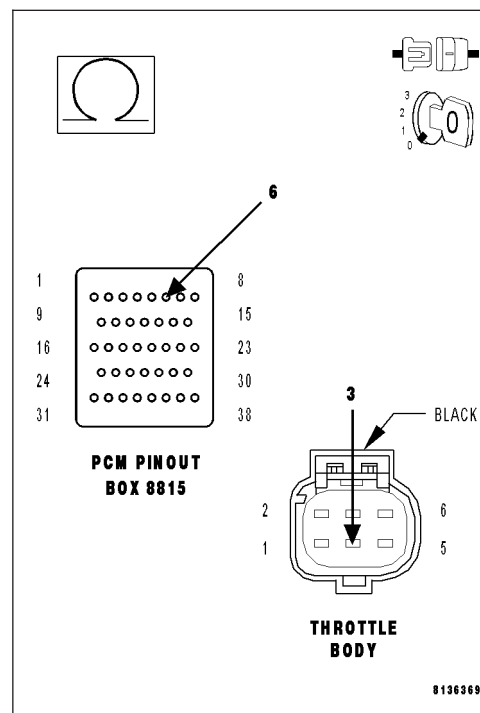
Turn the ignition off.

Measure the resistance of the (K124) ETC Positive circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K124) ETC Positive circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. (K124) ETC POSITIVE CIRCUIT SHORTED TO GROUND**

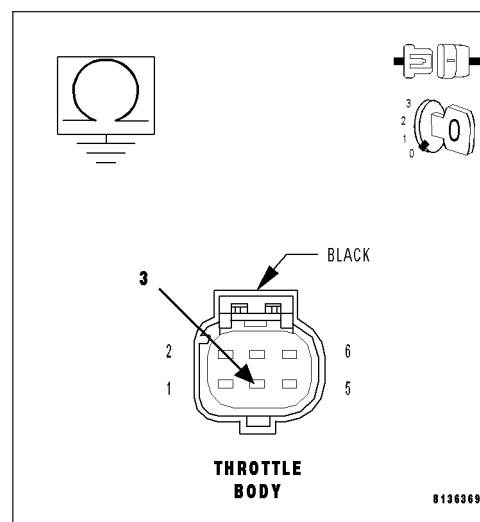
Measure the resistance between ground and the (K124) ETC Positive circuit at the appropriate terminal of the special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K124) ETC Positive circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8



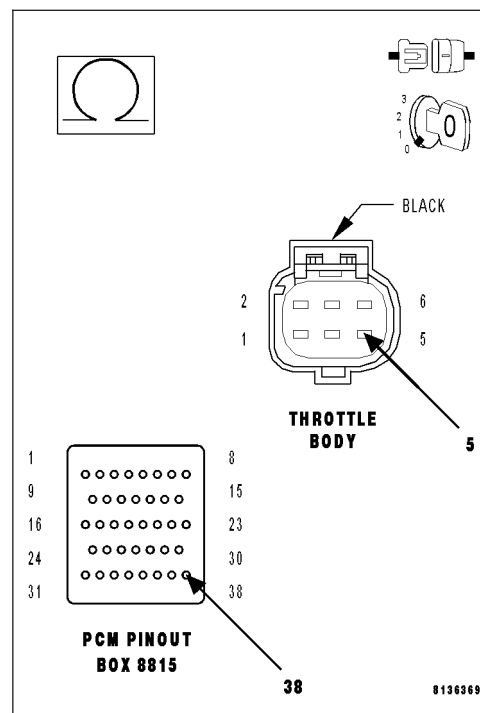
**P2118-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)****8. (K126) ETC NEGATIVE CIRCUIT OPEN**

Measure the resistance of the (K126) ETC Negative circuit between the Throttle Body harness connector and the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the open in the (K126) ETC Negative circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**9. (K126) ETC NEGATIVE CIRCUIT SHORTED TO GROUND**

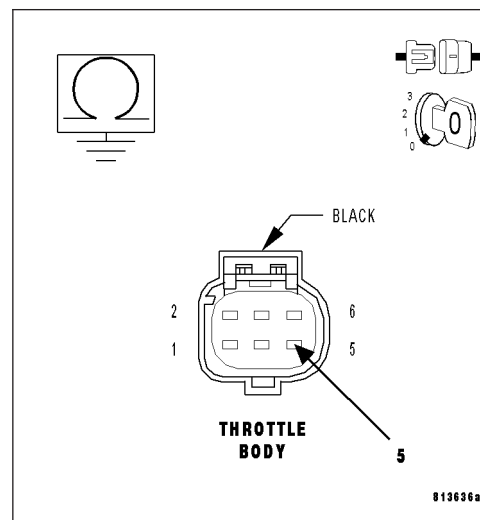
Measure the resistance between ground and the (K126) ETC Negative circuit at the appropriate terminal of the special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K126) ETC Negative circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 10





**P2118-ELECTRONIC THROTTLE CONTROL MOTOR CIRCUIT (CONTINUED)****10. ETC MOTOR**

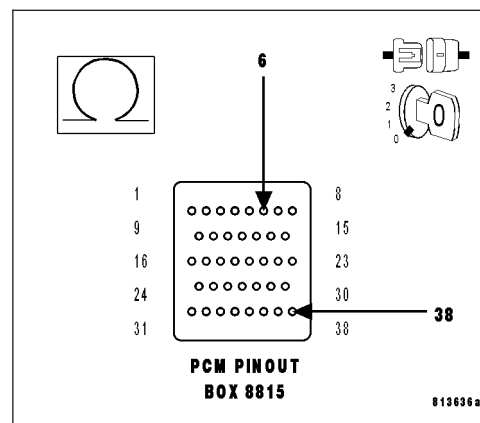
**Note:** Take the following measurement using special tool #8815 to avoid possible damage to the Throttle Body harness connector. Measure the resistance of the ETC Motor between the (K124) ETC Positive circuit and the (K126) ETC Negative circuit at the appropriate terminals of special tool #8815.

**Is the resistance between 2.5 and 25 ohms at closed throttle?**

**Yes** >> Go To 11

**No** >> Replace the Throttle Body Assembly. Disconnect the Battery when replacing the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**11. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

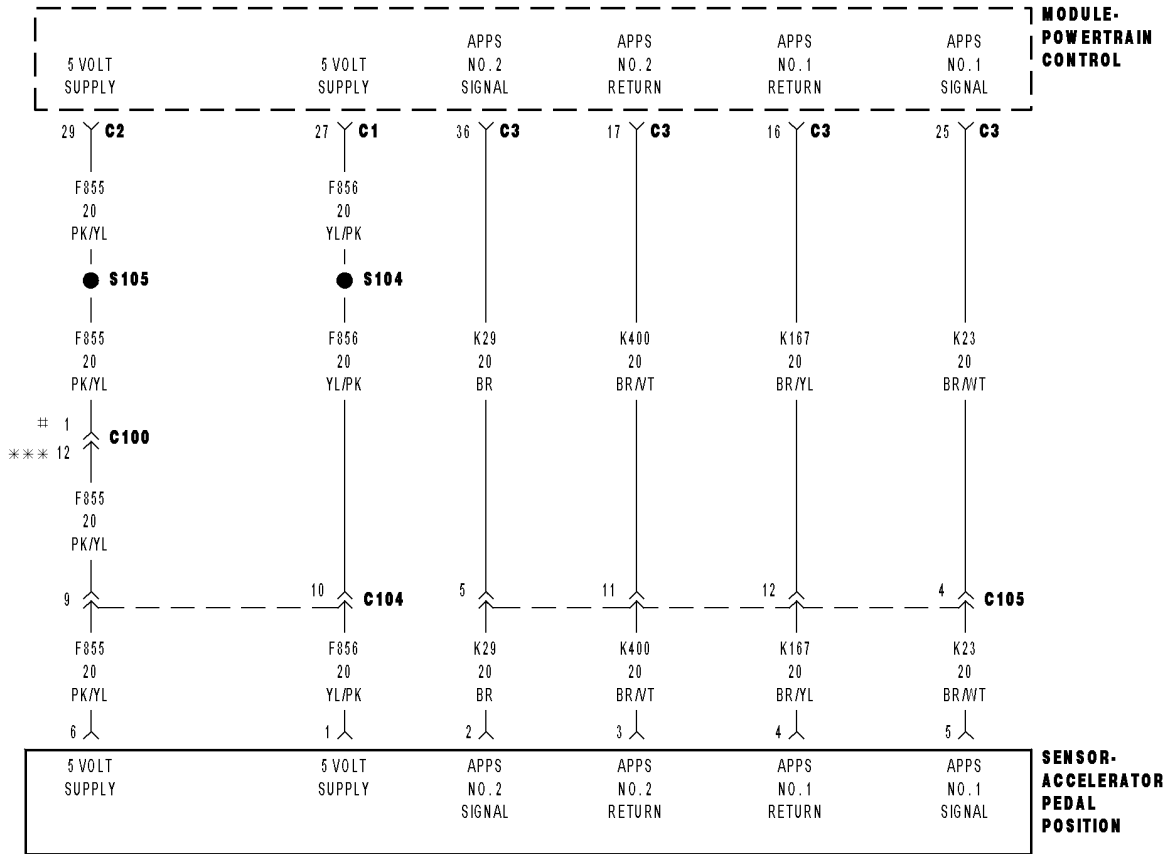
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

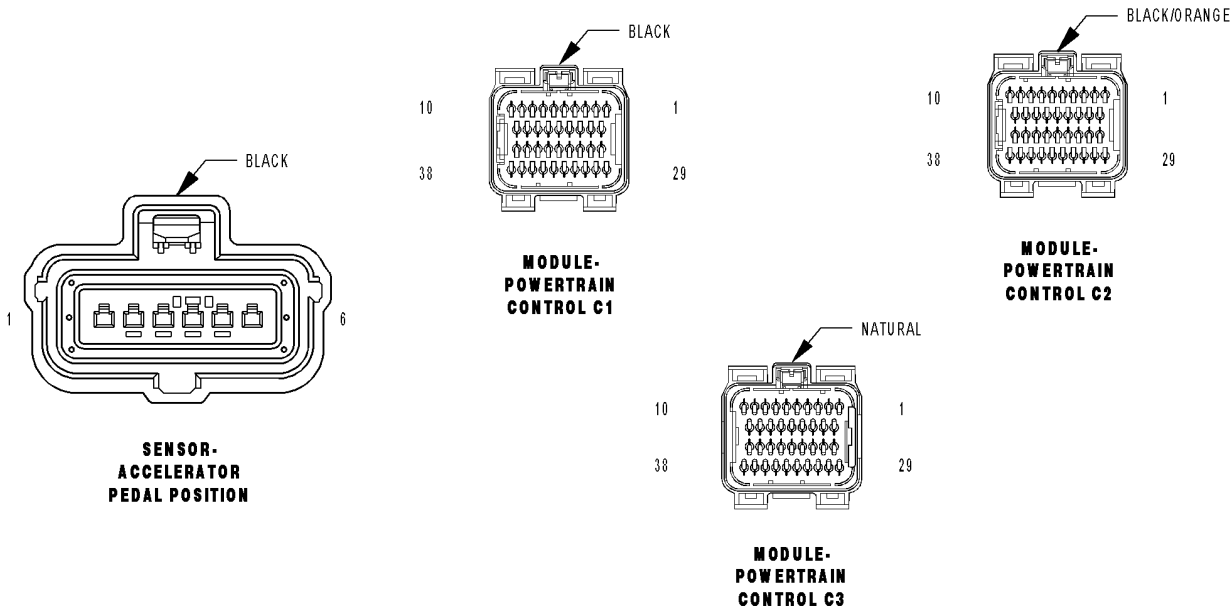
**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

# P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW



± 2.7L/3.5L  
\*\*\* 5.7L



**P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on and no other APPS No.1 DTCs present.
- **Set Condition:**  
When the APP Sensor No.1 voltage is too low. Engine will additionally idle if the brake pedal is pressed or has failed. Acceleration rate and Engine output are limited. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
(F855) 5-VOLT SUPPLY CIRCUIT OPEN (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND (K23) APP SENSOR NO.1 SIGNAL CIRCUIT OPEN (K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND (K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K167) APP SENSOR NO.1 RETURN CIRCUIT (K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K400) APP SENSOR NO.2 RETURN CIRCUIT APP SENSOR PCM

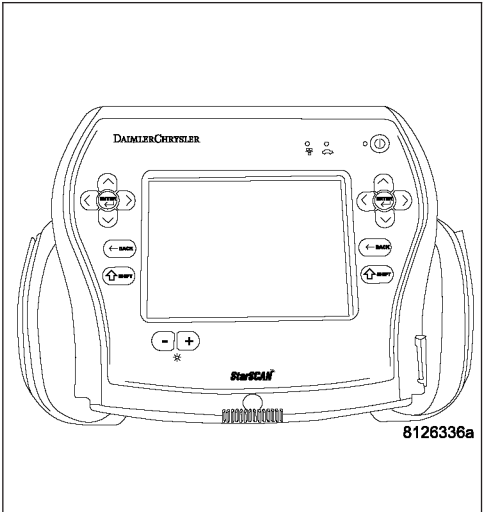
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test**

**1. APP SENSOR BELOW 0.25 OF A VOLT**

Ignition on, engine not running.  
With a scan tool, read the APP Sensor No.1 voltage.

- Is the voltage below 0.25 of a volt?**
- Yes**    >> Go To 2
- No**     >> Go To 11



**P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)****2. (F855) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the APP Sensor harness connector.

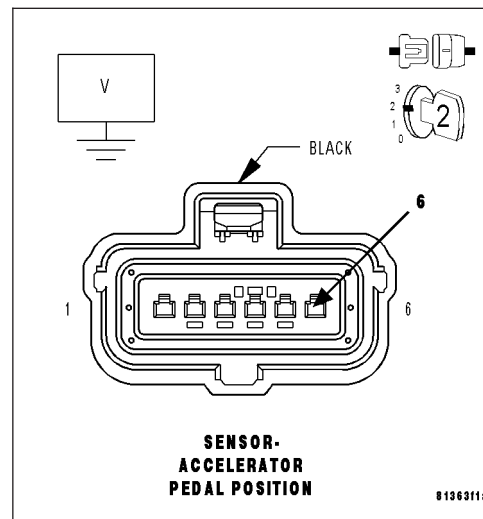
Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit in the APP Sensor harness connector.

**Is the voltage between 4.5 and 5.2 volts?**

**Yes** >> Go To 3

**No** >> Go To 8

**3. ACCELERATOR PEDAL POSITION SENSOR**

Connect a jumper wire between the (F855) 5-volt Supply circuit and the (K23) APP Sensor No.1 Signal circuit in the Sensor harness connector.

With a scan tool, monitor the APP Sensor No.1 voltage.

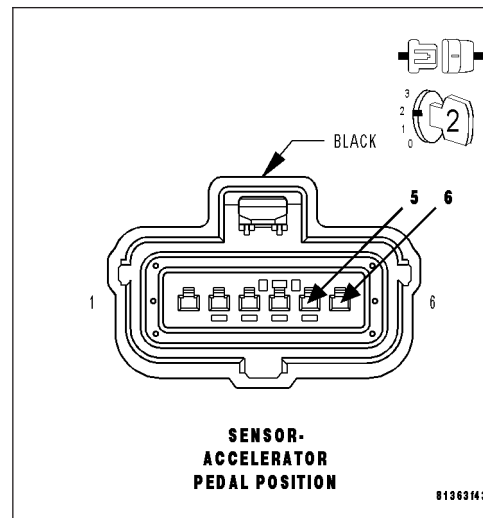
**Is the voltage above 4.5 volts?**

**Yes** >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

**Note:** Remove the jumper wire before continuing.



**P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)****4. (K23) APP SENSOR NO.1 SIGNAL CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connector.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

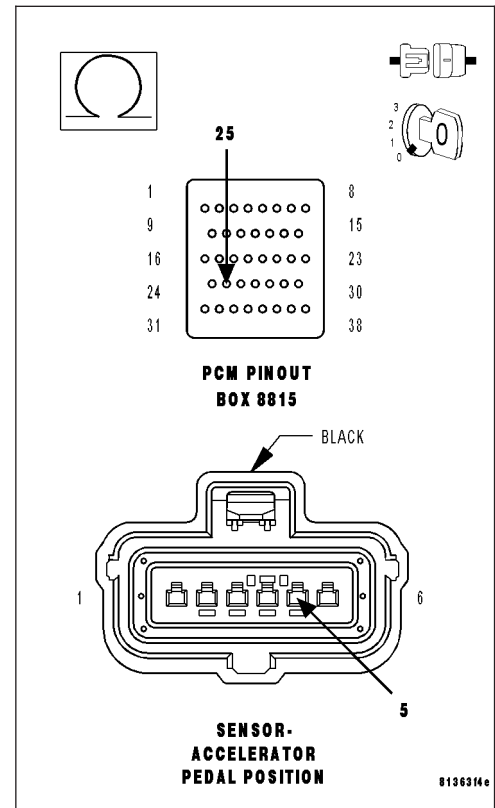
Measure the resistance of the (K23) APP Sensor No.1 Signal circuit from the APP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 5

**No** >> Repair the open in the (K23) APP Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. (K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND**

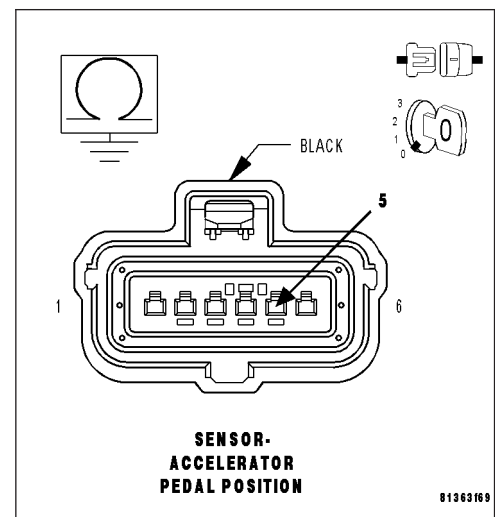
Measure the resistance between ground and the (K23) APP Sensor No.1 Signal circuit in the APP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K23) APP Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



## P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)

### 6. (K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K167) APP SENSOR NO.1 RETURN CIRCUIT

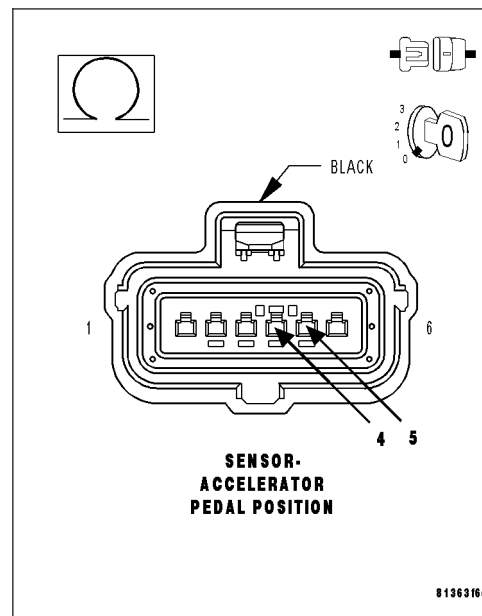
Measure the resistance between the (K23) APP Sensor No.1 Signal circuit and the (K167) Sensor No.1 Return circuit at the APP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K167) APP Sensor No.1 Return circuit and the (K23) APP Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 7



### 7. (K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO THE (K400) APP SENSOR NO.2 RETURN CIRCUIT

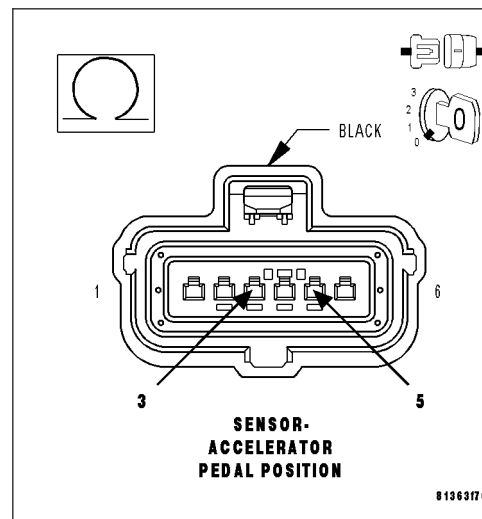
Measure the resistance between the (K23) APP Sensor No.1 Signal circuit and the (K400) Sensor No.2 Return circuit in the APP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K400) APP Sensor No.2 Return circuit and the (K23) APP Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 10



**P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)****8. (F855) 5-VOLT SUPPLY CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connector.

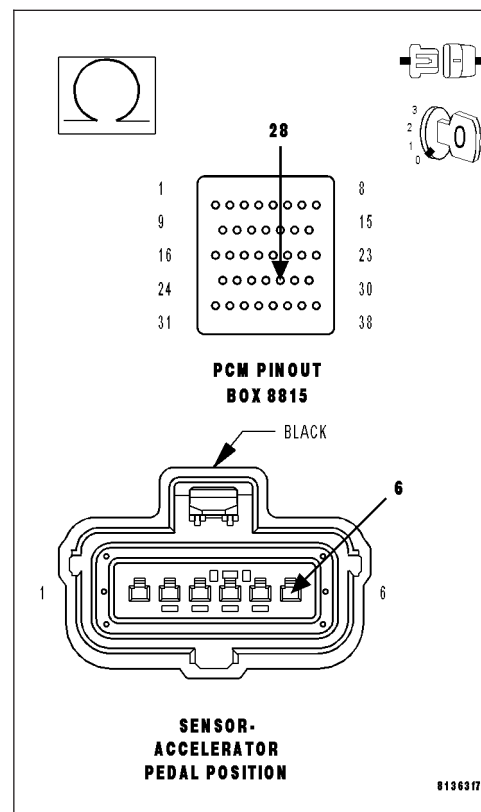
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F855) 5-volt Supply circuit from the Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the open in the (F855) 5-volt Supply circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**9. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

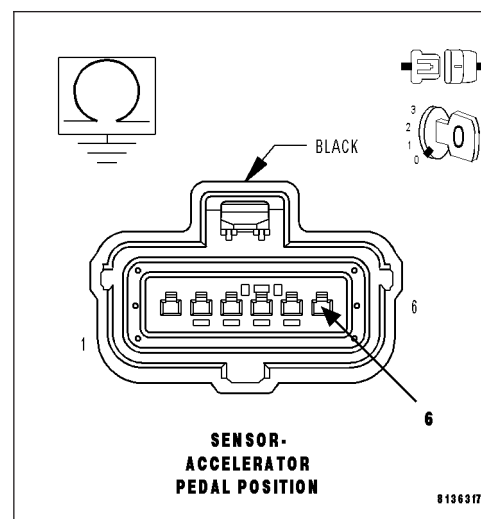
Measure the resistance between ground and the (F855) 5-volt Supply circuit in the APP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 10



**P2122-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT LOW (CONTINUED)****10. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**11. APP SENSOR SWEEP**

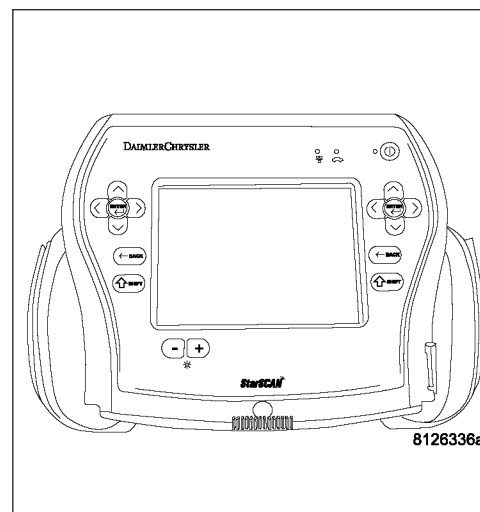
Ignition on, engine not running.

With a scan tool, monitor the APP Sensor No.1 voltage.

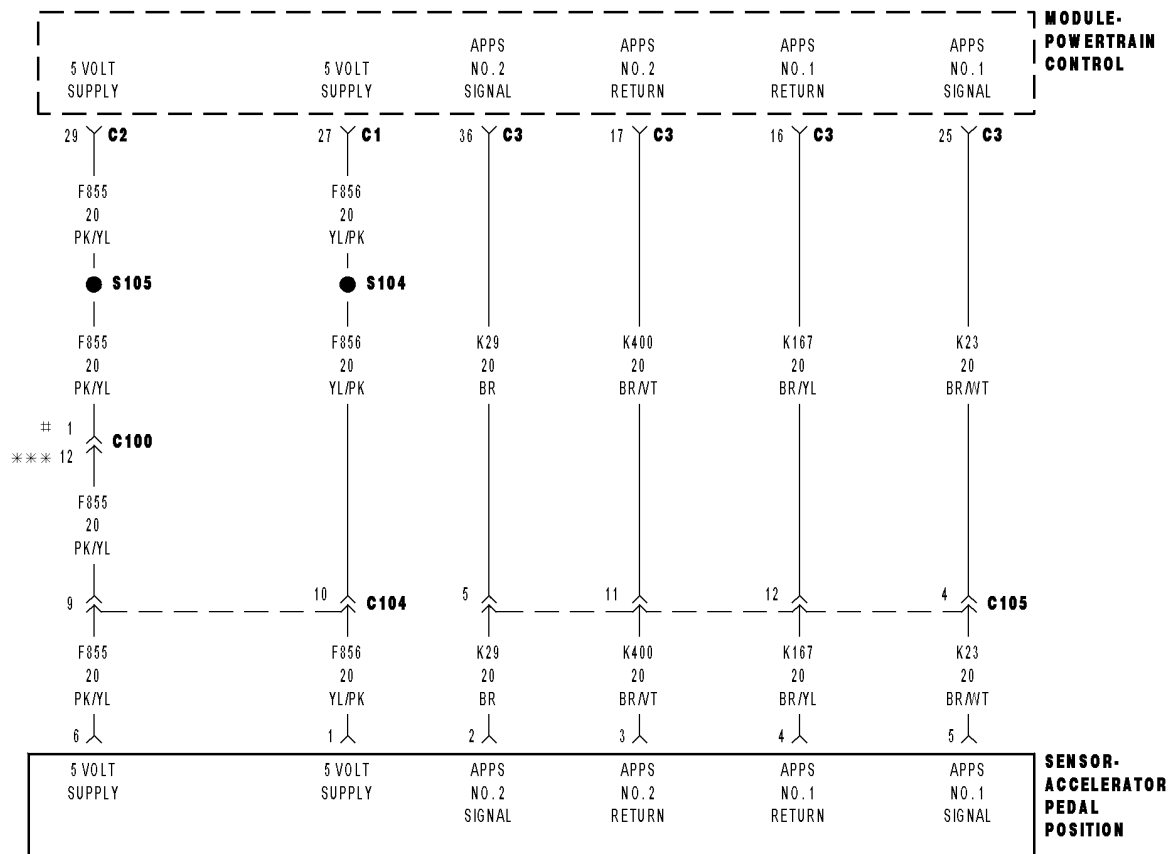
Slowly press the Accelerator pedal down.

**Does voltage start at approximately 0.45 of a volt and go above 4.6 volts with a smooth transition?**

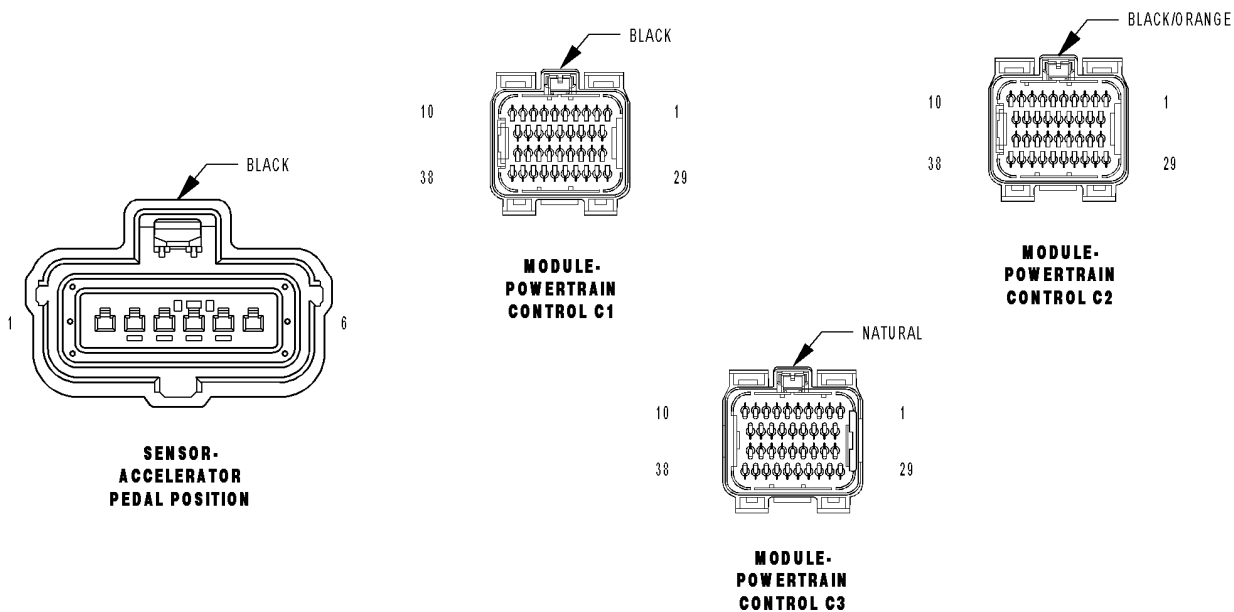
- Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No** >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P2123-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH**

± 2.7L/3.5L  
\*\*\* 5.7L



**P2123-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on and no other APPS No.1 DTCs present.

- **Set Condition:**

When APP Sensor No.1 voltage is too high. Engine will additionally idle if the brake pedal is pressed or has failed. Acceleration rate and Engine output are limited. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
(K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K23) APP SENSOR NO.1 SIGNAL SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT
(K23) APP SENSOR NO.1 SIGNAL SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT
(K167) APP SENSOR NO.1 RETURN CIRCUIT OPEN
APP SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. APPS NO.1 VOLTAGE ABOVE 4.8 VOLTS**

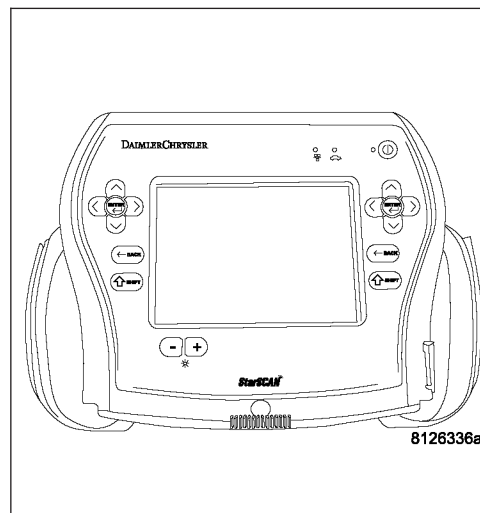
Ignition on, engine not running.

With a scan tool, read the APP Sensor No.1 voltage.

**Is the voltage above 4.8 volts?**

**Yes** >> Go To 2

**No** >> Go To 8



**P2123-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH (CONTINUED)****2. ACCELERATOR PEDAL POSITION SENSOR**

Turn the ignition off.

Disconnect the APP Sensor harness connector.

Using a jumper wire, connect it from the (K23) APP Sensor Signal circuit and the Sensor ground circuit.

Turn the ignition on.

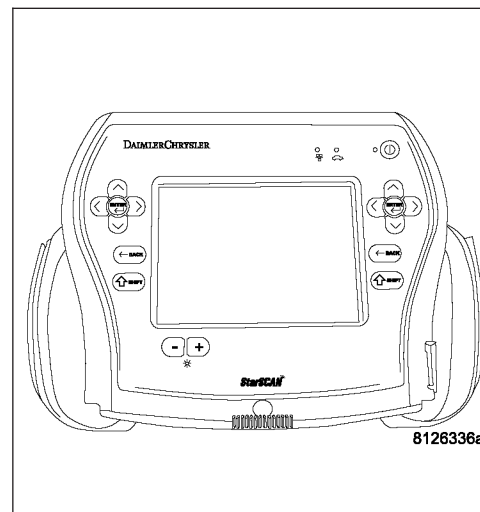
With a scan tool, monitor the Accelerator Pedal Position Sensor voltage.

**Is the voltage reading 0 volt?**

**Yes** >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K23) APP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connector.

Ignition on, engine not running.

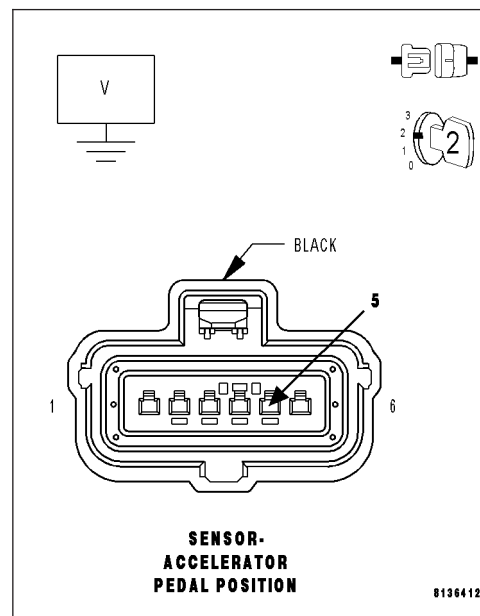
Measure the voltage on the (K23) APP Sensor No.1 Signal circuit in the APP Sensor harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (K23) APP Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4



**P2123-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH (CONTINUED)****4. (K23) APPS NO.1 SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

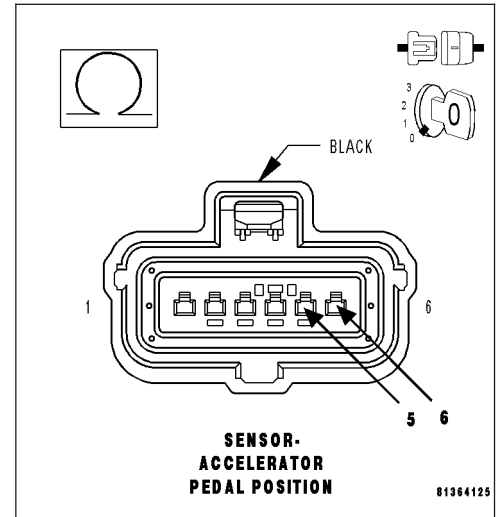
Measure the resistance between the (K23) APP Sensor No.1 Signal circuit and the (F855) 5-volt Supply circuit in the APP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K23) APP Sensor No.1 Signal circuit and the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K23) APPS NO.1 SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT**

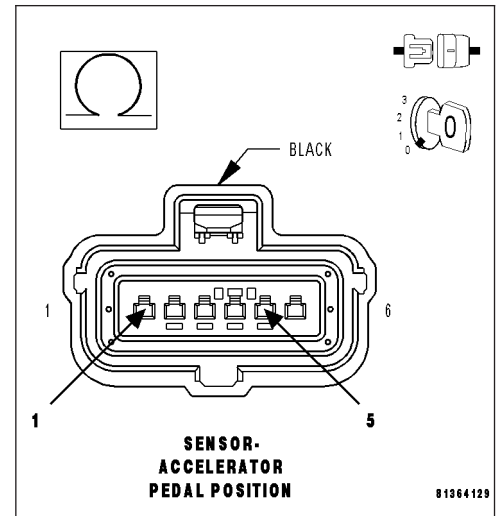
Measure the resistance between the (K23) APP Sensor No.1 Signal circuit and the (F856) 5-volt Supply circuit in the APP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K23) APP Sensor No.1 Signal circuit and the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P2123-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH (CONTINUED)****6. (K167) APP SENSOR NO.1 RETURN CIRCUIT OPEN**

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

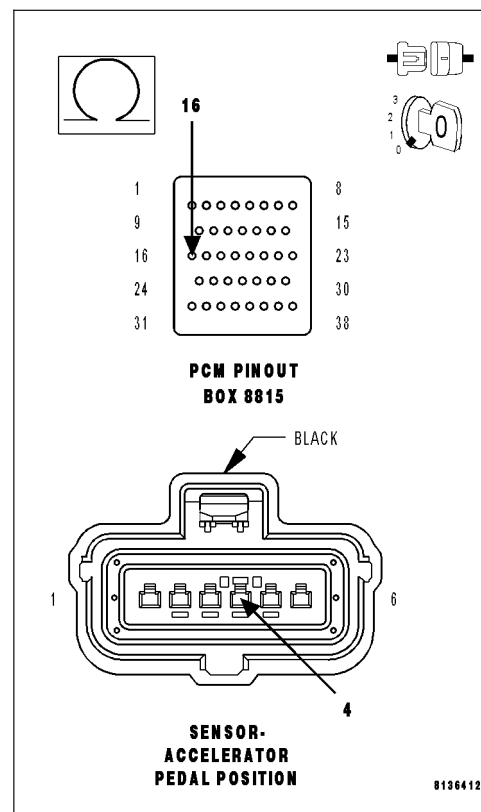
Measure the resistance of the (K167) APP Sensor No.1 Return circuit from the APP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K167) APP Sensor No.1 Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P2123-ACCELERATOR PEDAL POSITION SENSOR 1 CIRCUIT HIGH (CONTINUED)****8. APP SENSOR NO.1 SWEEP**

Ignition on, engine not running.

With a scan tool, monitor the Accelerator Pedal Position Sensor voltage.

Slowly press the Accelerator Pedal down.

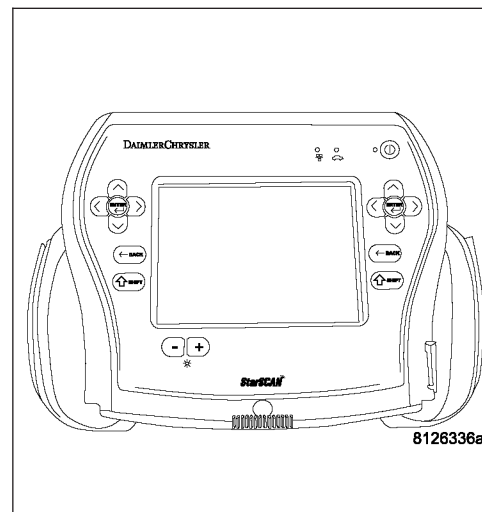
**Does voltage start at approximately 0.45 of a volt and go above 4.6 volts with a smooth transition?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

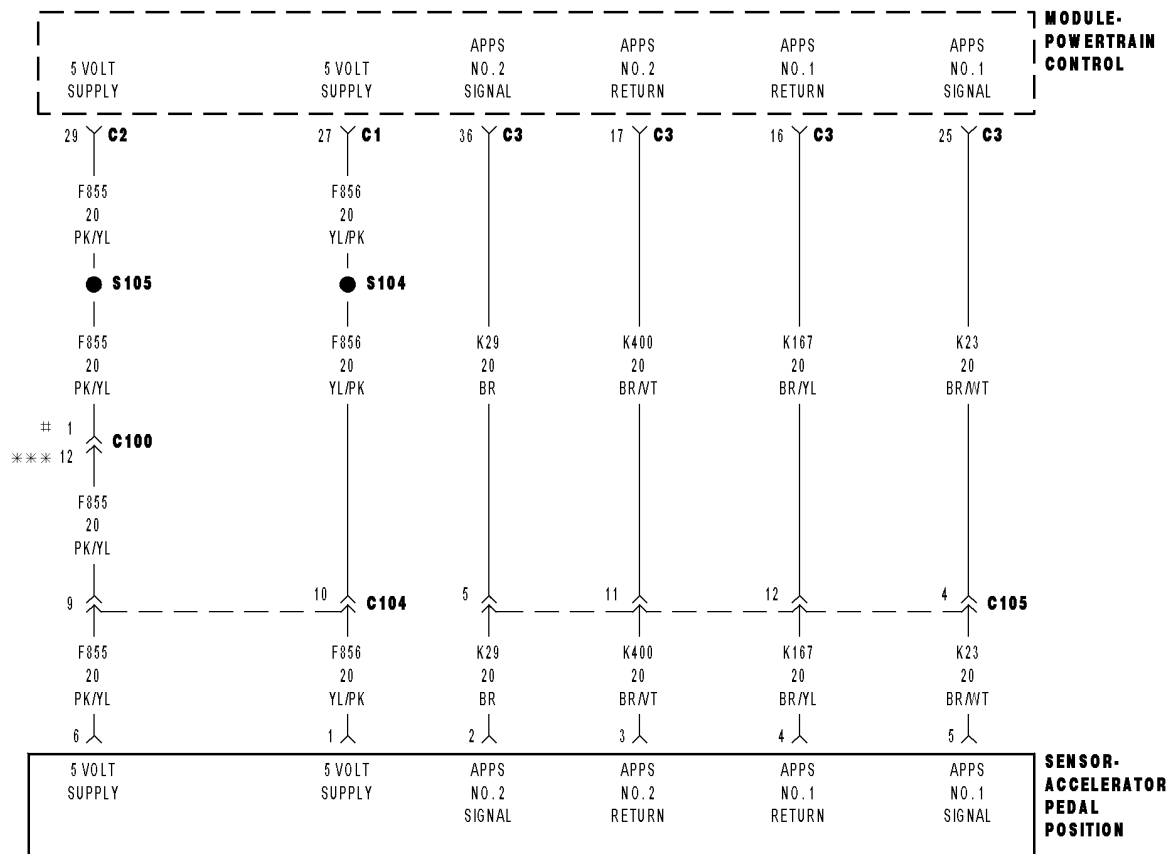
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.

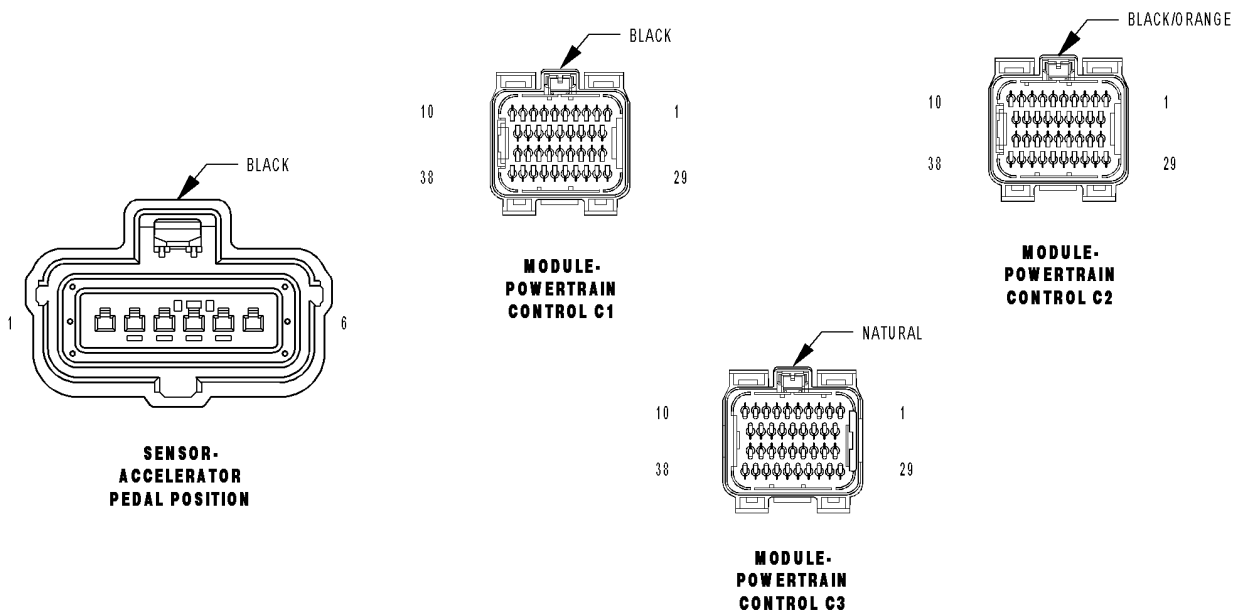
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW



† 2.7L/3.5L  
\*\*\* 5.7L



**P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on and no other APPS No.2 DTCs present.

- **Set Condition:**

When the APP Sensor No.2 voltage is too low. Engine will only idle if the Brake pedal is Pressed or has failed. Acceleration rate and Engine output are limited. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
(K29) APP SENSOR NO.2 SIGNAL CIRCUIT OPEN
(K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO GROUND
(K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO THE (K167) APP SENSOR NO.1 RETURN CIRCUIT
(K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO THE (K400) APP SENSOR NO.2 RETURN CIRCUIT
APP SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. APP SENSOR BELOW 0.25 OF A VOLT

Ignition on, engine not running.

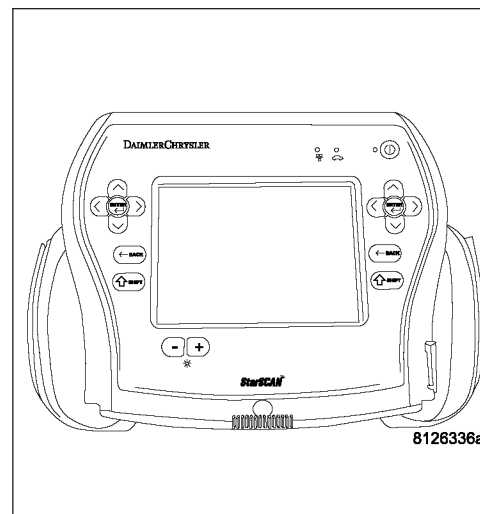
With a scan tool, read the APP Sensor No.1 voltage.

**Note: Sensor No. 2 is pulled low by the PCM as part of its system testing. This test happens a couple of times a second. So you can expect to see voltages close to zero occasionally with a normal sensor.**

**Is the voltage consistently below 0.25 of a volt?**

**Yes** >> Go To 2

**No** >> Go To 11





**P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)****2. (F856) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the APP Sensor harness connector.

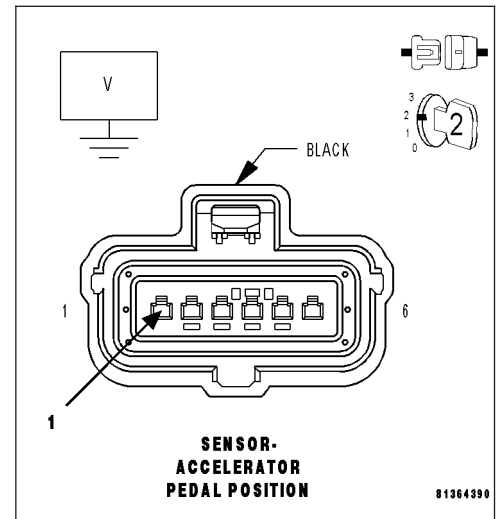
Ignition on, engine not running.

Measure the voltage on the (F856) 5-volt Supply circuit in the APP Sensor harness connector.

**Is the voltage between 4.5 and 5.2 volts?**

**Yes** >> Go To 3

**No** >> Go To 8

**3. ACCELERATOR PEDAL POSITION SENSOR**

Connect a jumper wire between the (F856) 5-volt Supply circuit and the (K29) APP Sensor No.2 Signal circuit in the Sensor harness connector.

With a scan tool, monitor the APP Sensor No.2 voltage.

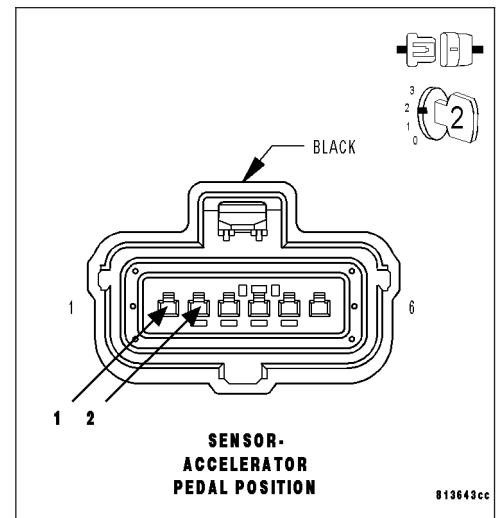
**Is the voltage above 4.5 volts with the jumper wire installed?**

**Yes** >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

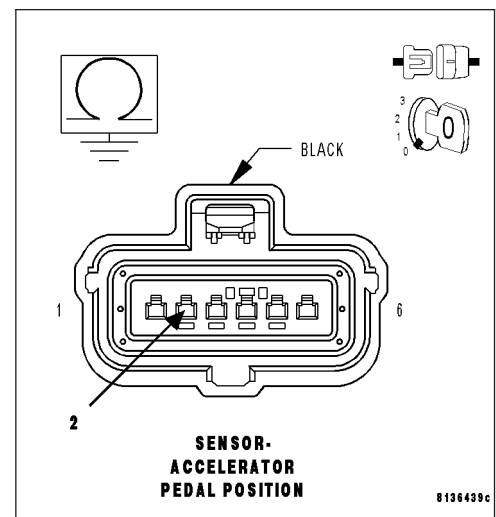
**No** >> Go To 4

**Note:** Remove the jumper wire before continuing.



#### 4. (K29) APP SENSOR NO.2 SIGNAL CIRCUIT OPEN

Disconnect the PCM harness connectors.



**P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)****6. (K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO THE (K400) APP SENSOR NO.2 RETURN CIRCUIT**

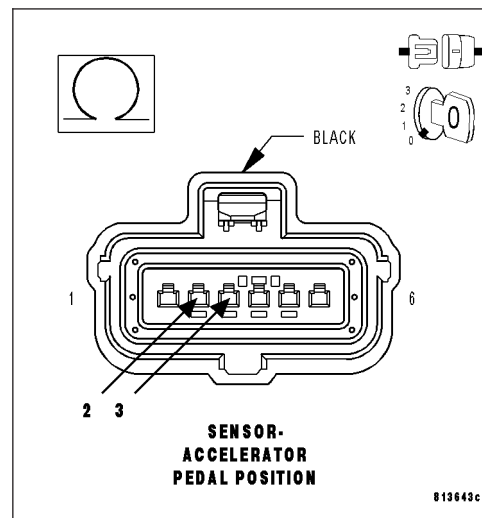
Measure the resistance between the (K29) APP Sensor No.2 Signal circuit and the (K400) Sensor No.2 Return circuit in the APP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K400) APP Sensor No.2 Return circuit and the (K29) APP Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. (K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO THE (K167) APP SENSOR NO.1 RETURN CIRCUIT**

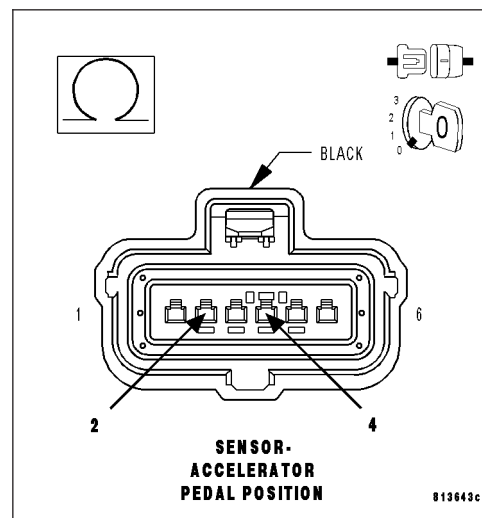
Measure the resistance between the (K29) APP Sensor No.2 Signal circuit and the (K167) Sensor No.1 Return circuit in the APP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short between the (K167) APP Sensor No.1 Return circuit and the (K29) APP Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 10



**P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)****8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

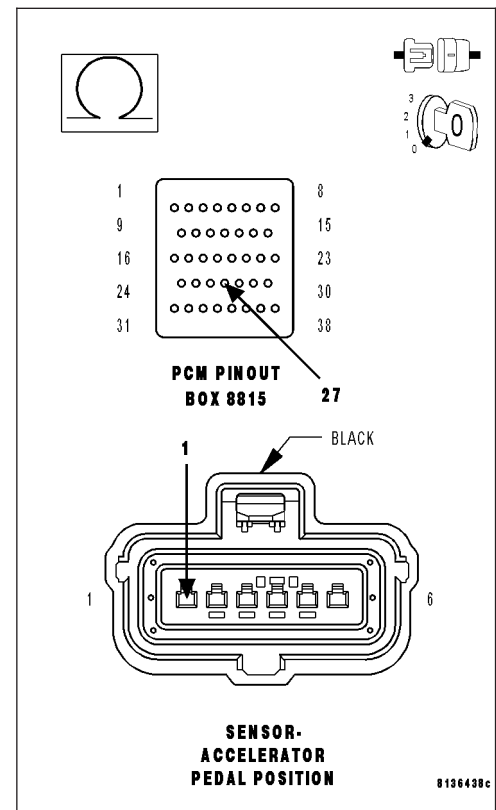
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the open in the (F856) 5-volt Supply circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**9. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

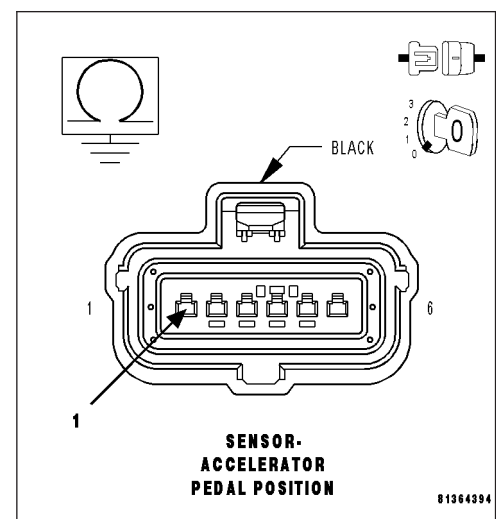
Measure the resistance between ground and the (F856) 5-volt Supply circuit in the APP Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 10



**P2127-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT LOW (CONTINUED)****10. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**11. APP SENSOR SWEEP**

Ignition on, engine not running.

With a scan tool, monitor the APP Sensor No.2 voltage.

Slowly press the Accelerator pedal down.

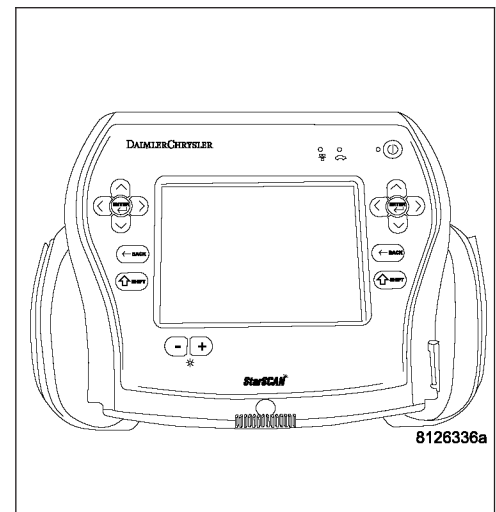
**Does voltage start at approximately 0.22 of a volt and go above 2.31 volts with a smooth transition?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

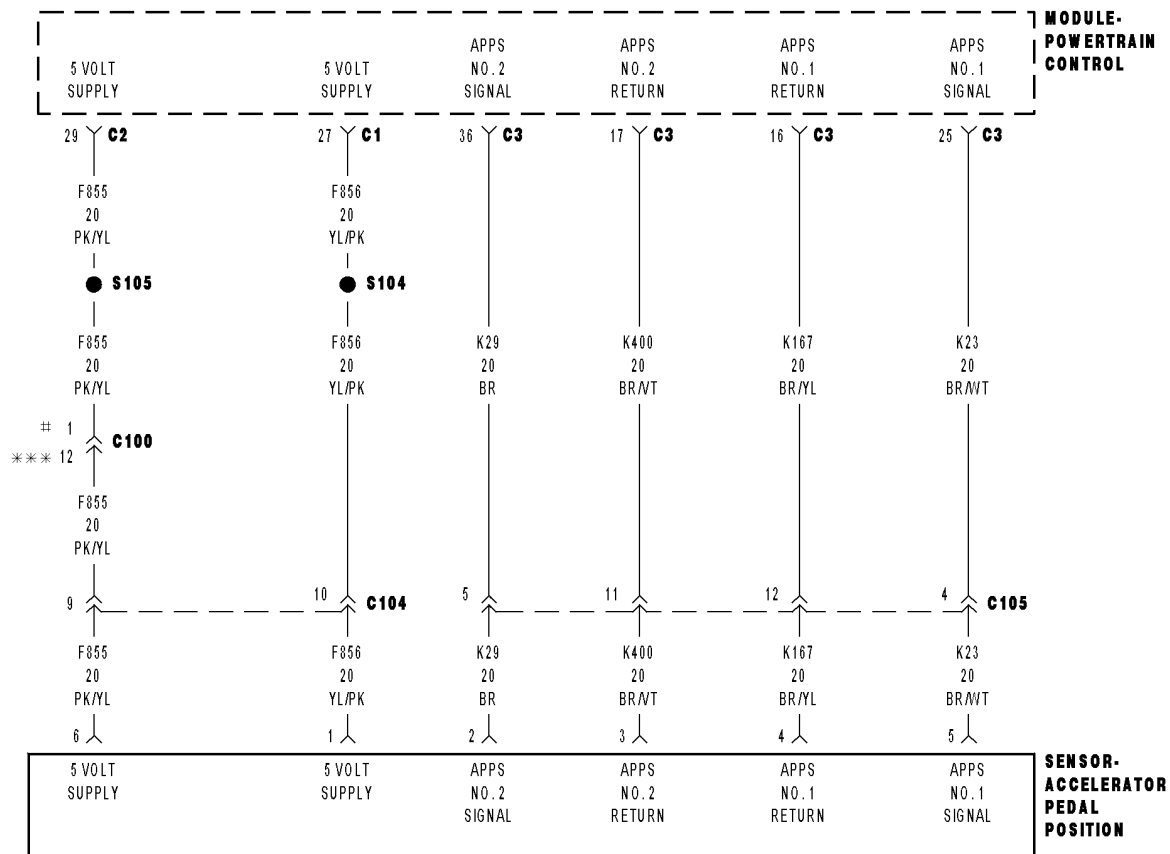
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.

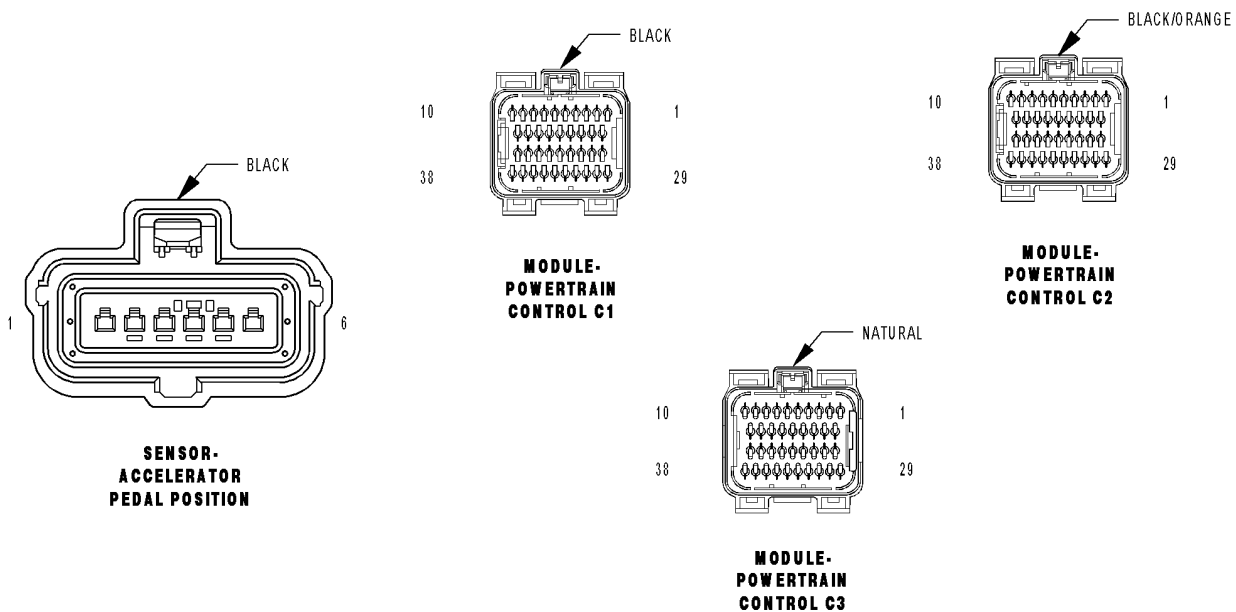
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



# P2128-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH



± 2.7L/3.5L  
\*\*\* 5.7L



**P2128-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on and no other APPS No.2 DTCs present.
- **Set Condition:**  
When APP Sensor No.2 voltage is too high. Idle is additionally forced any time the brake is applied or failed. Acceleration rate and Engine output are limited. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
(K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
(K29) APP SENSOR NO.2 SIGNAL SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT
(K29) APP SENSOR NO.2 SIGNAL SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT
(K400) APP SENSOR NO.2 RETURN CIRCUIT OPEN
APP SENSOR
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

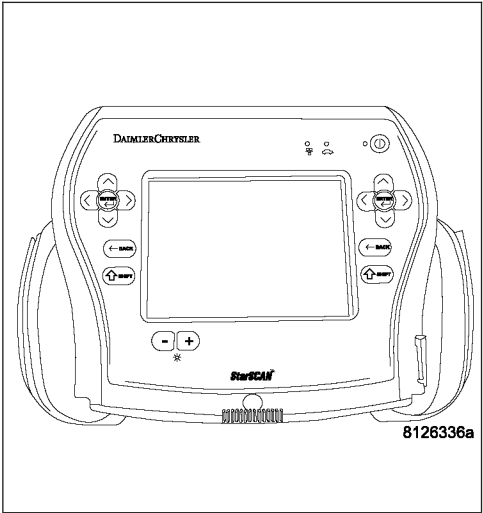
**Diagnostic Test**

**1. APPS NO.2 VOLTAGE ABOVE 3.0 VOLTS**

Ignition on, engine not running.  
With a scan tool, read the APP Sensor No.2 voltage.

**Note:** Diagnose any 5-Volt Supply DTCs before continuing.

- Is the voltage above 3.0 volts?**
- Yes**    >> Go To 2
- No**    >> Go To 8



**P2128-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)****2. ACCELERATOR PEDAL POSITION SENSOR**

Turn the ignition off.

Disconnect the APP Sensor harness connector

Using a jumper wire, connect it from the (K29) APP Sensor Signal circuit and the Sensor ground circuit.

Turn the ignition on.

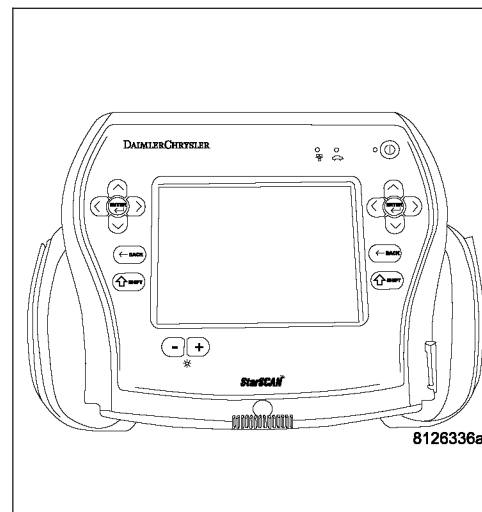
With a scan tool, monitor the Accelerator Pedal Position Sensor voltage.

**Is the voltage at 0 volt?**

**Yes** >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K29) APP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connector.

Ignition on, engine not running.

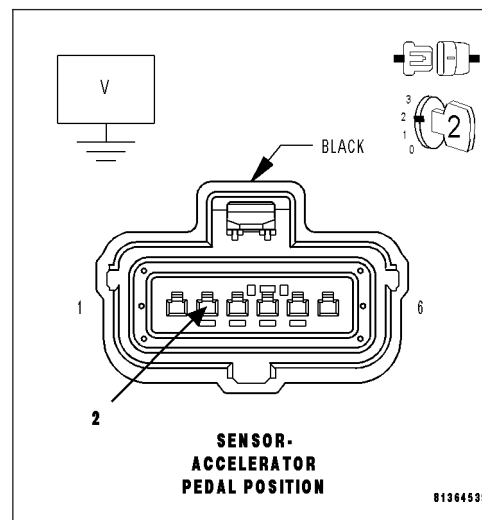
Measure the voltage on the (K29) APP Sensor No.2 Signal circuit in the APP Sensor harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (K29) APP Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4





**P2128-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)****4. (K29) APPS NO.2 SIGNAL CIRCUIT SHORTED TO THE (F856) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

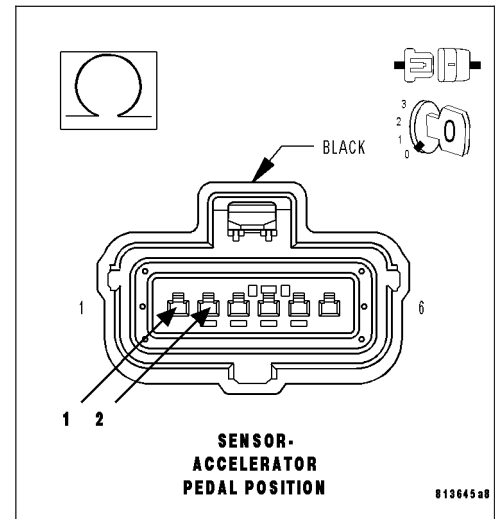
Measure the resistance between the (K29) APP Sensor No.2 Signal circuit and the (F856) 5-volt Supply circuit in the APP Sensor harness connector.

**Is the resistance below 10 ohms?**

**Yes** >> Repair the short between the (K29) APP Sensor No.2 Signal circuit and the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K29) APPS NO.2 SIGNAL CIRCUIT SHORTED TO THE (F855) 5-VOLT SUPPLY CIRCUIT**

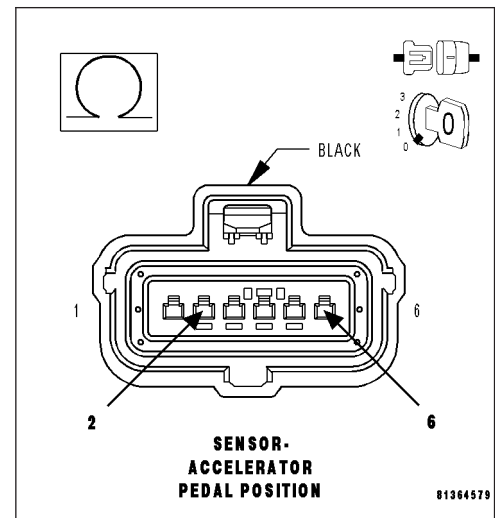
Measure the resistance between the (K29) APP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit in the APP Sensor harness connector.

**Is the resistance below 10 ohms?**

**Yes** >> Repair the short between the (K29) APP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P2128-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)****6. (K400) APP SENSOR NO.2 RETURN CIRCUIT OPEN**

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

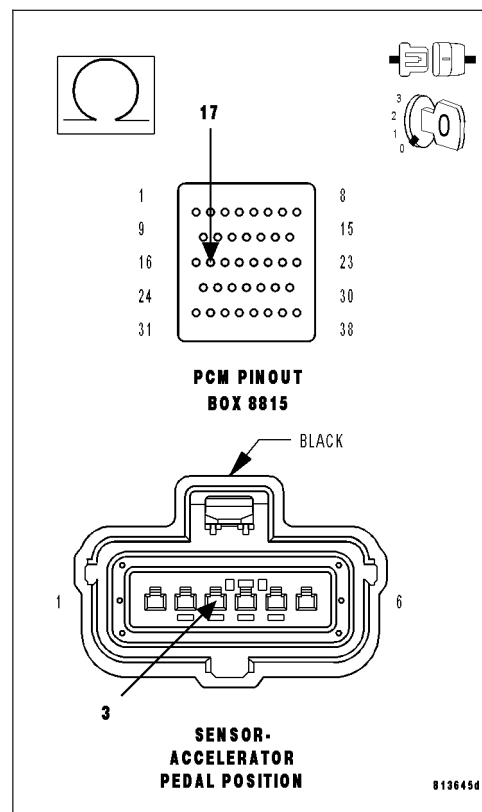
Measure the resistance of the (K400) APP Sensor No.2 Return circuit from the APP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K400) APP Sensor No.2 Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P2128-ACCELERATOR PEDAL POSITION SENSOR 2 CIRCUIT HIGH (CONTINUED)****8. APP SENSOR NO.2 SWEEP**

Ignition on, engine not running.

With a scan tool, monitor the Accelerator Pedal Position Sensor voltage.

Slowly press the Accelerator Pedal down.

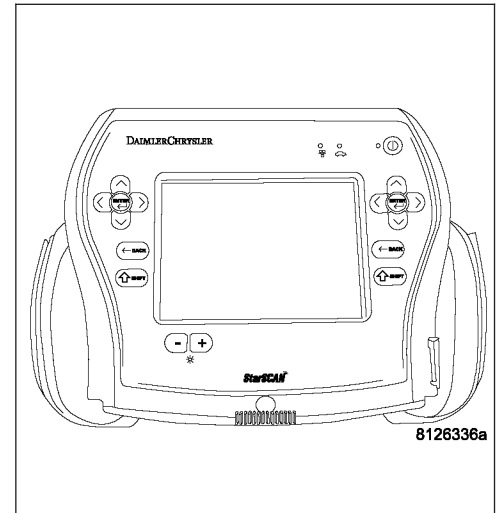
**Does voltage start at approximately 0.22 of a volt and go above 2.31 volts with a smooth transition?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

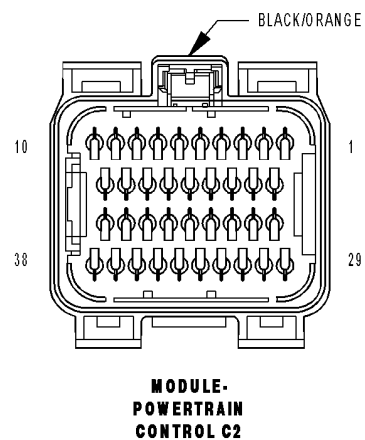
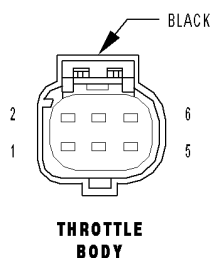
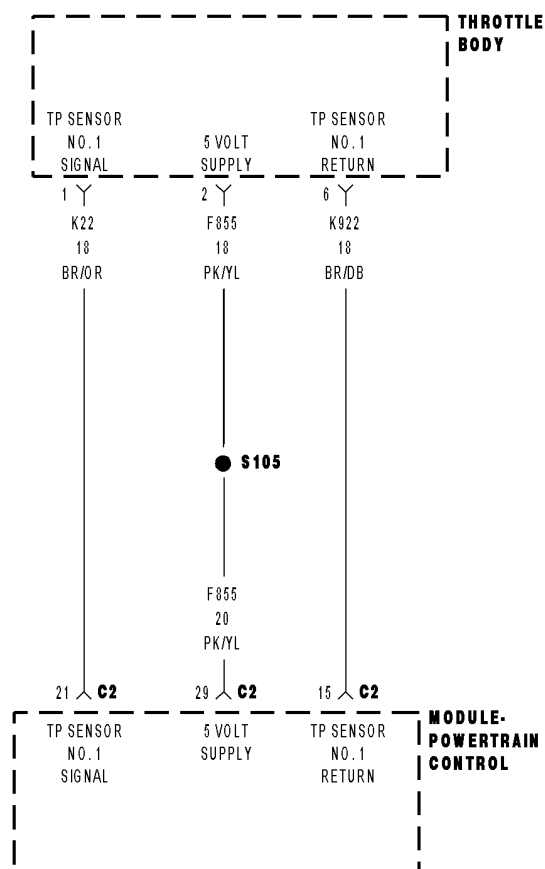
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION



**P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)**

For the Engine System Schematic circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on and no other DTCs present for TP Sensor No.1 or No.2.

- **Set Condition:**

PCM recognizes TP Sensors No.1 and No.2 are not coherent. One trip fault and the code will set within 5 seconds. ETC light is illuminated.

Possible Causes
(K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
RESISTANCE IN THE (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT
(K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO GROUND
RESISTANCE IN (F855) 5-VOLT SUPPLY CIRCUIT
(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
RESISTANCE IN THE (K922) SENSOR GROUND CIRCUIT
(K22) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO (K122) TP SENSOR NO.2 SIGNAL CIRCUIT
THROTTLE POSITION SENSOR
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** The throttle plate and linkage should be free from binding and carbon build up.

**Note:** Make sure the throttle plate is at the idle position.

Ignition on, engine not running.

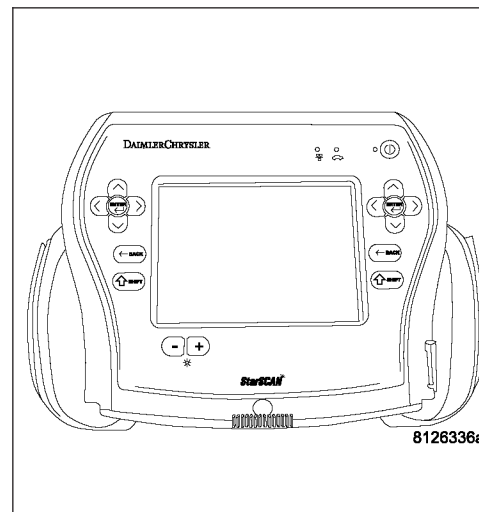
**Note:** Inspect the engine for vacuum leaks.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Go To 11



**P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)****2. (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connector.

Disconnect the Throttle Body harness connector.

Ignition on, engine not running.

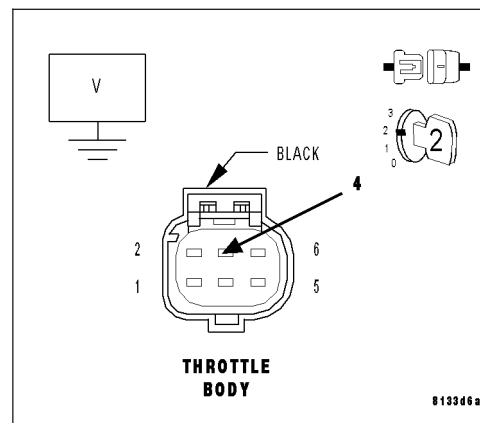
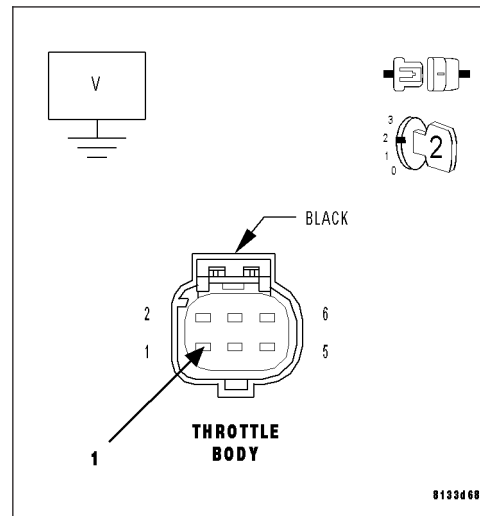
Measure the voltage on the (K22) TP No.1 Signal and the (K122) TP No.2 Signal circuits in the Throttle Body harness connector.

**Is the voltage above 5.2 volts?**

**Yes** >> Repair the short to battery voltage in the (K22) TP Sensor No.1 or (K122) TP Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3



**P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)****3. THROTTLE POSITION SENSOR**

Turn the ignition off.

Connect the PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the TP Sensor No.1 and No.2 voltage.

Connect a jumper wire between the (K922) Sensor Return circuit and the (K22) TP Sensor No.1 Signal circuit.

TP Sensor No.1 voltage should change from approximately 4.5 volts to 0.5 of a volt?

For TP Sensor No.2, connect a jumper wire between (F855) 5-volt supply circuit and the (K122) TP Sensor No.2 signal circuit.

TP Sensor No.2 voltage should change from approximately 0 volts to 5.0 volts?

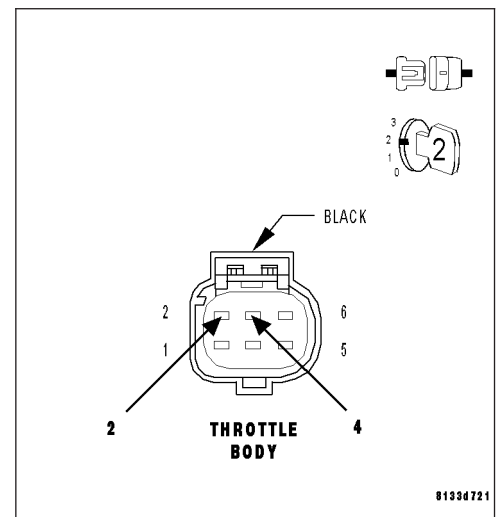
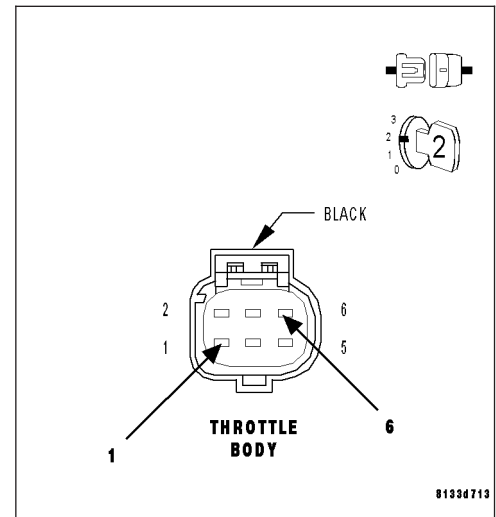
**Is the voltage reading within the listed specification with the jumper wire installed?**

**Yes** >> Replace the Throttle Body Assembly.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

**Note:** Remove the jumper wire before continuing.



## P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)

### 4. EXCESSIVE RESISTANCE IN THE (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.2 SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the PCM harness connector.

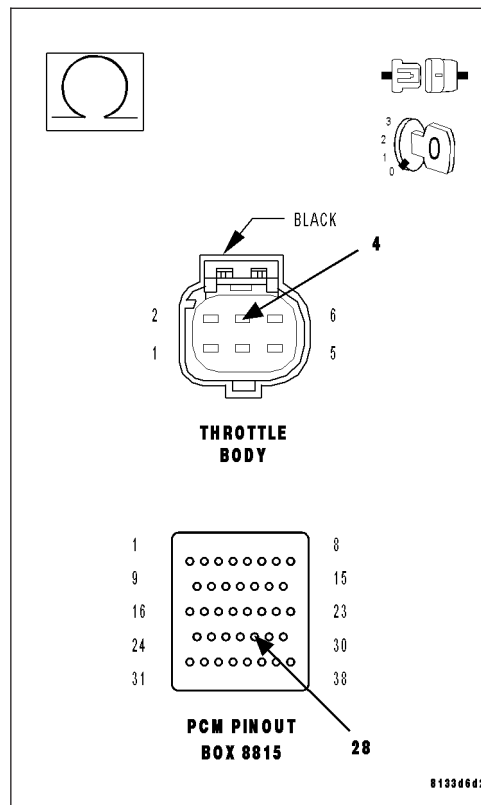
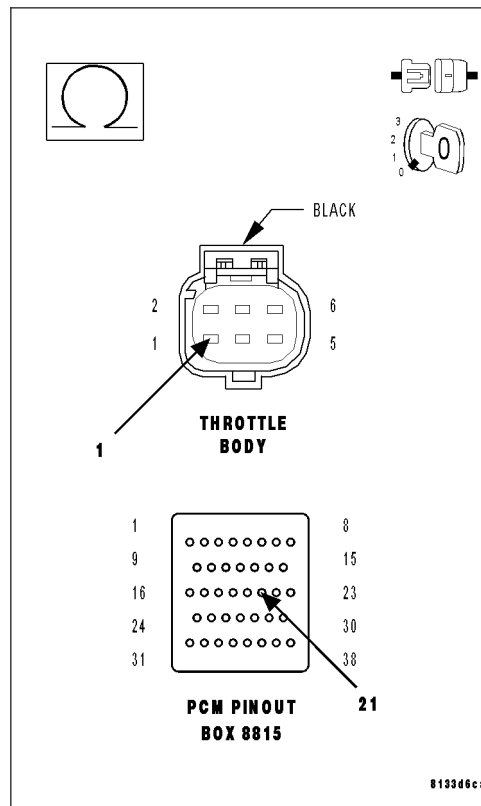
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K22) TP Sensor No.1 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815. Measure the resistance of the (K122) TP Sensor No.2 Signal circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms for each circuit?**

**Yes** >> Go To 5

**No** >> Repair the excessive resistance in the (K22) TP Sensor No.1 or (K122) TP Sensor No.2 Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)****5. (K22) TP SENSOR NO.1 OR (K122) TP SENSOR NO.1 SIGNAL CIRCUIT SHORTED TO GROUND**

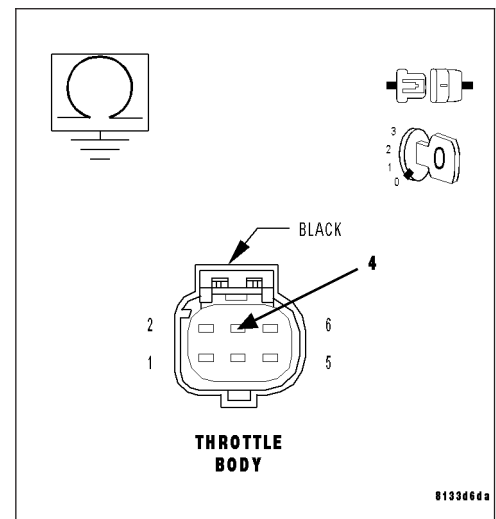
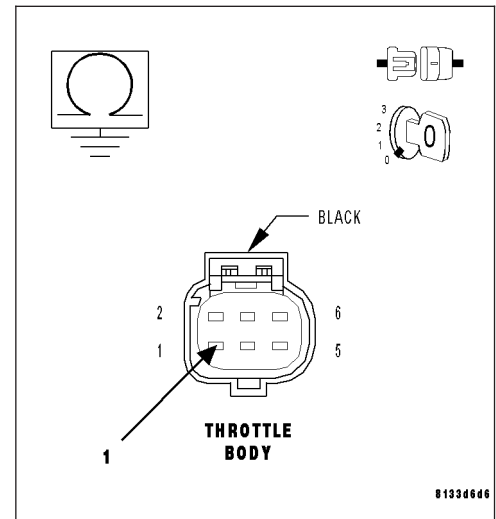
Measure the resistance between ground and the (K22) TP Sensor No.1 Signal circuit and the (K122) TP Sensor No.2 Signal circuit at the appropriate terminal of the special tool #8815.

**Is the resistance below 100 ohms for either circuit?**

**Yes** >> Repair the short to ground in the (K22) TP No.1 Signal or (K122) TP No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)****6. EXCESSIVE RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT**

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

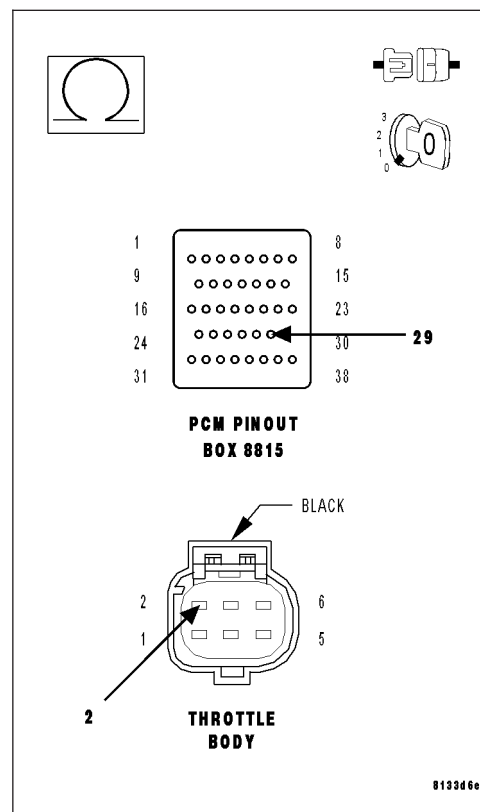
Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. (F855) 5-VOLT SUPPLY SHORTED TO GROUND**

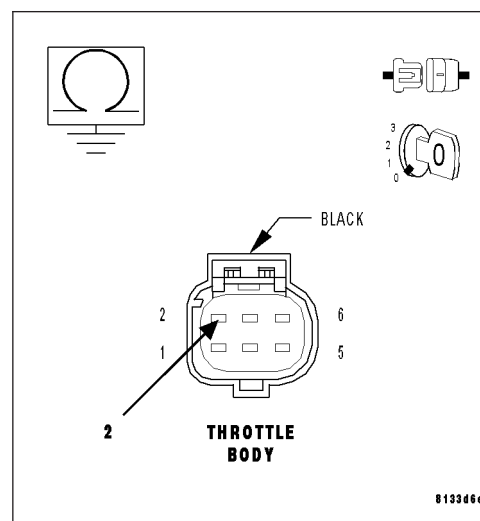
Measure the resistance between ground and the (F855) 5-volt Supply circuit at the appropriate terminal of the special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)****8. EXCESSIVE RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT**

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

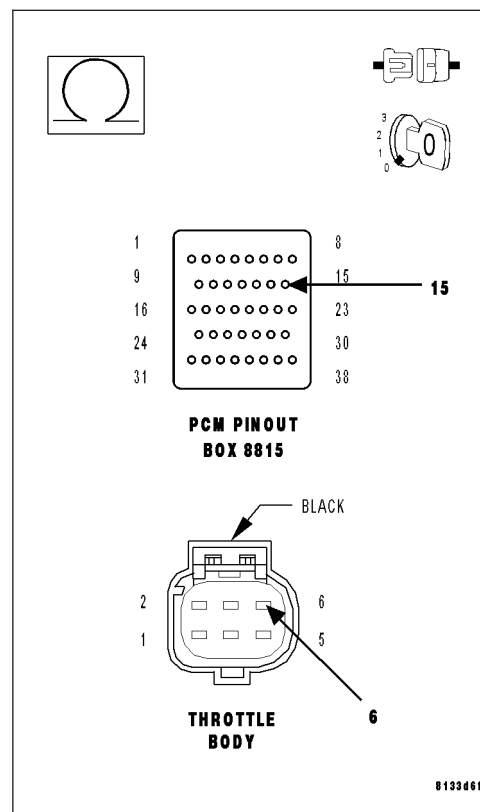
Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 9

**No** >> Repair the excessive resistance in the (K922) Sensor Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**9. (K22) TP SENSOR NO.1 SIGNAL SHORTED TO (K122) TP SENSOR NO.2 SIGNAL**

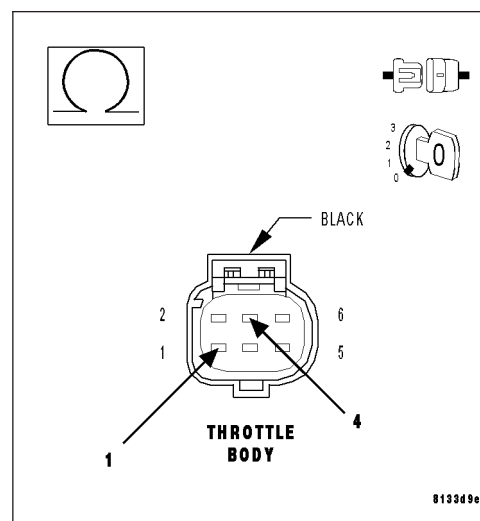
Measure the resistance between the (K22) TP Sensor No.1 Signal circuit and the (K122) TP Sensor No.2 Signal circuit at the appropriate terminal of the special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (K122) TP Sensor No.2 Signal circuit and the (K22) TP Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 10



**P2135-THROTTLE POSITION SENSOR 1/2 CORRELATION (CONTINUED)****10. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**If there are no possible causes remaining, review repair.**

**Repair**

Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**11. THROTTLE FOLLOWER TEST**

Ignition on, engine not running.

With a scan tool, perform the Throttle Follower Test and monitor the TP Sensor No.1 or No.2 voltage.

Slowly press the throttle pedal down.

The voltage for TP Sensor No.1 should start at approximately 0.8 of a volt and increase to above 4.2 volts.

The voltage for TP Sensor No.2 should start at approximately 4.2 volts and decrease to approximately 0.8 of a volt.

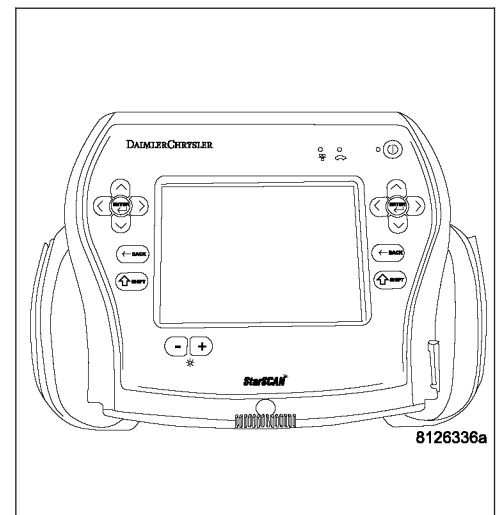
**Is the voltage within the range of the listed specification for the appropriate Sensor?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

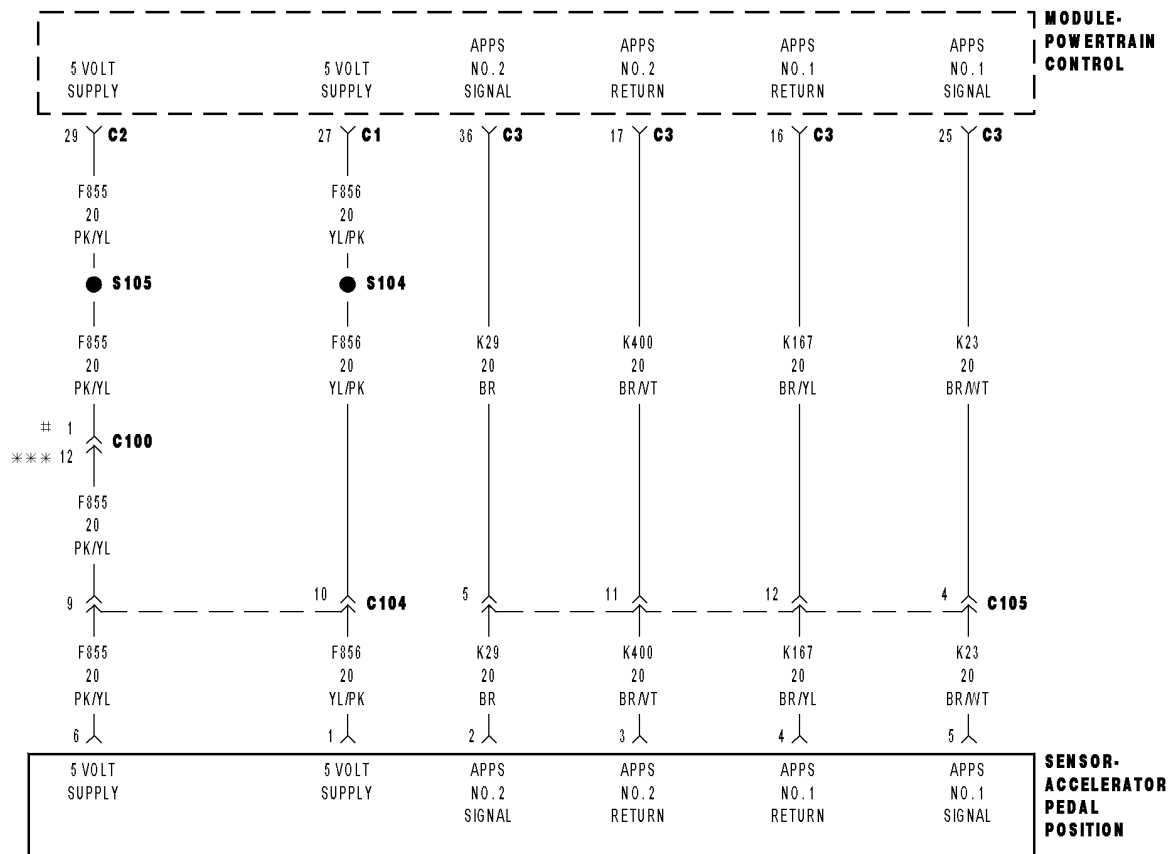
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Disconnect the Battery when replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function.

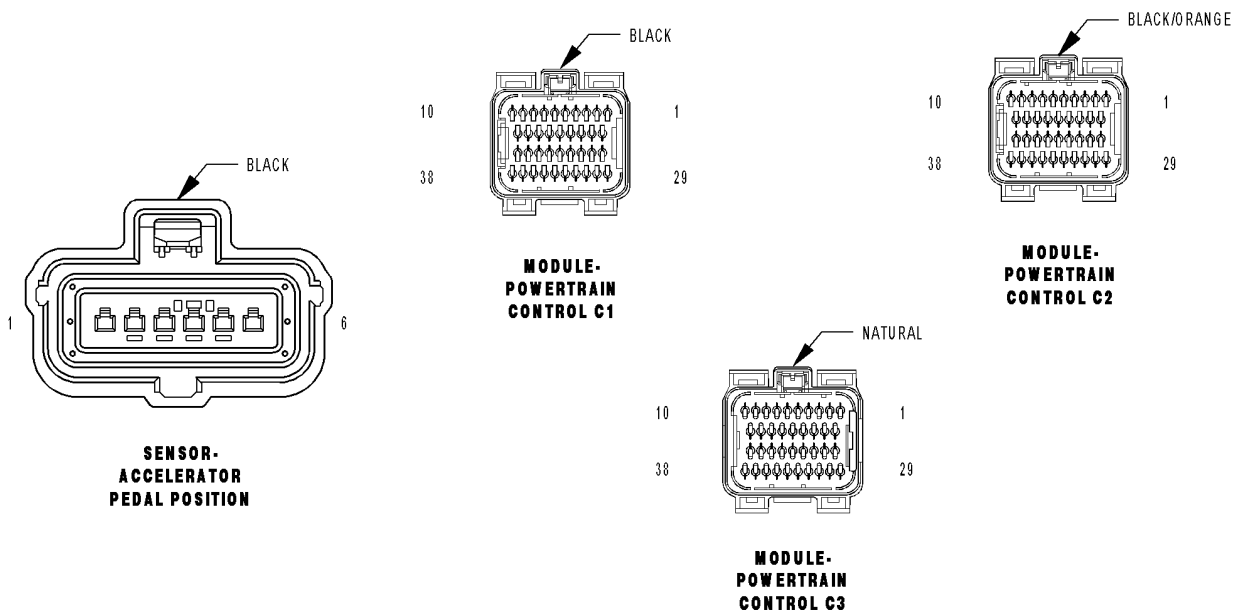
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P2138-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION



† 2.7L/3.5L  
\*\*\* 5.7L



### P2138-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- When Monitored:**  
 With the ignition on and no APPS No.1 and APPS No.2 DTC present.
- Set Condition:**  
 APPS values No.1 and No.2 are not coherent. Idle is additionally forced when the brake pedal is pressed or failed. Acceleration rate and Engine output are limited. One trip fault and the code will set within 5 seconds. ETC light is flashing.

Possible Causes
EXCESSIVE RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT EXCESSIVE RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT EXCESSIVE RESISTANCE IN THE (K167) SENSOR NO.1 RETURN CIRCUIT EXCESSIVE RESISTANCE IN THE (K400) SENSOR NO.2 RETURN CIRCUIT EXCESSIVE RESISTANCE IN THE (K23) APP SENSOR NO.1 SIGNAL CIRCUIT EXCESSIVE RESISTANCE IN THE (K29) APP SENSOR NO.2 SIGNAL CIRCUIT APP SENSOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

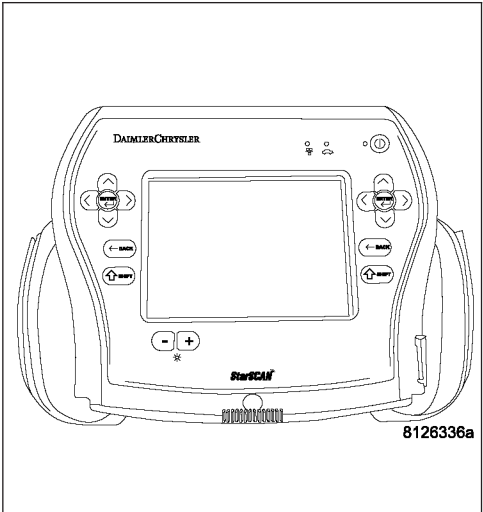
Ignition on, engine not running.

With a scan tool, read DTCs.

**Note:** Repair any other 5-Volt Supply or APPS High and Low DTCs before diagnosing P2138.

**Is the DTC active at this time?**

- Yes**    >> Go To 2
- No**     >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
 Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2138-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION (CONTINUED)****2. EXCESSIVE RESISTANCE IN THE (K23) APPS NO.1 SIGNAL CIRCUIT**

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Turn the ignition off.

Disconnect the APP Sensor harness connector.

Disconnect the PCM harness connector.

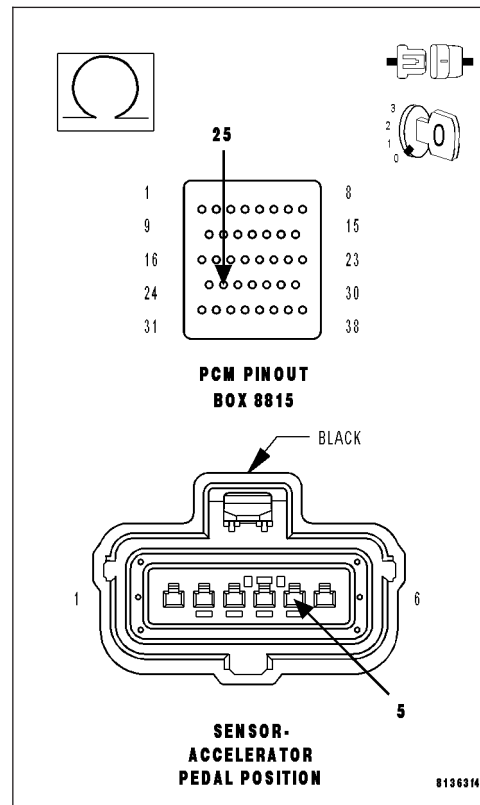
Measure the resistance of (K23) APP Sensor No.1 Signal circuit from the APP Sensor harness connector to the appropriate terminals of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the excessive resistance in the (K23) APP Sensor No.1 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**3. EXCESSIVE RESISTANCE IN THE (K29) APPS NO.2 SIGNAL CIRCUIT**

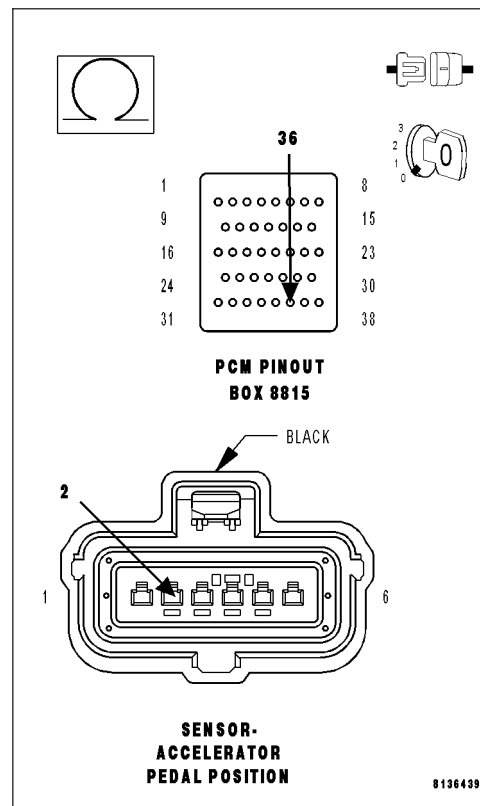
Measure the resistance of (K29) APPS No.2 Signal circuit from the APP Sensor harness connector to the appropriate terminals of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the excessive resistance in the (K29) APP Sensor No.2 Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2138-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION (CONTINUED)****4. EXCESSIVE RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT**

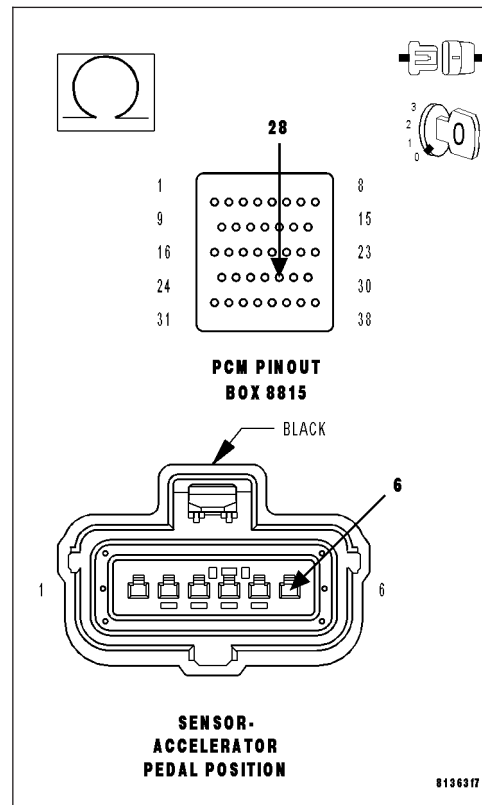
Measure the resistance of the (F855) 5-volt Supply circuit from the APP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. EXCESSIVE RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT**

Disconnect the C1/A PCM harness connector.

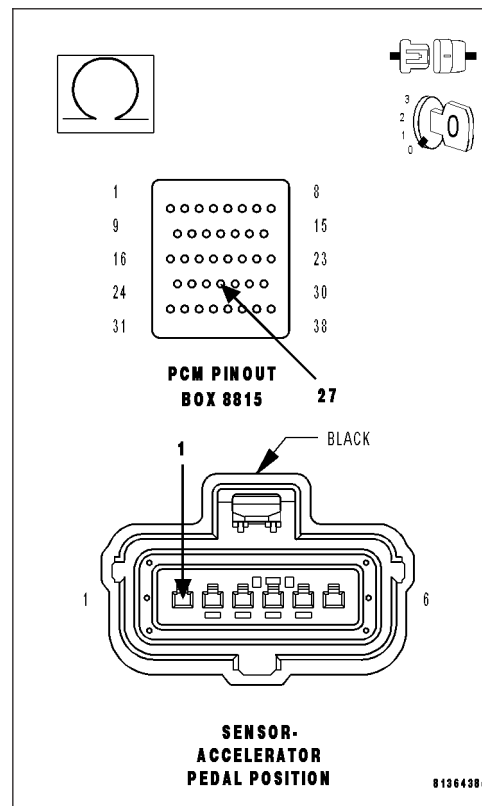
Measure the resistance of the (F856) 5-volt Supply circuit from the APP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6





**P2138-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION (CONTINUED)****6. EXCESSIVE RESISTANCE IN THE (K167) SENSOR NO.1 RETURN CIRCUIT**

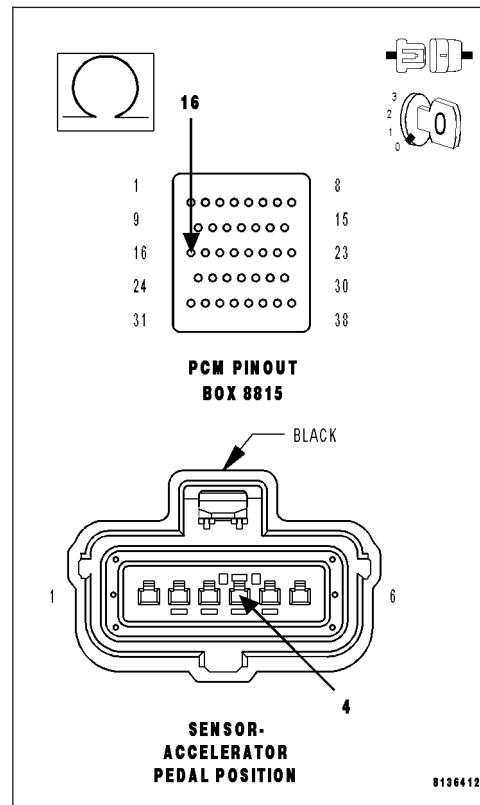
Measure the resistance of the (K167) APP Sensor No.1 Return circuit from the APP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the excessive resistance in the (K167) Sensor No.1 Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. EXCESSIVE RESISTANCE IN THE (K400) SENSOR NO.2 RETURN CIRCUIT**

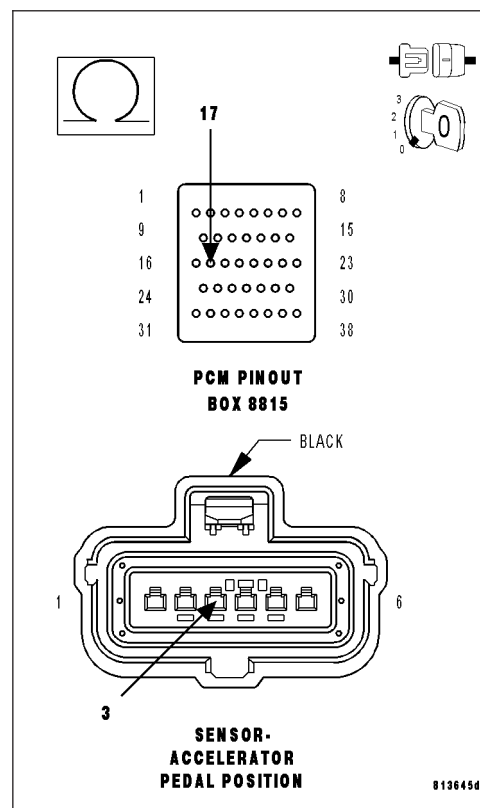
Measure the resistance of the (K400) APP Sensor No.2 Return circuit from the APP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the excessive resistance in the (K400) Sensor No.2 Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P2138-ACCELERATOR PEDAL POSITION SENSOR 1/2 CORRELATION (CONTINUED)****8. CHECKING APPS NO.1 AND NO.2 WITH A LAB SCOPE**

Ignition on, engine not running.

Set up a lab scope in a way that you can view two graphs simultaneously.

Backprobe (K23) APP Sensor No.1 Signal circuit using Channel 1 at the APP Sensor harness connector.

Backprobe (K29) APP Sensor No.2 Signal circuit using Channel 2 at the APP Sensor harness connector.

Slowly press and release the Accelerator Pedal while monitoring the lab scope screen.

**Does the scope pattern show any missing or erratic signals?**

**Yes** >> Replace the APP Sensor Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function to relearn the APPS values.

Go To 9

**No** >> Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

---

**9. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

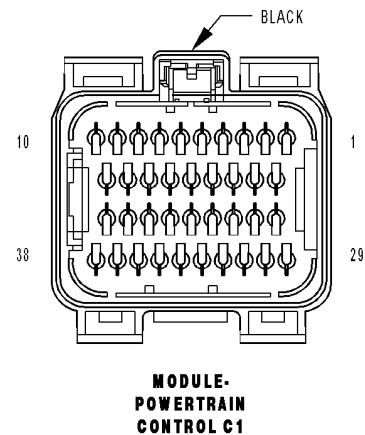
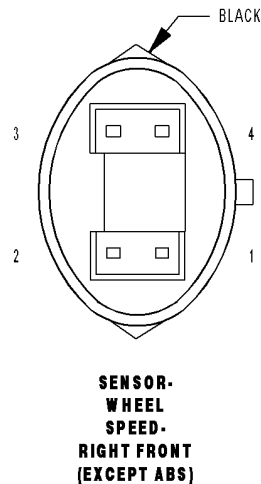
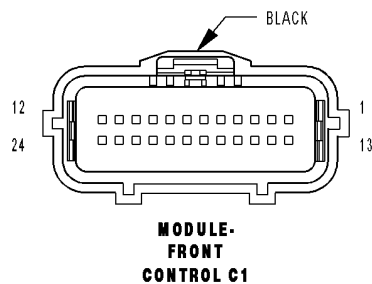
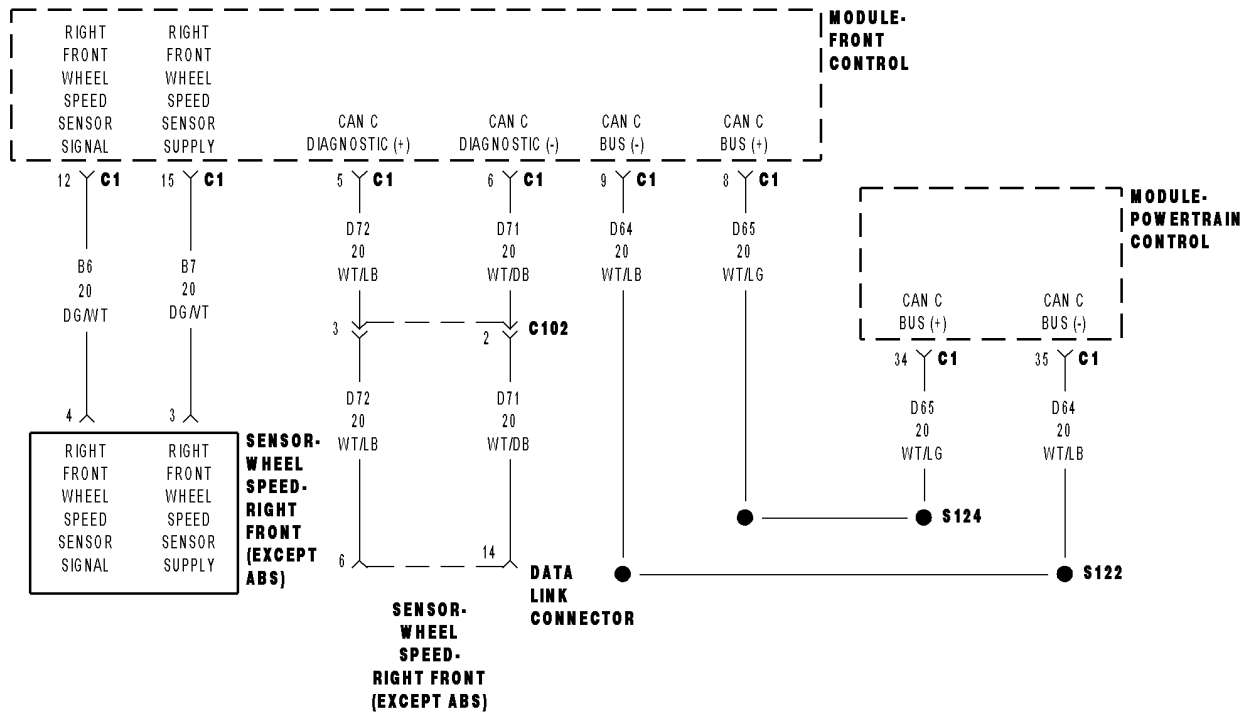
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**P2161-VEHICLE SPEED SENSOR 2 ERRATIC (Not Equipped with ABS)**

**P2161-VEHICLE SPEED SENSOR 2 ERRATIC (Not Equipped with ABS) (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on and battery voltage greater than 10 volts. Transmission in Drive or Reverse.

- **Set Condition:**

The PCM recognizes the vehicle speed in No. 2 is erratic or high. No MIL and no ETC light. Cruise Control is disabled.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCs
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** The following items must be checked before continuing.

- Pinion Factor and Tire Size **MUST** be programmed in the Front Control Module.
- All Bus Communication DTCs **MUST** be diagnosed.
- All Vehicle Speed DTCs that may be active in the Front Control Module or in the Transmission Control Module **MUST** be diagnosed.

Ignition on, engine not running.

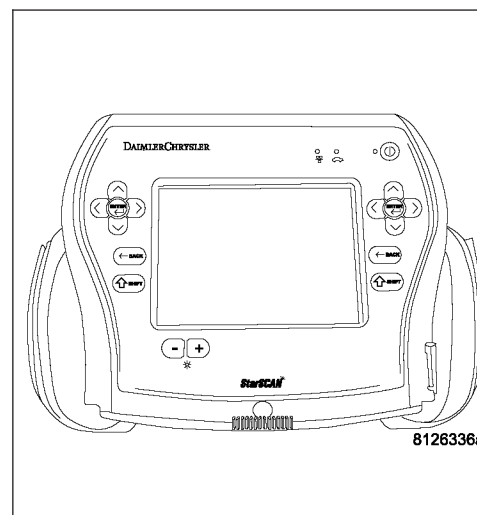
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2161-VEHICLE SPEED SENSOR 2 ERRATIC (Not Equipped with ABS) (CONTINUED)****2. VISUAL INSPECTION**

**Note:** This code can set due following conditions.

- Unequal tire circumference between the tires on the vehicle.
- Front or Rear wheels moving while the opposite wheels are not. (i.e., wheels slipping on loose gravel, ice or hard acceleration)

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

**Were any of the above conditions found?**

**Yes** >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

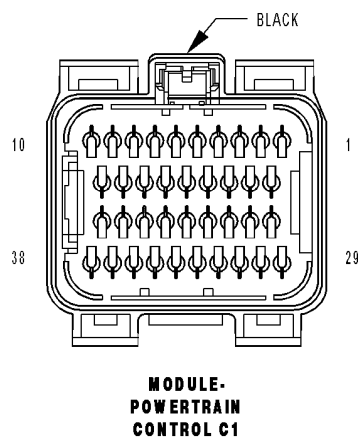
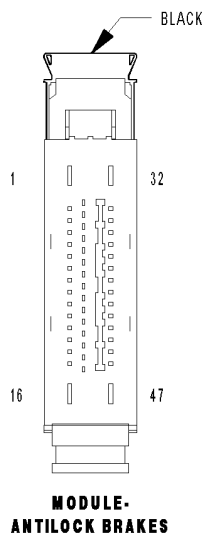
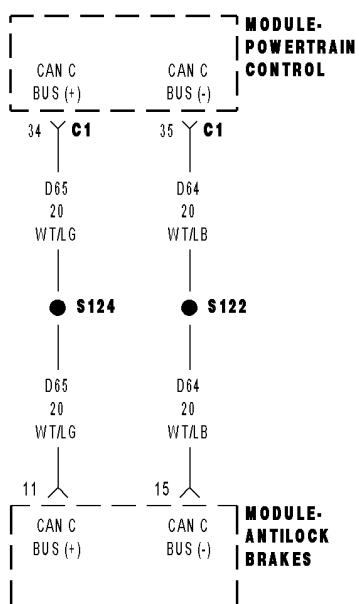
**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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## P2161-VEHICLE SPEED SENSOR 2 ERRATIC (Equipped with ABS)



**P2161-VEHICLE SPEED SENSOR 2 ERRATIC (Equipped with ABS) (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on and battery voltage greater than 10 volts. Transmission in Drive or Reverse.
- **Set Condition:**  
The PCM recognizes the vehicle speed signal No. 2 is erratic or high. No MIL and no ETC light. Cruise Control is disabled.

Possible Causes
ACTIVE BUS OR COMMUNICATION DTCs
TIRE CIRCUMFERENCE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test**

**1. ACTIVE DTC**

**Note:** The following items must be checked before continuing.

- Pinion Factor and Tire Size **MUST** be programmed in the ABS Module.
- All Bus Communication DTCs **MUST** be diagnosed.
- All related Vehicle Speed and Wheel Speed DTCs that may be active in the ABS Module **MUST** be diagnosed. Refer to the ABS diagnostic information for the correct procedure.

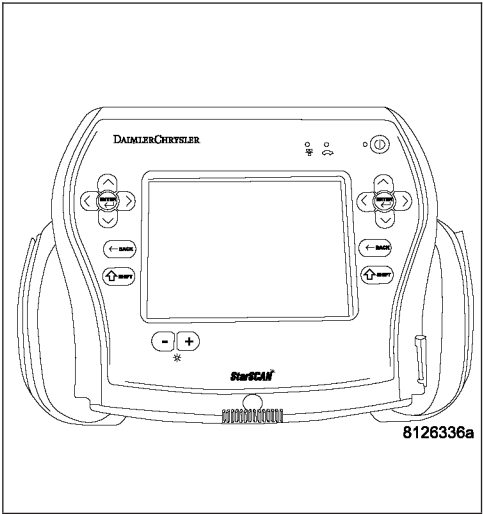
Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes**    >> Go To 2

**No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2161-VEHICLE SPEED SENSOR 2 ERRATIC (Equipped with ABS) (CONTINUED)****2. VISUAL INSPECTION**

**Note:** This code can set due following conditions.

- Unequal tire circumference between the tires on the vehicle.
- Front or Rear wheels moving while the opposite wheels are not. (i.e., wheels slipping on loose gravel, ice or hard acceleration)

Check tire pressure of all the tires.

Check tire wear on all the tires.

Ask the customer what the road and driving conditions were like when the fault set.

**Were any of the above conditions found?**

**Yes** >> Repair as necessary. If the code set during a front OR rear wheel spin condition, no repair is necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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## P2166-ACCELERATOR PEDAL POSITION SENSOR 1 MAXIMUM STOP PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on. During in plant mode the APP Sensors need to be checked to make sure that idle and full pedal travel can be reached on both sensors.

- **Set Condition:**

APPS No.1 has failed to achieve the required maximum value during In Plant testing. One trip fault and the code will set within 5 seconds. Engine will only idle.

Possible Causes
IN PLANT TEST FAILURE
APPS RELEARN

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

### Diagnostic Test

#### 1. IN PLANT TEST FAILURE

Ignition on, engine not running.

**Note: This DTC is set when the APP Sensors are learned in plant but do not reach the Minimum or Maximum voltage range.**

With a scan tool read DTCs.

With the scan tool, erase DTCs.

Start the engine.

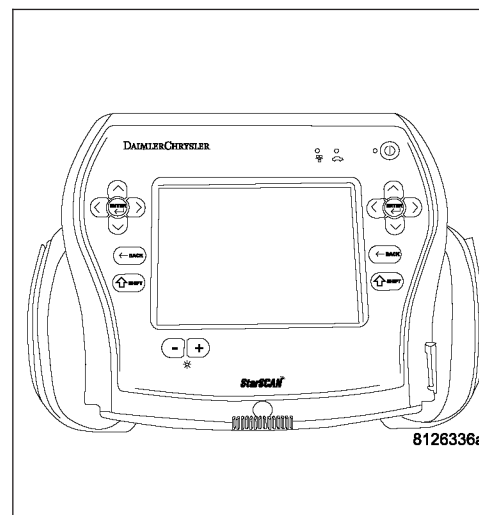
With the scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



#### 2. APPS RELEARN

With a scan tool select the ETC RELEARN function.

Next, erase DTCs.

Start the engine.

**Does the DTC return?**

**Yes** >> Replace the APPS Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Test Complete.

## P2167-ACCELERATOR PEDAL POSITION SENSOR 2 MAXIMUM STOP PERFORMANCE

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on. During in plant mode the APP Sensors need to be checked to make sure that idle and full pedal travel can be reached on both sensors.

- **Set Condition:**

APPS No.2 has failed to achieve the required maximum value during In Plant testing. One trip fault and the code will set within 5 seconds. Engine will only idle.

Possible Causes
IN PLANT TEST FAILURE
APPS RELEARN

### Diagnostic Test

#### 1. IN PLANT TEST FAILURE

Ignition on, engine not running.

**Note: This DTC is set when the APP Sensors are learned in plant but do not reach the Minimum or Maximum voltage range.**

With a scan tool read DTCs.

With the scan tool, erase DTCs.

Start the engine.

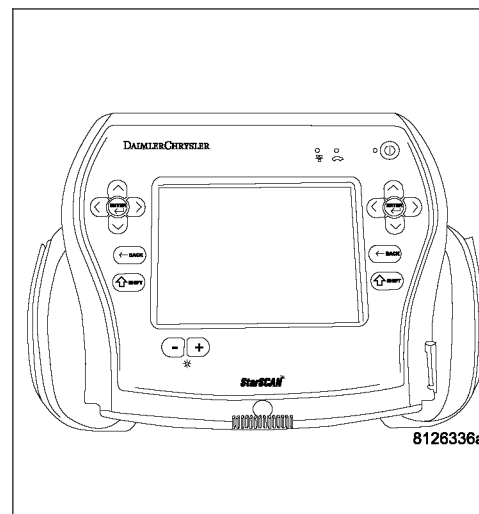
With the scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



#### 2. APPS RELEARN

With a scan tool select the ETC RELEARN function.

Next, erase DTCs.

Start the engine.

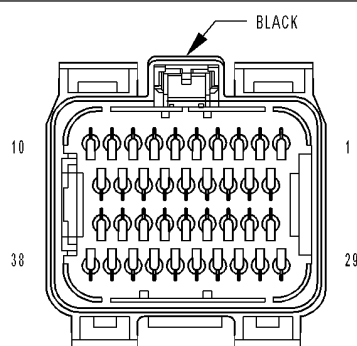
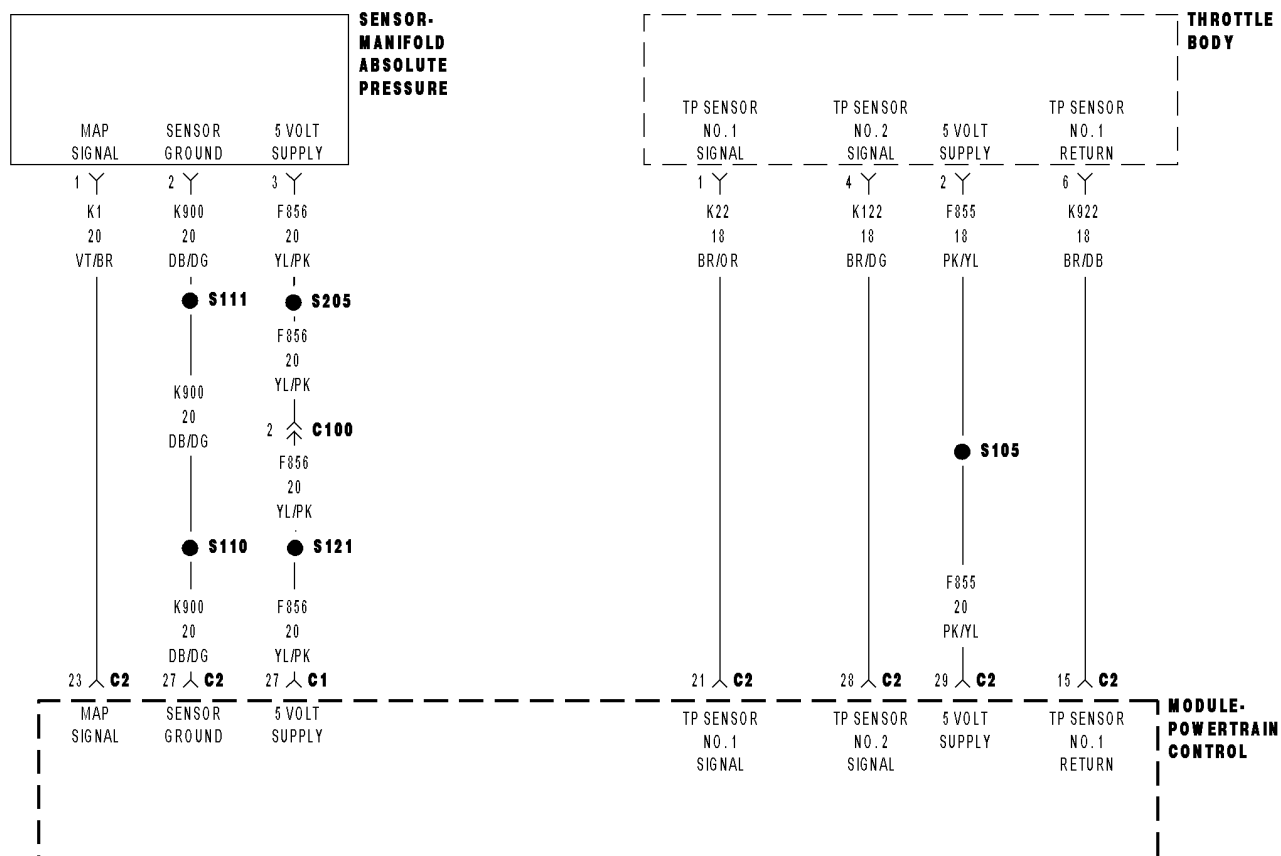
**Does the DTC return?**

**Yes** >> Replace the APPS Assembly per Service Information. After installation is complete, use a scan tool and select the ETC RELEARN function.

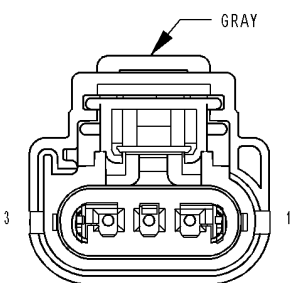
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Test Complete.

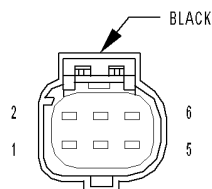
# P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION)



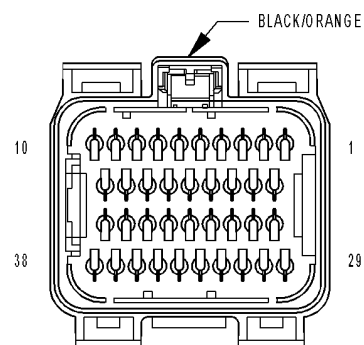
**MODULE-  
POWERTRAIN  
CONTROL C1**



**SENSOR-  
MANIFOLD ABSOLUTE  
PRESSURE**



**THROTTLE  
BODY**



**MODULE-  
POWERTRAIN  
CONTROL C2**

## P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on and engine running with no MAP Sensor DTCs.

- **Set Condition:**

A large vacuum leak has been detected or both of the TP Sensors have failed based on their position being 2.5 volts and the calculated MAP value is less than the actual MAP minus an Offset value. One trip fault and the code will set within 5 seconds. ETC light will flash.

Possible Causes
<p>VACUUM LEAK</p> <p>RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT</p> <p>(F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND</p> <p>RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT</p> <p>(K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND</p> <p>RESISTANCE IN (K900) SENSOR GROUND CIRCUIT</p> <p>RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT</p> <p>(F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND</p> <p>RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT</p> <p>TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND</p> <p>RESISTANCE IN THE (K922) TP SENSOR RETURN CIRCUIT</p> <p>MAP SENSOR</p> <p>TP SENSOR</p> <p>PCM</p>

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** The most likely cause of this DTC is a vacuum leak.

**Note:** Diagnose any 5-Volt Supply, TP Sensor, Fuel System Lean or Rich, or MAP Sensor DTCs before continuing.

**Note:** The throttle plate should be free from binding and carbon build up.

Ignition on, engine not running.

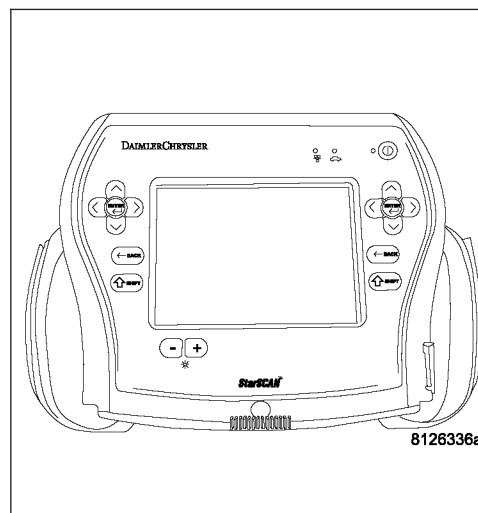
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)****2. VACUUM LEAK**

**Note:** This code is enabled on engines with a plastic intake manifold and is intended to limit the maximum engine speed if a large crack occurs.

**Note:** A large vacuum leak is most likely the cause of this DTC.

Inspect the Intake Manifold and Throttle body for leaks and cracks.

Inspect the Power Brake Booster for any vacuum leaks.

Inspect the PCV system for proper operation or any vacuum leaks.

Inspect the MAP Sensor for proper installation.

**Were any vacuum leaks found?**

**Yes** >> Repair the vacuum leak as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. MAP SENSOR OPERATION**

Start the engine.

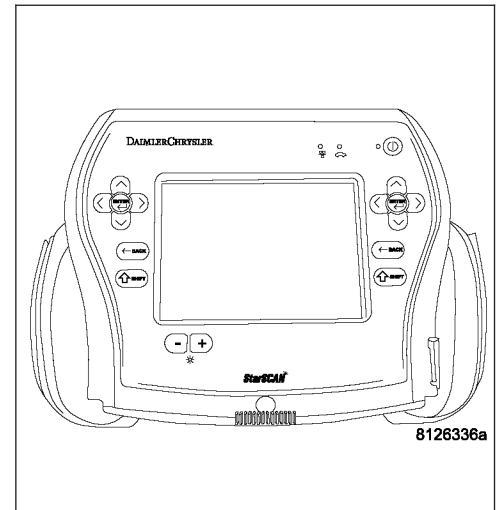
With a scan tool, monitor the MAP Sensor voltage.

Snap the Accelerator pedal.

**Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at Wide Open Throttle?**

**Yes** >> Go To 4

**No** >> Go To 11



**P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)****4. TP SENSOR OPERATION**

Ignition on, engine not running.

With a scan tool, perform the Throttle Follower Test.

TP Sensor No.1 should start at approximately 0.8 of a volt and increase to 4.2 volts.

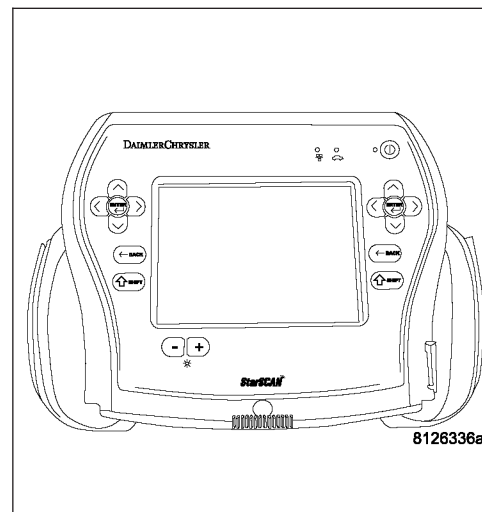
TP Sensor No.2 should start at approximately 4.2 volts and decrease to 0.8 of a volt.

**Is the voltage transition smooth between the appropriate values?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. RESISTANCE IN (F855) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connector.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

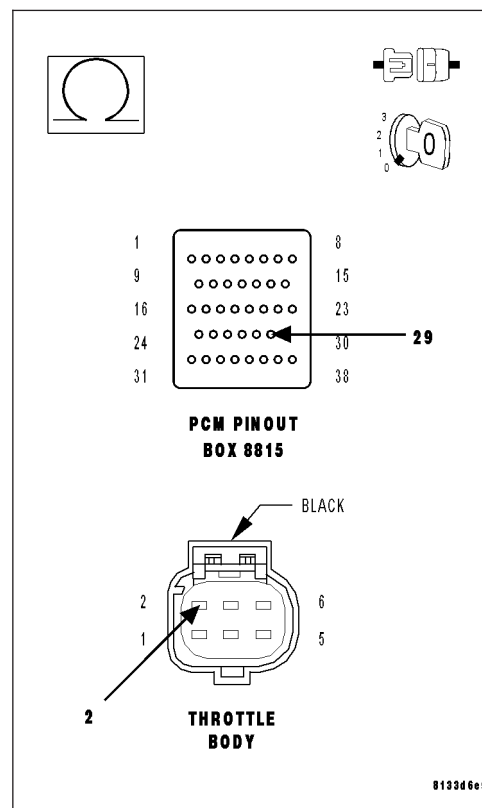
Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance above 100 ohms?**

**Yes** >> Go To 6

**No** >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)****6. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

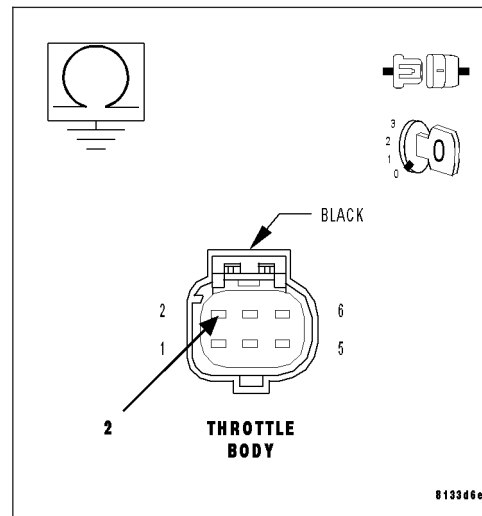
Measure the resistance between ground and (F855) 5-volt Supply circuit at the appropriate terminal of the special tool #8815.

**Is the resistance above 100 ohms?**

**Yes** >> Go To 7

**No** >> Repair the short to ground in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. TP SENSOR**

Connect the PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the TP Sensor voltage.

Connect a jumper wire between the (K22) TP Sensor No.1 Signal circuit and the (K922) Sensor Return circuit in the Throttle Body harness connector.

TP Sensor No.1 voltage should start at approximately 4.8 volts and decrease to 0.2 of a volt.

Connect a jumper wire between the (K122) TP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit in the Throttle Body harness connector.

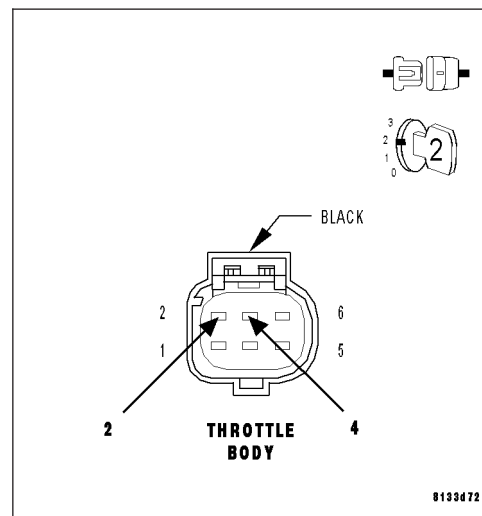
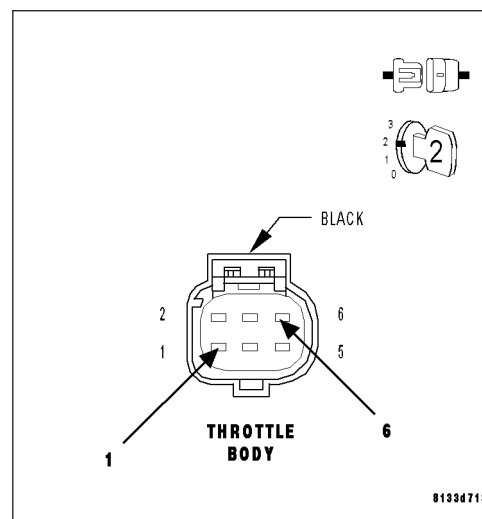
TP Sensor No.2 voltage should start at approximately 0 volts and increase to 4.8 to 5.2 volts.

**Does the TP Sensor voltage change to the appropriate voltage with the jumper wire installed?**

**Yes** >> Disconnect the Battery before replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)****8. RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connector.

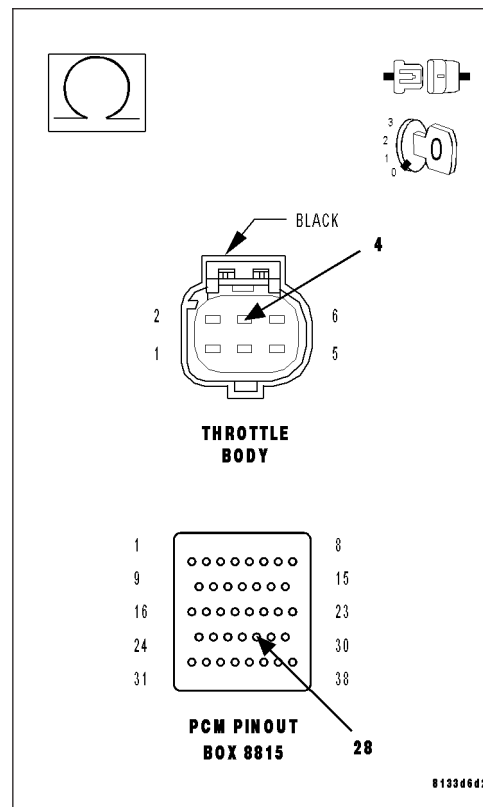
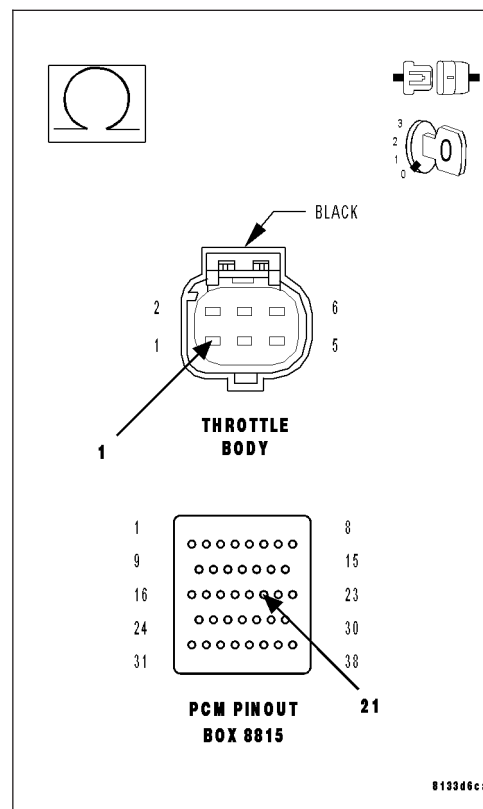
Measure the resistance of the (K22) and (K122) TP Signal circuits from the Throttle Body harness connector to the appropriate terminals of special tool #8815.

**Is the resistance below 5.0 ohms for each circuit?**

**Yes** >> Go To 9

**No** >> Repair the excessive resistance in the (K22) or (K122) TP Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)****9. TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND**

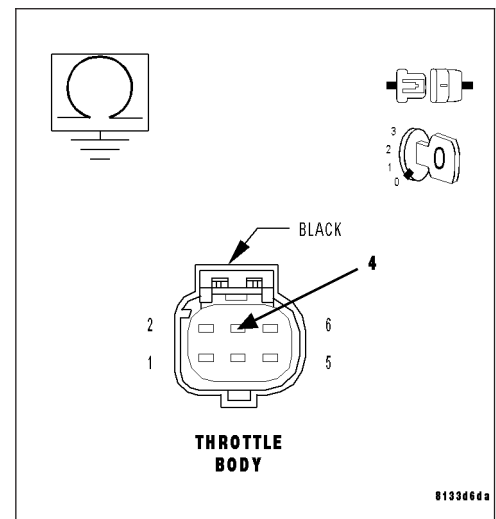
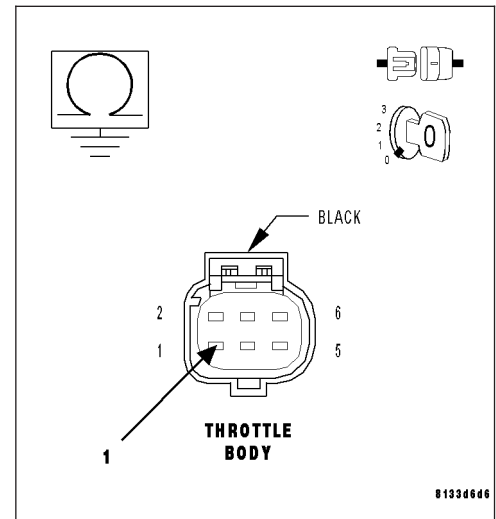
Measure the resistance between ground and the (K22) and (K122) TP Signal circuits at the appropriate terminal of the special tool #8815.

**Is the resistance above 100 ohms for each circuit?**

**Yes** >> Go To 10

**No** >> Repair the short to ground in the (K22) or (K122) TP Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

### 10. RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT

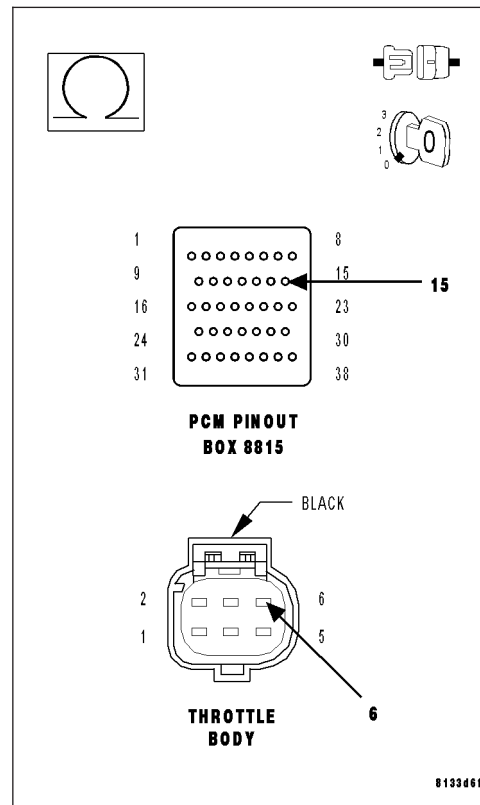
Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 17

**No** >> Repair the excessive resistance in the (K922) Sensor Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



### 11. RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the C1/A PCM harness connector.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

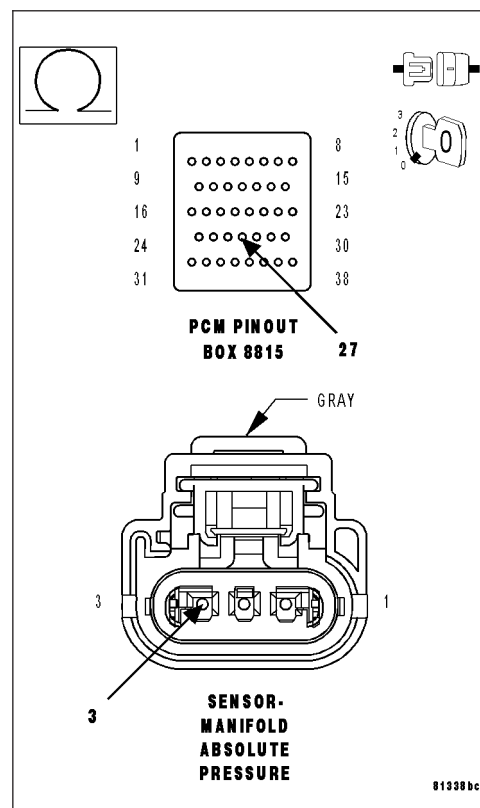
Measure the resistance of the (F856) 5-volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 12

**No** >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)****12. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

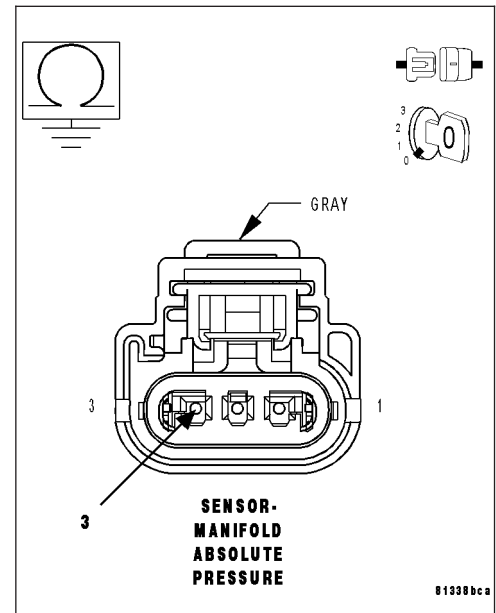
Measure the resistance between ground and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.

**Is the resistance above 100k ohms?**

**Yes** >> Go To 13

**No** >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**13. MAP SENSOR**

Connect the PCM harness connectors.

Ignition on, engine not running.

With a scan tool, monitor the MAP Sensor voltage.

Connect a jumper wire between the (K1) MAP Signal circuit and the (K900) Sensor ground circuit in the MAP Sensor harness connector.

Cycle the ignition switch from off to on.

With a scan tool, monitor the MAP Sensor voltage.

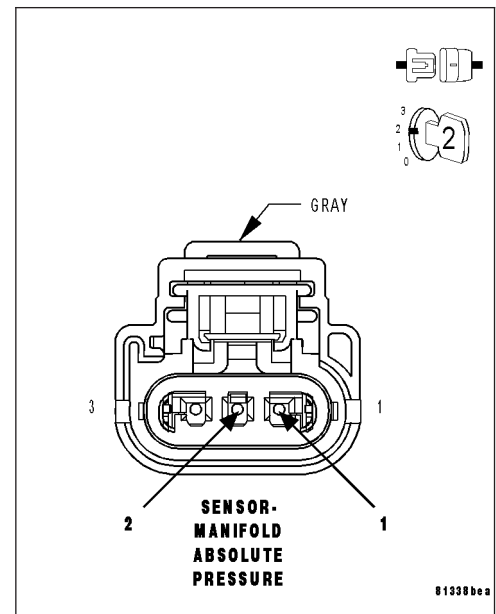
**Does the scan tool display MAP voltage from approximately 4.9 volts to below 0.5 volt with the jumper wire installed?**

**Yes** >> Replace the MAP Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 14

**Note:** Remove the jumper wire before continuing.



**P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)****14. RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connector.

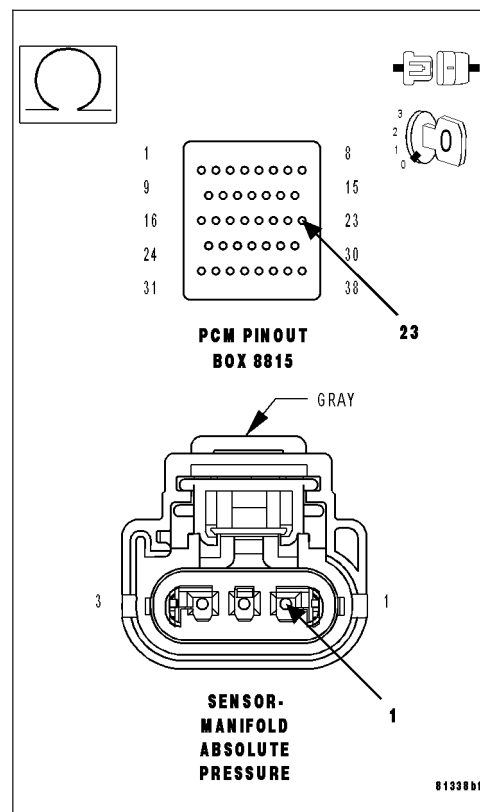
Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 15

**No** >> Repair the excessive resistance in the (K1) MAP Signal circuit

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

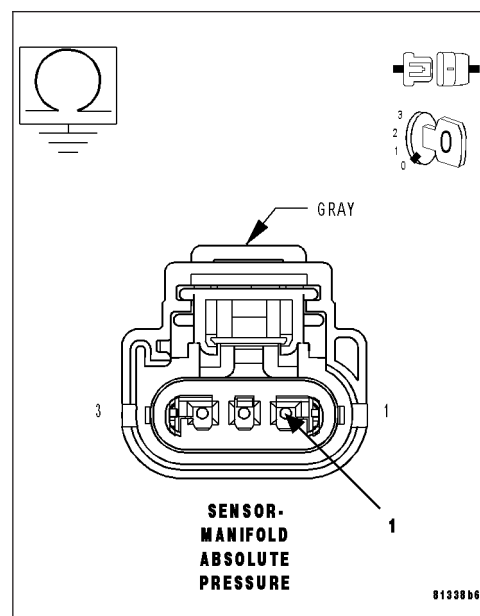
**15. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND**

Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.

**Is the resistance above 100k ohms?**

**Yes** >> Go To 16

**No** >> Repair the short to ground in the (K1) MAP Signal circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2172-HIGH AIRFLOW/VACUUM LEAK DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)****16. RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT**

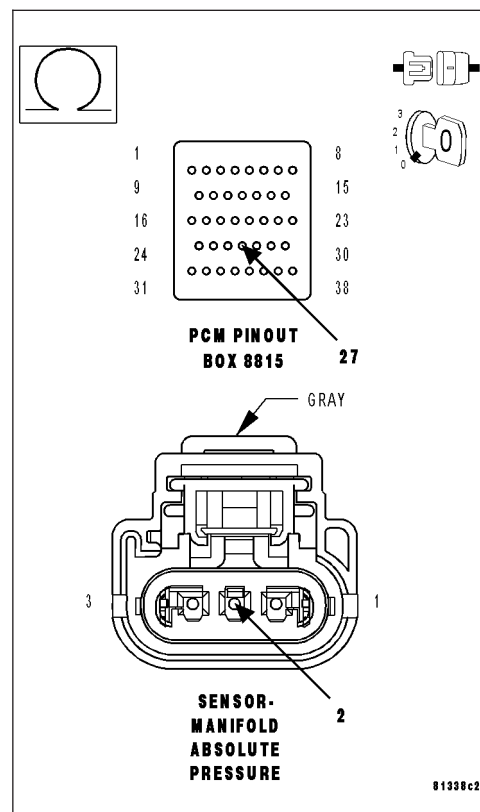
Measure the resistance of the (K900) Sensor ground circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 17

**No** >> Repair the excessive resistance in the (K900) Sensor ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**17. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

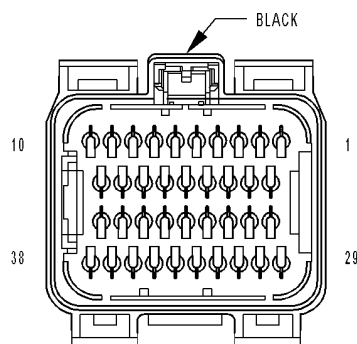
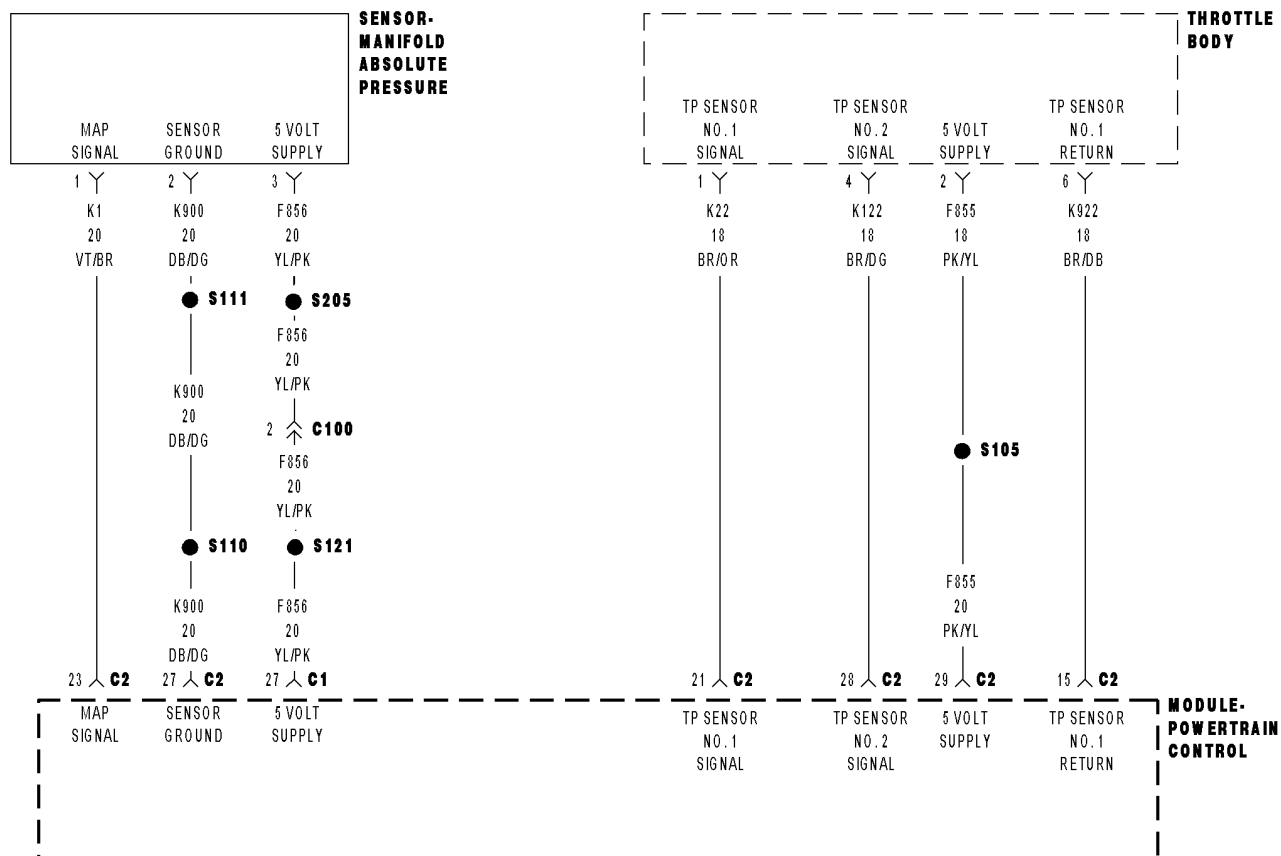
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

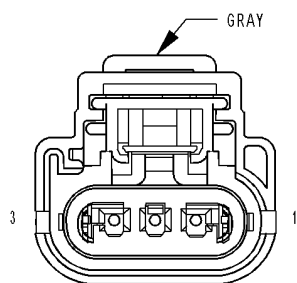
**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

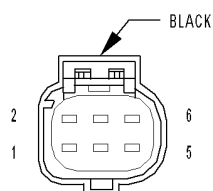
# P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION)



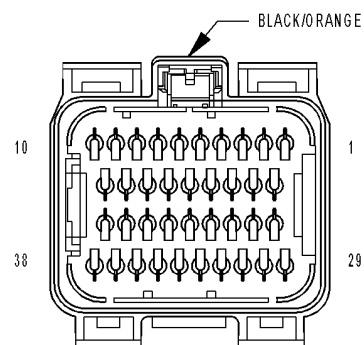
**MODULE-POWERTRAIN CONTROL C1**



**SENSOR-MANIFOLD ABSOLUTE PRESSURE**



**THROTTLE BODY**



**MODULE-POWERTRAIN CONTROL C2**

**P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on and engine running with no MAP Sensor DTCs.

- **Set Condition:**

A large vacuum leak has been detected or both of the TP Sensors have failed based on their position being 2.5 volts and the calculated MAP value is less than the Gas Flow Adaptation value is too high. One trip fault the code will set within 5 seconds. ETC light will flash.

Possible Causes
VACUUM LEAK RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND RESISTANCE IN (K900) SENSOR GROUND CIRCUIT RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND RESISTANCE IN THE (K922) TP SENSOR RETURN CIRCUIT MAP SENSOR TP SENSOR PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** The most likely cause of this DTC is a vacuum leak.

**Note:** Diagnose any 5-Volt Supply, TP Sensor, Oxygen Sensor, Fuel related, or MAP Sensor DTCs before continuing.

**Note:** The throttle plate should be free from binding and carbon build up.

Ignition on, engine not running.

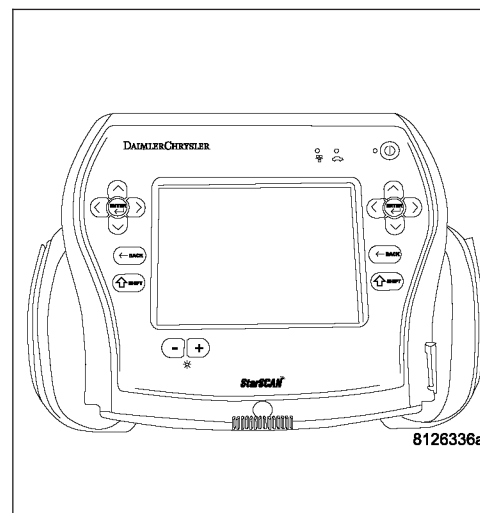
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)****2. VACUUM LEAK**

**Note:** This code is enabled on engines with a plastic intake manifold and is intended to limit the maximum engine speed if a large crack occurs.

**Note:** A large vacuum leak is most likely the cause of this DTC.

Inspect the Intake Manifold and Throttle body for leaks and cracks.

Inspect the Power Brake Booster for any vacuum leaks.

Inspect the PCV system for proper operation or any vacuum leaks.

Inspect the MAP Sensor for proper installation.

**Were any vacuum leaks found?**

**Yes** >> Repair the vacuum leak as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. MAP SENSOR OPERATION**

Start the engine.

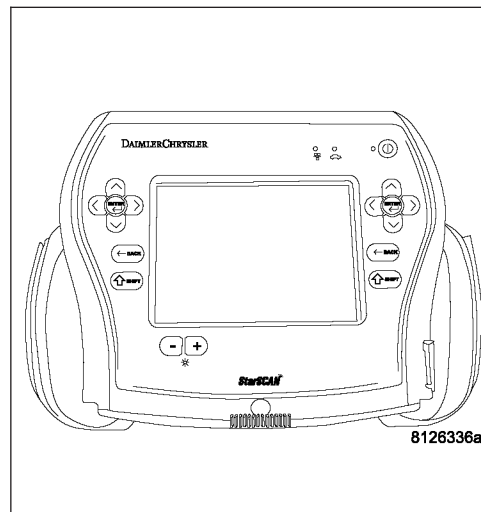
With a scan tool, monitor the MAP Sensor voltage.

Snap the Accelerator pedal.

**Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at Wide Open Throttle?**

**Yes** >> Go To 4

**No** >> Go To 11





**P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)****4. TP SENSOR OPERATION**

Ignition on, engine not running.

With a scan tool, perform the Throttle Follower Test.

TP Sensor No.1 should start at approximately 0.8 of a volt and increase to 4.2 volts.

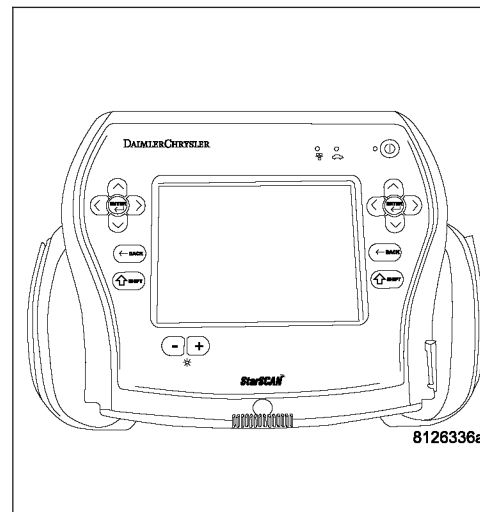
TP Sensor No.2 should start at approximately 4.2 volts and decrease to 0.8 of a volt.

**Is the voltage transition smooth between the appropriate values?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. RESISTANCE IN (F855) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connector.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

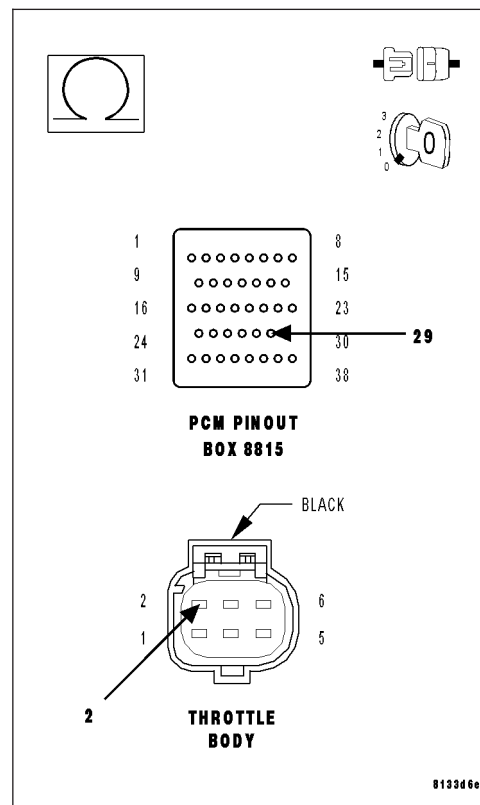
Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Go To 6

**No** >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)****6. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

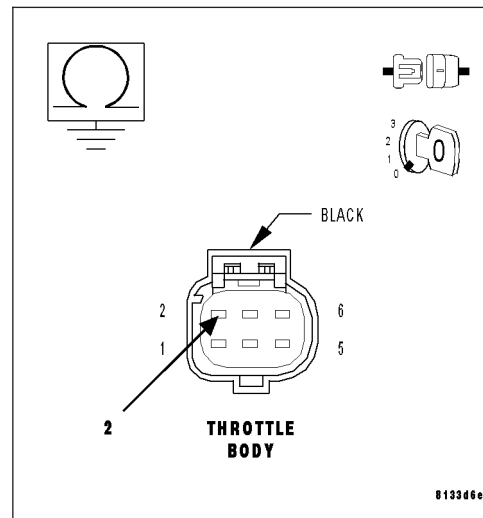
Measure the resistance between ground and (F855) 5-volt Supply circuit between the appropriate terminals of special tool #8815.

**Is the resistance above 100 ohms?**

**Yes** >> Go To 7

**No** >> Repair the short to ground in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. TP SENSOR**

Connect the PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the TP Sensor voltage.

Connect a jumper wire between the (K22) TP Sensor No.1 Signal circuit and the (K922) Sensor Return circuit in the Throttle Body harness connector.

TP Sensor No.1 voltage should start at approximately 4.8 volts and decrease to 0.2 of a volt.

Connect a jumper wire between the (K122) TP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit in the Throttle Body harness connector.

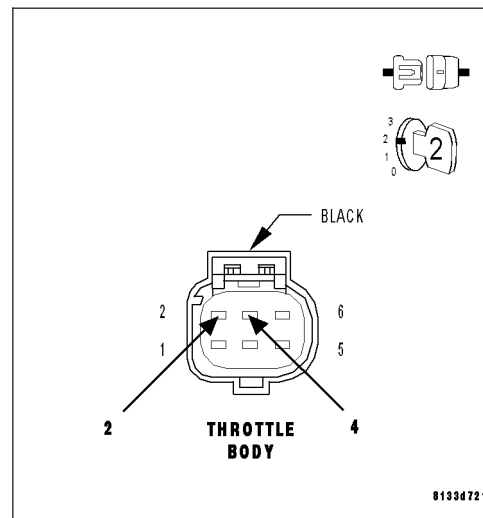
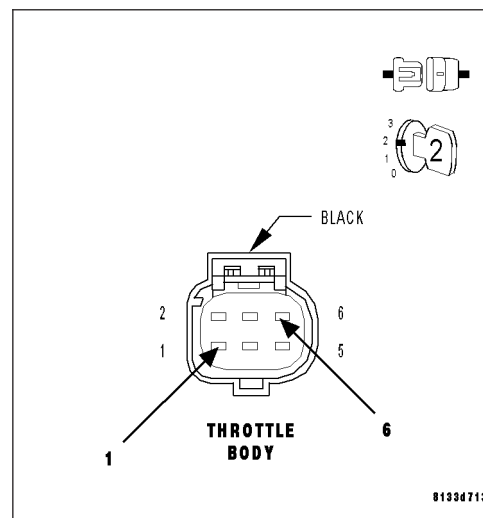
TP Sensor No.2 voltage should start at approximately 0 volts and increase to 4.8 to 5.2 volts.

**Does the TP Sensor voltage change to the appropriate voltage with the jumper wire installed?**

**Yes** >> Disconnect the Battery before replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)****8. RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connector.

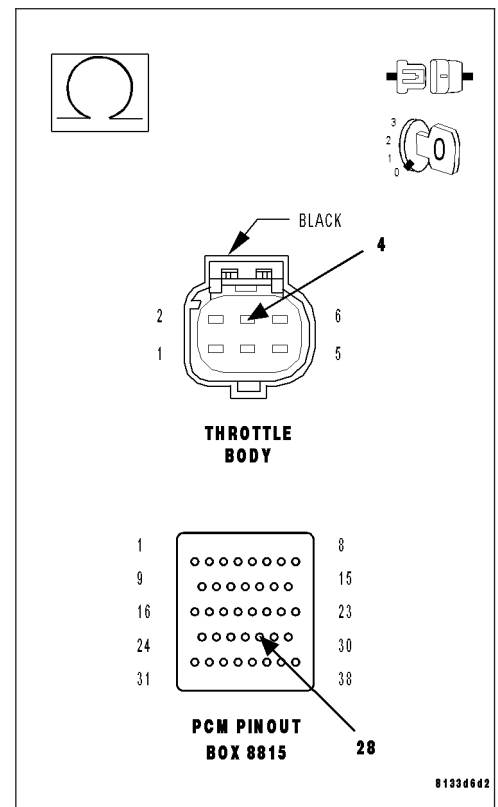
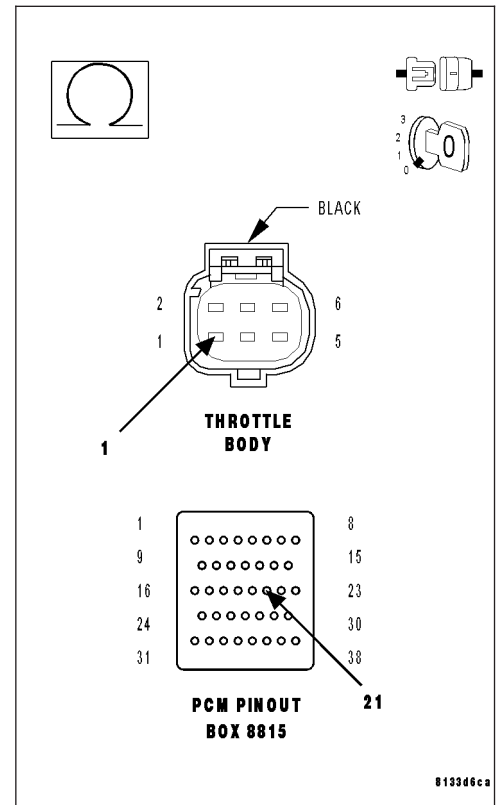
Measure the resistance of the (K22) and (K122) TP Signal circuits from the Throttle Body harness connector to the appropriate terminals of special tool #8815.

**Is the resistance below 5.0 ohms for each circuit?**

**Yes** >> Go To 9

**No** >> Repair the excessive resistance in the (K22) or (K122) TP Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)****9. TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND**

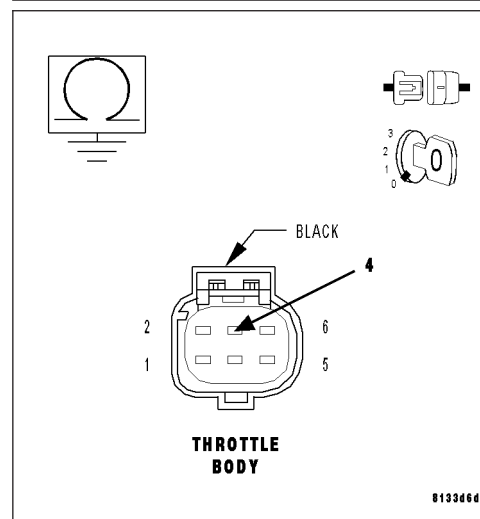
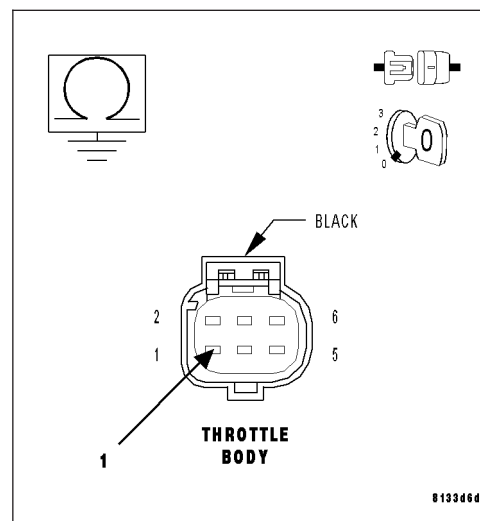
Measure the resistance between ground and the (K22) and (K122) TP Signal circuits at the appropriate terminals of special tool #8815.

**Is the resistance above 100k ohms for each circuit?**

**Yes** >> Go To 10

**No** >> Repair the short to ground in the (K22) or (K122) TP Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)****10. RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT**

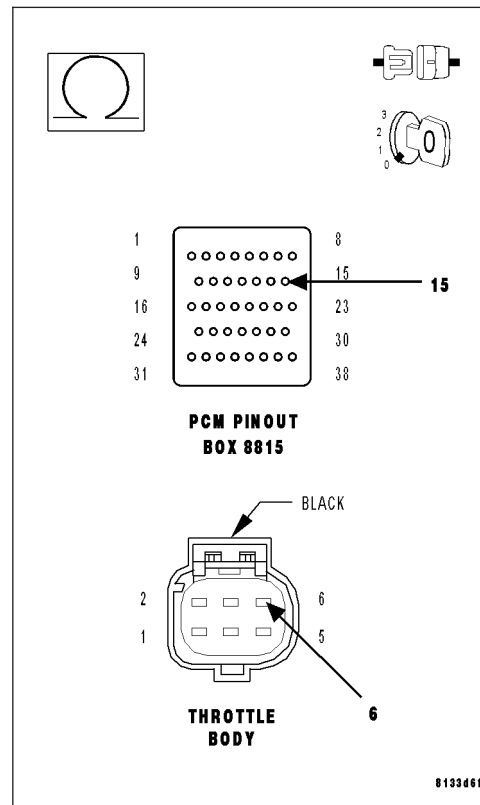
Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 17

**No** >> Repair the excessive resistance in the (K922) Sensor Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**11. RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the C1/A PCM harness connector.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

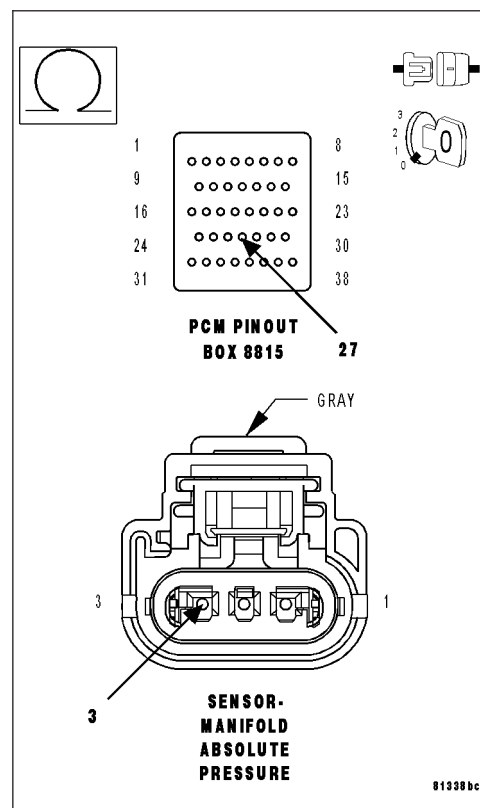
Measure the resistance of the (F856) 5-volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 12

**No** >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)****12. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

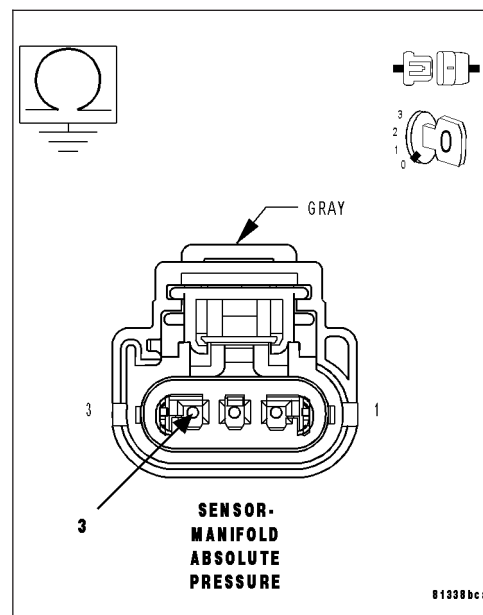
Measure the resistance between ground and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.

**Is the resistance above 100k ohms?**

**Yes** >> Go To 13

**No** >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**13. MAP SENSOR**

Connect the C1/A PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the MAP Sensor voltage.

Connect a jumper wire between the (K1) MAP Signal circuit and the (K900) Sensor ground circuit in the MAP Sensor harness connector.

Cycle the ignition switch from off to on.

With a scan tool, monitor the MAP Sensor voltage.

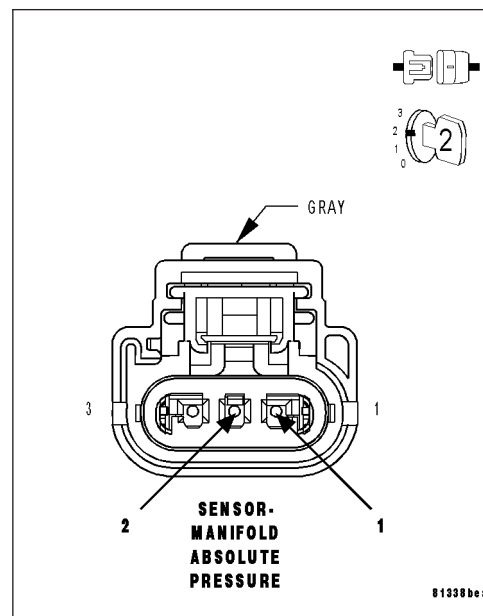
**Does the scan tool display MAP voltage from approximately 4.9 volts to below 0.5 volt with the jumper wire installed?**

**Yes** >> Replace the MAP Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 14

**Note:** Remove the jumper wire before continuing.



**P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)****14. RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connector.

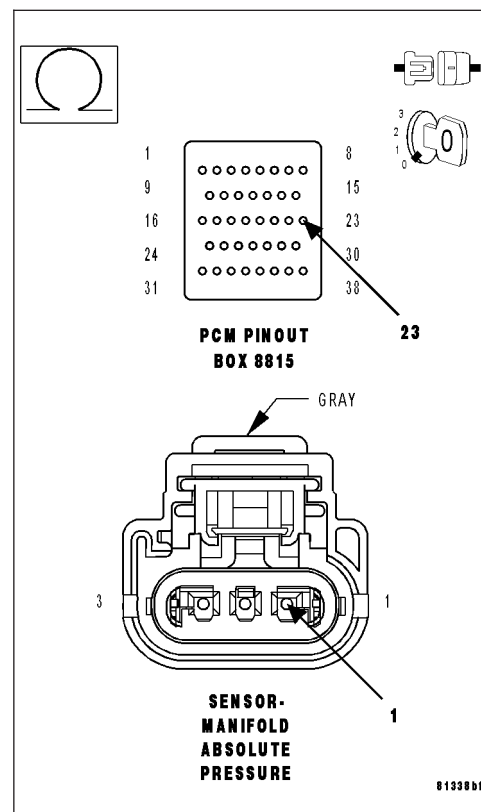
Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 15

**No** >> Repair the excessive resistance in the (K1) MAP Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**15. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND**

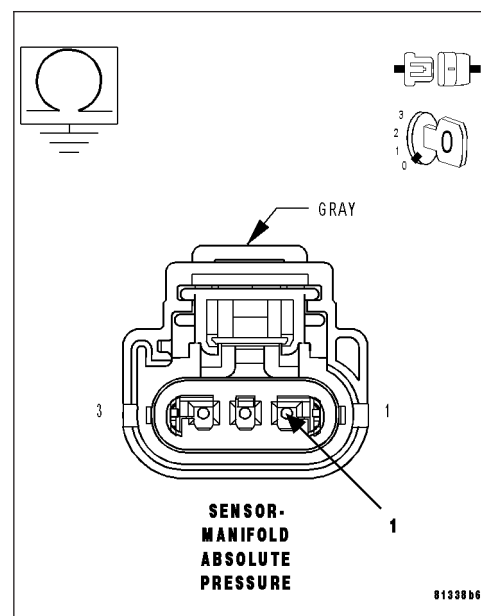
Measure the resistance between ground and the (K1) MAP Signal circuit at the MAP Sensor harness connector.

**Is the resistance above 100k ohms?**

**Yes** >> Go To 16

**No** >> Repair the short to ground in the (K1) MAP Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2173-HIGH AIRFLOW/VACUUM LEAK DETECTED (SLOW ACCUMULATION) (CONTINUED)****16. RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT**

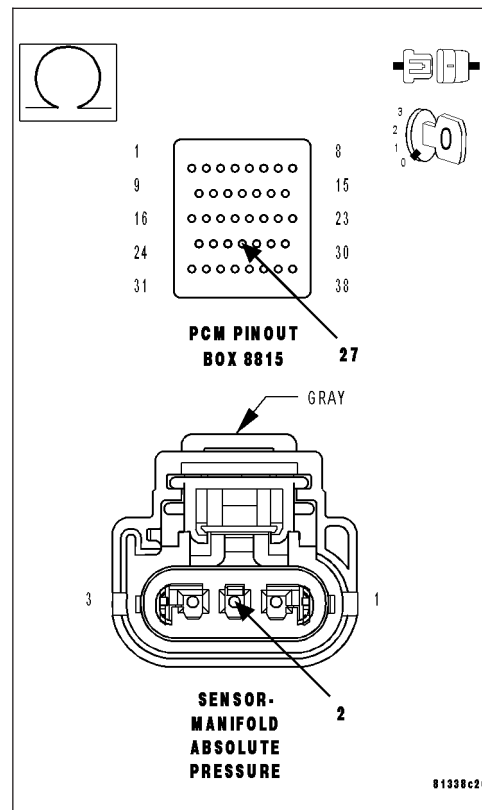
Measure the resistance of the (K900) Sensor ground circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 17

**No** >> Repair the excessive resistance in the (K900) Sensor ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**17. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

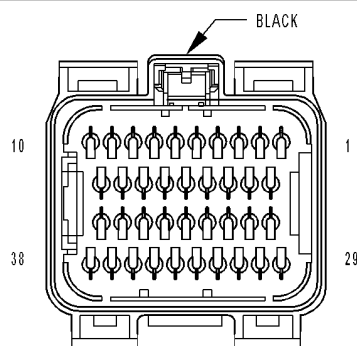
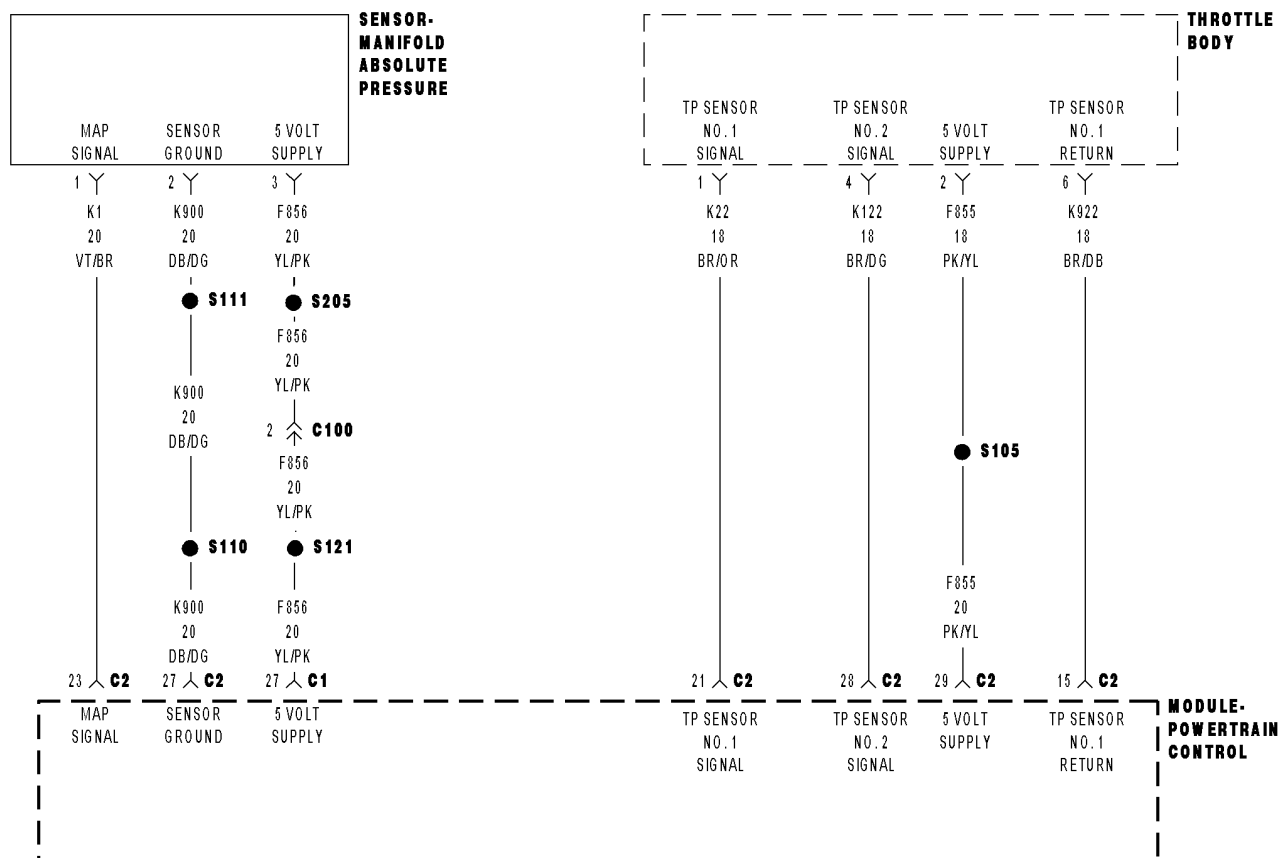
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

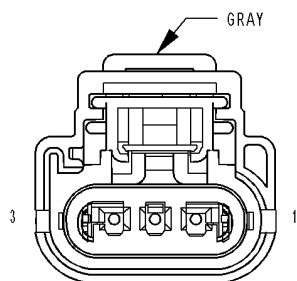
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



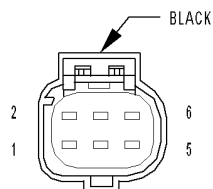
## P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION)



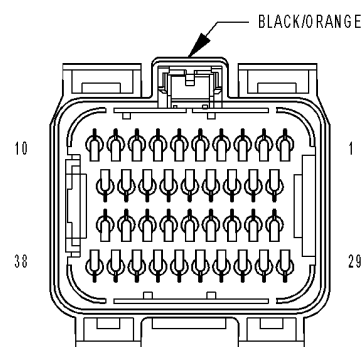
**MODULE-POWERTRAIN CONTROL C1**



**SENSOR-MANIFOLD ABSOLUTE PRESSURE**



**THROTTLE BODY**



**MODULE-POWERTRAIN CONTROL C2**

**P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on and engine running with no MAP Sensor DTCs.

- **Set Condition:**

PCM calculated MAP value is greater than actual MAP value plus an offset value. One trip fault and the code will set within 5 seconds. Three good trips to turn of the MIL. ETC light will flash.

Possible Causes
RESTRICTED AIR INLET SYSTEM RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND RESISTANCE IN (K900) SENSOR GROUND CIRCUIT RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND RESISTANCE IN THE (K922) TP SENSOR RETURN CIRCUIT MAP SENSOR TP SENSOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** The most likely cause of this DTC is a vacuum leak.

**Note:** Diagnose any 5-Volt Supply, TP Sensor, Fuel System Lean or Rich, or MAP Sensor DTCs before continuing.

**Note:** The throttle plate should be free from binding and carbon build up.

**Note:** Question the customer about weather conditions, as ICE build up on the blade can cause this fault when ambient is around +4 to -10 Celsius range.

Ignition on, engine not running.

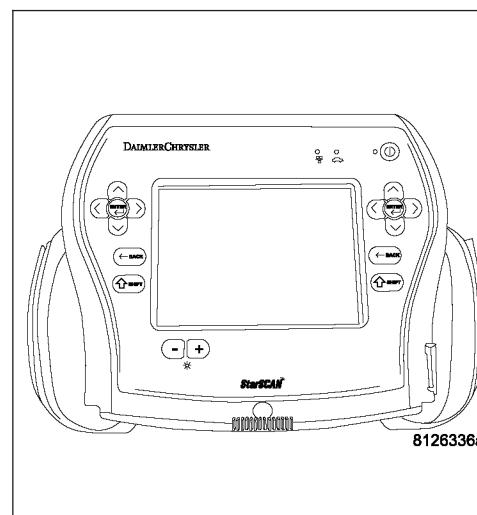
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)****2. RESTRICTED AIR INLET SYSTEM**

Turn the ignition off.

Remove the Air Cleaner Assembly.

Remove the Air Filter.

Inspect the Throttle Body opening for signs of any foreign materials.

Check the intake tube/ air cleaner for obstructions.

**Were any restrictions found?**

**Yes** >> Repair the restriction as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. MAP SENSOR OPERATION**

Start the engine.

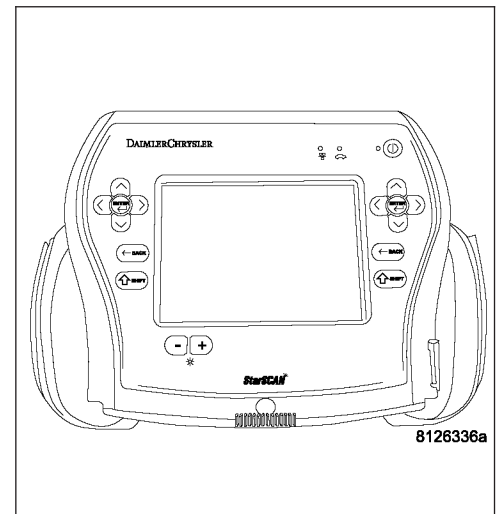
With a scan tool, monitor the MAP Sensor voltage.

Snap the Accelerator pedal.

**Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at Wide Open Throttle?**

**Yes** >> Go To 4

**No** >> Go To 11

**4. TP SENSOR OPERATION**

Ignition on, engine not running.

With a scan tool, perform the Throttle Follower Test.

TP Sensor No.1 should start at approximately 0.8 of a volt and increase to 4.2 volts.

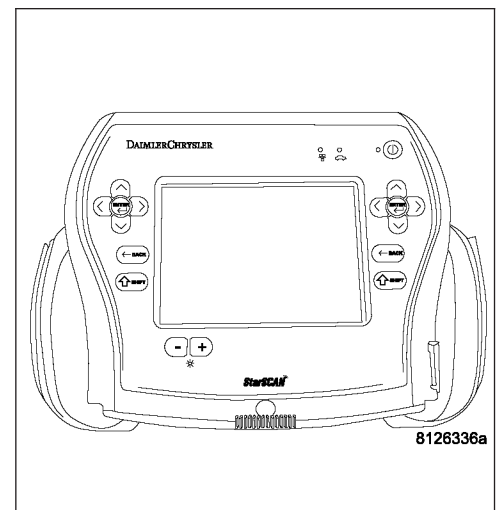
TP Sensor No.2 should start at approximately 4.2 volts and decrease to 0.8 of a volt.

**Is the voltage transition smooth between the appropriate values?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



## P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

### 5. RESISTANCE IN (F855) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connector.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

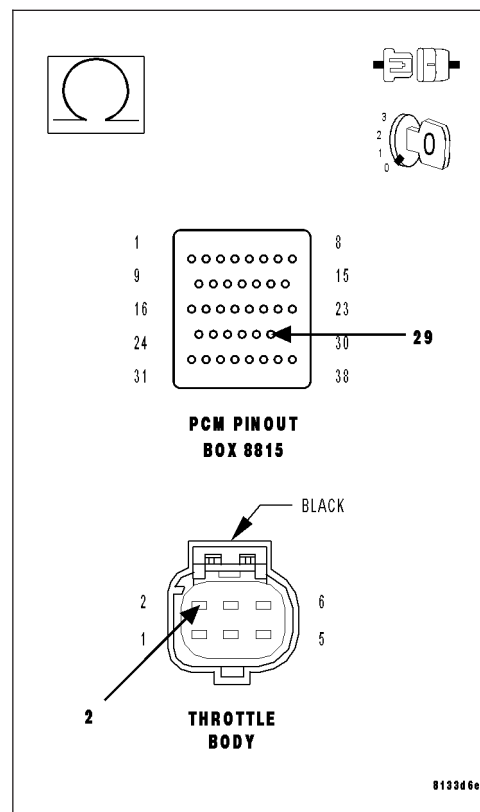
Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Go To 6

**No** >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



### 6. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

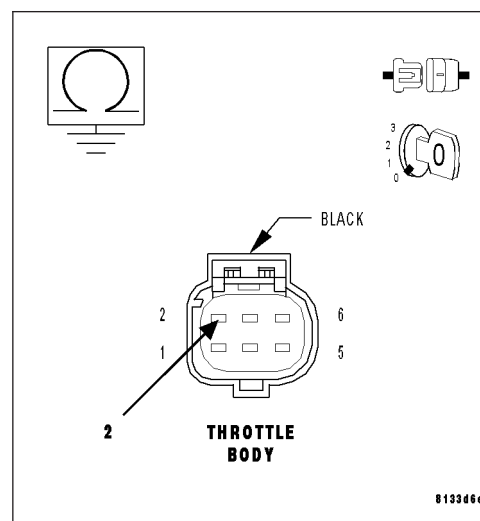
Measure the resistance between ground and (F855) 5-volt Supply circuit between the appropriate terminals of special tool #8815.

**Is the resistance above 100k ohms?**

**Yes** >> Go To 7

**No** >> Repair the short to ground in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)****7. TP SENSOR**

Connect the PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the TP Sensor voltage.

Connect a jumper wire between the (K22) TP Sensor No.1 Signal circuit and the (K922) Sensor Return circuit in the Throttle Body harness connector.

TP Sensor No.1 voltage should start at approximately 4.8 volts and decrease to 0.2 of a volt.

Connect a jumper wire between the (K122) TP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit in the Throttle Body harness connector.

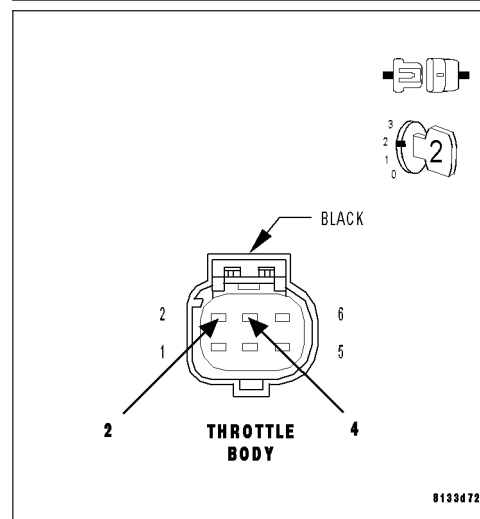
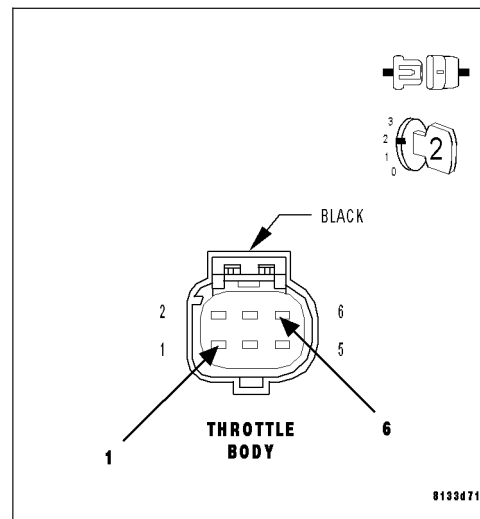
TP Sensor No.2 voltage should start at approximately 0 volts and increase to 4.8 to 5.2 volts.

**Does the TP Sensor voltage change to the appropriate voltage with the jumper wire installed?**

**Yes** >> Disconnect the Battery before replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8



## P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

### 8. RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the PCM harness connector.

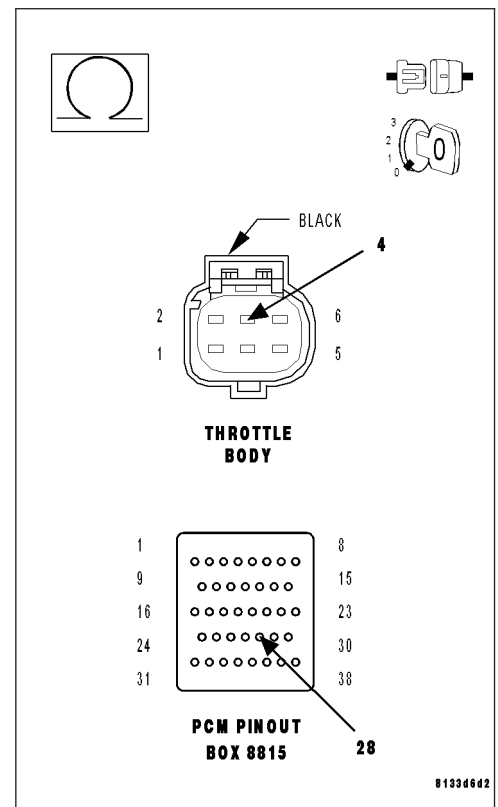
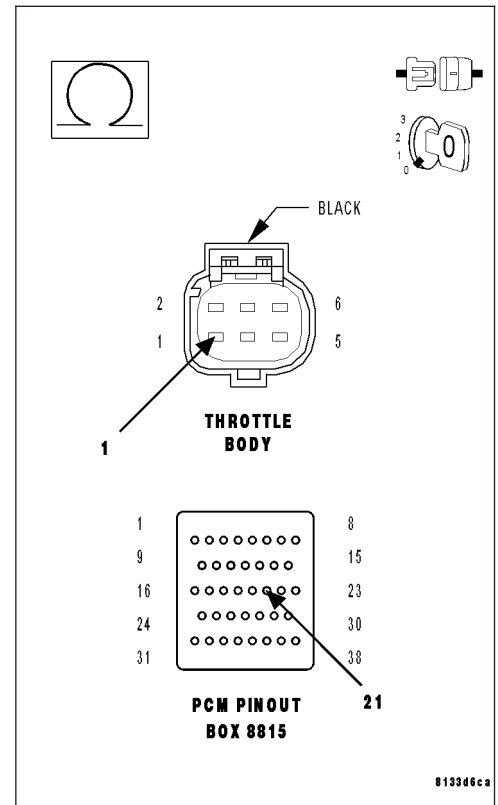
Measure the resistance of the (K22) and (K122) TP Signal circuits from the Throttle Body harness connector to the appropriate terminals of special tool #8815.

**Is the resistance below 5.0 ohms for each circuit?**

**Yes** >> Go To 9

**No** >> Repair the excessive resistance in the (K22) or (K122) TP Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)****9. TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND**

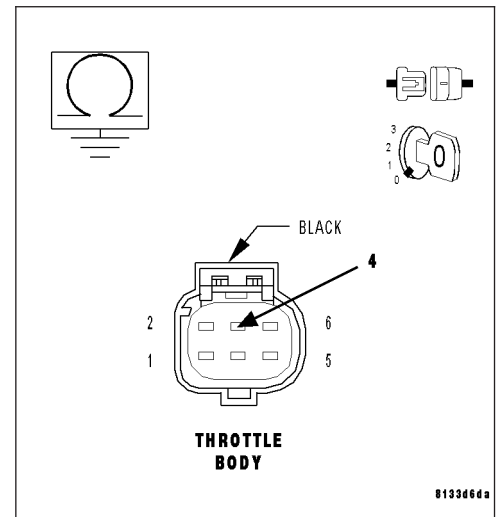
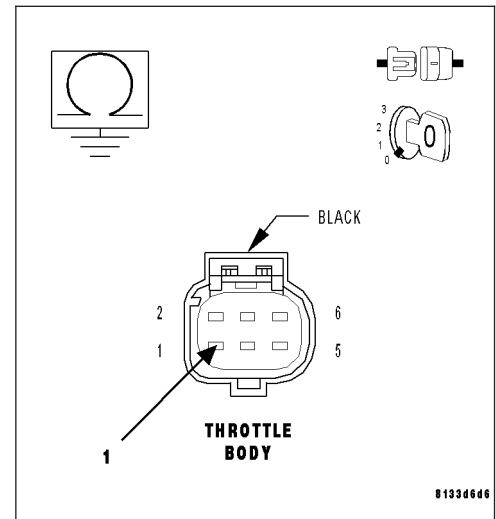
Measure the resistance between ground and the (K22) and (K122) TP Signal circuits at the appropriate terminals of special tool #8815.

**Is the resistance above 100 ohms for each circuit?**

**Yes** >> Go To 10

**No** >> Repair the short to ground in the (K22) or (K122) TP Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

### 10. RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT

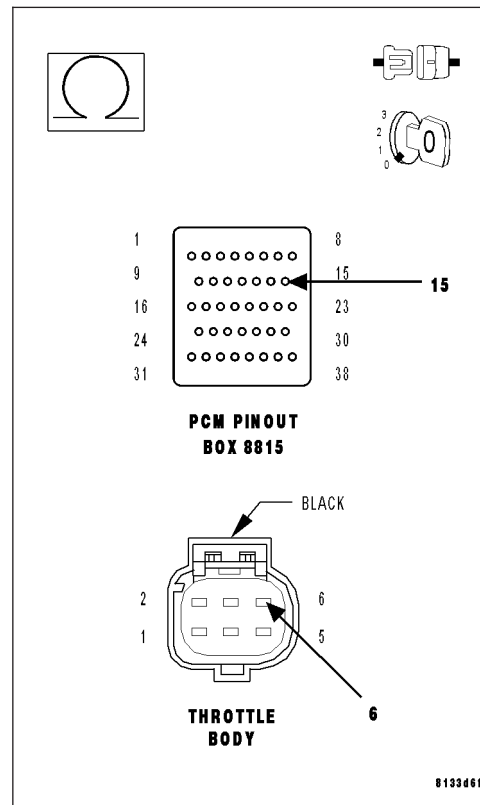
Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 17

**No** >> Repair the excessive resistance in the (K922) Sensor Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



### 11. RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the C1/A PCM harness connector.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

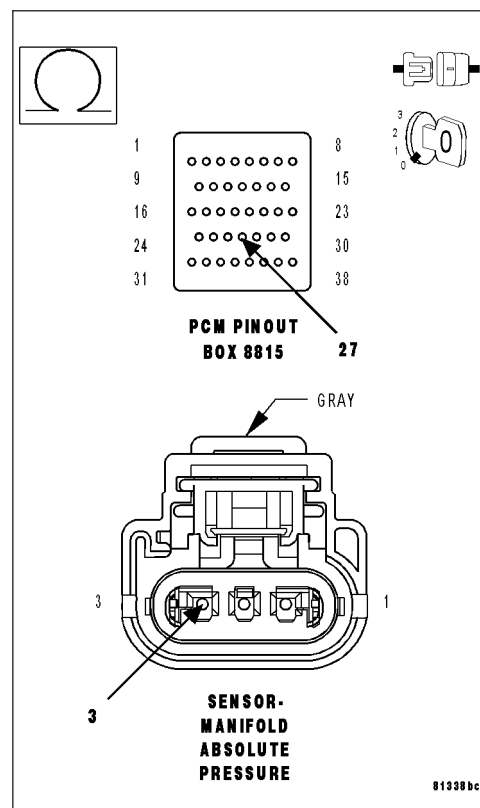
Measure the resistance of the (F856) 5-volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 12

**No** >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)****12. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

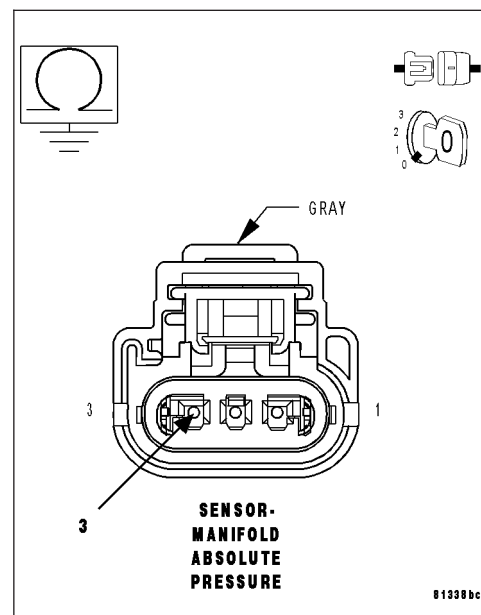
Measure the resistance between ground and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.

**Is the resistance above 100k ohms?**

**Yes** >> Go To 13

**No** >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**13. MAP SENSOR**

Connect the C1/A PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the MAP Sensor voltage.

Connect a jumper wire between the (K1) MAP Signal circuit and the (K900) Sensor ground circuit in the MAP Sensor harness connector.

Cycle the ignition switch from off to on.

With a scan tool, monitor the MAP Sensor voltage.

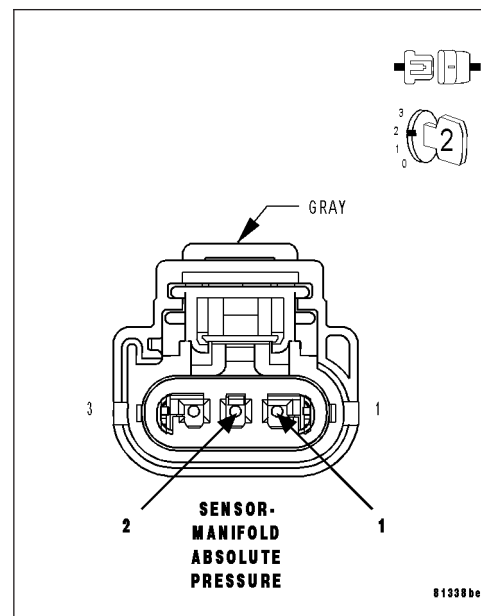
**Does the scan tool display MAP voltage from approximately 4.9 volts to below 0.5 volt with the jumper wire installed?**

**Yes** >> Replace the MAP Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 14

**Note:** Remove the jumper wire before continuing.



## P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)

### 14. RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT

Turn the ignition off.

Disconnect the PCM harness connector.

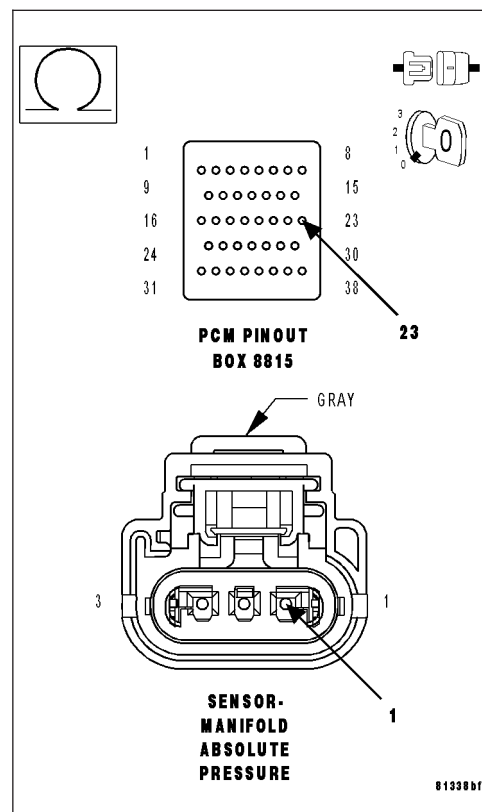
Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 15

**No** >> Repair the excessive resistance in the (K1) MAP Signal circuit

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



### 15. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND

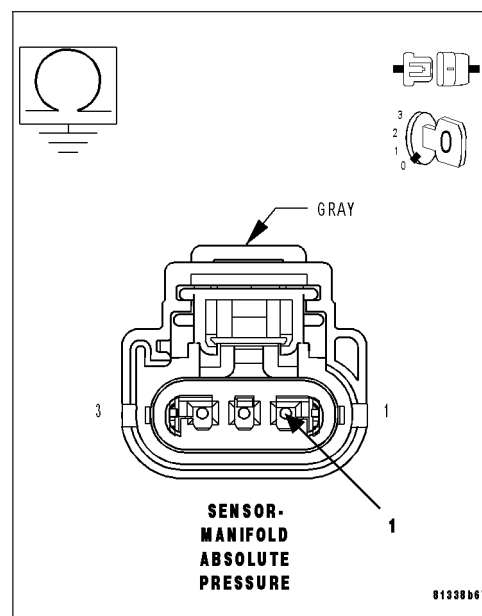
Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.

**Is the resistance above 100k ohms?**

**Yes** >> Go To 16

**No** >> Repair the short to ground in the (K1) MAP Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2174-LOW AIRFLOW/RESTRICTION DETECTED (INSTANTANEOUS ACCUMULATION) (CONTINUED)****16. RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT**

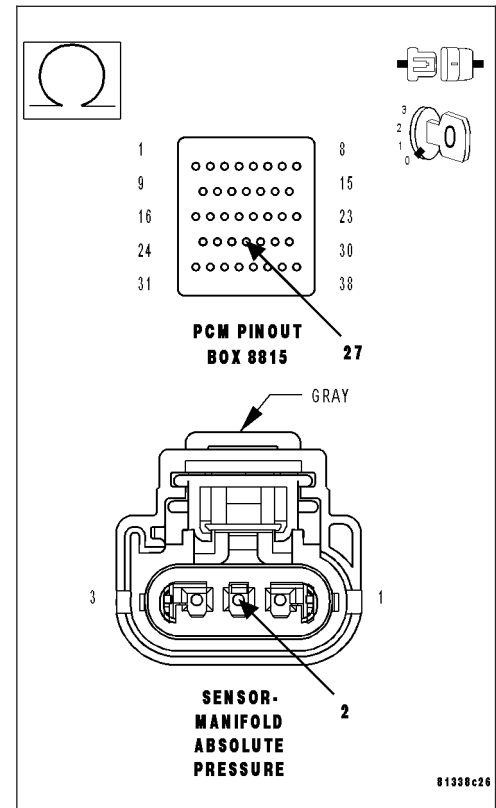
Measure the resistance of the (K900) Sensor ground circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 17

**No** >> Repair the excessive resistance in the (K900) Sensor ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**17. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

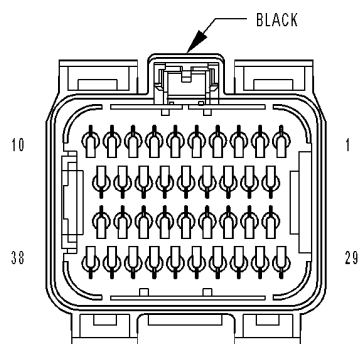
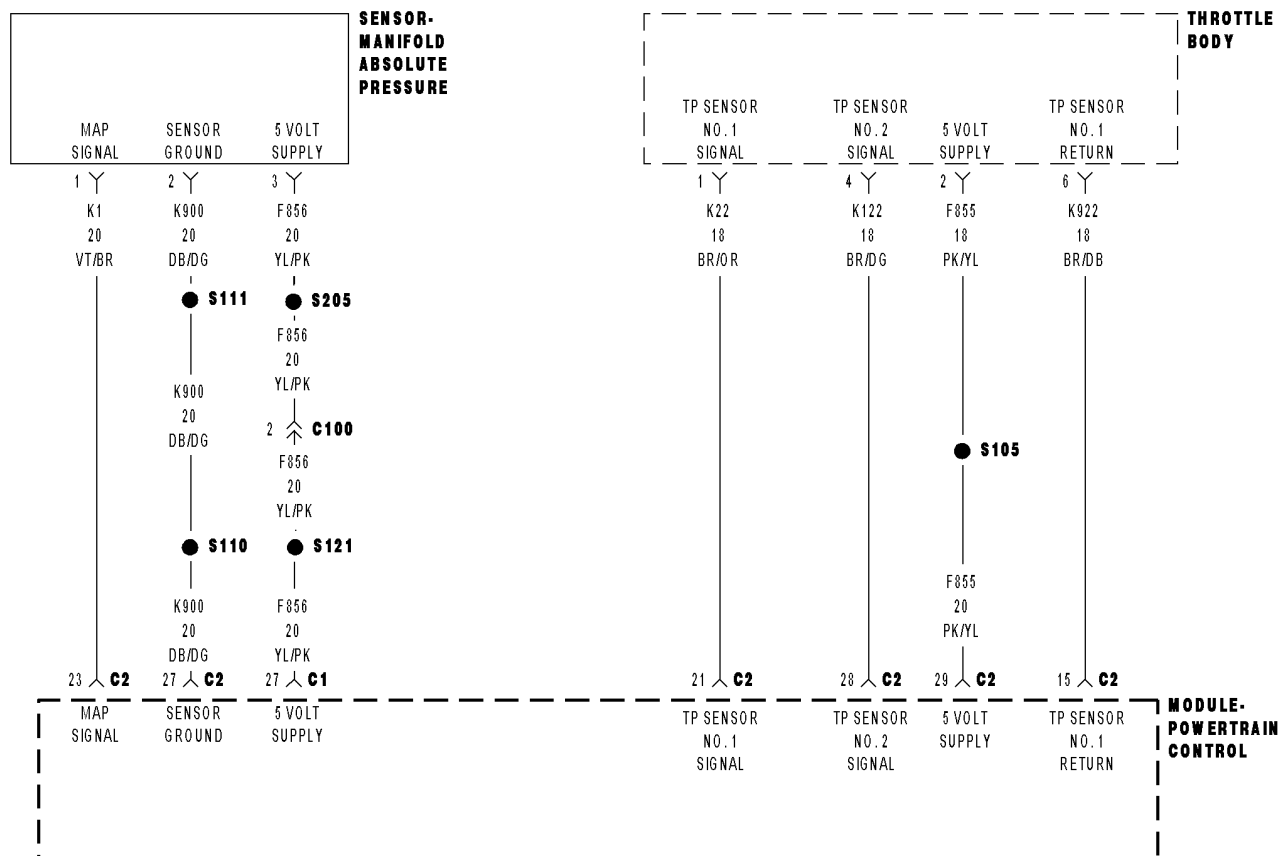
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

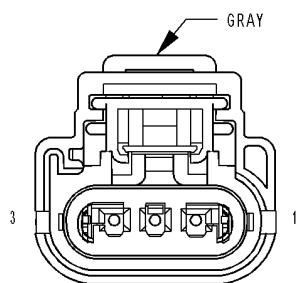
**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

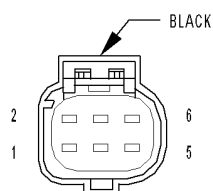
# P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION)



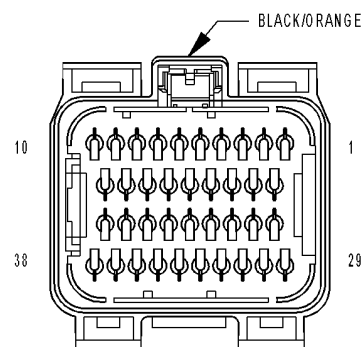
**MODULE-POWERTRAIN CONTROL C1**



**SENSOR-MANIFOLD ABSOLUTE PRESSURE**



**THROTTLE BODY**



**MODULE-POWERTRAIN CONTROL C2**

**P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on and engine running with no MAP Sensor DTCs.

- **Set Condition:**

PCM calculated MAP value is greater than actual MAP value plus an offset value. One trip fault and the code will set within 5 seconds. Three good trips to turn off the MIL. ETC light will flash.

Possible Causes
RESTRICTED AIR INLET SYSTEM RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND RESISTANCE IN (K900) SENSOR GROUND CIRCUIT RESISTANCE IN THE (F855) 5-VOLT SUPPLY CIRCUIT (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND RESISTANCE IN THE (K922) TP SENSOR RETURN CIRCUIT MAP SENSOR TP SENSOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** The most likely cause of this DTC is a vacuum leak.

**Note:** Diagnose any 5-Volt Supply, TP Sensor, Oxygen Sensor, Fuel related or MAP Sensor DTCs before continuing.

**Note:** The throttle plate should be free from binding and carbon build up.

**Note:** Question the customer about weather conditions, as ICE build up on the blade can cause this fault when ambient is around +4 to -10 Celsius range.

Ignition on, engine not running.

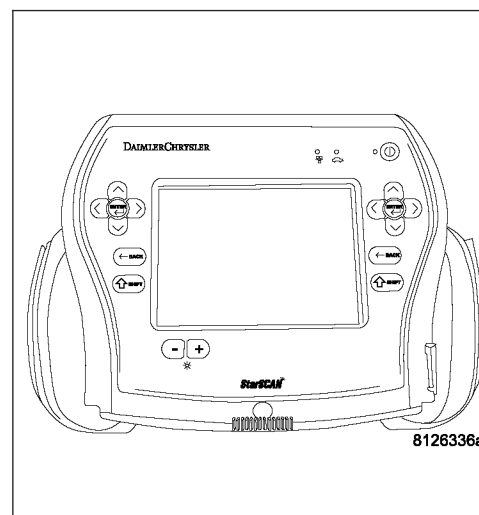
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)****2. RESTRICTED AIR INLET SYSTEM**

Turn the ignition off.

Remove the Air Cleaner Assembly.

Remove the Air Filter.

Inspect the Throttle Body opening for signs of any foreign materials.

Check the intake tube/ air cleaner for obstructions - include snow packing questions to customer.

**Were any restrictions found?**

**Yes** >> Repair the restriction as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. MAP SENSOR OPERATION**

Start the engine.

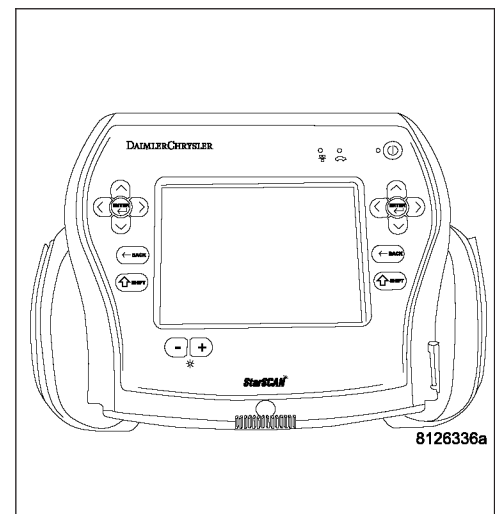
With a scan tool, monitor the MAP Sensor voltage.

Snap the Accelerator pedal.

**Does the MAP Sensor voltage vary from below 2.0 volts at idle to above 3.5 volts at Wide Open Throttle?**

**Yes** >> Go To 4

**No** >> Go To 11

**4. TP SENSOR OPERATION**

Ignition on, engine not running.

With a scan tool, perform the Throttle Follower Test.

TP Sensor No.1 should start at approximately 0.8 of a volt and increase to 4.2 volts.

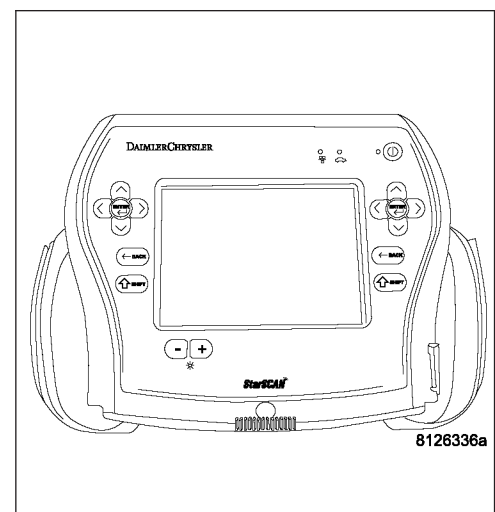
TP Sensor No.2 should start at approximately 4.2 volts and decrease to 0.8 of a volt.

**Is the voltage transition smooth between the appropriate values?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



**P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)****5. RESISTANCE IN (F855) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Disconnect the PCM harness connector.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

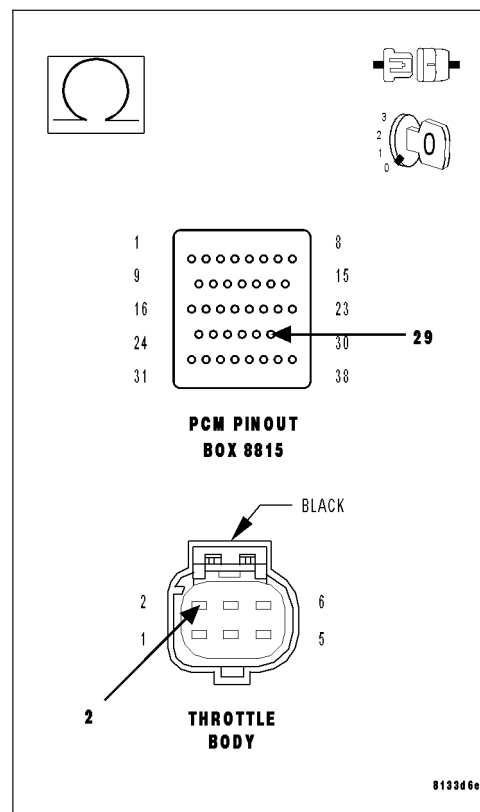
Measure the resistance of the (F855) 5-volt Supply circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 100 ohms?**

**Yes** >> Go To 6

**No** >> Repair the excessive resistance in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**6. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

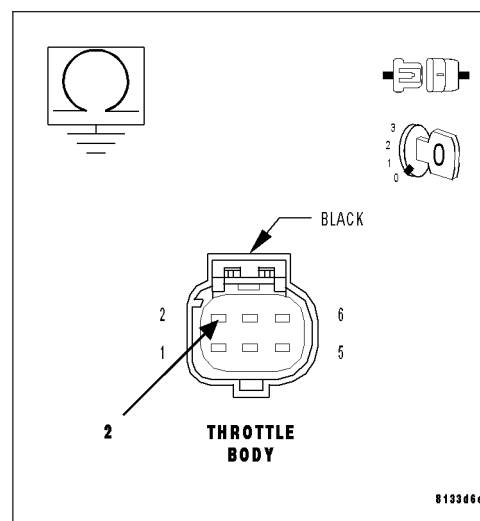
Measure the resistance between ground and (F855) 5-volt Supply circuit between the appropriate terminals of special tool #8815.

**Is the resistance above 100k ohms?**

**Yes** >> Go To 7

**No** >> Repair the short to ground in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)****7. TP SENSOR**

Connect the PCM harness connectors.

Ignition on, engine not running.

With a scan tool, monitor the TP Sensor voltage.

Connect a jumper wire between the (K22) TP Sensor No.1 Signal circuit and the (K922) Sensor Return circuit in the Throttle Body harness connector.

TP Sensor No.1 voltage should start at approximately 4.8 volts and decrease to 0.2 of a volt.

Connect a jumper wire between the (K122) TP Sensor No.2 Signal circuit and the (F855) 5-volt Supply circuit in the Throttle Body harness connector.

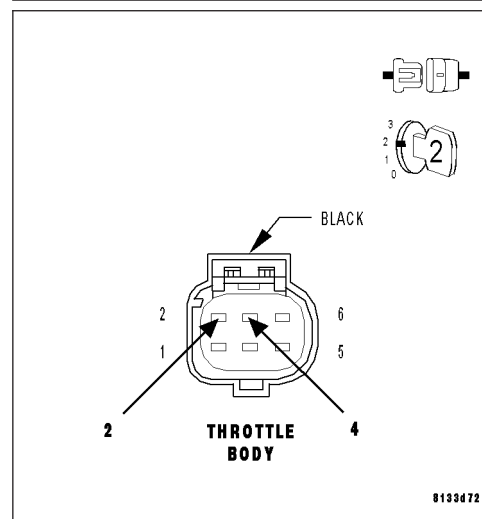
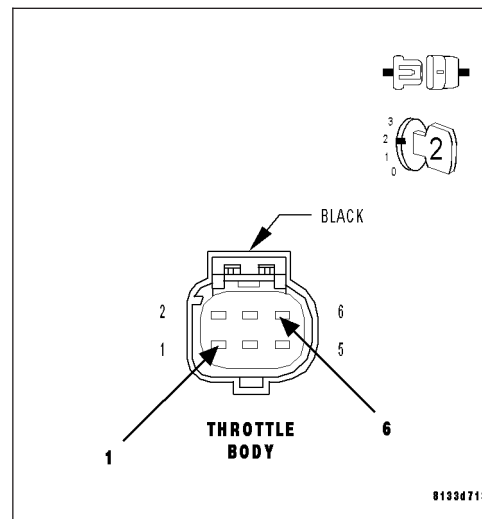
TP Sensor No.2 voltage should start at approximately 0 volts and increase to 4.8 to 5.2 volts.

**Does the TP Sensor voltage change to the appropriate voltage with the jumper wire installed?**

**Yes** >> Disconnect the Battery before replacing the Throttle Body Assembly. Replace the Throttle Body Assembly. After installation is complete, use a scan tool and select the ETC RELEARN function

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8





**P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)****8. RESISTANCE IN THE TP SENSOR SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connector.

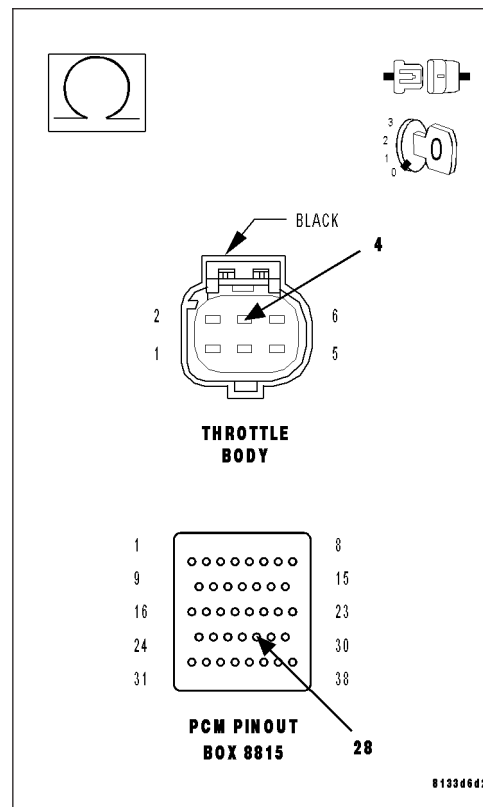
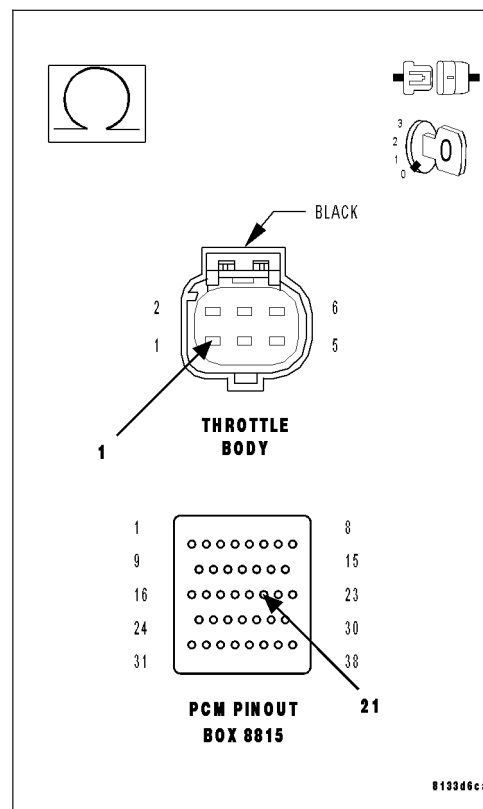
Measure the resistance of the (K22) and (K122) TP Signal circuits from the Throttle Body harness connector to the appropriate terminals of special tool #8815.

**Is the resistance below 5.0 ohms for each circuit?**

**Yes** >> Go To 9

**No** >> Repair the excessive resistance in the (K22) or (K122) TP Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)****9. TP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND**

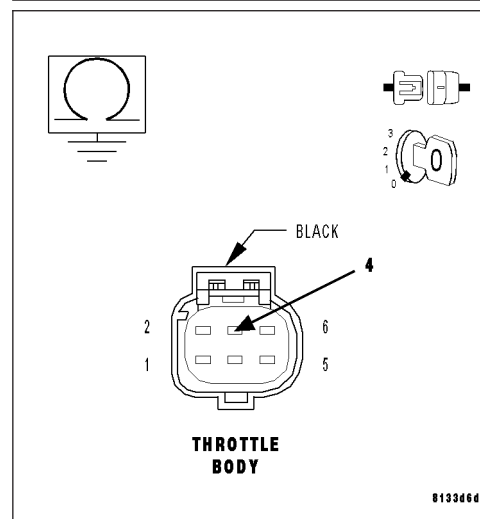
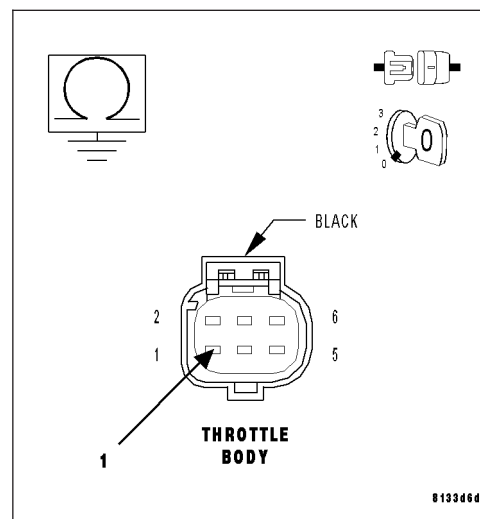
Measure the resistance between ground and the (K22) and (K122) TP Signal circuits at the appropriate terminals of special tool #8815.

**Is the resistance above 100k ohms for each circuit?**

**Yes** >> Go To 10

**No** >> Repair the short to ground in the (K22) or (K122) TP Sensor Signal circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)

**10. RESISTANCE IN THE (K922) SENSOR RETURN CIRCUIT**

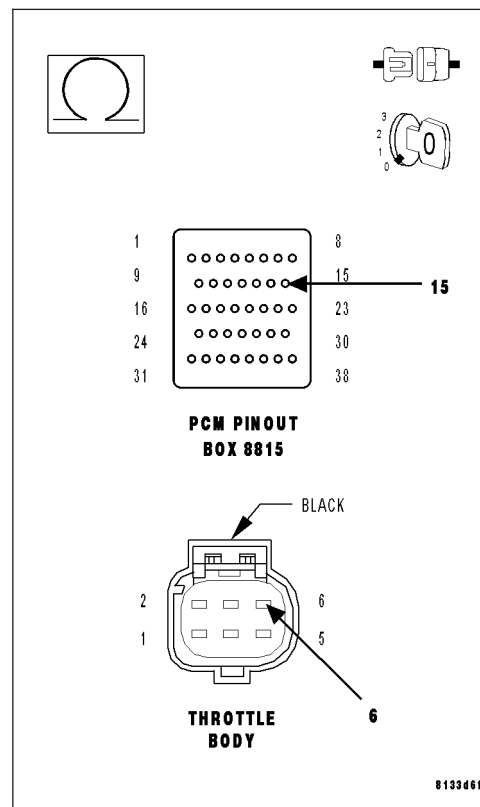
Measure the resistance of the (K922) Sensor Return circuit from the Throttle Body harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 17

**No** >> Repair the excessive resistance in the (K922) Sensor Return circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**11. RESISTANCE IN THE (F856) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Disconnect the MAP Sensor harness connector.

Disconnect the C1/A PCM harness connector.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

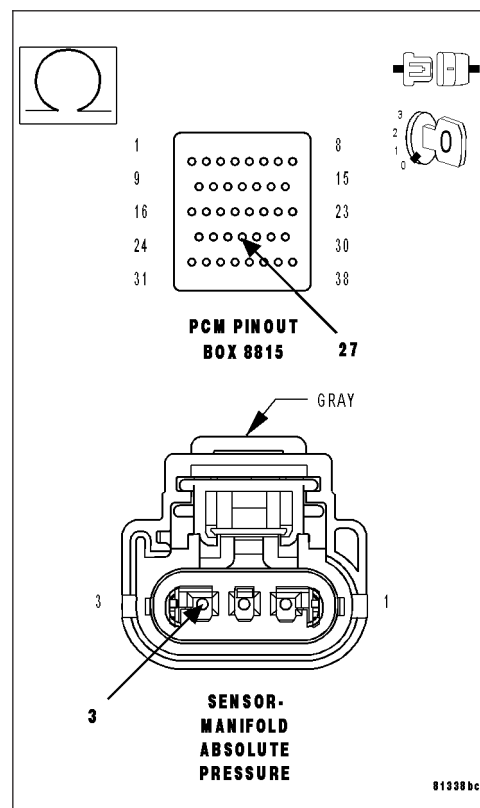
Measure the resistance of the (F856) 5-volt Supply circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 12

**No** >> Repair the excessive resistance in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)

### 12. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND

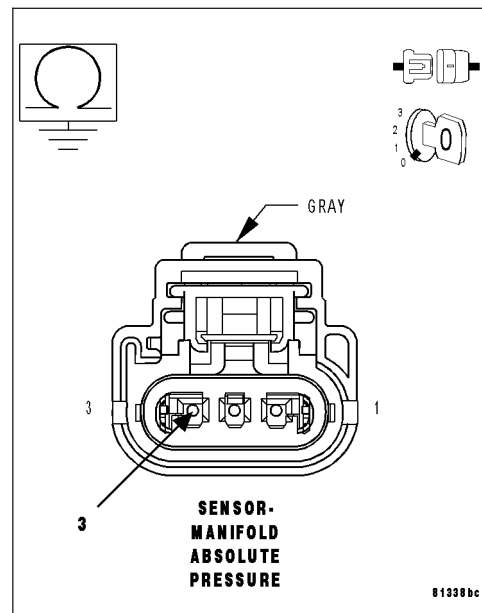
Measure the resistance between ground and the (F856) 5-volt Supply circuit in the MAP Sensor harness connector.

**Is the resistance above 100k ohms?**

**Yes** >> Go To 13

**No** >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



### 13. MAP SENSOR

Connect the C1/A PCM harness connector.

Ignition on, engine not running.

With a scan tool, monitor the MAP Sensor voltage.

Connect a jumper wire between the (K1) MAP Signal circuit and the (K900) Sensor ground circuit.

Cycle the ignition switch from off to on.

With a scan tool, monitor the MAP Sensor voltage.

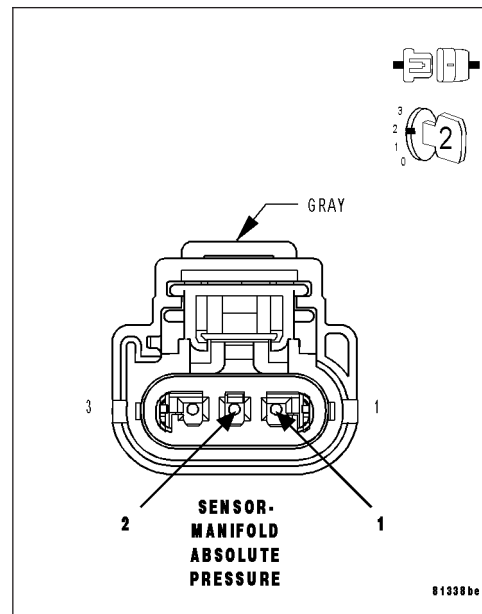
**Does the scan tool display MAP voltage from approximately 4.9 volts to below 0.5 volt with the jumper wire installed?**

**Yes** >> Replace the MAP Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 14

**Note:** Remove the jumper wire before continuing.



**P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)****14. RESISTANCE IN THE (K1) MAP SIGNAL CIRCUIT**

Turn the ignition off.

Disconnect the PCM harness connector.

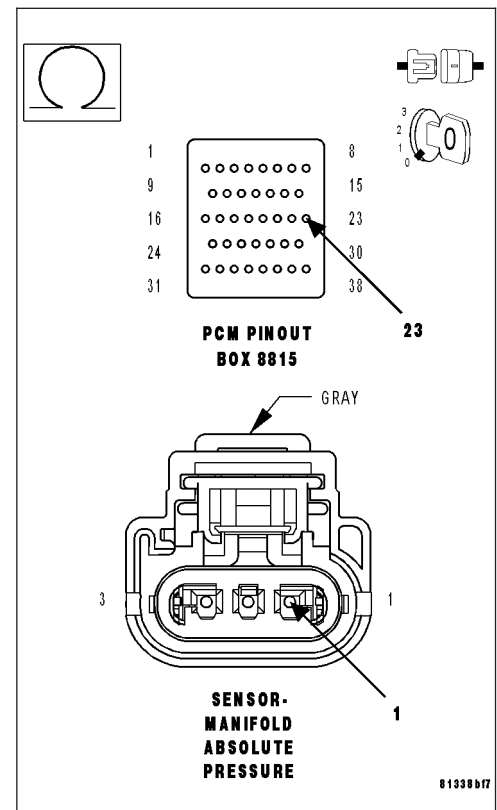
Measure the resistance of the (K1) MAP Signal circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 15

**No** >> Repair the excessive resistance in the (K1) MAP Signal circuit

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

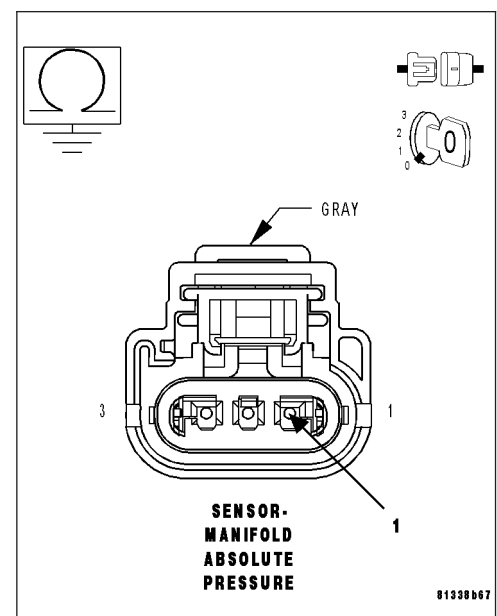
**15. (K1) MAP SIGNAL CIRCUIT SHORTED TO GROUND**

Measure the resistance between ground and the (K1) MAP Signal circuit in the MAP Sensor harness connector.

**Is the resistance above 100k ohms?**

**Yes** >> Go To 16

**No** >> Repair the short to ground in the (K1) MAP Signal circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2175-LOW AIRFLOW/RESTRICTION DETECTED (SLOW ACCUMULATION) (CONTINUED)****16. RESISTANCE IN THE (K900) SENSOR GROUND CIRCUIT**

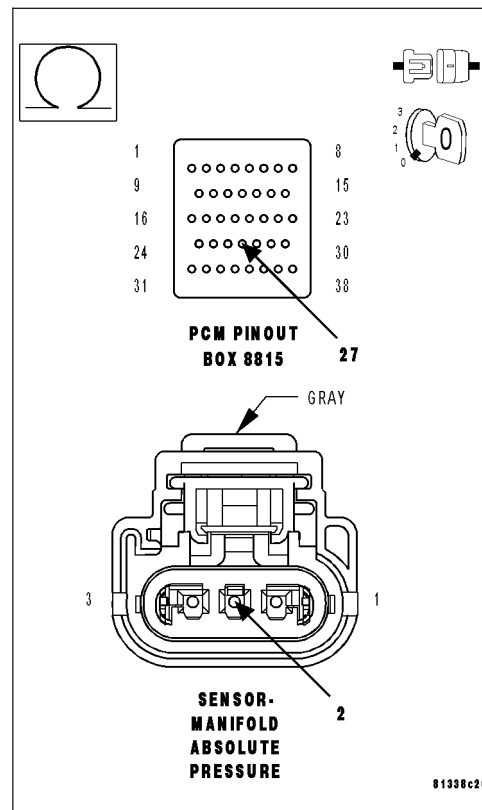
Measure the resistance of the (K900) Sensor ground circuit from the MAP Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 17

**No** >> Repair the excessive resistance in the (K900) Sensor ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**17. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

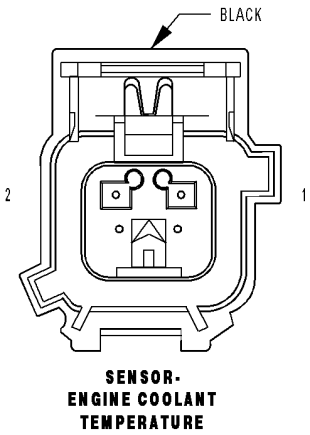
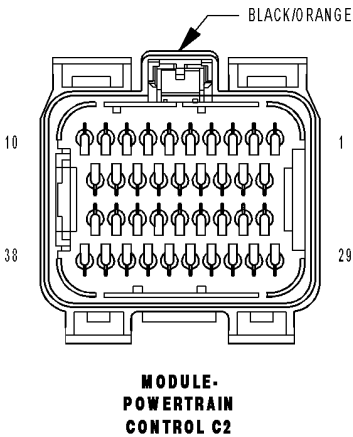
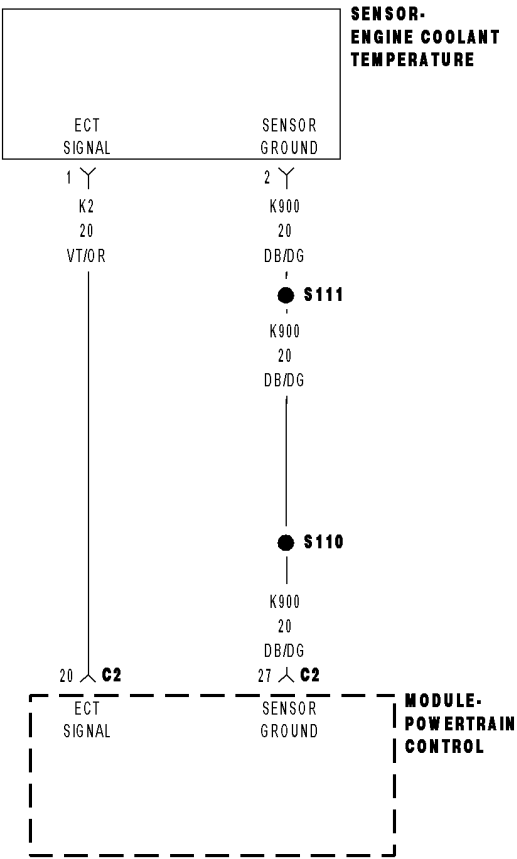
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

P2181-COOLING SYSTEM PERFORMANCE



## P2181-COOLING SYSTEM PERFORMANCE (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on, Engine running, and no ECT DTCs present.

- **Set Condition:**

PCM recognizes that the ECT has failed its self coherence test. The coolant temp should only change at a certain rate, if this rate is too slow or too fast this fault will set. Two trip fault. Three good trips to clear MIL. ETC light will illuminate on first trip failure.

Possible Causes
<p>LOW COOLANT LEVEL</p> <p>(K2) ECT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE</p> <p>(K2) ECT SIGNAL CIRCUIT OPEN</p> <p>(K900) SENSOR GROUND CIRCUIT OPEN</p> <p>(K2) ECT SIGNAL CIRCUIT SHORTED TO GROUND</p> <p>(K2) ECT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND</p> <p>THERMOSTAT</p> <p>ECT SENSOR</p> <p>PCM</p>

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

**Note: If this code sets during extreme ambient temperatures, improper installation of a block heater could be the cause of this DTC.**

With a scan tool, read DTCs.

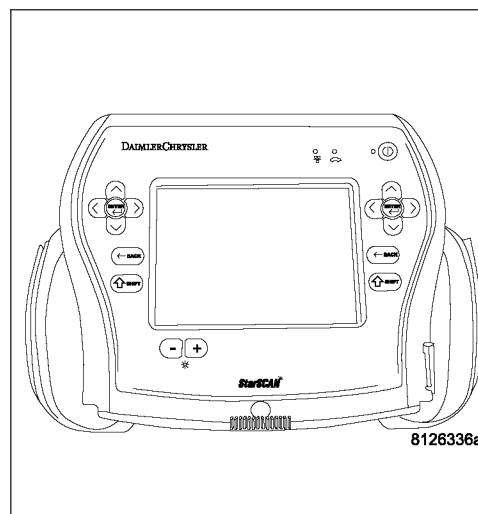
Diagnose all other ECT and Cooling System codes before continuing.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P2181-COOLING SYSTEM PERFORMANCE (CONTINUED)****2. LOW COOLANT LEVEL**

**Note:** If a Engine Coolant Temperature (ECT) DTC is set along with this code, diagnose the ECT DTC first.

**Note:** Inspect the ECT terminals and related PCM terminals. Ensure the terminals are free from corrosion and damage.

**Note:** The best way to diagnose this DTC is to allow the vehicle to sit overnight outside in order to have a totally cold soaked engine.

**Note:** Extremely cold outside ambient temperatures may have caused this DTC to set.

**Note:** Need to make sure that no Cooling System DTCs are set or changes that would make the warm up much slower or much faster: broken water pump can set this, addition of aftermarket auxiliary cooler can set this DTC.

**WARNING:** Never open the cooling system when the engine is hot. The system is under pressure. Failure to follow these instructions can result in personal injury or death. Allow the engine to cool before opening the cooling system.

Inspect the coolant system for proper level and condition.

**Is the coolant level and condition OK?**

**Yes** >> Go To 3

**No** >> Inspect the vehicle for a coolant leak and add the necessary amount of coolant.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**3. THERMOSTAT**

**Note:** This test works best if performed on a cold engine (cold soak).

Ignition on, engine not running.

With a scan tool, read the Eng Coolant Tmp Deg value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.

**Note:** If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.

Start the Engine.

During engine warm-up monitor the Eng Coolant Tmp Deg value. The temp deg value change should be a smooth transition from start up to normal operating temp 82°C (180°F). Also monitor the actual coolant temperature with a thermometer.

**Note:** As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the Eng Coolant Tmp Deg on the scan tool should stay relatively close to each other.

Using the appropriate service information, determine the proper opening temperature of the thermostat.

**Did the thermostat open at the proper temperature?**

**Yes** >> Go To 4

**No** >> Replace the thermostat.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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P2181-COOLING SYSTEM PERFORMANCE (CONTINUED)

4. ECT SENSOR

Connect a jumper between the (K2) ECT Signal circuit and the (K900) Sensor ground circuit in the ECT Sensor harness connector.

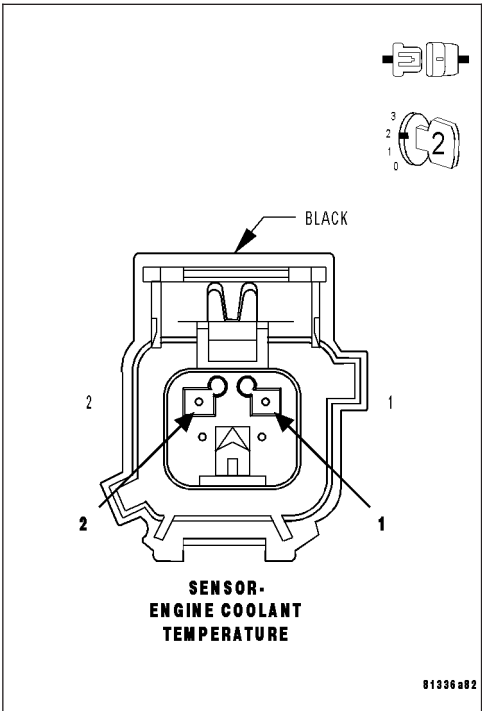
Turn the ignition off.

Disconnect the ECT Sensor harness connector.

With a scan tool, read the ECT voltage.

Is the voltage below 1.0 volt?

- Yes
- >> Replace the ECT Sensor.
- Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No
- >> Go To 5



5. (K2) ECT SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE

Turn the ignition off.

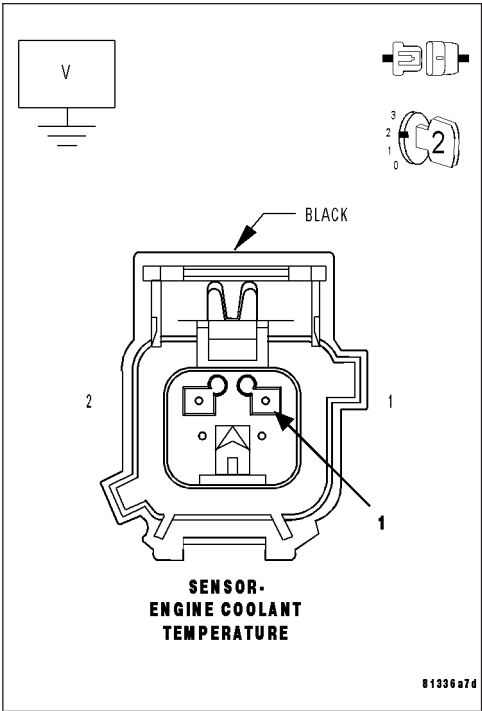
Disconnect the PCM harness connectors.

Ignition on, engine not running.

Measure the voltage on the (K2) ECT Signal circuit in the ECT Sensor harness connector.

Is the voltage above 5.2 volts?

- Yes
- >> Repair the short to battery voltage in the (K2) ECT Signal circuit.
- Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)
- No
- >> Go To 6



**P2181-COOLING SYSTEM PERFORMANCE (CONTINUED)****6. (K2) ECT SIGNAL CIRCUIT OPEN**

Turn the ignition off.

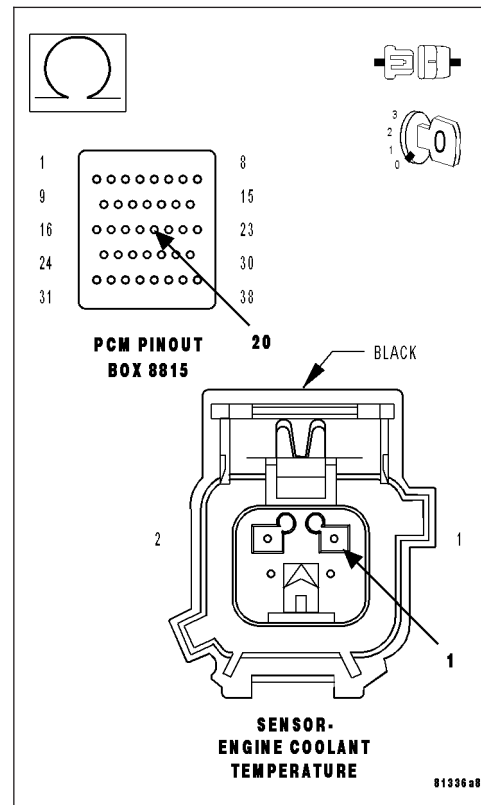
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K2) ECT Signal circuit from the ECT Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K2) ECT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

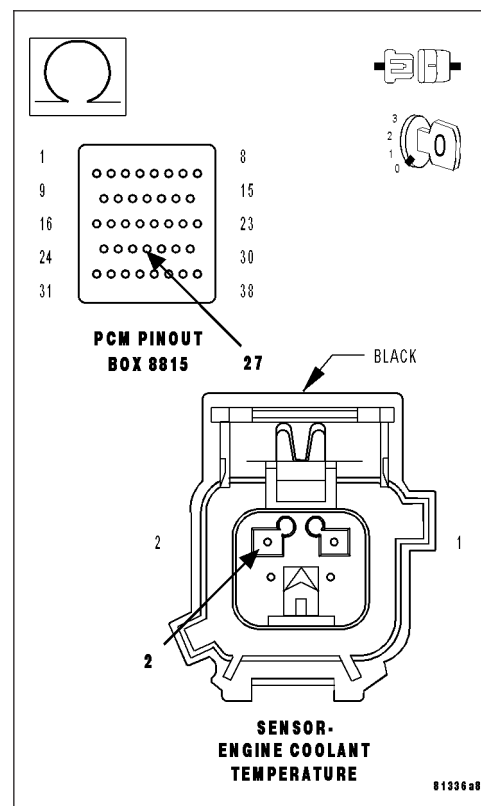
**7. (K900) SENSOR GROUND CIRCUIT OPEN**

Measure the resistance of the (K900) Sensor ground circuit from the ECT Sensor harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (K900) Sensor ground circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



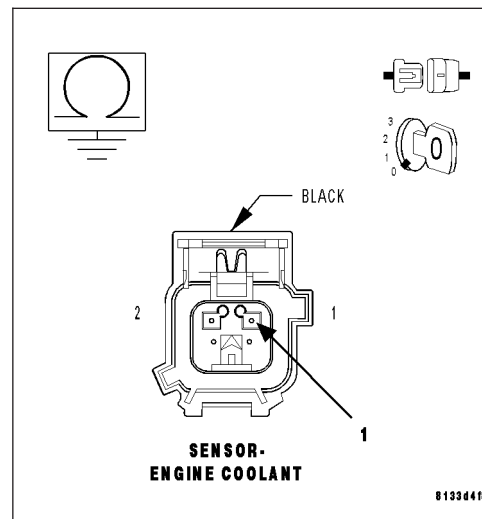
**P2181-COOLING SYSTEM PERFORMANCE (CONTINUED)****8. (K2) ECT SIGNAL CIRCUIT SHORTED TO GROUND**

Measure the resistance between ground and the (K2) ECT Signal circuit in the ECT Sensor harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K2) ECT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 9

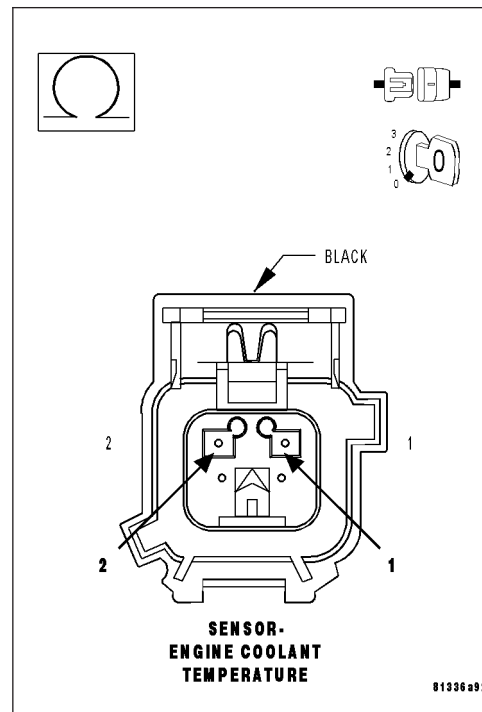
**9. (K2) ECT SIGNAL CIRCUIT SHORTED TO THE (K900) SENSOR GROUND CIRCUIT**

Measure the resistance between the (K2) ECT Signal circuit and the (K900) Sensor ground circuit in the ECT Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the short between the (K900) Sensor ground and the (K2) ECT Signal circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 10



**P2181-COOLING SYSTEM PERFORMANCE (CONTINUED)****10. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

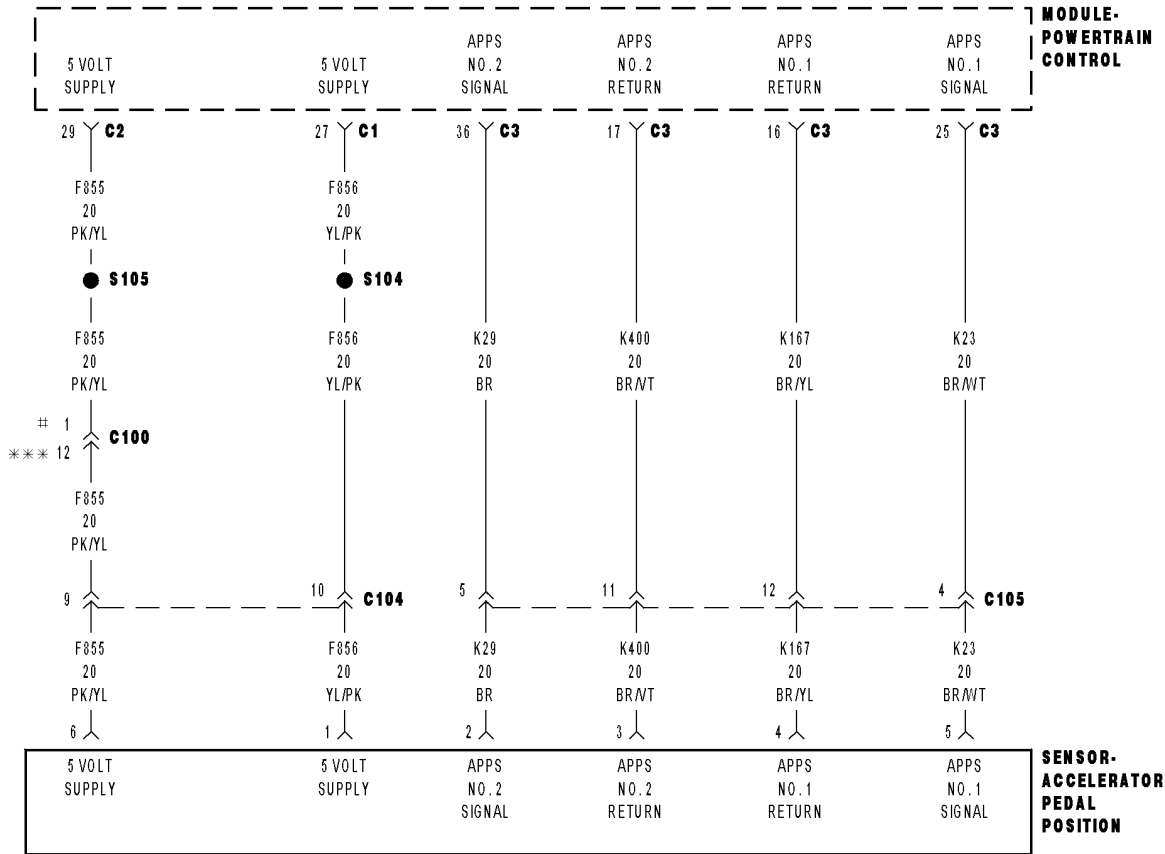
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

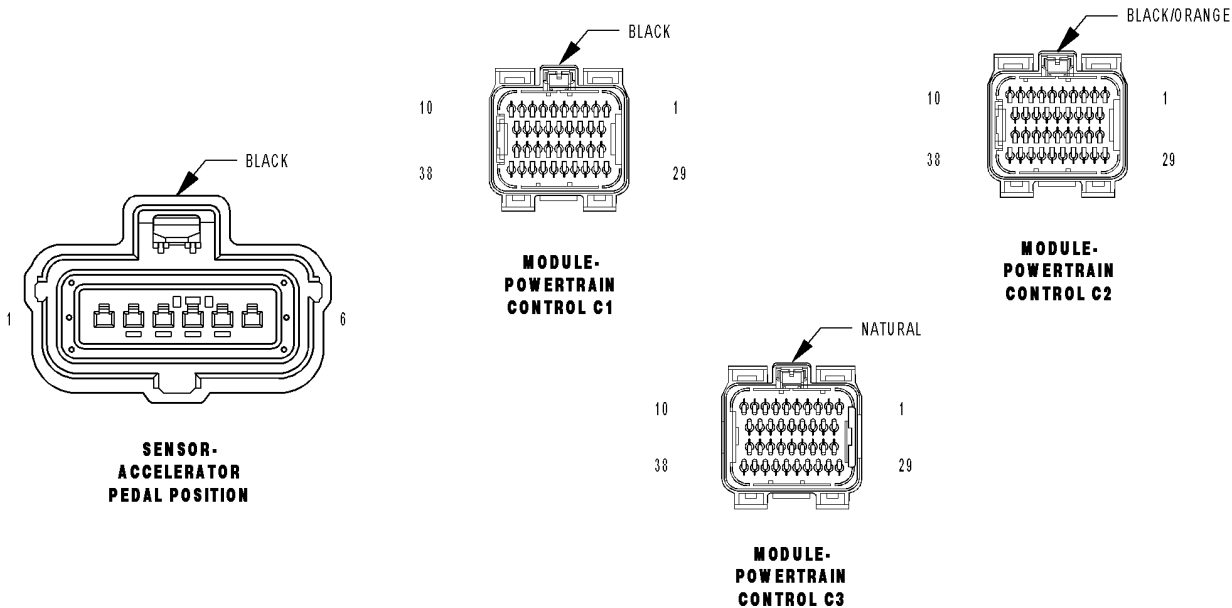
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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# P2299-BRAKE PEDAL POSITION / ACCELERATOR PEDAL POSITION INCOMPATIBLE



± 2.7L/3.5L  
\*\*\* 5.7L



**P2299-BRAKE PEDAL POSITION / ACCELERATOR PEDAL POSITION INCOMPATIBLE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on. No Break or APPS faults present.

- **Set Condition:**

The PCM recognizes a brake application following the APPS showing a fixed pedal opening. Temporary or permanent. Internally the PCM will reduce throttle opening below driver demand. One trip fault and the code will be set within 5 seconds. ETC light will illuminate, the light will only stay illuminated while DTC is active.

Possible Causes
CUSTOMER PRESSING ACCELERATOR PEDAL, THEN PRESSING BRAKE PEDAL, AND CONTINUES HOLDING THEM DOWN SIMULTANEOUSLY
STOP LAMP SWITCH
APP SENSOR

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. DTC INFORMATION

**Note:** If a pedal assembly becomes mechanically stuck the voltage output will stay fixed, if this is also followed by a long application of the brakes this code will set.

**Note:** When this code sets the pedal position in the PCM software will ramp to idle. If the Pedal voltage changes OR the brake pedal is released, the pedal position in the PCM software will ramp up to the pedal position and the ETC light will go out.

With a scan tool, read DTCs and record the related Freeze Frame data.

Diagnose all other Stop Lamp Switch and APP Sensor codes before continuing.

This code can be set by a driver who uses both feet while driving, one for the Accelerator Pedal and the other for the Brake Pedal.

**Note:** The most likely cause of this DTC is caused by the customer Brake Torquing the engine by pressing the Accelerator pedal and the pressing the Brake Pedal.

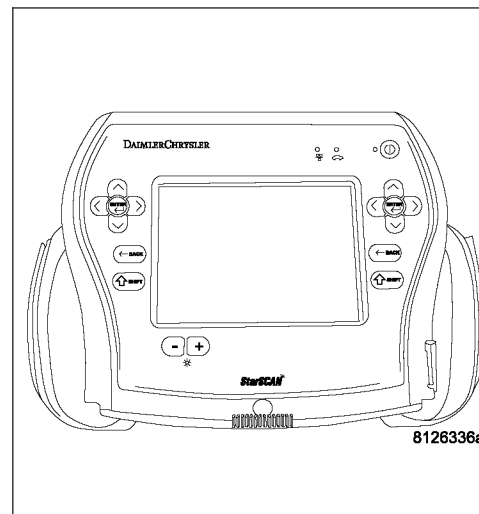
Ask the driver of the vehicle if these conditions apply to their driving habits.

**Are the listed conditions part of the customers driving habits?**

**Yes** >> Advise the customer of what caused the DTC. This is normal operation of a ETC equipped vehicle because of safety issues.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 2



**P2299-BRAKE PEDAL POSITION / ACCELERATOR PEDAL POSITION INCOMPATIBLE (CONTINUED)****2. STOP LAMP SWITCH OPERATION**

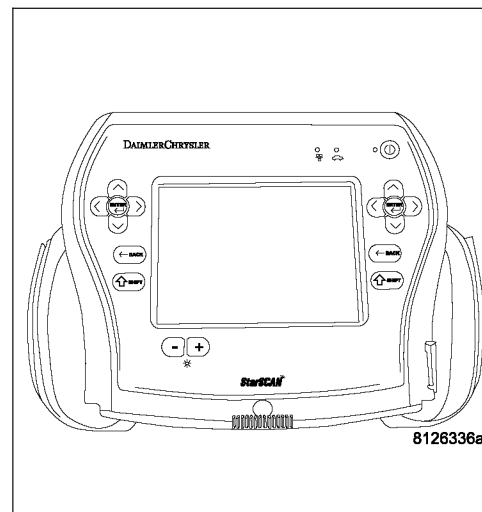
With a scan tool, read both Stop Lamp Switch statuses while pressing and releasing the Brake Pedal.

**Does the scan tool display the Pressed and Released while pressing and releasing the Pedal?**

**Yes** >> Go To 3

**No** >> Check the Stop Lamp Switch for proper installation and check the related circuits for opens and shorts using the appropriate wiring diagram. If OK, replace the Stop Lamp Switch assembly.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**3. APP SENSOR SWEEP**

Ignition on, engine not running.

With a scan tool, monitor both APP Sensor voltage readings.

Slowly press the accelerator pedal from idle until it reaches the end stop near the floor.

APPS No.1 voltage should start at approximately 0.45 of a volt and increase to approximately 4.6 volts with a smooth transition.

APPS No.2 voltage should start at approximately 0.22 of a volt and increase to approximately 2.31 volts with a smooth transition.

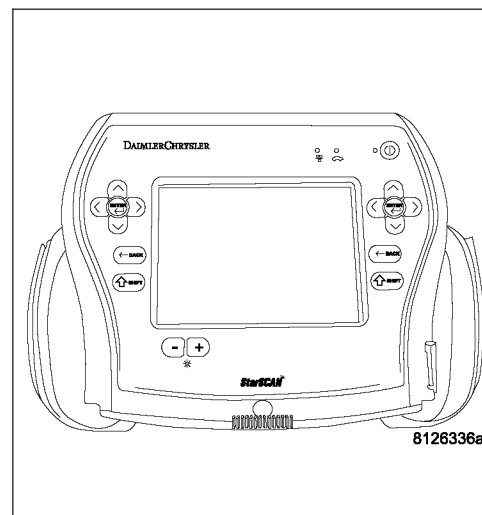
**Does the voltage for the appropriate sensor follow the list specification?**

**Yes** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

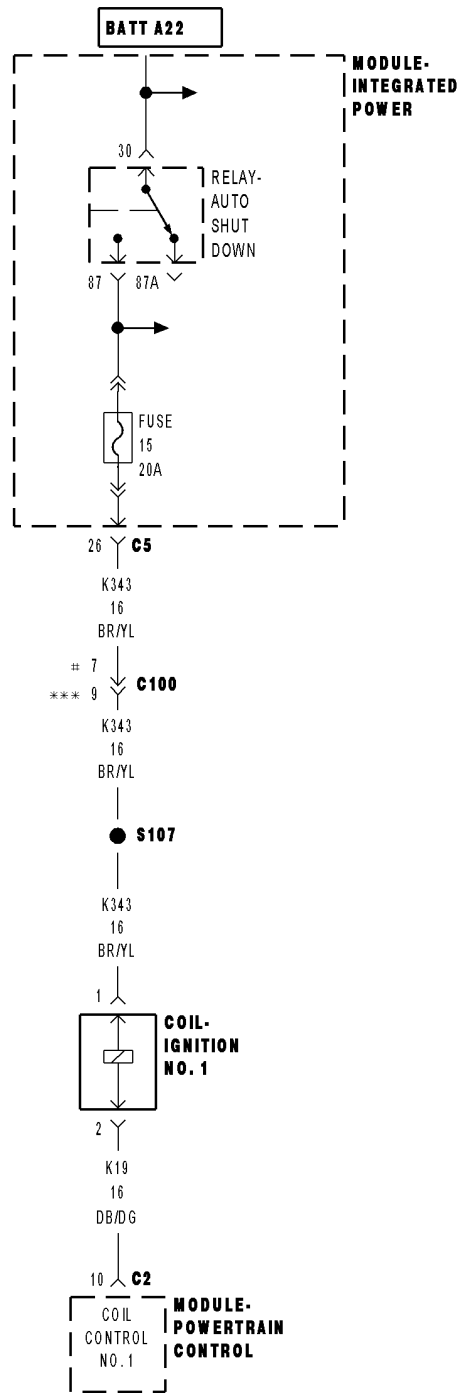
**No** >> Check the Signal and Return circuits for opens and shorts. If OK, Replace the APP Sensor Assembly per Service Information. After installation is complete, with a scan tool select the ETC RELEARN function to relearn the APPS values.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



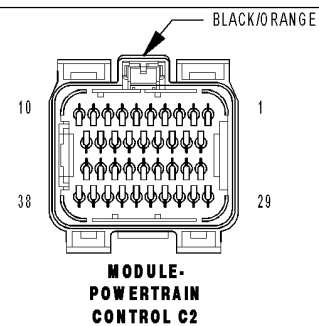
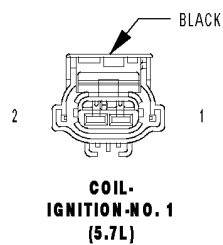
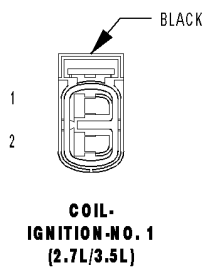


## P2302-IGNITION COIL 1 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION



# 2.7L/3.5L

\*\*\* 5.7L



**P2302-IGNITION COIL 1 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running and battery voltage greater than 10 volts.

- **Set Condition:**

If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected.  
One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT
(K19) COIL CONTROL NO.1 CIRCUIT OPEN
(K19) COIL CONTROL NO.1 CIRCUIT SHORTED TO GROUND
SPARK PLUG
COIL ON PLUG
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

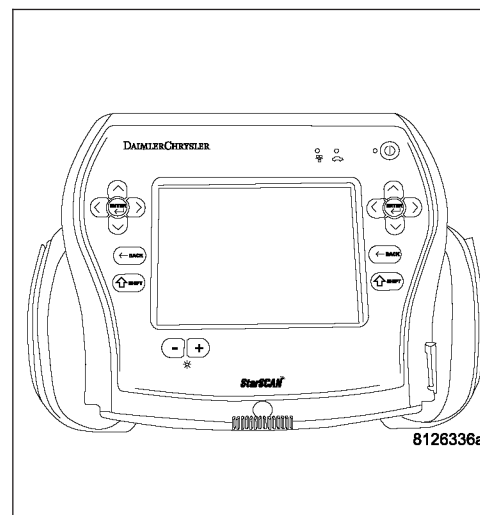
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Go To 9

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2302-IGNITION COIL 1 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****2. SECONDARY SPARK**

**Note:** Inspect the ignition coil for damage, carbon tracking on the coil or a damaged spark plug insulator boot. If a problem is found, replace the ignition coil.

Turn the ignition off.

Remove the ignition coil.

Install a spark tester to the ignition coil.

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils. Once the ignition coil has been removed from the cylinder head, the intake must be reinstalled to be able to crank the engine. Move the ignition coil harness connector through the slots in the upper intake and then connect the coil to the harness connector. Secure the upper intake to the lower intake in accordance with the service information. While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark generated?**

**Yes** >> Ensure the cylinder is operating properly. If OK, replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K343) ASD RELAY OUTPUT 2 CIRCUIT**

Turn the ignition off.

Disconnect the Ignition Coil harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2 circuit in the Coil on Plug harness connector.

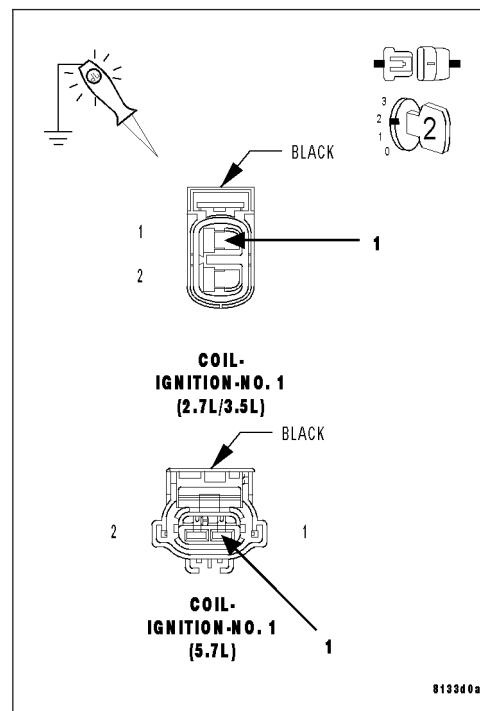
**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open or short to ground in the (K343) ASD Relay Output 2 circuit between the IPM and Coil harness connector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**Note:** Stop All Actuations.



**P2302-IGNITION COIL 1 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****4. IGNITION COIL RESISTANCE**

Turn the ignition off.

**Note:** The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Ignition Coil.

**Is the resistance between 0.55 to 1.5 ohms at 77°F (25°C) for the Ignition Coil being tested?**

**Yes** >> Go To 5

**No** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. IGNITION COIL**

Using a 12-volt test light connected to a 12-volt source, probe the (K19) Coil Control No.1 circuit.

Crank the engine for 5 seconds while observing the test light.

**What is the condition of the test light while cranking the engine?**

**Brightly blinking.**

Replace the Ignition Coil.

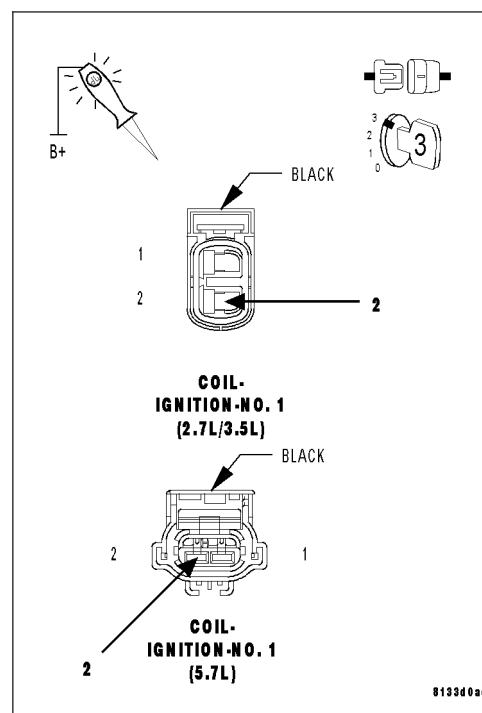
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**ON constantly.**

Go To 6

**OFF constantly.**

Go To 7



**P2302-IGNITION COIL 1 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****6. (K19) COIL CONTROL NO.1 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

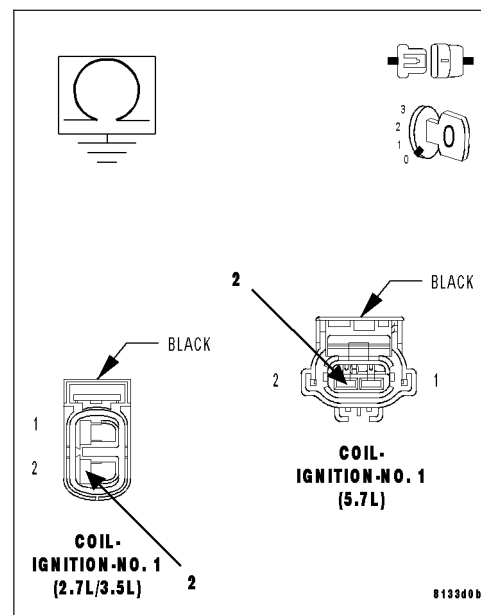
Measure the resistance between ground and the (K19) Coil Control No.1 circuit in the Ignition Coil harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K19) Coil Control No.1 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8

**7. (K19) COIL CONTROL NO.1 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

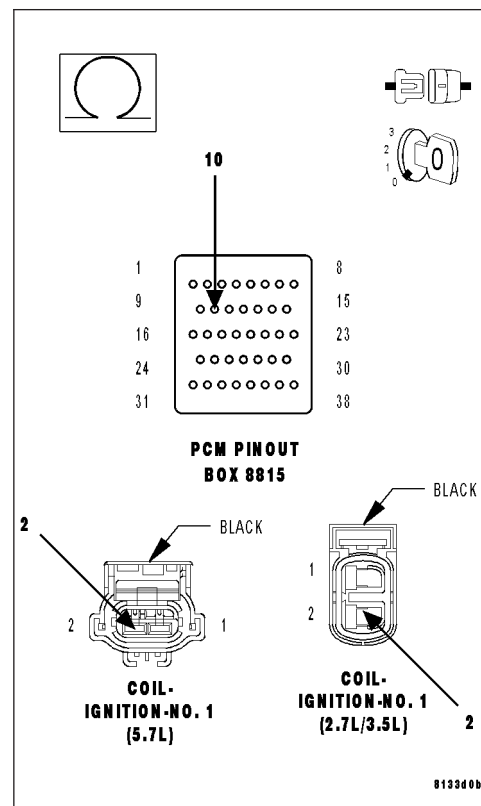
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K19) Coil Control No.1 circuit from the Ignition Coil harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (K19) Coil Control No.1 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2302-IGNITION COIL 1 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****8. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**9. VISUAL AND PHYSICAL INSPECTION**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broken electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

**Were any of the above conditions present?**

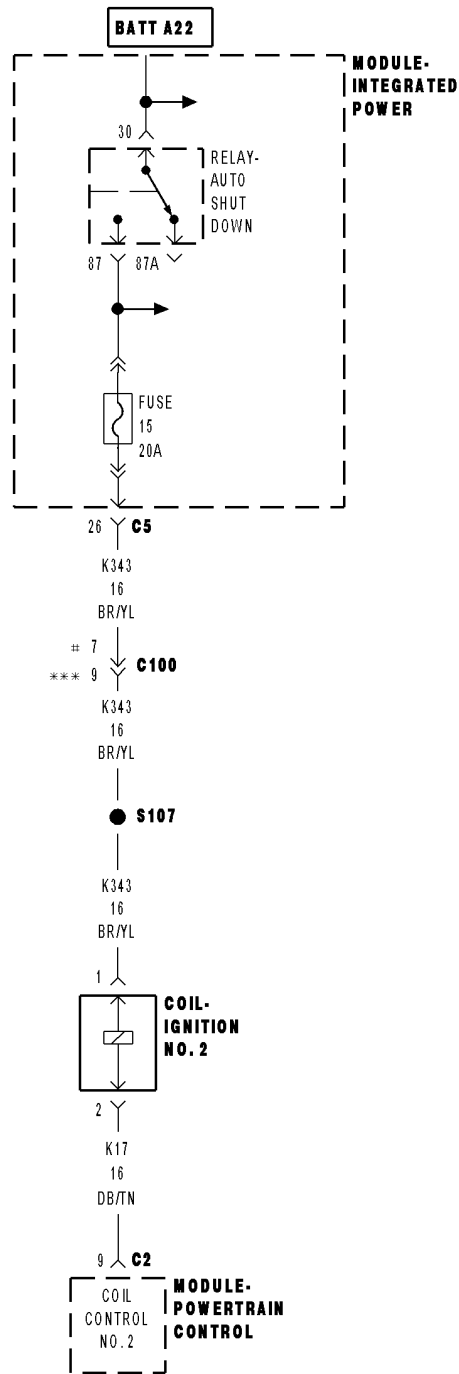
**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Refer to the INTERMITTENT CONDITION symptom in the Driveability category.

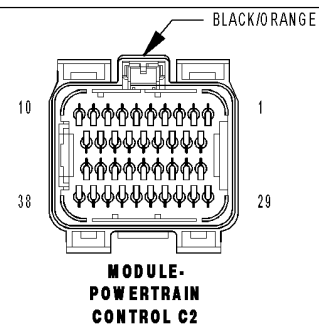
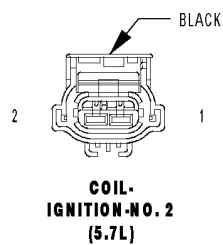
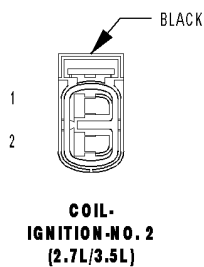
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## P2305-IGNITION COIL 2 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION



# 2.7L/3.5L

\*\*\* 5.7L



**P2305-IGNITION COIL 2 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running and battery voltage greater than 10 volts.

- **Set Condition:**

If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected.  
One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT
(K17) COIL CONTROL NO.2 CIRCUIT OPEN
(K17) COIL CONTROL NO.2 CIRCUIT SHORTED TO GROUND
SPARK PLUG
COIL ON PLUG
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

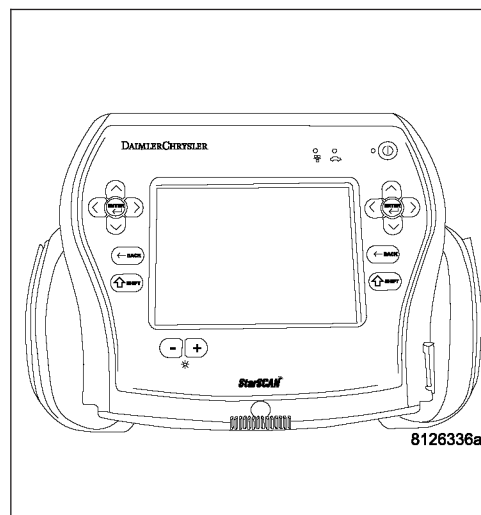
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Go To 9

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P2305-IGNITION COIL 2 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****2. SECONDARY SPARK**

**Note:** Inspect the ignition coil for damage, carbon tracking on the coil or a damaged spark plug insulator boot. If a problem is found, replace the ignition coil.

Turn the ignition off.

Remove the ignition coil.

Install a spark tester to the ignition coil.

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils. Once the ignition coil has been removed from the cylinder head, the intake must be reinstalled to be able to crank the engine. Move the ignition coil harness connector through the slots in the upper intake and then connect the coil to the harness connector. Secure the upper intake to the lower intake in accordance with the service information. While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark generated?**

**Yes** >> Ensure the cylinder is operating properly. If OK, replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K343) ASD RELAY OUTPUT2 CIRCUIT**

Turn the ignition off.

Disconnect the Ignition Coil harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2 circuit in the Coil on Plug harness connector.

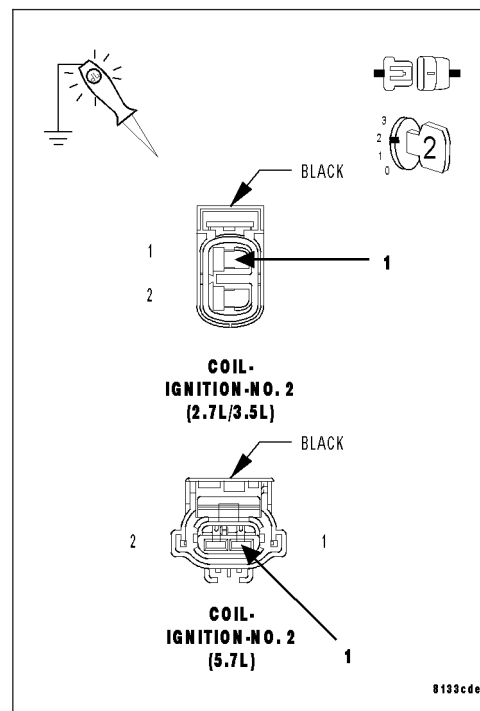
**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open or short to ground in the (K343) ASD Relay Output 2 circuit between the IPM and Coil harness connector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**Note:** Stop All Actuations.



**P2305-IGNITION COIL 2 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****4. IGNITION COIL RESISTANCE**

Turn the ignition off.

**Note:** The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Ignition Coil.

**Is the resistance between .55 to 1.5 ohms at 77°F (25°C) for the Ignition Coil being tested?**

**Yes** >> Go To 5

**No** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. IGNITION COIL**

Using a 12-volt test light connected to a 12-volt source, probe the (K17) Coil Control No.2 circuit.

Crank the engine for 5 seconds while observing the test light.

**What is the condition of the test light while cranking the engine?**

**Brightly blinking.**

Replace the Ignition Coil.

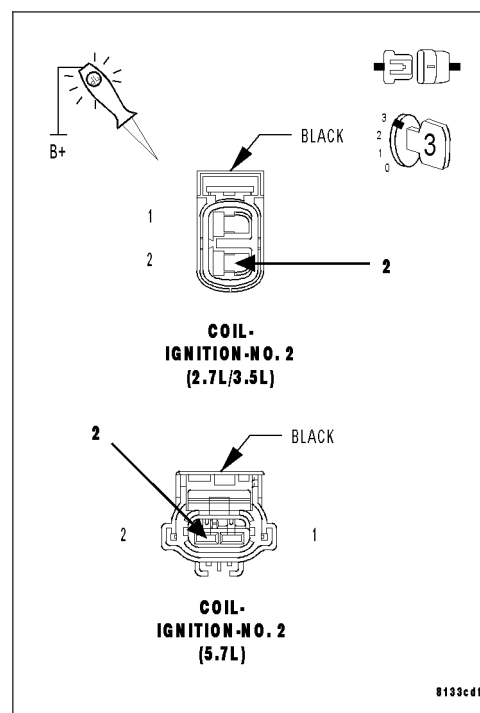
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**ON constantly.**

Go To 6

**OFF constantly.**

Go To 7



**P2305-IGNITION COIL 2 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****6. (K17) COIL CONTROL NO.2 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

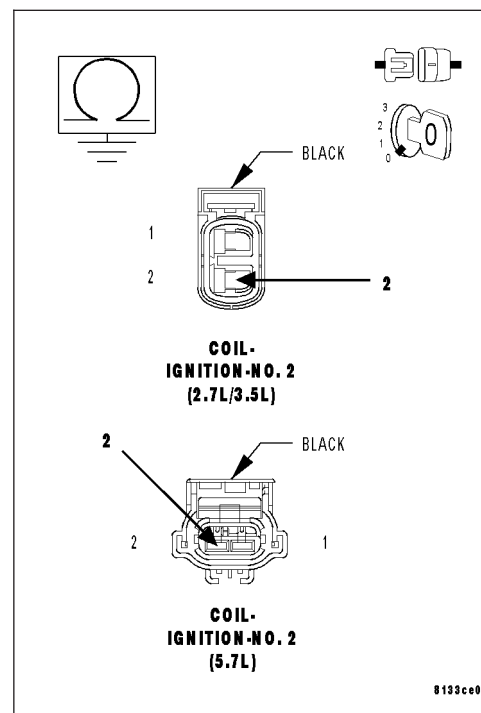
Measure the resistance between ground and the (K17) Coil Control No.2 circuit in the Ignition Coil harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K17) Coil Control No.2 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8

**7. (K17) COIL CONTROL NO.2 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

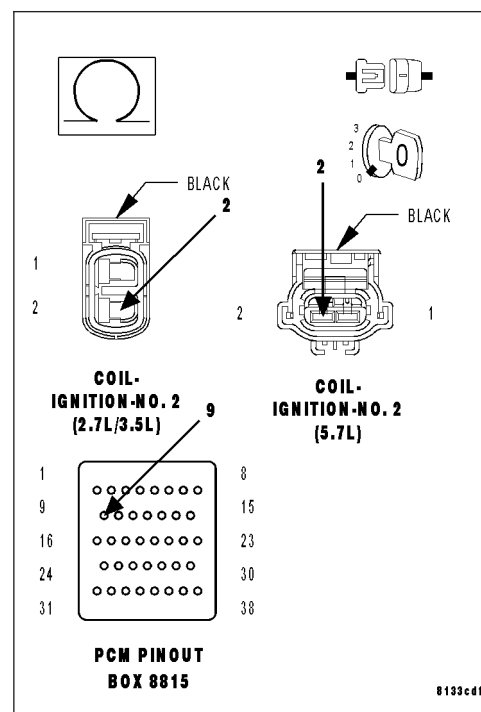
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K17) Coil Control No.2 circuit from the Ignition Coil harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (K17) Coil Control No.2 circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2305-IGNITION COIL 2 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****8. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**9. Visual and Physical Inspection**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broken electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

**Were any of the above conditions present?**

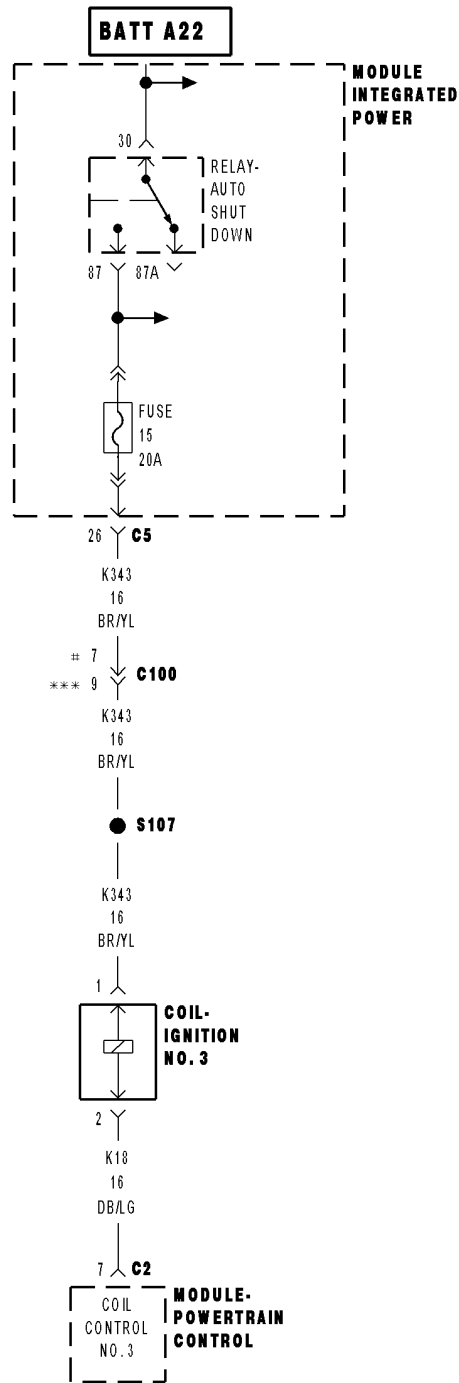
**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Refer to the INTERMITTENT CONDITION symptom in the Driveability category.

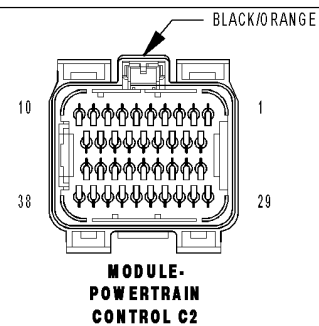
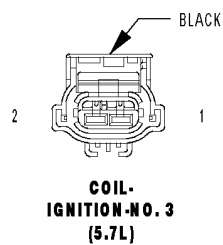
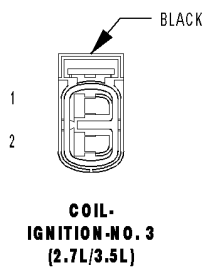
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## P2308-IGNITION COIL 3 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION



# 2.7L/3.5L

\*\*\* 5.7L



**P2308-IGNITION COIL 3 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Engine running and battery voltage greater than 10 volts.
- **Set Condition:**  
If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected.  
One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K18) COIL CONTROL NO.3 CIRCUIT OPEN (K18) COIL CONTROL NO.3 CIRCUIT SHORTED TO GROUND SPARK PLUG COIL ON PLUG PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

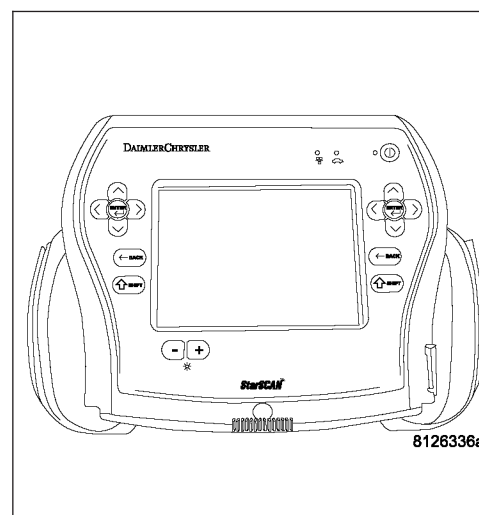
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Go To 9

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2308-IGNITION COIL 3 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****2. Secondary Spark**

**Note:** Inspect the ignition coil for damaged, carbon tracking on the coil or a damaged spark plug insulator boot. If a problem is found, replace the ignition coil.

Turn the ignition off.

Remove the ignition coil.

Install a spark tester to the ignition coil.

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils. Once the ignition coil has been removed from the cylinder head, the intake must be reinstalled to be able to crank the engine. Move the ignition coil harness connector through the slots in the upper intake and then connect the coil to the harness connector. Secure the upper intake to the lower intake in accordance with the service information. While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark generated?**

**Yes** >> Ensure the cylinder is operating properly. If OK, replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K343) ASD RELAY OUTPUT2 CIRCUIT**

Turn the ignition off.

Disconnect the Ignition Coil harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2 circuit in the Coil on Plug harness connector.

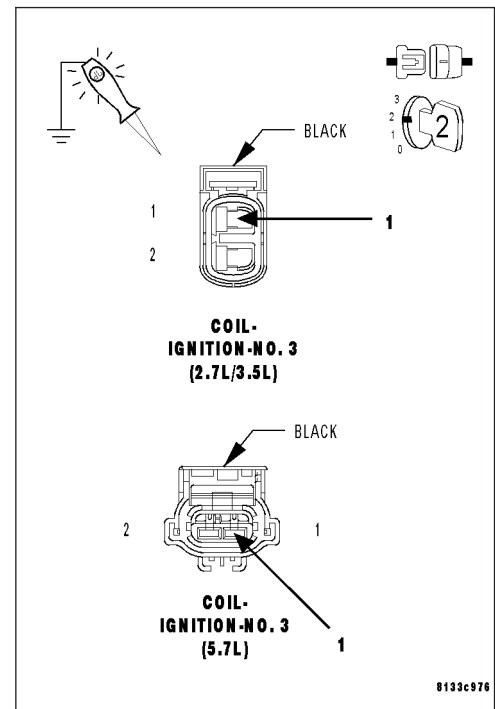
**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open or short to ground in the (K343) ASD Relay Output 2 circuit between the IPM and Coil harness connector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**Note:** Stop All Actuations.



**P2308-IGNITION COIL 3 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****4. IGNITION COIL RESISTANCE**

Turn the ignition off.

**Note:** The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Ignition Coil.

**Is the resistance between .55 to 1.5 ohms at 77°F (25°C) for the Ignition Coil being tested?**

**Yes** >> Go To 5

**No** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. IGNITION COIL**

Using a 12-volt test light connected to a 12-volt source, probe the (K18) Coil Control No.3 circuit.

Crank the engine for 5 seconds while observing the test light.

**What is the condition of the test light while cranking the engine?**

**Brightly blinking.**

Replace the Ignition Coil.

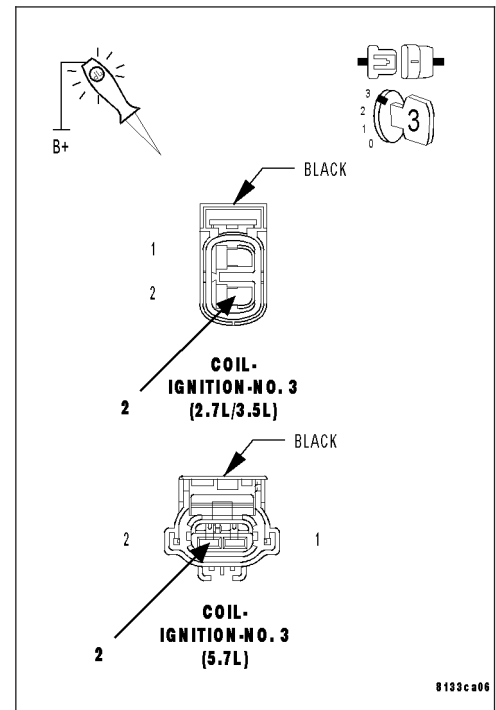
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**ON constantly.**

Go To 6

**OFF constantly.**

Go To 7





**P2308-IGNITION COIL 3 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****6. (K18) COIL CONTROL NO.3 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

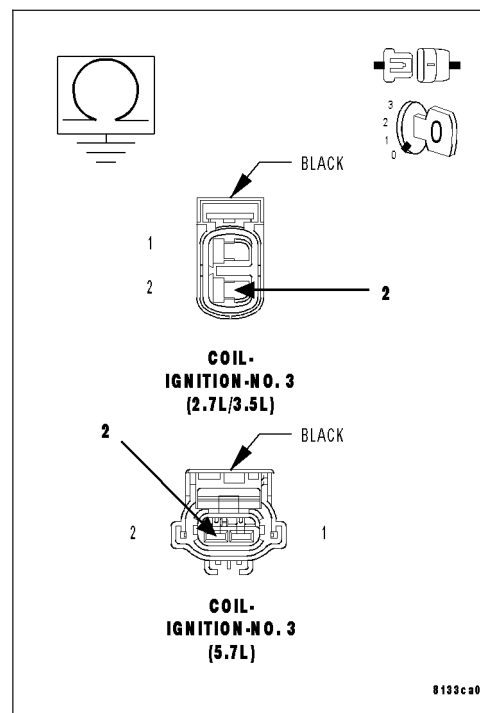
Measure the resistance between ground and the (K18) Coil Control No.3 circuit in the Ignition Coil harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K18) Coil Control No.3 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8

**7. (K18) COIL CONTROL NO.3 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

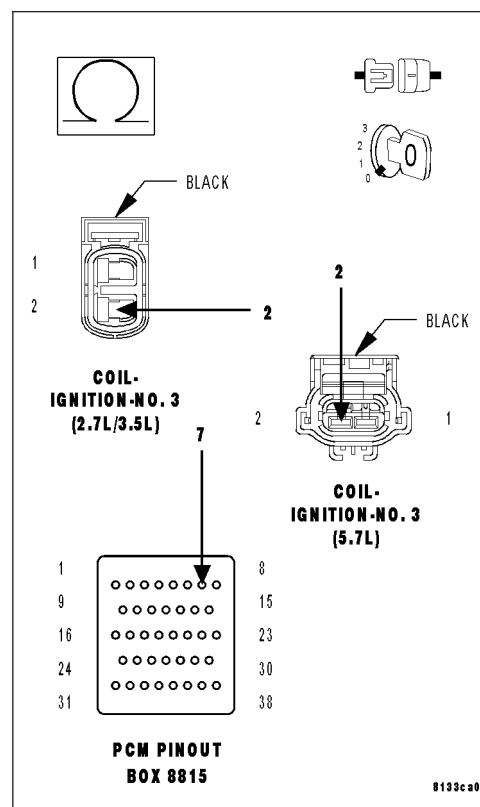
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K18) Coil Control No.3 circuit from the Ignition Coil harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (K18) Coil Control No.3 circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2308-IGNITION COIL 3 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****8. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**9. Visual and Physical Inspection**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broken electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

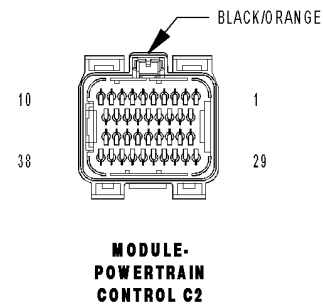
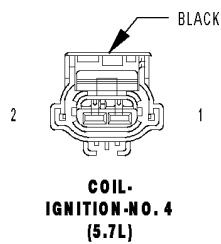
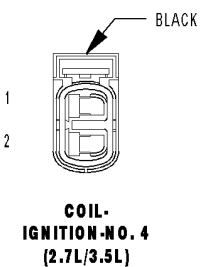
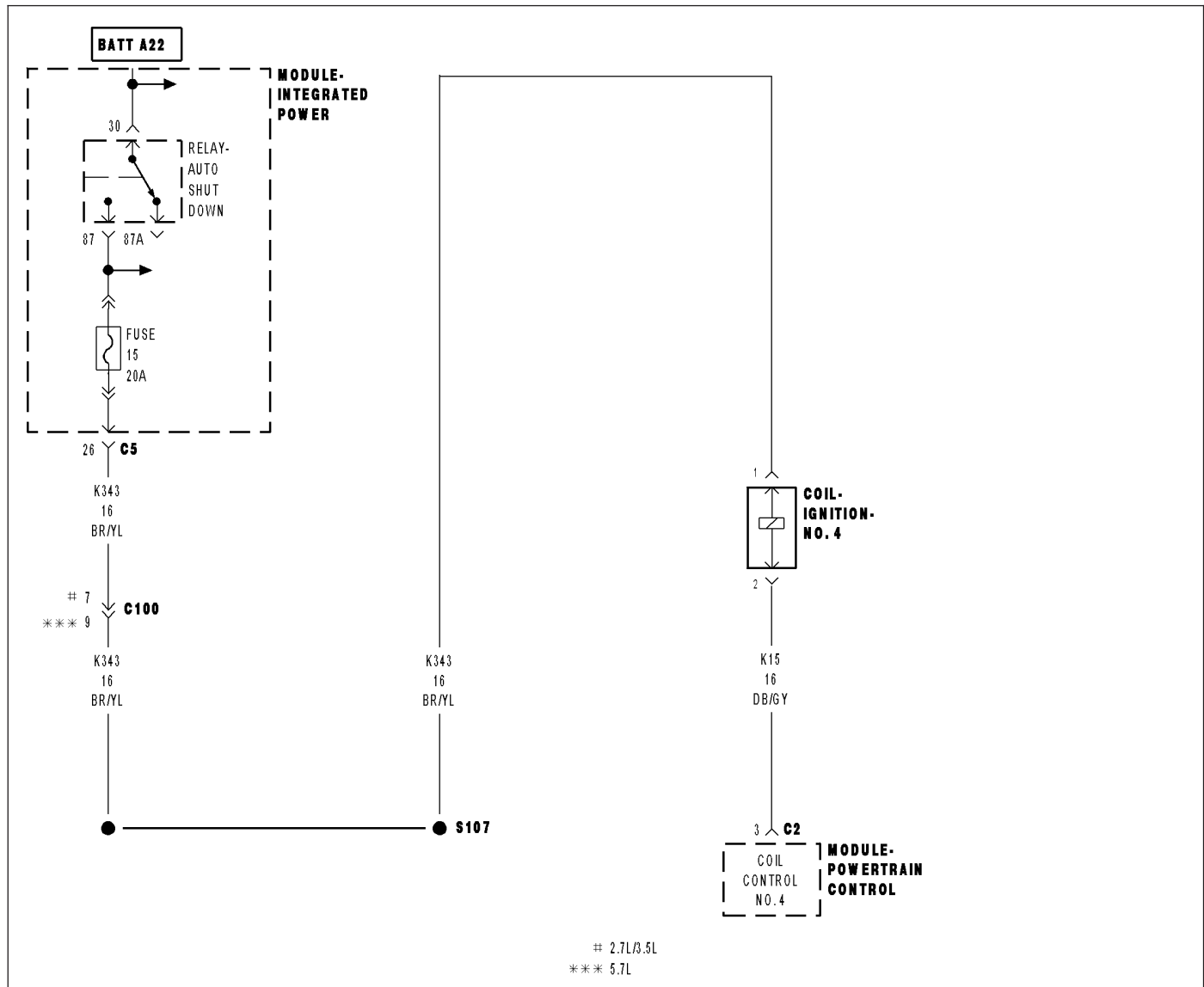
**Were any of the above conditions present?**

**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Refer to the INTERMITTENT CONDITION symptom in the Driveability category.

---

**P2311-IGNITION COIL 4 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION**

**P2311-IGNITION COIL 4 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running and battery voltage greater than 10 volts.

- **Set Condition:**

If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected.  
One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT
(K15) COIL CONTROL NO.4 CIRCUIT OPEN
(K15) COIL CONTROL NO.4 CIRCUIT SHORTED TO GROUND
SPARK PLUG
COIL ON PLUG
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

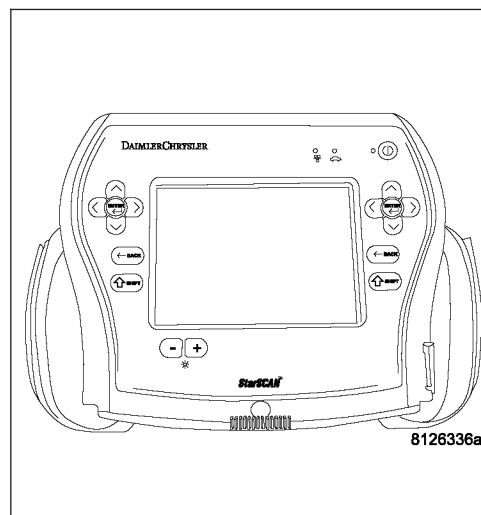
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Go To 9

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2311-IGNITION COIL 4 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****2. Secondary Spark**

**Note:** Inspect the ignition coil for damage, carbon tracking on the coil or a damaged spark plug insulator boot. If a problem is found, replace the ignition coil.

Turn the ignition off.

Remove the ignition coil.

Install a spark tester to the ignition coil.

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils. Once the ignition coil has been removed from the cylinder head, the intake must be reinstalled to be able to crank the engine. Move the ignition coil harness connector through the slots in the upper intake and then connect the coil to the harness connector. Secure the upper intake to the lower intake in accordance with the service information. While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark generated?**

**Yes** >> Ensure the cylinder is operating properly. If OK, replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K343) ASD RELAY OUTPUT2 CIRCUIT**

Turn the ignition off.

Disconnect the Ignition Coil harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2 circuit in the Coil on Plug harness connector.

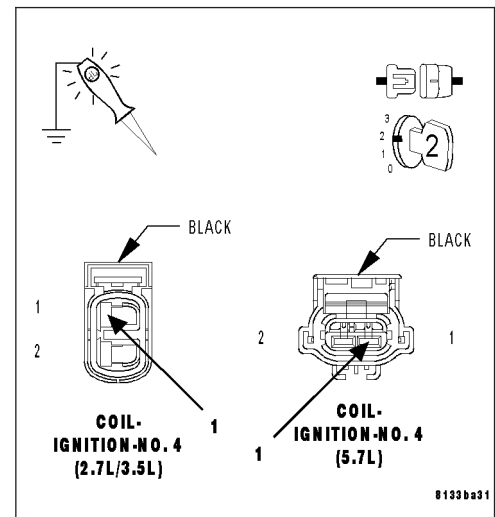
**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open or short to ground in the (K343) ASD Relay Output 2 circuit between the IPM and Coil harness connector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**Note:** Stop All Actuations.



**P2311-IGNITION COIL 4 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****4. IGNITION COIL RESISTANCE**

Turn the ignition off.

**Note:** The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Ignition Coil.

**Is the resistance between .55 to 1.5 ohms at 77°F (25°C) for the Ignition Coil being tested?**

**Yes** >> Go To 5

**No** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. IGNITION COIL**

Using a 12-volt test light connected to a 12-volt source, probe the (K15) Coil Control No.4 circuit.

Crank the engine for 5 seconds while observing the test light.

**What is the condition of the test light while cranking the engine?**

**Brightly blinking.**

Replace the Ignition Coil.

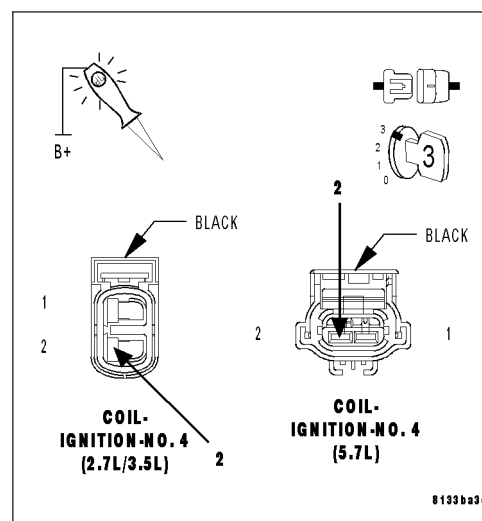
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**ON constantly.**

Go To 6

**OFF constantly.**

Go To 7

**6. (K15) COIL CONTROL NO.4 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

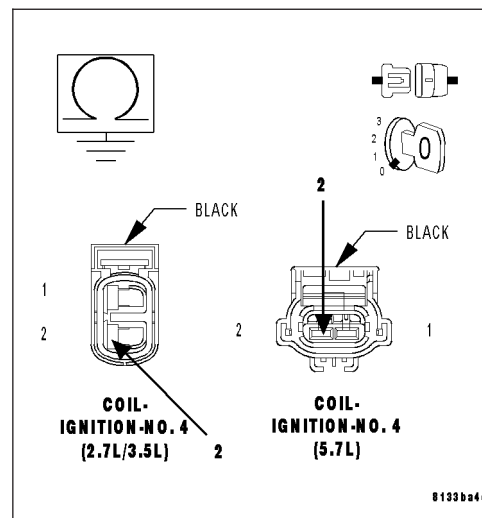
Measure the resistance between ground and the (K15) Coil Control No.4 circuit in the Ignition Coil harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K15) Coil Control No.4 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P2311-IGNITION COIL 4 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****7. (K15) COIL CONTROL NO.4 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

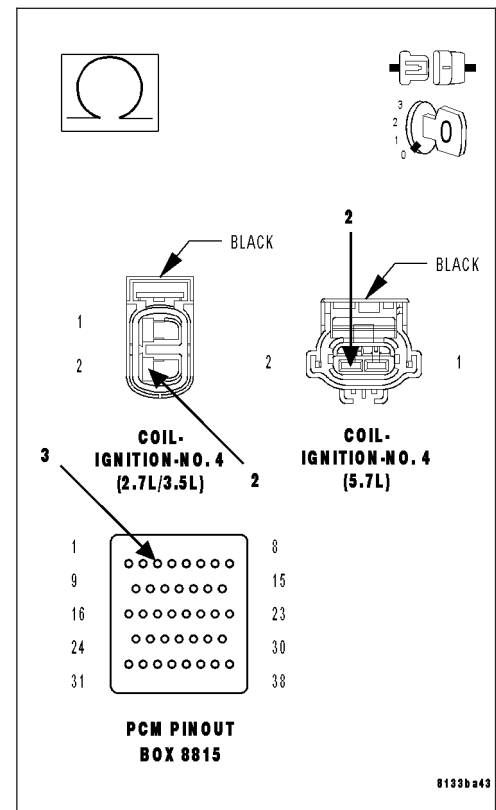
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K15) Coil Control No.4 circuit from the Ignition Coil harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (K15) Coil Control No.4 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**8. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P2311-IGNITION COIL 4 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****9. Visual and Physical Inspection**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broken electrode

**Note: Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.**

**Were any of the above conditions present?**

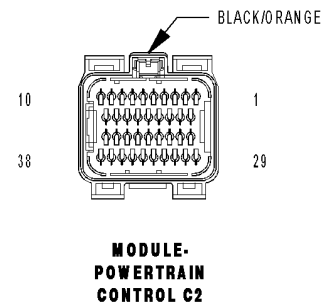
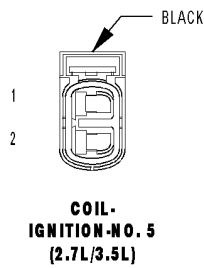
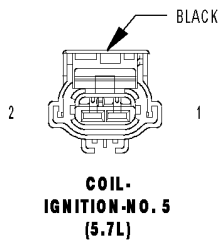
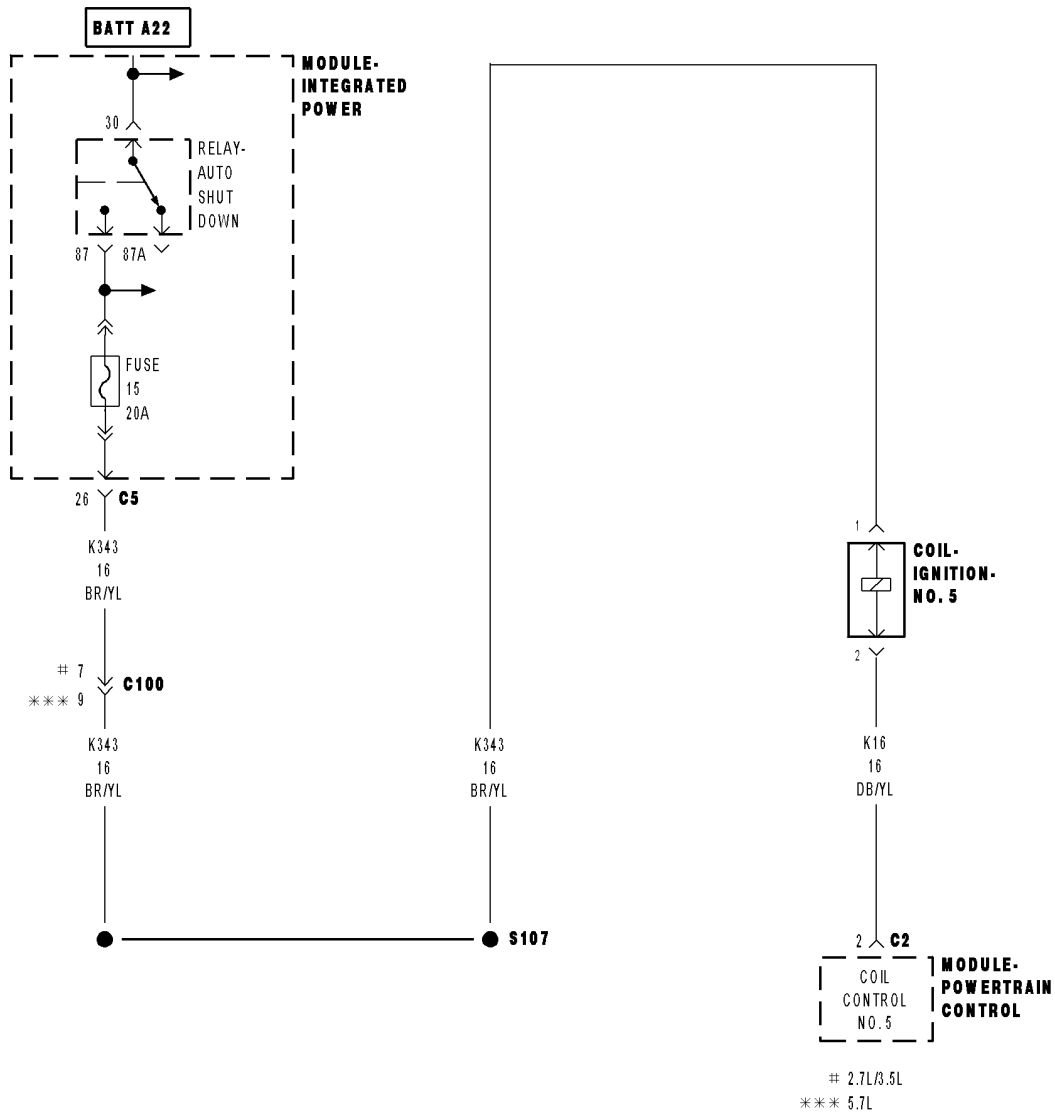
**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Refer to the INTERMITTENT CONDITION symptom in the Driveability category.

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**P2314-IGNITION COIL 5 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION**

**P2314-IGNITION COIL 5 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Engine running and battery voltage greater than 10 volts.
- **Set Condition:**  
If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected.  
One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K16) COIL CONTROL NO.5 CIRCUIT OPEN (K16) COIL CONTROL NO.5 CIRCUIT SHORTED TO GROUND SPARK PLUG COIL ON PLUG PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

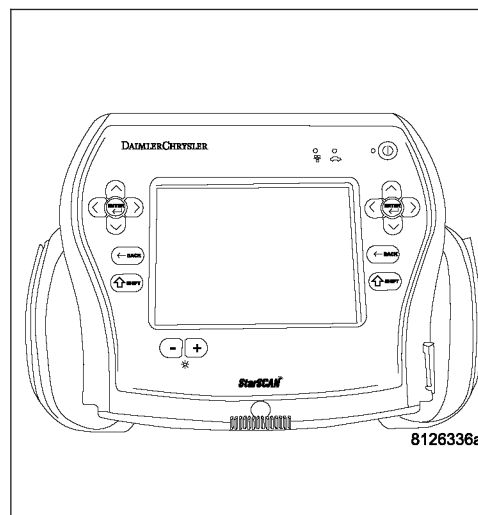
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Go To 9

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2314-IGNITION COIL 5 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****2. Secondary Spark**

**Note:** Inspect the ignition coil for damaged, carbon tracking on the coil or a damage spark plug insulator boot. If a problem is found, replace the ignition coil.

Turn the ignition off.

Remove the ignition coil.

Install a spark tester to the ignition coil.

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils. Once the ignition coil has been removed from the cylinder head, the intake must be reinstalled to be able to crank the engine. Move the ignition coil harness connector through the slots in the upper intake and then connect the coil to the harness connector. Secure the upper intake to the lower intake in accordance with the service information. While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark generated?**

**Yes** >> Ensure the cylinder is operating properly. If OK, replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K343) ASD RELAY OUTPUT2 CIRCUIT**

Turn the ignition off.

Disconnect the Ignition Coil harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2 circuit in the Coil on Plug harness connector.

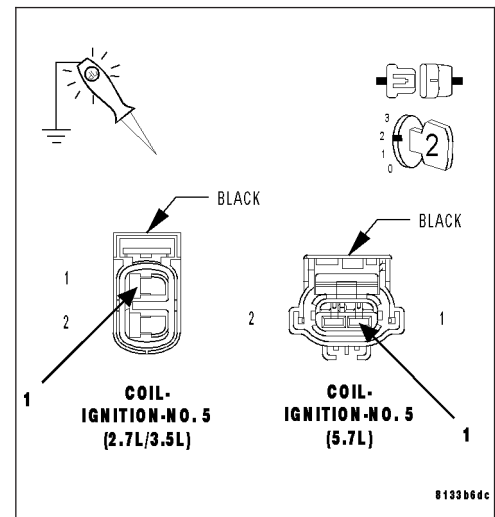
**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open or short to ground in the (K343) ASD Relay Output 2 circuit between the IPM and Coil harness connector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**Note:** Stop All Actuations.



**P2314-IGNITION COIL 5 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****4. IGNITION COIL RESISTANCE**

Turn the ignition off.

**Note:** The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Ignition Coil.

**Is the resistance between .55 to 1.5 ohms at 77°F (25°C) for the Ignition Coil being tested?**

**Yes** >> Go To 5

**No** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. IGNITION COIL**

Using a 12-volt test light connected to a 12-volt source, probe the (K16) Coil Control No.5 circuit.

Crank the engine for 5 seconds while observing the test light.

**What is the condition of the test light while cranking the engine?**

**Brightly blinking.**

Replace the Ignition Coil.

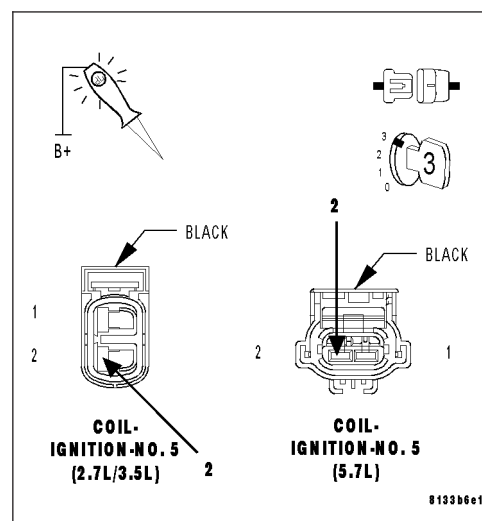
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**ON constantly.**

Go To 6

**OFF constantly.**

Go To 7

**6. (K16) COIL CONTROL NO.5 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

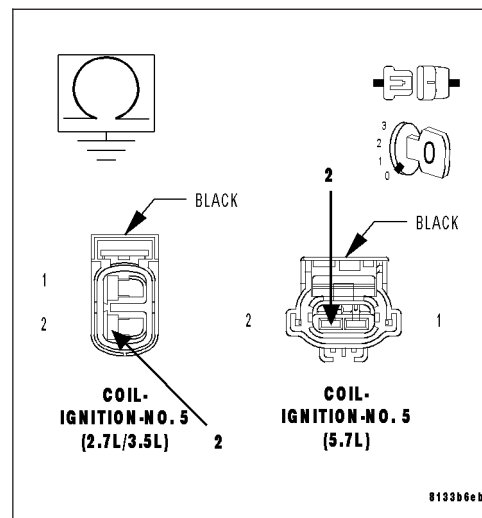
Measure the resistance between ground and the (K16) Coil Control No.5 circuit in the Ignition Coil harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K16) Coil Control No.5 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P2314-IGNITION COIL 5 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****7. (K16) COIL CONTROL NO.5 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

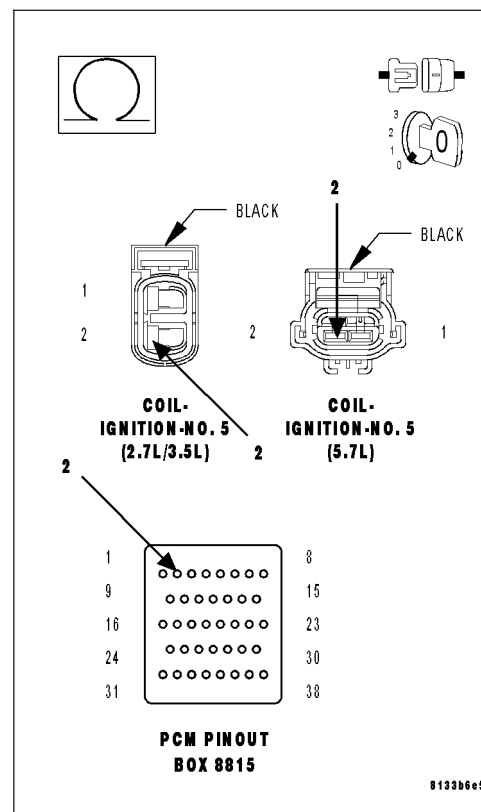
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K16) Coil Control No.5 circuit from the Ignition Coil harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (K16) Coil Control No.5 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**8. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P2314-IGNITION COIL 5 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****9. Visual and Physical Inspection**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broken electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

**Were any of the above conditions present?**

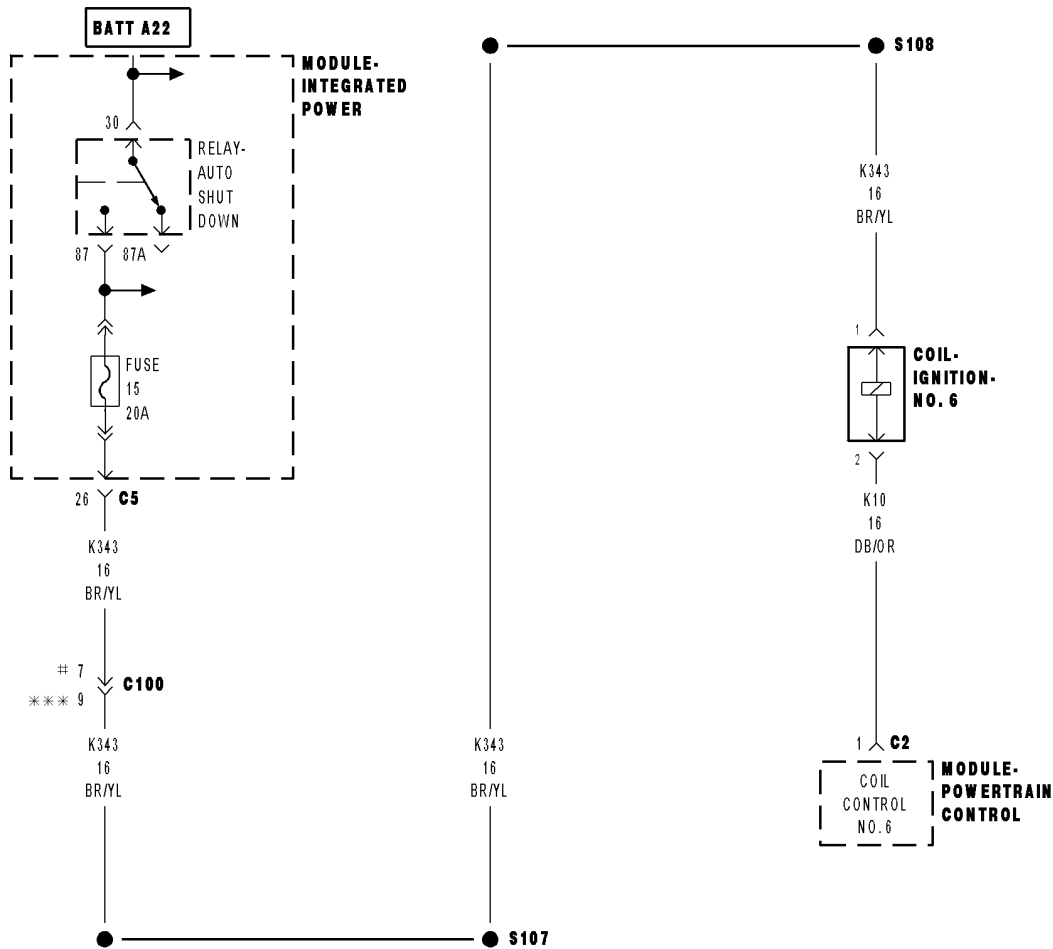
**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

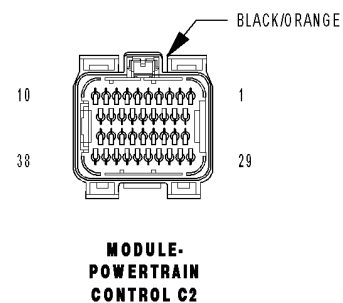
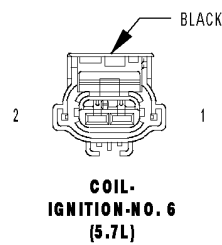
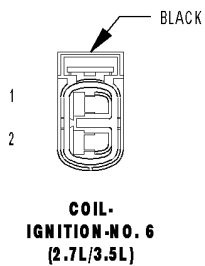
**No** >> Refer to the INTERMITTENT CONDITION symptom in the Driveability category.

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## P2317-IGNITION COIL 6 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION



≠ 2.7L/3.5L  
\*\*\* 5.7L



**P2317-IGNITION COIL 6 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running and battery voltage greater than 10 volts.

- **Set Condition:**

If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected.  
One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT
(K10) COIL CONTROL NO.6 CIRCUIT OPEN
(K10) COIL CONTROL NO.6 CIRCUIT SHORTED TO GROUND
SPARK PLUG
COIL ON PLUG
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

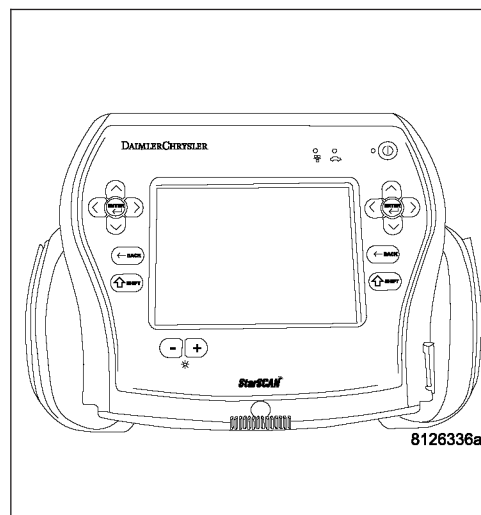
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Go To 9

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P2317-IGNITION COIL 6 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****2. Secondary Spark**

**Note:** Inspect the ignition coil for damage, carbon tracking on the coil or a damaged spark plug insulator boot. If a problem is found, replace the ignition coil.

Turn the ignition off.

Remove the ignition coil.

Install a spark tester to the ignition coil.

**Note:** On the 2.7 and 3.5L engines, cylinders 1, 3 and 5, it is necessary to remove the upper intake to access the ignition coils. Once the ignition coil has been removed from the cylinder head, the intake must be reinstalled to be able to crank the engine. Move the ignition coil harness connector through the slots in the upper intake and then connect the coil to the harness connector. Secure the upper intake to the lower intake in accordance with the service information. While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark generated?**

**Yes** >> Ensure the cylinder is operating properly. If OK, replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K343) ASD RELAY OUTPUT2 CIRCUIT**

Turn the ignition off.

Disconnect the Ignition Coil harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2 circuit in the Coil on Plug harness connector.

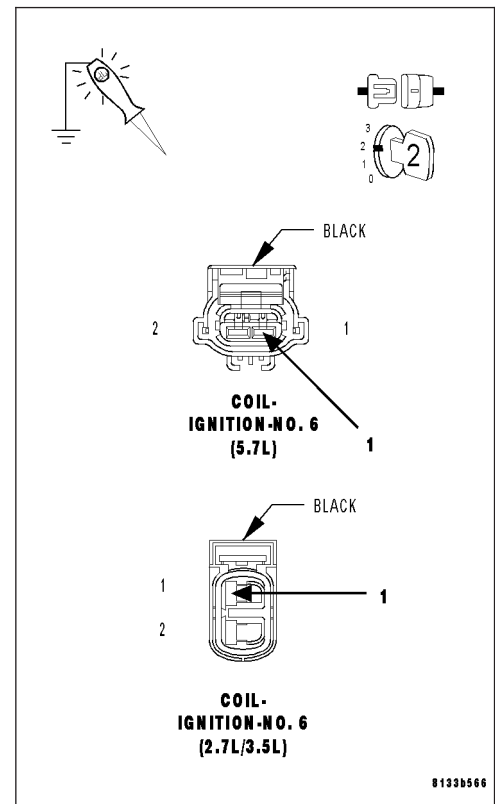
**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open or short to ground in the (K343) ASD Relay Output 2 circuit between the IPM and Coil harness connector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**Note:** Stop All Actuations.



**P2317-IGNITION COIL 6 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****4. IGNITION COIL RESISTANCE**

Turn the ignition off.

**Note:** The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Ignition Coil.

**Is the resistance between .55 to 1.5 ohms at 77°F (25°C) for the Ignition Coil being tested?**

**Yes** >> Go To 5

**No** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. IGNITION COIL**

Using a 12-volt test light connected to a 12-volt source, probe the (K10) Coil Control No.6 circuit.

Crank the engine for 5 seconds while observing the test light.

**What is the condition of the test light while cranking the engine?**

**Brightly blinking.**

Replace the Ignition Coil.

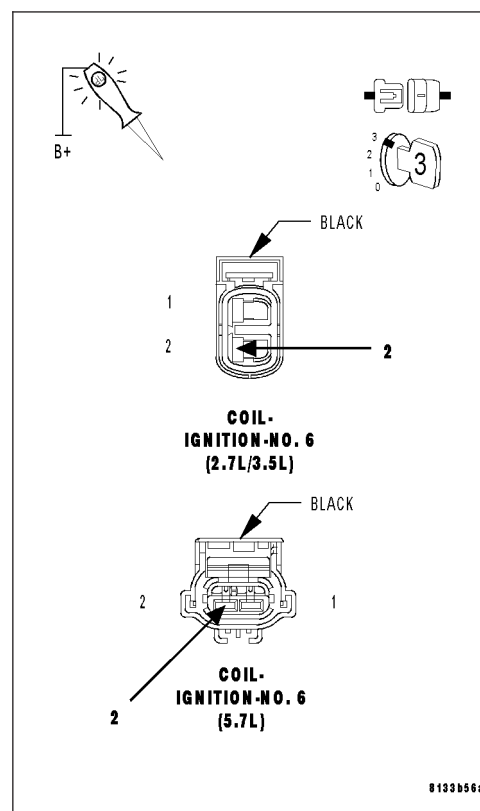
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**ON constantly.**

Go To 6

**OFF constantly.**

Go To 7



**P2317-IGNITION COIL 6 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****6. (K10) COIL CONTROL NO.6 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

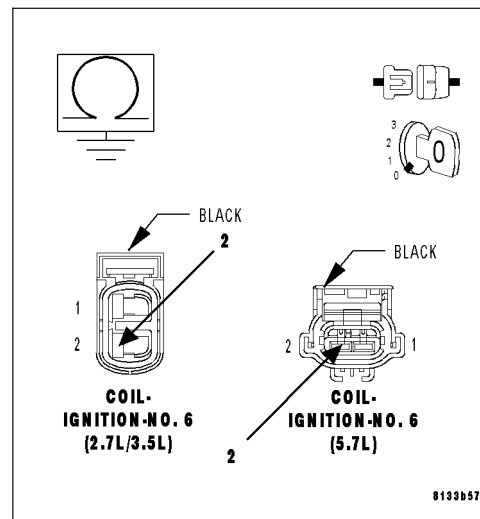
Measure the resistance between ground and the (K10) Coil Control No.6 circuit in the Ignition Coil harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K10) Coil Control No.6 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8

**7. (K10) COIL CONTROL NO.6 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

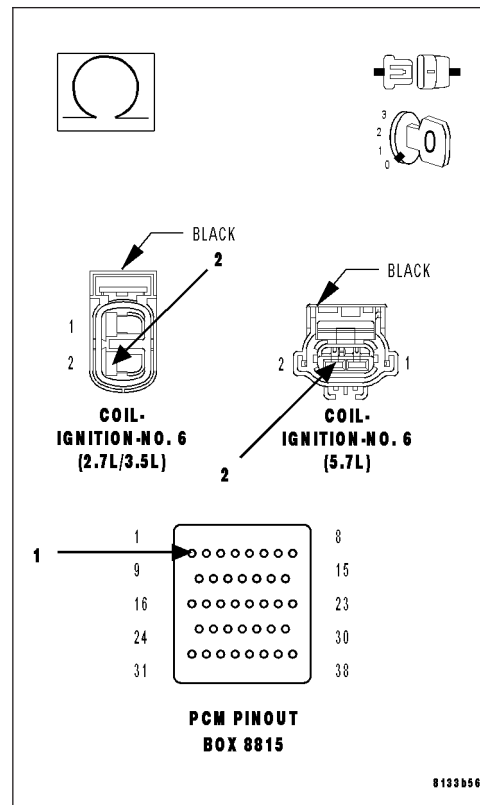
Measure the resistance of the (K10) Coil Control No.6 circuit from the Ignition Coil harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (K10) Coil Control No.6 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2317-IGNITION COIL 6 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****8. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

---

**9. Visual and Physical Inspection**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broken electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

**Were any of the above conditions present?**

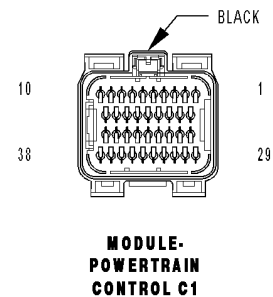
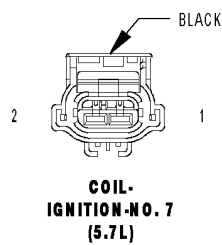
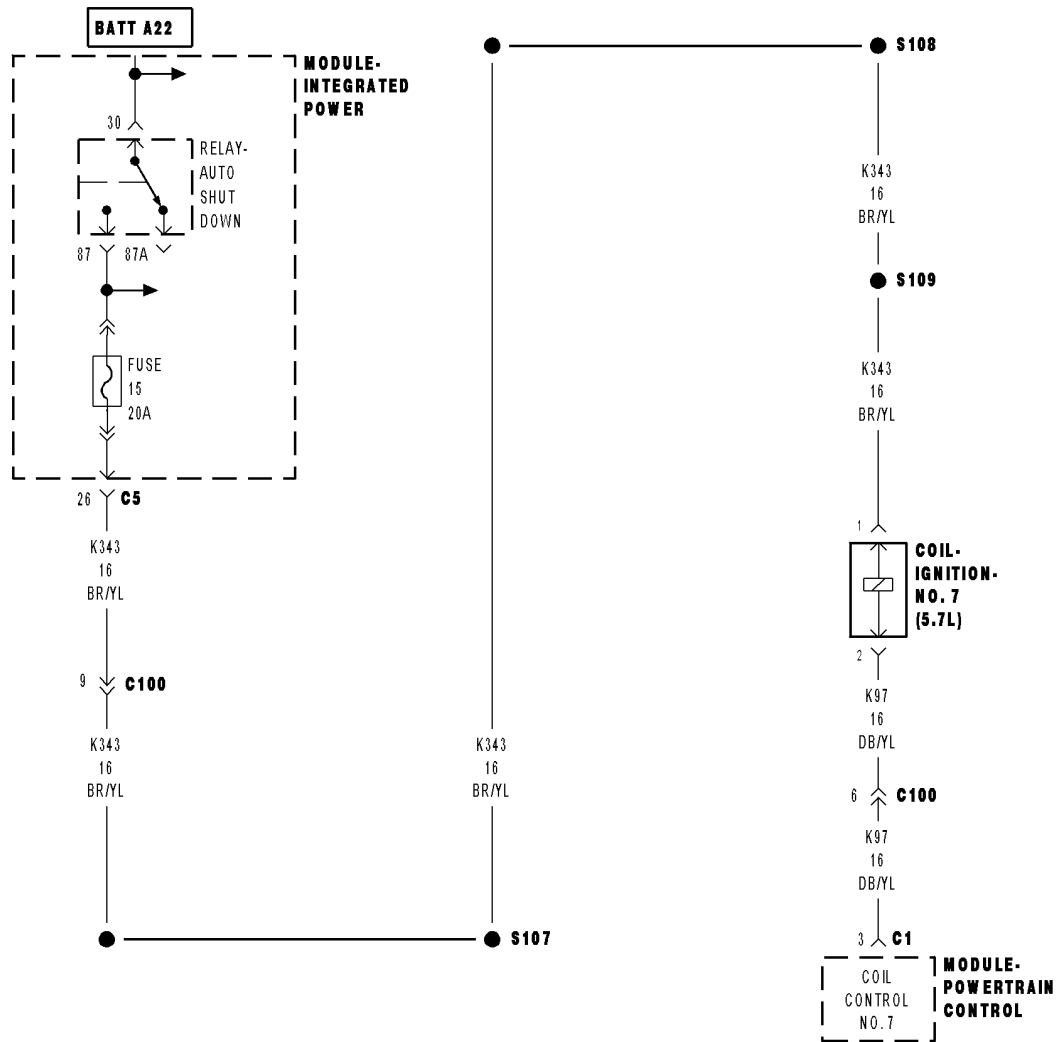
**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Refer to the INTERMITTENT CONDITION symptom in the Driveability category.

---

## P2320-IGNITION COIL 7 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION



**P2320-IGNITION COIL 7 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Engine running and battery voltage greater than 10 volts.
- **Set Condition:**  
If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected.  
One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K97) COIL CONTROL NO.7 CIRCUIT OPEN (K97) COIL CONTROL NO.7 CIRCUIT SHORTED TO GROUND SPARK PLUG COIL ON PLUG PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

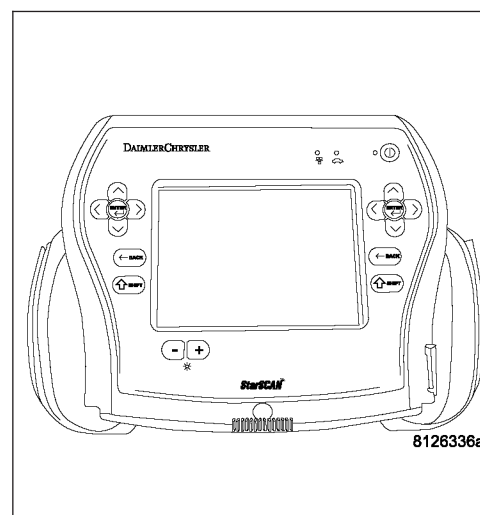
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Go To 9

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2320-IGNITION COIL 7 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****2. Secondary Spark**

**Note:** Inspect the ignition coil for damage, carbon tracking on the coil or a damaged spark plug insulator boot. If a problem is found, replace the ignition coil.

Turn the ignition off.

Remove the ignition coil.

Install a spark tester to the ignition coil.

While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark generated?**

**Yes** >> Ensure the cylinder is operating properly. If OK, replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (K343) ASD RELAY OUTPUT2 CIRCUIT**

Turn the ignition off.

Disconnect the Ignition Coil harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2 circuit in the Coil on Plug harness connector.

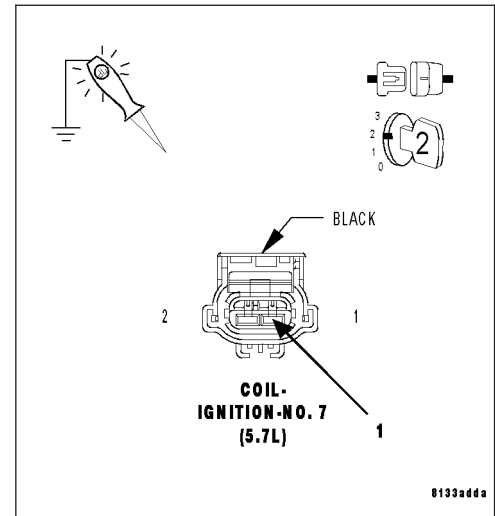
**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open or short to ground in the (K343) ASD Relay Output 2 circuit between the IPM and Coil harness connector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**Note:** Stop All Actuations.

**4. IGNITION COIL RESISTANCE**

Turn the ignition off.

**Note:** The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Ignition Coil.

**Is the resistance between .55 to 1.5 ohms at 77°F (25°C) for the Ignition Coil being tested?**

**Yes** >> Go To 5

**No** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P2320-IGNITION COIL 7 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****5. IGNITION COIL**

Using a 12-volt test light connected to a 12-volt source, probe the (K97) Coil Control No.7 circuit.

Crank the engine for 5 seconds while observing the test light.

**What is the condition of the test light while cranking the engine?**

**Brightly blinking.**

Replace the Ignition Coil.

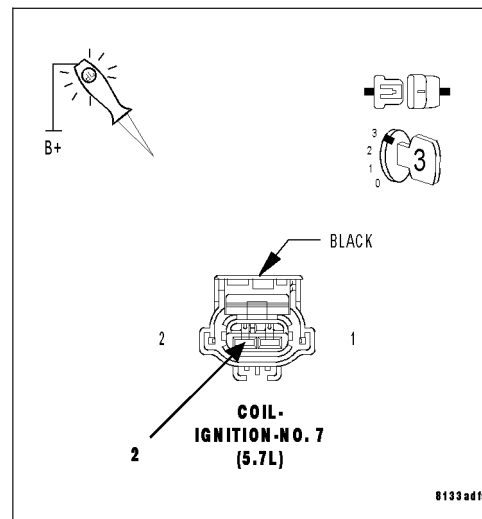
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**ON constantly.**

Go To 6

**OFF constantly.**

Go To 7

**6. (K97) COIL CONTROL NO.7 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

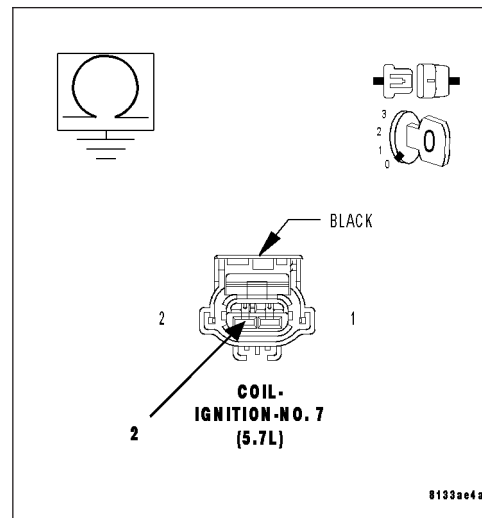
Measure the resistance between ground and the (K97) Coil Control No.7 circuit in the Ignition Coil harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K97) Coil Control No.7 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8





**P2320-IGNITION COIL 7 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****7. (K97) COIL CONTROL NO.7 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

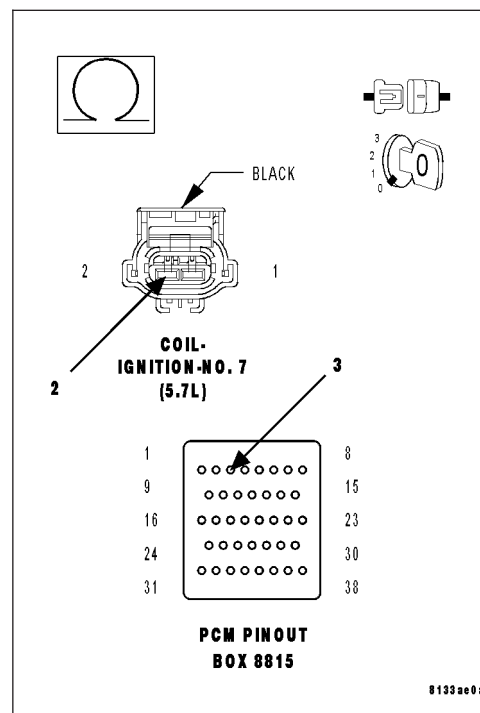
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K97) Coil Control No.7 circuit from the Ignition Coil harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (K97) Coil Control No.7 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**8. PCM**

**Note: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P2320-IGNITION COIL 7 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****9. Visual and Physical Inspection**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broken electrode

**Note:** Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.

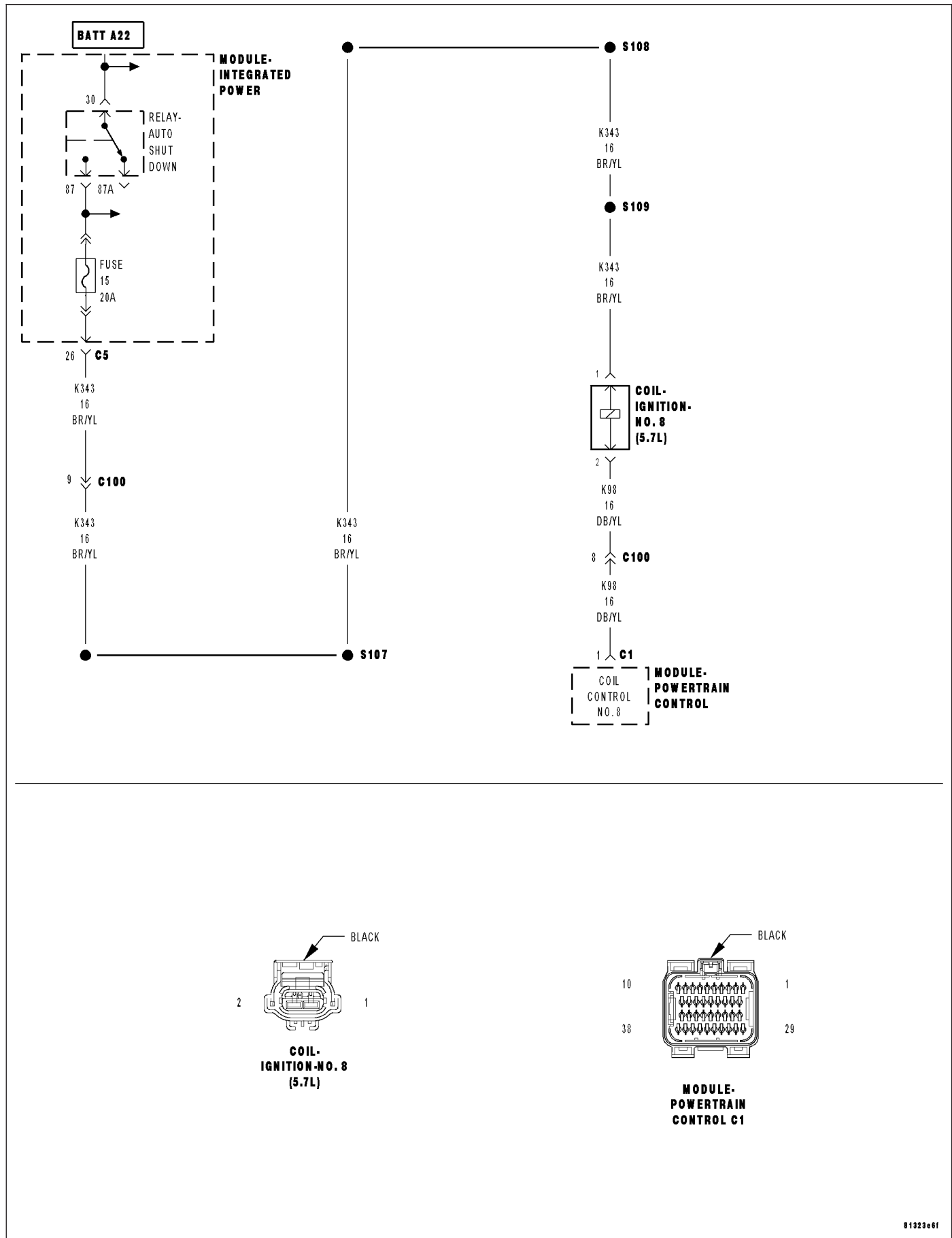
**Were any of the above conditions present?**

**Yes** >> Replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Refer to the INTERMITTENT CONDITION symptom in the Driveability category.

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**P2323-IGNITION COIL 8 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION**

**P2323-IGNITION COIL 8 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Engine running and battery voltage greater than 10 volts.

- **Set Condition:**

If PCM detects that the secondary ignition burn time is incorrect, too short, or not present, an error is detected.  
One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
(K343) ASD RELAY OUTPUT 2 CIRCUIT (K98) COIL CONTROL NO.8 CIRCUIT OPEN (K98) COIL CONTROL NO.8 CIRCUIT SHORTED TO GROUND SPARK PLUG COIL ON PLUG PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

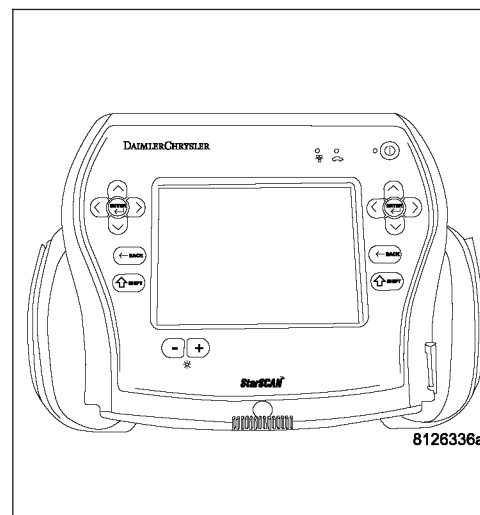
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Go To 9

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2323-IGNITION COIL 8 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****2. Secondary Spark**

**Note:** Inspect the ignition coil for damage, carbon tracking on the coil or a damaged spark plug insulator boot. If a problem is found, replace the ignition coil.

Turn the ignition off.

Remove the ignition coil.

Install a spark tester to the ignition coil.

While cranking the engine observe the spark coming from the spark tester.

**Note:** A crisp blue spark that is able to jump the gap of the spark tester should be generated.

**Is good spark generated?**

**Yes** >> Ensure the cylinder is operating properly. If OK, replace the Spark Plug.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

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**3. (K343) ASD RELAY OUTPUT2 CIRCUIT**

Turn the ignition off.

Disconnect the Ignition Coil harness connector.

Ignition on, engine not running.

With a scan tool, actuate the ASD Relay.

Using a 12-volt test light connected to ground, probe the (K343) ASD Relay Output 2 circuit in the Coil on Plug harness connector.

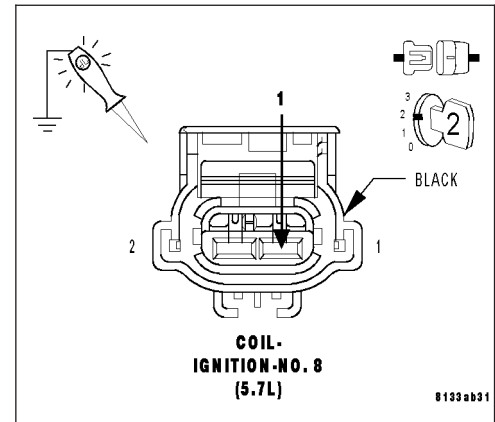
**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open or short to ground in the (K343) ASD Relay Output 2 circuit between the IPM and Coil harness connector.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**Note:** Stop All Actuations.



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**4. IGNITION COIL RESISTANCE**

Turn the ignition off.

**Note:** The following resistance measurement should be taken at 70°-80° F.

Measure the resistance of the Ignition Coil.

**Is the resistance between .55 to 1.5 ohms at 77°F (25°C) for the Ignition Coil being tested?**

**Yes** >> Go To 5

**No** >> Replace the Ignition Coil.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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**P2323-IGNITION COIL 8 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****5. IGNITION COIL**

Using a 12-volt test light connected to a 12-volt source, probe the (K98) Coil Control No.8 circuit.

Crank the engine for 5 seconds while observing the test light.

**What is the condition of the test light while cranking the engine?**

**Brightly blinking.**

Replace the Ignition Coil.

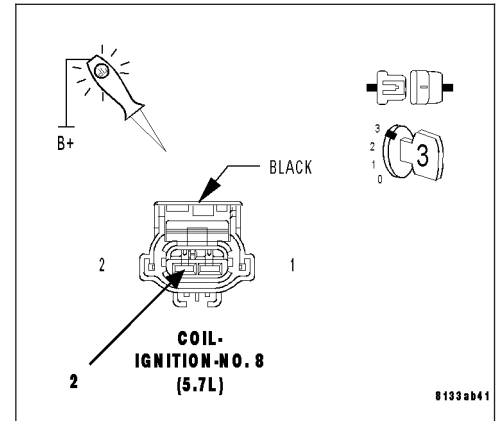
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**ON constantly.**

Go To 6

**OFF constantly.**

Go To 7

**6. (K98) COIL CONTROL NO.8 CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

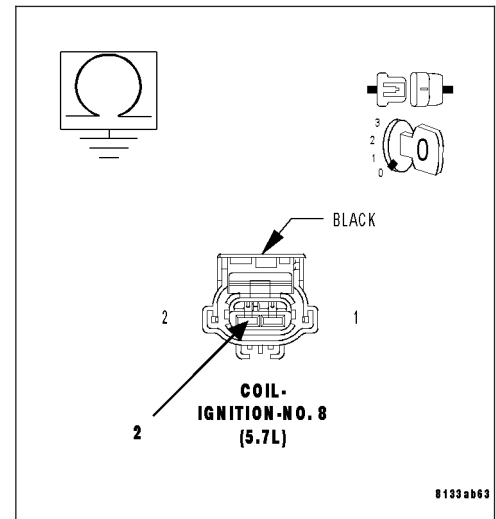
Measure the resistance between ground and the (K98) Coil Control No.8 circuit in the Ignition Coil harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K98) Coil Control No.8 circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8



**P2323-IGNITION COIL 8 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****7. (K98) COIL CONTROL NO.8 CIRCUIT OPEN**

Turn the ignition off.

Disconnect the C2 PCM harness connector.

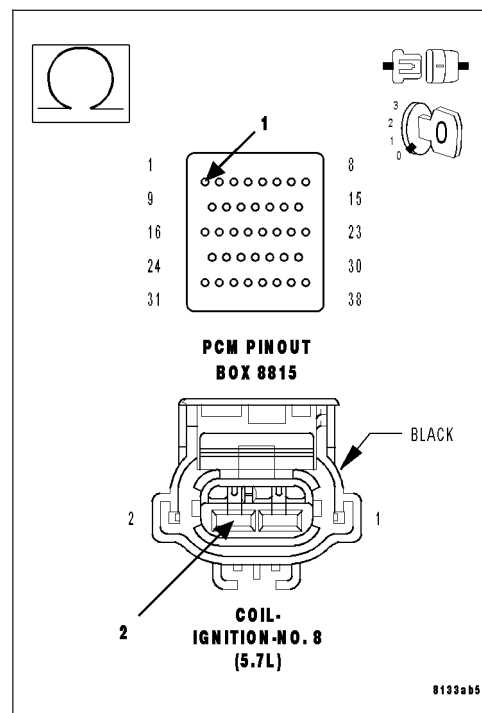
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Measure the resistance of the (K98) Coil Control No.8 circuit from the Ignition Coil harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (K98) Coil Control No.8 circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**8. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P2323-IGNITION COIL 8 SECONDARY CIRCUIT- INSUFFICIENT IONIZATION (CONTINUED)****9. Visual and Physical Inspection**

Turn the ignition off.

Remove the Spark Plug.

Inspect the Spark Plug for the following conditions.

- Cracks
- Carbon Tracking
- Foreign Material
- Gap size out of specifications
- Loose or broken electrode

**Note: Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.**

**Were any of the above conditions present?**

**Yes** >> Replace the Spark Plug.

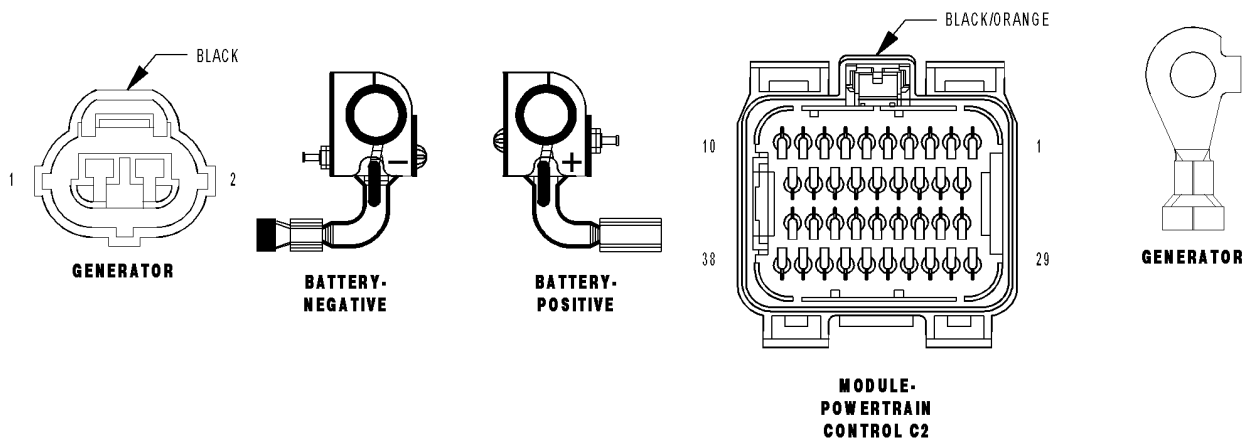
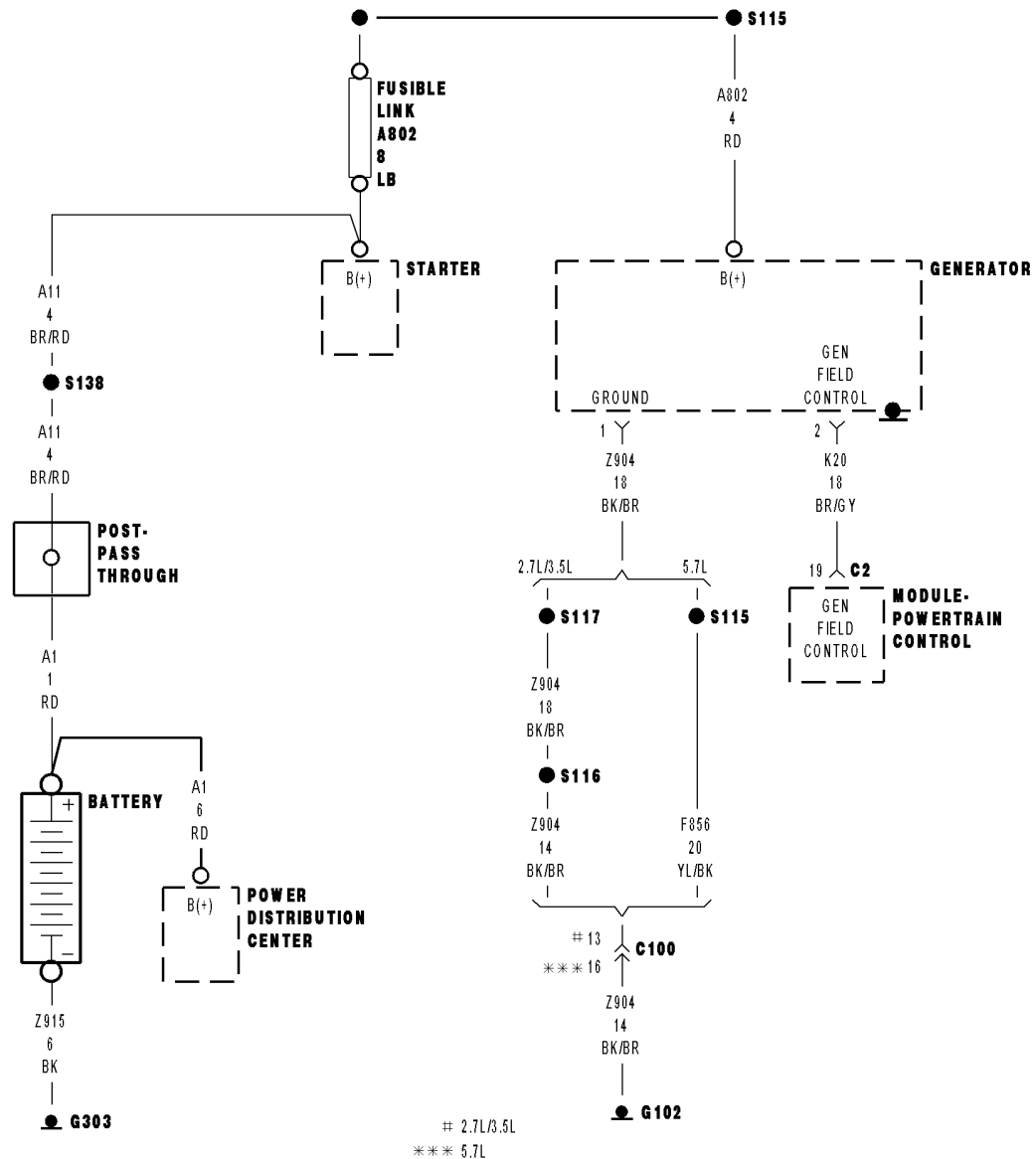
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Refer to the INTERMITTENT CONDITION symptom in the Driveability category.

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## P2503-CHARGING SYSTEM OUTPUT LOW



**P2503-CHARGING SYSTEM OUTPUT LOW (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The engine running. The engine speed greater than 1157 RPM.

- **Set Condition:**

The battery sensed voltage is 1 volt below the charging goal for 13.47 seconds. The PCM senses the battery voltage turns off the field driver and senses the battery voltage again. If the voltages are the same, the code is set. One Trip Fault. Three good trips to turn off the MIL.

Possible Causes
EXCESSIVE RESISTANCE IN THE BATTERY POSITIVE CIRCUIT EXCESSIVE RESISTANCE IN THE CASE GROUND (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE (K20) GEN FIELD CONTROL CIRCUIT OPEN (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO GROUND (Z904) GEN GROUND CIRCUIT OPEN GENERATOR PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Inspect the vehicle for aftermarket accessories that may exceed the Generator System output.

Ignition on, engine not running.

**Note:** The battery must be fully charged.

**Note:** The Generator belt tension and condition must be checked before continuing.

With a scan tool, read DTCs.

With a scan tool, erase DTCs.

Start the engine.

Allow the idle to stabilize.

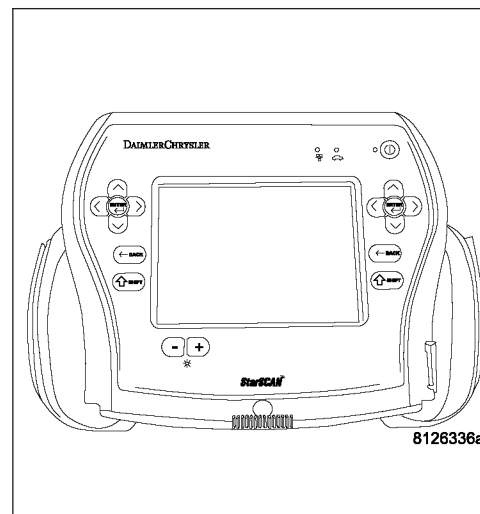
With the scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2503-CHARGING SYSTEM OUTPUT LOW (CONTINUED)****2. FUSED B+ CIRCUIT HIGH RESISTANCE**

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Ignition on, engine not running.

**Note:** Make sure all wires are clear of the engine's moving parts.

Measure the voltage between the Generator B+ Output Terminal and the Battery+ Post.

Start the engine.

**Is the voltage above 0.4 of a volt?**

**Yes** >> Repair the excessive resistance in the battery positive circuit between the Generator and Battery.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. EXCESSIVE RESISTANCE IN THE CASE GROUND**

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Start the engine.

Warm the engine to operating temperature.

**Note:** Make sure all wires are clear of the engine's moving parts.

Measure the voltage between the Generator Case and Battery ground post.

**Is the voltage above 0.1 of a volt?**

**Yes** >> Repair the excessive resistance in the Generator Case Ground.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 4

**4. GENERATOR OPERATION**

Turn the ignition off.

Disconnect the Generator Field harness connector.

Using a 12-volt test light, jump across the Generator Field harness connector.

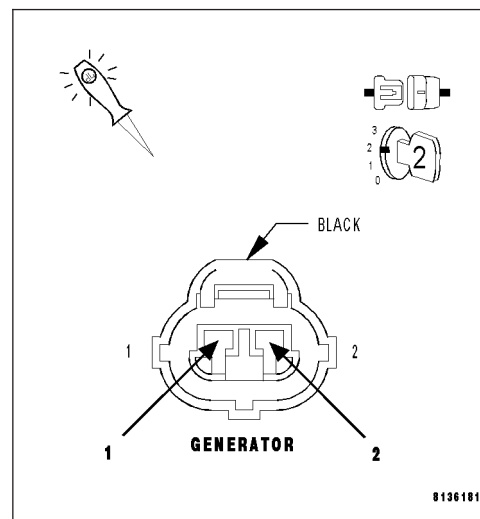
Ignition on, engine not running.

With a scan tool, actuate the Generator Field Driver.

**Does the test light illuminate brightly and flash on and off?**

**Yes** >> Replace the Generator.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5



**P2503-CHARGING SYSTEM OUTPUT LOW (CONTINUED)****5. (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Ignition on, engine not running.

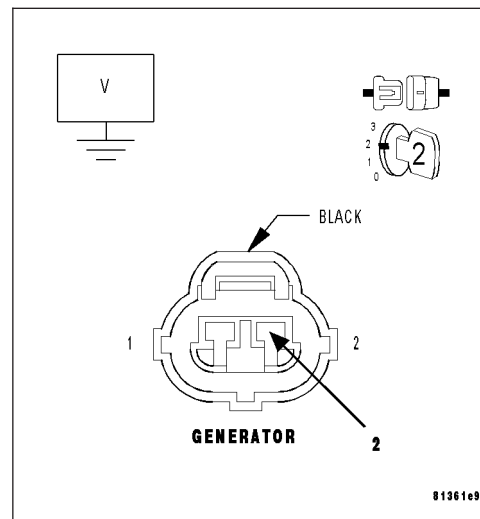
Measure the voltage on the (K20) Gen Field Control circuit in the Generator Field harness connector.

**Is the voltage above 1.0 volt?**

**Yes** >> Repair the short to battery voltage in the (K20) Gen Field Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6

**6. (K20) FIELD CONTROL CIRCUIT OPEN**

Turn the ignition off.

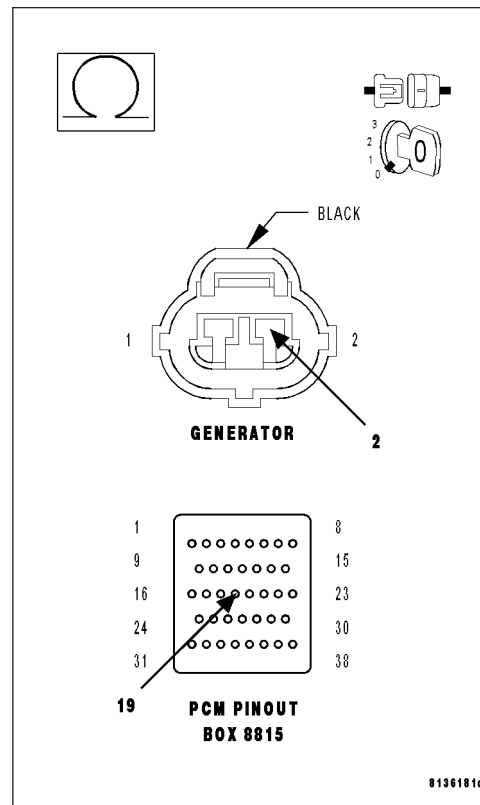
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (K20) Gen Field Control circuit from the Generator Field harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K20) Gen Field Control circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P2503-CHARGING SYSTEM OUTPUT LOW (CONTINUED)****7. (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO GROUND**

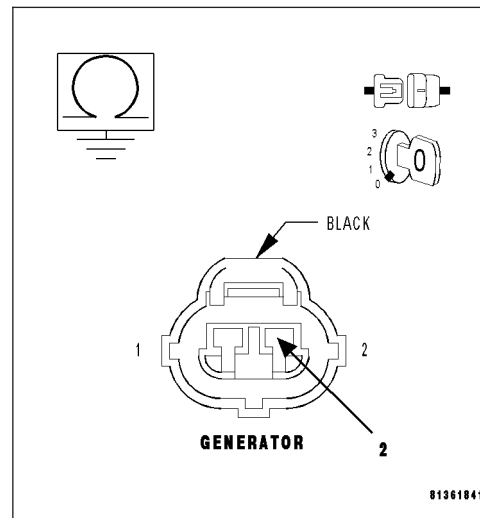
Measure the resistance between ground and the (K20) Gen Field Control circuit in the Generator Field harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K20) Gen Field Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 8

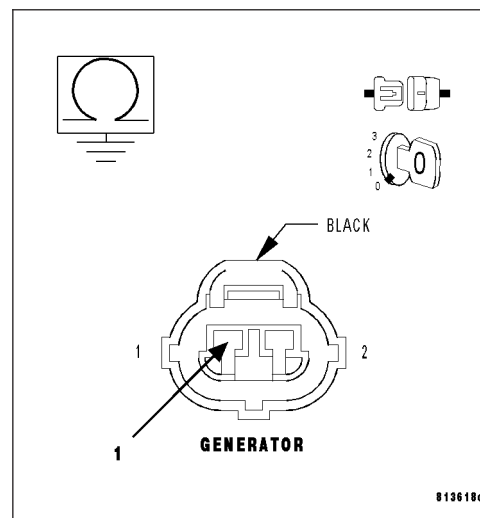
**8. (Z904) GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to battery voltage, probe the (Z904) Ground circuit in the Generator Field harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 9

**No** >> Repair the open in the (Z904) Generator Ground circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**9. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P3400-MDS RATIONALITY BANK 1

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

### Theory of Operation

When all criteria has been met, power is supplied to each MDS Solenoid when the engine is making a transition from 8 cylinder mode to 4 cylinder mode. By actuating the solenoid, oil pressure is raised to the pair of lifters that coincide with each particular solenoid. The oil pressure pushes in the locking pins that allows the lifter to collapse, decoupling the valves and camshaft.

- **When Monitored:**  
Transition from 8 to 4 cylinder mode.
- **Set Condition:**  
O2 sensor readings on Bank 1 side indicate a lean condition while in 4 cylinder mode.

Possible Causes
INSUFFICIENT OIL PRESSURE ACTING ON THE LIFTER LOCKING PINS
OIL PASSAGES RESTRICTED
LIFTER
MDS SOLENOID

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

### Diagnostic Test

#### 1. ACTIVE DTC

Ignition on, engine not running.

With a scan tool, read DTCs.

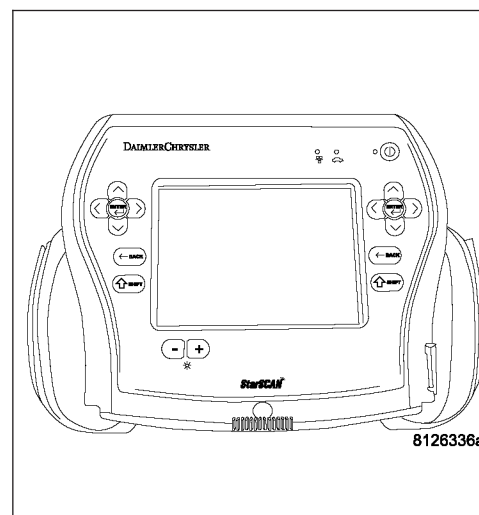
**Note: Diagnose any Oil Pressure DTCs before continuing.**

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3400-MDS RATIONALITY BANK 1 (CONTINUED)****2. MDS SOLENOID 1**

Turn the ignition off.

Remove the Intake Manifold per Service Information.

Turn the ignition on.

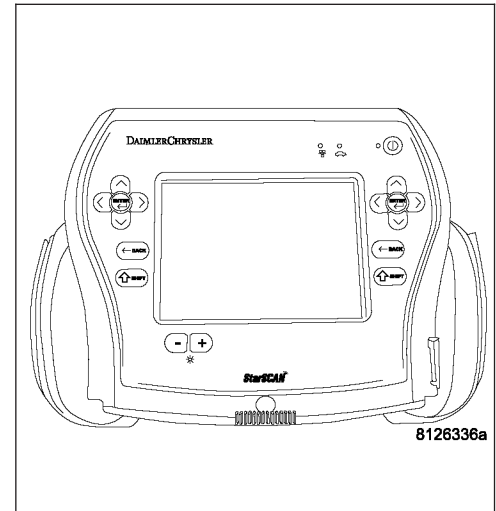
With the scan tool actuate the MDS Solenoid 1.

**Can you feel and hear the Solenoid Actuating?**

**Yes** >> Go To 3

**No** >> Remove the Solenoid and check for any debris that may be blocking the oil passages to the Solenoid. If the passages are clogged, clean the passages and replace the MDS Solenoid 1. If the passages are not clogged with debris, replace the MDS Solenoid 1.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**3. MDS SOLENOID 7**

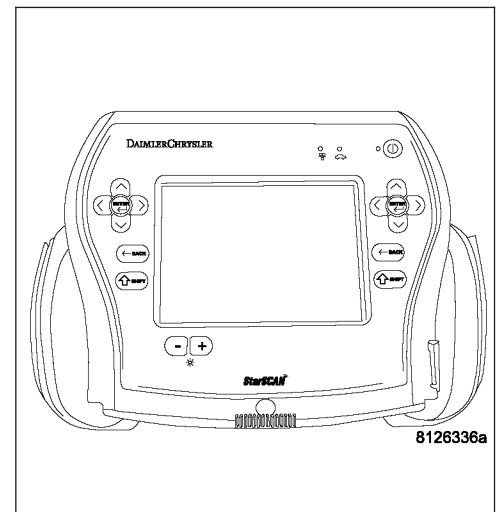
With the scan tool actuate the MDS Solenoid 7.

**Can you feel and hear the Solenoid Actuating?**

**Yes** >> Go To 4

**No** >> Remove the Solenoid and check for any debris that may be blocking the oil passages to the Solenoid. If the passages are restricted, clean the passages and replace the MDS Solenoid 7. If the passages are not clogged with debris, replace the MDS Solenoid 7.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3400-MDS RATIONALITY BANK 1 (CONTINUED)****4. OIL PASSAGES RESTRICTED**

Turn the ignition off.

Remove both Solenoids on Bank 1 of the engine block.

Remove the Bank 1 Cylinder Head per Service Information.

Remove the Lifters from the left engine bank.

Inspect the oil passages to the Solenoids and from the Solenoids to the lifters.

**Are the passages blocked?**

**Yes** >> Clean the oil passages as necessary. If the entire engine is restricted disassembly of the entire engine block may be necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

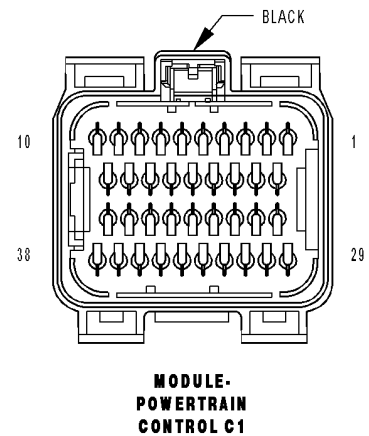
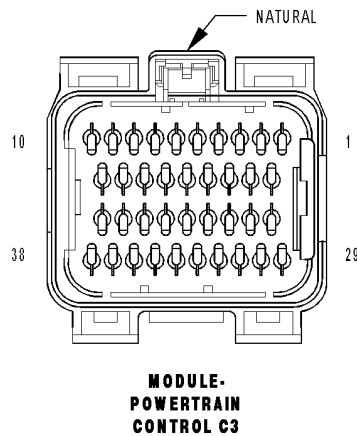
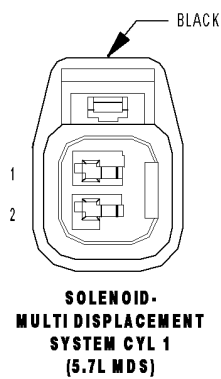
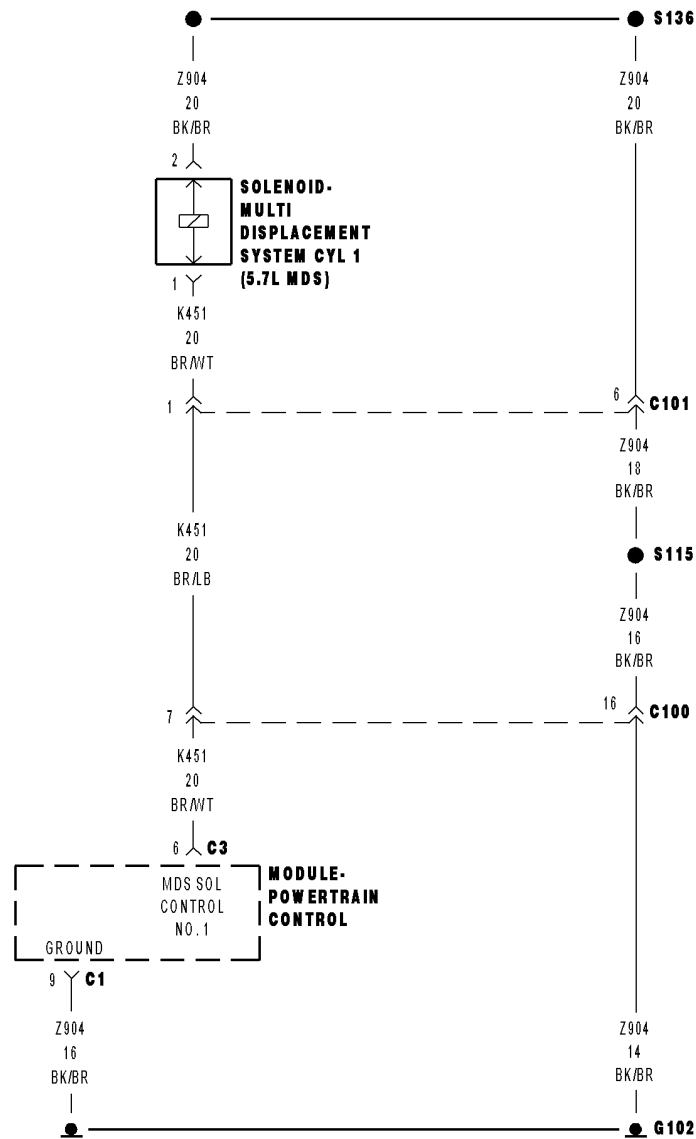
**No** >> Replace both sets of lifters if no other possible causes remain.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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## P3401-MDS SOLENOID 1 CIRCUIT



**P3401-MDS SOLENOID 1 CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

When all criteria has been met, power is supplied to each MDS Solenoid when the engine is making a transition from 8 cylinder mode to 4 cylinder mode. By actuating the solenoid, oil pressure is raised to the pair of lifters that coincide with each particular solenoid. The oil pressure pushes in the locking pins that allows the lifter to collapse, decoupling the valves and camshaft.

- **When Monitored:**  
Transition from 8 to 4 cylinder mode.
- **Set Condition:**  
When the PCM recognizes a problem with the Solenoid Control circuit.

Possible Causes
(K451) MDS SOLENOID NO.1 CONTROL SHORT TO BATTERY VOLTAGE
(K451) MDS SOLENOID NO.1 CONTROL SHORT TO GROUND
(K451) MDS SOLENOID NO.1 CONTROL OPEN
(Z904) GROUND CIRCUIT OPEN
MDS SOLENOID NO.1
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

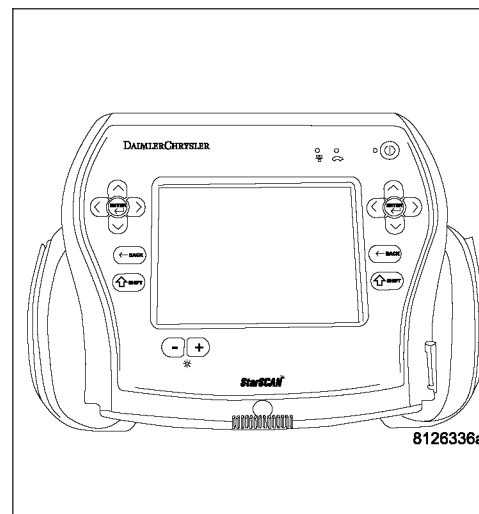
**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3401-MDS SOLENOID 1 CIRCUIT (CONTINUED)****2. MDS SOLENOID NO.1**

Turn the ignition off.

Gain access to the MDS Solenoid No.1..

Disconnect the MDS Solenoid No.1 harness connector.

Ignition on, engine not running.

Turn off all accessories.

Using a 12-volt test light connected to the (Z904) Ground circuit, probe the (K451) MDS Solenoid No.1 Control circuit.

With a scan tool, actuate the MDS Solenoid 1.

**Does the 12-volt test light flash on and off?**

**Yes** >> Replace the MDS Solenoid No.1.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (Z904) GROUND CIRCUIT OPEN**

Turn the ignition off.

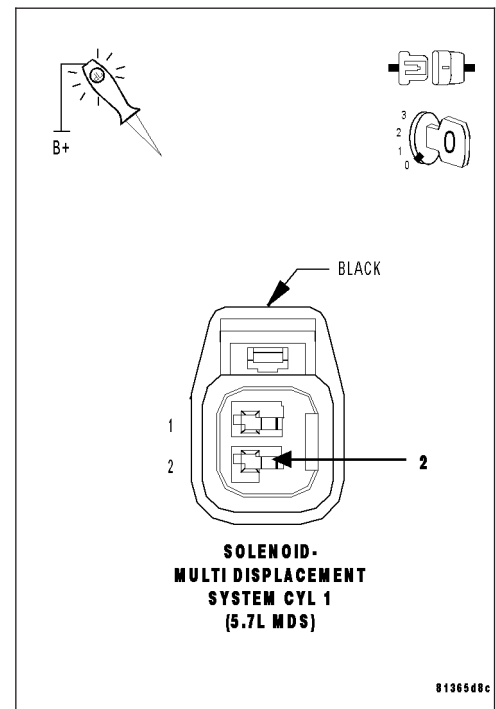
Using a 12-volt test light connected to the 12-volts, probe the (Z904) Ground circuit in the MDS Solenoid No.1 harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open in the (Z904) Ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3401-MDS SOLENOID 1 CIRCUIT (CONTINUED)****4. (K451) MDS SOLENOID NO.1 CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Disconnect the PCM harness connector.

Ignition on, engine not running.

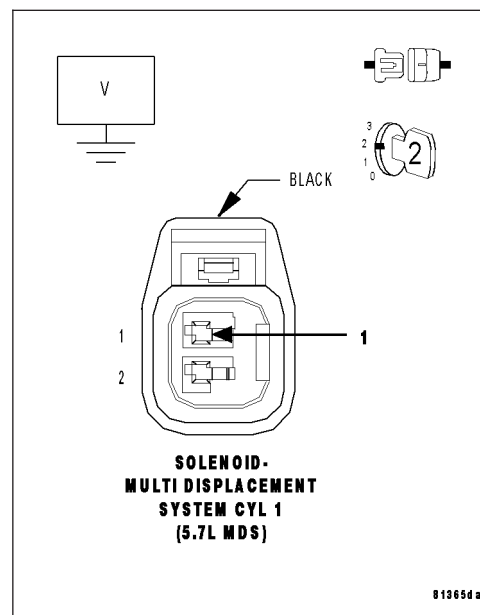
Measure the voltage on the (K451) MDS Solenoid No.1 Control circuit in the MDS Solenoid No.1 connector.

**Is the voltage above 1.0 volt?**

**Yes** >> Repair the short to battery voltage in the (K451) MDS Solenoid No.1 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K451) MDS SOLENOID NO.1 CONTROL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

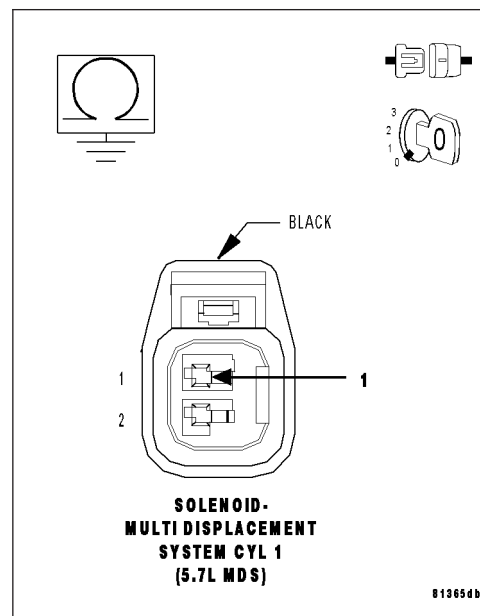
Measure the resistance between ground and the (K451) MDS Solenoid No.1 Control circuit in the MDS Solenoid No.1 harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K451) MDS Solenoid No.1 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P3401-MDS SOLENOID 1 CIRCUIT (CONTINUED)****6. (K451) MDS SOLENOID NO.1 CONTROL CIRCUIT OPEN**

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

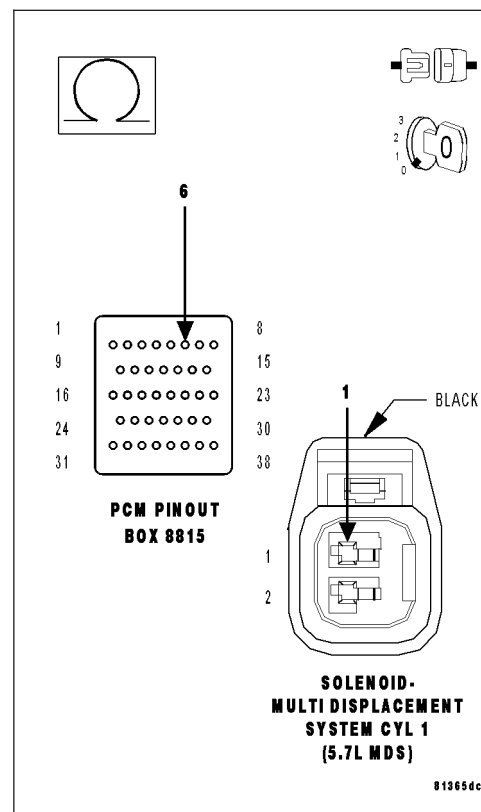
Measure the resistance of the (K451) MDS Solenoid No.1 Control circuit from the MDS Solenoid No.1 harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K451) MDS Solenoid No.1 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

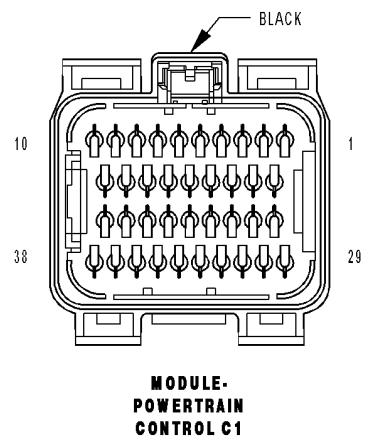
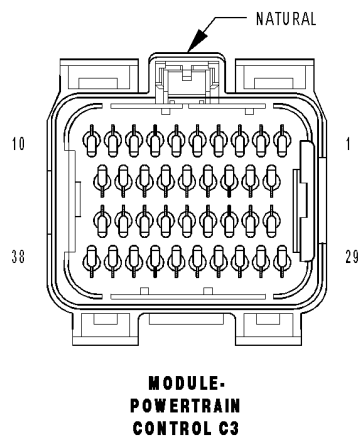
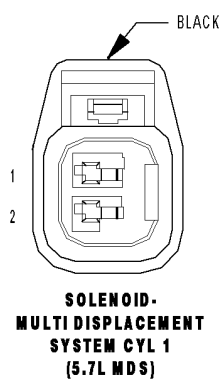
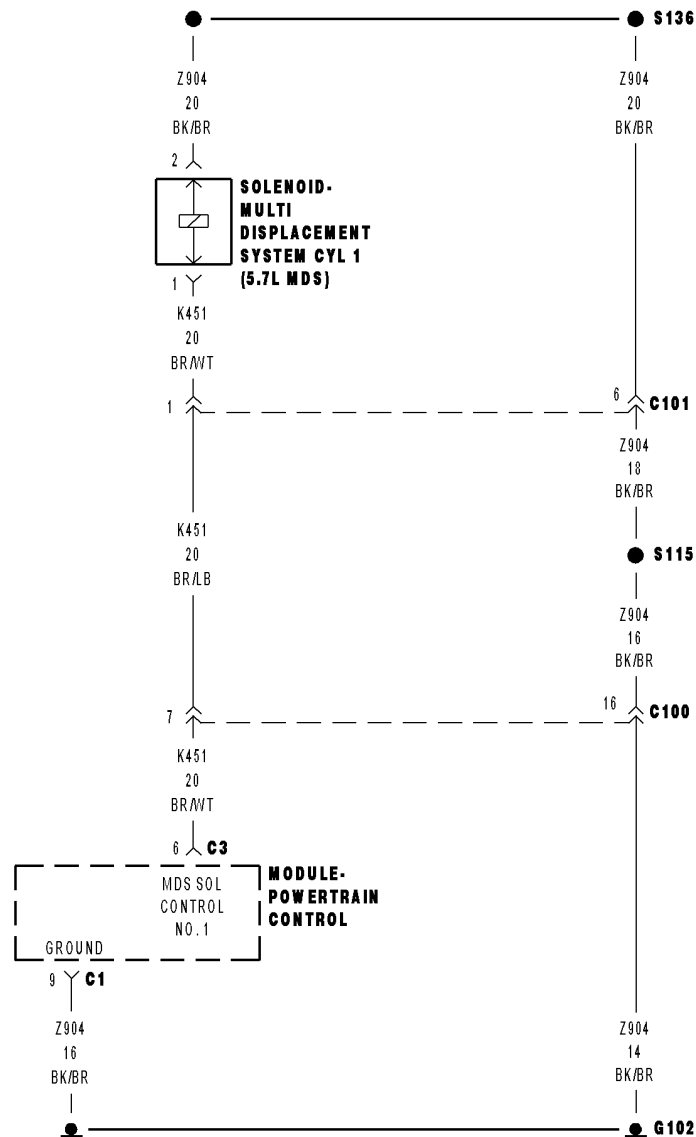
**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P3402-CYLINDER 1 DEACTIVATION CONTROL PERFORMANCE



**P3402-CYLINDER 1 DEACTIVATION CONTROL PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

**Theory of Operation**

When all criteria has been met, power is supplied to each MDS Solenoid when the engine is making a transition from 8 cylinder mode to 4 cylinder mode. By actuating the solenoid, oil pressure is raised to the pair of lifters that coincide with each particular solenoid. The oil pressure pushes in the locking pins that allows the lifter to collapse, decoupling the valves and camshaft.

- **When Monitored:**  
Transition from 8 to 4 cylinder mode.
- **Set Condition:**  
The MDS fails to disengage for cylinder 1.

Possible Causes
(K451) MDS SOLENOID NO.1 CONTROL SHORT TO VOLTAGE OIL PASSAGES RESTRICTED LIFTER MDS SOLENOID NO.1 PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

**Diagnostic Test****1. ACTIVE DTC**

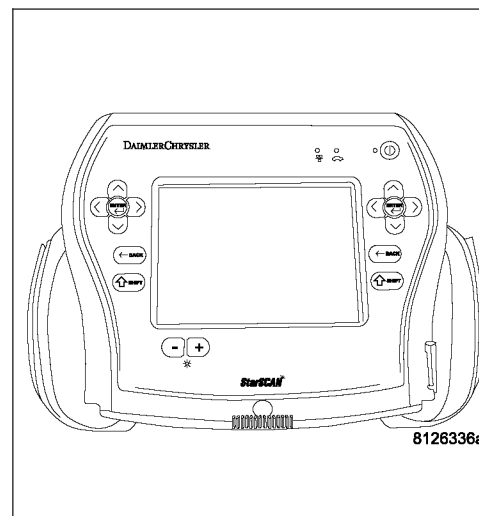
Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3402-CYLINDER 1 DEACTIVATION CONTROL PERFORMANCE (CONTINUED)****2. MDS SOLENOID NO.1 CONTROL CIRCUIT**

Turn the ignition off.

Disconnect the MDS Solenoid No.1 harness connector.

Ignition on, engine not running.

Turn off all accessories.

Using a 12-volt test light connected to ground, probe the (K451) MDS Solenoid No.1 Control circuit.

**Does the 12-volt test light illuminate?**

**Yes** >> Go To 3

**No** >> Go To 4

**3. (K451) MDS SOLENOID NO.1 CONTROL CIRCUIT SHORTED TO VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Turn the ignition on.

Measure the voltage on (K451) MDS Solenoid No.1 Control circuit in the MDS Solenoid No.1 harness connector.

**Is voltage present?**

**Yes** >> Repair the short to voltage in the (K451) MDS Solenoid No.1 Control circuit.

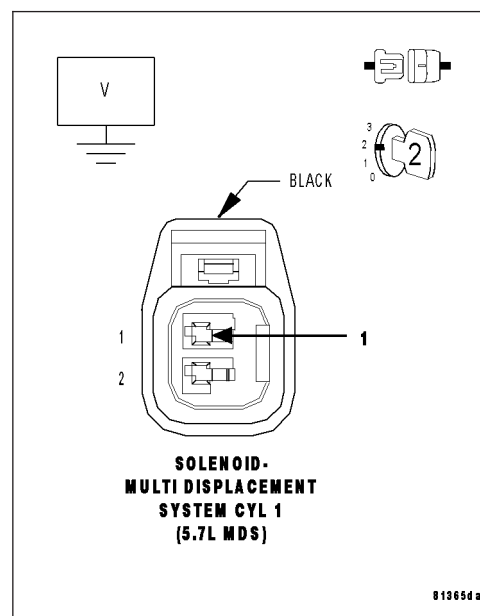
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >>

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P3402-CYLINDER 1 DEACTIVATION CONTROL PERFORMANCE (CONTINUED)****4. MDS SOLENOID 1**

Turn the ignition off.

Remove the Intake Manifold per Service Information.

Turn the ignition on.

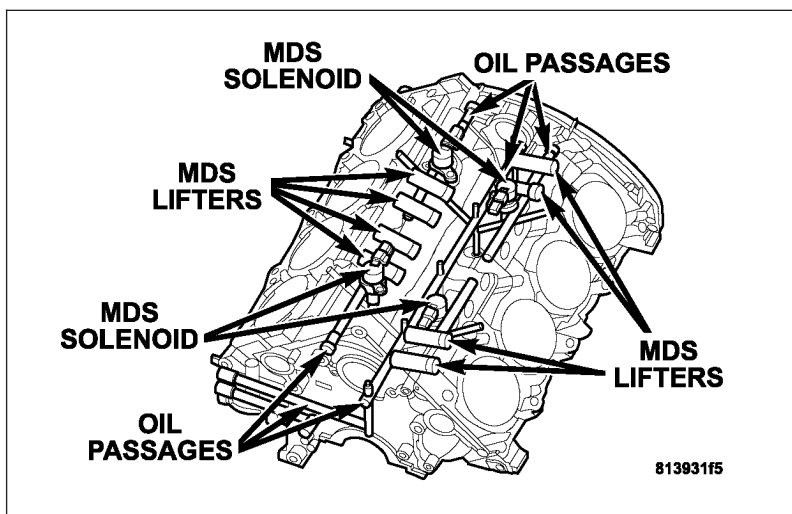
With the scan tool actuate the MDS Solenoid 1.

**Can you feel and hear the Solenoid Actuating?**

**Yes** >> Go To 5

**No** >> Remove the Solenoid and check for any debris that may be blocking the oil passages to the Solenoid. If the passages are clogged, clean the passages and replace the MDS Solenoid 1. If the passages are not clogged with debris, replace the MDS Solenoid 1.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. OIL PASSAGES RESTRICTED**

Turn the ignition off.

Remove both Solenoids on Bank 1 of the engine block.

Remove the Bank 1 Cylinder Head per Service Information.

Remove the Lifters from the left engine bank.

Inspect the oil passages to the Solenoids and from the Solenoids to the lifters.

**Are the passages blocked?**

**Yes** >> Clean the oil passages as necessary. If the entire engine is restricted disassembly of the entire engine block may be necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace both sets of lifters if no other possible causes remain.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3425-MDS SOLENOID 4 CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

When all criteria has been met, power is supplied to each MDS Solenoid when the engine is making a transition from 8 cylinder mode to 4 cylinder mode. By actuating the solenoid, oil pressure is raised to the pair of lifters that coincide with each particular solenoid. The oil pressure pushes in the locking pins that allows the lifter to collapse, decoupling the valves and camshaft.

- **When Monitored:**  
Transition from 8 to 4 cylinder mode.
- **Set Condition:**  
When the PCM recognizes a problem with the Solenoid Control circuit.

**Possible Causes**

(K452) MDS SOLENOID NO.4 CONTROL SHORT TO BATTERY VOLTAGE  
(K452) MDS SOLENOID NO.4 CONTROL SHORT TO GROUND  
(K452) MDS SOLENOID NO.4 CONTROL OPEN  
(Z904) GROUND CIRCUIT OPEN  
MDS SOLENOID NO.4  
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

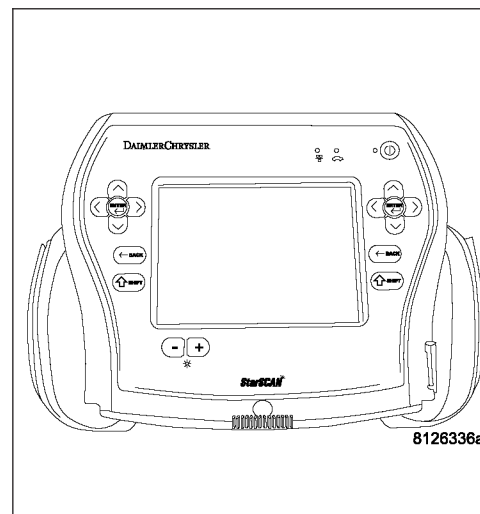
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3425-MDS SOLENOID 4 CIRCUIT (CONTINUED)****2. MDS SOLENOID NO.4**

Turn the ignition off.

Gain access to the MDS Solenoid No. 4.

Disconnect the MDS Solenoid No.4 harness connector.

Ignition on, engine not running.

Turn off all accessories.

Using a 12-volt test light connected to the (Z904) Ground circuit, probe the (K452) MDS Solenoid No.4 Control circuit.

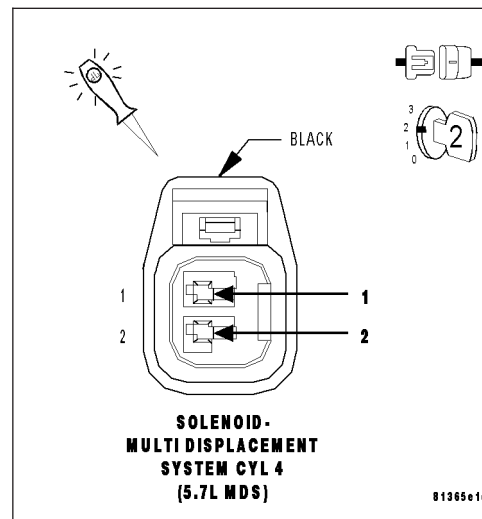
With a scan tool, actuate the MDS Solenoid 4.

**Does the 12-volt test light flash on and off?**

**Yes** >> Replace the MDS Solenoid No.4.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (Z904) GROUND CIRCUIT OPEN**

Turn the ignition off.

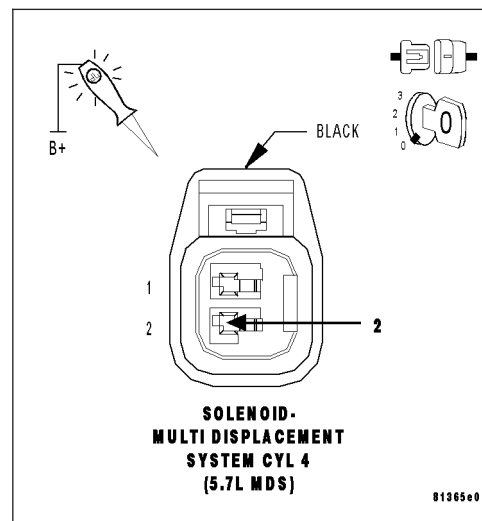
Using a 12-volt test light connected to the 12-volts, probe the (Z904) Ground circuit in the MDS Solenoid No.4 harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open in the (Z904) Ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3425-MDS SOLENOID 4 CIRCUIT (CONTINUED)****4. (K452) MDS SOLENOID NO.4 CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Disconnect the PCM harness connector.

Ignition on, engine not running.

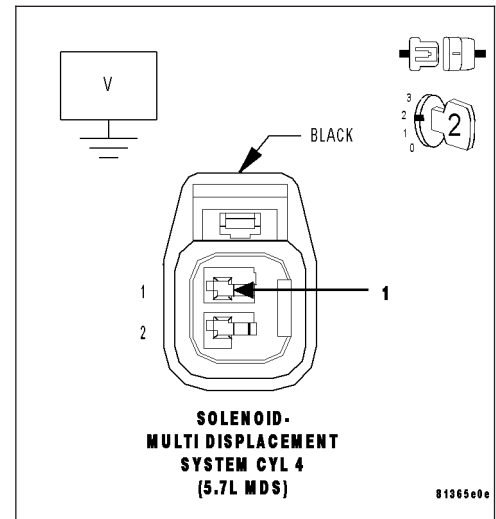
Measure the voltage on the (K452) MDS Solenoid No.4 Control circuit in the MDS Solenoid No.4 harness connector.

**Is the voltage above 1.0 volt?**

**Yes** >> Repair the short to battery voltage in the (K452) MDS Solenoid No.4 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K452) MDS SOLENOID NO.4 CONTROL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

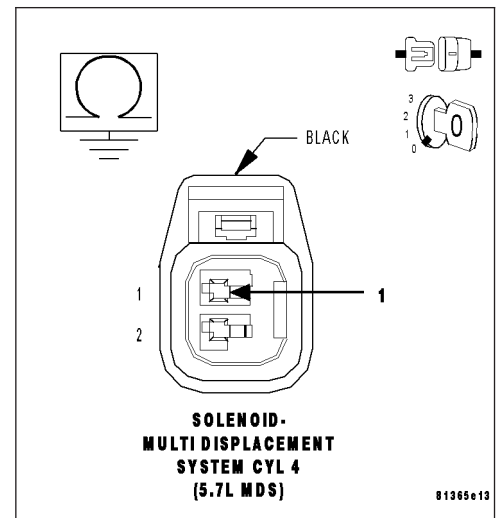
Measure the resistance between ground and the (K452) MDS Solenoid No.4 Control circuit in the MDS Solenoid No.4 harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K452) MDS Solenoid No.4 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P3425-MDS SOLENOID 4 CIRCUIT (CONTINUED)****6. (K452) MDS SOLENOID NO.4 CONTROL CIRCUIT OPEN**

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

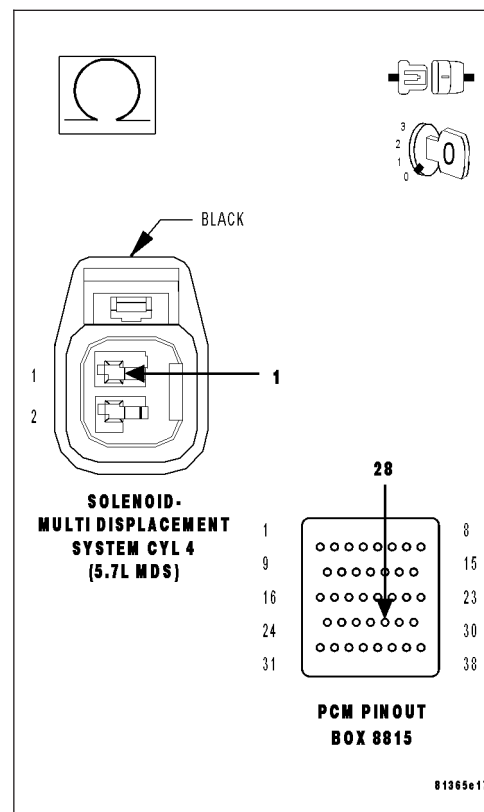
Measure the resistance of the (K452) MDS Solenoid No.4 Control circuit from the MDS Solenoid No.4 harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K452) MDS Solenoid No.4 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

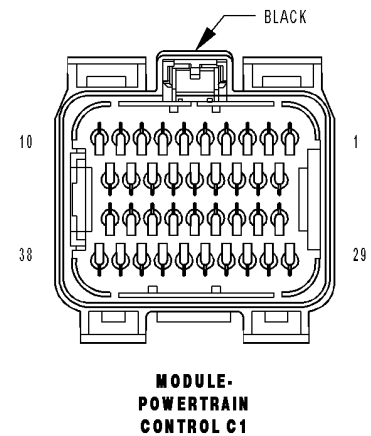
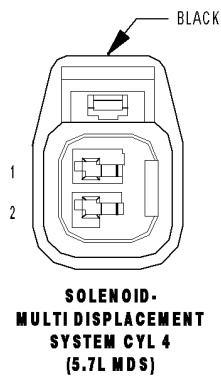
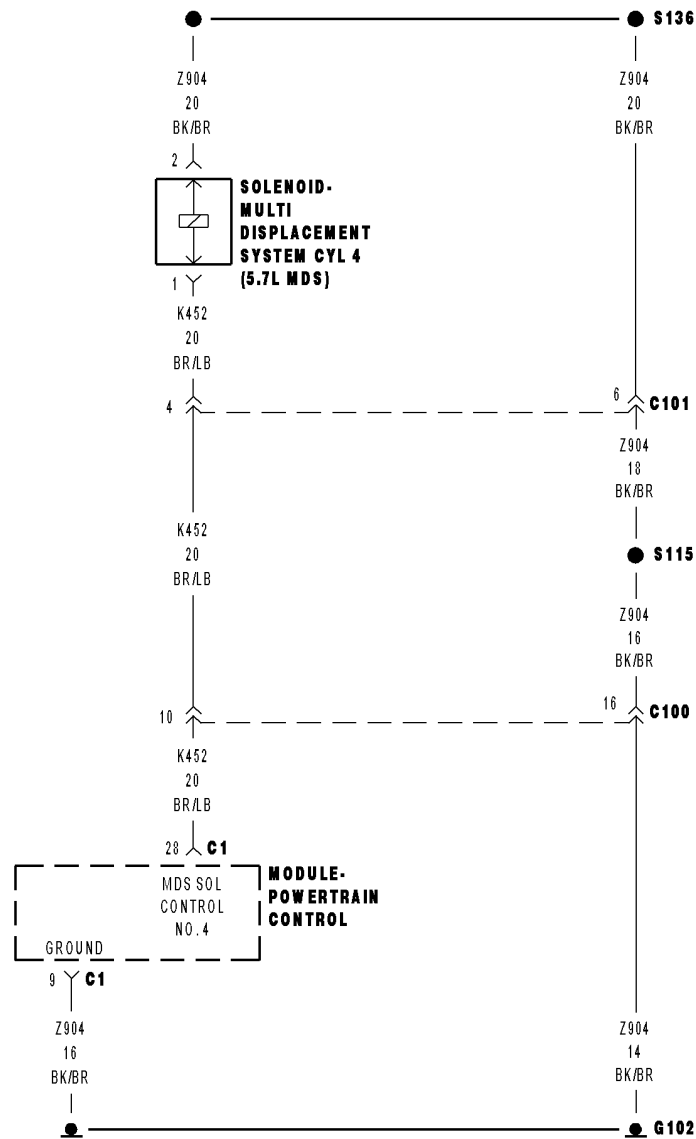
**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**P3426—CYLINDER 4 DEACTIVATION CONTROL PERFORMANCE**

**P3426-CYLINDER 4 DEACTIVATION CONTROL PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

When all criteria has been met, power is supplied to each MDS Solenoid when the engine is making a transition from 8 cylinder mode to 4 cylinder mode. By actuating the solenoid, oil pressure is raised to the pair of lifters that coincide with each particular solenoid. The oil pressure pushes in the locking pins that allows the lifter to collapse, decoupling the valves and camshaft.

- **When Monitored:**  
Transition from 8 to 4 cylinder mode.
- **Set Condition:**  
The MDS fails to disengage for cylinder 4.

Possible Causes
(K452) MDS SOLENOID NO.4 CONTROL SHORT TO VOLTAGE OIL PASSAGES RESTRICTED LIFTER MDS SOLENOID NO.4 PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

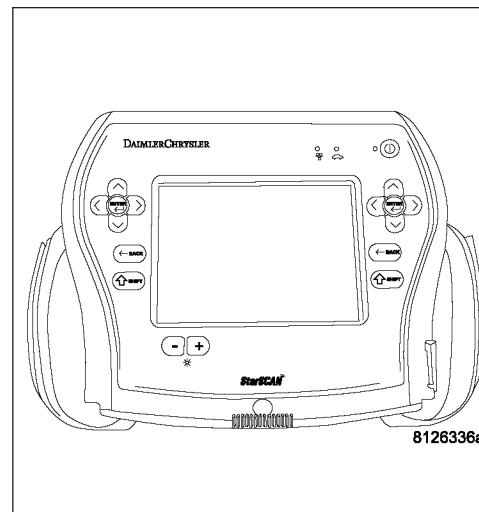
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P3426-CYLINDER 4 DEACTIVATION CONTROL PERFORMANCE (CONTINUED)****2. MDS SOLENOID NO.4 CONTROL CIRCUIT**

Turn the ignition off.

Disconnect the MDS Solenoid No.4 harness connector.

Ignition on, engine not running.

Turn off all accessories.

Using a 12-volt test light connected to ground, probe the (K452) MDS Solenoid No.4 Control circuit.

**Does the 12-volt test light illuminate?**

**Yes** >> Go To 3

**No** >> Go To 4

**3. (K452) MDS SOLENOID NO.4 CONTROL CIRCUIT SHORTED TO VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Turn the ignition on.

Measure the voltage of the (K452) MDS Solenoid No.4 Control circuit in the MDS Solenoid No.4 harness connector.

**Is voltage present?**

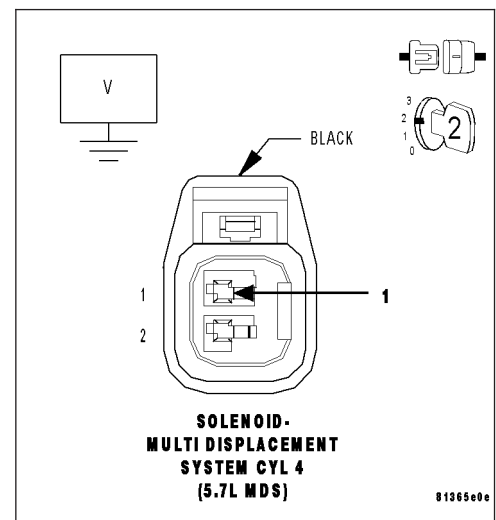
**Yes** >> Repair the short to voltage in the (K452) MDS Solenoid No.4 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >>

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3426–CYLINDER 4 DEACTIVATION CONTROL PERFORMANCE (CONTINUED)****4. MDS SOLENOID 4**

Turn the ignition off.

Remove the Intake Manifold per Service Information.

Turn the ignition on.

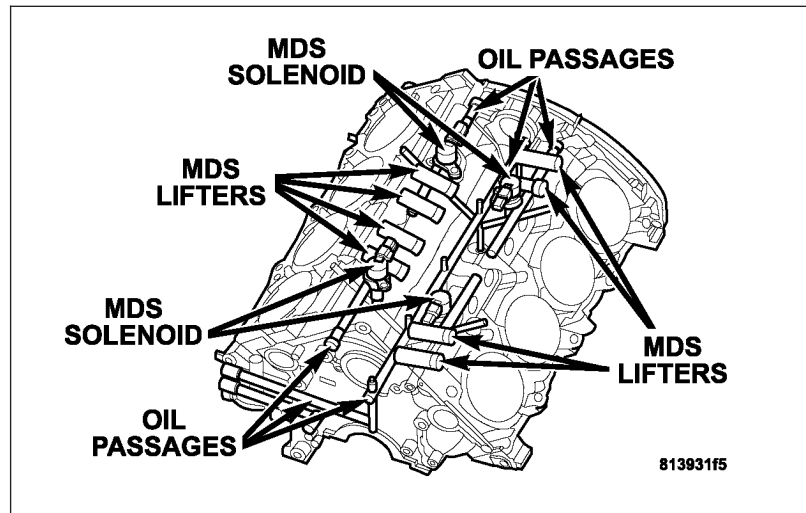
With the scan tool actuate the MDS Solenoid 4.

**Can you feel and hear the Solenoid Actuating?**

**Yes** >> Go To 5

**No** >> Remove the Solenoid and check for any debris that may be blocking the oil passages to the Solenoid. If the passages are clogged, clean the passages and replace the MDS Solenoid 4. If the passages are not clogged with debris, replace the MDS Solenoid 4.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. OIL PASSAGES RESTRICTED**

Turn the ignition off.

Remove both Solenoids on Bank 2 of the engine block.

Remove the Bank 2 Cylinder Head per Service Information.

Remove the Lifters from the left engine bank.

Inspect the oil passages to the Solenoids and from the Solenoids to the lifters.

**Are the passages blocked?**

**Yes** >> Clean the oil passages as necessary. If the entire engine is restricted disassembly of the entire engine block may be necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace both sets of lifters if no other possible causes remain.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**SOLENOID-MULTI DISPLACEMENT SYSTEM CYL 6 (5.7L MDS)**

**MODULE-POWERTRAIN CONTROL**

**MODULE-POWERTRAIN CONTROL C2**

**SOLENOID-MULTI DISPLACEMENT SYSTEM CYL 6 (5.7L MDS)**

**MODULE-POWERTRAIN CONTROL C1**

**MODULE-POWERTRAIN CONTROL C2**

**MODULE-POWERTRAIN CONTROL C1**

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**P3441-MDS SOLENOID 6 CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

When all criteria has been met, power is supplied to each MDS Solenoid when the engine is making a transition from 8 cylinder mode to 4 cylinder mode. By actuating the solenoid, oil pressure is raised to the pair of lifters that coincide with each particular solenoid. The oil pressure pushes in the locking pins that allows the lifter to collapse, decoupling the valves and camshaft.

- **When Monitored:**  
Transition from 8 to 4 cylinder mode.
- **Set Condition:**  
When the PCM recognizes a problem with the Solenoid Control circuit.

Possible Causes
(K453) MDS SOLENOID NO.6 CONTROL SHORT TO BATTERY VOLTAGE (K453) MDS SOLENOID NO.6 CONTROL SHORT TO GROUND (K453) MDS SOLENOID NO.6 CONTROL OPEN (Z904) GROUND CIRCUIT OPEN MDS SOLENOID NO.6 PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

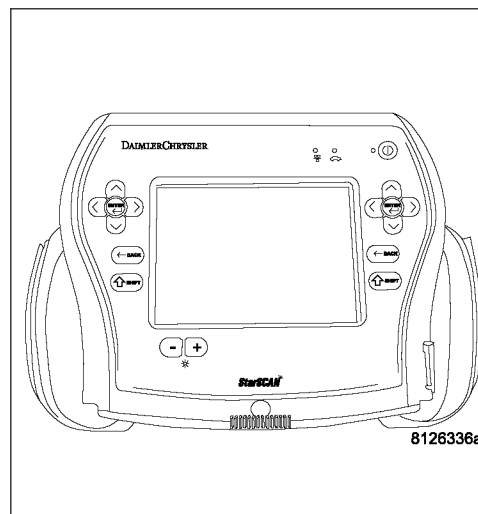
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3441-MDS SOLENOID 6 CIRCUIT (CONTINUED)****2. MDS SOLENOID NO.6**

Turn the ignition off.

Gain access to the MDS Solenoid No.6.

Disconnect the MDS Solenoid No.6 harness connector.

Ignition on, engine not running.

Turn off all accessories.

Using a 12-volt test light connected to the (Z904) Ground circuit, probe the (K453) MDS Solenoid No.6 Control circuit.

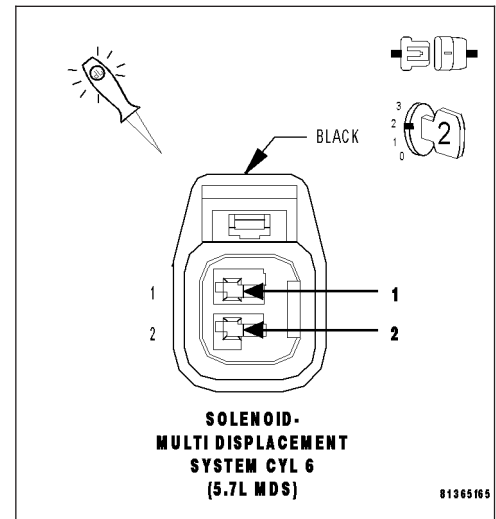
With a scan tool, actuate the MDS Solenoid No.6.

**Does the 12-volt test light flash on and off?**

**Yes** >> Replace the MDS Solenoid No.6.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (Z904) GROUND CIRCUIT OPEN**

Turn the ignition off.

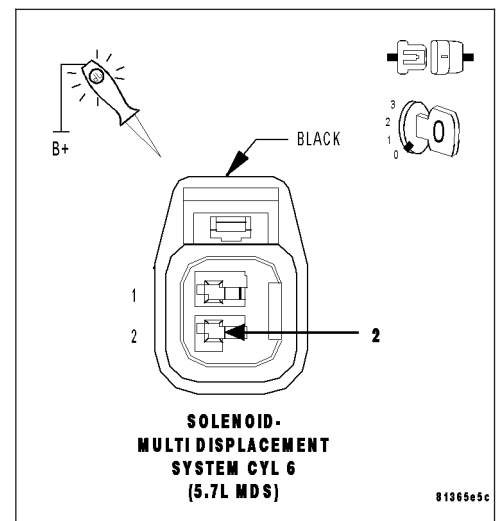
Using a 12-volt test light connected to the 12-volts, probe the (Z904) Ground circuit in the MDS Solenoid No.6 harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open in the (Z904) Ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3441-MDS SOLENOID 6 CIRCUIT (CONTINUED)****4. (K453) MDS SOLENOID CONTROL NO.6 CIRCUIT SHORTED TO BATTERY VOLTAGE**

Disconnect the PCM harness connector.

Ignition on, engine not running.

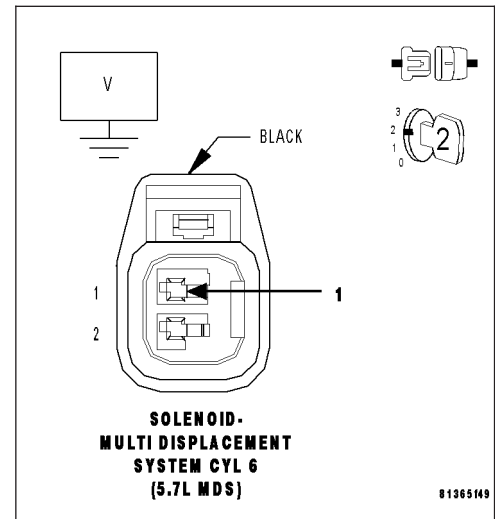
Measure the voltage on the (K453) MDS Solenoid No.6 Control circuit in the MDS Solenoid No.6 connector.

**Is the voltage above 1.0 volt?**

**Yes** >> Repair the short to battery voltage in the (K453) MDS Solenoid No.6 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K453) MDS SOLENOID NO.6 CONTROL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

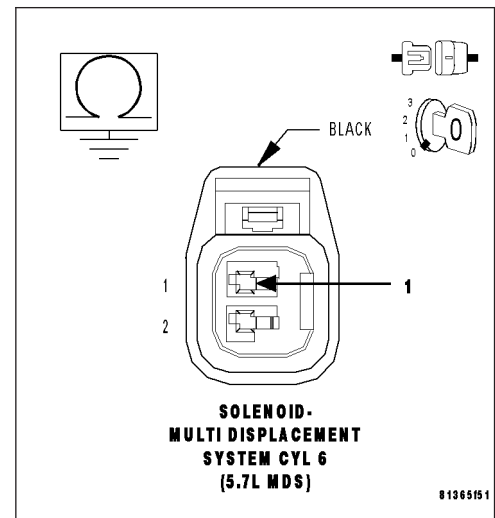
Measure the resistance between ground and the (K453) MDS Solenoid No.6 Control circuit in the MDS Solenoid No.6 harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K453) MDS Solenoid No.6 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



## P3441-MDS SOLENOID 6 CIRCUIT (CONTINUED)

**6. (K453) MDS SOLENOID NO.6 CONTROL CIRCUIT OPEN**

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

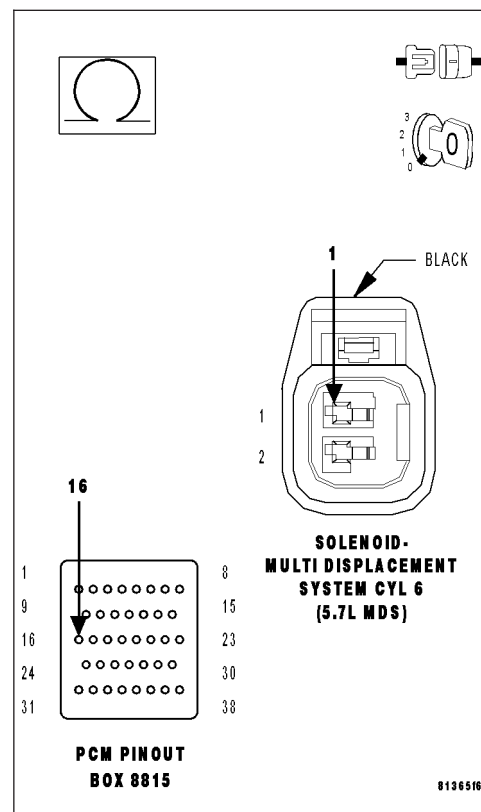
Measure the resistance of the (K453) MDS Solenoid No.6 Control circuit from the MDS Solenoid No.6 harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K453) MDS Solenoid No.6 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)





**P3442–CYLINDER 6 DEACTIVATION CONTROL PERFORMANCE (CONTINUED)**  
For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

When all criteria has been met, power is supplied to each MDS Solenoid when the engine is making a transition from 8 cylinder mode to 4 cylinder mode. By actuating the solenoid, oil pressure is raised to the pair of lifters that coincide with each particular solenoid. The oil pressure pushes in the locking pins that allows the lifter to collapse, decoupling the valves and camshaft.

- **When Monitored:**  
Transition from 8 to 4 cylinder mode.
- **Set Condition:**  
The MDS fails to disengage for cylinder 6.

Possible Causes
(K452) MDS SOLENOID NO.4 CONTROL SHORT TO VOLTAGE OIL PASSAGES RESTRICTED LIFTER MDS SOLENOID NO.4 PCM

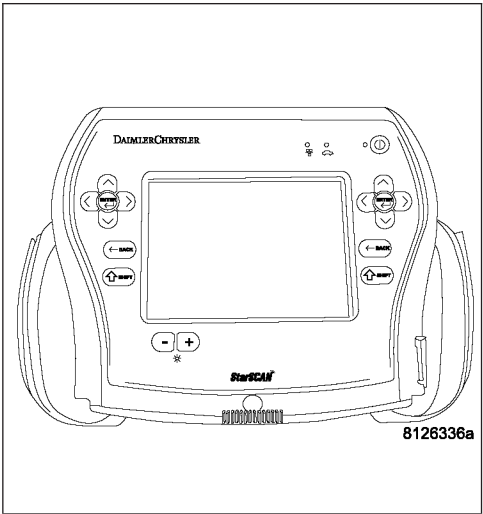
**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test**

**1. ACTIVE DTC**

Ignition on, engine not running.  
With a scan tool, read DTCs.

- Is the DTC active at this time?**
- Yes**    >> Go To 2
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3442-CYLINDER 6 DEACTIVATION CONTROL PERFORMANCE (CONTINUED)****2. MDS SOLENOID NO.6 CONTROL CIRCUIT**

Turn the ignition off.

Disconnect the MDS Solenoid No.6 harness connector.

Ignition on, engine not running.

Turn off all accessories.

Using a 12-volt test light connected to ground, probe the (K453) MDS Solenoid No.6 Control circuit.

**Does the 12-volt test light illuminate?**

**Yes** >> Go To 3

**No** >> Go To 4

**3. (K453) MDS SOLENOID NO.6 CONTROL CIRCUIT SHORTED TO VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Turn the ignition on.

Measure the voltage of the (K453) MDS Solenoid No.6 Control circuit in the MDS Solenoid No.6 harness connector.

**Is voltage present?**

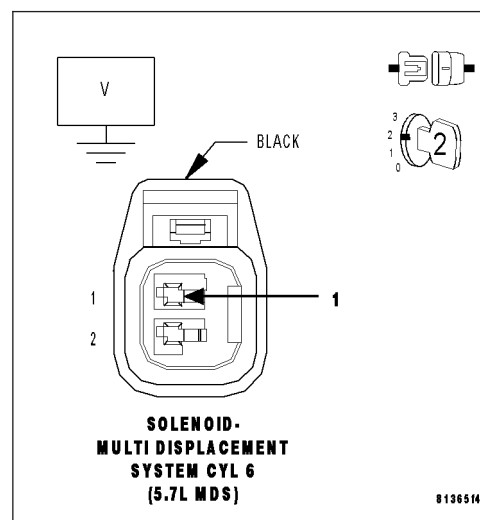
**Yes** >> Repair the short to voltage in the (K453) MDS Solenoid No.6 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >>

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3442-CYLINDER 6 DEACTIVATION CONTROL PERFORMANCE (CONTINUED)****4. MDS SOLENOID 6**

Turn the ignition off.

Remove the Intake Manifold per Service Information.

Turn the ignition on.

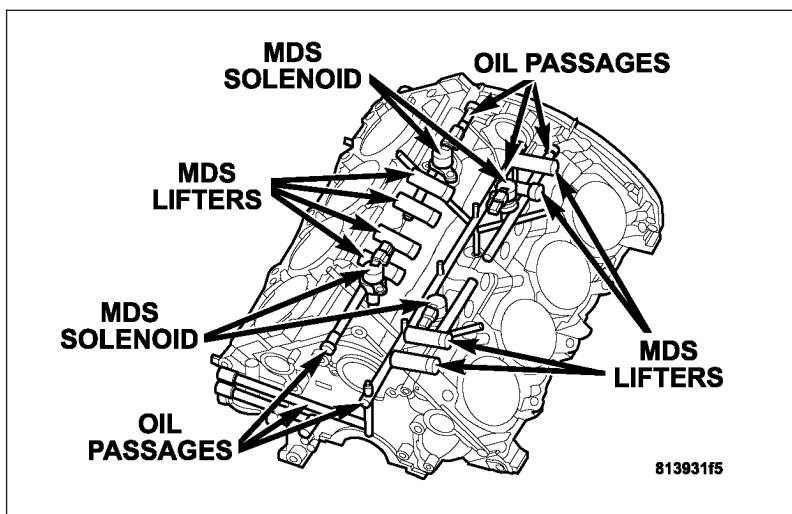
With the scan tool actuate the MDS Solenoid 6.

**Can you feel and hear the Solenoid Actuating?**

**Yes** >> Go To 5

**No** >> Remove the Solenoid and check for any debris that may be blocking the oil passages to the Solenoid. If the passages are clogged, clean the passages and replace the MDS Solenoid 6. If the passages are not clogged with debris, replace the MDS Solenoid 6.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. OIL PASSAGES RESTRICTED**

Turn the ignition off.

Remove both Solenoids on Bank 2 of the engine block.

Remove the Bank 2 Cylinder Head per Service Information.

Remove the Lifters from the left engine bank.

Inspect the oil passages to the Solenoids and from the Solenoids to the lifters.

**Are the passages blocked?**

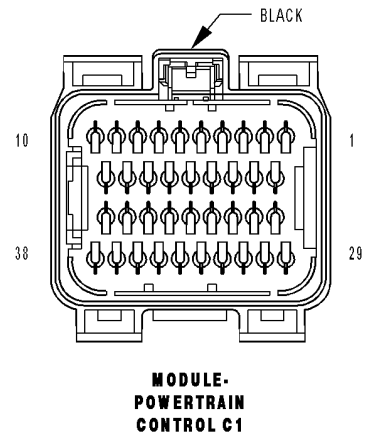
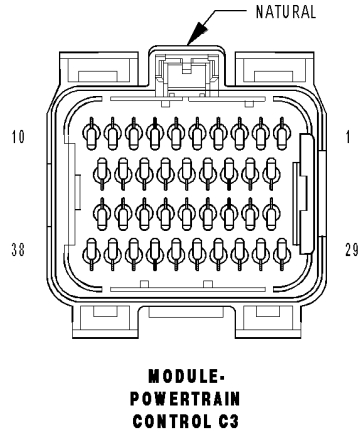
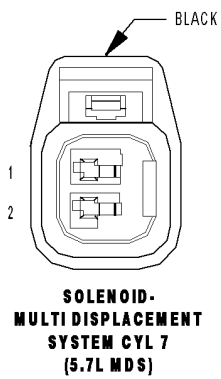
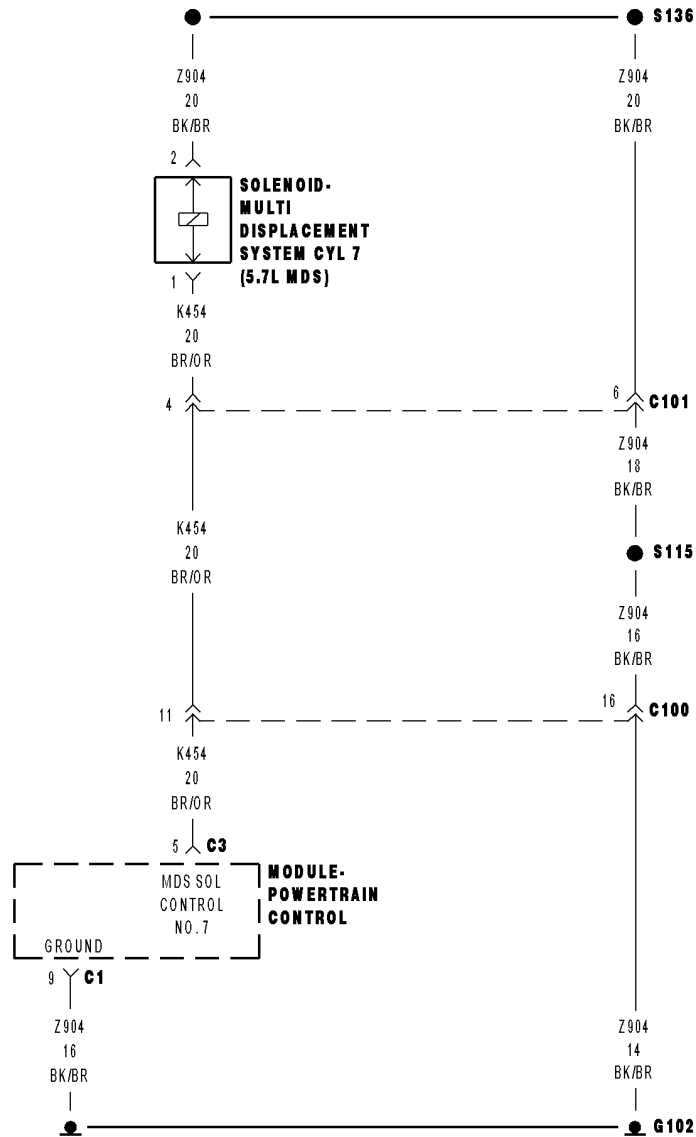
**Yes** >> Clean the oil passages as necessary. If the entire engine is restricted disassembly of the entire engine block may be necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace both sets of lifters if no other possible causes remain.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

## P3449-MDS SOLENOID 7 CIRCUIT



**P3449-MDS SOLENOID 7 CIRCUIT (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

When all criteria has been met, power is supplied to each MDS Solenoid when the engine is making a transition from 8 cylinder mode to 4 cylinder mode. By actuating the solenoid, oil pressure is raised to the pair of lifters that coincide with each particular solenoid. The oil pressure pushes in the locking pins that allows the lifter to collapse, decoupling the valves and camshaft.

- **When Monitored:**  
Transition from 8 to 4 cylinder mode.
- **Set Condition:**  
When the PCM recognizes a problem with the Solenoid Control circuit.

**Possible Causes**

(K454) MDS SOLENOID NO.7 CONTROL SHORT TO BATTERY VOLTAGE  
(K454) MDS SOLENOID NO.7 CONTROL SHORT TO GROUND  
(K454) MDS SOLENOID NO.7 CONTROL OPEN  
(Z904) GROUND CIRCUIT OPEN  
MDS SOLENOID NO.7  
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

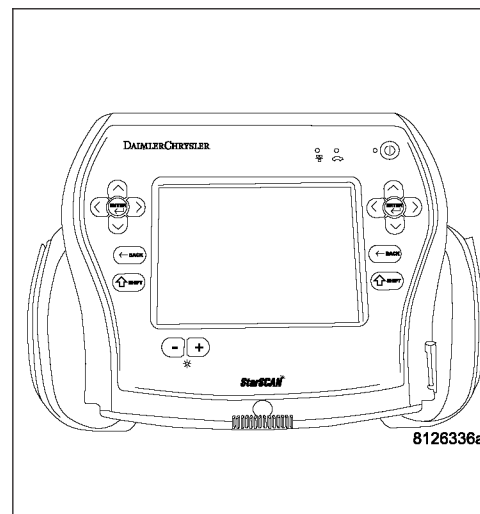
With a scan tool, read DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3449-MDS SOLENOID 7 CIRCUIT (CONTINUED)****2. MDS SOLENOID NO.7**

Turn the ignition off.

Gain access to the MDS Solenoid No.7.

Disconnect the MDS Solenoid No.7 harness connector.

Ignition on, engine not running.

Turn off all accessories.

Using a 12-volt test light connected to the (Z904) Ground circuit, probe the (K454) MDS Solenoid No.7 Control circuit.

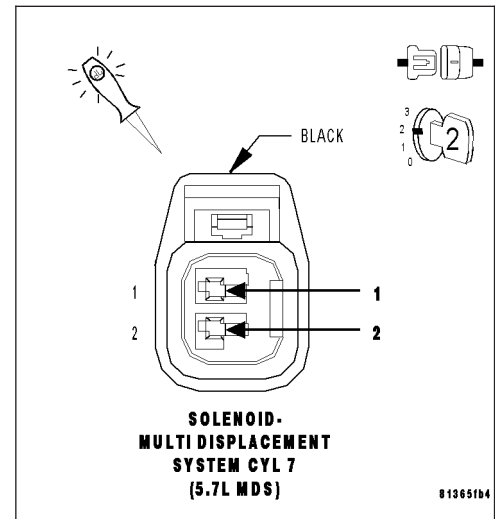
With a scan tool, actuate the MDS Solenoid No.7.

**Does the 12-volt test light flash on and off?**

**Yes** >> Replace the MDS Solenoid No.7.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. (Z904) GROUND CIRCUIT OPEN**

Turn the ignition off.

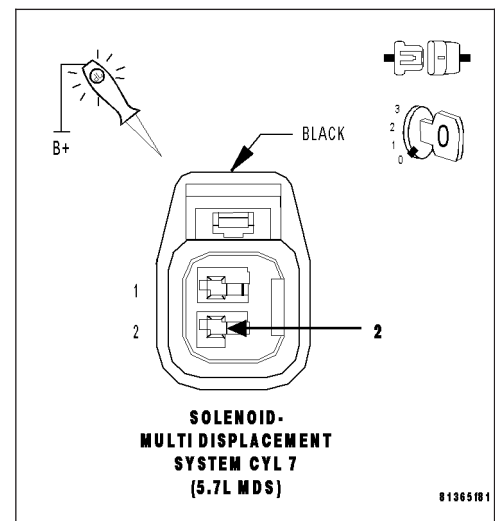
Using a 12-volt test light connected to the 12-volts, probe the (Z904) Ground circuit in the MDS Solenoid No.7 harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the open in the (Z904) Ground circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3449-MDS SOLENOID 7 CIRCUIT (CONTINUED)****4. (K454) MDS SOLENOID NO.7 CONTROL CIRCUIT SHORTED TO BATTERY VOLTAGE**

Disconnect the PCM harness connector.

Ignition on, engine not running.

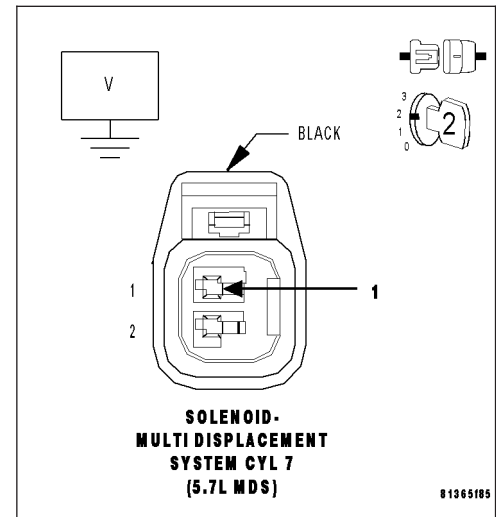
Measure the voltage on the (K454) MDS Solenoid No.7 Control circuit in the MDS Solenoid No.7 harness connector.

**Is the voltage above 1.0 volt?**

**Yes** >> Repair the short to battery voltage in the (K454) MDS Solenoid No.7 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 5

**5. (K454) MDS SOLENOID NO.7 CONTROL CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

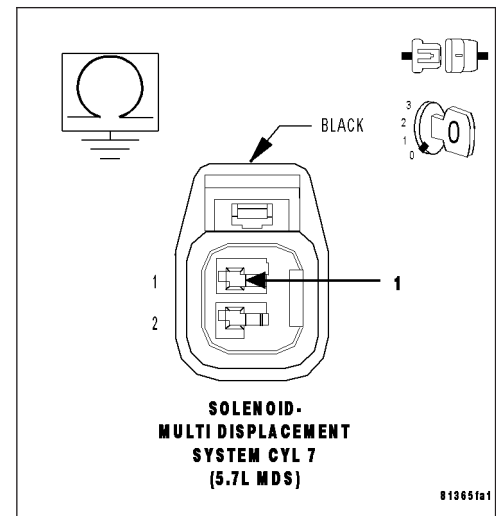
Measure the resistance between ground and the (K454) MDS Solenoid No.7 Control circuit in the MDS Solenoid No.7 harness connector.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (K454) MDS Solenoid No.7 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Go To 6



**P3449-MDS SOLENOID 7 CIRCUIT (CONTINUED)****6. (K454) MDS SOLENOID NO.7 CONTROL CIRCUIT OPEN**

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

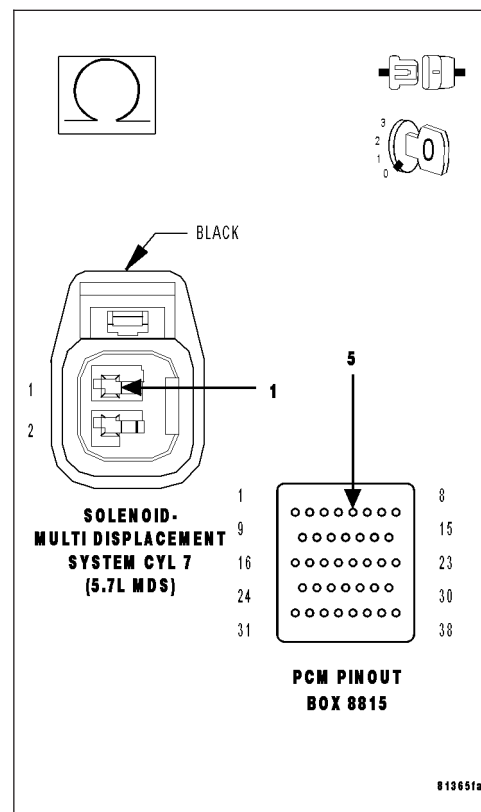
Measure the resistance of the (K454) MDS Solenoid No.7 Control circuit from the MDS Solenoid No.7 harness connector to the appropriate terminal of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 7

**No** >> Repair the open in the (K454) MDS Solenoid No.7 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**7. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

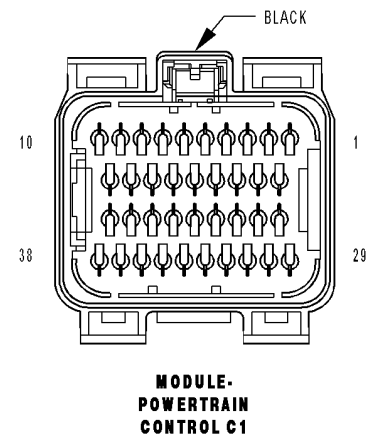
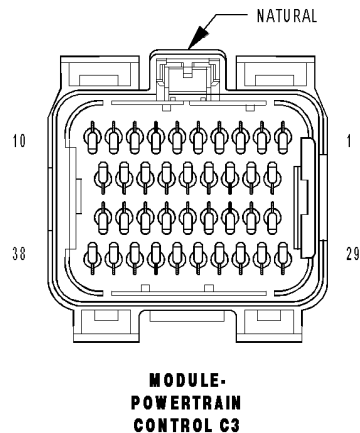
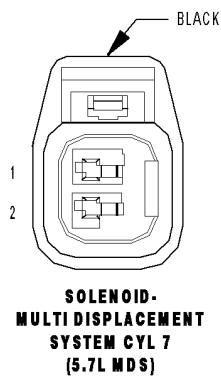
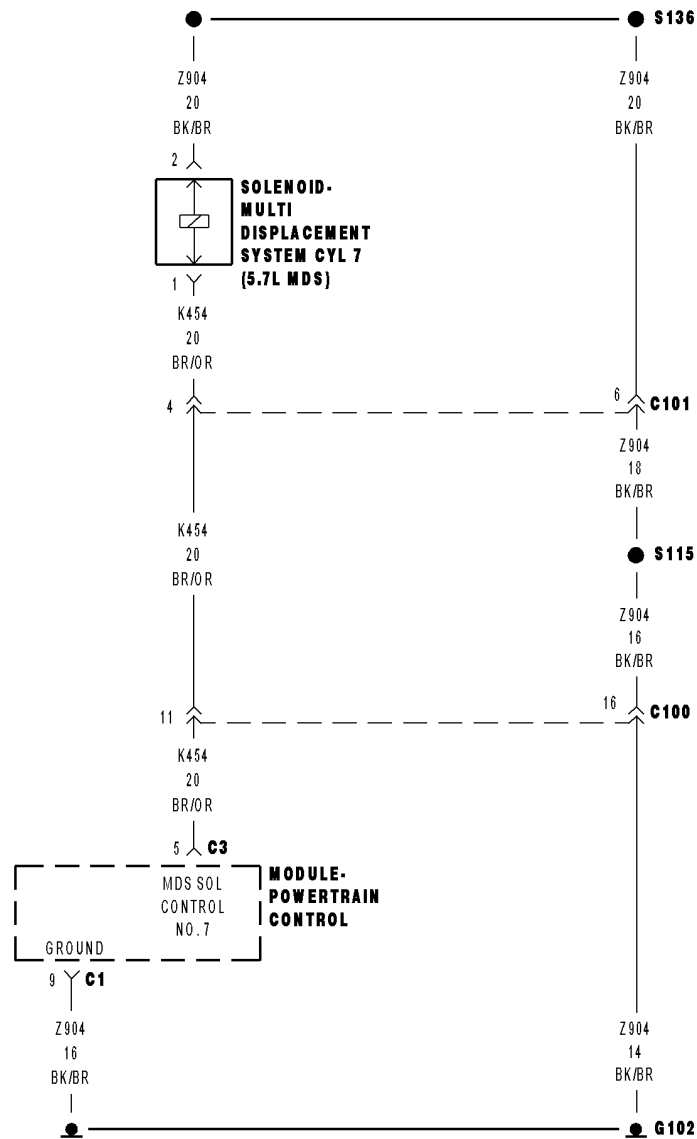
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



## P3450—CYLINDER 7 DEACTIVATION CONTROL PERFORMANCE



**P3450-CYLINDER 7 DEACTIVATION CONTROL PERFORMANCE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

When all criteria has been met, power is supplied to each MDS Solenoid when the engine is making a transition from 8 cylinder mode to 4 cylinder mode. By actuating the solenoid, oil pressure is raised to the pair of lifters that coincide with each particular solenoid. The oil pressure pushes in the locking pins that allows the lifter to collapse, decoupling the valves and camshaft.

- **When Monitored:**  
Transition from 8 to 4 cylinder mode.
- **Set Condition:**  
The MDS fails to disengage for cylinder 7.

Possible Causes
(K451) MDS SOLENOID NO.1 CONTROL SHORT TO VOLTAGE OIL PASSAGES RESTRICTED LIFTER MDS SOLENOID NO.1 PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

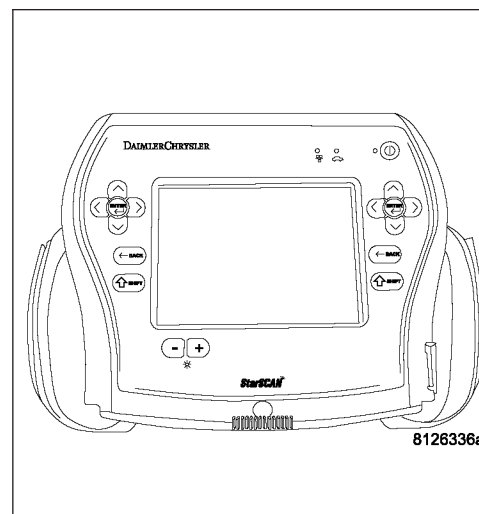
**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the DTC active at this time?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
 Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3450-CYLINDER 7 DEACTIVATION CONTROL PERFORMANCE (CONTINUED)****2. MDS SOLENOID NO.7 CONTROL CIRCUIT**

Turn the ignition off.

Disconnect the MDS Solenoid No.7 harness connector.

Ignition on, engine not running.

Turn off all accessories.

Using a 12-volt test light connected to ground, probe the (K454) MDS Solenoid No.7 Control circuit.

**Does the 12-volt test light illuminate?**

**Yes** >> Go To 3

**No** >> Go To 4

**3. (K454) MDS SOLENOID NO.7 CONTROL CIRCUIT SHORTED TO VOLTAGE**

Turn the ignition off.

Disconnect the PCM harness connectors.

Turn the ignition on.

Measure the voltage of the (K454) MDS Solenoid No.7 Control circuit in the MDS Solenoid No.7 harness connector.

**Is voltage present?**

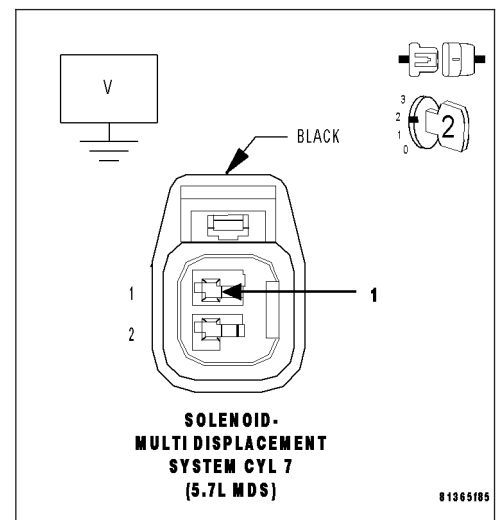
**Yes** >> Repair the short to voltage in the (K454) MDS Solenoid No.7 Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >>

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary. Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3450-CYLINDER 7 DEACTIVATION CONTROL PERFORMANCE (CONTINUED)****4. MDS SOLENOID 7**

Turn the ignition off.

Remove the Intake Manifold per Service Information.

Turn the ignition on.

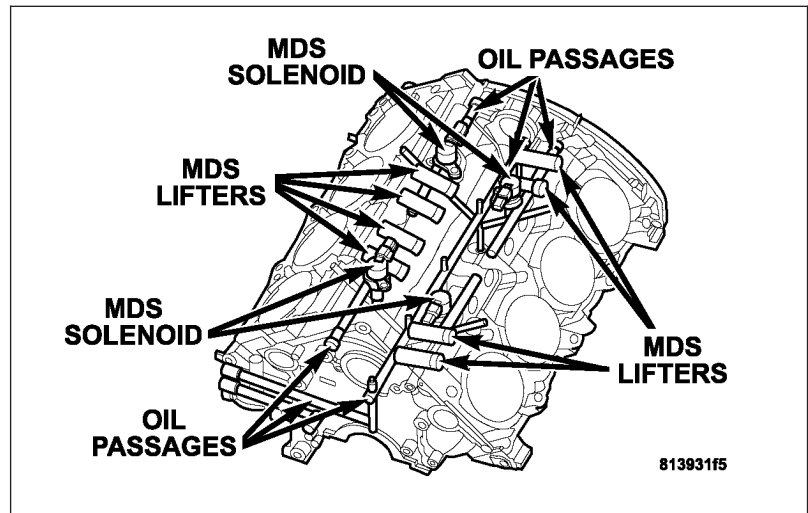
With the scan tool actuate the MDS Solenoid 7.

**Can you feel and hear the Solenoid Actuating?**

**Yes** >> Go To 5

**No** >> Remove the Solenoid and check for any debris that may be blocking the oil passages to the Solenoid. If the passages are clogged, clean the passages and replace the MDS Solenoid 7. If the passages are not clogged with debris, replace the MDS Solenoid 7.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**5. OIL PASSAGES RESTRICTED**

Turn the ignition off.

Remove both Solenoids on Bank 1 of the engine block.

Remove the Bank 1 Cylinder Head per Service Information.

Remove the Lifters from the left engine bank.

Inspect the oil passages to the Solenoids and from the Solenoids to the lifters.

**Are the passages blocked?**

**Yes** >> Clean the oil passages as necessary. If the entire engine is restricted disassembly of the entire engine block may be necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace both sets of lifters if no other possible causes remain.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

P3497-MDS RATIONALITY BANK 2

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Theory of Operation

When all criteria has been met, power is supplied to each MDS Solenoid when the engine is making a transition from 8 cylinder mode to 4 cylinder mode. By actuating the solenoid, oil pressure is raised to the pair of lifters that coincide with each particular solenoid. The oil pressure pushes in the locking pins that allows the lifter to collapse, decoupling the valves and camshaft.

- **When Monitored:**  
Transition from 8 to 4 cylinder mode.
- **Set Condition:**  
O2 sensor readings on Bank 2 side indicate a lean condition while in 4 cylinder mode.

Possible Causes
INSUFFICIENT OIL PRESSURE ACTING ON THE LIFTER LOCKING PINS
OIL PASSAGES RESTRICTED
LIFTER
MDS SOLENOID

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.

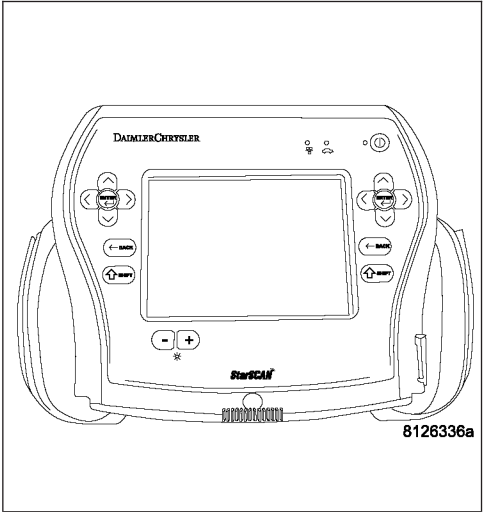
With a scan tool, read DTCs.

**Note:** Diagnose any Oil Pressure DTCs before continuing.

- Is the DTC active at this time?
- Yes

>> Go To 2
- No

>> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3497-MDS RATIONALITY BANK 2 (CONTINUED)****2. MDS SOLENOID 4**

Turn the ignition off.

Remove the Intake Manifold per Service Information.

Turn the ignition on.

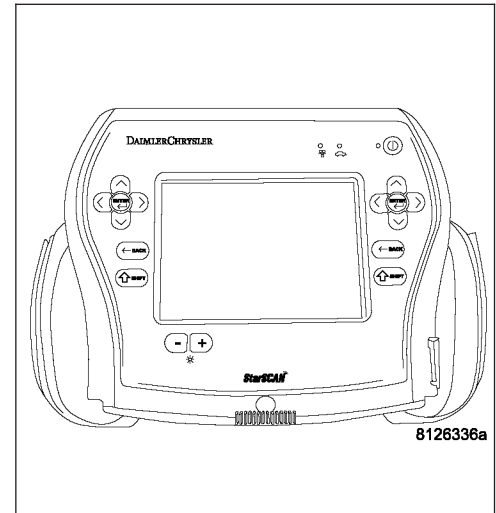
With the scan tool actuate the MDS Solenoid 4.

**Can you feel and hear the Solenoid Actuating?**

**Yes** >> Go To 3

**No** >> Remove the Solenoid and check for any debris that may be blocking the oil passages to the Solenoid. If the passages are clogged, clean the passages and replace the MDS Solenoid 4. If the passages are not clogged with debris, replace the MDS Solenoid 4.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**3. MDS SOLENOID 6**

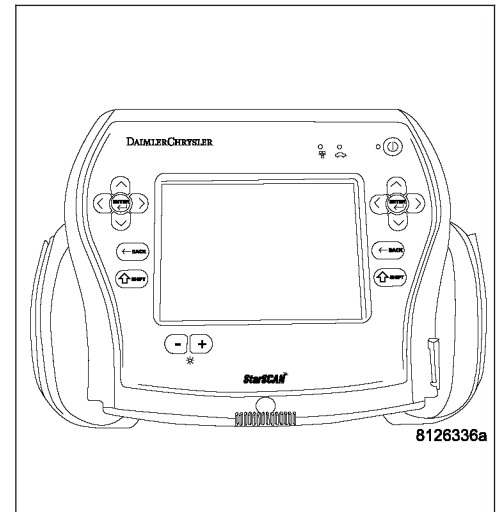
With the scan tool actuate the MDS Solenoid 6.

**Can you feel and hear the Solenoid Actuating?**

**Yes** >> Go To 4

**No** >> Remove the Solenoid and check for any debris that may be blocking the oil passages to the Solenoid. If the passages are restricted, clean the passages and replace the MDS Solenoid 6. If the passages are unable to be cleaned out, replacing the engine block may be necessary. If the passages are not clogged with debris, replace the MDS Solenoid 6.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)



**P3497-MDS RATIONALITY BANK 2 (CONTINUED)****4. OIL PASSAGES RESTRICTED**

Turn the ignition off.

Remove both Solenoids on Bank 2 of the engine block.

Remove the Bank 2 Cylinder Head per Service Information.

Remove the each pair of lifters for Cylinders 4 and 6.

Inspect the oil passages to the Solenoids and from the Solenoids to the lifters.

**Are the passages blocked?**

**Yes** >> Clean the oil passages as necessary. If the entire engine is restricted disassembly of the entire engine block may be necessary.

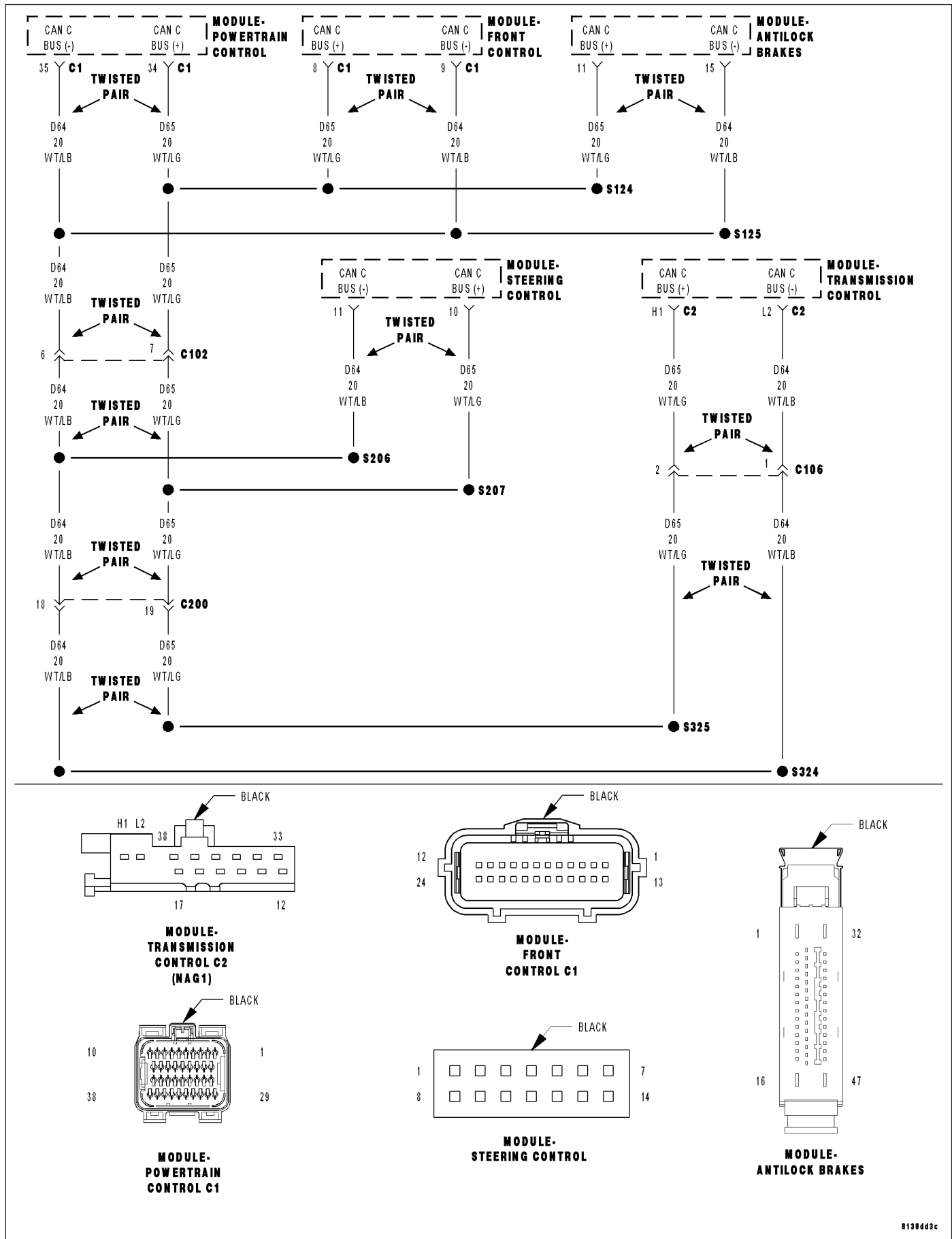
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

**No** >> Replace both sets of lifters if no other possible causes remain.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DIAGNOSIS AND TESTING)

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# U0001-CAN C BUS





U0001-CAN C BUS (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.
- **Set Condition:**  
The PCM loses communication over the CAN C Bus circuit. The circuit is continuously monitored.

Possible Causes
CAN C BUS FAILURE OPEN OR SHORTED CONDITION
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

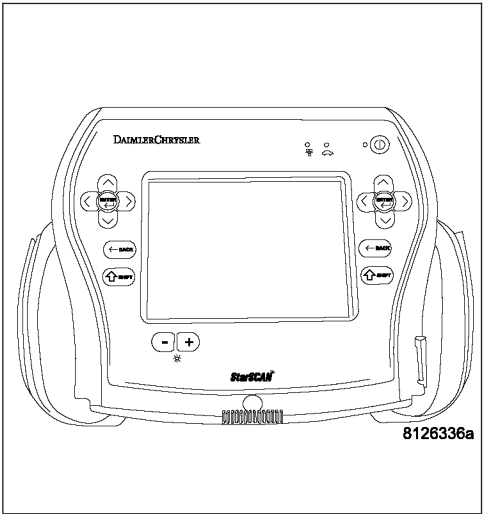
Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

Diagnostic Test

1. ACTIVE DTC

Ignition on, engine not running.  
With a scan tool, read FCM DTCs.

- Is the DTC active at this time?
- Yes**    >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.
- No**    >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.



## U0101-LOST COMMUNICATION WITH TCM

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.
- **Set Condition:**  
The PCM doesn't receive a Bus Message from the Transmission Control Module for 7 consecutive seconds. The circuit is continuously monitored.

Possible Causes
CAN C BUS FAILURE OPEN OR SHORTED CONDITION PCM

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

### Diagnostic Test

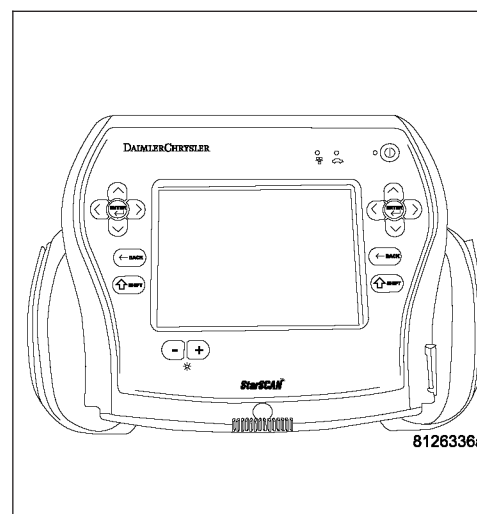
#### 1. ACTIVE DTC

Ignition on, engine not running.

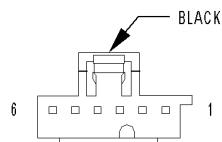
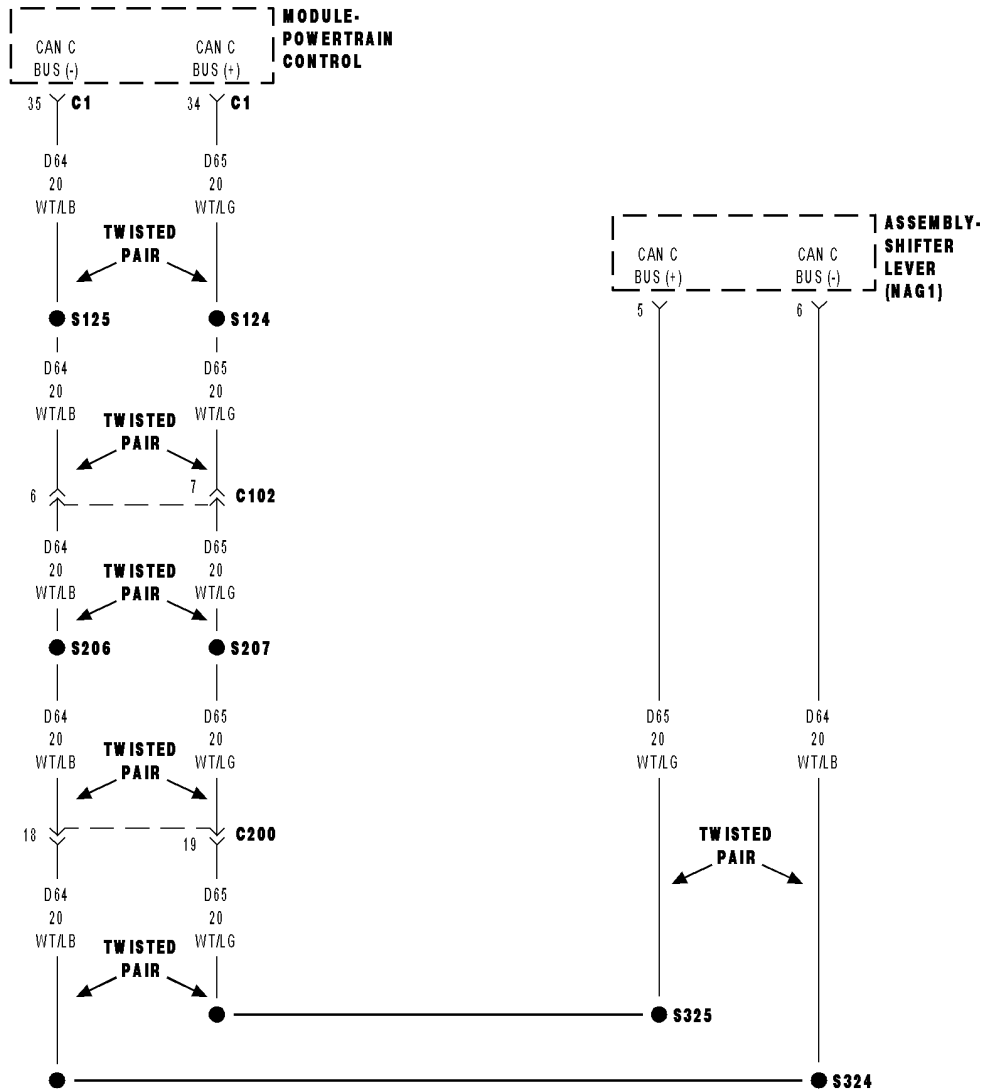
With a scan tool, read PCM DTCs.

**Is the DTC active at this time?**

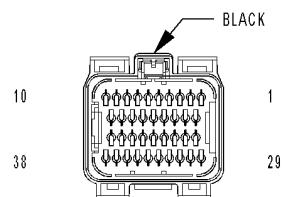
- Yes** >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 3.



## U0103-LOST COMMUNICATION WITH ELECTRIC GEAR SHIFT MODULE



**ASSEMBLY-SHIFTER LEVER (NAG1)**



**MODULE-POWERTRAIN CONTROL C1**

**U0103-LOST COMMUNICATION WITH ELECTRIC GEAR SHIFT MODULE (CONTINUED)**

For a complete wiring diagram Refer to **Section 8W**.

- **When Monitored:**

Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.

- **Set Condition:**

The PCM doesn't receive a Electric Gear Shift Module message over the CAN C circuit. The circuit is continuously monitored.

Possible Causes
CAN C BUS FAILURE OPEN OR SHORTED CONDITION
ELECTRIC GEAR SHIFT MODULE
PCM

Refer to **8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING** for diagnostic procedures and for further possible causes.

## Diagnostic Test

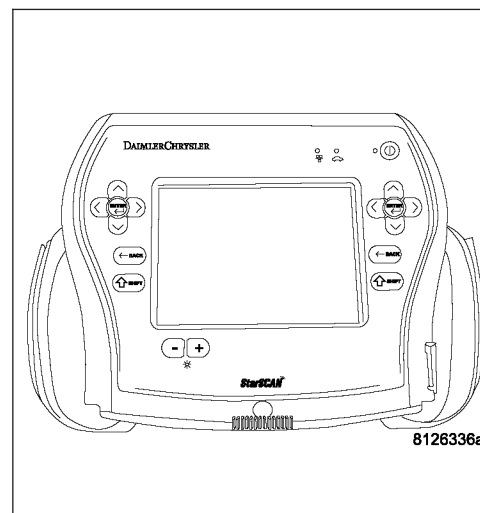
### 1. ACTIVE DTC

Ignition on, engine not running.

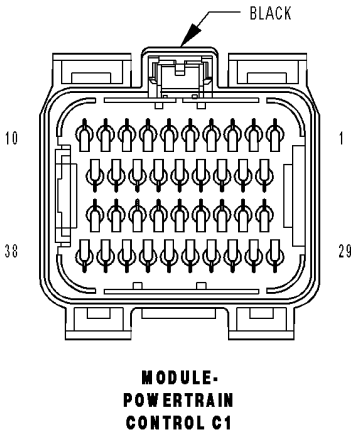
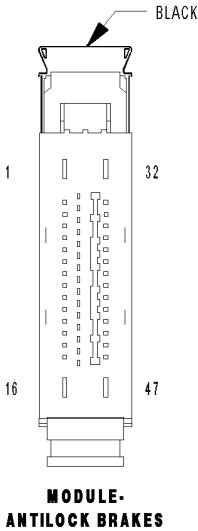
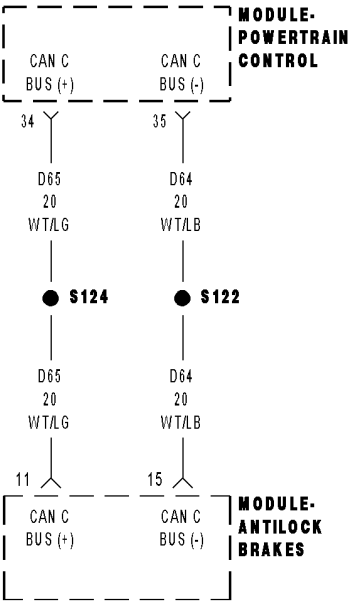
With a scan tool, read PCM DTCs.

**Is the DTC active at this time?**

- Yes** >> Refer to **8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING** for diagnostic procedures and for further possible causes.
- No** >> Refer to the **INTERMITTENT CONDITION** Diagnostic Procedure.  
Perform (NGC) **POWERTRAIN VERIFICATION TEST VER - 5**.



U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE



**U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE (CONTINUED)**

For a complete wiring diagram Refer to **Section 8W**.

- **When Monitored:**

Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.

- **Set Condition:**

The PCM doesn't receive an ABS message over the CAN C circuit for 7 consecutive seconds. The circuit is continuously monitored.

Possible Causes
CAN C BUS FAILURE OPEN OR SHORTED CONDITION ABS MODULE PCM

Refer to **8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING** for diagnostic procedures and for further possible causes.

**Diagnostic Test****1. ACTIVE DTC**

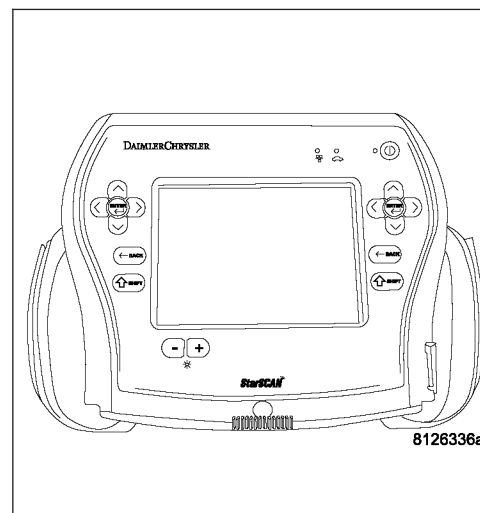
Ignition on, engine not running.

With a scan tool, read PCM DTCs.

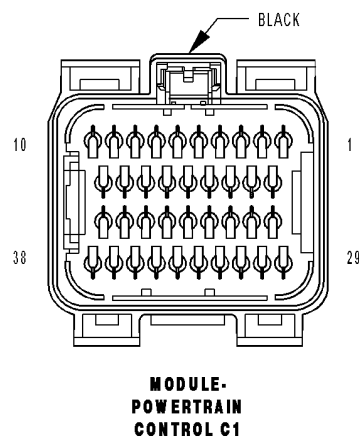
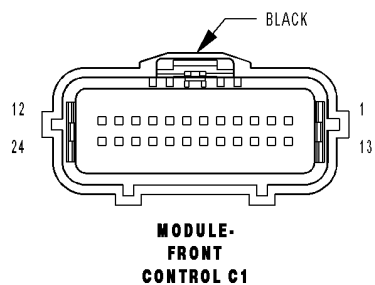
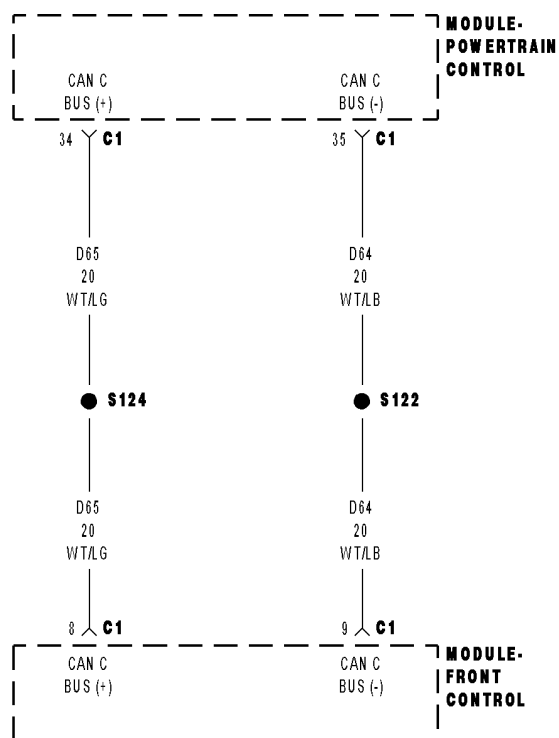
**Is the DTC active at this time?**

**Yes** >> Refer to **8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING** for diagnostic procedures and for further possible causes.

**No** >> Refer to the **INTERMITTENT CONDITION** Diagnostic Procedure.  
Perform (NGC) **POWERTRAIN VERIFICATION TEST VER - 5**.



## U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE



**U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts.

- **Set Condition:**

The PCM doesn't receive a FCM message over the CAN C circuit for 7 consecutive seconds. The circuit is continuously monitored.

Possible Causes
CAN C BUS FAILURE OPEN OR SHORTED CONDITION FRONT CONTROL MODULE PCM

**Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.**

## Diagnostic Test

### 1. ACTIVE DTC

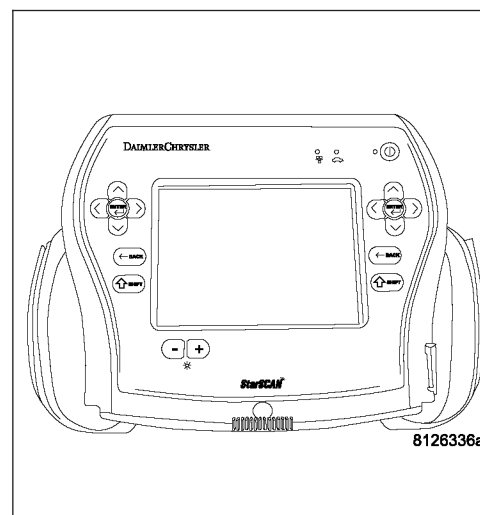
Ignition on, engine not running.

With a scan tool, read PCM DTCs.

**Is the DTC active at this time?**

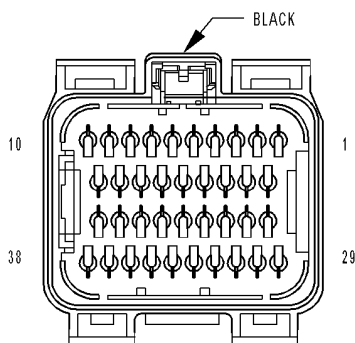
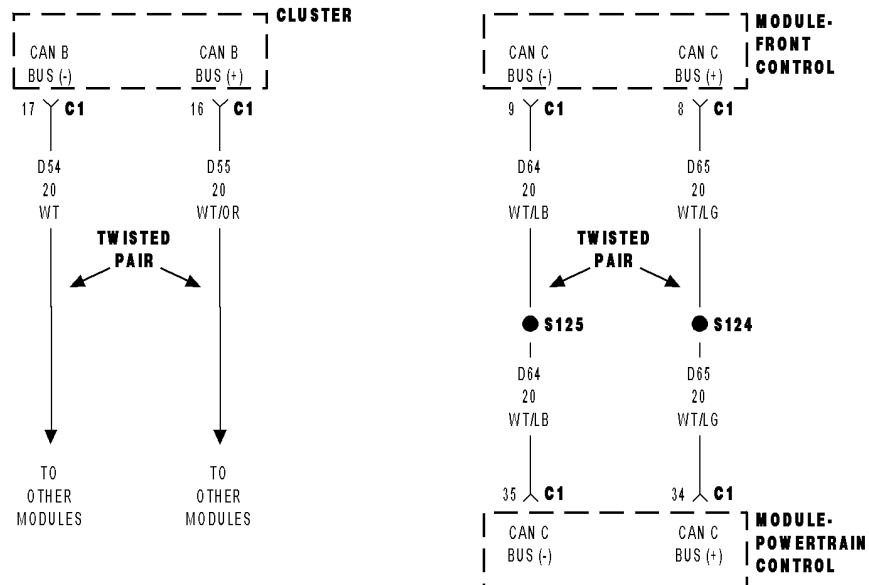
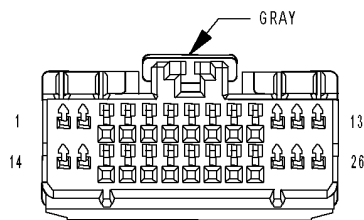
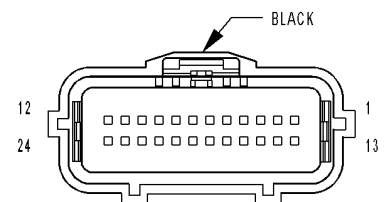
**Yes** >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.





## U0155-LOST COMMUNICATION WITH CLUSTER/CCN

**MODULE-  
POWERTRAIN  
CONTROL C1****CLUSTER C1****MODULE-  
FRONT  
CONTROL C1**

**U0155-LOST COMMUNICATION WITH CLUSTER/CCN (CONTINUED)**

For a complete wiring diagram Refer to **Section 8W**.

- **When Monitored:**

Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.

- **Set Condition:**

The PCM doesn't receive a Cluster message over the CAN C circuit. The circuit is continuously monitored.

Possible Causes
CAN C BUS FAILURE OPEN OR SHORTED CONDITION CLUSTER/CCN PCM

Refer to **8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING** for diagnostic procedures and for further possible causes.

## Diagnostic Test

### 1. ACTIVE DTC

Ignition on, engine not running.

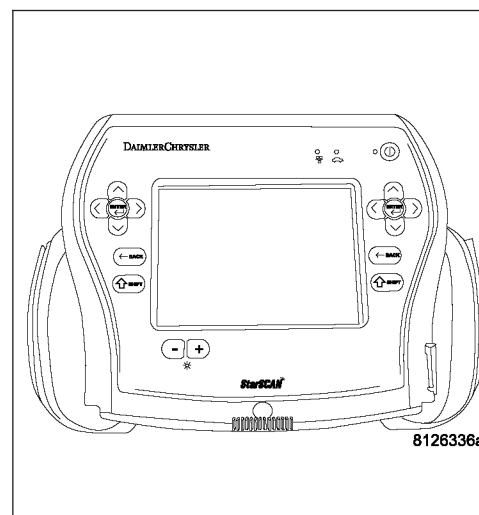
With a scan tool, read PCM DTCs.

**Is the DTC active at this time?**

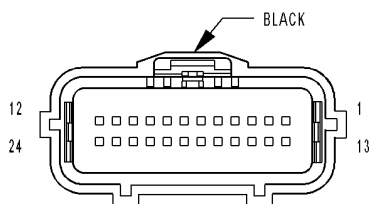
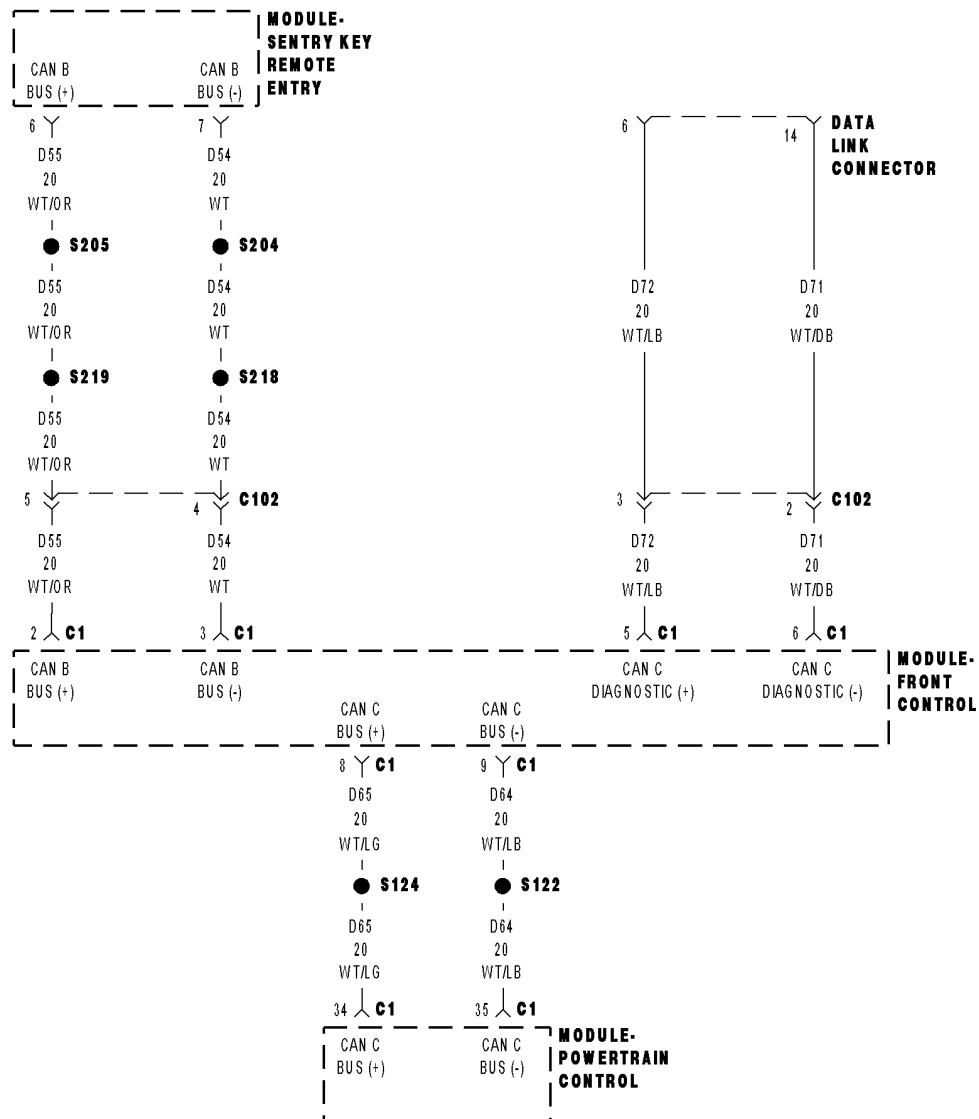
**Yes** >> Refer to **8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING** for diagnostic procedures and for further possible causes.

**No** >> Refer to the **INTERMITTENT CONDITION** Diagnostic Procedure.

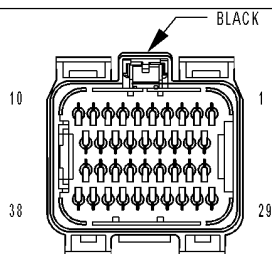
Perform (NGC) **POWERTRAIN VERIFICATION TEST VER - 5**.



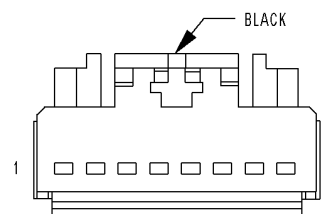
# U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM)



**MODULE-FRONT CONTROL C1**



**MODULE-POWERTRAIN CONTROL C1**



**MODULE-SENTRY KEY REMOTE ENTRY**

**U0168-LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE  
(SKREEM/WCM) (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**

Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.

- **Set Condition:**

Bus messages not received from the Sentry Key Remote Entry Module (WCM) for approximately 2 to 5 seconds.

Possible Causes
CAN C BUS FAILURE OPEN OR SHORTED CONDITION SKREEM (WCW) PCM

Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

## Diagnostic Test

### 1. ACTIVE DTC

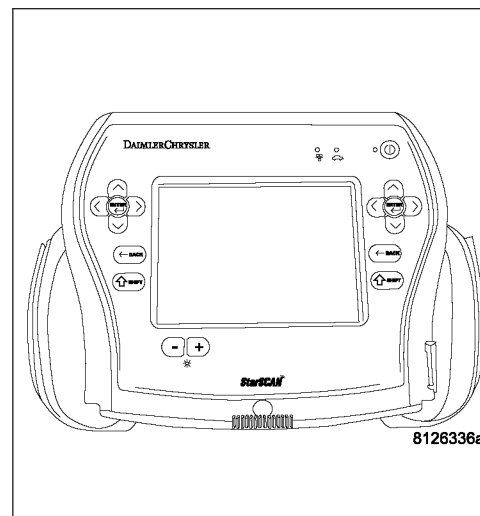
Ignition on, engine not running.

With a scan tool, read PCM DTCs.

**Is the DTC active at this time?**

**Yes** >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



The diagram illustrates the CAN C network architecture. It shows four main modules: Module-Powertrain Control, Module-Steering Control, Data Link Connector, and Module-Front Control. The network is composed of twisted pairs (WT/LB, WT/LG, WT/DB) and signal relays (S122, S124, S206, S207). The connections are as follows:

- Module-Powertrain Control:** CAN C BUS (-) (35) and CAN C BUS (+) (34) are connected to twisted pairs D64 (20) WT/LB and D65 (20) WT/LG. These are connected to signal relays S122 and S124.
- Module-Steering Control:** CAN C BUS (-) (11) and CAN C BUS (+) (10) are connected to twisted pairs D64 (20) WT/LB and D65 (20) WT/LG. These are connected to signal relays S206 and S207.
- Data Link Connector:** Twisted pairs D72 (20) WT/LB and D71 (20) WT/DB are connected to twisted pairs D72 (20) WT/LB and D71 (20) WT/DB. These are connected to signal relays S122 and S124.
- Module-Front Control:** CAN C BUS (+) (8), CAN C BUS (-) (9), CAN C DIAGNOSTIC (+) (5), and CAN C DIAGNOSTIC (-) (6) are connected to twisted pairs D65 (20) WT/LG, D64 (20) WT/LB, D72 (20) WT/LB, and D71 (20) WT/DB. These are connected to signal relays S122 and S124.

The diagram also shows the physical layout of the connectors and the location of the signal relays (S122, S124, S206, S207) within the vehicle's wiring harness.

**U110A-LOST COMMUNICATION WITH SCCM - CAN - C (CONTINUED)**

For a complete wiring diagram Refer to **Section 8W**.

- **When Monitored:**

Ignition run time is greater than 1 second. Battery voltage between 9 and 16 volts. Engine run time greater than 3 seconds.

- **Set Condition:**

Bus messages not received from the SCCM for approximately 2 to 5 seconds.

Possible Causes
CAN C BUS FAILURE OPEN OR SHORTED CONDITION
SCCM
PCM

Refer to **8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING** for diagnostic procedures and for further possible causes.

**Diagnostic Test****1. ACTIVE DTC**

Ignition on, engine not running.

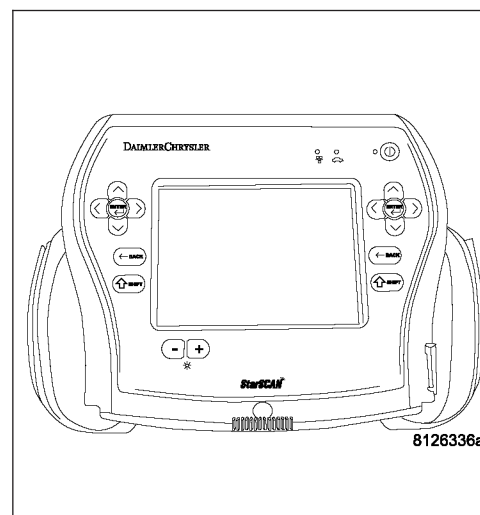
With a scan tool, read PCM DTCs.

**Is the DTC active at this time?**

**Yes** >> Refer to **8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING** for diagnostic procedures and for further possible causes.

**No** >> Refer to the **INTERMITTENT CONDITION** Diagnostic Procedure.

Perform (NGC) **POWERTRAIN VERIFICATION TEST VER - 5**.



[illegible]

**U110C-NO FUEL LEVEL BUS MESSAGE RECEIVED (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on.

- **Set Condition:**

When the PCM does not receive a fuel level signal from the FCM over the CAN C circuit. The circuit is constantly monitored.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
FRONT CONTROL MODULE
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) .**

## Theory of Operation

The fuel level signal is a direct input to the Cluster. The fuel level signal is sent to the FCM over the CAN B bus circuit. The NGC receives the fuel level signal from the FCM over the CAN C bus circuit.

## Diagnostic Test

### 1. ACTIVE DTC

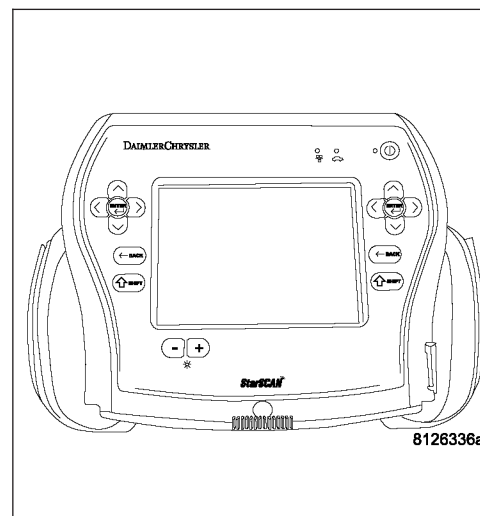
Ignition on, engine not running.

With the scan tool read Powertrain DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



### 2. U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE ALSO ACTIVE

With the scan tool read DTCs.

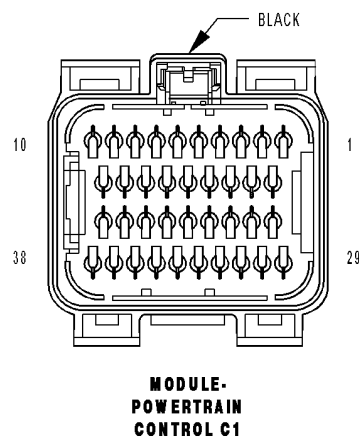
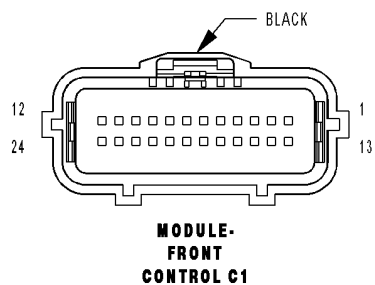
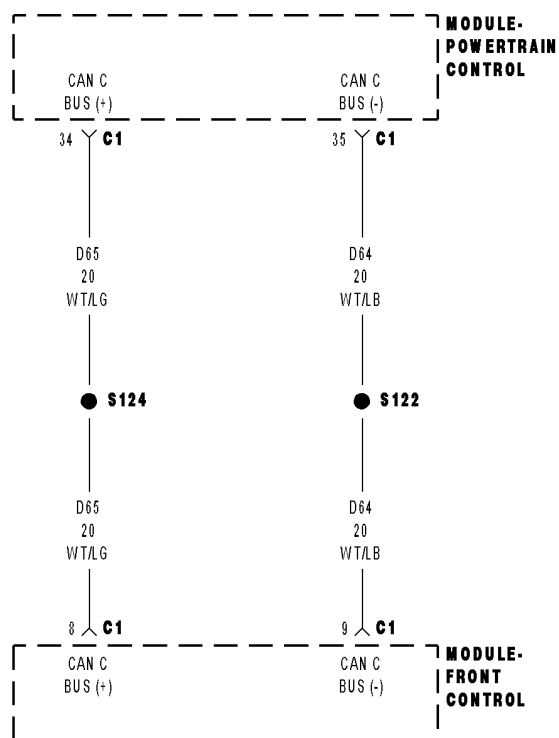
**Is the U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE also set?**

**Yes** >> Follow the diagnostics for U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



## U110E-LOST AMBIENT TEMPERATURE MESSAGE



**U110E-LOST AMBIENT TEMPERATURE MESSAGE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on.

- **Set Condition:**

The PCM doesn't receive the ambient temperature signal over the CAN C bus from the FCM. The circuit is continuously monitored.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
FRONT CONTROL MODULE
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The ambient temperature sensor signal is a direct input to the FCM. The FCM sends the PCM the ambient temperature signal over the CAN C bus.

## Diagnostic Test

### 1. ACTIVE DTC

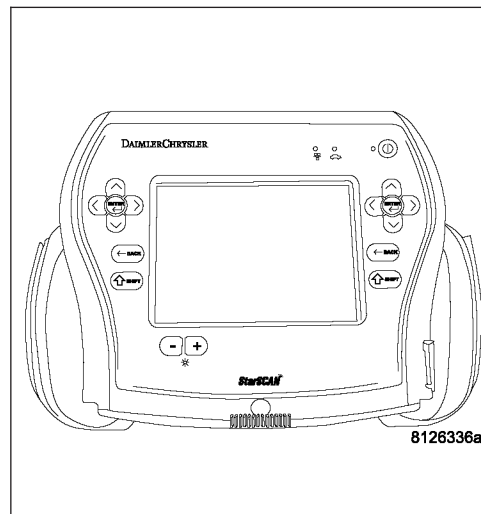
Ignition on, engine not running.

With the scan tool read Powertrain DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



### 2. U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE ALSO ACTIVE

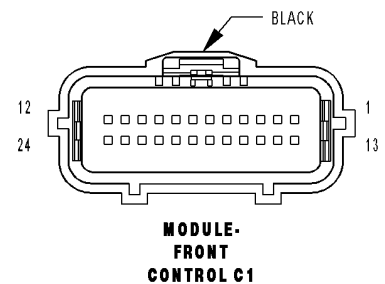
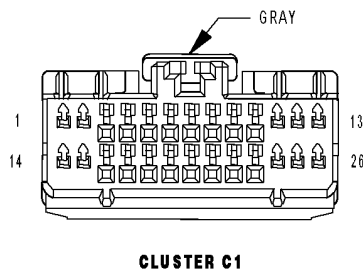
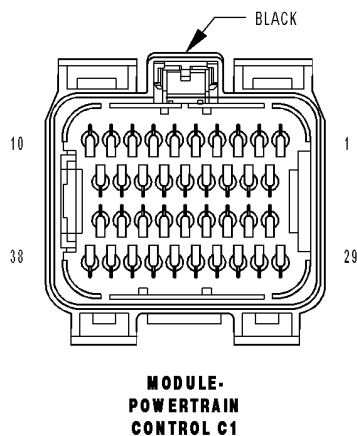
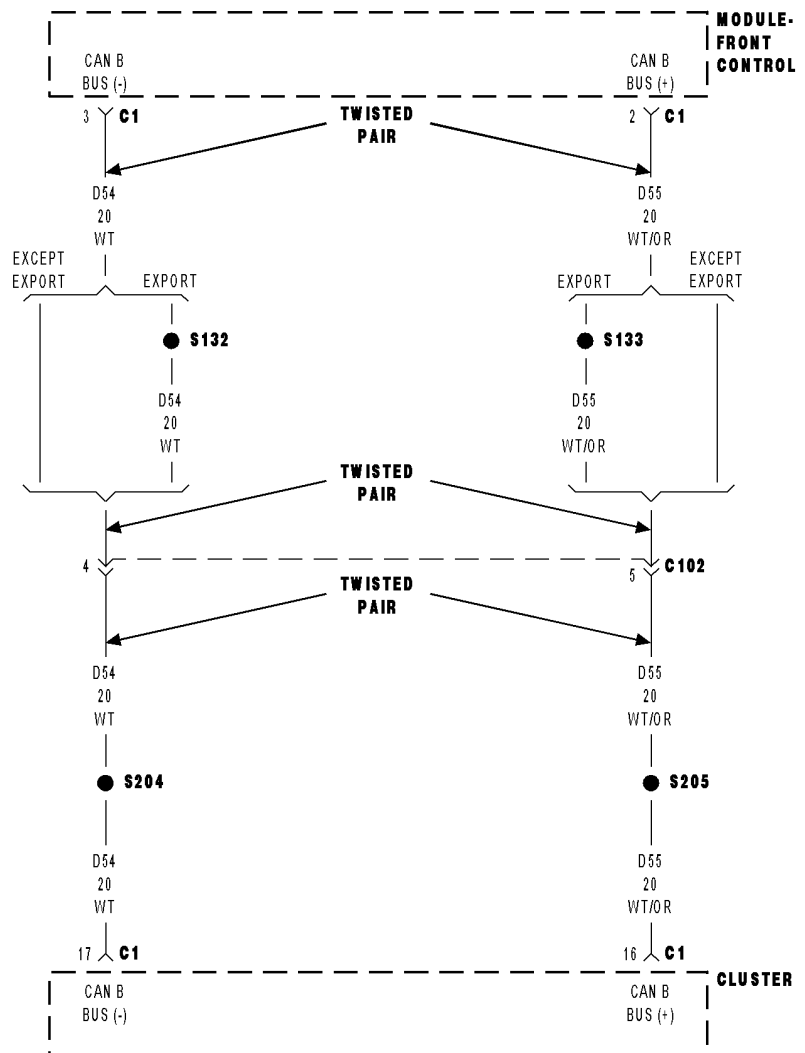
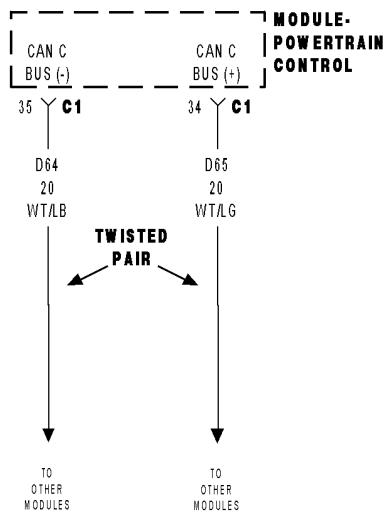
With the scan tool read DTCs.

**Is the U0141-NO BUS MESSAGE RECEIVED FROM THE FCM also set?**

**Yes** >> Follow the diagnostics for U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

## U110F-LOST FUEL VOLUME MESSAGE



**U110F-LOST FUEL VOLUME MESSAGE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
When the PCM does not receive a fuel volume signal from the FCM over the CAN C circuit. The circuit is constantly monitored.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED FRONT CONTROL MODULE PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The fuel level signal is a direct input to the Cluster. The fuel level signal is sent to the FCM over the CAN B bus circuit. The NGC receives the fuel level signal from the FCM over the CAN C bus circuit.

**Diagnostic Test****1. ACTIVE DTC**

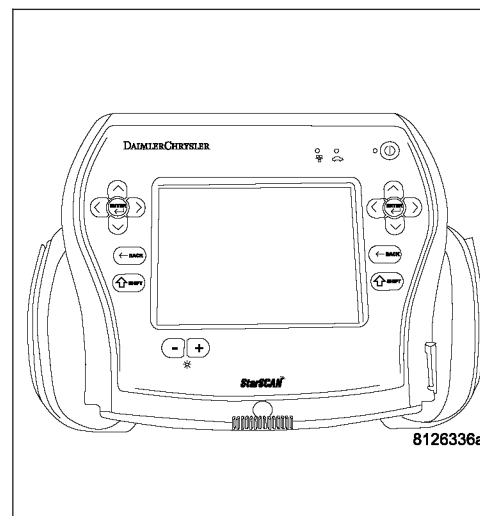
Ignition on, engine not running.

With the scan tool read Powertrain DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**2. U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE ALSO ACTIVE**

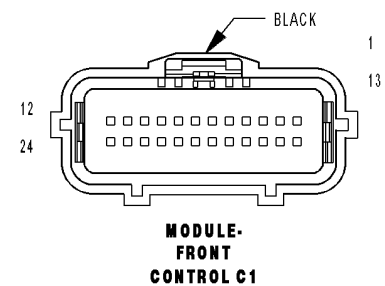
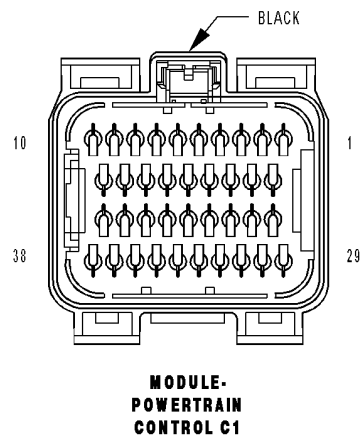
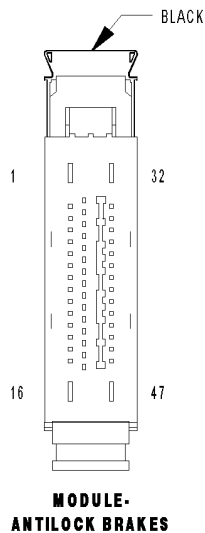
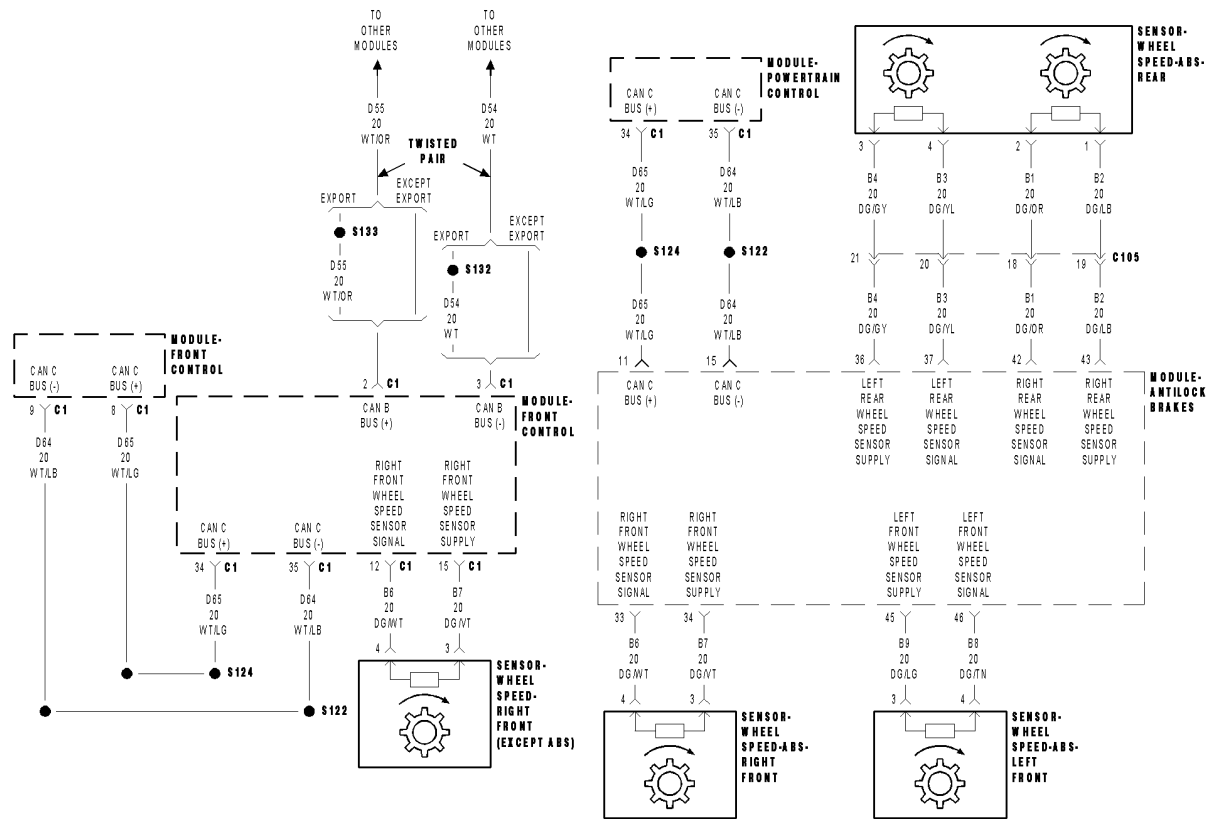
With the scan tool read DTCs.

**Is the U0141-NO BUS MESSAGE RECEIVED FROM THE FCM also set?**

**Yes** >> Follow the diagnostics for U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

## U1110-LOST VEHICLE SPEED MESSAGE



**U1110-LOST VEHICLE SPEED MESSAGE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on.

- **Set Condition:**

The PCM doesn't receive a vehicle speed signal from the Anti-lock brake Module or FCM (NON-ABS) over the CAN C bus.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED
ANTI-LOCK BRAKE MODULE
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) .**

## Theory of Operation

The PCM receives the vehicle speed signal over the CAN C bus from the Anti-lock Brake Module or FCM (NON-ABS).

## Diagnostic Test

### 1. ACTIVE DTC

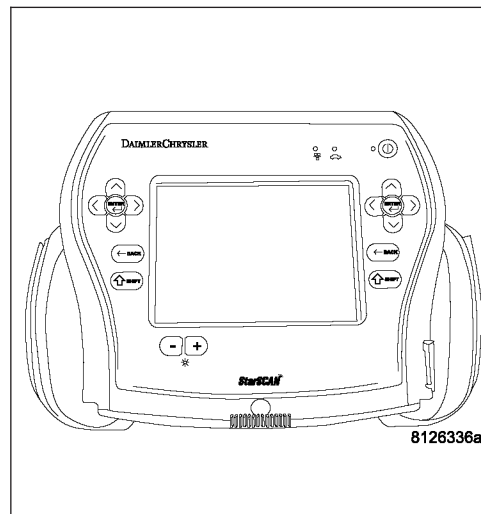
Ignition on, engine not running.

With the scan tool read Powertrain DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



**U1110-LOST VEHICLE SPEED MESSAGE (CONTINUED)**

**2. U0121-LOST COMMUNICATION WITH ABS MODULE/P0141-LOST COMMUNICATION WITH FCM ALSO SET**

**Note:** If the vehicle is not equipped with ABS the VSS signal will come from the FCM.

With the scan tool, read the appropriate module for DTCs.

**Is the U0121-LOST COMMUNICATION WITH ABS MODULE/P0141-Lost Communicate With FCM also set?**

**Yes** >> Perform the appropriate diagnostic test.

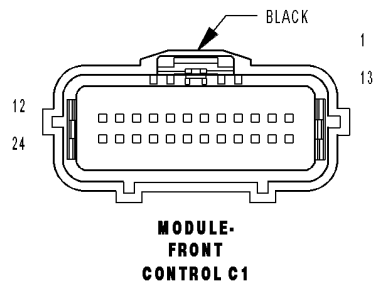
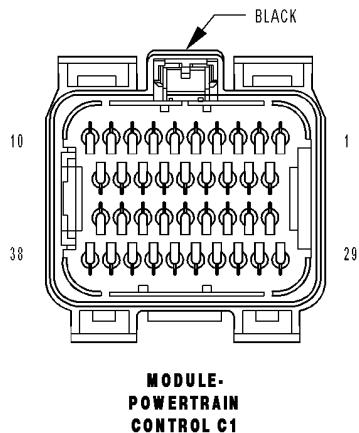
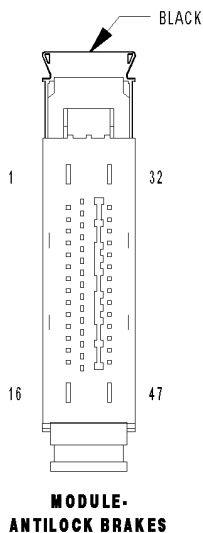
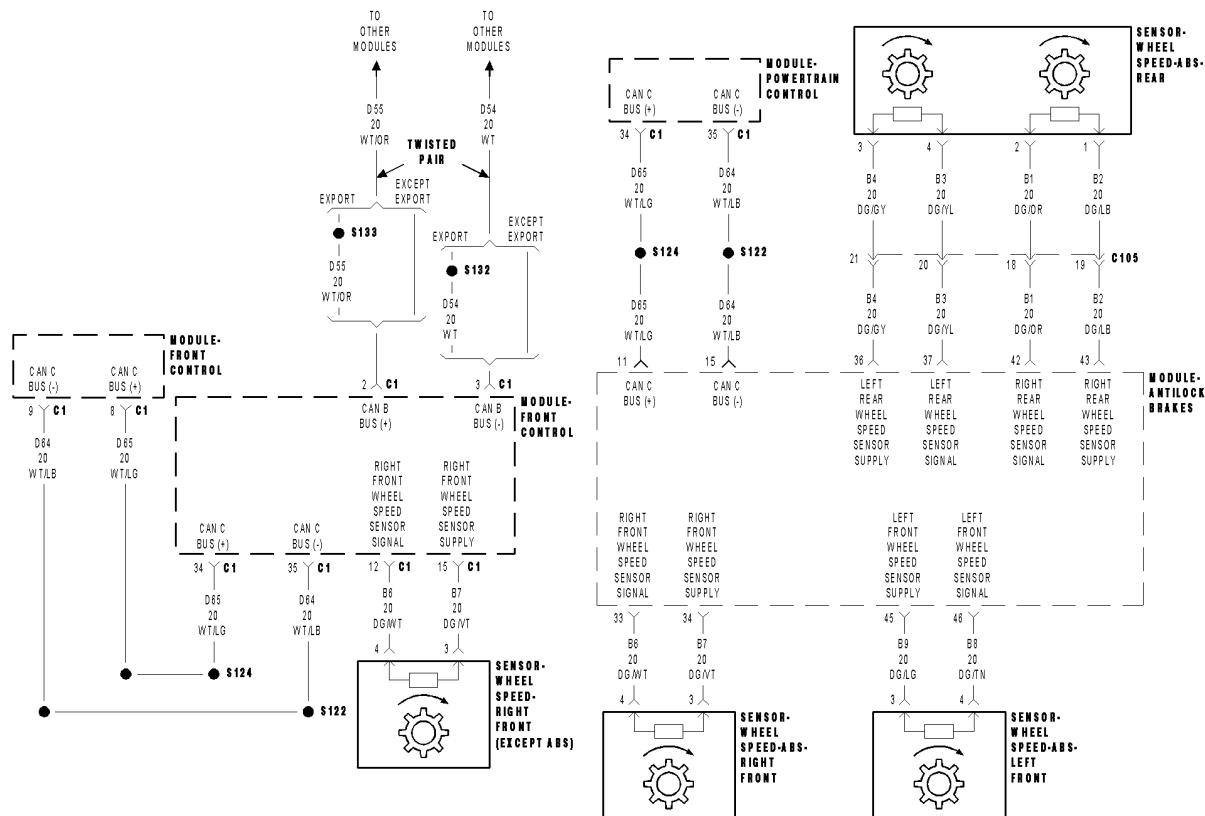
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

---

# U1120-LOST WHEEL DISTANCE MESSAGE





**U1120-LOST WHEEL DISTANCE MESSAGE (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on.

- **Set Condition:**

The PCM doesn't receive a wheel distance message from the Anti-lock brake Module or FCM (NON-ABS) over the CAN C bus.

Possible Causes
CAN C BUS CIRCUIT OPEN OR SHORTED ANTI-LOCK BRAKE MODULE PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The PCM receives the vehicle speed signal over the CAN C bus from the Anti-lock Brake Module or FCM (NON-ABS).

## Diagnostic Test

### 1. ACTIVE DTC

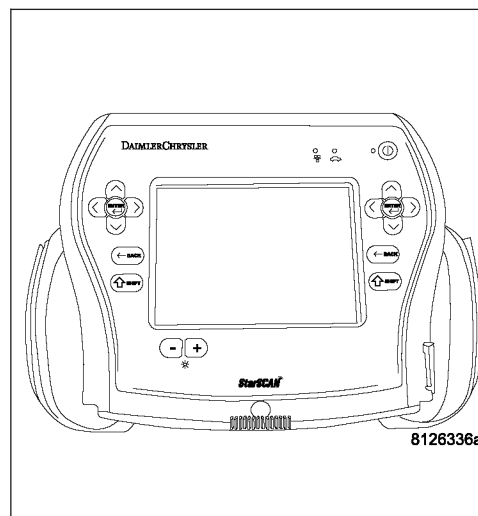
Ignition on, engine not running.

With the scan tool read Powertrain DTCs.

**Is the DTC active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



**U1120-LOST WHEEL DISTANCE MESSAGE (CONTINUED)****2. U0121-LOST COMMUNICATION WITH ABS MODULE/P0141-LOST COMMUNICATION WITH FCM ALSO SET**

**Note:** If the vehicle is not equipped with ABS the VSS signal will come from the FCM.

With the scan tool, read the appropriate module for DTCs.

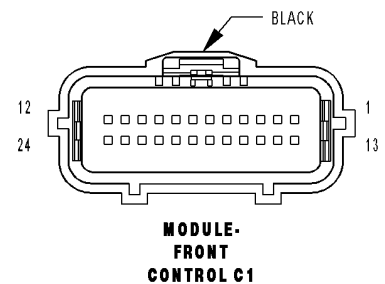
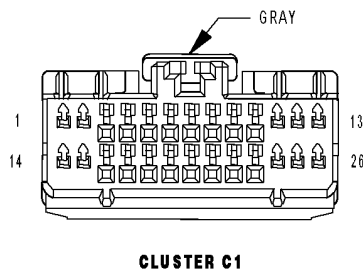
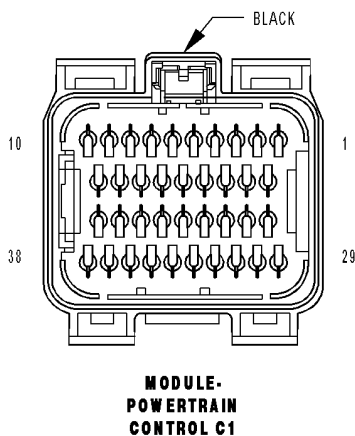
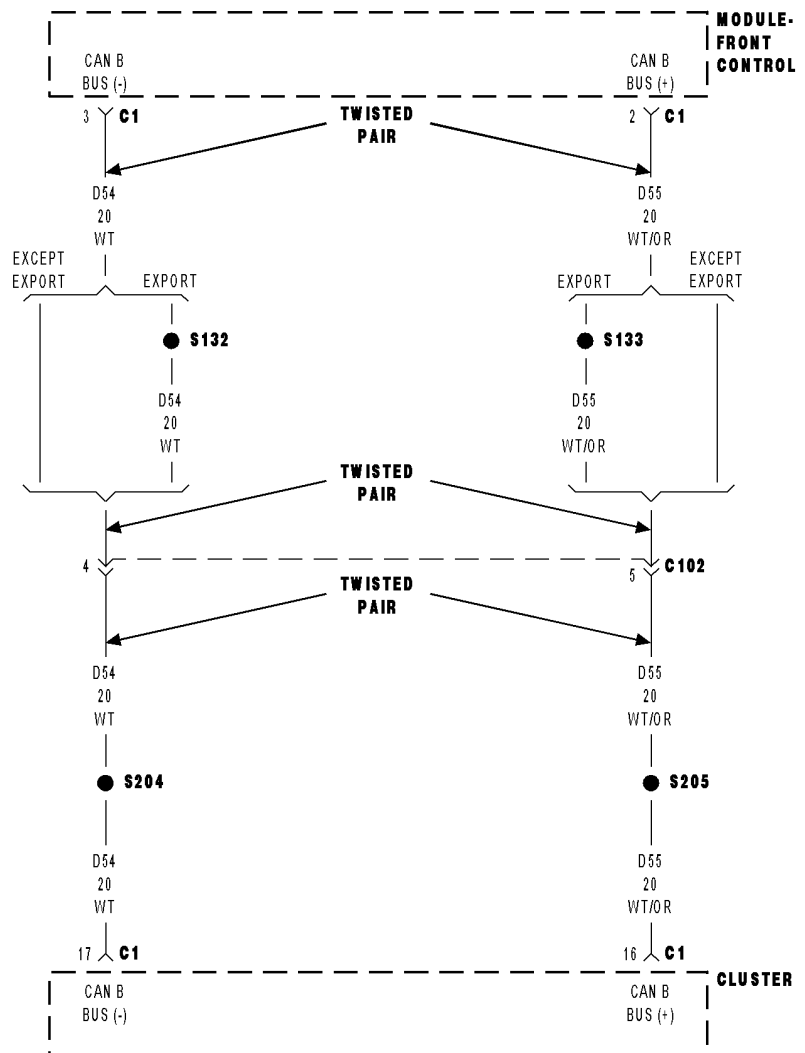
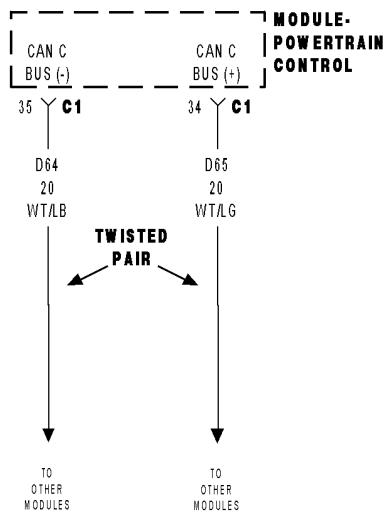
**Is the U0121-LOST COMMUNICATION WITH ABS MODULE/P0141-Lost Communicate With FCM also set?**

**Yes** >> Perform the appropriate diagnostic test.Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

---

## U1403-IMPLAUSIBLE FUEL LEVEL SIGNAL



**U1403-IMPLAUSIBLE FUEL LEVEL SIGNAL (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
The fuel level message that the PCM is receiving is implausible. The circuit is continuously monitored.

Possible Causes
CAN B OPEN OR SHORTED CLUSTER MODULE FRONT CONTROL MODULE PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The Front Control Module receives a fuel level signal over CAN B from the Cluster Module. Once the message is received from the FCM, it passages the fuel level message via CAN C to the PCM.

**Diagnostic Test****1. ACTIVE DTC**

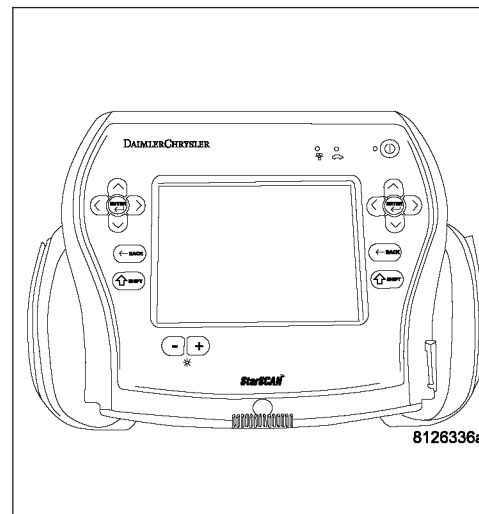
**Note:** Diagnose all CAN B and C communication failures before continuing.

Ignition on, engine not running.

With a scan tool read DTCs.

**Is the DTC active at this time?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



## U1403-IMPLAUSIBLE FUEL LEVEL SIGNAL (CONTINUED)

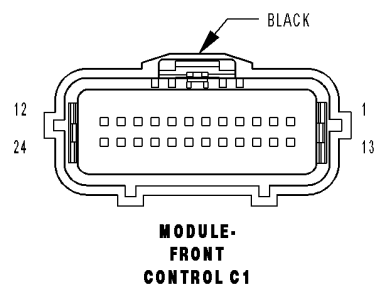
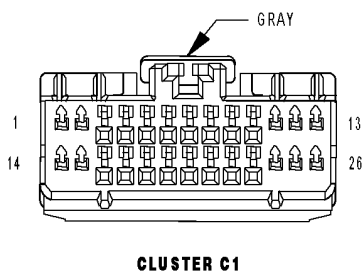
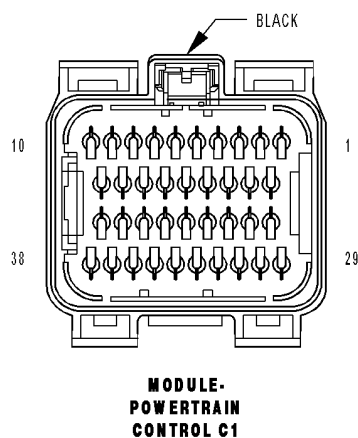
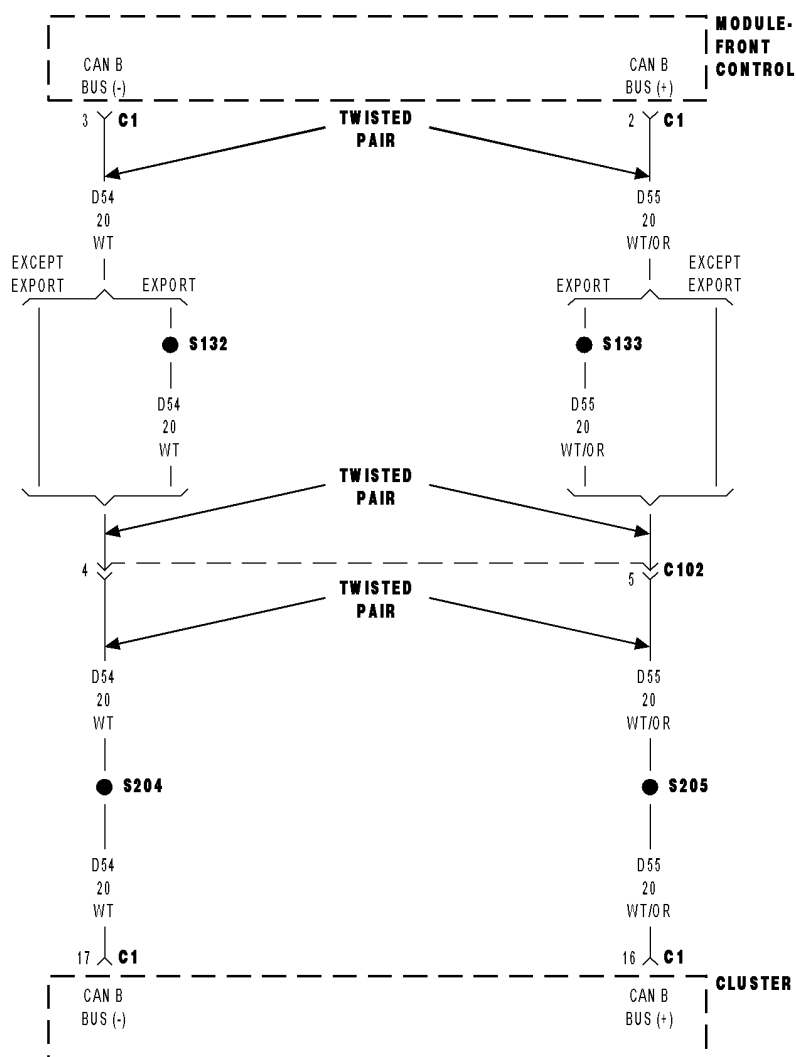
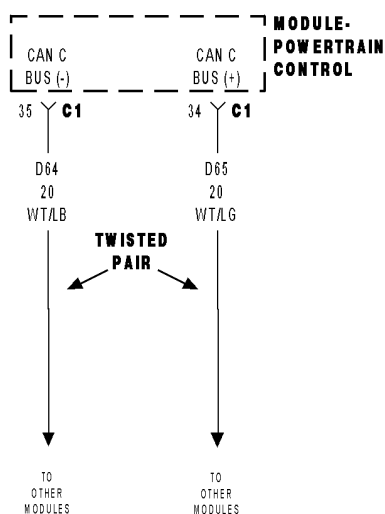
### 2. U0019-NO COMMUNICATION ON THE CAN B BUS CIRCUIT ALSO ACTIVE

With a scan tool check for DTCs in the FCM.

**Is the U0019-NO COMMUNICATION ON THE CAN B BUS CIRCUIT active at this time?**

- Yes** >> Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for the U0019-NO COMMUNICATION ON THE CAN B BUS CIRCUIT diagnostic procedures.  
Perform BODY VERIFICATION TEST – VER 1.
- No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.
-

# U1411-IMPLAUSIBLE FUEL VOLUME SIGNAL RECEIVED



**U1411-IMPLAUSIBLE FUEL VOLUME SIGNAL RECEIVED (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
The fuel volume message that the PCM is receiving is implausible. The circuit is continuously monitored.

Possible Causes
CAN B OPEN OR SHORTED CLUSTER MODULE FRONT CONTROL MODULE PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The Front Control Module receives a fuel volume signal over CAN B from the Cluster Module. Once the message is received from the FCM, it passages the fuel level message via CAN C to the PCM.

**Diagnostic Test****1. ACTIVE DTC**

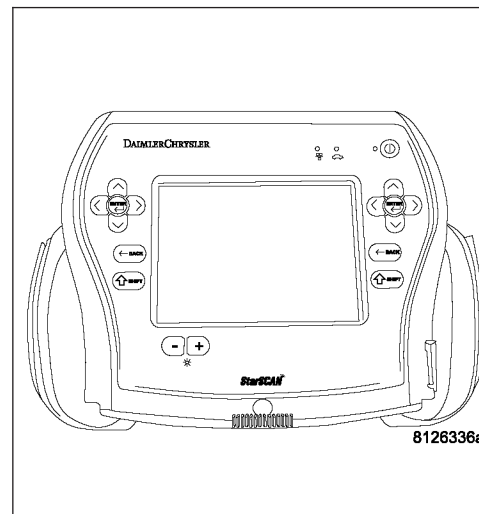
**Note: Diagnose all CAN B and C communication failures before continuing.**

Ignition on, engine not running.

With a scan tool read DTCs.

**Is the DTC active at this time?**

- Yes** >> Go To 2
- No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



**U1411-IMPLAUSIBLE FUEL VOLUME SIGNAL RECEIVED (CONTINUED)****2. U0019-NO COMMUNICATION ON THE CAN B BUS CIRCUIT ALSO ACTIVE**

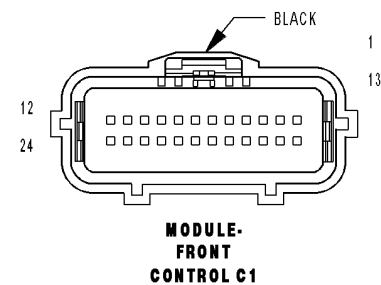
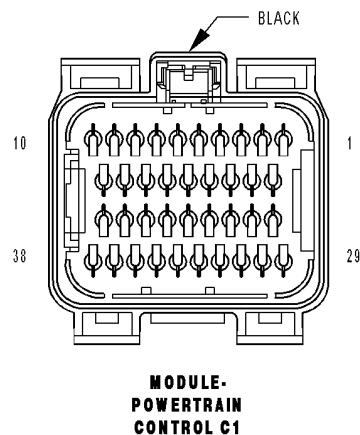
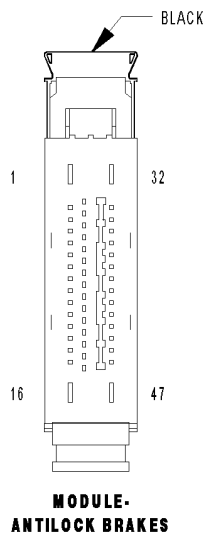
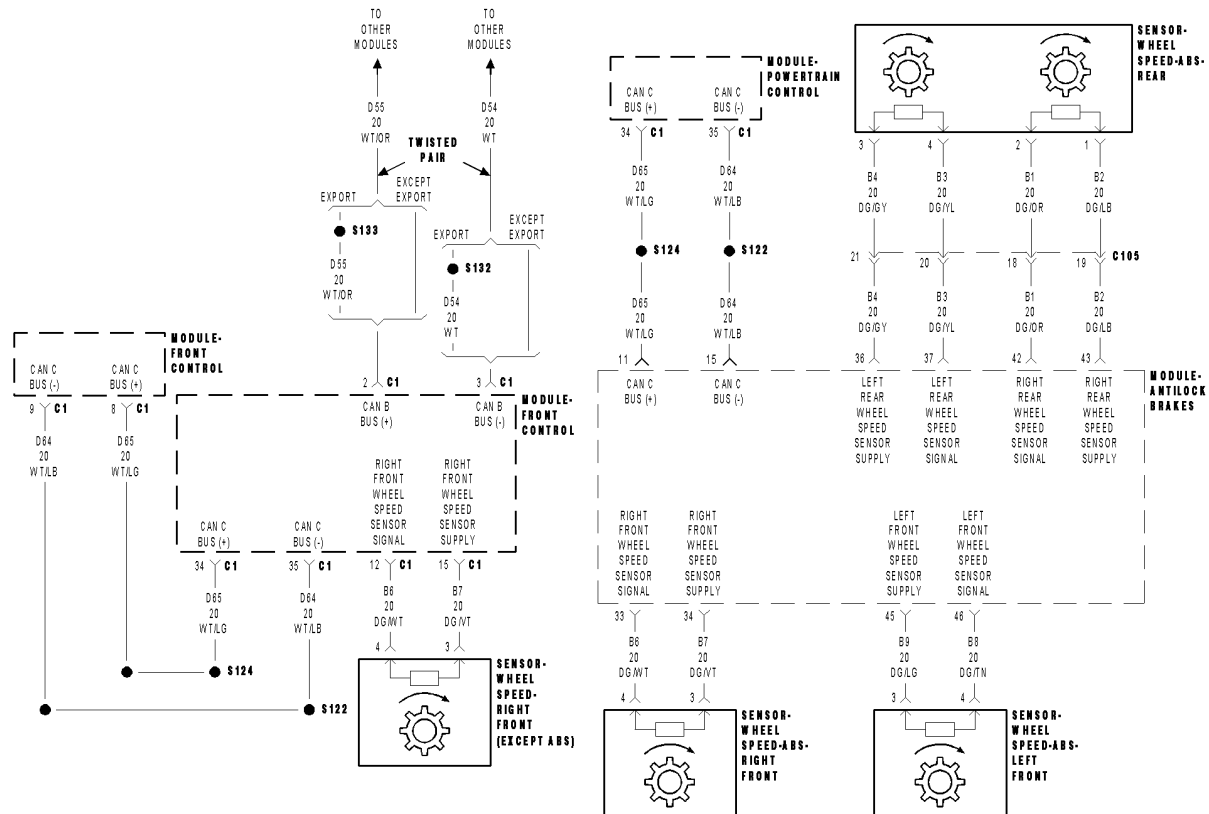
With a scan tool check for DTCs in the FCM.

**Is the U0019-NO COMMUNICATION ON THE CAN B BUS CIRCUIT active at this time?**

- Yes** >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the U0019-NO COMMUNICATION ON THE CAN B BUS CIRCUIT diagnostic procedures.  
Perform BODY VERIFICATION TEST – VER 1.
- No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.
-



## U1412-IMPLAUSIBLE VEHICLE SPEED SIGNAL RECEIVED



**U1412-IMPLAUSIBLE VEHICLE SPEED SIGNAL RECEIVED (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
The PCM gets an implausible signal over the CAN C circuit from the ABS Module or FCM (NON-ABS). The circuit is continuously monitored.

Possible Causes
CAN C BUS CIRCUIT SHORTED
CAN C BUS CIRCUIT OPEN
ABS MODULE
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The ABS Module or FCM (NON-ABS) sends vehicle speed information over the CAN C Bus circuit to the PCM.

**Diagnostic Test****1. ACTIVE DTC**

**Note:** Diagnose all CAN B and C communication failures before continuing.

Ignition on, engine not running.

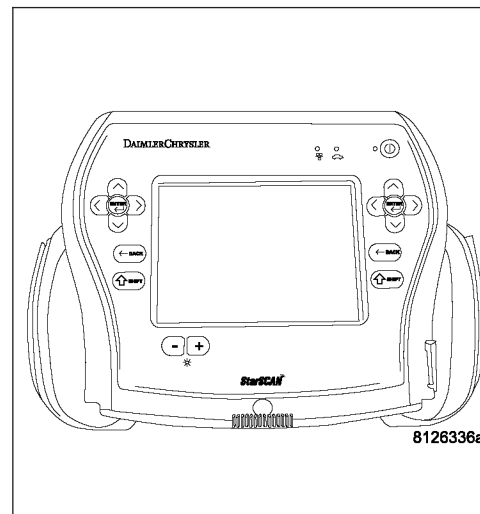
With a scan tool, read DTCs.

**Is the U1412-IMPLAUSIBLE VEHICLE SPEED SIGNAL RECEIVED active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.

**2. U0001-NO COMMUNICATION ON THE CAN C BUS CIRCUIT IS ACTIVE**

Continue reading DTCs.

**Is the U0001-NO COMMUNICATION ON THE CAN C BUS CIRCUIT ACTIVE at this time?**

**Yes** >> Refer to the Diagnostic Procedure for the U0001-NO COMMUNICATION ON THE CAN C BUS CIRCUIT.

**No** >> Go To 3

**U1412-IMPLAUSIBLE VEHICLE SPEED SIGNAL RECEIVED (CONTINUED)****3. ABS MODULE IS ACTIVE ON THE CAN C BUS**

With the scan tool, select ECU View.

Verify that the ABS Module is active on the bus.

**Is the ABS Module active on the bus?**

**Yes** >> Go To 4

**No** >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.  
Perform BODY VERIFICATION TEST – VER 1.

---

**4. ACTIVE DTCS IN THE FCM**

With the scan tool, select ECU View and select FCM.

With the scan tool, read active DTCs.

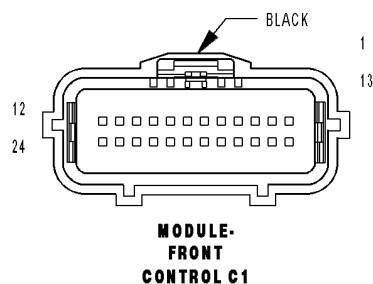
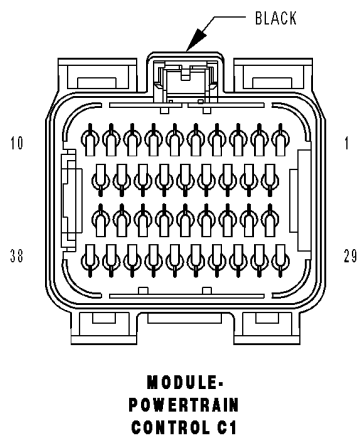
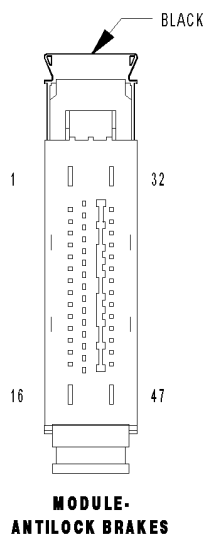
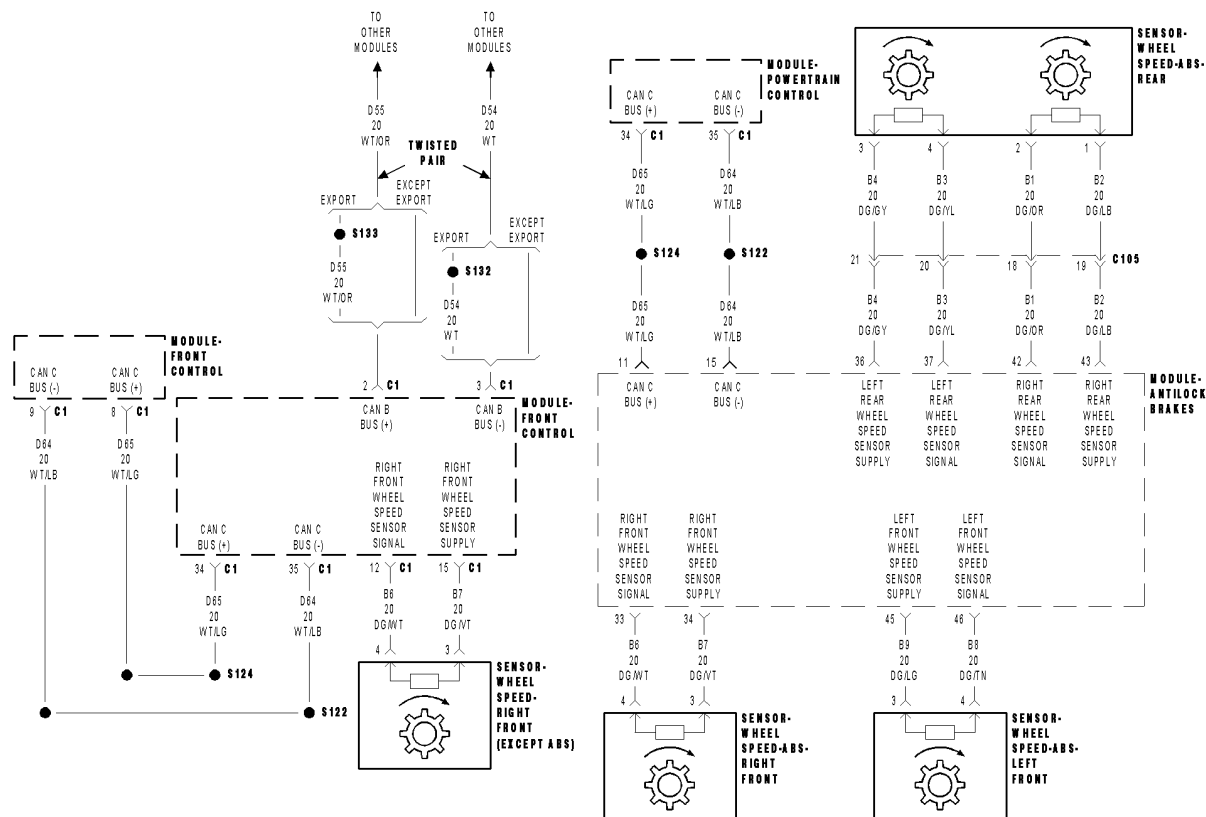
**Is the U0001-NO COMMUNICATION ON THE CAN C BUS CIRCUIT ACTIVE in the FCM at this time?**

**Yes** >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for U0001 diagnostic procedures.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform POWERTRAIN VERIFICATION TEST – VER 5.

---

## U1417-IMPLAUSIBLE LEFT WHEEL DISTANCE SIGNAL RECEIVED



U1417-IMPLAUSIBLE LEFT WHEEL DISTANCE SIGNAL RECEIVED (CONTINUED)

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Ignition on.
- **Set Condition:**  
The PCM gets an implausible signal over the CAN C circuit from the ABS Module or FCM (NON-ABS). The circuit is continuously monitored.

Possible Causes
VEHICLE SPEED SENSOR FAULT ACTIVE IN ANTI-LOCK BRAKE MODULE
CAN C BUS CIRCUIT SHORTED
CAN C BUS CIRCUIT OPEN
ABS MODULE
PCM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).

Theory of Operation

The ABS Module or FCM (NON-ABS) sends an implausible distance signal over the CAN C Bus circuit to the PCM.

Diagnostic Test

1. ACTIVE DTC

**Note:** Diagnose all CAN B and C communication failures before continuing.

Ignition on, engine not running.

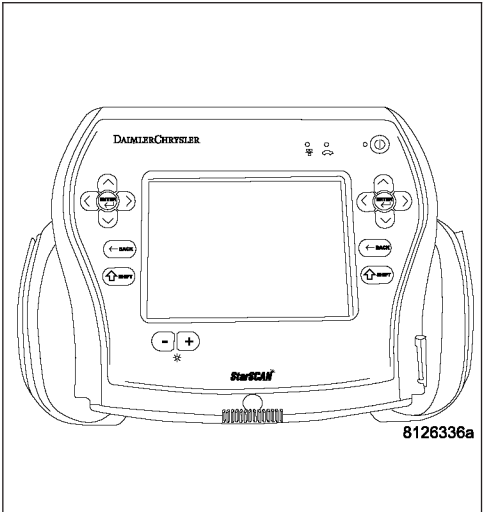
With a scan tool, read DTCs.

Is the U1417-IMPLAUSIBLE LEFT WHEEL DISTANCE SIGNAL RECEIVED active at this time?

- Yes

>> Go To 2
- No

>> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.



**U1417-IMPLAUSIBLE LEFT WHEEL DISTANCE SIGNAL RECEIVED (CONTINUED)****2. ABS MODULE IS ACTIVE ON THE CAN C BUS**

With the scan tool, select ECU View.

Verify that the ABS Module active on the bus.

**Is the ABS Module active on the bus?**

**Yes** >> Go To 3

**No** >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.  
Perform BODY VERIFICATION TEST – VER 1.

---

**3. DTCS STORED OR ACTIVE IN THE ABS MODULE**

Check for wheel speed DTCs in the ABS Module or FCM (NON-ABS).

**Are any DTCs active or stored in the ABS Module/FCM?**

**Yes** >> Refer to the appropriate section and perform the diagnostics for the DTCs.  
Perform VERIFICATION TEST – VER

**No** >> Go to 4

---

**4. ACTIVE DTCS IN THE FCM**

With the scan tool, select ECU View and select FCM.

With the scan tool, read active DTCs.

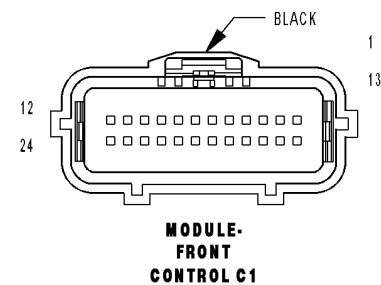
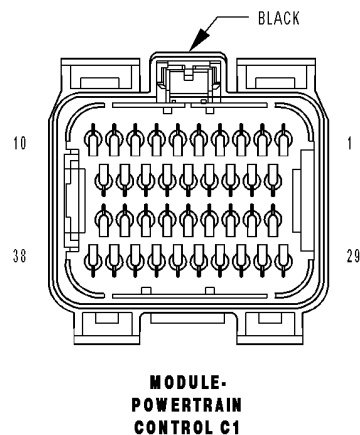
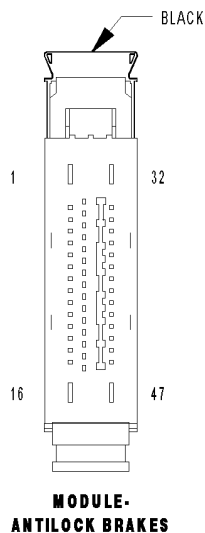
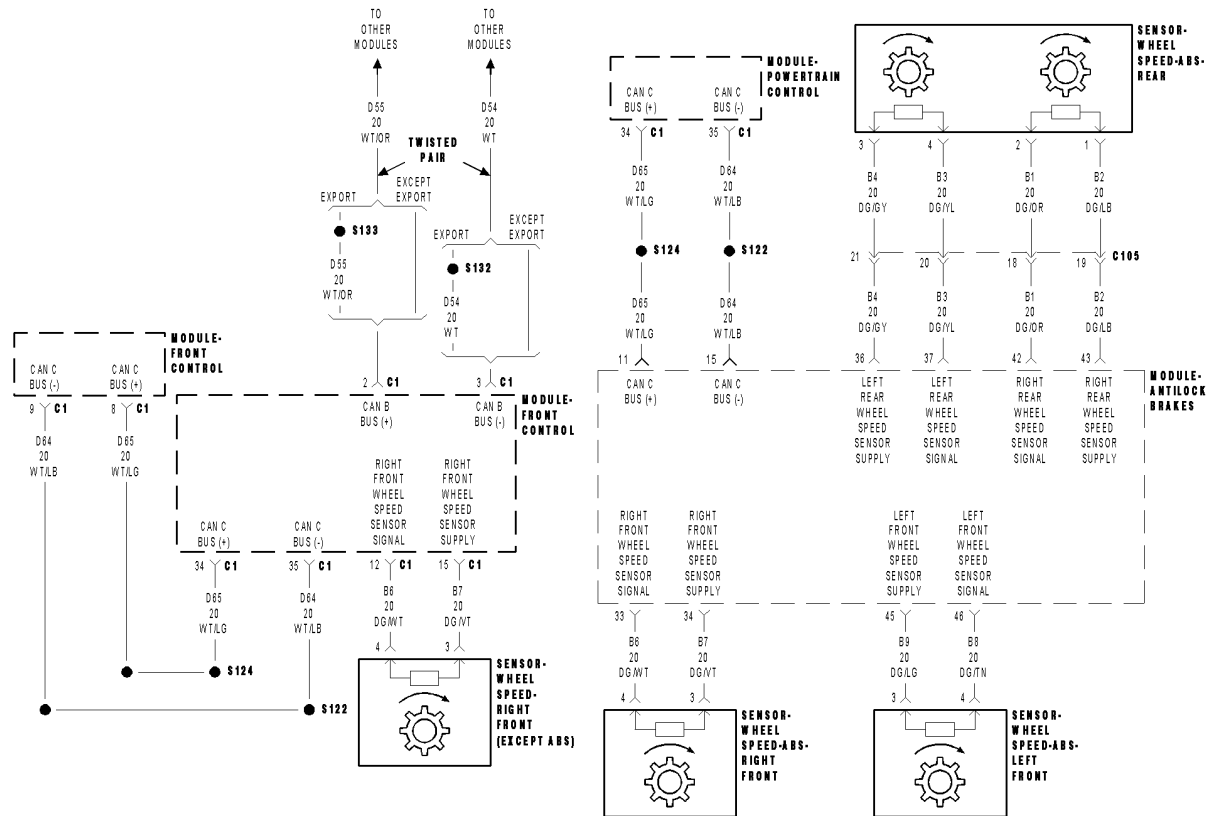
**Are any Communication DTCs active in the FCM relating to the ABS System?**

**Yes** >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic procedures.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform POWERTRAIN VERIFICATION TEST – VER 5.

---

## U1418-IMPLAUSIBLE RIGHT WHEEL DISTANCE SIGNAL RECEIVED



**U1418-IMPLAUSIBLE RIGHT WHEEL DISTANCE SIGNAL RECEIVED (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on.

- **Set Condition:**

The PCM gets an implausible signal over the CAN C circuit from the ABS Module or FCM (NON-ABS). The circuit is continuously monitored.

Possible Causes
VEHICLE SPEED SENSOR FAULT ACTIVE IN ANTI-LOCK BRAKE MODULE
CAN C BUS CIRCUIT SHORTED
CAN C BUS CIRCUIT OPEN
ABS MODULE
PCM

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The ABS Module or FCM (NON-ABS) sends an implausible distance signal over the CAN C Bus circuit to the PCM.

## Diagnostic Test

### 1. ACTIVE DTC

**Note:** Diagnose all CAN B and C communication failures before continuing.

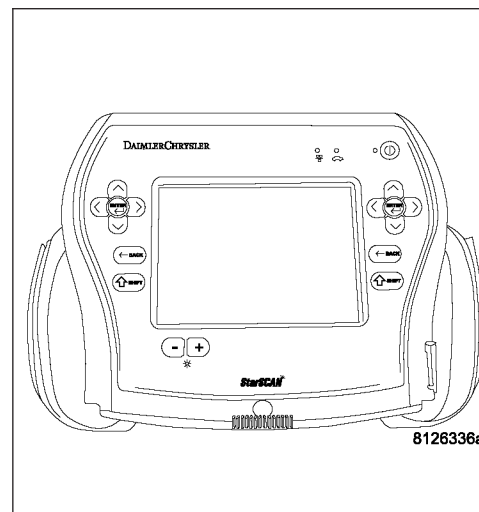
Ignition on, engine not running.

With a scan tool, read DTCs.

**Is the U1418-IMPLAUSIBLE RIGHT WHEEL DISTANCE SIGNAL RECEIVED active at this time?**

**Yes** >> Go To 2

**No** >> Refer to the INTERMITTENT CONDITION Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5.





**U1418-IMPLAUSIBLE RIGHT WHEEL DISTANCE SIGNAL RECEIVED (CONTINUED)****2. ABS MODULE IS ACTIVE ON THE CAN C BUS**

With the scan tool, select ECU View.

Verify that the ABS Module active on the bus.

**Is the ABS Module active on the bus?**

**Yes** >> Go To 3

**No** >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for No Response diagnostic procedures.  
Perform BODY VERIFICATION TEST – VER 1.

---

**3. DTCS STORED OR ACTIVE IN THE ABS MODULE/FCM (NON-ABS)**

Check for wheel speed DTCs in the ABS Module or FCM (NON-ABS).

**Are any DTCs active or stored in the ABS Module/FCM?**

**Yes** >> Refer to the appropriate section and perform the diagnostics for the DTCs.  
Perform VERIFICATION TEST – VER

**No** >> Go to 4

---

**4. ACTIVE DTCS IN THE FCM**

With the scan tool, select ECU View and select FCM.

With the scan tool, read active DTCs.

**Are any Communication DTCs active in the FCM relating to the ABS System?**

**Yes** >> (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING) for the diagnostic procedures.  
Perform BODY VERIFICATION TEST – VER 1.

**No** >> Replace and program the Powertrain Control Module per Service Information.  
Perform POWERTRAIN VERIFICATION TEST – VER 5.

---

**\*5.7L INTERMITTENT NO CRANK CONDITION**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
ETC STARTER INHIBIT

**Diagnostic Test****1. ETC STARTER INHIBIT**

**Note:** ETC equipped engines will try to relearn ETC position when the key is left in the on position for an extended period of time and will not allow the starter to crank during this procedure. This procedure can take up to 2.5 seconds.

To verify the cause of the no crank condition or delayed crank use the scan tool, and read the ETC Starter Inhibit mileage.

The controller will store the mileage at which the no start condition occurred because of the ETC testing procedure.

This is considered normal operation for a vehicle equipped with an Electronic Throttle Control System and no repairs are necessary.

**Is a mileage stored under the ETC Starter Inhibit?**

**Yes** >> Test Complete.

**No** >> Refer to the diagnostic procedure for \*No Crank Condition for further assistance.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER -2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

## \*CHECKING THE FUEL DELIVERY SYSTEM

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
RESTRICTED FUEL SUPPLY LINE FUEL PUMP INLET STRAINER PLUGGED (N1) FUEL PUMP RELAY OUTPUT CIRCUIT OPEN FUEL PUMP RELAY FUEL PUMP

### Diagnostic Test

#### 1. FUEL PUMP OPERATION

Ignition on, engine not running.

With a scan tool, actuate the Fuel System test.

**Note:** It may be necessary to use a mechanics stethoscope in the next step.

Listen for fuel pump operation at the fuel tank.

**CAUTION: Stop All Actuations.**

**Does the Fuel Pump operate?**

**Yes** >> Go To 2

**No** >> Go To 6

---

#### 2. FUEL PRESSURE

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge at the engine.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note:** **NOTE:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

**CAUTION: Stop All Actuations.**

**Choose a conclusion that best matches your fuel pressure reading.**

**Below Specification**

Go To 3

**Within Specification**

Test Complete.

**Above Specification**

Replace the fuel filter/fuel pressure regulator.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**\*CHECKING THE FUEL DELIVERY SYSTEM (CONTINUED)****3. RESTRICTED FUEL SUPPLY LINE**

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**

Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.

Install special tool #6539 (5/16") or #6631(3/8") fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).**

**CAUTION: Stop All Actuations.**

**Is the fuel pressure within specification now?**

**Yes** >> Repair/replace fuel supply line as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 4

---

**4. CHECKING FUEL TANK SIPHON HOSE AND FUEL LINE**

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.**

Gain access to the Fuel Pump Module and the Fuel Tank Module.

Inspect the following fuel components:

- Fuel line and siphon hose between the Fuel Pump Module and the Fuel Tank Module. Look for disconnected and/or damaged lines or hoses
- Fuel Pressure Regulator not properly seated in the module.
- Debris near or in the modules fuel pick up.

**Were the above items in good working condition?**

**Yes** >> Go To 5

**No** >> Repair or replace as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**\*CHECKING THE FUEL DELIVERY SYSTEM (CONTINUED)****5. FUEL PRESSURE REGULATOR**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove the Fuel Tank Module.

Replace the Fuel Pressure Regulator.

Install the Fuel Pump Module and the Fuel Tank Module in accordance with the service information.

Retest the fuel pressure.

**Is the fuel pressure within specification?**

**Yes** >> Test complete.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace the Fuel Pump Module.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**6. FUEL PUMP RELAY FUSED B+ CIRCUIT OPEN**

Turn the ignition off.

Remove the Fuel Pump Relay from the IPM.

Using a 12 volt test light connected to ground, probe the (A35) Fused B+ circuit at the relay connector.

**Does the test illuminate brightly?**

**Yes** >> Go To 7

**No** >> Repair the open in the (A35) Fused B+ circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**7. (N1) FUEL PUMP RELAY OUTPUT CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Fuel Pump Module harness connector.

Measure the resistance of the (N1) Fuel Pump Relay Output circuit from the relay connector to the fuel pump module connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Fuel Pump Relay.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Repair the open in the (N1) Fuel Pump Relay Output circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**\*HARD START FUEL SYSTEM**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
FUEL CONTAMINATION RESTRICTED FUEL SUPPLY LINE FUEL PUMP INLET STRAINER PLUGGED FUEL PUMP MODULE FAULTY FUEL PUMP MODULE FUEL INJECTOR(S)

**Diagnostic Test****1. CHECKING FUEL PRESSURE**

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install a fuel pressure gauge at the engine.

Ignition on, engine not running.

With a scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note: NOTE:** Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Choose a conclusion that best matches your fuel pressure reading.

**Below Specification**

Go To 2

**Within Specification**

Go To 4

---

**\*HARD START FUEL SYSTEM (CONTINUED)****2. RESTRICTED FUEL SUPPLY LINE**

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.**

Raise vehicle on hoist, and disconnect the fuel supply line at the fuel pump module.

Install special tool #6539 (5/16") #6631(3/8") fuel line adapter and the fuel pressure gauge between the fuel supply line and the fuel pump module.

Ignition on, engine not running.

With the scan tool, actuate the ASD Fuel System test and observe the fuel pressure gauge.

**Note: Fuel pressure specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).**

**Is the fuel pressure within specification?**

**Yes** >> Visually and physically inspect the fuel supply lines between the fuel tank and the fuel rail. Repair/replace as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**3. CHECKING THE FUEL INLET STRAINER**

Turn the ignition off.

**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.**

Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.

**Is the Fuel Inlet Strainer plugged?**

**Yes** >> Replace the Fuel Pump Inlet Strainer.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace the Fuel Pump Module.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**\*HARD START FUEL SYSTEM (CONTINUED)****4. FUEL PUMP MODULE**

**Note:** Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install special tool #6539 (5/16") or #6631 (3/8") fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

**Note:** Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

**Note:** The pressure should not fall below 241 KPa (35 psi)

**Does the fuel pressure drop?**

**Yes** >> Replace Fuel Pump Module.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 5

---

**5. FUEL INJECTOR(S)**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove special tool #C4390.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

**Note:** Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and fuel pump module.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

**Note:** The pressure should not fall below 241 KPa (35 psi)

**Does the fuel pressure drop?**

**Yes** >> Replace the leaking fuel injectors.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Check the fuel for contaminants.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---



**\*ENGINE CRANKS BUT DOES NOT START**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
NO START PRE-TEST POWERTRAIN FUSES OPEN SECONDARY INDICATORS PRESENT ENGINE MECHANICAL PROBLEM ASD RELAY OUTPUT CIRCUIT OPEN FUEL CONTAMINATION

**Diagnostic Test****1. NO START PRE-TEST**

**Note:** The following list of items must be checked before continuing with any no start tests.

The battery must be fully charged and in good condition. A low charged battery may produce invalid test results. If the battery is low, charge the battery and then attempt to start the vehicle by cranking the engine for 15 seconds, 3 consecutive times.

This will allow any DTCs to set that may have been erased due to a dead battery.

Try to communicate with PCM if not able to communicate check fuses.

Make sure the Powers and Ground to the PCM are OK.

Make sure the PCM communicates with the scan tool and that there are no DTCs stored in the PCM memory. If the PCM reports a No Response condition, refer to section 8 Electrical Electronic Control Module Electrical Diagnostics for the proper tests.

Read the PCM DTCs with the scan tool. If any DTCs are present, they must be repaired before continuing with any other No Start diagnostic tests. Refer to the Table of Contents for the related P-code that is reported by the PCM.

Make sure that the Bus is functional. Attempt to communicate with the Instrument Cluster and VTSS, If you are unable to establish communications refer to 8 Electrical Electronic Control Module Electrical Diagnostics for the proper Diagnostic procedures.

The Sentry Key Immobilizer System must be operating properly. Check for proper communication with the scan tool and check for DTCs that may be stored in the Sentry Key Immobilizer Module (SCREEM). Repair the DTC(s) before continuing.

If no DTCs are found, using the scan tool, select Clear PCM (BATT Disconnect).

Crank the engine several times. Using the scan tool, read DTCs. If a DTC is present perform the DTC diagnostics before continuing.

**Were any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 2

---

**\*ENGINE CRANKS BUT DOES NOT START (CONTINUED)****2. OPEN FUSE**

Check for any open fuses in both IPM (PDC) or Junction Block that may be related to the No Start condition.

**Are any of the fuses open?**

- Yes** >> Replace the open fuse and check the related circuit(s) for a short to ground.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 3
- 

**3. SECONDARY INDICATORS PRESENT**

Ignition on, engine not running.

With the scan tool, under DTCs & Related Functions, read the Secondary Indicators while cranking the engine.

**Are there any Secondary Indicators present while cranking the engine?**

- Yes** >> Refer to the Engine Electrical Diagnostics group and perform the tests related to the secondary indicator that is reported by the scan tool.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 4
- 

**4. POSSIBLE MECHANICAL PROBLEMS**

Check for any of the following conditions/mechanical problems.

ENGINE VALVE TIMING - must be within specifications, check for broken timing components

ENGINE COMPRESSION - must be within specifications

ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.

**Are there any engine mechanical problems?**

- Yes** >> Repair as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)
- No** >> Go To 5
-

**\*ENGINE CRANKS BUT DOES NOT START (CONTINUED)****5. (K542) ASD RELAY OUTPUT CIRCUIT OPEN**

Turn the ignition off.

Remove the ASD relay from the IPM.

Disconnect the PCM harness connectors.

Verify the ASD Relay is getting voltage on the Fused B+ circuits before continuing.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the ASD Relay Output circuit from the ASD Relay connector to the appropriate terminals of special tool #8815, Ignition coil, and the fuel injectors.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 6

**No** >> Repair the open in the (K542) ASD Relay Output circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**6. FUEL PUMP DELIVERY**

Verify that the Fuel tank is not empty before continuing.

Follow the diagnostics for Checking Fuel Delivery in the Driveability section of this manual.

**Was the No Start condition solved after following the above diagnostic test?**

**Yes** >> Test Complete.

**No** >> Check for contamination/water in the fuel. Make sure the fuel being used in this vehicle meets manufactures Fuel Requirement, refer to the service manual.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**\*FUEL PRESSURE LEAK DOWN**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
FUEL PUMP MODULE
FUEL INJECTOR(S)

**Diagnostic Test****1. FUEL PUMP MODULE**

**Note:** Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair / replace as necessary.

Turn the ignition off.

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Install special tool #6539 (5/16") or #6631 (3/8") fuel line adapter.

Install the fuel pressure gauge.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

**Note:** Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

**Note:** The pressure should not fall below 241 KPa (35 psi)

**Does the fuel pressure drop?**

**Yes** >> Replace Fuel Pump Module.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 2

---

**\*FUEL PRESSURE LEAK DOWN (CONTINUED)****2. FUEL INJECTOR(S)**

**WARNING:** The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released. Failure to follow these instructions can result in personal injury or death.

Remove special tool #C4390.

Start the engine and allow the fuel system to reach maximum pressure.

Turn the ignition off.

**Note: NOTE: Fuel specification is 407 KPa +/- 34 KPa (59 psi +/- 5 psi).**

Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and fuel pump module.

Monitor the fuel pressure gauge for a minimum of 5 minutes.

**Note: The pressure should not fall below 241 KPa (35 psi)**

**Does the fuel pressure drop?**

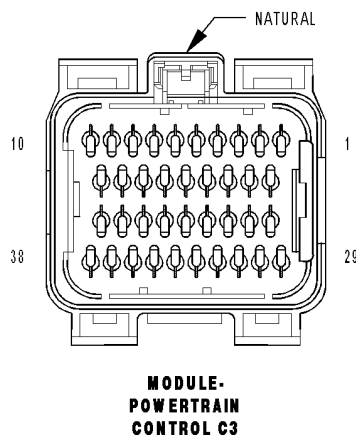
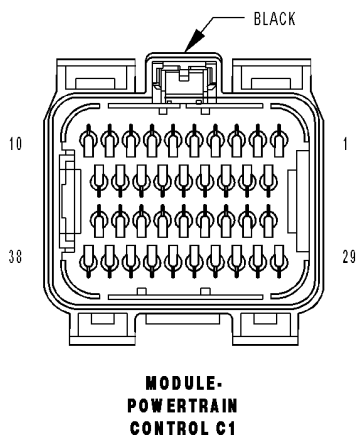
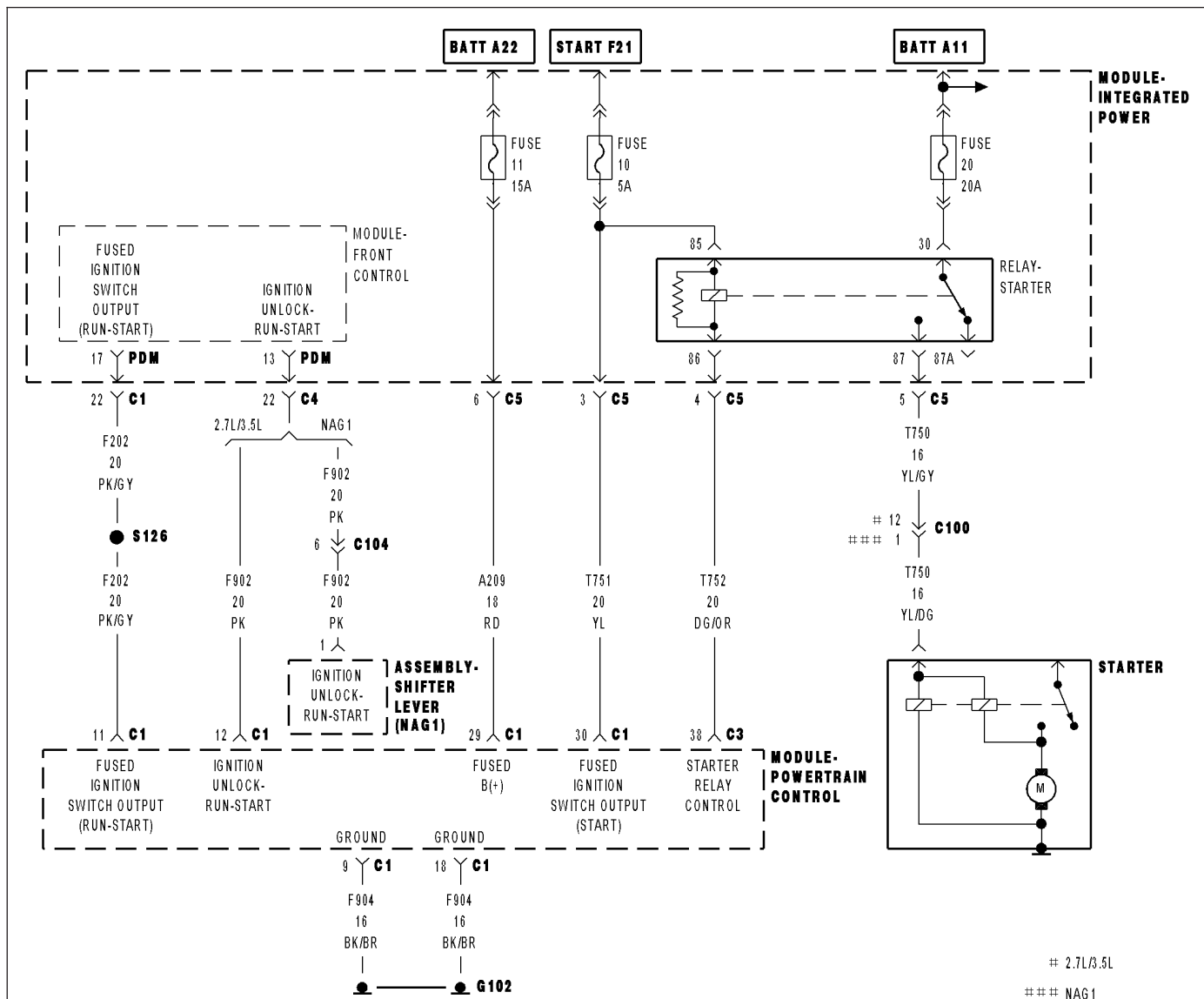
**Yes** >> Replace the leaking fuel injectors.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 2.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Test Complete.

---

**\*NO CRANK CONDITION**



**\*NO CRANK CONDITION (CONTINUED)**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
MECHANICAL CONDITION BATTERY CIRCUIT RESISTANCE TOO HIGH FUSED IGNITION SWITCH OUTPUT CIRCUITS FUSED B+ CIRCUIT OPEN (T752) STARTER RELAY CONTROL CIRCUIT OPEN (T750) STARTER RELAY OUTPUT CIRCUIT OPEN TRANSMISSION RANGE SENSOR STARTER RELAY STARTER

**Diagnostic Test****1. MECHANICAL CONDITION**

**Note:** Verify the battery is fully charged and capable of passing a load test before continuing.

**WARNING:** Make sure the battery is disconnected, then wait two minutes before proceeding. Failure to do so may result in personal injury or possible death.

Turn the engine over by hand to make sure the engine is not seized.

**Is the engine able to turn over?**

**Yes** >> Go To 2

**No** >> Repair the mechanical condition preventing the starter motor from cranking.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**2. EXCESSIVE RESISTANCE IN THE BATTERY CIRCUIT**

Turn the ignition off.

Check the Battery Cables for excessive resistance using the service information procedure.

**Did either Battery Cable have a voltage drop greater than 0.2 of a volt?**

**Yes** >> Repair the excessive resistance in the Battery circuit.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

---

**\*NO CRANK CONDITION (CONTINUED)****3. STARTER RELAY**

Turn ignition off.

Remove the Starter Relay from IPM.

**CAUTION:** The Parking Brake must be on and the Transmission must be in park for a vehicle equipped with an automatic transmission.

**WARNING:** When the engine is operating, do not stand in direct line with the fan. Do not put your hands near the pulleys, belts, or fan. Do not wear loose clothing. Failure to follow these instructions can result in personal injury or death.

Briefly connect a jumper wire between Fused B+ circuit and the (T750) Starter Relay Output circuit.

**Did the Starter Motor crank the engine?**

**Yes** >> Go To 4

**No** >> Go To 6

---

**4. (T751) FUSED IGNITION SWITCH OUTPUT CIRCUIT**

Ignition on, engine not running.

Using a 12-volt test light, probe the (T751) Fused Ignition Switch Output circuit in the Starter Relay connector.

While observing 12-volt test light, hold ignition key in the start position.

**Does the test light illuminate brightly?**

**Yes** >> Go To 5

**No** >> Repair the excessive resistance in the (T751) Fused Ignition Switch Output circuit. Inspect related fuses and repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**5. (T752) STARTER RELAY CONTROL CIRCUIT OPEN**

Turn the ignition off.

Disconnect the PCM harness connectors.

Measure the resistance in the (T752) Starter Relay Control circuit from the Relay terminal to the appropriate terminals of special tool #8815.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Starter Motor Relay.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Repair the open in the (T752) Starter Relay Control circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---



**\*NO CRANK CONDITION (CONTINUED)****6. FUSED B+ CIRCUIT OPEN**

Turn the ignition off.

Using a 12-volt test light connected to ground, probe the Fused B+ circuit at the Starter Relay terminal.

**Does the test light illuminate brightly?**

**Yes** >> Go To 7

**No** >> Repair the excessive resistance in the Fused B+ circuit. Inspect related fuses and repair as necessary. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**7. (T750) STARTER RELAY OUTPUT CIRCUIT OPEN**

Disconnect the Starter Relay Output connector from the Starter Solenoid.

Measure the resistance of the (T750) Starter Relay Output circuit between the Relay and the Solenoid harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 8

**No** >> Repair the open in the (T750) Starter Relay Output circuit. Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

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**8. STARTER**

**If there are no other possible causes remaining, review repair.**

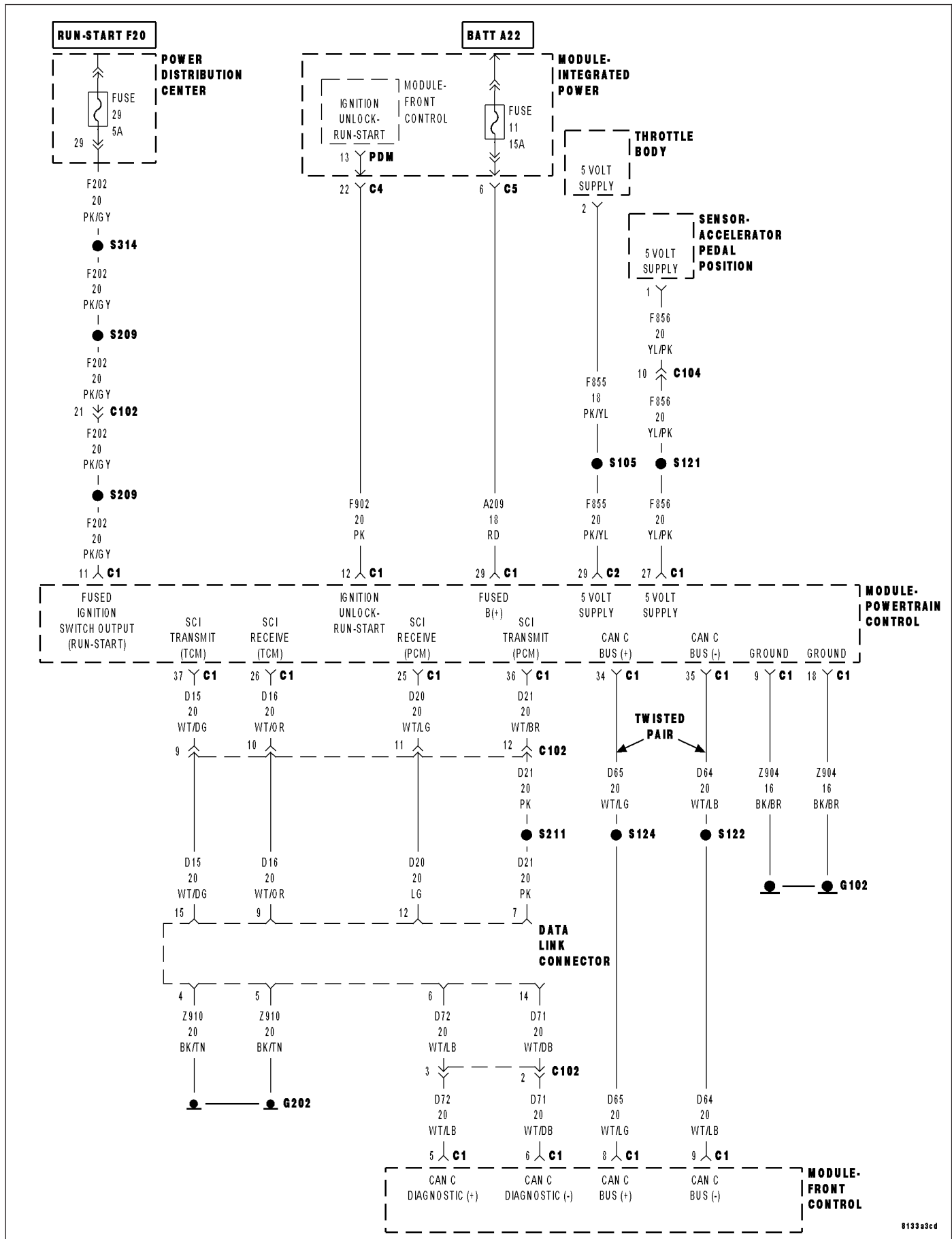
**Repair**

Replace the Starter.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

# \*NO RESPONSE WITH A NO START CONDITION



**\*NO RESPONSE WITH A NO START CONDITION (CONTINUED)**  
For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).  
For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
(A209) PCM FUSED B+ CIRCUIT PCM NO RESPONSE (F202) (F902) PCM FUSED IGNITION SWITCH OUTPUT CIRCUITS (Z904) PCM GROUND CIRCUITS CRANKSHAFT POSITION SENSOR (F855) 5-VOLT SENSOR OPEN/SHORTED (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND PCM

Diagnostic Test

1. (A209) PCM FUSED B+ CIRCUIT

**Note:** The scan tool and cable must be operating properly for the results of this test to be valid.

**Note:** Make sure the ignition switch was on while trying to communicate with the PCM.

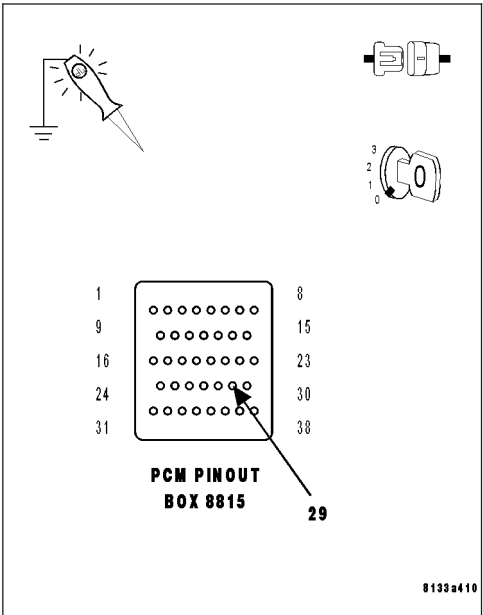
Turn the ignition off.  
Disconnect the PCM harness connectors.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

Using a 12-volt test light connected to ground probe the appropriate terminal of special tool #8815.

Does the test light illuminate brightly?

- Yes    >> Go To 2
- No    >> Repair the open or short to ground in the (A209) Fused B+ circuit. Inspect and replace fuses as necessary.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**\*NO RESPONSE WITH A NO START CONDITION (CONTINUED)****2. (F202) (F902) PCM FUSED IGNITION SWITCH CIRCUITS**

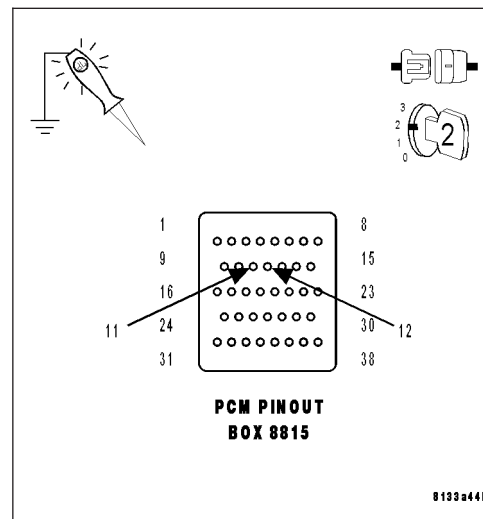
Using a 12-volt test light connected to ground, probe the PCM Fused Ignition Switch Output circuit in the appropriate terminals of special tool #8815.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Repair the (F202) and (F902) Ignition Switch Output circuits. Inspect and replace fuses as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**3. (Z904) PCM GROUND CIRCUITS**

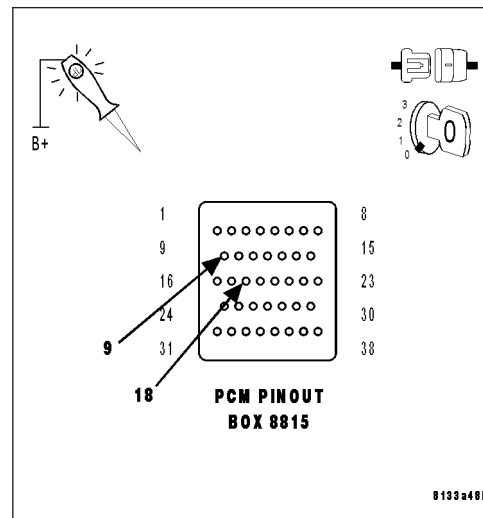
Using a 12-volt test light connected to battery voltage, probe the (Z904) PCM ground circuits in the appropriate terminals of special tool #8815.

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the PCM ground circuits.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**\*NO RESPONSE WITH A NO START CONDITION (CONTINUED)****4. (F855) 5-VOLT SUPPLY CIRCUIT**

Turn the ignition off.

Connect the PCM harness connectors.

Disconnect the Crankshaft Position Sensor harness connector.

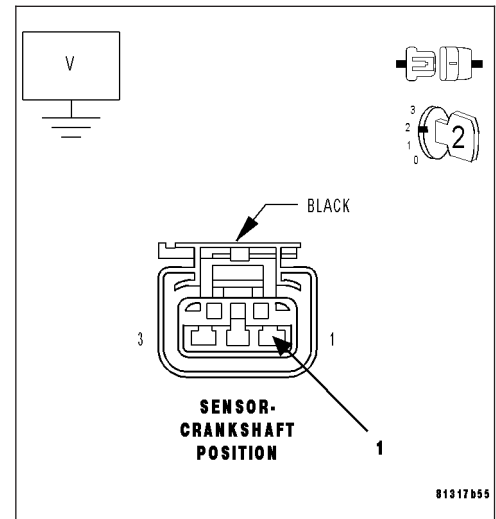
Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit.

**Is the voltage between 4.5 and 5.2 volts?**

**Yes** >> Go To 5

**No** >> Go To 6

**5. CKP SENSOR**

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit in the Throttle Body harness connector.

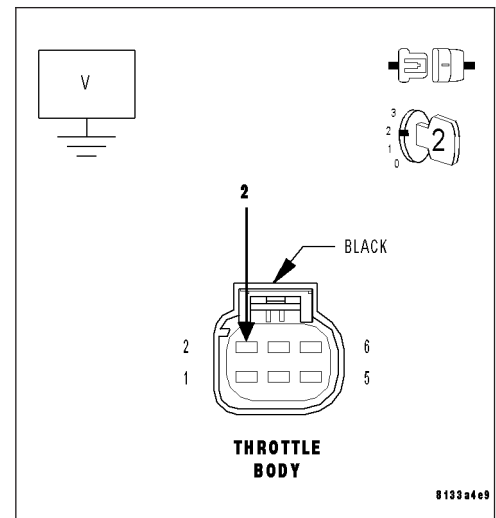
**Is the voltage between 4.5 and 5.2 volts?**

**Yes** >> If communication is available with a PCM on a like vehicle, replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace the Crankshaft Position Sensor.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**\*NO RESPONSE WITH A NO START CONDITION (CONTINUED)****6. (F855) 5-VOLT SENSOR OPEN/SHORTED**

Turn the ignition off.

Disconnect the Throttle Body harness connector.

Ignition on, engine not running.

Measure the voltage on the (F855) 5-volt Supply circuit.

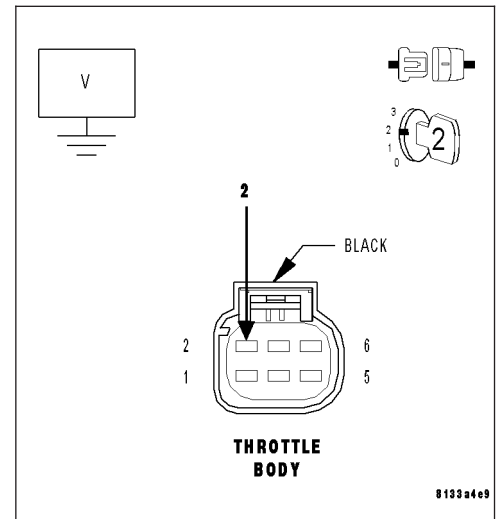
Disconnect all the sensors that use the (F855) 5-volt Supply circuit.

**Did the voltage return to 4.5 to 5.2 volts when disconnecting any of the sensors.**

**Yes** >> Replace the sensor that is pulling down the (F855) 5-volt supply.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7

**7. (F855) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect PCM harness connectors.

Disconnect all the sensors that share the (F855) 5-volt Supply circuit.

Measure the resistance between ground and the (F855) 5-volt Supply circuit at one of the sensor harness connectors.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F855) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 8

**8. (F856) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND**

Disconnect all the sensors that share the (F856) 5-volt Supply circuit.

Measure the resistance between ground and the (F856) 5-volt Supply circuit at one of the sensor harness connectors.

**Is the resistance below 100 ohms?**

**Yes** >> Repair the short to ground in the (F856) 5-volt Supply circuit.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 9

**\*NO RESPONSE WITH A NO START CONDITION (CONTINUED)****9. PCM**

**Note:** Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Replace and program the Powertrain Control Module per Service Information.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**\*START AND STALL CONDITION**

For the Engine circuit diagram (Refer to 9 - ENGINE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Possible Causes
CURRENT PCM DTCS
CURRENT SKIM DTCS
THROTTLE POSITION SENSOR SWEEP
TP SENSOR NO.1 VOLTAGE GREATER THAN 0.92 VOLTS WITH THROTTLE CLOSED
ECT SENSOR
OTHER POSSIBLE CAUSES FOR START AND STALL CONDITON
FUEL CONTAMINATION

**Diagnostic Test****1. CHECKING DTCS**

Ignition on, engine not running.

With a scan tool, read DTCs.

**Are any DTCs present?**

**Yes** >> Refer to the appropriate Diagnostic Procedure.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.

**No** >> Go To 2

**2. CHECKING SKIM DTCS**

**Note:** If you are unable to communicate with the SKIM/SKREEM, refer to the VEHICLE THEFT AND SECURITY ELECTRICAL DIAGNOSTICS in Section 8 and perform the appropriate diagnostics.

With the scan tool, read the SKIM codes.

**Are there any SKIM DTCs?**

**Yes** >> Refer to the Sentry Key Vehicle Theft Security Electrical Diagnostics in Section 8.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 3

**3. TP SENSOR SWEEP**

Ignition on, engine not running.

Using a scan tool, perform the pedal follower test and monitor both TP Sensor voltage readings.

**Was the voltage change smooth for both sensors?**

**Yes** >> Go To 4

**No** >> Replace the Throttle Body Assembly.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)



**\*START AND STALL CONDITION (CONTINUED)****4. TP SENSOR NO.1 VOLTAGE GREATER THAN 0.92 VOLTS WITH THROTTLE CLOSED**

With the scan tool, read Throttle Position Sensor No.1 voltage.

Throttle must be against its stop.

**Is the voltage 0.92 or less with the Throttle closed?**

**Yes** >> Go To 5

**No** >> Check for a binding throttle condition. If OK, replace the Throttle Body Assembly.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**5. ECT SENSOR OPERATION**

**Note:** For this test to be valid, the thermostat must be operating correctly.

**Note:** This test works best if performed on a cold engine (cold soaked).

**Note:** If the vehicle was allowed to sit over night with no engine start, coolant temperature should be near ambient temperatures.

Ignition on, engine not running.

With the scan tool, read the ECT value.

**Note:** If engine coolant temperature is above 82° C (180° F), allow the engine to cool until 65° C (150° F) is reached.

Start the engine.

During engine warm-up, monitor the Engine Coolant Temperature value. The temperature value change should be a smooth transition from start up to normal operating temp 82° C (180° F). The value should reach at least 82° C (180° F).

**Did the Engine Temperature value increase smoothly and did it reach at least 82° C (180° F)?**

**Yes** >> Go To 6

**No** >> Replace the Engine Coolant Temperature Sensor.  
Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

---

**6. OTHER POSSIBLE CAUSES OF START AND STALL CONDITION**

The following additional items should be checked as a possible cause for a start and stall condition.

Refer to any Technical Service Bulletins (TSBs) that may apply to the symptom.

The exhaust system must be free of any restrictions.

The engine compression must be within specifications.

The engine valve timing must be within specifications.

The engine must be free from vacuum leaks.

The throttle body must be free of carbon buildup and dirt.

**Do any of the above conditions exist?**

**Yes** >> Repair as necessary.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

**No** >> Go To 7

---

**\*START AND STALL CONDITION (CONTINUED)****7. FUEL PUMP DELIVERY**

Verify that the Fuel tank is not empty before continuing.

Follow the diagnostics for Checking Fuel Delivery in this manual.

**Was the No Start condition solved after following the above diagnostic test?**

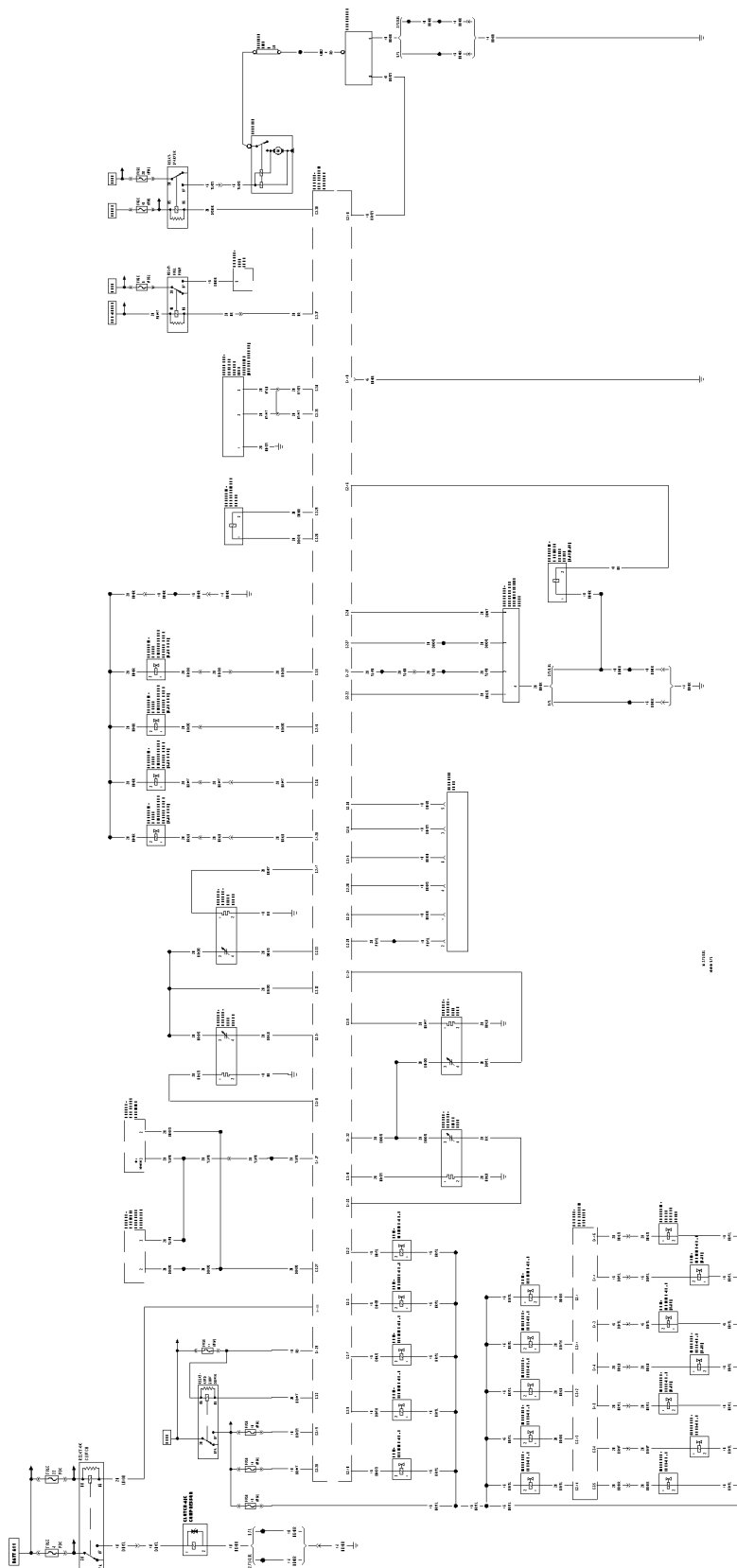
**Yes** >> Test Complete.

**No** >> Check for contamination/water in the fuel. Ensure the fuel being used in this vehicle meets OEM Fuel Requirement, refer to the service manual.

Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 1.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE -DIAGNOSIS AND TESTING)

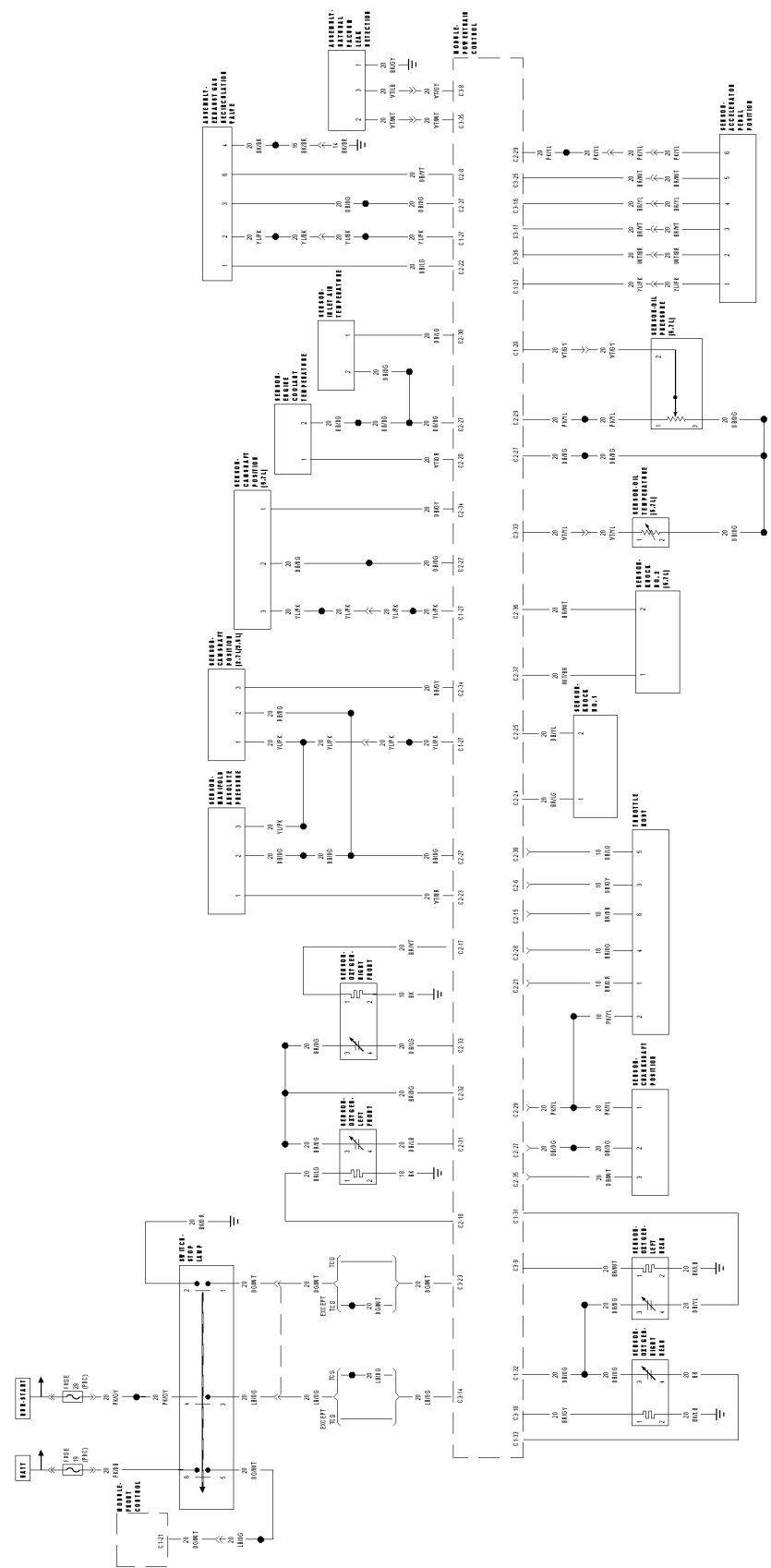
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## SCHEMATICS AND DIAGRAMS



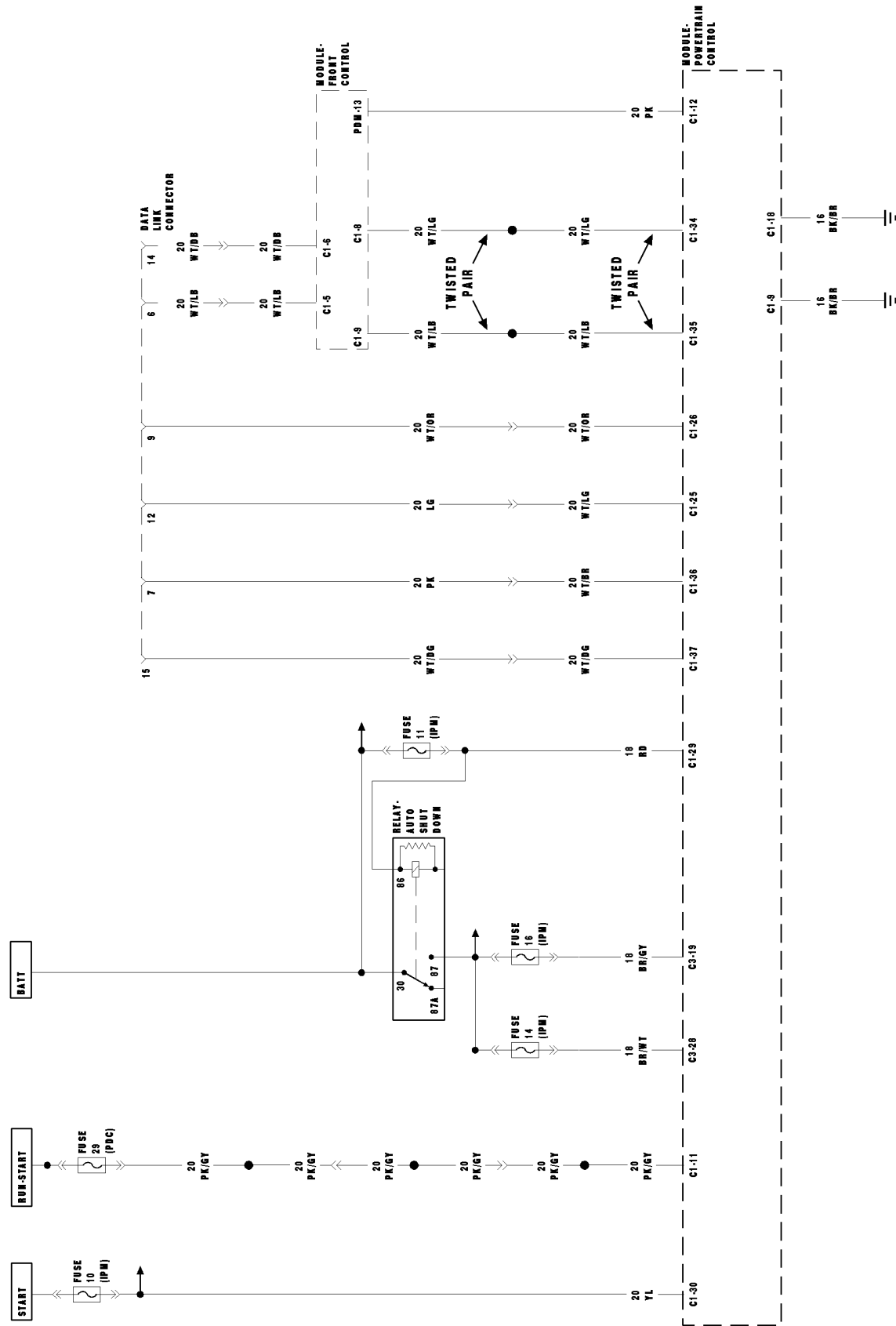
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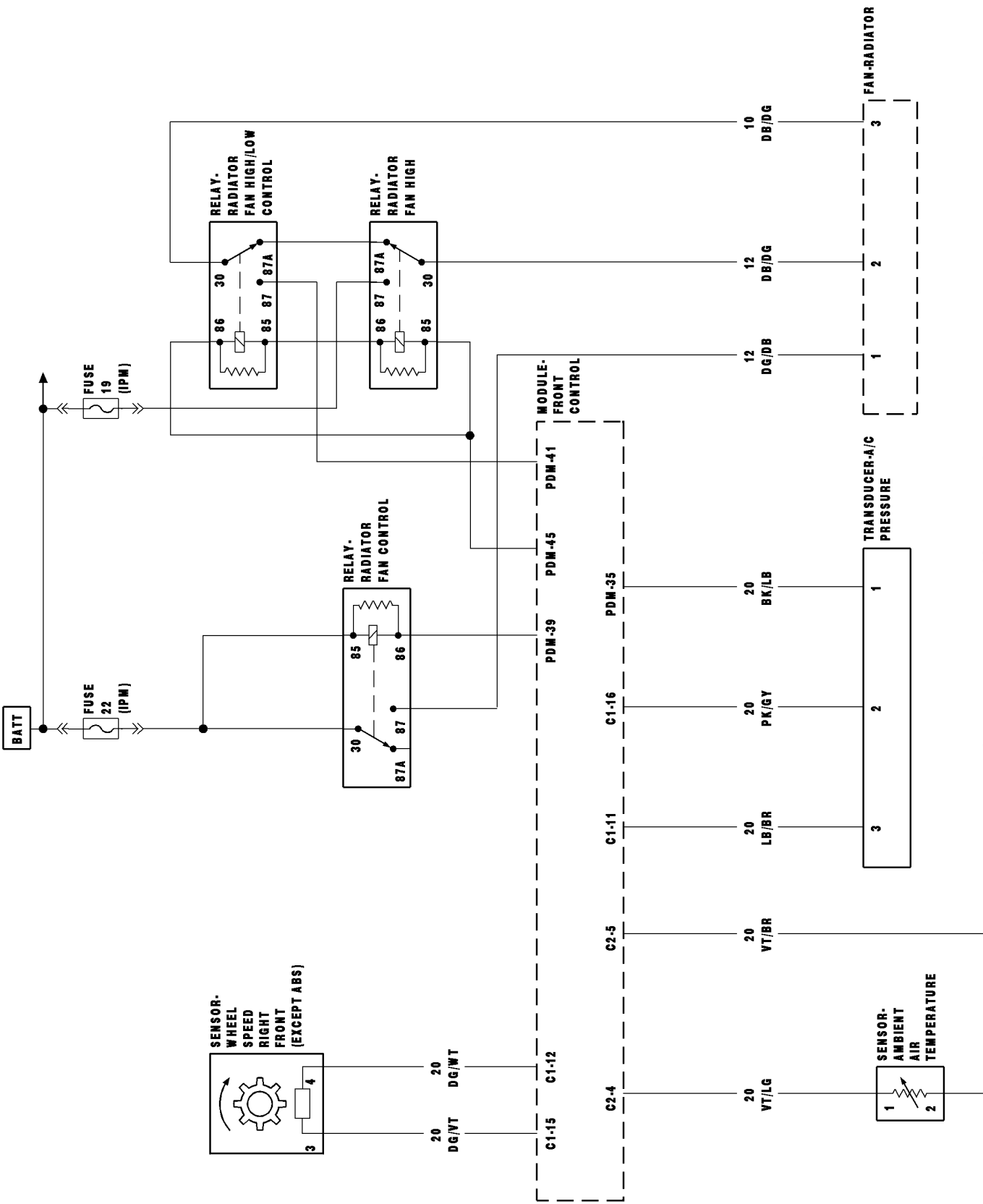
PCM CONTROLS



PCM INPUTS

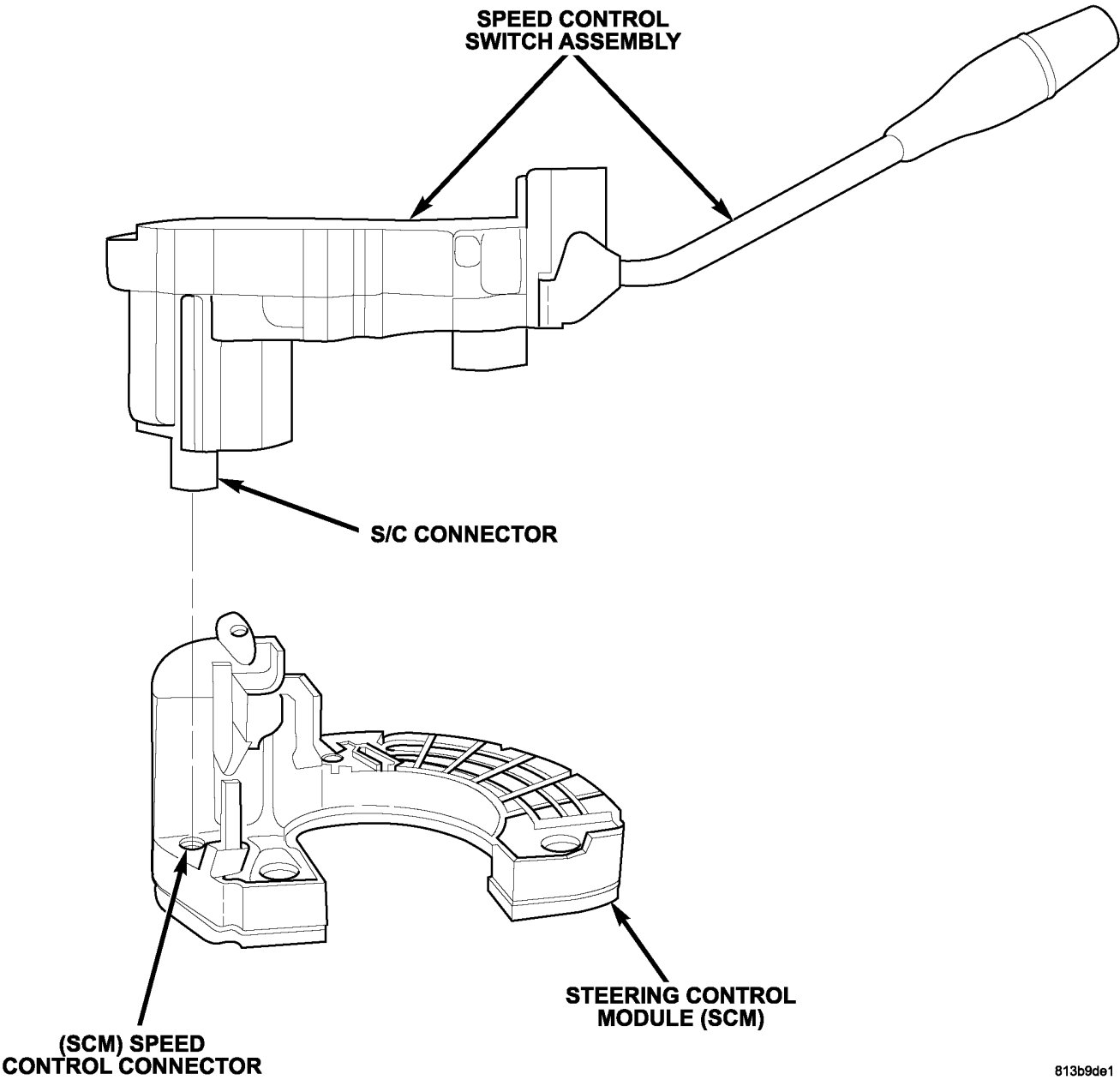
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FCM ENGINE INPUTS/CONTROLS

81335508



## ENGINE - 2.7L DOHC - SERVICE INFORMATION

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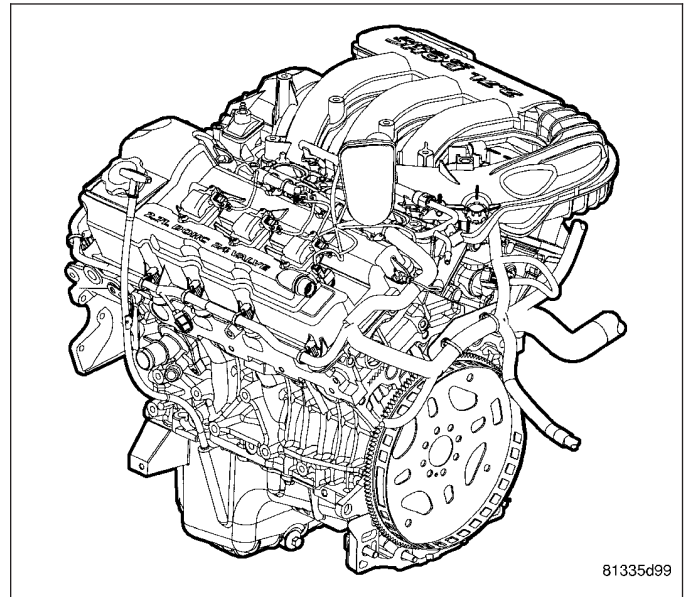
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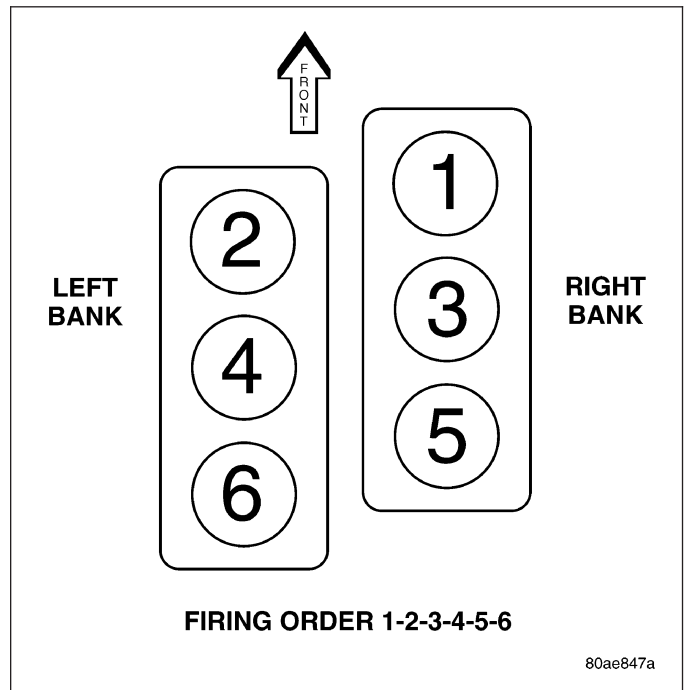
## ENGINE - 2.7L DOHC - SERVICE INFORMATION

### DESCRIPTION

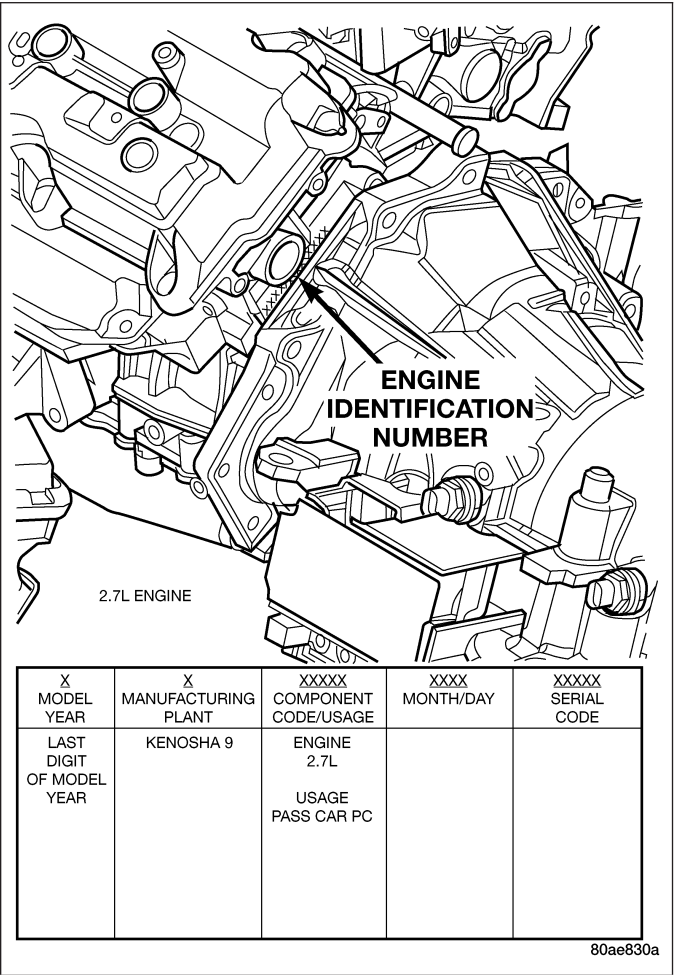
The 2.7 Liter (167 Cubic Inches) 60 degree V-6 engine is a double overhead camshaft design with hydraulic lifters and four valves per cylinder. The engine does not have provisions for a free wheeling valve train.



The cylinders are numbered from front to rear, with the right bank odd numbered, and the left bank even numbered. The firing order is 1-2-3-4-5-6.



The engine identification number is located on the rear of the cylinder block just below the left cylinder head



DIAGNOSIS AND TESTING

ENGINE DIAGNOSIS - INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either mechanical (e.g., a strange noise), or performance (e.g., engine idles rough and stalls).

Refer to Service Diagnosis—Mechanical Chart and Service Diagnosis—Performance Chart, for possible causes and corrections of malfunctions. Refer to FUEL SYSTEM for the fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that cannot be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following:

- Cylinder Compression Pressure Test
- Cylinder Combustion Pressure Leakage Test
- Cylinder Head Gasket Failure Diagnosis
- Intake Manifold Leakage Diagnosis
- Lash Adjuster (Tappet) Noise Diagnosis
- Engine Oil Leak Inspection

**ENGINE DIAGNOSIS - PERFORMANCE**

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	<ol style="list-style-type: none"> <li>1. Weak battery.</li> <li>2. Corroded or loose battery connections.</li> <li>3. Faulty starter.</li> <li>4. Faulty coil(s) or control unit.</li> <li>5. Incorrect spark plug gap.</li> <li>6. Contamination in fuel system.</li> <li>7. Faulty fuel pump.</li> <li>8. Incorrect engine timing.</li> </ol>	<ol style="list-style-type: none"> <li>1. Test battery. Charge or replace as necessary. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/ BATTERY - DESCRIPTION)</li> <li>2. Clean and tighten battery connections. Apply a coat of light mineral grease to terminals.</li> <li>3. Test starting system. (Refer to 8 - ELECTRICAL/STARTING - DIAGNOSIS AND TESTING)</li> <li>4. Test and replace as needed. (Refer to Appropriate Diagnostic Information)</li> <li>5. Check and adjust gap as needed.</li> <li>6. Clean system and replace fuel filter.</li> <li>7. Test fuel pump and replace as needed. (Refer to Appropriate Diagnostic Information)</li> <li>8. Check for a skipped timing chain.</li> </ol>
ENGINE STALLS OR IDLES ROUGH	<ol style="list-style-type: none"> <li>1. Idle speed too low.</li> <li>2. Incorrect fuel mixture.</li> <li>3. Intake manifold leakage.</li> <li>4. Faulty coil(s).</li> </ol>	<ol style="list-style-type: none"> <li>1. Test minimum air flow. (Refer to Appropriate Diagnostic Information)</li> <li>2. (Refer to Appropriate Diagnostic Information)</li> <li>3. Inspect intake manifold gasket, manifold, and vacuum hoses.</li> <li>4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)</li> </ol>
ENGINE LOSS OF POWER	<ol style="list-style-type: none"> <li>1. Dirty or incorrectly gapped plugs.</li> <li>2. Contamination in fuel system.</li> <li>3. Faulty fuel pump.</li> <li>4. Incorrect valve timing.</li> <li>5. Leaking cylinder head gasket.</li> <li>6. Low compression.</li> <li>7. Burned, warped, or pitted valves.</li> <li>8. Plugged or restricted exhaust system.</li> <li>9. Faulty coil(s).</li> </ol>	<ol style="list-style-type: none"> <li>1. Set gap as needed or replace plug(s).</li> <li>2. Clean system and replace fuel filter.</li> <li>3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)</li> <li>4. Correct valve timing as needed.</li> <li>5. Replace cylinder head gasket.</li> <li>6. Test compression of each cylinder.</li> <li>7. Replace valves.</li> <li>8. Check exhaust system restriction. Replace parts, as necessary.</li> <li>9. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)</li> </ol>

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE MISSES ON ACCELERATION	<ol style="list-style-type: none"> <li>1. Dirty or incorrectly gapped spark plugs.</li> <li>2. Contamination in Fuel System.</li> <li>3. Burned, warped, or pitted valves.</li> <li>4. Faulty coil(s).</li> </ol>	<ol style="list-style-type: none"> <li>1. Set gap as needed or replace plug(s).</li> <li>2. Clean fuel system and replace fuel filter.</li> <li>3. Replace valves.</li> <li>4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)</li> </ol>
ENGINE MISSES AT HIGH SPEED	<ol style="list-style-type: none"> <li>1. Dirty or incorrect spark plug gap.</li> <li>2. Faulty coil(s).</li> <li>3. Dirty fuel injector(s).</li> <li>4. Contamination in fuel system.</li> </ol>	<ol style="list-style-type: none"> <li>1. Set gap as needed or replace plug(s).</li> <li>2. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)</li> <li>Test and replace as necessary. (Refer to Appropriate Diagnostic Information)</li> <li>4. Clean system and replace fuel filter.</li> </ol>

## ENGINE DIAGNOSIS - MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VALVES	<ol style="list-style-type: none"> <li>1. High or low oil level in crankcase.</li> <li>2. Thin or diluted oil.</li> <li>3. Thick oil</li> <li>4. Low oil pressure.</li> <li>5. Dirt in tappets/lash adjusters.</li> <li>6. Worn rocker arms.</li> <li>7. Worn tappets/lash adjusters.</li> <li>8. Worn valve guides.</li> <li>9. Excessive runout of valve seats on valve faces.</li> <li>10. Missing adjuster pivot.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and correct engine oil level.</li> <li>2. Change oil to correct viscosity.</li> <li>3. (a.) Change oil and filter. (b.) Run engine to operating temperature. (c.) Change oil and filter again.</li> <li>4. Check and correct engine oil level.</li> <li>5. Replace rocker arm/hydraulic lash adjuster assembly.</li> <li>6. Inspect oil supply to rocker arms.</li> <li>7. Install new rocker arm/hydraulic lash adjuster assembly.</li> <li>8. Ream guides and install new valves with oversize stems.</li> <li>9. Grind valve seats and valves.</li> <li>10. Replace rocker arm/hydraulic lash adjuster assembly.</li> </ol>

CONDITION	POSSIBLE CAUSES	CORRECTION
CONNECTING ROD NOISE	<ol style="list-style-type: none"> <li>1. Insufficient oil supply.</li> <li>2. Low oil pressure.</li> <li>3. Thin or diluted oil.</li> <li>4. Thick oil</li> <li>5. Excessive bearing clearance.</li> <li>6. Connecting rod journal out-of-round.</li> <li>7. Misaligned connecting rods.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check engine oil level.</li> <li>2. Check engine oil level. Inspect oil pump relief valve and spring.</li> <li>3. Change oil to correct viscosity.</li> <li>3. (a.) Change oil and filter.</li> <li>(b.) Run engine to operating temperature.</li> <li>(c.) Change oil and filter again.</li> <li>5. Measure bearings for correct clearance. Repair as necessary.</li> <li>6. Replace crankshaft or grind surface.</li> <li>7. Replace bent connecting rods.</li> </ol>
MAIN BEARING NOISE	<ol style="list-style-type: none"> <li>1. Insufficient oil supply.</li> <li>2. Low oil pressure.</li> <li>3. Thin or diluted oil.</li> <li>4. Thick oil</li> <li>4. Excessive bearing clearance.</li> <li>5. Excessive end play.</li> <li>6. Crankshaft journal out-of-round or worn.</li> <li>7. Loose flywheel or torque converter.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check engine oil level.</li> <li>2. Check engine oil level. Inspect oil pump relief valve and spring.</li> <li>3. Change oil to correct viscosity.</li> <li>3. (a.) Change oil and filter.</li> <li>(b.) Run engine to operating temperature.</li> <li>(c.) Change oil and filter again.</li> <li>4. Measure bearings for correct clearance. Repair as necessary.</li> <li>5. Check thrust bearing for wear on flanges.</li> <li>6. Replace crankshaft or grind journals.</li> <li>7. Tighten to correct torque.</li> </ol>
OIL PRESSURE DROP	<ol style="list-style-type: none"> <li>1. Low oil level.</li> <li>2. Faulty oil pressure sending unit.</li> <li>3. Low oil pressure.</li> <li>4. Clogged oil filter.</li> <li>5. Worn parts in oil pump.</li> <li>6. Thin or diluted oil.</li> <li>7. Oil pump relief valve stuck.</li> <li>8. Oil pump suction tube loose.</li> <li>9. Oil pump cover warped or cracked.</li> <li>10. Excessive bearing clearance.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check engine oil level.</li> <li>2. Install new sending unit.</li> <li>3. Check sending unit and main bearing oil clearance.</li> <li>4. Install new oil filter.</li> <li>5. Replace worn parts or pump.</li> <li>6. Change oil to correct viscosity.</li> <li>7. Remove valve and inspect, clean, or replace.</li> <li>8. Remove oil pan and install new tube or clean, if necessary.</li> <li>9. Install new oil pump.</li> <li>10. Measure bearings for correct clearance.</li> </ol>

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Misaligned or deteriorated gaskets. 2. Loose fastener, broken or porous metal part. 3. Misaligned or deteriorated cup or threaded plug.	1. Replace gasket(s). 2. Tighten, repair or replace the part. 3. Replace as necessary.
OIL CONSUMPTION OR SPARK PLUGS FOULED	1. PCV system malfunction. 2. Worn, scuffed or broken rings. 3. Carbon in oil ring slots. 4. Rings fitted too tightly in grooves. 5. Worn valve guide(s). 6. Valve stem seal(s) worn or damaged.	1. Check system and repair as necessary. (Refer to Appropriate Diagnostic Manual) 2. Hone cylinder bores. Install new rings. 3. Clean pistons and install new rings. 4. Remove rings and check grooves. If groove is not proper width, replace piston. 5. Replace cylinder head(s). 6. Replace seal(s).

## CYLINDER COMPRESSION PRESSURE TEST

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

1. Check engine oil level and add oil if necessary.
2. Drive the vehicle until engine reaches normal operating temperature. Select a route free from traffic and other forms of congestion, observe all traffic laws, and accelerate through the gears several times briskly.
3. Remove all spark plugs from engine. As spark plugs are being removed, check electrodes for abnormal firing indicators fouled, hot, oily, etc. Record cylinder number of spark plug for future reference.
4. Remove the Auto Shutdown (ASD) relay from the PDC.
5. Be sure throttle blade is fully open during the compression check.
6. Insert compression gauge adaptor Special Tool 8116 or the equivalent, into the #1 spark plug hole in cylinder head. Connect the 0–500 psi (Blue) pressure transducer (Special Tool CH7059) with cable adaptors to the DRBIII®. For Special Tool identification, (Refer to 9 - ENGINE - SPECIAL TOOLS).
7. Crank engine until maximum pressure is reached on gauge. Record this pressure as #1 cylinder pressure.
8. Repeat the previous step for all remaining cylinders.
9. Compression should not be less than 689 kPa (100 psi) and not vary more than 25 percent from cylinder to cylinder.
10. If one or more cylinders have abnormally low compression pressures, repeat the compression test.
11. If the same cylinder or cylinders repeat an abnormally low reading on the second compression test, it could indicate the existence of a problem in the cylinder in question. **The recommended compression pressures are to be used only as a guide to diagnosing engine problems. An engine should not be disassembled to determine the cause of low compression unless some malfunction is present.**



## CYLINDER COMBUSTION PRESSURE LEAKAGE TEST

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/compression pressure loss.

**WARNING: DO NOT REMOVE THE PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.**

Check the coolant level and fill as required. DO NOT install the pressure cap.

Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.

Clean spark plug recesses with compressed air.

Remove the spark plugs.

Remove the oil filler cap.

Remove the air cleaner.

Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum, with 552 kPa (80 psi) recommended.

Perform the test procedures on each cylinder according to the tester manufacturer's instructions. While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the coolant.

All gauge pressure indications should be equal, with no more than 25% leakage per cylinder.

**FOR EXAMPLE:** At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

## ENGINE OIL LEAK INSPECTION

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

1. Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.
2. Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil level indicator to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair as necessary.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection.
5. **If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method as follows:
  - Disconnect the fresh air hose (make-up air) at the cylinder head cover and plug or cap the nipple on the cover.
  - Remove the PCV valve hose from the cylinder head cover. Cap or plug the PCV valve nipple on the cover.
  - Attach an air hose with pressure gauge and regulator to the oil level indicator tube.

**CAUTION: Do not subject the engine assembly to more than 20.6 kpa (3 PSI) of test pressure.**

- Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provides the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.
  - If the leakage occurs at the crankshaft rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.
6. If no leaks are detected, turn off the air supply. Remove the air hose, all plugs, and caps. Install the PCV valve and fresh air hose (make-up air). Proceed to next step.



7. Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

**Note:** If oil leakage is observed at the oil level indicator tube to block location; remove the tube, clean and reseal using Mopar® Stud & Bearing Mount (press fit tube applications only), and for O-ring style tubes, remove tube and replace the O-ring seal.

## INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak. If a leak is present in this area, remove transmission for further inspection.
  - a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
  - b. Where leakage tends to run straight down, possible causes are a porous block, oil gallery cup plug, bedplate to cylinder block mating surfaces and seal bore. See proper repair procedures for these items.
4. If no leaks are detected, pressurize the crankcase as previously described.

**CAUTION:** Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

**CAUTION:** Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is specially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.
7. After the oil leak root cause and appropriate corrective action have been identified, replace component(s) as necessary.

## STANDARD PROCEDURE

### REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads (excluding spark plug and camshaft bearing cap attaching threads) can be repaired. Essentially, this repair consists of drilling out worn or damaged threads, tapping the hole with a special Heli-Coil Tap, (or equivalent) and installing an insert into the tapped hole. This brings the hole back to its original thread size.

**CAUTION:** Be sure that the tapped holes maintain the original center line.

Heli-Coil tools and inserts are readily available from automotive parts jobbers.

## HYDROSTATIC LOCKED ENGINE

When an engine is suspected to be hydrostatically locked, regardless of what caused the problem, the following steps should be used.

**CAUTION:** DO NOT use starter motor to rotate the engine, severe damage may occur.

1. Inspect air cleaner, induction system and intake manifold to insure system is dry and clear of foreign material.
2. Remove negative battery cable.
3. Place a shop towel around the spark plugs when removing them from the engine. This will catch any fluid that may possibly be in the cylinder under pressure.

4. With all spark plugs removed, rotate engine crankshaft using a breaker bar and socket.
5. Identify the fluid in the cylinder(s) (i.e., coolant, fuel, oil or other).
6. Make sure all fluid has been removed from the cylinders. Inspect engine for damage (i.e., connecting rods, pistons, valves, etc.)
7. Repair engine or components as necessary to prevent this problem from re-occurring.

**CAUTION: Squirt approximately one teaspoon of oil into the cylinders, rotate engine to lubricate the cylinder walls to prevent damage on restart.**

8. Install new spark plugs.
9. Drain engine oil and remove oil filter.
10. Install a new oil filter.
11. Fill engine with specified amount of approved oil.
12. Connect negative battery cable.
13. Start engine and check for any leaks.

## FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results. **Do not use form-in-place gasket material unless specified.** Bead size, continuity, and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

**MOPAR® ENGINE RTV GEN II** is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

**MOPAR® ATF RTV** is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

**MOPAR® GASKET MAKER** is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

**MOPAR® BED PLATE SEALANT** is a unique (green-in-color) anaerobic type gasket material that is specially made to seal the area between the bed plate and cylinder block without disturbing the bearing clearance or alignment of these components. The material cures slowly in the absence of air when torqued between two metallic surfaces, and will rapidly cure when heat is applied.

**MOPAR® GASKET SEALANT** is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material is used on engines with multi-layer steel (MLS) cylinder head gaskets. This material also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4oz./16 oz. can w/applicator.

## SEALER APPLICATION

Mopar® Gasket Maker material should be applied sparingly 1 mm (0.040 in.) diameter or less of sealant to one gasket surface. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. All mounting holes must be circled. For corner sealing, a 3.17 or 6.35 mm (1/8 or 1/4 in.)

drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towel. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The usage of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces. Material in an aerosol can should be used on engines with multi-layer steel gaskets.

## ENGINE GASKET SURFACE PREPARATION

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

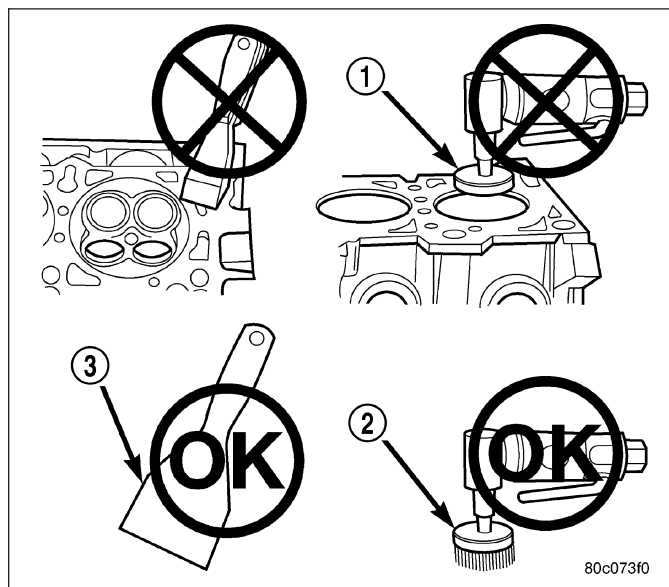
**Never** use the following to clean gasket surfaces:

- Metal scraper
- Abrasive pad or paper to clean cylinder block and head
- High speed power tool with an abrasive pad or a wire brush

**Note: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.**

Only use the following for cleaning gasket surfaces:

- Solvent or a commercially available gasket remover
- Plastic or wood scraper
- Drill motor with 3M Roloc™ Bristle Disc (white or yellow)



**CAUTION: Excessive pressure or high RPM (beyond the recommended speed), can damage the sealing surfaces. The mild (white, 120 grit) bristle disc is recommended. If necessary, the medium (yellow, 80 grit) bristle disc may be used on cast iron surfaces with care.**

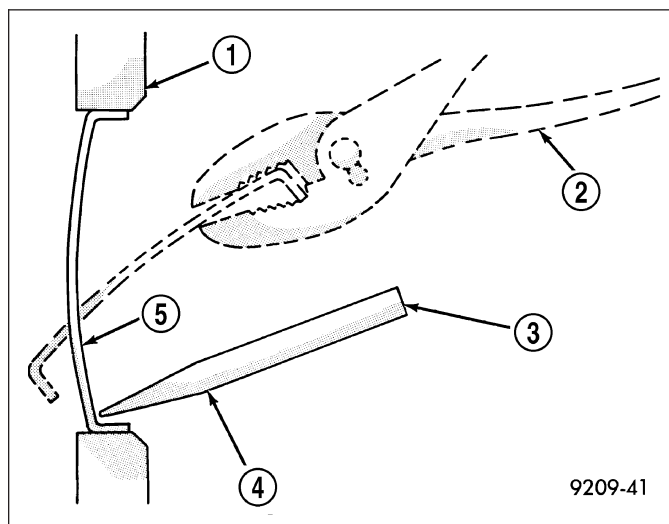
## ENGINE CORE AND OIL GALLERY PLUGS

Using a blunt tool such as a drift and a hammer, strike the bottom edge of the cup plug. With the cup plug rotated, grasp firmly with pliers or other suitable tool and remove plug.

**CAUTION: Do not drive cup plug into the casting as restricted cooling can result and cause serious engine problems.**

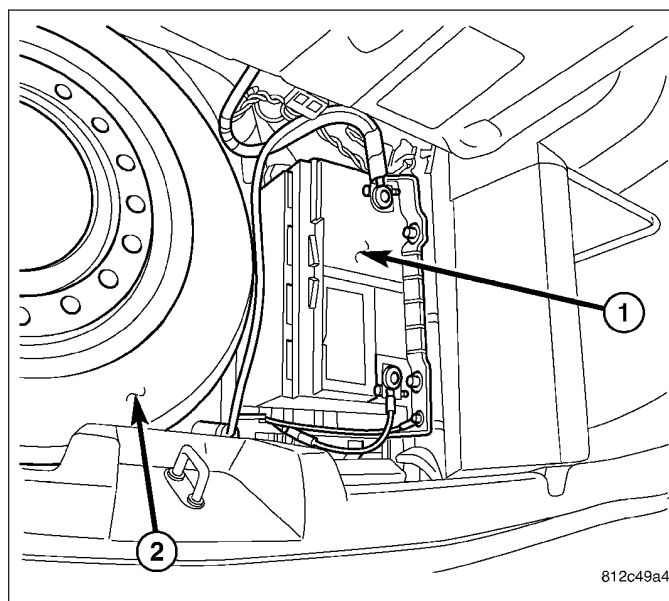
Thoroughly clean inside of cup plug hole in cylinder block or head. Be sure to remove old sealer. Lightly coat inside of cup plug hole with Mopar® Stud and Bearing Mount. Make certain the new plug is cleaned of all oil or grease. Using proper drive plug, drive plug into hole so that the sharp edge of the plug is at least 0.5 mm (0.020 in.) inside the lead-in chamfer.

It is not necessary to wait for curing of the sealant. The cooling system can be refilled and the vehicle placed in service immediately.

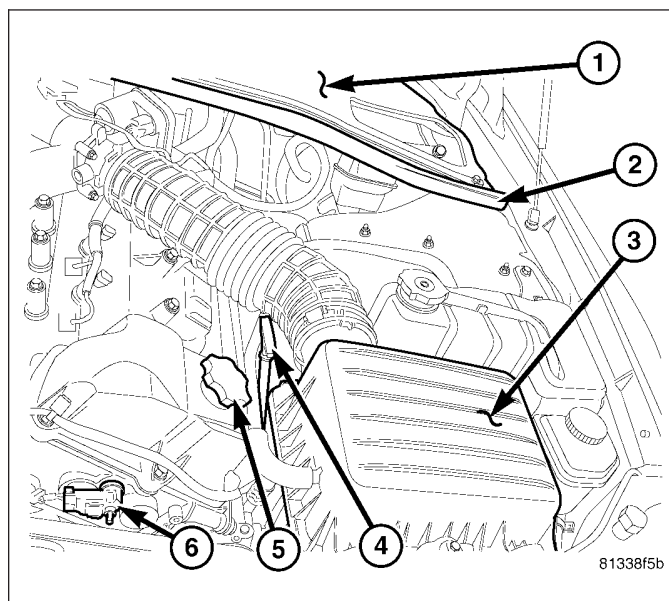


## REMOVAL - ENGINE ASSEMBLY

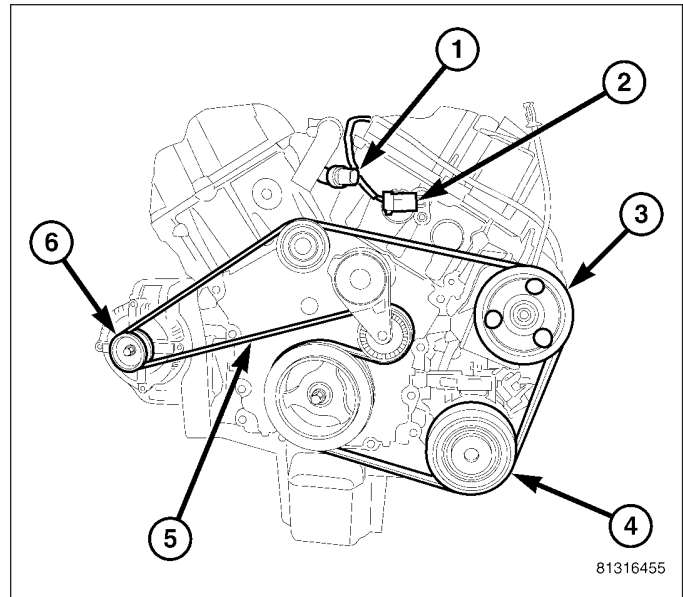
1. Remove hood.
2. Release fuel pressure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
3. Disconnect negative battery cable (1) located in the trunk.



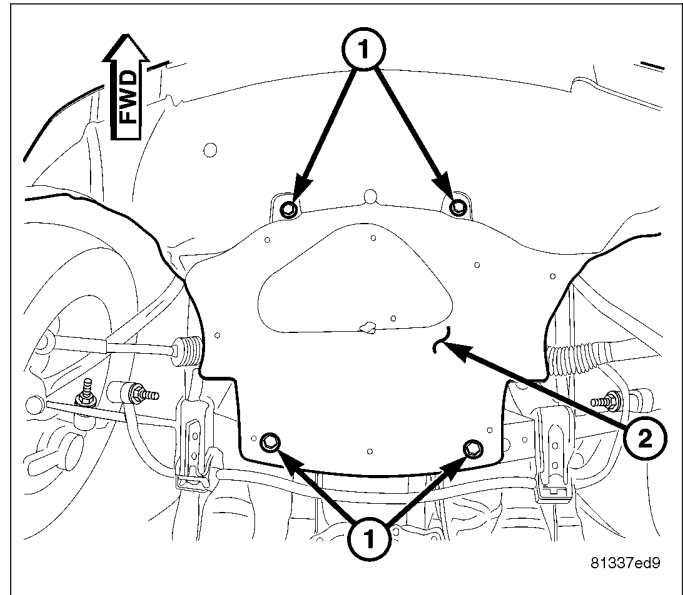
4. Disconnect intake air temperature sensor electrical connector.
5. Remove air cleaner housing assembly (3)(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).



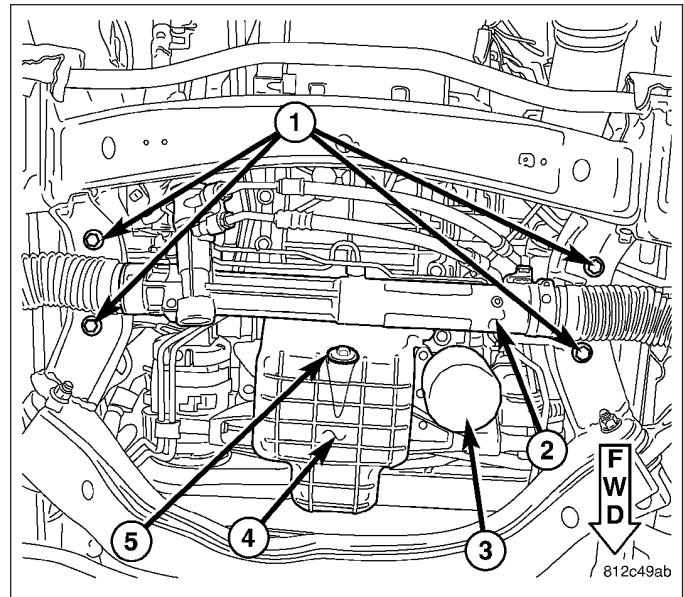
6. Remove accessory drive belt (5)(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
7. Disconnect lines from power steering pump (3).
8. Remove power steering pump attaching bolts and set pump aside (3).
9. Recover A/C system using a suitable refrigerant recovery machine(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).
10. Disconnect A/C compressor (4) electrical connectors.
11. Remove A/C compressor (4)(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - REMOVAL).



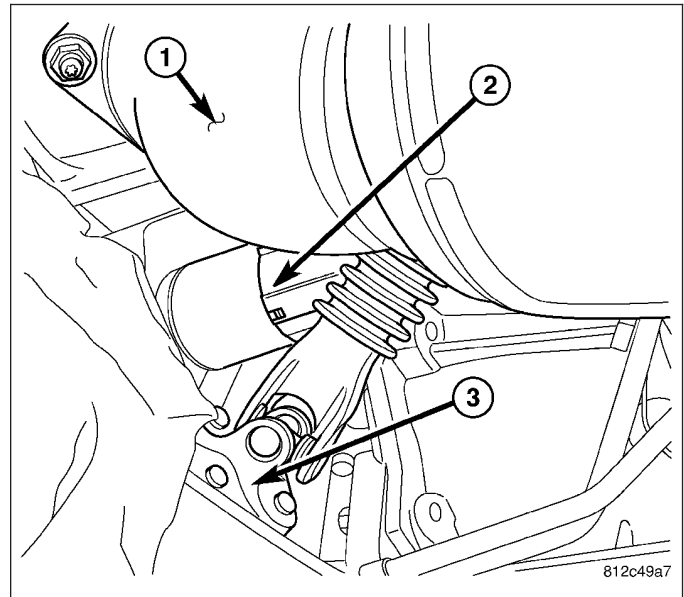
12. Raise vehicle.
13. Remove lower splash shield bolts (1) and remove splash shield (2).
14. Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).



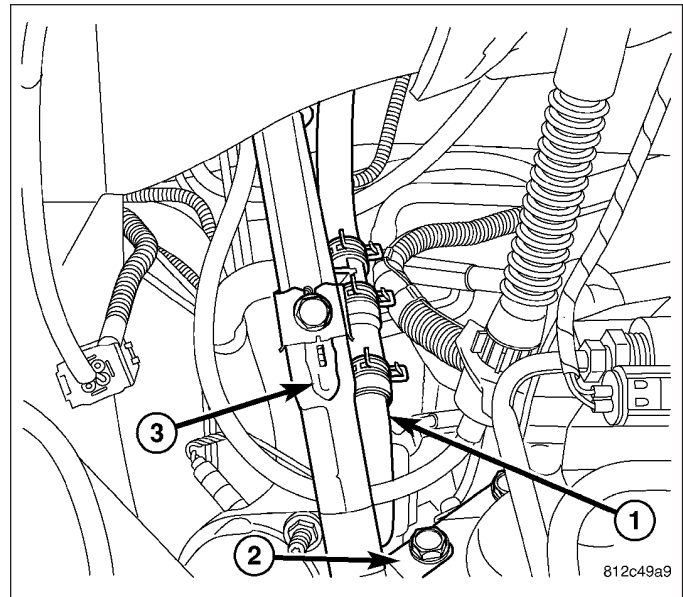
15. Drain the engine oil (5) and remove the oil filter (3).
16. Disconnect down stream oxygen sensor connectors.
17. Disconnect exhaust pipes at the manifolds.



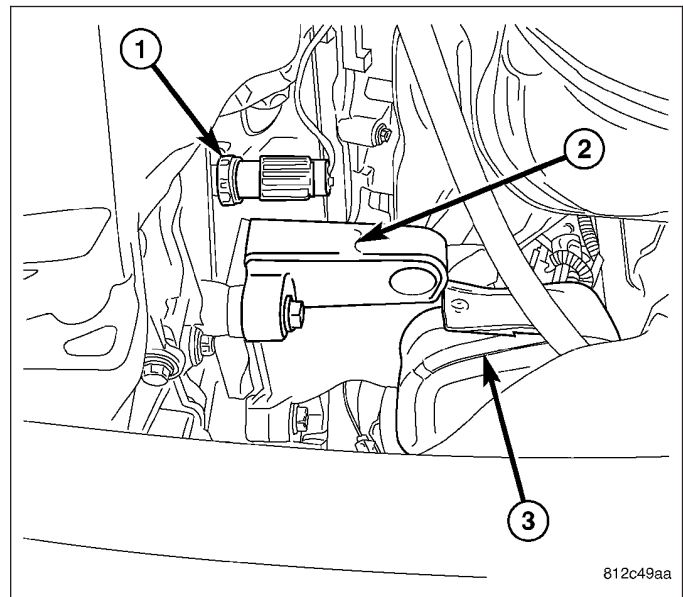
18. Disconnect starter (2) electrical connectors.
19. Remove starter (2) bolts and set starter aside.



20. Disconnect coolant pipe (1) near starter from hose.
21. Disconnect crankshaft position sensor electrical connector and remove sensor (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/CRANKSHAFT POSITION SENSOR - REMOVAL).
22. Disconnect ground strap.

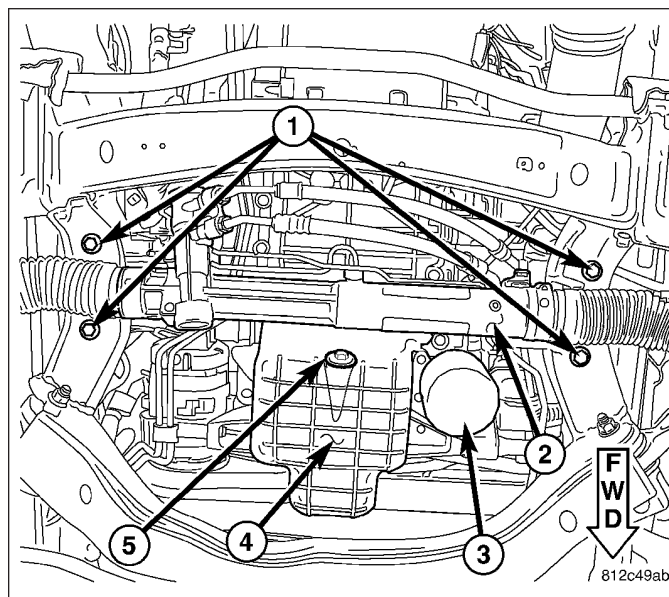


23. Disconnect oil pressure sensor (1) electrical connector.

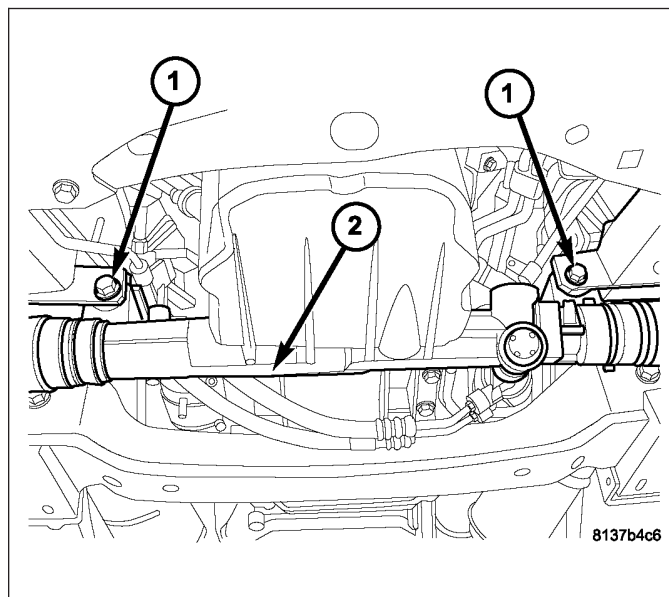




24. Remove 4 engine mount nuts (1).
25. Remove engine mount studs (1) from mount.

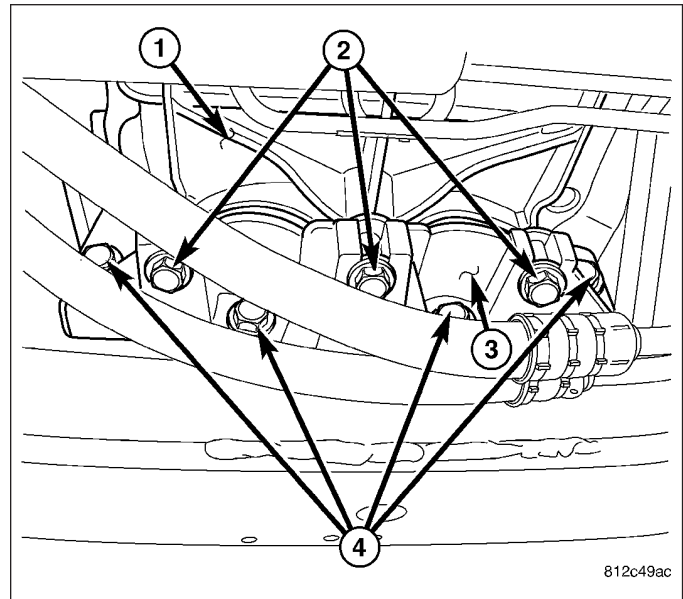


26. Remove steering gear mounting bolts (1) and lower steering gear (2) for clearance.

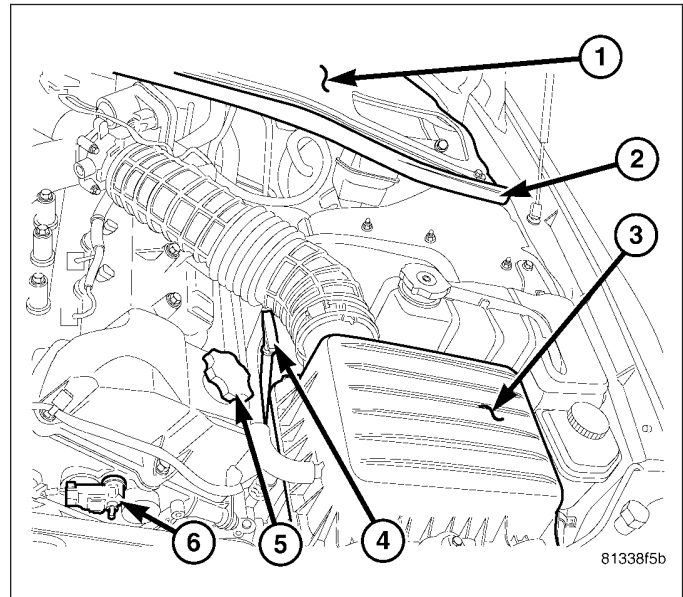




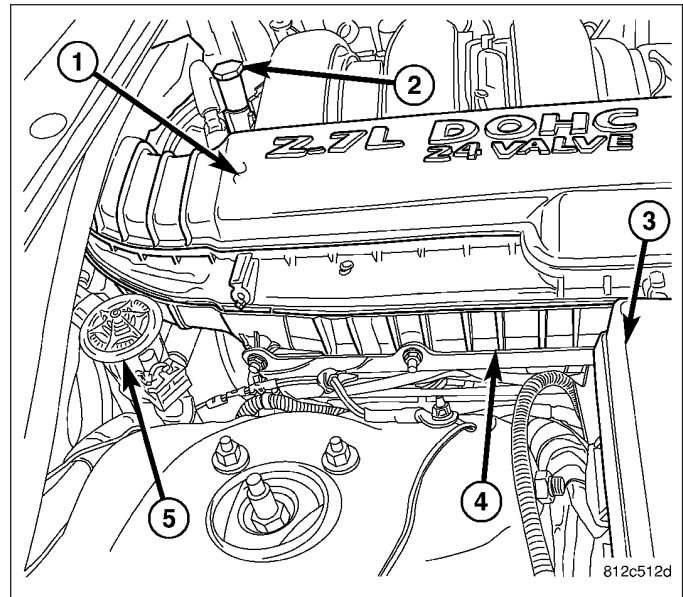
27. Using a block of wood and a suitable lifting device under the oil pan, raise the engine.
28. Remove structural collar bolts (2 & 4).
29. Remove structural collar (3).
30. Remove lower bell housing bolts.
31. Lower engine and remove jack stand.
32. Mark flex plate to torque converter location.
33. Remove torque converter bolts.
34. Lower vehicle.



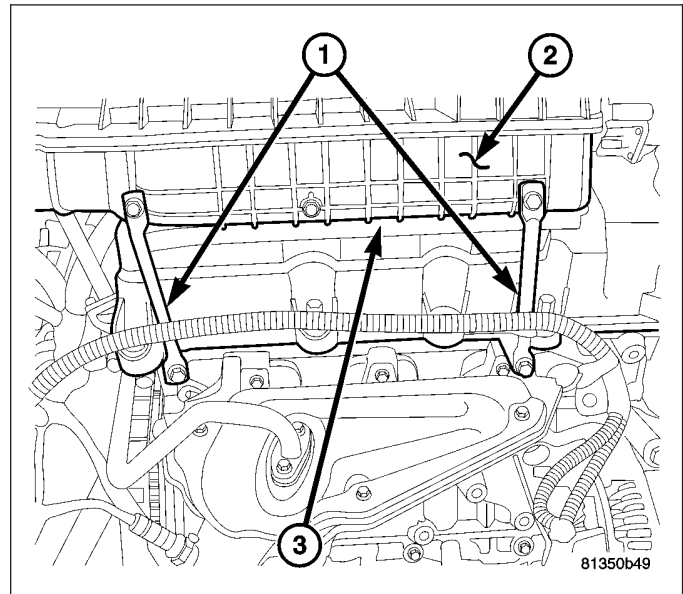
35. Remove wiper arms (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - REMOVAL).
36. Remove wiper cowl (1)(Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - REMOVAL).
37. Remove strut tower support (2).



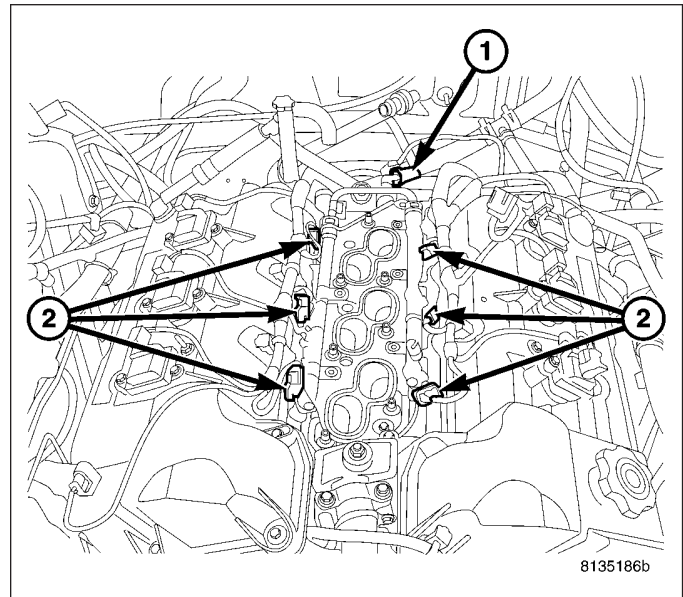
38. Reposition purge solenoid (5).

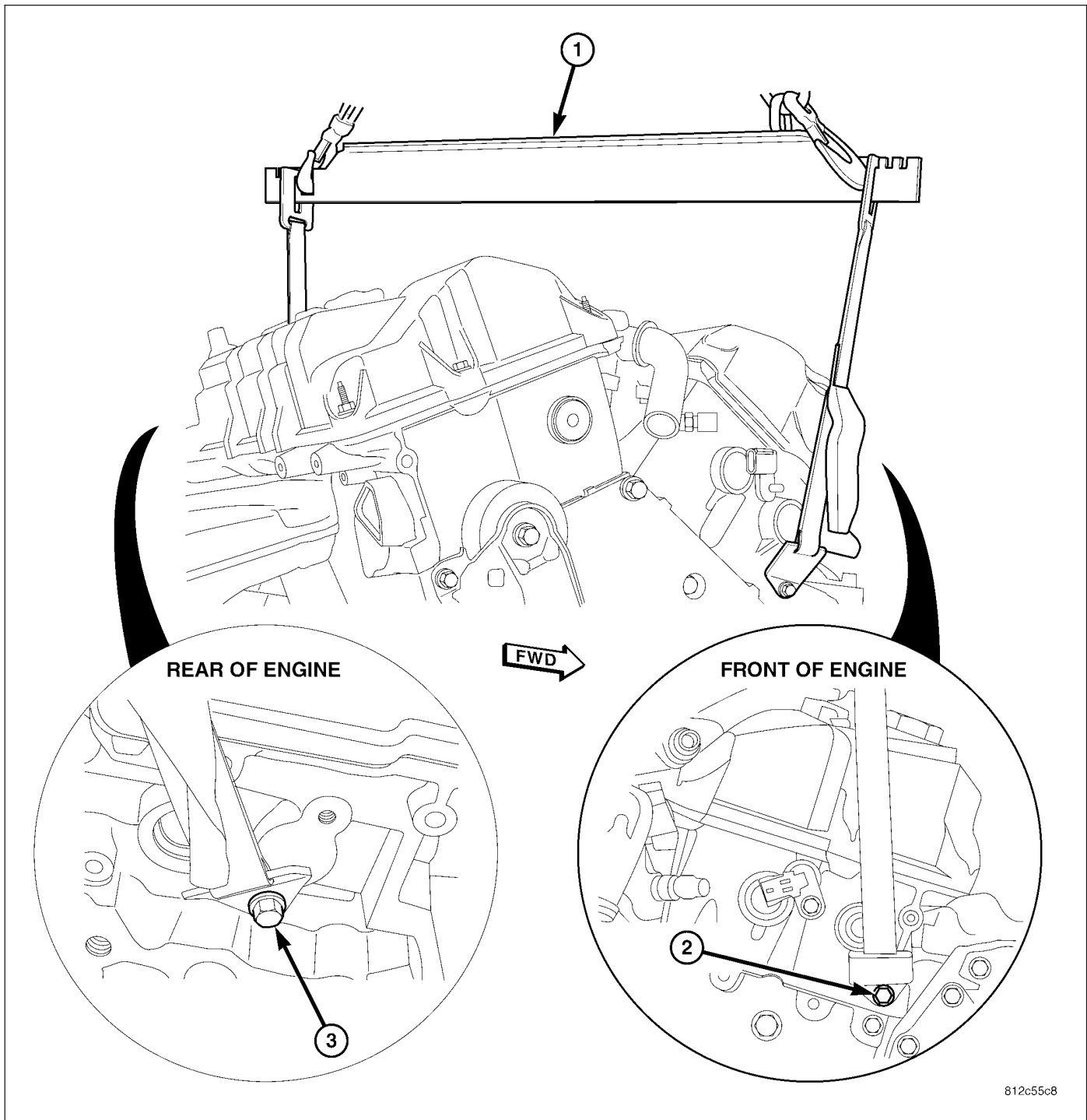


- 39. Remove the intake manifold (2)(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
- 40. Disconnect all vacuum lines and electrical connectors.
- 41. Disconnect all ground straps attaching to the engine.



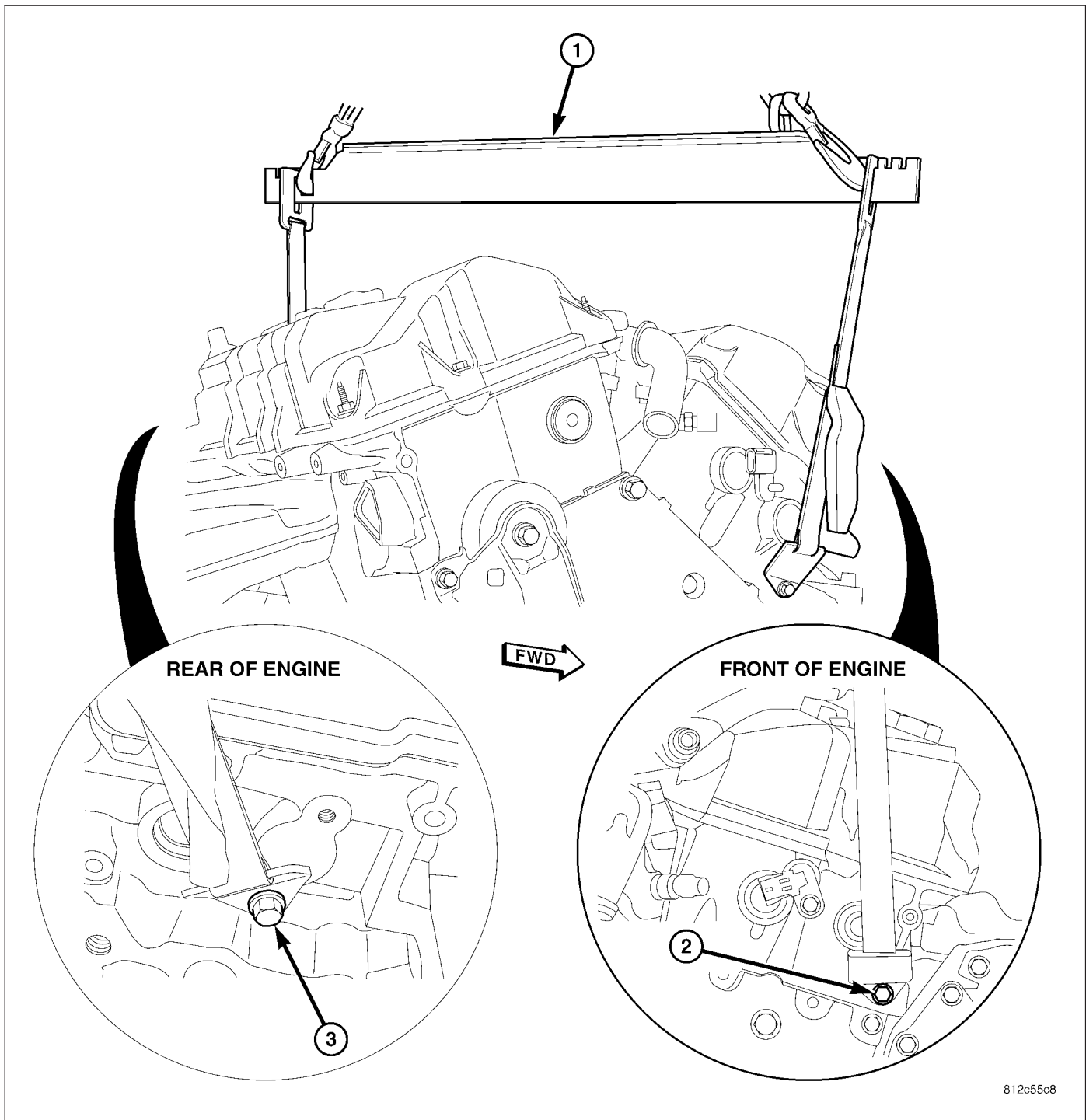
- 42. Disconnect fuel line at fuel rail (1).
- 43. Disconnect coil, injector (2), capacitor, and knock sensor connectors.
- 44. Remove egr valve and tube assembly(Refer to 25 - EMISSIONS CONTROL/EXHAUST GAS RECIRCULATION/VALVE - REMOVAL).
- 45. Remove upper bellhousing bolts and reposition electrical harness.





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46. Attach special tool #8342A (1).
  - a. Attach special tool #8342A to the front of the left cylinder head (2).
  - b. Attach special tool #8342A to the rear of the right cylinder head (3).
47. Support transmission with a block of wood and floor jack.
48. Hoist engine from engine compartment.

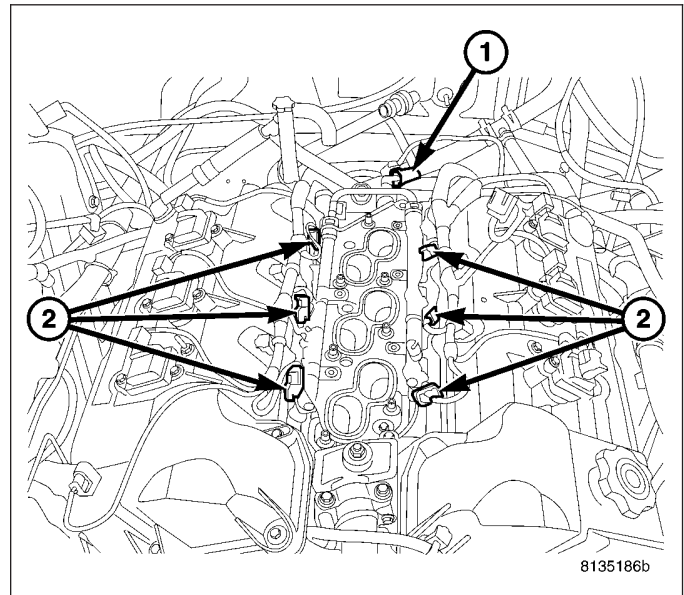
**INSTALLATION - ENGINE ASSEMBLY**

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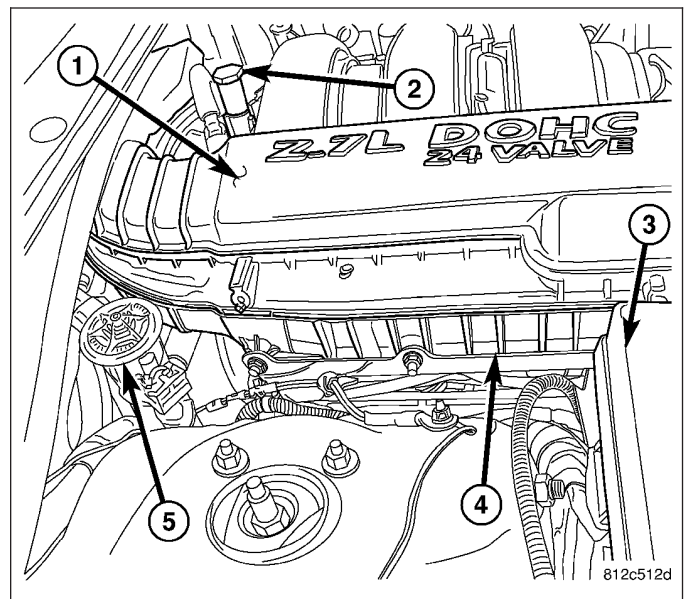
1. Attach special tool #8342A engine lifting fixture (1).
  - a. Attach special tool #8342A to the front of the left cylinder head (2).
  - b. Attach special tool #8342A to the rear of the right cylinder head (3).
2. Lower engine into engine compartment.
3. Remove special tool #8342A (1).

**CAUTION:** Do not tighten the transmission case to engine block bolts until all bolts have been hand started, and the two mating surfaces are completely joined together, as damage to cylinder block or transmission could occur.

4. Install bell housing to cylinder block bolts and tighten to 68 N·m (50 ft. lbs.).
5. Install egr valve and tube assembly(Refer to 25 - EMISSIONS CONTROL/EXHAUST GAS RECIRCULATION/ VALVE - INSTALLATION).
6. Connect coil, injector (2), capacitor, and knock sensor connectors.
7. Connect the fuel line (1).
8. Install upper intake manifold(Refer to 9 - ENGINE/ MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).



9. Install purge solenoid (5).
10. Connect all ground straps.
11. Connect all vacuum lines and electrical connectors.



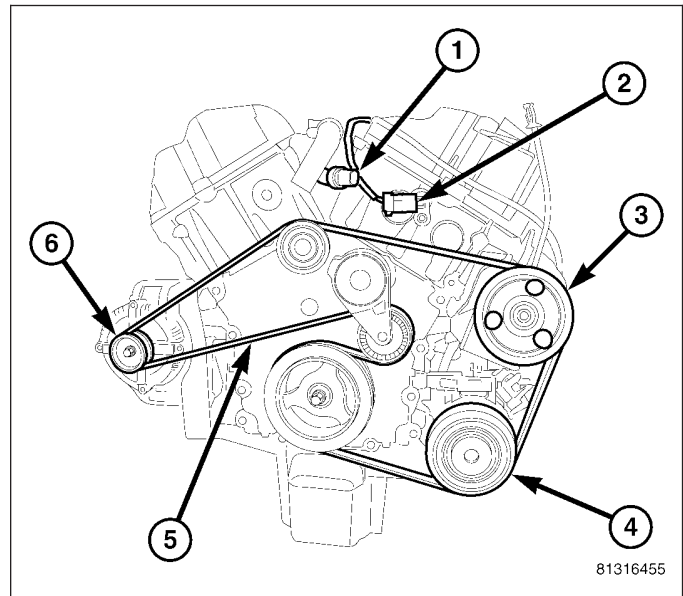
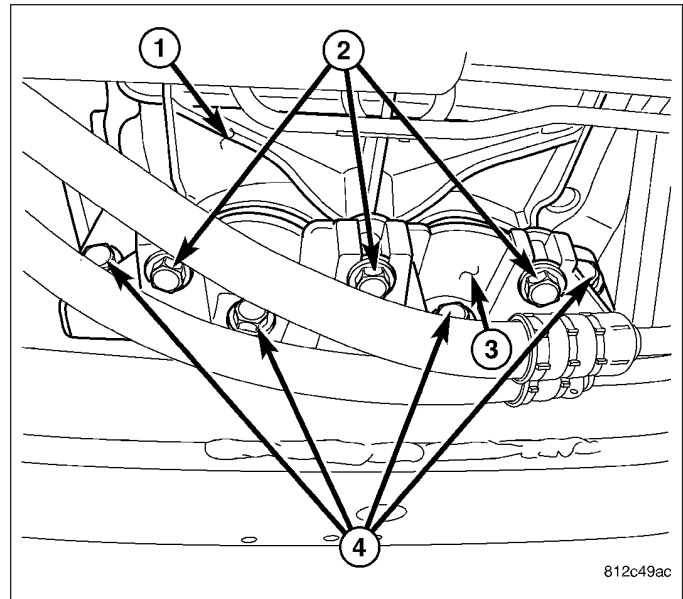
12. Raise vehicle.
13. Align flexplate and torque converter.

**Note: Make sure all four bolts are installed finger tight before torquing bolts.**

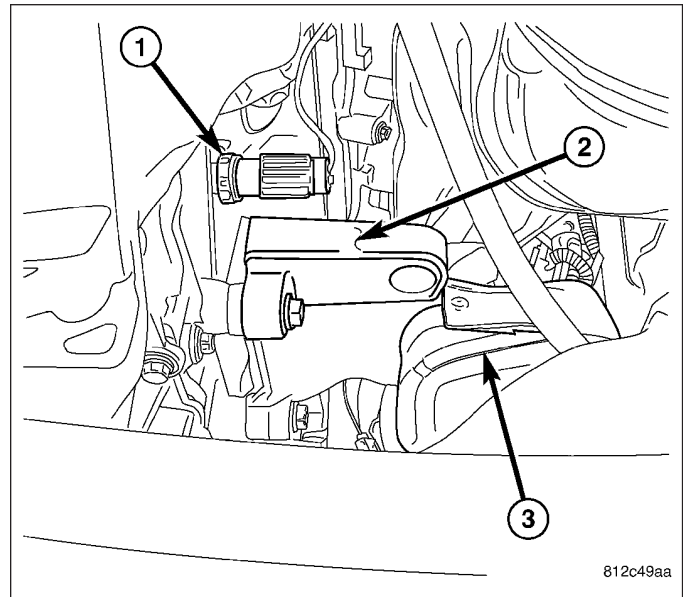
14. Tighten torque converter bolts to 75N·m (55 ft. lbs.).
15. Using a block of wood and a suitable lifting device under the oil pan, raise the engine.
16. Install the structural collar (3) and position in place.

**Note: Make sure that structural collar (3) is flush with the oil pan (1) and the transmission bell housing.**

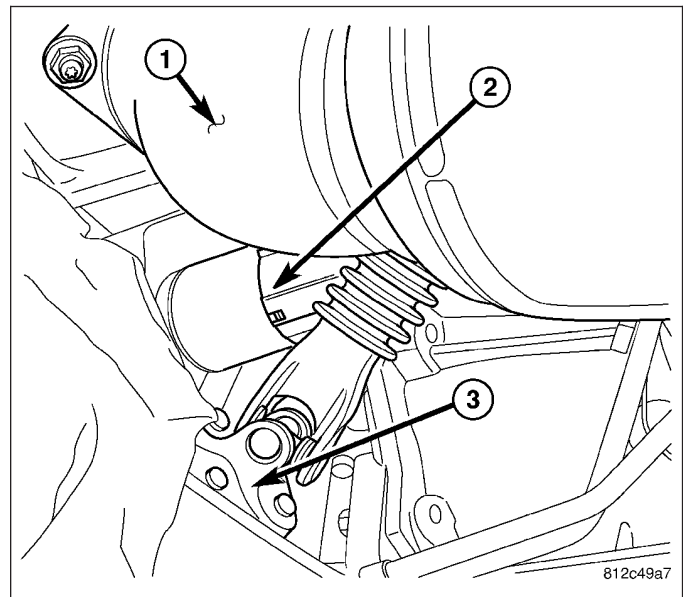
17. Finger tighten all bolts (2&4).
  18. Tighten the structural collar to oil pan bolts (2) to 55 N·m (40 ft. lbs.).
  19. Tighten structural collar to transmission bolts (4) to 55 N·m (40 ft. lbs.).
20. Install the power steering pump (3).
  21. Install the A/C compressor (4)(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - INSTALLATION).



22. Install the crankshaft position sensor and connect electrical connector(Refer to 14 - FUEL SYSTEM/ FUEL INJECTION/CRANKSHAFT POSITION SENSOR - INSTALLATION).
23. Connect oil pressure sensor (1) electrical connector.

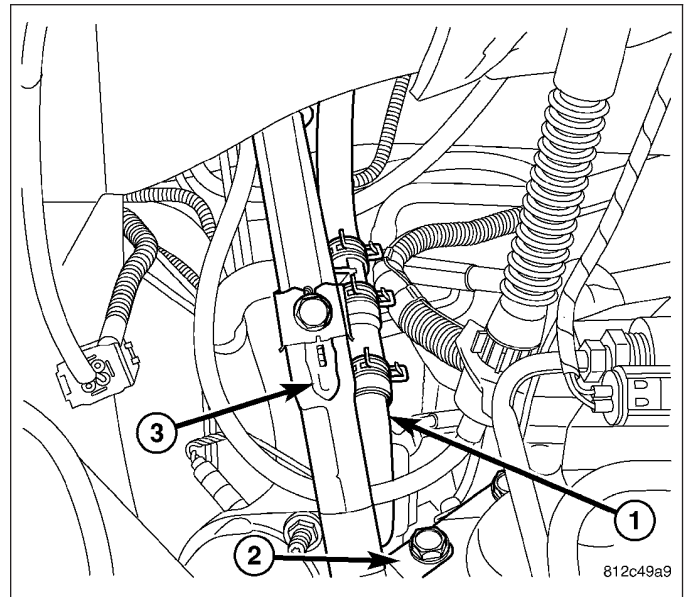


24. Install starter (2), tighten bolts to 41N·m (30 ft. lbs.)
25. Connect electrical connectors at starter.

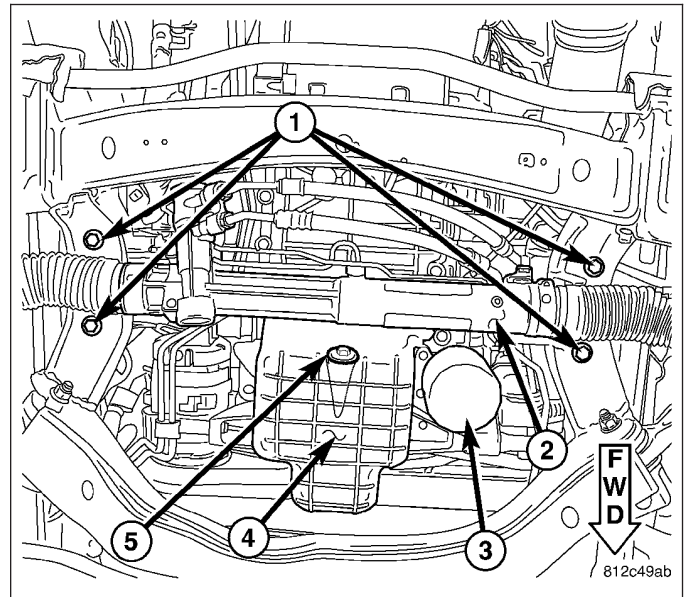




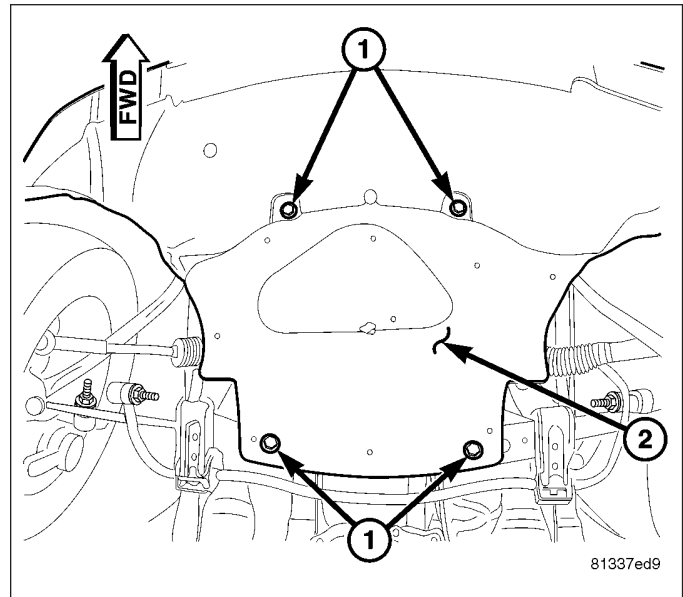
26. Connect the coolant pipe (1) to coolant hose.
27. Connect the exhaust pipes to the manifolds.
28. Connect the down stream oxygen sensor connectors.
29. Connect A/C compressor electrical connectors.



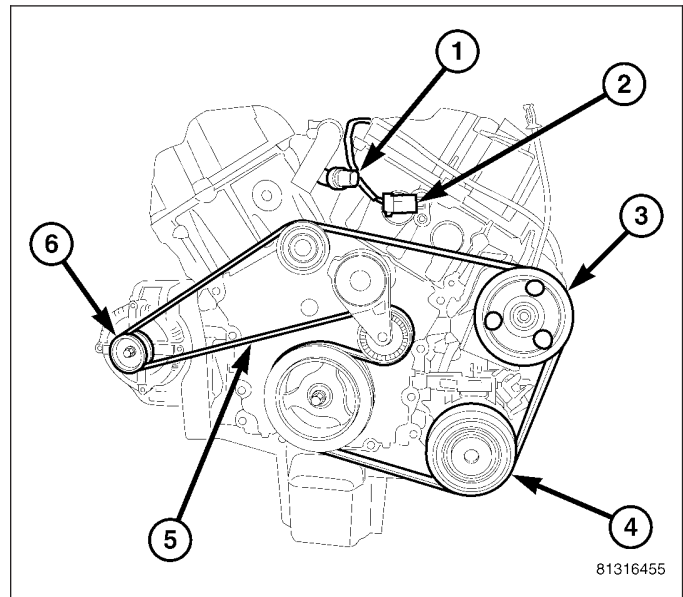
30. Install new oil filter (3).



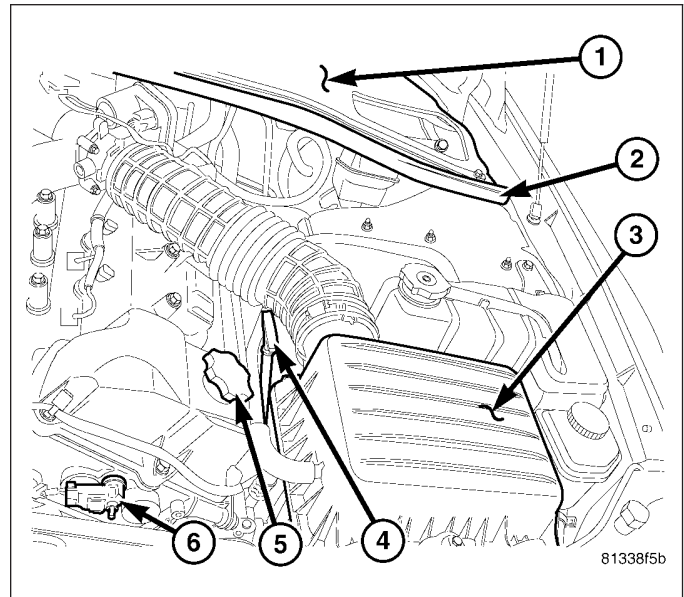
31. Install lower splash shield (2) and tighten retaining bolts (1).
32. Lower vehicle.



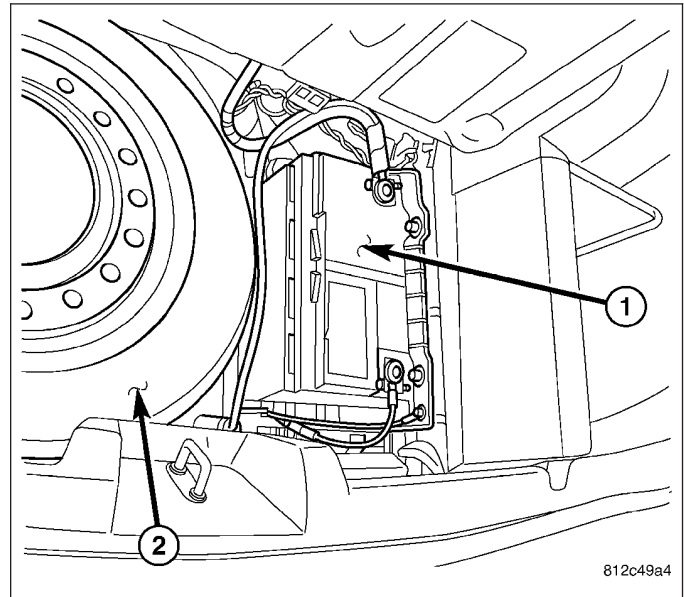
33. Install power steering pump (3)(Refer to 19 - STEERING/PUMP - INSTALLATION).
34. Connect lines to power steering pump (3).
35. Install accessory drive belt (5)(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).



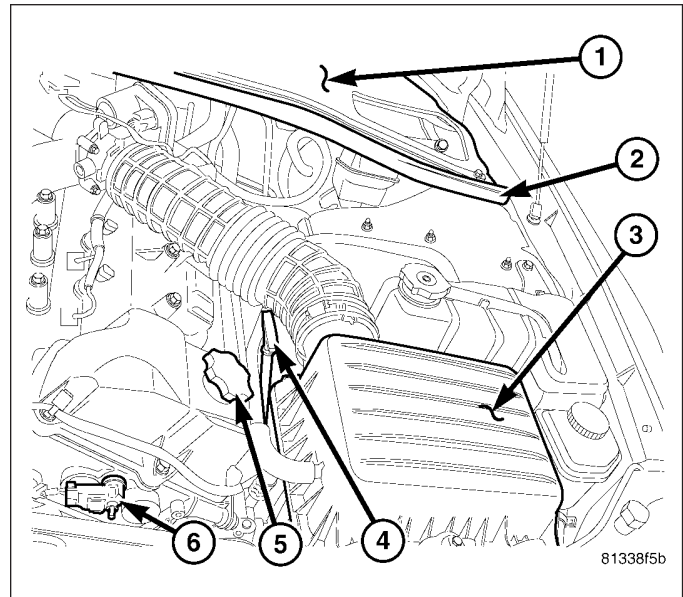
36. Install air cleaner housing assembly (3)(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
37. Connect intake air temperature sensor connector.



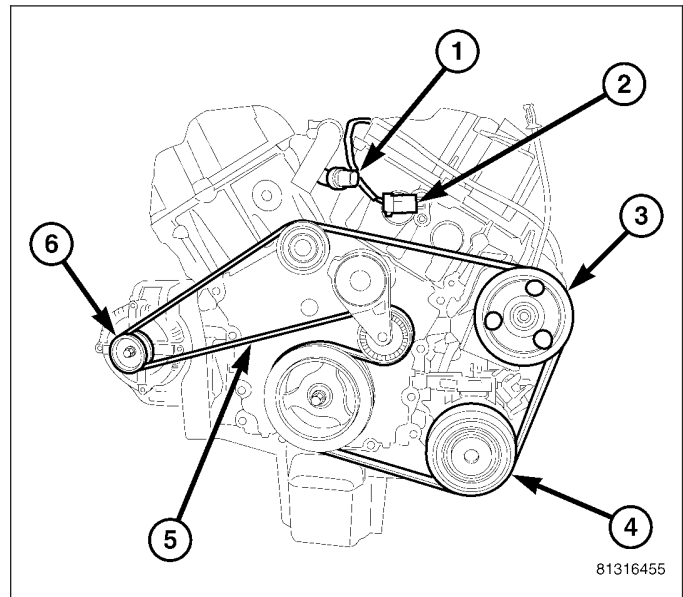
38. Connect negative battery (1) cable.



39. Fill coolant system(Refer to 7 - COOLING - STANDARD PROCEDURE).
40. Fill engine with correct grade of oil (5).
41. Install strut tower support (2).
42. Install cowl screen (1).
43. Install wiper arms(Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - INSTALLATION).
44. Install the hood.



45. Fill and bleed power steering system(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).
46. Evacuate and charge A/C system(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).
47. Start engine and check for leaks.



## SPECIFICATIONS

### 2.7L ENGINE

#### GENERAL SPECIFICATIONS

DESCRIPTION	SPECIFICATION	
Type	60° DOHC V-6 24-Valve	
Compression Ratio	9.67:1	
Lead Cylinder	#1 Right Bank	
Firing Order	1-2-3-4-5-6	
	Metric	Standard
Displacement	2.7 Liters	167 Cubic Inches
Bore & Stroke	86.0 x 78.5 mm	3.386 in. x 3.091 in.

#### CYLINDER BLOCK

Description	Specification	
	Metric	Standard
Cylinder Bore Diameter	86.0 mm $\pm 0.0076$	3.3859 in. $\pm 0.0003$
Out of Round (Max.)	0.076 mm	0.003 in.
Taper (Max.)	0.051 mm	0.002 in.

#### PISTONS

Description	Specification	
	Metric	Standard
Material	Aluminum Alloy	
Piston Diameter	85.983 mm $\pm 0.019$	3.3851 in. $\pm 0.0017$
Clearance at Size Location	- 0.0096 to +0.0436 mm	- 0.0003 to +0.0016 in.
Piston Weight	316-326 grams	11.1466-11.4994 oz.
Piston Ring Groove Diameter—No. 1	77.8-78 mm	3.063-3.070 in.
Piston Ring Groove Diameter—No. 2	75.9-76.1 mm	2.988-2.996 in.
Piston Ring Groove Diameter—No. 3	76.5-76.7 mm	3.011-3.019 in.

#### PISTON PINS

Description	Specification	
	Metric	Standard
Type	Full Floating	
Pin Diameter	21.997-22.000 mm	0.8661-0.8662 in.
Clearance in Piston	0.005-0.013 mm	0.0002-0.0005 in.
Clearance in Rod	0.007-0.018 mm	0.0003-0.0008 in.

**PISTON RINGS**

Description	Specification	
	Metric	Standard
Ring Gap-Top Compression Ring	0.20-0.36 mm	0.008-0.014 in.
Ring Gap-2nd Compression Ring	0.37-0.63 mm	0.0146-0.0249 in.
Ring Gap-Oil Control (Steel Rails)	0.25-0.76 mm	0.010-0.030 in.

**PISTON RING SIDE CLEARANCE**

Description	Specification	
	Metric	Standard
Compression Ring-Top	0.035-0.083 mm	0.0013-0.0032 in.
Compression Ring-Second	0.040-0.080 mm	0.0016-0.0031 in.
Oil Ring (Steel Rails)	0.058-0.204 mm	0.0022-0.0080 in.

**PISTON RING WIDTH**

Description	Specification	
	Metric	Standard
Compression Rings-Top and Second	1.47-1.49 mm	0.0579-0.0587 in.
Oil Ring (Steel Rails)	0.445-0.470 mm	0.0176-0.0186 in.

**CONNECTING RODS**

Description	Specification	
	Metric	Standard
Bearing Clearance	0.024-0.064 mm	0.001-0.0026 in.
Side Clearance	0.13-0.38 mm	0.0052-0.015 in.
Side Clearance (Max.)	0.4318 mm	0.017 in.
Piston Pin Bore Diameter	22.007-22.015 mm	0.8665-0.8668 in.
Bearing Bore Out of Round (Max.)	0.004 mm	0.0002 in.
Total Weight (Less Bearing)	529.9 ±7 grams	18.6917 ±0.247 oz.

**CRANKSHAFT MAIN BEARING JOURNALS**

Description	Specification	
	Metric	Standard
Diameter	63.49-63.51 mm	2.4997-2.5004 in.
Bearing Clearance	0.032-0.056 mm	0.0012-0.0022 in.
Bearing Clearance (Max.)	0.080 mm	0.0031 in.
Out of Round (Max.)	0.010 mm	0.0004 in.
Taper (Max.)	0.015 mm	0.0006 in.
End Play	0.0475-0.2725 mm	0.0019-0.0108 in.
End Play (Max.)	0.43 mm	0.017 in.

**CONNECTING ROD JOURNALS**

Description	Specification	
	Metric	Standard
Diameter	53.51-53.49 mm	2.1067-2.106 in.
Bearing Clearance	0.034-0.070 mm	0.0013-0.0027 in.
Out of Round (Max.)	0.010 mm	0.0004 in.
Taper (Max.)	0.015 mm	0.0006 in.

**CAMSHAFT**

Description	Specification	
	Metric	Standard
Bore Diameter	24.050-24.071 mm	0.9469-0.09476 in.
Bearing Journal Diameter	24.000-23.981 mm	0.9449-0.9441 in.
Bearing Clearance	0.05-0.09 mm	0.0020-0.0035 in.
Bearing Clearance (Max.)	0.10 mm	0.004 in.
End Play	0.13-0.28 mm	0.0051-0.0110 in.

**VALVE TIMING-INTAKE VALVES**

Description	Specification
Opens (ATDC)	2°
Closes (ABDC)	44°
Duration	222°

**VALVE TIMING-EXHAUST VALVES**

Description	Specification
Opens (BBDC)	36°
Closes (ATDC)	4°
Duration	220°
Valve Overlap	2°

**CYLINDER HEAD**

Description	Specification	
	metric	Standard
Gasket Thickness (Compressed)	1.50 mm ±0.05	0.0591 in. ±0.002 in.
Valve Seat Angle	45°-45.5°	
Valve Seat Runout (Max.)	0.05 mm	0.002 in.
Intake Valve Seat Width	1.00-1.5 mm	0.0394-0.0591 in.
Exhaust Valve Seat Width	1.25-1.75 mm	0.0492-0.0689 in.
Guide Bore Diameter (Std.)	5.975-6.00 mm	0.2353-0.2363 in.
Valve Guide Height*—Intake & Exhaust	13.25-13.75 mm	0.5217-0.5414 in.
*Measured from cylinder head surface to top of guide		

**VALVES**

Description	Specification	
	Metric	Standard
Face Angle	44.5°-45.5°	
Head Diameter-Intake	33.67-33.93	1.3256-1.3358 in.
Head Diameter-Exhaust	27.67-27.93 mm	1.0894-1.1000 in.
Length-Intake (Overall)	107.89-108.39 mm	4.2476-4.2673 in.
Length-Exhaust (Overall)	105.88-106.38 mm	4.1685-4.1882 in.
Stem Diameter-Intake	5.934-5.952 mm	0.2337-0.2344 in.
Stem Diameter-Exhaust	5.906-5.924 mm	0.2326-0.2333 in.
Stem-to-Guide Clearance-Intake (New)	0.023-0.066 mm	0.0009-0.0026 in.
Stem-to-Guide Clearance-Exhaust (New)	0.051-0.094 mm	0.002-0.0037 in.
Stem-to-Guide Clearance-Intake (Max., Rocking Method)	0.29 mm	0.0114 in.
Stem-to-Guide Clearance-Exhaust (Max., Rocking Method)	0.370 mm	0.0146 in.
Valve Lift-Intake (Zero Lash)	9.0 mm	0.3543 in.
Valve Lift-Exhaust (Zero Lash)	8.0 mm	0.3150 in.
Valve Stem Tip Height-Intake	47.125 ±0.711 mm	1.8550 ±0.028 in.
Valve Stem Tip Height-Exhaust	47.187 ±0.65 mm	1.858 ±0.026 in.

**VALVE SPRING**

Description	Specification	
	Metric	Standard
Free Length—Intake & Exhaust (Approx.)	45.63 mm	1.7965 in.
Spring Force—Intake & Exhaust (Valve Closed)	249-284 N @ 38.0 mm	56.0-64.0 lbs. @ 1.4961 in.
Spring Force—Intake (Valve Open)	658-721 N @ 29.0 mm	147.9-162.1 lbs. @ 1.1417 in.
Spring Force—Exhaust (Valve Open)	614-671 N @ 30.0 mm	138.0-150.8 lbs. @ 1.1811 in.
Number of Coils—Intake & Exhaust	7.35	
Wire Diameter—Intake & Exhaust	3.861 mm	0.1520 in.
Installed Height—Intake & Exhaust (Spring seat to bottom of retainer)	38.0 mm	1.4961 in.



**OIL PUMP**

Description	Specification	
	Metric	Standard
Clearance Over Rotors (Max.)	0.077 mm	0.003 in.
Cover-Out-of-Flat (Max.)	0.025 mm	0.001 in.
Inner & Outer Rotor Thickness	9.475-9.500 mm	0.3731-0.3741 in.
Outer Rotor Clearance (Max.)	0.39 mm	0.015 in.
Outer Rotor Diameter (Min.)	89.175 mm	3.5109 in.
Tip Clearance Between Rotors (Max.)	0.20 mm	0.008 in.

**OIL PRESSURE**

Description	Specification	
	Metric	Standard
(NOTE: At Normal Operating Temperatures)		
Pressure @ Curb Idle Speed*	34.7 kPa Min.	5 psi Min.
Pressure @ 3000 RPM	300-724 kPa	45-105 psi
*CAUTION: If oil pressure is zero at idle, DO NOT run engine at 3000 RPM.		

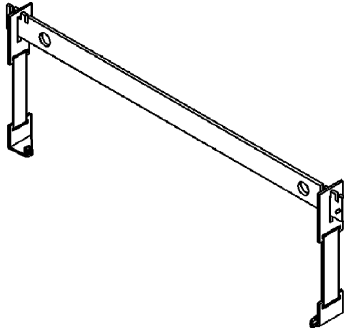
**TORQUE**

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
A/C Compressor to Engine - Bolts	28	21	-
Camshaft Sprocket - Bolts	28	-	250
Camshaft Chain Tensioner (Secondary) - Bolts	12	-	105
Camshaft Bearing Cap - Bolts	12	-	105
Connecting Rod Cap - Bolts	27 + $\frac{1}{4}$ Turn	20 + $\frac{1}{4}$ Turn	-
Cooling System Bleed Screw	12	-	110
Crankshaft Main Bearing Cap - Tie Bolts	28	-	250
Crankshaft Main Bearing Cap - Outer Cap Bolts	27 + $\frac{1}{4}$ Turn	20 + $\frac{1}{4}$ Turn	-
Crankshaft Main Bearing Cap - Inner Cap Bolts	20 + $\frac{1}{4}$ Turn	15 + $\frac{1}{4}$ Turn	-
Crankshaft Damper - Bolt	170	125	-
Crankshaft Rear Seal Retainer - Bolts	12	-	105
Cylinder Head - Bolts	(Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION)		
Cylinder Head Cover - Bolts	12	-	105
Exhaust Manifold - Bolts	23	-	200
Exhaust Manifold Heat Shield - Bolts	12	-	105
Engine Mount Bracket to Block - Bolts	61	45	-
Engine Mount Isolator - Nuts	61	45	-
Intake Manifold (Upper and Lower) - Bolts	12	-	105
Generator Bracket-Bolts	41	30	-

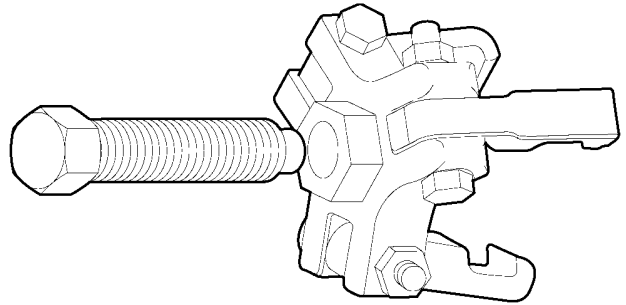
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Oil Pan - m8 Bolts	28	-	250
Oil Pan - m6 Nuts	12	-	105
Oil Pan Drain - Plug	27	20	-
Oil Filter	16	12	-
Oil Pump to Block - Bolts	28	-	250
Oil Pump Cover - Bolts	12	-	105
Oil Pump Pick Up Tube - Bolt	28	-	250
PCV Valve	7	-	60
Spark Plugs	20	15	-
Starter Mounting - Bolts	41	30	-
Structural Collar	(Refer to 9 - ENGINE/ENGINE BLOCK/ STRUCTURAL COVER - INSTALLATION)		
Thermostat Housing/Water Inlet Connector - Bolts	12	-	105
Throttle Body - Bolts	12	-	105
Timing Chain Cover - M6 Bolts	12	-	105
Timing Chain Cover - M10 Bolts	54	40	-
Timing Chain Tensioner (Primary)	12	-	105
Timing Chain Guide Access Plug	20	15	-
Torque Converter	75	55	-
Water Pump - Bolts	12	-	105
Water Outlet Housing - Bolts	12	-	105

## SPECIAL TOOLS

### 2.7L ENGINE

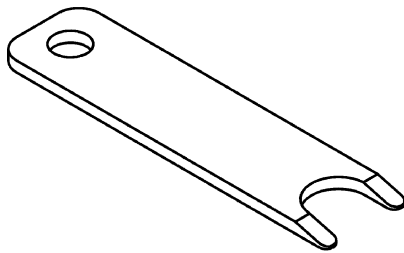


**Engine Lifting Fixture 8342**

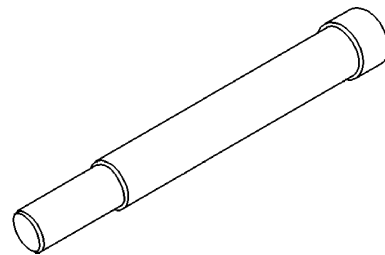


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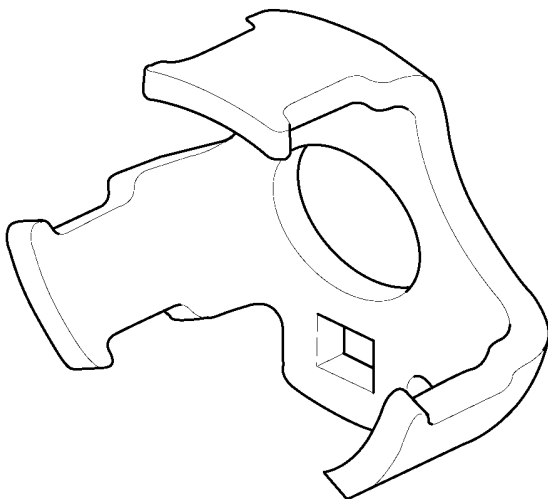
**Puller 8454**



**Disconnect Tool, 6638A**

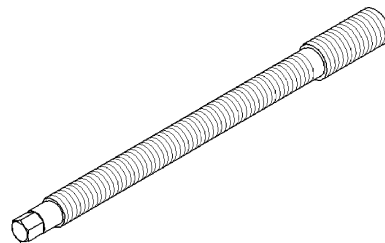


**Crankshaft Damper Remover Insert 8194**

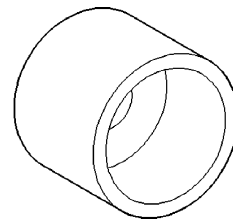


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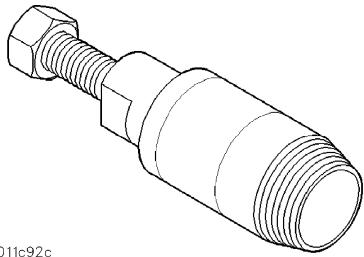
**Damper Holding Fixture 9365**



**Crankshaft Damper Installer Screw 8179**

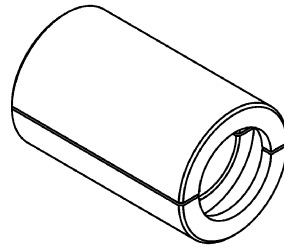


**Crankshaft Damper Installer 6792-1**

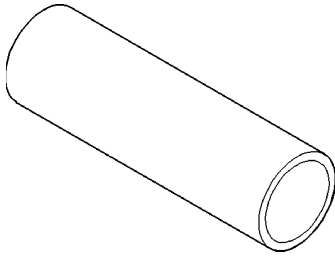


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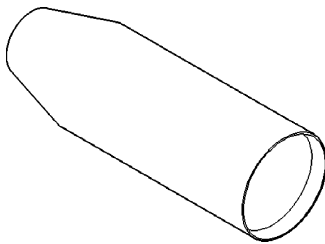
**Crankshaft Seal Remover 6771**



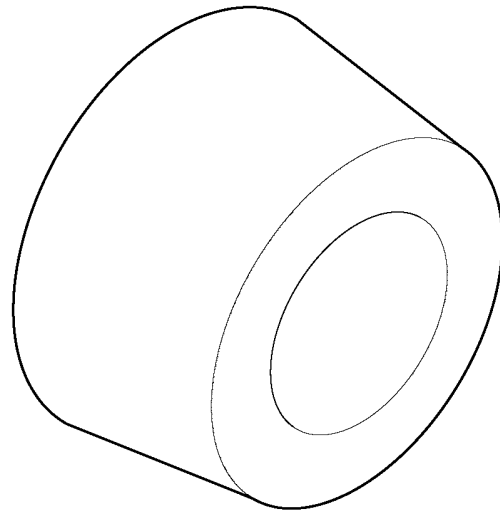
**Puller Adaptor 8539**



**Crankshaft Seal & Sprocket Installer 6780-1**

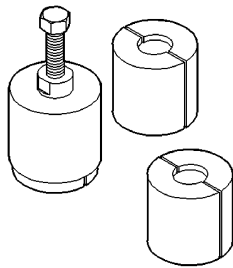


**Crankshaft Seal Protector 6780-2**

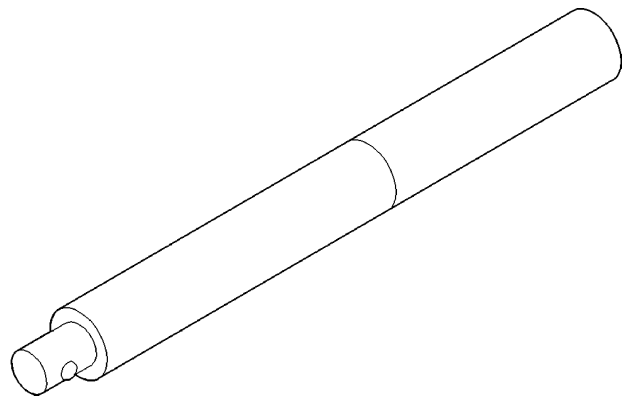


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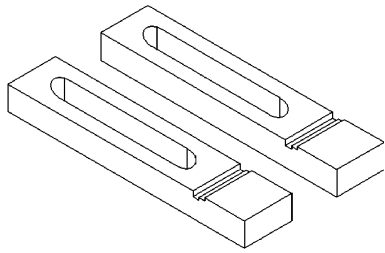
**Crankshaft Rear Seal Guide 6926-1 & Installer 6926-2**



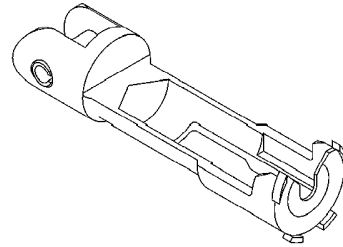
**Puller 5048**



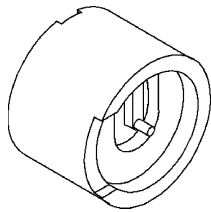
**Driver Handle C-4171**



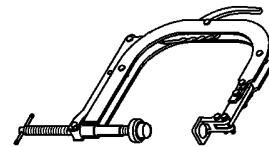
***Crankshaft Real Seal Retainer Alignment Fixture  
8225***



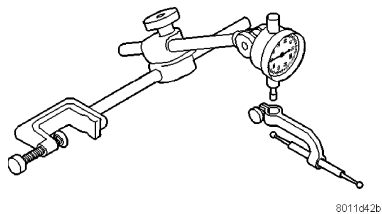
***Adaptor 8216-A***



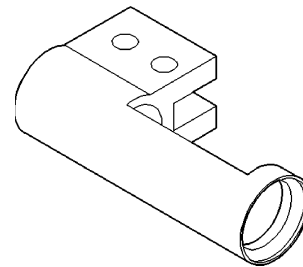
***Timing Chain Tensioner Resetting Gauge 8186***



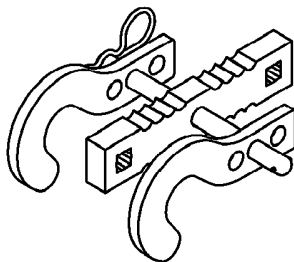
***Valve Spring Compressor C-3422-D***



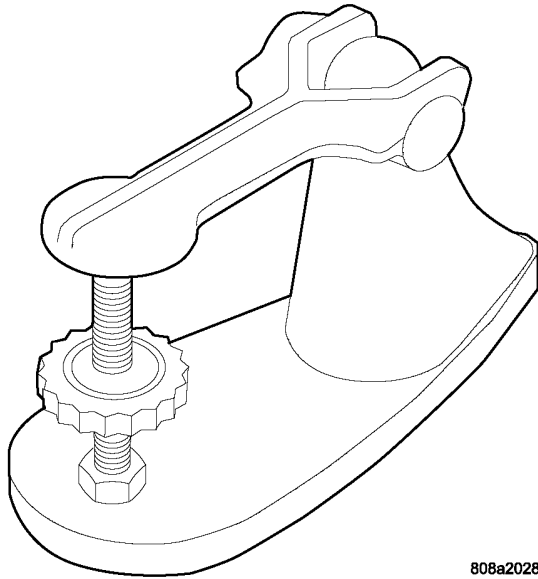
***Dial Indicator C-3339***



***Valve Spring Adapter 6526***

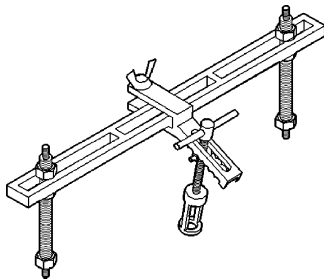


***Valve Spring Compressor 8215-A***

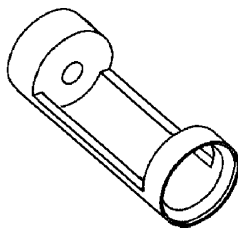


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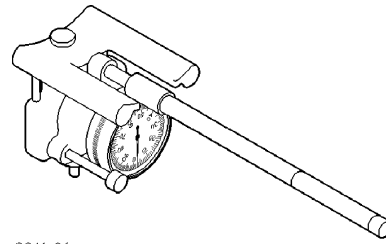
**Valve Spring Tester C-647**



**Valve Spring Compressor MD-998772-A**

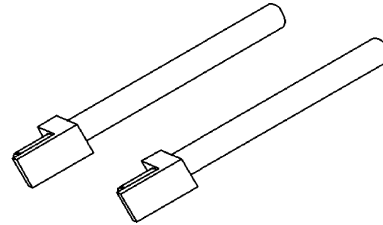


**Valve Spring Adapter 6527**

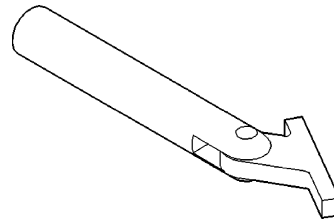


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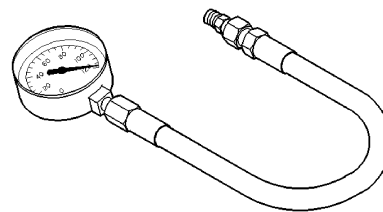
**Indicator Bore Size C-119**



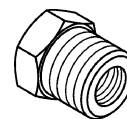
**Connecting Rod Installation Guides 8189**



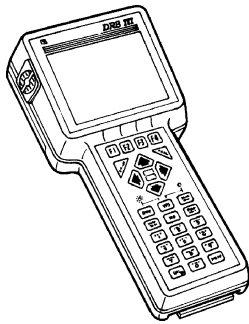
**Main Bearing Remover/Installer C-3059**



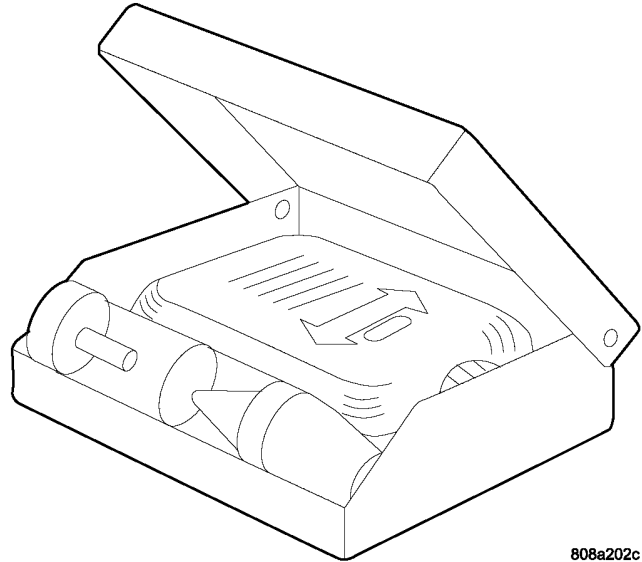
**Pressure Gauge C-3292**



**Adapter 8406**

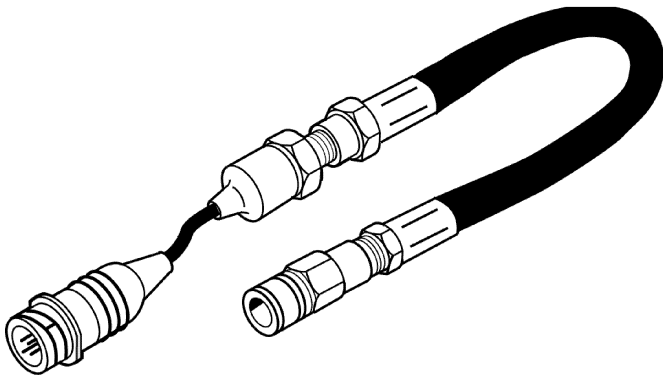


**DRB III® with PEP Module – OT-CH6010A**

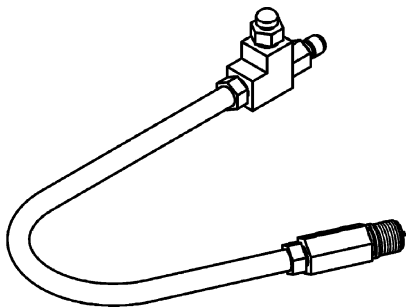


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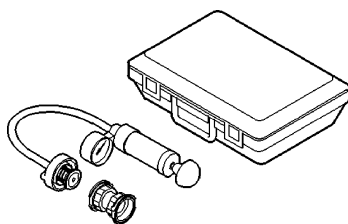
**Combustion Leak Tester C-3685-A**



**Pressure Transducer CH7059**



**Adaptor 8116**

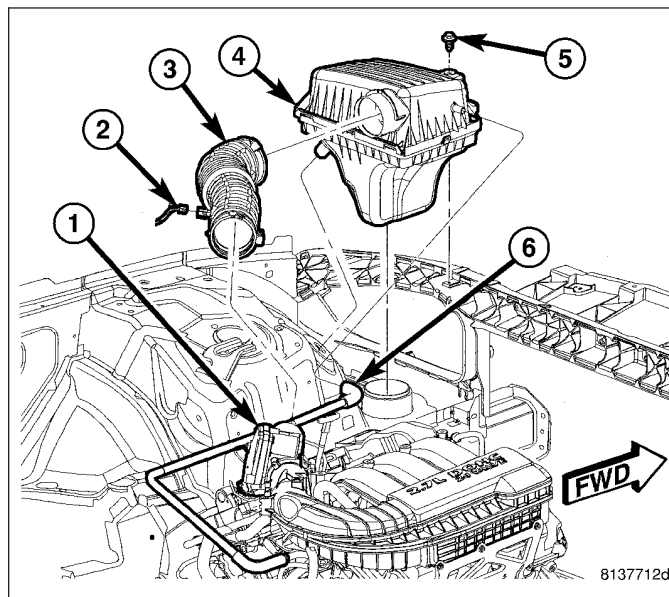


**Cooling System Tester 7700**

## AIR CLEANER HOUSING

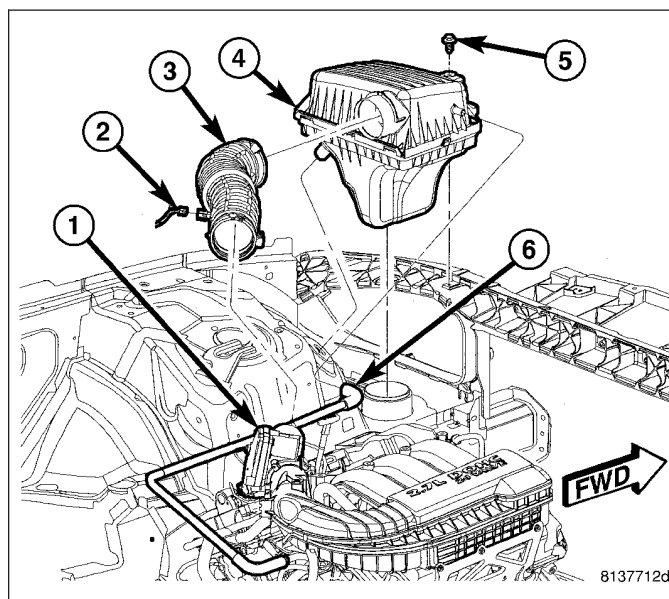
### REMOVAL

1. Disconnect negative battery cable.
2. Disconnect mass airflow sensor electrical connector.
3. Remove clean air duct between throttle body and air filter housing.
4. Remove vent tube.
5. Remove mounting bolt.
6. Remove air filter housing.
7. Raise vehicle.
8. Partially remove front fascia to gain access to air filter resonator (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).
9. Remove mounting bolt.
10. Remove air cleaner resonator.



### INSTALLATION

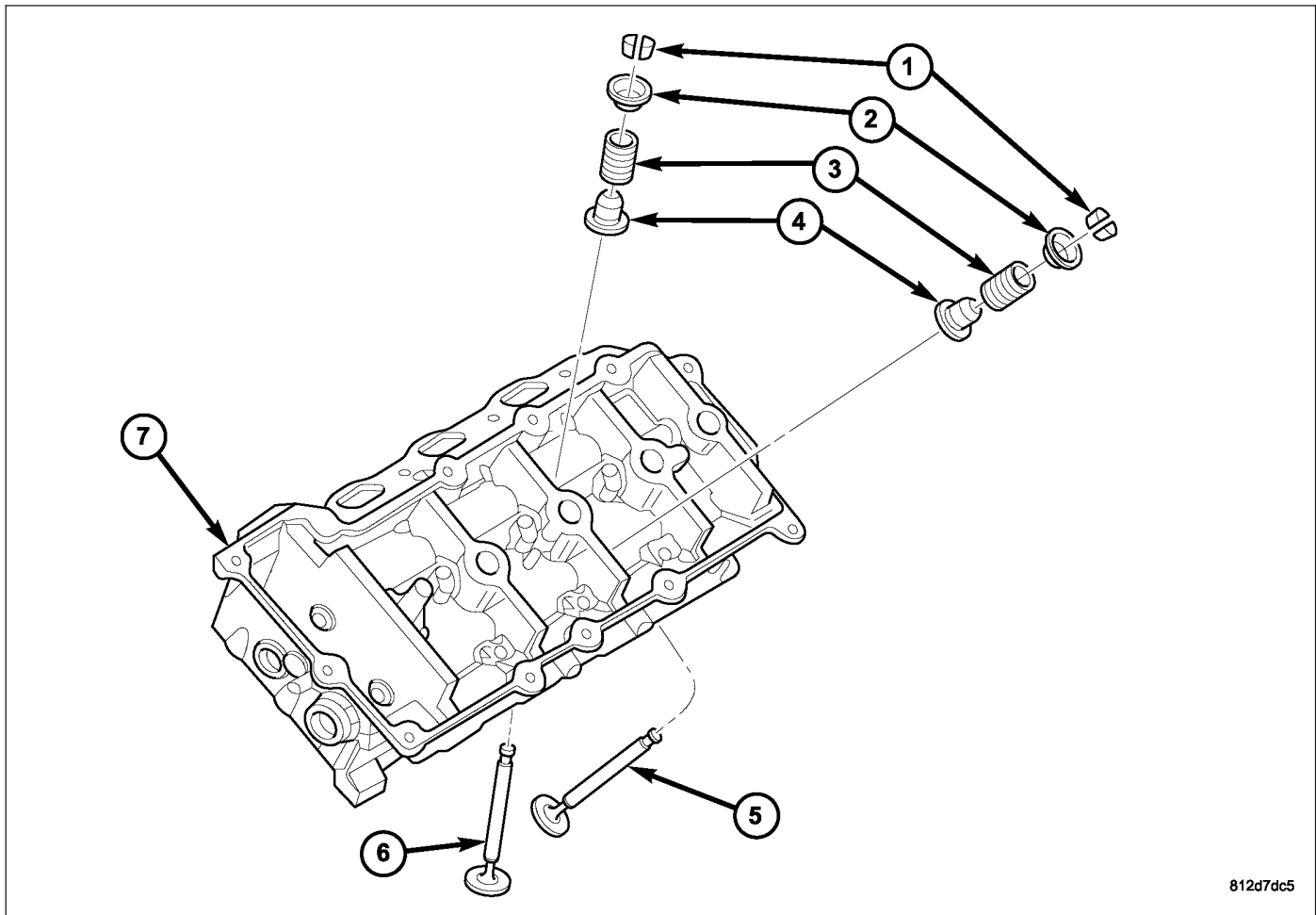
1. Position air cleaner resonator assembly in vehicle.
2. Install mounting bolt. Tighten bolt to 10 N·m (89 in. lbs.).
3. Install front fascia (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).
4. Position air filter assembly in vehicle.
5. Install mounting bolt. Tighten to 10 N·m (89 in. lbs.).
6. Install vent tube.
7. Install clean air duct between air filter housing and throttle body.





## CYLINDER HEAD

### DESCRIPTION



The cylinder heads (7) are made of an aluminum alloy. The cylinder head features four valves (5&6) per cylinder with pressed in powdered metal valve guides. The cylinder heads provide enclosures for the timing chain drive, necessitating a unique right and left cylinder head.

### DIAGNOSIS AND TESTING

#### CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

## CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

## CYLINDER-TO-WATER JACKET LEAKAGE TEST

**WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.**

### VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

### COOLING SYSTEM TESTER METHOD

**WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).**

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

### CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

## STANDARD PROCEDURE - Cylinder Head Oil Gallery Cup Plug Service

**Note: DETERMINE WHICH CUP PLUG IS LEAKING BEFORE PERFORMING THIS PROCEDURE. IF NECESSARY, PERFORM AN ENGINE OIL LEAK DYE TEST.**

Each cylinder head on a 2.7L engine has 6 external oil gallery cup plugs. It is not necessary to remove the original cup plug to install a new cup plug. The cup plug bore is deep enough to allow for two plugs. If it becomes necessary to service an oil gallery cup plug, perform the Repair Procedure.

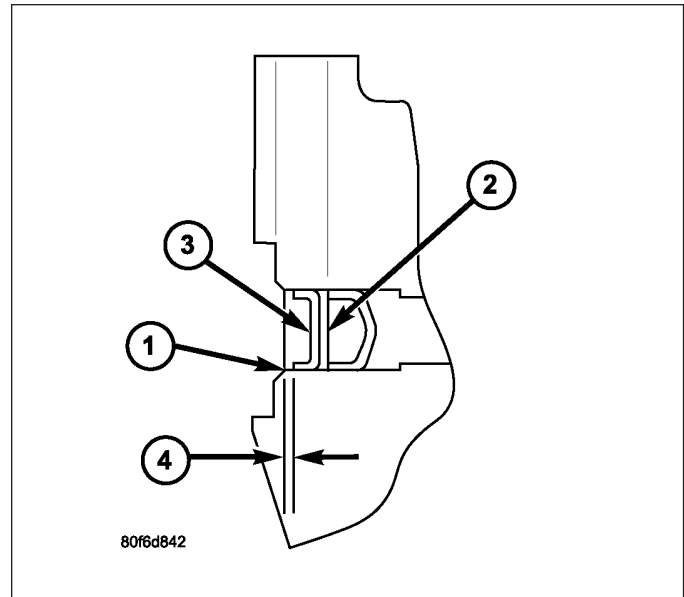
**Note: INSPECT THE CUP PLUG BORE IN QUESTION FOR THE PRESENCE OF TWO CUP PLUGS. IF THE CUP PLUG FLANGE IS JUST INSIDE (1–2 MM) THE CHAMFERED EDGE OF THE BORE TWO CUP PLUGS ARE ALREADY IN PLACE AND THE CYLINDER HEAD CANNOT BE REPAIRED.**

## Repair Procedure

1. Remove component(s) necessary to gain access to the oil gallery cup plug requiring service.

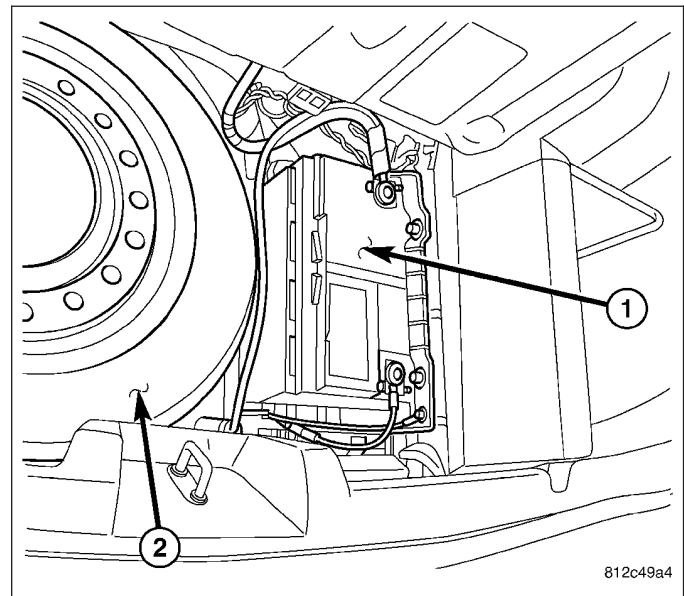
**Note: SOME OF THE OIL GALLERY CUP PLUGS ARE SERVICEABLE WITH THE HEAD INSTALLED ON THE ENGINE AND THE ENGINE IN THE VEHICLE, WHILE OTHERS REQUIRE REMOVING THE AFFECTED CYLINDER HEAD FROM THE ENGINE. IN EITHER CASE ONLY REPLACE THE CUP PLUG REQUIRING SERVICE.**

2. Clean the cup plug bore with brake cleaner and compressed air. It is not necessary to remove the existing cup plug.
3. Lightly coat the new cup plug with sealer; p/n 04318083.
4. Using an appropriate installation tool drive the new cup plug into the bore until the flanged edge of the plug is just inside (1-2 mm) the chamfered edge of the bore.
5. Allow the sealant to cure for at least 20 minutes.
6. Assemble any components removed in step # 1 as necessary.

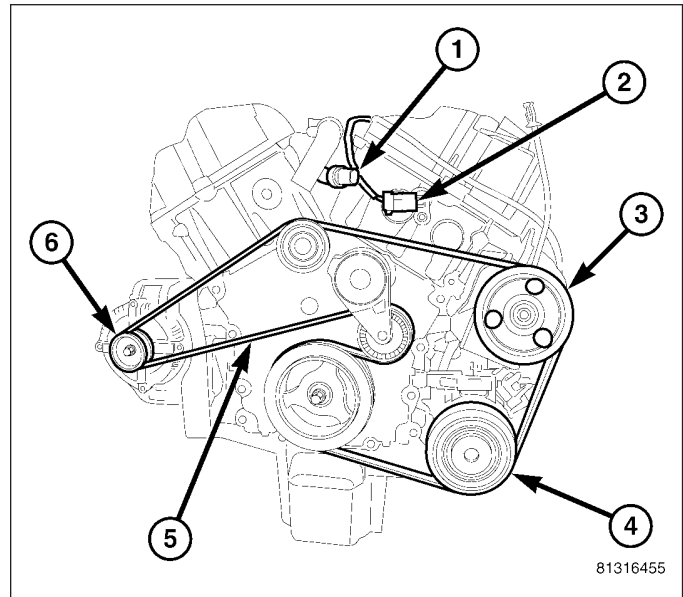


## REMOVAL

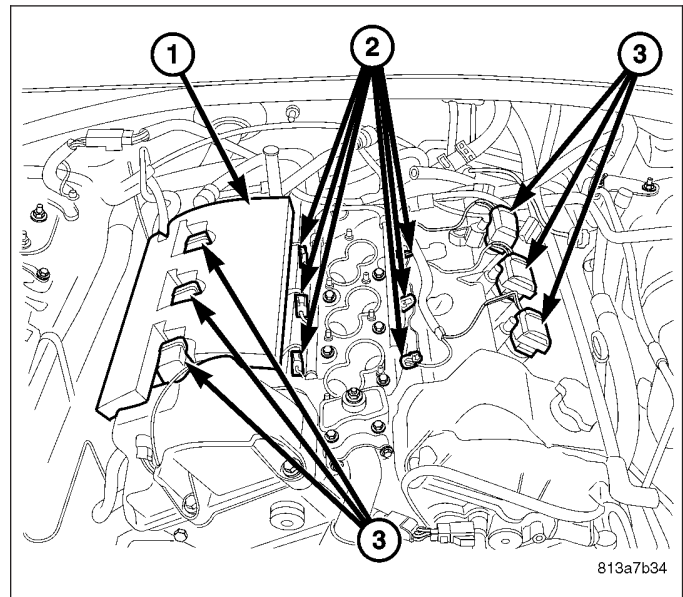
1. Perform fuel pressure release procedure **before attempting any repairs.** (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE)
2. Disconnect negative cable from battery (1).
3. Raise vehicle on hoist.
4. Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).



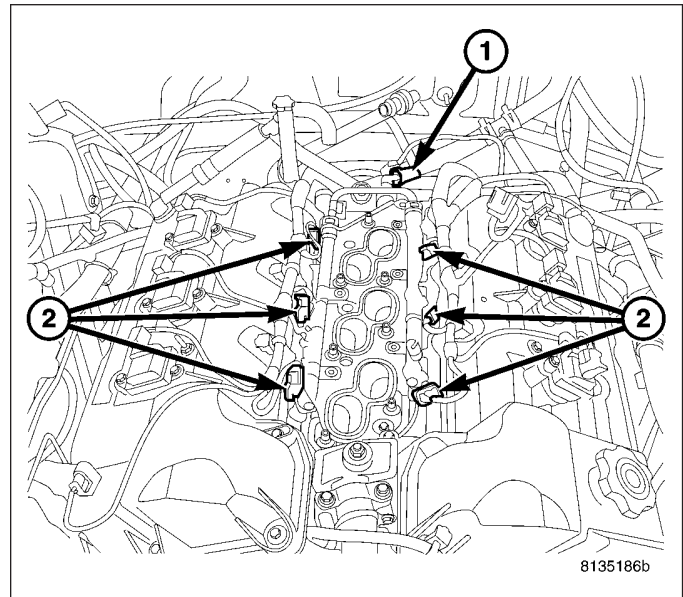
5. Remove accessory drive belt (5). (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
6. Remove the vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
7. Disconnect camshaft position sensor (2), and coolant temperature sensor (1) connectors.
8. Remove upper intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).



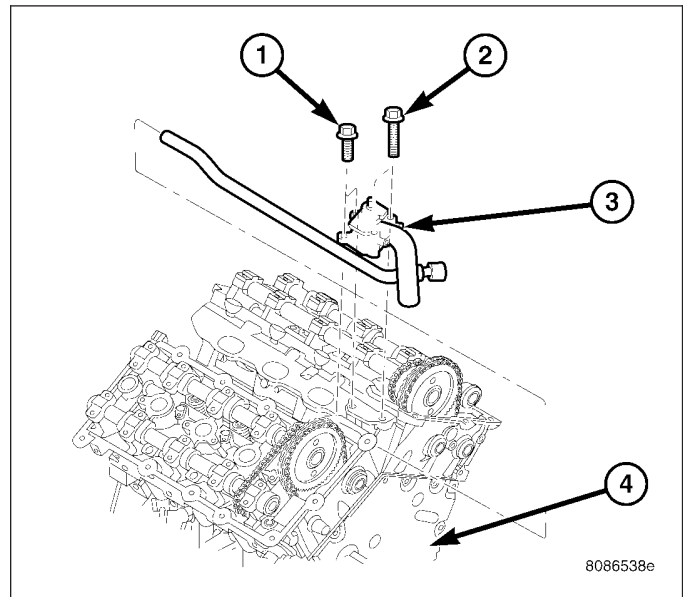
9. Disconnect coils (3), capacitors, and injector connectors (2).
10. Reposition harness out of the way.



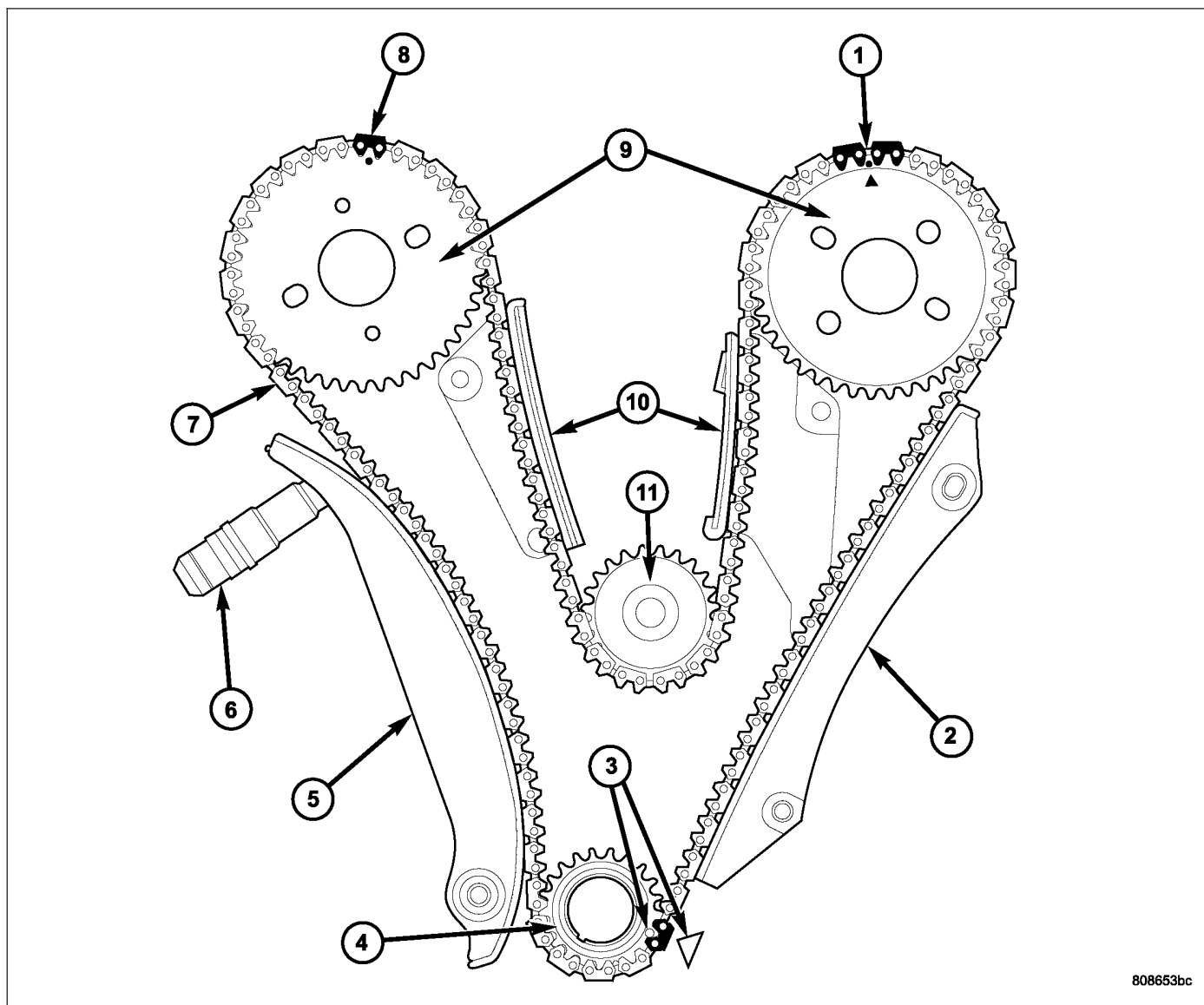
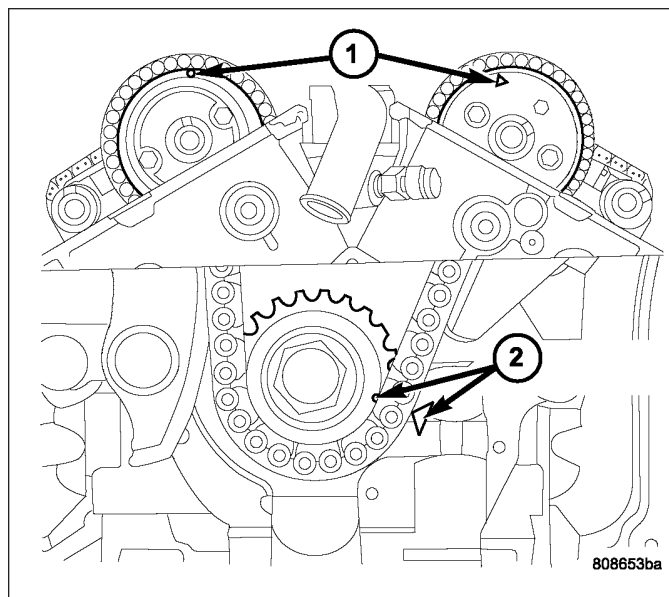
11. Disconnect fuel feed line (1)(Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
12. Remove lower intake manifold.
13. Remove cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).



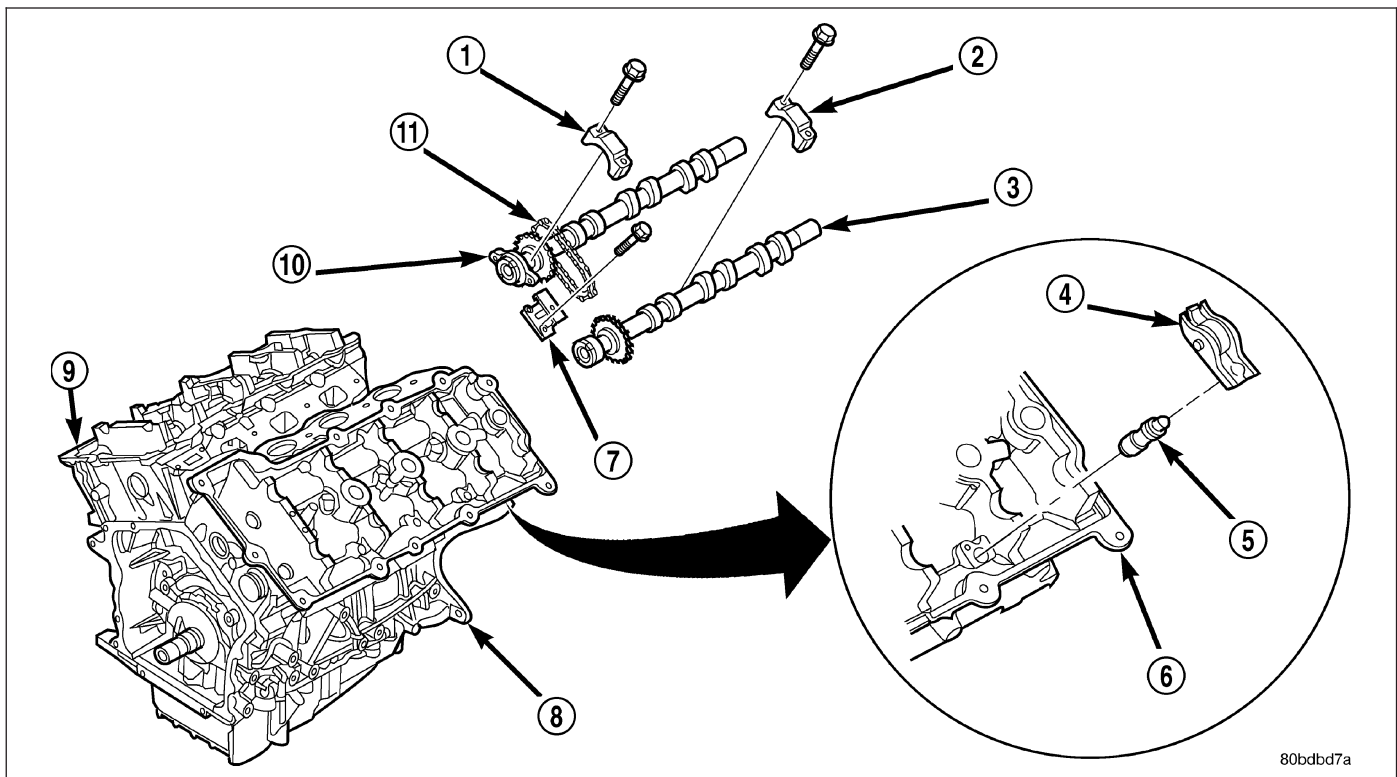
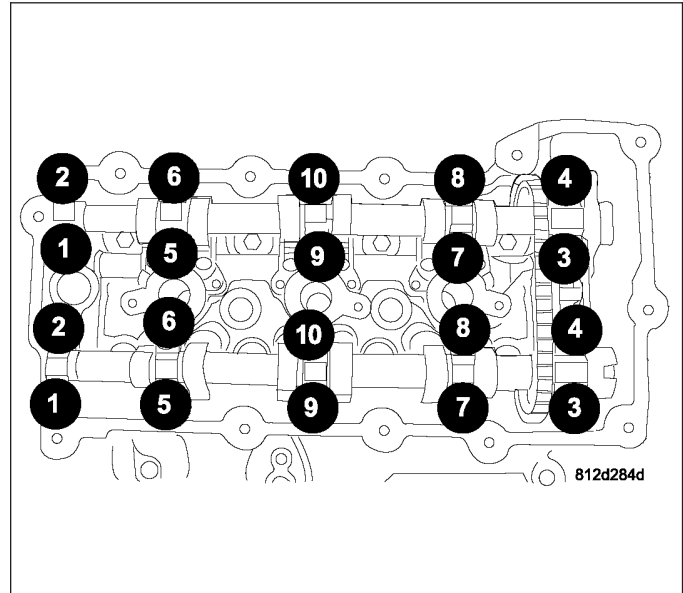
14. Remove coolant outlet (3) (Refer to 7 - COOLING/ENGINE/COOLANT OUTLET HOUSING - REMOVAL).
15. Remove timing chain cover (4) (Refer to 9 - ENGINE/VALVE TIMING/TIMING CHAIN COVER - REMOVAL).



16. Rotate crankshaft until crankshaft sprocket timing mark aligns with timing mark on oil pump housing (2).



17. Remove primary timing chain (7)(Refer to 9 - ENGINE/VALVE TIMING/TIMING CHAIN AND SPROCKETS - REMOVAL).
18. Remove upper primary timing chain guides (10).
19. Remove camshaft bearing caps **gradually** in the sequence shown.



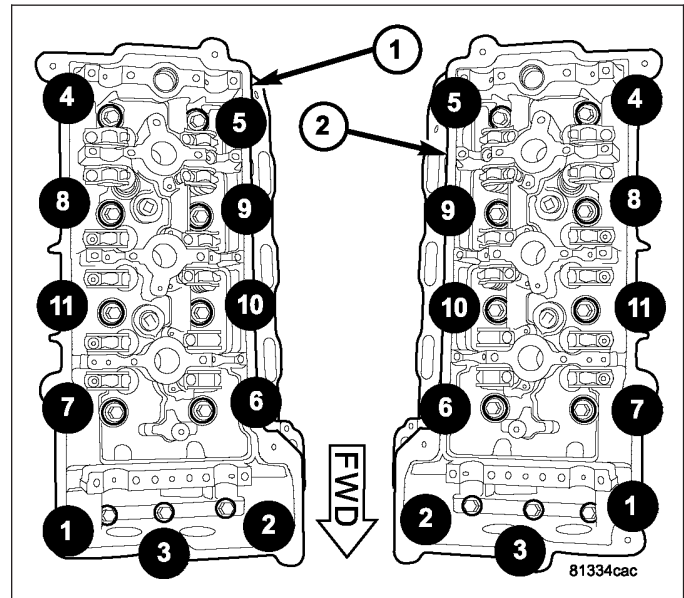
20. Remove camshafts (3 & 10) and valvetrain components from cylinder head. Note component locations for re-installation in original locations.
21. For left cylinder head removal:
  - Remove fastener securing engine oil dipstick tube to cylinder head. Remove engine oil dipstick tube.
  - Remove generator.
22. For right cylinder head removal:



- Remove cylinder head ground strap.
- Disconnect EGR valve electrical connector and remove EGR valve from head(Refer to 25 - EMISSIONS CONTROL/EXHAUST GAS RECIRCULATION/VALVE - REMOVAL).

**CAUTION:** Ensure cylinder head bolts 1 - 3 are removed before attempting the removal of cylinder head, as damage to cylinder head and/or block may occur.

23. Remove cylinder left head bolts (2) and right head bolts (1) in sequence shown.
24. Remove cylinder head(s).
25. Remove and discard cylinder head gasket.
26. Clean cylinder head and block sealing surfaces-(Refer to 9 - ENGINE/CYLINDER HEAD - CLEANING).



## CLEANING

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

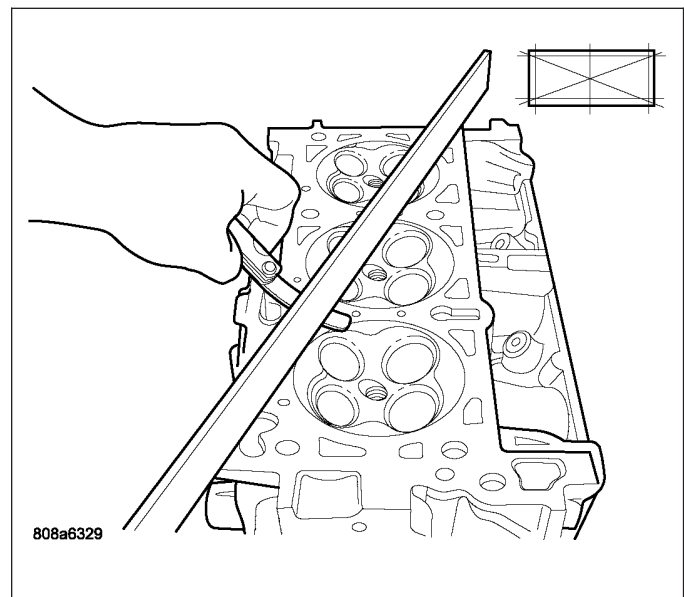
**Note:** Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

Remove all gasket material from cylinder head and block (Refer to 9 - ENGINE - STANDARD PROCEDURE). Be careful not to gouge or scratch the aluminum head sealing surface.

Clean all engine oil passages.

## INSPECTION

1. Before cleaning, check for leaks, damage and cracks.
2. Clean cylinder head and oil passages.
3. Check cylinder head for flatness .
4. Cylinder head must be flat within:
  - Standard dimension = less than 0.05 mm (0.002 inch.)
  - Service Limit = 0.2 mm (0.008 inch.)
  - Grinding Limit = Maximum of 0.2 mm (0.008 inch.) is permitted.





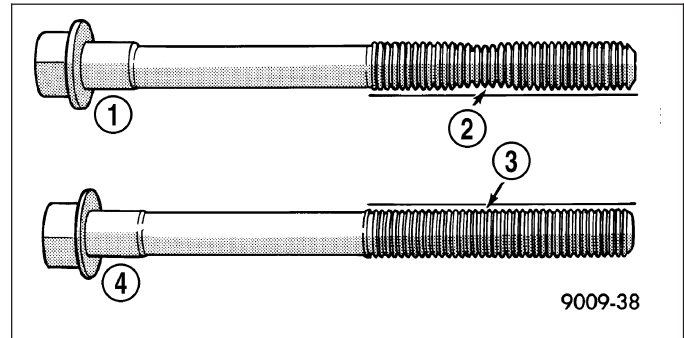
**CAUTION:** 0.20 mm (0.008 in.) MAX is a combined total dimension of the stock removal limit from cylinder head and block top surface (Deck) together.

## INSTALLATION

**Note:** The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined **BEFORE** reuse. If the threads are necked down the bolts must be replaced

Necking can be checked by holding a straight edge against the threads (3). If all the threads do not contact the scale (2), the bolt must be replaced.

**CAUTION:** When cleaning cylinder head and cylinder block surfaces, **DO NOT** use a metal scraper because the surfaces could be cut or ground. Use **ONLY** a wooden or plastic scraper.

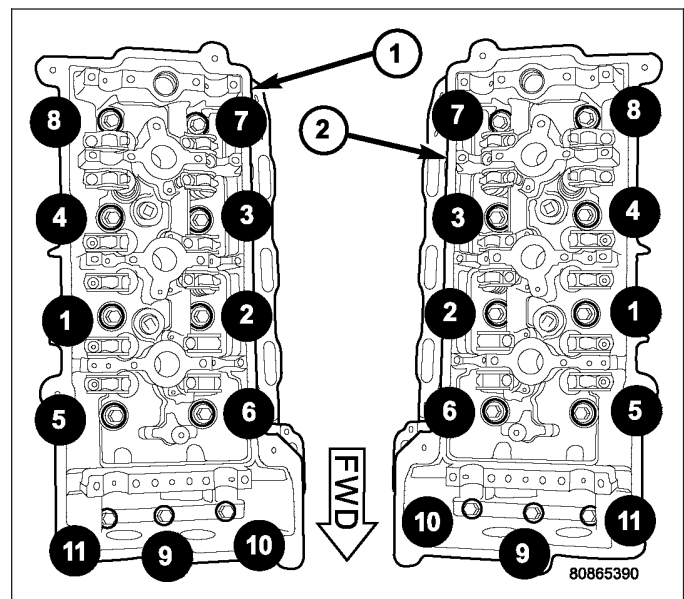


1. Clean sealing surfaces of cylinder head and block(Refer to 9 - ENGINE - STANDARD PROCEDURE).
2. Install new head gasket over locating dowels.
3. Install cylinder head to block, assuring head is properly positioned over locating dowels.

4. Lubricate bolt threads with clean engine oil and install bolts.

5. Tighten bolts in sequence shown for left head (2) and right head (1), using the following steps and torque values:

- Step 1: Bolts 1–8 to 48 N·m (35 ft. lbs.)
- Step 2: Bolts 1–8 to 75 N·m (55 ft. lbs.)
- Step 3: Bolts 1–8 to 75 N·m (55 ft. lbs.)
- Step 4: Bolts 1–8 to +90° Turn **Do not use a torque wrench for this step.**
- Step 5: Bolts 9–11 to 28 N·m (250 in. lbs.)



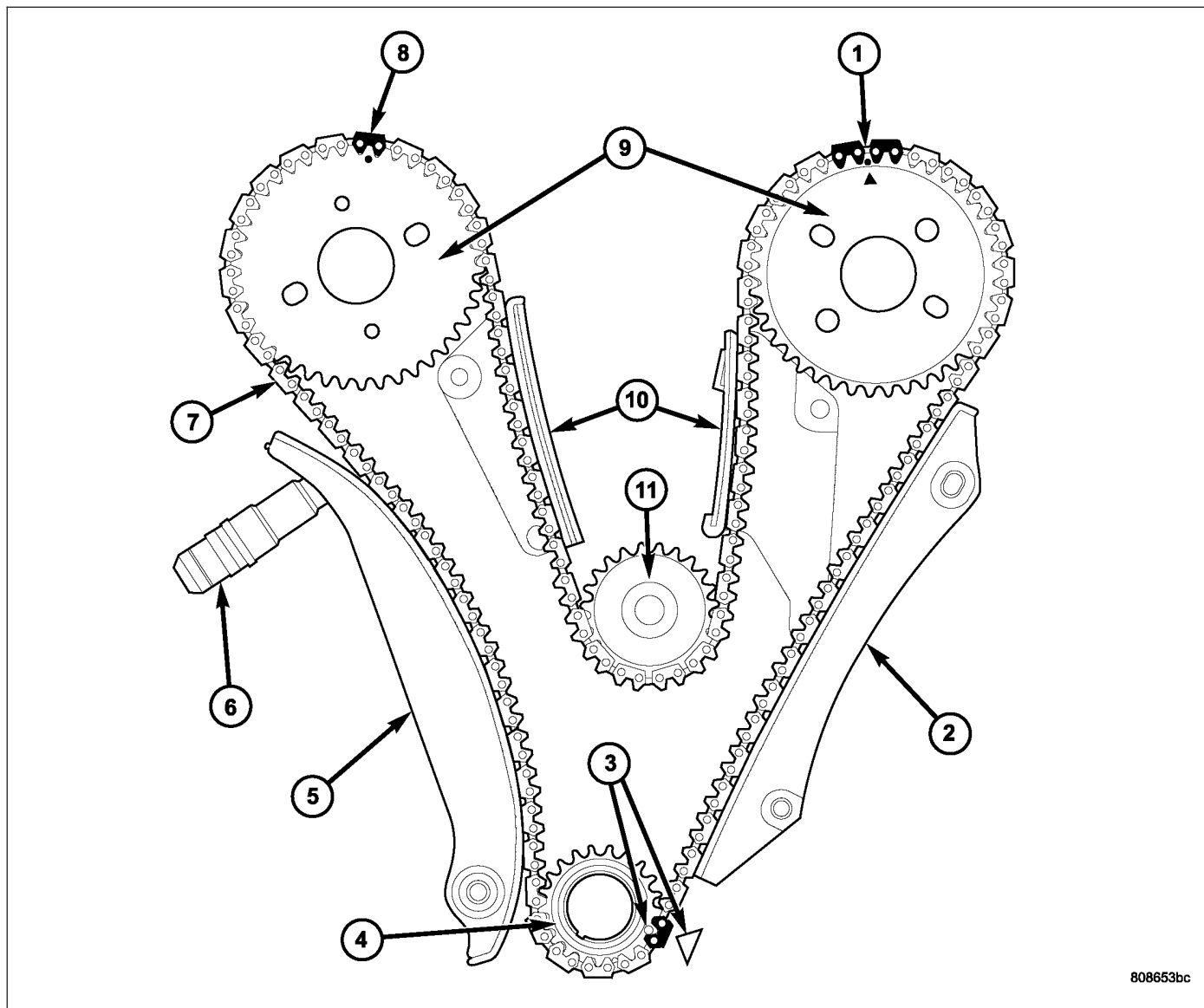
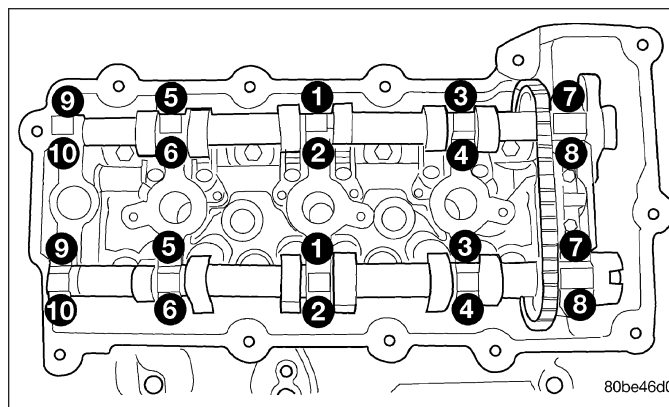
6. For left cylinder head installation:

- Install engine oil dipstick tube.
- Install generator.

7. For right cylinder head Installation:

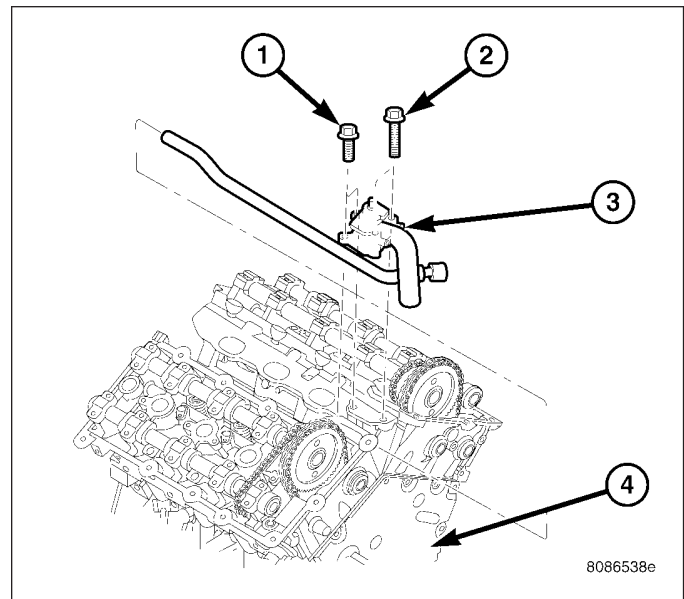
- Install cylinder head ground strap.
- Install EGR valve (if equipped) (Refer to 25 - EMISSIONS CONTROL/EXHAUST GAS RECIRCULATION/ VALVE - INSTALLATION).

8. Install all valvetrain components and camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAM-SHAFT(S) - INSTALLATION). Tighten camshaft bearing caps in sequence shown to 12 N·m (105 in. lbs.).

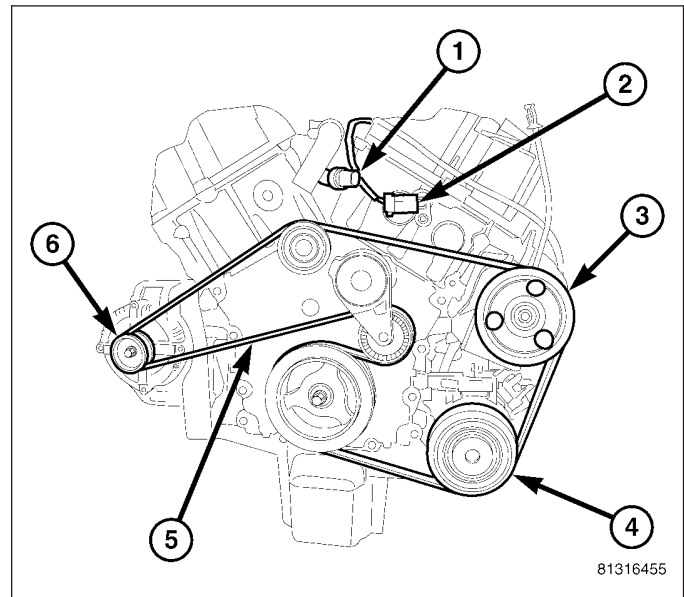


9. Install primary timing chain (7), guides (2,5,10) and sprockets (9)(Refer to 9 - ENGINE/VALVE TIMING/TIMING CHAIN AND SPROCKETS - INSTALLATION).

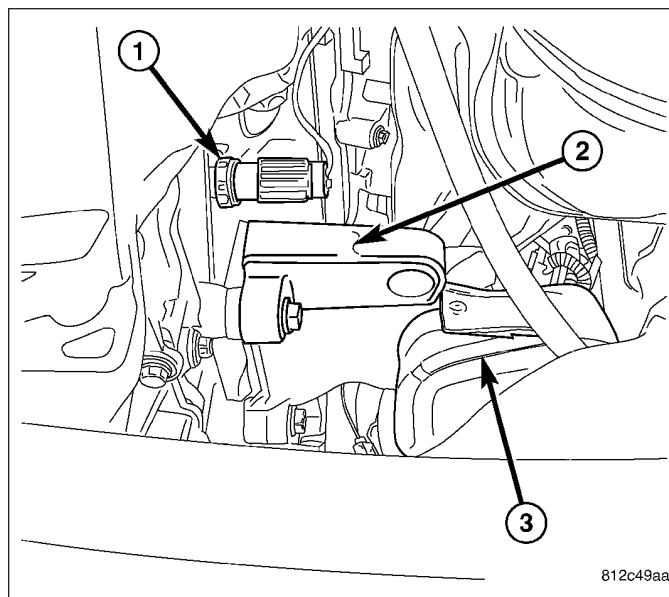
10. Install coolant outlet (3) (Refer to 7 - COOLING/ENGINE/COOLANT OUTLET HOUSING - INSTALLATION).



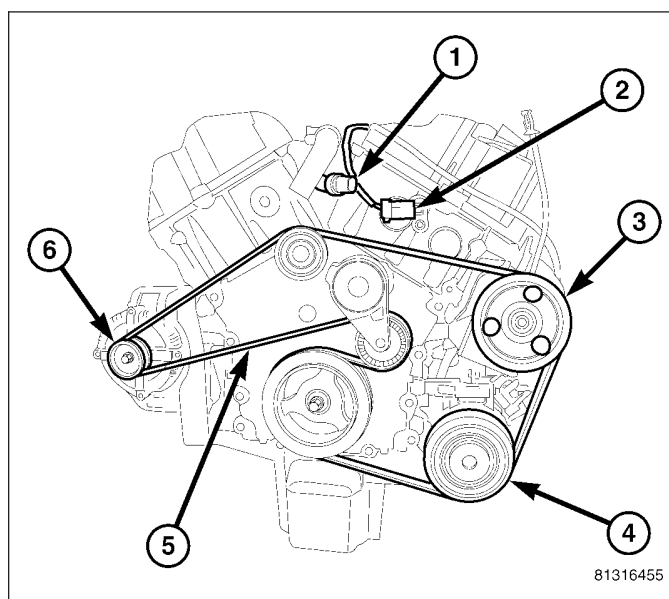
11. Install lower intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
12. Install cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
13. Connect camshaft position sensor (2) and coolant temperature sensor (1) connectors.
14. Install timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING CHAIN COVER(S) - INSTALLATION).
15. Install crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
16. Install upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).



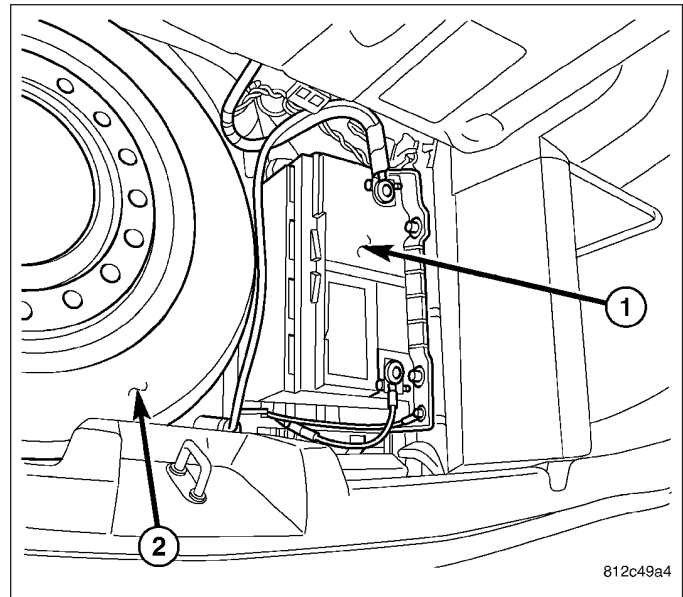
17. Connect oil pressure sensor (1) connector.



18. Install accessory drive belt (5)(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
19. Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

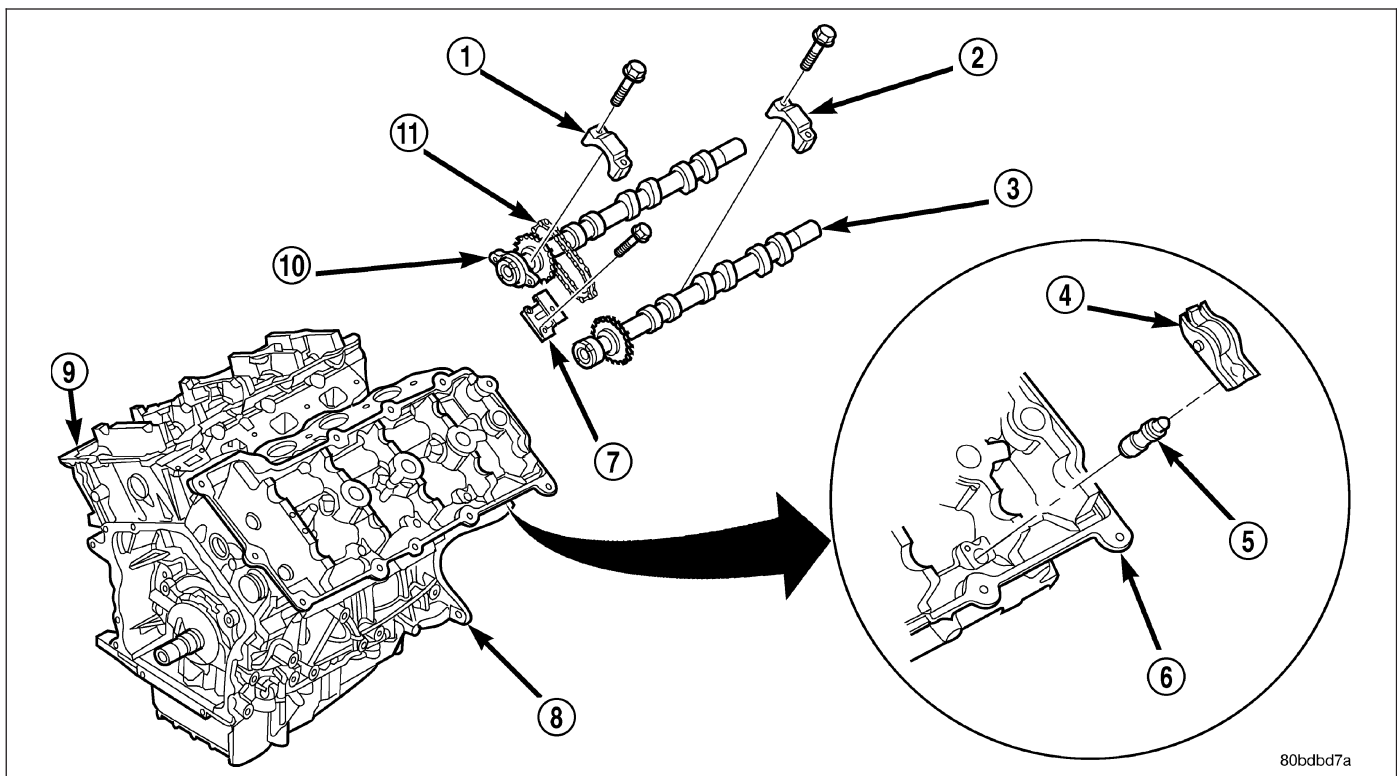


20. Connect negative battery (1) cable.
21. Start engine and check for leaks.



## CAMSHAFT(S)

### DESCRIPTION

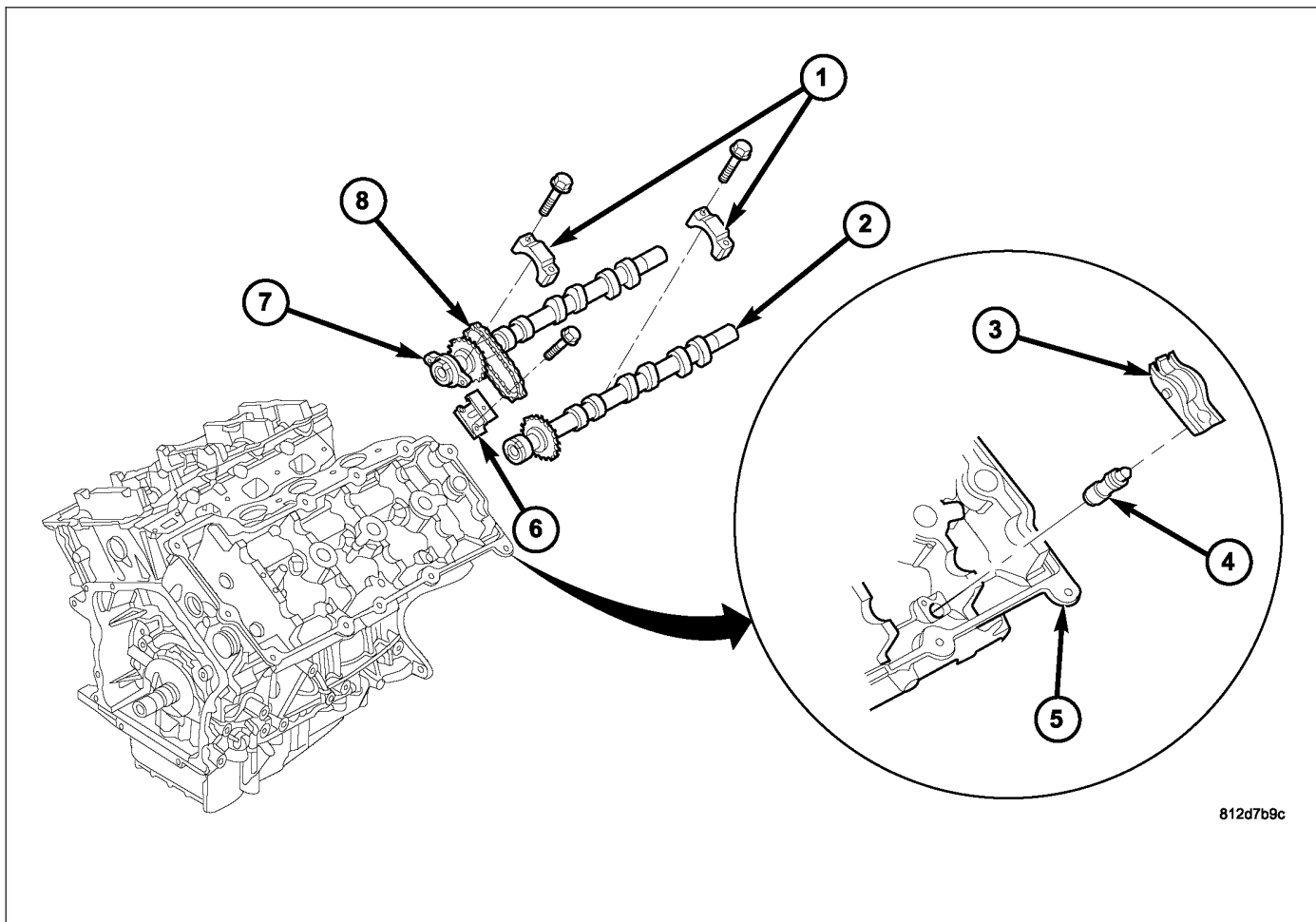


The assembled fabricated camshafts are composed of five bearing journals machined onto a hollow steel tube. The camshafts are secured in the cylinder head (6) by the camshaft bearing caps (1&2). Six steel lobes, a secondary timing drive sprocket, and a primary sprocket/thrust flange are pressed onto the camshaft tube using a unique assembly process. Camshaft end play is controlled by the primary camshaft sprocket attachment flange on the intake camshafts (7) and by a thrust flange on the exhaust camshafts (3). The intake camshafts are driven by the primary chain. The exhaust camshafts (3) are driven by the intake camshafts (10) through a secondary chain (11). The secondary chain tensioner (7) keeps tension on the secondary chain (11).

## OPERATION

The camshaft has precisely machined (egg shaped) lobes to provide accurate valve timing and duration. The camshaft is driven by the crankshaft via drive sprockets and chains.

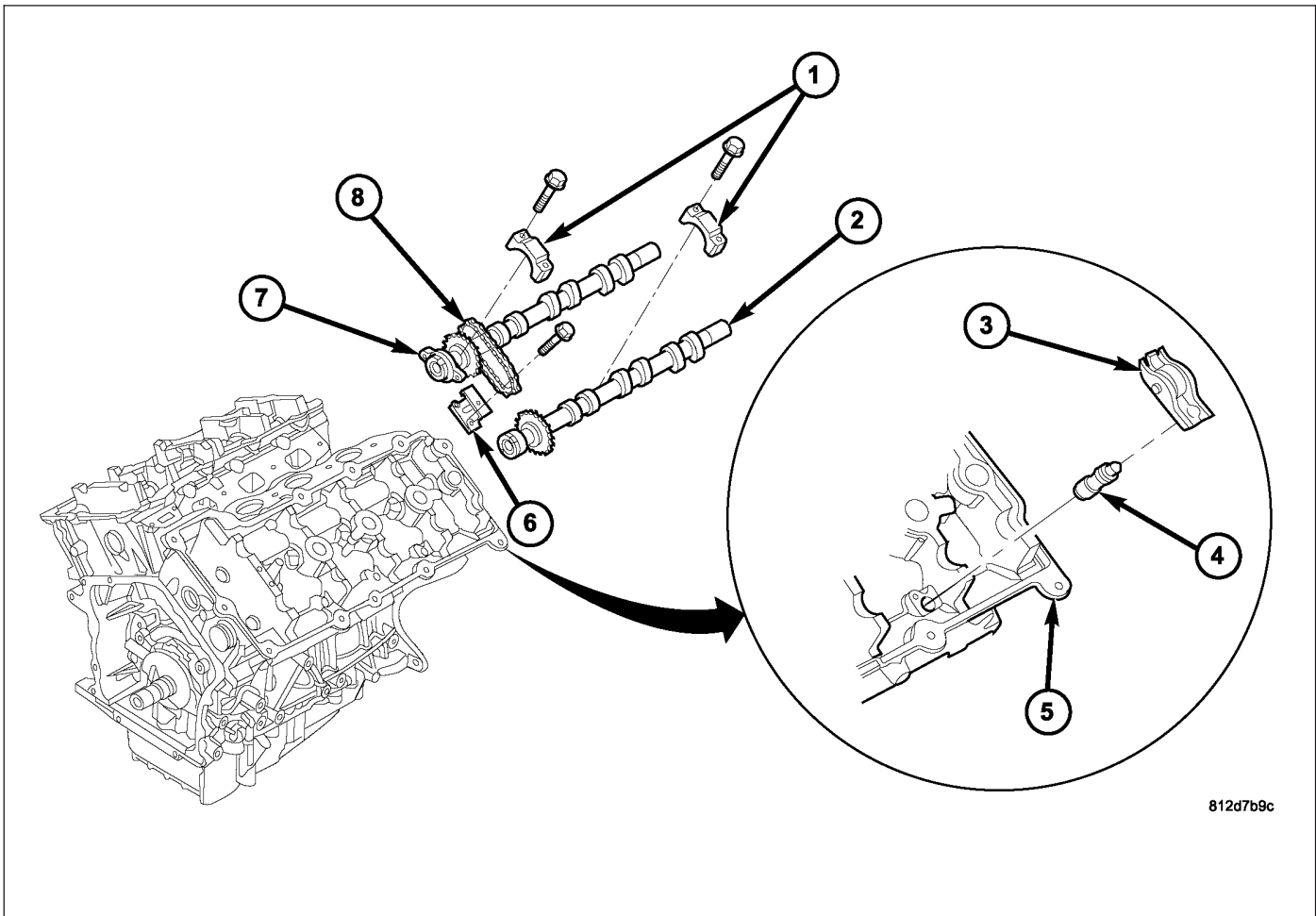
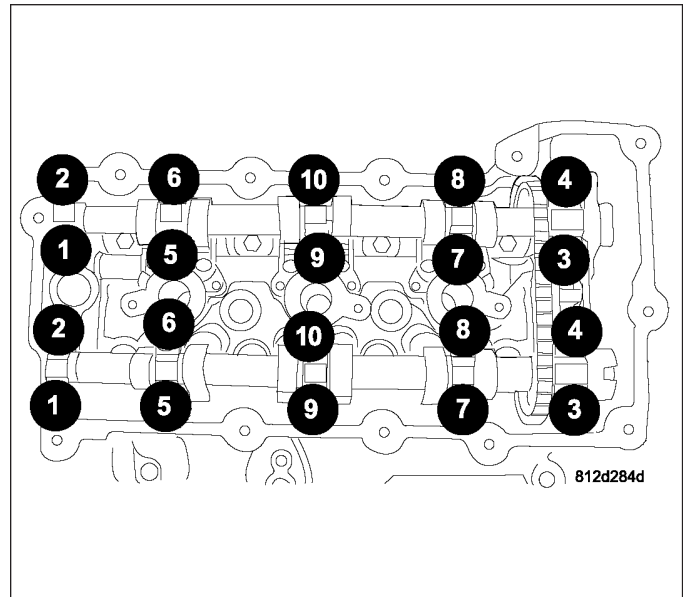
## REMOVAL



1. Remove the primary timing chain(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
2. Remove secondary chain tensioner (6) mounting bolts.

**Note:** Camshaft bearing caps have been marked during engine manufacturing. For example, number one exhaust camshaft bearing is marked "1E"

3. Slowly loosen camshaft bearing cap bolts in the order shown.

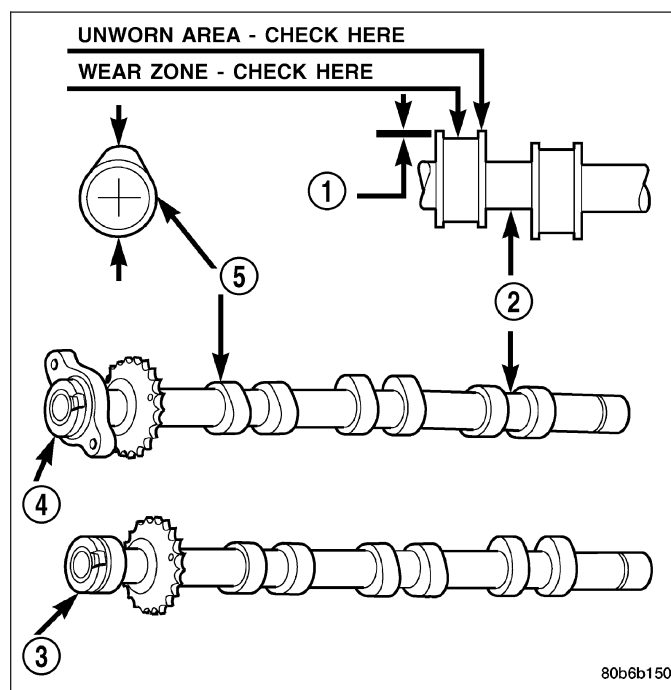


4. Remove camshaft bearing caps (1).
5. Remove intake camshaft (7), exhaust camshaft (2), secondary timing chain (8), and secondary timing chain tensioner (6) together as an assembly.
6. Remove secondary timing chain tensioner (6) and secondary timing chain (8) from camshafts (2&7).
7. Inspect camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSPECTION).



## INSPECTION

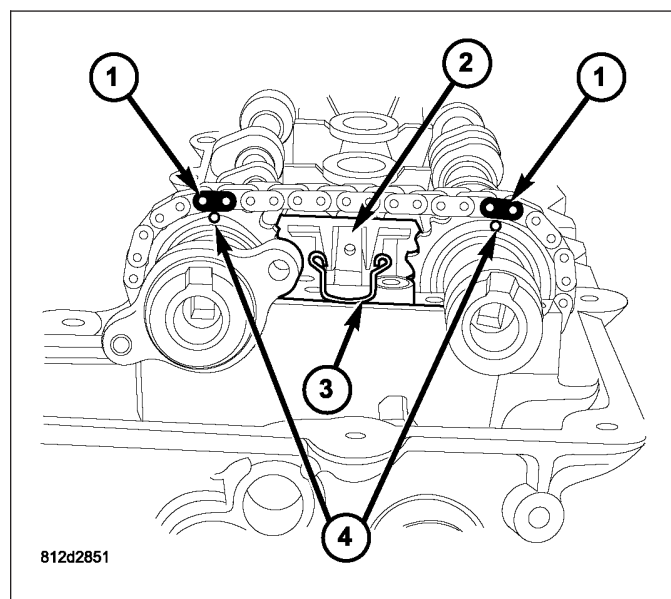
1. Inspect camshaft bearing journals (2) for damage and binding. If journals are binding, check the cylinder head for damage. Also check cylinder head oil holes for clogging.
2. Inspect camshaft sprockets for excessive wear. Replace camshafts if necessary.
3. Check the cam lobe (5) surfaces for abnormal wear and damage. Replace camshaft if defective. Measure the actual wear and replace, if out of limits—standard value is 0.0254 mm (0.001 in.); wear **limit** is 0.254 mm (0.010 in.).



## INSTALLATION

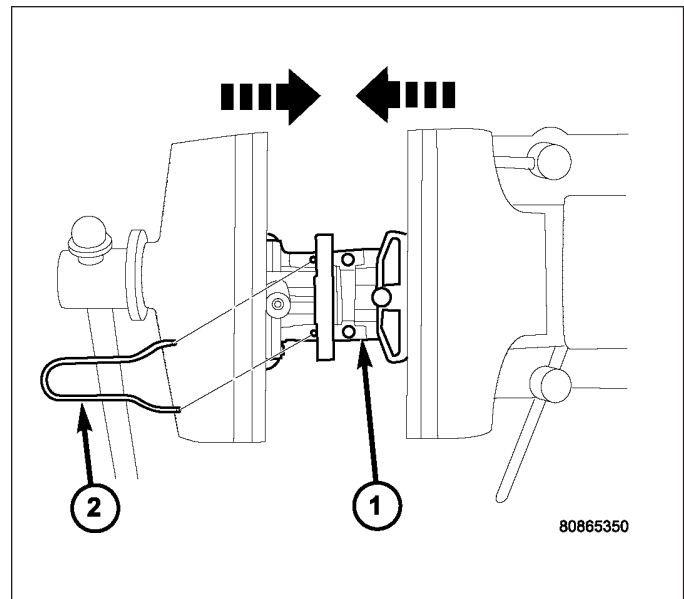
**CAUTION:** When the timing chain is removed and the cylinder heads are installed, **DO NOT** rotate the camshafts or crankshaft without first locating the proper crankshaft position. Failure to do so will result in valve and/or piston damage.

1. Assemble camshaft chain on the cams. Verify that plated links (1) are facing toward the front. Align the plated links (1) to the dots (4) on the camshaft sprockets.

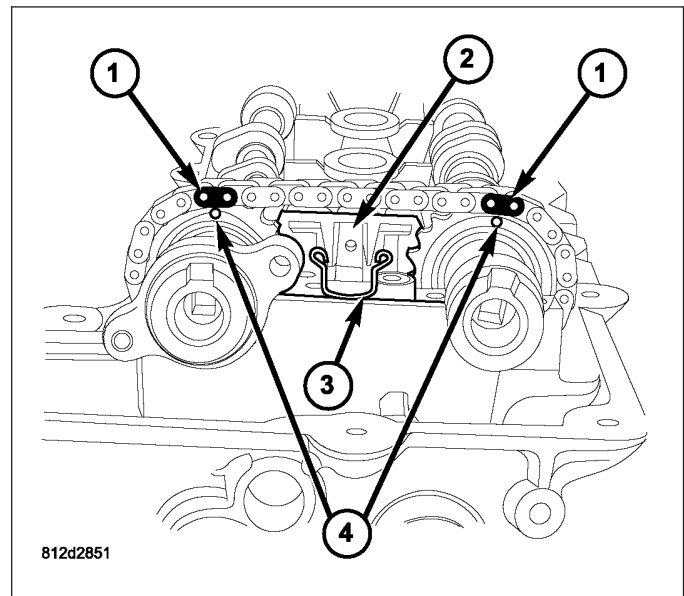




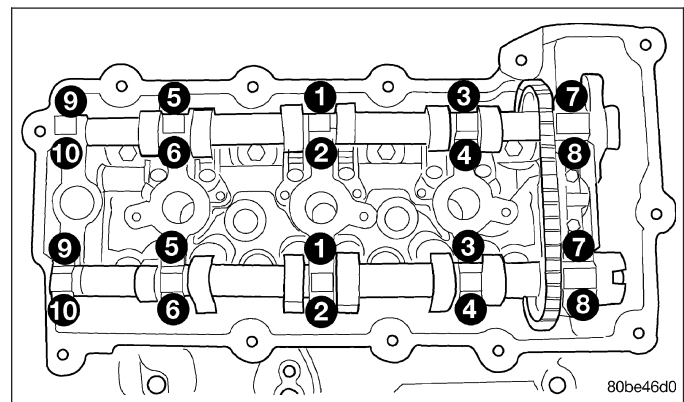
2. If camshaft chain tensioner is already in the compressed and locked position, proceed to step (4).
3. When the camshaft chain tensioner is removed, it is necessary to compress and lock the tensioner using the following procedures:
  - a. Place tensioner (1) into a soft jaw vise.
  - b. SLOWLY compress tensioner until fabricated lock pin (2) or the equivalent can be inserted into the locking holes.
  - c. Remove compressed and locked tensioner from the vise.



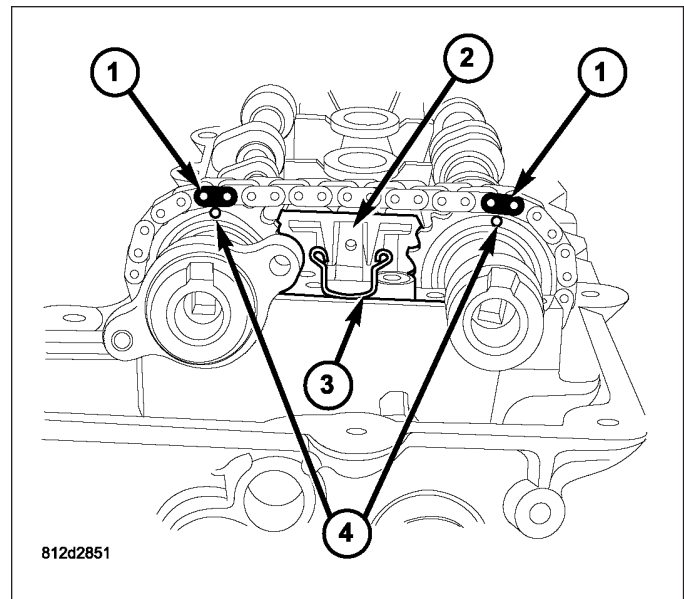
4. Insert the compressed and locked camshaft chain tensioner (2) in-between the camshafts and chain.
5. Rotate the cams so that the plated links (1) and dots (4) are facing the 12:00 O'clock position.
6. Install cams to cylinder head. Verify that rocker arms are correctly seated and in proper positions.



7. Install camshaft bearing caps. Verify that bearing caps are installed in same position as removed.
8. Tighten cam bearing cap bolts gradually in sequence shown in to 12 N·m (105 in. lbs.).



9. Install secondary chain tensioner (2) bolts and tighten to 12 N·m (105 in. lbs.).
10. Remove locking pin (3) from secondary tensioners (2).
11. Measure camshafts end play (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - STANDARD PROCEDURE).
12. Install the primary timing chain(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).

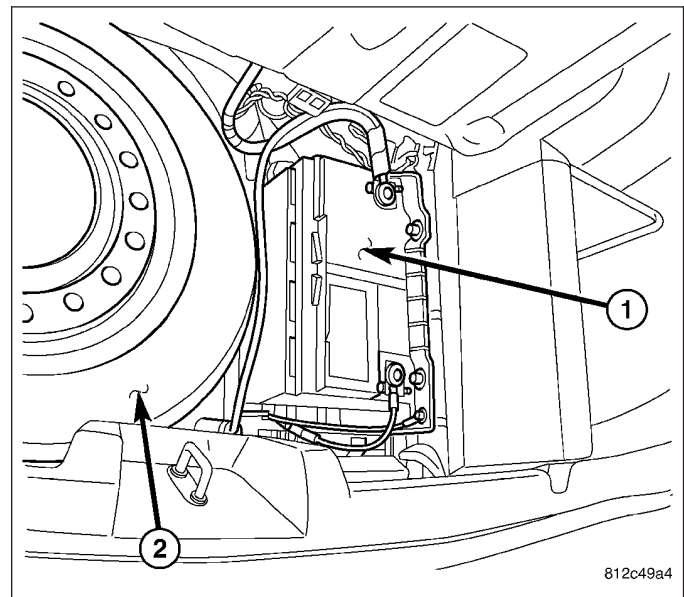


## COVER(S)-CYLINDER HEAD

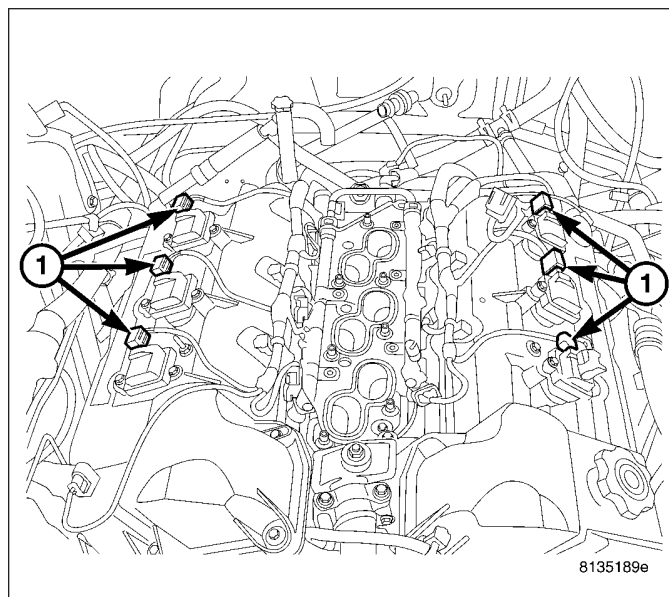
### REMOVAL

#### LEFT

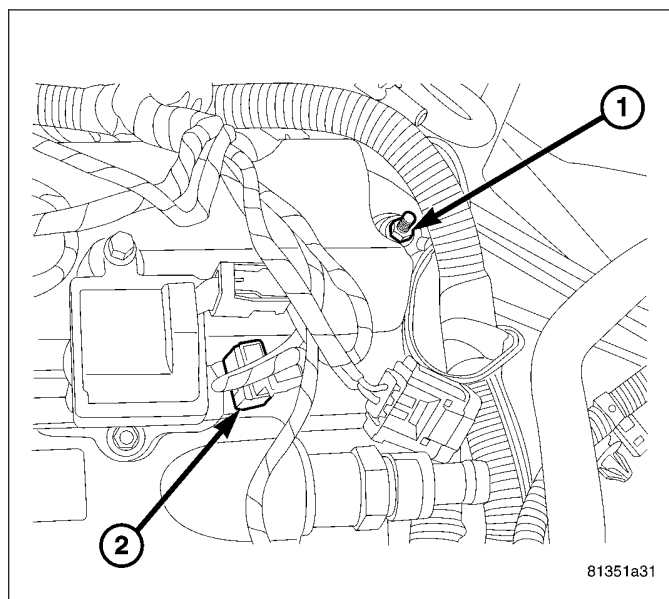
1. Disconnect negative battery (1) cable located in trunk.



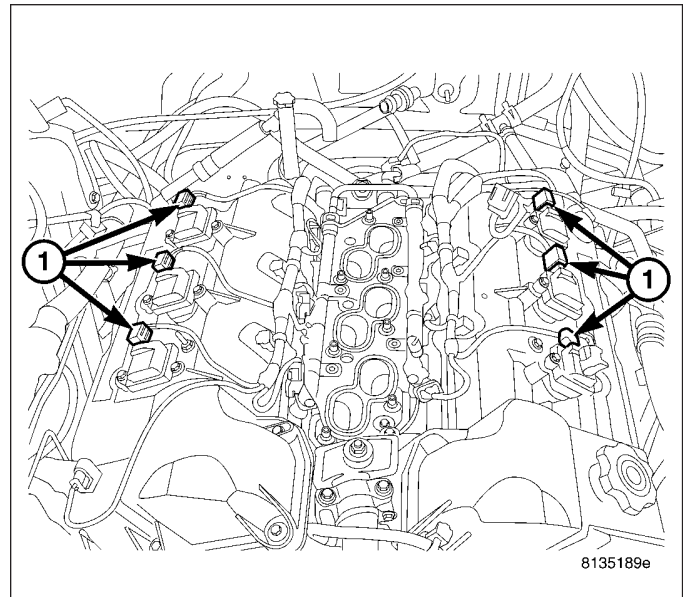
2. Remove upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
3. Disconnect electrical connectors from ignition coils (1) and



4. Remove ground strap from cylinder head cover stud (1) and disconnect capacitor connector (2). Reposition electrical harness.
5. Disconnect electrical harness retaining clips from cylinder head cover studs. Reposition electrical harness.



6. Remove make up air hose.
7. Remove fastener attaching ignition coil capacitor.
8. Remove ignition coils (1).

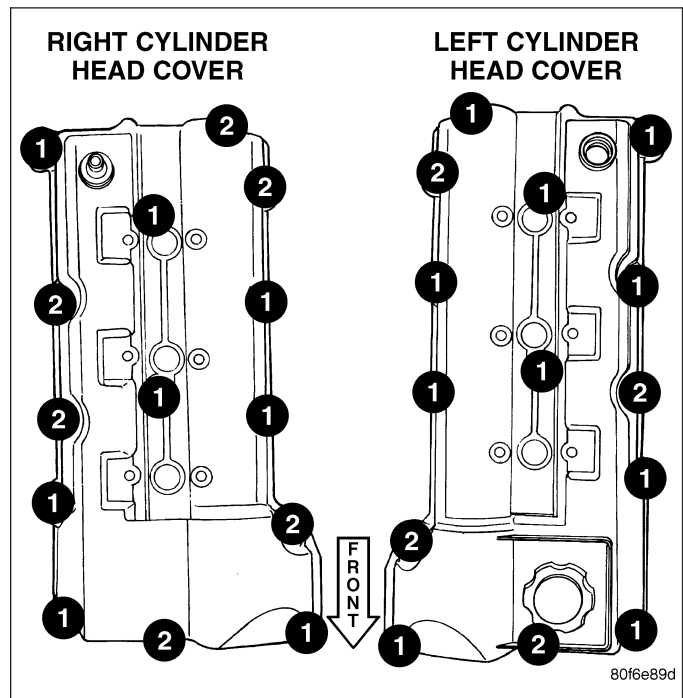


9. Loosen all cylinder head cover fasteners (1&2).

**Note:** Cylinder head cover attaching bolts are captured to the cover.

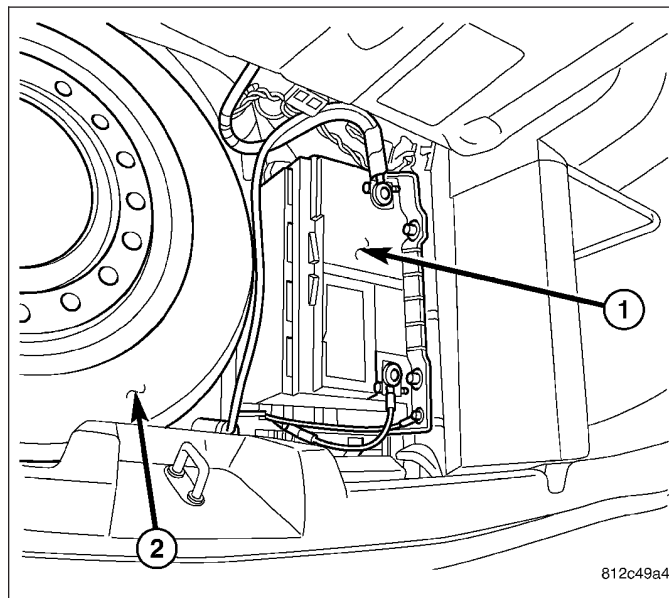
**CAUTION:** Make certain the double ended studs (1) in the center of the cylinder head cover are loose before attempting to remove cover.

10. Remove cylinder head cover.

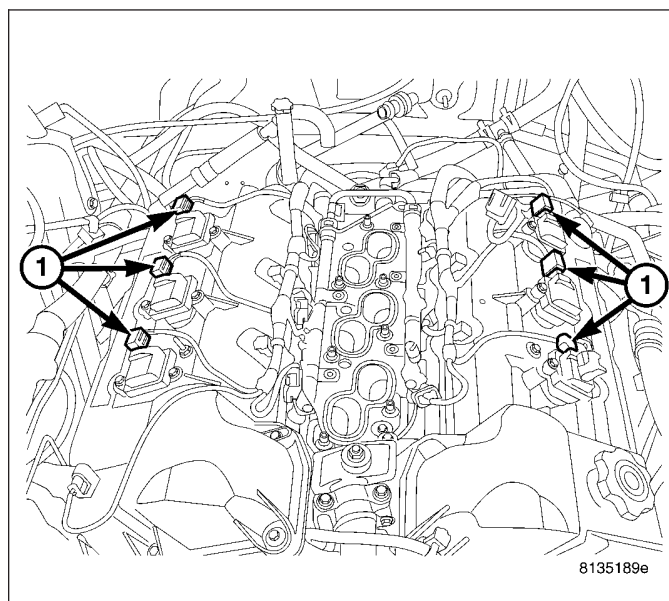


**RIGHT**

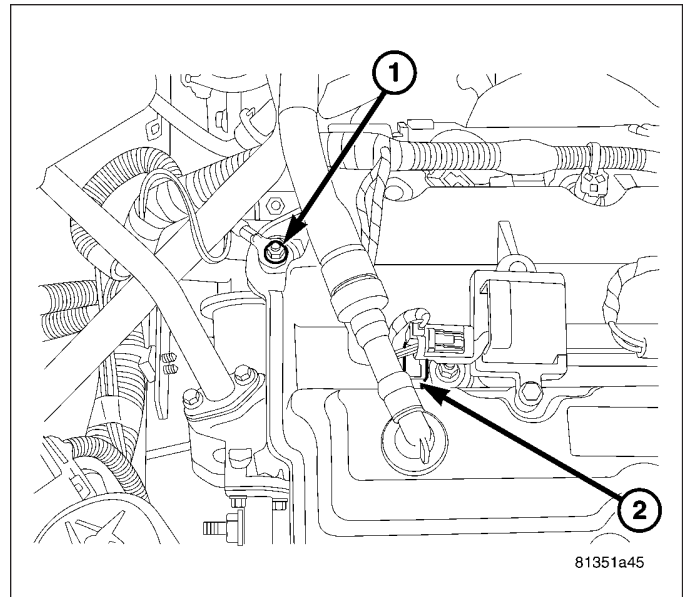
1. Disconnect negative battery (1) cable.



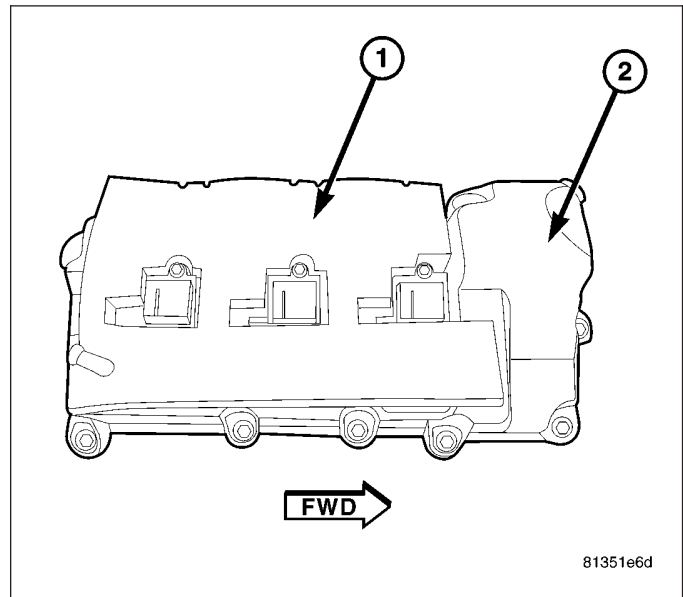
2. Remove upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
3. Disconnect electrical connectors from ignition coils (1) and



4. Disconnect capacitor electrical connector (2).
5. Remove PCV hose from cylinder head cover grommet.
6. Remove ground strap from cylinder head cover stud (1).
7. Disconnect electrical harness retaining clips from cylinder head cover studs. Reposition electrical harness.
8. Remove fastener attaching ignition coil capacitor.
9. Remove ignition coils.



10. Remove foam insulator (1).

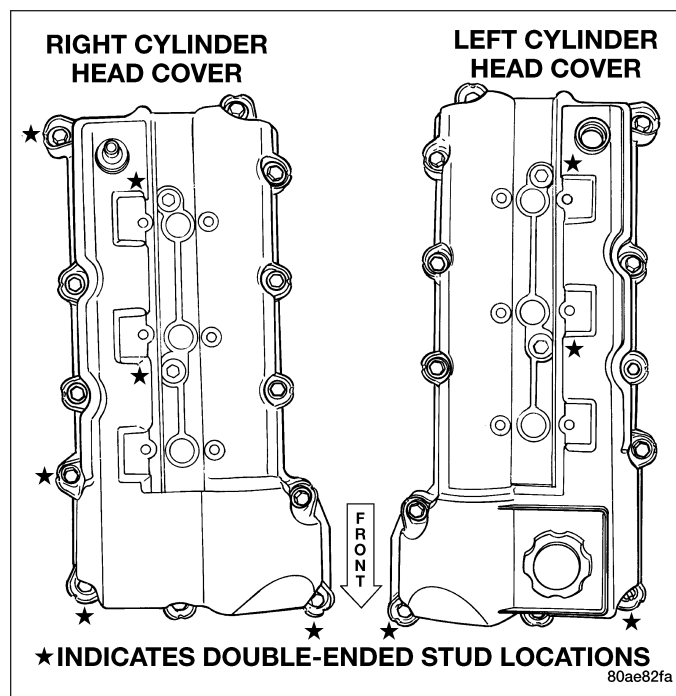


11. Loosen all cylinder head cover fasteners.

**Note:** Cylinder head cover attaching bolts are captured to the cover.

**CAUTION:** Make certain the double ended studs in the center of the cylinder head cover are loose before attempting to remove cover.

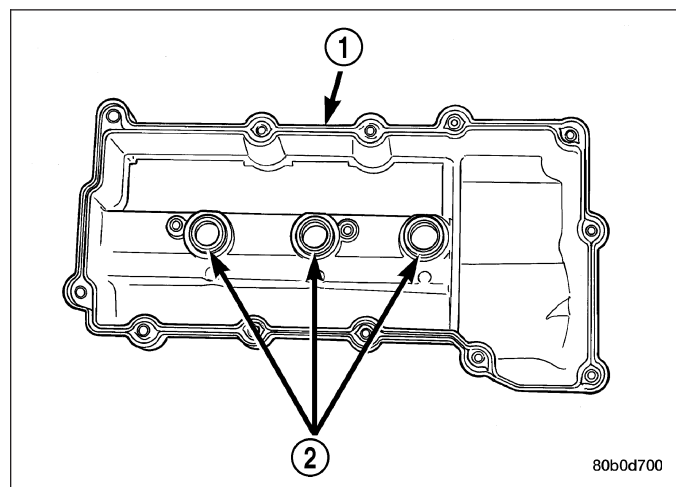
12. Remove cylinder head cover.



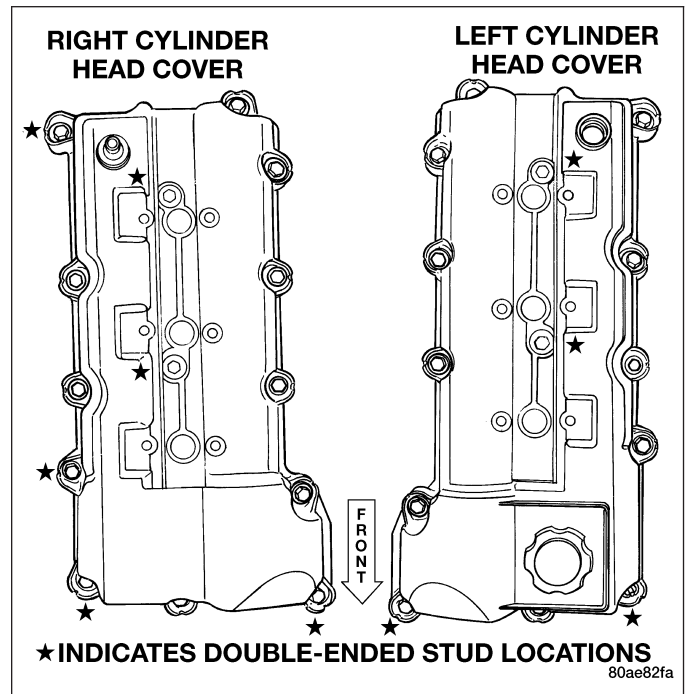
## INSTALLATION

### LEFT

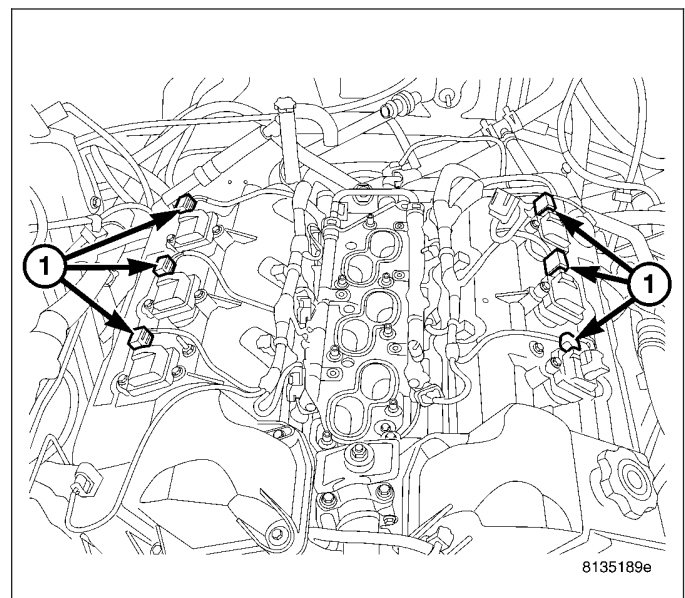
1. Clean cylinder head cover and both sealing surfaces. Inspect and replace gaskets (1&2) as necessary.



2. Install cylinder head cover and hand start all fasteners. Verify that all double-ended studs are in the correct locations.
3. Tighten cylinder head cover attaching bolts and double-ended studs to 12 N·m (105 in. lbs.).

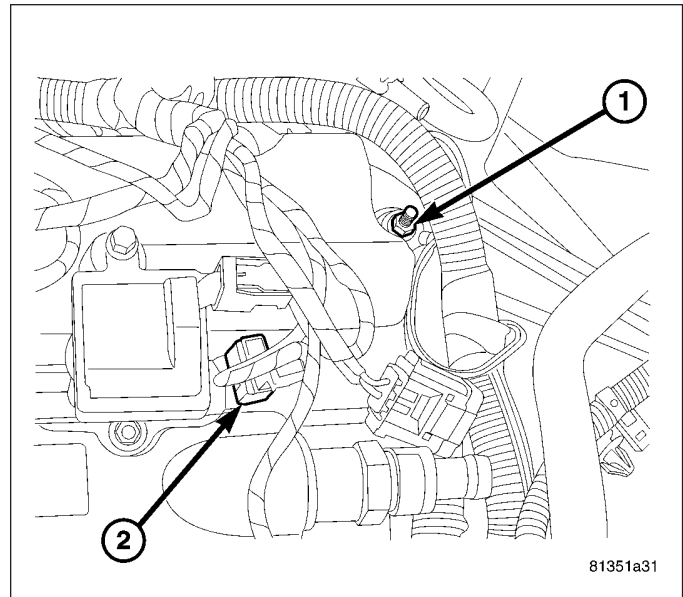


4. Install ignition coils (1).

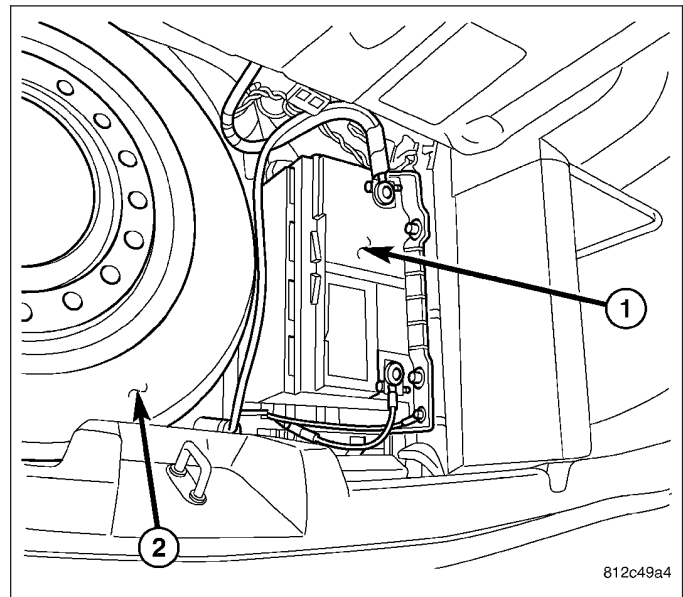




5. Install ignition coil capacitor (2) and fastener.
6. Install ground strap (1) to cylinder head cover stud.
7. Connect all electrical connectors and harness clips.
8. Connect make up air hose.
9. Install upper intake manifold (Refer to 9 - ENGINE/  
MANIFOLDS/INTAKE MANIFOLD -  
INSTALLATION).

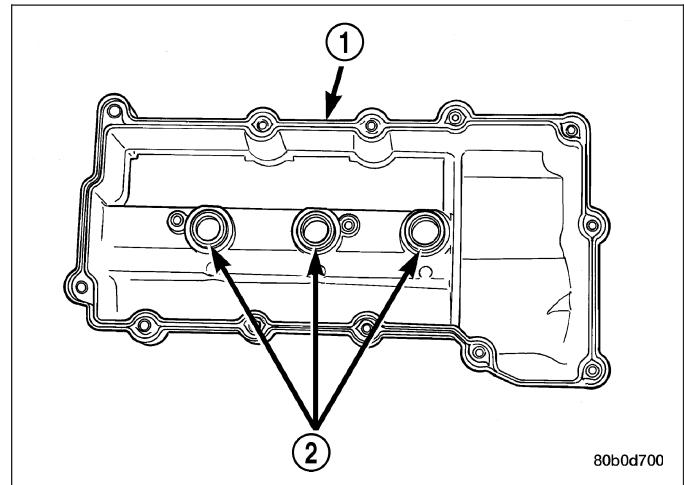


10. Connect negative battery (1) cable.

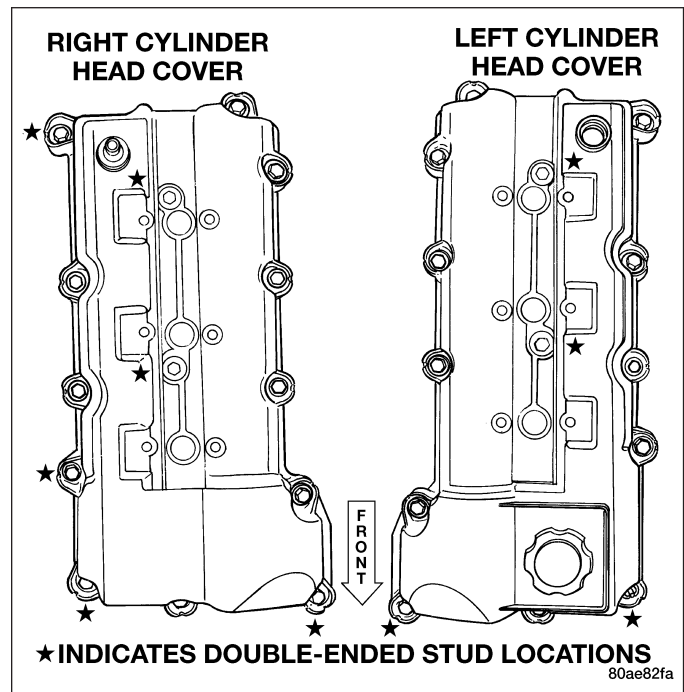


**RIGHT**

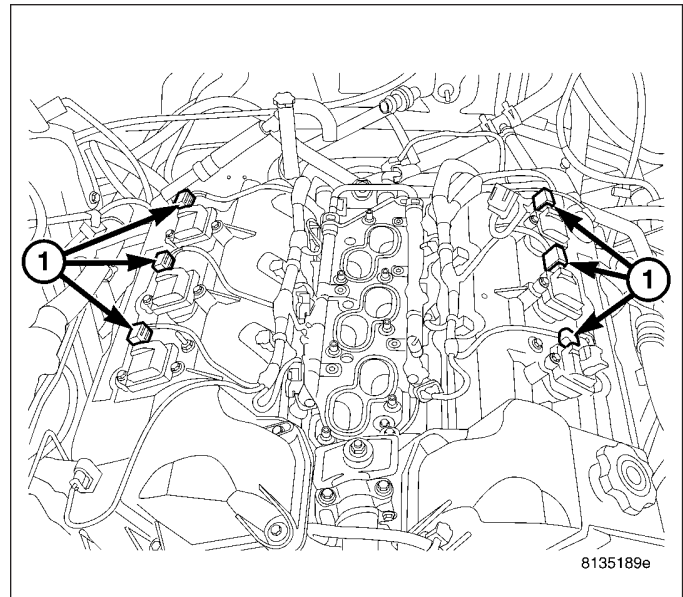
1. Clean cylinder head cover and both sealing surfaces. Inspect and replace gaskets (1 & 2) as necessary.



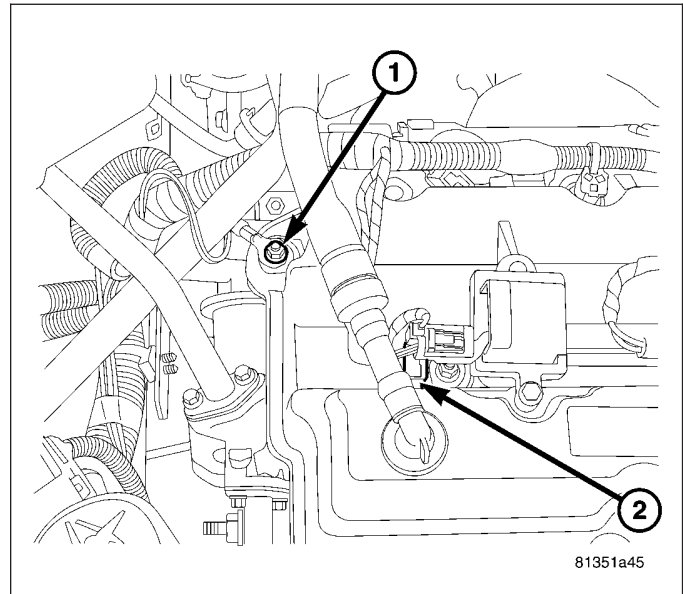
2. Install cylinder head cover and hand start all fasteners. Verify that all double-ended studs are in the correct locations.
3. Tighten cylinder head cover attaching bolts and double-ended studs to 12 N·m (105 in. lbs.).



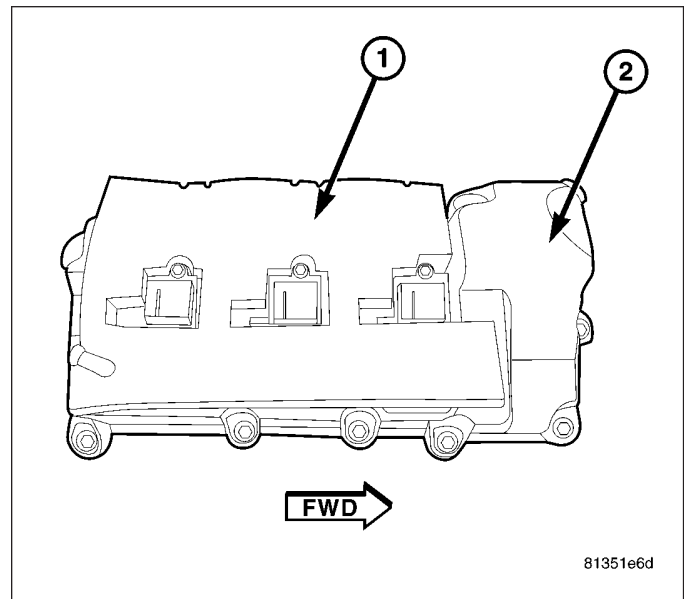
4. Install ignition coils (1).



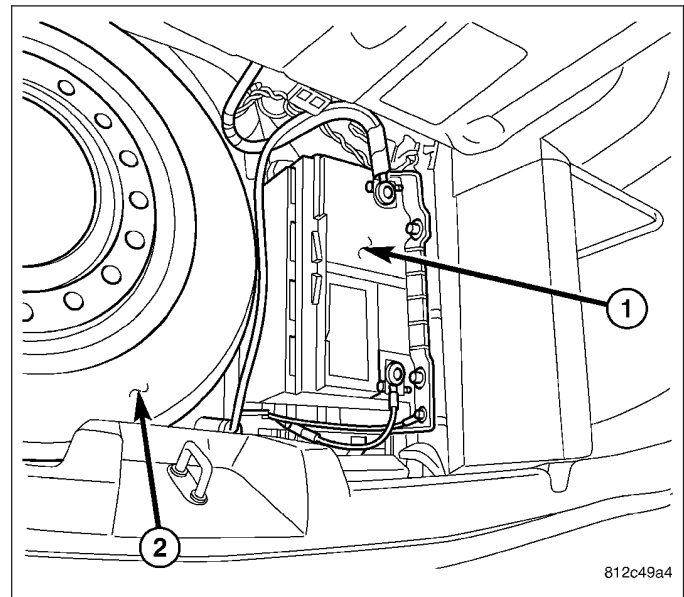
5. Install ignition coil capacitor (2) and fastener.
6. Connect ground strap (1) to cylinder head cover stud.
7. Connect PCV hose to cylinder head cover grommet.
8. Connect all electrical connectors and harness clips.



9. Install foam insulator (1) on top of cylinder head cover (2).
10. Install upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).

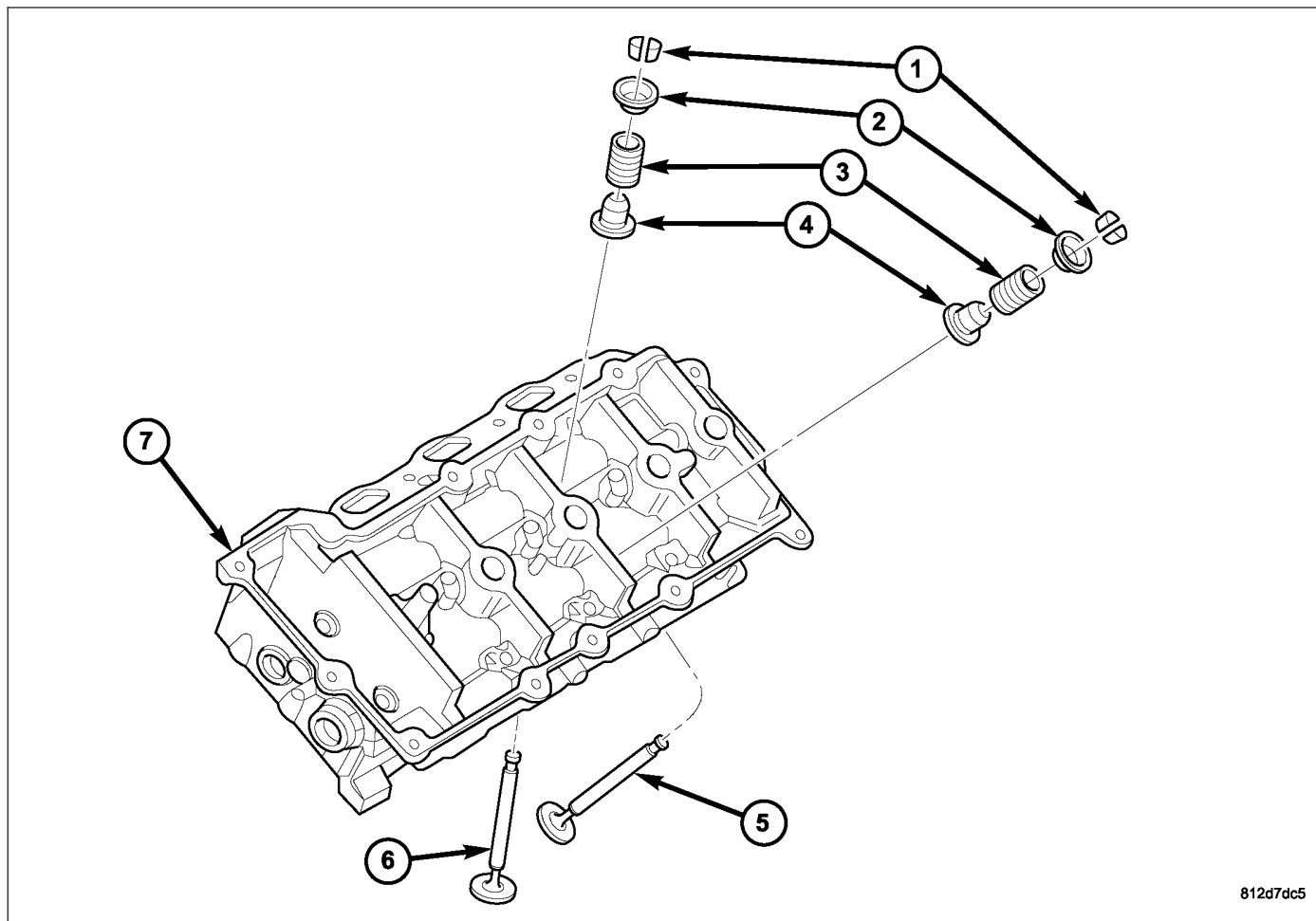


11. Connect negative battery (1) cable.



## VALVES & SEATS-INTAKE/EXHAUST

### DESCRIPTION

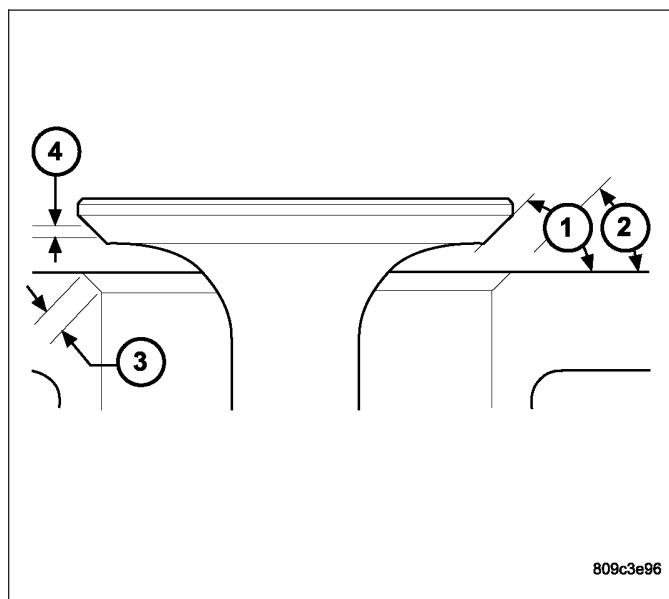


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The valves (5&6) are made of heat resistant steel, and have chrome plated stems to prevent scuffing. The four valves per cylinder (two intake (6) and two exhaust (5)) are actuated by roller rocker arms, which pivot on stationary lash adjusters. All valves use three bead lock keepers (1) to retain springs (3) and to promote valve rotation.

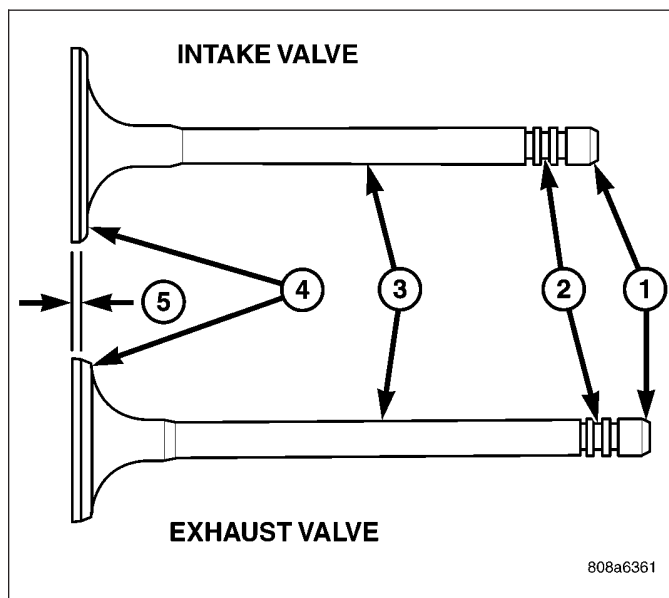
## STANDARD PROCEDURE - VALVE AND VALVE SEAT REFACING

The intake and exhaust valves have a 44.5 to 45 degree face angle (1). The valve seats (2) have a 45 to 45.5 degree face angle.



## VALVES

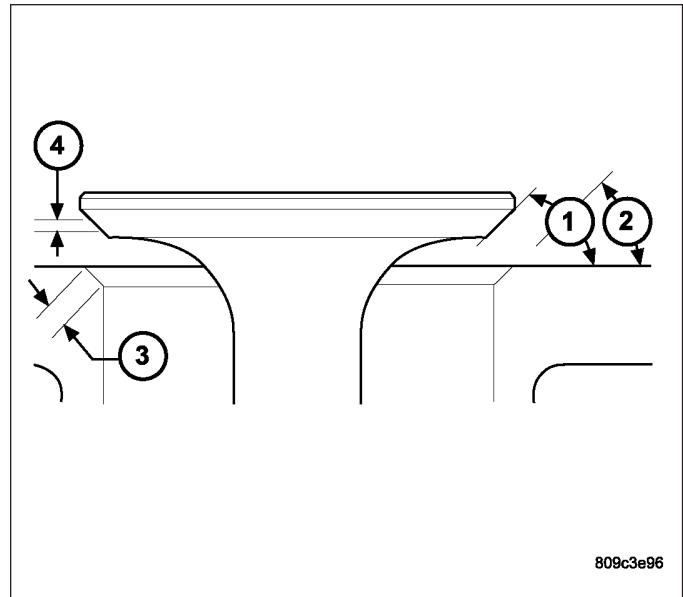
Inspect the remaining margin (5) after the valves are refaced(Refer to 9 - ENGINE - SPECIFICATIONS).



## VALVE SEATS

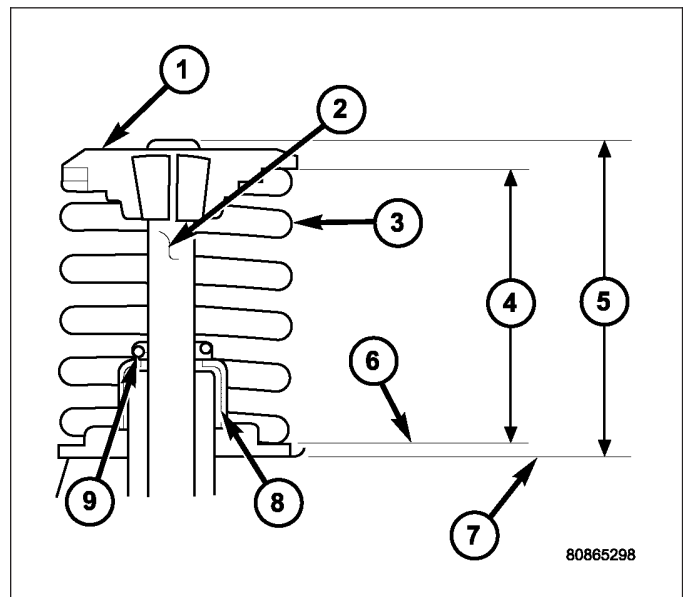
**Note:** When refacing valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.

1. Measure the concentricity of valve seat using dial indicator. Total runout should not exceed 0.051 mm (0.002 inch.) total indicator reading.
2. Inspect the valve seat (3) with Prussian blue to determine where the valve contacts the seat. To do this, coat valve seat (3) **LIGHTLY** with Prussian blue then set valve in place. Rotate the valve with light pressure. If the blue is transferred to the center of valve face (4), contact is satisfactory. If the blue is transferred to top edge of valve face, then lower valve seat with a 15 degree stone. If the blue is transferred to the bottom edge of valve face, then raise valve seat with a 65 degree stone.



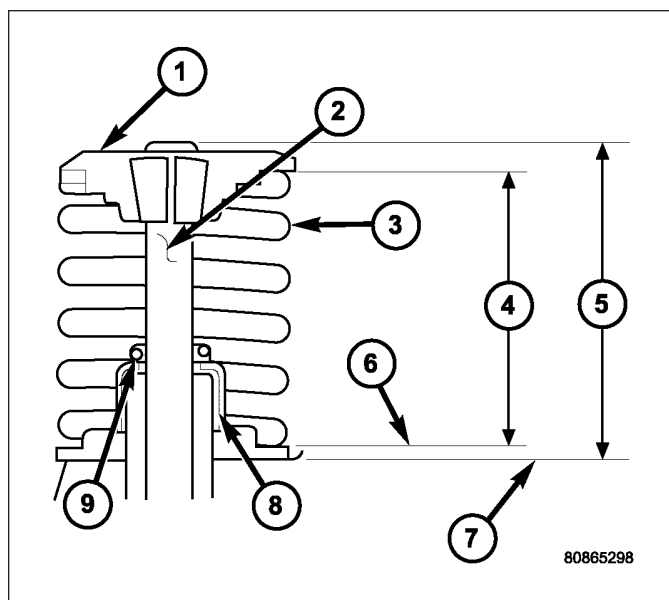
**Note:** Valve seats which are worn or burned can be reworked, provided that correct angle and seat width are maintained. Otherwise cylinder head must be replaced.

3. When seat is properly positioned the width of the intake 1.00 to 1.50 mm (0.0394 to 0.0591 in.) and exhaust seats should be 1.25 to 1.75 mm (0.049 to 0.069 in.).
4. Check the valve spring installed height (4) after refacing the valve and seat.

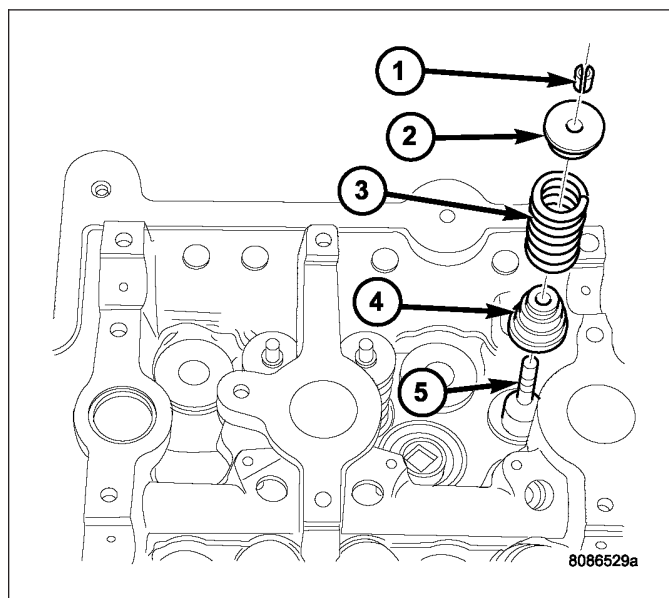


## VALVE AND SPRING INSTALLED HEIGHT

1. Coat valve stems (2) with clean engine oil and insert them in cylinder head.
2. If valves or seats have been refaced, check valve tip height (5). If valve tip height (5) for intake valve is greater than 47.836 mm (1.883 in.) or 47.837 mm (1.883 in.) for exhaust valve, grind valve tip until within specifications. Make sure measurement is taken from cylinder head surface to the top of valve stem.
3. Install valve seal/spring seat assembly (8) over valve guides on all valve stems. Ensure that the garter spring (9) is intact around the top of the rubber seal.

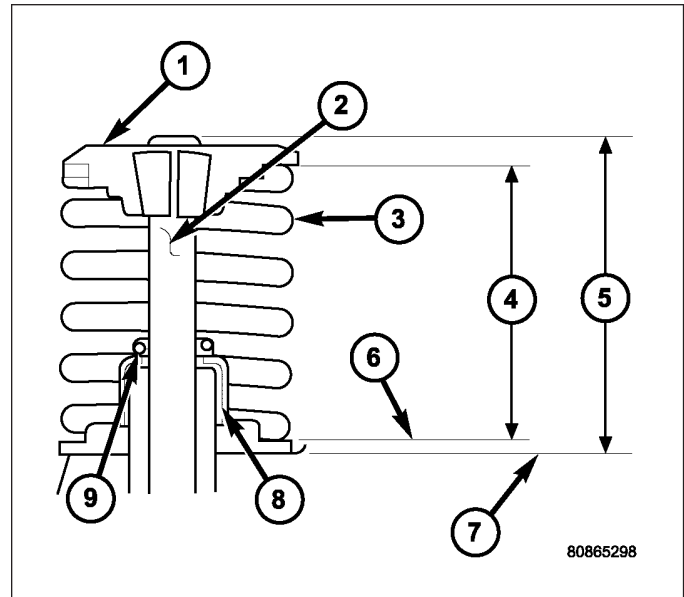


4. Position valve springs (3) and retainer (2) on spring seat (4).
5. Compress valve spring with a valve spring compressor.
6. Install retainer locks (1) and release tool.



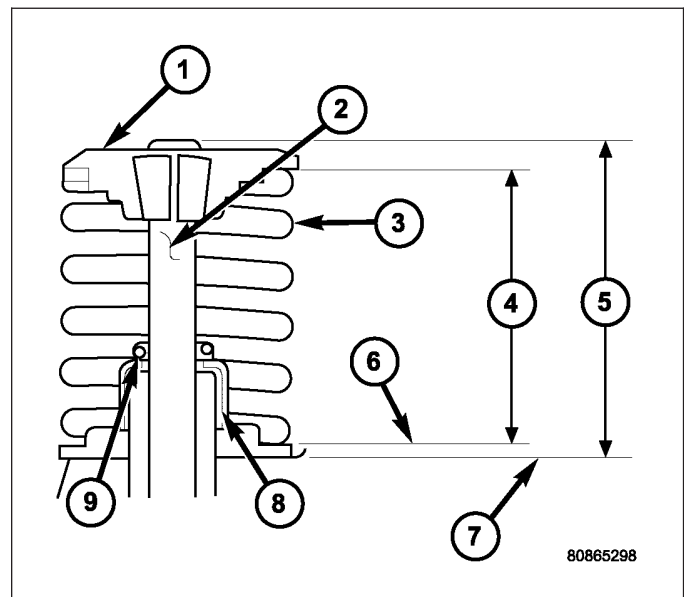


7. If valves and/or seats are refaced, measure the installed height of springs (4). Measurement is taken from top of spring seat to the bottom surface of spring retainer. If height is greater than 38.75 mm (1.5256 in.), install a 0.762 mm (0.030 in.) spacer in head counterbore under the valve spring seat to bring spring height back within specification.

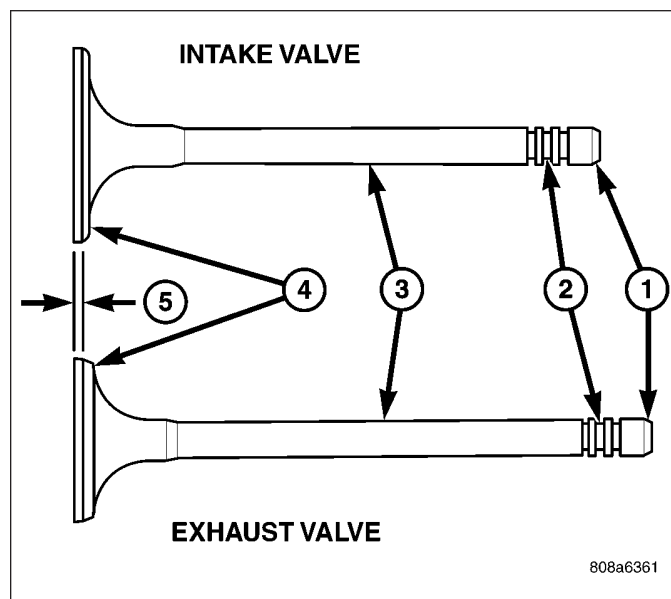


## REMOVAL

1. Remove cylinder head(s)(Refer to 9 - ENGINE/ CYLINDER HEAD - REMOVAL).
2. Remove valve spring (3)(Refer to 9 - ENGINE/ CYLINDER HEAD/VALVE SPRINGS - REMOVAL).



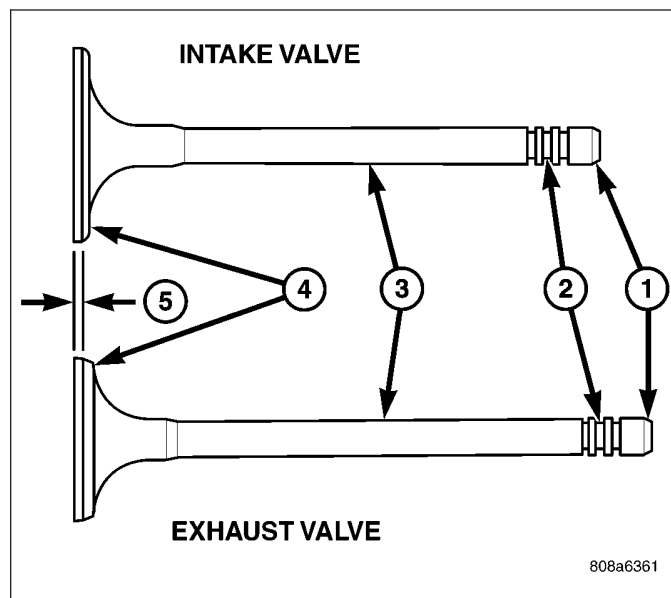
3. Before removing valves (3), **remove any burrs from valve stem retainer lock grooves (2) and stem tip (1) to prevent damage to the valve guides.**
4. Remove valve. Identify each valve to ensure installation in original location.



## INSPECTION

### VALVES

1. Clean and inspect valves thoroughly. Replace burned, warped and cracked valves.
2. Inspect retainer lock grooves for wear or damage (2).
3. Inspect valve face (4) for wear and pitting.
4. Measure valve stems (3) and margins (5) for wear. For valve specifications, (Refer to 9 - ENGINE - SPECIFICATIONS).

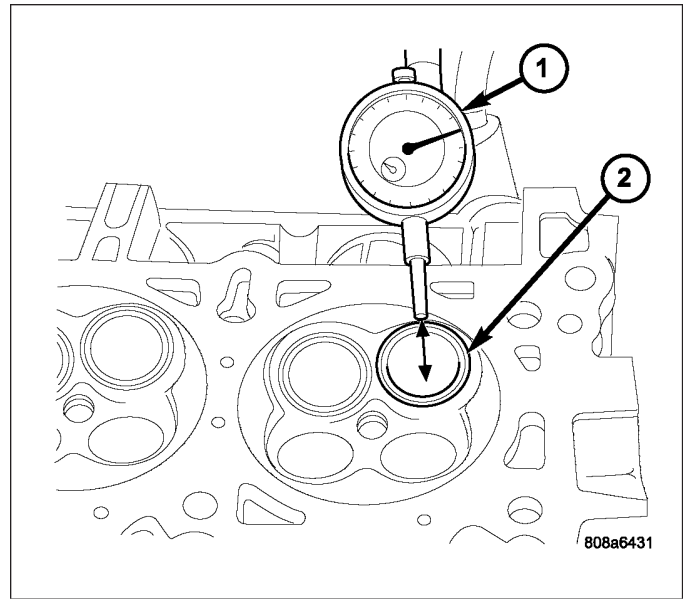


**Note:** Valve stems (3) are chrome plated and should not be polished.

## VALVE GUIDES

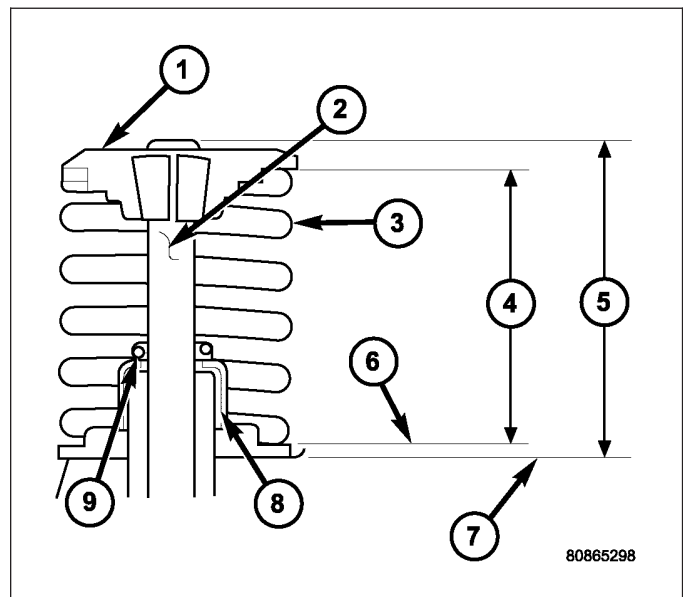
1. Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.
2. Measure valve stem-to-guide clearance as follows:
3. Install valve (2) into cylinder head so it is 15 mm (0.590 inch.) off the valve seat. A small piece of hose may be used to hold valve in place.
4. Attach dial indicator Tool C-3339 (1) to cylinder head and set it at right angle of valve stem being measured.
5. Move valve to and from the indicator. For clearance specifications, (Refer to 9 - ENGINE - SPECIFICATIONS).

**Note:** If stem-to-guide clearance exceeds specifications, you must measure valve stem. If valve stem is within specifications or if guide is loose in cylinder head, replace cylinder head.



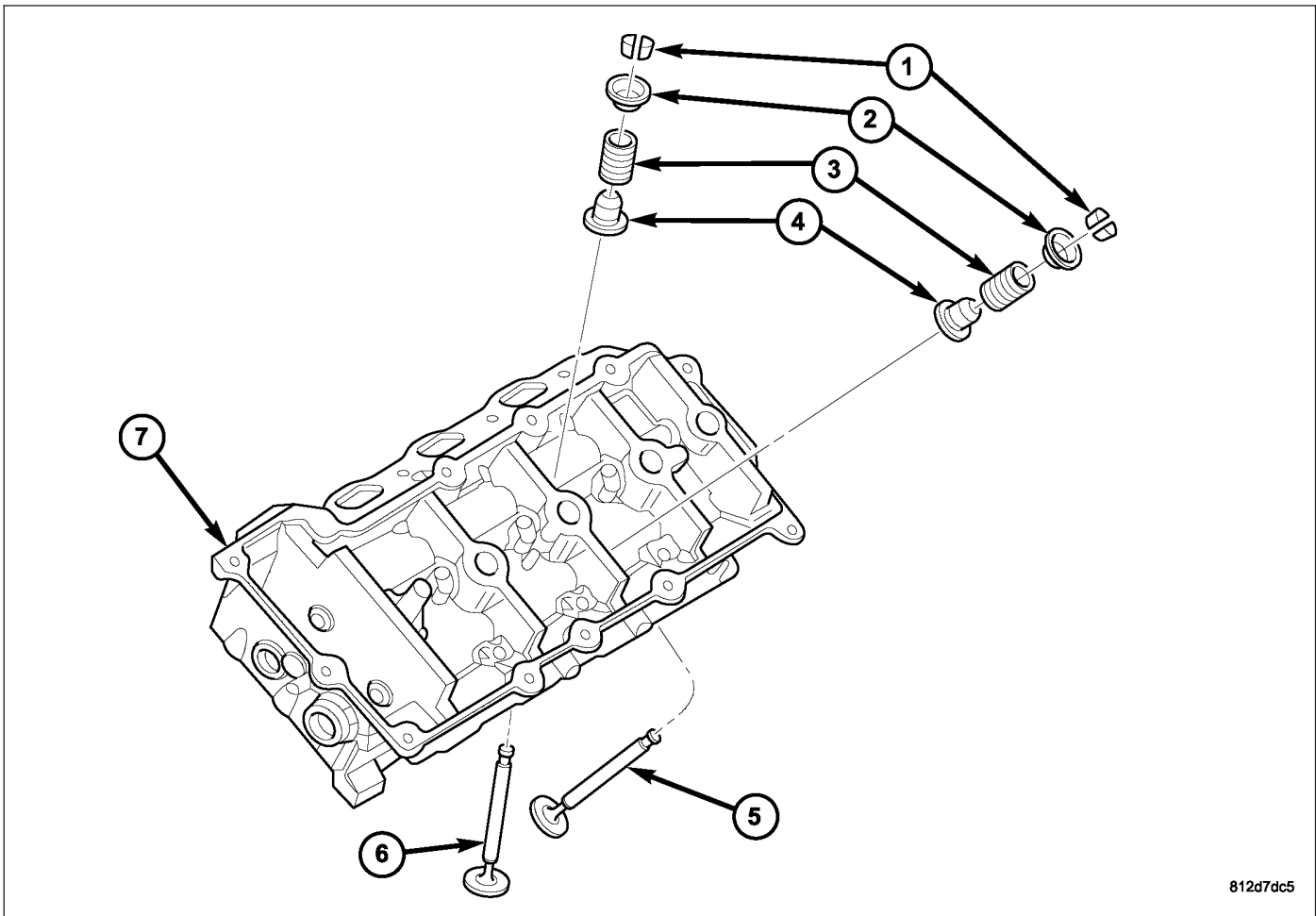
## INSTALLATION

1. Coat valve stems (2) with clean engine oil and insert them in cylinder head.
2. If valves or seats have been reground, check valve tip height (5). If valve tip height (5) for intake valve is greater than 47.836 mm (1.883 in.) or 47.837 mm (1.883 in.) for exhaust valve, grind valve tip until within specifications. Make sure measurement is taken from cylinder head surface (7) to the top of valve stem (2).
3. Install valve stem seals (8) (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE STEM SEALS - INSTALLATION).
4. After installing valve stem seals, make sure the garter spring (9) is in place.
5. Install valve spring (3) (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE SPRINGS - INSTALLATION).



## SPRINGS-VALVE

### DESCRIPTION



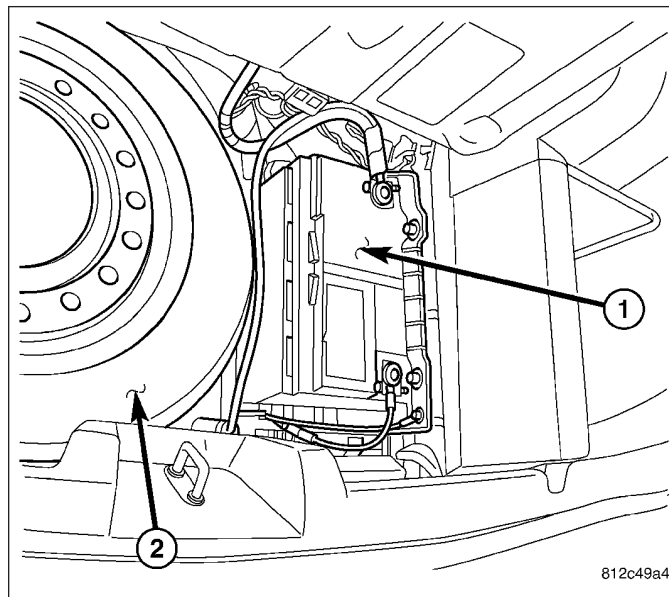
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The valve springs (3) are made from high strength, chrome-silicon steel. The springs are common for intake and exhaust applications. The valve spring seat is integral with the valve stem seal (4), which incorporates a garter spring to maintain consistent lubrication control to the valve stem.

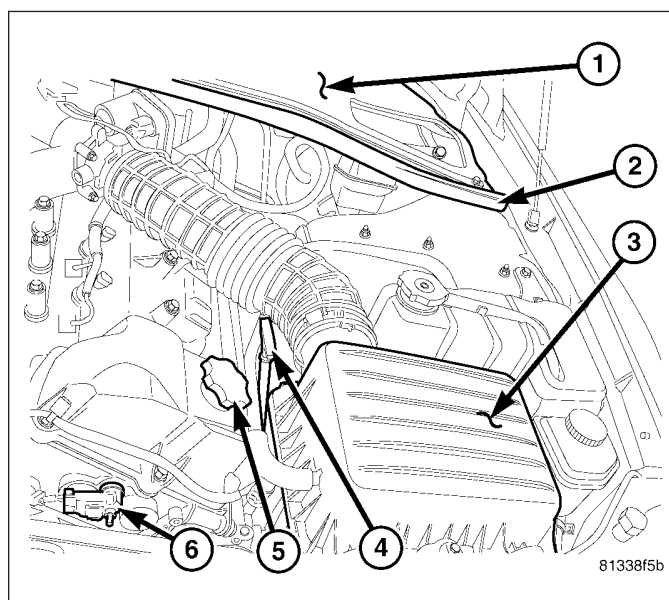
## REMOVAL

### IN VEHICLE

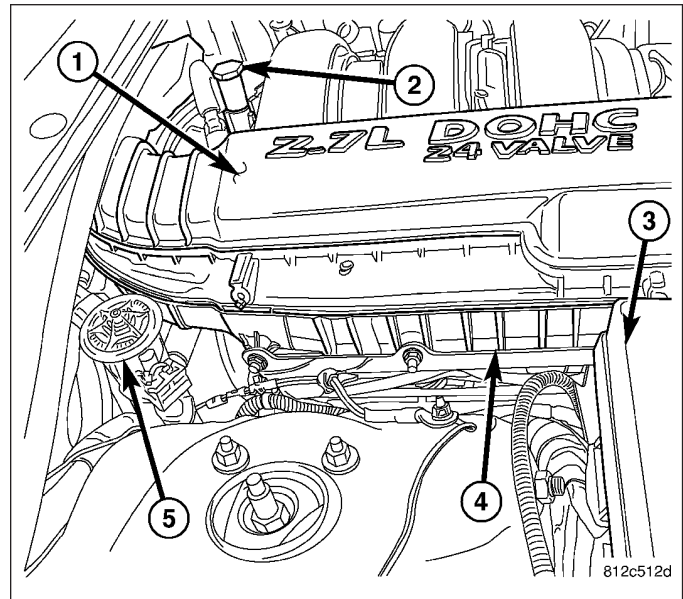
1. Release fuel pressure **before attempting any repairs** (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
2. Disconnect negative battery (1) cable located in trunk.



3. Remove air cleaner housing (3) and inlet hose (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).



4. Remove upper intake manifold (1)(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
5. Remove cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
6. Remove crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
7. Remove timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
8. Remove timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
9. Remove camshafts and rocker arms(Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - REMOVAL).



10. With air hose attached to spark plug adapter installed in the cylinder being serviced, apply 620.5–689 kPa (90–100 psi) air pressure. This is to hold valves in place while servicing components.
11. Using Special Tool MD 998772A with adapter 6779, compress valve spring and remove valve locks, retainer, and valve spring.
12. Remove valve stem seal (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE STEM SEALS - REMOVAL).

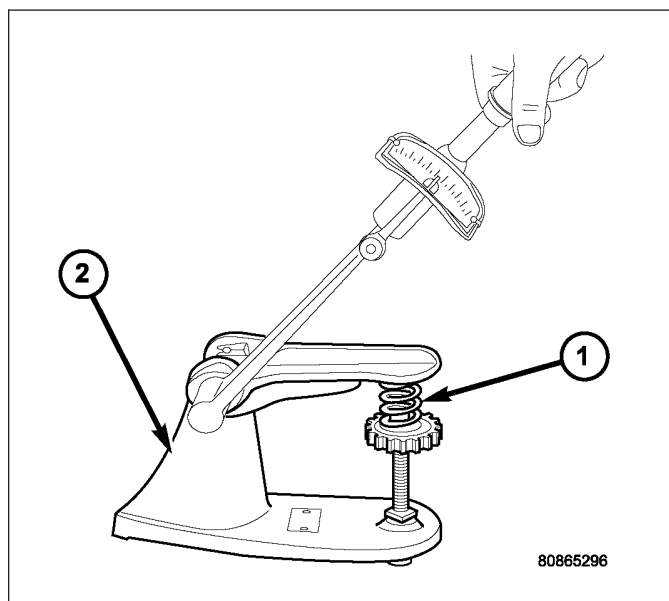
## OFF VEHICLE



1. With cylinder head removed, compress valve springs (3) using a Special Tool C-3422-D, Valve Spring Compressor.
2. Remove valve retaining locks (1), valve spring retainers (2), valve springs (3).

## INSPECTION

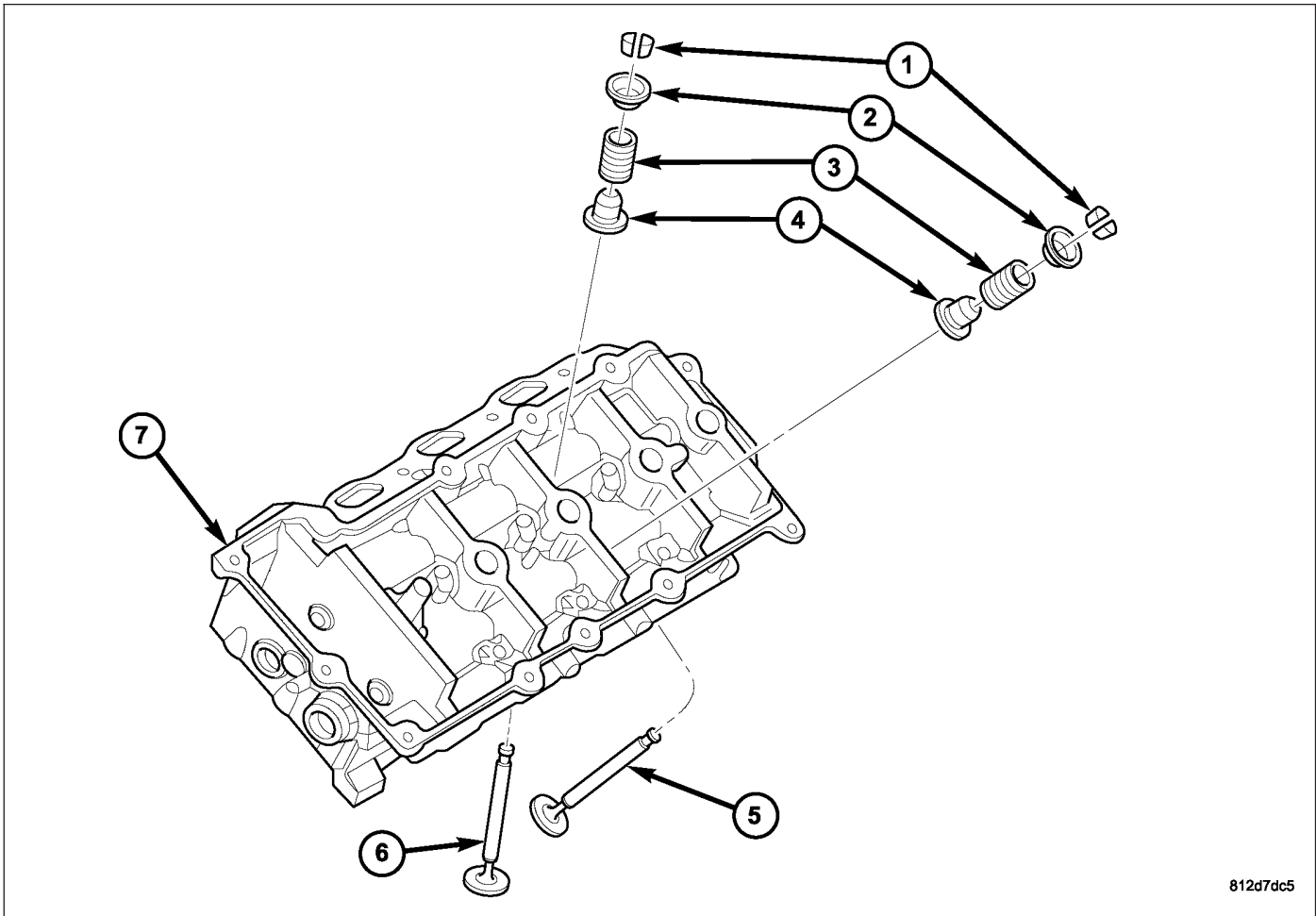
Whenever valves have been removed for inspection, reconditioning or replacement, valve springs (1) should be tested . **As an example;** the compression length of a spring to be tested is 38.00 mm (1.496 in.). Turn the table of Tool C-647 (2) until surface is in line with the 38.00 mm (1.496 in.) mark on the threaded stud and the zero mark on the front. Place spring (1) over stud on the table and lift compressing lever to set tone device. Pull on torque wrench until ping is heard. Take reading on torque wrench at this instant. Multiply this reading by two. This will give the spring load at test length. Fractional measurements are indicated on the table for finer adjustments. Refer to Engine Specifications to obtain specified height and allowable tensions (Refer to 9 - ENGINE - SPECIFICATIONS). Replace any springs that do not meet specifications.





## INSTALLATION

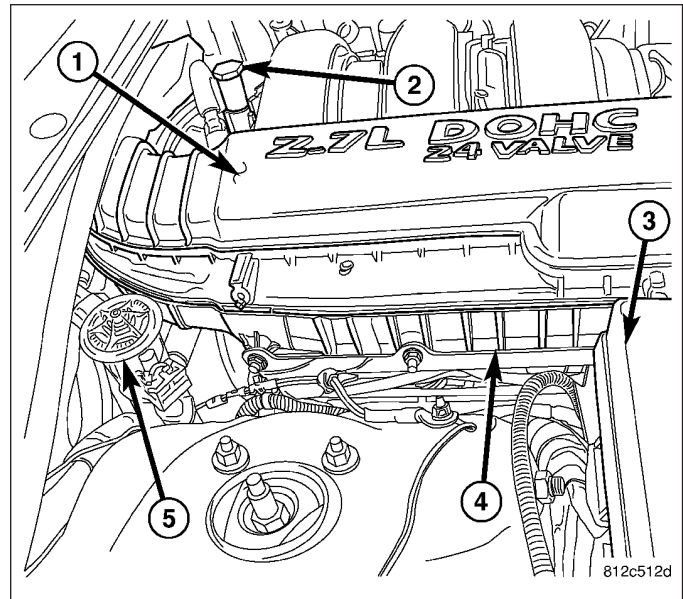
### IN VEHICLE



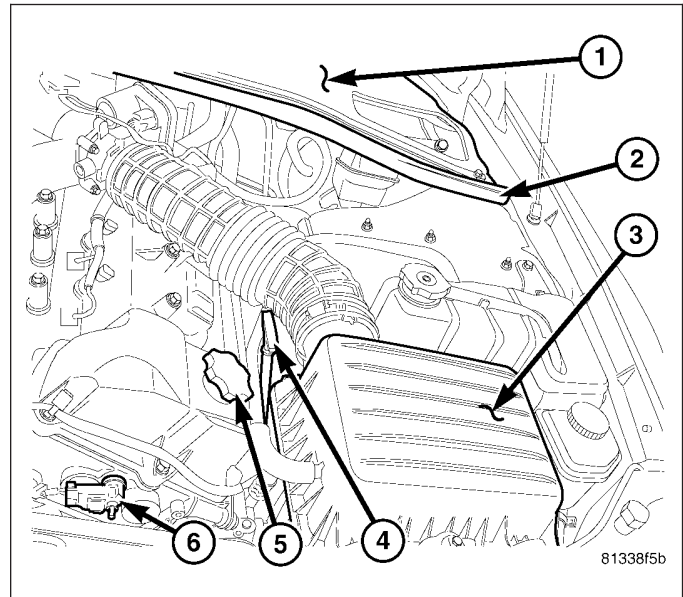
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1. The valve stem seal/valve spring seat (4) should be pushed firmly and squarely over the valve guide using the valve stem as guide. **Do Not Force** seal against top of guide. When installing the valve retainer locks (1), compress the spring (3)**only enough** to install locks (1).
2. Follow the same procedure on the remaining cylinders using the firing sequence 1-2-3-4-5-6. **Make sure piston is at TDC on the cylinder that the valve spring is to be removed.**
3. Remove spark plug adapter tool and Special Tool MD 998772A.
4. Install rocker arm(s)(Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARMS - INSTALLATION).
5. Install camshafts (Refer to 9 - ENGINE/CYLINDER HEAD/CAMSHAFT(S) - INSTALLATION), timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION), and timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
6. Install cylinder head covers(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

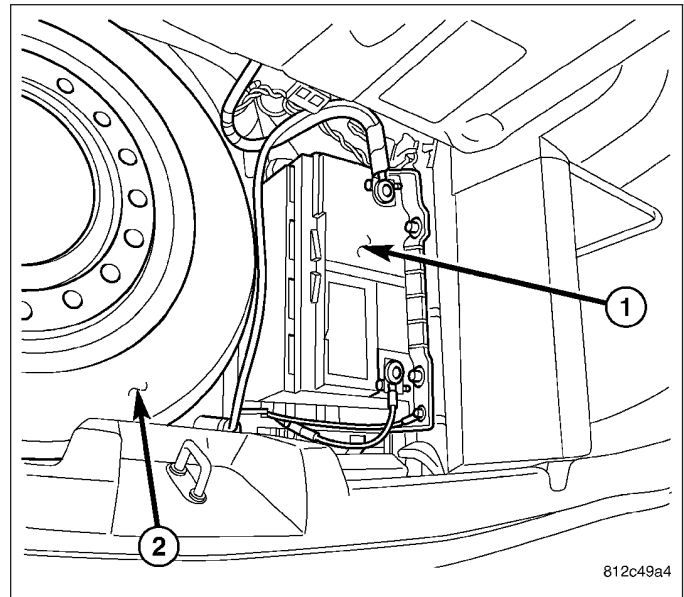
7. Install upper intake manifold (1)(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).



8. Install air cleaner housing (3) and inlet hose(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

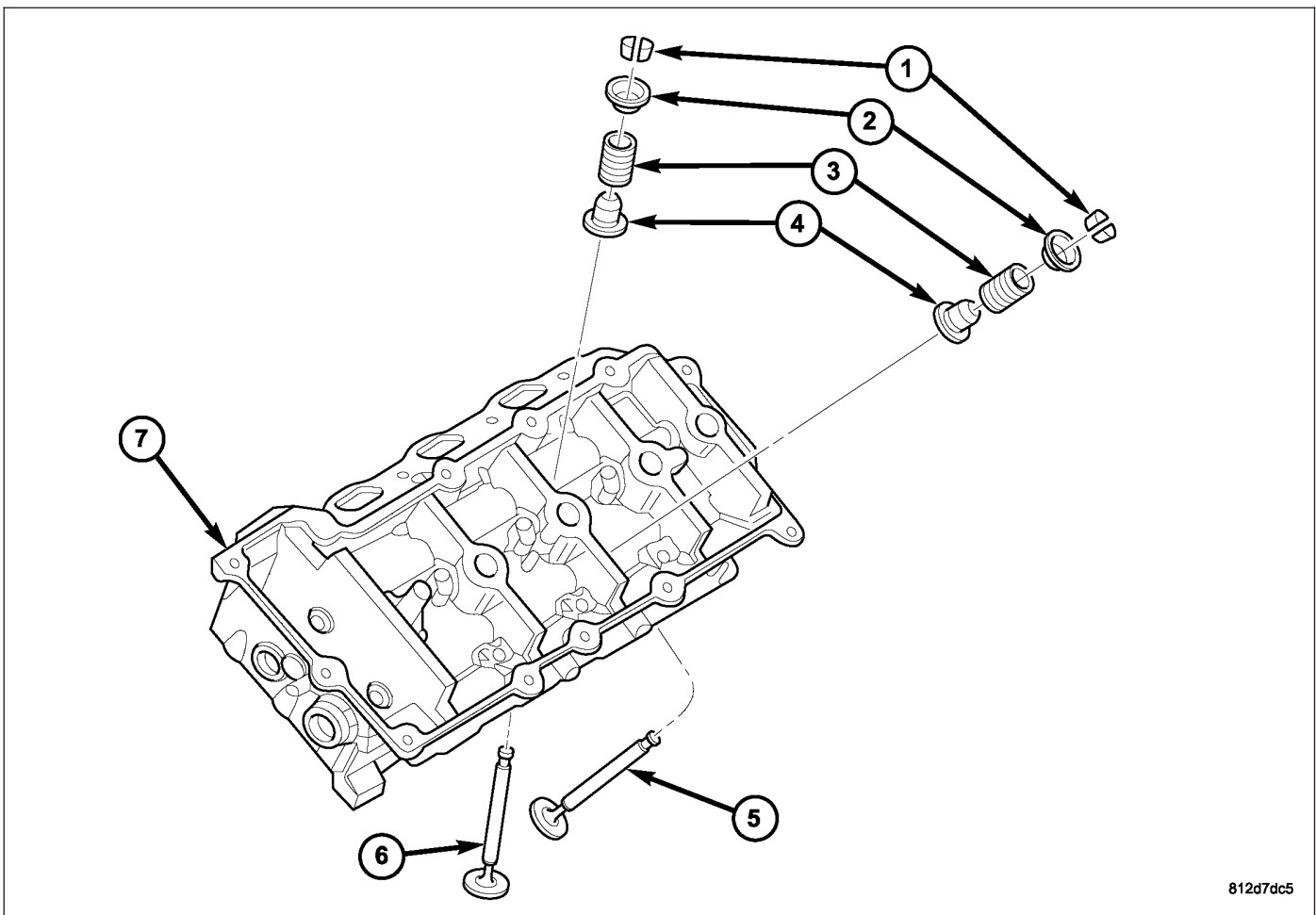


9. Connect negative battery (1) cable.



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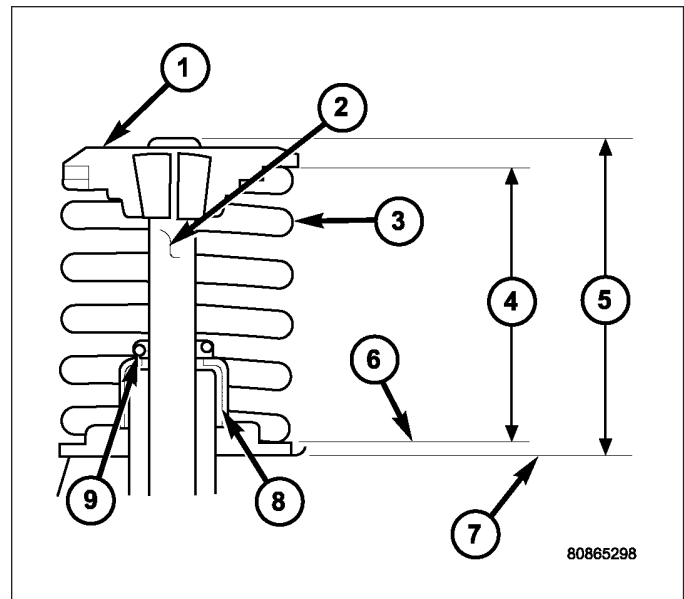
## OFF VEHICLE



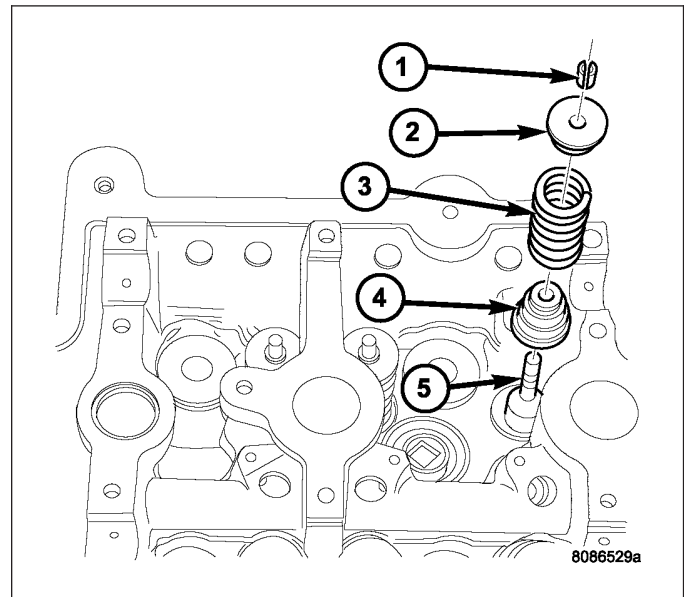
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1. If removed, install valve(s) (5&6) (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - INSTALLATION).

2. If valves or seats have been reground, check valve tip height (5). If valve tip height for intake valve is greater than 47.836 mm (1.883 in.) or 47.837 mm (1.883 in.) for exhaust valve, grind valve tip until within specifications. Make sure measurement is taken from cylinder head surface to the top of valve stem.

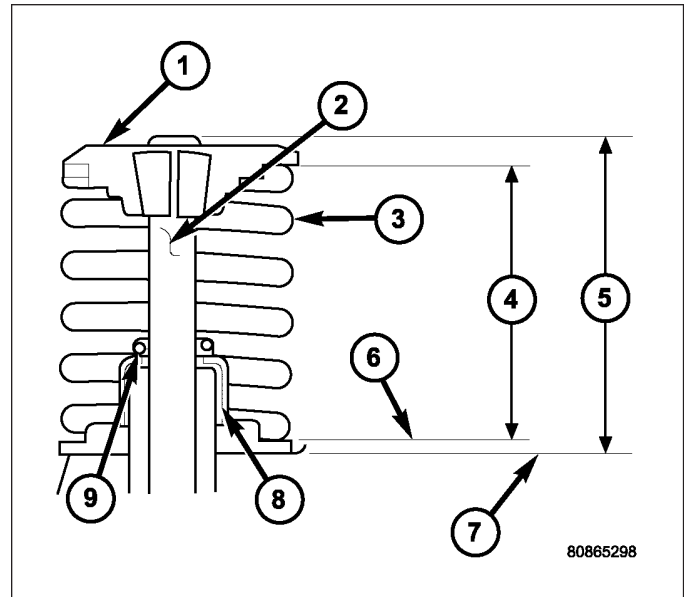


3. Install valve seal/spring seat assembly (4) over valve guides on all valve stems (5).



**Note:** Ensure that the garter spring (9) is intact around the top of the rubber seal. Install valve springs (3) , valve retainers (1).

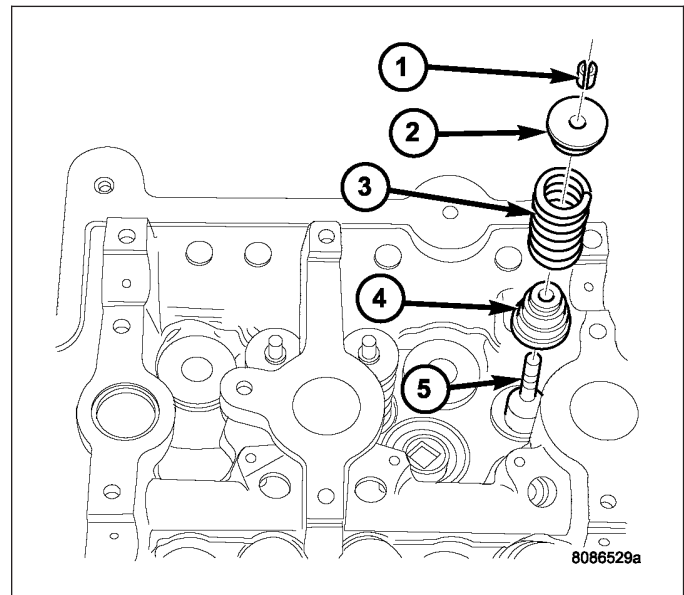
4. Compress valve springs with a valve spring compressor install locks and release tool. **If valves and/or seats are reground, measure the installed height of springs (4), make sure measurements are taken from top of spring seat (6) to the bottom surface of spring retainer (1).** If height is greater than 38.75 mm (1.5256 in.), install a 0.762 mm (0.030 in.) spacer in head counterbore under the valve seal/spring seat (8) to bring spring height back within specification.



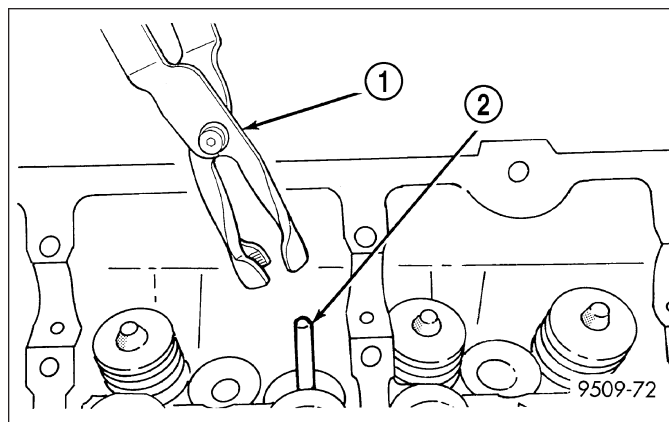
## SEALS-VALVE STEM

### REMOVAL

1. Remove valve spring (3) (Refer to 9 - ENGINE/ CYLINDER HEAD/VALVE SPRINGS - REMOVAL).

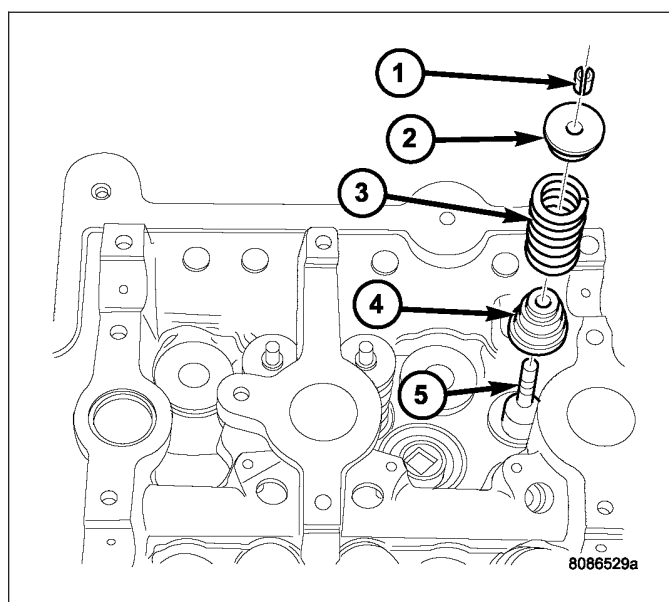


2. Remove valve stem seal by using a valve seal tool (1).



## INSTALLATION

1. The valve stem seal/valve spring seat (4) should be pushed firmly and squarely over the valve guide using the valve stem (5) as guide. **Do Not Force** seal against top of guide.
2. Install valve spring (3) (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE SPRINGS - INSTALLATION).



## ADJUSTERS-HYDRAULIC LASH

### DIAGNOSIS AND TESTING

#### HYDRAULIC LASH ADJUSTER NOISE DIAGNOSIS

Proper noise diagnosis is essential in locating the source of a NVH complaint. Locating a lash adjuster (tappet) type noise can sometimes be difficult. As a result, an initial misdiagnosis may occur.

Refer to LASH ADJUSTER (TAPPET) NOISE CHART indicating possible lash adjuster (tappet) noise sources and possible sources that could lead to a misdiagnosis.

Refer to LASH ADJUSTER (TAPPET) NOISE CHART for possible causes and correction of a lash adjuster (tappet) type noise.

**LASH ADJUSTER (TAPPET) NOISE CHART**

POSSIBLE CAUSES	CORRECTION
1. Engine oil level—too high or too low. This may cause aerated oil to enter the adjusters and cause them to be spongy.	1. Check and correct engine oil level.
2. Insufficient running time after rebuilding cylinder head.	2. Low speed running of up to 1 hour may be required to fully evacuate trapped air from the valve train system. During this time, turn engine off and let set for a few minutes before restarting. Repeat this several times after engine has reached normal operating temperature.
3. Air trapped in lash adjuster (after 1 hour run time).	3. See below: (a) Check lash adjusters for sponginess while installed in cylinder head. Depress part of rocker arm over adjuster. Normal adjusters should feel very firm. Very spongy adjusters can be bottomed out easily. (b) If lash adjuster(s) are still spongy, replace with new adjuster/rocker arm assembly.
4. Low oil pressure	4. See below: (a) Check and correct engine oil level. (b) Check engine oil pressure. (c) Check for excessive bearing clearance and correct. (d) Check for worn oil pump.
5. Oil passage to cylinder head(s) plugged with debris.	5. Check cylinder head oil passages and cylinder head gasket restrictor for blockage. Clean or replace as necessary.
6. Worn valve guide(s).	6. Ream guide(s) and replace valve(s) with oversize valves and seal(s).
7. Air ingested into oil due to broken or cracked oil pump pickup tube.	7. Inspect pickup tube and replace as necessary.
8. Collapsed lash adjuster due to debris ingestion.	8. Clean debris from engine and replace lash adjuster(s).

**REMOVAL**

1. Remove cylinder head cover(s). (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)
2. Remove rocker arm(s). (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARMS - REMOVAL)

**CAUTION:** If lash adjusters and rocker arms are to be reused, always mark position for reassembly in their original positions.

3. Remove lash adjuster(s).

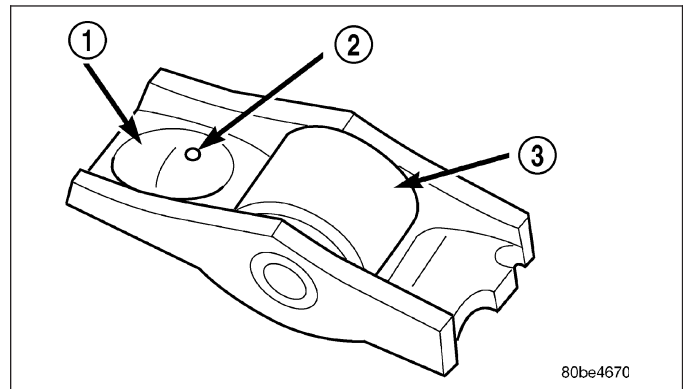
**INSTALLATION**

1. Install hydraulic lash adjuster making sure adjusters are at least partially full of oil. This can be verified by little or no plunger travel when lash adjuster is depressed.
2. Install rocker arm(s) (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARMS - INSTALLATION) and cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

## ARMS-ROCKER

### DESCRIPTION

The rocker arms are composed of steel stampings with an integral roller bearing (3). The rocker arms incorporate a 0.5 mm (0.0197 in.) oil hole (2) in the lash adjuster socket (1) for roller/camshaft lobe lubrication.



### REMOVAL

1. Remove cylinder head cover(s). (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)

**CAUTION:** Always rotate engine by turning the crankshaft. Failure to do so will result in valve and/or piston damage.

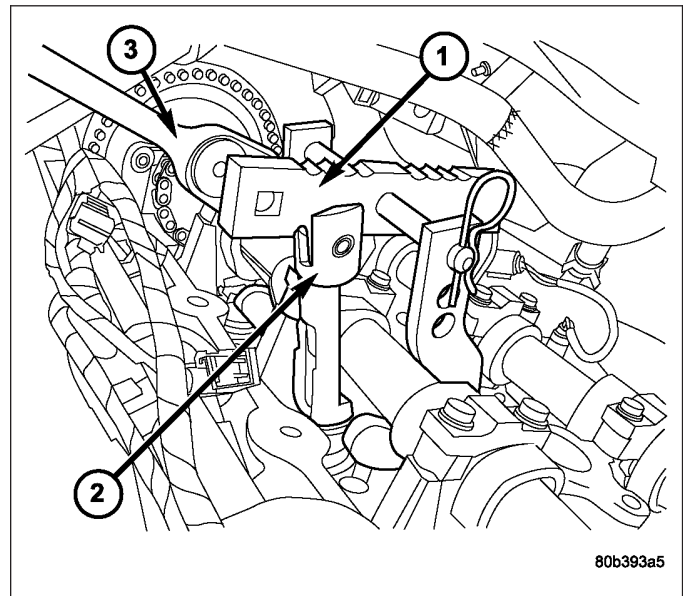
2. Rotate engine until the cam lobe is on its base circle (heel), on the rocker arm being removed.

**CAUTION:** Depress valve spring only enough to remove rocker arm.

3. Using Special Tools 8215 (1) and 8216 Adaptor (2) and a 3/8" ratchet (3), depress valve spring only enough to release tension on rocker arm.
4. Remove rocker arm from cylinder head.

**CAUTION:** If rocker arms are to be reused, identify position of rocker arms for reassembly in their original positions.

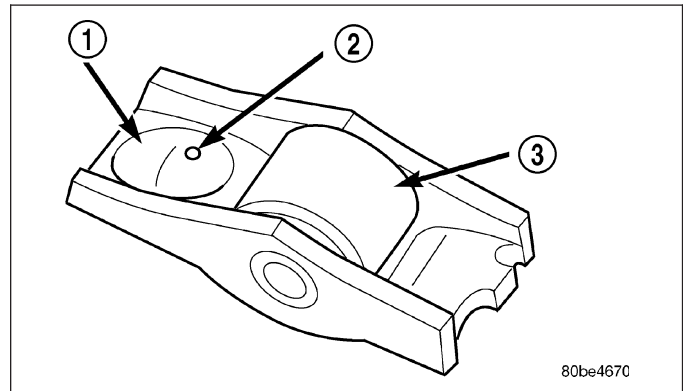
5. Repeat procedure for each rocker arm removed.
6. Inspect the rocker arm for wear or damage. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARMS - INSPECTION).





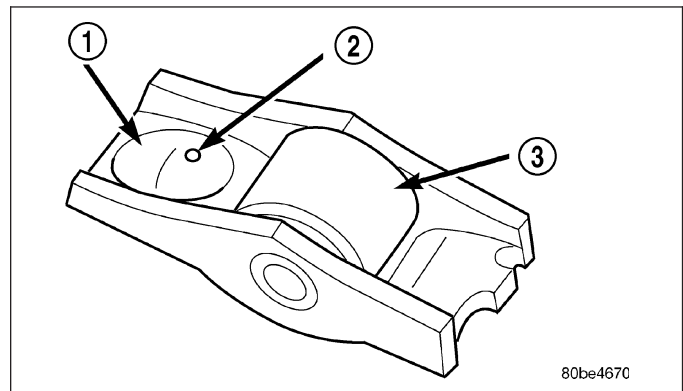
## INSPECTION

Inspect the cam follower assembly for wear or damage. Replace as necessary.



## INSTALLATION

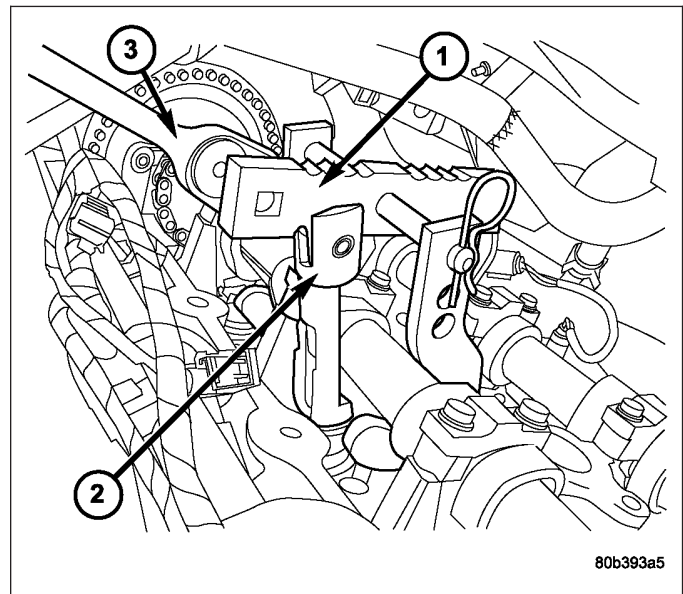
1. Lubricate rocker arms with clean engine oil before installation.
2. Rotate engine until cam lobe is on its base circle (heel) of rocker arm being installed.



3. Using Special Tools 8215-A (1), 8216-A adaptor (2), and a 3/8" Drive Ratchet (3), depress valve spring only enough to install rocker arm.
4. Install rocker arm in original position (if reused) over valve and lash adjuster. Release tension on valve spring.

**Note: Inspect rocker arm for proper engagement into lash adjuster and valve tip.**

5. Repeat procedure for each rocker arm being installed.
6. Install cylinder head cover(s). Refer to procedure in this section.

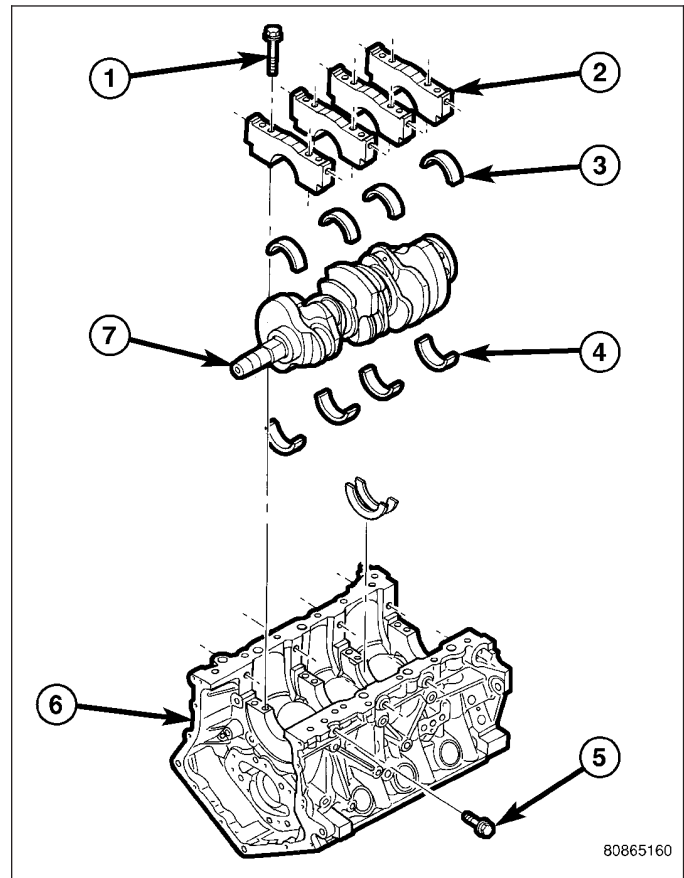


## ENGINE BLOCK

### DESCRIPTION

The cylinder block (6) is made of heat treated aluminum with cast-in-place iron liners. The block is a closed deck design with the right bank forward. To provide high rigidity and improved NVH, the block has cast-in contours and ribs, along with powdered metal main caps (2) each with 6 bolts 4 vertical (1) and 2 horizontal (5). The engine is equipped with a windage tray mounted to the main caps.

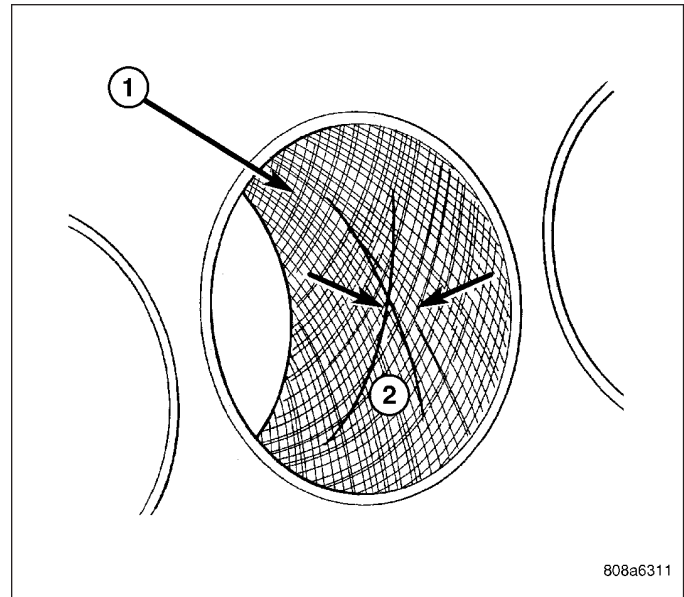
The block design allows coolant flow between the cylinder bores and an internal coolant by-pass to the thermostat.



### STANDARD PROCEDURE - CYLINDER BORE HONING

1. Used carefully, the cylinder bore resizing hone, recommended tool C-823 or equivalent, equipped with 220 grit stones, is the best tool for this honing procedure. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually a few strokes will clean up a bore and maintain the required limits.
2. Deglazing of the cylinder walls may be done using a cylinder surfacing hone, recommended tool C-3501 or equivalent, equipped with 280 grit stones, if the cylinder bore is straight and round. 20–60 strokes depending on the bore condition, will be sufficient to provide a satisfactory surface. Use a light honing oil. **Do not use engine or transmission oil, mineral spirits or kerosene.** Inspect cylinder walls after each 20 strokes.

3. Honing should be done by moving the hone up and down fast enough to get a cross-hatch pattern (1). When hone marks **intersect** at 40-60 degrees (2), the cross hatch angle is most satisfactory for proper seating of rings.
4. A controlled hone motor speed between 200–300 RPM is necessary to obtain the proper cross-hatch angle. The number of up and down strokes per minute can be regulated to get the desired 40–60 degree angle (2). Faster up and down strokes increase the cross-hatch angle.
5. After honing, it is necessary that the block be cleaned again to remove all traces of abrasive.



**CAUTION:** Ensure all abrasives are removed from engine parts after honing. It is recommended that a solution of soap and hot water be used with a brush and the parts then thoroughly dried. The bore can be considered clean when it can be wiped clean with a white cloth and cloth remains clean. Oil the bores after cleaning to prevent rusting.

## CLEANING

Clean cylinder block thoroughly using a suitable cleaning solvent.

## INSPECTION

### ENGINE BLOCK

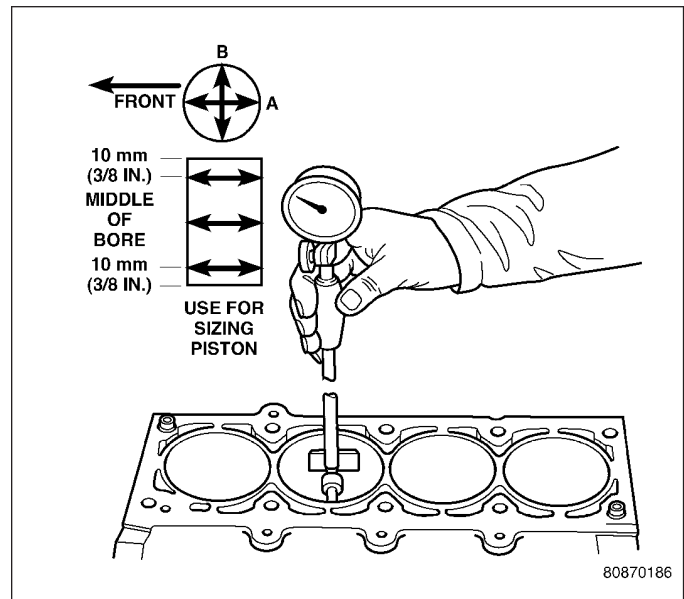
1. Clean cylinder block thoroughly and check all core hole plugs for evidence of leaking.
2. If new core plugs are to be installed, (Refer to 9 - ENGINE - STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS).
3. Examine block and cylinder bores for cracks or fractures.
4. Check block deck surfaces for flatness. Deck surface must be within service limit of 0.1 mm (0.004 in.).

### CYLINDER BORE

**Note:** The cylinder bores should be measured at normal room temperature, 21°C (70°F).

The cylinder walls should be checked for out-of-round and taper with Tool C119 or equivalent (Refer to 9 - ENGINE - SPECIFICATIONS). If the cylinder walls are badly scuffed or scored, the cylinder block should be replaced, and new pistons and rings fitted.

Measure the cylinder bore at three levels in directions A and B. Top measurement should be 10 mm (3/8 in.) down and bottom measurement should be 10 mm (3/8 in.) up from bottom of bore. (Refer to 9 - ENGINE - SPECIFICATIONS).



## BEARINGS-CONNECTING ROD

### STANDARD PROCEDURE - CONNECTING ROD AND BEARING FITTING

#### CONNECTING ROD BEARING

Fit all connecting rods on one bank until complete.

The bearing caps are not interchangeable and should be marked at removal to ensure correct assembly.

**CAUTION:** Do not use a punch to mark rods as rod damage may occur.

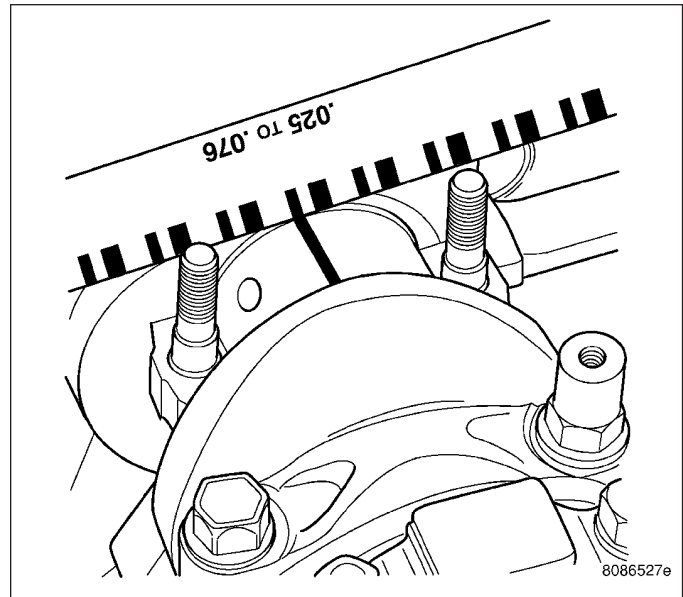
**CAUTION:** Care must be taken not to damage the fractured rod and cap joint face surfaces as engine damage may occur.

The bearing shells must be installed with the tangs inserted into the machined grooves in the rods and caps. Also, assure that the hole in upper bearing half aligns with oil squirt hole in rod. Install cap with the tangs on the same side as the rod.

**CAUTION:** Assure that hole in upper bearing half aligns with hole in connecting rod as engine damage may occur.

Limits of taper on any crankshaft journals should be held to 0.015 mm (0.0006 in.). Limits of out-of-round on any crankshaft journal should be held to 0.010 mm (0.0004 in.). Bearings are available 0.025 mm (0.001 in.) and 0.250 mm (0.010 in.) undersize. **Install the bearings in pairs. Do not use a new bearing half with an old bearing half. Do not file the rods or bearing caps.**

1. For measuring Main Bearing Clearance and Connecting Rod Bearing Clearance use plastigage. For more information on using plastigage (Refer to 9 - ENGINE - STANDARD PROCEDURE). Refer to Engine Specifications for bearing clearance specifications (Refer to 9 - ENGINE - SPECIFICATIONS).

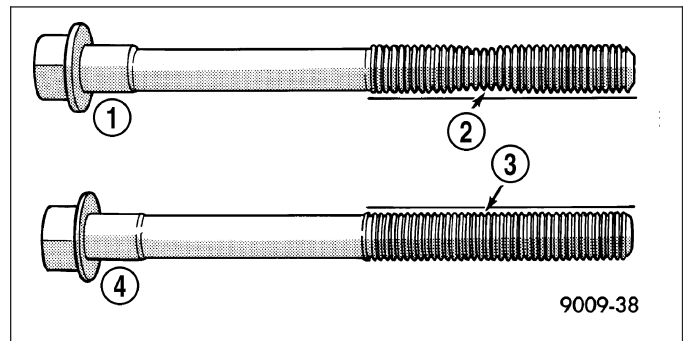


## CONNECTING ROD BOLTS

**Note:** The connecting rod bearing cap bolts must be examined before reuse. If the threads are necked down due to stretching, the bolt(s) must be replaced.

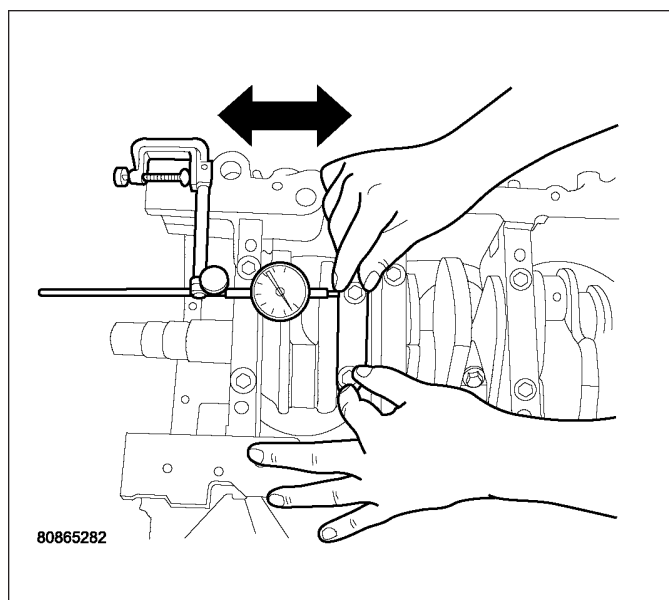
**Note:** Connecting rod bolts are retained in the rod cap with a light press fit. If bolts are to be removed, use a hammer and punch to drive bolts from connecting rod cap using care not to damage fractured cap surface.

1. Examine connecting rod bolt for stretching. Stretching can be checked by holding a scale or straight edge against the threads. If all the threads do not contact the scale (2) the bolt should be replaced.
2. Before installing the bolts, lubricate the threads with engine oil.
3. Install bolts finger tight. Then alternately torque each nut to assemble the cap properly.
4. Tighten the nuts to specification (Refer to 9 - ENGINE - SPECIFICATIONS).



## CONNECTING ROD SIDE CLEARANCE

1. Mount a dial indicator to a stationary point on engine. Locate probe perpendicular to and resting against the connecting rod cap being checked. Move connecting rod all the way to rear of its travel. Zero the dial indicator. Move connecting rod forward to limit of travel and read the dial indicator. Compare measurement to specification listed in engine specifications (Refer to 9 - ENGINE - SPECIFICATIONS). Repeat procedure for each connecting rod. Turn crankshaft for connecting rod accessibility.

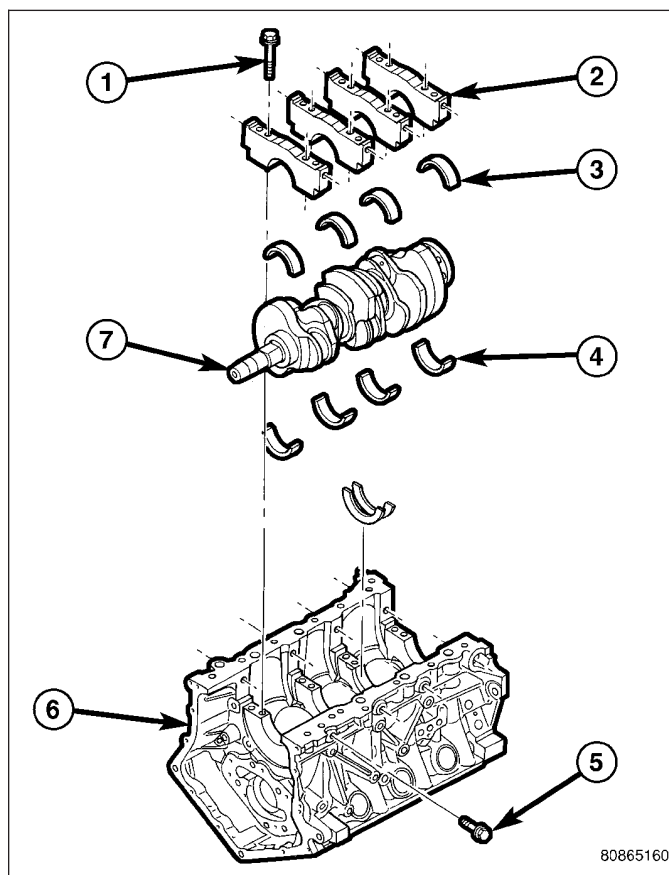


## CRANKSHAFT

### DESCRIPTION

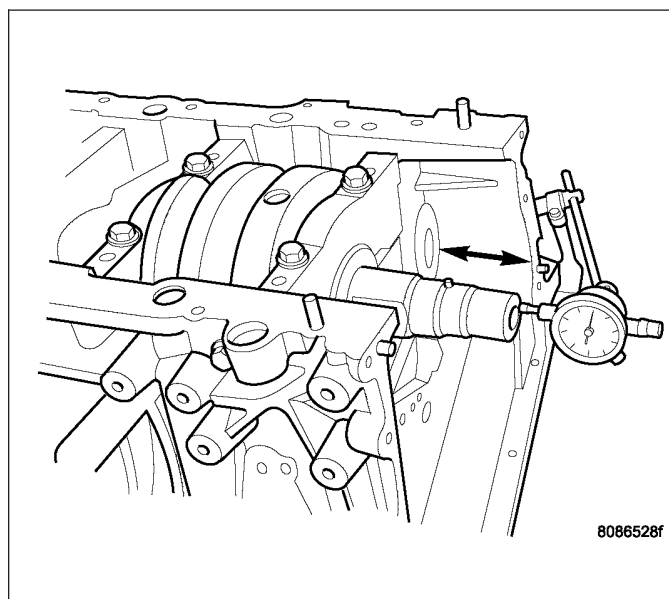
The crankshaft (7) is constructed of a forged micro alloy steel. The six throw, nine counterweight crankshaft is supported by four select fit main bearings with the number three serving as the thrust washer location. The select fit identification markings will be on the rear side of the number nine (rearmost) counterweight. The six separate connecting rod throws are an even-firing design which reduces torque fluctuations while a vibration damper is used to control torsional vibration.

The crankshaft oil seals are a one piece design. The front seal is retained by the timing chain cover, and the rear seal is part of a housing that attaches to the cylinder block.



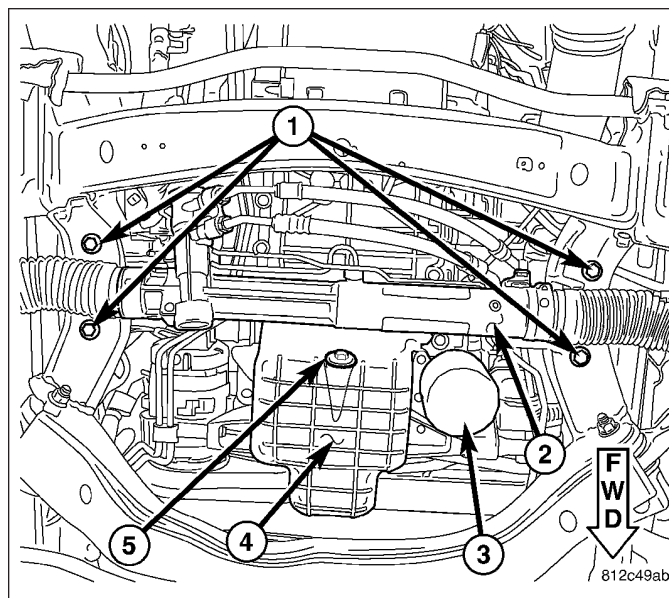
## STANDARD PROCEDURE - CRANKSHAFT END PLAY

1. Mount a dial indicator to a stationary point at front of engine. Locate the probe perpendicular against nose of crankshaft.
2. Move crankshaft all the way to the rear of its travel.
3. Zero the dial indicator.
4. Move crankshaft all the way to the front and read the dial indicator. For crankshaft end play clearances (Refer to 9 - ENGINE - SPECIFICATIONS).



## REMOVAL

1. Drain engine oil (5) and remove oil filter (3).
2. Remove engine from vehicle (Refer to 9 - ENGINE - REMOVAL).
3. Mount engine on an engine stand.
4. Remove oil pan and oil pick-up tube (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
5. Remove idler pulley bracket for accessory drive belt.
6. Remove upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
7. Remove cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
8. Remove timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING CHAIN COVER - REMOVAL).
9. Remove primary timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING CHAIN AND SPROCKETS - REMOVAL).
10. Remove crankshaft sprocket (Refer to 9 - ENGINE/VALVE TIMING/TIMING CHAIN AND SPROCKETS - REMOVAL).
11. Remove oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
12. Remove crankshaft rear oil seal retainer (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT REAR OIL SEAL RETAINER - REMOVAL).





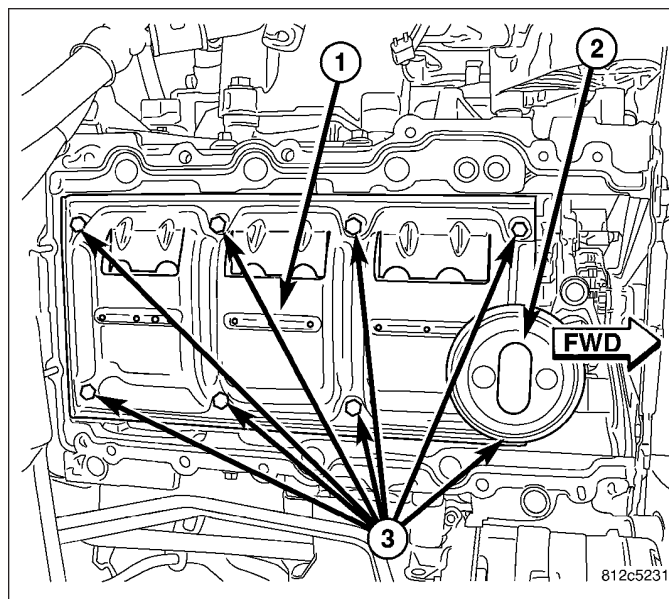
13. Remove windage tray (1)(Refer to 9 - ENGINE/ENGINE BLOCK/WINDAGE TRAY / STRUCT SUPPORT - REMOVAL).
14. Turn crankshaft until connecting rod cap to be removed is accessible.

**Note:** Connecting rod bearing caps are not interchangeable and should be marked before removing to ensure correct reassembly.

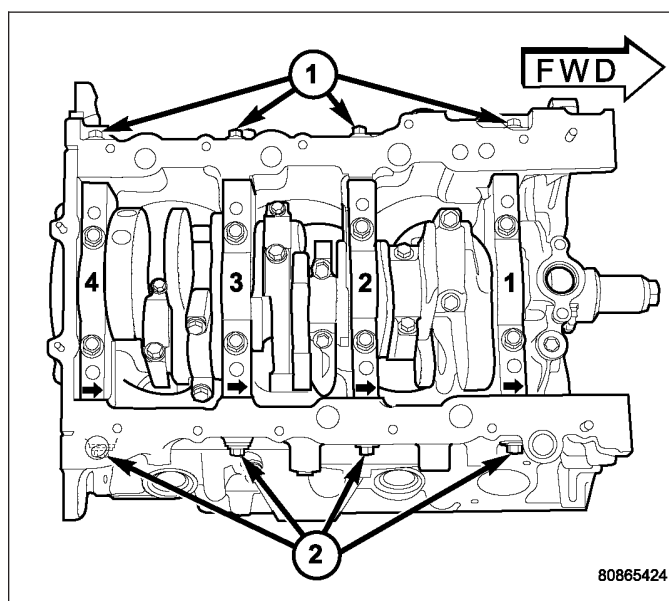
**CAUTION:** DO NOT use a number stamp or a punch to mark connecting rods. Damage to connecting rod could occur.

15. Mark connecting rod bearing cap positions using a permanent ink marker or scribe tool.
16. Remove connecting rod bearing caps. Use care to prevent damage to the crankshaft bearing surfaces.

**CAUTION:** Care should be taken not to damage the fractured rod and cap joint face surfaces or damage to the engine may occur.



17. Remove main bearing cap bolts and tie bolts (1&2).

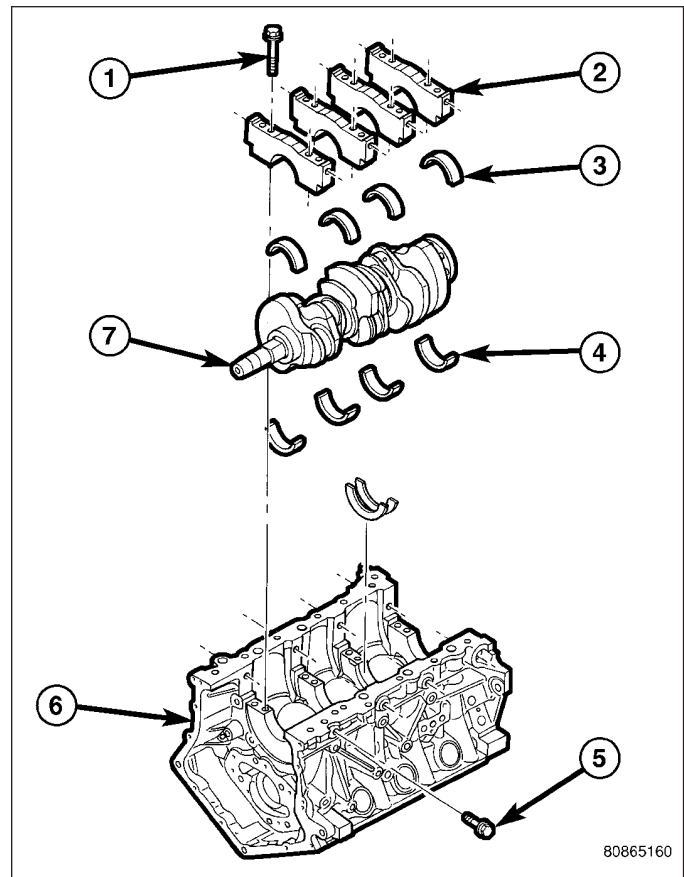




18. Remove main bearing caps (2).

**CAUTION:** When removing crankshaft, use care not to damage bearing surfaces on the crankshaft.

19. Remove crankshaft (7) from cylinder block (6).



## INSTALLATION

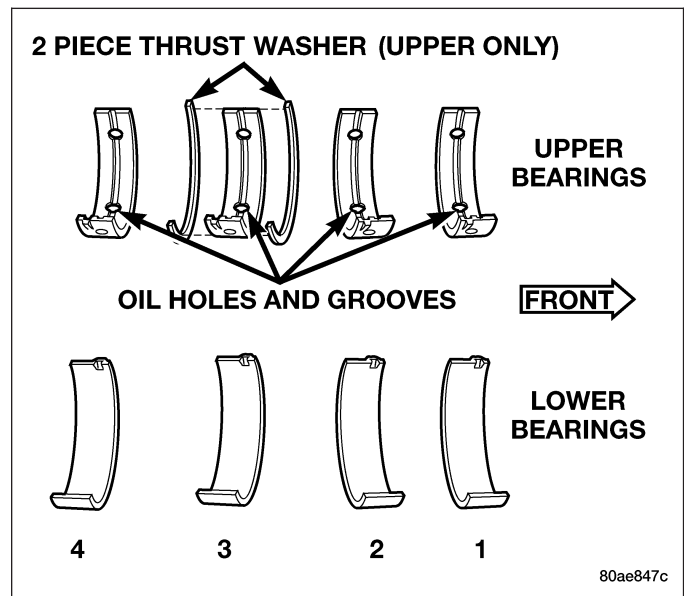
**Note:** Upper and lower bearing halves are NOT interchangeable.

**CAUTION:** Main bearings are select fit (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - STANDARD PROCEDURE).

1. Install the main bearing in the block and main caps making sure the tangs engage the slots in the block and main caps.
2. Lubricate upper main bearing halves with engine oil.

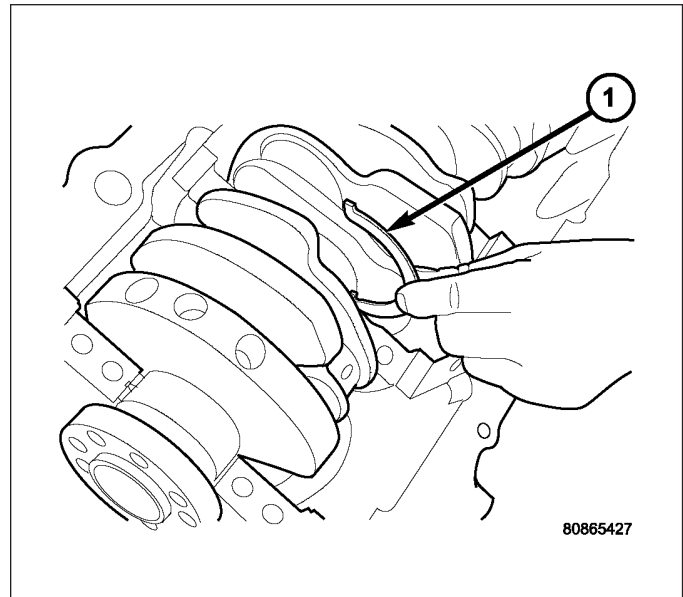
**CAUTION:** When installing crankshaft, use care not to damage bearing surfaces on the crankshaft.

3. Install crankshaft.



**Note:** Make sure that the coated and oil groove side of crankshaft thrust washer faces the crankshaft thrust surface.

4. Push crankshaft forward. Lubricate and install the front thrust washer (1) by rolling the thrust washer onto the machined shelf between the No. 3 upper main bulk head and crankshaft thrust surface.
5. Move crankshaft rearward. Lubricate and install the rear thrust washer by rolling the thrust washer onto the machined shelf between the No. 3 upper main bulk head and crankshaft thrust surface.

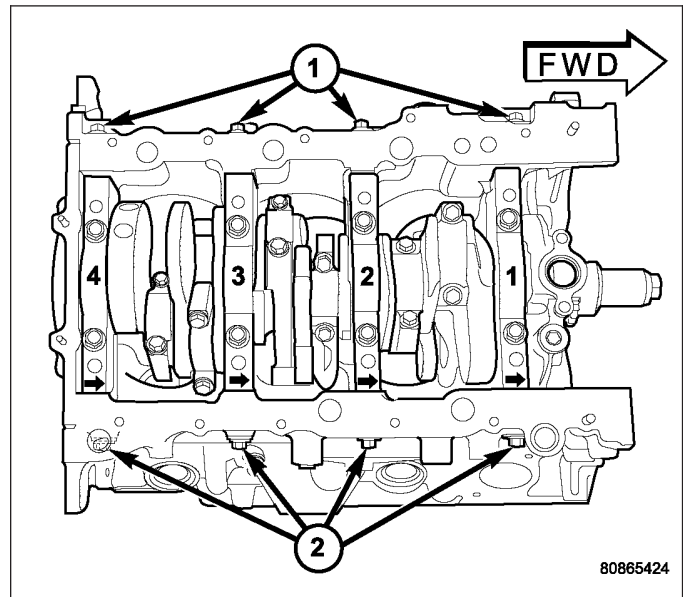


6. Lubricate lower main bearings with engine oil.
7. Install main bearings caps.

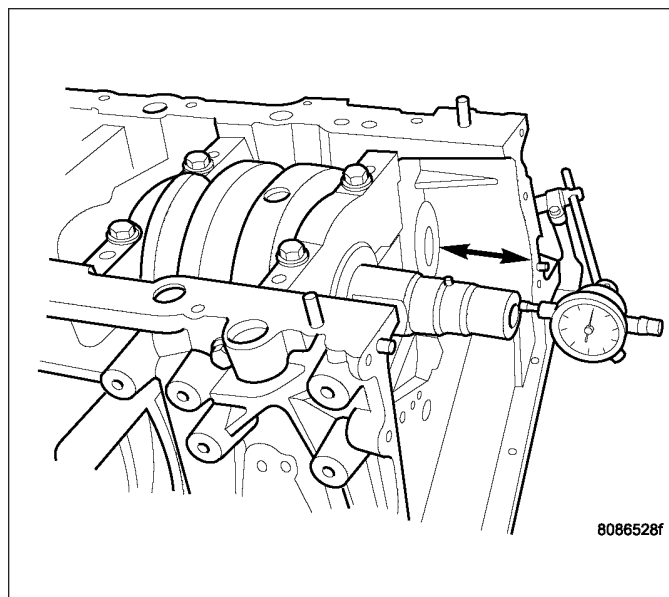
**Note:** Lubricate main bearing cap bolts with engine oil before installation.

**Note:** The main bearing cap bolts must be tightened in the proper sequence. First the inner main cap bolts, secondly the windage tray bolts, and lastly the main cap tie (horizontal) bolts.

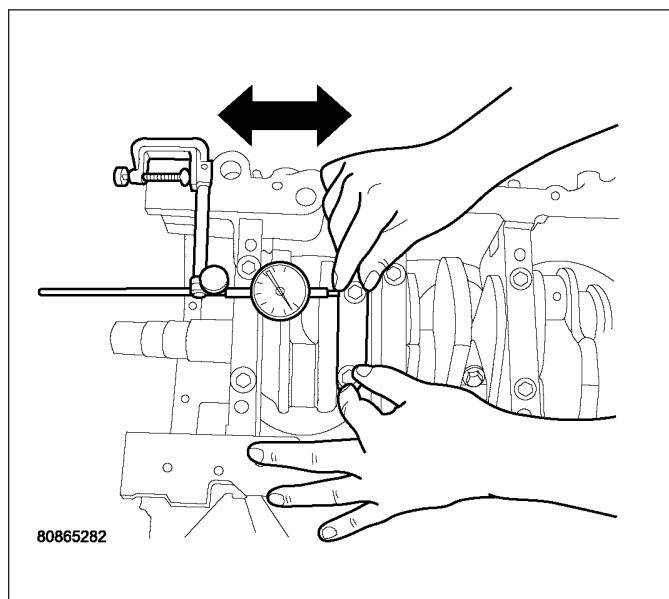
8. Install the inner main bearing cap bolts and tighten to 20 N·m + 1/4 Turn (15 ft. lbs. + 1/4 Turn).



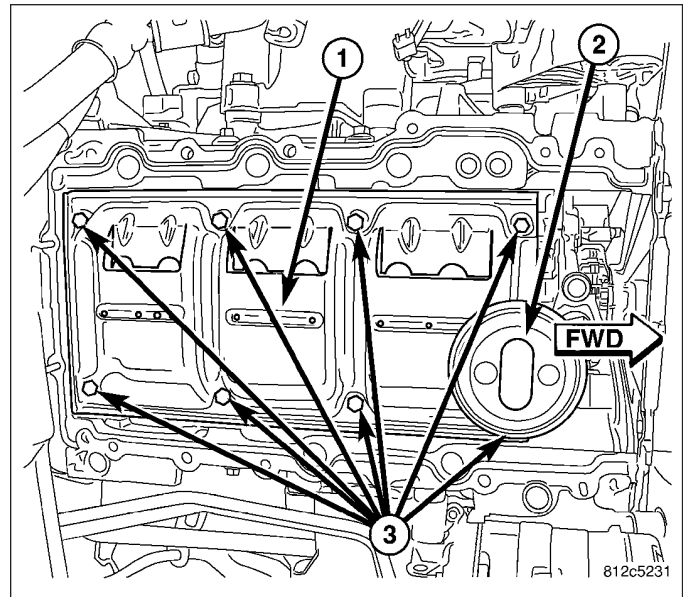
9. Measure crankshaft end play (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - STANDARD PROCEDURE).



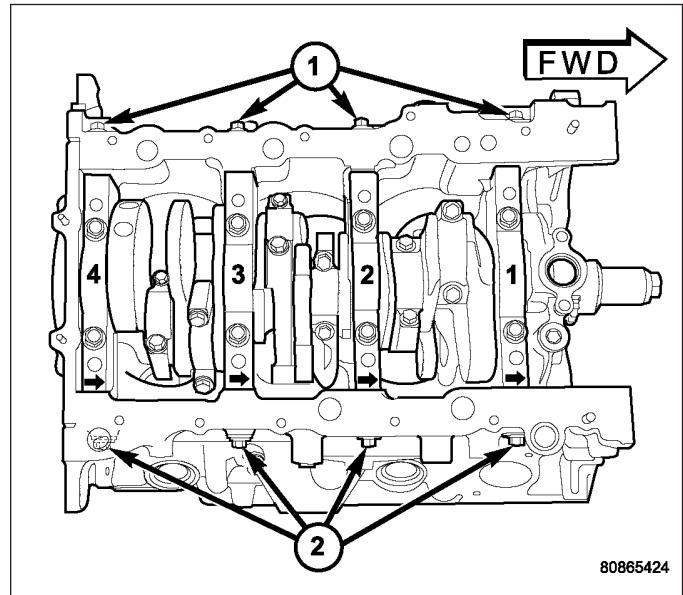
10. Install connecting rods and measure side clearance (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON & CONNECTING ROD - INSTALLATION) (Refer to 9 - ENGINE/ENGINE BLOCK/CONNECTING ROD BEARINGS - STANDARD PROCEDURE).



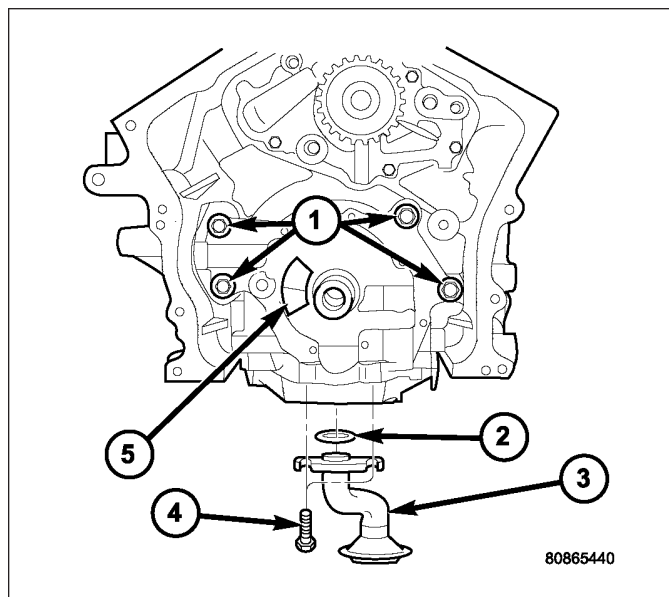
11. Install windage tray (1) with the slots to right side of engine. Lubricate bolts (3) with engine oil and tighten to 27 N·m + 1/4 Turn (20 ft. lbs. + 1/4 turn).



12. Install the main cap tie (horizontal) bolts (1&2) and tighten to 28 N·m (250 in. lbs.).
13. Install rear crankshaft oil seal retainer and oil seal assembly(Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT REAR OIL SEAL RETAINER - INSTALLATION).



14. Install oil pump assembly (5)(Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).
15. Install oil pick-up tube (3) and O-ring (2). Tighten bolts (4) to 28 N·m (250 in.lbs.).
16. Install oil pan gasket, oil pan, and oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
17. Install crankshaft sprocket (Refer to 9 - ENGINE/VALVE TIMING/TIMING CHAIN AND SPROCKETS - INSTALLATION).
18. Install timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING CHAIN AND SPROCKETS - INSTALLATION).
19. Install timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING CHAIN COVER - INSTALLATION).
20. Install cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
21. Install oil dipstick tube.
22. Install engine assembly (Refer to 9 - ENGINE - INSTALLATION).
23. Fill engine crankcase with proper oil to correct level (Refer to 9 - ENGINE/LUBRICATION/OIL - STANDARD PROCEDURE).
24. Fill with coolant(Refer to 7 - COOLING - STANDARD PROCEDURE).
25. Start engine and check for leaks.

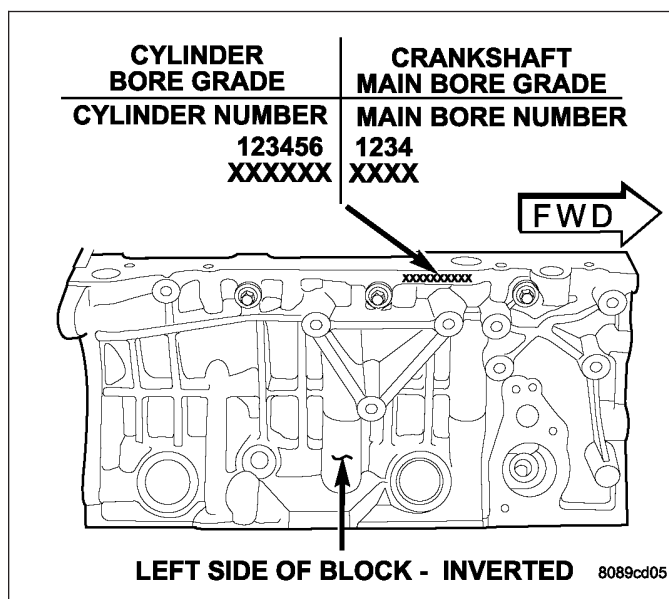


## BEARINGS-CRANKSHAFT MAIN

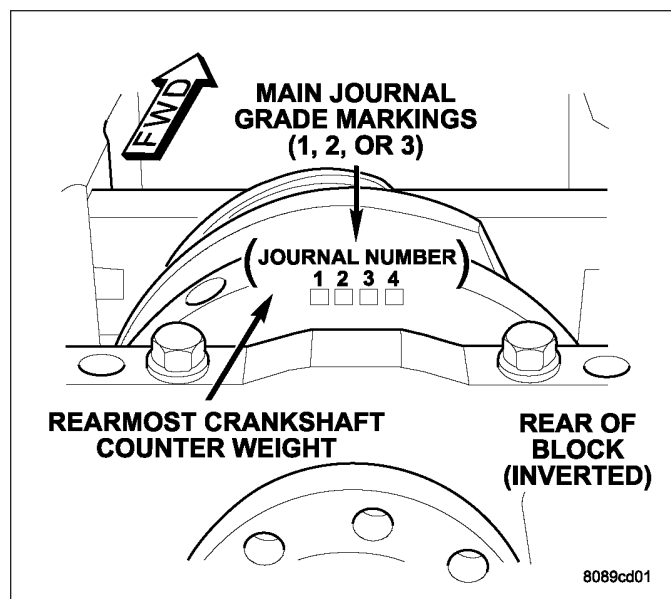
### STANDARD PROCEDURE - CRANKSHAFT MAIN BEARING FITTING

The main bearings are “select fit” to achieve proper oil clearances. For main bearing selection, the block and crankshaft have grade identification marks.

The grade marks for the cylinder block main bearing bore grade is located on the pan rail just below the left side engine mount bracket. These marks are read left to right, corresponding to main bore 1, 2, 3, 4.



The grade marks for the crankshaft are located on the rearmost crankshaft counter weight as shown in. The crankshaft journal grade marks are read left to right, corresponding with journal number 1, 2, 3, 4.



#### MAIN BEARING SELECTION CHART—2.7L

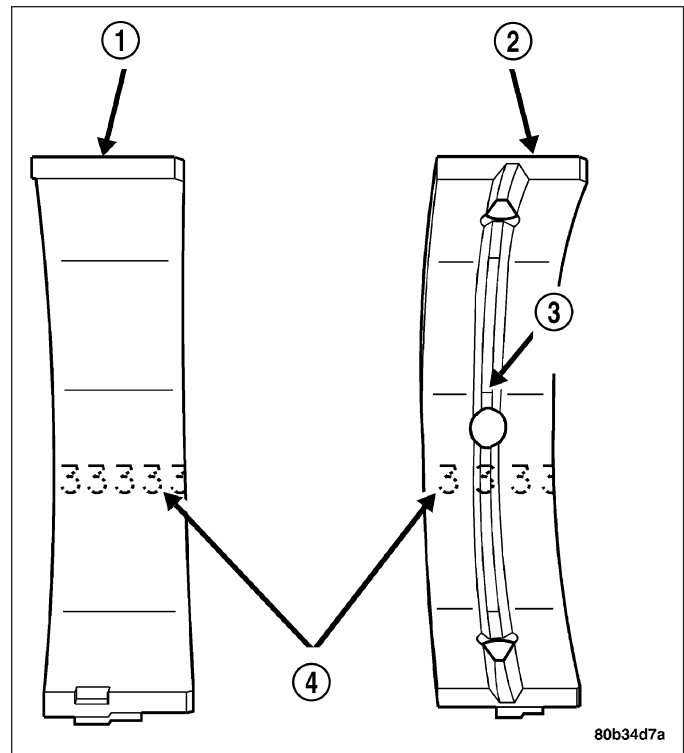
		Main Bearing Bore Grade Mark		
		1	2	3
Crankshaft Main Journal Grade Mark	1	(3) standard	(2) +0.003 mm (+0.0001 in.)	(1) +0.006 mm (+0.0002 in.)
	2	(4) -0.003 mm (-0.0001)	(3) standard	(2) +0.003 mm (+0.0001 in.)
	3	(5) -0.006 mm (-0.0002 in.)	(4) -0.003 mm (-0.0001 in.)	(3) standard

Refer to the MAIN BEARING SELECTION CHART—2.7L to properly select the main bearings. For an example, if the main bore grade is 3 and the journal grade is 2, the proper select fit bearing would be (2) +0.003 mm (+0.0002 in.).

**Note:** Service main bearings have a number from 1–5 marked in ink on the bearing surface. For verification, use the **MAIN BEARING SELECTION CHART—2.7L** for number to size identification.

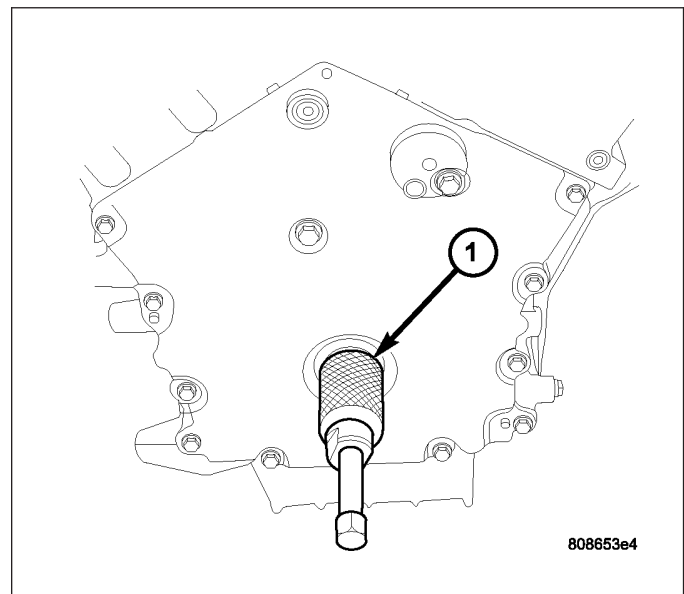
The upper main bearing (2) has a oil feed hole and a center groove (3) to allow lubrication of the main journal and must be properly positioned in the block.

**Note:** Although cylinder bores are graded for size, there is only one piston size.



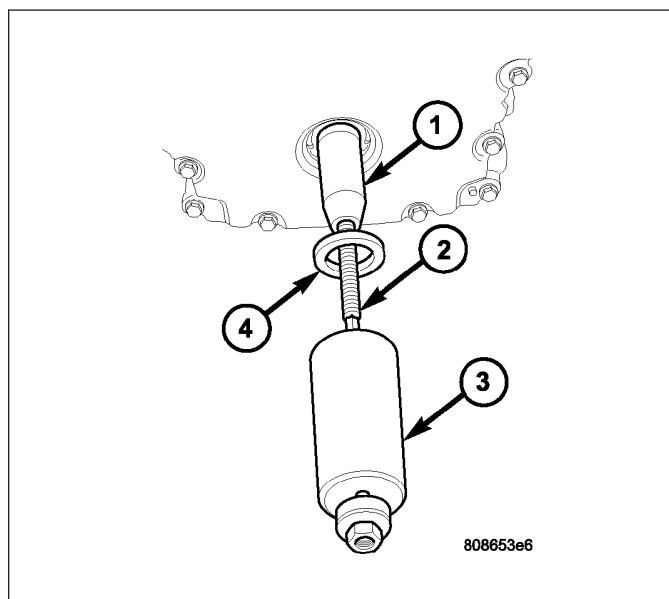
## SEAL- CRANKSHAFT FRONT OIL REMOVAL

1. Remove crankshaft vibration damper(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
2. Install Special Tool 8194 (1), Insert into crankshaft nose. Remove seal using Special Tool 6771, Remover.



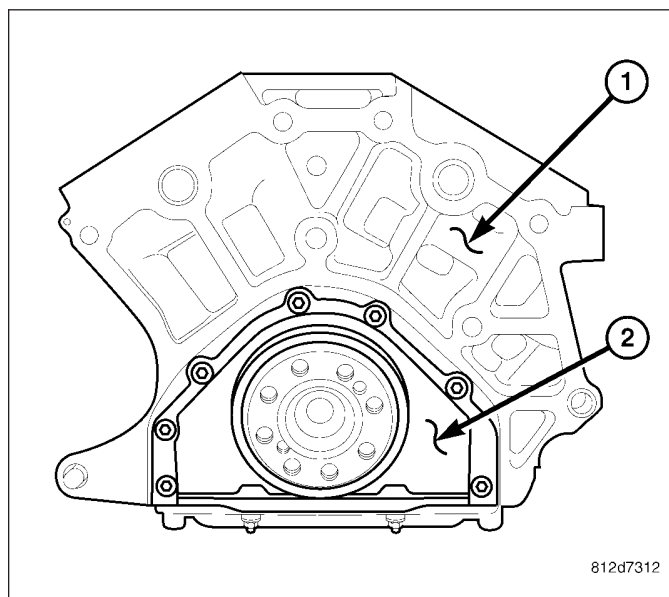
## INSTALLATION

1. Install new seal (4) using Special Tools 6780-2 Sleeve (1), 6780-1 Installer (3), and 8179 Stud (2).
2. Install crankshaft vibration damper(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).



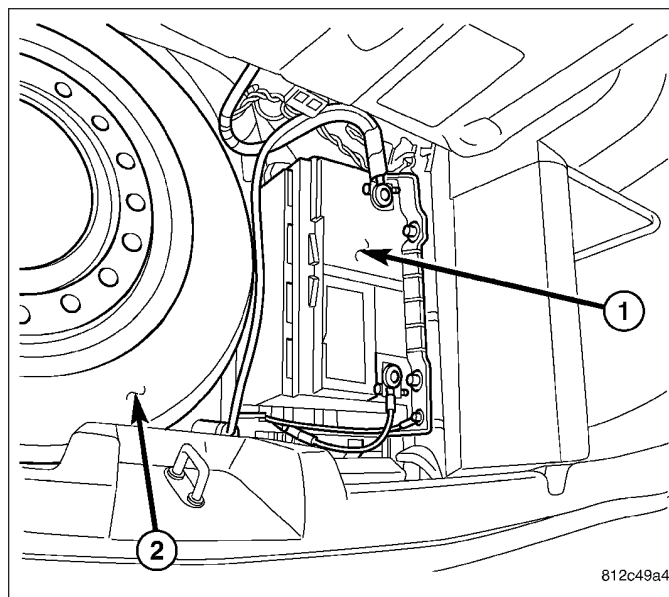
## SEAL- CRANKSHAFT REAR OIL REMOVAL

The crankshaft rear oil seal is incorporated in the seal adapter (2) and can not be removed from the adapter. The crankshaft rear oil seal/seal adapter (2) are serviced as an assembly.

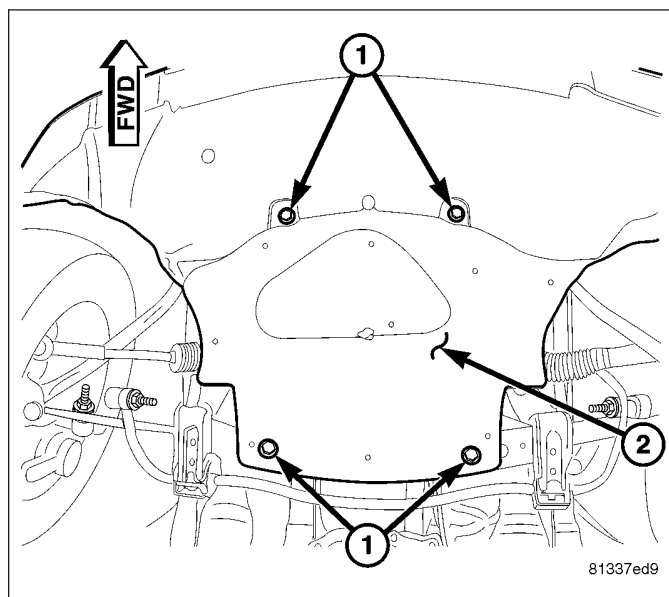




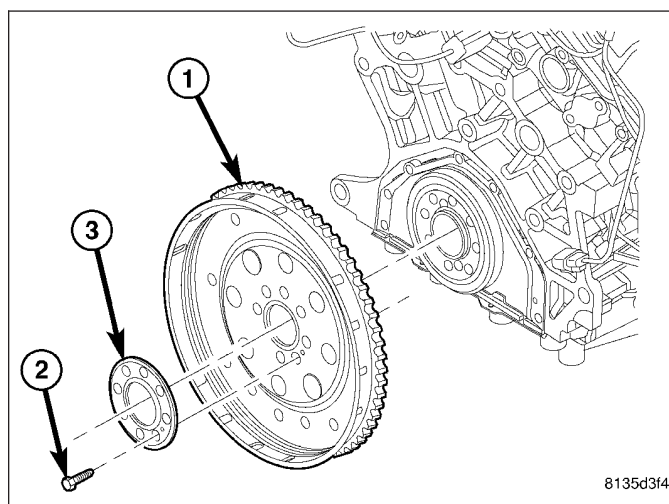
1. Disconnect negative battery (1) cable.



2. Raise vehicle.
3. Remove splash shield retaining bolts (1) and splash shield (2).
4. Remove the structural collar(Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - REMOVAL).
5. Remove transmission(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - REMOVAL).



6. Remove flex plate attaching bolts (2), backing plate (3), and flex plate (1).

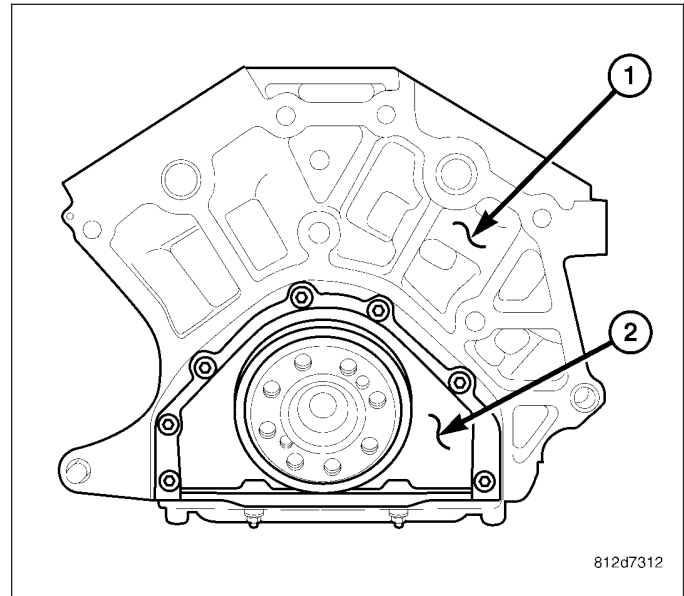


7. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

**Note:** The integrated stamped steel rear crankshaft seal is not interchangeable with the cast aluminum rear seal adapter and seal assembly.

8. Remove seal retainer attaching screws.

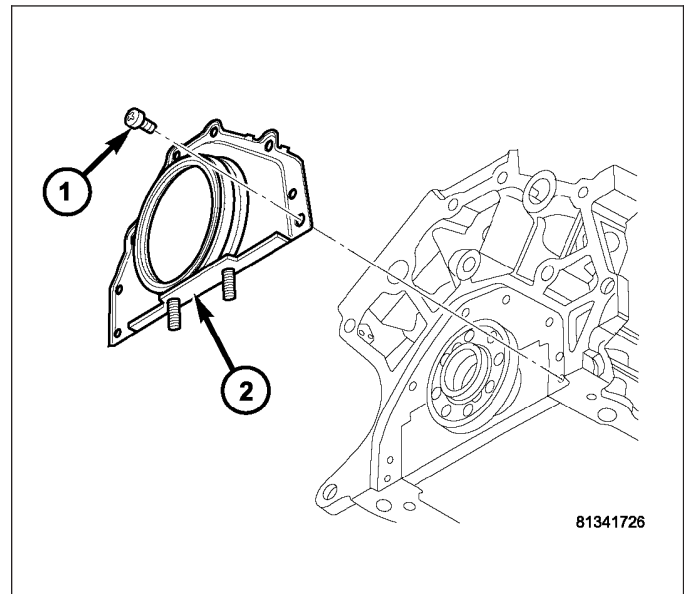
9. Remove crankshaft rear oil seal/adapter (2).



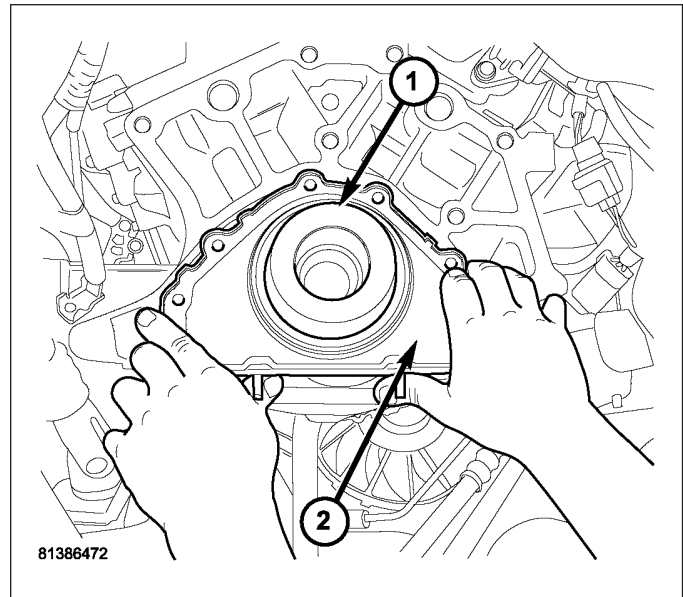
## INSTALLATION

**Note:** The integrated rear crankshaft seal (2) is not interchangeable with the cast aluminum rear seal adapter and seal assembly.

1. Clean sealing surfaces.



2. Install seal assembly (2) using special tool 6926-1(1).
3. Install seal retaining bolts finger tight.

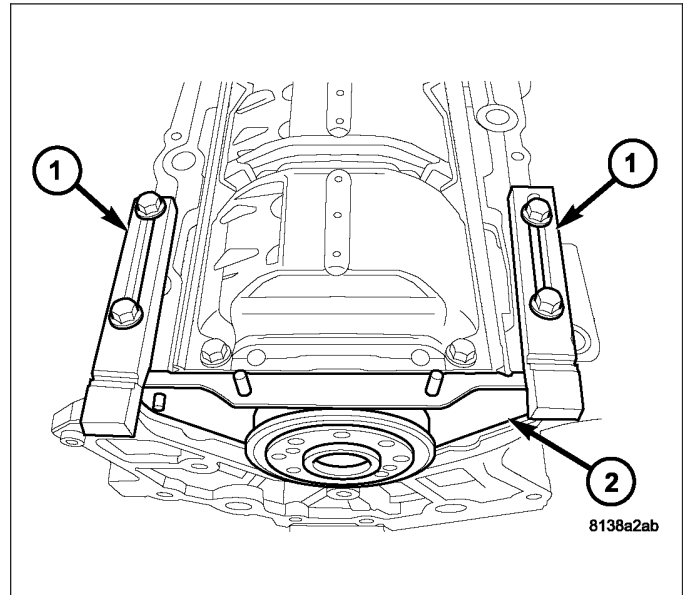


**Note:** The following steps must be performed to prevent oil leaks at sealing joints.

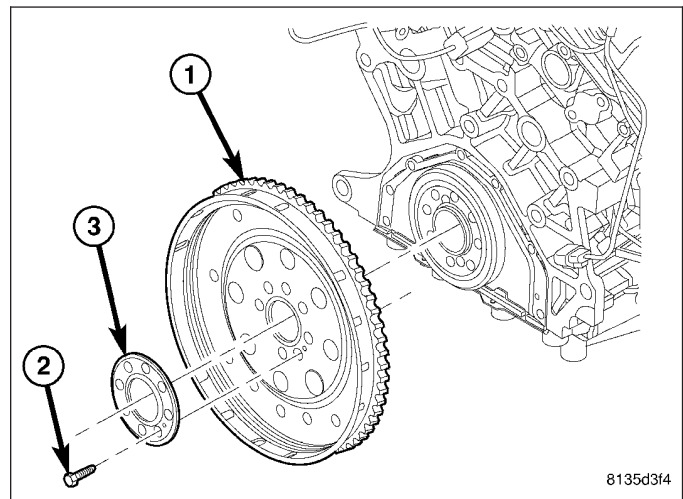
4. Attach Special Tools 8225 (1) to pan rail using the oil pan fasteners.

**Note:** Make sure that the “2.7L” stamped on the special tool is facing the cylinder block (flat side of tools against pan rail).

5. While applying firm pressure to the seal assembly (2) against Special Tools 8225 (1), tighten seal assembly screws to 12 N·m (105 in. lbs.).
6. Remove special tool 8225.
7. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

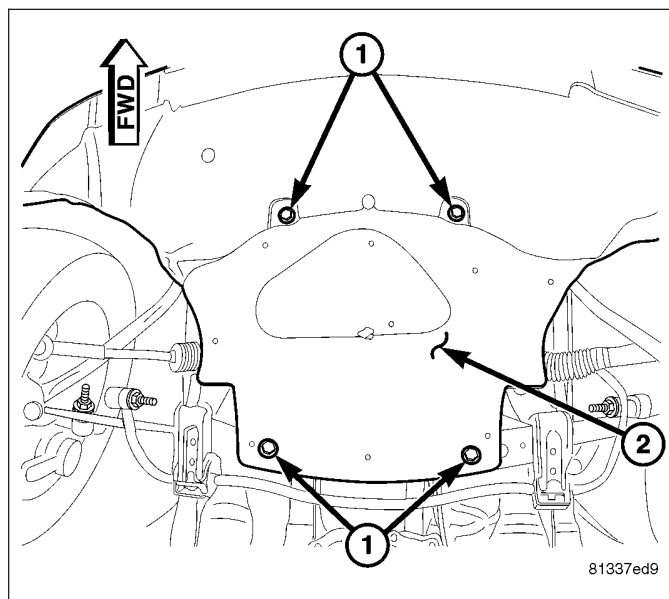


8. Install flex plate (1), backing plate (3), and attaching bolts (2) (Refer to 9 - ENGINE/ENGINE BLOCK/FLEX PLATE - INSTALLATION).
9. Install transmission (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE -

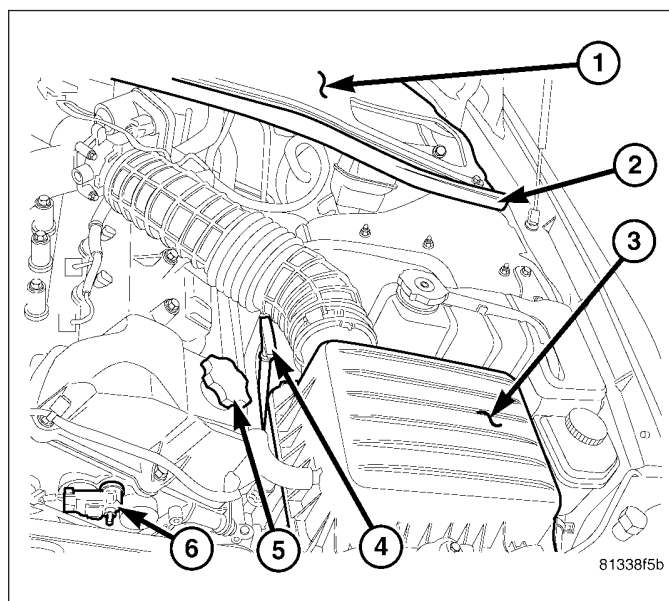


INSTALLATION).

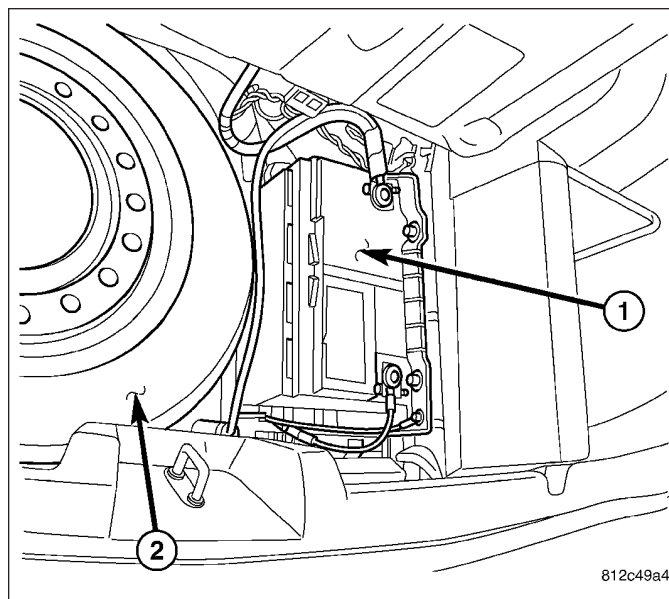
10. Install lower splash shield retaining bolts (1) and splash shield (2).
11. Lower vehicle.



12. Fill with oil (5).



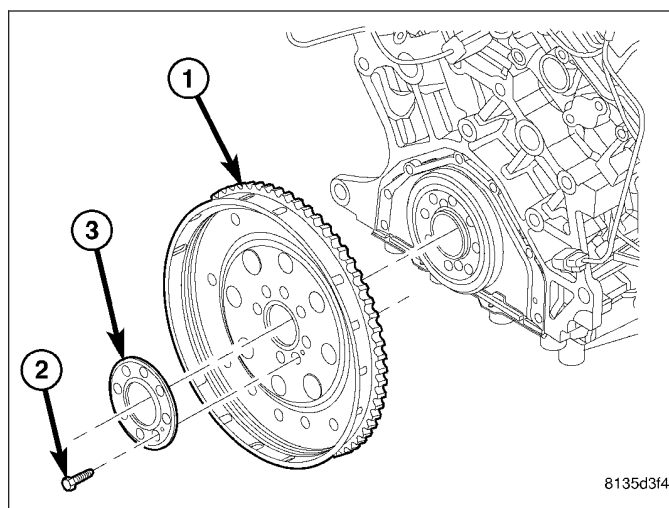
13. Connect negative battery (1) cable.
14. Start engine and check for leaks.



## PLATE-FLEX

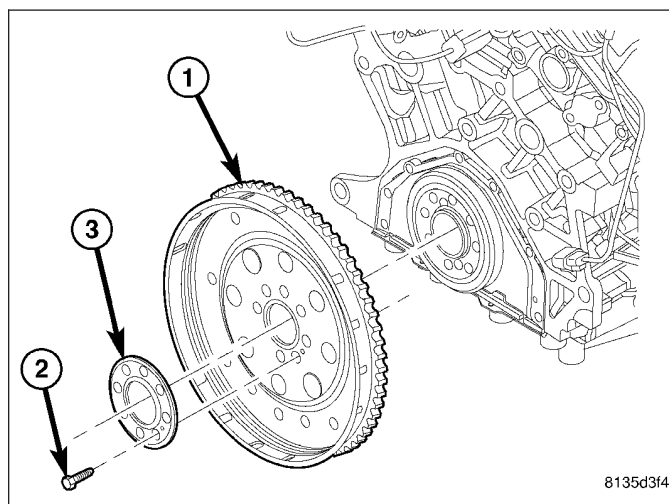
### REMOVAL

1. Remove transmission(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - REMOVAL).
2. Remove flex plate attaching bolts (2).
3. Remove backing plate (3) and flex plate (1).



## INSTALLATION

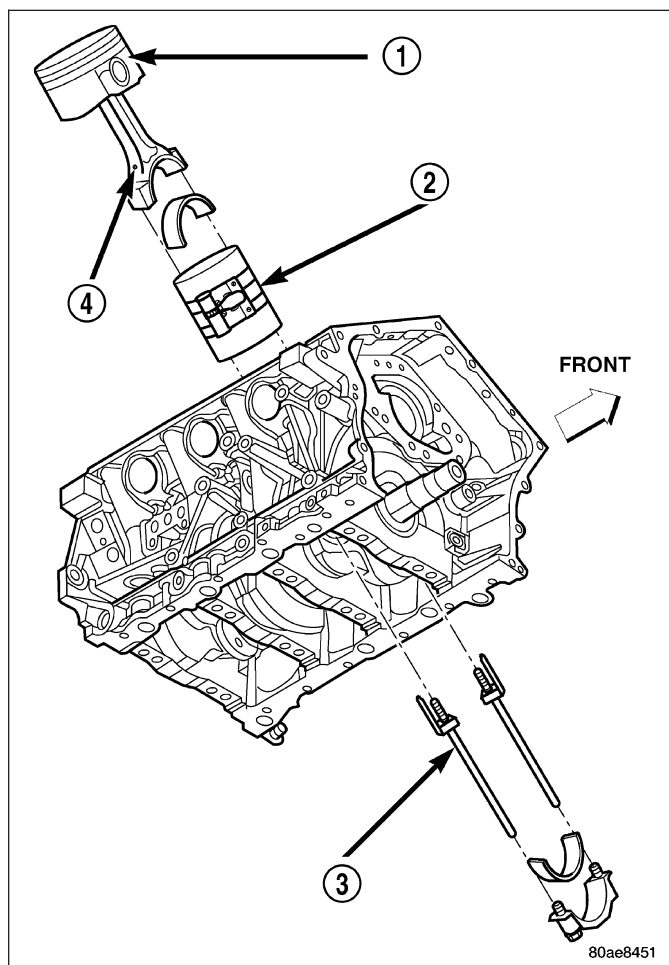
1. Install flex plate (1) and backing plate (3).
2. Apply MOPAR® Lock & Seal Adhesive to the flex plate bolts.
3. Install all flex plate bolts (2) finger tight.
4. Tighten flex plate bolts (2) to 95 N·m (70 ft. lbs.).
5. Install transmission(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - INSTALLATION).



## ROD-PISTON & CONNECTING

### DESCRIPTION

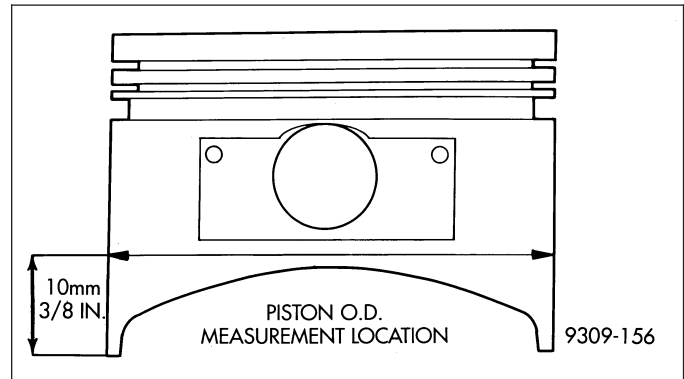
The pistons (1) are made of a high strength aluminum alloy with an anodized top ring groove. Piston skirts are coated with a solid lubricant for scuff resistance. The pistons have an "F" cast into the side next to the pin bore that must face towards the front of the engine. The connecting rods are made of powdered metal with a "fractured cap" design. The connecting rod attaches to the piston with a full floating pin retained by lock rings. The piston and connecting rod are serviced as an assembly.



## STANDARD PROCEDURE - FITTING PISTONS

The pistons have been cast and machined to one size and weight. The piston and rod assemblies are matched to weigh the same for engine balance.

Piston and cylinder wall must be clean and dry. Piston diameter should be measured 90 degrees to piston pin at size location shown. Cylinder bores should be measured halfway down the cylinder bore and transverse to the engine crankshaft center line. Refer to Engine Specifications. (Refer to 9 - ENGINE - SPECIFICATIONS) **Pistons and cylinder bores should be measured at normal room temperature, 70°F (21°C).**



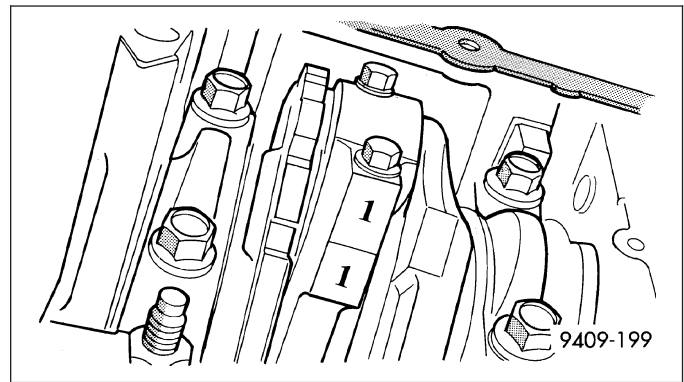
## PISTON PINS

The piston pin is full floating and is held in place by lock rings. **Do Not switch pistons with other rods.** Pistons and connecting rods are serviced as an assembly for balance.

## REMOVAL

1. Remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation. Pistons and connecting rods must be removed from top of cylinder block. When removing piston and connecting rod assemblies from the engine, rotate crankshaft so that each connecting rod is centered in cylinder bore.**

**Note:** Connecting rod bearing caps are not interchangeable and should be marked before removing to ensure correct reassembly.



**CAUTION:** DO NOT use a number stamp or a punch to mark connecting rods. Damage to connecting rod could occur.

2. Mark connecting rod and bearing cap positions using a permanent ink marker or scribe tool.

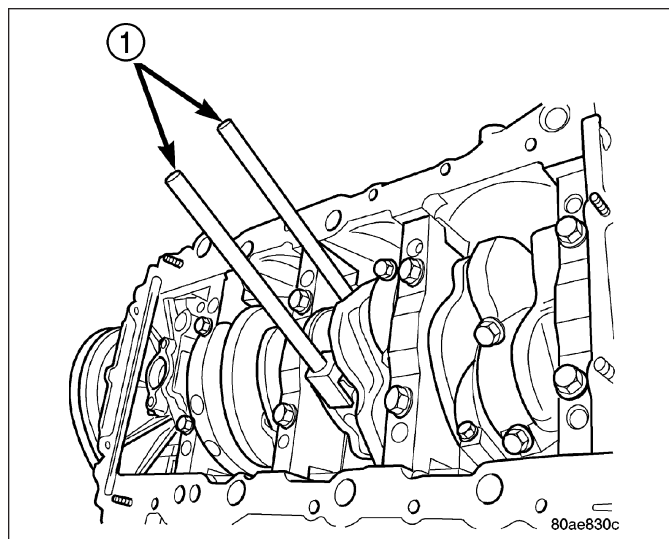


**CAUTION:** Care must be taken not to damage the fractured rod and cap joint face surfaces, as engine damage may occur.

3. Remove connecting rod cap. Install Special Tool 8189 Connecting Rod Guides (1) into the connecting rod being removed. Remove each piston and rod assembly out of cylinder bore.

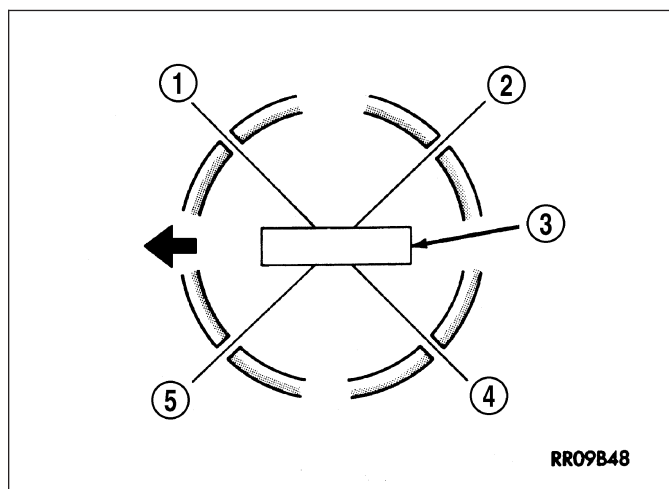
**Note:** Be careful not to nick crankshaft journals.

4. After removal, install bearing cap on the mating rod to prevent damage to the fractured cap to rod surfaces.



## INSTALLATION

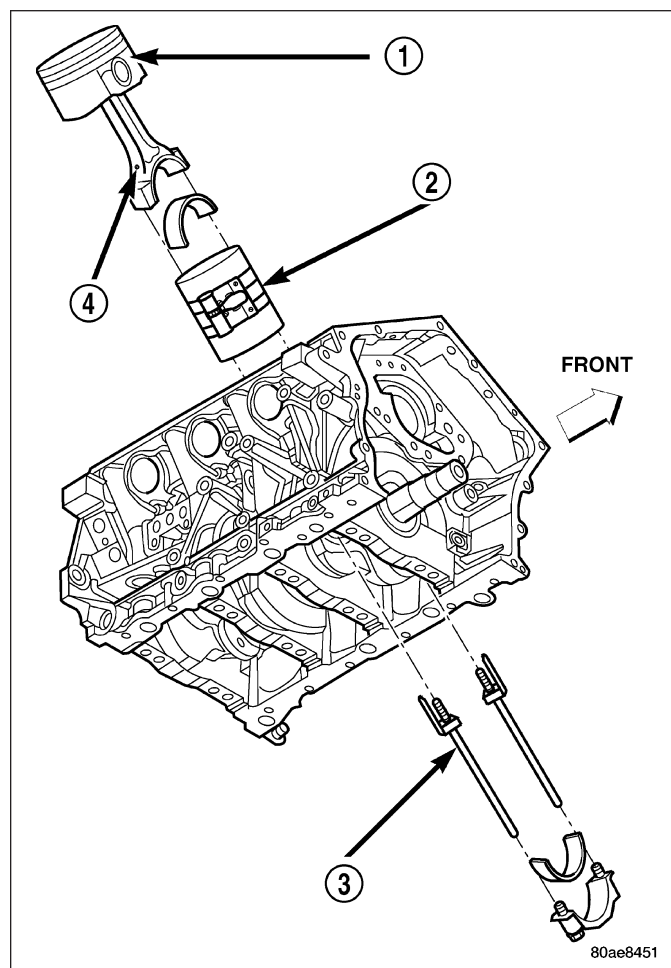
1. Install the piston rings (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - INSTALLATION).
2. Before installing piston and connecting rod assemblies into the bore, ensure that compression ring gaps (2&5) are staggered so that neither is in line with oil ring gap (1&4).
3. Before installing the ring compressor, make sure the oil ring expander (5) ends are butted and the rail gaps located as shown (1&4).
4. Immerse the piston head and rings in clean engine oil, slide the ring compressor over the piston and tighten with the special wrench. **Ensure position of rings does not change during this operation.**

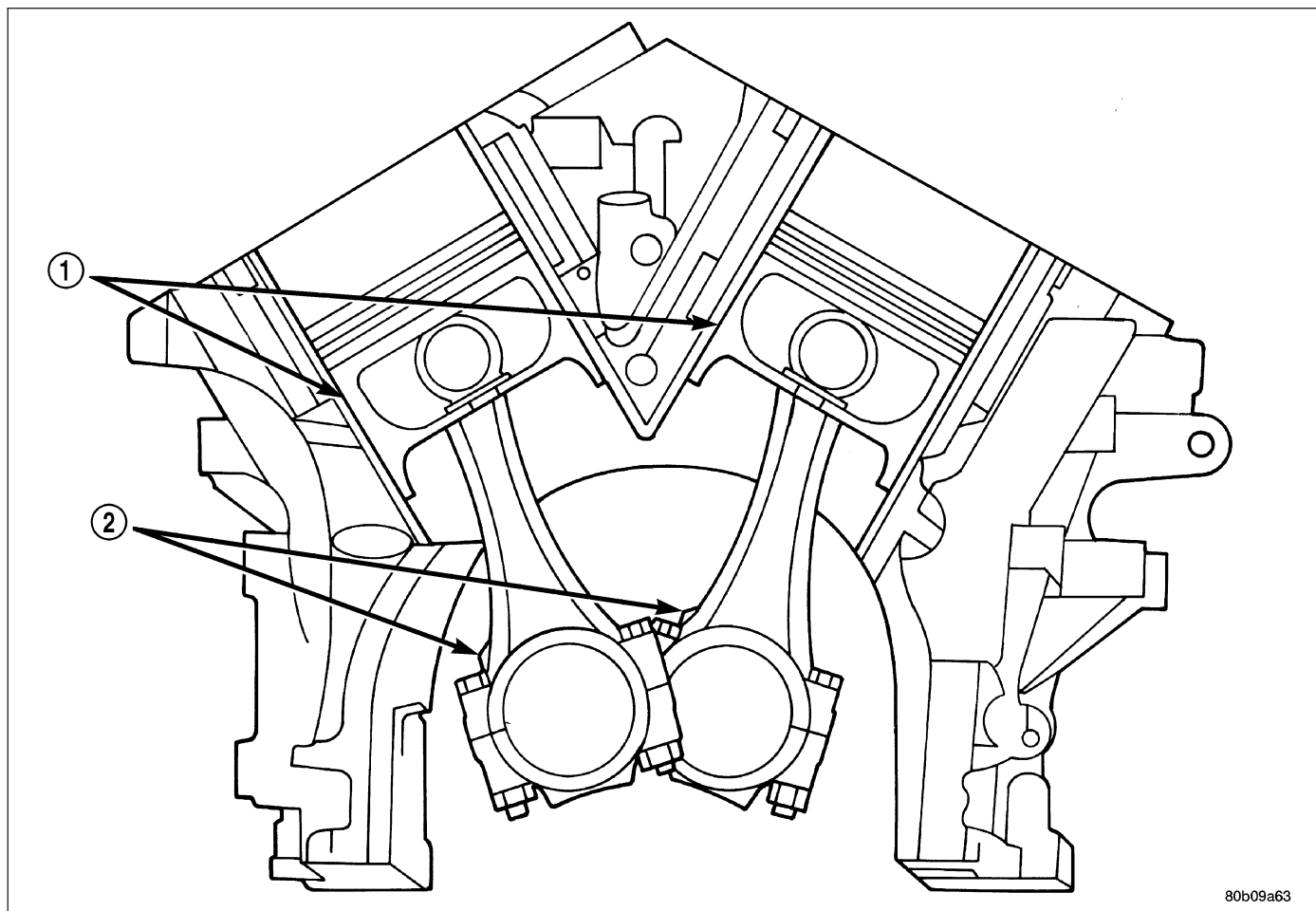




**CAUTION:** Ensure the hole in bearing half aligns with hole in connecting rod, as damage to engine may occur.

5. Position bearing onto connecting rod. Ensure that hole in bearing half is aligned to hole in connecting rod. Lubricate bearing surface with clean engine oil.
6. Install Special Tools 8189 Connecting Rod Guides (3) into connecting rod.
7. The pistons(1) are marked on top with an arrow and with an "F" (Front) above the pin boss. These marks must be pointing towards the front of engine on both cylinder banks.





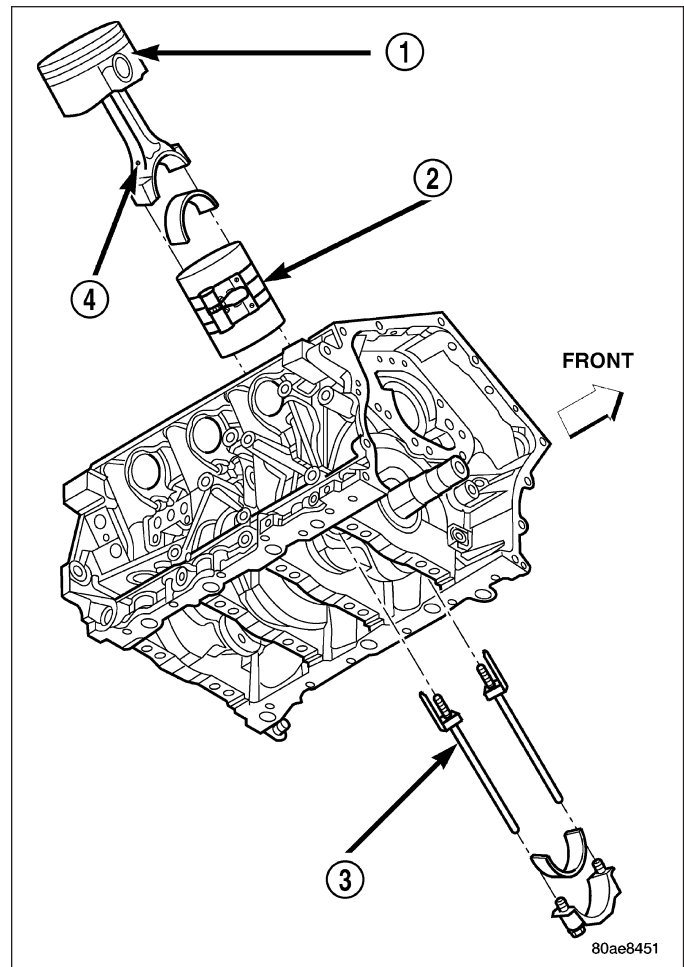
80b09a63

8. The connecting rod oil squirt hole (2) faces the major thrust (right) side of the block (1).

9. Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Insert rod and piston into cylinder bore and guide rod over the crankshaft journal.

**CAUTION: Do Not interchange piston assemblies bank to bank, as engine damage may occur.**

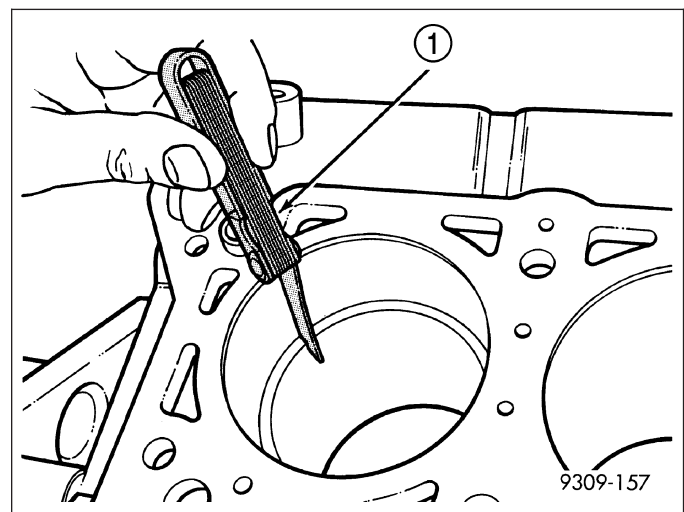
10. Tap the piston down in cylinder bore, using a hammer handle. At the same time, guide connecting rod into position on connecting rod journal.
11. Lubricate rod bolts and bearing surface with engine oil. Install connecting rod cap and bearing. Tighten bolts to 27 N·m (20 ft. lbs.) Plus 1/4 turn.



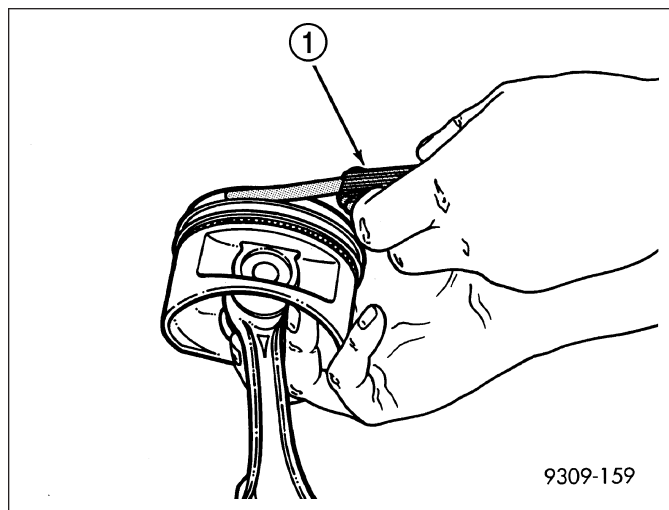
## RINGS-PISTON

### STANDARD PROCEDURE - PISTON RING FITTING

1. Wipe cylinder bore clean. Insert ring and push down with piston to ensure it is square in bore. The ring gap measurement must be made with the ring positioning at least 12 mm (0.50 inch.) from bottom of cylinder bore. Check gap with feeler gauge (1). Refer to (Refer to 9 - ENGINE - SPECIFICATIONS) for clearance measurements.

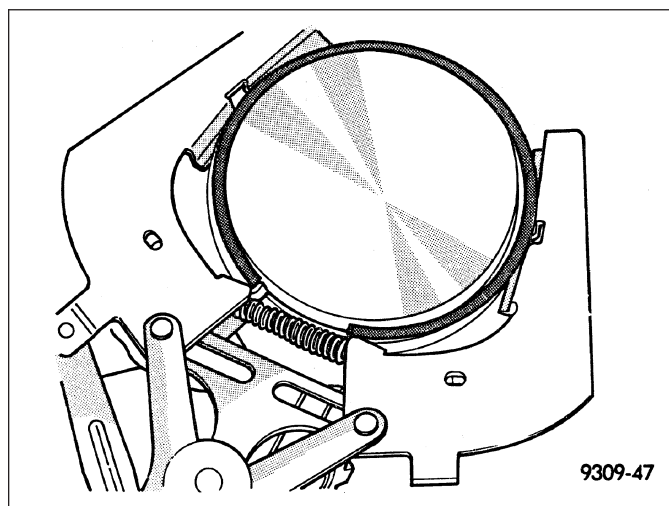


2. Check piston ring to groove clearance with feeler gauge (1). For clearance specifications (Refer to 9 - ENGINE - SPECIFICATIONS).

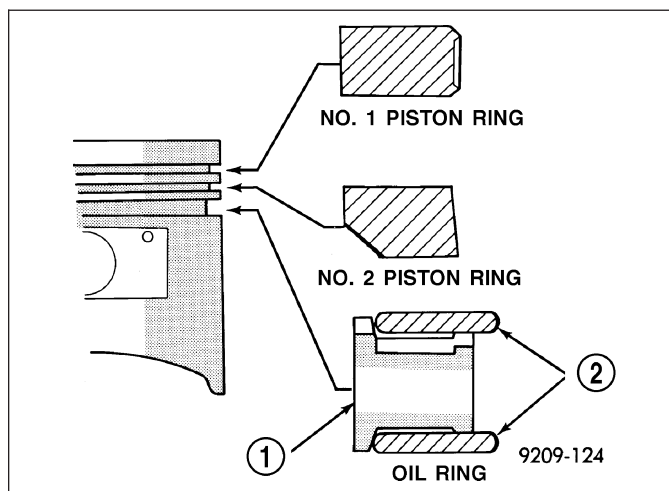


## REMOVAL

1. Remove piston and connecting rod(Refer to 9 - ENGINE/ENGINE BLOCK/PISTON & CONNECTING ROD - REMOVAL).
2. Remove No. 1 and No.2 piston rings from piston using a ring expander tool.



3. Remove upper oil ring side rail (2).
4. Remove lower oil ring side rail (2).
5. Remove oil ring expander (1).

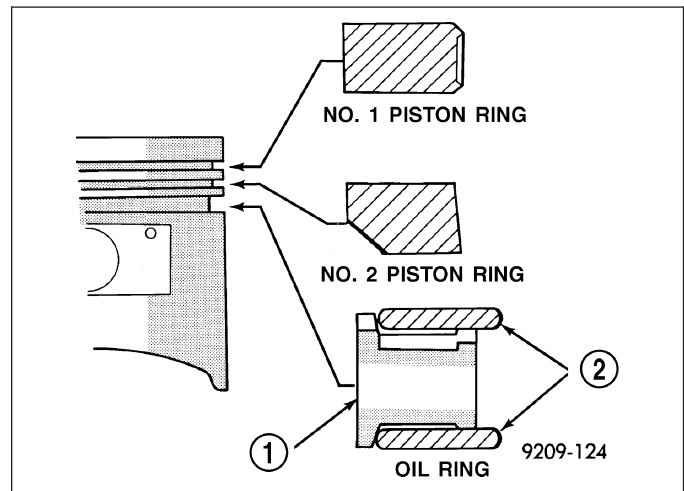


## INSTALLATION

1. Measure clearance of piston rings to the cylinder bore and piston. (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - STANDARD PROCEDURE)

**CAUTION:** Install piston rings in the following order:

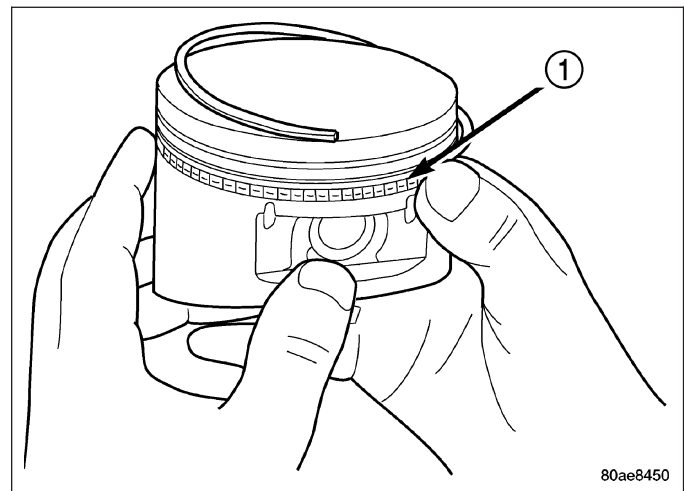
- Oil ring expander.
- Lower oil ring side rail.
- Upper oil ring side rail.
- No. 2 Intermediate piston ring.
- No. 1 Upper piston ring.



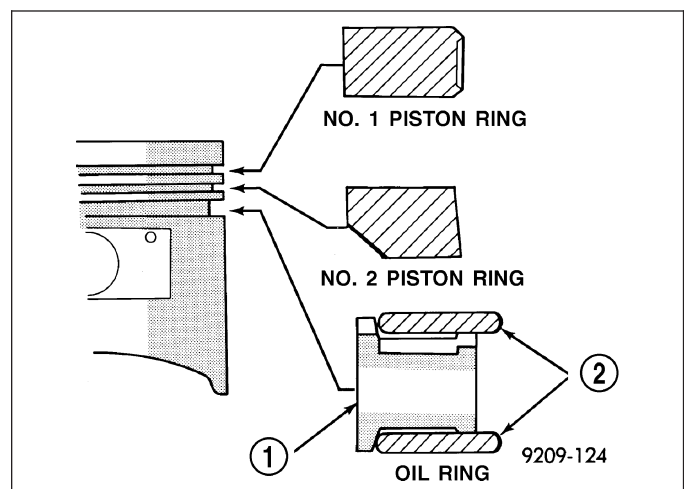
2. Install oil ring expander.

Install the side rail by placing one end between the piston ring groove and the oil ring expander. Hold end firmly and press down the portion to be installed until side rail is in position. **Do not use a piston ring expander during this step.**

3. Install lower side rail first and then the upper side rail.

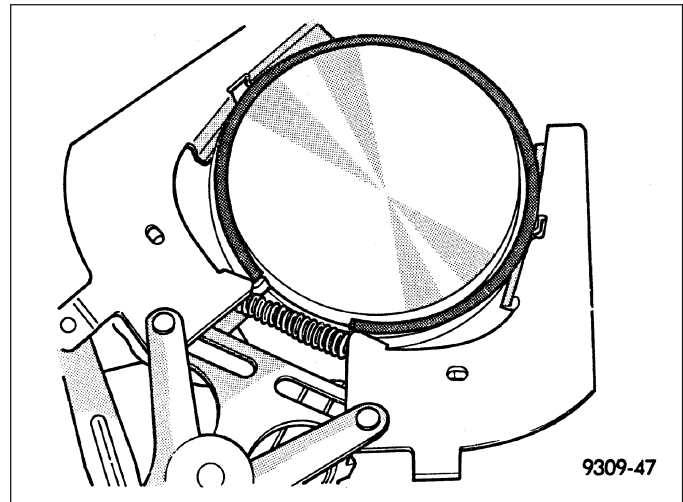


**Note:** The No. 1 and No. 2 piston rings have a different cross section. Ensure No. 2 ring is installed with manufacturers I.D. mark (dot) facing up, towards top of the piston.

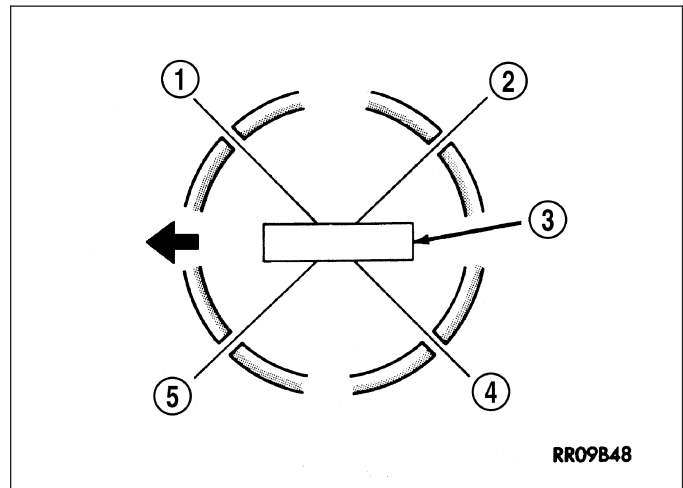


**Note:** Be sure to use a ring expander to install piston rings.

4. Install No. 2 piston ring and then No. 1 piston ring.



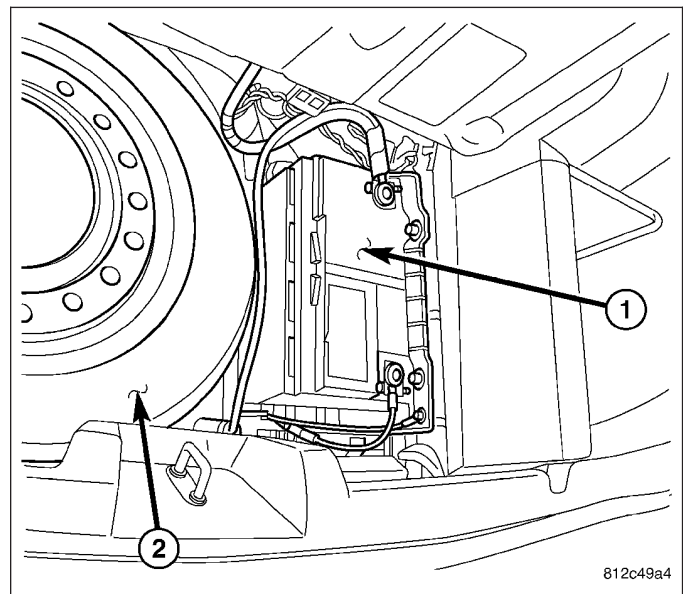
5. Position oil ring expander gap (5) as shown. Staggering ring gap is important for oil control.
6. Position piston lower side rail end gap (4) as shown.
7. Position piston upper side rail end gap (1) as shown.
8. Position piston ring no. 2 (5) end gap as shown in
9. Position piston ring no. 1 (2) end gap as shown in.



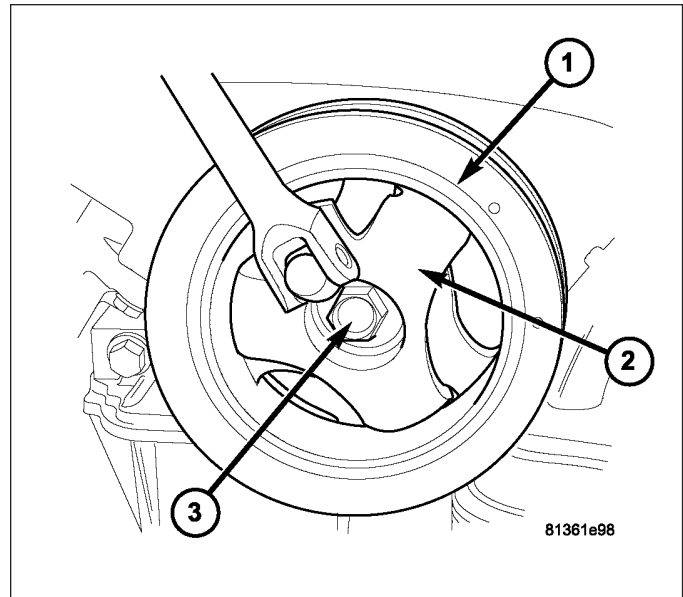
## DAMPER-VIBRATION

### REMOVAL

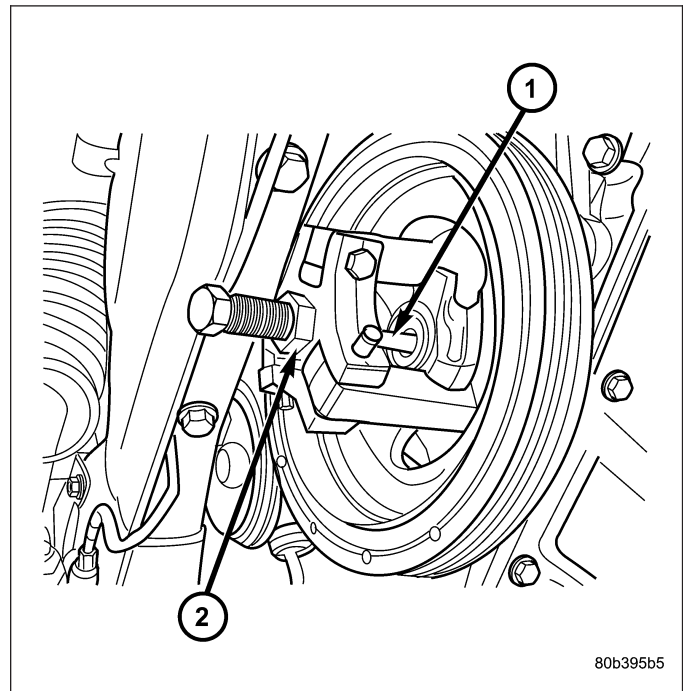
1. Disconnect negative battery (1) cable located in trunk.
2. Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).



3. Use special tool 9365 Damper Holder (2) to hold damper (1) while removing attaching bolt (3).

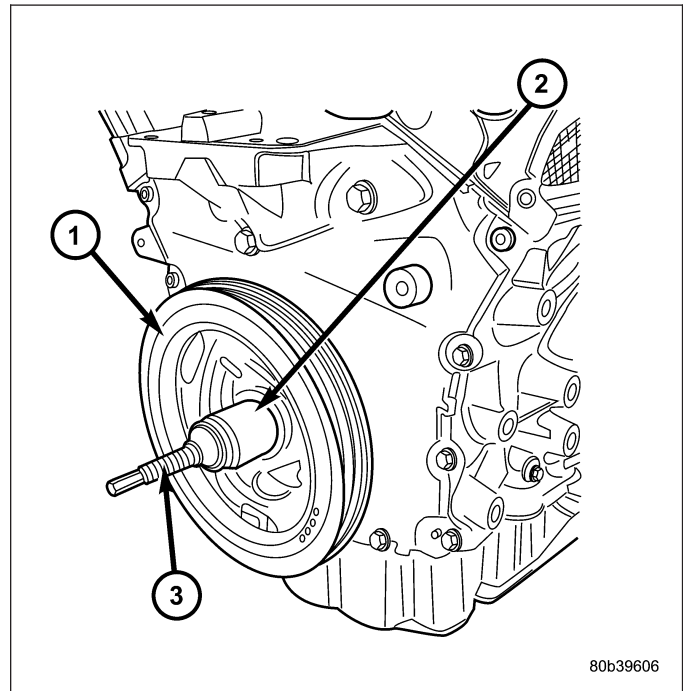


4. Remove damper by using Special Tools 8194 Insert (1) and 8454 Puller (2).

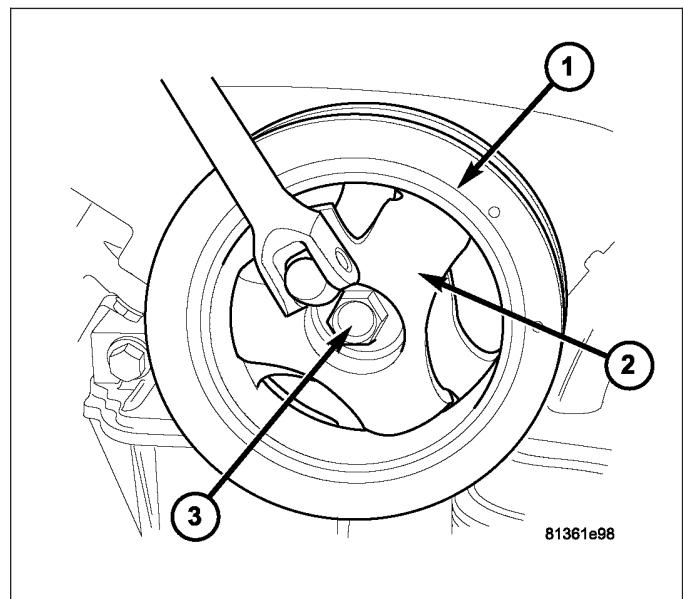


## INSTALLATION

1. Install damper (1) using Special Tools 8179 Screw (3), with Nut and Thrust Bearing from 6792, and 6792-1 Installer (2).

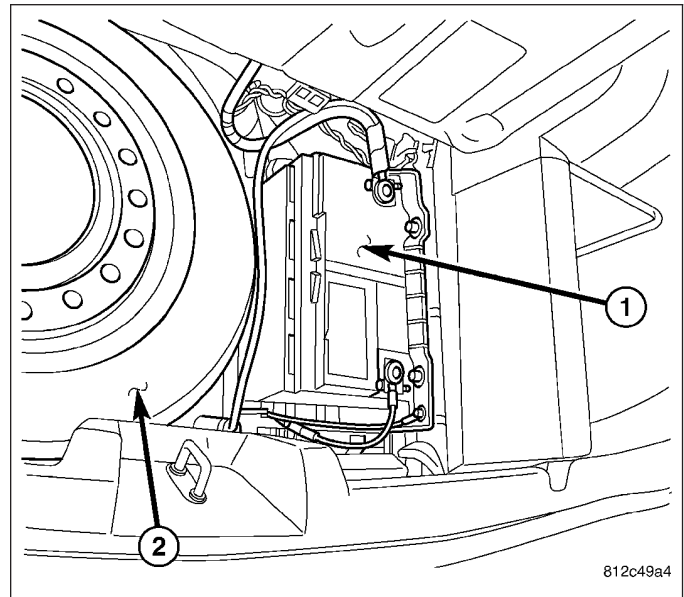


2. Install damper attaching bolt (3). Use special tool 9365 damper holder (2) to hold damper (1) while tightening attaching bolt to 170 N·m (125 ft. lbs.).
3. Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).





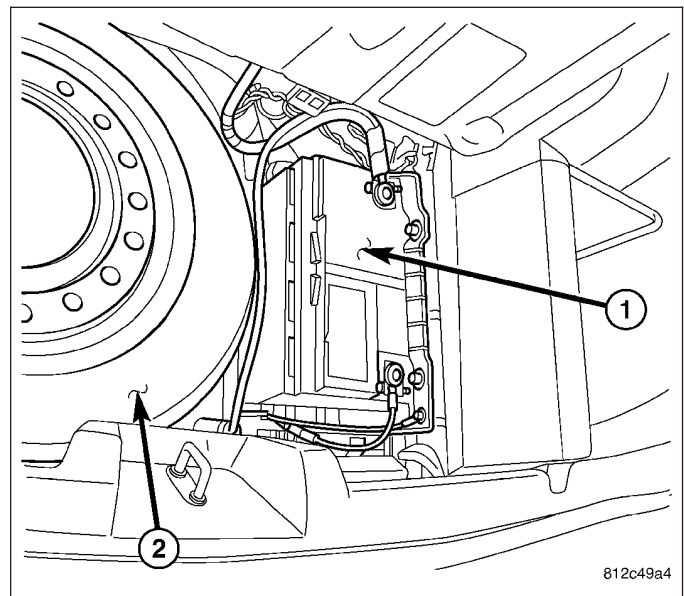
4. Connect negative battery (1) cable located in trunk.



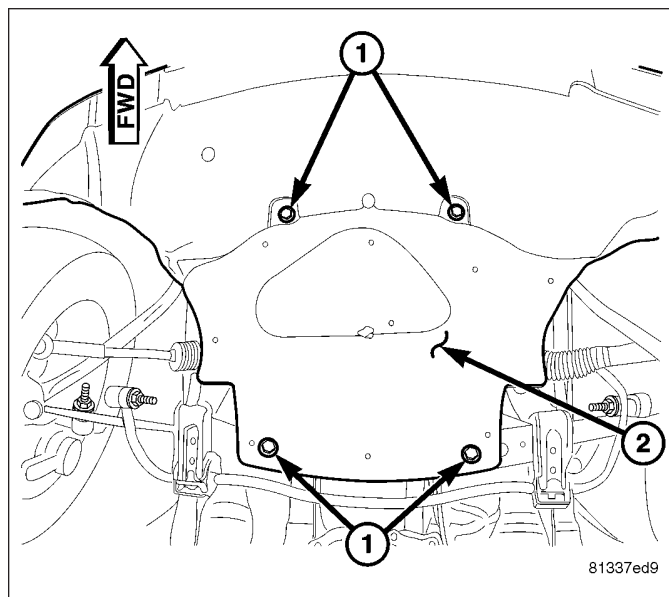
## WINDAGE TRAY

### REMOVAL

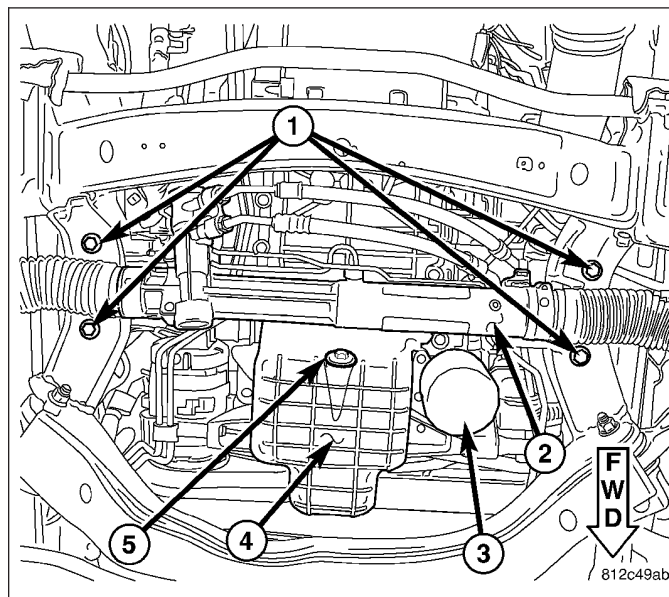
1. Disconnect negative battery (1) cable located in the trunk.
2. Raise vehicle.



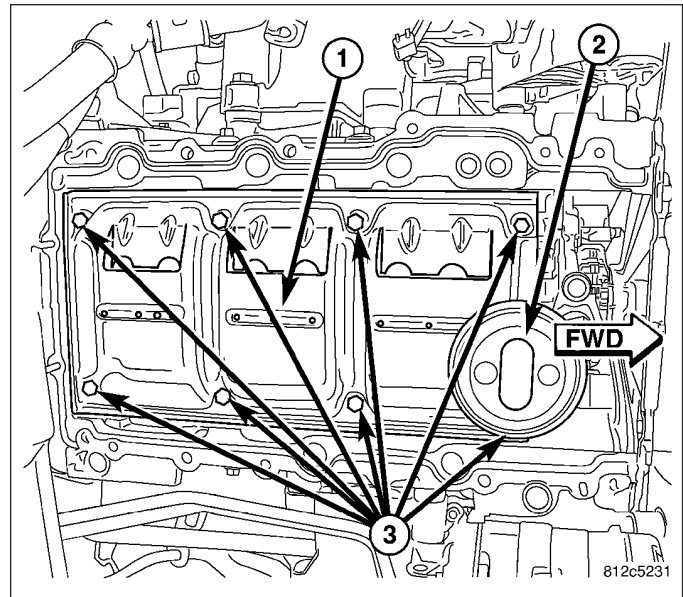
3. Remove lower splash shield retaining bolts (1) and splash shield (2).



4. Remove oil filter (3).
5. Remove oil pan (4)(Refer to 9 - ENGINE/LUBRI-CATION/OIL PAN - REMOVAL).



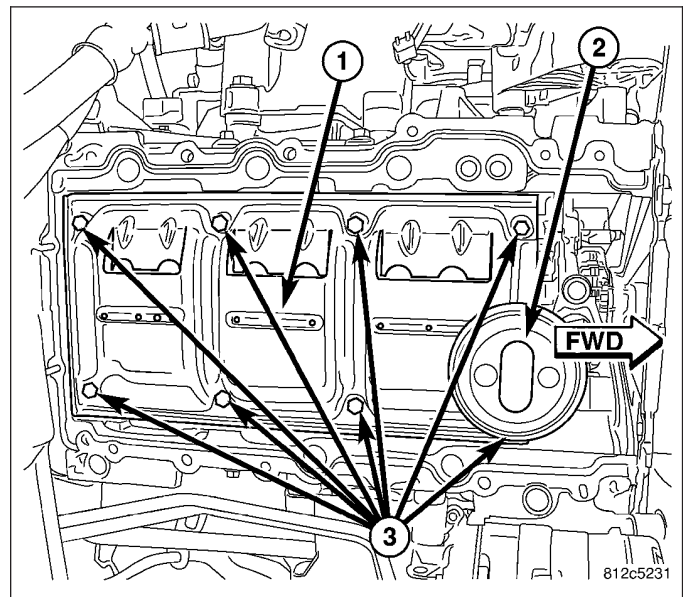
6. Remove oil pump pickup tube (2).
7. Remove windage tray/outer main bearing cap bolts (3).
8. Remove windage tray (1).



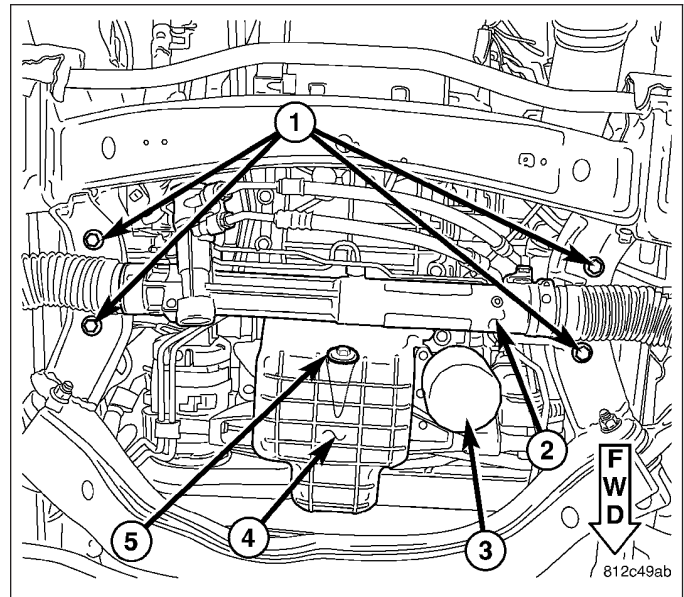
## INSTALLATION

**Note:** Slots in windage tray should be on the right side of engine. If windage tray is improperly installed, damage to oil pan could result.

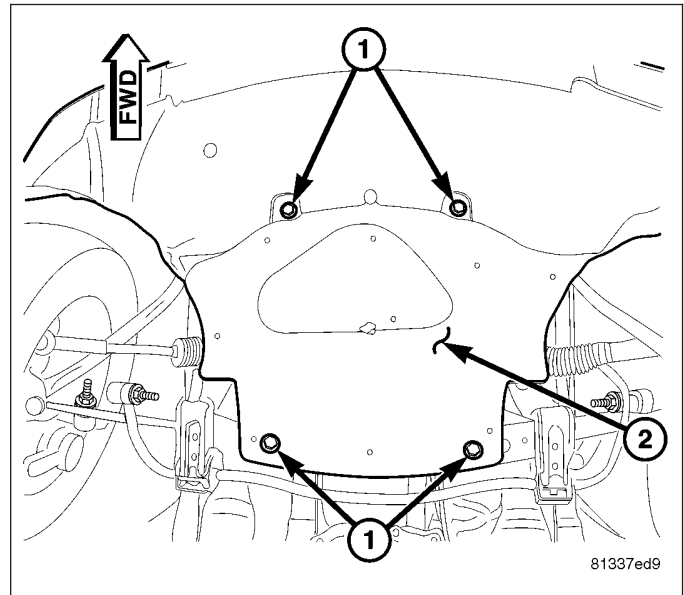
1. Install windage tray (1) torque mounting bolts to 27N·m + 1/4 turn (20 Ft. Lbs. + 1/4 turn).
2. Install oil pump pick up tube, torque mounting bolts to 28 N·m (250 In. Lbs.).



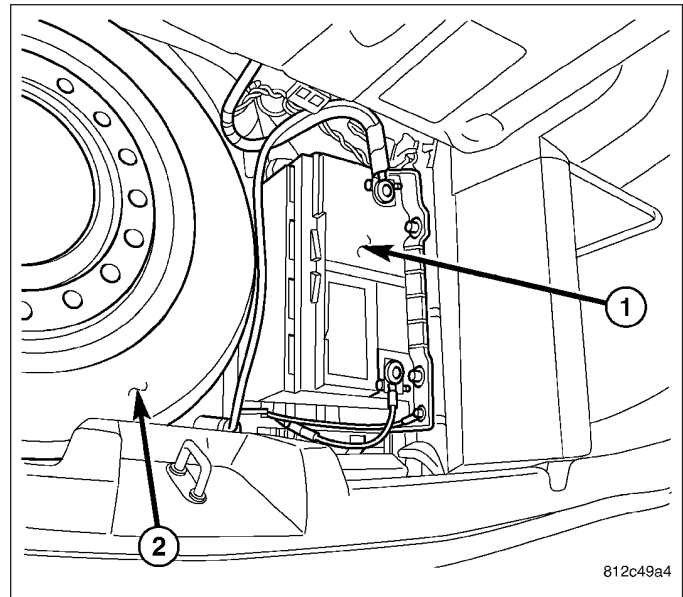
3. Install oil pan(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
4. Install oil filter (3).



5. Install lower splash shield (2) and retaining bolts (1).
6. Lower vehicle.
7. Fill with correct grade of oil.

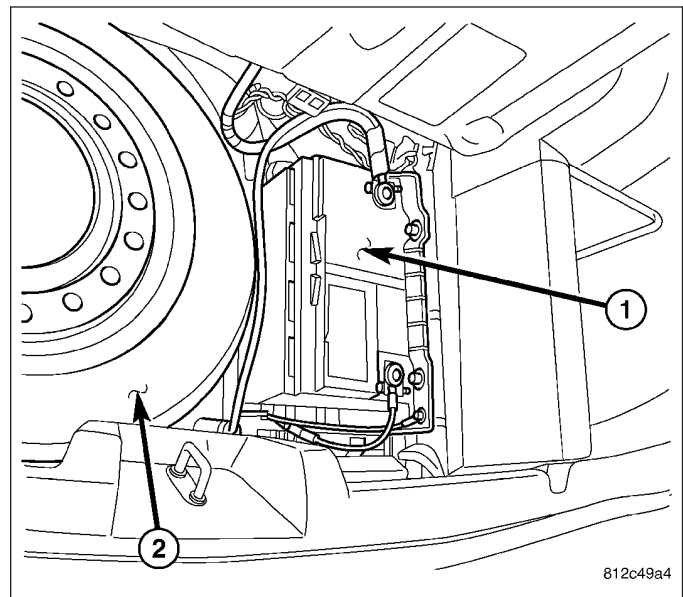


8. Connect negative battery (1) cable located in trunk.
9. Start engine and check for leaks.

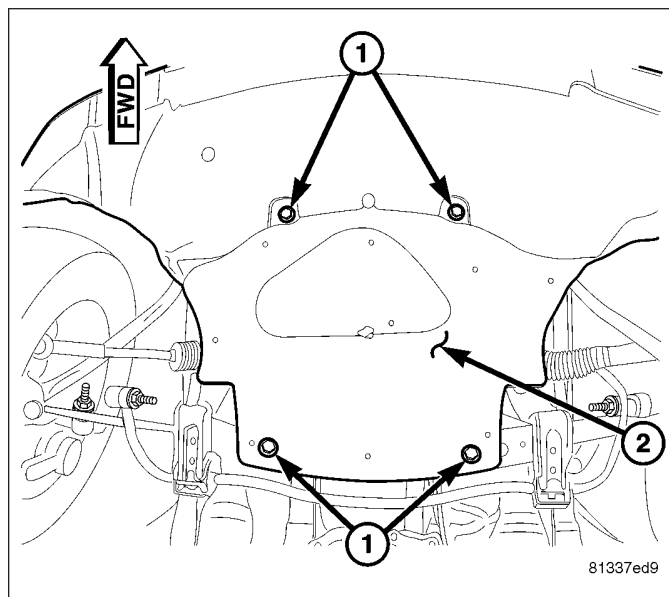


## COLLAR-STRUCTURAL REMOVAL

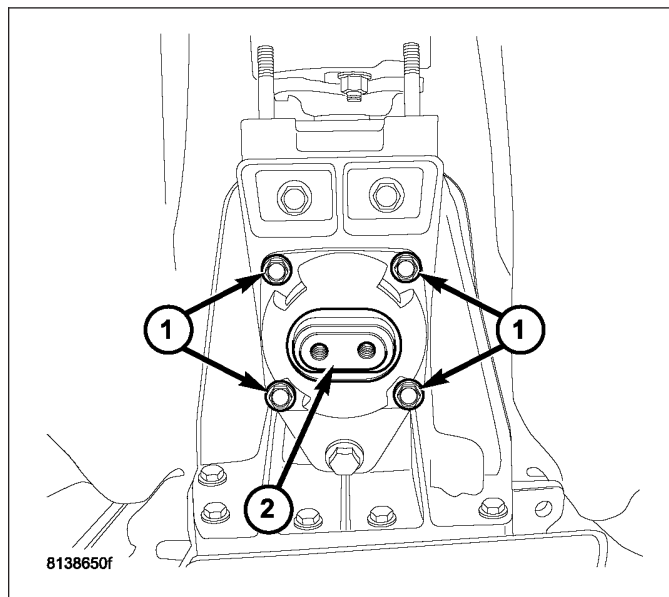
1. Disconnect negative battery (1) cable located in trunk.



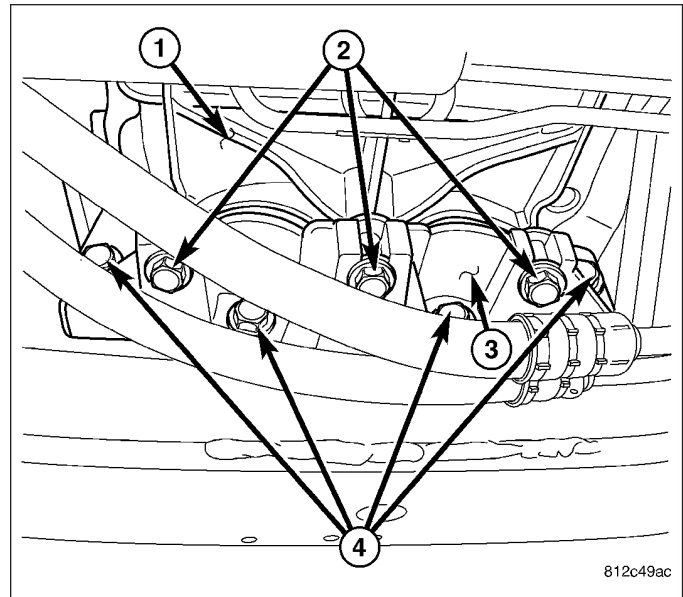
2. Raise vehicle on hoist.
3. Remove lower splash shield retaining bolts (1) and splash shield (2).



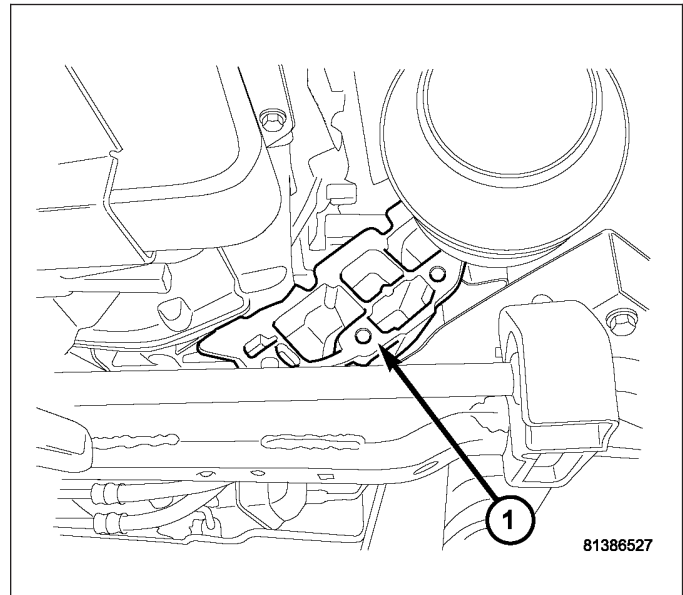
4. Remove transmission mount bolts (2).
5. Place a transmission jack under the transmission pan and raise engine and transmission.



6. Remove bolts attaching structural collar to oil pan (3) and transmission bell housing (4).

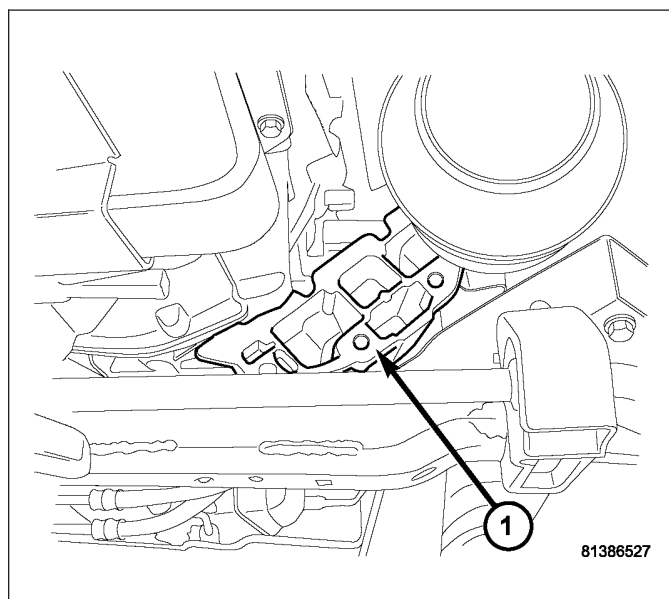


7. Move structural collar (1) to the right.
8. Remove structural collar (1) out towards the rear.



## INSTALLATION

1. Install structural collar (1) from the right rear.

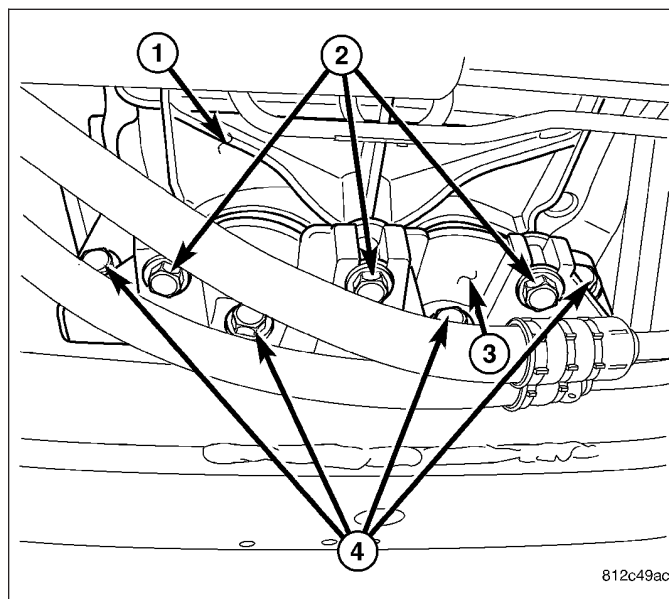


**CAUTION:** The structural collar must be tightened using this service procedure, or damage to transmission case and/or oil pan may occur.

2. Position structural collar (3) in place.
3. Finger tighten all bolts (2&4).

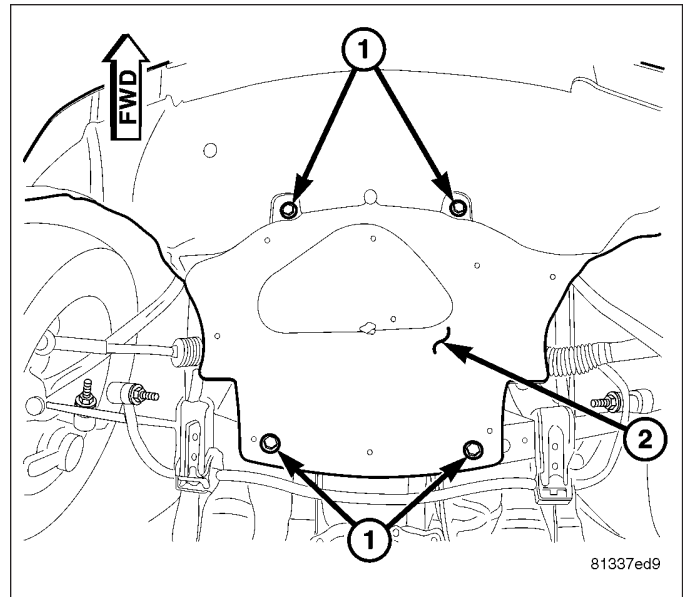
**Note:** Make sure that structural collar (3) is flush with the oil pan (1) and the transmission bell housing.

4. Tighten the structural collar to oil pan bolts (2) to 55 N·m (40 ft. lbs.).
5. Tighten structural collar to transmission bolts (4) to 55 N·m (40 ft. lbs.).

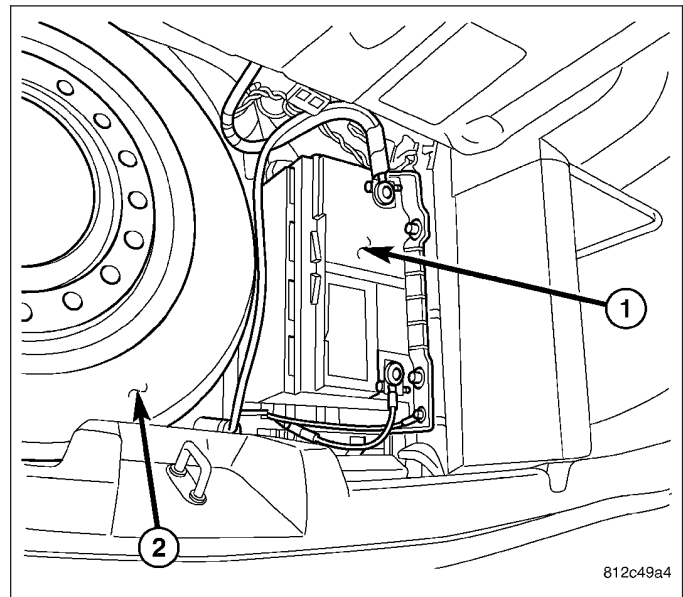




6. Install lower splash shield(2) and retaining bolts (1).
7. Lower vehicle.



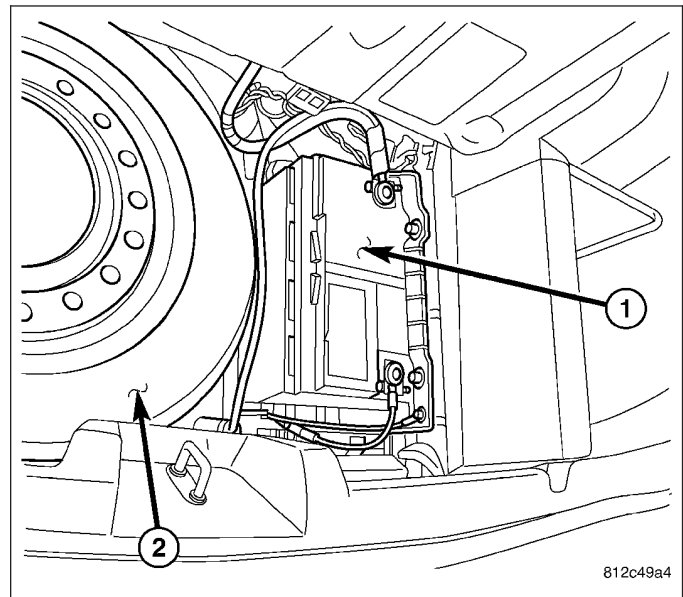
8. Connect neative battery (1) cable.



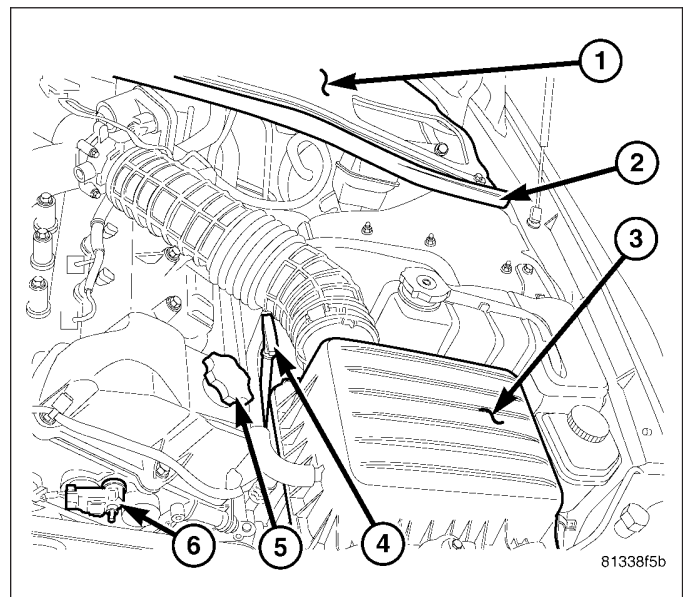
## MOUNT-LEFT

### REMOVAL

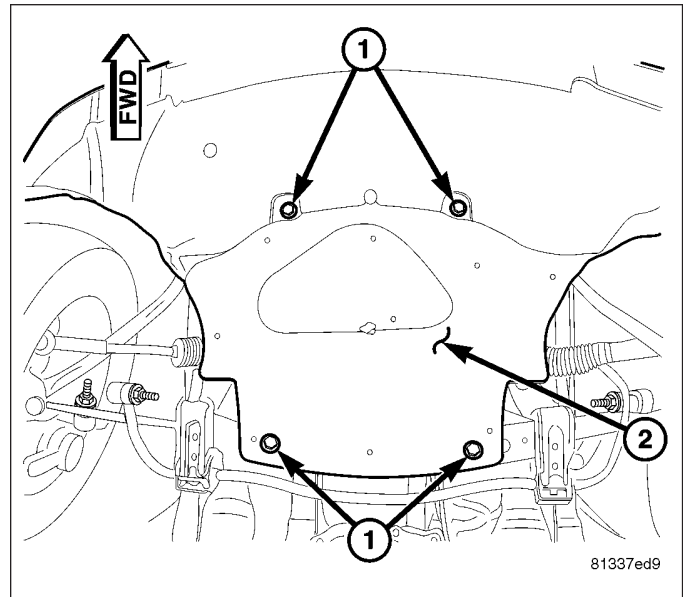
1. Disconnect negative battery (1) cable located in trunk.



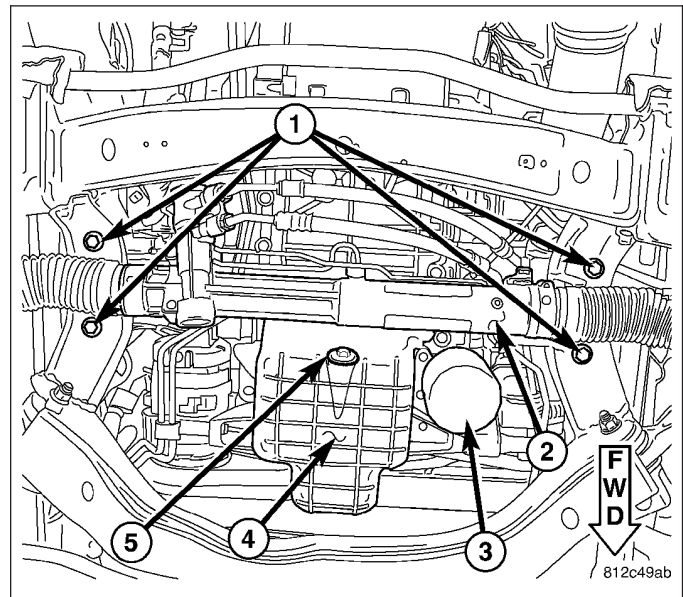
2. Remove air cleaner housing (3)(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
3. Raise vehicle.



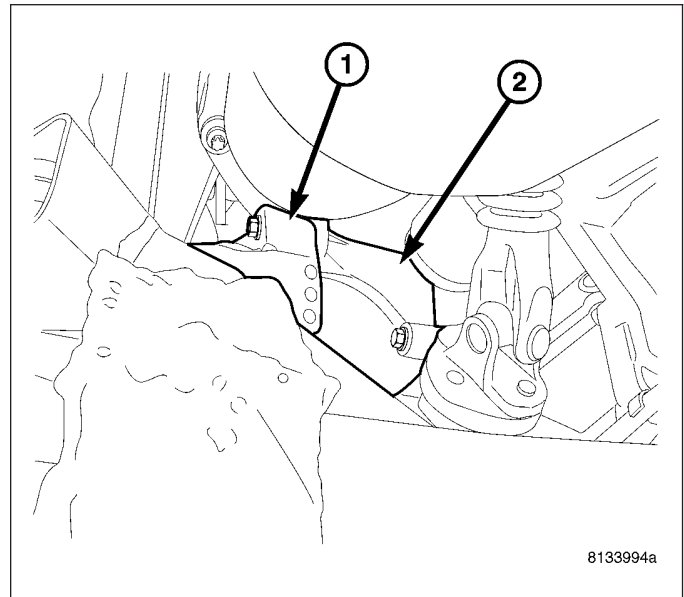
4. Remove lower splash shield retaining bolts (1) and splash shield (2).



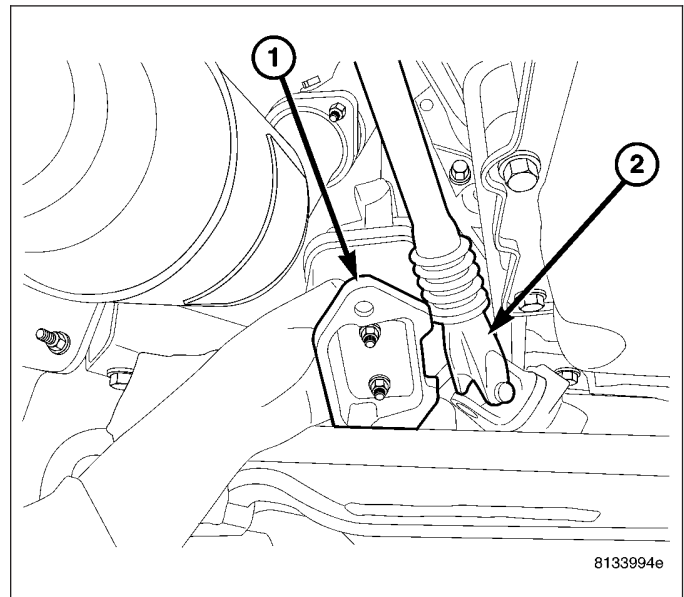
5. Remove engine mount nuts (1).
6. Remove engine mount studs (1) from the left mount isolater.
7. Place a block of wood under the oil pan (4) and raise engine with suitable jackstand.



8. Remove engine mount isolater (1) to engine mount adapter (2) bolts.

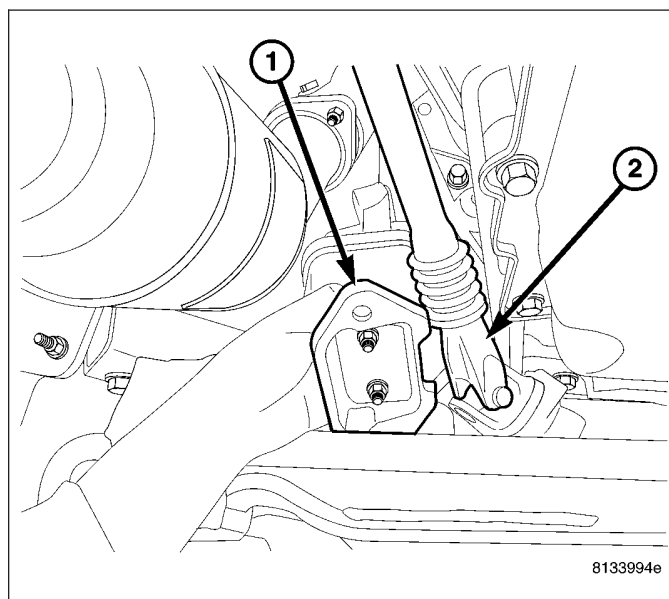


9. Remove engine mount isolater (1).

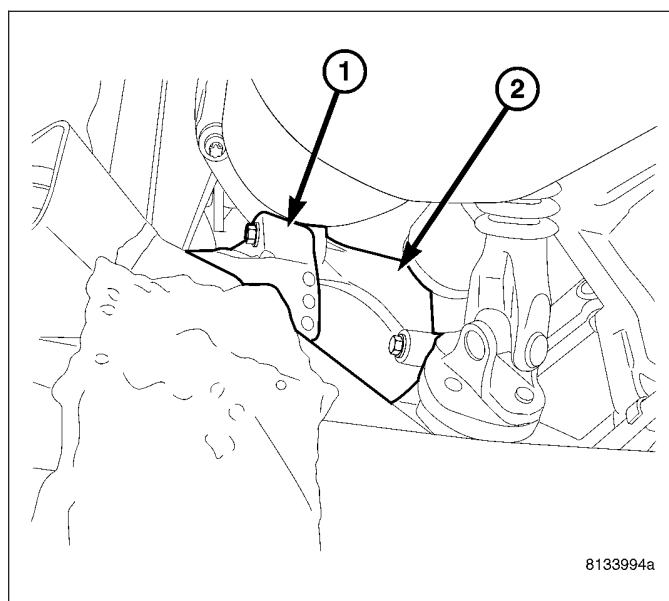


## INSTALLATION

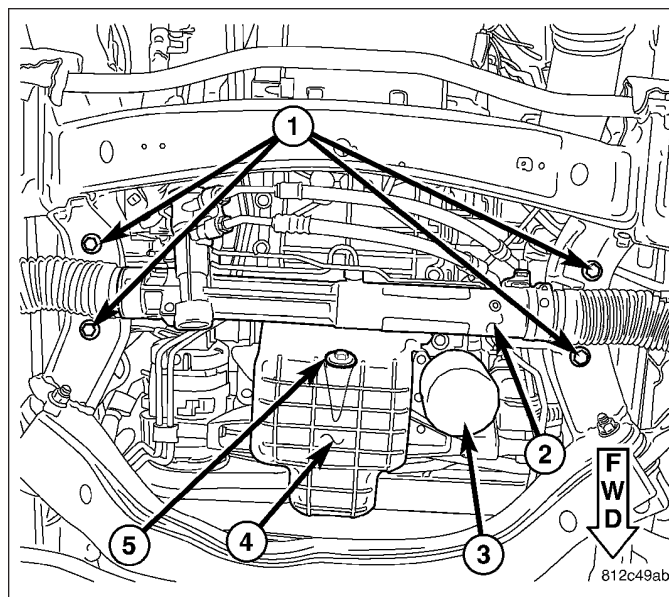
1. Install engine mount isolater (1) in place.



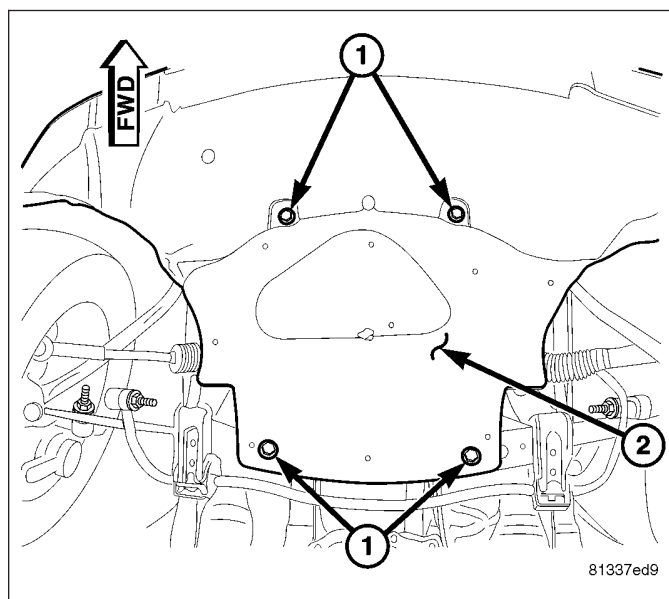
2. Attach left engine mount isolater (1) to engine mount adapter (2). Install bolts and tighten to 75 N·m (55 ft. lbs.).
3. Lower engine but do not let mount contact frame.
4. Install engine mount studs and tighten to 12N·m (106 in. lbs.).



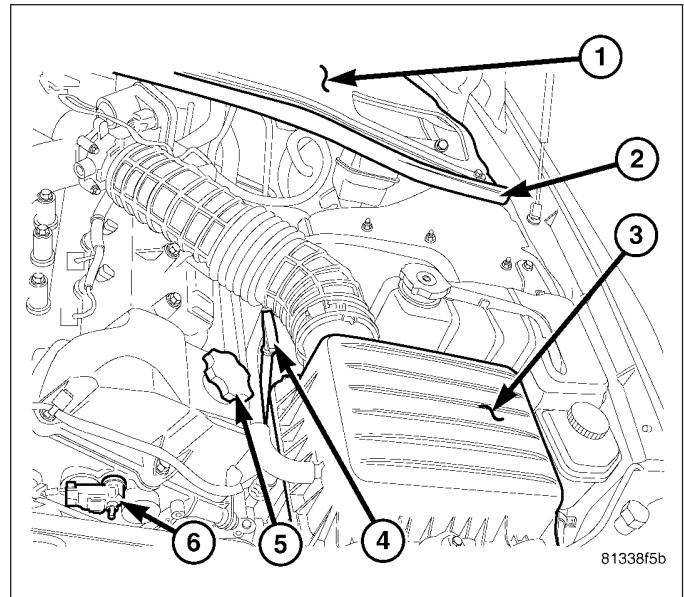
5. Lower engine and remove lifting device.
6. Tighten engine mount isolater nuts (1) to 75 N-m (55 ft. lbs.).



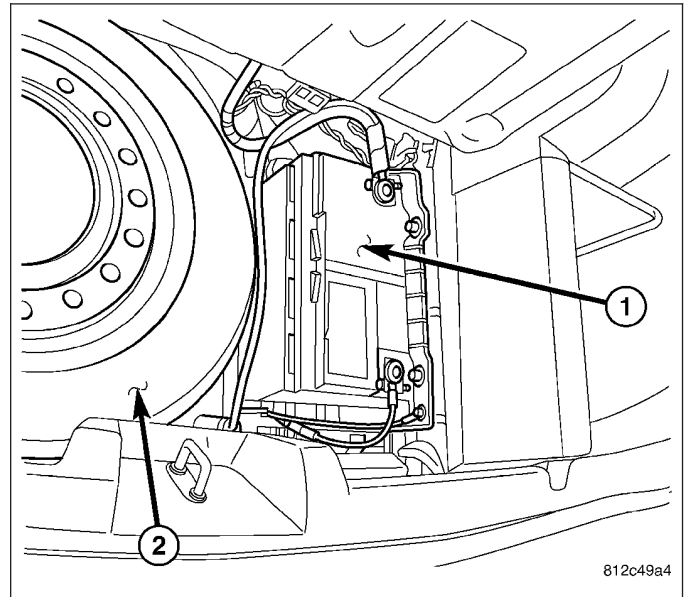
7. Install lower splash sheild (2) and tighten retaining bolts(1).
8. Lower vehicle.



9. Install air cleaner housing assembly (3)(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).



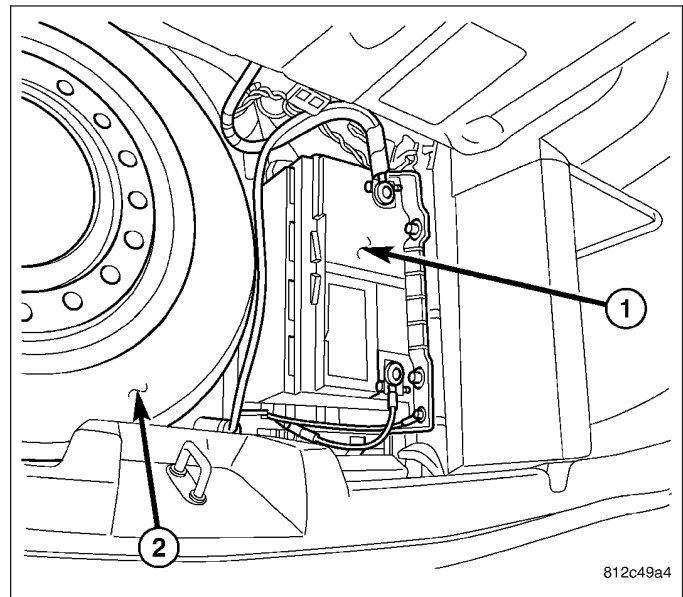
10. Connect negative battery (1) cable.



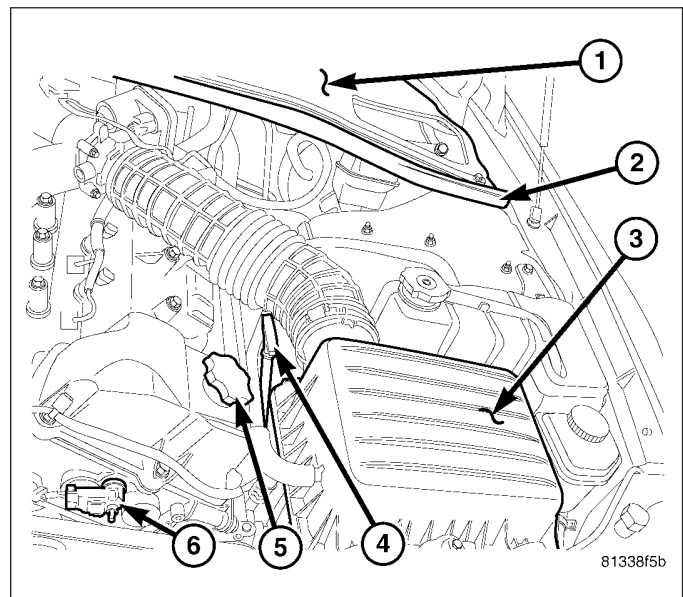
## MOUNT-RIGHT

### REMOVAL

1. Disconnect negative battery (1) cable located in trunk.

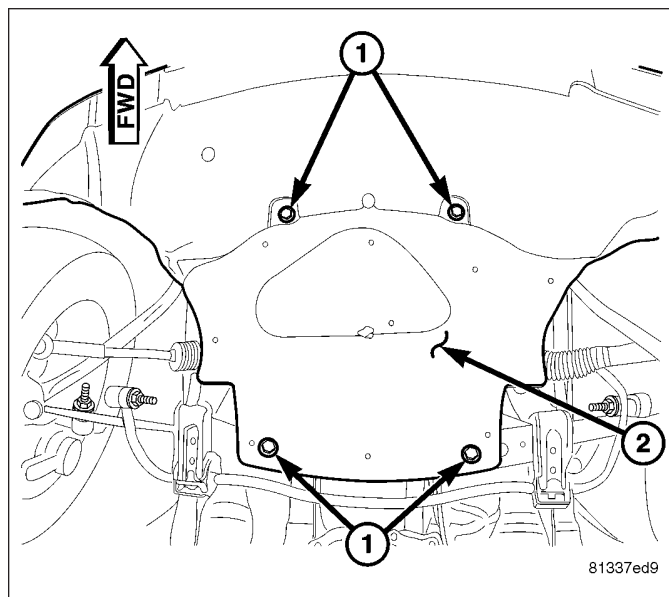


2. Remove air cleaner housing (3)(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
3. Raise vehicle.

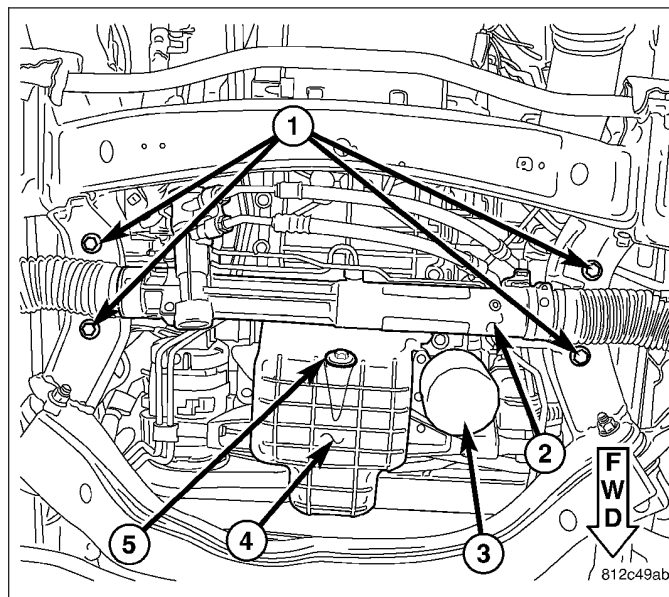




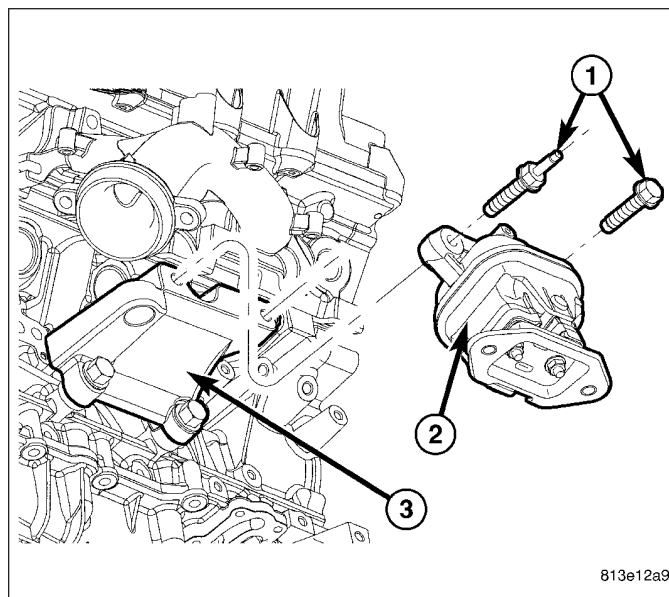
4. Remove lower splash shield retaining bolts (1) and splash shield (2).



5. Remove engine mount nuts (1).
6. Remove engine mount studs (1) from the right engine mount isolater.
7. Place a block of wood under the oil pan (4) and raise engine with suitable jackstand.

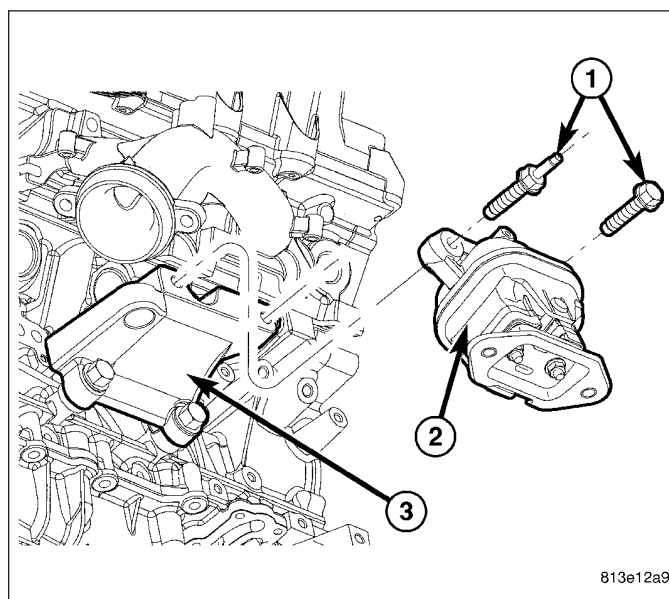


8. Remove engine mount isolater to engine mount adapter bolts (1).
9. Remove engine mount isolater (2).

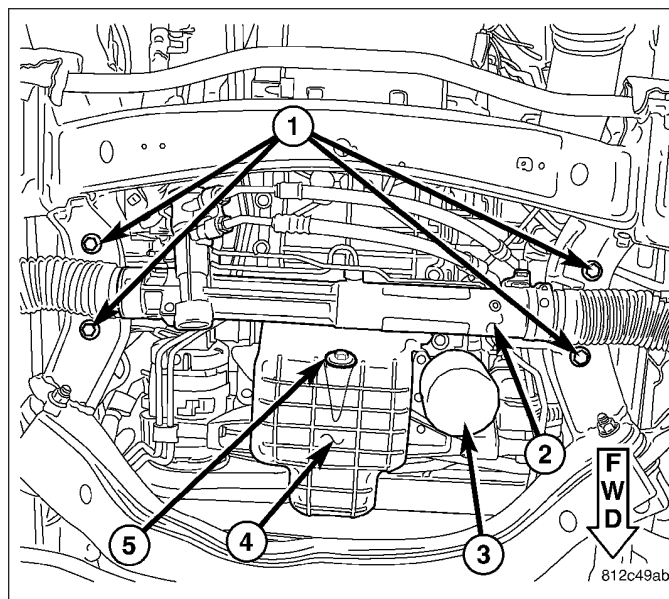


## INSTALLATION

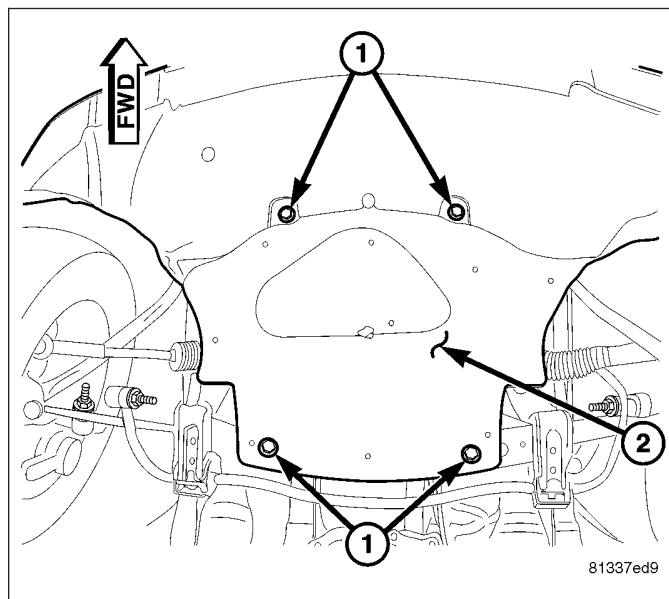
1. Install right engine mount isolater to engine mount adapter bolts (1). Tighten bolts to 75 N·m (55 ft. lbs.).
2. Lower engine but do not let mount contact frame.



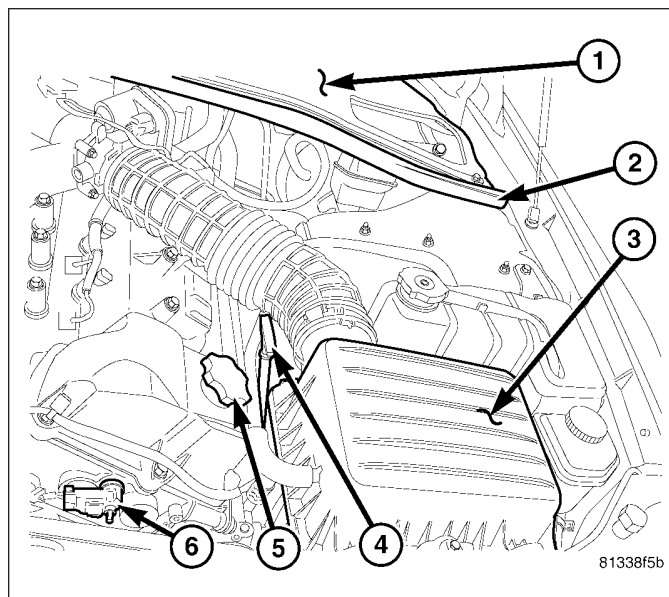
3. Install engine mount studs (1) and tighten to 12N·m (106 in. lbs.).
4. Lower engine and remove lifting device.
5. Tighten engine mount isolater nuts (1) to 75 N·m (55 ft. lbs.).



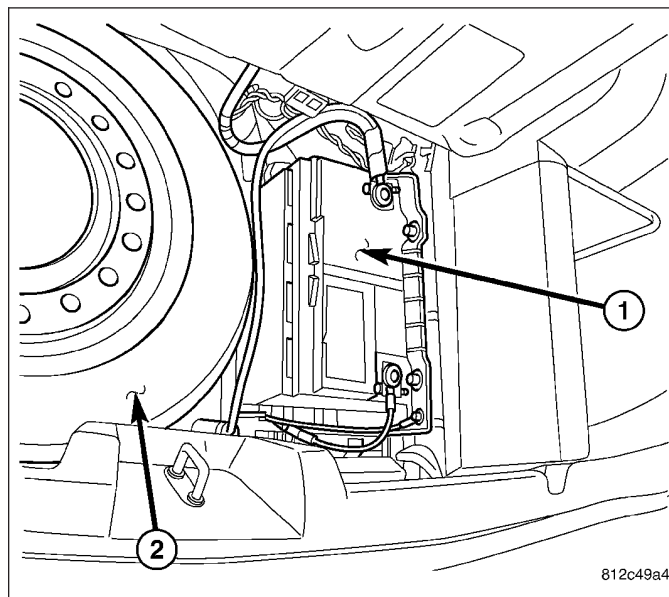
6. Install lower splash shield (2) and tighten retaining bolts (1).
7. Lower vehicle.



8. Install air cleaner housing assembly (3)(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).



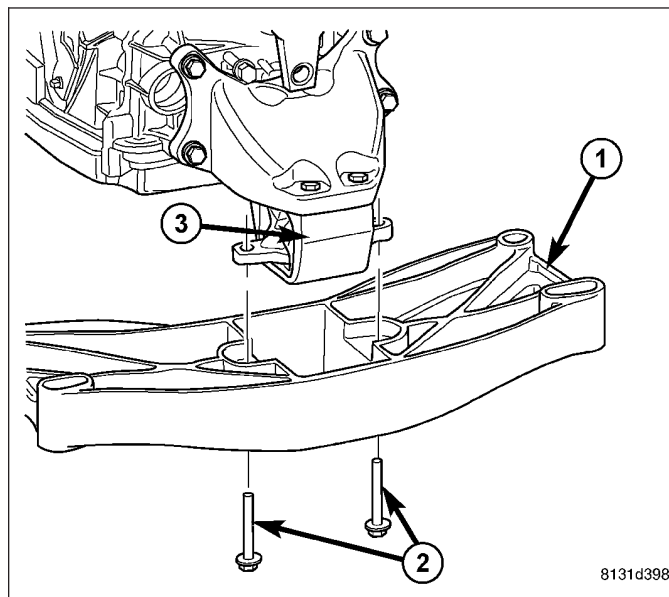
9. Connect negative battery (1) cable.



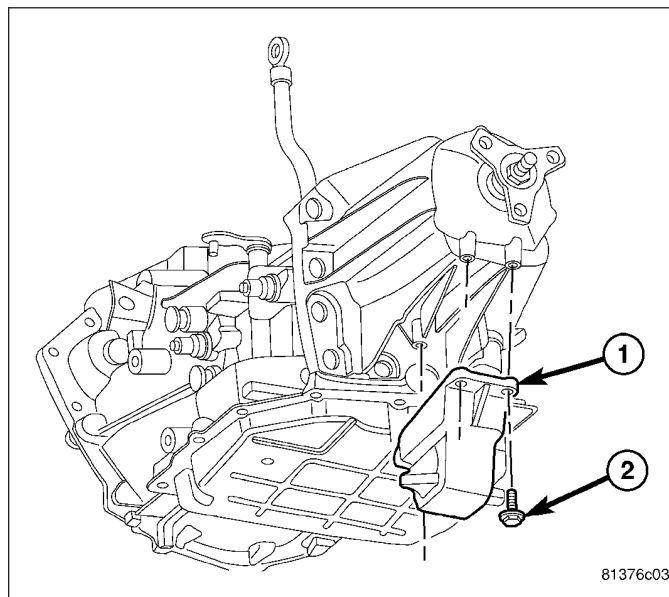
## REAR MOUNT

### REMOVAL

1. Raise vehicle on hoist.
2. Remove cross member to mount bolts (2).
3. Place transmission jack under transmission pan and raise transmission.
4. Remove cross member attaching bolts and remove crossmember (1).

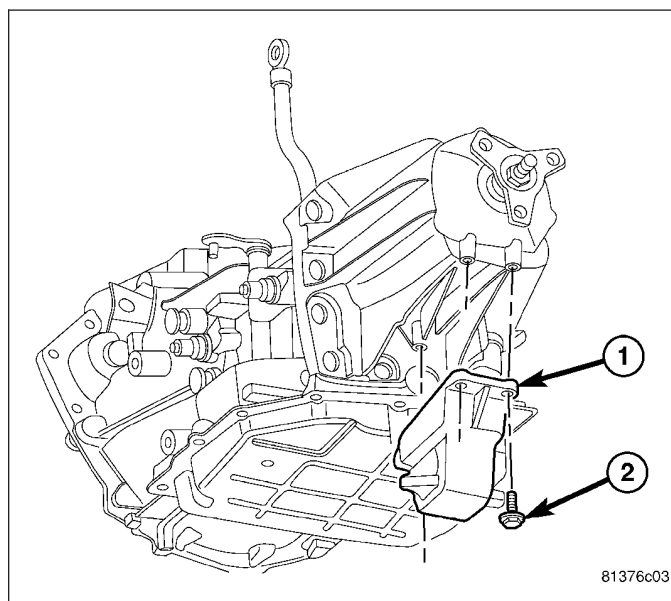


5. Remove mount to transmission bolts (2), remove mount (1).

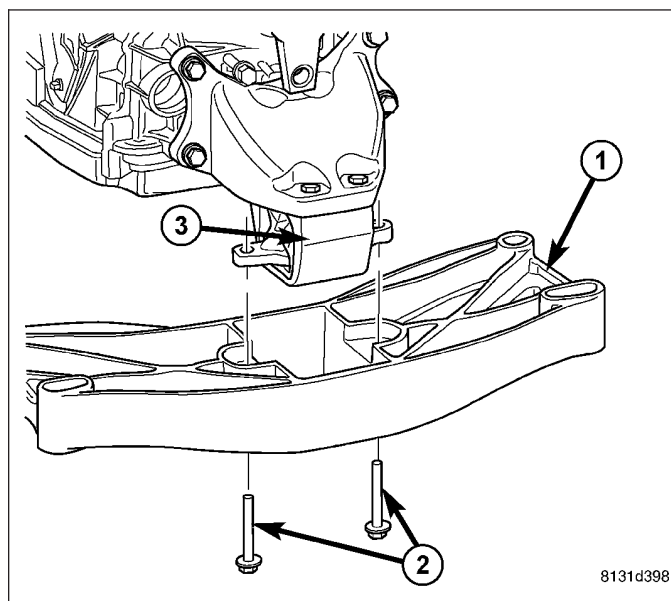


## INSTALLATION

1. Install mount to transmission bolts (2) and tighten to 47 N·m (35 ft.lbs.).



2. Install cross member (1) and attaching bolts. Tighten bolts to 68 N·m (50 ft.lbs.).
3. Lower transmission so cross member to mount bolts (2) can be started tightened by hand.
4. Lower transmission and remove jack.
5. Tighten mount bolts (2) to 47 N·m (39 ft.lbs.).



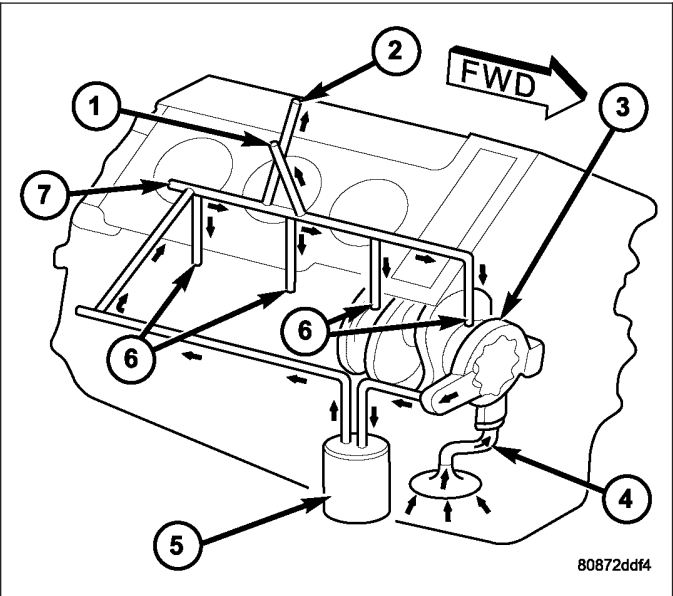
## LUBRICATION

### DESCRIPTION

The lubrication system is a full-flow filtration, pressure feed type. The oil pump body is mounted to the engine block. The pump inner rotor is driven by the crankshaft. A windage tray is used to increase power by minimizing oil windage at high engine RPM. An engine oil cooler is used on some models.

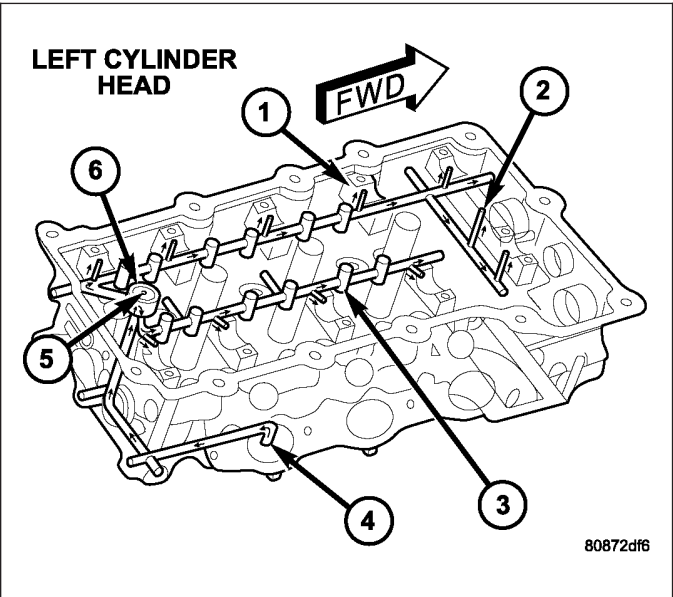
OPERATION

Oil from the oil pan is pumped by a gerotor type oil pump (3) directly coupled to the crankshaft. Oil pressure is controlled by a relief valve mounted inside the oil pump housing. Refer to Cylinder Block, Left Cylinder Head or Right Cylinder Head art between the charts for engine oil lubrication circuits.

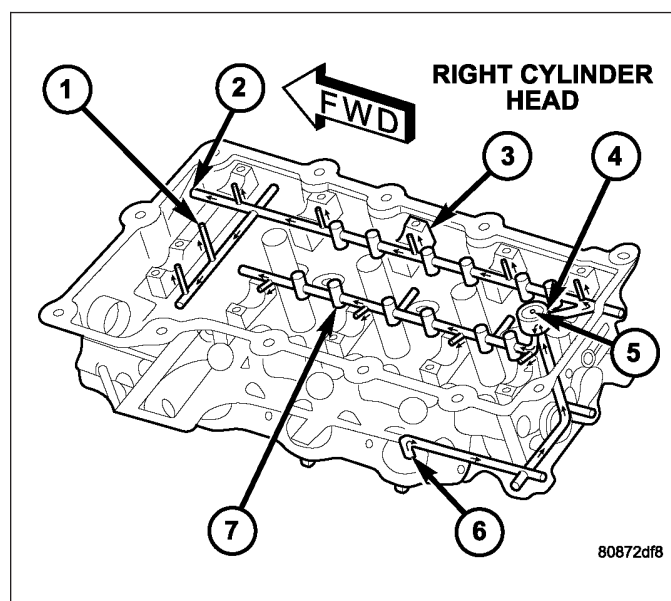


FROM:	TO:	FROM:	TO:
Oil Pump	Oil Filter Mounting (inlet)	Main Oil Gallery - Center of Block	1. Crankshaft Main Bearings
Oil Filter Mounting (inlet)	Oil Filter		2. Left Cylinder Head*
Oil Filter	Oil Filter Mounting (outlet)		3. Right Cylinder Head*
Oil Filter Mounting (outlet)	Oil Gallery - Right side of Block	Crankshaft Main Bearings	Connecting Rod Bearings
Oil Gallery - Right side of Block	Oil Gallery - Rear of Block and to Oil Cooler (some models)	Left Cylinder Head	Left Cylinder Head
Oil Gallery - Rear of Block	Main Oil Gallery - Center of Block	Right Cylinder Head	Right Cylinder Head

\*The cylinder head gaskets have an oil restrictor to control oil flow to the cylinder heads.



FROM:	TO:
Left Cylinder Head Oil Inlet Gallery (intake side of head)	Oil Gallery and Accumulator – Rear of Head*
Oil Gallery and Accumulator – Rear of Head*	1. Exhaust Camshaft Oil Passage 2. Intake Camshaft Oil Passage
Left Exhaust Camshaft Oil Passage	1. Left Exhaust Camshaft Journals 2. Hydraulic Valve Lash Adjusters and Rocker Arms 3. Left Camshaft (Secondary) Chain Tensioner**
Left Intake Camshaft Oil Passage	1. Left Intake Camshaft Journals 2. Hydraulic Valve Lash Adjusters and Rocker Arms
* When oil reaches the back of the cylinder head, the oil gallery feeds oil into an accumulator chamber that is located towards center of the head. The accumulator chamber is closed off with a pressed in core plug that has a small orifice to act as a vent. Oil then travels down at a 45 degree angle from the accumulator into two passages, one for the intake and one for the exhaust side of the cylinder head.	
** The secondary camshaft chain tensioner is the last component to receive oil on the left cylinder head.	



FROM:	TO:
Right Cylinder Head Oil Inlet Gallery (intake side of head)	Oil Gallery and Accumulator – Rear of Head*
Oil Gallery and Accumulator – Rear of Head*	1. Exhaust Camshaft Oil Passage 2. Intake Camshaft Oil Passage
Right Exhaust Camshaft Oil Passage	1. Right Exhaust Camshaft Journals 2. Hydraulic Valve Lash Adjusters and Rocker Arms 3. Right Camshaft (Secondary) Chain Tensioner 4. Primary Timing Chain Tensioner - Right Head**
Right Intake Camshaft Oil Passage	1. Right Intake Camshaft Journals 2. Hydraulic Valve Lash Adjusters and Rocker Arms
* When oil reaches the back of the cylinder head, the oil gallery feeds oil into an accumulator chamber that is located towards center of the head. The accumulator chamber is closed off with a pressed in core plug that has a small orifice to act as a vent. Oil then travels down at a 45 degree angle from the accumulator into two passages, one for the intake and one for the exhaust side of the cylinder head.	
** The timing (primary) chain tensioner is the last component to receive oil on the right cylinder head.	



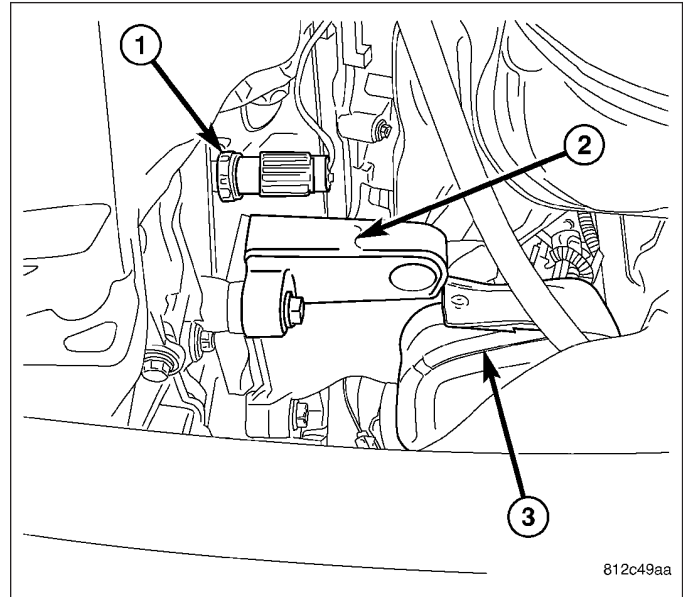
## DIAGNOSIS AND TESTING

### CHECKING ENGINE OIL PRESSURE

1. Remove the oil pressure switch (1)(Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - REMOVAL).
2. Install oil pressure test gauge assembly, Special Tools C-3292 with 8406 adaptor.
3. Start engine and monitor gauge readings.

**CAUTION:** If oil pressure is 0 at idle, Do Not Run engine at 3000 RPM

4. Oil Pressure (engine at operating temperature):  
**Curb Idle** 34.5 kPa (5 psi) minimum **3000 RPM** 300–724 kPa (45–105 psi).
5. If oil pressure is 0 at idle. Shut off engine, check for pressure relief valve stuck open or a clogged oil pickup screen.
6. Remove oil pressure test gauge assembly, Special Tools C-3292 with 8406 adaptor and install oil pressure switch after testing is completed(Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - INSTALLATION).



## OIL

### DESCRIPTION

For engine oil type and capacity (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION - ENGINE OIL)

### STANDARD PROCEDURE

### ENGINE OIL AND FILTER CHANGE

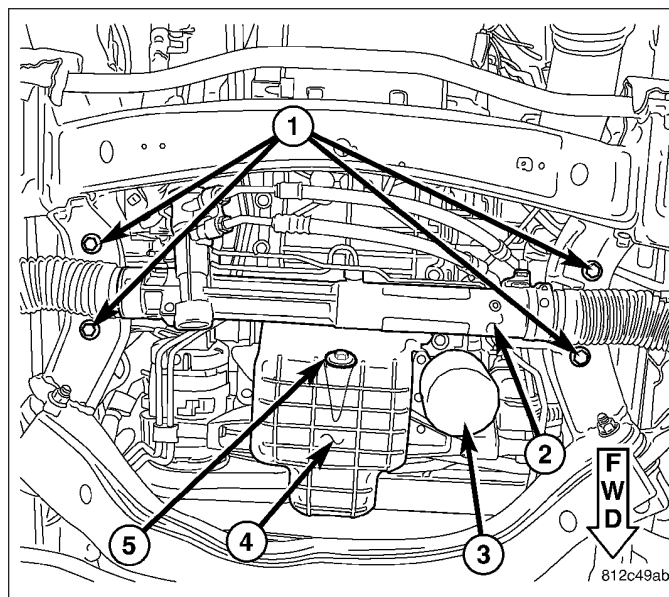
**WARNING:** NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA.

Change engine oil and filter at mileage and time intervals described in the Maintenance Schedule (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION).

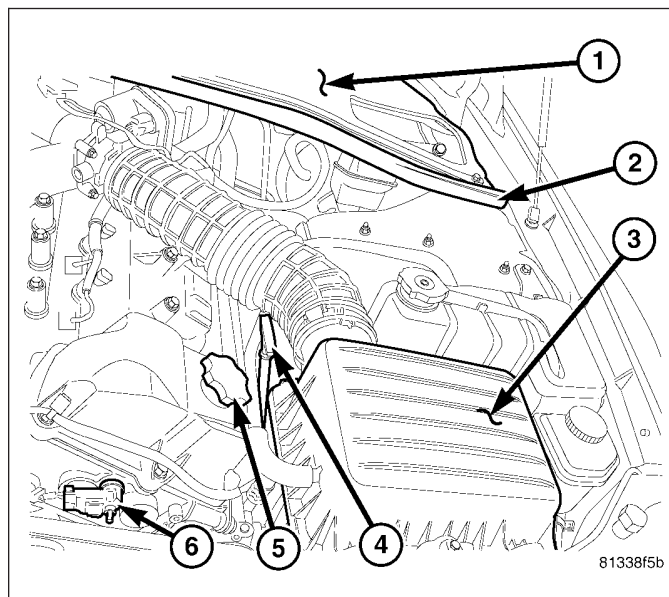
### TO CHANGE ENGINE OIL

1. Run engine until achieving normal operating temperature.
2. Position the vehicle on a level surface and turn engine off.

3. Hoist and support vehicle on safety stands(Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).
4. Place a suitable drain pan under crankcase drain (5).
5. Remove drain plug (5) from oil pan and allow oil to drain into pan. Inspect drain plug (5) threads for stretching or other damage. Replace drain plug (5) and gasket if damaged.
6. Remove oil filter (3). Refer to (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL)
7. Install drain plug (5) in oil pan.
8. Install new oil filter (3)(Refer to 9 - ENGINE/LUBRI-CATION/OIL FILTER - INSTALLATION).



9. Lower vehicle and remove oil fill cap (5). Fill crankcase with specified type and amount of engine oil,. (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION - ENGINE OIL) (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS).
10. Install oil fill cap (5).
11. Start engine and inspect for leaks.
12. Stop engine and inspect oil level (4).



## OIL FILTER SPECIFICATION

All engines are equipped with a high quality full-flow, disposable type oil filter. When replacing oil filter, use a Mopar® filter or equivalent.

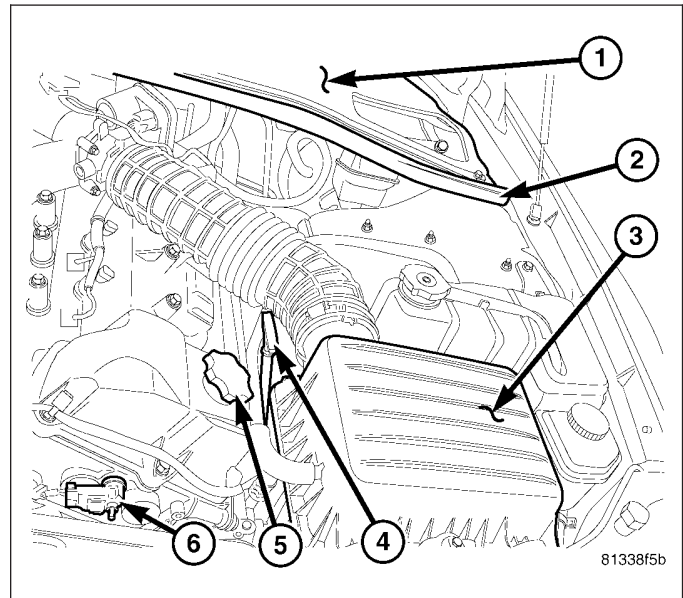
## USED ENGINE OIL DISPOSAL

Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING listed above.

## ENGINE OIL LEVEL CHECK

The best time to check engine oil level is after it has sat overnight, or if the engine has been running, allow the engine to be shut off for at least 5 minutes before checking oil level (4).

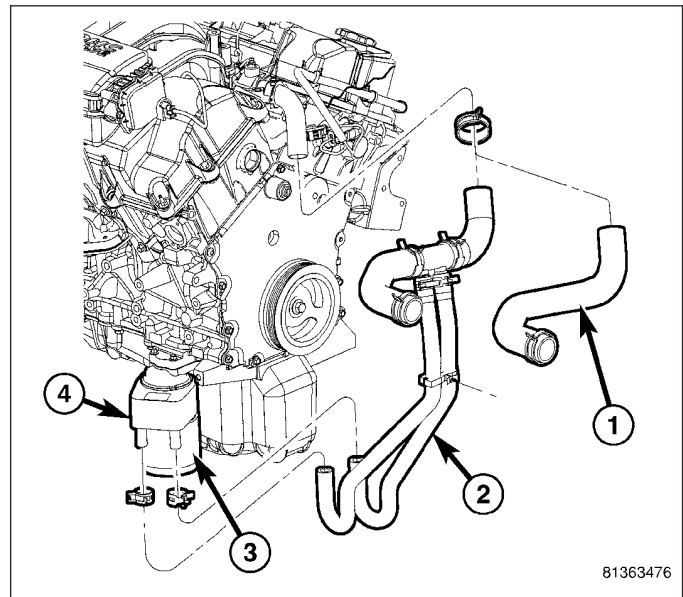
Checking the oil while the vehicle is on level ground will improve the accuracy of the oil level reading. Add oil in the oil fill (5) only when the level is at or below the ADD mark.



## OIL COOLER & LINES

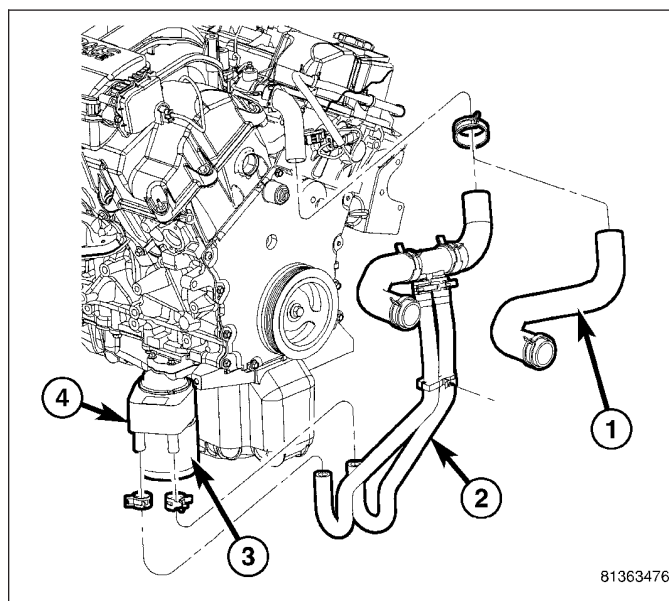
### DESCRIPTION

The 2.7L engine oil cooler (if equipped) is an oil-to-coolant type engine oil cooler (4). The cooler (4) is mounted between the oil filter adapter and the oil filter (3). If equipped, the engine will have hose assembly (2). If not equipped, the engine will have hose assembly (1).



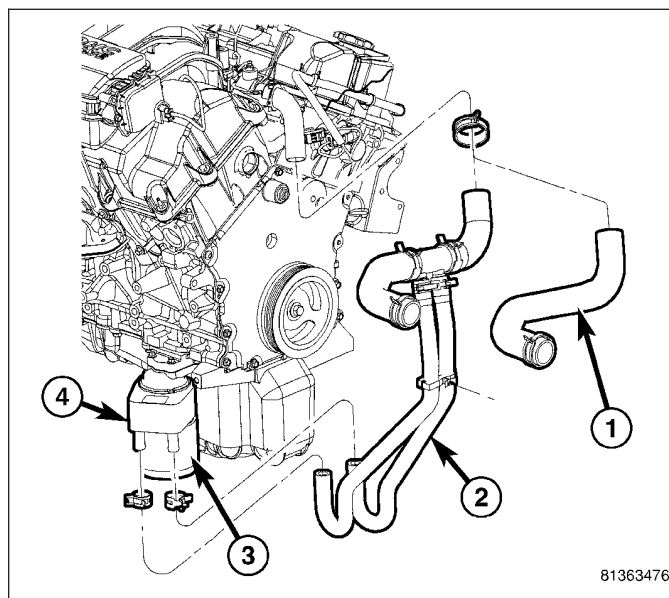
## OPERATION

Engine oil travels from the oil cooler (4) and into the oil filter (3). Engine oil then exits the filter into the main gallery. Engine coolant flows from the upper radiator hose to and from the cooler through hoses (2) and back to the upper radiator hose.



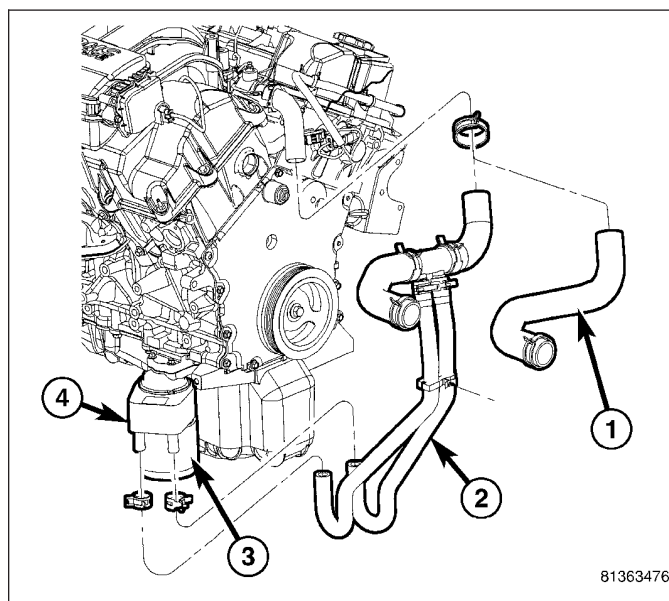
## REMOVAL

1. Drain cooling system(Refer to 7 - COOLING - STANDARD PROCEDURE).
2. Raise vehicle on hoist.
3. Disconnect coolant hoses (2) from oil cooler (4).
4. Remove oil filter (3).
5. Remove oil cooler attaching fastener from center of oil cooler (4).
6. Remove oil cooler (4).



## INSTALLATION

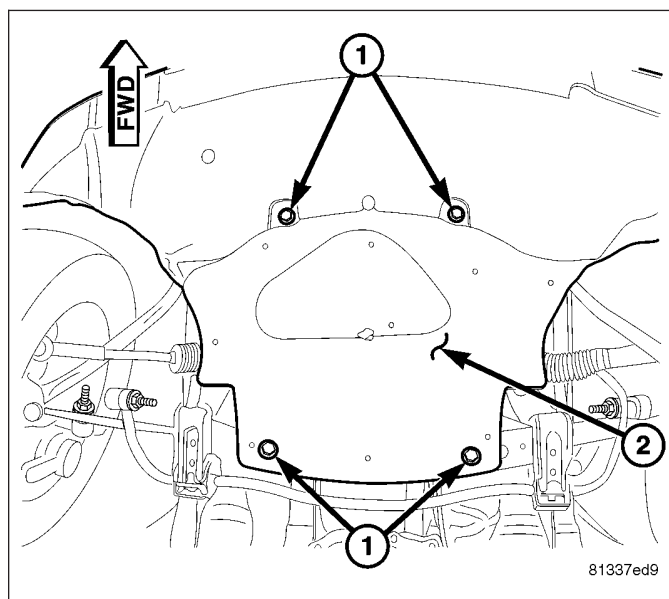
1. Install oil cooler (4).
2. Install oil cooler (4) attaching fastener and tighten to 54 N·m (40 ft. lbs.).
3. Install oil filter (3).
4. Connect coolant hoses (2) to oil cooler (4).
5. Lower vehicle.
6. Fill cooling system(Refer to 7 - COOLING - STANDARD PROCEDURE).
7. Start engine and check for leaks.
8. Check engine oil and add as needed.



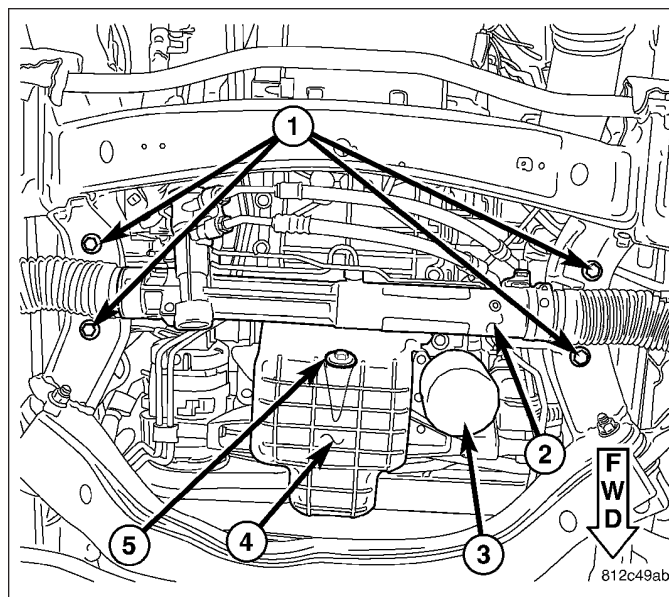
## FILTER-OIL

### REMOVAL

1. Raise vehicle on hoist.
2. Remove lower splash shield retaining bolts (1) and splash shield (2).

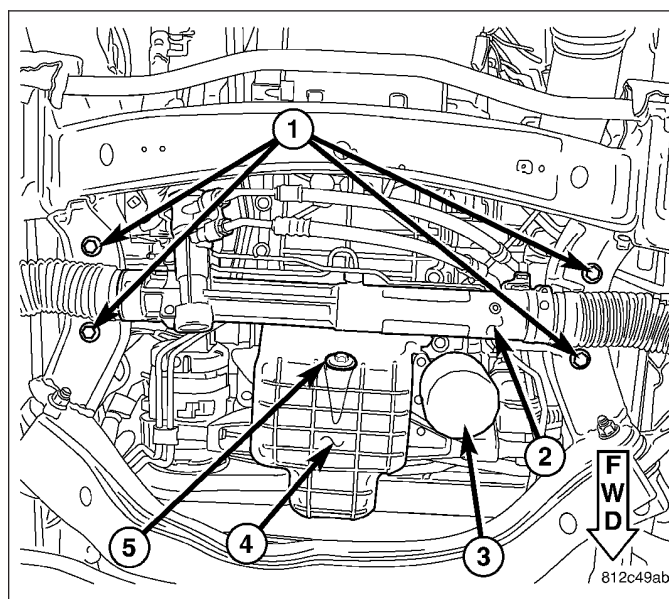


3. Position a suitable collecting container under oil filter (3) location.
4. Remove oil filter (3) using a suitable oil filter wrench. Dispose of oil filter (3) following environmental guidelines.



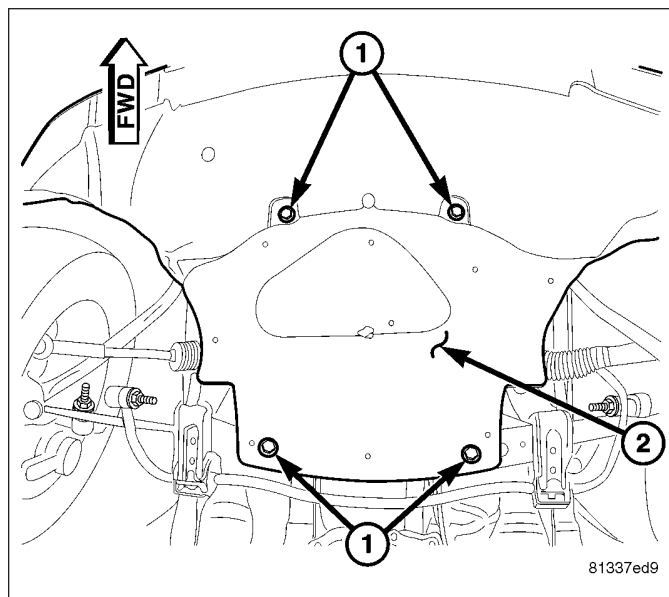
## INSTALLATION

1. Wipe filter base clean, then inspect gasket sealing surface.
2. Lubricate gasket of new filter with clean engine oil.
3. Install oil filter (3) and tighten to 16 N·m (9 ft. lbs.) of torque after gasket contacts base. Use filter wrench if necessary.

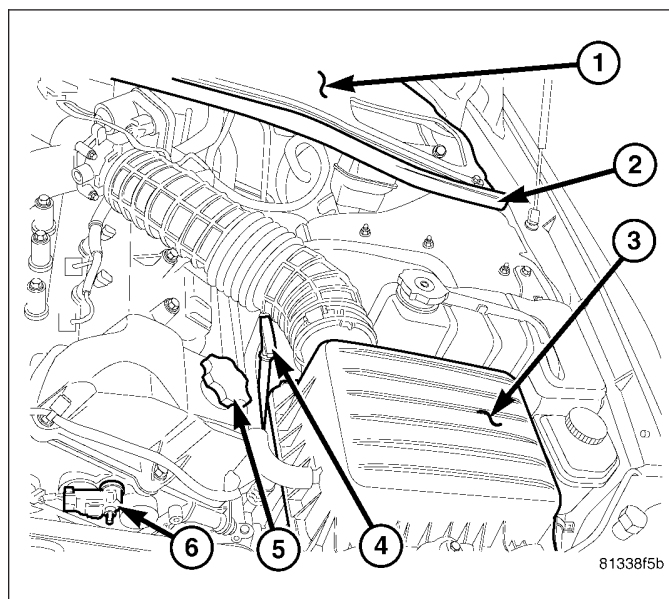




4. Install lower splash shield (2) and retaining bolts (1).



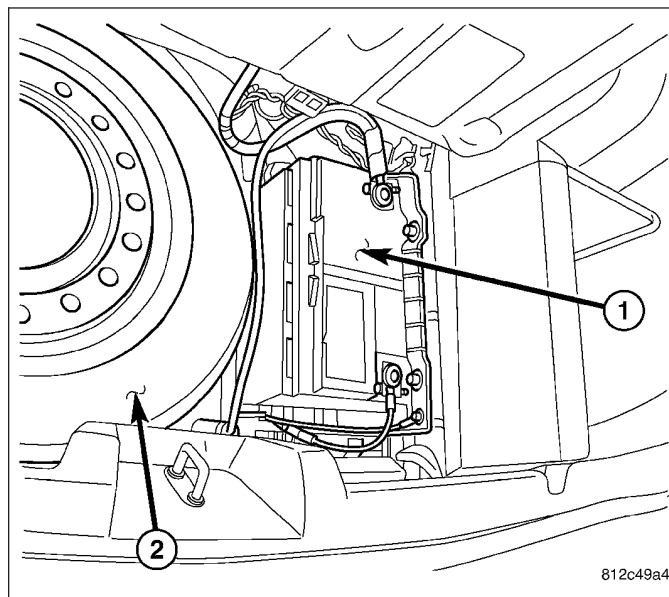
5. Fill crankcase with proper engine oil to correct level. Start engine and check for leaks.
6. Check engine oil level on dipstick (4) and fill as needed (5).



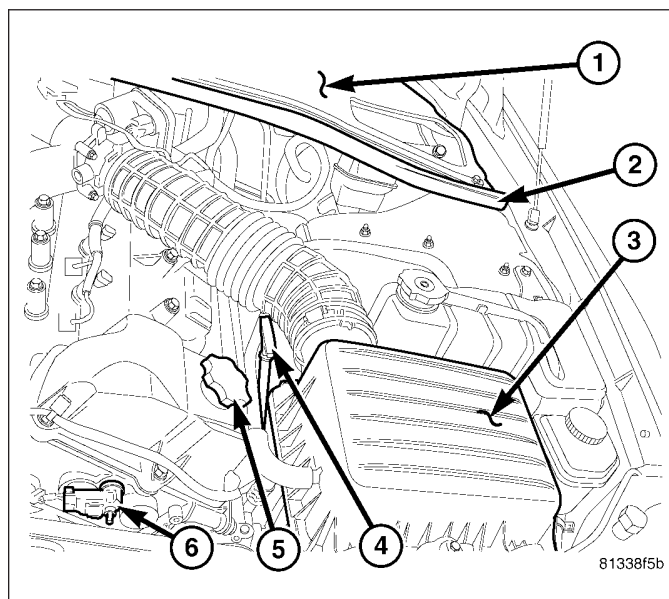
## PAN-OIL

### REMOVAL

1. Disconnect negative battery cable (1) located in trunk.

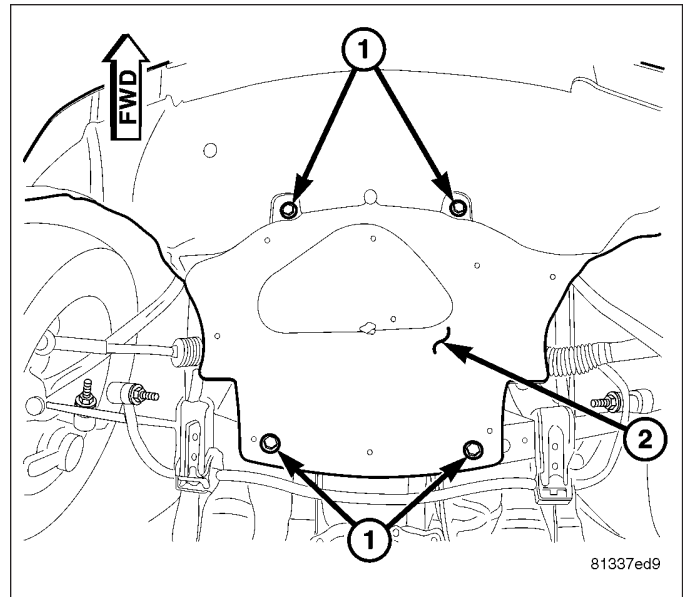


2. Remove engine oil dipstick (4) and tube.
3. Raise vehicle on hoist.

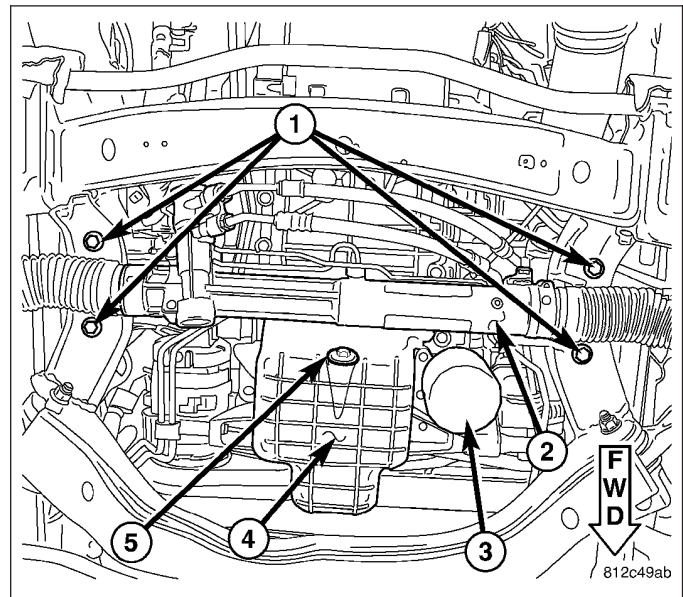




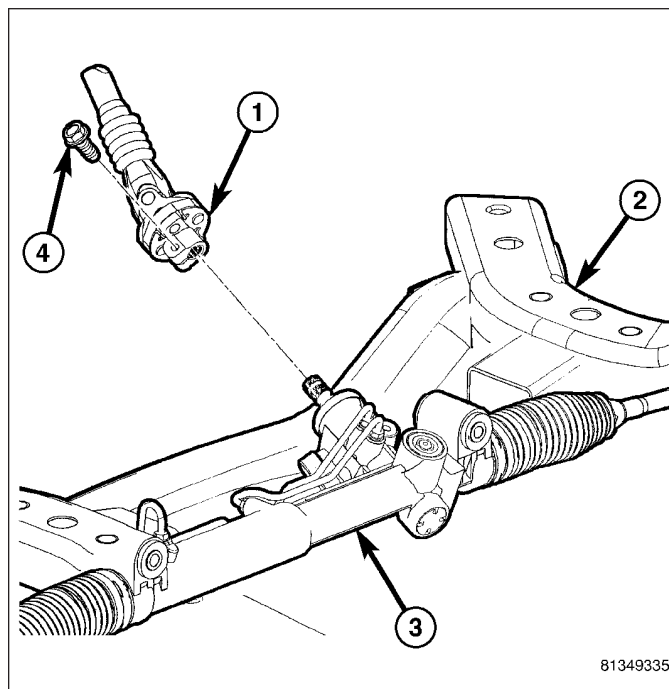
4. Remove lower splash shield retaining bolts (1) and splash shield (2).



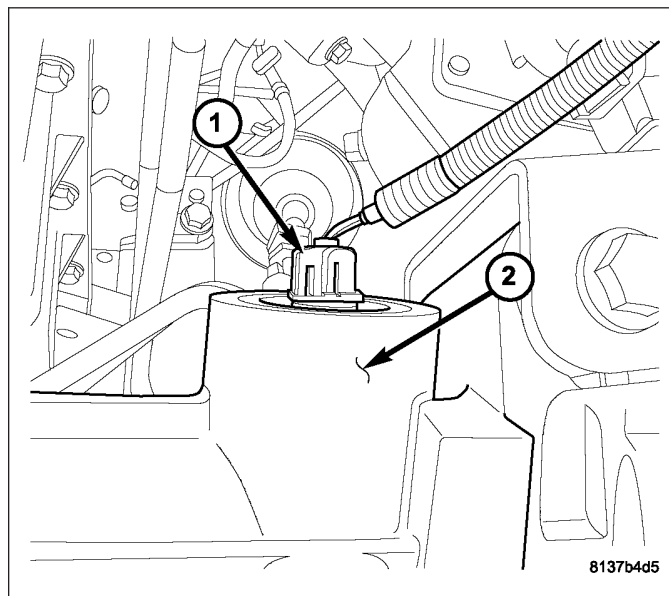
5. Drain engine oil (5) and remove oil filter (3).



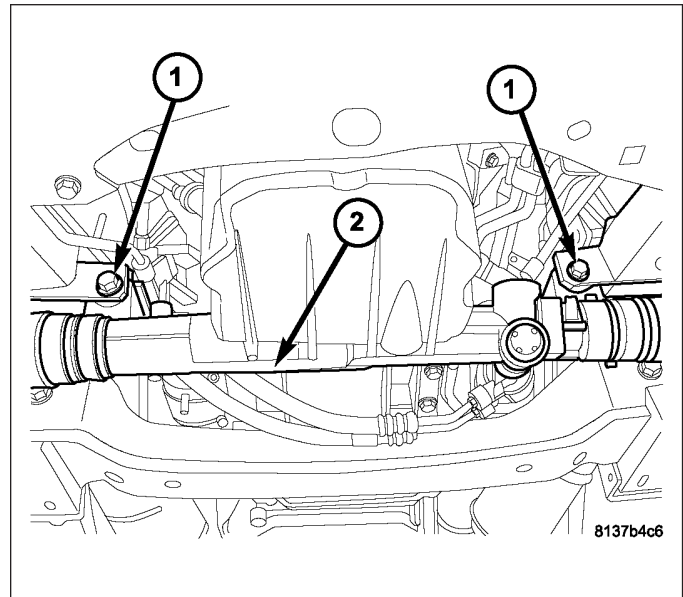
6. Remove the steering coupler bolt (4) and separate coupler (1) from rack (3).



7. Disconnect power steering pressure switch electrical connector (1).



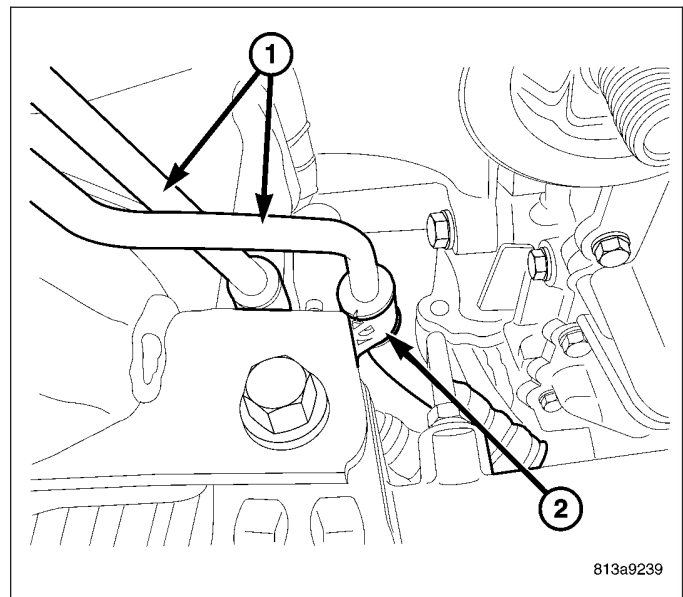
8. Remove steering rack mounting bolts (1).



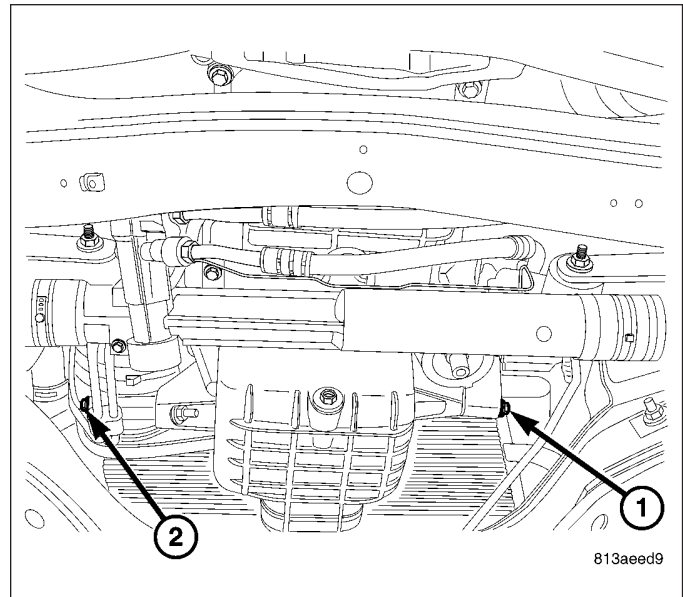
9. Remove power steering line support (2) from frame.

10. Reposition rack out of the way.

11. Remove structural collar (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - REMOVAL).



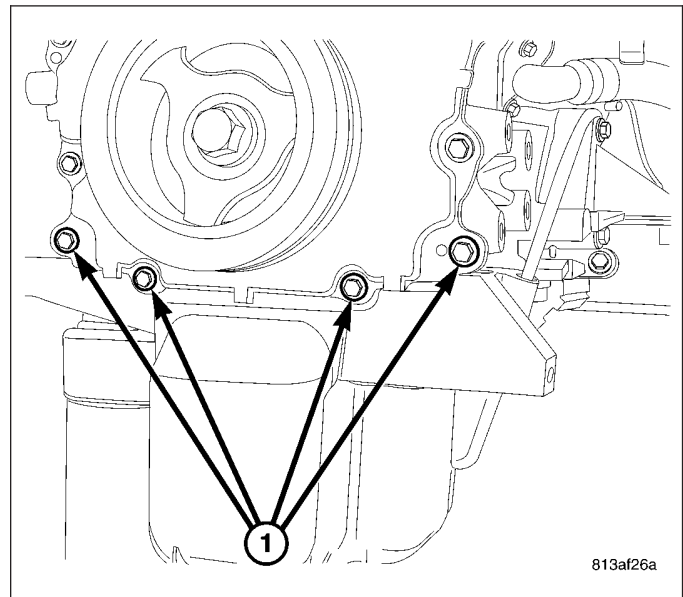
12. Remove generator mounting bracket to oil pan lower bolt (1).
13. Remove A/C compressor bracket to oil pan lower bolt (2).



14. Remove lower timing chain cover to oil pan bolts (1).

**CAUTION:** Assure removal of the four lower timing cover bolts, as damage to the timing cover and/or oil pan may occur.

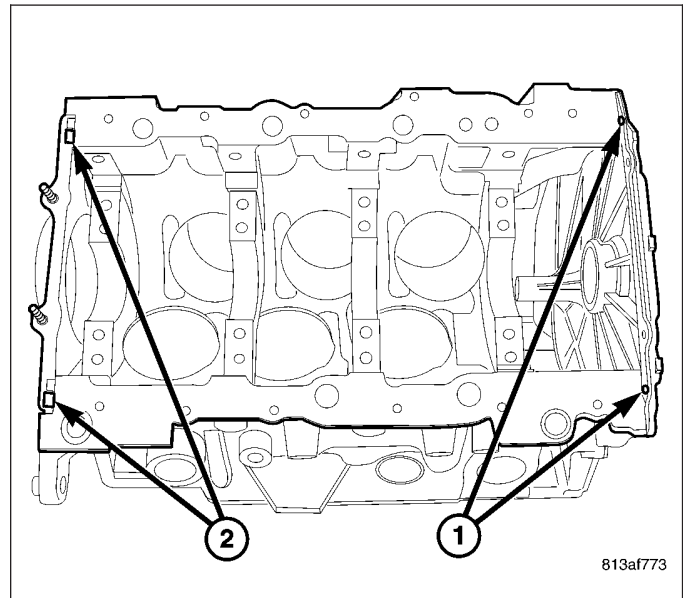
15. Remove oil pan attaching bolts. Remove oil pan and gasket.



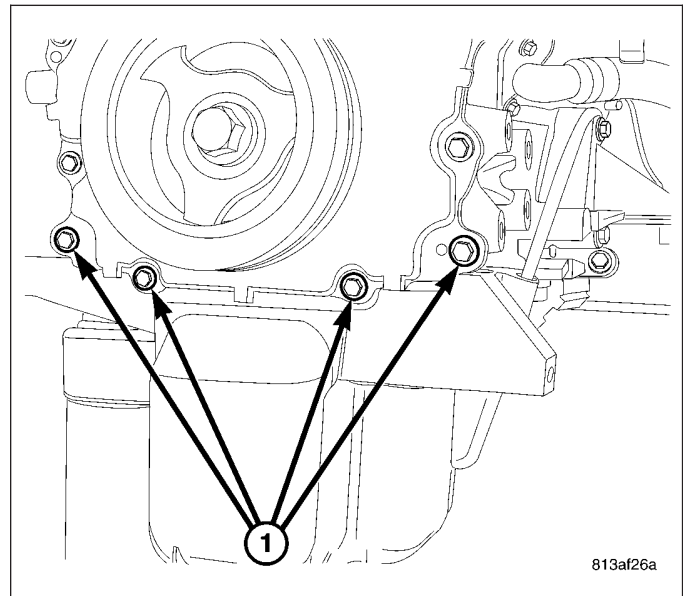
## INSTALLATION

1. Clean oil pan and sealing surfaces. Inspect timing chain cover gaskets. Replace as necessary.
2. Apply an 1/8 inch bead of Mopar® Engine RTV GEN II to the front T-joints (1) (oil pan gasket to timing cover gasket interface) and the rear T-joints (2) (oil pan gasket to crankshaft rear oil seal retainer gasket interface).
3. Install oil pan gasket to block.

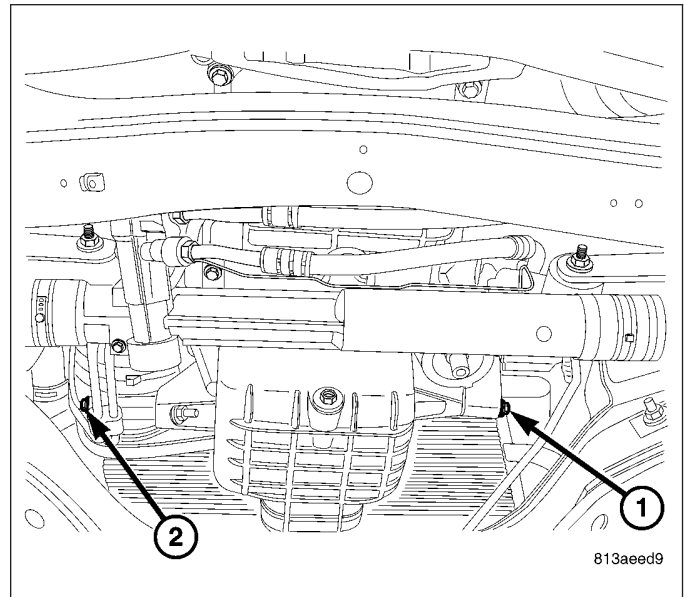
**Note:** To prevent oil leaks at oil pan to timing chain cover, the following tightening sequence procedure must be performed.



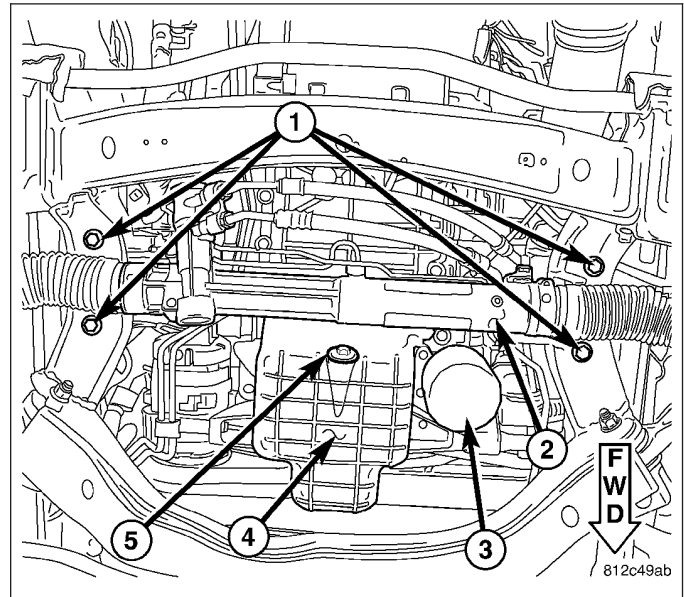
4. Install oil pan and fasteners using the following tightening sequence:
  - a. Install oil pan bolts and nuts **finger tight only—just tight enough to compress the gasket's rubber seal. Line up front of oil pan to be flush with front face of block.**
  - b. Install lower timing chain cover bolts (1) and tighten to 12 N·m (105 in. lbs.).
  - c. Tighten oil pan bolts to 28 N·m (250 in. lbs.).
  - d. Tighten oil pan nuts to 12 N·m (105 in. lbs.).



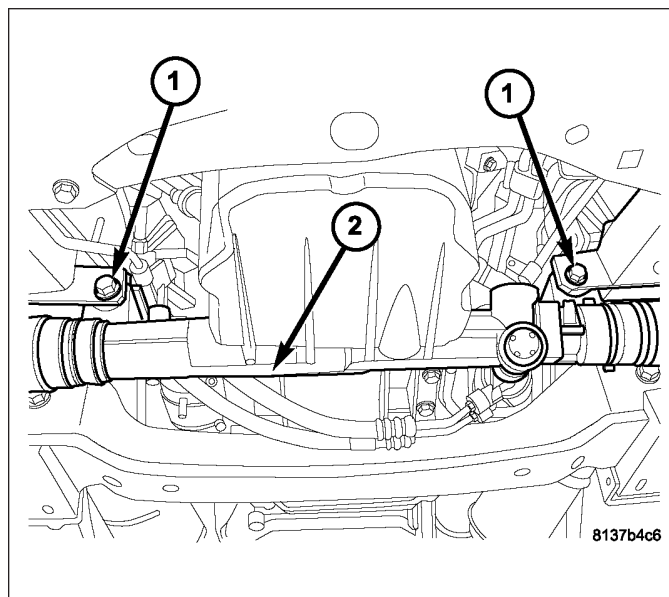
5. Install lower bolt attaching the A/C compressor to oil pan (2). Tighten bolt to 28 N·m (21 ft. lbs.).
6. Install lower bolt attaching the alternator bracket to oil pan (1). Tighten bolt to 28 N·m (21 ft. lbs.).



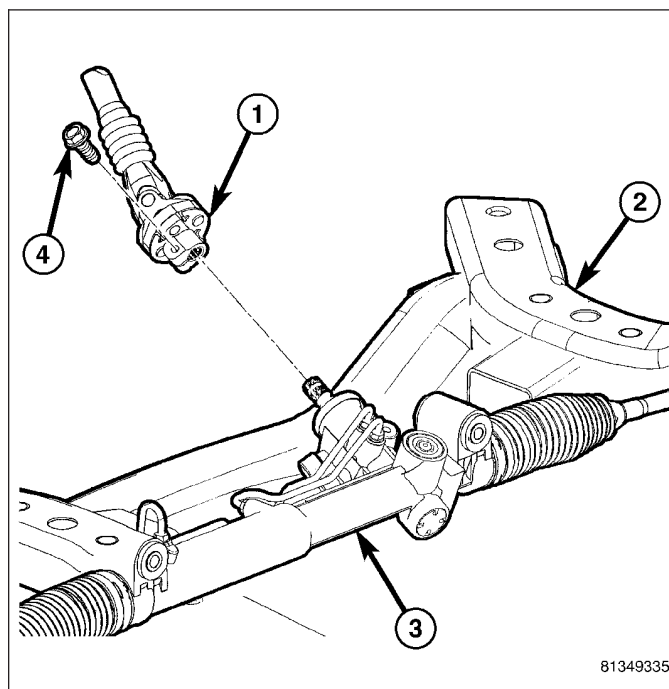
7. Install oil filter (3) and drain plug (5).
8. Install structural collar(Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - INSTALLATION).



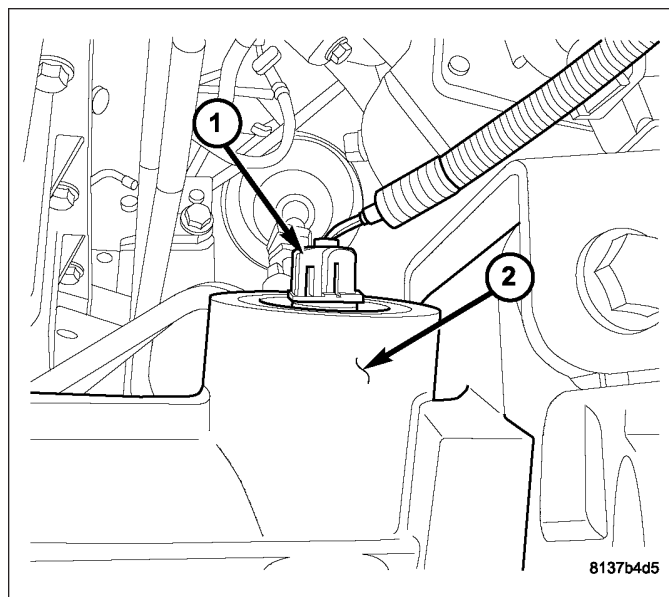
9. Position steering gear (2) in place and install mounting bolts (1). Tighten bolts (1) to 70 N·m (95 ft. lbs.).



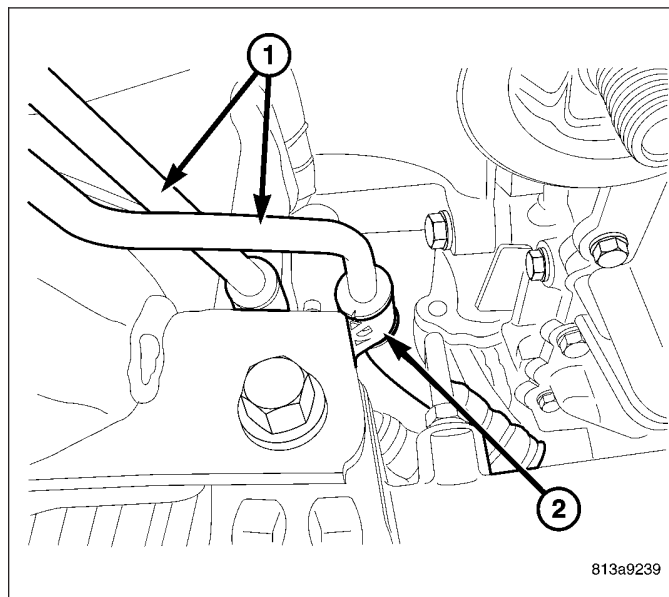
10. Install the steering coupling (2) lower pinch bolt (1) at the gear (3) **using a new bolt (1)**. Tighten to 30 N·m (22 ft.lbs.)(Refer to 19 - STEERING/COLUMN/STEERING COUPLING - INSTALLATION).



11. Connect electrical connector (1) to steering gear (2).

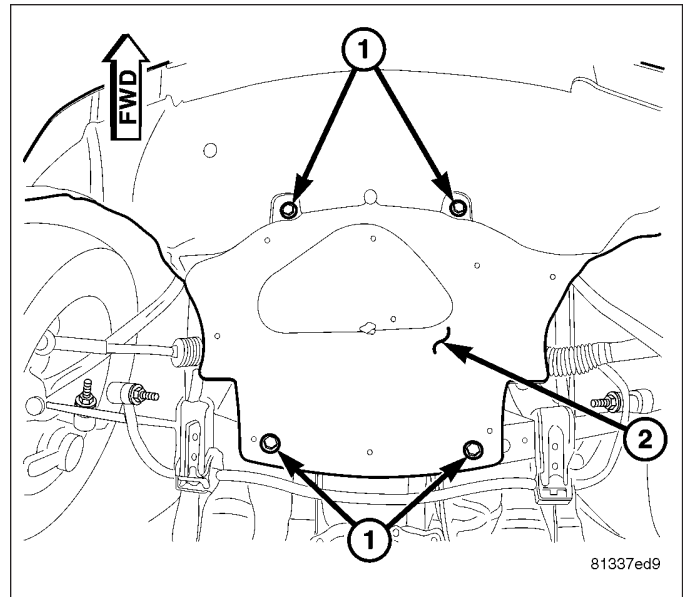


12. Install power steering line support (2) and tighten.

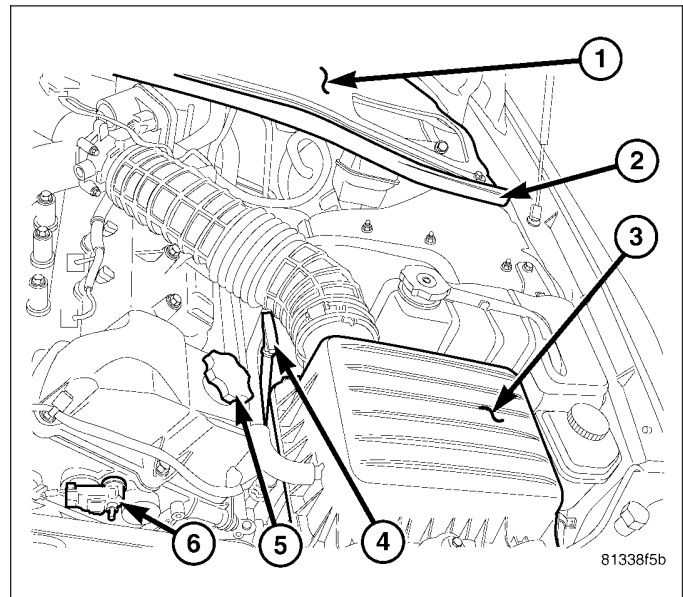




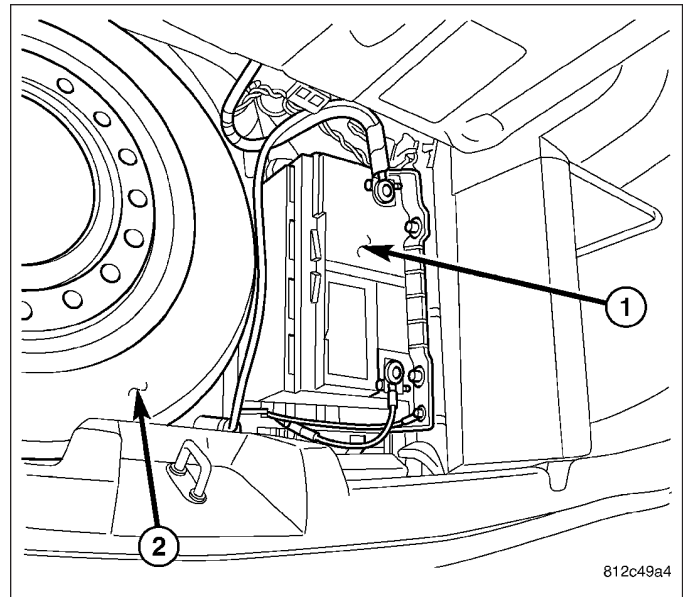
13. Install lower splash shield (2) and retaining bolts (1).
14. Lower vehicle.



15. Install engine oil dipstick and tube (4).
16. Fill engine crankcase (5) with proper oil to correct level.



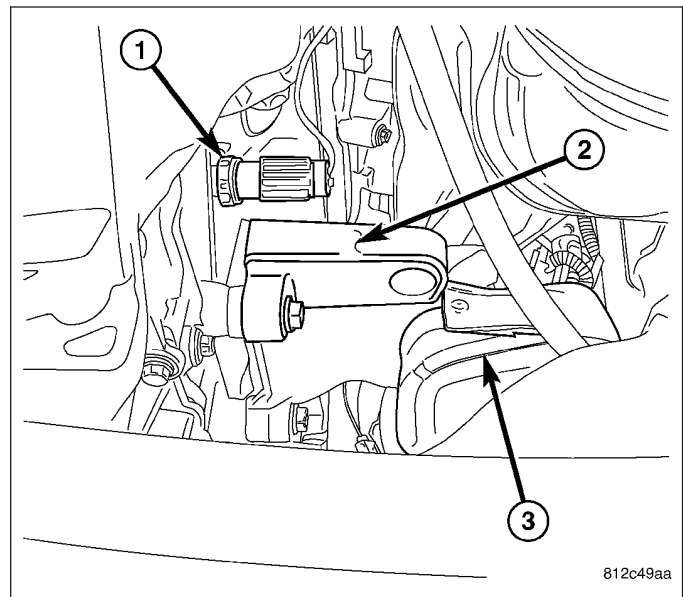
17. Connect negative battery (1) cable.
18. Start engine and check for leaks.



## SWITCH-OIL PRESSURE

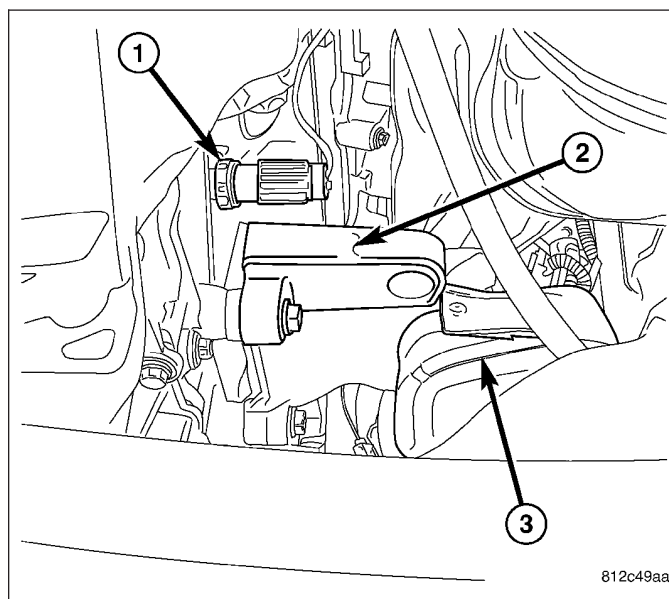
### DESCRIPTION

The engine oil pressure switch (1) is located on the right side of the engine block. The switch screws into the engine main oil gallery. The normally closed switch provides an input through a single wire to the low pressure indicator light on the instrument cluster.



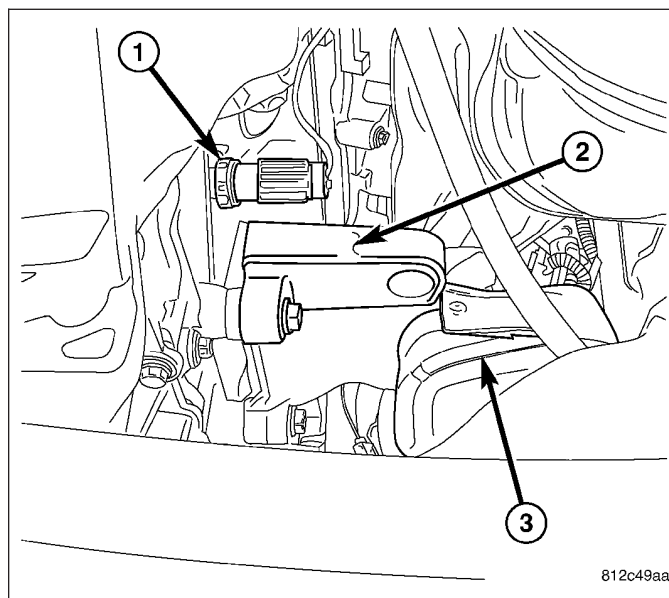
## REMOVAL

1. Raise vehicle on hoist.
2. Remove lower splash shield.
3. Disconnect oil pressure switch (1) electrical connector.
4. Position an oil collecting container under switch location.
5. Remove switch by unscrewing from the engine block.



## INSTALLATION

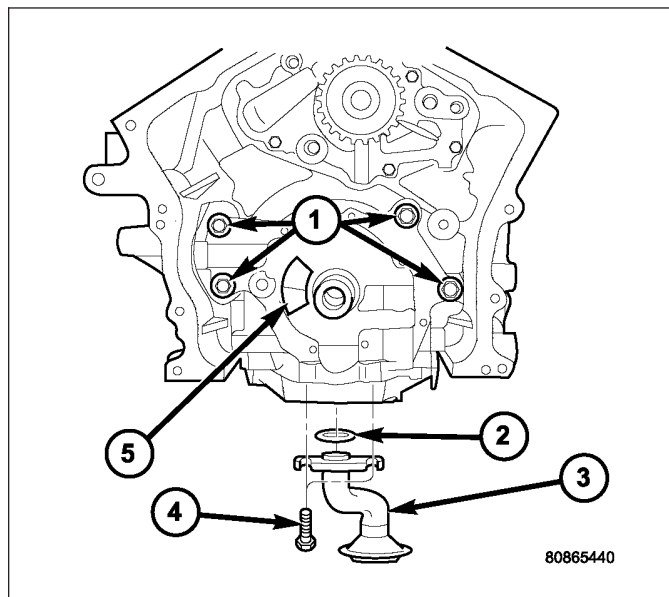
1. Apply Mopar® Thread Sealant to the switch threads.
2. Install oil pressure switch (1).
3. Connect electrical connector.
4. Lower vehicle.
5. Start engine and check for leaks.
6. Check engine oil level and adjust as necessary.



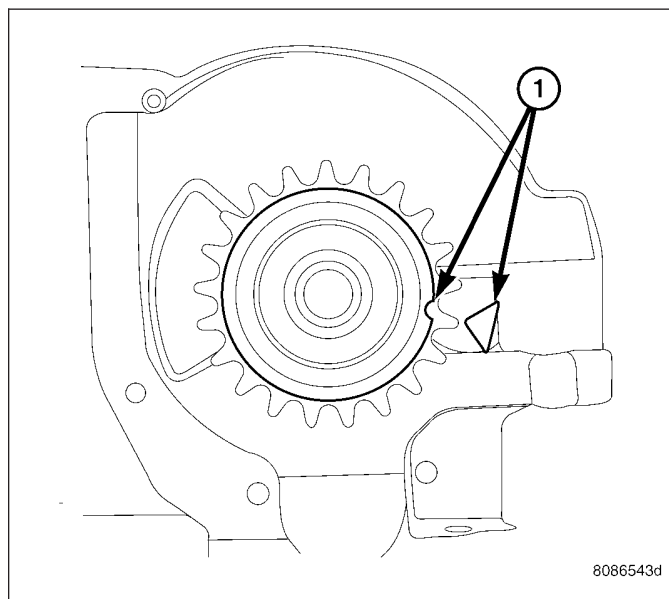
## PUMP-OIL

### REMOVAL

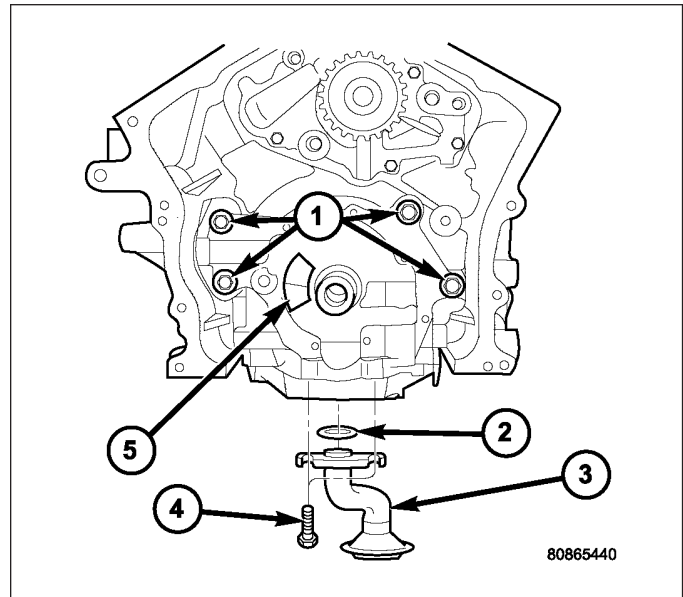
1. Remove crankshaft vibration damper(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
2. Remove timing chain cover (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
3. Remove timing chain and sprockets(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
4. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
5. Remove oil pick-up tube (3) and O-ring (2).



6. Ensure that crankshaft position is at 60° ATDC of No.1 cylinder, or crankshaft sprocket mark aligns with mark on oil pump (1). This position will properly locate oil pump upon installation.



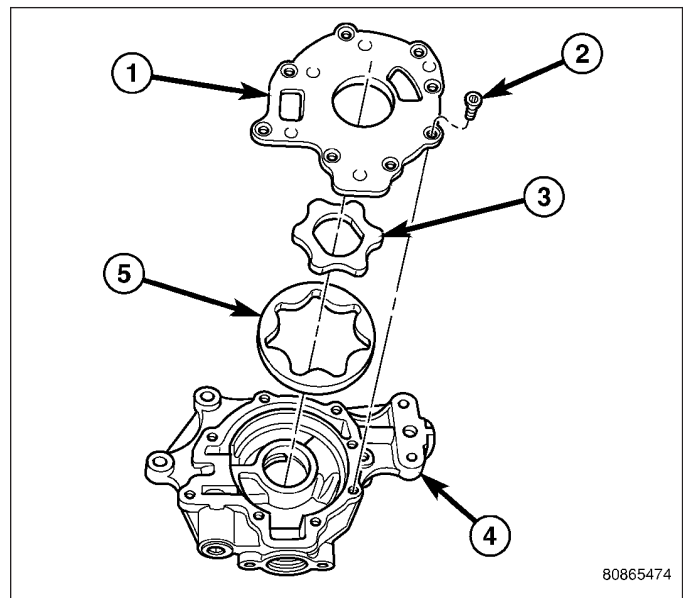
7. Remove oil pump attaching bolts (1).
8. Remove oil pump (5).



## DISASSEMBLY

**Note:** DO NOT remove oil pressure relief valve. If the oil pressure relief valve is suspect, replace the oil pump assembly.

1. Remove oil pump cover screws (2) and lift off oil pump cover (1).
2. Remove inner pump rotor (3) and outer pump rotor (5).
3. Wash all parts in a suitable solvent.
4. Inspect components carefully for damage or wear. (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSPECTION).



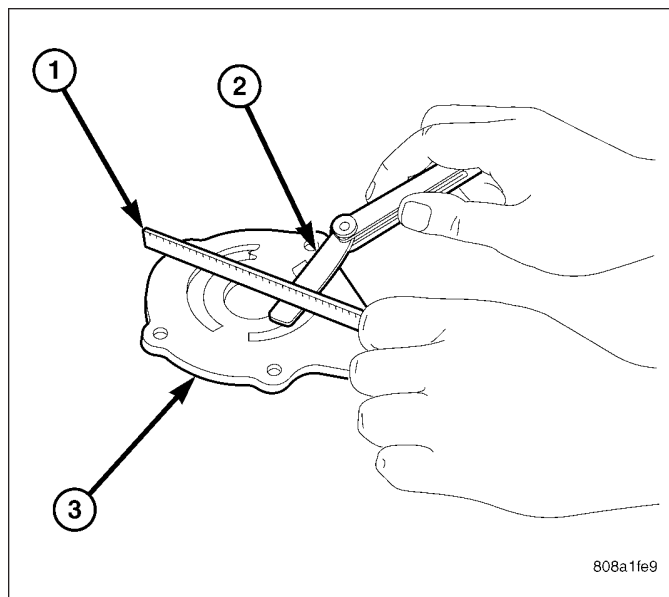
## CLEANING

1. Clean all parts thoroughly in a suitable solvent.

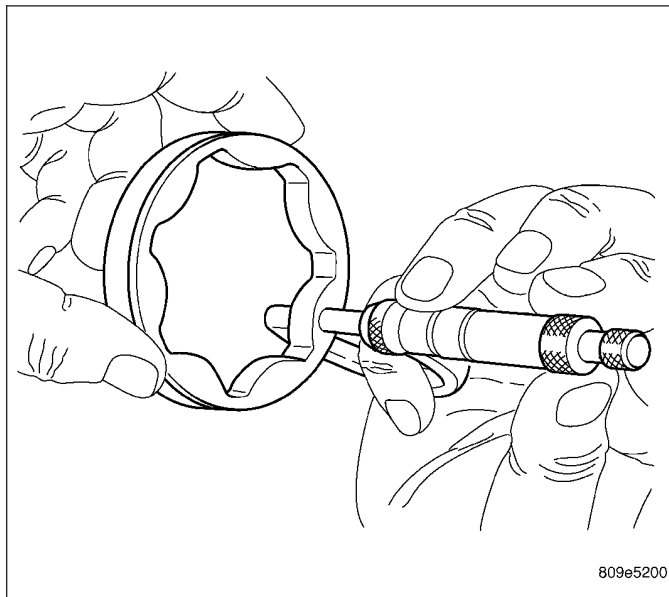
## INSPECTION

**Note:** DO NOT remove oil pressure relief valve. If the oil pressure relief valve is suspect, replace the oil pump assembly.

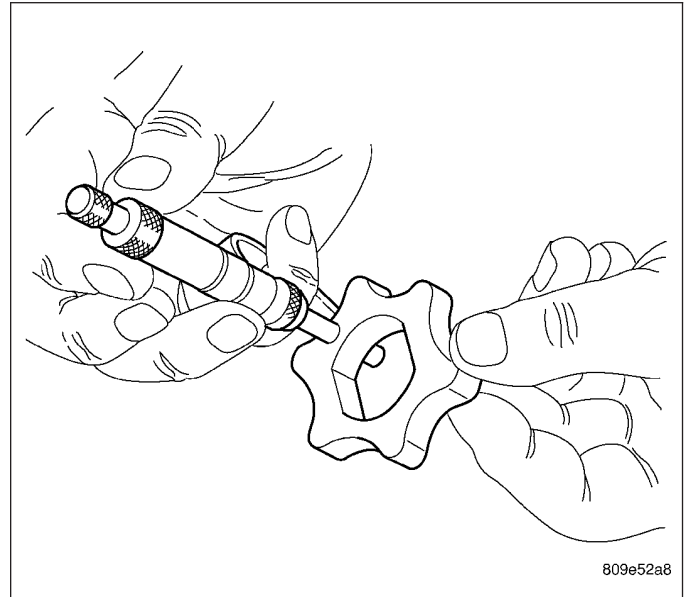
1. Disassemble the oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - DISASSEMBLY).
2. Clean all oil pump components (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - CLEANING).
3. Inspect mating surface of the oil pump housing and cover. Replace oil pump if deeply scratched or grooved (minor surface scratches and polishing is normal).
4. Lay a straightedge (1) across the pump cover (3) surface. If a 0.025 mm (0.001 in.) feeler gauge (2) can be inserted between cover and straight edge, cover should be replaced.



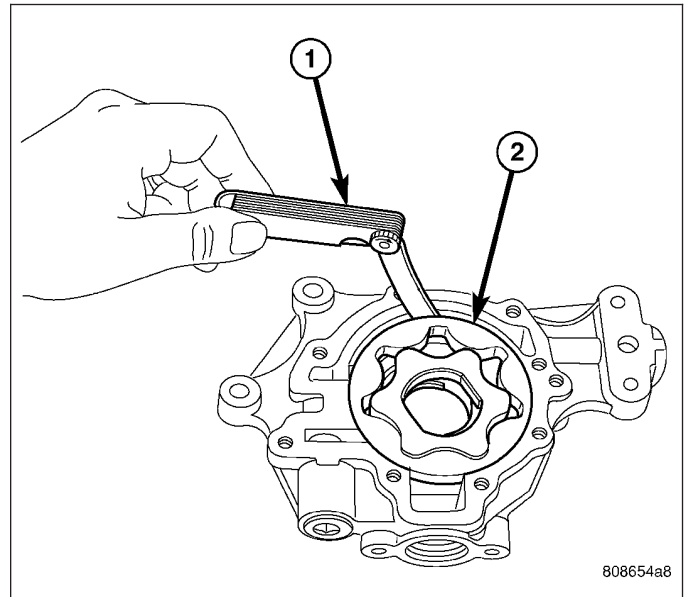
5. Measure thickness and diameter of outer rotor. If outer rotor thickness measures 9.474 mm (0.373 in.) or less, or if the diameter is 89.174 mm (3.5108 in.) or less, replace outer rotor.



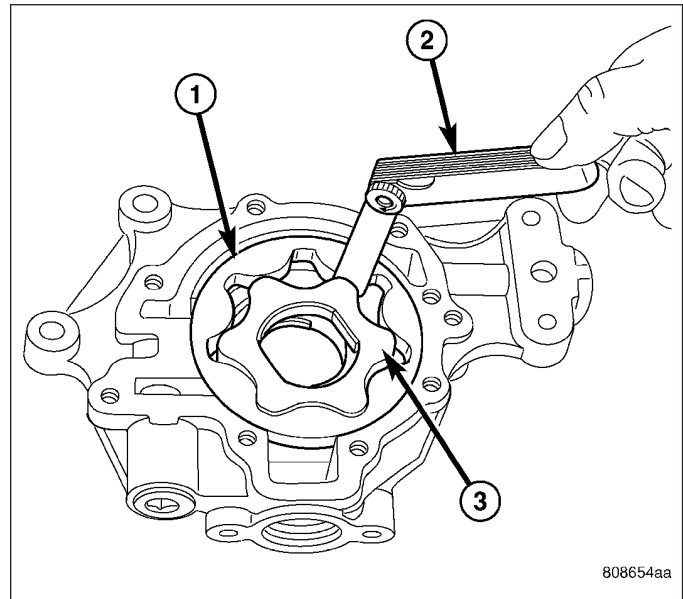
6. Measure the inner rotor, if inner rotor measures 9.474 mm (0.373 in.) or less replace inner rotor.



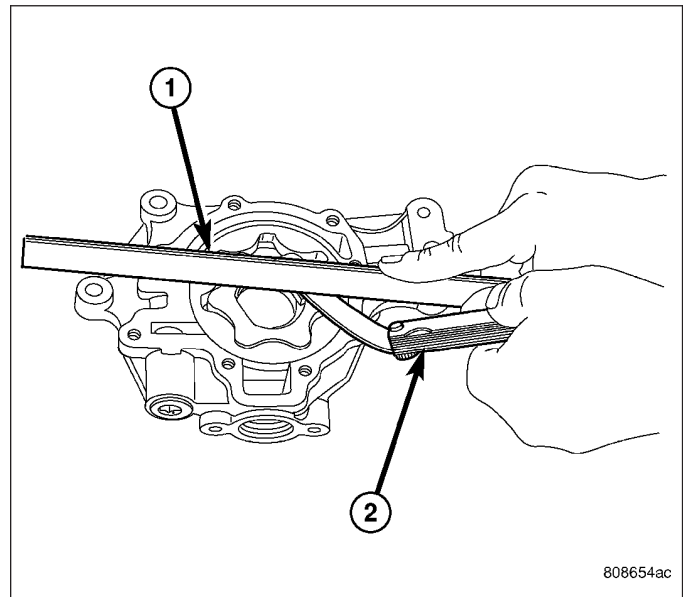
7. Slide outer rotor into body, press to one side with fingers and measure clearance between rotor and body (2). If measurement is 0.39 mm (0.015 in.) or more, replace body only if outer rotor is in specifications.



8. Install inner rotor (3) into body. If clearance between inner rotor (3) and outer rotor (1) is 0.20 mm (0.008 in.) or more, replace both rotors.



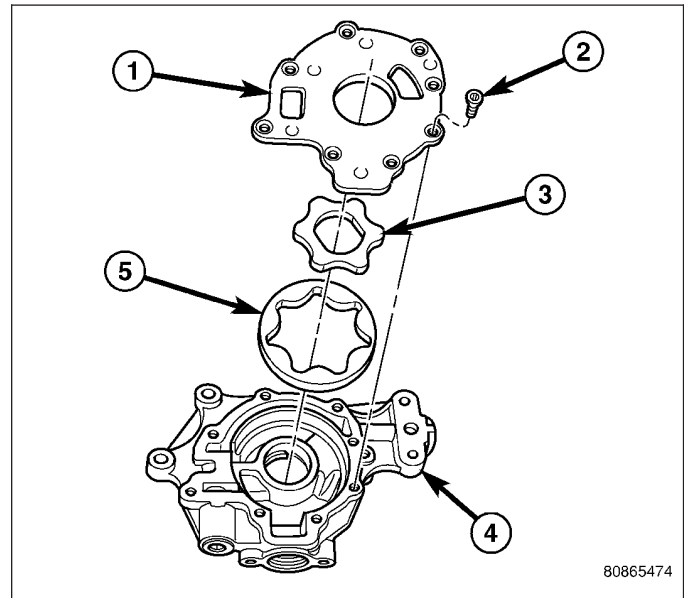
9. Place a straightedge (1) across the face of the body, between bolt holes. If a feeler gauge (2) of 0.077 mm (0.003 in.) or more can be inserted between rotors and the straightedge, replace pump assembly **ONLY** if rotors are in specification.
10. Assemble oil pump(Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - ASSEMBLY).





## ASSEMBLY

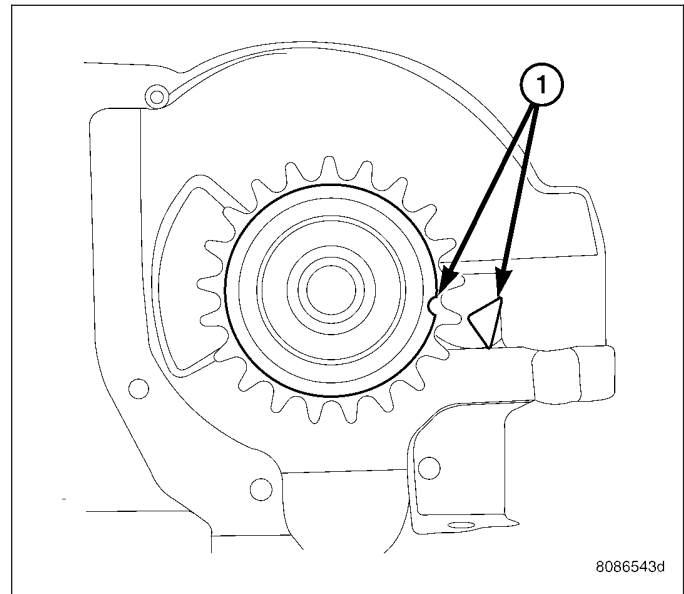
1. Assemble pump using new parts as required.
2. Tighten cover screws (2) to 12 N·m (105 in. lbs.).
3. Prime oil pump before installation by filling rotor cavity with engine oil.



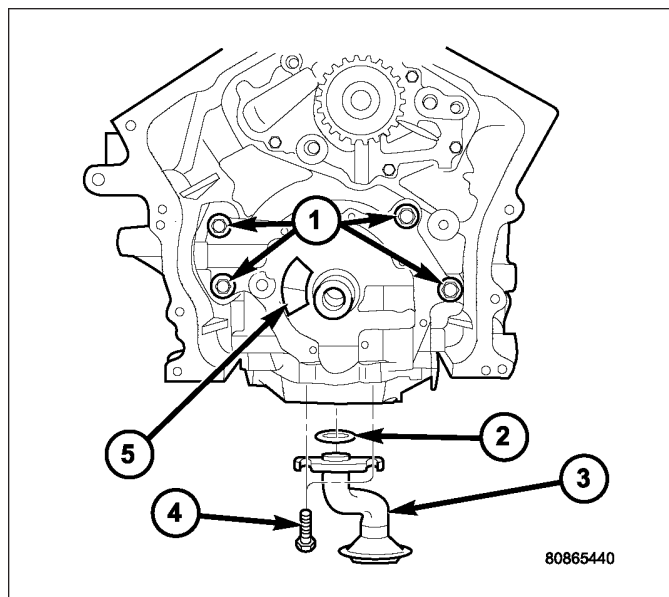
## INSTALLATION

**CAUTION:** Crankshaft position must be at 60° ATDC of No.1 cylinder before installing oil pump (1). This position will properly locate oil pump. If not properly located, severe damage to oil pump can occur.

1. Prime oil pump before installation by filling rotor cavity with engine oil.
2. If crankshaft has been rotated, it must be repositioned to 60° ATDC of No.1 cylinder (1) prior to oil pump installation.



3. Install oil pump (5) carefully over crankshaft and into position.
4. Install oil pump attaching bolts (1). Tighten bolts to 28 N·m (250 in. lbs.).
5. Install oil pick-up tube (3) with new O-ring (2). Lubricate O-ring (2) with clean engine oil before installation. Tighten attaching bolts (1) to 28 N·m (250 in. lbs.).
6. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
7. Install timing chain and sprockets(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
8. Install timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
9. Install crankshaft vibration damper(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
10. Fill crankcase with engine oil to correct level.



## MANIFOLD-INTAKE

### DIAGNOSIS AND TESTING

#### INTAKE MANIFOLD LEAKS

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

**WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.**

1. Start the engine.
2. Spray a small stream of water (Spray Bottle) at the suspected leak area.
3. If engine RPM'S change, the area of the suspected leak has been found.
4. Repair as required.

#### STANDARD PROCEDURE - INTAKE MANIFOLD VACUUM PORT REPAIR

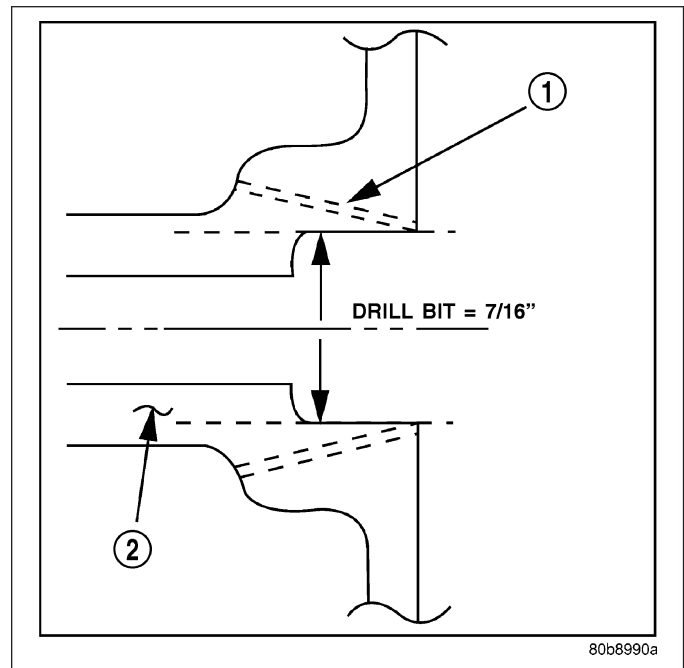
The composite intake manifold vacuum ports can be repaired. Although, if the manifold plenum chamber is damaged or cracked, the manifold must be replaced.

To repair a broken or damaged vacuum nipple (port) on the composite intake manifold, perform the following procedure:

PARTS REQUIRED	TOOLS REQUIRED
Brass Nipple – 3/8" O.D. x 1/4" pipe thread (Speed Control Port)	Pipe Tap – 1/4" - 18 NPT
Brass Nibble – 1/2" O.D. x 1/4" pipe thread (Brake Booster Port)	Drill Bit – 7/16"
	File/Sand Paper

**Note:** While performing this procedure, avoid getting the manifold material residue into the plenum chamber.

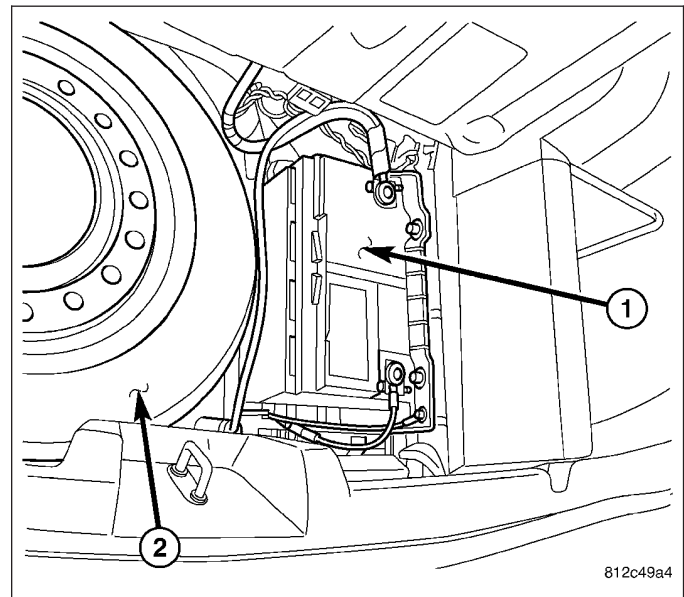
1. File or sand the remaining port back until a flat surface is obtained (plane normal to nipple (port) axis).
2. Drill out the nipple port (2) base using a 7/16" drill bit.
3. Using a 1/4"-18 NPT pipe tap (1), cut internal threads. Use caution to start tap in a axis same as original nipple.
4. Apply Mopar® Thread Sealant to threads of repair nipple(s).
5. Install repair nipple(s). Do not over torque repair nipple(s).



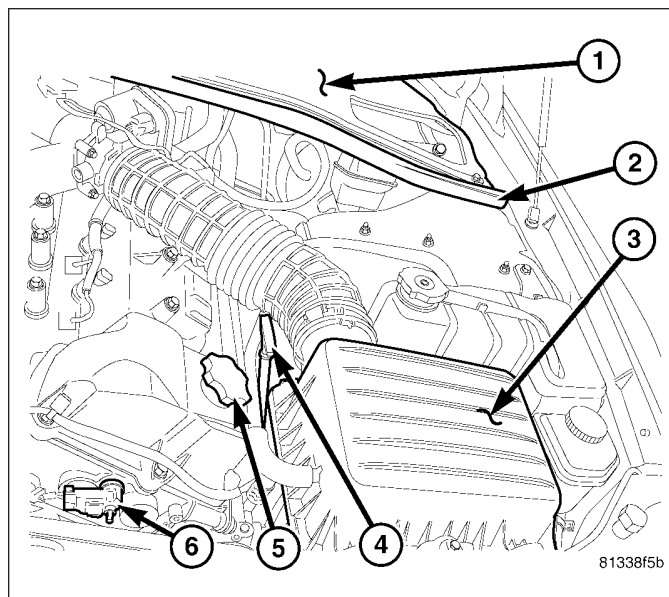
## REMOVAL

### INTAKE MANIFOLD UPPER

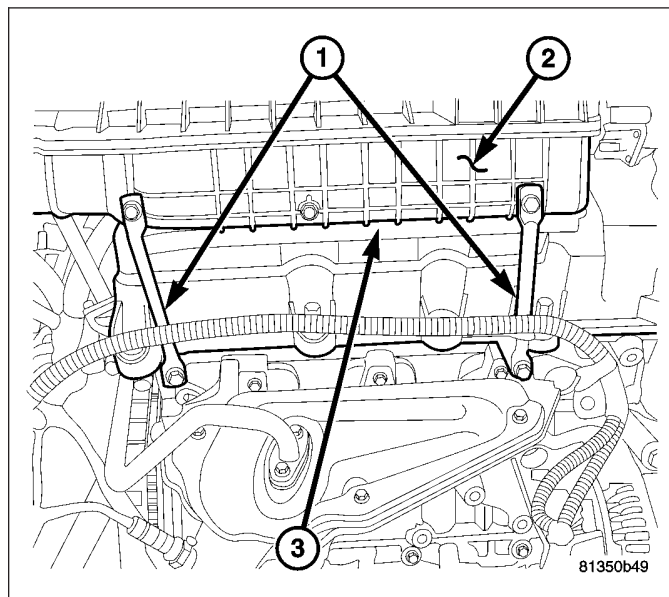
1. Disconnect negative battery (1) cable.



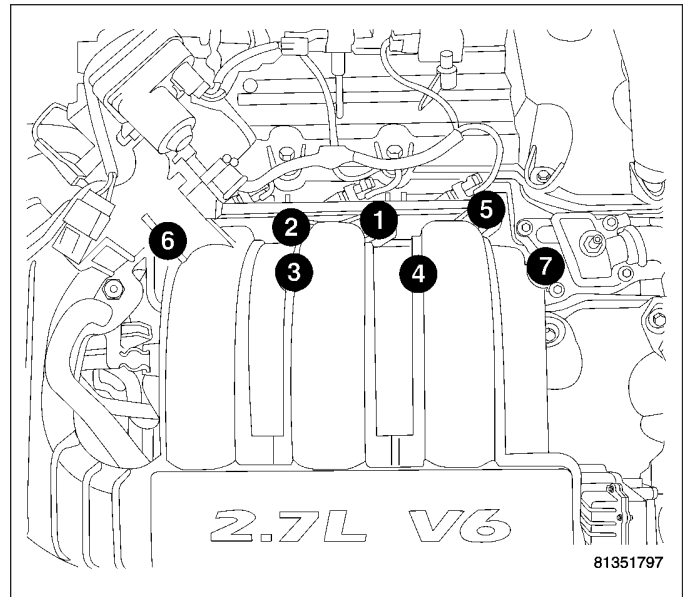
2. Remove throttle body air inlet hose and air cleaner housing assembly (3)(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
3. Disconnect electrical connectors from the following components:
  - Manifold Absolute Pressure (MAP) Sensor
  - Electronic Throttle Control
  - Manifold Tuning Valve
4. Disconnect Vapor Purge hose, Brake Booster hose, Positive Crankcase Ventilation (PCV) hose.



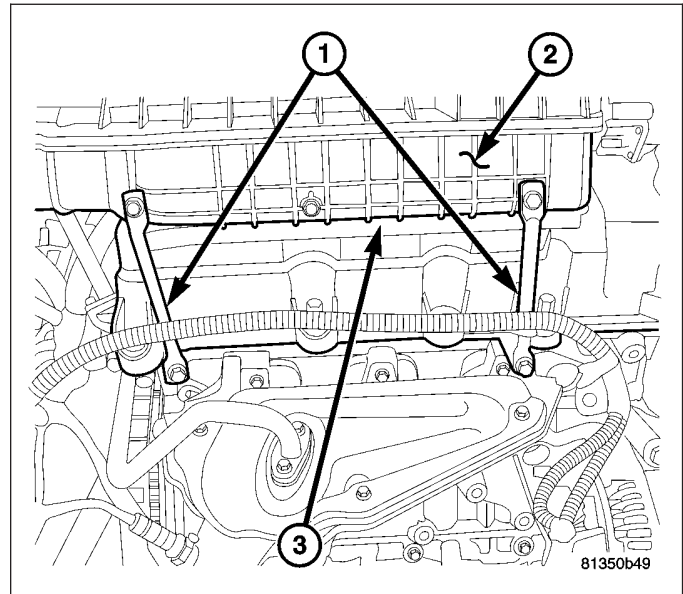
5. Remove manifold support brackets (1).



6. Remove manifold attaching bolts.

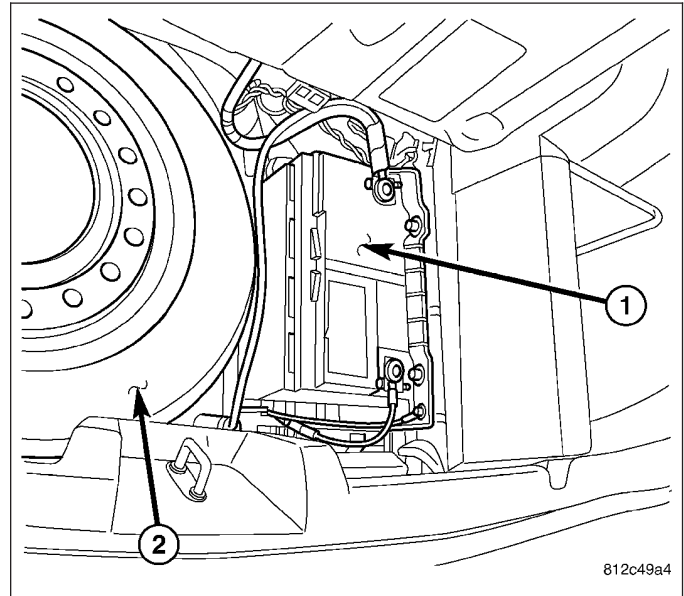


- 7. Remove upper manifold (2).
- 8. Remove foam insulator (3).
- 9. Inspect manifold (2) (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSPECTION).

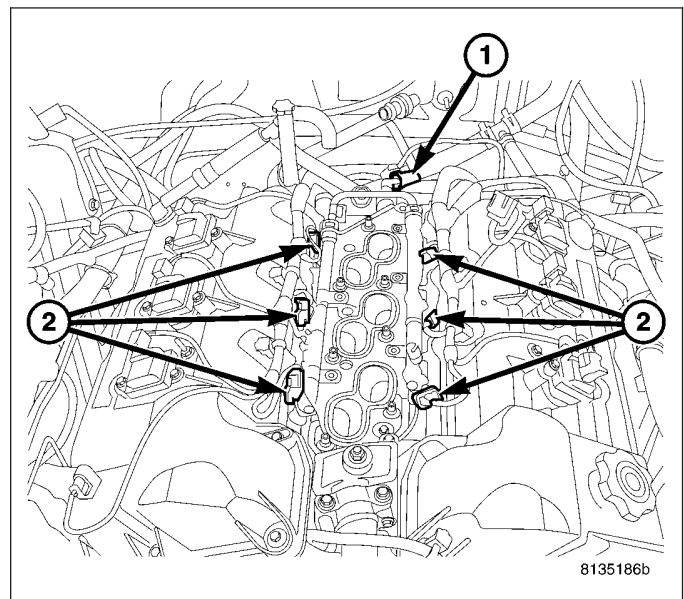


## REMOVAL - INTAKE MANIFOLD LOWER

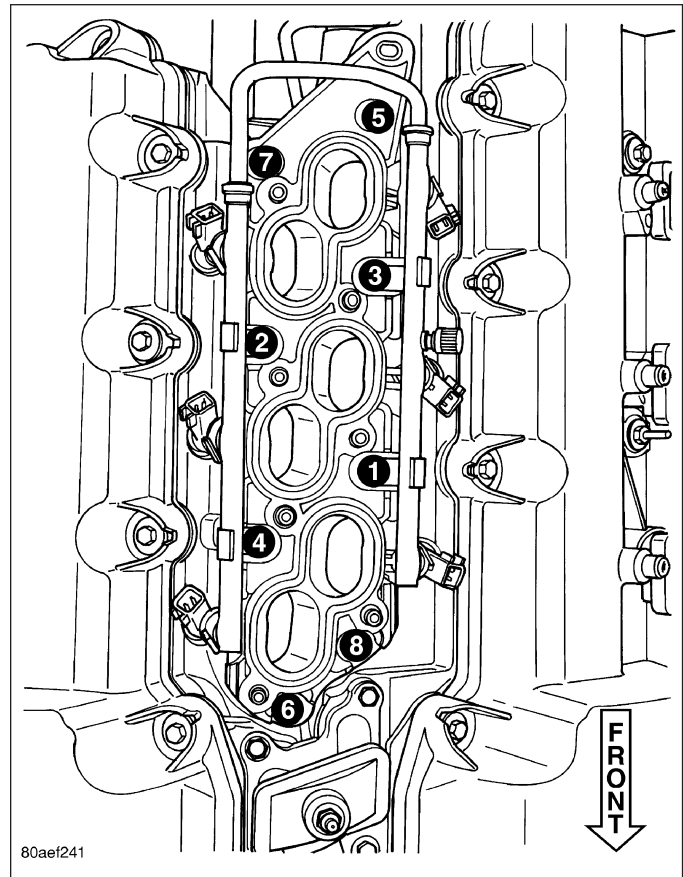
1. Release fuel system pressure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
2. Disconnect negative battery (1) cable located in trunk.
3. Remove upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).



4. Disconnect injector electrical connectors (2).
5. Disconnect fuel supply hose (1) from fuel rail (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL LINES - STANDARD PROCEDURE).



6. Remove bolts attaching fuel rail (1 - 4).
7. Remove fuel rail and injectors as an assembly.
8. Remove manifold attaching bolts.
9. Remove lower manifold.
10. Inspect manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSPECTION).



## INSPECTION

### INTAKE MANIFOLD UPPER

Check manifold for:

- Damage and cracks
- Gasket surface damage or warpage
- Damaged or clogged EGR ports

If the manifold exhibits any damaged or warped conditions, replace the manifold. Clean EGR ports as necessary.

If a vacuum port is damaged, a repair procedure can be performed (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - STANDARD PROCEDURE).

### INSPECTION - INTAKE MANIFOLD LOWER

Check manifold for:

- Damage and cracks
- Gasket surface damage or warpage
- Damaged fuel injector ports

If the manifold exhibits any of these conditions, replace the manifold.

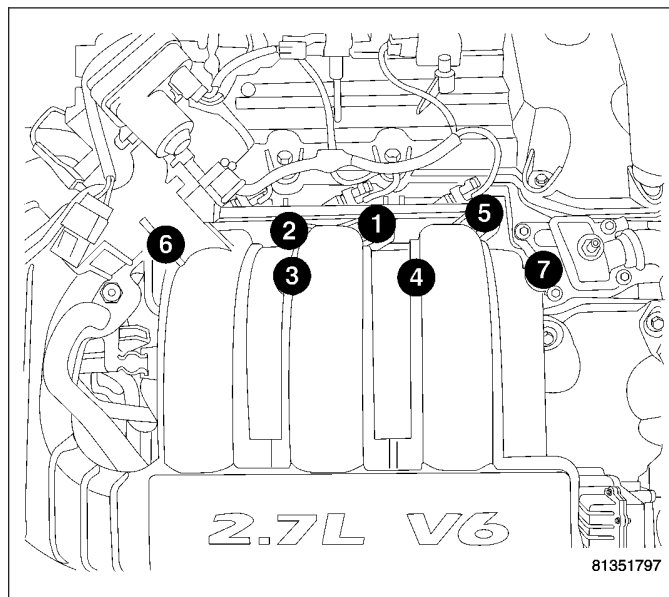
## INSTALLATION

### INTAKE MANIFOLD UPPER

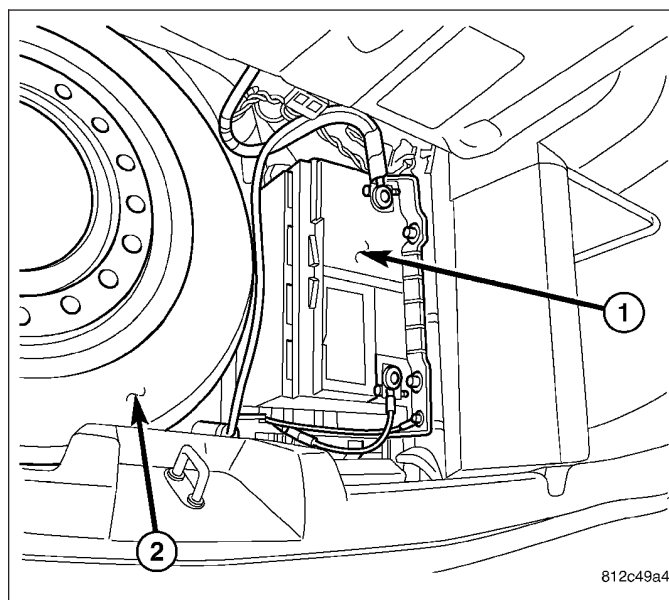
1. Clean and inspect sealing surfaces. Gaskets can be reused, if free of cuts or tears.

**Note:** Make sure fuel injectors and wiring harnesses are in correct position to not interfere with upper manifold installation.

2. Install upper manifold gasket.
3. Position upper manifold onto lower manifold.
4. Install manifold attaching bolts and tighten in sequence shown in to 12 N·m (105 in. lbs.).
5. Connect PCV , brake booster, and vapor purge hoses.
6. Connect electrical connectors to the following components:
  - Manifold Absolute Pressure (MAP) Sensor
  - Electronic Throttle Control
  - Manifold Tuning Valve
7. Install throttle body air inlet hose and air cleaner housing assembly(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION) .



8. Connect negative battery (1) cable.

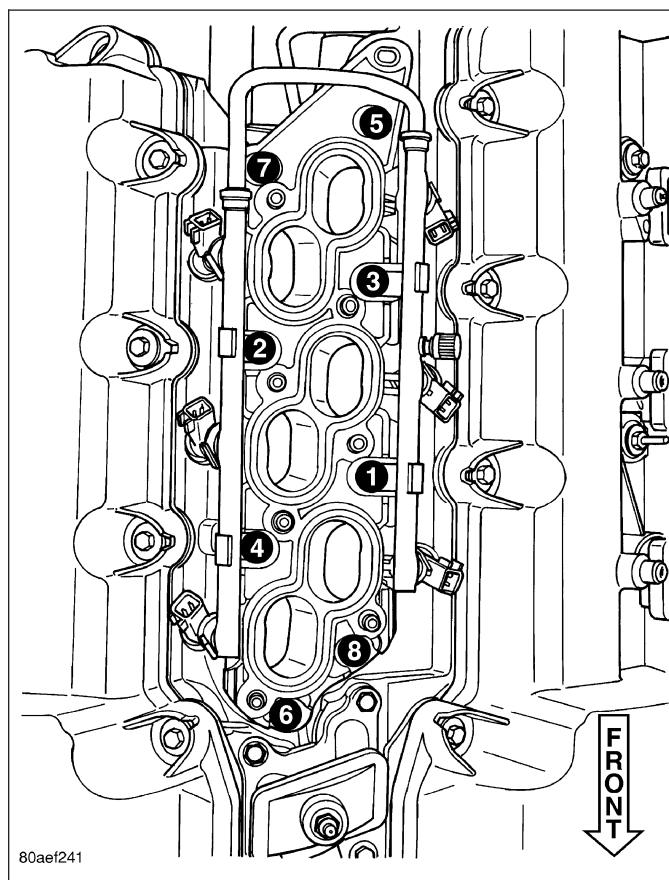




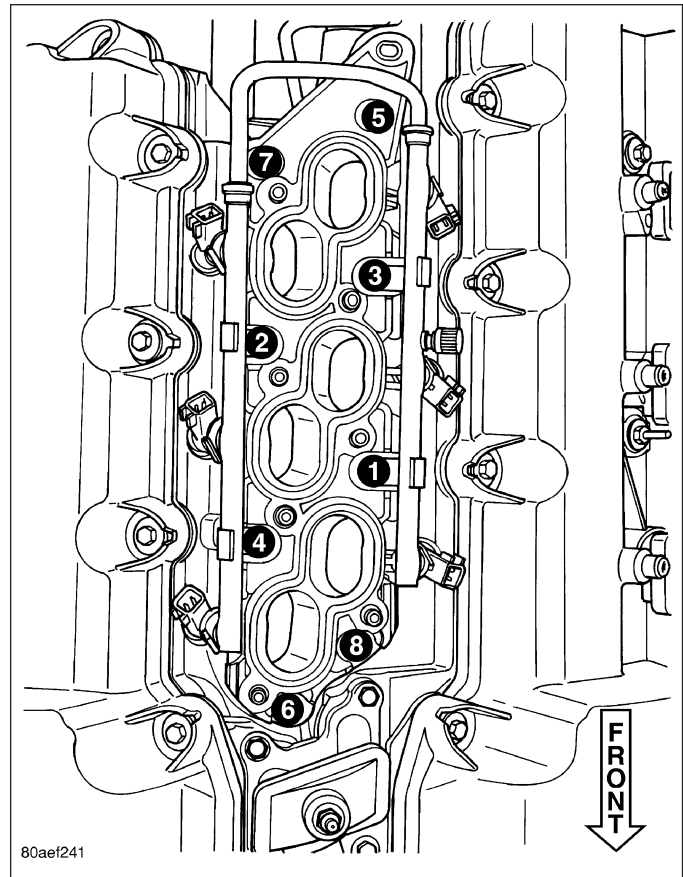
## INTAKE MANIFOLD LOWER

1. Clean and inspect sealing surfaces of cylinder head and manifold. Gaskets can be reused provided they are free of cuts or tears.
2. Install lower manifold gasket.
3. Position manifold on cylinder head surfaces.

**Note:** For ease of installing upper intake manifold, install a bolt 2 – 3 turns to the rearmost attaching hole of intake. This will properly position lower manifold.



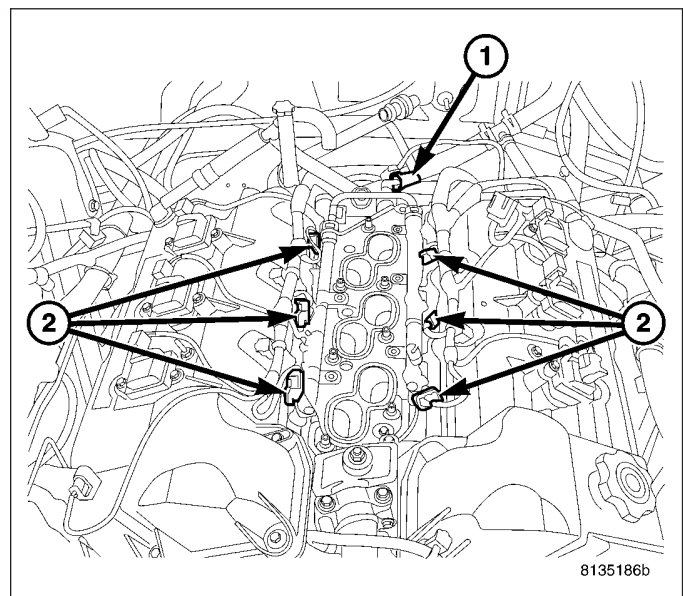
4. Install fuel rail with injectors and start bolts (1 - 4).
5. Install manifold attaching bolts and tighten in sequence shown in to 12 N·m (105 in. lbs.). Remove bolt used for aligning manifold.



6. Connect the fuel injector electrical connectors (2).

**Note:** Make sure fuel injectors are located in the correct location and position, as upper intake manifold interference could occur.

7. Connect fuel supply hose (1) to fuel rail. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL LINES - STANDARD PROCEDURE)
8. Install upper intake manifold. (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION)

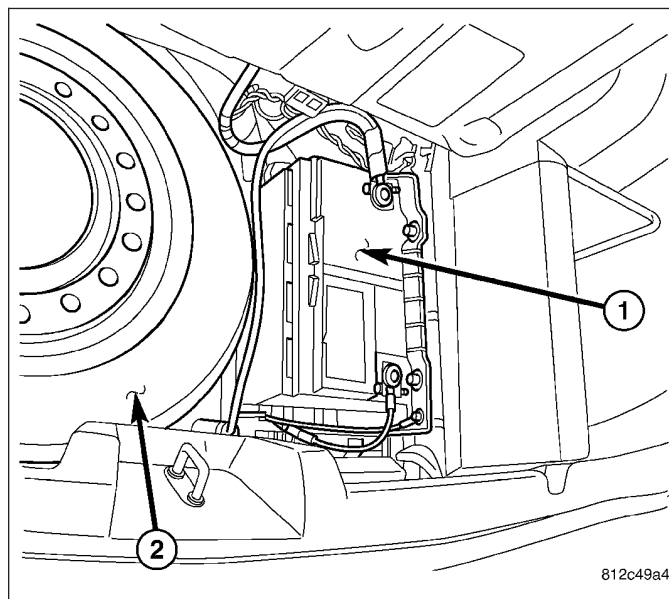


## MANIFOLD-EXHAUST

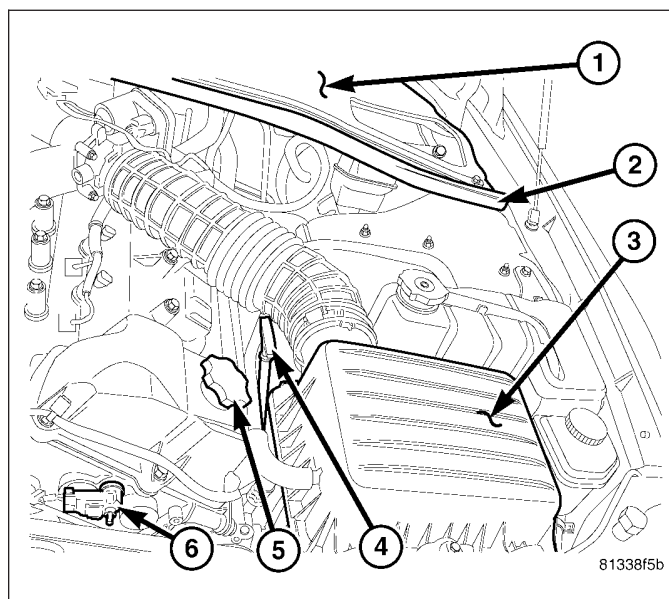
### REMOVAL

#### LEFT EXHAUST MANIFOLD

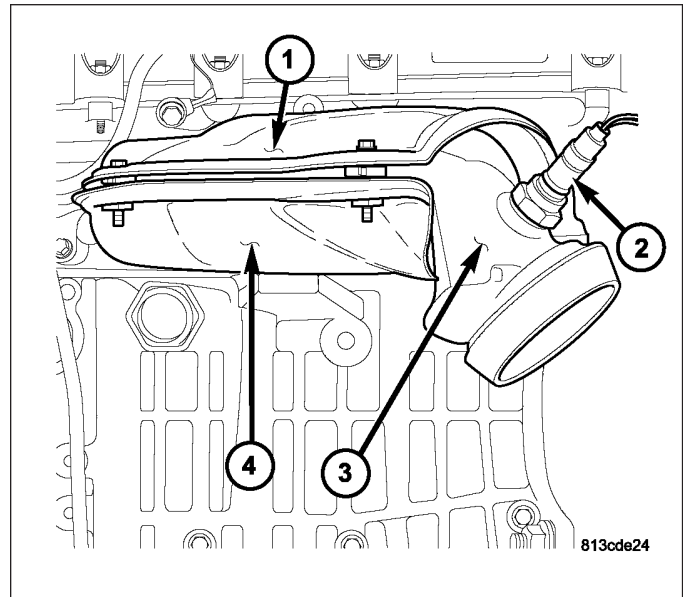
1. Disconnect negative battery (1) cable located in trunk.



2. Disconnect intake air temperature sensor connector.
3. Remove air cleaner housing assembly (3)(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
4. Remove oil dipstick tube (4).

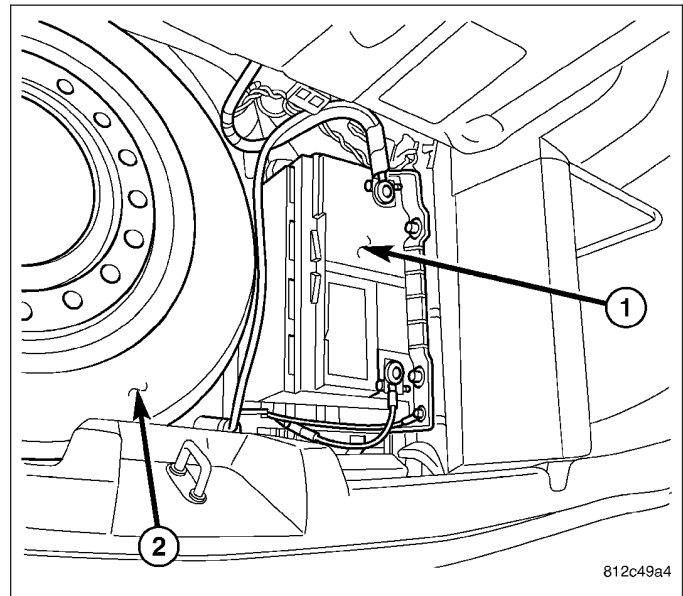


5. Disconnect and remove oxygen sensor (2).
6. Remove upper heat shield (1) and lower heat shield (4).
7. Raise vehicle on hoist.
8. Disconnect down stream oxygen sensor connector.
9. Remove exhaust pipe from manifold(Refer to 11 - EXHAUST SYSTEM/CATALYTIC CONVERTER - REMOVAL).
10. Remove exhaust manifold attaching bolts and remove manifold.

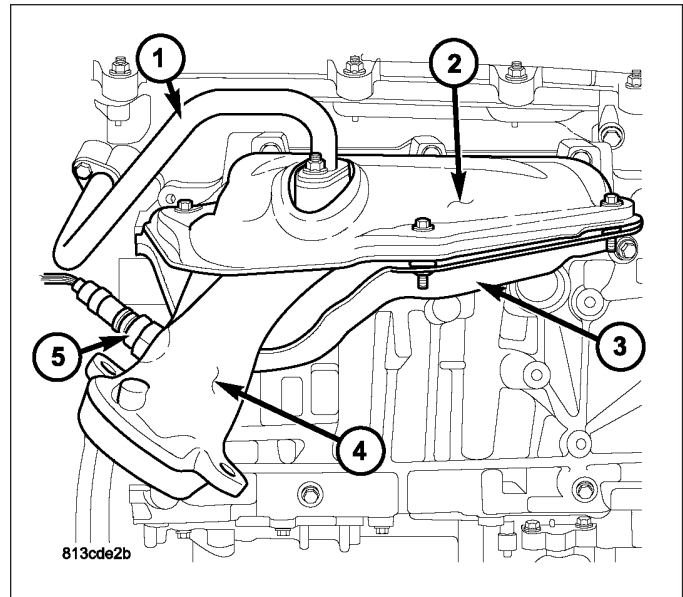


## RIGHT EXHAUST MANIFOLD

1. Disconnect negative battery (1) cable located in trunk.



2. Disconnect and remove upstream oxygen sensor (5).
3. Raise vehicle.
4. Remove EGR tube at EGR valve (1).
5. Remove EGR tube at manifold (1).
6. Disconnect down stream oxygen sensor electrical connector.
7. Disconnect exhaust pipe from manifold (4)(Refer to 11 - EXHAUST SYSTEM/CATALYTIC CONVERTER - REMOVAL).
8. Remove upper heat shield (2) and lower heat shield (3).
9. Remove manifold attaching bolts and remove manifold.



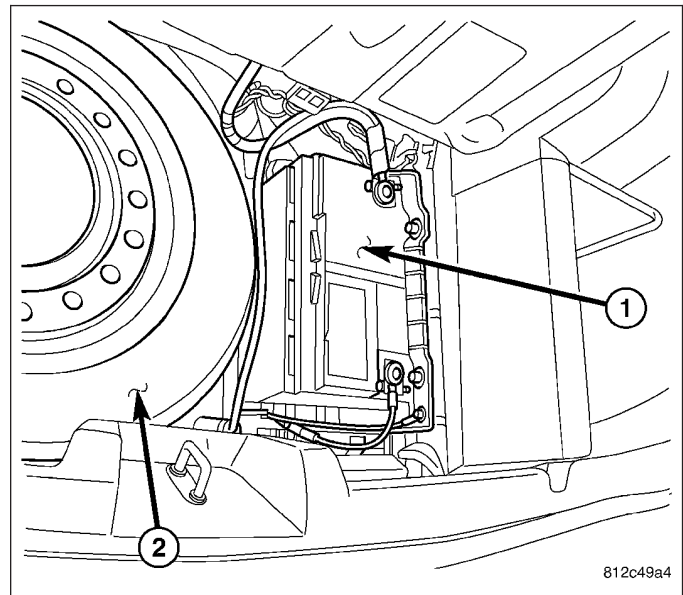
## INSPECTION

1. Inspect exhaust manifolds for damage or cracks.
2. Check manifold flatness.
3. Inspect the exhaust manifold gasket for obvious discoloration or distortion.
4. Check distortion of the cylinder head mounting surface with a straightedge and thickness gauge.

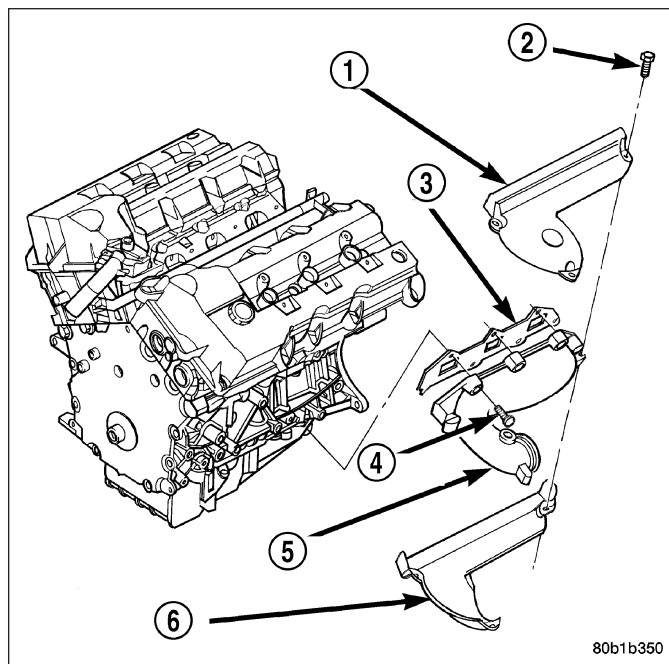
## INSTALLATION

### LEFT EXHAUST MANIFOLD

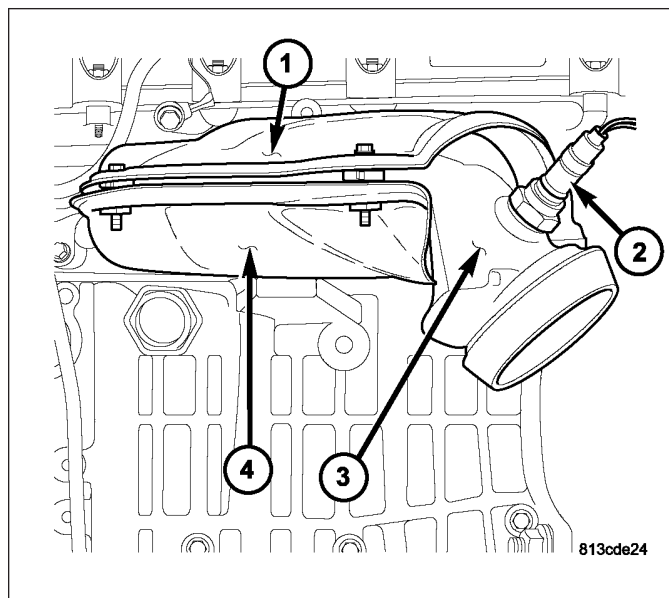
1. Disconnect negative battery (1) cable.



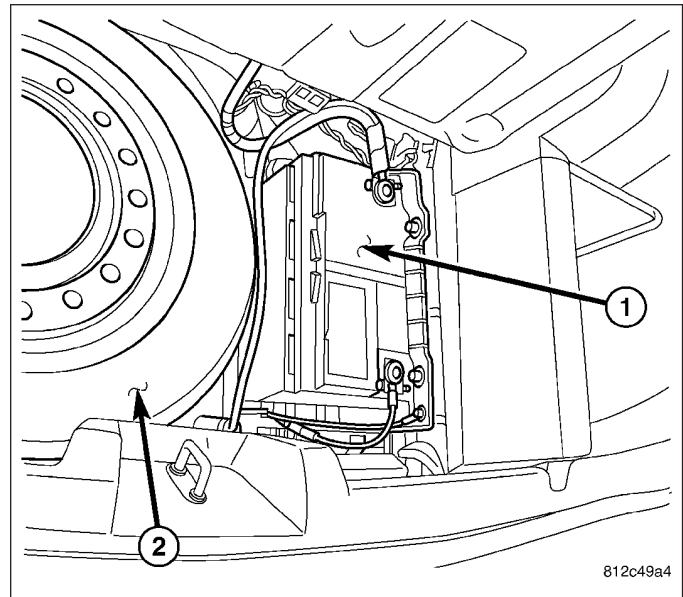
2. Raise vehicle on hoist.
3. Install exhaust manifold gasket (3) and manifold (4). Tighten bolts starting at the center working outward to 23 N·m (200 in. lbs.).
4. Install manifold lower heat shield (6) and upper heat shield (1). Tighten fasteners to 28 N·m (250 in. lbs.).
5. Install exhaust pipes to manifolds(Refer to 11 - EXHAUST SYSTEM/CATALYTIC CONVERTER - INSTALLATION).
6. Connect down stream oxygen sensor connectors.
7. Lower vehicle.



8. Install oxygen sensor (2) and connect electrical connector.

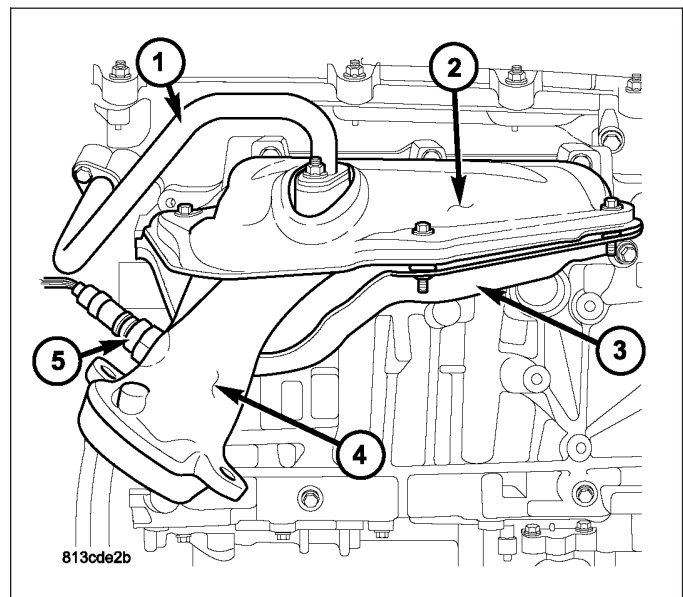


9. Connect negative battery (1) cable.



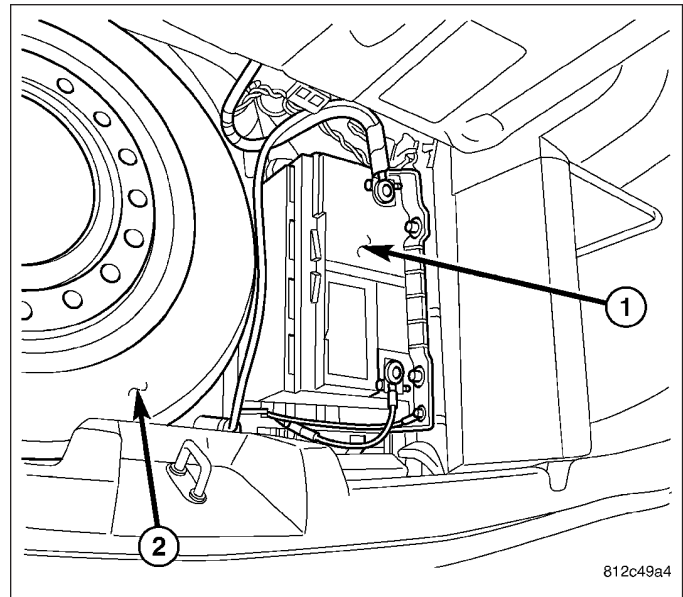
## RIGHT EXHAUST MANIFOLD

1. Install exhaust manifold gasket and manifold (4). Tighten bolts working from center outwards to 23 N·m (200 in. lbs.).
2. Install exhaust pipe to manifold (Refer to 11 - EXHAUST SYSTEM/CATALYTIC CONVERTER - INSTALLATION).
3. Install lower heat shield (3) and upper heat shield (2).
4. Install oxygen sensor (5) and connect electrical connector.
5. Connect down stream oxygen sensor electrical connector.
6. Lower vehicle.
7. Install EGR tube (1) using new gaskets. Tighten screws to 11 N·m (95 in. lbs.).



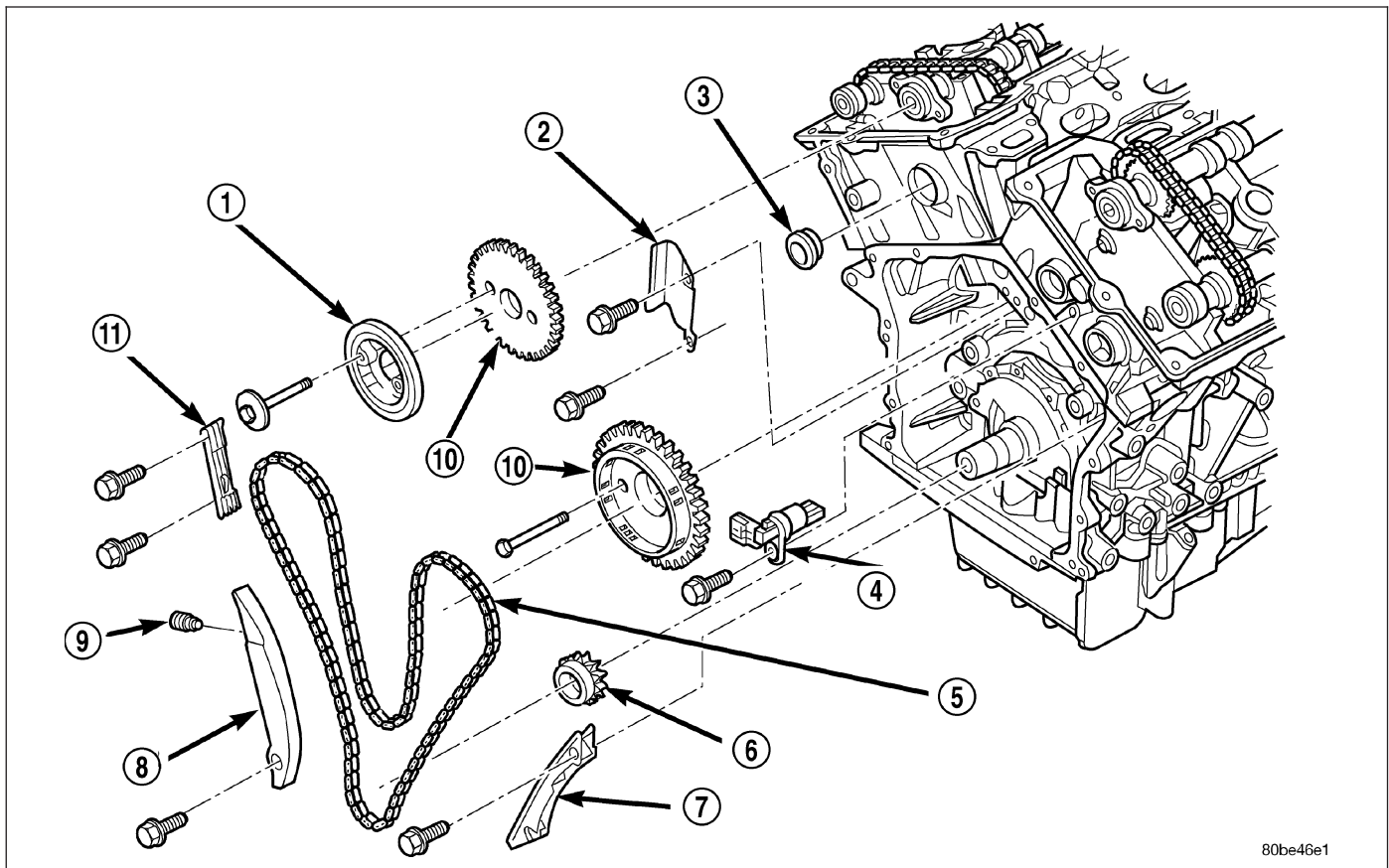


8. Connect negative battery (1) cable.



## VALVE TIMING

### DESCRIPTION



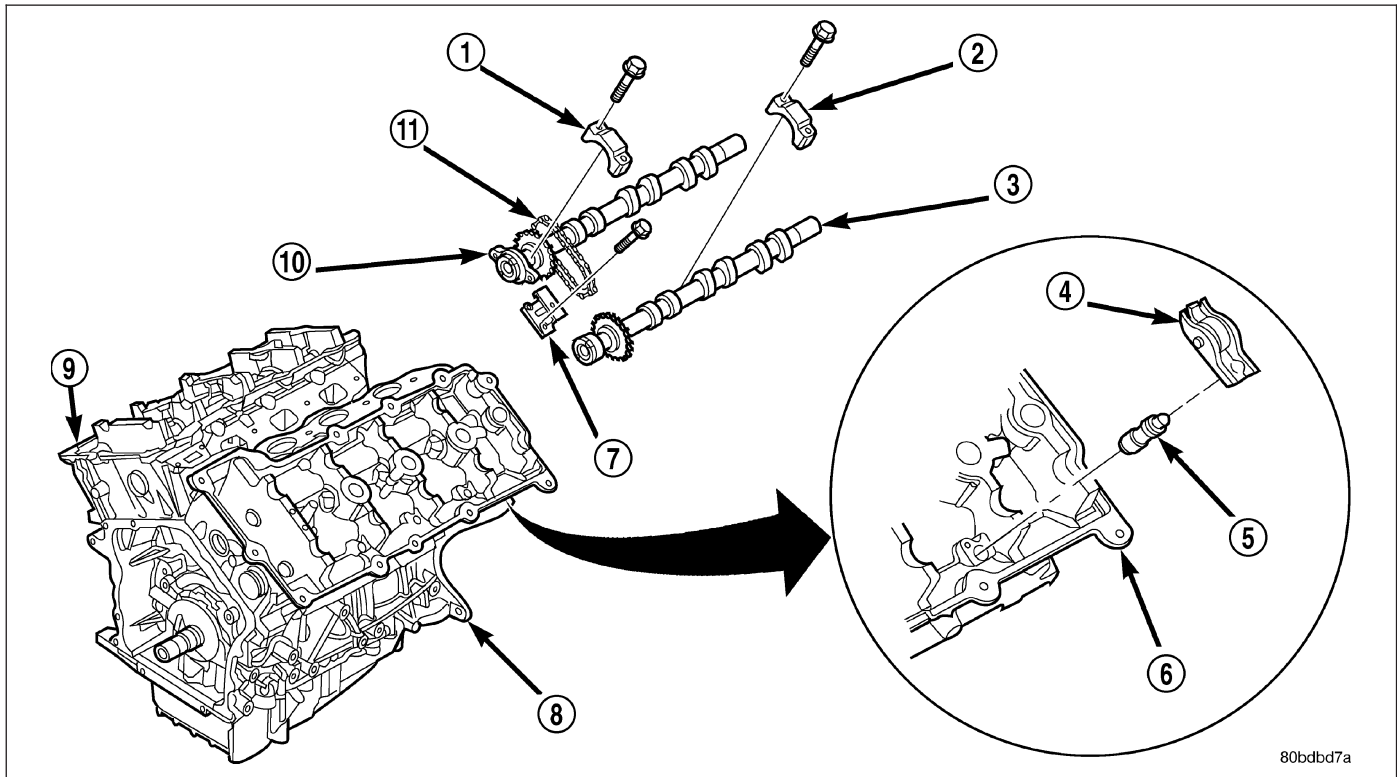
The timing drive system has been designed to provide quiet performance and reliability to support a **NON** free-wheeling engine. The system consists of a primary (5) drive chain and a secondary chain drive.

The **primary** timing chain (5) is a double-flexure, inverted tooth type chain. The primary chain drives both of the intake camshafts directly from a sprocket mounted on the crankshaft. In addition, the water pump is driven by the "back side" of the primary chain, necessitating the double-flexure type chain.



The chain is controlled by three fixed chain guides (2,7,11) and a pivoting tensioner arm (8). These guides utilize low-friction and long wearing nylon plastic wear faces. To tension the primary chain, a fully automatic spring-loaded, engine oil-fed, hydraulic tensioner (9) is used. The tensioner (9) is mounted in the right cylinder head with the plunger contacting the pivoting tensioner arm. A mechanical ratchet mechanism inside the tensioner prevents excessive chain slack upon engine start-up as the chain wears. The tensioner is designed with an internal oil reservoir to assure noise-free performance, even during engine start-up before oil pressure reaches the tensioner.

For lubrication the primary chain utilizes oil leakage from the front of the oil pump. This oil spills on the crankshaft sprocket, which is then carried by the chain throughout the primary drive.



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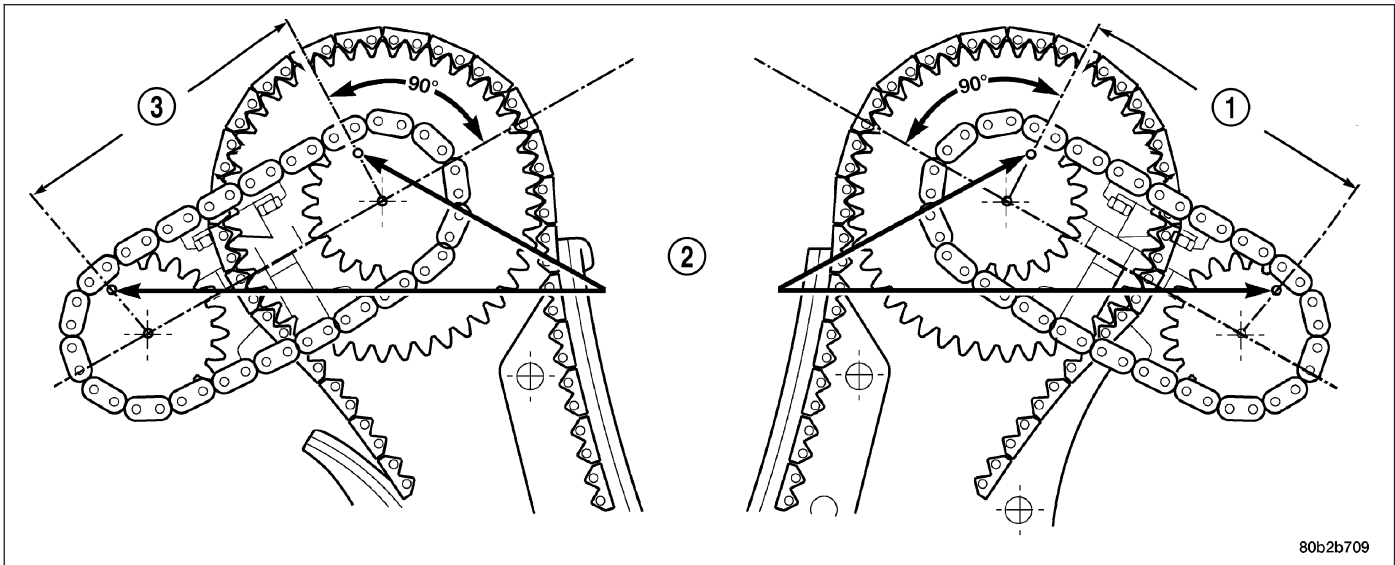
The **secondary** timing chain (11) drive system uses two conventional roller-type chains, one at each cylinder bank. The purpose of the secondary chain (11) is to provide a mechanical driven connection between the intake and exhaust camshafts. The intake camshafts drive the exhaust camshafts. The sprockets for both intake and exhaust camshafts are a press-fit and are only serviced as an assembly with the camshafts.

To tension the secondary chain a spring-loaded, hydraulic tensioners (7) are used at each bank and attaches to each cylinder head between the intake and exhaust camshafts. The tensioner (7) incorporates upper and lower chain guide faces. The lower guide face is attached directly to the tensioner's hydraulic plunger. Also, the tensioner uses an internal oil reservoir design to prevent engine start-up noise. The secondary chains are lubricated via an oil passage through the upper guide face on each tensioner.

## STANDARD PROCEDURE

### ENGINE TIMING - VERIFICATION

Correct timing is critical for the NON free-wheeling designed, 2.7L engine. Engine timing can be verified by using the following procedures:

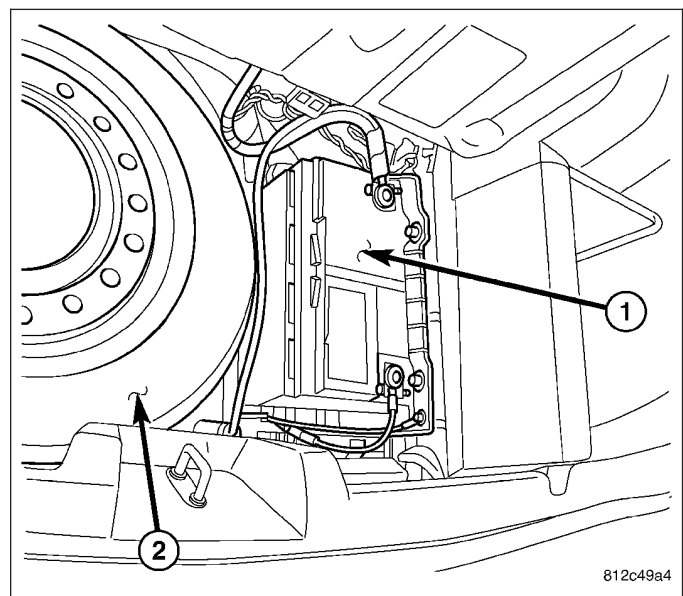


1. Remove cylinder head covers. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)
2. Rotate engine until number one cylinder is at TDC on the EXHAUST stroke.
3. View the intake camshaft sprocket timing mark. The mark should be 90° from the cylinder head cover sealing surface on both right and left cylinder banks.
4. Count chain pins from the mark on the intake camshaft towards the exhaust camshaft (1&3). Engine is timed correctly when there are 12 chain pins between the timing marks (2) on the intake camshaft and exhaust camshaft.
5. If marks are not correctly aligned, proceed to Timing Chain and Sprockets for service procedures(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

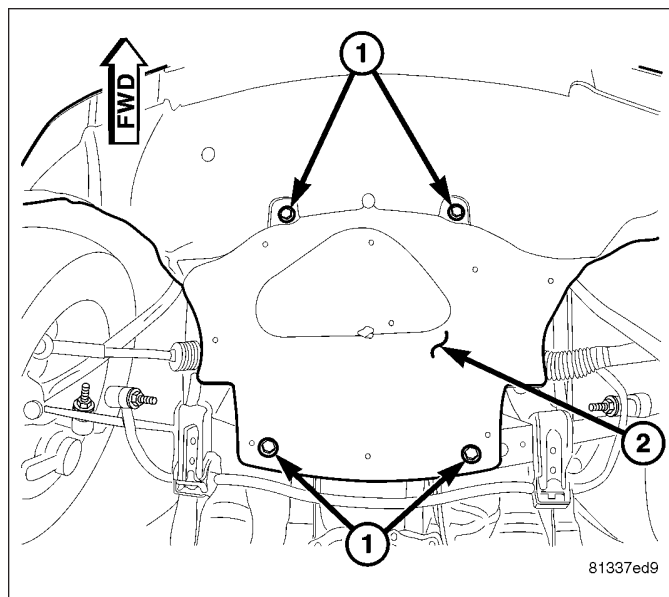
## COVER-TIMING CHAIN

### REMOVAL

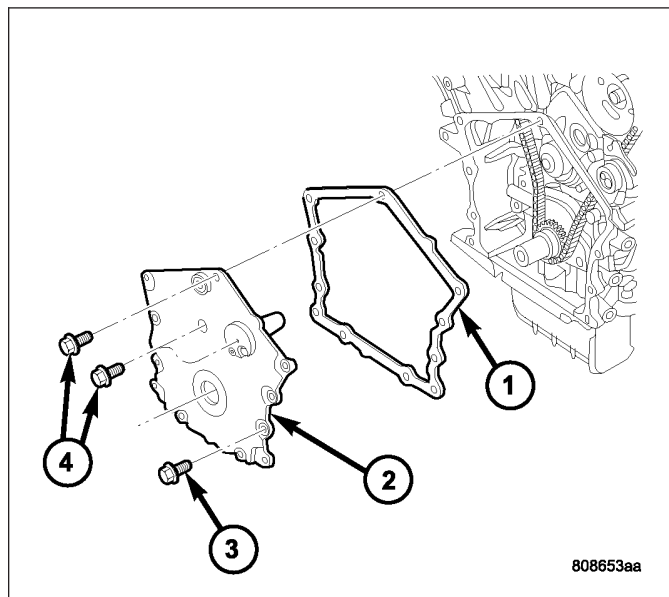
1. Disconnect negative battery (1) cable.
2. Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
3. Remove coolant pressure container (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY PRESS CONTAINER - REMOVAL).



4. Raise vehicle on hoist.
5. Remove lower splash shield retaining bolts (1) and splash shield (2).
6. Remove accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
7. Remove crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
8. Lower vehicle.

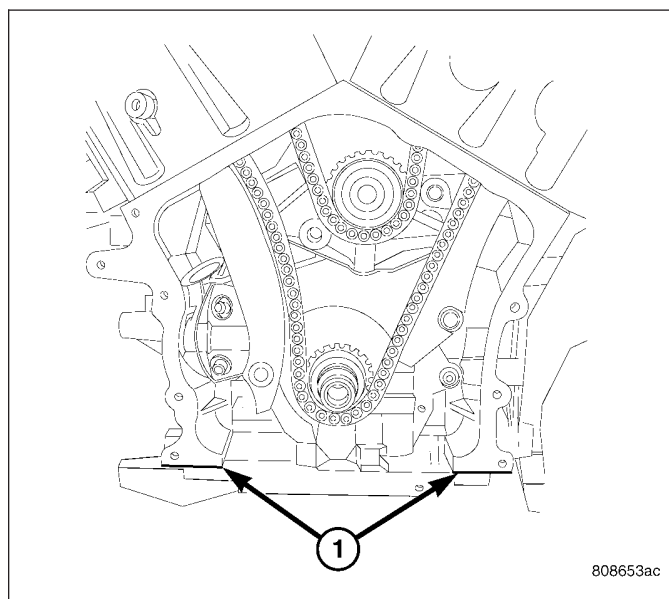


9. Remove timing chain cover bolts (3&4).
10. Remove timing chain cover (2).
11. Discard timing chain cover gasket (1). Remove front crankshaft oil seal from cover (2).

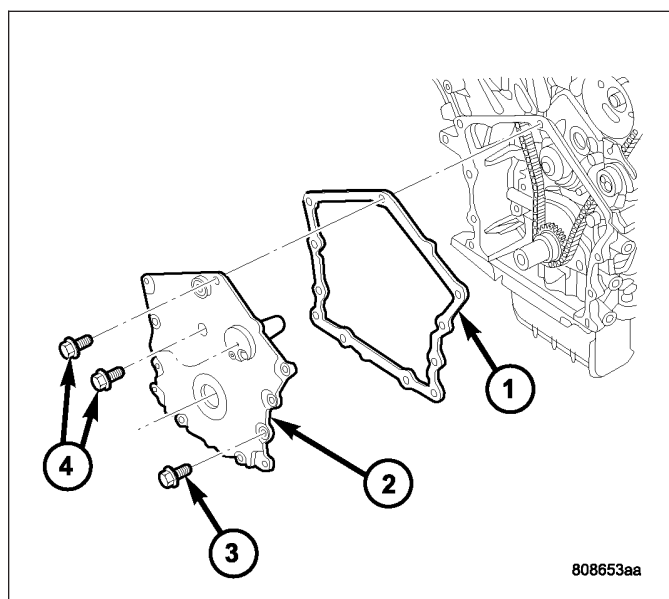


## INSTALLATION

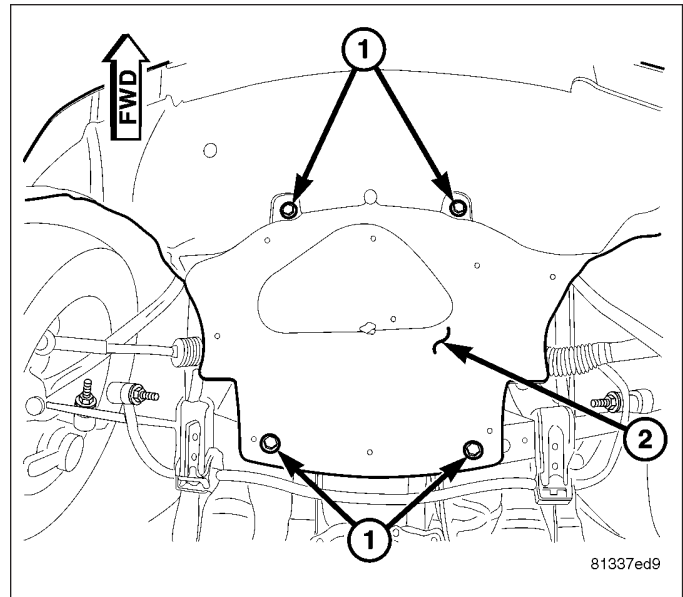
1. Inspect and clean timing chain cover sealing surfaces.
2. Before installing timing cover gasket apply a 1/8 inch bead of Mopar® Engine RTV GEN II to the parting lines between the oil pan and cylinder block (1).



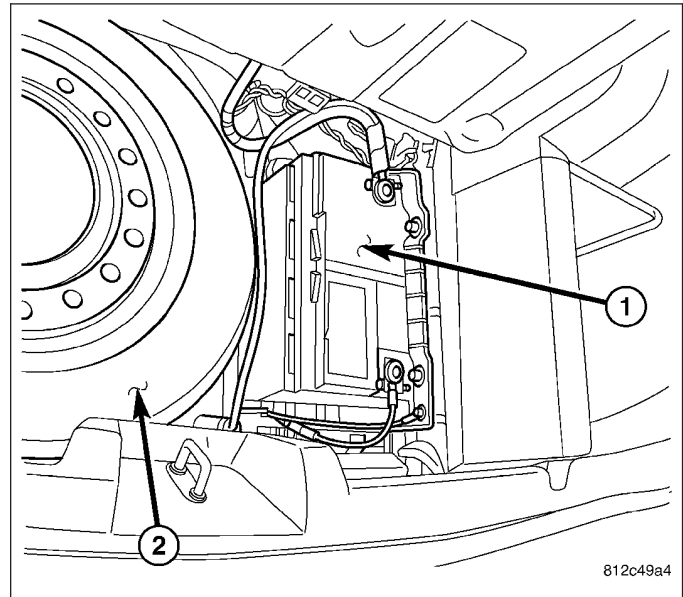
3. Install timing cover (2) and gasket (1). Tighten M10 cover bolts (4) to 54 N·m (40 ft. lbs.) and M6 bolts (3) to 12 N·m (105 in. lbs.).
4. Install front crankshaft oil seal using Special Tool 6780-2 sleeve and 6780-1 installer(Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - FRONT - INSTALLATION).
5. Install crankshaft vibration damper(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
6. Install accessory drive belts (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).



7. Install lower splash shield (2) and retaining bolts (1).



8. Lower vehicle.
9. Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
10. Connect negative battery (1) cable.

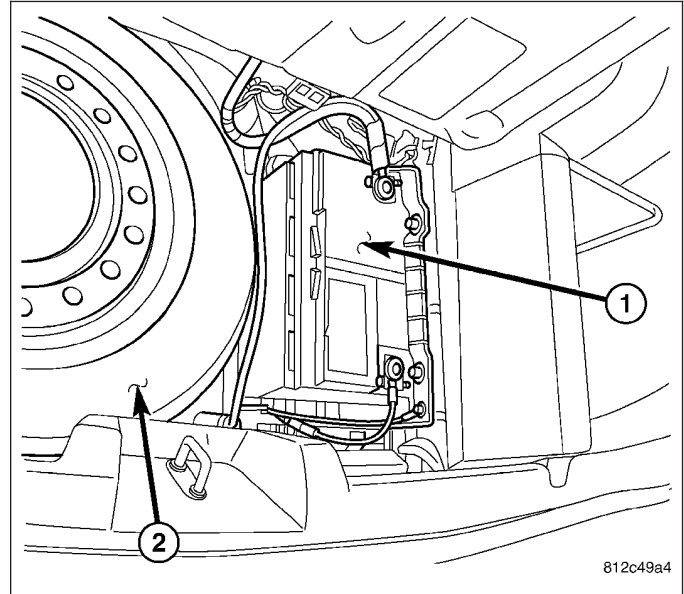


## CHAIN AND SPROCKETS-TIMING

### REMOVAL

#### TIMING CHAIN

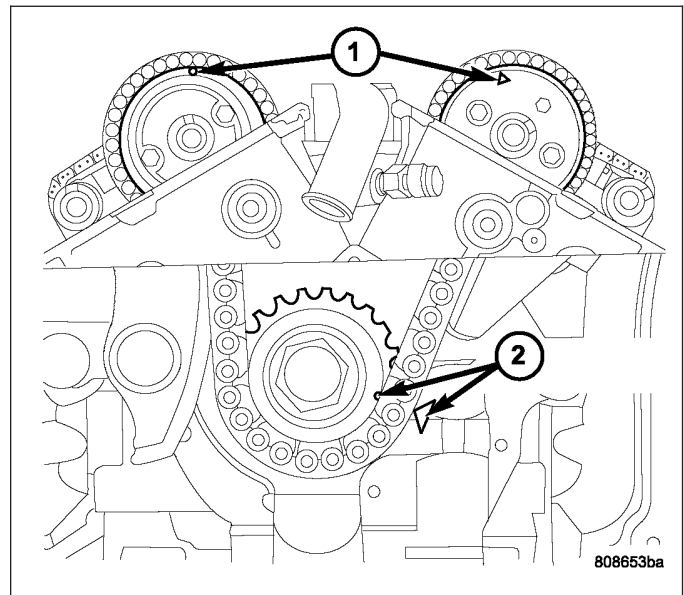
1. Disconnect negative battery (1)cable.
2. Drain cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).
3. Remove upper intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
4. Remove cylinder head covers, crankshaft vibration damper, and timing chain cover(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL) (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL) (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).



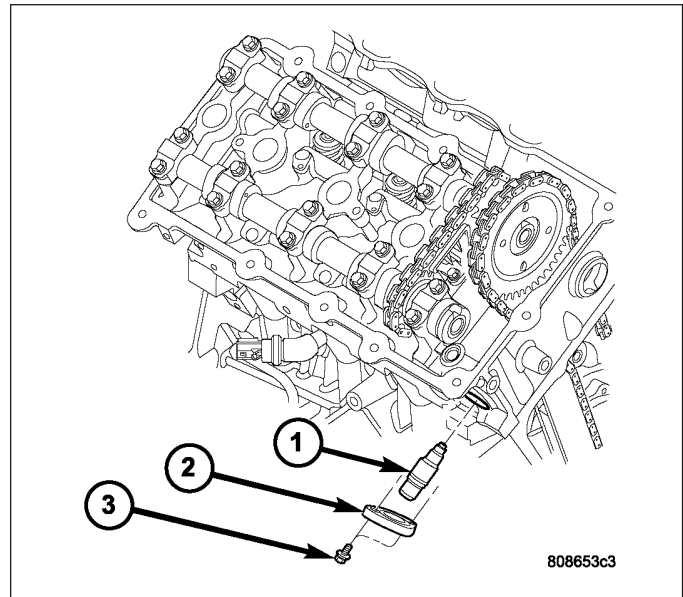
**CAUTION:** When aligning timing marks, always rotate engine by turning the crankshaft. Failure to do so will result in valve and/or piston damage.

5. Align crankshaft sprocket timing mark to mark on oil pump housing (2). The mark on oil pump housing is 60° ATDC of #1 cylinder.

**CAUTION:** When the timing chain is removed and the cylinder heads are still installed, DO NOT rotate the camshafts or crankshaft without first locating the proper crankshaft position. Failure to do so will result in valve and/or piston damage.



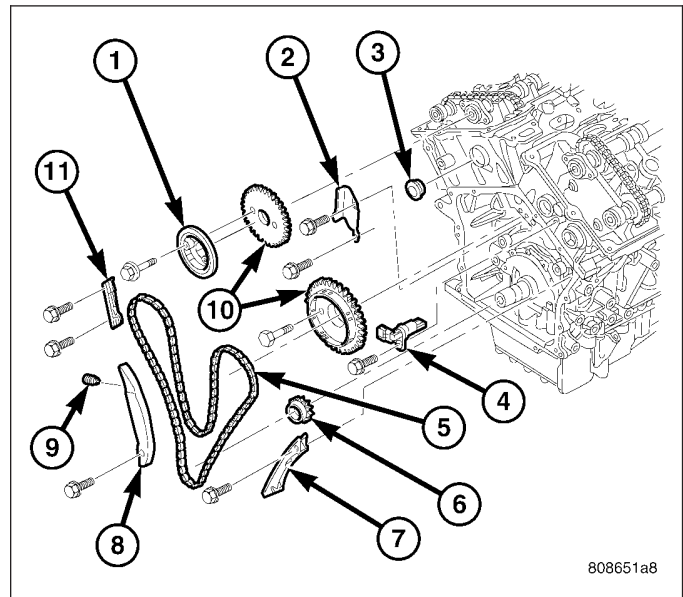
6. Remove primary timing chain tensioner retainer cap (2) and tensioner (1) from right cylinder head.



7. Disconnect and remove camshaft position sensor (4) from left cylinder head.
8. Remove timing chain guide access plugs (3) from cylinder heads.

**Note: When camshaft sprocket bolts are removed, the camshafts will rotate in a clockwise direction.**

9. Starting with the right camshaft sprocket, remove the sprocket attaching bolts. Remove camshaft damper (1) (if equipped) and sprocket.
10. Remove left side camshaft sprocket attaching bolts and remove sprocket.
11. Remove lower chain guide (7) and tensioner arm (8).
12. Remove the primary timing chain (5).
13. For removal of crankshaft sprocket (6), (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - REMOVAL).

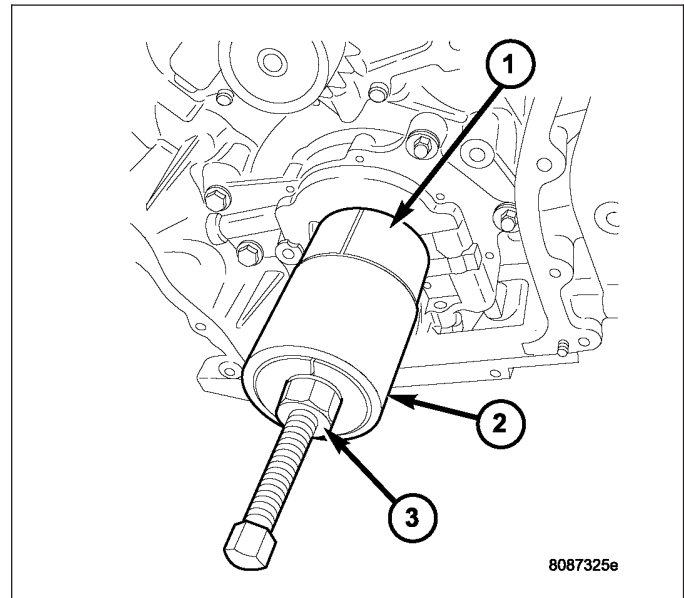


## REMOVAL - CRANKSHAFT SPROCKET

1. Remove primary timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

**CAUTION:** Use care not to turn crankshaft while removing crankshaft sprocket, as damage to valves and or pistons could occur.

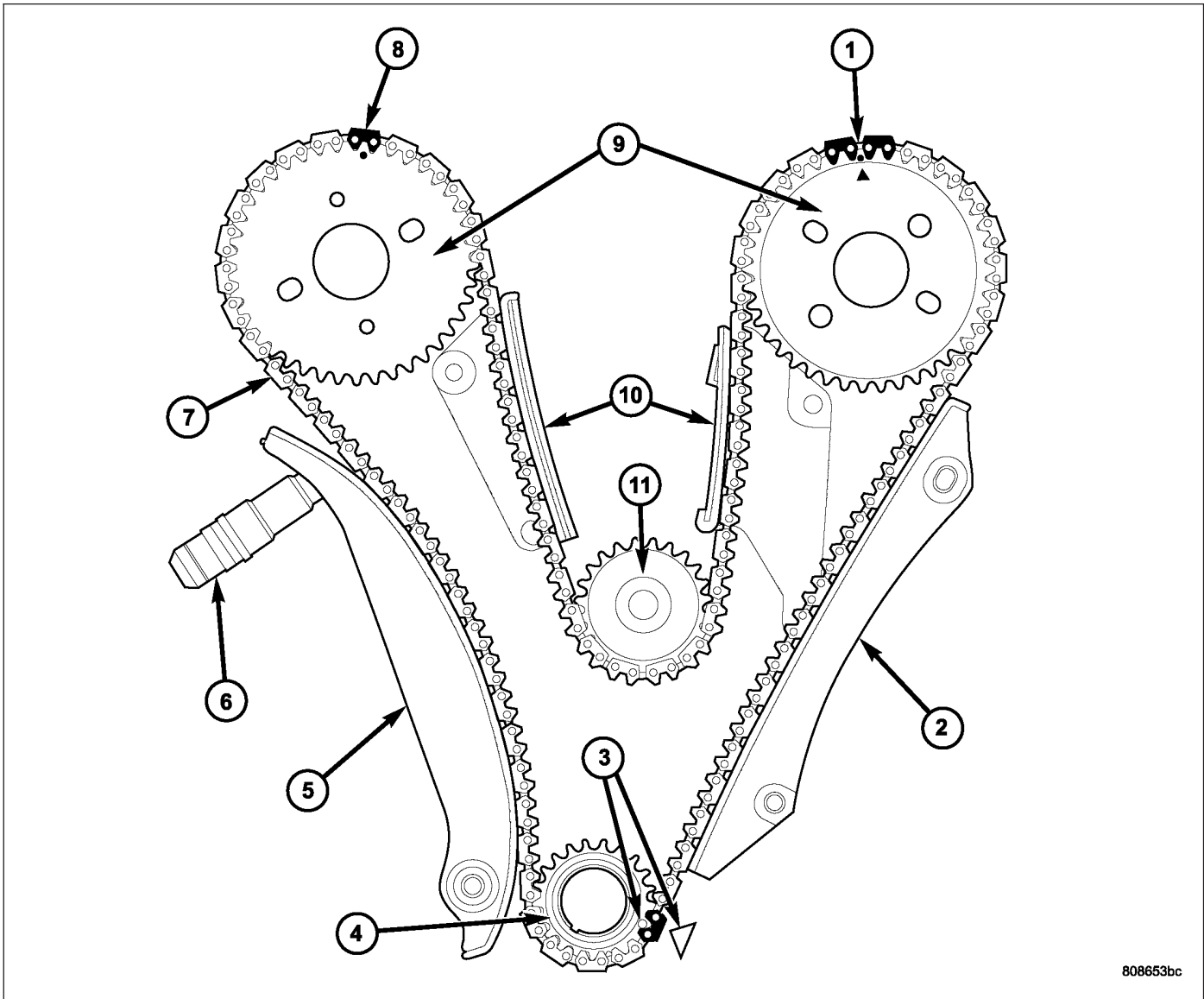
2. Remove crankshaft sprocket by first installing the crankshaft damper bolt. Apply grease or equivalent to damper bolt head and position Special Tools 5048-1(3), 5048-6 (2), and 8539 (1) on sprocket and crankshaft nose. Remove sprocket using care not to rotate the crankshaft.





## INSTALLATION

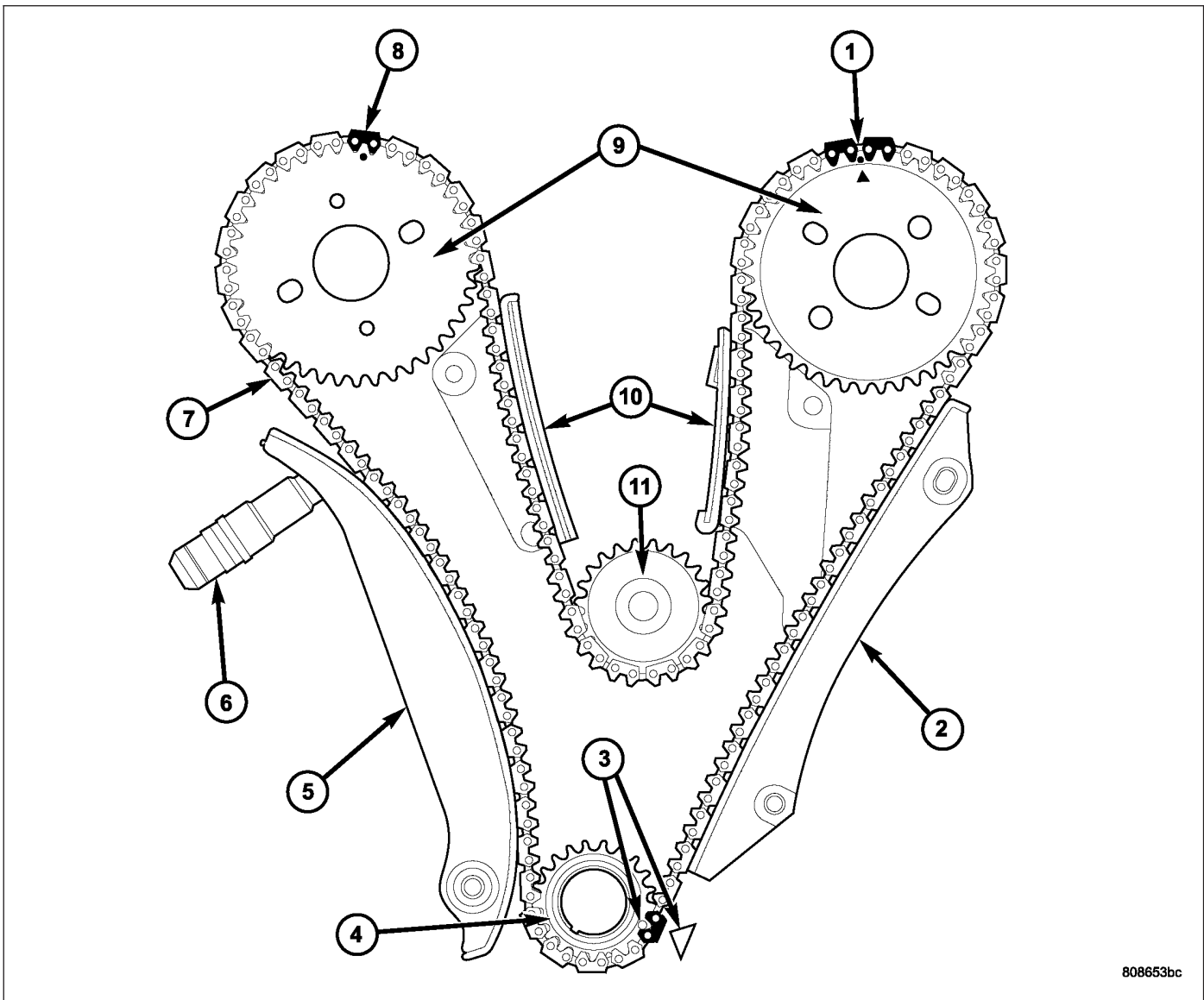
### TIMING CHAIN



1. Inspect all sprockets (4,9,11) and chain guides (2,5,10). Replace if worn.
2. For crankshaft sprocket installation procedures (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - INSTALLATION).
3. If removed, install right and left side short chain guides (11). Tighten attaching bolts to 28 N-m (250 in. lbs.).
4. Align crankshaft sprocket timing mark to the mark on oil pump housing(3).

**Note:** Lubricate timing chain and guides with engine oil before installation.

5. Place left side primary chain sprocket onto the chain so that the timing mark is located in-between the two (plated) timing links (1).



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6. Lower the primary chain with left side sprocket through the left cylinder head opening.

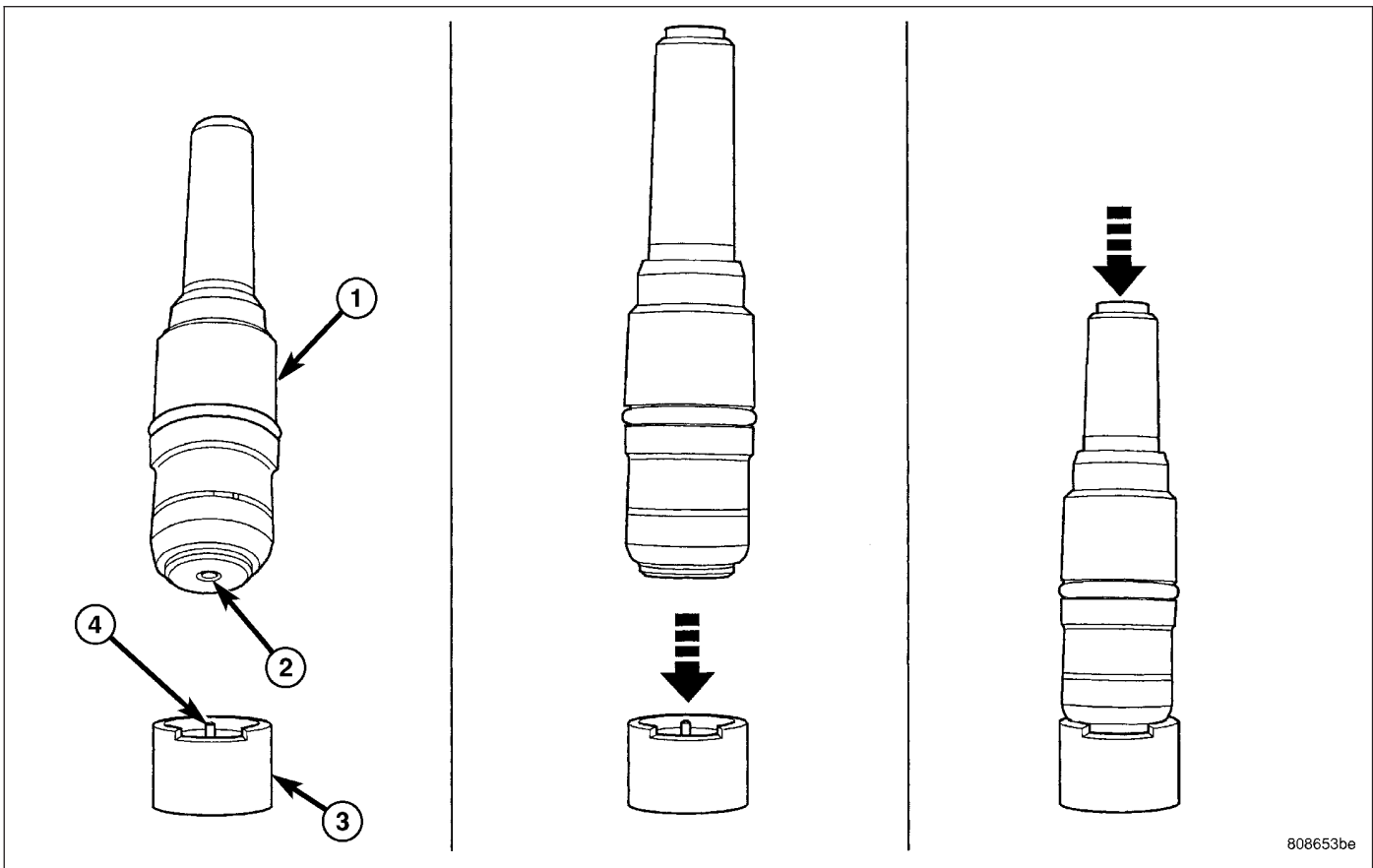
**Note: The camshaft sprockets can be allowed to float on the camshaft hub during installation.**

7. Loosely position left side camshaft sprocket over camshaft hub.
8. Align timing (plated) link to the crankshaft sprocket timing mark (3).
9. Position primary chain onto water pump drive sprocket (10).
10. Align right camshaft sprocket timing mark to the timing (plated) link on the timing chain (8) and loosely position over camshaft hub.
11. Verify that all chain timing (plated) links are properly aligned to the timing marks on all sprockets.
12. Install left side lower chain guide (2) and tensioner arm (5). Tighten attaching bolts to 28 N·m (250 in. lbs.).

**Note: Inspect O-ring on chain guide access plugs before installing. Replace O-ring as necessary.**

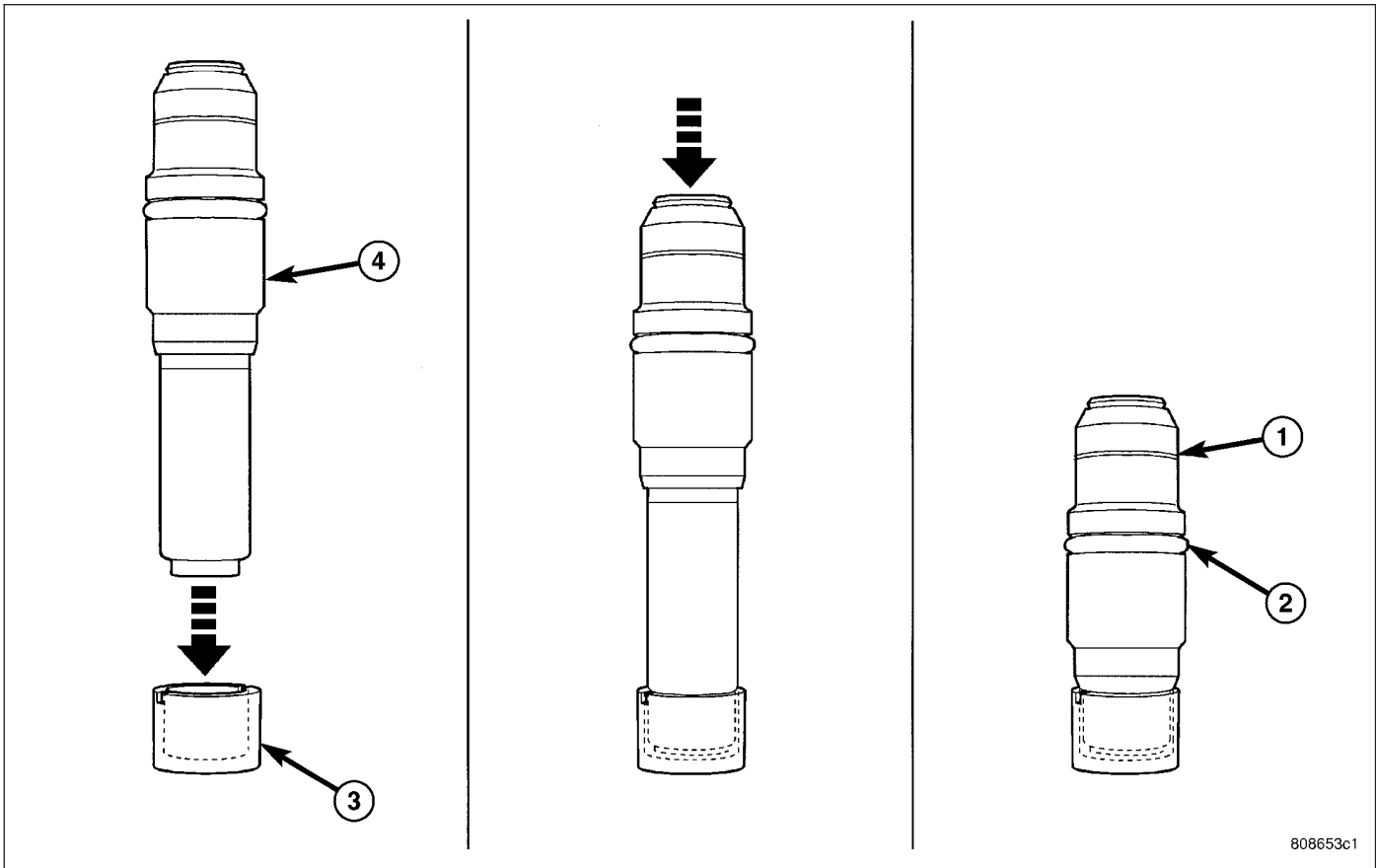
13. Install chain guide access plugs to cylinder heads. Tighten plugs to 20 N·m (15 ft. lbs.).

**Note: To reset the primary timing chain tensioner, engine oil will first need to be purged from the tensioner.**



14. Purge oil from timing chain tensioner using the following procedure:

- a. Place the check ball (2) end of tensioner into the shallow end of Special Tool 8186 (3).
- b. Using hand pressure, slowly depress tensioner until oil is purged from tensioner.



15. Reset timing chain tensioner using the following procedure:

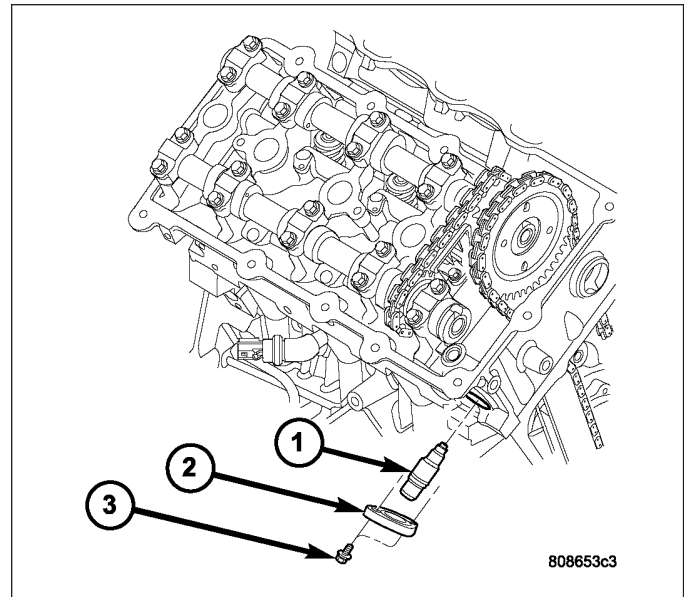
- Position cylinder plunger (4) into the deeper end of Special Tool 8186 (3).
- Apply a downward force until tensioner is reset.

**Note:** If oil was not first purged from the tensioner, use slight finger pressure to assist the center arm pin of Special Tool 8186 to unseat the tensioner's check ball.

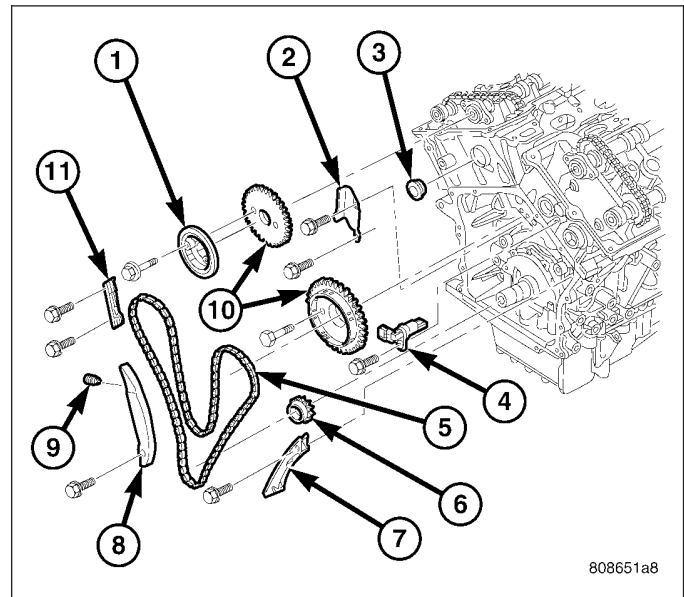
**CAUTION:** Ensure the tensioner is properly reset. The tensioner body (4) must bottom against the top edge of Special Tool 8186 (3). Failure to properly perform the resetting procedure may cause tensioner jamming.

**Note:** Inspect the tensioner o-ring (2) for nicks or cuts and make sure the snap ring (1) is correctly installed, replace as necessary.

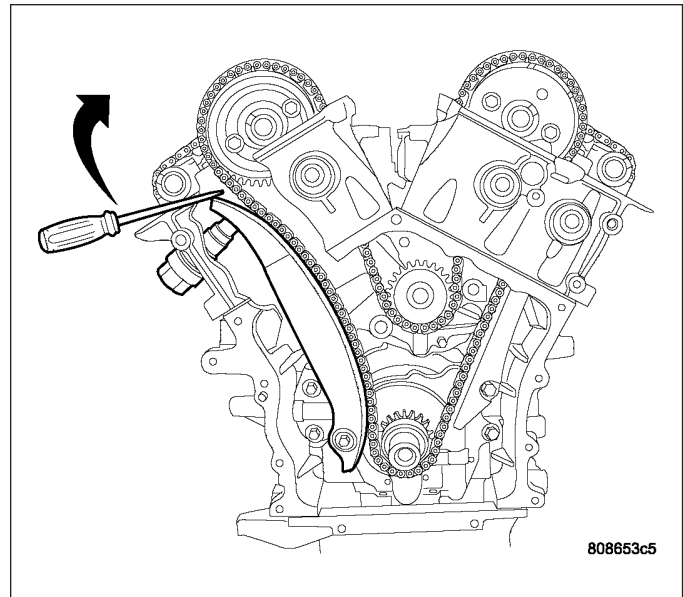
16. Install the reset chain tensioner (1) into the right cylinder head.
17. Position tensioner retaining plate (2) and tighten bolts (3) to 12 N·m (105 in. lbs.).



18. Starting at the right cylinder bank, first position the camshaft damper (1) (if equipped) on camshaft hub, then insert a 3/8" square drive extension with a breaker bar into intake camshaft drive hub. Rotate camshaft until the camshaft hub aligns to the camshaft sprocket and damper attaching holes. Install the sprocket attaching bolts and tighten to 28 N·m (250 in. lbs.).
19. Turn the left side camshaft by inserting a 3/8" square drive extension with a breaker bar into intake camshaft drive hub and rotate camshaft until the sprocket attaching bolts can be installed. Tighten sprocket bolts to 28 N·m (250 in. lbs.).
20. Rotate engine slightly clockwise to remove timing chain slack, if necessary.



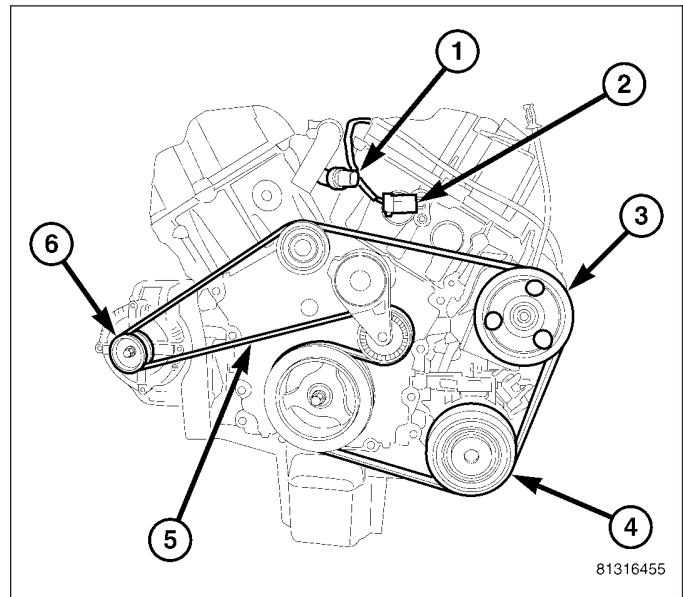
21. Activate the timing chain tensioner by using a flat bladed pry tool to gently pry tensioner arm towards the tensioner slightly. Then release the tensioner arm. Verify the tensioner is activated (extends).



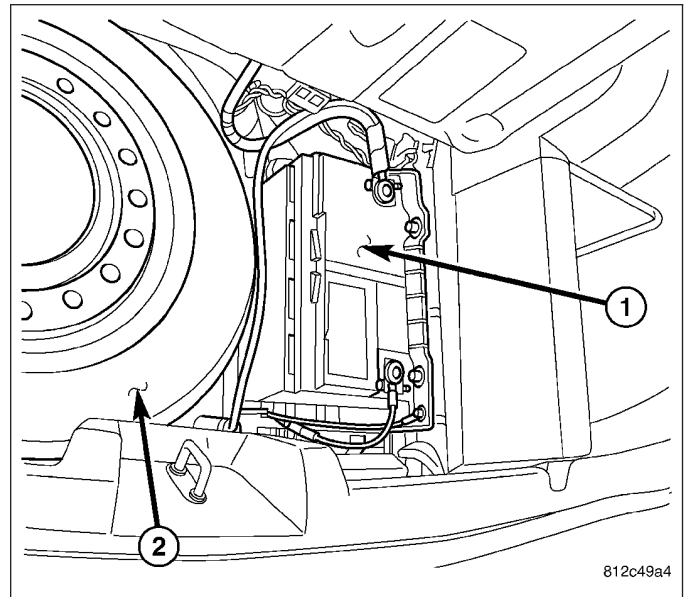
22. Install camshaft position sensor (2) and connect electrical connector.
23. Install the timing chain cover, crankshaft vibration damper, and cylinder head covers. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION) (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION) (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)
24. Install upper intake manifold. (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION)

**Note:** After installation of a reset tensioner, engine noise will occur after initial start-up. This noise will normally disappear within 5–10 seconds.

25. Fill cooling system (Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

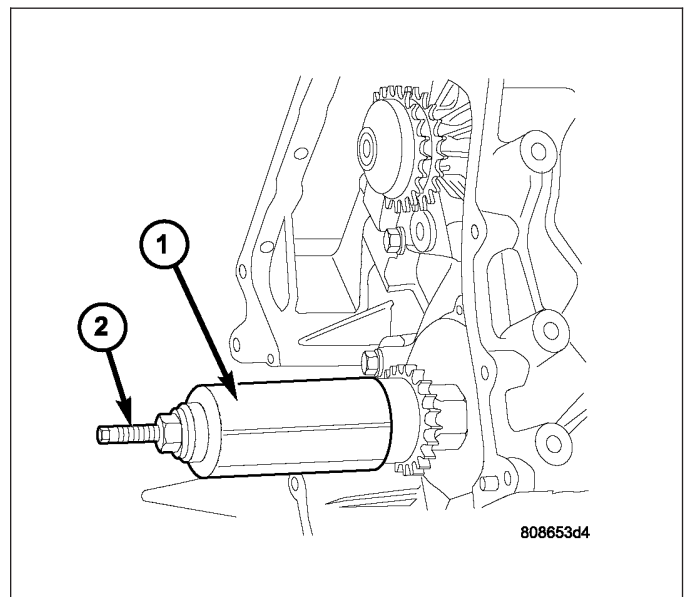


26. Connect negative battery (1) cable.

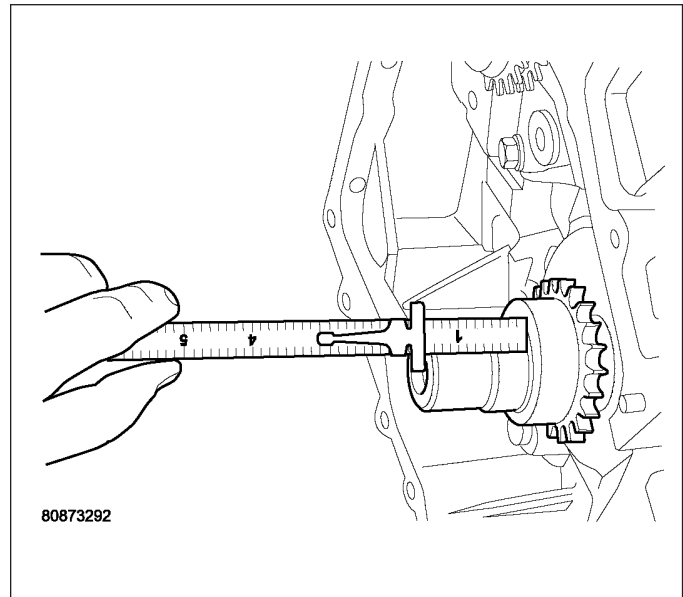


## INSTALLATION - CRANKSHAFT SPROCKET

1. Install crankshaft sprocket using Special Tools 6780-1(1) and 8179 (2) until sprocket bottoms against crankshaft step flange. Use care not to rotate crankshaft.



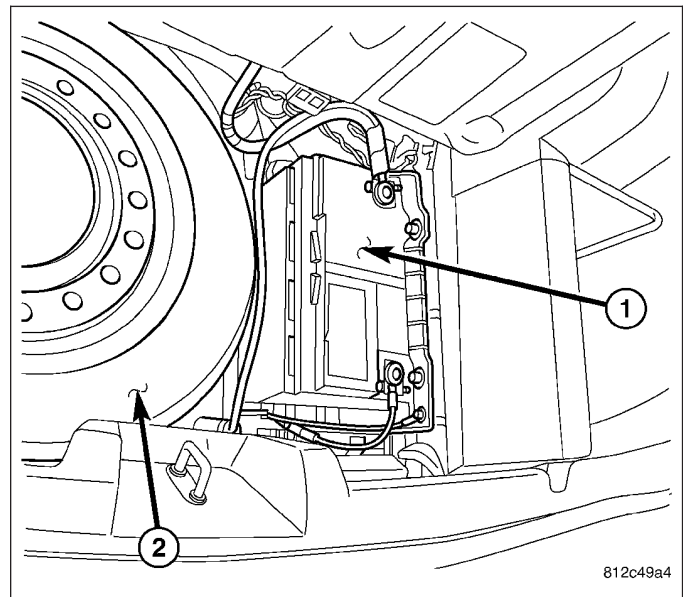
2. Verify that crankshaft sprocket is installed to proper depth by measuring from sprocket outer face to end of crankshaft. Measurement should read:  $39.05 \pm 0.50$  mm ( $1.5374 \pm 0.020$  in.).
3. Install primary timing chain(Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).



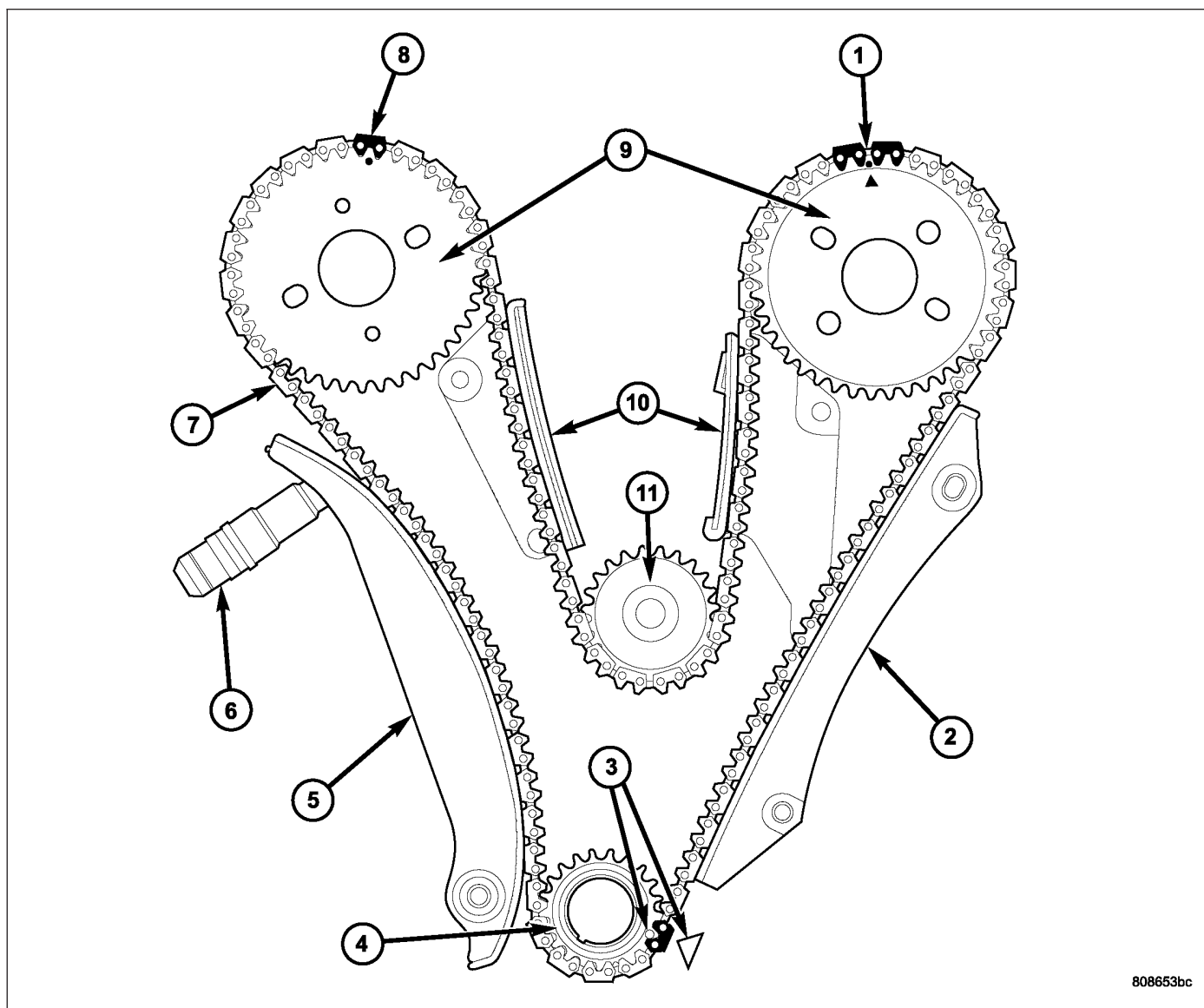
## TENSIONER-TIMING CHAIN

### REMOVAL

1. Disconnect negative battery (1) cable.
2. Remove timing chain cover(Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).



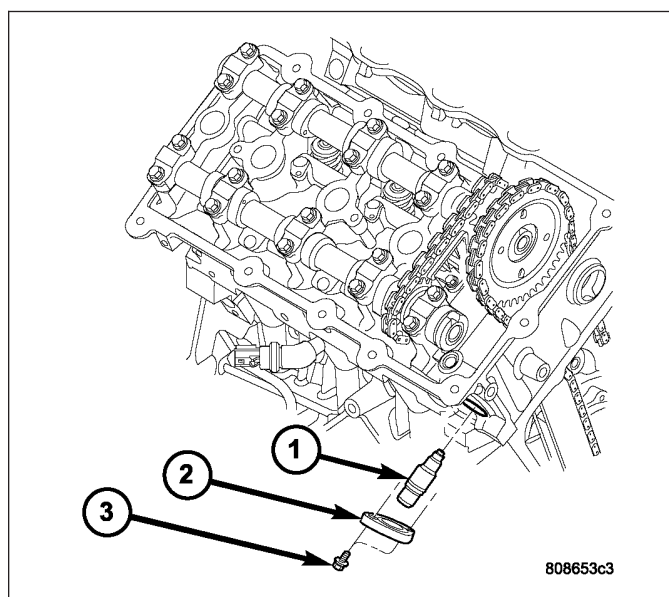




3. Align timing marks (1,3,8)(Refer to 9 - ENGINE/VALVE TIMING - STANDARD PROCEDURE).

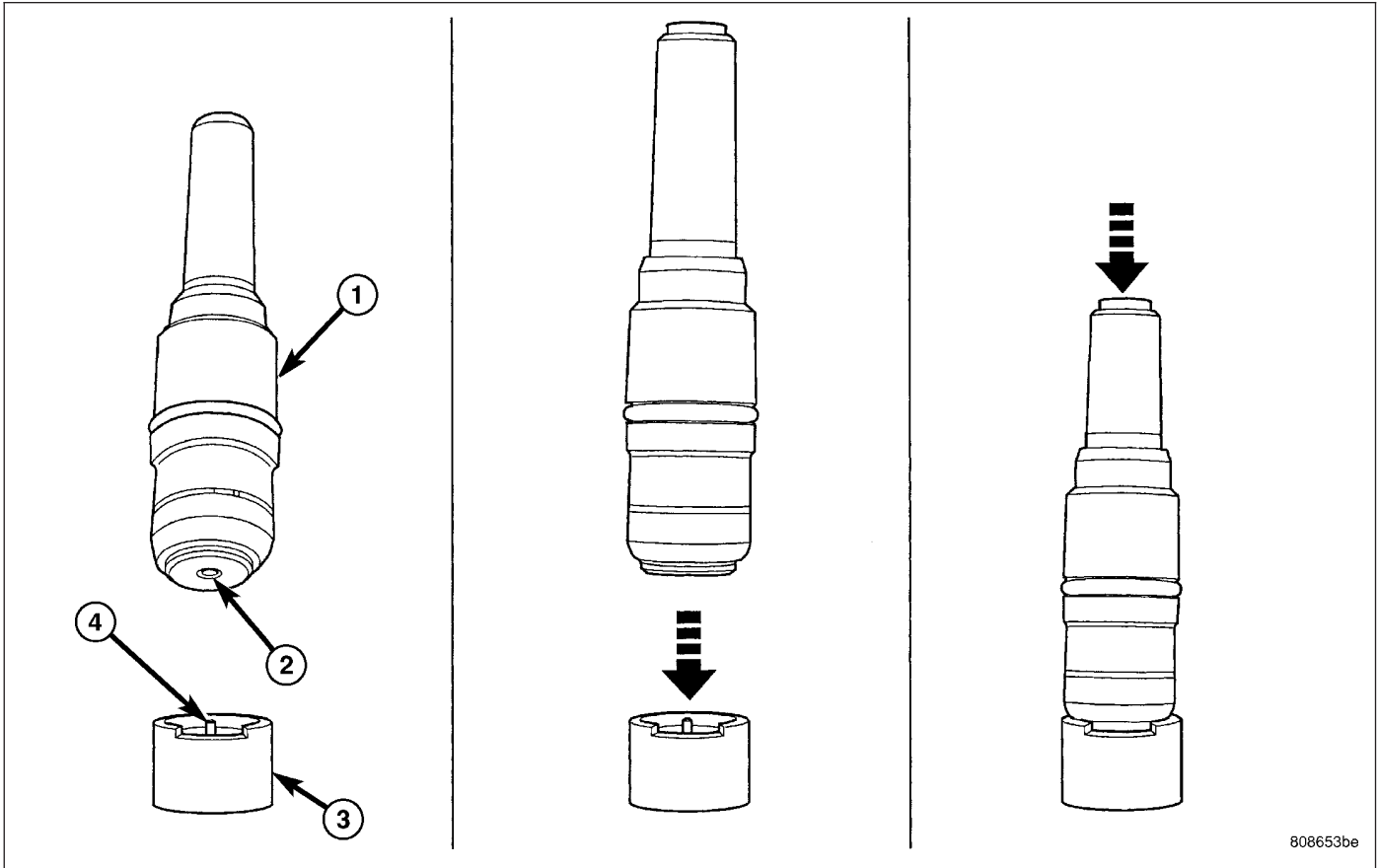
4. Remove timing chain tensioner cover (2).

5. Remove timing chain tensioner (1).



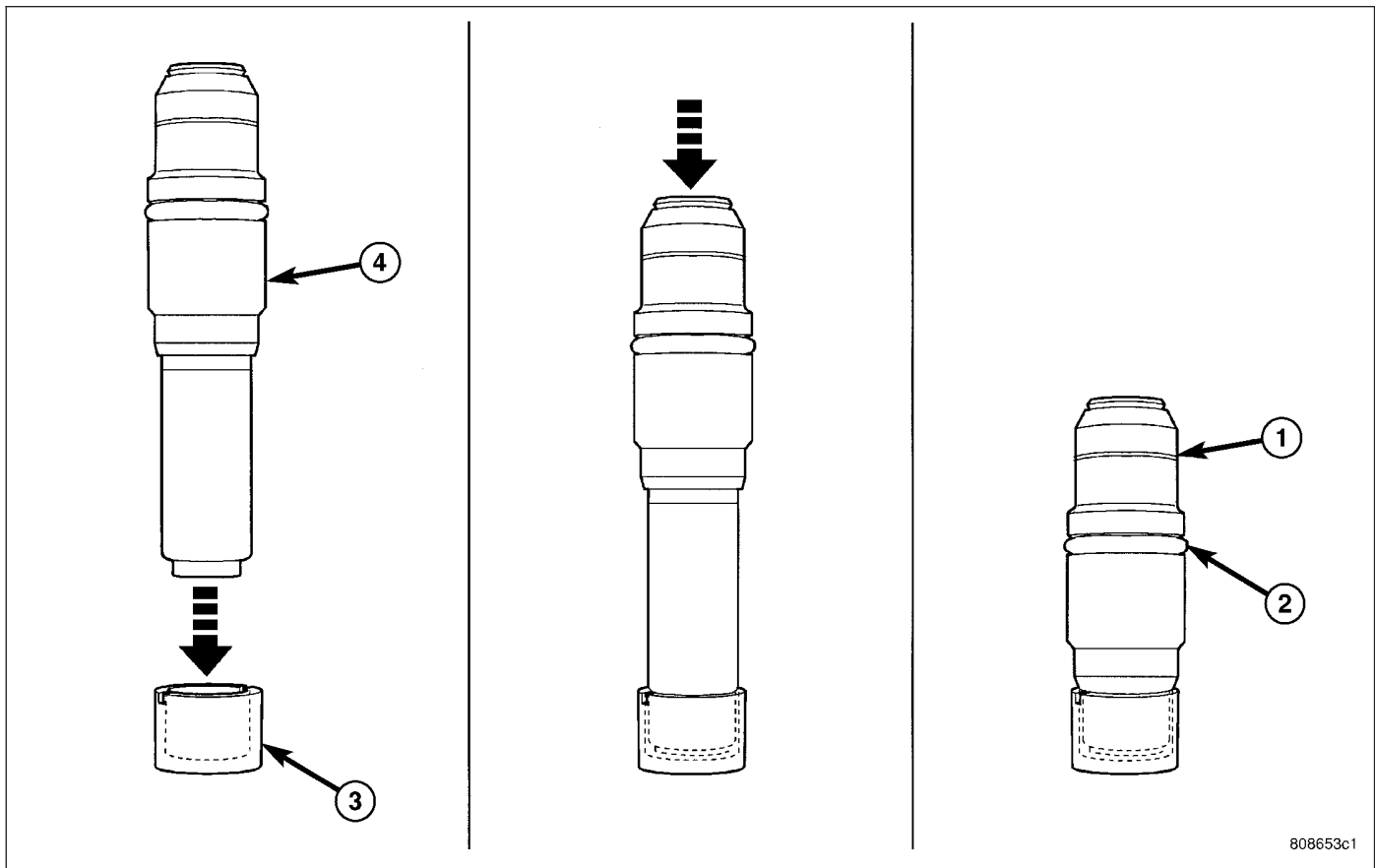
## INSTALLATION

### RESETTING TENSIONER



The timing chain tensioner is a spring loaded hydraulic tensioner. To reset the timing chain tensioner, the following procedure must be followed.

1. Purge oil from timing chain tensioner using the following procedure:
  - a. Place the check ball end of tensioner (1) into the shallow end of Special Tool 8186 (3).
  - b. Using hand pressure, slowly depress tensioner (1) until all of the oil is purged out.



**Note:** To reset the primary timing chain tensioner, engine oil will first need to be purged from the tensioner.

2. Reset timing chain tensioner (4) using the following procedure:

- a. Position cylinder plunger into the deeper end of Special Tool 8186 (3).
- b. Apply a downward force until tensioner (4) is reset.

**Note:** If oil was not first purged from the tensioner, use slight finger pressure to assist the center arm pin of Special Tool 8186 (3) to unseat the tensioner's check ball.

**Note:** Inspect the tensioner o-ring (2) for nicks or cuts and make sure the snap ring (1) is correctly installed, replace as necessary.

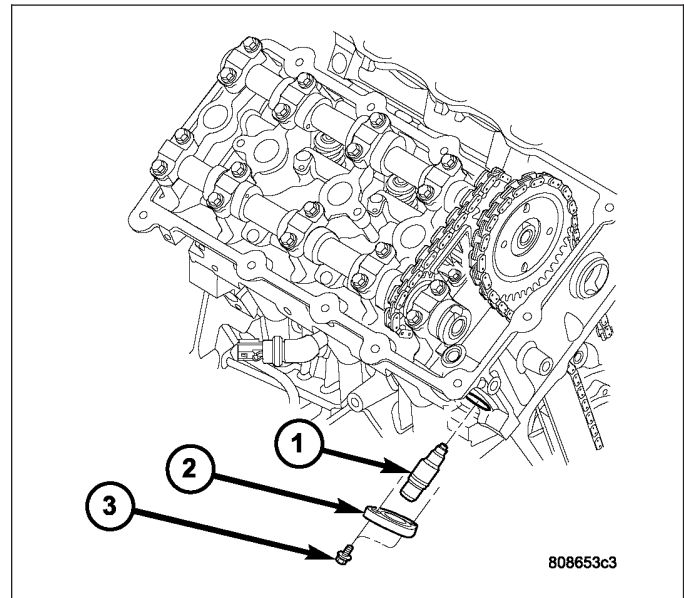
## TENSIONER-TIMING CHAIN

**Note:** Verify proper timing alignment prior to tensioner installation(Refer to 9 - ENGINE/VALVE TIMING - STANDARD PROCEDURE).

1. Reset tensioner(Refer to 9 - ENGINE/VALVE TIMING/TMNG BELT/CHAIN TENSIONER&PULLEY - INSTALLATION).

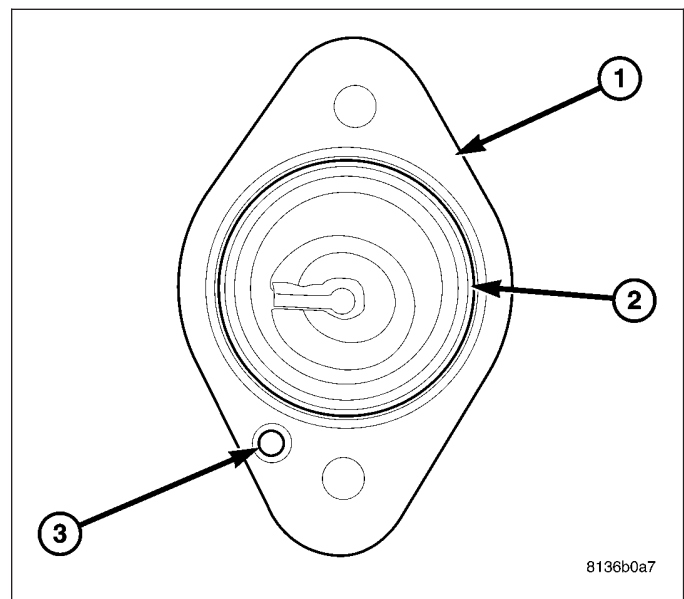
**Note:** Inspect tensioner o-ring and snap ring, replace as necessary.

2. Install tensioner (1) in cylinder head.

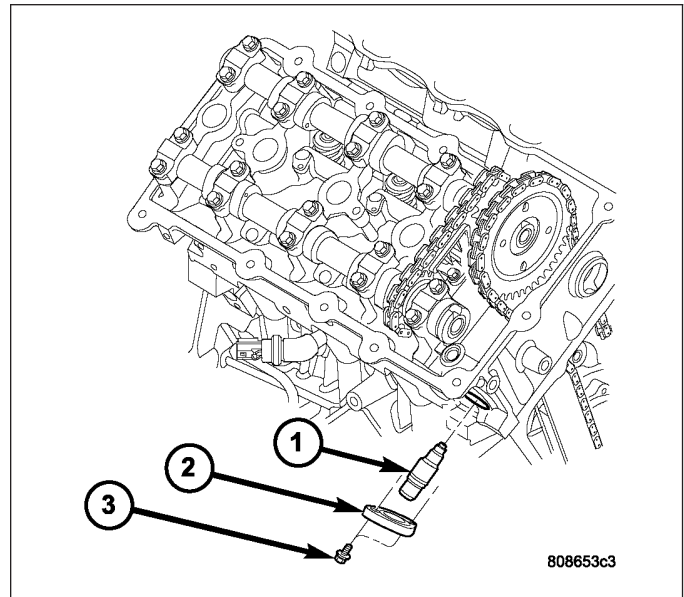


**Note:** Tensioner retaining plate dowel pin (3) must be aligned with hole in cylinder head for proper installation.

3. Inspect tensioner retaining plate o-ring (2) and replace as necessary.



4. Install tensioner retaining plate (2) and attaching bolts (3). Tighten bolts to 12 N·m (105 in. lbs.).



## ENGINE - 3.5L - SERVICE INFORMATION

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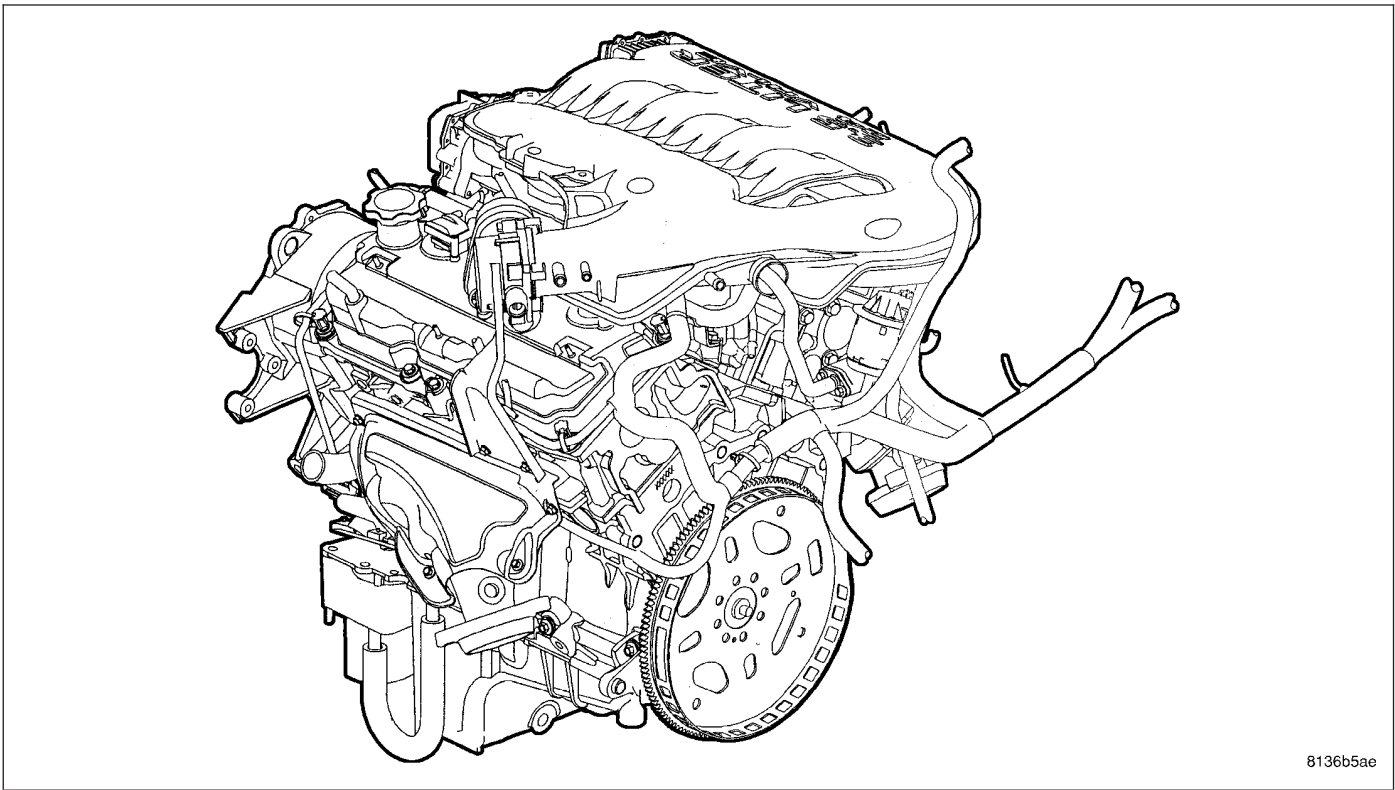
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**ENGINE - 3.5L - SERVICE INFORMATION**

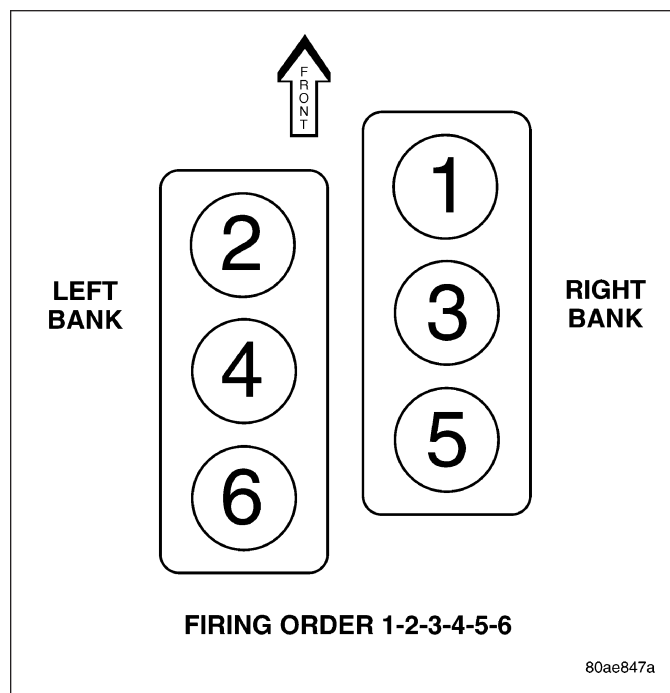
**DESCRIPTION**



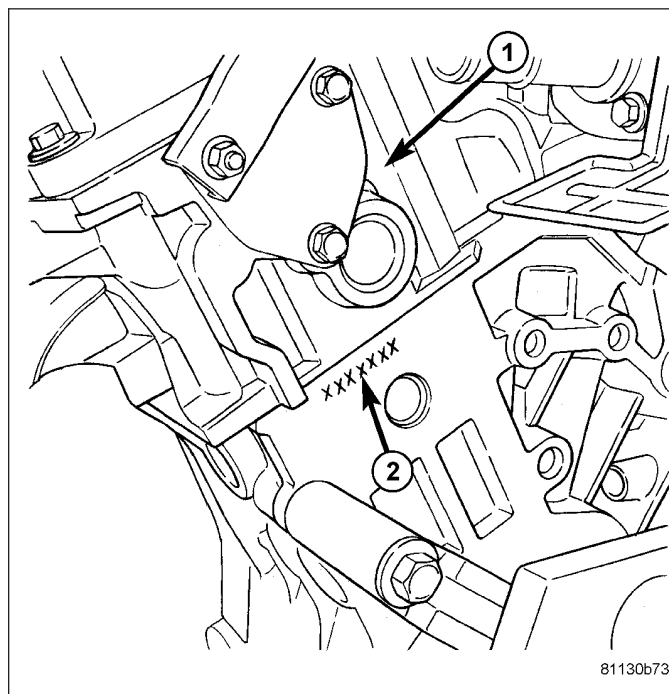
The 3.5 Liter (214 Cubic Inches) 60 degree V-6 engine is a single overhead camshaft design with hydraulic lifters and four valves per cylinder. The engine does not have provisions for a free wheeling valve train.



The cylinders are numbered from front to rear, with the right bank odd numbered, and the left bank even numbered. The firing order is 1-2-3-4-5-6.



The engine identification number is located on the rear of engine block just below the left cylinder head..



## DIAGNOSIS AND TESTING

### DIAGNOSIS AND TESTING - INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either mechanical (e.g., a strange noise), or performance (e.g., engine idles rough and stalls).

Refer to Service Diagnosis—Mechanical Chart and Service Diagnosis—Performance Chart, for possible causes and corrections of malfunctions. Refer to FUEL SYSTEM for the fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that cannot be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following:

- Cylinder Compression Pressure Test
- Cylinder Combustion Pressure Leakage Test
- Cylinder Head Gasket Failure Diagnosis
- Intake Manifold Leakage Diagnosis
- Lash Adjuster (Tappet) Noise Diagnosis
- Engine Oil Leak Inspection

### DIAGNOSIS AND TESTING - ENGINE PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	<ol style="list-style-type: none"> <li>1. Weak battery.</li> <li>2. Corroded or loose battery connections.</li> <li>3. Faulty starter.</li> <li>4. Faulty coil(s) or control unit.</li> <li>5. Incorrect spark plug gap.</li> <li>6. Contamination in fuel system.</li> <li>7. Faulty fuel pump.</li> <li>8. Incorrect engine timing.</li> </ol>	<ol style="list-style-type: none"> <li>1. Test battery. Charge or replace as necessary. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/ BATTERY - DESCRIPTION)</li> <li>2. Clean and tighten battery connections. Apply a coat of light mineral grease to terminals.</li> <li>3. Test starting system. (Refer to 8 - ELECTRICAL/STARTING - DIAGNOSIS AND TESTING)</li> <li>4. Test and replace as needed. (Refer to Appropriate Diagnostic Information)</li> <li>5. Check and adjust gap as needed.</li> <li>6. Clean system and replace fuel filter.</li> <li>7. Test fuel pump and replace as needed. (Refer to Appropriate Diagnostic Information)</li> <li>8. Check for a skipped timing belt or a loose camshaft sprocket.</li> </ol>

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE STALLS OR IDLES ROUGH	<ol style="list-style-type: none"> <li>1. Idle speed too low.</li> <li>2. Incorrect fuel mixture.</li> <li>3. Intake manifold leakage.</li> <li>4. Faulty coil(s).</li> </ol>	<ol style="list-style-type: none"> <li>1. Test minimum air flow. (Refer to Appropriate Diagnostic Information)</li> <li>2. (Refer to Appropriate Diagnostic Information)</li> <li>3. Inspect intake manifold gasket, manifold, and vacuum hoses.</li> <li>4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)</li> </ol>
ENGINE LOSS OF POWER	<ol style="list-style-type: none"> <li>1. Dirty or incorrectly gapped plugs.</li> <li>2. Contamination in fuel system.</li> <li>3. Faulty fuel pump.</li> <li>4. Incorrect valve timing.</li> <li>5. Leaking cylinder head gasket.</li> <li>6. Low compression.</li> <li>7. Burned, warped, or pitted valves.</li> <li>8. Plugged or restricted exhaust system.</li> <li>9. Faulty coil(s).</li> </ol>	<ol style="list-style-type: none"> <li>1. Set gap as needed or replace plug(s).</li> <li>2. Clean system and replace fuel filter.</li> <li>3. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)</li> <li>4. Correct valve timing as needed.</li> <li>5. Replace cylinder head gasket.</li> <li>6. Test compression of each cylinder.</li> <li>7. Replace valves.</li> <li>8. Check exhaust system restriction. Replace parts, as necessary.</li> <li>9. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)</li> </ol>
ENGINE MISSES ON ACCELERATION	<ol style="list-style-type: none"> <li>1. Dirty or incorrectly gapped spark plugs.</li> <li>2. Contamination in Fuel System.</li> <li>3. Burned, warped, or pitted valves.</li> <li>4. Faulty coil(s).</li> </ol>	<ol style="list-style-type: none"> <li>1. Set gap as needed or replace plug(s).</li> <li>2. Clean fuel system and replace fuel filter.</li> <li>3. Replace valves.</li> <li>4. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)</li> </ol>
ENGINE MISSES AT HIGH SPEED	<ol style="list-style-type: none"> <li>1. Dirty or incorrect spark plug gap.</li> <li>2. Faulty coil(s).</li> <li>3. Dirty fuel injector(s).</li> <li>4. Contamination in fuel system.</li> </ol>	<ol style="list-style-type: none"> <li>1. Set gap as needed or replace plug(s).</li> <li>2. Test and replace as necessary. (Refer to Appropriate Diagnostic Information)</li> <li>Test and replace as necessary. (Refer to Appropriate Diagnostic Information)</li> <li>4. Clean system and replace fuel filter.</li> </ol>

**DIAGNOSIS AND TESTING - ENGINE MECHANICAL**

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VALVES	<ol style="list-style-type: none"> <li>1. High or low oil level in crankcase.</li> <li>2. Thin or diluted oil.</li> <li>3. Thick oil</li> <li>4. Low oil pressure.</li> <li>5. Dirt in tappets/lash adjusters.</li> <li>6. Worn rocker arms.</li> <li>7. Worn tappets/lash adjusters.</li> <li>8. Worn valve guides.</li> <li>9. Excessive runout of valve seats on valve faces.</li> <li>10. Missing adjuster pivot.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and correct engine oil level.</li> <li>2. Change oil to correct viscosity.</li> <li>3. (a.) Change oil and filter. (b.) Run engine to operating temperature. (c.) Change oil and filter again.</li> <li>4. Check and correct engine oil level.</li> <li>5. Replace rocker arm/hydraulic lash adjuster assembly.</li> <li>6. Inspect oil supply to rocker arms.</li> <li>7. Install new rocker arm/hydraulic lash adjuster assembly.</li> <li>8. Replace cylinder head(s).</li> <li>9. Grind valve seats and valves.</li> <li>10. Replace rocker arm/hydraulic lash adjuster assembly.</li> </ol>
CONNECTING ROD NOISE	<ol style="list-style-type: none"> <li>1. Insufficient oil supply.</li> <li>2. Low oil pressure.</li> <li>3. Thick / Thin or diluted oil.</li> <li>4. Excessive bearing clearance.</li> <li>5. Connecting rod journal out-of-round.</li> <li>6. Misaligned connecting rods.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check engine oil level.</li> <li>2. Check engine oil level. Inspect oil pump relief valve and spring.</li> <li>3. Change oil to correct viscosity. 3. (a.) Change oil and filter. (b.) Run engine to operating temperature. (c.) Change oil and filter again.</li> <li>4. Measure bearings for correct clearance. Repair as necessary.</li> <li>5. Replace crankshaft or grind surface.</li> <li>6. Replace bent connecting rods.</li> </ol>

CONDITION	POSSIBLE CAUSES	CORRECTION
MAIN BEARING NOISE	<ol style="list-style-type: none"> <li>1. Insufficient oil supply.</li> <li>2. Low oil pressure.</li> <li>3. Thick / Thin or diluted oil.</li> <li>4. Excessive bearing clearance.</li> <li>5. Excessive end play.</li> <li>6. Crankshaft journal out-of-round or worn.</li> <li>7. Loose flywheel or torque converter.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check engine oil level.</li> <li>2. Check engine oil level. Inspect oil pump relief valve and spring.</li> <li>3. Change oil to correct viscosity.</li> <li>3. (a.) Change oil and filter. (b.) Run engine to operating temperature. (c.) Change oil and filter again.</li> <li>4. Measure bearings for correct clearance. Repair as necessary.</li> <li>5. Check thrust bearing for wear on flanges.</li> <li>6. Replace crankshaft or grind journals.</li> <li>7. Tighten to correct torque.</li> </ol>
OIL PRESSURE DROP	<ol style="list-style-type: none"> <li>1. Low oil level.</li> <li>2. Faulty oil pressure sending unit.</li> <li>3. Low oil pressure.</li> <li>4. Clogged oil filter.</li> <li>5. Worn parts in oil pump.</li> <li>6. Thin or diluted oil.</li> <li>7. Oil pump relief valve stuck.</li> <li>8. Oil pump suction tube loose.</li> <li>9. Oil pump cover warped or cracked.</li> <li>10. Excessive bearing clearance.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check engine oil level.</li> <li>2. Install new sending unit.</li> <li>3. Check sending unit and main bearing oil clearance.</li> <li>4. Install new oil filter.</li> <li>5. Replace worn parts or pump.</li> <li>6. Change oil to correct viscosity.</li> <li>7. Remove valve and inspect, clean, or replace.</li> <li>8. Remove oil pan and install new tube or clean, if necessary.</li> <li>9. Install new oil pump.</li> <li>10. Measure bearings for correct clearance.</li> </ol>
OIL LEAKS	<ol style="list-style-type: none"> <li>1. Misaligned or deteriorated gaskets.</li> <li>2. Loose fastener, broken or porous metal part.</li> <li>3. Misaligned or deteriorated cup or threaded plug.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace gasket(s).</li> <li>2. Tighten, repair or replace the part.</li> <li>3. Replace as necessary.</li> </ol>

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL CONSUMPTION OR SPARK PLUGS FOULED	<ol style="list-style-type: none"> <li>1. PCV system malfunction.</li> <li>2. Worn, scuffed or broken rings.</li> <li>3. Carbon in oil ring slots.</li> <li>4. Rings fitted too tightly in grooves.</li> <li>5. Worn valve guide(s).</li> <li>6. Valve stem seal(s) worn or damaged.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check system and repair as necessary. (Refer to Appropriate Diagnostic Manual)</li> <li>2. Hone cylinder bores. Install new rings.</li> <li>3. Clean pistons and install new rings.</li> <li>4. Remove rings and check grooves. If groove is not proper width, replace piston.</li> <li>5. Replace cylinder head(s).</li> <li>6. Replace seal(s).</li> </ol>

## DIAGNOSIS AND TESTING - CYLINDER COMPRESSION PRESSURE TEST

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

1. Check engine oil level and add oil if necessary.
2. Drive the vehicle until engine reaches normal operating temperature. Select a route free from traffic and other forms of congestion, observe all traffic laws, and accelerate through the gears several times briskly.
3. Remove all spark plugs from engine. As spark plugs are being removed, check electrodes for abnormal firing indicators fouled, hot, oily, etc. Record cylinder number of spark plug for future reference.
4. Remove the Auto Shutdown (ASD) relay from the PDC.
5. Be sure throttle blade is fully open during the compression check.
6. Insert compression gauge adaptor Special Tool 8116 or the equivalent, into the #1 spark plug hole in cylinder head. Connect the 0–500 psi (Blue) pressure transducer (Special Tool CH7059) with cable adaptors to the DRBIII®. For Special Tool identification, (Refer to 9 - ENGINE - SPECIAL TOOLS).
7. Crank engine until maximum pressure is reached on gauge. Record this pressure as #1 cylinder pressure.
8. Repeat the previous step for all remaining cylinders.
9. Compression should not be less than 689 kPa (100 psi) and not vary more than 25 percent from cylinder to cylinder.
10. If one or more cylinders have abnormally low compression pressures, repeat the compression test.
11. If the same cylinder or cylinders repeat an abnormally low reading on the second compression test, it could indicate the existence of a problem in the cylinder in question. **The recommended compression pressures are to be used only as a guide to diagnosing engine problems. An engine should not be disassembled to determine the cause of low compression unless some malfunction is present.**

## DIAGNOSIS AND TESTING - CYLINDER COMBUSTION PRESSURE LEAKAGE TEST

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/compression pressure loss.

**WARNING: DO NOT REMOVE THE PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.**

Check the coolant level and fill as required. DO NOT install the pressure cap.

Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.

Clean spark plug recesses with compressed air.

Remove the spark plugs.

Remove the oil filler cap.

Remove the air cleaner.

Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum, with 552 kPa (80 psi) recommended.

Perform the test procedures on each cylinder according to the tester manufacturer's instructions. While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the coolant.

All gauge pressure indications should be equal, with no more than 25% leakage per cylinder.

**FOR EXAMPLE:** At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

## ENGINE OIL LEAK INSPECTION

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

1. Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.
2. Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil level indicator to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair as necessary.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection.
5. **If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method as follows:
  - Disconnect the fresh air hose (make-up air) at the cylinder head cover and plug or cap the nipple on the cover.
  - Remove the PCV valve hose from the cylinder head cover. Cap or plug the PCV valve nipple on the cover.
  - Attach an air hose with pressure gauge and regulator to the oil level indicator tube.

**CAUTION:** Do not subject the engine assembly to more than 20.6 kPa (3 PSI) of test pressure.

- Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provides the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.
  - If the leakage occurs at the crankshaft rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.
6. If no leaks are detected, turn off the air supply. Remove the air hose, all plugs, and caps. Install the PCV valve and fresh air hose (make-up air). Proceed to next step.
  7. Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

**Note:** If oil leakage is observed at the oil level indicator tube to block location; remove the tube, clean and reseal using Mopar® Stud & Bearing Mount (press fit tube applications only), and for O-ring style tubes, remove tube and replace the O-ring seal.

## INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.



2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak. If a leak is present in this area, remove transmission for further inspection.
  - a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
  - b. Where leakage tends to run straight down, possible causes are a porous block, oil gallery cup plug, bedplate to cylinder block mating surfaces and seal bore. See proper repair procedures for these items.
4. If no leaks are detected, pressurize the crankcase as previously described.

**CAUTION: Do not exceed 20.6 kPa (3 psi).**

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

**CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is specially machined to complement the function of the rear oil seal.**

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.
7. After the oil leak root cause and appropriate corrective action have been identified, replace component(s) as necessary.

## STANDARD PROCEDURE

### STANDARD PROCEDURE - FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results. **Do not use form-in-place gasket material unless specified.** Bead size, continuity, and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

**MOPAR® ENGINE RTV GEN II** is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

**MOPAR® ATF RTV** is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

**MOPAR® GASKET MAKER** is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

**MOPAR® BED PLATE SEALANT** is a unique (green-in-color) anaerobic type gasket material that is specially made to seal the area between the bedplate and cylinder block without disturbing the bearing clearance or alignment of these components. The material cures slowly in the absence of air when torqued between two metallic surfaces, and will rapidly cure when heat is applied.

**MOPAR® GASKET SEALANT** is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material is used on engines with multi-layer steel (MLS) cylinder head gaskets. This material also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4oz./16 oz. can w/applicator.



## SEALER APPLICATION

Mopar® Gasket Maker material should be applied sparingly 1 mm (0.040 in.) diameter or less of sealant to one gasket surface. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. All mounting holes must be circled. For corner sealing, a 3.17 or 6.35 mm (1/8 or 1/4 in.) drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towel. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The usage of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces. Material in an aerosol can should be used on engines with multi-layer steel gaskets.

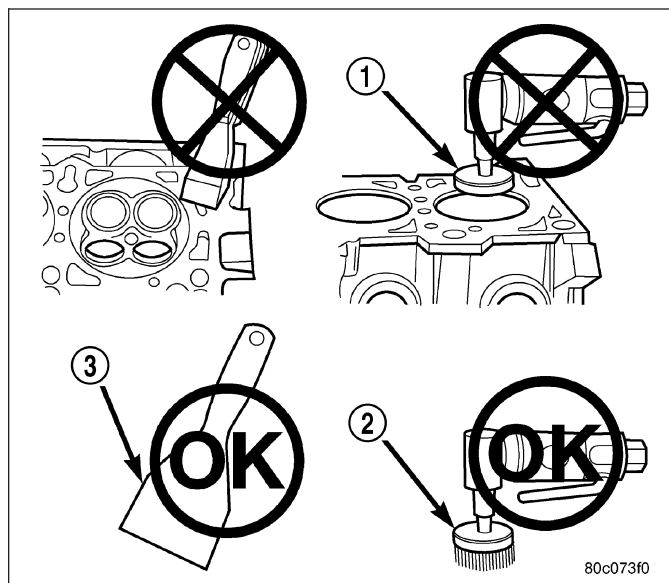
## STANDARD PROCEDURE - ENGINE GASKET SURFACE PREPARATION

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

**Never** use the following to clean gasket surfaces:

- Metal scraper
- Abrasive pad or paper to clean cylinder block and head
- High speed power tool with an abrasive pad or a wire brush.

**Note: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.**



Only use the following for cleaning gasket surfaces:

- Solvent or a commercially available gasket remover
- Plastic or wood scraper.
- Drill motor with 3M Roloc™ Bristle Disc (white or yellow).

**CAUTION:** Excessive pressure or high RPM (beyond the recommended speed), can damage the sealing surfaces. The mild (white, 120 grit) bristle disc is recommended. If necessary, the medium (yellow, 80 grit) bristle disc may be used on cast iron surfaces with care.

## STANDARD PROCEDURE - REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads (excluding spark plug and camshaft bearing cap attaching threads) can be repaired. Essentially, this repair consists of drilling out worn or damaged threads, tapping the hole with a special Heli-Coil Tap, (or equivalent) and installing an insert into the tapped hole. This brings the hole back to its original thread size.

**CAUTION:** Be sure that the tapped holes maintain the original center line.

Heli-Coil tools and inserts are readily available from automotive parts jobbers.

## STANDARD PROCEDURE - HYDROSTATIC LOCKED ENGINE

When an engine is suspected to be hydrostatically locked, regardless of what caused the problem, the following steps should be used.

**CAUTION: DO NOT use starter motor to rotate the engine, severe damage may occur.**

1. Inspect air cleaner, induction system and intake manifold to insure system is dry and clear of foreign material.
2. Remove negative battery cable.
3. Place a shop towel around the spark plugs when removing them from the engine. This will catch any fluid that may possibly be in the cylinder under pressure.
4. With all spark plugs removed, rotate engine crankshaft using a breaker bar and socket.
5. Identify the fluid in the cylinder(s) (i.e., coolant, fuel, oil or other).
6. Make sure all fluid has been removed from the cylinders. Inspect engine for damage (i.e., connecting rods, pistons, valves, etc.)
7. Repair engine or components as necessary to prevent this problem from re-occurring.

**CAUTION: Squirt approximately one teaspoon of oil into the cylinders, rotate engine to lubricate the cylinder walls to prevent damage on restart.**

8. Install new spark plugs.
9. Drain engine oil and remove oil filter.
10. Install a new oil filter.
11. Fill engine with specified amount of approved oil.
12. Connect negative battery cable.
13. Start engine and check for any leaks.

## STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS

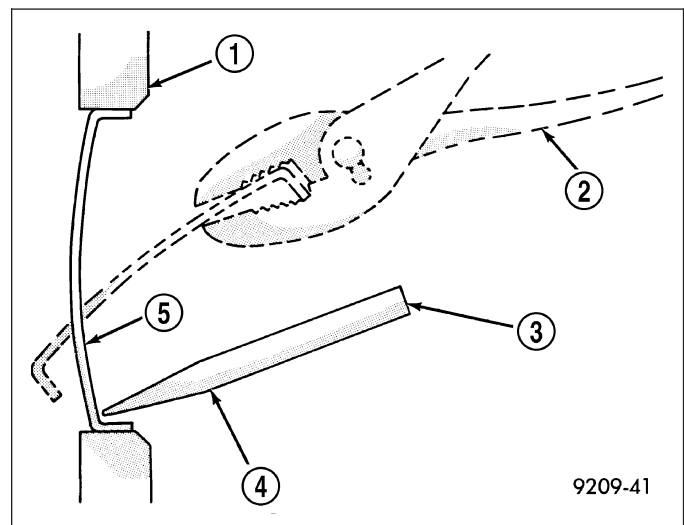
Using a blunt tool such as a drift (3) and a hammer, strike the bottom edge of the cup plug (5). With the cup plug rotated, grasp firmly with pliers (2) or other suitable tool and remove plug (5).

**CAUTION: Do not drive cup plug into the casting as restricted cooling can result and cause serious engine problems.**

Thoroughly clean inside of cup plug hole in cylinder block or head. Be sure to remove old sealer. Lightly coat inside of cup plug hole with Mopar® Stud and Bearing Mount. Make certain the new plug is cleaned of all oil or grease. Using proper drive plug, drive plug into hole so that the sharp edge of the plug is at least 0.5 mm (0.020 in.) inside the lead-in chamfer.

It is not necessary to wait for curing of the sealant.

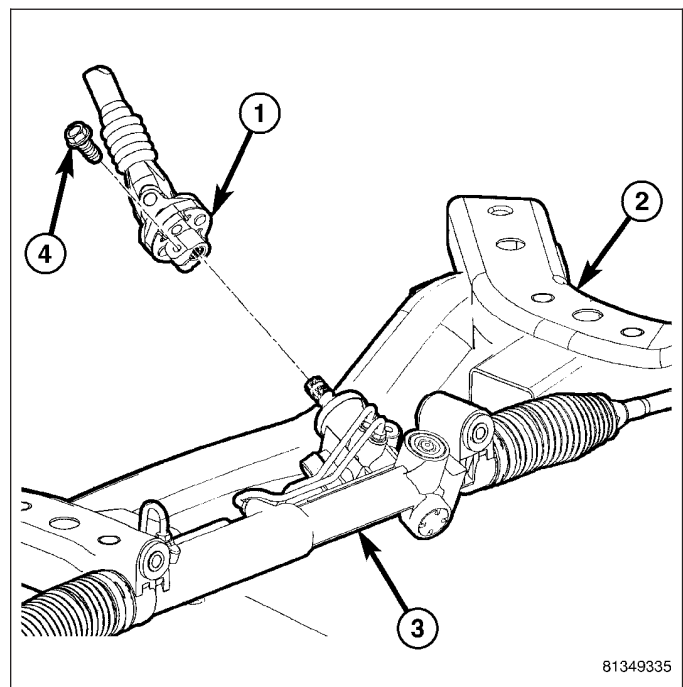
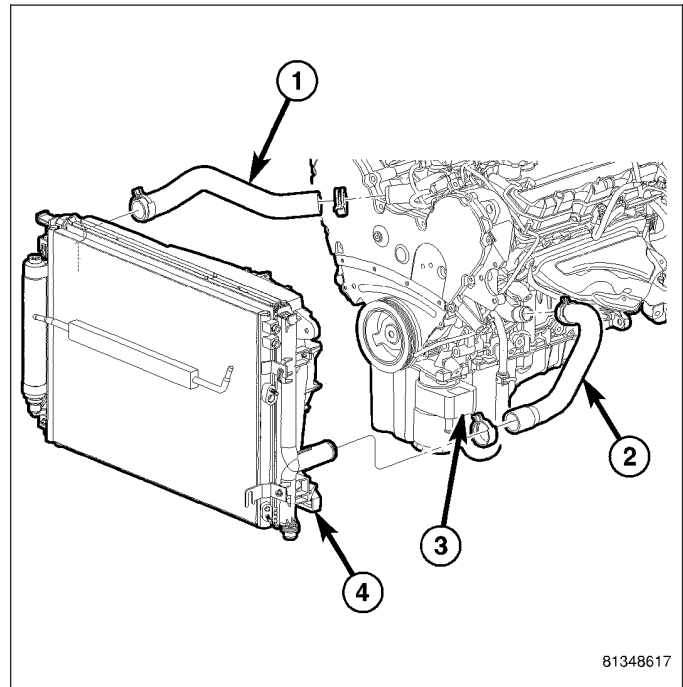
The cooling system can be refilled and the vehicle placed in service immediately.



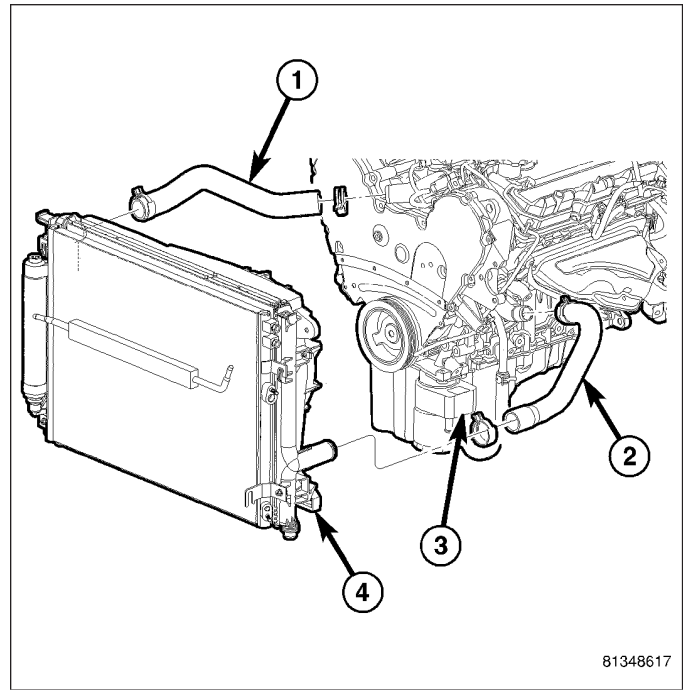
## REMOVAL - ENGINE ASSEMBLY

**Note:** Capture and store any residual fluid drainage, or leakage from ancillary components, in the appropriately marked containers.

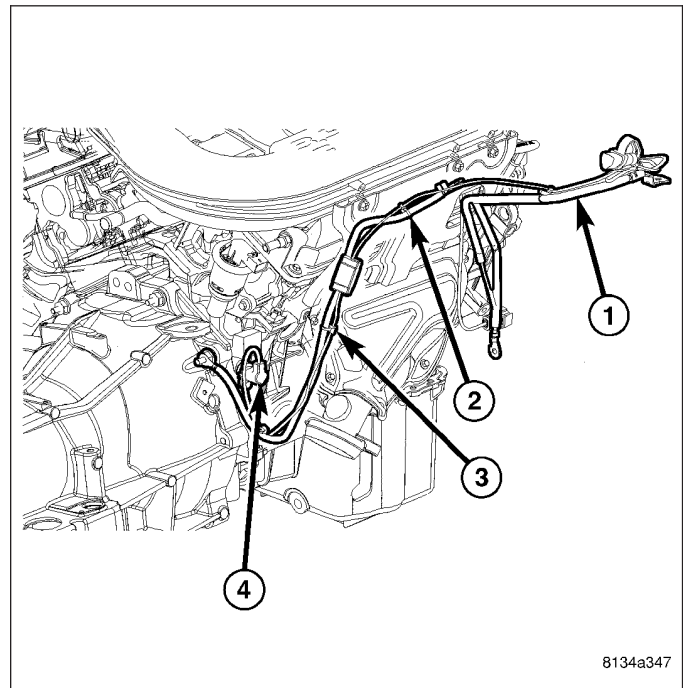
1. Perform the fuel pressure release procedure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
2. Center and secure the steering wheel.
3. Disconnect negative battery cable.
4. Evacuate the air conditioning system(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).
5. Remove the hood.
6. Remove the windshield cowl assembly.
7. Raise and support the vehicle.
8. Remove the lower engine close out panel.
9. Drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
10. Disconnect the lower radiator hose (2).
11. Disconnect the generator electrical connectors (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - REMOVAL).
12. Separate the steering column coupling (1) from the steering gear (3).



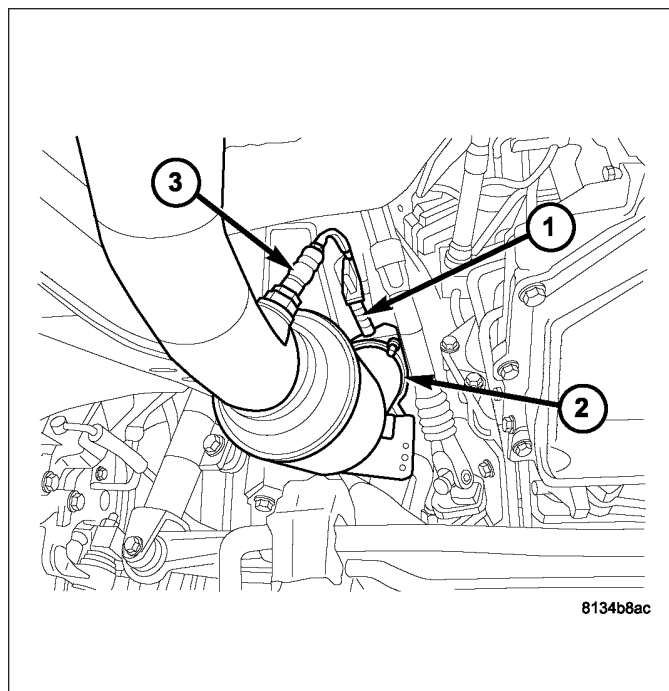
13. Remove the starter and spacer plate (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - REMOVAL).
14. Disconnect the oil cooler hose at the oil cooler (3) and remove the cooler hose retainer at the transmission.
15. Disconnect the transmission line bracket at the A/C compressor and allow the bolt to rest on the cradle.



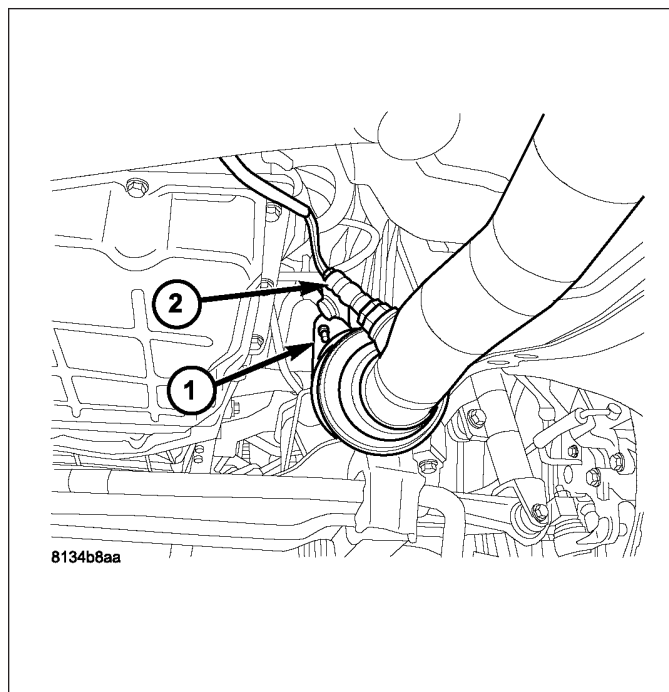
16. Disconnect the ground strap (3) at the right transmission housing.
17. Disconnect the engine block heater wiring connector (4) and set aside (if equipped).
18. Remove the crankshaft position sensor (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/CRANKSHAFT POSITION SENSOR - REMOVAL).



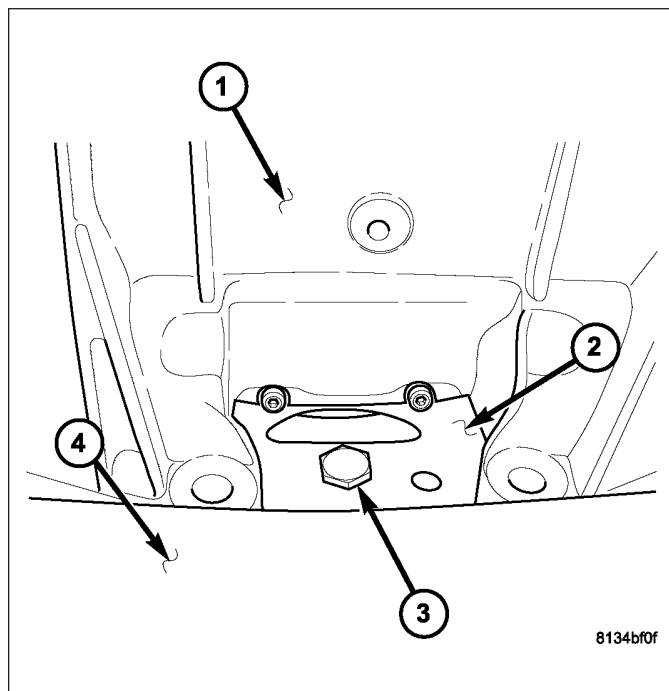
19. Disconnect the left #2 oxygen sensor (3) electrical connector and separate the exhaust manifold from the left exhaust pipe (2).



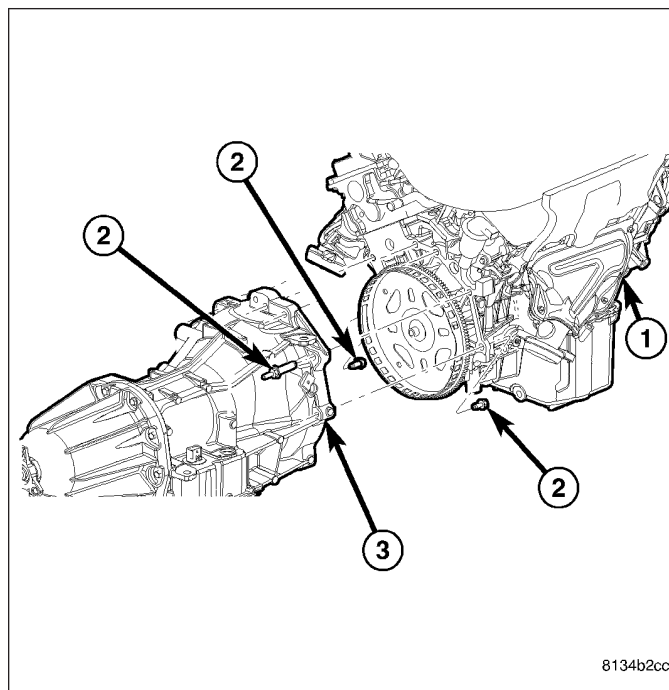
20. Disconnect the right #2 oxygen sensor (2) electrical connector and separate the exhaust manifold from the right exhaust pipe (1).



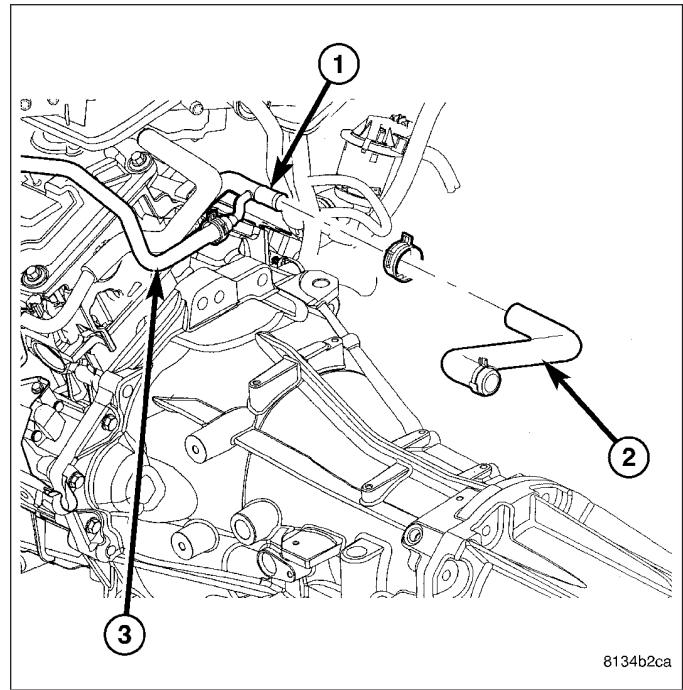
21. Remove the flex plate inspection cover and torque converter bolts (3).



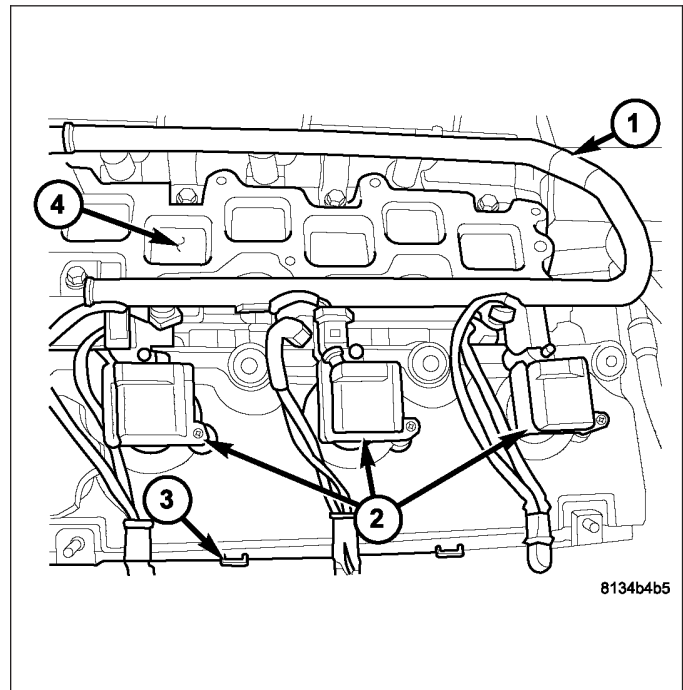
22. Remove the transmission housing to engine mounting bolts (2) accessible.
23. Remove the engine mounting to cradle fasteners.



24. Lower the vehicle.
25. Remove the upper intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
26. Disconnect the heater hose (2) and coolant reservoir hose (3) from the rear coolant pipe (1).

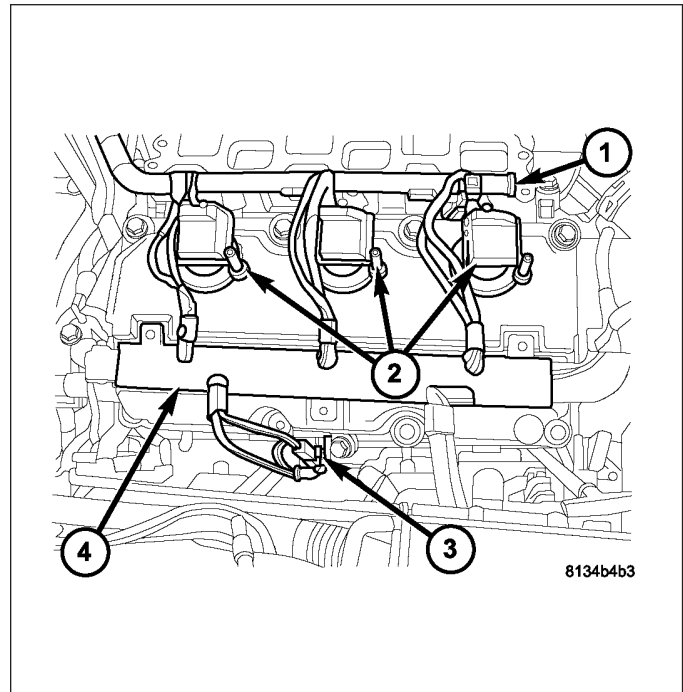


27. Disconnect the oxygen sensor connector and the ground wire on the left cylinder head cover.
28. Disconnect the coolant temperature, cam position, oil pressure sensor electrical connectors.
29. Disconnect the left ignition coil (2) and fuel injector harness connectors and position the wiring harness (3) aside.

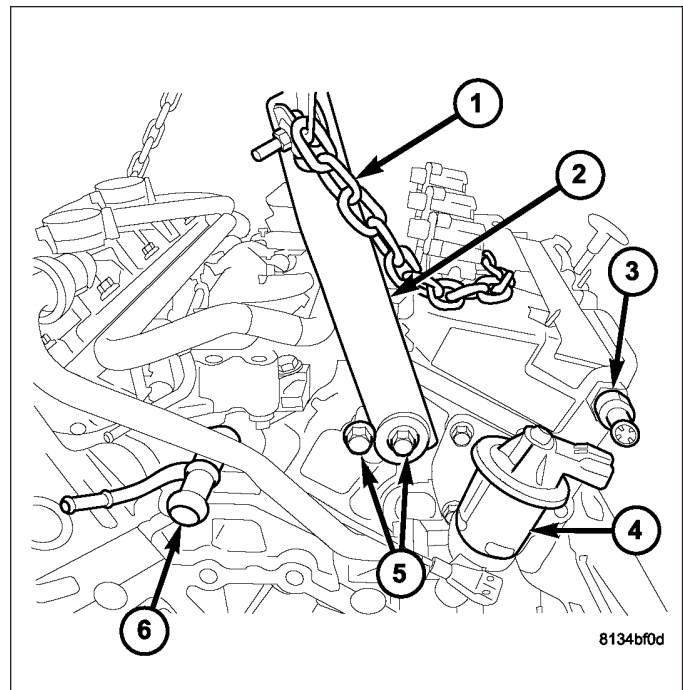




30. Remove the right intake manifold support braces.
31. Disconnect the capacitor and ground strap from the right cylinder head cover.
32. Disconnect the oxygen sensor, knock, EGR, injector and ignition coil harness connectors and position the wiring harness aside.
33. Disconnect the engine wiring harness from the transmission housing and remove the remaining transmission housing bolts.



34. Connect the engine lifting bracket (2) from special tool kit 8534B to the right rear of the cylinder head outer most bolt access hole (5).
35. Install a bolt into the inner most bolt access hole (5) next to the engine lift bracket to assure lifting bracket positioning.



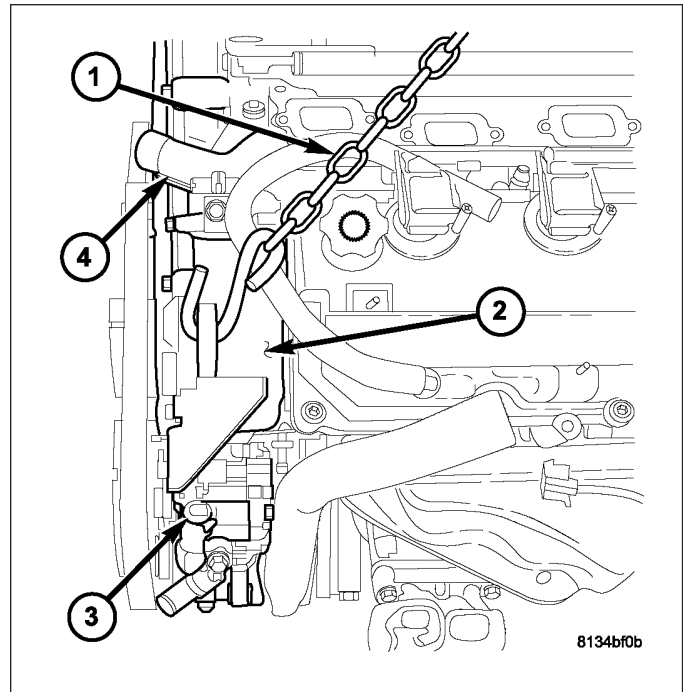


36. Connect a engine hoisting chain (1) to the left timing chain cover (2) engine lifting point and engine lift bracket.

**CAUTION:** While slowly separating the engine from the vehicle, constant checks must be made to assure proper positioning and that no damage to other components or wiring harnesses occur during separation.

**Note:** As the engine is hoisted from the engine bay area, remove the loosened A/C compressor bolt retaining the transmission cooler lines and direct the lines aside.

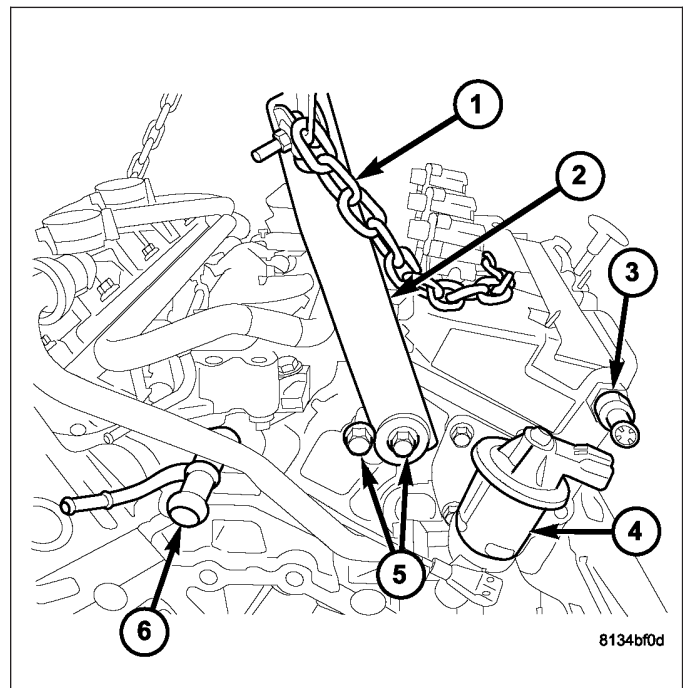
37. Carefully remove the engine from the engine bay area.



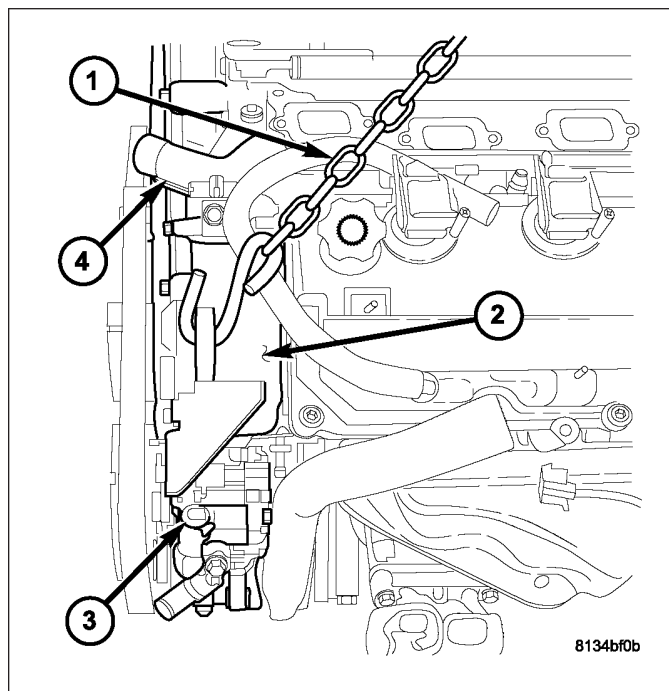
## INSTALLATION - ENGINE ASSEMBLY

**CAUTION:** Care must be taken when installing the engine to prevent pinching the power steering rack sensor with the left engine mount.

1. Install special tool #8534B, engine lifting bracket (2) to the right rear of the cylinder head and install a bolt into the inner most bolt hole (5) next to the bracket (5).



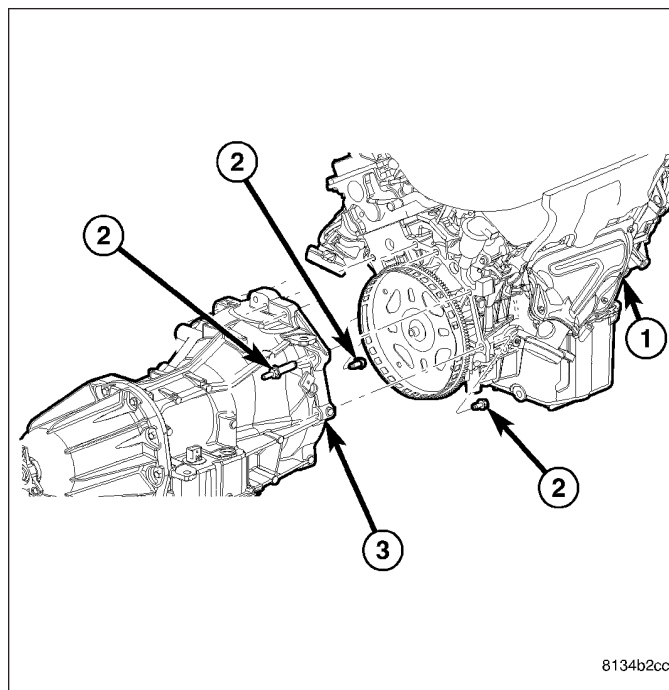
2. Connect a engine hoisting chain (1) to the left timing chain cover (2) lifting point and the engine lifting bracket (3).



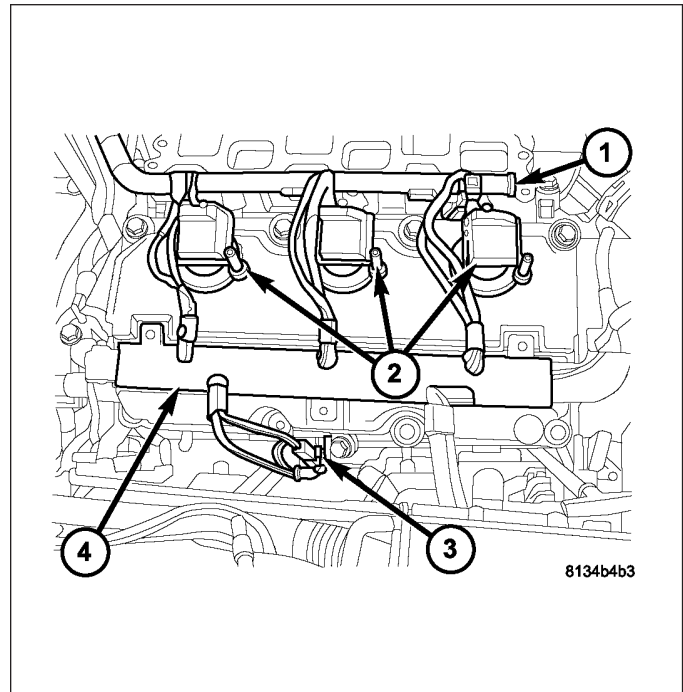
**CAUTION:** Care must be taken when installing the engine to prevent pinching the power steering rack sensor with the left engine mount. Constantly check to assure proper positioning and no damage occurs to other components or harnesses until union is made.

**Note:** As the engine is lowered into the engine bay area, install and hand tighten the A/C compressor bolt retaining the transmission cooler lines.

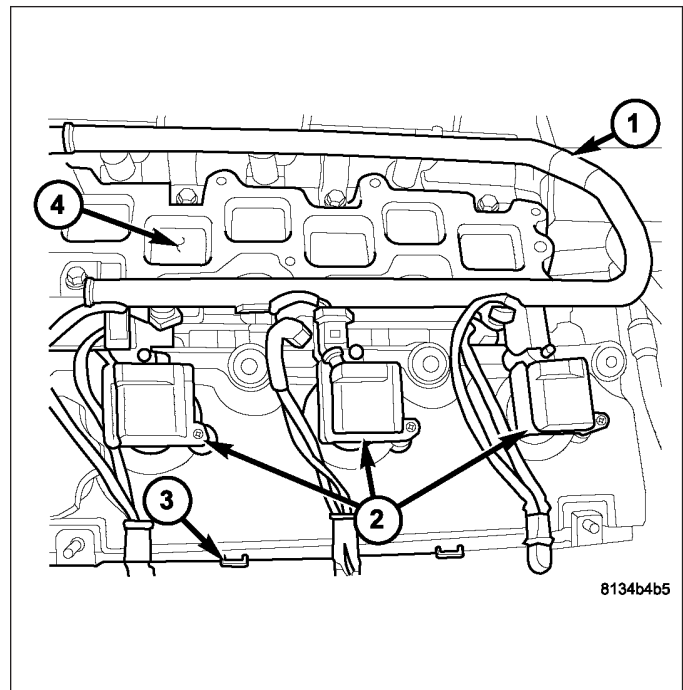
3. Carefully install the engine into the engine bay area and complete the union with the transmission.
4. Properly route the engine wiring harness behind the engine and tighten the accessible transmission bolts to 68N·m (50 ft.lbs.).



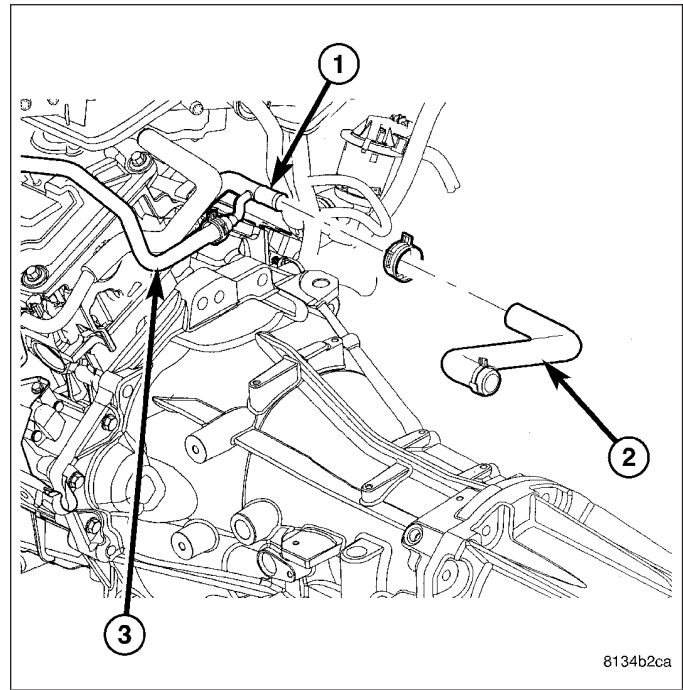
5. Properly position the right engine harness (4) and connect the oxygen sensor, knock sensor, EGR, fuel injector and ignition coil harness connectors.
6. Connect the capacitor (3) and ground strap (3) to the right cylinder head cover.
7. Install the right intake manifold support braces.



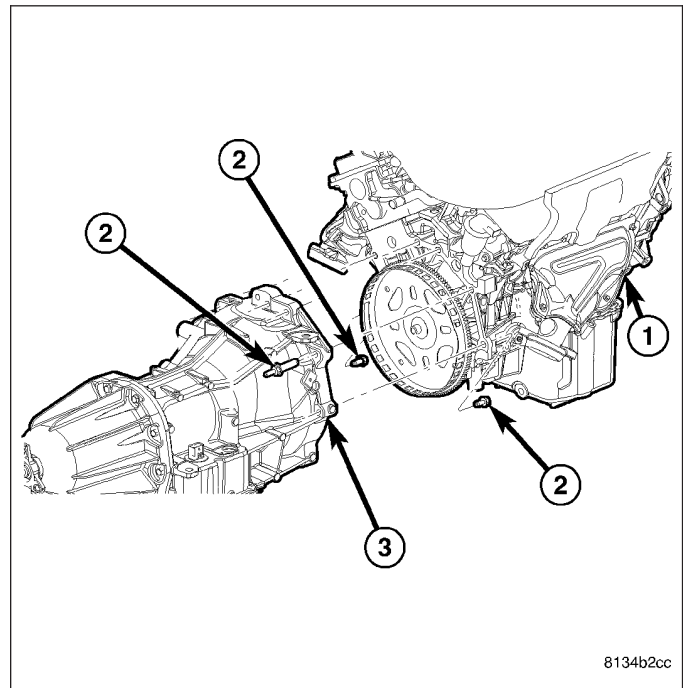
8. Properly position the left engine harness (3) and connect the ignition coil (2) and fuel injector harness connectors.
9. Connect the coolant temperature, cam position, oil pressure sensor harness connectors.
10. Connect the oxygen sensor, and the ground wire, to the left cylinder head cover.



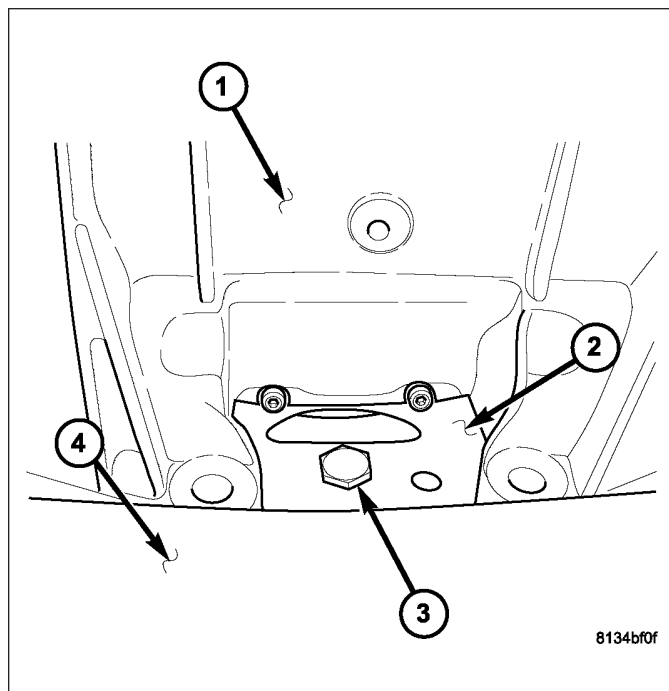
11. Connect the heater hose (2) and coolant reservoir hose (3) to the rear coolant pipe (1).
12. Install the upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
13. Connect the upper radiator hose.



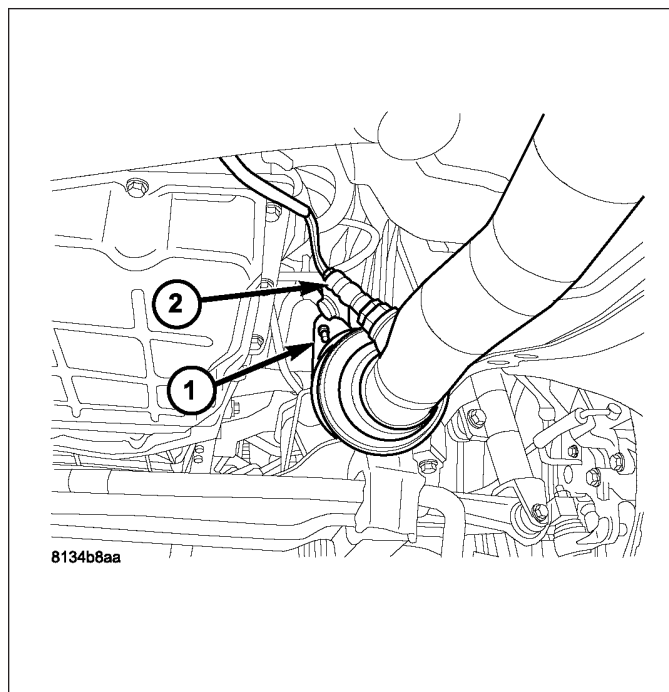
14. Raise and support the vehicle.
15. Install the engine mounting nuts and tighten to 101 N·m (75 lbs.ft.).
16. Install the remaining transmission housing bolts and tighten to 68 N·m (50 ft.lbs.).



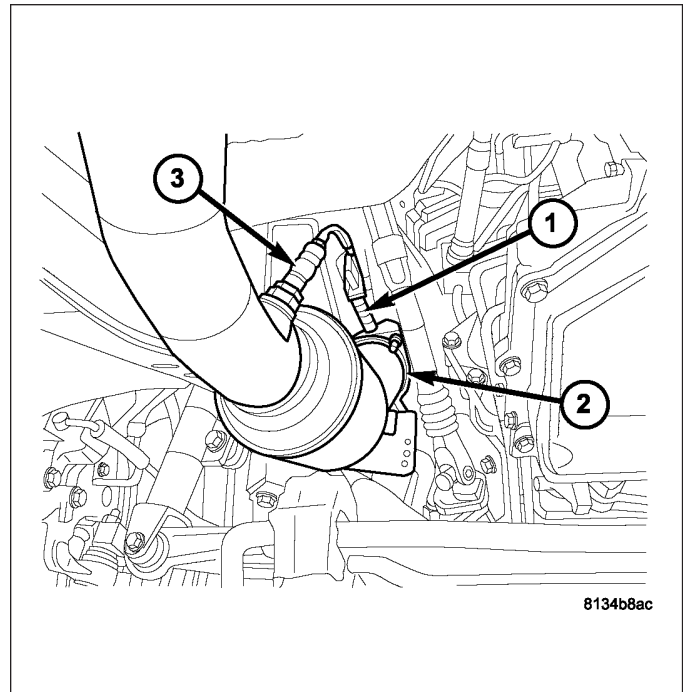
17. Install the torque converter bolts (3). Tighten bolts to 75 N·m (55 lbs.ft.).
18. Install the flywheel inspection cover. Tighten bolts to 12 N·m (105 lbs. in.)



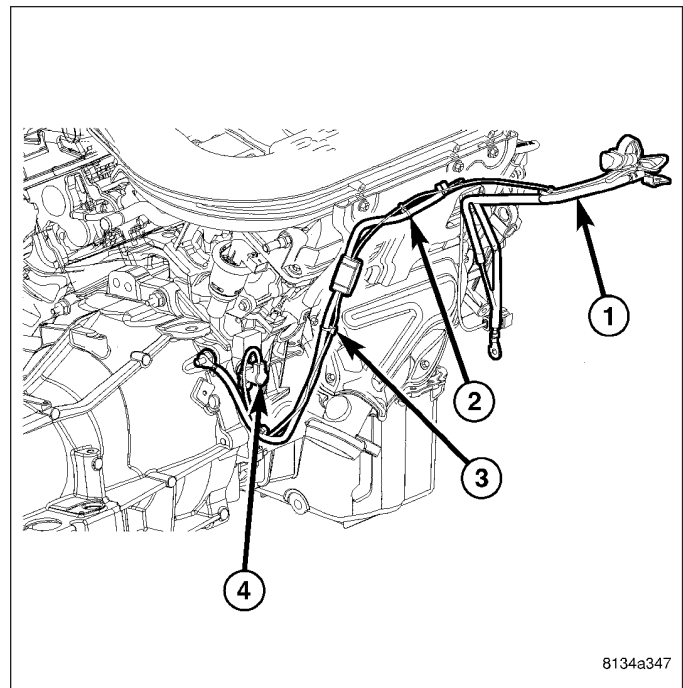
19. Connect the right exhaust pipe to the exhaust manifold (1) and connect the oxygen sensor (2).



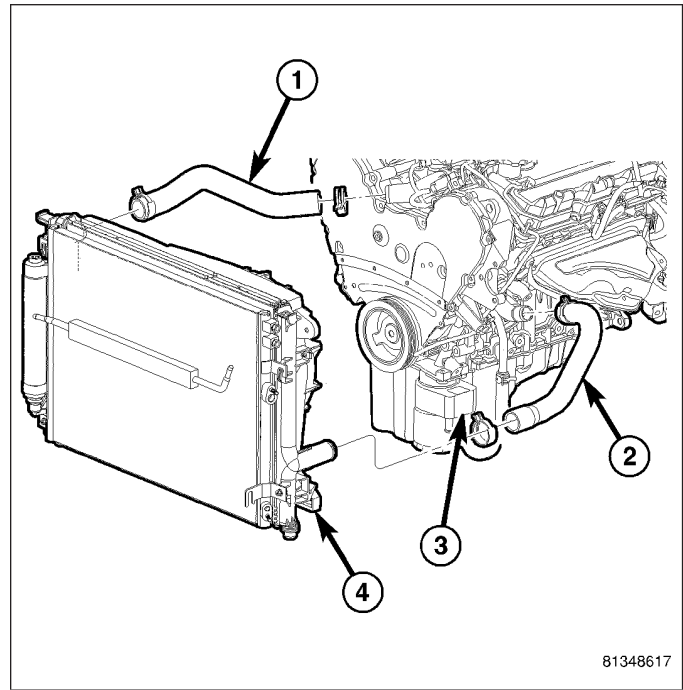
20. Connect the left exhaust pipe to the exhaust manifold (2) and connect the oxygen sensor (3)
21. Install the crankshaft position sensor (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/CRANKSHAFT POSITION SENSOR - INSTALLATION).



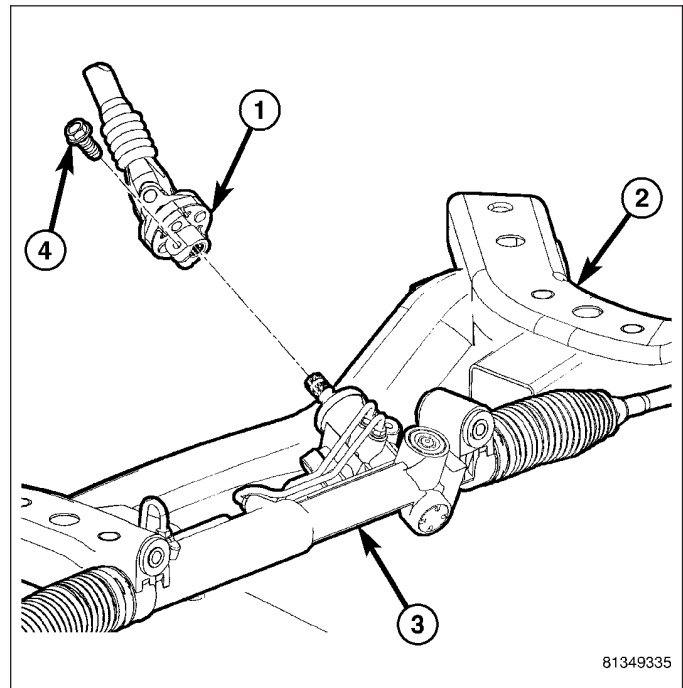
22. Connect the engine block heater (4) (if equipped).
23. Connect the ground strap (3) at the right transmission housing.



24. Tighten the transmission line bracket at the A/C compressor.
25. Connect the oil cooler hose at the cooler (3) and secure the cooler hose retainer at the transmission.
26. Connect the lower radiator hose (2).
27. Install the starter and spacer plate (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - INSTALLATION).



28. Align and connect the steering column coupler (1) to the steering gear (3).
29. Connect the generator electrical connectors (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - INSTALLATION).
30. Install new oil filter.
31. Install the lower engine close out panel.
32. Lower the vehicle.
33. Fill the cooling system to the proper level using the appropriate coolant (Refer to 7 - COOLING/ENGINE/COOLANT - STANDARD PROCEDURE).
34. Fill engine crankcase with proper oil to correct level (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - SPECIFICATIONS).
35. Evacuate and recharge air conditioning.
36. Install the windshield wiper cowl assembly.
37. Install the hood.
38. Connect the negative battery cable.
39. Start engine and run until operating temperature is reached and radiator fans cycle.
40. Check all fluid levels and properly fill.



**SPECIFICATIONS****SPECIFICATIONS - 3.5L ENGINE****GENERAL SPECIFICATIONS**

DESCRIPTION	SPECIFICATION	
Type	60° SOHC V-6 24-Valve	
Displacement	3.5L	
Firing Order	1-2-3-4-5-6	
Compression Ratio	10:1	
Lead Cylinder	#1 Right Bank	
	Metric	Standard
Displacement	3.5L Liters	214 cu. in.
Bore	96.0 mm	3.780 in.
Stroke	81.0 mm	3.189 in.

**CYLINDER BLOCK**

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Cylinder Bore Diameter	96.0 mm ± 0.0076	3.780 in. ± 0.0003 in.
Out-of-Round (Max.)	0.076 mm	0.003 in.
Taper (Max.)	0.051 mm	0.002 in.

**PISTONS**

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Material Type	Aluminum (Full Floating Pins)	
Piston Diameter	95.98 mm ± 0.019 mm	3.7788 in. ± 0.0008 in.
Clearance at Size Location	-0.007 to +0.047 mm	-0.003 to +0.0018 in.
Piston Weight - A	438-443 grams	15.45-15.62 oz.
Piston Weight - B	433-438 grams	15.27-15.45 oz.
Piston Ring Groove Diameter #1	87.4-87.6 mm	3.441-3.449 in.
Piston Ring Groove Diameter #2	86.3-86.5 mm	3.397-3.4055 in.
Piston Ring Groove Diameter #3	85.8-86.0 mm	3.378-3.385 in.

**PISTON PINS**

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Type	Full Floating	
Clearance in Piston	0.005-0.015 mm	0.002-0.0006 in.
Clearance in Rod	0.007-0.018 mm	0.0003-0.007 in.
Diameter	23.997-24.000 mm	0.9448-0.9449 in.



**PISTON RINGS**

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Ring Gap-Top Compression Ring	0.20-0.36 mm	0.008-0.014 in.
Ring Gap-2nd Compression Ring (Micro-Napier	0.20-0.40 mm	0.0078-0.0157 in.
Ring Gap-Oil Control (Steel Rails)	0.25-0.76 mm	0.010-0.030 in.

**PISTON RING SIDE CLEARANCE**

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Top and Second Compression Ring	0.04-0.08 mm	0.0016-0.0031 in.
Oil Ring (Steel Rails	0.038-0.184 mm	0.0015-0.0073 in.

**PISTON RING WIDTH**

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Top Compression Ring	1.17-1.19 mm	0.0461-0.0469 in.
2nd Compression Ring (Micro-Napier	1.47-1.49 mm	0.058-0.059 in.
Oil Control (Steel Rails)	0.445-0.470 mm	0.0176-0.0186 in.

**CONNECTING RODS**

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Bearing Clearance	0.038-0.074 mm	0.0015-0.0029 in.
Piston Pin Bore Diameter	24.0076-24.0153 mm	0.9452-0.9455 in.
Side Clearance (MAX)	0.39 mm	0.0153 in.
Total Weight (Less Bearing)	647 grams	22.8223 oz.

**CRANKSHAFT MAIN BEARING JOURNALS**

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Diameter	63.987-64.013 mm	2.519-2.520 in.
Main Bearing Diametrical Clearance	0.036-0.065 mm	0.0014-0.0026 in.
MAX Allowable	0.080 mm	0.0031 in.
Out-of-Round (MAX)	0.015 mm	0.0006 in.
Taper (MAX)	0.015	0.0006 in.
End Play	0.10-0.30 mm	0.004-0.012 in.
End Play (MAX)	0.43 mm	0.017 in.

**CONNECTING ROD JOURNALS**

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Diameter	57.982-58.002 mm	2.282-2.283 in.
Bearing Diametrical Clearance	0.028-0.084 mm	0.001-0.003 in.
Out-of-Round (MAX)	0.010 mm	0.0004 in.
Taper (MAX)	0.015	0.0006 in.

**CAMSHAFT**

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Bore Diameter	43.038-43.059 mm	1.6944-1.6953 in.
Diametrical Clearance	0.078-0.12 mm	0.003-0.0047 in.
Diametrical Clearance (MAX)	0.15 mm	0.0059 in.
Bearing Journal Diameter	42.939-42.960 mm	1.6905-1.6913 in.
End Play	0.03-0.035 mm	0.001-0.014 in.

**VALVE TIMING-INTAKE VALVE**

DESCRIPTION	SPECIFICATIONS (CRANKSHAFT DEGREES)
Opens (ATDC)	3°
Closes (ABDC)	61°
Duration	238°
Centerline	122°

**VALVE TIMING-EXHAUST VALVE**

DESCRIPTION	SPECIFICATIONS (CRANKSHAFT DEGREES)
Opens (BBDC)	56°
Closes (ATDC)	16°
Duration	252°
Centerline	110°

**CYLINDER HEAD**

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Gasket Thickness (Compressed)	1.78 mm	0.059 in.
Valve Seat Angle (From Horizontal)	45-45.5°	
Valve Seat Runout (MAX)	0.051 mm	0.002 in.
Valve Seat Width-Intake	0.8-1.2 mm	0.031-0.067 in.
Valve Seat Width-Exhaust	1.3-1.7 mm	0.05-0.067 in.
Guide Bore Diameter (Std.)	6.975-7.00 mm	0.2746-0.2756 in.
Valve Guide Height *	9.5-10.5 mm	0.3740-0.4134 in.
* Measured from cylinder head surface		

## VALVES

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Face Angle (From Horizontal)	44.5°-45°	
Head Diameter-Intake	36.37-36.63 mm	1.4319-1.4421 in.
Head Diameter-Exhaust	28.87-29.13 mm	1.1366-1.1469 in.
Length-Intake (Overall)	114.41-114.99 mm	4.5043-4.5272 in.
Length-Exhaust (Overall)	126.17-126.75 mm	4.9673-4.9902 in.
Stem Diameter-Intake	6.935-6.953 mm	0.2730-0.2737 in.
Stem Diameter-Exhaust	6.906-6.924 mm	0.2719-0.2726 in.
Stem-to-Guide Clearance-Intake	0.022-0.065 mm	0.0009-0.0026 in.
Stem-to-Guide Clearance-Intake (MAX.) Rocking Method	0.29 mm	0.0114 in.
Stem-to-Guide Clearance-Exhaust	0.051-0.094 mm	0.002-0.0037 in.
Stem-to-Guide Clearance-Intake (MAX.) Rocking Method	0.370 mm	0.0146 in.
Valve Lift-Intake (Zero Lash)	8.55 mm	0.3367 in.
Valve Lift-Exhaust (Zero Lash)	6.53 mm	0.2571 in.
Valve Margin-Intake	0.835-1.165 mm	0.0329-0.0459 in.
Valve Margin-Exhaust	1.44-1.77 mm	0.0567-0.0697 in.
Valve Stem Tip Height-Intake	42.366-43.665 mm	1.6680-1.7187 in.
Valve Stem Tip Height-Exhaust	45.205-46.486 mm	1.780-1.8305 in.

## VALVE SPRINGS

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Free Length-Intake (Approx.)	43.675 mm	1.7195 in.
Free Length-Exhaust- Yellow (Approx.)	47.1 mm	1.8543 in.
Free Length-Exhaust- White (Approx.)	48.3 mm	1.9015 in.
Spring Force-Intake (Valve Closed)	309-358 N @ 38.0 mm	69.5-80.5 lbs. @ 1.4961 in.
Spring Force-Exhaust- Yellow-(Valve Closed)	314-354 N @ 38.0 mm	70.5-79.5 lbs. @ 1.496 in.
Spring Force-Exhaust- White-(Valve Closed)	355-401 N @ 38.0 mm	80-90 lbs. @ 1.496 in.
Spring Force-Exhaust- Yellow-(Valve Open)	579-640 N @ 31.47 mm	130-144 lbs. @ 1.239 in.
Spring Force-Exhaust- White-(Valve Open)	621-687 N @ 31.47 mm	139.5-154.5 lbs. @ 1.239 in.
Spring Force-Intake (Valve Open)	836-907 N @ 29.45 mm	188-204 lbs. @ 1.1594 in.
Number of Coils-Intake	6.86	
Number of Coils-Exhaust	7.66	
Color of Spring (Top of Coils)- Intake-Right Hand Coil Direction	Orange	

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Color of Spring (Top of Coils)- Exhaust-Left Hand Coil Direction	Yellow or White	
Wire Diameter-Intake	4.29-4.35 mm	0.1547-0.1570 in.
Wire Diameter-Exhaust	3.93-3.99 mm	0.1547-0.1570 in.
Spring Installed Height *	38.0 mm	1.4961 in.
* Spring Seat to Bottom Retainer-Intake and Exhaust		

**OIL PUMP**

DESCRIPTION	SPECIFICATIONS	
	Metric	Standard
Clearance Over Rotors	0.077 mm	0.003 in.
Cover-Out-of-Flat (MAX.)	0.025 mm	0.001 in.
Inner and Outer Rotor Thickness (MIN.)	14.229 mm	0.563 in.
Outer Rotor Thickness (MAX.)	0.39 mm	0.015 in.
Outer Rotor Diameter (MIN.)	79.997 mm	3.149 in.
Tip Clearance Between Rotors (MAX.)	0.20 mm	0.008 in.

**OIL PRESSURE**

DESCRIPTION	SPECIFICATIONS
NOTE: At Normal Operating Temperatures	
Pressure @ Curb Idle Speed *	34.47 kPa Min. (5 PSI MIN.)
Pressure @ 3000 RPM	300-724 kPa (45-105 PSI.)
*CAUTION: If pressure is zero at curb idle, DO NOT run engine at 3000 RPM.	

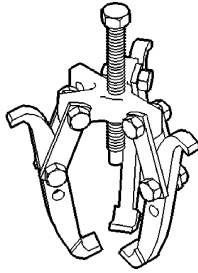
**SPECIFICATIONS - TORQUE**

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Camshaft Sprocket Bolt—Right Side	102 + $\frac{1}{4}$ Turn	75 + $\frac{1}{4}$ Turn	—
Camshaft Sprocket Bolt—Left Side	102 + $\frac{1}{4}$ Turn	75 + $\frac{1}{4}$ Turn	—
Camshaft Thrust Plate—Bolts	28	—	250
Connecting Rod Cap—Bolts	27 + $\frac{1}{4}$ Turn	20 + $\frac{1}{4}$ Turn	—
Crankshaft Main Bearing Cap			
—Inner Main Cap Bolts	20 + $\frac{1}{4}$ Turn	15 + $\frac{1}{4}$ Turn	—
—Outer Main Cap Bolts	27 + $\frac{1}{4}$ Turn	20 + $\frac{1}{4}$ Turn	—
—Tie Bolts (Horizontal)	28	—	250
Crankshaft Damper—Bolt	95	70	—
Cylinder Head Bolts*			
—Step 1	61	45	—
—Step 2	88	65	—
—Step 3	88	65	—
—Step 4	+ $\frac{1}{4}$ Turn	+ $\frac{1}{4}$ Turn	—
*Refer to procedure for tightening sequence. (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION)			

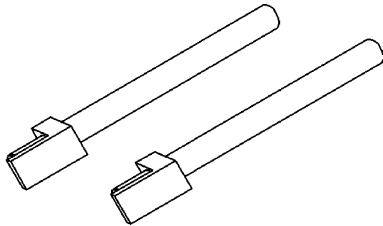
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Cylinder Head Cover—Bolts	12	—	105
Exhaust Manifold to Cylinder Head—Bolts	23	—	200
Exhaust Manifold Heat Shield—Bolts	12	—	105
Flex plate to Crankshaft	95	70	—
Flex plate to Torque Converter	75	55	—
Intake Manifold - Lower	28	—	250
Intake Manifold - Upper	12	—	105
Oil Pan			
—M6 Bolts	12	—	105
—M8 Bolts	28	—	250
Oil Pan to Transmission Bell Housing	55	40	—
Flex Plate Inspection Cover	11	—	97
Oil Pan Drain Plug	27	20	—
Oil Cooler Connector Bolt	75	55	—
Oil Filter	12	—	102
Oil Pump to Block—Bolts	28	—	250
Oil Pump Cover—Bolts	12	—	105
Oil Pump Pick Up Tube—Bolt	28	—	250
Crankshaft Rear Seal Retainer	12	—	105
Engine Mount to Mounting Bracket	75	55	—
Engine Mount to Cradle - Nuts	75	55	—
Engine Mount Heat Shield	11	—	97
Engine Mount Through Studs	12	—	106
Rocker Shaft Pedestal Retaining—Bolts	31	—	275
Spark Plugs	28	20	—
Timing Belt Tensioner—Bolts	28	—	250
Timing Belt Tensioner Pulley Assembly—Bolt	61	45	—
Timing Belt Cover			
—M6 Bolts	12	—	105
—M8 Bolts	28	—	250
—M10 Bolts	54	40	—

## SPECIAL TOOLS

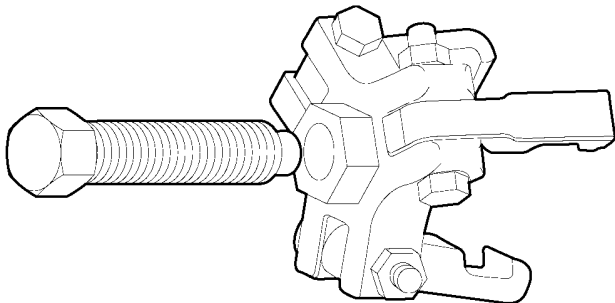
### 3.5L ENGINE



**Puller 1023**

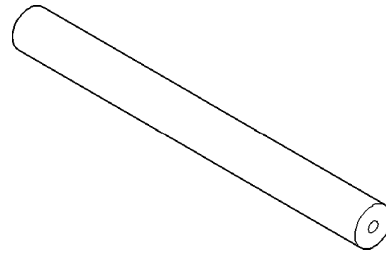


**Connecting Rod Installation Guides 8189**

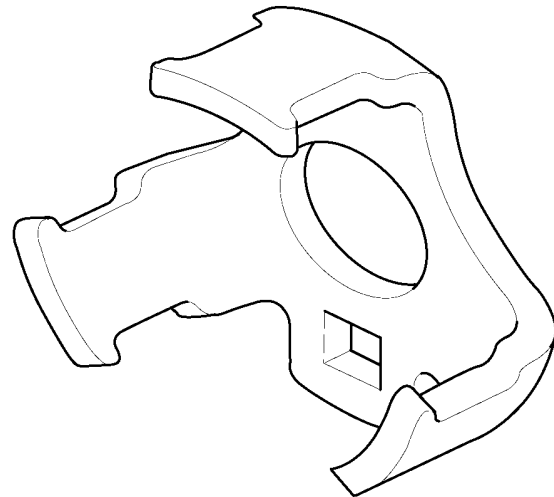


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**Puller 8454**

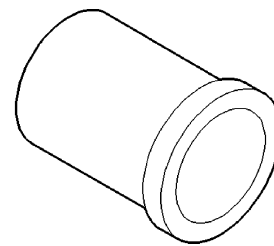


**Vibration Damper Remover Insert 9020 - Crank  
Sprocket Remover Insert C4685-C2**

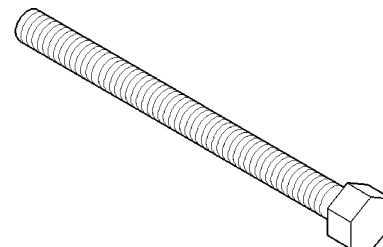


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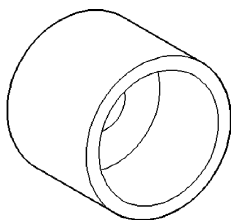
**Damper Holding Fixture 9365**



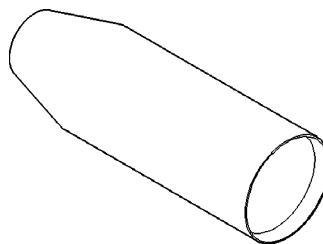
**Camshaft Seal Installer MD-998306**



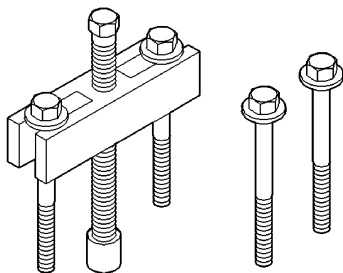
**Crankshaft Damper Installer Bolt C-4685-C1**



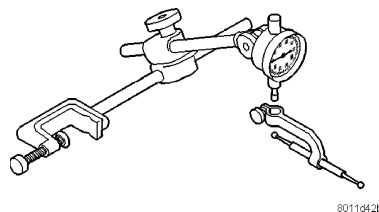
***Crankshaft Damper Installer 6792-1***



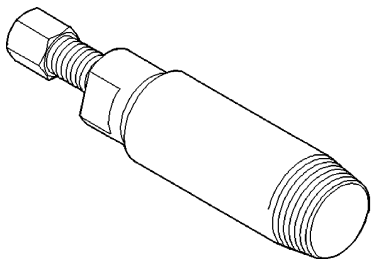
***Crankshaft Seal Protector 6780-2***



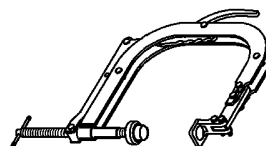
***Gear Puller L-4407A***



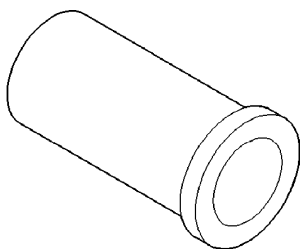
***DIAL INDICATOR C-3339***



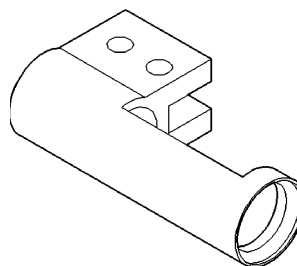
***Front Crankshaft Seal Remover 6341A***



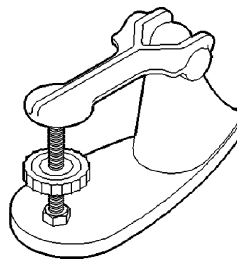
***Valve Spring Compressor C-3422-D***



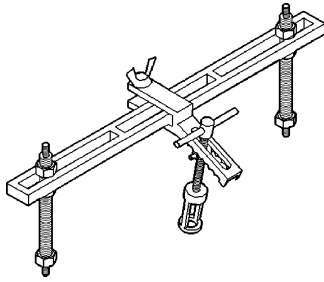
***Driver 6342***



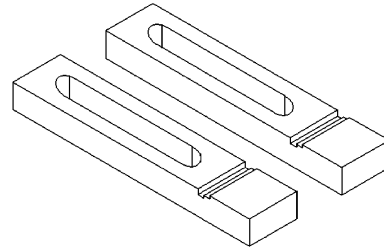
***Spring Compressor Adapter 6526***



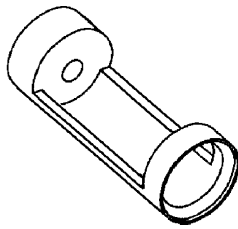
***Valve Spring Tester C-647***



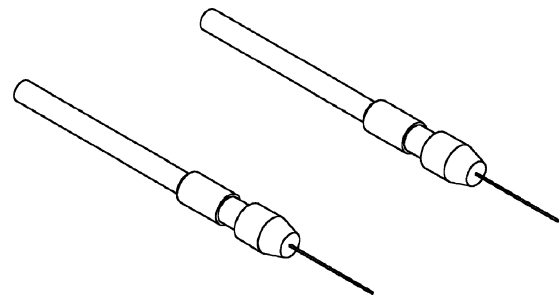
**Valve Spring Compressor MD998772A**



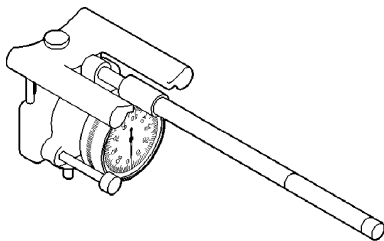
**Crankshaft Real Seal Retainer Alignment Fixture 8225**



**Valve Spring Adapter 6527**

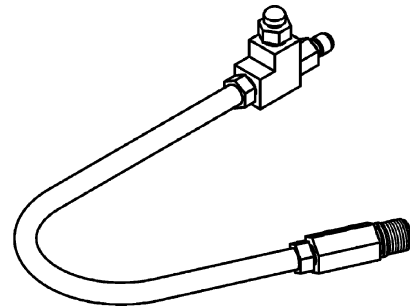


**Release Probe 8351**

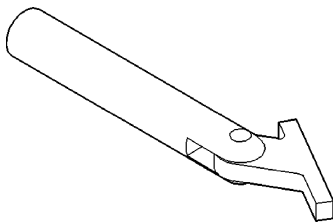


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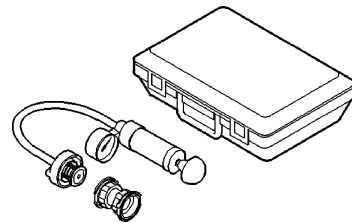
**Indicator, Cylinder Bore C-119**



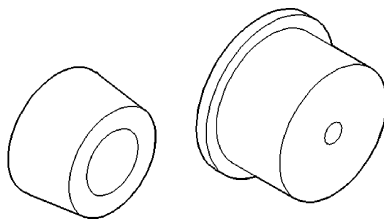
**Cylinder Compression Pressure Adaptor 8116**



**Crankshaft Main Bearing Remover C-3059**

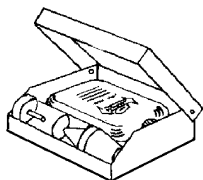


**Pressure Tester Kit 7700**

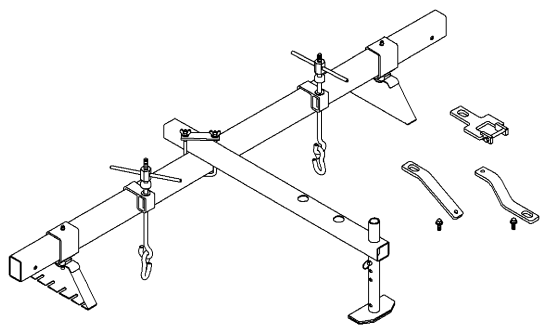


**Rear Crankshaft Oil Seal Installer 6926**





***Bloc-Chek-Kit C-3685-A***

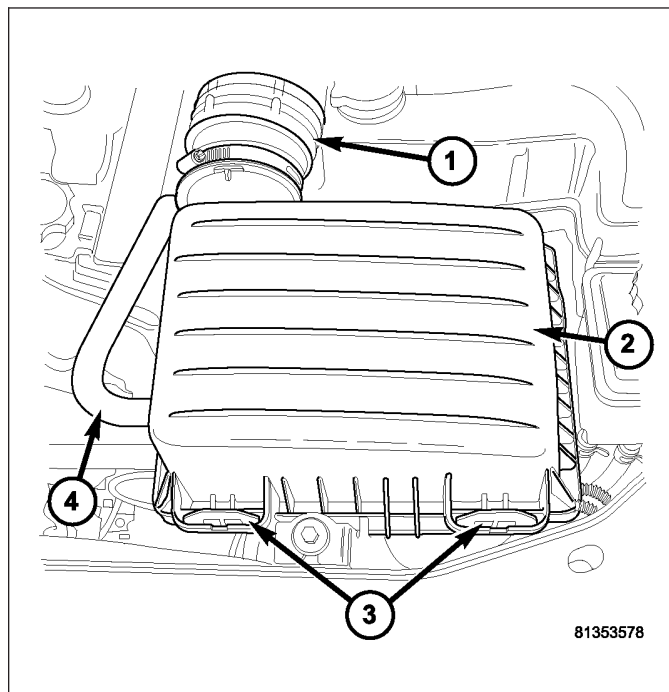


***Driveline Support Fixture 8534B***

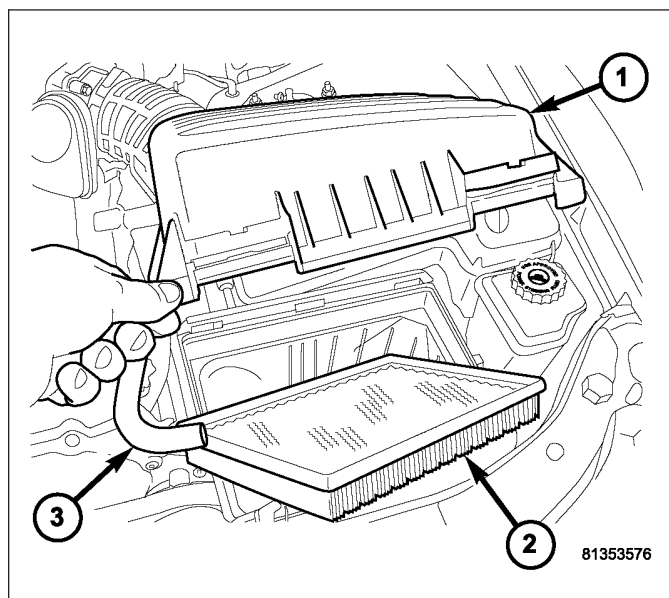
## AIR CLEANER ELEMENT

### REMOVAL

1. Disconnect the CCV hose (4) at the housing cover (2).
2. Release the housing cover tabs (3)

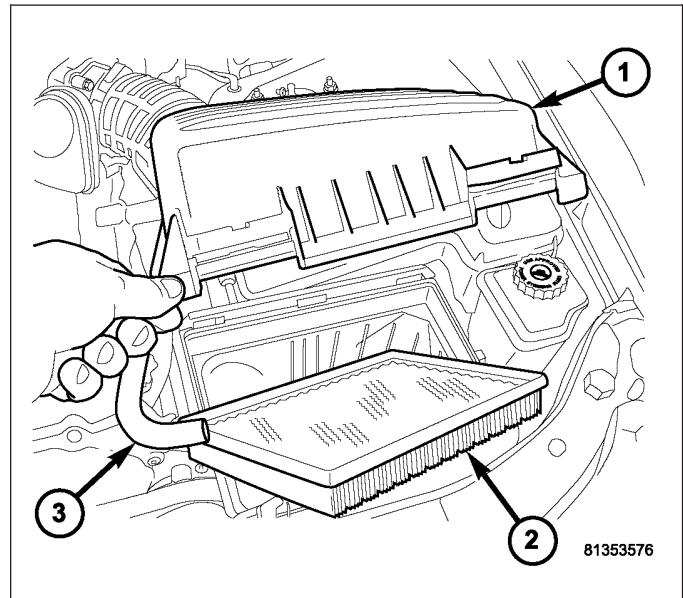


3. Lift the cover (1) and pull toward the front of the vehicle to release the rear cover to housing alignment tabs.
4. Remove the element (2).



## INSTALLATION

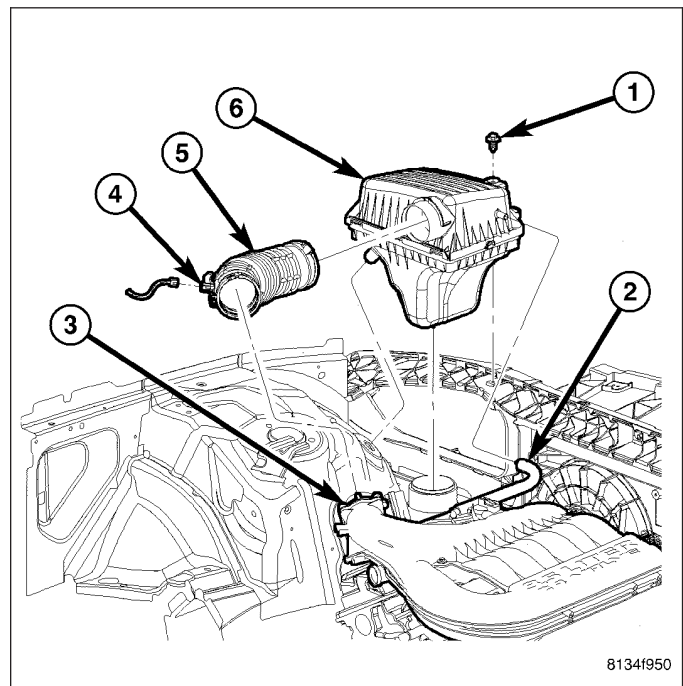
1. Install the air filter element (2) into air box.
2. Position the cover (1) so that the rear locking tabs insert into the lower housing.
3. Seat cover (1) onto element housing and assure that the front locking tabs engage.
4. Reconnect the CCV hose (3)



## AIR CLEANER HOUSING

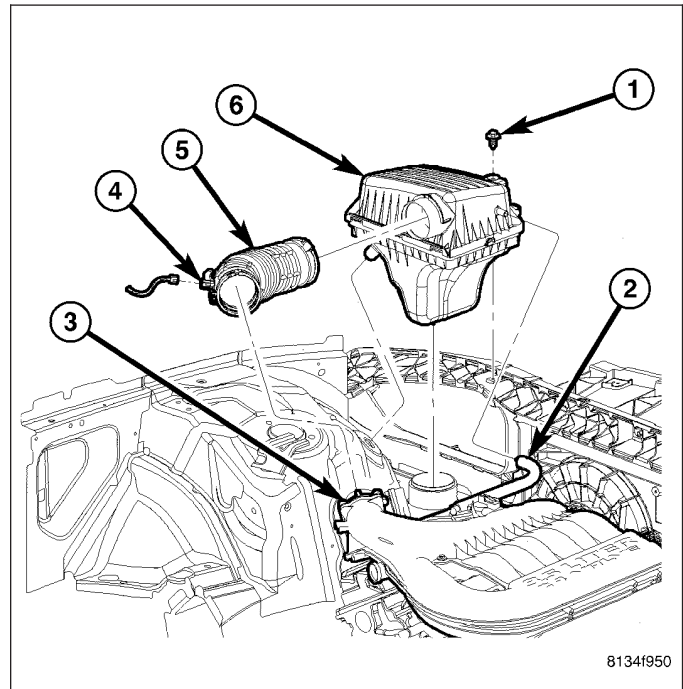
### REMOVAL

1. Separate the air inlet duct (5) at the element housing (6).
2. Disconnect the CCV hose (2) at the element housing (6).
3. Remove the housing retaining bolt (1).
4. Pull housing up and off of the locating pin.
5. Remove element housing (6) from vehicle



## INSTALLATION

1. Align the housing (6) with the lower air inlet duct and alignment grommet in the wheel housing.
2. Properly fit the housing (6) and install housing retaining bolt (1).
3. Connect the inlet air duct (5) to the housing (6) and tighten clamp.
4. Connect the CCV hose (2) to housing



81341950

## CYLINDER HEAD(S)

### DESCRIPTION

The aluminum alloy cylinder heads feature cross- flow type intake and exhaust ports. Valve guides and seat inserts are powdered metal. Valves are arranged in a "V", with each camshaft on center. To improve combustion speed the chambers are a compact spherical design with a squish area of approximately 30 percent of the piston top area. The cylinder heads are common to either cylinder bank by reversing the direction of installation.

### DIAGNOSIS AND TESTING—CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

### CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

## CYLINDER-TO-WATER JACKET LEAKAGE TEST

**WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.**

### VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

### COOLING SYSTEM TESTER METHOD

**WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).**

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

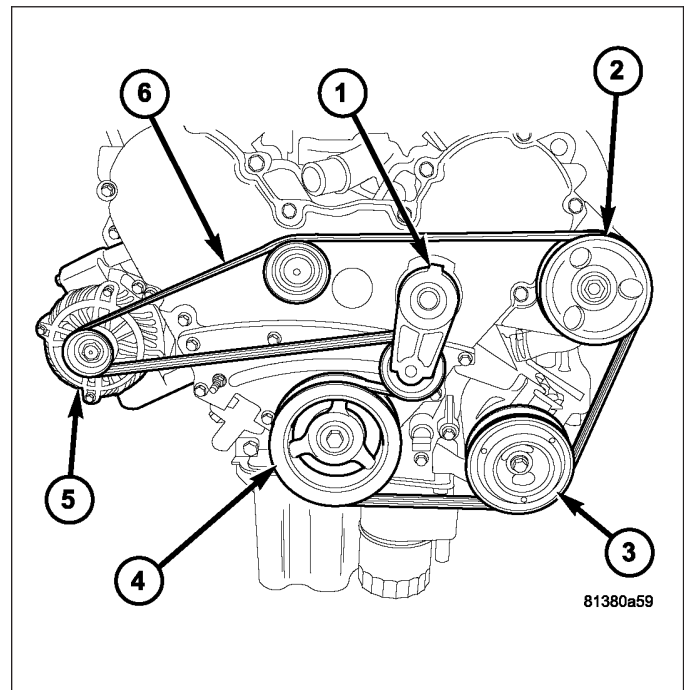
### CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

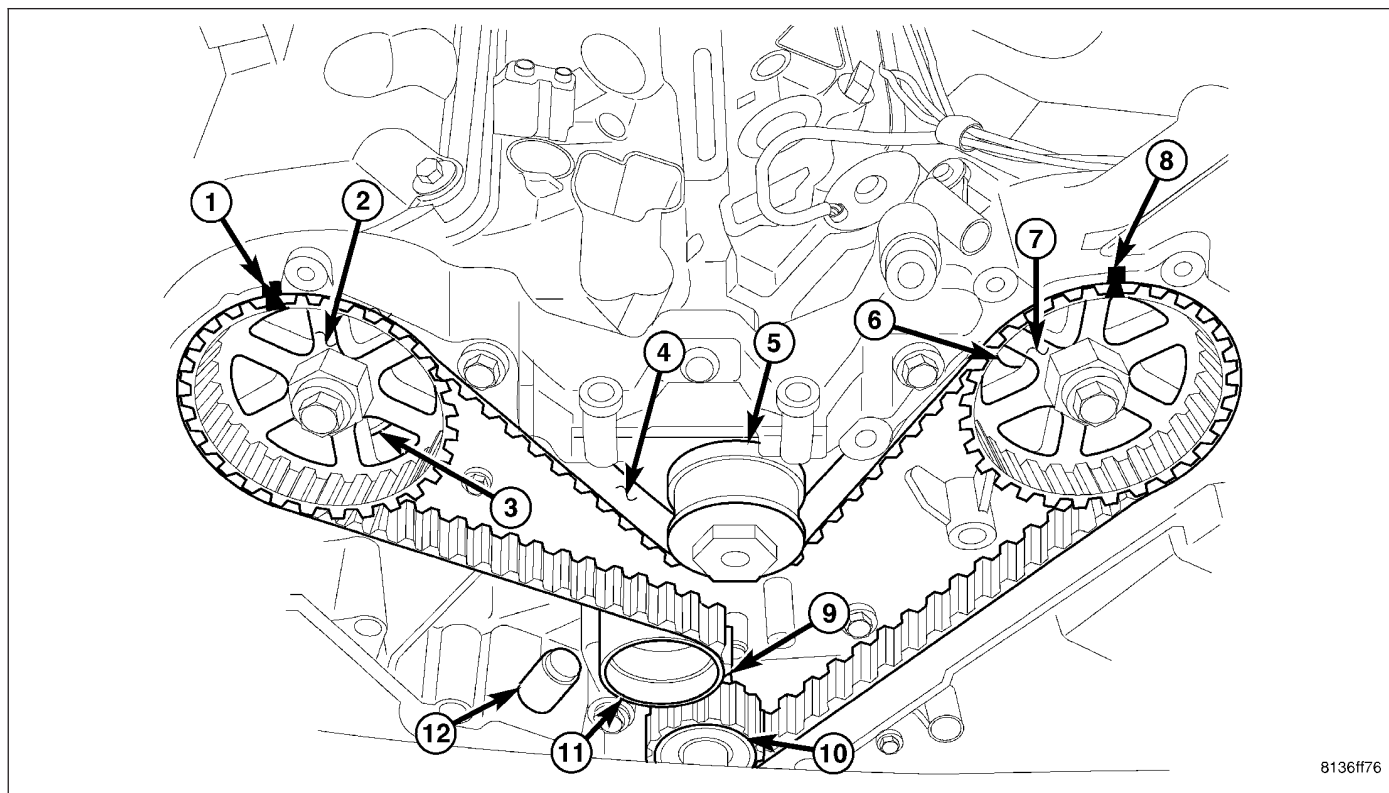
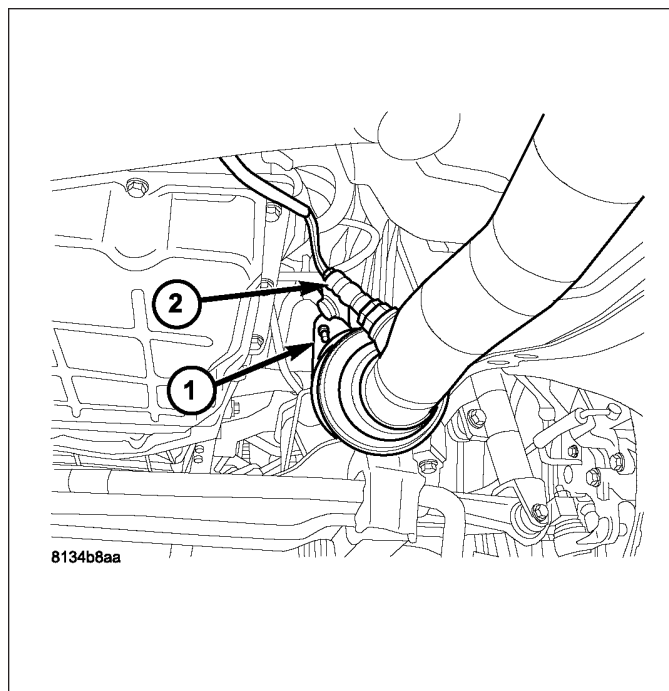
## REMOVAL - CYLINDER HEAD(S)

### RIGHT CYLINDER HEAD

1. Perform the fuel relief procedure.
2. Disconnect the negative battery cable.
3. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
4. Remove the upper intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
5. Remove the lower intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
6. Remove accessory drive belt (6).
7. Remove accessory drive belt idler pulley.
8. Remove the power steering mounting bolts (2) and set the pump aside(Refer to 19 - STEERING/ PUMP - REMOVAL).
9. Raise the vehicle.
10. Remove crankshaft damper (4) (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
11. Remove lower outer timing belt cover bolts.

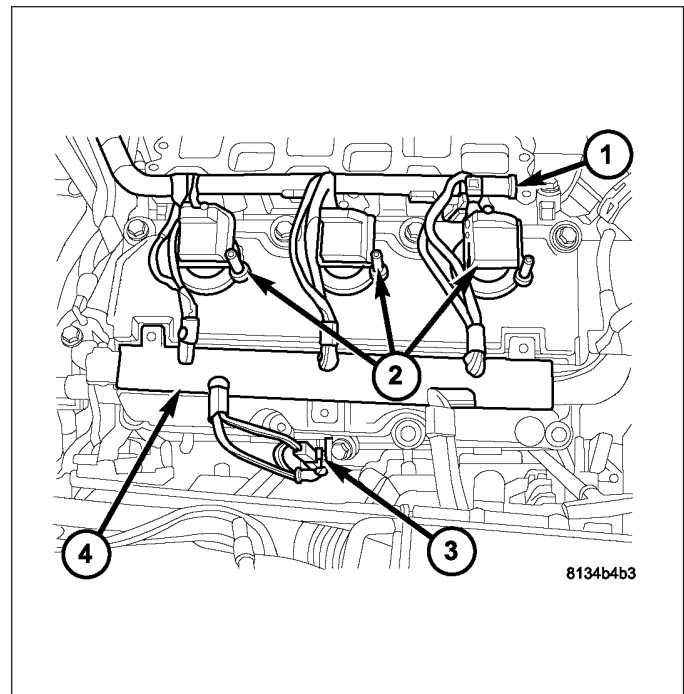


12. Remove front exhaust pipe to exhaust manifold mounting nuts (1).
13. Disconnect both oxygen sensor (2) harness connectors on each side.
14. Lower vehicle.
15. Remove the remaining outer timing belt cover bolts and cover.

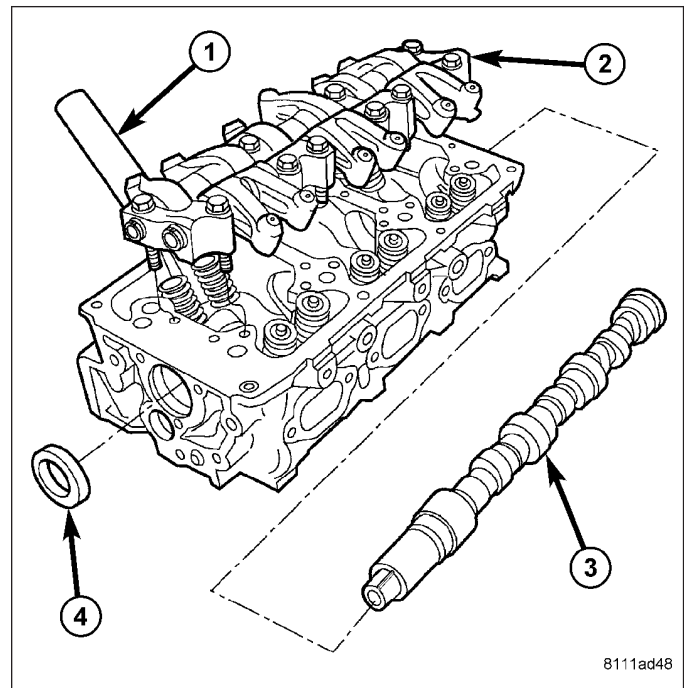


16. Rotate the engine to TDC and align timing belt marks (1,8,9).
17. Remove the timing belt tensioner (12) and reset the tensioner (Refer to 9 - ENGINE/VALVE TIMING/TMNG BELT/CHAIN TENSIONER&PULLEY - REMOVAL).
18. Remove the timing belt (4) (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

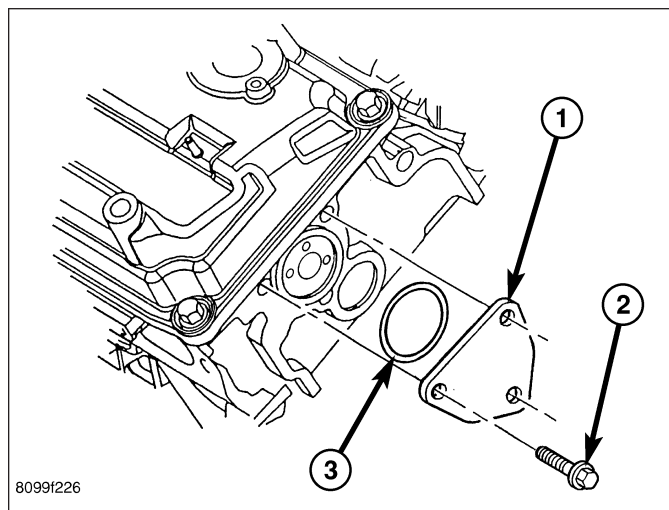
19. Remove the right cylinder head cover to cylinder head ground strap and capacitor (3).
20. Remove the EGR valve and tube assembly.
21. Remove the right cylinder head cover.



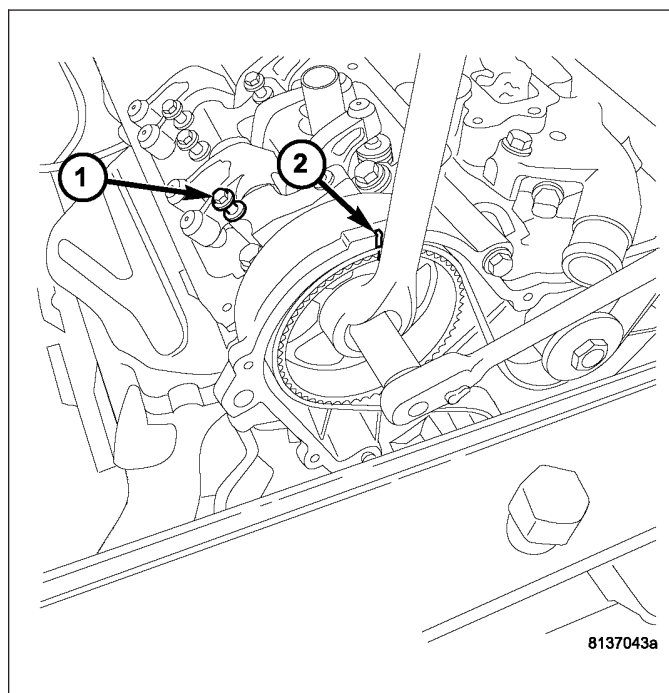
22. Remove the right rocker arm assembly (2).



23. Remove the right rear camshaft thrust plate (1).

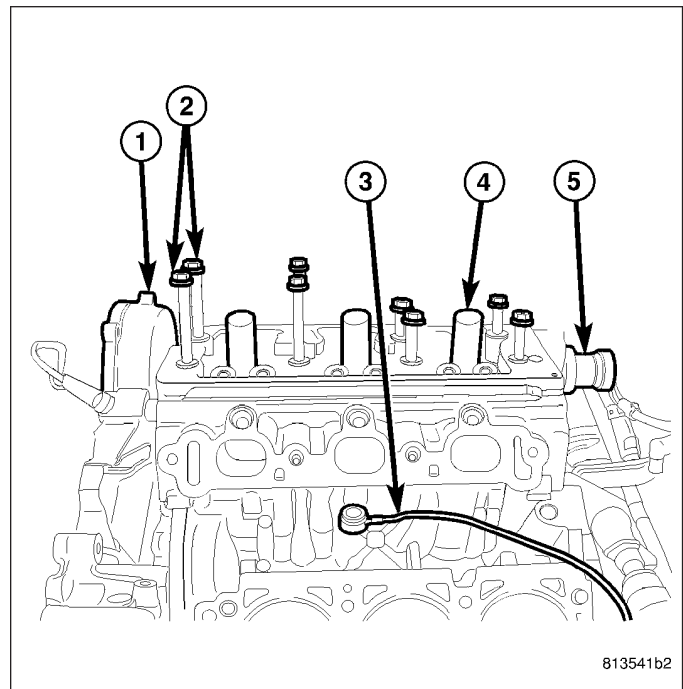


24. Counterhold the cam gear and remove the right cam gear retaining bolt.

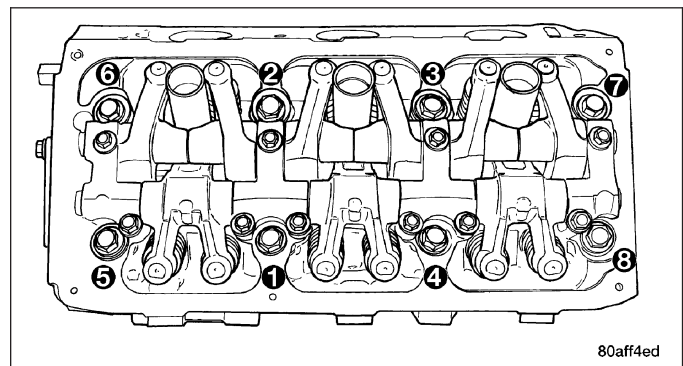




25. Push the camshaft (5) out of the back of the cylinder head approximately 3.5 inches and remove the right cam gear.

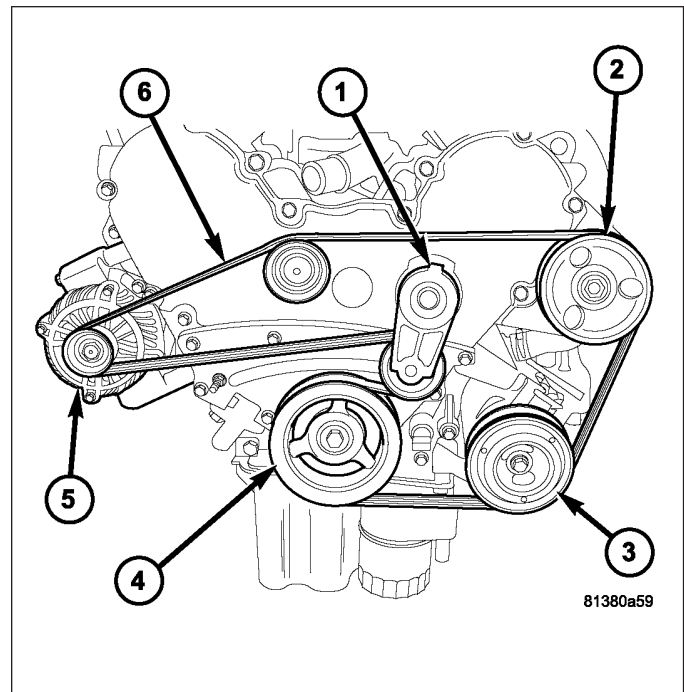


26. Remove the inner timing cover to cylinder head retaining bolts.  
27. Remove the cylinder head bolts in REVERSE of tightening sequence.  
28. Remove the cylinder head.  
29. Clean and inspect all mating surfaces.

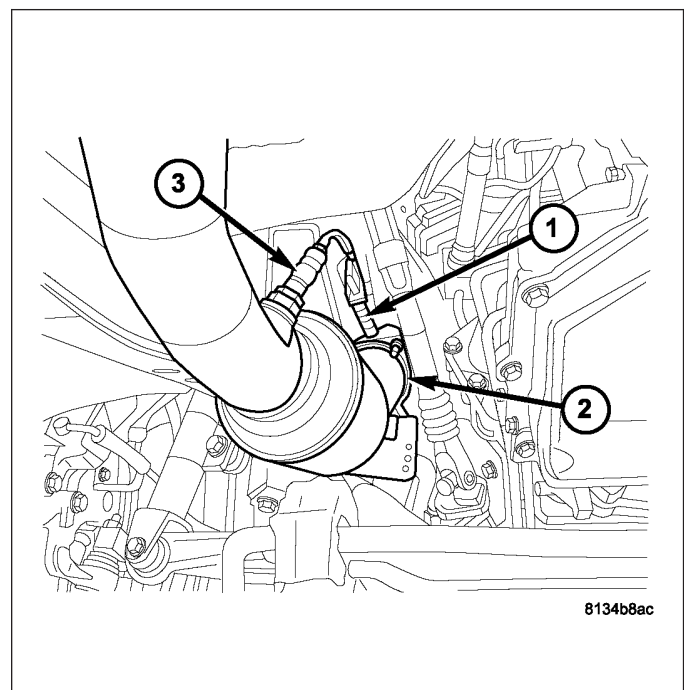


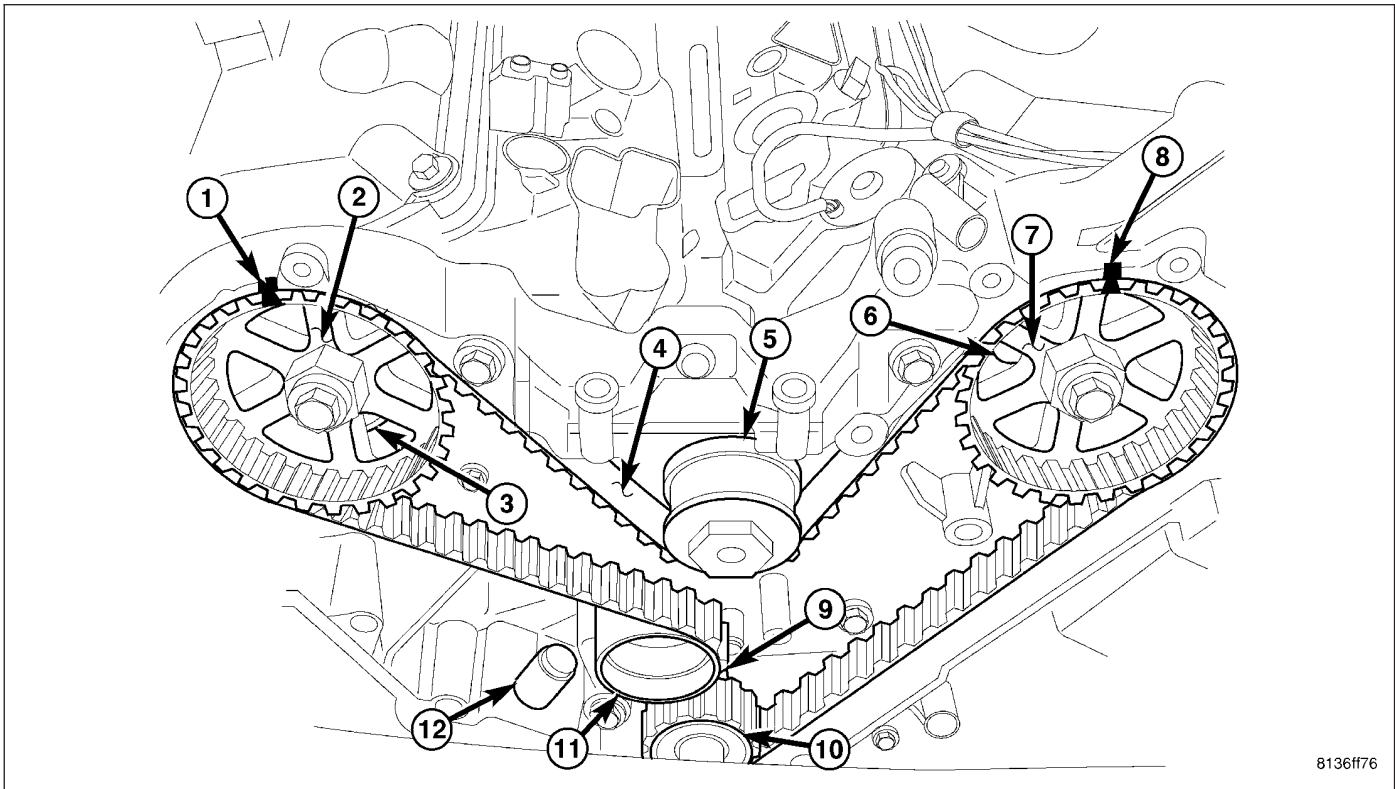
**LEFT CYLINDER HEAD**

1. Perform the fuel relief procedure.
2. Disconnect the negative battery cable.
3. Drain cooling system(Refer to 7 - COOLING - STANDARD PROCEDURE).
4. Remove the upper intake manifold.
5. Remove the lower intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
6. Remove the accessory drive belt (6).
7. Remove the belt tensioner (1).
8. Remove the accessory drive idler pulley.
9. Remove the power steering mounting bolts and set pump (2) aside.
10. Remove the crankshaft damper (4) (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
11. Remove the lower outer timing belt cover.
12. Raise and support the vehicle.



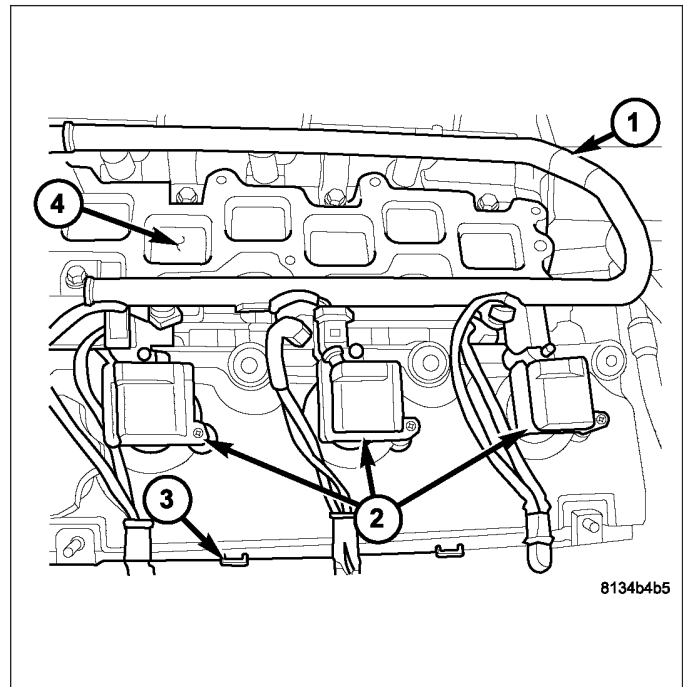
13. Remove the front exhaust pipe to exhaust manifold mounting nuts(2).
14. Disconnect both oxygen sensor harness connectors(1,2).





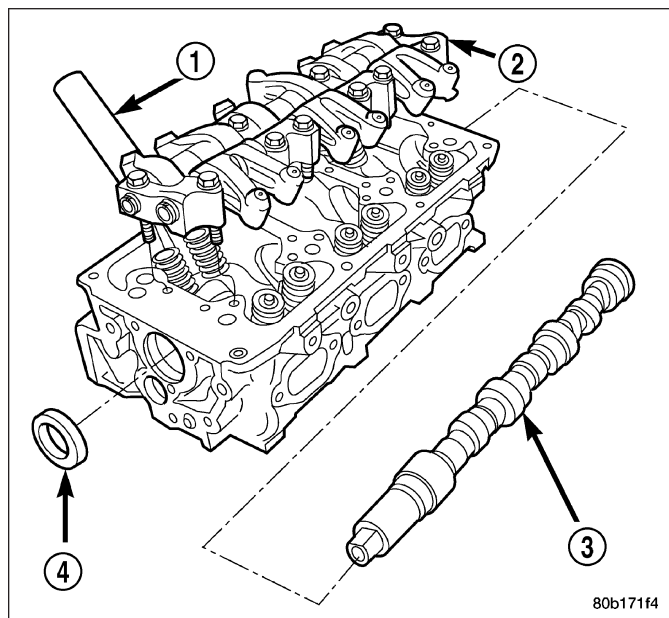
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15. Lower the vehicle.
16. Remove the outer timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
17. Rotate the engine to TDC and align the timing marks (1,8,9).
18. Remove the timing belt tensioner (12), timing belt (4), then reset tensioner.(Refer to 9 - ENGINE/VALVE TIMING/TMNG BELT/CHAIN TENSIONER&PULLEY - REMOVAL)
19. Remove the left cylinder head cover to cylinder head ground strap (3).
20. Remove the left cylinder head cover.

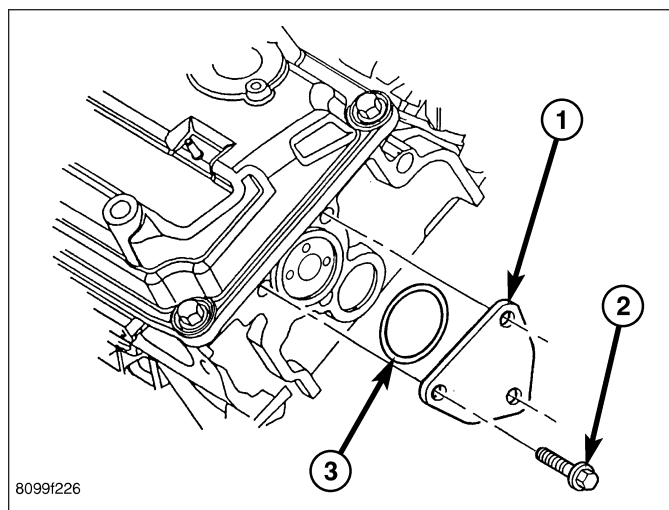


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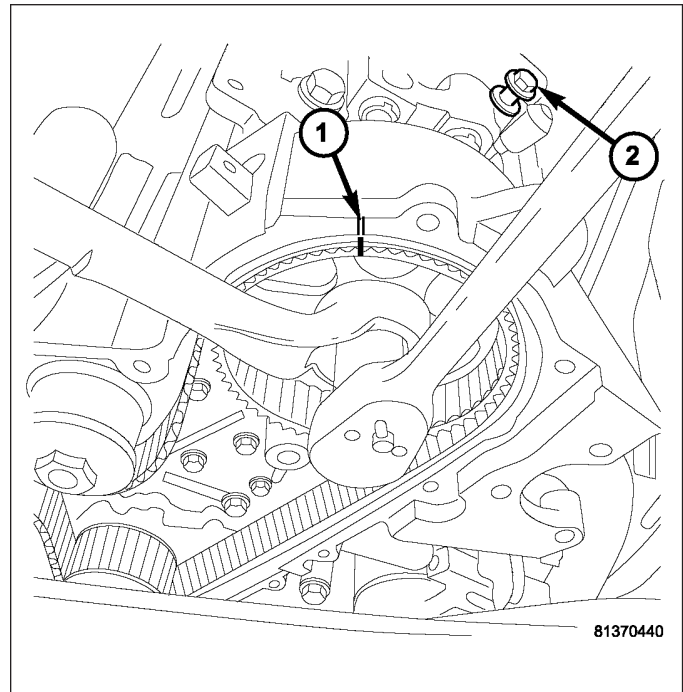
21. Remove the left rocker arm assembly (2).



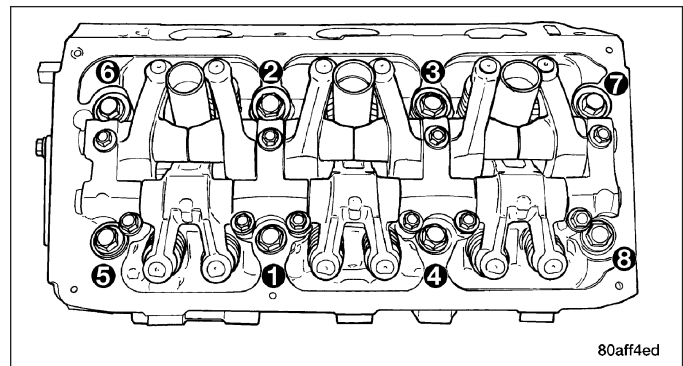
22. Remove the left camshaft thrust plate (1).



23. Counterhold the left cam gear and remove the cam gear retaining bolt.(Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)
24. Push the camshaft out of the back of the cylinder head approximately 3.5 inches and remove the cam gear.Remove the front timing belt housing to cylinder head bolts.



25. Remove the cylinder head bolts in REVERSE of tightening sequence.
26. Remove the cylinder head.
27. Clean and inspect all mating surfaces.



## CLEANING

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

**Note: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.**

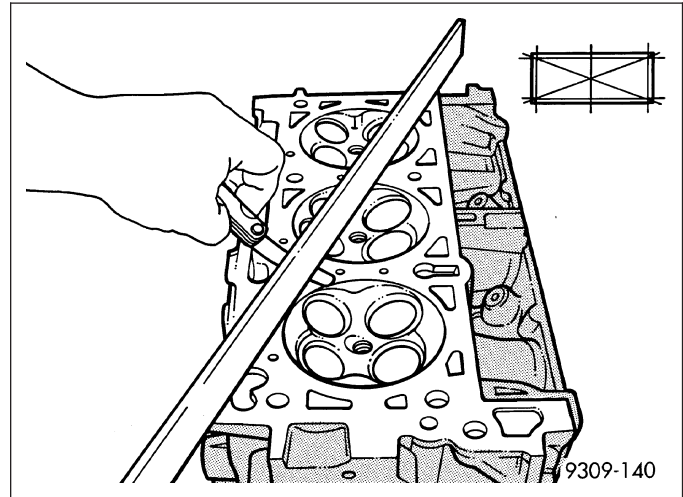
Remove all gasket material from cylinder head and block (Refer to 9 - ENGINE - STANDARD PROCEDURE). Be careful not to gouge or scratch the aluminum head sealing surface.

Clean all engine oil passages.

## INSPECTION

1. Before cleaning, check for leaks, damage and cracks.
2. Clean cylinder head and oil passages.
3. Check cylinder head for flatness.
4. Cylinder head must be flat within:
  - Standard dimension = less than 0.05 mm (0.002 inch.)
  - Service Limit = 0.2 mm (0.008 inch.)
  - Grinding Limit = Maximum of 0.2 mm (0.008 inch.) is permitted.

**CAUTION: 0.20 mm (0.008 in.) MAX is a combined total dimension of the stock removal limit from cylinder head and block top surface (Deck) together.**



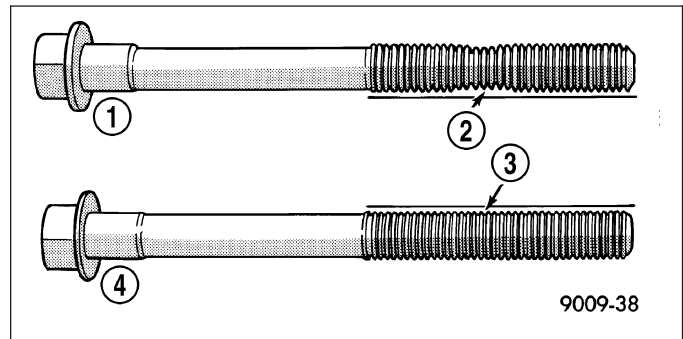
## INSTALLATION - CYLINDER HEAD(S)

### RIGHT CYLINDER HEAD

**CAUTION: THE CYLINDER HEAD GASKETS ARE NOT INTERCHANGEABLE BETWEEN CYLINDER HEADS AND ARE CLEARLY MARKED RIGHT OR LEFT.**

The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined **BEFORE** reuse. If the threads are necked down the bolts must be replaced..

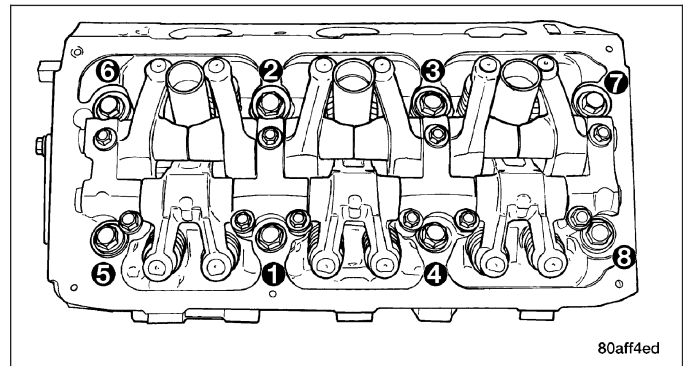
Necking can be checked by holding a scale or straight edge against the threads. If all the threads do not contact the scale the bolt must be replaced.



**CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper because the surfaces could be cut or ground. Use ONLY a wooden or plastic scraper (Refer to 9 - ENGINE - STANDARD PROCEDURE - ENGINE GASKET SURFACE PREPARATION).**

1. Clean sealing surfaces of cylinder head and block.

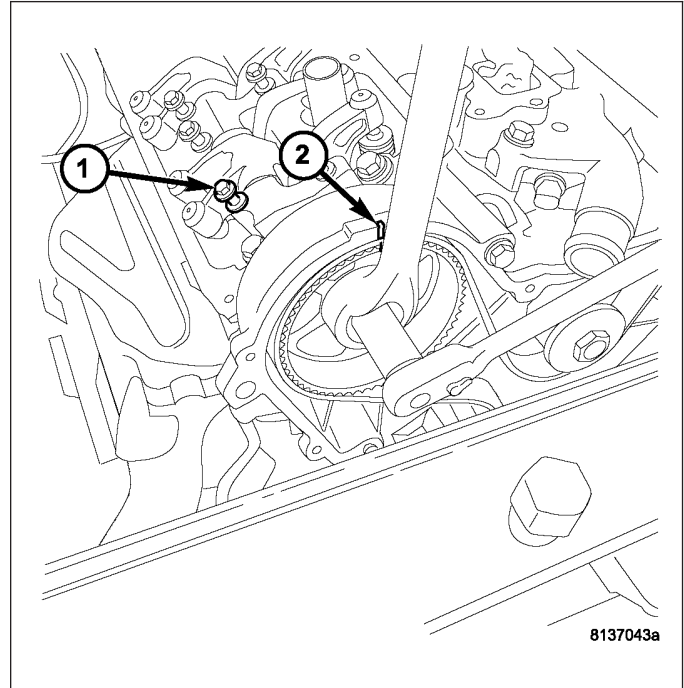
**CAUTION: Ensure that the correct head gaskets are used and are oriented correctly on cylinder block.**



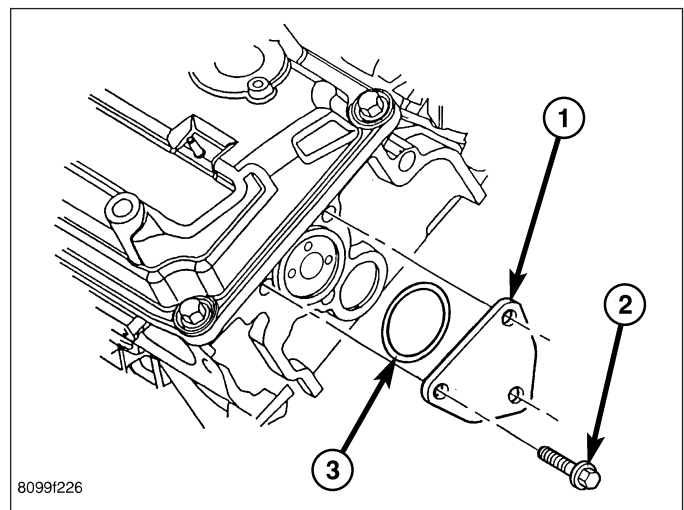
**Note: Before installing the cylinder head bolts, lubricate the threads with clean engine oil.**

2. Install the cylinder head over locating dowels and finger tighten the head bolts.
3. Tighten the cylinder head bolts in the following sequence, using the 4 step torque-turn method. Tighten according to the following torque values:.

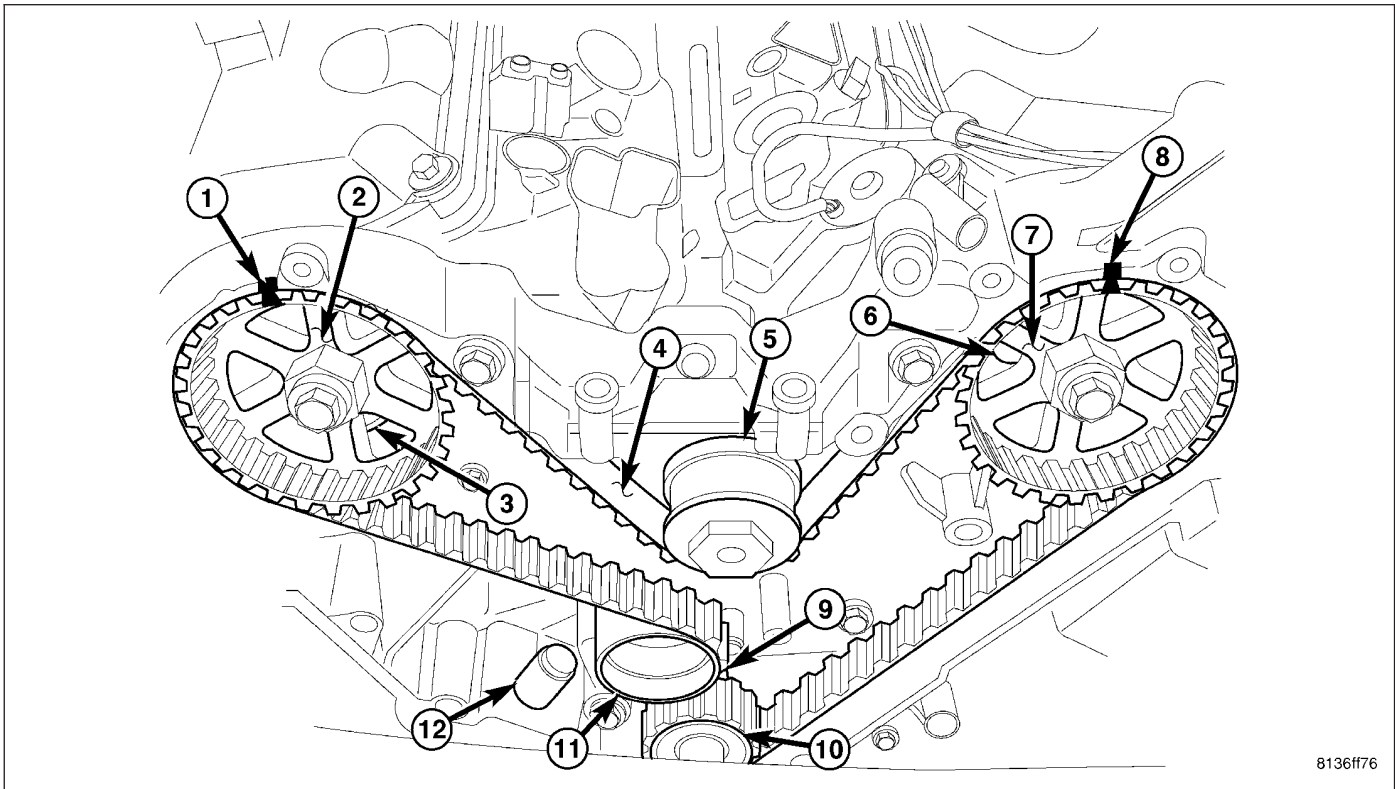
- Step 1: All to 61 N·m (45 ft. lbs.)
  - Step 2: All to 88 N·m (65 ft. lbs.)
  - Step 3: All (again) to 88 N·m (65 ft. lbs.)
  - Step 4: + 90° Turn **Do not use a torque wrench for this step.**
4. Bolt torque after 90° turn should be over 122 N·m (90 ft. lbs.) in the tightening direction. If not, replace the bolt.
5. Install the inner timing cover to cylinder head bolts. Tighten bolts to 54 N·m (40 lbs.ft.).
6. Install camshaft sprocket (2) Counterhold the camshaft sprocket gear (2) and tighten the camshaft sprocket bolt to 102 N·m plus a 1/4 turn (75 lbs. ft. plus a 1/4 turn).(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).



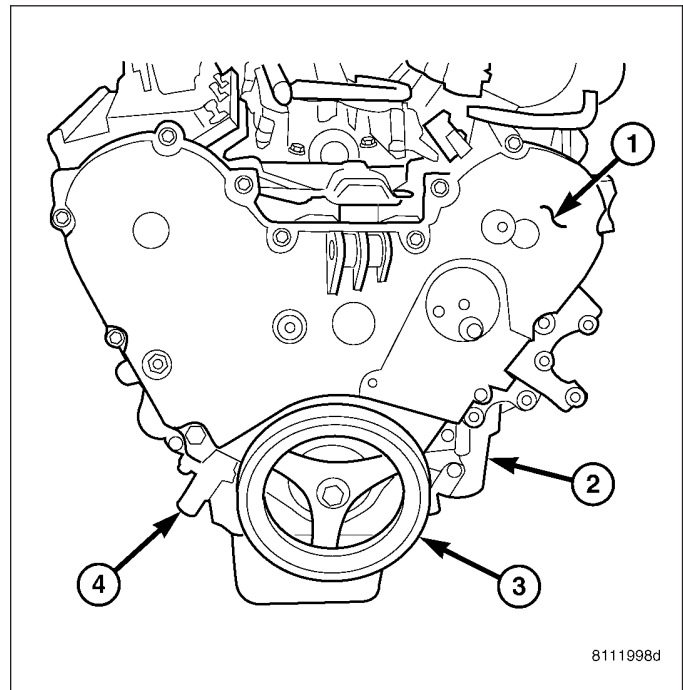
7. Install the rear camshaft thrust plate (1) and seal (3) and the EGR valve.





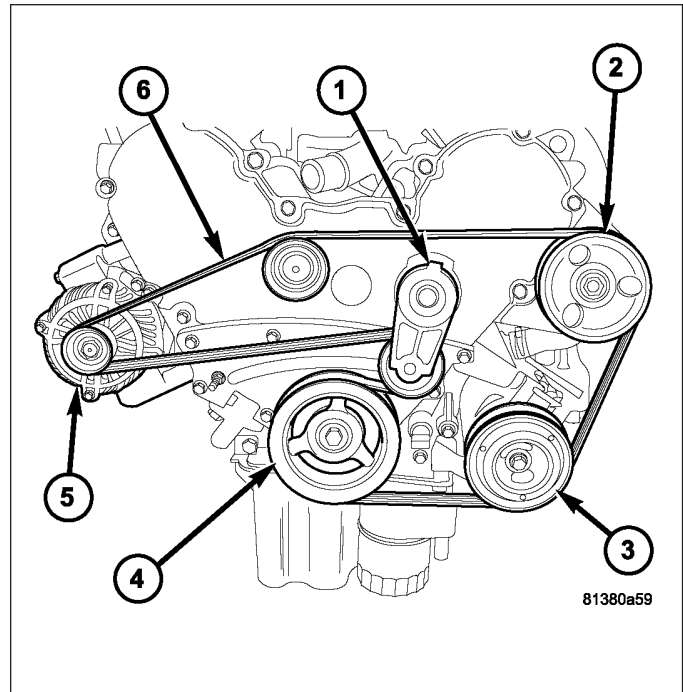


8. Rotate the camshaft gear to it's alignment mark (1) and check the left camshaft gear (7) and crankshaft gear timing alignment marks (9)..
9. Install the timing belt (4) and tensioner (12)(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
10. Install the timing belt outer cover (1)(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).

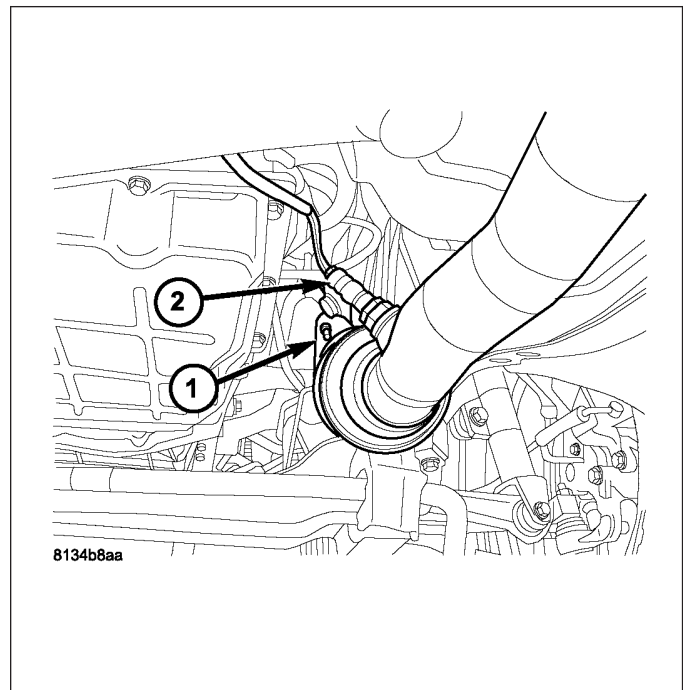




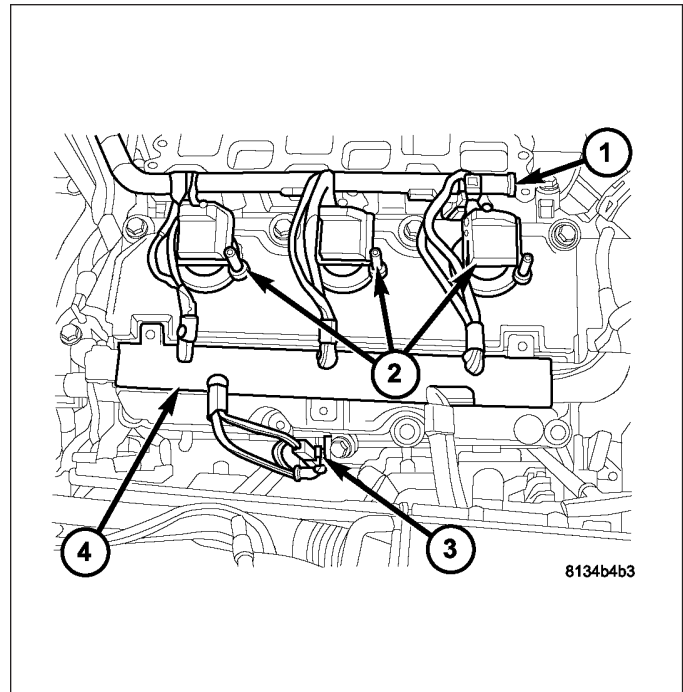
11. Install the power steering reservoir (2).
12. Install the vibration damper (4)(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
13. Install the accessory drive belt tensioner (1).
14. Install the accessory drive belt idler pulley.



15. Install the right exhaust manifold (Refer to 9 - ENGINE/MANIFOLDS/EXHAUST MANIFOLD - INSTALLATION).
16. Raise and support the vehicle.
17. Install the front exhaust pipe (1) and connect the oxygen sensors (2).
18. Lower the vehicle.



19. Install the right rocker arm assembly.
20. Install the right cylinder head cover, ground strap (3) and insulator.
21. Install lower intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
22. Install the fuel rail.
23. Install the upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
24. Connect the air cleaner element housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
25. Fill the coolant system.
26. Connect the negative battery cable.

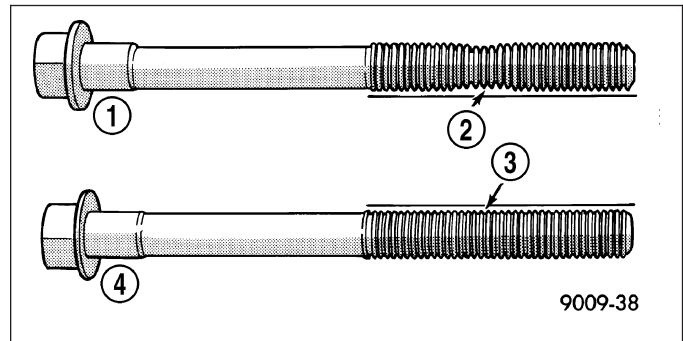


## LEFT CYLINDER HEAD

**CAUTION: THE CYLINDER HEAD GASKETS ARE NOT INTERCHANGEABLE BETWEEN CYLINDER HEADS AND ARE CLEARLY MARKED RIGHT OR LEFT.**

The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined **BEFORE** reuse. If the threads are necked down the bolts must be replaced..

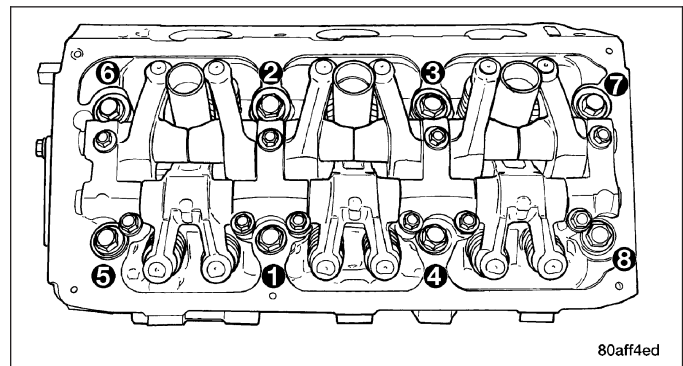
Necking can be checked by holding a scale or straight edge against the threads. If all the threads do not contact the scale the bolt must be replaced.



**CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper because the surfaces could be cut or ground. Use ONLY a wooden or plastic scraper (Refer to 9 - ENGINE - STANDARD PROCEDURE - ENGINE GASKET SURFACE PREPARATION).**

1. Clean sealing surfaces of cylinder head and block.

**CAUTION: Ensure that the correct head gaskets are used and are oriented correctly on cylinder block.**

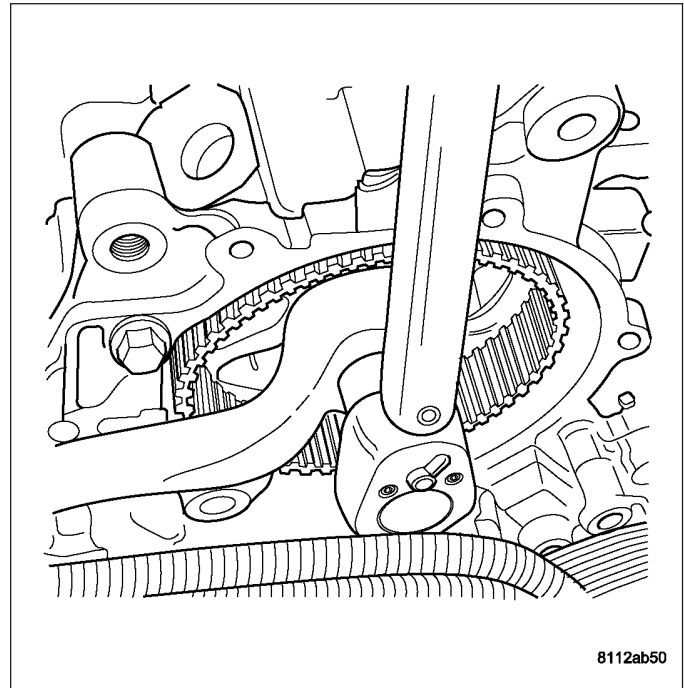


2. Install head gasket over locating dowels. Ensure the gasket is installed on the correct side of engine.

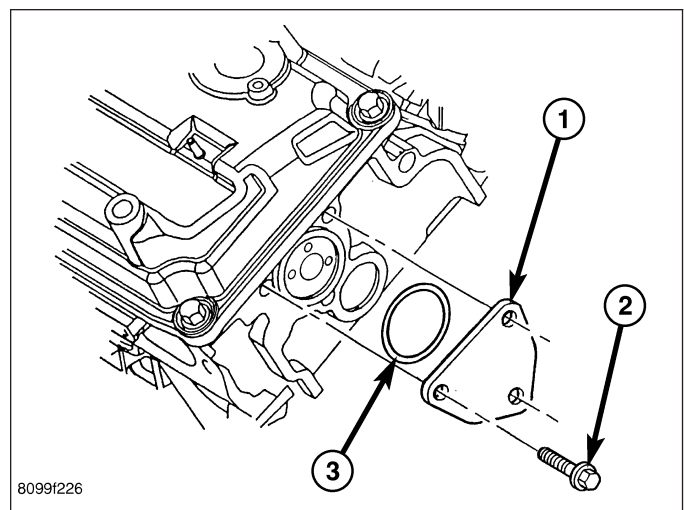
**Note: Before installing the cylinder head bolts, lubricate the threads with engine oil.**

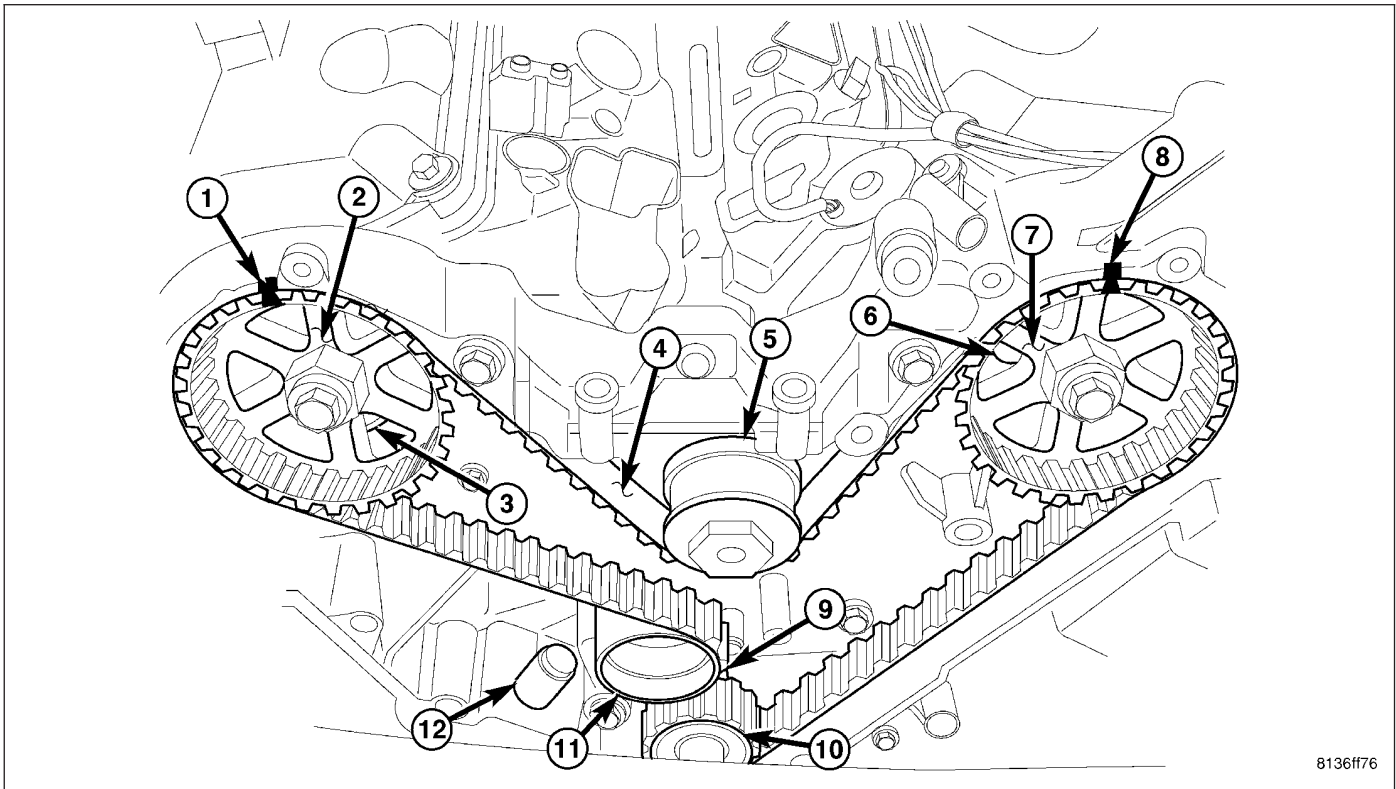
3. Install the cylinder head over locating dowels, insert and finger tighten the head bolts.

4. Tighten the cylinder head bolts in the sequence shown in. Using the 4 step torque-turn method, tighten according to the following torque values:
  - Step 1: All to 61 N·m (45 ft. lbs.)
  - Step 2: All to 88 N·m (65 ft. lbs.)
  - Step 3: All (again) to 88 N·m (65 ft. lbs.)
  - Step 4: + 90° Turn **Do not use a torque wrench for this step.**
5. Bolt torque after 90° turn should be over 122 N·m (90 ft. lbs.) in the tightening direction. If not, replace the bolt.
6. Install the inner timing cover to cylinder head bolts. Tighten bolts to 54 N·m (40 lbs.ft.).
7. Install camshaft sprocket. Counterhold the camshaft sprocket gear and tighten the camshaft sprocket bolt to 102 N·m plus a 1/4 turn (75 lbs. ft. plus a 1/4 turn)



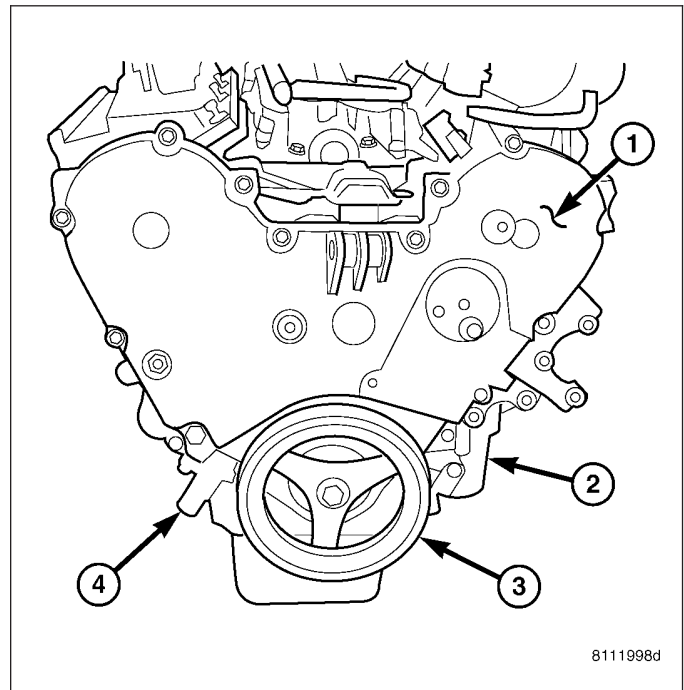
8. Install the rear camshaft thrust plate (1) and seal (3).





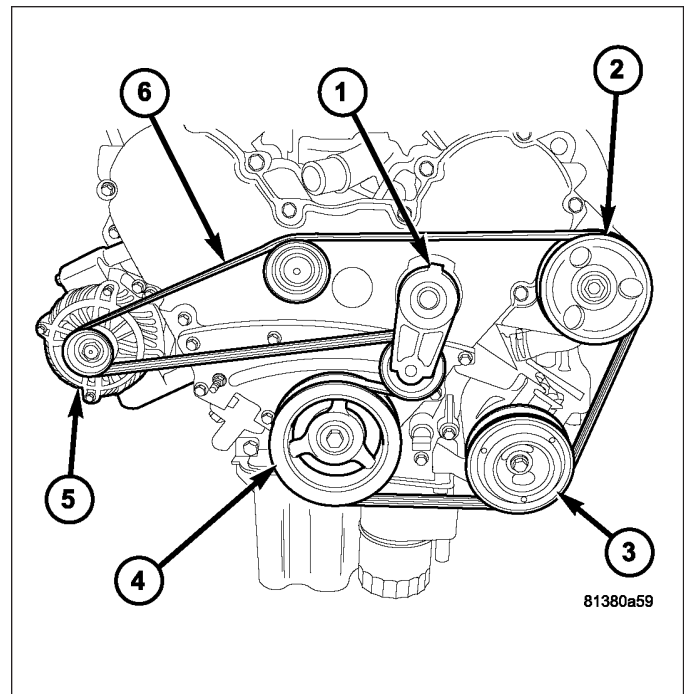
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9. Rotate the camshaft gear (7) to its alignment mark (8) and check the right camshaft gear (1) and crankshaft gear timing (9) alignment marks.
10. Install the timing belt (4) and tensioner (11)(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
11. Install the timing belt front cover (1)(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).

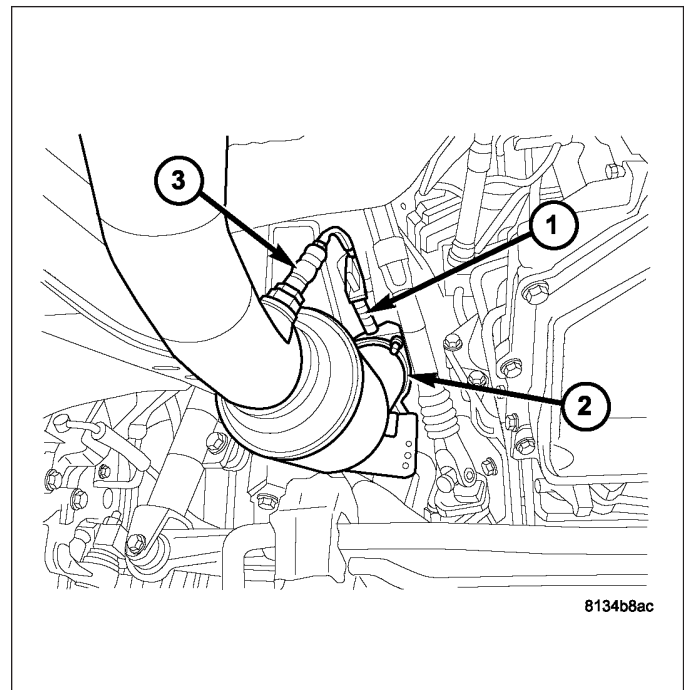


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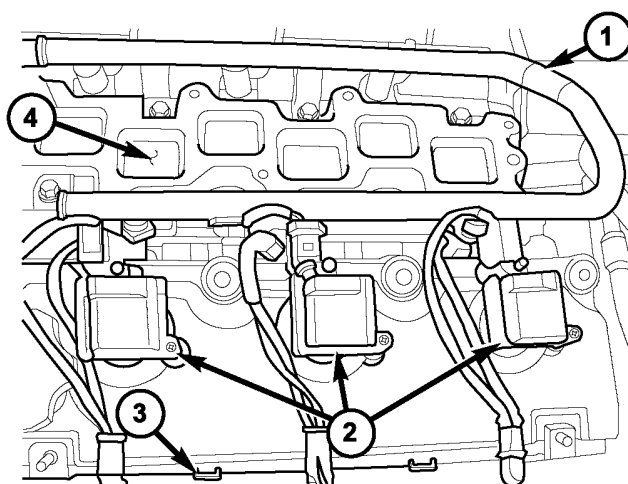
12. Install the accessory drive belt tensioner (1).
13. Install the accessory drive belt idler pulley.
14. Install the vibration damper (3) (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).



15. Install the left exhaust manifold.(Refer to 9 - ENGINE/MANIFOLDS/EXHAUST MANIFOLD - INSTALLATION).
16. Raise the vehicle.
17. Connect the left exhaust pipe (2) and connect the oxygen sensor (3).



18. Lower the vehicle.
19. Install the left rocker arm assembly.
20. Install the left cylinder head cover and ground strap..
21. Install lower intake manifold (4)(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
22. Install the fuel rail (1).
23. Install the upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
24. Connect the air cleaner element housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
25. Fill the coolant system.
26. Connect the negative battery cable.

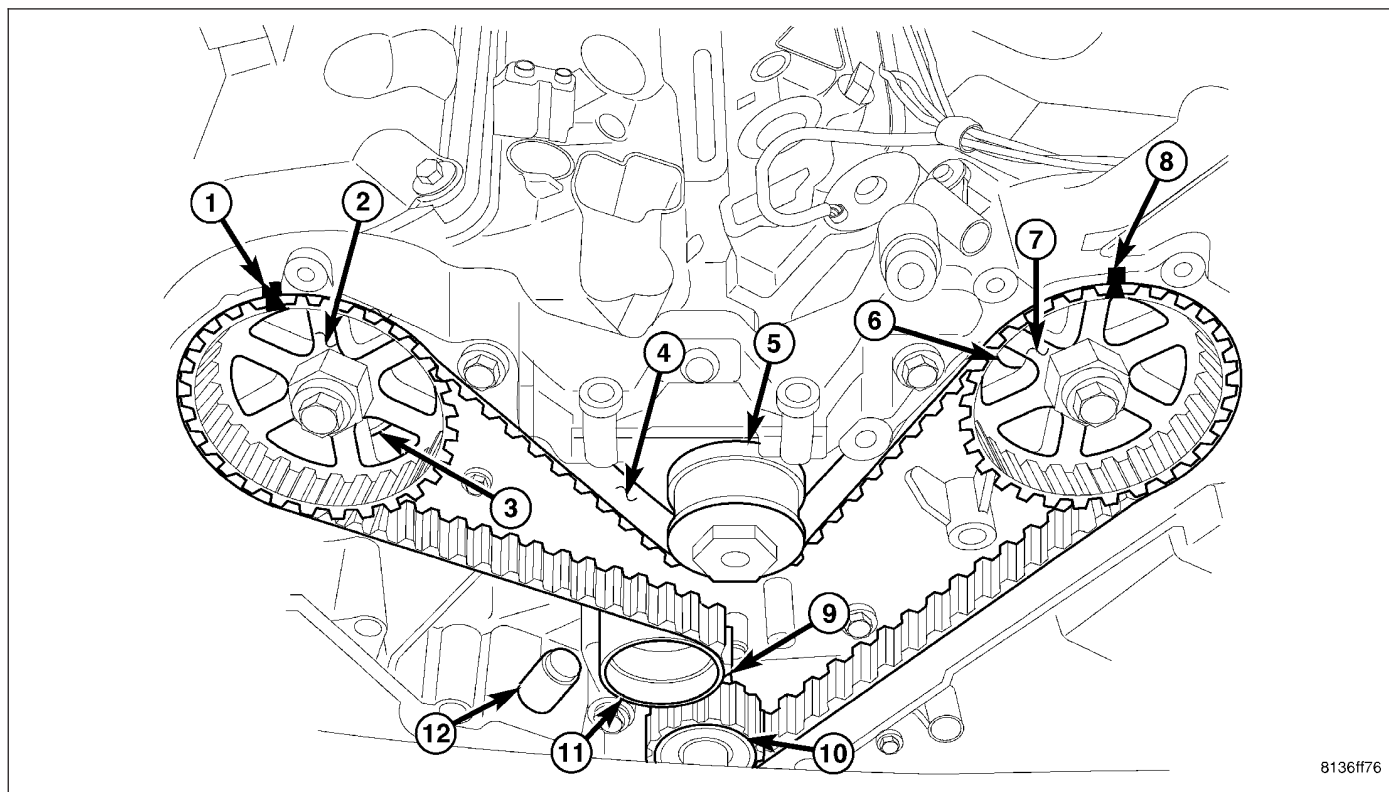


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## CAMSHAFT OIL SEAL(S)

### REMOVAL

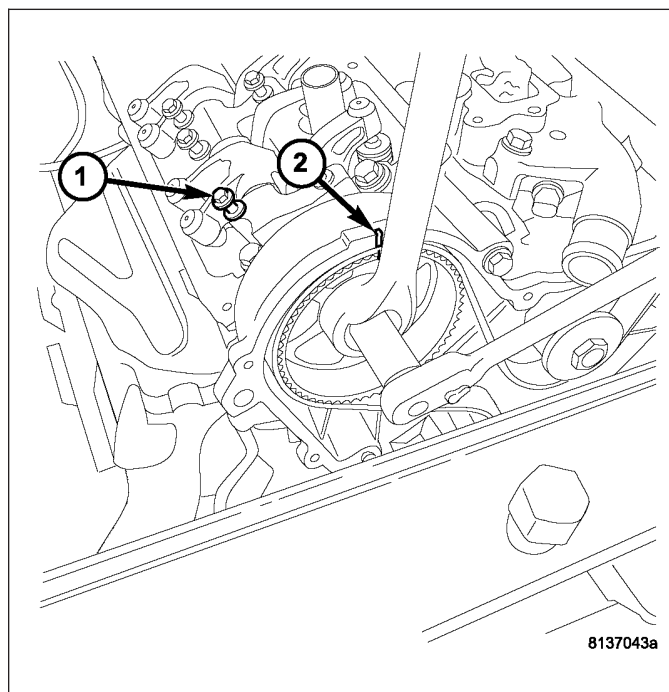
#### RIGHT CYLINDER HEAD



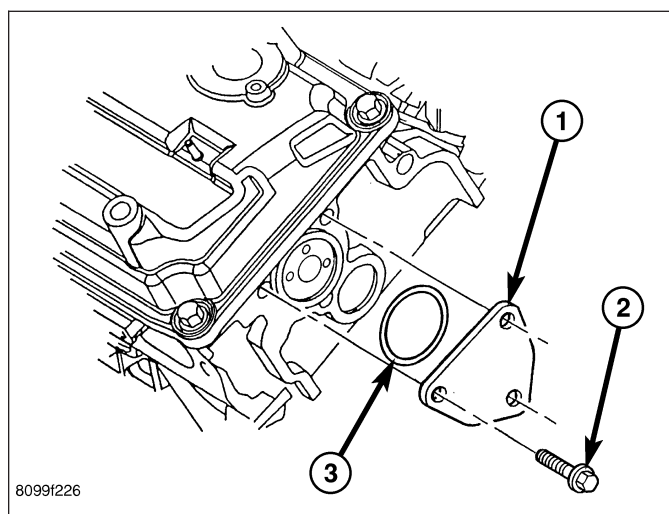
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1. Disconnect the negative battery cable.
2. Remove front timing cover and align the camshaft gear (1,8) and crankshaft gear timing mark (9) to TDC (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

3. Remove timing belt (4).
4. Remove the right camshaft sprocket (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

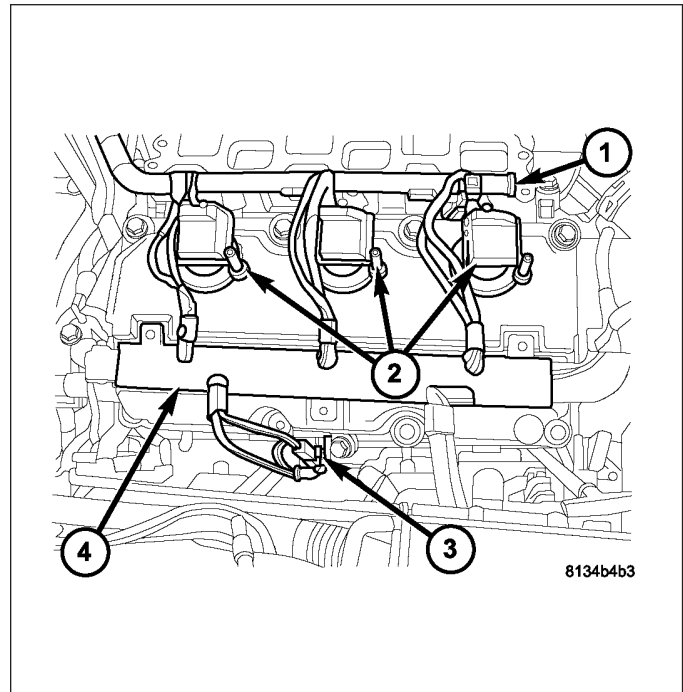


5. Remove the EGR valve and camshaft thrust plate (1) from the rear of the cylinder head.



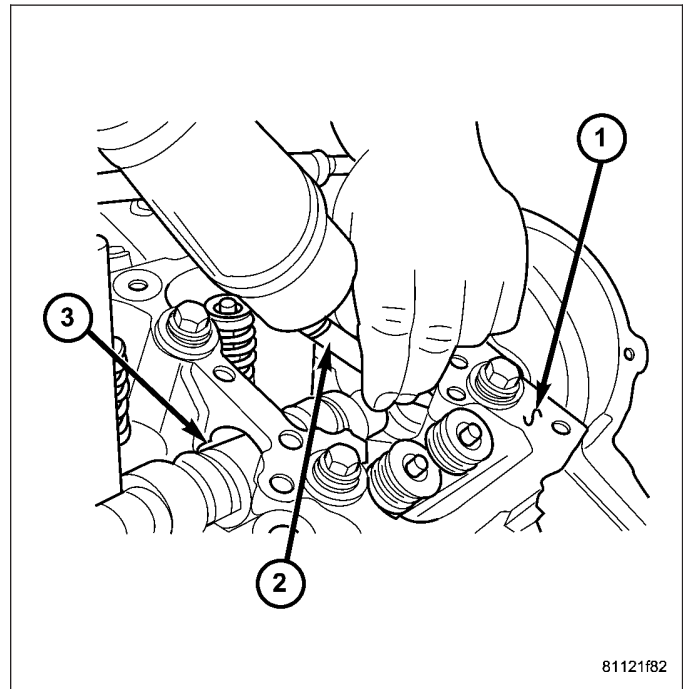


6. Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
7. Remove the rocker arm assembly (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL).
8. Maneuver the camshaft rearward and out of the cylinder head approximately 3.5 inches.

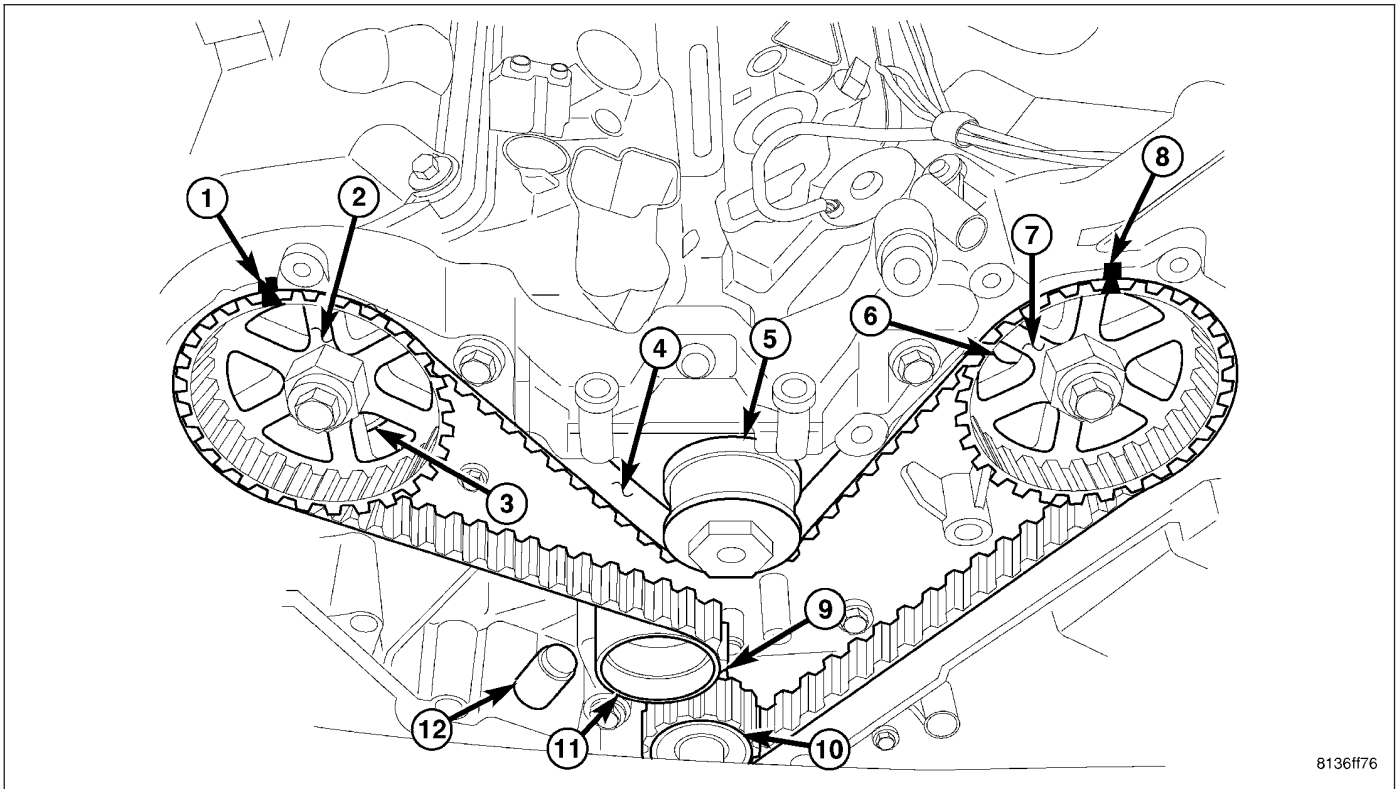


**Note:** Care must be taken not to damage the cylinder head to seal or camshaft journal surfaces when removing the camshaft seal.

9. Using an appropriate driver carefully remove camshaft oil seal

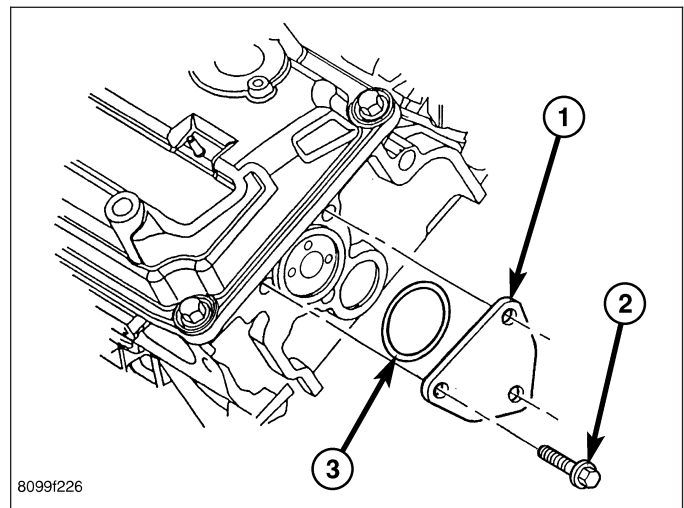




**LEFT CYLINDER HEAD**

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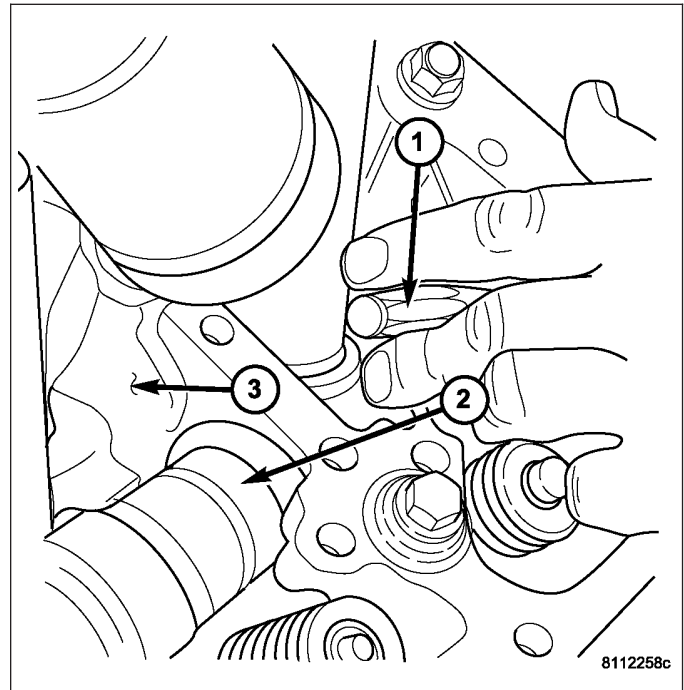
1. Disconnect the negative battery cable.
2. Drain cooling system.
3. Remove front timing cover and align the camshaft gear and crankshaft gear timing marks to TDC (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
4. Remove the rear timing cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
5. Remove the cylinder head cover(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
6. Remove the rocker arm assembly (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL).
7. Remove the camshaft thrust plate (1) from the rear of the cylinder head.
8. Maneuver the camshaft rearward and out of the cylinder head approximately 3.5 inches



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**Note:** Care must be taken not to damage the cylinder head to seal or camshaft journal surfaces when removing the camshaft seal.

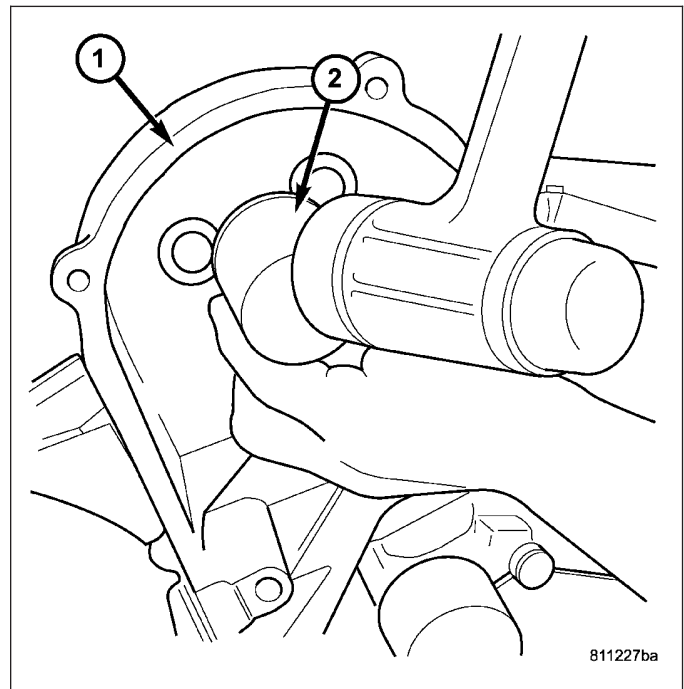
9. Using an appropriate driver (1) carefully remove camshaft oil seal



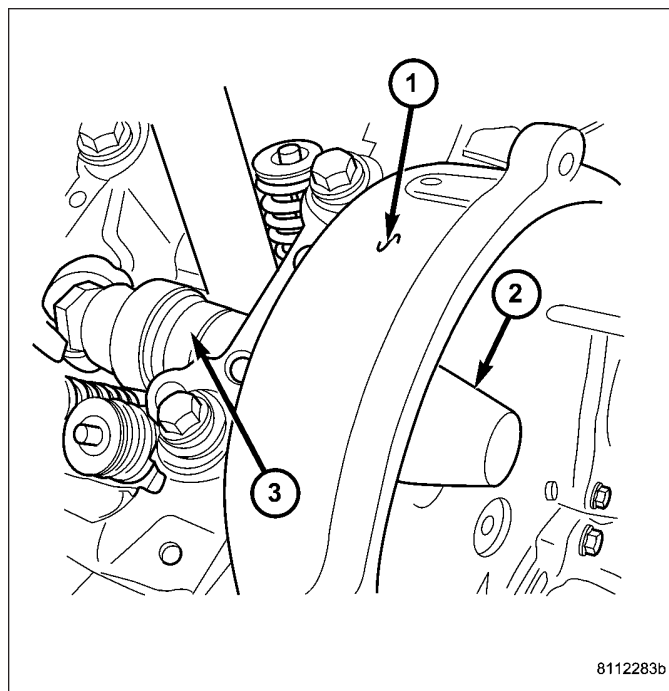
## INSTALLATION

### RIGHT CYLINDER HEAD

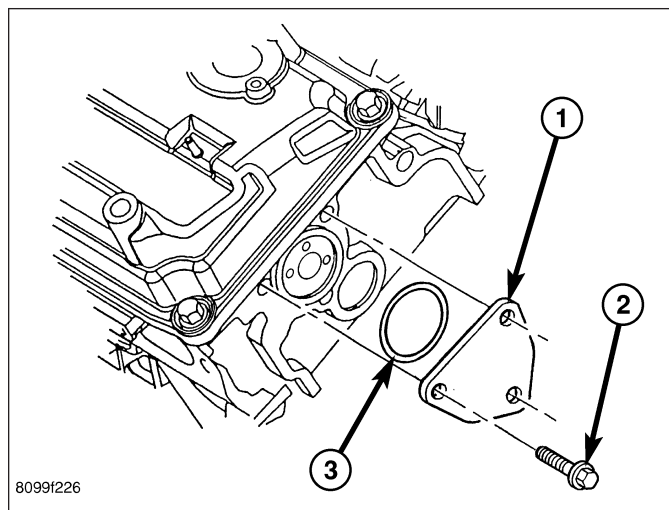
1. Position the camshaft seal into the cylinder head.
2. Using special tool MD-998306 (2) tap the seal into place.



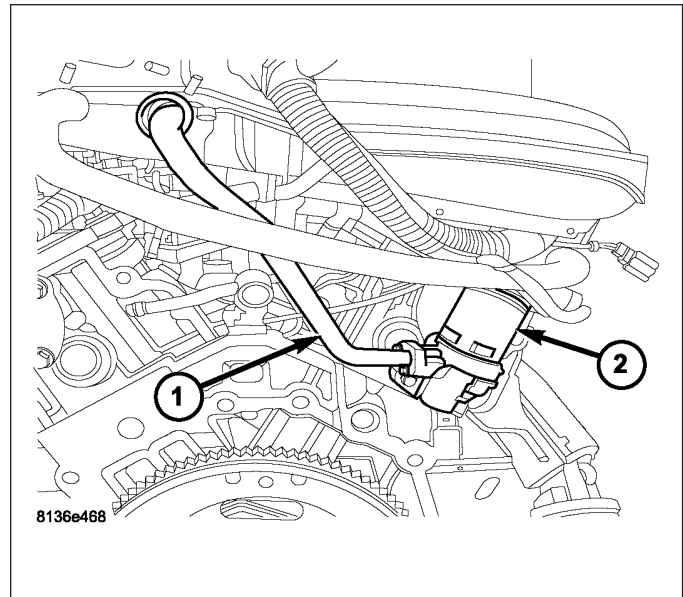
3. Apply light coat of clean engine oil to the camshaft oil seal lip and Special Tool 6788 Seal Protector Sleeve (2).
4. Install oil seal Special Tool 6788 Seal Protector Sleeve (2) onto the camshaft.
5. Slide the camshaft (3) forward, inserting the seal protector (2) through the camshaft seal until the camshaft (3) seats.
6. Remove Special Tool 6788 (2) from the camshaft.



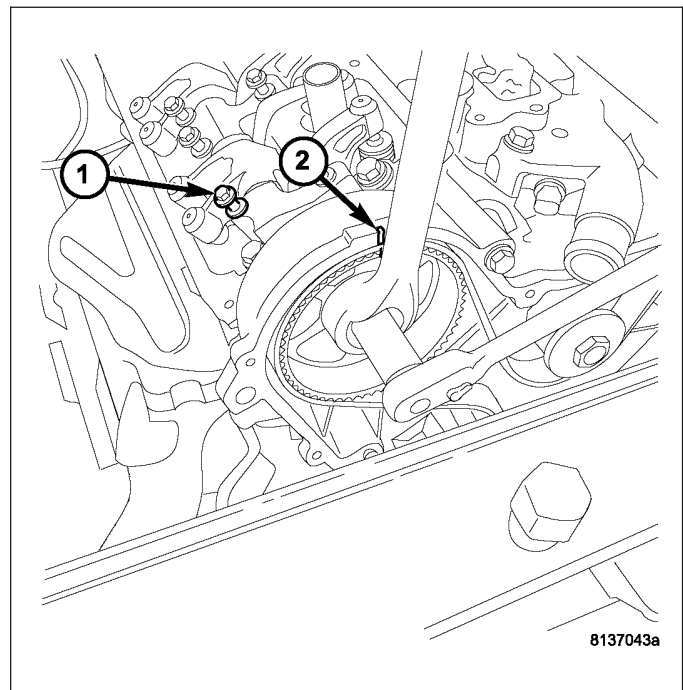
7. Install the camshaft thrust plate (1), and new seal (3) to the rear of the cylinder head.



8. Install the EGR valve (2).

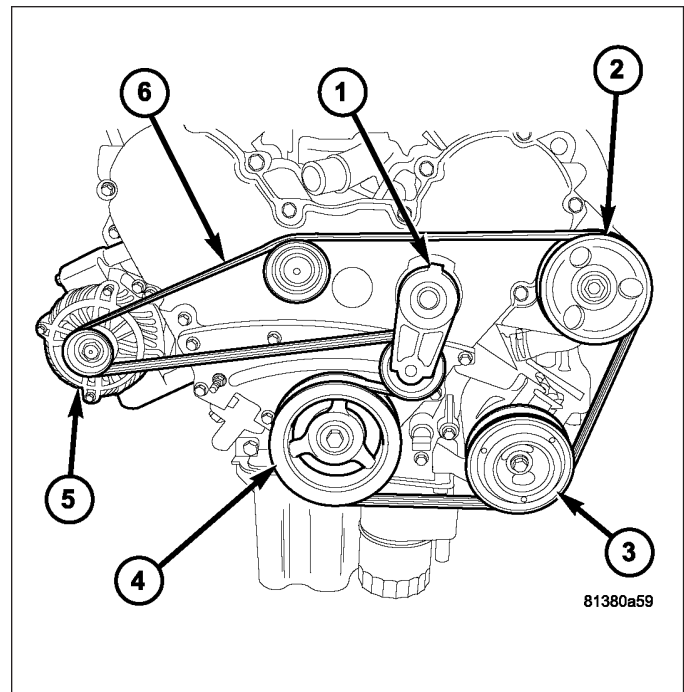


9. Install camshaft sprocket (2) and tighten the camshaft sprocket bolt to 102N·m (75 ft.lbs.).



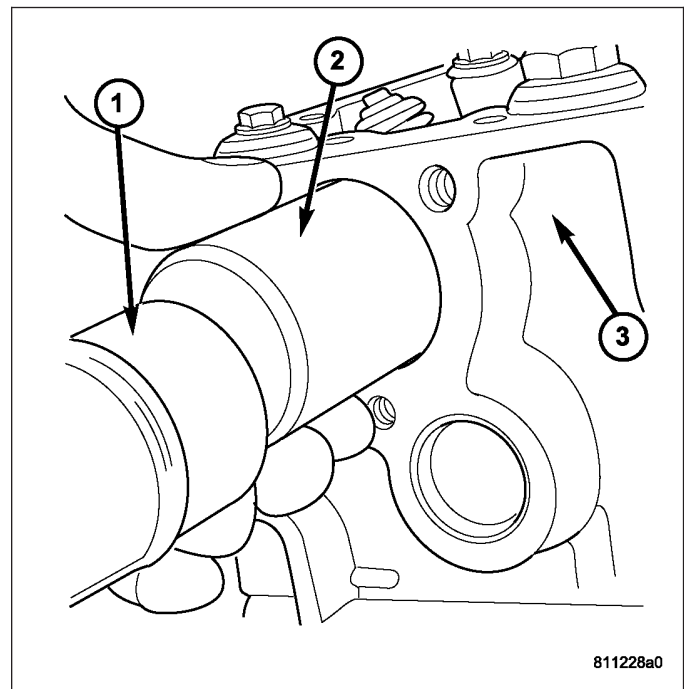


13. Install the front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
14. Install the vibration damper (4)(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
15. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
16. Connect the negative battery cable.

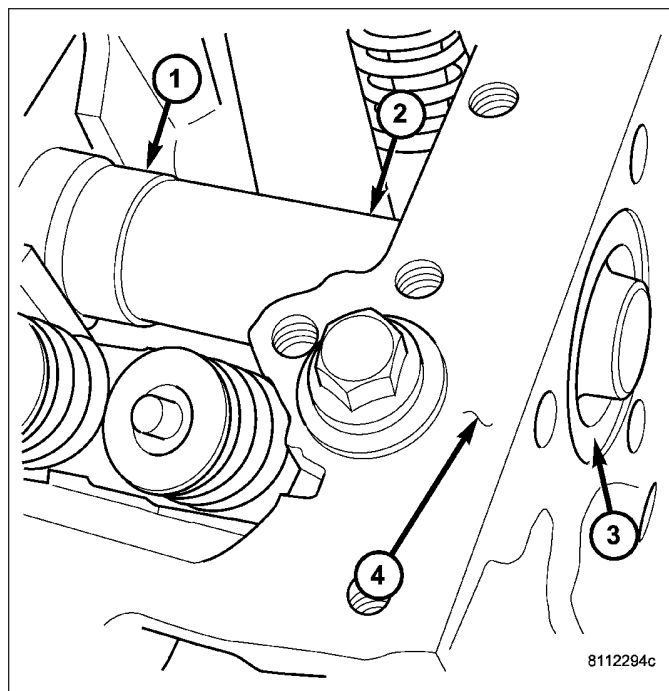


## LEFT CYLINDER HEAD

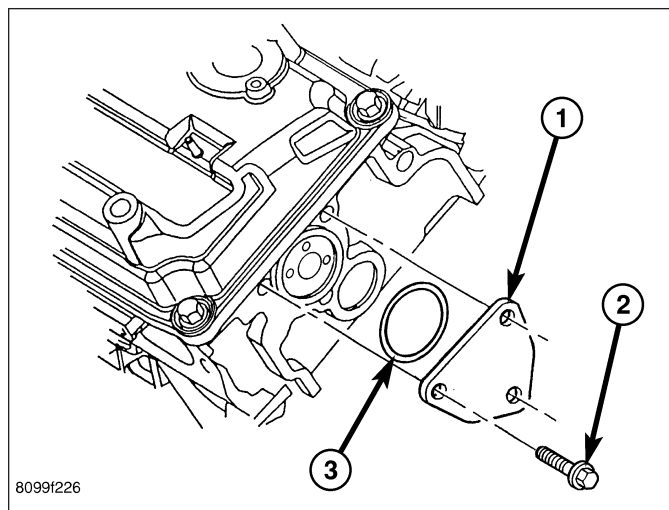
1. Position the camshaft seal into the cylinder head (3)
2. Using special tool MD-998306 (2) tap the seal into place.

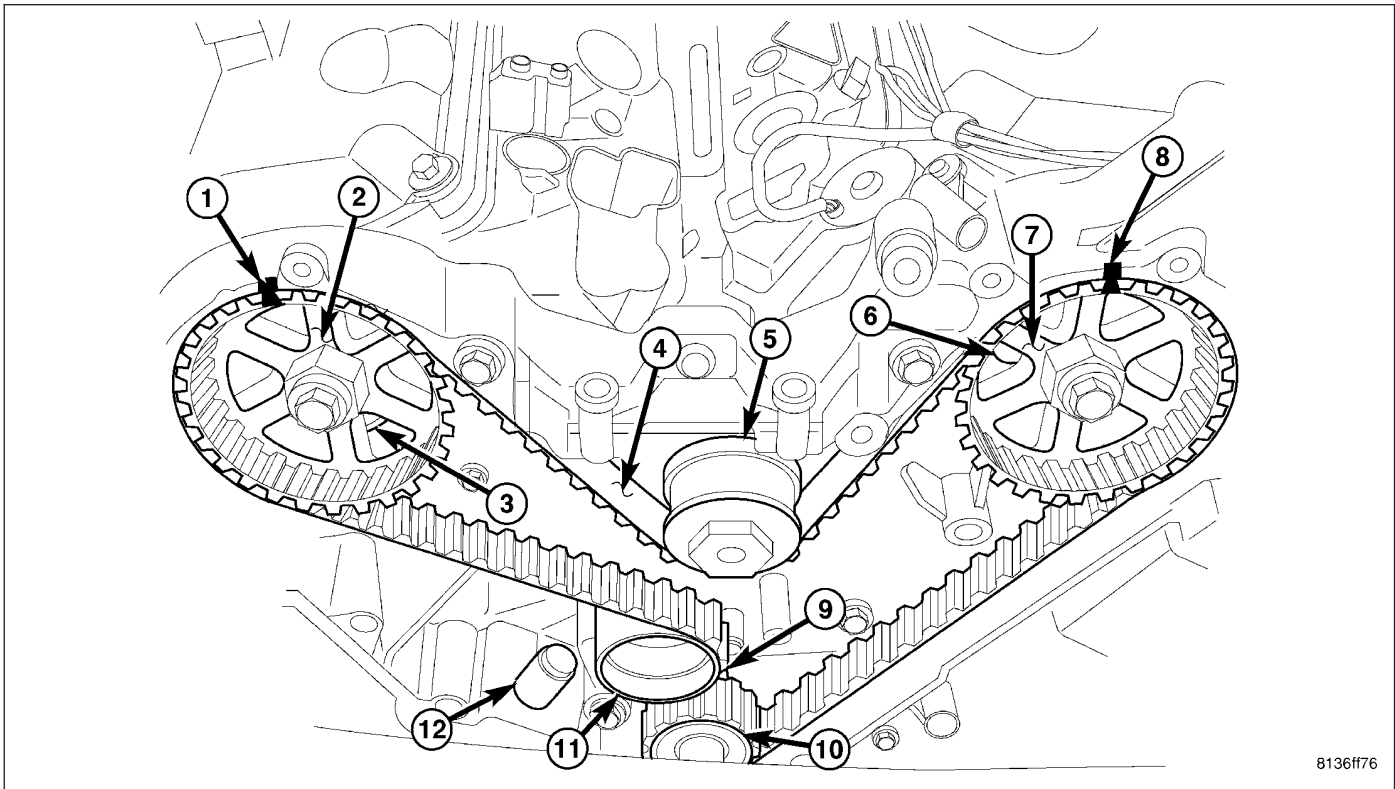


3. Apply light coat of engine oil to the camshaft oil seal lip (3) and Special Tool 6788 (2) Seal Protector Sleeve.
4. Install oil seal (3) Special Tool 6788 Seal Protector Sleeve (2) onto the camshaft (1)
5. Slide the camshaft (1) forward, inserting the seal protector (2) through the camshaft seal (3) until the camshaft seats.
6. Remove Special Tool 6788 (2) from the camshaft (1).

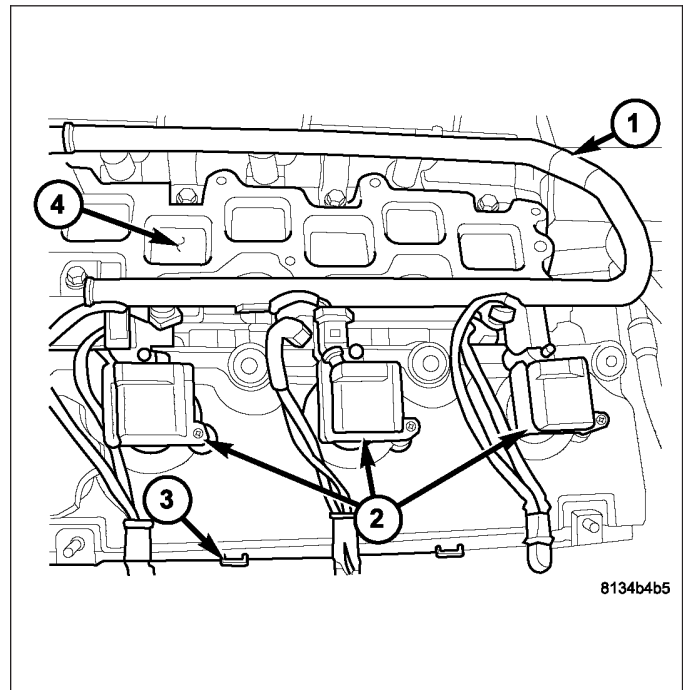


7. Install the camshaft thrust plate (1) and new seal (3) to the rear of the cylinder head.
8. Install rear timing belt cover(Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).



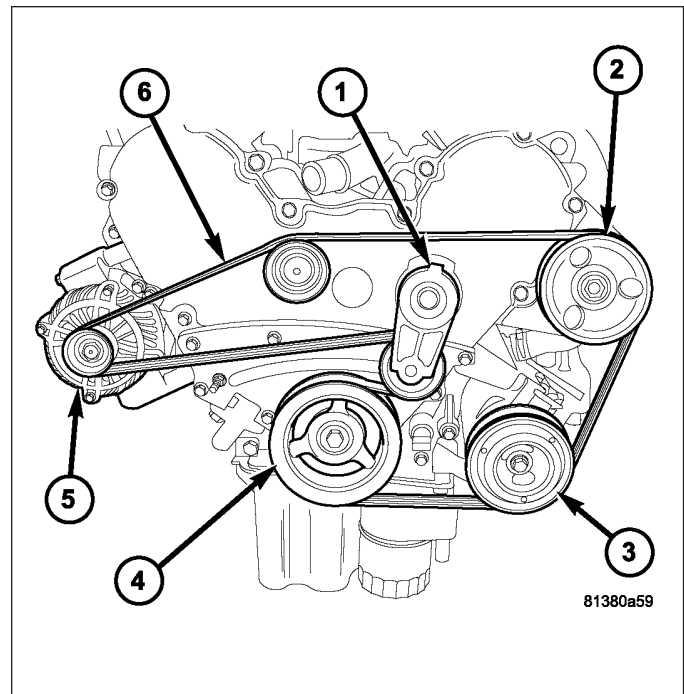


9. Install the camshaft gear (7) and align the timing marks (1,8,9)(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
10. Install the timing belt (4) (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
11. Install the rocker arm assembly (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).
12. Install the cylinder head cover.





13. Install the front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
14. Install the vibration damper (4)(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
15. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
16. Connect the negative battery cable.



## CAMSHAFT(S)

### DESCRIPTION

A single overhead camshaft per cylinder head provides valve actuation. The left camshaft accommodates a cam sensor pick-up wheel and is therefore longer. Each camshaft is supported by four bearing journals. A thrust plate attached to the rear of each cylinder head controls camshaft end play. Right and left camshaft driving sprockets support a timing mark, are keyed, and not interchangeable because of the cam sensor pick-up wheel on the left sprocket. Camshaft bearing lubrication is provided via a oil supply passage through each rocker shaft pedestal dowel.

### OPERATION

The camshaft is driven by the crankshaft via drive sprockets and belt. The camshaft has precisely machined lobes to provide accurate valve timing and duration.

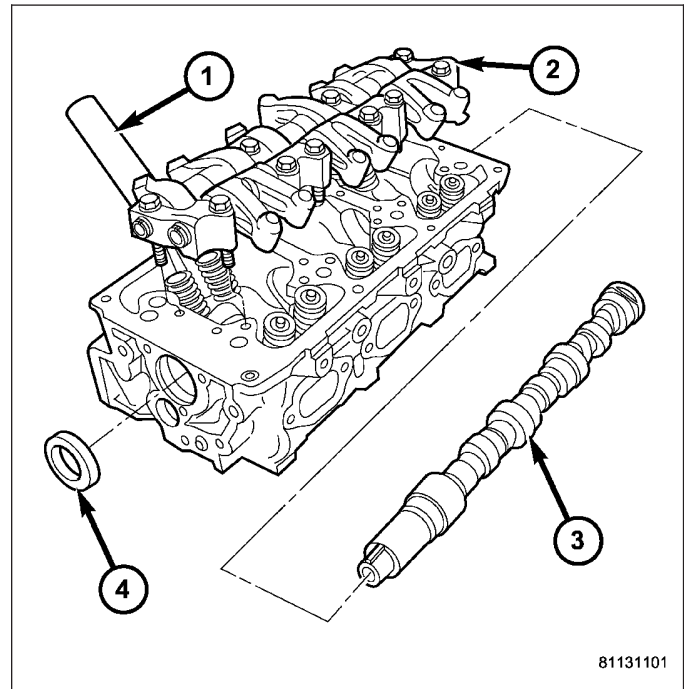
## REMOVAL

**Note:** Camshafts are removed from the rear of each cylinder head.

1. Remove the cylinder head(Refer to 9 - ENGINE/ CYLINDER HEAD - REMOVAL).

**CAUTION:** Care must be taken not to nick or scratch the journals when removing the camshaft.

2. Carefully remove the camshaft (3) from the rear of the cylinder head.

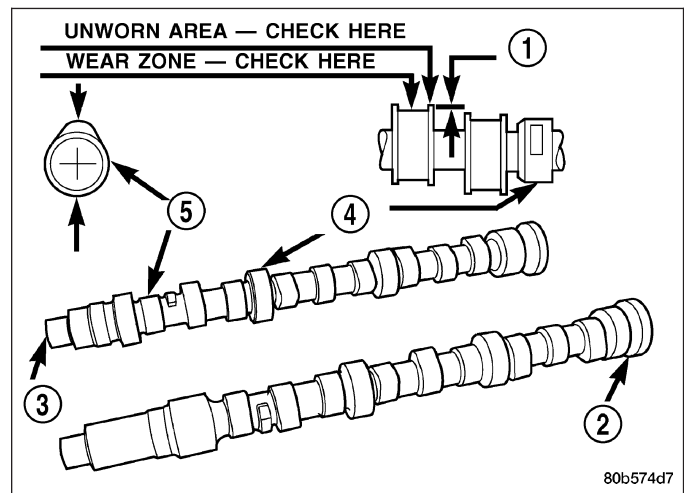


## INSPECTION

1. Inspect camshaft bearing journals (4) for damage and binding. If journals are binding, check the cylinder head for damage. Also check cylinder head oil holes for clogging.
2. Check the cam lobe (5) and bearing surfaces for abnormal wear and damage. Replace camshaft if defective.

**Note:** If camshaft is replaced due to lobe wear or damage, always replace the rocker arms.

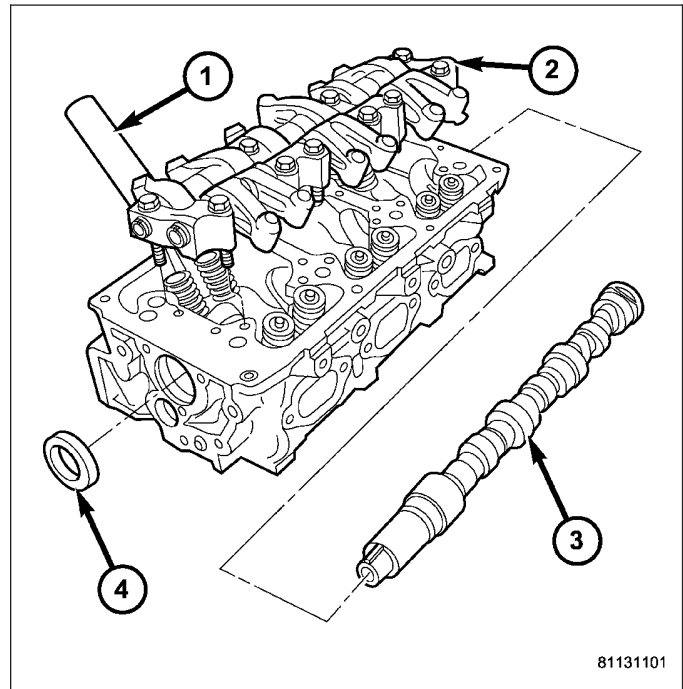
3. Measure the lobe (5) actual wear and replace camshaft if out of limit. Standard value is 0.0254 mm (0.001 in.), wear **limit** is 0.254 mm (0.010 in.)



## INSTALLATION

**Note:** Care must be taken not to scrape or nick the camshaft journals when installing the camshaft into position.

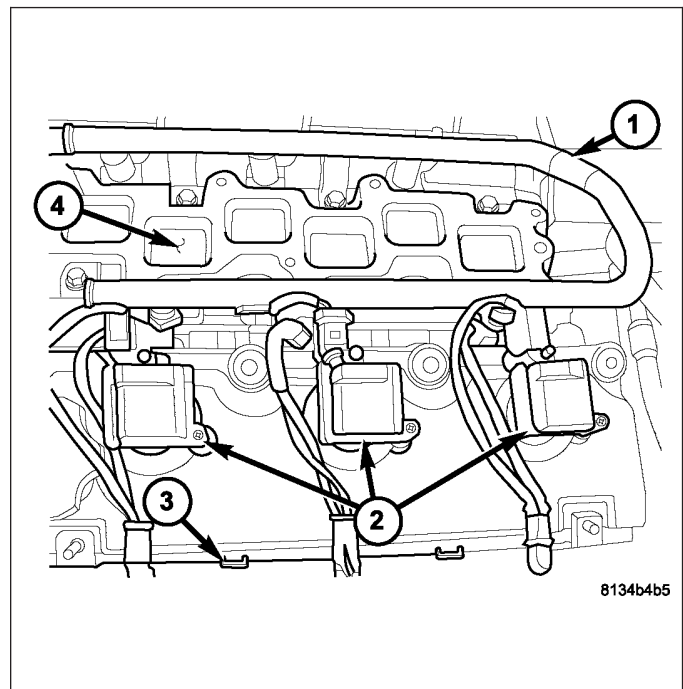
1. Lubricate camshaft (3) bearing journals, camshaft lobes and camshaft seal (4) with clean engine oil and install camshaft (3) into cylinder head.
2. Install the cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).



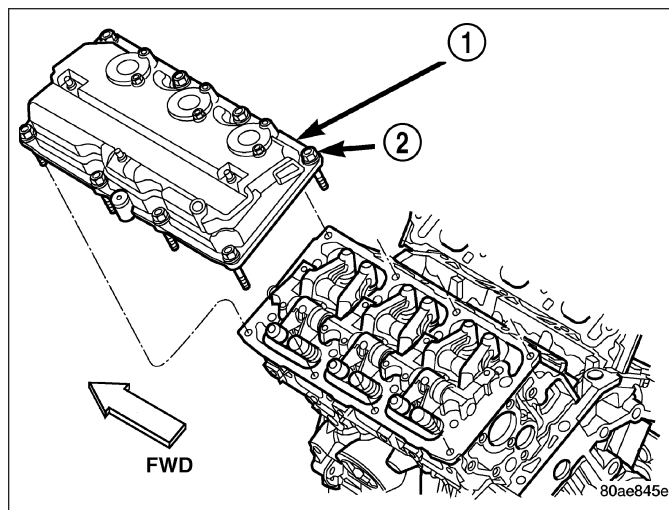
## CYLINDER HEAD COVER - LEFT REMOVAL

**WARNING: DO NOT START OR RUN ENGINE WITH CYLINDER HEAD COVER REMOVED FROM THE ENGINE. DAMAGE OR PERSONAL INJURY MAY OCCUR.**

1. Disconnect and isolate the negative battery cable.
2. Remove the upper intake manifold from the engine (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
3. Cover lower intake manifold (4) with a suitable cover during service.
4. Disconnect and remove the three ignition coils (2).
5. Remove the ground strap/resistor retaining bolt from the cylinder head cover.
6. Lift up on the wire harness track (3) retaining tabs.

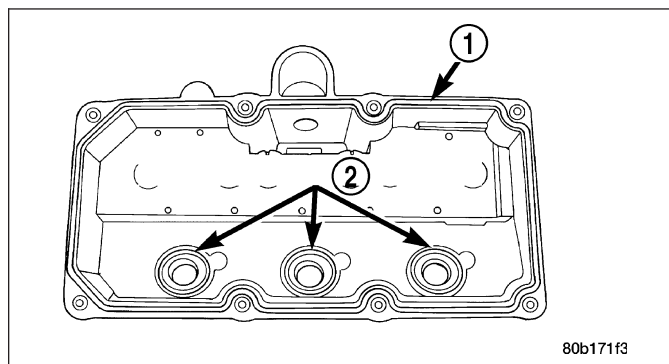


7. Completely loosen the cylinder head cover retaining bolts and remove the cylinder head cover.

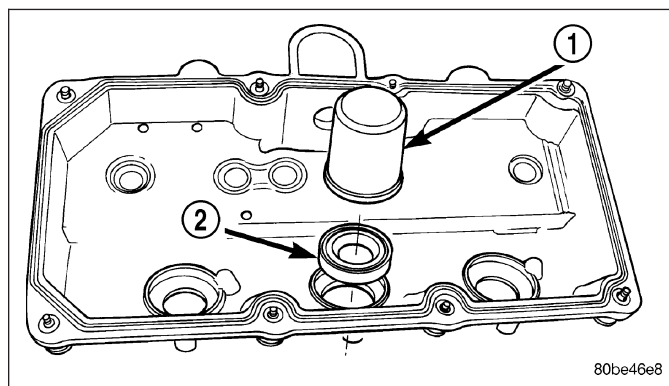


## INSTALLATION

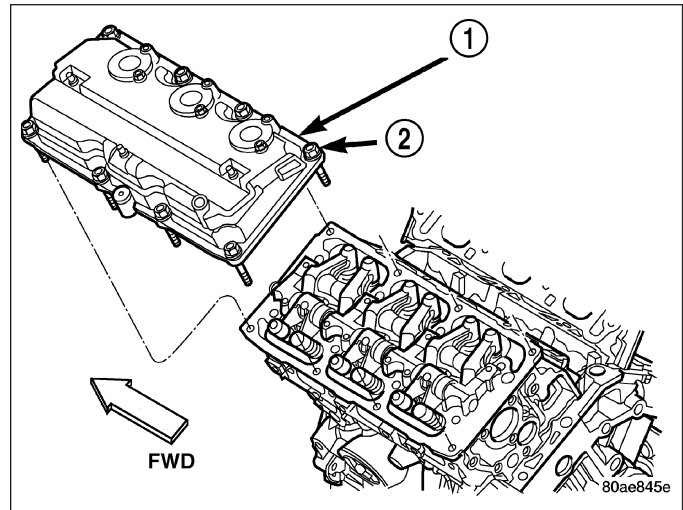
1. Clean cylinder head and cover mating surfaces. Inspect and replace gasket (1) and seals (2) as necessary.



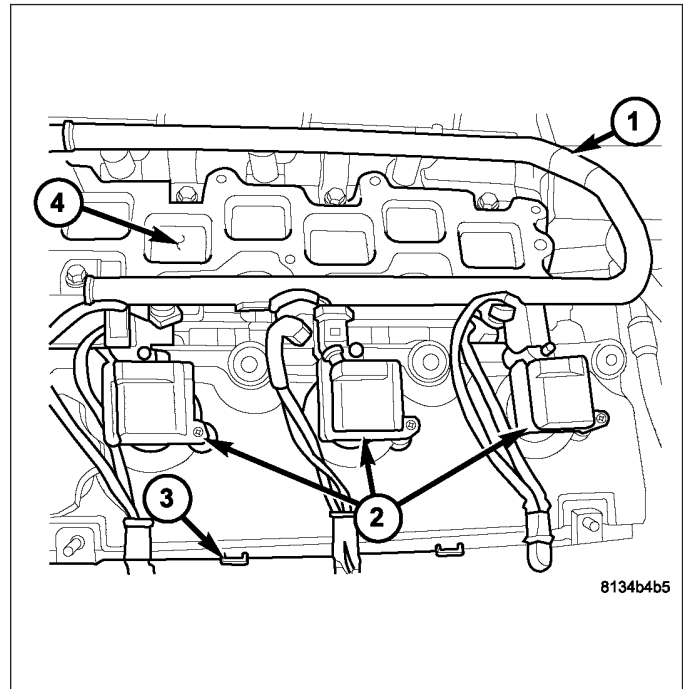
2. To replace spark plug tube seals (2):
  - a. Using a suitable pry tool, carefully remove tube seals (2).
  - b. Position new seal (2) with the part number on seal facing cylinder head cover.
  - c. Install seals using Special Tool MD-998306 (1).



3. Install cylinder head cover (1) and bolts (2). Tighten to 12 N·m (105 in. lbs.).



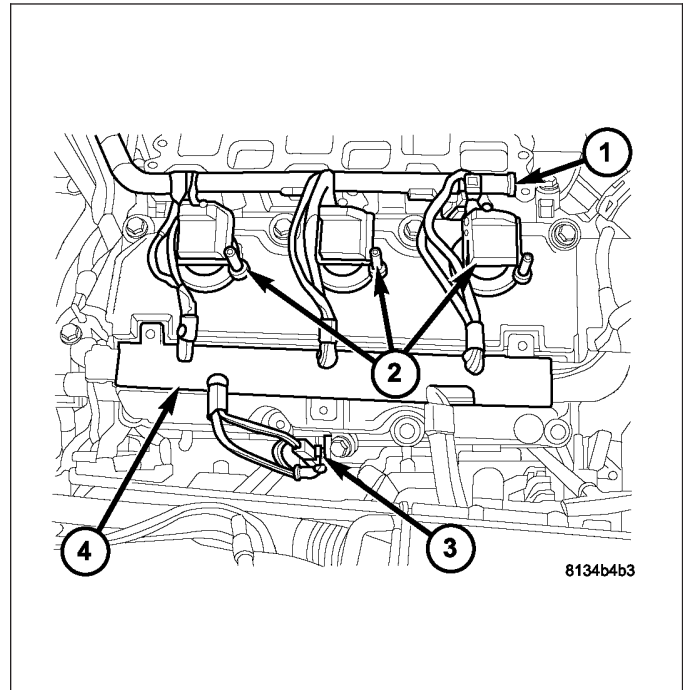
4. Position the wiring harness (3) on the cylinder head cover.
5. Reclip the wire harness track retaining tabs into the cover.
6. Install the ground strap/resistor retaining bolt onto the cylinder head cover.
7. Install the ignition coils (2). Tighten mounting screws to 6.7 N·m (60 in. lbs.)
8. Connect the ignition coil electrical connectors (2).
9. Install upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
10. Connect negative battery cable



## CYLINDER HEAD COVER - RIGHT REMOVAL

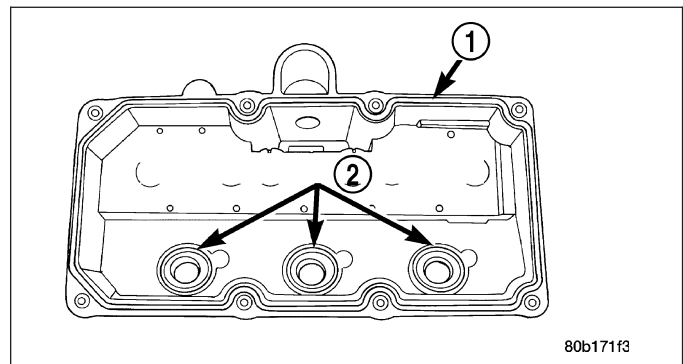
**WARNING: DO NOT START OR RUN ENGINE WITH CYLINDER HEAD COVER REMOVED FROM THE ENGINE. DAMAGE OR PERSONAL INJURY MAY OCCUR.**

1. Disconnect the negative battery cable.
2. Remove the upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
3. Cover lower intake manifold openings during service.
4. Disconnect and remove the three ignition coils (2).
5. Lift up on the wire harness track retaining tabs (4).
6. Remove the ground strap retaining bolt (3) from the cylinder head cover.
7. Completely loosen the cylinder head cover retaining bolts and remove the cylinder head cover

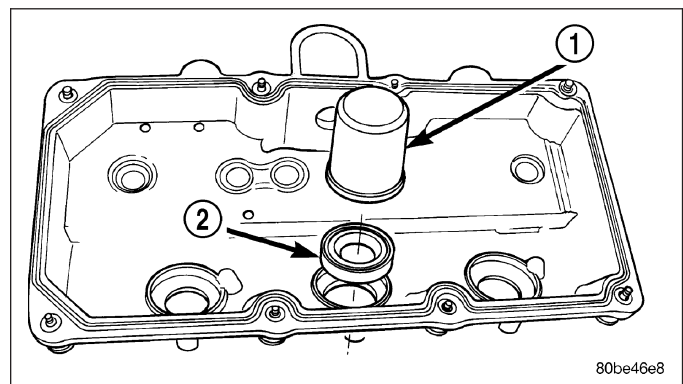


## INSTALLATION

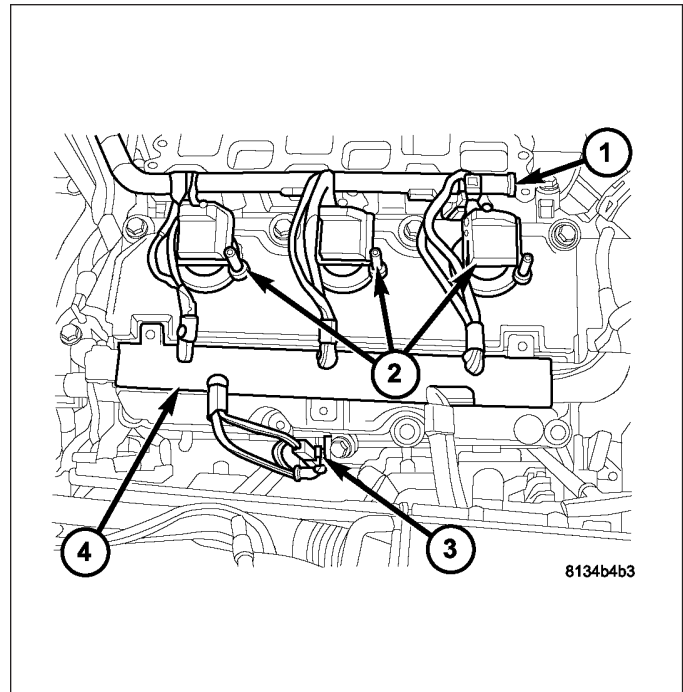
1. Clean cylinder head and cover mating surfaces. Inspect and replace gasket (1) and seals (2) as necessary.



2. To replace spark plug tube seals (2):
  - a. Using a suitable pry tool, carefully remove tube seals (2).
  - b. Position new seal (2) with the part number on seal facing cylinder head cover.
  - c. Install seals using Special Tool MD-99830 (1).



3. Install cylinder head cover bolts and tighten to 12 N·m (105 in. lbs.).
4. Install the ground strap retaining bolt (3) to the cylinder head cover.
5. Install the wire harness track (4).
6. Install the ignition coils (2). Tighten mounting screws to 6.7 N·m (60 in. lbs.).
7. Connect the ignition coil electrical connectors (2).
8. Install upper intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
9. Connect negative battery cable



## INTAKE/EXHAUST VALVES & SEATS

### DESCRIPTION

Valves are made of highly heat-resistant steel and are chrome plated to prevent stem scuffing. The intake valve is a one-piece forging, while the exhaust valve has a forged head with a welded stem for lock groove hardness. The four valves (two intake and two exhaust) employ a three-groove lock design to help facilitate valve rotation.

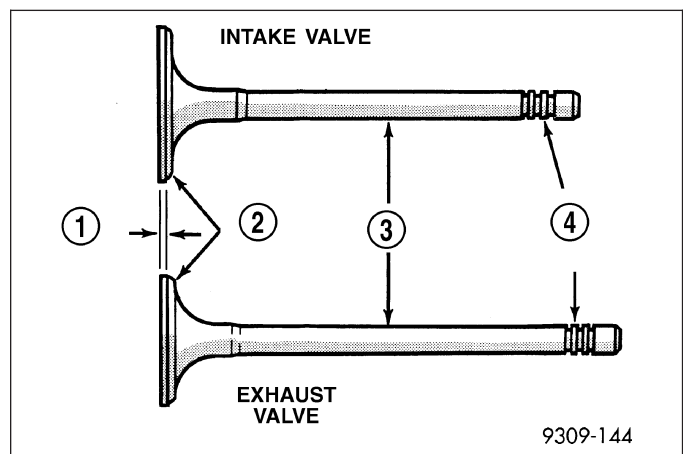
### OPERATION

The intake valve allows the air/fuel mixture to enter the combustion chamber. The exhaust valve allows the burned air/fuel mixture to exit the combustion chamber. Also, the intake and exhaust valves seal the combustion chamber during the compression and power strokes.

### STANDARD PROCEDURE - VALVE AND VALVE SEAT REFACING

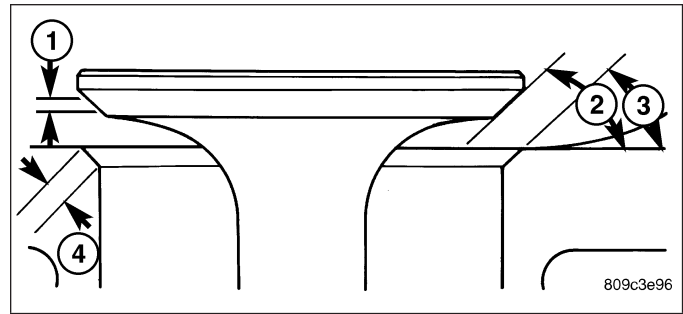
#### VALVES

1. Inspect the remaining margin (1) after the valves are refaced (Refer to 9 - ENGINE - SPECIFICATIONS).



## VALVE SEATS

1. When refacing valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.
2. Measure the concentricity of valve seat using dial indicator. Total runout should not exceed 0.051 mm (0.002 inch.) total indicator reading.
3. Inspect the valve seat (3) with Prussian blue to determine where the valve (1) contacts the seat. To do this, coat valve seat (1) **LIGHTLY** with Prussian blue then set valve in place. Rotate the valve with light pressure. If the blue is transferred to the center of valve face (2), contact is satisfactory. If the blue is transferred to top edge of valve face (2), then lower valve seat (3) with a 15 degree stone. If the blue is transferred to the bottom edge of valve face (2), then raise valve seat (3) with a 65 degree stone.

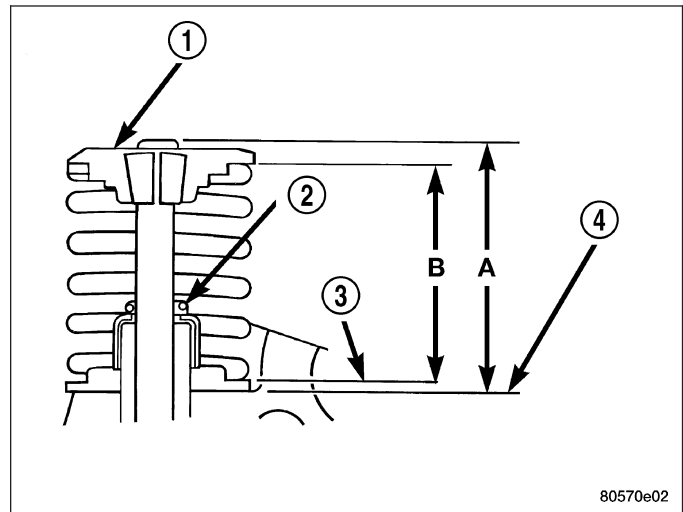


**Note: Valve seats (1) which are worn or burned can be reworked, provided that correct angle and seat width (1) are maintained. Otherwise cylinder head must be replaced.**

4. When seat is properly positioned the width of the intake seats should be 0.75 to 1.25 mm (0.0296 to 0.0493 in.) and exhaust seats should be 1.25 to 1.75 mm (0.049 to 0.069 in.).

## VALVE AND SPRING INSTALLED HEIGHT

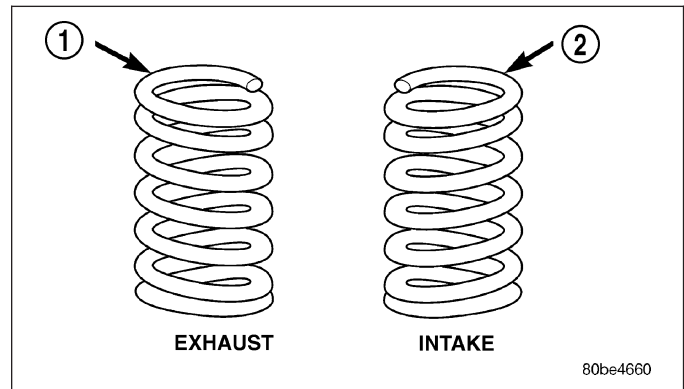
1. Coat valve stems with clean engine oil and insert them in cylinder head.
2. If valves or seats have been refaced, check valve tip height (A). If valve tip height is greater than 43.65 mm (1.7185 in.) intake or 46.48 mm (1.8299 in.) exhaust, grind valve tip until within specifications. Make sure measurement is taken from cylinder head surface to the top of valve stem.
3. Install valve seal/spring seat assembly over valve guides on all valve stem. Ensure that the garter



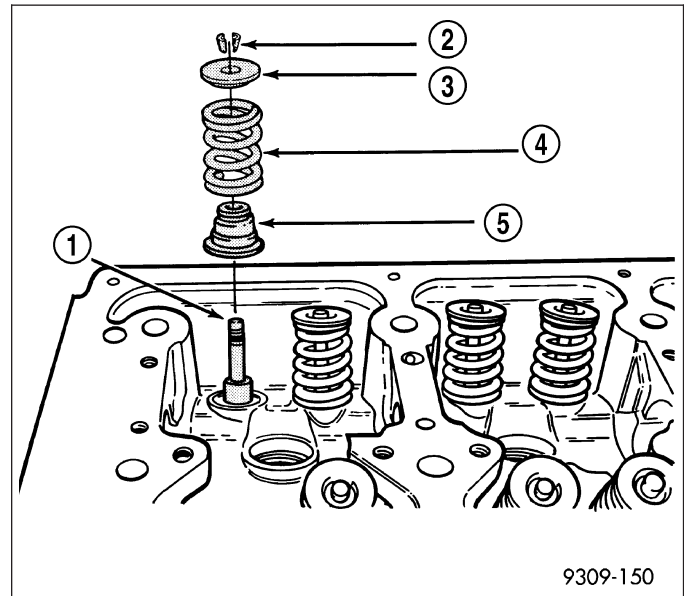


spring is intact around the top of the rubber seal.

4. Place valve spring (color-coded end facing up ) and valve retainer into position on spring seat.



5. Compress valve springs (4) with valve spring compressor C-3422-D and adapter 6526 (Refer to 9 - ENGINE - SPECIAL TOOLS), install locks (2) and release tool.
6. If valves (1) and/or seats are refaced, measure the installed height of springs. Measurements are taken from top of spring (4) seat to the bottom surface of spring retainer. If height is greater than 38.75 mm (1.5256 in.), install a 0.762 mm (0.030 in.) spacer in head counterbore under the valve spring seat to bring spring height back within specification.



## REMOVAL

1. Remove cylinder head(s) (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
2. Remove rocker arm assembly (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL).
3. Remove valve spring(s) (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE SPRINGS - REMOVAL).
4. Before removing valve, **remove any burrs from valve stem lock grooves to prevent damage to the valve guides.** Identify valves to insure installation in original location.
5. Remove valve(s) from cylinder head.

## CLEANING

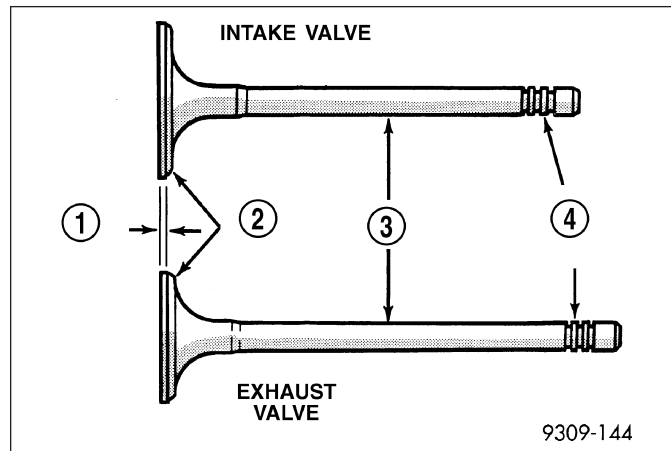
1. Clean all valves thoroughly and discard burned, warped and cracked valves.

## INSPECTION

### INSPECTION - VALVES

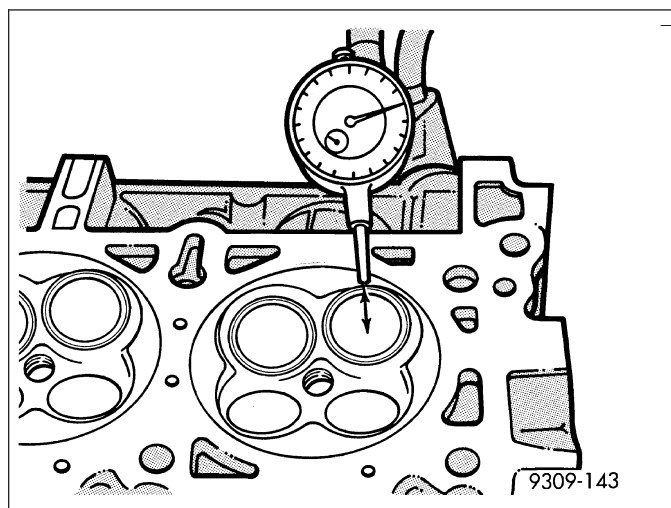
1. Measure valve stems for wear approximately 60 mm (2.36 in.) below the valve lock grooves.
2. Compare measurement to specifications,(Refer to 9 - ENGINE - SPECIFICATIONS).

**Note:** Valve stems are chrome plated and should not be polished.



### INSPECTION - VALVE GUIDES

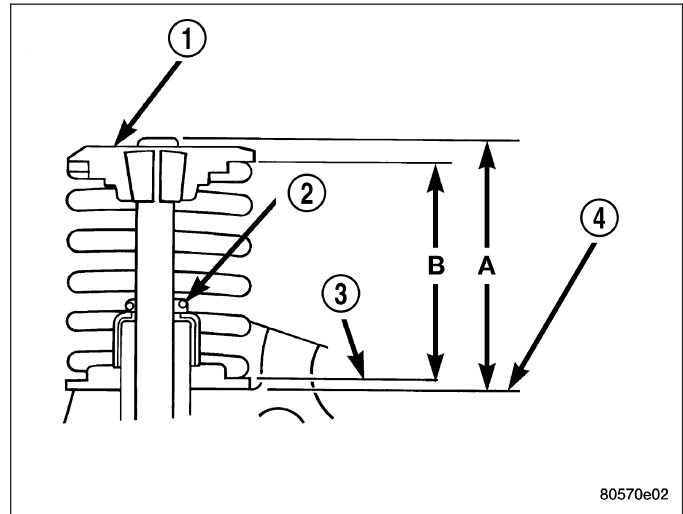
1. Measure valve stem-to-guide clearance as follows:
2. Install valve into cylinder head so it is 15 mm (0.590 inch.) off the valve seat. A small piece of hose may be used to hold valve in place.
3. Attach dial indicator Tool C-3339 to cylinder head and set it at right angle of valve stem being measured.
4. Move valve to and from the indicator.
5. Note dial indicator reading and compare to engine specifications.(Refer to 9 - ENGINE - SPECIFICATIONS)



**Note:** Replace cylinder head if stem-to-guide clearance exceeds specifications, or if guide is loose in cylinder head.

## INSTALLATION

1. Coat valve stems with clean engine oil and insert them in cylinder head.
2. If valves or seats have been reground, check valve tip height (A). If valve tip height is greater than 43.65 mm (1.7185 in.) intake or 46.48 mm (1.8299 in.) exhaust, grind valve tip until within specifications. Make sure measurement is taken from cylinder head surface to the top of valve stem.
3. Install new valve stem seals.
4. Install valve springs(Refer to 9 - ENGINE/CYLINDER HEAD/VALVE SPRINGS - INSTALLATION).
5. Install cylinder head(s)(Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).

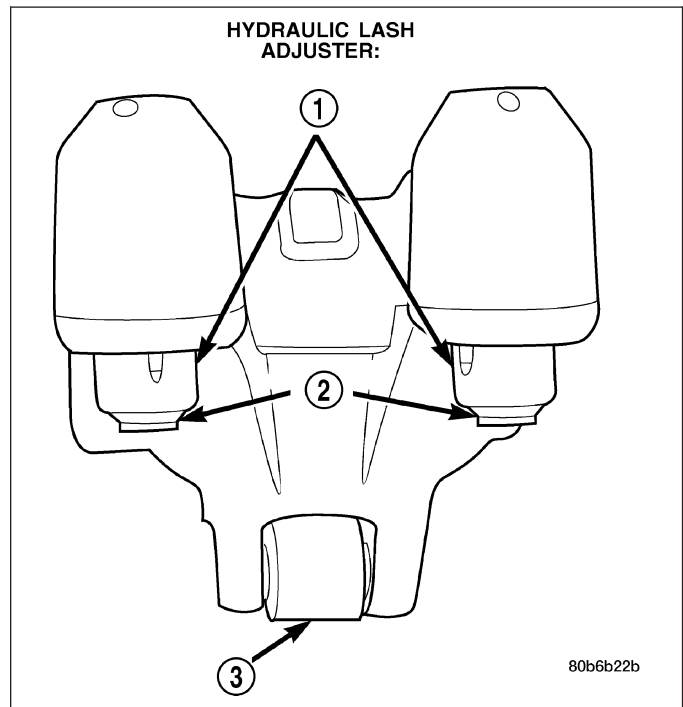


## ROCKER ARM SHAFT/ ROCKER ARM / LASH ADJUSTER

### DESCRIPTION

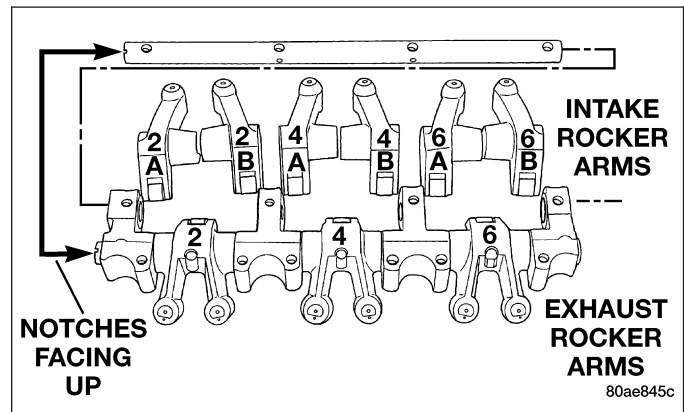
#### DESCRIPTION - ROCKER ARM

Rocker arms are made of light weight permanent mold aluminum alloy with a roller (3) type follower operating against the camshaft. The valve actuating end of the rocker arms are machined to retain hydraulic lash adjusters, eliminating the need for manual valve lash adjustment.



## DESCRIPTION - ROCKER ARM SHAFTS

The rocker arm shafts are tubular steel and are supported by several forged aluminum alloy pedestals, which are fastened to the cylinder head. Four shafts are used, one for each intake and exhaust rocker arm bank on each cylinder head. The shafts are hollow to provide a duct for lubricating oil flow from the cylinder head to the valve mechanisms. One hollow dowel per pedestal is used to locate the pedestal to the cylinder head, orient the exhaust rocker shaft, and serve as a cam bearing oil feed passage.



## OPERATION

The rocker arm is the pivot point between the camshaft lobe and the valve.

## DIAGNOSIS AND TESTING

### LASH ADJUSTER (TAPPET) NOISE DIAGNOSIS

Proper noise diagnosis is essential in locating the source of a NVH complaint. Locating a lash adjuster (tappet) type noise can sometimes be difficult. As a result, an initial misdiagnosis may occur.

Refer to the following chart indicating possible lash adjuster (tappet) noise sources and possible sources that could lead to a misdiagnosis.

Refer to Lash Adjuster (Tappet) Noise Chart for Possible Causes and Correction of a lash adjuster (tappet) type noise.

POSSIBLE NOISE SOURCES	POSSIBLE NOISE MISDIAGNOSIS SOURCES
Spongy/soft/aerated lash adjusters.	Exhaust leak.
Missing lash adjuster swivel contact pads.	Exhaust rocker arm-to-cylinder head cover contact.
Intake rocker-to-camshaft bearing journal contact.	Piston pin bore fit.
Rocker arm bind-up.	Timing drive hydraulic tensioner tick.
Intake rocker arm-to-spark plug tube contact.	Accessory drive belt deterioration.
Excessive cam end play.	Piston-to-bore clearance knock.
Broken valve spring.	Crankshaft bearing noise.
Broken/loose camshaft sprocket bolt.	
Incomplete cam lobe machining.	
Cracked lash adjuster cartridge body.	

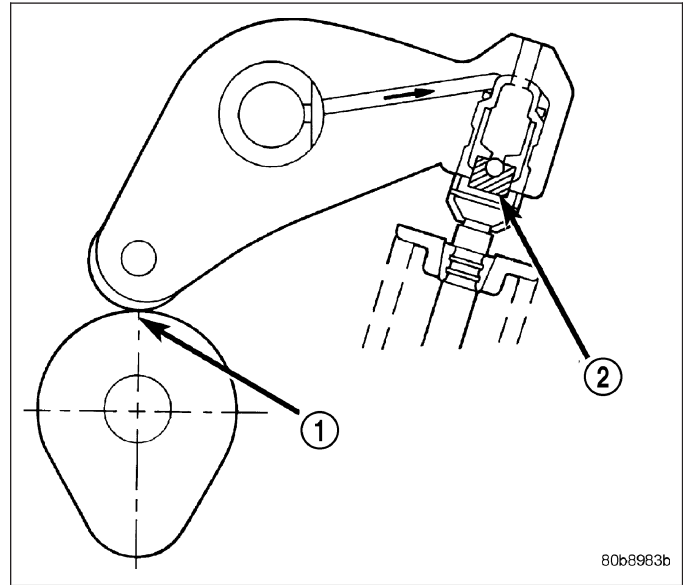
**LASH ADJUSTER (TAPPET) NOISE CHART**

POSSIBLE CAUSES	CORRECTION
1. Engine oil level—too high or too low. This may cause aerated oil to enter the adjusters and cause them to be spongy.	1. Check and correct engine oil level.
2. Insufficient running time after rebuilding cylinder head.	2. Low speed running of up to 1 hour may be required to fully evacuate trapped air from the valve train system. During this time, turn engine off and let set for a few minutes before restarting. Repeat this several times after engine has reached normal operating temperature.
3. Air trapped in lash adjuster (after 1 hour run time).	3. See below: (a) Check lash adjusters for sponginess while installed in cylinder head. Depress part of rocker arm over adjuster. Normal adjusters should feel very firm. Very spongy adjusters can be bottomed out easily. (b) Before proceeding, perform Lash Adjuster Bleeding procedure. (c) If lash adjuster(s) are still spongy, replace with new adjuster/rocker arm assembly*.
4. Low oil pressure	4. See below: (a) Check and correct engine oil level. (b) Check engine oil pressure. (c) Check for excessive bearing clearance and correct. (d) Check for worn oil pump.
5. Oil passage to cylinder head(s) plugged with debris.	5. Check cylinder head oil passages and cylinder head gasket restrictor for blockage. Clean or replace as necessary.
6. Worn valve guide(s).	6. Ream guide(s) and replace valve(s) with oversize valves and seal(s).
7. Air injected into oil due to broken or cracked oil pump pickup tube.	7. Inspect pickup tube and replace as necessary.
8. Collapsed lash adjuster due to debris injection.	8. Clean debris from engine and replace lash adjuster/rocker assembly*.
9. Intake rocker arm roller clevis ear(s) contacting camshaft bearing journal(s) on side.	9. Inspect camshaft end play and all valve train components for wear. Replace as necessary.
<b>*Lash adjusters are serviced with the rocker arms—do not disassemble.</b>	

## STANDARD PROCEDURE - HYDRAULIC LASH ADJUSTER BLEEDING

Use this procedure to manually bleed aerated oil from the lash adjuster and remove sponginess.

1. Run the engine, bringing it to operating temperature in order to freshly pressurize and warm the valvetrain system oil supply.
2. Remove cylinder head cover(s).
3. Ensure the rocker arm is positioned on the base circle (1) of the cam. Rotate engine as necessary.

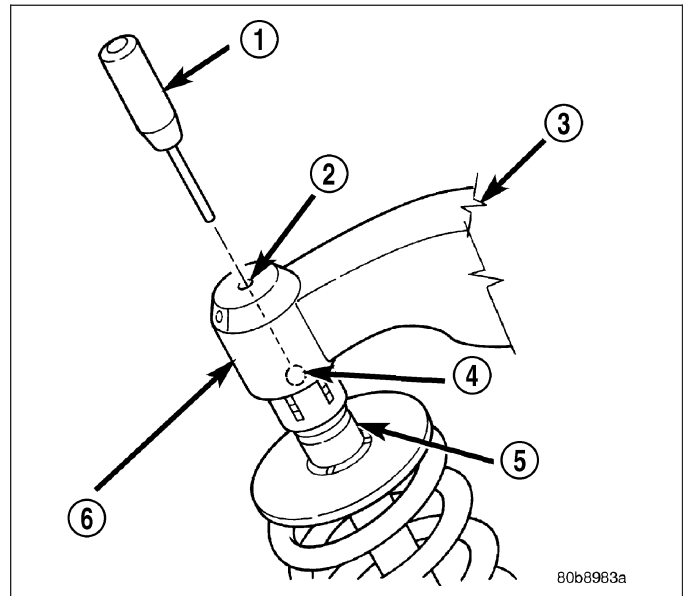


4. For intake rocker arm positions:

- a. Adjust Special Tool 8351 (1) Release Probe's gauge pin to extend approximately 20 mm (0.787 in.). Then, carefully insert the release probe gauge pin into the lash adjuster (6) service access hole (2).

**CAUTION: If probe tip (1) breaks off within the lash adjuster (6), replace the affected rocker arm (3).**

- b. Gently unseat lash adjuster's internal check ball (4).
- c. While the internal check ball (4) is held unseated, press the rocker arm (3) into the valve tip (5), allowing the lash adjuster (6) to fully collapse. Hold this fully collapsed position for about one second, or longer.



- d. Slowly release the rocker arm (3), thereby allowing the lash adjuster (6) to extend, which in turn refills the high pressure chamber with non-aerated oil.
- e. Remove probe to allow check ball (4) to seat.
- f. Recheck for sponginess. If the lash adjuster (6) sponginess is not completely or nearly eliminated, then repeat procedure.
- g. If the spongy condition cannot be removed, replace effected rocker arm(s) (3).

5. For exhaust rocker arm (3) positions:

- a. Adjust Special Tool 8351 (1) Release Probe gauge pin to extend approximately 20 mm (0.787 in.). Then, using two release probes, carefully insert gauge pins into the lash adjuster service access holes.

**CAUTION: If probe tip (1) breaks off within the lash adjuster (6), replace the affected rocker arm (3).**

- b. Gently unseat BOTH lash adjuster's internal check ball (4) at the same time.

- c. While the internal check ball (4) is held unseated, press the rocker arm (6) into the valve tip, allowing the lash adjuster to fully collapse. Hold this fully collapsed position for about one second, or longer.
  - d. Slowly release the rocker arm (3), thereby allowing the lash adjuster (6) to extend, which in turn refills the high pressure chamber with non-aerated oil.
  - e. Remove probes (1) to allow check balls (4) to seat.
  - f. Recheck for sponginess. If the lash adjuster (6) sponginess is not completely or nearly eliminated, then repeat procedure.
  - g. If the spongy condition cannot be removed, replace effected rocker arm(s) (3).
6. Install cylinder head cover(s).

## REMOVAL

**CAUTION:** The rocker arm shafts are hollow and are used as lubrication oil passages. The rocker arm and shaft assembly on the RIGHT side of the engine has an oil passage hole from the cylinder head to the third rocker shaft support. The rocker arm shaft assembly on the LEFT side of the engine has an oil passage hole from the cylinder head to the second rocker shaft support.

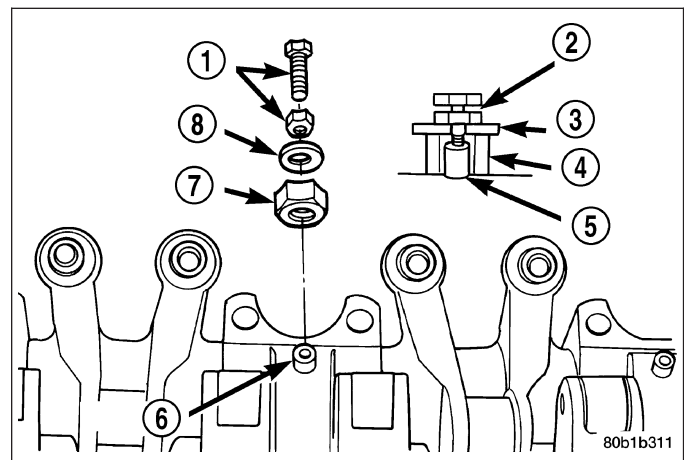
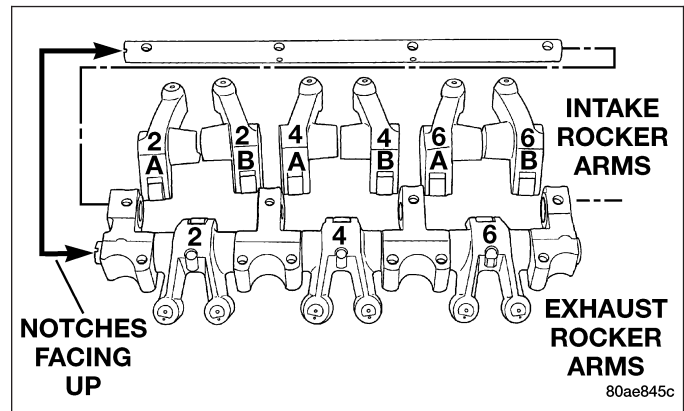
1. Remove cylinder head covers. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)
2. Identify the rocker arm assembly and rocker arms before disassembly.
3. Remove rocker arm assembly bolts.
4. Remove rocker arm assembly.

**Note:** To prevent air ingestion into lash adjusters, avoid turning rocker arm assembly upside down.

**CAUTION:** Do not allow rocker arm assembly to rest on lash adjusters, as damage may occur to lash adjusters and/or plastic retainers.

## DISASSEMBLY

1. Remove rocker arm and shafts. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL)
2. Remove dowel pin using a 4 mm screw, nut, spacer, and washer installed into the pin. Thread the screw into the pin, then loosen the nut on the screw. This will pull the dowel out of the shaft support. Do not reuse dowel pins. Remove the rocker arms and pedestals in order.
3. Check the rocker arm mounting portion of the shafts for wear or damage. Replace if damaged or heavily worn.
4. Check shaft oil holes for clogging with small wire, clean as required.



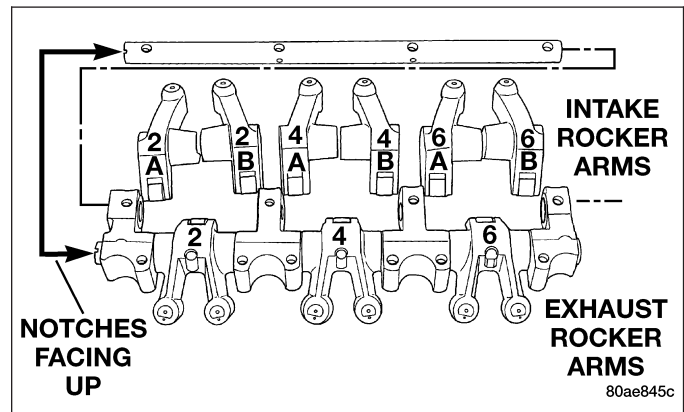


## INSPECTION

The rocker arm shafts are hollow and are used as lubrication oil ducts. The rocker arm and shaft assembly on the **right** side of the engine has an oil passage hole from the cylinder head located at the third rocker shaft support pedestal. The rocker arm and shaft assembly on the **left** side of the engine has an oil passage hole from the cylinder head located at the second rocker shaft support pedestal.

**Note:** To prevent air ingestion into lash adjusters, avoid turning rocker arm assembly upside down.

**CAUTION:** Do not allow rocker arm assembly to rest on lash adjusters, as damage may occur to lash adjuster and plastic retainer.



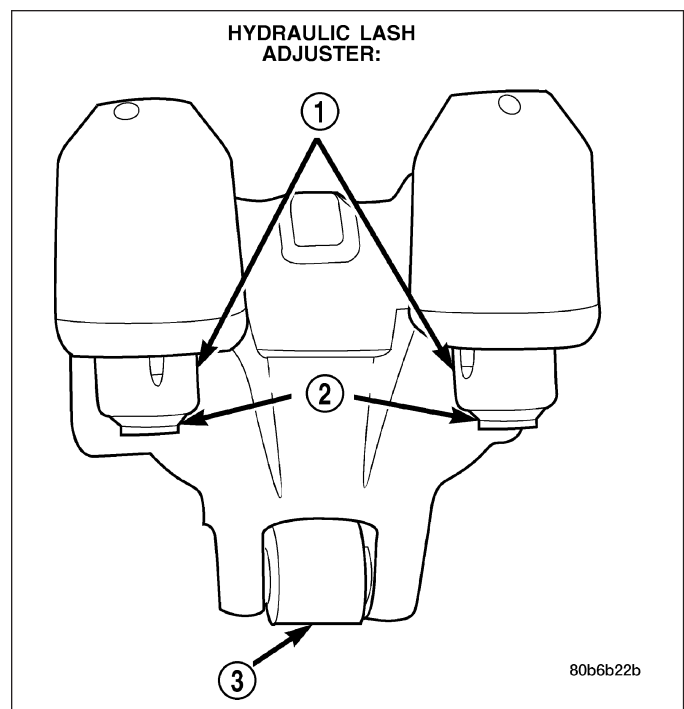
The intake and exhaust rocker arms are different. They should be identified before disassembling the assembly.

Check rocker arms for wear or damage :

- Roller scuffing or wear
- Shaft bore scuffing or wear
- Swivel pad on lash adjuster missing or broken
- Rocker arm showing signs of fatigue or cracking
- Roller axle protruding from arm

Replace assembly as necessary if any rocker arms shows signs of wear.

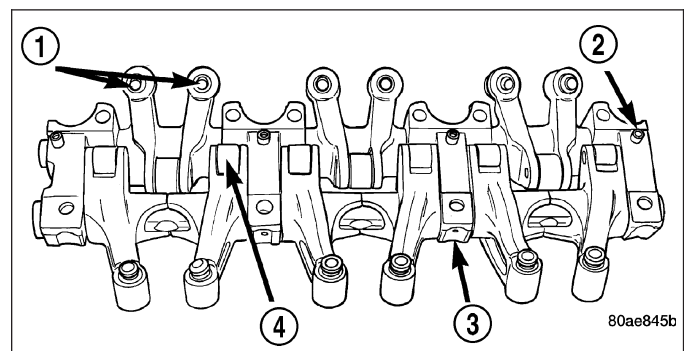
**CAUTION:** Do Not remove lash adjuster from rocker arm assembly. Damage to the adjuster and rocker arm will result.



## ASSEMBLY

**CAUTION:** New dowel pins must be installed when reassembling.

1. Install the rocker arms, and pedestals (3) onto the shaft.
2. Install dowel pins (2). Dowel pins (2) pass through the pedestal (3) into the exhaust rocker shafts. Dowel pins (2) should be pressed in until they bottom-out against the rocker shaft in the pedestal (3).



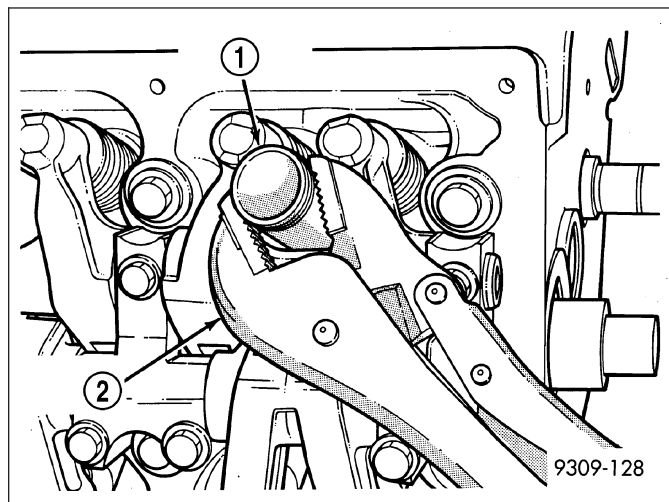




## SPARK PLUG TUBE

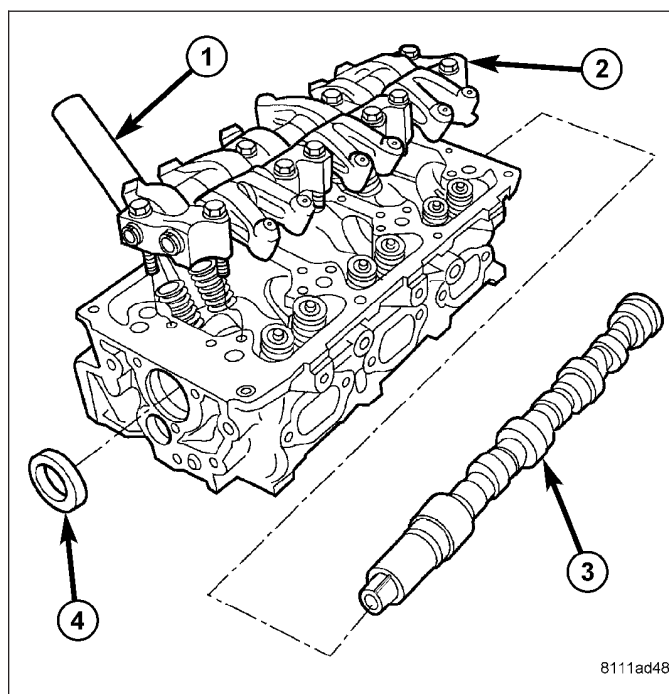
### REMOVAL

1. Remove cylinder head cover(s). (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)
2. Using suitable locking pliers, remove the tube from the cylinder head and discard tube.
3. Clean area around spark plug with Mopar® Parts Cleaner or equivalent.



### INSTALLATION

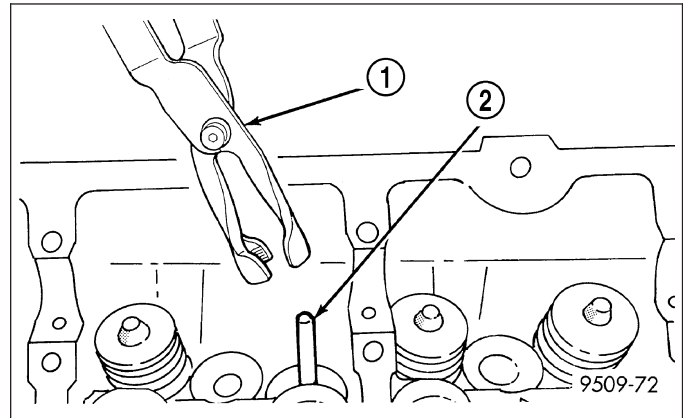
1. Apply Mopar® Stud and Bearing Mount to a new tube (1) approximately 1 mm (0.039 in.) from the end of tube, in a 3 mm (0.118 in.) wide area.
2. Install sealer end of tube (1) into the cylinder head. Then carefully install the tube (1) using a hardwood block and mallet. Install the tube (1) until it is seated into the bottom of the bore.
3. For spark plug tube (1) seal replacement, (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
4. Install cylinder head cover(s). (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)



## VALVE STEM SEALS

### REMOVAL

1. Remove valve spring. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE SPRINGS - REMOVAL)
2. Remove valve stem seals by using a valve stem seal tool.

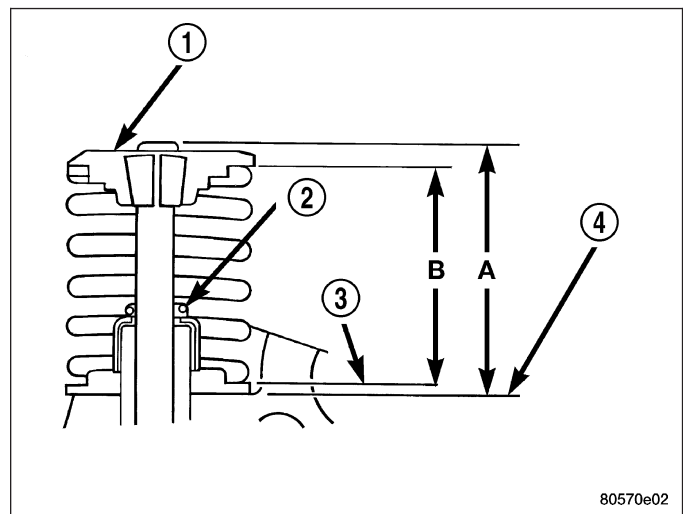


### INSTALLATION

1. The valve stem seal/valve spring seat should be pushed firmly and squarely over the valve guide using the valve stem as guide. **Do Not Force** seal against top of guide. When installing the valve retainer locks, compress the spring **only enough** to install the locks.

**CAUTION:** Do not remove garter spring (2) around the seal at the top of the valve stem seal.

2. Install valve spring. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE SPRINGS - INSTALLATION)

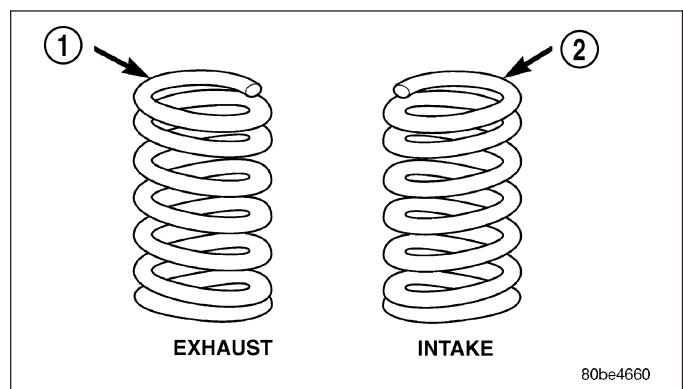


## VALVE SPRINGS

### DESCRIPTION

The valve springs are made from chrome silicon alloy wire and incorporate a "bee-hive" design. Valve spring retainers and locks are common from valve-to-valve. The valve spring seat is integral with the valve stem oil seal, which incorporates a garter spring to maintain consistent lubrication control to the valve stem.

The valve springs are unique for intake compared to exhaust. Both have different lengths and are wound in opposite directions. The valve springs are color coded, intake spring is right hand coil direction with orange dye on the top coils, and the exhaust spring is left hand coil direction with a yellow or white dye on the top coils.



The exhaust spring with the white dye on the top of the coils has an increased open and closed load when compared to the exhaust spring with the yellow dye. A yellow and a white exhaust valve spring **should never** be used on a single forked rocker arm. Color coated exhaust springs should always be used in pairs for a forked exhaust rocker springs.

## OPERATION

The valve spring returns the valve against its seat for a positive seal of the combustion chamber.

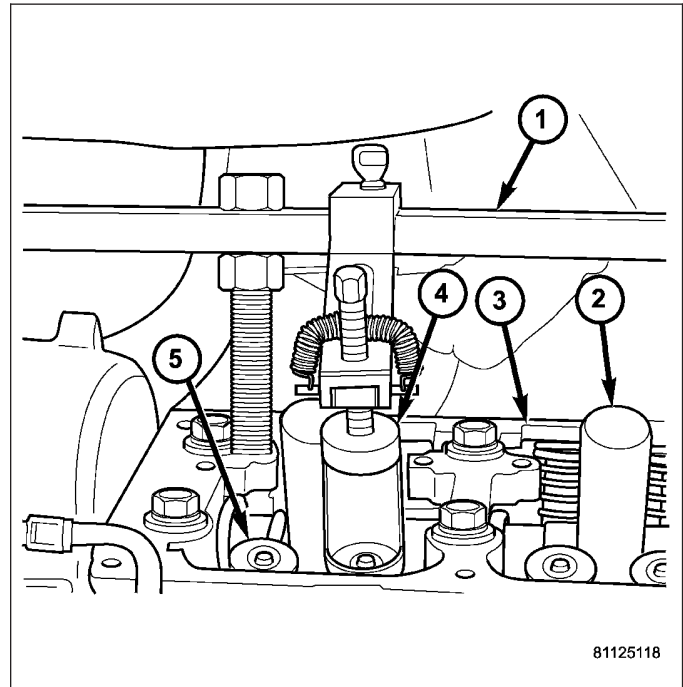
## REMOVAL

### REMOVAL - CYLINDER HEAD OFF

1. Compress valve spring with valve spring compressor C-3422-D and adapter 6526 (Refer to 9 - ENGINE - SPECIAL TOOLS).
2. Remove valve retaining locks. Release valve spring compressor. Remove valve spring retainer and valve spring.
3. Remove valve stem seal assembly. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE STEM SEALS - REMOVAL)

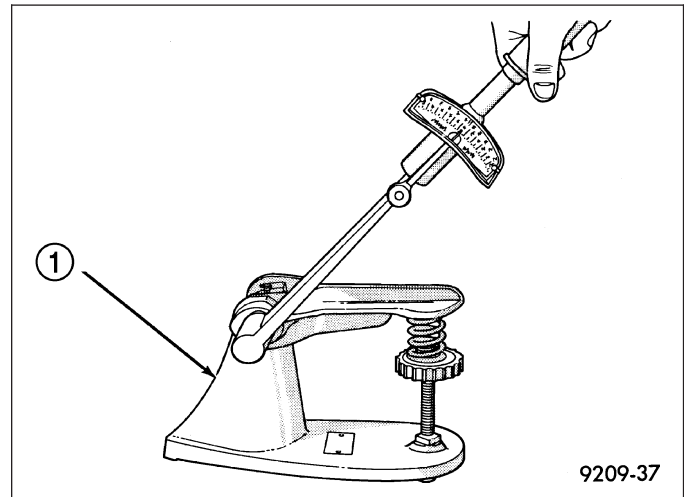
### REMOVAL - CYLINDER HEAD ON

1. Disconnect negative battery cable.
2. Remove upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
3. Remove cylinder head cover(s) (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
4. Remove rocker arm and shaft assembly (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL).
5. Remove spark plugs.
6. Rotate the crankshaft clockwise, until the number 1 piston is at Top Dead Center (TDC) on the compression stroke.
7. With air hose attached to spark plug adapter installed in number 1 spark plug hole, apply 620.5 to 689 kPa (90 to 100 psi) air pressure. This is to hold valves into place while servicing components.
8. Using Tool MD 998772A (1) with adapter 6527 (4) or equivalent, compress valve spring and remove valve locks (5). Release tension on valve spring, remove retainer (5) and valve spring (Refer to 9 - ENGINE - SPECIAL TOOLS).
9. Remove valve stem seal, if required. (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE STEM SEALS - REMOVAL)
10. Follow the same procedure on the remaining 5 cylinders using the firing sequence 1-2-3-4-5-6. **Make sure piston is at TDC in each cylinder of the valve spring that is being removed.**
11. Remove spark plug adapter tool.



## INSPECTION

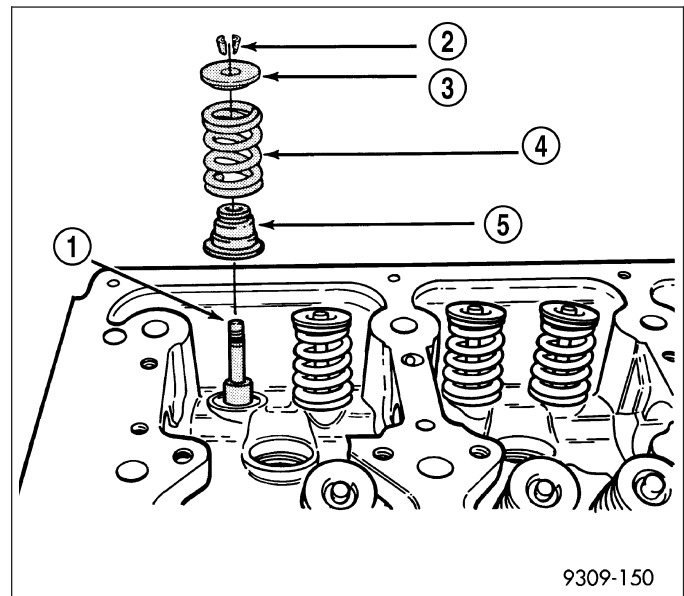
When valves have been removed for inspection, reconditioning or replacement, valve springs should be tested. **As an example;** the compression length of the spring to be tested is 38.00 mm (1.496 in.). Turn table of Tool C-647 until surface is in line with the 38.00 mm (1.496 inches.) mark on the threaded stud and the zero mark on the front. Place spring over stud on the table and lift compressing lever to set tone device. Pull on torque wrench until ping is heard. Take reading on torque wrench at this instant. Multiply this reading by two. This will give the spring load at test length. Fractional measurements are indicated on the table for finer adjustments. Refer to Engine Specifications to obtain specified height and allowable tensions (Refer to 9 - ENGINE - SPECIFICATIONS). Replace springs that do not meet specifications.



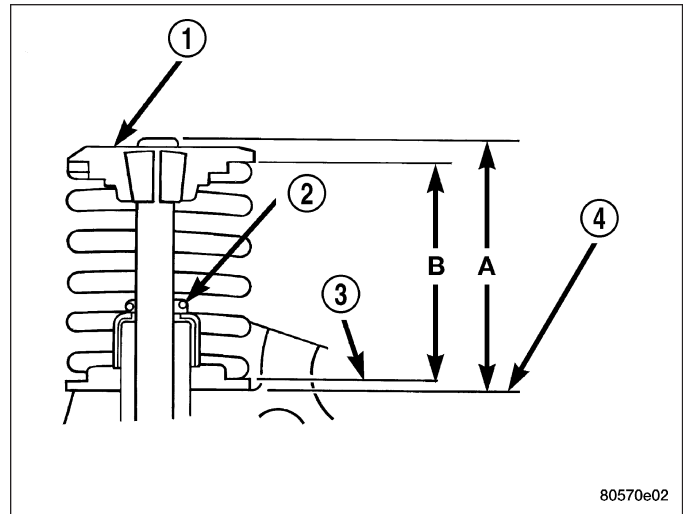
## INSTALLATION

### INSTALLATION - CYLINDER HEAD OFF

1. Install valves if removed.
2. Install valve stem seal/spring seat assembly (5) over valve guides on all valve stems. Ensure that the garter spring is intact around the top of the rubber seal.
3. Place valve spring (color-coded end facing up) (4) and valve retainer into position.

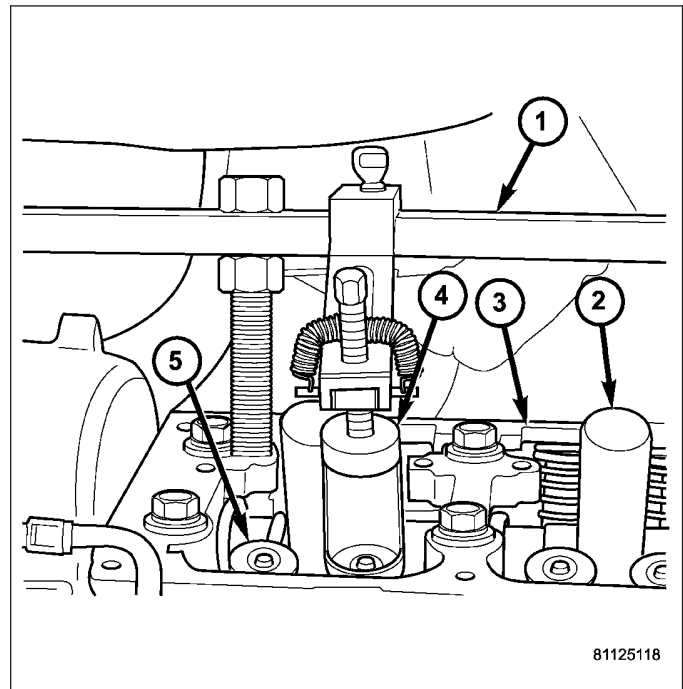


4. Compress valve spring with valve spring compressor. Install locks and release tool. **If valve and/or seat are reground, measure the installed height of springs (B), make sure measurements are taken from top of spring seat to the bottom surface of spring retainer.** If height is greater than 38.75 mm (1.5256 in.), install a 0.762 mm (0.030 in.) spacer in head counterbore under the valve spring seat to bring spring height back within specification.



## INSTALLATION - CYLINDER HEAD ON

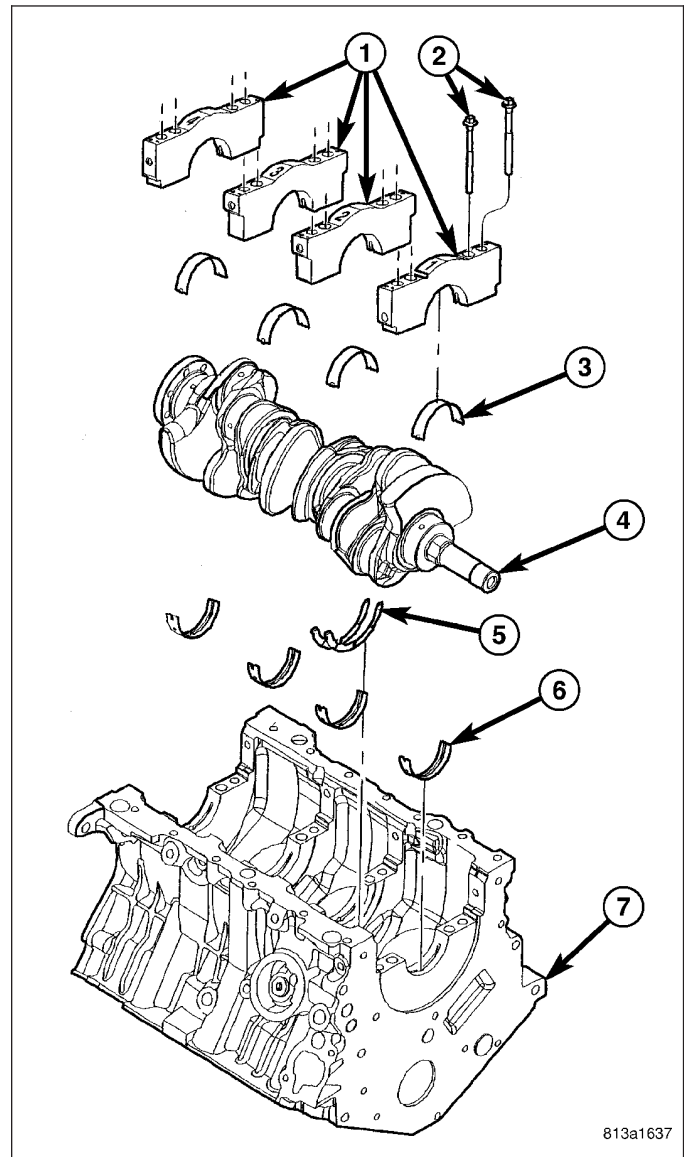
1. Install new valve seal(s) if required (Refer to 9 - ENGINE/CYLINDER HEAD/VALVE STEM SEALS - INSTALLATION).
2. Place valve spring (color-coded end facing up) and valve retainer into position.
3. Compress valve spring using Special Tool MD 998772A (1) with Adaptor 6527 (4) only enough to install locks (5).
4. After installing locks, release tension on valve spring and verify proper installation.
5. Remove Special Tool MD 998772A (1) and spark plug adapter tool.
6. Install rocker arm and shaft assembly. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION)
7. Install cylinder head cover(s) (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
8. Install spark plugs.
9. Install upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
10. Connect negative battery cable.



## ENGINE BLOCK

### DESCRIPTION

The cylinder block is made of heat treated aluminum with cast-in-place iron liners. The block is a closed deck design with the right bank forward. To provide high rigidity and improved noise, vibration and harshness (NVH), the block has cast-in contours and ribs, along with powdered metal 6 bolt main caps (4 vertical, 2 horizontal), with a die cast aluminum structural beam windage tray mounted to the main caps.



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### CLEANING

Clean cylinder block thoroughly using a suitable cleaning solvent.

### INSPECTION

#### ENGINE BLOCK

1. Clean cylinder block thoroughly and check all core hole plugs for evidence of leaking.
2. If new core plugs are to be installed, (Refer to 9 - ENGINE - STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS).
3. Examine block and cylinder bores for cracks or fractures.
4. Check block deck surfaces for flatness. Deck surface must be within service limit of 0.1 mm (0.004 in.).

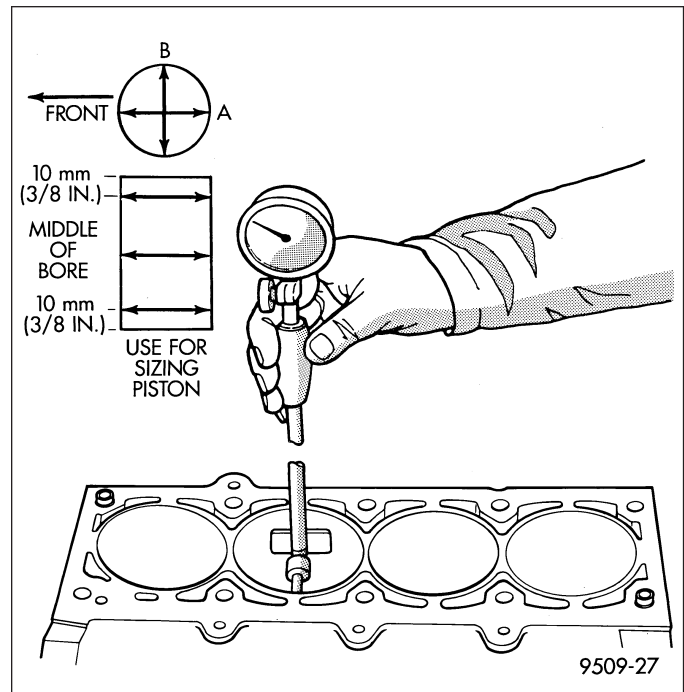


## CYLINDER BORE

**Note:** The cylinder bores should be measured at normal room temperature, 21°C (70°F).

The cylinder walls should be checked for out-of-round and taper with Tool C119 cylinder bore gauge, or equivalent (Refer to 9 - ENGINE - SPECIFICATIONS). If the cylinder walls are badly scuffed or scored, the cylinder block should be replaced, and new pistons and rings fitted.

Measure the cylinder bore at three levels in directions A and B. Top measurement should be 10 mm (3/8 in.) down and bottom measurement should be 10 mm (3/8 in.) up from bottom of bore. (Refer to 9 - ENGINE - SPECIFICATIONS).



## CONNECTING ROD BEARINGS

### STANDARD PROCEDURE - CONNECTING RODS AND BEARINGS

#### CONNECTING ROD BEARINGS

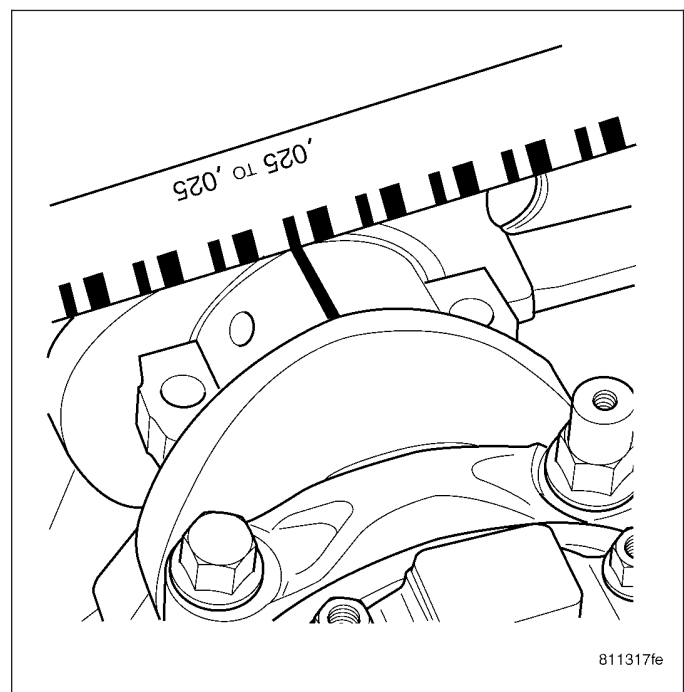
**CAUTION:** The bearing caps are not interchangeable and should be paint marked or scribed at removal to insure correct assembly. **DO NOT** use a metal stanp.

The bearing shells must be installed with the tangs inserted into the machined grooves in the rods and caps. Install cap with the tangs on the same side as the rod.

Fit all rods on one bank until complete.

Limits of taper or out-of-round on any crankshaft journals should be held to 0.010 mm (0.0004 in.). Bearings are available in standard, 0.025 mm (0.001 in.), and 0.254 mm (0.010 in.) undersizes. **Install the bearings in pairs. Do not use a new bearing half with an old bearing half. Do not file the rods or bearing caps.**

1. For measuring main bearing clearance and connecting rod bearing clearance use plastigage. For more information on using plastigage (Refer to 9 - ENGINE - STANDARD PROCEDURE). Refer to Engine Specifications for bearing clearance specifications (Refer to 9 - ENGINE - SPECIFICATIONS).

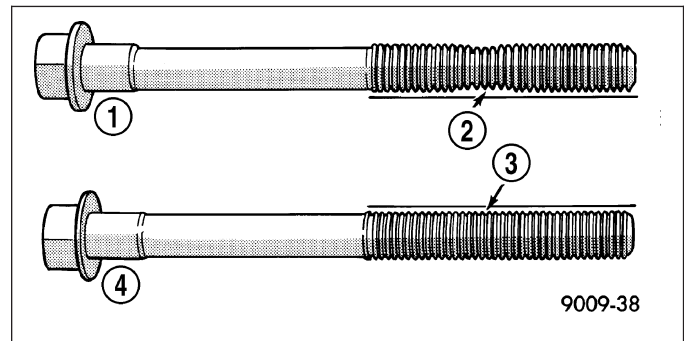




**Note:** The rod bearing bolts should be examined before reuse. If the threads are necked down the bolts must be replaced.

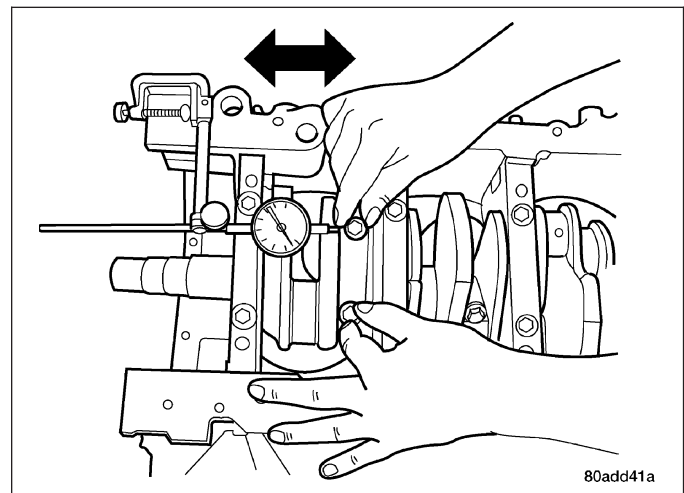
## CONNECTING ROD BOLTS

1. Examine connecting rod bolts for stretching (1). Stretching (1) can be checked by holding a scale or straight edge against the threads. If all the threads do not contact the scale the bolt must be replaced.
2. Before installing the bolts the threads should be cleaned and inspected.
3. Install clean bolts finger tight. Then alternately torque each bolt to assemble the cap properly.
4. Tighten the connecting rod cap bolts to specification. (Refer to 9 - ENGINE - SPECIFICATIONS).



## CONNECTING ROD SIDE CLEARANCE

1. Mount a dial indicator to a stationary point on engine. Locate probe perpendicular to and resting against the connecting rod cap being checked. Move connecting rod all the way to rear of its travel. Zero the dial indicator. Move connecting rod forward to limit of travel and read the dial indicator. Compare measurement to specification listed in engine specifications (Refer to 9 - ENGINE - SPECIFICATIONS). Repeat procedure for each connecting rod. Turn crankshaft for connecting rod accessibility.



## CRANKSHAFT

### DESCRIPTION

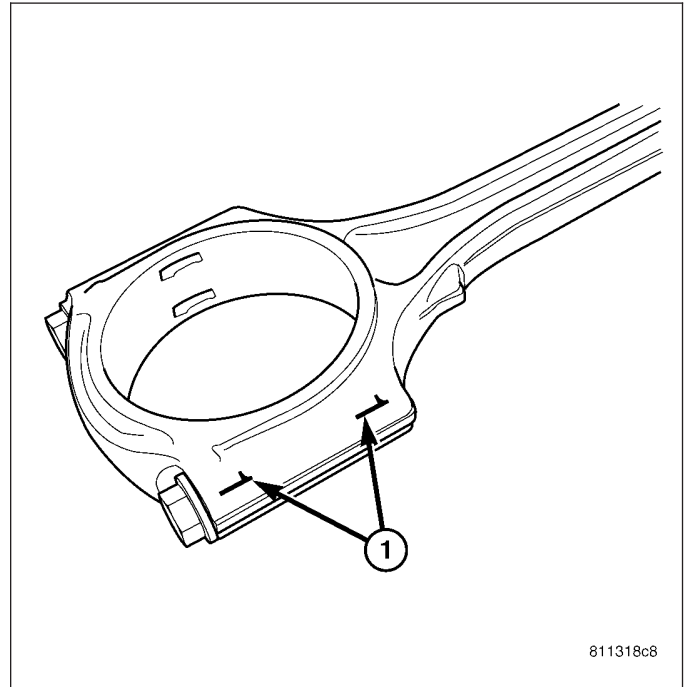
The crankshaft is constructed of a forged micro alloy steel. A six throw, nine counterweight crankshaft is supported by four select fit main bearings with number two serving as the thrust washer location. The six separate connecting rod throws are an even-firing design which reduces torque fluctuations while a torsional vibration damper is used to control torsion caused vibration of the crankshaft. Rubber lipped seals are used at front and rear. The front seal is retained in the oil pump case and the rear seal is retained in a block-mounted housing.

### OPERATION

The crankshaft transfers force generated by combustion within the cylinder to the flywheel or flexplate.

## REMOVAL

1. Remove engine from vehicle (Refer to 9 - ENGINE - REMOVAL).
2. Remove oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
3. Remove oil pickup tube.
4. Remove front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
5. Remove timing belt and tensioner (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
6. Remove crankshaft sprocket (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
7. Tap dowel pin out of crankshaft.
8. Remove oil pump assembly (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
9. Remove crankshaft rear oil seal retainer (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT REAR OIL SEAL RETAINER - REMOVAL).

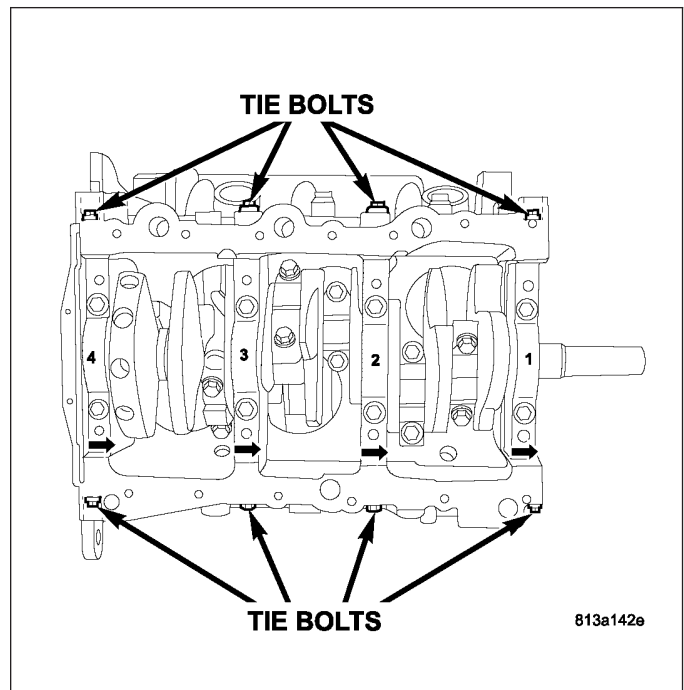


**CAUTION:** Connecting rod bearing caps are not interchangeable and should be paint marked or scribed before removal to insure correct assembly. DO NOT use a metal stamp to mark the bearing caps.

10. Remove connecting rod bearing caps..

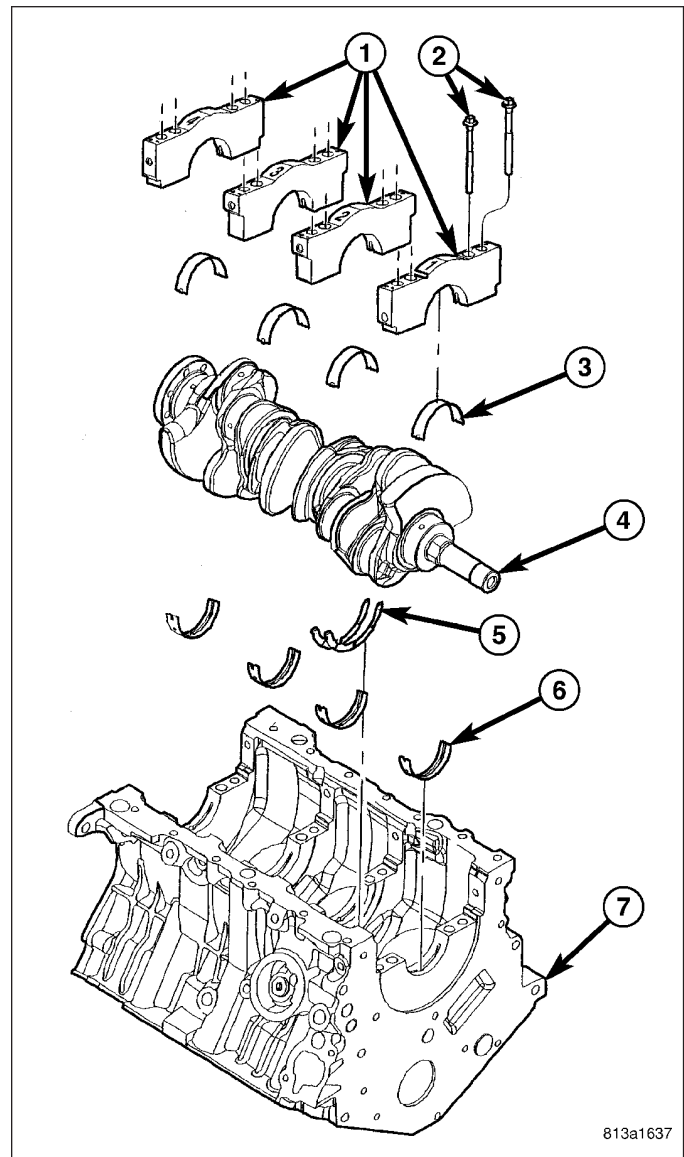
**WARNING:** Main bearing caps are not interchangeable and should be paint marked or scribed before removal to insure correct assembly. DO NOT use a metal stamp to mark the bearing caps.

11. Remove main bearing caps (1). Main bearing caps (1) are not interchangeable and are marked to insure correct assembly.



12. Remove crankshaft (4) from cylinder block (7).

**Note:** Before installing crankshaft, refer to Fitting Main Bearings and Installation of Connecting Rod Bearings. (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - STANDARD PROCEDURE) (Refer to 9 - ENGINE/ENGINE BLOCK/CONNECTING ROD BEARINGS - STANDARD PROCEDURE)



## INSPECTION

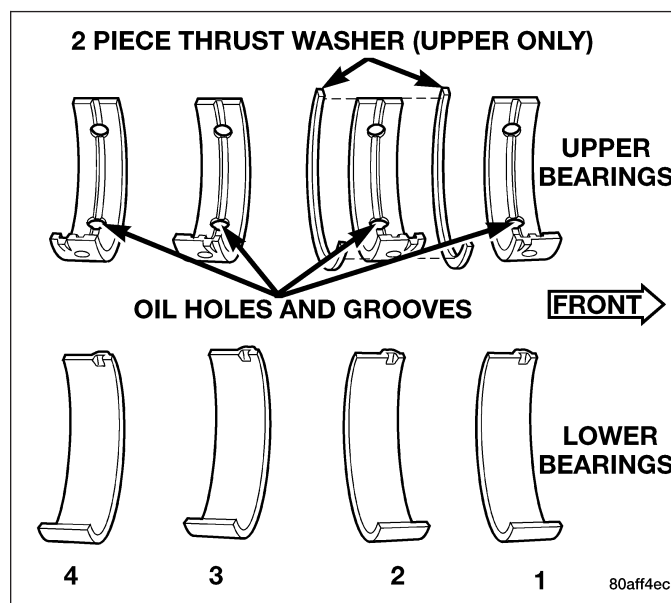
The crankshaft journals should be checked for excessive wear, taper and scoring. Limits of taper on any crankshaft journals should be held to 0.015 mm (0.0006 in.). Limits for journal roundness should be 0.010 mm (0.0004 in.). Journal grinding should not exceed 0.254 mm (0.010 in.) under the standard journal diameter. DO NOT grind thrust faces of Number 2 main bearing. DO NOT nick crank pin or bearing fillets. After grinding, remove rough edges from crankshaft oil holes and clean out all passages.

**CAUTION:** With a forged steel crankshaft it is important that the final paper or cloth polish after any journal regrind be in the same direction as normal rotation in the engine.

## INSTALLATION

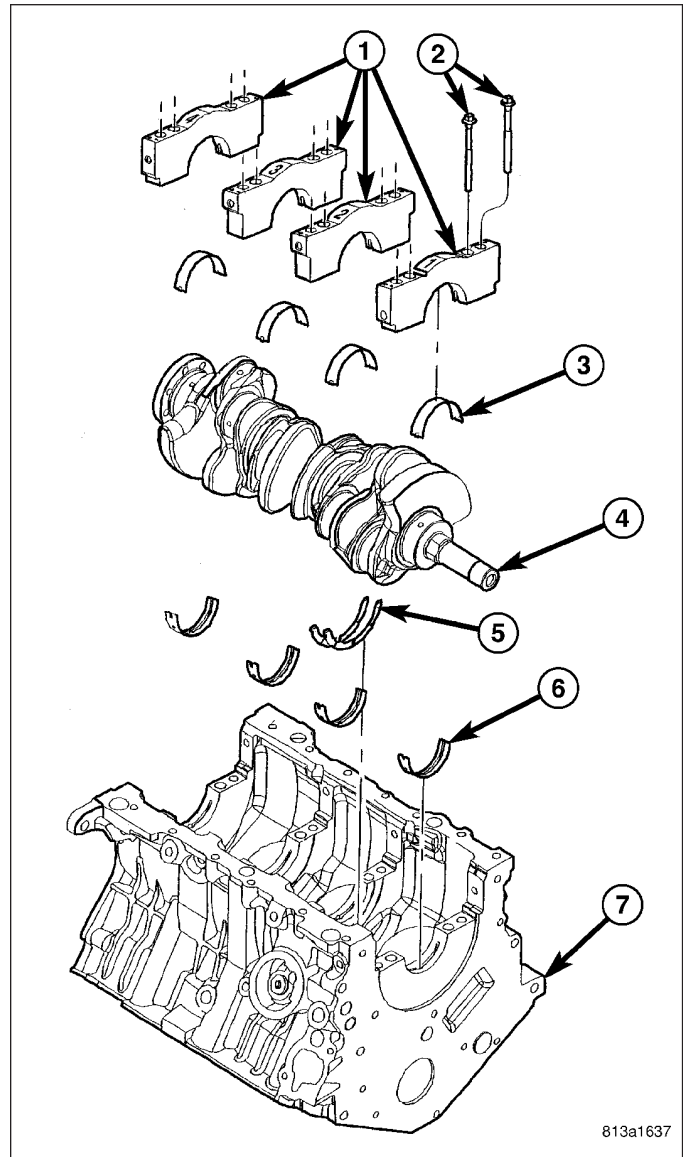
**CAUTION:** Main bearings are select fit (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - STANDARD PROCEDURE) for proper bearing size selection.

1. Install crankshaft upper main bearings in cylinder block. Ensure oil holes in bearings line up with oil holes in cylinder block. (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - STANDARD PROCEDURE)

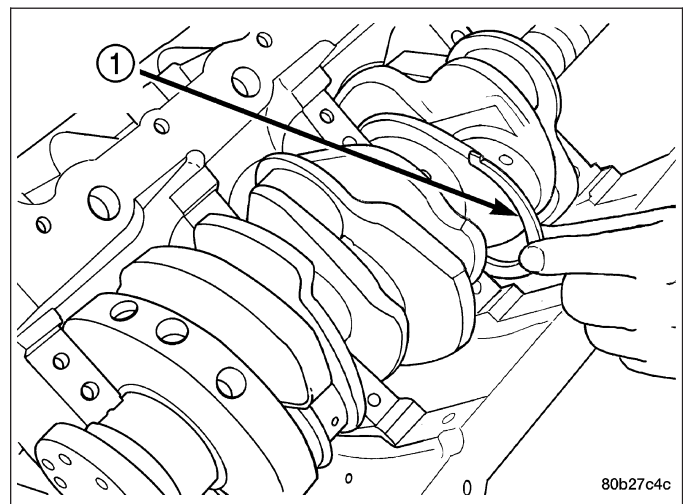


**Note:** Care must be taken not to damage the journals or bearings during crankshaft installation.

2. Install the crankshaft (4) to cylinder block (7)



3. Move crankshaft forward to limit of travel. Lubricate and install the front thrust washer (1) by rolling the washer (1) onto the machined shelf between the No. 2 upper main bulk head and crankshaft thrust surface.
4. Move crankshaft rearward to limit of travel. Lubricate and install the rear thrust washer by rolling the washer onto the machined shelf between the No. 2 upper main bulk head and crankshaft thrust surface.



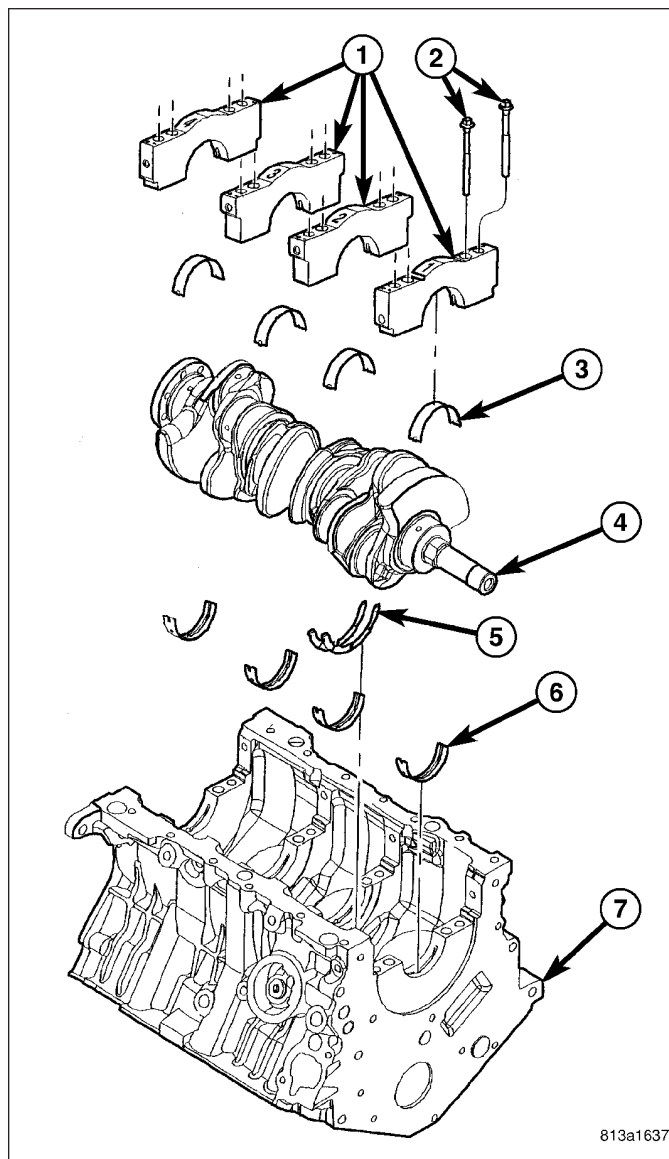
5. Install lower main bearings (3) into main bearing caps (1).
6. Lubricate lower main bearings (3) with clean engine oil.

**Note:** Lubricate main bearing cap bolts (1) with engine oil before installation.

7. Install each main cap (1) and tighten bolts finger tight.

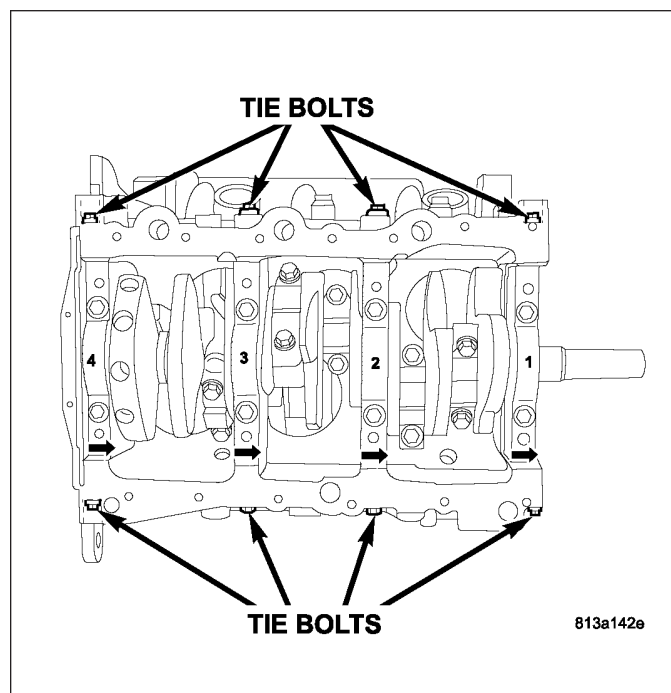
The main bearing cap bolts (2) must be tightened in the proper sequence. First the inner main cap bolts (2), secondly the windage tray bolts, lastly the main cap tie (horizontal) bolts (6).

8. Install the inside main bearing cap bolts (2) and tighten to 20 N·m + 1/4 turn (15 ft. lbs. + 1/4 turn).
9. Measure crankshaft end play. (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - STANDARD PROCEDURE)
10. Install connecting rods and measure side clearance. (Refer to 9 - ENGINE/ENGINE BLOCK/CONNECTING ROD BEARINGS - STANDARD PROCEDURE)
11. Install windage tray. Lubricate bolts with engine oil and tighten to 27 N·m + 1/4 turn (20 ft. lbs. + 1/4 turn).



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12. Install the main cap tie (horizontal) bolts and tighten to 28 N·m (250 in. lbs.).
13. Install rear crankshaft oil seal retainer and oil seal (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT REAR OIL SEAL RETAINER - INSTALLATION) and (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - INSTALLATION)
14. Install oil pump assembly (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).
15. Install dowel pin in crankshaft (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - FRONT - INSTALLATION).
16. Install crankshaft sprocket (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
17. Install timing belt and tensioner (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
18. Install front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
19. Install oil pickup tube and tighten bolt to 28 N·m (250 in. lbs.).
20. Install oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
21. Install engine assembly (Refer to 9 - ENGINE - INSTALLATION).
22. Fill engine crankcase with proper amount of oil.

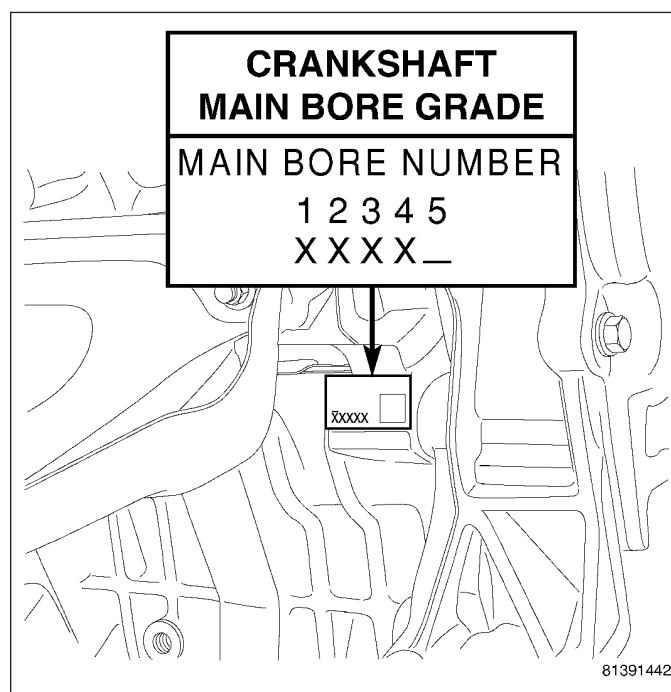


## CRANKSHAFT MAIN BEARINGS

### STANDARD PROCEDURE - CRANKSHAFT MAIN BEARING FITTING

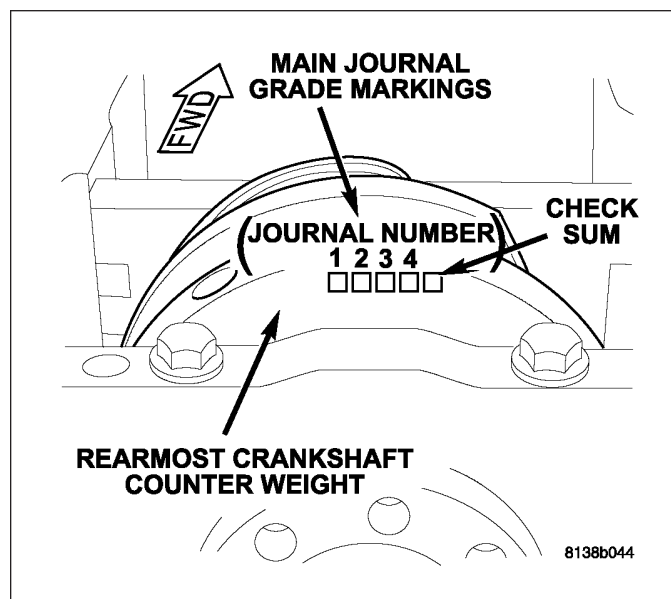
The main bearings are a “select fit” to achieve proper oil clearances. For main bearing selection, the block and crankshaft have grade identification marks.

The marks for the cylinder block main bore grade are located on the right front side of the engine block. These grade marks (1, 2, or 3) are read left to right, corresponding to main bore 1, 2, 3, 4. The 5th digit is a check some digit for plant validation during manufacturing.



The grade marks for the crankshaft are located on the rearmost crankshaft counter weight as shown in. The crankshaft journal grade marks (A, B, or C) are read left to right, corresponding with journal number 1, 2, 3, 4.

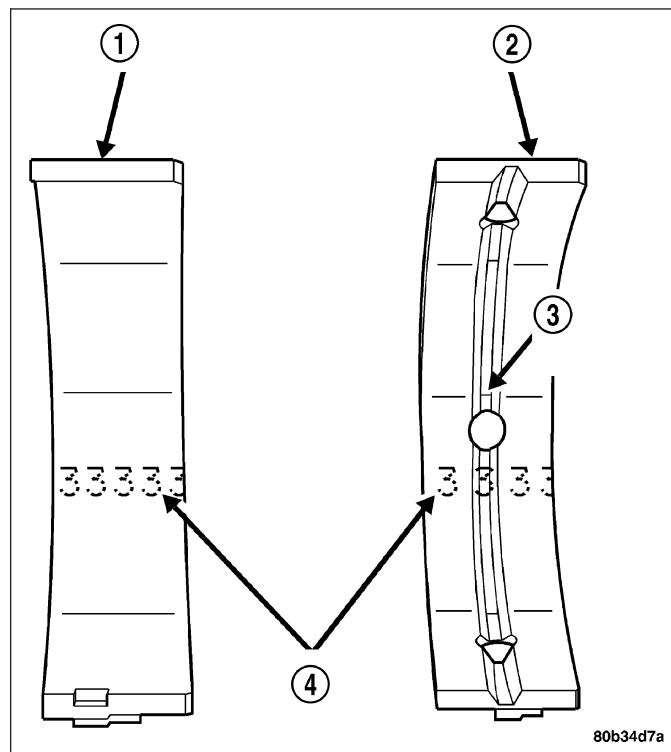
Refer to the MAIN BEARING SELECTION CHART to properly select the main bearings. For an example, if the main bore grade is 3 and the journal grade is B, the proper select fit bearing would be a (2) +0.003 mm (+0.0002 in.).



**Note:** Service main bearings have a number from (1–5) marked in ink on the bearing surface. For verification, refer to the MAIN BEARING SELECTION CHART for number to size identification.

The upper main bearing (2) has a oil feed hole and a center groove to allow lubrication of the main journal and must be properly positioned in the block.

#### MAIN BEARING SELECTION CHART



Main Bearing Bore Grade Marks				
		1	2	3
Crankshaft Main Journal Grade Marks	A	(3) Standard	(2) +003 mm (+0.0001 in.)	(1) +0.006 mm (+0.0002 in.)
	B	(4) -0.003 mm (-0.0001 in.)	(3) Standard	(2) +003 mm (+0.0001 in.)
	C	(5) -0.006 mm (-0.0002 in.)	(4) -0.003 mm (-0.0001 in.)	(3) Standard



CHART 1

Crankshaft Diameter (mm)		
Min	Max	Grade
63.9870 mm	63.9956 mm	A
63.9957 mm	64.0042 mm	B
64.0043 mm	64.0130 mm	C

CHART 2

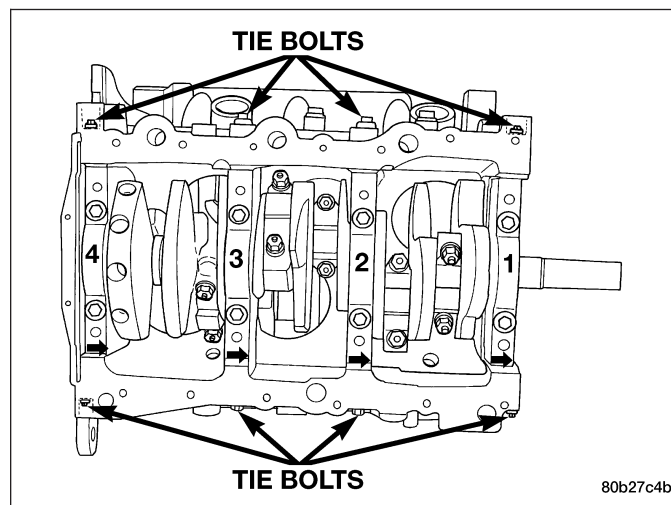
Block Main Bore Diameter (mm)		
Min	Max	Grade
68.9895 mm	68.9964 mm	1
68.9965 mm	69.0034 mm	2
69.0035 mm	69.0105 mm	3

Block Main Bore Grade					
Crankshaft Journal Grade		1	2	3	
		A	Class 3	Class 2	Class 1
		B	Class 4	Class 3	Class 2
		C	Class 5	Class 4	Class 3

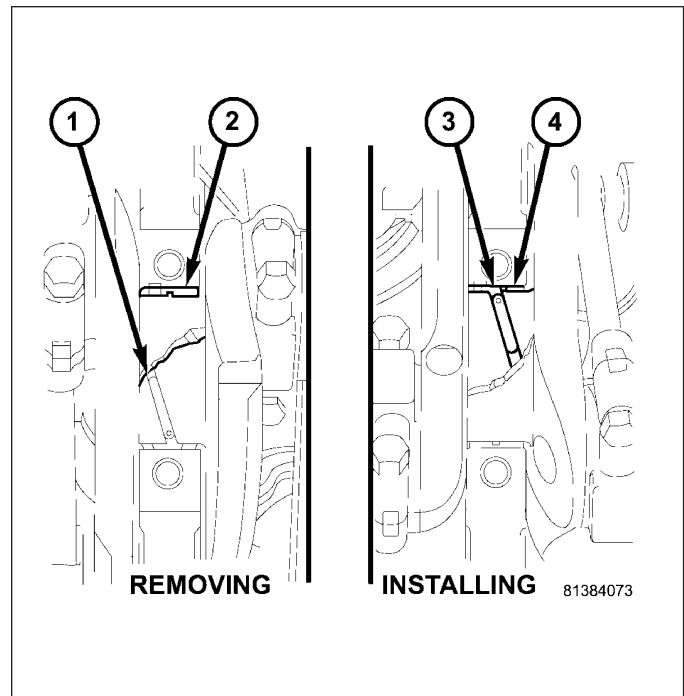
## REMOVAL

Bearing caps are not interchangeable and are marked to insure correct assembly. Upper and lower bearing halves are NOT interchangeable.

1. Remove oil pan. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL)
2. Remove oil pick-up tube and windage tray.
3. Identify bearing caps before removal.



4. Remove bearing caps one at a time. Remove upper half of bearing by inserting Special Main Bearing Tool C-3059 into the oil hole of crankshaft.
5. Slowly rotate crankshaft clockwise, forcing out upper half of bearing shell.



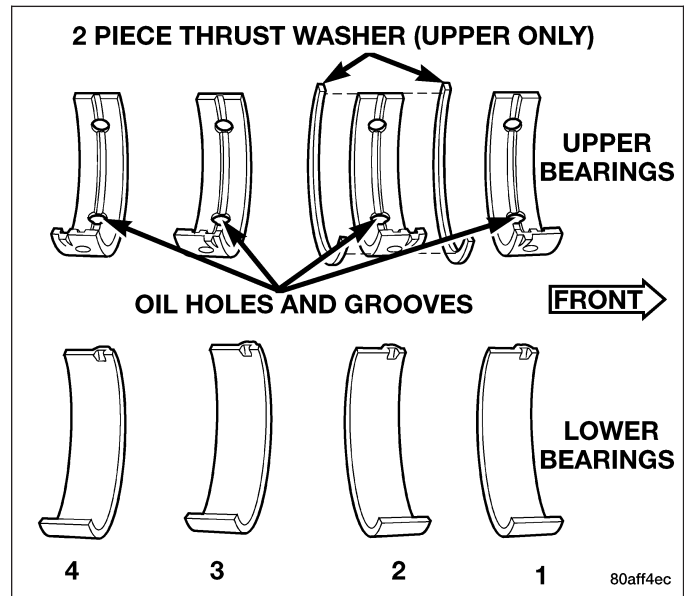
## INSTALLATION

Bearing caps are not interchangeable and are marked to insure correct assembly. Upper and lower bearing halves are NOT interchangeable.

**CAUTION:** Main bearings are select fit. (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - STANDARD PROCEDURE)

**Note:** Only one main bearing should be selectively fitted while all other main bearing caps are properly tightened.

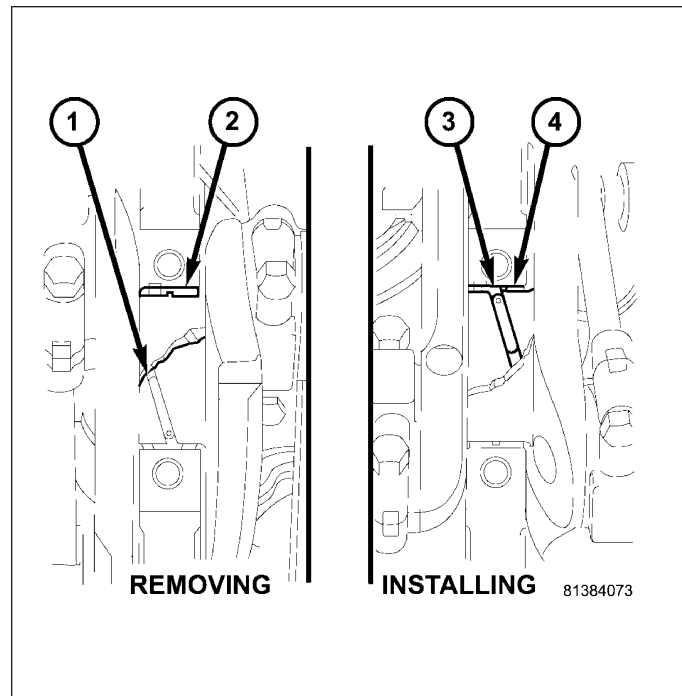
When installing a new upper bearing shell, slightly chamber the sharp edges from the plain side.



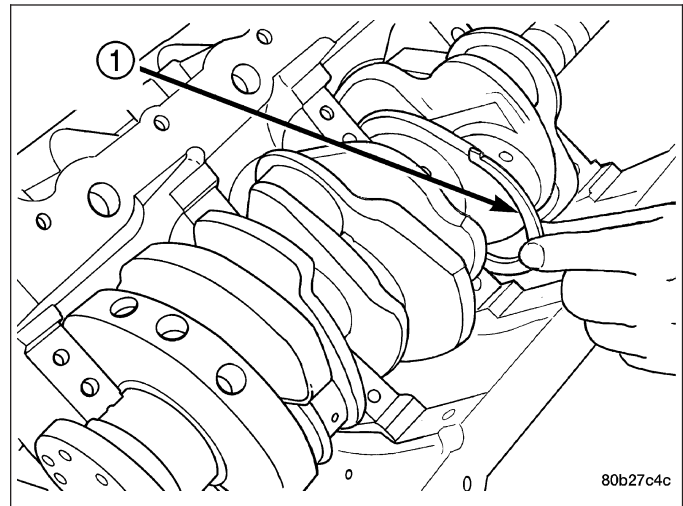
1. Lubricate main bearing (4) with clean engine oil.
2. Start bearing (4) in place, and insert Main Bearing Tool C-3059 (3) into oil hole of crankshaft.
3. Slowly rotate crankshaft counterclockwise sliding the bearing into position. Remove Special Main Bearing Tool C-3059.

**Note: Lubricate main bearing cap bolts with engine oil before installation.**

4. Lubricate and install lower bearing half and main cap. Tighten bolts finger tight.

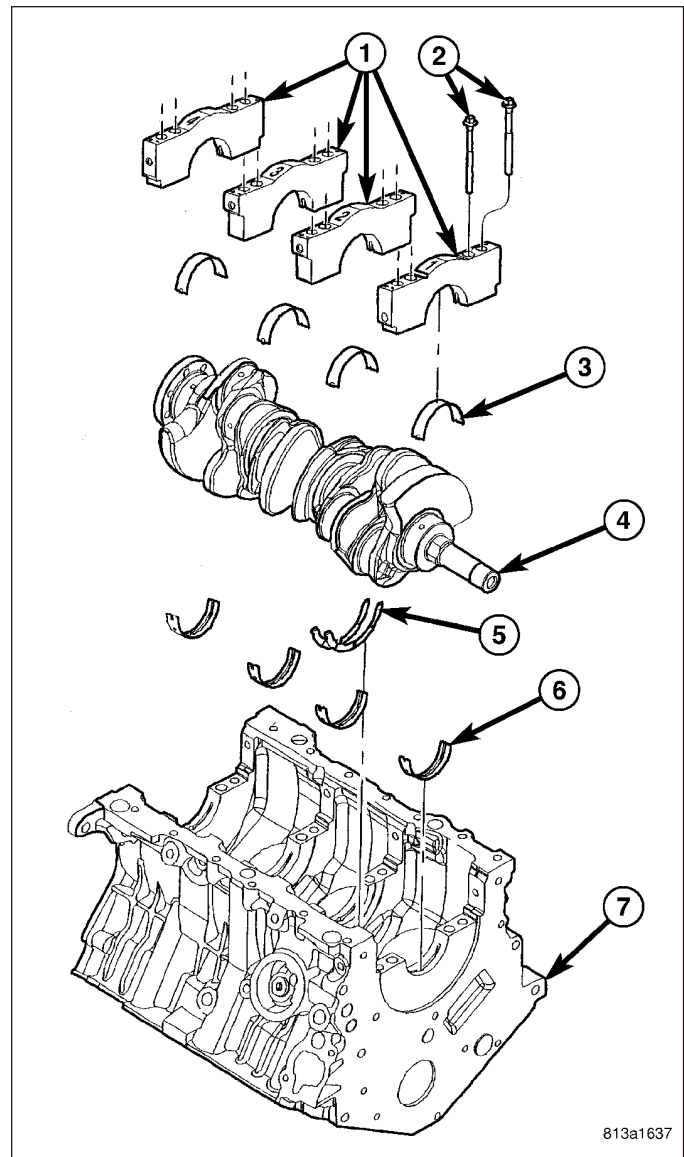


5. For installing thrust washers (1) at the No. 2 main bearing location, use the following procedure:
  - a. Move crankshaft forward to limit of travel. Lubricate and install the front thrust washer (1) by rolling the washer onto the machined shelf between the No. 2 upper main bulk head and crankshaft thrust surface.
  - b. Move crankshaft rearward to limit of travel. Lubricate and install the rear thrust washer by rolling the washer onto the machined shelf between the No. 2 upper main bulk head and crankshaft thrust surface.

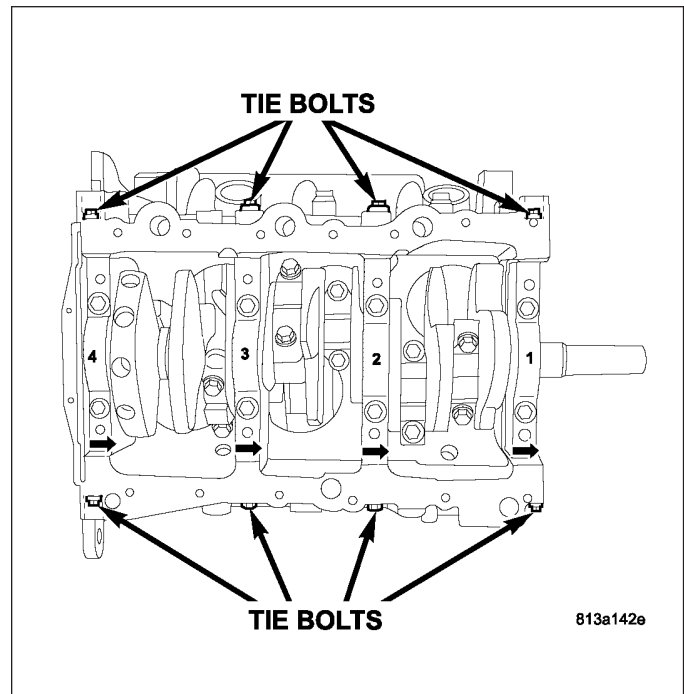


The main bearing cap bolts (2) must be tightened in the proper sequence. First the inner main cap bolts, secondly the windage tray bolts, lastly the main cap tie (horizontal) bolts.

6. Install each main bearing cap (1) and tighten inner bolts finger tight.
7. Tighten inner main bearing cap bolts (2) to 20 N·m + 1/4 turn (15 ft. lbs. + 1/4 turn).
8. Measure crankshaft end play. (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - STANDARD PROCEDURE)
9. Install windage tray. Lubricate bolts with engine oil and tighten to 27 N·m + 1/4 turn (20 ft. lbs. + 1/4 turn).

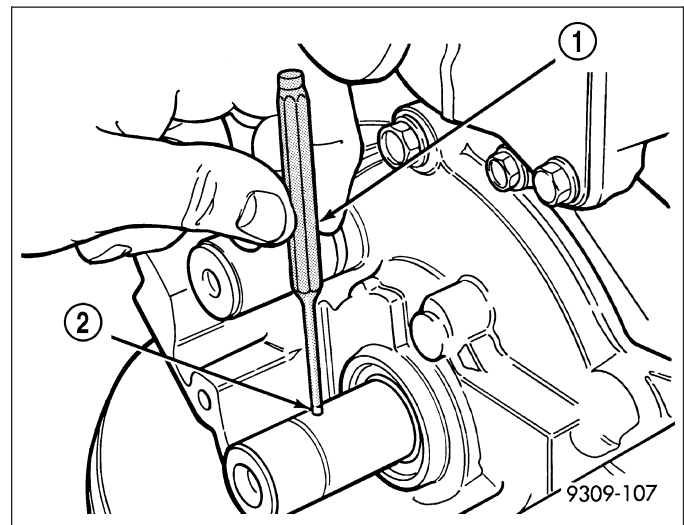


10. Install the main cap tie (horizontal) bolts and tighten to 28 N·m (250 in. lbs.).
11. Install oil pick-up tube.
12. Install oil pan. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION)
13. Fill engine crankcase with proper oil to correct level.



## CRANKSHAFT OIL SEAL - FRONT REMOVAL

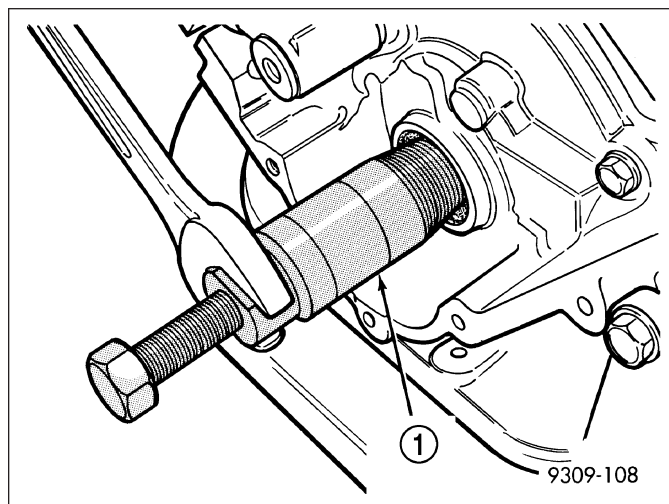
1. Remove the crankshaft sprocket. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)
2. Tap the dowel pin (2) out of the crankshaft.



3. Remove crankshaft seal using Special Tool 6341A (1).

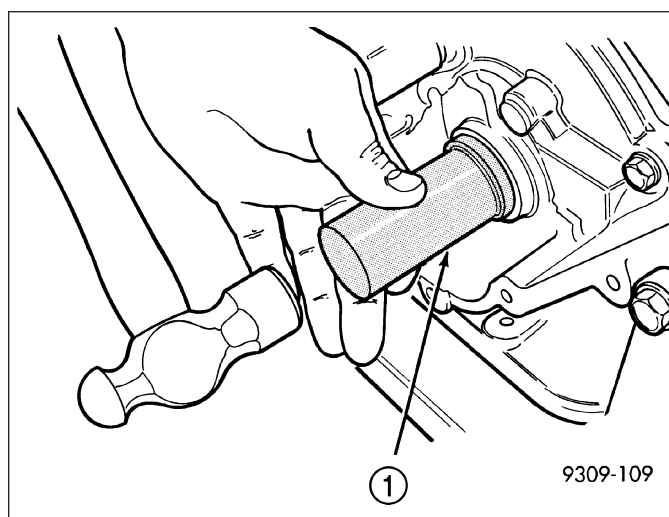
**CAUTION:** Do not nick shaft seal surface or seal bore.

4. Shaft seal lip surface must be free of varnish, dirt or nicks. Polish with 400 grit paper if necessary.



## INSTALLATION

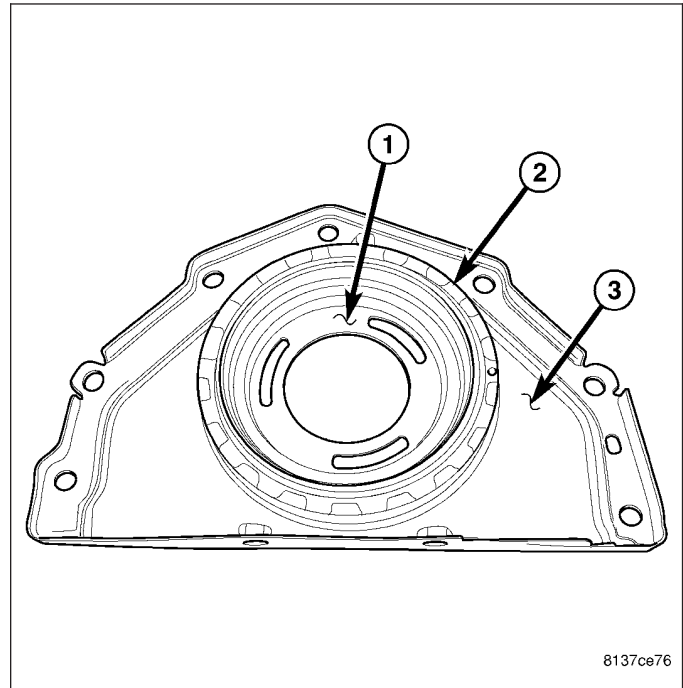
1. Install crankshaft seal using Special Tool 6342 (1).
2. Install the dowel pin into the crankshaft to 1.2 mm (0.047 in.) protrusion.
3. Install the crankshaft sprocket (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION.)



## CRANKSHAFT OIL SEAL - REAR

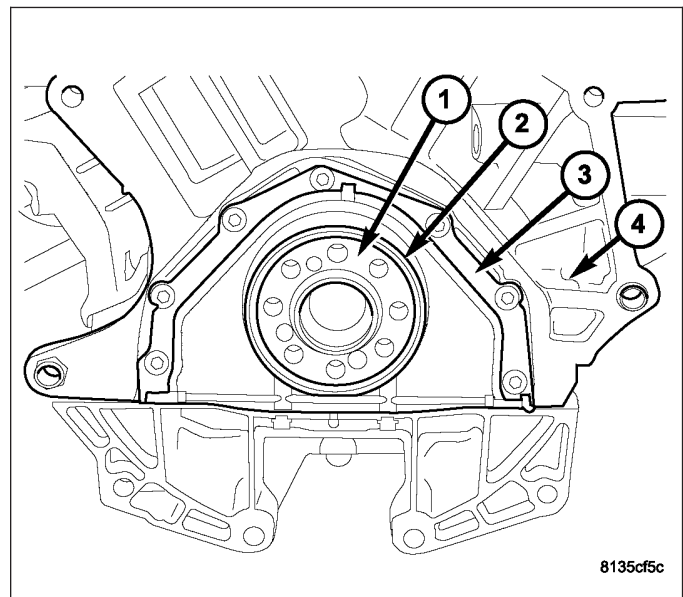
### DESCRIPTION

The rear crankshaft oil seal (1) and retainer (3) are molded and serviced as an assembly. This assembly also includes a separate rear crankshaft seal protector (2) that should not be removed before the seal is installed on the engine block. Once the seal protector (2) is separated from the assembly it can not be re-installed on the assembly or reused. The rear crankshaft oil seal (1) is unique to this engine and CAN NOT be used on prior model years.



### REMOVAL

1. Remove the engine oil pan(Refer to 9 - ENGINE/ LUBRICATION/OIL PAN - REMOVAL).
2. Lower the weight of the engine back onto the engine mounts.
3. Remove transmission from vehicle. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42LE - REMOVAL)
4. Remove the flex plate.
5. Remove the rear crankshaft oil seal retainer bolts.
6. Remove the crankshaft oil seal and clean all mating surfaces.

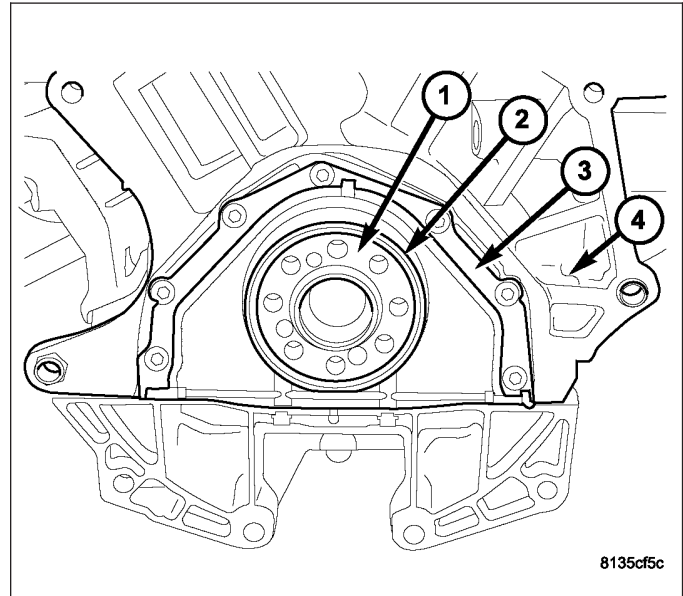


## INSTALLATION

**CAUTION:** If a burr or scratch is present on the crankshaft edge (chamfer), clean surface using 400 grit sand paper to prevent seal damage during installation.

**Note:** The rear crankshaft oil seal and retainer are an assembly. **DO NOT** separate the seal protector from the rear crankshaft oil seal before installation on engine. Damage to the seal lip will occur if the seal protector is removed and installed prior to installation on engine.

1. Carefully position the oil seal, retainer and seal protector on crankshaft and push firmly into place on engine block (the seal protector will be removed from the rear oil seal assembly as a result of installing the rear oil seal). Hand tighten the rear oil seal fasteners.

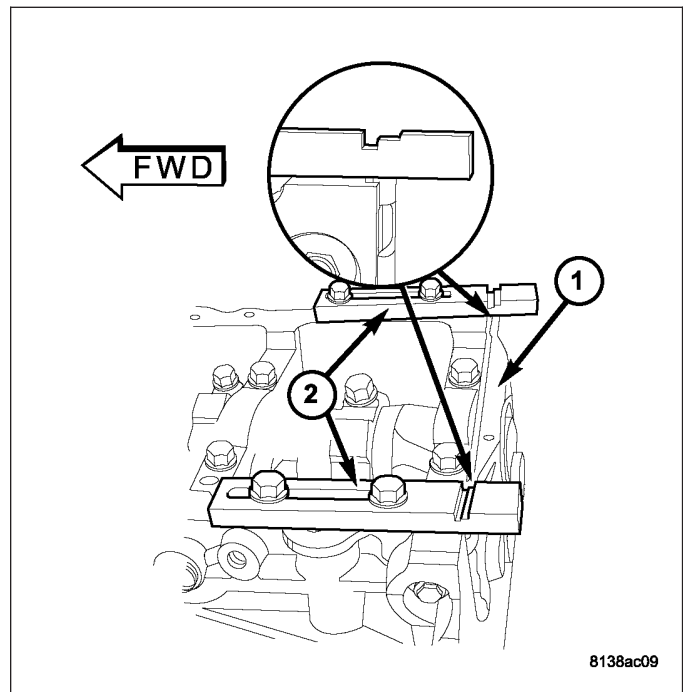


**Note:** The following steps must be performed to prevent oil leaks at sealing joints.

2. Attach Special Tools 8225 (1) to pan rail using the oil pan fasteners.

**Note:** Special Tools 8225 (1), are use to assist with the fit of the flush mount rear main seal retainer. The notch on tool should be located away the seal retainer.

3. While applying firm pressure to the seal retainer against Special Tools 8225 (1), tighten seal retainer screws to 12 N·m (105 in. lbs.).
4. Remove special tool #8225 (1).
5. Install oil pan. Tighten the 6mm fasteners to 12N·m (105 in.lbs.) and the 8mm fasteners to 28N·m (250 in.lbs.).
6. Install the flex plate and transmission.

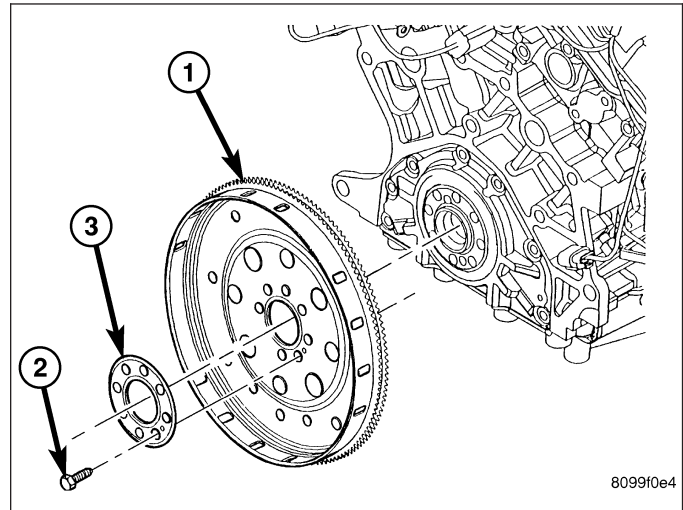




## FLEX PLATE

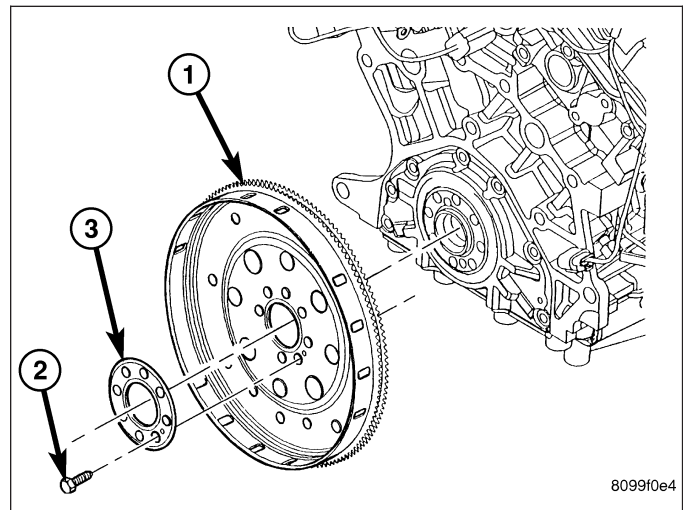
### REMOVAL

1. Remove the transmission.
2. Remove flex plate attaching bolts (2).
3. Remove the flex plate (1).



### INSTALLATION

1. Position flex plate (1) with backing plate (3) on the crankshaft.
2. Apply Mopar® Lock & Seal Adhesive to the flex plate bolts (2).
3. Install flex plate bolts (2). Tighten bolts to 95 N-m (70 ft. lbs.).
4. Install the transmission.



## PISTON & CONNECTING ROD

### DESCRIPTION

The pistons are made of a high strength aluminum alloy. Top land height has been decreased to reduce emissions. Piston skirts are coated with a solid lubricant for scuff resistance. Connecting rod is forged steel with a fractured connecting rod cap design. The connecting rod is also equipped with a squirt hole and attaches to the piston with a full floating pin retained by lock rings.

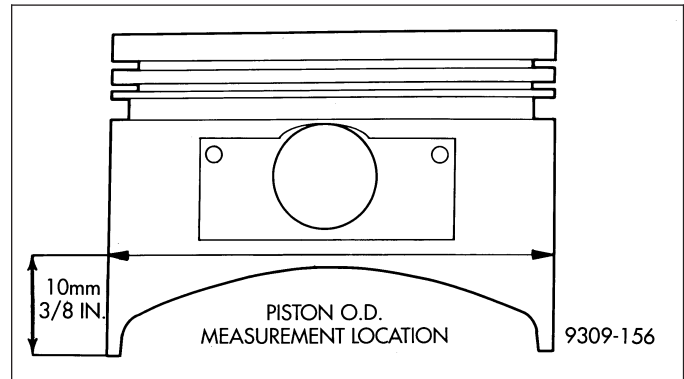
### OPERATION

The piston and connecting rod assembly is the link between the combustion force and the crankshaft.

## STANDARD PROCEDURE - FITTING PISTONS

The pistons are machined to two different weight specifications and matched to rods based on weight. All piston and rod assemblies weigh the same to maintain engine balance.

Piston and cylinder wall must be clean and dry. Piston diameter should be measured 90 degrees to piston pin at size location shown in. Cylinder bores should be measured halfway down the cylinder bore and transverse to the engine crankshaft center line (Refer to 9 - ENGINE - SPECIFICATIONS). **Pistons and cylinder bores should be measured at normal room temperature, 70°F (21°C).**

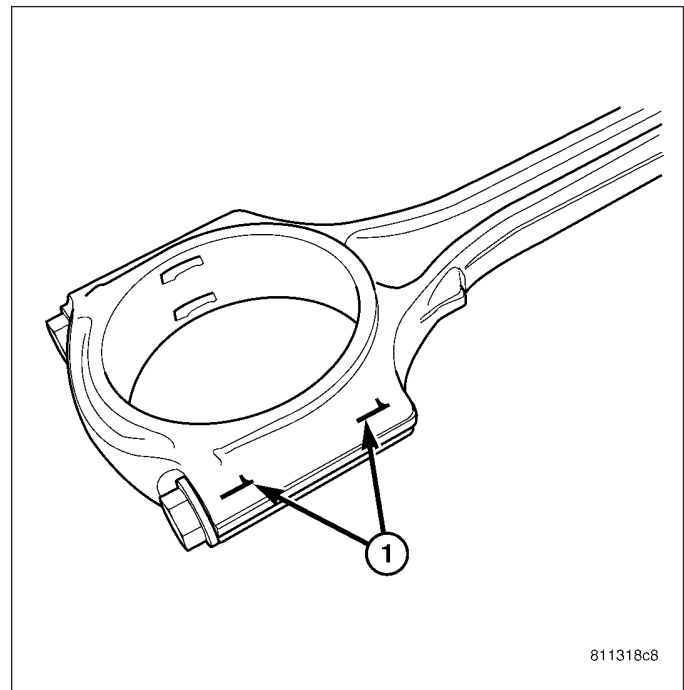


## REMOVAL

1. Remove the cylinder heads (Refer to 9 - ENGINE/ CYLINDER HEAD - REMOVAL)
2. Remove the oil pan. (Refer to 9 - ENGINE/LUBRI- CATION/OIL PAN - REMOVAL)
3. Remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation. Pistons and connecting rods must be removed from top of cylinder block. When removing piston and connecting rod assemblies from the engine, rotate crankshaft so that each connecting rod is centered in cylinder bore.**

**CAUTION: DO NOT stamp the connecting rods for cylinder identification**

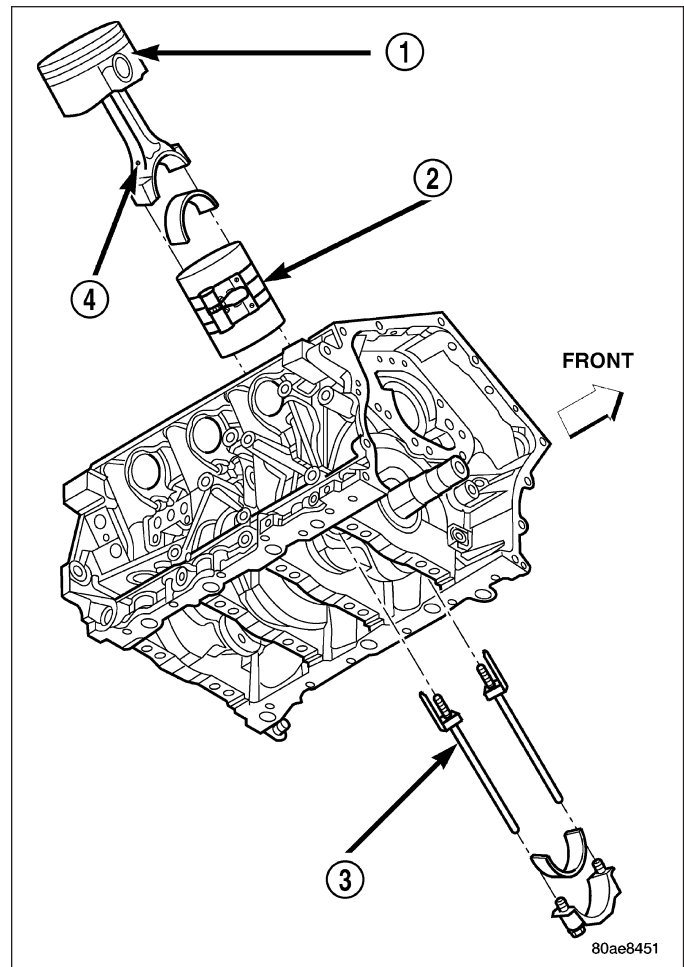
4. Inspect connecting rods and connecting rod caps for cylinder identification. Identify them with a paint mark or scribe, if necessary.



5. Remove connecting rod cap. Install protectors, special tool 8189, on connecting rod.. Guide each piston and rod assembly out of cylinder bore.

**Note:** Be careful not to nick crankshaft journals.

6. After removal, install bearing cap on the mating rod.

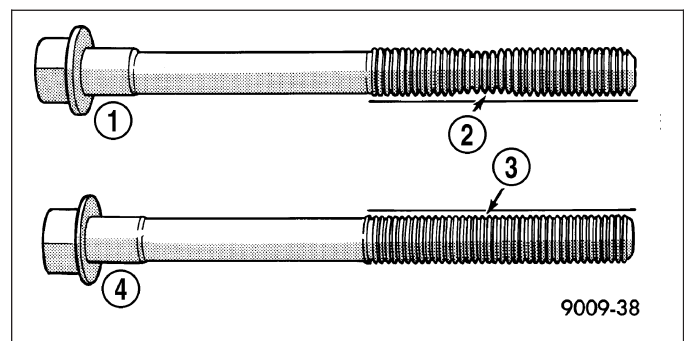


## INSTALLATION

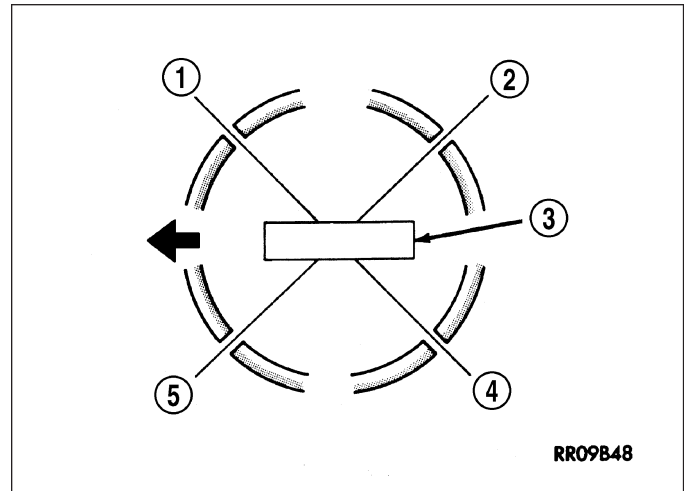
1. Install the piston rings. (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - INSTALLATION)

**Note:** The connecting rod bearing cap bolts must be examined before reuse. If the threads are necked down, the bolts must be replaced.

2. Check connecting rod bolts for necking by holding a scale or straight edge against the threads. If all threads do not contact the scale, the bolt must be replaced.

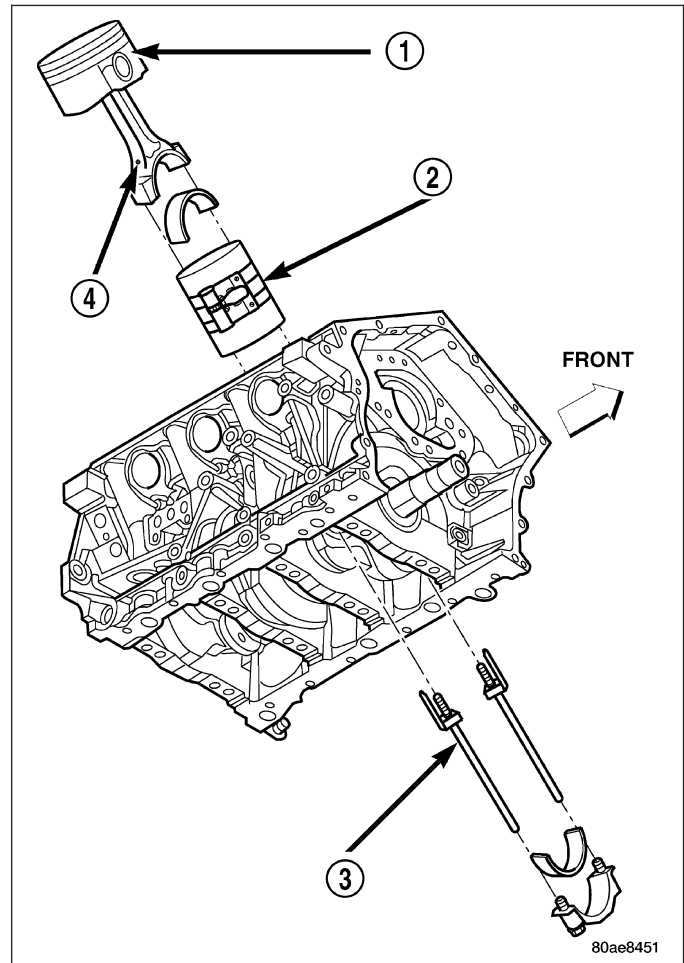


3. Before installing pistons and connecting rod assemblies into the bore, ensure that compression ring gaps are staggered so that neither is in line with oil ring rail gap.

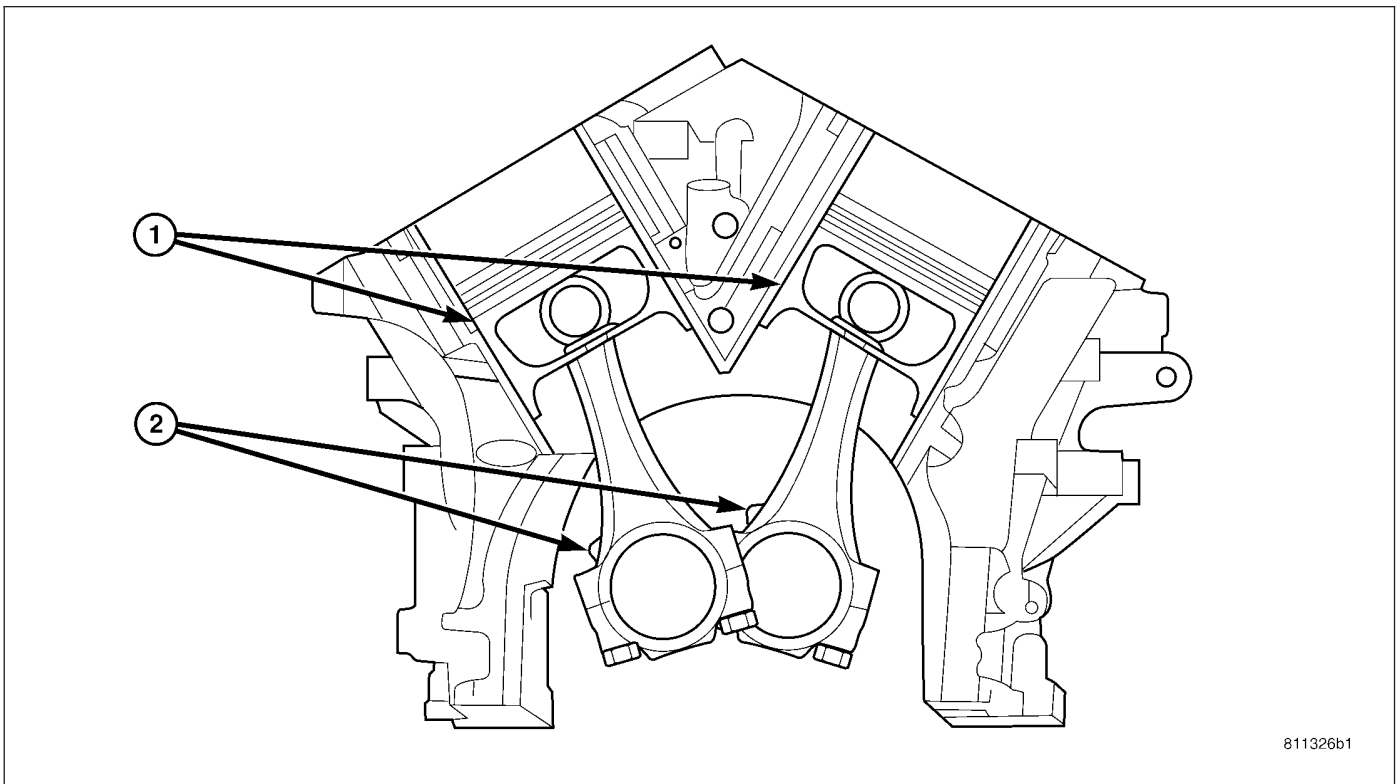
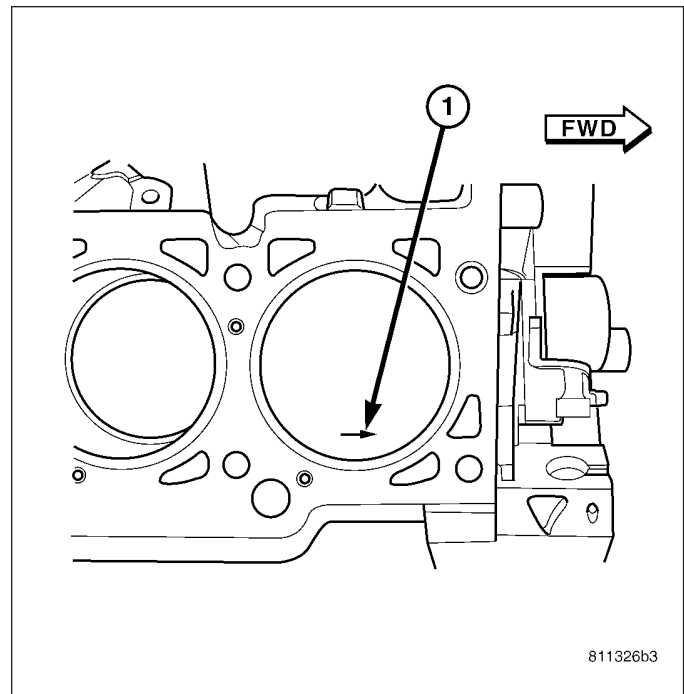


4. Immerse the piston head and rings in clean engine oil, slide the ring compressor over the piston and tighten with the special wrench. **Ensure position of rings does not change during this operation.**
5. Install connecting rod bolt protectors, special tool # 8189.
6. Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Insert the rod and piston into cylinder bore and guide the rod over the crankshaft journal.

**CAUTION: Do Not interchange piston assemblies cylinder-to-cylinder or bank-to-bank.**



7. The arrow on top of piston must be pointing toward front of engine.



**CAUTION:** View of connecting rod oil squirt hole is from the front of the engine.

8. The oil squirt hole on connecting rod faces the major thrust (right) side of the cylinder bore.
9. Tap the piston down in cylinder bore, using a hammer handle. At the same time, guide connecting rod into position on connecting rod journal.

**Note:** Connecting rod bolts must be lubricated with clean engine oil.

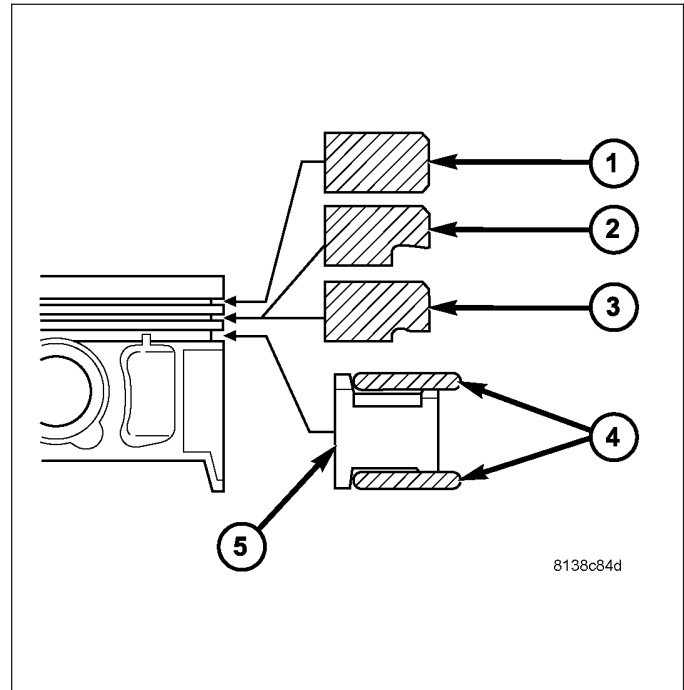
10. Install the rod caps. Install cleaned and inspected connecting rod bolts and tighten to 27 N·m (20 ft. lbs.) Plus 1/4 turn.

11. Install the cylinder head(s) (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION)
12. Install the oil pan. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION.)

## PISTON RINGS

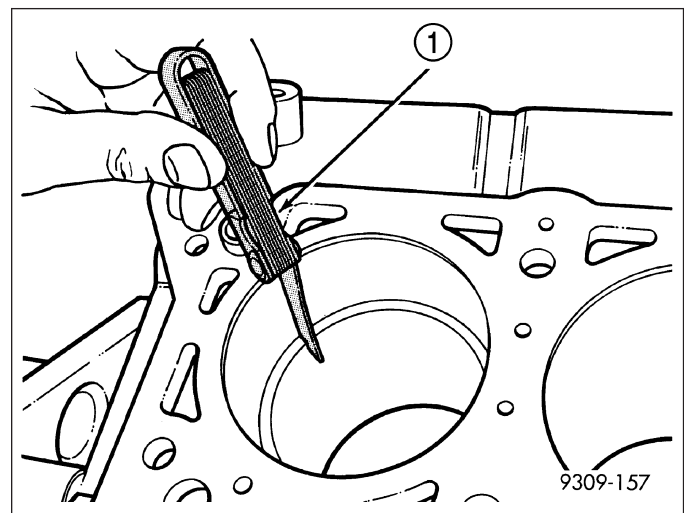
### DESCRIPTION

The piston rings include a moly-filled top ring with a symmetric barrel face. The intermediate piston ring is of the standard chrome design OR Micro-Napier design. The Micro-Napier design has a reduced “hook” on the running face, removes the need for chroming and improves oil economy. The oil control package consists of two steel rails and an expander spacer.

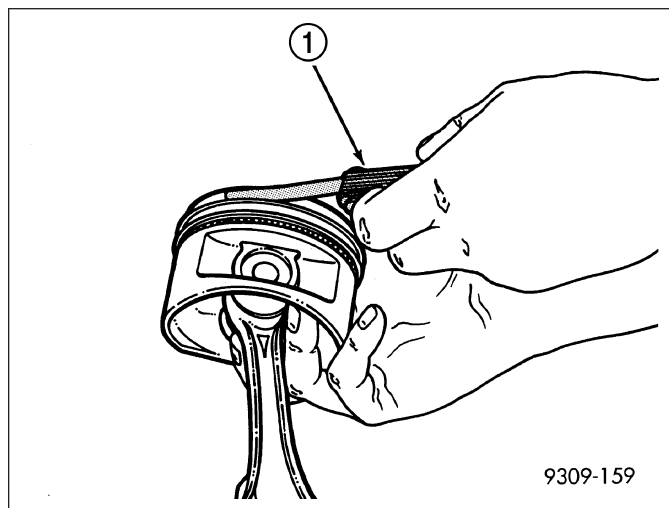


### STANDARD PROCEDURE - PISTON RING FITTING

1. Wipe cylinder bore clean. Insert ring and push down with piston to ensure it is square in bore. The ring gap measurement must be made with the ring positioning at least 12 mm (0.50 in.) from bottom of cylinder bore. Check gap with feeler gauge. For clearance specifications, (Refer to 9 - ENGINE - SPECIFICATIONS).

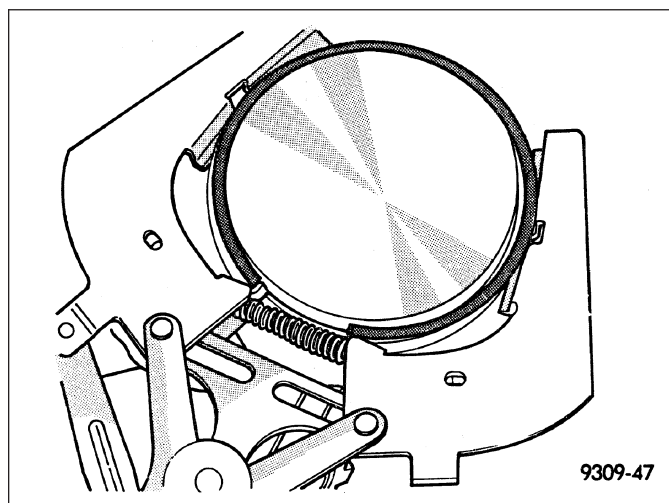


2. Check piston ring to groove clearance:. For clearance specifications, (Refer to 9 - ENGINE - SPECIFICATIONS).

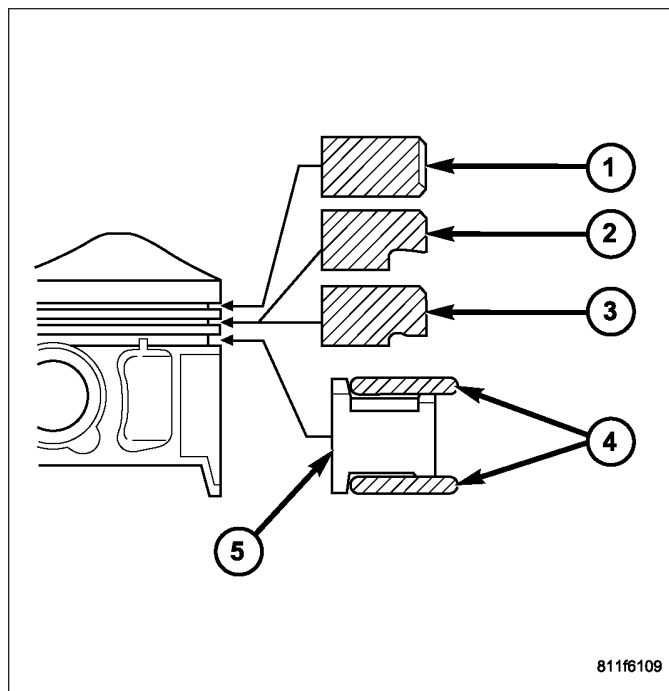


## REMOVAL

1. Remove piston and connecting rod. (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON & CONNECTING ROD - REMOVAL)
2. Remove No. 1 and No.2 piston rings from piston using a ring expander tool.



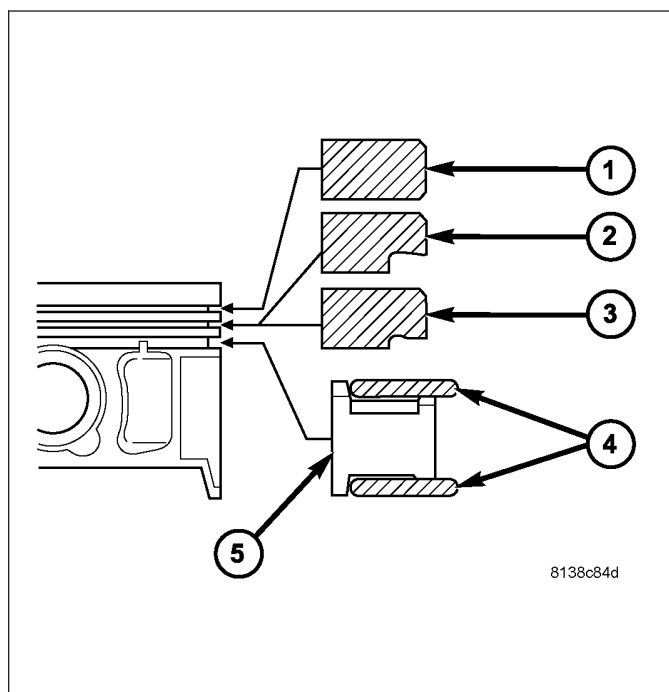
3. Remove upper oil control ring side rail.
4. Remove lower oil control ring side rail.
5. Remove oil control ring expander



## INSTALLATION

1. Measure clearance of piston rings to the cylinder bore and piston. (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - STANDARD PROCEDURE)

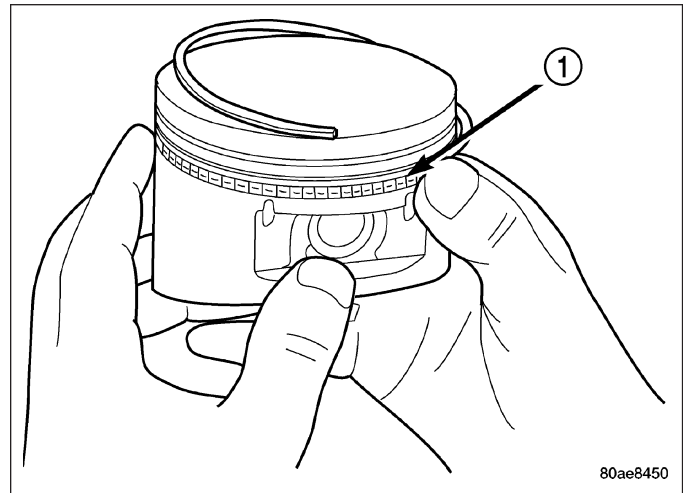
The No. 1 and No. 2 piston rings have a different cross section. Insure that which ever design No. 2 ring is installed, it is installed with manufacturers I.D. mark (dot) facing up, towards top of the piston (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - DESCRIPTION).





**CAUTION:** Install piston rings in the following order:

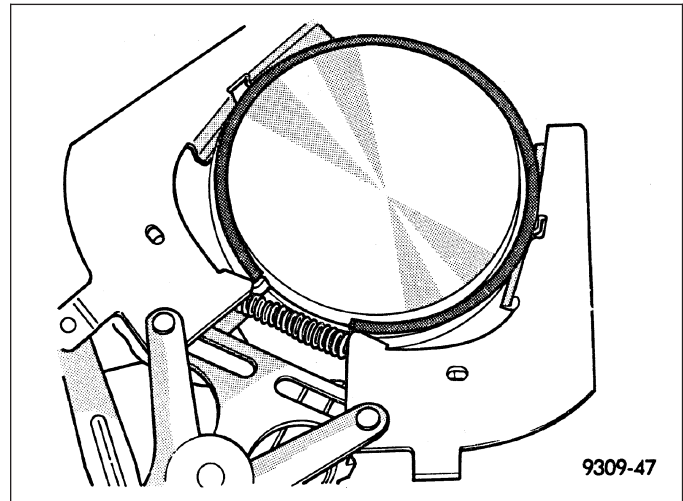
- Oil ring expander.
  - Lower oil control ring side rail.
  - Upper oil control ring side rail.
  - No. 2 Intermediate piston ring.
  - No. 1 Upper piston ring.
2. Install the side rail by placing one end between the piston ring groove and the spacer. Hold end firmly and press down the portion to be installed until side rail is in position. **Do not use a piston ring expander tool during this step.**



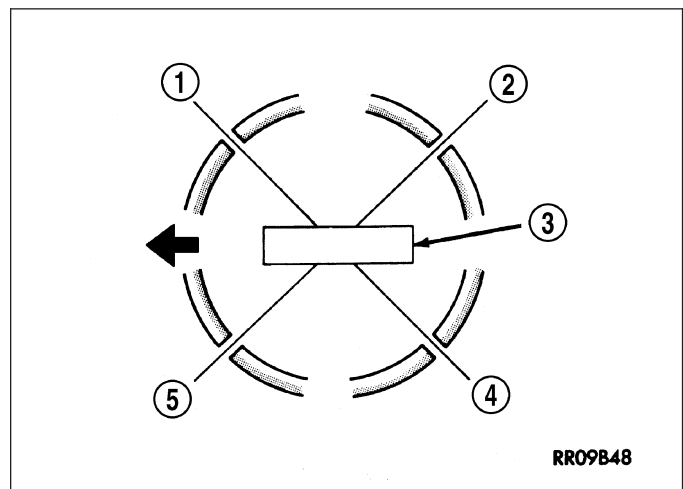
3. Install lower side rail first and then the upper side rail.

The No. 1 and No. 2 piston rings have a different cross section. Insure that which ever design No. 2 ring is installed, it is installed with manufacturers I.D. mark (dot) facing up, towards top of the piston (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - DESCRIPTION).

4. Install No. 2 piston ring and then No. 1 piston ring.



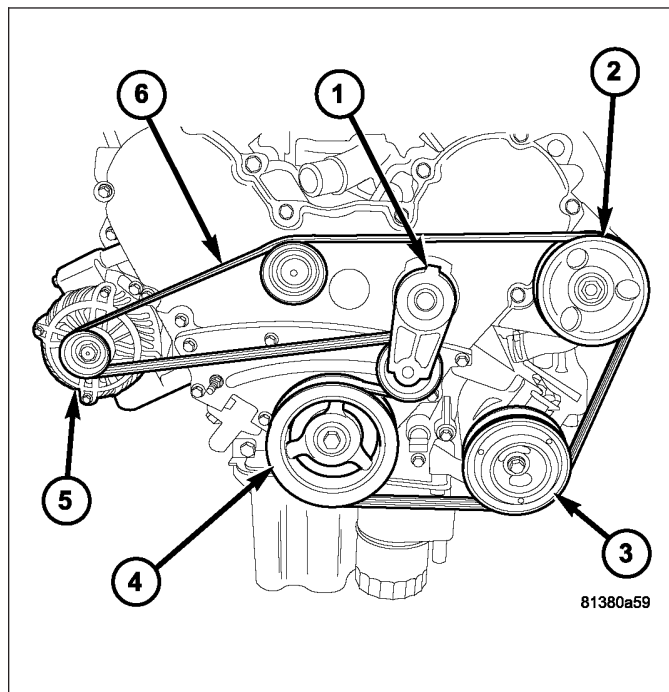
5. Position piston ring end gaps as shown in.
6. Position oil control ring expander gap at least 45° from the side rail gaps but **not** on the piston pin center or on the thrust direction. Staggering ring gap is important for oil control.



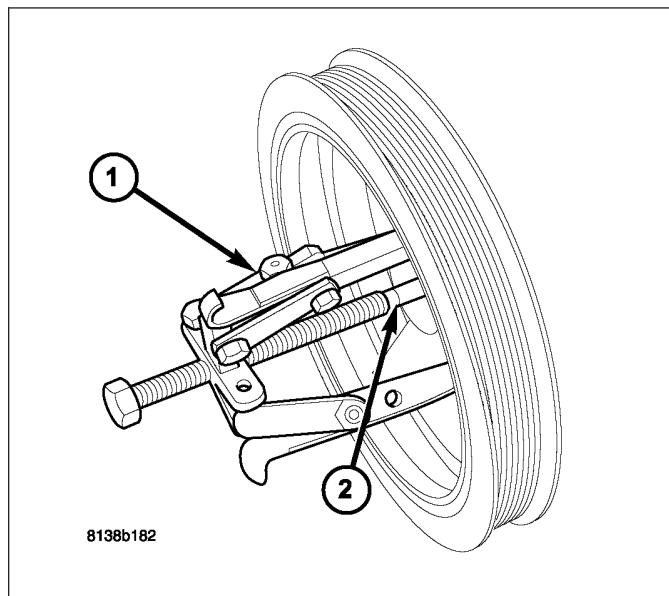
## VIBRATION DAMPER

### REMOVAL

1. Disconnect negative battery cable.
2. Remove the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
3. Raise vehicle on hoist.

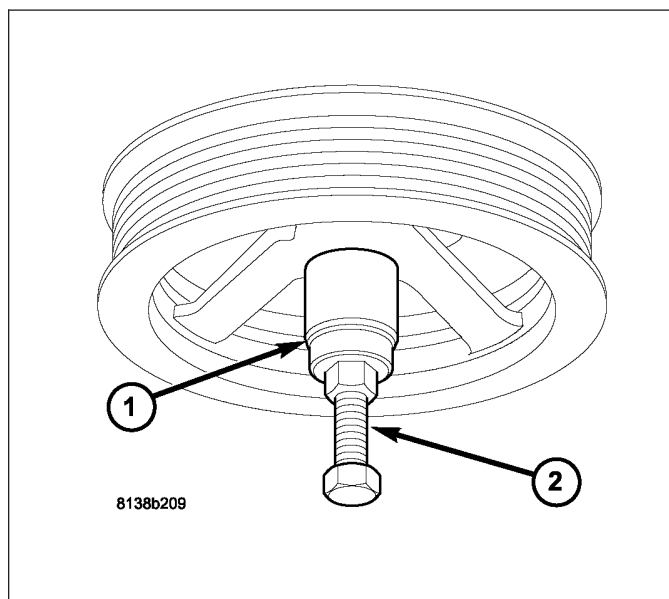


4. Remove crankshaft damper bolt.
5. Use Special Tool 1023 puller, and insert 9020-R, remove crankshaft damper

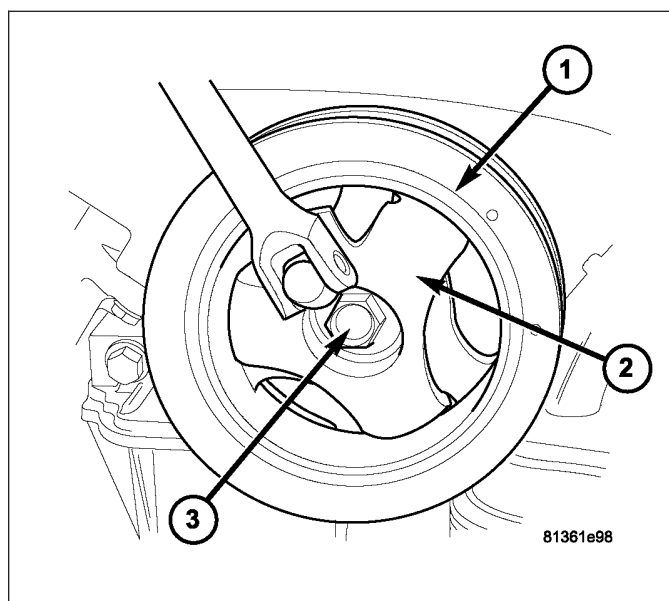


## INSTALLATION

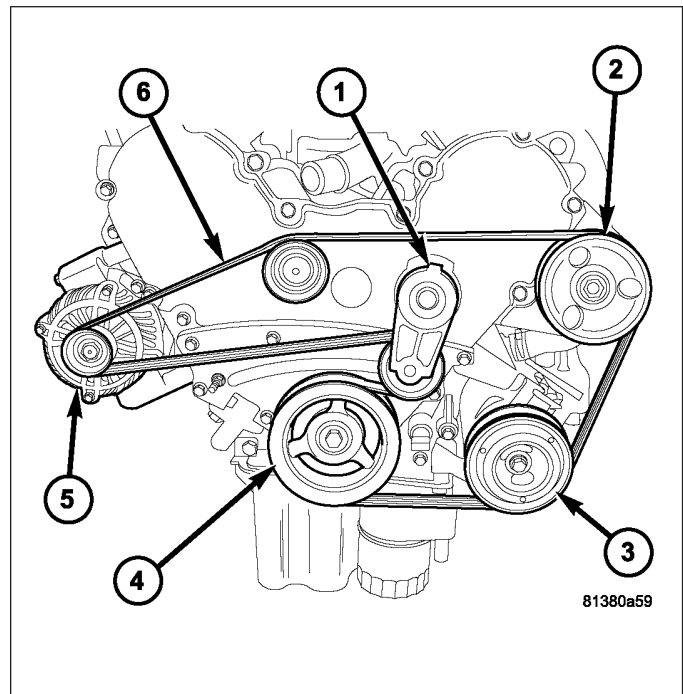
1. Install crankshaft damper using Special Tools C-4685-C1 (5.9 in.) Bolt, with Nut and Thrust Bearing from 6792, and 6792-1 Installer.



2. Install crankshaft damper bolt. Torque bolt to 95 N·m (70 ft. lbs.) while holding damper with Special Tool 9365.
3. Lower vehicle.



4. Install accessory drive belt.
5. Connect negative battery cable.



## ENGINE MOUNTING

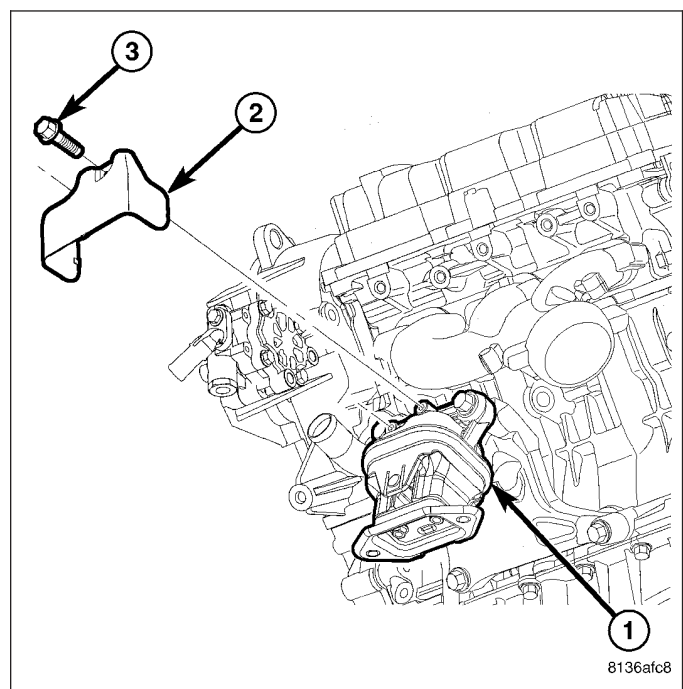
### DESCRIPTION

The engine mounting system are of molded rubber material and consist of two mounts; right and a left side support the powertrain, and control powertrain torque.

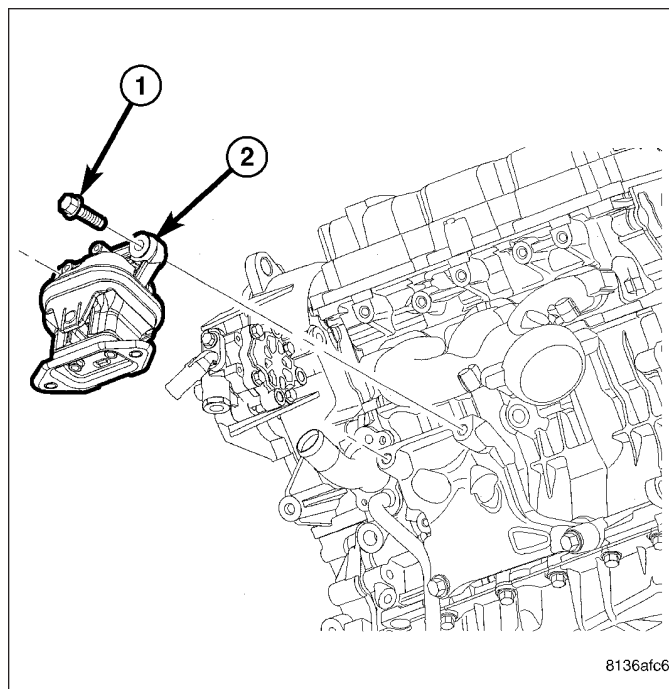
### LEFT MOUNT

#### REMOVAL

1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Remove both engine mount to cradle nuts and remove the left engine mount studs.
4. Using a suitable jack and a block of wood under the oil pan, raise the engine until the weight is off of the mounts (approximately 5mm).
5. Remove the engine mount heat shield.

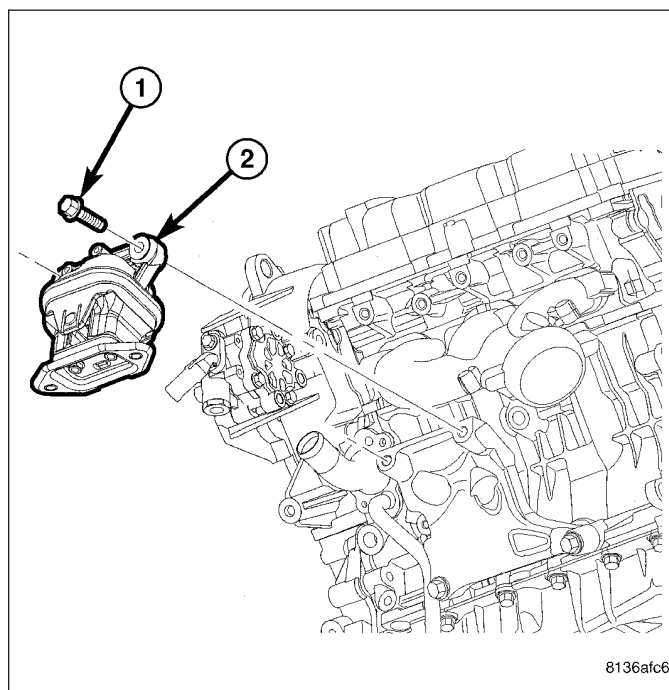


6. Remove the engine mount bolts and remove the mount.

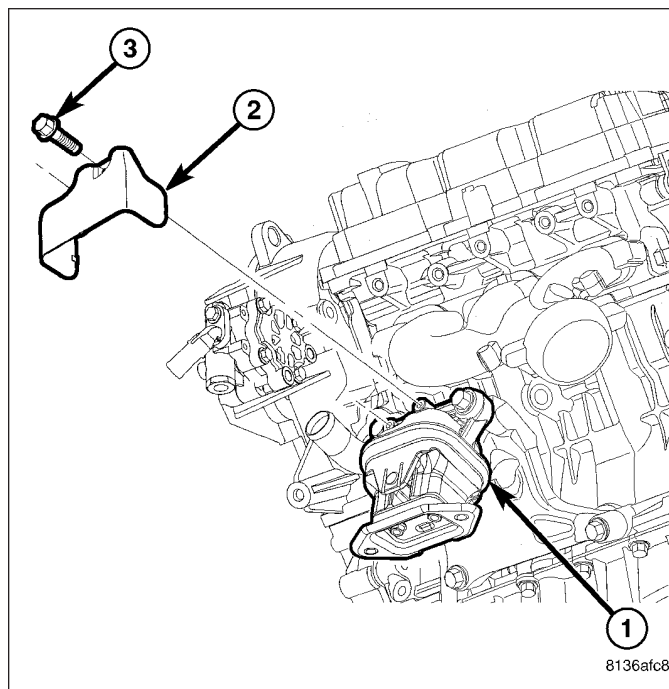


## INSTALLATION

1. Install the left mount (1) to the engine mounting bracket. Hand tighten fasteners.
2. Install and hand tighten the engine mount through studs.
3. Tighten the engine mount to mounting bracket fasteners to 75 N·m ( 55 ft.lbs.).
4. Lower the engine and remove lifting device.
5. Tighten the engine mount through studs to nut to 12 N·m ( 106in.lbs.).



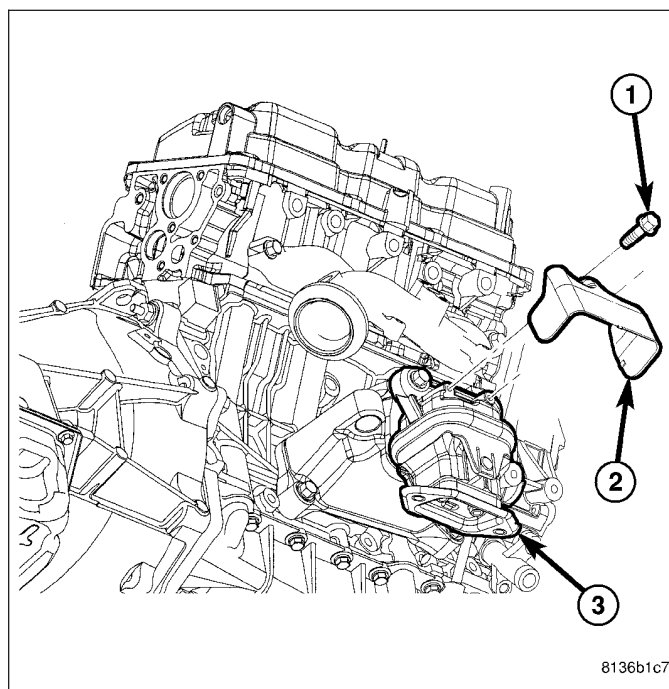
6. Install the engine mount heat shield (2). Tighten fasteners to 11 N·m ( 97 in.lbs.).
7. Install the left engine mount to cradle nuts and tighten both to 75 N·m (55 ft. lbs.).
8. Lower the vehicle.
9. Connect the negative battery cable.



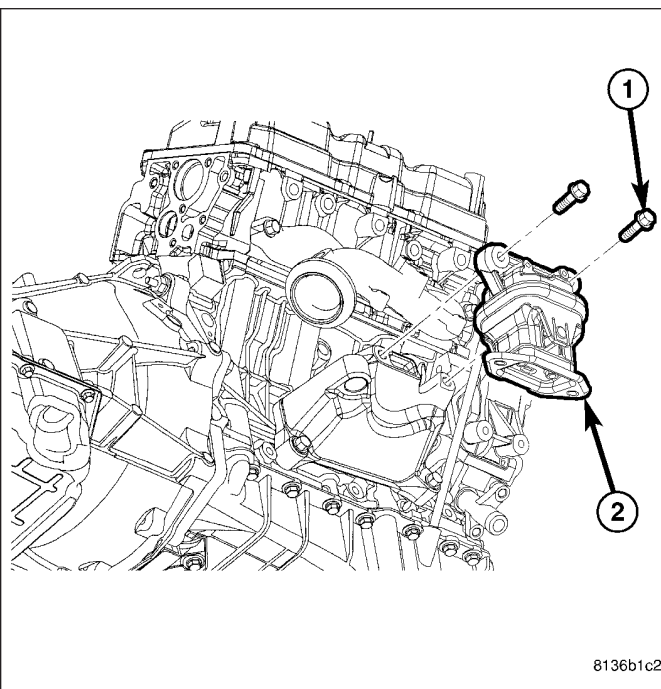
## RIGHT MOUNT

### REMOVAL

1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Remove both of the engine mount to cradle nuts.
4. Remove both of the engine mount through studs.
5. Using a suitable jack stand and a block of wood positioned under the oil pan, raise the engine until the weight is off of the mounts (approximately 5 mm.).
6. Remove the right mount heat shield (2) bolts.

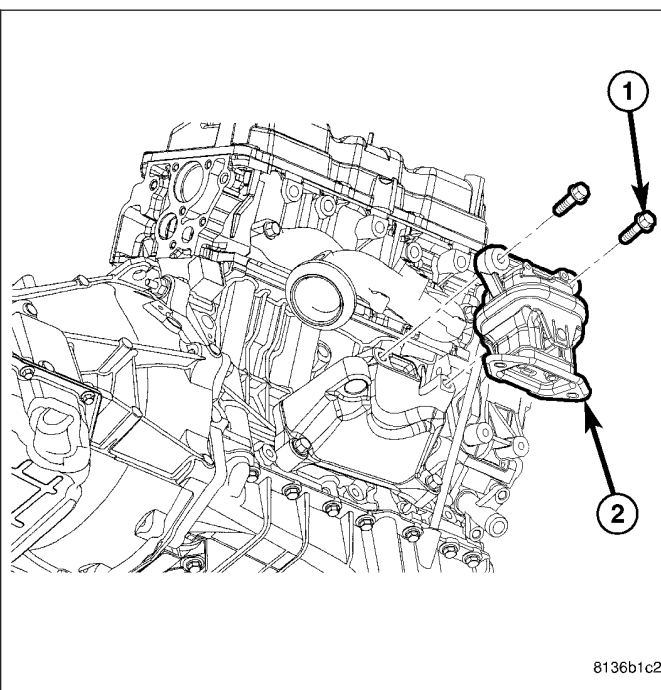


7. Remove the engine mount (2).



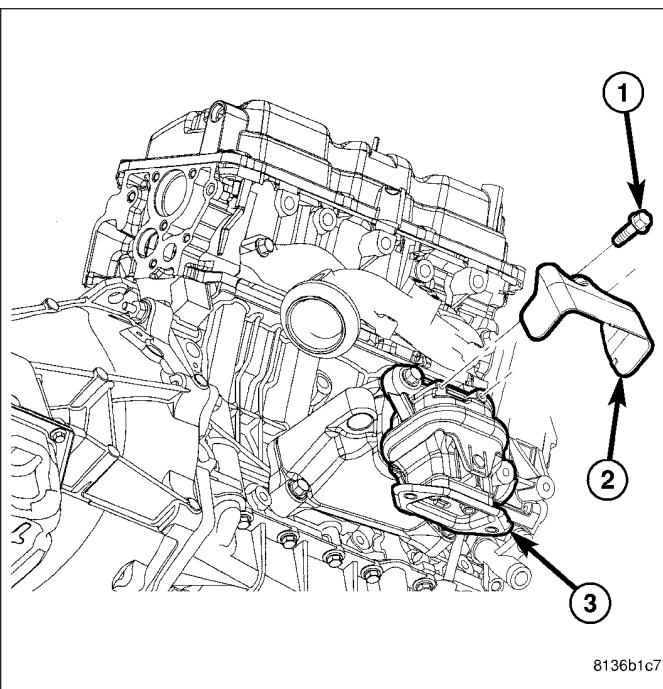
## INSTALLATION

1. Install the engine mount to the engine bracket and hand tighten.. Tighten bolts to 54 N·m (40 lbs. ft.).
2. Install and hand tighten the engine mount through studs.
3. Tighten the engine mount to engine bracket fasteners to 75 N·m (55 lbs. ft.).





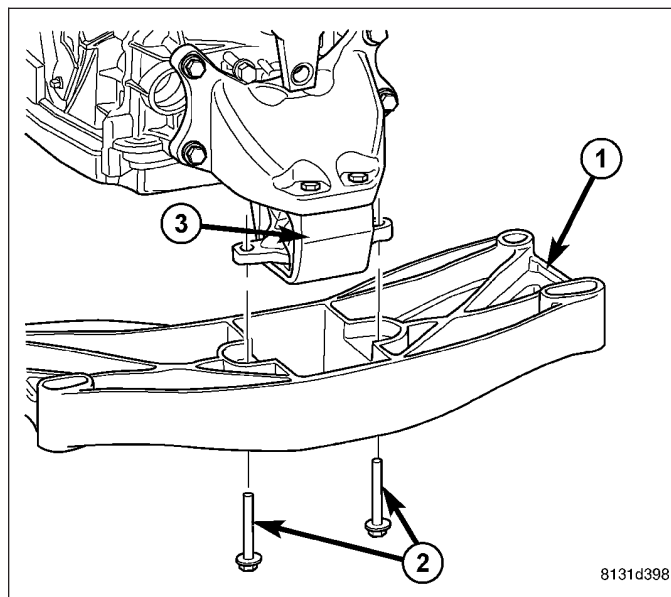
4. Install the engine mount heat shield (2). Tighten the fasteners to 11 N·m (97 in. lbs.).
5. Lower the engine and remove the lifting devise.
6. Tighten the engine mount through studs to 12 N·m (106 in. lbs.).
7. Install the right engine mount to cradle nuts and tighten both engine mount fasteners to 75 N·m (55 lbs. ft.).
8. Lower the vehicle.
9. Connect the negative battery cable.



## REAR MOUNT

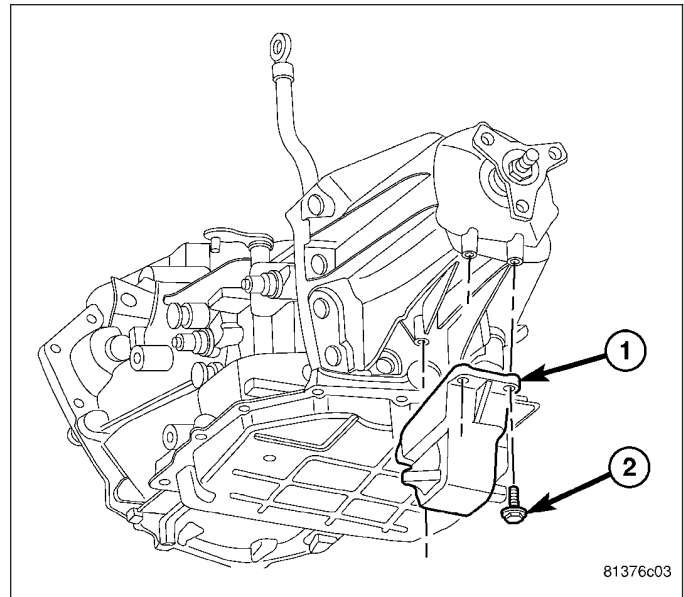
### REMOVAL

1. Raise vehicle on hoist.
2. Remove cross member to mount bolts (2).
3. Place transmission jack under transmission pan and raise transmission.
4. Remove cross member attaching bolts and remove cross member (1).



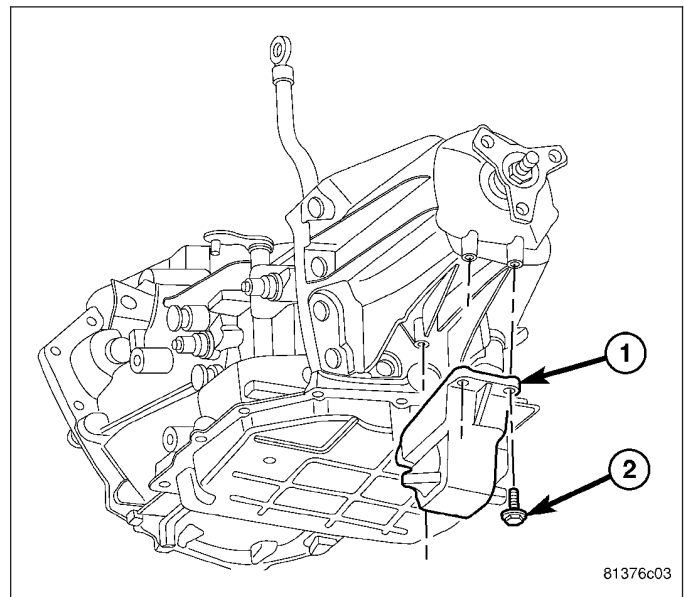


5. Remove mount to transmission bolts (2), remove mount (1).

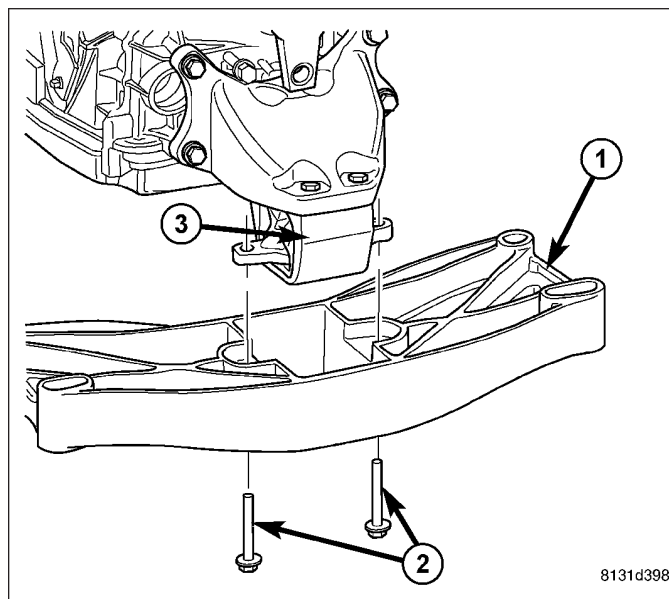


## INSTALLATION

1. Install mount to transmission bolts (2) and tighten to 47 N·m (35 ft.lbs.).

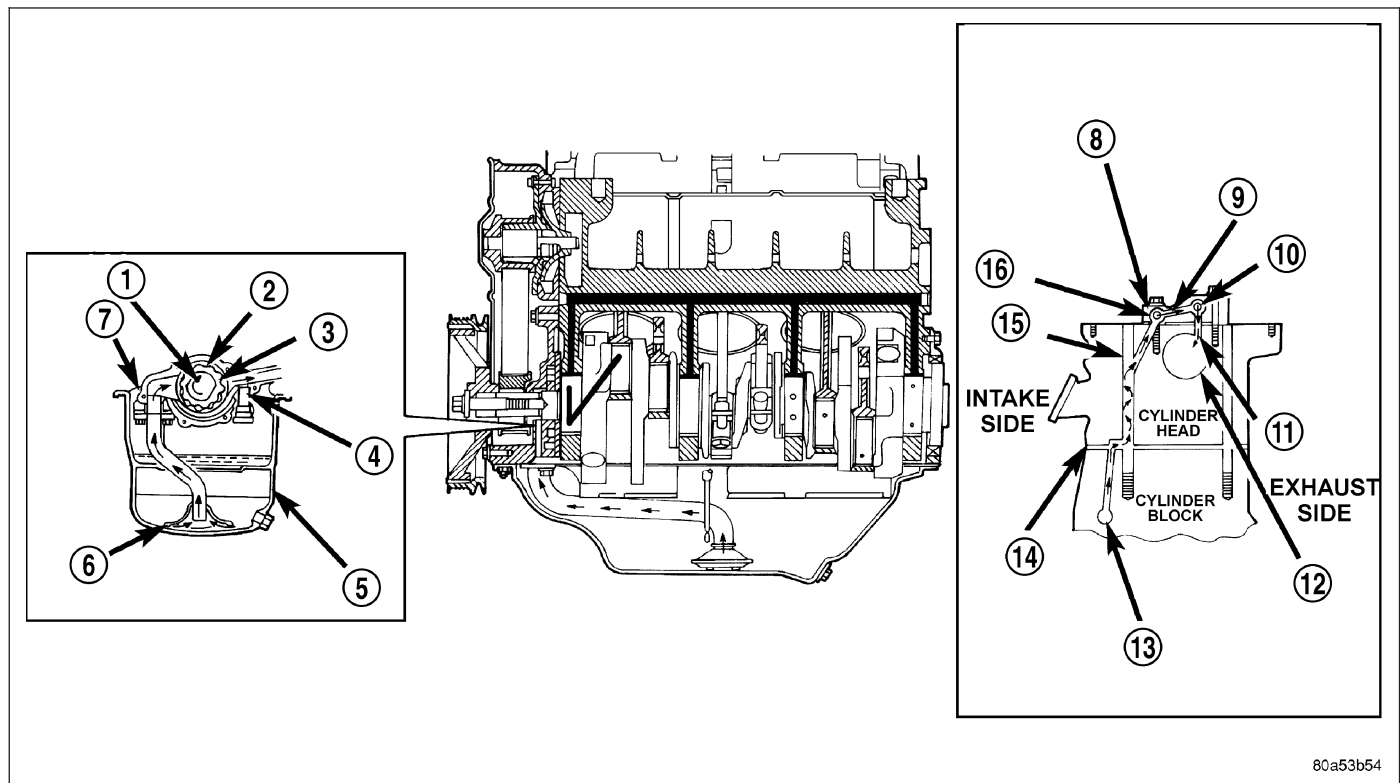


2. Install cross member (1) and attaching bolts. Tighten bolts to 68 N·m (50 ft.lbs.).
3. Lower transmission so cross member to mount bolts (2) can be started tightened by hand.
4. Lower transmission and remove jack.
5. Tighten mount bolts (2) to 47 N·m (39 ft.lbs.).



## LUBRICATION

### DESCRIPTION

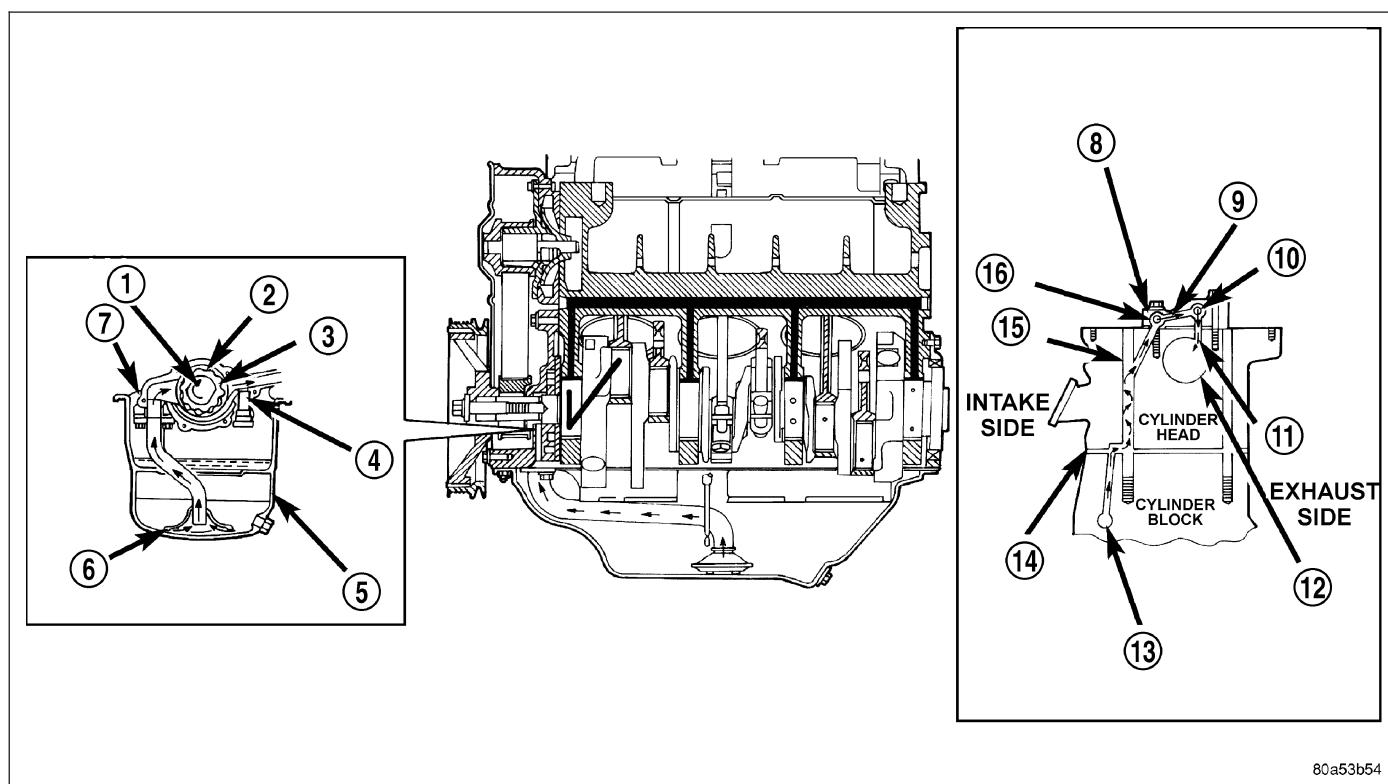


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#### *Oil Lubrication System*

- |   |                                   |
|---|-----------------------------------|
| 1 - CRANKSHAFT  | 9 - PEDESTAL DRILLED PASSAGE      |
| 2 - OUTER ROTOR   | 10 - EXHAUST ROCKER SHAFT         |
| 3 - INNER ROTOR   | 11 - SHAFT/PEDESTAL DOWEL PASSAGE |
| 4 - RELIEF VALVE  | 12 - CAMSHAFT BEARING BORE        |
| 5 - OIL PAN   | 13 - CYLINDER BLOCK OIL GALLERY   |
| 6 - OIL SCREEN  | 14 - CYLINDER HEAD GASKET         |
| 7 - OIL PUMP CASE   | 15 - HEAD BOLT HOLE               |
| 8 - OIL FLOWS TO ONLY ONE PEDESTAL ON EACH HEAD -<br>SECOND FROM REAR ON RIGHT HEAD - SECOND FROM FRONT<br>ON LEFT HEAD | 16 - INTAKE ROCKER SHAFT          |

The oil lubrication system is a full-flow filtration, pressure feed type. The oil pump body is mounted to the engine block. The pump inner rotor is driven by the crankshaft. A windage tray, increases power by minimizing oil windage at high engine RPM. For increased oil cooling, an oil pan mounted, oil-to-coolant oil cooler is used.

**OPERATION**

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***Oil Lubrication System***

- |   |                                   |
|---|-----------------------------------|
| 1 - CRANKSHAFT  | 9 - PEDESTAL DRILLED PASSAGE      |
| 2 - OUTER ROTOR   | 10 - EXHAUST ROCKER SHAFT         |
| 3 - INNER ROTOR   | 11 - SHAFT/PEDESTAL DOWEL PASSAGE |
| 4 - RELIEF VALVE  | 12 - CAMSHAFT BEARING BORE        |
| 5 - OIL PAN   | 13 - CYLINDER BLOCK OIL GALLERY   |
| 6 - OIL SCREEN  | 14 - CYLINDER HEAD GASKET         |
| 7 - OIL PUMP CASE   | 15 - HEAD BOLT HOLE               |
| 8 - OIL FLOWS TO ONLY ONE PEDESTAL ON EACH HEAD -<br>SECOND FROM REAR ON RIGHT HEAD - SECOND FROM FRONT<br>ON LEFT HEAD | 16 - INTAKE ROCKER SHAFT          |

Engine oil stored in the oil pan (5) is drawn in and discharged by a gear rotor type oil pump (2, 3). The oil pump is directly coupled to the crankshaft (1). Oil pressure is regulated by a relief valve (4). The oil is fed through an oil filter and to the crankshaft journals from the oil gallery (8) in the cylinder block. This gallery also feeds oil under pressure to the cylinder heads. Oil flows through each cylinder heads oil passage to the rocker shafts (10, 16). Oil then feeds the camshaft journals (12), rocker arms, and hydraulic lash adjusters.

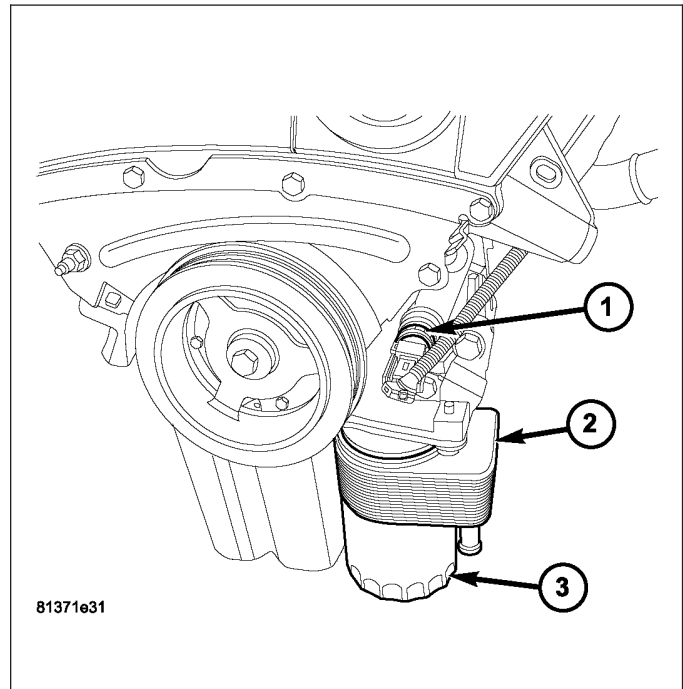
## DIAGNOSIS AND TESTING - CHECKING ENGINE OIL PRESSURE

Check oil pressure using a gauge at oil pressure switch (1) location.

1. Remove the oil pressure switch (1)(Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - REMOVAL).
2. Install oil pressure test gauge, Special Tool C-3292 with Adapter 8406. For Special Tool identification, (Refer to 9 - ENGINE - SPECIAL TOOLS).

**CAUTION: If oil pressure is 0 at idle, Do Not Run engine at 3000 RPM.**

3. Warm engine to normal operating temperature.
4. Monitor gauge readings at idle and 3000 rpm. For specifications (Refer to 9 - ENGINE - SPECIFICATIONS).



## OIL

### DESCRIPTION

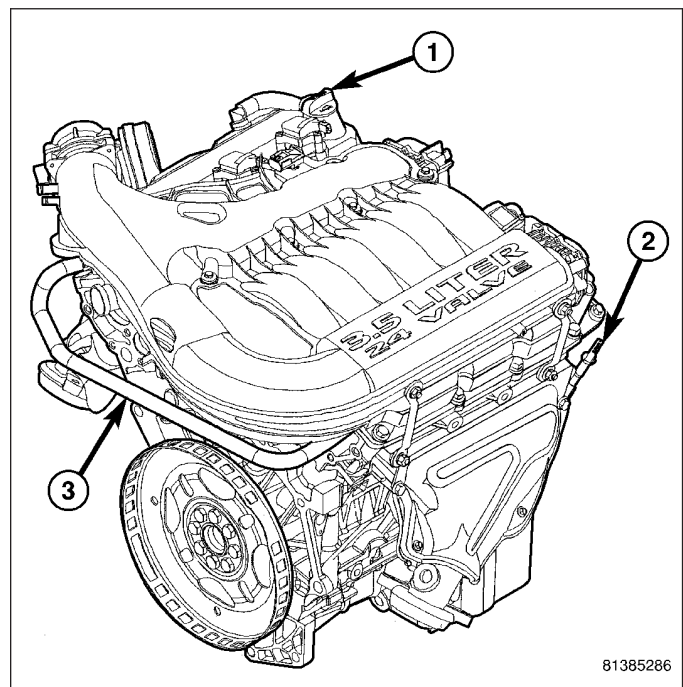
For engine oil type and capacity (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION - ENGINE OIL)

### STANDARD PROCEDURE

#### ENGINE OIL LEVEL CHECK

The best time to check engine oil level (2) is after the engine has sat overnight, or if the engine has been running, allow the engine to be shut off for at least 5 minutes before checking oil level.

Checking the oil (2) while the vehicle is on level ground will improve the accuracy of the oil level reading. Add oil (1) only when the level is at, or below, the ADD mark on the indicator (2).



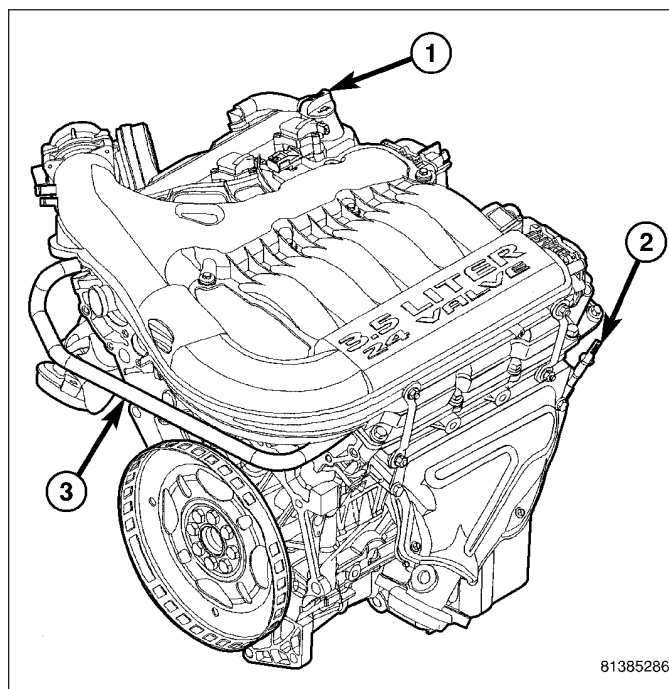
## ENGINE OIL AND FILTER CHANGE

Change engine oil at mileage and time intervals described in the Maintenance Schedule. (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION)

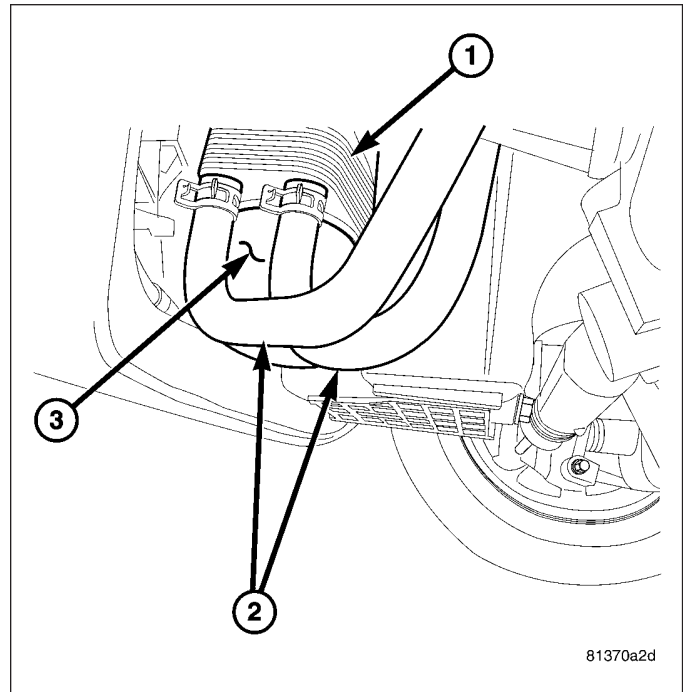
**WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA.**

### TO CHANGE ENGINE OIL

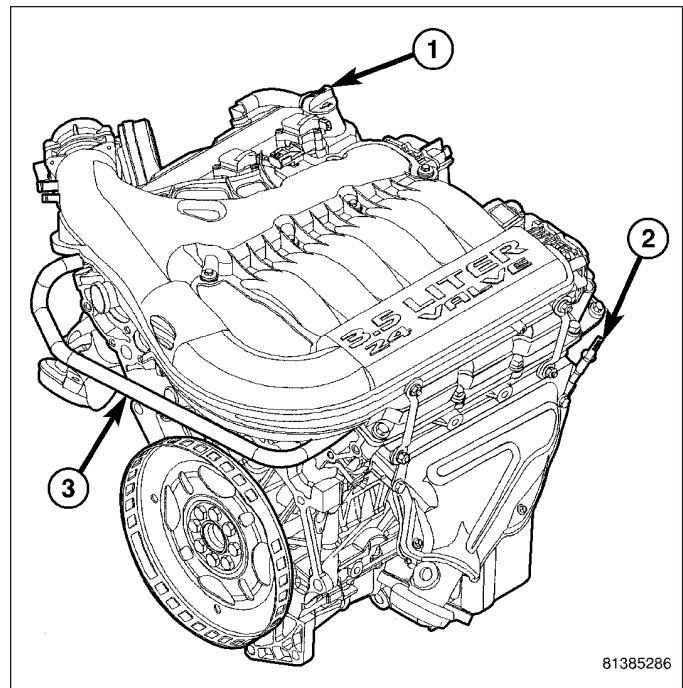
1. Run engine until achieving normal operating temperature.
2. Position the vehicle on a level surface and turn engine off.
3. Open hood, remove engine oil fill cap (1).



4. Raise vehicle on hoist.
5. Place a suitable drain pan under crankcase drain.
6. Remove oil pan drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug and gasket if damaged.
7. Remove oil filter (3).
8. Install drain plug in crankcase. Torque oil pan drain plug to 27 N·m (20 ft. lbs.).
9. Install new oil filter (3).



10. Lower vehicle.
11. Fill crankcase (1) with specified amount and type of engine oil. (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION - ENGINE OIL) (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS)
12. Install oil fill cap (1).
13. Start engine and inspect for leaks.
14. Stop engine and inspect oil level (2).



## OIL FILTER SPECIFICATION

All engines are equipped with a high quality full-flow, disposable type oil filter. When replacing oil filter, use a Mopar® filter or equivalent.

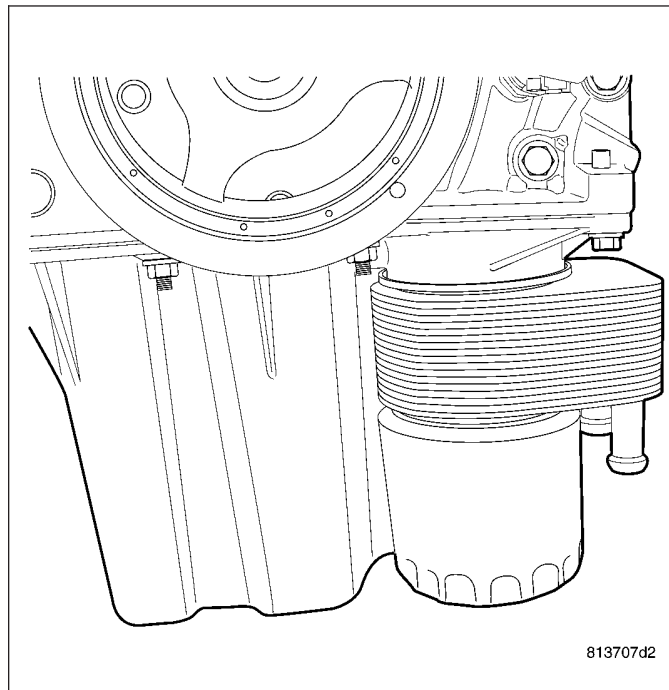
## USED ENGINE OIL DISPOSAL

Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING above.

## ENGINE OIL COOLER

### DESCRIPTION

The engine oil cooler (2) is a oil-to-coolant type and is mounted between the oil filter (3) and the oil pan.

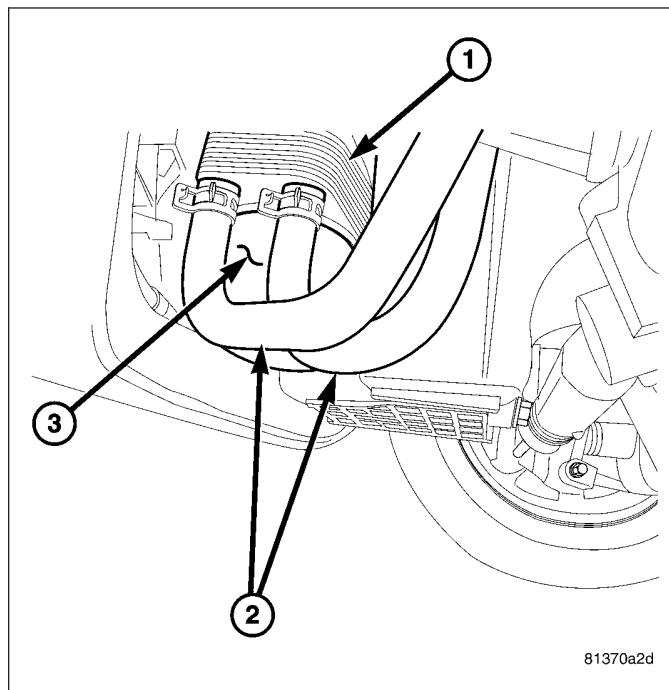


### OPERATION

Engine oil travels from the oil cooler and into the oil filter. Engine oil then exits the filter into the main gallery. Engine coolant flows into the cooler from the heater return tube and exits into the water inlet tube.

### REMOVAL

1. Drain cooling system (Refer to 7 - COOLING/ENGINE/COOLANT - STANDARD PROCEDURE).
2. Raise vehicle on hoist.
3. Disconnect coolant hoses (2) from oil cooler (1).
4. Remove oil filter (3).
5. Remove oil cooler attaching fastener from center of oil cooler (1).
6. Remove oil cooler (1).



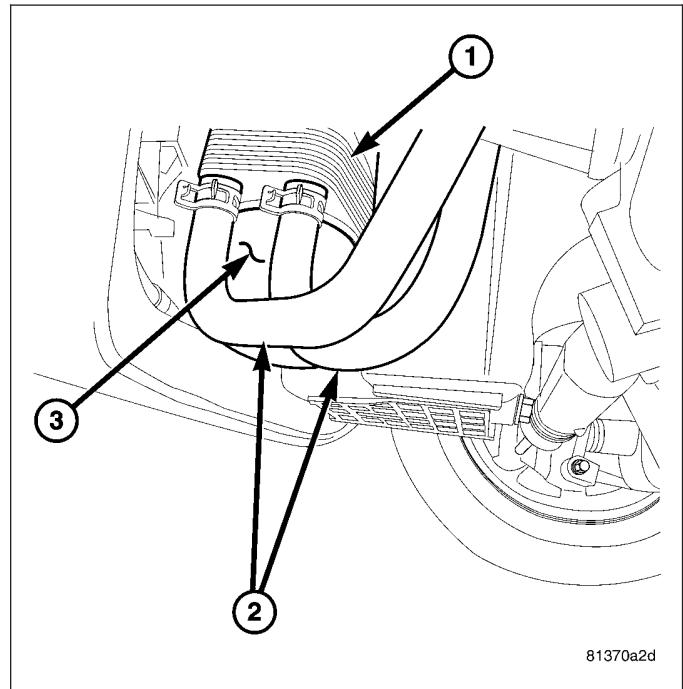


## INSTALLATION

1. Position oil cooler to fitting on oil pan.

**Note:** The cut out section of the oil cooler seal retainer flange (top), must be aligned with the tab on the oil pan. The oil cooler must be prevented from turning during the tightening sequence.

2. Install oil cooler (1) attaching fastener and tighten to 75 N·m (55 ft. lbs.).
3. Install oil filter (3).
4. Connect coolant hoses to oil cooler (2).
5. Fill cooling system (Refer to 7 - COOLING/ENGINE/COOLANT - STANDARD PROCEDURE).

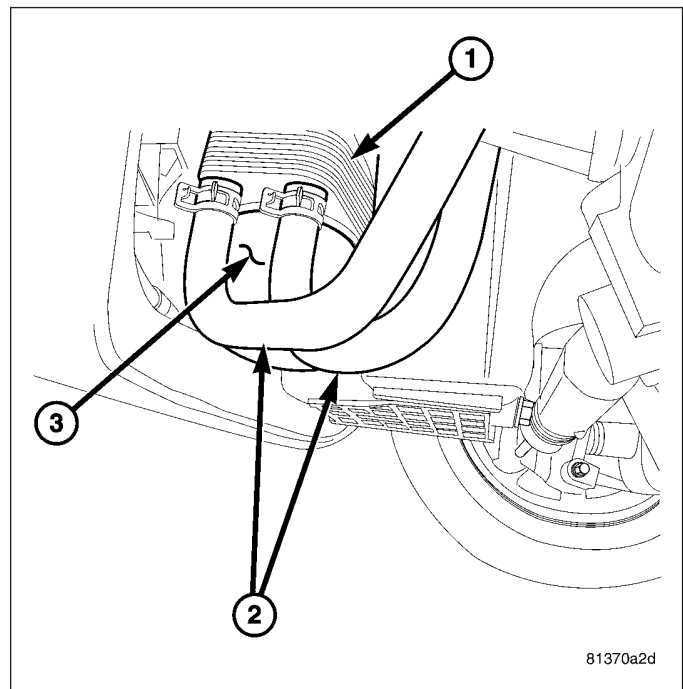


## OIL FILTER

### REMOVAL

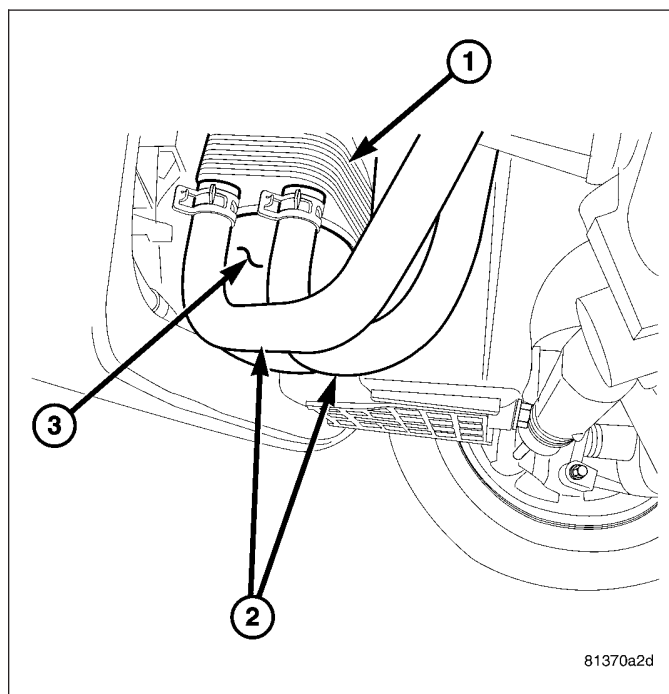
**Note:** When servicing the oil filter, avoid deforming the filter can. Install the remove/install tool band strap against the base lock seam. The lock seam joining the can to the base is reinforced by the base plate.

1. Using a suitable oil filter wrench, unscrew filter (3) from base and discard.



## INSTALLATION

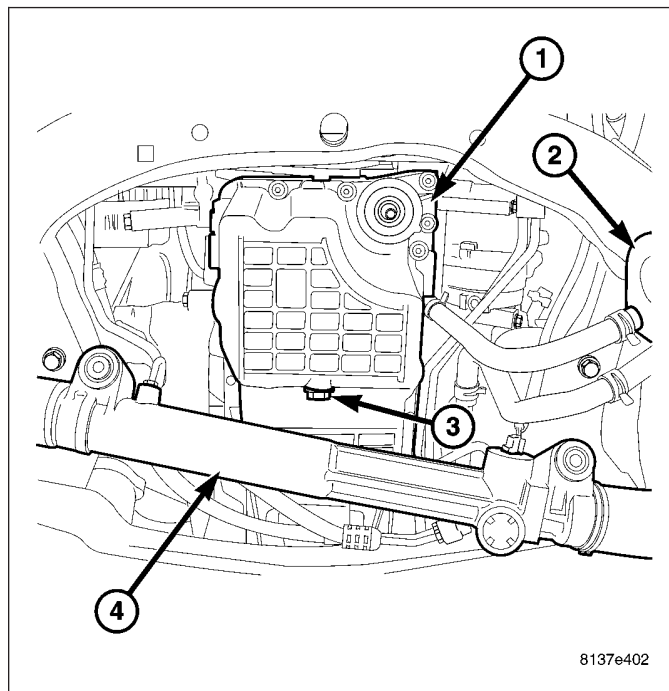
1. Wipe base clean, then inspect gasket contact surface.
2. Lubricate gasket of new filter (2) with clean engine oil.
3. Install and tighten filter to 12 N·m (106 in. lbs.) of torque after gasket contacts base. Use filter wrench if necessary.
4. Start engine and check for leaks.



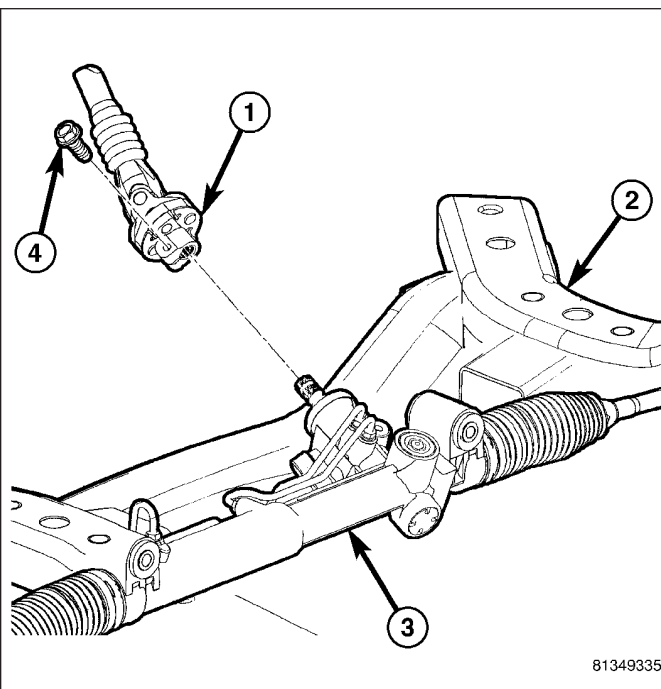
## OIL PAN

### REMOVAL

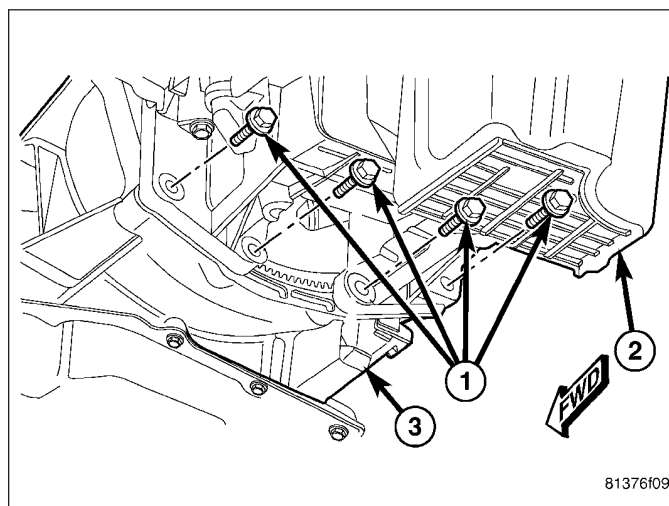
1. Disconnect negative battery cable.
2. Raise and support the vehicle
3. Drain engine oil and remove the oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL - STANDARD PROCEDURE).
4. Remove the oil filter / oil cooler mounting stud and set oil cooler aside (Refer to 9 - ENGINE/LUBRICATION/OIL COOLER & LINES - REMOVAL).



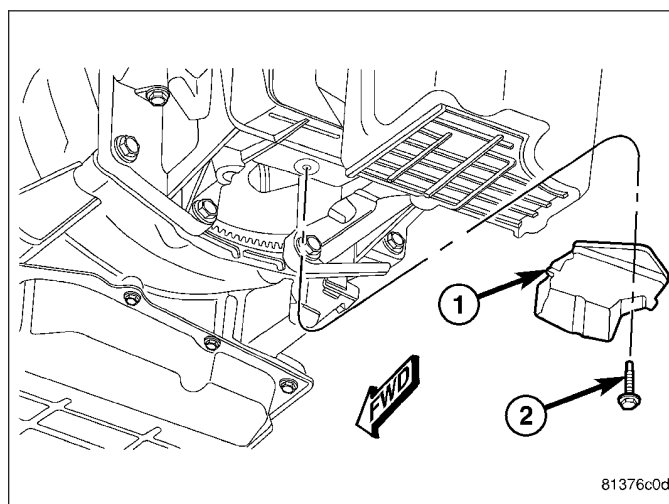
5. Separate the steering column coupler (1) from the steering gear (3).
6. Remove steering gear (3) to cradle mounting bolts and suspend steering gear (3) aside.



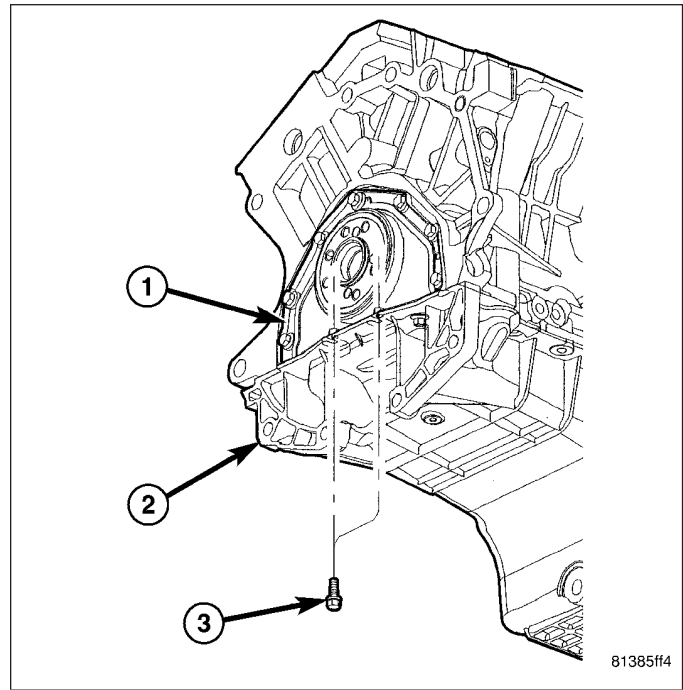
7. Remove the rear oil pan (2) to transmission (3) bolts (1).



8. Remove the flex plate access cover (1).



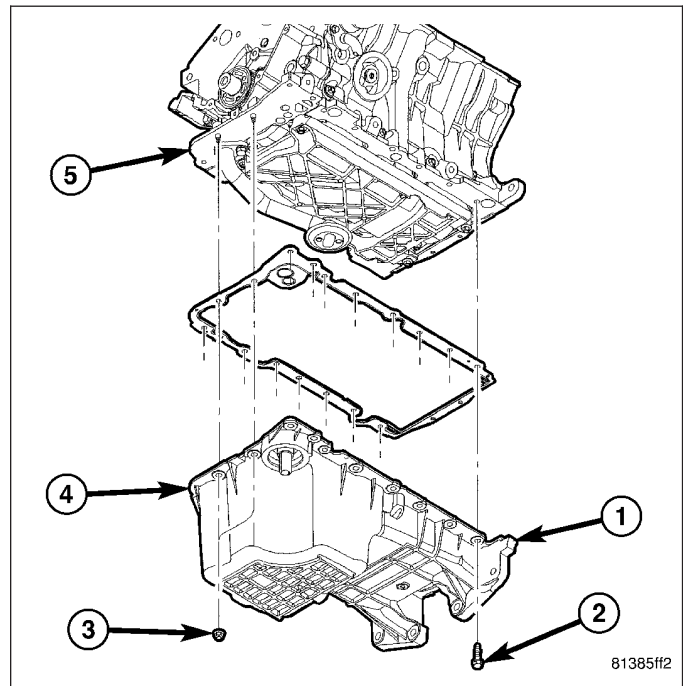
9. Remove the two rear oil pan bolts (3).



10. Remove the remaining oil pan bolts.  
11. Loosen the engine mount bolts at the cradle.  
12. Raise and support the engine using a suitable floor jack with a block of wood at the transmission housing.  
13. Remove the oil pan.

**Note:** A small amount of oil will remain in the oil pan. Use care when removing the oil pan from the engine.

14. Clean all mating surfaces.

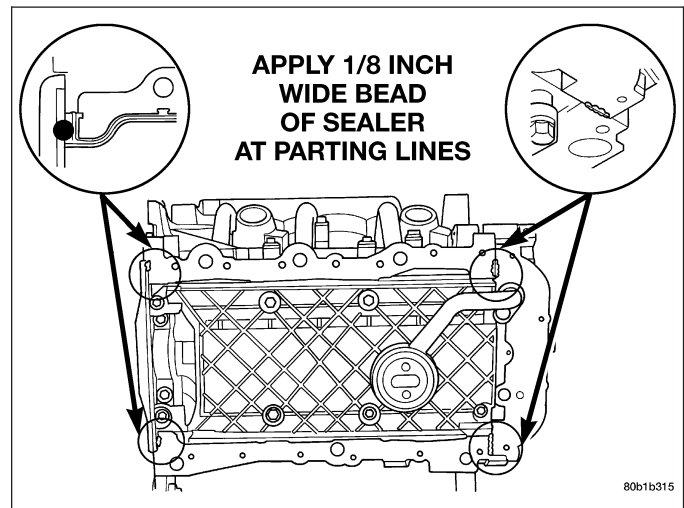


## INSTALLATION

1. Clean oil pan and all gasket surfaces.

**Note:** Assure that the rear face of the oil pan is flush to the transmission bell housing.

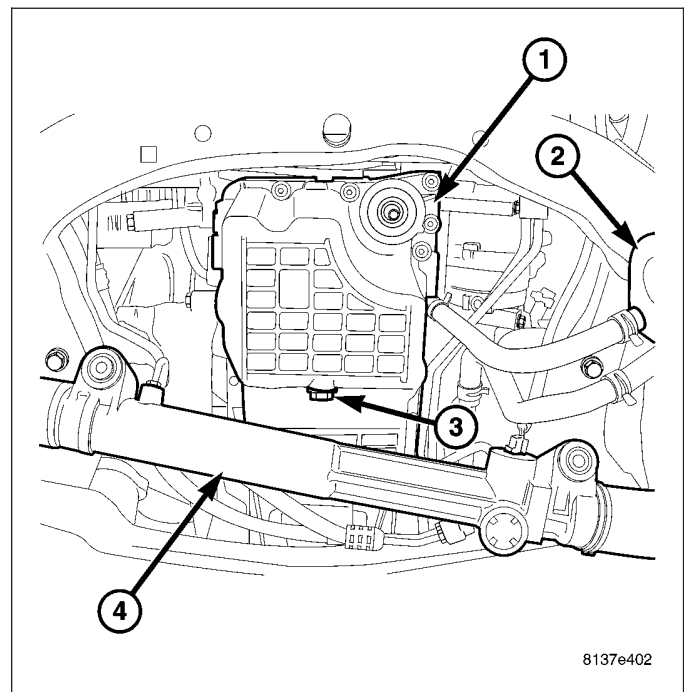
2. Apply a 1/8 inch bead of Mopar® Engine RTV GEN II at the parting line of the oil pump housing and the rear seal retainer.



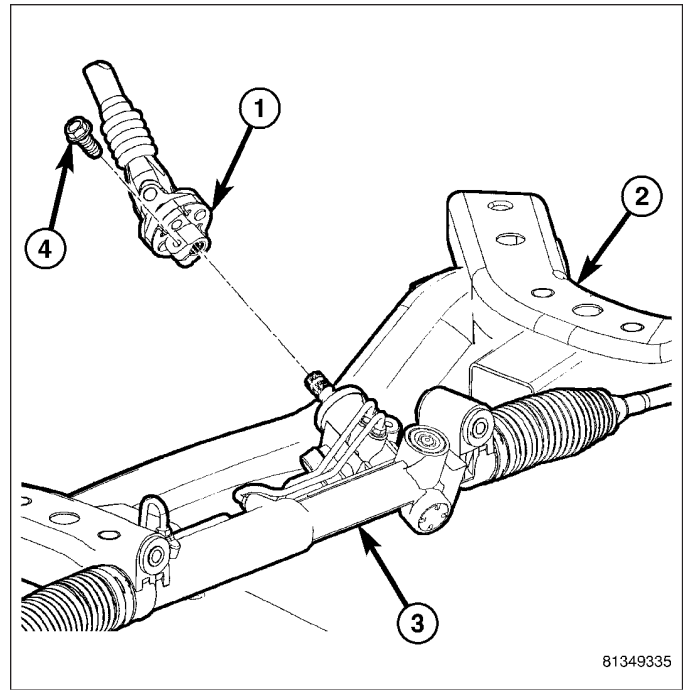
3. Install oil pan gasket to the engine block.

**Note:** Assure that the rear face of the oil pan is flush to the transmission bell housing when installing the oil pan.

4. Install pan and the attaching fasteners finger tight.
5. First tighten the M8 (1, 4) oil pan alignment bolts to 28N·m (250 lbs. in.).
6. Tighten the remaining M6 bolts to 12 N·m (105 in. lbs.) and M8 bolts to 28 N·m (250 in. lbs.).
7. Install the engine oil indicator tube.
8. Lower the engine and remove the lifting fixture. Tighten the engine mount to cradle fasteners to 75 N·m (55 in. ft.).
9. Install the flex plate inspection cover and tighten the fastener to 11 N·m (97 in. lbs.).
10. Install the oil cooler and tighten the stud to 54 N·m (40 ft. lbs.).
11. Install the engine oil filter.
12. Install the steering gear to cradle bolts and tighten the fasteners to 70 N·m (95 ft.lbs.).



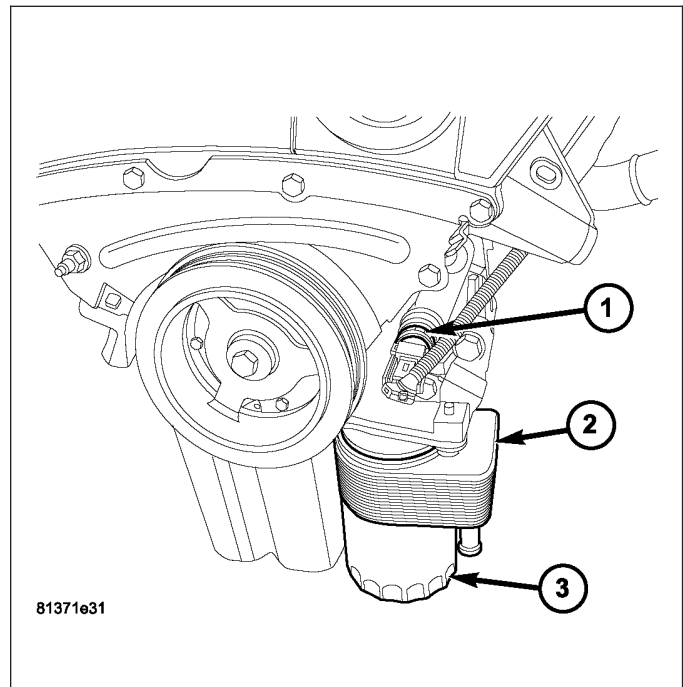
13. Connect the steering gear coupler and tighten the fastener to 30 N·m (22 ft. lbs.)
14. Lower the vehicle.
15. Fasten the upper oil indicator tube.
16. Fill engine crankcase with proper oil to correct level.
17. Connect negative battery cable.



## SWITCH-OIL PRESSURE SENSOR

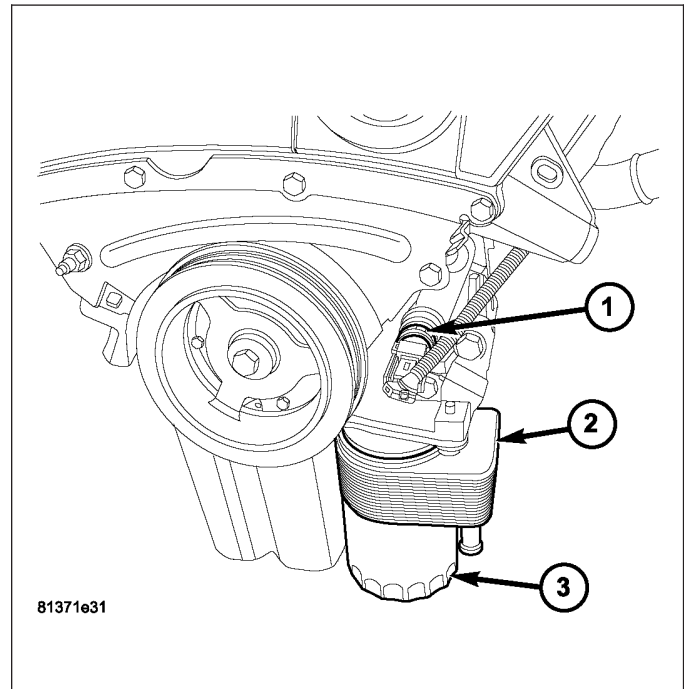
### REMOVAL

1. Raise vehicle on hoist.
2. Position an oil collecting container under switch location.
3. Disconnect electrical connector.
4. Unscrew oil pressure switch (1).



## INSTALLATION

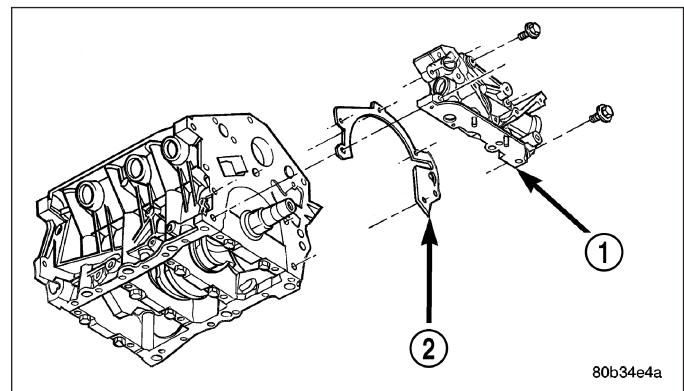
1. Apply Mopar® Thread Sealant to the switch (1) threads.
2. Install oil pressure switch (1) to fitting.
3. Connect electrical connector.
4. Lower vehicle.
5. Start engine and check for leaks.
6. Check engine oil level and adjust as necessary.



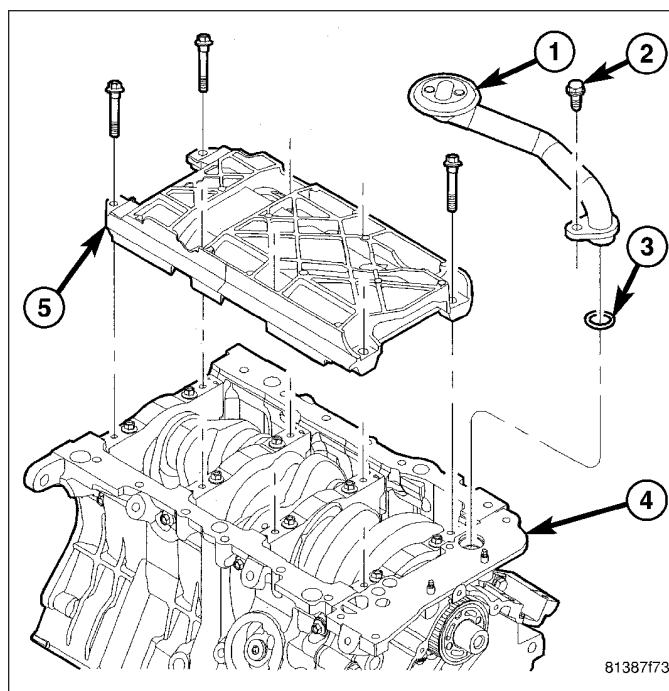
## OIL PUMP

### REMOVAL

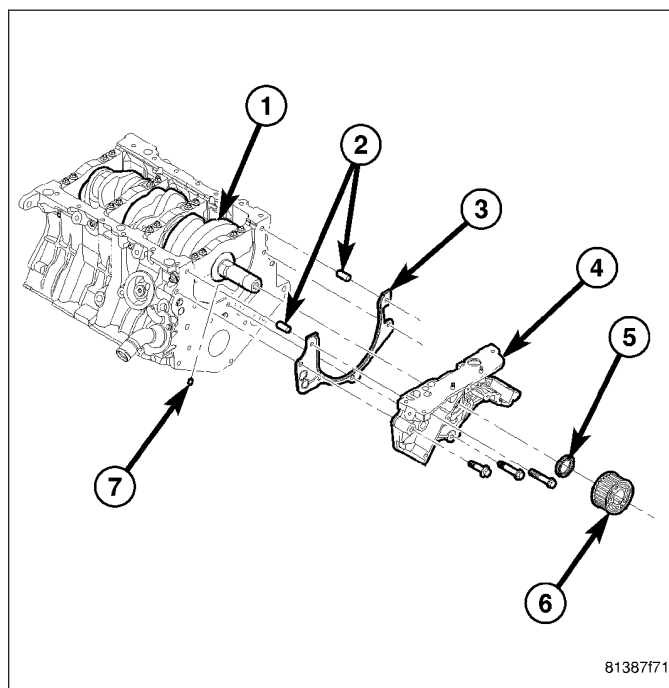
1. Drain the cooling system. (Refer to 7 - COOLING - STANDARD PROCEDURE)
2. Remove the timing belt. (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)
3. Remove the crankshaft sprocket. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)
4. Remove the oil pan. (Refer to 9 - ENGINE/LUBRI- CATION/OIL PAN - REMOVAL).



5. Remove the oil pickup tube.



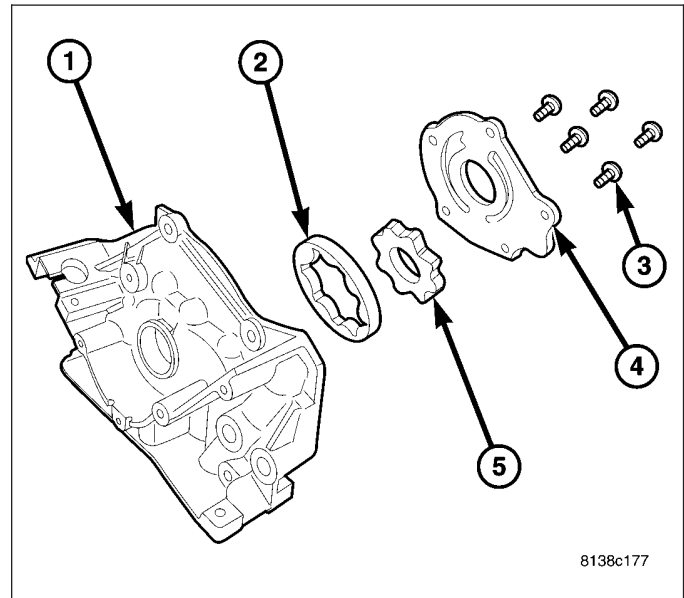
6. Remove the oil pump fasteners. Remove the oil pump (1) and gasket (2) from engine.





## DISASSEMBLY

1. Remove oil pump cover screws (3) and lift off cover (4).
2. Remove pump rotors (2, 5).
3. Wash all parts in a suitable solvent and inspect carefully for damage or wear.



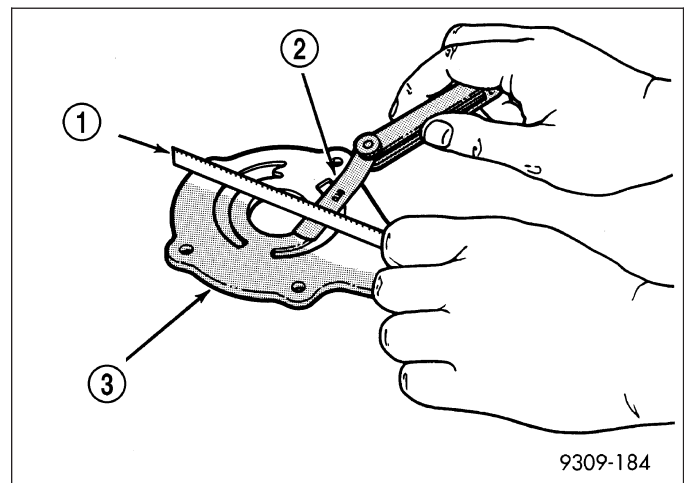
## CLEANING

1. Clean all parts thoroughly in a suitable solvent.

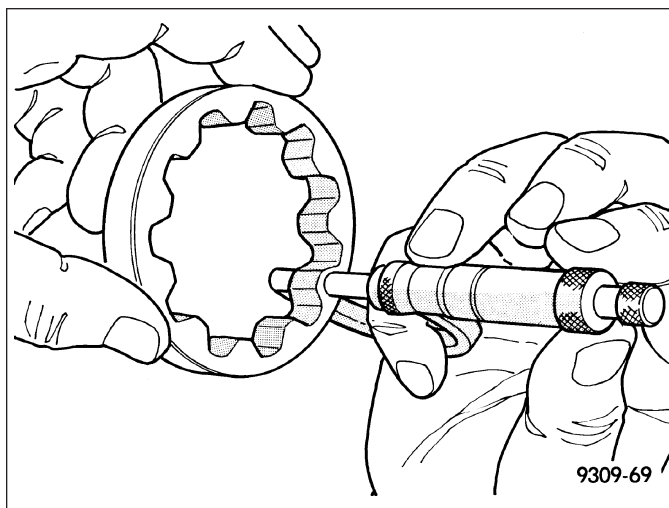
## INSPECTION

**Note:** DO NOT inspect the oil relief valve assembly. If the oil relief valve is suspect, replace the oil pump.

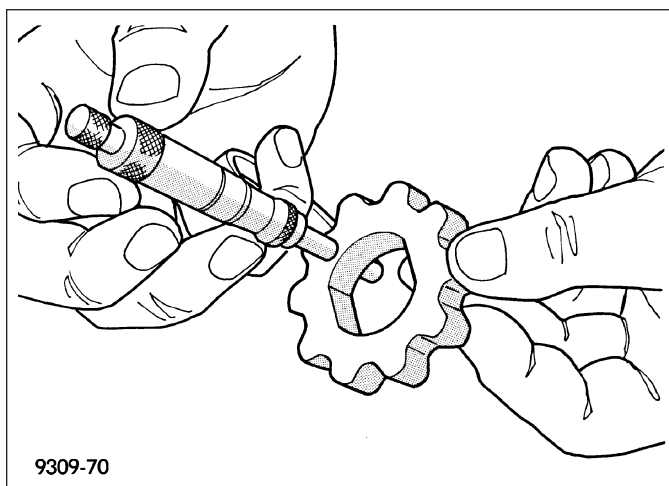
1. Disassemble oil pump. (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - DISASSEMBLY)
2. Clean all parts thoroughly. Mating surface of the oil pump housing should be smooth. Replace pump cover if scratched or grooved.
3. Lay a straightedge (1) across the pump cover (3) surface. If a 0.025 mm (0.001 in.) feeler gauge can be inserted between cover and straight edge, cover should be replaced.



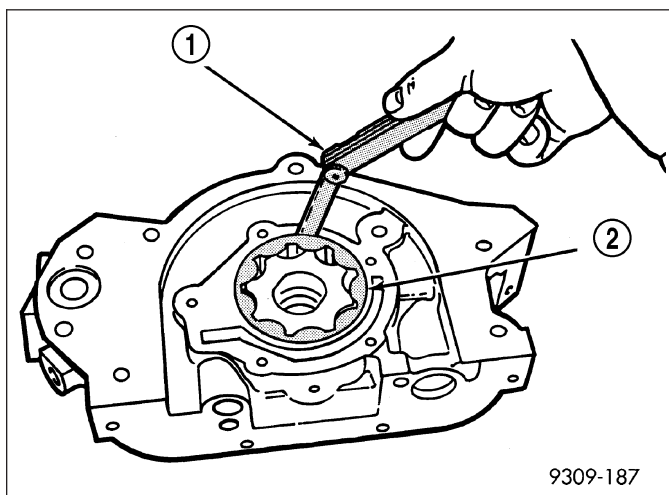
4. Measure thickness and diameter of outer rotor. If outer rotor thickness measures 14.299 mm (0.563 in.) or less , or if the diameter is 79.78 mm (3.141 inches.) or less, replace outer rotor.



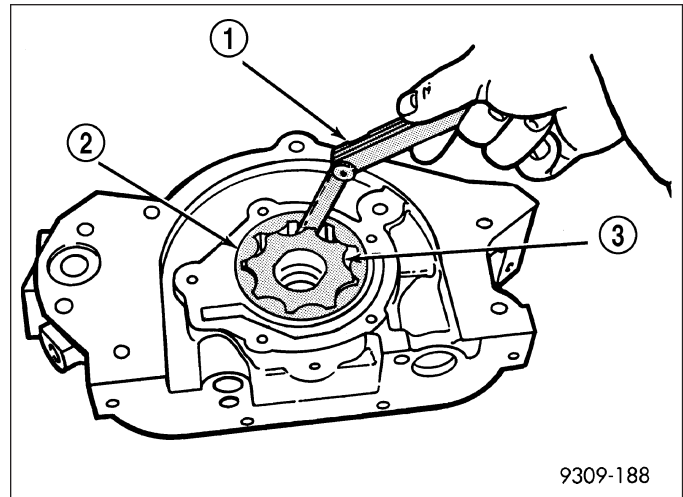
5. If inner rotor measures 14.299 mm (0.563 in.) or less replace inner rotor.



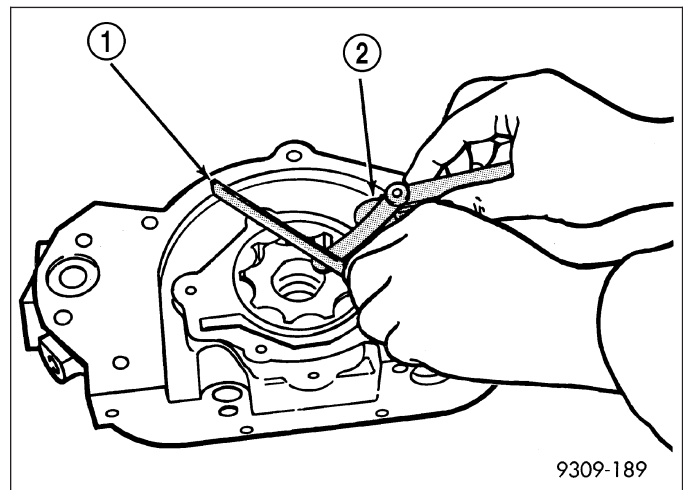
6. Slide outer rotor (2) into body, press to one side with fingers and measure clearance between rotor and body. If measurement is 0.39 mm (0.015 inch.) or more, replace body only if outer rotor is in specifications.



7. Install inner rotor into body. If clearance between inner (3) and outer rotors (2) is 0.20 mm (0.008 inch.) or more, replace both rotors.



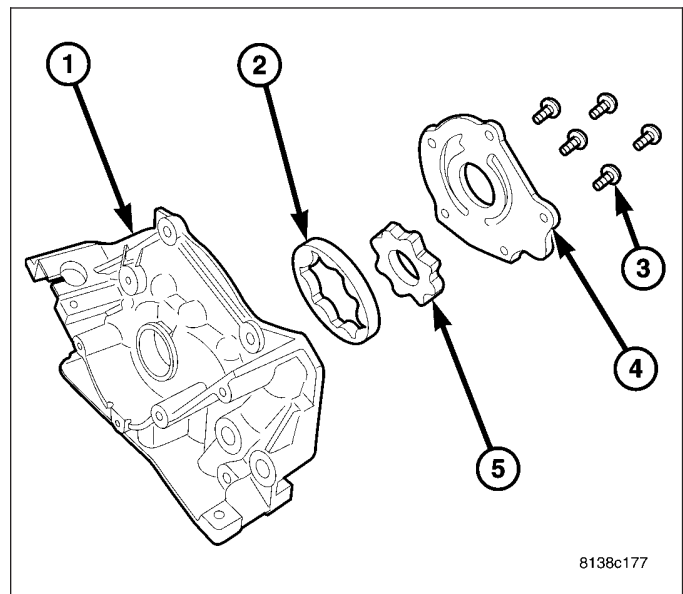
8. Place a straightedge (1) across the face of the body, between bolt holes. If a feeler gauge of 0.077 mm (0.003 in.) or more can be inserted between rotors and the straightedge, replace pump assembly **ONLY** if rotors are in specs.



9. Assemble oil pump. (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - ASSEMBLY)

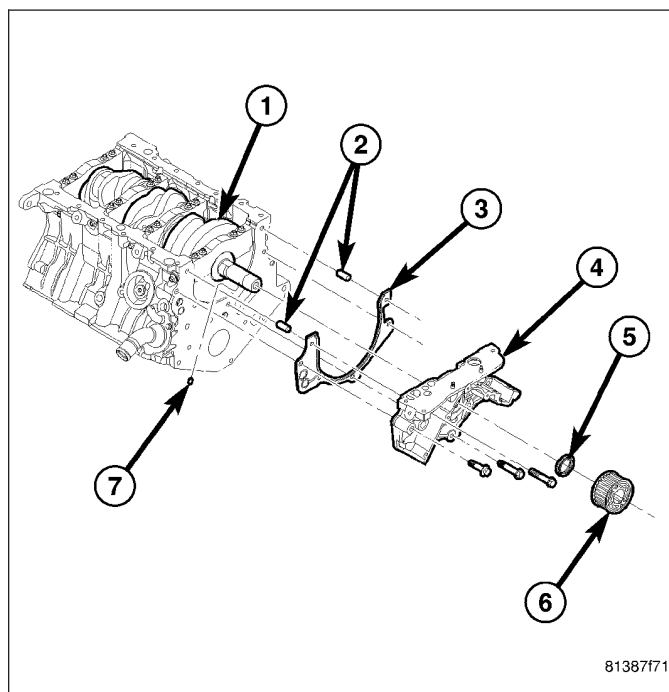
## ASSEMBLY

1. Assemble oil pump using new parts as required.
2. Tighten cover screws (3) to 12 N·m (105 in. lbs.).
3. Prime oil pump before installation by filling rotor cavity with engine oil.
4. If oil pressure is low and pump is within specifications, inspect for worn engine bearings or other reasons for oil pressure loss.

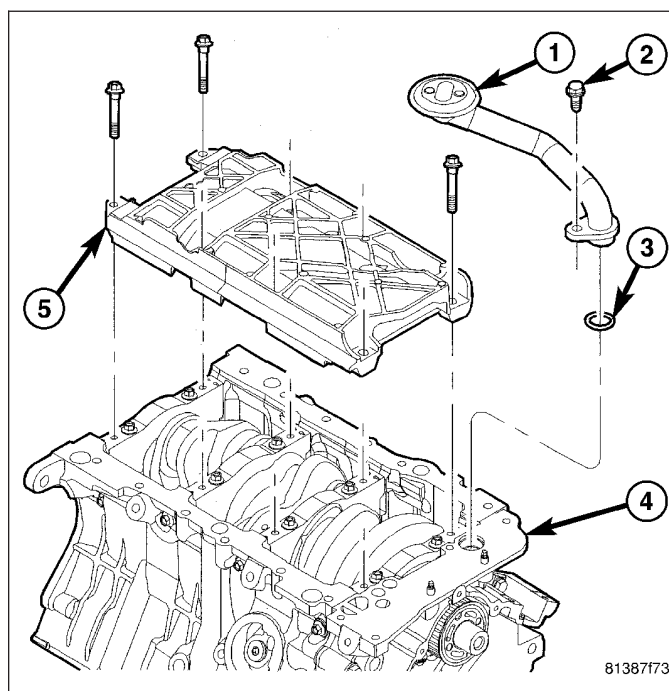


## INSTALLATION

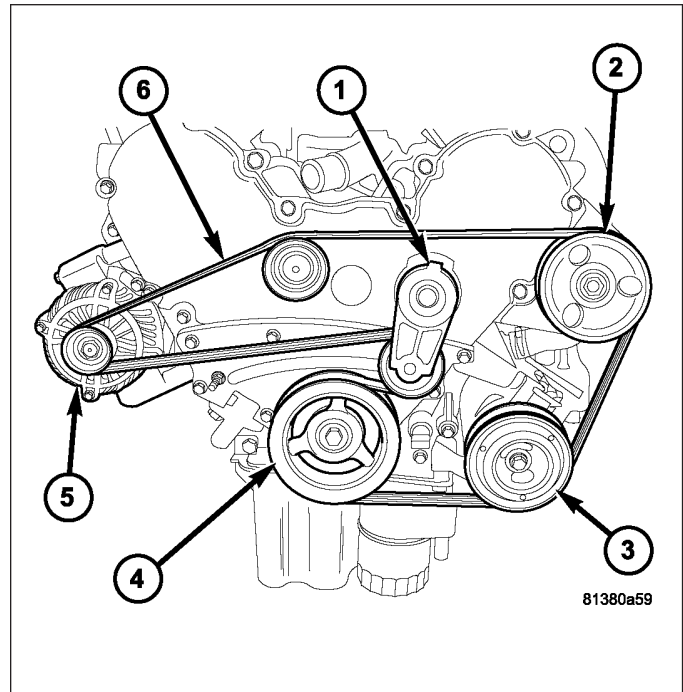
1. Prime oil pump (4) before installation by filling rotor cavity with clean engine oil.
2. Install oil pump (4) and gasket (3) carefully over the crankshaft. Position pump onto block and tighten bolts to 28 N·m (250 in. lbs.).



3. Install new O-ring (3) on oil pickup tube (1).
4. Install oil pickup tube (1).
5. Install oil pan. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION)
6. Install crankshaft sprocket. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION)
7. Install timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION)
8. Install the timing belt covers. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION)



9. Install the crankshaft vibration damper (4). (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION)
10. Install the accessory drive belt (6). (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION)
11. Fill the cooling system. (Refer to 7 - COOLING - STANDARD PROCEDURE)
12. Fill engine crankcase with proper oil to the correct level.

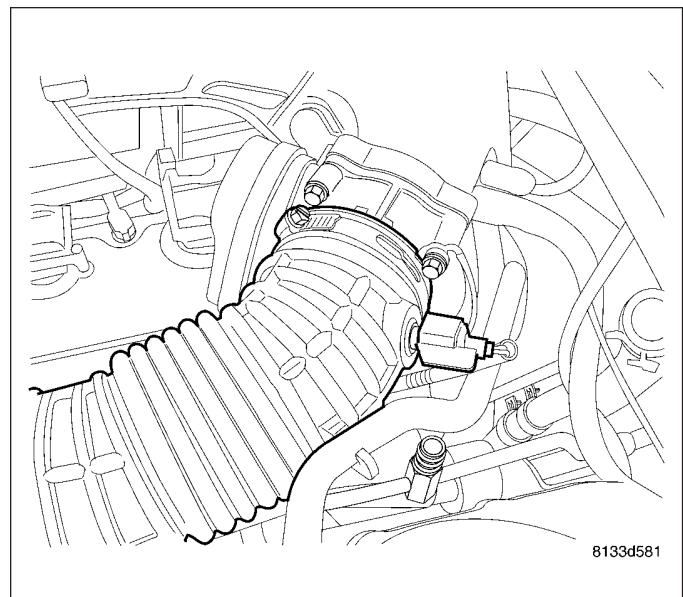


## INTAKE MANIFOLD

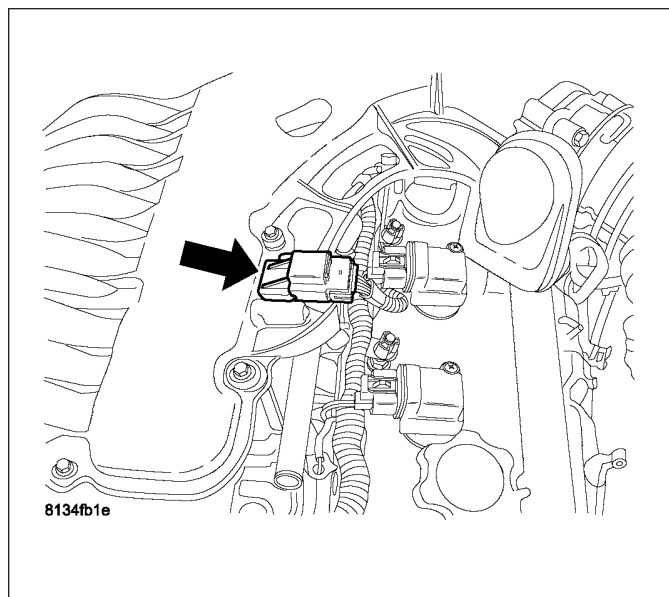
### REMOVAL

#### UPPER INTAKE MANIFOLD

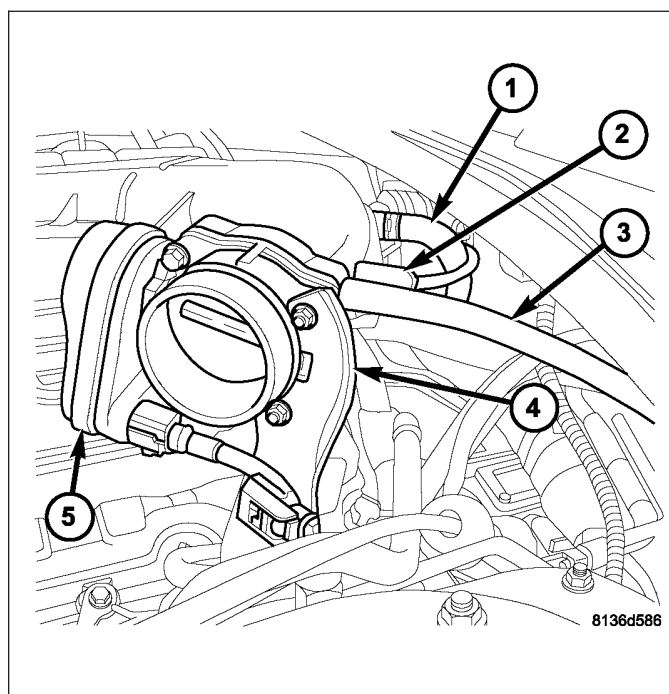
1. Disconnect negative battery cable.
2. Disconnect the IAT sensor electrical connector.
3. Remove air inlet hose from the throttle body.



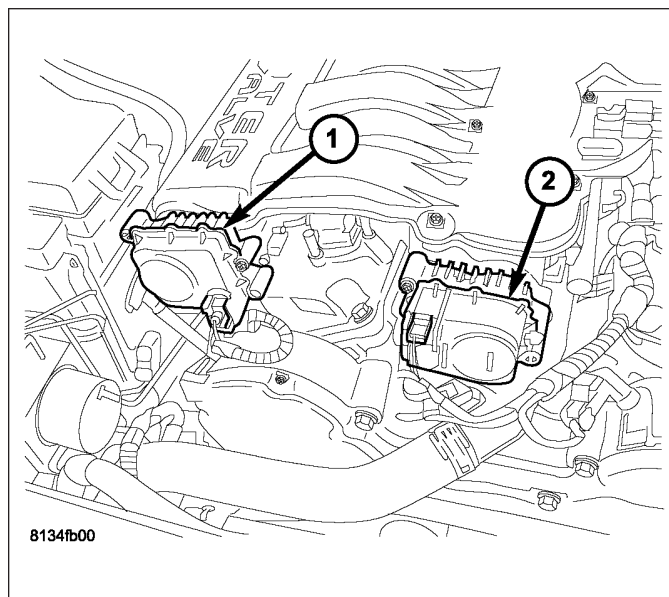
4. Disconnect the MAP sensor electrical connector.



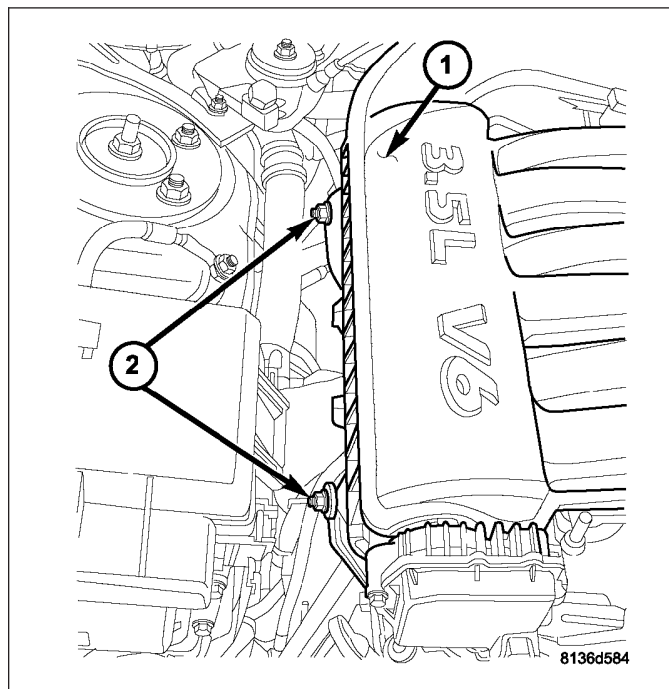
5. Separate the engine electrical harness connectors from the intake manifold.
6. Disconnect the EGR tube, PCV, Purge and power brake booster vacuum hoses from the upper intake manifold.
7. Disconnect the electronic throttle control electrical connector.
8. Remove the throttle bracket (4) fasteners from the throttle body and cylinder head.



9. Disconnect electrical connectors from the Manifold Tuning Valve (MTV) and Short Runner Valve.



10. Remove the right intake manifold support brackets.

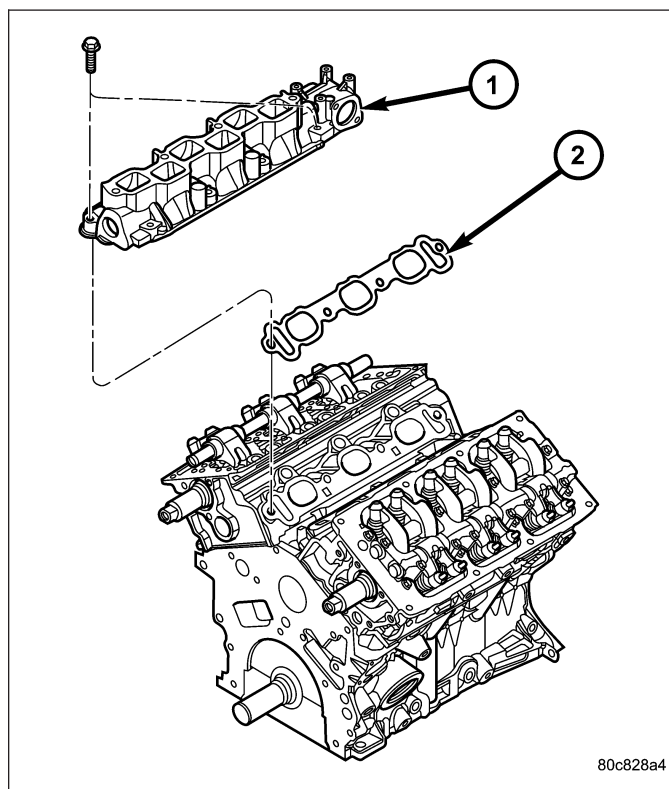


11. Remove the upper intake manifold retaining bolts, insulation foam pad and manifold. Clean all gasket sealing surfaces.

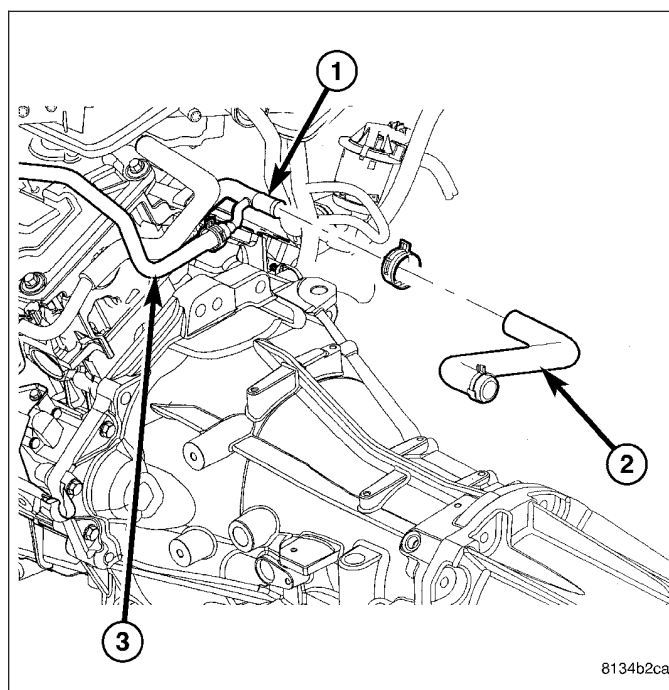


## LOWER INTAKE MANIFOLD

1. Perform fuel pressure release procedure. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE)
2. Drain the cooling system (Refer to 7 - COOLING/ENGINE/COOLANT - STANDARD PROCEDURE).
3. Disconnect the upper radiator hose from the thermostat housing.
4. Remove the upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
5. Reposition power steering fluid reservoir and bracket.
6. Disconnect the electrical connectors to fuel injectors and coolant temperature sensor.

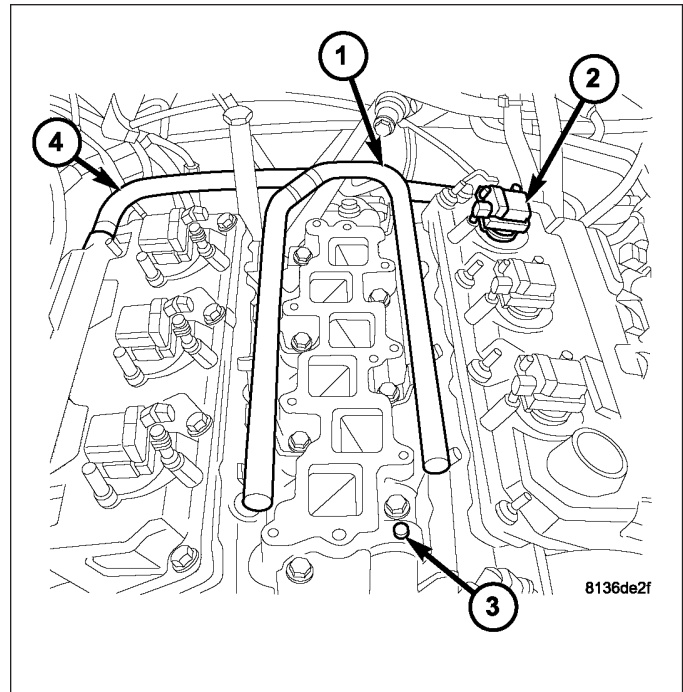


7. Disconnect heater hose from the rear intake manifold.
8. Disconnect the coolant container hose at the rear intake manifold.





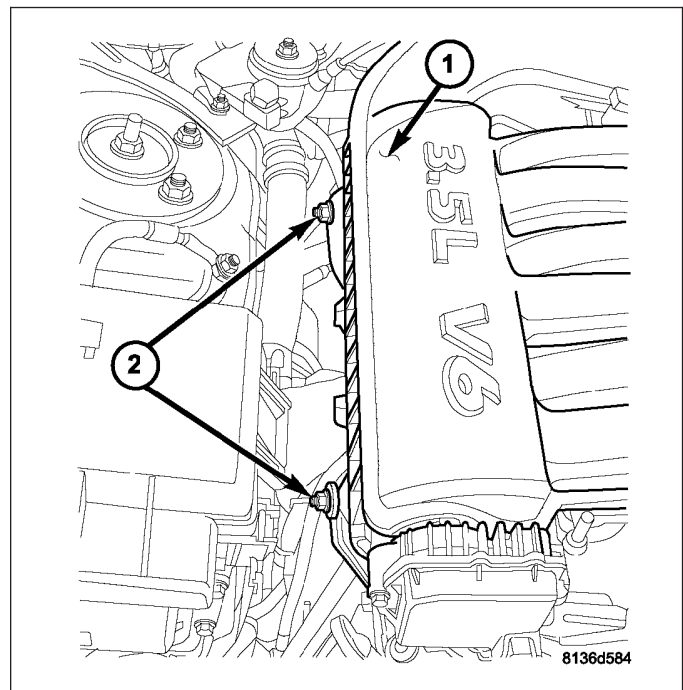
9. Disconnect the fuel supply hose from fuel rail (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL LINES - STANDARD PROCEDURE).
10. Remove the bolts attaching fuel rail.
11. Remove fuel rail and injectors as an assembly.
12. Remove bolts attaching lower intake and remove intake manifold.



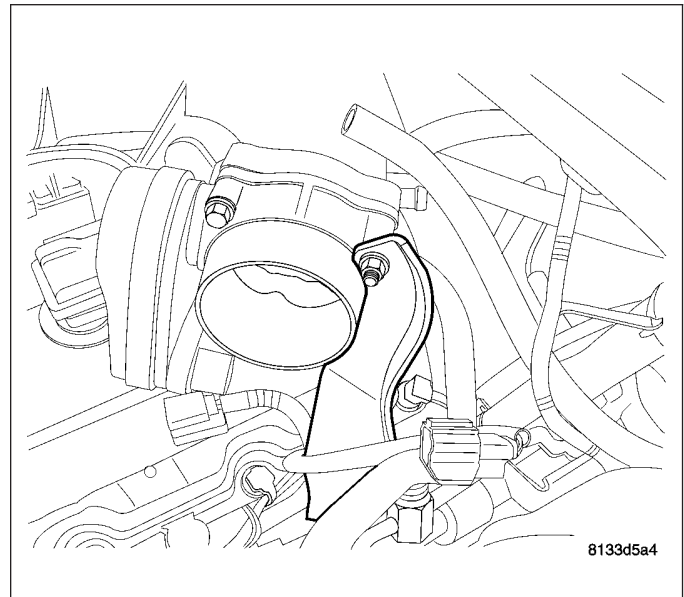
## INSTALLATION

### UPPER INTAKE MANIFOLD

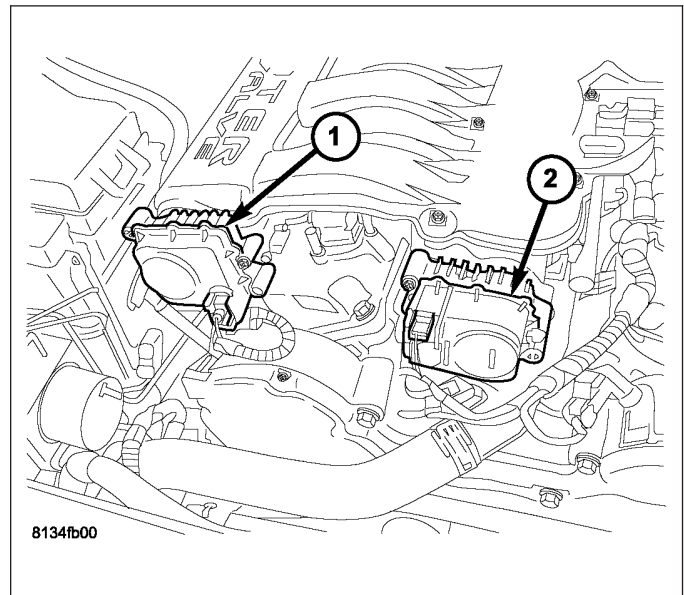
1. Clean and inspect gasket sealing surfaces.
2. Position new gasket.
3. Install the upper intake manifold insulator foam.
4. Install the upper intake manifold. Tighten bolts to 12 N·m (105 in.lbs.) starting in the center working outward in a cross sequence pattern.
5. Install the right manifold support brackets. Tighten fasteners to 12 N·m (105 in.lbs.).



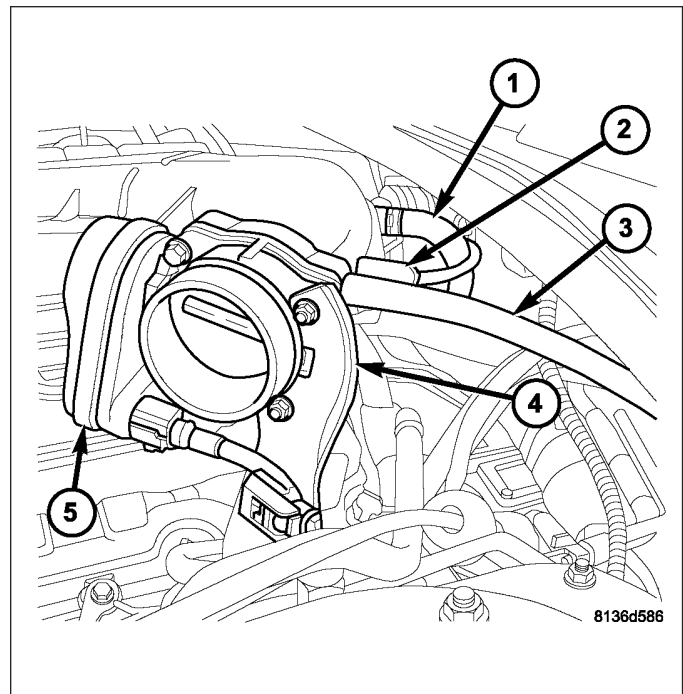
6. Install the throttle bracket. Tighten fasteners to 12 N·m (105 in.lbs.) at the throttle body and 28N·m (259 in.lbs.) at the cylinder head.



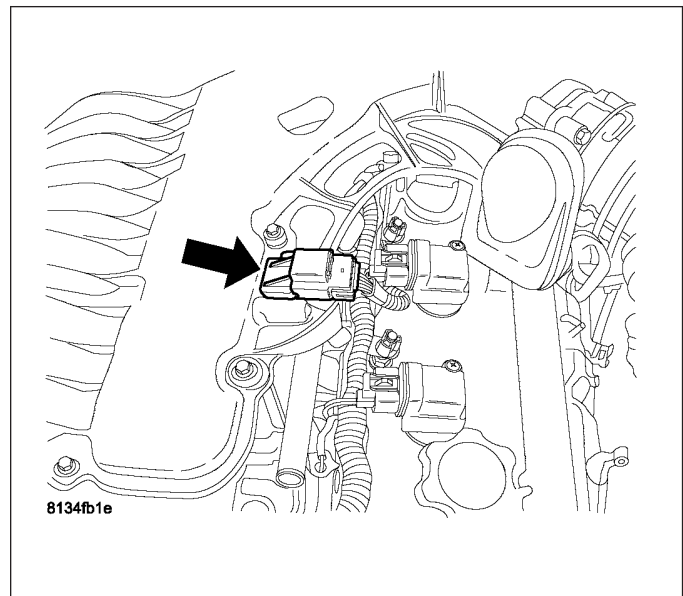
7. Connect the manifold tuning valve and short runner valve electrical connectors.



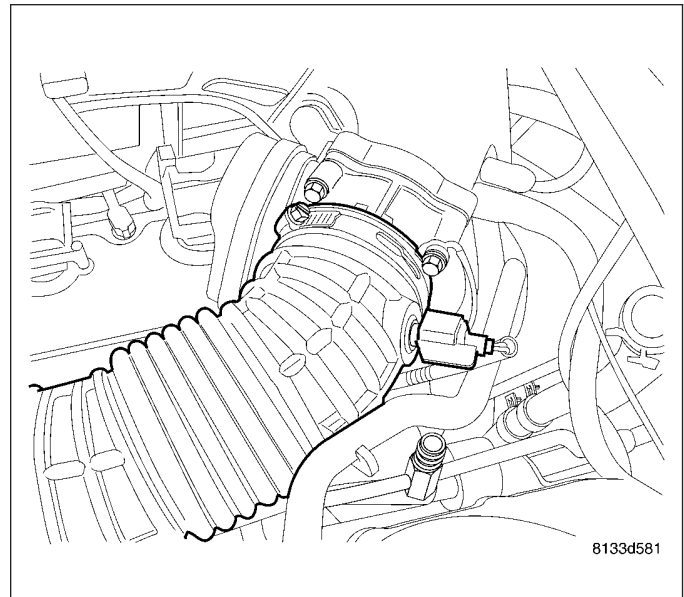
8. Connect the electronic throttle control harness connector.
9. Connect the engine electrical connectors to the intake manifold.
10. Connect the EGR tube, PCV, Purge and power brake booster vacuum hoses to the intake manifold.



11. Connect the MAP sensor harness connector.

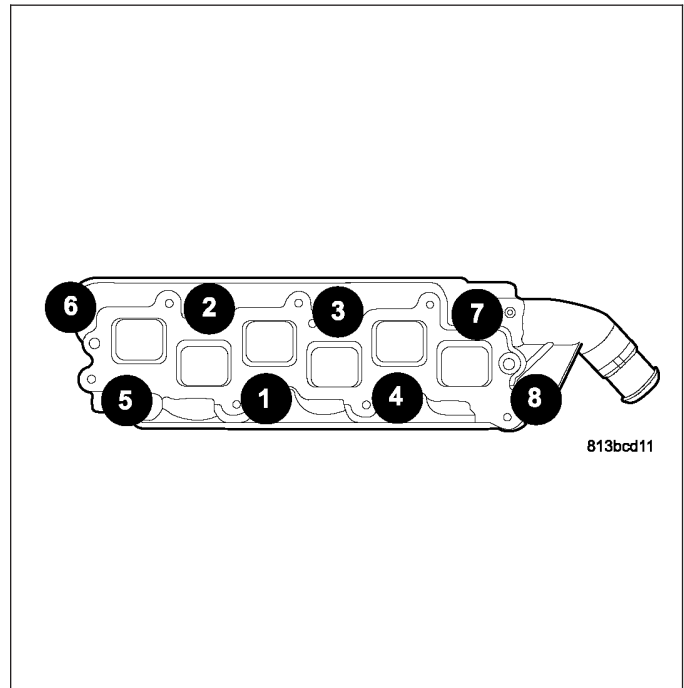


12. Install the inlet hose and connect the IAT sensor harness connector.
13. Connect negative battery cable.

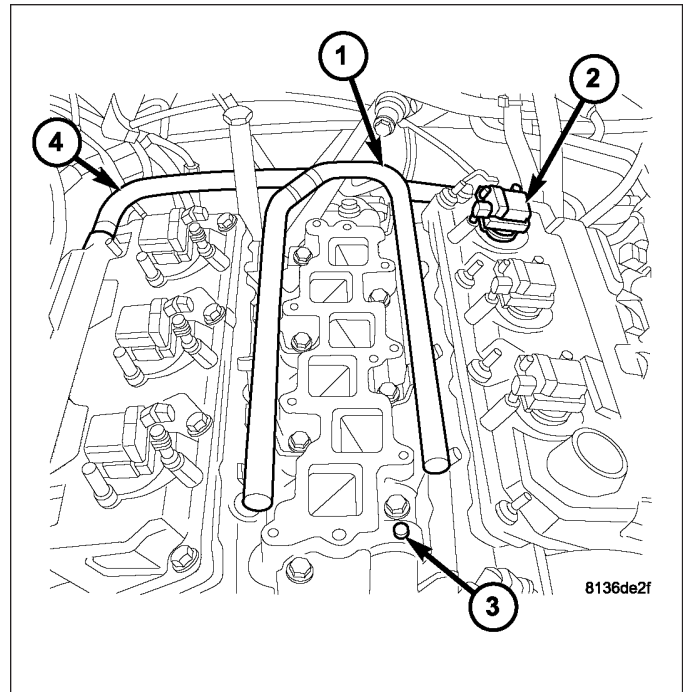


## LOWER INTAKE MANIFOLD

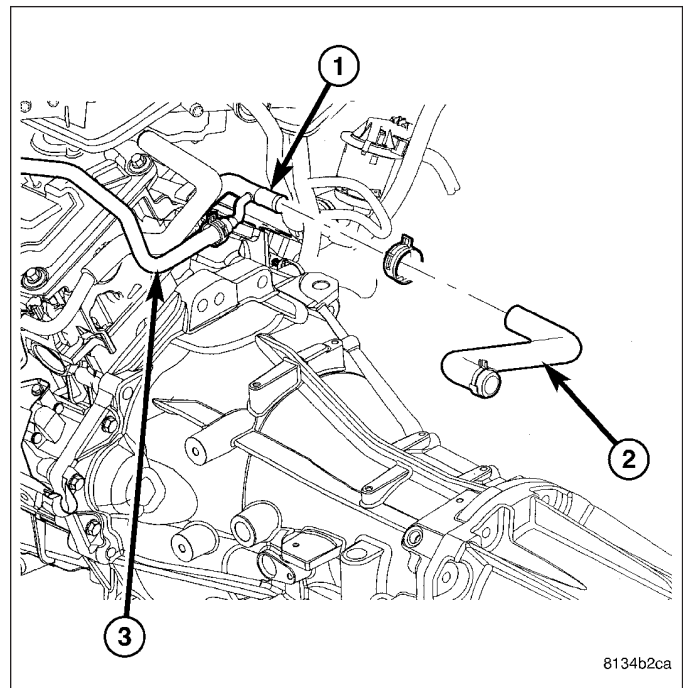
1. Clean all sealing surfaces.
2. Position new gaskets and intake manifold on cylinder head surfaces.
3. Install intake manifold bolts and gradually tighten in sequence shown until a torque of 28 N·m (250 in. lbs.) is obtained.



4. Install fuel rail and injectors as an assembly, (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/FUEL INJECTOR - INSTALLATION).
5. Connect fuel supply hose to fuel rail. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL LINES - STANDARD PROCEDURE)



6. Connect heater hose to rear lower intake manifold.
7. Connect coolant container hose to the rear lower intake manifold.



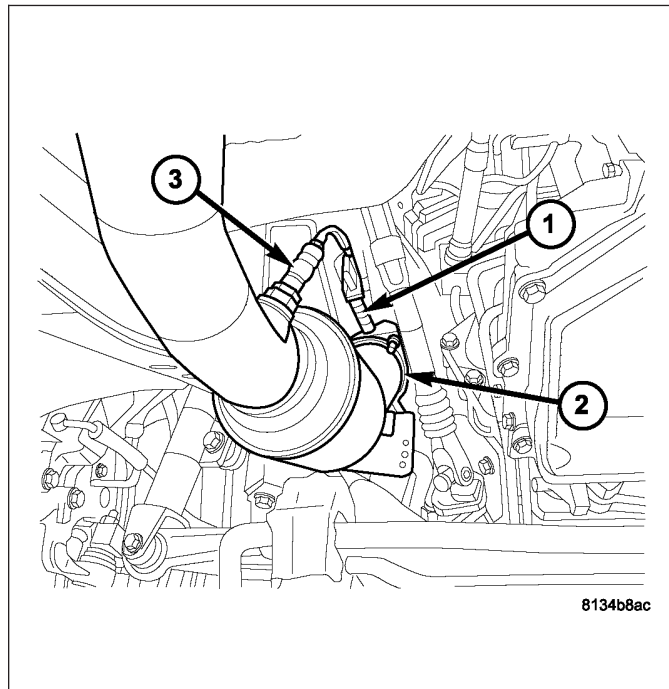
8. Connect electrical connectors to fuel injectors and coolant temperature sensor.
9. Install power steering fluid reservoir and bracket.
10. Install upper intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
11. Connect the upper radiator hose to the thermostat housing.
12. Fill the cooling system (Refer to 7 - COOLING/ENGINE/COOLANT - STANDARD PROCEDURE).

## EXHAUST MANIFOLD - LEFT

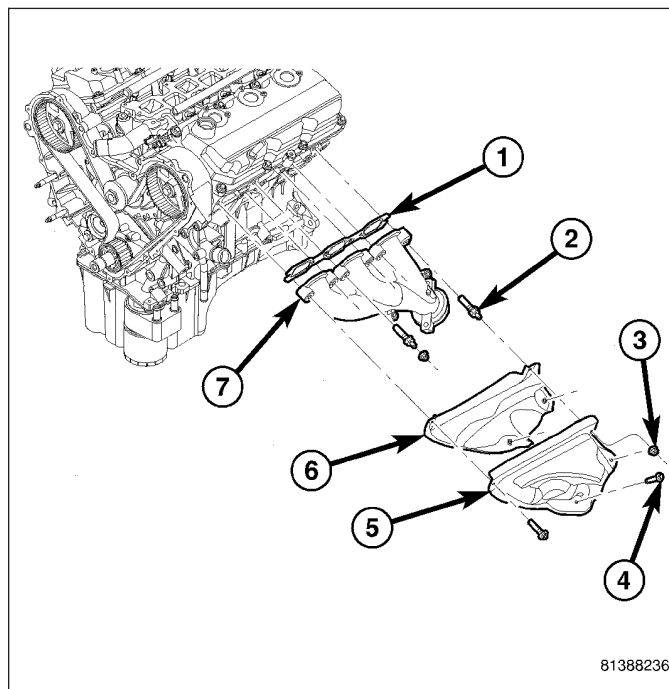
### REMOVAL

#### LEFT EXHAUST MANIFOLD

1. Disconnect and isolate the negative battery cable.
2. Raise and support the vehicle.
3. Separate the front exhaust pipe to manifold union (2).



4. Lower the vehicle.
5. Disconnect and remove the oxygen sensor from the exhaust manifold (7)
6. Remove the exhaust manifold shield (5) retaining bolts, exhaust manifold (7) , and discard gasket (1).



### INSPECTION

1. Inspect exhaust manifolds for damage or cracks.
2. Check manifold flatness.

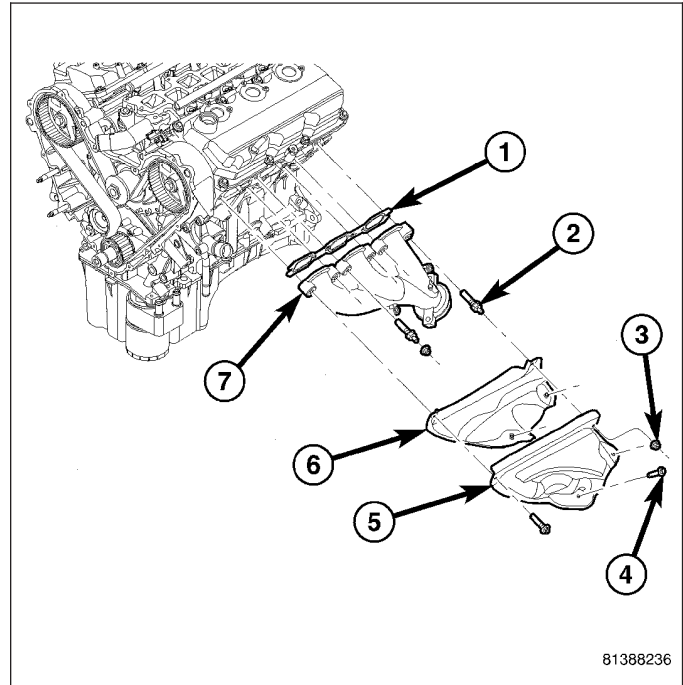
3. Inspect the exhaust manifold gasket for obvious discoloration or distortion.
4. Check distortion of the cylinder head mounting surface with a straightedge and thickness gauge.

## INSTALLATION

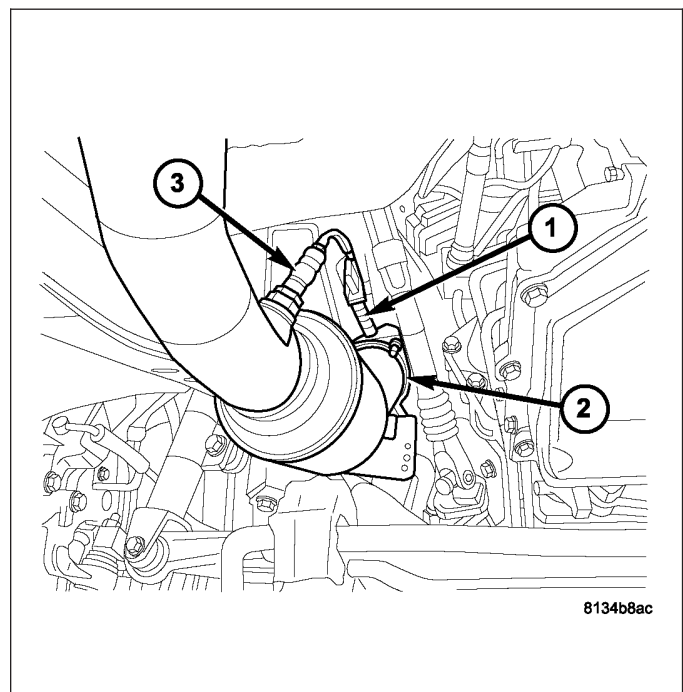
### LEFT EXHAUST MANIFOLD

**Note:** If replacing the exhaust manifold, tighten the exhaust outlet studs to manifold to 40N·m (350 in.lbs.).

1. Position the exhaust manifold (7) and gasket (1). Install the retaining bolts (2). Tighten 4 bolts starting at the center working outward to 23 N·m (200 in. lbs.).
2. Install the exhaust manifold heat shields (5,6). Tighten the bolts to 12N·m (105 in. lbs.).
3. Tighten the out most stud nuts to 8N·m (73 in.lbs.).
4. Connect the oxygen sensor.



5. Raise and support the vehicle.
6. Connect the exhaust pipe to manifold union (3). Tighten the exhaust stud nuts to 34N·m (300 in.lbs.).
7. Connect the negative battery cable.

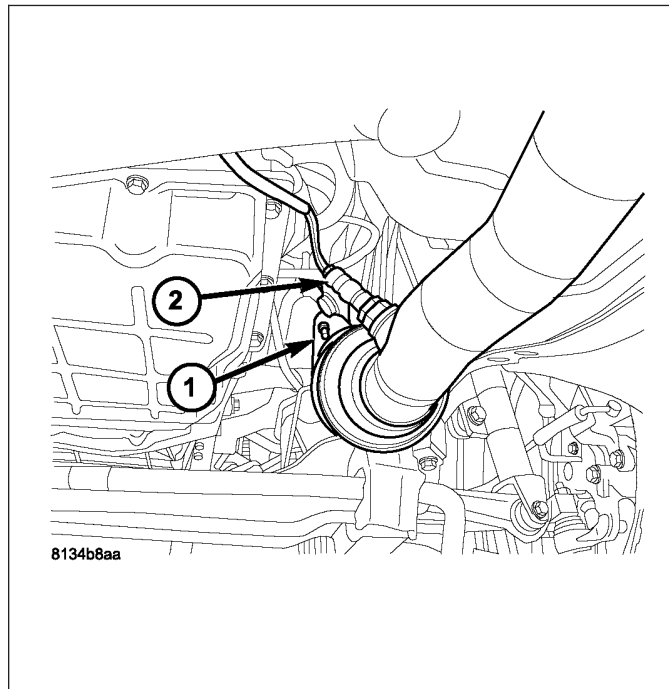


## EXHAUST MANIFOLD - RIGHT

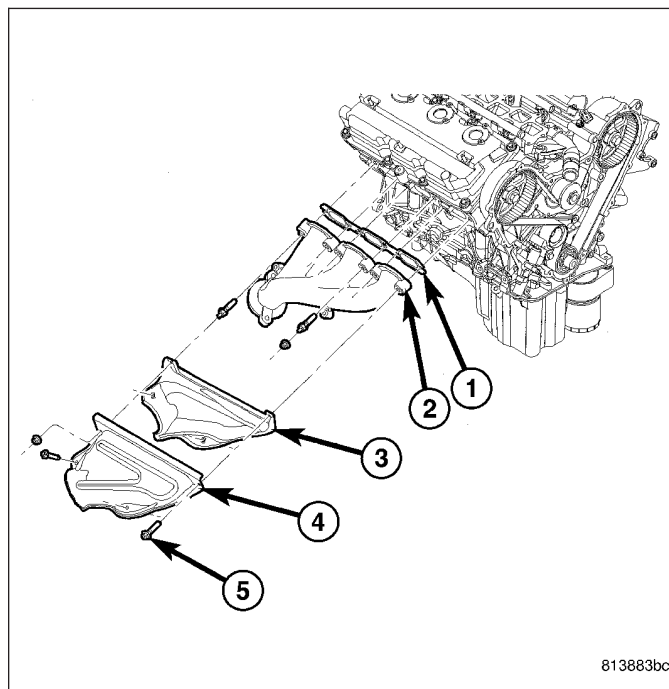
### REMOVAL

#### RIGHT EXHAUST MANIFOLD

1. Disconnect the negative battery cable.
2. Disconnect the upstream oxygen sensor electrical connector.
3. Raise and support the vehicle.
4. Remove the exhaust manifold to exhaust pipe flange retaining bolts (1).



5. Lower the vehicle.
6. Remove the exhaust manifold heat shield and manifold.
7. Remove the oxygen sensor from the exhaust manifold.





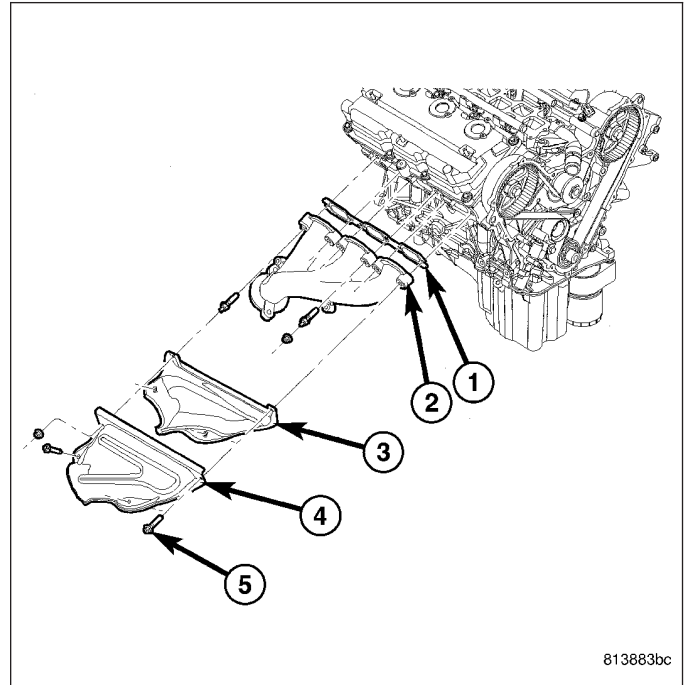
## INSTALLATION

### RIGHT EXHAUST MANIFOLD

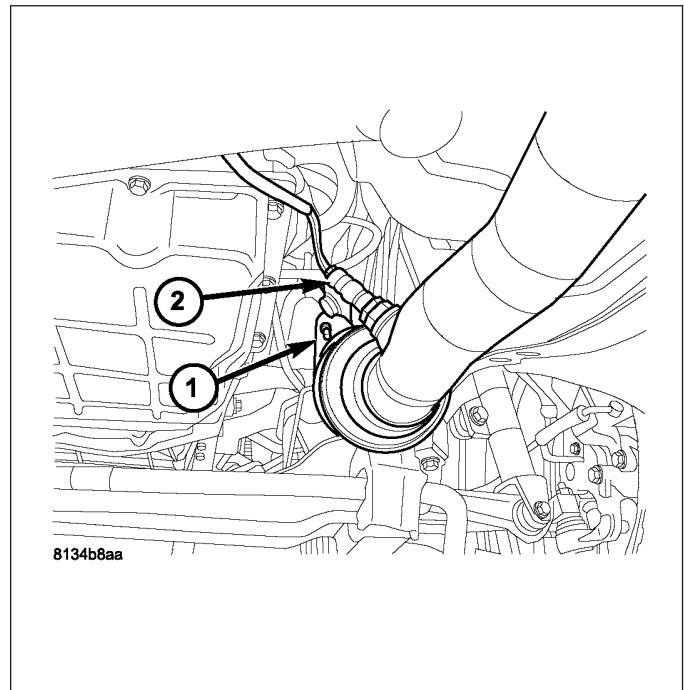
1. Clean gasket surfaces.

**Note:** If replacing the exhaust manifold, tighten the exhaust outlet studs to 39N·m (350 in.lbs.).

2. Position the exhaust manifold and gasket. Install the retaining bolts. Tighten 4 bolts starting at the center working outward to 23 N·m (200 in. lbs.).
3. Install the heat shields. Tighten the heat shield fasteners to 12 N·m (105 in.lbs.).
4. Tighten the 2 out most nuts to 8 N·m (73 in.lbs.).
5. Connect the oxygen sensor.
6. Raise and support the vehicle.



7. Connect the front exhaust pipe to exhaust manifold. Tighten the fasteners to 34 N·m (300 in. lbs.).
8. Connect the negative battery cable.

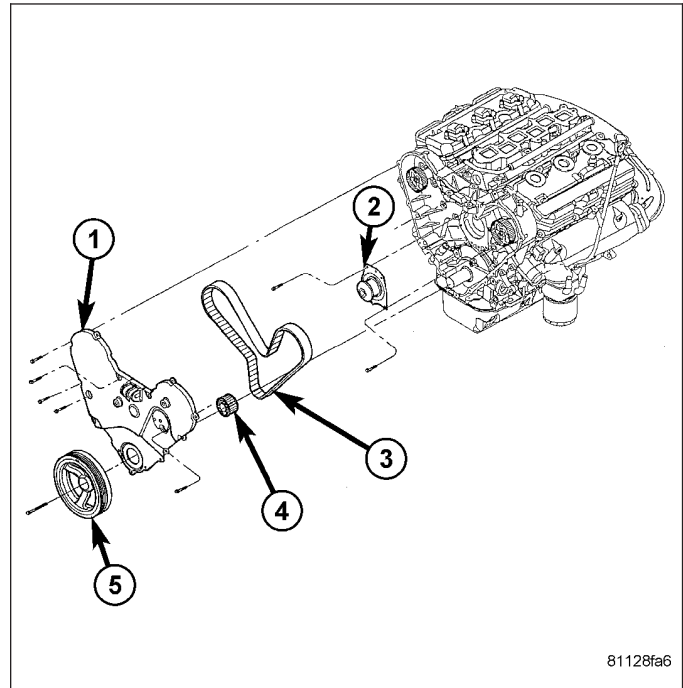


## VALVE TIMING

### DESCRIPTION

The timing drive system has been designed to provide quiet performance and reliability to support a **NON** free-wheeling engine.

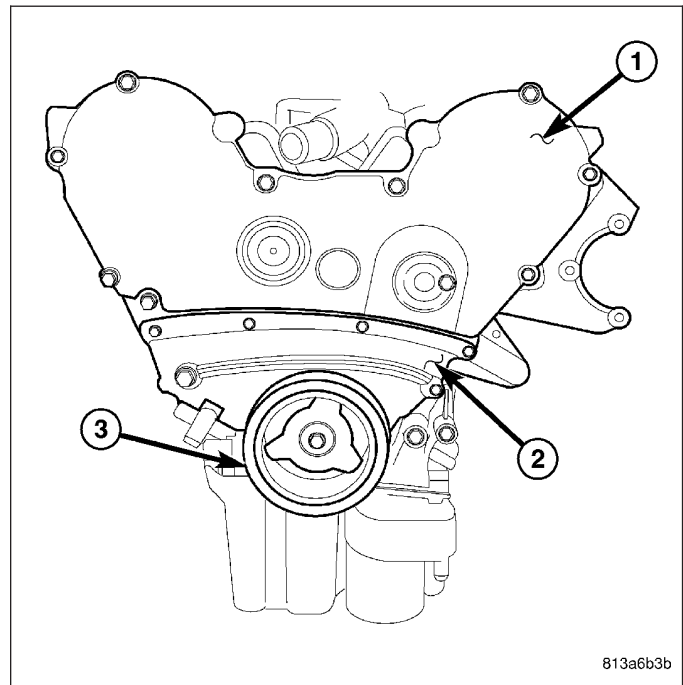
The timing drive components include a crankshaft sprocket (4), camshaft sprockets, tensioner pulley, hydraulic tensioner and a timing belt (3). The water pump (2) is driven by the back side of the timing belt (3). The right and left camshaft sprockets are keyed and not interchangeable because of the cam sensor pick-up wheel on the left sprocket.



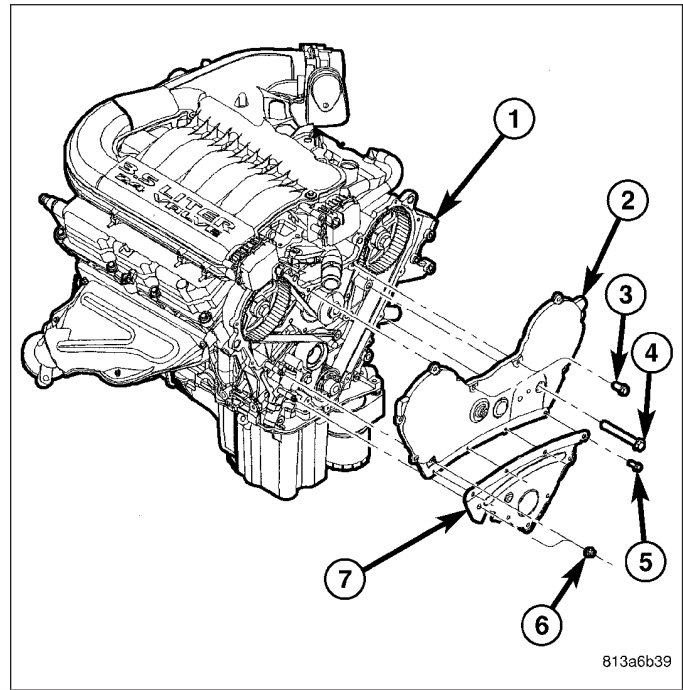
## FRONT TIMING BELT COVER

### REMOVAL

1. Perform fuel pressure release procedure. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
2. Disconnect negative battery cable.
3. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
4. Remove accessory drive belt tensioner.
5. Remove bolts for power steering pump. Reposition power steering pump aside.
6. Raise vehicle on hoist.
7. Remove crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
8. Remove the lower front timing belt cover fasteners.

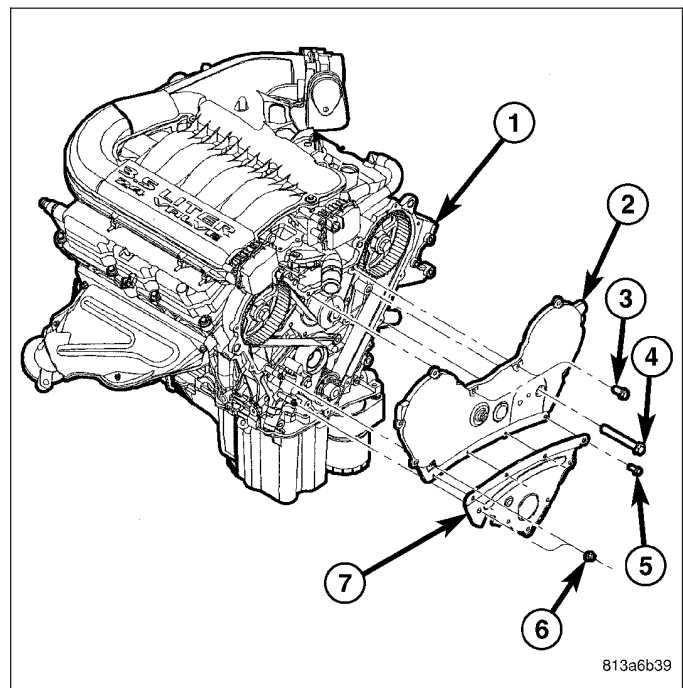


9. Lower the vehicle.
10. Remove the upper timing belt cover bolts and remove front timing belt cover.



## INSTALLATION

1. Exchange the accessory drive belt pulley if necessary. Tighten bolt to 61 N·m (45 ft.lbs.).
2. Install upper front timing belt cover.
3. Install lower timing belt front cover.
4. Tighten the timing cover bolts as follows:
  - M6 bolts - 12N·m (105 in.lbs.)
  - M8 bolts - 28N·m (250 in.lbs.)
  - M10 bolts - 54N·m (40 lbs.ft.)
5. Install power steering pump fasteners. Tighten bolts to 23 N·m (200 lbs. in.).
6. Install crankshaft damper(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
7. Install accessory drive belt tensioner (Refer to 7 - COOLING/ACCESSORY DRIVE/BELT TENSIONERS - INSTALLATION). Torque fastener to 28 N·m (250 in. lbs.).
8. Install accessory drive belt(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
9. Lower vehicle.
10. Connect negative battery cable.

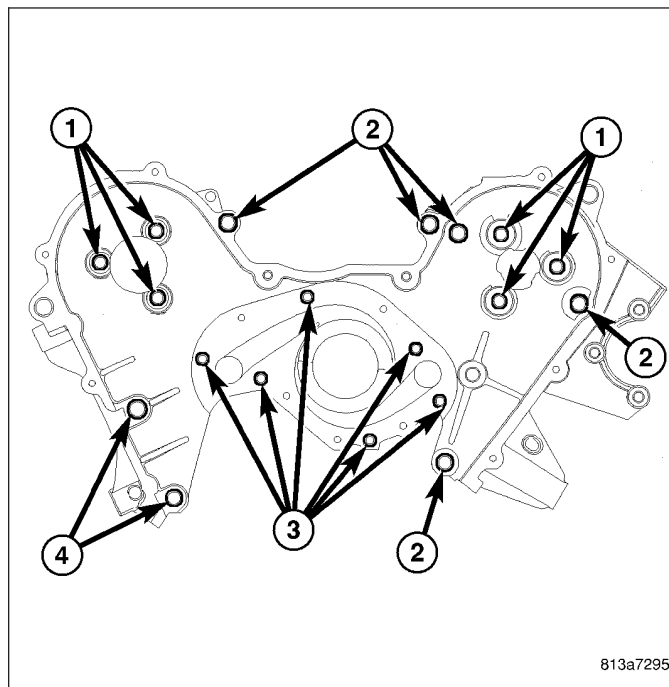


## REAR TIMING BELT COVER

### REMOVAL

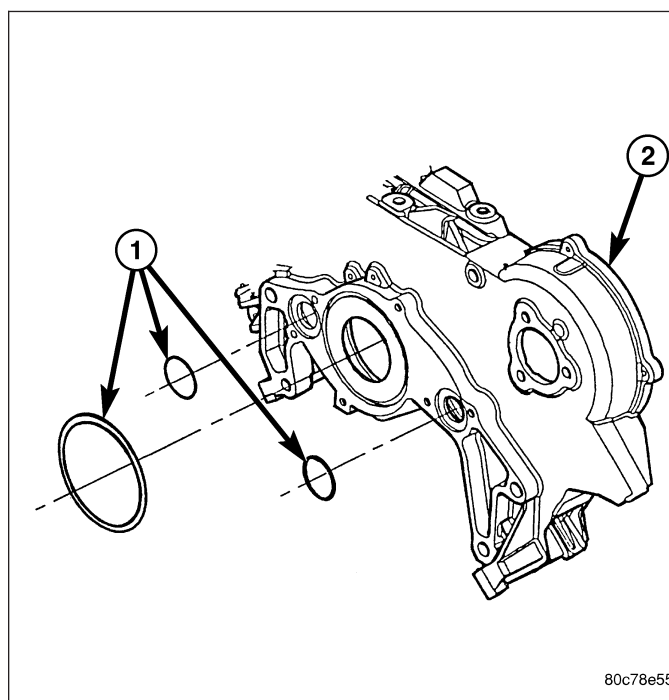
**Note:** The rear timing belt cover has O-rings to seal the water pump passages to cylinder block. Do not reuse the O-rings.

1. Perform fuel pressure release procedure. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
2. Disconnect the negative battery cable.
3. Remove timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
4. Remove camshaft sprockets (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
5. Remove rear timing belt cover bolts (1, 2, 3).
6. Remove the rear cover.

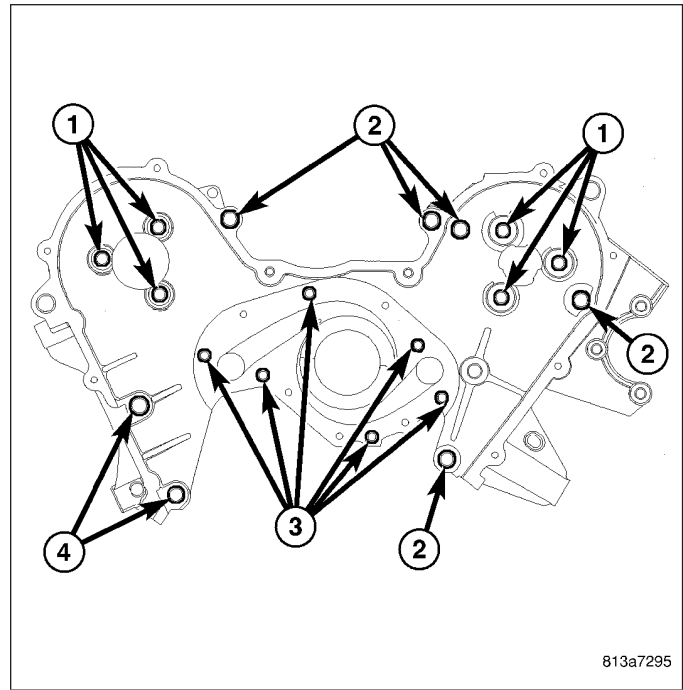


### INSTALLATION

1. Clean rear timing belt cover O-ring (1) sealing surfaces and grooves. Lubricate new O-rings with Mopar® Dielectric Grease or equivalent to facilitate assembly.
2. Position **NEW** O-rings on cover (2).



3. Install rear timing belt cover (4). Tighten bolts to the following specified torque:
  - M10 (2, 5) - 54 N·m (40 ft. lbs.)
  - M8 (1) - 28 N·m (20 ft. lbs.)
  - M6 (3) - 12 N·m (105 in. lbs.)
4. Install camshaft sprockets (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
5. Install timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).

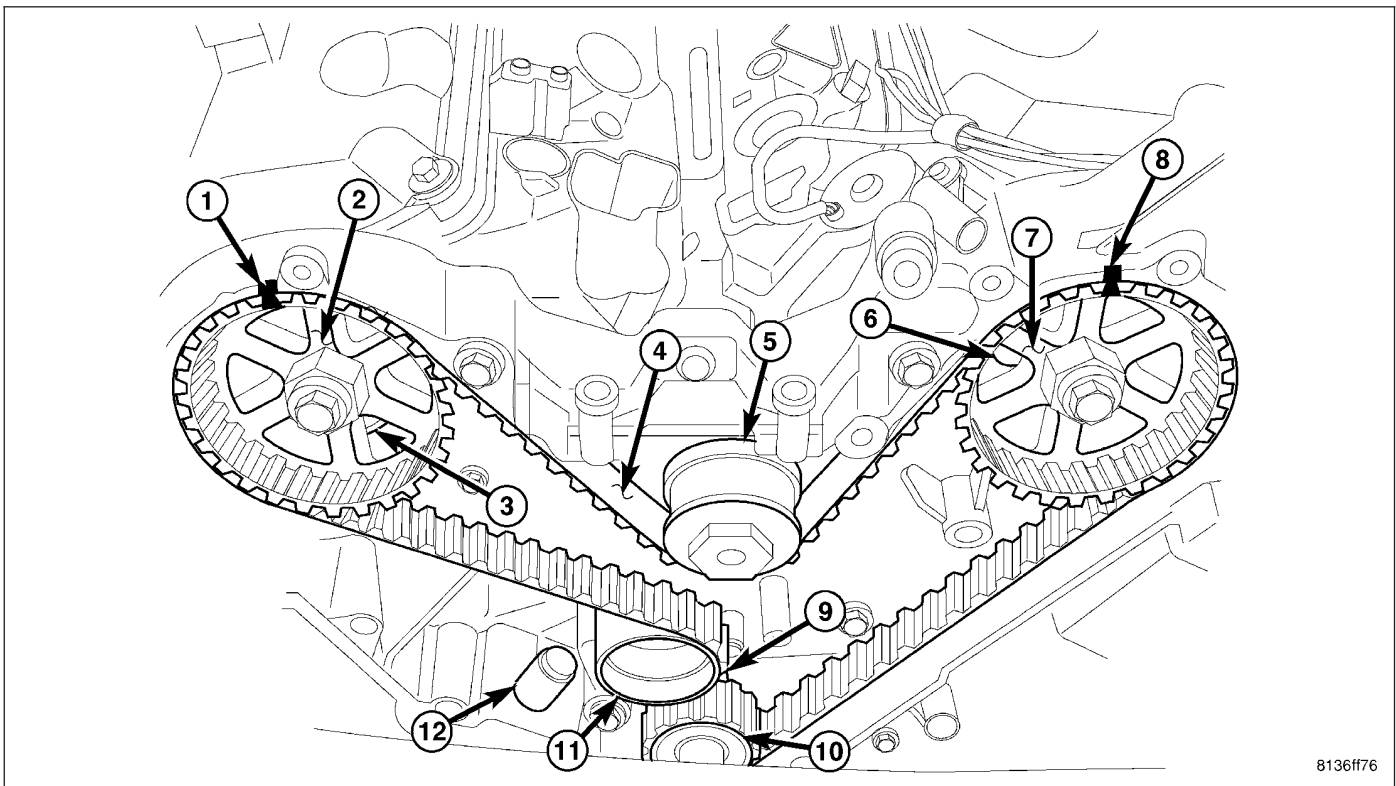


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## TIMING BELT AND SPROCKETS

### REMOVAL

#### TIMING BELT



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**CAUTION:** The 3.5L is NOT a freewheeling engine. Therefore, loosen the valve train rocker assemblies before servicing the timing drive.

1. Perform fuel pressure release procedure. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
2. Disconnect negative battery cable.
3. Remove both cylinder head covers and loosen the rocker arm assemblies (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL).
4. Remove the front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
5. Mark belt running direction, if timing belt is to be reused.

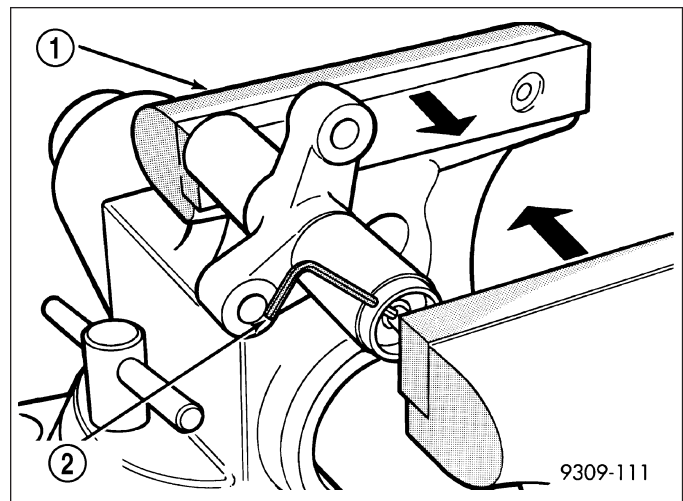
**CAUTION: When aligning timing marks, always rotate engine by turning the crankshaft. Failure to do so will result in valve and/or piston damage.**

6. Rotate engine clockwise until crankshaft (10) mark aligns with the TDC mark on oil pump housing (9) and the camshaft sprocket (2, 7) timing marks (1, 8) are aligned with the marks on the rear cover.
7. Remove the timing belt tensioner (12) and remove timing belt.
8. Inspect the tensioner for fluid leakage.
9. Inspect the pivot and bolt for free movement, bearing grease leakage, and smooth rotation. If not rotating freely, replace the arm and pulley assembly.

10. When tensioner is removed from the engine it is necessary to compress the plunger into the tensioner body.

**CAUTION: Index the tensioner in the vise the same way it is installed on the engine. This ensures proper pin orientation when tensioner is installed on the engine.**

- a. Place the tensioner into a vise (1) and SLOWLY compress the plunger. Total bleed down of tensioner should take about 5 minutes.
- b. When plunger is compressed into the tensioner body install a pin (2) through the body and plunger to retain plunger in place until tensioner is installed.

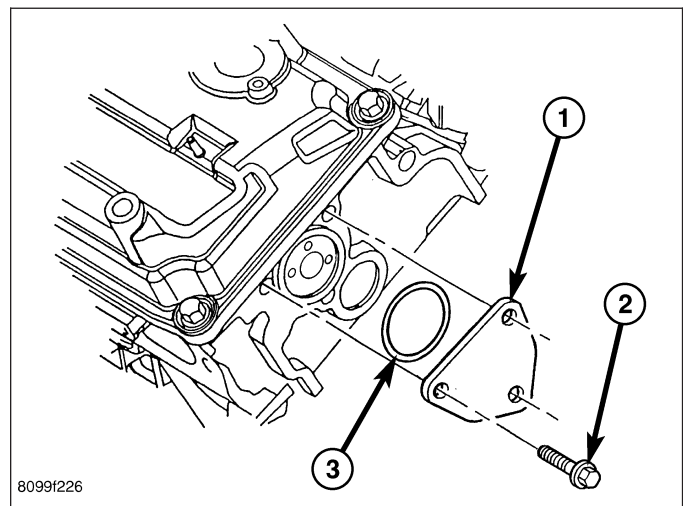


## CAMSHAFT SPROCKETS

**CAUTION: The 3.5L engine is NOT a free-wheeling design. Therefore, care should be taken not to rotate the camshafts or crankshaft with the timing belt removed.**

**Note: The camshaft timing gears are keyed to the camshaft.**

1. Perform fuel pressure release procedure. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
2. Remove front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

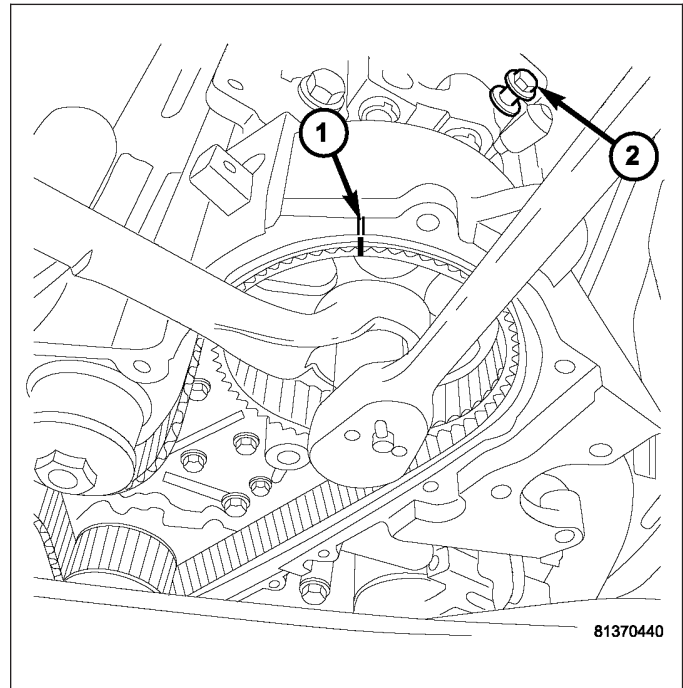




3. Position crankshaft sprocket to the TDC mark on the oil pump housing by turning crankshaft in the clockwise direction.
4. Install a dial indicator in number 1 cylinder to check TDC of the piston. Rotate the crankshaft until the piston is at exactly TDC.
5. Remove camshaft retainer/thrust plate (1) from rear of right cylinder head.
6. Remove the right cylinder head cover.
7. Remove the right rocker arm assembly.
8. Remove the timing belt tensioner and timing belt.
9. Hold left camshaft sprocket with a 36 mm (1 7/16 in.) box end wrench.
10. Loosen and remove the camshaft gear retaining bolt and washer. The left bolt is 255 mm (10.0 in.) long.

**Note: The camshaft timing gears are keyed to the camshaft.**

11. Remove the camshaft sprocket.

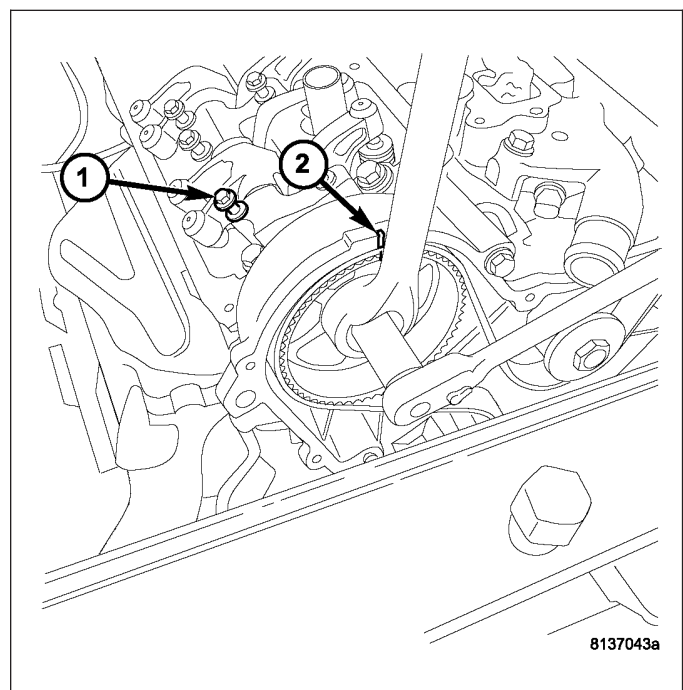


**CAUTION: The right camshaft must be pushed rearward approximately 3 1/2 inches to remove the camshaft gear retaining bolt and gear. Care must be taken not to scratch or nick the camshaft or cylinder head journals when moving camshaft.**

12. Hold right camshaft sprocket with a 36 mm (1 7/16 in.) box end wrench.
13. Loosen and remove the camshaft gear retaining bolt and washer. The right bolt is 213 mm (8 3/8 in.) long.

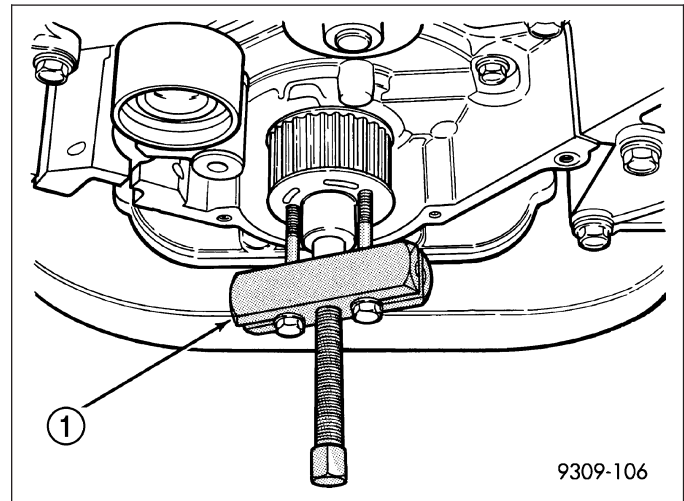
**Note: The camshaft timing gears are keyed to the camshaft.**

14. Remove the camshaft sprocket..



## CRANKSHAFT SPROCKET

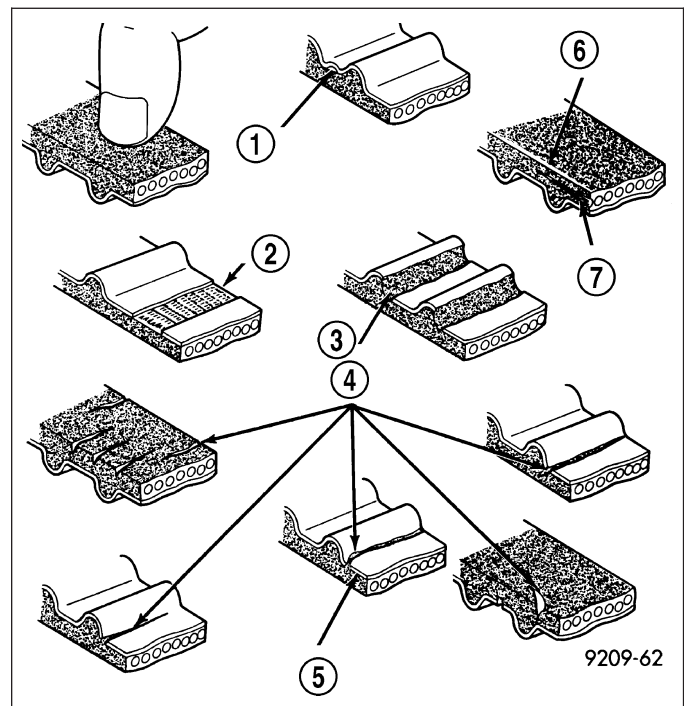
1. Remove the timing belt (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
2. Remove crankshaft sprocket using Special Tool L-4407-A (1).



## INSPECTION

### TIMING BELT

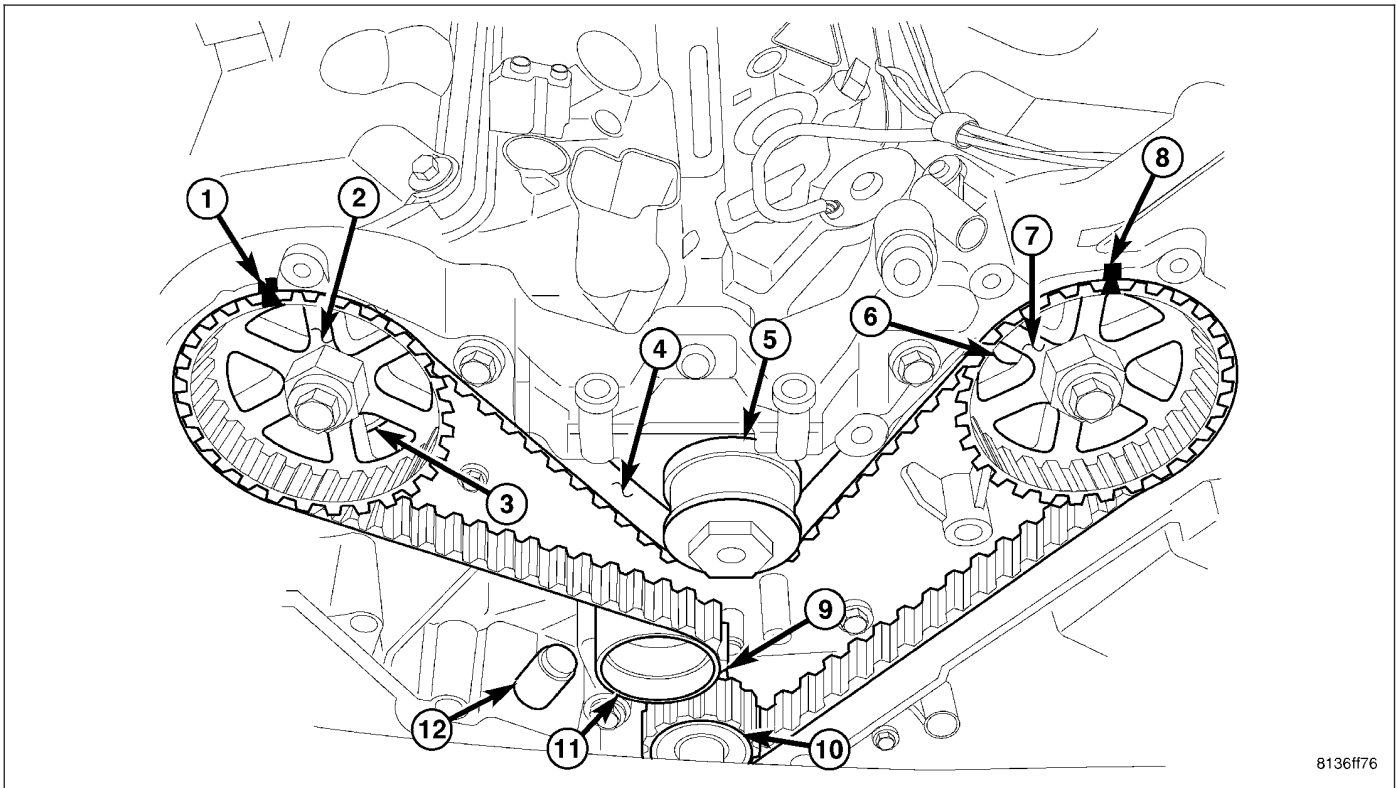
1. Remove front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
2. Inspect both sides of the timing belt. Replace belt if any of the following conditions exist :
  - a. Hardening of back rubber back side is glossy without resilience and leaves no indent when pressed with fingernail.
  - b. Cracks (4) on rubber back.
  - c. Cracks or peeling (1) of canvas.
  - d. Cracks on rib root.
  - e. Cracks on belt sides.
  - f. Missing teeth (2).
  - g. Abnormal wear (7) of belt sides. The sides are normal if they are sharp as if cut by a knife.
  - h. Vehicle mileage or time at component maintenance requirement. (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION)



3. If none of the above conditions are seen on the belt, the front timing belt cover can be installed (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).



## TIMING VERIFICATION

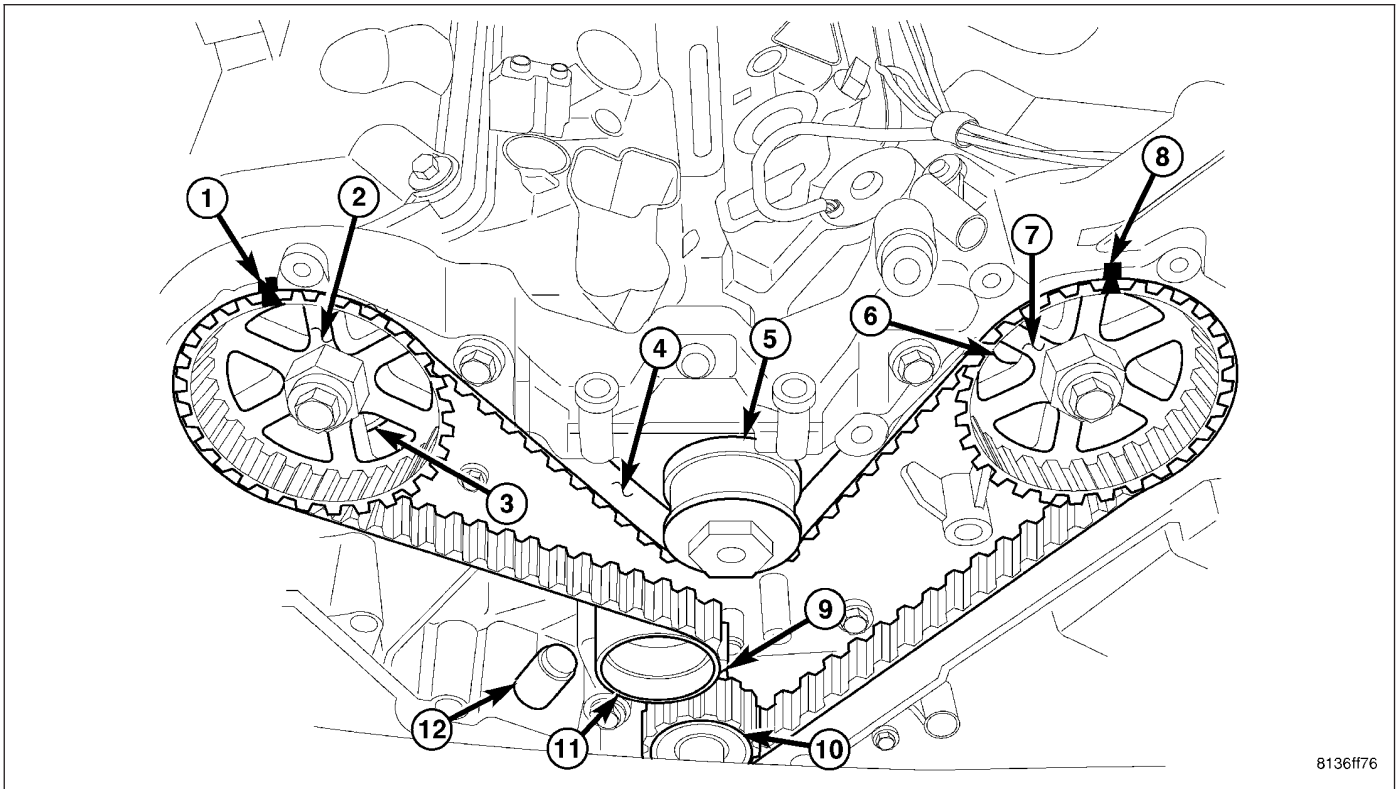


Remove the outer timing covers. Rotate the crankshaft until the pointer on the crankshaft sprocket (10) aligns the TDC mark on the oil pump (9). Check to determine if the camshaft sprocket (2, 7) timing marks (1, 8) are aligned with the marks on the inner timing cover. It may take an additional full revolution of the crankshaft before the camshaft sprocket marks are aligned.

## INSTALLATION

### TIMING BELT

**CAUTION:** If camshafts have moved from the timing marks, always rotate camshaft towards the direction nearest to the timing marks (DO NOT TURN CAMSHAFTS A FULL REVOLUTION OR DAMAGE to valves and/or pistons could result).



1. Align the crankshaft sprocket (10) with the TDC mark (9) on oil pump cover.
2. Align the camshaft sprockets (2, 7) timing reference marks (1, 8) with the marks on the rear cover.
3. Install the timing belt starting at the crankshaft sprocket (10) going in a counterclockwise direction. Install the belt around the last sprocket. Maintain tension on the belt as it is positioned around the tensioner pulley (11).

**Note:** If the camshaft gears have been removed it is only necessary to have the camshaft gear retaining bolts installed to a snug torque at this time.

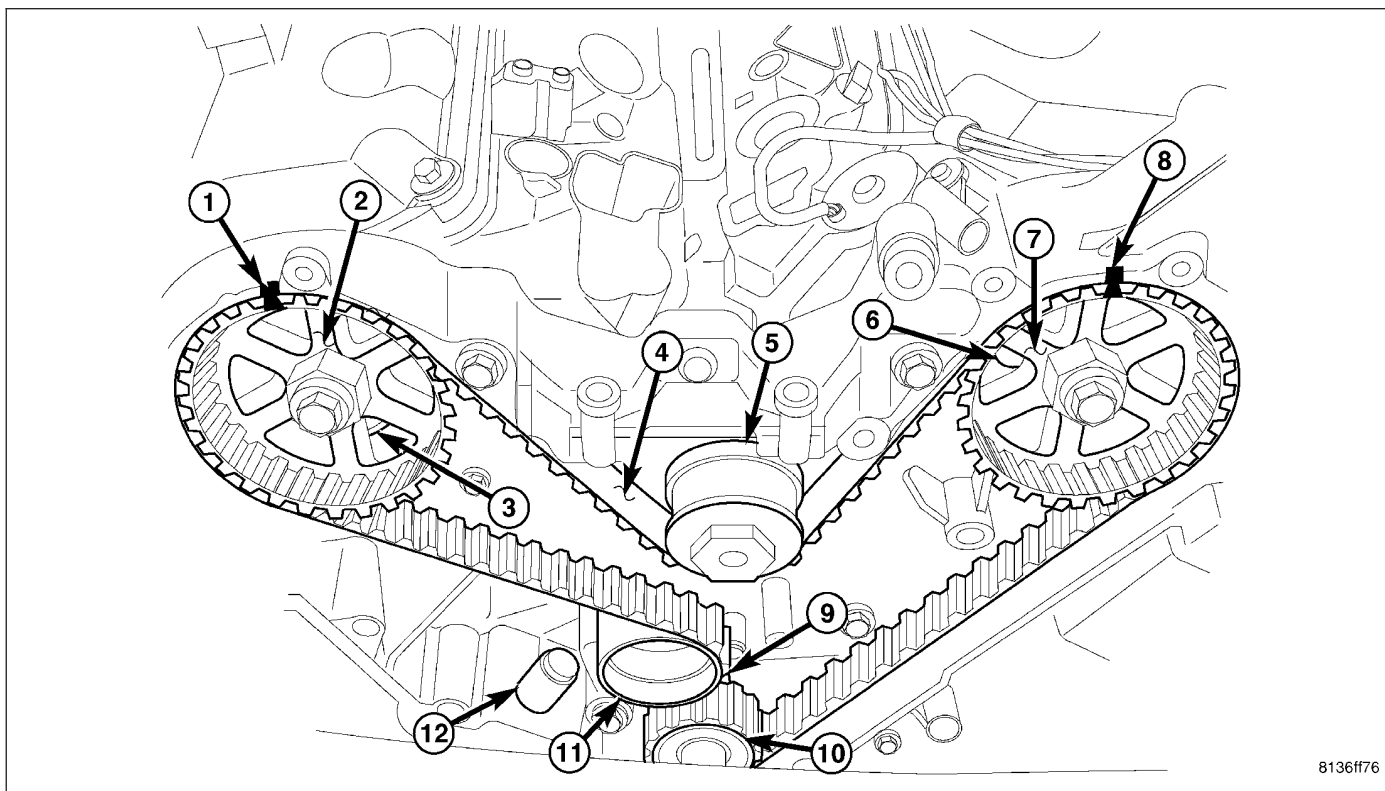
4. Holding the tensioner pulley (11) against the belt, install the tensioner into the housing and tighten to 28 N-m (250 in. lbs.). Each camshaft sprocket mark should remain aligned the cover marks.
5. When tensioner is in place pull retaining pin to allow the tensioner to extend to the pulley bracket.
6. Rotate crankshaft sprocket 2 revolutions and check the timing marks on the camshafts and crankshaft. The marks should line up within their respective locations. If marks do not line up, repeat procedure.

**Note:** If camshaft gears have been removed and timing is correct, counterhold and tighten the camshaft gears to final torque specification(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).

7. Install the front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
8. Tighten the rocker arm assemblies and install the cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).
9. Connect negative battery cable.

## CAMSHAFT SPROCKETS

**CAUTION:** The camshaft sprockets are keyed and not interchangeable from side to side because of the camshaft position sensor pick-up.

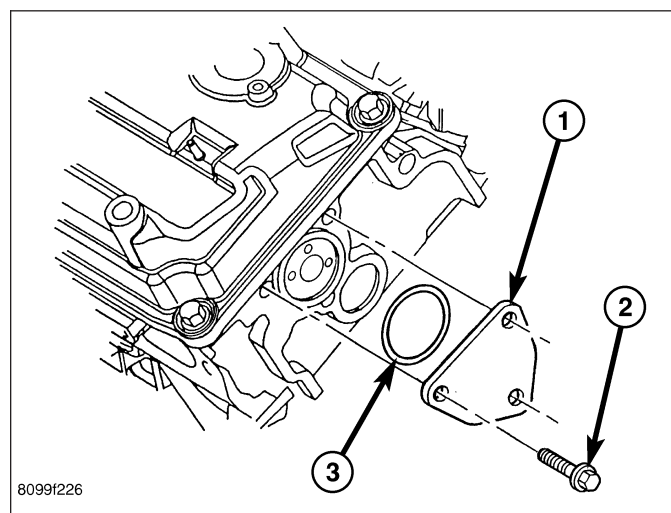


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1. Install camshaft sprockets onto the camshafts. Install **NEW** sprocket attaching bolts into place. The 255 mm (10 in.) bolt is to be installed in the left camshaft and the 213 mm (8 3/8 in.) bolt is to be installed into the right camshaft. **Do not tighten the bolts; tightened at later step.** Camshaft sprocket (2, 7) marks (1, 8) should be aligned with the marks on the cover at both sprockets.
2. Install the camshaft thrust plates (1) and o-ring (3). Tighten bolts (2) to 28 N·m (250 in. lbs.).
3. Install the timing belt starting first at the crankshaft sprocket (10), then to remaining components in a counterclockwise direction.
4. Install the belt around the last sprocket. Maintain tension on the belt as it is positioned around the tensioner pulley (11). Each camshaft sprockets mark should still be aligned with the rear cover marks.

**Note:** For timing belt tensioner reset procedure, (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - TIMING BELT - REMOVAL).

5. Hold the tensioner pulley against the belt and install the reset (pinned) timing belt tensioner into the housing. Tighten attaching bolts to 28 N·m (250 in. lbs.).
6. Remove tensioner retaining pin to allow the tensioner to extend to the pulley bracket.
7. Using a dial indicator, position the number 1 piston at TDC.
8. Hold the camshaft sprocket hex with a 36 mm (1 7/16 in.) wrench and tighten the camshaft bolts to the following:
  - Right side = 102 N·m (75 ft. lbs.) +90° turn
  - Left side = 102 N·m (75 ft. lbs.) +90° turn
9. Remove dial indicator and install spark plug.
10. Remove Special Tools 6642.



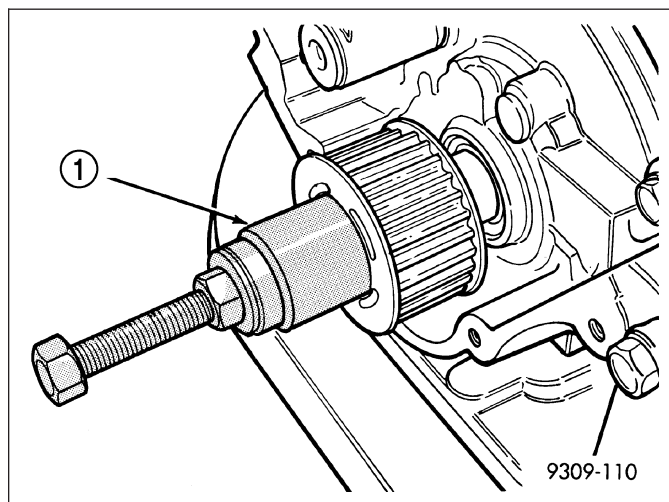
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11. Install front timing belt cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).

## CRANKSHAFT SPROCKET

**CAUTION:** To ensure proper installation depth of crankshaft sprocket, Special Tool 6641 must be used.

1. Install crankshaft sprocket using Special Tools 6641 (1) and C-4685-C1.
2. Install timing belt (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).



## TIMING BELT TENSIONER & PULLEY

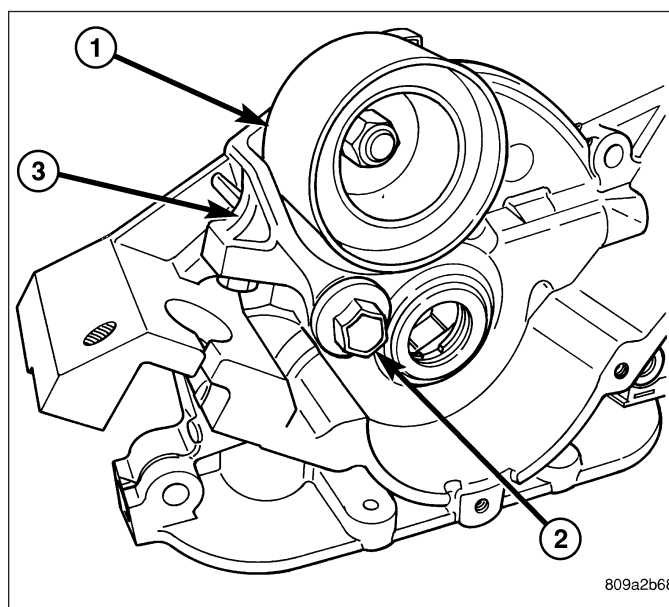
### REMOVAL

#### TENSIONER

1. For timing belt tensioner removal procedure (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL - TIMING BELT)

#### TENSIONER PULLEY ASSEMBLY

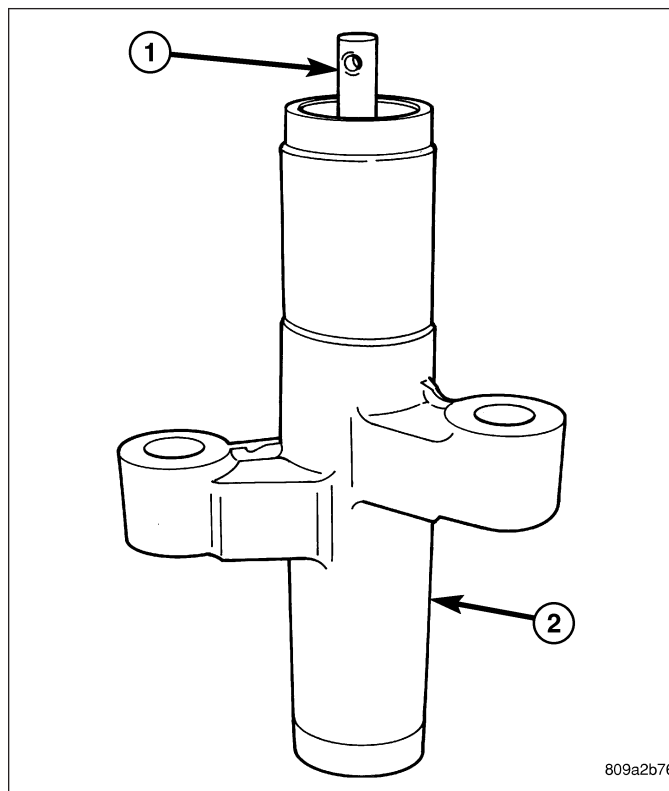
1. Remove the timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - REMOVAL - TIMING BELT)
2. Remove the timing belt tensioner pulley (1) and bracket (3) assembly by unscrewing the pivot bolt (2) from the oil pump housing.



## INSPECTION

### TENSIONER

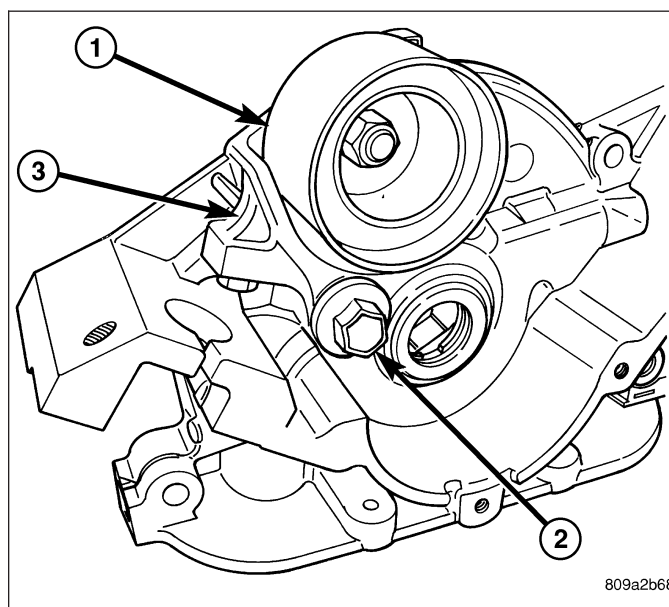
1. Inspect hydraulic tensioner (2) for fluid loss around the plunger (1) seal. Replace tensioner if leaking.



### TENSIONER PULLEY ASSEMBLY

**Note:** The tensioner pulley (1), bracket (3), and pivot bolt (2) is serviced as an assembly.

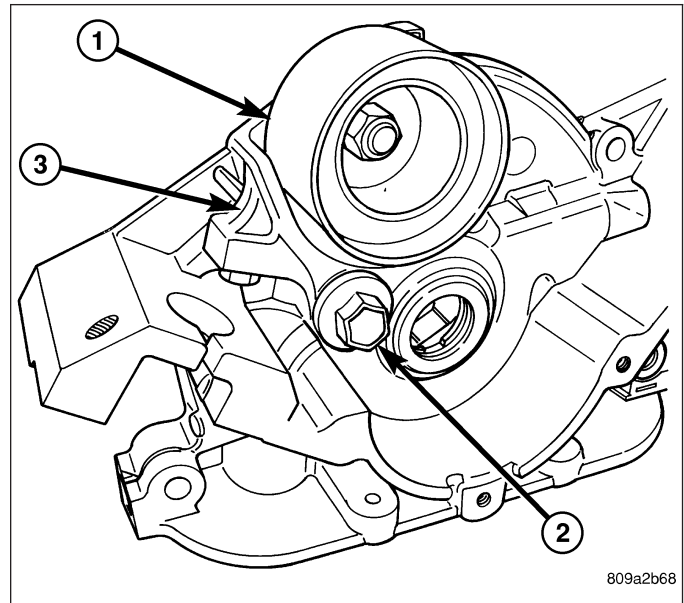
1. Inspect pulley (1) for free movement. Replace if pulley is loose, seized, or rough turning.
2. Inspect pulley bearing and seal. Replace if damaged.
3. Inspect pivot bolt (2) for free movement in assembly housing. Replace assembly if seized or excessive looseness.



## INSTALLATION

### TENSIONER PULLEY ASSEMBLY

1. Install the timing belt tensioner pulley (1) assembly. Tighten the pivot bolt (2) to 61 N·m (45 ft. lbs.).
2. Install the timing belt. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION - TIMING BELT)



### TENSIONER

1. For timing belt tensioner installation procedure (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT AND SPROCKETS - INSTALLATION - TIMING BELT).

## ENGINE - 5.7L SERVICE INFORMATION

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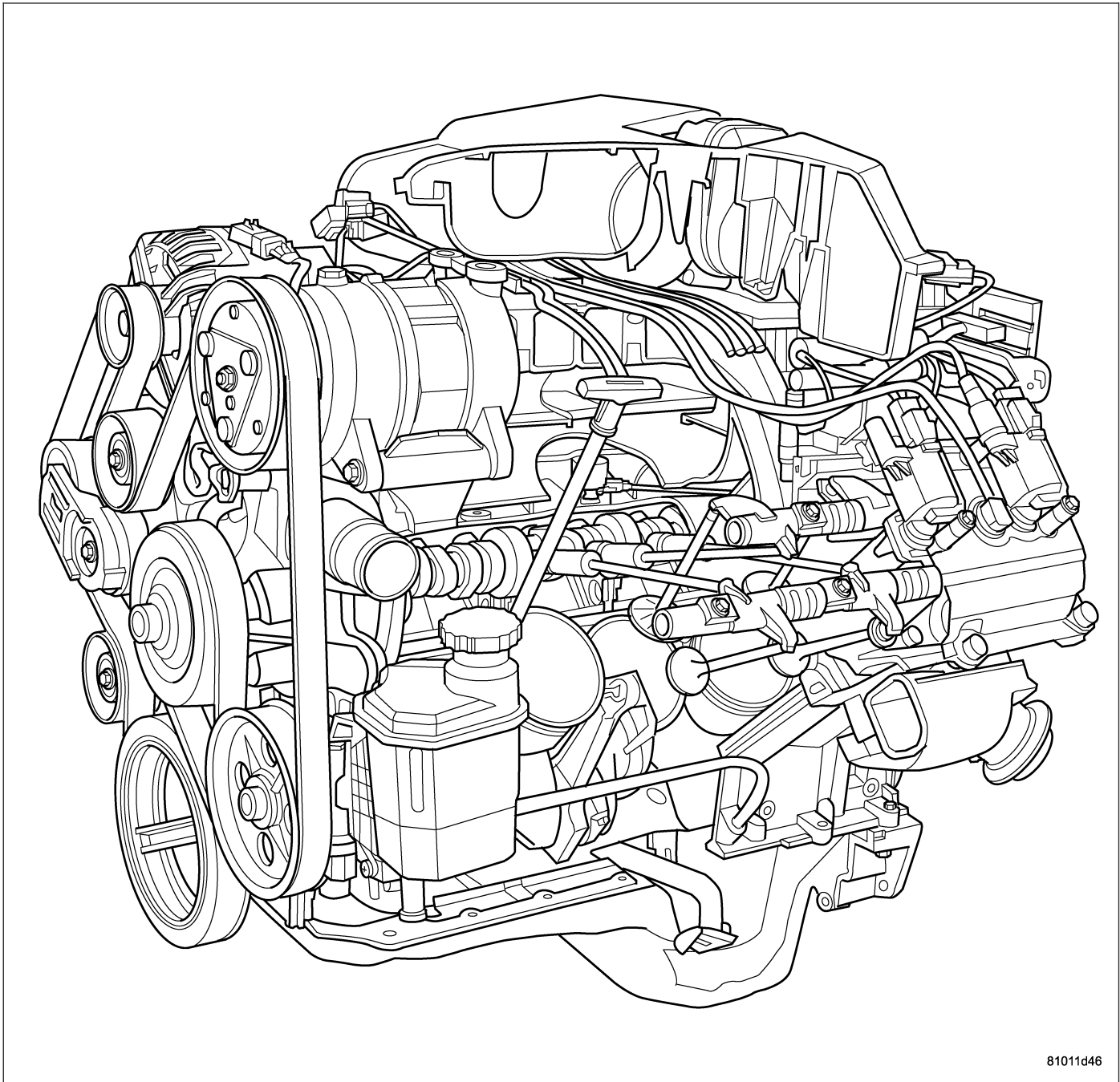
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## ENGINE - 5.7L SERVICE INFORMATION

### DESCRIPTION



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The 5.7L engine (345 CID) eight-cylinder engine is a 90° V-Type lightweight, deep skirt cast iron block, aluminum heads, single cam, overhead valve engine with hydraulic roller tappets. The heads incorporate splayed valves with a hemispherical style combustion chamber and dual spark plugs. The cylinders are numbered from front to rear; 1, 3, 5, 7 on the left bank and 2, 4, 6, 8 on the right bank. The firing order is 1-8-4-3-6-5-7-2.

## DIAGNOSIS AND TESTING

### DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either performance (e.g., engine idles rough and stalls) or mechanical (e.g., a strange noise).

(Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) - PERFORMANCE and (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)—MECHANICAL for possible causes and corrections of malfunctions. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DIAGNOSIS AND TESTING) and (Refer to 14 - FUEL SYSTEM/FUEL INJECTION - DIAGNOSIS AND TESTING) for the fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that can not be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following diagnosis:

- Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- Cylinder Combustion Pressure Leakage Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- Engine Cylinder Head Gasket Failure Diagnosis (Refer to 9 - ENGINE/CYLINDER HEAD - DIAGNOSIS AND TESTING).
- Intake Manifold Leakage Diagnosis (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - DIAGNOSIS AND TESTING).

### DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	<ol style="list-style-type: none"> <li>1. Weak battery</li> <li>2. Corroded or loose battery connections.</li> <li>3. Faulty starter.</li> <li>4. Incorrect spark plug gap.</li> <li>5. Dirt or water in fuel system.</li> <li>6. Faulty fuel pump, relay or wiring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Charge or replace as necessary.</li> <li>2. Clean and tighten battery connections. Apply a coat of light mineral grease to the terminals.</li> <li>3. (Refer to 8 - ELECTRICAL/STARTING - DIAGNOSIS AND TESTING).</li> <li>4. (Refer to 8 - ELECTRICAL/IGNITION CONTROL/SPARK PLUG - CLEANING).</li> <li>5. Clean system and replace fuel filter.</li> <li>6. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)</li> </ol>
ENGINE STALLS OR ROUGH IDLE	<ol style="list-style-type: none"> <li>1. Idle speed set to low.</li> <li>2. Vacuum leak.</li> <li>3. Incorrect engine timing.</li> </ol>	<ol style="list-style-type: none"> <li>1. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)</li> <li>2. Inspect intake manifold and vacuum hoses, repair or replace as necessary.</li> <li>3. (Refer to 9 - ENGINE/VALVE TIMING - STANDARD PROCEDURE).</li> </ol>

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE LOSS OF POWER	<ol style="list-style-type: none"><li>1. Dirty or incorrectly gapped spark plugs.</li><li>2. Dirt or water in fuel system.</li><li>3. Blown cylinder head gasket.</li><li>4. Low compression.</li><li>5. Burned, warped or pitted valves.</li><li>6. Plugged or restricted exhaust system.</li></ol>	<ol style="list-style-type: none"><li>1. Replace spark plugs.</li><li>2. Clean system and replace fuel filter.</li><li>3. Replace cylinder head gasket.</li><li>4. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).</li><li>5. Replace as necessary.</li><li>6. Inspect and replace as necessary.</li></ol>

## DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTIONS
NOISY VALVES	<ol style="list-style-type: none"><li>1. High or low oil level in crankcase.</li><li>2. Thin or diluted oil.</li><li>3. Low oil pressure.</li><li>4. Dirt in lash adjusters.</li><li>5. Worn rocker arms.</li><li>6. Worn lash adjusters</li><li>7. Worn valve guides.</li><li>8. Excessive runout of valve seats on valve faces.</li></ol>	<ol style="list-style-type: none"><li>1. (Refer to LUBRICATION &amp; MAINTENANCE - SPECIFICATIONS)</li><li>2. Change oil and filter.</li><li>3. Check oil pump, if Ok, check rod and main bearings for excessive wear.</li><li>4. Replace as necessary.</li><li>5. Replace as necessary.</li><li>6. Replace as necessary.</li><li>7. (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES &amp; SEATS - STANDARD PROCEDURE)</li><li>8. (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES &amp; SEATS - STANDARD PROCEDURE)</li></ol>
CONNECTING ROD NOISE	<ol style="list-style-type: none"><li>1. Insufficient oil supply.</li><li>2. Low oil pressure.</li><li>3. Thin or diluted oil.</li><li>4. Excessive bearing clearance.</li><li>5. Connecting rod journal out-of-round.</li><li>6. Misaligned connecting rods.</li></ol>	<ol style="list-style-type: none"><li>1. (Refer to LUBRICATION &amp; MAINTENANCE - SPECIFICATIONS)</li><li>2. Check oil pump, if Ok, check rod and main bearings for excessive wear.</li><li>3. Change oil and filter.</li><li>4. Replace as necessary.</li><li>5. Service or replace crankshaft.</li><li>6. Replace bent connecting rods.</li></ol>

CONDITION	POSSIBLE CAUSES	CORRECTIONS
MAIN BEARING NOISE	<ol style="list-style-type: none"> <li>1. Insufficient oil supply.</li> <li>2. Low oil pressure.</li> <li>3. Thin or diluted oil.</li> <li>4. Excessive bearing clearance.</li> <li>5. Excessive end play.</li> <li>6. Crankshaft journal out-of round.</li> <li>7. Loose flywheel or torque converter.</li> </ol>	<ol style="list-style-type: none"> <li>1. (Refer to LUBRICATION &amp; MAINTENANCE - SPECIFICATIONS)</li> <li>2. Check oil pump, if Ok, check rod and main bearings for excessive wear.</li> <li>3. Change oil and filter.</li> <li>4. Replace as necessary.</li> <li>5. Check thrust washers for wear.</li> <li>6. Service or replace crankshaft.</li> <li>7. Tighten to correct torque</li> </ol>

## DIAGNOSIS AND TESTING - CYLINDER COMPRESSION PRESSURE

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

1. Clean the spark plug recesses with compressed air.
2. Remove the spark plugs.
3. Disable the fuel system (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DESCRIPTION).
4. Remove the ASD relay (Refer to 8 - ELECTRICAL/IGNITION CONTROL/AUTO SHUT DOWN RELAY - REMOVAL).
5. Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.
6. Record the compression pressure on the 3rd revolution. Continue the test for the remaining cylinders.
7. (Refer to 9 - ENGINE - SPECIFICATIONS) for the correct engine compression pressures.

## DIAGNOSIS AND TESTING - CYLINDER COMBUSTION PRESSURE LEAKAGE

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
  - Leaks between adjacent cylinders or into water jacket.
  - Any causes for combustion/compression pressure loss.
1. Check the coolant level and fill as required. DO NOT install the radiator cap.
  2. Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.
  3. Remove the spark plugs.
  4. Remove the oil filler cap.
  5. Remove the air cleaner hose.
  6. Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum and 552 kPa (80 psi) recommended.
  7. Perform the test procedures on each cylinder according to the tester manufacturer's instructions. Set piston of cylinder to be tested at TDC compression, While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the radiator coolant.

All gauge pressure indications should be equal, with no more than 25% leakage.

**FOR EXAMPLE:** At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

Refer to CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART .

**CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART**

CONDITION	POSSIBLE CAUSE	CORRECTION
AIR ESCAPES THROUGH THROTTLE BODY	Intake valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH TAILPIPE	Exhaust valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH RADIATOR	Head gasket leaking or cracked cylinder head or block	Remove cylinder head and inspect. Replace defective part
MORE THAN 50% LEAKAGE FROM ADJACENT CYLINDERS	Head gasket leaking or crack in cylinder head or block between adjacent cylinders	Remove cylinder head and inspect. Replace gasket, head, or block as necessary
MORE THAN 25% LEAKAGE AND AIR ESCAPES THROUGH OIL FILLER CAP OPENING ONLY	Stuck or broken piston rings; cracked piston; worn rings and/or cylinder wall	Inspect for broken rings or piston. Measure ring gap and cylinder diameter, taper and out-of-round. Replace defective part as necessary

**DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - LUBRICATION**

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	<ol style="list-style-type: none"><li>Gaskets and O-Rings.<ol style="list-style-type: none"><li>Misaligned or damaged.</li><li>Loose fasteners, broken or porous metal parts.</li></ol></li><li>Crankshaft rear seal</li><li>Crankshaft seal flange. Scratched, nicked or grooved.</li><li>Oil pan flange cracked.</li><li>Front cover seal, damaged or misaligned.</li><li>Scratched or damaged vibration damper hub.</li><li>Crankshaft Rear Flange Microporosity</li></ol>	<ol style="list-style-type: none"><li><ol style="list-style-type: none"><li>Replace as necessary.</li><li>Tighten fasteners, Repair or replace metal parts.</li></ol></li><li>Replace as necessary.</li><li>Polish or replace crankshaft.</li><li>Replace oil pan.</li><li>Replace seal.</li><li>Polish or replace damper.</li><li>Replace Crankshaft</li></ol>
OIL PRESSURE DROP	<ol style="list-style-type: none"><li>Low oil level.</li><li>Faulty oil pressure sending unit.</li><li>Low oil pressure.</li><li>Clogged oil filter.</li><li>Worn oil pump.</li><li>Thin or diluted oil.</li><li>Excessive bearing clearance.</li><li>Oil pump relief valve stuck.</li><li>Oil pickup tube loose or damaged.</li></ol>	<ol style="list-style-type: none"><li>Check and correct oil level.</li><li>Replace sending unit.</li><li>Check pump and bearing clearance.</li><li>Replace oil filter.</li><li>Replace as necessary.</li><li>Change oil and filter.</li><li>Replace as necessary.</li><li>Replace oil pump.</li><li>Replace as necessary.</li></ol>

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL PUMPING AT RINGS; SPARK PLUGS FOULING	<ol style="list-style-type: none"> <li>1. Worn or damaged rings.</li> <li>2. Carbon in oil ring slots.</li> <li>3. Incorrect ring size installed.</li> <li>4. Worn valve guides.</li> <li>5. Leaking intake gasket.</li> <li>6. Leaking valve guide seals.</li> </ol>	<ol style="list-style-type: none"> <li>1. Hone cylinder bores and replace rings.</li> <li>2. Replace rings.</li> <li>3. Replace rings.</li> <li>4. Ream guides and replace valves.</li> <li>5. Replace intake gaskets.</li> <li>6. Replace valve guide seals.</li> </ol>

## DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - MECHANICAL

### ENGINE MECHANICAL DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VALVES/LIFTERS	<ol style="list-style-type: none"> <li>1. High or low oil level in crankcase</li> <li>2. Thin or diluted oil</li> <li>3. Low oil pressure</li> <li>4. Dirt in tappets/lash adjusters</li> <li>5. Bent push rod(s)</li> <li>6. Worn rocker arms</li> <li>7. Worn tappets/lash adjusters</li> <li>8. Worn valve guides</li> <li>9. Excessive runout of valve seats or valve faces</li> </ol>	<ol style="list-style-type: none"> <li>1. Check for correct oil level. Adjust oil level by draining or adding as needed</li> <li>2. Change oil. (Refer to 9 - ENGINE/LUBRICATION/OIL - STANDARD PROCEDURE)</li> <li>3. Check engine oil level. If ok, Perform oil pressure test. (Refer to 9 - ENGINE/LUBRICATION - DIAGNOSIS AND TESTING) for engine oil pressure test/ specifications</li> <li>4. Clean/replace hydraulic tappets/lash adjusters</li> <li>5. Install new push rods</li> <li>6. Inspect oil supply to rocker arms and replace worn arms as needed</li> <li>7. Install new hydraulic tappets/lash adjusters</li> <li>8. Inspect all valve guides and replace as necessary</li> <li>9. Grind valves and seats</li> </ol>

CONDITION	POSSIBLE CAUSES	CORRECTION
CONNECTING ROD NOISE	<ol style="list-style-type: none"> <li>1. Insufficient oil supply</li> <li>2. Low oil pressure</li> <li>3. Thin or diluted oil</li> <li>4. Excessive connecting rod bearing clearance</li> <li>5. Connecting rod journal out of round</li> <li>6. Misaligned connecting rods</li> </ol>	<ol style="list-style-type: none"> <li>1. Check engine oil level.</li> <li>2. Check engine oil level. If ok, Perform oil pressure test. (Refer to 9 - ENGINE/LUBRICATION - DIAGNOSIS AND TESTING) engine oil pressure test/specifications</li> <li>3. Change oil to correct viscosity. (Refer to 9 - ENGINE/LUBRICATION/OIL - STANDARD PROCEDURE) for correct procedure/engine oil specifications</li> <li>4. Measure bearings for correct clearance with plasti-gage. Repair as necessary</li> <li>5. Replace crankshaft or grind journals</li> <li>6. Replace bent connecting rods</li> </ol>
MAIN BEARING NOISE	<ol style="list-style-type: none"> <li>1. Insufficient oil supply</li> <li>2. Low oil pressure</li> <li>3. Thin or diluted oil</li> <li>4. Excessive main bearing clearance</li> <li>5. Excessive end play</li> <li>6. Crankshaft main journal out of round or worn</li> <li>7. Loose flywheel or torque converter</li> </ol>	<ol style="list-style-type: none"> <li>1. Check engine oil level.</li> <li>2. Check engine oil level. If ok, Perform oil pressure test. (Refer to 9 - ENGINE/LUBRICATION - DIAGNOSIS AND TESTING)</li> <li>3. Change oil to correct viscosity.</li> <li>4. Measure bearings for correct clearance. Repair as necessary</li> <li>5. Check crankshaft thrust bearing for excessive wear on flanges</li> <li>6. Grind journals or replace crankshaft</li> <li>7. Inspect crankshaft, flexplate/flywheel and bolts for damage. Tighten to correct torque</li> </ol>
LOW OIL PRESSURE	<ol style="list-style-type: none"> <li>1. Low oil level</li> <li>2. Faulty oil pressure sending unit</li> <li>3. Clogged oil filter</li> <li>4. Worn oil pump</li> <li>5. Thin or diluted oil</li> <li>6. Excessive bearing clearance</li> <li>7. Oil pump relief valve stuck</li> <li>8. Oil pickup tube loose, broken, bent or clogged</li> <li>9. Oil pump cover warped or cracked</li> </ol>	<ol style="list-style-type: none"> <li>1. Check oil level and fill if necessary</li> <li>2. Install new sending unit</li> <li>3. Install new oil filter</li> <li>4. Replace oil pump assembly.</li> <li>5. Change oil to correct viscosity.</li> <li>6. Measure bearings for correct clearance</li> <li>7. Remove valve to inspect, clean and reinstall</li> <li>8. Inspect oil pickup tube and pump, and clean or replace if necessary</li> <li>9. Install new oil pump</li> </ol>



CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	<ol style="list-style-type: none"> <li>1. Misaligned or deteriorated gaskets</li> <li>2. Loose fastener, broken or porous metal part</li> <li>3. Front or rear crankshaft oil seal leaking</li> <li>4. Leaking oil gallery plug or cup plug</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace gasket</li> <li>2. Tighten, repair or replace the part</li> <li>3. Replace seal</li> <li>4. Remove and reseal threaded plug. Replace cup style plug</li> </ol>
EXCESSIVE OIL CONSUMPTION OR SPARK PLUGS OIL FOULED	<ol style="list-style-type: none"> <li>1. CCV System malfunction</li> <li>2. Defective valve stem seal(s)</li> <li>3. Worn or broken piston rings</li> <li>4. Scuffed pistons/cylinder walls</li> <li>5. Carbon in oil control ring groove</li> <li>6. Worn valve guides</li> <li>7. Piston rings fitted too tightly in grooves</li> </ol>	<ol style="list-style-type: none"> <li>1. (Refer to 25 - EMISSIONS CONTROL/EVAPORATIVE EMISSIONS - DESCRIPTION) for correct operation</li> <li>2. Repair or replace seal(s)</li> <li>3. Hone cylinder bores. Install new rings</li> <li>4. Hone cylinder bores and replace pistons as required</li> <li>5. Remove rings and de-carbon piston</li> <li>6. Inspect/replace valve guides as necessary</li> <li>7. Remove rings and check ring end gap and side clearance. Replace if necessary</li> </ol>

## STANDARD PROCEDURE

### STANDARD PROCEDURE - REPAIR DAMAGED OR WORN THREADS

**CAUTION:** Be sure that the tapped holes maintain the original center line.

Damaged or worn threads can be repaired. Essentially, this repair consists of:

- Drilling out worn or damaged threads.
- Tapping the hole with a special Heli-Coil Tap, or equivalent.
- Installing an insert into the tapped hole to bring the hole back to its original thread size.

### STANDARD PROCEDURE - HYDROSTATIC LOCK

**CAUTION:** DO NOT use the starter motor to rotate the crankshaft. Severe damage could occur.

When an engine is suspected of hydrostatic lock (regardless of what caused the problem), follow the steps below.

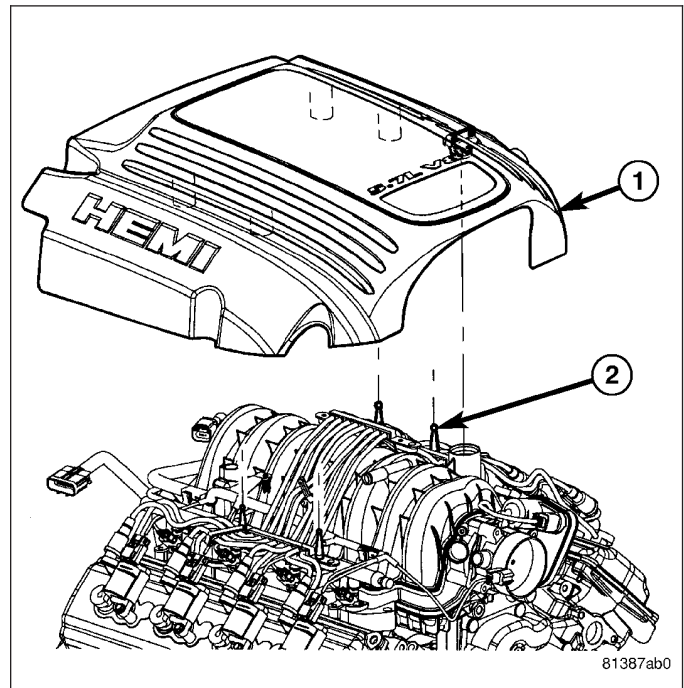
1. Perform the Fuel Pressure Release Procedure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
2. Disconnect the negative cable(s) from the battery.
3. Inspect air cleaner, induction system, and intake manifold to ensure system is dry and clear of foreign material.
4. Place a shop towel around the spark plugs to catch any fluid that may possibly be under pressure in the cylinder head. Remove the spark plugs.
5. With all spark plugs removed, rotate the crankshaft using a breaker bar and socket.
6. Identify the fluid in the cylinders (coolant, fuel, oil, etc.).
7. Be sure all fluid has been removed from the cylinders.



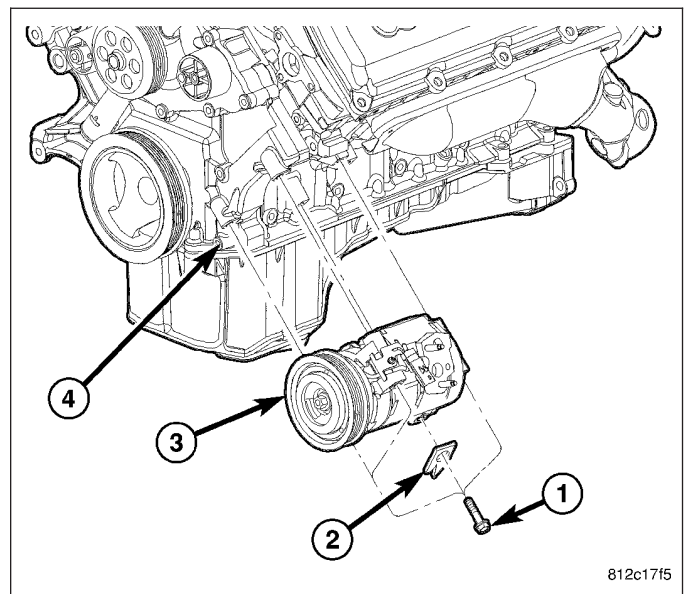
8. Repair engine or components as necessary to prevent this problem from occurring again.
9. Squirt a small amount of engine oil into the cylinders to lubricate the walls. This will prevent damage on restart.
10. Install new spark plugs. Tighten the spark plugs to 41 N·m (30 ft. lbs.) torque.
11. Drain engine oil. Remove and discard the oil filter.
12. Install the drain plug. Tighten the plug to 34 N·m (25 ft. lbs.) torque.
13. Install a new oil filter.
14. Fill engine crankcase with the specified amount and grade of oil. (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS).
15. Connect the negative cable(s) to the battery.
16. Start the engine and check for any leaks.

## REMOVAL - ENGINE

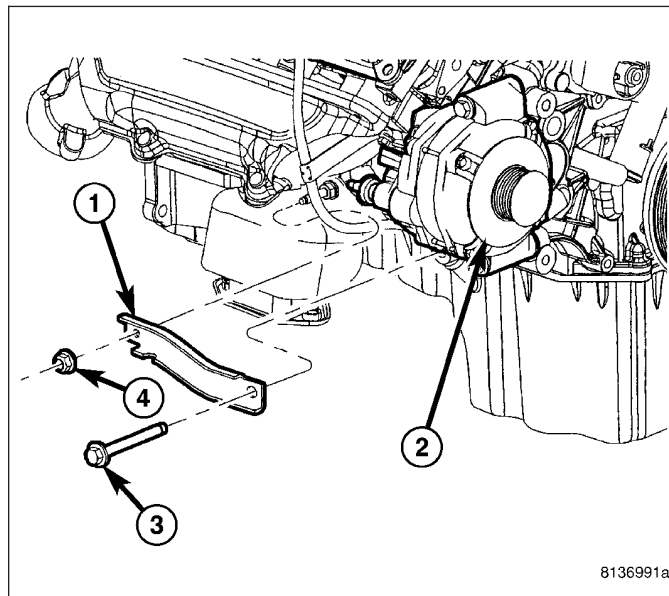
1. Remove the engine cover.
2. Perform the Fuel System Pressure Release procedure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
3. Disconnect the battery negative cable.
4. Remove the air cleaner resonator and duct work as an assembly.
5. Remove the cowl top panel (Refer to 23 - BODY/ EXTERIOR/COWL GRILLE - REMOVAL).
6. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
7. Remove the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
8. Remove radiator fan shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).



9. Remove the A/C compressor with the lines attached. Secure compressor out of the way.

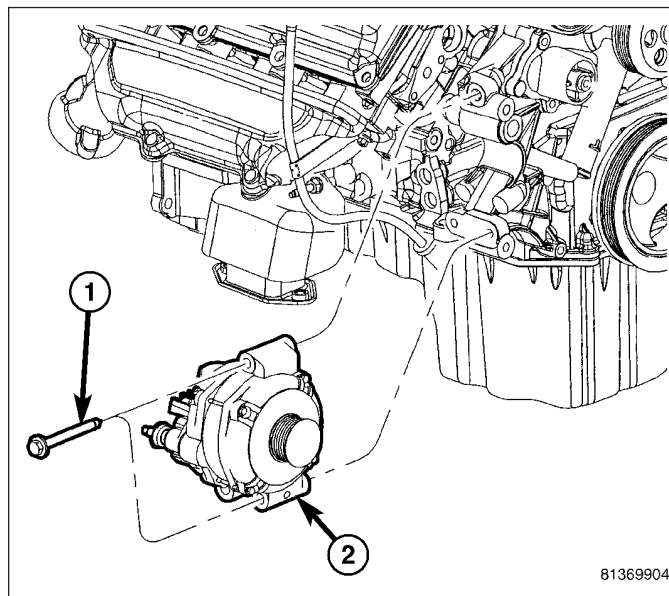


10. Remove generator assembly (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - REMOVAL).

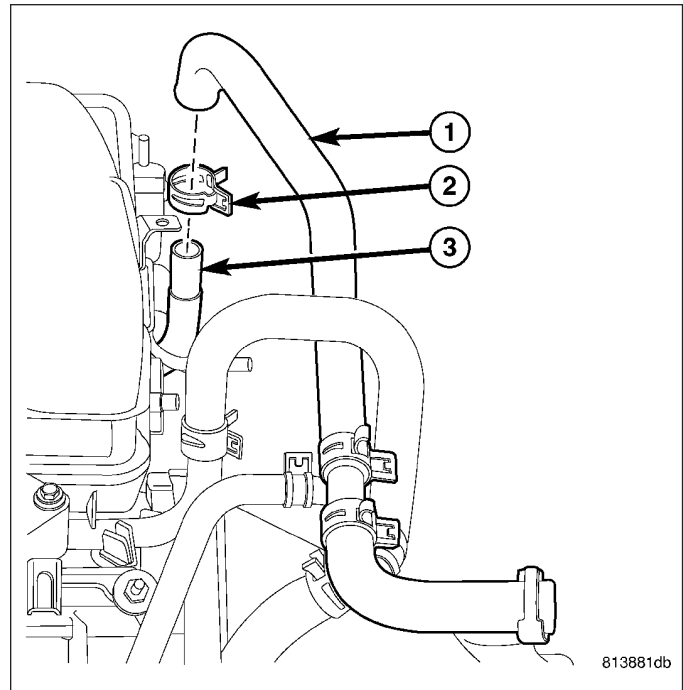


11. Remove the intake manifold and IAFM as an assembly (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).

12. Remove the ground wires from the rear of each cylinder head.

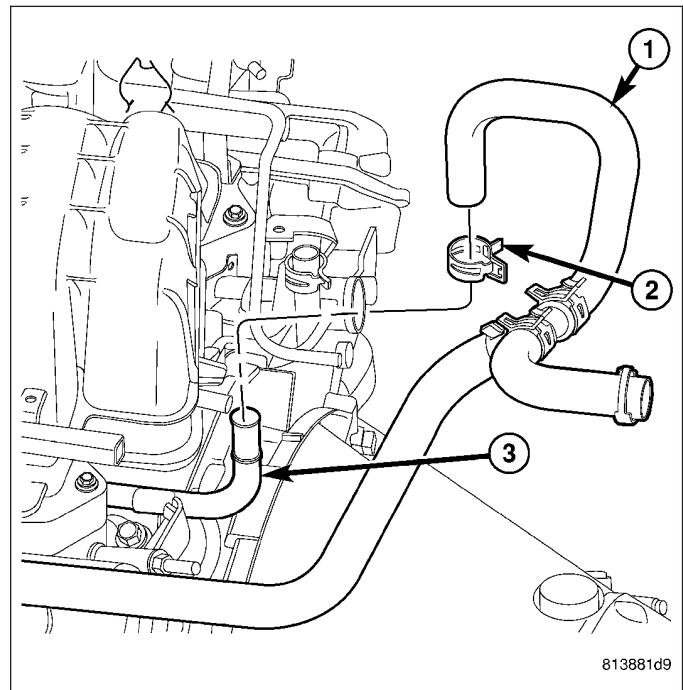


13. Disconnect the heater hoses.

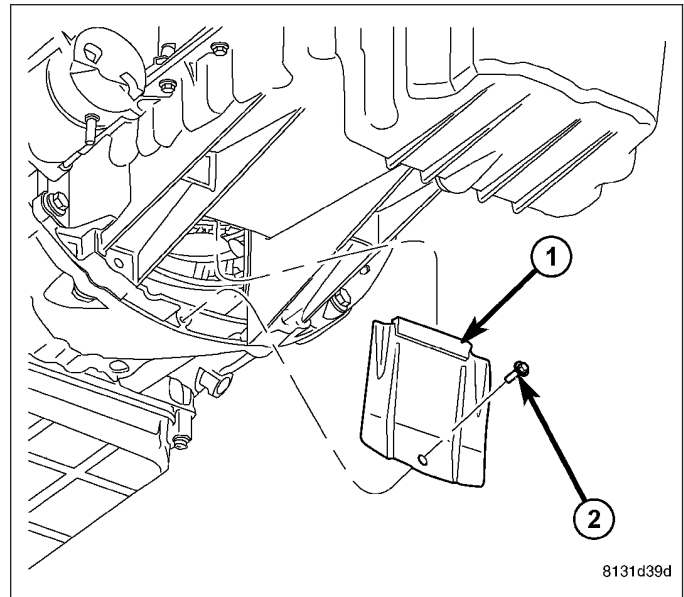


**Note:** It is not necessary to disconnect P/S hoses from pump, for P/S pump removal.

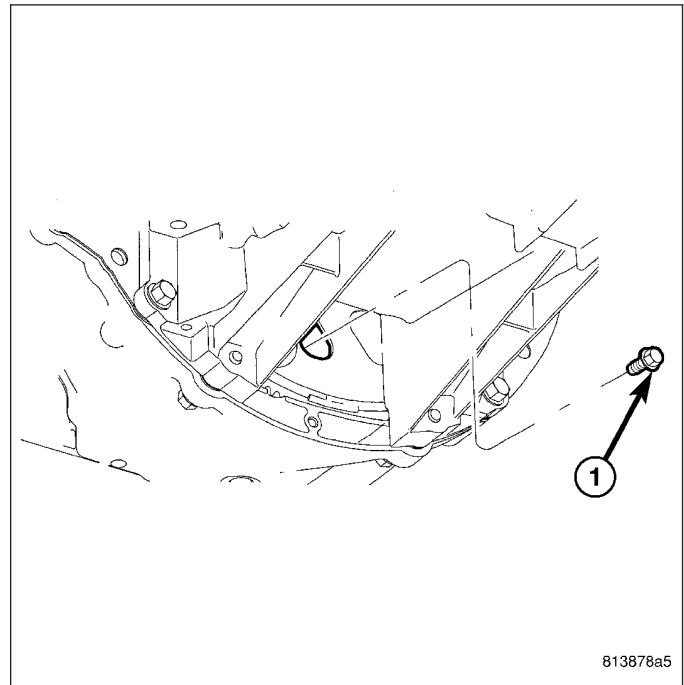
14. Remove the power steering pump and set aside.
15. Disconnect the fuel supply line (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
16. Raise and support the vehicle on a hoist and drain the engine oil.
17. Remove the belly pan (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL).
18. Remove engine front mount to frame nuts.
19. Disconnect the transmission oil cooler lines from their retainers at the oil pan bolts.
20. Disconnect exhaust pipe at manifolds.
21. Disconnect the starter wires. Remove starter motor (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - REMOVAL).



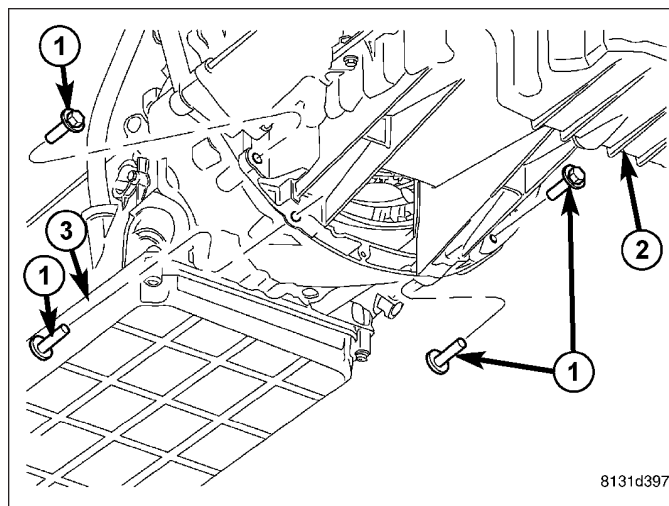
22. Remove the torque converter access cover.



23. Remove drive plate to converter bolts.

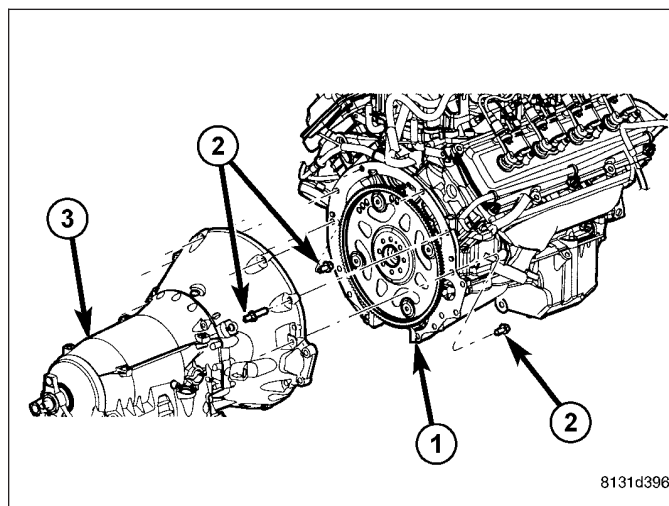


24. Remove transmission bell housing to engine block bolts.

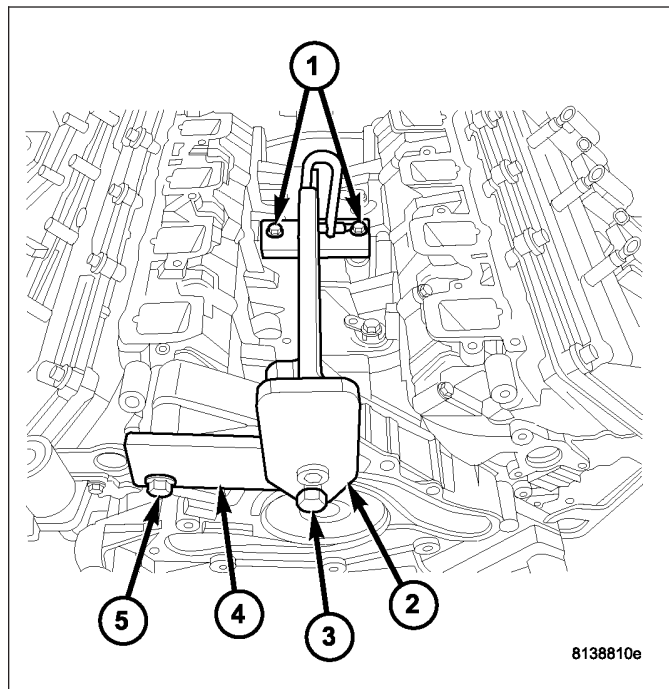


25. Lower the vehicle.

26. Install engine lift fixture, special tool # 8984 and 8984-UPD.

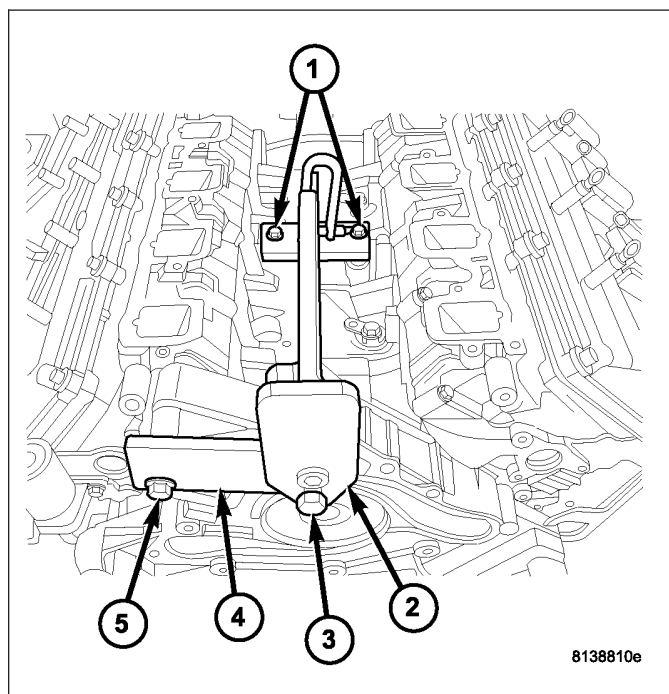


27. Separate engine from transmission, remove engine from vehicle, and install engine assembly on a repair stand.

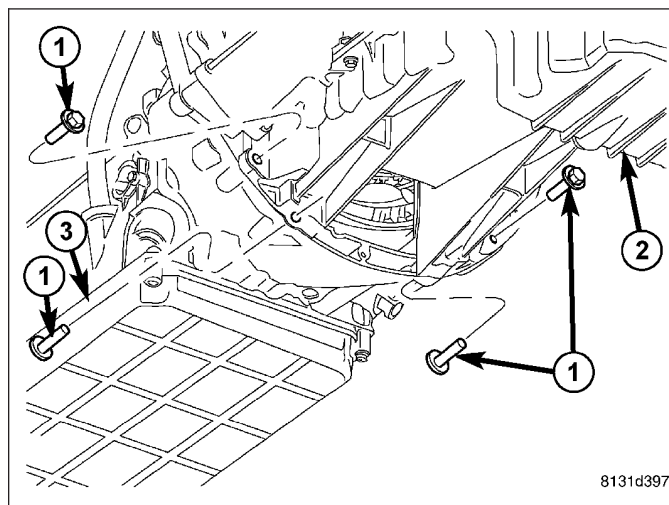


## INSTALLATION - ENGINE

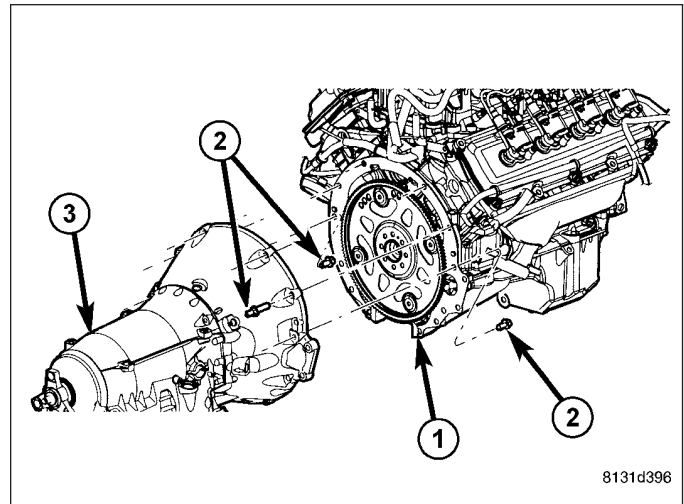
1. Install engine lift fixture Special tool # 8984 and 8984-UPD.
2. Position the engine in the engine compartment.
3. Lower engine into compartment and align engine with transmission.



4. Mate engine and transmission and install two transmission to engine block mounting bolts finger tight.
5. Lower engine assembly until engine mount studs rest in frame perches.

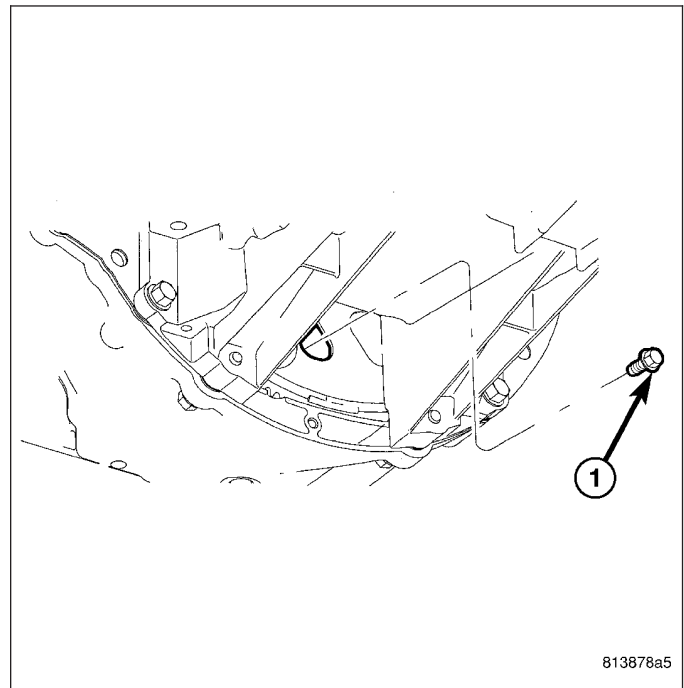


6. Install remaining transmission to engine block mounting bolts and tighten.

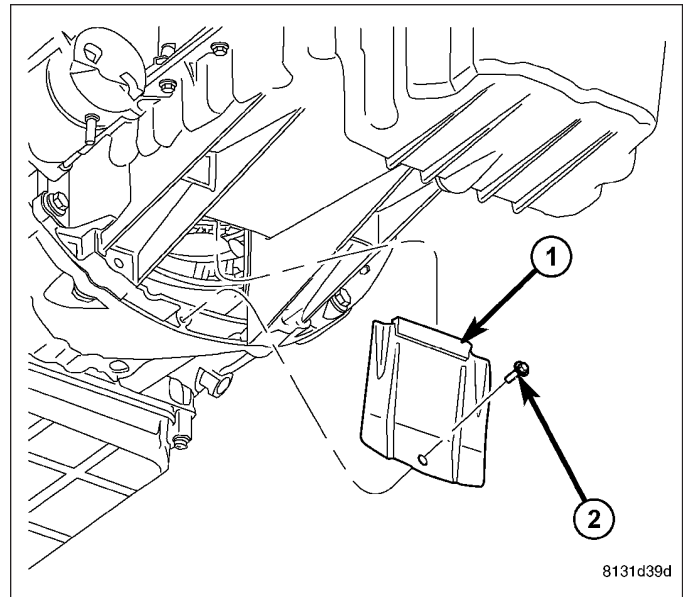


7. Install and tighten engine mount to frame nuts.

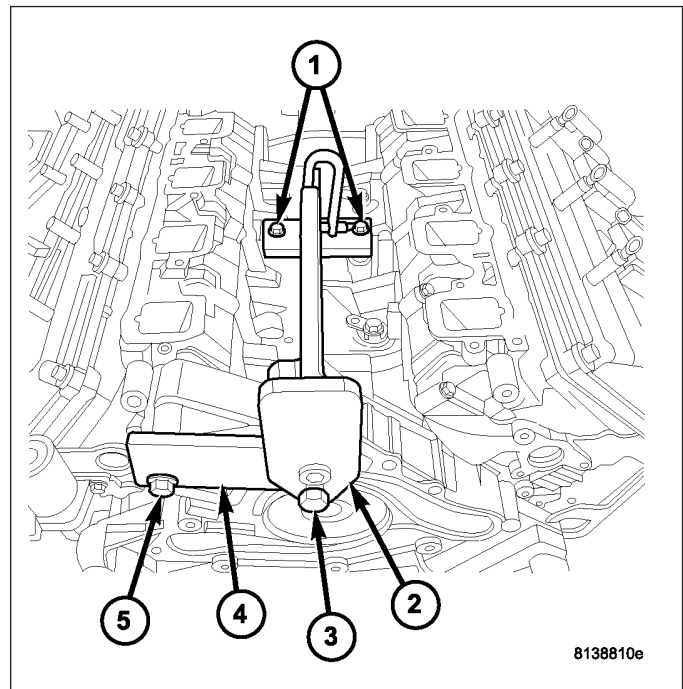
8. Install drive plate to torque converter bolts).



9. Install the torque converter access cover.



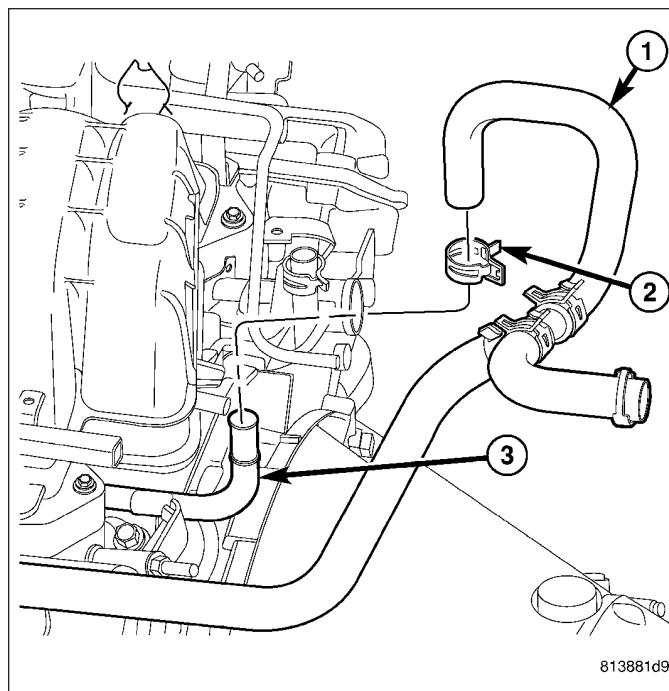
10. Install the starter and connect the starter wires (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - INSTALLATION).
11. Install exhaust pipe to manifold.
12. Lower the vehicle.
13. Remove engine lift fixture, special tool # 8984 and 8984-UPD.



14. Connect the fuel supply line (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
15. Reinstall the power steering pump.

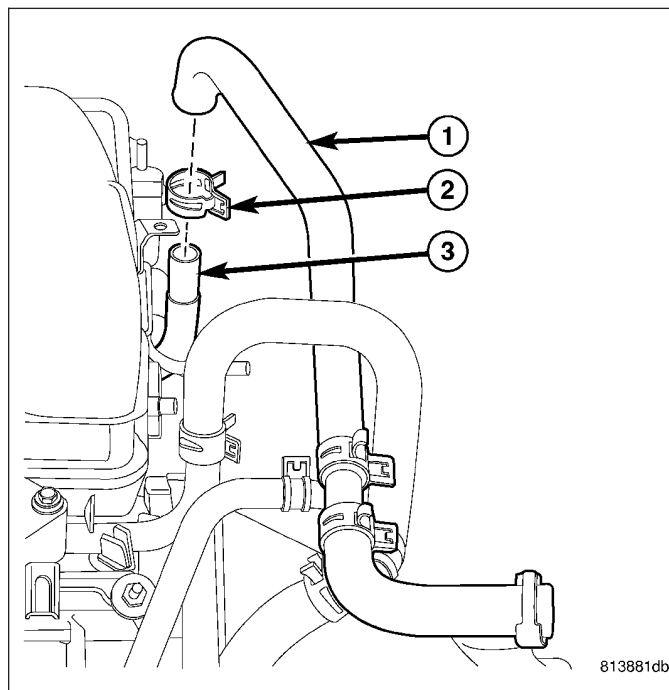


16. Connect the heater hoses.

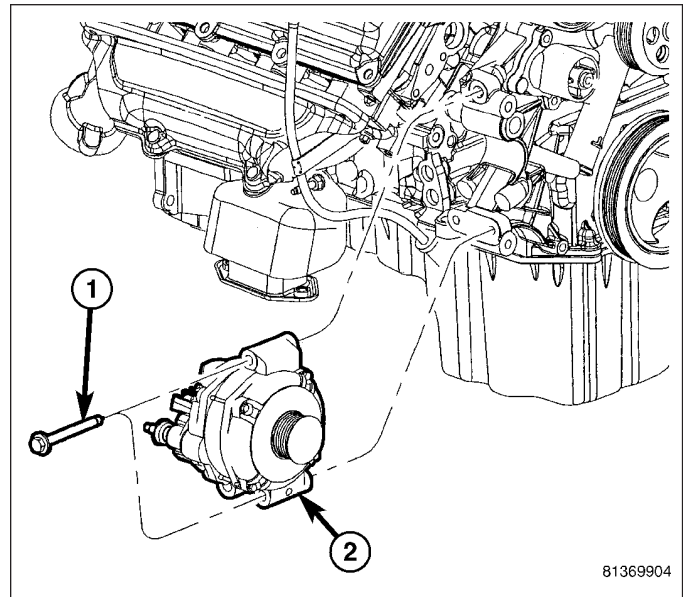


17. Reconnect the ground wires to the rear of each cylinder head.

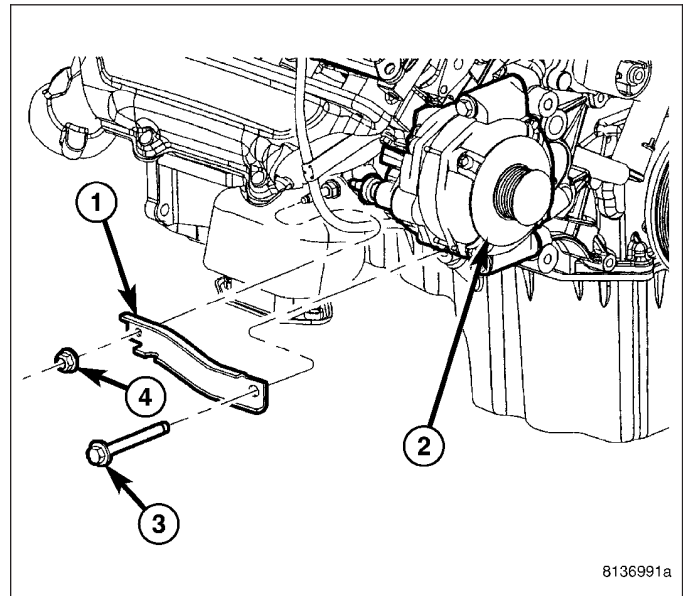
18. Install the intake manifold. (Refer to 9 - ENGINE/  
MANIFOLDS/INTAKE MANIFOLD -  
INSTALLATION)



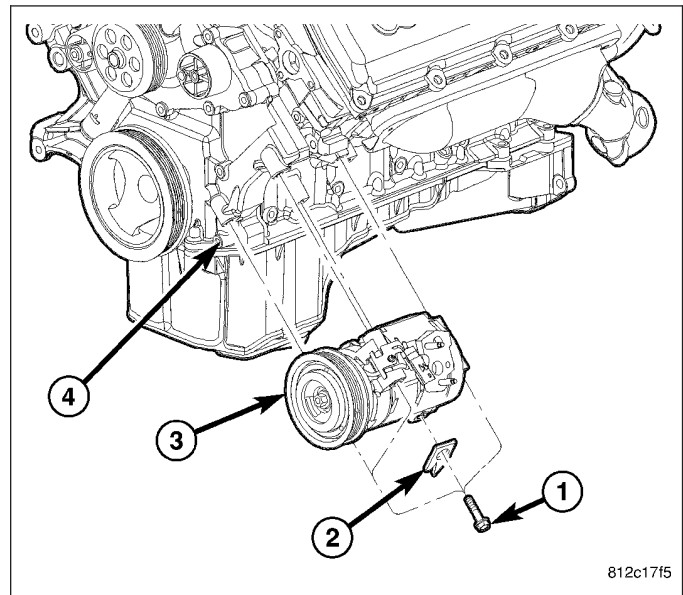
19. Install the generator, generator support bracket, and wire connections (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - INSTALLATION).



20. Install a/c compressor (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - INSTALLATION).

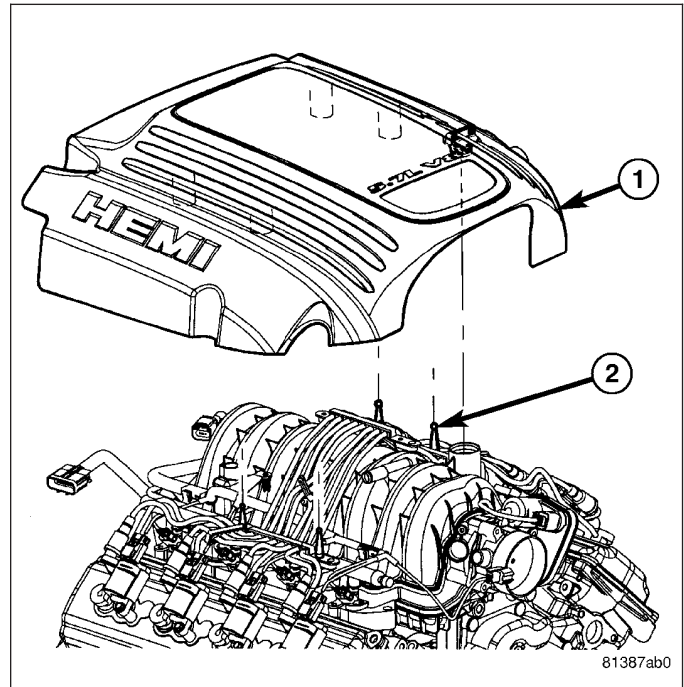


21. Install the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
22. Install the radiator fan shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
23. Connect the radiator lower hose.
24. Connect the transmission oil cooler lines to the radiator.
25. Connect the radiator upper hose.
26. Install cowl top panel (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - INSTALLATION).
27. Install the air cleaner resonator and duct work..
28. Add engine oil to crankcase (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - SPECIFICATIONS).



29. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

30. Install the engine cover.



31. Connect battery negative cable.

32. Start engine and inspect for leaks.

33. Install the belly pan (Refer to 23 - BODY/EXTERIOR/BELLY PAN - INSTALLATION).

34. Road test vehicle.

**SPECIFICATIONS****5.7L ENGINE****GENERAL DESCRIPTION**

DESCRIPTION	SPECIFICATION
Engine Type	90° V-8 OHV
Displacement	5.7 Liters 345 ( Cubic Inches)
Bore	99.5 mm (3.91 in.)
Stroke	90.9 mm (3.58 in.)
Compression Ratio	9.6:1
Firing Order	1-8-4-3-6-5-7-2
Lubrication	Pressure Feed - Full Flow Filtration
Cooling System	Liquid Cooled - Forced Circulation
Cylinder Block	Cast Iron
Cylinder Head	Aluminum
Crankshaft	Nodular Iron
Camshaft	Hollow Assembled Camshaft
Pistons	Aluminum Alloy
Connecting Rods	Powdered Metal

**CYLINDER BLOCK**

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Cylinder Bore Diameter	99.50 mm	3.917 in.
Out of Round (MAX)	0.0076 mm	0003 in.
Taper (MAX)	0.0127 mm	0.0005 in.
Lifter Bore Diameter	21.45 - 21.425 mm	0.8444 - 0.8435 in.

**PISTONS**

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Clearance Measured at 38.0 mm ( 1.5 in.) Below Deck	0.0215 - 0.0485 mm	0.0008 - 0.0019 in.
Ring Groove Diameter		
Groove #1	89.6 - 89.8 mm	3.527 - 3.535 in.
Groove #2	88.1 - 88.3 mm	3.468 - 3.476 in.
Weight	413 grams	14.56 oz
Piston Length	54.70 - 55.30	2.153 - 2.177 in.
<b>Ring Groove Width</b>		
No. 1	1.51 - 1.54 mm	0.0594 - 0.0606 in.
No. 2	1.51 - 1.53 mm	0.0594 - 0.0602 in.
No. 3	3.030 - 3.055 mm	0.1192 - 0.1202 in.

**PISTON PINS**

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Clearance In Piston	0.009 - 0.018 mm	0.00035 - 0.0007 in.
Diameter	24.0 - 24.003 mm	0.9448 - 0.9449 in.
Length	70.53 - 71.03 mm	2.78 - 2.80 in.

**PISTON RINGS**

DESCRIPTION	SPECIFICATION	
	Metric	Standard
<b>Ring Gap</b>		
Top Compression Ring	0.23 - 0.38 mm	0.0090 - 0.0149 in.
Second Compression Ring	0.35 - 0.60 mm	0.0137 - 0.0236 in.
Oil Control (Steel Rails)	0.15 - 0.66 mm	0.0059 - 0.0259 in.
<b>Side Clearance</b>		
Top Compression Ring	.02 - .068 mm	0.0007 - 0.0026 in.
Second Compression Ring	0.02 - 0.058 mm	0.0007 - 0.0022 in.
Oil Ring (Steel Ring)	.019 - .229 mm	.0007 - .0091 in.
<b>Ring Width</b>		
Top Compression Ring	1.472 - 1.490 mm	0.0579 - 0.0586 in.
Second Compression Ring	1.472 - 1.490 mm	0.0579 - 0.0586 in.
Oil Ring (Steel Rails)	0.447 - 0.473 mm	0.0175 - 0.0186 in.

**CONNECTING RODS**

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Piston Pin Bore Diameter	23.955 - 23.975 mm	0.9431 - 0.9438 in.
Side Clearance	0.10 - 0.35 mm	0.003 - 0.0137 in.

**CRANKSHAFT**

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Main Bearing Journal Diameter	64.988 - 65.012 mm	2.5585 - 2.5595 in.
Bearing Clearance	0.023 - 0.051 mm	0.0009 - 0.002 in.
Out of Round (MAX)	0.005 mm	0.0002 in.
Taper (MAX)	0.003 mm	0.0001 in.
End Play	0.052 - 0.282 mm	0.002 - 0.011 in.
End Play (MAX)	0.282 mm	0.011 in.
Connecting Rod Journal Diameter	53.992 - 54.008 mm	2.125 - 2.126 in.
Bearing Clearance	0.020 - 0.060 mm	0.0007 - 0.0023 in.
Out of Round (MAX)	0.005 mm	0.0002 in.
Taper (MAX)	0.003 mm	0.0001 in.

**CAMSHAFT**

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bearing Journal Diameter		
No. 1	58.2 mm	2.29 in.
No. 2	57.8 mm	2.27 in.
No. 3	57.4 mm	2.26 in.
No. 4	57.0 mm	2.24 in.
No. 5	43.633 mm	1.72 in.
Bearing To Journal Clearance		
Standard		
No. 1	0.040 - 0.080 mm	.0015 - .003 in.
No. 2	0.050 - 0.090 mm	0.0019 - .0035 in.
No. 3	0.040 - 0.080 mm	.0015 - .003 in.
No. 4	0.050 - 0.090 mm	0.0019 - .0035 in.
No. 5	0.040 - 0.080 mm	.0015 - .003 in.
Camshaft End Play	.080 - 0.290mm	0.0031 - 0.0114 in.

**VALVE TIMING**

DESCRIPTION	SPECIFICATION
<b>Intake</b>  Opens (BTDC) Closes (ATDC)	  7.0° 253.0°
<b>Exhaust</b>  Opens (BTDC) Closes (ATDC) Duration	  233° 27° 253.70°
Valve Overlap	34°

**CYLINDER HEAD**

DESCRIPTION	SPECIFICATION
Valve Seat Angle	44.5° - 45.0°
Valve Seat Runout (MAX)	0.05 mm (0.0019 in.)
Valve Seat Width (Finish)  Intake  Exhaust	  1.018 - 1.62 mm (0.0464 - 0.0637 in.)  1.48 - 1.92 mm (0.0582 - 0.0755 in.)
Guide Bore Diameter (Std.)	7.975 - 8.00 mm (0.313 - 0.314 in.)

**HYDRAULIC TAPPETS**

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Body Diameter	21.387 - 21.405 mm	0.8420 - 0.8427 in.
Clearance (To Bore)	0.020 - 0.063 mm	0.0007 - 0.0024 in.
Dry Lash	3.0 mm (at the valve)	0.1181 in.

**VALVES**

DESCRIPTION		SPECIFICATION
Face Angle		45.0° - 45.5°
Head Diameter	Intake	50.67 - 50.93 mm (1.99 - 2.00 in.)
	Exhaust	39.27 - 39.53 mm (1.54 - 1.55 in.)
Length (Overall)	Intake	123.38 - 123.76 mm (4.857 - 4.872 in.)
	Exhaust	120.475 - 120.855 mm (4.743 - 4.758 in.)
Stem Diameter	Intake	7.935 - 7.953 mm (0.312 - 0.313 in.)
	Exhaust	7.905 - 7.925 mm (0.311 - 0.312 in.)
Stem - to - Guide Clearance	Intake	0.022 - 0.065 mm (0.0008 - 0.0025 in.)
	Exhaust	0.050 - 0.095 mm (0.0019 - 0.0037 in.)
Valve Lift ( @ Zero Lash)	Intake	12.0 mm (0.472 in.)
	Exhaust	11.70 mm (0.460 in.)

**VALVE SPRING**

DESCRIPTION		SPECIFICATION
Spring Force (Valve Closed)	Intake and Exhaust	418.0 N +/- 30.0 N (93.0 lbs +/- 7.0 lbs.)
	Intake and Exhaust	1077.0 N +/- 47.0 N 242.0 lbs. +/- 11 lbs.
Free Length (approx)		57.3 mm (2.256 in.)
Number of Coils	Intake and Exhaust	7.4
	Intake and Exhaust	5.39 x 4.52 mm (0.212 - 0.177 in.)
Installed Height (Spring Seat to Bottom of Retainer)		46.0 mm (1.81 in.)



**OIL PUMP**

DESCRIPTION	SPECIFICATION
Clearance Over Rotors (MAX)	0.095 mm (0.0038 in.)
Outer Rotor to Pump Body Clearance (MAX)	.235 mm (.009 in.)
Tip Clearance Between Rotors (MAX)	0.150 mm (0.006 in.)

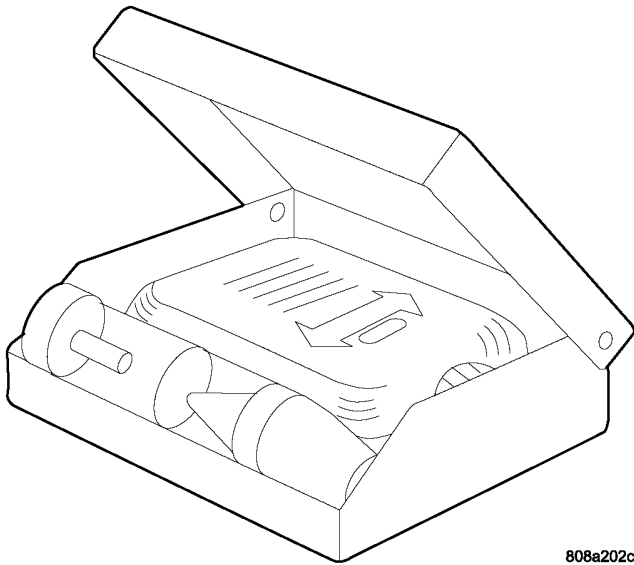
**OIL PRESSURE**

SPECIFICATION	SPECIFICATION
At Curb Idle Speed (MIN)*	25 kPa (4 psi)
@ 3000 rpm	170 - 758 kPa (25 - 110 psi)
* CAUTION: If pressure is zero at curb idle, DO NOT run engine	

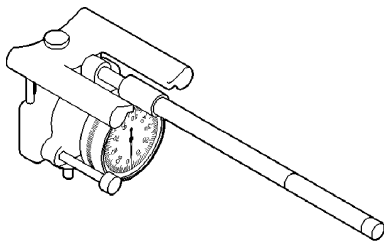
**TORQUE****TORQUE CHART 5.7L ENGINE**

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Block Pipe Plugs (1/4 NPT)	20	—	177
(3/8 NPT)	27	—	240
Camshaft Sprocket—Bolt	122	90	—
Camshaft Tensioner Plate—Bolts	28	—	250
Timing Chain Case Cover—Bolts	28	—	250
Lifting Stud	55	40	—
Connecting Rod Cap—Bolts	21 plus 90° Turn	15 plus 90° Turn	—
Main Bearing Cap—Bolts M-12	27 plus 90° Turn	—	—
Crossbolts M-8	28	—	—
Cylinder Head—Bolts M-12 Bolts	Step 1 34 Step 2 54 Step 3 Turn 90° M-8 Bolts Step 1 20 Step 2 34	25 40 Turn 90° 15 25	— — — — —
Cylinder Head Cover—Bolts	8	—	70
Exhaust Manifold to Cylinder Head	25	—	220
Flexplate to crankshaft—Bolts	95	70	—
Flywheel to crankshaft—Bolts	75	55	—
Front Insulator—Through bolt/nut	95	70	—
Front Insulator to Block—Bolts	95	70	—
Generator—Mounting Bolt	55	40	—

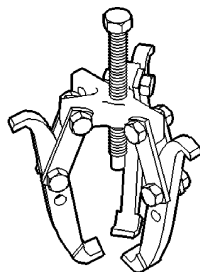
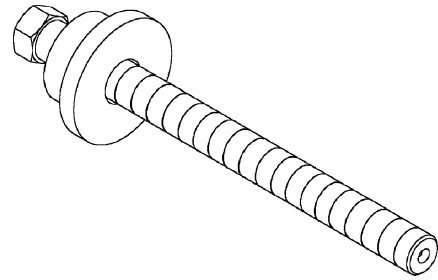
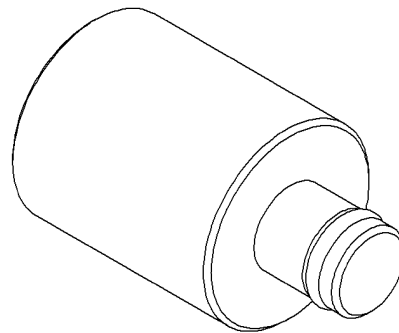
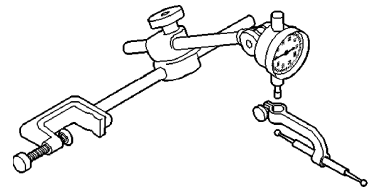
DESCRIPTION	N-m	Ft.	In.
Intake Manifold—Bolts	Refer to Procedure		
Lifter Guide Holder	12	—	106
Oil Pan Bolts	12	-	105
Oil Dipstick Tube	12	—	105
Oil Pan—Drain Plug	27	20	—
Oil Pump—Attaching Bolts	28	—	250
Oil Pump Pickup Tube – Bolt and Nut	28	—	250
Rear Seal Retainer Attaching Bolts	15	—	132
Rear Insulator to Bracket—	68	50	—
Rear Insulator to Crossmember	41	30	—
Rear Insulator to Transmission—	68	50	—
Rear Insulator Bracket—Bolts	68	50	—
Rocker Arm—Bolts	22	—	195
Spark Plugs	—	—	—
Thermostat Housing—Bolts	28	—	250
Throttle Body—Bolts	12	—	105
Vibration Damper—Bolt	176	129	—
Water Pump to Timing Chain	28	—	250
Case Cover—Bolts			

**SPECIAL TOOLS****5.7L ENGINE**

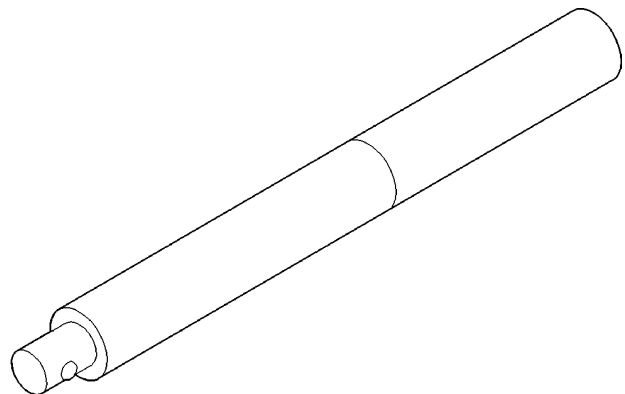
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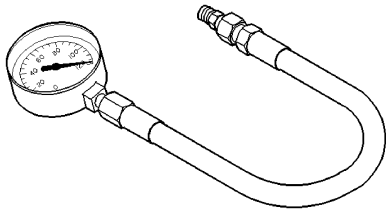
**BLOC-CHEK KIT C-3685**

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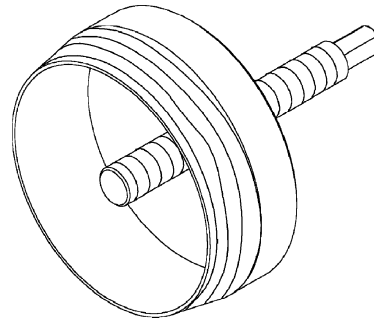
**Bore Size Indicator C-119****Puller 1023****Crankshaft Damper Installer 8512****CRANKSHAFT DAMPER REMOVER INSERT - 8513-A**

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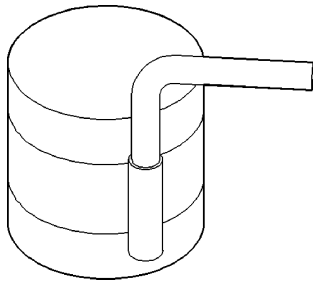
**Dial Indicator C-3339****Driver Handle C-4171**



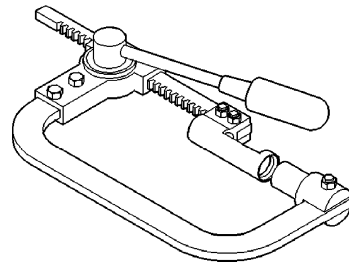
***Oil Pressure Gauge C-3292***



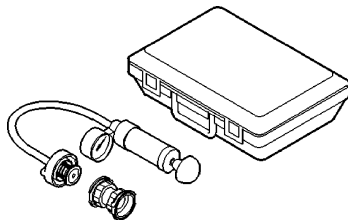
***Rear Crankshaft Seal Remover 8506***



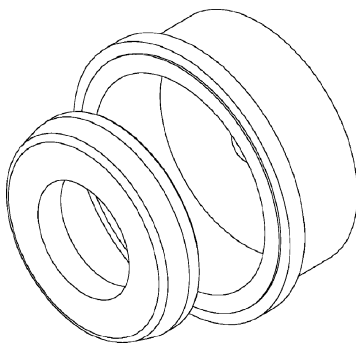
***Piston Ring Compressor C-385***



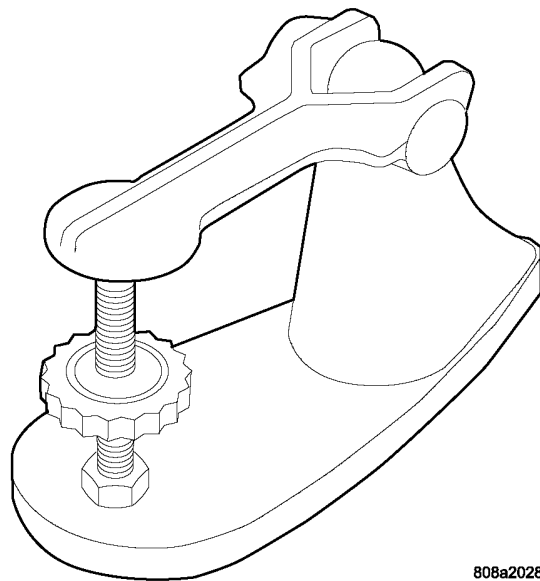
***Valve Spring Compressor C-3422-B***



***Pressure Tester Kit 7700***

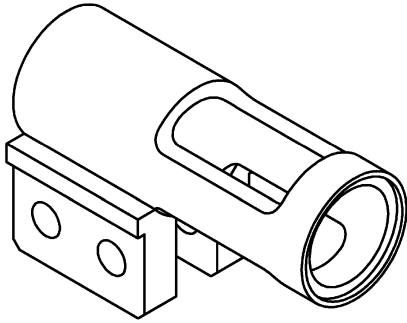


***Rear Crankshaft Seal Installer 8349***

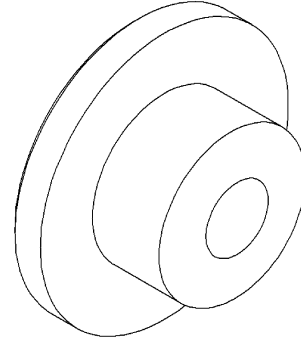


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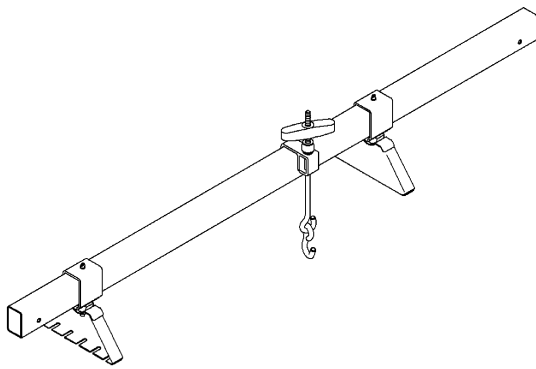
***Valve Spring Tester C-647***



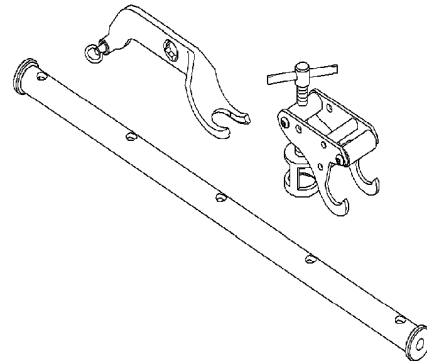
**Adapter, Valve Spring Compressor Off-vehicle 8464**



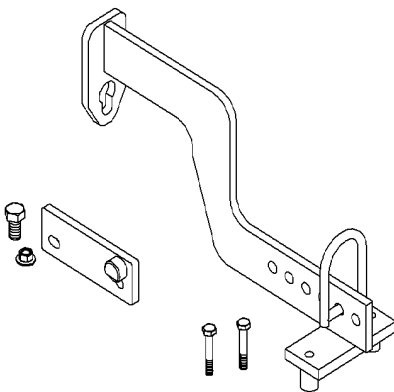
**REAR CAM PLUG INSTALLER 9048**



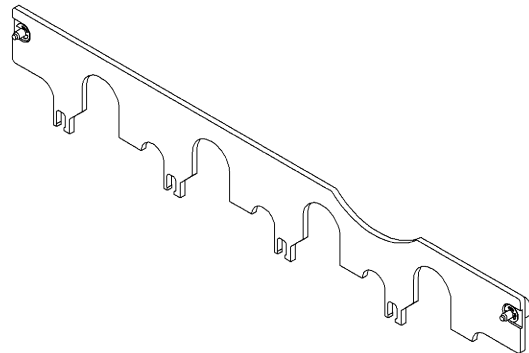
**ENGINE SUPPORT FIXTURE 8534**



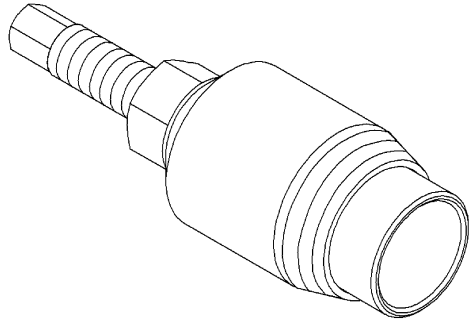
**VALVE SPRING COMPRESSOR 9065A**



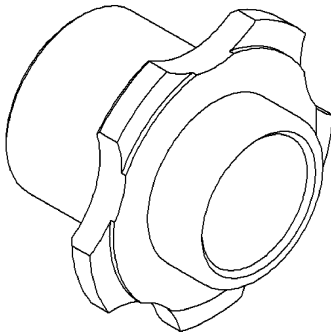
**ENGINE LIFT FIXTURE AND ADAPTER**



**PUSHROD RETAINING PLATE - 9070**



***FRONT CRANK SEAL REMOVER - 9071***



***FRONT CRANK SEAL INSTALLER 9072***

## AIR INTAKE SYSTEM

### REMOVAL

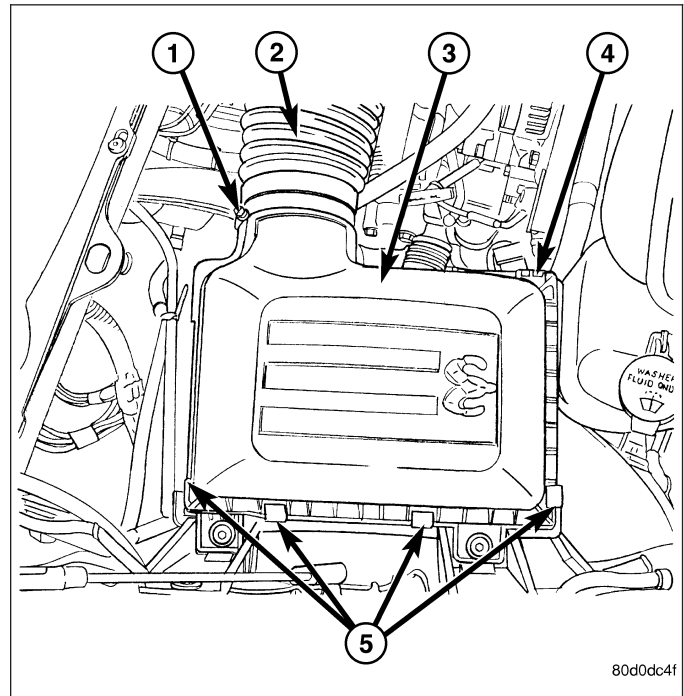
#### Filter Element Only

Housing removal is not necessary for element (filter) replacement.

1. Loosen clamp and disconnect air duct at air cleaner cover.
2. Pry over 4 spring clips from housing cover (spring clips retain cover to housing).
3. Release housing cover from locating tabs on housing and remove cover.
4. Remove air cleaner element (filter) from housing.
5. Clean inside of housing before replacing element.

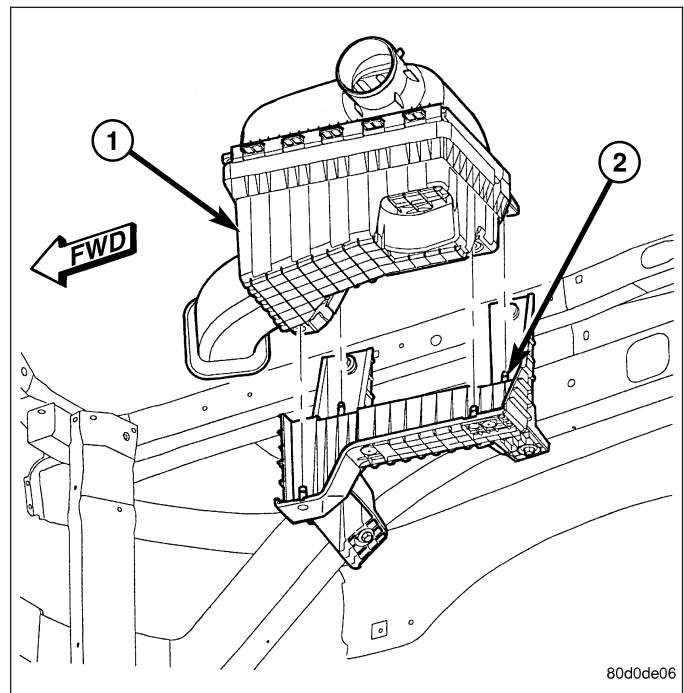
#### Housing Assembly

1. Loosen clamp and disconnect air duct at air cleaner cover.
2. Lift entire housing assembly from 4 locating pins.



### INSTALLATION

1. Install filter element into housing.
2. Position housing cover into housing locating tabs.
3. Pry up 4 spring clips and lock cover to housing.
4. Install air duct to air cleaner cover and tighten hose clamp to 3 N·m (30 in. lbs.) torque.
5. If any other hose clamps were removed from air intake system, tighten them to 3.4 N·m (30 in. lbs.) torque.
6. If any bolts were removed from air resonator housing or air intake tubing, tighten them to 4.5 N·m (40 in. lbs.) torque.



## CYLINDER HEAD

### OPERATION—CYLINDER HEAD

The cylinder head closes the combustion chamber allowing the pistons to compress the air fuel mixture to the correct ratio for ignition. The valves located in the cylinder head open and close to either allow clean air into the combustion chamber or to allow the exhaust gases out, depending on the stroke of the engine.

### DIAGNOSIS AND TESTING - CYLINDER HEAD GASKET FAILURE

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

- Possible indications of the cylinder head gasket leaking between adjacent cylinders are:
  - Loss of engine power
  - Engine misfiring
  - Poor fuel economy
- Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:
  - Engine overheating
  - Loss of coolant
  - Excessive steam (white smoke) emitting from exhaust
  - Coolant foaming

### CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test in this section. An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

### CYLINDER-TO-WATER JACKET LEAKAGE TEST

**WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.**

#### VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

#### COOLING SYSTEM TESTER METHOD

**WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).**

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

#### CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

## REMOVAL

1. Perform the Fuel System Pressure Release procedure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE). Disconnect the fuel supply line (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
2. Disconnect the battery negative cable.
3. Drain cooling system.



4. Remove the air cleaner resonator and duct work.
5. Remove closed crankcase ventilation system.
6. Disconnect the evaporation control system.
7. Disconnect heater hoses.
8. Remove the power steering pump.
9. Remove cylinder head covers and gaskets.
10. Remove intake manifold and throttle body as an assembly.
11. Remove rocker arm assemblies and push rods. Identify to ensure installation in original locations. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL).
12. Remove the head bolts from each cylinder head and remove cylinder heads. Discard the cylinder head gasket.

## CLEANING

Clean all surfaces of cylinder block and cylinder heads.

Clean cylinder block front and rear gasket surfaces using a suitable solvent.

## INSPECTION

1. Inspect the cylinder head for out-of-flatness, using a straightedge and a feeler gauge. If tolerances exceed 0.0508 mm (0.002 in.) replace the cylinder head.
2. Inspect the valve seats for damage. Service the valve seats as necessary.
3. Inspect the valve guides for wear, cracks or looseness. If either condition exist, replace the cylinder head.
4. Inspect pushrods. Replace worn or bent pushrods.

## INSTALLATION

1. Clean all surfaces of cylinder block and cylinder heads.
2. Clean cylinder block front and rear gasket surfaces using a suitable solvent.

**CAUTION: The head gaskets are not interchangeable between left and right sides. They are marked "L" and "R" to indicate left and right sides.**

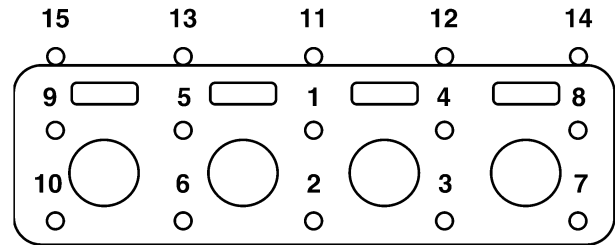
3. Position new cylinder head gaskets onto the cylinder block.

**CAUTION: The head gaskets are marked "TOP" to indicate which side goes up.**

4. Position cylinder heads onto head gaskets and cylinder block.

## 5. Tighten the cylinder head bolts in three steps :

- Step 1— Snug tighten M12 cylinder head bolts, in sequence, to 34 N·m (25 ft. lbs.) and M8 bolts to 20 N·m (15 ft. lbs.) torque.
- Step 2— Tighten M12 cylinder head bolts, in sequence, to 54 N·m (40 ft. lbs.) and verify M8 bolts to 20 N·m (15 ft. lbs.) torque..
- Step 3— Turn M12 cylinder head bolts, in sequence, 90 degrees and tighten M8 bolts to 34 N·m (25 ft. lbs.) torque.



8100fa03

6. Install push rods and rocker arm assemblies in their original position, using pushrod retaining plate special tool# 9070. (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).
7. Install the intake manifold and throttle body assembly.
8. If required, adjust spark plugs to specifications. Install the plugs.
9. Connect the heater hoses.
10. Install the fuel supply line.
11. Install the power steering pump.
12. Install the drive belt.
13. Install cylinder head covers(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
14. Connect the evaporation control system.
15. Install the air cleaner.
16. Fill cooling system.
17. Connect the negative cable to the battery.
18. Start engine check for leaks.

## COVER(S)-CYLINDER HEAD

### REMOVAL

1. Disconnect battery negative cable.
2. Disconnect coil on plug connectors.

**CAUTION:** The ground straps must be installed in the same location as removed. The covers are machined to accept the ground straps in those locations only.

3. Remove cylinder head cover retaining bolts, and ground straps.
4. Remove cylinder head cover.

**Note:** The gasket may be used again, provided no cuts, tears, or deformation has occurred.

## INSTALLATION

**CAUTION:** Do not use harsh cleaners to clean the cylinder head covers. Severe damage to covers may occur.

**CAUTION:** DO NOT allow other components including the wire harness to rest on or against the engine cylinder head cover. Prolonged contact with other objects may wear a hole in the cylinder head cover.

1. Clean cylinder head cover and both sealing surfaces. Inspect and replace gasket as necessary.
2. Install cylinder head cover and hand start all fasteners. Verify that all double ended studs are in the correct location and install left and right ground straps.

**CAUTION:** The ground straps must be installed in the same location as removed. The covers are machined to accept the ground straps in those locations only.

**Note:** The right hand ground strap is located on the front inboard stud. The left hand ground strap is located on the rear inboard stud.

3. Tighten cylinder head cover bolts and double ended studs to 8 N·m (70 in. lbs). Begin torque sequence in the middle of head cover and torque bolts moving outward in a crisscross pattern from top to bottom.
4. Install ignition coil on plug, and torque fasteners to 12 N·m (105 in. lbs)
5. Connect, ignition coil electrical connectors.
6. Install PCV hose.
7. Connect battery negative cable.

## SEATS-INTAKE/EXHAUST VALVES

### DESCRIPTION

#### DESCRIPTION - VALVE GUIDES

The valve guides are made of powdered metal and are pressed into the cylinder head. The guides are not replaceable or serviceable, and valve guide reaming is not recommended. If the guides are worn beyond acceptable limits, replace the cylinder heads.

### DESCRIPTION

Both the intake and exhaust valves are made of steel. The intake valve is 50.93 mm (2.00 inches) in diameter and the exhaust valve is 39.53 mm (1.55 inches) in diameter. All valves use three bead lock keepers to retain the springs and promote valve rotation.

#### STANDARD PROCEDURE - REFACING

**Note:** Valve seats that are worn or burned can be reworked, provided that correct angle and seat width are maintained. Otherwise the cylinder head must be replaced.

**Note:** When refacing valves and valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.

1. Using a suitable dial indicator measure the center of the valve seat. Total run out must not exceed 0.051 mm (0.002 in).
2. Apply a small amount of Prussian blue to the valve seat, insert the valve into the cylinder head, while applying light pressure on the valve rotate the valve. Remove the valve and examine the valve face. If the blue is trans-

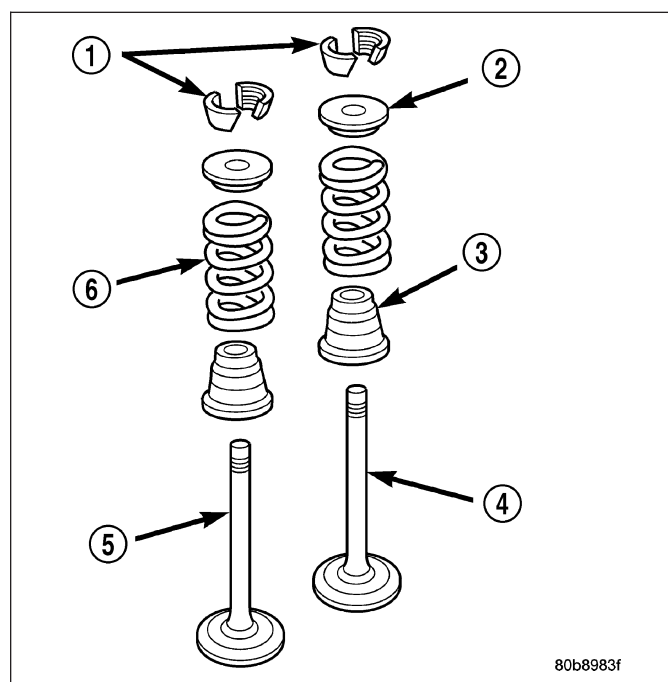
ferred below the top edge of the valve face, lower the valve seat using a 15 degree stone. If the blue is transferred to the bottom edge of the valve face, raise the valve seat using a 65 degree stone.

- When the seat is properly positioned the width of the intake seat must be 1.018 - 1.62 mm (0.0464 - 0.0637 in.) and the exhaust seat must be 1.48 - 1.92 mm (0.058 - 0.075 in.).
- Check the valve spring installed height after refacing the valve and seat. The installed height for both intake and exhaust valve springs must not exceed 46.0 mm (1.81 in.).

#### VALVE FACE AND VALVE SEAT ANGLE CHART

DESCRIPTION	SPECIFICATION
SEAT WIDTH  INTAKE  EXHAUST	1.018 - 1.62 mm (0.0464 - 0.0637 in.)  1.48 - 1.92 mm (0.058 - 0.075 in.)
FACE ANGLE (INT. AND EXT.)	45° - 45½°
SEAT ANGLE (INT. AND EXT.)	44½° - 45°

- The valve seat must maintain an angle of 44.5 – 45.0 degrees angle.
- The valve face must maintain a face angle of 45.0 – 45.5 degrees angle.



## REMOVAL

- Remove the cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
- Compress valve springs using Valve Spring Compressor Tool special tool # C-3422 and adapter 8464.
- Remove valve retaining locks, valve spring retainers, valve stem seals and valve springs.
- Before removing valves, remove any burrs from valve stem lock grooves to prevent damage to the valve guides. Identify valves to ensure installation in original location.

## INSTALLATION

- Clean valves thoroughly. Discard burned, warped and cracked valves.
- Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.

3. Measure valve stems for wear. If wear exceeds 0.051 mm (0.002 inch), replace the valve.
4. Coat valve stems with lubrication oil and insert them in cylinder head.
5. If valves or seats are reground, check valve stem height. If valve is too long, replace cylinder head.
6. Install new seals on all valve guides. Install valve springs and valve retainers.
7. Compress valve springs with Valve Spring Compressor Tool special tool # C- 3422 and adapter 8464, install locks and release tool. If valves and/or seats are ground, measure the installed height of springs. Make sure the measurement is taken from bottom of spring seat in cylinder head to the bottom surface of spring retainer.
8. Install cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).

## ROCKER ARM

### REMOVAL

1. Remove cylinder head cover.(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)
2. Loosen the rocker shafts using the following sequence: **Center, center-left, center-right, left, right,.**

**CAUTION: The rocker shaft assemblies are not interchangeable between intake and exhaust. The intake rocker arms are marked with an "I".**

3. Remove the rocker shafts. Note location for reassembly.

**CAUTION: The longer push rods are for the exhaust side, and the shorter push rods are for intake side.**

4. Remove the pushrods. Note pushrod location for reassembly.

### INSTALLATION

**CAUTION: The longer push rods are for the exhaust side, and the shorter push rods are for intake side.**

1. Install the push rods in the same order as removed.

**CAUTION: Verify that pushrod is installed into rocker arm and lifter correctly while installing rocker shaft assembly. Recheck after rocker shaft has been torqued to specification.**

**CAUTION: The rocker shaft assemblies are not interchangeable between intake and exhaust. The intake rocker arms are marked with the letter "I".**

2. Install rocker shaft assemblies in the same order as removed.

**CAUTION: Ensure that hold downs and rocker arms are not overlapped when torquing bolts.**

3. Tighten the rocker shaft bolts to 22 N·m (195 in. lbs.) torque, using the following sequence: **Center, center-right, center-left, right, left.**

**CAUTION: DO NOT rotate or crank the engine during or immediately after rocker arm installation. Allow the hydraulic roller tappets adequate time to bleed down (about 5 minutes).**

4. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

## SEALS-VALVE GUIDE

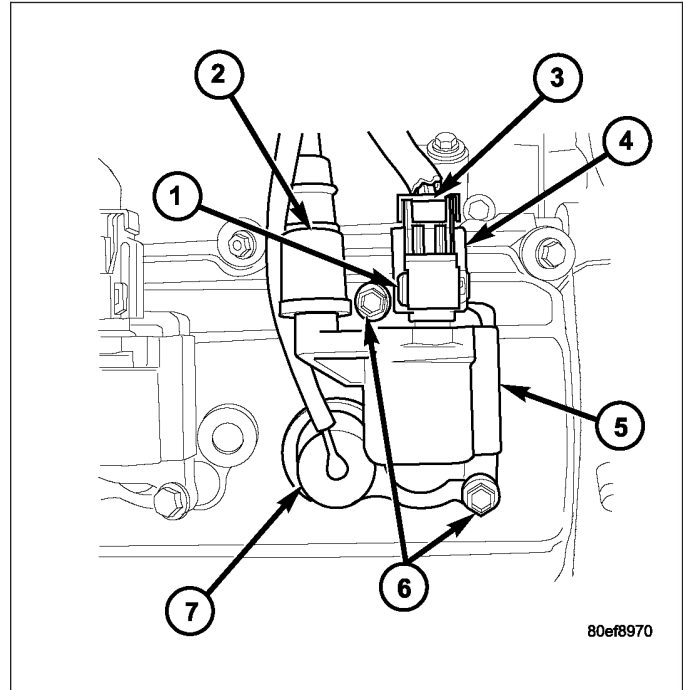
### DESCRIPTION

The valve guide seals are made of rubber and incorporate an integral steel valve spring seat. The integral garter spring maintains consistent lubrication control to the valve stems.

## SPRINGS-VALVE

### REMOVAL

1. Disconnect negative battery cable.
2. Remove air cleaner assembly.
3. Remove air intake resonator.
4. Remove spark plug cables.
5. Remove ignition coil connectors.
6. Remove ignition coils.



7. Remove one spark plug.
8. Remove valve cover.

**CAUTION:** The piston must be at TDC, and both valves closed on the cylinder to be serviced.

**Note:** If removing intake valve spring, install special tool# 9070, pushrod retaining plate, to retain the intake pushrods.

9. Remove exhaust/intake rocker arm shafts.
10. Install spring compressor, special tool# 9065.

**Note:** All valve springs and seals are removed in the same manner.

11. Charge cylinder with air.

**Note:** Tap the top of the valve spring retainer to loosen the spring retainers locks.

12. Compress valve spring and remove valve retainer locks.
13. Release spring compressor and remove valve spring.

**Note:** The valve springs are interchangeable between intake and exhaust.

14. Remove valve seal.

## INSTALLATION

1. Install valve seal.
2. Install valve spring.
3. Using special tool# 9065, compress valve spring and install valve spring retainer and locks.
4. Release air charge in cylinder.
5. Remove spring compressor tool # 9065.

**CAUTION: Verify that the pushrods are fully seated into lifter and rocker arm. Recheck after rocker arm shaft has been torqued to specification.**

6. Install rocker arm shaft and pushrods(Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).
7. Tighten the rocker shaft bolts to 22 N·m (195 in. lbs.) torque,using the following sequence: **Center, center-right, center-left, right, left.**
8. Remove special tool# 9070, pushrod retaining plate, if used.
9. Install cylinder head cover.
10. Tighten cylinder head cover bolts and double ended studs(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION) .
11. Install spark plugs.
12. Install ignition coil on plug, and torque fasteners to 12 N·m (105 in. lbs)
13. Install ignition coil connectors.
14. Install spark plug cables.
15. Install air intake resonator.
16. Install air cleaner assembly.
17. Connect negative battery cable.

## ENGINE BLOCK

### CLEANING

Thoroughly clean the oil pan and engine block gasket surfaces.

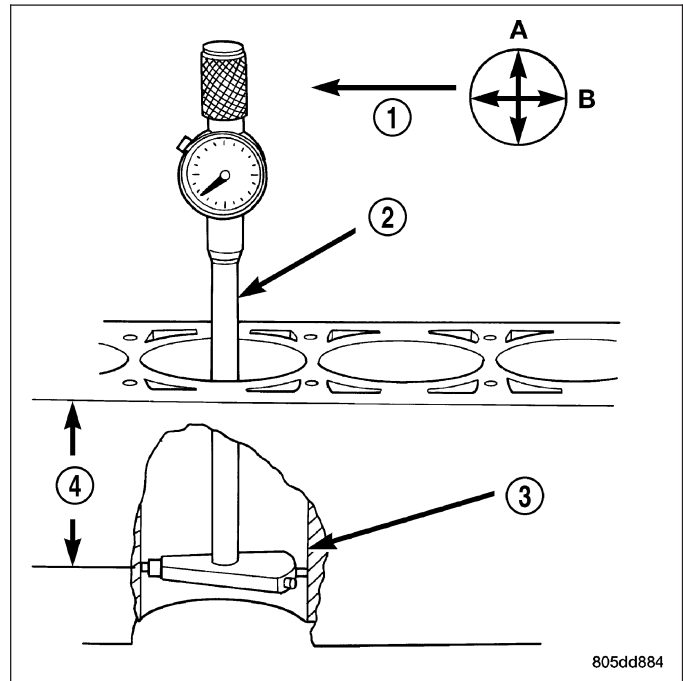
Use compressed air to clean out:

- The galley at the oil filter adaptor hole.
- The front and rear oil galley holes.
- The feed holes for the crankshaft main bearings.

Once the block has been completely cleaned, apply Loctite PST pipe sealant with Teflon 592 to the threads of the front and rear oil galley plugs. Tighten the 1/4 inch NPT plugs to 20 N·m (177 in. lbs.) torque. Tighten the 3/8 inch NPT plugs to 27 N·m (240 in. lbs.) torque.

## INSPECTION

1. It is mandatory to use a dial bore gauge to measure each cylinder bore diameter. To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.
2. Measure the inside diameter of the cylinder bore at three levels below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft and then take two additional reading.
3. Measure the cylinder bore diameter crosswise to the cylinder block near the top of the bore. Repeat the measurement near the middle of the bore, then repeat the measurement near the bottom of the bore.
4. Determine taper by subtracting the smaller diameter from the larger diameter.
5. Rotate measuring device 90° and repeat steps above.
6. Determine out-of-roundness by comparing the difference between each measurement.
7. If cylinder bore taper does not exceed 0.025 mm (0.001 inch) and out-of-roundness does not exceed 0.025 mm (0.001 inch), the cylinder bore can be honed. If the cylinder bore taper or out-of-round condition exceeds these maximum limits, the cylinder block must be replaced. A slight amount of taper always exists in the cylinder bore after the engine has been in use for a period of time.



## CAMSHAFT-ENGINE

### REMOVAL

#### REMOVAL - CAMSHAFT CORE HOLE PLUG

**CAUTION:** Do not damage the rear surface of the camshaft or the core plug sealing surface, when removing the core plug.

1. Remove the rear cam bearing core plug.

#### REMOVAL - CAMSHAFT

1. Remove the battery negative cable.
2. Remove the air cleaner assembly.
3. Drain coolant.
4. Remove the accessory drive belt.
5. Remove the generator.
6. Remove the A/C compressor, and set aside
7. Remove the radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - REMOVAL).
8. Remove intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
9. Remove cylinder head covers(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
10. Remove both left and right cylinder heads(Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
11. Remove the oil pan(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).



12. Remove timing case cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
13. Remove the oil pick up tube.
14. Remove the oil pump(Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL) .
15. Remove timing chain(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
16. Remove camshaft tensioner/thrust plate assembly.

**Note: Identify lifters to ensure installation in original location.**

17. Remove the lifters and retainer assembly.
18. Install a long bolt into front of camshaft to aid in removal of the camshaft. Remove camshaft, being careful not to damage cam bearings with the cam lobes.

## INSPECTION

1. The cam bearings are not serviceable. Do not attempt to replace cam bearings for any reason.

## INSTALLATION

### INSTALLATION - CAMSHAFT CORE HOLE PLUG

**CAUTION: The new core hole plug must be installed to the proper depth or camshaft damage could develop. The plug must be installed squarely in the bore.**

1. Clean core hole in block.

**Note: Do not apply adhesive to the new core hole plug. A new plug will have adhesive pre-applied.**

2. Install a new core hole plug at the rear of camshaft, using special tool # 9048. The plug must be fully seated on the cylinder block shoulder.

### INSTALLATION - CAMSHAFT

**CAUTION: The 5.7L LX engine uses a unique camshaft for use with the Multi Displacement System. When installing a new camshaft, the replacement camshaft must be compatible with the Multi Displacement System.**

1. Lubricate camshaft lobes and camshaft bearing journals and insert the camshaft
2. Install camshaft Tensioner plate assembly. Tighten bolts to 28 N·m (250 in. lbs.) torque.
3. Install timing chain and sprockets(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
4. Measure camshaft end play(Refer to 9 - ENGINE - SPECIFICATIONS). If not within limits install a new thrust plate.
5. Install the oil pump(Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).
6. Install the oil pick up tube.
7. Each lifter reused must be installed in the same position from which it was removed. **When camshaft is replaced, all of the lifters must be replaced.**

**CAUTION: The 5.7L LX engine uses both standard roller tappets and deactivating roller tappets, for use with the Multi Displacement System. The deactivating roller tappets must be used in cylinders 1,4,6,7. The deactivating tappets can be identified by the two holes in the side of the tappet body, for the latching pins.**

8. Install lifters and retaining yoke assembly. (Refer to 9 - ENGINE/ENGINE BLOCK/HYDRAULIC LIFTERS (CAM IN BLOCK) - INSTALLATION).
9. Install both left and right cylinder heads(Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
10. Install pushrods

11. Install rocker arms(Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).
12. Install timing case cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
13. Install the oil pan(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
14. Install cylinder head covers(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
15. Install intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
16. Install the A/C compressor, and set aside
17. Install the generator.
18. Install the accessory drive belt.
19. Install the radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - INSTALLATION).
20. Install the air cleaner assembly.
21. Install the battery negative cable.
22. Refill coolant.
23. Refill engine oil.
24. Start engine and check for leaks.

## CRANKSHAFT

### REMOVAL

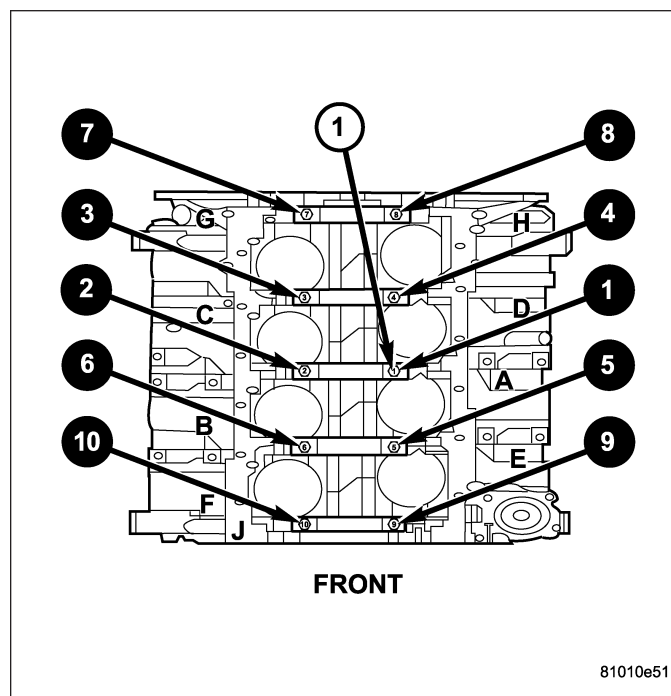
1. Remove the vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
2. Remove the oil pan(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
3. Remove the oil pump pickup.
4. Remove the windage tray/oil pan gasket.
5. Remove the timing chain cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
6. Remove the oil pump(Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
7. Remove the timing drive(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
8. Identify rod bearing caps before removal. Remove rod bearing caps with bearings.
9. Identify main bearing caps before removal. Remove main bearing caps and bearings one at a time.
10. Remove the thrust washers.
11. Remove the rear oil seal retainer(Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT REAR OIL SEAL RETAINER - REMOVAL).
12. Remove the crankshaft out of the block.
13. Remove and discard the crankshaft rear oil seal.
14. Remove and discard the front crankshaft oil seal.

### INSTALLATION

1. Select the proper main bearings(Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - STANDARD PROCEDURE).
2. Install main bearings in block and caps, and lubricate bearings.
3. Position the crankshaft into the cylinder block.
4. Install the thrust washers.

**Note:** The main cap crossbolts are torqued after final torque of the main cap bolts. Always use a new washer/seal on crossbolts.

5. Clean and oil all cap bolts. Install all main bearing caps. Install all cap bolts and alternately tighten in two steps using the following sequence.
  - Step 1 – 27 N·m ( 20ft. lbs.) torque.
  - Step 2 – Turn main cap bolts an additional 90°.
6. Install the crossbolts with new washer/gasket. Starting with crossbolt A torque each crossbolt to 28 N·m ( 21ft. lbs.)torque.
7. Repeat crossbolt torque procedure.



8. Measure crankshaft end play(Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - STANDARD PROCEDURE).
9. Position the connecting rods onto the crankshaft and install the rod bearing caps(Refer to 9 - ENGINE/ENGINE BLOCK/PISTON & CONNECTING ROD - INSTALLATION).
10. Install timing drive(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
11. Install oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).
12. Install the timing chain cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
13. Install the rear main seal and retainer(Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT REAR OIL SEAL RETAINER - INSTALLATION).
14. Install the windage tray/oil pan gasket.
15. Install the oil pick up tube.
16. Install the oil pan(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
17. Install the vibration damper(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
18. Install the engine(Refer to 9 - ENGINE - INSTALLATION).

## BEARINGS-CRANKSHAFT MAIN

### STANDARD PROCEDURE - CRANKSHAFT MAIN BEARING - FITTING

#### MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)

Crankshaft removed from the cylinder block.

Clean the oil off the main bearing journal.

Determine the maximum diameter of the journal with a micrometer. Measure at two locations 90° apart at each end of the journal.

The maximum allowable taper is 0.008mm (0.0004 inch.) and maximum out of round is 0.005mm (0.0002 inch). Compare the measured diameter with the journal diameter specification (Main Bearing Fitting Chart). Select inserts required to obtain the specified bearing-to-journal clearance.

## CRANKSHAFT MAIN BEARING SELECTION

The main bearings are “select fit” to achieve proper oil clearances. For main bearing selection, the crankshaft counterweight has grade identification marks stamped into it. These marks are read from left to right, corresponding with journal number 1, 2, 3, 4 and 5.

**Note:** Service main bearings are coded. These codes identify what size (grade) the bearing is.

### MAIN BEARING SELECTION CHART - 5.7L

GRADE MARKING	SIZE mm (in.)	FOR USE WITH JOURNAL SIZE
A	0.008 mm U/S (0.0004 in.) U/S	64.988–64.995 mm (2.5585– 2.5588in.)
B	NOMINAL	64.996–65.004 mm (2.5588–2.5592 in.)
C	0.008 mm O/S (0.0004 in.) O/S	65.005–65.012 mm (2.5592–2.5595 in.)

## INSPECTION

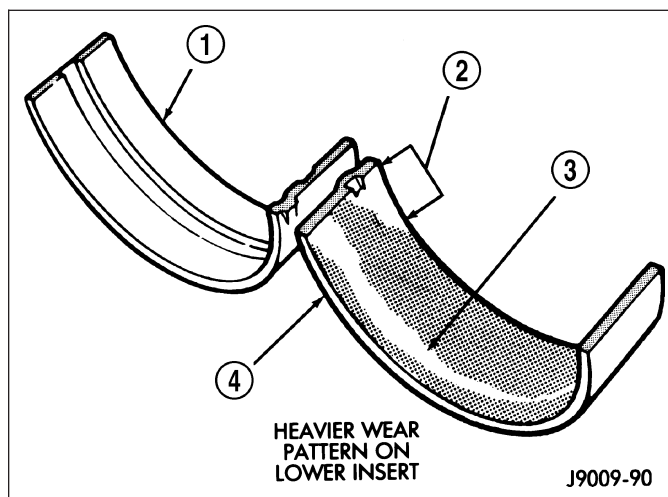
Wipe the inserts clean and inspect for abnormal wear patterns and for metal or other foreign material imbedded in the lining. Normal main bearing insert wear patterns are illustrated.

**Note:** If any of the crankshaft journals are scored, the crankshaft must be repaired or replaced.

Inspect the back of the inserts for fractures, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.

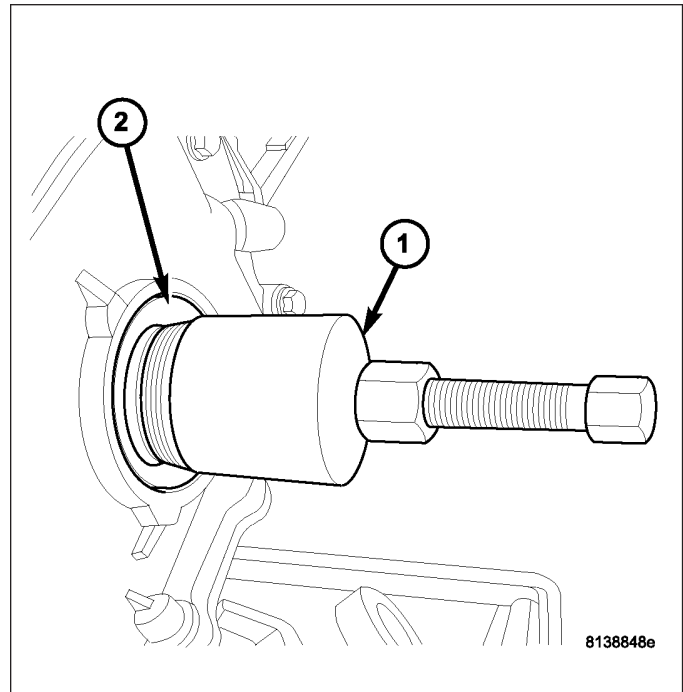


## SEAL-CRANKSHAFT OIL-FRONT

### REMOVAL

1. Disconnect negative cable from battery.
2. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
3. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
4. Remove upper radiator hose.
5. Remove radiator shroud attaching fasteners.
6. Remove radiator cooling fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
7. Remove crankshaft damper bolt.
8. Remove damper using Special Tools 8513A Insert and 1023 Three Jaw Puller(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL) .

9. Using Special Tool 9071, remove crankshaft front seal.



## INSTALLATION

**CAUTION:** The front crankshaft seal must be installed dry. Do not apply lubricant to sealing lip or to outer edge.

1. Using Special Tool 8348 and 8512A, install crankshaft front seal.

**CAUTION:** To prevent severe damage to the Crankshaft or Damper, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

2. Install vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
3. Install radiator cooling fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
4. Install upper radiator hose.
5. Install accessory drive belt refer (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
6. Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
7. Connect negative cable to battery.

## SEAL-CRANKSHAFT OIL-REAR

### DIAGNOSIS AND TESTING - REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
  - a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
  - b. Where leakage tends to run straight down, possible causes are a porous block, camshaft bore cup plugs, oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces. See Engine, for proper repair procedures of these items.

4. If no leaks are detected, pressurized the crankcase as outlined in the section, Inspection (Engine oil Leaks in general)

**CAUTION: Do not exceed 20.6 kPa (3 psi).**

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

**CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks or scratches. The crankshaft seal flange is specially machined to complement the function of the rear oil seal.**

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING), under the Oil Leak row, for components inspections on possible causes and corrections.
7. After the oil leak root cause and appropriate corrective action have been identified, (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - REMOVAL).

## REMOVAL

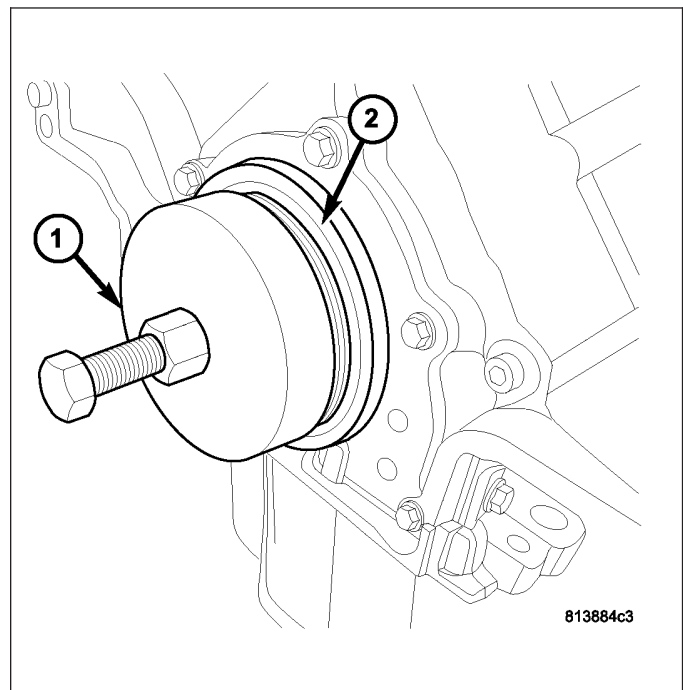
**Note: This procedure can be performed in vehicle.**

1. If being performed in vehicle, remove the transmission.
2. Remove the flexplate (Refer to 9 - ENGINE/ENGINE BLOCK/FLEX PLATE - REMOVAL).

**Note: The crankshaft oil seal CAN NOT be reused after removal.**

**Note: The crankshaft rear oil seal remover Special Tool 8506 must be installed deeply into the seal. Continue to tighten the removal tool into the seal until the tool can not be turned farther. Failure to install tool correctly the first time will cause tool to pull free of seal without removing seal from engine.**

3. Using Special Tool 8506, remove the crankshaft rear oil seal.

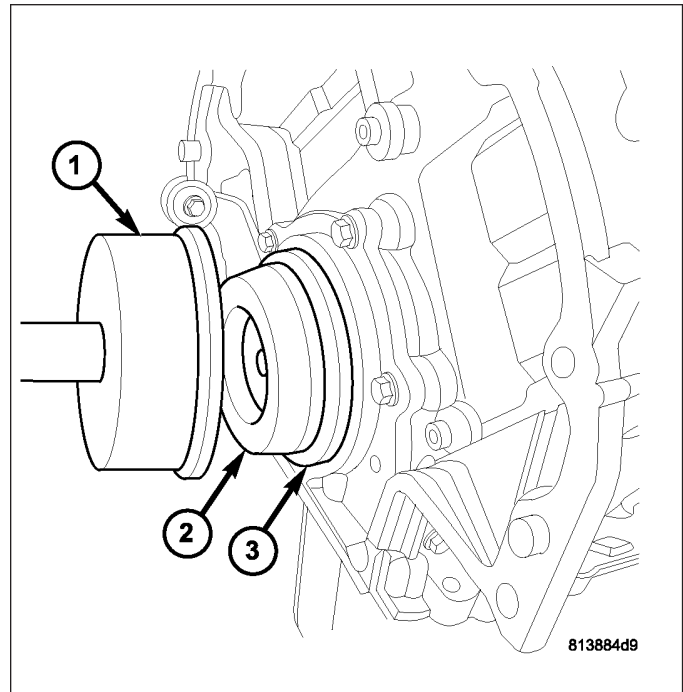


## INSTALLATION

**CAUTION: The rear seal must be installed dry for proper operation. Do not lubricate the seal lip or outer edge.**

1. Position the plastic seal guide onto the crankshaft rear face. Then position the crankshaft rear oil seal onto the guide.

2. Using Special Tools 8349 Crankshaft Rear Oil Seal Installer and C-4171 Driver Handle, with a hammer, tap the seal into place. Continue to tap on the driver handle until the seal installer seats against the cylinder block crankshaft bore.



3. Install the flexplate.
4. Install the transmission.

## RETAINER-CRANKSHAFT REAR OIL SEAL

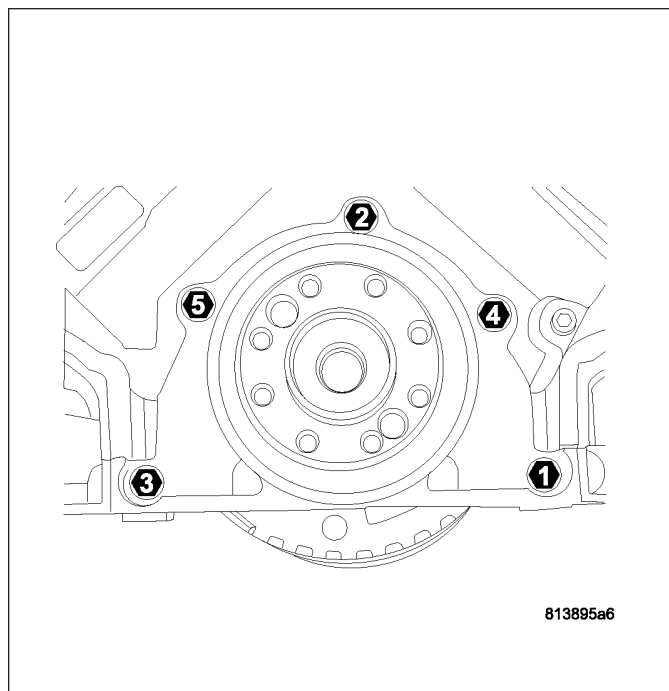
### REMOVAL

1. Disconnect negative cable from battery.
2. Remove the transmission. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - REMOVAL).
3. Remove the flexplate. (Refer to 9 - ENGINE/ENGINE BLOCK/FLEX PLATE - REMOVAL).
4. Remove the oil pan. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL)
5. Remove the rear oil seal retainer mounting bolts.
6. Carefully remove the retainer from the engine block.

### INSTALLATION

1. Thoroughly clean all gasket residue from the engine block.
2. Use extreme care and clean all gasket residue from the retainer.
3. Position the gasket onto the retainer.
4. Position the retainer onto the engine block.

5. Install the retainer mounting bolts. Tighten the bolts to 15 N·m (132 in. lbs.) using the procedure shown.



6. Install the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
7. Install the flexplate (Refer to 9 - ENGINE/ENGINE BLOCK/FLEX PLATE - INSTALLATION).
8. Install the transmission (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - INSTALLATION).
9. Check and verify engine oil level.
10. Start engine and check for leaks.

## FLEX PLATE

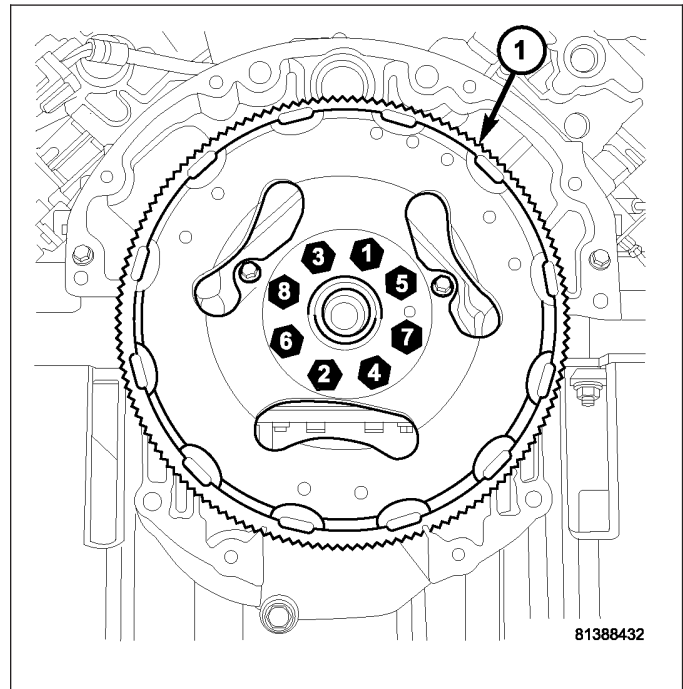
### REMOVAL

1. Remove the transmission. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - REMOVAL).
2. Remove the bolts and flexplate.



## INSTALLATION

1. Position the flexplate or flywheel onto the crankshaft and install the bolts hand tight.
2. **For automatic transmissions:** Tighten the flexplate retaining bolts to 95 N·m (70 ft. lbs.).



3. Install the transmission. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - INSTALLATION).

## TAPPETS-HYDRAULIC ROLLER

### DIAGNOSIS AND TESTING - HYDRAULIC TAPPETS

Before disassembling any part of the engine to correct tappet noise, check the oil pressure. If vehicle has no oil pressure gauge, install a reliable gauge at the pressure sending-unit. The pressure should be between 207-552 kPa (30-70 psi) at 3,000 RPM.

Check the oil level after the engine reaches normal operating temperature. Allow 5 minutes to stabilize oil level, check dipstick. The oil level in the pan should never be above the FULL mark or below the ADD OIL mark on dipstick. Either of these two conditions could be responsible for noisy tappets.

### OIL LEVEL

#### HIGH

If oil level is above the FULL mark, it is possible for the connecting rods to dip into the oil. With the engine running, this condition could create foam in the oil pan. Foam in oil pan would be fed to the hydraulic tappets by the oil pump causing them to lose length and allow valves to seat noisily.

#### LOW

Low oil level may allow oil pump to take in air. When air is fed to the tappets, they lose length, which allows valves to seat noisily. Any leaks on intake side of oil pump through which air can be drawn will create the same tappet action. Check the lubrication system from the intake strainer to the pump cover, including the relief valve retainer cap. When tappet noise is due to aeration, it may be intermittent or constant, and usually more than one tappet will be noisy. When oil level and leaks have been corrected, operate the engine at fast idle. Run engine for a sufficient time to allow all of the air inside the tappets to be bled out.

## TAPPET NOISE DIAGNOSIS

1. To determine source of tappet noise, crank over engine with cylinder head covers removed.
2. Feel each valve spring or rocker arm to detect noisy tappet. The noisy tappet will cause the affected spring and/or rocker arm to vibrate or feel rough in operation.

**Note: Worn valve guides or cocked springs are sometimes mistaken for noisy tappets. If such is the case, noise may be dampened by applying side thrust on the valve spring. If noise is not appreciably reduced, it can be assumed the noise is in the tappet. Inspect the rocker arm push rod sockets and push rod ends for wear.**

3. Valve tappet noise ranges from light noise to a heavy click. A light noise is usually caused by excessive leak-down around the unit plunger, or by the plunger partially sticking in the tappet body cylinder. The tappet should be replaced. A heavy click is caused by a tappet check valve not seating, or by foreign particles wedged between the plunger and the tappet body. This will cause the plunger to stick in the down position. This heavy click will be accompanied by excessive clearance between the valve stem and rocker arm as valve closes. In either case, tappet assembly should be removed for inspection and cleaning.
4. The valve train generates a noise very much like a light tappet noise during normal operation. Care must be taken to ensure that tappets are making the noise. If more than one tappet seems to be noisy, it's probably not the tappets.

## REMOVAL

1. Disconnect the negative cable from the battery.
2. Remove the air cleaner(Refer to 9 - ENGINE/AIR INTAKE SYSTEM - REMOVAL).
3. Remove intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
4. Remove cylinder head cover(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
5. Remove rocker arm assembly and push rods(Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL). Identify push rods to ensure installation in original location.
6. Remove the cylinder head(Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
7. Remove bolt from tappet guide holder.
8. Remove tappet guide holder.
9. Pull tappet out of bore with a twisting motion. **If all tappets are to be removed and reused, identify tappets to ensure installation in original location.**
10. Check camshaft lobes for abnormal wear.

## INSTALLATION

1. Lubricate tappets.
2. Install tappets in their original positions.

**CAUTION: The 5.7L LX engine uses both standard roller tappets and deactivating roller tappets, for use with the Multi Displacement System. The deactivating roller tappets must be used in cylinders 1,4,6,7. The deactivating tappets can be identified by the two holes in the side of the tappet body, for the latching pins.**

3. Install tappet guide yoke. Install the tappet guide yoke bolt and tighten to 12 N·m (106 in. lbs.) torque.
4. Install cylinder head(Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
5. Install pushrods and rocker arm assembly(Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).
6. Install cylinder head cover(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
7. Install intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
8. Install the air cleaner(Refer to 9 - ENGINE/AIR INTAKE SYSTEM - INSTALLATION).
9. Connect the negative cable to the battery.

**CAUTION:** To prevent damage to valve mechanism, engine must not be run above fast idle until all hydraulic tappets have filled with oil and have become quiet.

10. Road test vehicle and check for leaks.

## PISTON & CONNECTING ROD

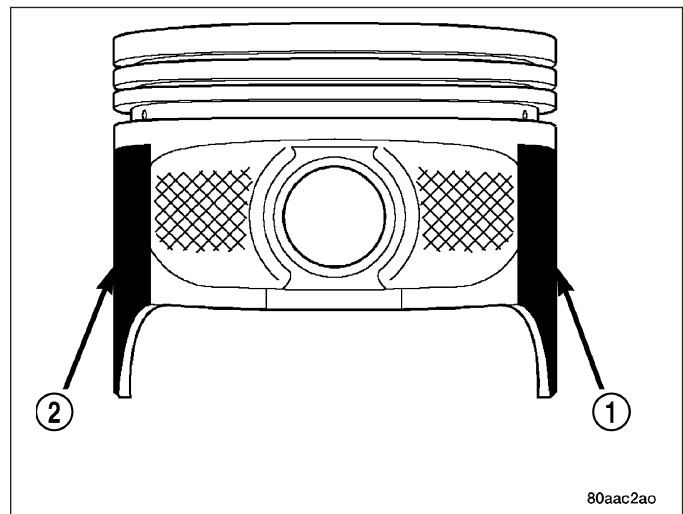
### DESCRIPTION

**CAUTION:** Do not use a metal stamp to mark connecting rods as damage may result, instead use ink or a scratch awl.

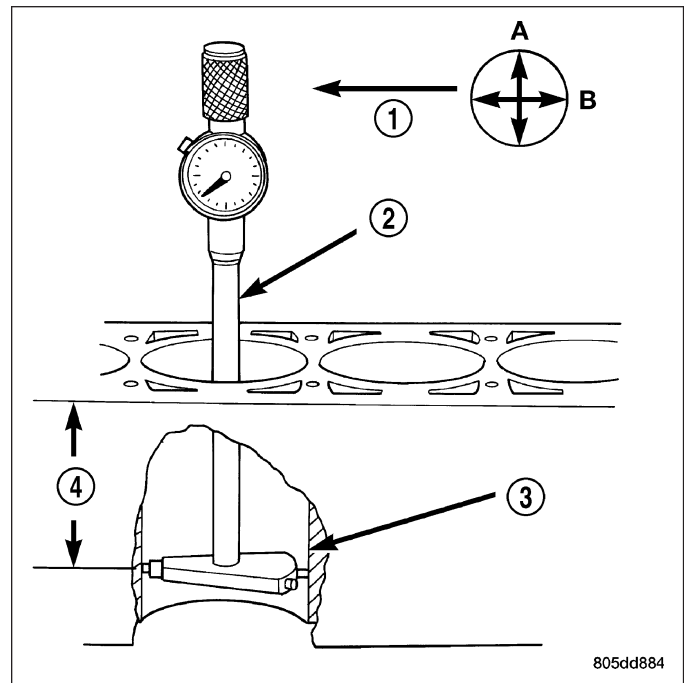
The pistons are made of a high strength aluminum alloy. Piston skirts are coated with a solid lubricant (Molykote) to reduce friction and provide scuff resistance. The piston top ring groove and land is anodized. The connecting rods are made of forged powdered metal, with a "fractured cap" design. A pressed fit piston pin is used to attach the piston and connecting rod.

### STANDARD PROCEDURE - PISTON FITTING

1. To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm ( .0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.
2. Measure the inside diameter of the cylinder bore at a point 38.0 mm (1.5 inches) below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft at point A and then take an additional bore reading 90 degrees to that at point B.
3. The coated pistons will be serviced with the piston pin and connecting rod pre-assembled. The piston-rod assembly is specific for the left cylinder bank ( odd numbered) and the right cylinder bank ( even numbered) and must not be interchanged.



4. The coating material is applied to the piston after the final piston machining process. Measuring the outside diameter of a coated piston will not provide accurate results. Therefore measuring the inside diameter of the cylinder bore with a dial Bore Gauge is **MANDATORY**. To correctly select the proper size piston, a cylinder bore gauge capable of reading in 0.003 mm (.0001 in.) increments is required.
5. Piston installation into the cylinder bore requires slightly more pressure than that required for non-coated pistons. The bonded coating on the piston will give the appearance of a line-to-line fit with the cylinder bore.



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## REMOVAL

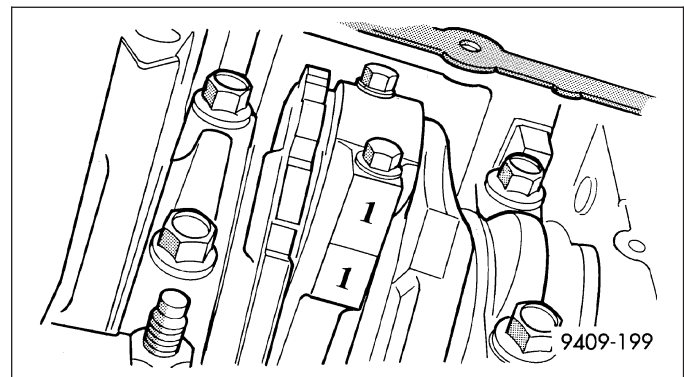
1. Disconnect negative cable from battery.
2. Remove the following components:
  - Oil pan and gasket/windage tray (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
  - Cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL) and (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
  - Timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
  - Cylinder head(s) (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL) and (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
3. If necessary, remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation.** Pistons and connecting rods must be removed from top of cylinder block. When removing piston and connecting rod assemblies from the engine, rotate crankshaft so the each connecting rod is centered in cylinder bore.

**CAUTION: DO NOT use a number stamp or a punch to mark connecting rods or caps, as damage to connecting rods could occur**

**Note: Connecting rods and bearing caps are not interchangeable and should be marked before removing to ensure correct reassembly.**

4. Mark connecting rod and bearing cap positions using a permanent ink marker or scribe tool.

**CAUTION: Care must be taken not to damage the fractured rod and cap joint face surfaces, as engine damage may occur.**



5. Remove connecting rod cap. Install Special Tool 8507 Connecting Rod Guides into the connecting rod being removed. Remove piston from cylinder bore. Repeat this procedure for each piston being removed.

**CAUTION: Care must be taken not to nick crankshaft journals, as engine damage may occur**

6. Immediately after piston and connecting rod removal, install bearing cap on the mating connecting rod to prevent damage to the fractured cap and rod surfaces.
7. Carefully remove piston rings from piston(s), starting from the top ring down.

## CLEANING

**CAUTION: DO NOT use a wire wheel or other abrasive cleaning device to clean the pistons or connecting rods. The pistons have a Moly coating, this coating must not be damaged.**

1. Using a suitable cleaning solvent clean the pistons in warm water and towel dry.
2. Use a wood or plastic scraper to clean the ring land grooves.

**CAUTION: DO NOT remove the piston pin from the piston and connecting rod assembly.**

## INSPECTION

Check the connecting rod journal for excessive wear, taper and scoring (Refer to 9 - ENGINE/ENGINE BLOCK/CONNECTING ROD BEARINGS - STANDARD PROCEDURE).

Check the connecting rod for signs of twist or bending.

Check the piston for taper and elliptical shape before it is fitted into the cylinder bore (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON & CONNECTING ROD - STANDARD PROCEDURE).

Check the piston for scoring, or scraping marks in the piston skirts. Check the ring lands for cracks and/or deterioration.

## INSTALLATION

1. Before installing piston and connecting rod assemblies into the bore, install the piston rings (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - STANDARD PROCEDURE).
2. Immerse the piston head and rings in clean engine oil. Position a ring compressor over the piston and rings. Tighten ring compressor. **Ensure position of rings do not change during this operation.**
3. Position bearing onto connecting rod. Lubricate bearing surface with clean engine oil.
4. Install Special Tool 8507 Connecting Rod Guides into connecting rod bolt threads.
5. The pistons are marked on the piston pin bore surface with an raised "F" or arrow on top of piston indicating installation position. This mark must be pointing toward the front of engine on both cylinder banks.
6. Wipe cylinder bore clean and lubricate with engine oil.
7. Rotate crankshaft until connecting rod journal is on the center of cylinder bore. Insert rod and piston into cylinder bore and carefully position connecting rod guides over crankshaft journal.
8. Tap piston down in cylinder bore using a hammer handle. While at the same time, guide connecting rod into position on rod journal.

**CAUTION: Connecting Rod Bolts are Torque to Yield Bolts and Must Not Be Reused. Always replace the Rod Bolts whenever they are loosened or removed.**

9. Lubricate rod bolts and bearing surfaces with engine oil. Install connecting rod cap and bearing. Tighten bolts to 21 N·m (15 ft. lbs.) plus a 90° turn.
10. Install the following components:
  - Cylinder head(s). (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
  - Cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
  - Install the intake manifold.
  - Oil pan and gasket/windage tray. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
11. Fill crankcase with proper engine oil to correct level.
12. Connect negative cable to battery.

## RINGS-PISTON

### STANDARD PROCEDURE - PISTON RING FITTING

Before reinstalling used rings or installing new rings, the ring clearances must be checked.

1. Wipe the cylinder bore clean.
2. Insert the ring in the cylinder bore.

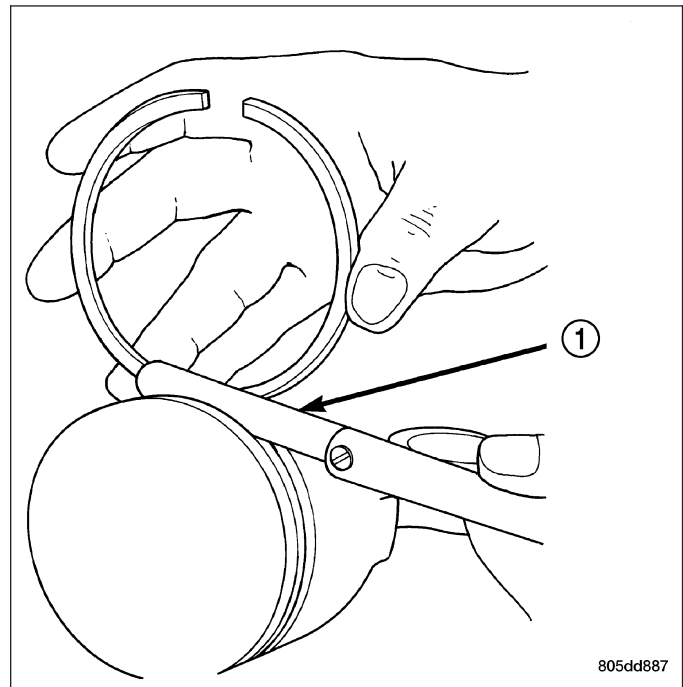
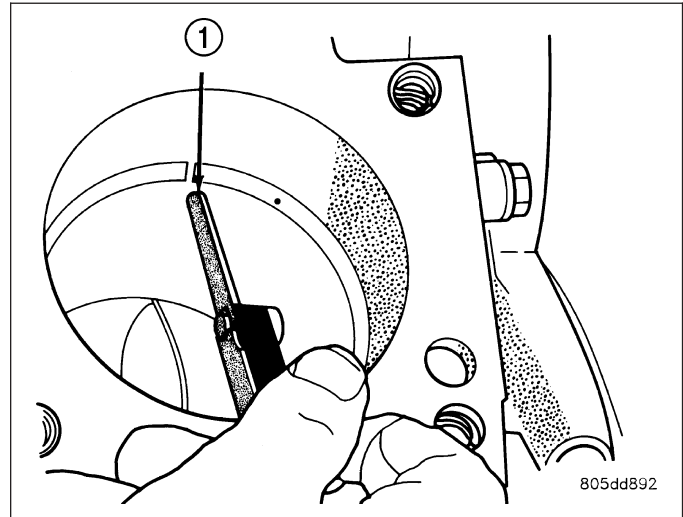
**Note:** The ring gap measurement must be made with the ring positioned at least 12mm (0.50 inch.) from bottom of cylinder bore.

3. Using a piston, to ensure that the ring is squared in the cylinder bore, slide the ring downward into the cylinder.
4. Using a feeler gauge check the ring end gap. Replace any rings not within specification.

#### PISTON RING SIDE CLEARANCE

**Note:** Make sure the piston ring grooves are clean and free of nicks and burrs.

5. Measure the ring side clearance as shown make sure the feeler gauge fits snugly between the ring land and the ring. Replace any ring not within specification.
6. Rotate the ring around the piston, the ring must rotate in the groove with out binding.



**PISTON RING SPECIFICATION CHART**

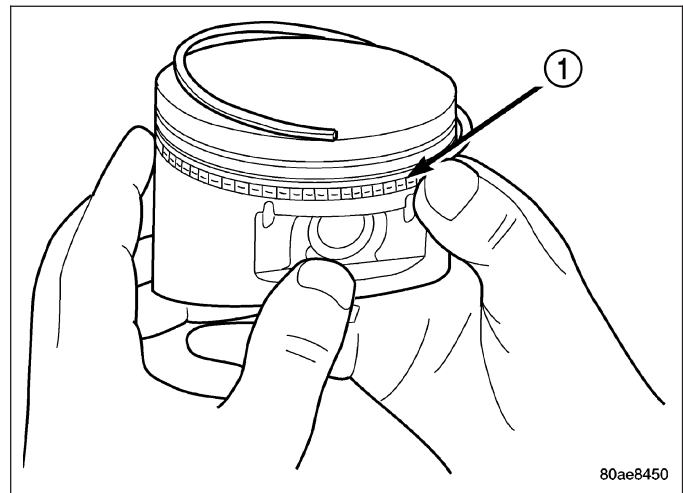
Ring Position	Ring/Groove Side Clearance	Maximum Clearance
Upper Ring	0.02-0.07mm (0.0008- 0.0028 in.)	0.11mm (0.004 in.)
Intermediate Ring	0.02-0.06 mm (0.0008-0.0023 in.)	0.10mm (0.004 in.)
Ring Position	Ring Gap	Wear Limit
Upper Ring	0.23-0.38mm (0.0090-0.0149 in.)	0.43mm (0.017 in.)
Intermediate Ring	0.35-0.60mm (0.0137-0.0236 in.)	0.74mm (0.029 in.)
Oil Control Ring (Steel Rail)	0.015-0.66mm (0.0059- 0.0259 in.)	0.76mm (0.030 in.)

7. The No. 1 and No. 2 piston rings have a different cross section. Ensure No. 2 ring is installed with manufacturers I.D. mark (Dot) facing up, towards top of the piston.

**Note: Piston rings are installed in the following order:**

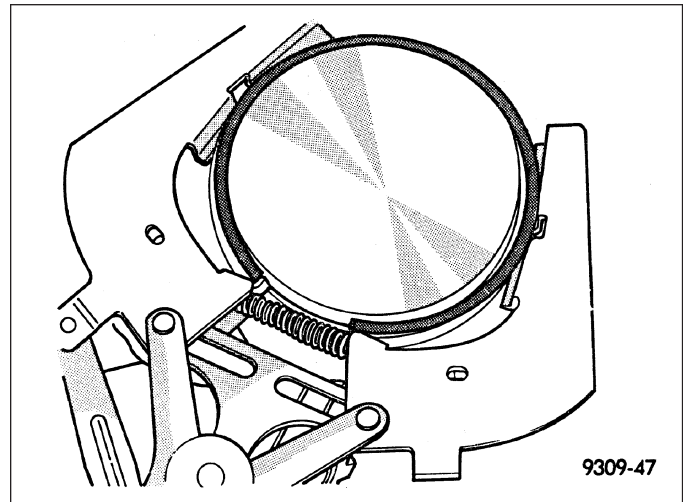
- Oil ring expander.
- Lower oil ring side rail.
- Upper oil ring side rail.
- No. 2 Intermediate piston ring.
- No. 1 Upper piston ring.

8. Install the oil ring expander.
9. Install upper side rail by placing one end between the piston ring groove and the expander ring. Hold end firmly and press down the portion to be installed until side rail is in position. Repeat this step for the lower side rail.

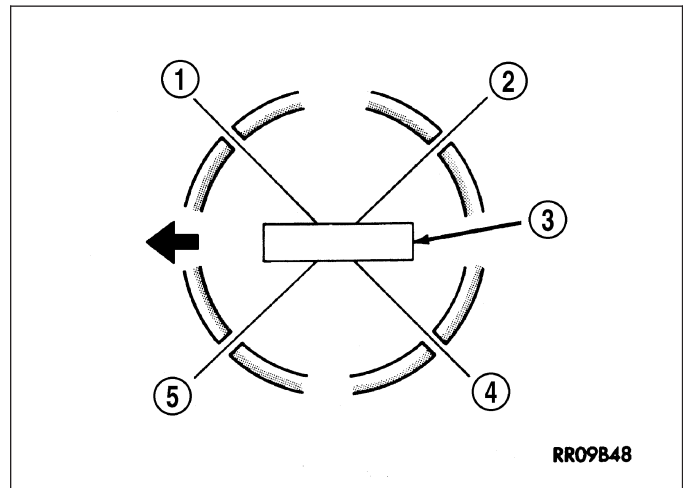




10. Install No. 2 intermediate piston ring using a piston ring installer.
11. Install No. 1 upper piston ring using a piston ring installer.



12. Position piston ring end gaps as shown in. It is important that expander ring gap is at least 45° from the side rail gaps, but not on the piston pin center or on the thrust direction.



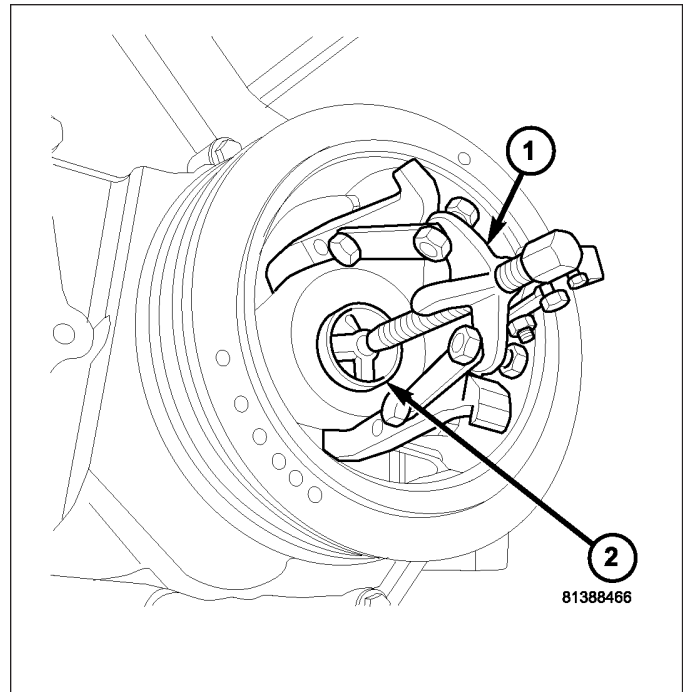
## DAMPER-CRANKSHAFT

### REMOVAL

1. Disconnect negative cable from battery.
2. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
3. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
4. Remove radiator upper hose.
5. Remove fan shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
6. Remove crankshaft damper bolt.



7. Remove damper using Special Tools 8513A Insert and 1023 Three Jaw Puller.



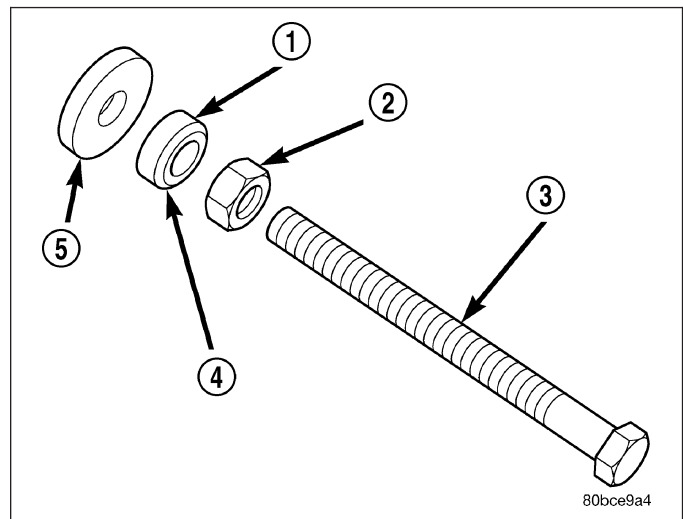
## INSTALLATION

**CAUTION:** To prevent severe damage to the Crankshaft, Damper or Special Tool 8512-A, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

1. Slide damper onto crankshaft slightly.

**CAUTION:** Special Tool 8512-A, is assembled in a specific sequence. Failure to assemble this tool in this sequence can result in tool failure and severe damage to either the tool or the crankshaft.

2. Assemble Special Tool 8512-A as follows, The nut is threaded onto the shaft first. Then the roller bearing is placed onto the threaded rod (The hardened bearing surface of the bearing **MUST** face the nut). Then the hardened washer slides onto the threaded rod. Once assembled coat the threaded rod's threads with Mopar® Nickel Anti-Seize or (Loctite No. 771).



3. Using Special Tool 8512-A, press damper onto crankshaft.
4. Install then tighten crankshaft damper bolt to 176 N·m (129 ft. lbs.).
5. Install radiator upper hose.
6. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
7. Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
8. Connect negative cable to battery.

## COVER-STRUCTURAL

### DESCRIPTION

The structural dust cover is made of die cast aluminum and joins the lower half of the transmission bell housing to the engine. The LX uses an integral one piece aluminum oil pan/structural cover.

### OPERATION

The structural cover provides additional powertrain stiffness and reduces noise and vibration. The LX uses an integral structural cover/oil pan.

## SOLENOID-MDS

### DESCRIPTION

The Multi Displacement System selectively deactivates cylinders 1,4,6, and 7, to improve fuel economy. It has two modes of operation :

- 8 cylinders for acceleration and heavy loads.
- 4 cylinders for cruising and city traffic.

The main components of the Multi Displacement System are :

- Unique MDS camshaft.
- Deactivating roller tappets.
- 4 control valves/solenoids.
- control valve/solenoid wiring harness.
- oil temp sensor.

### OPERATION

#### Cylinder Deactivation

- Trap an exhaust charge
- Normal combustion event
- Don't open exhaust valve
- Don't open intake valve
- Piston is an air spring
- Cylinders deactivated in firing sequence

#### Cylinder Reactivation

- Empty the cylinder
- Open exhaust valve
- Open intake valve
- Normal combustion event
- Cylinders reactivated in firing sequence

## DIAGNOSIS AND TESTING

The Multi Displacement System has the following detectible issues:

- Solenoid circuit
- Fail to deactivate a cylinder(s)
- Fail to reactivate a cylinder(s)
- Low oil pressure

CONDITION	POSSIBLE CAUSES	CORRECTION
MDS does not activate	1. Low oil pressure 2. Bad oil temp sensor 3. Malfunctioning MDS Solenoid 4. Malfunctioning MDS Tappet	1. Check for proper oil pressure 2. Replace oil temp sensor 3. Replace Solenoid 4. Replace Tappet
MDS Does Not Deactivate	1. Low oil pressure 2. Bad oil temp sensor 3. Malfunctioning MDS Solenoid 4. Malfunctioning MDS Tappet	1. Check for proper oil pressure 2. Replace oil temp sensor 3. Replace Solenoid 4. Replace Tappet

## REMOVAL

1. Disconnect the negative battery cable.
2. Remove the intake manifold. (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
3. Remove wiring harness connectors from the MDS solenoids.
4. Remove hold down bolt from MDS solenoid.
5. Remove MDS solenoid.

## INSTALLATION

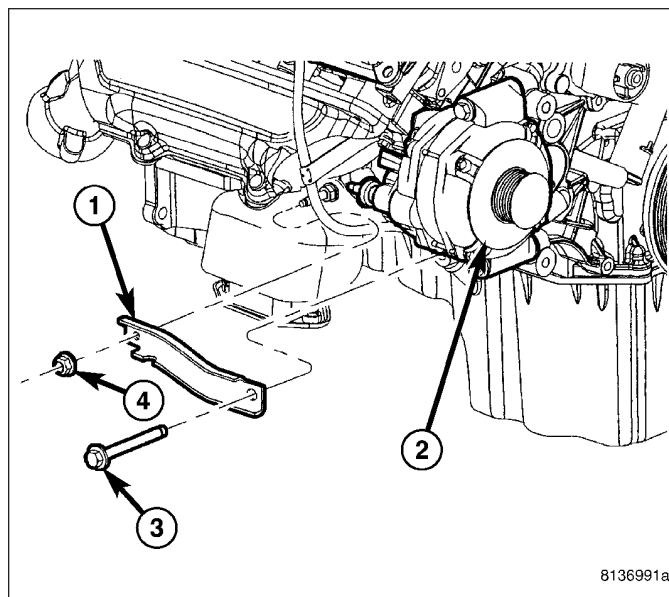
1. Install MDS solenoid fully into block.
2. Install hold down bolt and torque to
3. Reconnect the MDS wiring harness to the solenoids.
4. Install the intake manifold. (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).

## ENGINE MOUNTING-FRONT

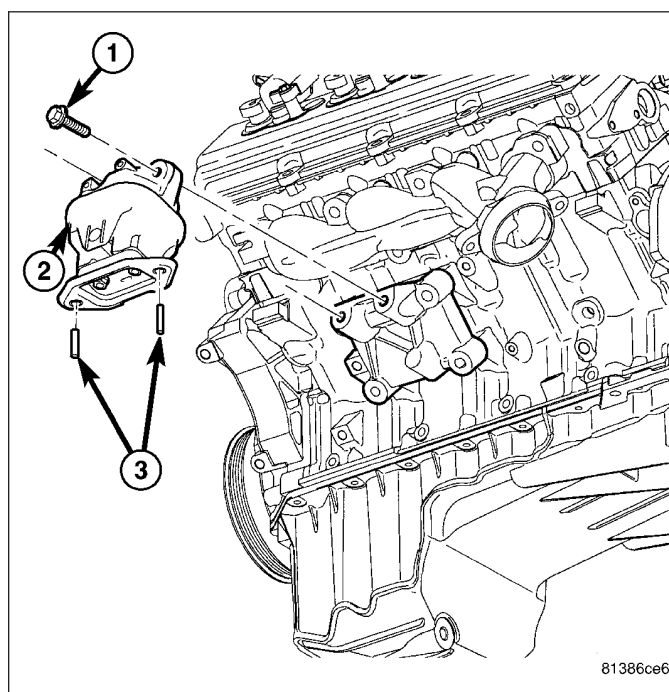
### REMOVAL

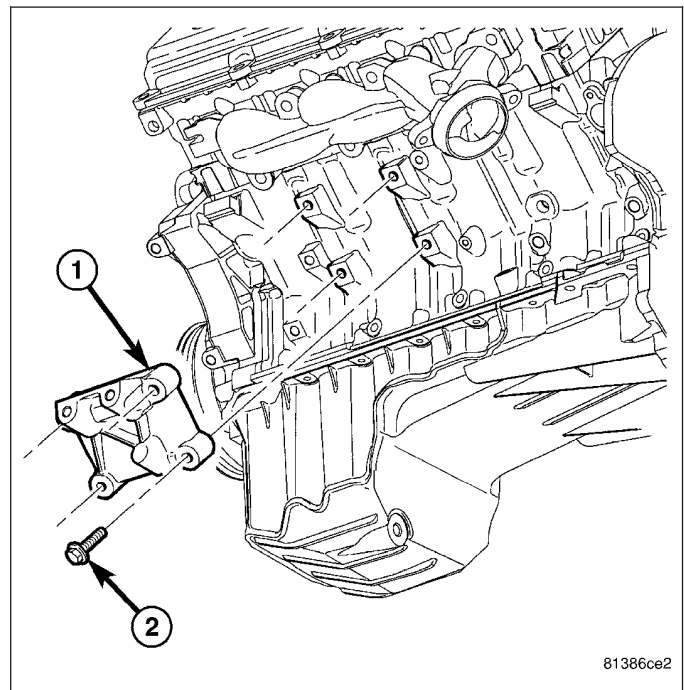
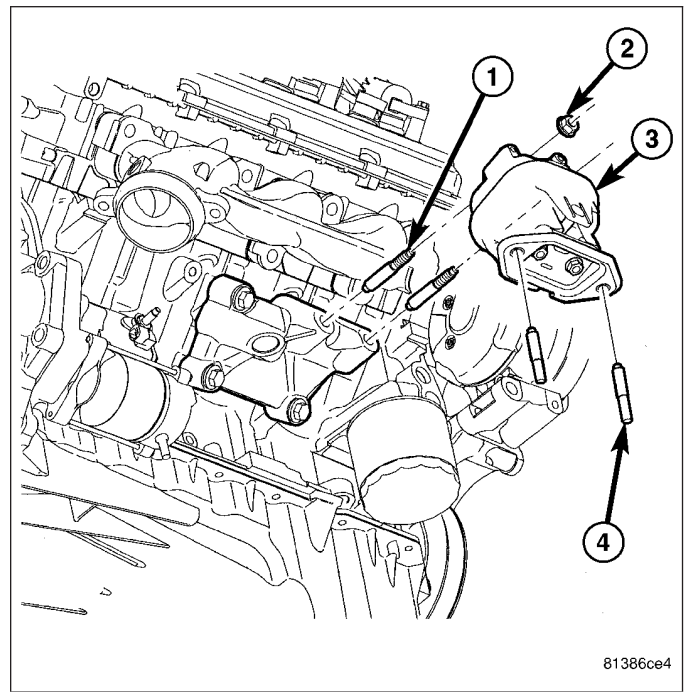
1. Disconnect negative battery cable.
2. Raise vehicle.

3. Remove the generator support bracket.

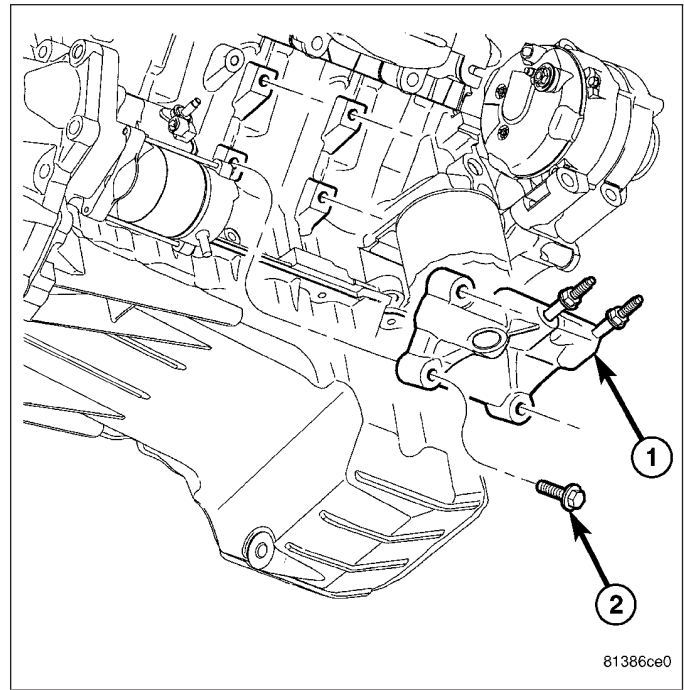


4. Remove engine mount nuts, and studs.

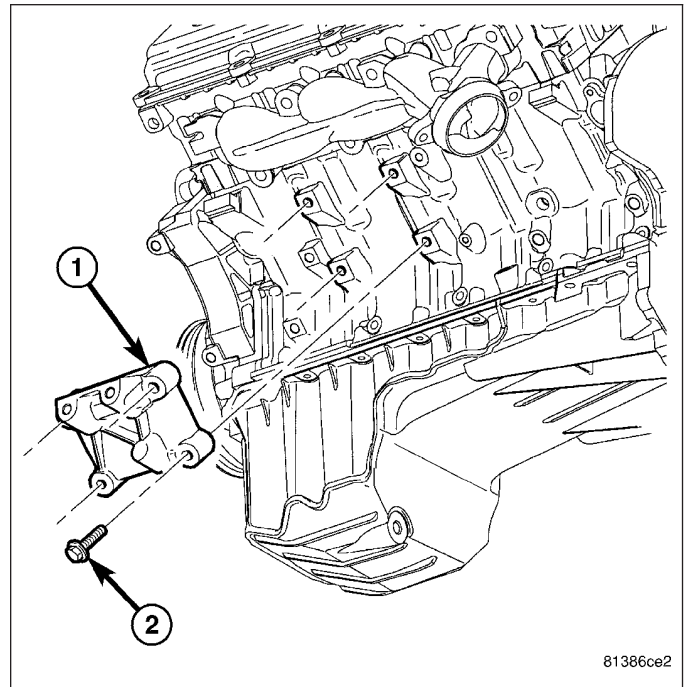




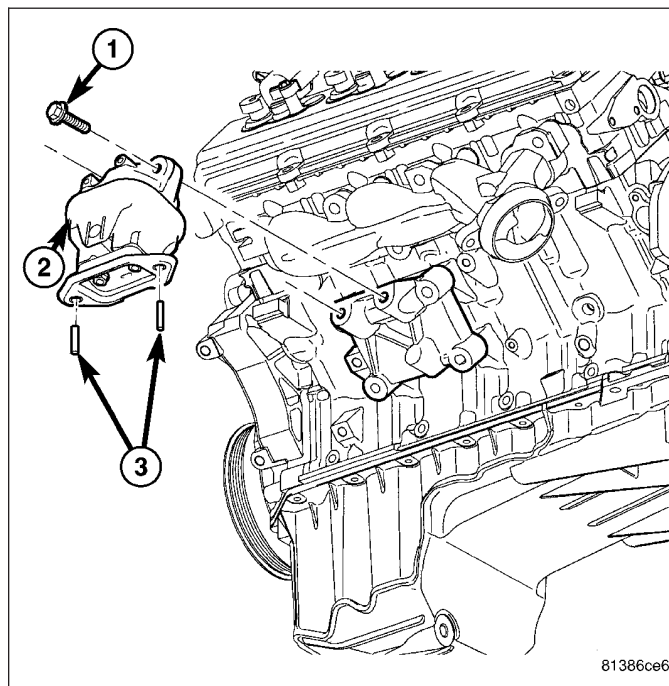
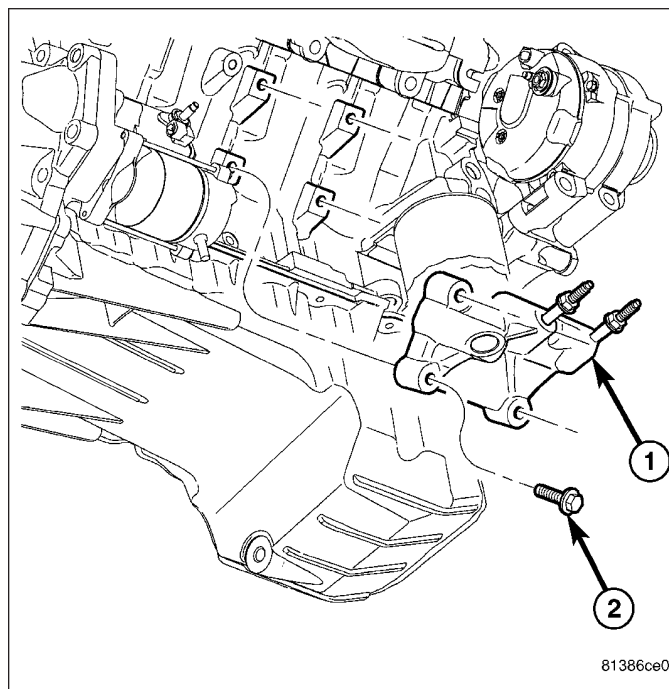
5. Raise engine using suitable jack.
6. Remove engine mount to insulator bolts.
7. Remove insulator from engine.



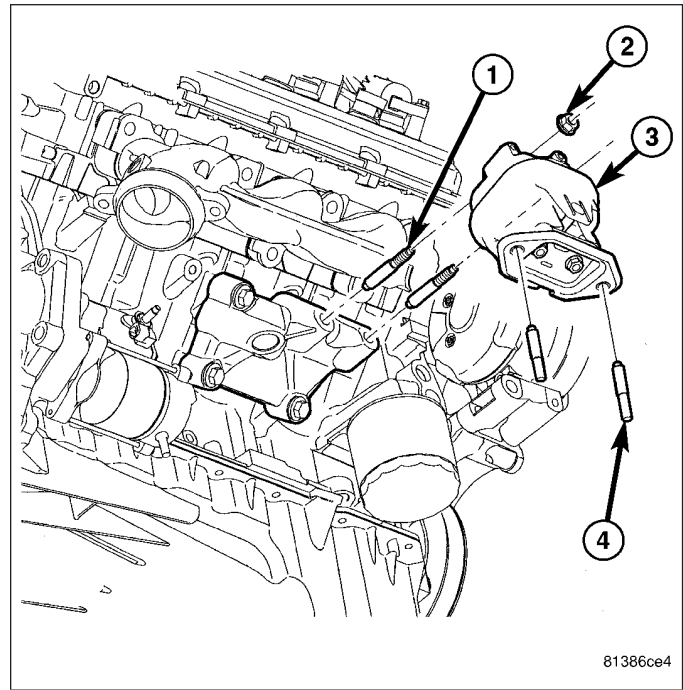
## INSTALLATION



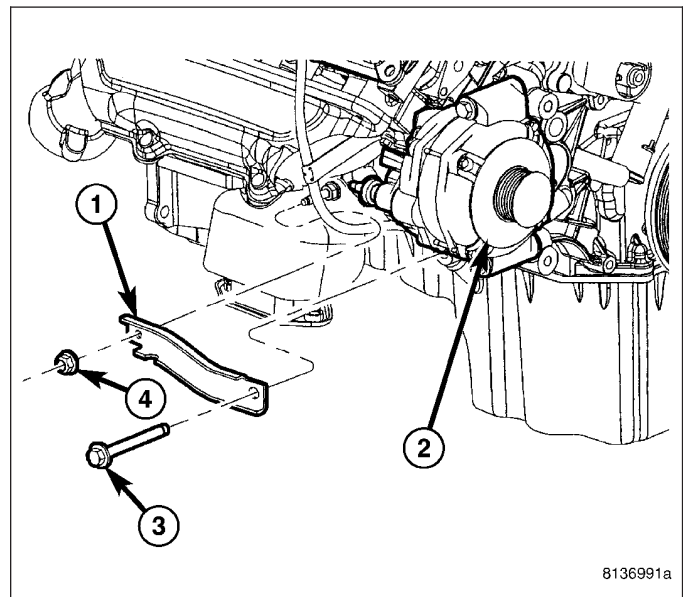
1. Install the engine mount brackets, if removed.



2. Install insulator on the engine. Tighten insulator to bracket fasteners.
3. Install the studs to the insulator.
4. Install the generator support bracket.



5. Lower the engine.
6. Install the nuts on the studs, and tighten.



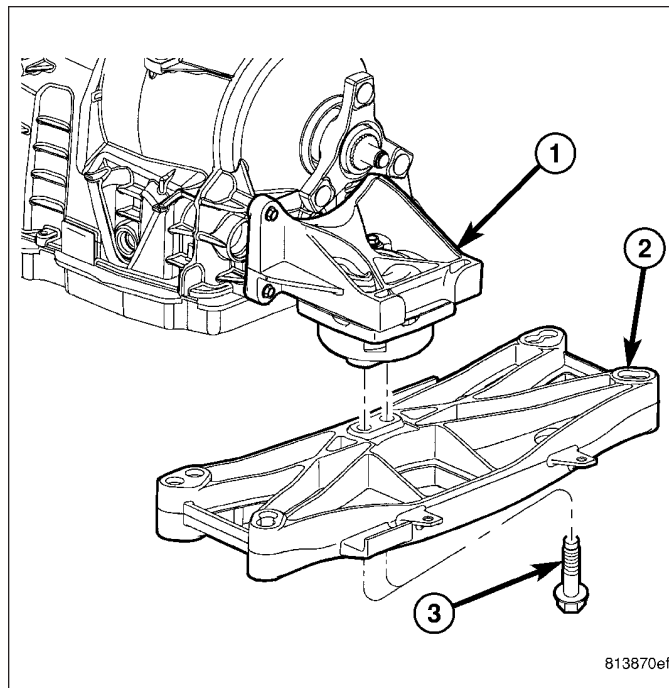
7. Lower vehicle.
8. Connect negative battery cable.



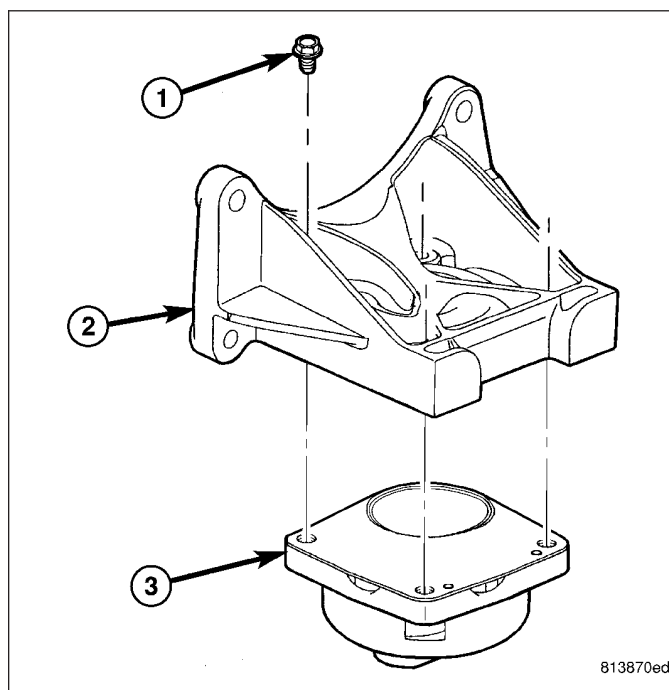
## MOUNTING-ENGINE REAR

### REMOVAL

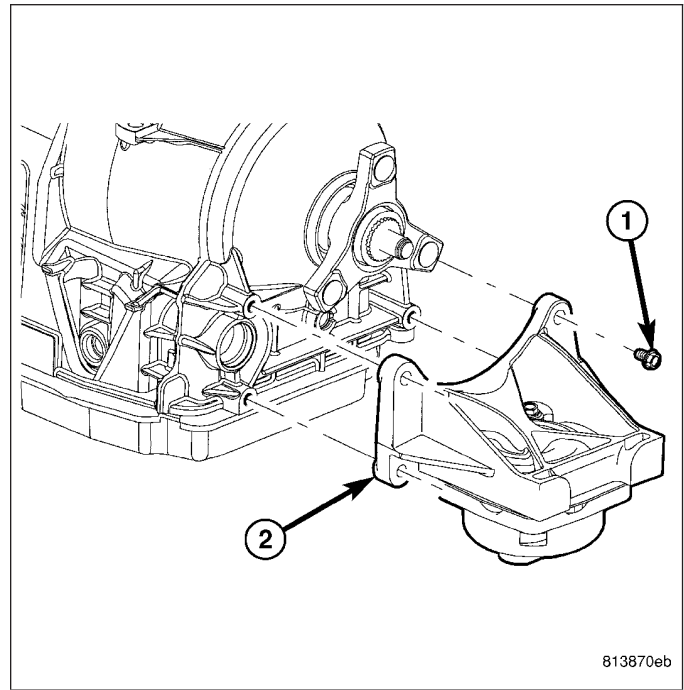
1. Raise the vehicle on a hoist.
2. Using a suitable jack, support transmission.
3. Remove the crossmember.



4. Remove the fasteners from the transmission mount to transmission.
5. Remove the mount.

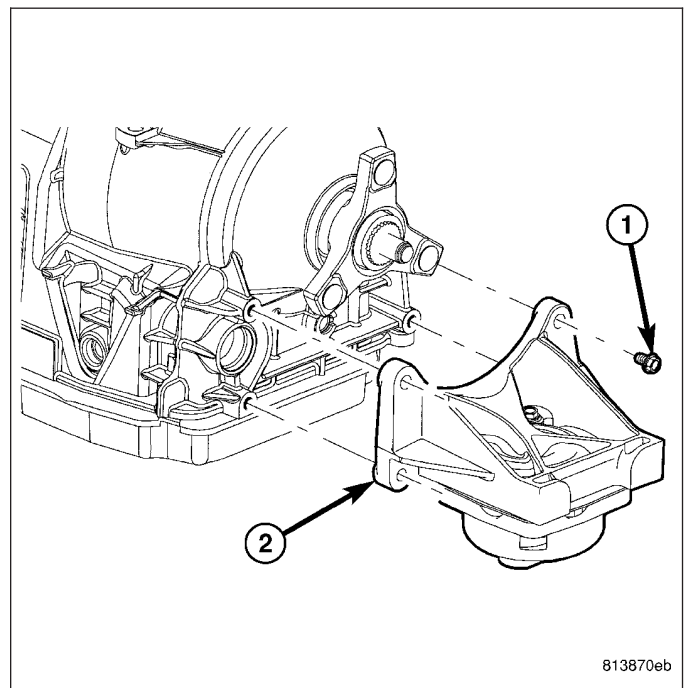


6. Remove the transmission mount bracket, if required.

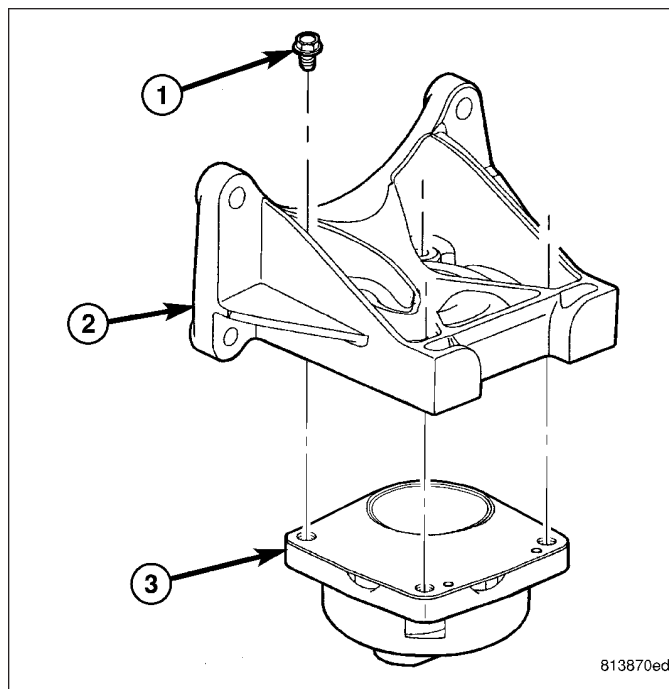


## INSTALLATION

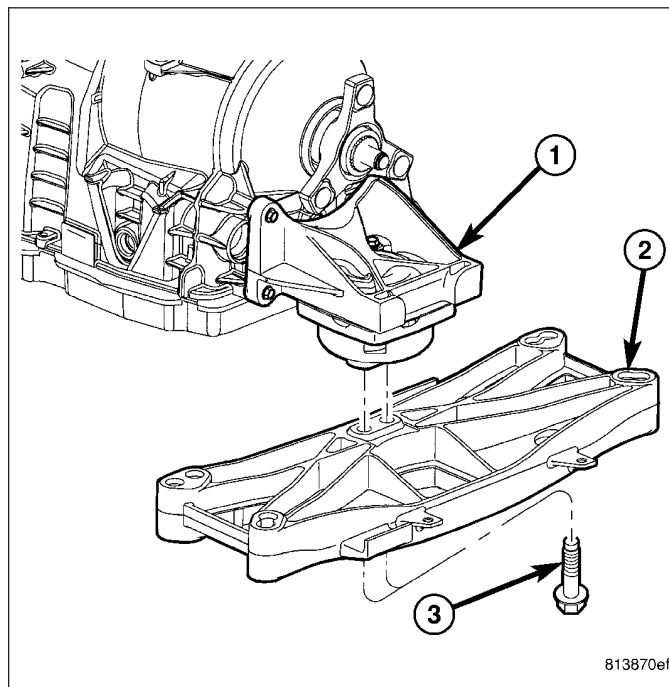
1. Install the transmission mount bracket, if removed.



2. Position the transmission mount on the transmission mount bracket. Install the bolts that attach the transmission mount to the bracket.
3. Torque the bolts to N·m ( ft.lbs.) torque.

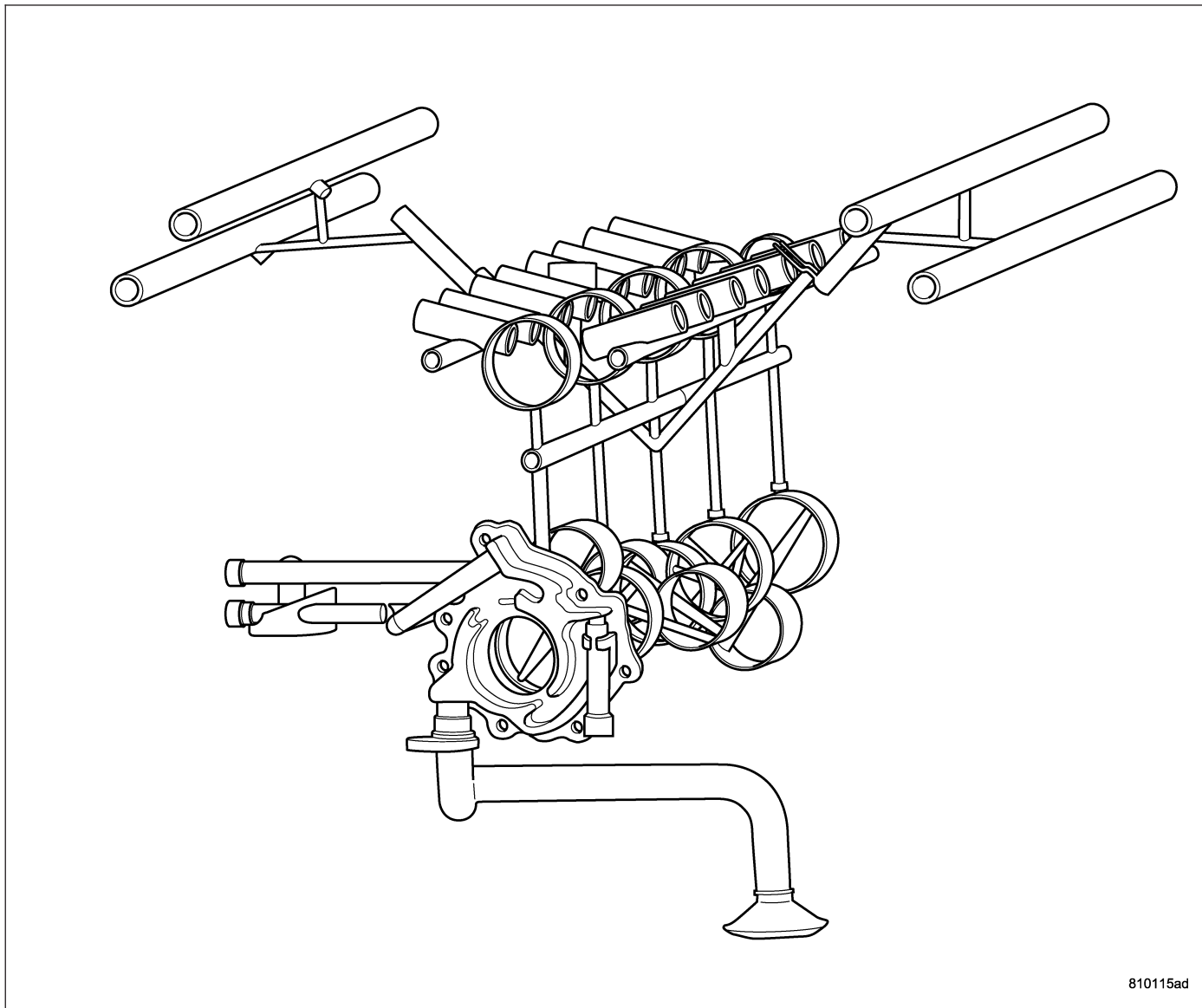


4. Install the crossmember.



## LUBRICATION

### DESCRIPTION



The lubrication system is a full flow filtration pressure feed type.

## DIAGNOSIS AND TESTING

### DIAGNOSIS AND TESTING - CHECKING ENGINE OIL PRESSURE

1. Remove oil pressure sending unit and install gauge assembly C-3292.
2. Run engine until thermostat opens.
3. Oil Pressure:
  - Curb Idle—25 kPa (4 psi) minimum
  - 3000 rpm—170 - 758 kPa (25 - 110 psi)
4. If oil pressure is 0 at idle, shut off engine. Check for a clogged oil pick-up screen or a pressure relief valve stuck open.

## DIAGNOSIS AND TESTING - ENGINE OIL LEAK

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

1. Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.
2. Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair per service manual instructions.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection. **If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method.

### Air Leak Detection Test Method

1. Remove the PCV valve from the IAFM. Cap or plug the PCV valve grommet.
2. Attach an air hose with pressure gauge and regulator to the dipstick tube.

**CAUTION: Do not subject the engine assembly to more than 20.6 kPa (3 PSI) of test pressure.**

3. Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provide the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.
4. If the leakage occurs at the rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.
5. If no leaks are detected, turn off the air supply and remove the air hose and all plugs and caps. Install the PCV valve.
6. Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

## INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
  - a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
  - b. Where leakage tends to run straight down, possible causes are a porous block, distributor seal, camshaft bore cup plugs oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces.
4. If no leaks are detected, pressurize the crankcase as outlined in the, Inspection (Engine oil Leaks in general)

**CAUTION: Do not exceed 20.6 kPa (3 psi).**

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

**CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.**

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

## OIL

### STANDARD PROCEDURE - ENGINE OIL SERVICE

The engine oil level indicator is located at the right hand of the engine on the 5.7L engines.

#### CRANKCASE OIL LEVEL INSPECTION

**CAUTION: Do not overfill crankcase with engine oil, pressure loss or oil foaming can result.**

Inspect engine oil level approximately every 800 kilometers (500 miles). Unless the engine has exhibited loss of oil pressure, run the engine for about ten minutes before checking oil level. Checking engine oil level on a cold engine is not accurate.

To ensure proper lubrication of an engine, the engine oil must be maintained at an acceptable level. The acceptable levels are indicated between the ADD and SAFE marks on the engine oil dipstick.

1. Position vehicle on level surface.
2. With engine OFF, allow approximately five minutes for oil to settle to bottom of crankcase, remove engine oil dipstick.
3. Wipe dipstick clean.
4. Install dipstick and verify it is seated in the tube.
5. Remove dipstick, with handle held above the tip, take oil level reading.
6. Add oil only if level is below the ADD mark on dipstick.

#### ENGINE OIL CHANGE

Change engine oil at mileage and time intervals described in Maintenance Schedules(Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION).

Run engine until achieving normal operating temperature.

1. Position the vehicle on a level surface and turn engine off.
2. Remove oil fill cap.
3. Hoist and support vehicle on safety stands.
4. Remove the belly pan (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL).
5. Place a suitable drain pan under crankcase drain.
6. Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug if damaged.
7. Install drain plug in crankcase. Torque to 27 N·m ( 20 ft. lbs.).
8. Lower vehicle and fill crankcase with specified type and amount of engine oil described in this section.
9. Install oil fill cap.
10. Start engine and inspect for leaks.
11. Stop engine and inspect oil level.
12. Install the belly pan (Refer to 23 - BODY/EXTERIOR/BELLY PAN - INSTALLATION).

**Note: Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING at beginning of this section.**

## FILTER-ENGINE OIL

### REMOVAL

All engines are equipped with a high quality full-flow, disposable type oil filter. DaimlerChrysler Corporation recommends a Mopar® or equivalent oil filter be used.

1. Remove belly pan (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL) .
2. Position a drain pan under the oil filter.

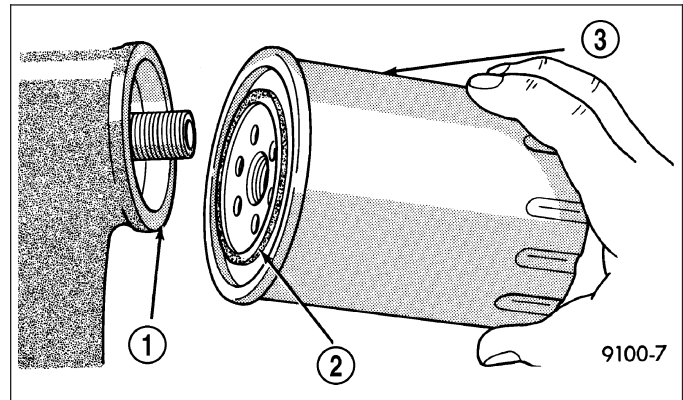
3. Using a suitable oil filter wrench loosen filter.
4. Rotate the oil filter counterclockwise to remove it from the cylinder block oil filter boss.
5. When filter separates from cylinder block oil filter boss, tip gasket end upward to minimize oil spill. Remove filter from vehicle.

**Note: Make sure filter gasket was removed with filter.**

6. With a wiping cloth, clean the gasket sealing surface of oil and grime.

## INSTALLATION

1. Lightly lubricate oil filter gasket with engine oil.
2. Thread filter onto adapter nipple. When gasket makes contact with sealing surface, hand tighten filter one half turn, or 180°, do not over tighten.



3. Add oil, verify crankcase oil level and start engine. Inspect for oil leaks.
4. Install belly pan (Refer to 23 - BODY/EXTERIOR/BELLY PAN - INSTALLATION).

## PAN-ENGINE OIL

### REMOVAL

1. Disconnect the negative battery cable.
2. Remove the intake manifold. (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
3. Install engine lift fixture special tool # 8984 and adapter # 8984-UPD. **Never use air tools when installing fasteners to engine.**
4. Raise vehicle.
5. Remove the belly pan (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL).
6. Remove both left and right side engine mount to frame nuts, and studs.
7. Drain engine oil and remove the oil filter.
8. Unbolt and lower the steering rack from the mounts. **Do not remove P/S hoses, tie rod ends or disconnect steering column.**
9. Remove the engine oil dipstick and tube from the oil pan.
10. Lower the vehicle.
11. Install engine support fixture special tool # 8534. **Do not use the third leg.**
12. Raise engine using special tool # 8534 and #8984 to provide clearance to remove oil pan.

**Note: Do not pry on oil pan or oil pan gasket. Gasket is integral to engine windage tray and does not come out with oil pan.**

**Note: The horizontal M10 fasteners are 5 mm longer in length, and must be reinstalled in original locations.**

13. Remove the M10 fasteners (vertical and horizontal) from the rear of the oil pan to the transmission and engine.

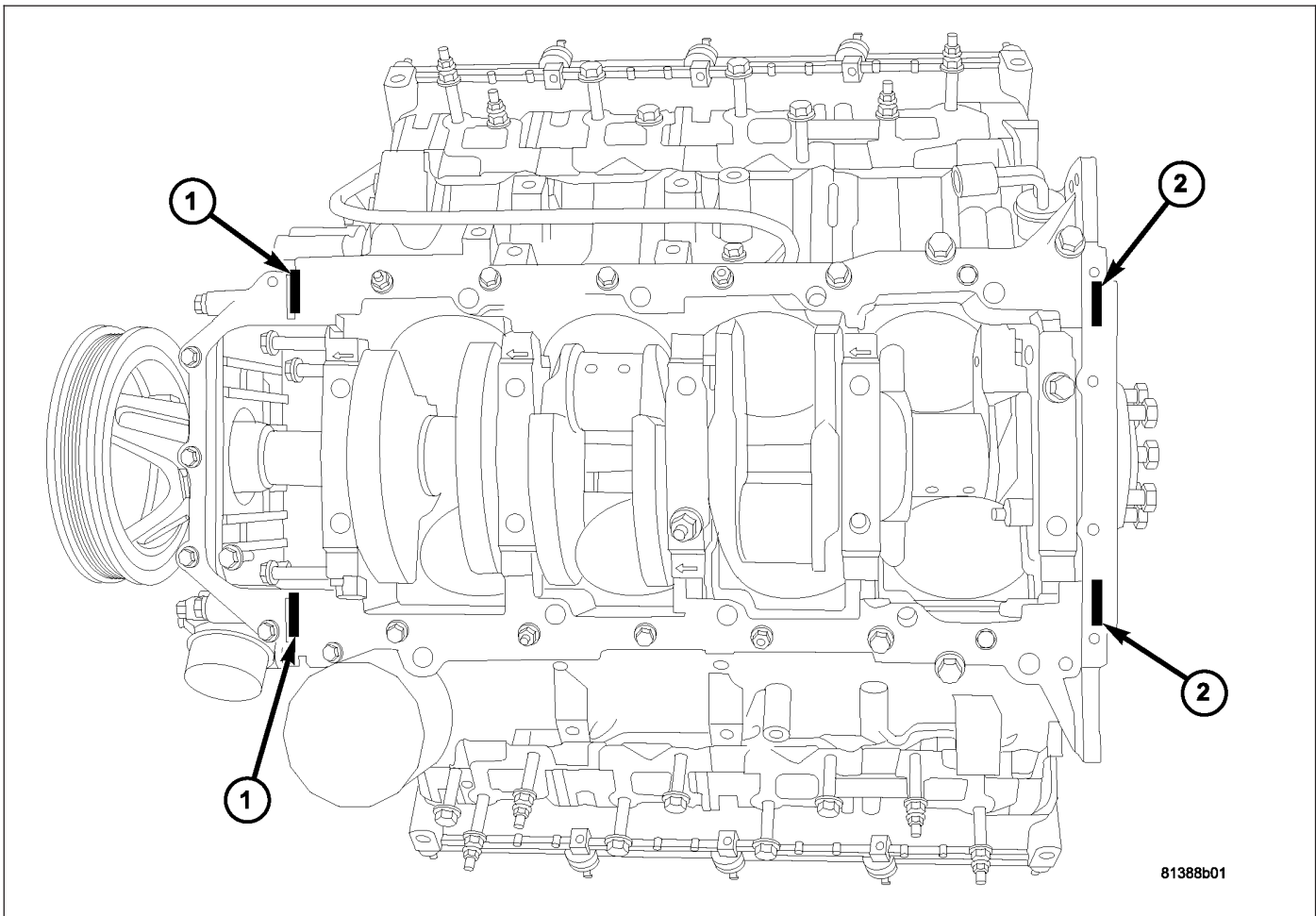
14. Remove the oil pan mounting bolts and oil pan.

**Note:** When the oil pan is removed, a new oil pan gasket/windage tray assembly must be installed. The old gasket cannot be reused.

15. Discard the integral windage tray and gasket and replace.

## INSTALLATION

1. Clean the oil pan gasket mating surface of the block and oil pan.



**Note:** Mopar® Engine RTV must be applied to the 4 T-joints, (area where front cover, rear retainer, block, and oil pan gasket meet). The bead of RTV should cover the bottom of the gasket. This area is approximately 4.5 mm x 25 mm in each of the 4 T-joint locations.

2. Apply Mopar® Engine RTV at the 4 T- joints.

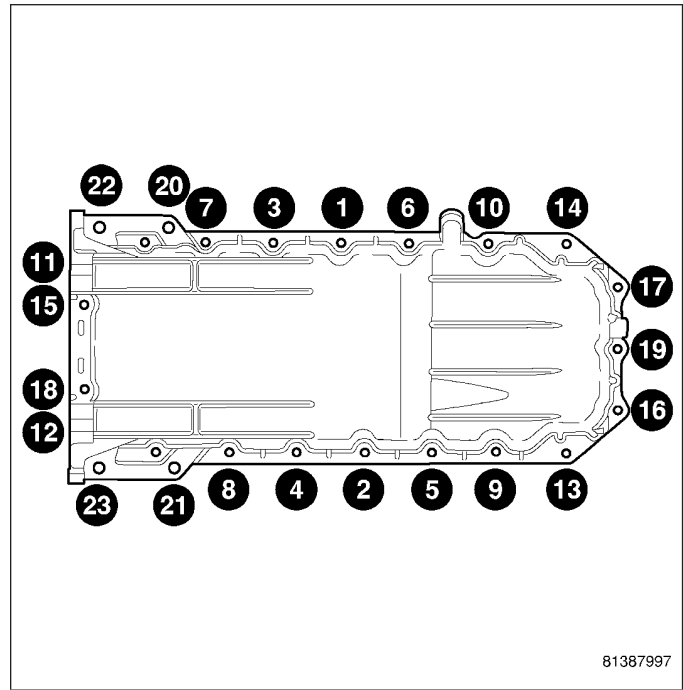
**Note:** When the oil pan is removed, a new oil pan gasket/windage tray assembly must be installed. The old gasket cannot be reused.

3. Install a new oil pan gasket/windage tray assembly.
4. If removed, reinstall the oil pump pickup tube with new o-ring. Tighten tube to pump fasteners to 28 N·m (250 in. lbs.).



**Note:** The horizontal M10 fasteners are 5 mm longer in length, and must be reinstalled in original locations.

5. Align the rear of the oil pan with the rear face of the engine block, and install the M10 and M6 oil pan fasteners finger tight. Using the following torque sequence, torque the M6 mounting bolts to 5 N·m (44 in.lbs.).
6. Using the following torque sequence, torque the M10 oil pan fasteners to 54 N·m (39 ft.lbs.).
7. Using the following torque sequence, torque the M6 oil pan fasteners to 12 N·m (106 in.lbs.).



8. Lower the engine into mounts using special tool # 8534.
9. Install both the left and right side engine mount studs and nuts. Torque the studs and nuts to N·m ( ft. lbs.).
10. Install the engine oil dipstick and tube.
11. Install the steering rack.
12. Remove special tool # 8534.
13. Remove special tool # 8984.
14. Install the intake manifold. (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
15. Fill engine oil.
16. Install oil filter, if removed.
17. Reconnect the negative battery cable.
18. Start engine and check for leaks.
19. Install the belly pan (Refer to 23 - BODY/EXTERIOR/BELLY PAN - INSTALLATION).

## PUMP-ENGINE OIL

### REMOVAL

1. Remove the oil pan and pick-up tube(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
2. Remove the timing chain cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
3. Remove the four bolts, and the oil pump.

### CLEANING

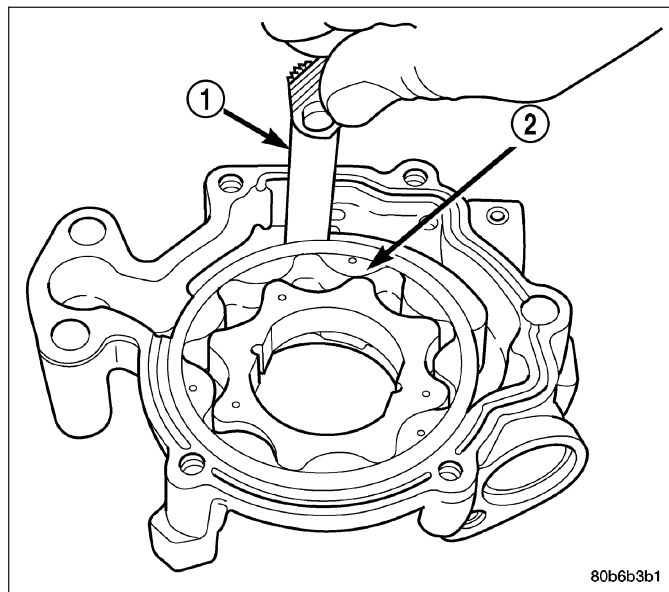
1. Wash all parts in a suitable solvent.

### INSPECTION

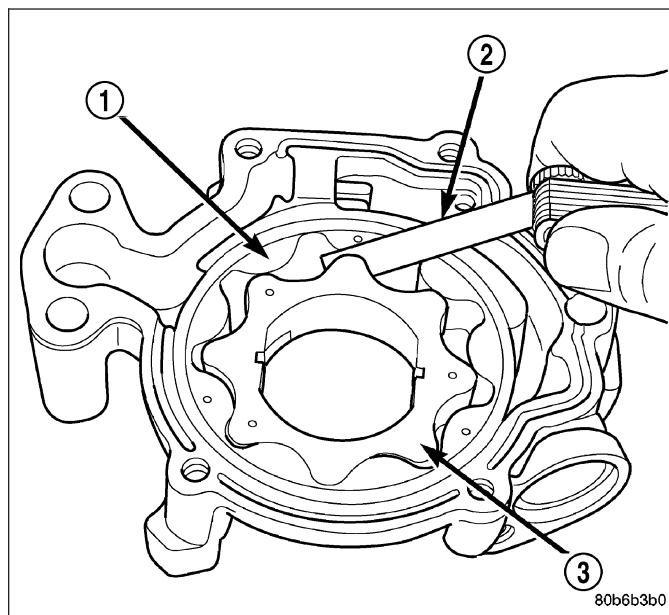
**CAUTION:** Oil pump pressure relief valve and spring should not be removed from the oil pump. If these components are disassembled and or removed from the pump the entire oil pump assembly must be replaced.

1. Remove the pump cover.

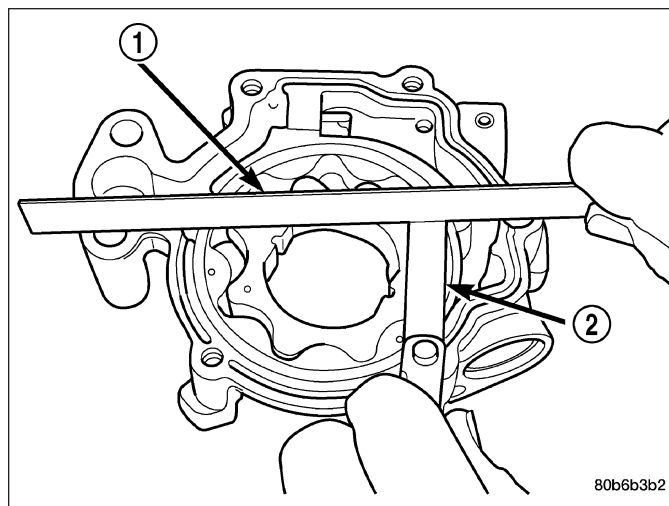
2. Clean all parts thoroughly. Mating surface of the oil pump housing should be smooth. If the pump cover is scratched or grooved the oil pump assembly should be replaced.
3. Slide outer rotor into the body of the oil pump. Press the outer rotor to one side of the oil pump body and measure clearance between the outer rotor and the body. If the measurement is 0.235mm (0.009 in.) or more the oil pump assembly must be replaced.



4. Install the inner rotor into the oil pump body. Measure the clearance between the inner and outer rotors. If the clearance between the rotors is .150 mm (0.006 in.) or more the oil pump assembly must be replaced.



5. Place a straight edge across the body of the oil pump (between the bolt holes), if a feeler gauge of .095 mm (0.0038 in.) or greater can be inserted between the straightedge and the rotors, the pump must be replaced.



6. Reinstall the pump cover. Torque fasteners to 15 N·m (132 in. lbs.).

**Note:** The 5.7 Oil pump is released as an assembly. There are no DaimlerChrysler part numbers for Sub-Assembly components. In the event the oil pump is not functioning or out of specification it must be replaced as an assembly.

## INSTALLATION

1. Position the oil pump onto the crankshaft and install the 4 oil pump retaining bolts.
2. Tighten the oil pump retaining bolts to 28 N·m (250 in. lbs.).
3. Install the timing chain cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
4. Install the pick-up tube and oil pan(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

## INTAKE MANIFOLD

### DESCRIPTION

The intake manifold is made of a composite material and features long runners which maximizes low end torque. The intake manifold uses single plane sealing which consist of eight individual press in place port gaskets to prevent leaks.

### DIAGNOSIS AND TESTING - INTAKE MANIFOLD LEAKAGE

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

**WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.**

1. Start the engine.
2. Spray a small stream of water at the suspected leak area.
3. If a change in RPM is observed the area of the suspected leak has been found.
4. Repair as required.

### REMOVAL

1. Remove engine cover.
2. Bleed fuel system (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
3. Disconnect negative cable from battery.

4. Remove air inlet hose.
5. Remove ignition wires from on top of intake manifold.
6. Disconnect electrical connectors for the following components:
  - Manifold Absolute Pressure (MAP) Sensor
  - Fuel Injectors
  - ETC ( Electric Throttle Control )
7. Remove wire harness from intake manifold.
8. Disconnect brake booster hose, purge hose, and MUA hose ( Make Up Air Hose ).
9. Remove EGR tube from intake manifold.
10. Remove intake manifold retaining fasteners in a crisscross pattern starting from the outside bolts and ending at the middle bolts.
11. Remove intake manifold as an assembly.

## CLEANING

**Note: There is NO approved repair procedure for the intake manifold. If severe damage is found during inspection, the intake manifold must be replaced.**

Before installing the intake manifold thoroughly clean the mating surfaces. Use a suitable cleaning solvent, then air dry.

## INSPECTION

1. Inspect the intake sealing surface for cracks, nicks and distortion.
2. Inspect the intake manifold vacuum hose fittings for looseness or blockage.

## INSTALLATION

1. Position intake manifold.
2. Install intake manifold retaining bolts, and tighten in sequence from the middle bolts towards the outside in a crisscross pattern. Torque fasteners to 12 N·m (105 in. lbs.).
3. Install EGR tube.
4. Install wire harness on intake manifold.
5. Connect electrical connectors for the following components:
  - Manifold Absolute Pressure (MAP) Sensor
  - Fuel Injectors
  - ETC ( Electronic Throttle Control )
6. Install ignition wires.
7. Connect Brake booster hose, purge hose, and MUA hose ( Make Up Air hose ).
8. Install air inlet hose.
9. Connect negative cable to battery.

## EXHAUST MANIFOLD

### DESCRIPTION

The exhaust manifolds are log style with a patented flow enhancing design to maximize performance. The exhaust manifolds are made of high silicon molybdenum cast iron. A multi-layer stainless steel exhaust manifold gasket is used to improve sealing to the cylinder head. The exhaust manifolds are covered by a three layer laminated heat shield for thermal protection and noise reduction. The heat shields are fastened with a torque prevailing nut that is backed off slightly to allow for the thermal expansion of the exhaust manifold, with the exception of the nut, which also secures the oil dipstick tube bracket. That nut should not be backed off.

### OPERATION

The exhaust manifolds collect the engine exhaust exiting the combustion chambers, then channels the exhaust gases to the exhaust pipes attached to the manifolds.

### REMOVAL

#### EXHAUST MANIFOLD

1. Disconnect negative battery cable.
2. Raise vehicle.
3. Remove exhaust pipe to manifold bolts.
4. Lower vehicle.
5. Install engine support fixture special tool #8534.
6. Raise engine enough to remove manifolds.

**CAUTION: Do not damage engine harness while raising the engine.**

7. Remove heat shield.
8. Remove manifold bolts.
9. Remove manifold and gasket.

### CLEANING

Clean mating surfaces on cylinder head and manifold. Wash with solvent and blow dry with compressed air.

### INSPECTION

Inspect manifold for cracks.

Inspect mating surfaces of manifold for flatness with a straight edge. Gasket surfaces must be flat within 0.2 mm per 300 mm (0.008 inch per foot).

### INSTALLATION

#### EXHAUST MANIFOLD

1. Install manifold gasket and manifold.
2. Install manifold bolts and tighten to 25 N·m (18 ft. lbs.).
3. Install heat shield and tighten nuts to 8 N·m (70 in. lbs.).
4. Lower engine.

**CAUTION: Do not damage engine harness while lowering the engine.**

5. Remove engine support fixture from engine.
6. Raise vehicle.
7. Tighten right and left side engine mount through bolts.
8. Install exhaust flange to pipe bolts.

9. Lower vehicle.
10. Connect negative battery cable.

## COVER-TIMING CASE

### REMOVAL

1. Disconnect the battery negative cable.
2. Remove air cleaner assembly.
3. Drain cooling system.
4. Remove accessory drive belt.
5. Remove fan and fan drive assembly (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL).
6. Remove coolant bottle and washer bottle.
7. Remove fan shroud.

**Note: It is not necessary to disconnect A/C lines or discharge freon.**

8. Remove A/C compressor and set aside.
9. Remove the generator.
10. Remove upper radiator hose.
11. Disconnect both heater hoses at timing cover.
12. Disconnect lower radiator hose at engine.
13. Remove accessory drive belt tensioner and both idler pulleys.
14. Remove crankshaft damper(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

**Note: Do not remove the hoses from the power steering pump.**

15. Remove power steering pump and set aside.
16. Remove the dipstick support bolt.
17. Drain the engine oil.
18. Remove the oil pan and pick up tube(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL) .

**Note: It is not necessary to remove water pump for timing cover removal.**

19. Remove timing cover bolts and remove cover.

### INSTALLATION

1. Clean timing chain cover and block surface.

**Note: Always install a new gasket on timing cover.**

2. Install cover and new gasket. Tighten fasteners to 28 N·m (250 in. lbs.).

**Note: The large lifting stud is torqued to 55 N·m (40 ft. lbs.).**

3. Install the oil pan and pick up tube(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
4. Install the A/C compressor.
5. Install the generator.
6. Install power steering pump.
7. Install the dipstick support bolt.
8. Install the thermostat housing.
9. Install crankshaft damper(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION) .
10. Install accessory drive belt tensioner assembly and both idler pulleys.

11. Install radiator lower hose.
12. Install both heater hoses.
13. Install radiator fan shroud.
14. Install the fan and fan drive assembly
15. Install the accessory drive belt.
16. Install the coolant bottle and washer bottle.
17. Install the upper radiator hose.
18. Install the air cleaner assembly.
19. Fill cooling system.
20. Refill engine oil.
21. Connect the battery negative cable.

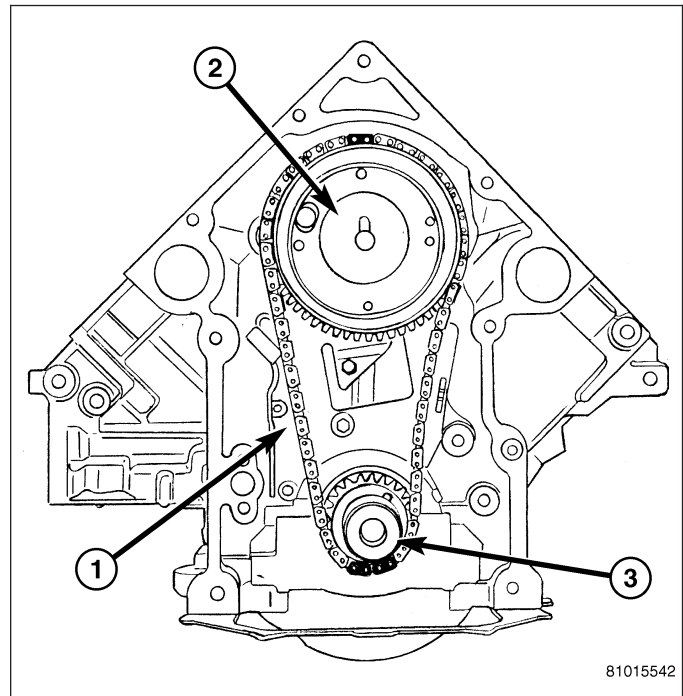
## TIMING/CHAIN AND SPROCKETS

### REMOVAL

1. Disconnect battery negative cable.
2. Drain cooling system.
3. Remove Timing Chain Cover.

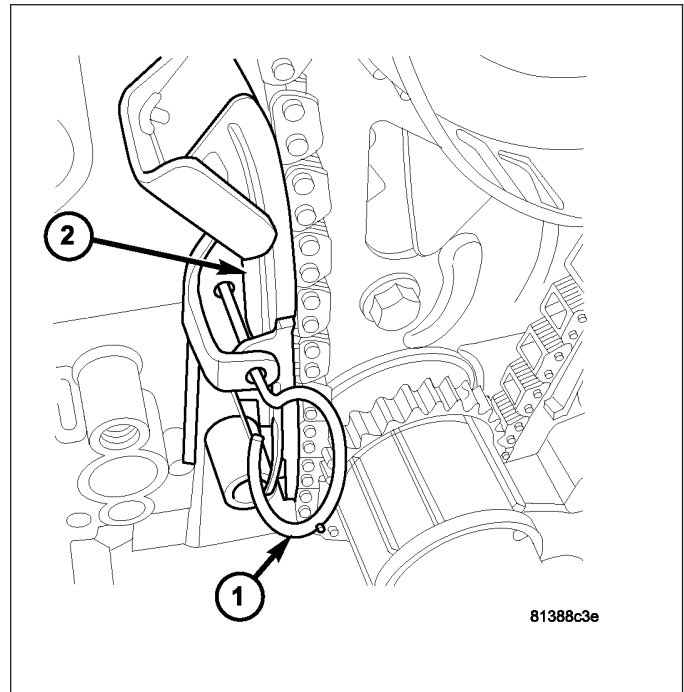
**CAUTION:** The camshaft pin and the slot in the cam sprocket must be clocked at 12:00. The crankshaft keyway must be clocked at 2:00. The crankshaft sprocket must be installed so that the dots and or paint marking is at 6:00.

4. Remove oil pump.
5. Re-install the vibration damper bolt finger tight. Using a suitable socket and breaker bar, rotate the crankshaft to align timing chain sprockets and keyways as shown.



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6. Retract tensioner shoe until hole in shoe lines up with hole in bracket. Slide a suitable pin into the holes.



7. Remove camshaft sprocket attaching bolt and remove timing chain with crankshaft and camshaft sprockets.
8. If tensioner assembly is to be replaced, remove the tensioner to block bolts and remove tensioner assembly.

## INSTALLATION

1. If tensioner assembly is being replaced, install tensioner and mounting bolts. Torque bolts to 28 N·m (250 in. lbs.).
2. Retract tensioner if required.

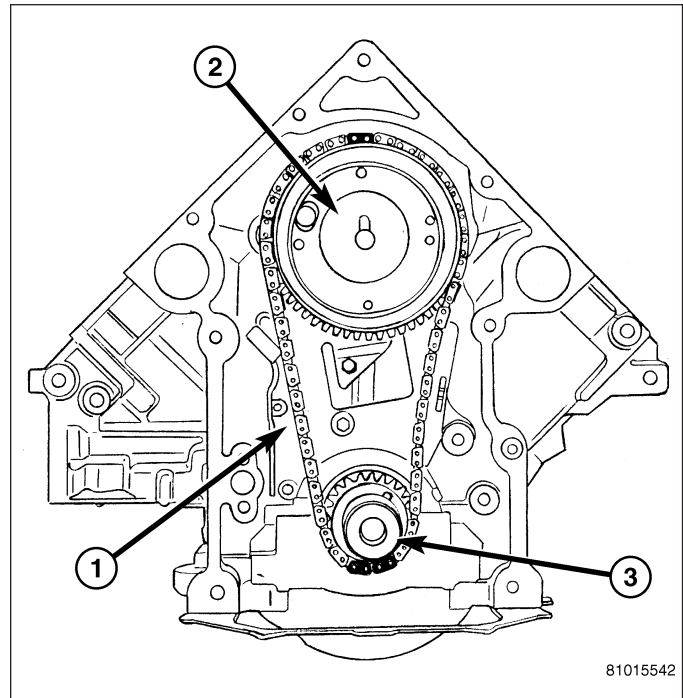
**CAUTION:** The camshaft pin and the slot in the cam sprocket must be clocked at 12:00. The crankshaft keyway must be clocked at 2:00. The crankshaft sprocket must be installed so that the dots and or paint marking is at 6:00.

3. Place both camshaft sprocket and crankshaft sprocket on the bench with timing marks on exact imaginary center line through both camshaft and crankshaft bores.



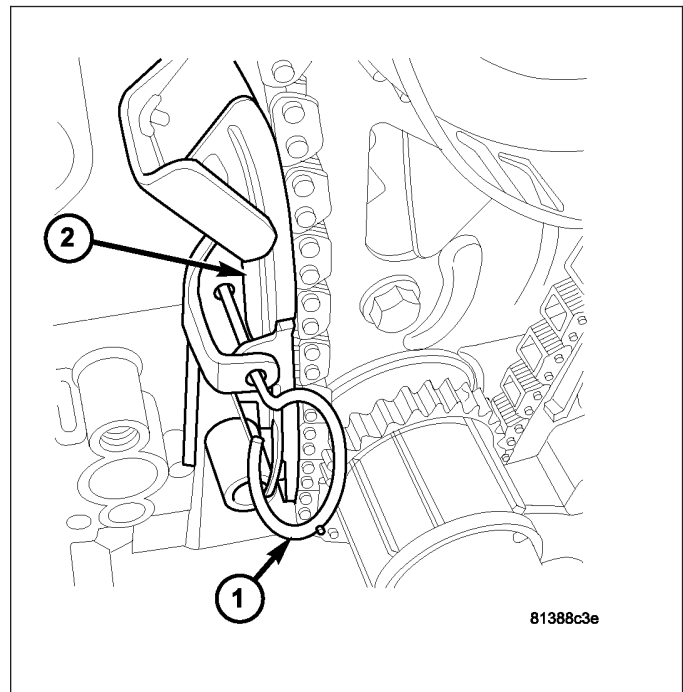
**CAUTION:** The timing chain must be installed with the single plated link aligned with the dot and or paint marking on the camshaft sprocket. The crankshaft sprocket is aligned with the dot and or paint marking on the sprocket between two plated timing chain links.

4. Place timing chain around both sprockets.
5. Lift sprockets and chain (keep sprockets tight against the chain in position as shown).
6. Slide both sprockets evenly over their respective shafts and check alignment of timing marks.



7. Install the camshaft bolt. Tighten the bolt to 122 N·m (90 ft. lbs.) torque.

8. **Remove tensioner pin.** Again, verify alignment of timing marks.



9. Install the oil pump(Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).
10. Install the oil pan and pick up(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
11. Install the timing chain cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
12. Refill engine oil.
13. Fill cooling system(Refer to 7 - COOLING - STANDARD PROCEDURE).
14. Connect battery negative cable.
15. Start engine and check for oil and coolant leaks.

## **TIMING CHAIN/TENSIONER**

### **DESCRIPTION**

The timing chain tensioner is a stamped steel constant tension mechanical design. It is mounted to the front of the engine, behind the timing chain drive.

### **OPERATION**

The timing chain tension is maintained by routing the timing chain through the tensioner assembly. A nylon covered spring steel arm presses on the timing chain maintaining the correct chain tension.



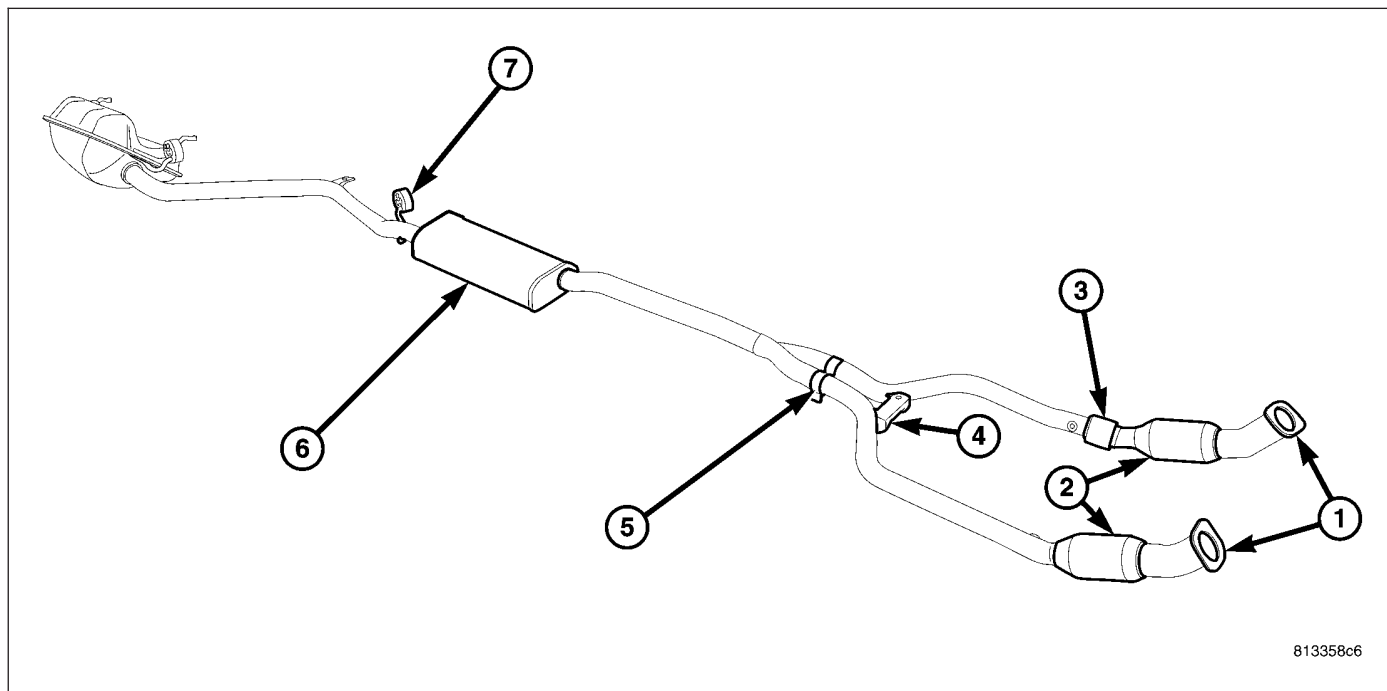
EXHAUST SYSTEM

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## EXHAUST SYSTEM

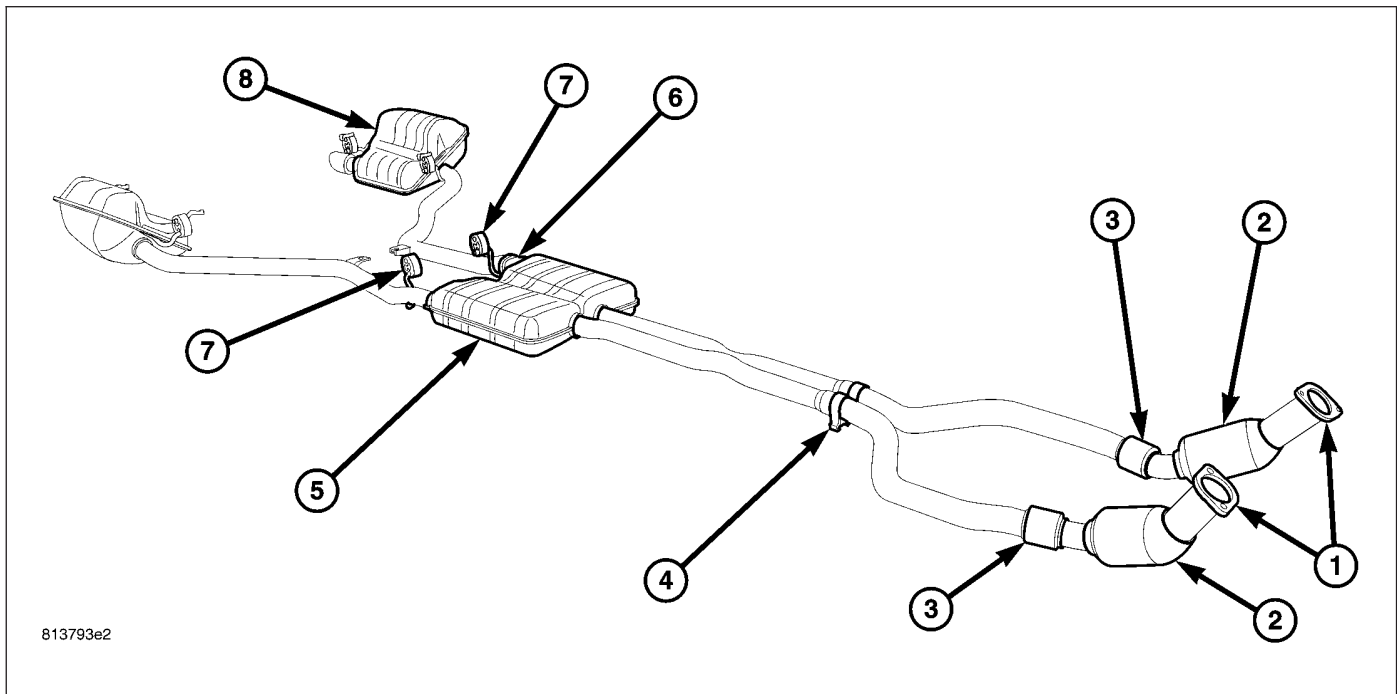
### DESCRIPTION



**EXHAUST SYSTEM - V6 SINGLE SYSTEM**

- 1 - BALL FLANGE
- 2 - CATALYTIC CONVERTER
- 3 - FLEX COUPLER
- 4 - BAND CLAMPS
- 5 - RH REAR EXHAUST MODULE
- 6 - REAR BALL FLANGE
- 7 - INSOLATORS
- 8 - LH RESONATOR AND TAILPIPE

The exhaust system consists of two front close coupled catalytic converters, a front exhaust module assembly (5), and on vehicles equipped with duel exhaust, LH resonator and tailpipe assembly (7).



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**EXHAUST SYSTEM - V8 DUEL SYSTEM**

- 1 - BALL FLANGE
- 2 - CATALYTIC CONVERTER
- 3 - FLEX COUPLER
- 4 - CROSS BRACE
- 5 - BAND CLAMPS
- 6 - REAR EXHAUST MODULE
- 7 - ISOLATOR

Both converters attach directly to the exhaust manifold using studs and nuts. The exhaust down pipes exit the converters and connect into the rear exhaust module assembly (1 and 6). On the 2.7L equipped vehicles, there is a flex coupler directly behind the LH catalytic converter. The upstream oxygen sensors are located in each exhaust manifold. On 3.5L and 5.7L equipped vehicles there is a flex coupler behind both LH and RH catalytic converters. The downstream oxygen sensors are located behind the flex couplers.

For the single exhaust systems, the rear module and tailpipe (1) are one single unit.

## DIAGNOSIS AND TESTING

### EXHAUST SYSTEM

CONDITION	POSSIBLE CAUSES	CORRECTION
EXCESSIVE EXHAUST NOISE (UNDER HOOD)	<ol style="list-style-type: none"><li>1. Exhaust manifold cracked or broken.</li><li>2. Manifold to cylinder head leak.</li><li>3. EGR tube to manifold gasket leakage.</li><li>4. EGR Valve to EGR tube gasket leakage.</li><li>5. Exhaust to manifold leak.</li><li>6. Pipe and shell noise from front exhaust pipe.</li></ol>	<ol style="list-style-type: none"><li>1. Replace manifold.</li><li>2. Tighten manifold and/or replace gasket.</li><li>3. Tighten fasteners or replace gasket.</li><li>4. Tighten fasteners or replace gasket.</li><li>5. Tighten or replace nuts</li><li>6. Characteristic of single wall pipe.</li></ol>
EXCESSIVE EXHAUST NOISE	<ol style="list-style-type: none"><li>1. Leak at exhaust pipe joints.</li><li>2. Burned or rusted out muffler assembly or exhaust pipe.</li><li>3. Burned or rusted out resonator(s).</li><li>4. Restriction in exhaust system.</li><li>5. Converter material in muffler or resonators.</li></ol>	<ol style="list-style-type: none"><li>1. Tighten clamps at leaking joints.</li><li>2. Replace exhaust module, rear resonator/tailpipe assembly or exhaust pipe with catalytic converter assembly.</li><li>3. Replace resonator assembly.</li><li>4. Remove restriction if possible, or replace components as necessary.</li><li>5. Replace muffler, resonators and converter assemblies. Check fuel injection and ignition systems for proper operation.</li></ol>

### INSPECTION

Inspect the exhaust pipes, catalytic converters, muffler, and resonators for cracked joints, broken welds and corrosion damage that would result in a leaking exhaust system. Inspect the clamps, support brackets, and insulators for cracks and corrosion damage.

**Note:** Slip joint band clamps are spot/tack welded to exhaust system. If a band clamp must be replaced, the spot/tack weld must be ground off.

### ADJUSTMENTS

A misaligned exhaust system is usually indicated by a vibration, rattling noise, or binding of exhaust system components. These noises are sometimes hard to distinguish from other chassis noises. Inspect exhaust system for broken or loose clamps, heat shields, isolators, and brackets. Replace or tighten as necessary. It is important that exhaust system clearances and alignment be maintained.

Perform the following procedures to align the exhaust system:

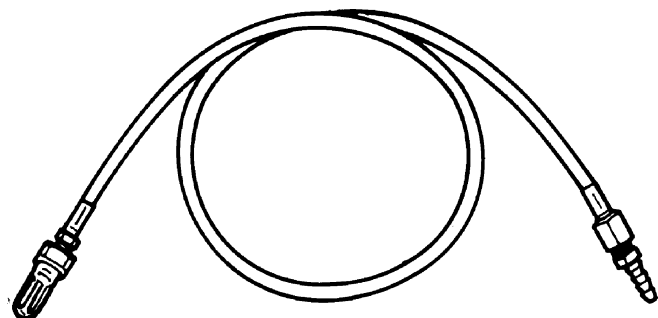
1. Loosen clamps and support brackets.
2. Align the exhaust system starting at the front, working rearward.
3. Tighten all clamps and brackets once alignment and clearances are achieved.

**SPECIFICATIONS****TORQUE**

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Nut - Catalytic Converter to Ball Flange Snug fit	12	-	106
Nut - Catalytic Converter to Ball Flange	34	25	-
Band Clamp	50	36	-
Nut - Catalytic Converter to Support Bracket	55	40	-
Fasteners - Exhaust Support Bracket	25	-	215
Retainers - Heat Shield	10	-	98
Nuts - Tunnel Reinforcement	25	-	215



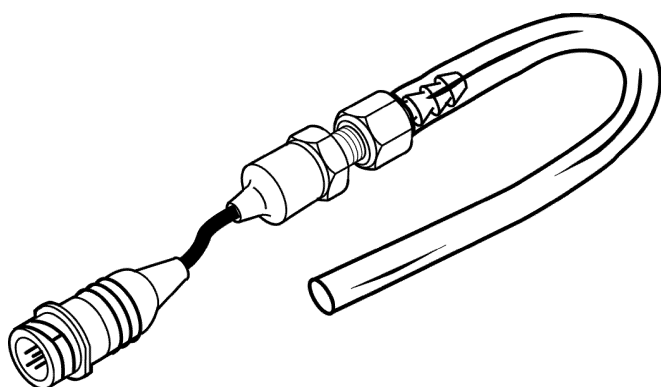
## SPECIAL TOOLS



*Back Pressure Test Adapter - CH8519*



*DRB III & PEP Module - OT-CH6010A*

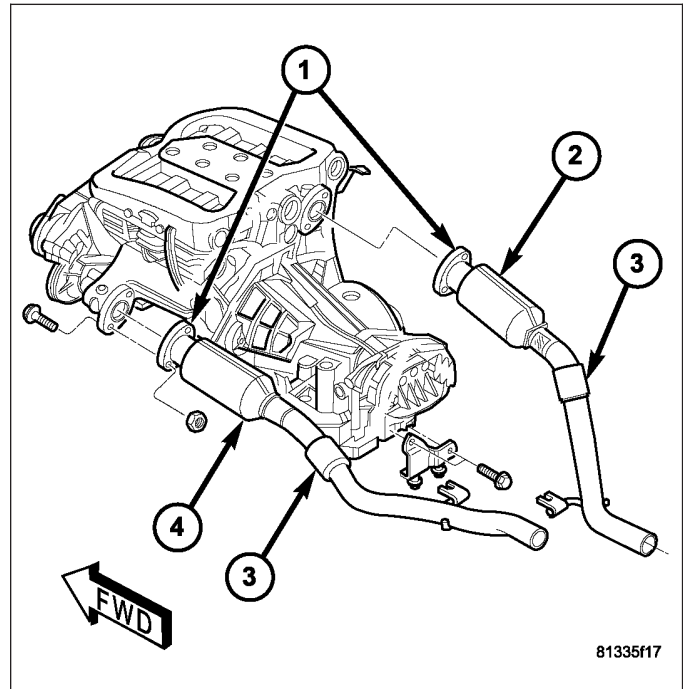


*Pressure Transducer CH7063*

## CATALYTIC CONVERTER

### DESCRIPTION

The close coupled, three-way catalytic converter inlets are connected to the exhaust manifolds by the use of ball flange (1). The 2.7L and 3.5L RWD vehicles incorporate a flex joint downstream of the LH catalytic converter to improve NVH. The 5.7L equipped RWD vehicles incorporate a flex joint downstream of the LH and RH catalytic converters. The left (3) and right (2) side converter outlet pipe connects to the exhaust system.

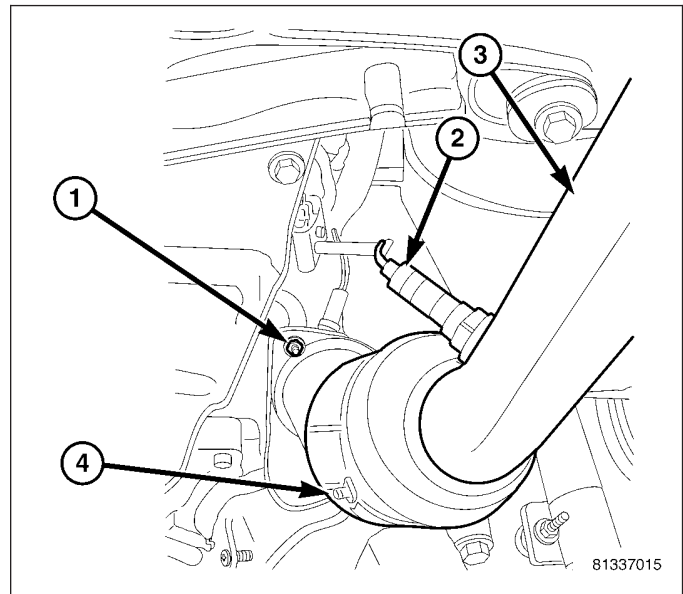


### REMOVAL

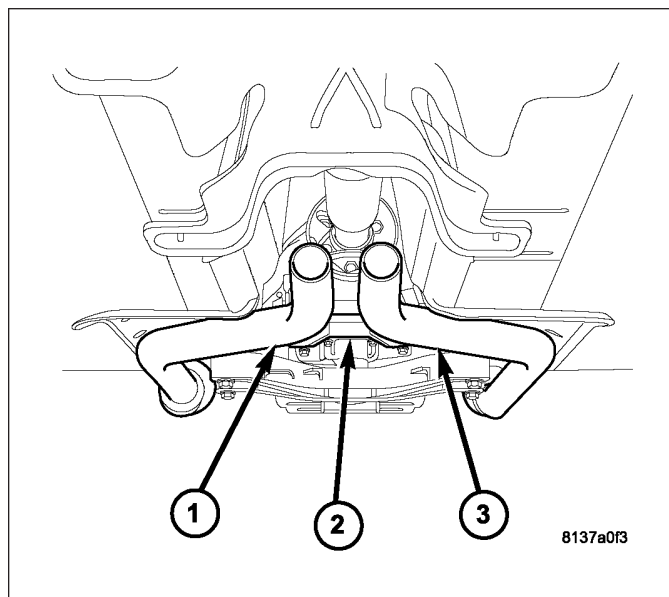
#### RH CATALYTIC CONVERTER

**WARNING:** The normal operating temperature of the exhaust system is very high. therefore, never work around or attempt to service any part of the exhaust system until it is cooled. special care should be taken when working near the catalytic converter. The temperature of the converter rises to a high level after a short period of engine operation time.

1. Disconnect negative battery cable.
2. Raise vehicle on hoist.
3. Disconnect downstream oxygen sensor (2) connectors.
4. Remove exhaust module (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - REMOVAL).



5. Remove nuts and cross-brace (2).
6. Remove catalytic converter to ball flange nuts (1).
7. Remove catalytic converter (3).

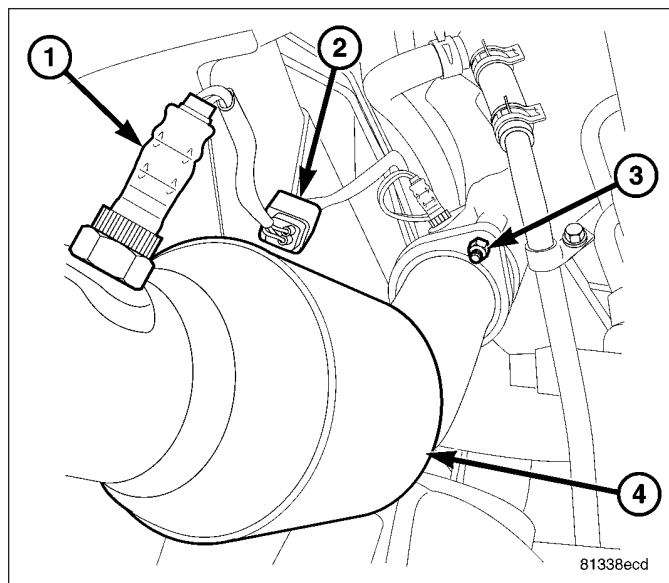


## LH CATALYTIC CONVERTER

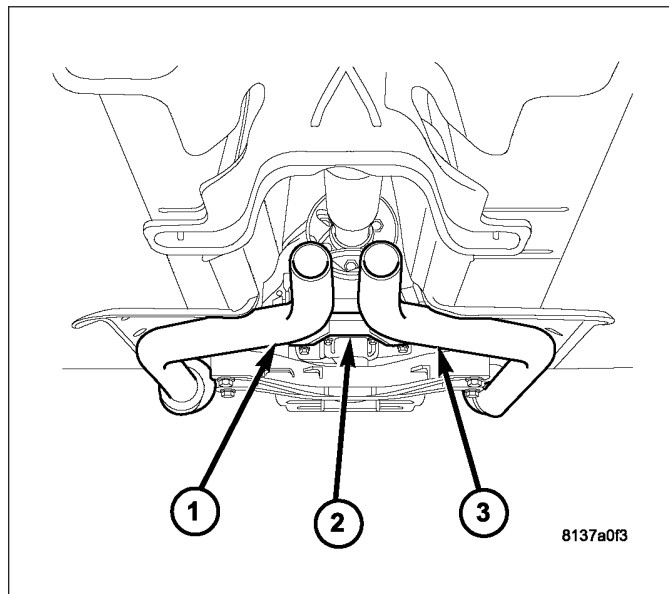
1. Raise vehicle on hoist.
2. Hoist vehicle.

**WARNING:** The normal operating temperature of the exhaust system is very high. therefore, never work around or attempt to service any part of the exhaust system until it is cooled. special care should be taken when working near the catalytic converter. The temperature of the converter rises to a high level after a short period of engine operation time.

3. Disconnect downstream oxygen sensor electrical connectors.
4. Remove exhaust module (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - REMOVAL).



5. Remove ball flange nuts.
6. Loosen or remove nut attaching left pipe to trans-axle bracket (2).
7. Remove catalytic converter ball fange nut.
8. Remove catalytic converter.



## INSPECTION

**WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.**

Check catalytic converter for a flow restriction. (Refer to 11 - EXHAUST SYSTEM - DIAGNOSIS AND TESTING) Exhaust System Restriction Check for procedure.

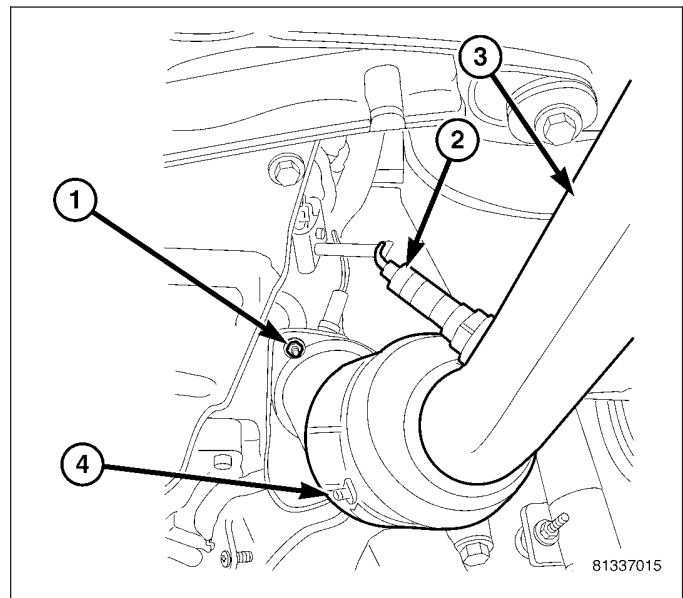
Visually inspect the catalytic converter element by using a borescope or equivalent. Remove oxygen sensor(s) and insert borescope. If borescope is not available, remove converter and inspect element using a flashlight. Inspect element for cracked or melted substrate.

**Note: Before replacing a catalytic converter, determine the root cause of failure. Most catalytic converter failures are caused by air, fuel or ignition problems. (Refer to Appropriate Diagnostic Information) for test procedures.**

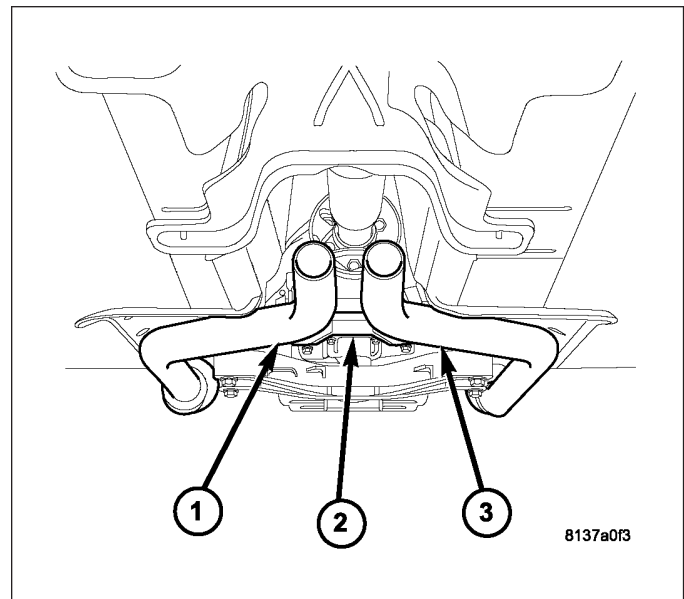
## INSTALLATION

### RH CATALYTIC CONVERTER

1. Install catalytic converter (3) onto exhaust manifold ball flange. Only finger tighten nuts at this time.
2. Install exhaust module (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - INSTALLATION).

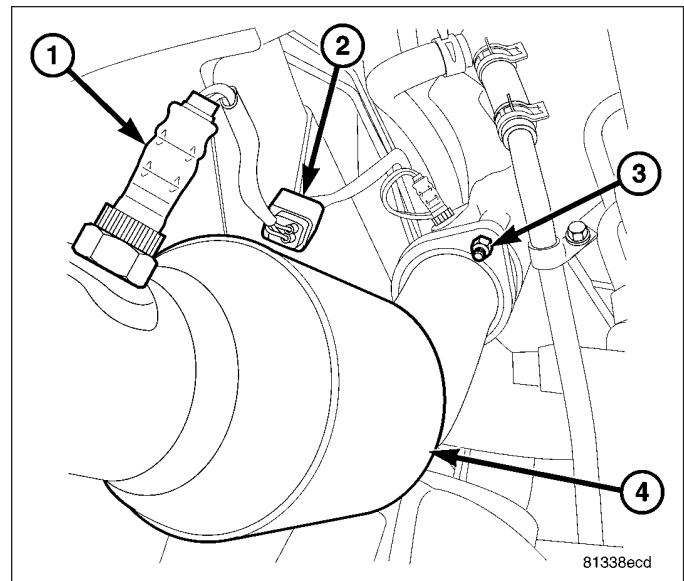


3. Install bolts and cross brace (3). Tighten bolts to 55 N·m (40 ft. lbs.).
4. Tighten manifold ball flange nut to 12 N·m (106 in. lbs.).
5. Check clearance between exhaust module and fuel tank. Clearance is 14mm (.55 in.) for V8 engine and 16mm (.62 in.) for V6 engine.
6. Check clearance at rear tunnel reinforcement. Clearance is 15 - 20mm (.59 - .78 in.).
7. Adjust clearance as necessary.
8. Tighten ball flange nuts to 34 N·m (25 ft. lbs.).
9. Connect oxygen sensor (2) connectors.
10. Lower vehicle.
11. Connect negative battery cable.
12. Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.



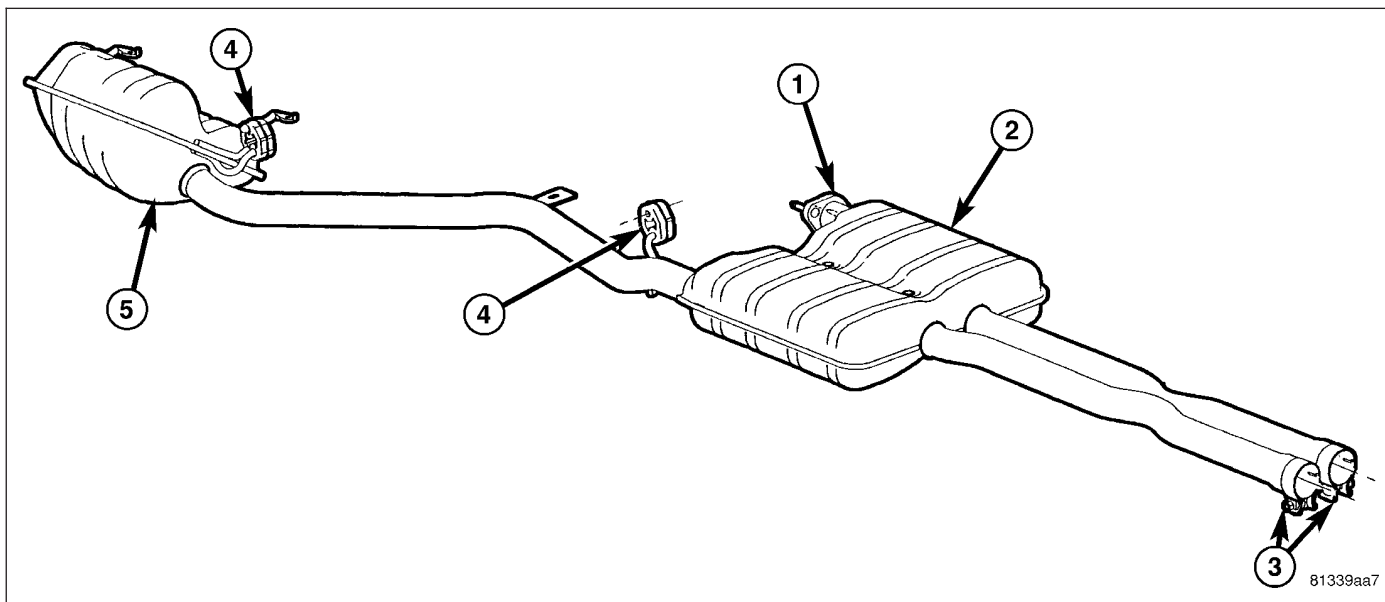
## LH CATALYTIC CONVERTER

1. Install catalytic converter (3) onto exhaust manifold ball flange. Only finger tighten nuts at this time.
2. Install exhaust module (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - INSTALLATION).
3. Install bolts and cross brace. Tighten bolts to 55 N·m (40 ft. lbs.).
4. Tighten manifold ball flange nut to 12 N·m (106 in. lbs.).
5. Check clearance between exhaust module and fuel tank. Clearance is 14mm (.55 in.) for V8 engine and 16mm (.62 in.) for V6 engine.
6. Check clearance at rear tunnel reinforcement. Clearance is 15 - 20mm (.59 - .78 in.).
7. Adjust clearance as necessary.
8. Tighten ball flange nuts to 34 N·m (25 ft. lbs.).
9. Lower vehicle.
10. Connect negative battery cable.
11. Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.



## EXHAUST PIPE

### DESCRIPTION



The 5.7L exhaust pipe assembly consists of:

- Front exhaust pipe and resonator module
- Ball flange
- Isolators
- Right rear exhaust module

The exhaust pipe assembly is serviced as an assembly.

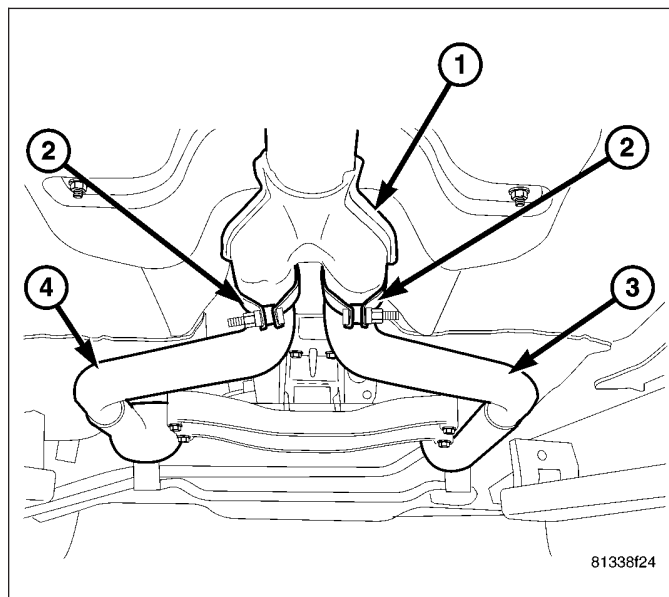
The 2.7L/3.5L exhaust pipe assembly consists of:

- Front exhaust module
- Isolators

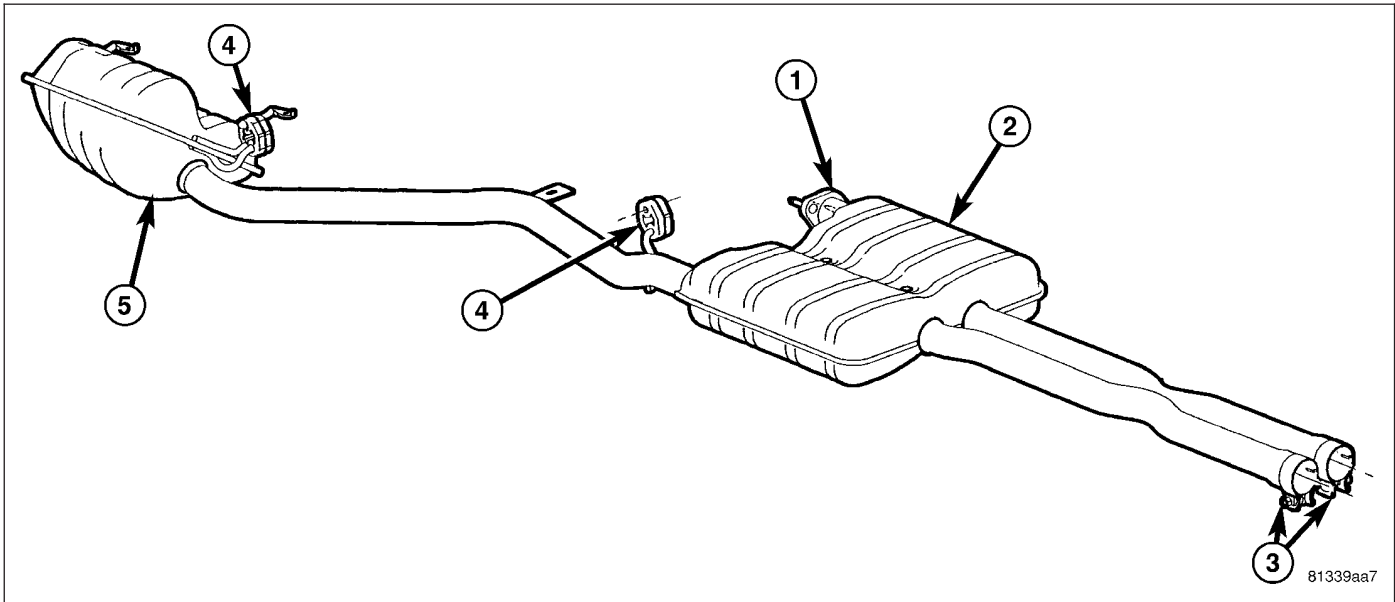
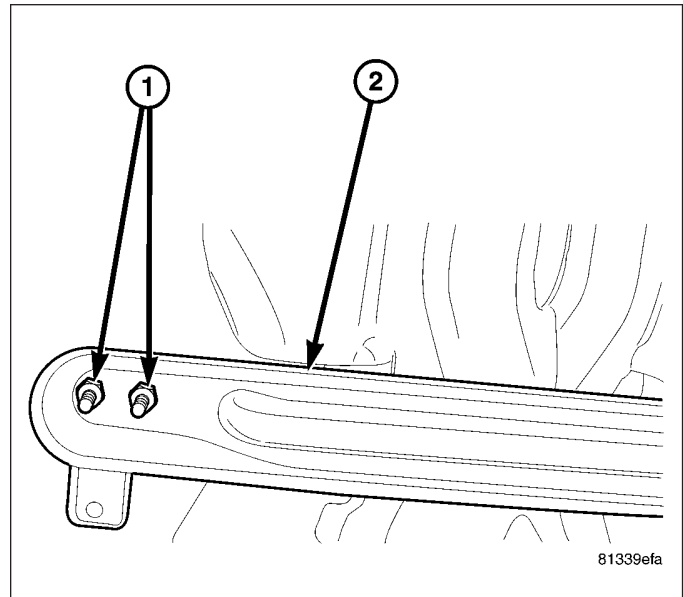
The exhaust module is serviced as an assembly.

### REMOVAL

1. Raise vehicle.
2. Remove catalytic converter to front exhaust module clamps (2).



3. Remove nuts (1) and tunnel reinforcement (2).



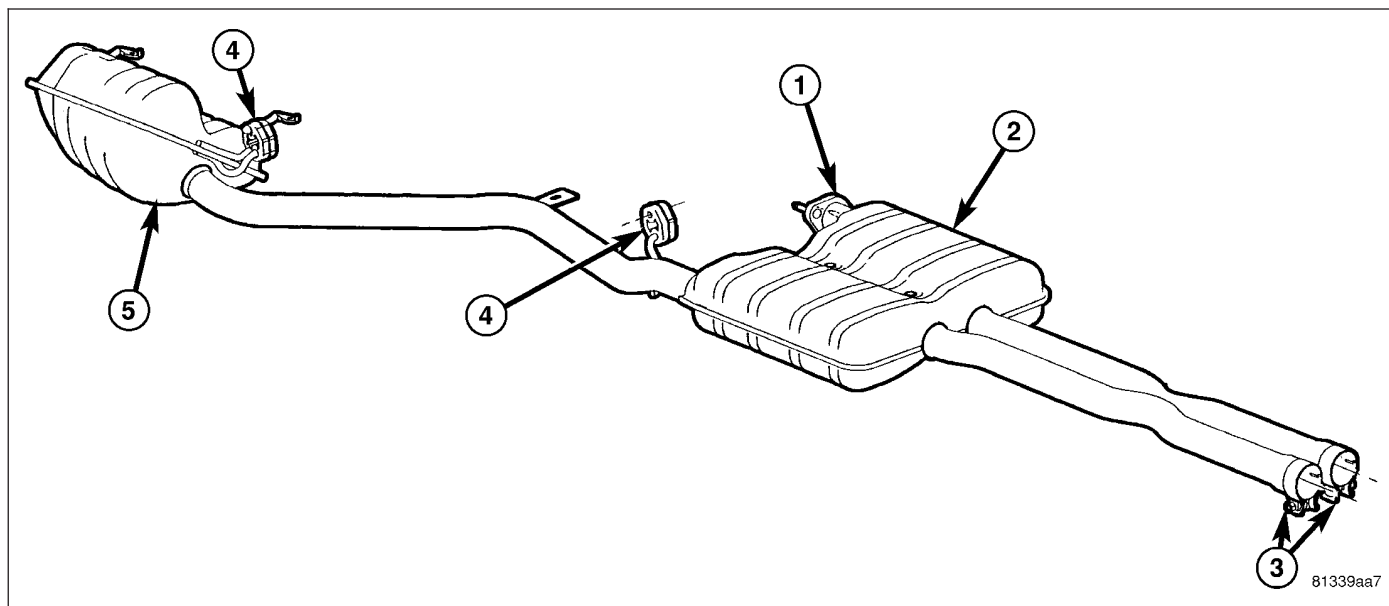
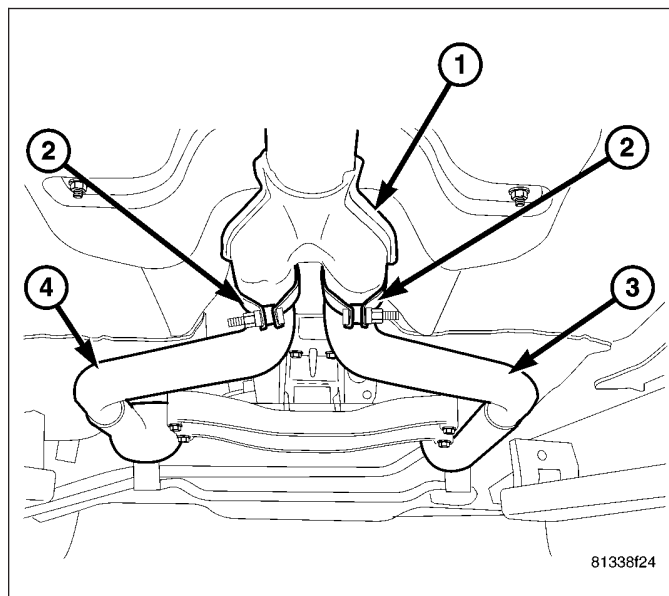
4. 5.7L Engine - Remove LH rear muffler assembly (Refer to 11 - EXHAUST SYSTEM/MUFFLER - REMOVAL).
5. Remove isolators (4).
6. Remove exhaust pipe assembly (5) by twisting/turning while pulling assembly out of catalytic converters.

## INSTALLATION

1. Position front exhaust pipe module clamps (2) on exhaust pipe assembly.
2. Install exhaust pipe assembly into catalytic converters (3 and 4).

**Note:** Isolators will have an approximately 10° forward angle when installed.

3. Install isolators.



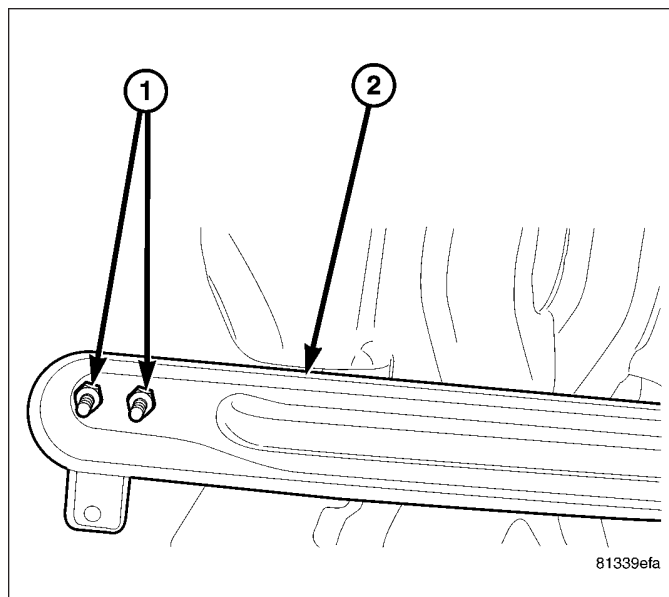
4. 5.7L Engine - Install LH rear muffler assembly (Refer to 11 - EXHAUST SYSTEM/MUFFLER - INSTALLATION).

**Note:** Check for proper alignment and clearance to underbody and engine compartment components before tightening clamps.

5. Tighten band clamps to 61 N·m (45 ft. lbs.).



6. Install tunnel reinforcement (2) and nuts (1). Tighten nuts to 25 N·m (215 in. lbs.)
7. Check clearance between exhaust module and fuel tank. Clearance is 14mm (.55 in.) for V8 engine and 16mm (.62 in.) for V6 engine.
8. Check clearance at rear tunnel reinforcement. Clearance is 15 - 20mm (.59 - .78 in.).
9. The tailpipe should be centered in the rear fascia opening.
10. Adjust clearance as necessary.
11. Lower vehicle.
12. Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.

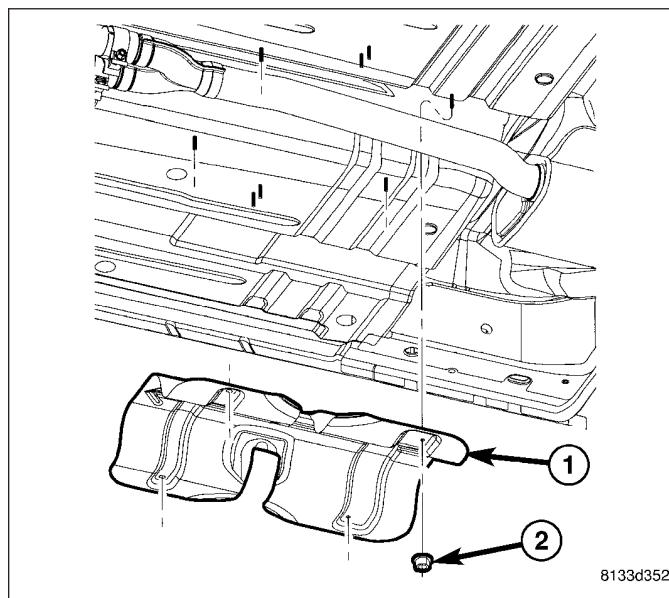


## HEAT SHIELDS

### REMOVAL

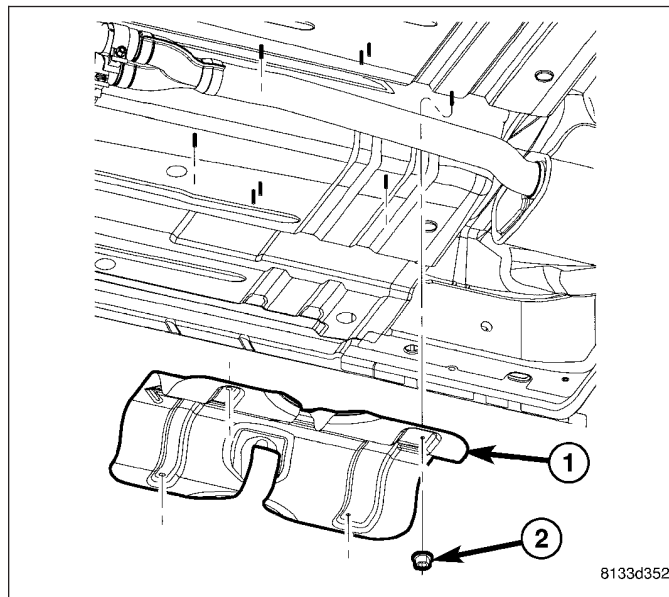
**WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER WORK AROUND OR ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.**

1. Raise vehicle.
2. Remove nuts (2).
3. Remove heat shields (1).



## INSTALLATION

1. Position heat shields (1).
2. Install nuts (2). Tighten nuts to 10 N·m (98 in. lbs.).

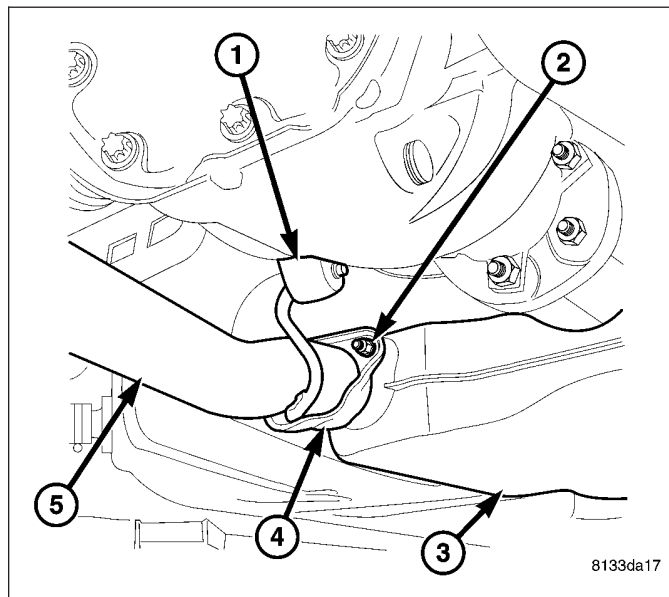


## MUFFLER

### REMOVAL

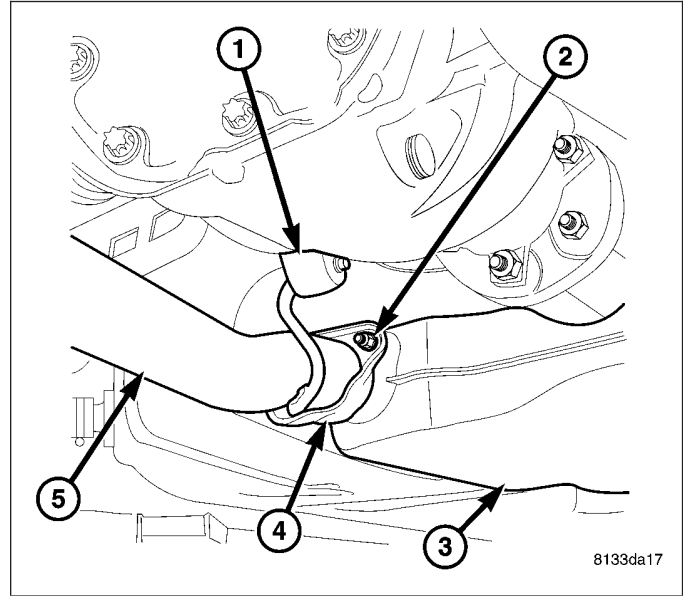
**WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER WORK AROUND OR ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.**

1. Raise vehicle.
2. Remove two nuts (2).
3. Remove isolators (1).
4. Remove LH resonator and tailpipe assembly (5).



**INSTALLATION**

1. Position LH resonator and tailpipe assembly (5) in vehicle.
2. Install isolators (1).
3. install ball flange nuts (2). Tighten nuts finger tight.
4. Check clearance between exhaust module and fuel tank. Clearance is 14mm (.55 in.) for V8 engine and 16mm (.62 in.) for V6 engine.
5. Check clearance at rear tunnel reinforcement. Clearance is 15 - 20mm (.59 - .78 in.).
6. The tailpipe should be centered in the rear fascia opening.
7. Tighten ball flange nuts (2) to 47 N·m (35 ft. lbs.).
8. Lower vehicle.
9. Start the engine and inspect for exhaust leaks. Repair exhaust leaks as necessary.



# FRAME & BUMPERS

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## BUMPERS

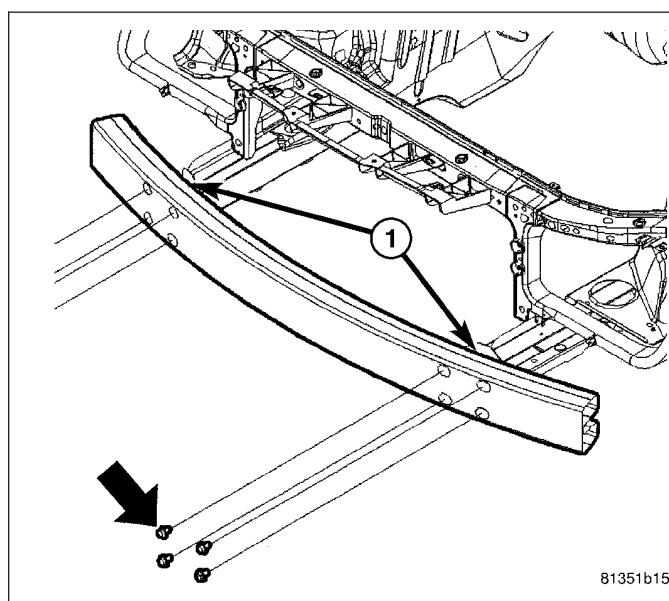
### SPECIFICATIONS - TIGHTENING

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Front bumper bolts	28	21	—
Rear bumper bolts	28	21	—

## BUMPER-FRONT

### REMOVAL

1. Remove fascia assembly. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FASCIA-FRONT - REMOVAL)
2. Drill out the four spot welds (2 per side) between the bumper bracket and rail end cap (1).
3. Remove the eight screws (4 per side) and remove the bumper.

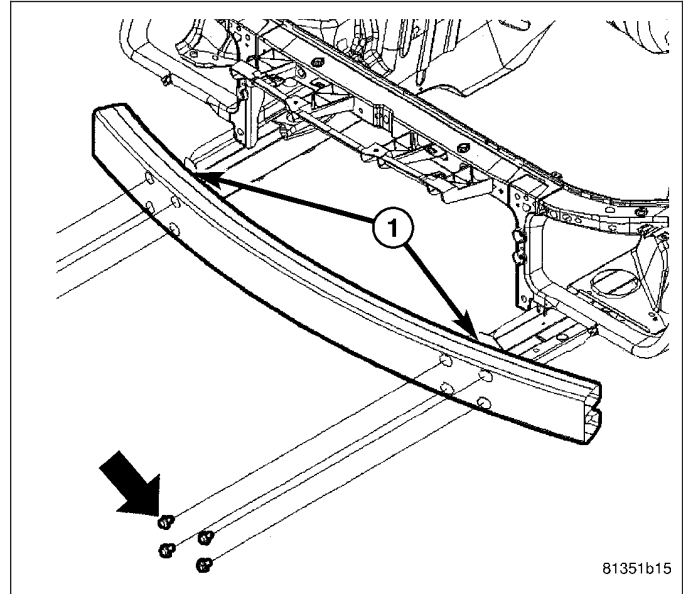


## INSTALLATION

1. Position the bumper.

**Note:** It is not necessary to spot weld the bumper back into place.

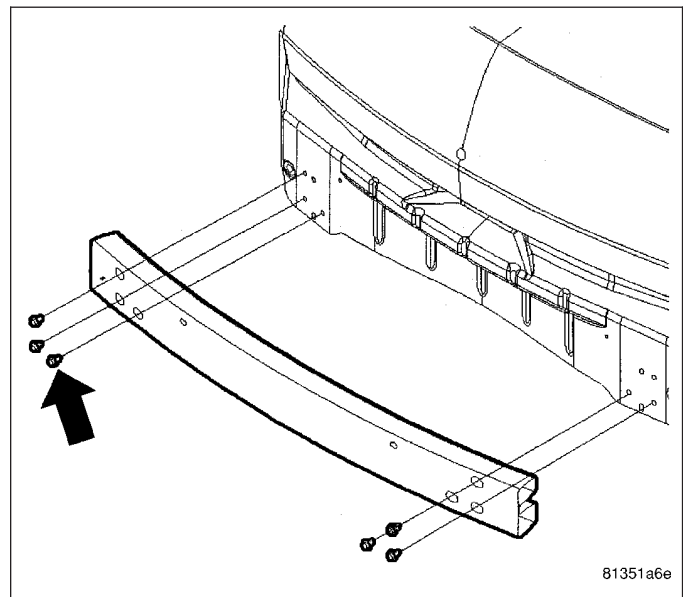
2. Install the bolts and tighten to 28 N·m (21 ft. lbs.).
3. Install the fascia. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FASCIA-FRONT - INSTALLATION)



## BUMPER-REAR

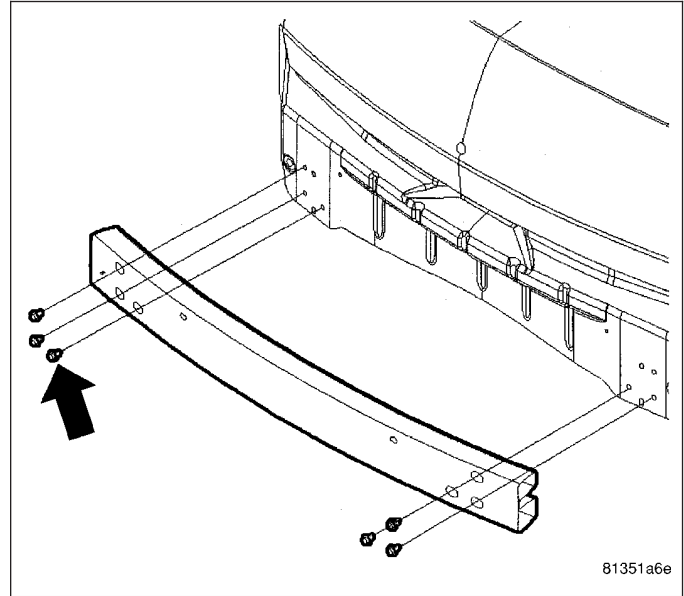
### REMOVAL

1. Remove the fascia assembly. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FASCIA-REAR - REMOVAL)
2. Remove the six nuts and washers and remove the bumper.



## INSTALLATION

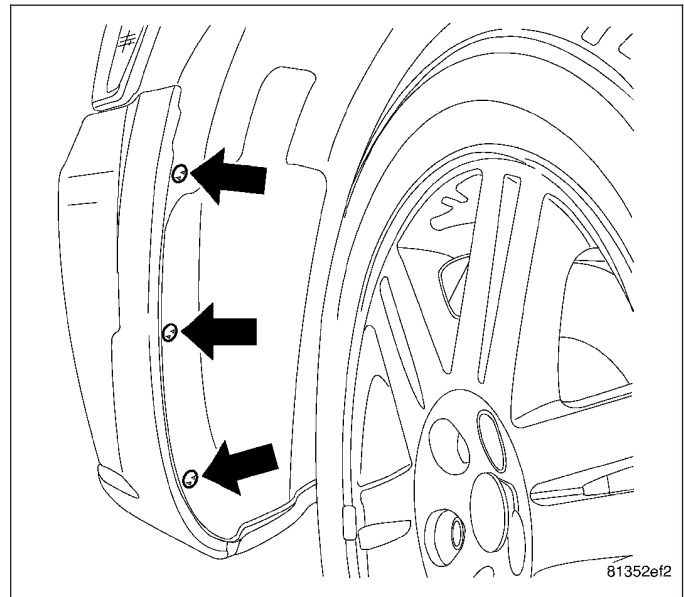
1. Position the bumper.
2. Install the nuts and washers and tighten to 28 N-m (21 ft. lbs.).
3. Install the fascia assembly. (Refer to 13 - FRAME & BUMPERS/BUMPERS/FASCIA-REAR - INSTALLATION)



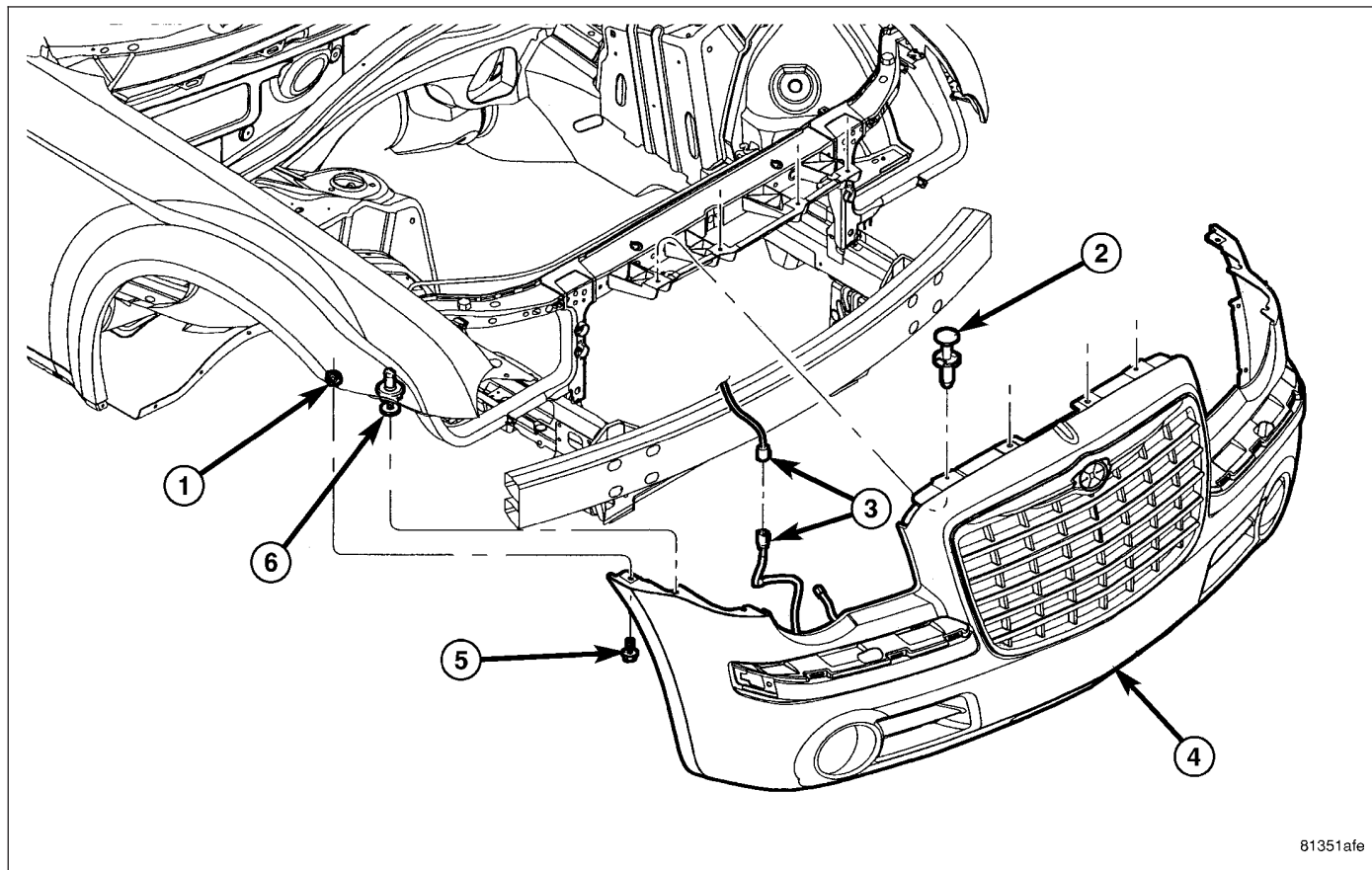
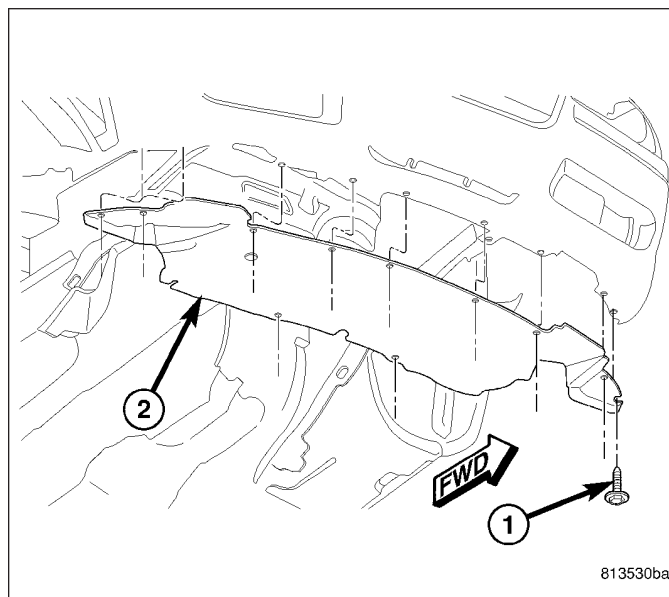
## FASCIA-FRONT

### REMOVAL

1. Remove the wheel house splash shield rivets three per side.

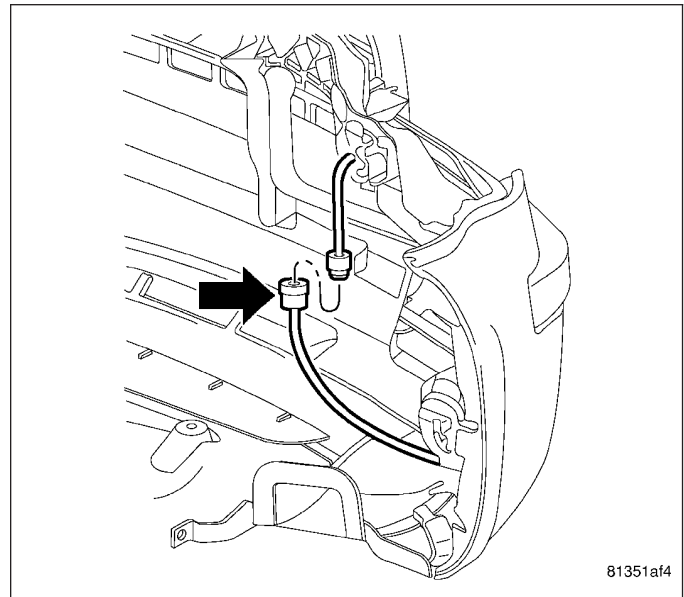


2. Remove the nine belly pan (1) screws (2).



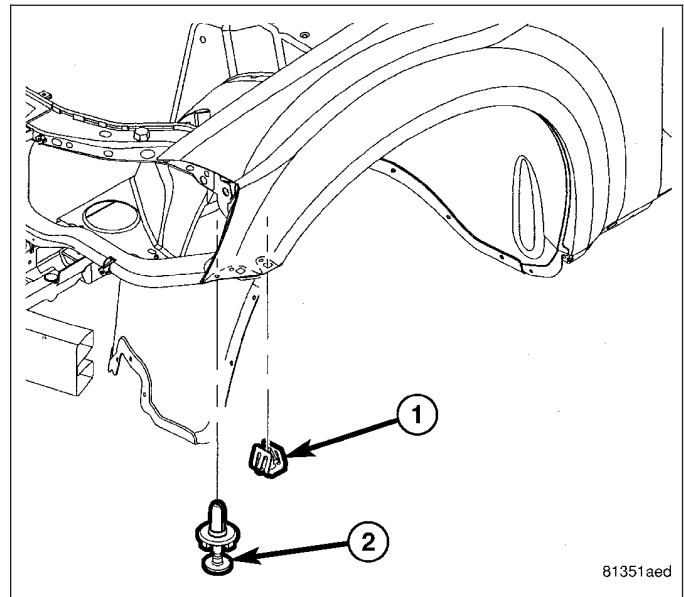
3. Remove the two fascia to fender screw (5), one per side.
4. Open the hood and remove the upper push pin fasteners (2), four per sedan, and six per wagon.
5. Remove the fascia assembly (4) from the vehicle.

6. Disconnect the electrical connectors and remove the fascia.

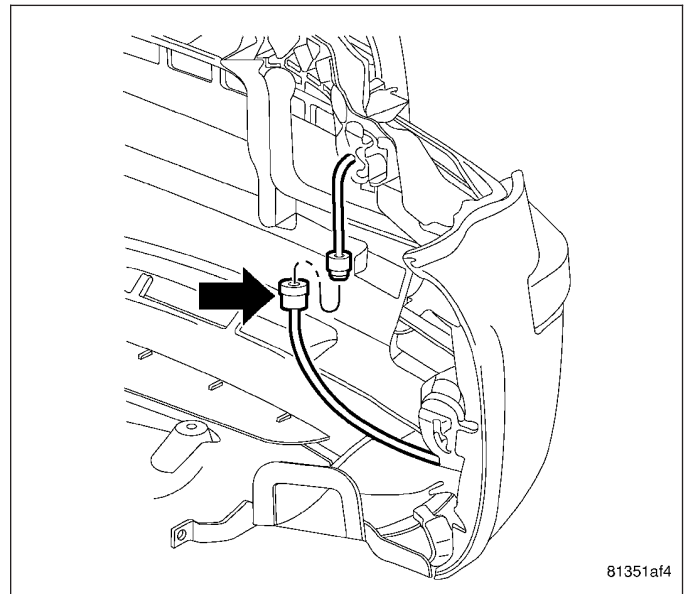


## INSTALLATION

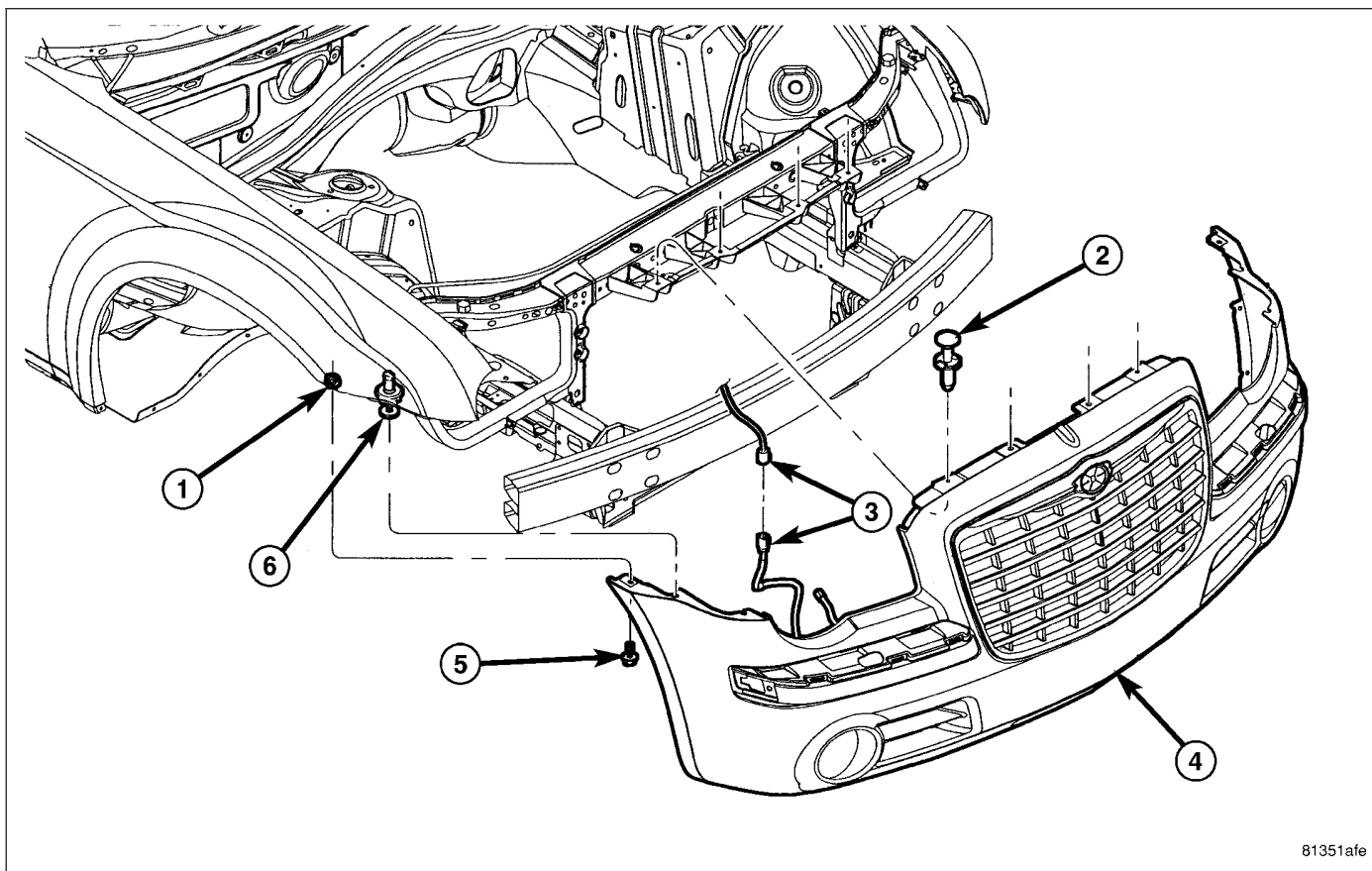
1. Verify that the clip (1) and the push pin (2) are secured into the fender.



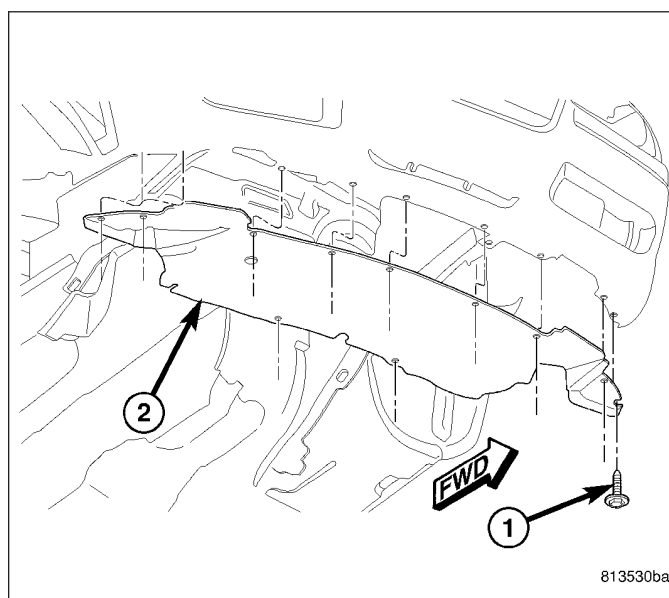
2. Place the fascia into position near the bumper to connect the electrical connector.



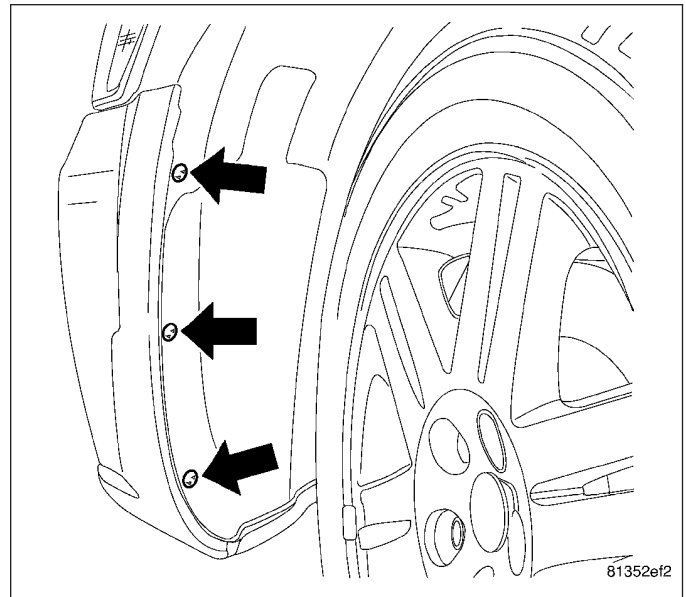




3. Install the fascia (4) onto the bumper and slide the open fascia slots over the two push pin fasteners (6).
4. Install the upper push pin fasteners (2) four per sedan and six per wagon.
5. Install the four upper push pin fasteners (2).
6. Install the fascia to fender screws (5) and secure into the fender clip (1).
7. Position the front belly pan (1).
8. Install the nine belly pan fasteners (2).



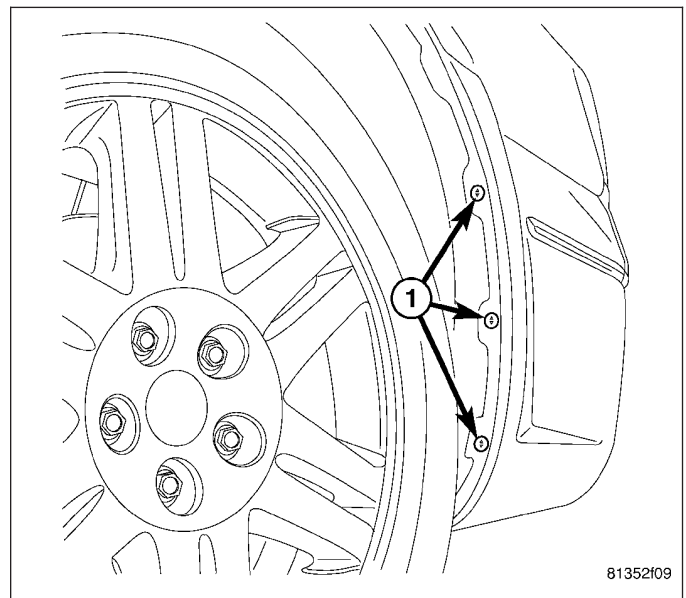
9. Install the wheel house splash shield rivets.



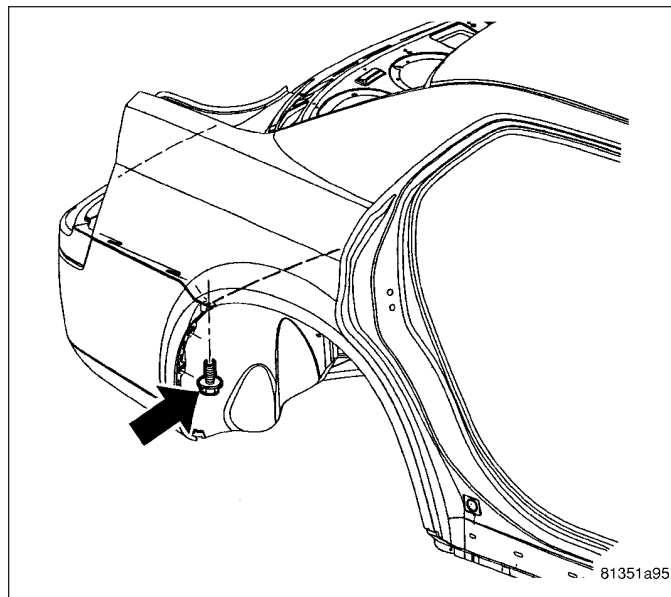
## FASCIA-REAR

### REMOVAL

1. Remove the wheel house splash shield rivets (1) three per side.



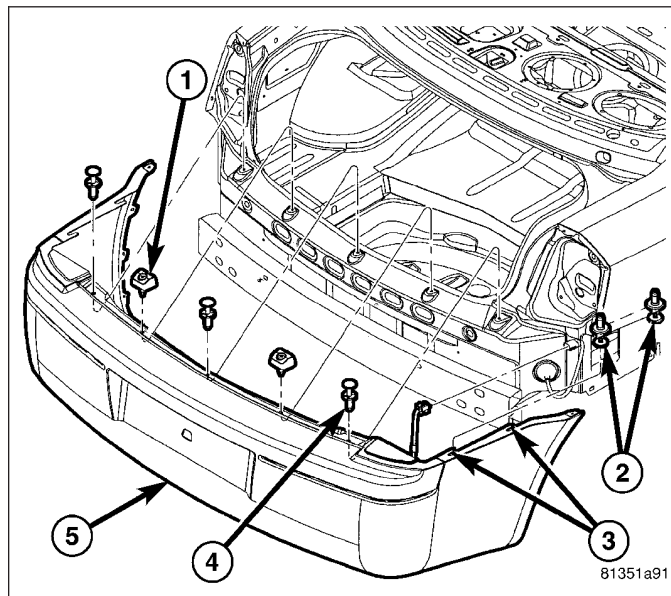
2. Remove the fascia to quarter panel screws.



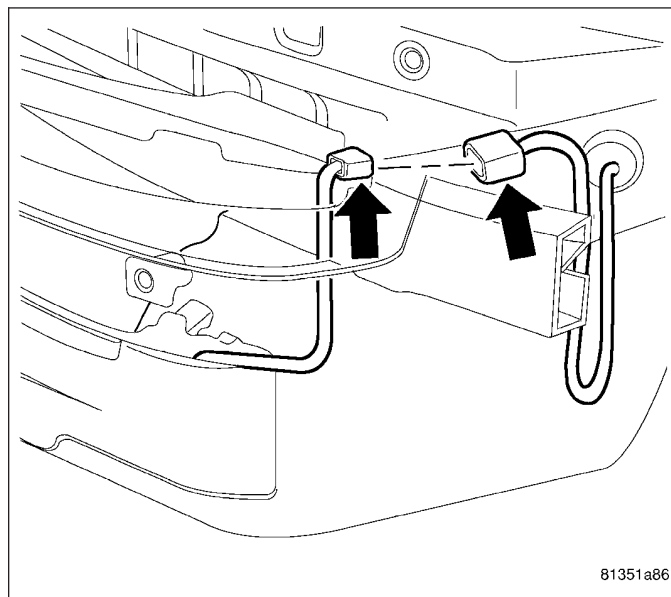
3. Remove the two deck lid bumper stops (1) sedan only.

4. Remove the fascia push pin fasteners (2), three per sedan and five per wagon.

5. Remove the fascia (5) from the vehicle.

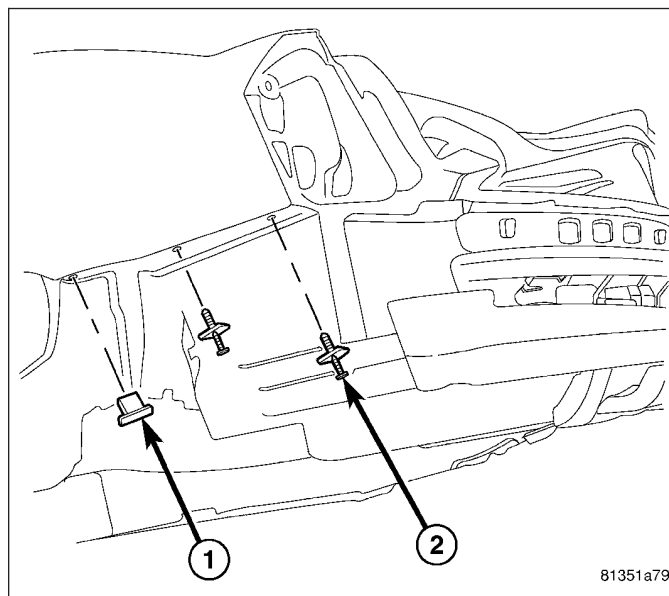


6. Disconnect the electrical connector and remove the fascia assembly.

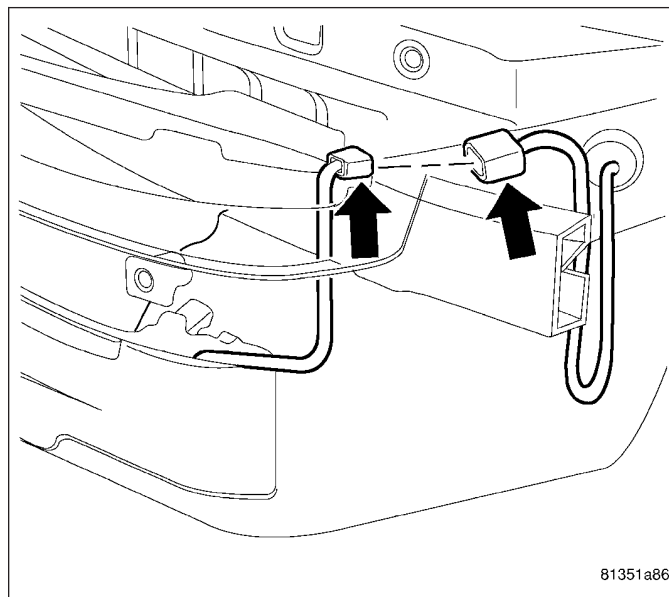


## INSTALLATION

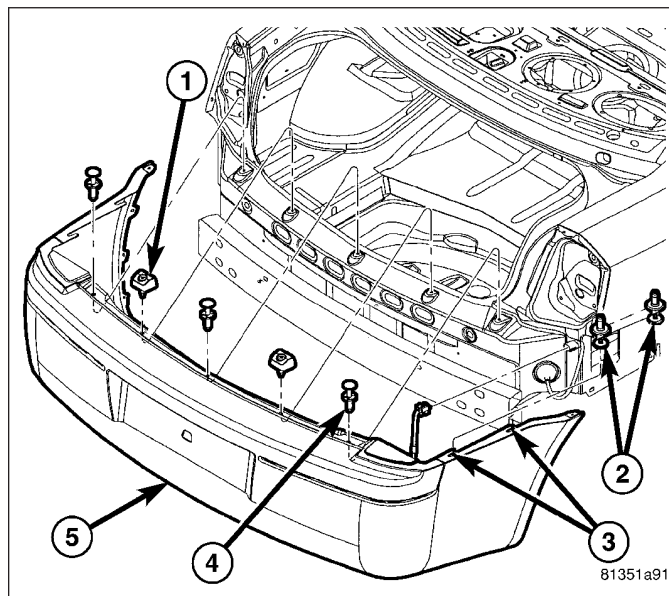
1. Verify that the clips (1) and the push pins (2) are secured into the fenders.



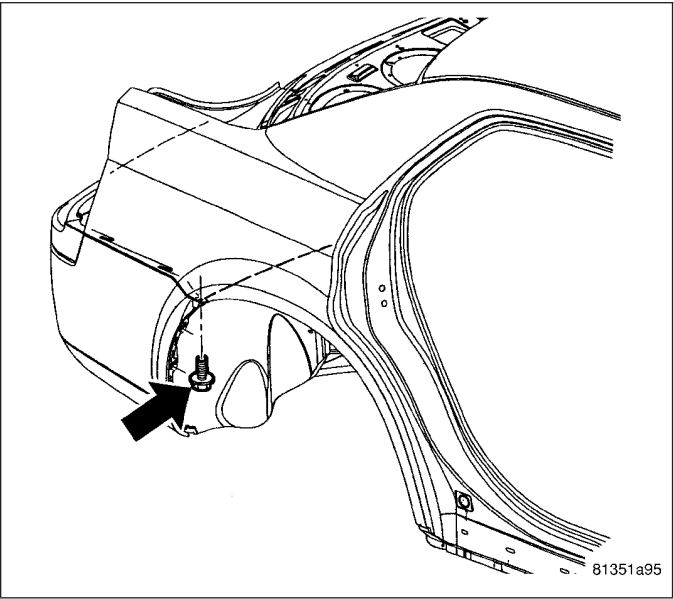
2. Place the fascia assembly into position near the bumper and connect the electrical connector.



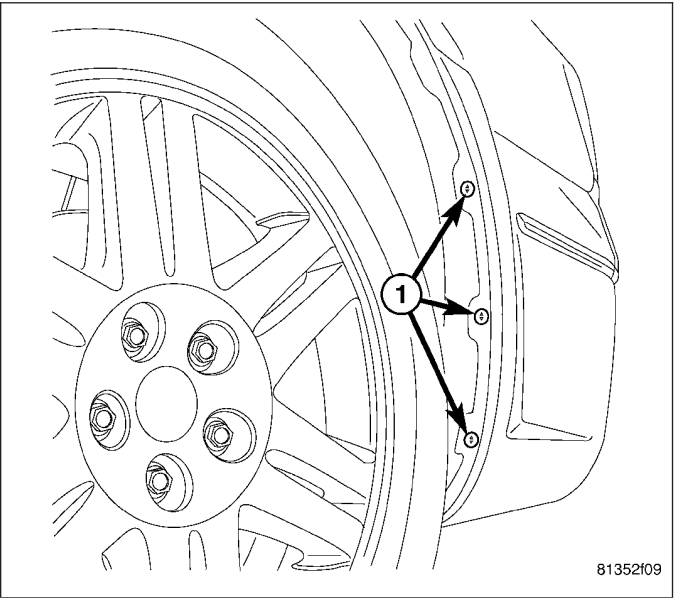
3. Install the fascia (5) onto the bumper and slide the open fascia slots over the for push pin fasteners (2).
4. Install the push pin fasteners (4), three per sedan and five per wagon.
5. Install the two bumper stops (1), sedan only.



6. Install the fascia to quarter panel screws and secure into the quarter pan.



7. Install the wheel house splash shield rivets (2).



FRAME

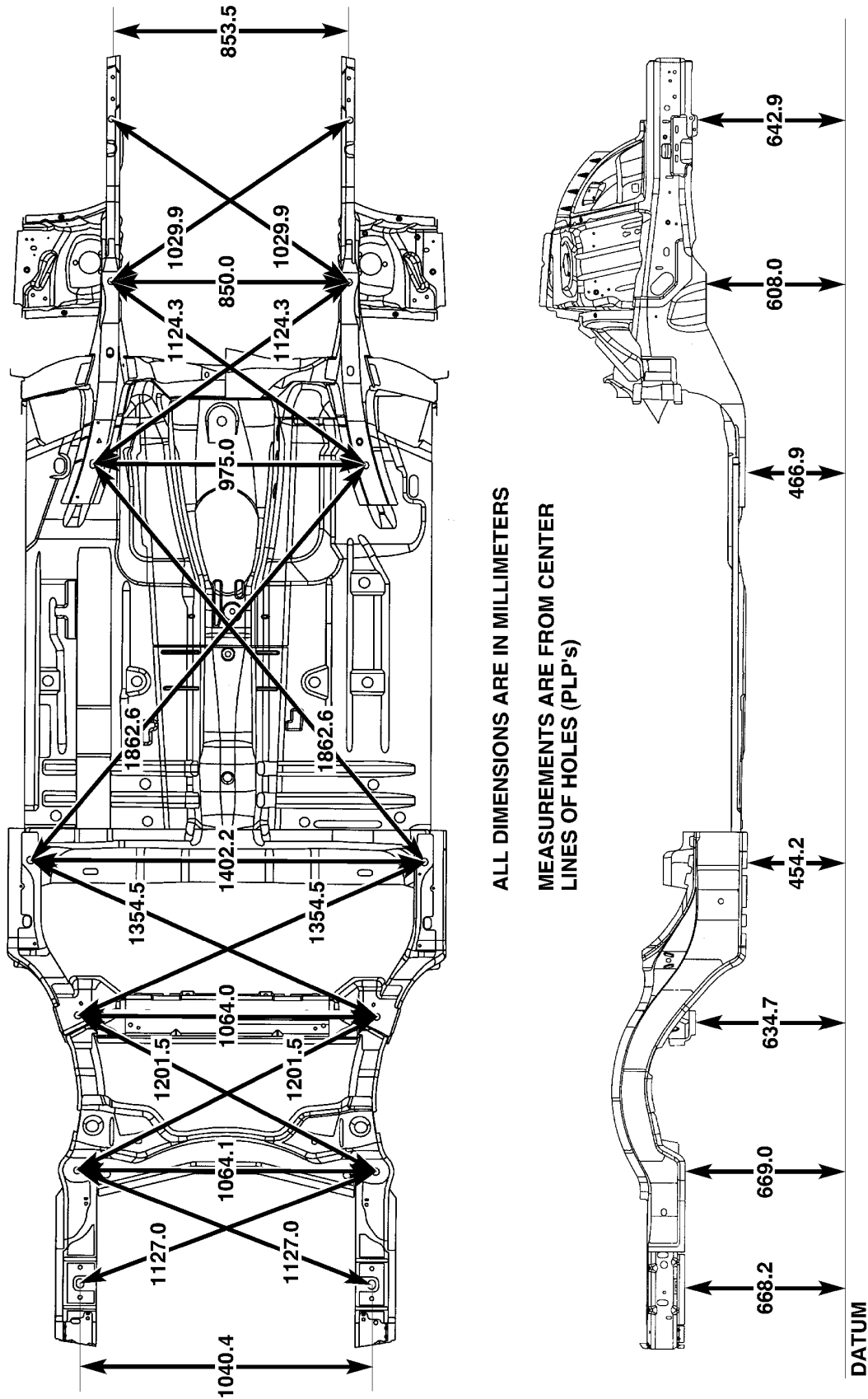
SPECIFICATIONS

FRAME DIMENSIONS

Frame dimensions are listed in metric scale then converted to inch scale listed in parenthesis. All dimensions are from center to center of Principal Locating Point (PLP), or from center to center of PLP and fastener location. Vertical dimensions can be taken from the work surface to the locations indicated.

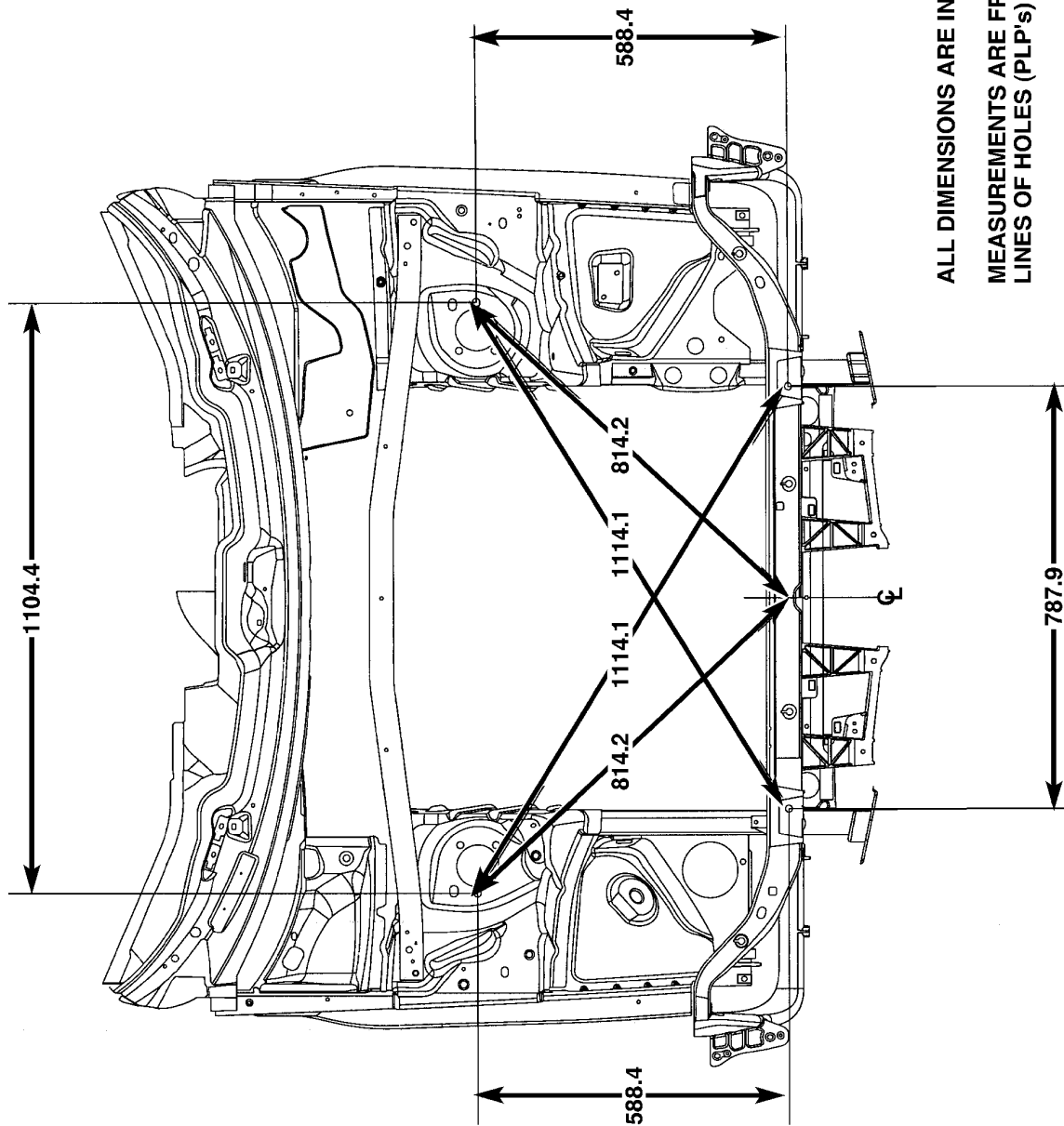
INDEX

DESCRIPTION	FIGURE
FRAME DIMENSIONS	1
ENGINE BOX DIMENSIONS	2



81377245

Fig. 1 FRAME DIMENSIONS



81377249

Fig. 2 ENGINE BOX DIMENSIONS

## SPECIFICATIONS - TORQUE

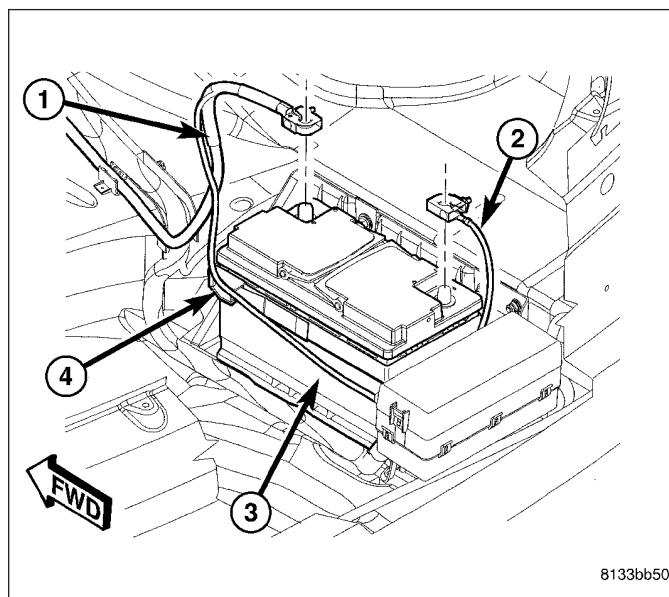
### TORQUE SPECIFICATIONS

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Rear bumper reinforcement attaching nut	28	21	—
Front suspension crossmember front attaching bolt	109	80	—
Front suspension crossmember rear attaching bolt	102	75	—
Radiator support crossmember attaching bolts	51	45	—

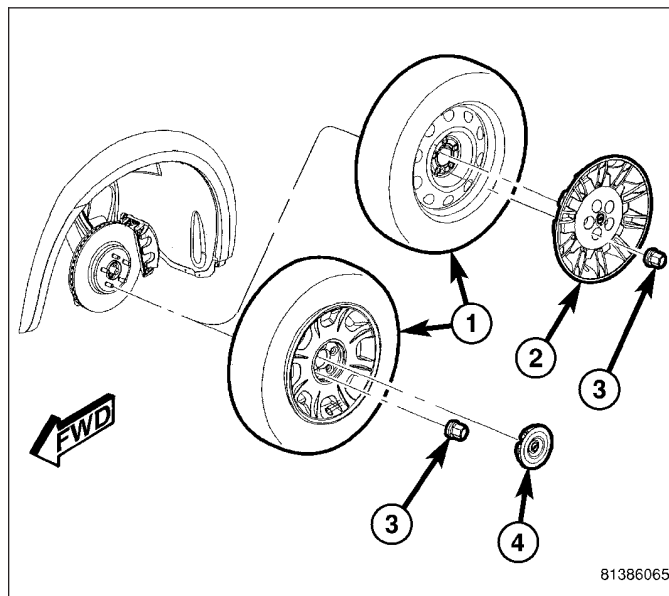
## CROSSMEMBER-REAR

### REMOVAL

1. Disconnect and isolate battery negative cable (2) from battery post.
2. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

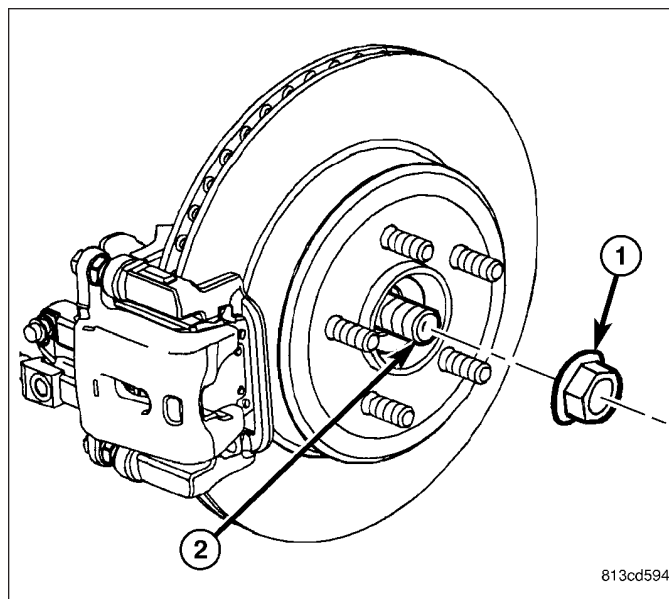


3. On each side of vehicle rear, remove wheel mounting nuts (3), then tire and wheel assembly (1).

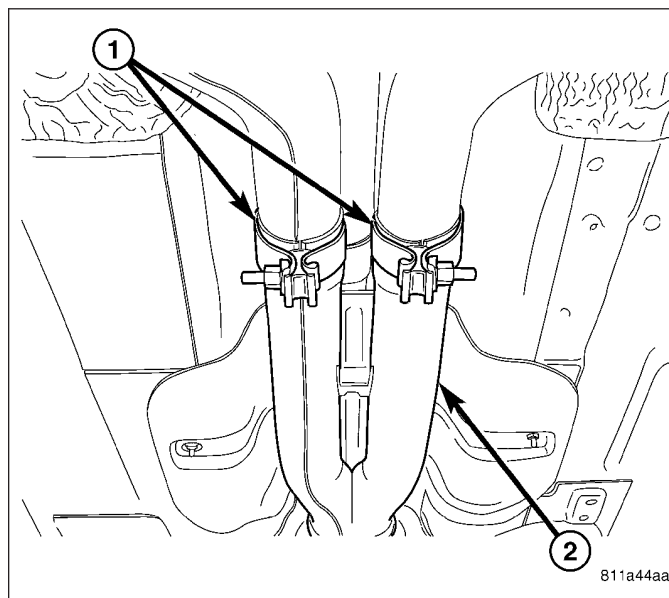




4. On each side of vehicle rear, while a helper applies brakes to keep hub from rotating, remove hub nut (1) from half shaft (2).

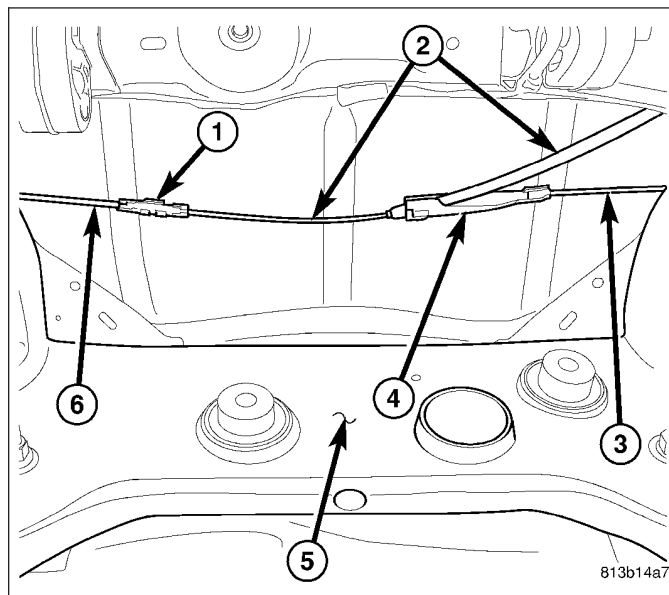


5. Remove rear exhaust system (2) (dual-outlet exhaust shown in figure). (Refer to 11 - EXHAUST SYSTEM - REMOVAL)
6. Remove rear axle differential. (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 198MM - REMOVAL) (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 210MM - REMOVAL)
7. Slide each axle half shaft from hub and bearing and remove from vehicle.



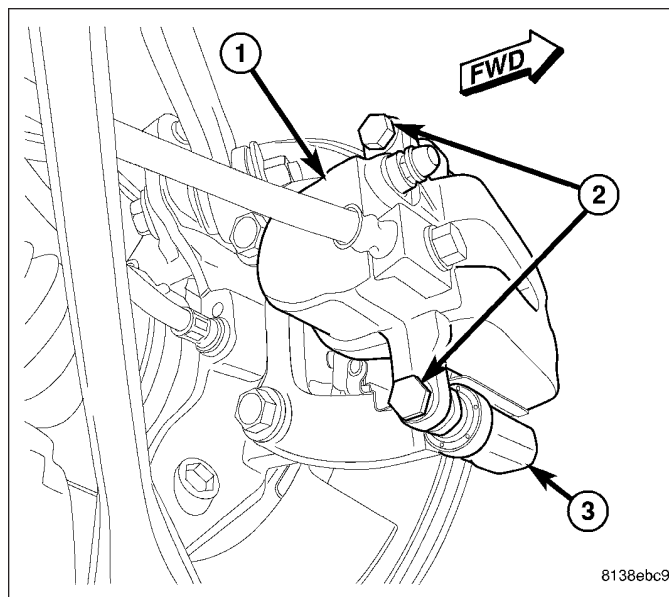
**Note:** Due to short travel and low spring tension, it is not necessary to lock-out parking brake lever to service parking brake components.

8. Disconnect front parking brake cable (2) at connector (1) to right rear parking brake cable.
9. Remove front parking brake cable (2) from equalizer (4).

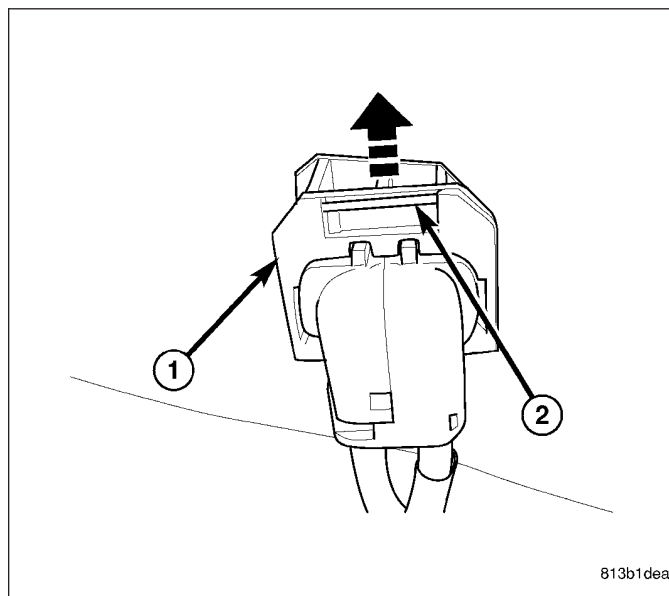


## 10. On each rear disc brake:

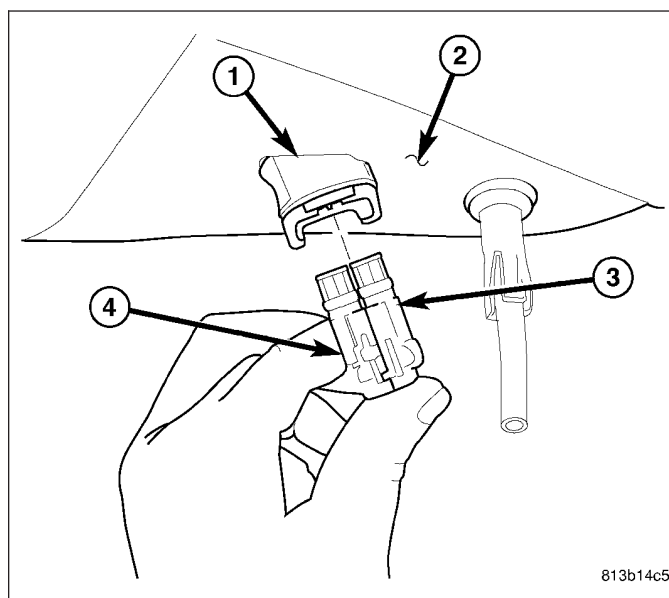
- While holding guide pins from turning, remove disc brake caliper guide pin bolts (2).
- Remove brake caliper (1) from brake adapter (3) and pads.
- Guide brake caliper up through suspension, following brake hose path. Support caliper above rear suspension using with bungee cord or wire to keep caliper from overextending brake hose when crossmember is lowered.



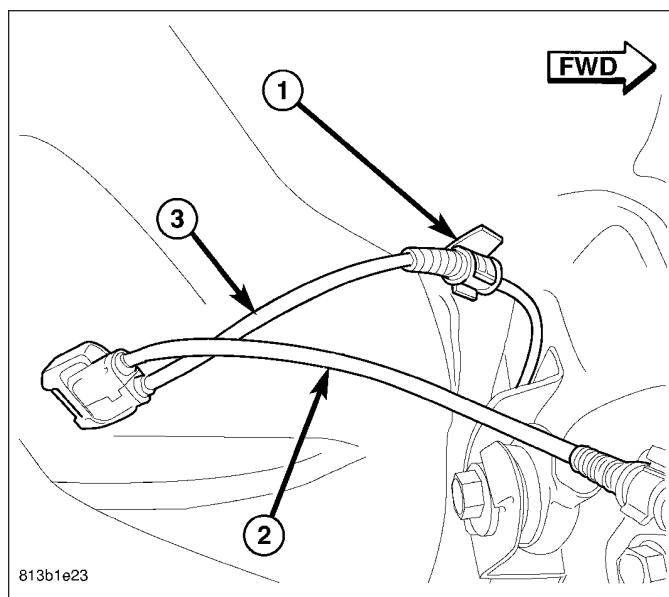
**Note:** To remove wheel speed sensor connector from body wiring harness connector, move retaining clip (2) and pull sensor connector outward.



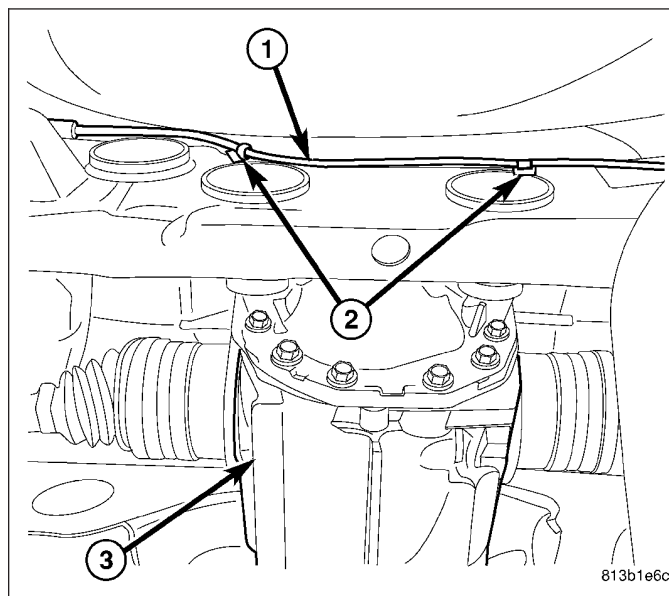
- Remove wheel speed sensor connectors (3 and 4) from body wiring harness connector (1) located in luggage compartment floor pan (2).



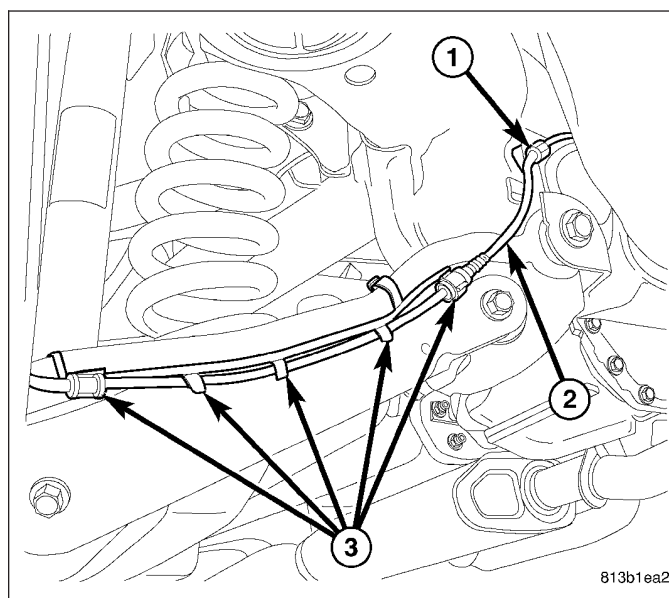
12. Unclip left wheel speed sensor cable (3) from routing clip (1) near body connector.



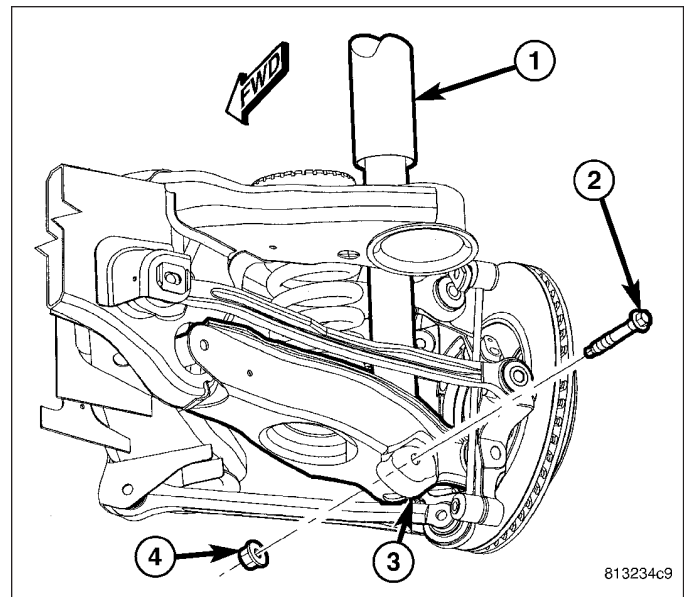
13. Unclip left sensor cable (1) from routing clips (2) along rear of crossmember near rear differential (3).



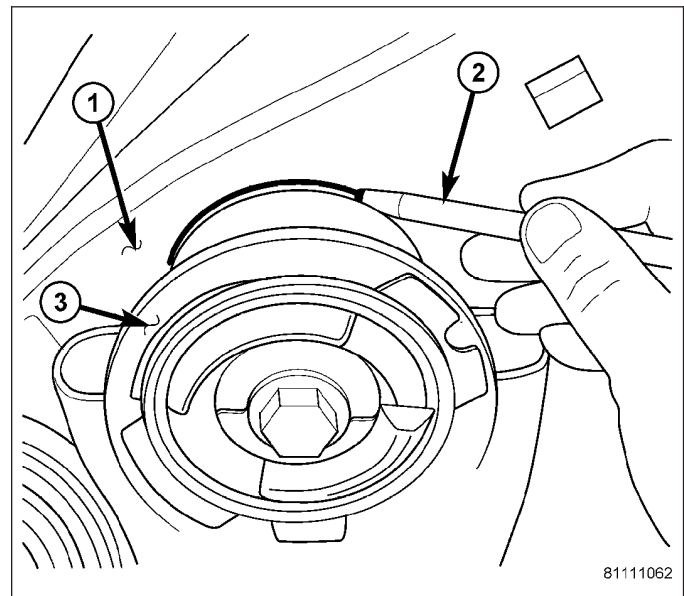
14. Unclip left sensor cable (2) from routing clip (1) above toe link mount on rear crossmember.



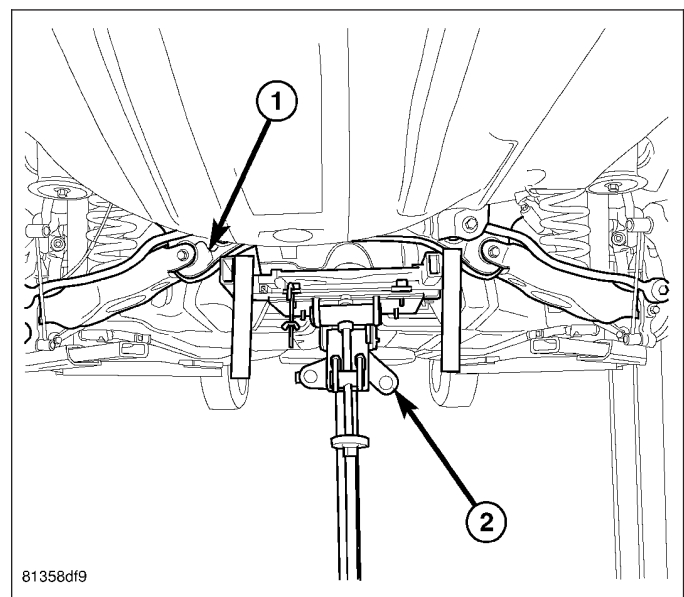
15. On each side of vehicle, remove shock absorber (1) lower mounting bolt (2) and nut (4).



16. Carefully mark location of rear crossmember on body at all four mount (bushing) locations using a marker or crayon. **Do not use a scratch awl to mark location.**
17. Position an extra pair of jack stands under and support forward end of engine cradle to help stabilize vehicle during rear suspension removal/installation.

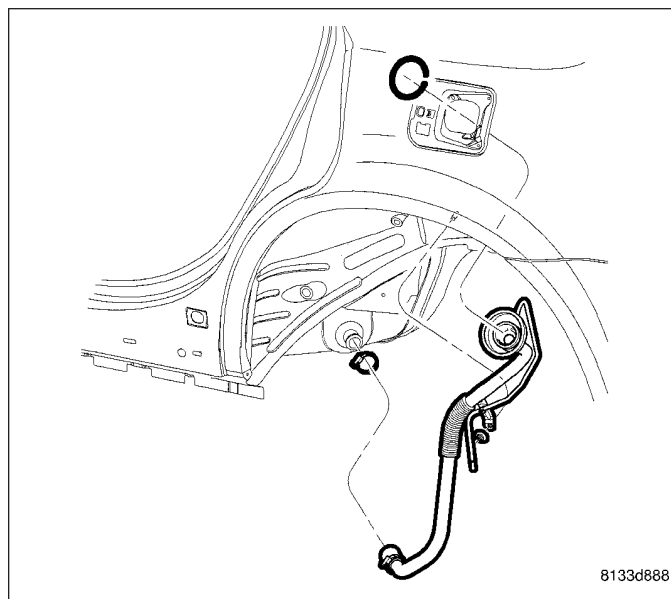


18. Position under-hoist utility jack or transmission jack (2) under center of rear crossmember (1). Raise jack head to contact crossmember and secure in place. **When securing crossmember to jack, be sure not to secure stabilizer bar.**

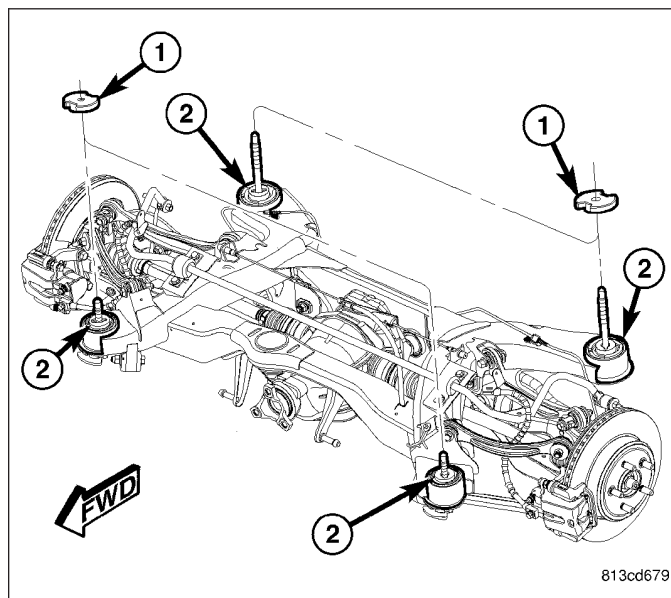


**WARNING:** Before opening fuel system, review all Warnings and Cautions.

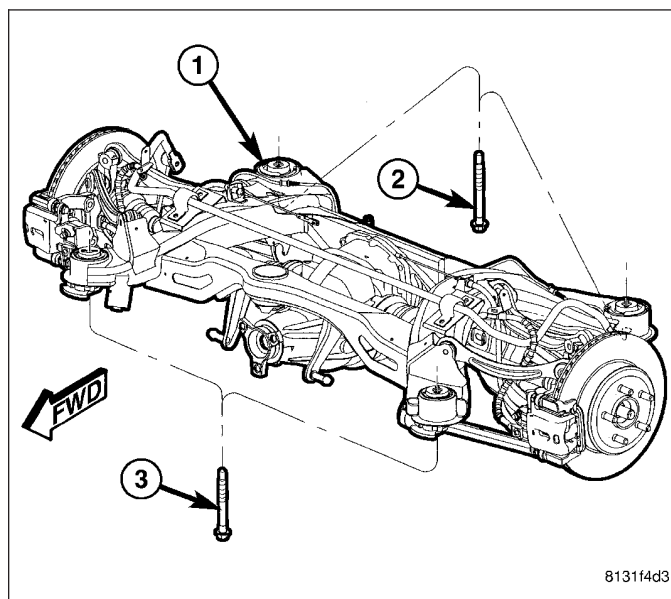
19. Remove fuel filler tube. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK FILLER TUBE - REMOVAL)



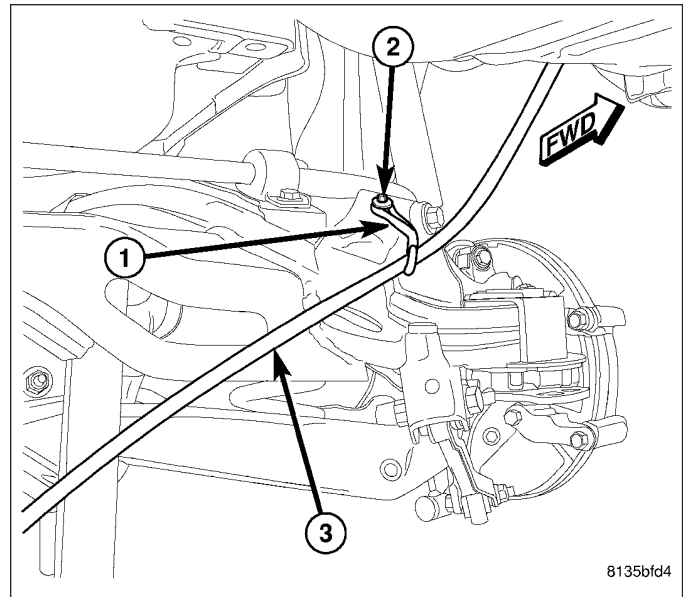
**Note:** If equipped with AWD, when removing crossmember mounting bolts in following step, be sure to not to misplace spacers (1) between crossmember mounts (2) and body.



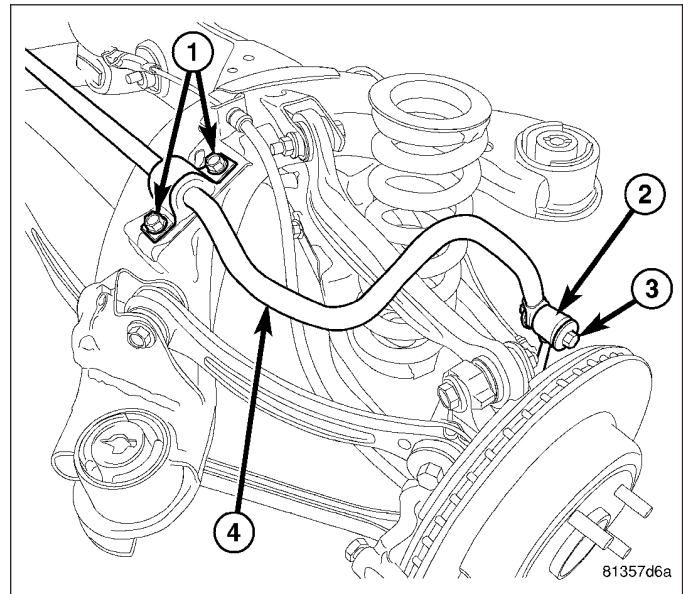
20. Remove both front (3) and both rear (2) mounting bolts fastening crossmember (1) in place.



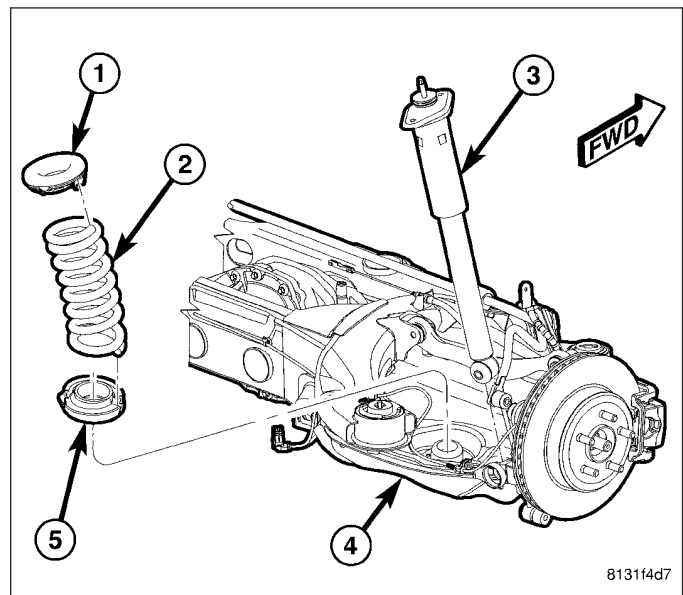
21. **Slowly** lower crossmember several inches using jack.
22. Remove screw (2) fastening front parking brake cable routing bracket (2) to rear crossmember.
23. Continue to lower jack until crossmember is at a comfortable working level to access link and stabilizer bar fasteners.



24. On each end, remove bolt (3) and nut fastening stabilizer bar (4) to stabilizer link (2).
25. Remove bolts (1) fastening each stabilizer bar cushion retainer to crossmember.
26. Remove stabilizer bar (4) with cushions and retainers.

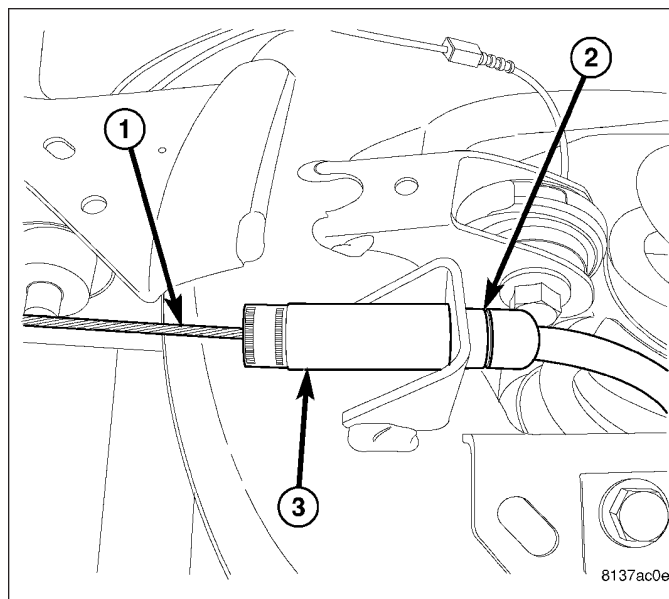


27. Remove coil springs and isolators (1, 2 and 5) from spring links.



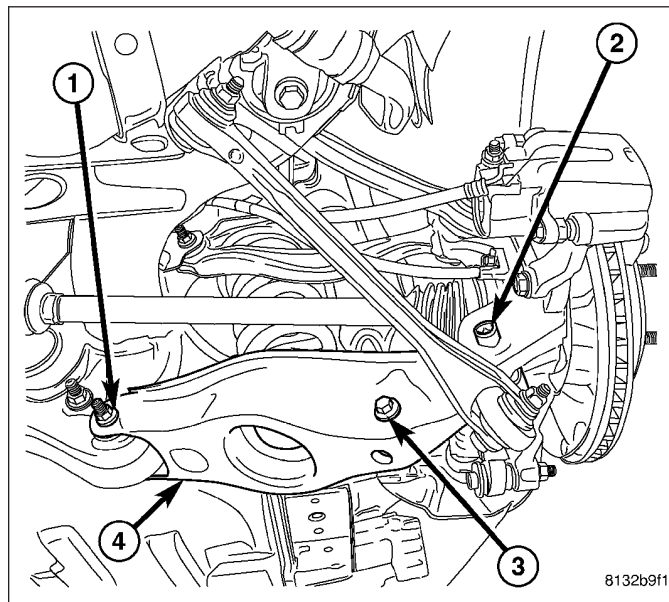


28. For each rear parking brake cable, place 14 mm 12-point deep well socket (3) over cable strand (1) onto cable retainer at crossmember bracket as shown to collapse retainer fingers. It may be necessary to wiggle the socket around somewhat to collapse fingers. With socket in place, pull cable (2) from bracket.

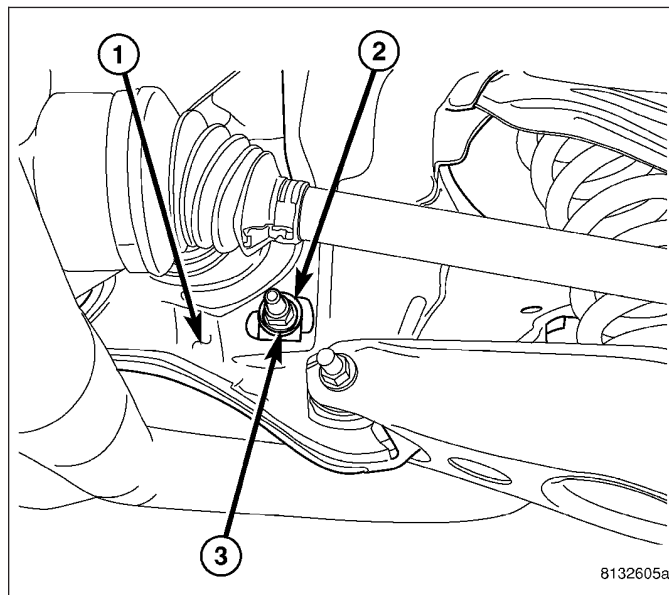


**Note:** For installation purposes, when removing fasteners for any rear suspension links, it is important to note which bolt fastens what component and in what direction it is installed in.

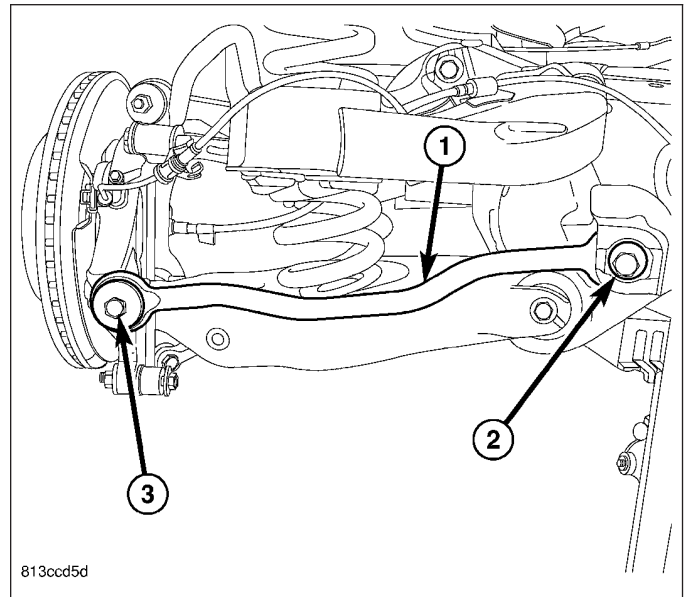
29. On each side of crossmember, remove bolt and nut (1) fastening spring link (4) to crossmember.



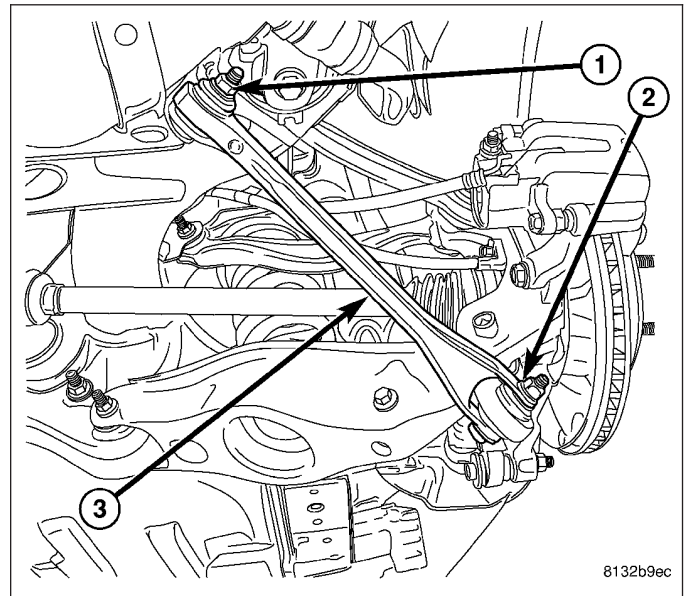
30. On each side of crossmember, while holding toe adjustment cam bolt from rotating, remove nut (3) securing toe link at crossmember (1).



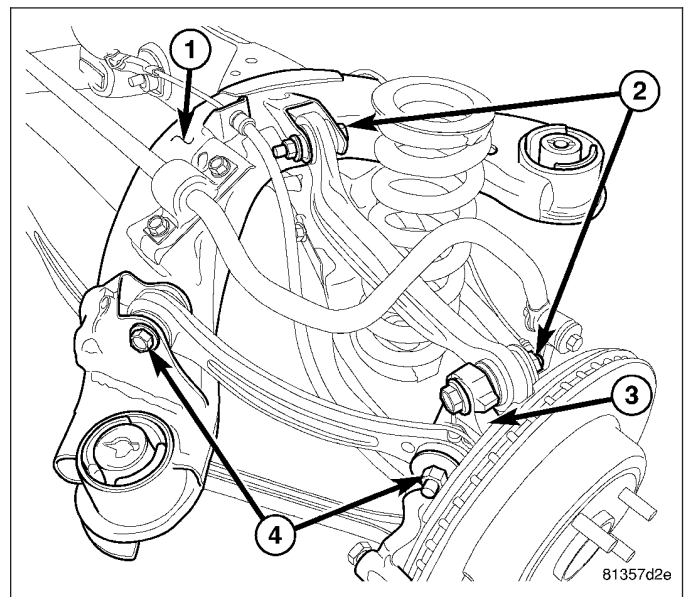
31. On each side of crossmember, slide cam bolt (2) attaching toe link rearward, out of crossmember and link (1).



32. On each side of crossmember, remove bolt and nut (1) mounting link (3) at crossmember.



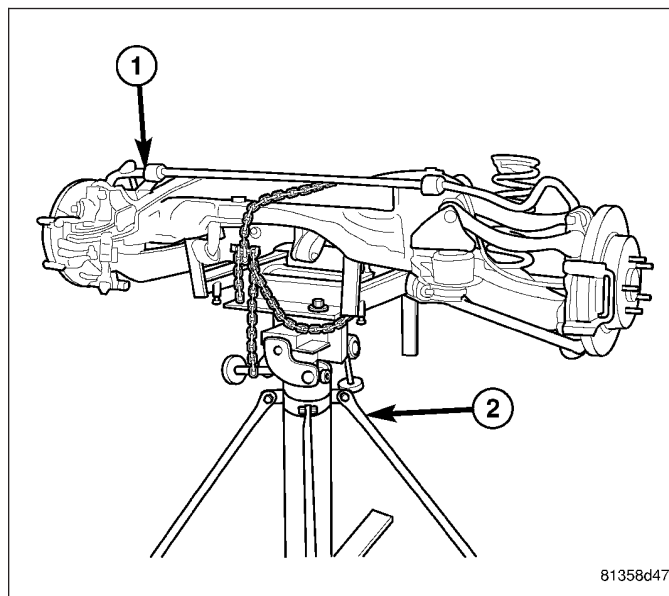
33. On each side of crossmember, remove nut and bolt (4) mounting tension link to crossmember (1).
34. On each side of crossmember, remove nut and bolt (2) mounting camber link to crossmember (1).
35. Carefully lift knuckle with links and parking brake cable attached from rear suspension crossmember.
36. Remove crossmember from jack.



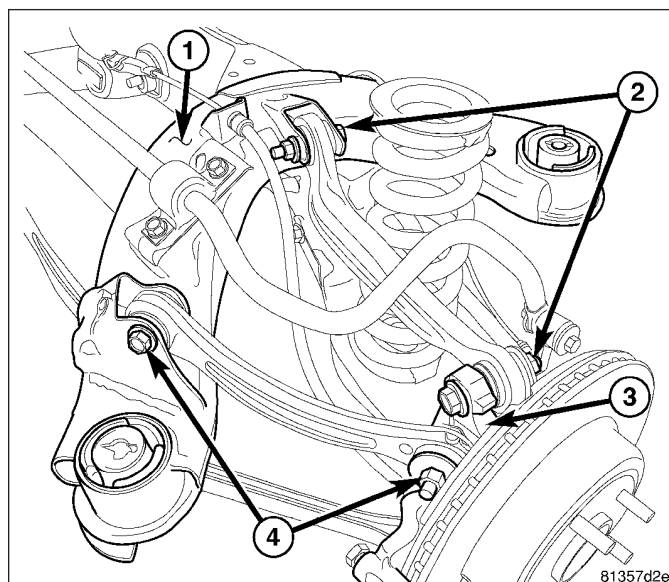


## INSTALLATION

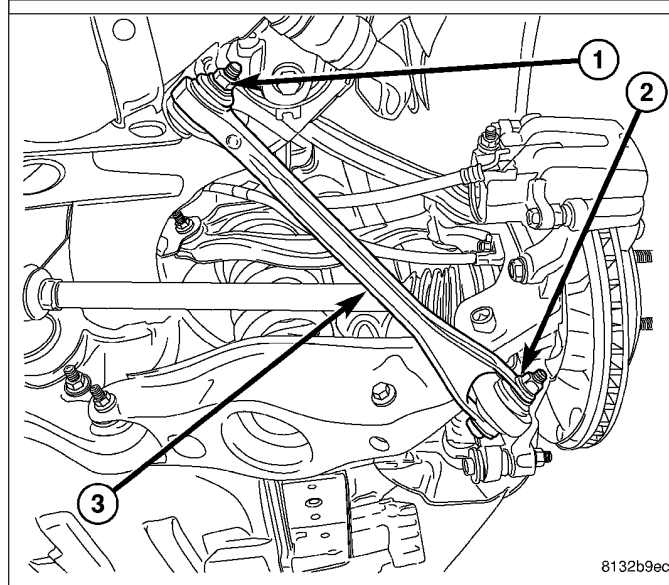
1. Install rear crossmember (1) on jack (2) head in same position in which it was removed and secure in place.



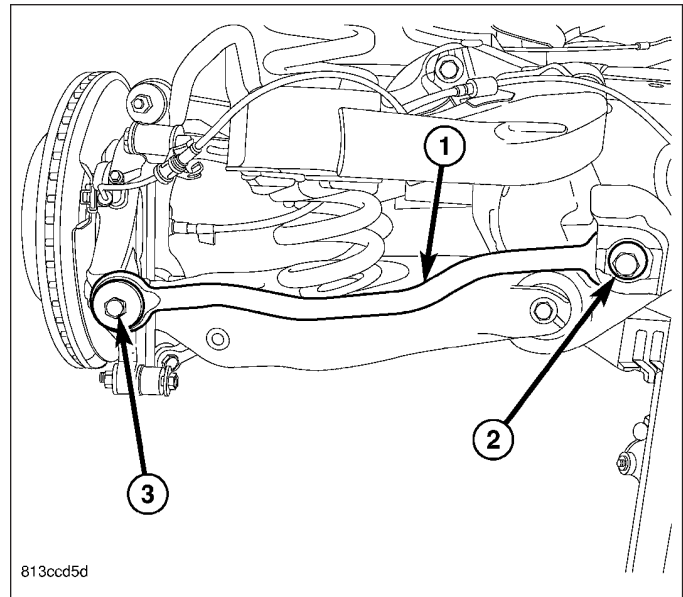
2. Carefully place one side knuckle with links and parking brake cable attached as an assembly into mounted position on rear suspension crossmember. Install nut and bolt (2) mounting camber link to crossmember (1) to hold assembly in place. **Do not tighten at this time.**
3. Carefully place opposite side knuckle with links and parking brake cable attached as an assembly into mounted position on rear suspension crossmember. Install nut and bolt (2) mounting camber link to crossmember (1) to hold assembly in place. **Do not tighten at this time.**
4. On each side of crossmember, install nut and bolt (4) mounting each tension link to crossmember (1). **Do not tighten at this time.**



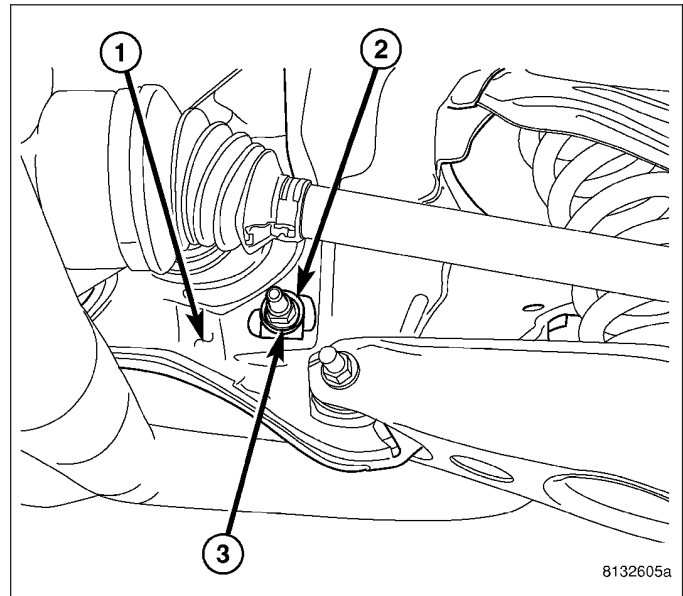
5. On each side of crossmember, Install bolt and nut (1) mounting each compression link (3) at crossmember. **Do not tighten at this time.**



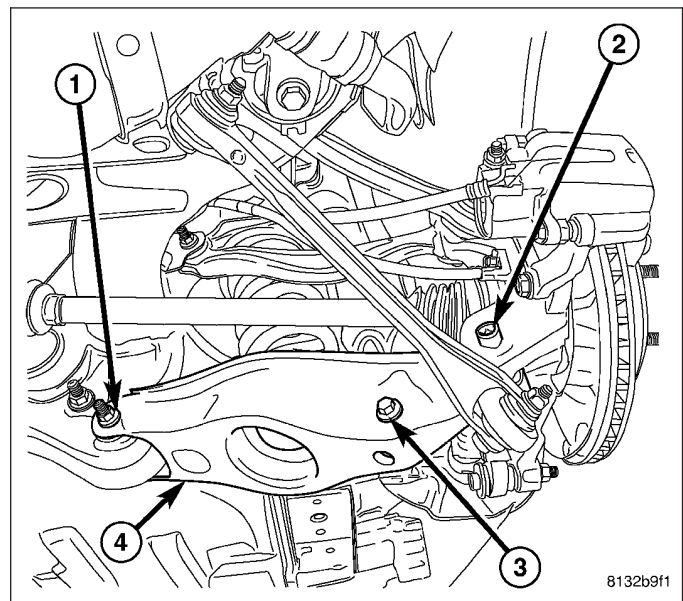
6. On each side of crossmember, slide cam bolt (2) attaching toe link through crossmember and link (1) from rear.



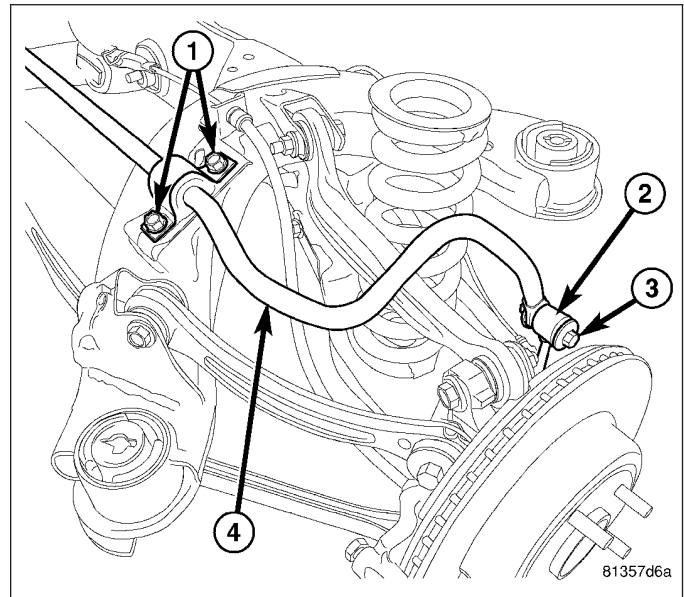
7. On each side of crossmember, while holding toe adjustment cam bolt from rotating, install cam washer (2) and nut (3) securing toe link at crossmember (1). **Do not tighten at this time.**



8. On each side of crossmember, install bolt and nut (1) fastening spring link (4) to crossmember. **Do not tighten at this time.**
9. Install end of each rear parking brake cable into mounting bracket on crossmember. Press retainer through bracket until retainer fingers lock cable into place.

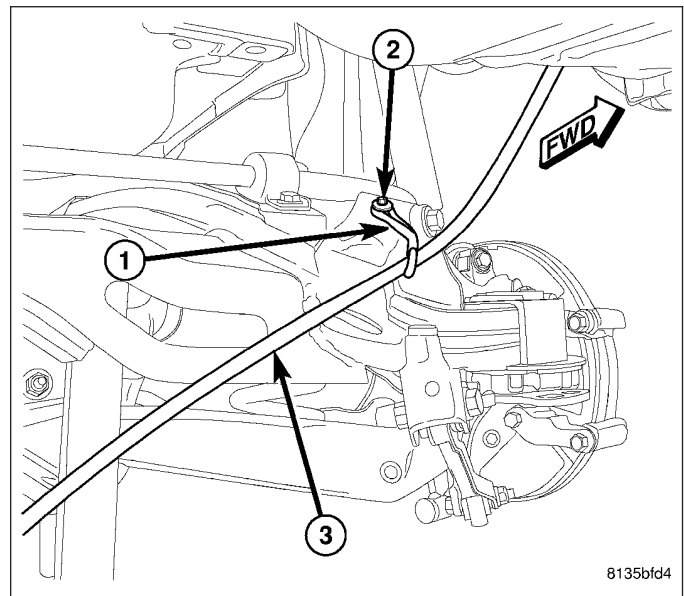


10. Install stabilizer bar (4) with cushions and retainers on crossmember.
11. Install cushion retainer mounting bolts (1). **Do not tighten at this time.**
12. Install bolt (3) and nut fastening stabilizer bar ends to each stabilizer link (2). **Do not tighten at this time.**
13. Tighten cushion retainer mounting bolts (1) to 60 N·m (44 ft. lbs.) torque.

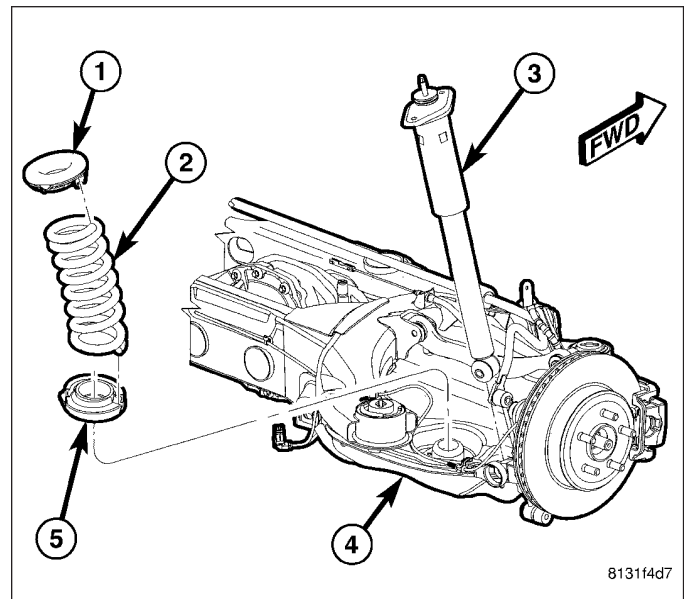


**Note:** Do not install coil springs on spring links at this time.

14. Raise crossmember using jack until there is about 10 inches (250 mm) clearance to the body mounting points.
15. Install screw (2) fastening front parking brake cable routing bracket (1) to rear crossmember.

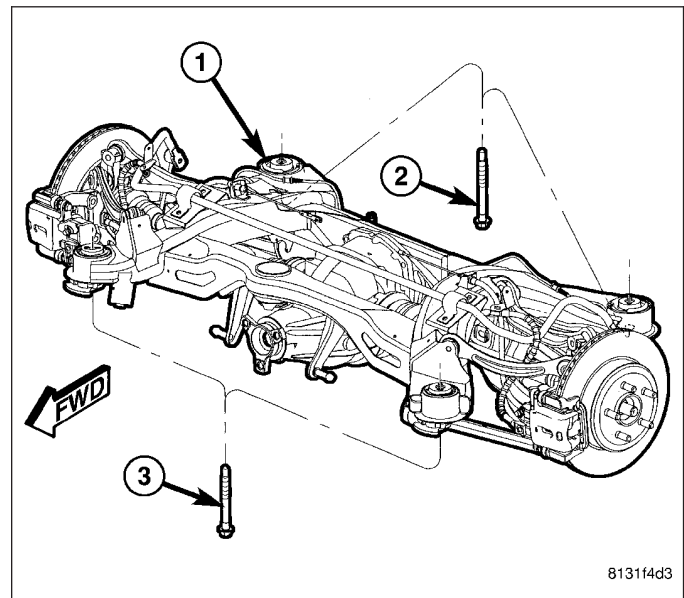


16. Raise crossmember to body mounting points. As crossmember is raised, align shocks (3) with pockets in spring links. **Do not install bolts at this time.**



**Note:** There are four crossmember mounting bolts. Rear mounting bolts (2) are longer than front mounting bolts (3). Do not interchange mounting bolts.

17. Continue to raise crossmember (1) with jack until crossmember mounting bolts (2 and 3) can be installed. Install left side crossmember mounting bolts, but not the right side bolts. It is not necessary to tighten bolts at this point.

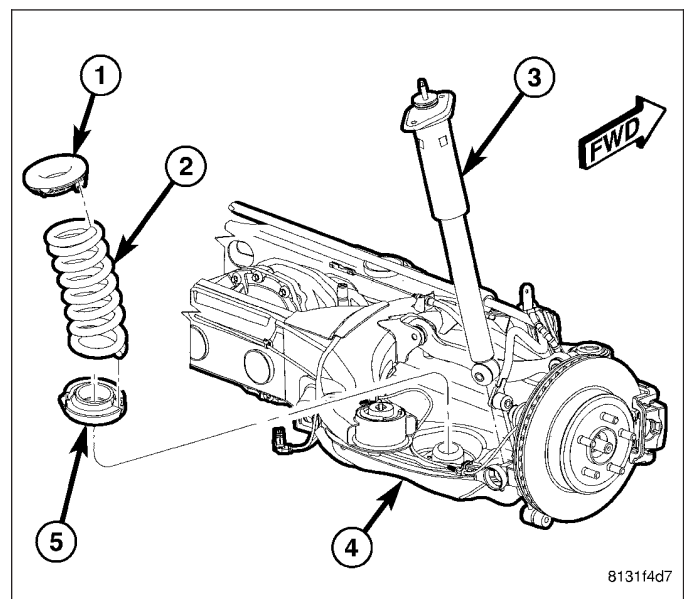


**CAUTION:** To avoid damaging other components of vehicle, do not lower crossmember any further than necessary to install coil spring (2).

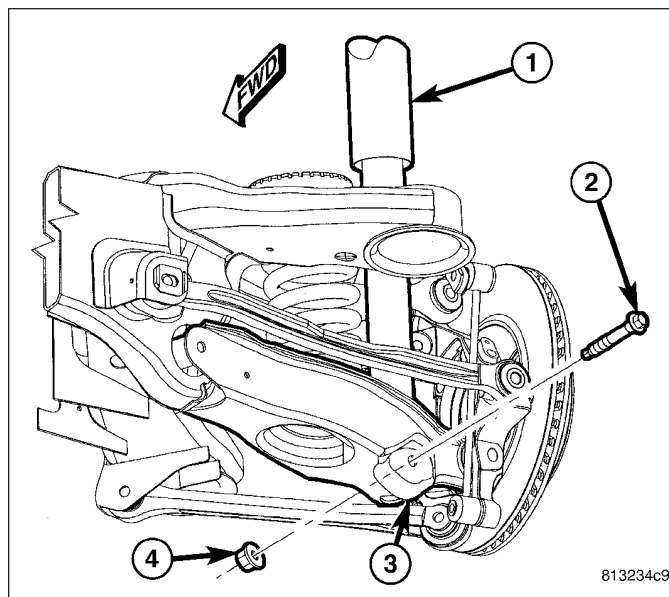
18. **Slowly** lower jack allowing right side of crossmember to drop. **Do not lower jack at a fast rate.** Lower jack just enough to allow spring (2) installation. **Do not lower jack any further than necessary.**

**Note:** Before installing coil spring, make sure isolators (1 and 5) are completely installed on ends of spring.

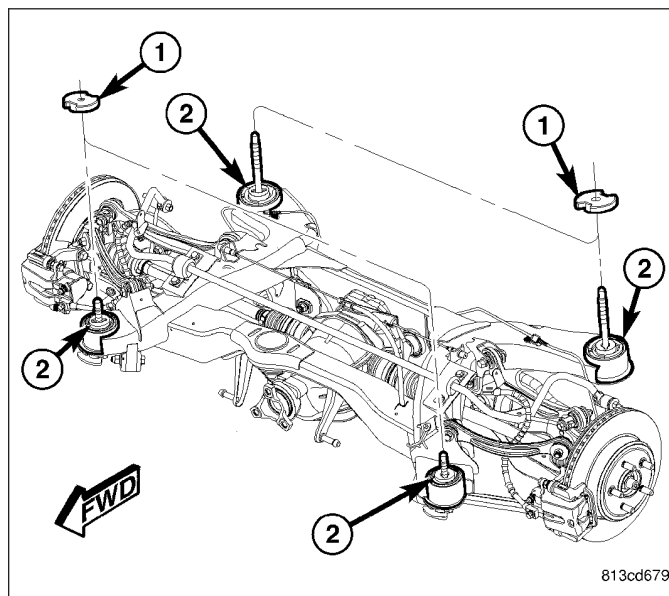
19. Install coil spring (2) with isolators into spring pocket of spring link fitting the lower isolator to the shape of the pocket, then align top of spring with body mount.



20. Carefully raise jack, guiding coil spring and lower end of shock absorber (1) into mounted positions. Once shock absorber (1) lower mounting hole lines up with hole in spring link (3), stop jacking.
21. Install lower shock mounting bolt (2) and nut (4). **Do not tighten at this time.**

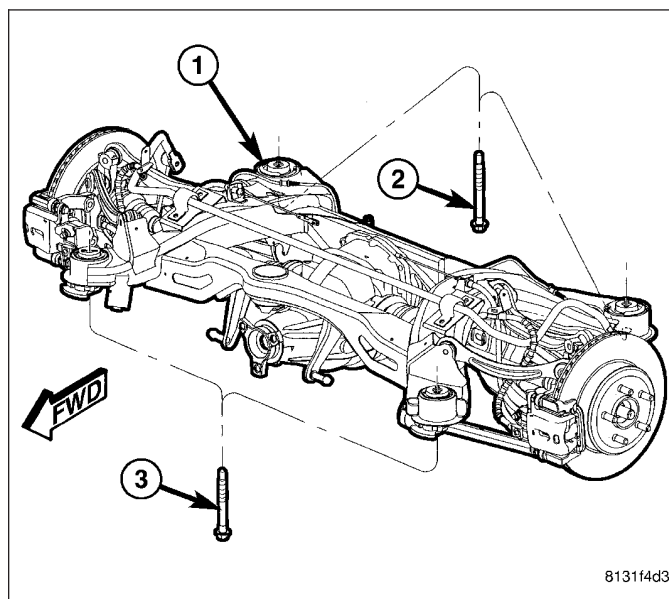


22. If vehicle is equipped with AWD, insert spacers (1) on top of right crossmember mount bushings (2) before crossmember is raised into place.



**Note:** There are four crossmember mounting bolts. Rear mounting bolts (2) are longer than front mounting bolts (3). Do not interchange mounting bolts.

23. Raise right side of crossmember (1) into mounted position. Install right side crossmember mounting bolts (2 and 3). **Snug, but do not fully tighten bolts at this time.**
24. Remove both front and rear crossmember mounting bolts (2 and 3) on **left** side of vehicle.





**CAUTION:** To avoid damaging other components of vehicle, do not lower crossmember any further than necessary to install coil spring (2).

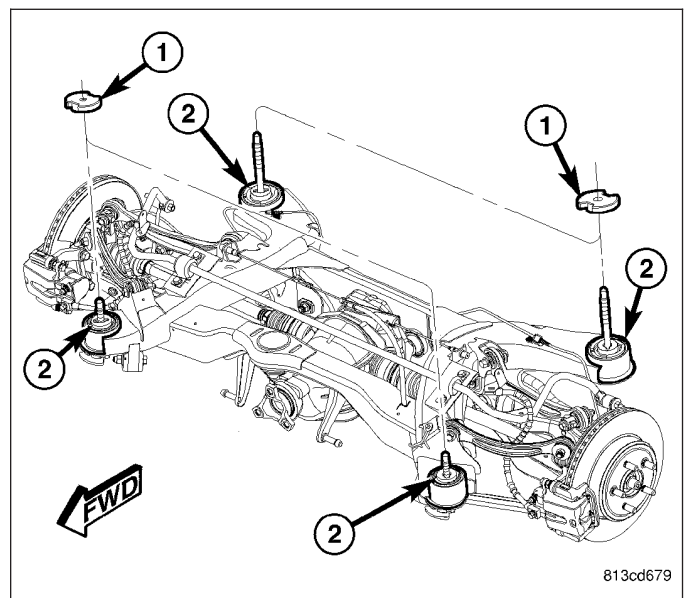
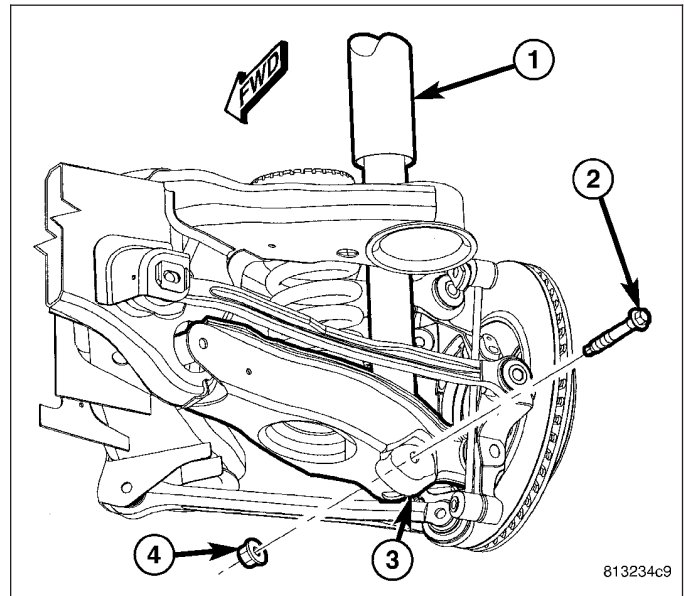
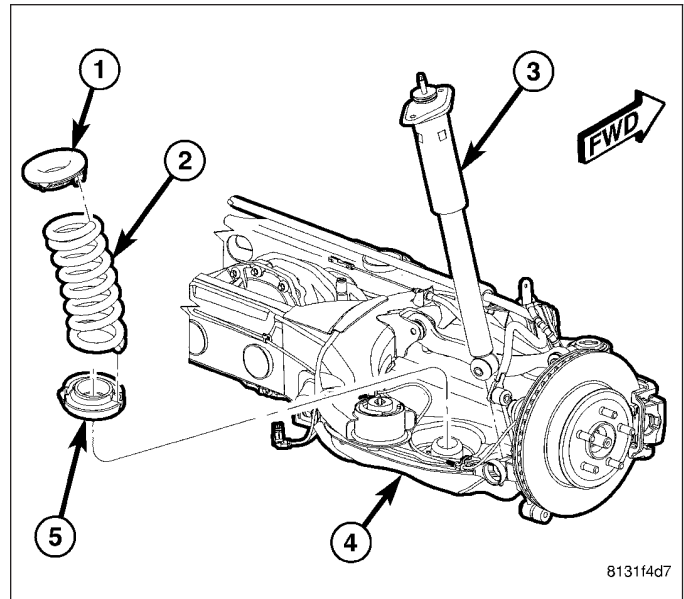
25. **Slowly** lower jack allowing left side of crossmember to drop. **Do not lower jack at a fast rate.** Lower jack just enough to allow spring (2) installation. **Do not lower jack any further than necessary.**

**Note:** Before installing coil spring, make sure isolators (1 and 5) are completely installed on ends of spring.

26. Install coil spring (2) with isolators into spring pocket of spring link fitting the lower isolator to the shape of the pocket, then align top of spring with body mount.

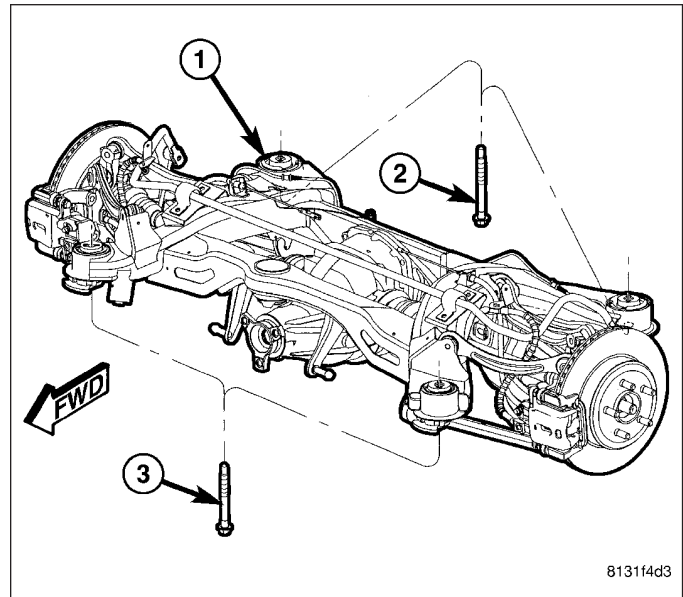
27. Carefully raise jack, guiding coil spring and lower end of shock absorber (1) into mounted positions. Once shock absorber (1) lower mounting hole lines up with hole in spring link (3), stop jacking.
28. Install lower shock mounting bolt (2) and nut (4). **Do not tighten at this time.**

29. If vehicle is equipped with AWD, insert spacers (1) on top of left crossmember mount bushings (2) before crossmember is raised into place.

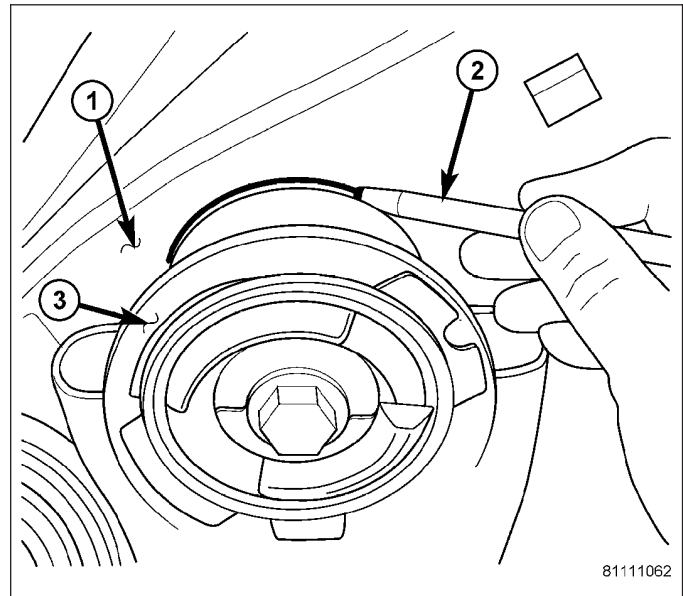


**Note:** There are four crossmember mounting bolts. Rear mounting bolts (2) are longer than front mounting bolts (3). Do not interchange mounting bolts.

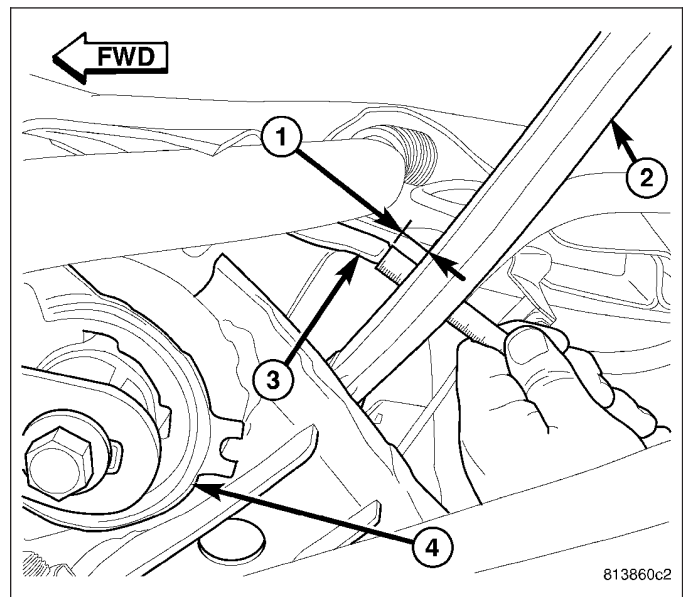
30. Raise left side of crossmember (1) into mounted position. Install left side crossmember mounting bolts (2 and 3). **Snug, but do not fully tighten bolts at this time.**



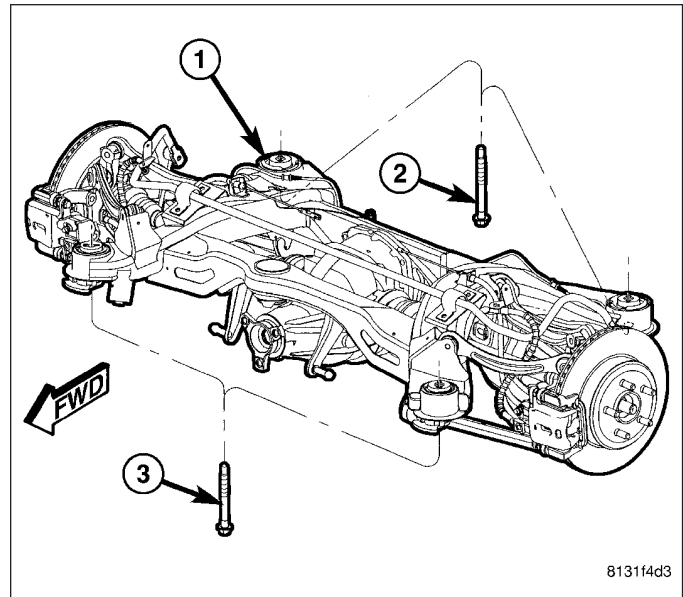
31. Shift crossmember as necessary to line up mounts (3) with location marks drawn on body (1) before removal.



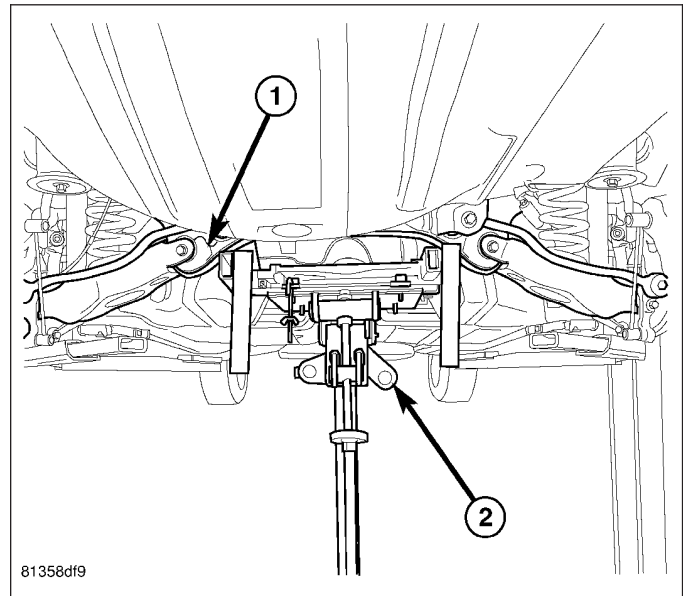
32. Once mounts are lined up with location marks, on both sides of vehicle, measure distance (1) between the tension link (2) and weld flange (3) on body directly in front of it, just outboard of the front mount bushing (4). **This distance must be at least 12 mm to allow proper clearance for suspension movement.** If distance is less than 12 mm on either side of vehicle, shift that side of rear crossmember directly rearward until distance is 12 mm or greater. To do so, loosen 3 mounting bolts slightly, leaving one on opposite side of shift snugged to pivot off of. Shift crossmember rearward and snug loosened bolts. Remeasure opposite side to be sure it still maintains minimum 12 mm distance.



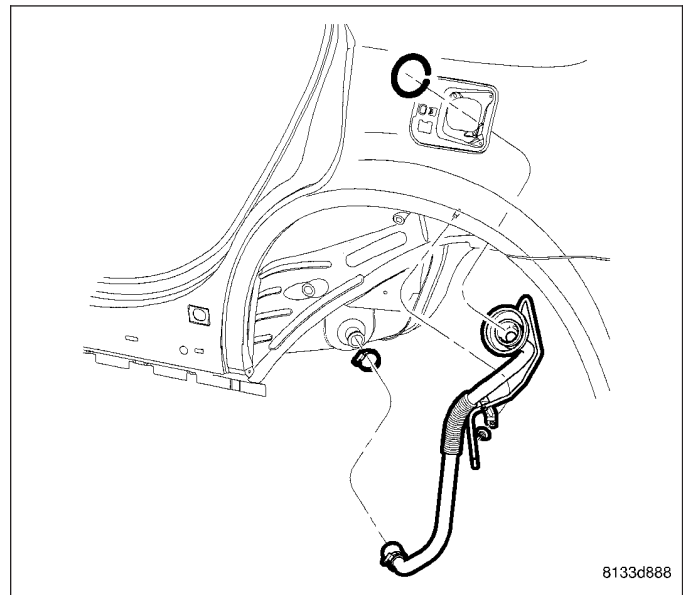
33. Tighten all four crossmember mounting bolts (2 and 3) to 180 N·m (133 ft. lbs.) torque.



34. Remove jack (3) from under rear crossmember.

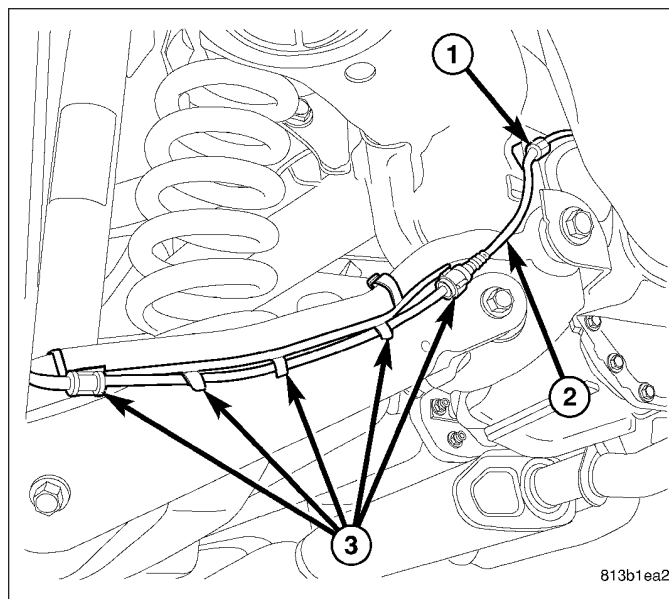


35. Install fuel filler tube. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL TANK FILLER TUBE - INSTALLATION)

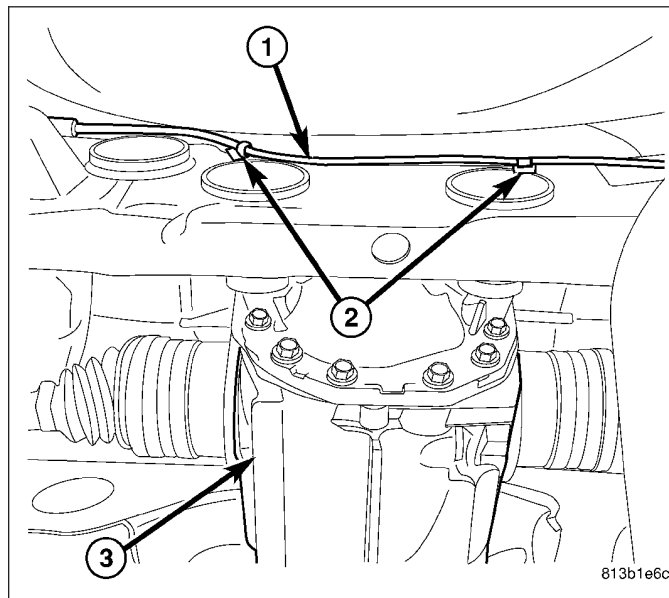




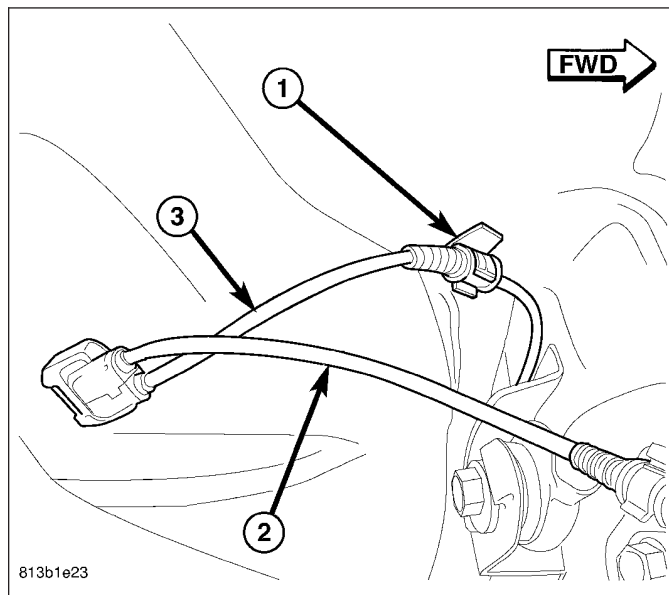
36. Clip left rear wheel speed sensor cable (2) to routing clip (1) above toe link mount on rear crossmember.



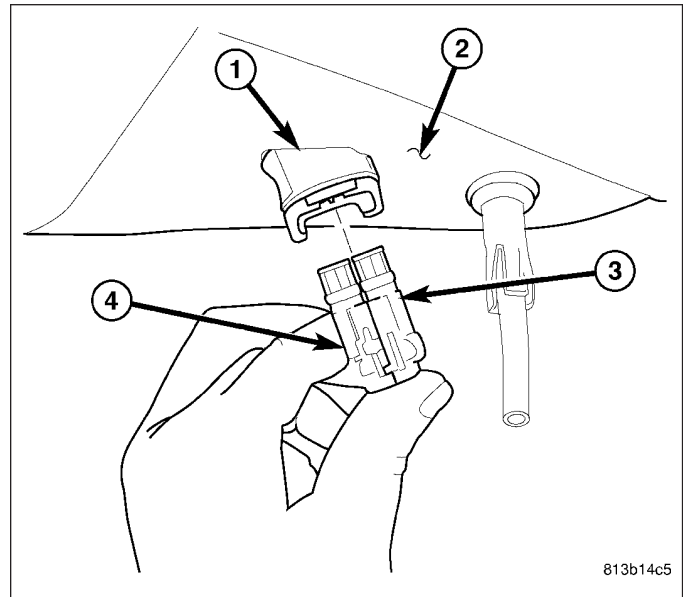
37. Clip left rear wheel speed sensor cable (1) to routing clips (2) along rear of crossmember near rear differential (3).



38. Clip left rear wheel speed sensor cable (3) to routing clip (1) near body connector.



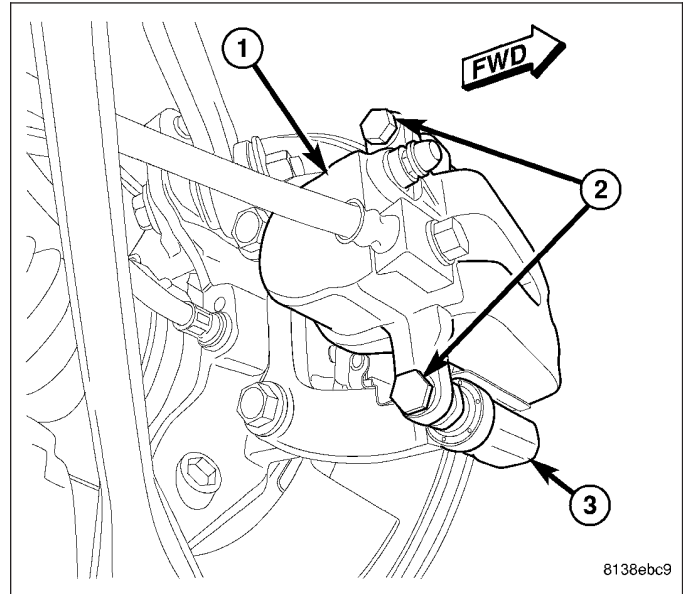
39. Match left rear wheel speed sensor connector (4) to right sensor connector (3) to make one connector.
40. Insert speed sensor connectors (3 and 4) into body wiring harness connector (1) located in luggage compartment floor pan (2). When installing connector, make sure retaining clip on body connector is properly in place and sensor connector cannot be pulled out.



41. On each rear disc brake:
  - a. Push caliper guide pins into caliper adapter to clear caliper mounting bosses when installing.
  - b. Guide caliper and brake hose down through rear suspension, then slide caliper over brake pads and onto caliper adapter (3).

**CAUTION:** Extreme caution should be taken not to cross-thread caliper guide pin bolts (2) when they are installed.

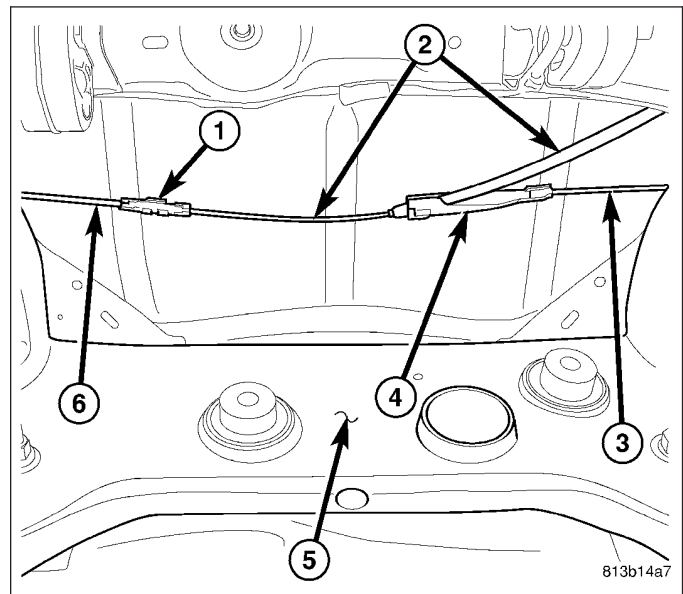
- c. Align caliper mounting holes with guide pins, then install guide pin bolts (2). While holding guide pins from turning, tighten bolts to 60 N·m (44 ft. lbs.) torque.
  - d. Make sure brake hose is properly routed and will not come in contact with suspension components.



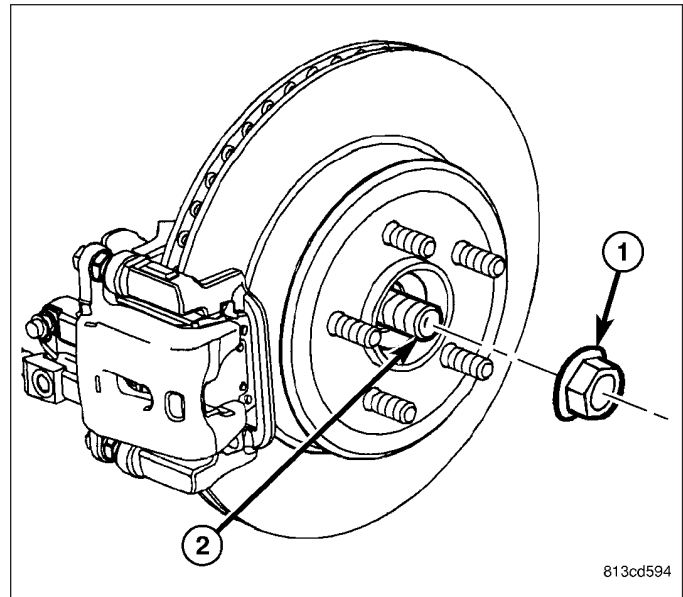
42. Route parking brake cable above rear crossmember, then slide cable (2) through equalizer (4) above rear differential.

**Note:** Due to short travel and low spring tension, it is not necessary to lock-out parking brake lever to service parking brake components.

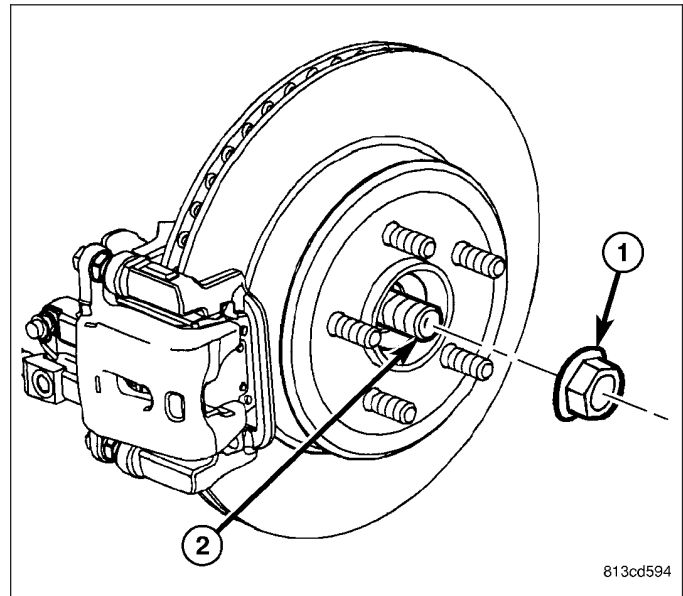
43. Connect front parking brake cable (2) at connector (1) to right rear parking brake cable (6).



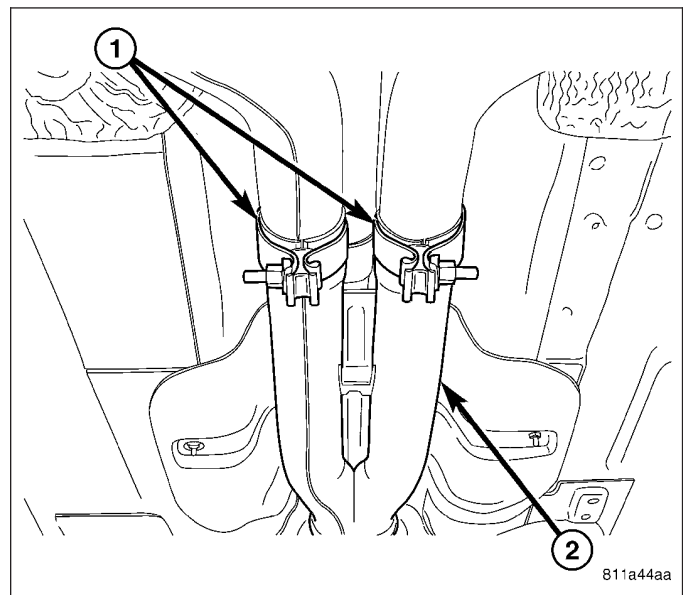
44. On each side of vehicle, slide an axle half shaft (2) through hub and bearing and install hub nut (1). **Do not tighten hub nuts at this time.**
45. Install rear axle differential. (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 198MM - INSTALLATION)(Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 210MM - INSTALLATION)



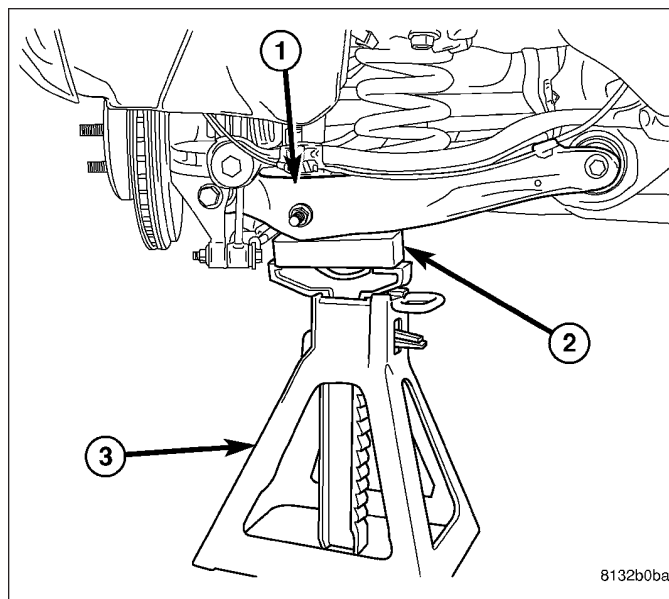
46. While a helper applies brakes to keep hub from turning, tighten hub nut to 213 N·m (157 ft. lbs.) torque.



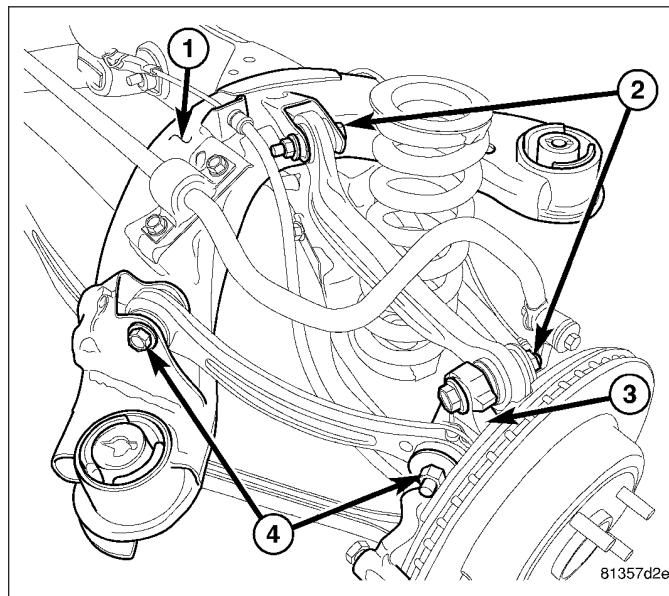
47. Install rear exhaust system (2) (dual-outlet exhaust shown in figure). (Refer to 11 - EXHAUST SYSTEM - INSTALLATION)



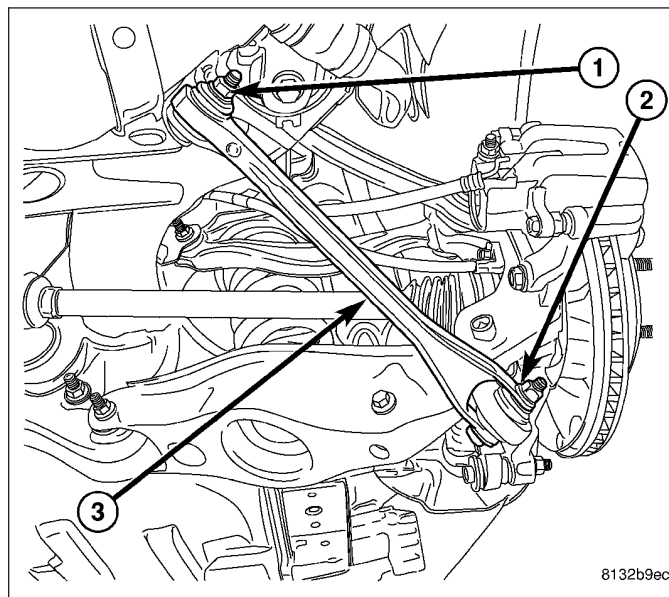
48. Lower vehicle until front tires contact floor but rear is still suspended. Place jack stands under each rear suspension spring link. Place an appropriate wooden block between stand and link to avoid damaging spring link, then lower vehicle until full vehicle weight is supported by suspension.



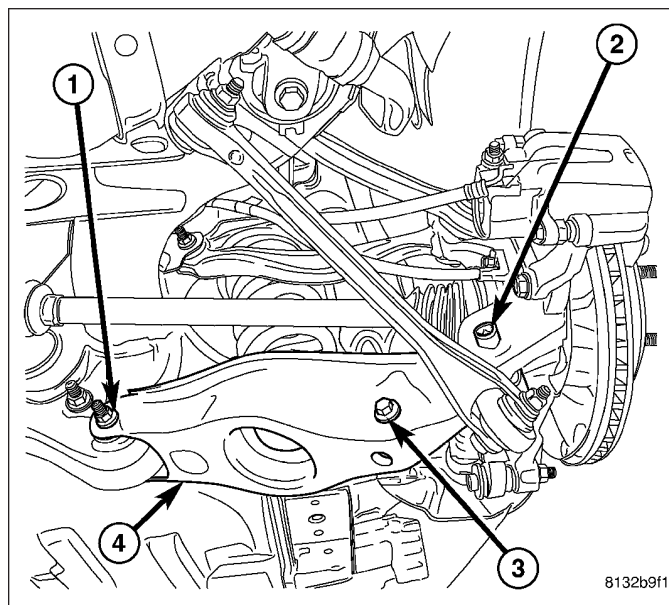
49. Tighten camber link bolt (2) at crossmember to 85 N·m (63 ft. lbs.) torque.
50. Tighten tension link bolt nut (2) at crossmember to 85 N·m (63 ft. lbs.) torque.



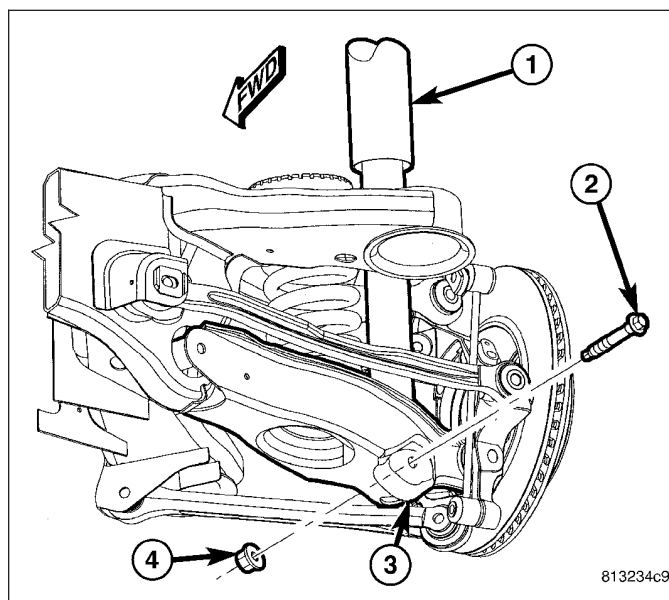
51. Tighten compression link bolt (2) at crossmember to 85 N·m (63 ft. lbs.) torque.



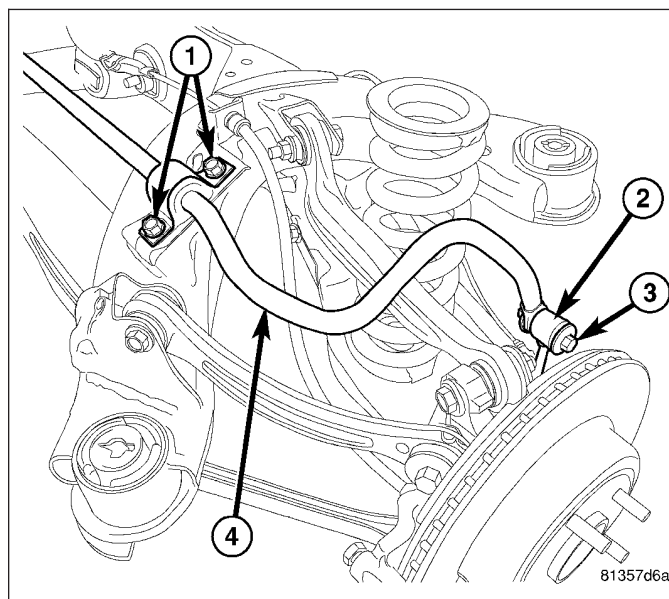
52. Tighten spring link bolt (1) at crossmember to 108 N·m (80 ft. lbs.) torque.



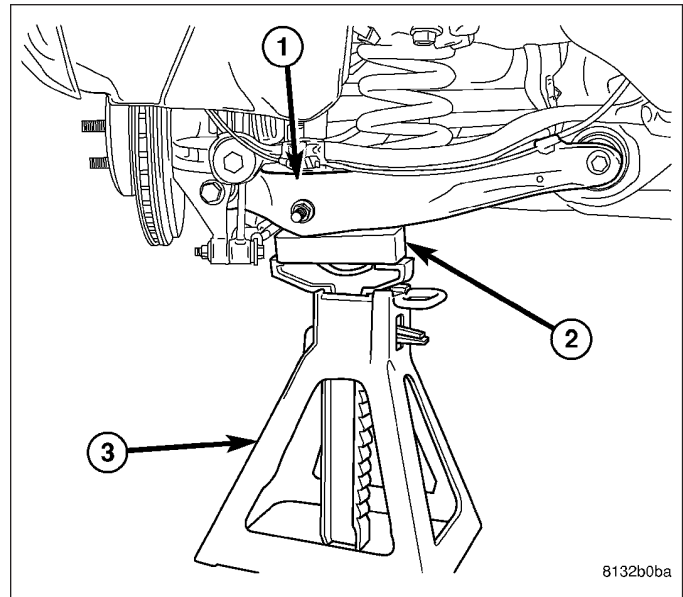
53. Tighten shock absorber lower mounting bolt nut (4) to 72 N·m (53 ft. lbs.) torque.



54. Tighten stabilizer link bolts (3) to 61 N·m (45 ft. lbs.) torque.

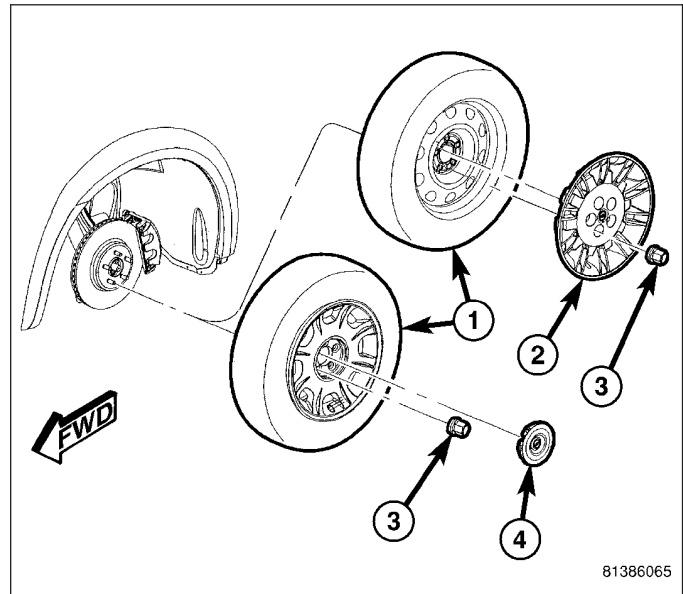


55. Raise vehicle and remove jack stands (3).



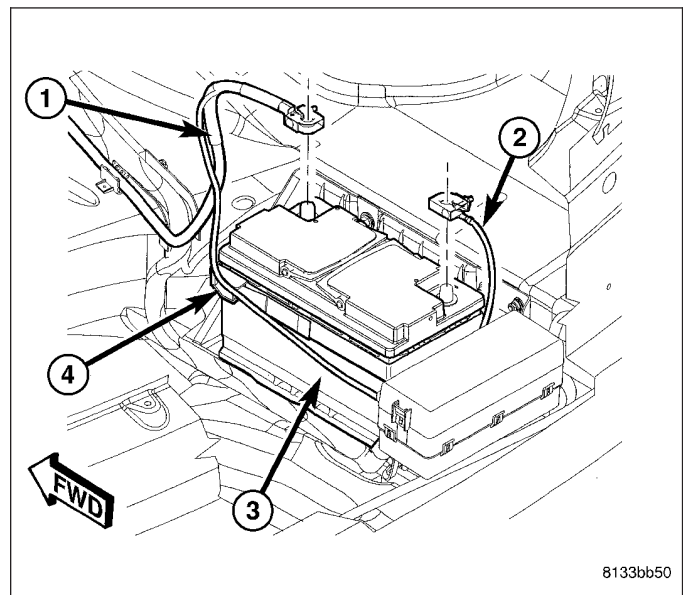
56. Install tire and wheel assemblies (1). Tighten wheel mounting nuts (3) to 150 N·m (110 ft. lbs.) torque. (Refer to 22 - TIRES/WHEELS - INSTALLATION)

57. Lower vehicle.

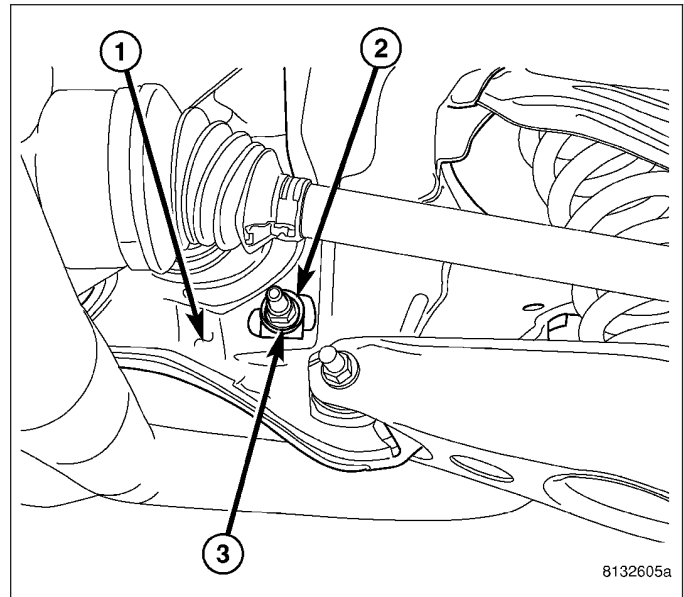


58. Connect battery negative cable (2) to battery post. It is important that this is performed properly. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)

59. Perform wheel alignment. (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE)



60. On each side of crossmember, while holding cam bolt from turning, tighten toe link cam bolt nut (2) to 108 N·m (80 ft. lbs.) torque.





# FUEL SYSTEM

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## FUEL DELIVERY

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## FUEL DELIVERY

### DESCRIPTION

The front wheel drive car uses a plastic fuel tank located rear center of the vehicle.

The Fuel Delivery System consists of: the following items:

- Electric fuel pump module
- Fuel filter
- Tubes/lines/hoses
- Fuel injectors



The in-tank fuel pump module contains the fuel pump. The pump is serviced as part of the fuel pump module. Refer to Fuel Pump Module.

The fuel filter is replaceable only as part of the fuel pump module.

## OPERATION

The fuel system provides fuel pressure by an in-tank pump module. The Powertrain Control Module (PCM) controls the operation of the fuel system by providing battery voltage to the fuel pump through the fuel pump relay. The PCM requires only three inputs and a good ground to operate the fuel pump relay. The three inputs are:

- Ignition voltage
- Crankshaft Position (CKP) sensor
- Camshaft Position (CMP) sensor

## DIAGNOSIS AND TESTING - FUEL DELIVERY SYSTEM

(Refer to Appropriate Diagnostic Information)

### STANDARD PROCEDURE - FUEL SYSTEM PRESSURE RELEASE PROCEDURE

1. Remove Fuel Pump relay from Power Distribution Center (PDC). For location of relay, refer to label on underside of PDC cover.
2. Start and run engine until it stalls.
3. Attempt restarting engine until it will no longer run.
4. Turn ignition key to OFF position.
5. Return fuel pump relay to PDC.
6. One or more Diagnostic Trouble Codes (DTC's) may have been stored in PCM memory due to fuel pump relay removal. The scan tool must be used to erase a DTC.

## SPECIFICATIONS

### TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Accelerator Pedal to Dash Nuts	12	8.8	106
Fuel Tank Strap Bolts	60	44	
Hose Clamps	3		25
Fuel Rail Mounting Bolts-5.7L	11	-	100

### FUEL SYSTEM PRESSURE

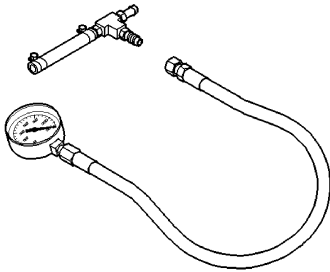
400 kpa  $\pm$ 34 kpa (58 psi  $\pm$  5 psi)

### FUEL TANK CAPACITY

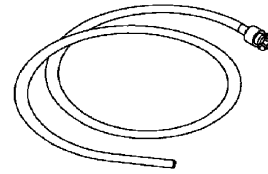
Vehicle	Liters	U.S. Gallons
LX V-6 Engine	68	18
LX V-8 Engine	72	19
Nominal refill capacities are shown. A variation may be observed from vehicle to vehicle due to manufacturing tolerance and refill procedure.		

## SPECIAL TOOLS

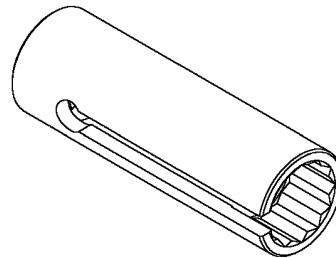
### FUEL



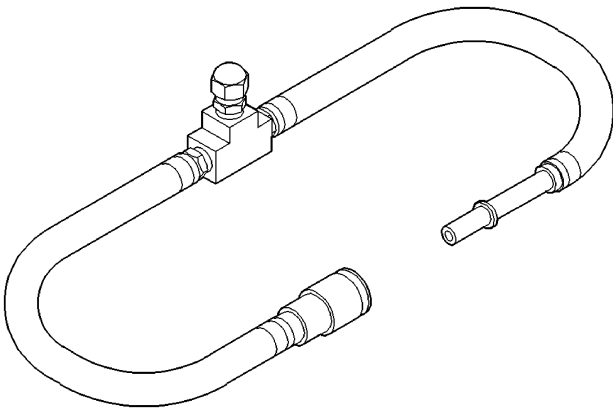
*Test Kit, Fuel*



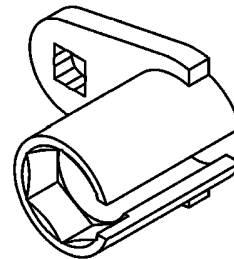
*Fuel Line Adapter 1/4*



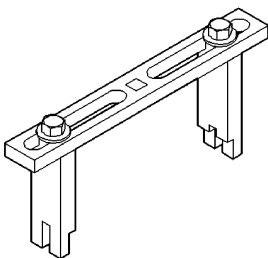
*O2S (OXYGEN SENSOR) REMOVAL/INSTALLER-  
C4907*



*Adapters, Fuel Pressure Test—6539 and/or 6631*



*Oxygen sensor tool*



*Spanner Wrench—6856*

## SENSOR-FUEL LEVEL

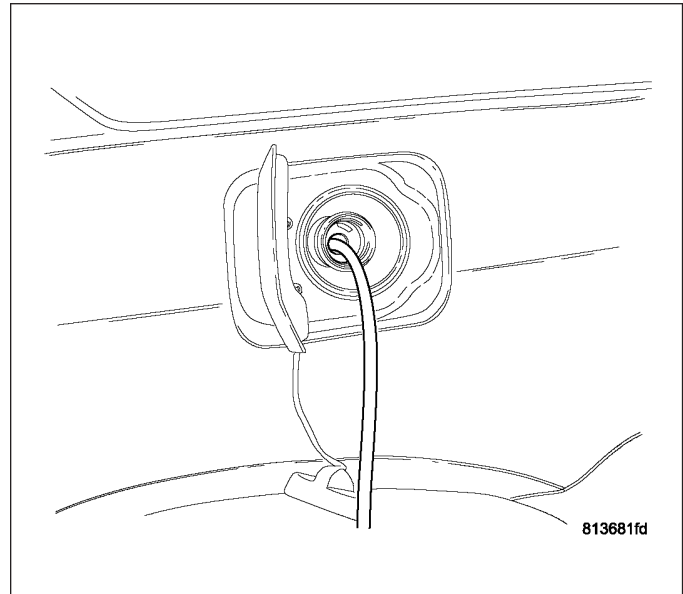
### REMOVAL

#### LEFT SIDE MODULE

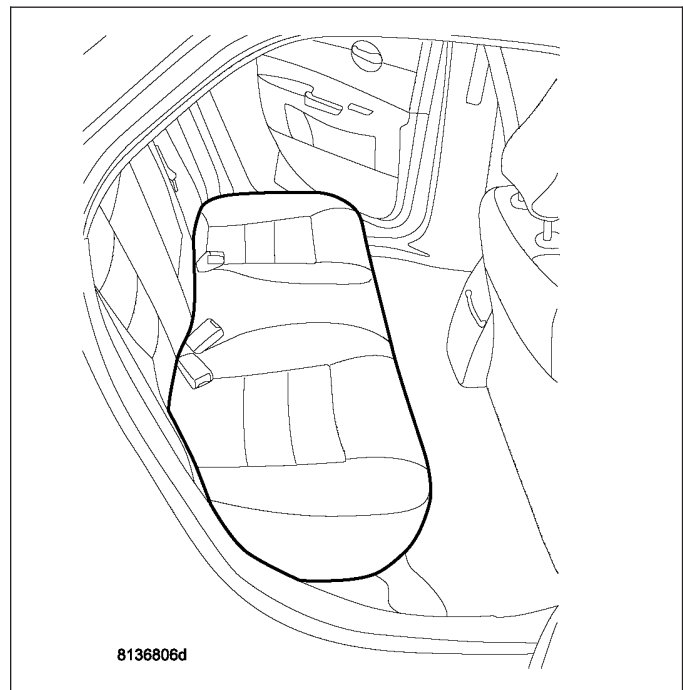
1. Release the fuel pressure, refer to the Fuel Pressure Release Procedure in this section.
2. Disconnect negative battery cable.

**Note:** The fuel level of the vehicle must be below 5/8 of a tank before you remove the module lock-rings. If it is above that you can spill fuel in the vehicle.

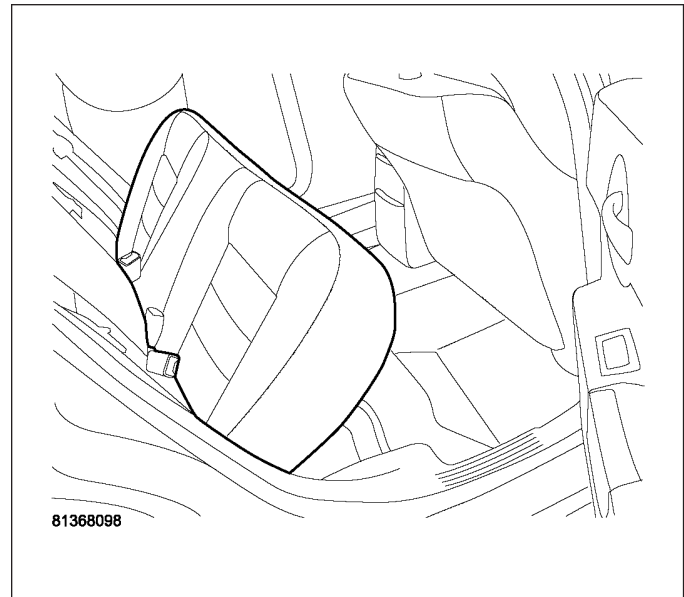
3. Drain partial fuel from fuel tank through the filler tube. Use a hard nylon tube, with a 30° cut on the end, to push the check valve open to drain fuel from tank.



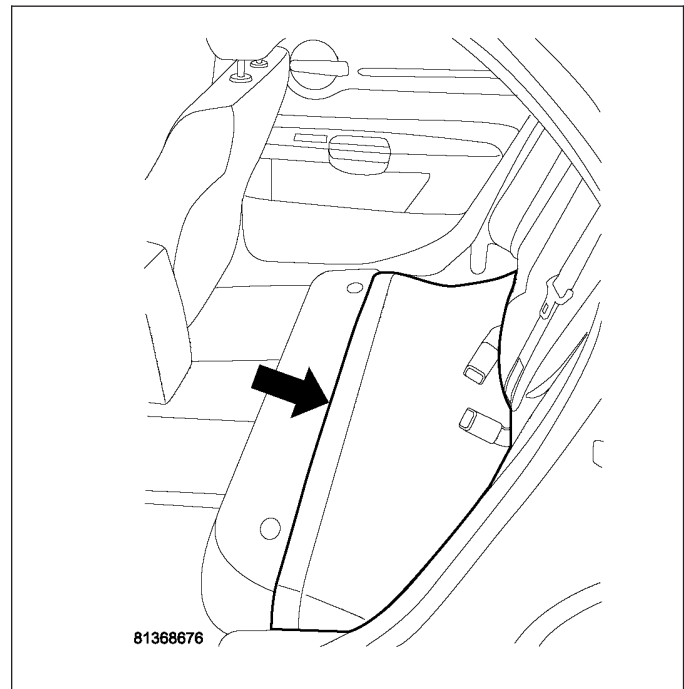
4. Remove the rear lower seat cushion.



5. Push seat back and up to remove seat cushion.

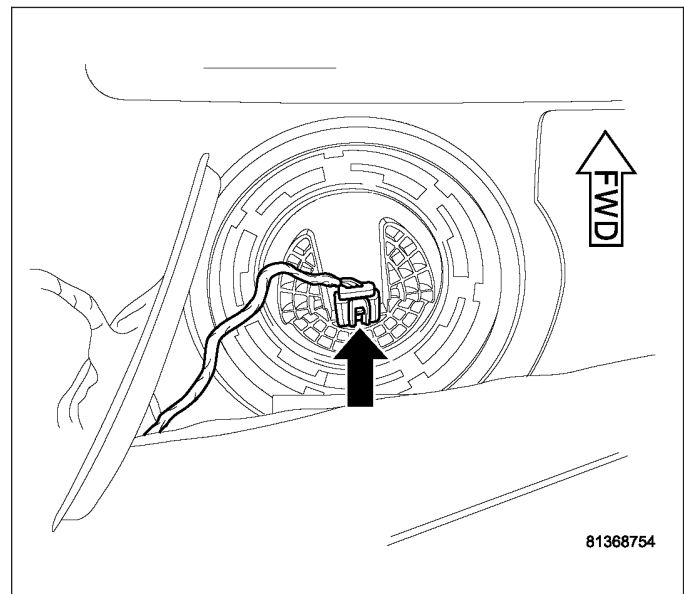


6. Fold back the foam pad covering access cover for modules.

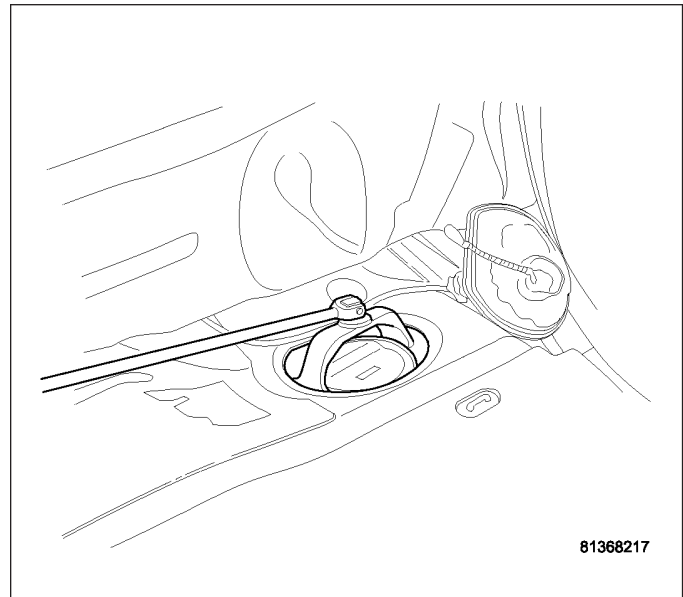


7. Disconnect the electrical connector from left side module.

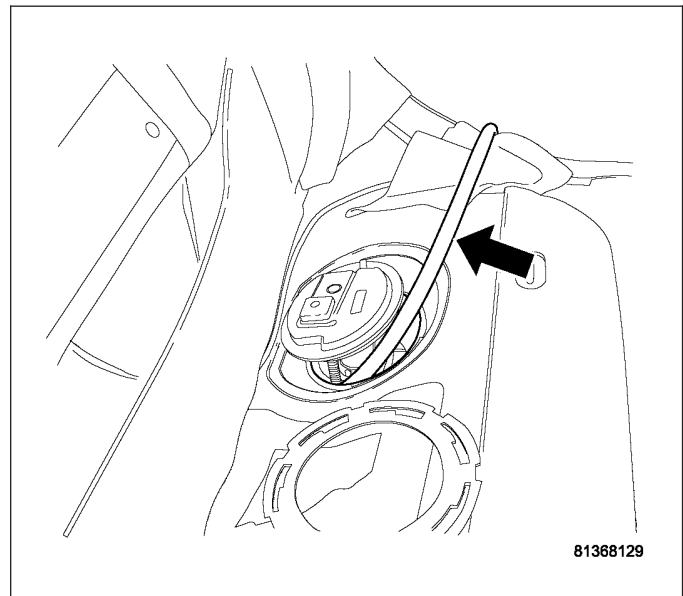
8. Mark the module orientation.



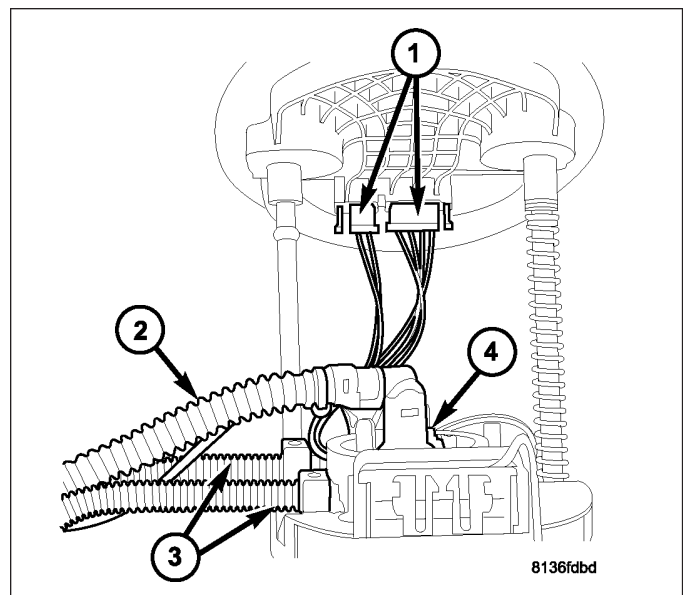
9. Use special tool #9340 to remove left side module lock ring.



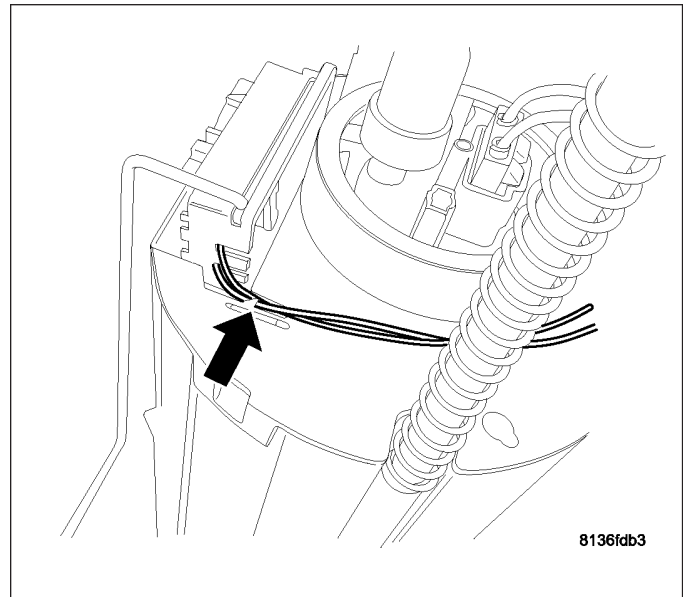
10. Drain fuel from left side of fuel tank. Lift module up enough to push hose into tank and drain. Do not spill fuel in interior of vehicle.



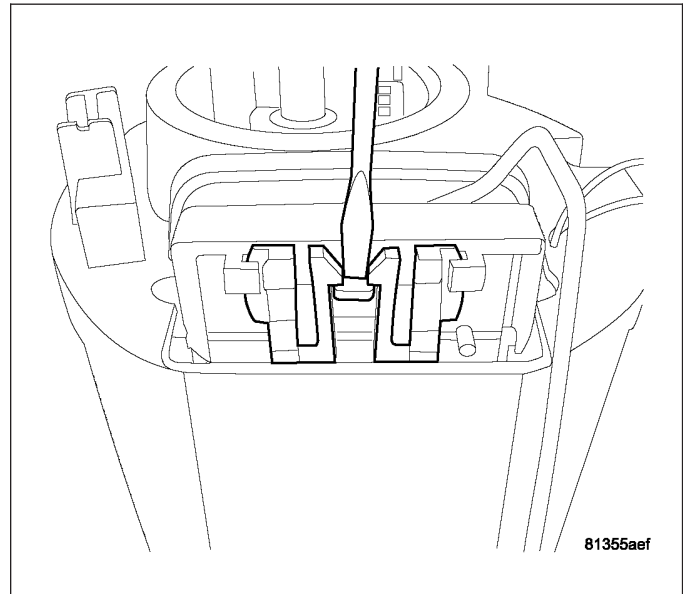
11. Disconnect the electrical connector for the left side fuel level card from bottom of the module top.
12. Disconnect the electrical connector for the right side fuel level sending card.
13. Lift module top half off and tip lower half on its side to drain remaining fuel from the reservoir.



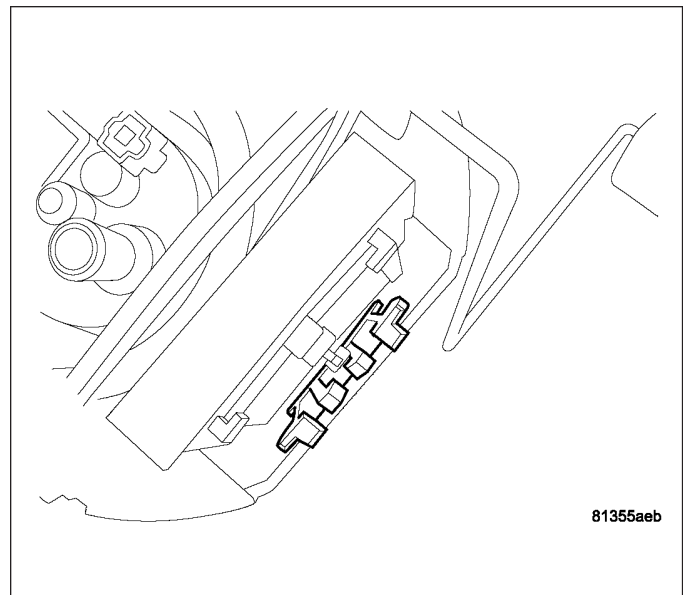
14. Remove wire from module.



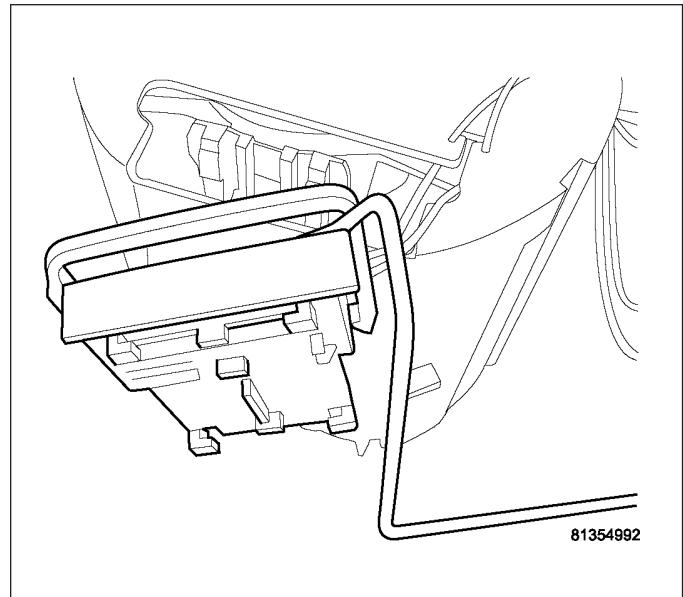
15. Use a screwdriver to separate the locking tabs on the level sending card.



16. Lift level sending card straight up and out of module.



17. Disconnect the electrical wiring from module.
18. Remove level sending card.

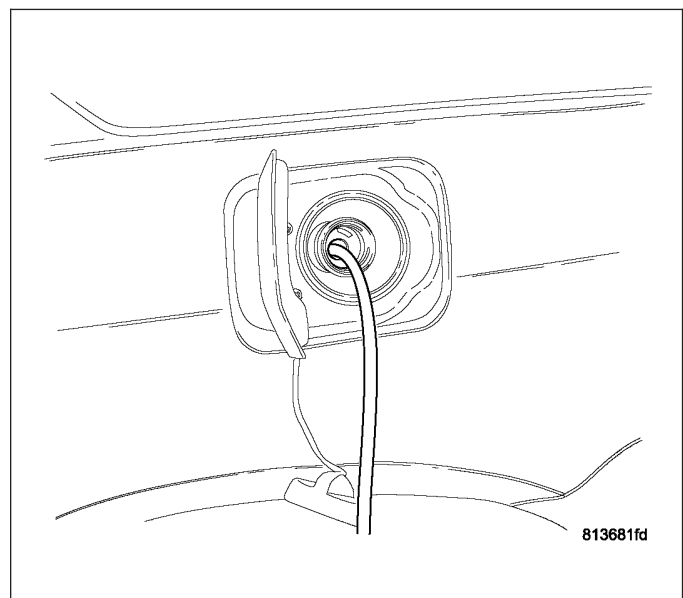


## RIGHT SIDE MODULE

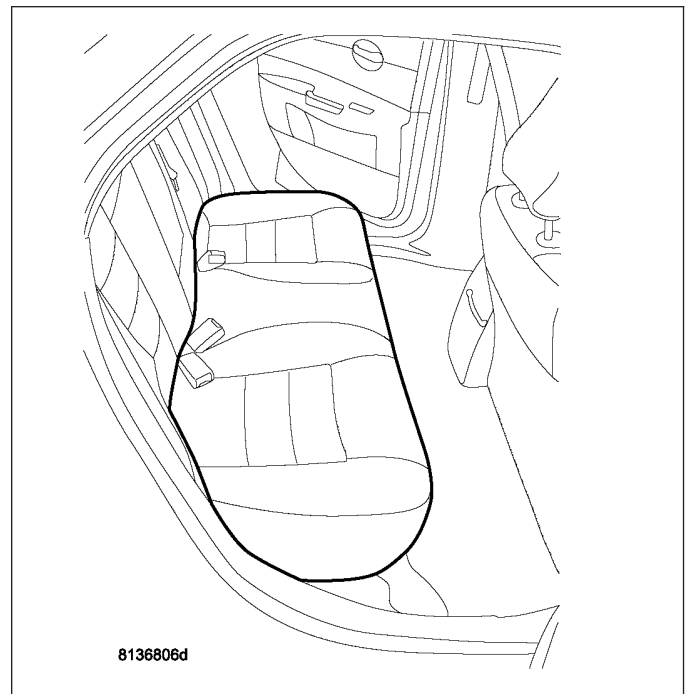
1. Release the fuel pressure, refer to the Fuel Pressure Release Procedure in this section.
2. Disconnect negative battery cable.

**Note:** The fuel level of the vehicle must be below 5/8 of a tank before you remove the module lock-rings. If it is above that you can spill fuel in the vehicle.

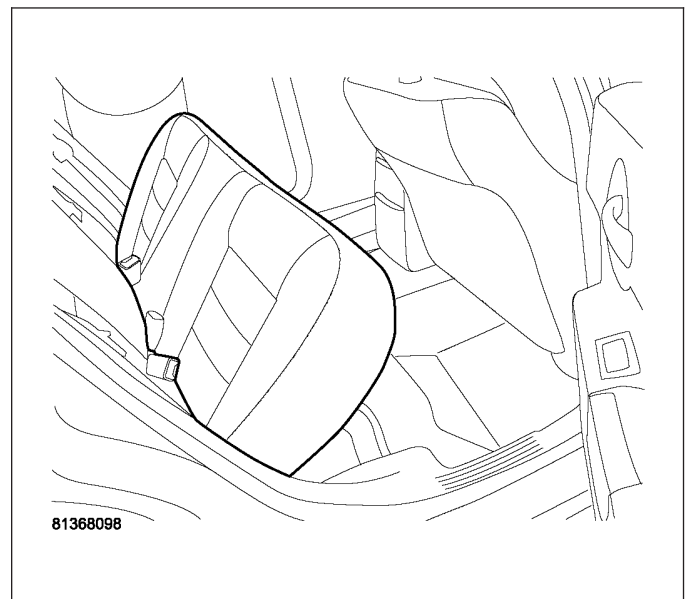
3. Drain partial fuel from fuel tank through the filler tube. Use a hard nylon tube, with a 30° cut on the end, to push the check valve open to drain fuel from tank.



4. Remove the rear lower seat cushion.

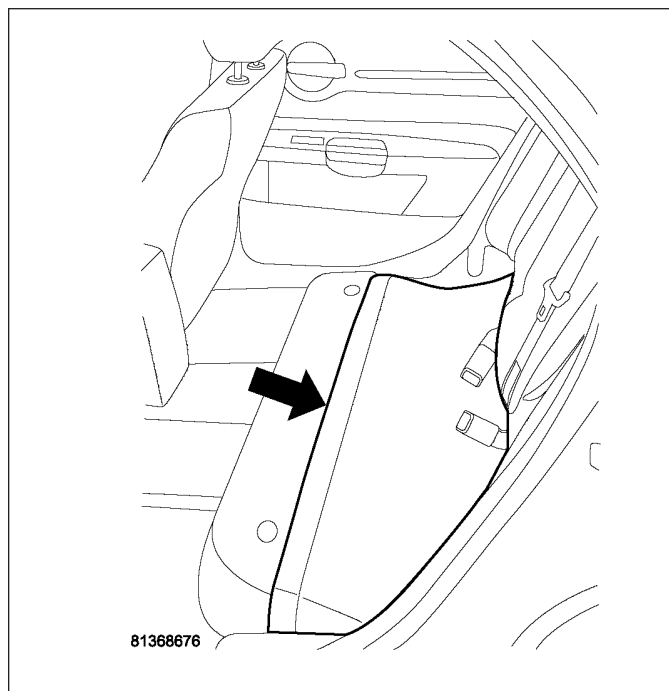


5. Push seat back and up to remove seat cushion.

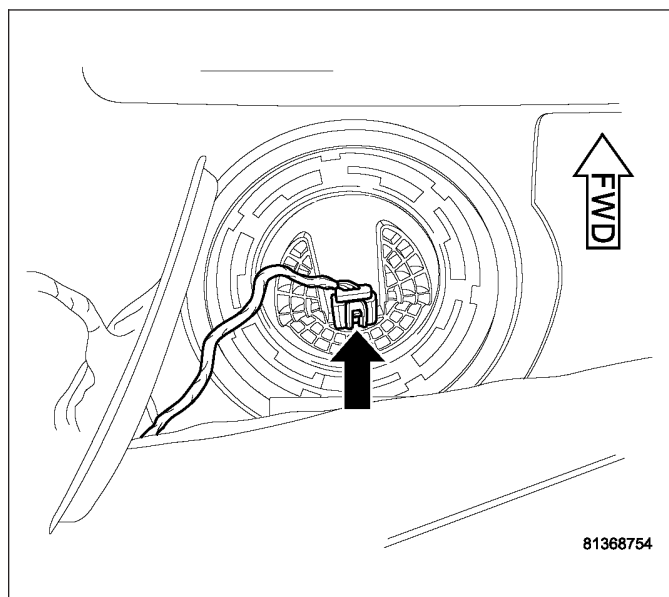




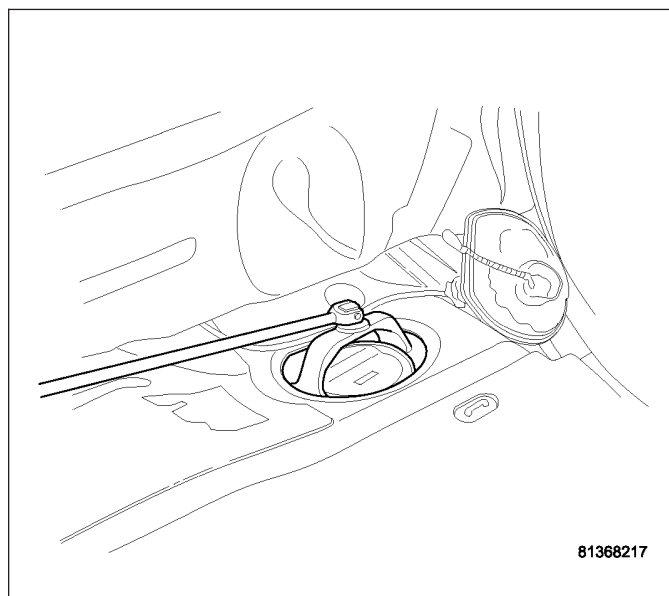
6. Fold back the foam pad covering access cover for modules.



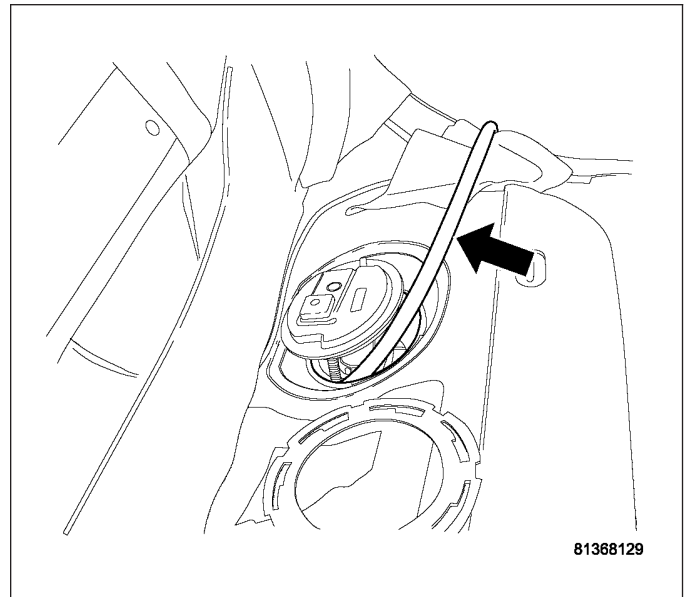
7. Disconnect the electrical connector from left side module.  
8. Mark the module orientation.



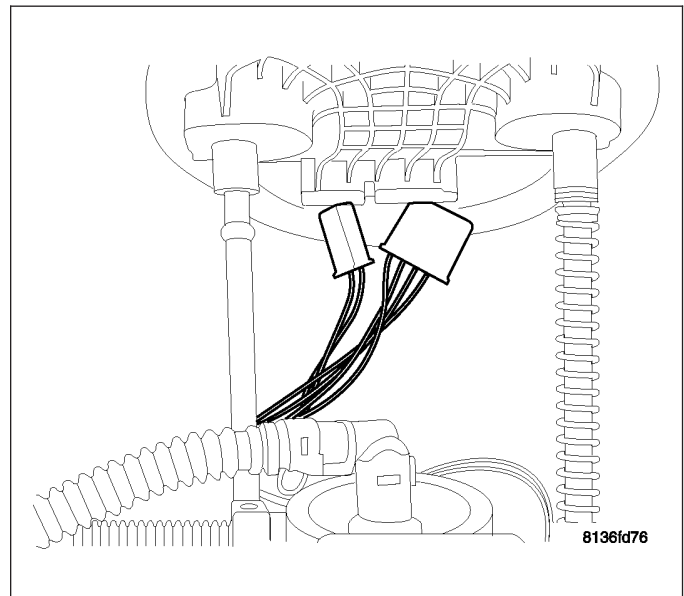
9. Use special tool #9340 to remove left side module lock ring.



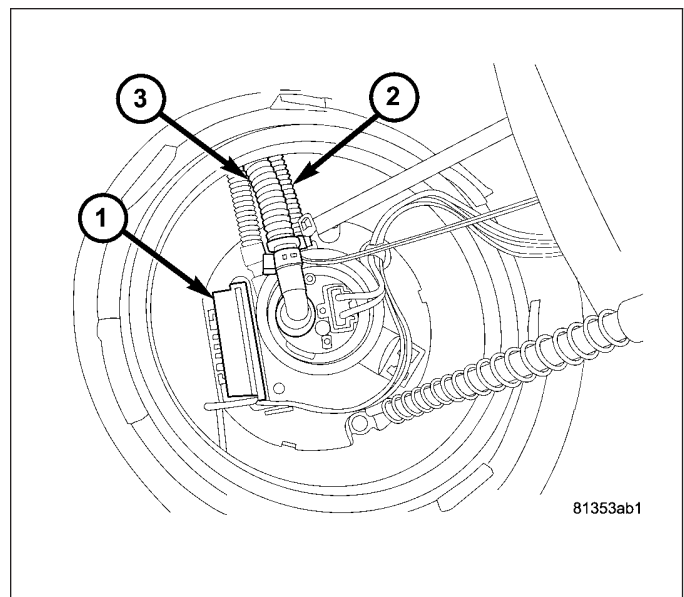
10. Drain fuel from left side of fuel tank. Lift module up enough to push hose into tank and drain. Do not spill fuel in interior of vehicle.



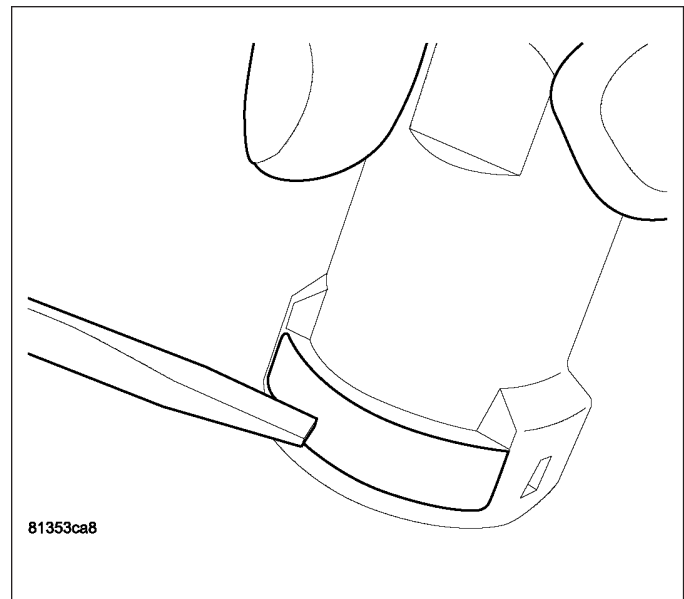
11. Lift module up and out of tank as far as possible.
12. Disconnect the electrical connector from the bottom of the left side module.



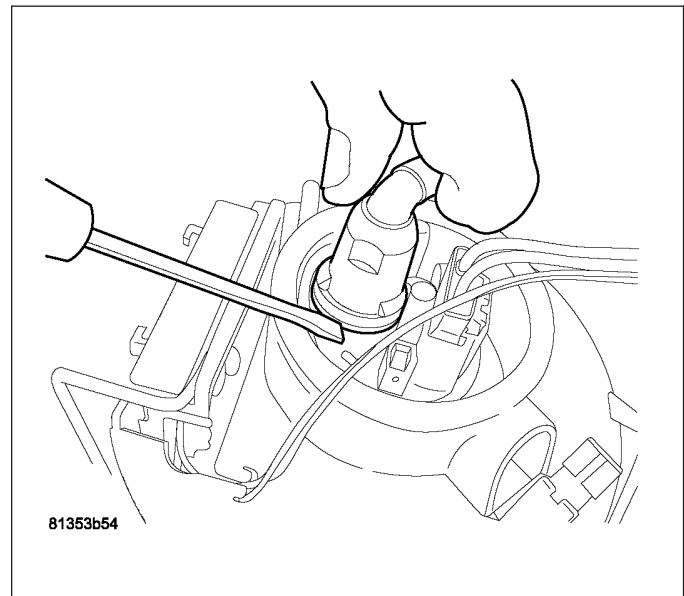
13. Pump module left side.
14. Lift module top half off and tip lower half on its side to drain remaining fuel from the reservoir.



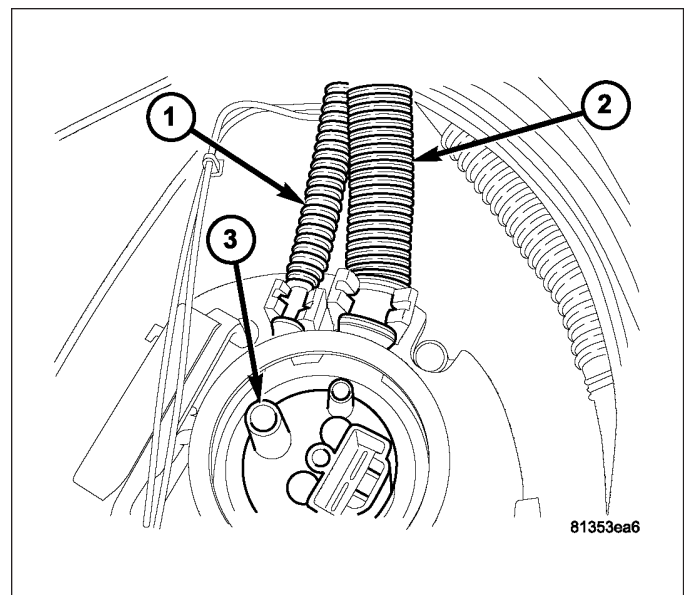
15. Push in on the release tab on the fuel line fitting to release the fuel line from the fuel pump fitting.



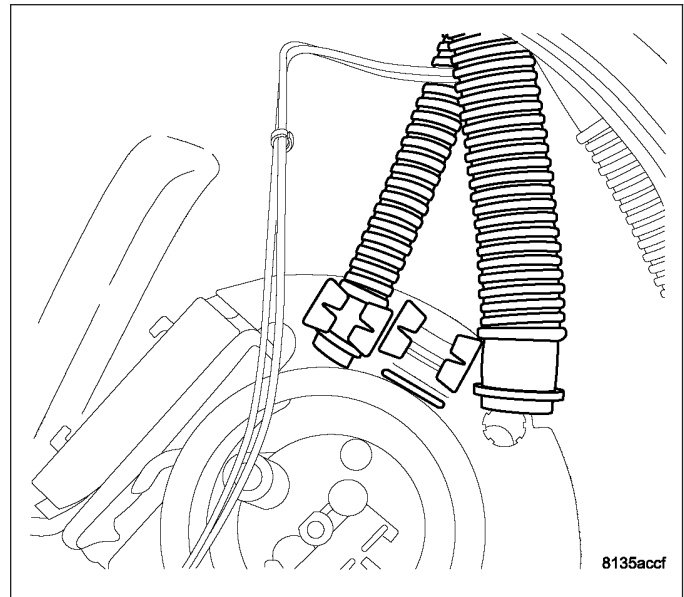
16. Remove the Fuel supply line from the top of the bottom half of the module.



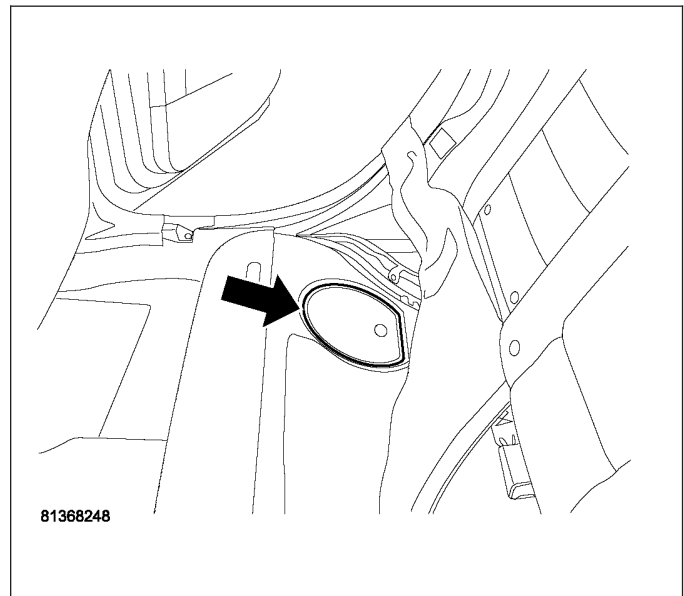
17. Fuel return line (1) and Saipan return line (2). Just pull tube up to release from module.



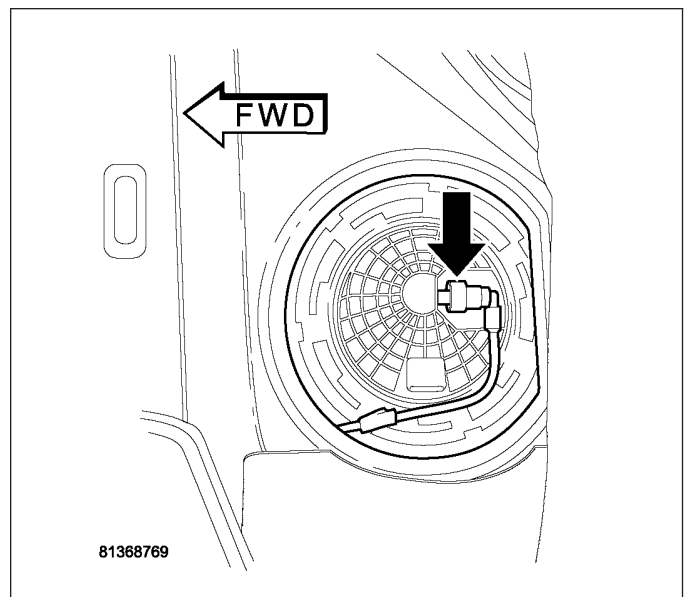
18. Remove the fuel return and Siphon return hoses from the bottom module.



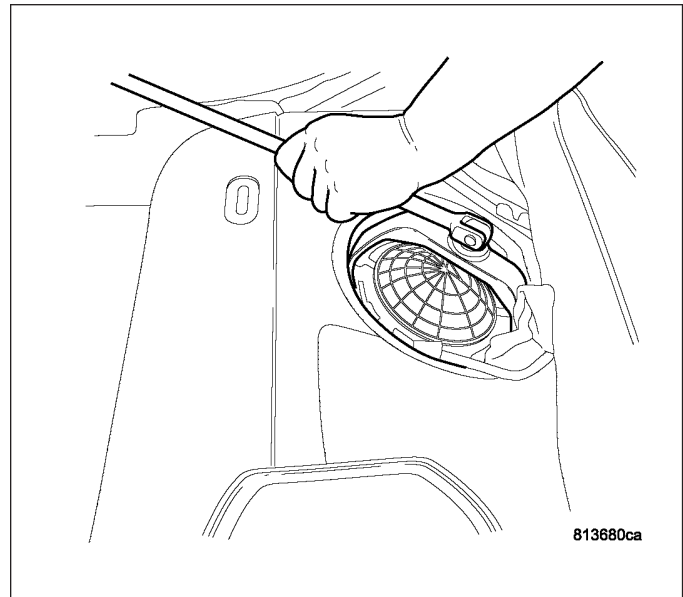
19. Remove plastic access covers from floor pan right side.



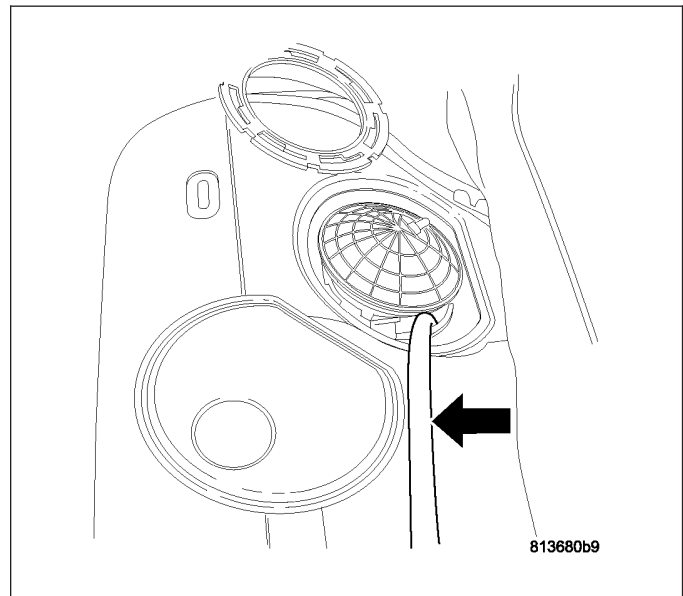
20. Disconnect the fuel supply line from module.
21. Mark the module orientation.



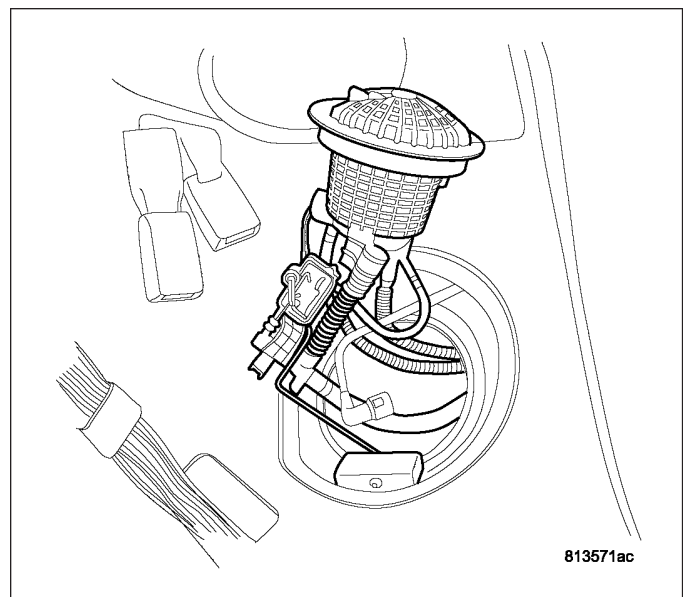
22. Use special tool #9340 to remove right side module lock ring.



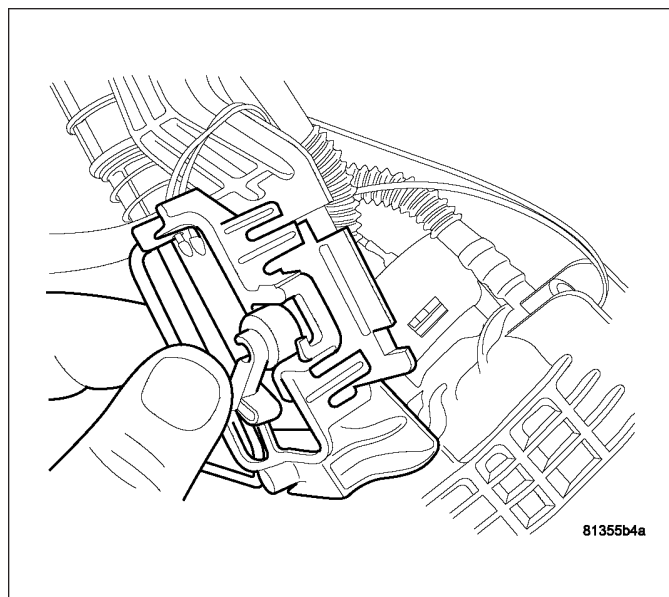
23. Drain fuel from right side of fuel tank. Lift module up enough to push hose into tank and drain. Do not spill fuel in interior of vehicle.



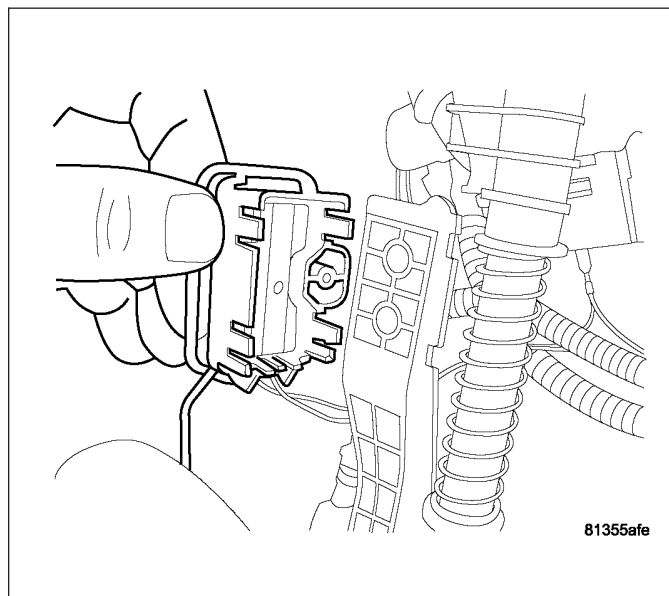
24. Pull module up and out of fuel tank.



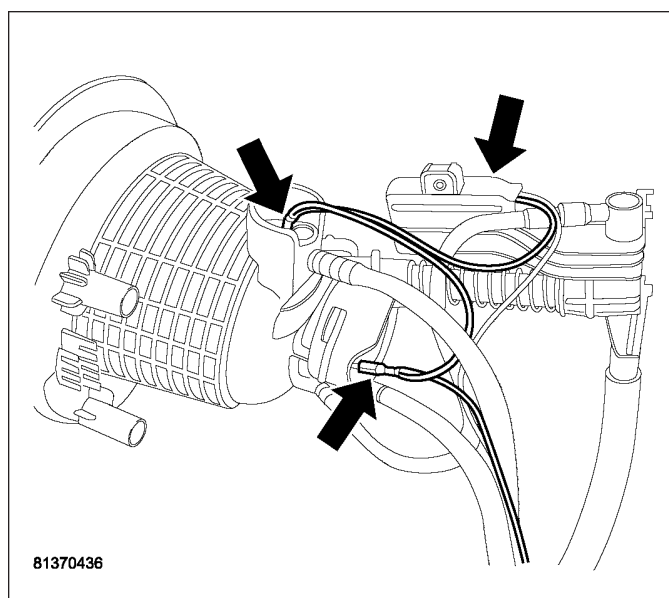
25. Unlatch the fuel level sending card from module.



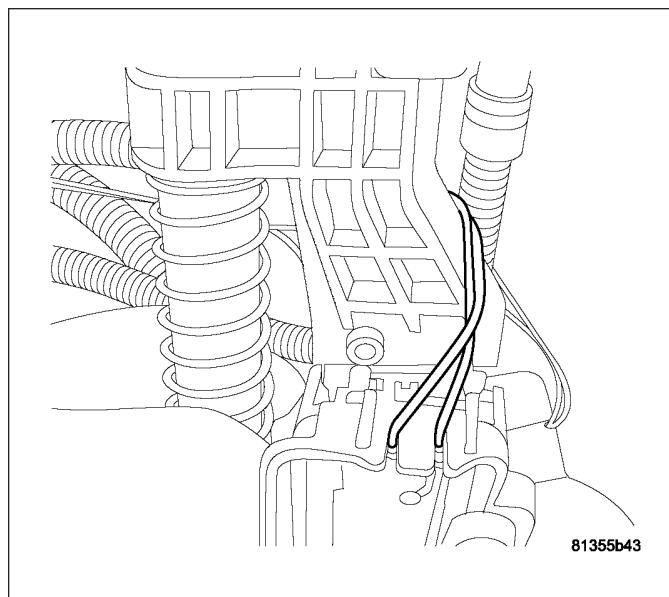
26. Fuel level sending card released.



27. Remove the ground wire from the check valve and fuel pressure regulator.



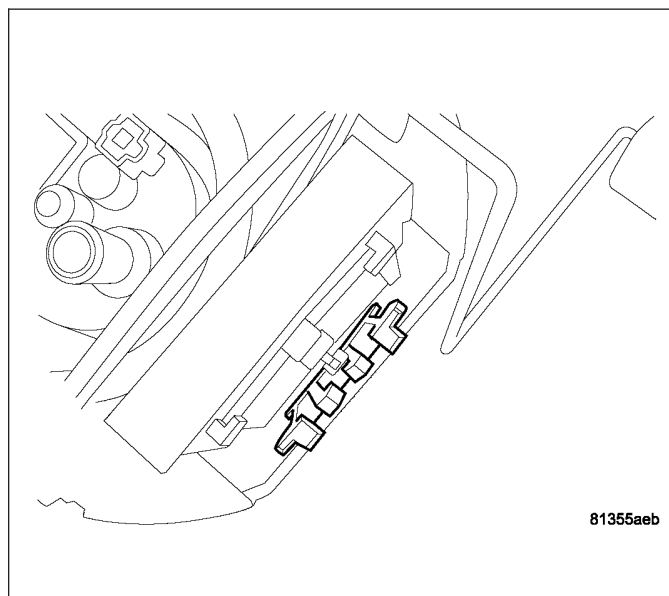
28. Remove fuel level sending card from module.
29. Cut tie straps from hoses to remove wiring harness for fuel level card.



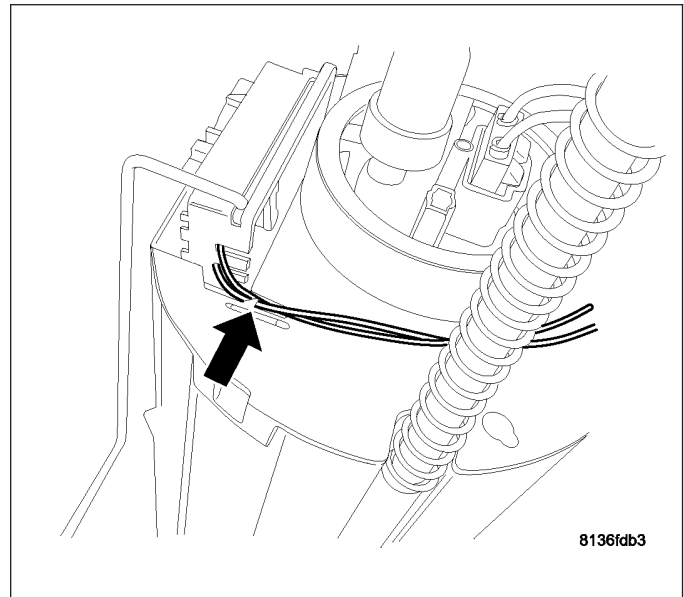
## INSTALLATION

### LEFT SIDE MODULE

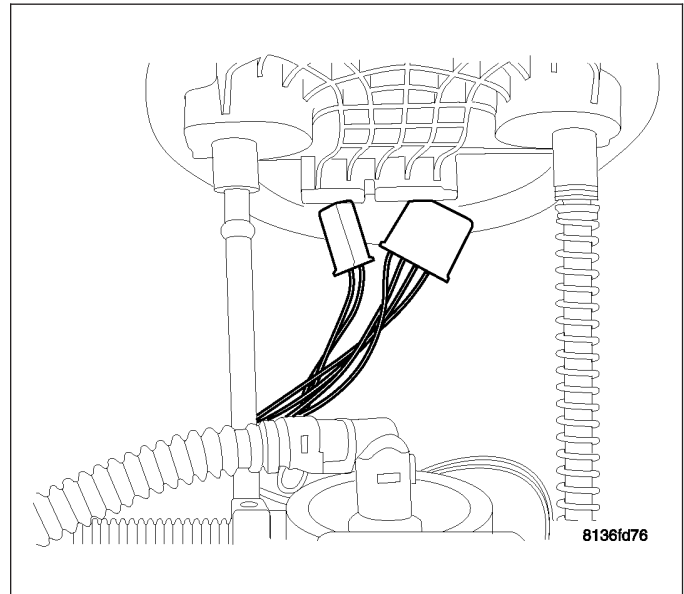
1. Install level sending card, make sure that the locking tabs are locked on the card.



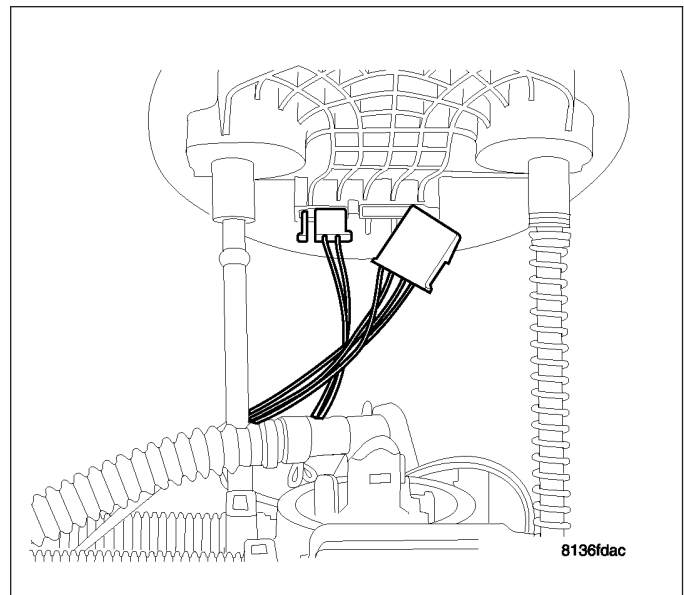
2. Route wires in the proper location.



3. Install module top to module bottom.

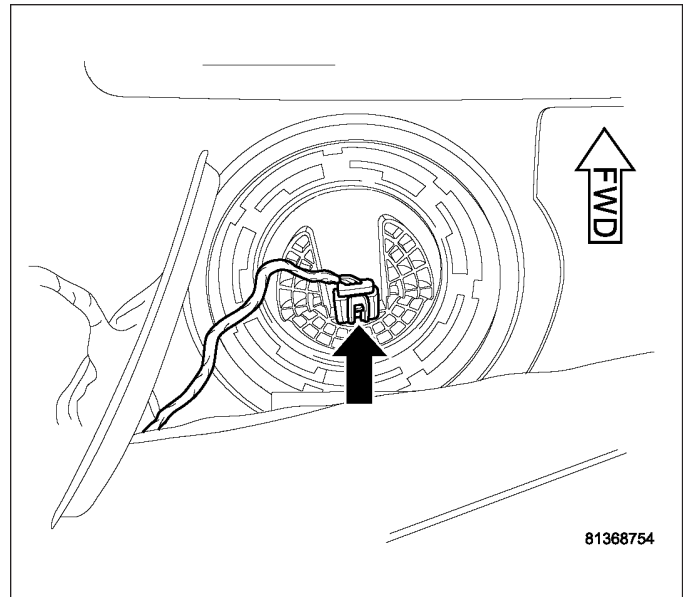


4. Connect the electrical connectors for right side fuel level sending card, left side module card and fuel pump.

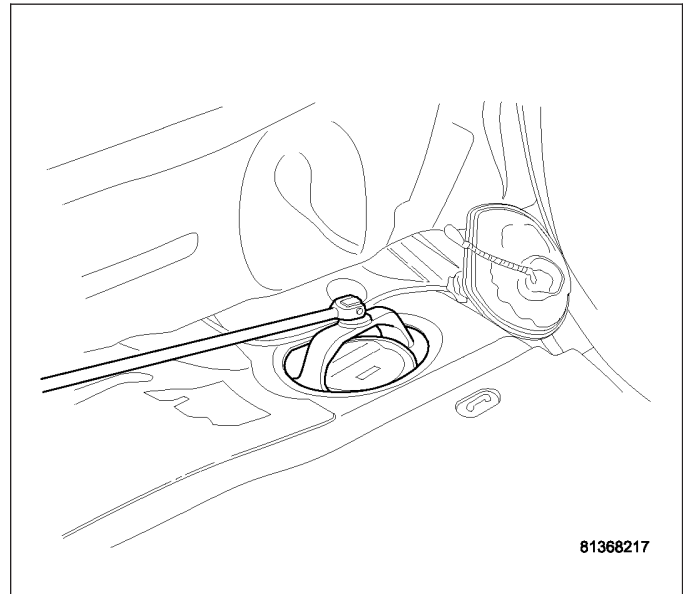




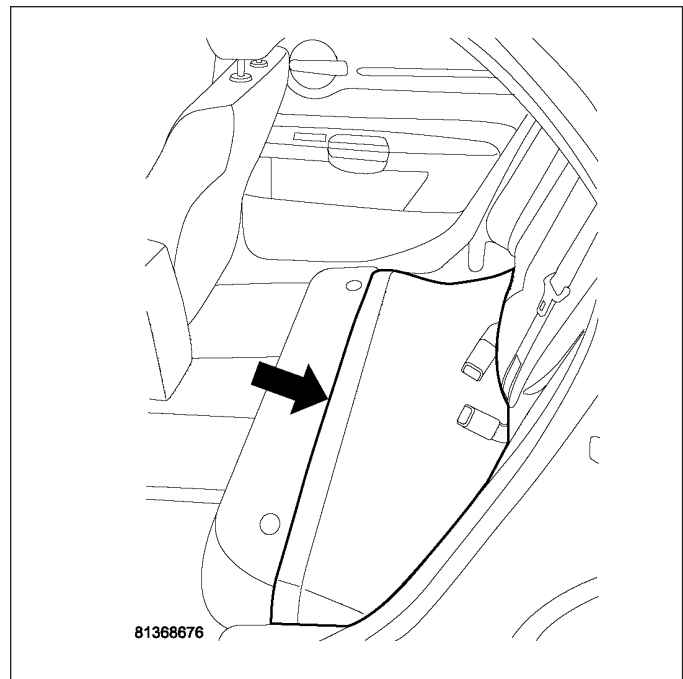
5. Install module and align marks on the module for proper orientation.



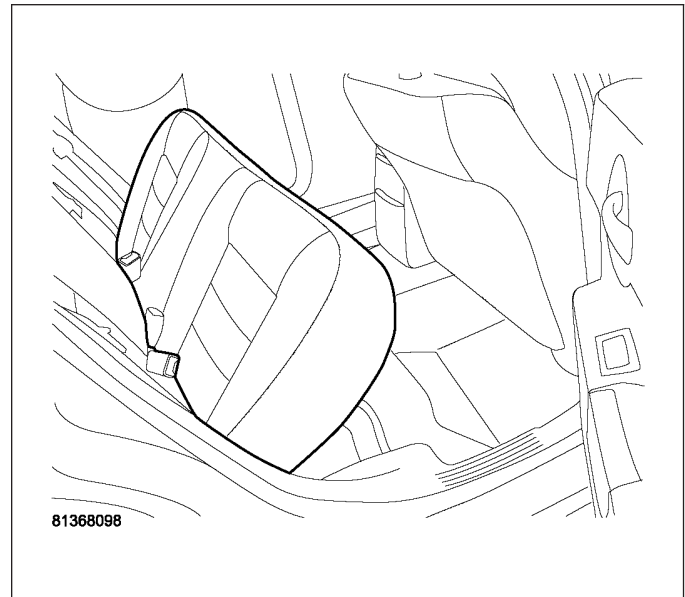
6. Install module lock-ring.
7. Use special tool #9340 to tighten left side module lock ring.
8. Connect the electrical connector to left side module and install plastic access cover.



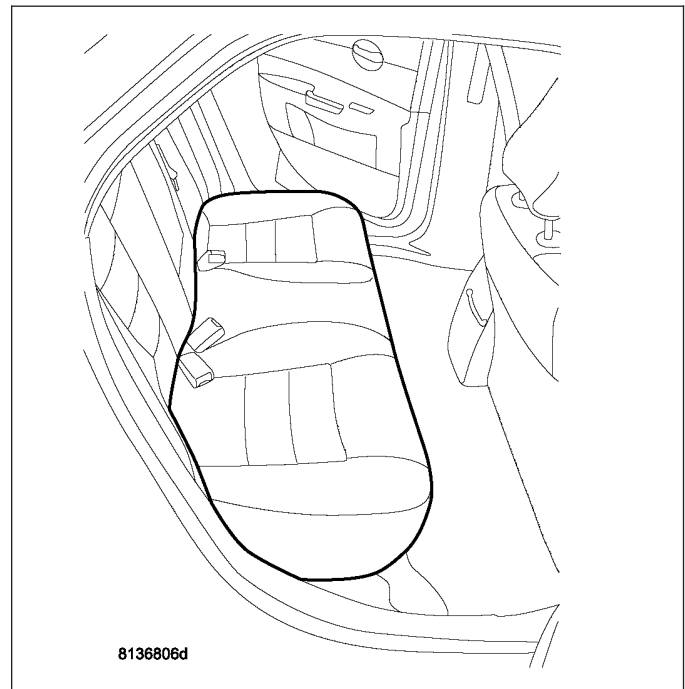
9. Fold the foam pad covering access cover for modules back into place.



10. Install rear lower seat cushion



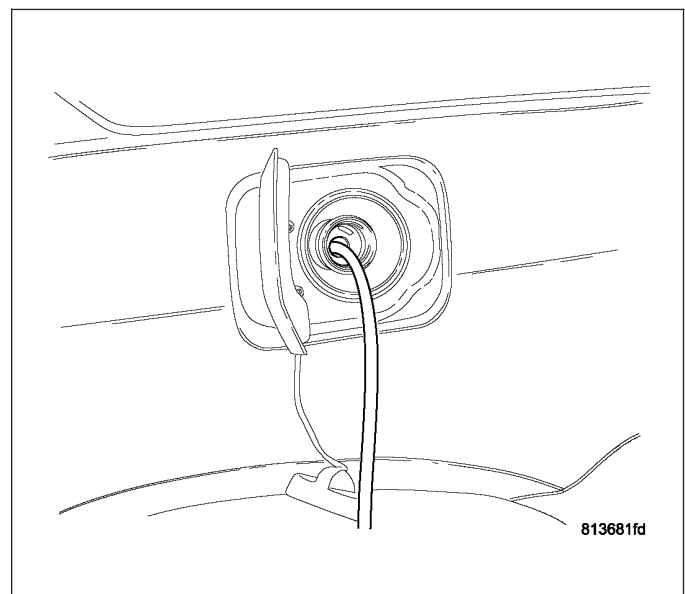
11. Rear lower seat cushion installed.



12. Fill fuel tank.

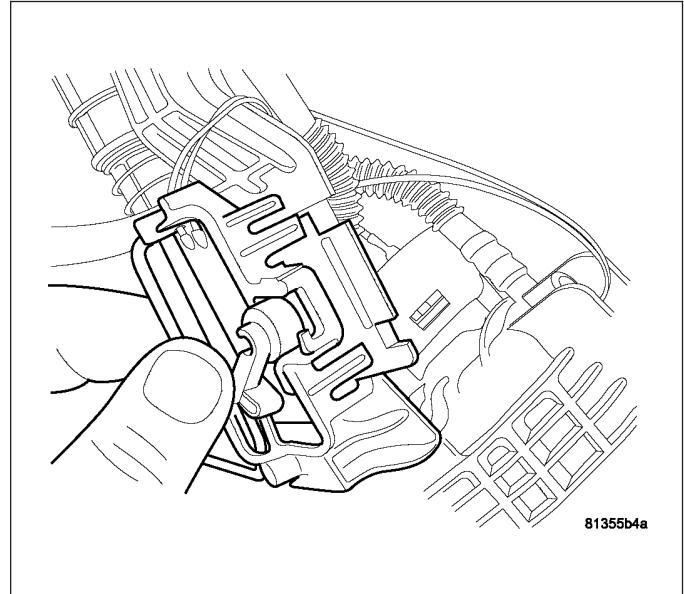
13. Connect negative battery cable.

14. Fill fuel tank. Use the scan tool to pressurize the fuel system. Check for leaks.

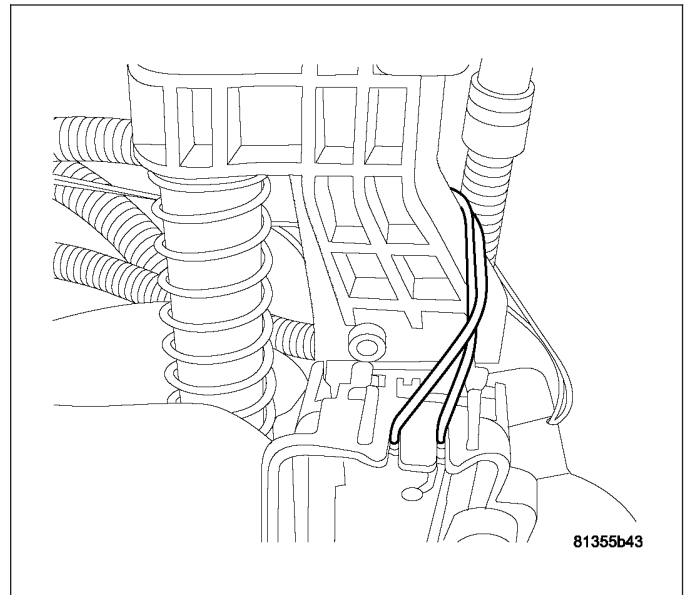


**RIGHT SIDE MODULE**

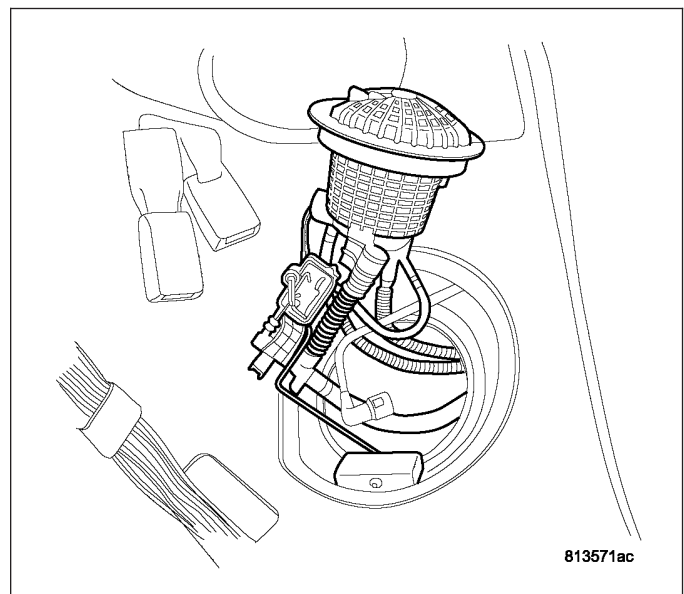
1. Install level sending card, make sure that the locking tabs are locked on the card.



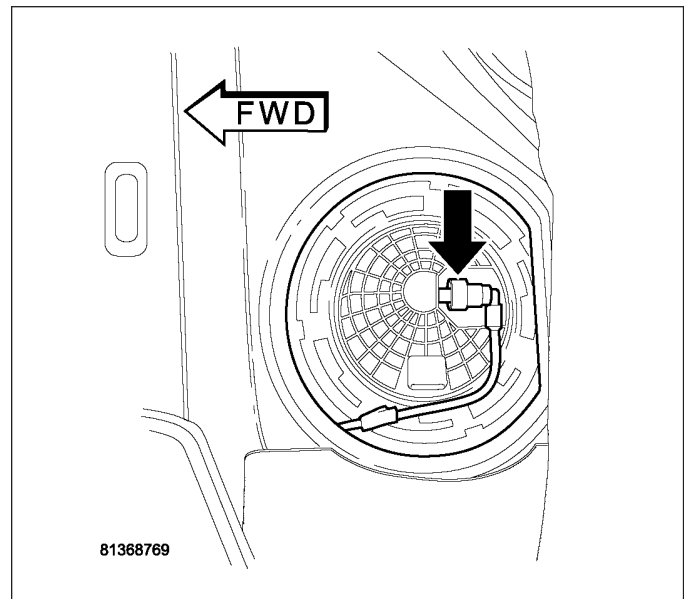
2. Route wires in the proper location.
3. Tie strap the wires harness to the hoses.



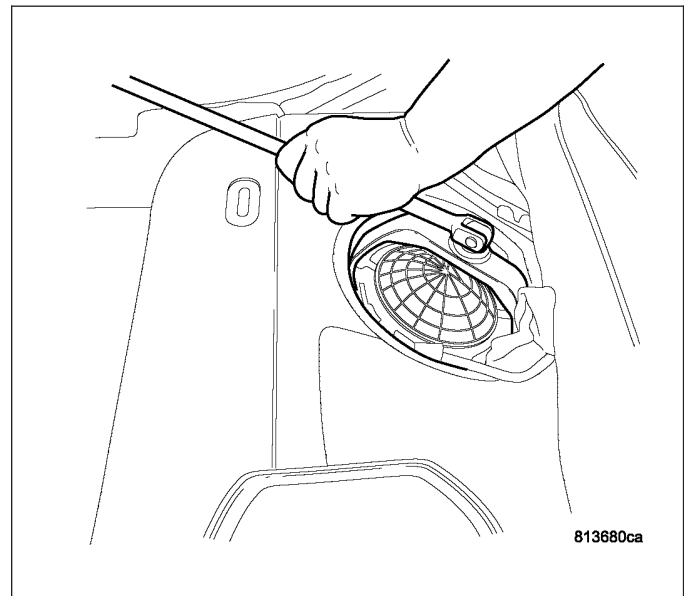
4. Feed hoses and wiring harness into fuel tank and over the center hump in tank.



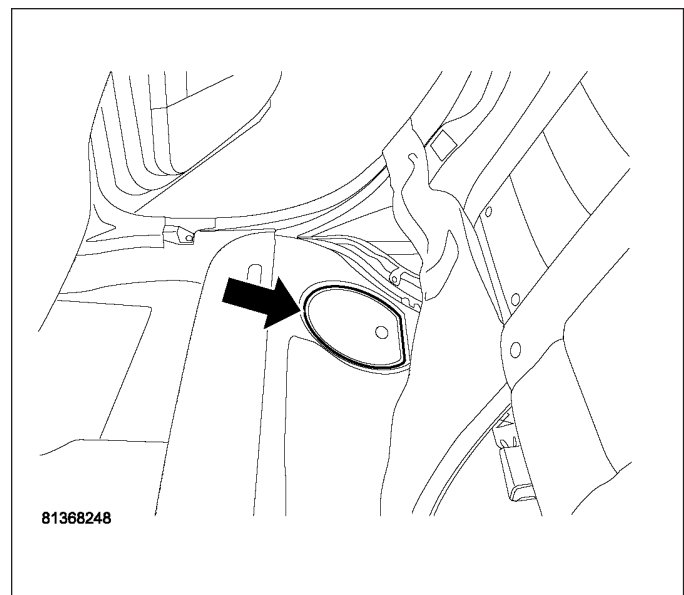
5. Install module and align marks on the module for proper orientation.



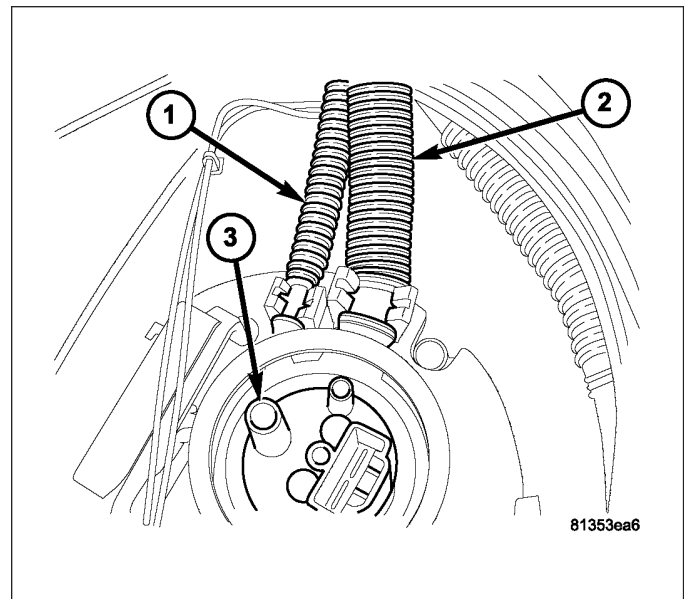
6. Install module lock-ring.  
7. Use special tool #9340 to tighten right side module lock ring.  
8. Connect the fuel supply line to module.



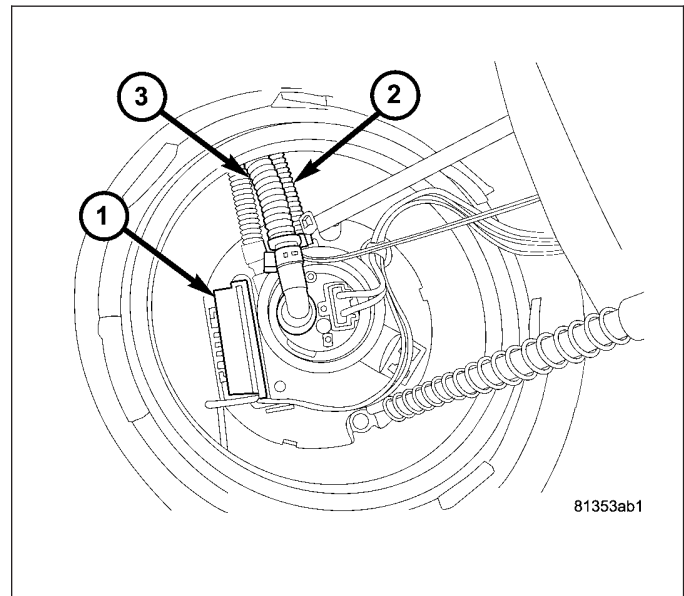
9. Install plastic access covers to floor pan right side.



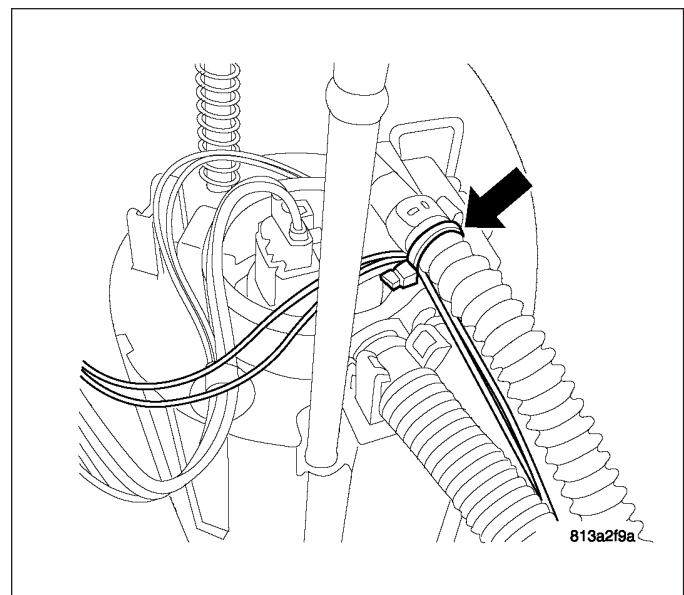
10. Install the fuel return hoses to module.
11. Install fuel supply line to module.



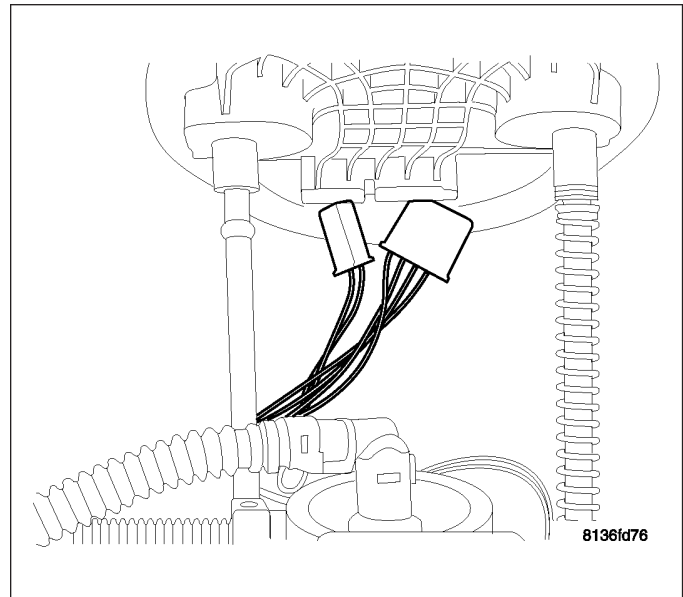
12. Make sure that wires are routed properly.



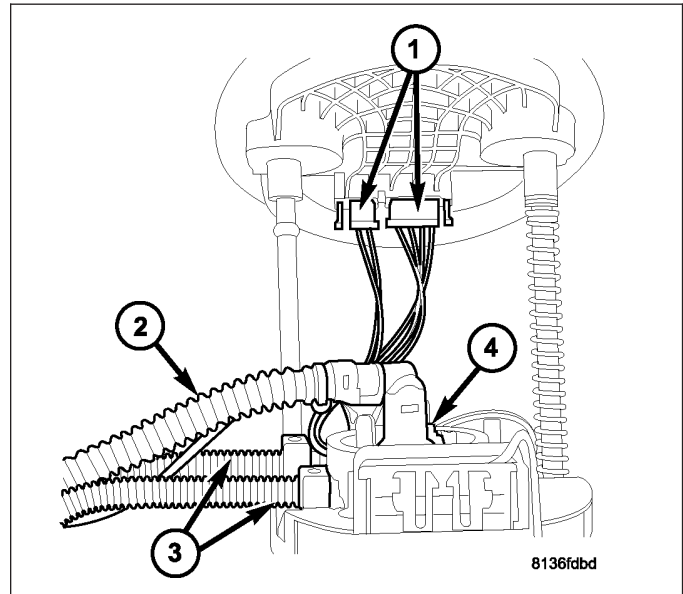
13. Make sure that the level sending card wire is tie strapped to the fuel supply line at the module.



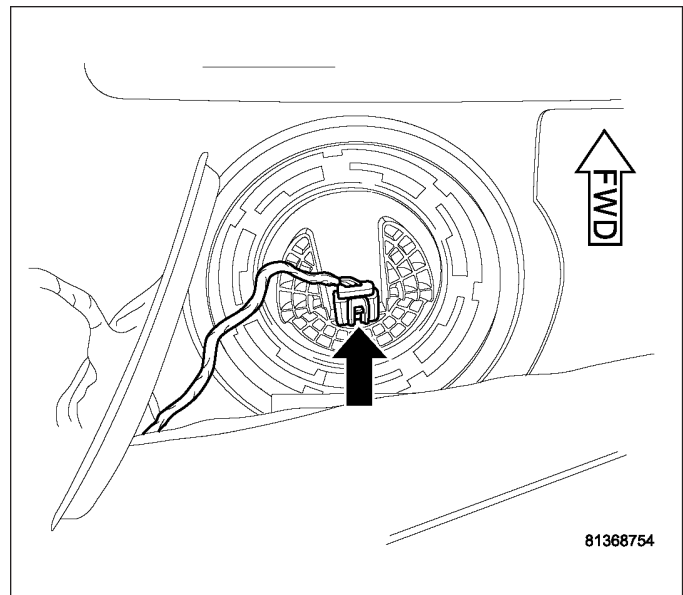
14. Install left side module top to module bottom.



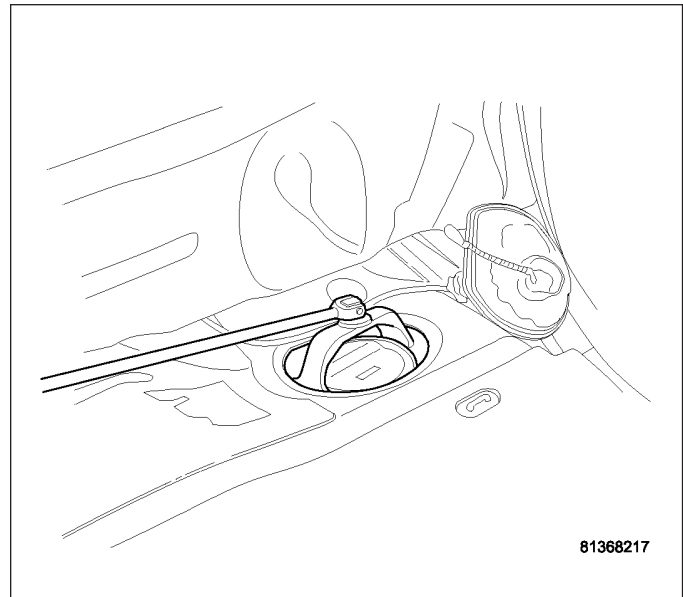
15. Connect the electrical connectors for right side fuel level sending card, left side module card. Make sure that wires are routed properly.



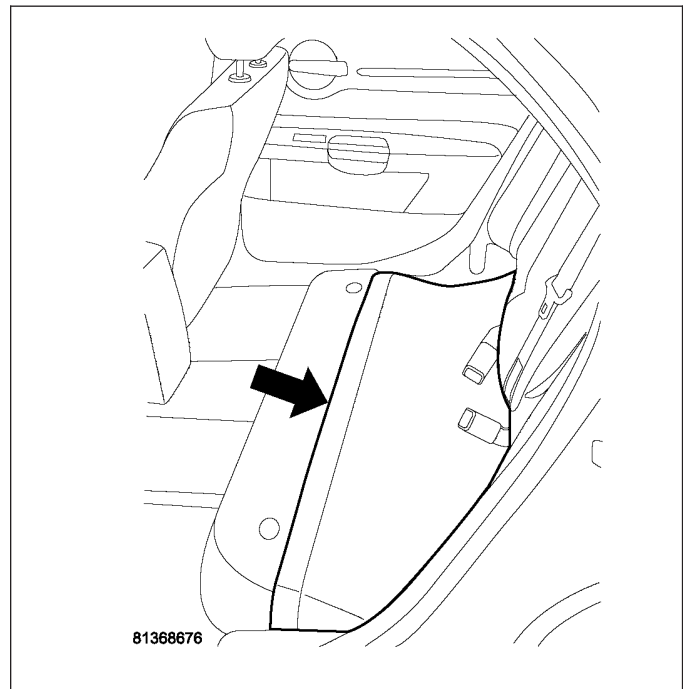
16. Install module and align marks on the module for proper orientation.



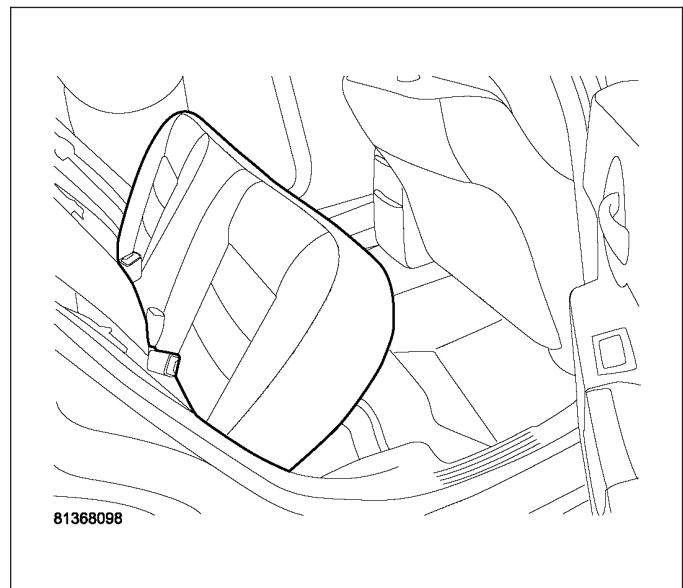
17. Install module lock-ring.
18. Use special tool #9340 to tighten left side module lock ring.
19. Connect the electrical connector to left side module and install plastic access cover.



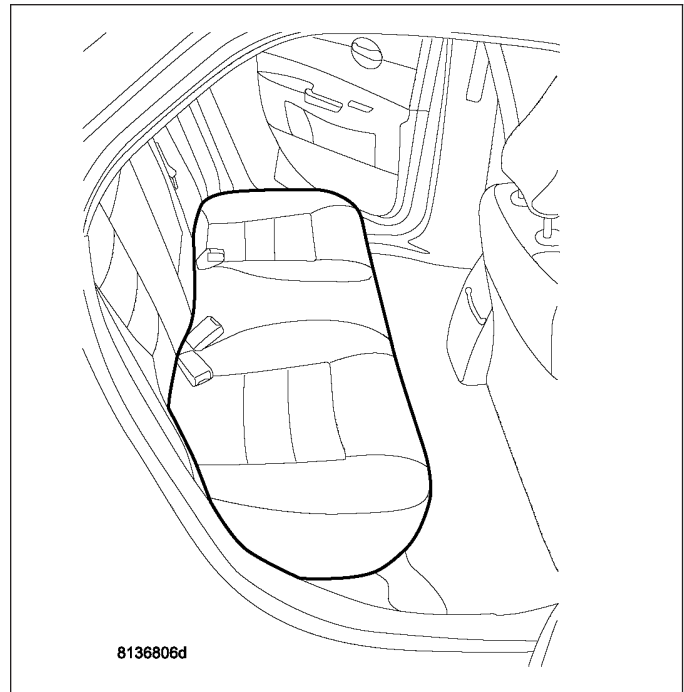
20. Fold the foam pad covering access cover for modules back into place.



21. Install rear lower seat cushion



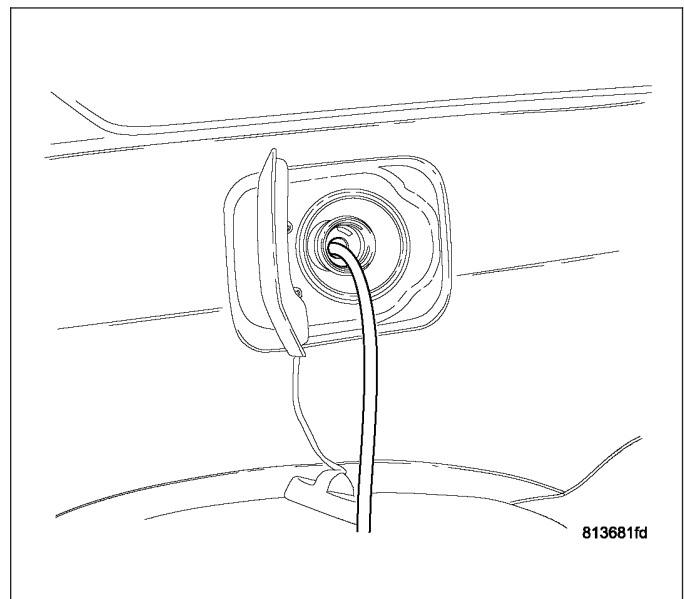
22. Rear lower seat cushion installed.



23. Fill fuel tank.

24. Connect negative battery cable.

25. Fill fuel tank. Use the scan tool to pressurize the fuel system. Check for leaks.



## REGULATOR-FUEL PRESSURE

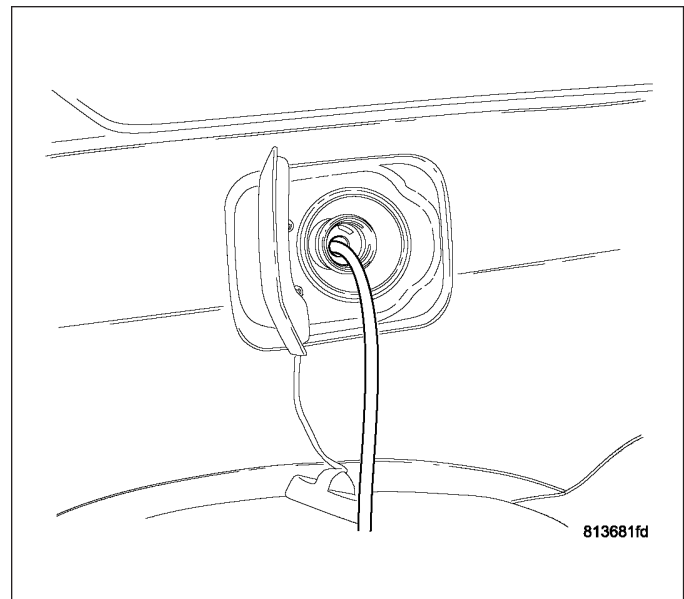
### REMOVAL

1. Release the fuel pressure, refer to the Fuel Pressure Release Procedure in this section.
2. Disconnect negative battery cable.

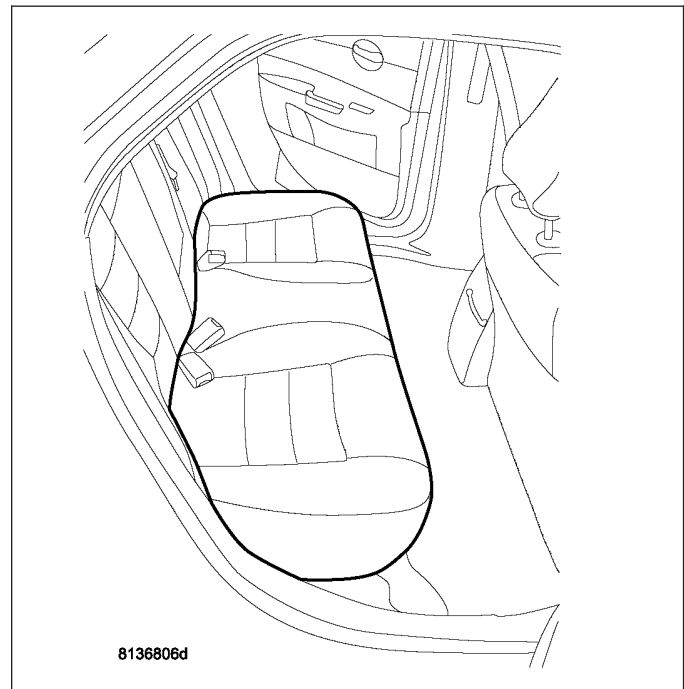
**Note:** The fuel level of the vehicle must be below 5/8 of a tank before you remove the module lock-rings. If it is above that you can spill fuel in the vehicle.



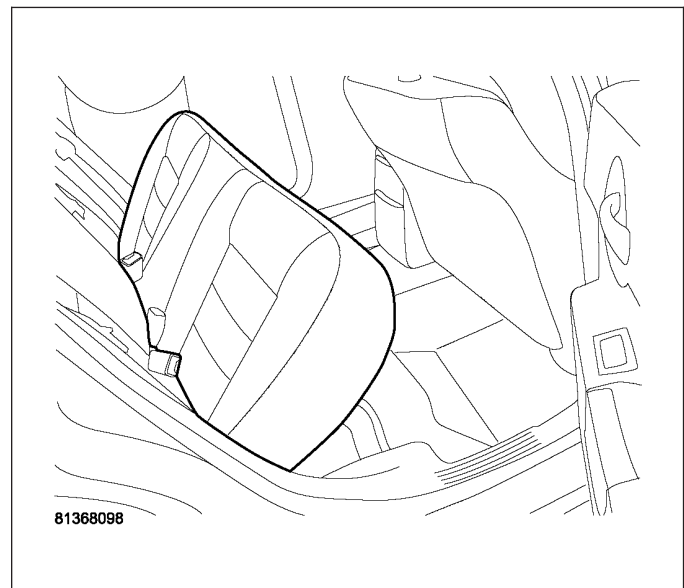
3. Drain partial fuel from fuel tank through the filler tube. Use a hard nylon tube, with a 30° cut on the end, to push the check valve open to drain fuel from tank.



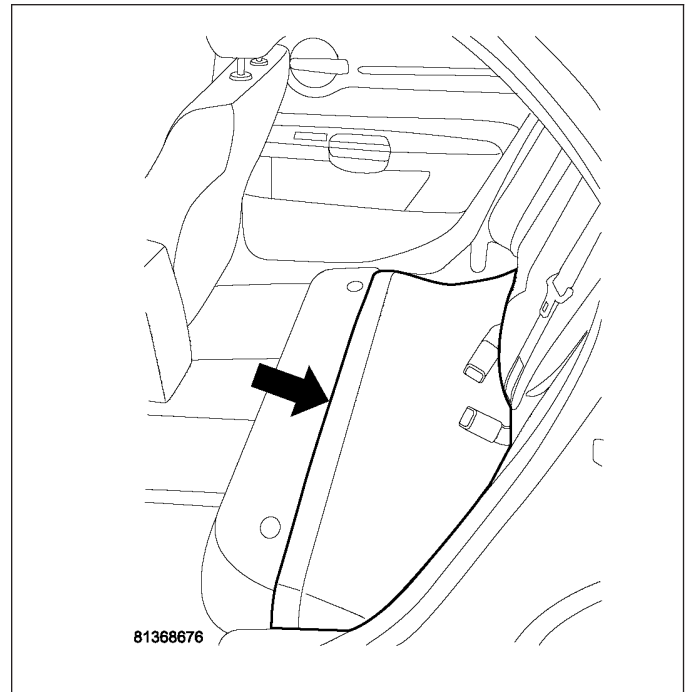
4. Remove the rear lower seat cushion.



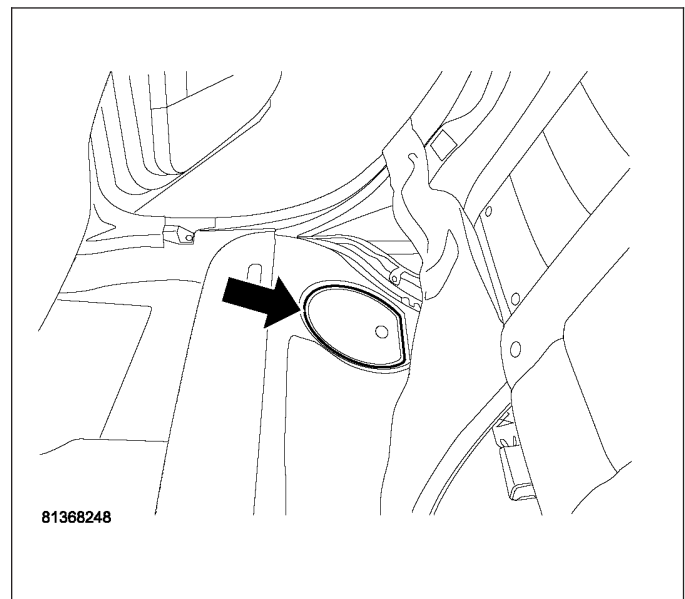
5. Push seat back and up to remove seat cushion.



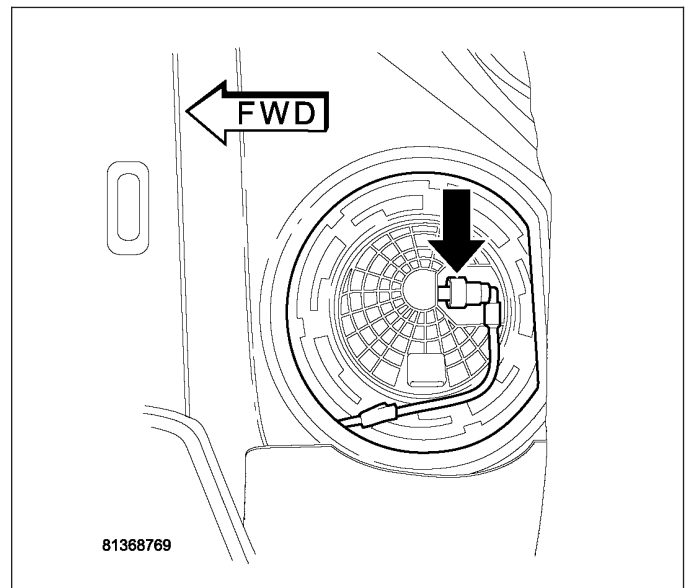
6. Fold back the foam pad covering access cover for modules.



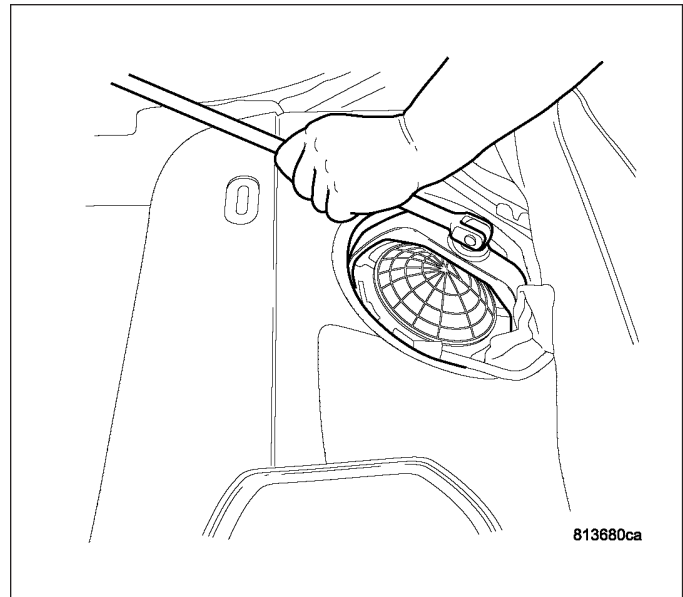
7. Remove plastic access covers from floor pan right side.



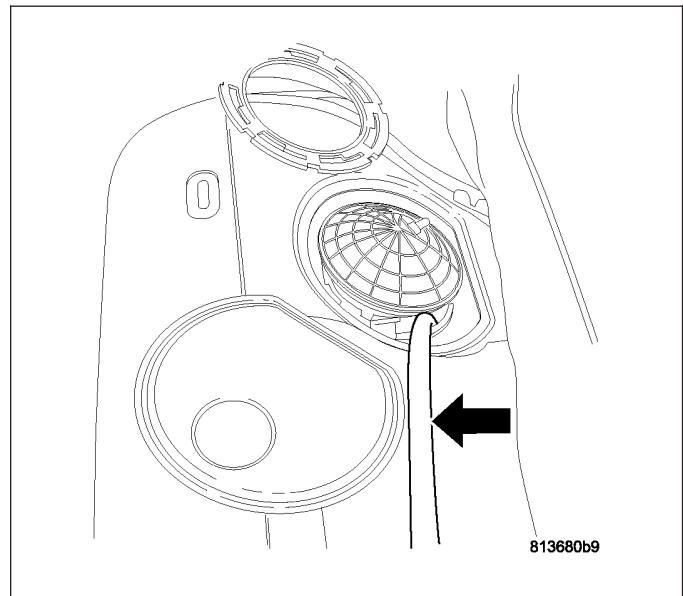
8. Disconnect the fuel supply line from module.
9. Mark the module orientation.



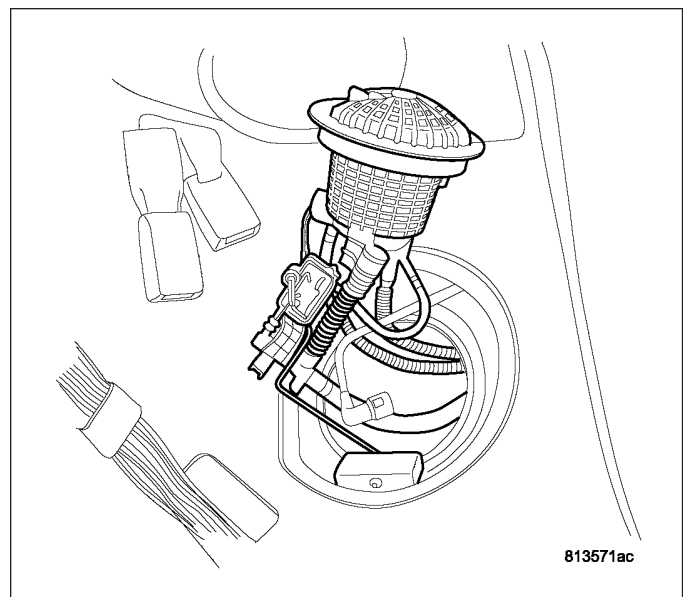
10. Use special tool #9340 to remove right side module lock ring.



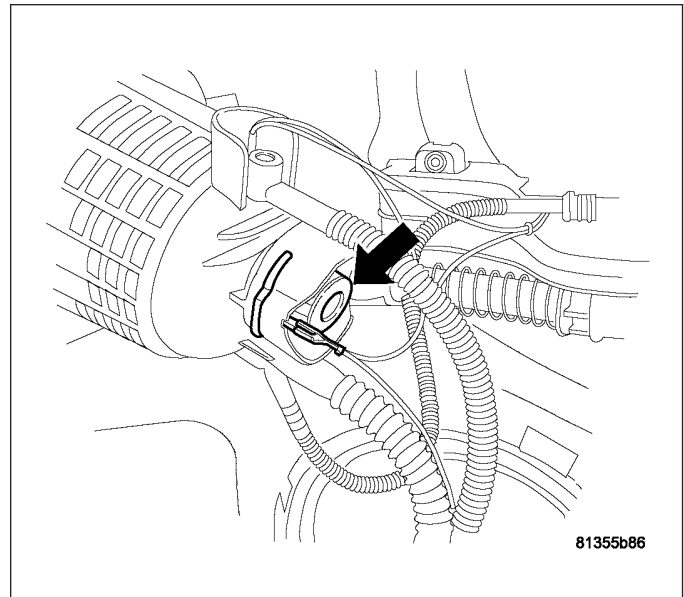
11. Drain fuel from right side of fuel tank. Lift module up enough to push hose into tank and drain. Do not spill fuel in interior of vehicle.



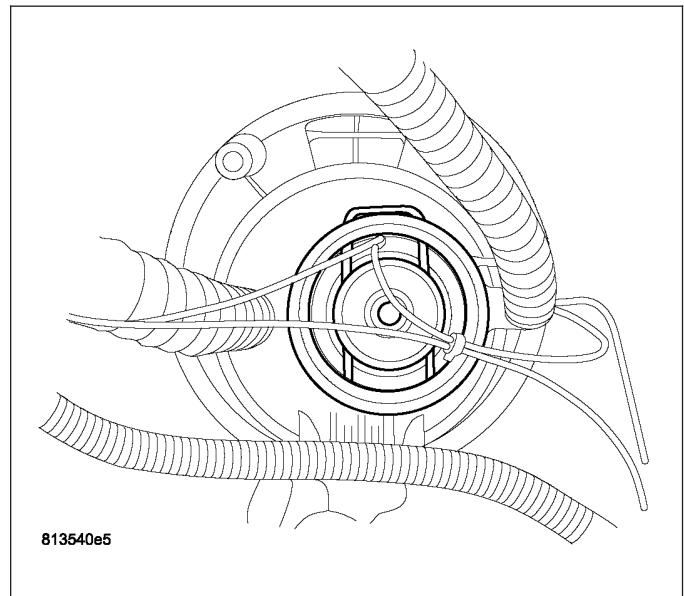
12. Pull module up and out of fuel tank.



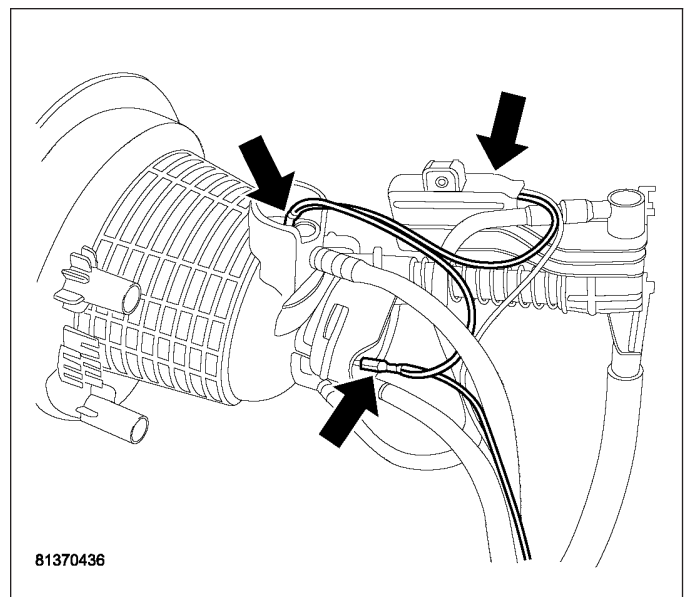
13. Fuel Pressure regulator location.



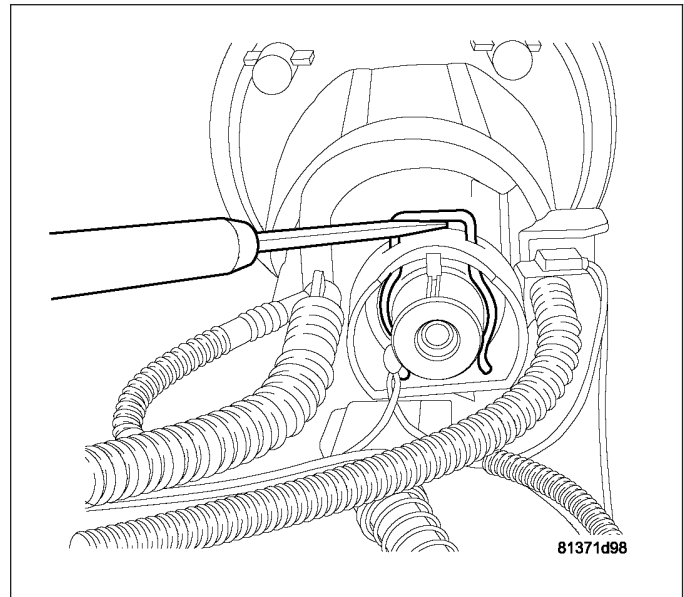
14. Note location of ground wire tab location.



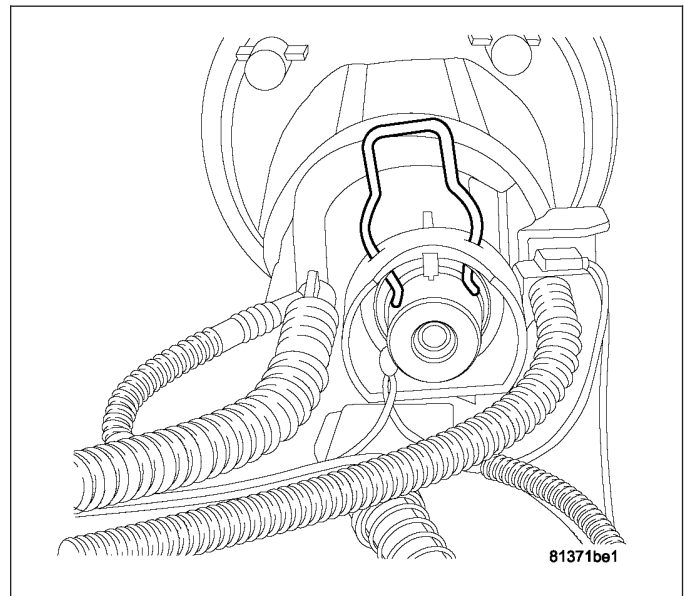
15. Remove ground wire.



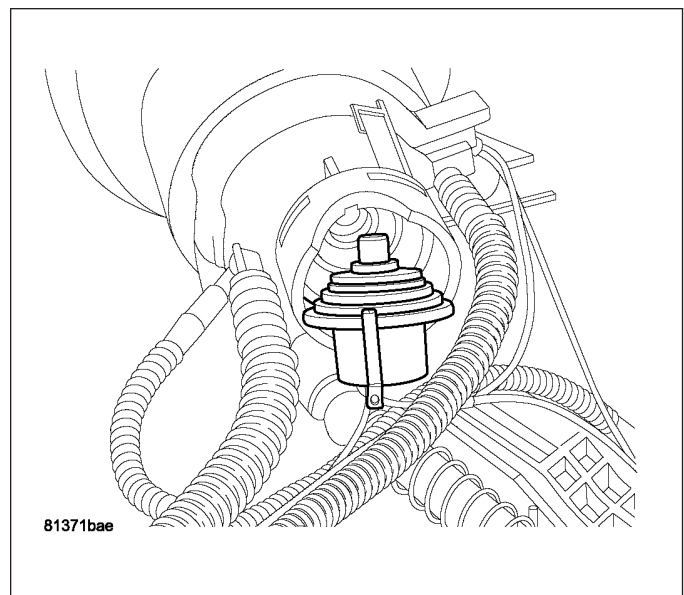
16. Use a screwdriver and pry up on retaining clip.



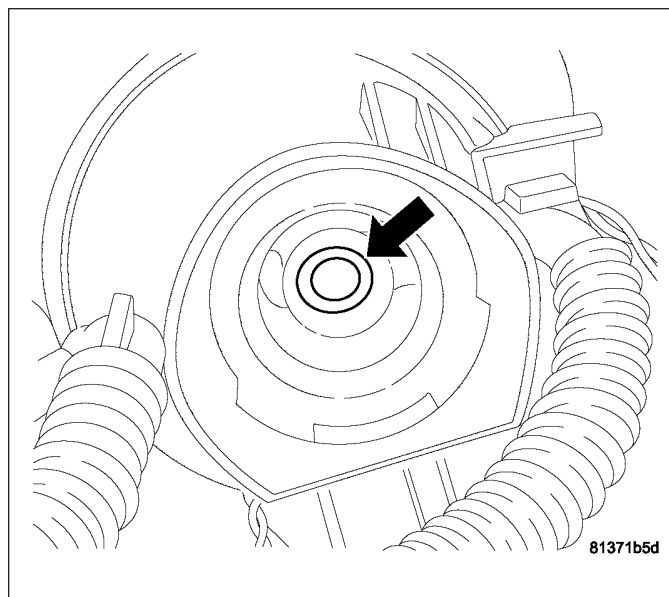
17. Clip in the off position.



18. Fuel pressure regulator removed.

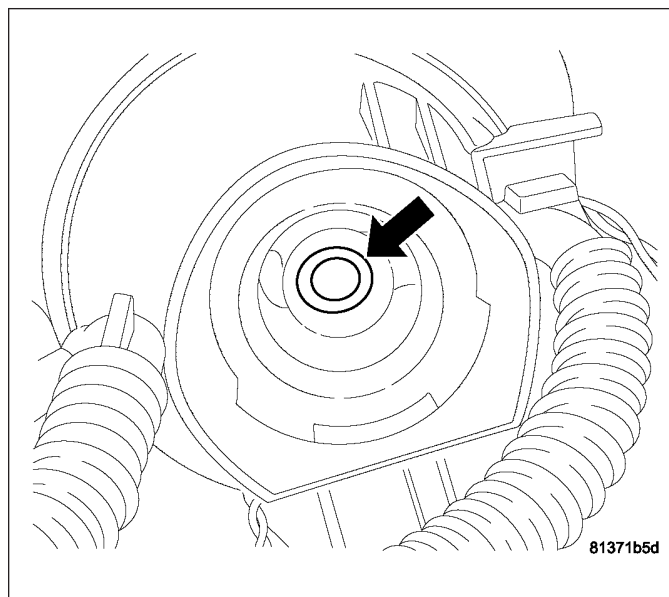


19. Remove o-ring from module.

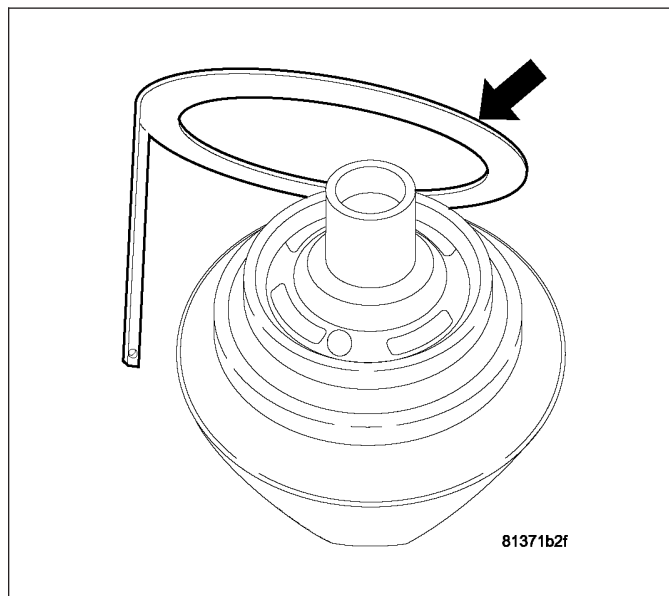


## INSTALLATION

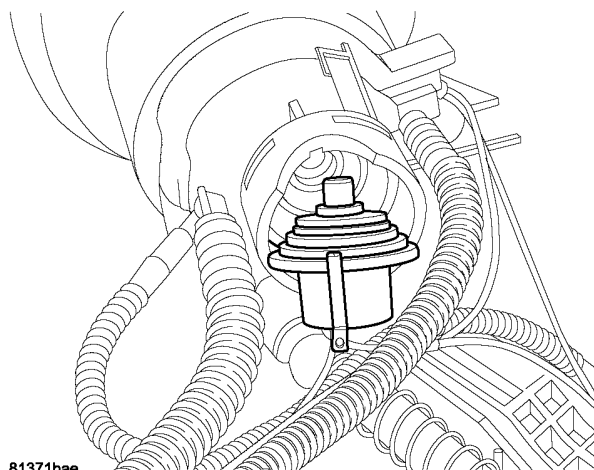
1. Install o-ring.



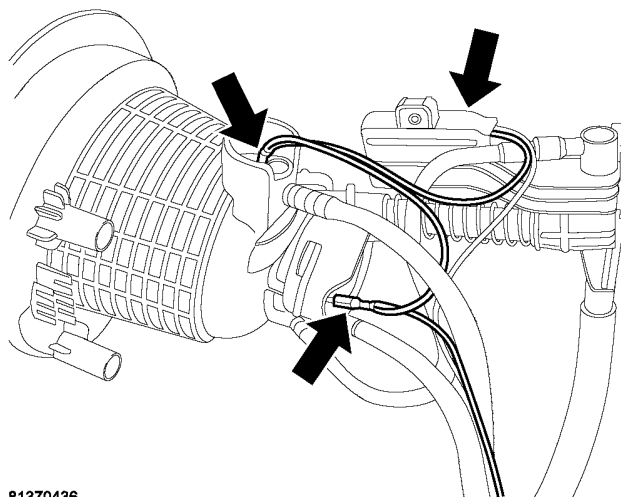
2. Install ground ring.



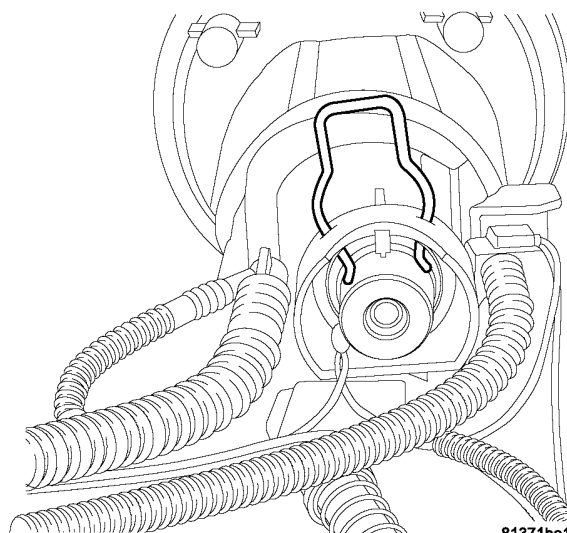
3. Install Fuel Regulator and ground ring. Note location of ground ring.



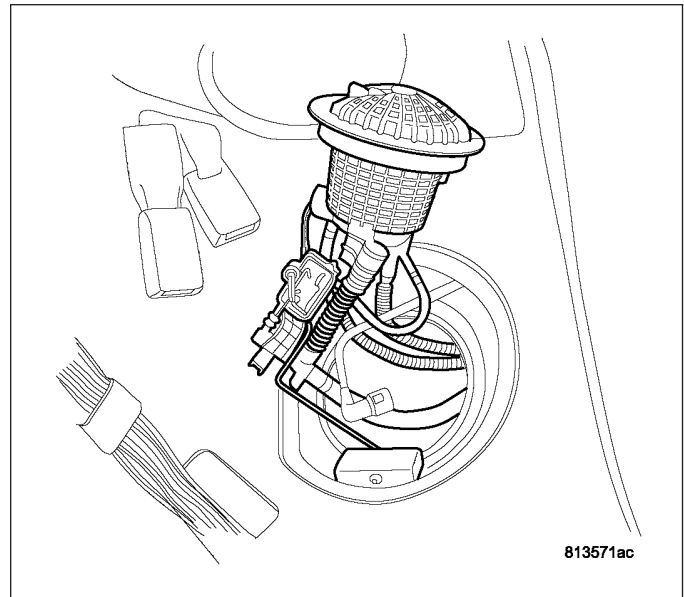
4. Install ground wire.



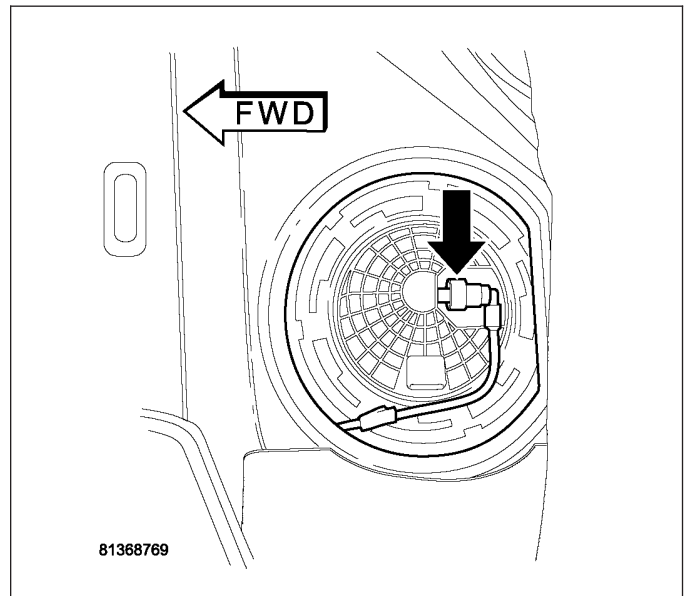
5. Install Fuel Pressure Regulator retaining clip.



6. Install module into tank.



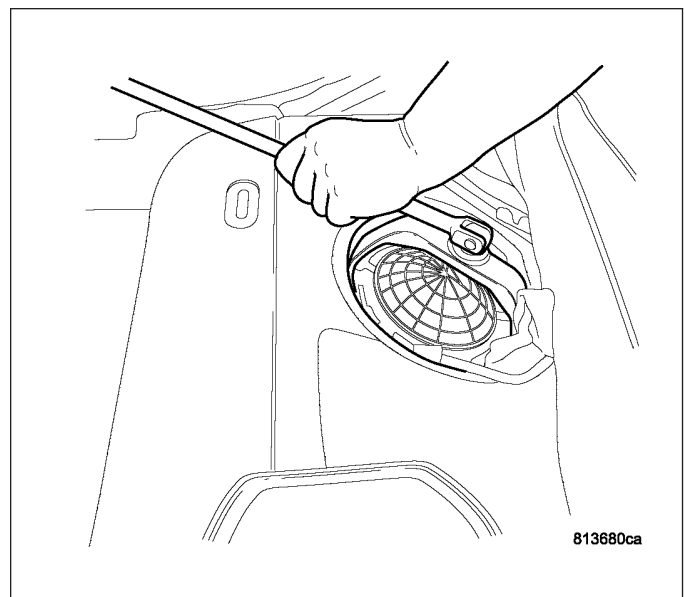
7. Align marks on the module for proper orientation.



8. Install module lock-ring.

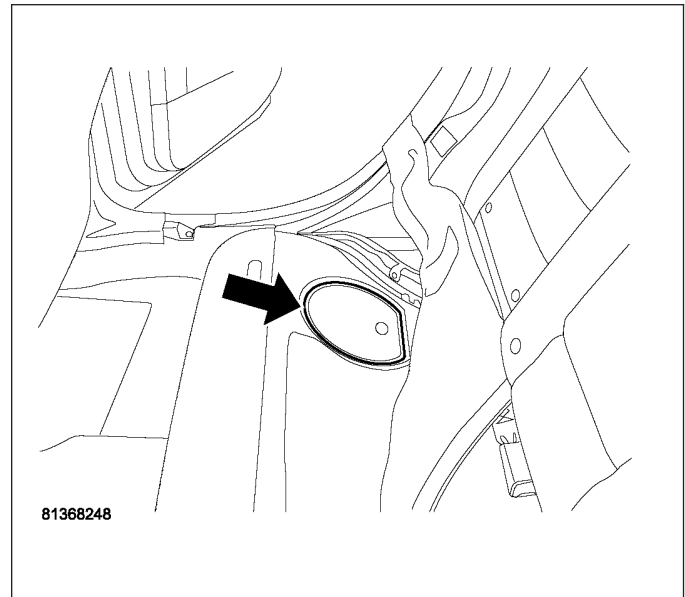
9. Use special tool #9340 to tighten right side module lock ring.

10. Connect the fuel supply line to module.

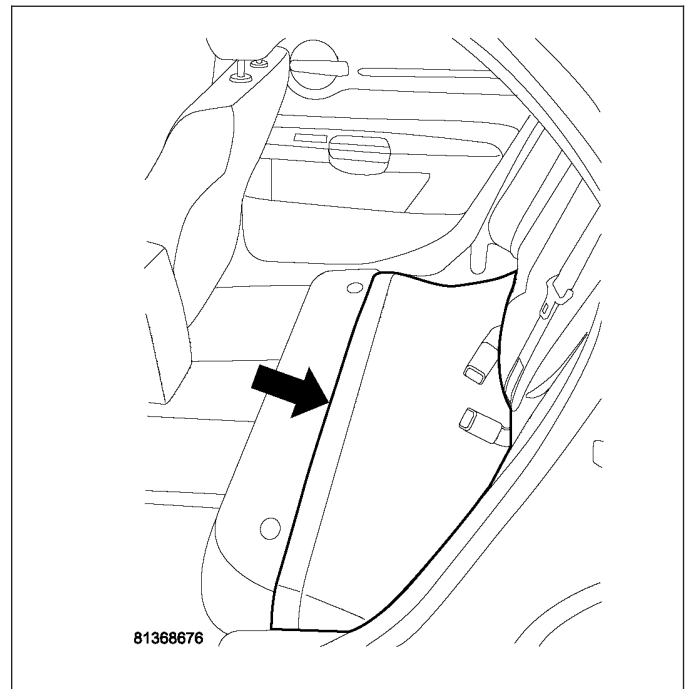




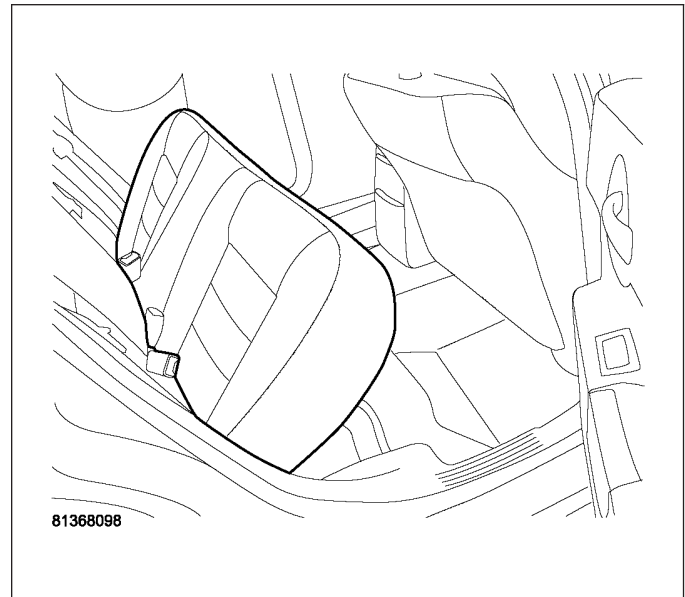
11. Install plastic access covers to floor pan right side.



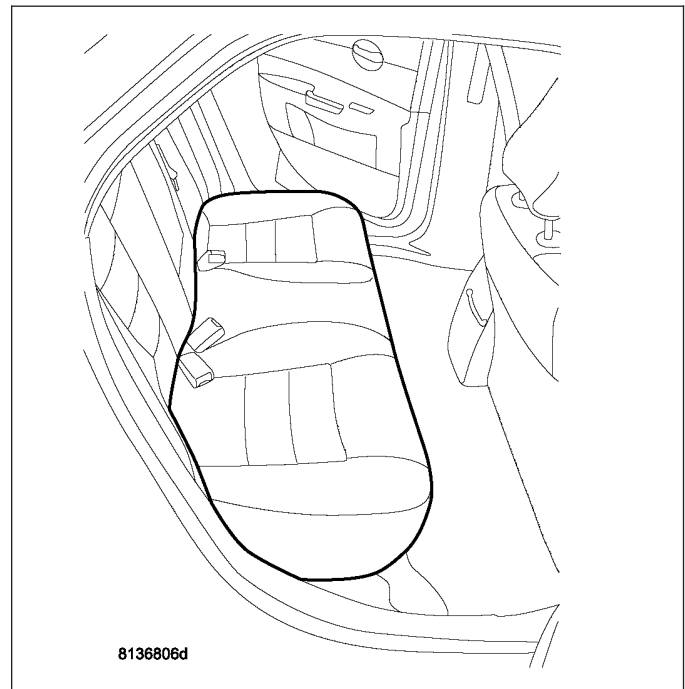
12. Fold the foam pad covering access cover for modules back into place.



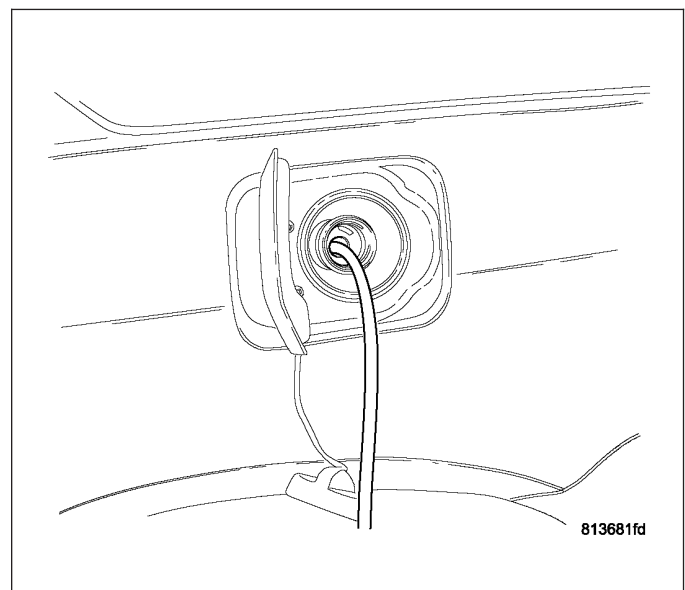
13. Install rear lower seat cushion



14. Rear lower seat cushion installed.



15. Fill fuel tank.
16. Connect negative battery cable.
17. Fill fuel tank. Use the scan tool to pressurize the fuel system. Check for leaks.



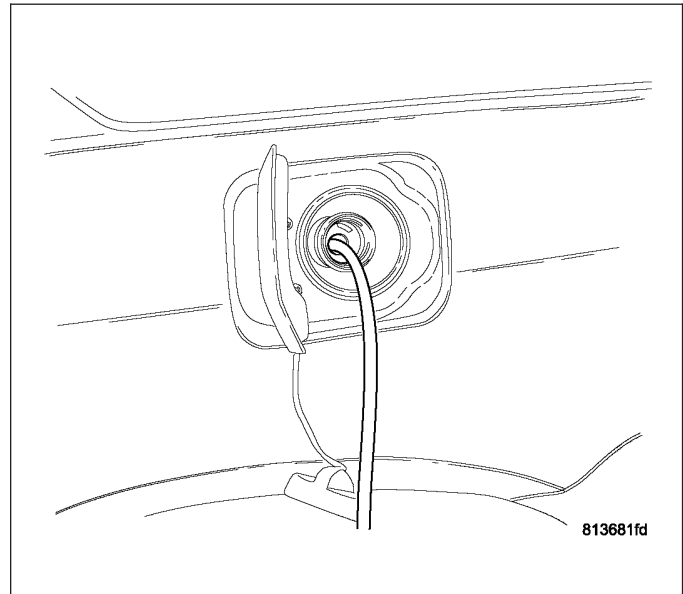
## MODULE-FUEL PUMP

### REMOVAL

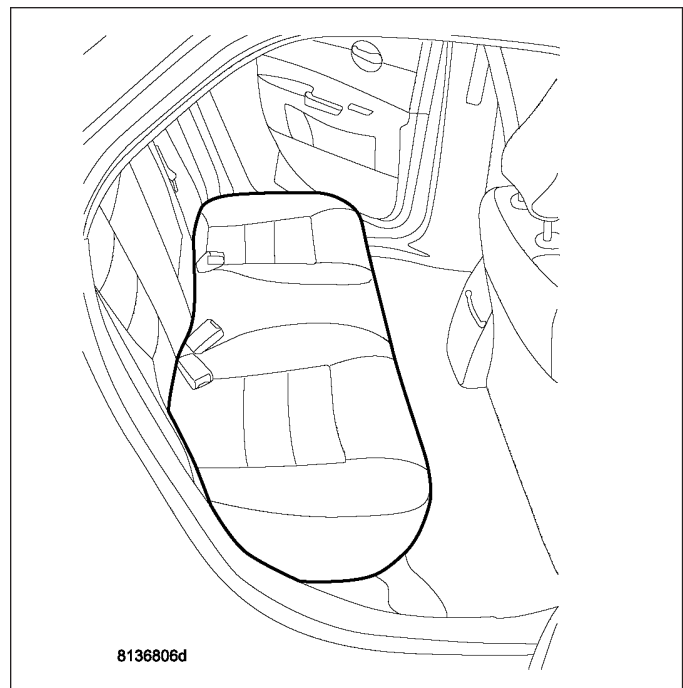
1. Release the fuel pressure, refer to the Fuel Pressure Release Procedure in this section.
2. Disconnect negative battery cable.

**Note:** The fuel level of the vehicle must be below 5/8 of a tank before you remove the module lock-rings. If it is above that you can spill fuel in the vehicle.

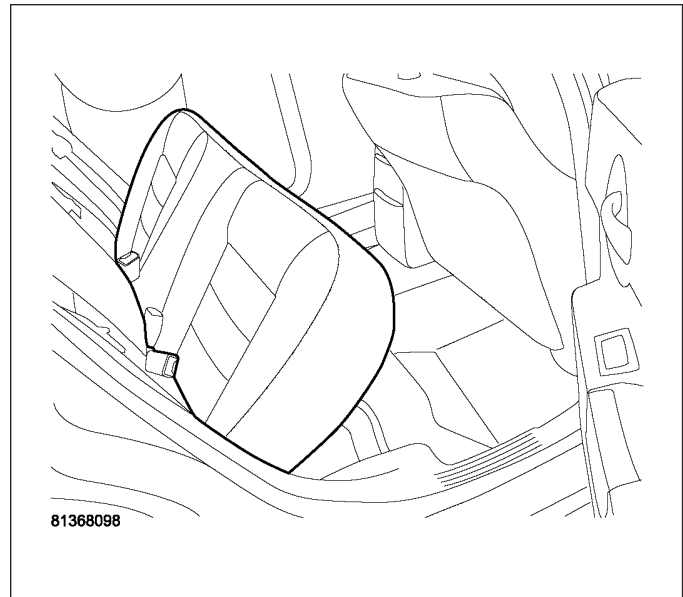
3. Drain partial fuel from fuel tank through the filler tube. Use a hard nylon tube, with a 30° cut on the end, to push the check valve open to drain fuel from tank.



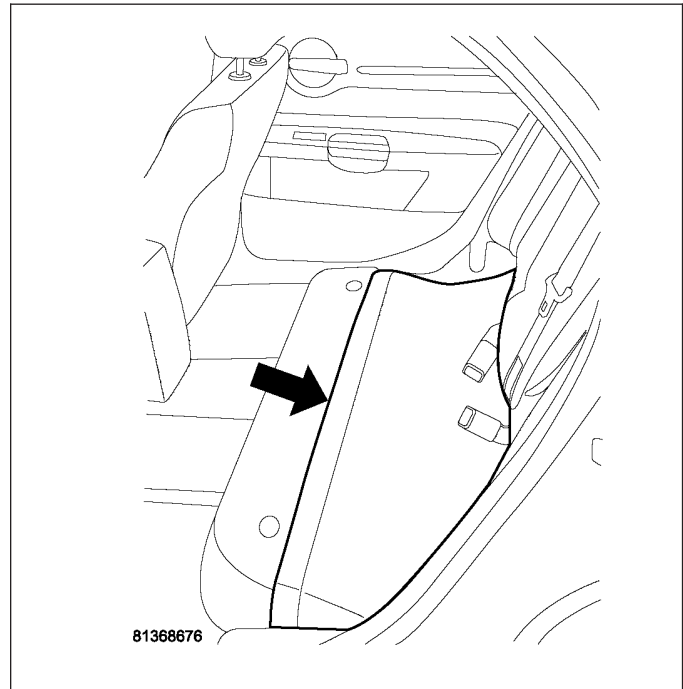
4. Remove the rear lower seat cushion.



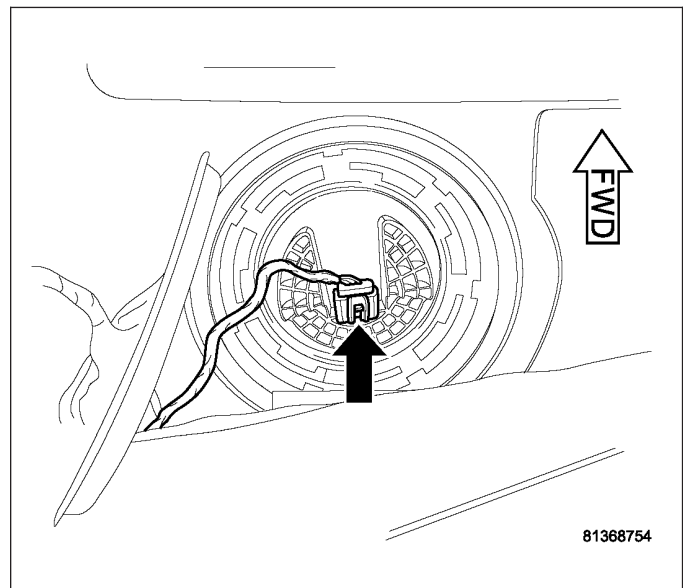
5. Push seat back and up to remove seat cushion.



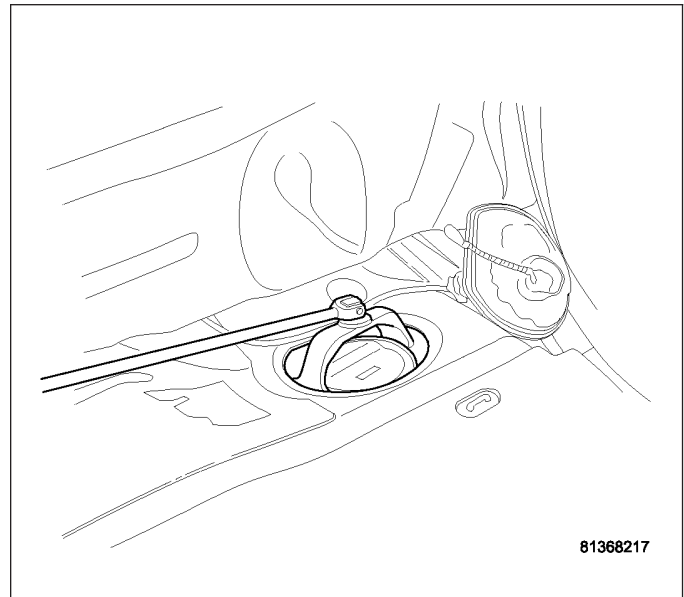
6. Fold back the foam pad covering access cover for modules.



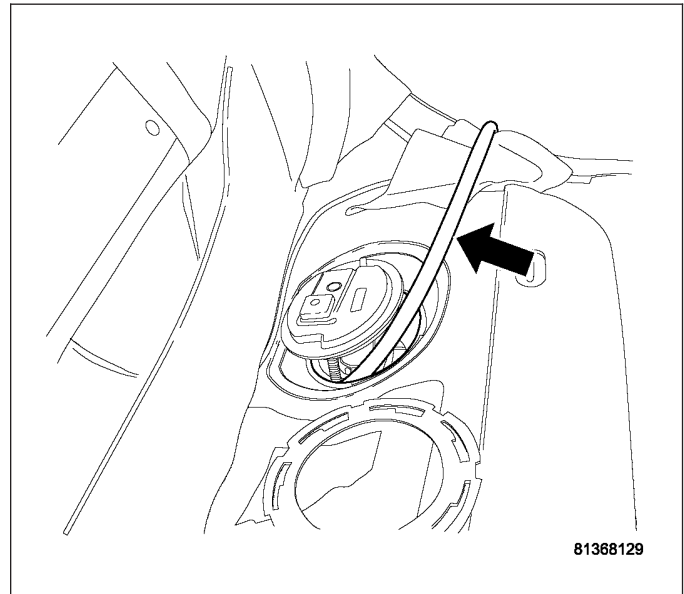
7. Disconnect the electrical connector from left side module.
8. Mark the module orientation.



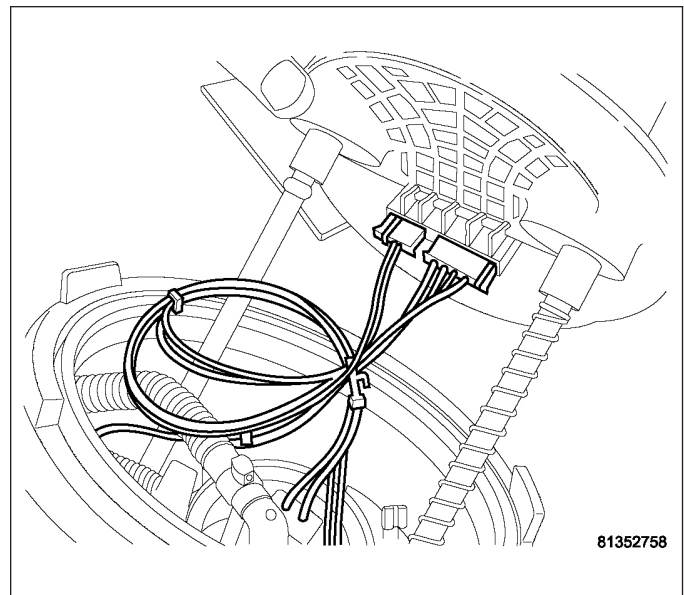
9. Use special tool #9340 to remove left side module lock ring.



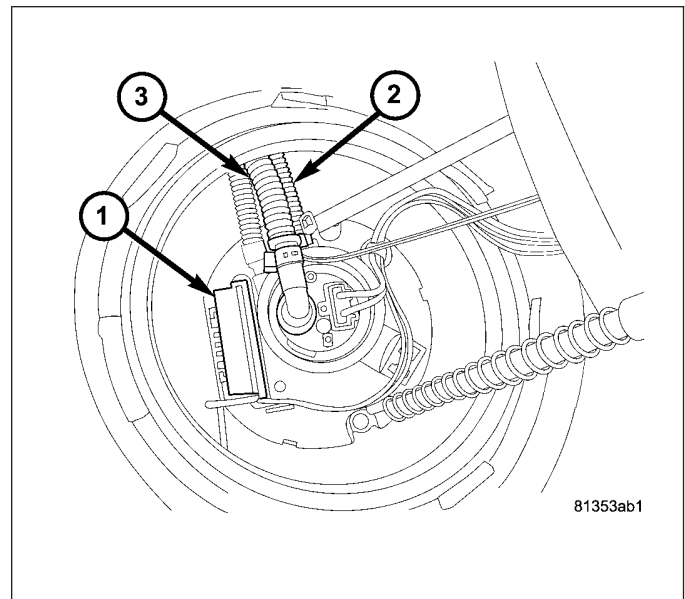
10. Drain fuel from left side of fuel tank. Lift module up enough to push hose into tank and drain. Do not spill fuel in interior of vehicle.



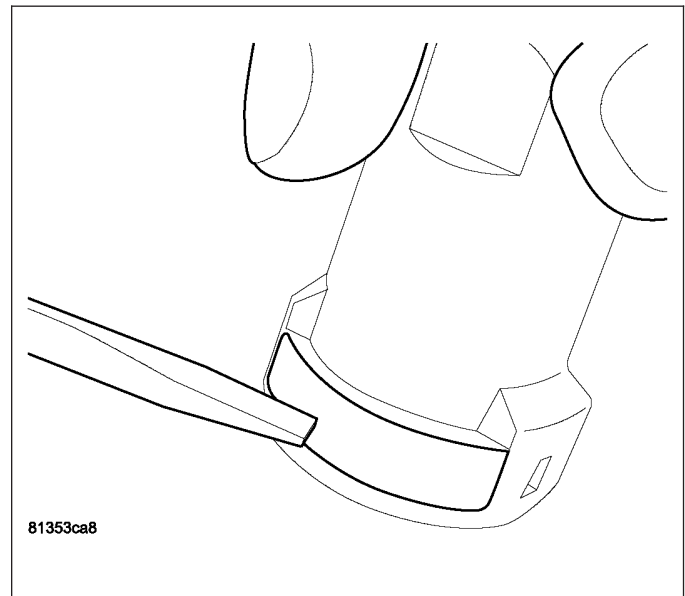
11. Disconnect the electrical connectors from the module top.
12. Remove the module top half.



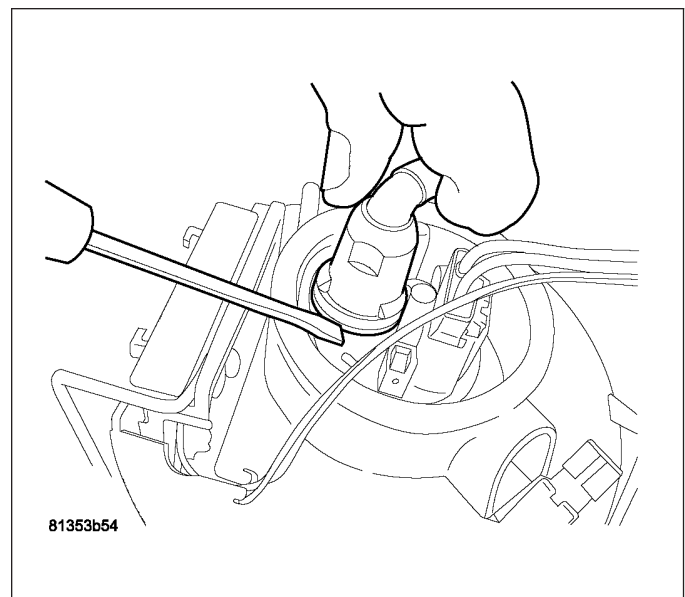
13. The module fuel level sending card (1). The fuel return lines (2). The fuel supply line (3).



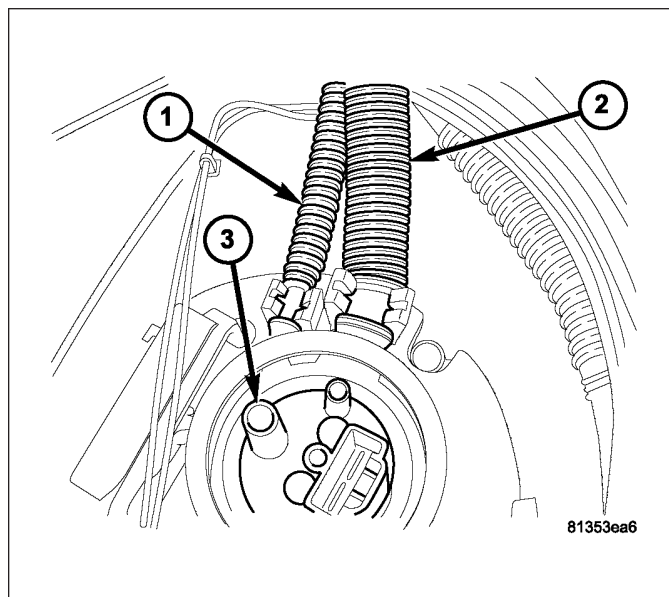
14. Fuel line release tab, press in the tab and pull up on fuel line.



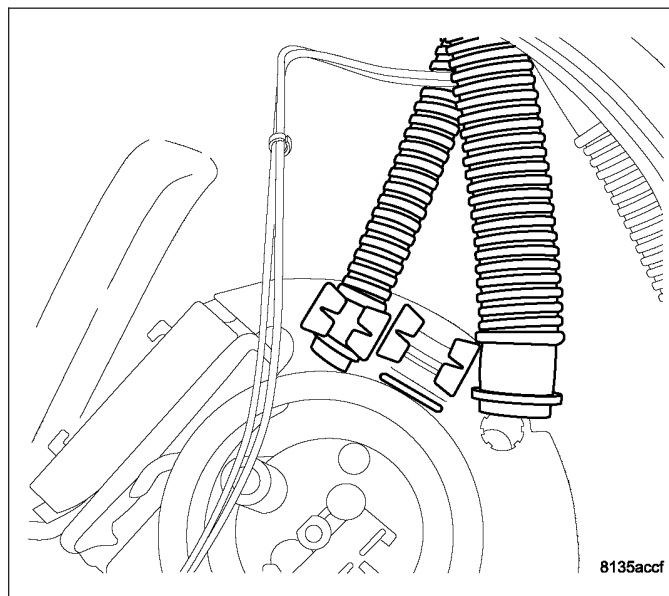
15. Remove fuel line.



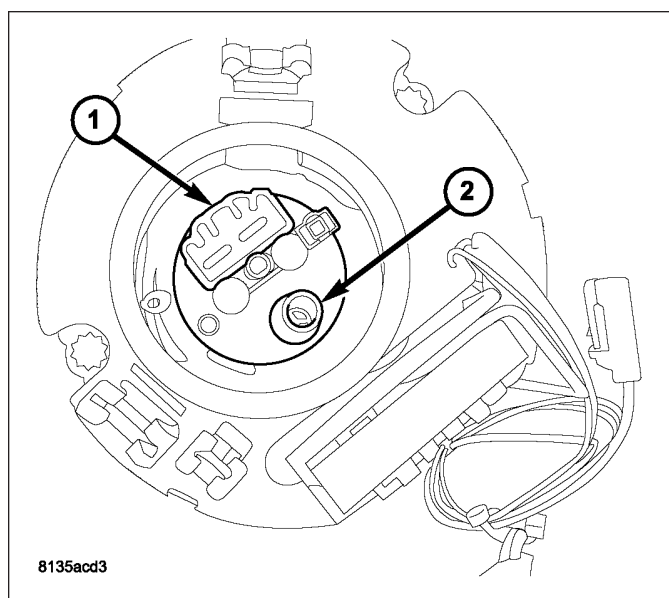
16. Remove fuel return line from lower module. Line unsnap from module.



17. Return line removed.

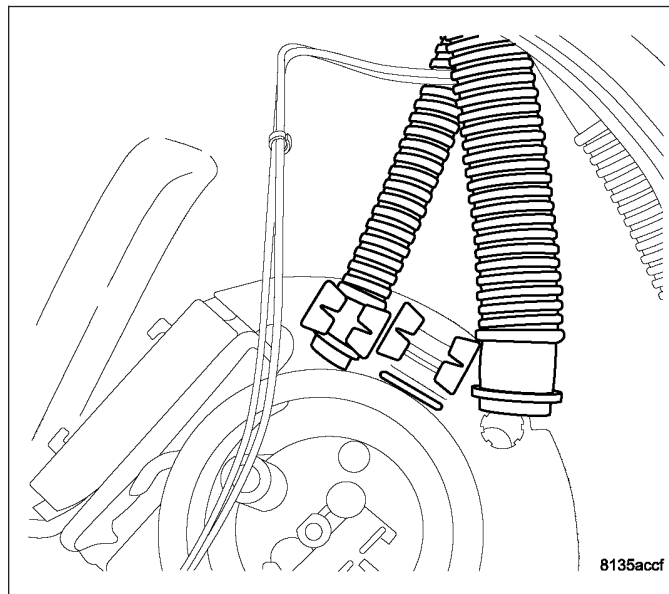


18. Tip module on its side to drain remaining fuel from reservoir and remove module from vehicle.

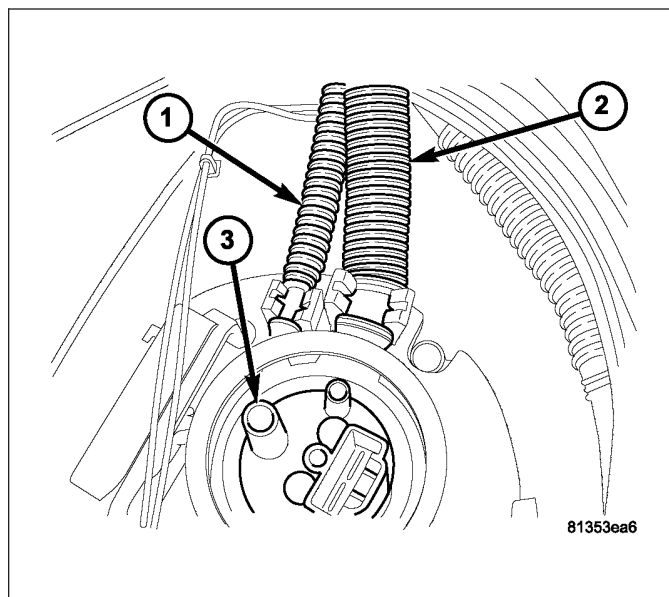


## INSTALLATION

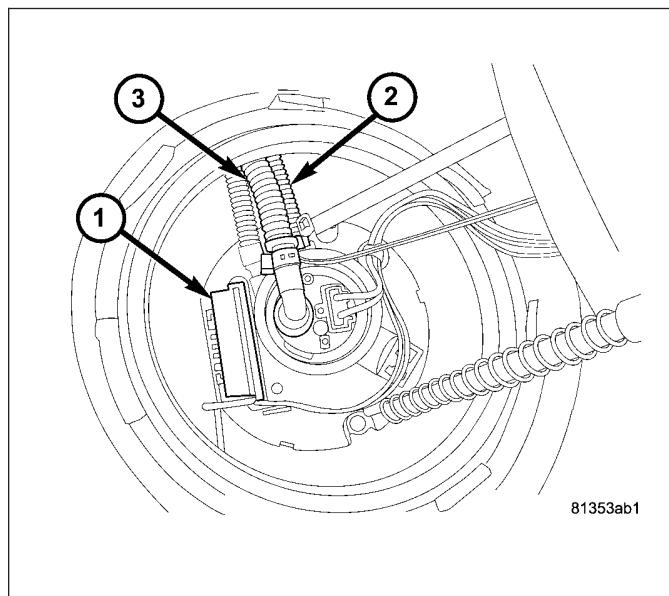
1. Install pump module into tank.
2. Connect fuel return lines to module.



3. Lines connected.

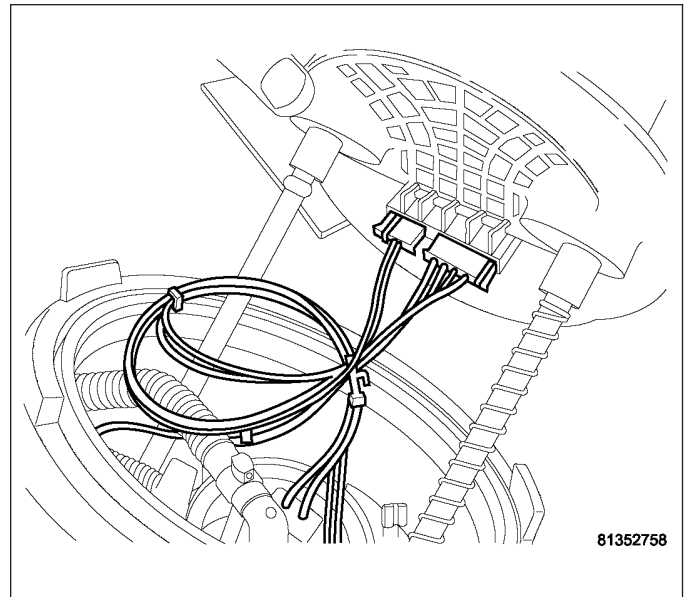


4. Connect fuel supply line to module and make sure it is locked in place.

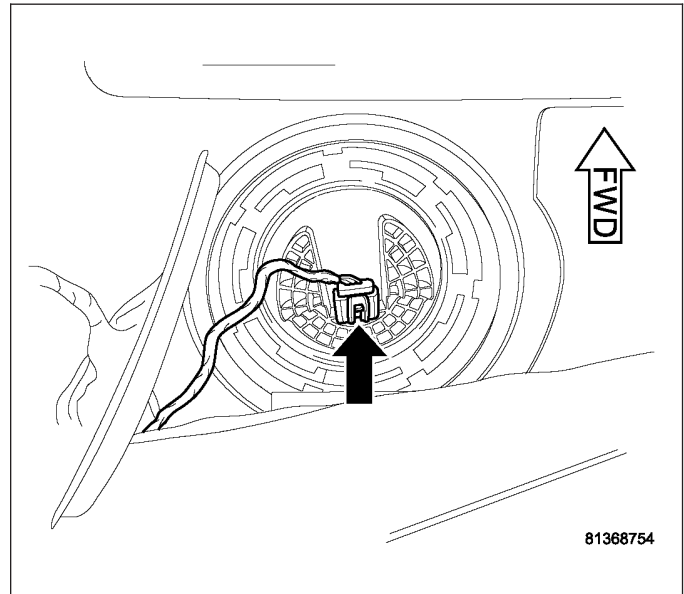




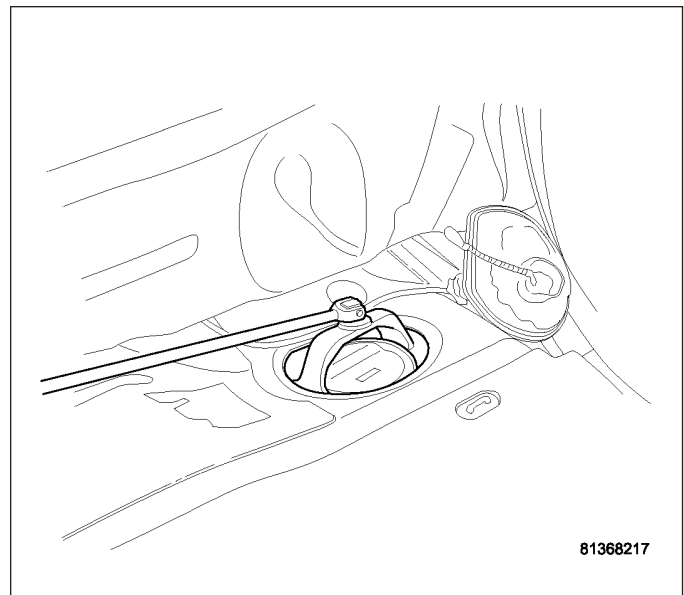
5. Connect electrical connectors to bottom of module top, Install module top to module bottom.



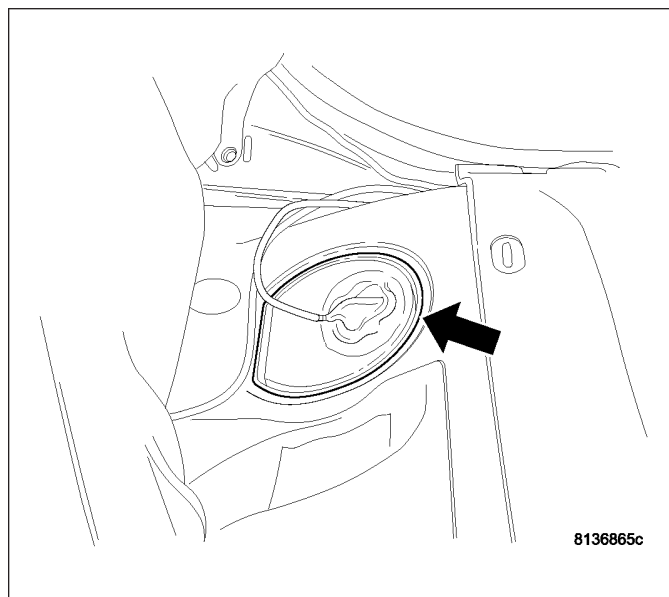
6. Install module and align marks on the module for proper orientation.



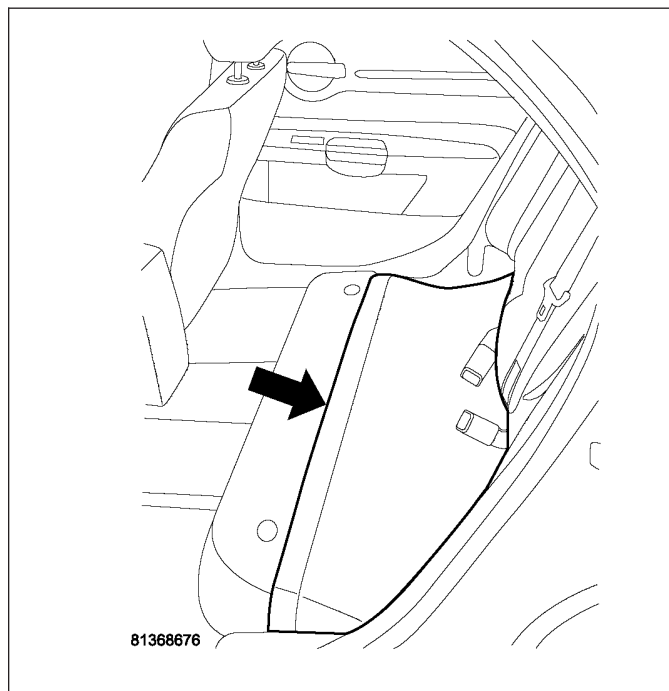
7. Install module lock-ring.  
8. Use special tool #9340 to tighten left side module lock ring.  
9. Connect the electrical connector to left side module.



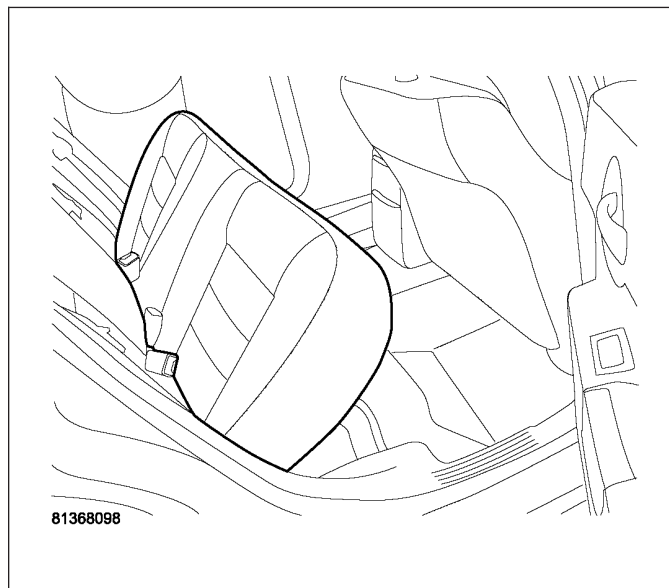
10. Install plastic access cover.



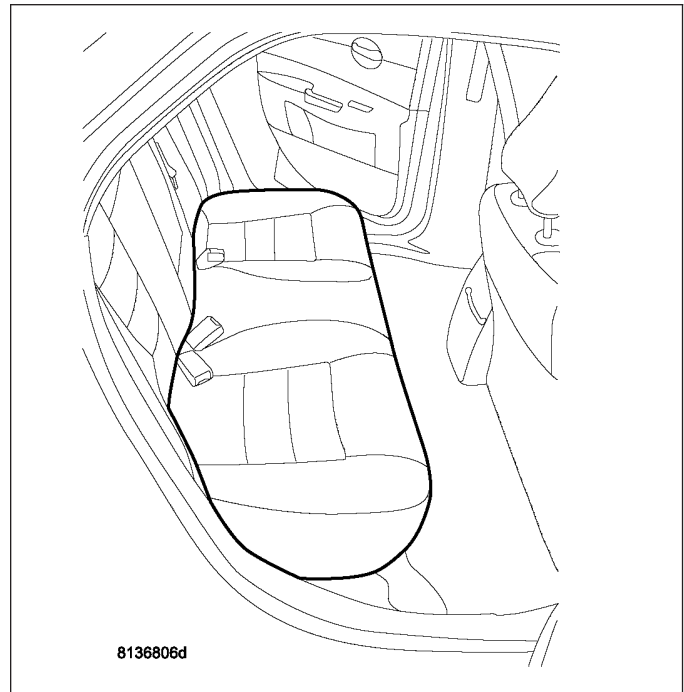
11. Fold the foam pad covering access cover for modules back into place.



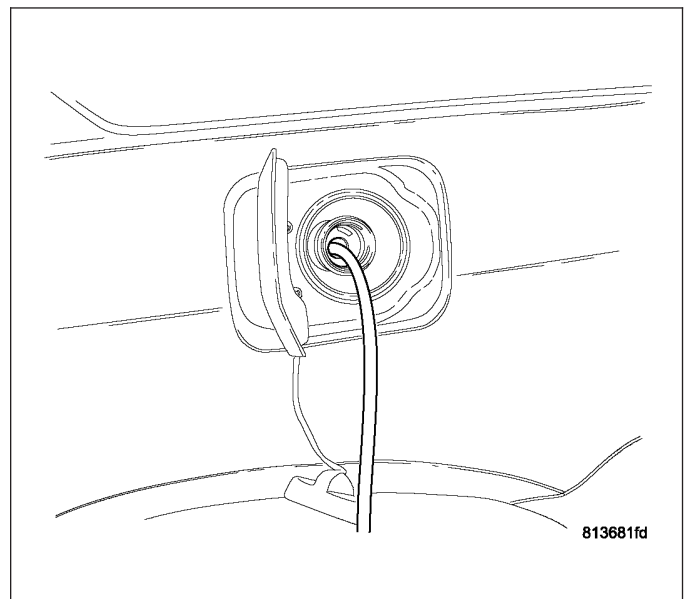
12. Install rear lower seat cushion



13. Rear lower seat cushion installed.



14. Fill fuel tank.
15. Connect negative battery cable.
16. Fill fuel tank. Use the scan tool to pressurize the fuel system. Check for leaks.



## RAIL-FUEL

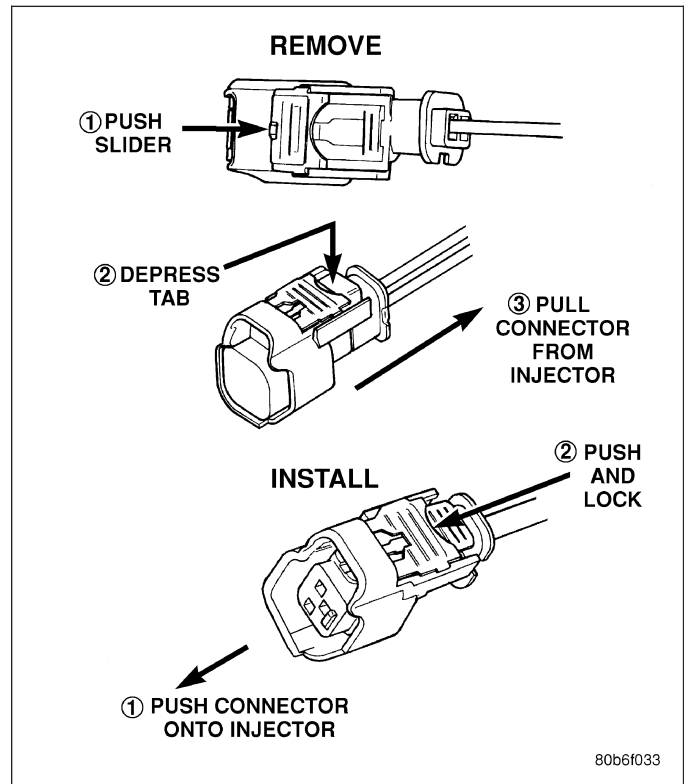
### REMOVAL

#### 2.7L

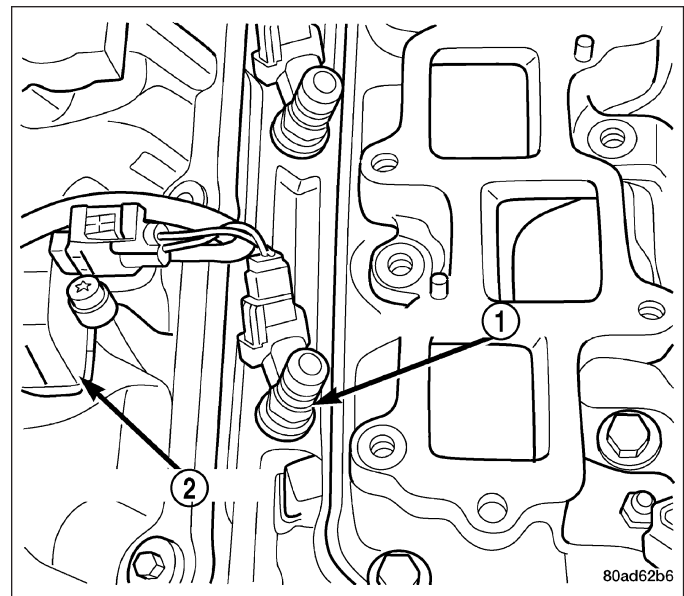
**WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE SERVICING FUEL RAIL. SERVICE VEHICLES IN WELL VENTILATED AREAS AND AVOID IGNITION SOURCES. NEVER SMOKE WHILE SERVICING THE VEHICLE.**

1. Release fuel system pressure. Refer to Fuel System Pressure Release Procedure in this section.
2. Disconnect the negative battery cable.
3. Remove intake manifold plenum. (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
4. Cover intake manifold to prevent foreign material from entering engine.

5. Disconnect fuel supply tube quick connect fitting at the rear of the fuel rail, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
6. Disconnect electrical connectors at fuel injectors. Refer to graphic. Push red colored slider away from injector (1). While pushing slider, depress tab (2) and remove connector (3) from injector. The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If harness is not tagged, note wiring location before removal.



7. Remove mounting bolts on both sides of fuel rail.
8. Lift fuel rail straight up off of cylinder head.
9. Remove retaining clips from fuel injectors at fuel rail.
10. Remove fuel injector from fuel rail.

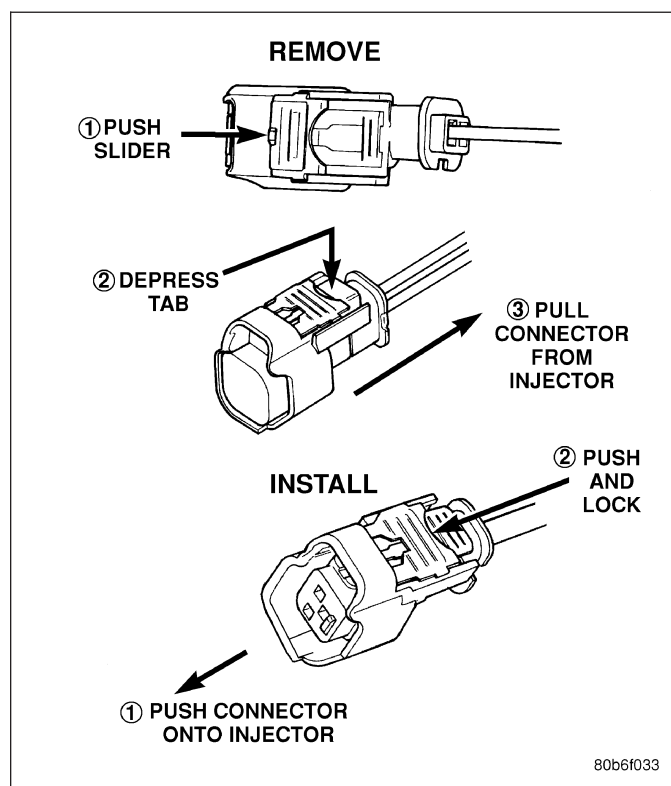


### 3.5L

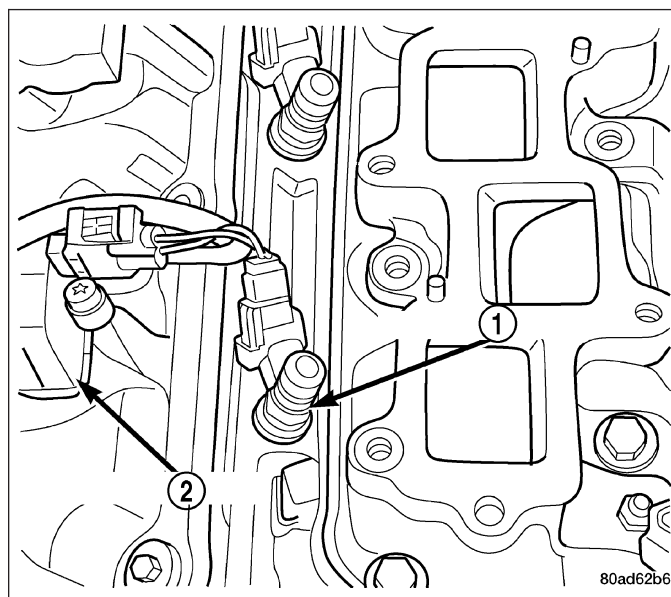
**WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE SERVICING FUEL RAIL. SERVICE VEHICLES IN WELL VENTILATED AREAS AND AVOID IGNITION SOURCES. NEVER SMOKE WHILE SERVICING THE VEHICLE.**

1. Release fuel system pressure. Refer to Fuel System Pressure Release Procedure in this section.
2. Disconnect the negative battery cable.
3. Remove intake manifold plenum. (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
4. Cover intake manifold to prevent foreign material from entering engine.
5. Disconnect fuel supply tube quick connect fitting at the rear of the fuel rail, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).

6. Disconnect electrical connectors at fuel injectors. Refer to graphic. Push red colored slider away from injector (1). While pushing slider, depress tab (2) and remove connector (3) from injector. The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If harness is not tagged, note wiring location before removal.



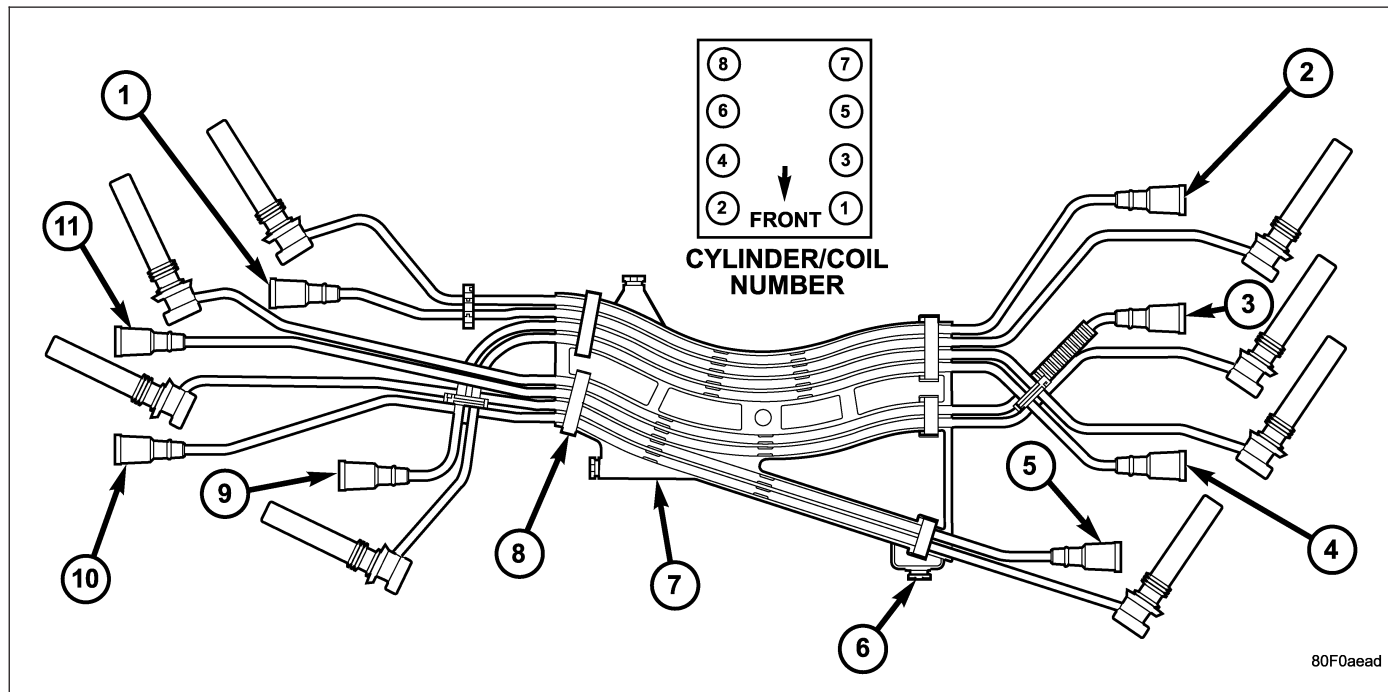
7. Remove mounting bolts on both sides of fuel rail.
8. Lift fuel rail straight up off of cylinder head.
9. Remove retaining clips from fuel injectors at fuel rail.
10. Remove fuel injector from fuel rail.



## 5.7L

**WARNING: THE FUEL SYSTEM IS UNDER CONSTANT PRESSURE EVEN WITH ENGINE OFF. BEFORE SERVICING FUEL RAIL, FUEL SYSTEM PRESSURE MUST BE RELEASED.**

**CAUTION:** The left and right fuel rails are replaced as an assembly. Do not attempt to separate rail halves at connector tube. Due to design of tube, it does not use any clamps. Never attempt to install a clamping device of any kind to tube. When removing fuel rail assembly for any reason, be careful not to bend or kink tube.

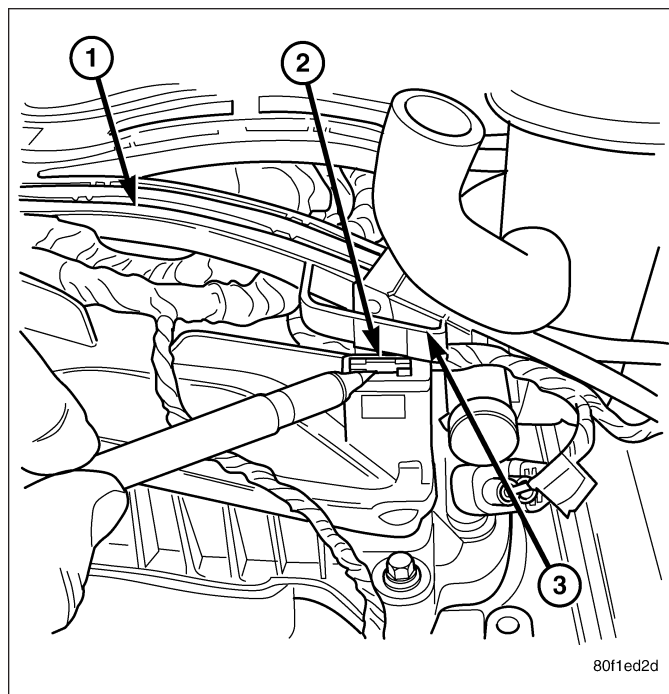


- 1 - #8 COIL-TO- #5 SPARK PLUG (MARKED 5/8)
- 2 - #5 COIL-TO- #8 SPARK PLUG (MARKED 5/8)
- 3 - #7 COIL-TO- #4 SPARK PLUG (MARKED 4/7)
- 4 - #3 COIL-TO- #2 SPARK PLUG (MARKED 2/3)
- 5 - #1 COIL-TO- #6 SPARK PLUG (MARKED 1/6)
- 6 - CLIPS (TRAY-TO-MANIFOLD RETENTION)

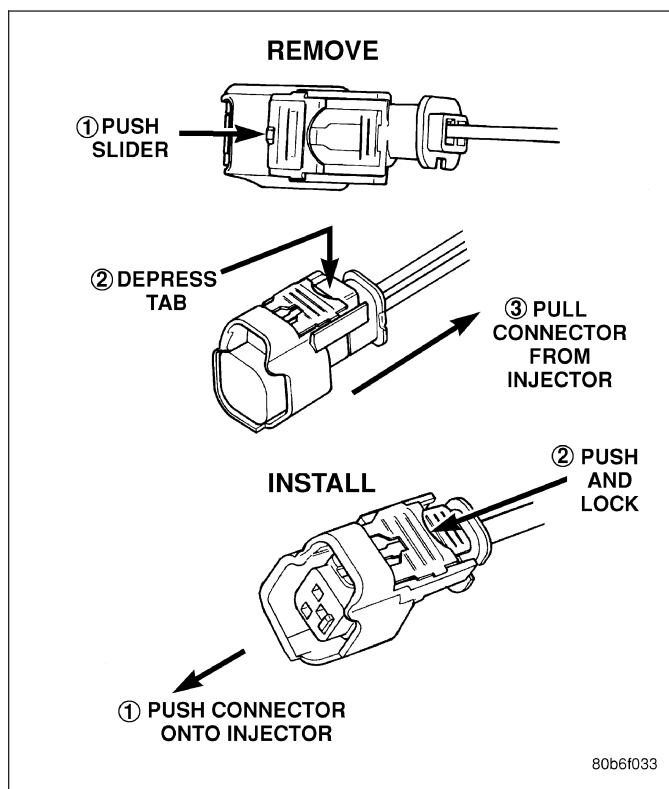
- 7 - CABLE TRAY
- 8 - CLIPS (SPARK PLUG CABLE-TO-TRAY- RETENTION)
- 9 - #2 COIL-TO- #3 SPARK PLUG (MARKED 2/3)
- 10 - #6 COIL-TO- #1 SPARK PLUG (MARKED 1/6)
- 11 - #4 COIL-TO- #7 SPARK PLUG (MARKED 4/7)

1. Remove fuel tank filler tube cap.
2. Perform Fuel System Pressure Release Procedure.
3. Remove negative battery cable at battery.
4. Remove flex tube (air cleaner housing to engine).
5. Remove air resonator box at throttle body.
6. Disconnect all spark plug cables from all spark plugs and ignition coils. Do not remove cables from cable routing tray. Note original cable positions while removing.

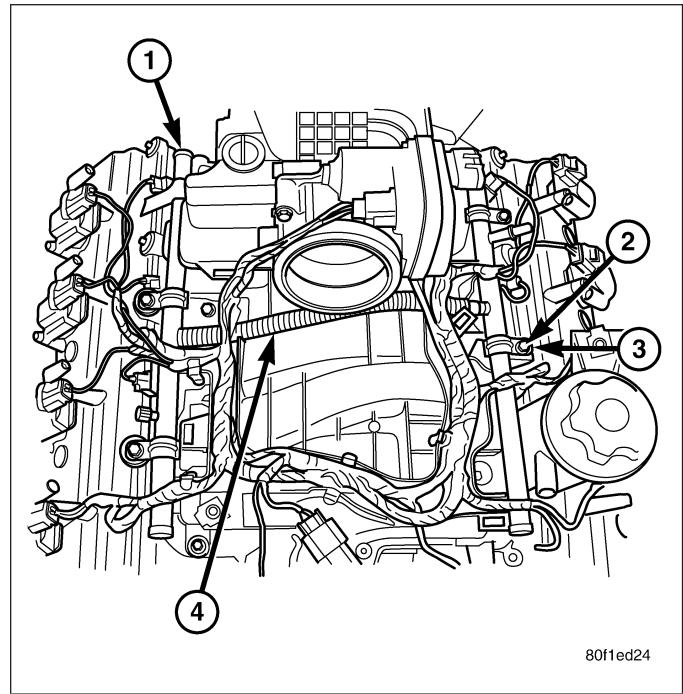
7. Remove spark plug cable tray from engine by releasing 4 retaining clips (2). Remove tray and cables from engine as an assembly.
8. Disconnect electrical connectors at all 8 ignition coils. Refer to Ignition Coil Removal/Installation.
9. Disconnect fuel line latch clip and fuel line at fuel rail. A special tool will be necessary for fuel line disconnection. Refer to Quick-Connect Fittings.



10. Disconnect electrical connectors at all 8 fuel injectors. Refer to graphic. Push red colored slider away from injector (1). While pushing slider, depress tab (2) and remove connector (3) from injector. The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If harness is not tagged, note wiring location before removal.
11. Disconnect electrical connectors at all throttle body sensors.



12. Remove four fuel rail mounting bolts (2) and hold-down clamps.
13. Gently rock and pull **left** side of fuel rail until fuel injectors just start to clear machined holes in intake manifold. Gently rock and pull **right** side of rail until injectors just start to clear intake manifold head holes. Repeat this procedure (left/right) until all injectors have cleared machined holes.
14. Remove fuel rail (with injectors attached) from engine.

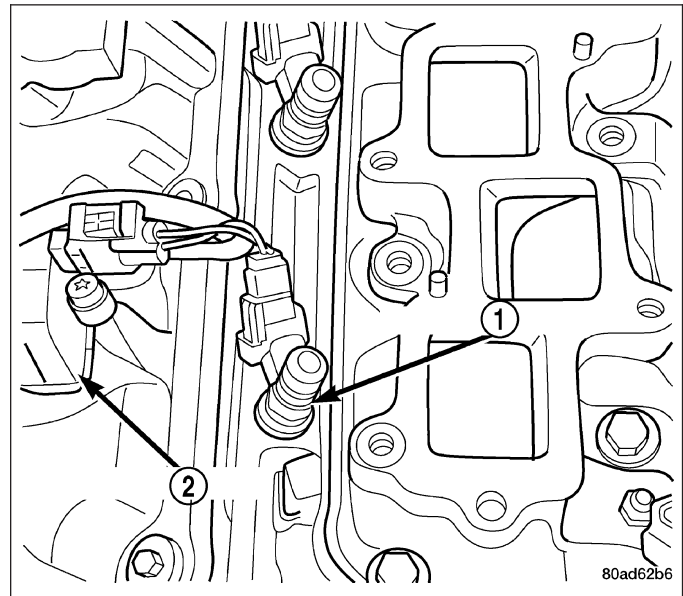


15. If fuel injectors are to be removed, refer to Fuel Injector Removal/Installation.

## INSTALLATION

### 2.7L

1. Lightly lubricate the fuel injector O-rings with a couple drops of clean engine oil.
2. Install retaining clips on fuel injectors.
3. Push injectors into fuel injector rail until clips are in the correct position.
4. Position fuel rail over cylinder heads, and push rail into place. Tighten fuel rail mounting bolts to 11 N·m (100 in. lbs.) torque.

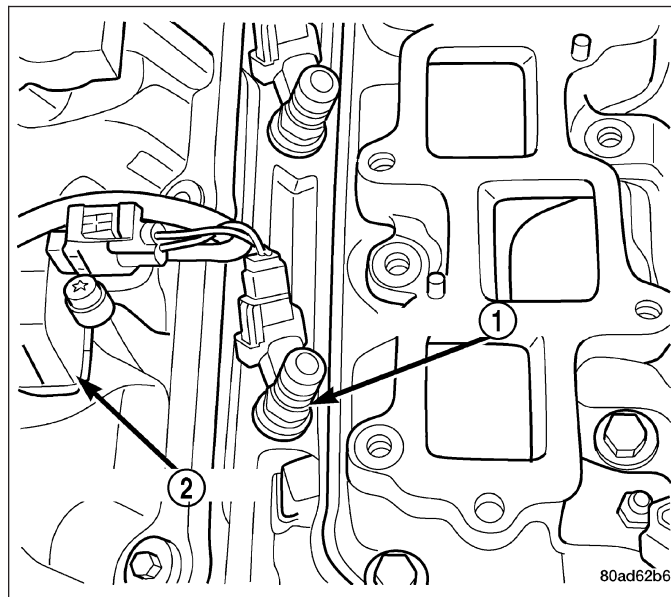


5. Connect the fuel supply tube quick connect fitting to the fuel rail, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/ QUICK CONNECT FITTING - STANDARD PROCEDURE).
6. Connect the electrical connectors to the fuel injectors.
7. Install intake manifold plenum, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
8. Connect negative cable to battery.
9. Use the scan tool to pressurize the fuel system. Check for leaks.



### 3.5L

1. Lightly lubricate the fuel injector O-rings with a couple drops of clean engine oil.
2. Install retaining clips on fuel injectors.
3. Push injectors into fuel injector rail until clips are in the correct position.
4. Position fuel rail over cylinder heads, and push rail into place. Tighten fuel rail mounting bolts to 28 N·m (250 in. lbs.) torque.

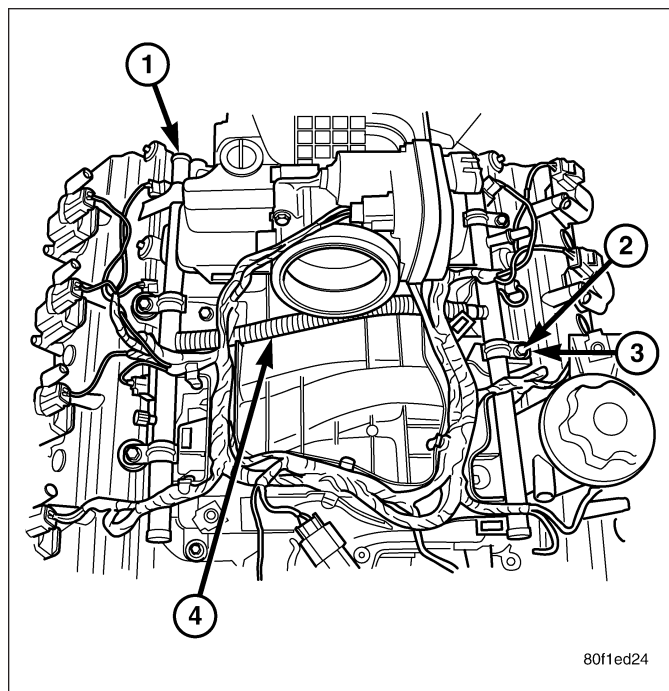


5. Connect the fuel supply tube quick connect fitting to the fuel rail, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/ QUICK CONNECT FITTING - STANDARD PROCEDURE).
6. Connect the electrical connectors to the fuel injectors.
7. Install intake manifold plenum, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
8. Connect negative cable to battery.
9. Use the scan tool to pressurize the fuel system. Check for leaks.

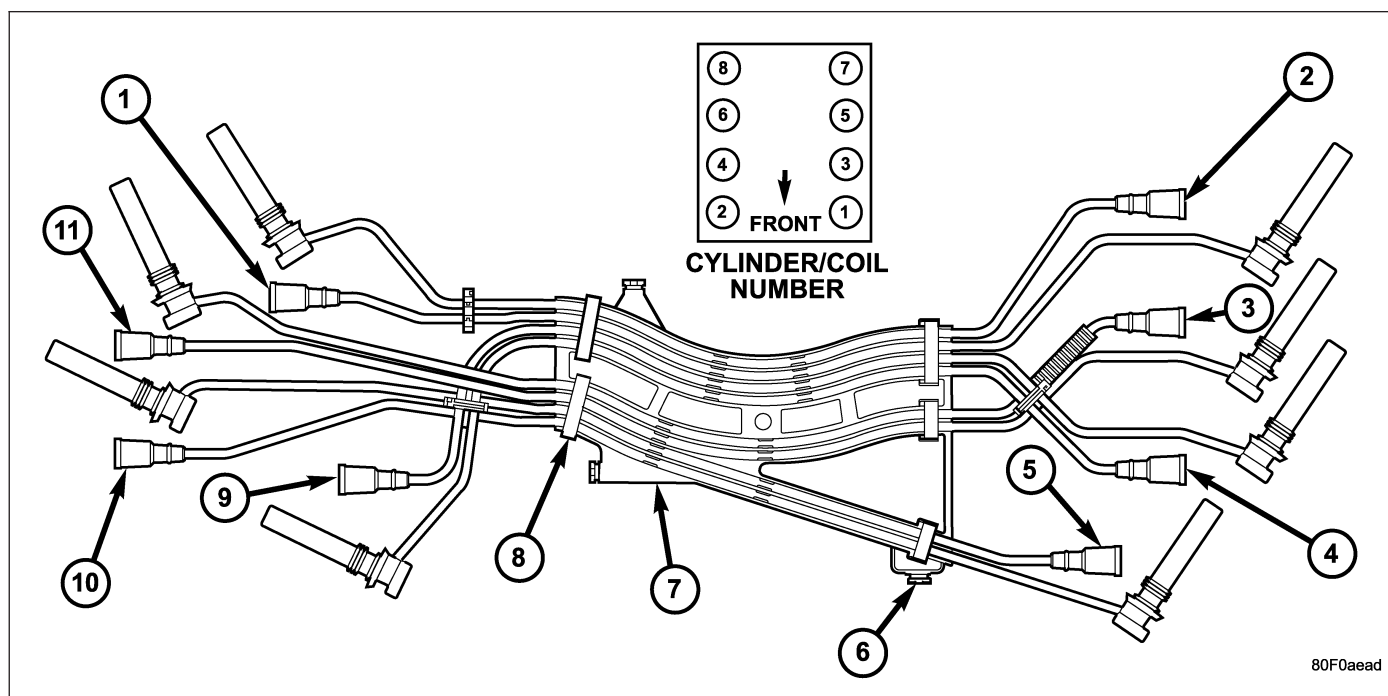
### 5.7L

1. If fuel injectors are to be installed, refer to Fuel Injector Removal/Installation.
2. Clean out fuel injector machined bores in intake manifold.
3. Apply a small amount of engine oil to each fuel injector o-ring. This will help in fuel rail installation.
4. Position fuel rail/fuel injector assembly to machined injector openings in intake manifold.
5. Guide each injector into intake manifold. Be careful not to tear injector o-rings.
6. Push **right** side of fuel rail down until fuel injectors have bottomed on shoulders. Push **left** fuel rail down until injectors have bottomed on shoulders.

7. Install 4 fuel rail holddown clamps and 4 mounting bolts (2) and (3). Refer to Torque Specifications.



8. Position spark plug cable tray (7) and cable assembly to intake manifold. Snap 4 cable tray retaining clips into intake manifold.

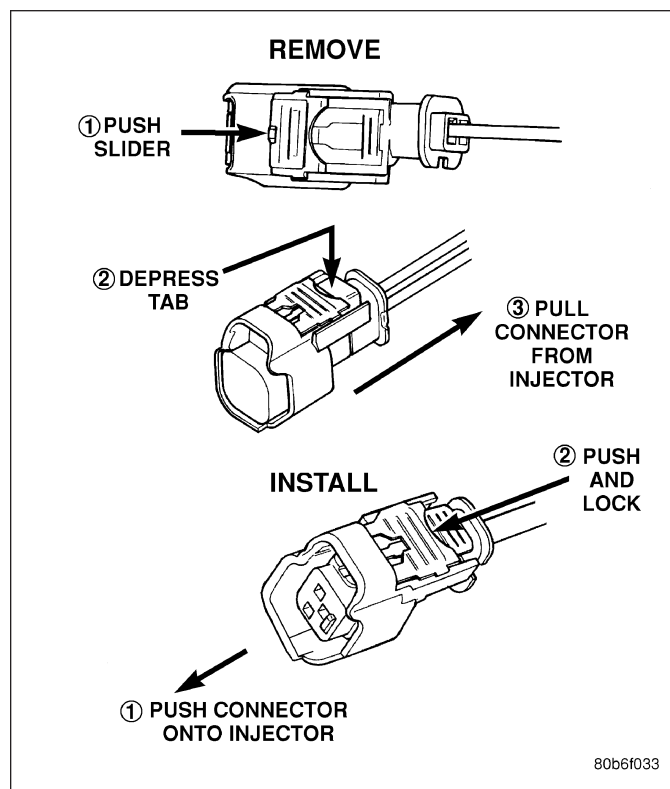


- 1 - #8 COIL-TO- #5 SPARK PLUG (MARKED 5/8)
- 2 - #5 COIL-TO- #8 SPARK PLUG (MARKED 5/8)
- 3 - #7 COIL-TO- #4 SPARK PLUG (MARKED 4/7)
- 4 - #3 COIL-TO- #2 SPARK PLUG (MARKED 2/3)
- 5 - #1 COIL-TO- #6 SPARK PLUG (MARKED 1/6)
- 6 - CLIPS (TRAY-TO-MANIFOLD RETENTION)

- 7 - CABLE TRAY
- 8 - CLIPS (SPARK PLUG CABLE-TO-TRAY- RETENTION)
- 9 - #2 COIL-TO- #3 SPARK PLUG (MARKED 2/3)
- 10 - #6 COIL-TO- #1 SPARK PLUG (MARKED 1/6)
- 11 - #4 COIL-TO- #7 SPARK PLUG (MARKED 4/7)

9. Install all cables to spark plugs and ignition coils.
10. Connect electrical connector to throttle body.
11. Install electrical connectors to all 8 ignition coils. Refer to Ignition Coil Removal/Installation.
12. Connect electrical connector to throttle body.

13. Connect electrical connectors at all fuel injectors. Refer to graphic. Push connector onto injector (1) and then push and lock red colored slider (2). Verify connector is locked to injector by lightly tugging on connector.
14. Connect fuel line latch clip and fuel line to fuel rail. Refer to Quick-Connect Fittings.
15. Install air resonator to throttle body (2 bolts).
16. Install flexible air duct to air box.
17. Connect battery cable to battery.
18. Start engine and check for leaks.



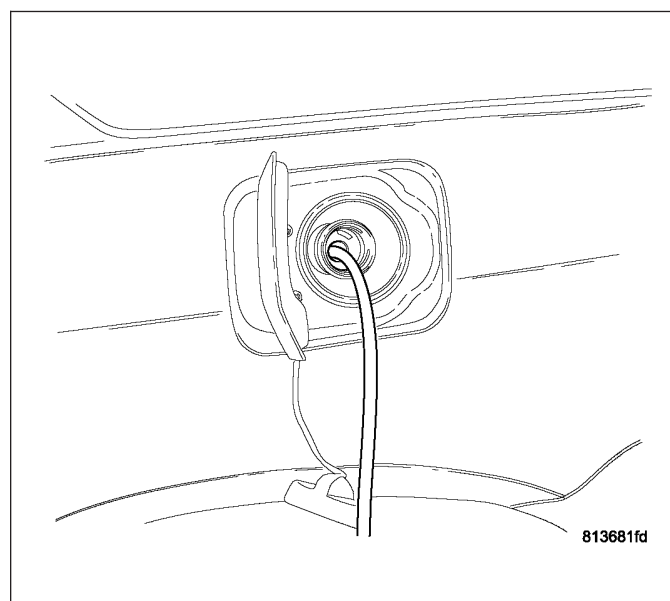
## TANK-FUEL

### REMOVAL

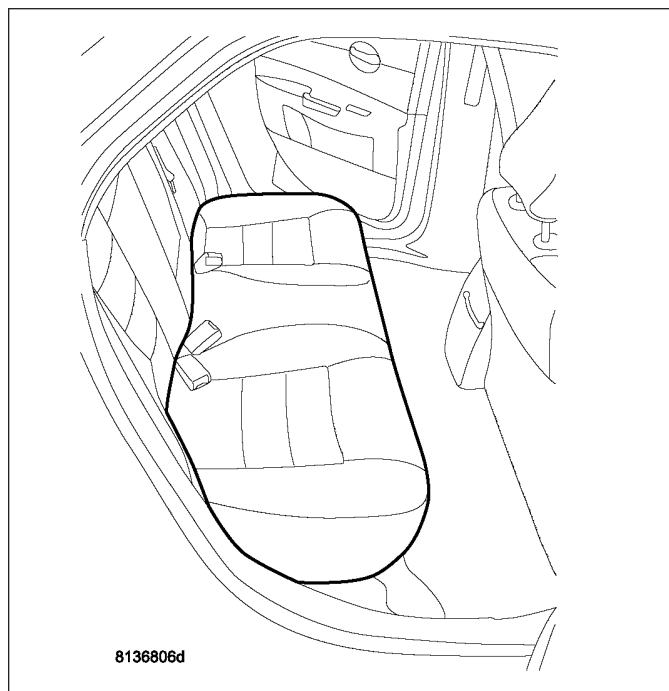
1. Release the fuel pressure, refer to the Fuel Pressure Release Procedure in this section.
2. Disconnect negative battery cable.

**Note:** The fuel level of the vehicle must be below 5/8 of a tank before you remove the module lock-rings. If it is above that you can spill fuel in the vehicle.

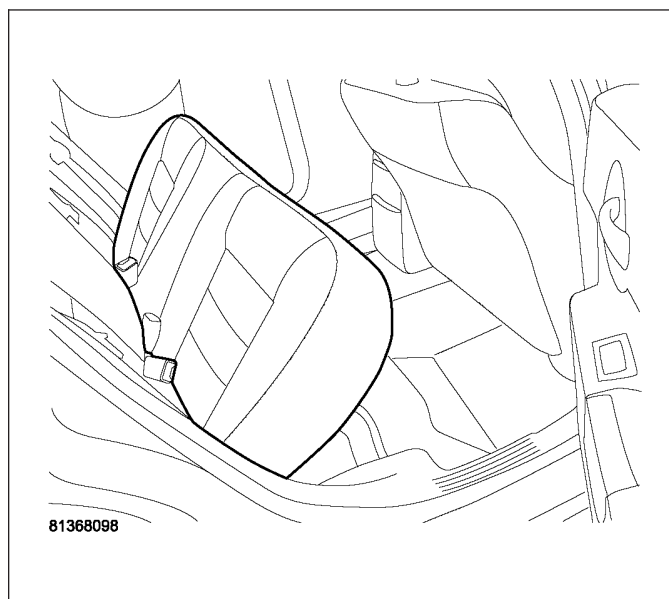
3. Drain partial fuel from fuel tank through the filler tube. Use a hard nylon tube, with a 30° cut on the end, to push the check valve open to drain fuel from tank.



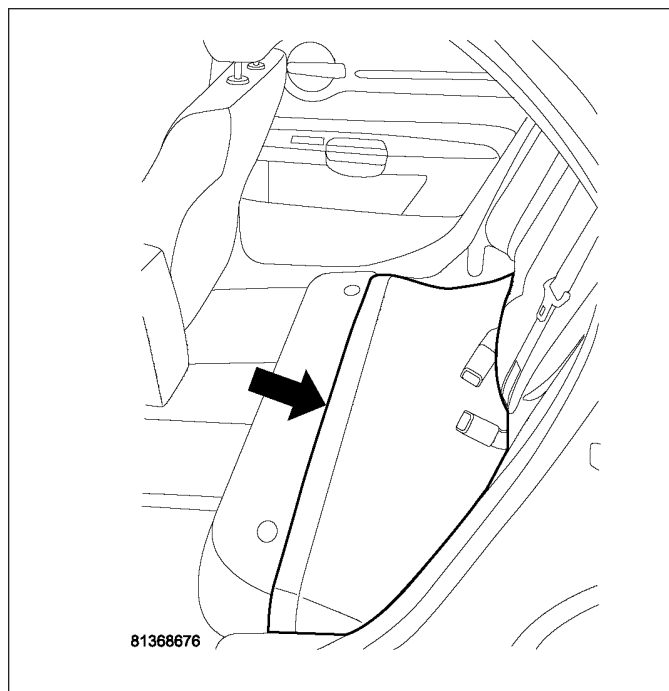
4. Remove the rear lower seat cushion.



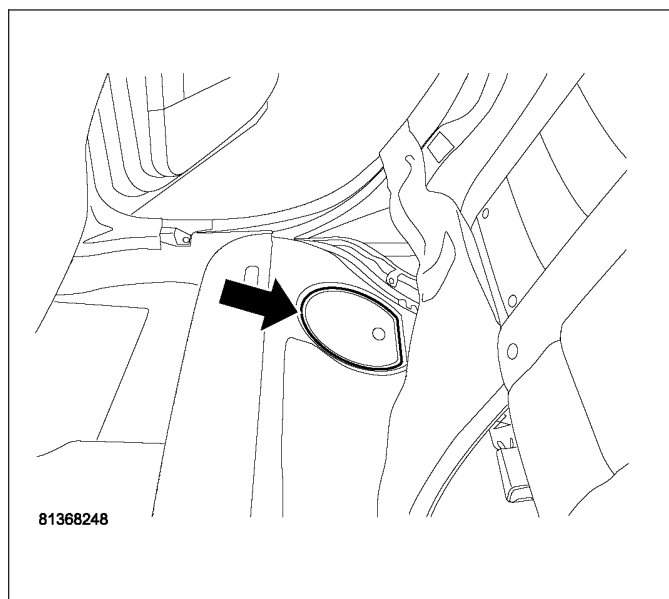
5. Push seat back and up to remove seat cushion.



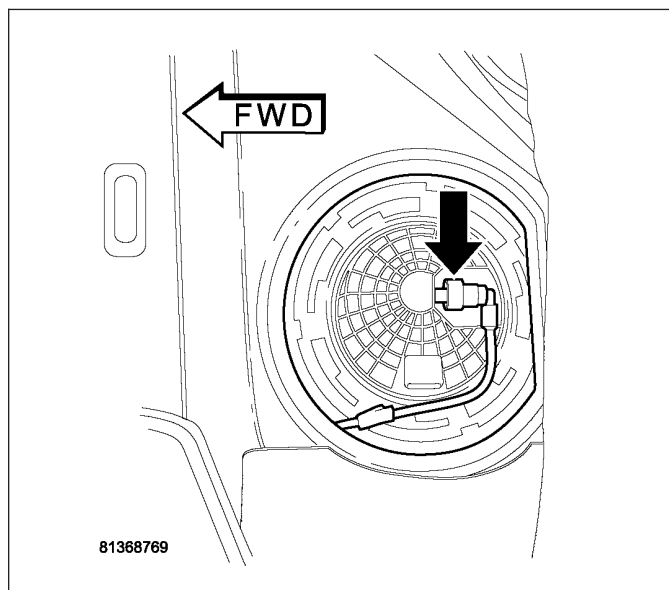
6. Fold back the foam pad covering access cover for modules.



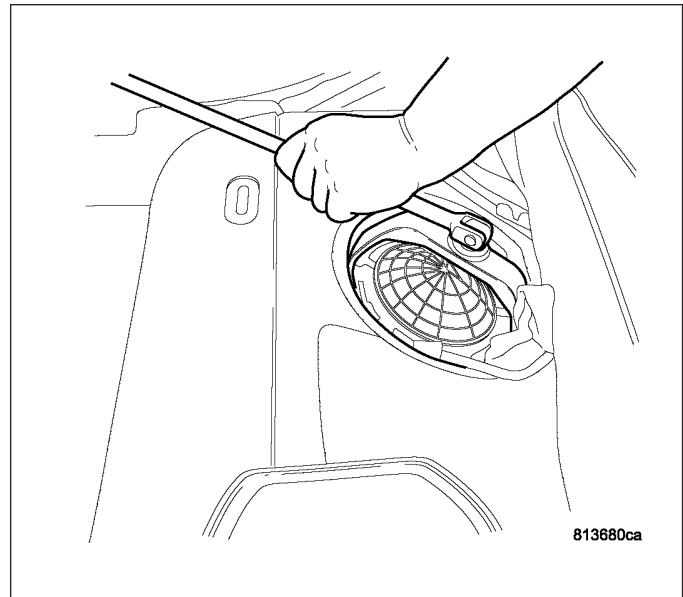
7. Remove plastic access covers from floor pan right side.



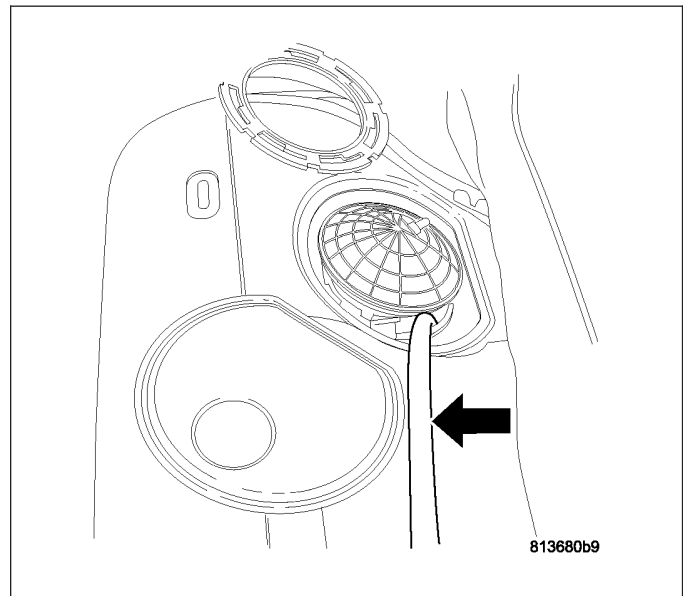
8. Disconnect the fuel supply line from module.  
9. Mark the module orientation.



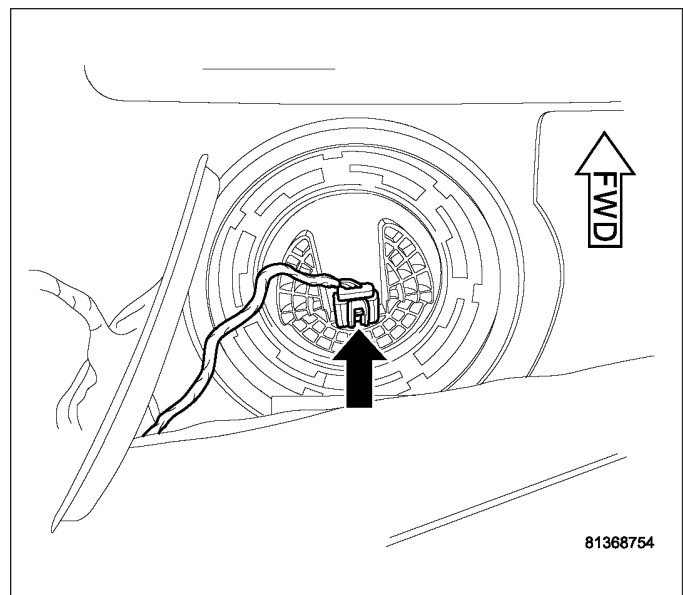
10. Use special tool #9340 to remove right side module lock ring.



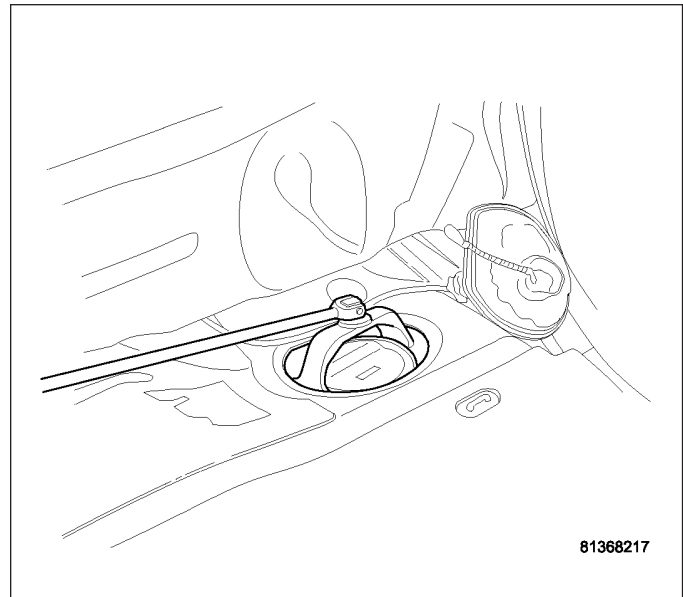
11. Drain fuel from right side of fuel tank. Lift module up enough to push hose into tank and drain. Do not spill fuel in interior of vehicle.



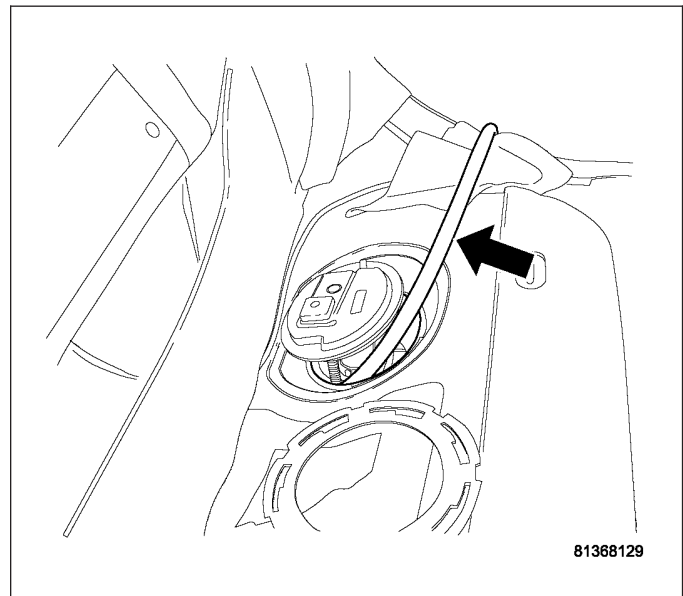
12. Disconnect the electrical connector from left side module.
13. Mark the module orientation.



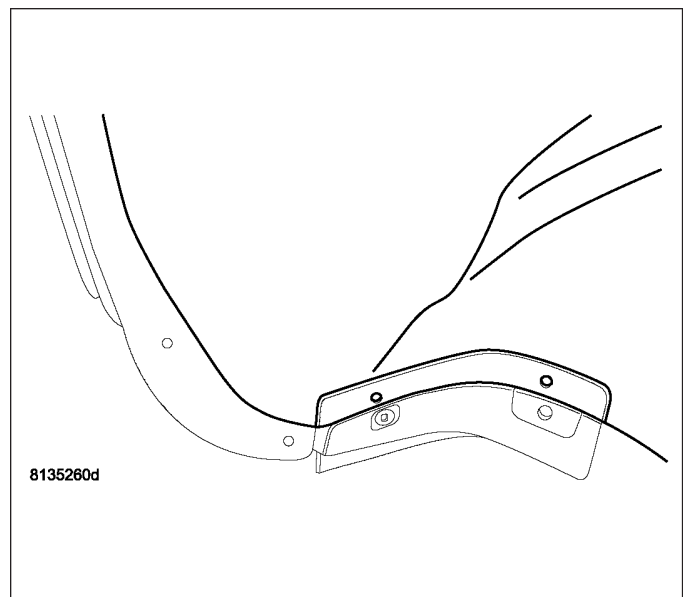
14. Use special tool #9340 to remove left side module lock ring.



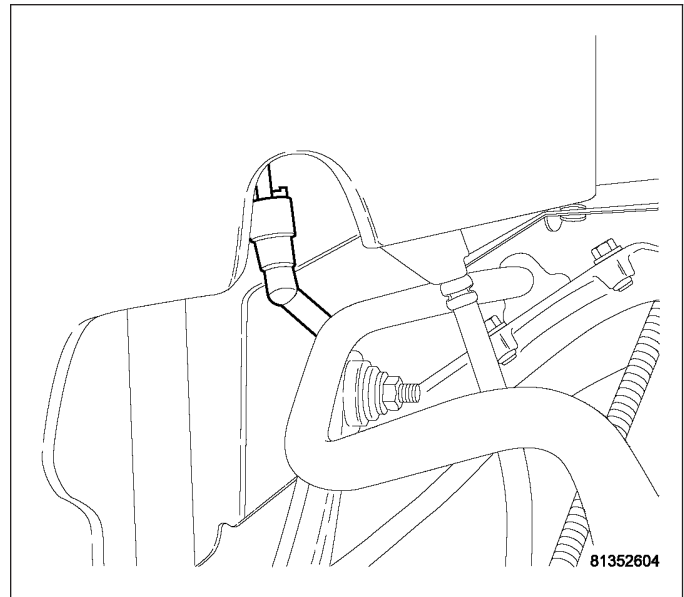
15. Drain fuel from left side of fuel tank. Lift module up enough to push hose into tank and drain. Do not spill fuel in interior of vehicle.
16. Install both module temporarily, hand tighten the lock ring to hold modules in place.
17. Raise vehicle and support.
18. Remove left rear tire.



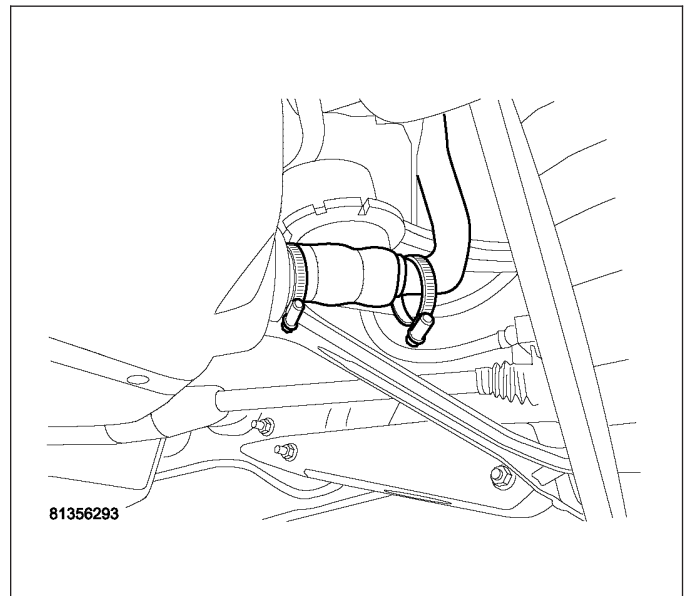
19. Remove the inner splash shield.



20. Disconnect the filler tube vent line.



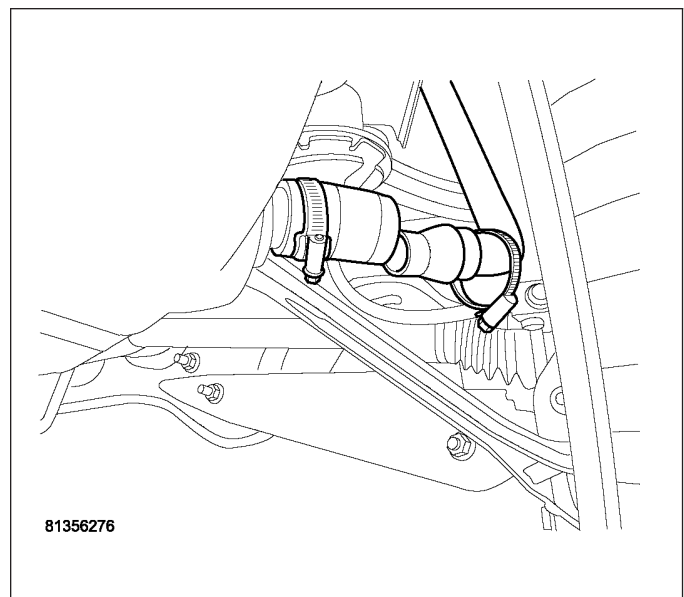
21. Remove clamp from filler tube.



22. Remove metal filler tube from rubber tube on fuel tank.

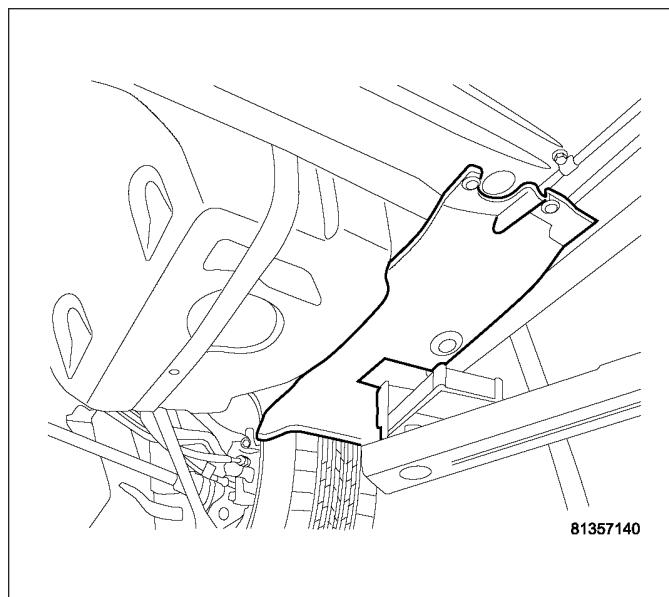
23. Remove the exhaust system, (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - REMOVAL)

24. Remove the drive shaft, (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - REMOVAL)

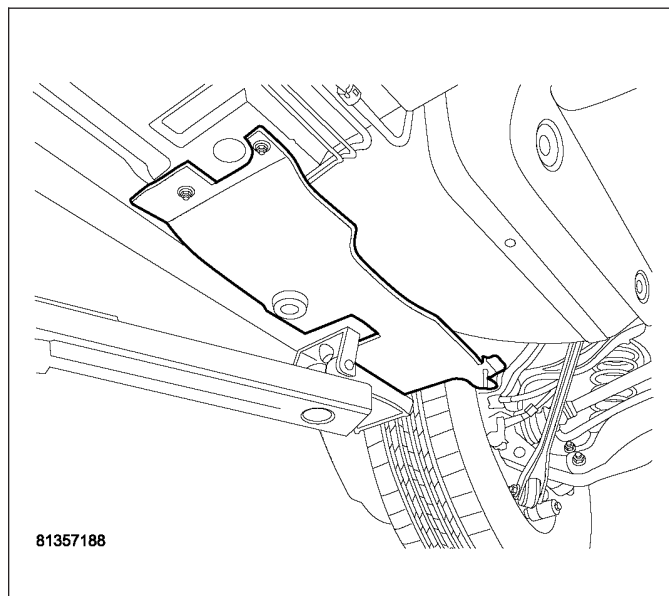




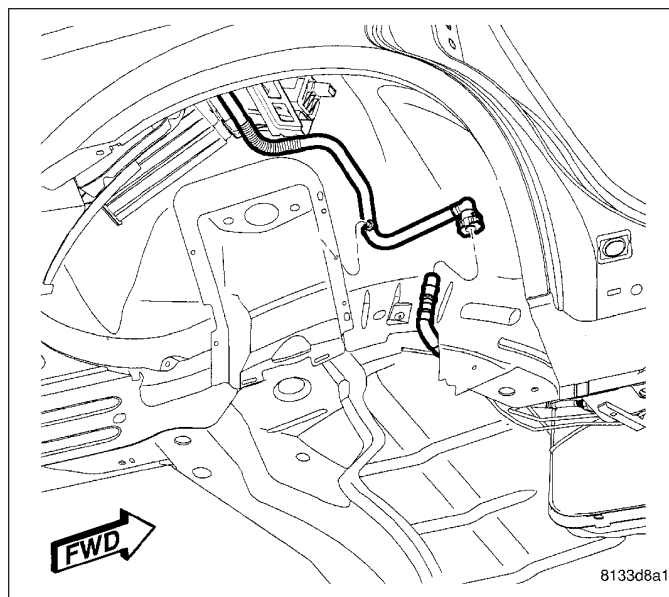
25. Remove the left underbody splash shield.



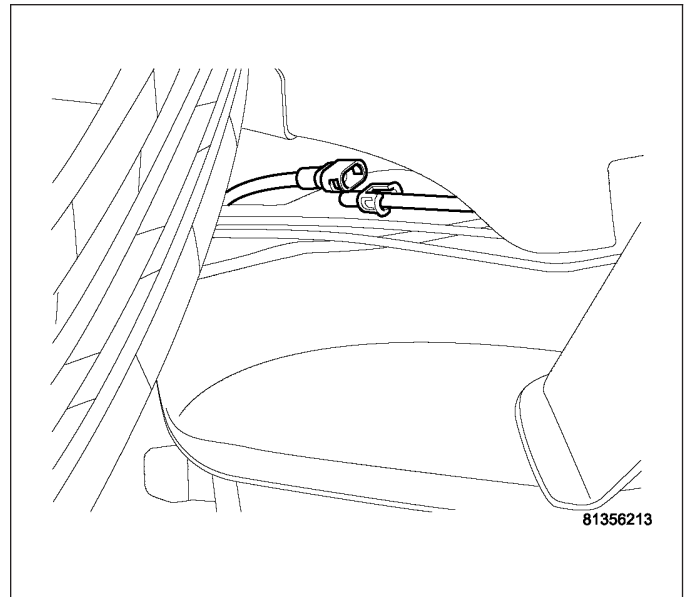
26. Remove the right underbody splash shield.



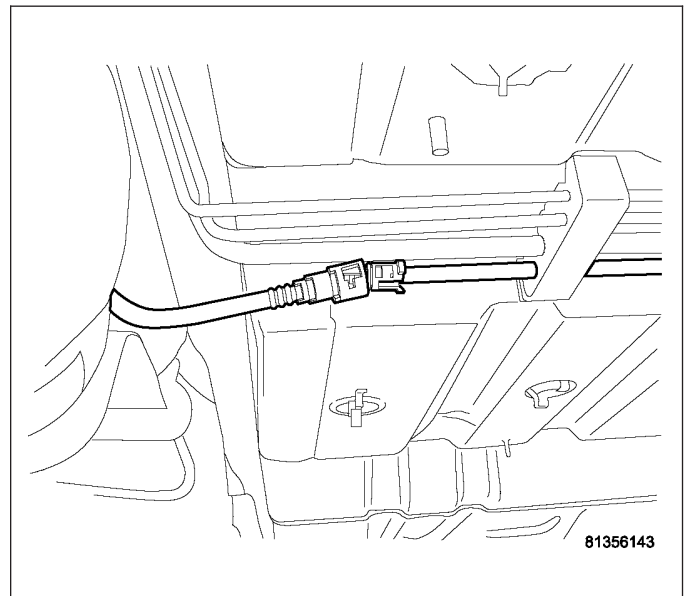
27. Disconnect the EVAP line in the right rear wheel well.



28. Disconnect vapor line.

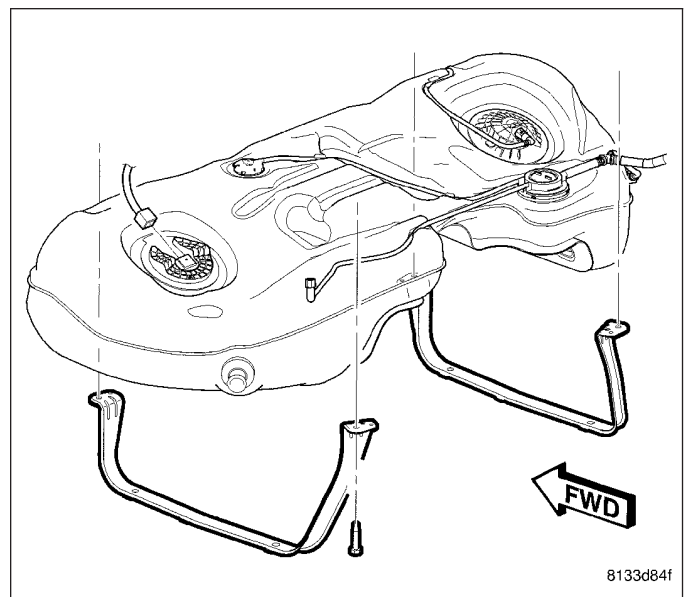


29. Disconnect the fuel supply line.

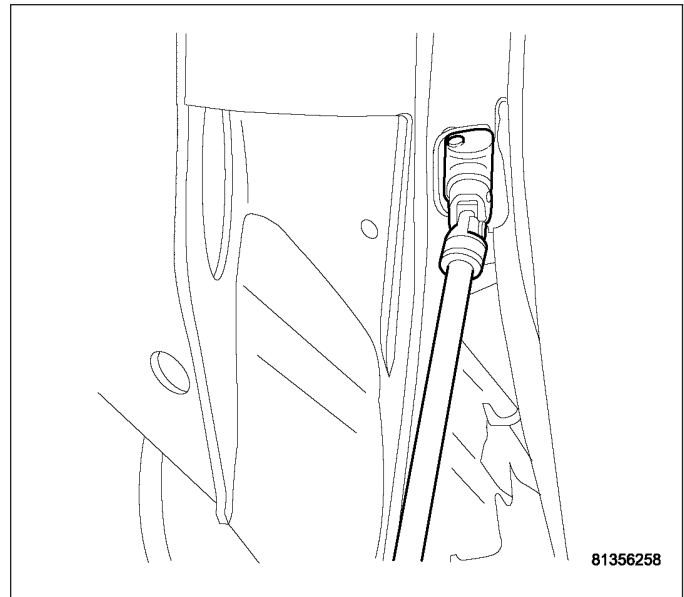


30. Support fuel tank with transmission jack.

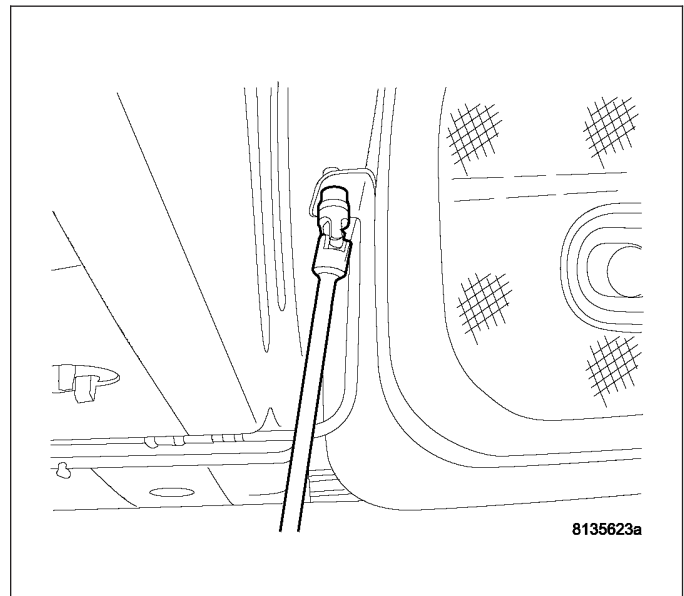
31. Fuel tank strap bolt locations.



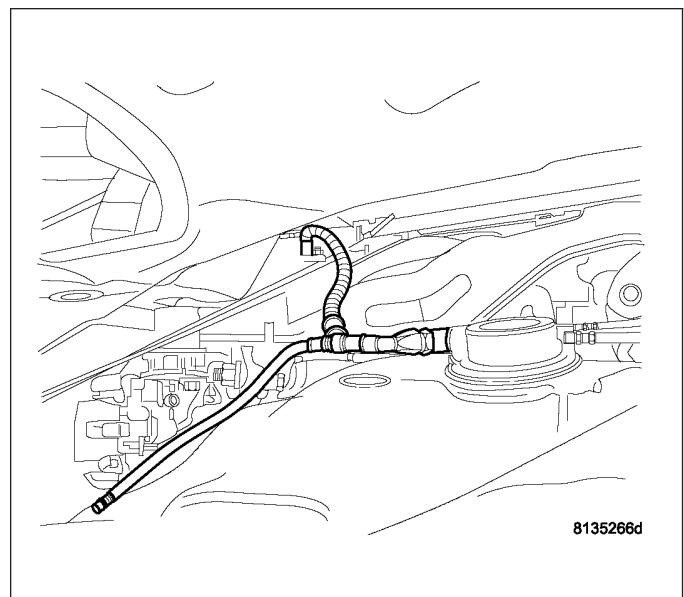
32. Remove bolt for fuel tank strap.



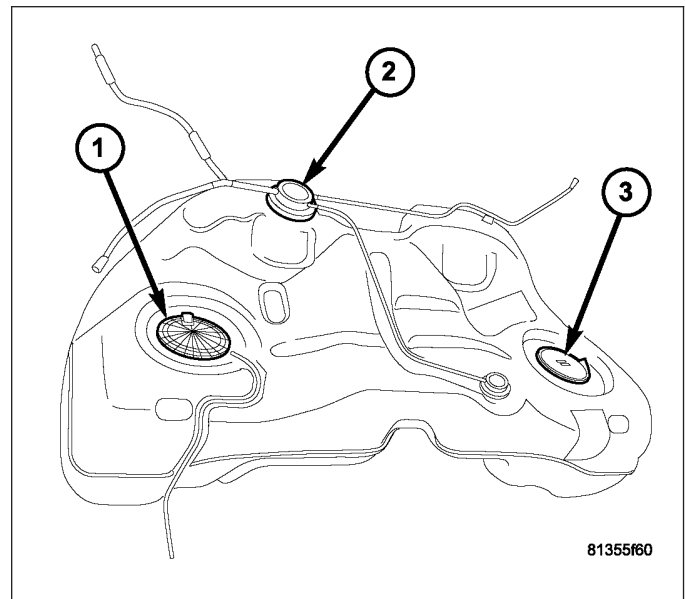
33. Remove bolt for fuel tank strap.



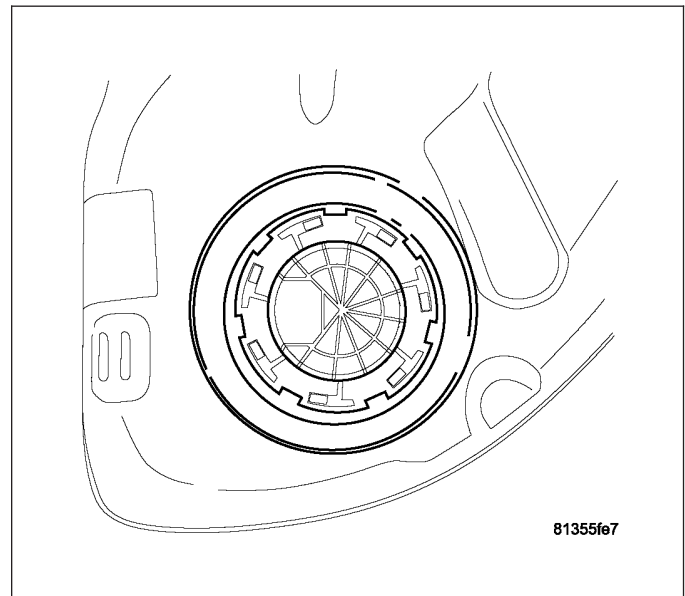
34. Lower tank and pull filler tube vent line through bracket.



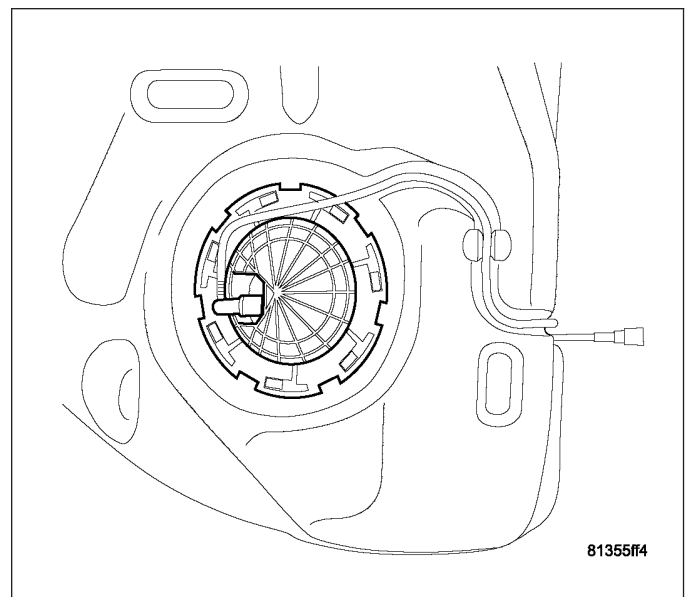
35. Lower Fuel tank and remove from vehicle.



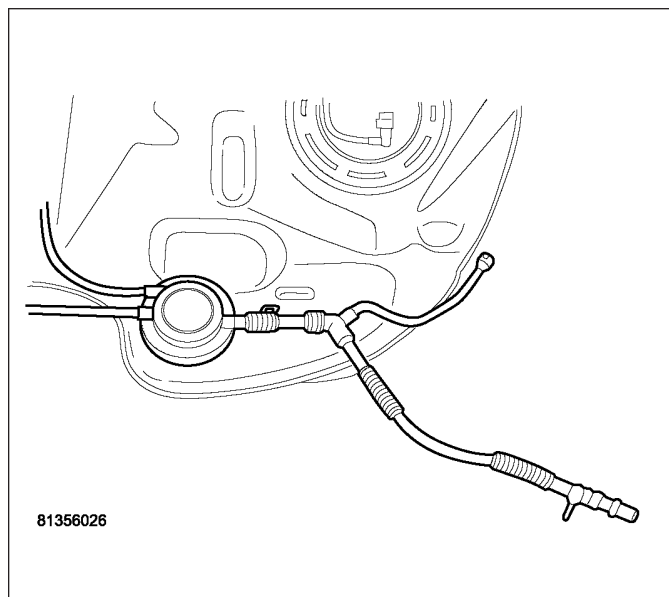
36. Left Side Module (Fuel Pump Module).



37. Right Side Module.

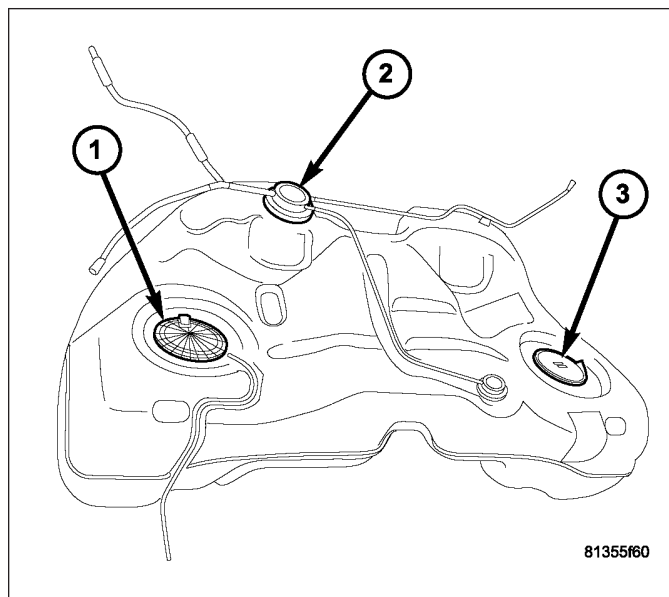


38. Control Valve and lines.

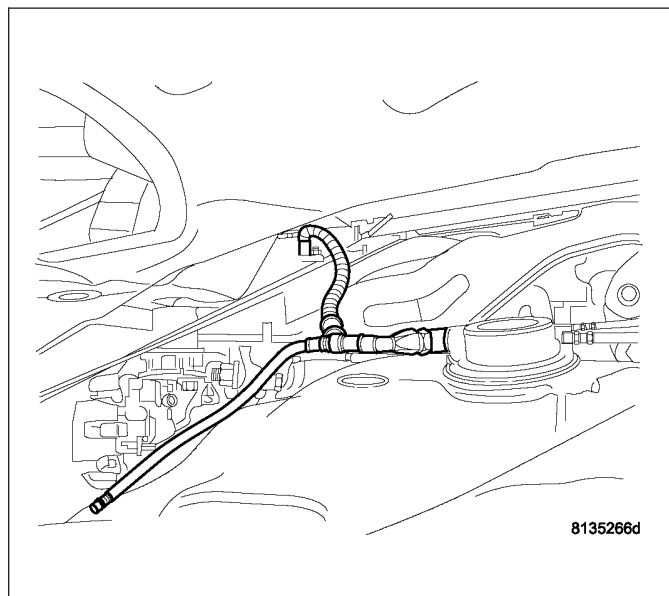


## INSTALLATION

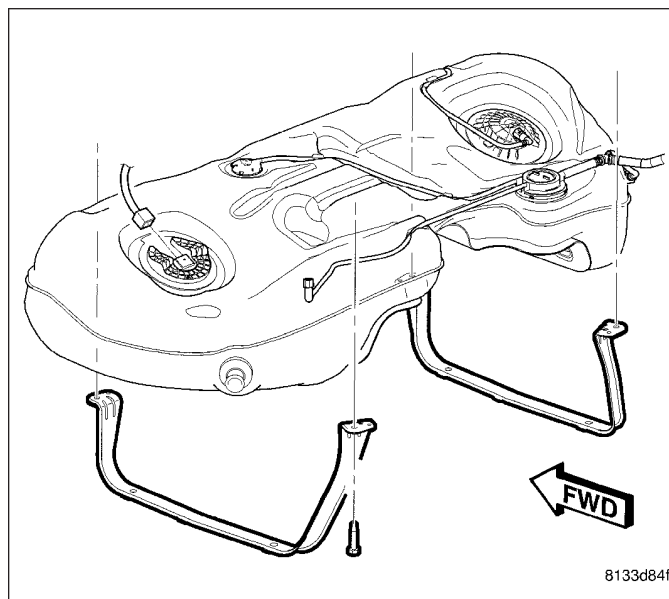
1. Support fuel tank with transmission jack.



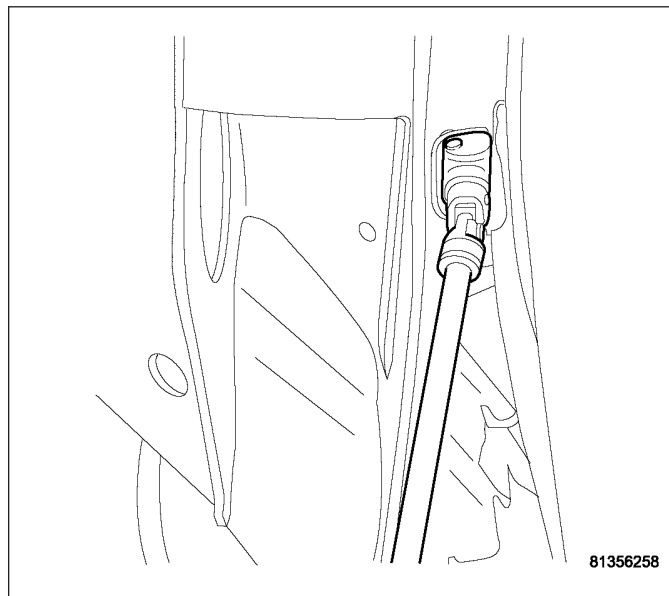
2. Raise tank and push filler tube vent line through bracket.



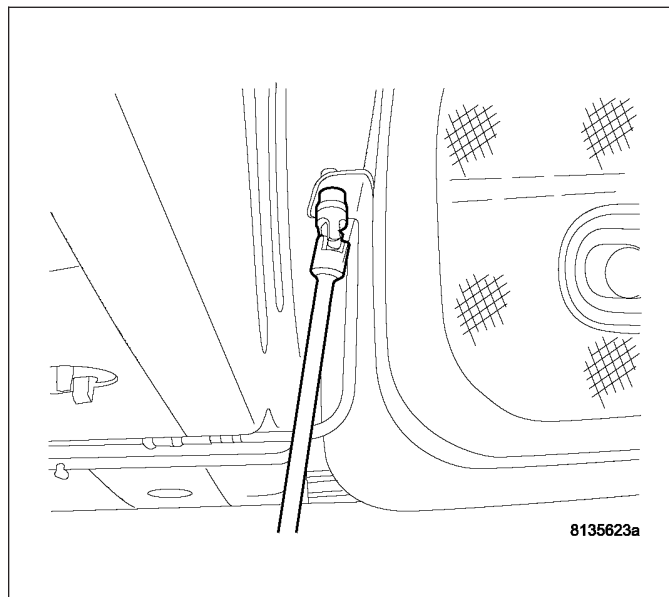
3. Fuel tank strap bolt locations.



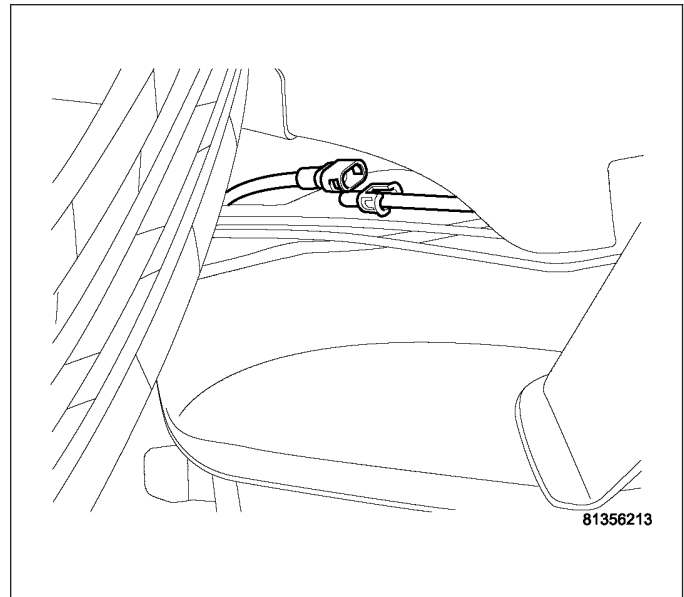
4. Install bolt for fuel tank strap and tighten.



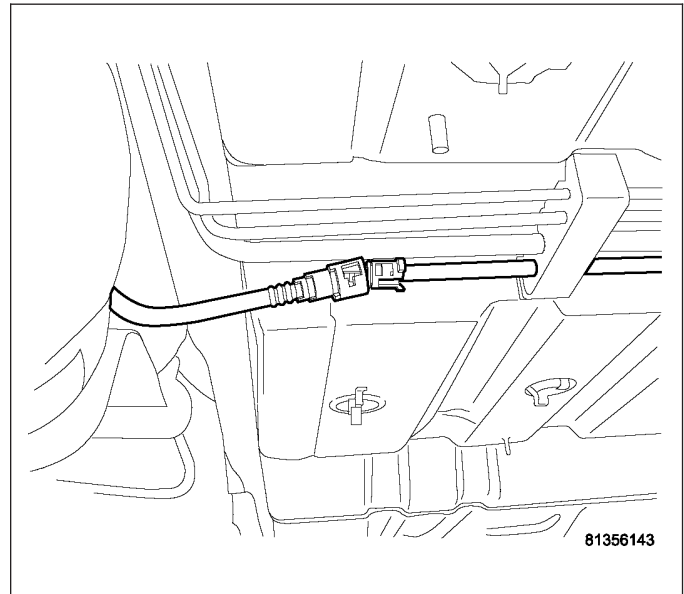
5. Install bolt for fuel tank strap and tighten.



6. Connect vapor line.



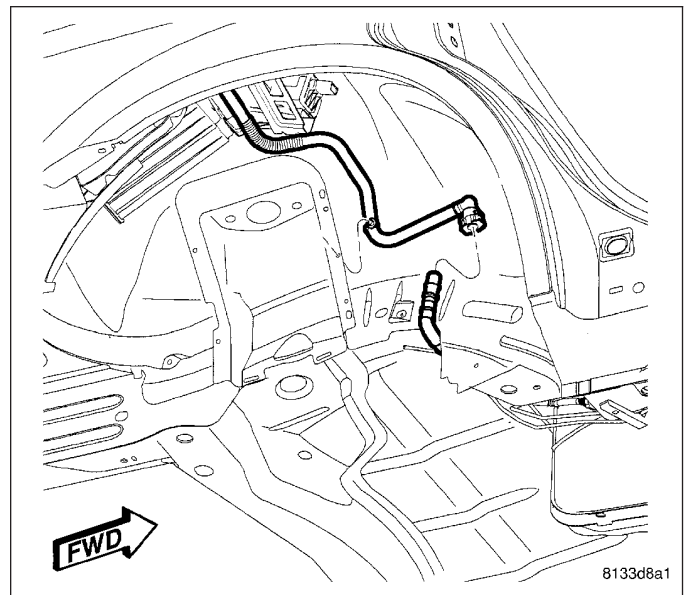
7. Connect the fuel supply line.



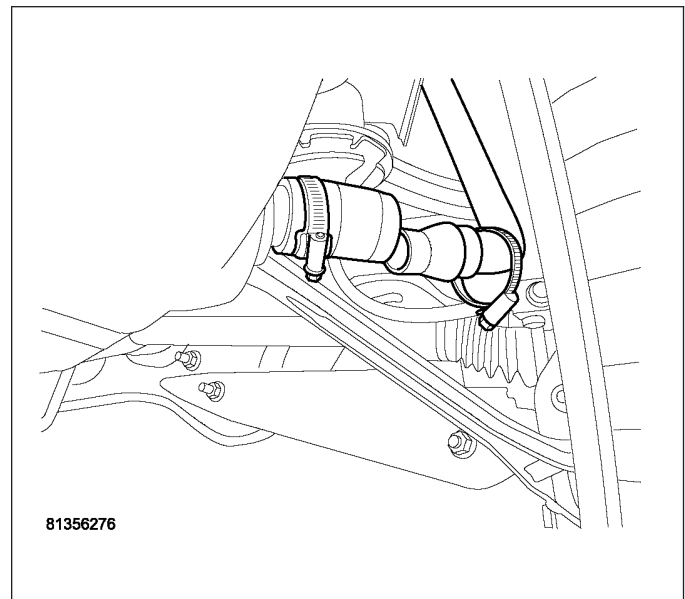
8. Connect the EVAP line in the right rear wheel well.

9. Install the drive shaft, (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - INSTALLATION)

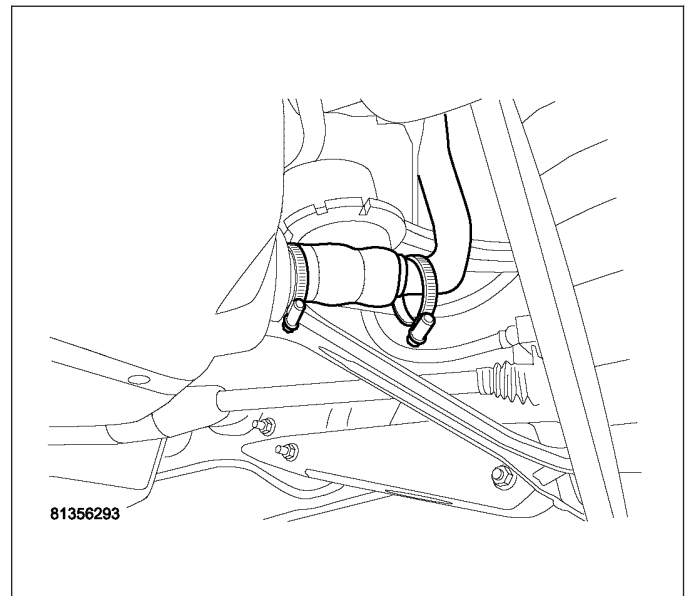
10. Install the exhaust system, (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - INSTALLATION)



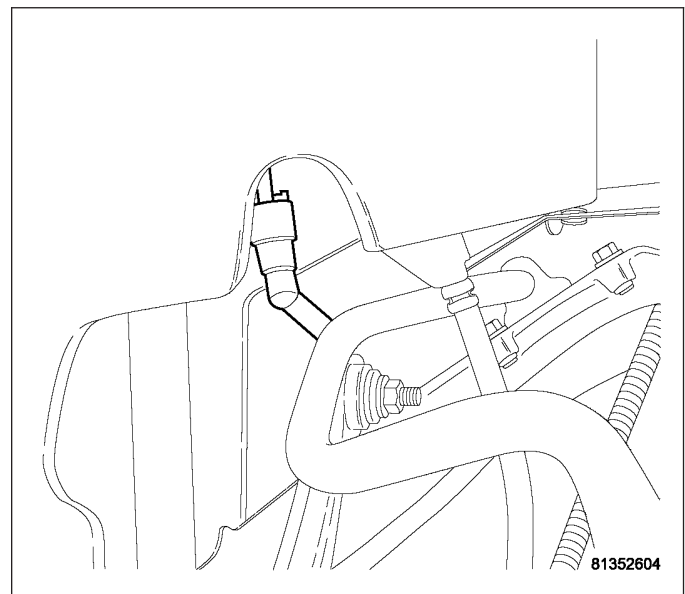
11. Install metal filler tube to rubber tube on fuel tank.



12. Install clamp to filler tube and tighten

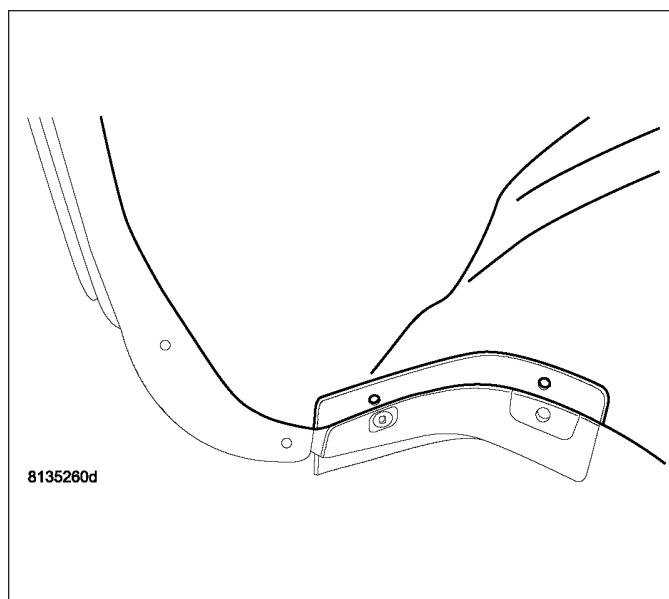


13. Connect the filler tube vent line.

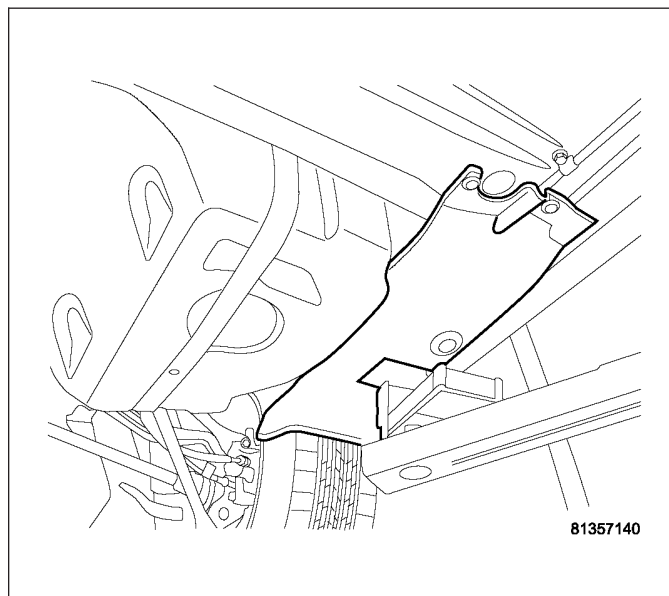




14. Install the inner splash shield.



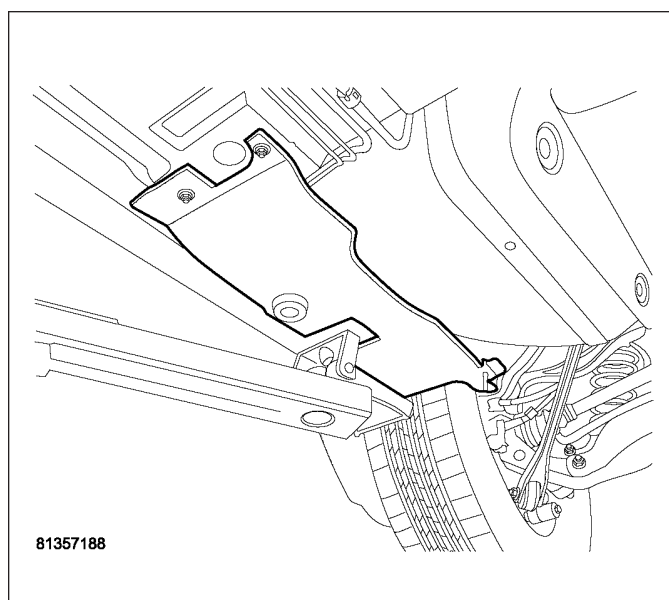
15. Install the left underbody splash shield.



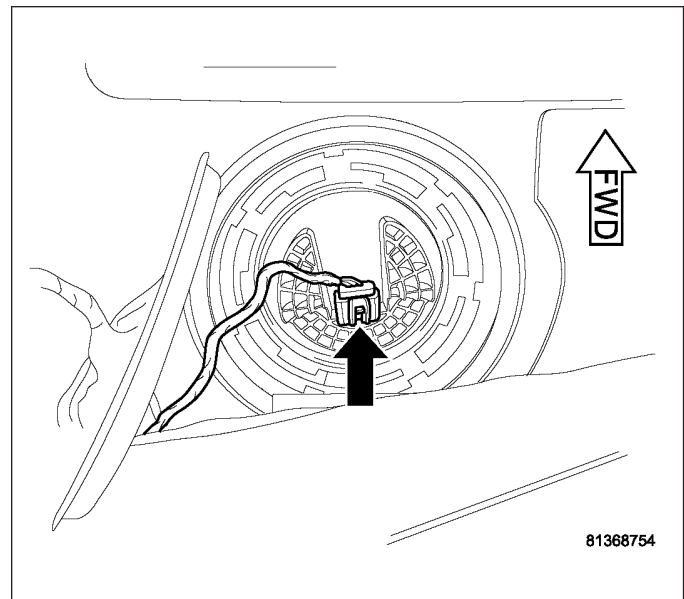
16. Install the right underbody splash shield.

17. Install left rear tire.

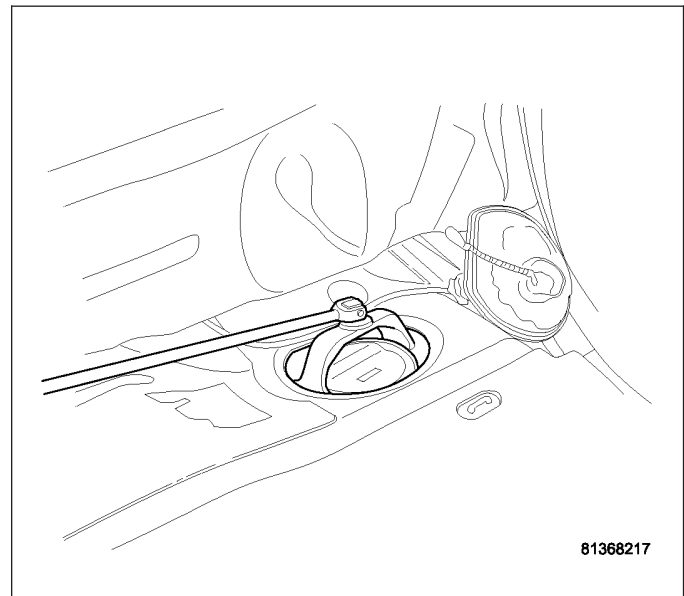
18. Lower vehicle.



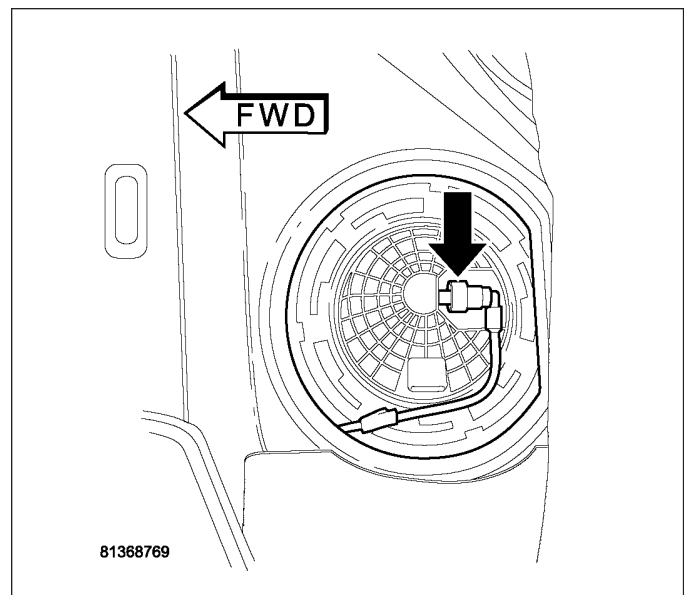
19. Install module and align marks on the module for proper orientation.



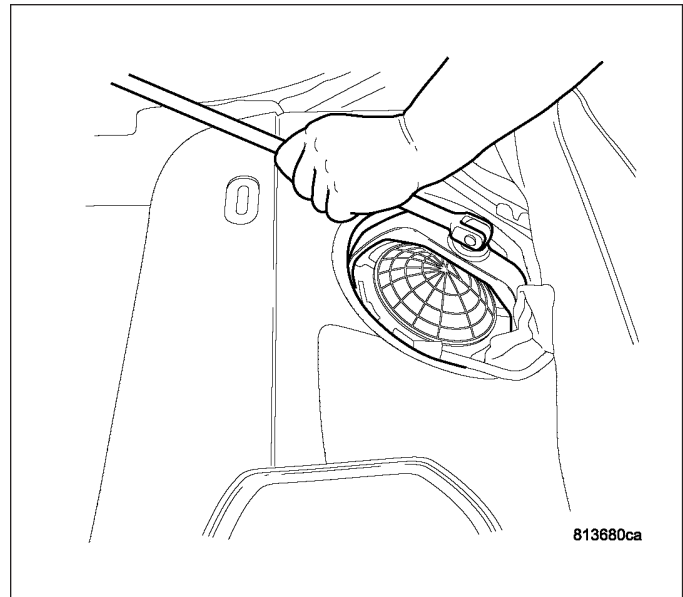
20. Install module lock-ring.  
21. Use special tool #9340 to tighten left side module lock ring.  
22. Connect the electrical connector to left side module and install plastic access cover.



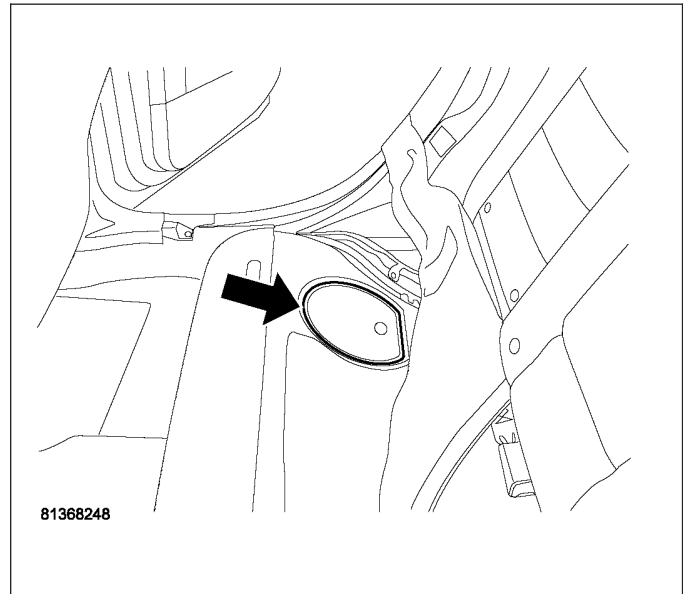
23. Install module and align marks on the module for proper orientation.



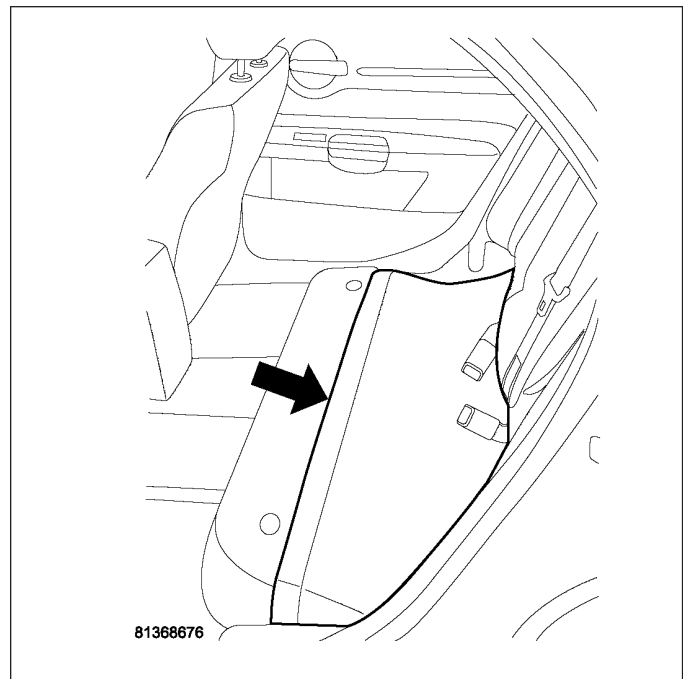
24. Install module lock-ring.
25. Use special tool #9340 to tighten right side module lock ring.
26. Connect the fuel supply line to module.



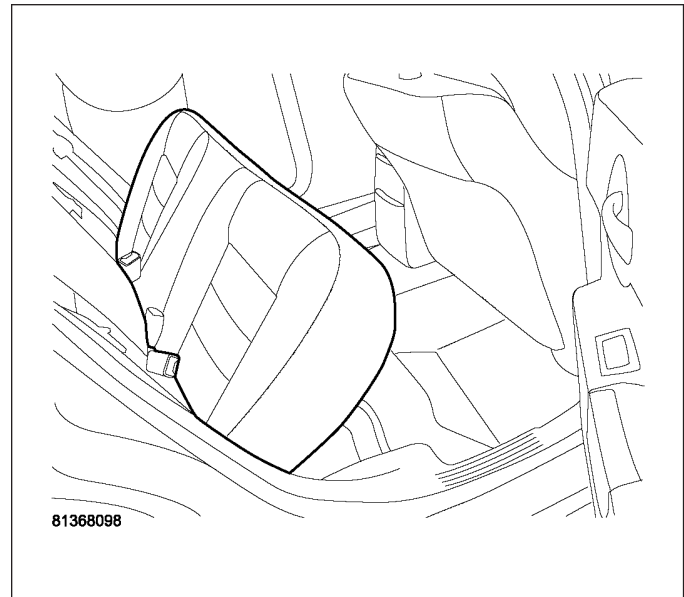
27. Install plastic access covers to floor pan right side.



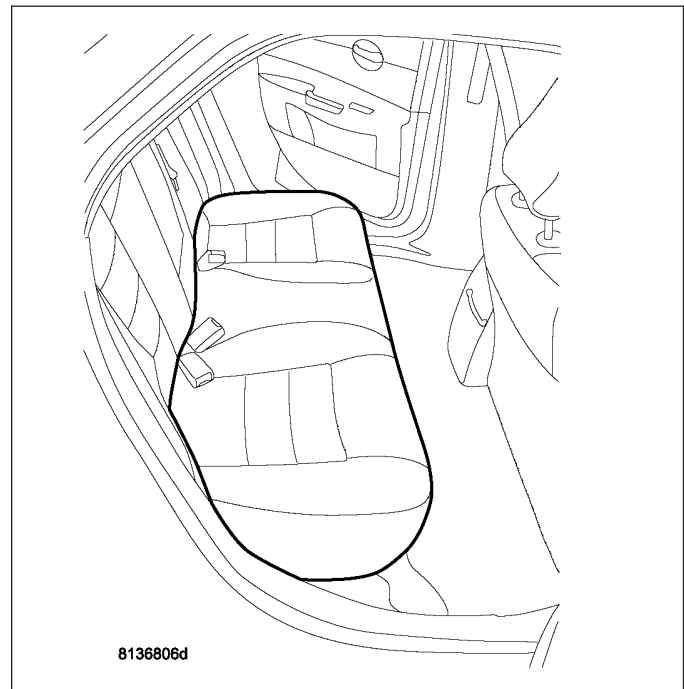
28. Fold the foam pad covering access cover for modules back into place.



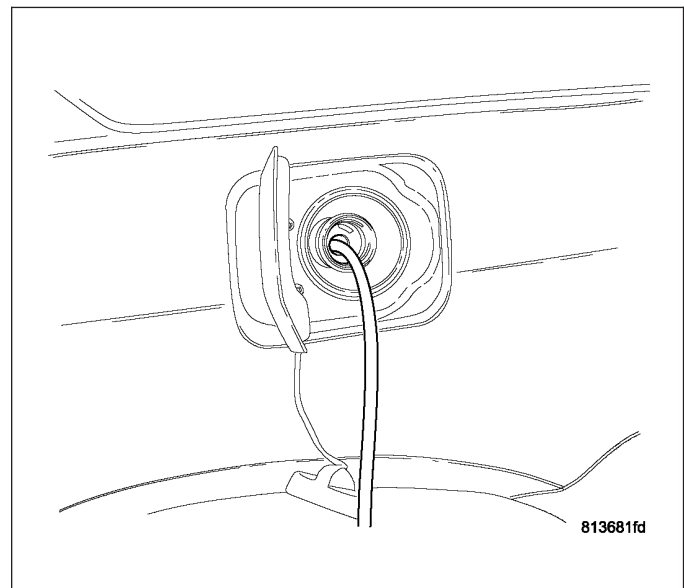
29. Install rear lower seat cushion



30. Rear lower seat cushion installed.



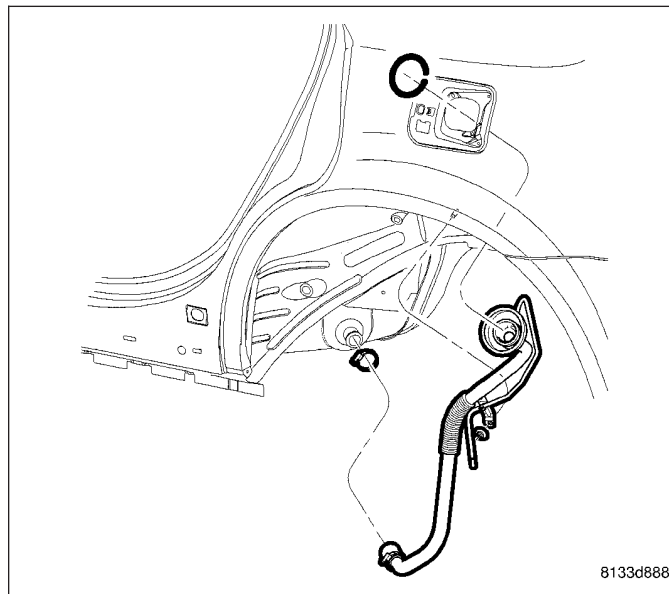
- 31. Fill fuel tank.
- 32. Connect negative battery cable.
- 33. Fill fuel tank. Use the scan tool to pressurize the fuel system. Check for leaks.



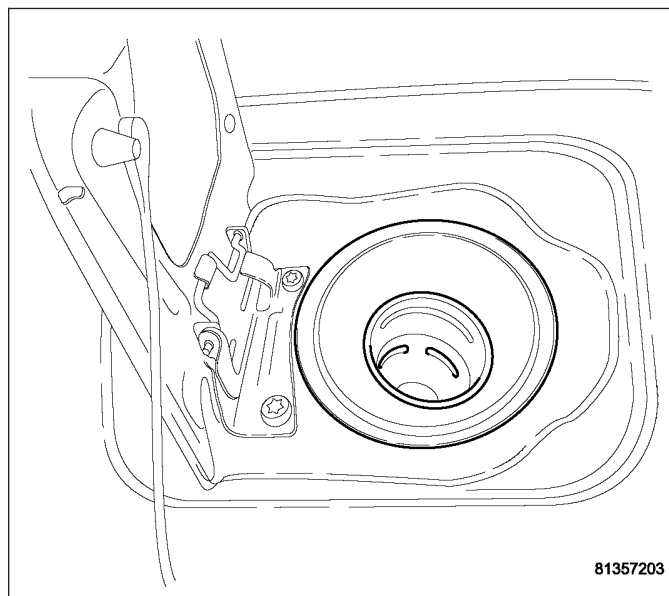
## FUEL TANK FILLER TUBE

### REMOVAL

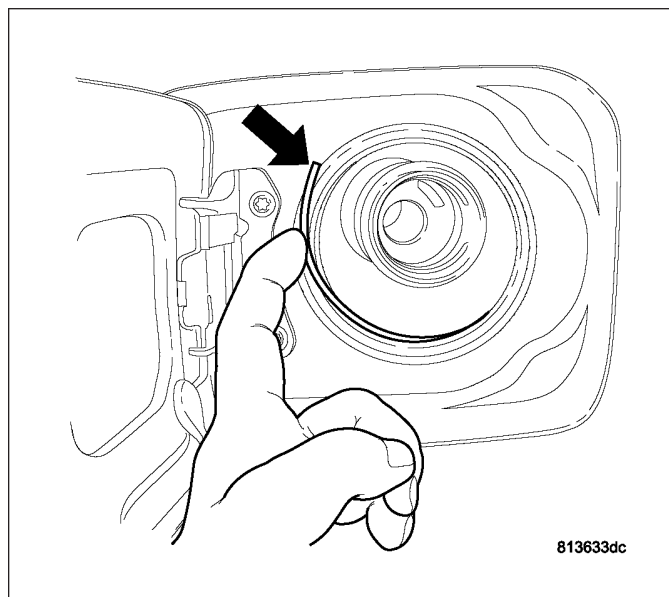
1. Disconnect negative battery cable.
2. Drain fuel from tank.
3. Fuel filler tube assembly.



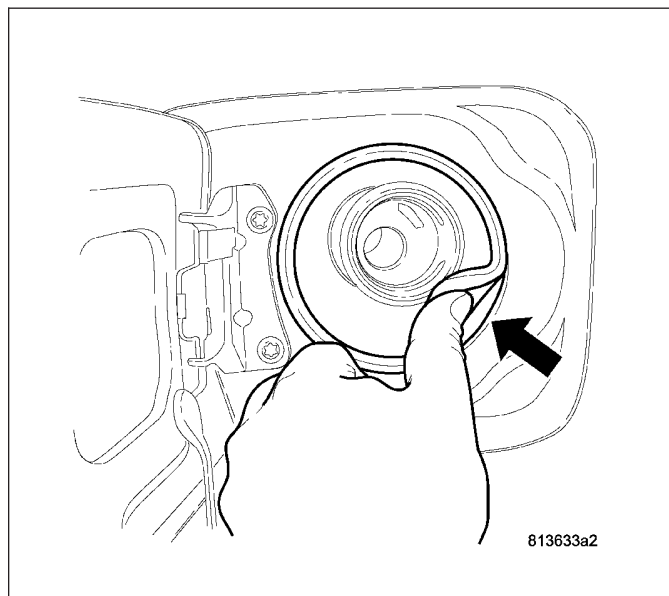
4. Open filler tube door.



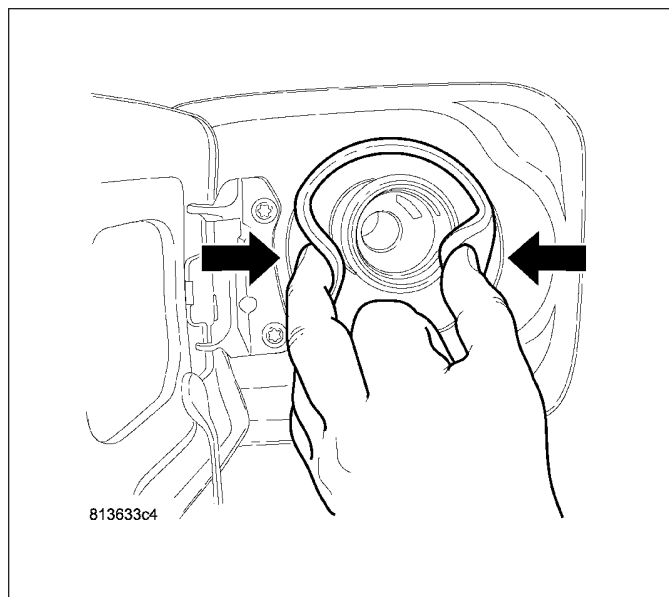
5. Remove retaining wire from inside filler tube rubber.



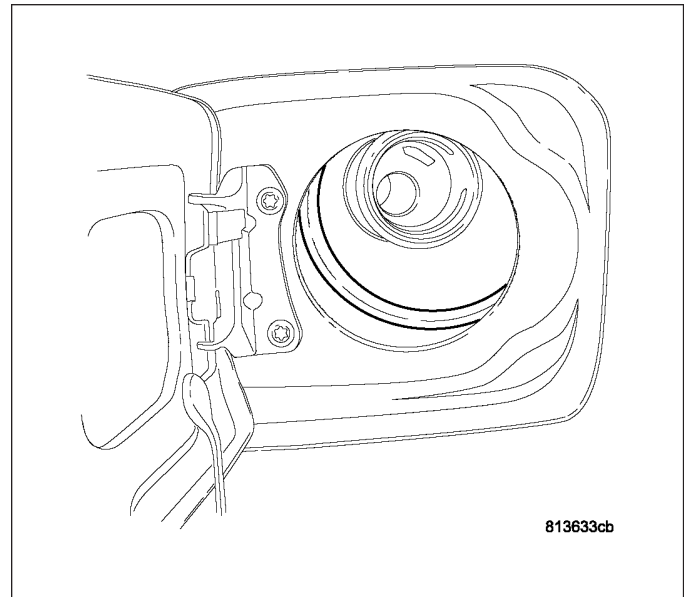
6. Start removing rubber from body sheet metal.



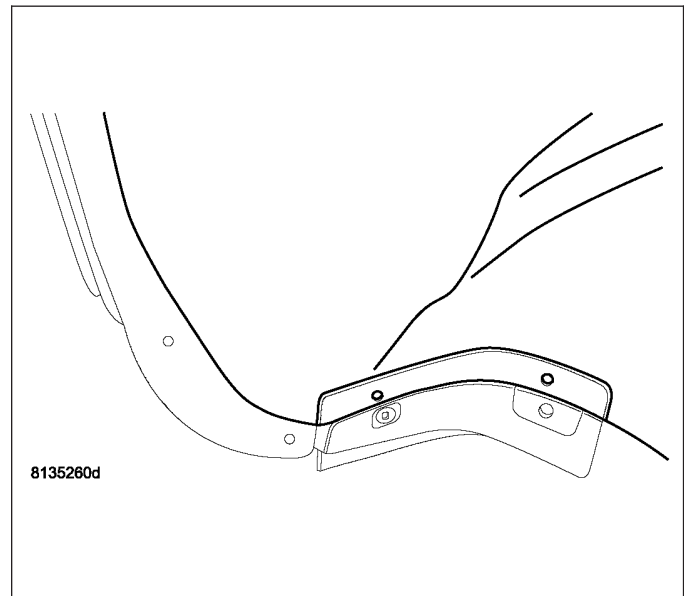
7. Squeeze rubber and push in.



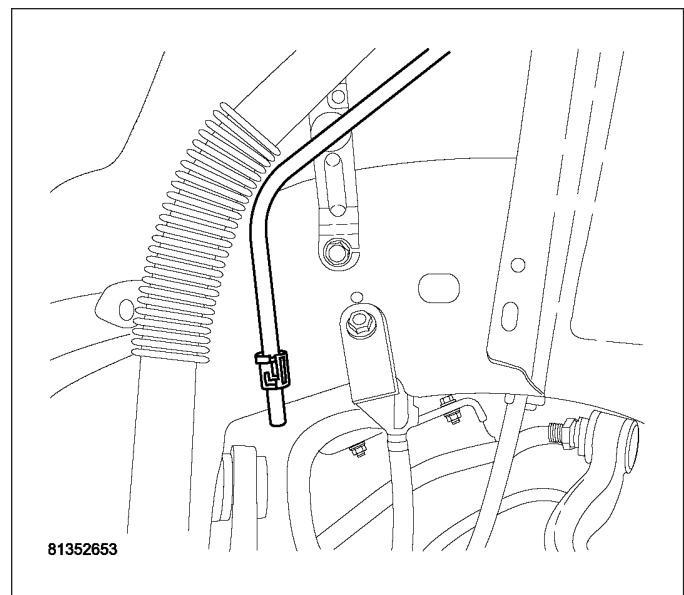
8. Filler tube and rubber removed from body sheet metal.



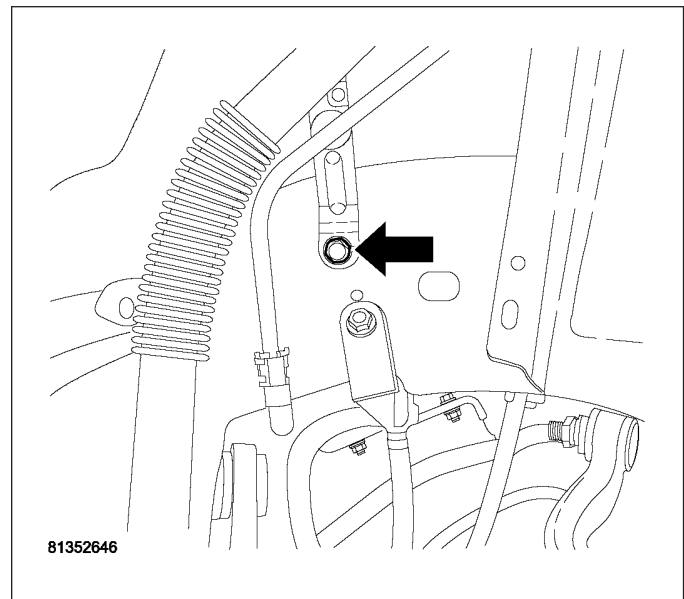
9. Raise vehicle and support.  
10. Remove the left rear tire.  
11. Remove the left inner splash shield.



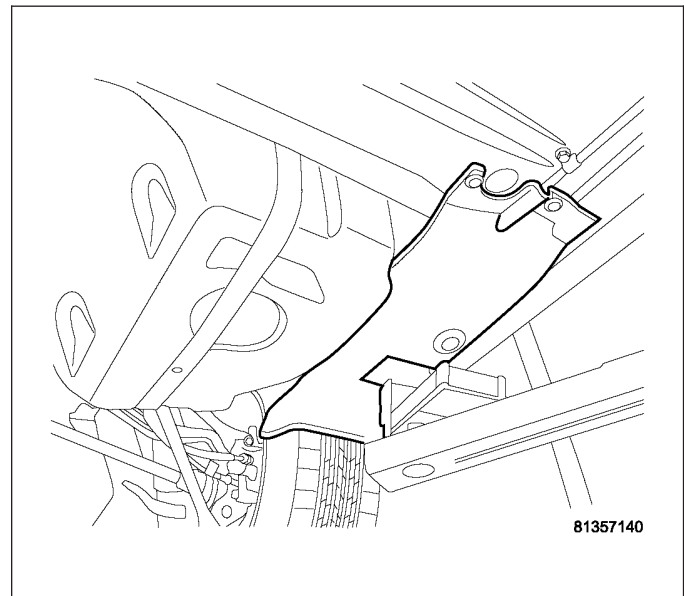
12. Disconnect the filler tube vent line.



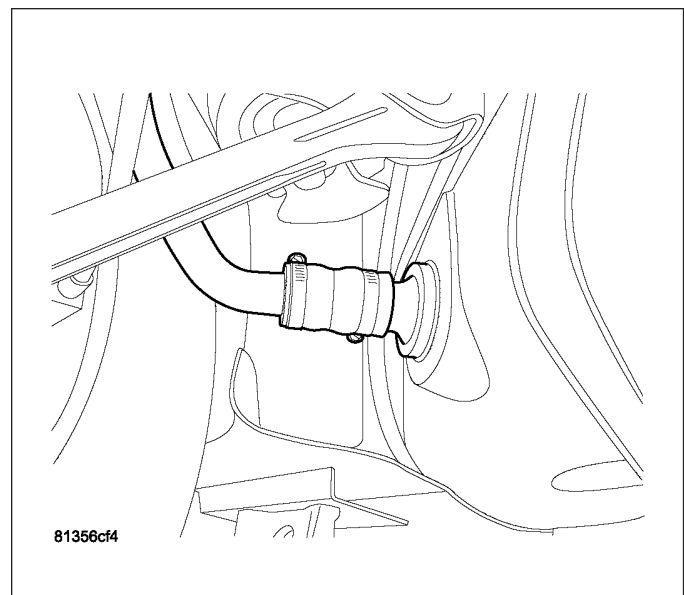
13. Remove the filler tube mounting bolt.



14. Remove the under body splash shield.

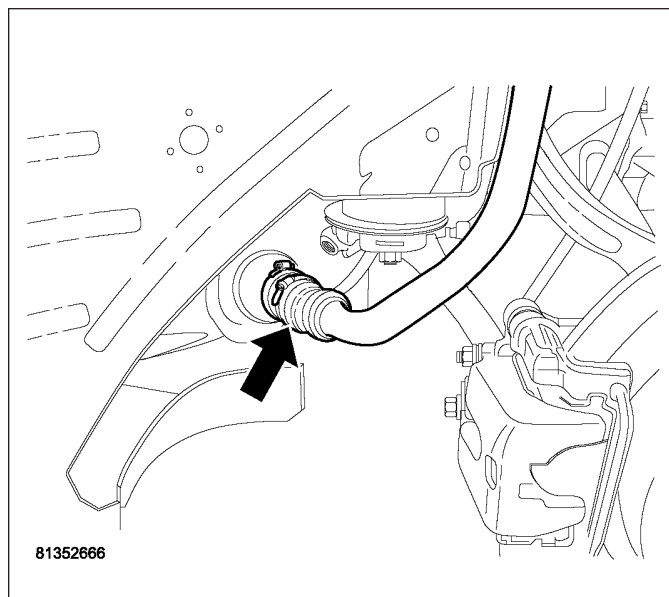


15. Loosen the filler tube hose clamp. Leave the clamp tight on the hose and fuel tank location.

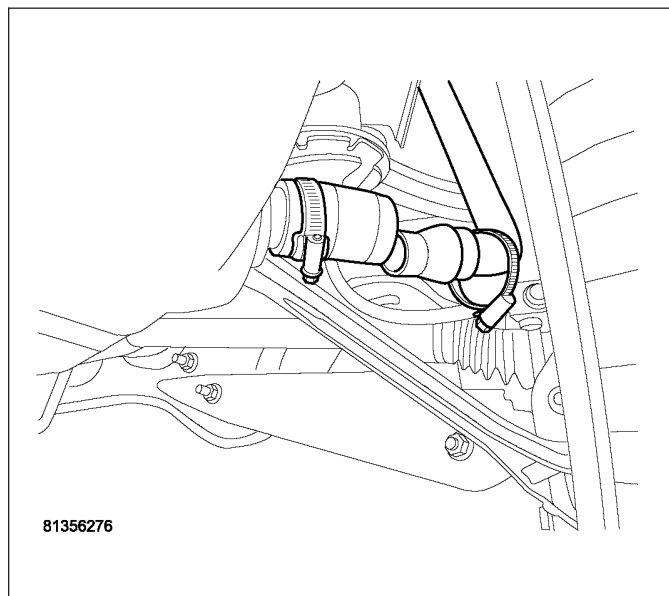




16. Move clamp toward the fuel tank.

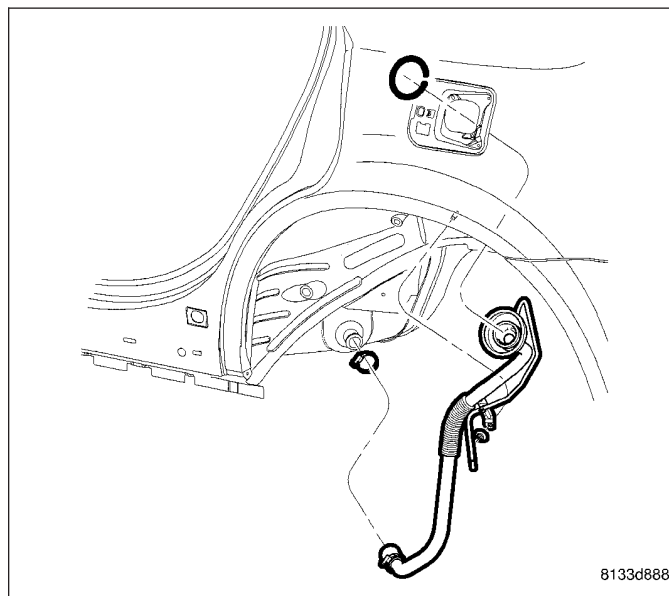


17. Remove the filler tube assembly from the vehicle.

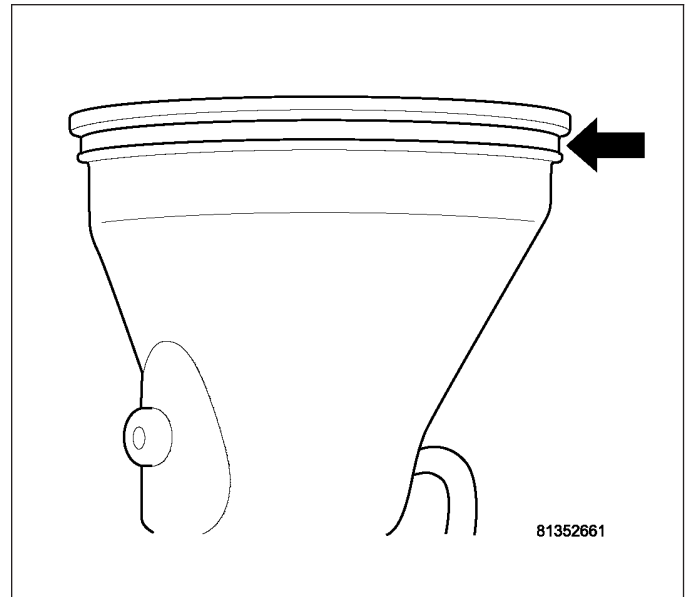


## INSTALLATION

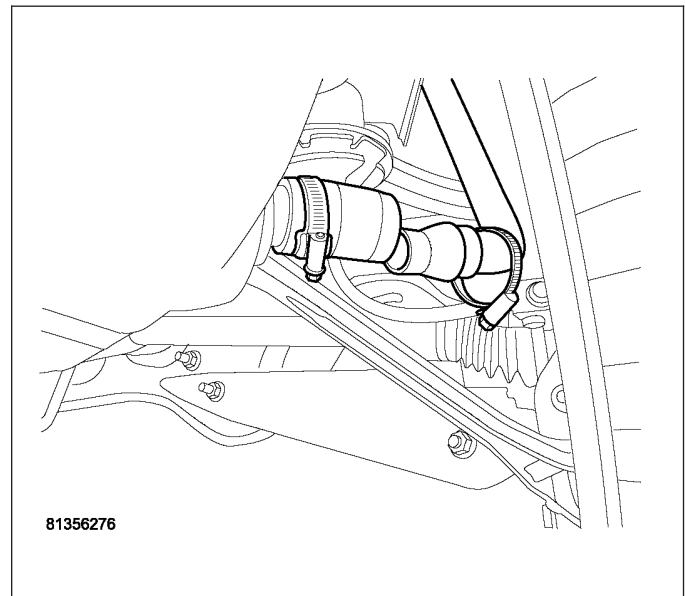
1. Filler tube assembly.



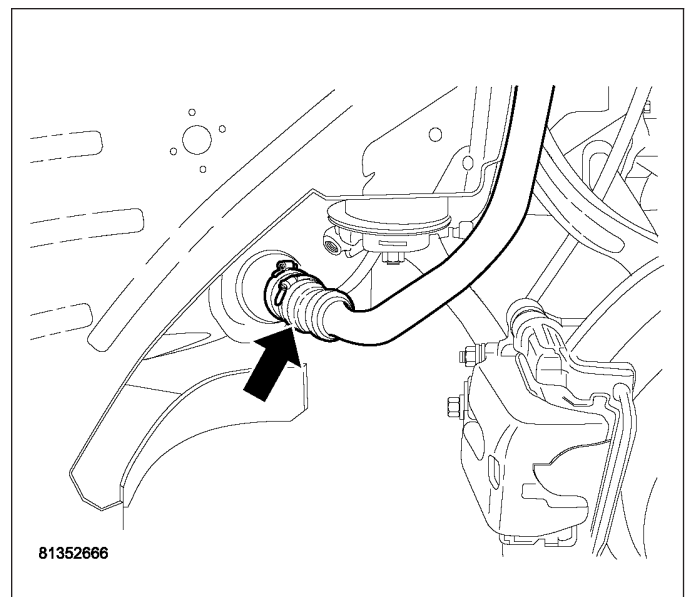
2. Groove in filler tube rubber is for the body sheet metal.



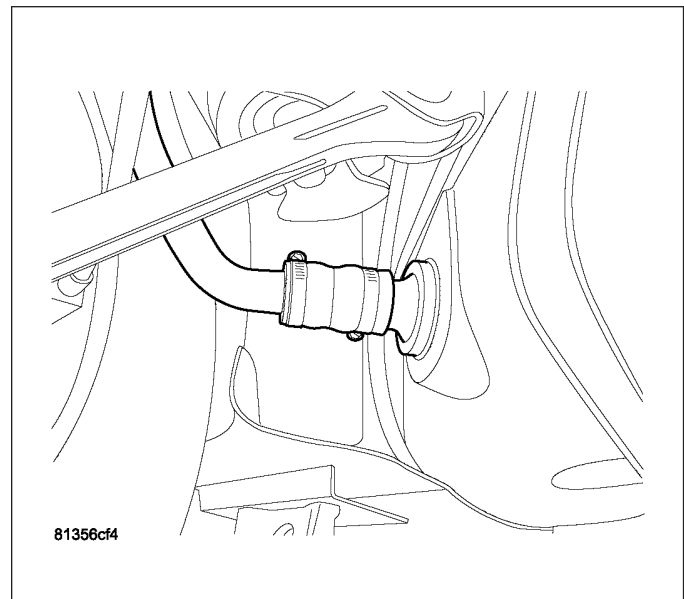
3. Insert filler tube into the fuel tank rubber hose.



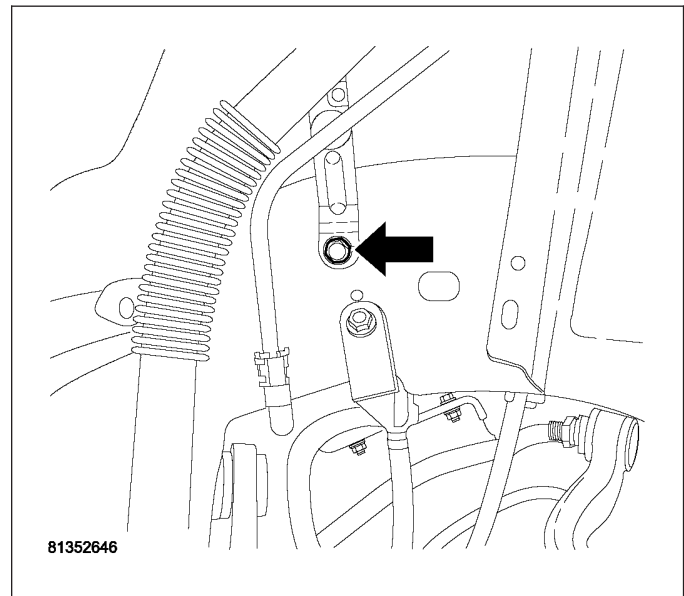
4. Slide hose clamp into place and tighten.



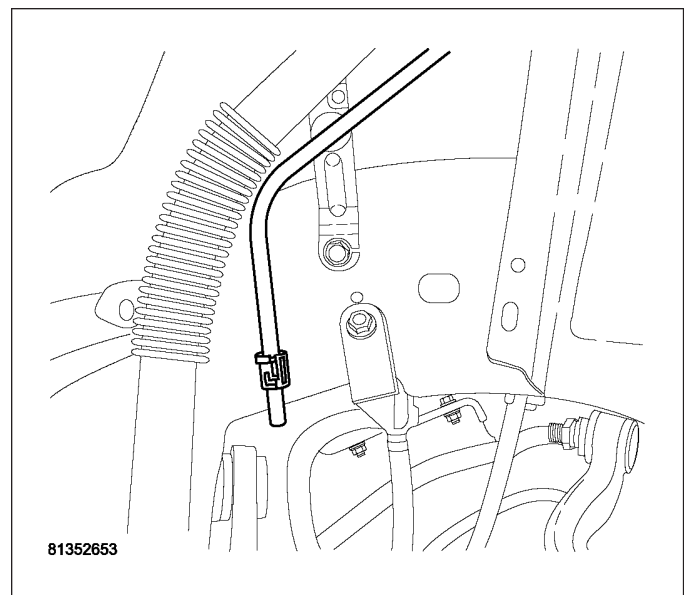
5. Hose clamp in place and tighten.



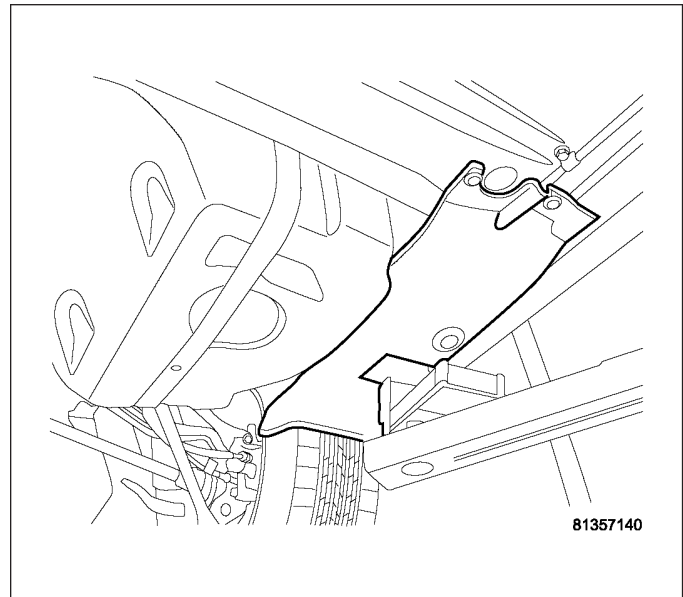
6. Install filler tube mounting bolt.



7. Install Filler tube vent line.



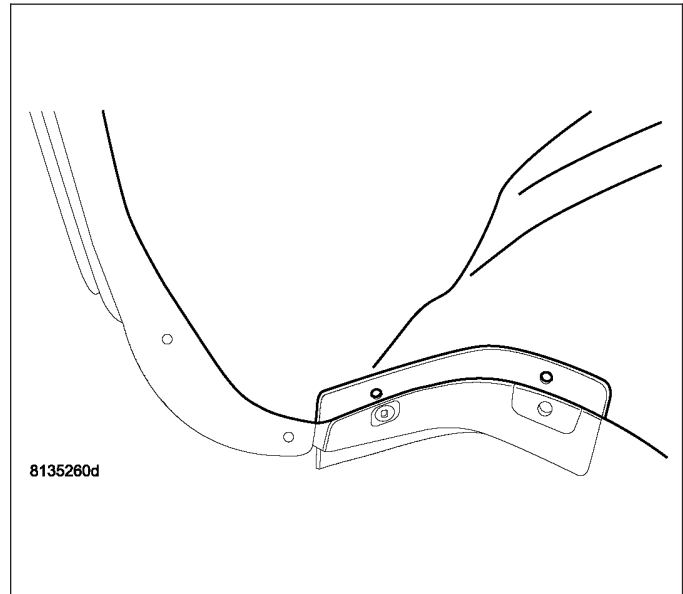
8. Install the underbody splash shield.



9. Install the left inner splash shield.

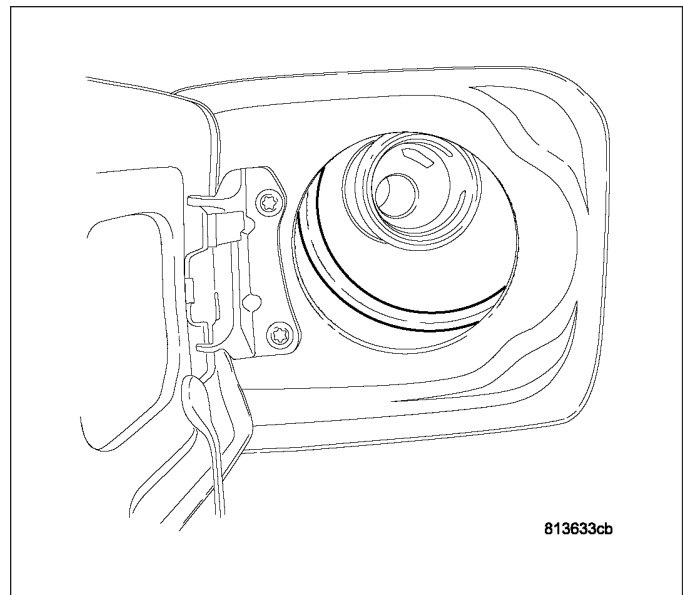
10. Install the left rear tire.

11. Lower vehicle.

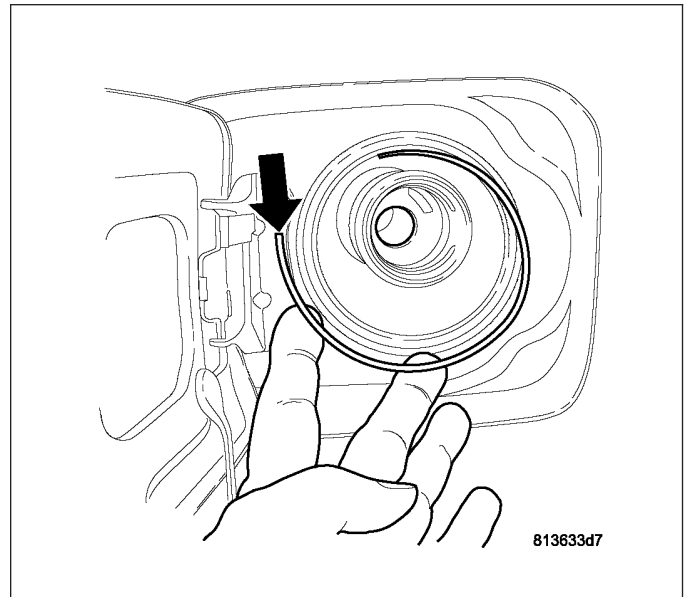


12. Filler tube rubber at body opening.

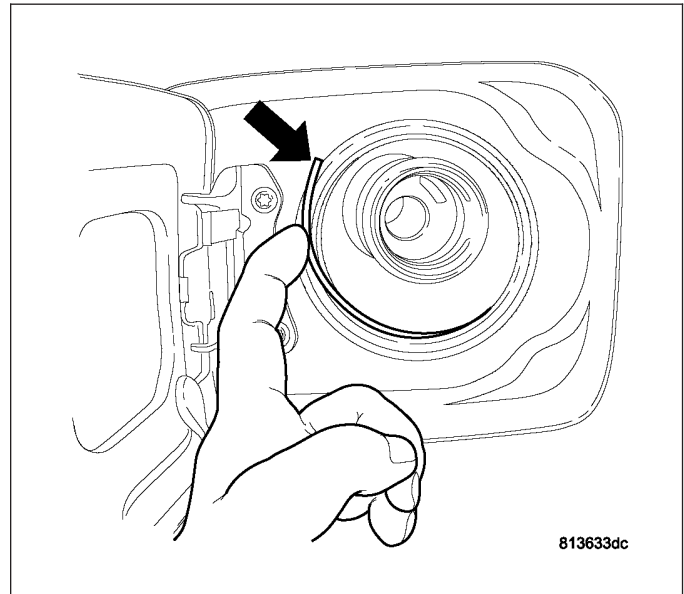
13. Pull rubber through opening and install to body. Make sure that the sheet metal is in the groove in the rubber.



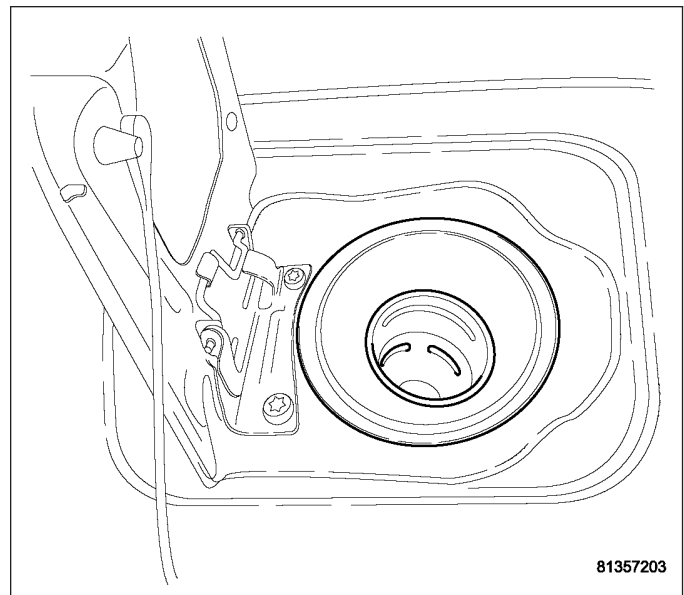
14. Start the metal wire retaining wire in the groove on the inside of the filler tube rubber.



15. Work wire retaining wire around the rubber.



16. Wire retainer install.  
17. Connect negative battery cable.  
18. Fill fuel tank.



## QUICK CONNECT FITTING

### STANDARD PROCEDURE - QUICK-CONNECT FITTINGS

#### REMOVAL

When disconnecting a quick-connect fitting, the retainer will remain on the fuel tube nipple.

**WARNING: RELEASE FUEL SYSTEM PRESSURE BEFORE DISCONNECTING A QUICK-CONNECT FITTINGS. REFER TO THE FUEL PRESSURE RELEASE PROCEDURE. THIS MAY RESULT IN PERSONAL INJURY OR DEATH.**

1. Perform Fuel Pressure Release Procedure. Refer to the Fuel Pressure Release Procedure in this section.
2. Disconnect negative cable from battery or auxiliary jumper terminal.
3. Squeeze retainer tabs together and pull fuel tube/quick-connect fitting assembly off of fuel tube nipple. The retainer will remain on fuel tube.

#### INSTALLATION

**CAUTION: Make sure that the o-ring is installed in fitting. Never install a quick-connect fitting without the retainer being either on the fuel tube or already in the quick-connect fitting. In either case, ensure the retainer locks securely into the quick-connect fitting by firmly push-pulling-push on fuel tube and fitting to ensure it is secured.**

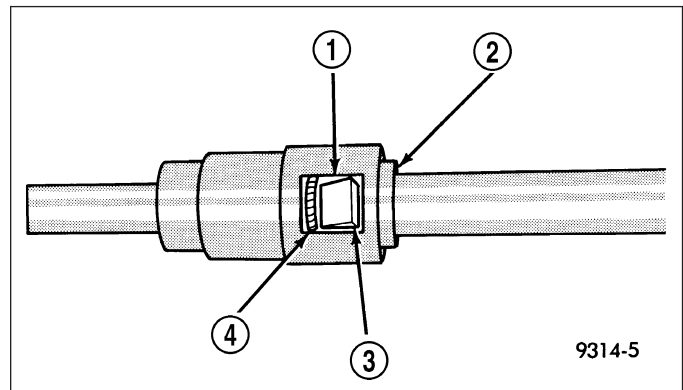
1. Using a clean lint free cloth, clean the fuel tube nipple and retainer.
2. Prior to connecting the fitting to the fuel tube, coat the fuel tube nipple with clean engine oil.
3. Push the quick-connect fitting over the fuel tube until the **retainer seats and a click is heard**.
4. The plastic quick-connect fitting has windows in the sides of the casing. When the fitting completely attaches to the fuel tube, the retainer locking ears and the fuel tube shoulder are visible in the windows. If they are not visible, the retainer was not properly installed. **Do not rely upon the audible click to confirm a secure connection.**
5. Connect negative cable to battery or auxiliary jumper terminal.

**CAUTION: When using the ASD Fuel System Test, the Auto Shutdown (ASD) Relay remains energized for several minutes, until the test is stopped, or until the ignition switch is turned to the Off position.**

6. Use the DRB III® scan tool ASD Fuel System Test to pressurize the fuel system. Check for leaks.

#### Single-Button Type Fitting

1. This type of fitting is equipped with a single push-button located on the quick-connect fitting. The push-button is attached to two internal latches. To disconnect, press on button with your thumb and unlatch fitting from fuel line. Special tools are not required for disconnection. **DO NOT ATTEMPT TO PRY OR PULL UP ON PUSH-BUTTON. LATCHES WILL BE BROKEN.**



## TWO-TAB TYPE FITTING

This type of fitting is equipped with tabs located on both sides of the fitting. These tabs are supplied for disconnecting the quick-connect fitting from component being serviced.

**CAUTION:** The interior components (O-rings, spacers) of this type of quick-connect fitting are not serviced separately, but new plastic retainers are available. Do not attempt to repair damaged fittings or fuel lines/tubes. If repair is necessary, replace the complete fuel tube assembly.

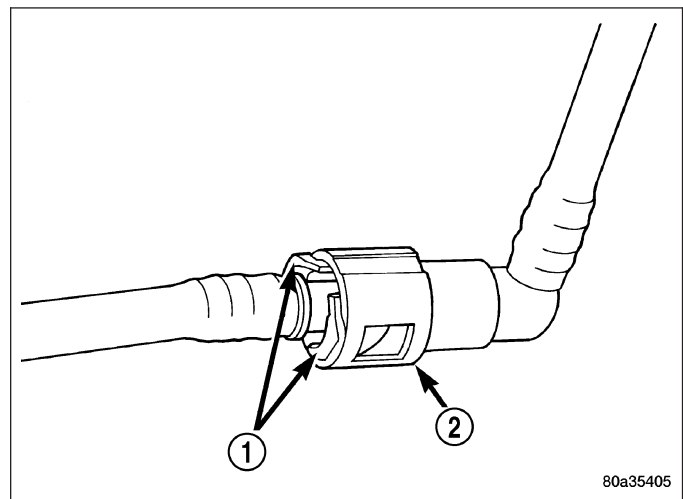
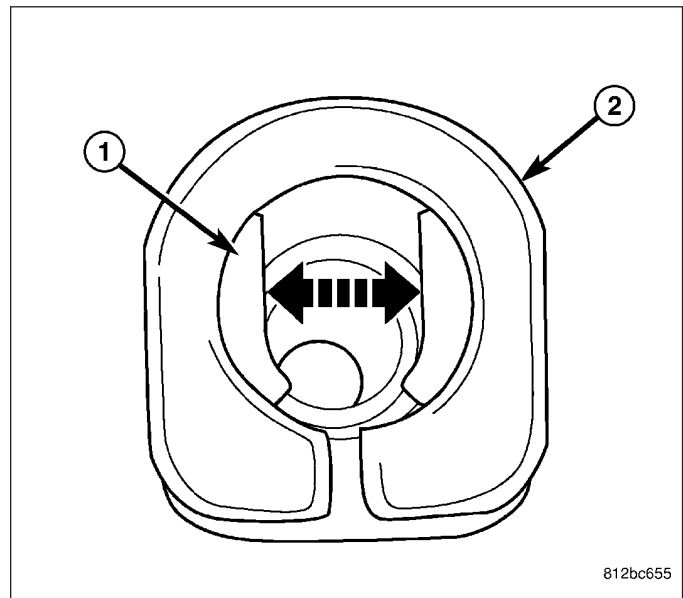
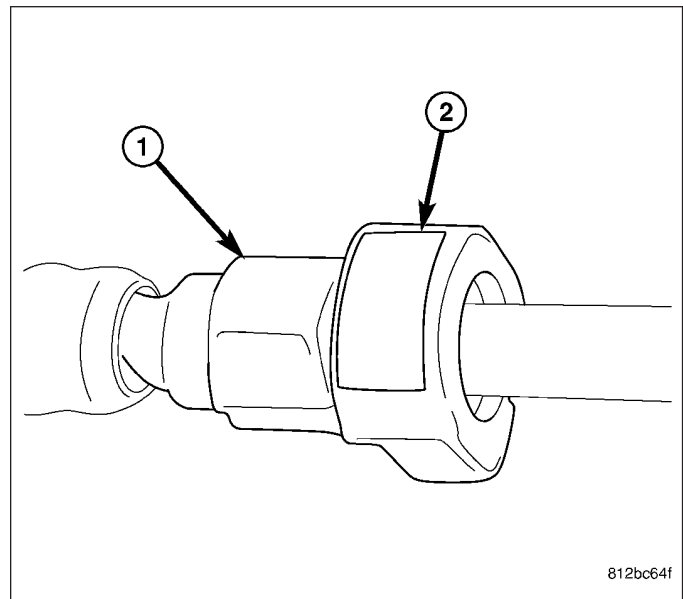
**WARNING:** THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSES, FITTINGS OR LINES, THE FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL PRESSURE RELEASE PROCEDURE IN THIS GROUP. THIS MAY RESULT IN PERSONAL INJURY OR DEATH.

### DISCONNECTION/CONNECTION

1. Perform fuel pressure release procedure. Refer to Fuel Pressure Release Procedure in this group.
2. Disconnect negative battery cable from battery or auxiliary jumper terminal.
3. Clean fitting of any foreign material before disassembly.
4. To disconnect quick-connect fitting, squeeze plastic retainer tabs against sides of quick-connect fitting with your fingers. Tool use is not required for removal and may damage plastic retainer. Pull fitting from fuel system component being serviced. The plastic retainer will remain on component being serviced after fitting is disconnected. The O-rings and spacer will remain in quick-connect fitting connector body.
5. Inspect quick-connect fitting body and component for damage. Replace as necessary.

**CAUTION:** When the quick-connect fitting was disconnected, the plastic retainer will remain on the component being serviced. If this retainer must be removed, very carefully release the retainer from the component with two small screwdrivers. After removal, inspect the retainer for cracks or any damage.

6. Prior to connecting quick-connect fitting to component being serviced, check condition of fitting and component. Clean parts with a lint-free cloth. Lubricate with clean engine oil.
7. Insert quick-connect fitting to component being serviced and into plastic retainer. When a connection is made, a click will be heard.
8. Verify a locked condition by firmly push-pulling-push on fuel tube and fitting (15-30 lbs.).



9. Connect negative cable to battery or auxiliary jumper terminal.
10. Use the DRB III® scan tool ASD Fuel System Test to pressurize the fuel system. Check for leaks.

## PLASTIC RETAINER RING TYPE FITTING

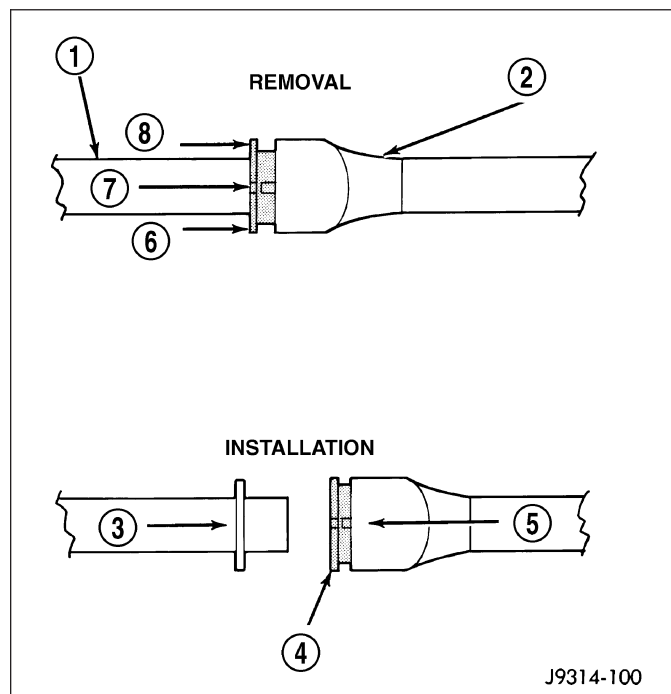
This type of fitting can be identified by the use of a full-round plastic retainer ring usually black in color.

**CAUTION:** The interior components (O-rings, spacers, retainers) of this type of quick-connect fitting are not serviced separately. Do not attempt to repair damaged fittings or fuel lines/tubes. If repair is necessary, replace the complete fuel tube assembly.

**WARNING:** THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSES, FITTINGS OR LINES, THE FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE IN THIS GROUP. THIS MAY RESULT IN PERSONAL INJURY OR DEATH.

### DISCONNECTION/CONNECTION

1. Perform fuel pressure release procedure. Refer to Fuel Pressure Release Procedure in this section.
2. Disconnect negative battery cable from battery or auxiliary jumper terminal.
3. Clean fitting of any foreign material before disassembly.
4. To release fuel system component from quick-connect fitting, firmly push fitting towards component being serviced while firmly pushing plastic retainer ring into fitting. With plastic ring depressed, pull fitting from component. **The plastic retainer ring must be pressed squarely into fitting body. If this retainer is cocked during removal, it may be difficult to disconnect fitting. Use an open-end wrench on shoulder of plastic retainer ring to aid in disconnection.**
5. After disconnection, plastic retainer ring will remain with quick-connect fitting connector body.
6. Inspect fitting connector body, plastic retainer ring and fuel system component for damage. Replace as necessary.
7. Prior to connecting quick-connect fitting to component being serviced, check condition of fitting and component. Clean parts with a lint-free cloth. Lubricate with clean engine oil.
8. Insert quick-connect fitting into component being serviced until a click is felt.
9. Verify a locked condition by firmly push-pulling-push on fuel tube and fitting (15-30 lbs.).
10. Connect negative battery cable to battery or auxiliary jumper terminal.
11. Use the DRB III® scan tool ASD Fuel System Test to pressurize the fuel system. Check for leaks.



## FUEL LINES

### DESCRIPTION - FUEL LINES/HOSES AND CLAMPS

Also refer to Quick-Connect Fittings.

**WARNING:** THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSES, FITTINGS OR LINES, THE FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE IN THIS GROUP. THIS MAY RESULT IN PERSONAL INJURY OR DEATH.



The lines/tubes/hoses used on fuel injected vehicles are of a special construction. This is due to the higher fuel pressures and the possibility of contaminated fuel in this system. If it is necessary to replace these lines/tubes/hoses, use new original equipment lines/tubes/hoses.

**If equipped:** The hose clamps used to secure rubber hoses on vehicles are of a special rolled edge construction. This construction is used to prevent the edge of the clamp from cutting into the hose. Only these rolled edge type clamps may be used in this system. All other types of clamps may cut into the hoses and cause leaks.

Use new original equipment type hose clamps.

## STANDARD PROCEDURE - HOSES AND CLAMP

Inspect all hose connections (clamps and quick connect fittings) for completeness and leaks. Replace cracked, scuffed, or swelled hoses. Replace hoses that rub against other vehicle components or show sign of wear.

Fuel injected vehicles use specially constructed hoses. When replacing hoses, only use hoses marked EFM/EFI.

When installing hoses, ensure that they are routed away from contact with other vehicle components that could rub against them and cause failure. Avoid contact with clamps or other components that cause abrasions or scuffing. Ensure that rubber hoses are properly routed and avoid heat sources.

The hose clamps have rolled edges to prevent the clamp from cutting into the hose. Only use clamps that are original equipment or equivalent. Other types of clamps may cut into the hoses and cause high pressure fuel leaks. Tighten hose clamps to 1 N·m (9 in. lbs.) torque.

Inspect all hose connections such as clamps, couplings and fittings to make sure they are secure and leaks are not present. The component should be replaced immediately if there is any evidence of degradation that could result in failure.

Never attempt to repair a plastic fuel line/tube. Replace as necessary.

Avoid contact of any fuel tubes/hoses with other vehicle components that could cause abrasions or scuffing. Be sure that the plastic fuel lines/tubes are properly routed to prevent pinching and to avoid heat sources.

# FUEL INJECTION

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## FUEL INJECTION

### OPERATION

#### OPERATION - INJECTION SYSTEM

All engines used in this section have a sequential Multi-Port Electronic Fuel Injection system. The MPI system is computer regulated and provides precise air/fuel ratios for all driving conditions. The Powertrain Control Module (PCM) operates the fuel injection system.

The PCM regulates:

- Ignition timing
- Air/fuel ratio
- Emission control devices
- Cooling fan
- Charging system
- Idle speed
- Vehicle speed control

Various sensors provide the inputs necessary for the PCM to correctly operate these systems. In addition to the sensors, various switches also provide inputs to the PCM.

The PCM can adapt its programming to meet changing operating conditions.

Fuel is injected into the intake port above the intake valve in precise metered amounts through electrically operated injectors. The PCM fires the injectors in a specific sequence. Under most operating conditions, the PCM maintains an air fuel ratio of 14.7 parts air to 1 part fuel by constantly adjusting injector pulse width. Injector pulse width is the length of time the injector is open.

The PCM adjusts injector pulse width by opening and closing the ground path to the injector. Engine RPM (speed) and manifold absolute pressure (air density) are the **primary** inputs that determine injector pulse width.

## OPERATION - MODES OF OPERATION

As input signals to the PCM change, the PCM adjusts its response to output devices. For example, the PCM must calculate a different injector pulse width and ignition timing for idle than it does for Wide Open Throttle (WOT). There are several different modes of operation that determine how the PCM responds to the various input signals.

There are two different areas of operation, OPEN LOOP and CLOSED LOOP.

During OPEN LOOP modes the PCM receives input signals and responds according to preset PCM programming. Inputs from the upstream and downstream heated oxygen sensors are not monitored during OPEN LOOP modes, except for heated oxygen sensor diagnostics (they are checked for shorted conditions at all times).

During CLOSED LOOP modes the PCM monitors the inputs from the upstream and downstream heated oxygen sensors. The upstream heated oxygen sensor input tells the PCM if the calculated injector pulse width resulted in the ideal air-fuel ratio of 14.7 to one. By monitoring the exhaust oxygen content through the upstream heated oxygen sensor, the PCM can fine tune injector pulse width. Fine tuning injector pulse width allows the PCM to achieve optimum fuel economy combined with low emissions.

For the PCM to enter CLOSED LOOP operation, the following must occur:

1. Engine coolant temperature must be over 35°F.
  - If the coolant is over 35°F the PCM will wait 38 seconds.
  - If the coolant is over 50°F the PCM will wait 15 seconds.
  - If the coolant is over 167°F the PCM will wait 3 seconds.
2. For other temperatures the PCM will interpolate the correct waiting time.
3. O<sub>2</sub> sensor must read either greater than 0.745 volts or less than 0.29 volt.
4. The multi-port fuel injection systems has the following modes of operation:
  - Ignition switch ON (Zero RPM)
  - Engine start-up
  - Engine warm-up
  - Cruise
  - Idle
  - Acceleration
  - Deceleration
  - Wide Open Throttle
  - Ignition switch OFF
5. The engine start-up (crank), engine warm-up, deceleration with fuel shutoff and wide open throttle modes are OPEN LOOP modes. Under most operating conditions, the acceleration, deceleration (with A/C on), idle and cruise modes, **with the engine at operating temperature** are CLOSED LOOP modes.

## IGNITION SWITCH ON (ZERO RPM) MODE

When the ignition switch activates the fuel injection system, the following actions occur:

- The PCM monitors the engine coolant temperature sensor and throttle position sensor input. The PCM determines basic fuel injector pulse width from this input.
- The PCM determines atmospheric air pressure from the MAP sensor input to modify injector pulse width.

When the key is in the ON position and the engine is not running (zero rpm), the Auto Shutdown (ASD) and fuel pump relays de-energize after approximately 1 second. Therefore, battery voltage is not supplied to the fuel pump, ignition coil, fuel injectors and heated oxygen sensors.

## ENGINE START-UP MODE

This is an OPEN LOOP mode. If the vehicle is in park or neutral (automatic transaxles) or the clutch pedal is depressed (manual transaxles) the ignition switch energizes the starter relay when the engine is not running. The following actions occur when the starter motor is engaged.

- If the PCM receives the camshaft position sensor and crankshaft position sensor signals, it energizes the Auto Shutdown (ASD) relay and fuel pump relay. If the PCM does not receive both signals within approximately one second, it will not energize the ASD relay and fuel pump relay. The ASD and fuel pump relays supply battery voltage to the fuel pump, fuel injectors, ignition coil, (EGR solenoid and PCV heater if equipped) and heated oxygen sensors.
- The PCM energizes the injectors (on the 69° degree falling edge) for a calculated pulse width until it determines crankshaft position from the camshaft position sensor and crankshaft position sensor signals. The PCM determines crankshaft position within 1 engine revolution.
- After determining crankshaft position, the PCM begins energizing the injectors in sequence. It adjusts injector pulse width and controls injector synchronization by turning the individual ground paths to the injectors On and Off.
- When the engine idles within  $\pm 64$  RPM of its target RPM, the PCM compares current MAP sensor value with the atmospheric pressure value received during the Ignition Switch On (zero RPM) mode.

Once the ASD and fuel pump relays have been energized, the PCM determines injector pulse width based on the following:

- MAP
- Engine RPM
- Battery voltage
- Engine coolant temperature
- Inlet/Intake air temperature (IAT)
- Throttle position
- The number of engine revolutions since cranking was initiated

During Start-up the PCM maintains ignition timing at 9° BTDC.

## ENGINE WARM-UP MODE

This is an OPEN LOOP mode. The following inputs are received by the PCM:

- Manifold Absolute Pressure (MAP)
- Crankshaft position (engine speed)
- Engine coolant temperature
- Inlet/Intake air temperature (IAT)
- Camshaft position
- Knock sensor
- Throttle position
- A/C switch status
- Battery voltage
- Vehicle speed
- Speed control
- O2 sensors

The PCM adjusts injector pulse width and controls injector synchronization by turning the individual ground paths to the injectors On and Off.

The PCM adjusts ignition timing and engine idle speed. Engine idle speed is adjusted through the idle air control motor.

## CRUISE OR IDLE MODE

When the engine is at operating temperature this is a CLOSED LOOP mode. During cruising or idle the following inputs are received by the PCM:

- Manifold absolute pressure
- Crankshaft position (engine speed)
- Inlet/Intake air temperature
- Engine coolant temperature
- Camshaft position
- Knock sensor
- Throttle position
- Exhaust gas oxygen content (O2 sensors)
- A/C switch status
- Battery voltage
- Vehicle speed

The PCM adjusts injector pulse width and controls injector synchronization by turning the individual ground paths to the injectors On and Off.

The PCM adjusts engine idle speed and ignition timing. The PCM adjusts the air/fuel ratio according to the oxygen content in the exhaust gas (measured by the upstream and downstream heated oxygen sensor).

The PCM monitors for engine misfire. During active misfire and depending on the severity, the PCM either continuously illuminates or flashes the malfunction indicator lamp (Check Engine light on instrument panel). Also, the PCM stores an engine misfire DTC in memory, if 2nd trip with fault.

The PCM performs several diagnostic routines. They include:

- Oxygen sensor monitor
- Downstream heated oxygen sensor diagnostics during open loop operation (except for shorted)
- Fuel system monitor
- EGR monitor (if equipped)
- Purge system monitor
- Catalyst efficiency monitor
- All inputs monitored for proper voltage range, rationality.
- All monitored components (refer to the Emission section for On-Board Diagnostics).

The PCM compares the upstream and downstream heated oxygen sensor inputs to measure catalytic converter efficiency. If the catalyst efficiency drops below the minimum acceptable percentage, the PCM stores a diagnostic trouble code in memory, after 2 trips.

During certain idle conditions, the PCM may enter a variable idle speed strategy. During variable idle speed strategy the PCM adjusts engine speed based on the following inputs.

- A/C status
- Battery voltage
- Battery temperature or Calculated Battery Temperature
- Engine coolant temperature
- Engine run time
- Inlet/Intake air temperature
- Vehicle mileage

## ACCELERATION MODE

This is a CLOSED LOOP mode. The PCM recognizes an abrupt increase in Throttle Position sensor output voltage or MAP sensor output voltage as a demand for increased engine output and vehicle acceleration. The PCM increases injector pulse width in response to increased fuel demand.

- Wide Open Throttle-open loop

## DECELERATION MODE

This is a CLOSED LOOP mode. During deceleration the following inputs are received by the PCM:

- A/C status
- Battery voltage
- Inlet/Intake air temperature
- Engine coolant temperature
- Crankshaft position (engine speed)
- Exhaust gas oxygen content (upstream heated oxygen sensor)
- Knock sensor
- Manifold absolute pressure
- Throttle position sensor
- IAC motor (solenoid) control changes in response to MAP sensor feedback

The PCM may receive a closed throttle input from the Throttle Position Sensor (TPS) when it senses an abrupt decrease in manifold pressure. This indicates a hard deceleration (Open Loop). In response, the PCM may momentarily turn off the injectors. This helps improve fuel economy, emissions and engine braking.

## WIDE-OPEN-THROTTLE MODE

This is an OPEN LOOP mode. During wide-open-throttle operation, the following inputs are used by the PCM:

- Inlet/Intake air temperature
- Engine coolant temperature
- Engine speed
- Knock sensor
- Manifold absolute pressure
- Throttle position

When the PCM senses a wide-open-throttle condition through the Throttle Position Sensor (TPS) it de-energizes the A/C compressor clutch relay. This disables the air conditioning system and disables EGR (if equipped).

The PCM adjusts injector pulse width to supply a predetermined amount of additional fuel, based on MAP and RPM.

## IGNITION SWITCH OFF MODE

When the operator turns the ignition switch to the OFF position, the following occurs:

- All outputs are turned off, unless O2 Heater Monitor test is being run. Refer to the Emission section for On-Board Diagnostics.
- No inputs are monitored except for the heated oxygen sensors. The PCM monitors the heating elements in the oxygen sensors and then shuts down.

## FUEL CORRECTION or ADAPTIVE MEMORIES

### DESCRIPTION

In Open Loop, the PCM changes pulse width without feedback from the O2 Sensors. Once the engine warms up to approximately 30 to 35° F, the PCM goes into closed loop **Short Term Correction** and utilizes feedback from the O2 Sensors. Closed loop **Long Term Adaptive Memory** is maintained above 170° to 190° F unless the PCM senses wide open throttle. At that time the PCM returns to Open Loop operation.

### OPERATION

#### Short Term

The first fuel correction program that begins functioning is the short term fuel correction. This system corrects fuel delivery in direct proportion to the readings from the Upstream O2 Sensor.

The PCM monitors the air/fuel ratio by using the input voltage from the O2 Sensor. When the voltage reaches its preset high or low limit, the PCM begins to add or remove fuel until the sensor reaches its switch point. The short term corrections then begin.

The PCM makes a series of quick changes in the injector pulse-width until the O2 Sensor reaches its opposite preset limit or switch point. The process then repeats itself in the opposite direction.

Short term fuel correction will keep increasing or decreasing injector pulse-width based upon the upstream O2 Sensor input. The maximum range of authority for short term memory is 25% (+/-) of base pulse-width. Short term is violated and is lost when ignition is turned OFF.

### Long Term

The second fuel correction program is the long term adaptive memory. In order to maintain correct emission throughout all operating ranges of the engine, a cell structure based on engine rpm and load (MAP) is used.

The number of cells varies upon the driving conditions. Two cells are used only during idle, based upon TPS and Park/Neutral switch inputs. There may be two other cells used for deceleration, based on TPS, engine rpm, and vehicle speed. The other twelve cells represent a manifold pressure and an rpm range. Six of the cells are high rpm and the other six are low rpm. Each of these cells has a specific MAP voltage range Typical Adaptive Memory Fuel Cells .

As the engine enters one of these cells the PCM looks at the amount of short term correction being used. Because the goal is to keep short term at 0 (O2 Sensor switching at 0.5 volt), long term will update in the same direction as short term correction was moving to bring the short term back to 0. Once short term is back at 0, this long term correction factor is stored in memory.

The values stored in long term adaptive memory are used for all operating conditions, including open loop and cold starting. However, the updating of the long term memory occurs after the engine has exceeded approximately 170°-190° F, with fuel control in closed loop and two minutes of engine run time. This is done to prevent any transitional temperature or start-up compensations from corrupting long term fuel correction.

Long term adaptive memory can change the pulse-width by as much as 25%, which means it can correct for all of short term. It is possible to have a problem that would drive long term to 25% and short term to another 25% for a total change of 50% away from base pulse-width calculation.

### Typical Adaptive Memory Fuel Cells

	Open Throttle	Open Throttle	Open Throttle	Open Throttle	Open Throttle	Open Throttle	Idle	Decel
Vacuum	20	17	13	9	5	0		
Above 1,984 rpm	1	3	5	7	9	11	13 Drive	15
Below 1,984 rpm	0	2	4	6	8	10	12 Neutral	14
<b>MAP volt =</b>	0	1.4	2.0	2.6	3.3	3.9		

### Fuel Correction Diagnostics

There are two fuel correction diagnostic routines:

- Fuel System Rich
- Fuel System Lean

A DTC is set and the MIL is illuminated if the PCM detects either of these conditions. This is determined based on total fuel correction, short term times long term.

## SYSTEM DIAGNOSIS

### OPERATION

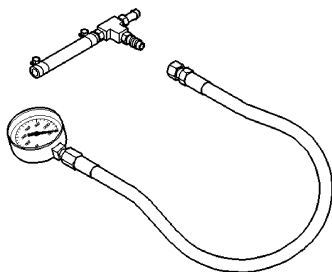
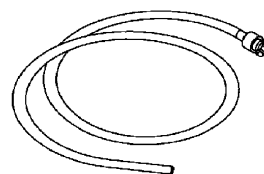
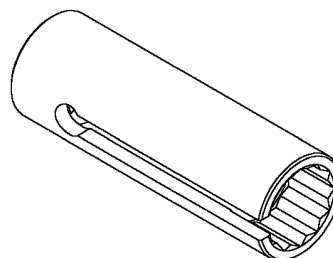
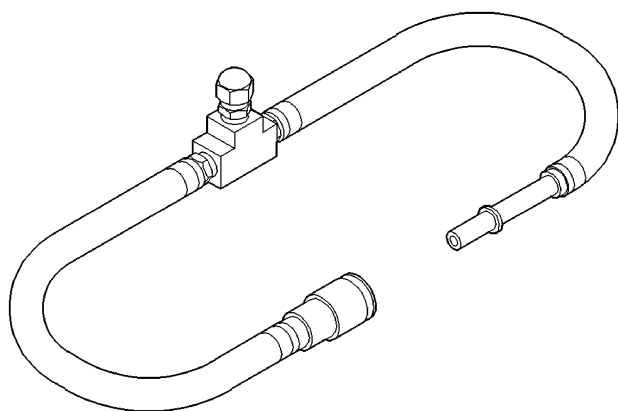
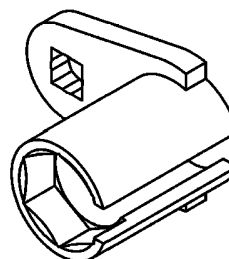
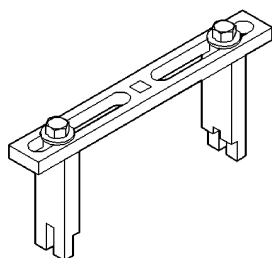
The PCM can test many of its own input and output circuits. If the PCM senses a fault in a major system, the PCM stores a Diagnostic Trouble Code (DTC) in memory.

For DTC information see On-Board Diagnostics (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ POWERTRAIN CONTROL MODULE - DESCRIPTION) .

**SPECIFICATIONS****TORQUE**

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Camshaft Position Sensor Mounting Bolts	12	8.8	105
Crankshaft Position Sensor Mounting Bolts	12	8.8	105
Engine Coolant Temperature Sensor	28	20	-
Idle Air Control Motor—2.7L	5.5	-	49
Idle Air Control Motor—3.5L	7.3	-	65
Knock Sensor bolt—2.7L	10	7	88.5
Knock Sensor bolt—3.5L	10	7	88.5
Manifold Tuning Valve—2.7L	2.8	-	25
Manifold Tuning Valve—3.5L	2.8	-	25
Oxygen Sensor	28	20	
Powertrain Control Module	4	-	35
Throttle Body Mounting—2.7L	11.9	-	105
Throttle Body Mounting—3.5L	11.9	-	105
Throttle Body Mounting—5.7L	11.9	-	105
Throttle Position Sensor—2.7L	6.2	-	55
Throttle Position Sensor—3.5L	6.2	-	55
Short Runner Valve	6.7	-	60
Fuel Rail Bolts—2.7L	11	-	100
Fuel Rail Bolts—3.5L	28	-	250
Fuel Rail Bolts—5.7L	28	-	250

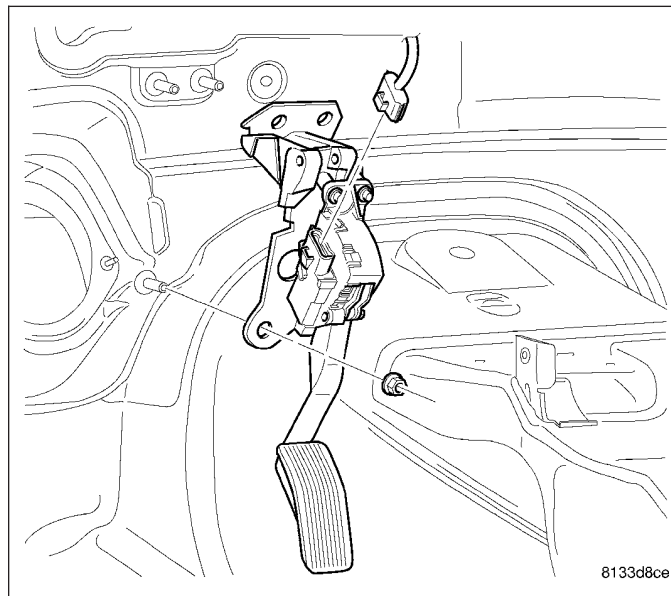


**SPECIAL TOOLS****FUEL*****Test Kit, Fuel******Fuel Line Adapter 1/4******O2S (OXYGEN SENSOR) REMOVAL/INSTALLER-  
C4907******Adapters, Fuel Pressure Test—6539 and/or 6631******Oxygen sensor tool******Spanner Wrench—6856***

## PEDAL-ACCELERATOR

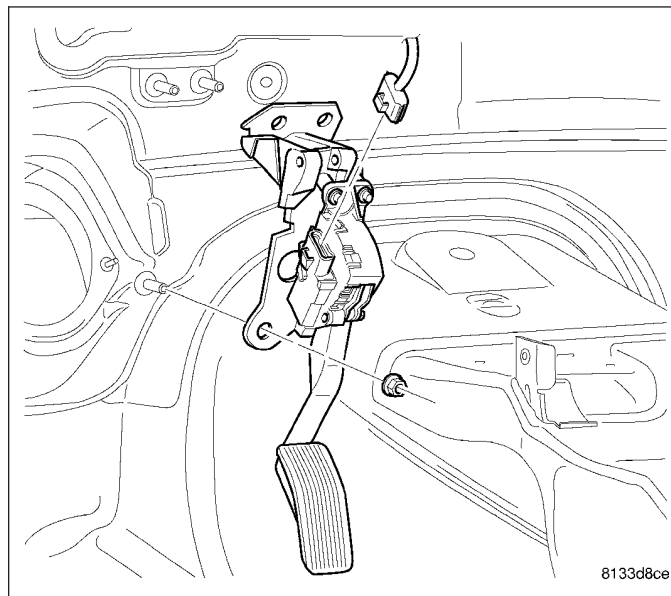
### REMOVAL

1. Disconnect negative battery cable.
2. Disconnect electrical connector.
3. Remove 3 mounting nuts.
4. Remove pedal assembly.



### INSTALLATION

1. Install pedal assembly to mounting studs.
2. Install nuts.
3. Tighten mounting nuts to 34 N·m (25 ft. lbs.).
4. Connect electrical connector to assembly.
5. Connect negative battery cable.

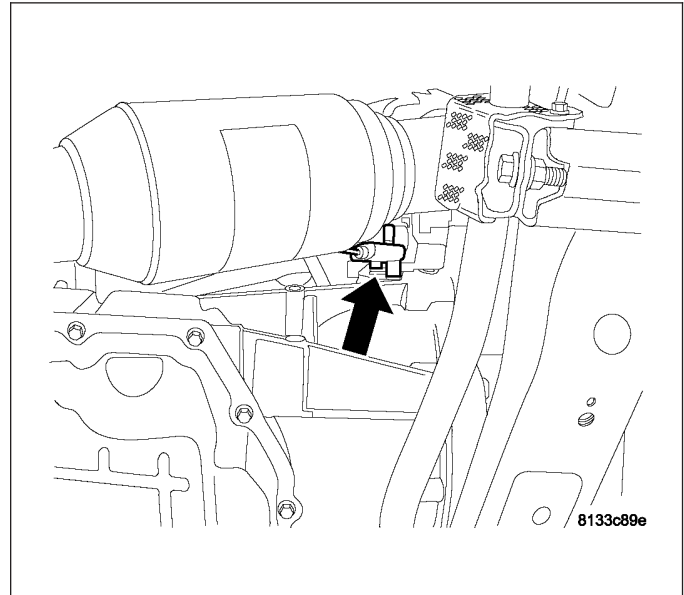


## SENSOR-CRANKSHAFT POSITION

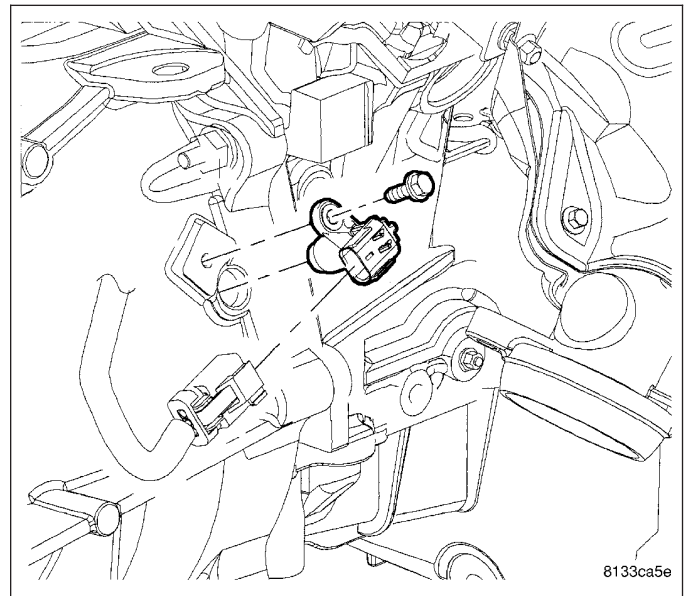
### REMOVAL

#### 2.7L

1. Disconnect negative battery cable.
2. Raise vehicle and support.

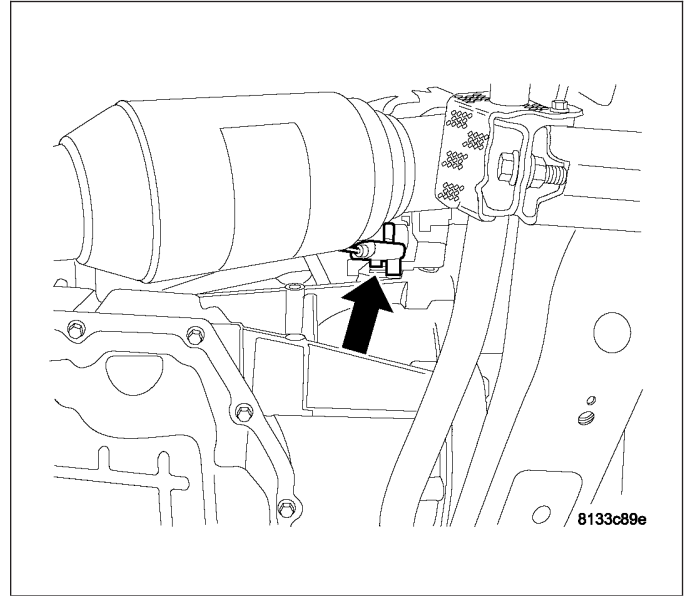


3. Unlock and disconnect the electrical connector.
4. Remove mounting bolt.
5. Remove sensor.

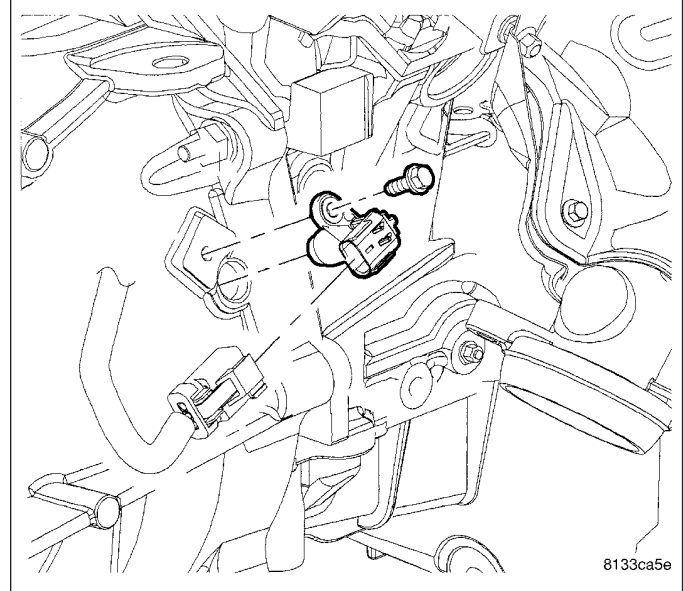


**3.5L**

1. Disconnect negative battery cable.
2. Raise vehicle and support.



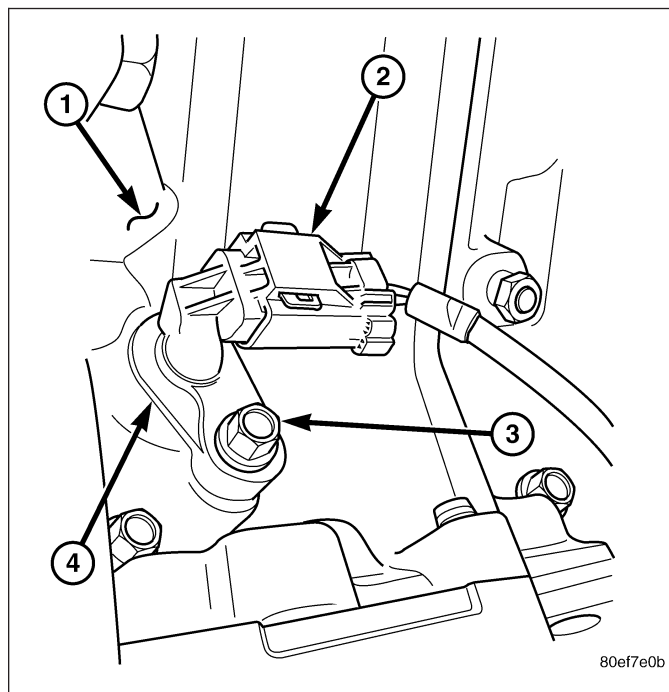
3. Unlock and disconnect the electrical connector.
4. Remove mounting bolt.
5. Remove sensor.



## 5.7L

The Crankshaft Position (CKP) sensor (4) is located at the right-rear side of the engine cylinder block (1). It is positioned and bolted into a machined hole in the engine block.

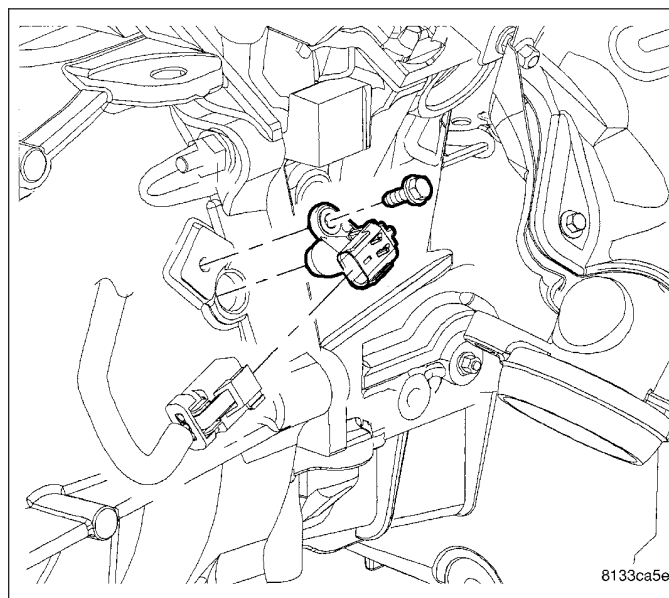
1. If equipped with AWD (All Wheel Drive) disconnect and isolate negative battery cable.
2. Raise vehicle.
3. If equipped with AWD (All Wheel Drive) remove starter motor.
4. Disconnect CKP electrical connector (2) at sensor.
5. Remove CKP mounting bolt (3).
6. Carefully twist sensor from cylinder block.
7. Remove sensor from vehicle.
8. Check condition of sensor o-ring.



## INSTALLATION

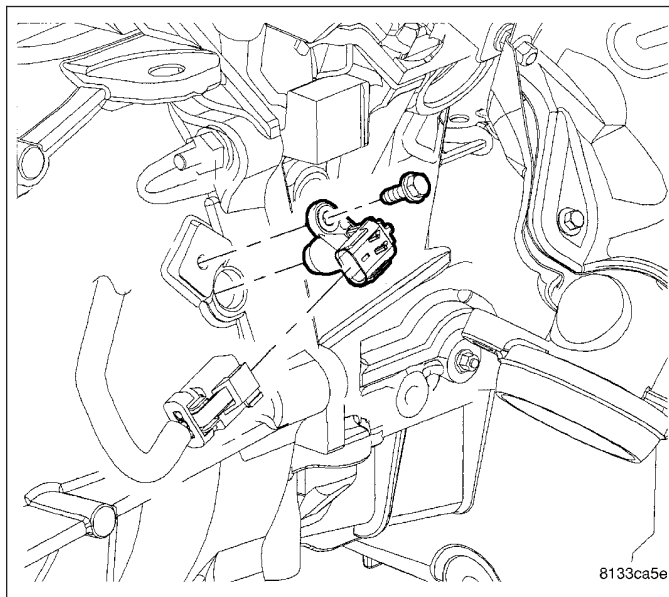
### 2.7L

1. Install sensor.
2. Install mounting bolt and tighten to 12 N·m (105 in. lbs.).
3. Connect the electrical connector and lock.
4. Lower vehicle.
5. Connect negative battery cable.



### 3.5L

1. Install sensor.
2. Install mounting bolt and tighten to 12 N·m (105 in. lbs.).
3. Connect the electrical connector and lock.
4. Lower vehicle.
5. Connect negative battery cable.

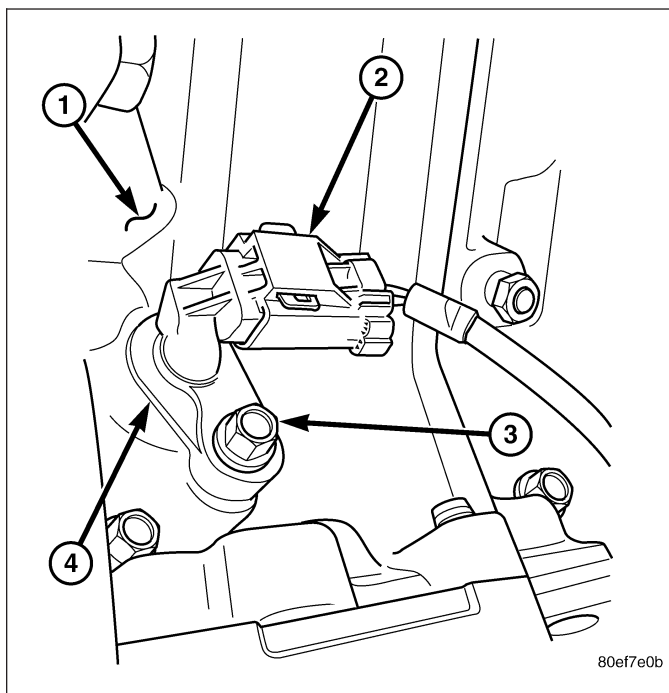


### 5.7L

1. Clean out machined hole in engine block.
2. Apply a small amount of engine oil to sensor o-ring.
3. Install sensor (4) into engine block with a slight rocking and twisting action.

**CAUTION:** Before tightening sensor mounting bolt (3), be sure sensor is completely flush to cylinder block. If sensor is not flush, damage to sensor mounting tang may result.

4. Install mounting bolt (3) and tighten to 12 N·m (106 in. lbs.) torque.
5. Connect electrical connector (2) to sensor.
6. Lower vehicle.



## INJECTOR-FUEL

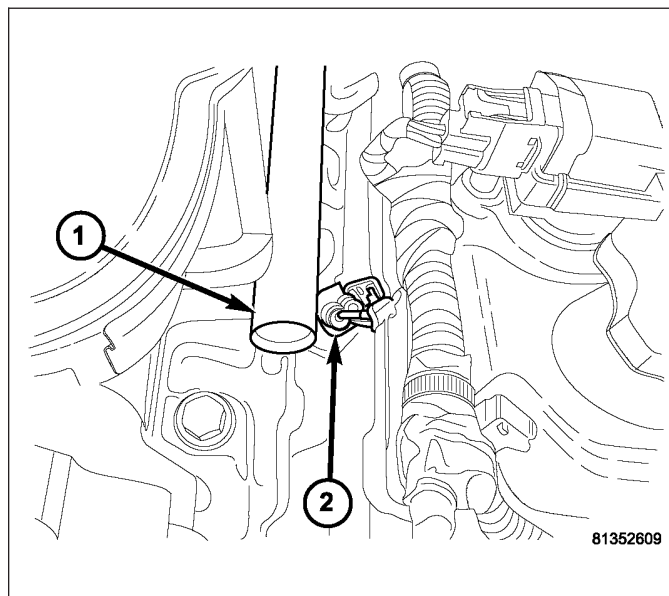
### REMOVAL

#### 2.7L

**WARNING: THE FUEL SYSTEM IS UNDER CONSTANT PRESSURE EVEN WITH ENGINE OFF. BEFORE SERVICING FUEL INJECTOR(S), FUEL SYSTEM PRESSURE MUST BE RELEASED.**

To remove one or more fuel injectors, the fuel rail assembly must be removed from engine.

1. Release fuel system pressure. Refer to Fuel System Pressure Release Procedure in this section.
2. Disconnect negative cable to battery.
3. Remove intake manifold plenum, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
4. Lift Plenum up off of engine. Cover intake manifold to prevent foreign material from entering engine.
5. Disconnect fuel supply tube quick connect fittings at the rear of intake manifold, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
6. If the injector connectors are not tagged with their cylinder number, tag them to identify the correct cylinder
7. Remove electrical connectors from the fuel injectors.
8. Remove fuel rail (1) mounting bolts.
9. Lift fuel rail straight up off of the cylinder head.



10. Remove retaining clips from fuel injectors (2) at fuel rail.
11. Remove fuel injectors (2).
12. Repeat for remaining injectors.
13. Check injector O-ring for damage. If O-ring is damaged, it must be replaced. Replace the injector clip if it is damaged.

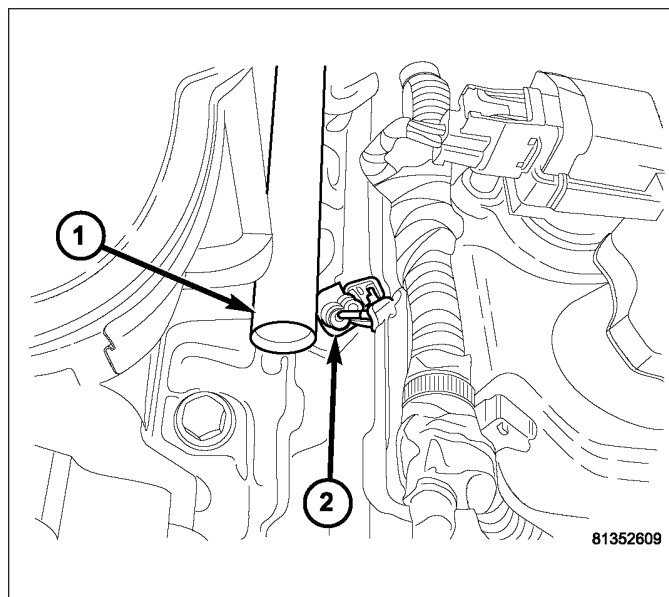
#### 3.5L

**WARNING: THE FUEL SYSTEM IS UNDER CONSTANT PRESSURE EVEN WITH ENGINE OFF. BEFORE SERVICING FUEL INJECTOR(S), FUEL SYSTEM PRESSURE MUST BE RELEASED.**

To remove one or more fuel injectors, the fuel rail assembly must be removed from engine.

1. Release fuel system pressure. Refer to Fuel System Pressure Release Procedure in this section.
2. Disconnect negative cable to battery.
3. Remove intake manifold plenum, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
4. Cover intake manifold to prevent foreign material from entering engine.
5. Disconnect fuel supply tube quick connect fittings at the rear of intake manifold, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).

6. If the injector connectors are not tagged with their cylinder number, tag them to identify the correct cylinder
7. Remove electrical connectors from the fuel injectors.
8. Remove fuel rail mounting bolts.
9. Lift fuel rail straight up off of the cylinder head.
10. Remove retaining clips from fuel injectors at fuel rail.
11. Remove fuel injectors.
12. Repeat for remaining injectors.
13. Check injector O-ring for damage. If O-ring is damaged, it must be replaced. Replace the injector clip if it is damaged.

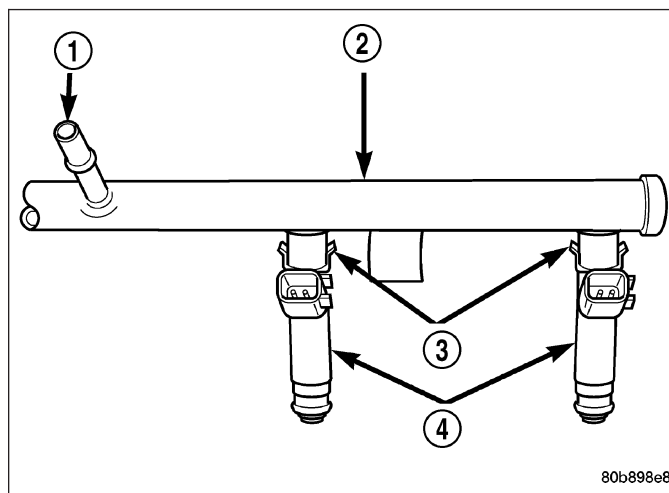


## 5.7L

**WARNING: THE FUEL SYSTEM IS UNDER CONSTANT PRESSURE EVEN WITH ENGINE OFF. BEFORE SERVICING FUEL INJECTOR(S), FUEL SYSTEM PRESSURE MUST BE RELEASED.**

To remove one or more fuel injectors, the fuel rail assembly must be removed from engine.

1. Perform Fuel System Pressure Release Procedure.
2. Remove fuel injector rail. Refer to Fuel Injector Rail Removal/Installation.
3. Remove clip(s) (3) retaining injector(s) (4) to fuel rail.
4. Remove injector(s) from fuel rail.

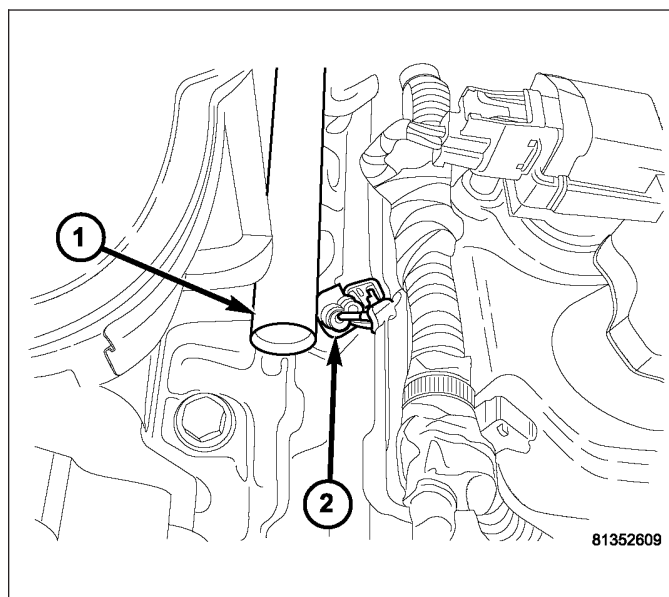




## INSTALLATION

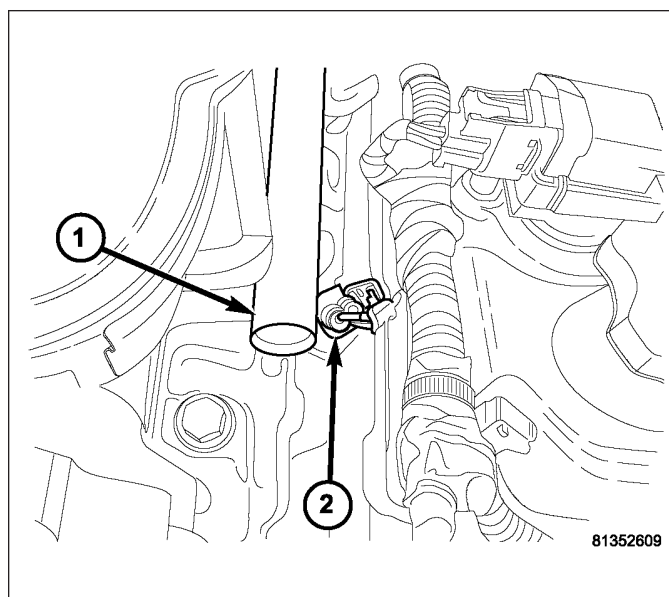
### 2.7L

1. Lightly lubricate the fuel injector O-rings with a couple drops of clean engine oil.
2. Install retaining clips on fuel injectors.
3. Push injectors into fuel injector rail until clips are in the correct position.
4. Position fuel rail over cylinder head, and push rail into place. Tighten fuel rail mounting bolts to 11 N·m (100 in. lbs.) torque.
5. Connect fuel supply tube quick connect fittings at the rear of intake manifold, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
6. Connect electrical connectors to fuel injectors.
7. Install intake manifold plenum, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
8. Connect negative cable to battery.
9. Use the scan tool to pressurize the fuel system. Check for leaks.



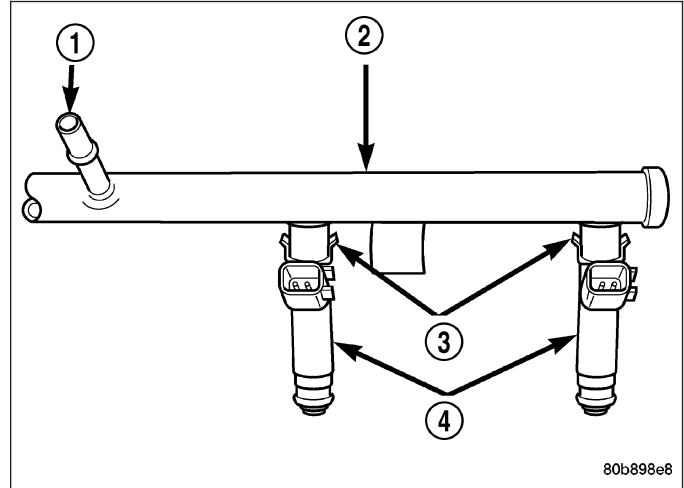
### 3.5L

1. Lightly lubricate the fuel injector O-rings with a couple drops of clean engine oil.
2. Install retaining clips on fuel injectors.
3. Push injectors into fuel injector rail until clips are in the correct position.
4. Position fuel rail over cylinder head, and push rail into place. Tighten fuel rail mounting bolts to 11 N·m (100 in. lbs.) torque.
5. Connect fuel supply tube quick connect fittings at the rear of intake manifold, (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
6. Connect electrical connectors to fuel injectors.
7. Install intake manifold plenum, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
8. Connect negative cable to battery.
9. Use the scan tool to pressurize the fuel system. Check for leaks.

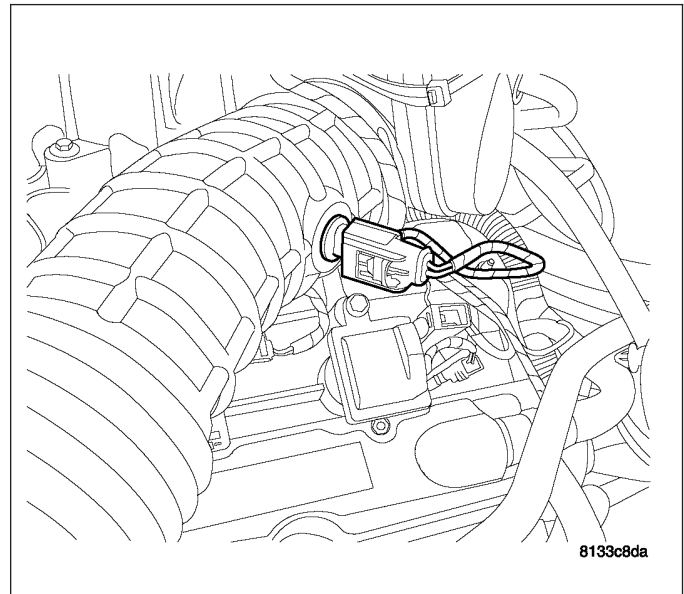


**5.7L**

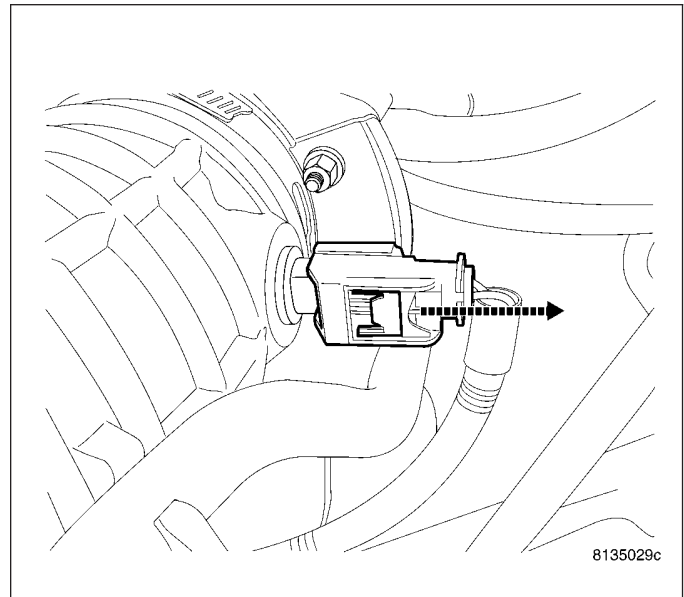
1. Apply a small amount of engine oil to each fuel injector o-ring. This will help in fuel rail installation.
2. Install injector(s) (4) and injector clip(s) (3) to fuel rail.
3. Install fuel rail assembly. Refer to Fuel Injector Rail Removal/Installation.
4. Start engine and check for leaks.

**SENSOR-INLET AIR TEMPERATURE****REMOVAL****2.7L**

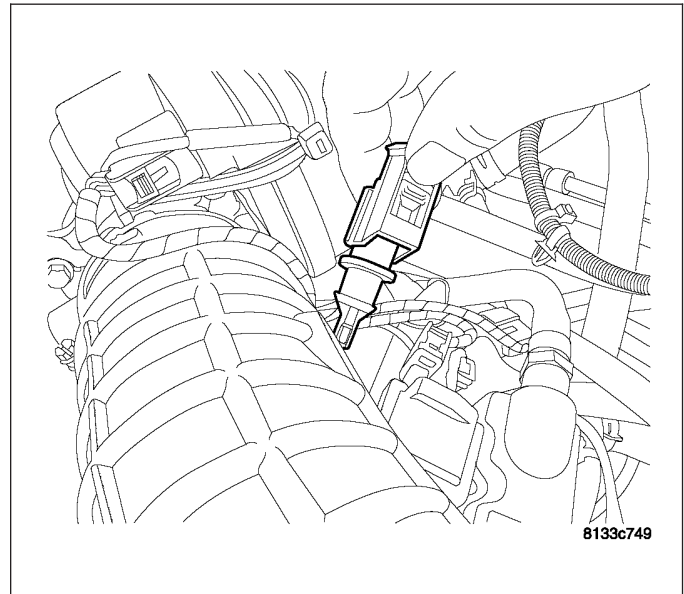
1. Sensor location.
2. Disconnect negative battery cable.



3. Unlock electrical connector.
4. Remove electrical connector from sensor.
5. Note the orientation of the sensor.

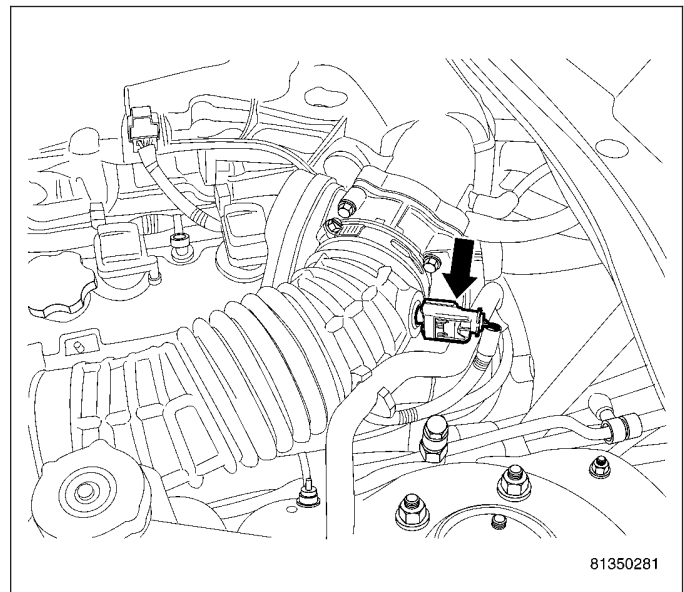


6. Remove sensor from air inlet hose.

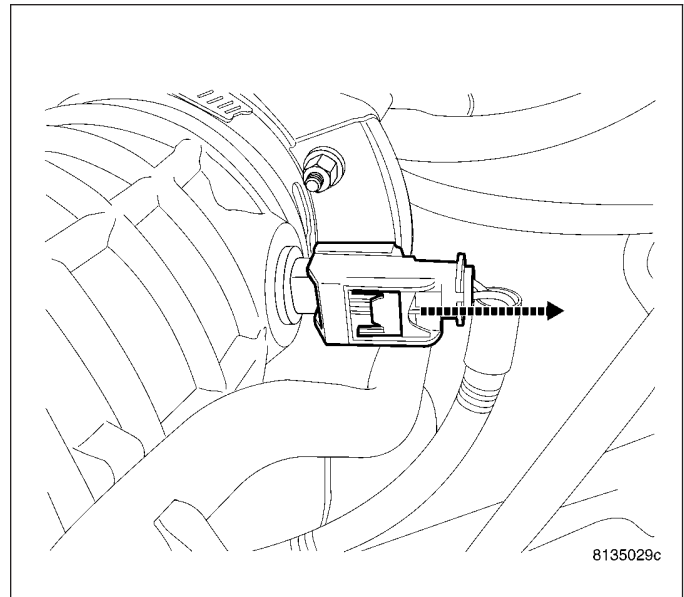


### 3.5L

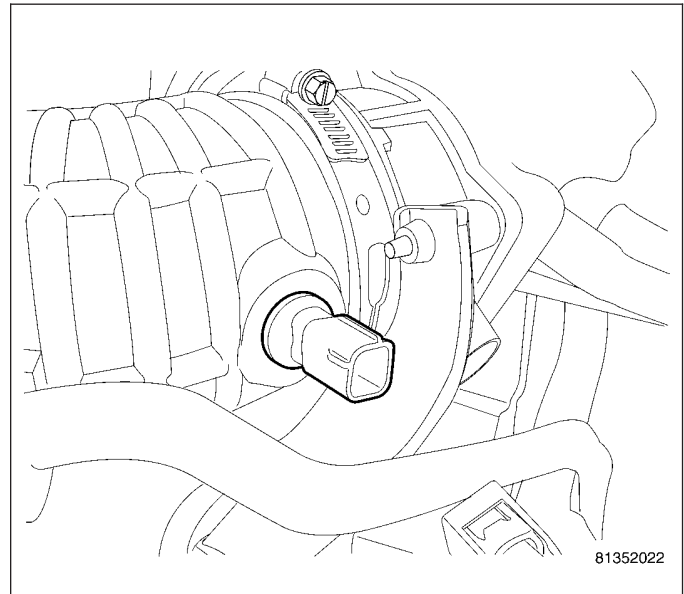
1. Sensor location.
2. Disconnect negative battery cable.



3. Unlock the electrical connector.
4. Remove electrical connector from sensor.



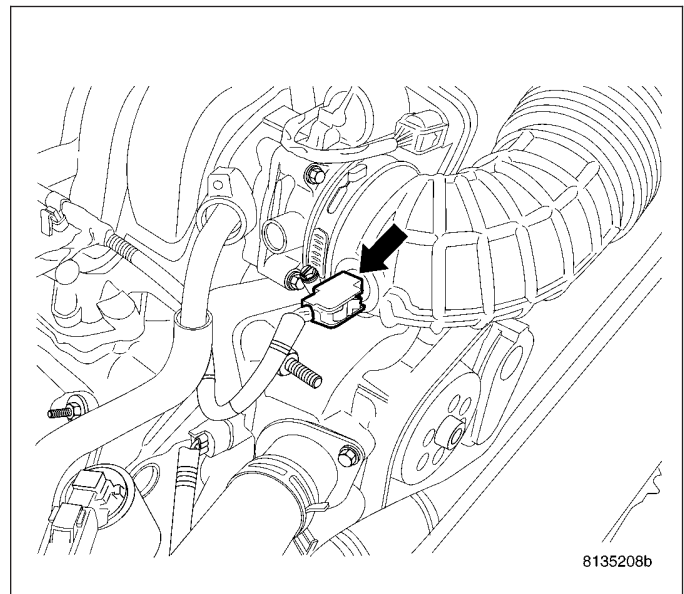
5. Note sensor orientation.
6. Remove sensor.



## 5.7L

The Inlet Manifold Air Temperature (IAT) sensor is installed into the rubber air intake hose near front of throttle body.

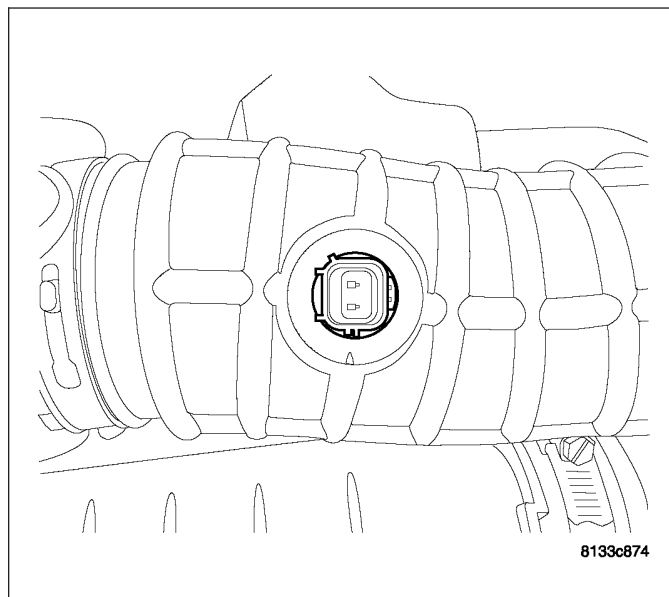
1. Disconnect electrical connector from IAT sensor.
2. Clean dirt from sensor base.
3. Pull sensor from rubber hose.



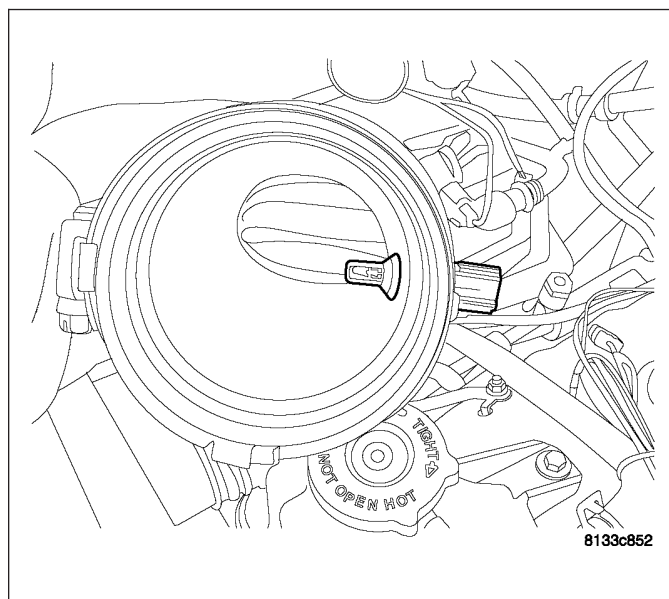
## INSTALLATION

### 2.7L

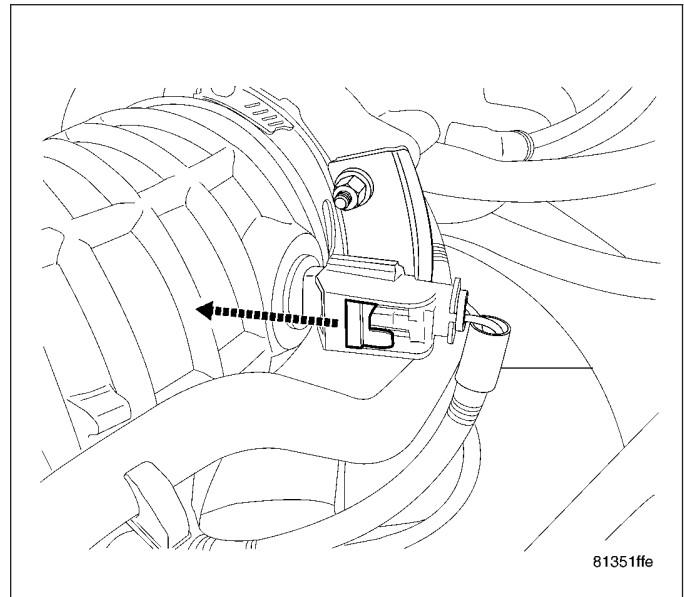
1. Install sensor. Rotate for proper orientation.



2. Proper orientation of sensor.

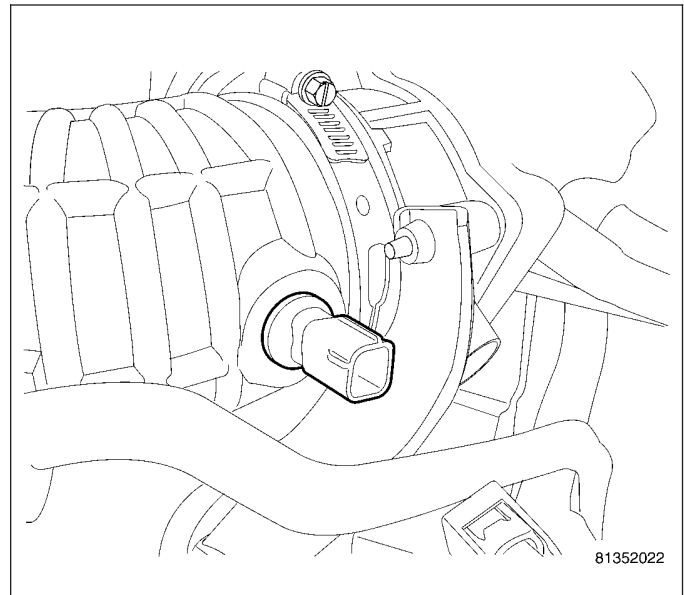


3. Install electrical connector and lock.
4. Connect negative battery cable.

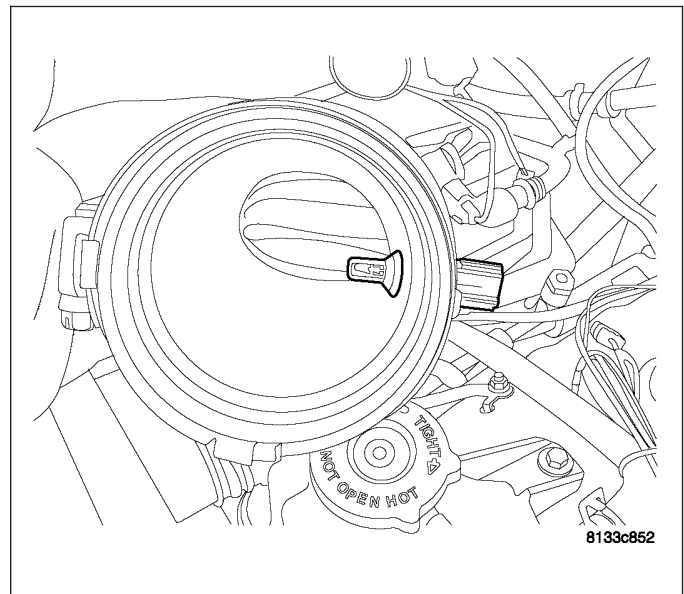


### 3.5L

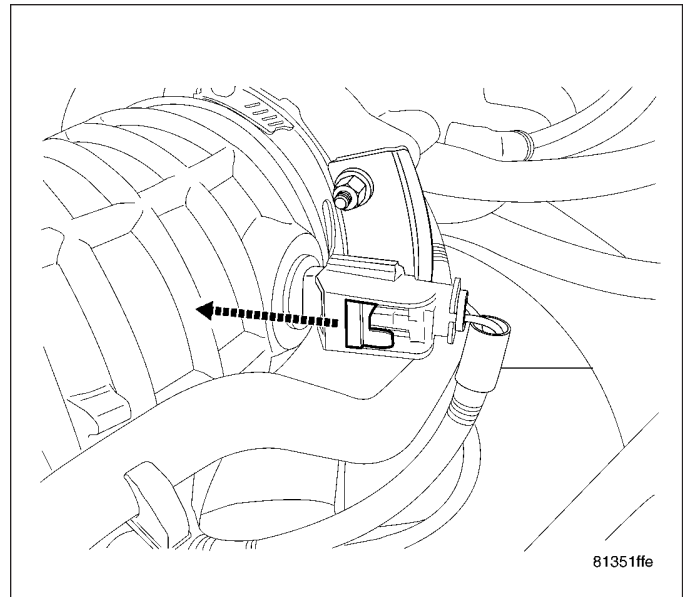
1. Install sensor. Rotate for proper orientation



2. Proper orientation of sensor.

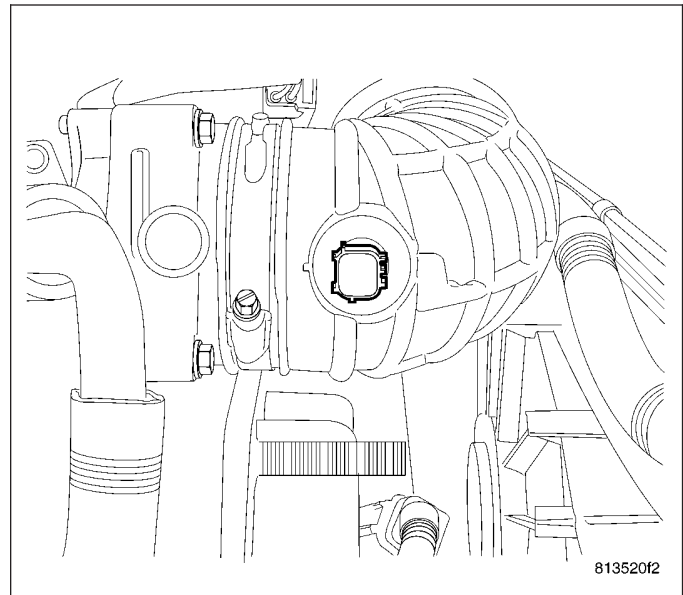


3. Install electrical connector and lock.
4. Connect negative battery cable.

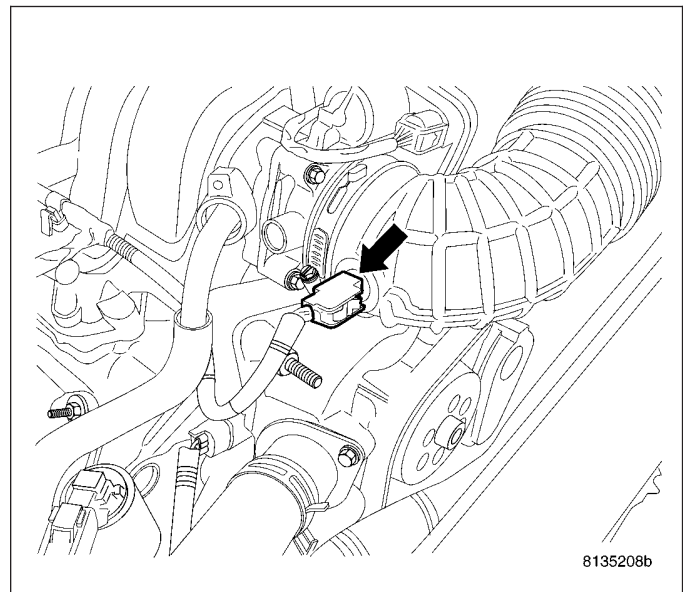


### 5.7L

1. Press sensor into rubber air hose.
2. Rotate sensor into position as shown in illustration.  
**For proper system operation, sensor must be positioned as shown in illustration.**



3. Connect electrical connector to sensor.

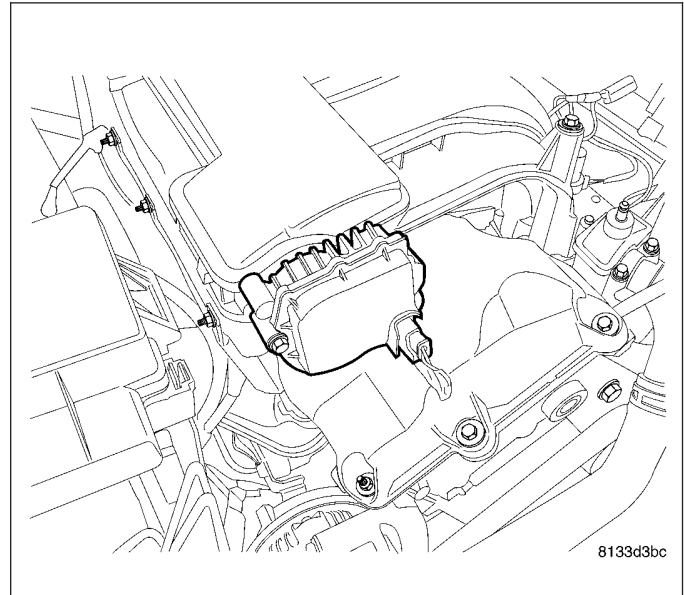


## ACTUATOR-MANIFOLD TUNE VALVE

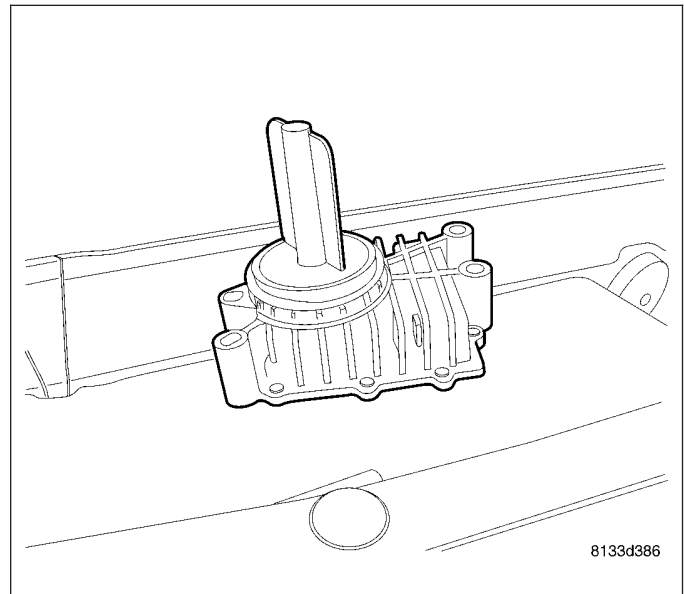
### REMOVAL

#### 2.7L

1. Disconnect negative battery cable.
2. Unlock and remove the electrical connector.
3. Remove the 2 mounting bolts.



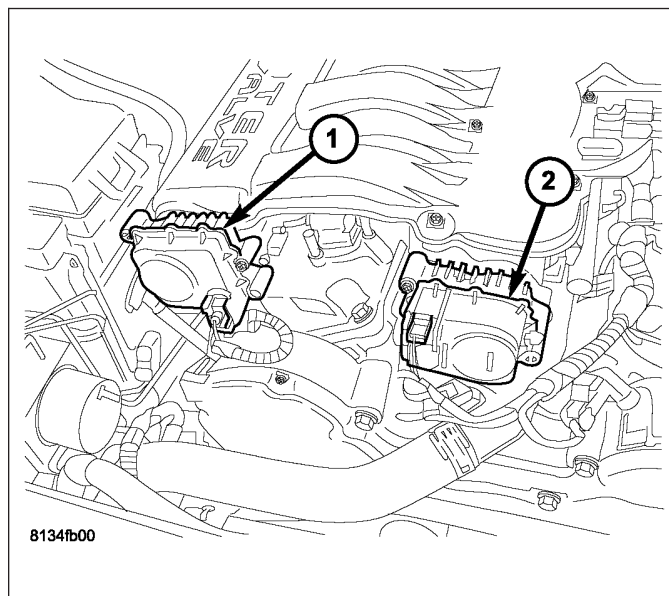
4. Remove the Short Runner Valve.



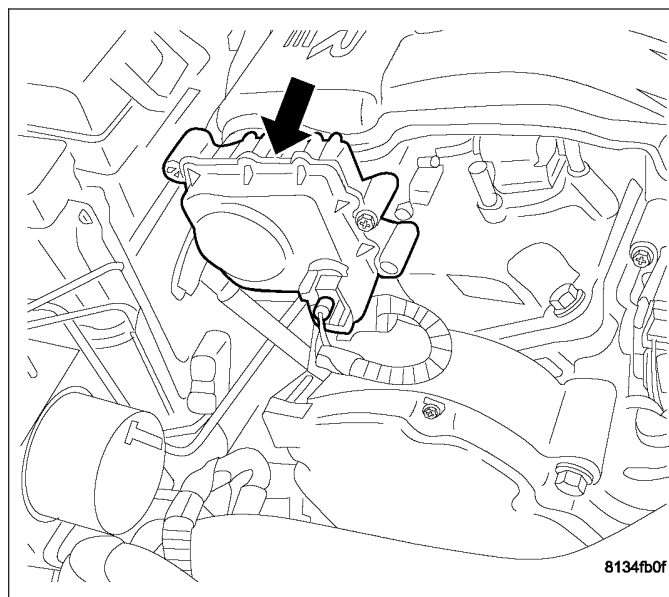


### 3.5L

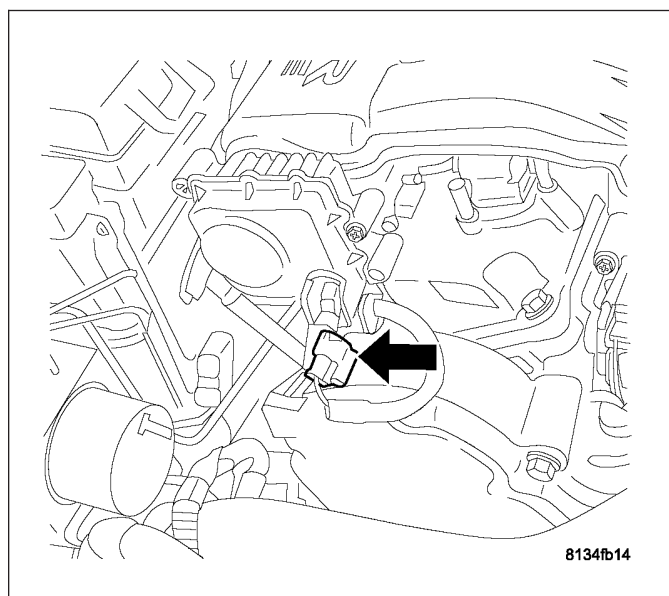
1. Manifold Tuning Valve location.



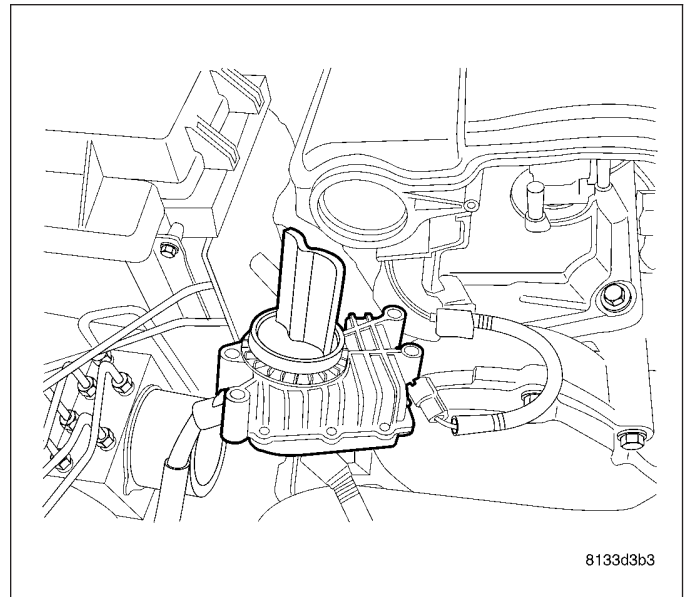
2. Disconnect negative battery cable.



3. Remove the electrical connector.
4. Remove the 2 mounting bolts.



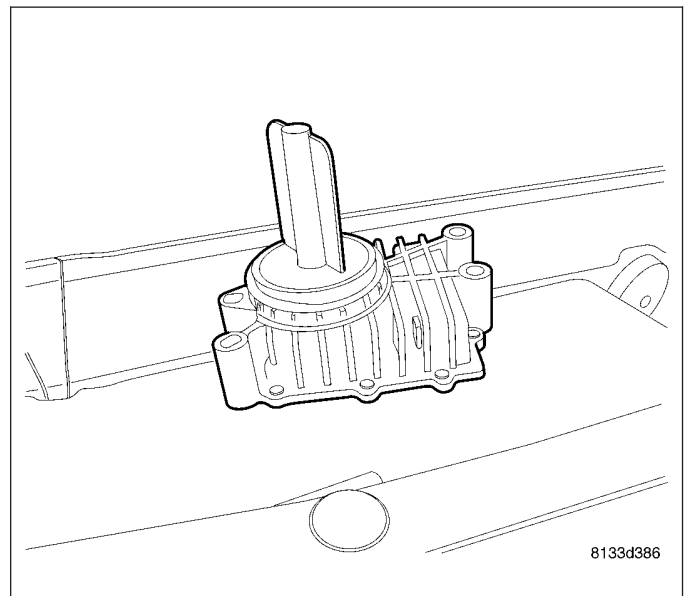
5. Remove the Manifold Tuning Valve.



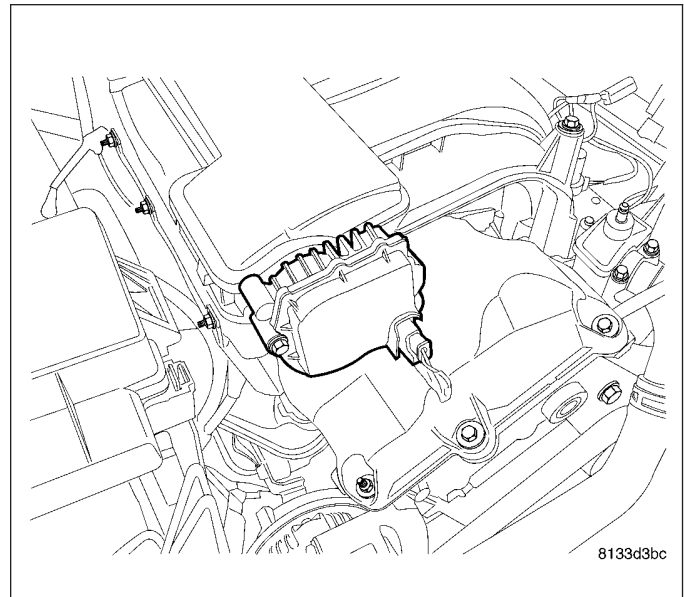
## INSTALLATION

### 2.7L

1. Install the Manifold Tuning Valve.
2. Install the 2 mounting bolts.
3. Tighten bolts to 2.8 N·m (25 in. lbs.).

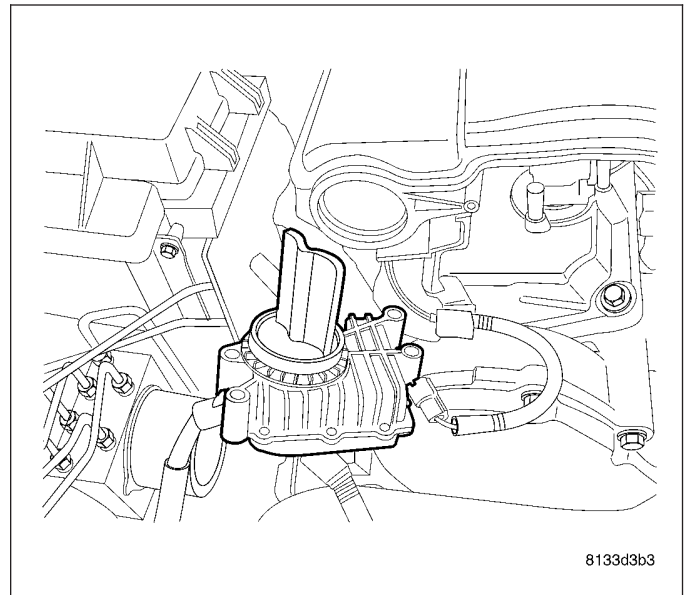


4. Connect the electrical connector and lock connector.
5. Connect negative battery cable.

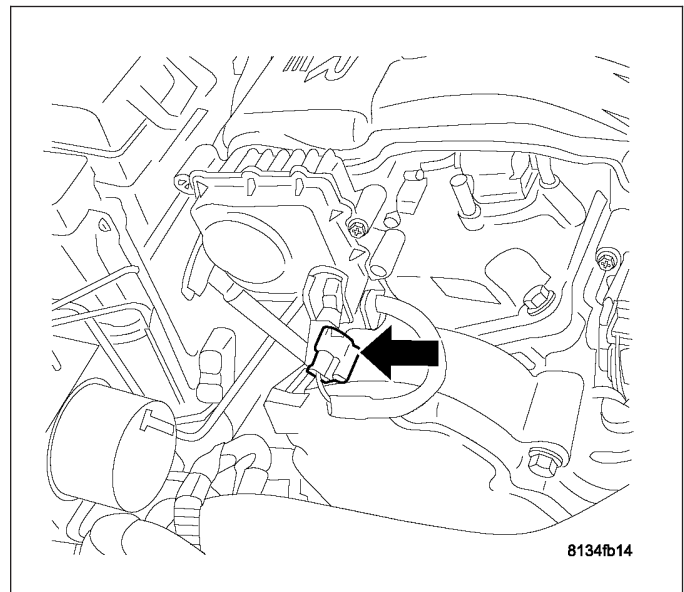


### 3.5L

1. Install the Manifold Tuning Valve.
2. Install the 2 mounting bolts.
3. Tighten bolts to 2.8 N·m (25 in. lbs.).



4. Connect the electrical connector.
5. Connect negative battery cable.

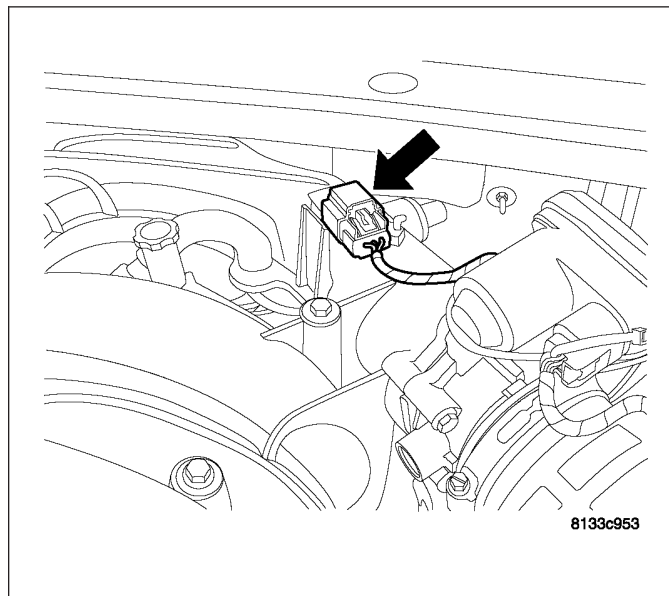


## SENSOR-MANIFOLD ABSOLUTE PRESSURE

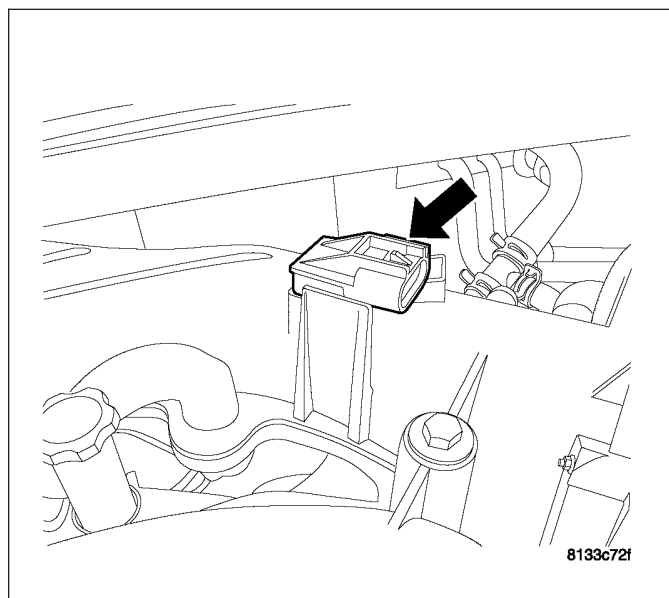
### REMOVAL

#### 2.7L

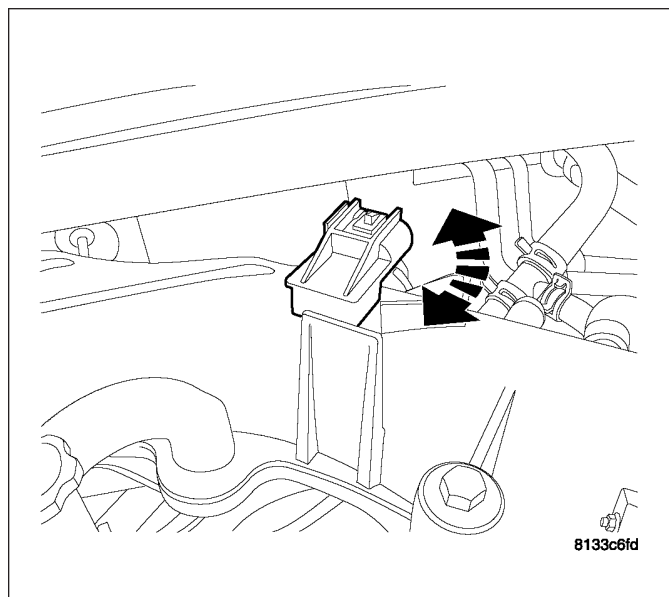
1. Sensor location.
2. Unlock the electrical connector.



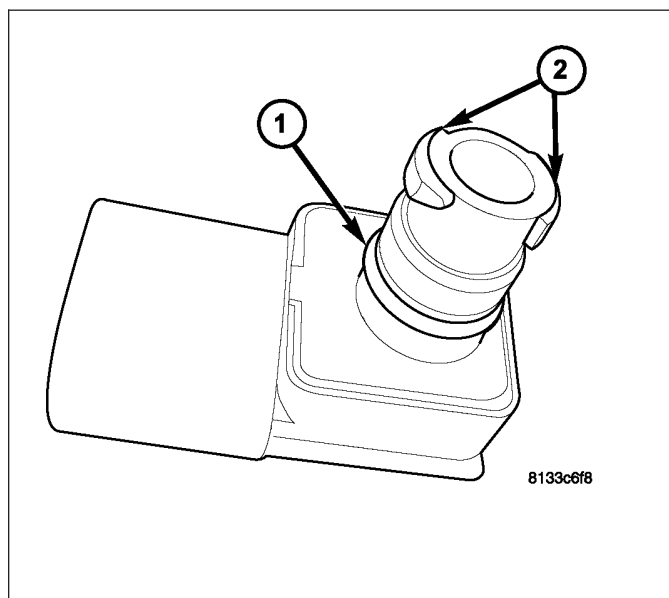
3. Remove electrical connector.



4. Turn sensor 1/4 turn counterclockwise.
5. Pull sensor straight up.

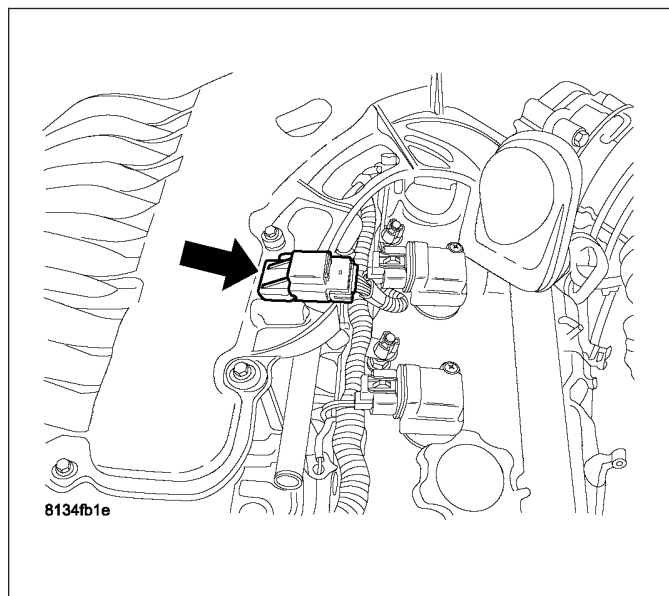


6. Remove sensor.
7. Inspect o-ring.

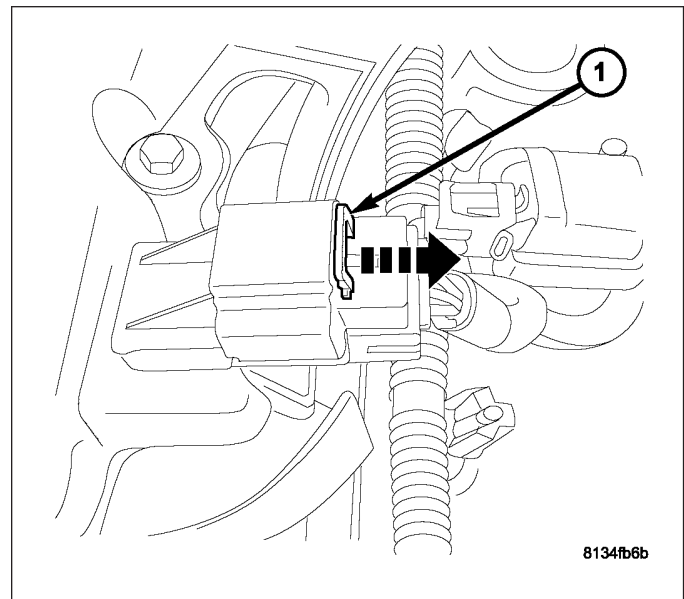


### 3.5L

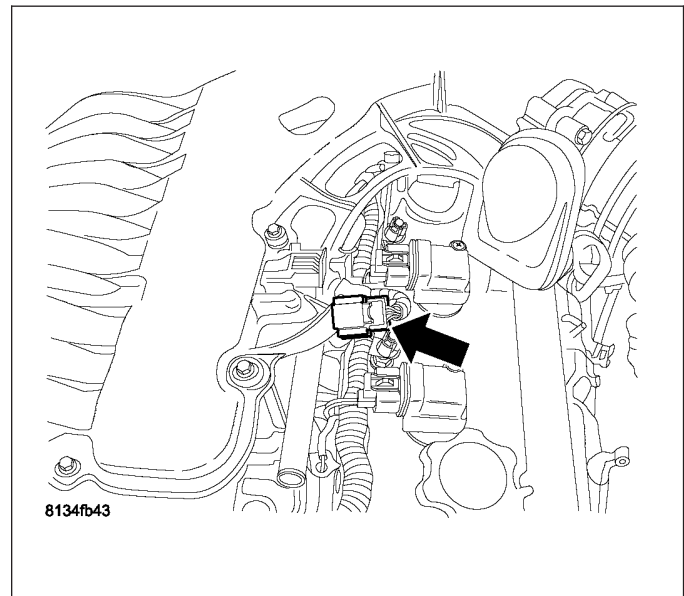
1. Sensor location.
2. Disconnect negative battery cable.



3. Unlock the electrical connector.

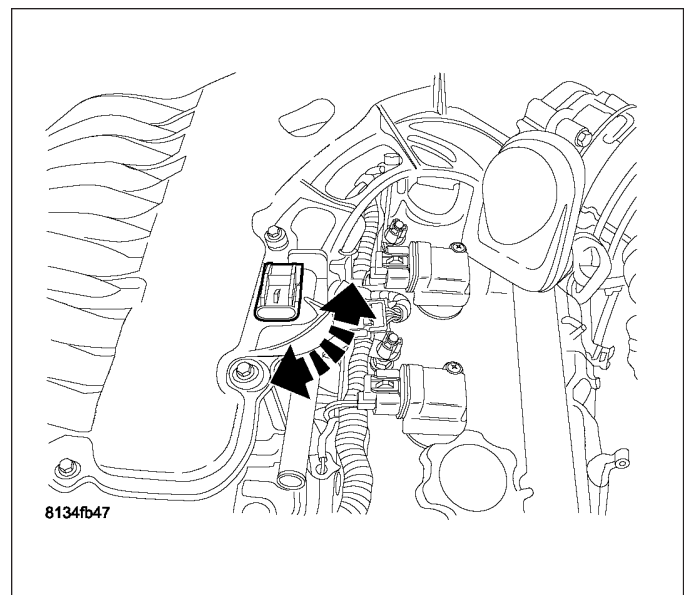


4. Disconnect the electrical connector.

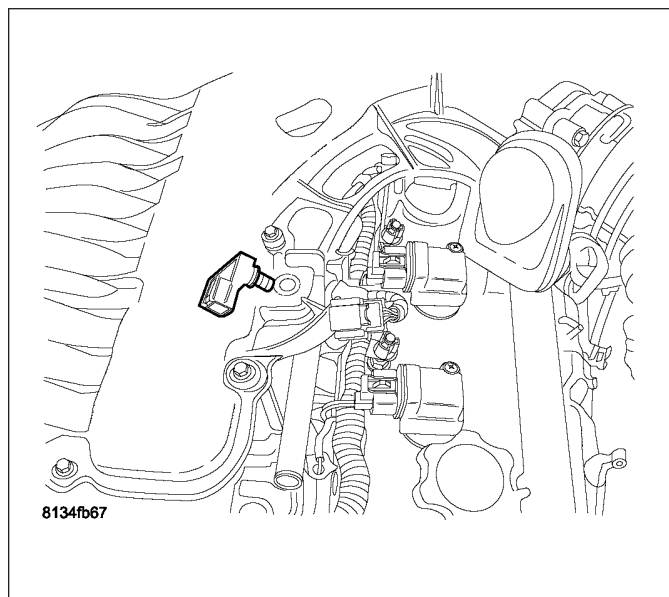


5. Rotate sensor 1/4 turn clockwise.

6. Pull up on sensor.

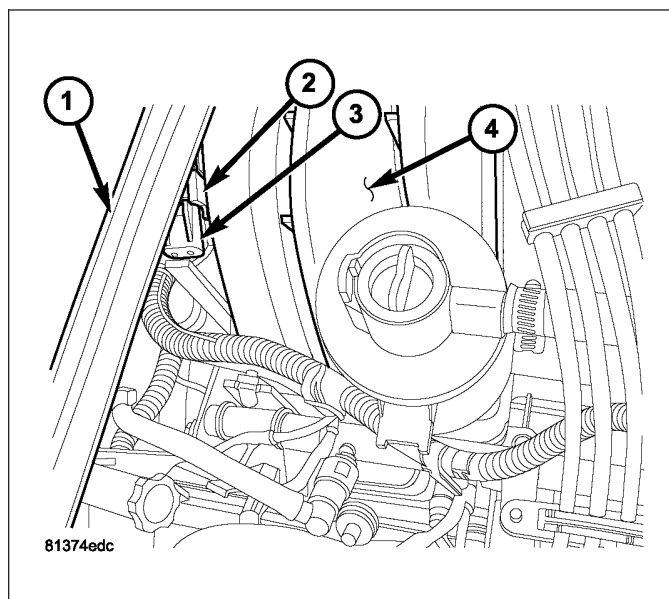


7. Remove sensor.

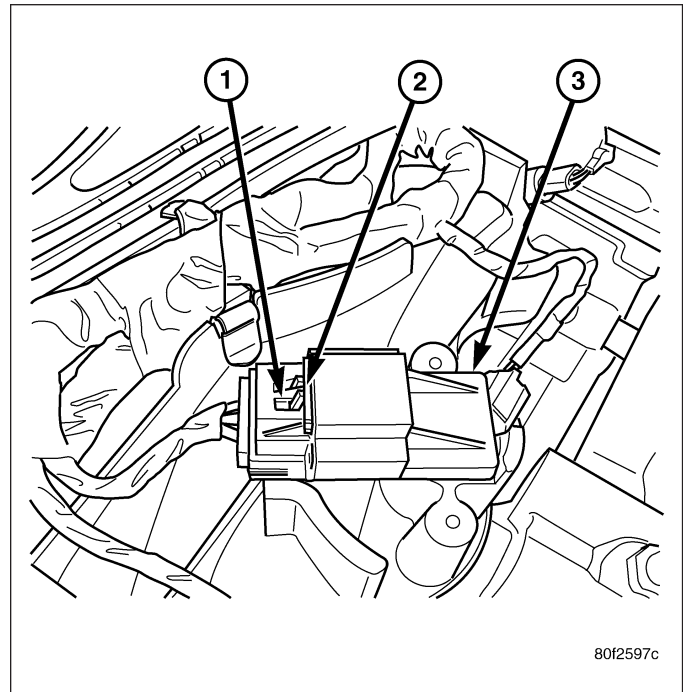


### 5.7L

The Manifold Absolute Pressure (MAP) sensor (3) is mounted into the top/rear of the intake manifold (4) near the cowl/hood seal (1).



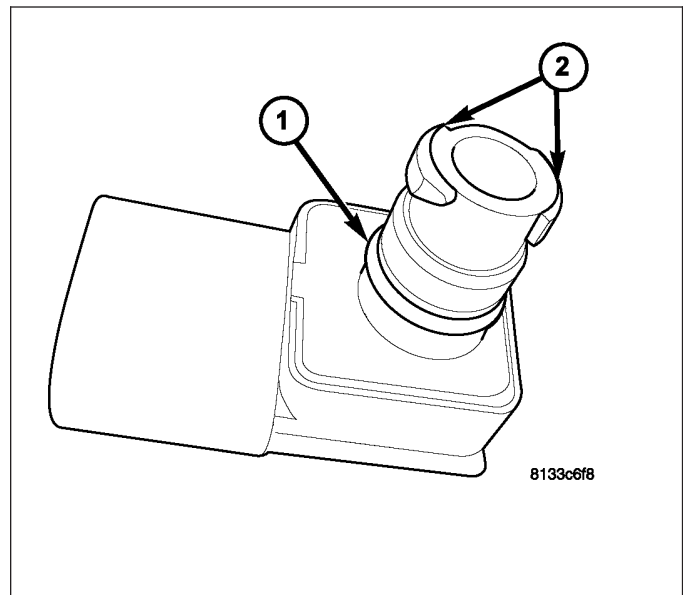
1. Disconnect electrical connector at sensor by sliding release lock out (1). Press down on lock tab (2) for removal.
2. Rotate sensor 1/4 turn counter-clockwise for removal.
3. Check condition of sensor o-ring.



## INSTALLATION

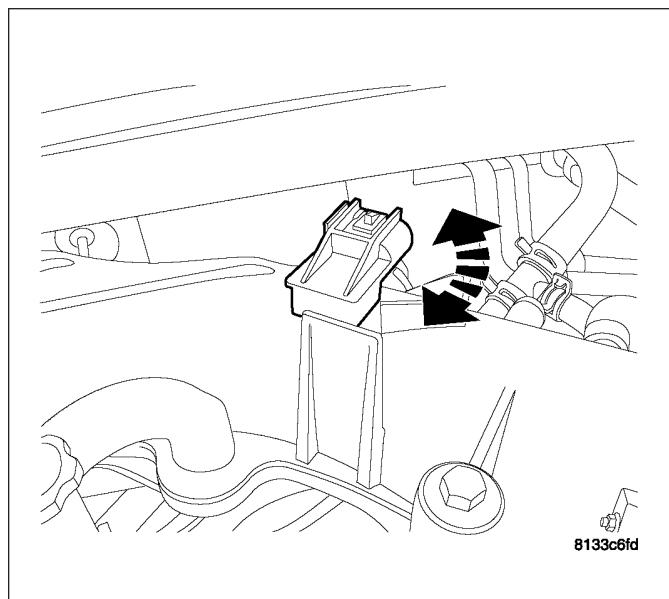
### 2.7L

1. Clean MAP sensor mounting hole at intake manifold.
2. Check MAP sensor o-ring seal for cuts or tears.

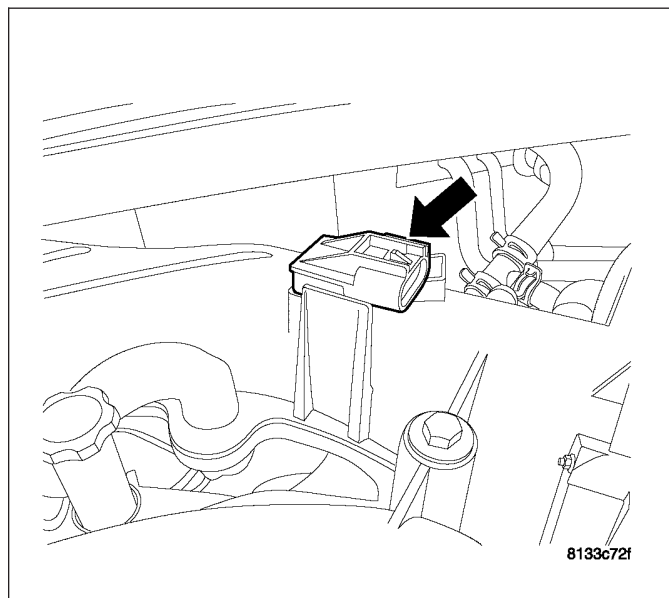




3. Position sensor into intake manifold.



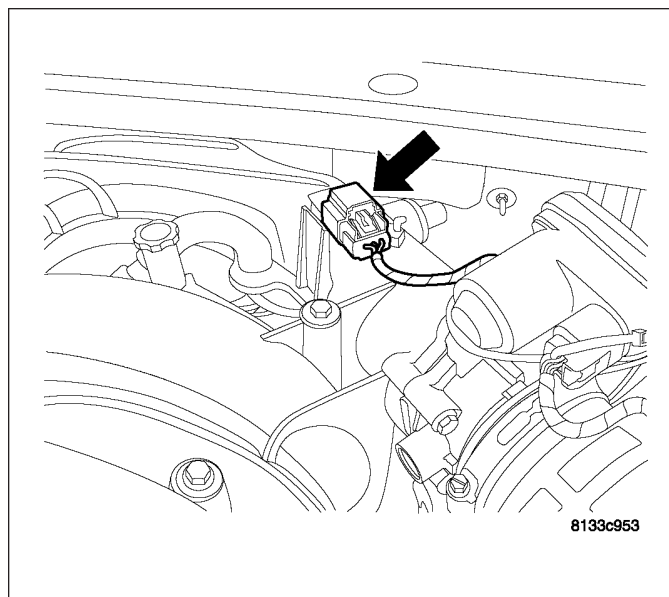
4. Rotate sensor 1/4 turn clockwise for installation.



5. Connect electrical connector to sensor.

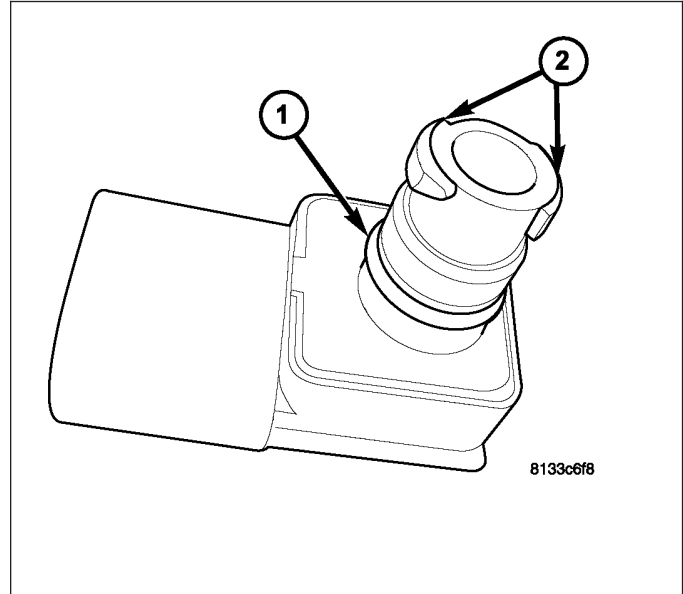
6. Lock electrical connector.

7. Connect negative battery cable.

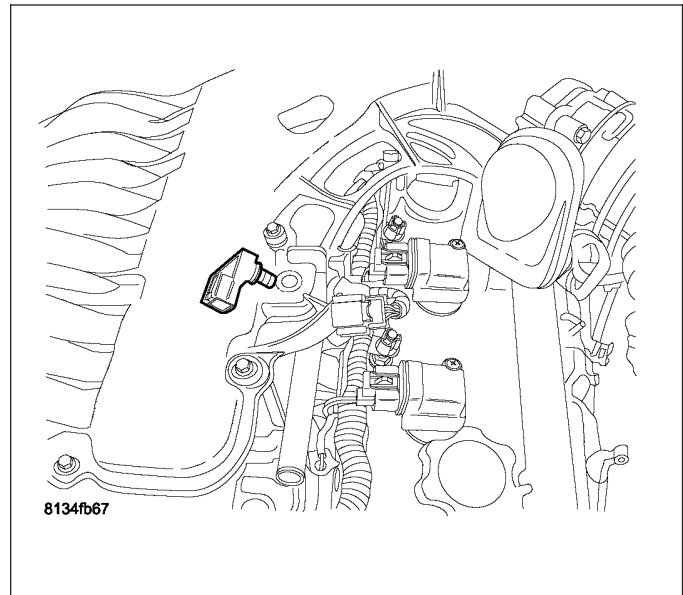


**3.5L**

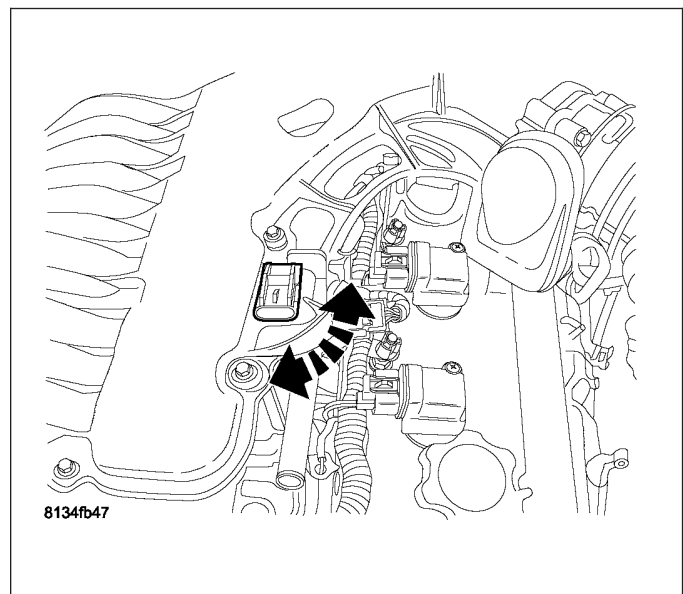
1. Clean MAP sensor mounting hole at intake manifold.
2. Check MAP sensor o-ring seal for cuts or tears.



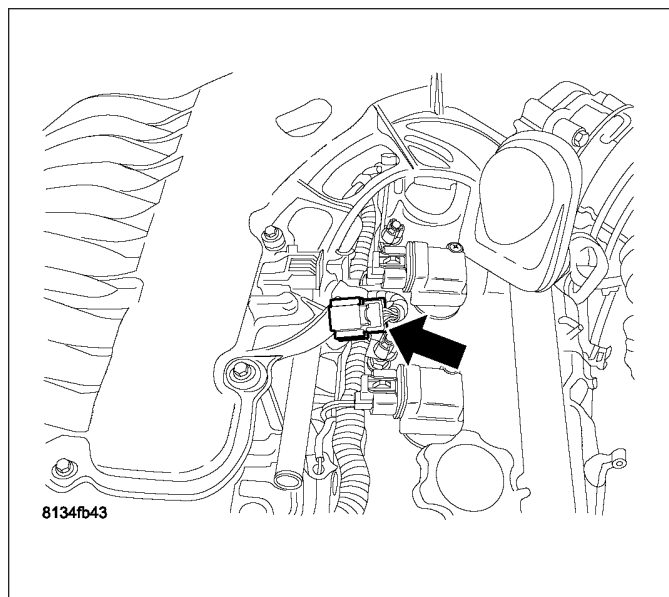
3. Position sensor into intake manifold.



4. Rotate sensor 1/4 turn clockwise for installation.

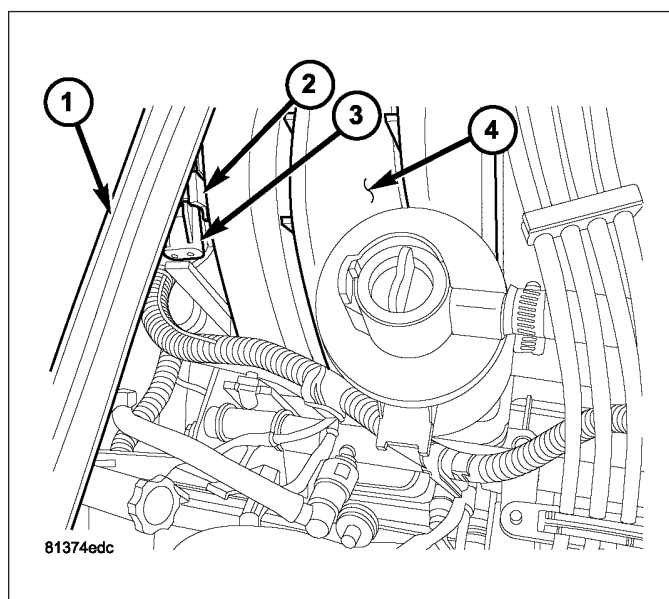


5. Connect electrical connector to sensor.
6. Lock electrical connector.
7. Connect negative battery cable.



### 5.7L

1. Clean MAP sensor mounting hole at intake manifold.
2. Check MAP sensor o-ring seal for cuts or tears.
3. Position sensor (3) into intake manifold.
4. Rotate sensor 1/4 turn clockwise for installation.
5. Connect electrical connector (2) to sensor (3).



## SENSOR-OXYGEN

### REMOVAL

#### 2.7L

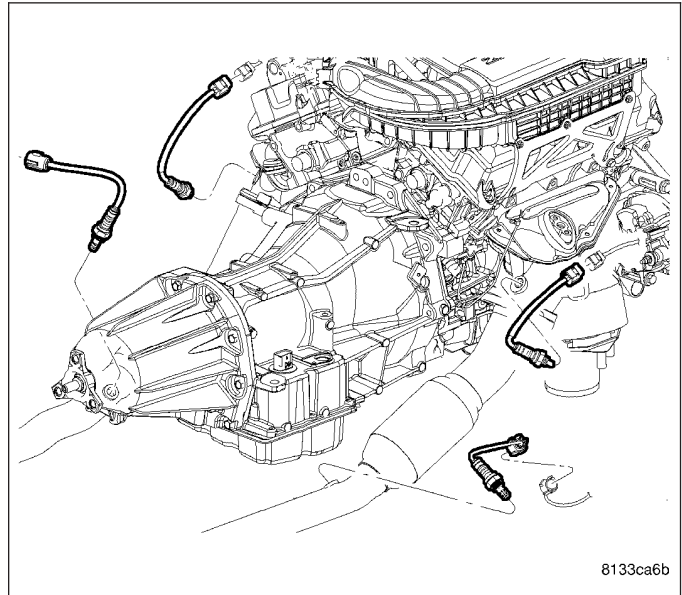
The engine uses two heated oxygen sensors, one in each exhaust manifold.

**CAUTION:** Never apply any type of grease to the oxygen sensor electrical connector, or attempt any soldering of the sensor wiring harness.

**WARNING:** THE EXHAUST MANIFOLD, EXHAUST PIPES AND CATALYTIC CONVERTER BECOME VERY HOT DURING ENGINE OPERATION. ALLOW ENGINE TO COOL BEFORE REMOVING OXYGEN SENSOR.

**CAUTION:** When disconnecting sensor electrical connector, do not pull directly on wire going into sensor.

1. Remove the negative battery cable.
2. Raise vehicle and support.
3. Disconnect the heated oxygen sensor electrical connector.
4. Use a socket such as Snap-On YA8875 or a crow foot wrench to remove oxygen sensor.



#### 2.7L

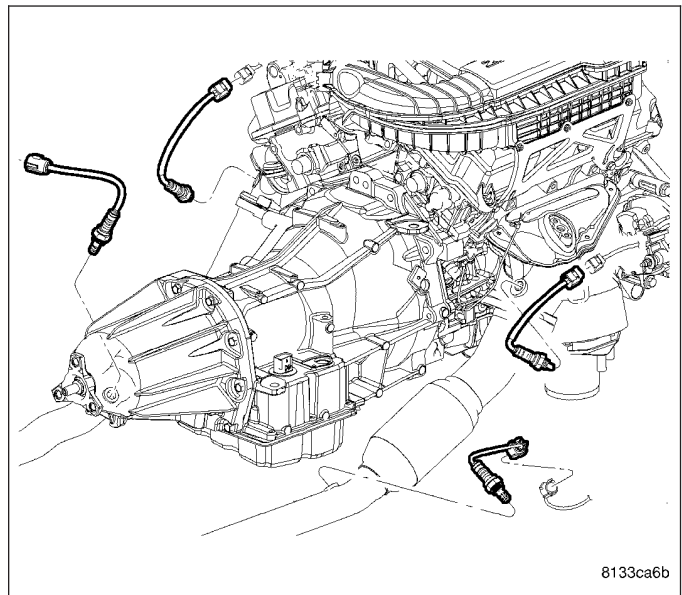
The engine uses two heated oxygen sensors, one in each exhaust manifold.

**CAUTION:** Never apply any type of grease to the oxygen sensor electrical connector, or attempt any soldering of the sensor wiring harness.

**WARNING:** THE EXHAUST MANIFOLD, EXHAUST PIPES AND CATALYTIC CONVERTER BECOME VERY HOT DURING ENGINE OPERATION. ALLOW ENGINE TO COOL BEFORE REMOVING OXYGEN SENSOR.

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1. Remove the negative battery cable.
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3. Disconnect the heated oxygen sensor electrical connector.
4. Use a socket such as Snap-On YA8875 or a crow foot wrench to remove oxygen sensor.



## 5.7L

Refer to graphic for typical O2S (oxygen sensor) locations if equipped with four oxygen sensors.

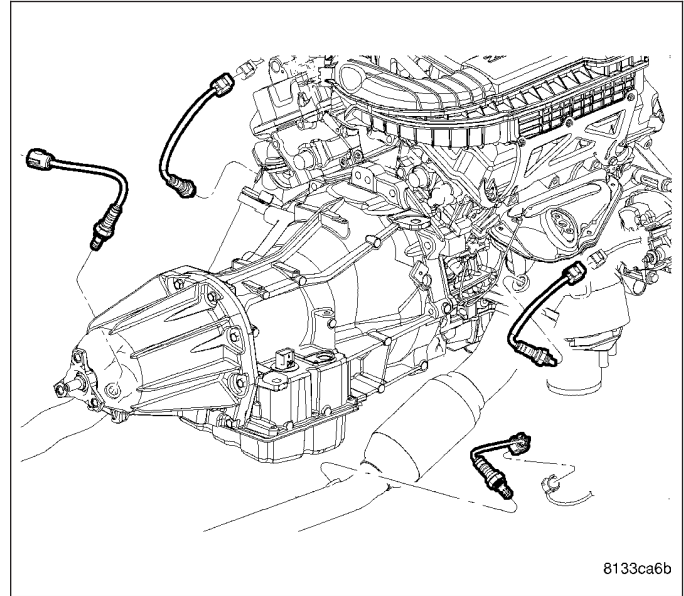
**CAUTION:** Never apply any type of grease to the oxygen sensor electrical connector, or attempt any soldering of the sensor wiring harness.

**WARNING:** THE EXHAUST MANIFOLD, EXHAUST PIPES AND CATALYTIC CONVERTER BECOME VERY HOT DURING ENGINE OPERATION. ALLOW ENGINE TO COOL BEFORE REMOVING OXYGEN SENSOR.

1. Raise and support vehicle.
2. Disconnect wire connector from O2S sensor.

**CAUTION:** When disconnecting sensor electrical connector, do not pull directly on wire going into sensor.

3. Remove O2S sensor with an oxygen sensor removal and installation tool.
4. Clean threads in exhaust pipe using appropriate tap.



## INSTALLATION

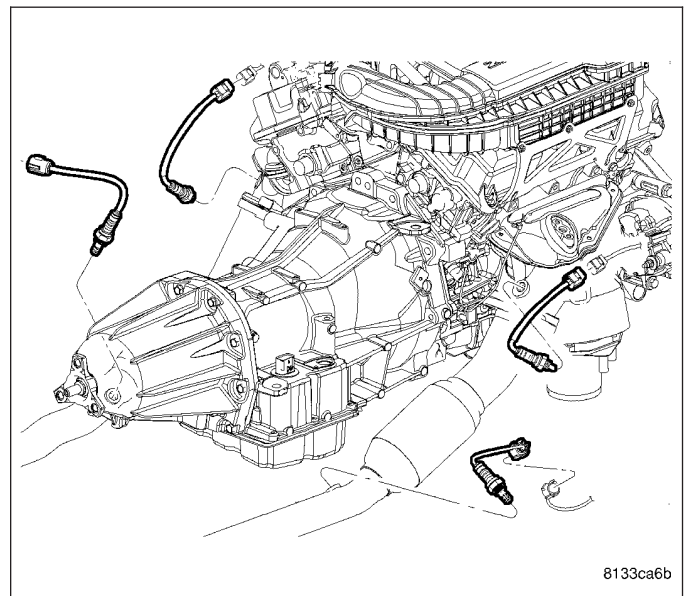
### 2.7L

**Note:** When replacing an O2 Sensor, the PCM RAM memory must be cleared, either by disconnecting the PCM C-1 connector or momentarily disconnecting the Battery negative terminal. The NGC learns the characteristics of each O2 heater element and these old values should be cleared when installing a new O2 sensor. The customer may experience driveability issues if this is not performed.

**CAUTION:** Never apply any type of grease to the oxygen sensor electrical connector, or attempt any soldering of the sensor wiring harness.

The engine uses two heated oxygen sensors, one in each exhaust manifold.

1. After removing the sensor, the exhaust manifold threads must be cleaned with an 18 mm X 1.5 + 6E tap. If reusing the original sensor, coat the sensor threads with an anti-seize compound such as Loctite 771-64 or equivalent. New sensors have compound on the threads and do not require an additional coating. Tighten the sensor to 28 N·m (20 ft. lbs.) torque.
2. Connect the heated oxygen sensor electrical connector.
3. Lower vehicle.
4. Install the negative battery cable.



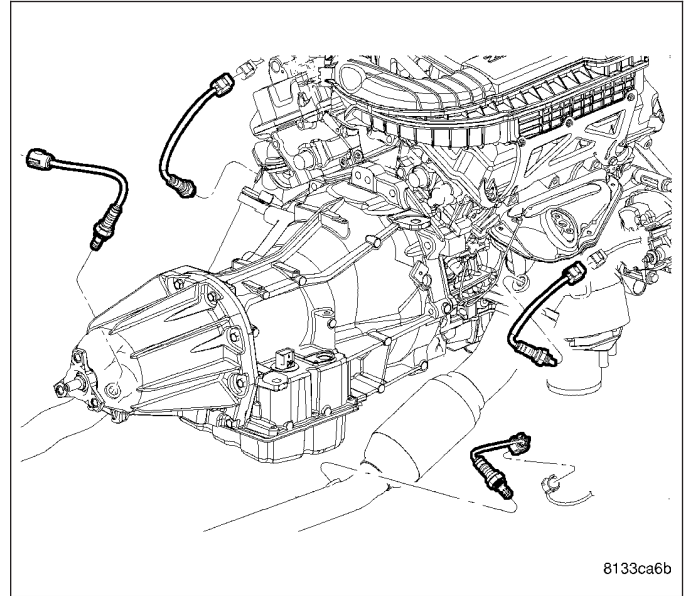
### 3.5L

**Note:** When replacing an O2 Sensor, the PCM RAM memory must be cleared, either by disconnecting the PCM C-1 connector or momentarily disconnecting the Battery negative terminal. The NGC learns the characteristics of each O2 heater element and these old values should be cleared when installing a new O2 sensor. The customer may experience driveability issues if this is not performed.

**CAUTION:** Never apply any type of grease to the oxygen sensor electrical connector, or attempt any soldering of the sensor wiring harness.

The engine uses two heated oxygen sensors, one in each exhaust manifold.

1. After removing the sensor, the exhaust manifold threads must be cleaned with an 18 mm X 1.5 + 6E tap. If reusing the original sensor, coat the sensor threads with an anti-seize compound such as Loctite 771- 64 or equivalent. New sensors have compound on the threads and do not require an additional coating. Tighten the sensor to 28 N·m (20 ft. lbs.) torque.
2. Connect the heated oxygen sensor electrical connector.
3. Lower vehicle.
4. Install the negative battery cable.



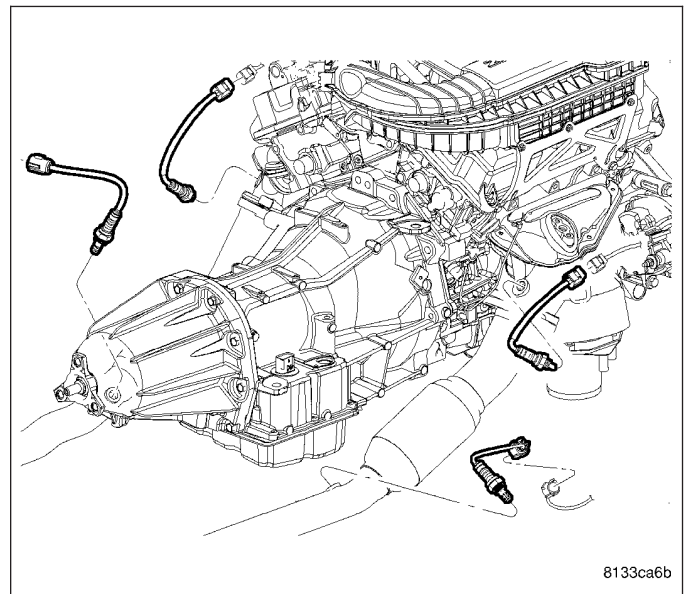
### 5.7L

**Note:** When replacing an O2 Sensor, the PCM's RAM memory must be cleared. This can be done by either by disconnecting the PCM's C-1 connector, or by momentarily disconnecting the negative battery cable. The PCM learns the characteristics of each O2 heater element, and these old values should be cleared when installing a new O2 sensor. Driveability problems may be experienced if this step is not performed.

**CAUTION:** Never apply any type of grease to the oxygen sensor electrical connector, or attempt any soldering of the sensor wiring harness.

Threads of new oxygen sensors are factory coated with anti-seize compound to aid in removal. **DO NOT add any additional anti-seize compound to threads of a new oxygen sensor.**

1. Install O2S sensor. Tighten to 30 N·m (22 ft. lbs.) torque.
2. Connect O2S sensor wire connector.
3. Lower vehicle.





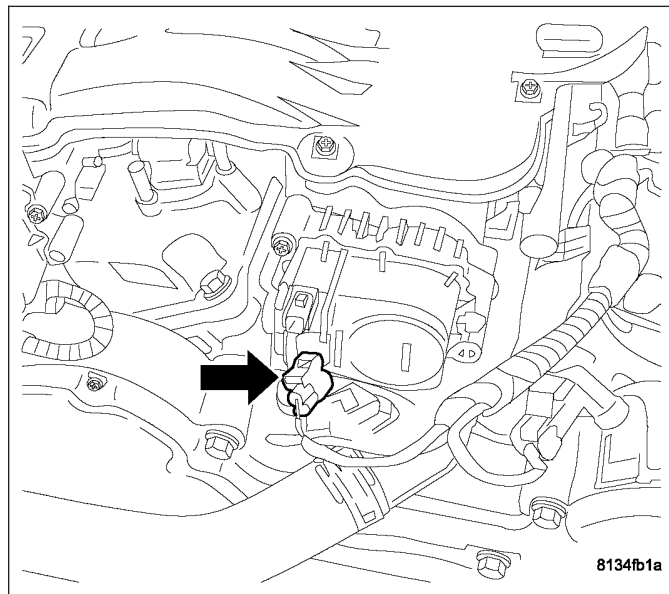
## SHORT RUNNER VALVE

### OPERATION

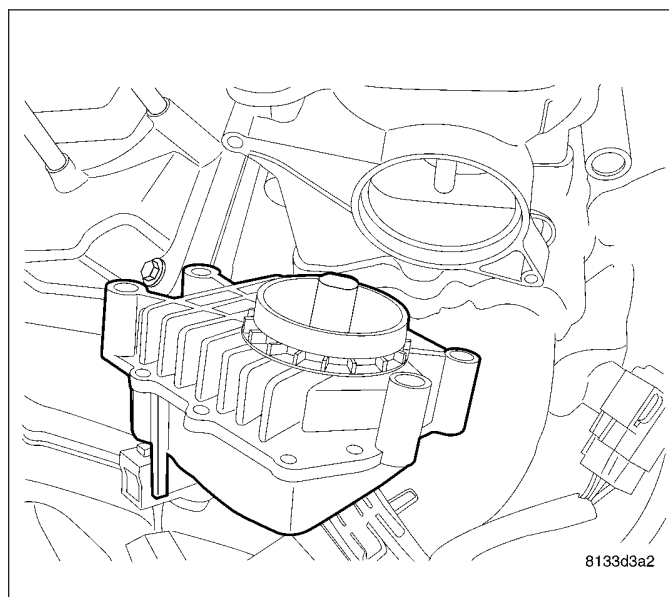
The SRV system operates under WOT conditions above 5000 rpm to maximize engine performance. When actuated by the PCM, the SRV solenoid energizes, allowing mechanical linkage to redirect the intake air flow to six short runners. The PCM looks for a current spike when actuating the solenoid. If the spike is not present, the PCM sets the DTC.

### REMOVAL - 3.5L

1. Disconnect negative battery cable.
2. Remove the electrical connector.

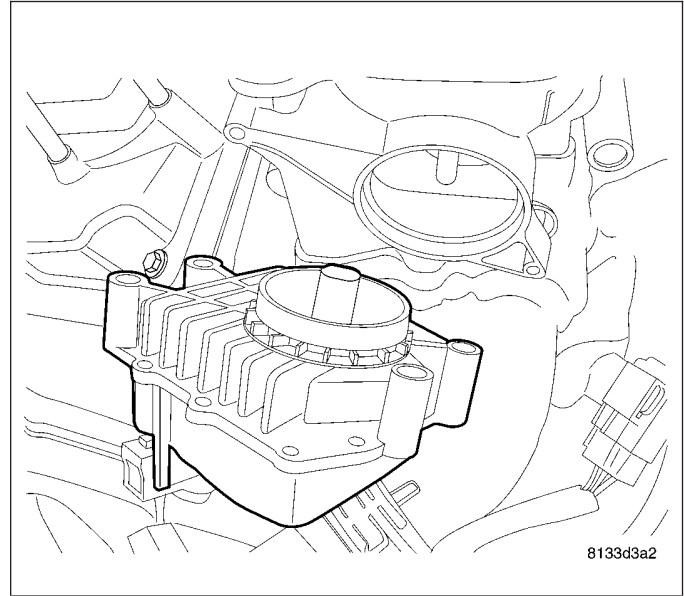


3. Remove the 2 mounting bolts.
4. Remove the Short Runner Valve.

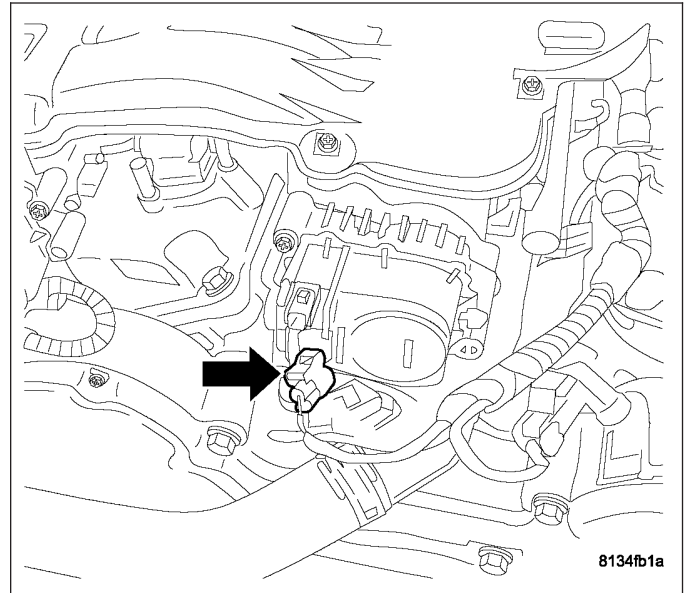


## INSTALLATION - 3.5L

1. Install the Sort Runner Valve. Align the slot in the valve with the tab on the intake manifold shaft.
2. Install the 2 mounting bolts.
3. Tighten bolts to 2.8 N·m (25 in. lbs.).



4. Connect the electrical connector.
5. Connect negative battery cable.



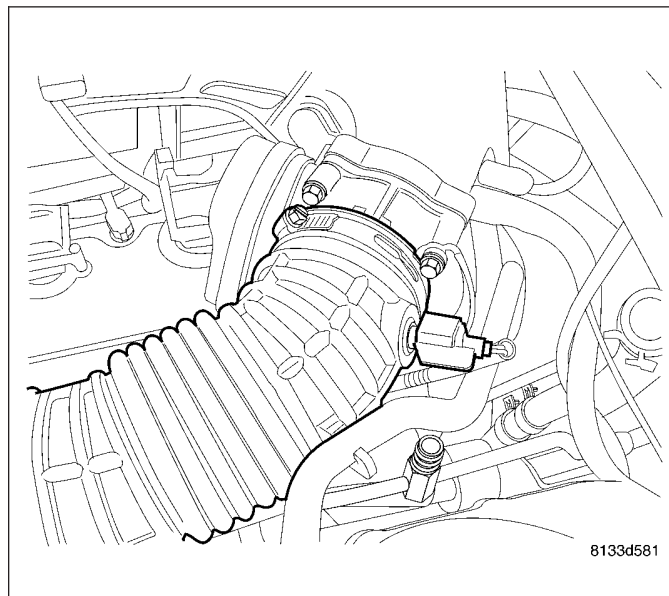


## THROTTLE BODY

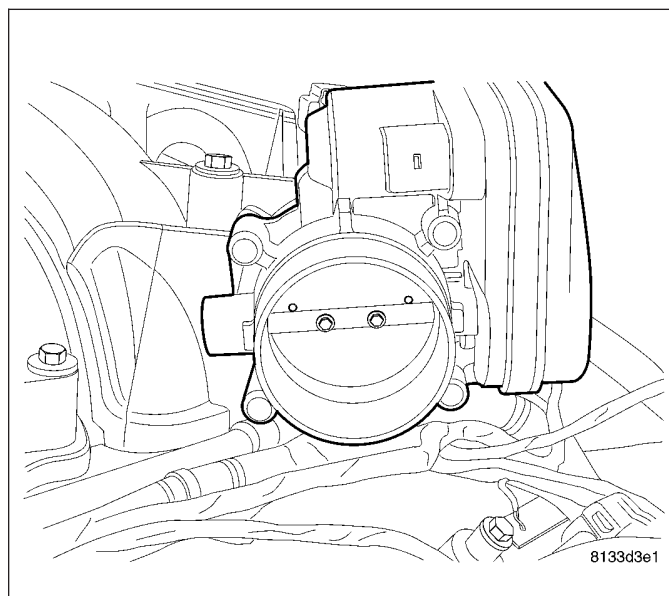
### REMOVAL

#### 2.7L

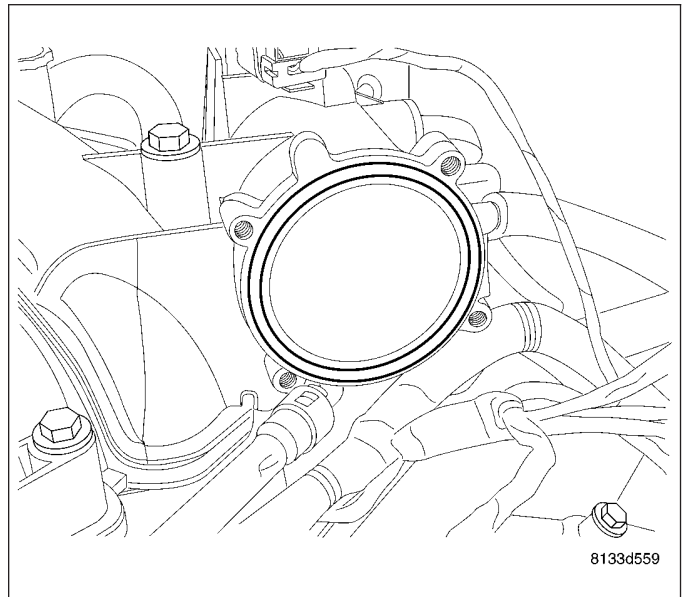
1. Disconnect negative cable from battery
2. Disconnect inlet hose from from throttle body.



3. Disconnect electrical connectors.
4. Disconnect vacuum hose.
5. Remove 3 throttle body bolts.
6. Remove throttle body.

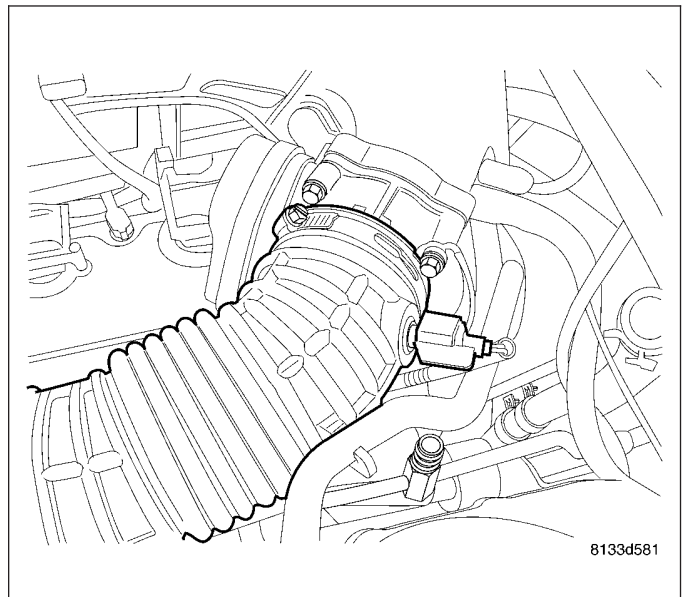


7. Clean mating surfaces.

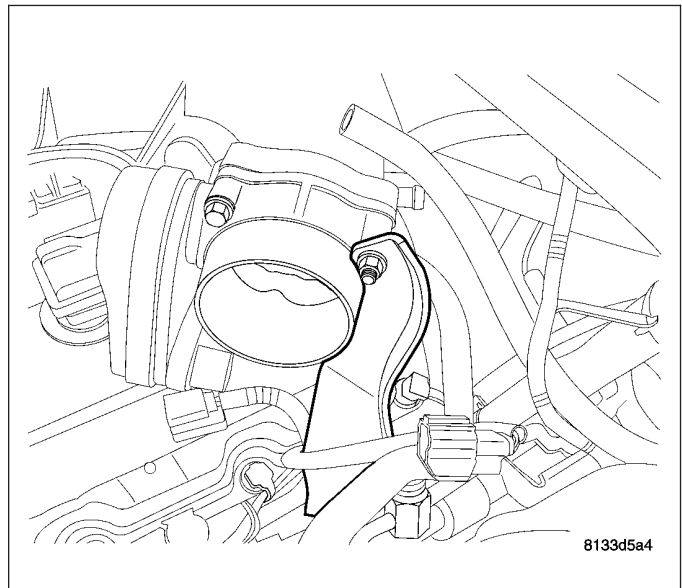


### 3.5L

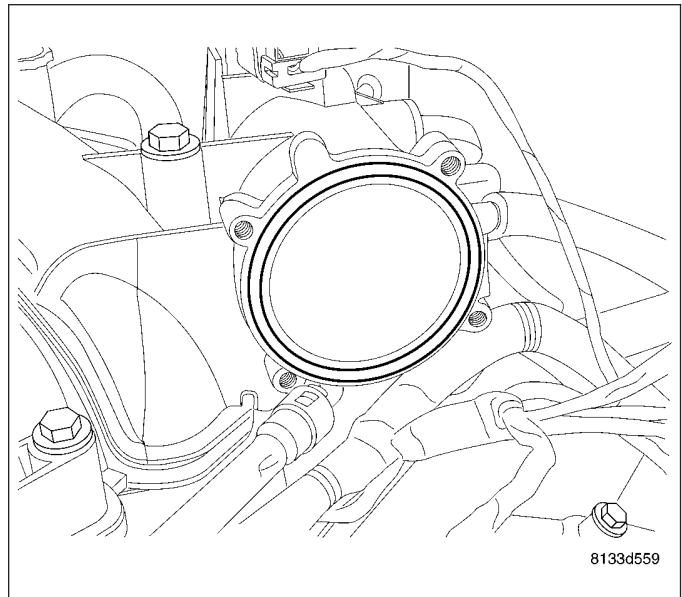
1. Disconnect negative cable from battery
2. Remove the inlet hose from throttle body.



3. Disconnect electrical connectors.
4. Disconnect vacuum hose.
5. Remove the throttle body support bracket.
6. Remove throttle body bolts.



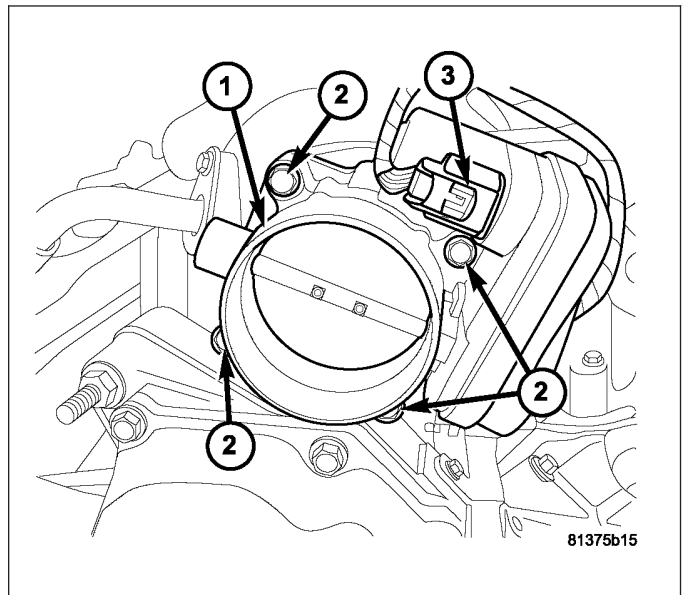
7. Clean mating surfaces.



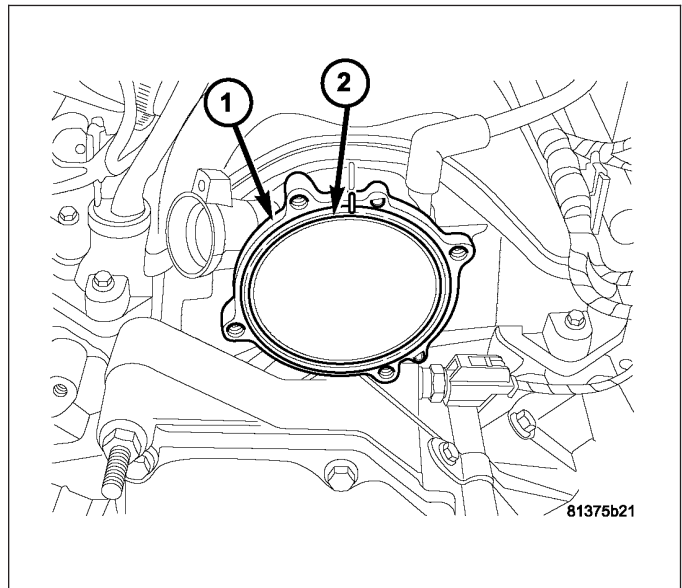
## 5.7L

**CAUTION:** Do not use spray (carb) cleaners on any part of the throttle body. Do not apply silicone lubricants to any part of the throttle body.

1. Remove rubber air duct at front of throttle body.
2. Disconnect electrical connector (3) at throttle body (1).
3. Remove four throttle body mounting bolts (2).
4. Remove throttle body from intake manifold.



5. Check condition of throttle body o-ring (2) at front of intake manifold (1).

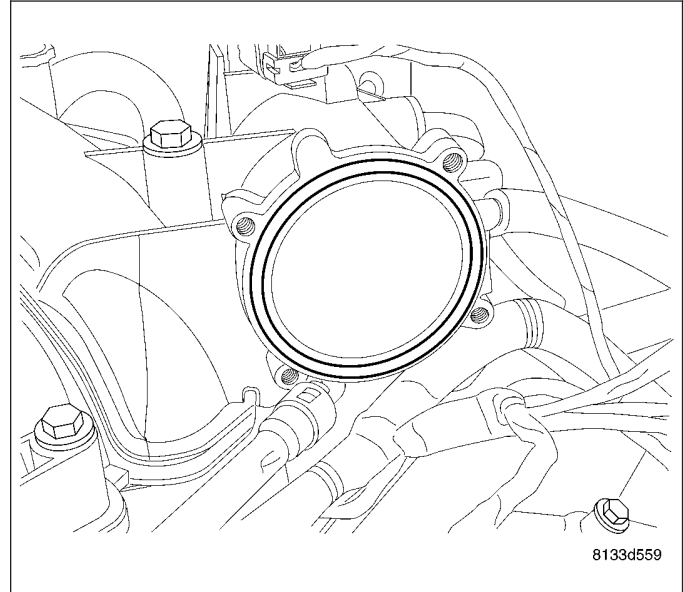


## INSTALLATION

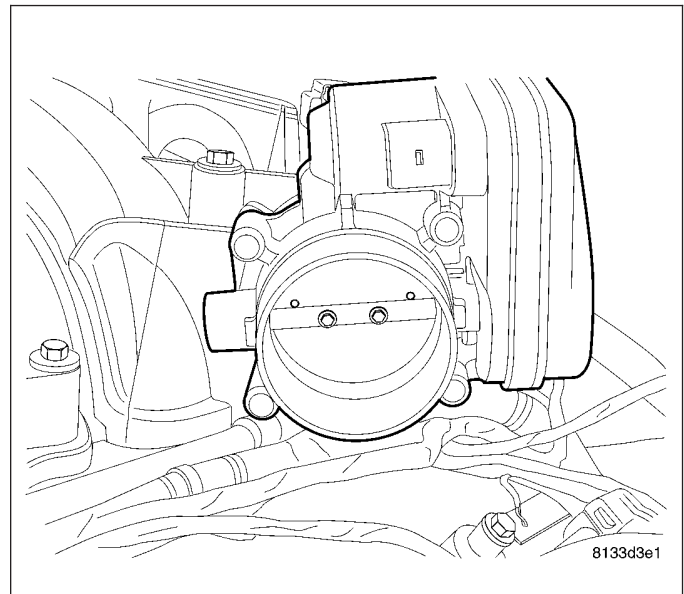
### 2.7L

**CAUTION:** Do not use spray (carb) cleaners on any part of the throttle body. Do not apply silicone lubricants to any part of the throttle body.

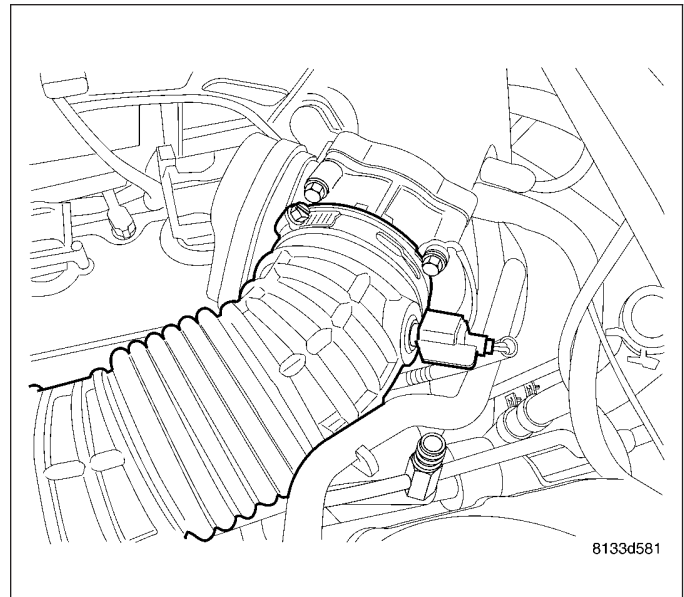
1. Install throttle body gasket.



2. Install throttle body and bolts.
3. Tighten bolts to 11.9 N·m (105 in. lbs.) torque.
4. Connect electrical connectors.
5. Connect vacuum hoses.



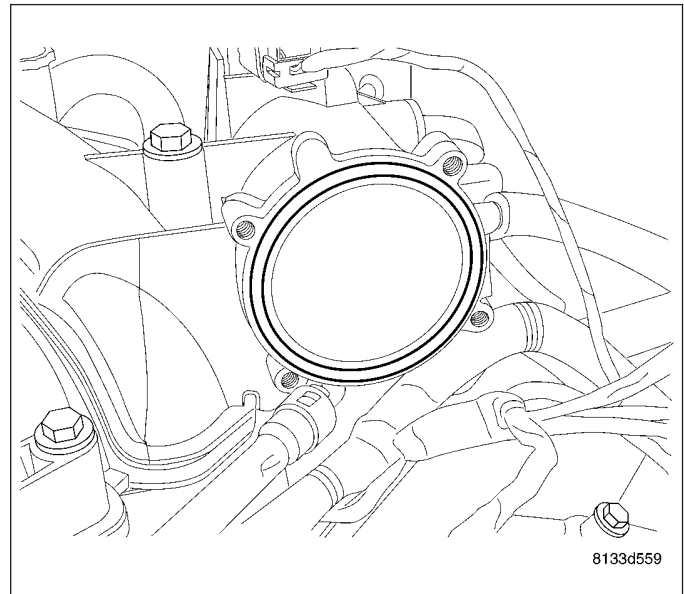
6. Install inlet hose and tighten clamp.
7. Connect negative cable to battery.
8. A Scan Tool may be used to learn electrical parameters. Go to the Miscellaneous menu, and then select ETC Relearn. If the relearn is not preformed, a Diagnostic Trouble Code (DTC) will be set. If necessary, use a scan tool to erase any Diagnostic Trouble Codes (DTC's) from PCM.



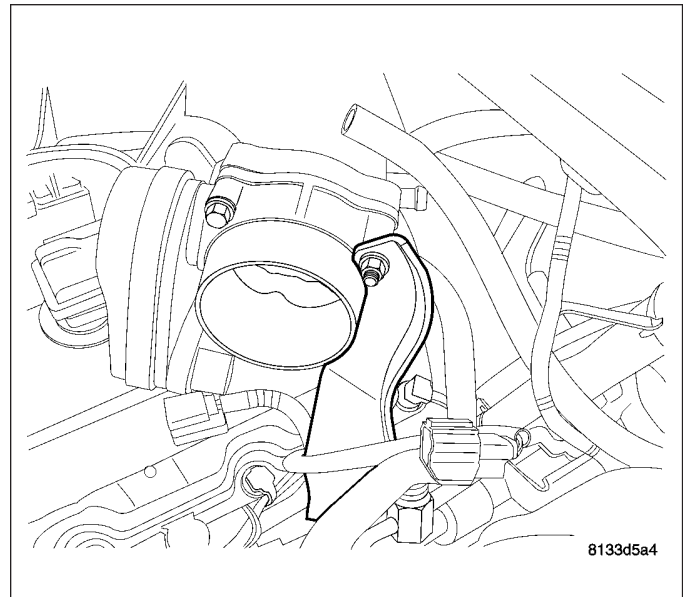
### 3.5L

**CAUTION:** Do not use spray (carb) cleaners on any part of the throttle body. Do not apply silicone lubricants to any part of the throttle body.

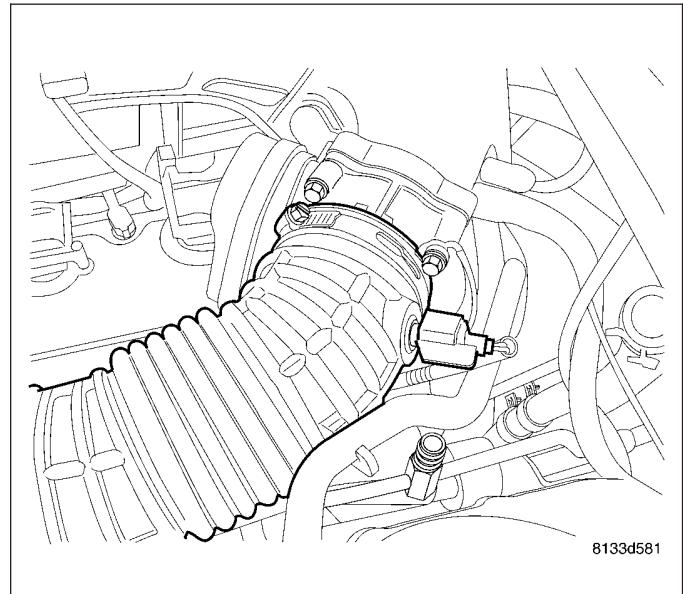
1. Install throttle gasket.



2. Install throttle body and bolts.
3. Tighten bolts to 11.9 N·m (105 in. lbs.) torque.
4. Install the throttle body support bracket to the bottom of the throttle body. Tighten the bolts to 27.1 N·m (20 ft. lbs.) torque.

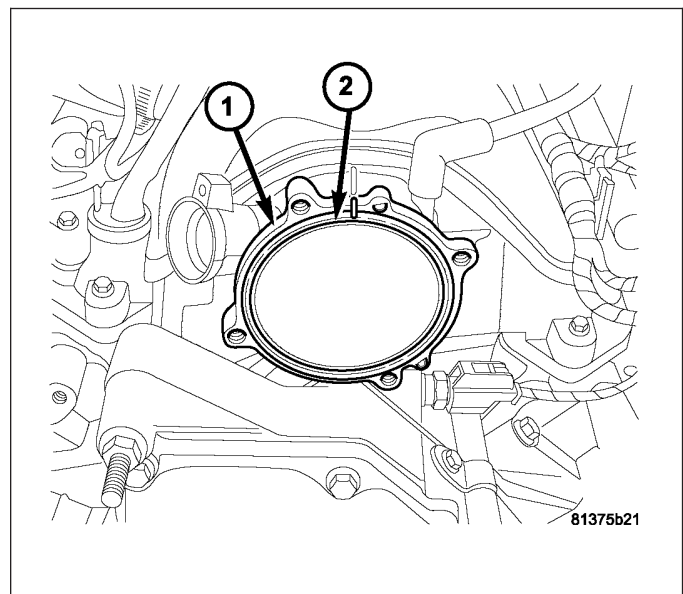


5. Install inlet hose and tighten clamp.
6. Connect negative cable to battery.
7. A Scan Tool may be used to learn electrical parameters. Go to the Miscellaneous menu, and then select ETC Relearn. If the relearn is not preformed, a Diagnostic Trouble Code (DTC) will be set. If necessary, use a scan tool to erase any Diagnostic Trouble Codes (DTC's) from PCM.



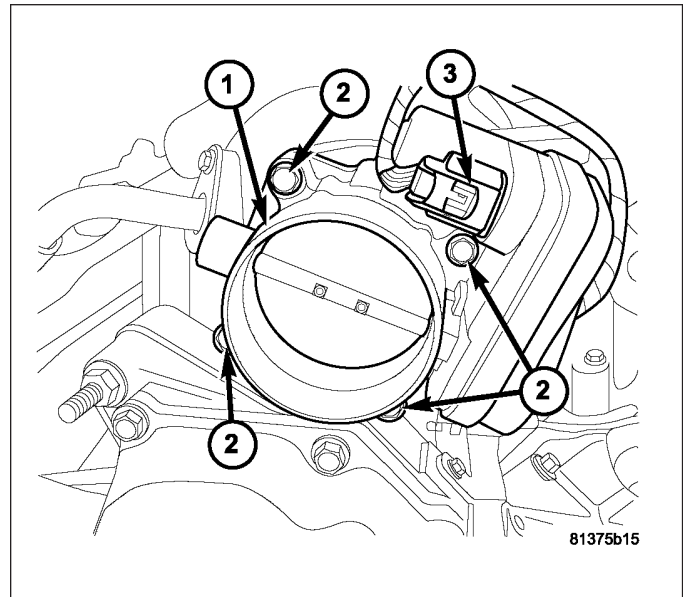
## 5.7L

1. Clean and check condition of throttle body-to-intake manifold o-ring (2).
2. Clean mating surfaces of throttle body and intake manifold (1).



**CAUTION:** Do not use spray (carb) cleaners on any part of the throttle body. Do not apply silicone lubricants to any part of the throttle body.

3. Install throttle body to intake manifold by positioning throttle body to manifold alignment pins.
4. Install and tighten four mounting bolts (2). Refer to Torque Specifications.
5. Install electrical connector (3).
6. Install rubber air hose to throttle body.
7. A Scan Tool may be used to learn electrical parameters. Go to the Miscellaneous menu, and then select ETC Relearn. If the relearn is not performed, a Diagnostic Trouble Code (DTC) will be set. If necessary, use a scan tool to erase any Diagnostic Trouble Codes (DTC's) from PCM.



STEERING

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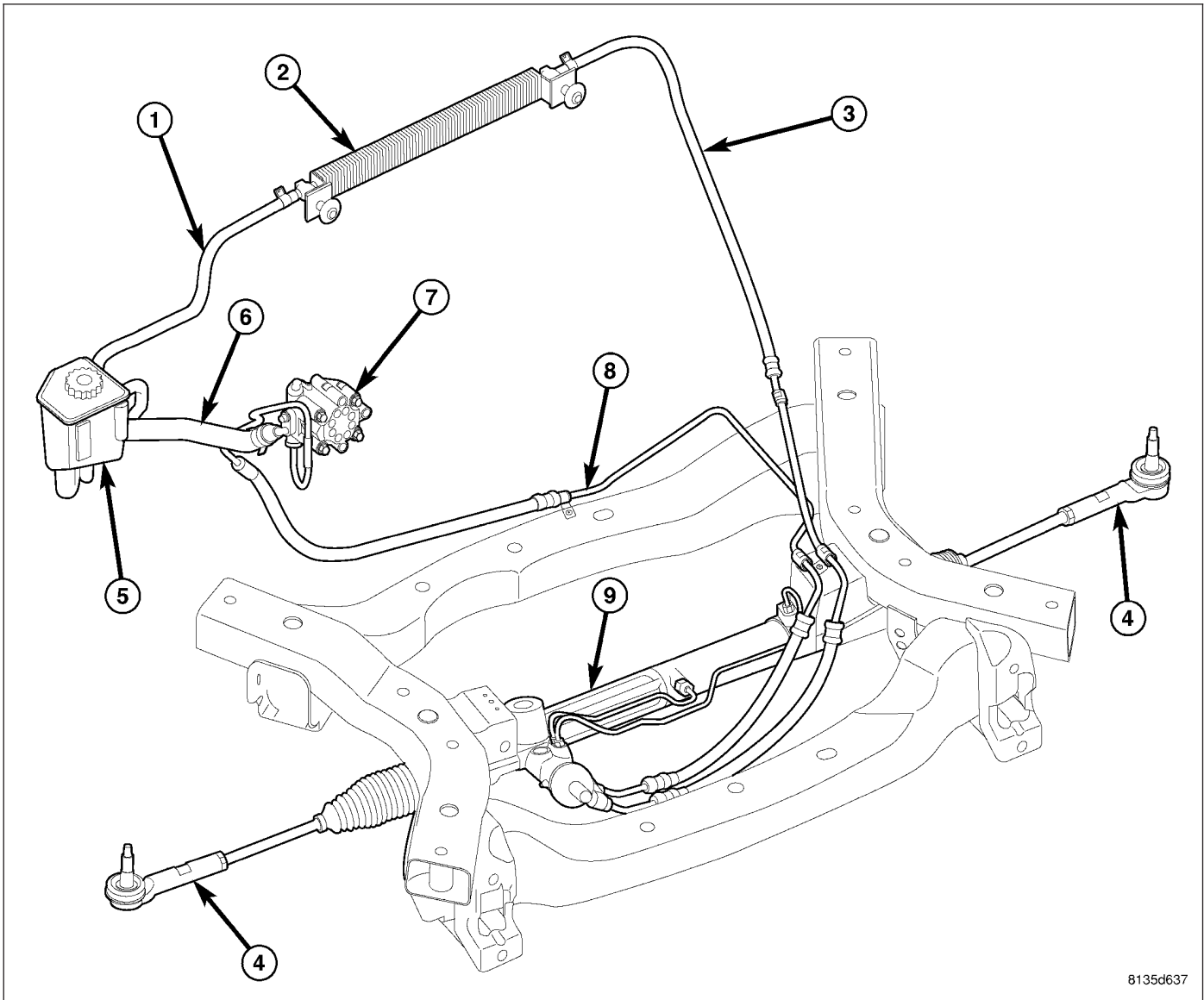
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## STEERING

### DESCRIPTION

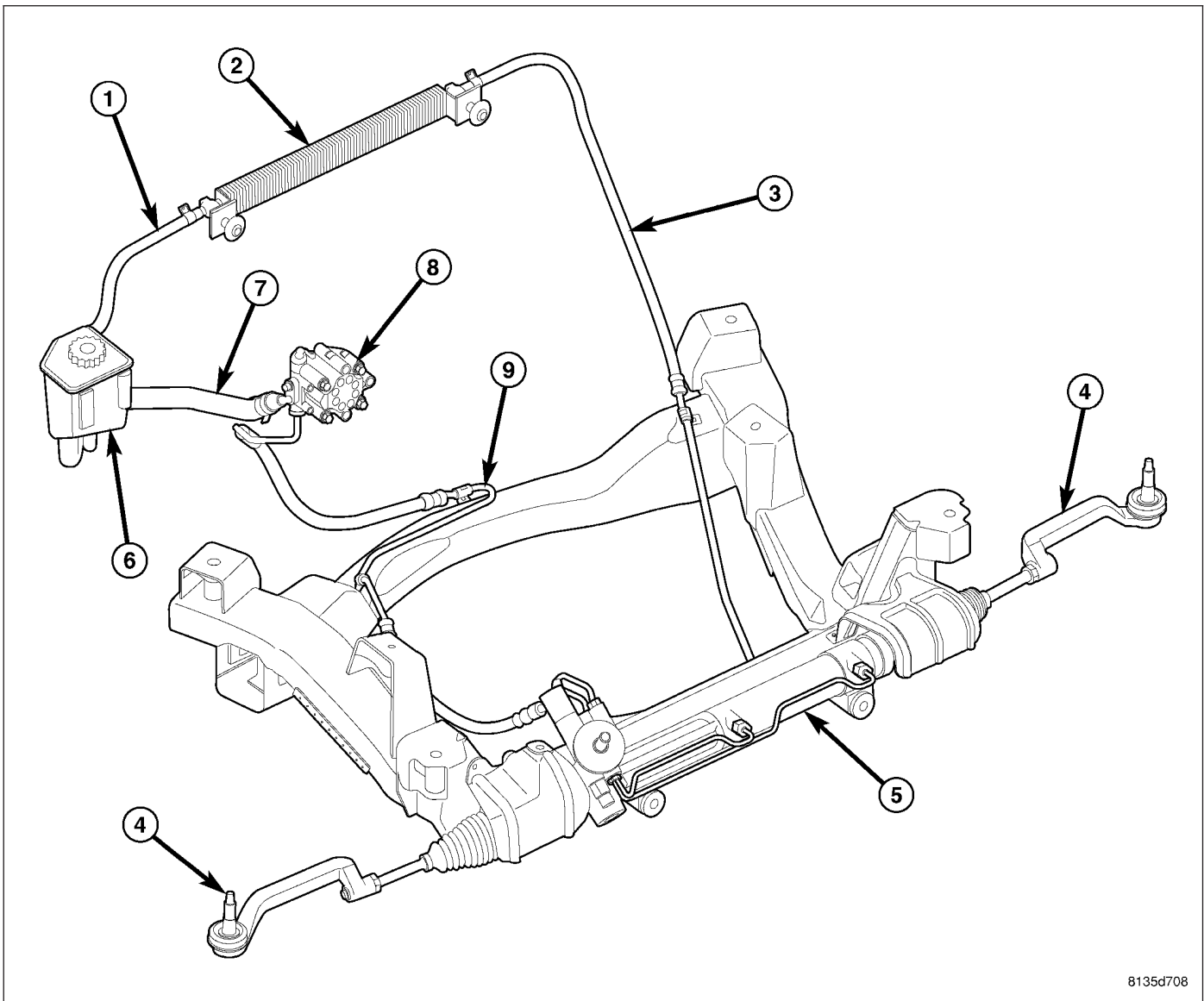
### STEERING SYSTEMS



8135d637

RWD Power steering systems consist of:

- Steering column
- Rack and pinion steering gear (9)
- Belt driven hydraulic steering pump (7)
- Pump pressure (8), return (1&3) and supply (6) hoses
- Oil Cooler (2)
- Remote Reservoir (5)
- Inner & Outer tie rod ends (4)



8135d708

AWD Power steering systems consist of:

- Steering column
- Rack and pinion steering gear (5)
- Belt driven hydraulic steering pump (8)
- Pump pressure (9), return (1&3) and supply (7) hoses
- Oil Cooler (2)
- Remote Reservoir (6)
- Inner & Outer tie rod ends (4)

## WARNING

**WARNING:** Power steering fluid, engine parts and exhaust system may be extremely hot if engine has been running. Do not start engine with any loose or disconnected hoses. Do not allow hoses to touch hot exhaust manifold or catalyst.

**WARNING:** Fluid level should be checked with the engine off to prevent personal injury from moving parts.

## CAUTION

**CAUTION:** Anytime the battery has been disconnected and is reconnected it is important that this be performed properly. The vehicle may be equipped with systems that require special calibration processes. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)

**CAUTION:** When the power steering system is open, cap all open ends of the hoses, power steering pump fittings or power steering gear ports to prevent entry of foreign material into the components.

**CAUTION:** When servicing power steering components, do not pinch off power steering hoses in any way to stop fluid flow. Damage to hoses may result.

## DIAGNOSIS AND TESTING

## HYDRAULIC FLOW AND PRESSURE TEST

The following procedure is used to test the operation of the power steering system on this vehicle. This test will provide the gallons per minute (GPM) or flow rate of the power steering pump along with the maximum relief pressure. Perform this test anytime a power steering system problem is present. This test will determine if the power steering pump or power steering gear is not functioning properly. The following test is performed using the Power Steering Analyzer kit 6815 (with appropriate hoses) and Adapters from kit 6893. (Refer to 19 - STEERING - SPECIAL TOOLS)

1. Check power steering belt to ensure it is in good condition and adjusted properly.
2. Assemble Power Steering Analyzer as follows:
  - a. Gauge end (inlet) of Flow Meter And Gauge 6800 (3) – Hose 6905 (6), Hose 6713 (4), Adapter Tube 6844 (5)
  - b. Valve end (outlet) of Flow Meter And Gauge 6800 (3) – Hose 6959 (1), Adapter Fitting 6826 (2)
3. Unthread pressure hose tube nut at power steering pump.
4. Connect Adapter Tube 9091-1 to pressure fitting on power steering pump.
5. Connect power steering pressure hose to Adapter Fitting 9091-3.

2. Assemble Power Steering Analyzer as follows:
  - a. Gauge end (inlet) of Flow Meter And Gauge 6800 (3) – Hose 6905 (6), Hose 6713 (4), Adapter Tube 6844 (5)
  - b. Valve end (outlet) of Flow Meter And Gauge 6800 (3) – Hose 6959 (1), Adapter Fitting 6826 (2)
3. Unthread pressure hose tube nut at power steering pump.
4. Connect Adapter Tube 9091-1 to pressure fitting on power steering pump.
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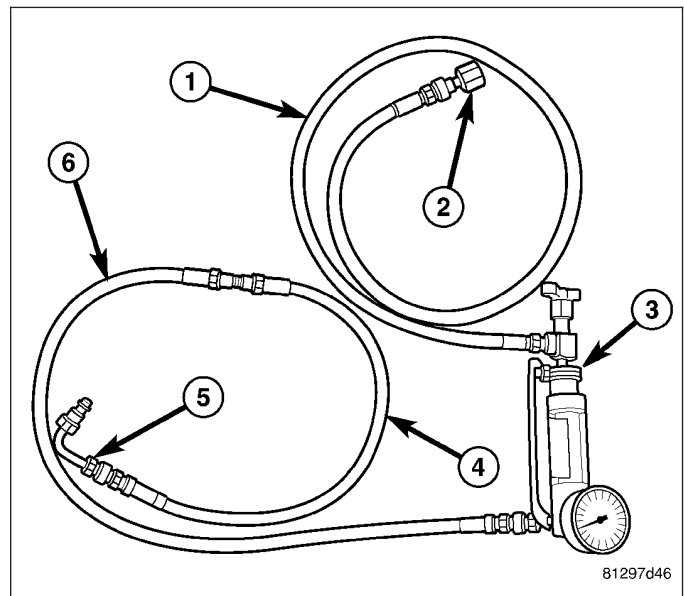
- a. Gauge end (inlet) of Flow Meter And Gauge 6800 (3) – Hose 6905 (6), Hose 6713 (4), Adapter Tube 6844 (5)
- b. Valve end (outlet) of Flow Meter And Gauge 6800 (3) – Hose 6959 (1), Adapter Fitting 6826 (2)

- b. Valve end (outlet) of Flow Meter And Gauge  
6800 (3) – Hose 6959 (1), Adapter Fitting 6826  
(2)

3. Unthread pressure hose tube nut at power steering pump.

4. Connect Adapter Tube 9091-1 to pressure fitting on power steering pump.

5. Connect power steering pressure hose to Adapter Fitting 9091-3.



6. Open Analyzer test valve completely.
7. Start engine and allow to idle long enough to circulate power steering fluid through Analyzer flow meter and hoses.
8. Shut off engine and check fluid level; add fluid as necessary. Repeat Step 7 and Step 8 until air is bled from system.
9. Start engine and allow to idle.
10. Check Analyzer gauge (3) pressure. Initial pressure reading should be 50-125 psi (345-862 kPa). If pressure is higher, inspect hoses for restrictions and repair as necessary.
11. Increase engine speed to 1100 rpm and read Analyzer Flow Meter. The reading should be 2.2 GPM (8.2 LPM) minimum. If flow reading is below specification, replace power steering pump.

7. Start engine and allow to idle long enough to circulate power steering fluid through Analyzer flow meter and hoses.

8. Shut off engine and check fluid level; add fluid as necessary. Repeat Step 7 and Step 8 until air is bled from system.

9. Start engine and allow to idle.

10. Check Analyzer gauge (3) pressure. Initial pressure reading should be 50-125 psi (345-862 kPa). If pressure is higher, inspect hoses for restrictions and repair as necessary.

11. Increase engine speed to 1100 rpm and read Analyzer Flow Meter. The reading should be 2.2 GPM (8.2 LPM) minimum. If flow reading is below specification, replace power steering pump.

**CAUTION:** The following test procedure involves testing maximum pump pressure output and flow control valve operation. Do not leave valve closed for more than five seconds as the pump could be damaged.

12. Close valve fully three times and record highest pressure indicated each time. **All three readings must be above specifications and within 50 psi (345 kPa) of each other.**

**Note:** Power steering pump maximum relief pressure is 1640-1740 psi (11307 to 11997 kPa).

- Power steering pump pressures above specifications but not within 50 psi (345 kPa) of each other, replace pump.
- Pressures within 50 psi (345 kPa) of each other but below specifications, replace pump.

**CAUTION:** Do not force the pump to operate against the stops for more than 2 to 4 seconds at a time because, pump damage will result.

13. Completely open the valve on the Power Steering Analyzer. Turn the steering wheel to the extreme left until the stop in the steering gear is met, then turn the steering wheel to the right until the right stop is met. Record the highest indicated pressure at each position. Compare the recorded readings to the specifications. If the highest recorded output pressure reading against one stop is not within 50 psi (345 kPa) of the highest recorded reading at the other stop, the steering gear is leaking internally and must be replaced.

## STEERING DIAGNOSIS CHARTS

**Note:** There are three diagnosis charts following that cover **POWER STEERING NOISE**, **STEERING WHEEL FEEL**, and **POWER STEERING FLUID**.

**POWER STEERING NOISE**

<b>CONDITION</b>	<b>POSSIBLE CAUSES</b>	<b>CORRECTION</b>
OBJECTIONABLE HISS OR WHISTLE*	<ol style="list-style-type: none"> <li>1. Damaged or mispositioned steering column shaft/coupling dash panel seal.</li> <li>2. Noisy valve in power steering gear.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reposition or replace steering column shaft/coupling dash panel seal.</li> <li>2. Replace power steering gear.</li> </ol>
RATTLE OR CLUNK	<ol style="list-style-type: none"> <li>1. Power steering gear loose on front suspension crossmember.</li> <li>2. Front suspension crossmember mounting fasteners loose at frame.</li> <li>3. Loose tie rod (outer or inner).</li> <li>4. Loose lower control arm mounting bolts at front suspension crossmember.</li> <li>5. Lower control arm pivot bushing worn.</li> <li>6. Lower control arm tension strut bushing worn.</li> <li>7. Loose strut assembly mounting fasteners at tower.</li> <li>8. Power steering fluid pressure hose touching the body of the vehicle.</li> <li>9. Internal power steering gear noise.</li> <li>10. Damaged front suspension crossmember.</li> <li>11. Stabilizer bar link ball joints worn.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inspect power steering gear mounting bolts. Replace as necessary. Tighten to the specified torque.</li> <li>2. Tighten the front suspension crossmember mounting fasteners to the specified torque.</li> <li>3. Check tie rod pivot points for wear. Replace worn/loose parts as required.</li> <li>4. Tighten control arm mounting bolts to the specified torques.</li> <li>5. Replace lower control arm pivot bushing.</li> <li>6. Replace lower control arm tension strut bushing.</li> <li>7. Tighten strut assembly fasteners to the specified torque.</li> <li>8. Adjust hose to proper position by loosening, repositioning, and tightening fitting to specified torque. Do not bend tubing.</li> <li>9. Replace power steering gear.</li> <li>10. Replace front suspension crossmember.</li> <li>11. Replace stabilizer bar link.</li> </ol>
POPPING NOISE	<ol style="list-style-type: none"> <li>1. Worn outer tie rod.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace outer tie rod.</li> </ol>
CHIRP OR SQUEAL (POWER STEERING PUMP)	<ol style="list-style-type: none"> <li>1. Loose power steering pump drive belt.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and adjust power steering pump drive belt to specifications. Replace belt if worn or glazed.</li> </ol>

CONDITION	POSSIBLE CAUSES	CORRECTION
WHINE OR GROWL (POWER STEERING PUMP)**	<ol style="list-style-type: none"> <li>1. Low fluid level.</li> <li>2. Power steering hose touching vehicle body or frame.</li> <li>3. Extreme wear of power steering pump internal components.</li> <li>4. Loose power steering pump drive belt.</li> <li>5. Extremely cold temperatures below -18°C (0°F).</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill power steering fluid reservoir to proper level and check for leaks (make sure all air is bled from the system fluid).</li> <li>2. Adjust hose to proper position by loosening, repositioning, and tightening fitting to specified torque. Do not bend tubing. Replace hose if damaged.</li> <li>3. Replace power steering pump and flush system as necessary.</li> <li>4. Check and adjust power steering pump drive belt to specifications. Replace belt if worn or glazed.</li> <li>5. Noise is typical when starting vehicle in extremely cold temperature. Normal duration of noise at start-up is less than one minute. If noise persists for extended time, verify proper fluid level. If fluid is low, inspect for leaks.</li> </ol>
SUCKING AIR SOUND	<ol style="list-style-type: none"> <li>1. Loose clamp on power steering fluid return hose.</li> <li>2. Missing O-Ring on power steering hose connection.</li> <li>3. Low power steering fluid level.</li> <li>4. Air leak between power steering fluid reservoir and power steering pump.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten or replace hose clamp.</li> <li>2. Inspect connection and replace O-Ring as required.</li> <li>3. Fill power steering fluid reservoir to proper level and check for leaks.</li> <li>4. Replace power steering pump (with reservoir).</li> </ol>
SQUEAK OR RUBBING SOUND	<ol style="list-style-type: none"> <li>1. Steering column shroud rubbing.</li> <li>2. Steering column shaft rubbing.</li> <li>3. Clockspring noisy.</li> <li>4. Steering gear internally noisy.</li> </ol>	<ol style="list-style-type: none"> <li>1. Realign shrouds as necessary.</li> <li>2. Move or realign item rubbing shaft.</li> <li>3. Remove clockspring. Reinstall wheel. If noise is gone, replace clockspring.</li> <li>4. Replace steering gear.</li> </ol>
SCRUBBING OR KNOCKING NOISE.	<ol style="list-style-type: none"> <li>1. Incorrect tire or wheel size.</li> <li>2. Interference between steering gear and other vehicle components.</li> <li>3. Steering gear internal stops worn excessively allowing tires to be steered excessively far.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace incorrect size tire or wheel with size used as original equipment.</li> <li>2. Check for bent or misaligned components and correct as necessary.</li> <li>3. Replace steering gear.</li> </ol>

\* note: There is some noise in all power steering systems. One of the most common is a hissing sound evident when turning the steering wheel when at a standstill or when parking and the steering wheel is at the end of its travel. Hiss is a very high frequency noise similar to that experienced while slowly closing a water tap. The noise is present in every valve and results when high velocity fluid passes valve orifice edges. There is no relationship between this noise and the performance of the steering system.

\*\* note: Power steering pump growl results from the development of high pressure fluid flow. Normally this noise level should not be high enough to be objectionable.

**STEERING WHEEL FEEL**

<b>CONDITION</b>	<b>POSSIBLE CAUSES</b>	<b>CORRECTION</b>
STEERING WHEEL/ COLUMN CLICKING, CLUNKING OR RATTLING.	<ol style="list-style-type: none"> <li>1. Loose steering coupling pinch bolt.</li> <li>2. Steering column bearings.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace pinch bolt and torque to specifications.</li> <li>2. Replace steering column.</li> </ol>
STEERING WHEEL HAS FORE AND AFT LOOSENESS.	<ol style="list-style-type: none"> <li>1. Steering wheel retaining nut not properly tightened and torqued.</li> <li>2. Steering column lower bearing spring retainer slipped on steering column shaft.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten the steering wheel retaining nut to its specified torque.</li> <li>2. Replace steering column.</li> </ol>
STEERING WHEEL OR DASH VIBRATES DURING LOW SPEED OR STANDSTILL STEERING MANEUVERS.	<ol style="list-style-type: none"> <li>1. Air in the fluid of the power steering system.</li> <li>2. Tires not properly inflated.</li> <li>3. Excessive engine vibration.</li> <li>4. Loose tie rod end jam nut.</li> <li>5. Overcharged air conditioning system.</li> </ol>	<ol style="list-style-type: none"> <li>1. Bleed air from system following the power steering pump initial operation service procedure.*</li> <li>2. Inflate tires to the specified pressure.</li> <li>3. Ensure that the engine is running properly.</li> <li>4. Tighten the inner to outer tie rod jam nut to the specified torque.</li> <li>5. Check air conditioning pump head pressure and correct as necessary.</li> </ol>
STEERING CATCHES, STICKS IN CERTAIN POSITIONS OR IS DIFFICULT TO TURN.	<ol style="list-style-type: none"> <li>1. Low power steering fluid level.</li> <li>2. Tires not inflated to specified pressure.</li> <li>3. Lack of lubrication in front suspension control arm ball joints.</li> <li>4. Worn lower control arm ball joint.</li> <li>5. Lack of lubrication in steering gear outer tie rod ends.</li> <li>6. Loose power steering pump drive belt.</li> <li>7. Faulty power steering pump flow control (Follow Power Steering System Flow and Pressure Test procedure).</li> <li>8. Excessive friction in steering column or intermediate shaft/coupler.</li> <li>9. Binding lower control arm ball joint.</li> <li>10. Excessive friction in power steering gear.</li> <li>11. Worn/binding seat and bearing in front strut assembly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill power steering fluid reservoir to specified level and check for leaks.</li> <li>2. Inflate tires to the specified pressure.</li> <li>3. Lubricate ball joints if ball joints are not a lubricated-for-life type ball joint. If ball joint is a lubricated-for-life ball joint, replace ball joint or control arm.</li> <li>4. Replace lower control arm.</li> <li>5. Lubricate tie rod ends if they are not a lubricated-for-life type. If tie rod end is a lubricated-for-life type, replace tie rod end.</li> <li>6. Tighten the power steering pump drive belt to specifications. If drive belt is worn or glazed, replace belt.</li> <li>7. Replace power steering pump.</li> <li>8. Isolate and correct condition.</li> <li>9. Replace the lower control arm.</li> <li>10. Replace power steering gear.</li> <li>11. Replace seat and bearing in front strut assembly.</li> </ol>

CONDITION	POSSIBLE CAUSES	CORRECTION
STIFF, HARD TO TURN, SURGE, MOMENTARY INCREASE IN EFFORT WHEN TURNING.	<ol style="list-style-type: none"> <li>1. Tires not properly inflated.</li> <li>2. Low power steering fluid level.</li> <li>3. Loose power steering pump drive belt.</li> <li>4. Lack of lubrication in lower control arm ball joints.</li> <li>5. Low power steering pump pressure (Follow Power Steering System Flow and Pressure Test procedure).</li> <li>6. High internal leak in power steering gear (Follow Power Steering System Flow and Pressure Test procedure).</li> </ol>	<ol style="list-style-type: none"> <li>1. Inflate tires to specified pressure.</li> <li>2. Add power steering fluid as required to power steering fluid reservoir to obtain proper level. Check for leaks.</li> <li>3. Tighten the power steering pump drive belt to specifications. If drive belt is worn or glazed, replace belt.</li> <li>4. Lubricate ball joints if ball joints are not a lubricated-for-life type ball joint. If ball joint is a lubricated-for-life ball joint, replace lower control arm.</li> <li>5. Replace the power steering pump as necessary.</li> <li>6. Replace power steering gear.</li> </ol>
STEERING WHEEL DOES NOT RETURN TO CENTER POSITION.	<ol style="list-style-type: none"> <li>1. Tires not inflated properly.</li> <li>2. Improper front wheel alignment.</li> <li>3. Lack of lubrication/binding in front lower control arm ball joints.</li> <li>4. Steering column coupling joints misaligned.</li> <li>5. Steering wheel rubbing.**</li> <li>6. Damaged, mis-positioned or un-lubricated steering column coupler to dash seal.**</li> <li>7. Binding seat and bearing in front strut assembly.</li> <li>8. Tight shaft bearing in steering column.</li> <li>9. Excessive friction in steering column coupling.</li> <li>10. Excessive friction in power steering gear.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inflate tires to specified pressure.</li> <li>2. Check and adjust wheel alignment as necessary.</li> <li>3. Lubricate ball joints if ball joints are not a lubricated for life type of ball joint, then inspect ball joint for wear, replace lower control arm as necessary. If ball joint is a lubricated for life ball joint, replace lower control arm.</li> <li>4. Realign steering column coupling joints.</li> <li>5. Adjust steering column shrouds to eliminate rubbing condition.</li> <li>6. Replace, reposition, or lubricate dash seal.</li> <li>7. Replace seat and bearing in front strut assembly.</li> <li>8. Replace the steering column.</li> <li>9. Replace steering column coupling.</li> <li>10. Replace power steering gear.</li> </ol>



CONDITION	POSSIBLE CAUSES	CORRECTION
EXCESSIVE STEERING WHEEL KICKBACK OR TOO MUCH STEERING WHEEL FREE PLAY.	<ol style="list-style-type: none"> <li>1. Air in the fluid of the power steering system.</li> <li>2. Power steering gear loose on crossmember.</li> <li>3. Power steering gear housing isolator bushings worn.</li> <li>4. Steering column coupling or intermediate shaft worn, broken or loose.</li> <li>5. Free play in steering column.</li> <li>6. Worn lower control arm ball joints.</li> <li>7. Loose steering knuckle-to-ball joint stud pinch bolt.</li> <li>8. Front wheel bearing loose or worn.</li> <li>9. Loose outer tie rod end.</li> <li>10. Worn inner tie rod bushing.</li> <li>11. Defective steering gear rotary valve.</li> </ol>	<ol style="list-style-type: none"> <li>1. Bleed air from system following the the power steering pump initial operation service procedure.*</li> <li>2. Inspect power steering gear mounting bolts. Replace as necessary. Tighten to the specified torque.</li> <li>3. Replace power steering gear housing isolator bushings.</li> <li>4. Replace steering column coupling or intermediate shaft.</li> <li>5. Check all components of the steering column and repair or replace as required.</li> <li>6. Replace lower control arm as required.</li> <li>7. Inspect pinch bolt, replace as necessary, and tighten to specified torque.</li> <li>8. Replace hub and bearing or knuckle as necessary.</li> <li>9. Replace outer tie rod end that has excessive free play.</li> <li>10. Replace inner tie rod.</li> <li>11. Replace power steering gear.</li> </ol>

\* note: Steering shudder can be expected in new vehicles and vehicles with recent steering system repairs. Shudder should dissipate after the vehicle has been driven several weeks.

\*\* note: To evaluate this condition, it may be necessary to disconnect the coupling at the base of the steering column. Turn the steering wheel and feel or listen for internal rubbing in steering column. To avoid damaging the column clockspring, note the following. Before disconnecting coupling, place tires in the straight-ahead position and center steering wheel. Once disconnected, DO NOT rotate steering wheel more than one revolution in either direction and place steering wheel in original location before reconnecting coupling. If this position is lost, the steering column clockspring must be recentered following the procedure found within the procedure for steering column installation in the steering column section.

**POWER STEERING FLUID**

CONDITION	POSSIBLE CAUSES	CORRECTION
LOW FLUID LEVEL WITH VISIBLE LEAK.	1. Loose power steering hose fittings. 2. Damaged or missing fitting seal, gasket, or O-ring. 3. Power steering fluid cooler leaking. 4. Power steering pump or power steering gear leaking.	1. Tighten the fitting to its specified torque. 2. Replace as necessary. 3. Replace power steering fluid cooler. 4. Repair or replace the leaking component as required.
AERATED FLUID.	1. Low fluid level.* 2. Air leak between power steering fluid reservoir and pump. 3. Cracked power steering pump housing.	1. Fill power steering fluid reservoir to proper level. 2. Inspect for proper sealing. Replace the power steering pump (with reservoir). 3. Replace the power steering pump.
RESERVOIR FLUID OVERFLOW AND FLUID THAT IS MILKY IN COLOR	1. Water contamination.	1. Drain the power steering fluid from the system. Flush the system with fresh clean power steering fluid, drain, then refill to the proper level.

\* note: Extremely cold temperatures may cause power steering fluid aeration if the power steering fluid level is low.

**SPECIFICATIONS****POWER STEERING FASTENER TORQUE**

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
GEAR MOUNTING BOLTS	142	105	—
HOSE TUBE NUTS	47	35	—
OUTER TIE ROD BALL JOINT NUT	85	63	—
PUMP MOUNTING BOLTS	28	21	—
TIE ROD JAM NUT	75	55	—

## COLUMN ELECTRICAL DIAGNOSIS

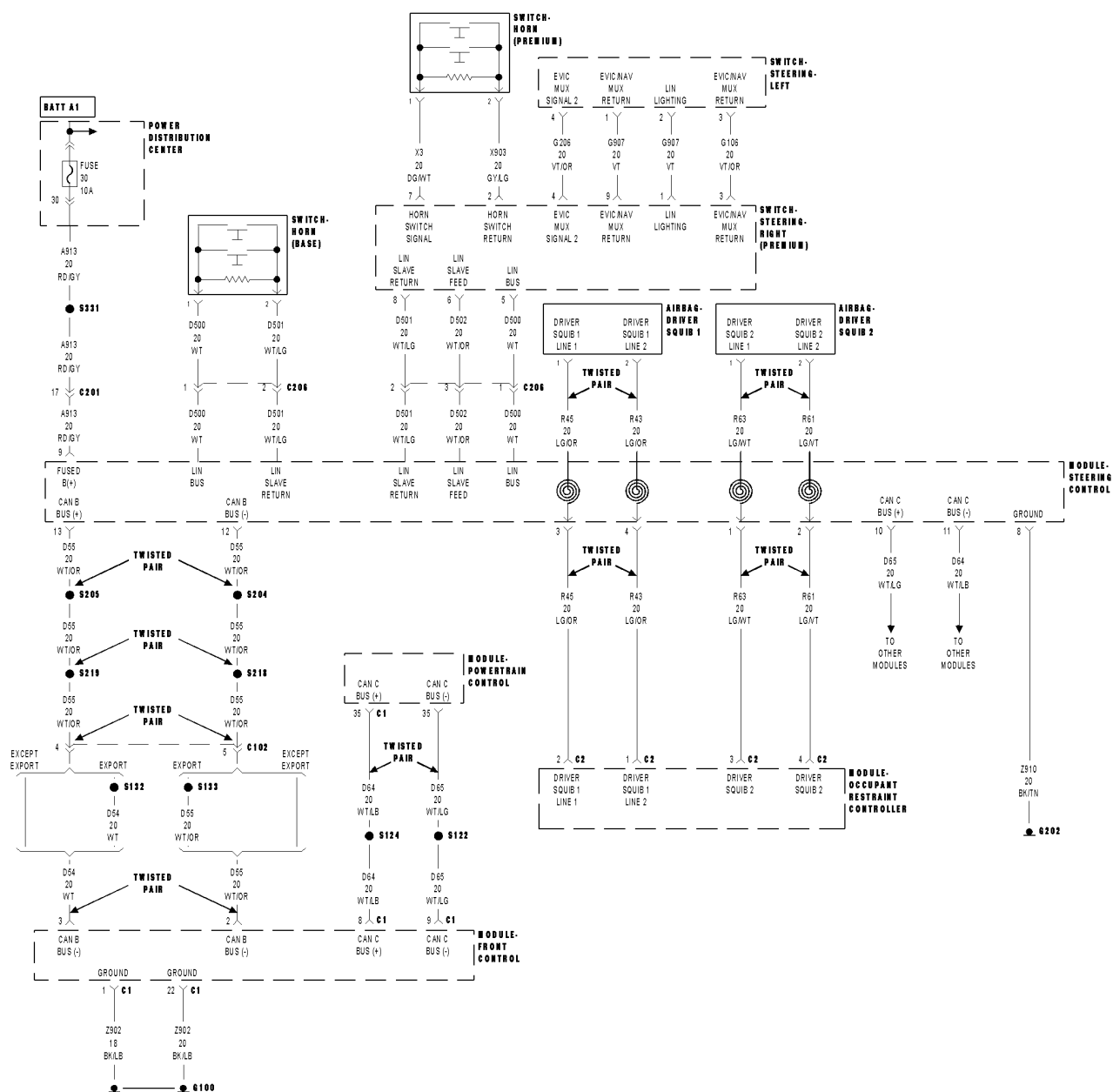
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## COLUMN ELECTRICAL DIAGNOSIS

### DIAGNOSIS AND TESTING

## P0562-BATTERY VOLTAGE LOW



**P0562-BATTERY VOLTAGE LOW (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
Continuously.
- **Set Condition:**  
If the voltage to the Steering Column Control Module (SCCM) is below 8.5 volts for more than one minute.

**Possible Causes**

RELATED DTC(S) PRESENT IN PCM  
INTERMITTENT BATTERY VOLTAGE LOW DTC  
(A913) FUSED B(+) CIRCUIT HIGH RESISTANCE  
(Z910) GROUND CIRCUIT HIGH RESISTANCE  
STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. RELATED DTC(S) PRESENT IN PCM**

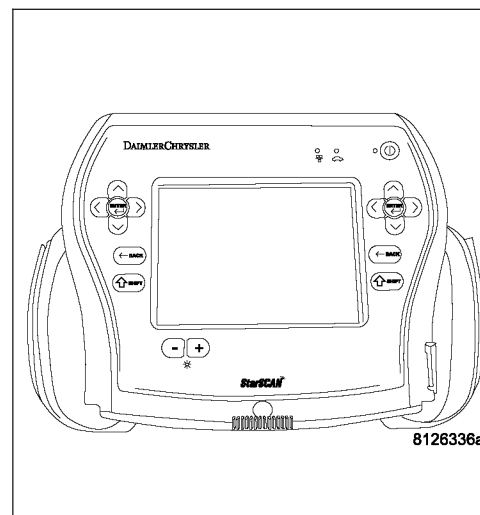
Ignition on, engine not running.

With the scan tool, select View DTCs in the Powertrain Control Module.

**Are there any charging system or related battery voltage DTCs present in the PCM?**

**Yes** >> Refer to the appropriate symptom in the Driveability category.

**No** >> Go to 2

**2. DTC STATUS IS ACTIVE**

With the scan tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 3

**No** >> Go to 5

## P0562-BATTERY VOLTAGE LOW (CONTINUED)

### 3. (A913) FUSED B(+) CIRCUIT HIGH RESISTANCE

Turn the ignition off.

Remove the Steering Column Control Module in accordance with the Service Information.

Turn the ignition on.

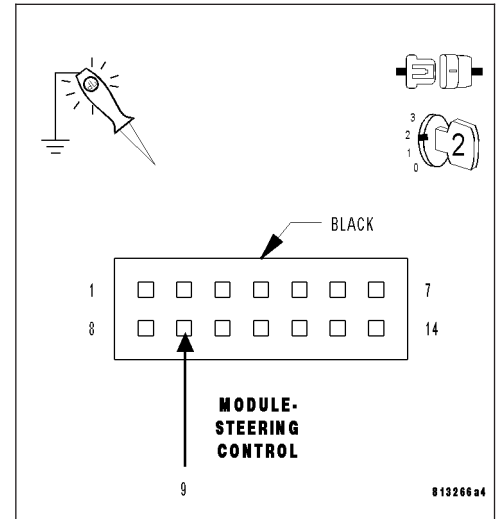
Using a 12-volt test light connected to ground, check the (A913) Fused B(+) circuit in the Steering Column Control Module harness connector.

**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly?**

**Yes** >> Go to 4

**No** >> Repair the (A913) Fused B(+) circuit.



### 4. (Z910) GROUND CIRCUIT HIGH RESISTANCE

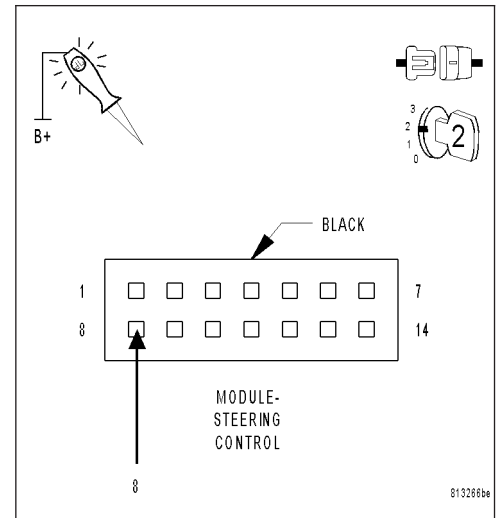
Using a 12-volt test light connected to 12-volts, check the (Z910) Ground circuit in the Steering Column Control Module harness connector.

**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly?**

**Yes** >> Replace the Steering Column Control Module in accordance with the Service Information.

**No** >> Repair the (Z910) Ground circuit.



### 5. INTERMITTENT BATTERY VOLTAGE LOW DTC

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

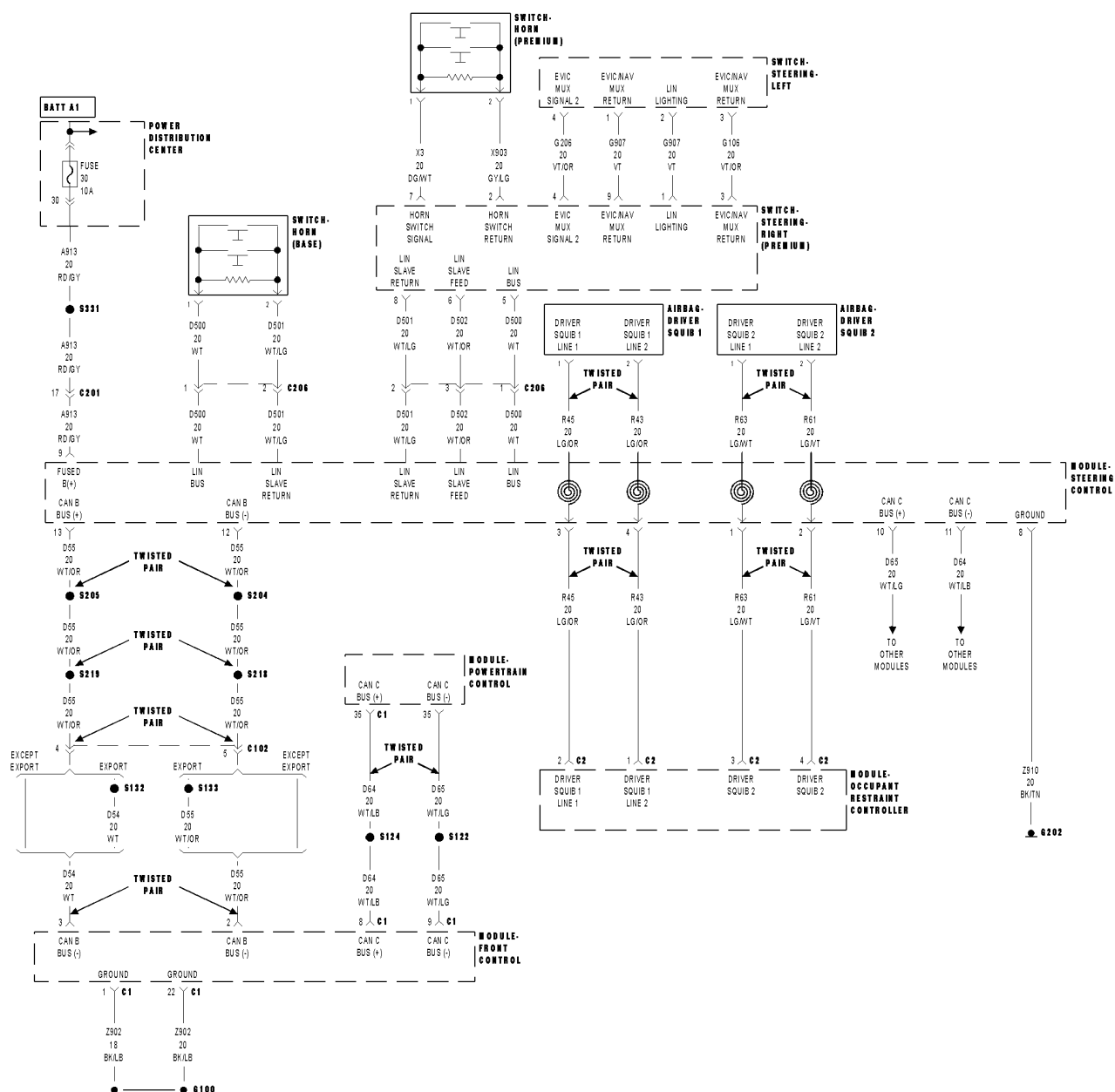
Look for the data to change or for the DTC to reset during the wiggle test.

**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

## P0563-BATTERY VOLTAGE HIGH



**P0563-BATTERY VOLTAGE HIGH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
Continuously.
- **Set Condition:**  
If the voltage to the Steering Column Control Module (SCCM) is above 16 volts for more than one minute.

Possible Causes
RELATED DTC(S) PRESENT IN THE PCM INTERMITTENT BATTERY VOLTAGE HIGH DTC (A913) FUSED B(+) CIRCUIT HIGH RESISTANCE (Z910) GROUND CIRCUIT HIGH RESISTANCE STEERING COLUMN CONTROL MODULE (SCCM)

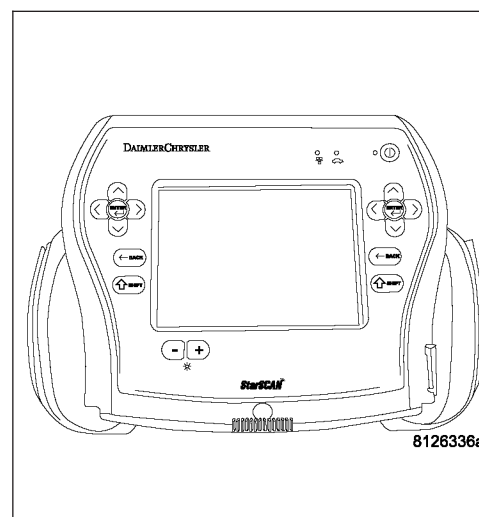
**Diagnostic Test****1. RELATED DTC(S) PRESENT IN THE PCM**

Ignition on, engine not running.

With the scan tool, select View DTCs in the Powertrain Control Module.

**Are there any charging system or related battery voltage DTCs present in the PCM?**

- Yes** >> Refer to the appropriate symptom in the Driveability category.
- No** >> Go to 2

**2. DTC IS ACTIVE**

Start the engine. Allow the engine to idle for 2 minutes.

With the scan tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

- Yes** >> Go to 3
- No** >> Go to 5



**P0563-BATTERY VOLTAGE HIGH (CONTINUED)****3. (A913) FUSED B(+) CIRCUIT HIGH RESISTANCE**

Turn the ignition off.

Remove the Steering Column Control Module in accordance with the Service Information.

Start the engine. Allow the engine to idle.

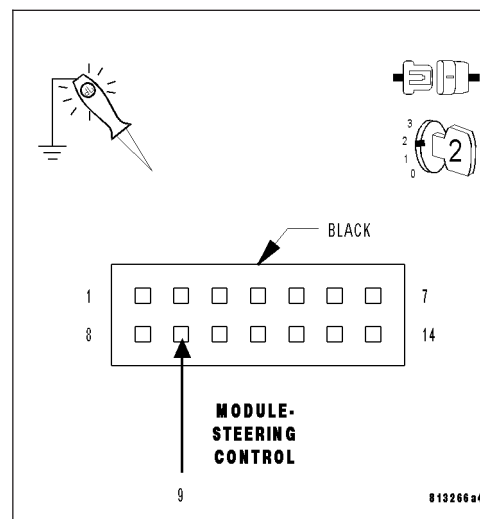
Using a 12-volt test light connected to ground, check the (A913) Fused B(+) circuit in the Steering Column Control Module harness connector.

**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly?**

**Yes** >> Go to 4

**No** >> Repair the (A913) Fused B(+) circuit.

**4. (Z910) GROUND CIRCUIT HIGH RESISTANCE**

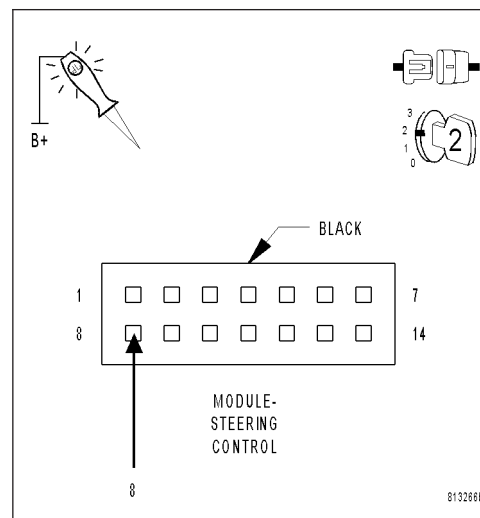
Using a 12-volt test light connected to 12-volts, check the (Z910) Ground circuit in the Steering Column Control Module harness connector.

**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly?**

**Yes** >> Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

**No** >> Repair the (Z910) Ground circuit.

**5. INTERMITTENT BATTERY VOLTAGE HIGH DTC**

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

**P0585-SPEED CONTROL MULTIPLEXED SWITCH 1/2 CORRELATION**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The Steering Column Control Module (SCCM) has detected that a non-permissible combination has occurred in the Speed Control Switch.

Possible Causes
INTERMITTENT SPEED CONTROL MULTIPLEXED SWITCH 1/2 CORRELATION DTC
SPEED CONTROL SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC IS ACTIVE**

**Note:** If **P0562-BATTERY VOLTAGE LOW** or **P0563-BATTERY VOLTAGE HIGH** is set along with this DTC, diagnose the battery voltage DTC first.

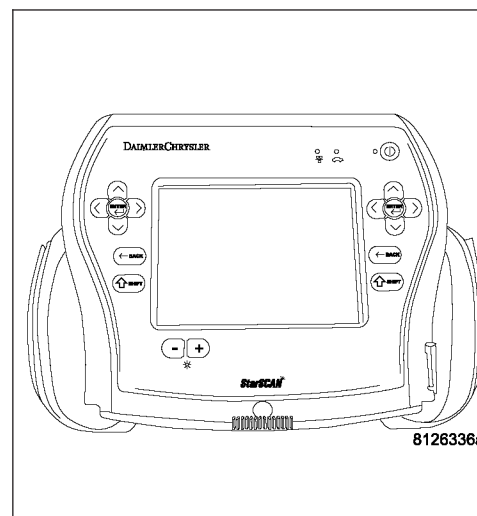
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 4

**2. SPEED CONTROL SWITCH**

Turn the ignition off.

Replace the Speed Control Switch in accordance with the Service Information.

Turn the ignition on.

Move the Speed Control Switch to each position several times.

With the Scan Tool, Clear Stored DTCs in the Steering Column Control Module.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

Move the Speed Control Switch to each position several times while monitoring the Scan Tool.

**Does this DTC reset?**

**Yes** >> Go To 3

**No** >> Test Complete.

## P0585-SPEED CONTROL MULTIPLEXED SWITCH 1/2 CORRELATION (CONTINUED)

### 3. STEERING COLUMN CONTROL MODULE (SCCM)

View repair.

#### Repair

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

---

### 4. INTERMITTENT SPEED CONTROL MULTIPLEXED SWITCH 1/2 CORRELATION DTC

The conditions necessary to set this DTC are not present at this time.

While monitoring the scan tool data relative to this circuit, move the Speed Control Switch to each position several times.

Look for the DTC to reset while the switch is being moved to each position.

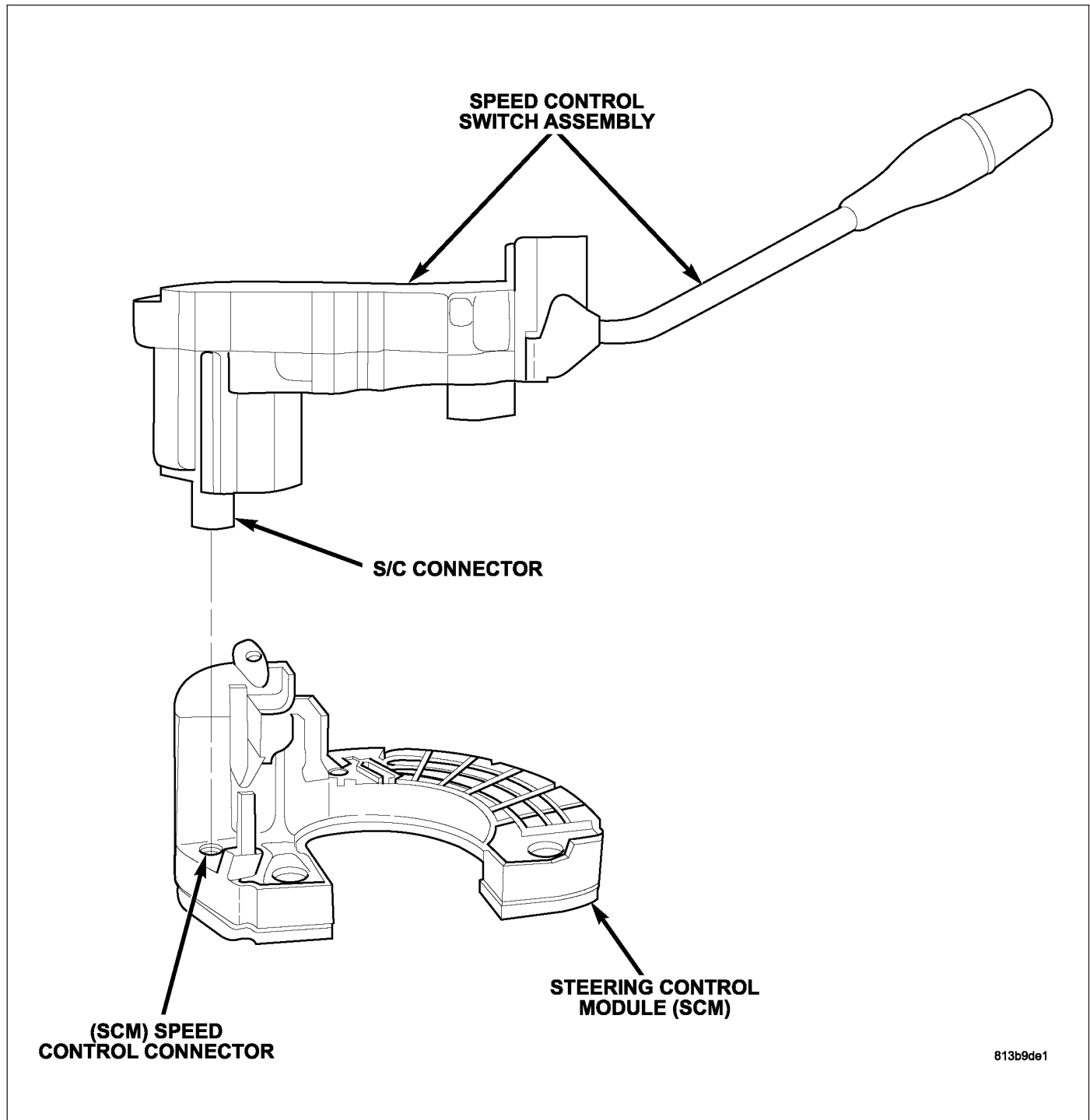
#### Were any problems found?

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

## P1593—SPEED CONTROL SWITCH 1/2 STUCK



**P1593–SPEED CONTROL SWITCH 1/2 STUCK (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The Steering Column Control Module (SCCM) has detected that the Speed Control Switches are not operating properly.

Possible Causes
INTERMITTENT SPEED CONTROL SWITCH 1/2 STUCK DTC SPEED CONTROL SWITCH STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC IS ACTIVE**

**Note:** If **P0562–BATTERY VOLTAGE LOW** or **P0563–BATTERY VOLTAGE HIGH** is set along with this DTC, diagnose the battery voltage DTC first.

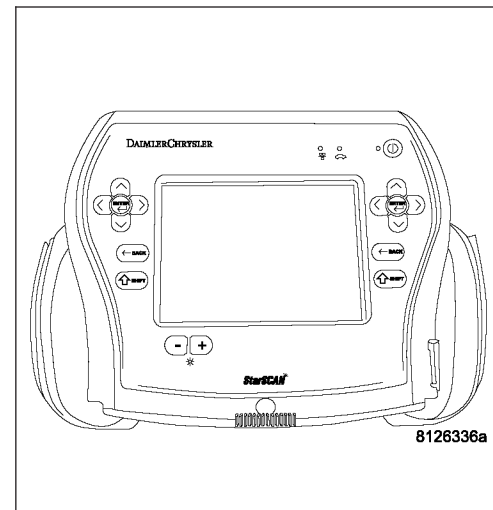
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 4

**2. SPEED CONTROL SWITCH**

Turn the ignition off.

Replace the Speed Control Switch in accordance with the Service Information.

Turn the ignition on.

Move the Speed Control Switch to each position several times.

With the Scan Tool, Clear Stored DTCs in the Steering Column Control Module.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

Move the Speed Control Switch to each position several times while monitoring the Scan Tool.

**Does this DTC reset?**

**Yes** >> Go To 3

**No** >> Test Complete.

**P1593-SPEED CONTROL SWITCH 1/2 STUCK (CONTINUED)****3. STEERING COLUMN CONTROL MODULE (SCCM)**

View repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

---

**4. INTERMITTENT SPEED CONTROL SWITCH 1/2 STUCK DTC**

The conditions necessary to set this DTC are not present at this time.

While monitoring the scan tool data relative to this circuit, move the Speed Control Switch to each position several times.

Look for the DTC to reset while the switch is being moved to each position.

**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

## C1219-STEERING ANGLE SENSOR ERRATIC PERFORMANCE

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Continuously.
- **Set Condition:**  
The Steering Column Control Module (SCCM) has detected a code error from the Steering Angle Sensor.

Possible Causes
INTERMITTENT STEERING ANGLE SENSOR ERRATIC PERFORMANCE DTC
STEERING ANGLE SENSOR TONE WHEEL
STEERING ANGLE SENSOR
STEERING COLUMN CONTROL MODULE (SCCM)

### Diagnostic Test

#### 1. DTC IS ACTIVE

**Note:** If P0562–BATTERY VOLTAGE LOW or P0563–BATTERY VOLTAGE HIGH is set along with this DTC, diagnose the battery voltage DTC first.

Ignition on, engine not running.

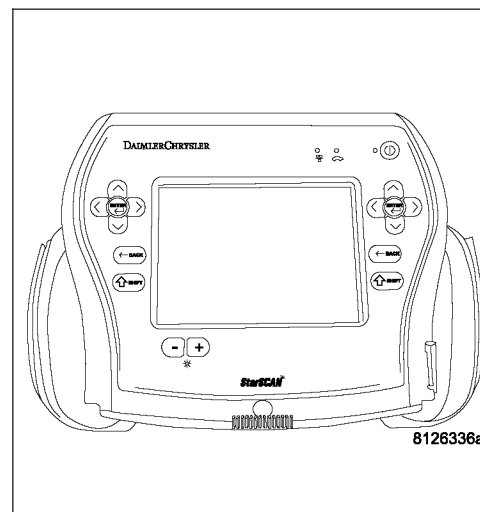
Turn the steering wheel from stop to stop at least three times.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 5



#### 2. STEERING ANGLE SENSOR TONE WHEEL

Turn the ignition off.

Remove the steering wheel in accordance with the Service Information.

Inspect the clockspring for loose mounting screws or damage.

Remove the clockspring in accordance with the Service Information.

Inspect the Steering Angle Sensor and Tone Wheel for damage, loose or missing mounting screws, etc.

**Were any problems found?**

**Yes** >> Repair or replace Sensor and/or Tone Wheel as necessary.

**No** >> Go To 3

**C1219-STEERING ANGLE SENSOR ERRATIC PERFORMANCE (CONTINUED)****3. STEERING ANGLE SENSOR**

Replace the Steering Angle Sensor in accordance with the Service Information.

Ignition on, engine not running.

Turn the steering wheel from stop to stop at least three times.

With the Scan Tool, Clear Stored DTCs in the Steering Column Control Module.

Turn the steering wheel from stop to stop at least three times.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go To 4

**No** >> Test Complete.

---

**4. STEERING COLUMN CONTROL MODULE (SCCM)**

View repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

---

**5. INTERMITTENT STEERING ANGLE SENSOR ERRATIC PERFORMANCE DTC**

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

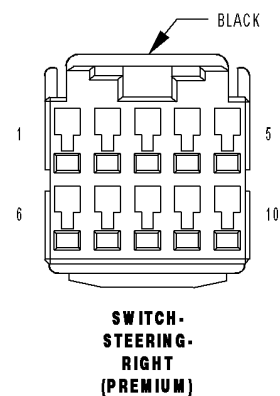
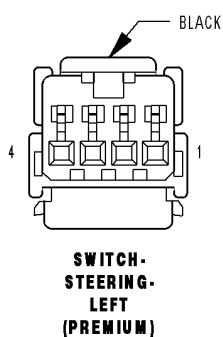
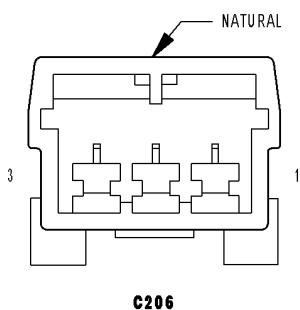
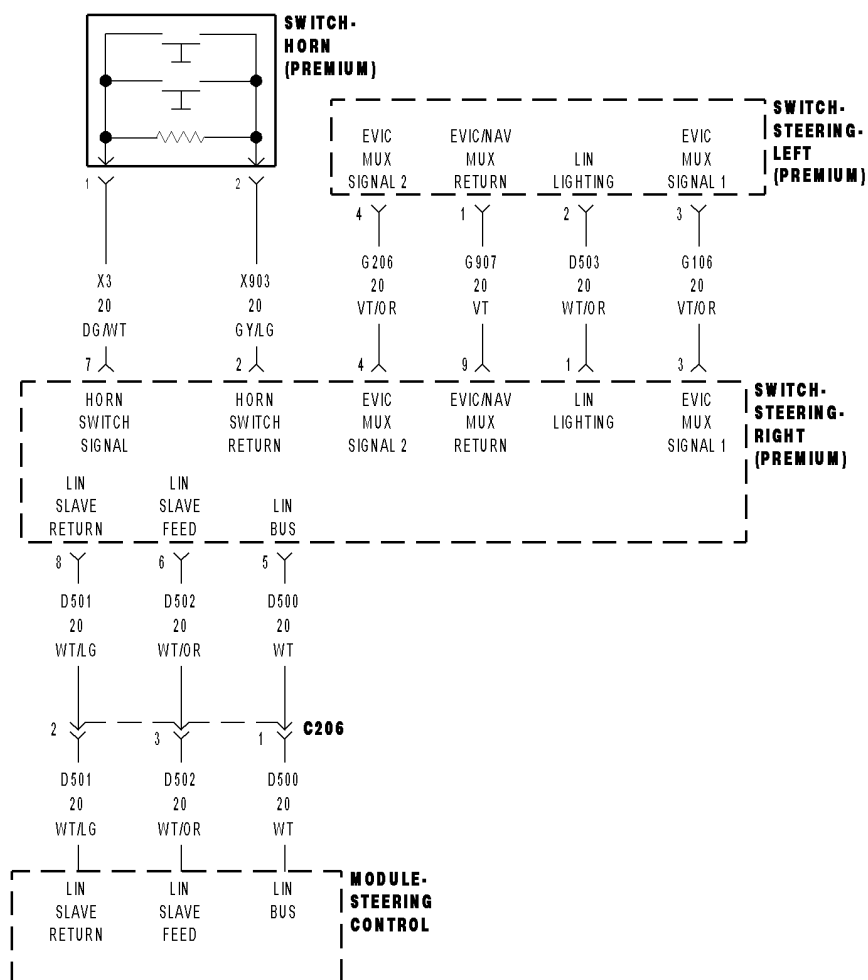
**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---



**B1489-STEERING WHEEL CONTROL AUDIO SWITCH CIRCUIT**

**B1489-STEERING WHEEL CONTROL AUDIO SWITCH CIRCUIT (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The Steering Wheel Control Audio Switch, when pressed, sends a multiplexed signal to the Right Steering Switch. The switching status is transferred to the Steering Column Control Module (SCCM) by way of the LIN bus, a serial sub-bus. The SCCM converts the data to CAN(B) and sends the message to the corresponding module on the bus.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The Steering Column Control Module senses that the Steering Wheel Control Audio Switch is in the Set position for greater than 50 seconds.

Possible Causes
INTERMITTENT STEERING WHEEL CONTROL AUDIO SWITCH CIRCUIT DTC (G206) EVIC MUX SIGNAL 2 CIRCUIT SHORT TO GROUND (G206) EVIC MUX SIGNAL 2 CIRCUIT SHORT TO (G907) EVIC/NAV MUX RETURN CIRCUIT LEFT STEERING SWITCH RIGHT STEERING SWITCH STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC STATUS IS ACTIVE**

**Note:** If U1109–LOST COMMUNICATION WITH LIN STEERING WHEEL CONTROLS is set along with this DTC, diagnose the communication DTC first.

**Note:** If P0562–BATTERY VOLTAGE LOW or P0563–BATTERY VOLTAGE HIGH is set along with this DTC, diagnose the battery voltage DTC first.

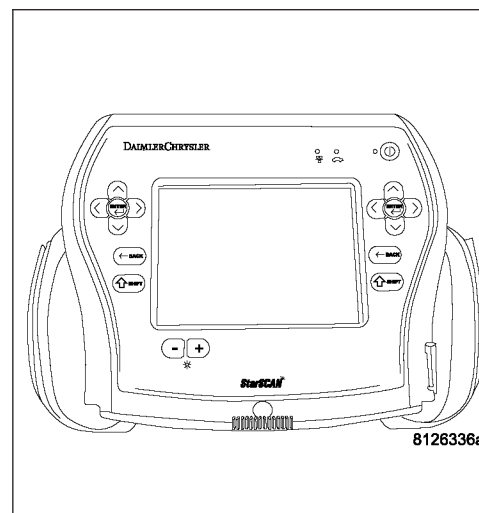
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 7



**B1489-STEERING WHEEL CONTROL AUDIO SWITCH CIRCUIT (CONTINUED)****2. (G206) EVIC MUX SIGNAL 2 CIRCUIT SHORT TO (G907) EVIC/NAV MUX RETURN CIRCUIT**

Turn the ignition off.

Remove the Driver Airbag in accordance with the Service Information to gain access to the Steering Wheel Control Switches.

Disconnect the Left Steering Switch harness connector.

Disconnect the Right Steering Switch harness connector.

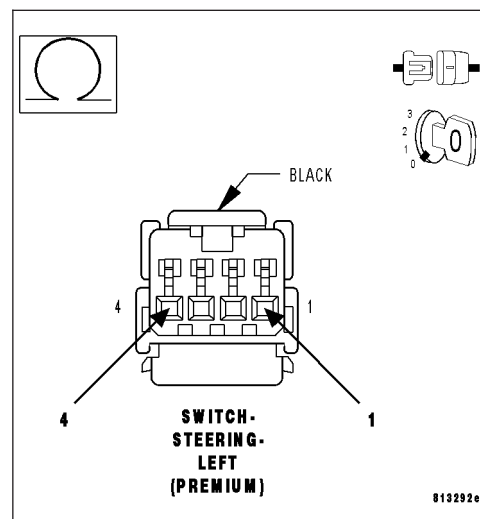
**Note:** Before proceeding, thoroughly inspect the wiring harness and connectors between the Left Steering Switch and the Right Steering Switch for a short to ground or to any other circuit.

Measure the resistance between the (G206) EVIC Mux Signal 2 circuit and the (G907) EVIC/NAV Mux Return circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (G206) EVIC Mux Signal 2 circuit for a short to the (G907) EVIC/NAV Mux Return circuit.

**No** >> Go to 3

**3. (G206) EVIC MUX SIGNAL 2 CIRCUIT SHORT TO GROUND**

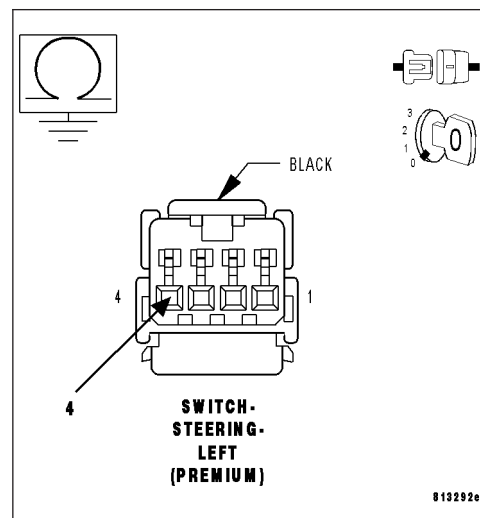
**Note:** Before proceeding, thoroughly inspect the wiring harness and connectors between the Left Steering Switch and the Right Steering Switch for a short to ground or to any other circuit.

Measure the resistance between the (G206) EVIC Mux Signal 2 circuit and ground.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (G206) EVIC Mux Signal 2 circuit for a short to ground.

**No** >> Go to 4



**B1489-STEERING WHEEL CONTROL AUDIO SWITCH CIRCUIT (CONTINUED)****4. LEFT STEERING SWITCH**

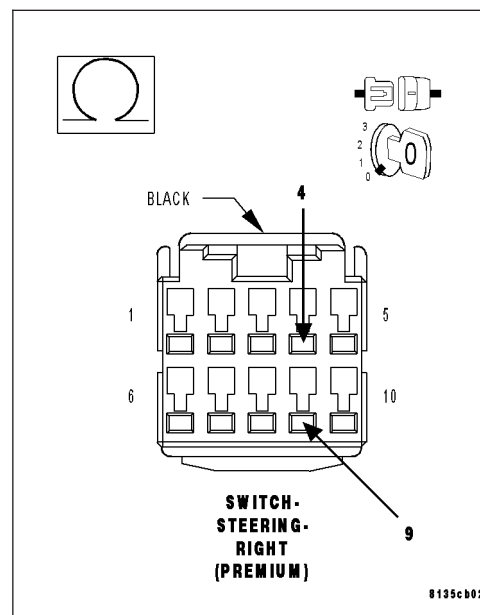
Reconnect the Left Steering Switch harness connector.

Measure the resistance between the (G206) EVIC Mux Signal 2 circuit and the (G907) EVIC/NAV Mux Return circuit at the Right Steering Switch harness connector.

**Is the resistance approximately 10.00 K ohms (+/- 10%)?**

**Yes** >> Replace the Left Steering Switch in accordance with the Service Information.

**No** >> Go to 5

**5. RIGHT STEERING SWITCH**

Replace the Right Steering Switch in accordance with the Service Information.

Reconnect the C206 (LIN Bus) connector.

Turn the ignition on.

Press and release the Audio Switch several times.

With the scan tool, Clear Stored DTCs in the Steering Column Control Module.

With the scan tool, select Data Display and view the Audio switch data.

While monitoring the Audio switch data, press and release the Audio Switch several times.

**Does the Audio switch data change from Set to Not Set as the switch is pressed and released?**

**Yes** >> Test Complete.

**No** >> Go to 6

**6. STEERING COLUMN CONTROL MODULE (SCCM)**

View repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

**B1489-STEERING WHEEL CONTROL AUDIO SWITCH CIRCUIT (CONTINUED)****7. INTERMITTENT STEERING WHEEL CONTROL AUDIO SWITCH CIRCUIT DTC**

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

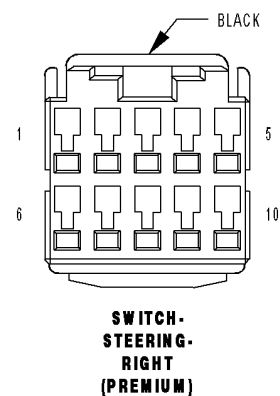
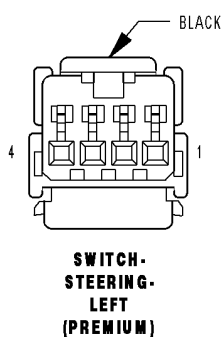
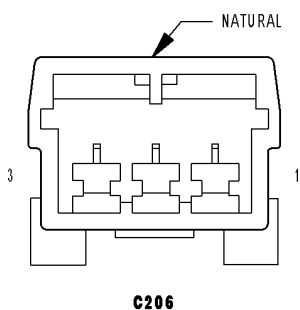
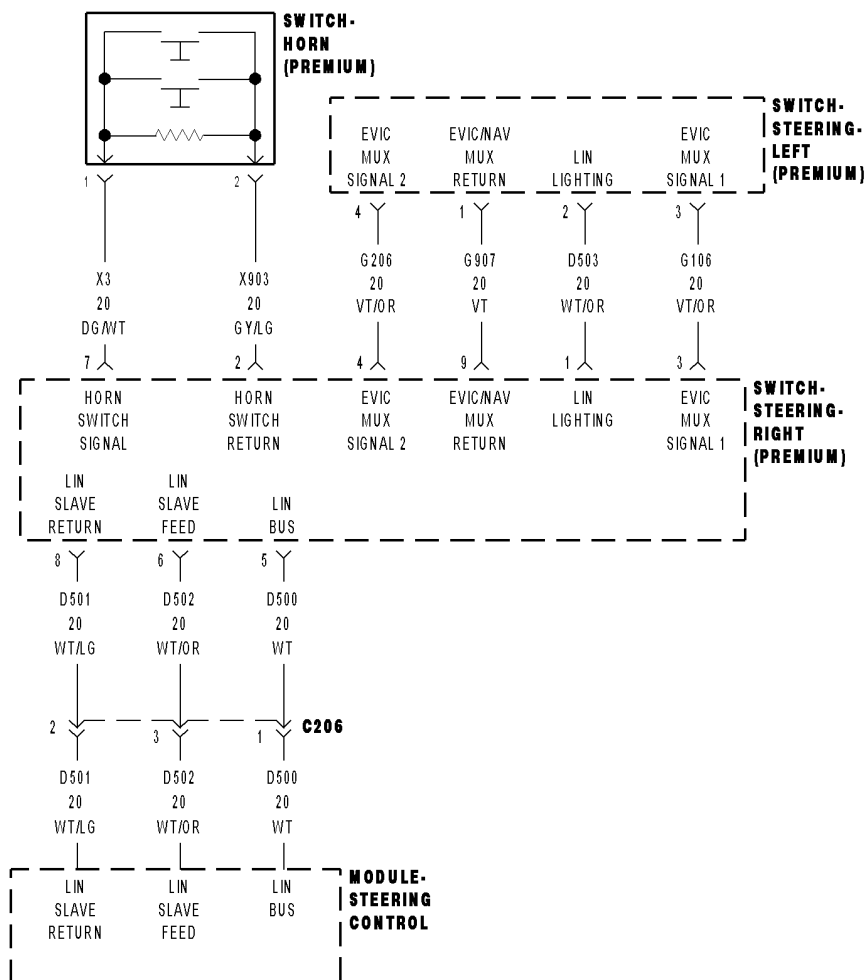
**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

# B148A-STEERING WHEEL CONTROL MENU SWITCH CIRCUIT



**B148A-STEERING WHEEL CONTROL MENU SWITCH CIRCUIT (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The Steering Wheel Control Menu Switch is part of the Right Steering Switch. The switching status is transferred to the Steering Column Control Module (SCCM) by way of the LIN bus, a serial sub-bus. The SCCM converts the data to CAN(B) and sends the message to the corresponding module on the bus.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The Steering Column Control Module senses that the Steering Wheel Control Menu Switch is in the Set position for greater than 50 seconds.

Possible Causes
INTERMITTENT STEERING WHEEL CONTROL MENU SWITCH CIRCUIT DTC
RIGHT STEERING SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC IS ACTIVE**

**Note:** If U1109–LOST COMMUNICATION WITH LIN STEERING WHEEL CONTROLS is set along with this DTC, diagnose the communication DTC first.

**Note:** If P0562–BATTERY VOLTAGE LOW or P0563–BATTERY VOLTAGE HIGH is set along with this DTC, diagnose the battery voltage DTC first.

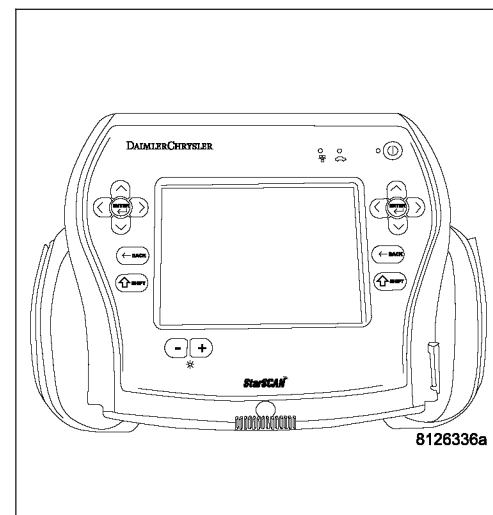
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 4



**B148A-STEERING WHEEL CONTROL MENU SWITCH CIRCUIT (CONTINUED)****2. RIGHT STEERING SWITCH**

Turn the ignition off.

Replace the Right Steering Switch in accordance with the Service Information.

Turn the ignition on.

Press and release the Menu Switch several times.

With the Scan Tool, Clear Stored DTCs in the Steering Column Control Module.

With the Scan Tool, select Data Display and view the Menu switch data.

While monitoring the Menu switch data, press and release the Menu Switch several times.

**Does the Menu switch data change from Set to Not Set when the switch is pressed and released?**

**Yes** >> Test complete.

**No** >> Go to 3

---

**3. STEERING COLUMN CONTROL MODULE (SCCM)**

View repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

---

**4. INTERMITTENT STEERING WHEEL CONTROL MENU SWITCH CIRCUIT DTC**

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

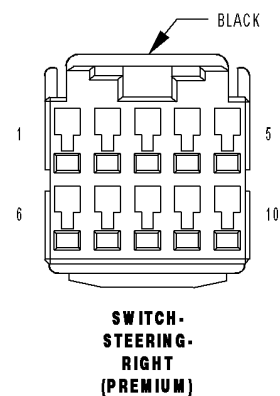
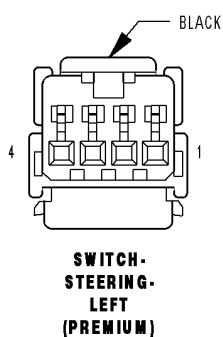
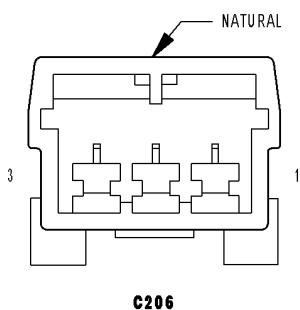
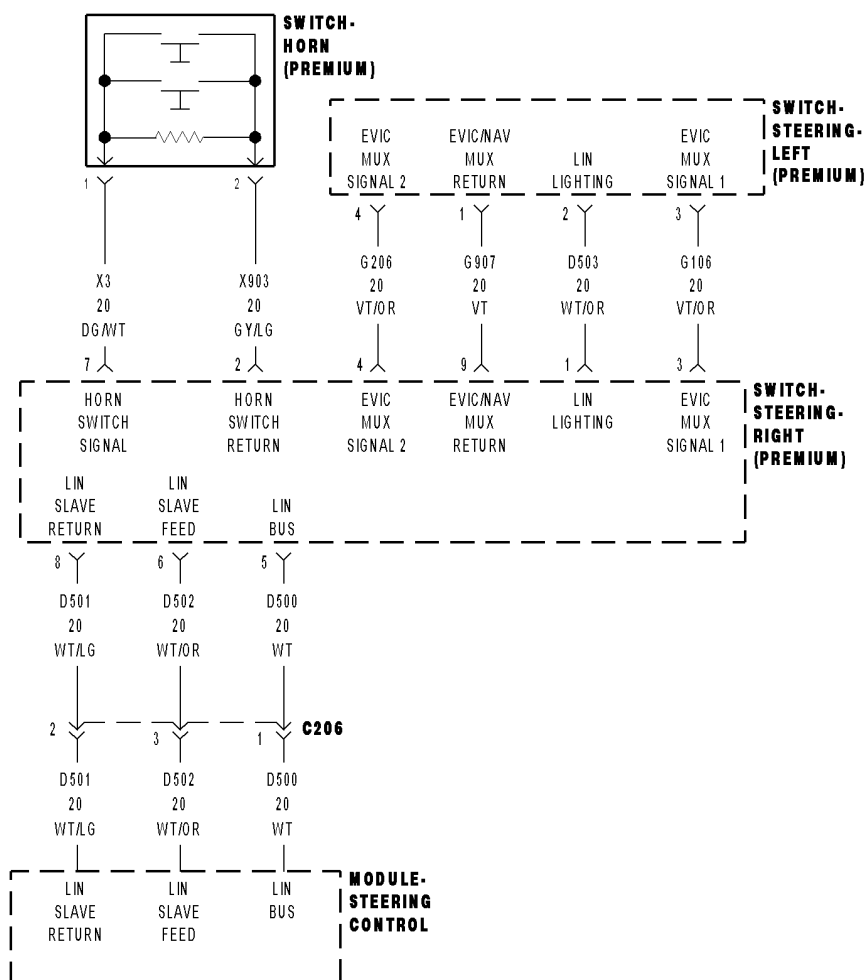
**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---



**B148B-STEERING WHEEL CONTROL UP SWITCH CIRCUIT**

**B148B-STEERING WHEEL CONTROL UP SWITCH CIRCUIT (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The Steering Wheel Control Up Switch, when pressed, sends a multiplexed signal to the Right Steering Switch. The switching status is transferred to the Steering Column Control Module (SCCM) by way of the LIN bus, a serial sub-bus. The SCCM converts the data to CAN(B) and sends the message to the corresponding module on the bus.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The Steering Column Control Module senses that the Steering Wheel Control Up Switch is in the Set position for greater than 50 seconds.

Possible Causes
INTERMITTENT STEERING WHEEL CONTROL UP SWITCH CIRCUIT DTC (G106) EVIC MUX SIGNAL 1 CIRCUIT SHORT TO (G907) EVIC/NAV MUX RETURN CIRCUIT (G106) EVIC MUX SIGNAL 1 CIRCUIT SHORT TO GROUND LEFT STEERING SWITCH RIGHT STEERING SWITCH STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC STATUS IS ACTIVE**

**Note:** If U1109–LOST COMMUNICATION WITH LIN STEERING WHEEL CONTROLS is set along with this DTC, diagnose the communication DTC first.

**Note:** If P0562–BATTERY VOLTAGE LOW or P0563–BATTERY VOLTAGE HIGH is set along with this DTC, diagnose the battery voltage DTC first.

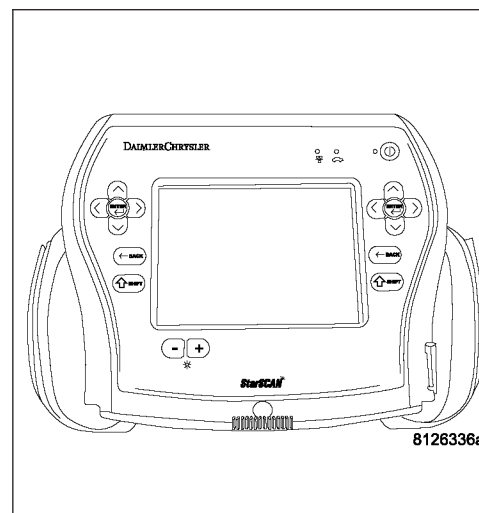
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 7



**B148B-STEERING WHEEL CONTROL UP SWITCH CIRCUIT (CONTINUED)****2. (G106) EVIC MUX SIGNAL 1 CIRCUIT SHORT TO (G907) EVIC/NAV MUX RETURN CIRCUIT**

Turn the ignition off.

Remove the Driver Airbag in accordance with the Service Information.

Disconnect the Left Steering Switch harness connector.

Disconnect the Right Steering Switch harness connector.

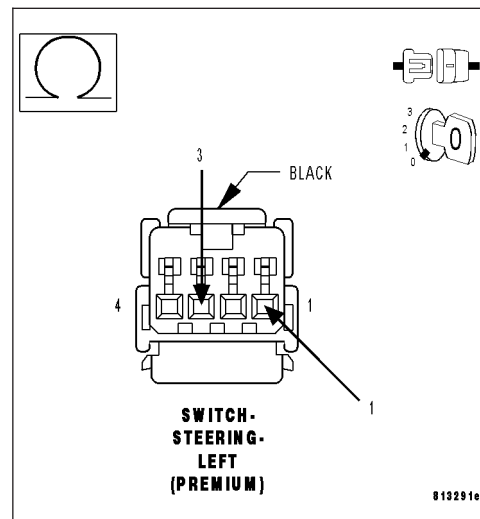
**Note:** Before proceeding, thoroughly inspect the wiring harness and connectors between the Left Steering Switch and the Right Steering Switch for a short to ground or any other circuit.

Measure the resistance between the (G106) EVIC Mux Signal 1 circuit and the (G907) EVIC/NAV Mux Return circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (G106) EVIC Mux Signal 1 circuit for a short to the (G907) EVIC/NAV Mux Return circuit.

**No** >> Go to 3

**3. (G106) EVIC MUX SIGNAL 1 CIRCUIT SHORT TO GROUND**

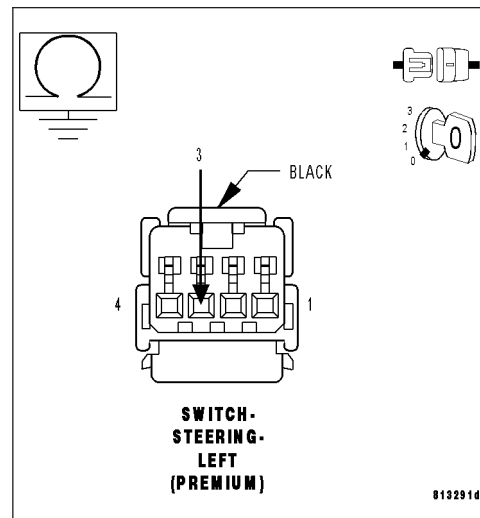
**Note:** Before proceeding, thoroughly inspect the wiring harness and connectors between the Left Steering Switch and the Right Steering Switch for a short to ground or any other circuit.

Measure the resistance between the (G106) EVIC Mux Signal 1 circuit and ground.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (G106) EVIC Mux Signal 1 circuit for a short to ground.

**No** >> Go to 4



**B148B-STEERING WHEEL CONTROL UP SWITCH CIRCUIT (CONTINUED)****4. LEFT STEERING SWITCH**

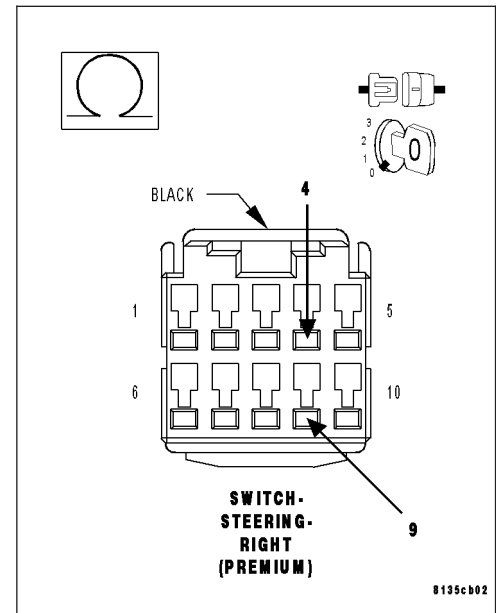
Reconnect the Left Steering Switch harness connector.

Measure the resistance between the (G106) EVIC Mux Signal 1 circuit and the (G907) EVIC/NAV Mux Return circuit at the Right Steering Switch harness connector.

**Is the resistance approximately .5 ohms (+/- 1 ohm)?**

**Yes** >> Replace the Left Steering Switch in accordance with the Service Information.

**No** >> Go to 5

**5. RIGHT STEERING SWITCH**

Replace the Right Steering Switch in accordance with the Service Information.

Reconnect the C206 (LIN Bus) connector.

Turn the ignition on.

Press and release the Up Switch several times.

With the scan tool, Clear Stored DTCs in the Steering Column Control Module.

With the scan tool, select Data Display and view the Up switch data.

While monitoring the Up switch data, press and release the Up Switch several times.

**Does the Up switch data change from Set to Not Set as the switch is pressed and released?**

**Yes** >> Test complete.

**No** >> Go to 6

**6. STEERING COLUMN CONTROL MODULE (SCCM)**

View repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

**B148B-STEERING WHEEL CONTROL UP SWITCH CIRCUIT (CONTINUED)****7. INTERMITTENT STEERING WHEEL CONTROL UP SWITCH CIRCUIT DTC**

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

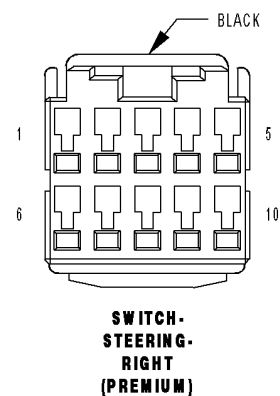
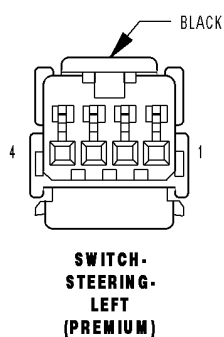
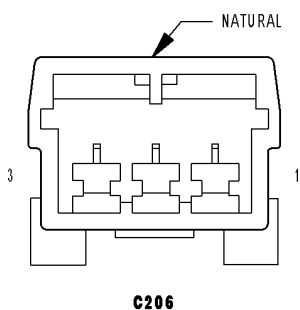
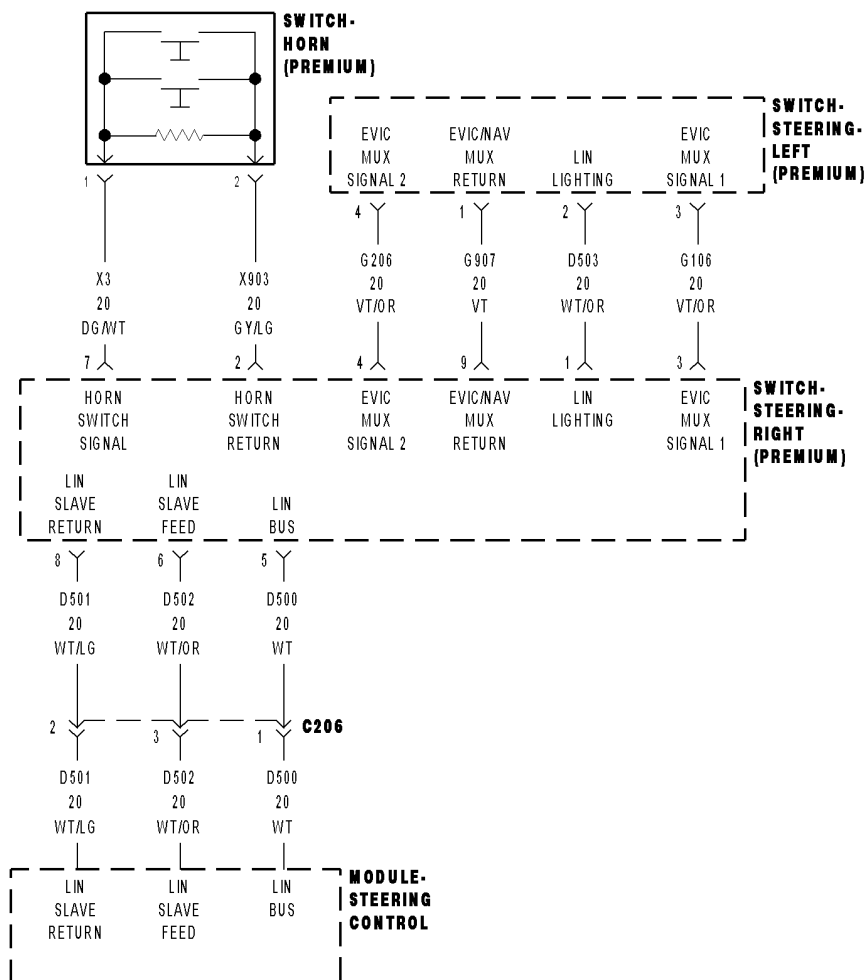
**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

# B148C-STEERING WHEEL CONTROL DOWN SWITCH CIRCUIT



**B148C-STEERING WHEEL CONTROL DOWN SWITCH CIRCUIT (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

**Theory of Operation**

The Steering Wheel Control Down Switch, when pressed, sends a multiplexed signal to the Right Steering Switch. The switching status is transferred to the Steering Column Control Module (SCCM) by way of the LIN bus, a serial sub-bus. The SCCM converts the data to CAN(B) and sends the message to the corresponding module on the bus.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The Steering Column Control Module senses that the Steering Wheel Control Down Switch is in the Set position for greater than 50 seconds.

Possible Causes
INTERMITTENT STEERING WHEEL CONTROL DOWN SWITCH CIRCUIT DTC (G106) EVIC MUX SIGNAL 1 CIRCUIT SHORT TO (G907) EVIC/NAV MUX RETURN CIRCUIT (G106) EVIC MUX SIGNAL 1 CIRCUIT SHORT TO GROUND LEFT STEERING SWITCH RIGHT STEERING SWITCH STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC STATUS IS ACTIVE**

**Note:** If U1109–LOST COMMUNICATION WITH LIN STEERING WHEEL CONTROLS is set along with this DTC, diagnose the communication DTC first.

**Note:** If P0562–BATTERY VOLTAGE LOW or P0563–BATTERY VOLTAGE HIGH is set along with this DTC, diagnose the battery voltage DTC first.

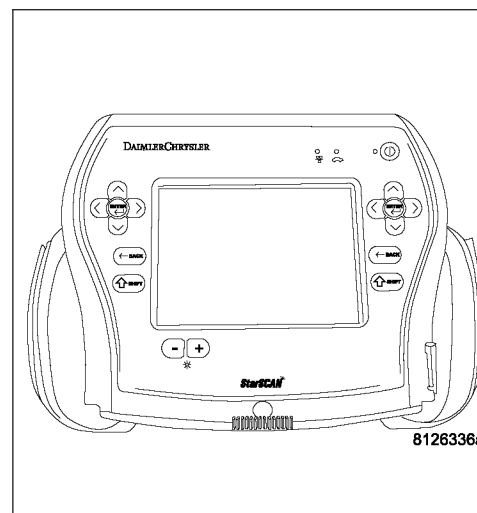
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 7



**B148C-STEERING WHEEL CONTROL DOWN SWITCH CIRCUIT (CONTINUED)****2. (G106) EVIC MUX SIGNAL 1 CIRCUIT SHORT TO (G907) EVIC/NAV MUX RETURN CIRCUIT**

Turn the ignition off.

Remove the Driver Airbag in accordance with the Service Information.

Disconnect the Left Steering Switch harness connector.

Disconnect the Right Steering Switch harness connector.

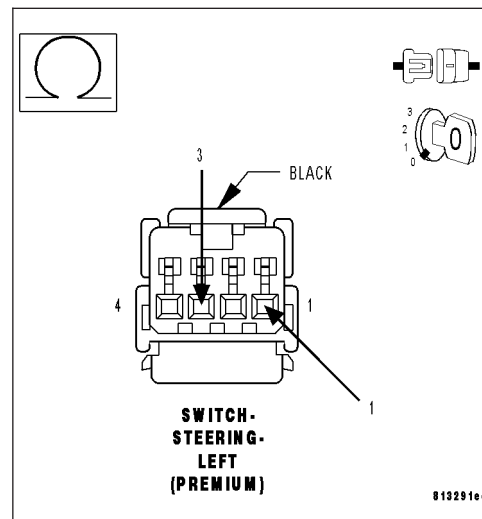
**Note:** Before proceeding, thoroughly inspect the wiring harness and connectors between the Left Steering Switch and the Right Steering Switch for a short to ground or any other circuit.

Measure the resistance between the (G106) EVIC Mux Signal 1 circuit and the (G907) EVIC/NAV Mux Return circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (G106) EVIC Mux Signal 1 circuit for a short to the (G907) EVIC/NAV Mux Return circuit.

**No** >> Go to 3

**3. (G106) EVIC MUX SIGNAL 1 CIRCUIT SHORT TO GROUND**

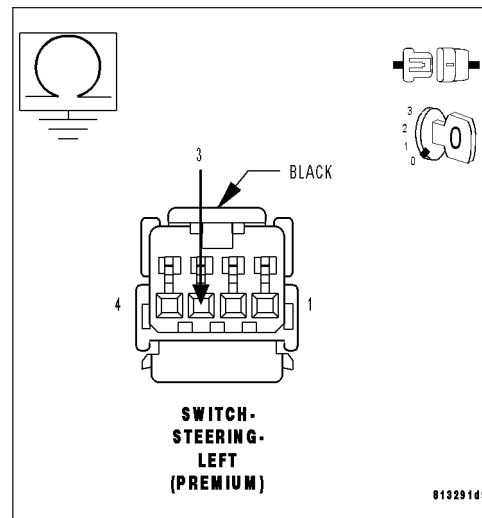
**Note:** Before proceeding, thoroughly inspect the wiring harness and connectors between the Left Steering Switch and the Right Steering Switch for a short to ground or any other circuit.

Measure the resistance between the (G106) EVIC Mux Signal 1 circuit and ground.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (G106) EVIC Mux Signal 1 circuit for a short to ground.

**No** >> Go to 4





**B148C-STEERING WHEEL CONTROL DOWN SWITCH CIRCUIT (CONTINUED)****4. LEFT STEERING SWITCH**

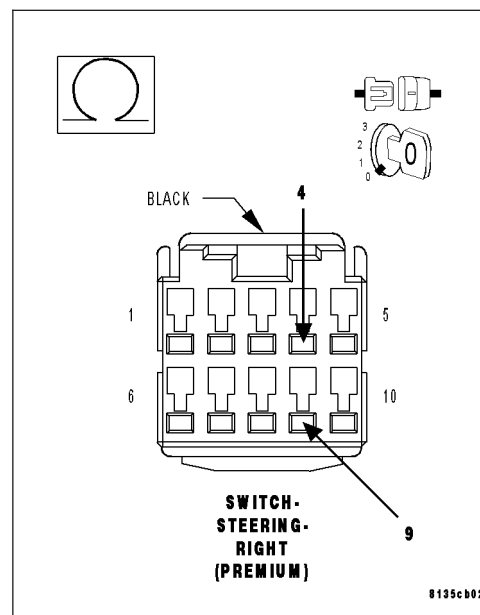
Reconnect the Left Steering Switch harness connector.

Measure the resistance between the (G106) EVIC Mux Signal 1 circuit and the (G907) EVIC/NAV Mux Return circuit at the Right Steering Switch harness connector.

**Is the resistance approximately 10 K ohms (+/- 10%)?**

**Yes** >> Replace the Left Steering Switch in accordance with the Service Information.

**No** >> Go to 5

**5. RIGHT STEERING SWITCH**

Replace the Right Steering Switch in accordance with the Service Information.

Reconnect the C206 (LIN Bus) connector.

Turn the ignition on.

Press and release the Down Switch several times.

With the scan tool, Clear Stored DTCs in the Steering Column Control Module.

With the scan tool, select Data Display and view the Down switch data.

While monitoring the Down switch data, press and release the Down Switch several times.

**Does the Down switch data change from Set to Not Set as the switch is pressed and released?**

**Yes** >> Test complete.

**No** >> Go to 6

**6. STEERING COLUMN CONTROL MODULE (SCCM)**

View repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

**B148C-STEERING WHEEL CONTROL DOWN SWITCH CIRCUIT (CONTINUED)****7. INTERMITTENT STEERING WHEEL CONTROL DOWN SWITCH CIRCUIT DTC**

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

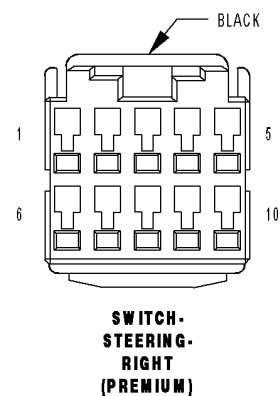
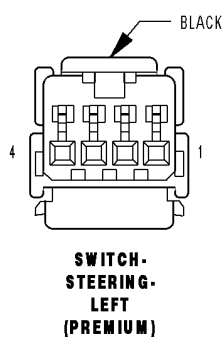
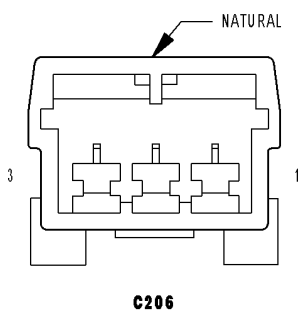
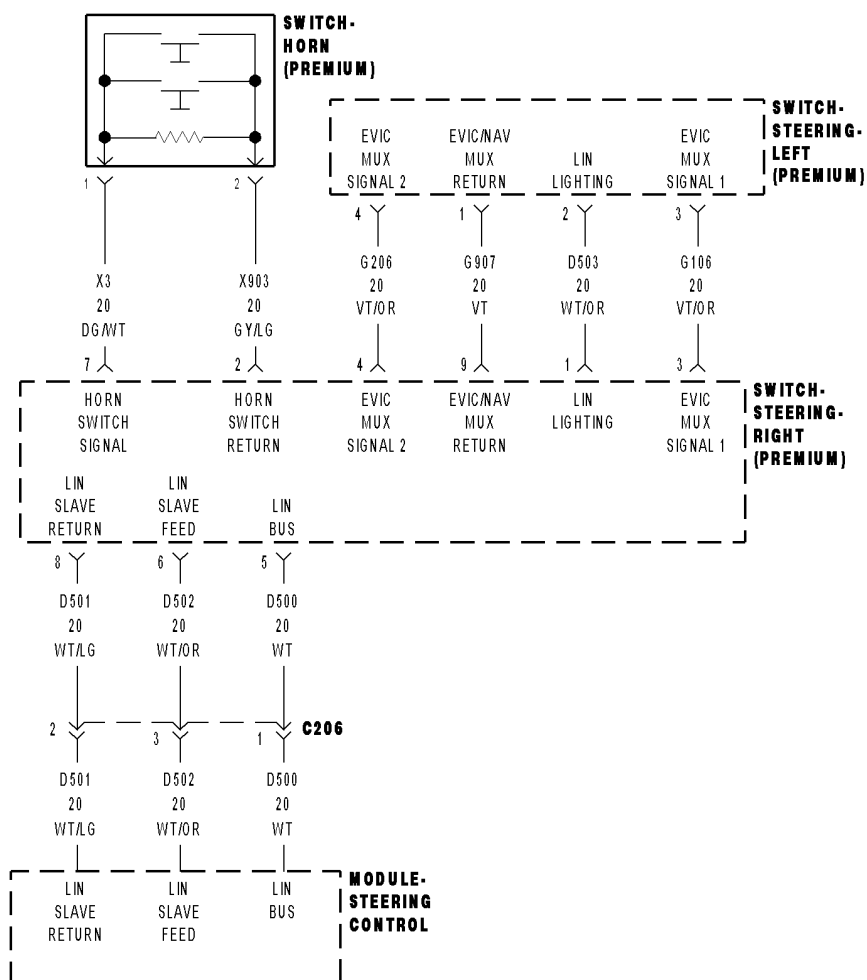
**Were any problems found?**

**Yes**     >> Repair as necessary.

**No**      >> Test complete.

---

## B148D-STEERING WHEEL CONTROL SIDE SWITCH CIRCUIT



**B148D-STEERING WHEEL CONTROL SIDE SWITCH CIRCUIT (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The Steering Wheel Control Side Switch, when pressed, sends a multiplexed signal to the Right Steering Switch. The switching status is transferred to the Steering Column Control Module (SCCM) by way of the LIN bus, a serial sub-bus. The SCCM converts the data to CAN(B) and sends the message to the corresponding module on the bus.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The Steering Column Control Module senses that the Steering Wheel Control Side Switch is in the Set position for greater than 50 seconds.

Possible Causes
INTERMITTENT STEERING WHEEL CONTROL SIDE SWITCH CIRCUIT DTC (G206) EVIC MUX SIGNAL 2 CIRCUIT SHORT TO (G907) EVIC/NAV MUX RETURN CIRCUIT (G206) EVIC MUX SIGNAL 2 CIRCUIT SHORT TO GROUND LEFT STEERING SWITCH RIGHT STEERING SWITCH STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC STATUS IS ACTIVE**

**Note:** If U1109–LOST COMMUNICATION WITH LIN STEERING WHEEL CONTROLS is set along with this DTC, diagnose the communication DTC first.

**Note:** If P0562–BATTERY VOLTAGE LOW or P0563–BATTERY VOLTAGE HIGH is set along with this DTC, diagnose the battery voltage DTC first.

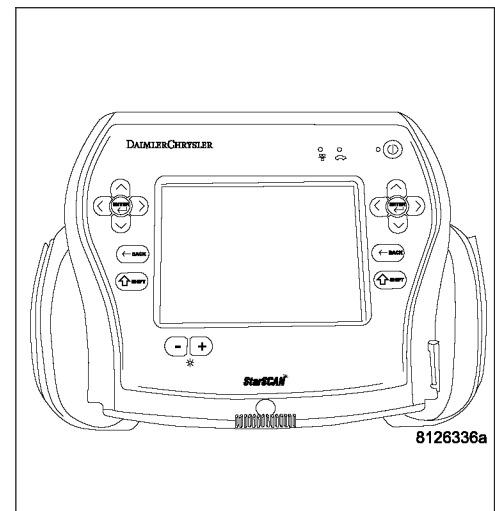
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 7



**B148D-STEERING WHEEL CONTROL SIDE SWITCH CIRCUIT (CONTINUED)****2. (G206) EVIC MUX SIGNAL 1 CIRCUIT SHORT TO (G907) EVIC/NAV MUX RETURN CIRCUIT**

Turn the ignition off.

Remove the Driver Airbag in accordance with the Service Information.

Disconnect the Left Steering Switch harness connector.

Disconnect the Right Steering Switch harness connector.

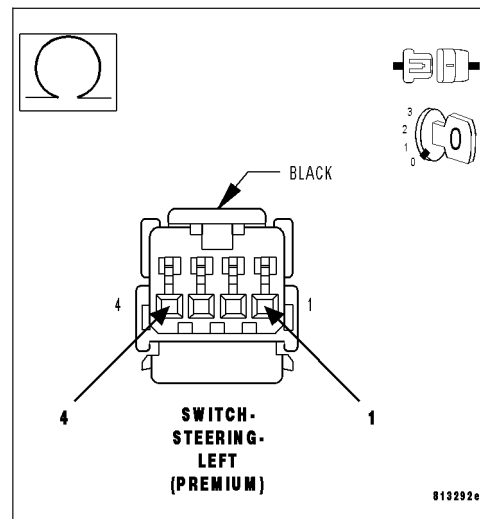
**Note:** Before proceeding, thoroughly inspect the wiring harness and connectors between the Left Steering Switch and the Right Steering Switch for a short to ground or any other circuit.

Measure the resistance between the (G206) EVIC Mux Signal 1 circuit and the (G907) EVIC/NAV Mux Return circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (G206) EVIC Mux Signal 1 circuit for a short to the (G907) EVIC/NAV Mux Return circuit.

**No** >> Go to 3

**3. (G206) EVIC MUX SIGNAL 1 CIRCUIT SHORT TO GROUND**

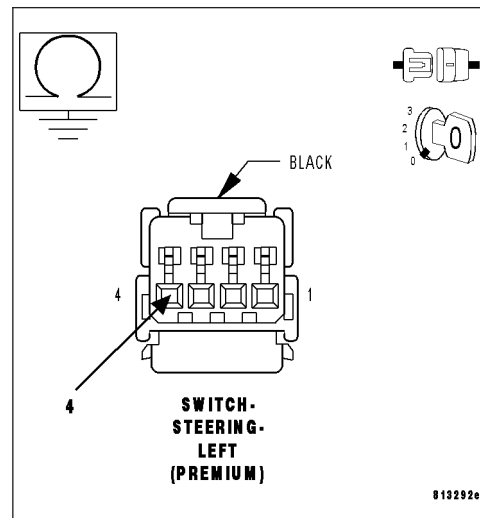
**Note:** Before proceeding, thoroughly inspect the wiring harness and connectors between the Left Steering Switch and the Right Steering Switch for a short to ground or any other circuit.

Measure the resistance between the (G206) EVIC Mux Signal 1 circuit and ground.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (G206) EVIC Mux Signal 1 circuit for a short to ground.

**No** >> Go to 4



**B148D-STEERING WHEEL CONTROL SIDE SWITCH CIRCUIT (CONTINUED)****4. LEFT STEERING SWITCH**

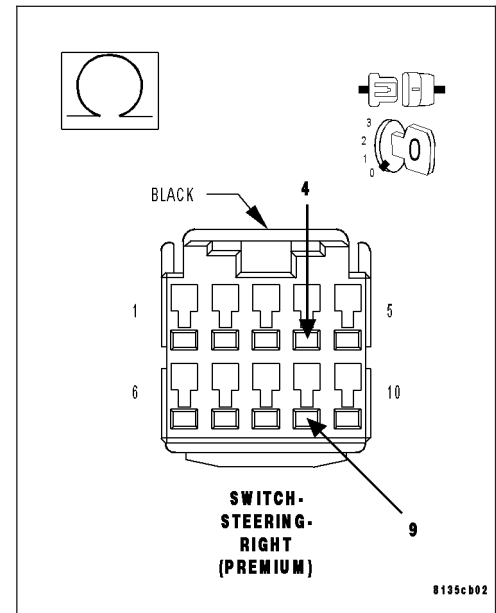
Reconnect the Left Steering Switch harness connector.

Measure the resistance between the (G206) EVIC Mux Signal 1 circuit and the (G907) EVIC/NAV Mux Return circuit at the Right Steering Switch harness connector.

**Is the resistance approximately .5 ohms (+/- 1 ohm)?**

**Yes** >> Replace the Left Steering Switch in accordance with the Service Information.

**No** >> Go to 5

**5. RIGHT STEERING SWITCH**

Replace the Right Steering Switch in accordance with the Service Information.

Reconnect the C206 (LIN Bus) connector.

Turn the ignition on.

Press and release the Side Switch several times.

With the scan tool, Clear Stored DTCs in the Steering Column Control Module.

With the scan tool, select Data Display and view the Side switch data.

While monitoring the Side switch data, press and release the Side Switch several times.

**Does the Side switch data change from Set to Not Set as the switch is pressed and released?**

**Yes** >> Test complete.

**No** >> Go to 6

**6. STEERING COLUMN CONTROL MODULE (SCCM)**

View repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

**B148D-STEERING WHEEL CONTROL SIDE SWITCH CIRCUIT (CONTINUED)****7. INTERMITTENT STEERING WHEEL CONTROL SIDE SWITCH CIRCUIT DTC**

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

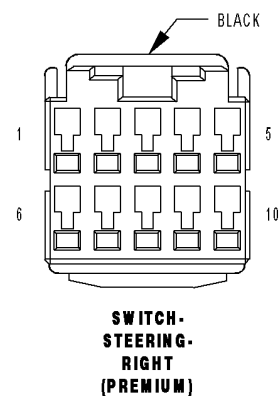
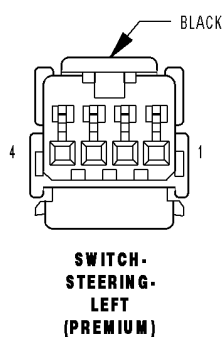
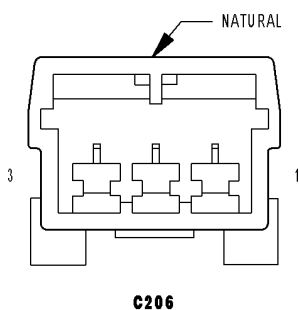
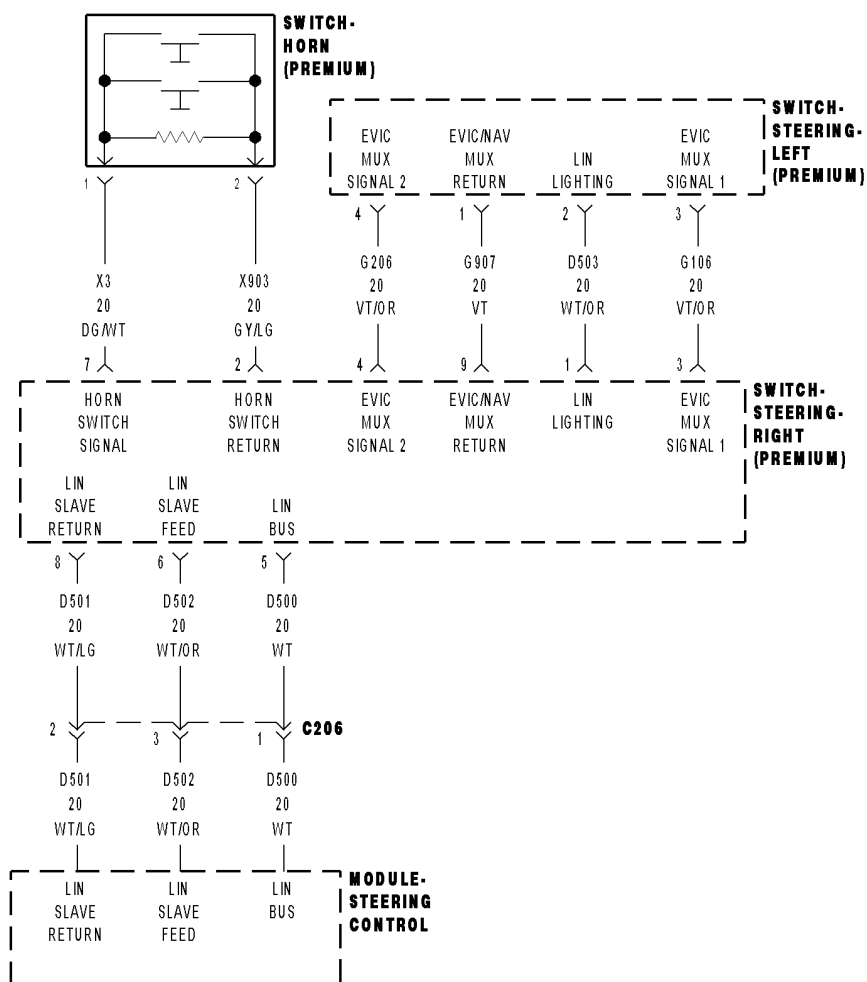
**Were any problems found?**

**Yes**     >> Repair as necessary.

**No**     >> Test complete.

---

# B148E-STEERING WHEEL CONTROL [+] SWITCH CIRCUIT





**B148E-STEERING WHEEL CONTROL [+] SWITCH CIRCUIT (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The Steering Wheel Control Plus (+) Switch is part of the Right Steering Switch. The switching status is transferred to the Steering Column Control Module (SCCM) by way of the LIN bus, a serial sub-bus. The SCCM converts the data to CAN(B) and sends the message to the corresponding module on the bus.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The Steering Column Control Module senses that the Steering Wheel Control Plus (+) Switch is in the Set position for greater than 50 seconds.

Possible Causes
INTERMITTENT STEERING WHEEL CONTROL [+] SWITCH CIRCUIT DTC
RIGHT STEERING SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC IS ACTIVE**

**Note:** If U1109–LOST COMMUNICATION WITH LIN STEERING WHEEL CONTROLS is set along with this DTC, diagnose the communication DTC first.

**Note:** If P0562–BATTERY VOLTAGE LOW or P0563–BATTERY VOLTAGE HIGH is set along with this DTC, diagnose the battery voltage DTC first.

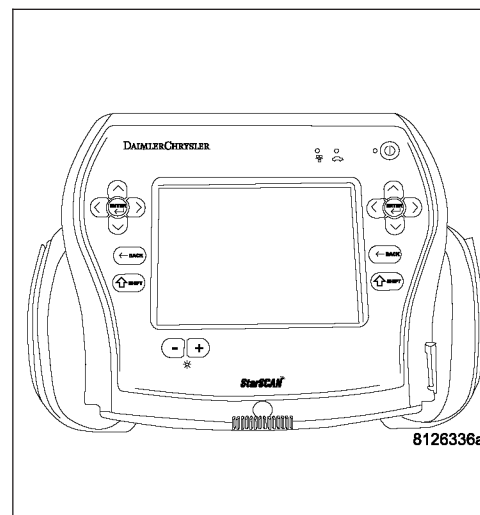
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 4



**B148E-STEERING WHEEL CONTROL [+] SWITCH CIRCUIT (CONTINUED)****2. RIGHT STEERING SWITCH**

Turn the ignition off.

Replace the Right Steering Switch in accordance with the Service Information.

Turn the ignition on.

Press and release the Plus (+) Switch several times.

With the Scan Tool, Clear Stored DTCs in the Steering Column Control Module.

With the Scan Tool, select Data Display and view the Plus (+) switch data.

While monitoring the Plus (+) switch data, press and release the Plus (+) Switch several times.

**Does the Plus (+) switch data change from Set to Not Set when the switch is pressed and released?**

**Yes** >> Test complete.

**No** >> Go to 3

---

**3. STEERING COLUMN CONTROL MODULE (SCCM)**

View repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

---

**4. INTERMITTENT STEERING WHEEL CONTROL [+] SWITCH CIRCUIT DTC**

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

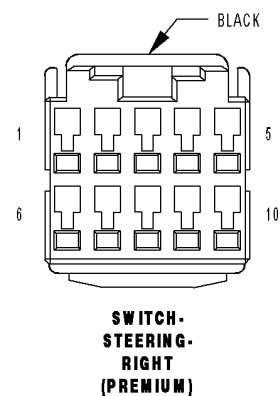
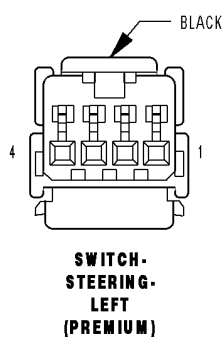
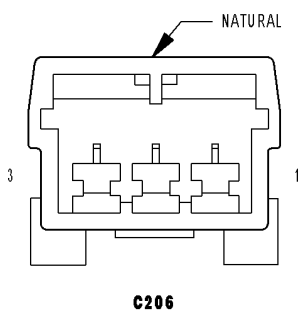
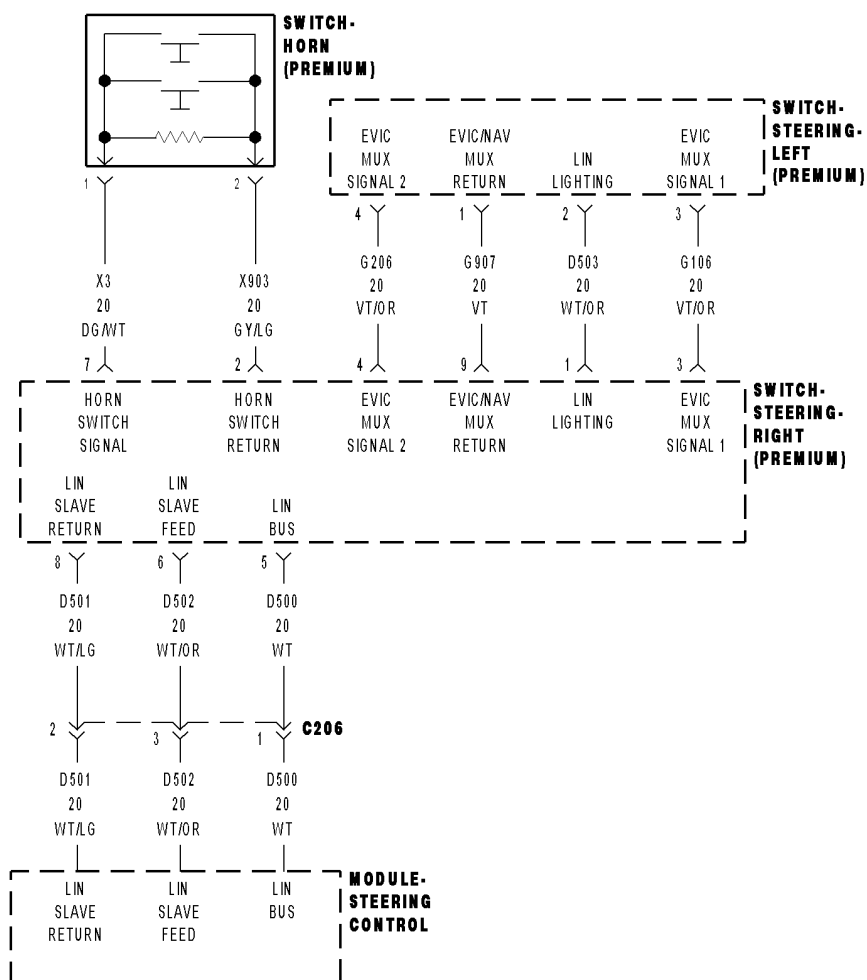
Look for the data to change or for the DTC to reset during the wiggle test.

**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

**B148F-STEERING WHEEL CONTROL [-] SWITCH CIRCUIT**

**B148F-STEERING WHEEL CONTROL [-] SWITCH CIRCUIT (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The Steering Wheel Control Minus (-) Switch is part of the Right Steering Switch. The switching status is transferred to the Steering Column Control Module (SCCM) by way of the LIN bus, a serial sub-bus. The SCCM converts the data to CAN(B) and sends the message to the corresponding module on the bus.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The Steering Column Control Module senses that the Steering Wheel Control Minus (-) Switch is in the Set position for greater than 50 seconds.

Possible Causes
INTERMITTENT STEERING WHEEL CONTROL [-] SWITCH CIRCUIT DTC
RIGHT STEERING SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC IS ACTIVE**

**Note:** If U1109–LOST COMMUNICATION WITH LIN STEERING WHEEL CONTROLS is set along with this DTC, diagnose the communication DTC first.

**Note:** If P0562–BATTERY VOLTAGE LOW or P0563–BATTERY VOLTAGE HIGH is set along with this DTC, diagnose the battery voltage DTC first.

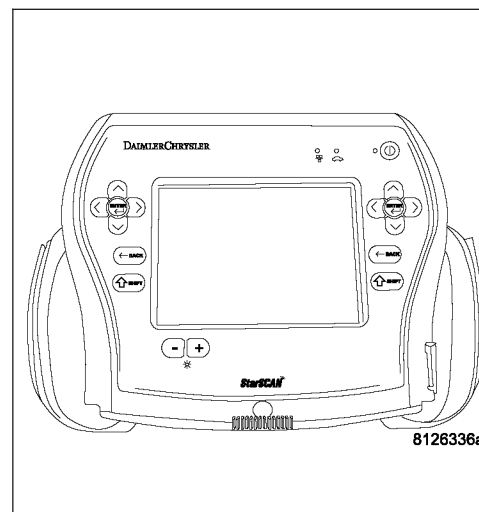
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 4



**B148F-STEERING WHEEL CONTROL [-] SWITCH CIRCUIT (CONTINUED)****2. RIGHT STEERING SWITCH**

Turn the ignition off.

Replace the Right Steering Switch in accordance with the Service Information.

Turn the ignition on.

Press and release the Minus (-) Switch several times.

With the Scan Tool, Clear Stored DTCs in the Steering Column Control Module.

With the Scan Tool, select Data Display and view the Minus (-) switch data.

While monitoring the Minus (-) switch data, press and release the Minus (-) Switch several times.

**Does the Minus (-) switch data change from Set to Not Set when the switch is pressed and released?**

**Yes** >> Test complete.

**No** >> Go to 3

---

**3. STEERING COLUMN CONTROL MODULE (SCCM)**

View repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

---

**4. INTERMITTENT STEERING WHEEL CONTROL [-] SWITCH CIRCUIT DTC**

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

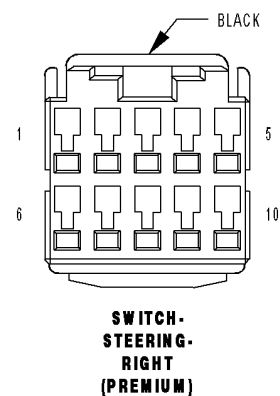
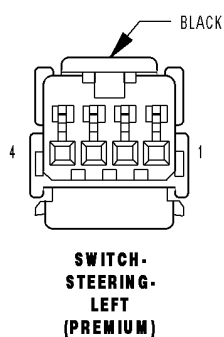
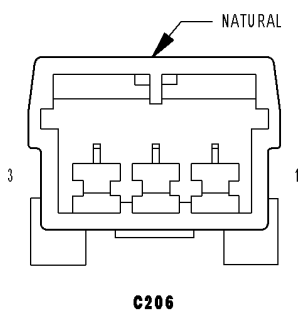
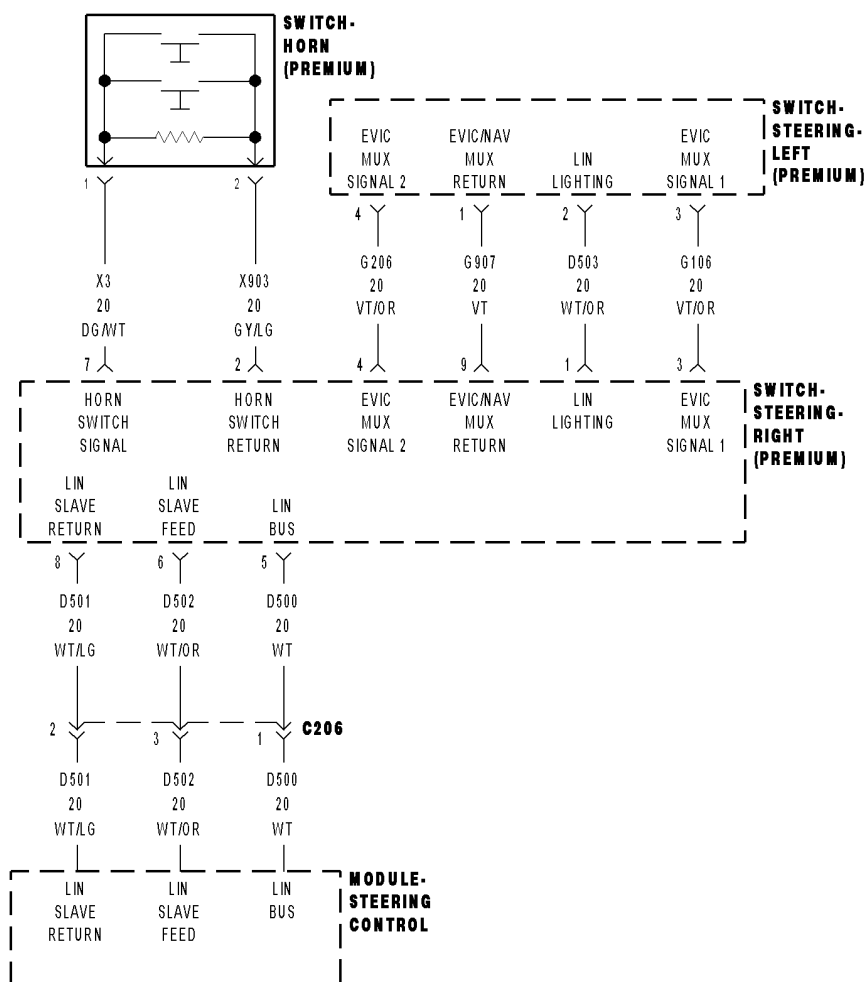
**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

# B1490-STEERING WHEEL CONTROL C/T SWITCH CIRCUIT



**B1490-STEERING WHEEL CONTROL C/T SWITCH CIRCUIT (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

**Theory of Operation**

The Steering Wheel Control Compass/Temperature Switch is part of the Right Steering Switch. The switching status is transferred to the Steering Column Control Module (SCCM) by way of the LIN bus, a serial sub-bus. The SCCM converts the data to CAN(B) and sends the message to the corresponding module on the bus.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The Steering Column Control Module senses that the Steering Wheel Control Compass/Temperature Switch is in the Set position for greater than 50 seconds.

Possible Causes
INTERMITTENT STEERING WHEEL CONTROL C/T SWITCH CIRCUIT DTC
RIGHT STEERING SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC IS ACTIVE**

**Note:** If U1109–LOST COMMUNICATION WITH LIN STEERING WHEEL CONTROLS is set along with this DTC, diagnose the communication DTC first.

**Note:** If P0562–BATTERY VOLTAGE LOW or P0563–BATTERY VOLTAGE HIGH is set along with this DTC, diagnose the battery voltage DTC first.

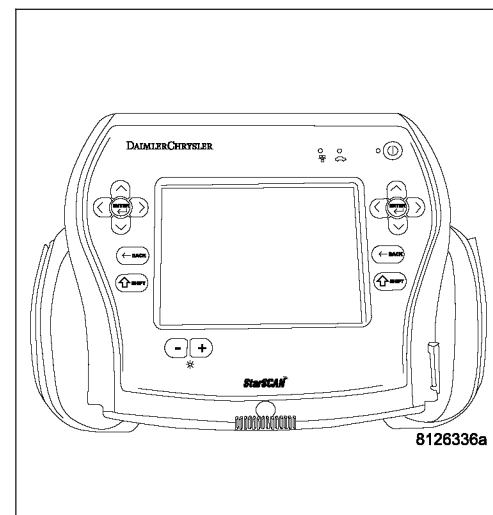
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 4



**B1490-STEERING WHEEL CONTROL C/T SWITCH CIRCUIT (CONTINUED)****2. RIGHT STEERING SWITCH**

Turn the ignition off.

Replace the Right Steering Switch in accordance with the Service Information.

Turn the ignition on.

With the Scan Tool, Clear Stored DTCs in the Steering Column Control Module.

With the Scan Tool, select Data Display and view the Compass/Temperature switch data.

While monitoring the Compass/Temperature switch data, press and release the Compass/Temperature Switch several times.

**Does the Compass/Temperature switch data change from Set to Not Set when the switch is pressed and released?**

**Yes** >> Test complete.

**No** >> Go to 3

---

**3. STEERING COLUMN CONTROL MODULE (SCCM)**

View repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

---

**4. INTERMITTENT STEERING WHEEL CONTROL C/T SWITCH CIRCUIT DTC**

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

**Were any problems found?**

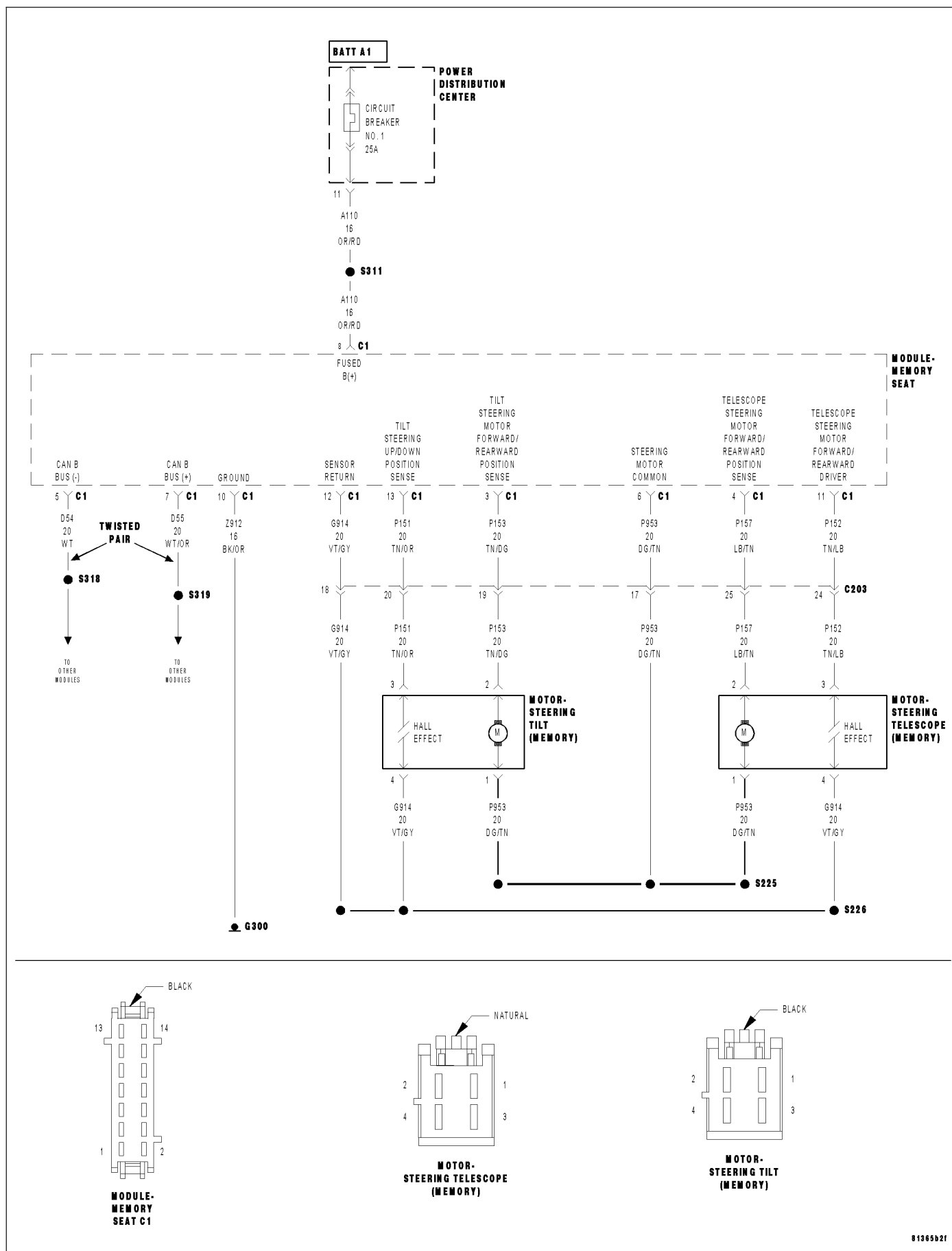
**Yes** >> Repair as necessary.

**No** >> Test complete.

---



## B1DA0-STEERING COLUMN TILT SWITCH CIRCUIT STUCK



**B1DA0-STEERING COLUMN TILT SWITCH CIRCUIT STUCK (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The Steering Column Control Module senses that the Steering Column Tilt Switch is in the Set position for greater than 50 seconds.

Possible Causes
INTERMITTENT STEERING COLUMN TILT SWITCH CIRCUIT STUCK DTC
STEERING COLUMN TILT/TELESCOPE SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC IS ACTIVE**

**Note:** If **P0562-BATTERY VOLTAGE LOW** or **P0563-BATTERY VOLTAGE HIGH** is set along with this DTC, diagnose the battery voltage DTC first.

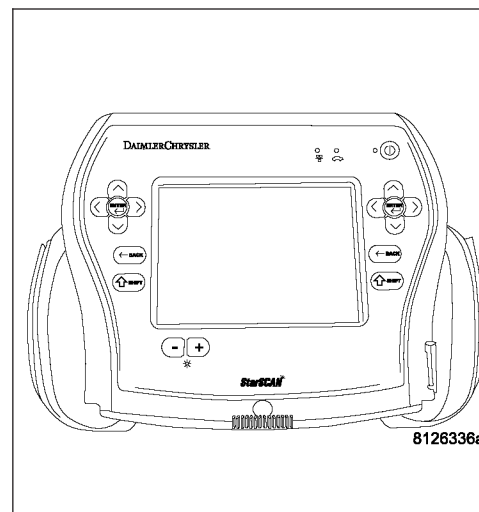
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 4

**2. STEERING COLUMN TILT/TELESCOPE SWITCH**

Turn the ignition off.

Replace the Steering Column Tilt/Telescope Switch in accordance with the Service Information.

Turn the ignition on.

Move the Steering column tilt switch to the up and down positions several times.

With the Scan Tool, Clear Stored DTCs in the Steering Column Control Module.

With the Scan Tool, select Data Display and view the Steering column up and the Steering column down switch data.

While monitoring the Steering column up and the Steering column down switch data, move the Steering column tilt switch to the up and down positions several times.

**Does the Steering column switch data change from Set to Not Set as the switch is moved to each position?**

**Yes** >> Test complete.

**No** >> Go to 3

## B1DA0-STEERING COLUMN TILT SWITCH CIRCUIT STUCK (CONTINUED)

### 3. STEERING COLUMN CONTROL MODULE (SCCM)

View repair.

#### Repair

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

---

### 4. INTERMITTENT STEERING COLUMN TILT SWITCH CIRCUIT STUCK DTC

The conditions necessary to set this DTC are not present at this time.

While monitoring the scan tool data relative to this circuit, wiggle test the component and connectors and move the switch to each position.

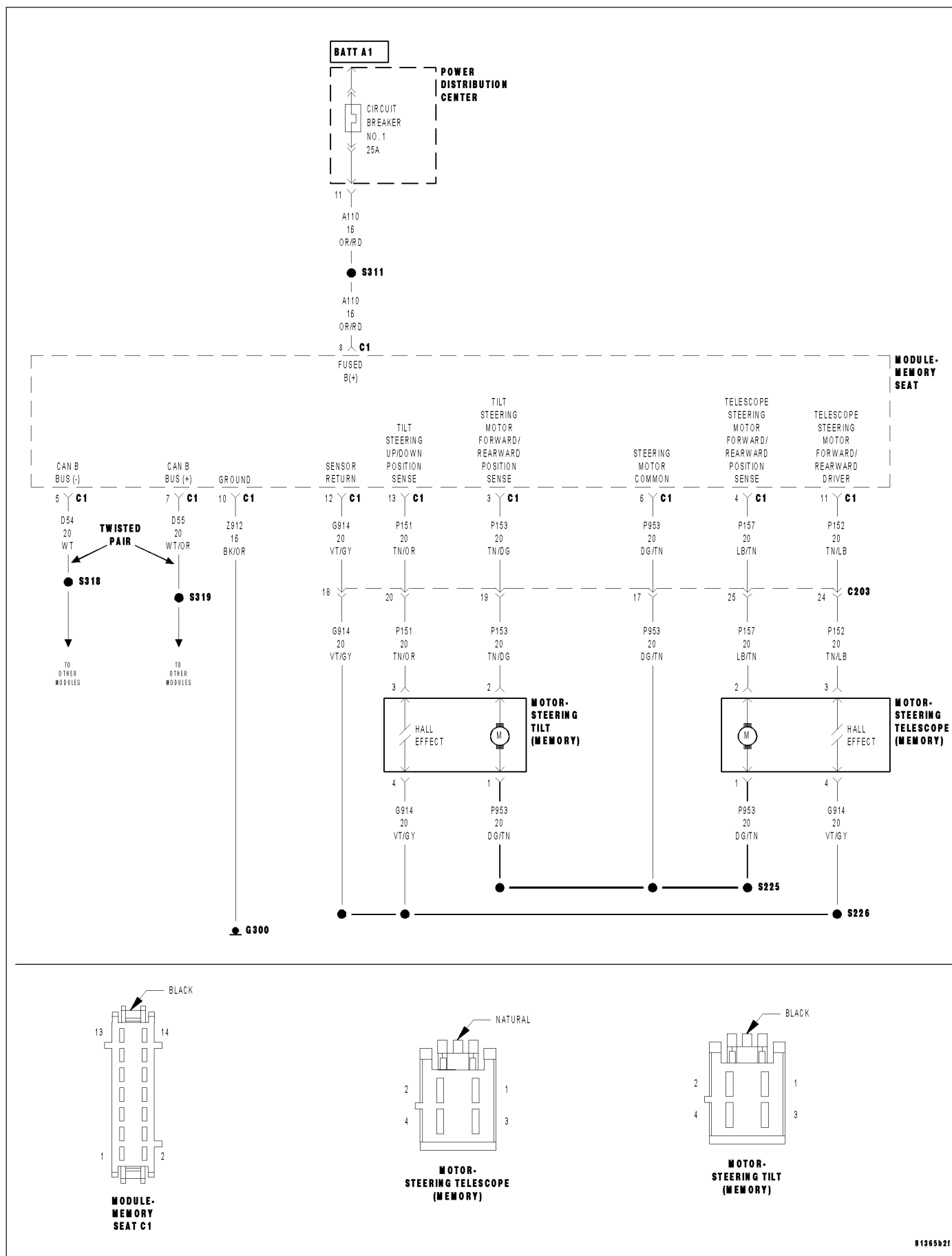
Look for the data to change other than as expected or for the DTC to reset during the test.

#### Were any problems found?

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

**B1DA5—STEERING COLUMN TELESCOPE SWITCH CIRCUIT STUCK**

**B1DA5-STEERING COLUMN TELESCOPE SWITCH CIRCUIT STUCK (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The Steering Column Control Module senses that the Steering Column Telescope Switch is in the Set position for greater than 50 seconds.

Possible Causes
INTERMITTENT STEERING COLUMN TELESCOPE SWITCH CIRCUIT STUCK DTC
STEERING COLUMN TILT/TELESCOPE SWITCH
STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC IS ACTIVE**

**Note:** If **P0562-BATTERY VOLTAGE LOW** or **P0563-BATTERY VOLTAGE HIGH** is set along with this DTC, diagnose the battery voltage DTC first.

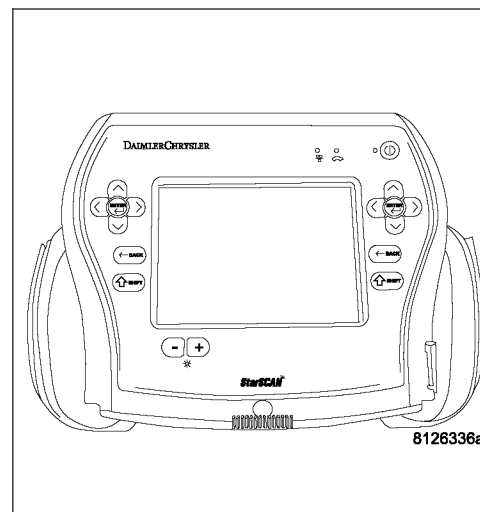
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 4

**2. STEERING COLUMN TILT/TELESCOPE SWITCH**

Turn the ignition off.

Replace the Steering Column Tilt/Telescope Switch in accordance with the Service Information.

Turn the ignition on.

Move the Steering column telescope switch forward and back several times.

With the Scan Tool, Clear Stored DTCs in the Steering Column Control Module.

With the Scan Tool, select Data Display and view the Steering column forward and Steering column back switch data.

While monitoring the Steering column forward and Steering column back switch data, move the Steering column telescope switch forward and back several times.

**Does the Steering column switch data change from Set to Not Set as the switch is moved to each position?**

**Yes** >> Test complete.

**No** >> Go to 3

**B1DA5-STEERING COLUMN TELESCOPE SWITCH CIRCUIT STUCK (CONTINUED)****3. STEERING COLUMN CONTROL MODULE**

View repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

---

**4. INTERMITTENT STEERING COLUMN TELESCOPE SWITCH CIRCUIT STUCK DTC**

The conditions necessary to set this DTC are not present at this time.

While monitoring the scan tool data relative to this circuit, wiggle test the component and connectors and move the switch to each position.

Look for the data to change other than as expected or for the DTC to reset during the test.

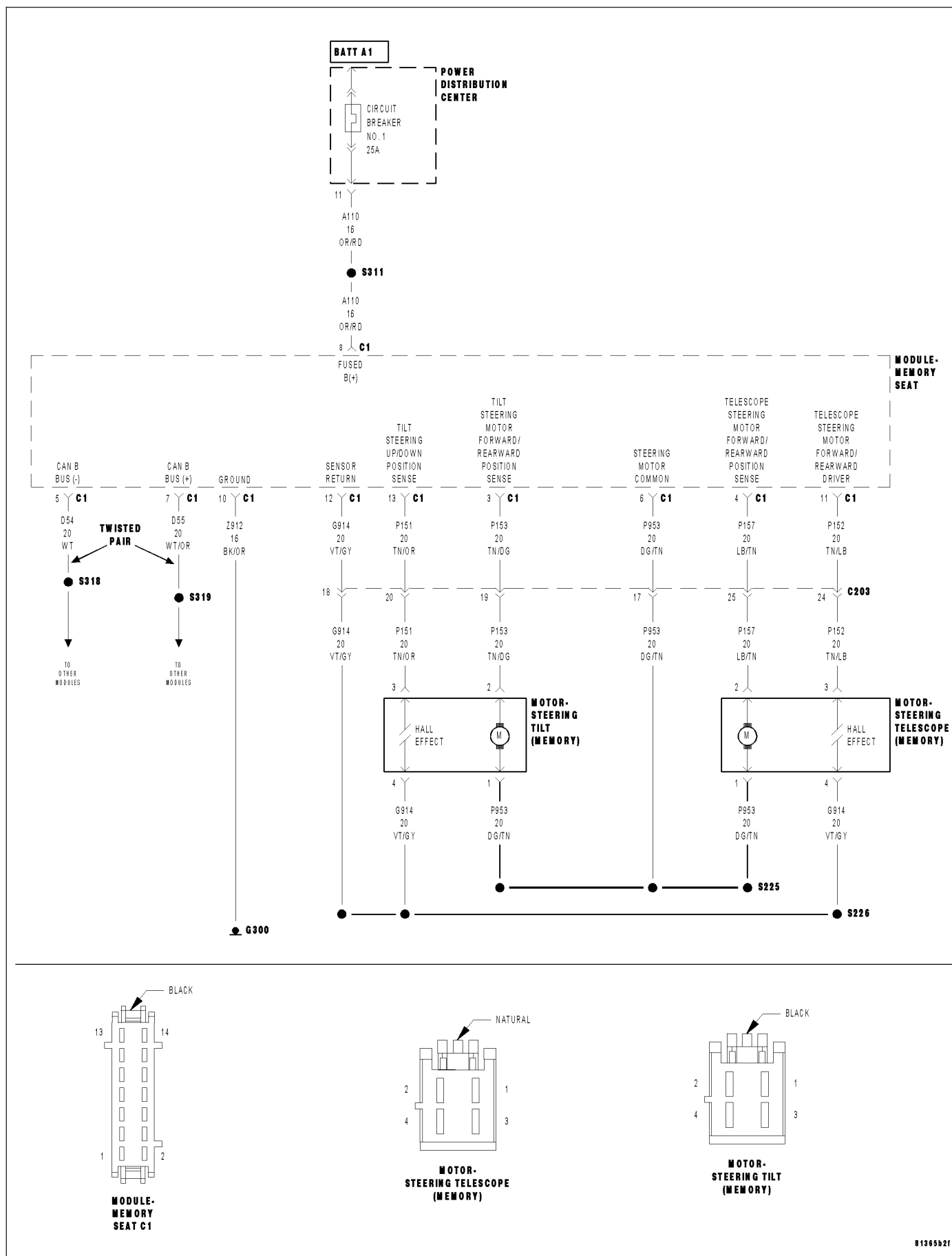
**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

## B1D8D-STEERING COLUMN TELESCOPE POSITION SENSOR CIRCUIT LOW



**B1D8D-STEERING COLUMN TELESCOPE POSITION SENSOR CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The MSM input signal from the Steering Column Telescope Sensor is recognized in a specified voltage area. The input channel is an analog to digital converter input and the sensor is a hall sensor.

- **When Monitored:**  
The hall supply voltage is switched on when the motor becomes activated.
- **Set Condition:**  
The sensed input is less than 1.7 volts (at the controller input, not at the module input) for more than 14 mS

Possible Causes
INTERMITTENT STEERING COLUMN TELESCOPE POSITION SENSOR CIRCUIT LOW DTC (P152) TELESCOPE STEERING FORWARD/REARWARD POSITION SENSE CIRCUIT SHORT TO GROUND STEERING COLUMN TELESCOPE MOTOR MEMORY SEAT MODULE (MSM)

**Diagnostic Test****1. DTC IS ACTIVE**

Ignition on, engine not running.

With the Scan Tool, select Clear Stored DTCs in the Memory Seat Module.

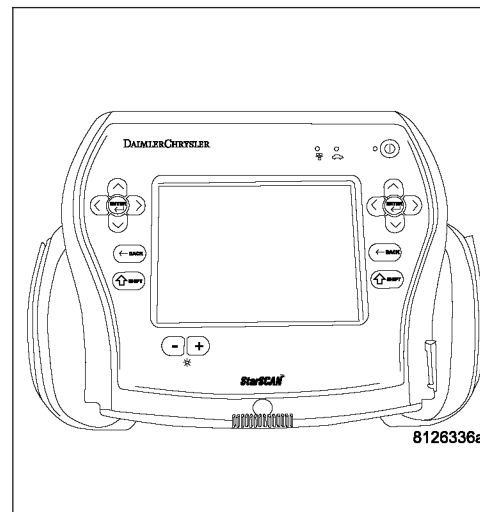
Move the Steering Column Telescope Switch to the Forward and Rearward positions several times, holding the switch in position for at least 2 seconds each time.

With the Scan Tool, select View DTCs in the Memory Seat Module.

**Does the DTC reset and/or remain active?**

**Yes** >> Go to 2

**No** >> Go to 6





**B1D8D-STEERING COLUMN TELESCOPE POSITION SENSOR CIRCUIT LOW (CONTINUED)****2. CHECK DTC WITH HARNESS DISCONNECTED**

Turn the ignition off.

Disconnect the Steering Column Telescope Motor connector.

Turn the ignition on.

Move the Steering Column Telescope Switch to the Forward and Rearward positions several times.

With the Scan Tool, select Clear Stored DTCs in the Memory Seat Module.

Move the Steering Column Telescope Switch to the Forward and Rearward positions several times, holding the switch in position for at least 2 seconds each time.

With the Scan Tool, select View DTCs in the Memory Seat Module.

**Does the DTC reset and/or remain active?**

**Yes** >> Go to 4

**No** >> Go to 3

---

**3. STEERING COLUMN TELESCOPE MOTOR**

View repair.

**Repair**

Inspect the wiring between the Steering Column Telescope Motor and the harness connector (on the motor side) for a short to ground or to any other circuit. If any problems are found, repair as necessary. If no problems are found, replace the Steering Column Telescope Motor in accordance with the Service Information.

---

**4. (P152) TELESCOPE STEERING FORWARD/REARWARD POSITION SENSE CIRCUIT SHORT TO GROUND**

Turn the ignition off.

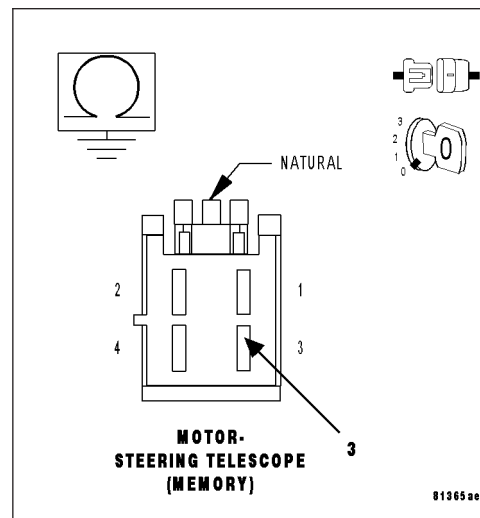
Disconnect the Memory Seat Module (MSM) C1 connector.

Measure the resistance between ground and the (P152) Telescope Steering Forward/Rearward Position Sense circuit at the Steering Column Telescope Motor connector (harness side).

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (P152) Telescope Steering Forward/Rearward Position Sense circuit for a short to ground.

**No** >> Go to 5



**B1D8D-STEERING COLUMN TELESCOPE POSITION SENSOR CIRCUIT LOW (CONTINUED)****5. MEMORY SEAT MODULE (MSM)**

Inspect the wiring between the Memory Seat Module harness connector and the Steering Column Telescope Motor harness connector for a short to ground or to any other circuit. If any problems are found, repair as necessary. If no problems are found, view repair.

**Repair**

Replace the Memory Seat Module (MSM) in accordance with the Service Information.

---

**6. INTERMITTENT STEERING COLUMN TELESCOPE POSITION SENSOR CIRCUIT LOW DTC**

The conditions necessary to set this DTC are not present at this time.

While monitoring the scan tool data relative to this circuit, wiggle test the component and connectors and move the switch to each position.

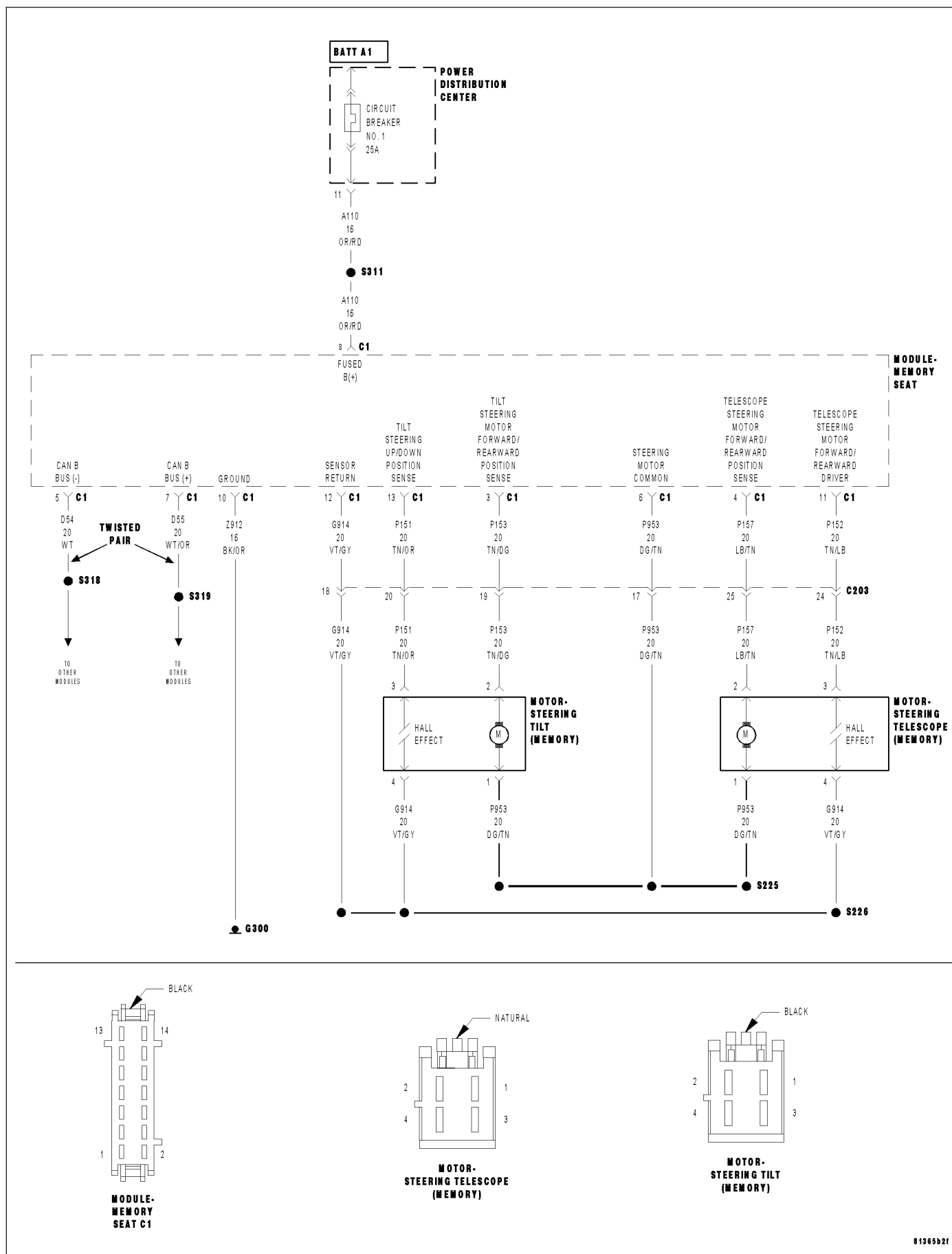
Look for the data to change other than as expected or for the DTC to reset during the wiggle test.

**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

**B1D8E—STEERING COLUMN TELESCOPE POSITION SENSOR CIRCUIT HIGH**

**B1D8E-STEERING COLUMN TELESCOPE POSITION SENSOR CIRCUIT HIGH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The MSM input signal from the Steering Column Telescope Sensor is recognized in a specified voltage area. The input channel is an analog to digital converter input and the sensor is a hall sensor.

- **When Monitored:**  
The hall supply voltage is switched on when the motor becomes activated.
- **Set Condition:**  
The sensed input is recognized in a defined voltage area (between 3.7 and 5.0 volts at the controller input, not at the module input) for more than 14 mS

Possible Causes
INTERMITTENT STEERING COLUMN TELESCOPE POSITION SENSOR CIRCUIT HIGH DTC (P152) TELESCOPE STEERING FORWARD/REARWARD POSITION SENSE CIRCUIT OPEN (P152) TELESCOPE STEERING FORWARD/REARWARD POSITION SENSE CIRCUIT SHORT TO VOLTAGE (P152) TELESCOPE STEERING FORWARD/REARWARD POSITION SENSE CIRCUIT SHORT TO TILT/ TELESCOPE MOTOR CIRCUIT(S) (G914) SENSOR RETURN CIRCUIT OPEN (G914) SENSOR RETURN CIRCUIT SHORT TO VOLTAGE STEERING COLUMN TELESCOPE MOTOR MEMORY SEAT MODULE (MSM)

**Diagnostic Test****1. DTC IS ACTIVE**

Ignition on, engine not running.

With the Scan Tool, select Clear Stored DTCs in the Memory Seat Module.

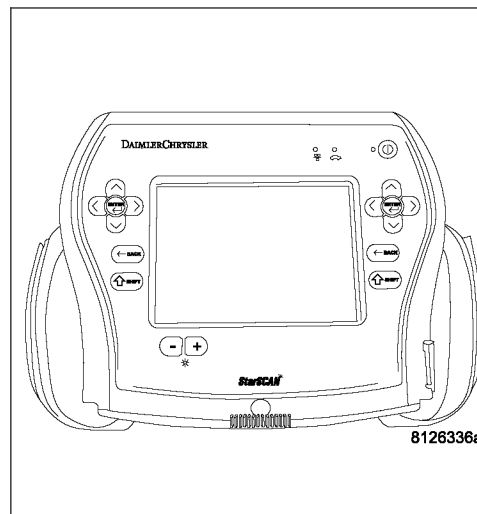
Move the Steering Column Telescope Switch to the Forward and Rearward positions several times, holding the switch in position for at least 2 seconds each time.

With the Scan Tool, select View DTCs in the Memory Seat Module.

**Does this DTC reset and/or remain active?**

**Yes** >> Go to 2

**No** >> Go to 10



**B1D8E-STEERING COLUMN TELESCOPE POSITION SENSOR CIRCUIT HIGH (CONTINUED)****2. CHECK DTC WITH HARNESS DISCONNECTED**

Turn the ignition off.

Disconnect the Steering Telescope Motor harness connector.

Ignition on, engine not running.

Move the Steering Column Telescope Switch to the Forward and Rearward positions several times.

With the Scan Tool, select Clear Stored DTCs in the Memory Seat Module.

Move the Steering Column Telescope Switch to the Forward and Rearward positions several times, holding the switch in position for at least 2 seconds each time.

With the Scan Tool, select View DTCs in the Memory Seat Module.

**Does this DTC reset and/or remain active?**

**Yes** >> Go to 3

**No** >> Go to 8

**3. (P152) TELESCOPE STEERING FORWARD/REARWARD POSITION SENSE CIRCUIT OPEN**

Turn the ignition off.

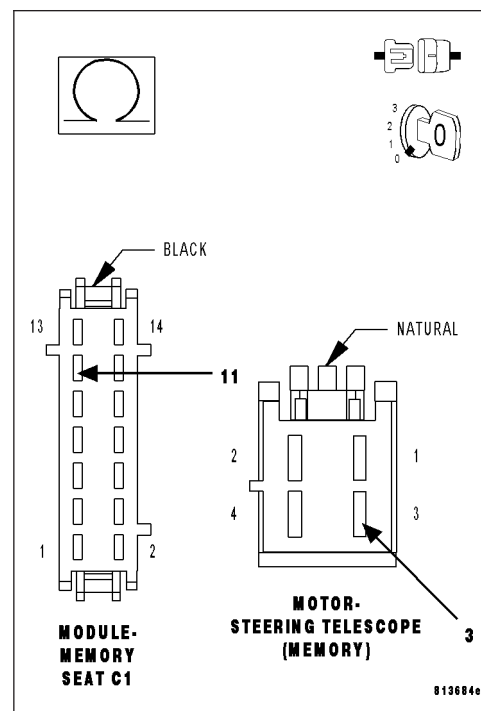
Disconnect the Memory Seat Module (MSM) C1 connector.

Measure the resistance of the (P152) Telescope Steering Forward/Rearward Position Sense circuit.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (P152) Telescope Steering Forward/Rearward Position Sense circuit for an open.

**No** >> Go to 4



**B1D8E-STEERING COLUMN TELESCOPE POSITION SENSOR CIRCUIT HIGH (CONTINUED)****4. (P152) TELESCOPE STEERING FORWARD/REARWARD POSITION SENSE CIRCUIT SHORT TO VOLTAGE**

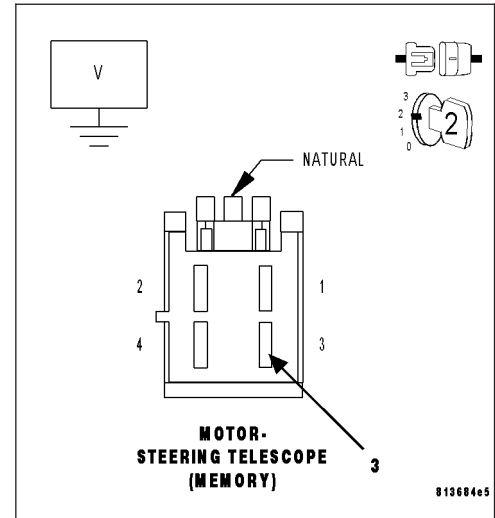
Turn the ignition on.

Measure the voltage of the (P152) Telescope Steering Forward/Rearward Position Sense circuit.

**Is there any voltage present?**

**Yes** >> Repair the (P152) Telescope Steering Forward/Rearward Position Sense circuit for a short to voltage.

**No** >> Go to 5

**5. (P152) TELESCOPE STEERING FORWARD/REARWARD POSITION SENSE CIRCUIT SHORT TO TILT/ TELESCOPE MOTOR CIRCUIT(S)**

Turn the ignition off.

Measure the resistance between the following circuits at the Memory Seat Module (MSM) C1 connector :

- The (P152) Telescope Steering Forward/Rearward Position Sense circuit and the (P157) Telescope Steering Motor Forward/Rearward Driver circuit.
- The (P152) Telescope Steering Forward/Rearward Position Sense circuit and the (P153) Tilt Steering Motor Up/Down Driver circuit.
- The (P152) Telescope Steering Forward/Rearward Position Sense circuit and the (P953) Steering Motor Common circuit.

**Is the resistance below 5.0 ohms for any of the circuit tests?**

**Yes** >> Repair the (P152) Telescope Steering Forward/Rearward Position Sense circuit for a short to the motor circuit(s).

**No** >> Go to 6

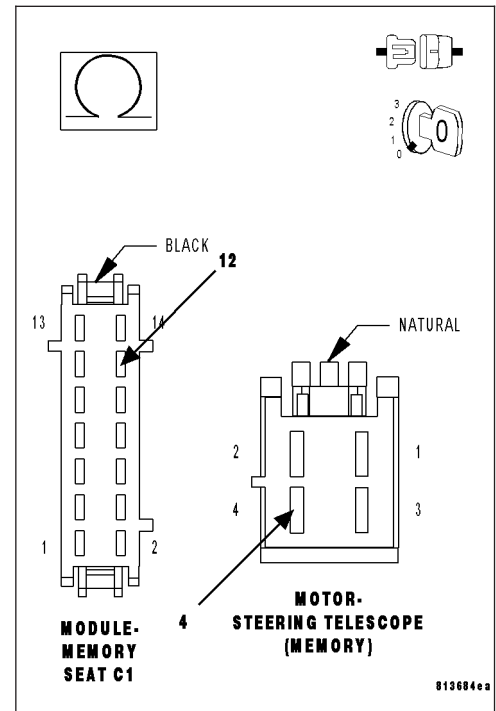
**B1D8E-STEERING COLUMN TELESCOPE POSITION SENSOR CIRCUIT HIGH (CONTINUED)****6. (G914) SENSOR RETURN CIRCUIT OPEN**

Measure the resistance of the (G914) Sensor Return circuit.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (G914) Sensor Return circuit for an open.

**No** >> Go to 7

**7. (G914) SENSOR RETURN CIRCUIT SHORT TO VOLTAGE**

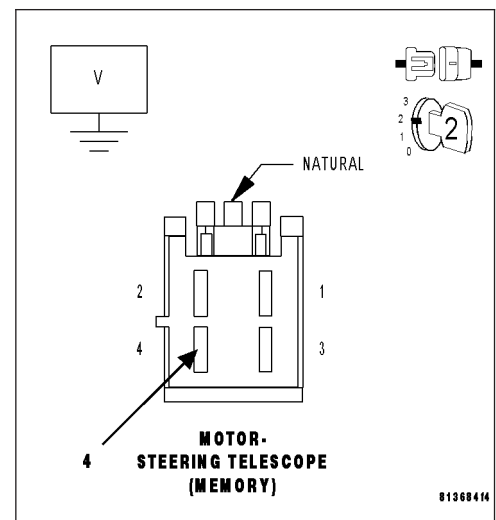
Turn the ignition on.

Measure the voltage of the (G914) Sensor Return circuit.

**Is there any voltage present?**

**Yes** >> Repair the (G914) Sensor Return circuit for a short to voltage.

**No** >> Go to 9



**B1D8E-STEERING COLUMN TELESCOPE POSITION SENSOR CIRCUIT HIGH (CONTINUED)****8. STEERING COLUMN TELESCOPE MOTOR**

Thoroughly inspect the wiring and connectors between the Memory Seat Module harness connector and the Steering Telescope Motor for a short to voltage or to any other circuit. If any problems are found, repair as necessary. If no other problems are found, view repair.

**Repair**

Replace the Steering Column Telescope Motor in accordance with the Service Information.

---

**9. MEMORY SEAT MODULE (MSM)**

Thoroughly inspect the wiring and connectors between the Memory Seat Module harness connector and the Steering Telescope Motor harness connector for a short to voltage or to any other circuit. If any problems are found, repair as necessary. If no other problems are found, view repair.

**Repair**

Replace the Memory Seat Module (MSM) in accordance with the Service Information.

---

**10. INTERMITTENT STEERING COLUMN TELESCOPE POSITION SENSOR CIRCUIT HIGH DTC**

The conditions necessary to set this DTC are not present at this time.

While monitoring the scan tool data relative to this circuit, wiggle test the component and connectors and move the switch to each position.

Look for the data to change other than as expected or for the DTC to reset during the wiggle test.

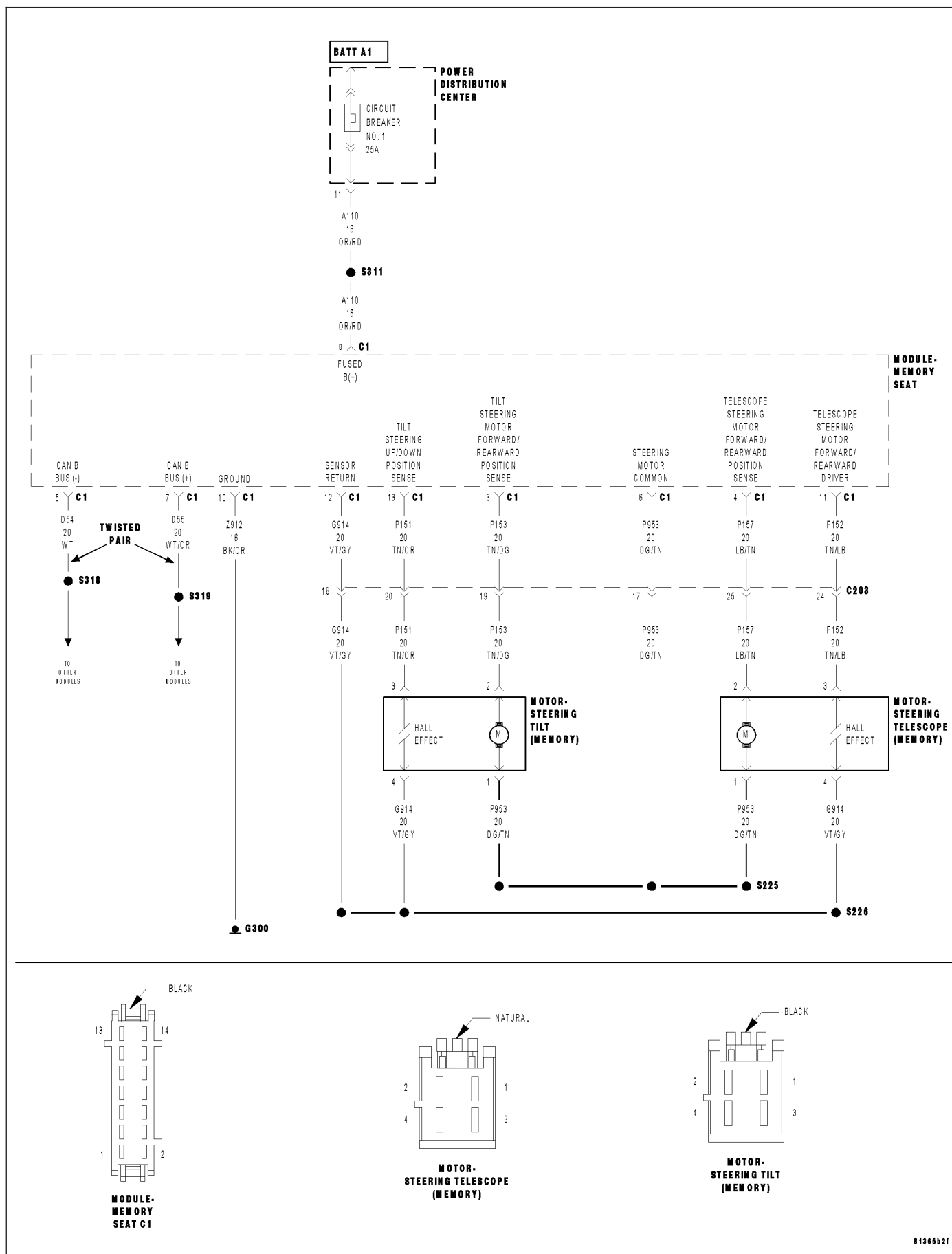
**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---



**B1D91-STEERING COLUMN TILT POSITION SENSOR CIRCUIT LOW**

**B1D91-STEERING COLUMN TILT POSITION SENSOR CIRCUIT LOW (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The MSM input signal from the Steering Column Tilt Sensor is recognized in a specified voltage area. The input channel is an analog to digital converter input and the sensor is a hall sensor.

- **When Monitored:**  
The hall supply voltage is switched on when the motor becomes activated.
- **Set Condition:**  
The sensed input is less than 1.7 volts (at the controller input, not at the module input) for more than 14 mS

Possible Causes
INTERMITTENT STEERING COLUMN TILT POSITION SENSOR CIRCUIT LOW DTC (P151) TILT STEERING UP/DOWN POSITION SENSE CIRCUIT SHORT TO GROUND STEERING COLUMN TILT MOTOR MEMORY SEAT MODULE (MSM)

**Diagnostic Test****1. DTC IS ACTIVE**

Ignition on, engine not running.

With the Scan Tool, select Clear Stored DTCs in the Memory Seat Module.

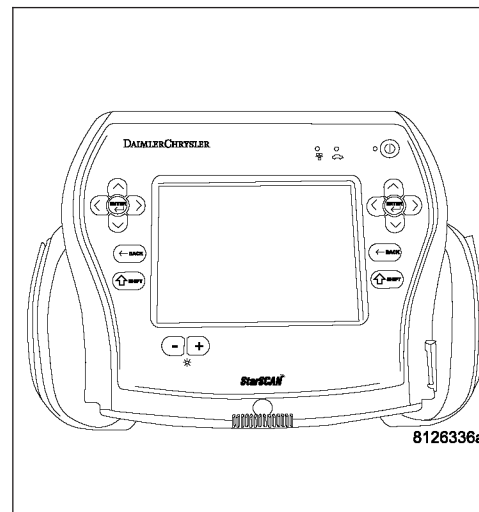
Move the Steering Column Tilt Switch to the Up and Down positions several times, holding the switch in position for at least 2 seconds each time.

With the Scan Tool, select View DTCs in the Memory Seat Module.

**Does the DTC reset and/or remain active?**

**Yes** >> Go to 2

**No** >> Go to 6



**B1D91-STEERING COLUMN TILT POSITION SENSOR CIRCUIT LOW (CONTINUED)****2. CHECK DTC WITH HARNESS DISCONNECTED**

Turn the ignition off.

Disconnect the Steering Column Tilt Motor connector.

Turn the ignition on.

Move the Steering Column Tilt Switch to the Up and Down positions several times.

With the Scan Tool, select Clear Stored DTCs in the Memory Seat Module.

Move the Steering Column Tilt Switch to the Up and Down positions several times, holding the switch in position for at least 2 seconds each time.

With the Scan Tool, select View DTCs in the Memory Seat Module.

**Does the DTC reset and/or remain active?**

**Yes** >> Go to 4

**No** >> Go to 3

**3. STEERING COLUMN TILT MOTOR**

View repair.

**Repair**

Inspect the wiring between the Steering Column Tilt Motor and the harness connector (on the motor side) for a short to ground or to any other circuit. If any problems are found, repair as necessary. If no problems are found, replace the Steering Column Tilt Motor in accordance with the Service Information.

**4. (P151) TILT STEERING UP/DOWN POSITION SENSE CIRCUIT SHORT TO GROUND**

Turn the ignition off.

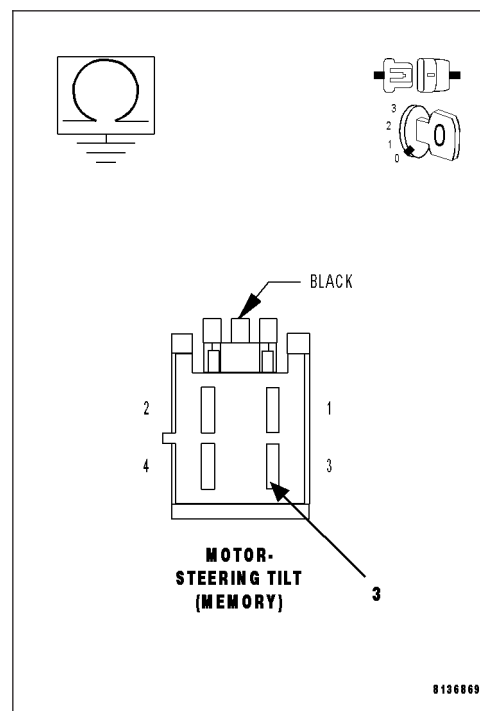
Disconnect the Memory Seat Module (MSM) C1 connector.

Measure the resistance between ground and the (P151) Tilt Steering Up/Down Position Sense circuit at the Steering Column Tilt Motor connector (harness side).

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (P151) Tilt Steering Up/Down Position Sense circuit for a short to ground.

**No** >> Go to 5



**B1D91-STEERING COLUMN TILT POSITION SENSOR CIRCUIT LOW (CONTINUED)****5. MEMORY SEAT MODULE (MSM)**

Inspect the wiring between the Memory Seat Module harness connector and the Steering Column Tilt Motor harness connector for a short to ground or to any other circuit. If any problems are found, repair as necessary. If no problems are found, view repair.

**Repair**

Replace the Memory Seat Module (MSM) in accordance with the Service Information.

---

**6. INTERMITTENT STEERING COLUMN TILT POSITION SENSOR CIRCUIT LOW DTC**

The conditions necessary to set this DTC are not present at this time.

While monitoring the scan tool data relative to this circuit, wiggle test the component and connectors and move the switch to each position.

Look for the data to change other than as expected or for the DTC to reset during the wiggle test.

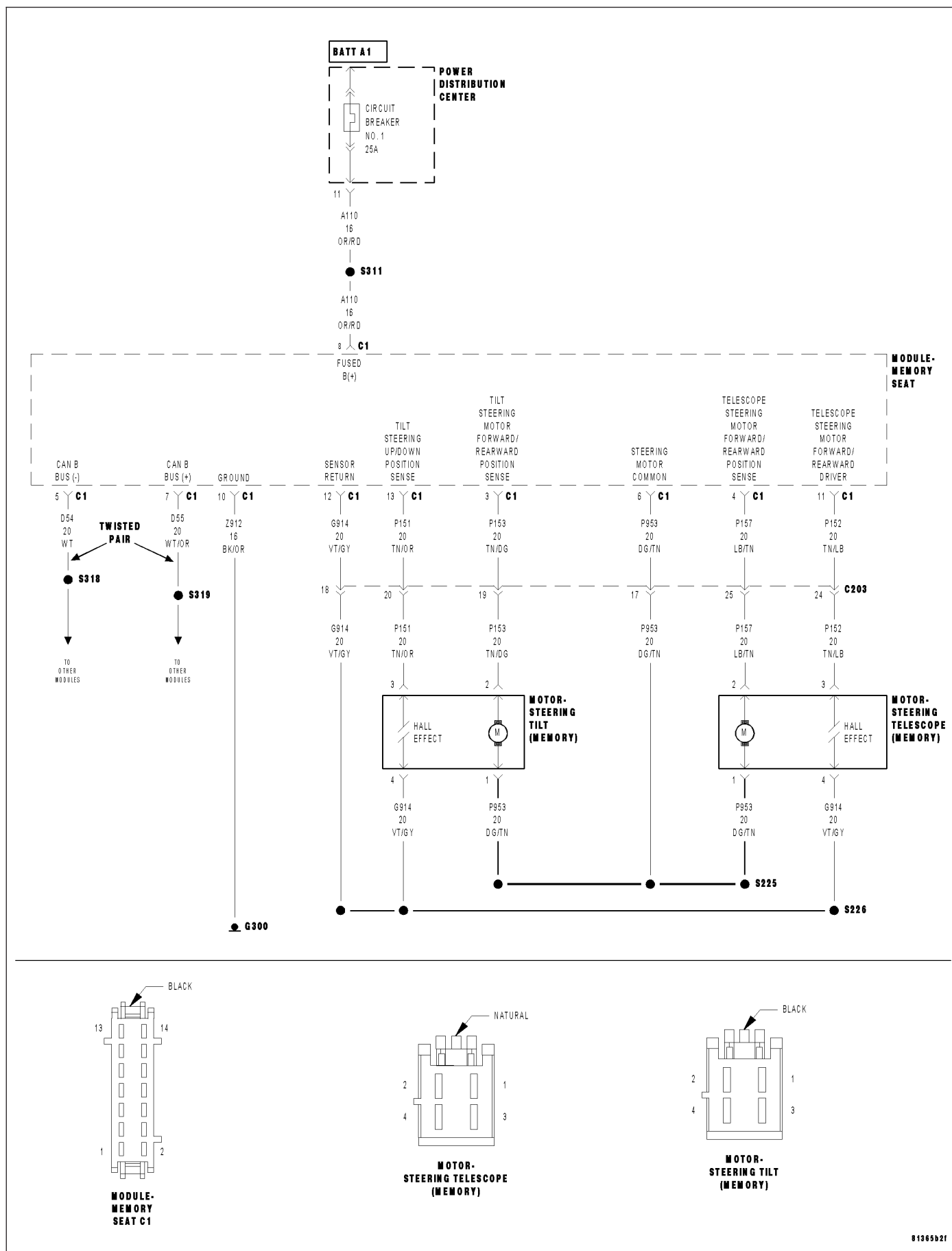
**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

## B1D92-STEERING COLUMN TILT POSITION SENSOR CIRCUIT HIGH



**B1D92–STEERING COLUMN TILT POSITION SENSOR CIRCUIT HIGH (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The MSM input signal from the Steering Column Tilt Sensor is recognized in a specified voltage area. The input channel is an analog to digital converter input and the sensor is a hall sensor.

- **When Monitored:**  
The hall supply voltage is switched on when the motor becomes activated.
- **Set Condition:**  
The sensed input is recognized in a defined voltage area (between 3.7 and 5.0 volts at the controller input, not at the module input) for more than 14 mS

Possible Causes
INTERMITTENT STEERING COLUMN TILT POSITION SENSOR CIRCUIT HIGH DTC (P151) TILT STEERING UP/DOWN POSITION SENSE CIRCUIT OPEN (P151) TILT STEERING UP/DOWN POSITION SENSE CIRCUIT SHORT TO VOLTAGE (P151) TILT STEERING UP/DOWN POSITION SENSE CIRCUIT SHORT TO TILT/TELESCOPE MOTOR CIRCUIT(S) (G914) SENSOR RETURN CIRCUIT OPEN (G914) SENSOR RETURN CIRCUIT SHORT TO VOLTAGE STEERING COLUMN TELESCOPE MOTOR MEMORY SEAT MODULE (MSM)

**Diagnostic Test****1. DTC IS ACTIVE**

Ignition on, engine not running.

With the Scan Tool, select Clear Stored DTCs in the Memory Seat Module.

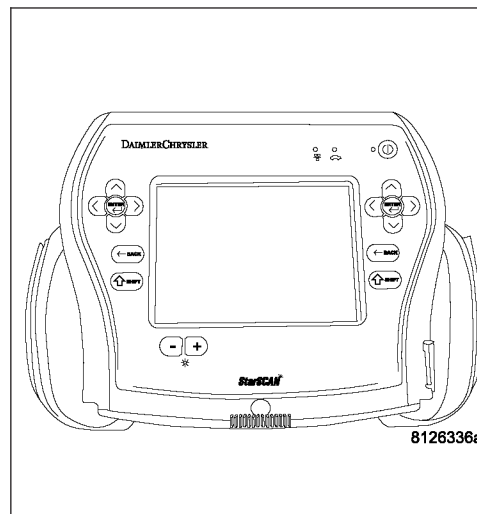
Move the Steering Column Tilt Switch to the Up and Down positions several times, holding the switch in position for at least 2 seconds each time.

With the Scan Tool, select View DTCs in the Memory Seat Module.

**Does this DTC reset and/or remain active?**

**Yes** >> Go to 2

**No** >> Go to 10



**B1D92-STEERING COLUMN TILT POSITION SENSOR CIRCUIT HIGH (CONTINUED)****2. CHECK DTC WITH HARNESS DISCONNECTED**

Turn the ignition off.

Disconnect the Steering Tilt Motor harness connector.

Ignition on, engine not running.

Move the Steering Column Tilt Switch to the Up and Down positions several times.

With the Scan Tool, select Clear Stored DTCs in the Memory Seat Module.

Move the Steering Column Tilt Switch to the Up and Down positions several times, holding the switch in position for at least 2 seconds each time.

With the Scan Tool, select View DTCs in the Memory Seat Module.

**Does this DTC reset and/or remain active?**

**Yes** >> Go to 3

**No** >> Go to 8

**3. (P151) TILT STEERING UP/DOWN POSITION SENSE CIRCUIT OPEN**

Turn the ignition off.

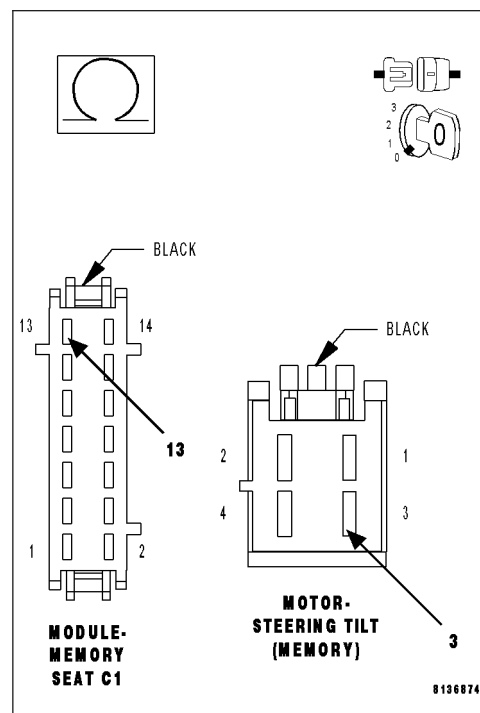
Disconnect the Memory Seat Module (MSM) C1 connector.

Measure the resistance of the (P151) Tilt Steering Up/Down Position Sense circuit.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (P151) Tilt Steering Up/Down Position Sense circuit for an open.

**No** >> Go to 4



## B1D92-STEERING COLUMN TILT POSITION SENSOR CIRCUIT HIGH (CONTINUED)

### 4. (P151) TILT STEERING UP/DOWN POSITION SENSE CIRCUIT SHORT TO VOLTAGE

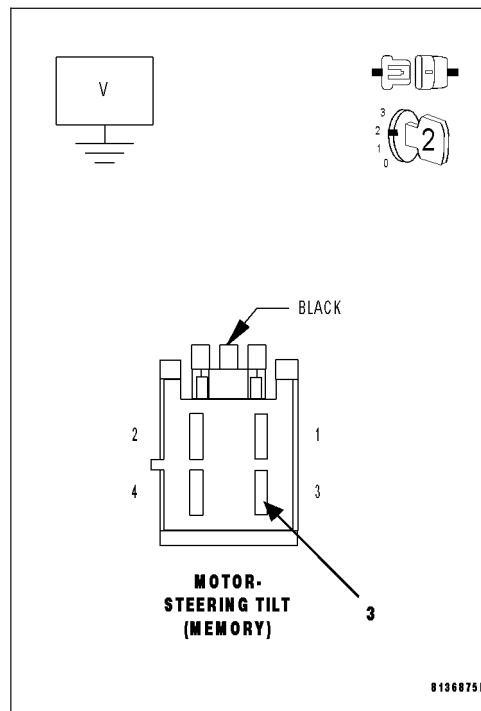
Turn the ignition on.

Measure the voltage of the (P151) Tilt Steering Up/Down Position Sense circuit.

**Is there any voltage present?**

**Yes** >> Repair the (P151) Tilt Steering Up/Down Position Sense circuit for a short to voltage.

**No** >> Go to 5



### 5. (P151) TILT STEERING UP/DOWN POSITION SENSE CIRCUIT SHORT TO TILT/TELESCOPE MOTOR CIRCUIT(S)

Turn the ignition off.

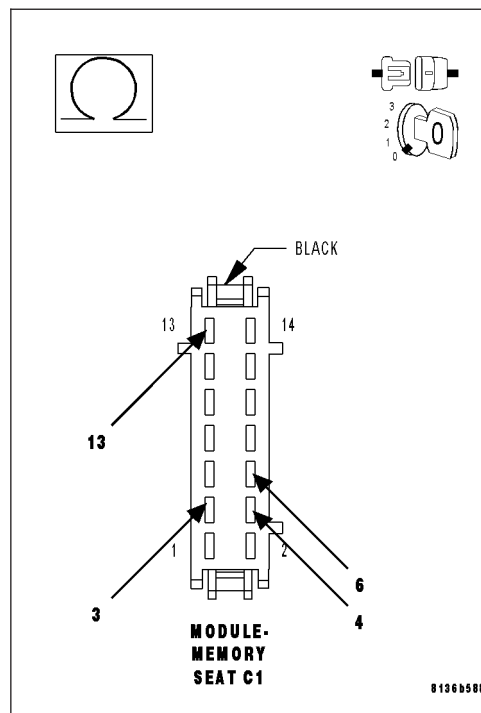
Measure the resistance between the following circuits at the Memory Seat Module (MSM) C1 connector :

- The (P151) Tilt Steering Up/Down Position Sense circuit and the (P157) Telescope Steering Motor Forward/Rearward Driver circuit.
- The (P151) Tilt Steering Up/Down Position Sense circuit and the (P153) Tilt Steering Motor Up/Down Driver circuit.
- The (P151) Tilt Steering Up/Down Position Sense circuit and the (P953) Steering Motor Common circuit.

**Is the resistance below 5.0 ohms for any of the circuit tests?**

**Yes** >> Repair the (P151) Tilt Steering Up/Down Position Sense circuit for a short to the motor circuit(s).

**No** >> Go to 6





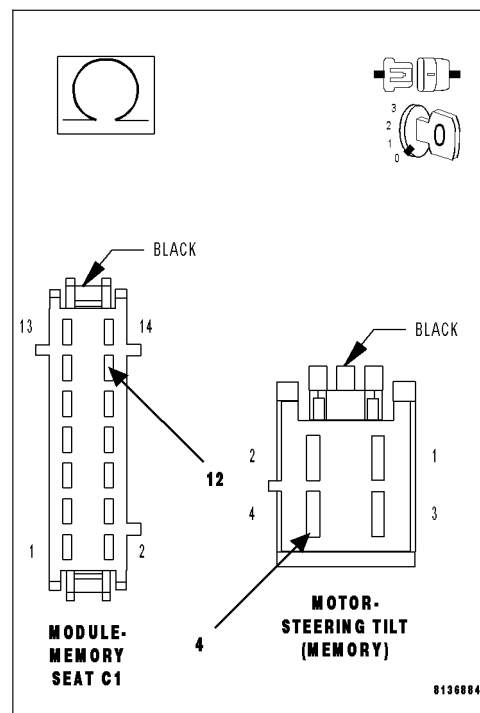
**B1D92-STEERING COLUMN TILT POSITION SENSOR CIRCUIT HIGH (CONTINUED)****6. (G914) SENSOR RETURN CIRCUIT OPEN**

Measure the resistance of the (G914) Sensor Return circuit.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (G914) Sensor Return circuit for an open.

**No** >> Go to 7

**7. (G914) SENSOR RETURN CIRCUIT SHORT TO VOLTAGE**

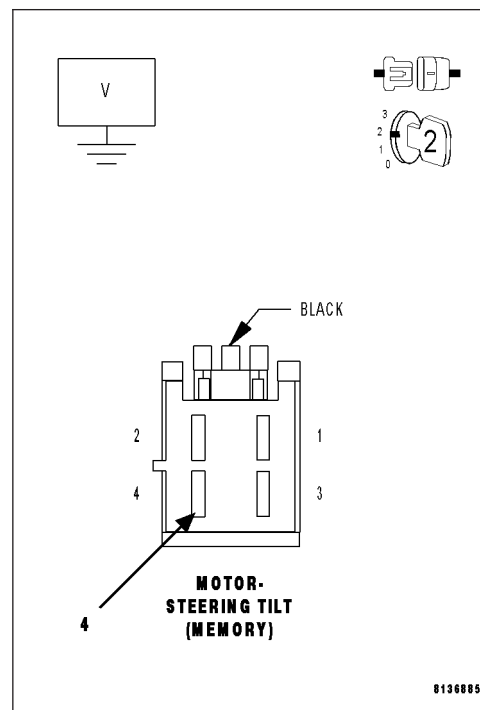
Turn the ignition on.

Measure the voltage of the (G914) Sensor Return circuit.

**Is there any voltage present?**

**Yes** >> Repair the (G914) Sensor Return circuit for a short to voltage.

**No** >> Go to 9



**B1D92–STEERING COLUMN TILT POSITION SENSOR CIRCUIT HIGH (CONTINUED)****8. STEERING COLUMN TILT MOTOR**

Thoroughly inspect the wiring and connectors between the Memory Seat Module harness connector and the Steering Tilt Motor for a short to voltage or to any other circuit. If any problems are found, repair as necessary. If no other problems are found, view repair.

**Repair**

Replace the Steering Column Tilt Motor in accordance with the Service Information.

---

**9. MEMORY SEAT MODULE (MSM)**

Thoroughly inspect the wiring and connectors between the Memory Seat Module harness connector and the Steering Tilt Motor harness connector for a short to voltage or to any other circuit. If any problems are found, repair as necessary. If no other problems are found, view repair.

**Repair**

Replace the Memory Seat Module (MSM) in accordance with the Service Information.

---

**10. INTERMITTENT STEERING COLUMN TILT POSITION SENSOR CIRCUIT HIGH DTC**

The conditions necessary to set this DTC are not present at this time.

While monitoring the scan tool data relative to this circuit, wiggle test the component and connectors and move the switch to each position.

Look for the data to change other than as expected or for the DTC to reset during the wiggle test.

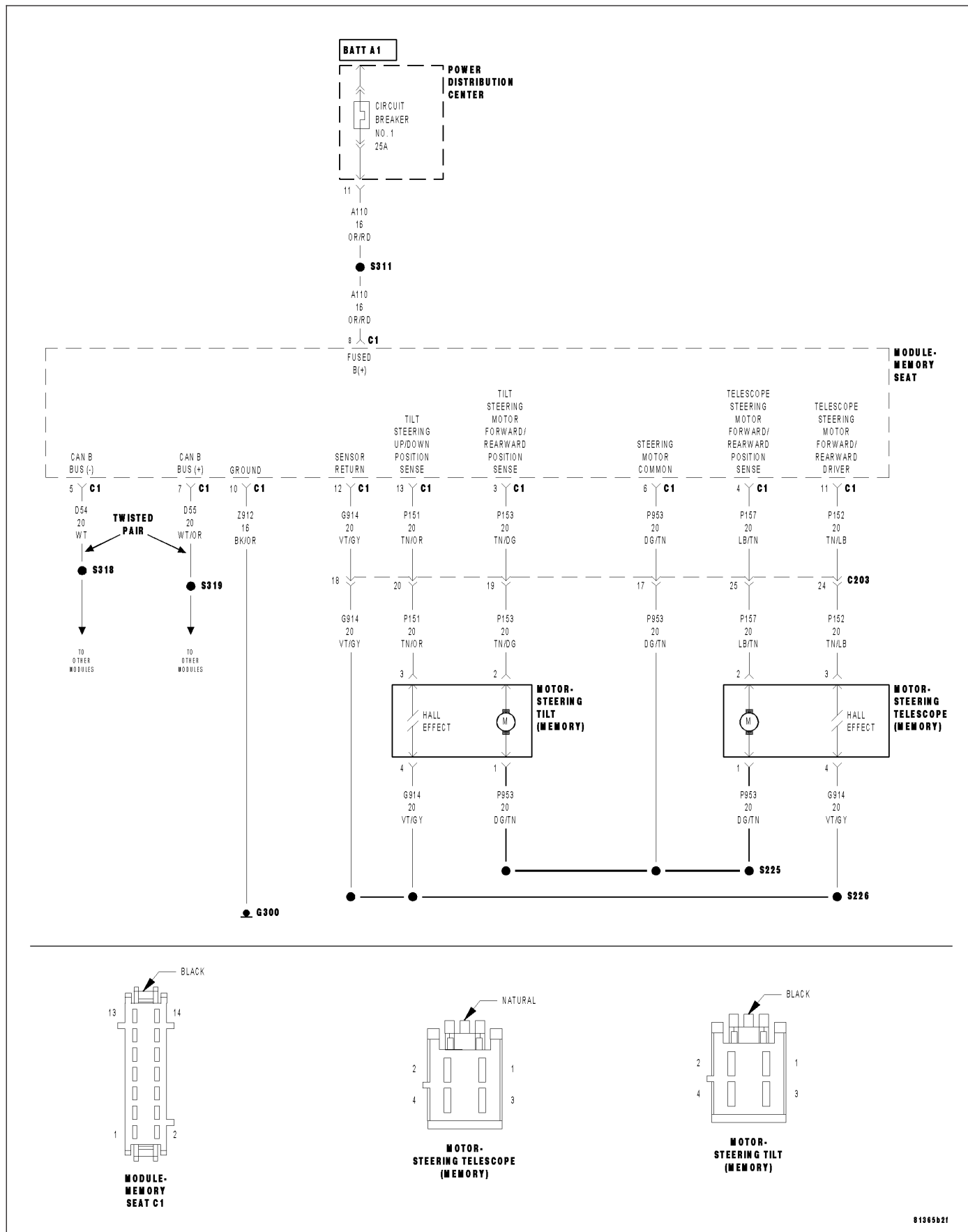
**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

# B1D93-STEERING COLUMN TELESCOPE MOTOR CONTROL CIRCUIT PERFORMANCE



**B1D93–STEERING COLUMN TELESCOPE MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

This DTC will set if movement in the Telescope Motor is requested and no motor movement is detected and only if failure counters are matured for both motor directions (forward/rearward). If the motor becomes energized and there are no hall pulses recognized after motor activation, the MSM will de-energize the motor after 2 seconds.

- **When Monitored:**  
When the motor is activated in either direction, until de-energized by the MSM.
- **Set Condition:**  
No movement is detected in an activated motor for more than 2000 ms.

Possible Causes
INTERMITTENT STEERING COLUMN TELESCOPE MOTOR CONTROL CIRCUIT PERFORMANCE DTC (P157) TELESCOPE STEERING FORWARD/REARWARD DRIVER CIRCUIT OPEN (P157) TELESCOPE STEERING FORWARD/REARWARD DRIVER CIRCUIT SHORT TO GROUND (P157) TELESCOPE STEERING FORWARD/REARWARD DRIVER CIRCUIT SHORT TO VOLTAGE (P953) STEERING MOTOR COMMON CIRCUIT OPEN (P953) STEERING MOTOR COMMON CIRCUIT SHORT TO GROUND (P953) STEERING MOTOR COMMON CIRCUIT SHORT TO VOLTAGE STEERING COLUMN TELESCOPE MOTOR MEMORY SEAT MODULE (MSM)

**Diagnostic Test****1. DTC IS ACTIVE**

Ignition on, engine not running.

**Note: If a DTC is set for B1D8D and/or B1D8E, perform the diagnostic procedure(s) before continuing.**

With the Scan Tool, select Clear Stored DTCs in the Memory Seat Module.

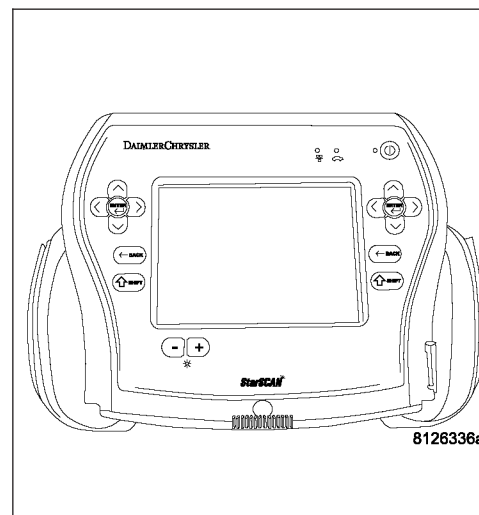
Move the Steering Column Telescope Switch to the Forward and Rearward positions several times, holding the switch in position for at least 2 seconds each time.

With the Scan Tool, select View DTCs in the Memory Seat Module.

**Does the DTC reset and/or remain active?**

**Yes** >> Go to 2

**No** >> Go to 14



**B1D93-STEERING COLUMN TELESCOPE MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****2. (P157) TELESCOPE STEERING MOTOR FORWARD/REARWARD DRIVER CIRCUIT — TEST TO GROUND**

Turn the ignition off.

Disconnect the Steering Telescope Motor harness connector.

Turn the ignition on.

Using a 12-volt test light connected to 12-volts, check the Telescope Steering Motor Forward/Rearward Driver circuit.

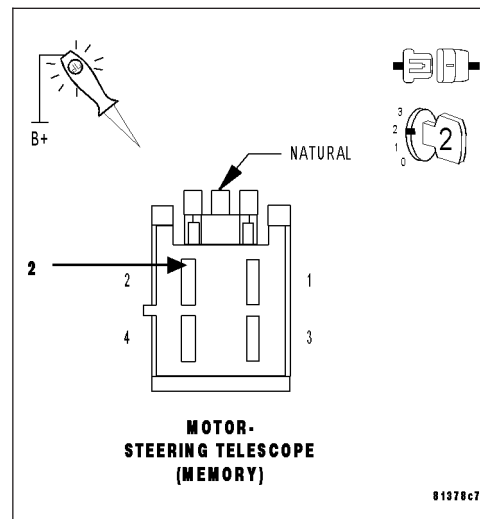
Monitor the test light with the Steering Column Telescope Switch in the Forward position, the Rearward position and with the switch at rest.

The test light should be illuminated and bright only when the switch is in the Rearward position.

**Does the test light illuminate as described?**

**Yes** >> Go to 3

**No** >> Go to 6

**3. (P953) TELESCOPE STEERING MOTOR COMMON CIRCUIT — TEST TO GROUND**

Using a 12-volt test light connected to 12-volts, check the Telescope Steering Motor Common circuit.

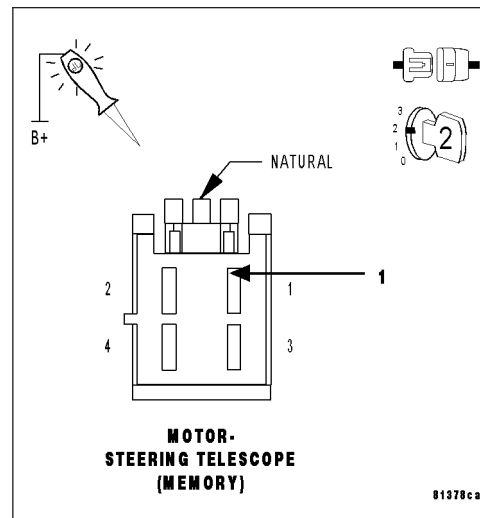
Monitor the test light with the Steering Column Telescope Switch in the Forward position, the Rearward position and with the switch at rest.

The test light should be illuminated and bright when the switch is in the Forward position and when the switch is at rest.

**Does the test light illuminate as described?**

**Yes** >> Go to 4

**No** >> Go to 9



**B1D93-STEERING COLUMN TELESCOPE MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****4. (P157) TELESCOPE STEERING MOTOR FORWARD/REARWARD DRIVER CIRCUIT- TEST TO VOLTAGE**

Using a 12-volt test light connected to ground, check the Telescope Steering Motor Forward/Rearward Driver circuit.

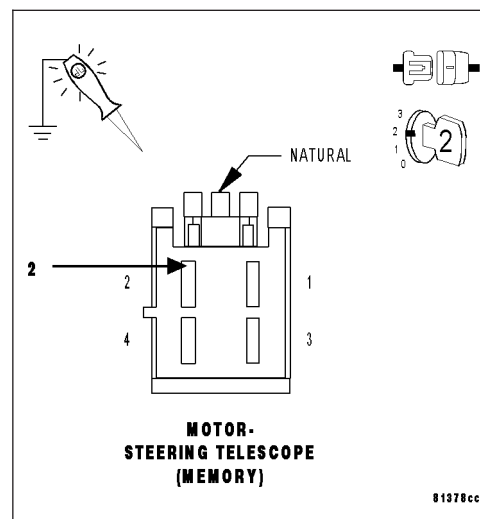
Monitor the test light with the Steering Column Telescope Switch in the Forward position, the Rearward position and with the switch at rest.

The test light should be illuminated and bright only when the switch is in the Forward position.

**Does the test light illuminate as described?**

**Yes** >> Go to 5

**No** >> Go to 6

**5. (P953) TELESCOPE STEERING MOTOR COMMON CIRCUIT — TEST TO VOLTAGE**

Using a 12-volt test light connected to ground, check the Telescope Steering Motor Common circuit.

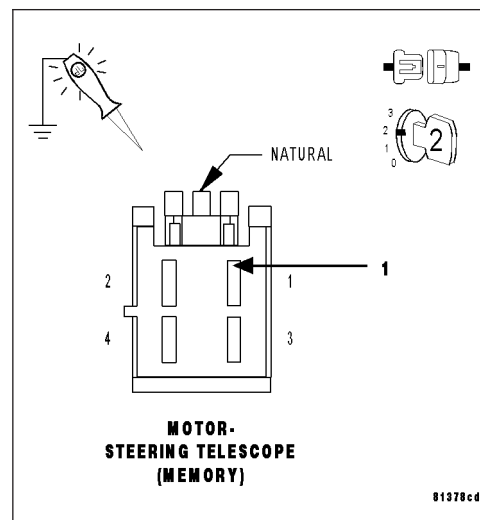
Monitor the test light with the Steering Column Telescope Switch in the Forward position, the Rearward position and with the switch at rest.

The test light should be illuminated and bright only when the switch is in the Rearward position.

**Does the test light illuminate as described?**

**Yes** >> Go to 12

**No** >> Go to 9



**B1D93-STEERING COLUMN TELESCOPE MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****6. (P157) TELESCOPE STEERING MOTOR FORWARD/REARWARD DRIVER CIRCUIT SHORT TO GROUND**

Turn the ignition off.

Disconnect the Memory Seat Module (MSM) C1 connector.

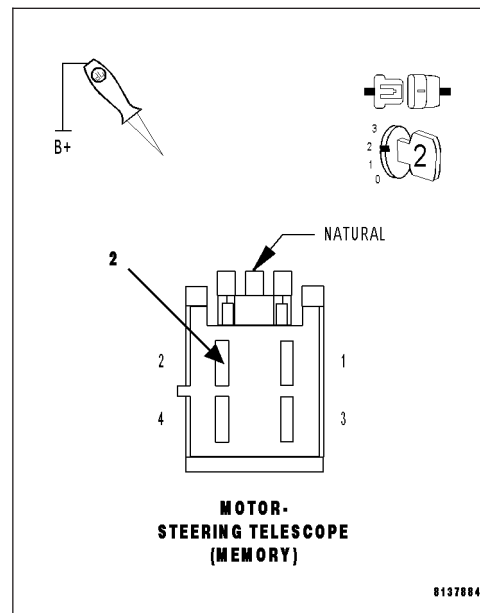
Turn the ignition on.

Using a 12-volt test light connected to 12-volts, check the Telescope Steering Motor Forward/Rearward Driver circuit.

**Does the test light illuminate?**

**Yes** >> Repair the Telescope Steering Motor Forward/Rearward Driver circuit for a short to ground.

**No** >> Go to 7

**7. (P157) TELESCOPE STEERING MOTOR FORWARD/REARWARD DRIVER CIRCUIT OPEN**

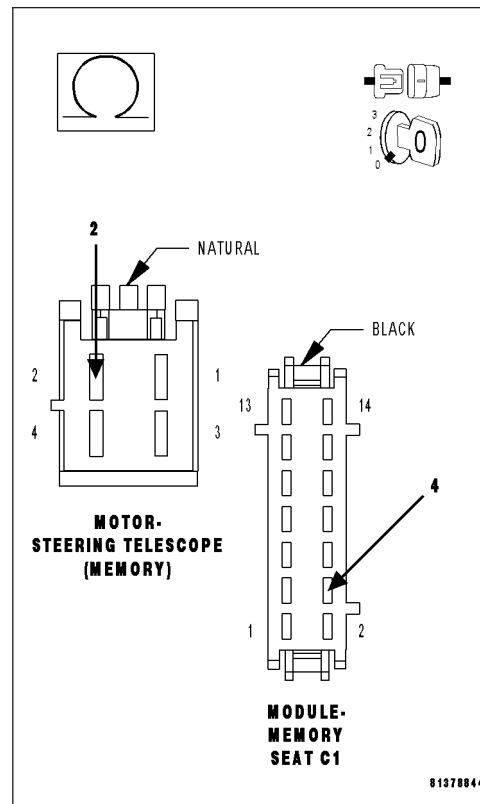
Turn the ignition off.

Measure the resistance of the (P157) Telescope Steering Motor Forward/Rearward Driver circuit.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (P157) Telescope Steering Motor Forward/Rearward Driver circuit for an open.

**No** >> Go to 8



**B1D93–STEERING COLUMN TELESCOPE MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****8. (P157) TELESCOPE STEERING MOTOR FORWARD/REARWARD DRIVER CIRCUIT SHORT TO VOLTAGE**

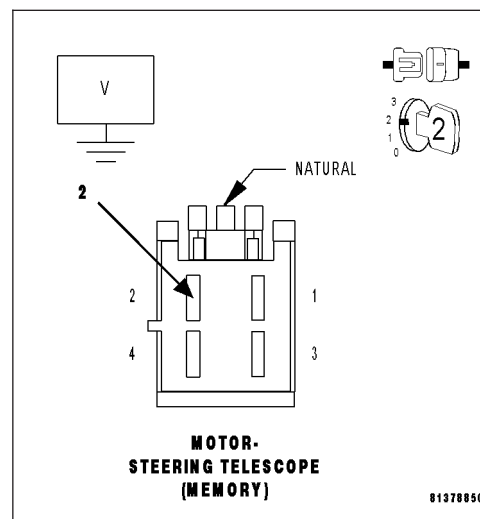
Turn the ignition on.

Measure the voltage of the Telescope Steering Motor Forward/Rearward Driver circuit.

**Is there any voltage present?**

**Yes** >> Repair the Telescope Steering Motor Forward/Rearward Driver circuit for a short to voltage.

**No** >> Go to 13

**9. (P953) TELESCOPE STEERING MOTOR COMMON CIRCUIT SHORT TO GROUND**

Turn the ignition off.

Disconnect the Memory Seat Module (MSM) C1 connector.

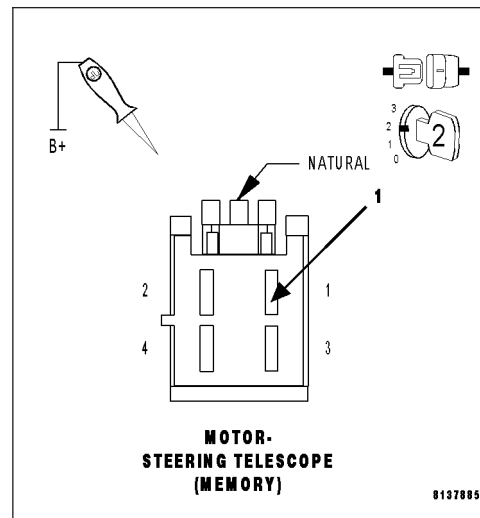
Turn the ignition on.

Using a 12-volt test light connected to 12-volts, check the Telescope Steering Motor Common circuit.

**Does the test light illuminate?**

**Yes** >> Repair the Telescope Steering Motor Common circuit for a short to ground.

**No** >> Go to 10





**B1D93-STEERING COLUMN TELESCOPE MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****10. (P953) TELESCOPE STEERING MOTOR COMMON CIRCUIT OPEN**

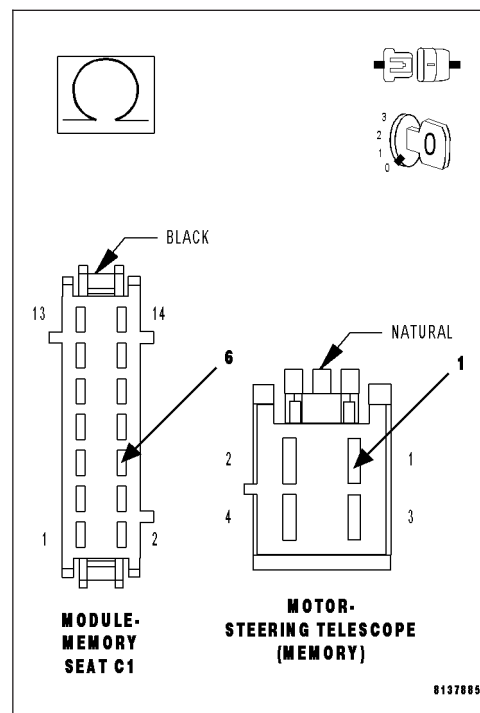
Turn the ignition off.

Measure the resistance of the (P157) Telescope Steering Motor Common circuit.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (P157) Telescope Steering Motor Common circuit for an open.

**No** >> Go to 11

**11. (P953) TELESCOPE STEERING MOTOR COMMON CIRCUIT SHORT TO VOLTAGE**

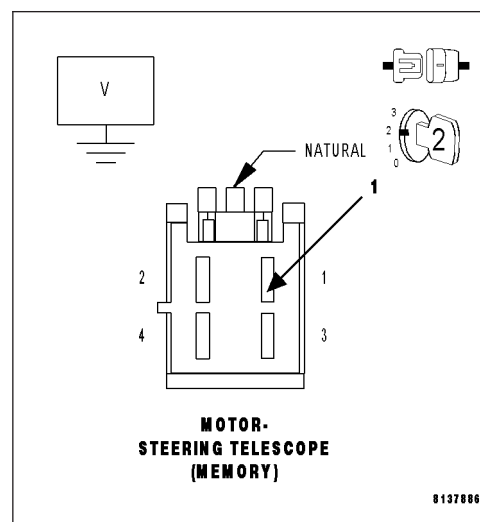
Turn the ignition on.

Measure the voltage of the Telescope Steering Motor Common circuit.

**Is there any voltage present?**

**Yes** >> Repair the Telescope Steering Motor Common circuit for a short to voltage.

**No** >> Go to 13



**B1D93–STEERING COLUMN TELESCOPE MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****12. STEERING COLUMN TELESCOPE MOTOR**

Inspect the wiring between the Memory Seat Module harness connector and the Steering Column Telescope Motor harness connector for a short to ground or to any other circuit. If any problems are found, repair as necessary. If no problems are found, view repair.

**Repair**

Replace the Steering Column Telescope Motor in accordance with the Service Information.

---

**13. MEMORY SEAT MODULE (MSM)**

Inspect the wiring between the Memory Seat Module harness connector and the Steering Column Telescope Motor harness connector for a short to ground or to any other circuit. If any problems are found, repair as necessary. If no problems are found, view repair.

**Repair**

Replace the Memory Seat Module (MSM) in accordance with the Service Information.

---

**14. INTERMITTENT STEERING COLUMN TELESCOPE MOTOR CONTROL CIRCUIT PERFORMANCE DTC**

The conditions necessary to set this DTC are not present at this time.

While monitoring the scan tool data relative to this circuit, wiggle test the component and connectors and move the switch to each position.

Look for the data to change other than as expected or for the DTC to reset during the wiggle test.

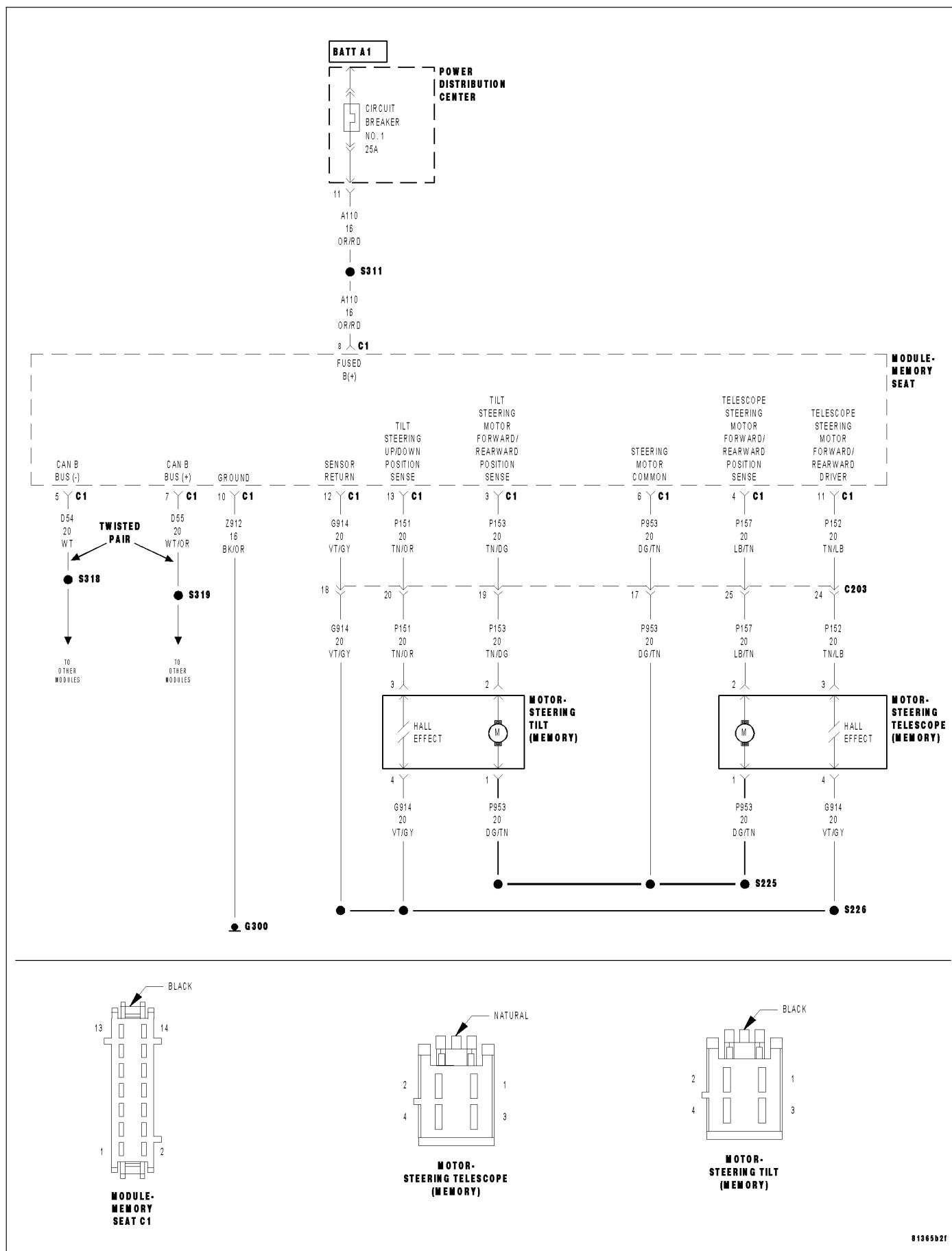
**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

## B1D97-STEERING COLUMN TILT MOTOR CONTROL CIRCUIT PERFORMANCE



**B1D97-STEERING COLUMN TILT MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

This DTC will set if movement in the Tilt Motor is requested and no motor movement is detected and only if failure counters are matured for both motor directions (up/down). If the motor becomes energized and there are no hall pulses recognized after motor activation, the MSM will de-energize the motor after 2 seconds.

- **When Monitored:**  
When the motor is activated in either direction, until de-energized by the MSM.
- **Set Condition:**  
No movement is detected in an activated motor for more than 2000 ms.

Possible Causes
INTERMITTENT STEERING COLUMN TILT MOTOR CONTROL CIRCUIT PERFORMANCE DTC (P153) TILT STEERING UP/DOWN DRIVER CIRCUIT OPEN (P153) TILT STEERING UP/DOWN DRIVER CIRCUIT SHORT TO GROUND (P153) TILT STEERING UP/DOWN DRIVER CIRCUIT SHORT TO VOLTAGE (P953) STEERING MOTOR COMMON CIRCUIT OPEN (P953) STEERING MOTOR COMMON CIRCUIT SHORT TO GROUND (P953) STEERING MOTOR COMMON CIRCUIT SHORT TO VOLTAGE STEERING COLUMN TELESCOPE MOTOR MEMORY SEAT MODULE (MSM)

**Diagnostic Test****1. DTC IS ACTIVE**

Ignition on, engine not running.

**Note: If a DTC is set for B1D8D and/or B1D8E, perform the diagnostic procedure(s) before continuing.**

With the Scan Tool, select Clear Stored DTCs in the Memory Seat Module.

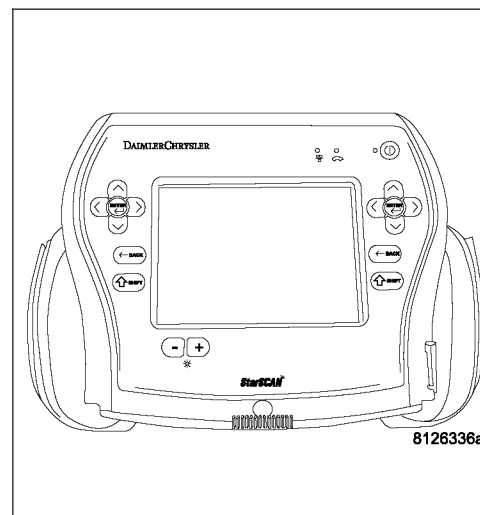
Move the Steering Column Tilt Switch to the Forward and Rearward positions several times, holding the switch in position for at least 2 seconds each time.

With the Scan Tool, select View DTCs in the Memory Seat Module.

**Does the DTC reset and/or remain active?**

**Yes** >> Go to 2

**No** >> Go to 14



**B1D97-STEERING COLUMN TILT MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****2. (P153) TILT STEERING MOTOR UP/DOWN DRIVER CIRCUIT — TEST TO GROUND**

Turn the ignition off.

Disconnect the Steering Tilt Motor harness connector.

Turn the ignition on.

Using a 12-volt test light connected to 12-volts, check the Tilt Steering Motor Up/Down Driver circuit.

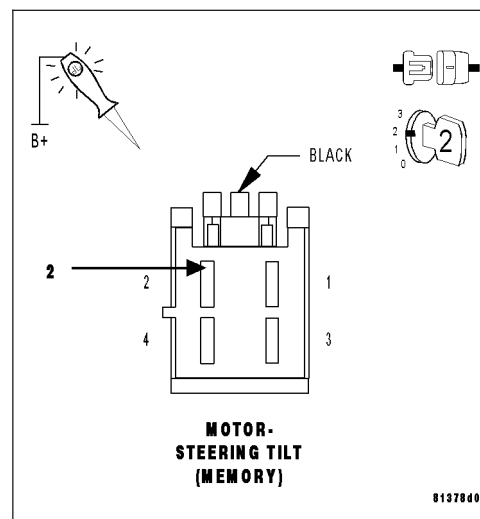
Monitor the test light with the Steering Column Tilt Switch in the Up position, the Down position and with the switch at rest.

The test light should be illuminated and bright only when the switch is in the Down position.

**Does the test light illuminate as described?**

**Yes** >> Go to 3

**No** >> Go to 6

**3. (P953) TILT STEERING MOTOR COMMON CIRCUIT — TEST TO GROUND**

Using a 12-volt test light connected to 12-volts, check the Tilt Steering Motor Common circuit.

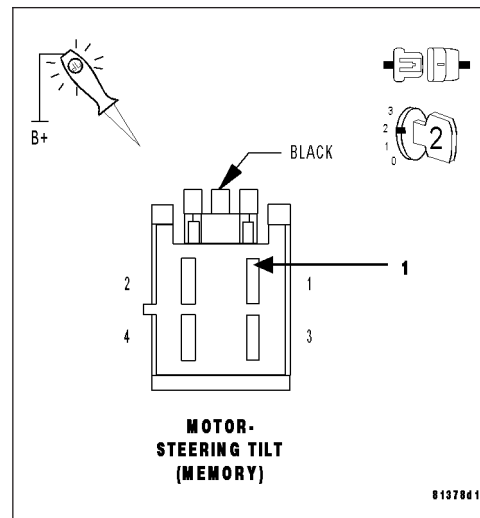
Monitor the test light with the Steering Column Tilt Switch in the Up position, the Down position and with the switch at rest.

The test light should be illuminated and bright when the switch is in the Up position and when the switch is at rest.

**Does the test light illuminate as described?**

**Yes** >> Go to 4

**No** >> Go to 9



**B1D97-STEERING COLUMN TILT MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****4. (P153) TILT STEERING MOTOR UP/DOWN DRIVER CIRCUIT- TEST TO VOLTAGE**

Using a 12-volt test light connected to ground, check the Tilt Steering Motor Up/Down Driver circuit.

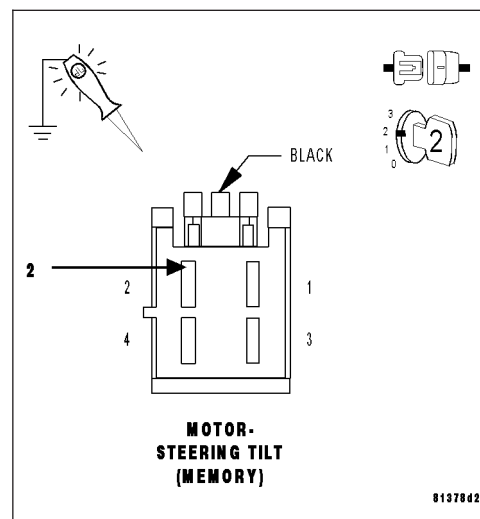
Monitor the test light with the Steering Column Tilt Switch in the Up position, the Down position and with the switch at rest.

The test light should be illuminated and bright only when the switch is in the Up position.

**Does the test light illuminate as described?**

**Yes** >> Go to 5

**No** >> Go to 6

**5. (P953) TILT STEERING MOTOR COMMON CIRCUIT — TEST TO VOLTAGE**

Using a 12-volt test light connected to ground, check the Tilt Steering Motor Common circuit.

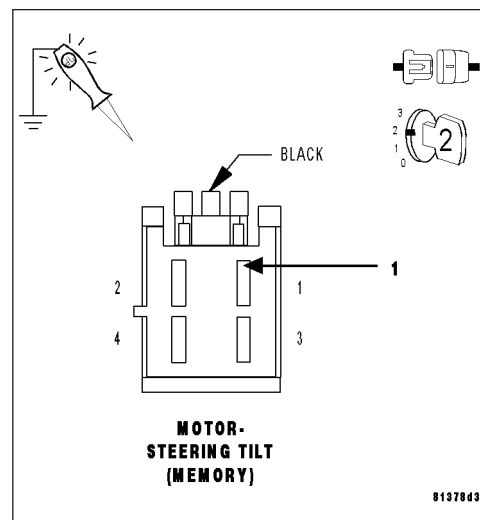
Monitor the test light with the Steering Column Tilt Switch in the Up position, the Down position and with the switch at rest.

The test light should be illuminated and bright only when the switch is in the Down position.

**Does the test light illuminate as described?**

**Yes** >> Go to 12

**No** >> Go to 9



**B1D97-STEERING COLUMN TILT MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****6. (P153) TILT STEERING MOTOR UP/DOWN DRIVER CIRCUIT SHORT TO GROUND**

Turn the ignition off.

Disconnect the Memory Seat Module (MSM) C1 connector.

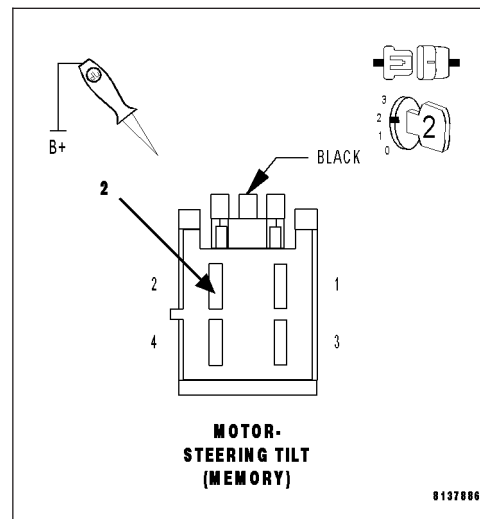
Turn the ignition on.

Using a 12-volt test light connected to 12-volts, check the Tilt Steering Motor Up/Down Driver circuit.

**Does the test light illuminate?**

**Yes** >> Repair the Tilt Steering Motor Up/Down Driver circuit for a short to ground.

**No** >> Go to 7

**7. (P153) TILT STEERING MOTOR UP/DOWN DRIVER CIRCUIT OPEN**

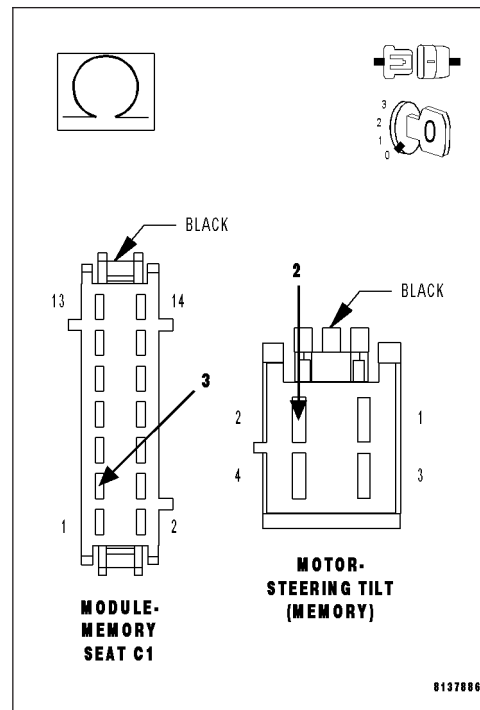
Turn the ignition off.

Measure the resistance of the (P153) Tilt Steering Motor Up/Down Driver circuit.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (P153) Tilt Steering Motor Up/Down Driver circuit for an open.

**No** >> Go to 8



**B1D97-STEERING COLUMN TILT MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****8. (P153) TILT STEERING MOTOR UP/DOWN DRIVER CIRCUIT SHORT TO VOLTAGE**

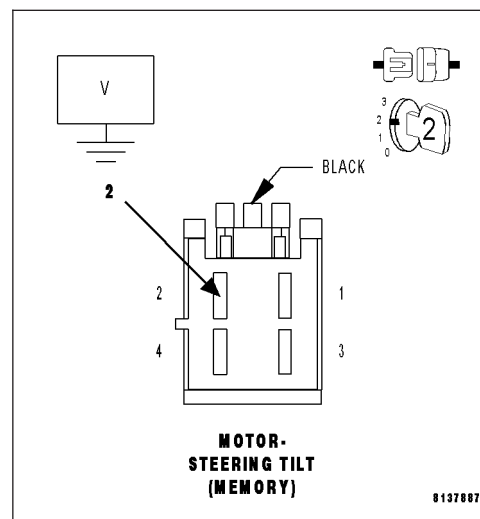
Turn the ignition on.

Measure the voltage of the Tilt Steering Motor Up/Down Driver circuit.

**Is there any voltage present?**

**Yes** >> Repair the Tilt Steering Motor Up/Down Driver circuit for a short to voltage.

**No** >> Go to 13

**9. (P953) TILT STEERING MOTOR COMMON CIRCUIT SHORT TO GROUND**

Turn the ignition off.

Disconnect the Memory Seat Module (MSM) C1 connector.

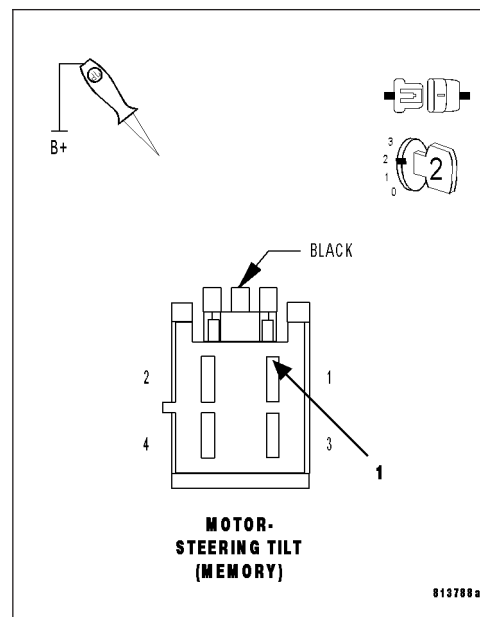
Turn the ignition on.

Using a 12-volt test light connected to 12-volts, check the Tilt Steering Motor Common circuit.

**Does the test light illuminate?**

**Yes** >> Repair the Tilt Steering Motor Common circuit for a short to ground.

**No** >> Go to 10





**B1D97-STEERING COLUMN TILT MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****10. (P953) TILT STEERING MOTOR COMMON CIRCUIT OPEN**

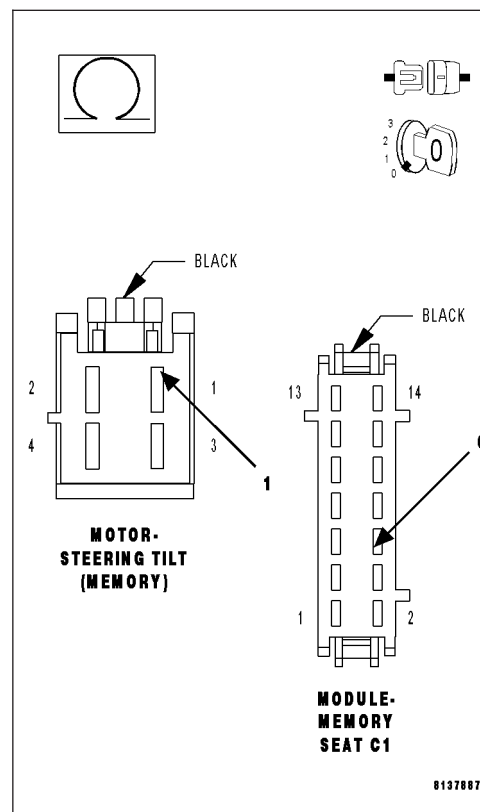
Turn the ignition off.

Measure the resistance of the (P153) Tilt Steering Motor Common circuit.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (P153) Tilt Steering Motor Common circuit for an open.

**No** >> Go to 11

**11. (P953) TILT STEERING MOTOR COMMON CIRCUIT SHORT TO VOLTAGE**

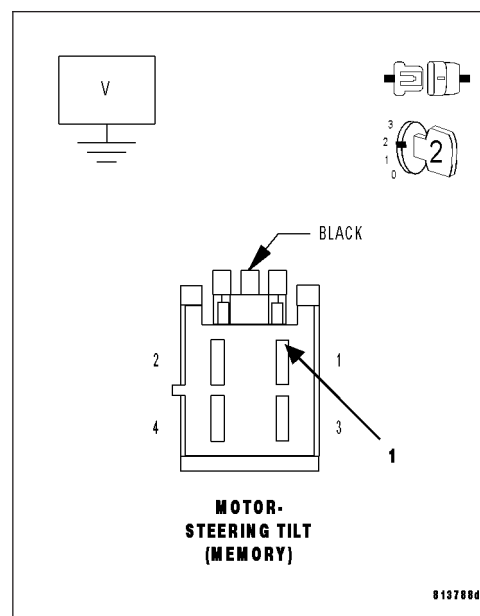
Turn the ignition on.

Measure the voltage of the Tilt Steering Motor Common circuit.

**Is there any voltage present?**

**Yes** >> Repair the Tilt Steering Motor Common circuit for a short to voltage.

**No** >> Go to 13



**B1D97-STEERING COLUMN TILT MOTOR CONTROL CIRCUIT PERFORMANCE (CONTINUED)****12. STEERING COLUMN TILT MOTOR**

Inspect the wiring between the Memory Seat Module harness connector and the Steering Column Tilt Motor harness connector for a short to ground or to any other circuit. If any problems are found, repair as necessary. If no problems are found, view repair.

**Repair**

Replace the Steering Column Tilt Motor in accordance with the Service Information.

---

**13. MEMORY SEAT MODULE (MSM)**

Inspect the wiring between the Memory Seat Module harness connector and the Steering Column Tilt Motor harness connector for a short to ground or to any other circuit. If any problems are found, repair as necessary. If no problems are found, view repair.

**Repair**

Replace the Memory Seat Module (MSM) in accordance with the Service Information.

---

**14. INTERMITTENT STEERING COLUMN TILT MOTOR CONTROL CIRCUIT PERFORMANCE DTC**

The conditions necessary to set this DTC are not present at this time.

While monitoring the scan tool data relative to this circuit, wiggle test the component and connectors and move the switch to each position.

Look for the data to change other than as expected or for the DTC to reset during the wiggle test.

**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

B2225–STEERING COLUMN CONTROL MODULE INTERNAL

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously.
- **Set Condition:**  
The Steering Column Control Module (SCCM) detects an internal failure.

Possible Causes
STEERING COLUMN CONTROL MODULE (SCCM)

Diagnostic Test

1. STEERING CONTROL COLUMN MODULE (SCCM)

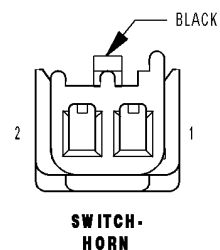
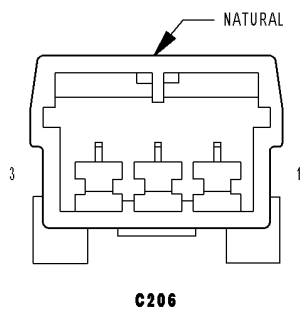
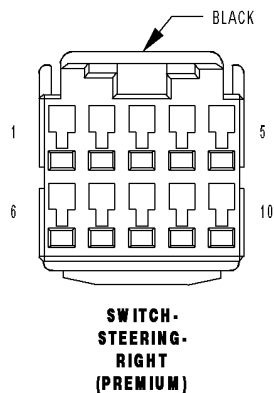
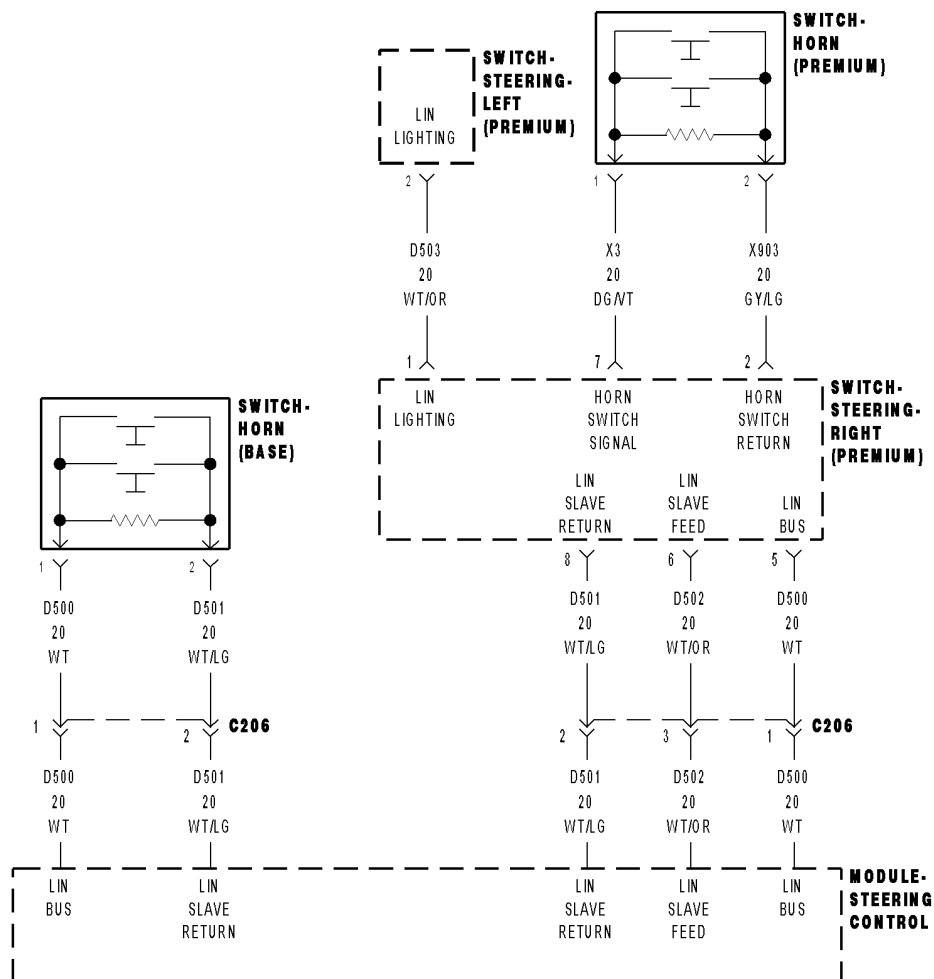
The Steering Column Control Module (SCCM) is reporting internal errors.

[View repair.](#)

Repair

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

# B2332–HORN SWITCH INPUT CIRCUIT/PERFORMANCE



**B2332–HORN SWITCH INPUT CIRCUIT/PERFORMANCE (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

**Theory of Operation**

The Horn Switch is connected to the Right Steering Switch. The switching status is transferred to the Steering Column Control Module (SCCM) by way of the LIN bus, a serial sub-bus. The SCCM converts the data to CAN(B) and sends the message to the corresponding module on the bus.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The Steering Column Control Module senses that the Horn Switch is in the Set position for greater than 50 seconds.

Possible Causes
INTERMITTENT HORN SWITCH INPUT CIRCUIT/PERFORMANCE DTC (X3) HORN SWITCH SIGNAL CIRCUIT SHORT TO (X903) HORN SWITCH RETURN CIRCUIT (X3) HORN SWITCH SIGNAL CIRCUIT SHORT TO GROUND HORN SWITCH RIGHT STEERING SWITCH STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC IS ACTIVE**

**Note:** If P0562–BATTERY VOLTAGE LOW or P0563–BATTERY VOLTAGE HIGH is set along with this DTC, diagnose the battery voltage DTC first.

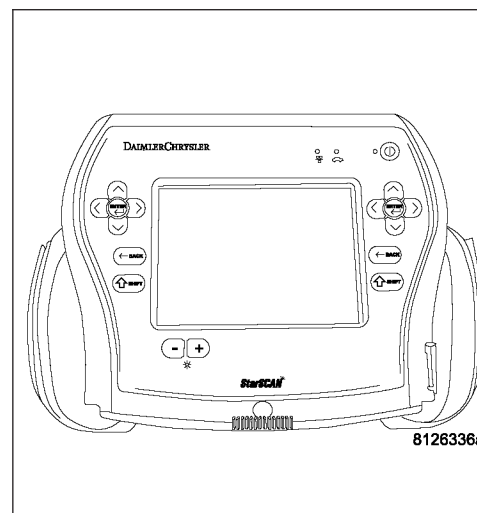
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 7



**B2332-HORN SWITCH INPUT CIRCUIT/PERFORMANCE (CONTINUED)****2. (X3) HORN SWITCH SIGNAL CIRCUIT SHORT TO (X903) HORN SWITCH RETURN CIRCUIT**

Turn the ignition off.

Remove the Driver Airbag in accordance with the Service information.

Disconnect the Horn Switch harness connector.

Disconnect the Right Steering Switch harness connector.

**Note: Before proceeding, thoroughly inspect the wiring harness and connectors between the Horn Switch and the Right Steering Switch for a short to ground or any other circuit.**

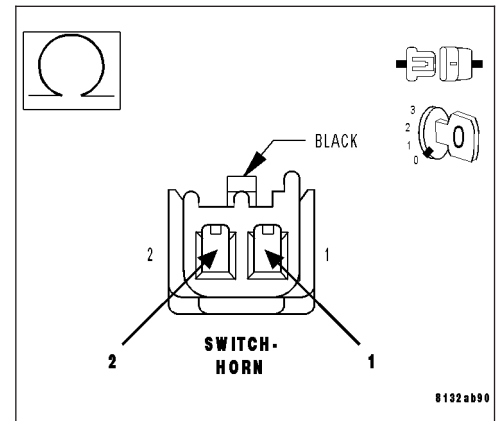
Measure the resistance between the (X3) Horn Switch circuit and the (X903) Horn Switch Return circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (X3) Horn Switch circuit for a short to the (X903) Horn Switch Return circuit.

Perform the VERIFICATION TEST-VER 1.

**No** >> Go to 3

**3. (X3) HORN SWITCH SIGNAL CIRCUIT SHORT TO GROUND**

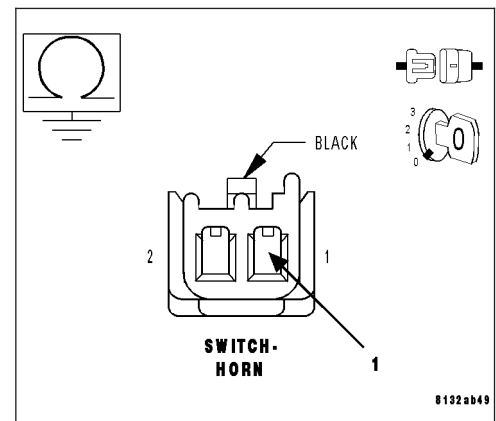
**Note: Before proceeding, thoroughly inspect the wiring harness and connectors between the Horn Switch and the Right Steering Switch for a short to ground or to any other circuit.**

Measure the resistance between the (X3) Horn Switch circuit at the harness connector to the Right Switch and ground (include the metal casing at the back side of the Airbag).

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (X3) Horn Switch circuit for a short to ground.

**No** >> Go to 4

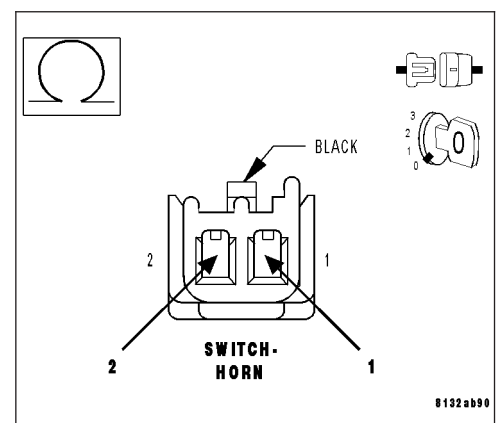
**4. HORN SWITCH**

Measure the resistance between the (X3) Horn Switch circuit and the (X903) Horn Switch Return circuit at the harness connector to the horn switch.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Horn Switch in accordance with the Service Information.

**No** >> Go to 5



**B2332–HORN SWITCH INPUT CIRCUIT/PERFORMANCE (CONTINUED)****5. RIGHT STEERING SWITCH**

Turn the ignition off.

Replace the Right Steering Switch in accordance with the Service Information.

Turn the ignition on.

**Note:** The C206 (LIN bus) connector must be connected for this test.

Press and release the Horn Switch several times.

With the Scan Tool, Clear Stored DTCs in the Steering Column Control Module.

With the Scan Tool, select Data Display and view the Horn switch data.

While monitoring the Horn switch data, press and release the Horn Switch several times.

**Does the Horn switch data change from Set to Not Set when the switch is pressed and released?**

**Yes** >> Test Complete.

**No** >> Go to 6

---

**6. STEERING COLUMN CONTROL MODULE (SCCM)**

View repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

---

**7. INTERMITTENT HORN SWITCH INPUT CIRCUIT/PERFORMANCE DTC**

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---





**U0002–CAN C BUS OFF PERFORMANCE (CONTINUED)**

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Continuously.
- **Set Condition:**  
Whenever the CAN C Bus (+) or CAN C Bus (-) is open, shorted to voltage or shorted to ground.

Possible Causes
INTERMITTENT CAN C BUS OFF PERFORMANCE DTC CAN C BUS DTCs SET IN FRONT CONTROL MODULE (D65) CAN C BUS (+) CIRCUIT OPEN (D64) CAN C BUS (-) CIRCUIT OPEN STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC IS ACTIVE**

Ignition on, engine not running.

With the scan tool, select Clear Stored DTCs in the Steering Column Control Module.

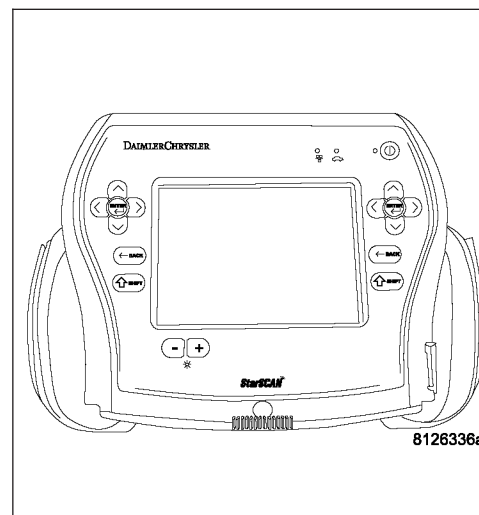
Cycle the ignition from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Does the DTC reset and/or remain active?**

**Yes** >> Go to 2

**No** >> Go to 6

**2. CAN C BUS DTCs SET IN FRONT CONTROL MODULE**

With the Scan Tool, select View DTCs in the Front Control Module (FCM).

**Are there any active CAN C Bus DTCs?**

**Yes** >> Refer to 8 — ELECTRICAL/ELECTRONIC CONTROL MODULES — DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

**No** >> Go to 3

**U0002–CAN C BUS OFF PERFORMANCE (CONTINUED)****3. (D65) CAN C BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Steering Column Control Module harness connector.

Disconnect the Front Control Module C1 harness connector.

Measure the resistance of the (D65) CAN C Bus (+) circuit between the Steering Column Control Module harness connector and the Front Control Module C1 harness connector.

**Is the resistance above 2.0 ohms?**

**Yes** >> Repair the (D65) CAN C Bus (+) circuit for an open.

**No** >> Go to 4

---

**4. (D64) CAN C BUS (-) CIRCUIT OPEN**

Measure the resistance of the (D64) CAN C Bus (-) circuit between the Steering Column Control Module harness connector and the Front Control Module C1 harness connector.

**Is the resistance above 2.0 ohms?**

**Yes** >> Repair the (D64) CAN C Bus (-) circuit for an open.

**No** >> Go to 5

---

**5. STEERING COLUMN CONTROL MODULE (SCCM)**

Inspect the wiring between the Steering Column Control Module harness connector and the Front Control Module harness connector. If any problems are found, repair as necessary. If no problems are found, view repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

---

**6. INTERMITTENT CAN C BUS OFF PERFORMANCE DTC**

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

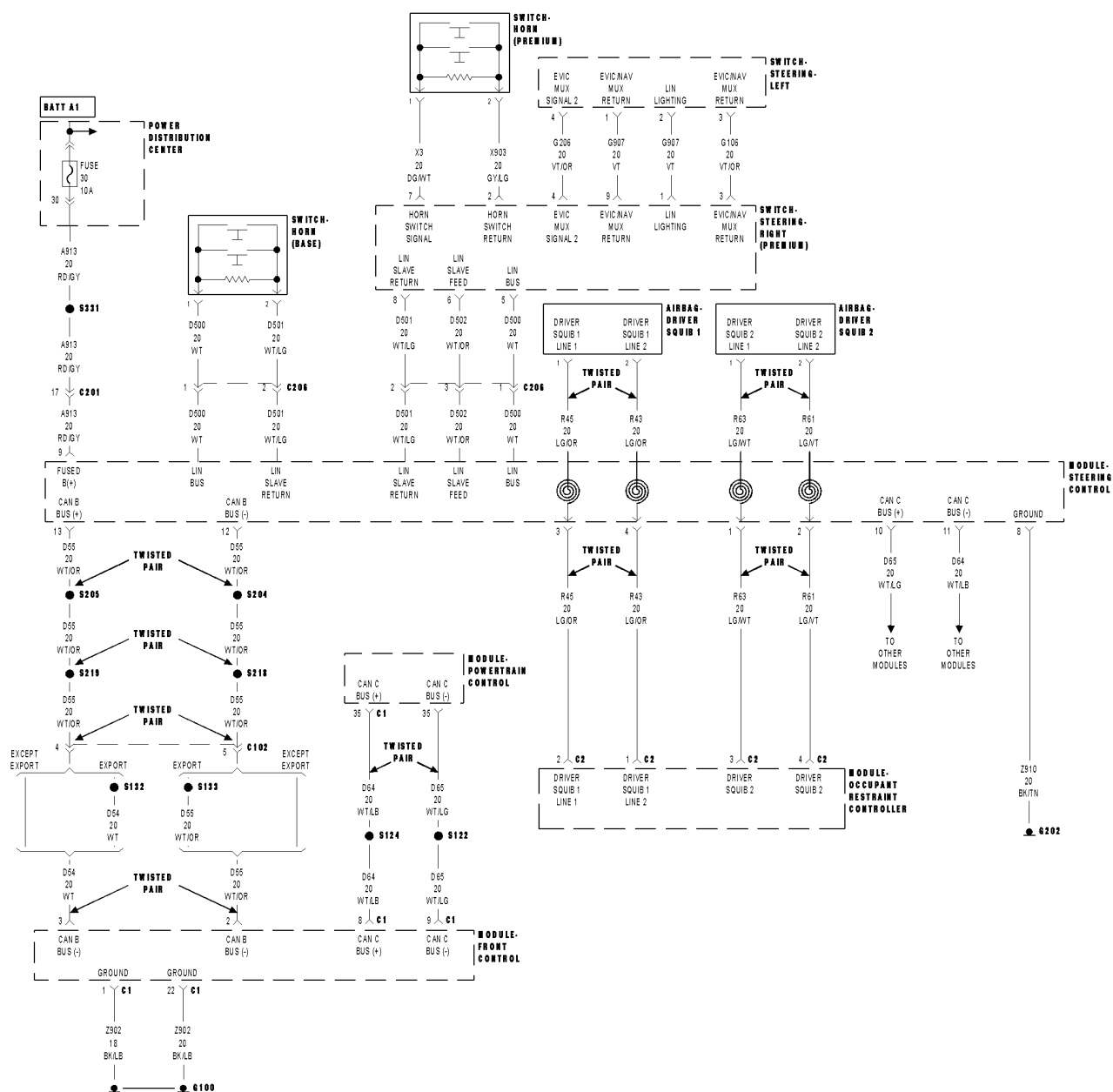
**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

## U0019-CAN B BUS CIRCUIT



**U0019–CAN B BUS CIRCUIT (CONTINUED)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously.
- **Set Condition:**  
Whenever the CAN B Bus (+) or CAN B Bus (-) is open, shorted to voltage or shorted to ground.

Possible Causes
INTERMITTENT CAN B BUS CIRCUIT DTC CAN B BUS DTCs SET IN FRONT CONTROL MODULE (D55) CAN B BUS (+) CIRCUIT OPEN (D54) CAN B BUS (-) CIRCUIT OPEN STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC IS ACTIVE**

Ignition on, engine not running.

With the scan tool, select Clear Stored DTCs in the Steering Column Control Module.

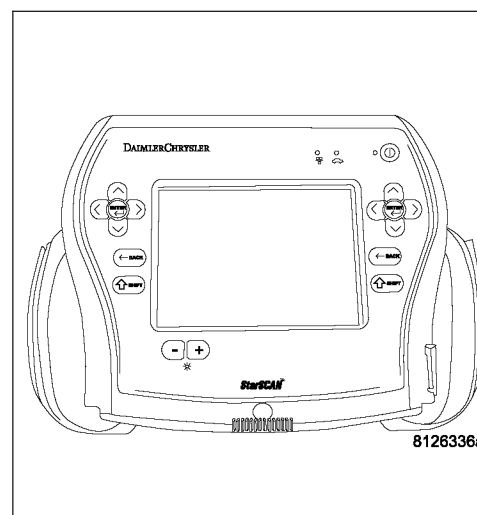
Cycle the ignition from off to on at least 5 times, leaving the ignition on for a minimum of 90 seconds per cycle.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Does the DTC reset and/or remain active?**

**Yes** >> Go to 2

**No** >> Go to 6

**2. CAN B BUS DTCs SET IN FRONT CONTROL MODULE**

With the Scan Tool, select View DTCs in the Front Control Module (FCM).

**Are there any active CAN B Bus DTCs?**

**Yes** >> Refer to 8 — ELECTRICAL/ELECTRONIC CONTROL MODULES — DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

**No** >> Go to 3

**U0019–CAN B BUS CIRCUIT (CONTINUED)****3. (D55) CAN B BUS (+) CIRCUIT OPEN**

Turn the ignition off.

Disconnect the Steering Column Control Module harness connector.

Disconnect the Front Control Module C1 harness connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Steering Column Control Module harness connector and the Front Control Module C1 harness connector.

**Is the resistance above 2.0 ohms?**

**Yes** >> Repair the (D55) CAN B Bus (+) circuit for an open.

**No** >> Go to 4

---

**4. (D54) CAN B BUS (-) CIRCUIT OPEN**

Measure the resistance of the (D54) CAN B Bus (-) circuit between the Steering Column Control Module harness connector and the Front Control Module C1 harness connector.

**Is the resistance above 2.0 ohms?**

**Yes** >> Repair the (D54) CAN B Bus (-) circuit for an open.

**No** >> Go to 5

---

**5. STEERING COLUMN CONTROL MODULE (SCCM)**

Inspect the wiring between the Steering Column Control Module harness connector and the Front Control Module harness connector. If any problems are found, repair as necessary. If no problems are found, view repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

---

**6. INTERMITTENT CAN B BUS CIRCUIT DTC**

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

## **U0121—LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

### **Diagnostic Test**

#### **1. LOST COMMUNICATION WITH ANTI-LOCK BRAKE SYSTEM (ABS) CONTROL MODULE**

The Steering Column Control Module (SCCM) is reporting that network communication has been lost with the ABS Control module.

**View repair.**

#### **Repair**

Refer to 8 — ELECTRICAL/ELECTRONIC CONTROL MODULES — DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

---

## **U0141—LOST COMMUNICATION WITH FRONT CONTROL MODULE**

For a complete wiring diagram **Refer to Section 8W.**

### **Diagnostic Test**

#### **1. LOST COMMUNICATION WITH FRONT CONTROL MODULE (FCM)**

The Steering Column Control Module (SCCM) is reporting that network communication has been lost with the Front Control Module (FCM).

**View repair.**

#### **Repair**

Refer to 8 — ELECTRICAL/ELECTRONIC CONTROL MODULES — DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

---

**U0155—LOST COMMUNICATION WITH CLUSTER / CCN**

For a complete wiring diagram **Refer to Section 8W.**

**Diagnostic Test****1. LOST COMMUNICATION WITH INSTRUMENT CLUSTER (CCN)**

The Steering Column Control Module (SCCM) is reporting that network communication has been lost with the Instrument Cluster (CCN).

**View repair.**

**Repair**

Refer to 8 — ELECTRICAL/ELECTRONIC CONTROL MODULES — DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

---



## U0212—LOST COMMUNICATION WITH STEERING COLUMN CONTROL MODULE

For a complete wiring diagram **Refer to Section 8W.**

### Diagnostic Test

#### 1. LOST COMMUNICATION WITH STEERING COLUMN CONTROL MODULE (SCCM)

The Memory Seat Module (MSM) is reporting that network communication has been lost with the Steering Column Control Module (SCCM).

**View repair.**

#### Repair

Refer to 8 — ELECTRICAL/ELECTRONIC CONTROL MODULES — DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.

---

**U1109—LOST COMMUNICATION WITH LIN STEERING WHEEL CONTROLS**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The Steering Wheel Control Switch status is transferred to the Steering Column Control Module (SCCM) by way of the LIN bus, a serial sub-bus. The SCCM converts the data to CAN and sends the messages to the corresponding module(s) on the bus.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
There is no response from the Steering Column Control (LIN) Switch for 10 ms.

Possible Causes
INTERMITTENT LOST COMMUNICATION WITH LIN STEERING WHEEL CONTROLS DTC LIN BUS WIRING AND CONNECTORS CLOCKSPRING RIGHT STEERING SWITCH STEERING COLUMN CONTROL MODULE (SCCM)

**Diagnostic Test****1. DTC IS ACTIVE**

**Note:** If P0562—BATTERY VOLTAGE LOW or P0563—BATTERY VOLTAGE HIGH is set along with this DTC, diagnose the battery voltage DTC first.

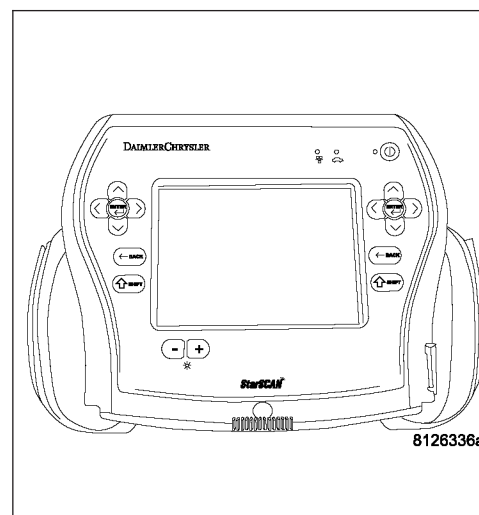
Ignition on, engine not running.

With the Scan Tool, select View DTCs in the Steering Column Control Module.

**Is the DTC status Active at this time?**

**Yes** >> Go to 2

**No** >> Go to 6



**U1109–LOST COMMUNICATION WITH LIN STEERING WHEEL CONTROLS (CONTINUED)****2. LIN BUS WIRING AND CONNECTORS**

Turn the ignition off.

Remove the Driver Airbag in accordance with the Service Information.

**Note:** Before proceeding, thoroughly inspect the wiring harness and connectors between the Clockspring and the Right Steering Switch for a short to ground or any other circuit.

Disconnect the Right Steering Switch harness connector.

Disconnect the C206 harness connector.

Measure the resistance of the following LIN Bus circuits:

- The (D500) LIN Bus circuit between the Right Steering Switch harness connector and the C206 harness connector (Steering Pad side).
- The (D501) LIN Bus Slave Return circuit between the Right Steering Switch harness connector and the C206 harness connector (Steering Pad side).
- The (D502) LIN Bus Slave Feed circuit between the Right Steering Switch harness connector and the C206 harness connector (Steering Pad side).

**Is the resistance above 5.0 ohms for any of the LIN Bus circuits?**

**Yes** >> Repair the LIN Bus circuit(s) for an open.

**No** >> Go to 3

---

**3. CLOCKSPRING**

Remove the Clockspring in accordance with the Service Information.

Measure the resistance of the following LIN Bus circuits:

- The (D500) LIN Bus circuit between the Clockspring connector to the SCCM and the C206 harness connector (Clockspring side).
- The (D501) LIN Bus Slave Return circuit between the Clockspring connector to the SCCM and the C206 harness connector (Clockspring side).
- The (D502) LIN Bus Slave Feed circuit between the Clockspring connector to the SCCM and the C206 harness connector (Clockspring side).

**Is the resistance above 5.0 ohms for any of the LIN Bus circuits?**

**Yes** >> Repair the LIN Bus circuit(s) for an open.

**No** >> Go to 4

---

**4. RIGHT STEERING SWITCH**

Replace the Right Steering Switch in accordance with the Service Information.

Reconnect the Clockspring.

Reconnect the C206 (LIN Bus) connector.

Turn the ignition on.

With the scan tool, select Clear Stored DTCs in the Steering Column Control Module.

With the scan tool, select View DTCs in the Steering Column Control Module.

**Does the DTC reset?**

**Yes** >> Go to 5

**No** >> Test complete.

---

**U1109—LOST COMMUNICATION WITH LIN STEERING WHEEL CONTROLS (CONTINUED)****5. STEERING COLUMN CONTROL MODULE (SCCM)**

View repair.

**Repair**

Replace the Steering Column Control Module (SCCM) in accordance with the Service Information.

---

**6. INTERMITTENT LOST COMMUNICATION WITH LIN STEERING WHEEL CONTROLS DTC**

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

**Were any problems found?**

**Yes** >> Repair as necessary.

**No** >> Test complete.

---

## COLUMN - SERVICE INFORMATION

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## COLUMN - SERVICE INFORMATION

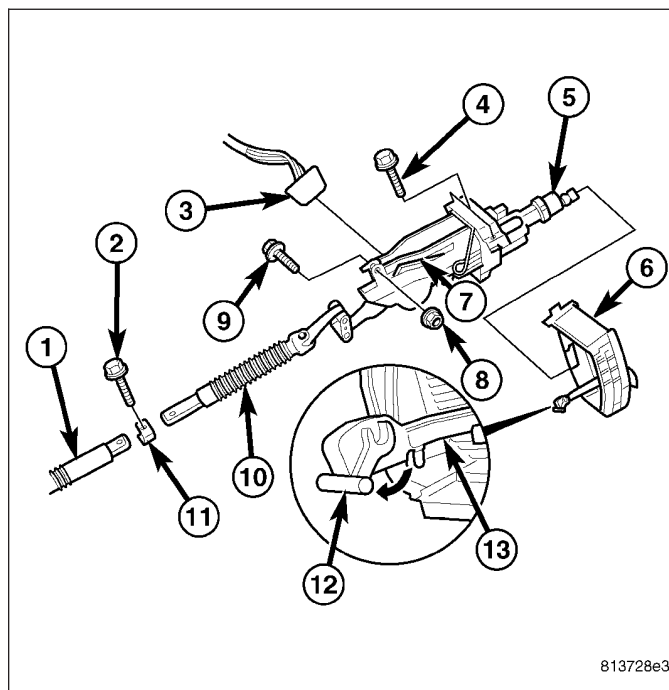
### DESCRIPTION

The tilt , telescoping (10) and electronic telescoping (7) column has been designed to be serviced as an assembly; less wiring (5), switches, shrouds, steering wheel, etc. Most steering column components can be serviced without removing the steering column from the vehicle.

To service the steering wheel, switches or airbag, refer to Restraints and follow all WARNINGS and CAUTIONS.

**Note:** When servicing the steering wheel after removing the old bolt a new bolt must be used when installing.

**Note:** When servicing the steering coupler a new bolt must be used when installing.



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**WARNING:** THE AIRBAG SYSTEM IS A SENSITIVE, COMPLEX ELECTRO-MECHANICAL UNIT. BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL THE AIRBAG SYSTEM COMPONENTS YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY. THE FASTENERS, SCREWS, AND BOLTS, ORIGINALLY USED FOR THE AIRBAG COMPONENTS, HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANYTIME A NEW FASTENER IS NEEDED, REPLACE WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR FASTENERS LISTED IN THE PARTS BOOKS.

**CAUTION:** Do not hammer on steering column shaft. This may cause damage to the column internally.

**CAUTION:** Do not attempt to remove or modify any part of the column.

## DIAGNOSIS AND TESTING

### STEERING COLUMN

If the vehicle is involved in a front end collision and/or the air bag has deployed, the steering column must be replaced.

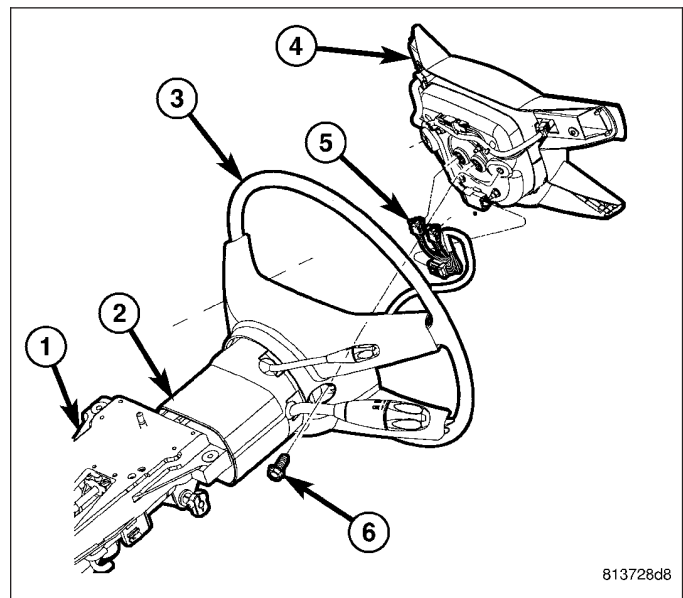
### REMOVAL

**WARNING:** Before servicing the steering column the airbag system must be disarmed. Refer to electrical restraint system for service procedures. Failure to do so may result in accidental deployment of the airbag and possible personal injury.

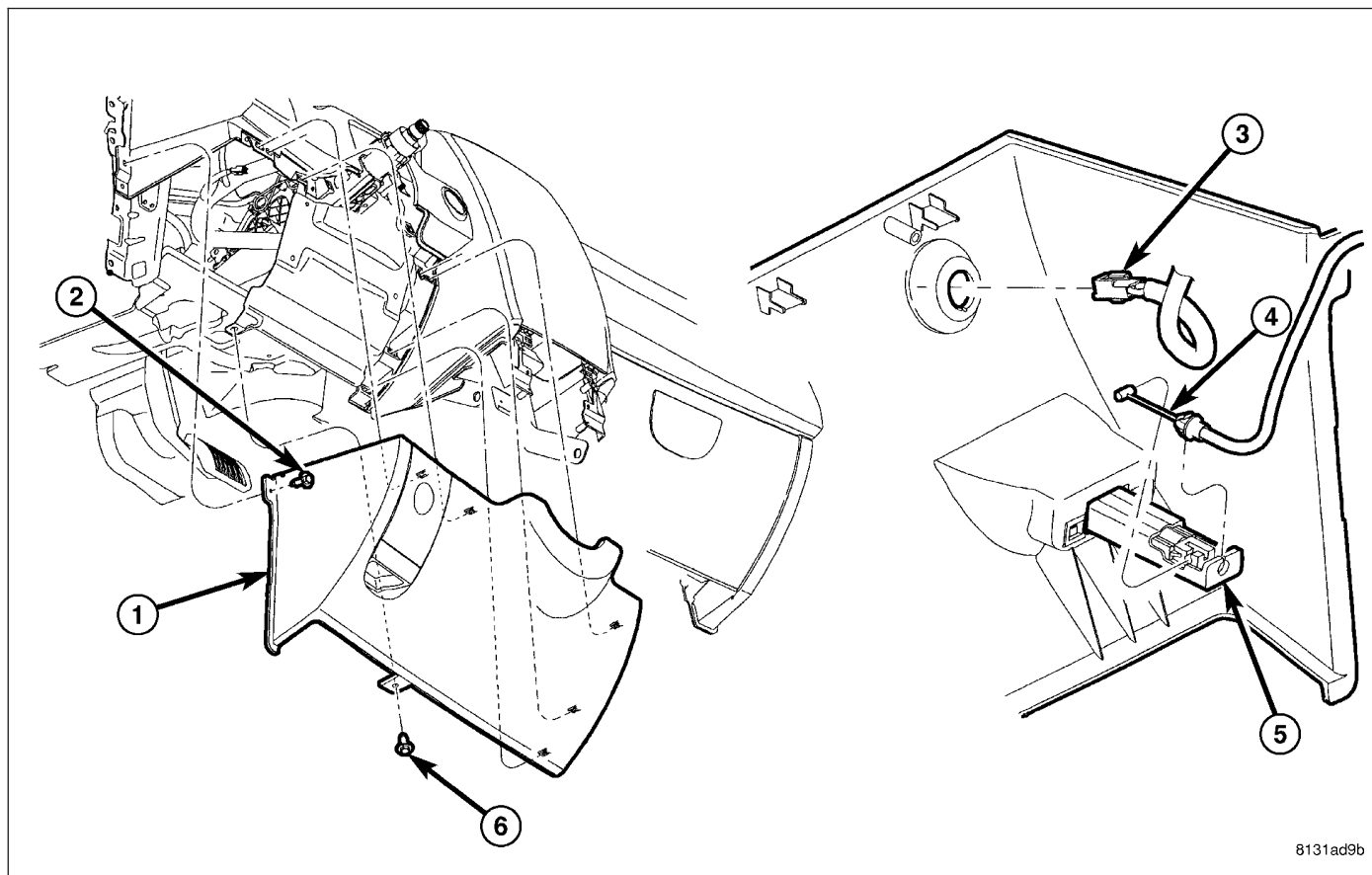
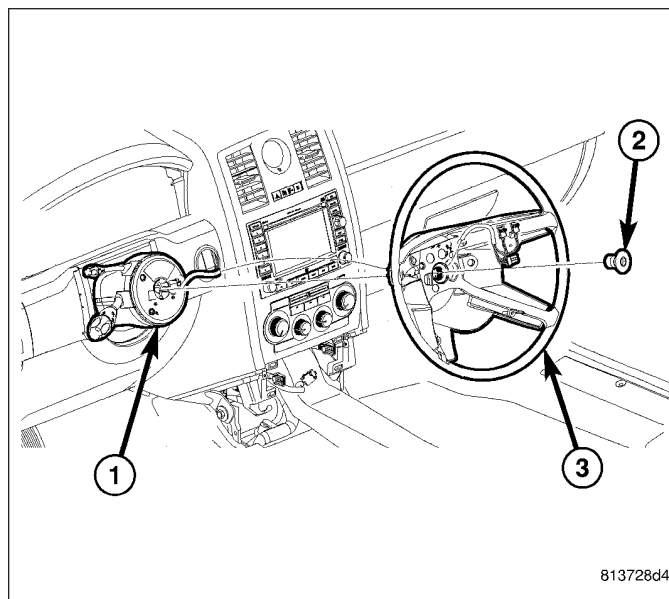
**CAUTION:** All fasteners must be torqued to specification to ensure proper operation of the steering column.

**Note:** If steering column being removed is an electric telescoping column and it is being reused, place column in mid-tilt position before removal to ease installation.

1. Position the front wheels **straight-ahead**.
2. Fully extend or pull out adjustable steering column.
3. Disconnect the negative (ground) cable from the battery.
4. Remove the airbag (4), (Refer to 8 - ELECTRICAL/ RESTRAINTS/DRIVER AIRBAG - REMOVAL).

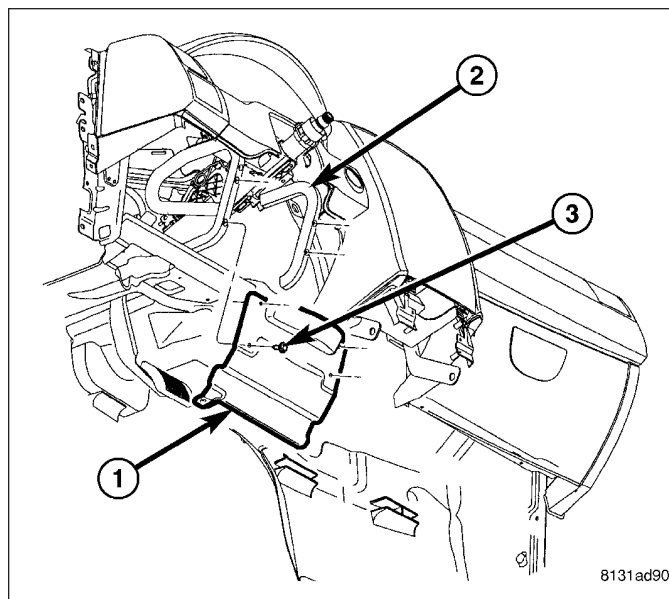


5. Remove the steering wheel retainer bolt (2) then slide the steering wheel (3) off the shaft.

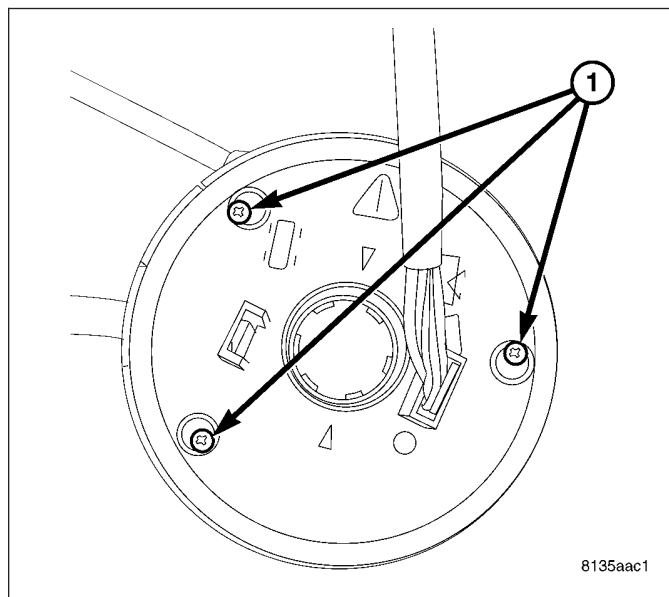


6. Remove the steering column opening cover (1)(Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

7. Remove the steering column opening reinforcement (1).

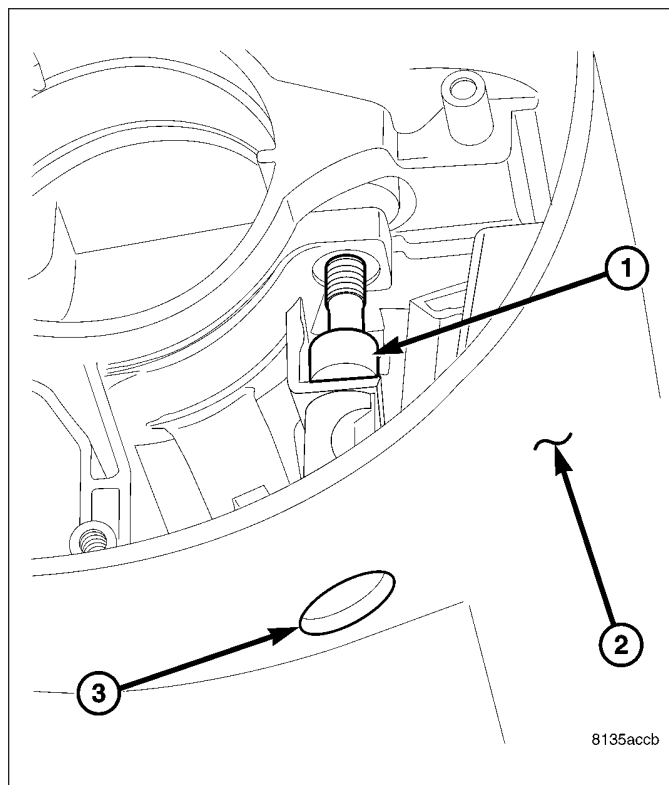


8. Remove at least one clockspring screw (1), (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).

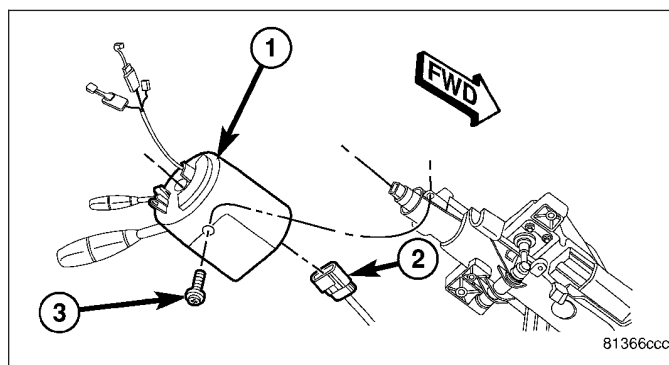




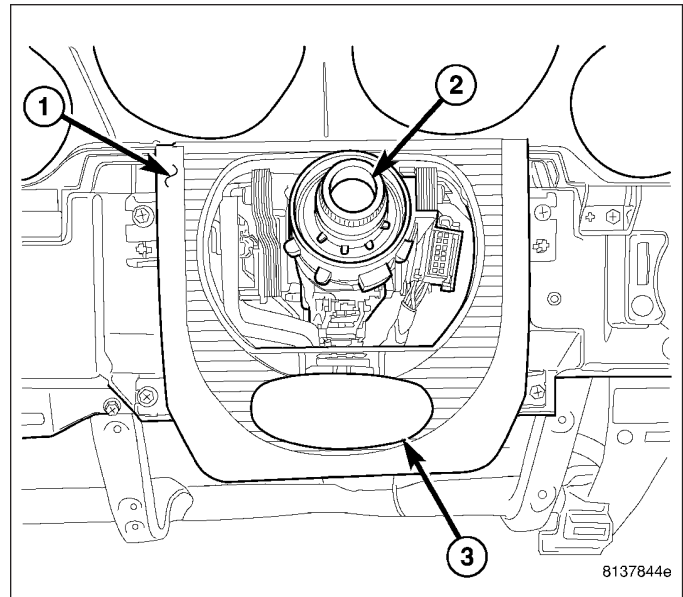
9. Back out the set screw (1) through the access hole (3) in the steering column control module (SCCM) (2) securing the multi function sccm assembly.



10. Pull the sccm assembly (1) off the steering column shaft.



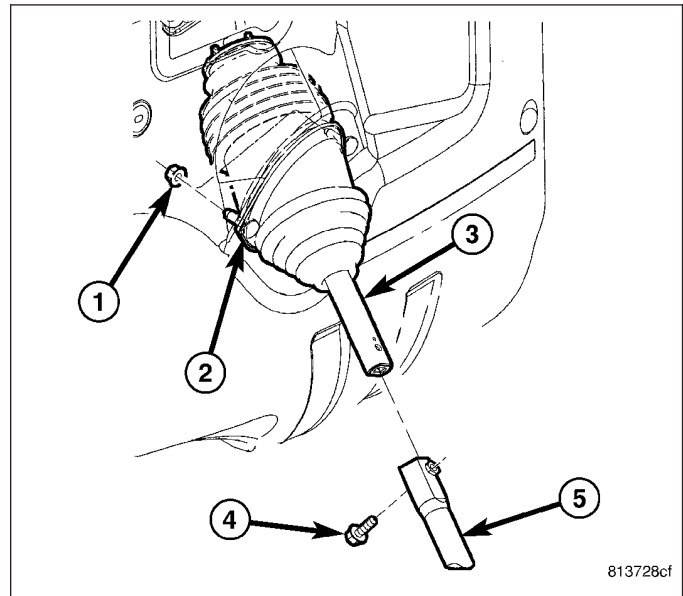
11. Remove the roll top shroud (1).



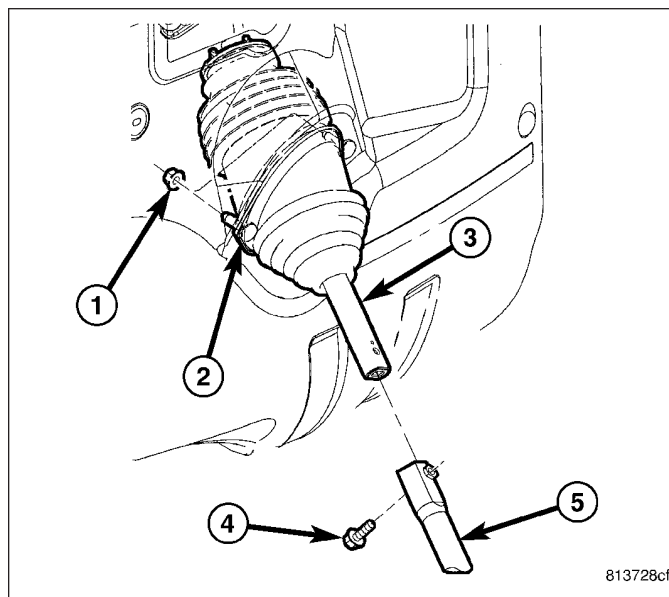
12. Remove the two retaining nuts (1) at the bulkhead (2) for the steering column.

13. Remove the instrument cluster assembly. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL)

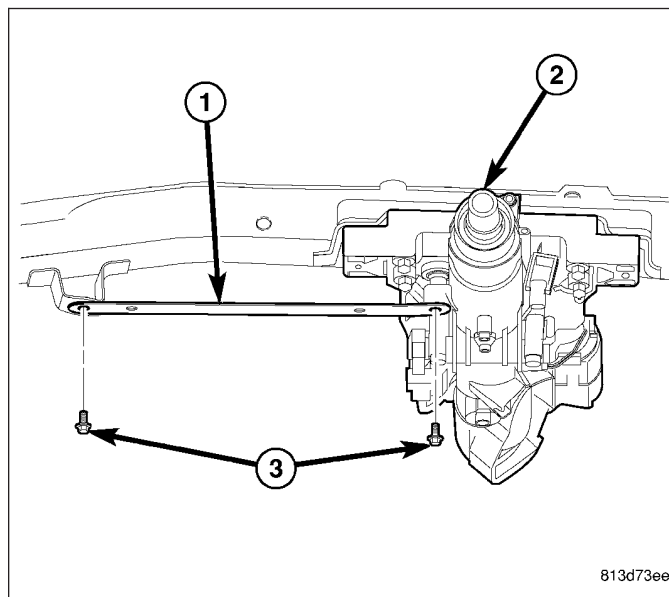
14. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)



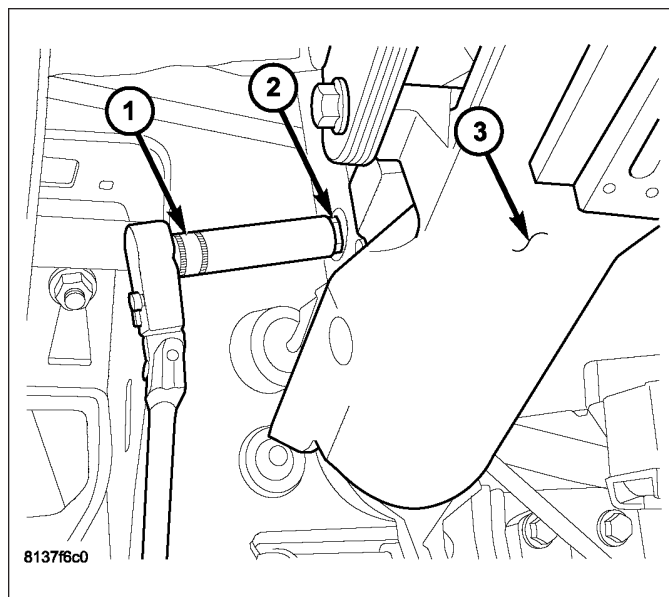
15. Remove the pinch bolt (4) at the lower coupling shaft (5).
16. Slide the steering shaft (3) out of the lower coupling shaft (5).
17. Lower vehicle.



18. If equipped with electronic telescoping column, remove the screws (3) mounting the brace (1) to the steering column (2) and support beam bracket.

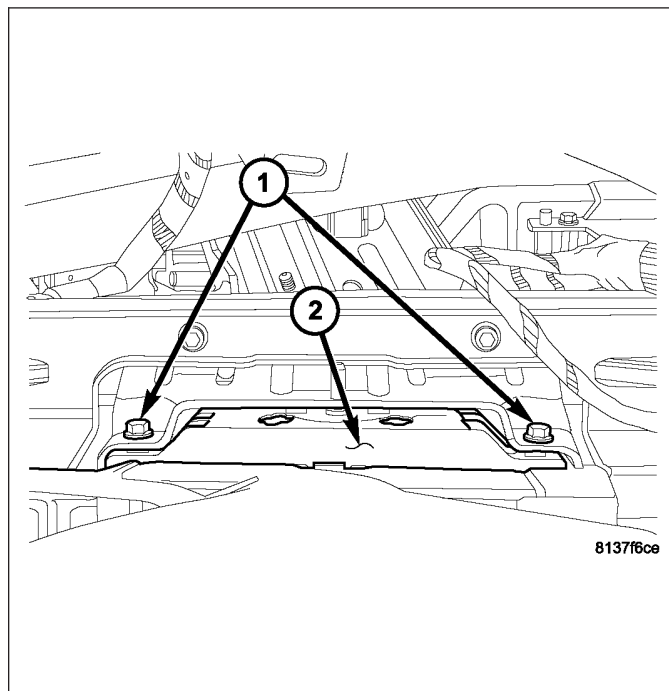


19. Remove the lower steering column mounting pivot bolt and nut (2).



**CAUTION:** When handling the steering column use care to avoid holding the column by any part of the tilt/telescope mechanism or by the shaft boot. The column should be held by its mounting bracket and the shaft by the exposed portions.

20. Remove the two upper mounting bolts (1) from the steering column (3)
21. Remove the steering column assembly from the vehicle.
22. Transfer remaining parts if necessary to the new column.



## INSTALLATION

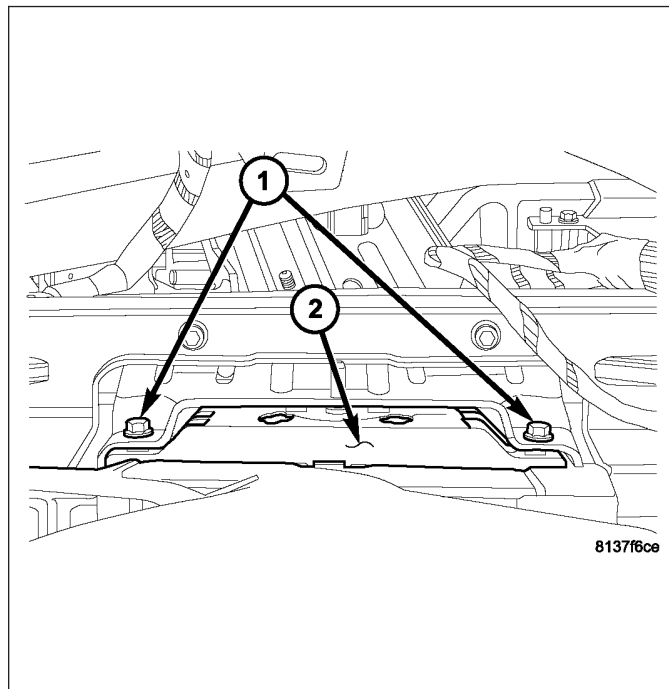
**WARNING:** Before servicing the steering column the airbag system must be disarmed. Refer to electrical restraint system for service procedures. Failure to do so may result in accidental deployment of the airbag and possible personal injury.

**CAUTION:** When handling the steering column use care to avoid holding the column by any part of the tilt/telescope mechanism or by the shaft boot. The column should be held by its mounting bracket and the shaft by the exposed portions.

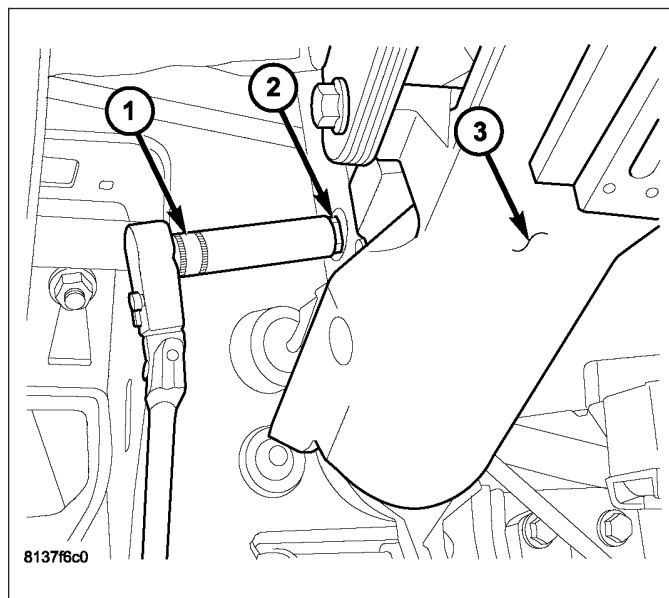
**CAUTION:** All fasteners must be torqued to specification to ensure proper operation of the steering column.

**Note:** New bolts must be used for reinstallation.

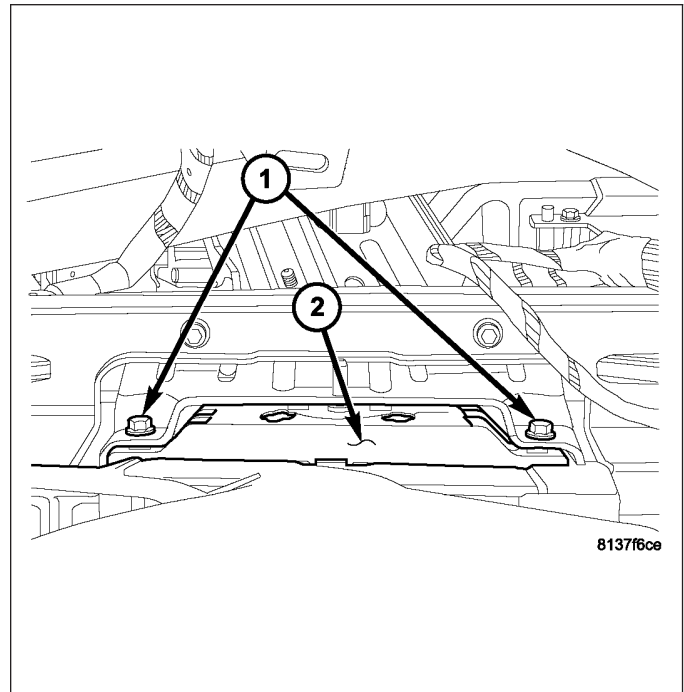
1. Position the steering column (2) on the instrument panel and loosely install the upper mounting screws (1).



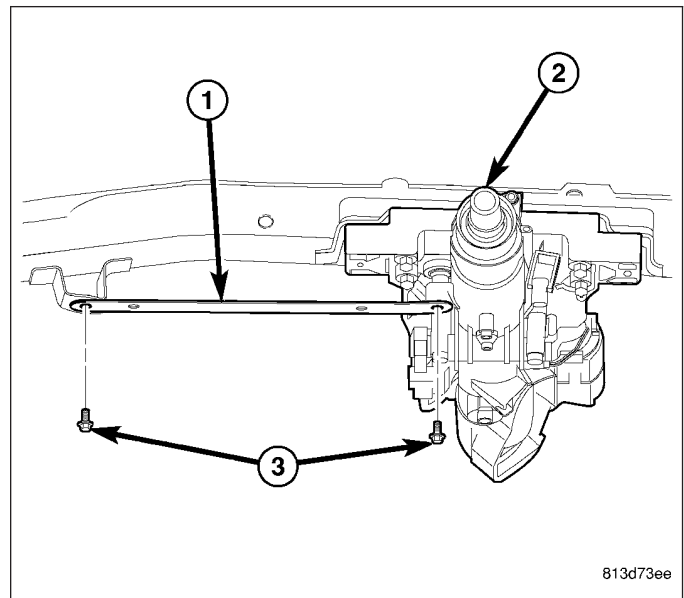
2. Firmly slide the steering column upward against the instrument panel and hand tighten the pivot bolt and nut (2).



3. Tighten the steering column upper mounting screws (1) to 30 N·m (22 ft. lbs.).

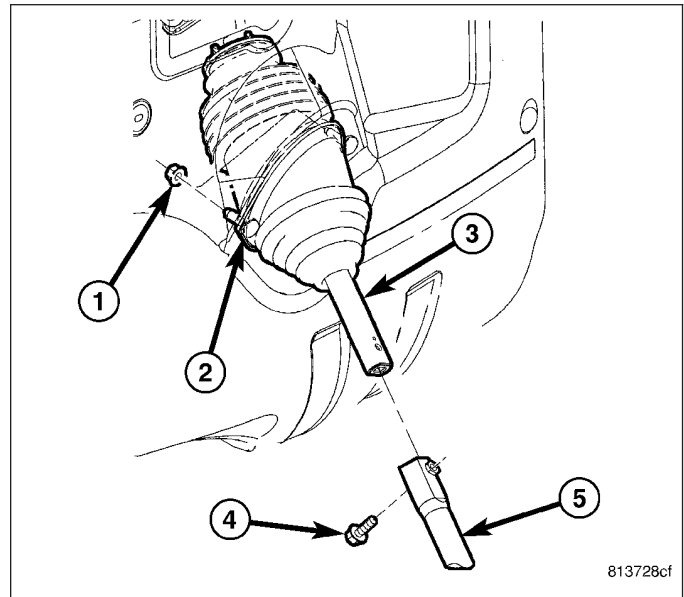


4. If equipped with electronic telescoping column, Install the screws (3) fastening the brace (1) to the steering column (2) and support beam bracket. First, tighten mounting screw at the column to 29 N·m (21 ft. lbs.). Then, tighten mounting screw at the support beam to 12 N·m (106 in. lbs.).

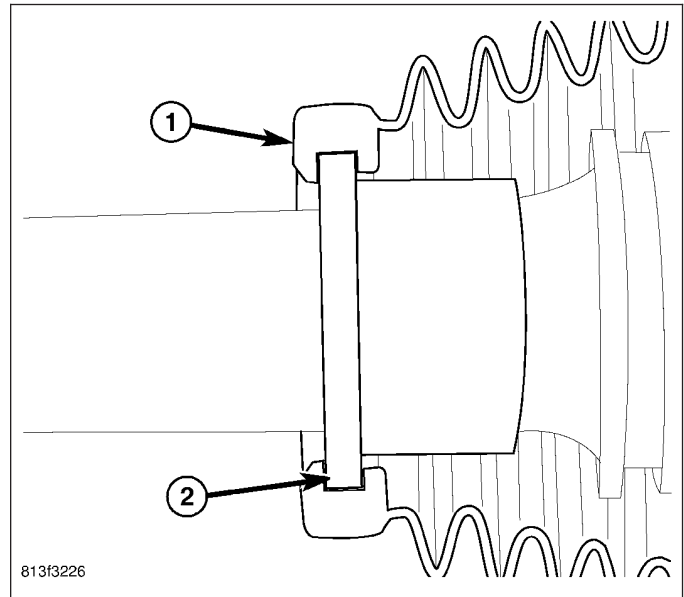


**CAUTION:** When handling the steering column, care must be taken not to squeeze the boot or distort the seal to the body.

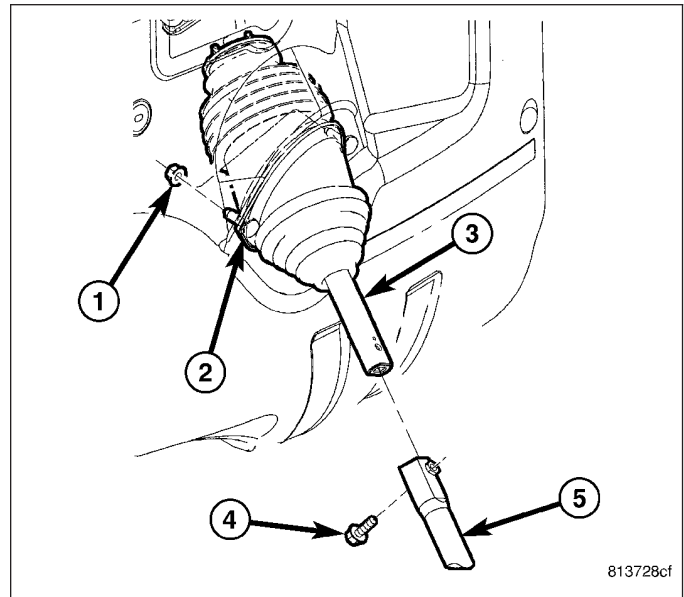
5. Center the two retaining nuts (1) at the bulkhead (2) for the steering column and tighten mounting nuts to 7 N·m (62 in. lbs.).
6. Raise and support vehicle.



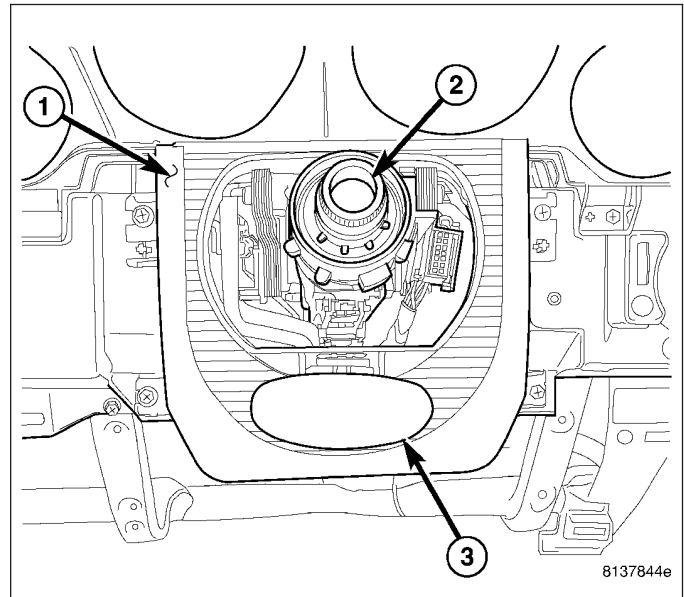
7. Check and make sure plastic collar (2) on column shaft is engaged in groove within boot (1).



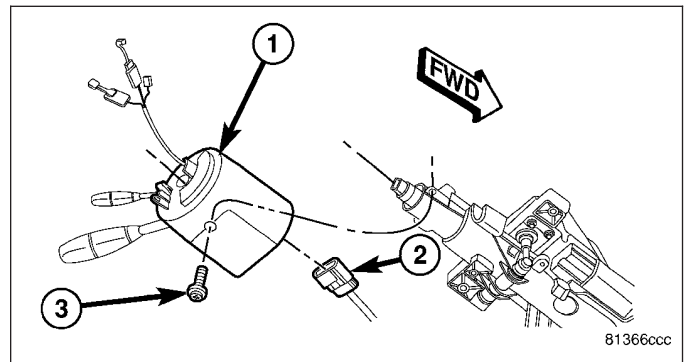
8. Align the pin on the steering shaft with the slot in the lower coupling shaft and slide the steering shaft (3) into the lower coupling (5).
9. Install a **NEW** pinch bolt (4). Tighten pinch bolt to 31 N·m (23 ft. lbs.).
10. Lower the vehicle.
11. Install the instrument cluster. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION)



12. Install the roll top shroud (1).

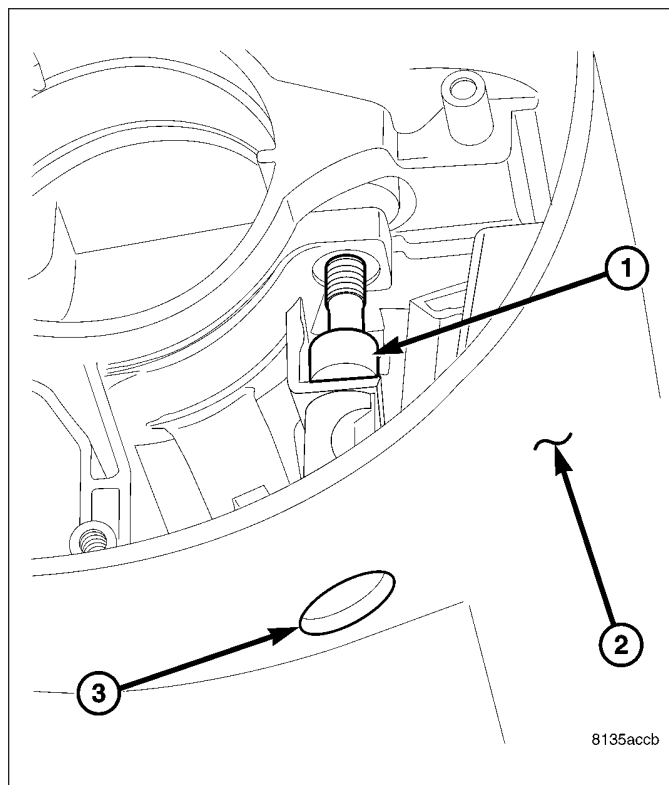


13. Install the SCCM assembly (1) onto the steering column.

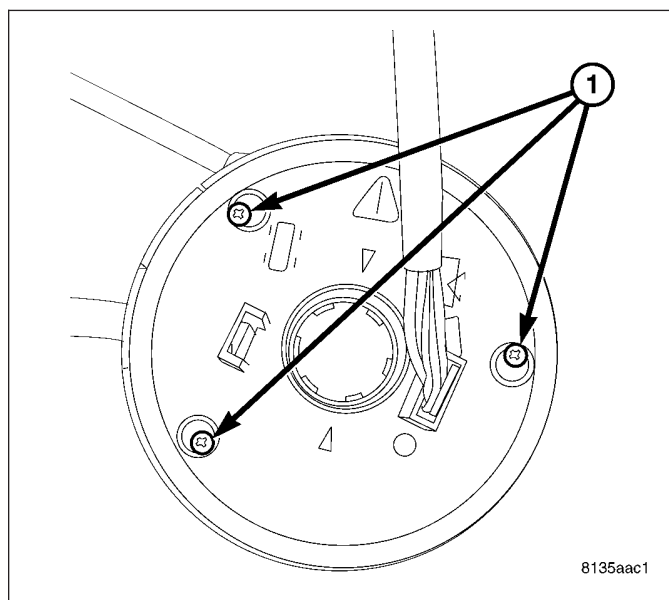




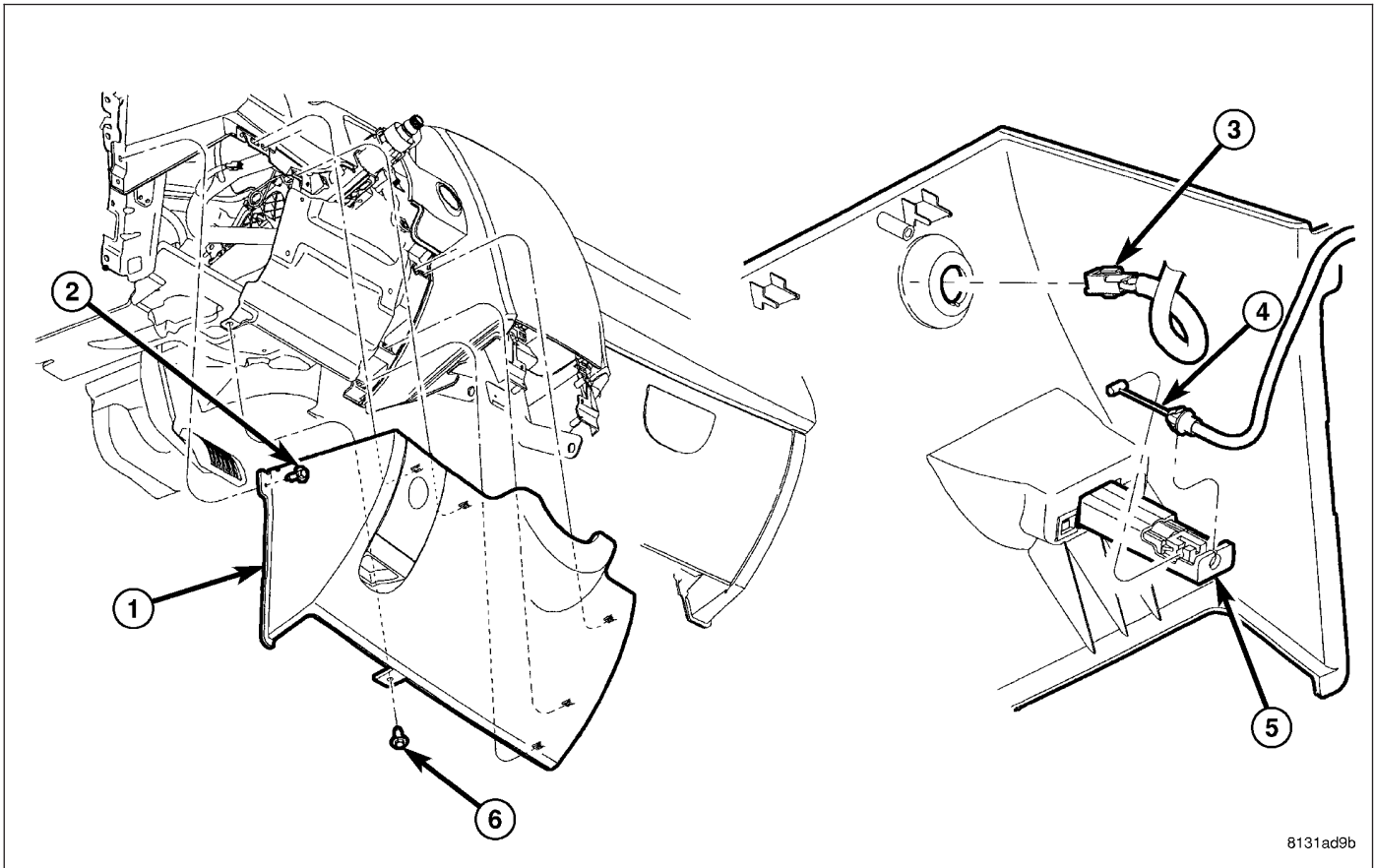
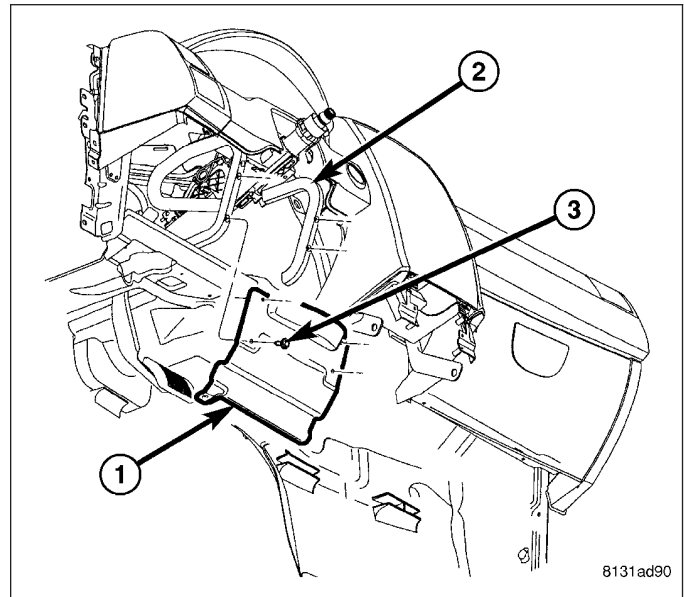
14. Tighten the set screw (1) securing the SCCM assembly (2).



15. Tighten clockspring screws (1) that were backed out to keep the clockspring from unwinding (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCK-SPRING - REMOVAL).

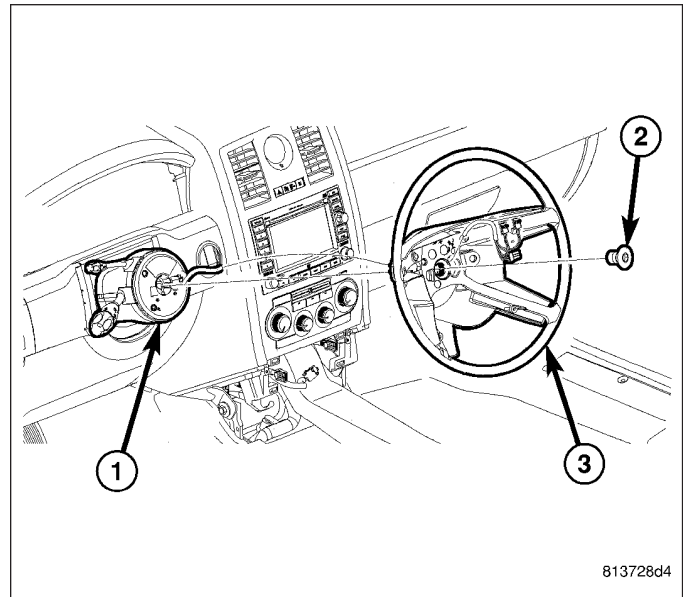


16. Install the steering column opening reinforcement (1).

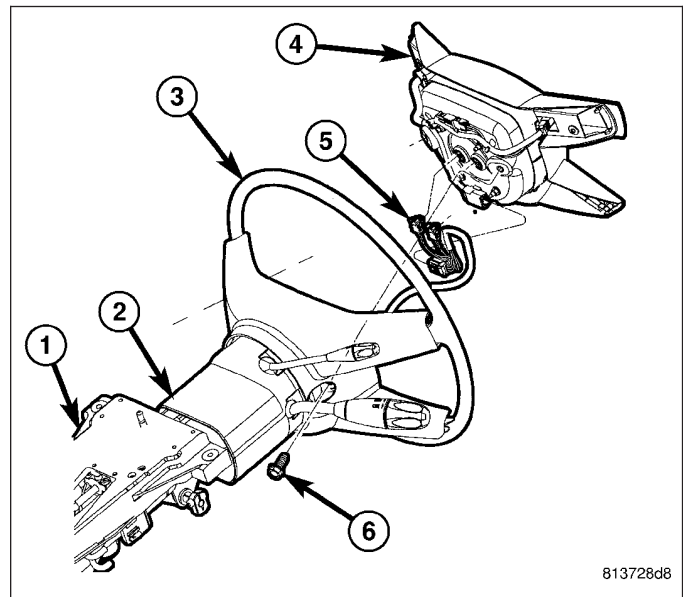


17. Install the steering column opening cover (1).

18. Align the spline on the steering wheel hub to shaft.
19. Then install the steering wheel (3) and install a **NEW** retainer bolt (2). Tighten the bolt to 70 N·m (52 ft. lbs.).



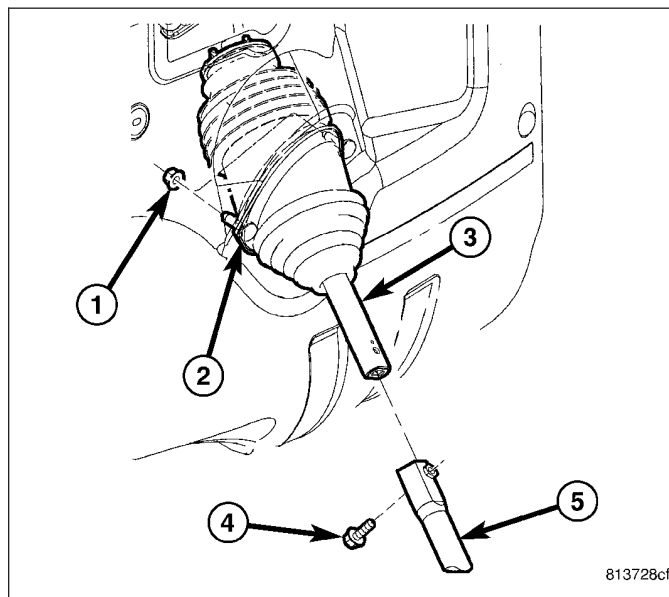
20. Install the airbag (4) (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).
21. Install the negative battery terminal on the battery. It is important that this is performed properly (including calibration of steering angle sensor if equipped with ESP). (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)
22. Test the operation of the horn, lights and any other functions that are steering column operated.



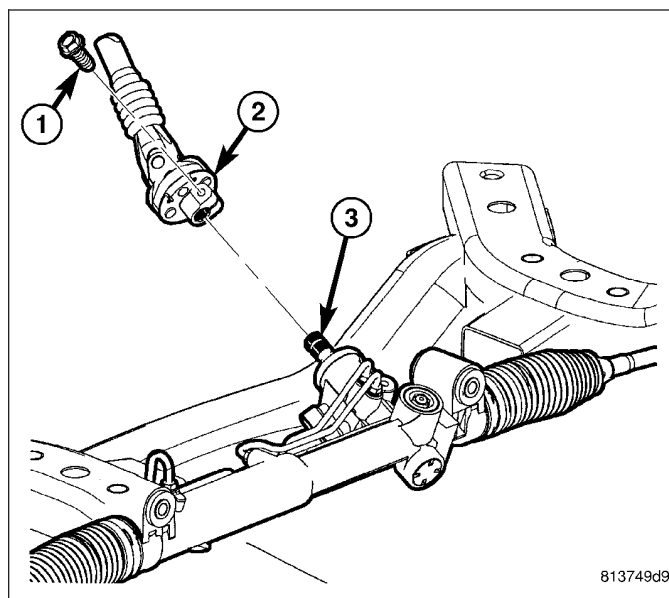
## COUPLING - STEERING

### REMOVAL

1. Fully extend or pull out adjustable steering column.
2. Center the steering wheel and lock the steering wheel with a steering wheel holder.
3. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
4. Remove the pinch bolt (4) connecting the steering shaft (3) to the lower steering coupling shaft (5).
5. Separate the lower coupling (5) from the steering shaft (3).

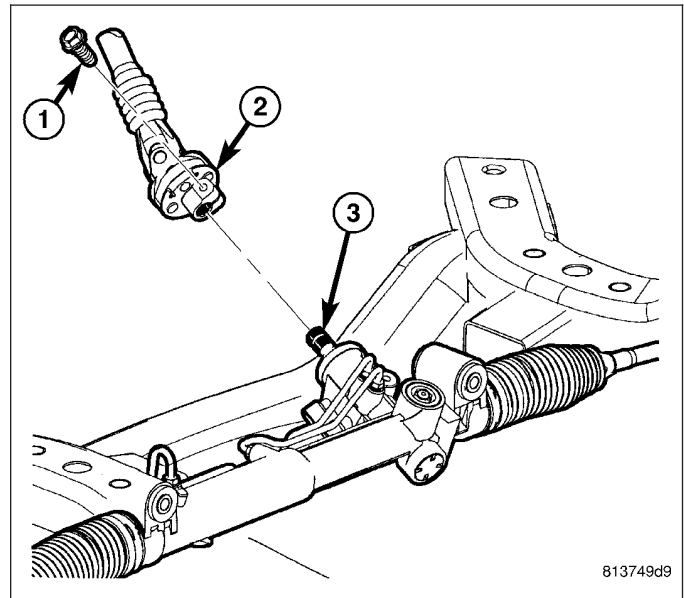


6. Remove the pinch bolt (1) from the steering coupling (2) at the steering gear (3).
7. Carefully slide the coupling (2) from the steering gear (3).
8. Remove the steering coupling (2) from the vehicle.

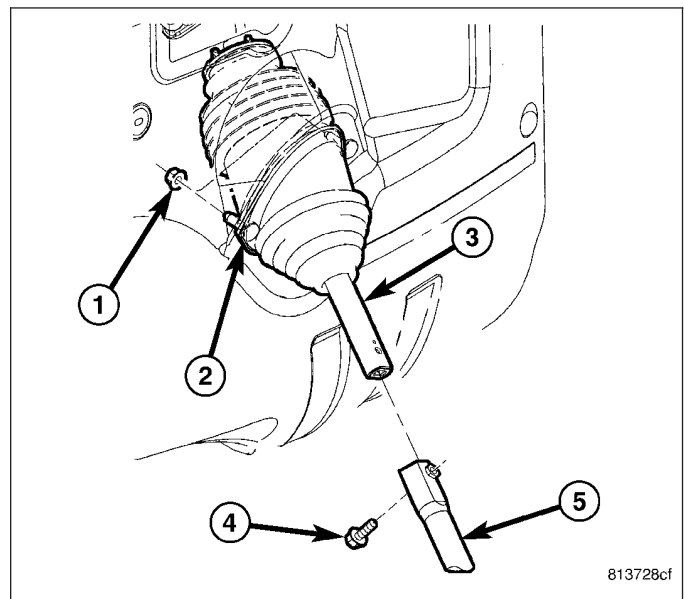


## INSTALLATION

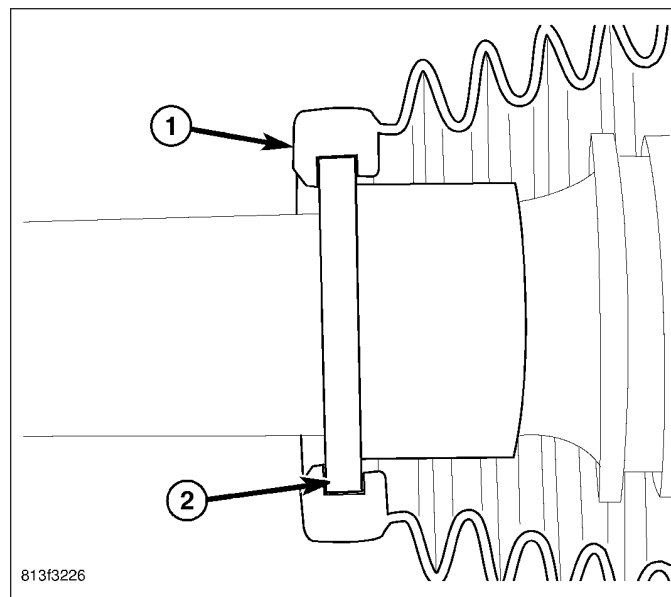
1. Carefully slide the lower coupling (2) onto the splines of the steering gear (3).
2. Install a **NEW** pinch bolt (1) to the steering coupling (2) at the steering gear (3). Tighten the pinch bolt to 54 N·m (40 ft. lbs).



3. Align the pin on the steering shaft with the slot in the lower coupling shaft and slide the shaft (3) into the lower coupling (5).
4. Install a **NEW** steering coupling pinch bolt (4). Tighten the pinch bolts to 31 N·m (23 ft. lbs).



5. Check and make sure the plastic collar (2) on the column shaft is engaged in the groove within the boot (1).
6. Lower the vehicle.
7. Remove the steering wheel holder.
8. Check the operation of the steering column for binding or noises.



## STEERING COLUMN CONTROL MODULE

### DESCRIPTION

Tilt and telescope steering columns are standard on all models. On 300 Hemi C and international 300C models the tilt and telescope functions are powered and are also included in the standard Memory System settings. Combined with available power seats and optional power adjustable pedals, the tilt and telescope steering column gives the driver every known adjustment to obtain a comfortable driving position. Both columns provide 2.36 inches (60 mm) of telescoping adjustment and 5.2 degrees of tilt. The adjustments are continuously variable for maximum adaptability.

A lever on the left side of the column controls powered adjustment. Fore and aft motion of the lever operates the telescoping mechanism. Up and down motion operates the tilt mechanism. Two electric motors turning threaded actuators move the column. The mechanisms lock in place when movement stops.

The Steering Column Control Module (SCCM) is mounted on the steering column and is removed as a complete unit. The components that are contained within this unit are:

- **Clockspring** - is attached to the top of the SCCM with three screws. The clockspring connector passes through the body of the SCCM and its terminals slide into the male side of the self docking connector within the Steering Column Module (SCM). (Refer to 8 - ELECTRICAL/RESTRAINTS - DESCRIPTION).
- **Multi-Function Switch** - is the middle left lever, and is plugged into, and mounting pins pass through, the SCM secured to the SCCM housing by three screws (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/MULTI-FUNCTION SWITCH - DESCRIPTION).
- **Speed Control Switch** - is the top left lever and is plugged into the SCM and held in place by the three screws of the clockspring (Refer to 8 - ELECTRICAL/SPEED CONTROL - DESCRIPTION).
- **Steering Angle Sensor (if equipped with Electronic Stability Program (ESP))** - is mounted on the right side of the SCCM, below the clockspring and is responsible for informing the ESP of steering angle.
- **Steering Control Module (SCM)** - is the module located in the bottom of the SCCM, retained by three screws, and is the mating point for all the switches and clockspring located in the SCCM.
- **Tilt/Telescopic Lever/Switch (if equipped)** - is the bottom left lever and is used for steering wheel tilt and telescoping. It is plugged into the SCM and if not equipped, will be replaced by a support bar. It is held in place by one of the three clockspring screws and one of its own retaining screws.

The SCCM communicates via the Local Interconnect Network (LIN) serial data bus. This is an ultra-low voltage serial data bus that allows the following components to communicate with the Controller Area Network (CAN) B and C data buses.

- Steering Wheel Switches
- Horn
- Speed Control Switch

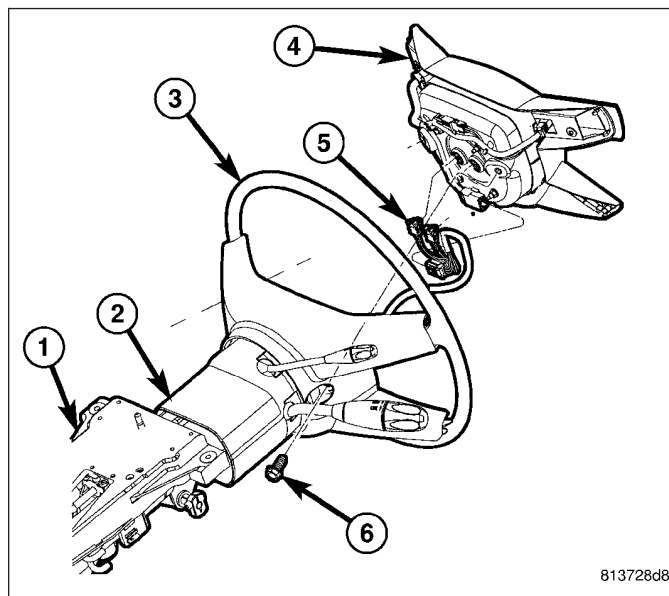
- Multi-function Switch
- Tilt/Telescoping Switch (if equipped)
- Steering Angle Sensor (if equipped with Electronic Stability Program (ESP))
- Steering Column Module (SCM)

## REMOVAL

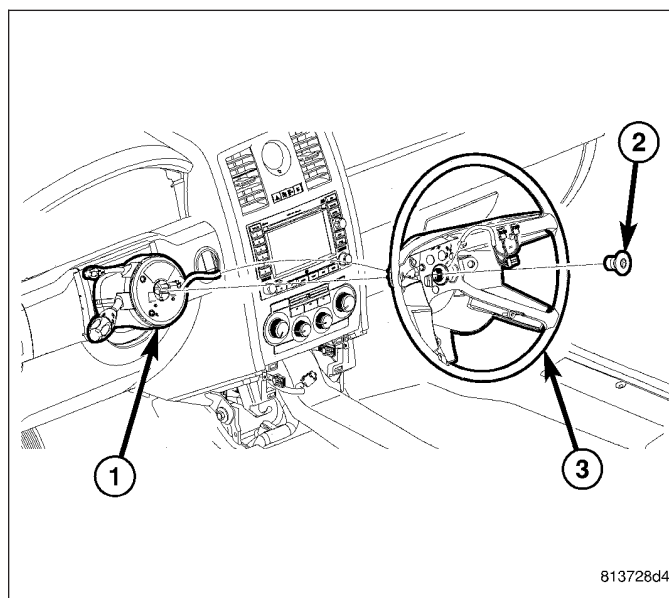
**WARNING:** Before servicing the steering column the airbag system must be disarmed. Refer to electrical restraint system for service procedures. Failure to do so may result in accidental deployment of the airbag and possible personal injury or death.

**CAUTION:** All fasteners must be torqued to specification to ensure proper operation of the steering column.

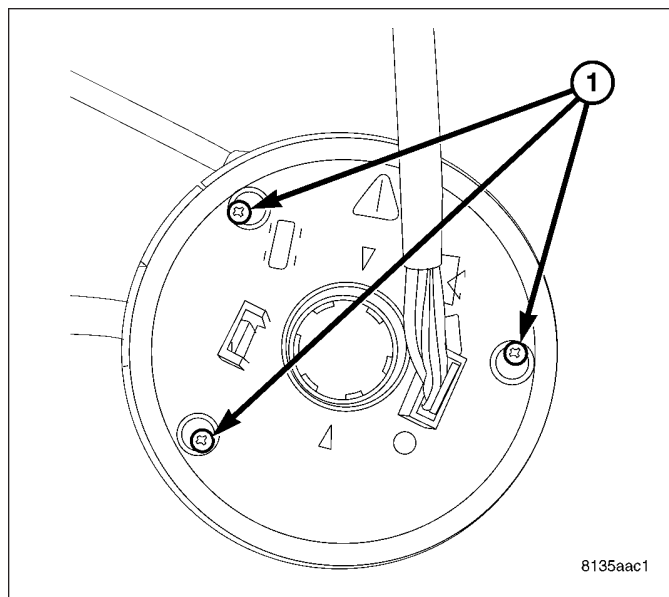
1. Position the front wheels **straight-ahead**.
2. Fully extend or pull out adjustable steering column.
3. Disconnect the negative (ground) cable from the battery.
4. Remove the driver airbag (4) (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).



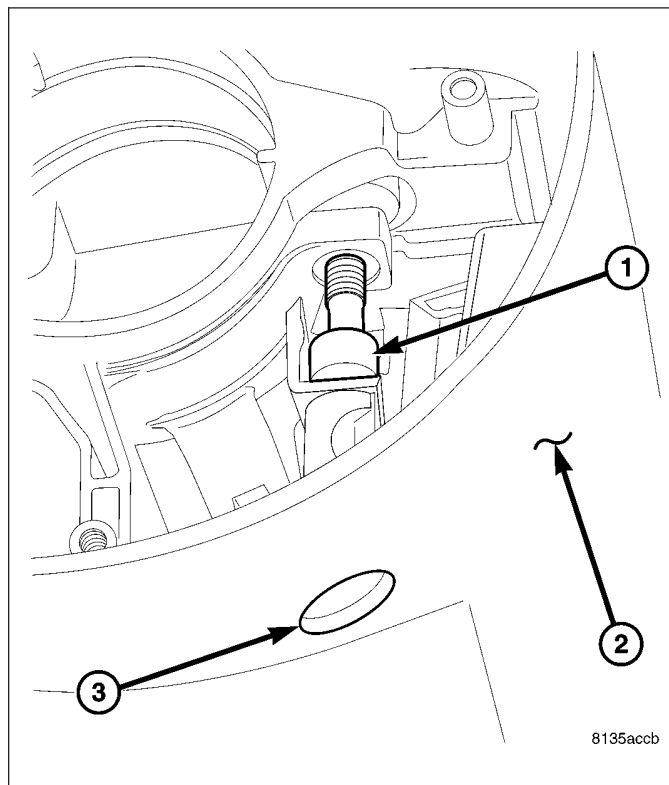
5. Remove the steering wheel retainer bolt (2) then slide the steering wheel (3) off the shaft.



6. Remove at least one clockspring screw (1), (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL). This will help keep the clockspring from uncentering itself.

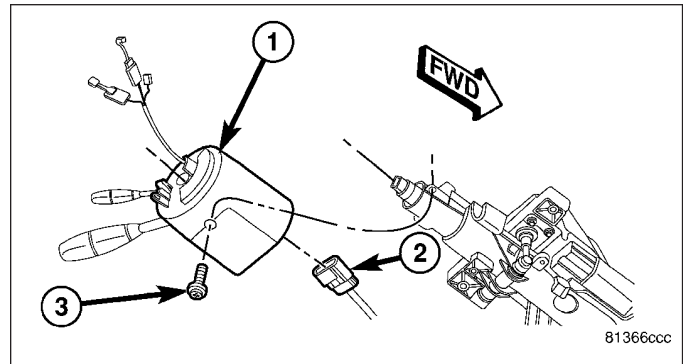


7. Back out the set screw (1) through the access hole (3) in the bottom of the Steering Column Control Module (SCCM) (2).



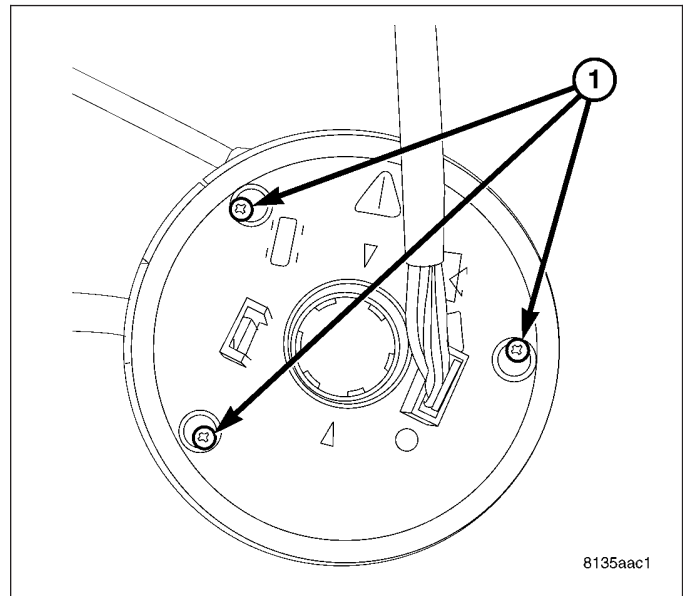


8. Pull the SCCM (1) off the steering column shaft.



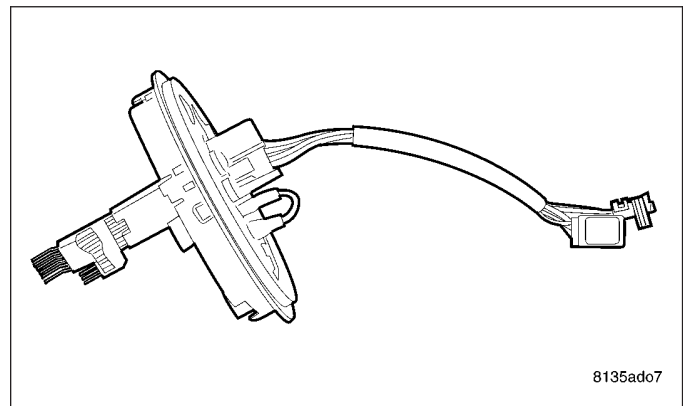
## DISASSEMBLY

1. Remove the three clockspring screws (1).

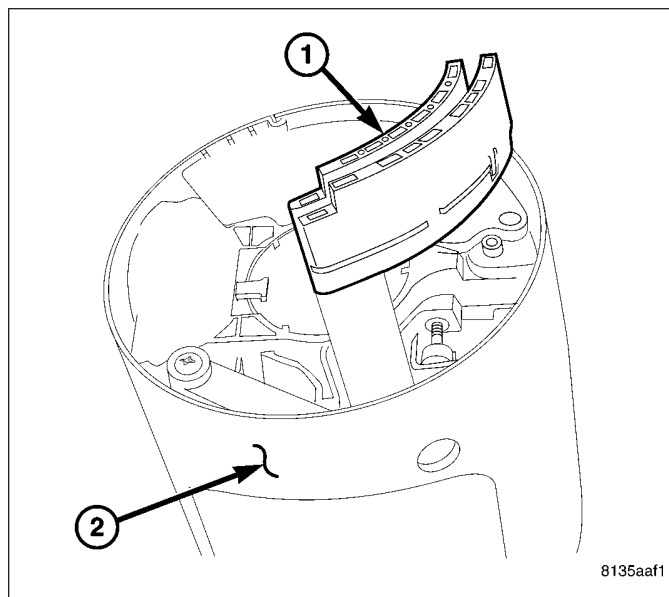


2. Carefully pull straight up on clockspring to remove (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCK-SPRING - REMOVAL).

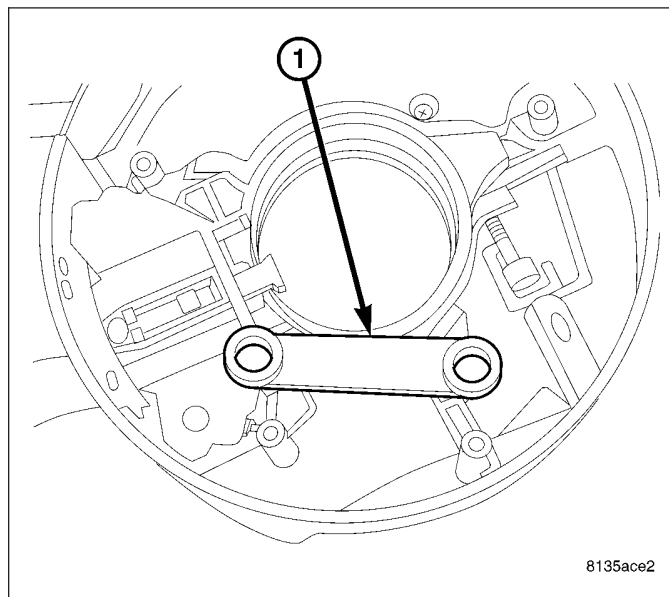
**Note:** After the clockspring is removed, there is only one more screw on the top side of the SCCM that needs to be removed and is located at approximately the six o'clock position on the SCCM. It holds the lower side of the steering angle sensor, the lower side of the electric tilt lever assembly, or the strengthening strut if not equipped with electric tilt.



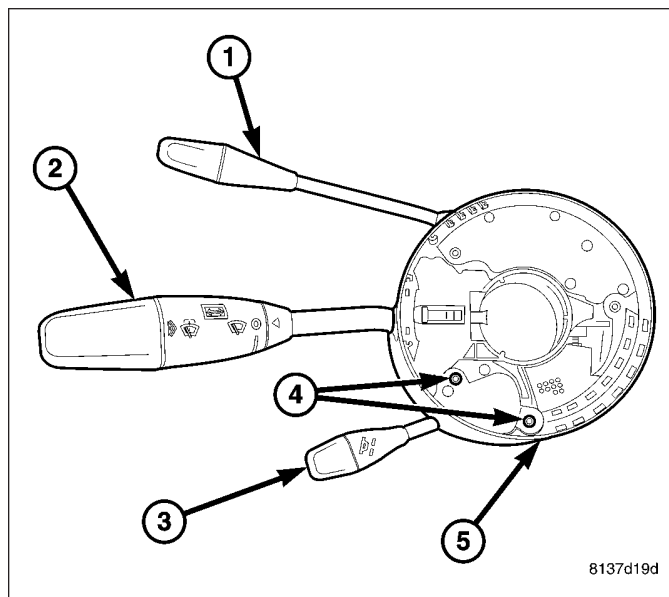
3. **If equipped with ESP**, remove the steering angle sensor screw located at the six o'clock position on the SCCM and remove the steering angle sensor (1) from the SCCM (2). **If not equipped with ESP**, there will be a plastic insert there for strengthening of the SCCM that will lift right out.



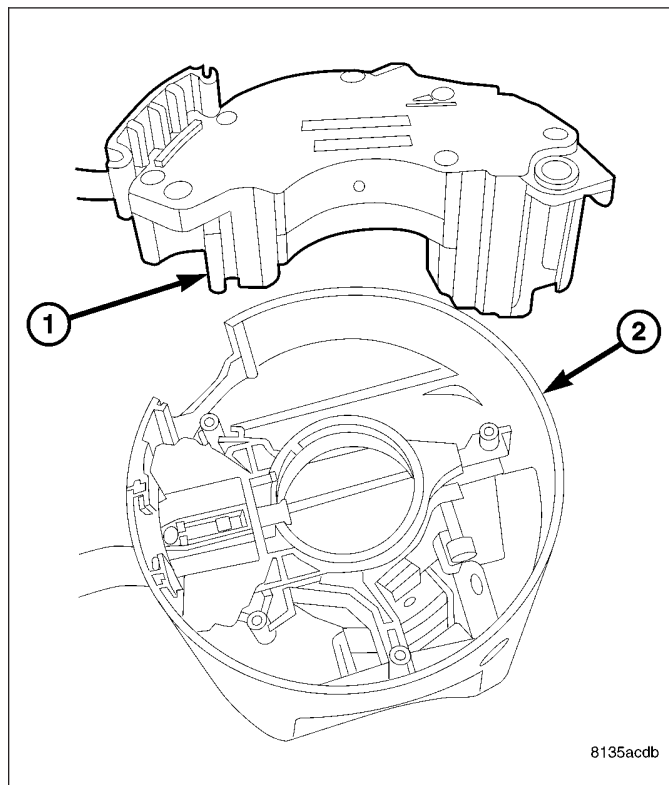
4. **If equipped with manual telescoping column**, remove the strut screw, located at the six o'clock position, and strut (1).



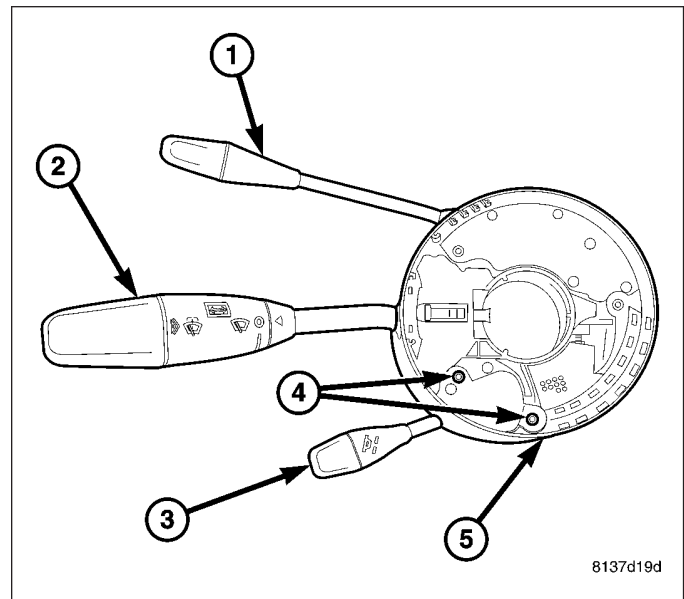
5. If equipped with electronic telescoping column, remove the one remaining screw (4) to electric tilt located at the six o'clock position, and remove stalk and switch (3).



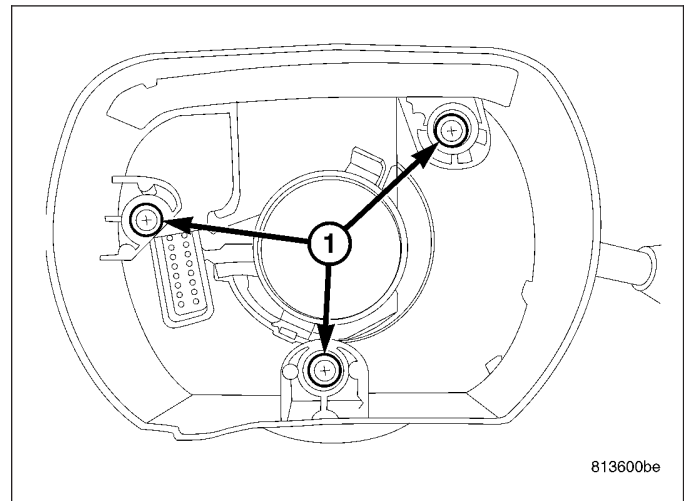
6. Remove the speed control switch (1).



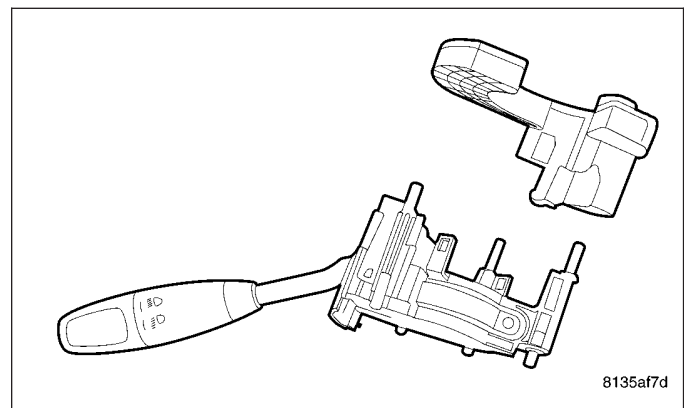
7. Remove the steering column tilt/telescoping lever (3) screw (4) located at the six o'clock position.



8. Remove the three screws (1) from the bottom of the SCCM for the multi-function switch and SCCM circuit board.

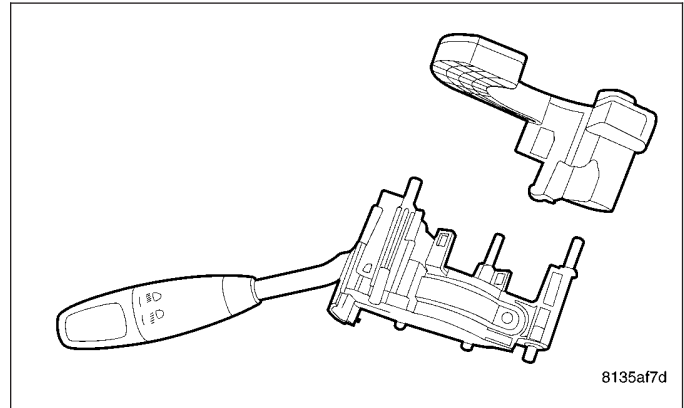


9. Separate the multi-function switch from the SCCM circuit board.

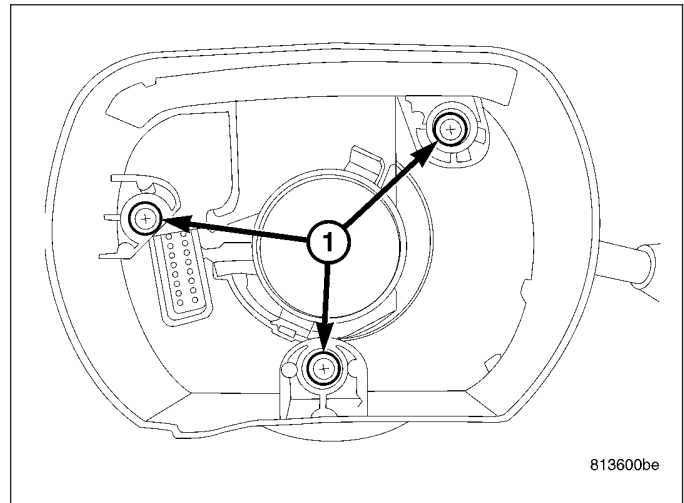


**ASSEMBLY**

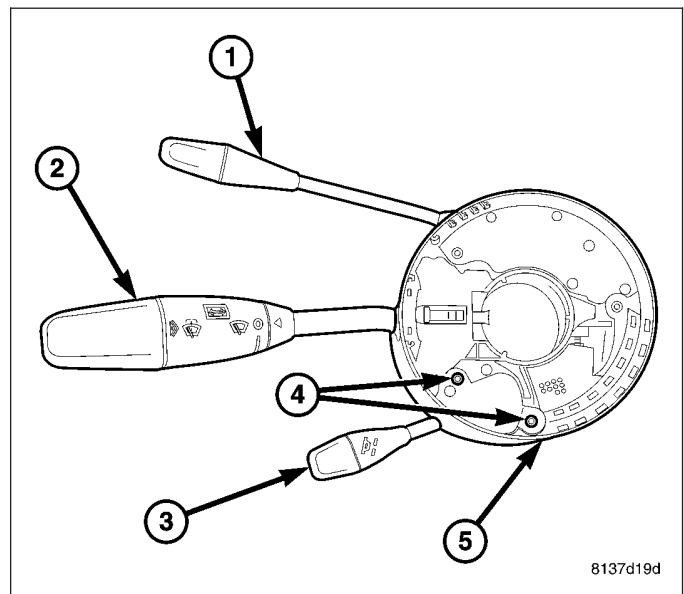
1. Position the Steering Column Control Module (SCCM) circuit board onto the multi-function switch.



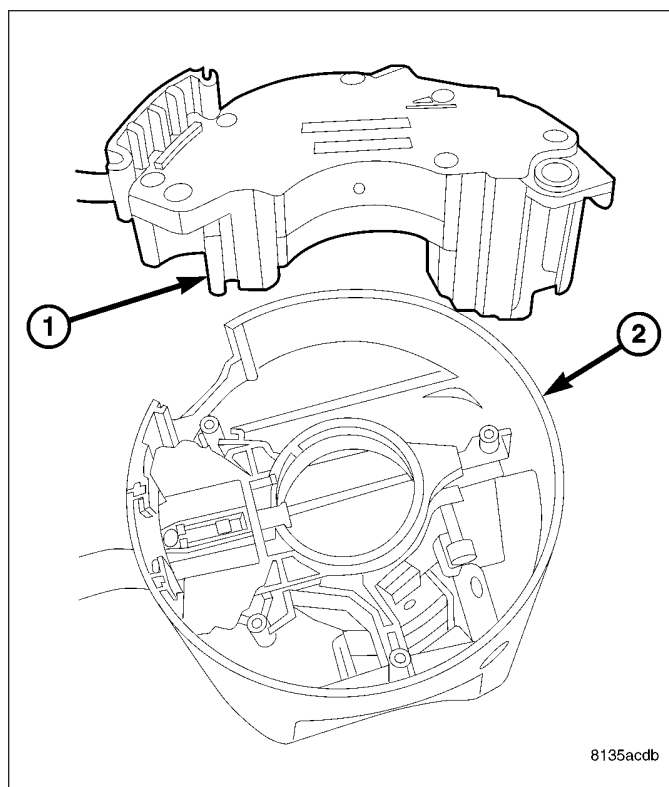
2. Install the multi-function switch and circuit board and tighten the three screws (1) from the bottom of the SCCM.



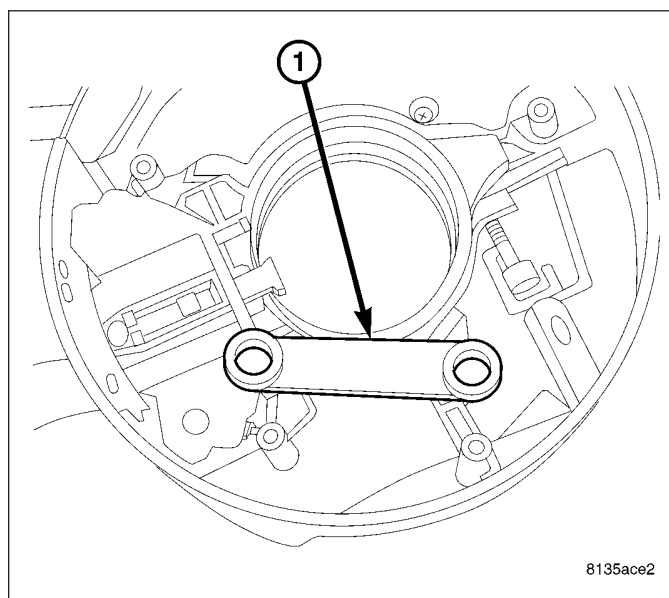
3. Install the steering column telescoping lever (3).



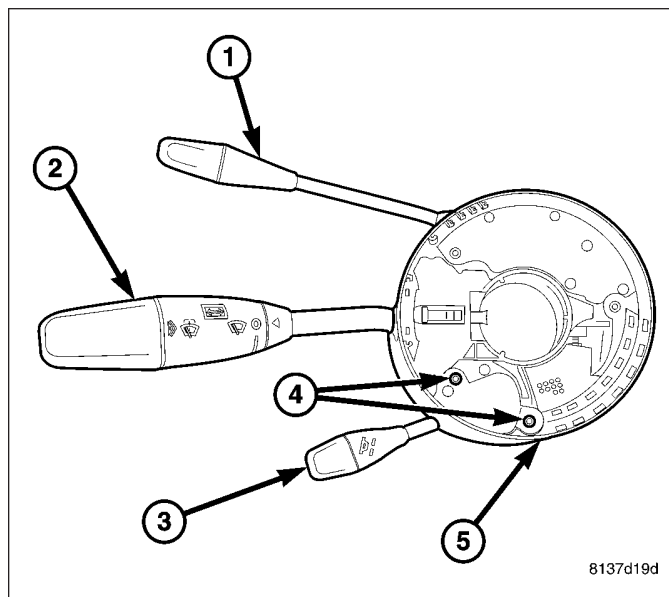
4. Install the speed control switch (1).



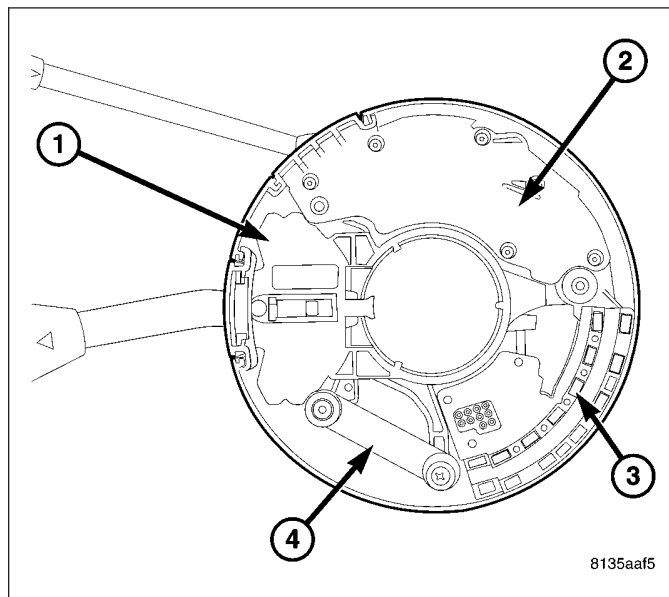
5. **If equipped with manual telescoping column**  
Install the strut (1).



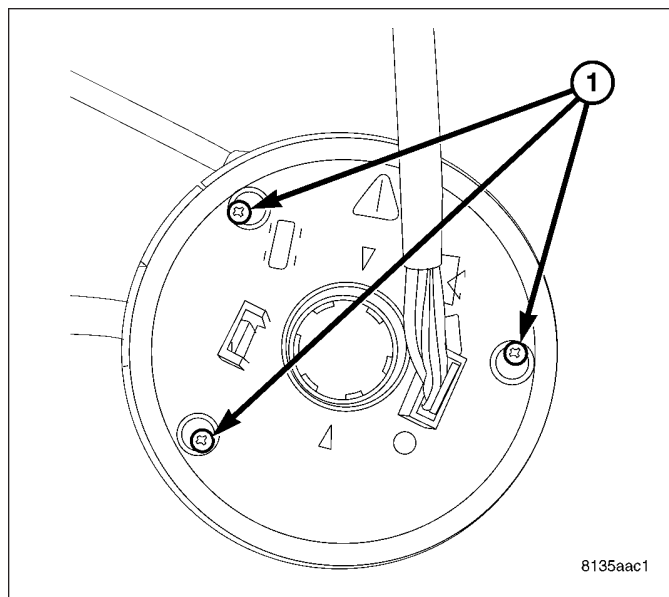
6. If equipped with electronic telescoping column, install the electric tilt lever and switch (3).



7. If equipped with ESP, install the steering angle sensor and screw (3) located at the six o'clock position.



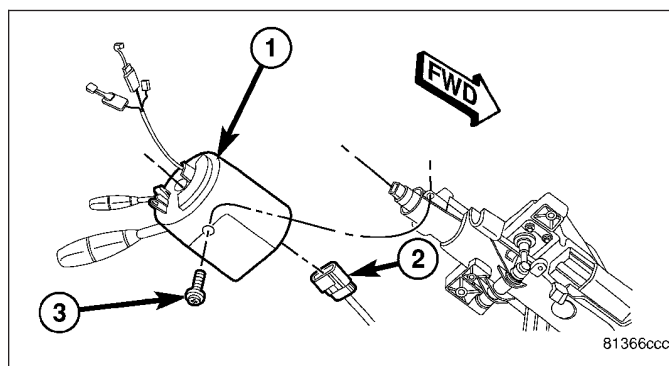
8. Install the clockspring and screws (1).



9. If equipped with ESP Recalibrate the steering angle sensor using the scan tool.

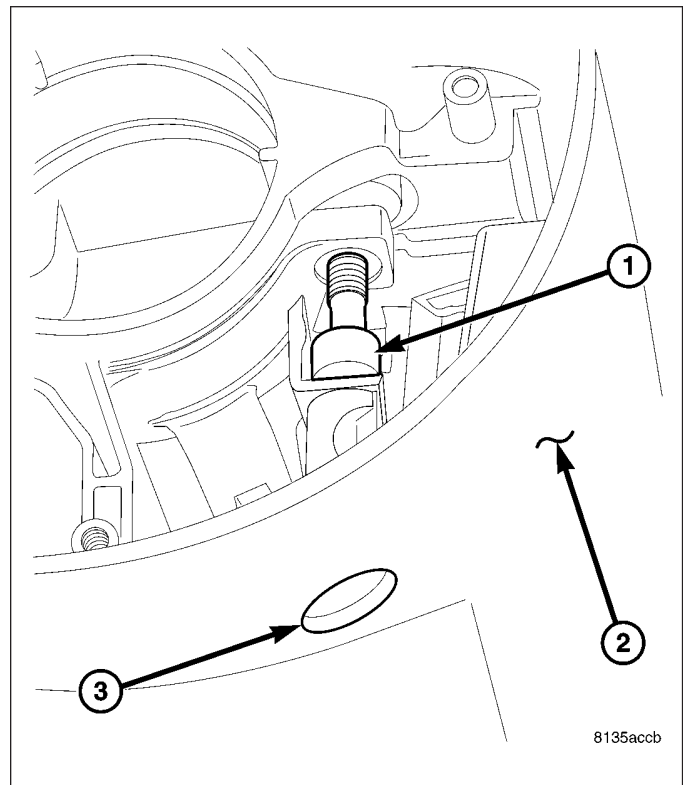
## INSTALLATION

1. Install the SCCM (1) onto the steering column.

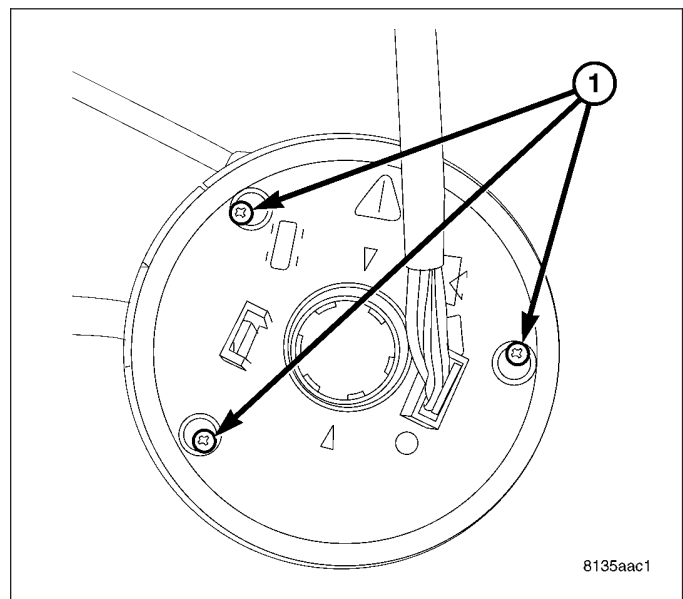




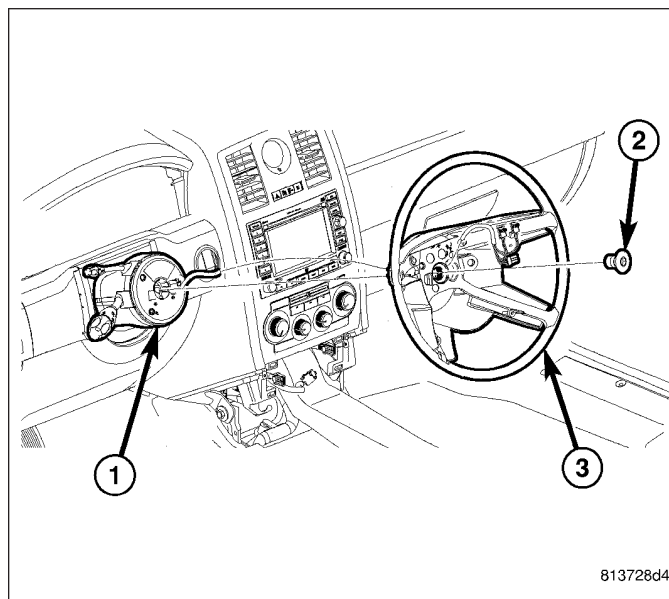
2. Tighten the set screw (1) securing the SCCM (2).



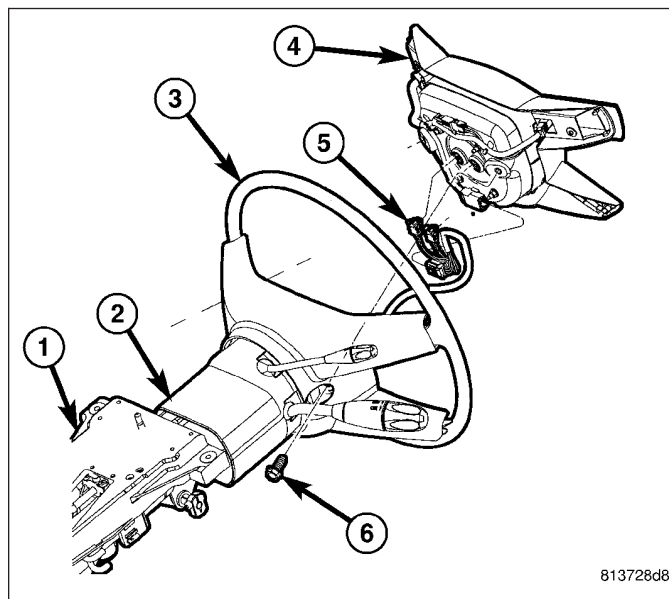
3. Tighten clockspring screws (1) that were backed out to keep the clockspring from unwinding (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).



4. Align the spline on the steering wheel hub to shaft and install the steering wheel (3).
5. Install a **NEW** retainer bolt (2). Tighten the bolt to 70 N·m (52 ft. lbs.).



6. Install the driver airbag (4) (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).
7. Install the negative battery cable on the battery. It is important that this is performed properly (including calibration of steering angle sensor if equipped with ESP). (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)
8. Test the operation of the horn, lights and any other functions that are steering column operated.



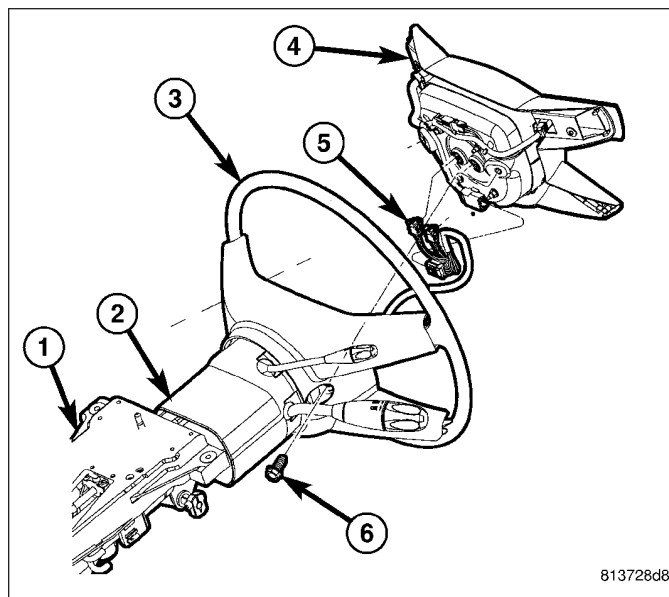
## SHROUD

### REMOVAL

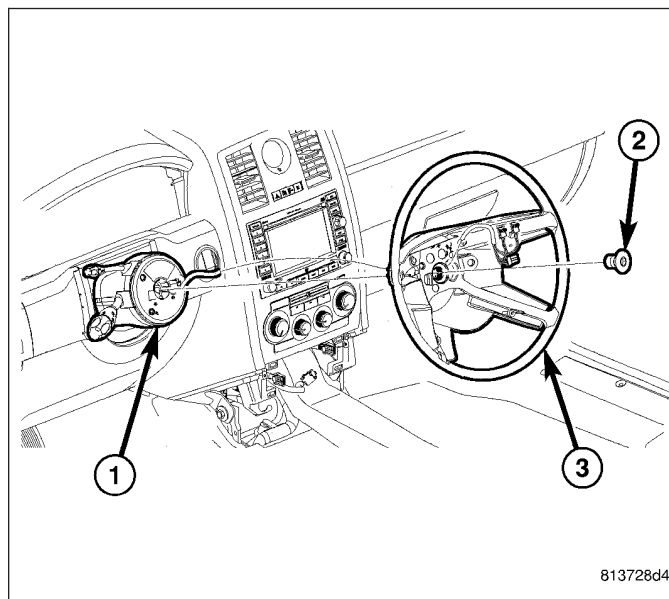
**WARNING:** Before servicing the steering column the airbag system must be disarmed. Refer to electrical restraint system for service procedures. Failure to do so may result in accidental deployment of the airbag and possible personal injury or death.

**CAUTION:** All fasteners must be torqued to specification to ensure proper operation of the steering column.

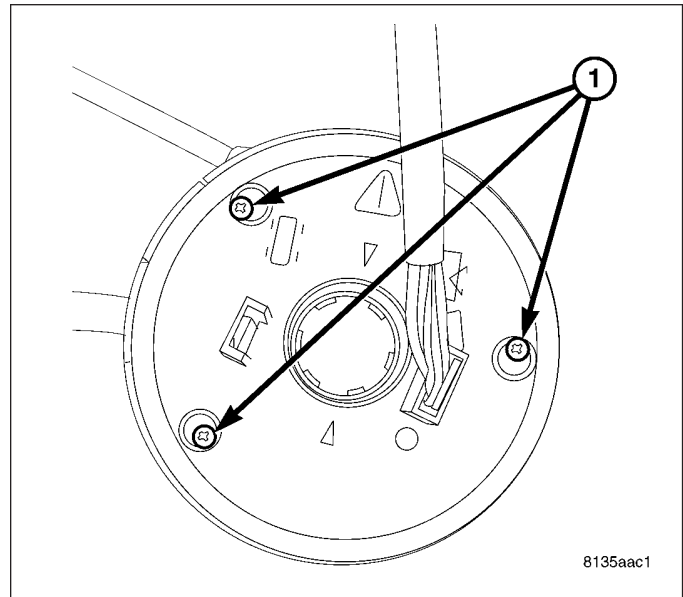
1. Position the front wheels **straight-ahead**.
2. Fully extend or pull out adjustable steering column.
3. Disconnect the negative (ground) cable from the battery.
4. Remove the driver airbag (4) (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).



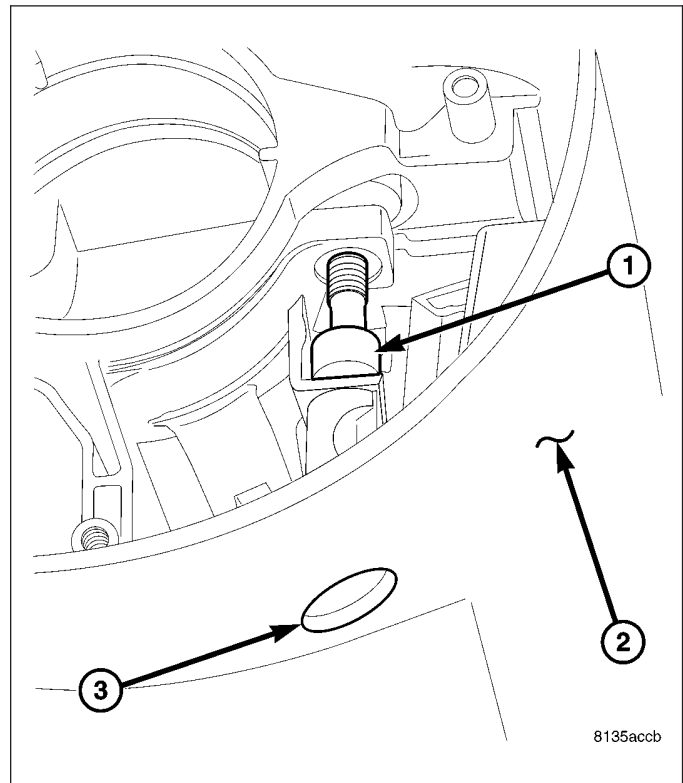
5. Remove the steering wheel retainer bolt (2), then slide the steering wheel (3) off the column shaft.



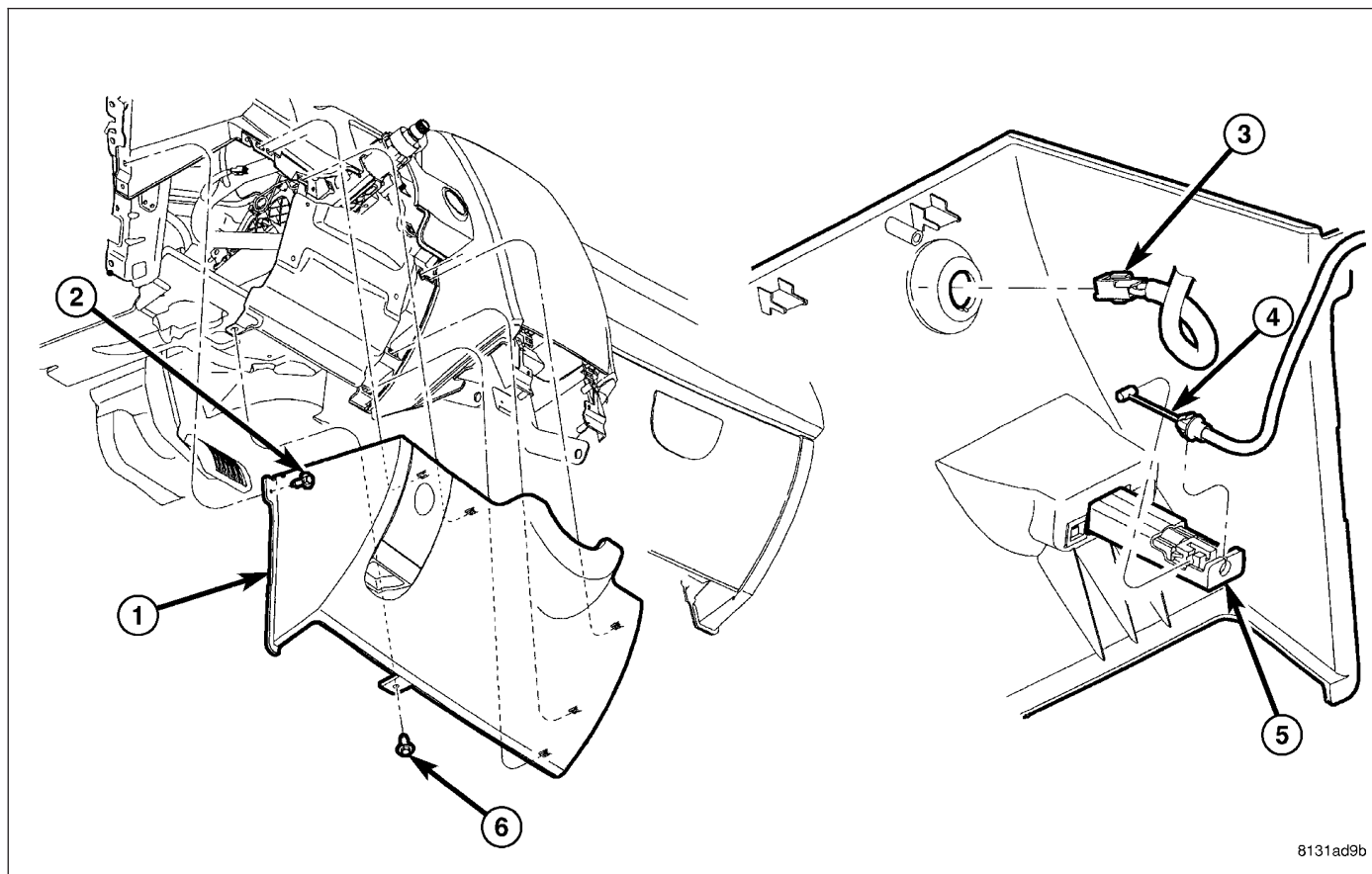
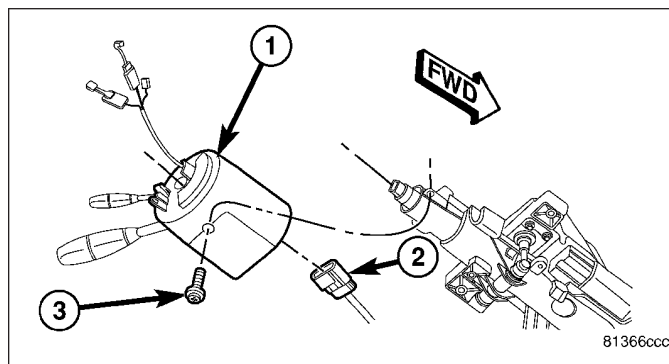
6. Remove at least one clockspring screw (1), (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL). This will help keep the clockspring from uncentering itself.



7. Back out the set screw (1) through the access hole (3) in the bottom of the Steering Column Control Module (SCCM) (2).

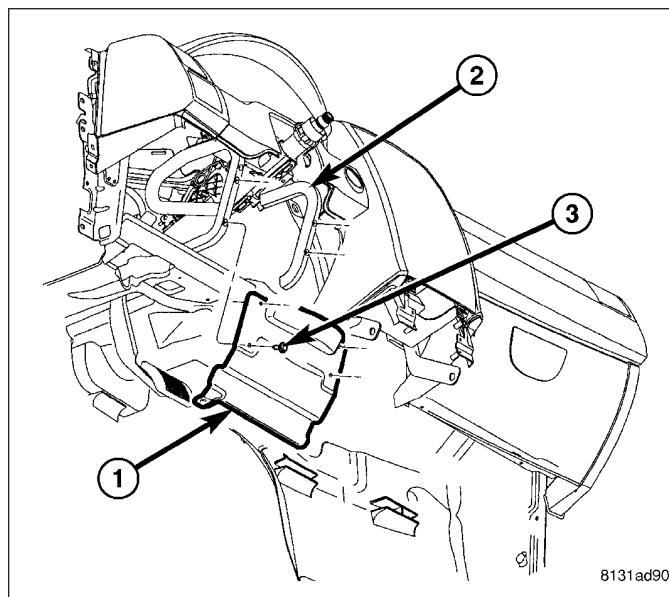


8. Pull the SCCM (1) off the steering column shaft.

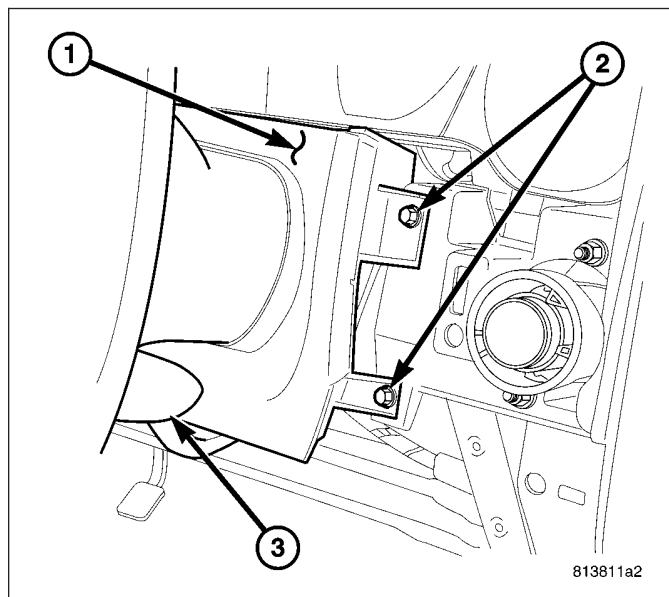


9. Remove the steering column opening cover (1)(Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

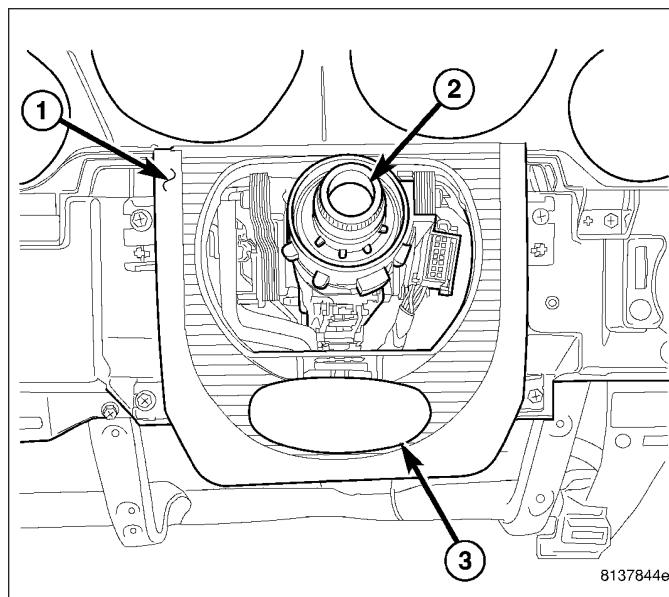
10. Remove the steering column opening reinforcement (1).



11. Remove the 4 shroud screws (2)
12. **If equipped with manual telescoping steering column** pull the lever (3) downwards.

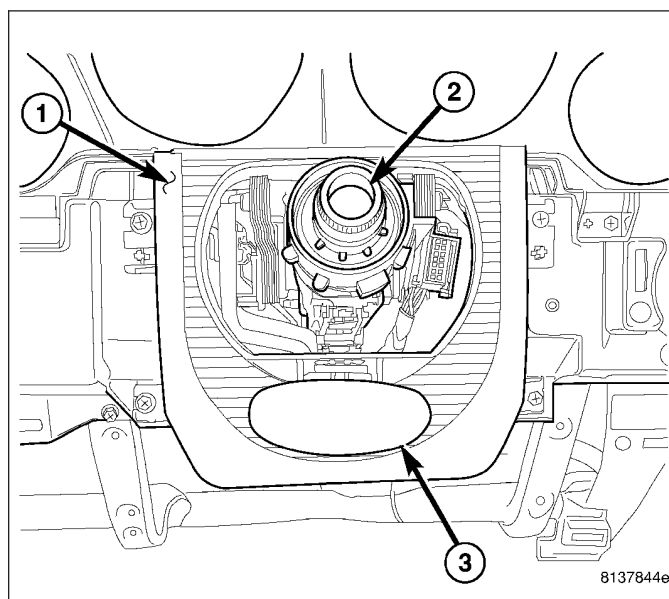


13. Remove the shroud (1).

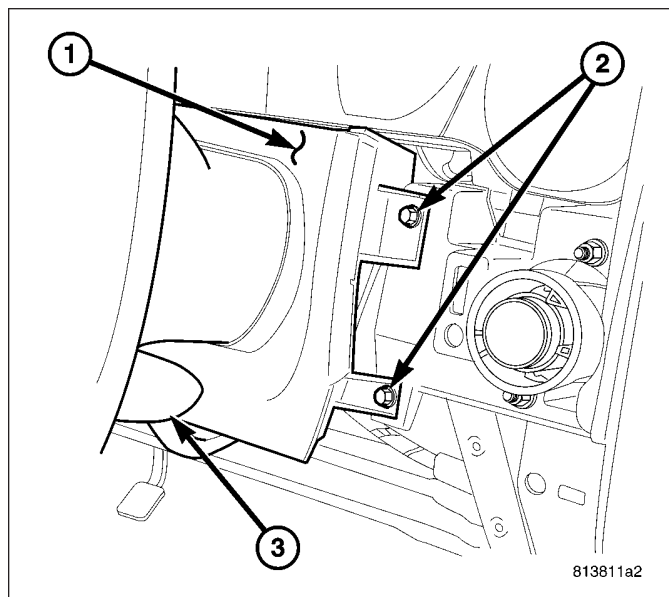


## INSTALLATION

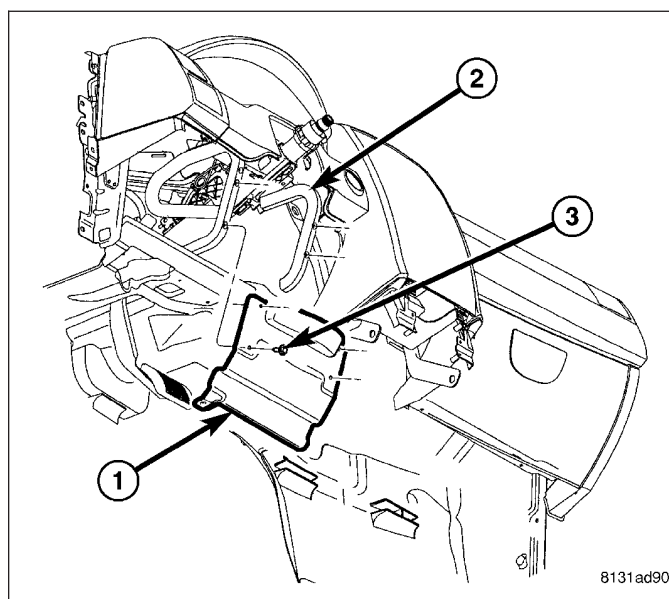
1. Install the shroud (1) over the steering column (2).



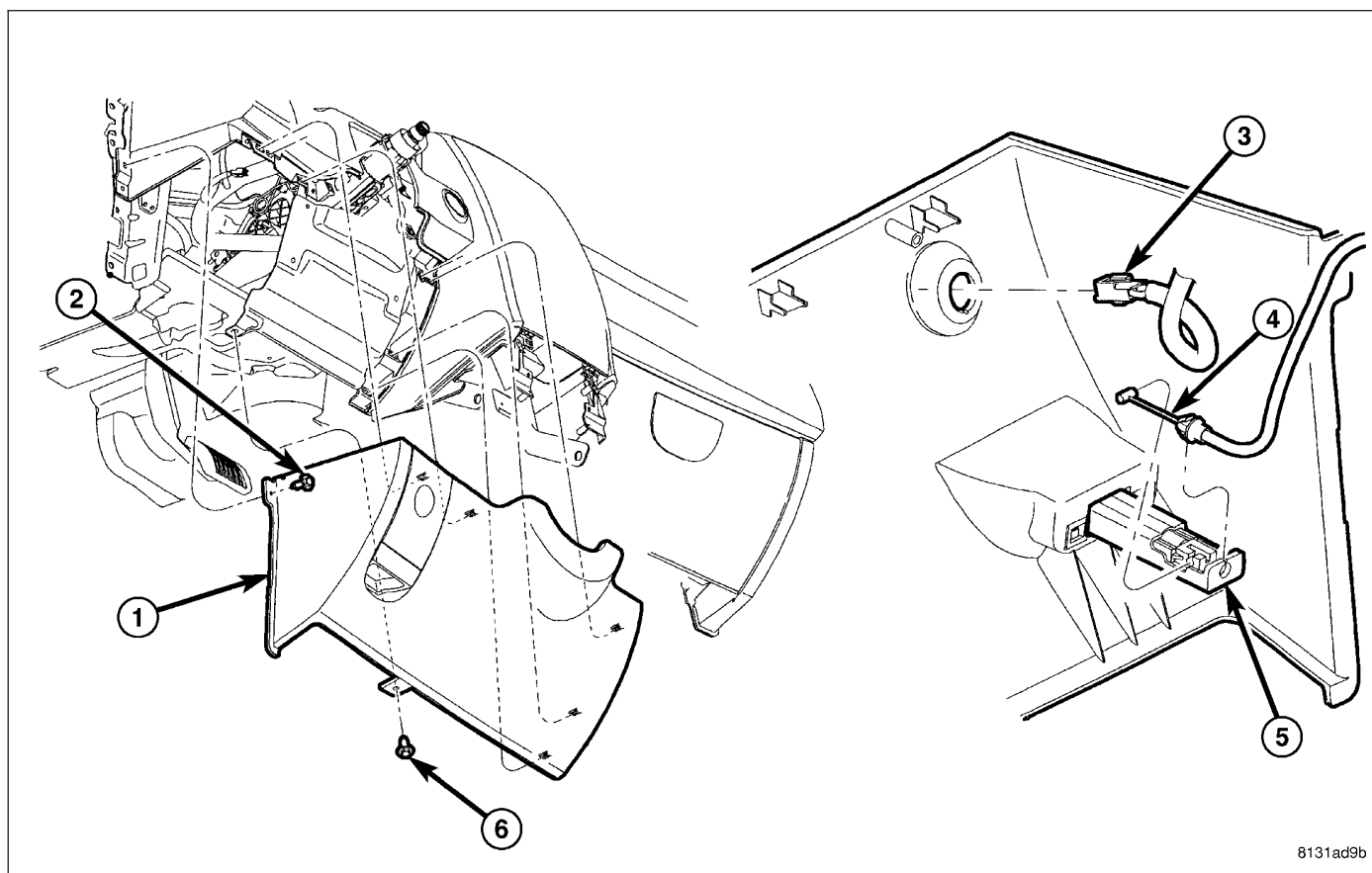
2. Install the four shroud screws (2).



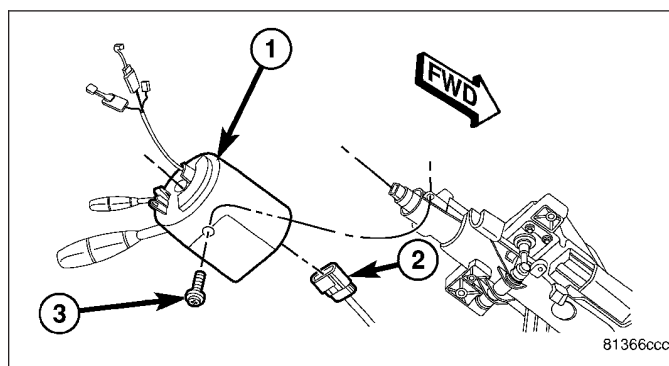
3. Install the steering column opening reinforcement (1).



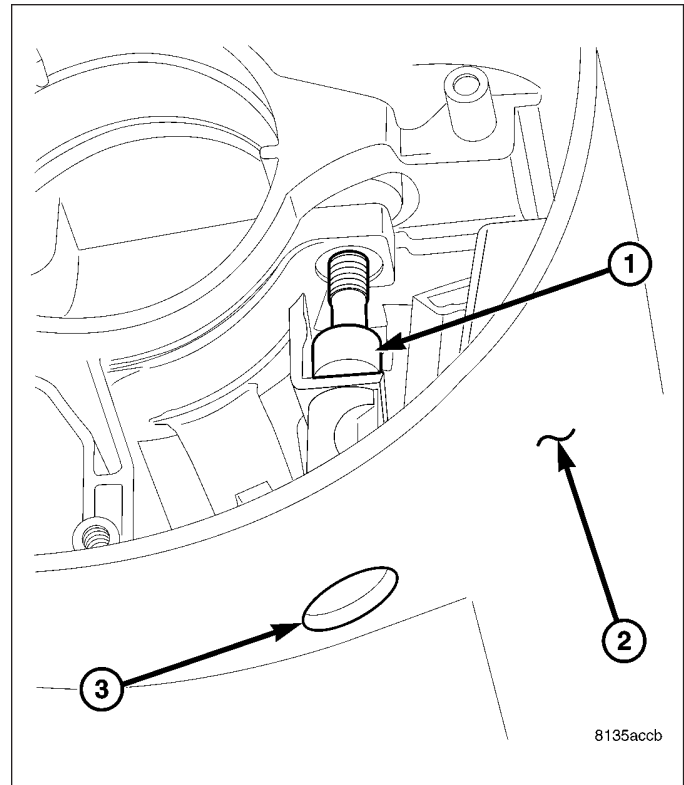




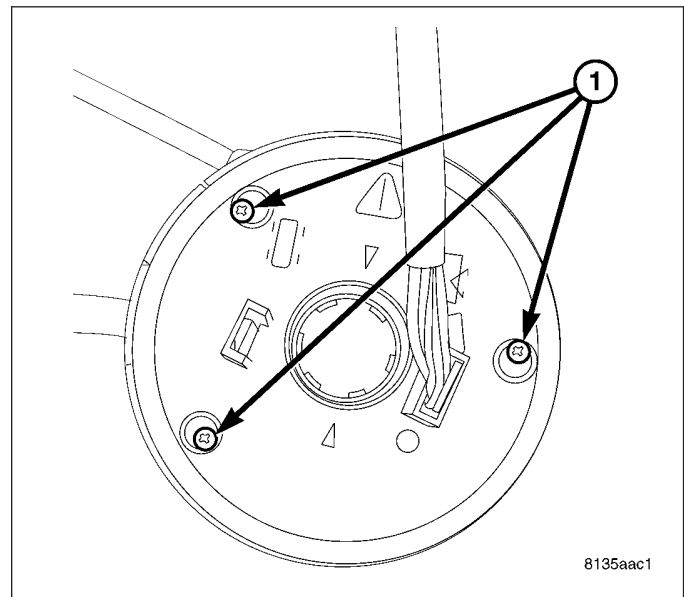
4. Install the steering column opening cover (1).
5. Install the SCCM (1) onto the steering column.



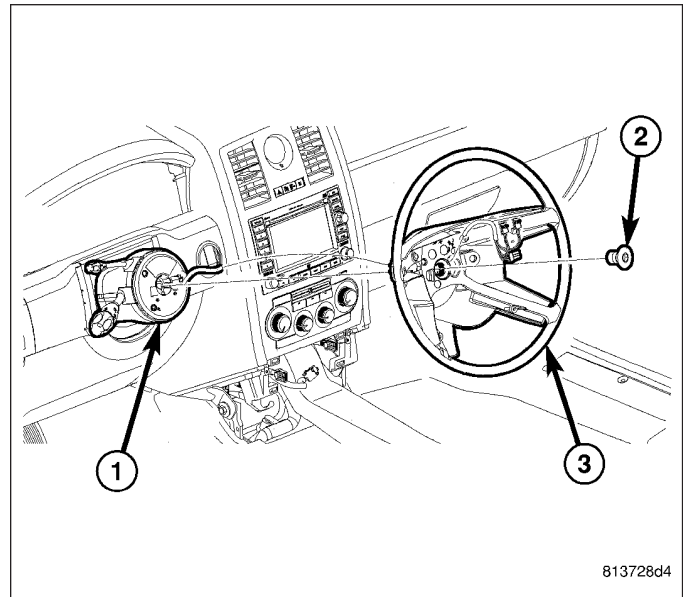
6. Tighten the set screw (1) securing the SCCM (2).



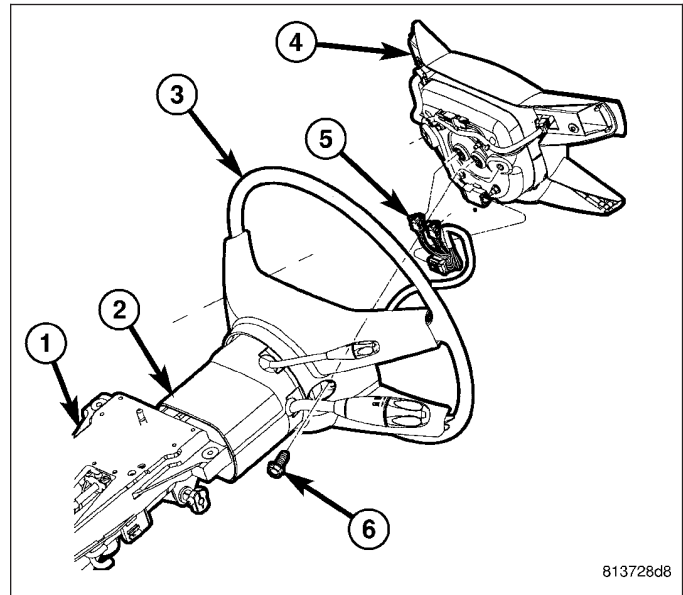
7. Tighten clockspring screws (1) that were backed out to keep the clockspring from unwinding (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).



8. Align the spline on the steering wheel hub to the column shaft, then install the steering wheel (3).
9. Install a **NEW** retainer bolt (2). Tighten the bolt to 70 N·m (52 ft. lbs.).



10. Install the driver airbag (4) (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).
11. Install the negative battery terminal on the battery. It is important that this is performed properly (including calibration of steering angle sensor if equipped with ESP). (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE)
12. Test the operation of the horn, lights and any other functions that are steering column operated.



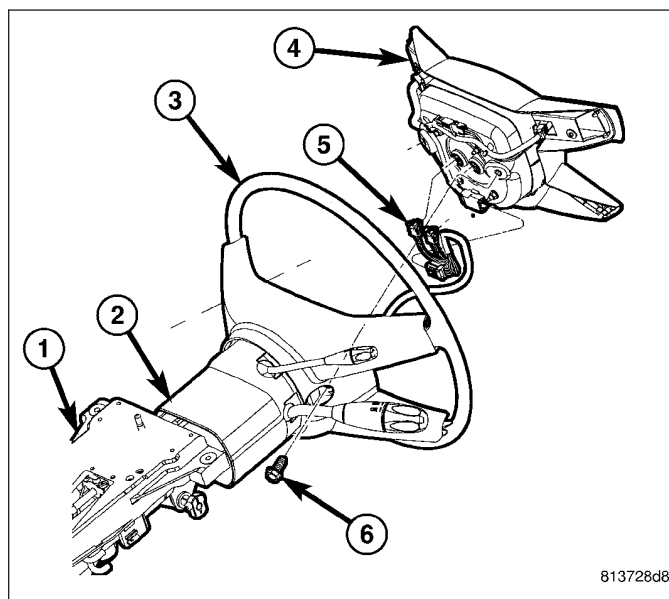
## WHEEL - STEERING

### REMOVAL

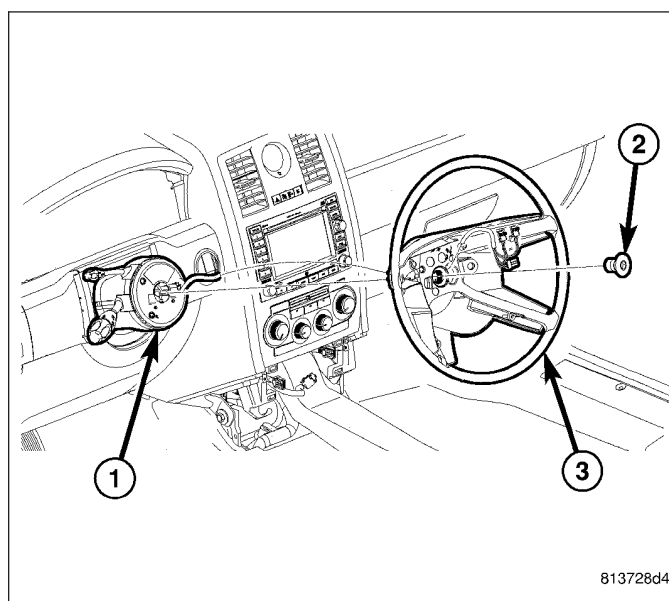
**WARNING:** Before servicing the steering column the airbag system must be disarmed. Refer to electrical restraint system for service procedures. Failure to do so may result in accidental deployment of the airbag and possible personal injury.

**CAUTION:** All fasteners must be torqued to specification to ensure proper operation of the steering column.

1. Position the front wheels **straight-ahead**.
2. Fully extend or pull out adjustable steering column.
3. Disconnect the negative (ground) cable from the battery.
4. Remove the airbag (4). (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).

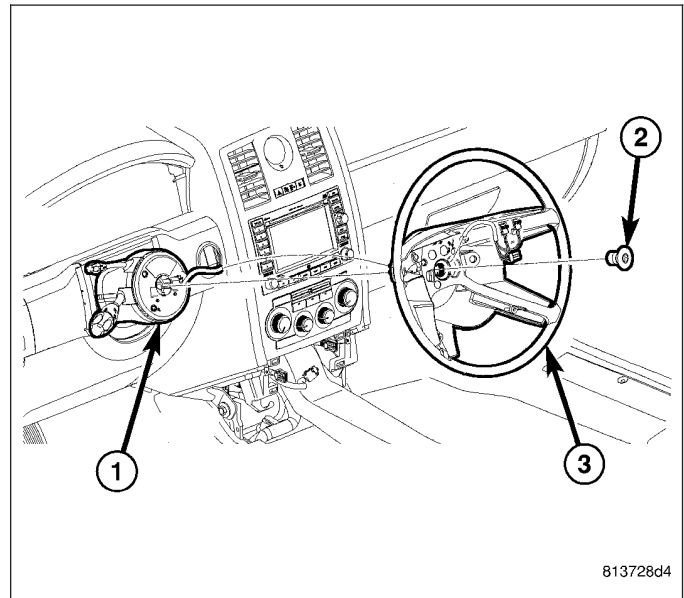


5. Remove the steering wheel retainer bolt (2), then slide the steering wheel (3) off the shaft.
6. If wheel is being replaced, transfer attached components as necessary.

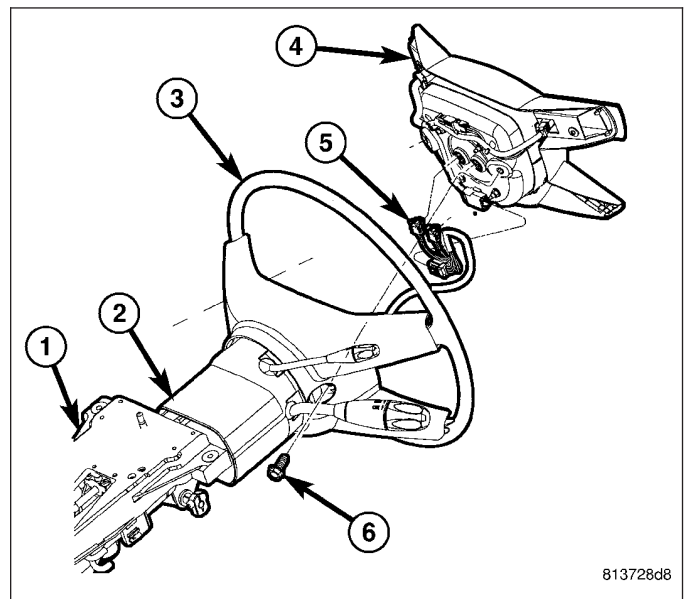


## INSTALLATION

1. Align the spline on the steering wheel hub to the column shaft, then install the steering wheel (3).
2. Install a **NEW** retainer bolt (2). Tighten the bolt to 70 N·m (52 ft. lbs.).



3. Install the airbag (4) (Refer to 8 - ELECTRICAL/ RESTRAINTS/DRIVER AIRBAG - INSTALLATION).
4. Install the negative battery terminal on the battery. It is important that this is performed properly (including calibration of steering angle sensor if equipped with ESP). (Refer to 8 - ELECTRICAL/ BATTERY SYSTEM - STANDARD PROCEDURE)
5. Test the operation of the horn, lights and any other functions that are steering column operated.



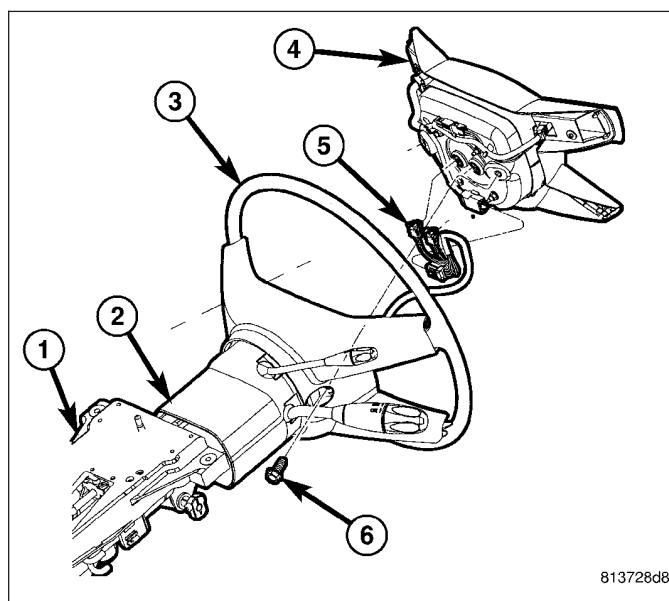
## LEVER-ELECTRONIC TELESCOPING

### REMOVAL

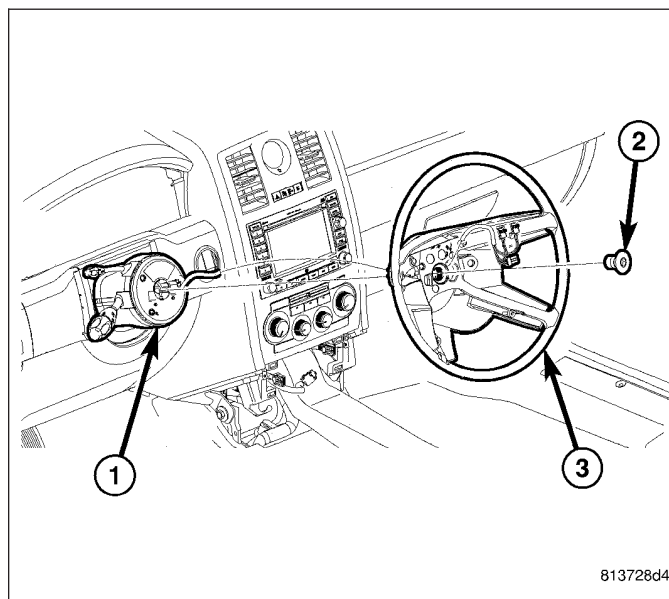
**WARNING:** Before servicing the steering column the airbag system must be disarmed. Refer to electrical restraint system for service procedures. Failure to do so may result in accidental deployment of the airbag and possible personal injury.

**CAUTION:** All fasteners must be torqued to specification to ensure proper operation of the steering column.

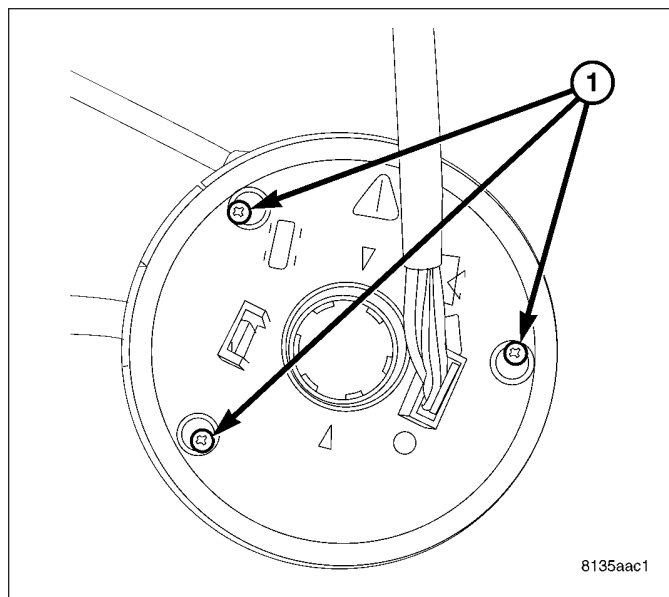
1. Position the front wheels **straight-ahead**.
2. Fully extend or pull out adjustable steering column.
3. Disconnect the negative (ground) cable from the battery.
4. Remove the airbag (4). (Refer to 8 - ELECTRICAL/ RESTRAINTS/DRIVER AIRBAG - REMOVAL).



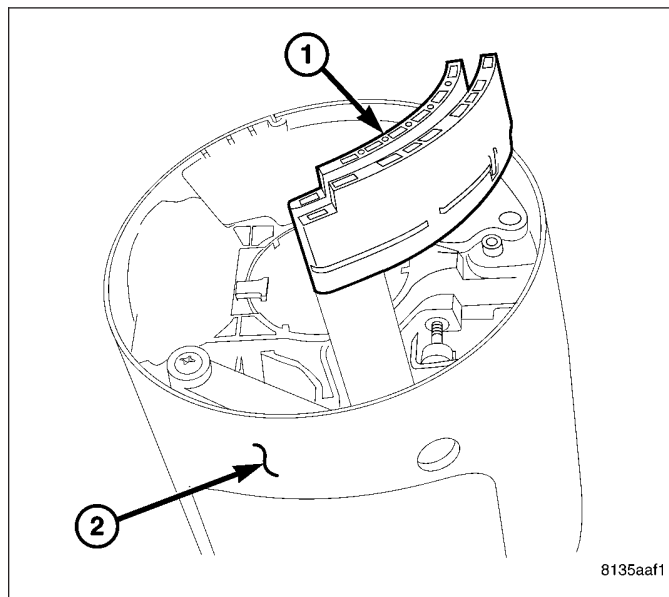
5. Remove the steering wheel retainer bolt (2) then slide the steering wheel (3) off the column shaft.



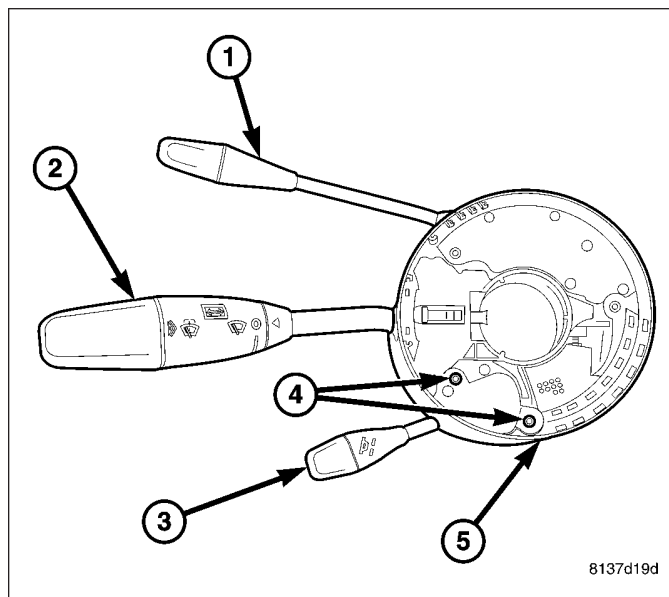
6. Remove the clockspring screws (1), (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).



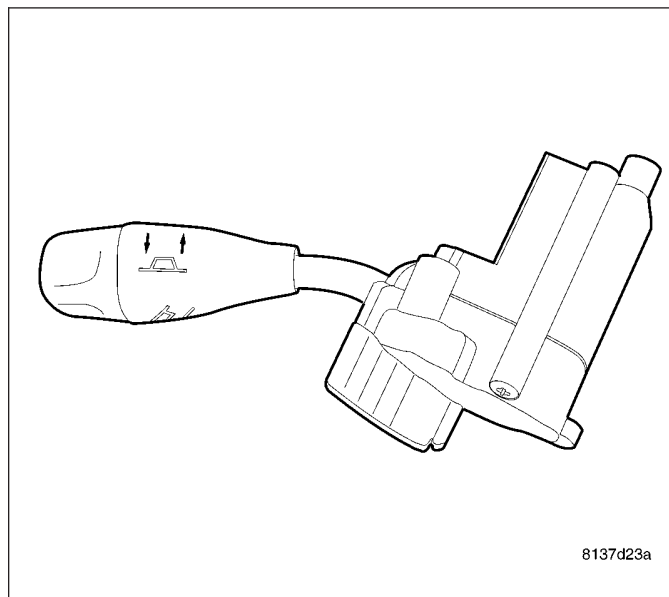
7. **If equipped with ESP**, remove the steering angle sensor (1) from the SCCM (2).



8. Remove the telescoping steering lever screws (4) from the SCCM (5).



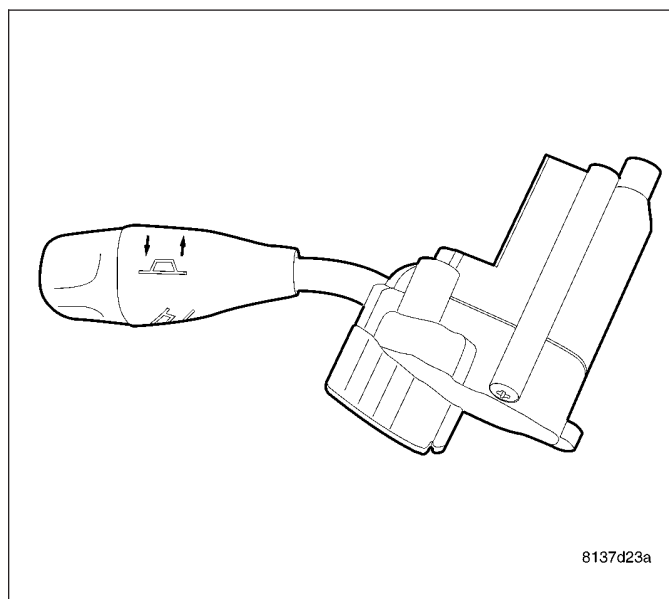
9. Remove the telescoping lever from the SCCM.



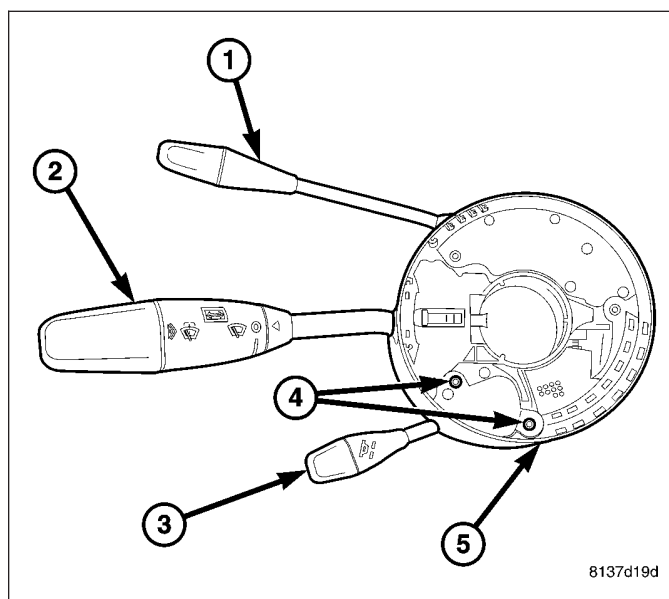


## INSTALLATION

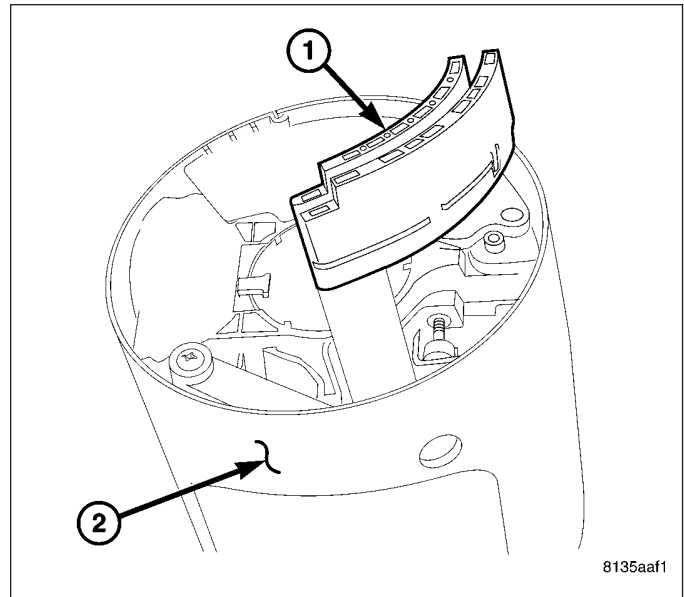
1. Install the telescoping lever to the SCCM.



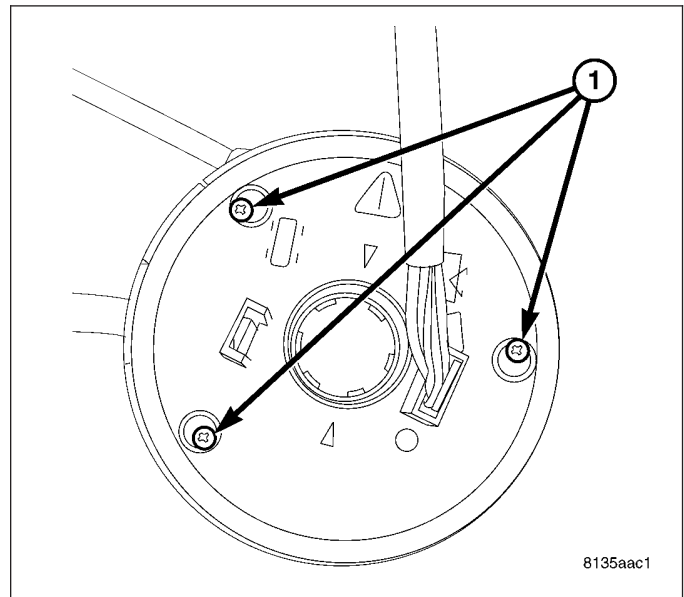
2. Install the screws (4) fastening the telescoping steering lever to the SCCM (5).



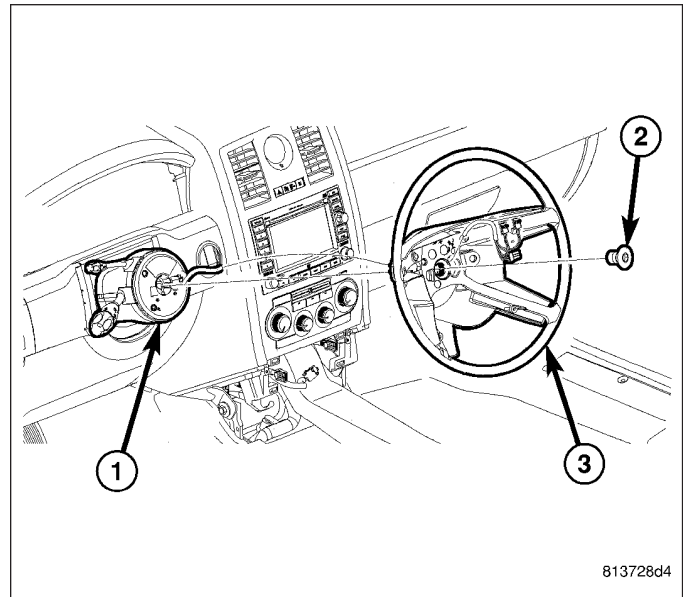
3. If equipped with ESP, install the steering angle sensor (1) to the SCCM (2).



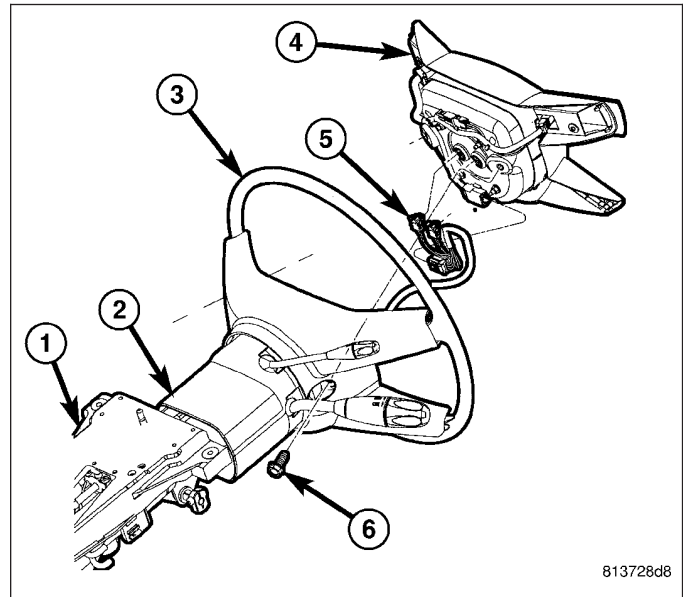
4. Install the clockspring screws (1). (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).



5. Align the spline on the steering wheel hub to shaft.
6. Then install the steering wheel (3) and install a **NEW** retainer bolt (2). Tighten the bolt to 70 N·m (52 ft. lbs.).



7. Install the airbag (4). (Refer to 8 - ELECTRICAL/ RESTRAINTS/DRIVER AIRBAG - REMOVAL).
8. Install the negative battery terminal on the battery. It is important that this is performed properly (including calibration of steering angle sensor if equipped with ESP). (Refer to 8 - ELECTRICAL/ BATTERY SYSTEM - STANDARD PROCEDURE)
9. Test the operation of the horn, lights and any other functions that are steering column operated.



GEAR

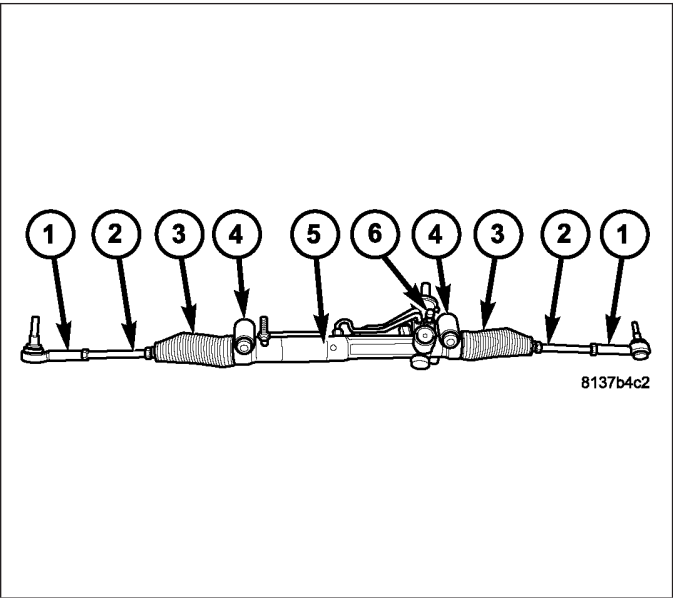
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GEAR

DESCRIPTION

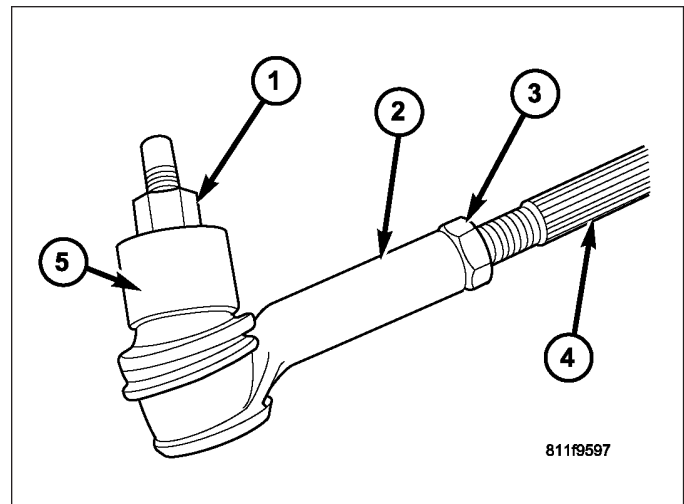
The rack and pinion steering gear is made up of two main components, the pinon shaft and the housing (5). Other components are the outer tie rod ends (1), inner tie rod ends (2), boots (3) and mounting bushings (4). The gear cannot be adjusted or internally serviced. If a malfunction or a fluid leak occurs, the gear must be replaced as an assembly. The only serviceable component on the steering gear is the outer tie rod (1).



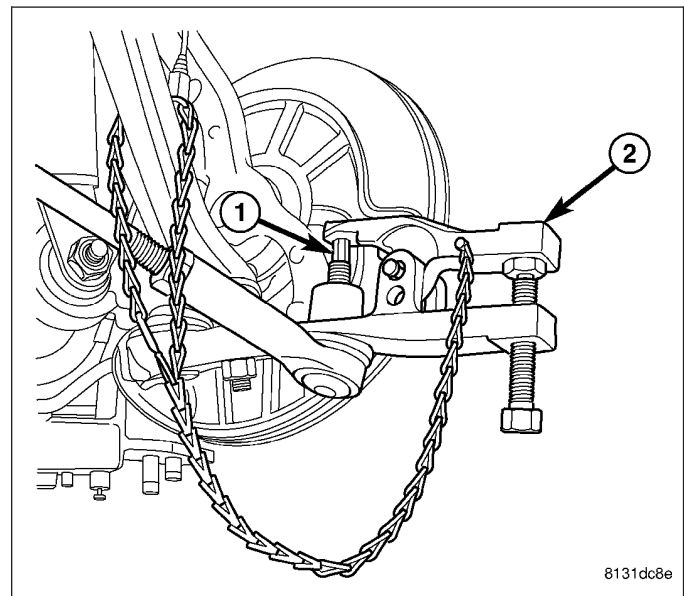
REMOVAL

1. Drain and siphon the power steering fluid from the reservoir.
2. Raise and support the vehicle.
3. Remove both front tires.

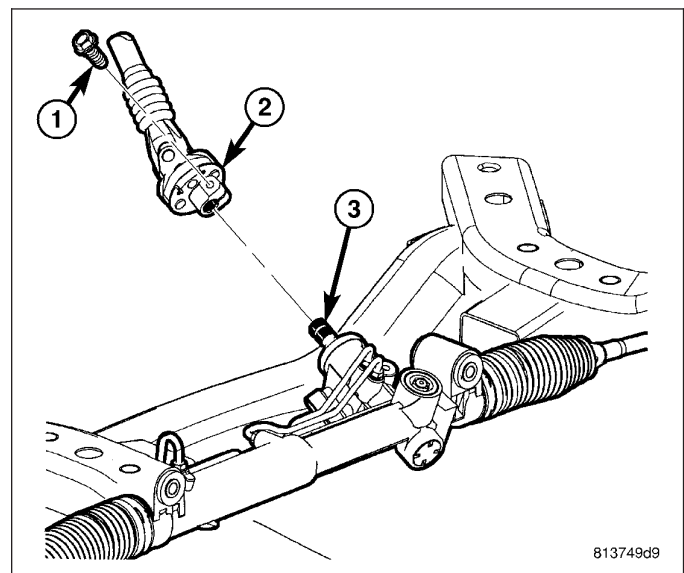
4. Loosen the jam nut (3).
5. Remove the outer tie rod end nut (1) from the knuckle (5).



6. Separate the outer tie rod end (1) from the knuckle with Remover 9630 (2) (Refer to 19 - STEERING/LINKAGE/TIE ROD END - REMOVAL).

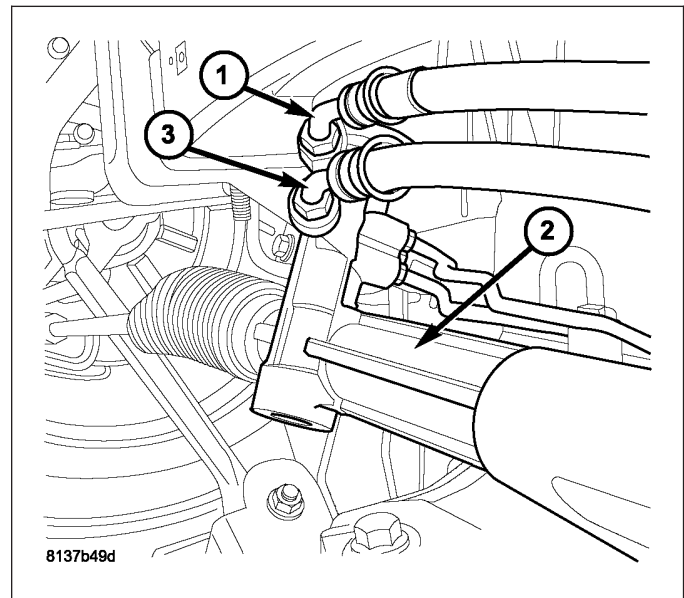


7. Remove the steering coupling (2) lower pinch bolt (1) at the gear (3) (Refer to 19 - STEERING/COL-

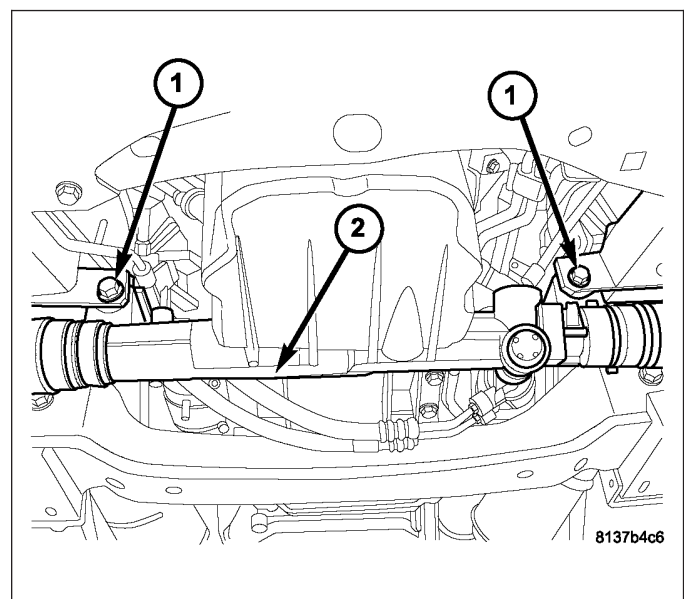


## UMN/STEERING COUPLING - REMOVAL).

8. Disconnect the pressure line (3) at the gear (2) (Refer to 19 - STEERING/PUMP/HOSES - REMOVAL).
9. Disconnect the return line (1) from the gear (2)(Refer to 19 - STEERING/PUMP/HOSES - REMOVAL).

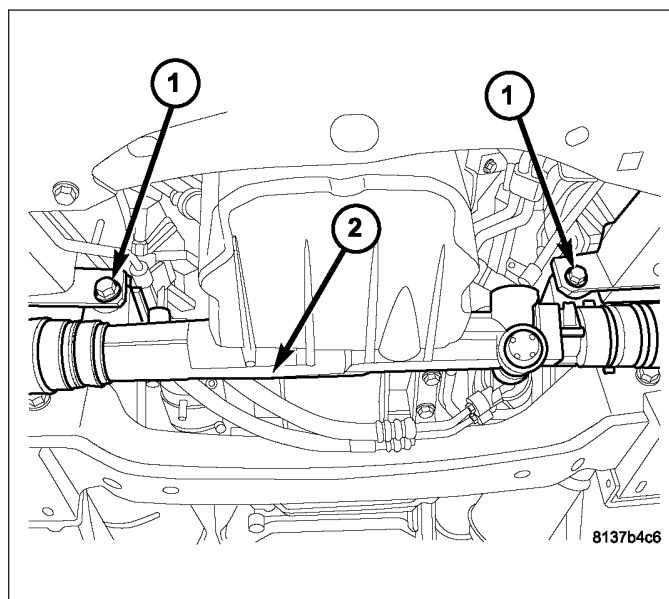


10. Remove the steering gear mounting bolts (1).
11. Remove the outer tie rods from the old gear if needed on replacement gear. Count the number of turns off for each tie rod for reference upon installation to replacement gear.

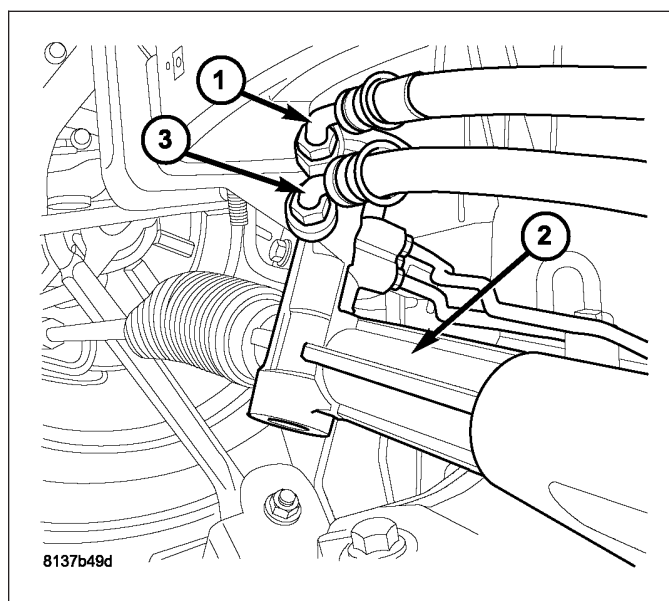


## INSTALLATION

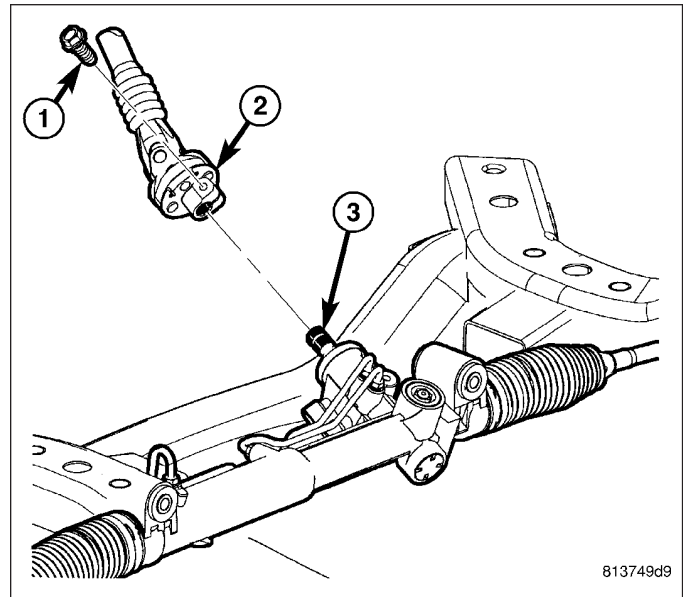
1. If necessary, install the outer tie rods from the old gear to the replacement. Install each outer tie rod the same amount of threads as it was installed on old gear. This will get the toe setting close, saving some time when the toe is set later in this procedure.
2. Install the steering gear mounting bolts (1). Tighten to 142 N·m (105 ft.lbs.).



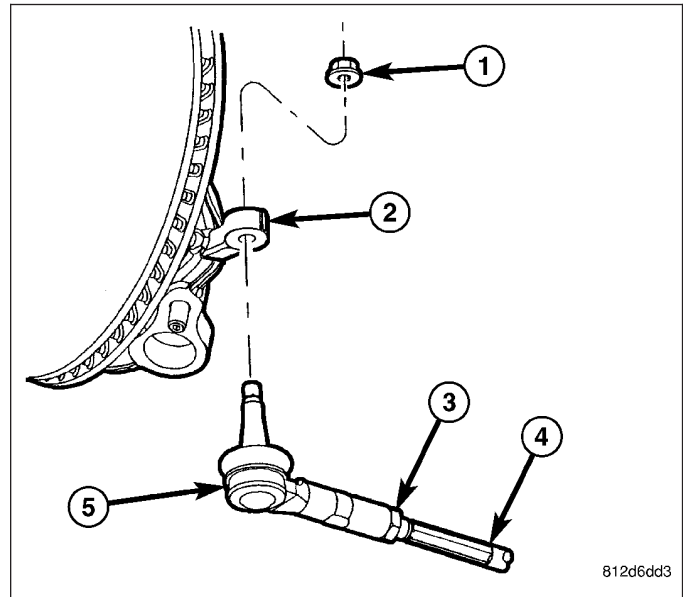
3. Reconnect the return line (1) to the gear (2). Tighten to 47 N·m (35 ft.lbs.). (Refer to 19 - STEERING/PUMP/HOSES - INSTALLATION).
4. Reconnect the pressure line (3) to the gear (2). Tighten to 47 N·m (35 ft.lbs.). (Refer to 19 - STEERING/PUMP/HOSES - INSTALLATION).



5. Install the steering coupling (2) to the gear (3). Install a **NEW** pinch bolt. Tighten bolt to 54 N·m (40 ft. lbs.). (Refer to 19 - STEERING/COLUMN/STEERING COUPLING - INSTALLATION).



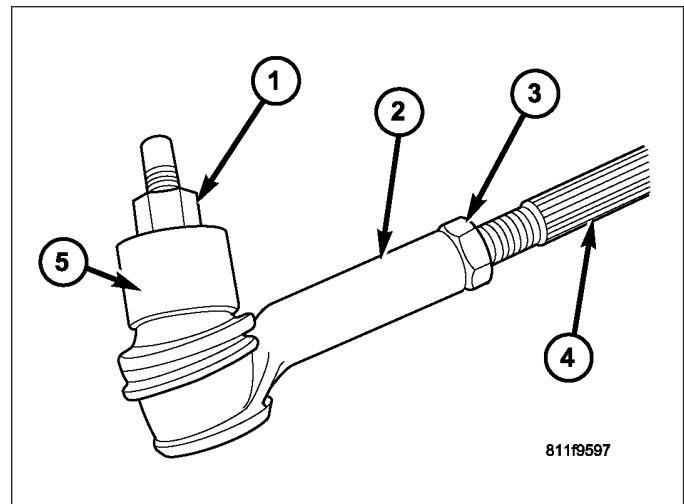
6. Install the tie rod end (5) to the knuckle (2), then install the nut (1). Tighten to 85 N·m (63 ft. lbs.)



7. Install both front tires. (Refer to 22 - TIRES/WHEELS - INSTALLATION)
8. Lower the vehicle.
9. Fill the power steering reservoir and perform initial operation procedure. (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE)
10. Set wheel toe pattern, (Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - STANDARD PROCEDURE).



11. Tighten the tie rod jam nuts (3) to 75 N·m (55 ft. lbs.).



## TIE ROD - OUTER

### DIAGNOSIS AND TESTING

#### OUTER TIE ROD END

**Note:** If the outer tie rod end is equipped with a lubrication fitting, grease the joint then road test the vehicle before performing test.

1. Raise the front of the vehicle. Place safety floor stands under both lower control arms as far outboard as possible. Lower the vehicle to allow the stands to support some or all of the vehicle weight.
2. Remove the front tires.
3. Mount a dial indicator solidly to the vehicle steering knuckle and then zero the dial indicator.
4. Position indicator plunger on the topside of the outer tie rod end.

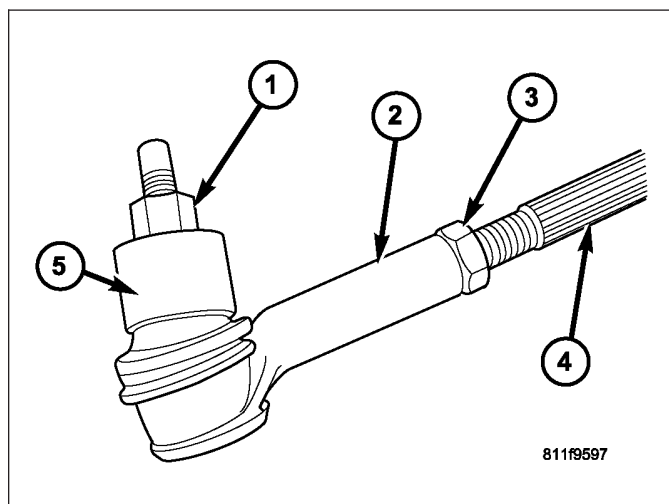
**Note:** The dial indicator plunger must be perpendicular to the machined surface of the outer tie rod end.

5. Position a pry bar in order to pry downwards on the outer tie rod end.
6. If the travel exceeds 0.5 mm (0.020 in.), replace the outer tie rod end (Refer to 19 - STEERING/LINKAGE/TIE ROD END - REMOVAL).
7. If the outer tie rod end is within specs reinstall the front tires (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

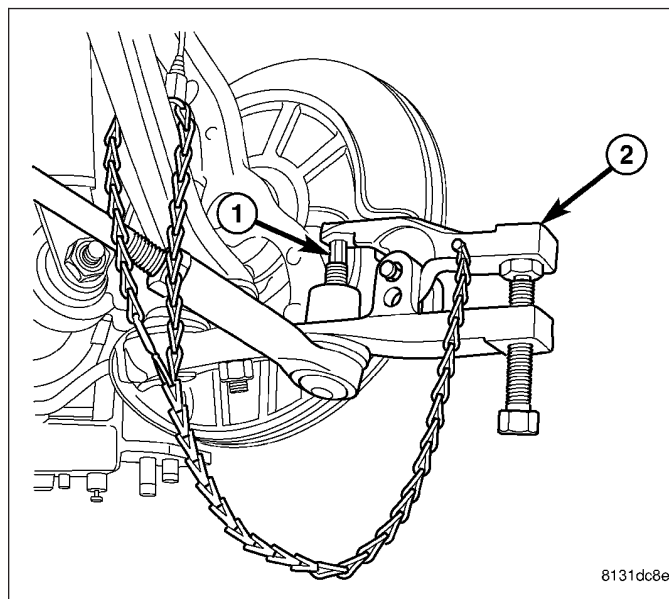
## REMOVAL

**Note:** Do not twist the boot anytime during removal or installation.

1. Loosen the jam nut (3).
2. Remove the outer tie rod end (2) nut (1) from the ball stud.



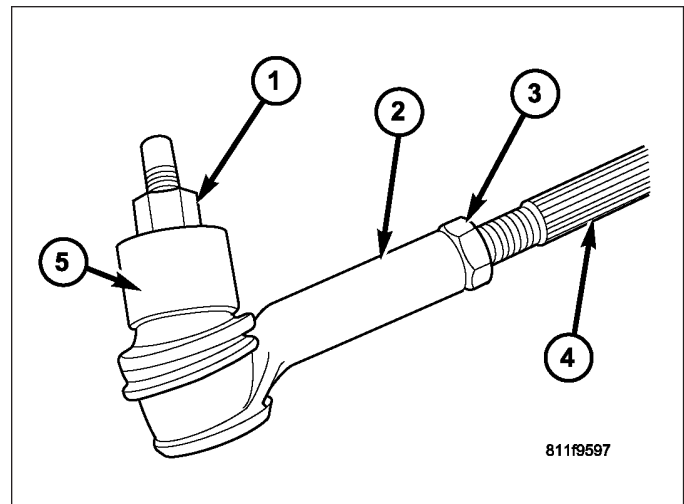
3. Separate the outer tie rod (1) from the knuckle with Remover 9630 (2).
4. Unthread the outer tie rod from the inner tie rod. **Count the number of turns when removing the tie rod, This will give a good starting point when reassembling and setting toe adjustment.**



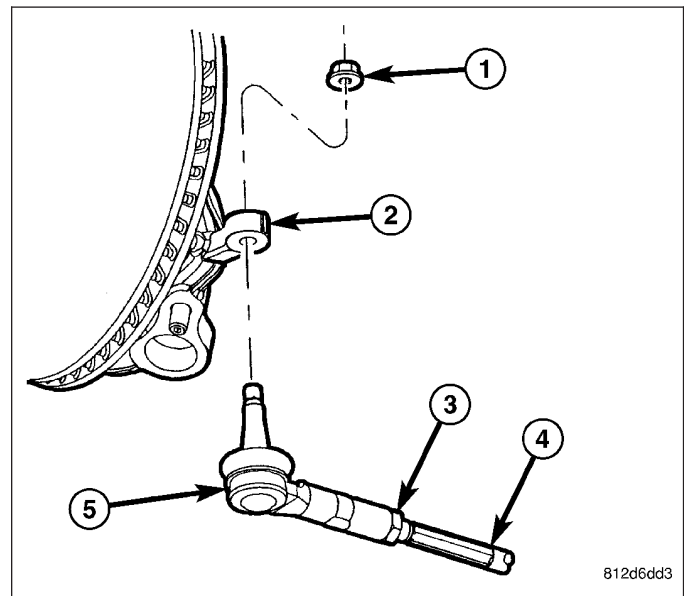
## INSTALLATION

**Note:** Do not twist the inner tie rod boot at anytime during removal or installation.

1. Thread the outer tie rod (2) onto the inner tie rod (4), the same number of turns as when removed.



2. Install the outer tie rod end (5) into the steering knuckle (2).
3. Install and tighten the nut (1) on the outer tie rod end ball stud to 85 N·m (63 ft. lbs.).
4. Set wheel toe pattern, (Refer to 2 - SUSPENSION/ WHEEL ALIGNMENT - STANDARD PROCEDURE).
5. Tighten jam nut (3) to 75 N·m (55 ft. lbs.).



# PUMP

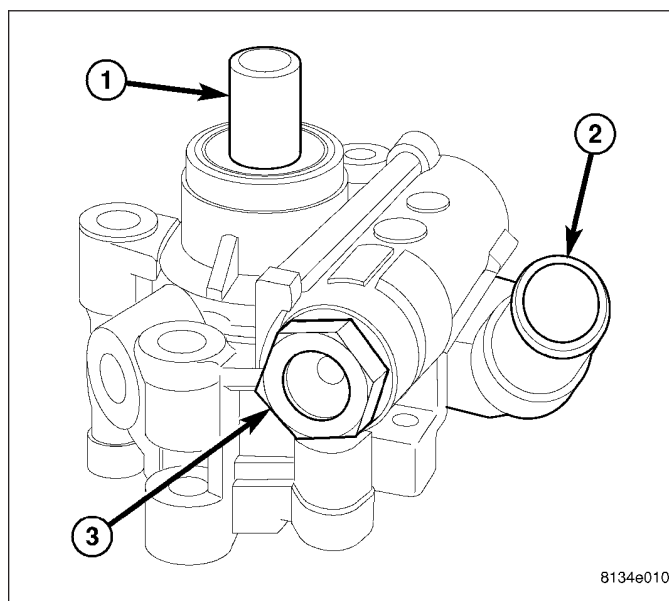
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## PUMP

### DESCRIPTION

Hydraulic pressure for operation of the power steering gear is provided by a belt-driven all-aluminum power steering pump. It is a droop flow rate and constant displacement type pump. A common power steering pump, mounted in a common location (left front of engine), is standard on all models.



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### DIAGNOSIS AND TESTING

#### PUMP LEAKAGE

The pump is serviced as an assembly and should not be disassembled.

Check for leaks in the following areas:

- Pump shaft seal behind the pulley
- Pressure and return lines
- Flow control valve fitting

## STANDARD PROCEDURE

### POWER STEERING PUMP INITIAL OPERATION

**WARNING: THE FLUID LEVEL SHOULD BE CHECKED WITH ENGINE OFF TO PREVENT INJURY FROM MOVING COMPONENTS.**

**CAUTION: MOPAR® ATF+4 is to be used in the power steering system. No other power steering or automatic transmission fluid is to be used in the system. Damage may result to the power steering pump and system if any other fluid is used, and do not overfill.**

Wipe filler cap clean, then check the fluid level. The dipstick should indicate **COLD** when the fluid is at normal temperature.

1. Turn steering wheel all the way to the left.
2. Fill the pump fluid reservoir to the proper level and let the fluid settle for at least two (2) minutes.
3. Raise the front wheels off the ground.
4. Slowly turn the steering wheel lock-to-lock 20 times with the engine off while checking the fluid level.

**Note: Vehicles with long return lines or oil coolers turn wheel 40 times.**

5. Start the engine. With the engine idling maintain the fluid level.
6. Lower the front wheels and let the engine idle for two minutes.
7. Turn the steering wheel in both direction and verify power assist and quiet operation of the pump.

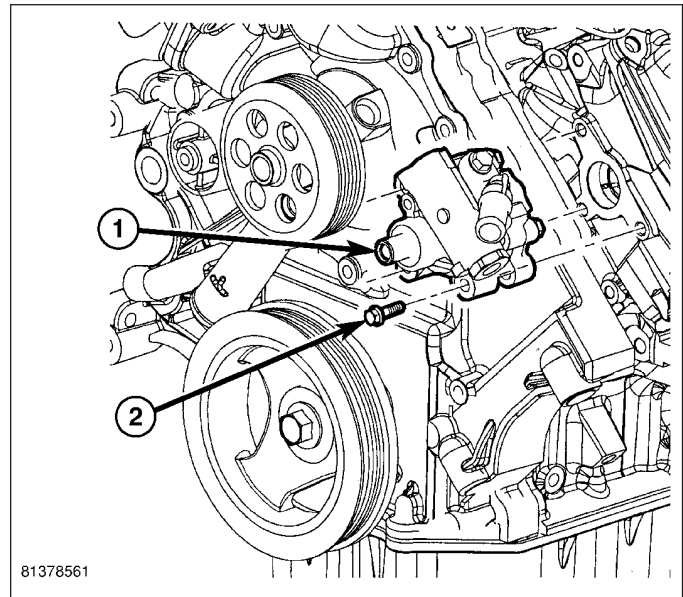
If the fluid is extremely foamy or milky looking, allow the vehicle to stand a few minutes and repeat the procedure.

**CAUTION: Do not run a vehicle with foamy fluid for an extended period. This may cause pump damage.**

## REMOVAL

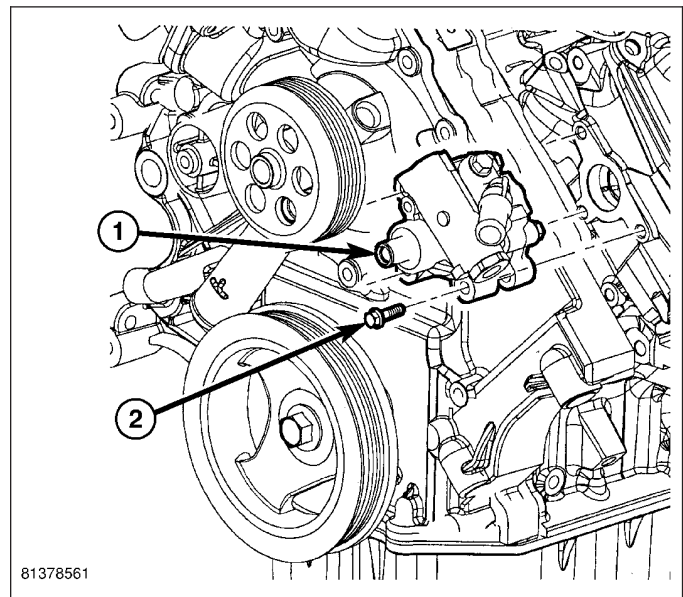
1. Drain and siphon the power steering fluid from the pump.
2. Remove the air cleaner housing and inlet tube (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
3. Remove the serpentine drive belt,(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
4. Remove the supply hose at the pump.
5. Remove the pressure hose from the pump.

6. Remove 3 pump mounting bolts (2) through pulley access holes.
7. Remove the pump (1) from the engine.



## INSTALLATION

1. Align the pump with the mounting holes on the engine.
2. Install 3 pump mounting bolts through the pulley access holes. Tighten the bolts to 28 NM (21 ft. lbs.).
3. Install the pressure hose to the pump. Tighten the pressure line to 47 NM (35 ft. lbs.).
4. Install the supply hose to the pump.



5. Install the serpentine drive belt. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
6. Fill the power steering pump and perform pump initial operation procedure. (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE)
7. Install the air cleaner housing and inlet tube. (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION)

## FLUID

### DESCRIPTION

The recommended fluid for the power steering system is Mopar® ATF+4 Automatic Transmission Fluid (MS-9602). Mopar® ATF+4, when new, is red in color. ATF+4 is dyed red so it can be identified from other fluids used in the vehicle such as engine oil or antifreeze. The red color is not permanent and is not an indicator of fluid condition. As the vehicle is driven, ATF+4 will begin to look darker in color and may eventually become brown. **THIS IS NORMAL.**

ATF+4 also has a unique odor that may change with age. Consequently, odor and color cannot be used to indicate the fluid condition or the need for a fluid change.

## STANDARD PROCEDURE

### POWER STEERING FLUID LEVEL CHECKING

**WARNING:** Fluid level should be checked with the engine off to prevent personal injury from moving parts.

**CAUTION:** MOPAR® ATF+4 is to be used in the power steering system. No other power steering or automatic transmission fluid is to be used in the system. Damage may result to the power steering pump and system if any other fluid is used, and do not overfill.

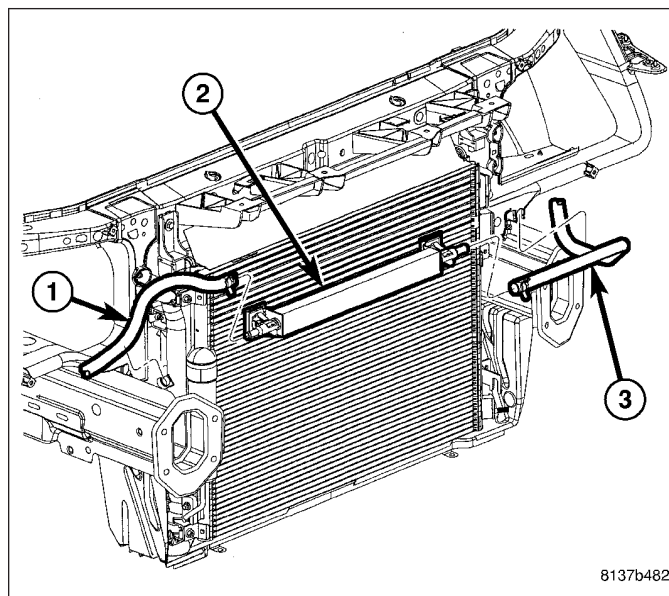
The power steering fluid level can be viewed on the dipstick attached to the filler cap. There are two ranges listed on the dipstick, COLD and HOT. Before opening power steering system, wipe the reservoir filler cap free of dirt and debris. Remove the cap and check the fluid level on its dipstick. When the fluid is at normal ambient temperature, approximately 21°C to 27°C (70°F to 80°F), the fluid level should read between the minimum and maximum area of the cold range. When the fluid is hot, fluid level is allowed to read up to the highest end of the HOT range. Only add fluid when the vehicle is cold.

**Use only Mopar® ATF+4 in the power steering system.** Do not overfill the power steering system.

## FLUID COOLER

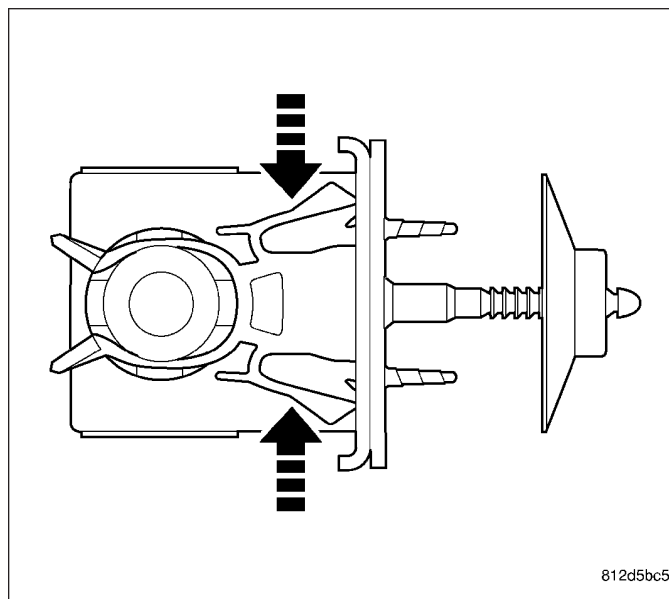
### REMOVAL

1. Siphon the power steering system.
2. Raise and support the vehicle.
3. Remove the lower splash shield.
4. Disconnect the return hose (1) at the cooler (2) from the gear.
5. Disconnect the return hose (3) at the cooler (2) from the reservoir.



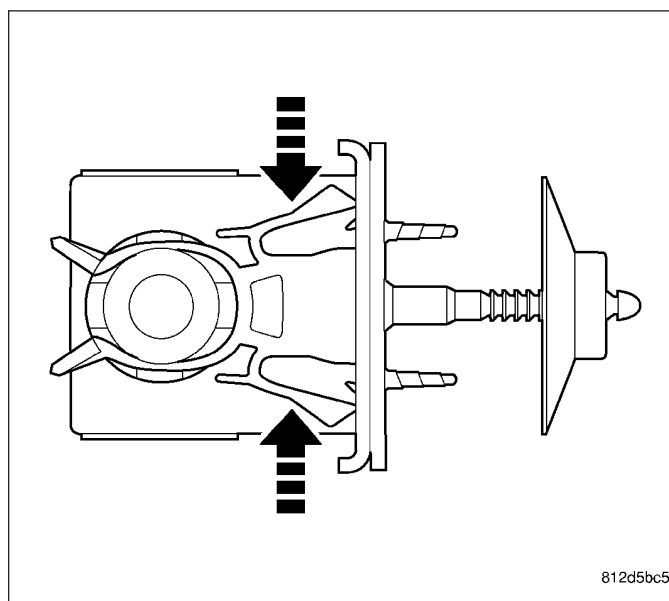
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6. Push in on the cooler mounting clip tabs.
7. Remove the cooler from the clips.



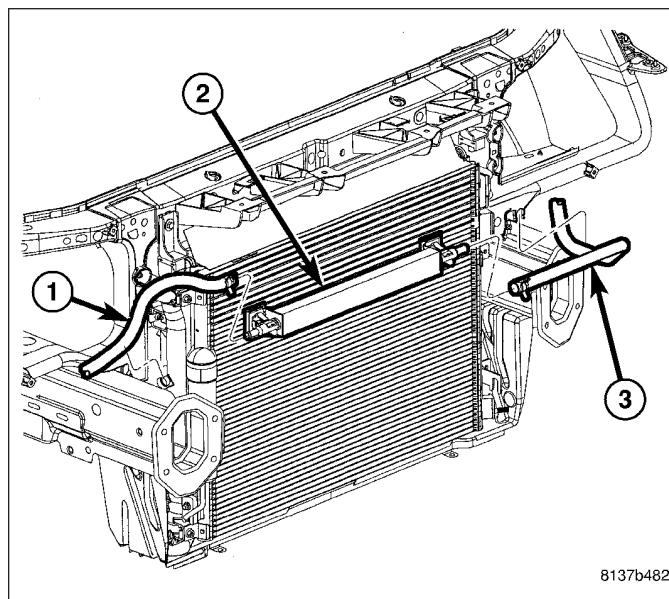
## INSTALLATION

1. Install the cooler over the mounting clips and past the retaining tabs allowing it to lock into place.





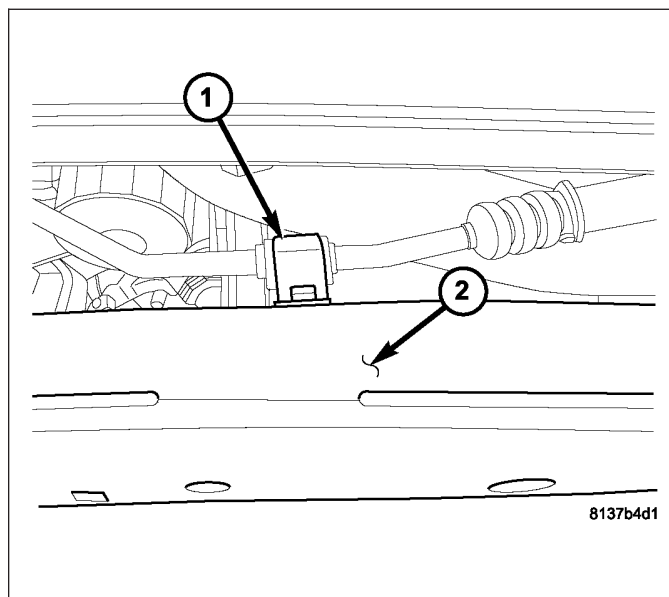
2. Reconnect the return hose (3) at the cooler (2) from the reservoir.
3. Reconnect the return hose (1) at the cooler (2) from the gear.
4. Install the lower splash shield.
5. Lower the vehicle.
6. Fill and bleed the power steering system (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).



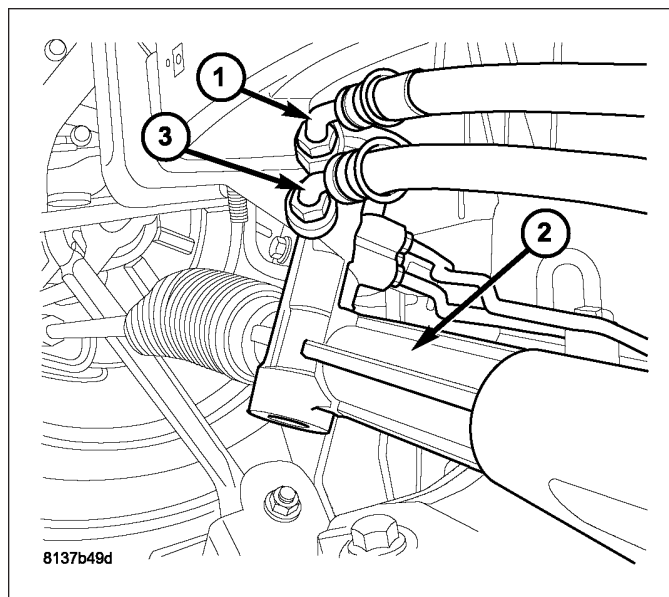
## HOSE - PRESSURE

### REMOVAL

1. Drain and siphon the power steering fluid from the reservoir.
2. Remove the air cleaner housing and inlet tube. (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL)
3. Disconnect the pressure line at the pump.
4. Raise and support the vehicle.
5. Remove the lower splash shield.
6. Disconnect the pressure line retainer at the engine cradle.
7. Remove the pressure and return line mounting bracket bolt (1) from the engine cradle (2).

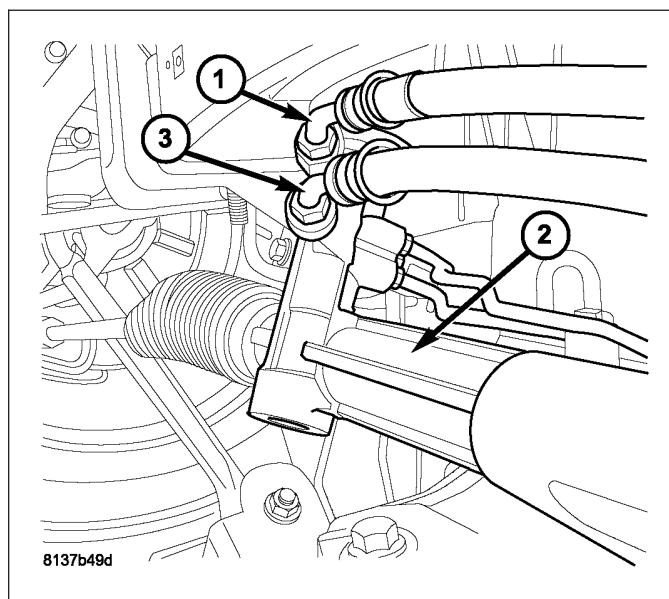


8. Disconnect the pressure line (3) at the gear (2).
9. Remove the pressure line (3) from the vehicle.



## INSTALLATION

1. Install the pressure line (3) to the vehicle.
2. Reconnect the pressure line (3) to the gear (2). Tighten to 47 N·m (35 ft.lbs.).



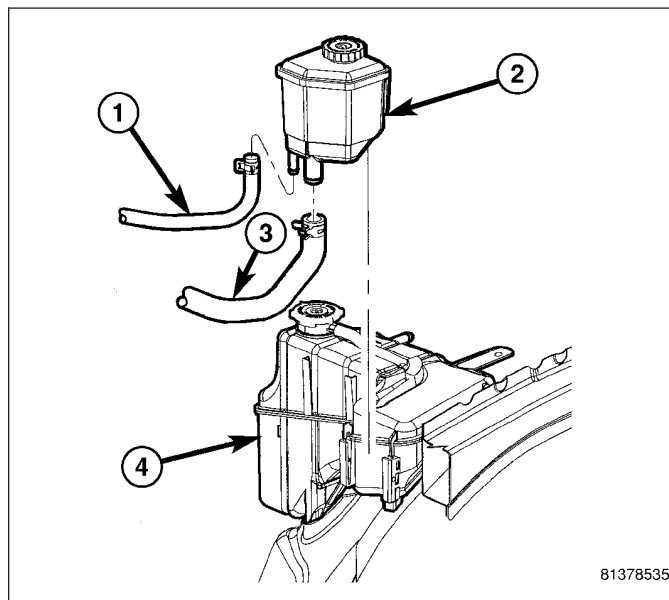
3. Install the pressure and return line routing bracket to the engine cradle.
4. Install the pressure line retainer bolt to the engine cradle.
5. Install the lower splash shield.
6. Lower the vehicle.
7. Reconnect the pressure line to the pump. Tighten to 47 N·m (35 ft.lbs.).
8. Fill the power steering reservoir,(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).
9. Install the air cleaner housing and inlet tube (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

## HOSE - RETURN

### REMOVAL

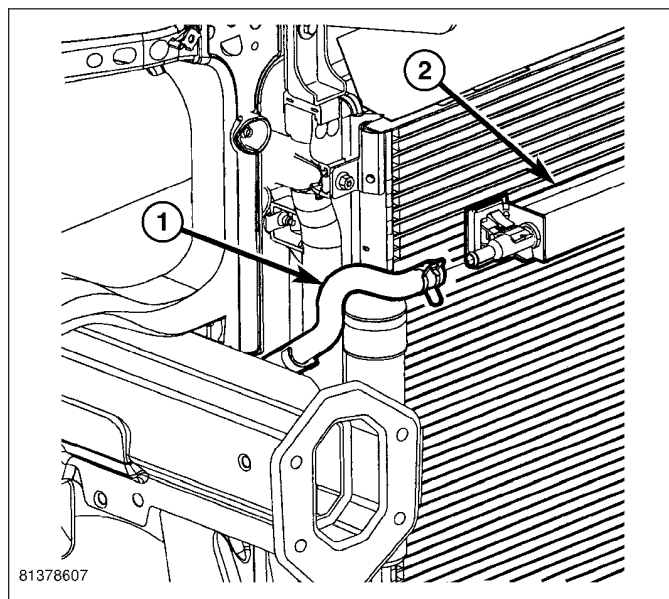
#### COOLER TO RESERVOIR

1. Remove the air cleaner housing and inlet tube (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
2. Drain and siphon the power steering fluid from the reservoir.
3. Disconnect the return hose (1) at the reservoir (2).
4. Remove the upper radiator closer panels.
5. Disconnect the cooler return hose (1) at the cooler (2).
6. Remove the cooler return hose from the vehicle.

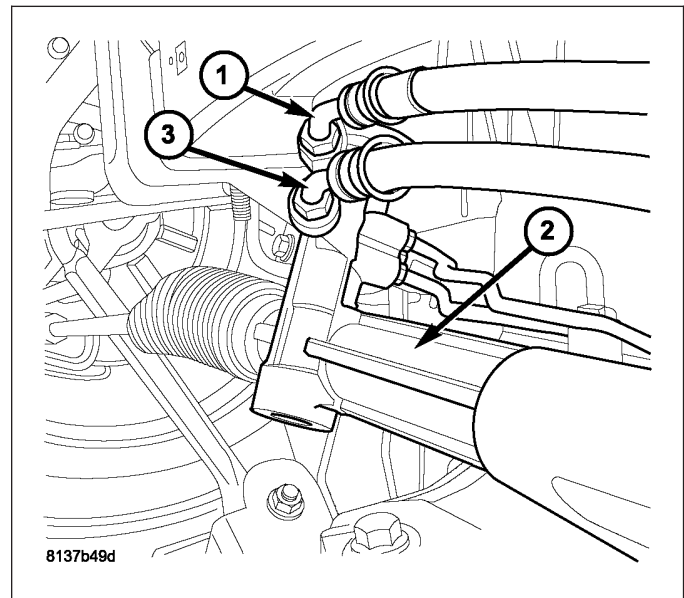


#### GEAR TO COOLER

1. Drain and siphon the power steering fluid from the reservoir
2. Raise and support the vehicle.
3. Remove the lower splash shield.
4. Disconnect the return hose (1) from the gear at the cooler (2).



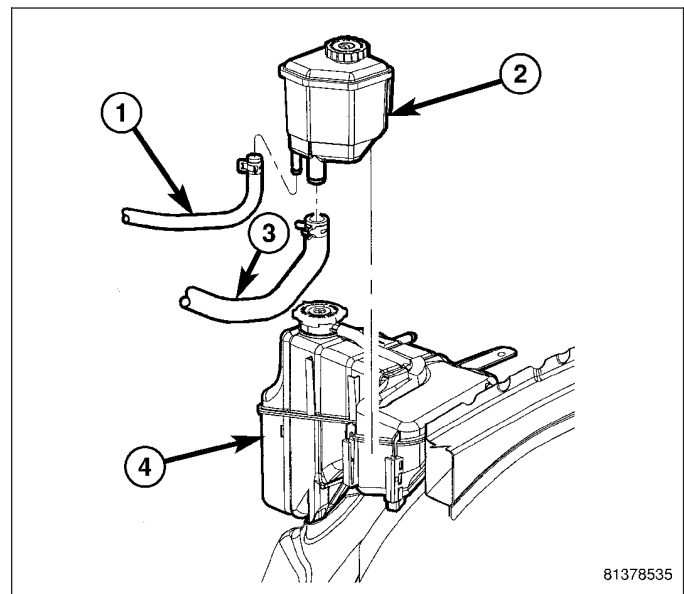
5. Remove the return and pressure routing bracket nut at the engine cradle.
6. Disconnect the return line (1) at the gear (2).
7. Remove the return hose (1) from the vehicle.



## INSTALLATION

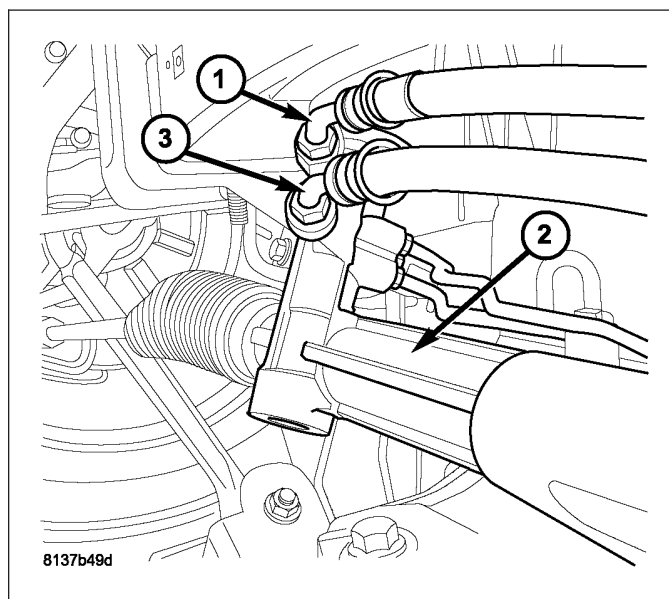
### COOLER TO RESERVOIR

1. Install the cooler return hose to the vehicle.
2. Reconnect the cooler return hose at the cooler.
3. Install the upper radiator closeout panels.
4. Reconnect the cooler return hose (1) at the reservoir (2).
5. Fill the power steering reservoir,(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).
6. Install the air cleaner housing and inlet tube (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

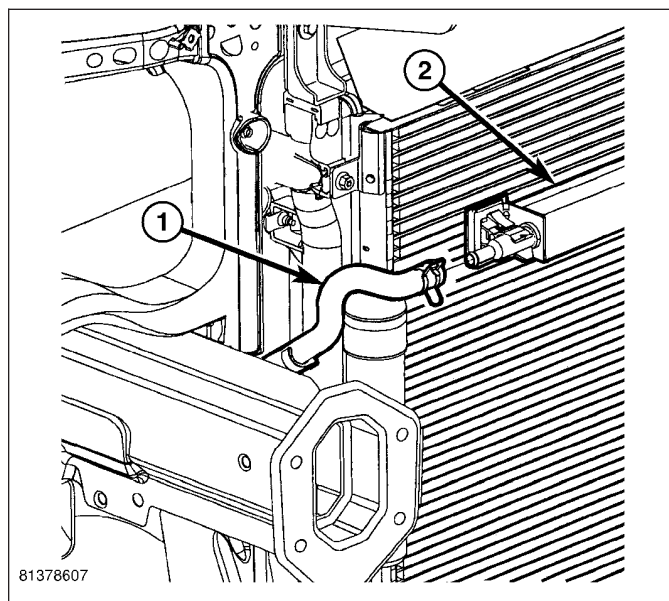


## GEAR TO COOLER

1. Install the return line (1) to the vehicle.
2. Reconnect the return line (1) to the gear (2). Tighten to 47 N·m (35 ft. lbs.).
3. Install the pressure and return line routing bracket to the engine cradle.



4. Install the return hose (1) at the cooler (2).
5. Install the lower splash shield.
6. Lower the vehicle.
7. Fill the power steering reservoir.(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE)

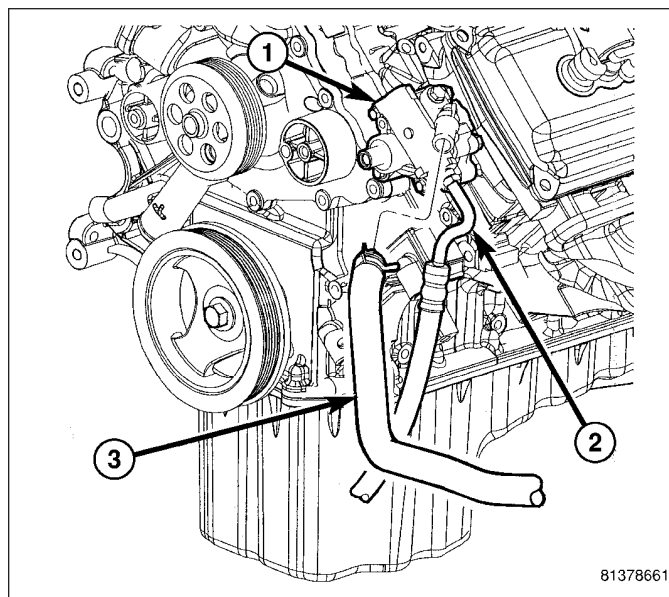


## HOSE - SUPPLY

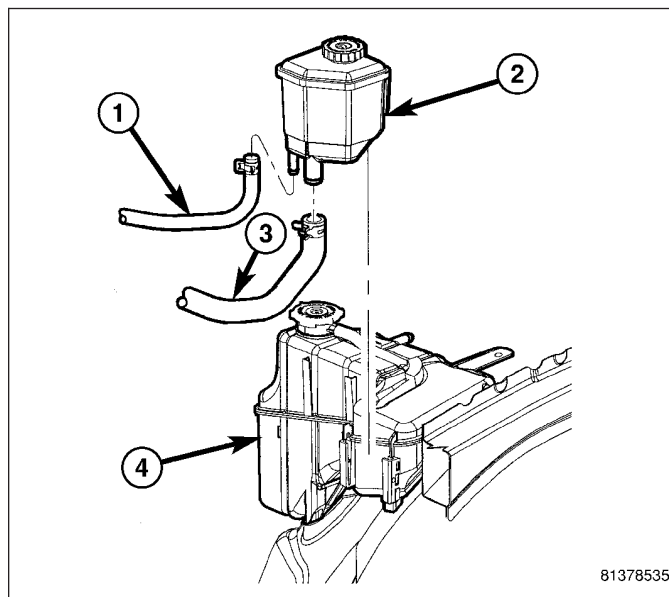
### REMOVAL

1. Remove the air cleaner housing and inlet tube (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
2. Drain and siphon the power steering fluid from the reservoir.

3. Disconnect the pump supply hose (3) at the pump (1).

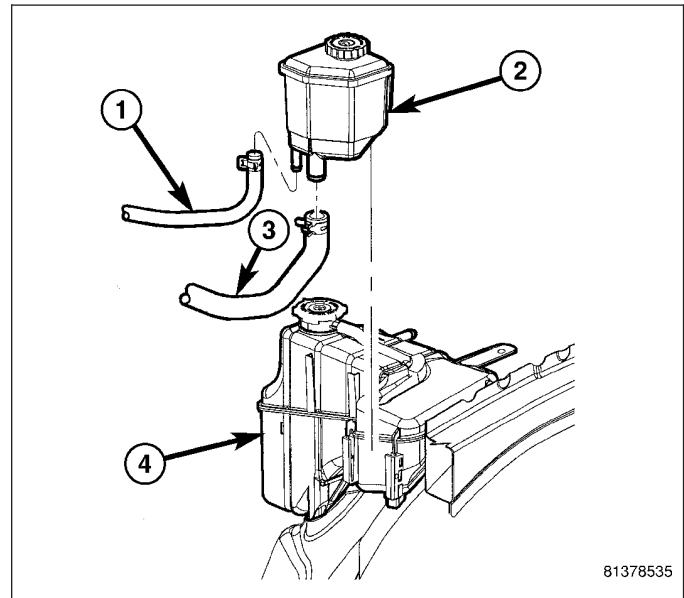


4. Disconnect the supply hose (3) at the reservoir (2).
5. Remove the supply hose from the vehicle.

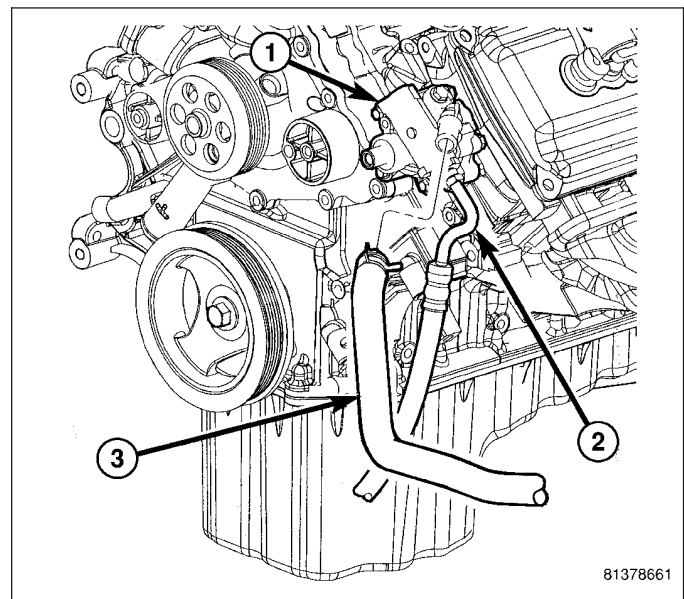


## INSTALLATION

1. Install the supply hose (3) to the vehicle.
2. Reconnect the supply hose (3) to the reservoir (2).



3. Reconnect the supply hose (3) at the pump (1).
4. Fill the power steering reservoir.(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE)
5. Install the air cleaner housing and inlet tube (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).



## PULLEY

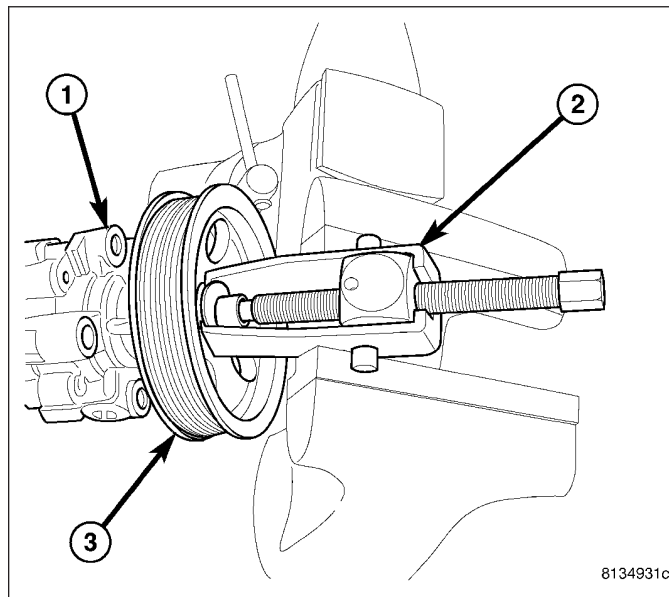
### REMOVAL

1. Remove power steering pump from engine. (Refer to 19 - STEERING/PUMP - REMOVAL)

**CAUTION:** Do not hammer on power steering pump pulley or shaft to remove power steering pump pulley. This will damage the pulley and the power steering pump.

2. Mount Puller, Special Tool C-4333 (2) , on power steering pump pulley (3). Mount puller (with power steering pump (1) in a vise. This will keep shaft of power steering pump from turning while removing pulley (3).
3. Tighten puller and remove pulley from shaft of power steering pump.

**Note:** Replace power steering pump pulley if bent, cracked, or loose.

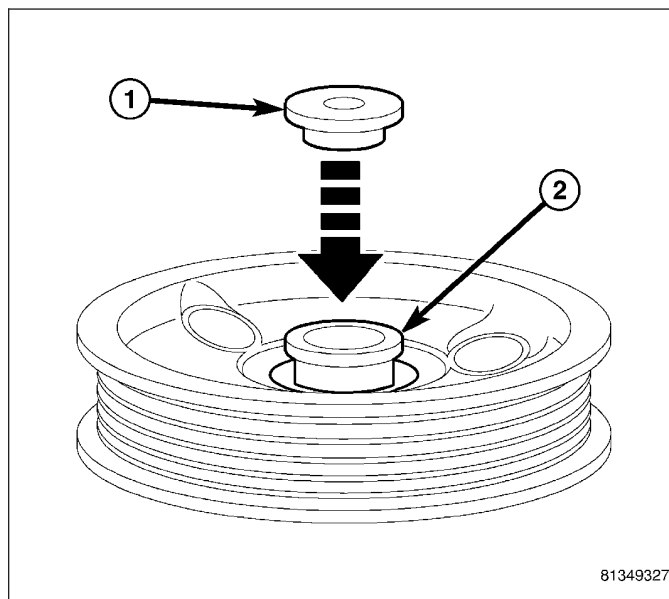


4.

### INSTALLATION

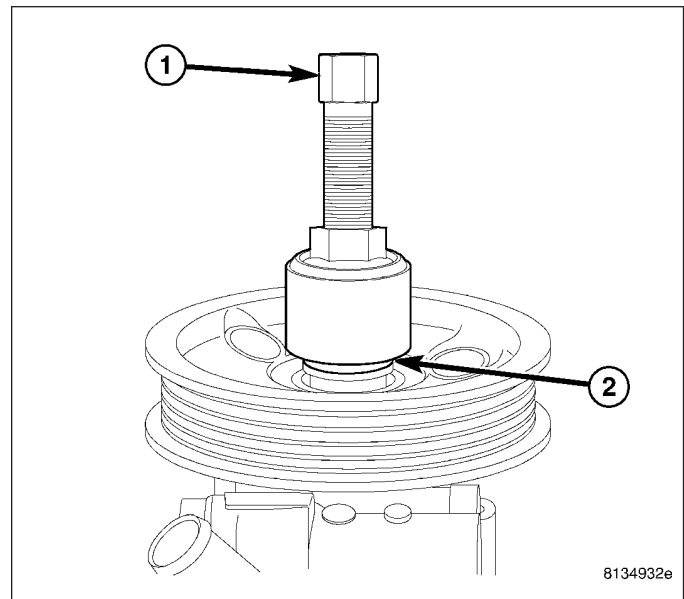
**CAUTION:** Do not hammer on power steering pump pulley (2) or shaft to install power steering pump pulley. This will damage the pulley and the power steering pump.

1. Place power steering pump pulley (2) squarely on end of power steering pump shaft.
2. Place Installation Spacer Special Tool 6936 (1), on top of the power steering pump pulley (2).





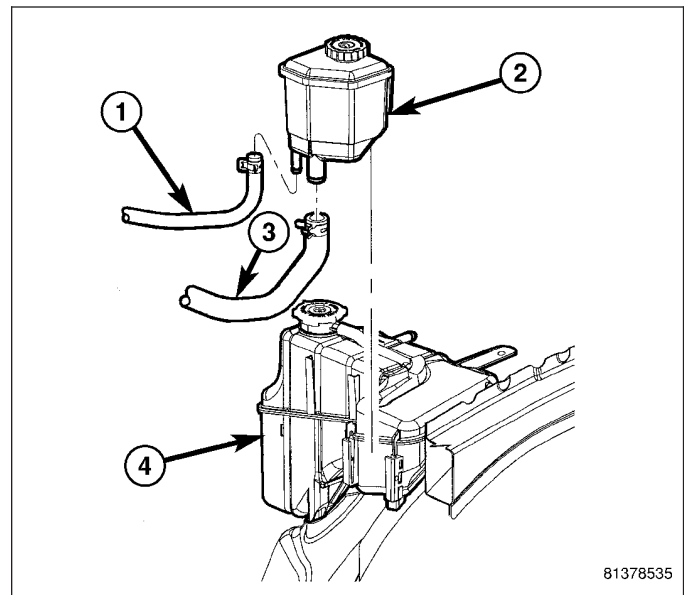
3. Mount Installer, Special Tool C-4063 (1), in internal threads of the power steering pump shaft and against Special Tool 6936 (2) on power steering pump pulley.
4. Ensuring that special tool and pulley remain aligned with pump shaft, force pulley onto power steering pump shaft until Special Tool 6936 (2) is against the end of the power steering pump shaft.  
**When Special Tool 6936 (2) is against the shaft of the power steering pump, Special Tool C-4063 (1) will no longer be able to be turned.**
5. Remove Installer from power steering pump.
6. Install power steering pump and mounting bracket back on engine.(Refer to 19 - STEERING/PUMP - INSTALLATION).



## RESERVOIR

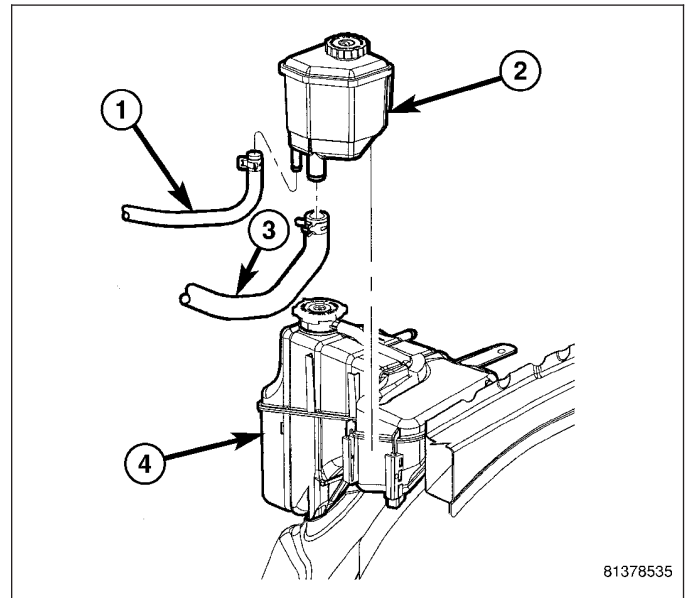
### REMOVAL

1. Drain and siphon the power steering fluid from the reservoir (2).
2. Remove the air cleaner housing and inlet tube (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
3. Disconnect the supply hose (3) at the reservoir (2).
4. Disconnect the cooler return hose (1) to the reservoir (2).
5. Remove the reservoir (2) from the coolant bottle (4).



## INSTALLATION

1. Install the reservoir (2) to the coolant bottle (4).
2. Reconnect the cooler return hose (1) to the reservoir (2).
3. Reconnect the supply hose (3) to the reservoir (2).
4. Fill the power steering reservoir (2),(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).
5. Install the air cleaner housing and inlet tube (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).





# AUTOMATIC TRANSMISSION

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## AUTOMATIC TRANSMISSION NAG1 - ELECTRICAL DIAGNOSTICS

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## **AUTOMATIC TRANSMISSION NAG1 - ELECTRICAL DIAGNOSTICS**

### **DIAGNOSIS AND TESTING**

## NAG1 PRE-DIAGNOSTIC CHECK OUT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

### Diagnostic Test

#### 1. NAG1 PRE-DIAGNOSTIC CHECK OUT

**Note:** Low fluid level can be the cause of many transmission problems. If the fluid level is low, locate and repair the leak then check and adjust the fluid level in accordance with the Service Information.

**Note:** Always perform diagnostics with a fully charged battery to avoid false symptoms.

With the scan tool, read the engine DTCs. Check and repair all engine DTCs prior to performing transmission symptom diagnostic procedures.

With the scan tool, read and record all Transmission DTCs.

**Note:** If the TCM detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set and is located in scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

**Note:** Check connectors - Clean/repair as necessary.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary.

Most DTCs set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run.

**Note:** Verify flash level of transmission controller. Some problems are corrected by software upgrades to the transmission controller. Verify no variant DTCs are present. If variant DTCs are present, perform their perspective test first.

**Note:** Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any repairs that fixed the customer's complaint?**

**Yes** >> Testing complete.

**No** >> Refer to 21 - AUTOMATIC TRANSMISSION - AUTOMATIC TRANSMISSION NAG1 - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

---

P0219–ENGINE OVERSPEED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The Transmission Control Module (TCM) monitors the engine speed over the CAN bus. If the engine speed is greater than 4100+ 800 RPM, the TCM assumes that either the information from the Powertrain Control Module (PCM) is incorrect or that a major mechanical problem exist. Once the DTC is set, the TCM will position the transmission gear into neutral to protect the engine and transmissin from damage. The transmission will remain in neutral and will not be reevaluated by the TCM until the ignition is cycled.

- **When Monitored:**  
Continuously with the ignition on, engine running, with the transmission in gear with a valid Engine RPM message received at least once, and the CAN Bus Circuit and Engine CAN Message Missing are not active.
- **Set Condition:**  
Engine speed is greater than 4100+ 800 RPM.

Possible Causes
MECHANICAL ENGINE PROBLEM MECHANICAL TRANSMISSION PROBLEM POWERTRAIN CONTROL MODULE TRANSMISSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMIS- SION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR OTHER TRANSMISSION DTCS

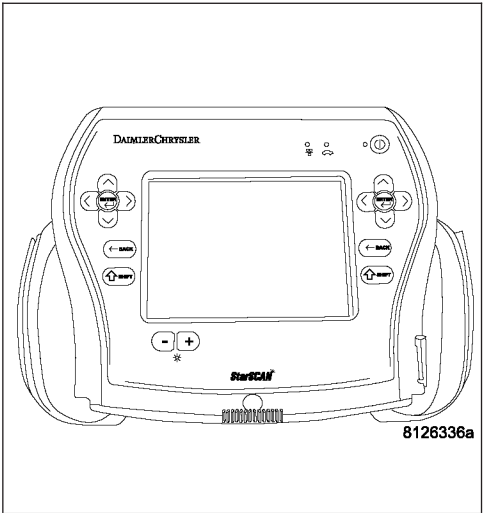
With the scan tool, check for other transmission DTCS.

Are there any gear ratio and/or speed sensor DTCS present in addition to P0219?

- Yes

>> Refer to the Symptom Category and perform the appropriate symptom. If speed sensor DTCS are present, perform their respective test first.
- No

>> Go To 2



**P0219-ENGINE OVERSPEED (CONTINUED)****2. CHECK IF ENGINE MECHANICAL PROBLEMS ARE PRESENT**

Determine if any Engine mechanical problems are present.

**Are there any Engine mechanical problems present?**

**Yes** >> Repair engine as necessary. Refer to 9 - ENGINE-SERVICE INFORMATION for the appropriate repair procedures.

**No** >> Go To 3

---

**3. CHECK IF TRANSMISSION MECHANICAL PROBLEMS ARE PRESENT**

Determine if any Transmission mechanical problems are present.

Turn the ignition off to the lock position.

Remove the Transmission Oil Pan and inspect for debris or a plugged Transmission Oil Filter. Refer to 21 - AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedures.

**Is there any debris, plugged Transmission Oil Filter, or signs of an internal transmission problem?**

**Yes** >> Repair Transmission as necessary. Refer to 21 - AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION-NAG1/SERVICE INFORMATION for the appropriate service procedures.

**No** >> Go To 4

---

**4. TEST DRIVE VEHICLE**

**Note:** The Engine and Transmission must not have mechanical problems and be operating normally before proceeding with this test.

Replace and program the Powertrain Control Module (PCM) per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE for the appropriate service procedures.

Reassemble any previously disconnected connectors and/or components.

With the scan tool, erase Transmission DTCs.

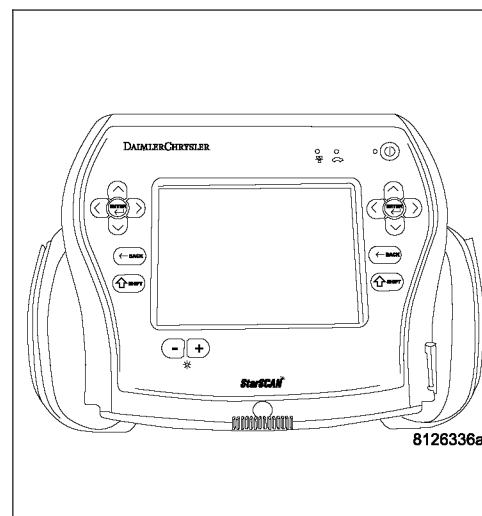
Road test the vehicle.

With the scan tool, read Transmission DTCs.

**Did DTC P0219-ENGINE OVERSPEED reset?**

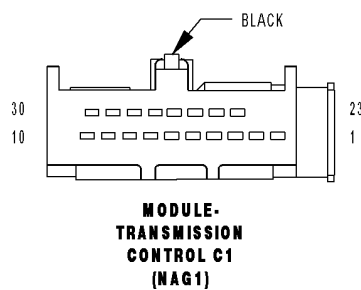
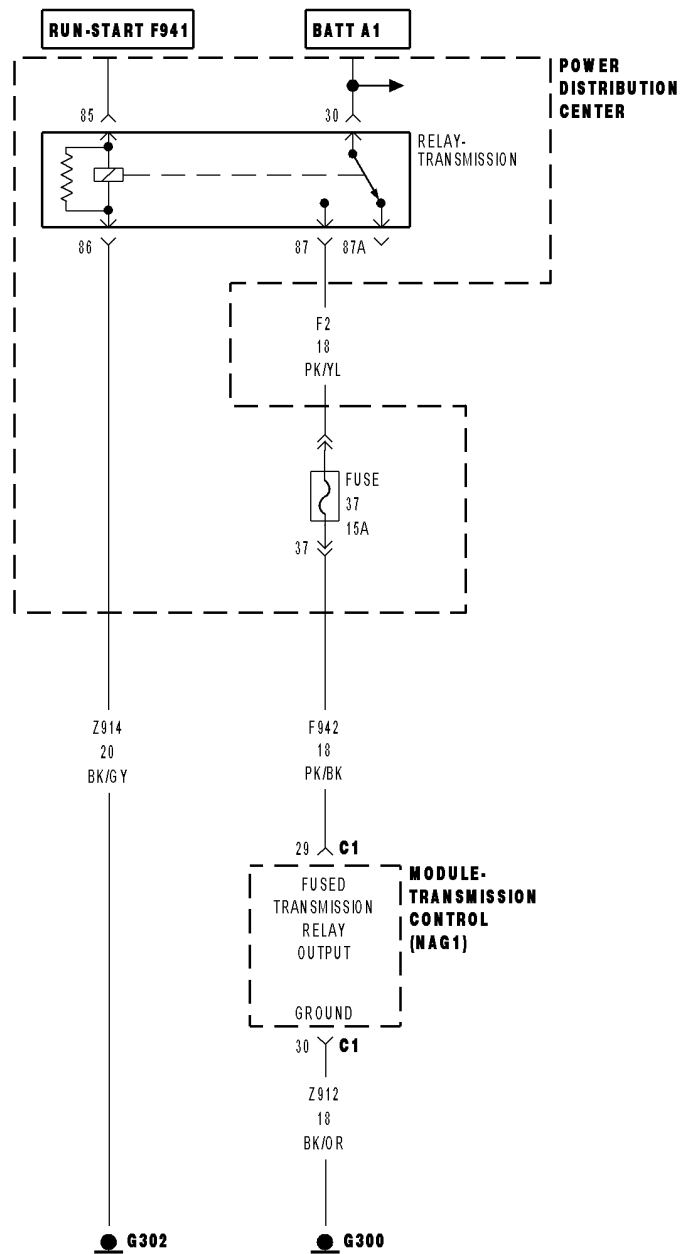
**Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.





## P0562-BATTERY VOLTAGE LOW



**P0562-BATTERY VOLTAGE LOW (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) monitors ignition voltage. The DTC will set if the monitored battery voltage drops below 8.5 volts and a temporary limp in will be activated. If the voltage rises above 9.0 volts, normal operations is resumed and the TCM will record the DTC as a one trip fault. The DTC will only mature to a full DTC if the voltage is less than 8.5 volts with a engine speed greater than 2000 RPM for a least 60 seconds.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
When monitored battery voltage drops below 8.5 volts.

Possible Causes
ENGINE CHARGING SYSTEM DTCS LOW BATTERY VOLTAGE (A1) B(+) CIRCUIT HIGH RESISTANCE (Z912) GROUND CIRCUIT HIGH RESISTANCE (F942) FUSED TRANSMISSION RELAY OUTPUT CIRCUIT HIGH RESISTANCE TRANSMISSION RELAY TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

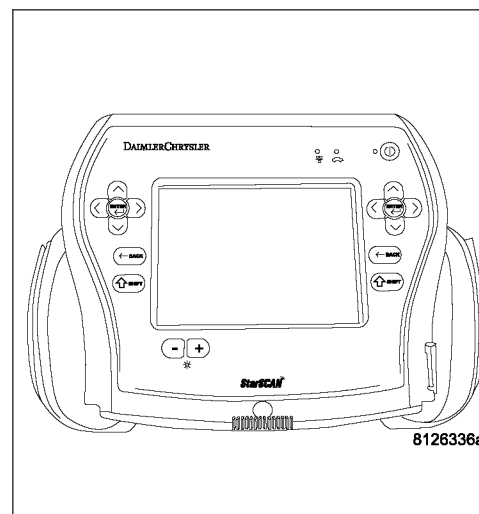
**Diagnostic Test****1. CHECK FOR ENGINE CHARGING SYSTEM DTCS**

With the scan tool, read Engine DTCs.

**Are there any Engine Charging System DTCs present?**

**Yes** >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and perform the appropriate symptom.

**No** >> Go To 2



**P0562-BATTERY VOLTAGE LOW (CONTINUED)****2. CHECK SYSTEM VOLTAGE**

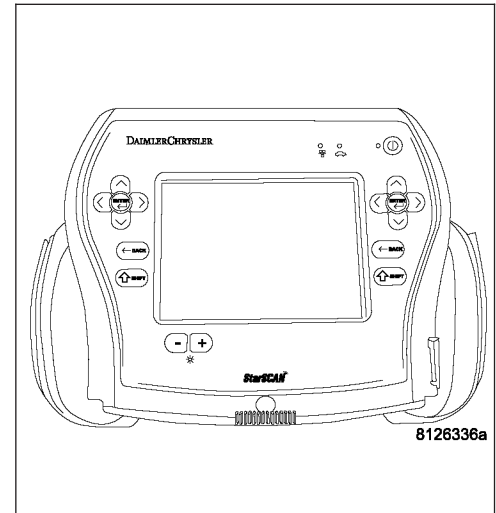
Start the engine.

With the scan tool, under transmission, check system voltage.

**Is the transmission system voltage above 9.0 volts?**

**Yes** >> Go To 7

**No** >> Go To 3

**3. CHECK (A1) B(+) CIRCUIT**

Turn the ignition off to the lock position.

Remove the Transmission Control relay.

Ignition on, engine not running.

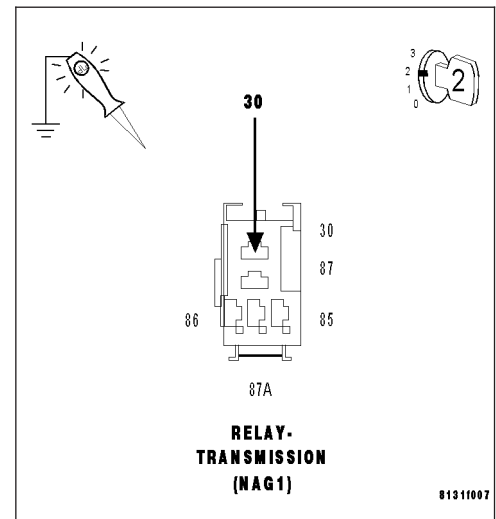
Using a 12-volt test light connected to ground, check the (A1) B(+) circuit in the Transmission Relay connector.

**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly?**

**Yes** >> Go To 4

**No** >> Repair the (A1) B(+) circuit for high resistance.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



**P0562-BATTERY VOLTAGE LOW (CONTINUED)****4. CHECK THE (F942) FUSED TRANSMISSION RELAY OUTPUT CIRCUIT**

Turn the ignition off to the lock position.

Remove the Transmission Relay.

Connect a jumper wire between the (A1) B+ circuit and the (F2) Transmission Relay Output circuit in the Transmission Relay connector.

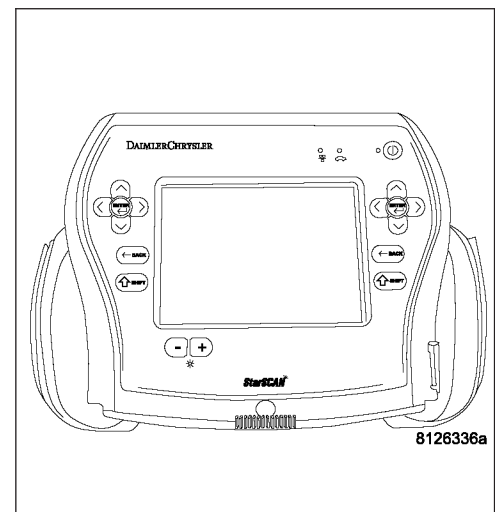
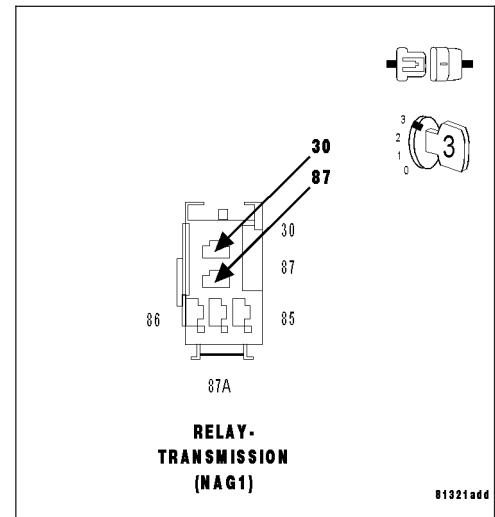
Start the engine.

With the scan tool, under transmission, check system voltage.

**Is the transmission system voltage above 9.0 volts?**

**Yes** >> Replace the Transmission Relay.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5



**P0562-BATTERY VOLTAGE LOW (CONTINUED)****5. CHECK THE (F942) FUSED TRANSMISSION RELAY OUTPUT CIRCUIT**

Turn the ignition off to the lock position.

Reinstall the Transmission Relay.

Disconnect the TCM C1 harness connector.

Start the engine.

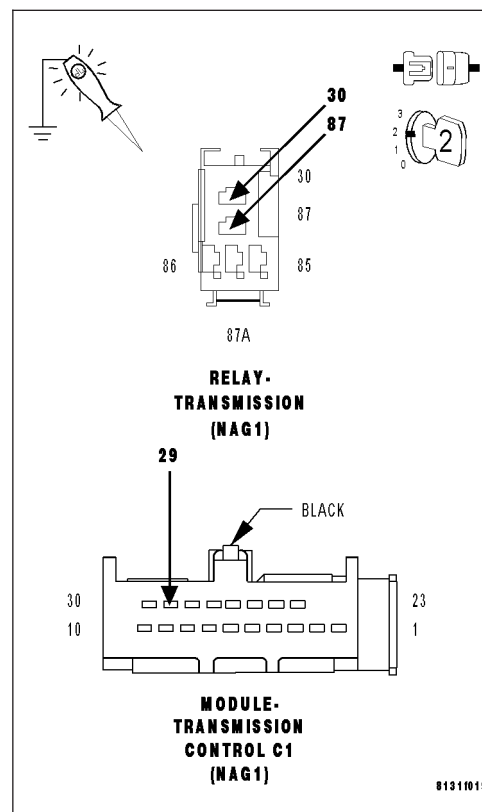
Using a 12-volt test light connected to ground, check the (F942) Fused Transmission Relay Output circuit in the TCM C1 harness connector.

**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly?**

**Yes** >> Go To 6

**No** >> Repair the (F942) Fused Transmission Relay Output circuit for high resistance. Pay attention to the Transmission fuse cavity for corrosion, damage, or terminal push out. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**6. CHECK (Z912) GROUND CIRCUIT**

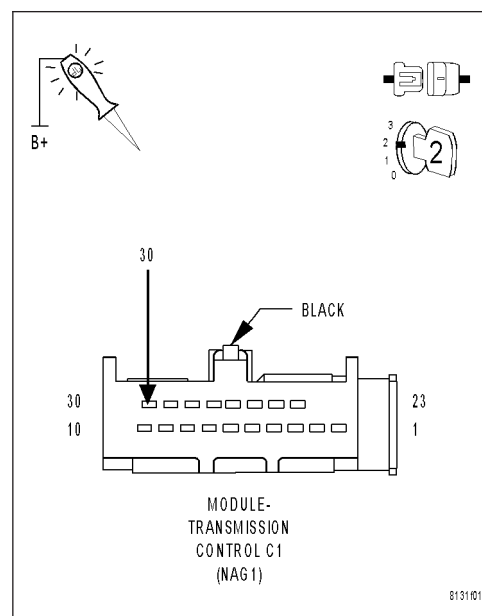
Turn the ignition off to the lock position.

Using a 12-volt test light connected to 12-volts, check the (Z912) Ground circuit in the TCM C1 harness connector.

**Does the test light illuminate brightly?**

**Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Repair the (Z912) Ground circuit for high resistance.



**P0562-BATTERY VOLTAGE LOW (CONTINUED)****7. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

**Where there any problems found?**

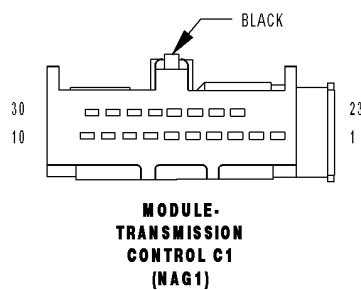
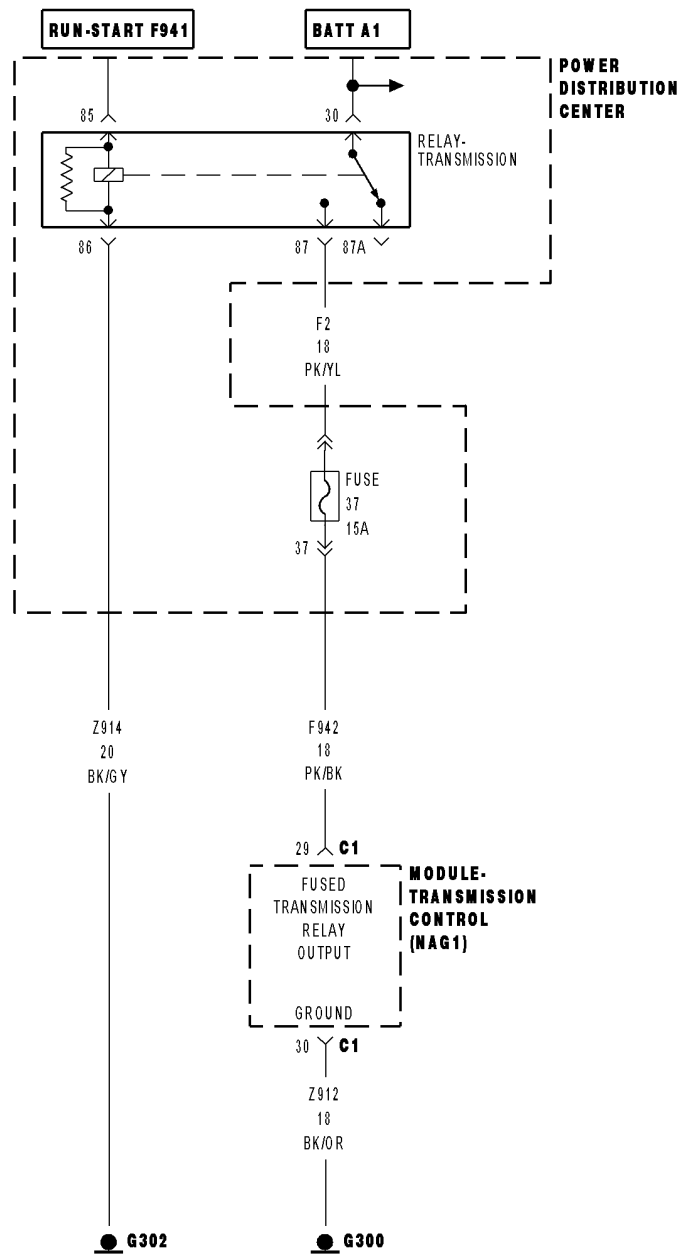
**Yes** >> Repair as necessary.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

---

## P0563-BATTERY VOLTAGE HIGH



**P0563-BATTERY VOLTAGE HIGH (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) monitors ignition voltage. The DTC will set and temporary limp-in will be activated, if the monitored battery voltage rises above 16.9 volts. If the voltage drops below 16.4 volts, normal operations is resumed and the TCM will record the DTC as a one trip fault. The DTC will only mature to a full DTC if the voltage rises above 16.9 volts with a engine speed greater than 2000 RPM for a least 60 seconds.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
When the monitored battery voltage rises above 16.9 volts.

Possible Causes
CHARGING SYSTEM OVERCHARGE CONDITION
JUMP START OFF A 24 VOLT SYSTEM
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK FOR CHARGING SYSTEM DTCs**

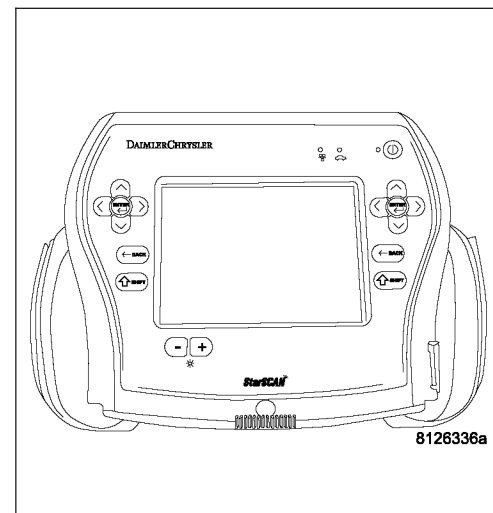
With the scan tool, read Engine DTCs.

**Note:** This includes any one trip faults.

**Are there any Engine Charging System DTCs present?**

**Yes** >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and perform the appropriate symptom.

**No** >> Go To 2





**P0563-BATTERY VOLTAGE HIGH (CONTINUED)****2. CHECK IF VOLTAGE IS GREATER THAN 16.9 VOLTS**

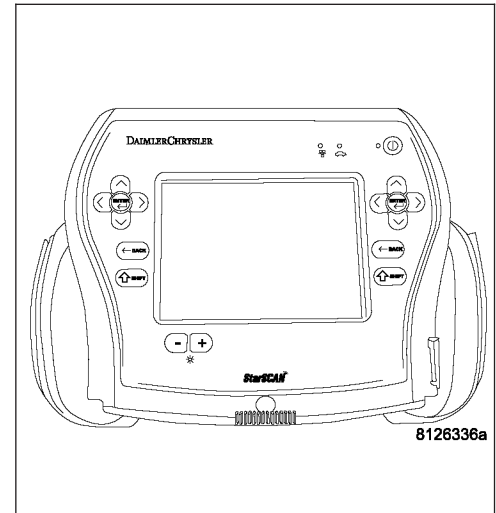
Start the engine and raise the engine speed to 2000 RPM.

With the scan tool, monitor the Transmission system voltage for at least 60 seconds.

**Does the Transmission system voltage read above 16.9 volts for any period of time?**

**Yes**    >> Go To 4

**No**    >> Go To 3



---

**3. VERIFY IF VEHICLE WAS JUMP STARTED WITH 24-VOLT SYSTEM**

Verify if the vehicle was jump started by another vehicle using a 24-volt charging system.

**Was the vehicle jump started by another vehicle using a 24-volt charging system?**

**Yes**    >> This is the cause of the DTC. Erase the DTC and return the vehicle to the customer.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 5

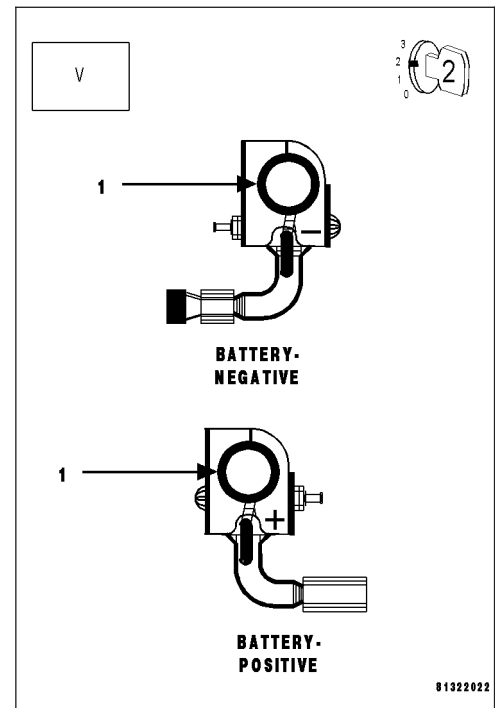
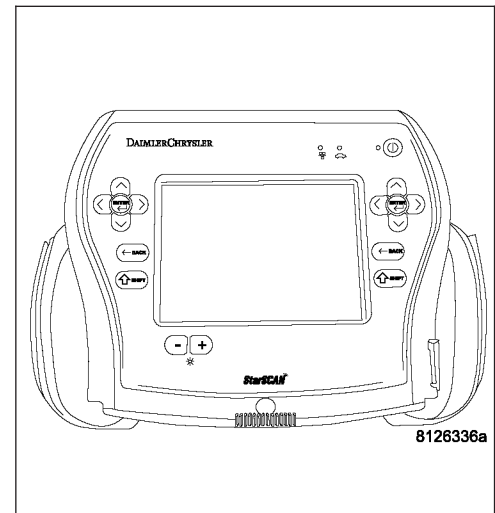
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**P0563-BATTERY VOLTAGE HIGH (CONTINUED)****4. CHECK BATTERY VOLTAGE**

Start the engine and raise the engine speed to 2000 RPM.  
 With the scan tool, read the Transmission system voltage.  
 With a voltmeter, measure the battery voltage at the battery.  
 Compare the readings.

**Does the voltage readings match between the Transmission scan tool reading and the battery voltmeter reading?**

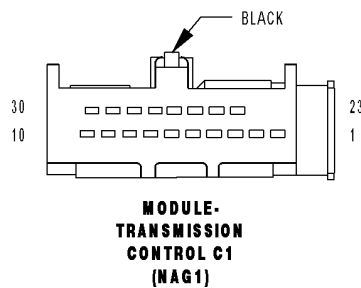
- Yes** >> Repair the charging system for an over charging condition. Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom as if the DTC is current.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.  
 Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**5. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.  
 Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.  
 Wiggle the wires while checking for shorted and open circuits.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
 Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Test Complete.



**P0602-CONTROL MODULE PROGRAMMING ERROR/NOT PROGRAMMED (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) performs various internal tests to verify proper controller operation. If the TCM detects that the variables that dictate the vehicle application are not present, the controller will enter Limp-in mode and illuminate the MIL.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
If the TCM detects that the variables that dictate the vehicle application are not present.

Possible Causes
CONTROLLER NOT CODED
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK IF TCM IS FLASHABLE**

**Note: Controller is programmed with generic software and will not allow the correct vehicle Powertrain management.**

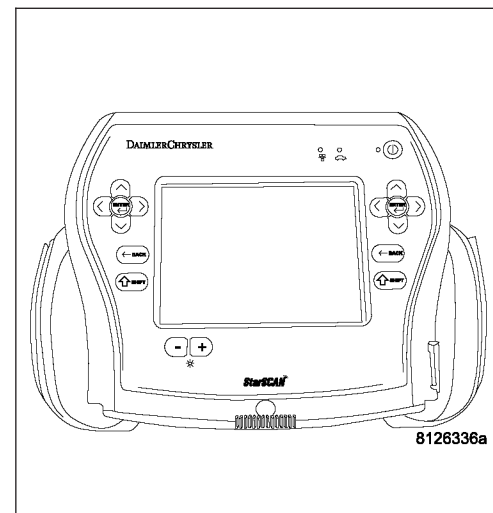
With the scan tool, record the vehicles controller part number.

Select Use Controller Part Number under the Flash Tab.

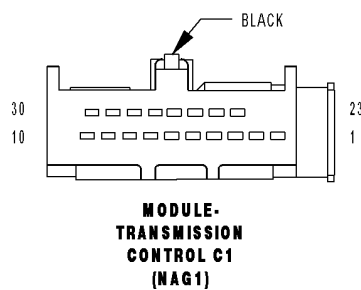
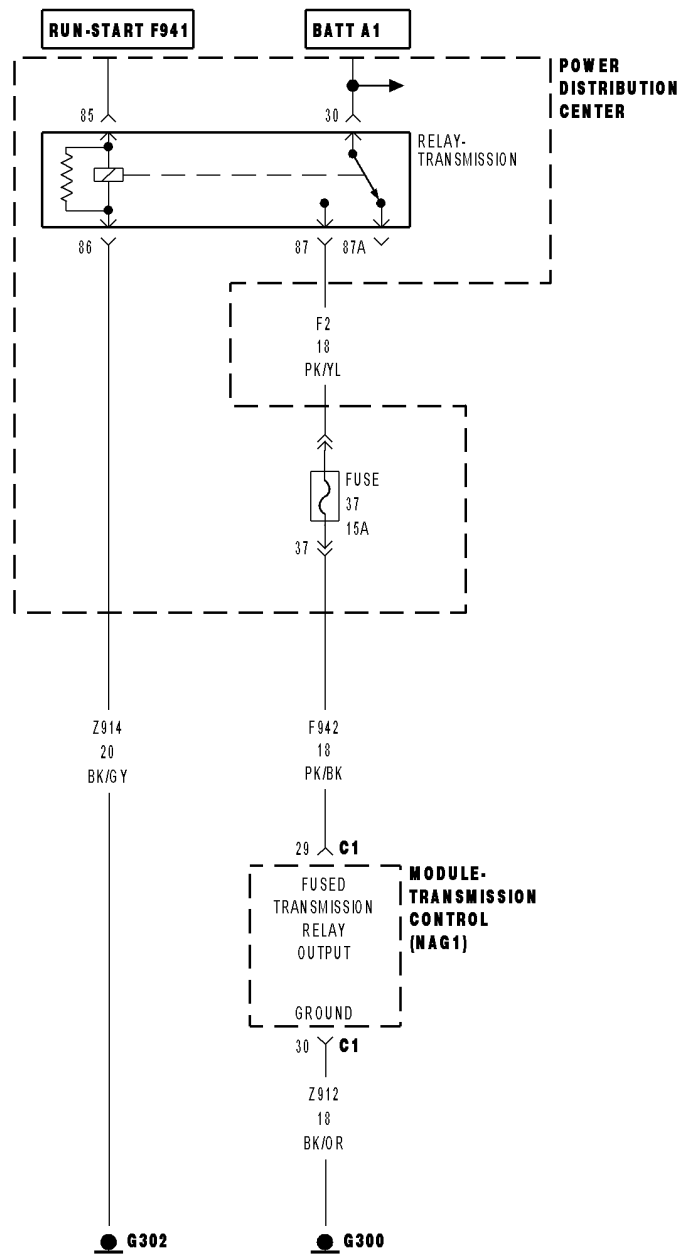
Flash the controller with the correct software.

**Were you able to update (flash) the controller successfully?**

- Yes** >> Test Complete.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



## P0604-INTERNAL CONTROL MODULE RAM



**P0604-INTERNAL CONTROL MODULE RAM (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) performs various internal tests to verify proper controller operation. If the TCM detects an error with the controllers Random Access Memory (RAM), the controller will enter Limp-in mode and illuminate the MIL.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
If the TCM detects an error with the controllers Random Access Memory (RAM).

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. TRANSMISSION CONTROL MODULE**

**View repair**

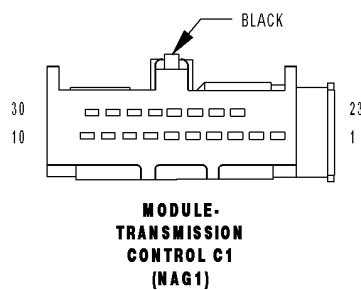
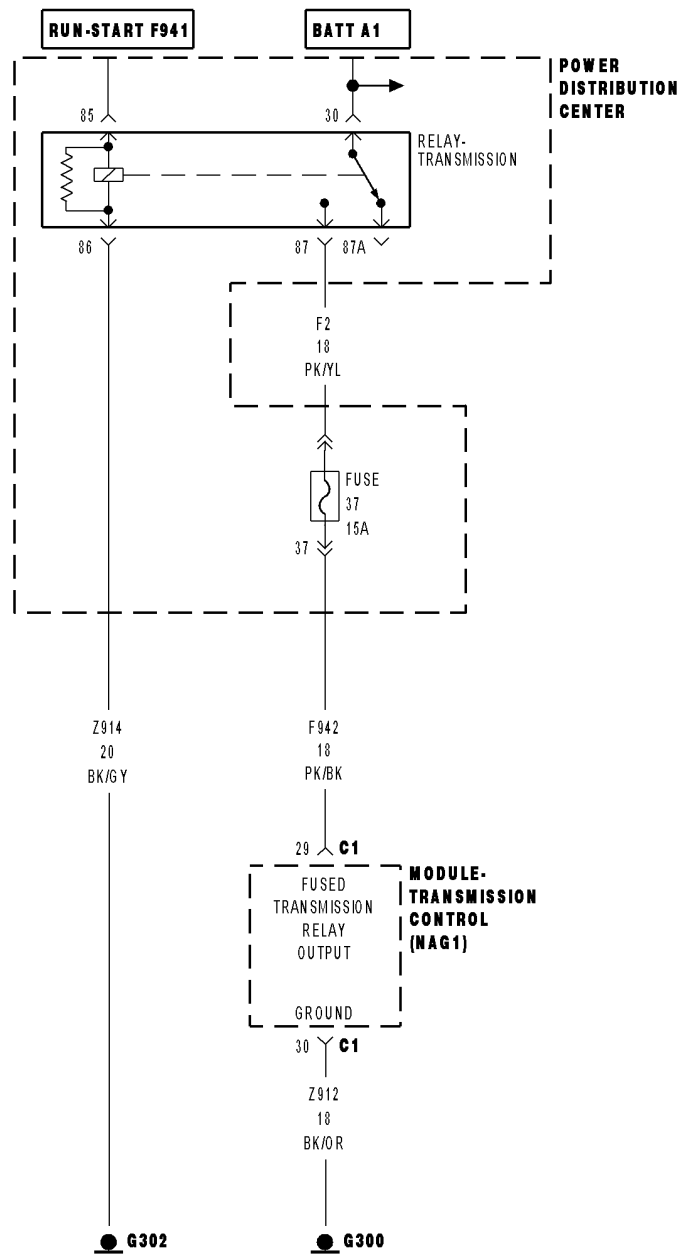
**Repair**

Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---

# P0605-INTERNAL CONTROL MODULE ROM



**P0605-INTERNAL CONTROL MODULE ROM (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) performs various internal tests to verify proper controller operation. If the TCM detects an error with the controllers Read Only Memory (ROM), the controller will enter Limp-in mode and illuminate the MIL.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
If the TCM detects an error with the controllers Read Only Memory (ROM).

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. TRANSMISSION CONTROL MODULE****View repair****Repair**

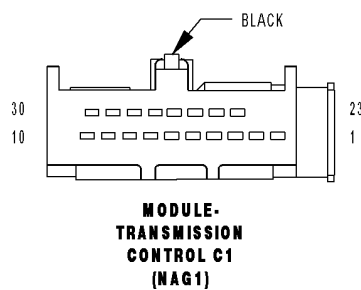
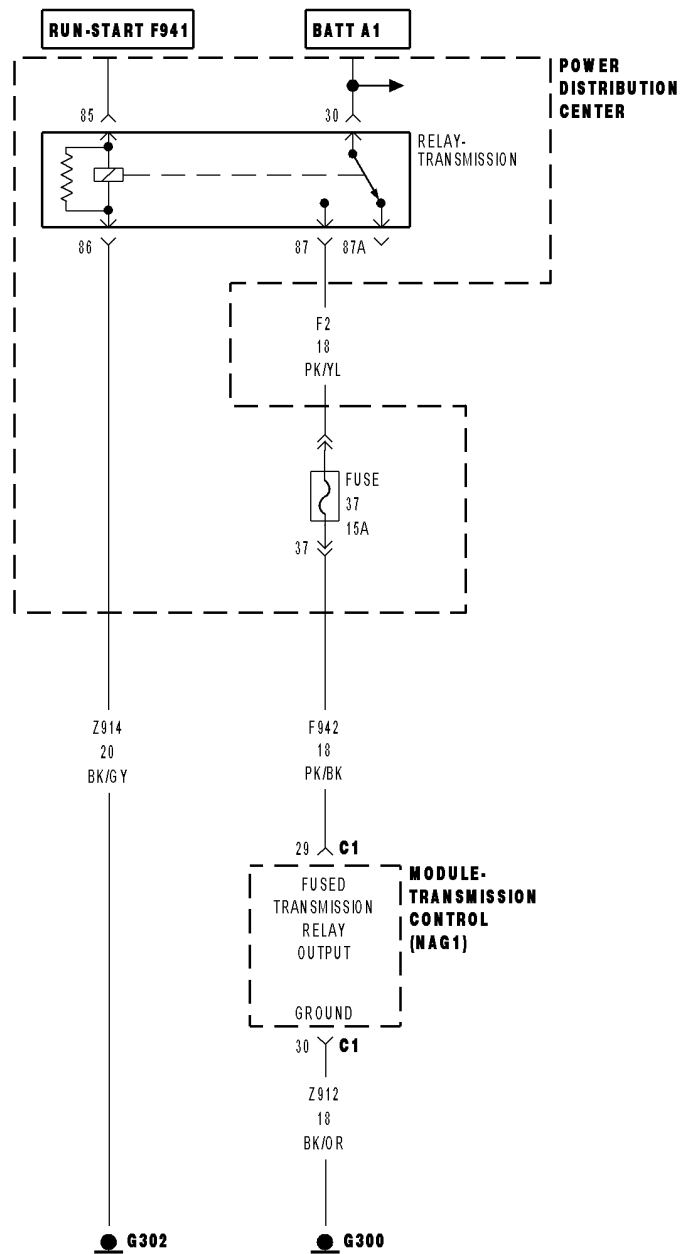
Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---



# P0613-INTERNAL TRANSMISSION PROCESSOR



**P0613-INTERNAL TRANSMISSION PROCESSOR (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) performs various internal tests to verify proper controller operation. If the TCM detects an error with the controllers processor, the controller will enter Limp-in mode and illuminate the MIL.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
If the TCM detects an error with the controllers processor.

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. TRANSMISSION CONTROL MODULE**

**View repair**

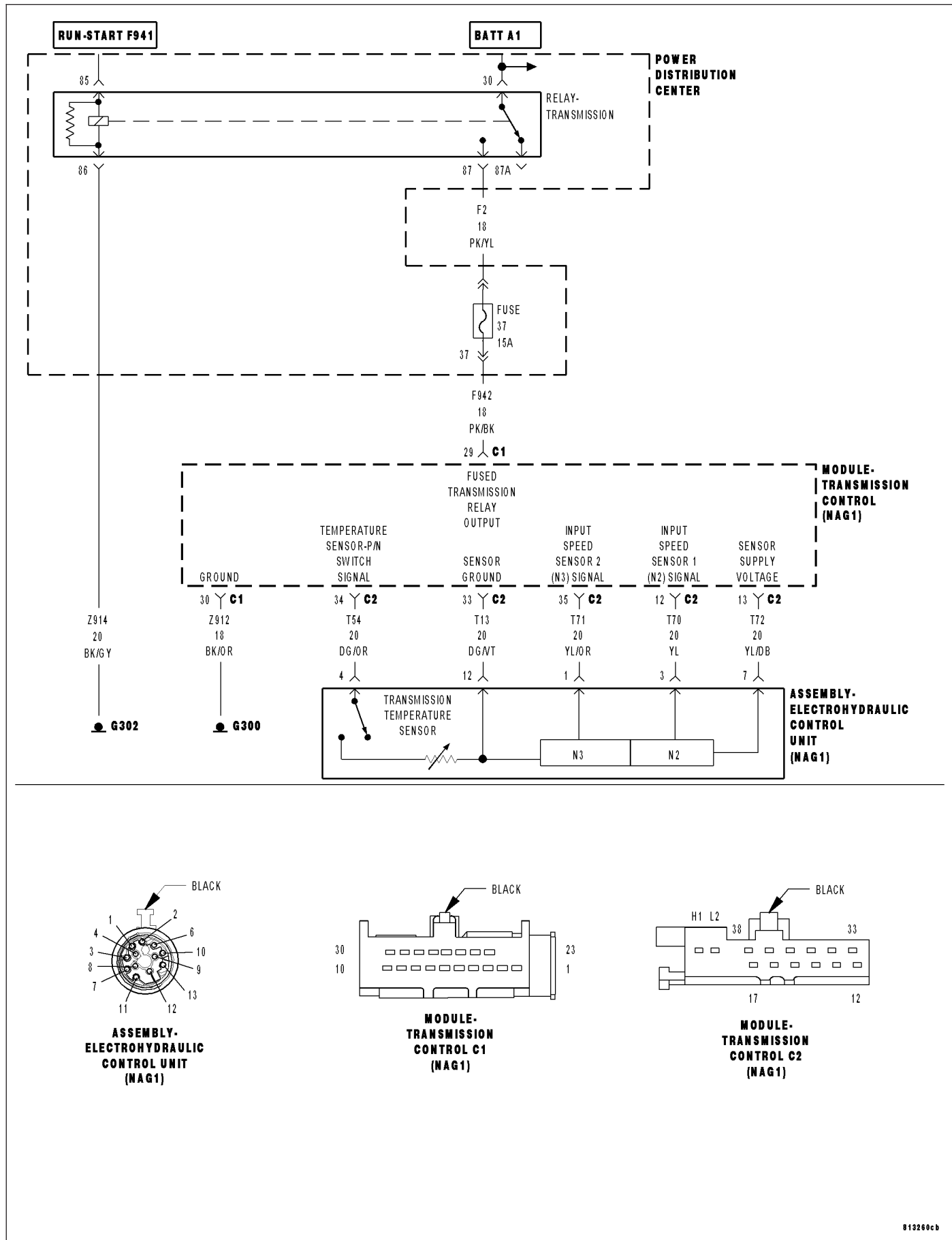
**Repair**

Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---

## P0642-SENSOR REFERENCE VOLTAGE 1 CIRCUIT LOW



**P0642-SENSOR REFERENCE VOLTAGE 1 CIRCUIT LOW (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Sensor Supply Voltage circuit supplies a 6-volt power supply to the two input speed sensors. The Sensor Supply Voltage circuit is constantly monitored for correct voltage between 4.8 to 7.2 volts. If the voltage does not stay within the 4.8 to 7.2 volt range, the appropriate DTC will set.

- **When Monitored:**  
Continuously with the ignition on and no undervoltage condition exist.
- **Set Condition:**  
When the monitored sensor voltage is not within specified limits drops below 4.8 volts.

Possible Causes
SPEED SENSOR DTCS PRESENT (T72) SENSOR SUPPLY VOLTAGE SHORT TO GROUND INTERNAL SHORT IN THE ELECTROHYDRAULIC CONTROL UNIT ASSEMBLY TRANSMISSION CONTROL MODULE

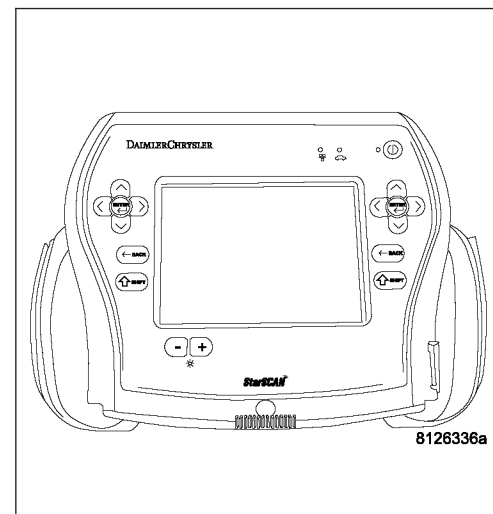
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

**Diagnostic Test****1. CHECK FOR SPEED SENSOR DTCS**

With the scan tool, check for other transmission DTCS.

**Are there any speed sensor DTCS present?**

- Yes** >> Refer to the AUTOMATIC TRANSMISSION NAG1 - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No** >> Go To 2



**P0642-SENSOR REFERENCE VOLTAGE 1 CIRCUIT LOW (CONTINUED)****2. CHECK FOR (T72) SENSOR SUPPLY VOLTAGE SHORT TO GROUND**

Turn the ignition off to the lock position.

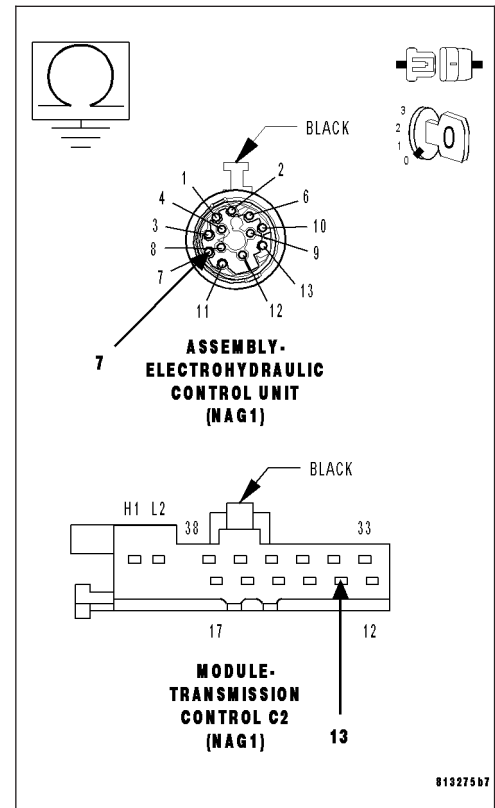
Disconnect the Electrohydraulic Control Unit Assembly harness connector.

Disconnect the TCM C2 harness connectors.

Measure the resistance between ground and the (T72) Sensor Supply Voltage circuit in the TCM harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Repair the (T72) Sensor Supply Voltage circuit for a short to ground  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Go To 3

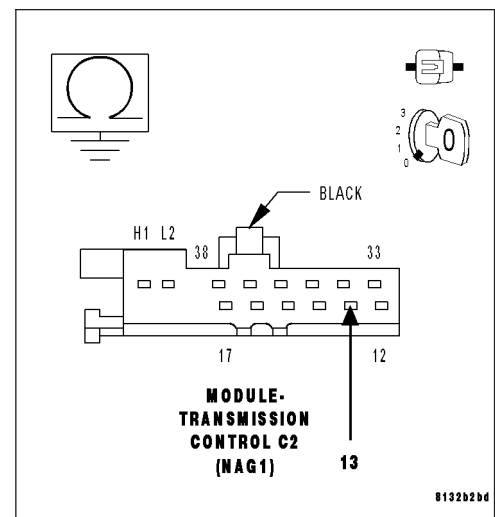
**3. CHECK FOR A SHORT IN THE ELECTOHYDRAULIC CONTROL UNIT**

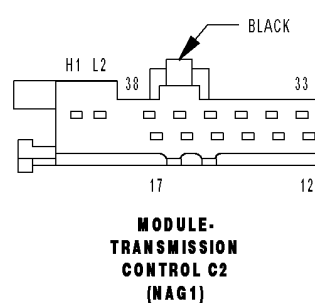
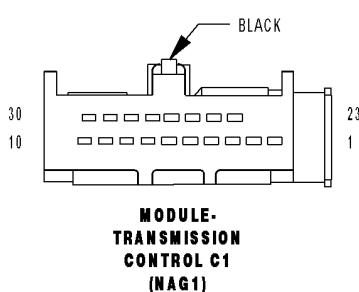
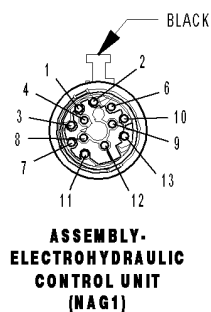
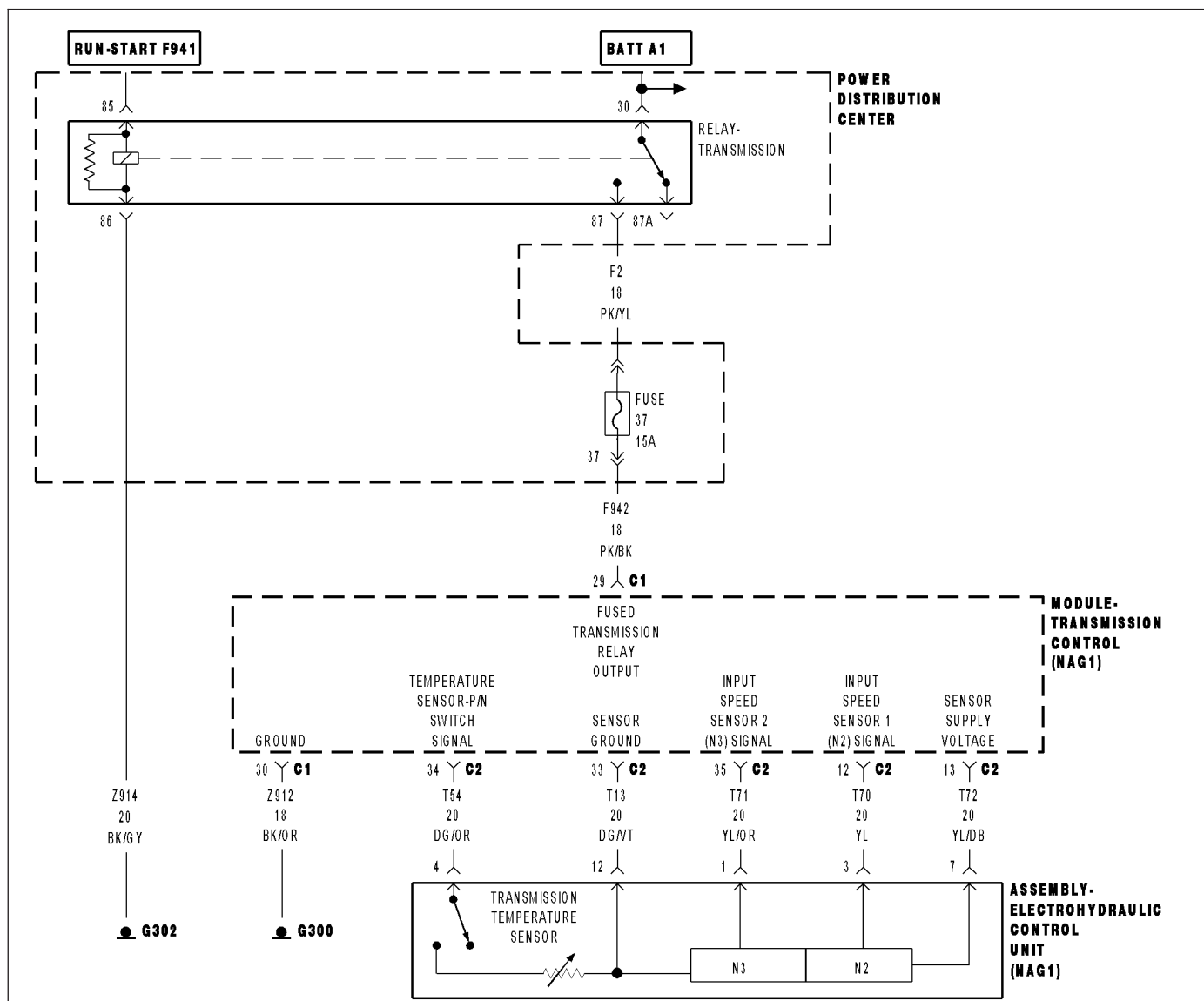
Reconnect the Electrohydraulic Control Unit Assembly harness connector.

Measure the resistance between ground and the (T72) Sensor Supply Voltage circuit in the TCM harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Repair the Electrohydraulic Control Unit Assembly for a short to ground. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for proper service procedures.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



**P0643-SENSOR REFERENCE VOLTAGE 1 CIRCUIT HIGH**

**P0643-SENSOR REFERENCE VOLTAGE 1 CIRCUIT HIGH (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Sensor Supply Voltage circuit supplies a 6 volt power supply for the two input speed sensors. The Sensor Supply Voltage circuit is constantly monitored for correct voltage between 4.8 to 7.2 volts. If the voltage does not stay within the 4.8 to 7.2 volt range, the appropriate DTC will set.

- **When Monitored:**  
Continuously with the ignition on and no overvoltage condition exist.
- **Set Condition:**  
When the monitored sensor voltage is not within specified limits and rises above 7.2 volts.

Possible Causes
(T72) SENSOR SUPPLY VOLTAGE CIRCUIT SHORT TO VOLTAGE
(T72) SENSOR SUPPLY VOLTAGE CIRCUIT SHORT TO OTHER CIRCUITS
TRANSMISSION CONTROL MODULE

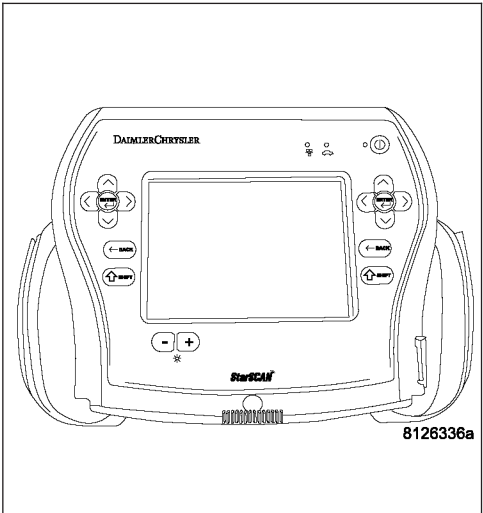
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

**Diagnostic Test**

**1. CHECK FOR SPEED SENSOR DTCS**

With the scan tool, check for other transmission DTCs.

- Are there any speed sensor and/or temperature sensor DTCs present?**
- Yes**    >> Refer to the AUTOMATIC TRANSMISSION NAG1 - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No**    >> Go To 2



**P0643-SENSOR REFERENCE VOLTAGE 1 CIRCUIT HIGH (CONTINUED)****2. CHECK SOLENOID SUPPLY VOLTAGE ON THE SCAN TOOL**

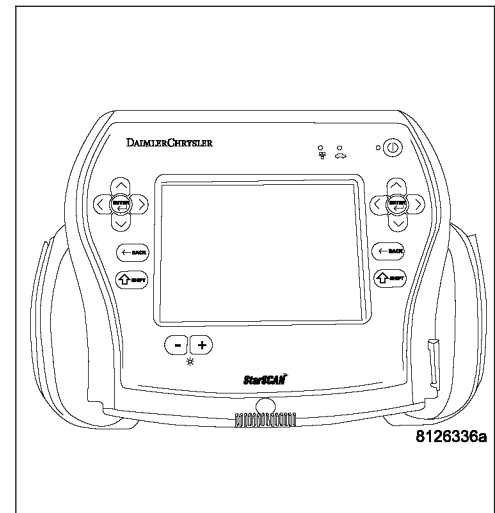
Start the engine.

With the scan tool, check the Transmission Solenoid Supply Voltage.

**Is the Transmission Solenoid Supply Voltage above 7.2 volts?**

**Yes** >> Go To 3

**No** >> Go To 5

**3. CHECK (T72) SENSOR SUPPLY CIRCUIT VOLTAGE**

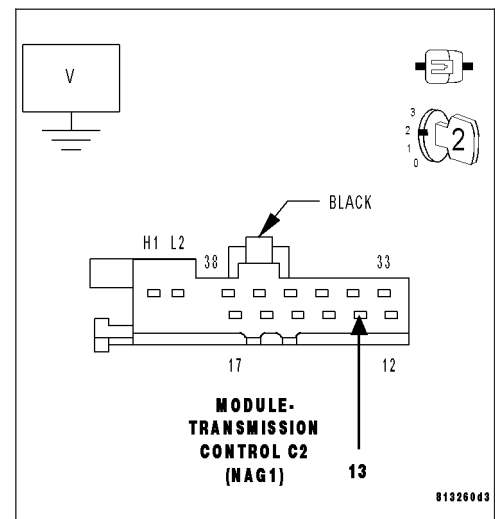
While back probing, measure the voltage of the (T72) Solenoid Supply Voltage circuit in the TCM harness connector.

**Does the measured voltage match the voltage reading on the scan tool  $\pm 0.2$  volts?**

**Yes** >> Go To 4

**No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.





**P0643-SENSOR REFERENCE VOLTAGE 1 CIRCUIT HIGH (CONTINUED)****4. (T72) SENSOR SUPPLY VOLTAGE CIRCUIT SHORT TO ANOTHER CIRCUIT**

Turn the ignition off to the lock position.

Disconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

Disconnect all TCM harness connectors.

Measure the resistance between the (T72) Solenoid Supply Voltage circuit and all other circuits in the Transmission Electrohydraulic Control Unit harness connector.

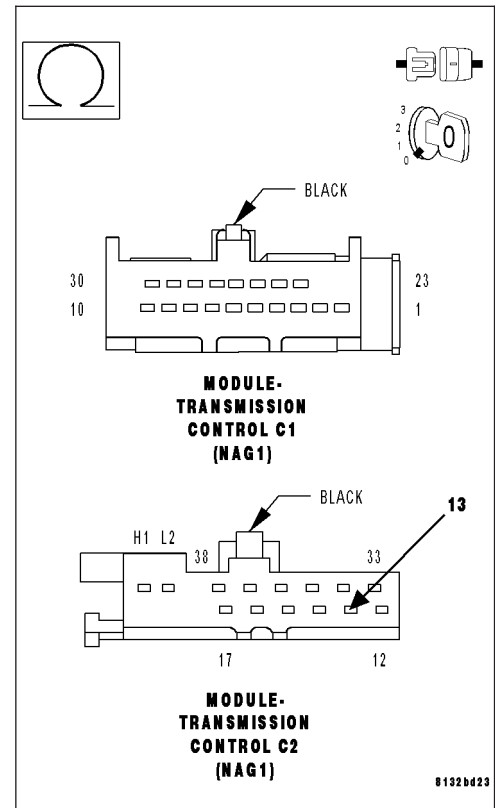
**Is the resistance below 5.0 ohms between the (T72) Solenoid Supply Voltage circuit and all other circuits in the Transmission Electrohydraulic Control Unit Assembly harness connector?**

**Yes** >> Repair the (T72) Solenoid Supply Voltage circuit for a short to another circuit(s).

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**5. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

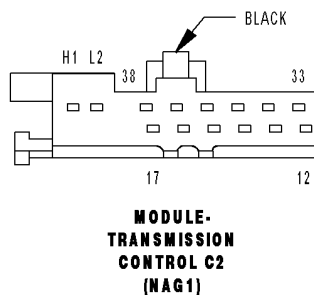
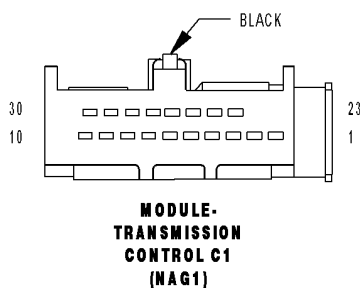
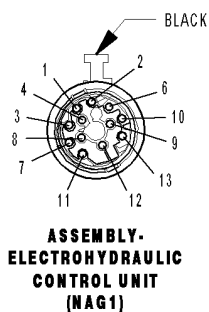
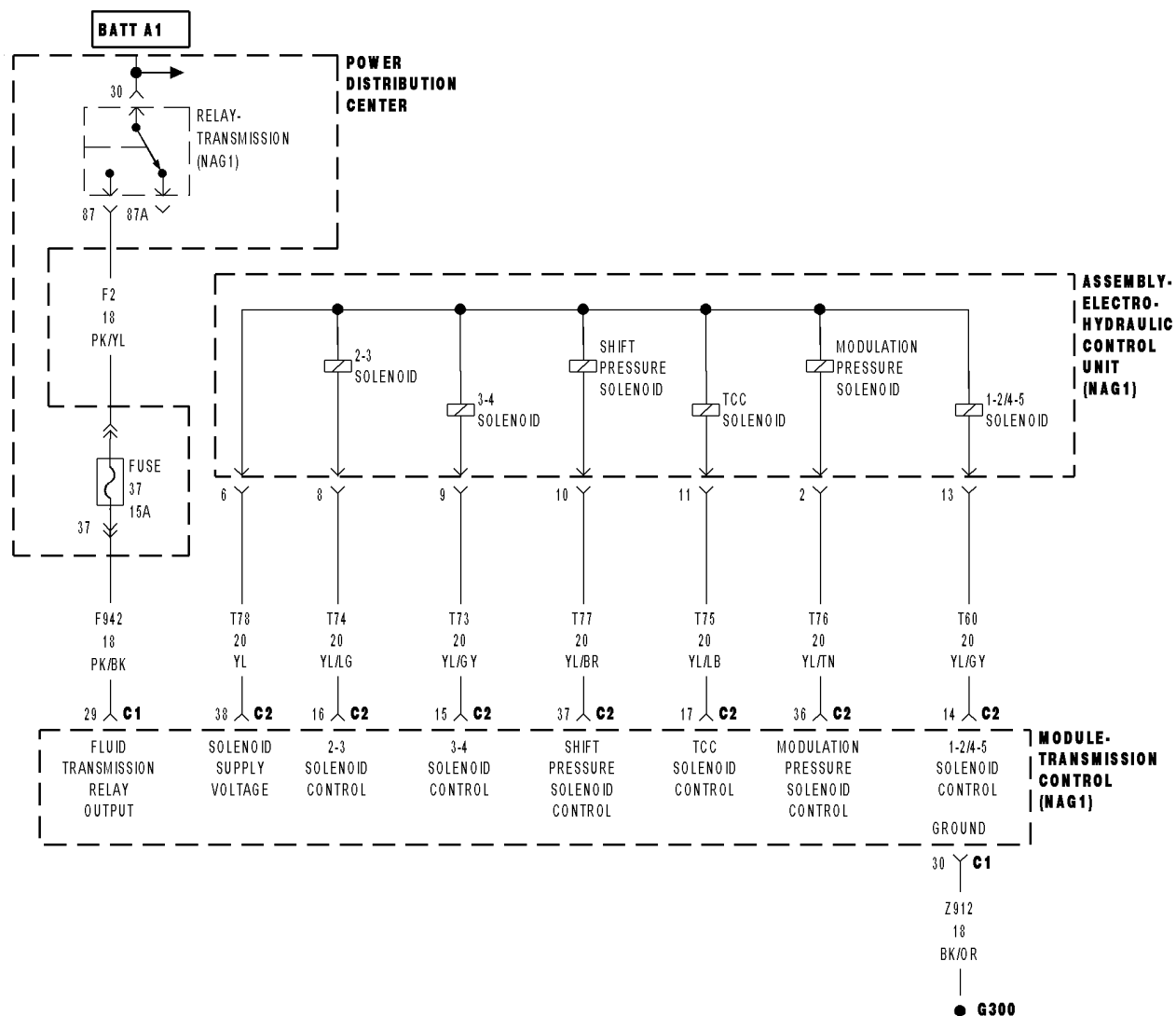
**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

# P0657-SOLENOID SUPPLY VOLTAGE CIRCUIT



P0657-SOLENOID SUPPLY VOLTAGE CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The Solenoid Supply Voltage output of the Transmission Control Module (TCM) provides the voltage to the three shift, two pressure and TCC solenoids. The output is active whenever the system is in normal operation. If a major system fault is detected, this output is turned off to ensure that no solenoids are active.

- **When Monitored:**  
When the output is active and no undervoltage condition exists.
- **Set Condition:**  
When the monitored supply voltage and battery voltage differ by 3.6 volts.

Possible Causes
(T78) SOLENOID SUPPLY VOLTAGE CIRCUIT OPEN
(T78) SOLENOID SUPPLY VOLTAGE CIRCUIT SHORT TO GROUND
(T78) SOLENOID SUPPLY VOLTAGE CIRCUIT SHORT TO VOLTAGE
(T78) SOLENOID SUPPLY VOLTAGE CIRCUIT SHORT TO ANOTHER CIRCUIT
TRANSMISSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. (T78) SOLENOID SUPPLY VOLTAGE CIRCUIT SHORT TO VOLTAGE

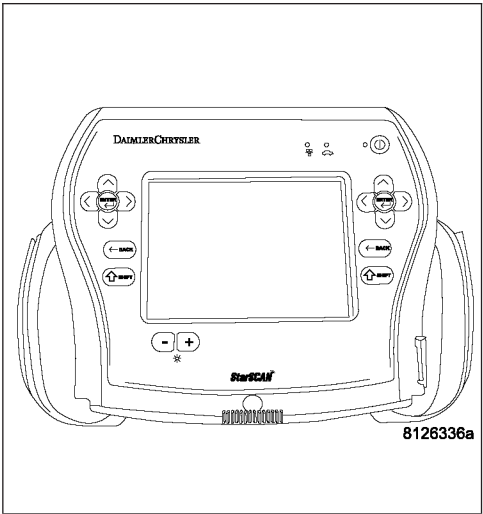
With the scan tool, check for other transmission DTCs.

Is the DTC P1629-TCM INTERNAL - SOLENOID SUPPLY/WATCH-DOG also present?

- Yes

>> When both P0657-SOLENOID SUPPLY VOLTAGE CIRCUIT and P1629-TCM INTERNAL - SOLENOID SUPPLY/WATCHDOG DTCs set at the same time indicates that the (T78) Solenoid Supply Voltage circuit is shorted to voltage. Repair the Solenoid Supply Voltage circuit for a short to voltage. If no short to voltage is present, using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No

>> Go To 2



**P0657-SOLENOID SUPPLY VOLTAGE CIRCUIT (CONTINUED)****2. (T78) SOLENOID SUPPLY VOLTAGE CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the TCM C1 and C2 harness connectors.

Disconnect the Electrohydraulic Control Unit Assembly harness connector.

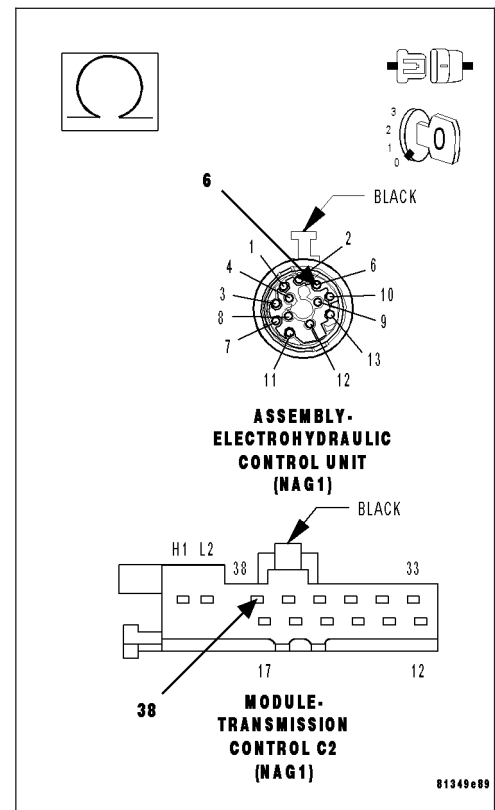
Measure the resistance of the (T78) Solenoid Supply Voltage circuit between the TCM C2 harness connector and the Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T78) Solenoid Supply Voltage circuit for an open.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. (T78) SOLENOID SUPPLY VOLTAGE CIRCUIT SHORT TO GROUND**

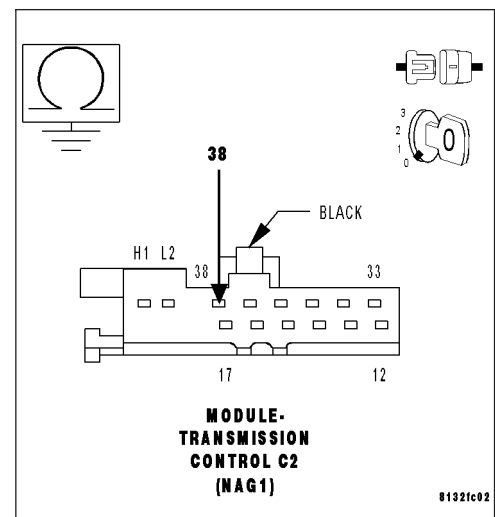
Measure the resistance between ground and the (T78) Solenoid Supply Voltage circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T78) Solenoid Supply Voltage circuit for a short to ground.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4

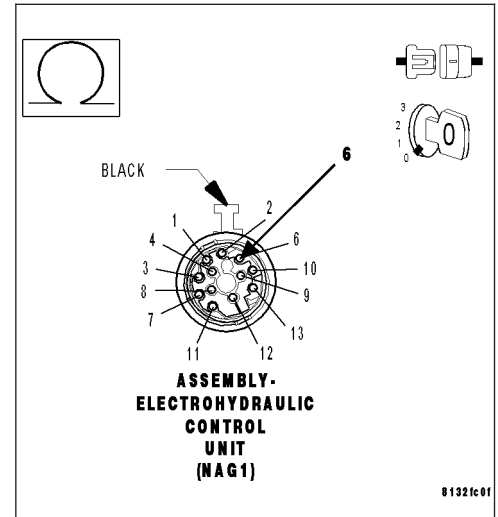


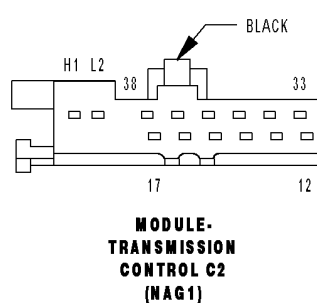
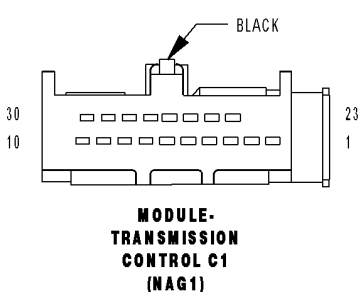
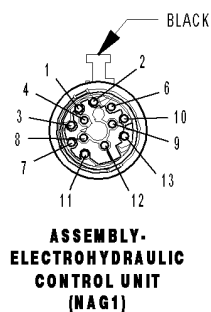
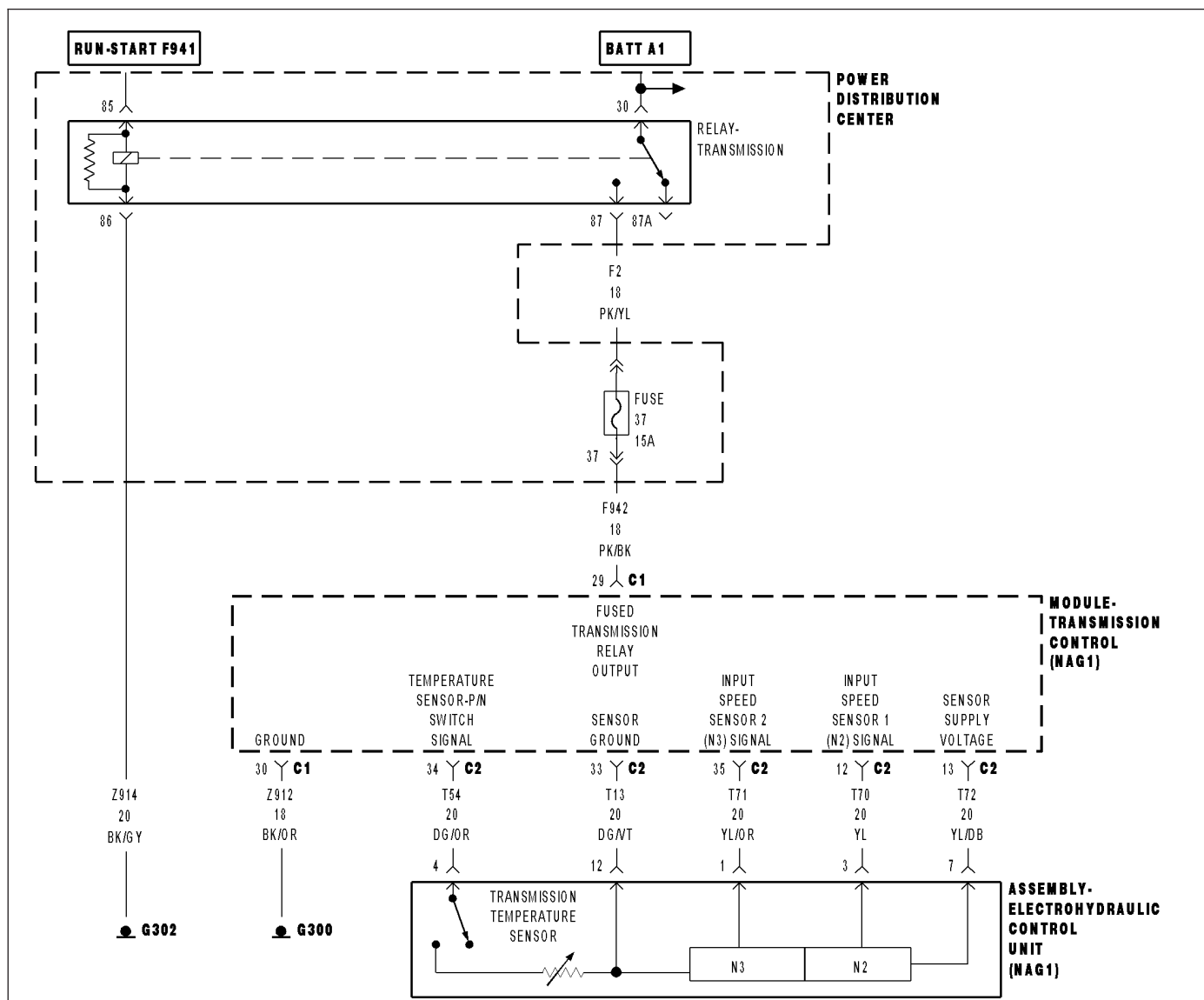
**P0657-SOLENOID SUPPLY VOLTAGE CIRCUIT (CONTINUED)****4. (T78) SOLENOID SUPPLY VOLTAGE CIRCUIT SHORT TO ANOTHER CIRCUIT**

Measure the resistance between the (T78) Solenoid Supply Voltage circuit and all other circuits in the Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T78) Solenoid Supply Voltage circuit and any other circuit(s) in the Electrohydraulic Control Unit Assembly harness connector?**

- Yes**    >> Repair the (T78) Solenoid Supply Voltage circuit for a short to another circuit(s).  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



**P0710-TRANSMISSION TEMPERATURE SENSOR CIRCUIT**

**P0710-TRANSMISSION TEMPERATURE SENSOR CIRCUIT (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Electrohydraulic Control Unit Assembly of the NAG1 transmission contains a temperature sensor to monitor the transmission oil temperature. This sensor is wired in series with the transmission Park/Neutral switch. The Transmission Control Module (TCM) expects to see a valid voltage level from the sensor when the shifter is in Reverse or any forward Drive position. The TCM also expects to see an open circuit condition when the shifter is in the Park or Neutral position. When the controller detects an open circuit when in Reverse or any forward drive position the DTC will set. Note: Due to a open circuit condition in Park or Neutral, the TCM substitutes the Transmission Temperature reading with Engine Temperature when in Park or Neutral

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
When the TCM detects an open circuit when in Reverse or any forward drive position the DTC will set.

Possible Causes
SHIFT LEVER ASSEMBLY OUT OF ADJUSTMENT (T54) TEMPERATURE SENSOR-P/N SWITCH SIGNAL CIRCUIT OPEN (T54) TEMPERATURE SENSOR-P/N SWITCH SIGNAL CIRCUIT SHORT TO VOLTAGE (T54) TEMPERATURE SENSOR-P/N SWITCH SIGNAL CIRCUIT SHORT TO OTHER CIRCUITS (T54) TEMPERATURE SENSOR-P/N SWITCH SIGNAL CIRCUIT SHORT TO ANOTHER CIRCUIT(S) SHIFT LEVER ASSEMBLY TRANSMISSION CONTROL MODULE

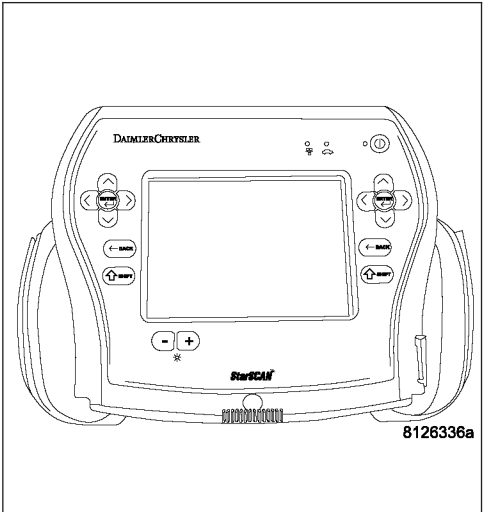
**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test**

**1. CHECK IF SPEED SENSOR DTCS ARE PRESENT**

With the scan tool, read Transmission DTCs.

- Are there any speed sensor DTCs present also?**
- Yes**    >> Refer to the AUTOMATIC TRANSMISSION NAG1 - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No**    >> Go To 2



**P0710-TRANSMISSION TEMPERATURE SENSOR CIRCUIT (CONTINUED)****2. CHECK IF SHIFT LEVER ASSEMBLY SHIFT CABLE IS OUT OF ADJUSTMENT**

Check the Shift Lever Assembly shift cable for proper adjustment. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the proper service procedures.

**Is the Shift Lever Assembly shift cable properly adjusted?**

**Yes** >> Go To 3

**No** >> Adjust the Shift Lever Assembly shift cable. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the proper service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**3. CHECK IF ENGINE STARTS IN PART OR NEUTRAL**

Attempt to start the engine in Park or Neutral.

**Does the engine start in either Park or Neutral?**

**Yes** >> Go To 4

**No** >> Go To 5

**4. TRANSMISSION TEMPERATURE SENSOR-P/N SWITCH**

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Place the gear selector in Drive.

Measure the resistance of the Transmission Temperature Sensor between the (T54) Temperature Sensor-P/N Switch Signal circuit and the (T13) Sensor Ground circuit in the TCM C2 harness connector.

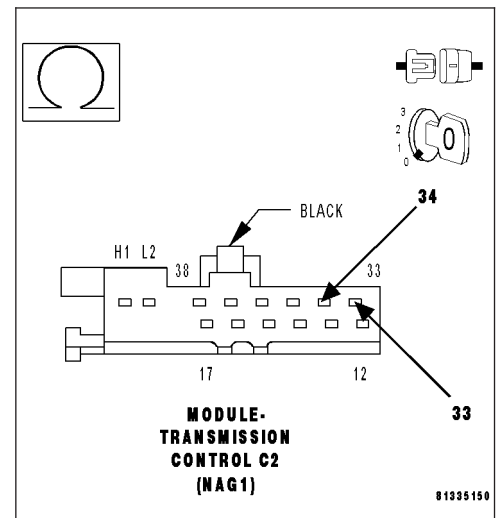
**Is the resistance between 500 to 2500 ohms?**

**Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Using the schematics as a guide, check the Electrohydraulic Control Unit Assembly and Transmission Temperature Sensor-P/N Switch pins and connector terminals for corrosion, damage, or terminal push out. If no problems are found, replace the Transmission Temperature Sensor-P/N Switch. Refer to 21-AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the proper service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.





**P0710-TRANSMISSION TEMPERATURE SENSOR CIRCUIT (CONTINUED)****5. CHECK THE TRANSMISSION TEMPERATURE SENSOR-P/N SWITCH**

Turn the ignition off to the lock position.

Reconnect the TCM C2 harness connector.

Disconnect the Electrohydraulic Control Unit Assembly harness connector.

**Note:** This procedure may set various DTCs to multiple modules connected to the CAN bus. Disregard and erase any DTCs that may set after completion of this procedure.

With the Shift Lever in the Park position, attempt to start the engine.

**Does the engine start?**

**Yes** >> Replace the Transmission Temperature Sensor-P/N Switch. Refer to 21- AUTOMATIC TRANSMISSION- AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the proper service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 6

**6. CHECK IF THE (T54) TEMPERATURE SENSOR-P/N SWITCH SIGNAL CIRCUIT IS SHORTED TO GROUND**

Turn the ignition off to the lock position.

Reconnect the Electrohydraulic Control Unit Assembly harness connector.

Disconnect the TCM C1 and C2 harness connectors.

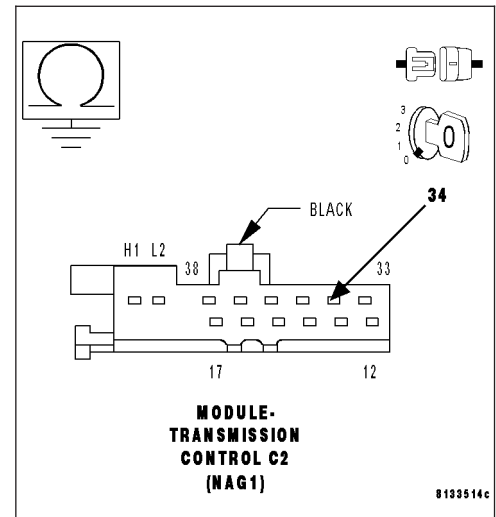
Measure the resistance between ground and the (T54) Temperature Sensor-P/N Switch Signal circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T54) Temperature Sensor-P/N Switch Signal circuit for a short to ground.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7



**P0710-TRANSMISSION TEMPERATURE SENSOR CIRCUIT (CONTINUED)****7. CHECK IF (T54) TEMPERATURE SENSOR-P/N SWITCH SIGNAL CIRCUIT IS SHORTED TO ANOTHER CIRCUIT(S)**

Measure the resistance between the (T54) Temperature Sensor-P/N Switch Signal circuit and all other circuits in the TCM C1 and C2 harness connectors.

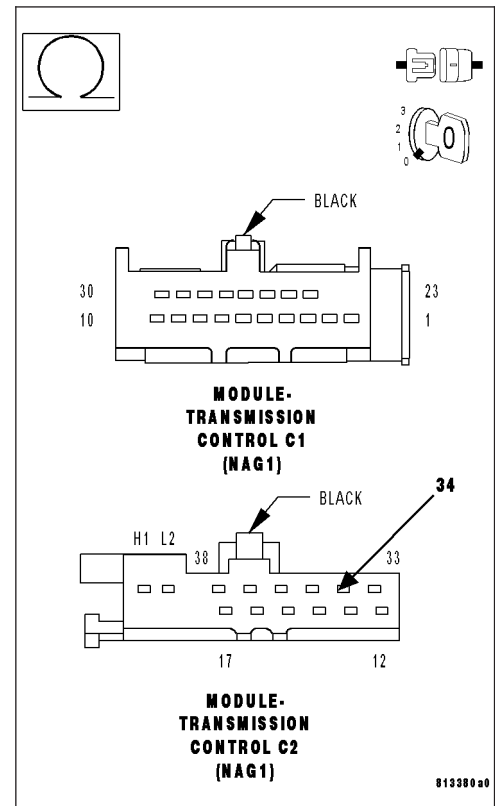
**Is the resistance below 5.0 ohms between the (T54) Temperature Sensor-P/N Switch Signal circuit and any other circuit(s)?**

**Yes** >> Repair the (T54) Temperature Sensor-P/N Switch Signal circuit for a short to another circuit(s).

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

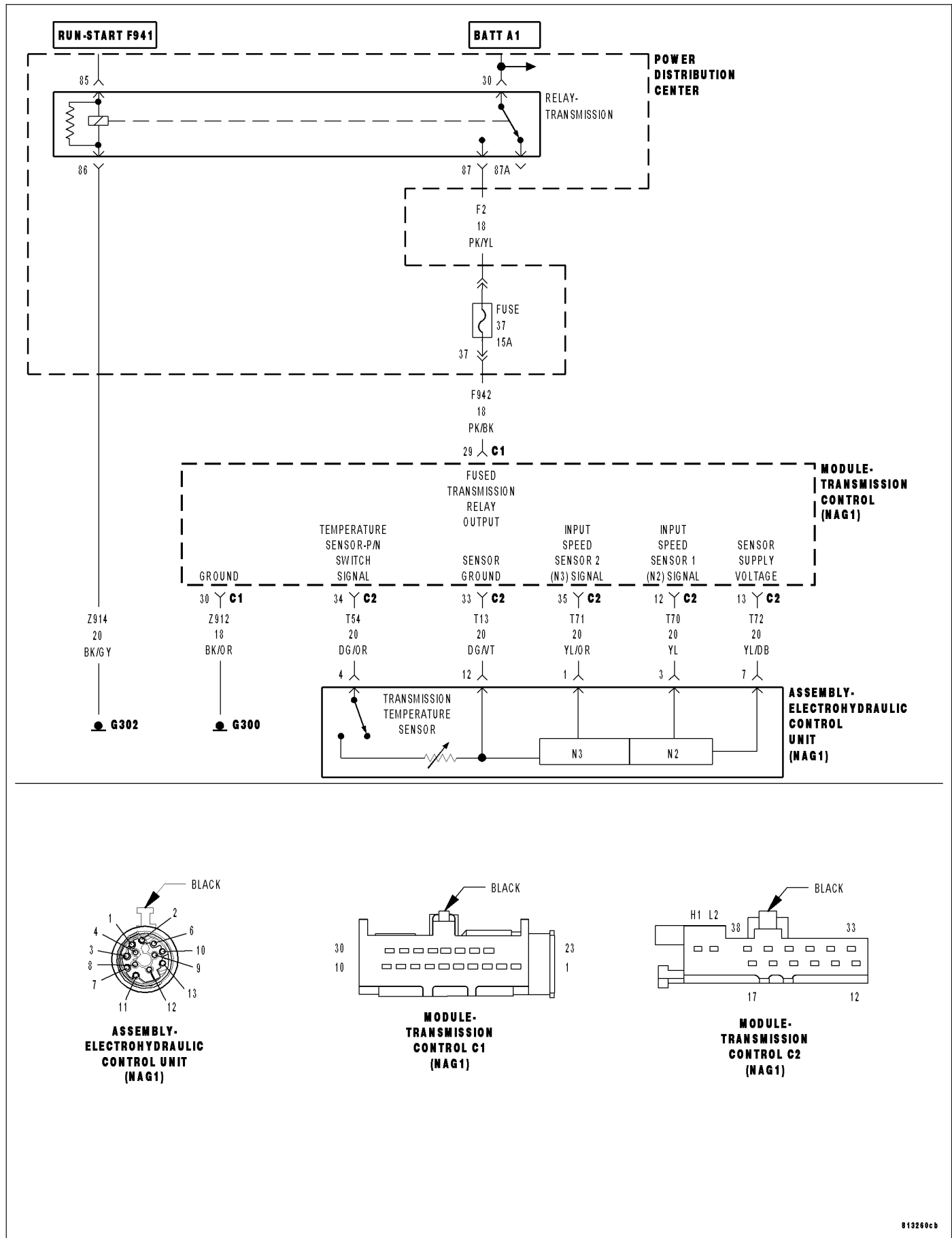
**No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



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# P0712-TRANSMISSION TEMPERATURE SENSOR LOW



**P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Electrohydraulic Control Unit Assembly of the NAG1 transmission contains a temperature sensor to monitor the transmission oil temperature. This sensor is wired in series with the transmission Park/Neutral switch. The Transmission Control Module (TCM) expects to see a valid voltage level from the sensor when the shifter is in Reverse or any forward Drive position. The TCM also expects to see an open circuit condition when the shifter is in the Park or Neutral position. When the controller detects an open circuit when in Reverse or any forward drive position the DTC will set. Note: The TCM substitutes the Transmission Temperature reading with Engine Temperature due to a open circuit condition in Park or Neutral.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
When the TCM detects the Temperature sensor input is below 0.5 volts.

Possible Causes
(T54) TEMPERATURE SENSOR-P/N SWITCH SIGNAL CIRCUIT SHORT TO GROUND (T54) TEMPERATURE SENSOR-P/N SWITCH SIGNAL CIRCUIT SHORT TO ANOTHER CIRCUIT TRANSMISSION TEMPERATURE SENSOR-P/N SWITCH TRANSMISSION CONTROL MODULE

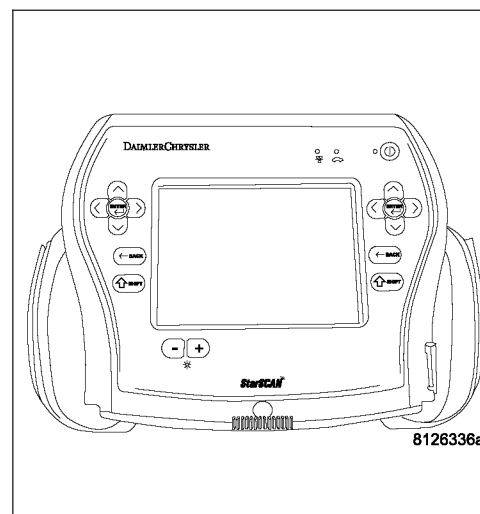
**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK FOR SHIFT LEVER ASSEMBLY DTCS**

With the scan tool, check for Shift Lever Assembly DTCS.

**Are there any Shift Lever Assembly DTCS present?**

- Yes** >> Refer to 21 - AUTOMATIC TRANSMISSION - AUTOMATIC TRANSMISSION NAG1 - SHIFTER DIAGNOSTICS category and perform the appropriate symptom. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Go To 2



**P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)****2. CHECK THE SHIFT LEVER ASSEMBLY CABLE FOR PROPER ADJUSTMENT**

Check the Shift Lever Assembly Cable for proper adjustment. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

**Is the Shift Lever Assembly Cable for properly adjusted?**

**Yes** >> Go To 3

**No** >> Adjust the Shift Lever Assembly Cable per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**3. CHECK THE (T54) TEMPERATURE SENSOR-P/N SWITCH SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

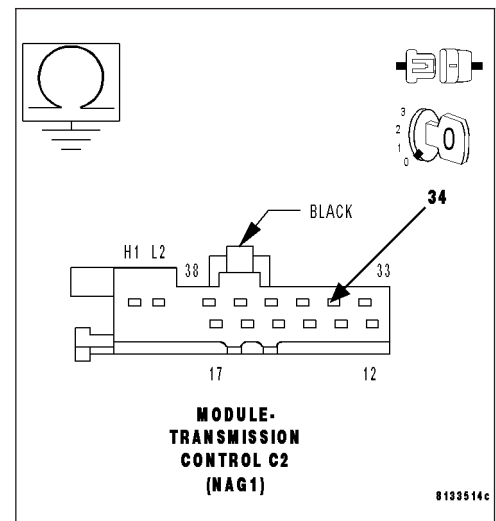
Measure the resistance between ground and the (T54) Temperature Sensor-P/N Switch Signal circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T54) Temperature Sensor-P/N Switch Signal circuit for a short to ground.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4



**P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)****4. CHECK THE (T54) TEMPERATURE SENSOR-P/N SWITCH SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT**

Disconnect the TCM C1 harness connector.

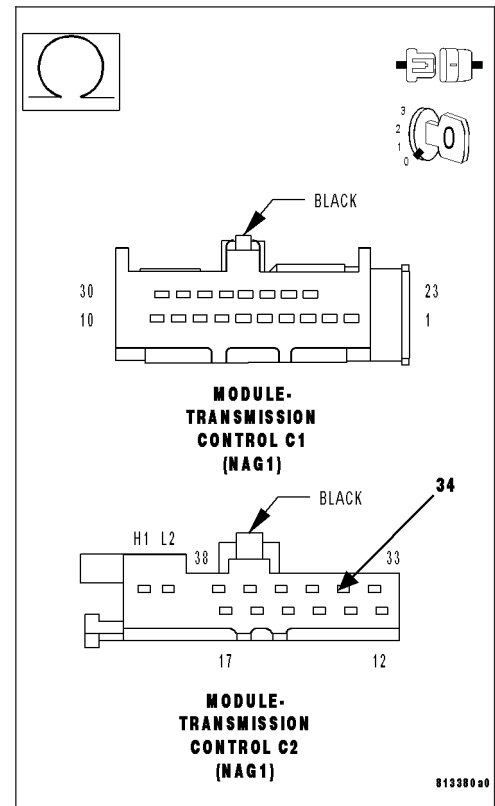
Disconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

Measure the resistance between the (T54) Temperature Sensor-P/N Switch Signal circuit and all other circuits in the TCM C1 and C2 harness connectors.

**Is the resistance below 5.0 ohms between the (T54) Temperature Sensor-P/N Switch Signal circuit and any other circuit(s)?**

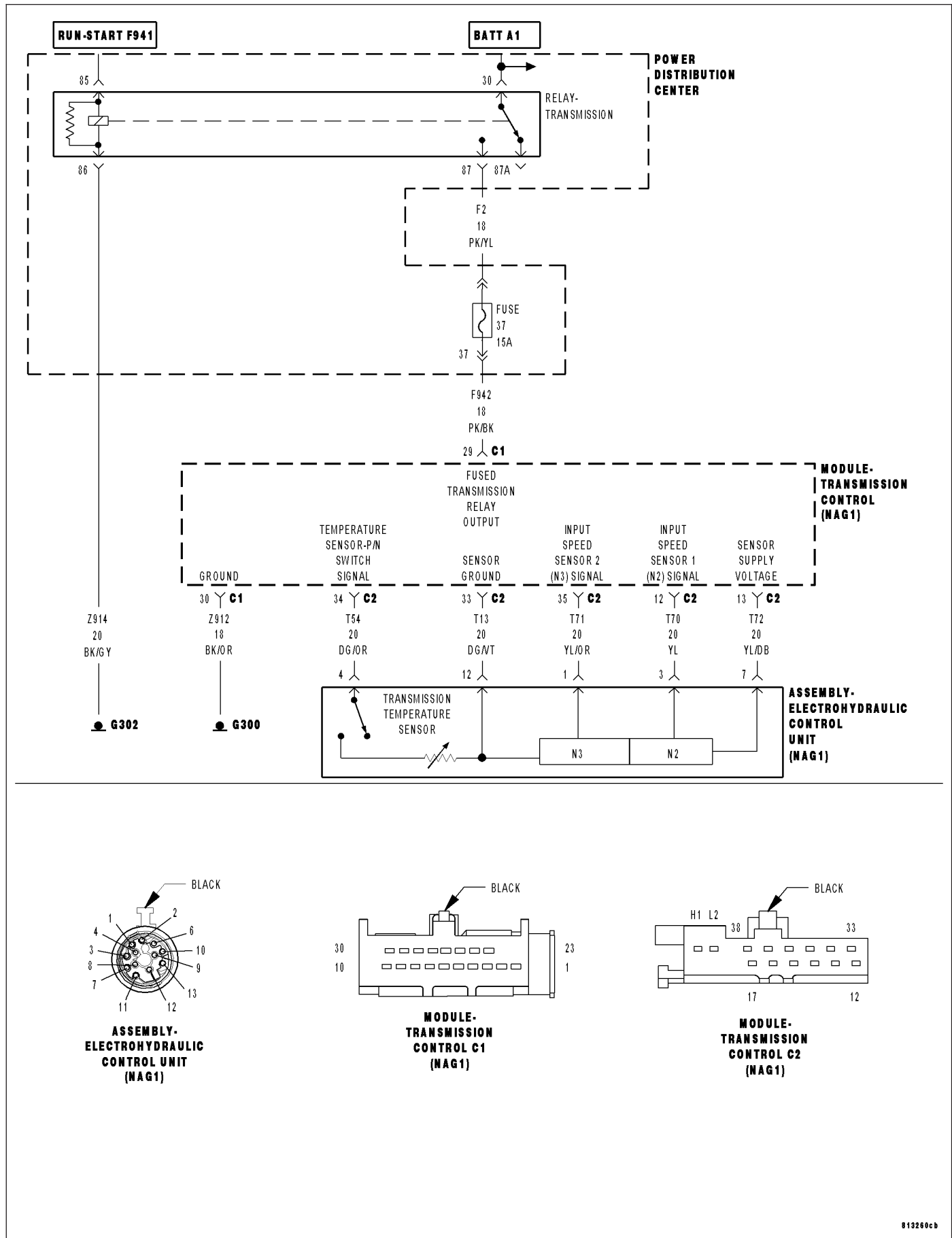
**Yes** >> Repair the (T54) Temperature Sensor-P/N Switch Signal circuit for a short to another circuit(s).  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



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# P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT



**P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Electrohydraulic Control Unit Assembly of the NAG1 transmission contains a temperature sensor to monitor the transmission oil temperature. This sensor is wired in series with the transmission Park/Neutral switch. The Transmission Control Module (TCM) expects to see a valid voltage level from the sensor when the shifter is in Reverse or any forward Drive position. The TCM also expects to see an open circuit condition when the shifter is in the Park or Neutral position. When the controller detects an open circuit when in Reverse or any forward drive position the DTC will set. Note: The TCM substitutes the Transmission Temperature reading with Engine Temperature due to a open circuit condition in Park or Neutral.

- **When Monitored:**

Continuously with the ignition on and the Transmission Temperature below 170 °C (338 °F).

- **Set Condition:**

When the TCM detects the Temperature sensor input changes more than 10 °C (50 °F) between each 20 mSec sensor read.

Possible Causes
WIRING AND CONNECTORS TRANSMISSION TEMPERATURE SENSOR - P/N SWITCH TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK WIRING AND CONNECTORS**

Ignition on, engine not running.

With the scan tool, monitor the Transmission Temperature.

Apply the parking brake.

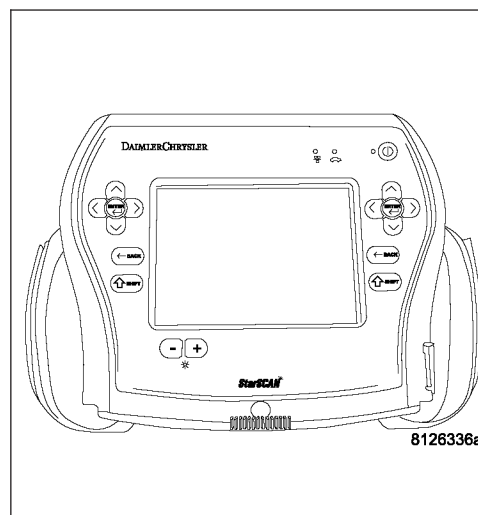
With the brakes firmly applied, place the gear selector in Drive.

While monitoring the scan tool, wiggle the wires and connectors from the TCM to the Electrohydraulic Control Unit.

**Did the transmission temperature fluctuate while wiggling the wires?**

**Yes** >> Repair the wiring and/or connectors as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2





**P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT (CONTINUED)****2. CHECK IF DTC RESETS**

Replace the Transmission Temperature Sensor - P/N Switch. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for proper service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

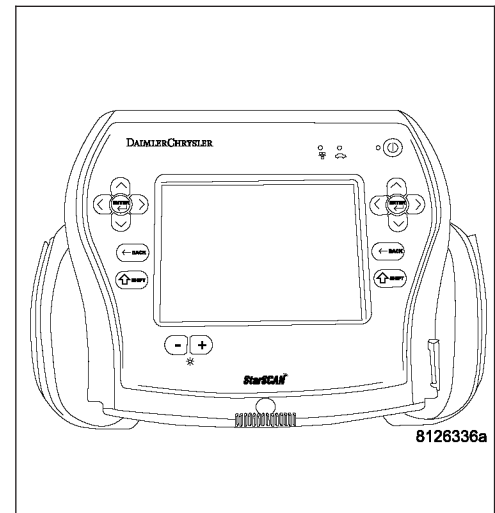
With the scan tool, read Transmission DTCs.

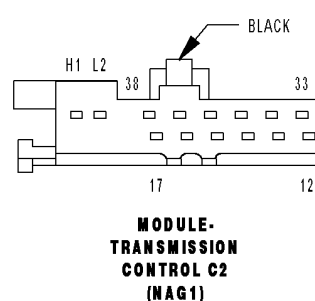
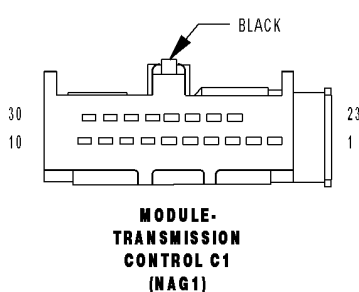
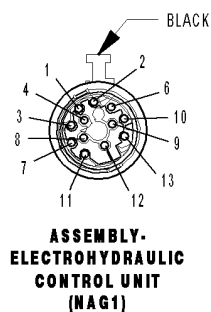
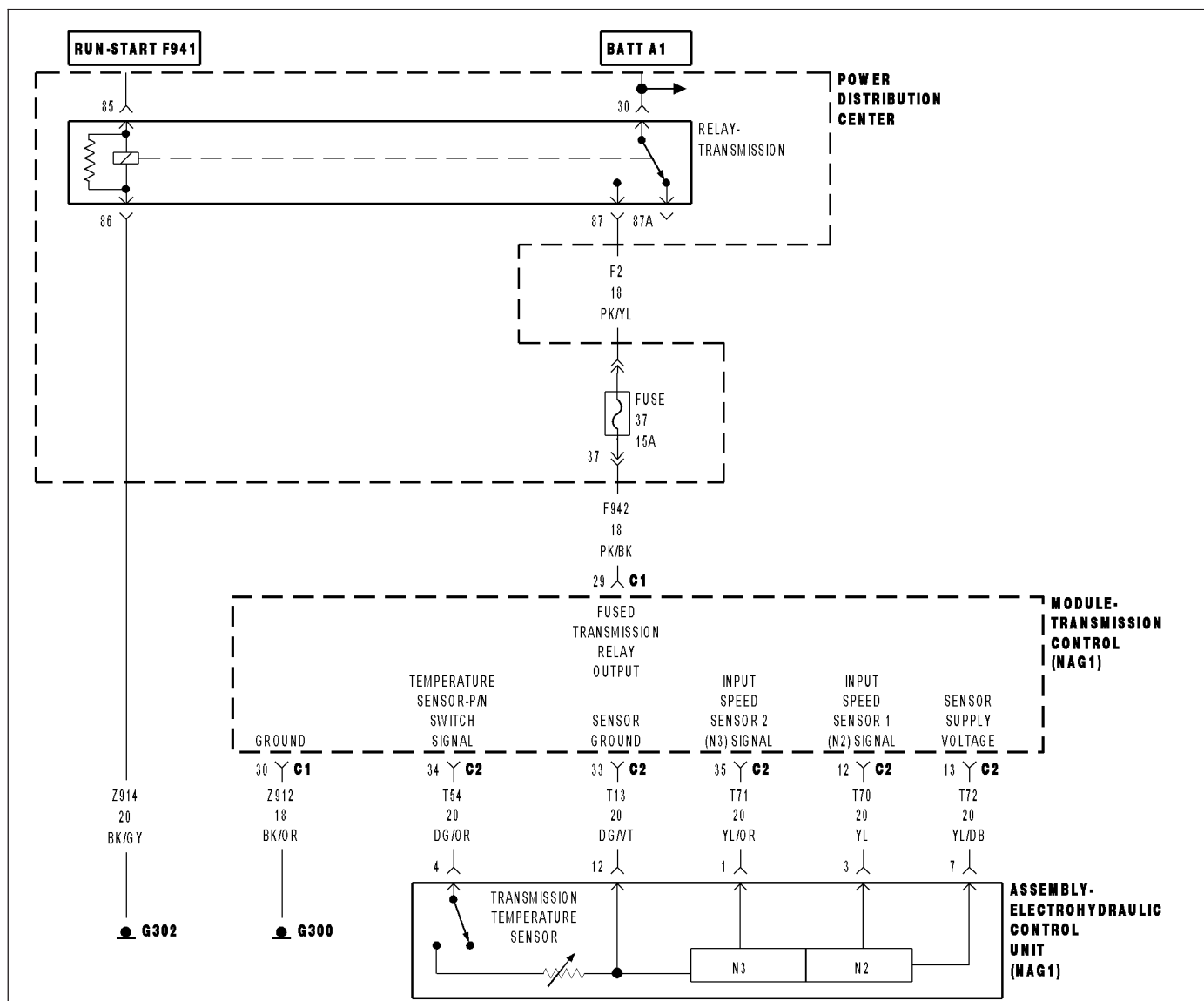
**Did DTC P0714 reset?**

**Yes**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.



**P0717-INPUT SPEED SENSOR 1 CIRCUIT NO SIGNAL**

**P0717-INPUT SPEED SENSOR 1 CIRCUIT NO SIGNAL (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Input Speed Sensor 1 (N2) is one of two hall effect speed sensors that are used by the Transmission Control Module (TCM) to calculate the transmissions turbine speed. Since the turbine speed could not be measured directly, two of the drive elements are measured. Two input speed sensors are required because both elements are not active in all gears.

- **When Monitored:**

Engine speed greater than 450 RPM with none of the following DTCs present: engine speed, TCM undervoltage, output speed sensor, and/or rear wheel speed DTCs. Also required are all wheel speeds above 250 RPM and no wheel slip detected (signal from the ABS system).

- **Set Condition:**

If the Input Speed Sensor 1 (N2) signal is equal to 0 RPM.

Possible Causes
(T72) SENSOR SUPPLY VOLTAGE CIRCUIT OPEN
(T70) INPUT SPEED SENSOR 1 (N2) SIGNAL CIRCUIT OPEN
(T70) SPEED SENSOR 1 (N2) SIGNAL CIRCUIT SHORT TO ANOTHER CIRCUIT
(T13) SENSOR GROUND CIRCUIT OPEN
(T13) SENSOR GROUND CIRCUIT SHORT TO ANOTHER CIRCUIT
(T70) SPEED SENSOR 1 (N2) SIGNAL CIRCUIT SHORT TO GROUND
(T13) SENSOR GROUND CIRCUIT SHORT TO GROUND
SPEED SENSOR 1 (N2)
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK IF DTC IS CURRENT**

**Note:** The Transmission Control Module stores under Environmental Data the transmission operating conditions when the DTC was set. Before erasure of any DTC, record all information pertaining to the DTC, even if there is more than one DTC stored.

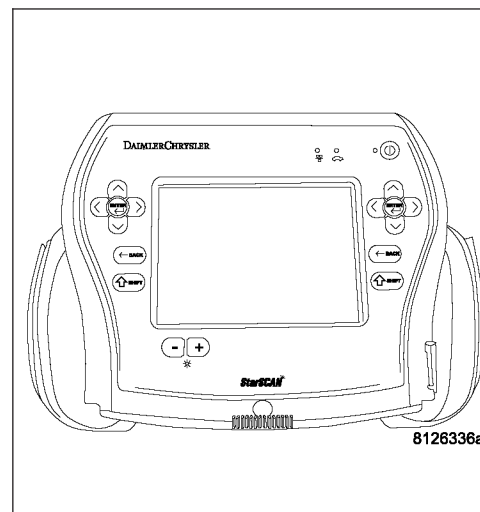
With the scan tool, erase transmission DTCs.

Using the Environmental Data previously recorded, drive the vehicle and try to duplicate the conditions in which the DTC originally set.

**Does the DTC reset?**

**Yes**    >> Go To 2

**No**     >> Go To 10



**P0717-INPUT SPEED SENSOR 1 CIRCUIT NO SIGNAL (CONTINUED)****2. CHECK THE (T72) SENSOR SUPPLY VOLTAGE CIRCUIT FOR AN OPEN**

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Disconnect the Electrohydraulic Control Unit Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

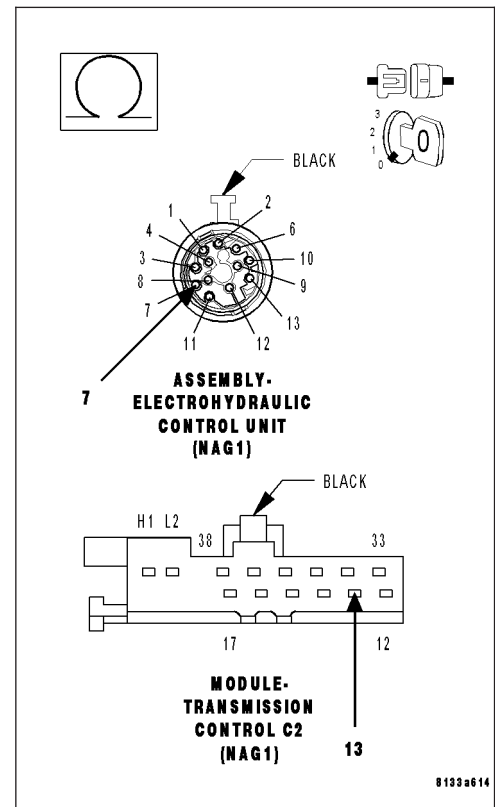
Measure the resistance of the (T72) Sensor Supply Voltage circuit from the TCM C2 harness connector to the Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T72) Sensor Supply Voltage circuit for an open.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (T70) INPUT SPEED SENSOR 1 (N2) SIGNAL CIRCUIT FOR AN OPEN**

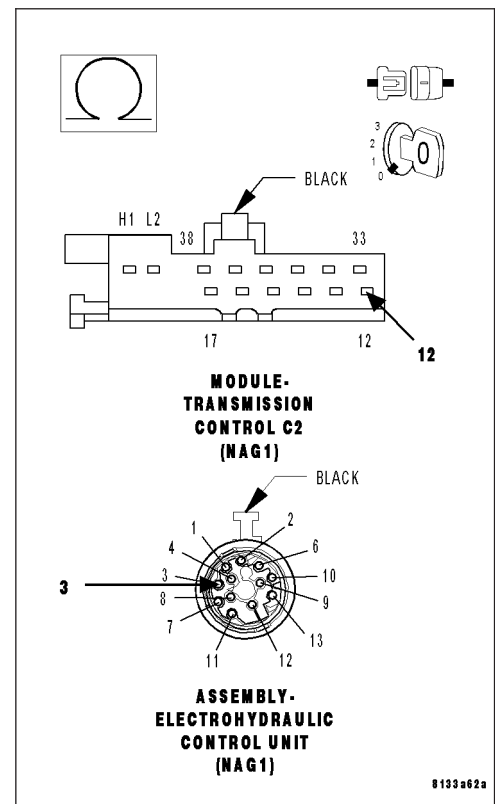
Measure the resistance of the (T70) Input Speed Sensor 1 (N2) Signal circuit from the TCM C2 harness connector to the Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T70) Input Speed Sensor 1 (N2) Signal circuit for an open.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4



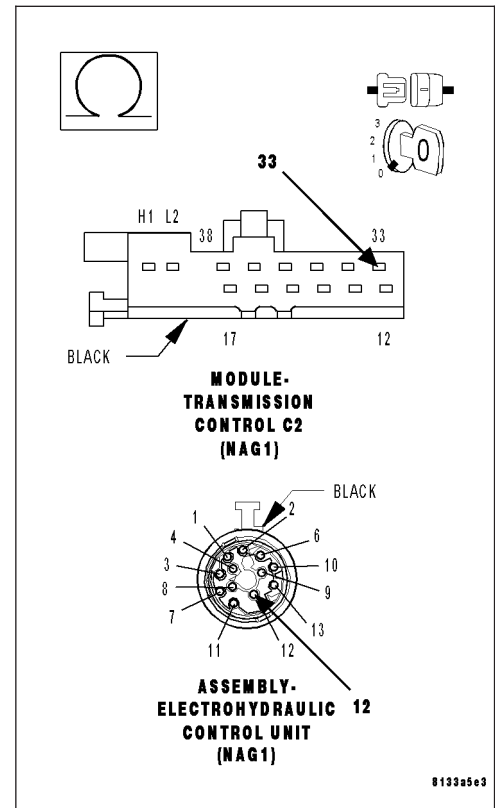
**P0717-INPUT SPEED SENSOR 1 CIRCUIT NO SIGNAL (CONTINUED)****4. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR AN OPEN**

Measure the resistance of the (T13) Sensor Ground circuit from the TCM C2 harness connector to the Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes**    >> Repair the (T13) Sensor Ground circuit for an open.  
            Perform NAG1 TRANSMISSION VERIFICATION TEST -  
            VER 1.

**No**      >> Go To 5

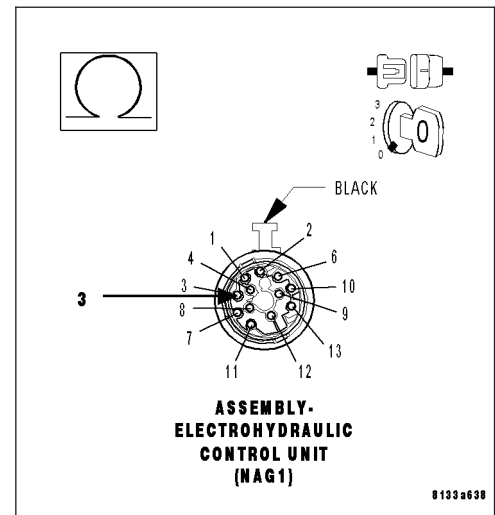
**5. CHECK THE (T70) INPUT SPEED SENSOR 1 (N2) SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT(S)**

Measure the resistance of the (T70) Input Speed Sensor 1 (N2) Signal circuit to all the other circuits in the Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T70) Input Speed Sensor 1 (N2) Signal circuit and any other circuit(s) in the Electrohydraulic Control Unit Assembly harness connector?**

**Yes**      >> Repair the (T70) Input Speed Sensor 1 (N2) Signal circuit  
            for a short to another circuit(s).  
            Perform NAG1 TRANSMISSION VERIFICATION TEST -  
            VER 1.

**No**      >> Go To 6



**P0717-INPUT SPEED SENSOR 1 CIRCUIT NO SIGNAL (CONTINUED)****6. CHECK THE (T70) INPUT SPEED SENSOR 1 (N2) SIGNAL CIRCUIT FOR A SHORT TO GROUND**

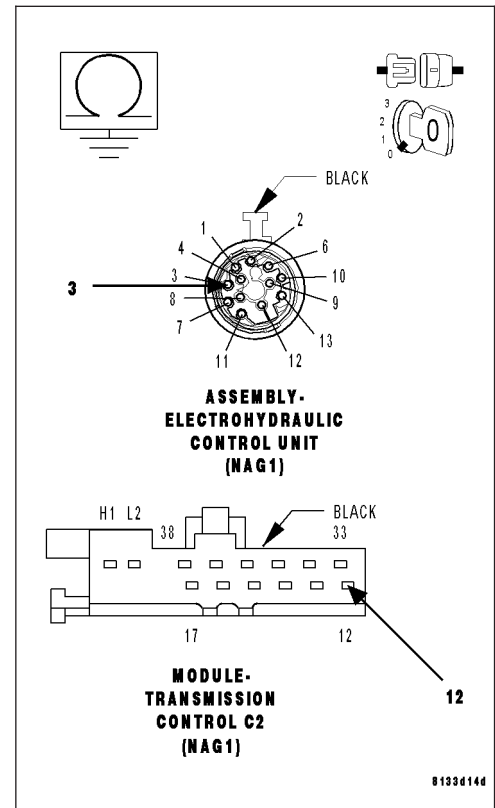
Measure the resistance between ground and the (T70) Input Speed Sensor 1 (N2) Signal circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T70) Input Speed Sensor 1 (N2) Signal circuit for a short to ground.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT(S)**

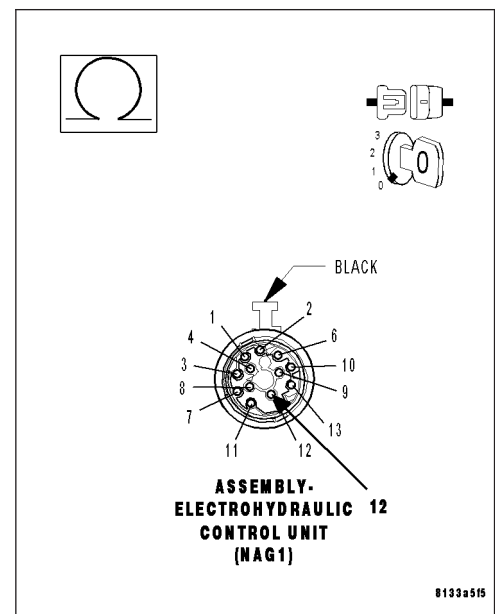
Measure the resistance between the (T13) Sensor Ground circuit to all the other circuits in the Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T13) Sensor Ground circuit and any other circuit(s) in the Electrohydraulic Control Unit Assembly harness connector.**

**Yes** >> Repair the (T13) Sensor Ground circuit for a short to another circuit(s)

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 8



**P0717-INPUT SPEED SENSOR 1 CIRCUIT NO SIGNAL (CONTINUED)****8. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND**

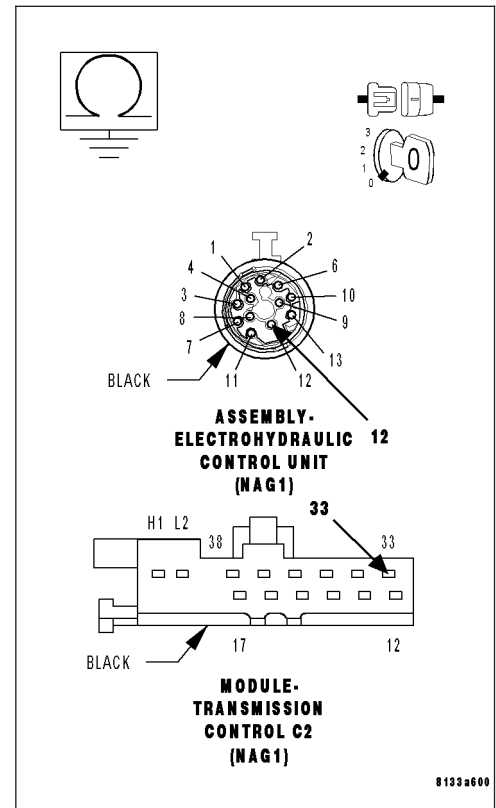
Measure the resistance between ground and the (T13) Sensor Ground circuit.

**Is the resistance below 5.0 ohms?**

**Yes**    >> Repair the (T13) Sensor Ground circuit for a short to ground.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 9



**P0717-INPUT SPEED SENSOR 1 CIRCUIT NO SIGNAL (CONTINUED)****9. CHECK THE INPUT SPEED SENSOR 1 (N2) SIGNAL**

Reconnect the Electrohydraulic Control Unit Assembly harness connector.

Using a Lab Scope, backprobe the (T70) Input Speed Sensor 1 (N2) Signal circuit at the TCM C2 harness connector.

**WARNING: Properly support the vehicle.**

Raise all drive wheels off the ground.

Start the engine.

**WARNING: To avoid personal injury or death, keep hands and feet clear of rotating wheels.**

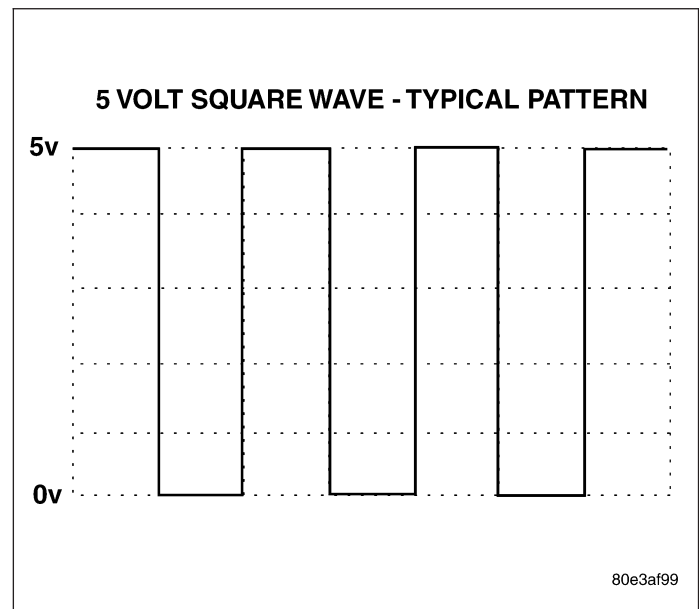
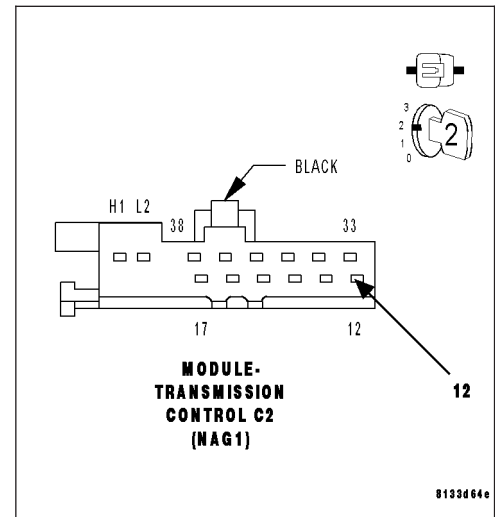
Place gear selector in drive and increase vehicle speed to engage 2nd gear.

Compare the scope pattern on the Lab Scope with a typical 5-volt square wave pattern.

**Is the scope pattern comparable to the typical 5-volt square wave signal scope pattern?**

**Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Replace the Input Speed Sensor 1 (N2). Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**10. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.



P0730-INCORRECT GEAR RATIO

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The Transmission Control Module (TCM) constantly calculates the transmission ratio based on the input speed sensor 1 and 2 (N2-N3) signals and the calculated output shaft speed. The intent of this diagnostic is to detect if the transmission is trying to mechanically shift into a lower gear then the TCM intends.

- **When Monitored:**  
Engine RPM greater than 450 RPM, output speed greater than 180 RPM, no N2 - N3 input speed sensor errors present, no gear selector lever errors present, no ABS system errors, and all wheel speeds above 450 RPM.
- **Set Condition:**  
No shifting operation and detected gear is not the actual gear. No shifting operation - detected (calculated) gear is less than actual (expected) gear, no plausible gear is calculated, actual turbine speed - calculated turbine speed is greater than 300 RPM or calculated transmission ratio is above threshold. During an Upshift - detected (calculated) gear is less than actual (expected) gear. During Downshift - detected (calculated) gear is less than actual (expected) gear.

Possible Causes
INTERNAL TRANSMISSION PROBLEM
TRANSMISSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR INTERNAL TRANSMISSION PROBLEM

Determine if there are any Transmission mechanical problems present.  
Remove the Transmission Oil Pan and inspect for excessive debris or a plugged Transmission Oil Filter. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure

- Is there any Transmission mechanical problems present?
- Yes**    >> Repair as necessary. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/ SERVICE INFORMATION for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

## P0731-GEAR RATIO ERROR IN 1ST

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

### Theory of Operation

The Transmission Control Module (TCM) constantly calculates the transmission ratio based on the input speed sensor 1 and 2 (N2-N3) signals and the calculated output shaft speed. The intent of this diagnostic is to detect if the transmission is slipping or an invalid gear ratio is present.

- **When Monitored:**

Engine RPM greater than 450 RPM, output speed greater than 180 RPM, no N2 - N3 input speed sensor errors present, no gear selector lever errors present, no ABS system errors, and all wheel speeds above 450 RPM.

- **Set Condition:**

No shifting operation and detected gear is not the actual gear. No shifting operation - detected (calculated) gear is less than actual (expected) gear, no plausible gear is calculated, actual turbine speed - calculated turbine speed is greater than 300 RPM or calculated transmission ratio is above threshold. During an Upshift - detected (calculated) gear is less than actual (expected) gear. During Downshift - detected (calculated) gear is less than actual (expected) gear.

Possible Causes
LOW TRANSMISSION FLUID
OTHER TRANSMISSION DTCS PRESENT
INTERNAL TRANSMISSION FAILURE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

### Diagnostic Test

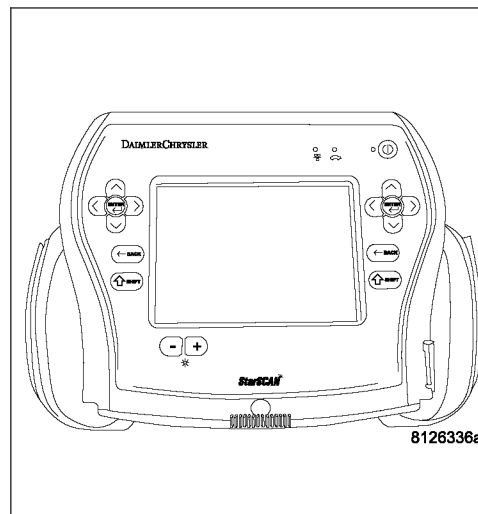
#### 1. CHECK FOR OTHER TRANSMISSION DTCS

With the scan tool, check transmission DTCS

**Are there any solenoid and/or solenoid supply voltage DTCS present?**

**Yes** >> Refer to 21 - AUTOMATIC TRANSMISSION - AUTOMATIC TRANSMISSION NAG1 - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2



**P0731-GEAR RATIO ERROR IN 1ST (CONTINUED)****2. CHECK TRANSMISSION FLUID LEVEL**

Check the transmission fluid level per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

**Is the fluid level correct?**

**Yes**    >> Go To 3

**No**    >> Properly adjust the fluid level per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION - AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**3. CHECK IF DTC IS CURRENT**

With the scan tool, record the Environmental Data and erase Transmission DTCs.

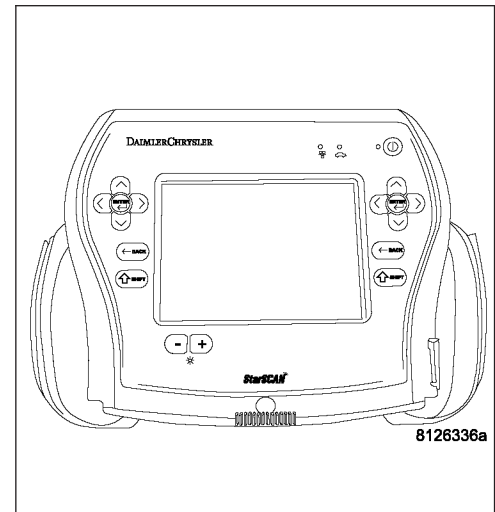
**Note:** If the TCM detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set and is located in scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Using the Environmental Data recorded earlier, test drive the vehicle while trying to duplicate the conditions in which the DTC originally set.

**Did the DTC P0731-GEAR RATIO ERROR IN 1ST reset?**

**Yes**    >> Repair internal transmission as necessary. Pay particular attention to components related to referenced DTC. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 4

**4. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

**Yes**    >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.

## P0732-GEAR RATIO ERROR IN 2ND

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

### Theory of Operation

The Transmission Control Module (TCM) constantly calculates the transmission ratio based on the input speed sensor 1 and 2 (N2-N3) signals and the calculated output shaft speed. The intent of this diagnostic is to detect if the transmission is slipping or an invalid gear ratio is present.

- **When Monitored:**

Engine RPM greater than 450 RPM, output speed greater than 180 RPM, no N2 - N3 input speed sensor errors present, no gear selector lever errors present, no ABS system errors, and all wheel speeds above 450 RPM.

- **Set Condition:**

No shifting operation and detected gear is not the actual gear. No shifting operation - detected (calculated) gear is less than actual (expected) gear, no plausible gear is calculated, actual turbine speed - calculated turbine speed is greater than 300 RPM or calculated transmission ratio is above threshold. During an Upshift - detected (calculated) gear is less than actual (expected) gear. During Downshift - detected (calculated) gear is less than actual (expected) gear.

Possible Causes
LOW TRANSMISSION FLUID
OTHER TRANSMISSION DTCS PRESENT
INTERNAL TRANSMISSION FAILURE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

### Diagnostic Test

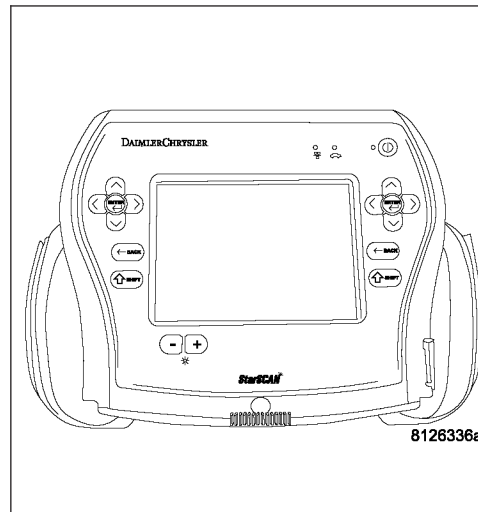
#### 1. CHECK FOR OTHER TRANSMISSION DTCS

With the scan tool, check transmission DTCS

**Are there any solenoid and/or solenoid supply voltage DTCS present?**

**Yes** >> Refer to 21 - AUTOMATIC TRANSMISSION - AUTOMATIC TRANSMISSION NAG1 - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2



**P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)****2. CHECK TRANSMISSION FLUID LEVEL**

Check the transmission fluid level per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

**Is the fluid level correct?**

**Yes**    >> Go To 3

**No**    >> Properly adjust the fluid level per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION - AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**3. CHECK IF DTC IS CURRENT**

With the scan tool, record the Environmental Data and erase Transmission DTCs.

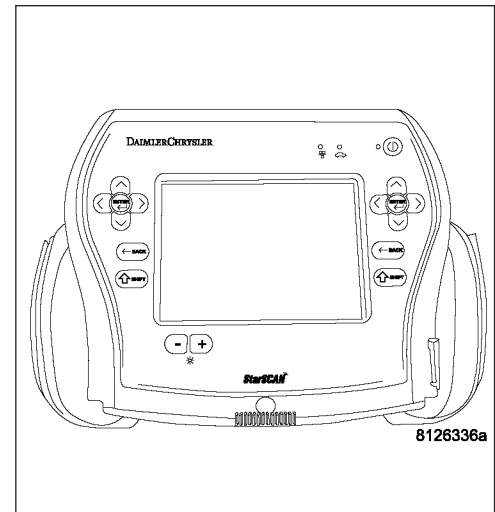
**Note:** If the TCM detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set and is located in scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Using the Environmental Data recorded earlier, test drive the vehicle while trying to duplicate the conditions in which the DTC originally set.

**Did the DTC P0732-GEAR RATIO ERROR IN 2ND reset?**

**Yes**    >> Repair internal transmission as necessary. Pay particular attention to components related to the referenced DTC. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 4

**4. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

**Yes**    >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.

## P0733-GEAR RATIO ERROR IN 3RD

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

### Theory of Operation

The Transmission Control Module (TCM) constantly calculates the transmission ratio based on the input speed sensor 1 and 2 (N2-N3) signals and the calculated output shaft speed. The intent of this diagnostic is to detect if the transmission is slipping or an invalid gear ratio is present.

- **When Monitored:**

Engine RPM greater than 450 RPM, output speed greater than 180 RPM, no N2 - N3 input speed sensor errors present, no gear selector lever errors present, no ABS system errors, and all wheel speeds above 450 RPM.

- **Set Condition:**

No shifting operation and detected gear is not the actual gear. No shifting operation - detected (calculated) gear is less than actual (expected) gear, no plausible gear is calculated, actual turbine speed - calculated turbine speed is greater than 300 RPM or calculated transmission ratio is above threshold. During an Upshift - detected (calculated) gear is less than actual (expected) gear. During Downshift - detected (calculated) gear is less than actual (expected) gear.

Possible Causes
LOW TRANSMISSION FLUID
OTHER TRANSMISSION DTCS PRESENT
INTERNAL TRANSMISSION FAILURE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

### Diagnostic Test

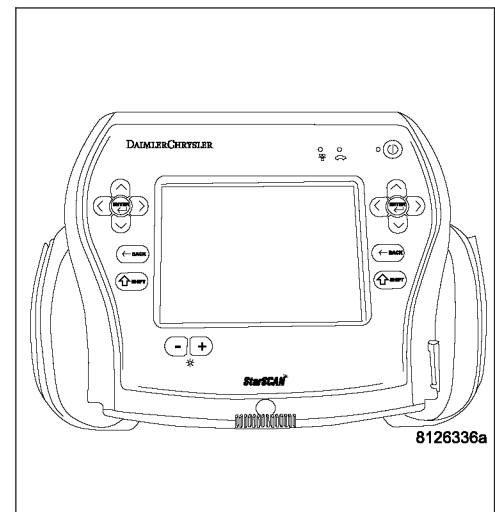
#### 1. CHECK FOR OTHER TRANSMISSION DTCS

With the scan tool, check transmission DTCS

**Are there any solenoid and/or solenoid supply voltage DTCS present?**

**Yes** >> Refer to 21 - AUTOMATIC TRANSMISSION - AUTOMATIC TRANSMISSION NAG1 - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2



**P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)****2. CHECK TRANSMISSION FLUID LEVEL**

Check the transmission fluid level per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

**Is the fluid level correct?**

**Yes**    >> Go To 3

**No**    >> Properly adjust the fluid level per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION - AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

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**3. CHECK IF DTC IS CURRENT**

With the scan tool, record the Environmental Data and erase Transmission DTCs.

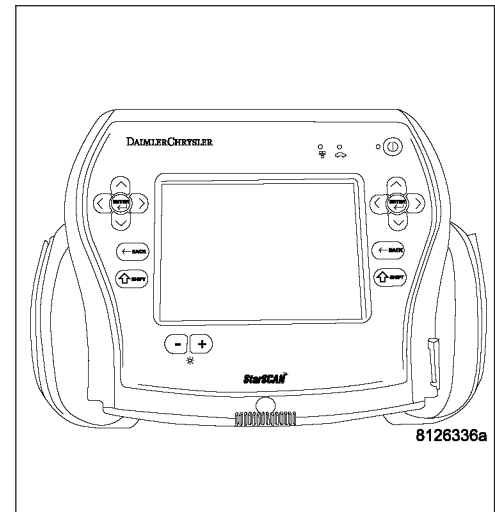
**Note:** If the TCM detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set and is located in scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Using the Environmental Data recorded earlier, test drive the vehicle while trying to duplicate the conditions in which the DTC originally set.

**Did the DTC P0733-GEAR RATIO ERROR IN 3RD reset?**

**Yes**    >> Repair internal transmission as necessary. Pay particular attention to components related to referenced DTC. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 4



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**4. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

**Yes**    >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.

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## P0734-GEAR RATIO ERROR IN 4TH

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

### Theory of Operation

The Transmission Control Module (TCM) constantly calculates the transmission ratio based on the input speed sensor 1 and 2 (N2-N3) signals and the calculated output shaft speed. The intent of this diagnostic is to detect if the transmission is slipping or an invalid gear ratio is present.

- **When Monitored:**

Engine RPM greater than 450 RPM, output speed greater than 180 RPM, no N2 - N3 input speed sensor errors present, no gear selector lever errors present, no ABS system errors, and all wheel speeds above 450 RPM.

- **Set Condition:**

No shifting operation and detected gear is not the actual gear. No shifting operation - detected (calculated) gear is less than actual (expected) gear, no plausible gear is calculated, actual turbine speed - calculated turbine speed is greater than 300 RPM or calculated transmission ratio is above threshold. During an Upshift - detected (calculated) gear is less than actual (expected) gear. During Downshift - detected (calculated) gear is less than actual (expected) gear.

Possible Causes
LOW TRANSMISSION FLUID
OTHER TRANSMISSION DTCS PRESENT
INTERNAL TRANSMISSION FAILURE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

### Diagnostic Test

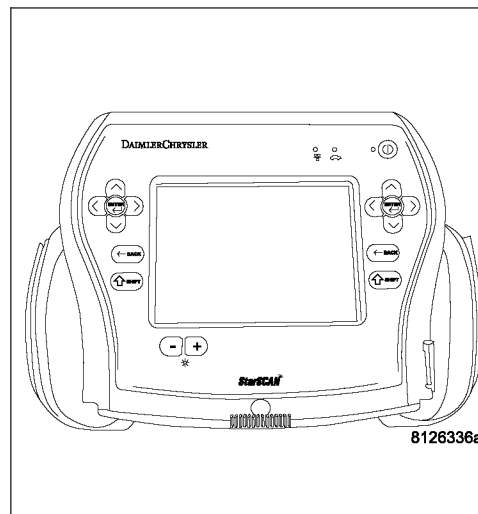
#### 1. CHECK FOR OTHER TRANSMISSION DTCS

With the scan tool, check transmission DTCS

**Are there any solenoid and/or solenoid supply voltage DTCS present?**

**Yes** >> Refer to 21 - AUTOMATIC TRANSMISSION - AUTOMATIC TRANSMISSION NAG1 - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2





**P0734-GEAR RATIO ERROR IN 4TH (CONTINUED)****2. CHECK TRANSMISSION FLUID LEVEL**

Check the transmission fluid level per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

**Is the fluid level correct?**

**Yes** >> Go To 3

**No** >> Properly adjust the fluid level per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION - AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**3. CHECK IF DTC IS CURRENT**

With the scan tool, record the Environmental Data and erase Transmission DTCs.

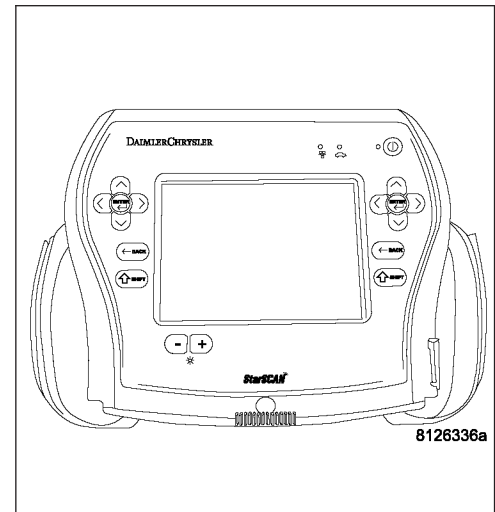
**Note:** If the TCM detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set and is located in scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Using the Environmental Data recorded earlier, test drive the vehicle while trying to duplicate the conditions in which the DTC originally set.

**Did the DTC P0734-GEAR RATIO ERROR IN 4TH reset?**

**Yes** >> Repair internal transmission as necessary. Pay particular attention to components related to referenced DTC. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4

**4. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

## P0735-GEAR RATIO ERROR IN 5TH

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

### Theory of Operation

The Transmission Control Module (TCM) constantly calculates the transmission ratio based on the input speed sensor 1 and 2 (N2-N3) signals and the calculated output shaft speed. The intent of this diagnostic is to detect if the transmission is slipping or an invalid gear ratio is present.

- **When Monitored:**

Engine RPM greater than 450 RPM, output speed greater than 180 RPM, no N2 - N3 input speed sensor errors present, no gear selector lever errors present, no ABS system errors, and all wheel speeds above 450 RPM.

- **Set Condition:**

No shifting operation and detected gear is not the actual gear. No shifting operation - detected (calculated) gear is less than actual (expected) gear, no plausible gear is calculated, actual turbine speed - calculated turbine speed is greater than 300 RPM or calculated transmission ratio is above threshold. During an Upshift - detected (calculated) gear is less than actual (expected) gear. During Downshift - detected (calculated) gear is less than actual (expected) gear.

Possible Causes
LOW TRANSMISSION FLUID
OTHER TRANSMISSION DTCS PRESENT
INTERNAL TRANSMISSION FAILURE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

### Diagnostic Test

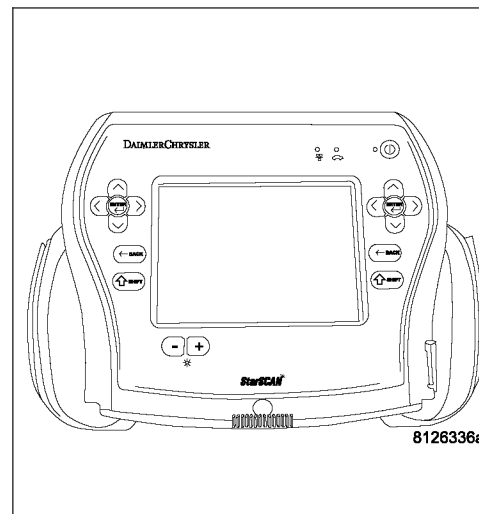
#### 1. CHECK FOR OTHER TRANSMISSION DTCS

With the scan tool, check transmission DTCS

**Are there any solenoid and/or solenoid supply voltage DTCS present?**

**Yes** >> Refer to 21 - AUTOMATIC TRANSMISSION - AUTOMATIC TRANSMISSION NAG1 - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2



**P0735-GEAR RATIO ERROR IN 5TH (CONTINUED)****2. CHECK TRANSMISSION FLUID LEVEL**

Check the transmission fluid level per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

**Is the fluid level correct?**

**Yes**    >> Go To 3

**No**    >> Properly adjust the fluid level per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION - AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**3. CHECK IF DTC IS CURRENT**

With the scan tool, record the Environmental Data and erase Transmission DTCs.

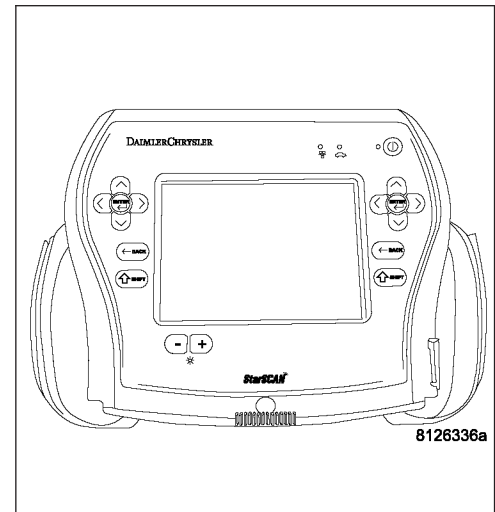
**Note:** If the TCM detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set and is located in scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Using the Environmental Data recorded earlier, test drive the vehicle while trying to duplicate the conditions in which the DTC originally set.

**Did the DTC P0735-GEAR RATIO ERROR IN 5TH reset?**

**Yes**    >> Repair internal transmission as necessary. Pay particular attention to components related to referenced DTC. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 4

**4. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

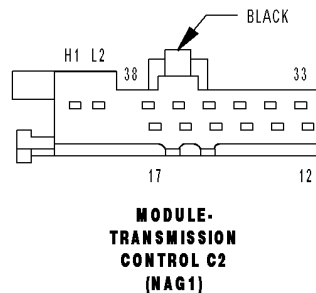
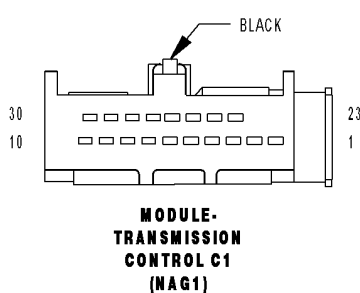
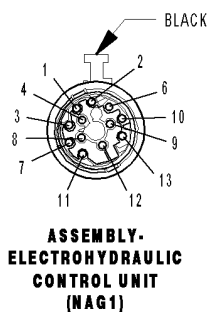
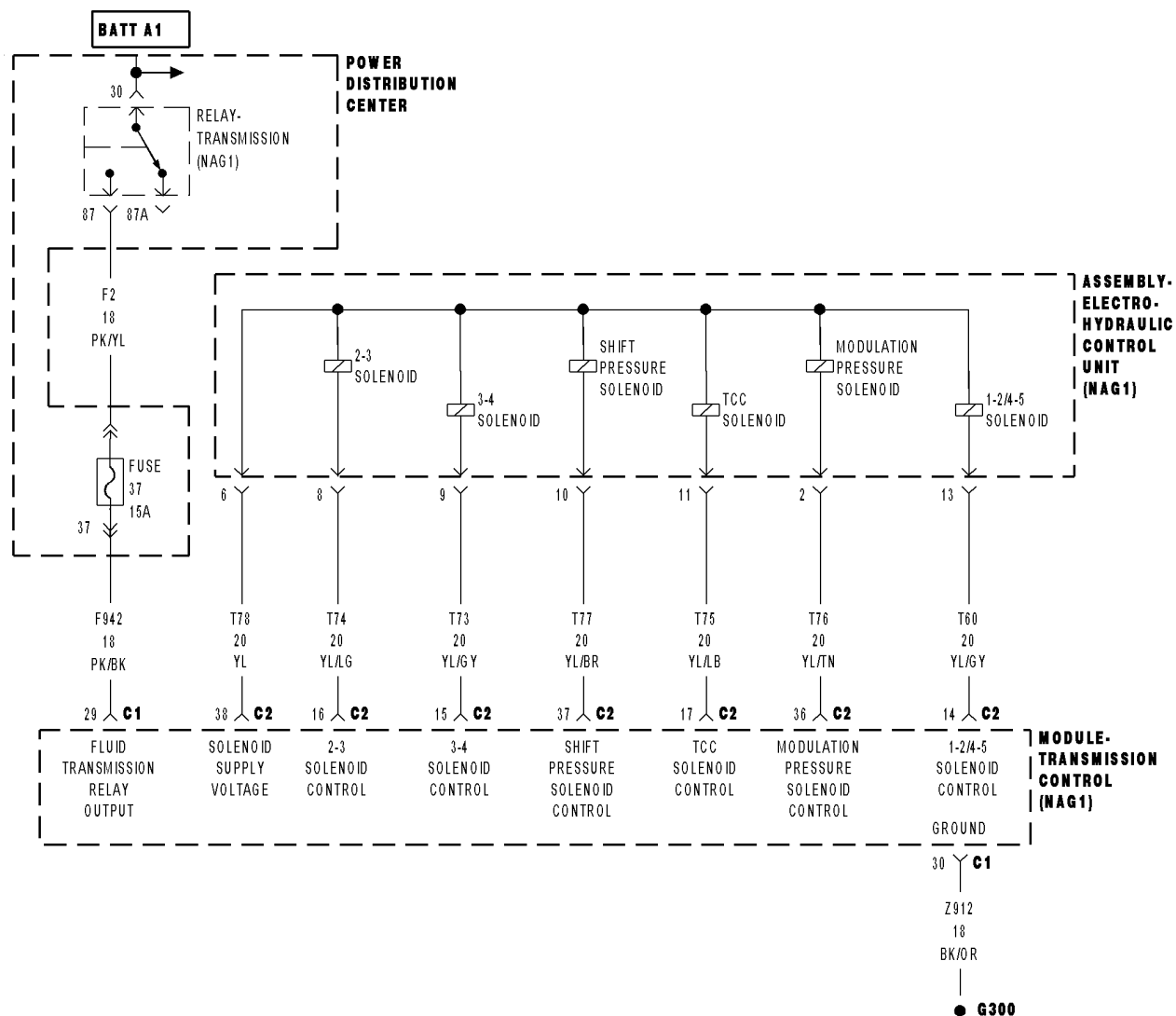
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

**Yes**    >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.

# P0742-TORQUE CONVERTER CLUTCH STUCK ON



**P0742-TORQUE CONVERTER CLUTCH STUCK ON (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) constantly monitors the amount of torque converter slippage. When the torque converter clutch (TCC) is open the slippage is expected to be above a threshold. If the slippage is less then expected when the TCC is open, the TCM assumes that the TCC is stuck on.

- **When Monitored:**

Ignition on, TCM not in initialization phase, No input speed sensor 1 or 2 (N2–N3) DTCs, No CAN bus or ECM DTCs, No CAN engine speed signal or engine torque signal not implausible DTCs, Engine speed greater than 450 rpm, No shift in progress, Gear 1, 2, 3, 4 or 5 engaged, and the TCM torque converter status is OPEN

- **Set Condition:**

Engine RPM (Turbine Speed) is greater than 30 RPM when engine torque less than 100 N·m (74.0 ft.lbs.) for period of 1.0 second.

Possible Causes
(T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO GROUND (T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT INTERNAL TRANSMISSION LOCKUP CONTROL VALVE STICKING IN ITS BORE LEAKING TCC SOLENOID TORQUE CONVERTER TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK IF ENGINE STALLS OR STUMBLES IN GEAR**

Turn the ignition off to the lock position.

Disconnect the Electrohydraulic Control Unit Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

Start the engine.

With the brakes firmly applied, shift the gear selector into Drive.

**Did the engine stall or stumble?**

**Yes**    >> Repair internal transmission. Pay particular attention to the components related to the TCC such as the Lockup Control Valve sticking in its bore or a leaking TCC Solenoid. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 2

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**P0742-TORQUE CONVERTER CLUTCH STUCK ON (CONTINUED)****2. (T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

**Note: Check connectors - Clean/repair as necessary.**

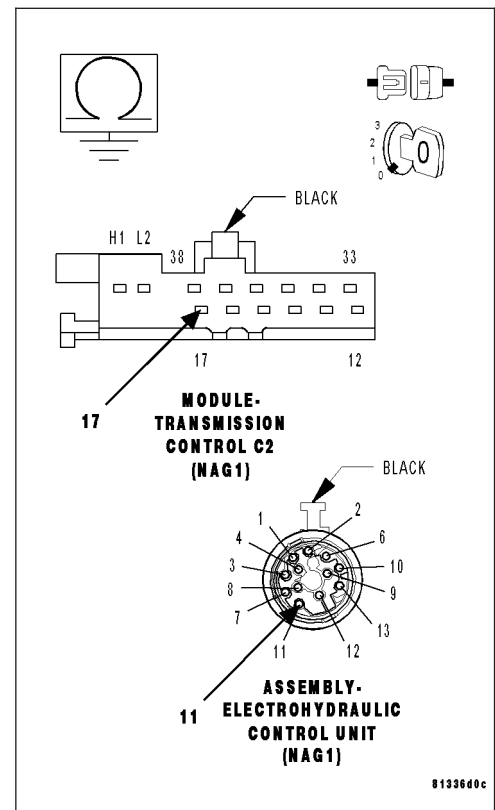
Measure the resistance between ground and the (T75) TCC Solenoid Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T75) TCC Solenoid Control circuit for a short to ground.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. (T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT**

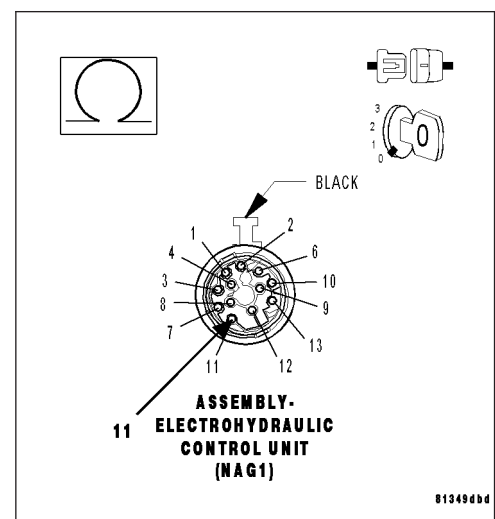
Measure the resistance between the (T75) TCC Solenoid Control circuit and all other circuits in the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T75) TCC Solenoid Control circuit and all other circuits in the Transmission Electrohydraulic Control Unit Assembly harness connector?**

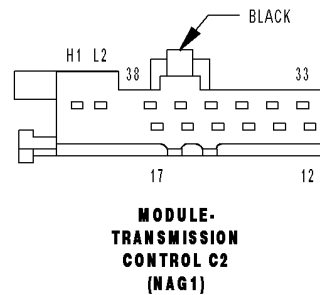
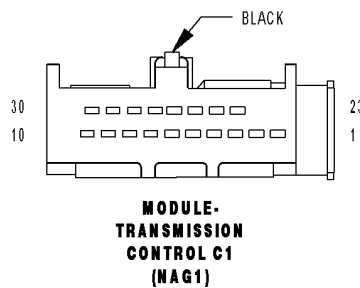
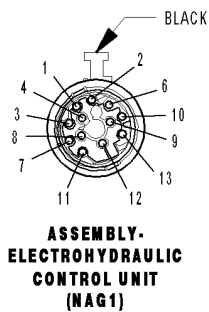
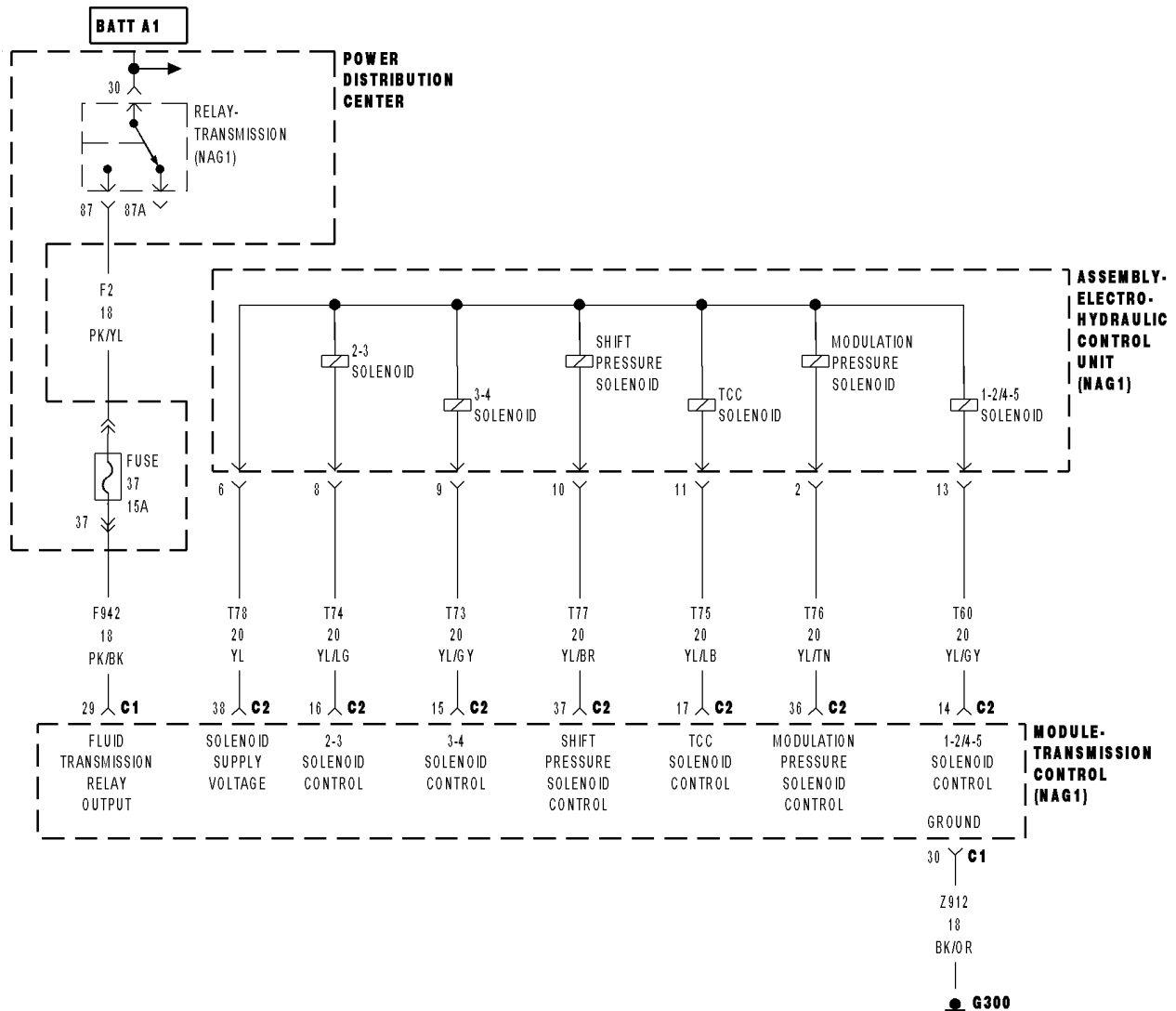
**Yes** >> Repair the (T75) TCC Solenoid Control circuit for a short to another circuit(s).

**No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



# P0743-TCC SOLENOID CIRCUIT



**P0743-TCC SOLENOID CIRCUIT (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The TCC Solenoid is activated when the Transmission Control Module (TCM) determines that the Torque Converter Clutch should be activated. The Torque Converter Clutch is a variable slip torque clutch that allows control of the slip from 5.5% to 95.5% of lock-up. The Clutch is controlled by the TCC Solenoid which is pulse width modulated (PWM) to provide the desired amount of slip. The clutch requires both an electrical PWM of 1000Hz and an hydraulic PWM of 100Hz.

- **When Monitored:**

Continuously with the ignition on, engine running, with the transmission in gear, the TCC Solenoid is inactive, or when the TCC Solenoid is active and controlled above 25% duty cycle, with the Solenoid Supply voltage active.

- **Set Condition:**

If the TCM detects on the TCC Solenoid control circuit a open, short to ground, short to voltage, internal short in the TCC Solenoid or open in the TCC Solenoid.

Possible Causes
(T75) TCC SOLENOID CONTROL CIRCUIT OPEN
(T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TCC SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT
TCC SOLENOID
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK IF THE DTC IS CURRENT**

**Note:** If the TCM detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in scan tool under **Environmental Data**. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Turn the ignition off to the lock position.

With the scan tool, erase Transmission DTC's.

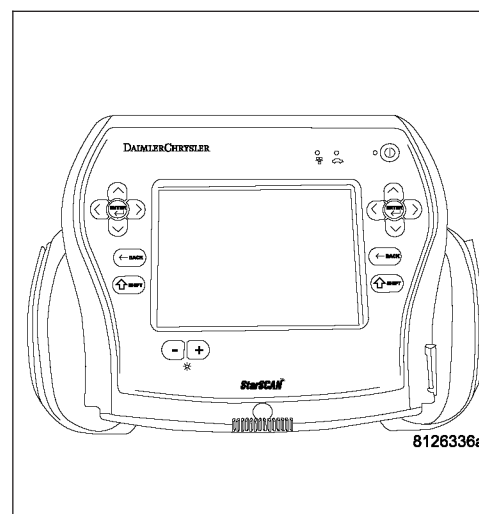
Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

**Did the DTC P0743 reset?**

**Yes** >> Go To 2

**No** >> Go To 6





**P0743-TCC SOLENOID CIRCUIT (CONTINUED)****2. CHECK THE (T75) TCC SOLENOID CONTROL CIRCUIT FOR AN OPEN**

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Disconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

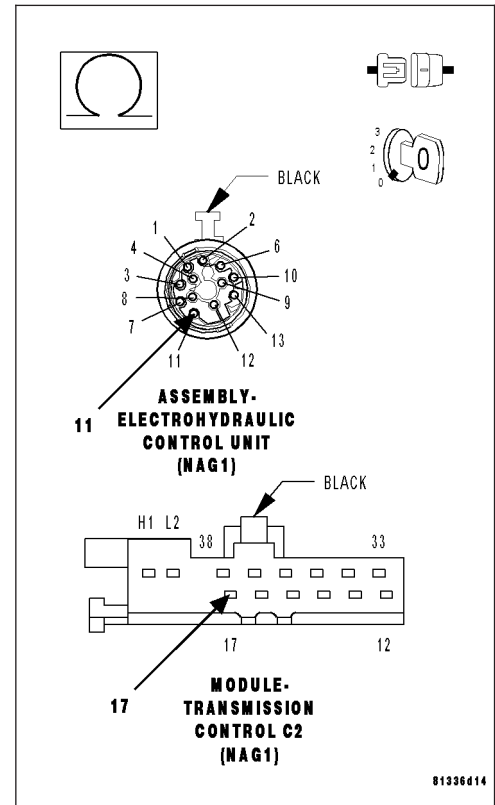
**Note: Check connectors - Clean/repair as necessary.**

Measure the resistance of the (T75) TCC Solenoid Control circuit from the TCM C2 harness connector to the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes**    >> Repair the (T75) TCC Solenoid Control circuit for an open.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 3

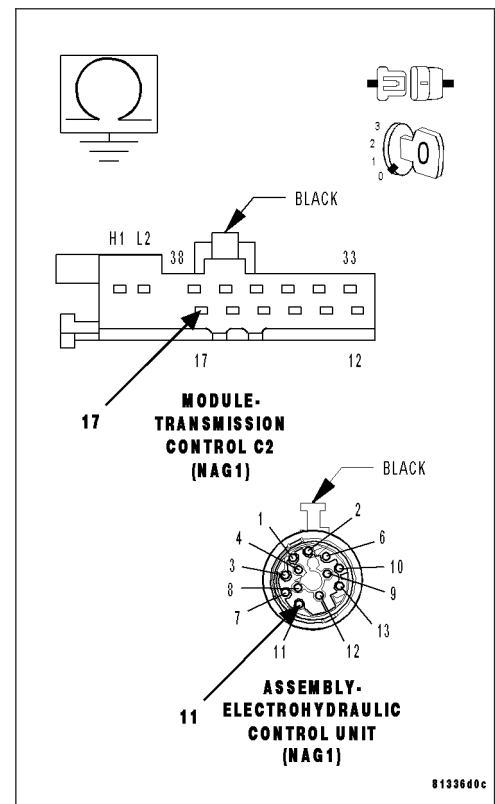
**3. CHECK THE (T75) TCC SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (T75) TCC Solenoid Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes**    >> Repair the (T75) TCC Solenoid Control circuit for a short to ground.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 4



**P0743-TCC SOLENOID CIRCUIT (CONTINUED)****4. CHECK THE (T75) TCC SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT**

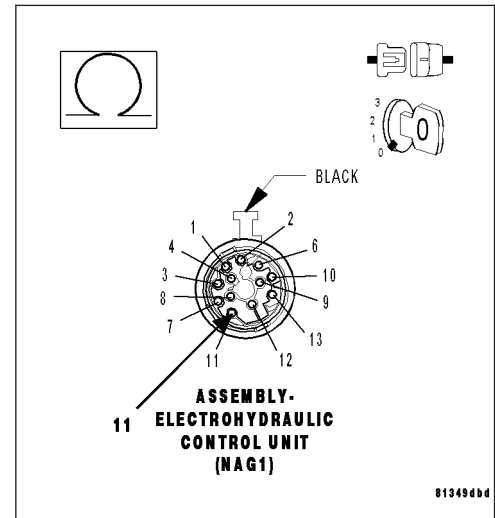
Measure the resistance between the (T75) TCC Solenoid Control circuit and all other circuits in the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T75) TCC Solenoid Control circuit and any other circuit(s) in the Transmission Electrohydraulic Control Unit Assembly harness connector?**

**Yes** >> Repair the (T75) TCC Solenoid Control circuit for a short to another circuit.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE TCC SOLENOID RESISTANCE**

Disconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

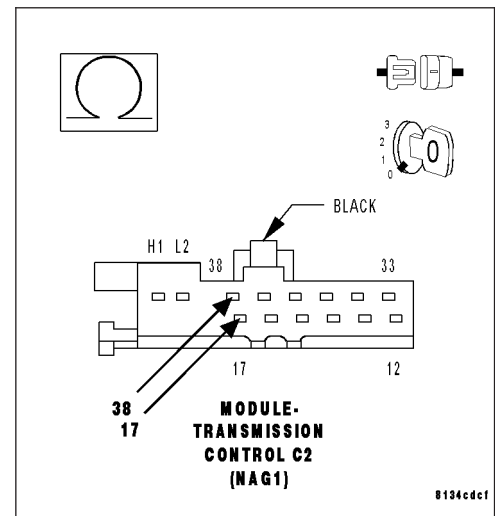
Measure the resistance of the TCC Solenoid between the (T75) TCC Solenoid Control circuit and the (T78) Solenoid Supply circuit in the TCM C2 harness connector.

**Is the resistance between 2.0 and 4.0 ohms?**

**Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Replace the TCC Solenoid per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

**6. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

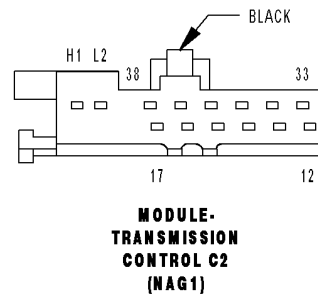
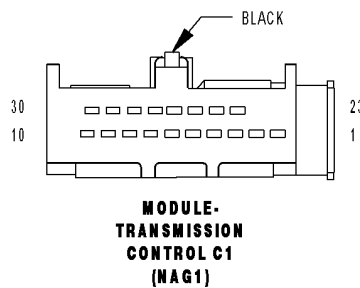
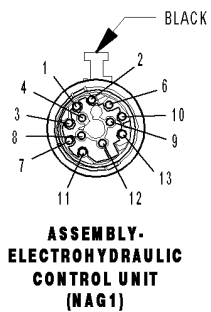
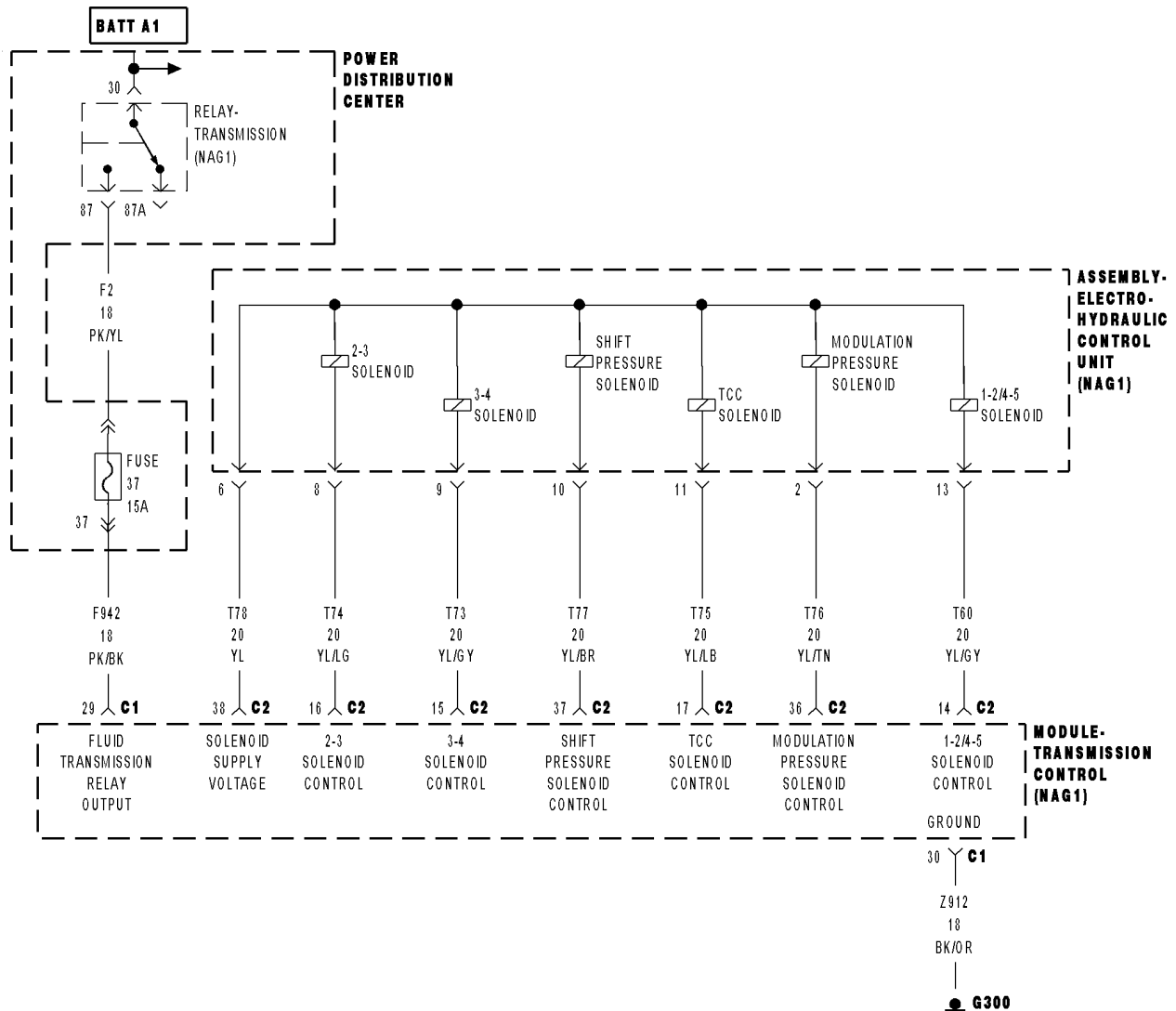
**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

## P0748-MODULATOR PRESSURE SOLENOID CIRCUIT



**P0748-MODULATOR PRESSURE SOLENOID CIRCUIT (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Modulating Pressure Control Solenoid Valve's purpose is to control the modulating pressure depending on the continuously changing operating conditions, such as load and gear change.

The Modulating Pressure Control Solenoid Valve is always active. The solenoid uses pulse width modulation (PWM) to control the transmissions hydraulic fluid pressure that is determined by the Transmission Control Module (TCM).

- **When Monitored:**

Continuously with the ignition on, engine running, the Modulating Pressure Control Solenoid Valve is either off, or active with 25-75% duty cycle, with no Solenoid Supply Voltage DTCs present.

- **Set Condition:**

When the Modulating Pressure Control Solenoid Valve is turned on and the Solenoid driver detects an error (the measured current is too different then the target current) or when the solenoid is off and a short to ground is detected.

Possible Causes
(T76) MODULATION PRESSURE SOLENOID CONTROL CIRCUIT OPEN
(T76) MODULATION PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T76) MODULATION PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
MODULATING PRESSURE CONTROL SOLENOID VALVE
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK IF THE DTC IS CURRENT**

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Turn the ignition off to the lock position.

With the scan tool, erase Transmission DTC's.

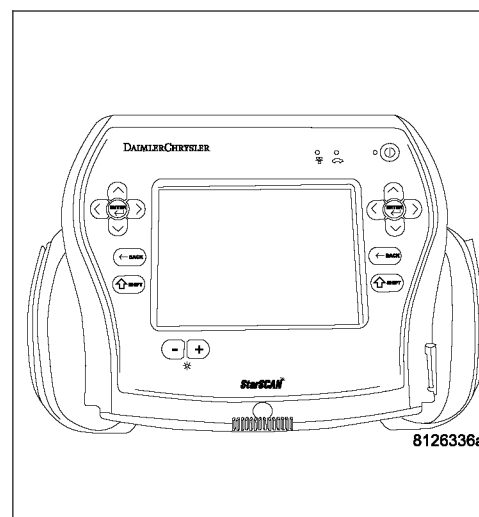
Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

**Did the DTC P0748 reset?**

**Yes** >> Go To 2

**No** >> Go To 6



**P0748-MODULATOR PRESSURE SOLENOID CIRCUIT (CONTINUED)****2. CHECK THE (T76) MODULATION PRESSURE SOLENOID CONTROL CIRCUIT FOR AN OPEN**

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Disconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

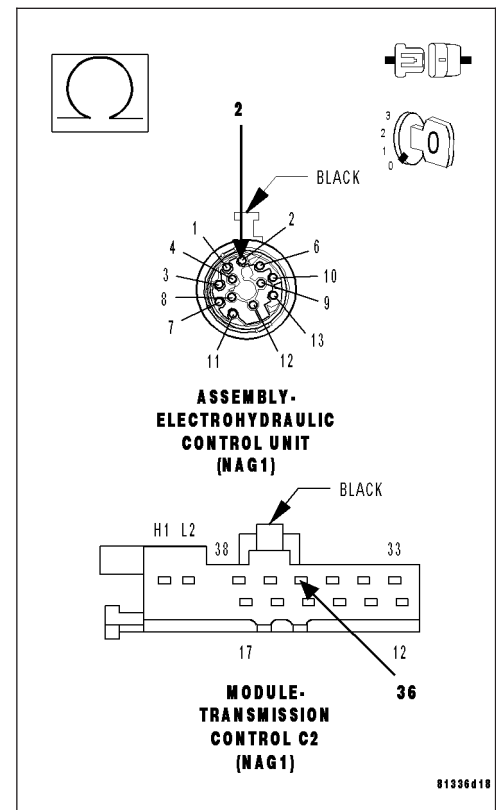
Measure the resistance of the (T76) Modulation Pressure Solenoid Control circuit between the TCM C2 harness connector and the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T76) Modulation Pressure Solenoid Control circuit for an open.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3



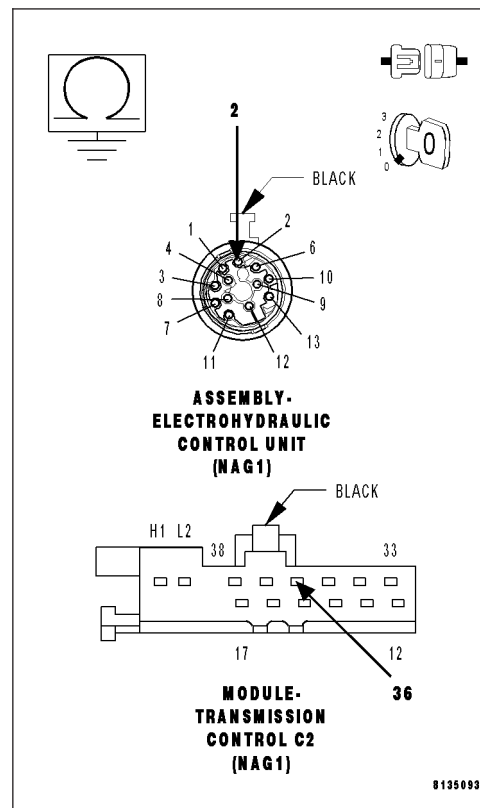
**P0748-MODULATOR PRESSURE SOLENOID CIRCUIT (CONTINUED)****3. CHECK THE (T76) MODULATION PRESSURE SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (T76) Modulation Pressure Solenoid Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T76) Modulation Pressure Solenoid Control circuit for a short to ground.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4

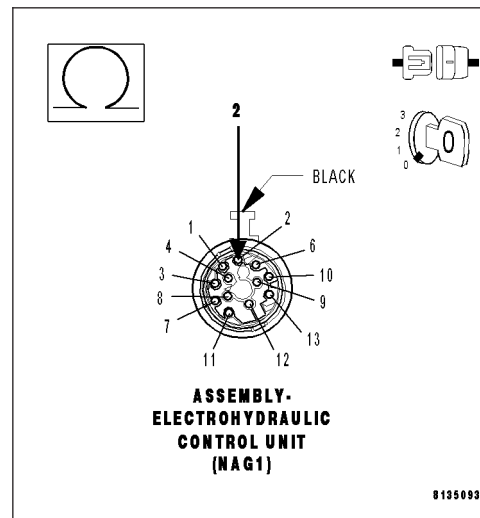
**4. CHECK THE (T76) MODULATION PRESSURE SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT**

Measure the resistance between the (T76) Modulation Pressure Solenoid Control circuit and every other circuit in the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T76) Modulation Pressure Solenoid Control circuit for a short to another circuit.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5



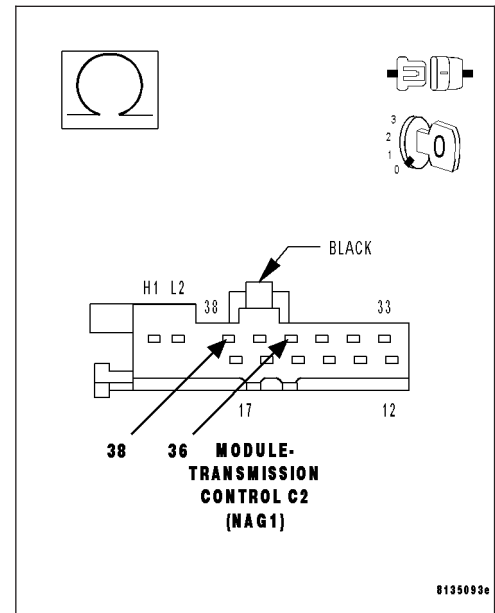
**P0748-MODULATOR PRESSURE SOLENOID CIRCUIT (CONTINUED)****5. CHECK THE MODULATING PRESSURE CONTROL SOLENOID VALVE**

Reconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

Measure the resistance between the (T76) Modulation Pressure Solenoid Control circuit and the (T78) Solenoid Supply Voltage circuit in the TCM C2 harness connector.

**Is the resistance between 2.5 and 6.5 ohms?**

- Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.
- Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Replace the Modulating Pressure Control Solenoid Valve per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/ SERVICE INFORMATION for the appropriate service procedure.

**6. INTERMITTENT WIRING AND CONNECTORS**

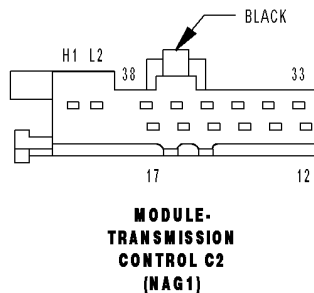
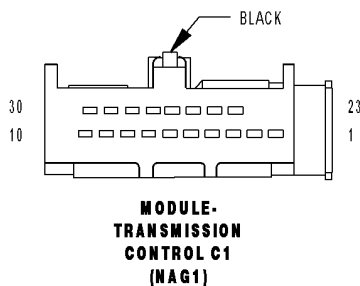
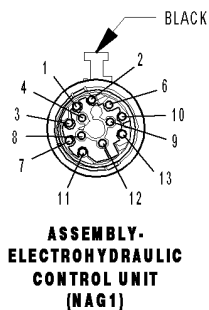
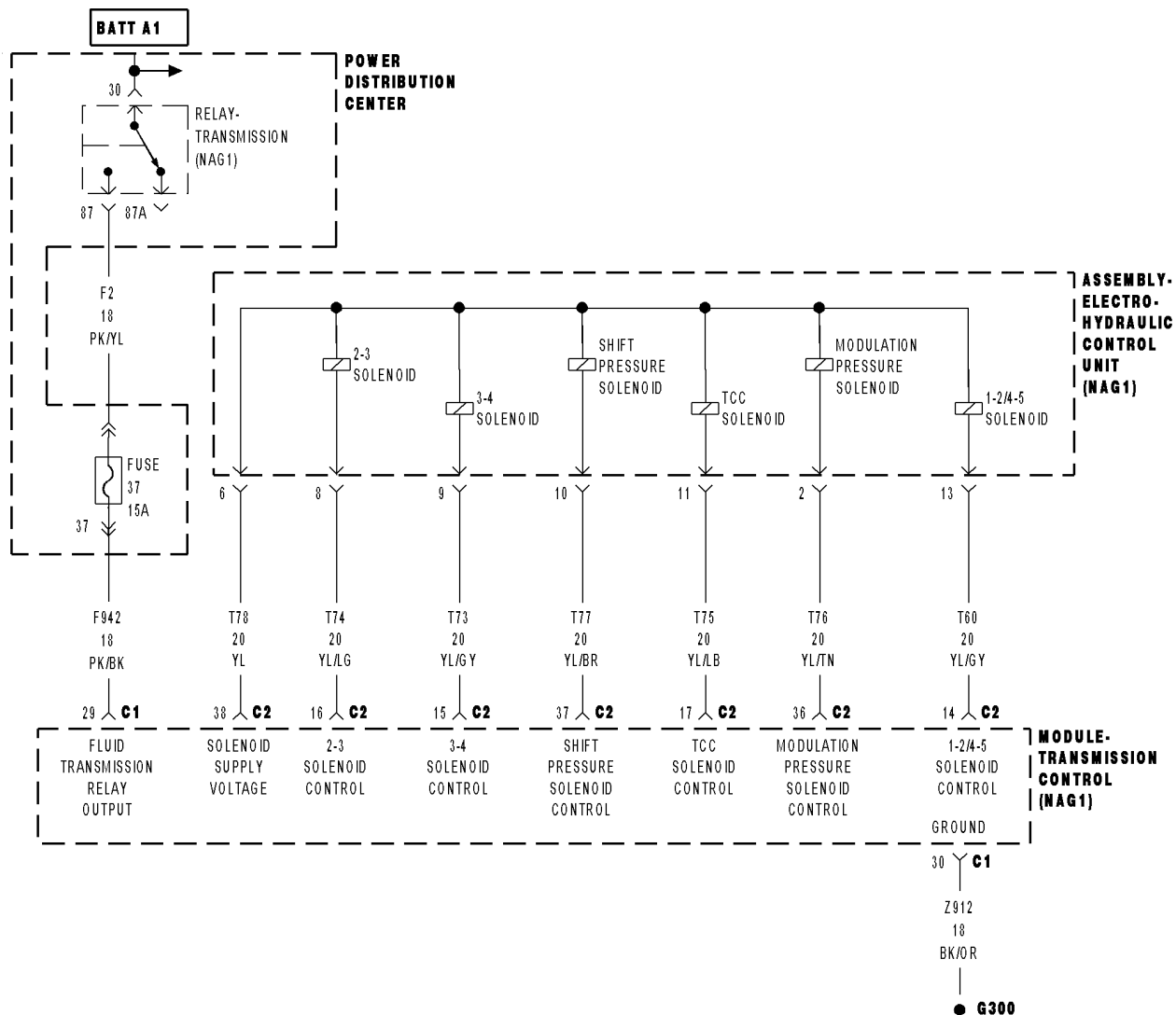
The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring and connectors while checking for any possible open or shorted circuits. Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

- Yes** >> Repair as necessary.
- Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Test Complete.

# P0752-1-2/4-5 SOLENOID





P0752-1-2/4-5 SOLENOID (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The 1-2/4-5 Solenoid is activated when the Transmission Control Module (TCM) determines that the transmission must shift into or out of second or fifth gear. The solenoid is only activated during the actual shift of the transmission. When the solenoid is activated, hydraulic pressure is applied to the proper shift elements in the transmission to allow the desired shift. Once the shift is completed the solenoid is turned off.

- **When Monitored:**  
When both the 1-2/4-5 Solenoid and the Solenoid Supply voltage is active.
- **Set Condition:**  
When 1-2/4-5 Solenoid is turned on and the TCM detects any of the following in the 1-2/4-5 Solenoid or circuit: open, short to ground, short to voltage, or the solenoid driver in the TCM.

Possible Causes
(T76) 1-2/4-5 SOLENOID CONTROL CIRCUIT OPEN
(T76) 1-2/4-5 SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T76) 1-2/4-5 SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
1-2/4-5 SOLENOID
TRANSMISSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Turn the ignition off to the lock position.

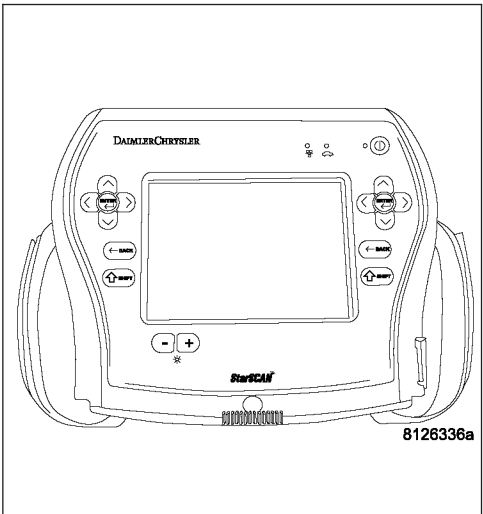
With the scan tool, erase Transmission DTC's.

Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

Did the DTC P0752 reset?

- Yes**    >> Go To 2
- No**     >> Go To 6



**P0752-1-2/4-5 SOLENOID (CONTINUED)****2. CHECK THE (T76) 1-2/4-5 SOLENOID CONTROL CIRCUIT FOR AN OPEN**

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Disconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

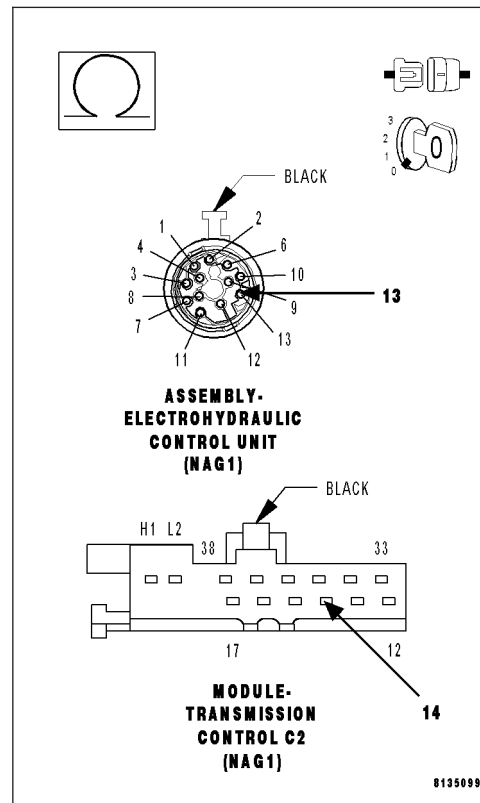
Measure the resistance of the (T76) 1-2/4-5 Solenoid Control circuit between the TCM C2 harness connector and the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (T76) 1-2/4-5 Solenoid Control circuit for an open.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**3. CHECK THE (T76) 1-2/4-5 SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND**

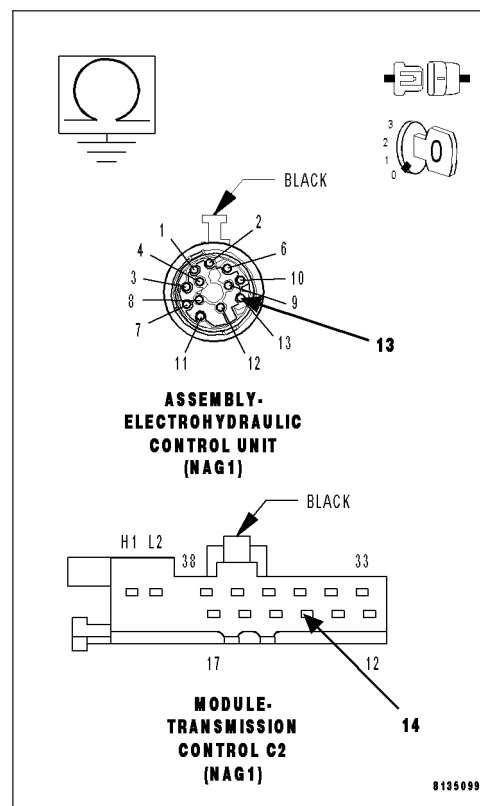
Measure the resistance between ground and the (T76) 1-2/4-5 Solenoid Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T76) 1-2/4-5 Solenoid Control circuit for a short to ground.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4



**P0752-1-2/4-5 SOLENOID (CONTINUED)****4. CHECK THE (T76) 1-2/4-5 SOLENOID CONTROL CIRCUIT FOR A TO ANOTHER CIRCUIT**

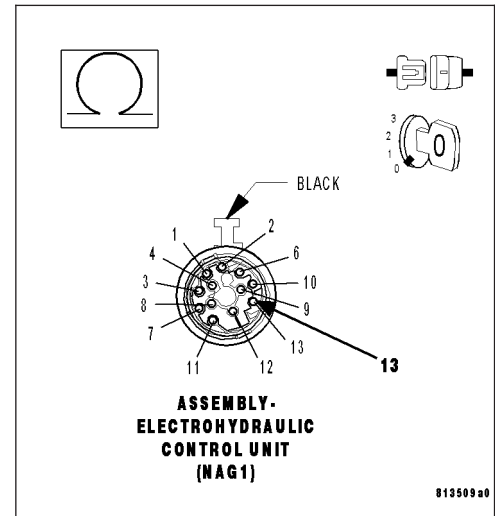
Measure the resistance between the (T76) 1-2/4-5 Solenoid Control circuit and every other circuit in the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T76) 1-2/4-5 Solenoid Control circuit and any other circuit(s) in the Transmission Electrohydraulic Control Unit Assembly harness connector?**

**Yes**    >> Repair the (T76) 1-2/4-5 Solenoid Control circuit for another circuit.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 5

**5. CHECK THE 1-2/4-5 SOLENOID**

Reconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

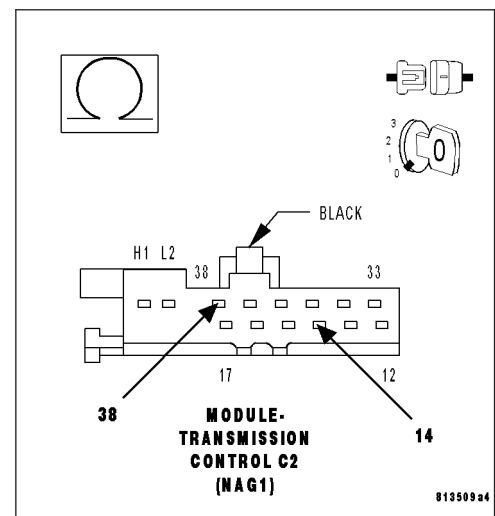
Measure the resistance of the 1-2/4-5 Solenoid between the (T76) 1-2/4-5 Solenoid Control circuit and the (T78) Solenoid Voltage Supply circuit in the TCM C2 harness connector.

**Is the resistance between 2.5 and 6.5 ohms?**

**Yes**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Replace the 1-2/4-5 Solenoid per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION- AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

**6. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

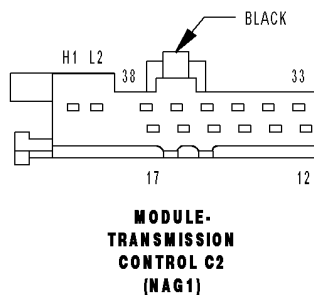
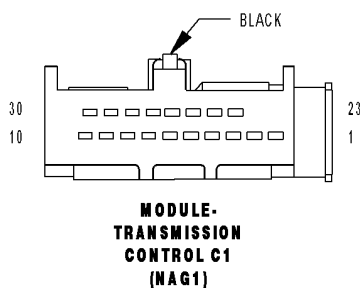
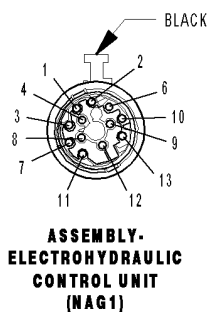
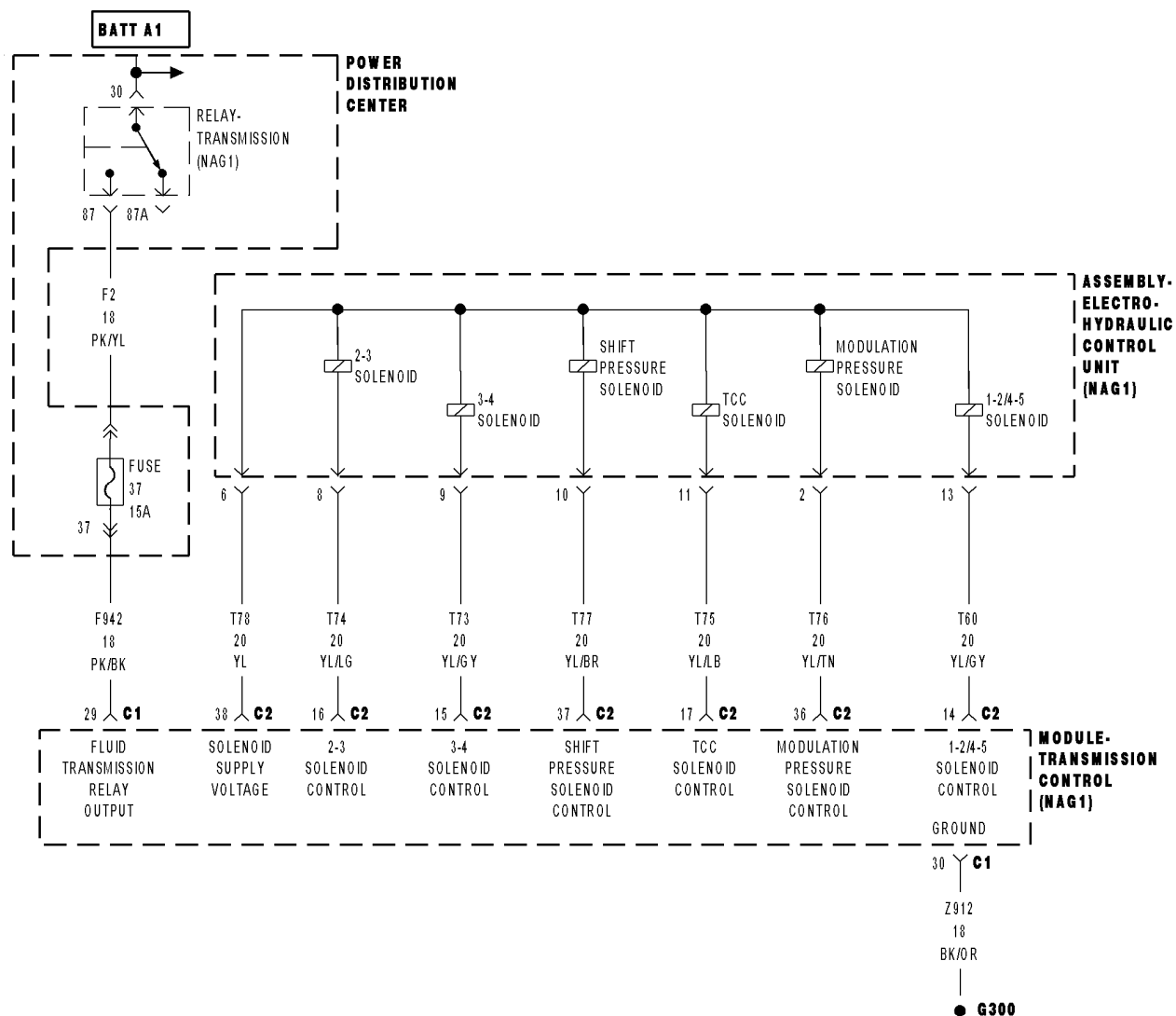
**Were there any problems found?**

**Yes**    >> Repair as necessary.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.

# P0753-1-2/4-5 SOLENOID CIRCUIT



P0753-1-2/4-5 SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The 1-2/4-5 Solenoid is activated when the Transmission Control Module (TCM) determines that the transmission must shift into or out of second or fifth gear. The solenoid is only activated during the actual shift of the transmission. When the solenoid is activated, hydraulic pressure is applied to the proper shift elements in the transmission to allow the desired shift. Once the shift is completed the solenoid is turned off.

- **When Monitored:**  
When both the 1-2/4-5 Solenoid and the Solenoid Supply voltage is active.
- **Set Condition:**When 1-2/4-5 Solenoid is turned on and the TCM detects any of the following in the 1-2/4-5 Solenoid or circuit: open, short to ground, short to voltage, or the solenoid driver in the TCM.

Possible Causes
(T76) 1-2/4-5 SOLENOID CONTROL CIRCUIT OPEN
(T76) 1-2/4-5 SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T76) 1-2/4-5 SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
1-2/4-5 SOLENOID
TRANSMISSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Turn the ignition off to the lock position.

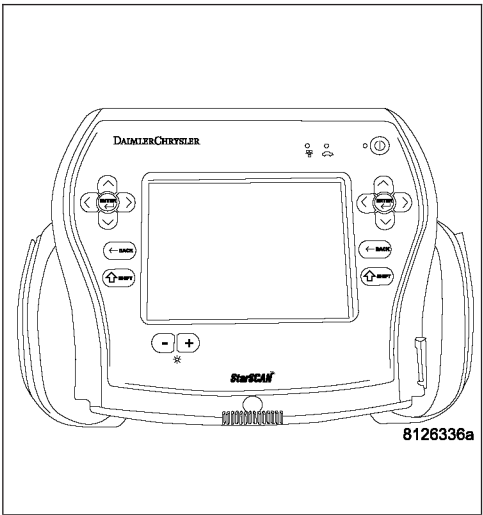
With the scan tool, erase Transmission DTC's.

Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

Did the DTC P0753 reset?

- Yes**    >> Go To 2
- No**     >> Go To 6



**P0753-1-2/4-5 SOLENOID CIRCUIT (CONTINUED)****2. CHECK THE (T76) 1-2/4-5 SOLENOID CONTROL CIRCUIT FOR AN OPEN**

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Disconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

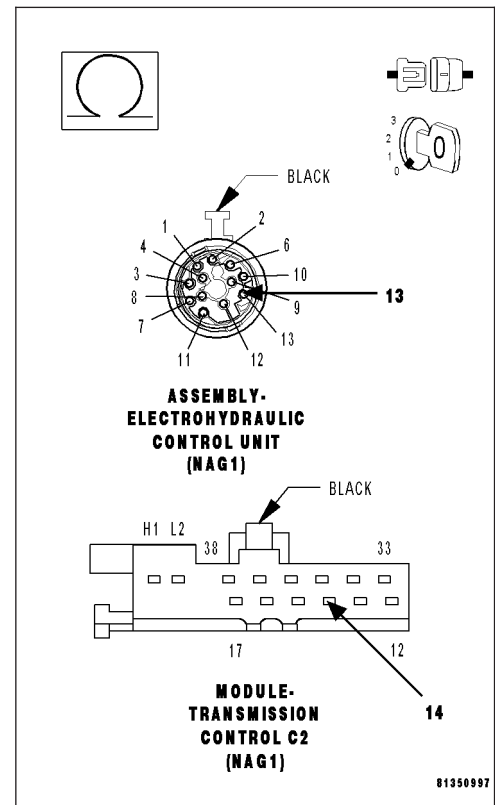
Measure the resistance of the (T76) 1-2/4-5 Solenoid Control circuit between the TCM C2 harness connector and the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (T76) 1-2/4-5 Solenoid Control circuit for an open.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**3. CHECK THE (T76) 1-2/4-5 SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND**

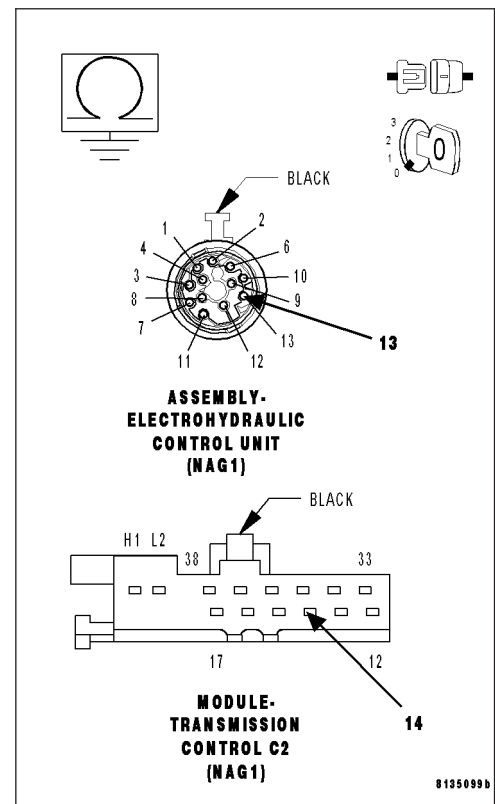
Measure the resistance between ground and the (T76) 1-2/4-5 Solenoid Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T76) 1-2/4-5 Solenoid Control circuit for a short to ground.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4



**P0753-1-2/4-5 SOLENOID CIRCUIT (CONTINUED)****4. CHECK THE (T76) 1-2/4-5 SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT**

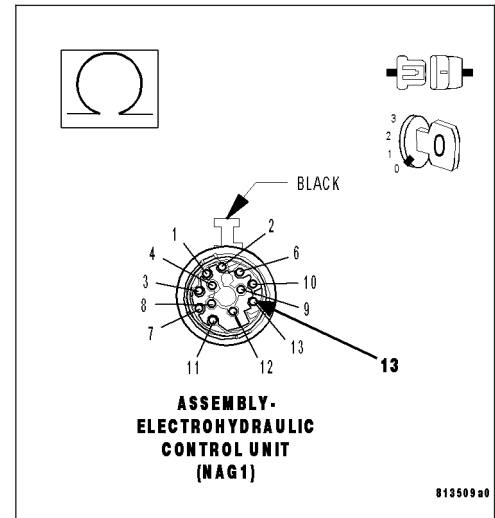
Measure the resistance between the (T76) 1-2/4-5 Solenoid Control circuit and every other circuit in the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T76) 1-2/4-5 Solenoid Control circuit and any other circuit(s) in the Transmission Electrohydraulic Control Unit Assembly harness connector?**

**Yes**    >> Repair the (T76) 1-2/4-5 Solenoid Control circuit for another circuit.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 5

**5. CHECK THE 1-2/4-5 SOLENOID**

Reconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

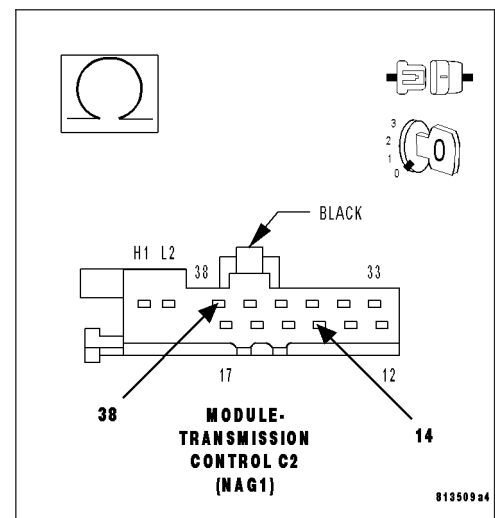
Measure the resistance of the 1-2/4-5 Solenoid between the (T76) 1-2/4-5 Solenoid Control circuit and the (T78) Solenoid Voltage Supply circuit in the TCM C2 harness connector.

**Is the resistance between 2.5 and 6.5 ohms?**

**Yes**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Replace the 1-2/4-5 Solenoid per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION- AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

**6. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

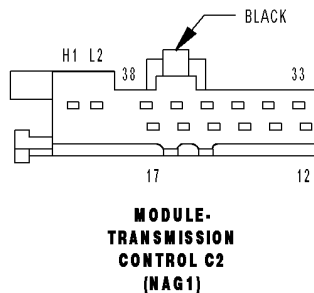
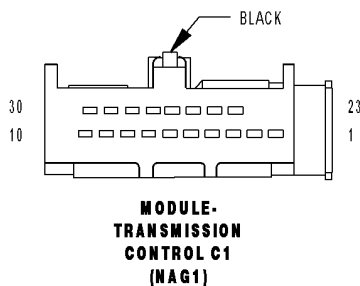
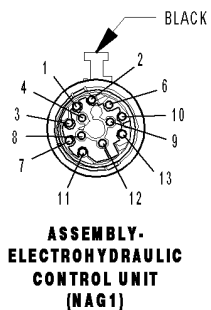
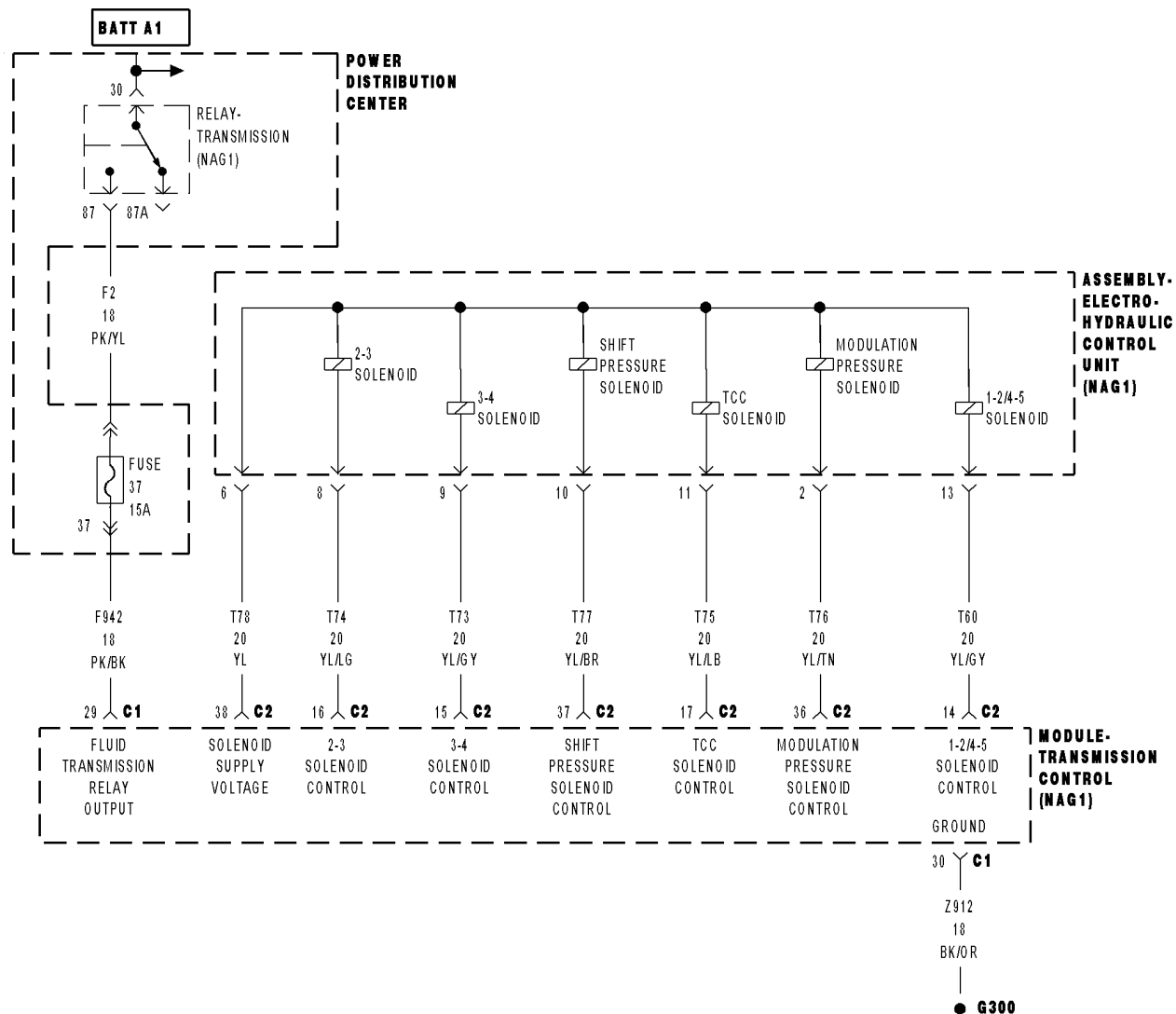
**Were there any problems found?**

**Yes**    >> Repair as necessary.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.

# P0758-2-3 SOLENOID





P0758-2-3 SOLENOID (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The 2-3 Solenoid is activated when the Transmission Control Module (TCM) determines that the transmission must shift into or out of 3rd gear. The solenoid is only activated during the shifting of the transmission. When the solenoid is activated hydraulic pressure is applied to the proper shift elements in the transmission to allow the desired shift. Once the shift is completed the solenoid is turned off.

- **When Monitored:**  
When both the 2-3 Solenoid and the Solenoid Supply voltage is active.
- **Set Condition:**  
When 2-3 Solenoid is turned on and the TCM detects any of the following in the 2-3 Solenoid or circuit: open, short to ground, short to voltage, or the solenoid driver in the TCM.

Possible Causes
(T74) 2-3 SOLENOID CONTROL CIRCUIT OPEN
(T74) 2-3 SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T74) 2-3 SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
2-3 SOLENOID
TRANSMISSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Turn the ignition off to the lock position.

With the scan tool, erase Transmission DTC's.

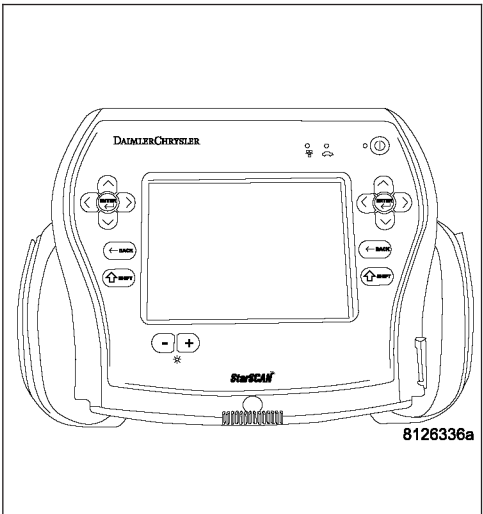
Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

Did the DTC P0757 reset?

Yes    >> Go To 2

No    >> Go To 6



**P0758-2-3 SOLENOID (CONTINUED)****2. CHECK THE (T74) 2-3 SOLENOID CONTROL CIRCUIT FOR AN OPEN**

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

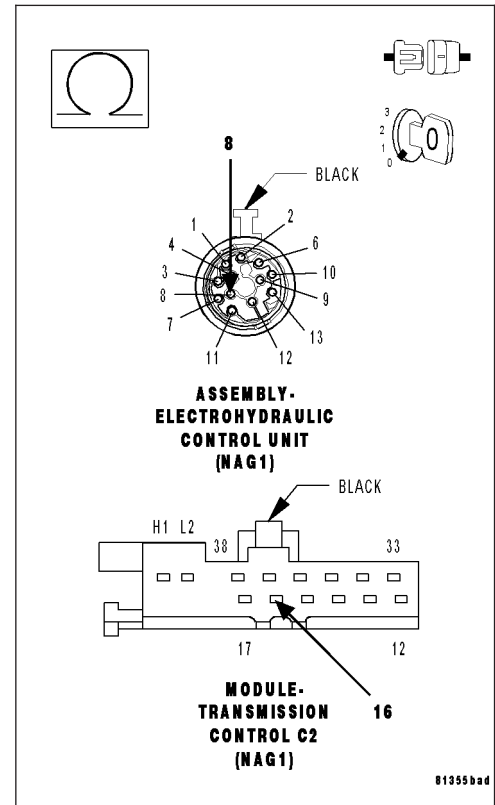
Disconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

Measure the resistance of the (T74) 2-3 Solenoid Control circuit between the TCM C2 harness connector and the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (T74) 2-3 Solenoid Control circuit for an open.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

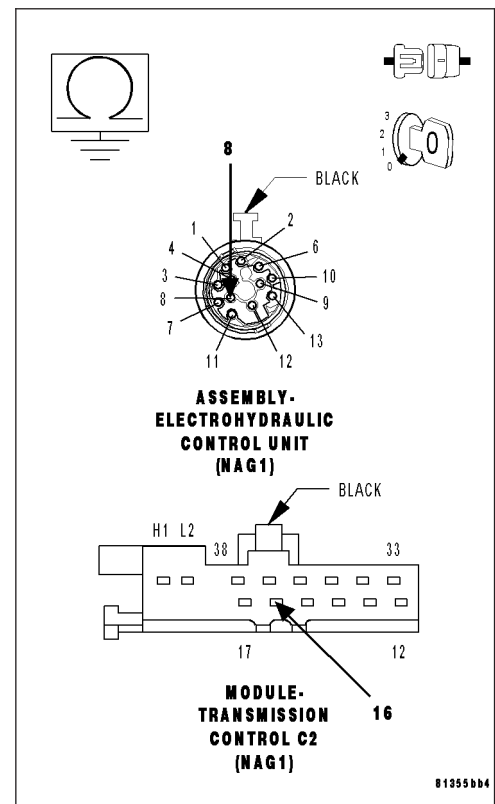
**3. CHECK THE (T74) 2-3 SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (T74) 2-3 Solenoid Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T74) 2-3 Solenoid Control circuit for a short to ground.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4



**P0758-2-3 SOLENOID (CONTINUED)****4. CHECK THE (T74) 2-3 SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT**

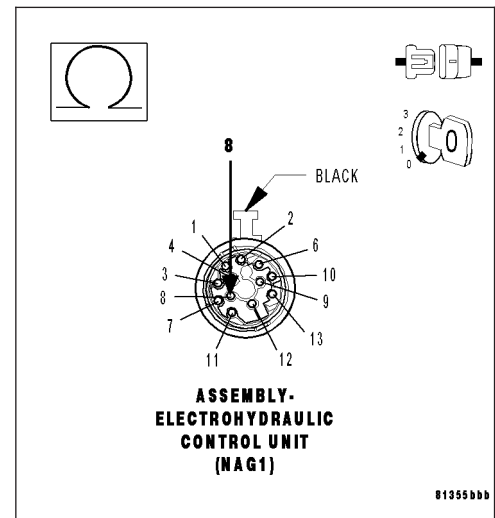
Measure the resistance between the (T74) 2-3 Solenoid Control circuit and every other circuit in the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T74) 2-3 Solenoid Control circuit and any other circuit(s) in the Transmission Electrohydraulic Control Unit Assembly harness connector?**

**Yes**    >> Repair the (T74) 2-3 Solenoid Control circuit for another circuit.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 5

**5. CHECK THE 2-3 SOLENOID**

Reconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

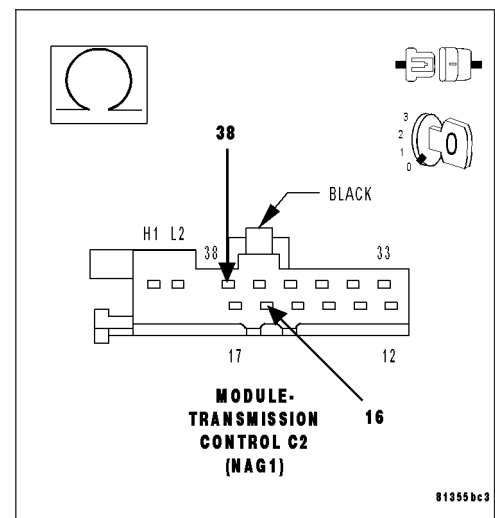
Measure the resistance of the 2-3 Solenoid between the (T74) 2-3 Solenoid Control circuit and the (T78) Solenoid Voltage Supply circuit in the TCM C2 harness connector.

**Is the resistance between 2.5 and 6.5 ohms?**

**Yes**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Replace the 2-3 Solenoid per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

**6. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

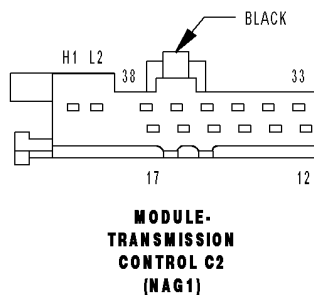
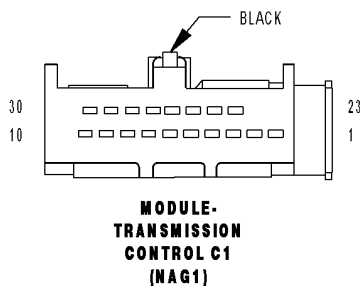
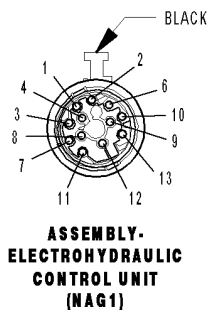
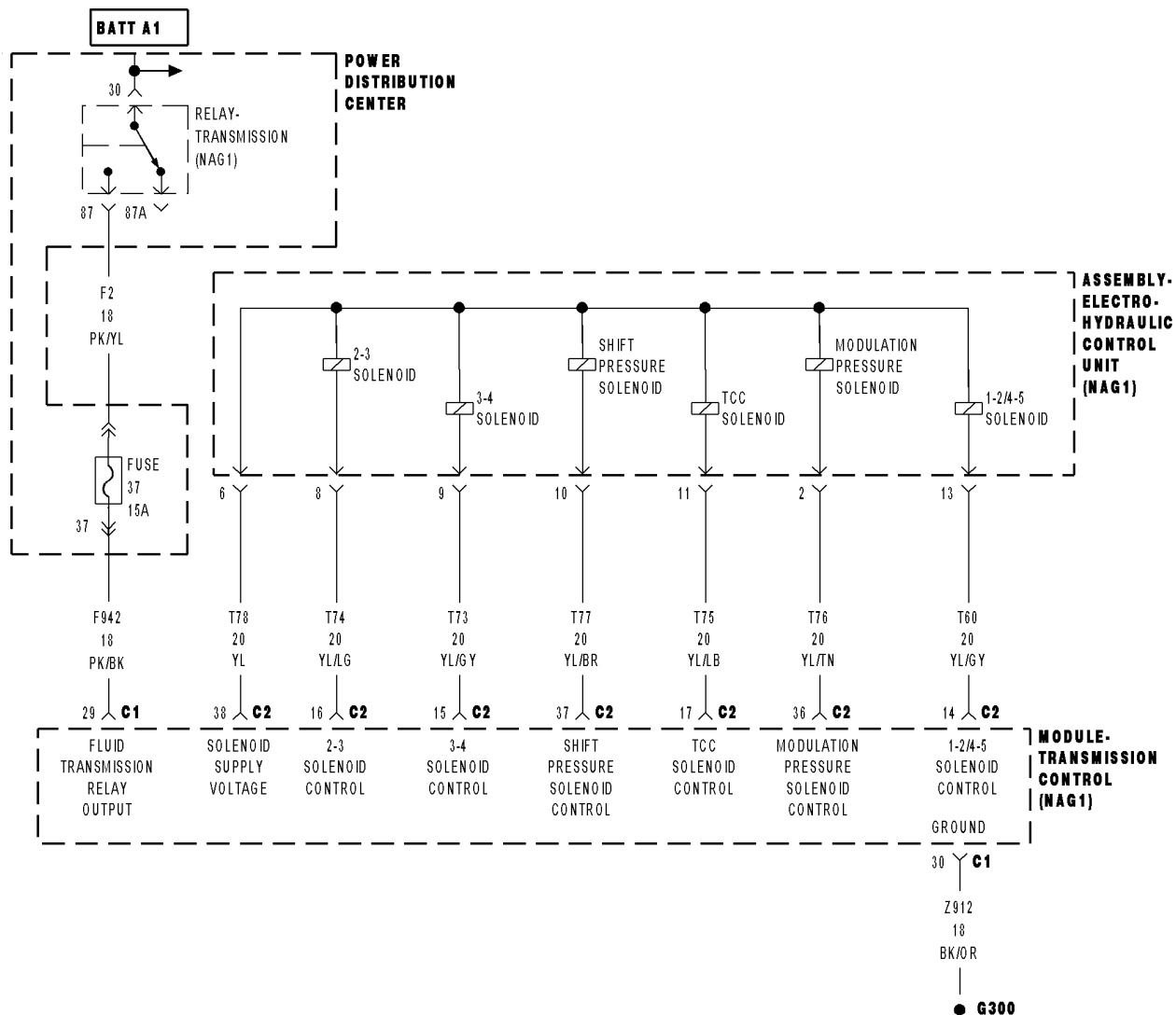
**Were there any problems found?**

**Yes**    >> Repair as necessary.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.

# P0758-2-3 SOLENOID CIRCUIT



P0758-2-3 SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The 2-3 Solenoid is activated when the Transmission Control Module (TCM) determines that the transmission must shift into or out of 3rd gear. The solenoid is only activated during the shifting of the transmission. When the solenoid is activated, hydraulic pressure is applied to the proper shift elements in the transmission to allow the desired shift. Once the shift is completed the solenoid is turned off.

- **When Monitored:**  
When both the 2-3 Solenoid and the Solenoid Supply voltage is active.
- **Set Condition:**  
When 2-3 Solenoid is turned on and the TCM detects any of the following in the 2-3 Solenoid or circuit: open, short to ground, short to voltage, or the solenoid driver in the TCM.

Possible Causes
(T74) 2-3 SOLENOID CONTROL CIRCUIT OPEN
(T74) 2-3 SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T74) 2-3 SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
2-3 SOLENOID
TRANSMISSSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Turn the ignition off to the lock position.

With the scan tool, erase Transmission DTC's.

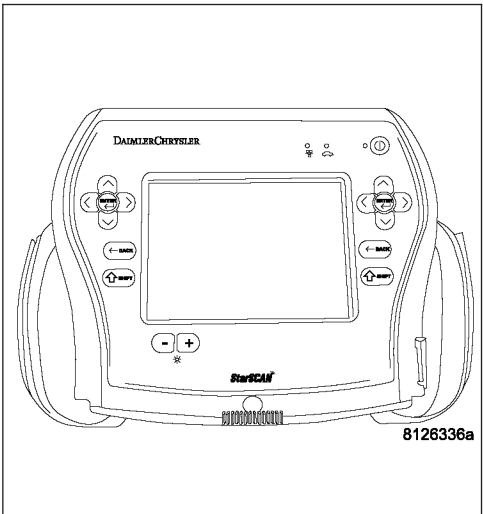
Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

Did the DTC P0758 reset?

Yes >> Go To 2

No >> Go To 6



**P0758-2-3 SOLENOID CIRCUIT (CONTINUED)****2. CHECK THE (T74) 2-3 SOLENOID CONTROL CIRCUIT FOR AN OPEN**

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

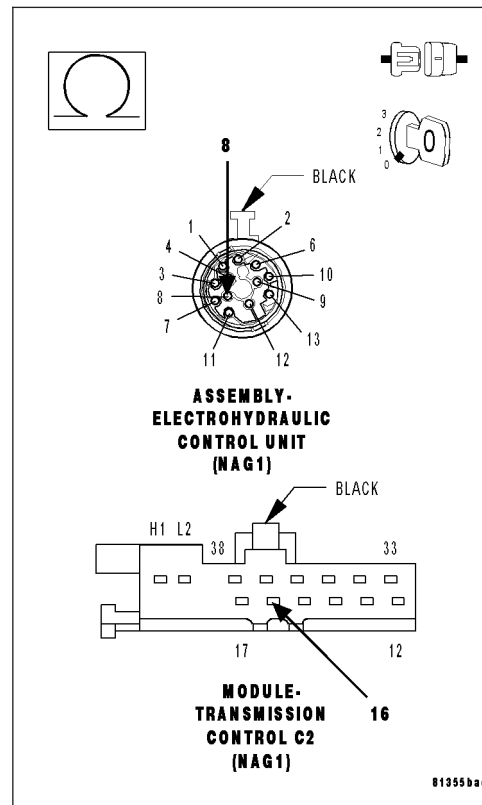
Disconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

Measure the resistance of the (T74) 2-3 Solenoid Control circuit between the TCM C2 harness connector and the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (T74) 2-3 Solenoid Control circuit for an open.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

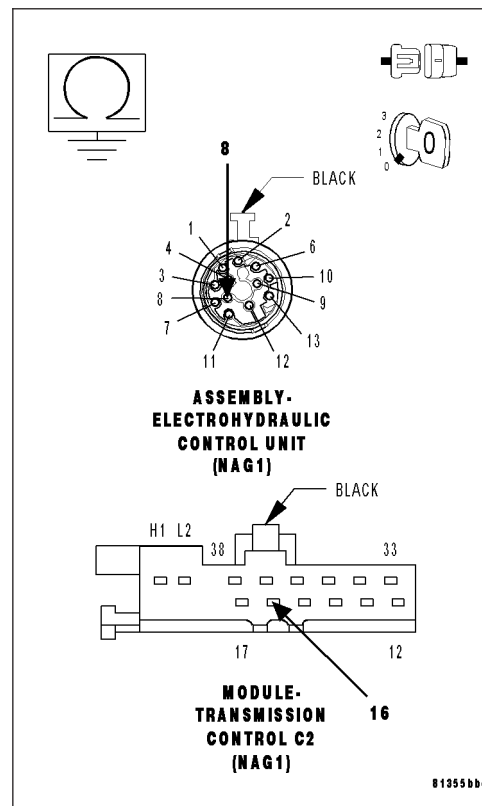
**3. CHECK THE (T74) 2-3 SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (T74) 2-3 Solenoid Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T74) 2-3 Solenoid Control circuit for a short to ground.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4



**P0758-2-3 SOLENOID CIRCUIT (CONTINUED)****4. CHECK THE (T74) 2-3 SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT**

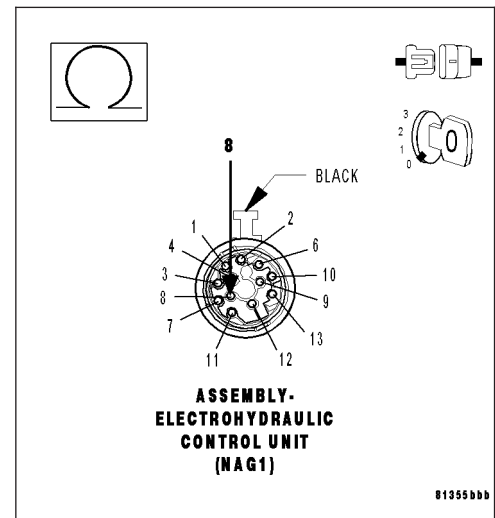
Measure the resistance between the (T74) 2-3 Solenoid Control circuit and every other circuit in the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T74) 2-3 Solenoid Control circuit and any other circuit(s) in the Transmission Electrohydraulic Control Unit Assembly harness connector?**

**Yes**    >> Repair the (T74) 2-3 Solenoid Control circuit for another circuit.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 5

**5. CHECK THE 2-3 SOLENOID**

Reconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

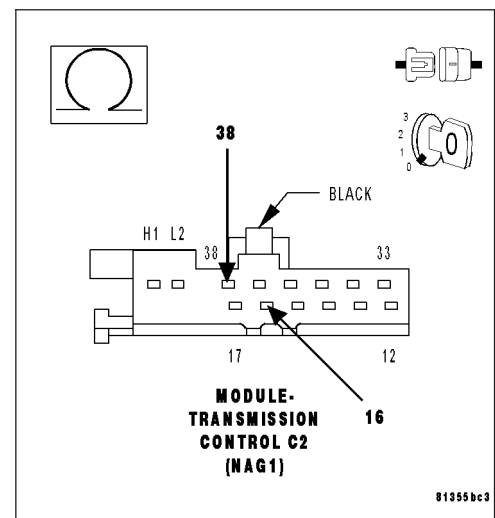
Measure the resistance of the 2-3 Solenoid between the (T74) 2-3 Solenoid Control circuit and the (T78) Solenoid Voltage Supply circuit in the TCM C2 harness connector.

**Is the resistance between 2.5 and 6.5 ohms?**

**Yes**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Replace the 2-3 Solenoid per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

**6. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

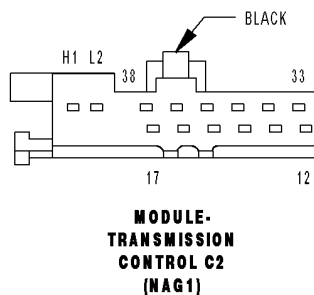
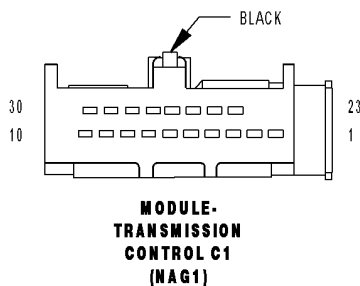
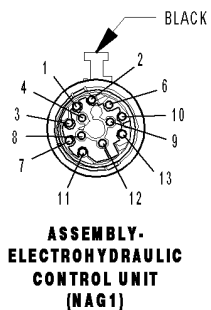
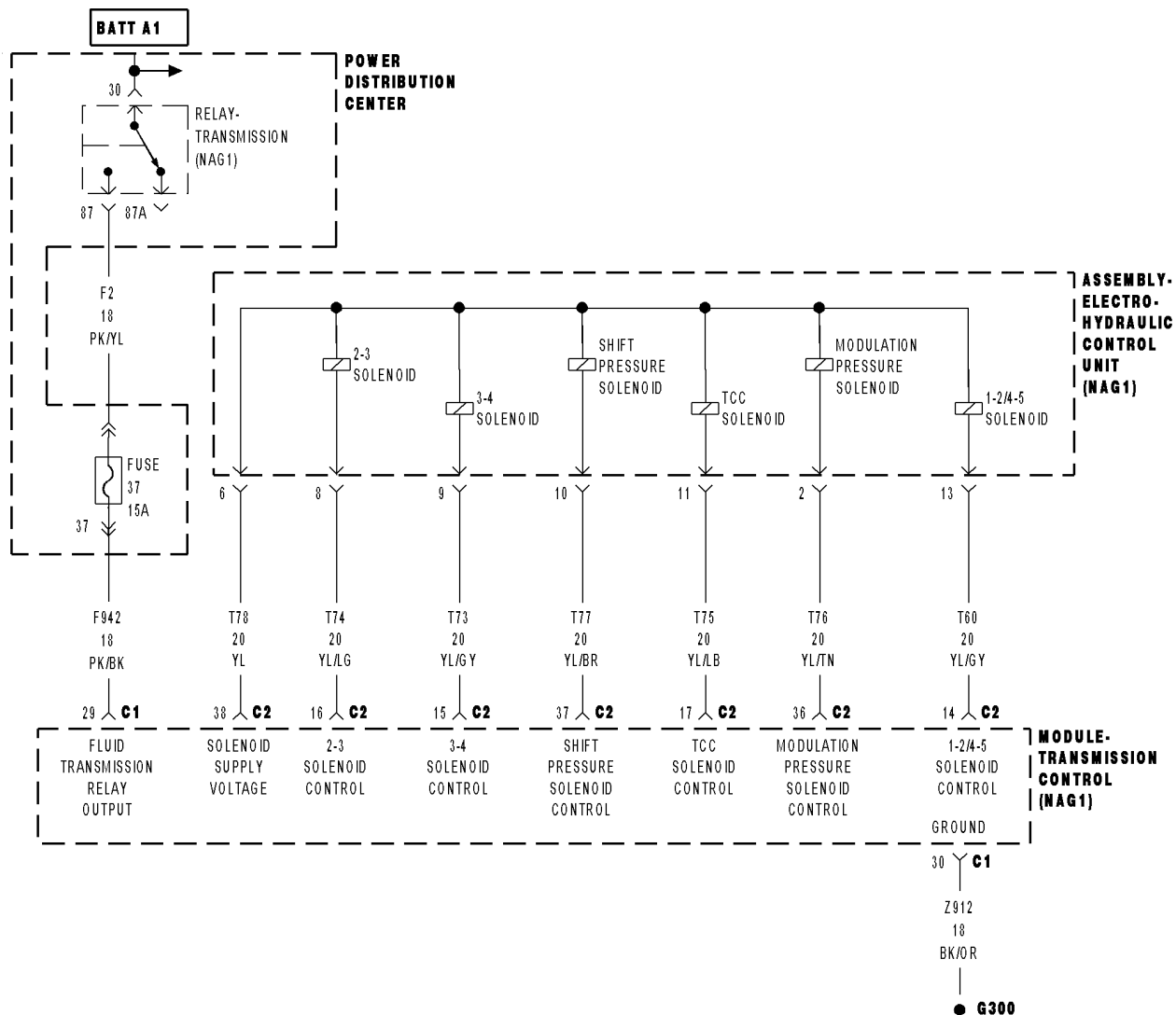
**Were there any problems found?**

**Yes**    >> Repair as necessary.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.

# P0762-3-4 SOLENOID





P0762-3-4 SOLENOID (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The 3-4 Solenoid is activated when the Transmission Control Module (TCM) determines that the transmission must shift into or out of 4th gear. The solenoid is only activated during the shifting of the transmission. When the solenoid is activated, hydraulic pressure is applied to the proper shift elements in the transmission to allow the desired shift. Once the shift is completed the solenoid is turned off.

- **When Monitored:**  
When both the 3-4 Solenoid and the Solenoid Supply voltage is active.
- **Set Condition:**  
When 3-4 Solenoid is turned on and the TCM detects any of the following in the 3-4 Solenoid or circuit: open, short to ground, short to voltage, or the solenoid driver in the TCM.

Possible Causes
(T73) 3-4 SOLENOID CONTROL CIRCUIT OPEN
(T73) 3-4 SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T73) 3-4 SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
3-4 SOLENOID
TRANSMISSSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Turn the ignition off to the lock position.

With the scan tool, erase Transmission DTC's.

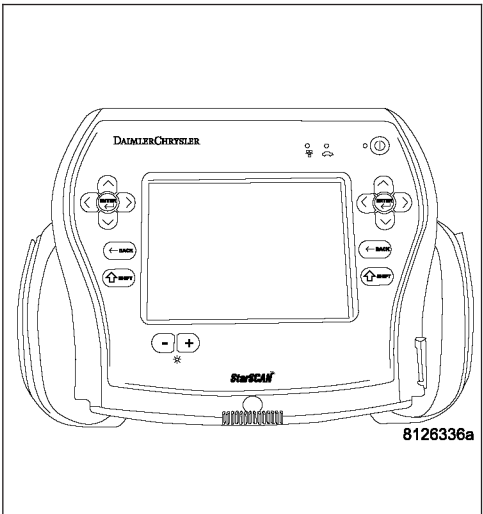
Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

Did the DTC P0762 reset?

Yes >> Go To 2

No >> Go To 6



**P0762-3-4 SOLENOID (CONTINUED)****2. CHECK THE (T73) 3-4 SOLENOID CONTROL CIRCUIT FOR AN OPEN**

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

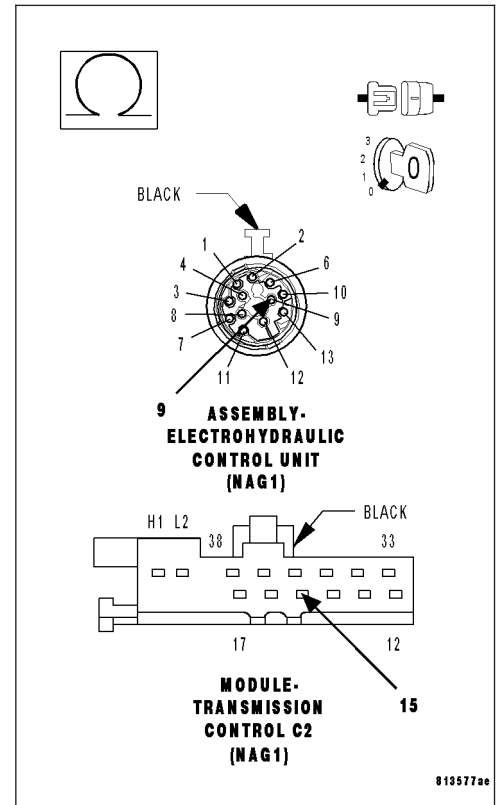
Disconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

Measure the resistance of the (T73) 3-4 Solenoid Control circuit between the TCM C2 harness connector and the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (T73) 3-4 Solenoid Control circuit for an open.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

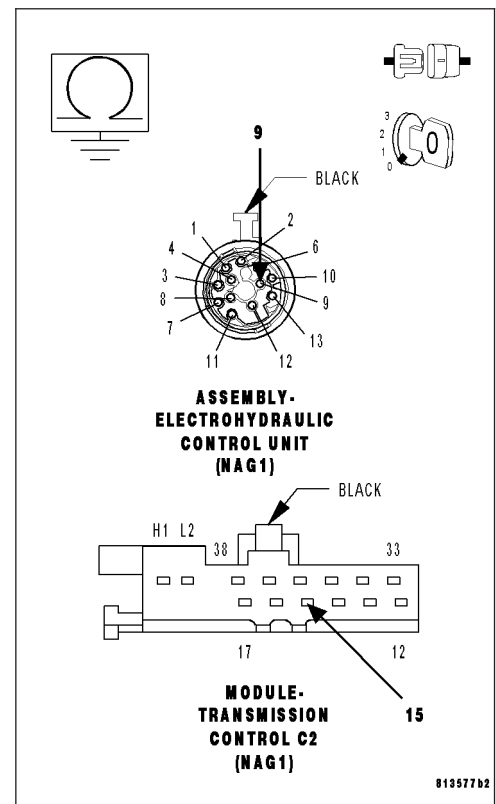
**3. CHECK THE (T73) 3-4 SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (T73) 3-4 Solenoid Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T73) 3-4 Solenoid Control circuit for a short to ground.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4



**P0762-3-4 SOLENOID (CONTINUED)****4. CHECK THE (T73) 3-4 SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT**

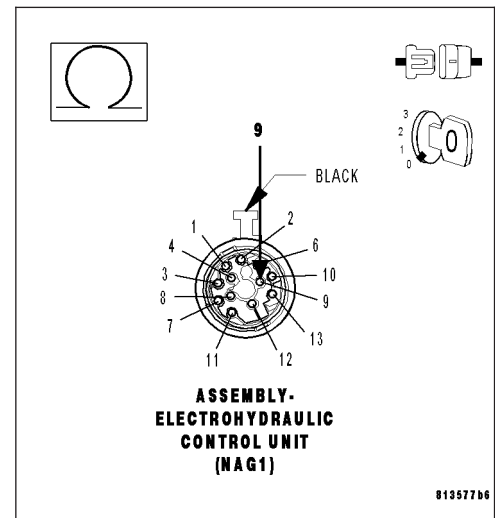
Measure the resistance between the (T73) 3-4 Solenoid Control circuit and every other circuit in the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T73) 3-4 Solenoid Control circuit and any other circuit(s) in the Transmission Electrohydraulic Control Unit Assembly harness connector?**

**Yes** >> Repair the (T73) 3-4 Solenoid Control circuit for another circuit.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE 3-4 SOLENOID**

Reconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

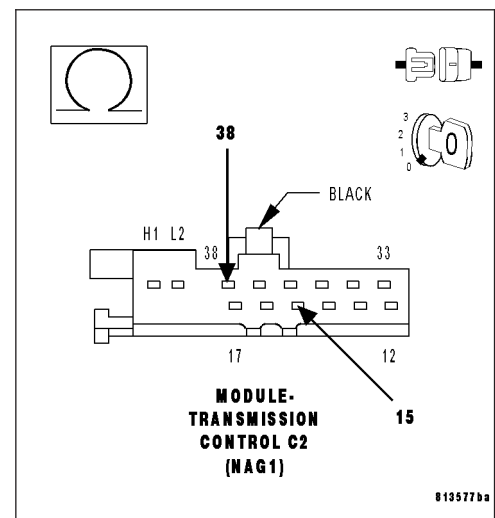
Measure the resistance of the 3-4 Solenoid between the (T73) 3-4 Solenoid Control circuit and the (T78) Solenoid Voltage Supply circuit in the TCM C2 harness connector.

**Is the resistance between 2.5 and 6.5 ohms?**

**Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Replace the 3-4 Solenoid per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

**6. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

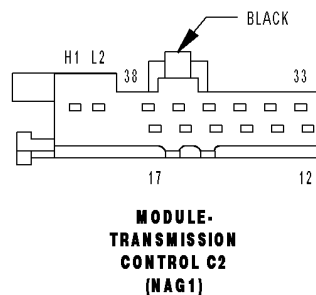
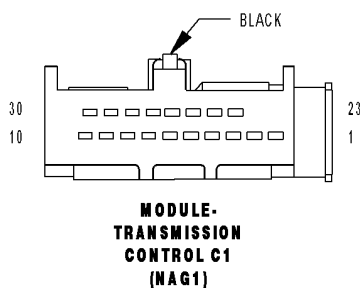
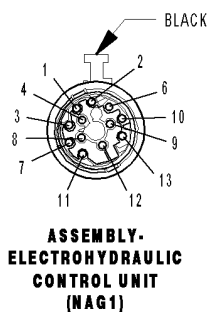
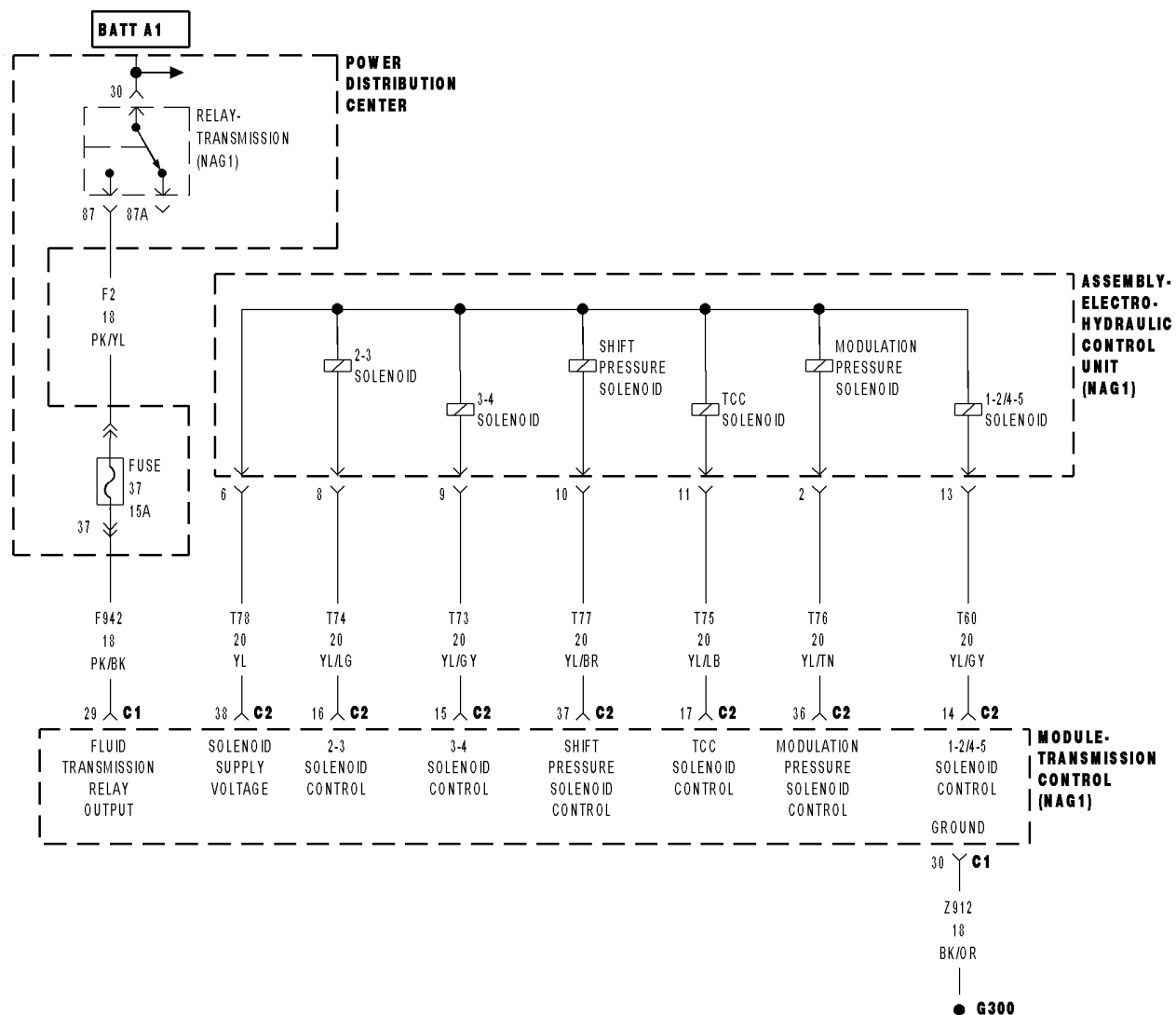
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

**P0763-3-4 SOLENOID CIRCUIT**

**P0763-3-4 SOLENOID CIRCUIT (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The 3-4 Solenoid is activated when the Transmission Control Module (TCM) determines that the transmission must shift into or out of 4th gear. The solenoid is only activated during the shifting of the transmission. When the solenoid is activated, hydraulic pressure is applied to the proper shift elements in the transmission to allow the desired shift. Once the shift is completed the solenoid is turned off.

- **When Monitored:**  
When both the 3-4 Solenoid and the Solenoid Supply voltage is active.
- **Set Condition:**  
When 3-4 Solenoid is turned on and the TCM detects any of the following in the 3-4 Solenoid or circuit: open, short to ground, short to voltage, or the solenoid driver in the TCM.

Possible Causes
(T73) 3-4 SOLENOID CONTROL CIRCUIT OPEN
(T73) 3-4 SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T73) 3-4 SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
3-4 SOLENOID
TRANSMISSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

**Diagnostic Test**

**1. CHECK IF THE DTC IS CURRENT**

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Turn the ignition off to the lock position.

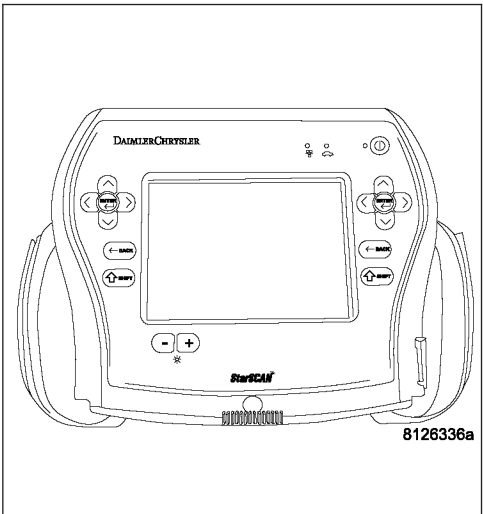
With the scan tool, erase Transmission DTC's.

Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

**Did the DTC P0763 reset?**

- Yes**    >> Go To 2
- No**     >> Go To 6



**P0763-3-4 SOLENOID CIRCUIT (CONTINUED)****2. CHECK THE (T73) 3-4 SOLENOID CONTROL CIRCUIT FOR AN OPEN**

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

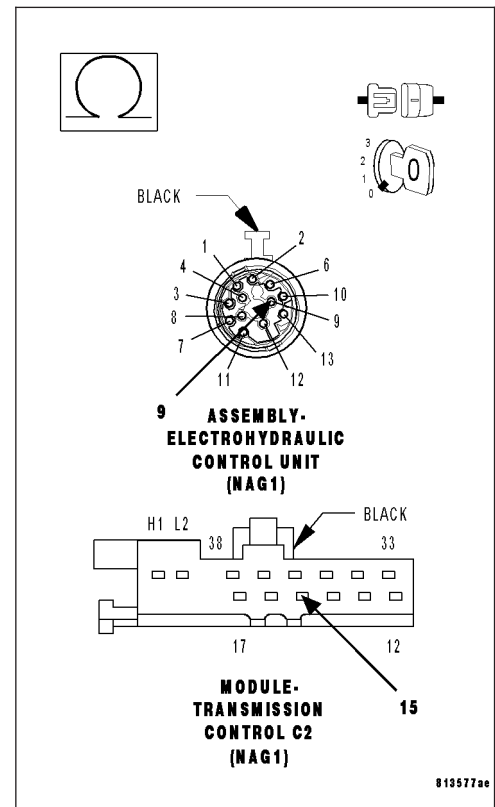
Disconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

Measure the resistance of the (T73) 3-4 Solenoid Control circuit between the TCM C2 harness connector and the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (T73) 3-4 Solenoid Control circuit for an open.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

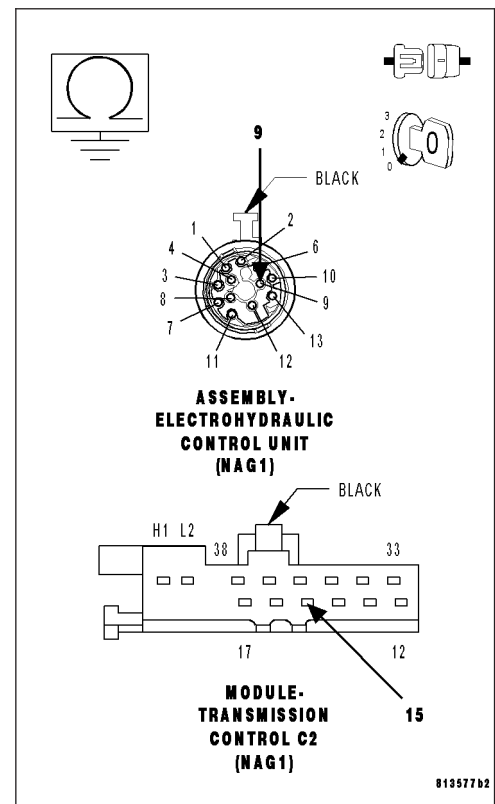
**3. CHECK THE (T73) 3-4 SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (T73) 3-4 Solenoid Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T73) 3-4 Solenoid Control circuit for a short to ground.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4



**P0763-3-4 SOLENOID CIRCUIT (CONTINUED)****4. CHECK THE (T73) 3-4 SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT**

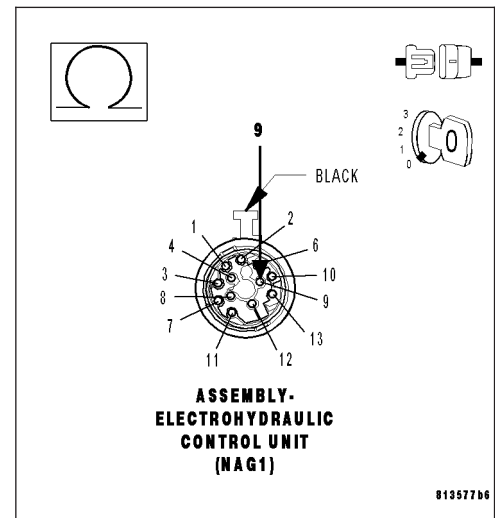
Measure the resistance between the (T73) 3-4 Solenoid Control circuit and every other circuit in the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T73) 3-4 Solenoid Control circuit and any other circuit(s) in the Transmission Electrohydraulic Control Unit Assembly harness connector?**

**Yes** >> Repair the (T73) 3-4 Solenoid Control circuit for another circuit.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. CHECK THE 3-4 SOLENOID**

Reconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

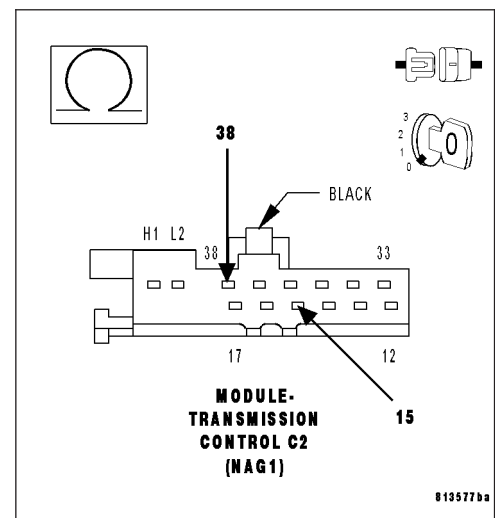
Measure the resistance of the 3-4 Solenoid between the (T73) 3-4 Solenoid Control circuit and the (T78) Solenoid Voltage Supply circuit in the TCM C2 harness connector.

**Is the resistance between 2.5 and 6.5 ohms?**

**Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Replace the 3-4 Solenoid per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

**6. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

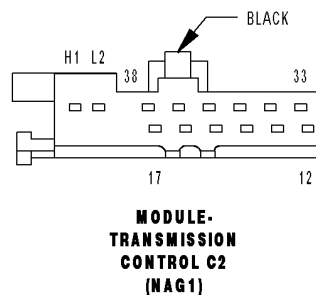
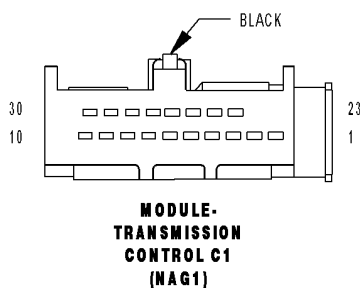
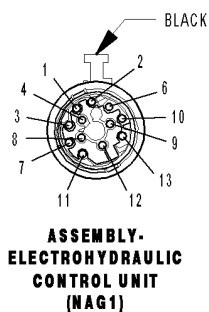
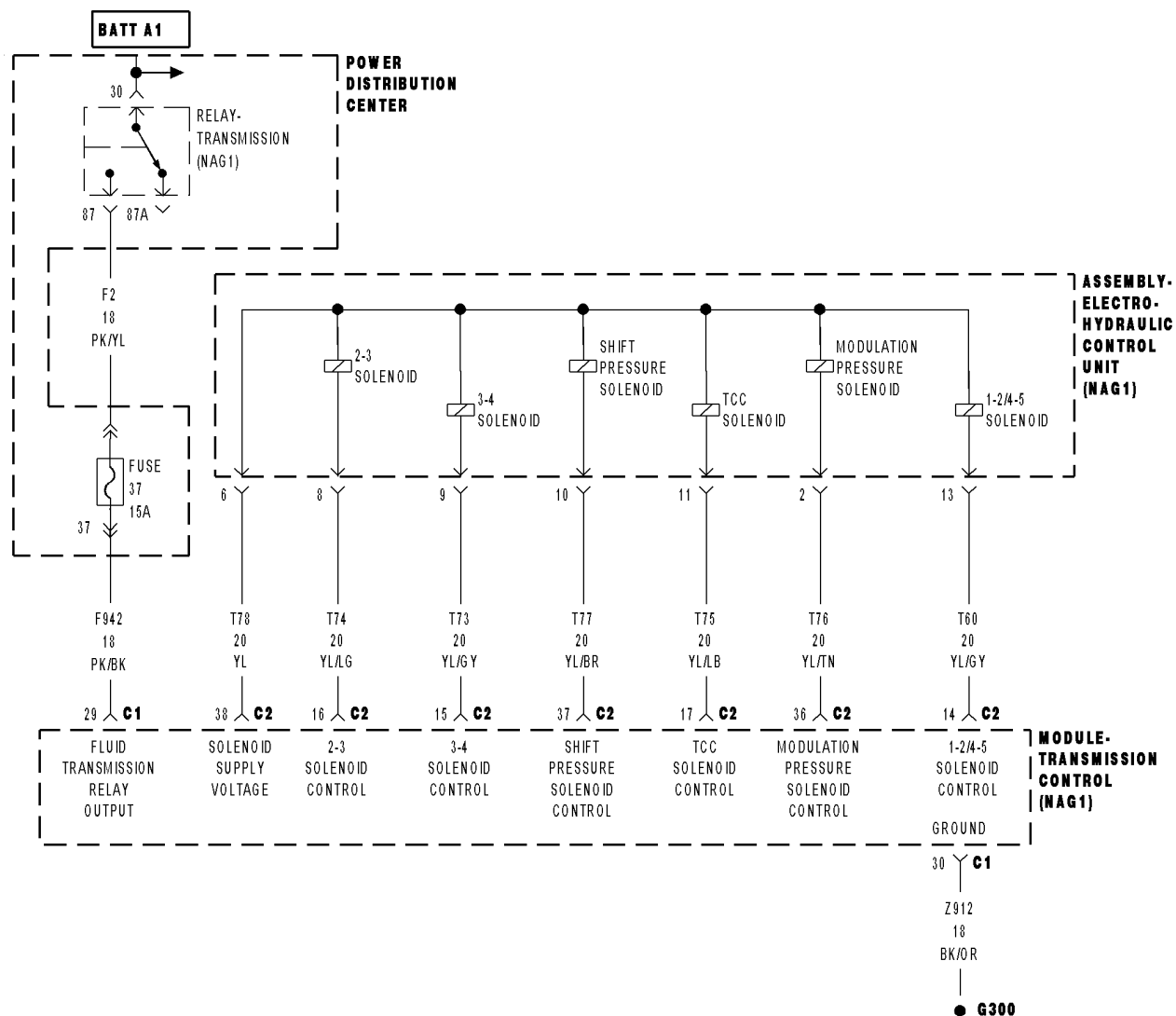
**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

# P0778-SHIFT PRESSURE SOLENOID CIRCUIT





**P0778-SHIFT PRESSURE SOLENOID CIRCUIT (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Shift Pressure Solenoid is activated when the Transmission Control Module (TCM) determines that a transmission gear shift is required. The Shift Pressure Solenoid is pulse width modulated (PWM) controlled to allow the proper amount of hydraulic pressure to the shift elements. The Shift Pressure Solenoid is only activated during the shift of the transmission. When the Shift Pressure Solenoid is activated, hydraulic pressure is applied to the proper shift elements through one of the shift solenoids in the transmission to allow the desired shift. Once the shift is completed the solenoid is turned off.

- **When Monitored:**

When the Shift Pressure Solenoid is: off, or active with 25-75% duty cycle, and the Solenoid Supply voltage is active.

- **Set Condition:**

When Shift Pressure Solenoid is turned on and the TCM detects any of the following in the Shift Pressure Solenoid or circuit: open, short to ground, short to voltage, or the solenoid driver in the TCM.

Possible Causes
(T77) SHIFT PRESSURE SOLENOID CONTROL CIRCUIT OPEN
(T77) SHIFT PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T77) SHIFT PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
SHIFT PRESSURE SOLENOID
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK IF THE DTC IS CURRENT**

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Turn the ignition off to the lock position.

With the scan tool, erase Transmission DTC's.

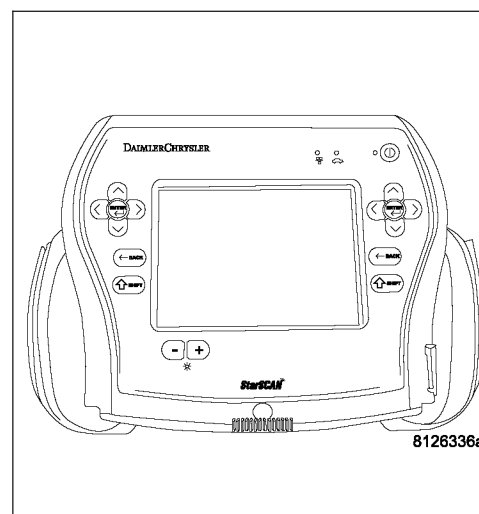
Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

**Did the DTC P0778 reset?**

**Yes** >> Go To 2

**No** >> Go To 6



**P0778-SHIFT PRESSURE SOLENOID CIRCUIT (CONTINUED)****2. CHECK THE (T77) SHIFT PRESSURE SOLENOID CONTROL CIRCUIT FOR AN OPEN**

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

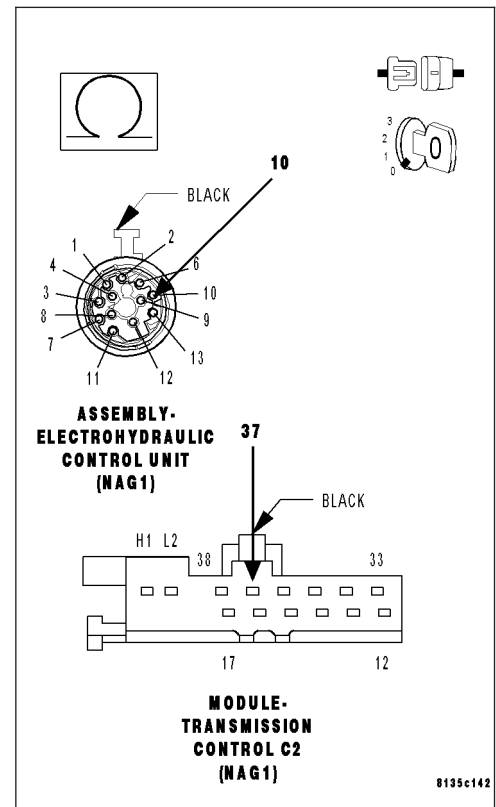
Disconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

Measure the resistance of the (T77) Shift Pressure Solenoid Control circuit between the TCM C2 harness connector and the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Repair the (T77) Shift Pressure Solenoid Control circuit for an open.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

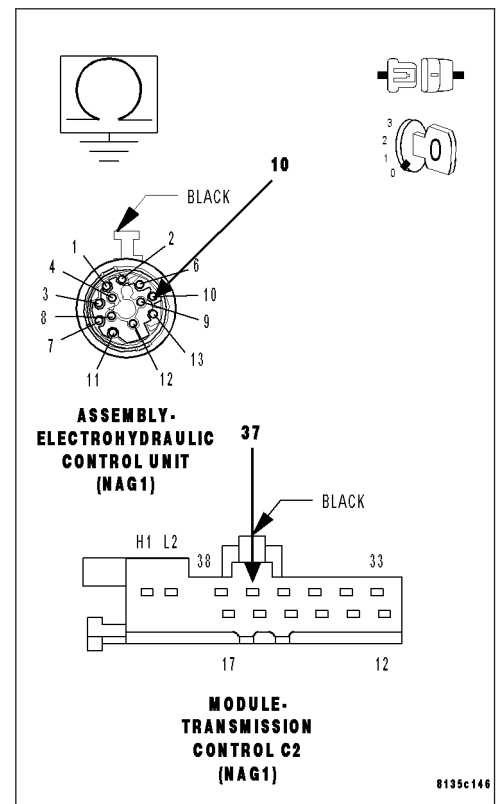
**3. CHECK THE (T77) SHIFT PRESSURE SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND**

Measure the resistance between ground and the (T77) Shift Pressure Solenoid Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T77) Shift Pressure Solenoid Control circuit for a short to ground.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4

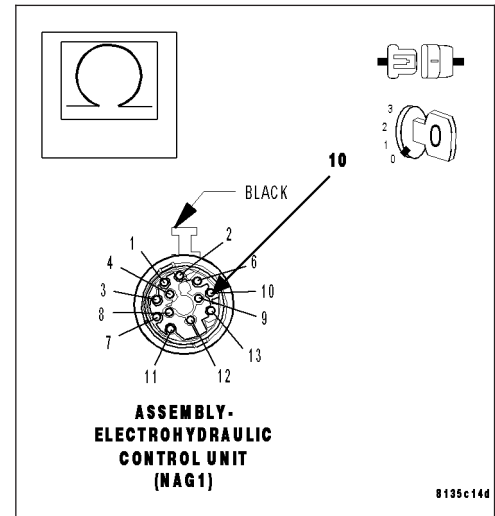


**P0778-SHIFT PRESSURE SOLENOID CIRCUIT (CONTINUED)****4. CHECK THE (T77) SHIFT PRESSURE SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT**

Measure the resistance between the (T77) Shift Pressure Solenoid Control circuit and every other circuit in the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T77) Shift Pressure Solenoid Control circuit and any other circuit(s) in the Transmission Electrohydraulic Control Unit Assembly harness connector?**

- Yes** >> Repair the (T77) Shift Pressure Solenoid Control circuit for another circuit.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Go To 5

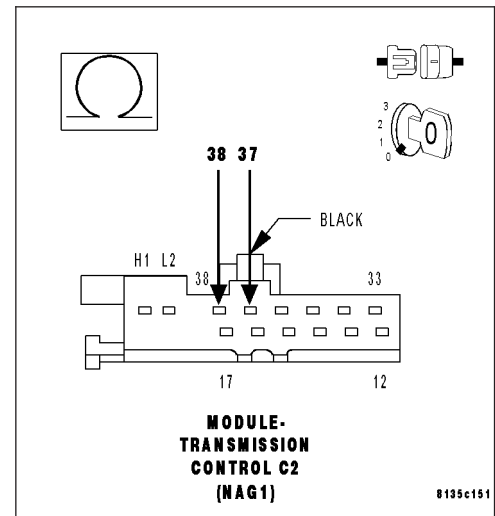
**5. CHECK THE SHIFT PRESSURE SOLENOID**

Reconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.

Measure the resistance of the Shift Pressure Solenoid between the (T77) Shift Pressure Solenoid Control circuit and the (T78) Solenoid Voltage Supply circuit in the TCM C2 harness connector.

**Is the resistance between 2.5 and 6.5 ohms?**

- Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Replace the Shift Pressure Solenoid per the Service Information. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

**6. INTERMITTENT WIRING AND CONNECTORS**

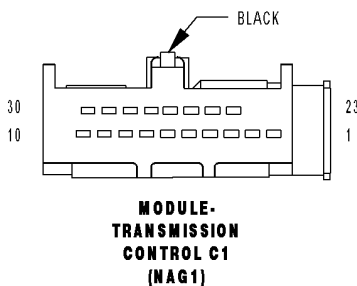
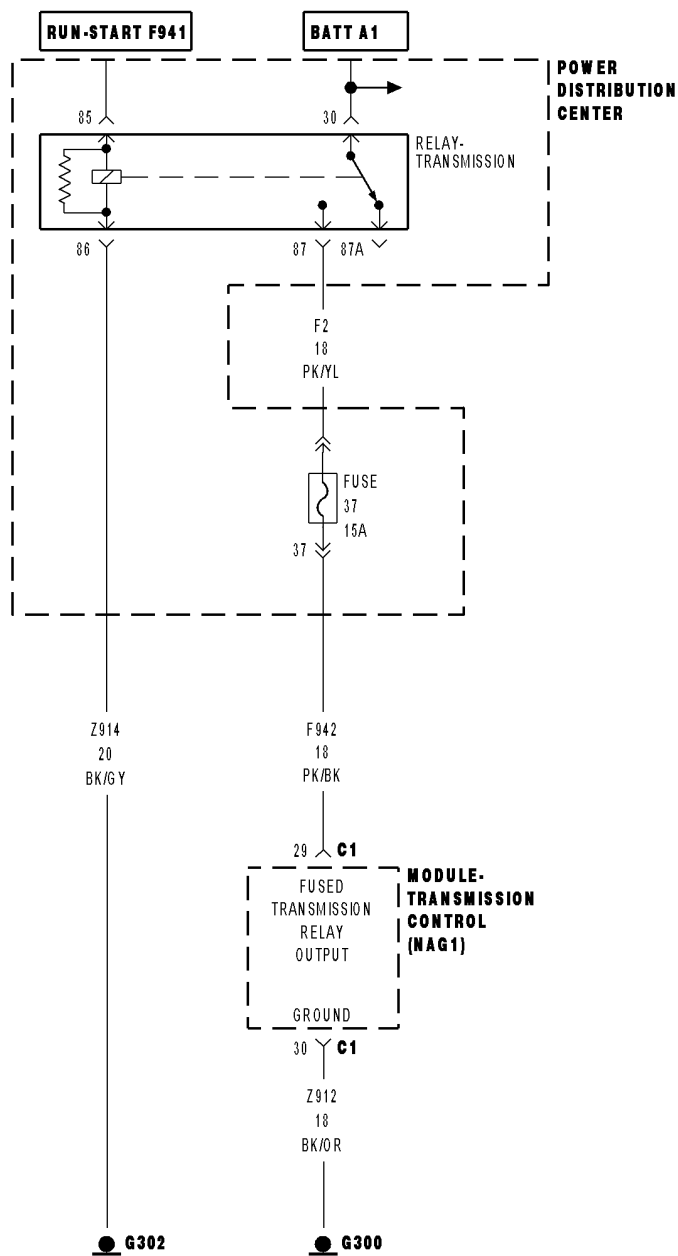
The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wiring and connectors while checking for any possible open or shorted circuits. Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Test Complete.

## P1629-TCM INTERNAL - SOLENOID SUPPLY/ WATCHDOG



**P1629-TCM INTERNAL - SOLENOID SUPPLY/ WATCHDOG (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) performs various internal tests to verify proper controller operation. During the power up of the controller, the TCM tests the ability of the TCM to shut down the Solenoid Supply Voltage circuit. The controller monitors the A/D feedback on the Solenoid Supply driver output to ensure that battery voltage is no longer present. Note: A short to voltage on the Solenoid Supply Voltage circuit or any one of the solenoids may set this DTC.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
If the TCM detects voltage on the Solenoid Supply Voltage circuit when the TCM request the circuit to be off.

Possible Causes
(T78) SOLENOID SUPPLY VOLTAGE CIRCUIT SHORT TO VOLTAGE TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

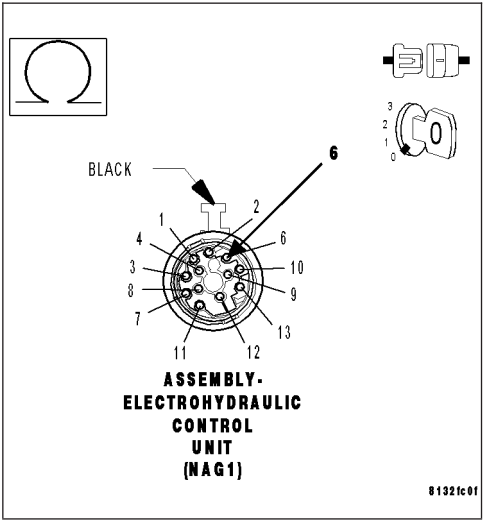
**Diagnostic Test**

**1. CHECK THE (T78) SOLENOID SUPPLY VOLTAGE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT**

Turn the ignition off to the lock position.  
Disconnect the TCM C1 and C2 harness connectors.  
Disconnect the Transmission Electrohydraulic Control Unit Assembly harness connector.  
Measure the resistance between the (T78) Solenoid Supply Voltage circuit and every other circuit in the Transmission Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T78) Solenoid Supply Voltage circuit and any other circuit(s) in the Transmission Electrohydraulic Control Unit Assembly harness connector?**

- Yes**    >> Repair the (T78) Solenoid Supply Voltage circuit for short to another circuit.  
            Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**      >> Go To 2

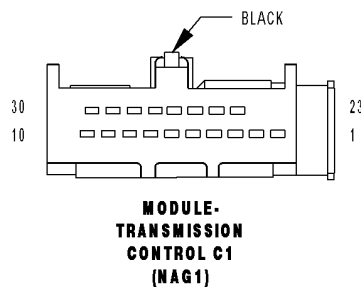


**P1629-TCM INTERNAL - SOLENOID SUPPLY/ WATCHDOG (CONTINUED)****2. TRANSMISSION CONTROL MODULE****View repair****Repair**

Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---



**P1631-TCM INTERNAL- PROCESSOR CLOCK PERFORMANCE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) performs various internal tests to verify proper controller operation. This DTC indicates that there is an issue with the TCM's internal clock. If the TCM detects an error with the controllers internal clock, the controller will enter Limp-in mode and illuminate the MIL.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
If the TCM detects an error with the controllers internal clock.

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test**

**1. TRANSMISSION CONTROL MODULE**

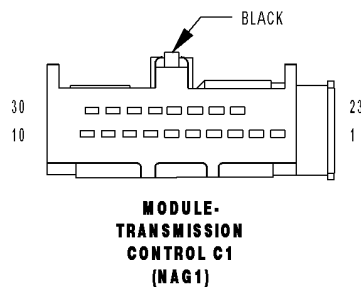
**View repair**

**Repair**

Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---





**P1632-TCM INTERNAL - TEST INTERNAL WATCHDOG PERFORMANCE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) performs various internal tests to verify proper controller operation. This DTC indicates that there is an issue with the TCM's internal watchdog failed. If the TCM detects an error with the controllers internal watchdog, the controller will enter Limp-in mode and illuminate the MIL.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
If the TCM detects an error with the controllers internal watchdog.

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. TRANSMISSION CONTROL MODULE**

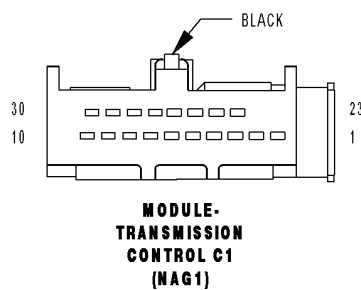
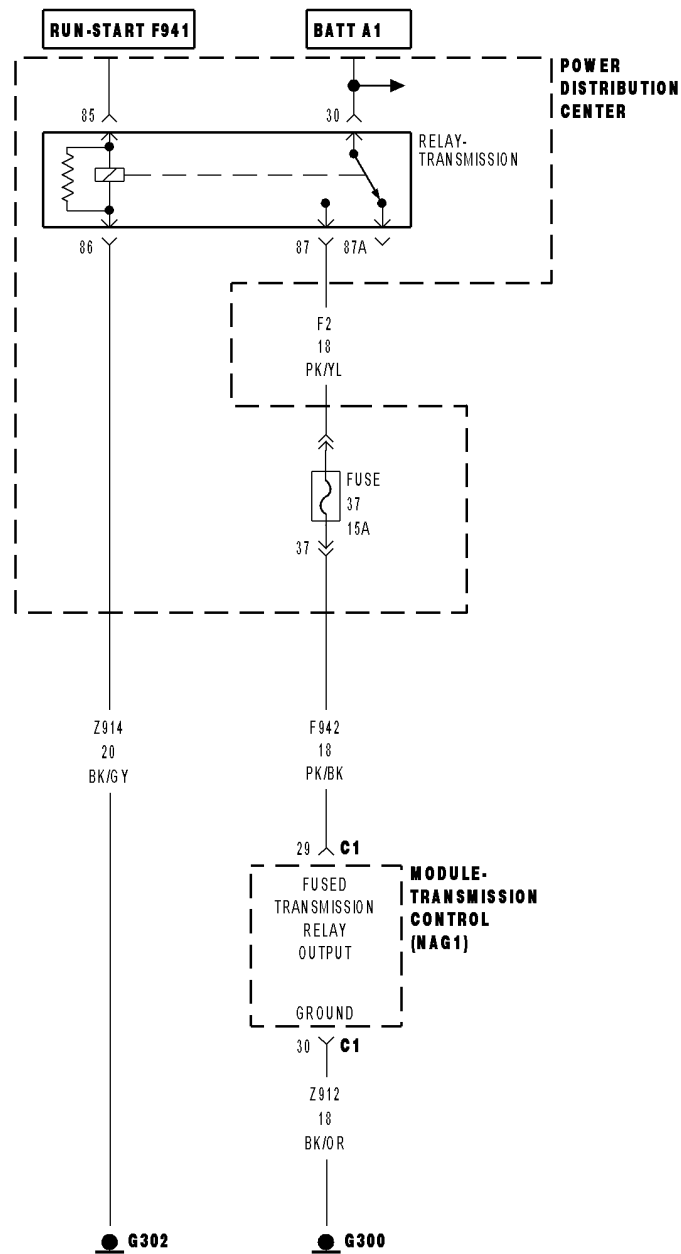
**View repair**

**Repair**

Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---

**P1633-TCM INTERNAL - TEST EXTERNAL WATCHDOG PERFORMANCE**

**P1633-TCM INTERNAL - TEST EXTERNAL WATCHDOG PERFORMANCE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) performs various internal tests to verify proper controller operation. This DTC indicates that there is an issue with the TCM's external watchdog. If the TCM detects an error with the controllers external watchdog failed the power up test, the controller will enter Limp-in mode and illuminate the MIL.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
If the TCM detects an error with the controllers external watchdog failed the power up test.

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test**

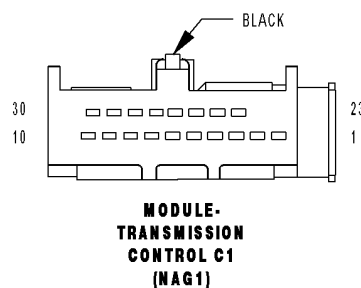
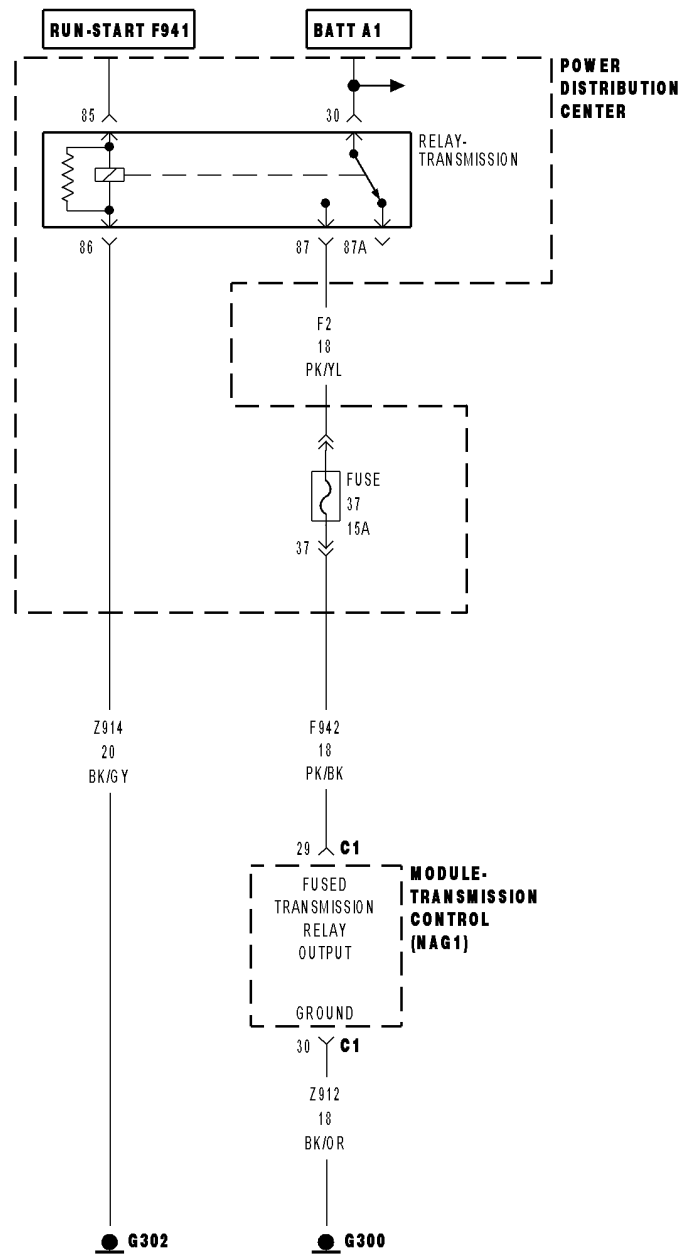
**1. TRANSMISSION CONTROL MODULE**

**View repair**

**Repair**

Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---

**P1634-TCM INTERNAL- INTERNAL WATCHDOG PERFORMANCE**

**P1634-TCM INTERNAL- INTERNAL WATCHDOG PERFORMANCE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) performs various internal tests to verify proper controller operation. This DTC indicates that the controller's microprocessor internal watchdog has detected an error. If the TCM microprocessor detects an internal watchdog error, the controller will enter Limp-in mode and illuminate the MIL.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
If the TCM microprocessor internal watchdog detects an error.

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test**

**1. TRANSMISSION CONTROL MODULE**

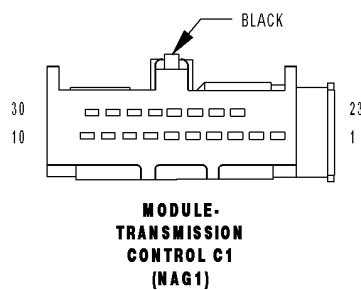
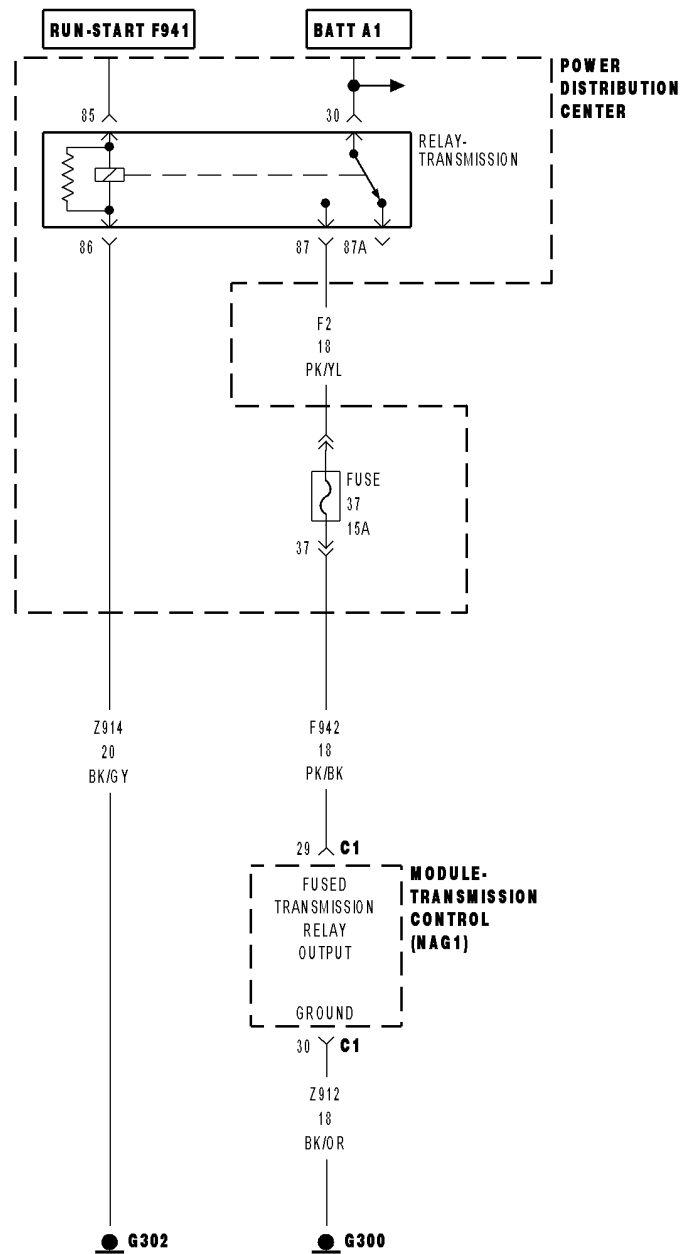
**View repair**

**Repair**

Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---

**P1636-TCM INTERNAL- EXTERNAL WATCHDOG PERFORMANCE**

**P1636-TCM INTERNAL- EXTERNAL WATCHDOG PERFORMANCE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) performs various internal tests to verify proper controller operation. This DTC indicates that watch dog circuitry external to the microprocessor has detected an error. If the TCM watch dog circuitry external to the microprocessor detects an error, the controller will enter Limp-in mode and illuminate the MIL.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
If the TCM watch dog circuitry external to the microprocessor detects an error.

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. TRANSMISSION CONTROL MODULE**

**View repair**

**Repair**

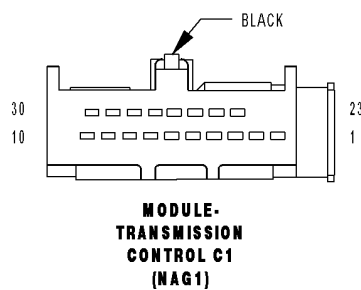
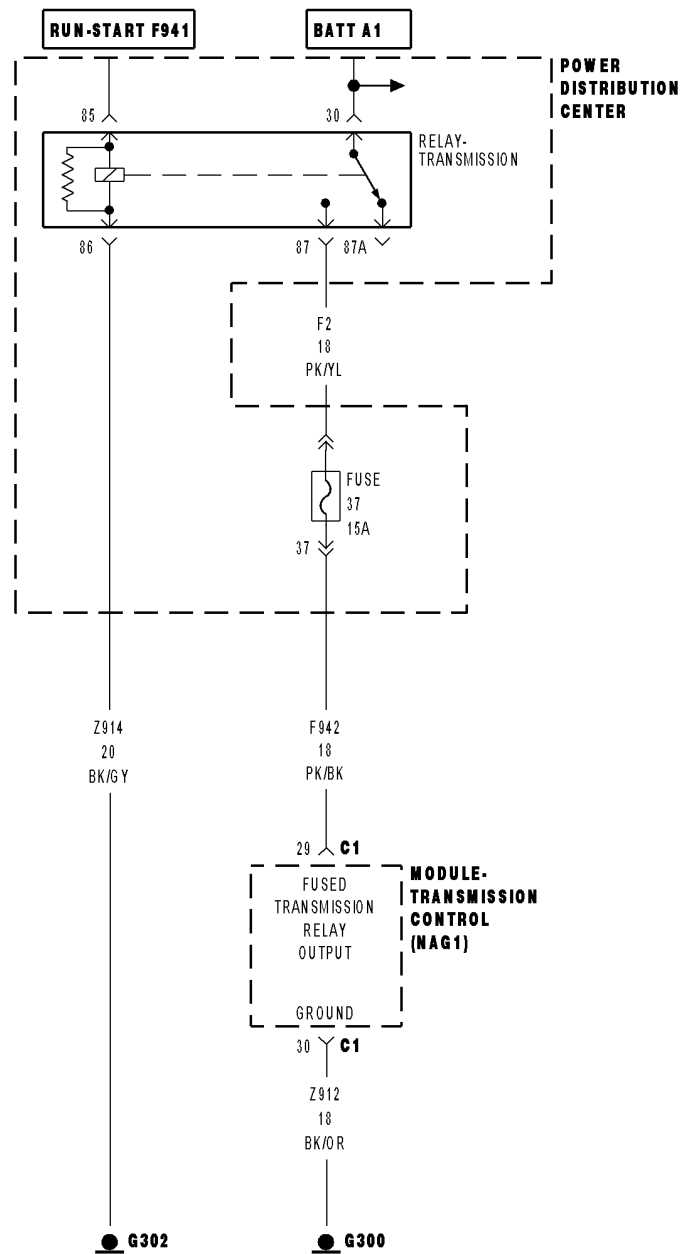
Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---



## P1637-TCM INTERNAL-EEPROM PERFORMANCE



**P1637-TCM INTERNAL-EEPROM PERFORMANCE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) performs various internal tests to verify proper controller operation. This DTC indicates that there is an internal error with the controllers Random Access Memory. If detected, the controller will enter Limp-in mode and illuminate the MIL.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
If the TCM indicates that there is an internal error with the controllers Random Access Memory.

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. TRANSMISSION CONTROL MODULE**

**View repair**

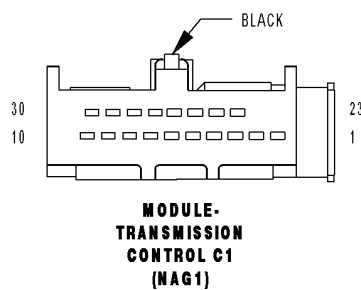
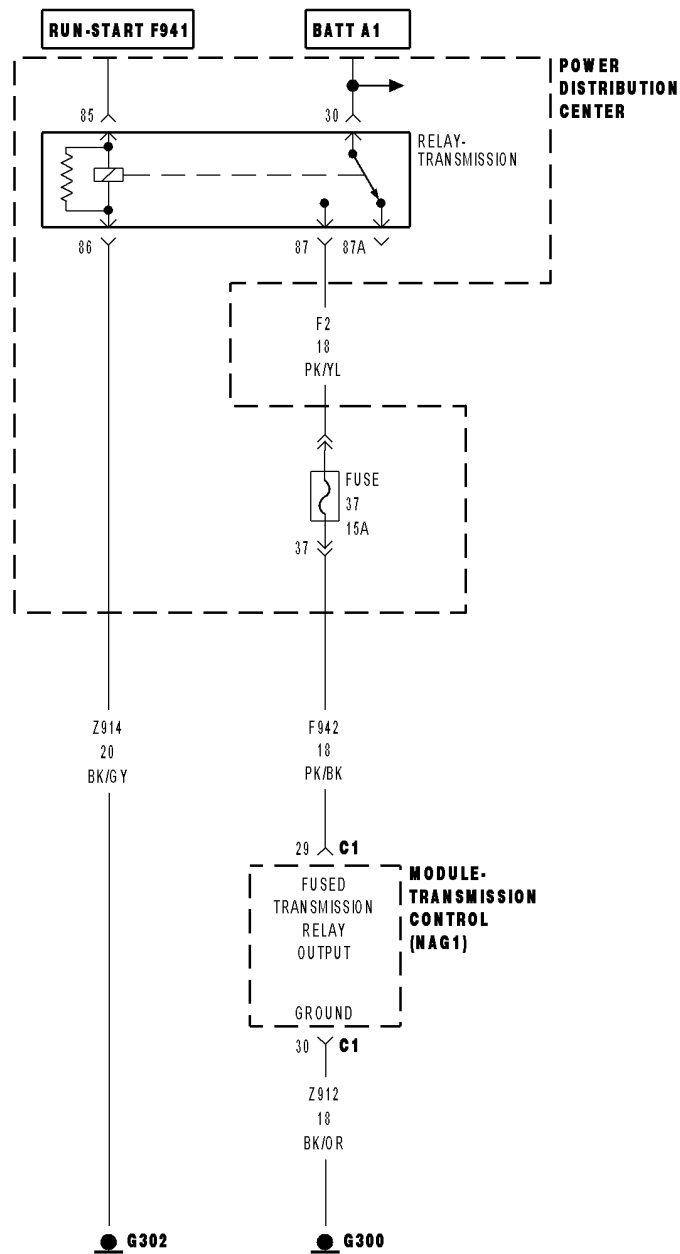
**Repair**

Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---

## P1638-TCM INTERNAL-CAN 1 RAM PERFORMANCE



**P1638-TCM INTERNAL-CAN 1 RAM PERFORMANCE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) performs various internal tests to verify proper controller operation. This DTC indicates that there is an internal error with the controllers Random Access Memory (RAM) on the CAN controller 1 section of the microprocessor. If detected, the controller will enter Limp-in mode and illuminate the MIL.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
If the TCM detects an internal error with the controllers Random Access Memory (RAM) on the CAN controller 1 section of the microprocessor.

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test**

**1. TRANSMISSION CONTROL MODULE**

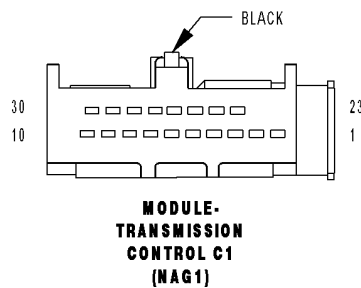
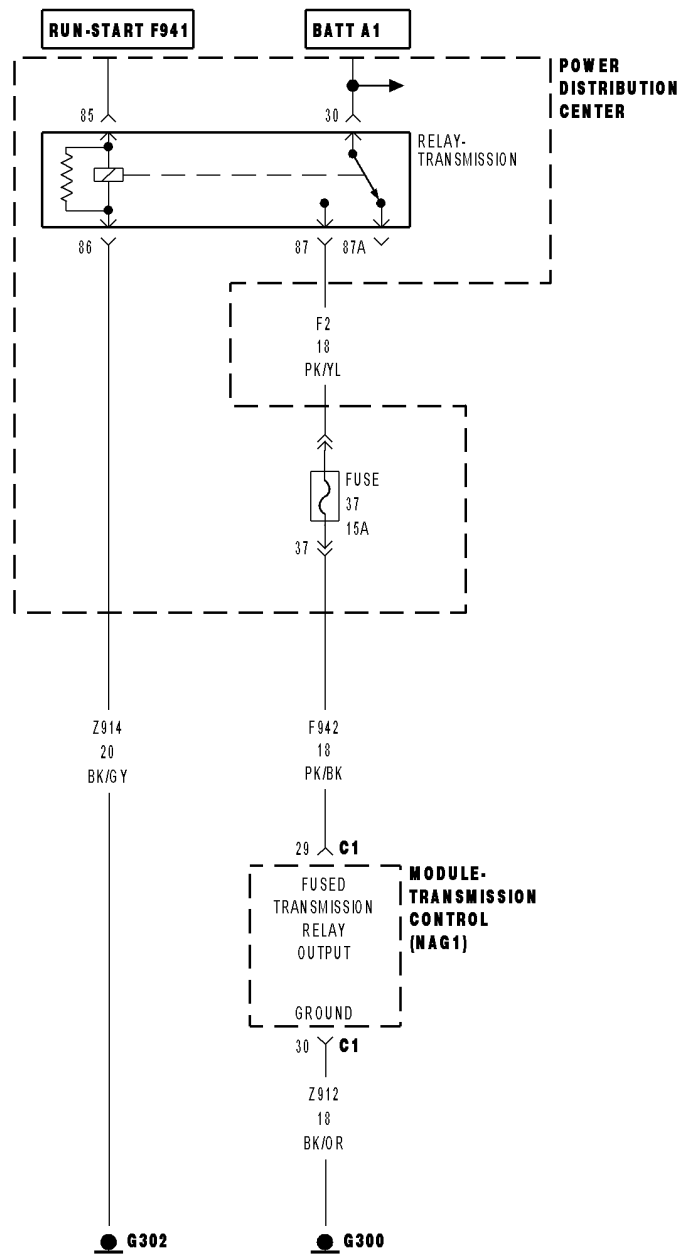
**View repair**

**Repair**

Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---

## P1639-TCM INTERNAL-CAN 2 RAM PERFORMANCE



**P1639-TCM INTERNAL-CAN 2 RAM PERFORMANCE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) performs various internal tests to verify proper controller operation. This DTC indicates that there is an internal error with the controllers Random Access Memory (RAM) on the CAN controller 2 section of the microprocessor. If detected, the controller will enter Limp-in mode and illuminate the MIL.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
If the TCM detects an internal error with the controllers Random Access Memory (RAM) on the CAN controller 2 section of the microprocessor.

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test**

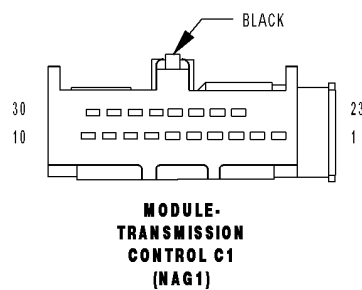
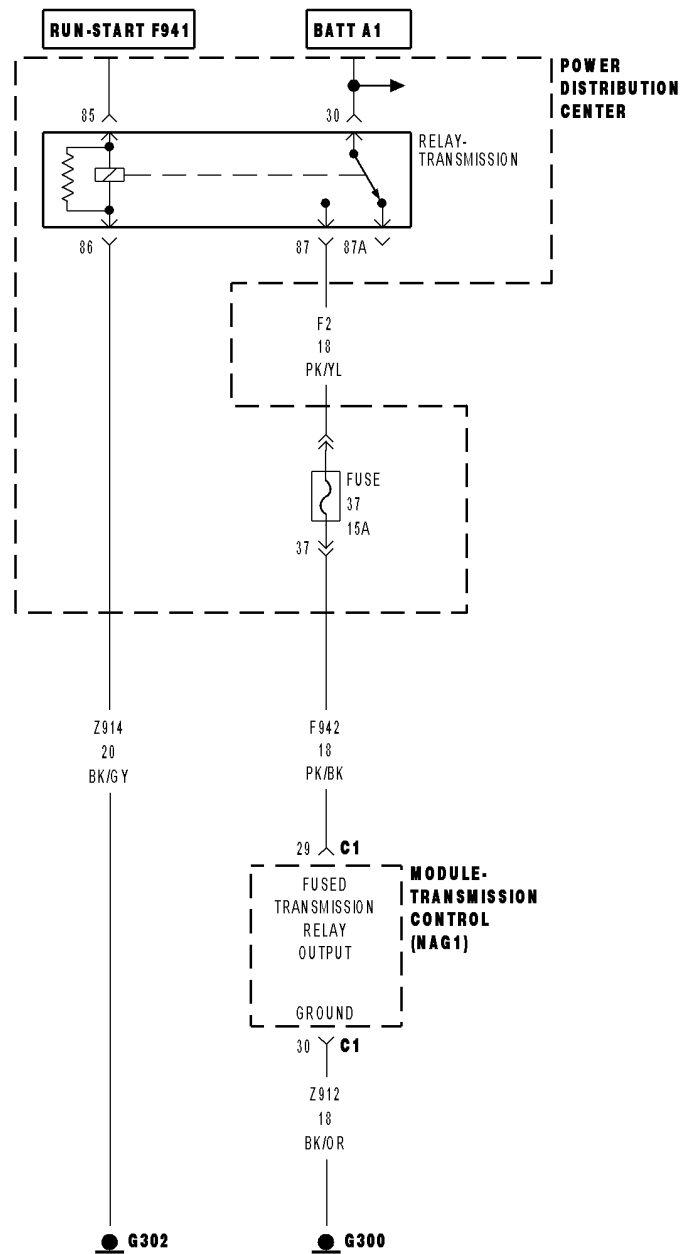
**1. TRANSMISSION CONTROL MODULE**

**View repair**

**Repair**

Using the schematics as a guide, check the Transmission Control Module (TCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---

**P1704-INPUT SPEED SENSOR 1 OVERSPEED**

**P1704-INPUT SPEED SENSOR 1 OVERSPEED (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The NAG1 transmission has two input speed sensors 1 and 2 (N2 and N3), both speed sensors are located on the valve body. The speed sensors are hall effect speed sensors that are used by the Transmission Control Module (TCM) to calculate the transmissions input speed. Since the input speed could not be measured directly, two of the drive elements are measured. Two input speed sensors were required because both drive elements are not active in all gears.

The input speed sensors 1 and 2 will report the same input speed in gears 2nd, 3rd or 4th. If the 1 and 2 input speed sensor signals are not the same in these gears, the TCM will set the DTC P2784-Input Speed Sensor 1/2 Correlation. The input speed sensor 2 is not reported in 1st and 5th gears. The input speed sensor 1 (N2) is not reported in Reverse. The P01704-Input Speed Sensor 1 Overspeed and P01705-Input Speed Sensor 2 Overspeed DTCs are rationality checks designed to detect a major transmission failure. If either DTC is detected, the TCM will place the transmission in Neutral.

- **When Monitored:**

Continuously with the ignition on, engine running, transmission in gear, and Input Speed Sensor 1 (N2) greater than 0 RPM

- **Set Condition:**

If the RPM of the Input Speed Sensor 1 (N2) is greater than 7700 RPM.

Possible Causes
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK TO SEE IF DTC IS CURRENT**

Turn the ignition on.

With the scan tool, erase Transmission DTCs.

Raise the vehicle on the hoist.

Start the engine.

With the scan tool, monitor the Input Speed Sensor 1 RPM.

Firmly apply the brakes and place the gear selector in Drive.

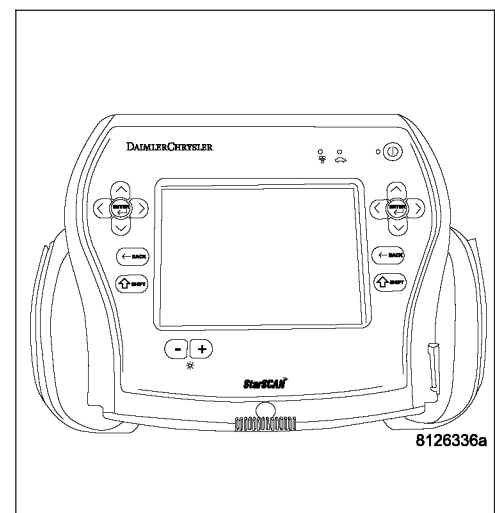
**WARNING: To avoid personal injury or death, keep hands and feet clear of rotating wheels.**

Release the brakes and raise the engine RPM to allow the transmission to upshift to the 2-3 and 3-4 shift schedule.

**Did the Input Speed Sensors 1 display an RPM above 7700?**

**Yes** >> Go To 2

**No** >> Go To 3





**P1704-INPUT SPEED SENSOR 1 OVERSPEED (CONTINUED)****2. INTERNAL TRANSMISSION**

This DTC is an indication of a internal transmission failure.

Remove the Transmission Oil Pan and inspect for excessive debris such as clutch friction material or metal contamination.

**Is there any indication of an internal transmission failure?**

- Yes**    >> Repair internal transmission as necessary. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- 

**3. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

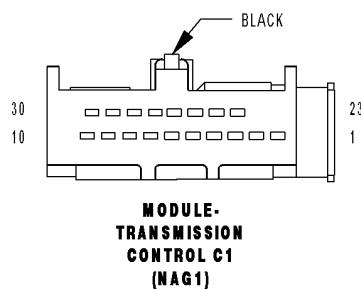
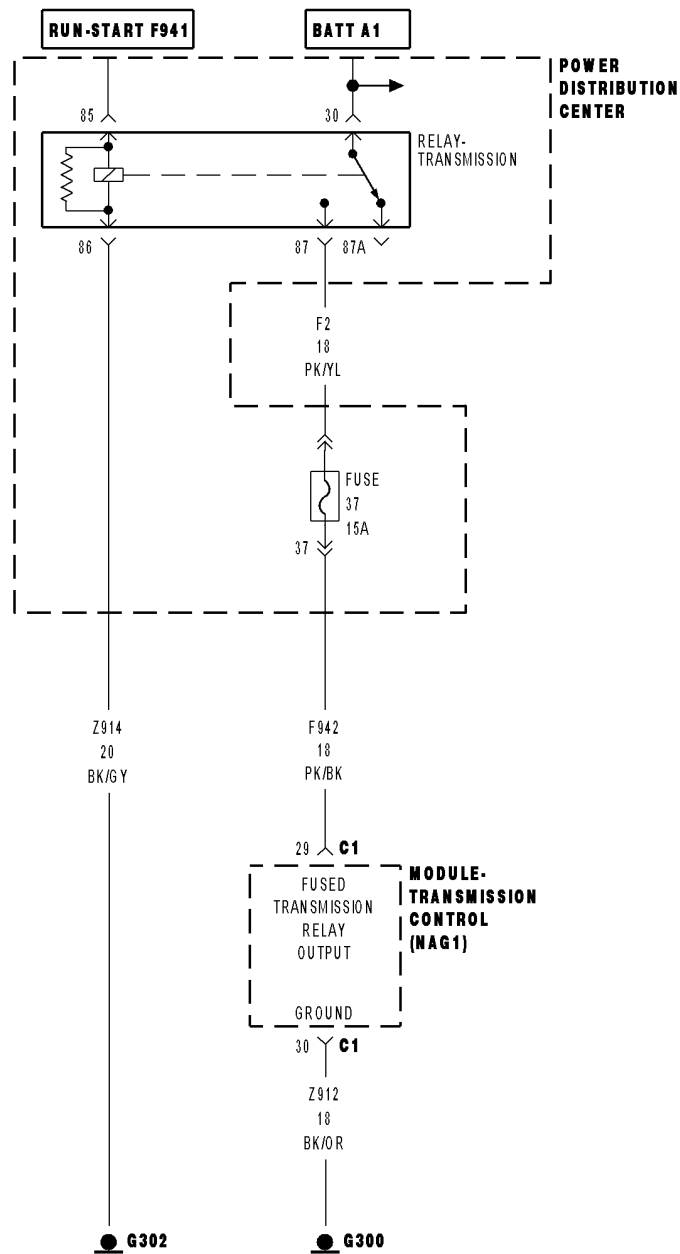
Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Test Complete.
-

# P1705-INPUT SPEED SENSOR 2 OVERSPEED



**P1705-INPUT SPEED SENSOR 2 OVERSPEED (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The NAG1 transmission has two input speed sensors 1 and 2 (N2 and N3), both speed sensors are located on the valve body. The speed sensors are hall effect speed sensors that are used by the Transmission Control Module (TCM) to calculate the transmissions input speed. Since the input speed could not be measured directly, two of the drive elements are measured. Two input speed sensors were required because both drive elements are not active in all gears.

The input speed sensors 1 and 2 will report the same input speed in gears 2nd, 3rd or 4th. If the 1 and 2 input speed sensor signals are not the same in these gears, the TCM will set the DTC P2784-Input Speed Sensor 1/2 Correlation. The input speed sensor 2 is not reported in 1st and 5th gears. The input speed sensor 1 (N2) is not reported in Reverse. The P01704-Input Speed Sensor 1 Overspeed and P01705-Input Speed Sensor 2 Overspeed DTCs are rationality checks designed to detect a major transmission failure. If either DTC is detected, the TCM will place the transmission in Neutral.

- **When Monitored:**

Continuously with the ignition on, engine running, transmission in gear, and Input Speed Sensor 2 (N3) greater than 0 RPM

- **Set Condition:**

If the RPM of the Input Speed Sensor 2 (N3) is greater than 7700 RPM.

Possible Causes
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK TO SEE IF DTC IS CURRENT**

Turn the ignition on.

With the scan tool, erase Transmission DTCs.

Raise the vehicle on the hoist.

Start the engine.

With the scan tool, monitor the Input Speed Sensor 2 RPM.

Firmly apply the brakes and place the gear selector in Drive.

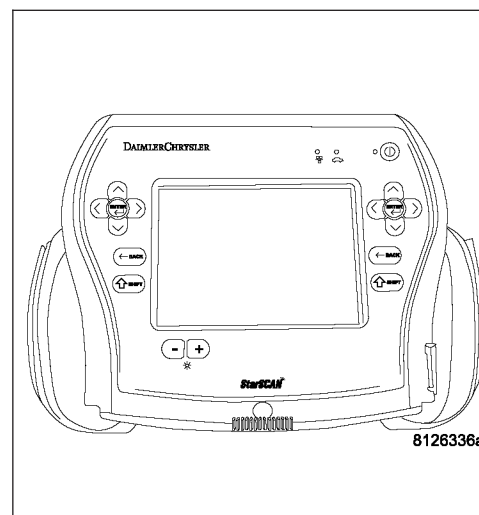
**WARNING: To avoid personal injury or death, keep hands and feet clear of rotating wheels.**

Release the brakes and raise the engine RPM to allow the transmission to upshift to the 2-3 and 3-4 shift schedule.

**Did the Input Speed Sensor 2 display an RPM above 7700?**

**Yes**    >> Go To 2

**No**    >> Go To 3



**P1705-INPUT SPEED SENSOR 2 OVERSPEED (CONTINUED)****2. INTERNAL TRANSMISSION**

This DTC is an indication of a internal transmission failure.

Remove the Transmission Oil Pan and inspect for excessive debris such as clutch friction material or metal contamination.

**Is there any indication of an internal transmission failure?**

**Yes** >> Repair internal transmission as necessary. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

---

**3. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

---

P1731-INCORRECT GEAR ENGAGED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The TCM compares the calculated gear with the gear the transmission has actually engaged. The actual gear is identified by verifying the signals of the two input speed sensors 1 (N2) and 2 (N3) as well as the transmission output speed (from the ABS system). If the actual gear differs from the gear calculated by the TCM, the TCM value is adjusted to the engaged gear and a counter is increased by 2 points. If after a shift the engaged gear and the calculated gear still match, the counter is decreased by 1 point. A DTC is detected as soon as the counter exceeds a threshold.

- **When Monitored:**  
The conditions for gear detection are: engine speed greater than 450 rpm, no input speed sensor failures are active, no selector lever error active, selector lever is not in intermediate position, selector lever position is not showing power-up value, no output speed error is active, no transfer case error is active, output speed (ABS system) greater than 180 rpm, no wheel speed (ABS system) overspeed detected.
- **Set Condition:**  
The detected gear calculated by the TCM is not identical to the actual gear. Exception: detected gear is 1st and actual gear is 2nd. If the problem is present for three consecutive ignition cycles, the TCM places the transmission into Limp-in mode until the DTC is cleared by the scan tool.

Possible Causes
TRANSMISSION SOLENOID DTCS PRESENT
ABS DTCS PRESENT
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

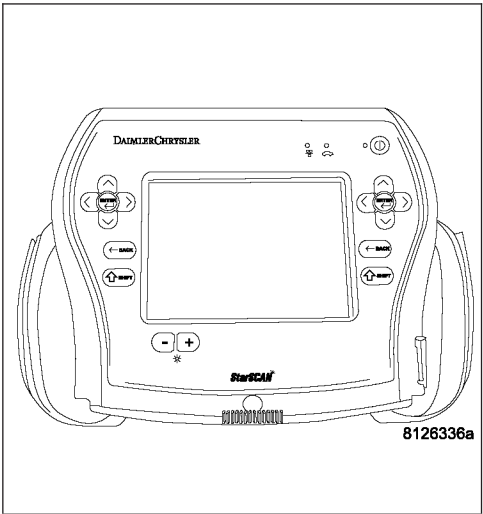
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK IF TRANSMISSION SOLENOID DTCS ARE PRESENT

With the scan tool, check for other transmission DTCS.

- Are there any Transmission Solenoid DTCS present?
- Yes    >> Refer to 21 - AUTOMATIC TRANSMISSION - AUTOMATIC TRANSMISSION NAG1 - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No    >> Go To 2



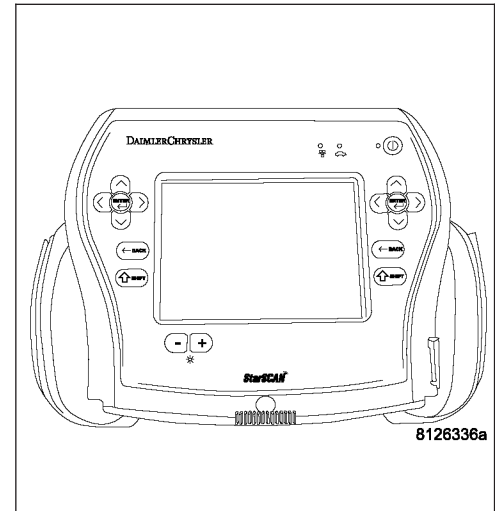
**P1731-INCORRECT GEAR ENGAGED (CONTINUED)****2. CHECK IF ABS DTCS ARE PRESENT**

With the scan tool, check for ABS DTCS.

**Are there any ABS DTCS present?**

**Yes** >> Refer to 5 - BRAKES - ABS ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 3

**3. CHECK FOR INTERNAL TRANSMISSION PROBLEM**

This DTC is usually set due to an internal transmission problem such as but not limited to: stuck solenoid valve and/or contamination in the valve body, broken springs, leaking clutch seals, dislodged or broken snap ring.

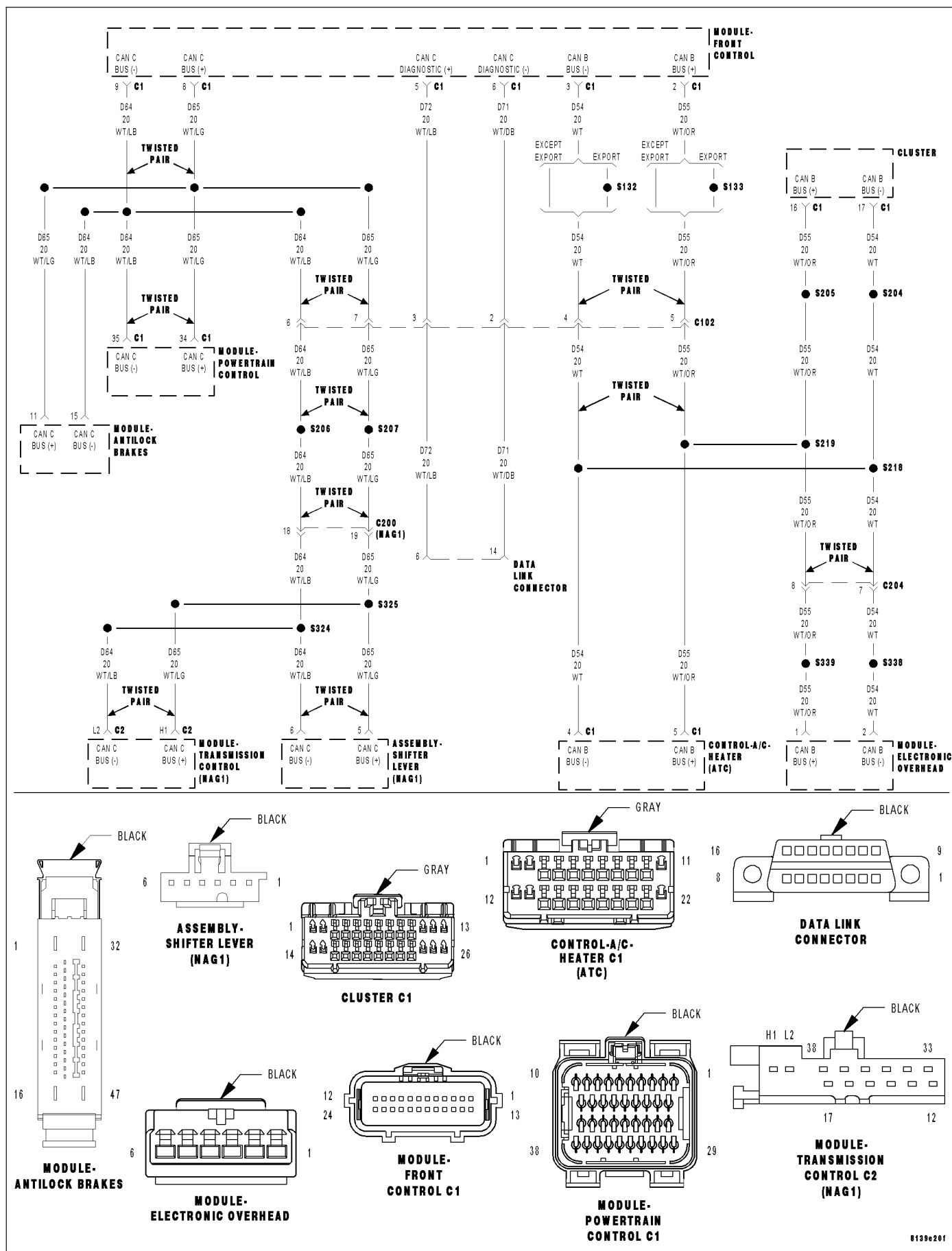
Inspect the internal transmission, Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/ SERVICE INFORMATION for the appropriate service procedure(s).

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

## P2638-TORQUE MANAGEMENT FEEDBACK SIGNAL PERFORMANCE



**P2638-TORQUE MANAGEMENT FEEDBACK SIGNAL PERFORMANCE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) requests torque reductions over the CAN bus during a transmission shift to improve shift quality. The TCM verifies that the PCM / ECM has performed the requested torque reduction by monitoring the response to the request. If the response is not within a specified tolerance, the TCM increments a counter, and if this counter reaches a threshold, the DTC sets.

- **When Monitored:**  
Engine intervention active for at least 20 ms, no engine torque errors, engine torque demand is greater than 0.
- **Set Condition:**  
Torque Reduction acknowledge bit - not set, no shift aborts, the error flag Torque Reduction Acknowledge is not set, Powertrain controller not supporting torque requests.

Possible Causes
CAN BUS CIRCUIT DTC PRESENT TRANSMISSION CONTROL MODULE POWERTRAIN / ENGINE CONTROL MODULE

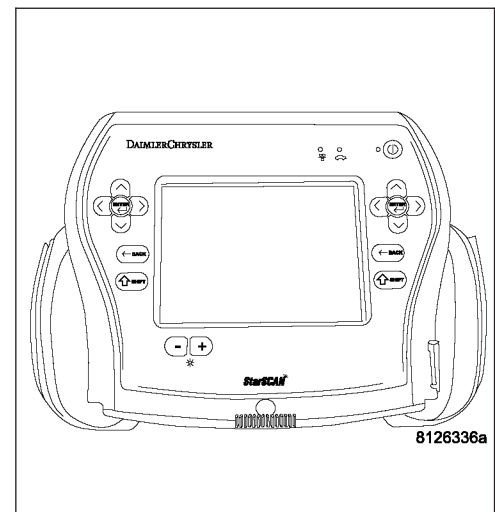
**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK FOR ENGINE DTC PRESENT**

With the scan tool, check engine DTCs.

**Are there any engine DTCs present?**

- Yes** >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Go To 2





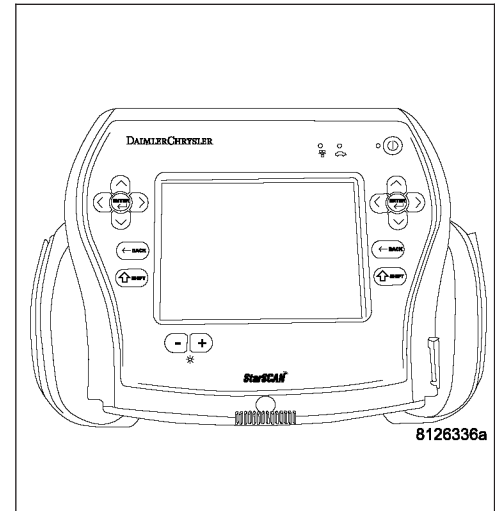
**P2638-TORQUE MANAGEMENT FEEDBACK SIGNAL PERFORMANCE (CONTINUED)****2. CHECK FOR CAN BUS DTCs**

With the scan tool, check for any CAN bus DTCs or a sign of a CAN bus failure.

**Are there any CAN bus DTCs present in any module other than the TCM or an overall indication of a CAN bus communication problem?**

**Yes**    >> This is an indication of a CAN bus communication problem. Depending on the DTC, either refer to the module reporting the DTC and perform diagnostics for the appropriate symptom or refer to 8 - ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS and perform the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 3

**3. CHECK IF DTC RESETS**

Turn the ignition off to the lock position.

Replace and program the Powertrain Control Module per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE for the appropriate service procedure.

With the scan tool, record the Environmental Data and erase Transmission DTCs.

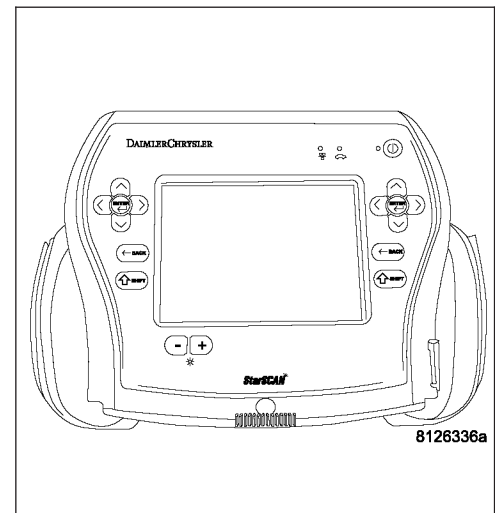
**Note: If the TCM detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set and is located in scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.**

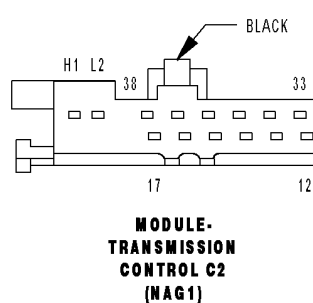
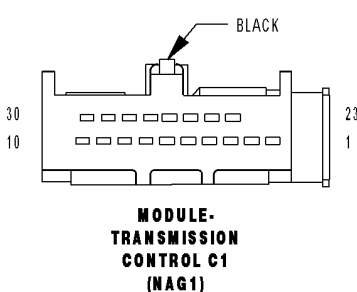
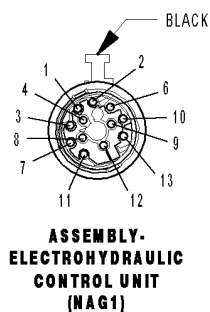
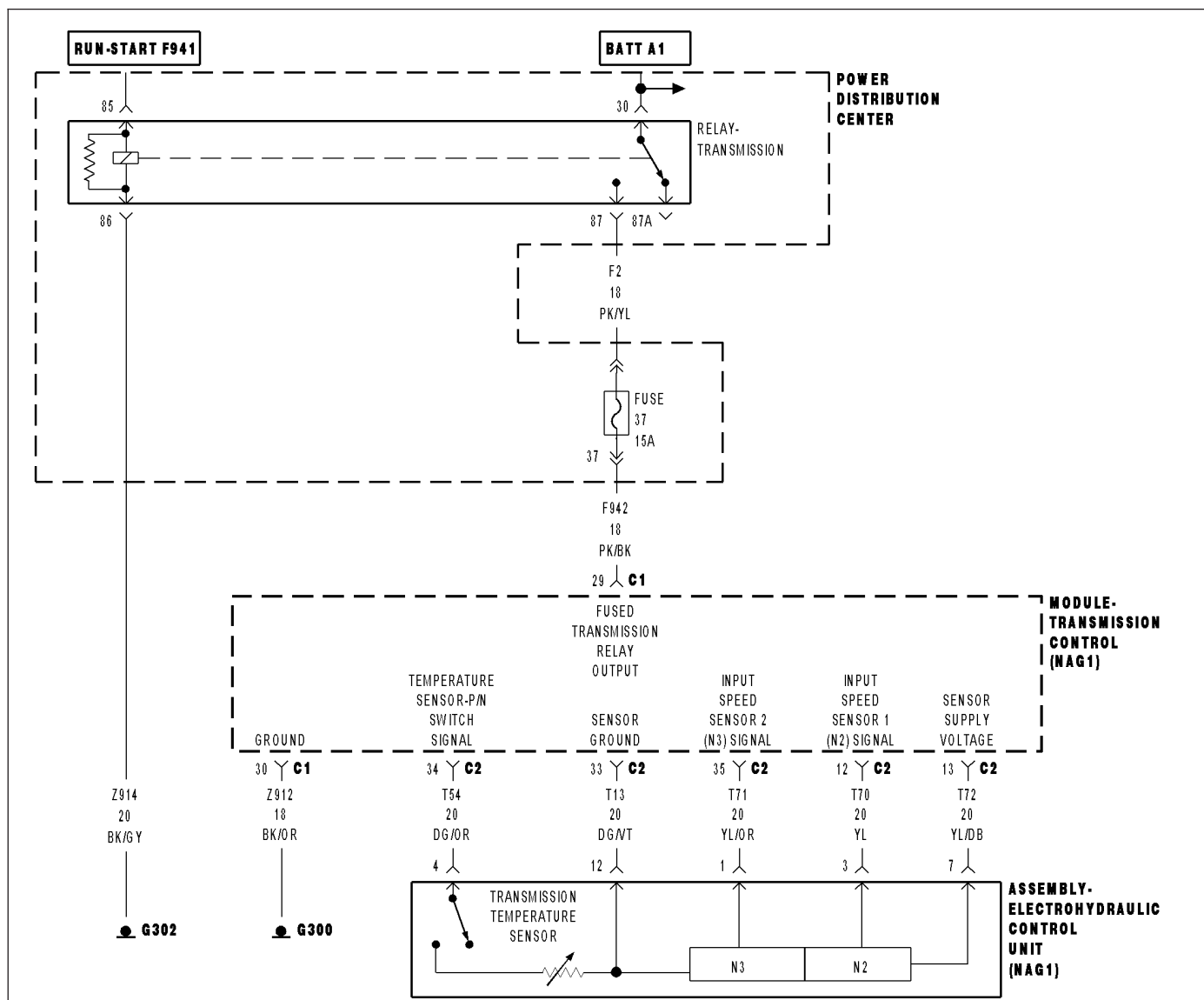
Using the Environmental Data recorded earlier, test drive the vehicle while trying to duplicate the conditions in which the DTC originally set. With the scan tool, read Transmission DTCs.

**Did the DTC P2638-TORQUE MANAGEMENT FEEDBACK SIGNAL PERFORMANCE reset?**

**Yes**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



**P2767-INPUT SPEED SENSOR 2 CIRCUIT NO SIGNAL**

**P2767-INPUT SPEED SENSOR 2 CIRCUIT NO SIGNAL (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Input Speed Sensor 2 (N3) is one of two hall effect speed sensors that are used by the Transmission Control Module (TCM) to calculate the transmissions turbine speed. Since the turbine speed could not be measured directly, two of the drive elements are measured. Two input speed sensors are required because both elements are not active in all gears.

- **When Monitored:**

Engine speed greater than 450 RPM with none of the following DTCs present: engine speed, TCM undervoltage, output speed sensor, and/or rear wheel speed DTCs. Also required are all wheel speeds above 250 RPM and no wheel slip detected (signal from the ABS system).

- **Set Condition:**

If the Input Speed Sensor 2 (N3) signal is equal to 0 RPM.

Possible Causes
(T72) SENSOR SUPPLY VOLTAGE CIRCUIT OPEN (T71) INPUT SPEED SENSOR 2 (N3) SIGNAL CIRCUIT OPEN (T71) SPEED SENSOR 2 (N3) SIGNAL CIRCUIT SHORT TO ANOTHER CIRCUIT (T13) SENSOR GROUND CIRCUIT OPEN (T13) SENSOR GROUND CIRCUIT SHORT TO ANOTHER CIRCUIT (T71) SPEED SENSOR 2 (N3) SIGNAL CIRCUIT SHORT TO GROUND (T13) SENSOR GROUND CIRCUIT SHORT TO GROUND INPUT SPEED SENSOR 2 (N3) TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK IF DTC IS CURRENT**

**Note:** The Transmission Control Module stores under Environmental Data the transmission operating conditions when the DTC was set. Before erasure of any DTC, record all information pertaining to the DTC, even if there is more than one DTC stored.

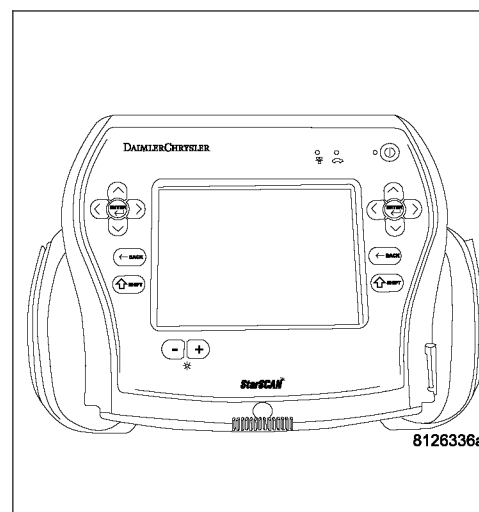
With the scan tool, erase transmission DTCs.

Using the Environmental Data previously recorded, drive the vehicle and try to duplicate the conditions in which the DTC originally set.

**Did the DTC P2767 reset?**

**Yes**    >> Go To 2

**No**    >> Go To 10



**P2767-INPUT SPEED SENSOR 2 CIRCUIT NO SIGNAL (CONTINUED)****2. CHECK THE (T72) SENSOR SUPPLY VOLTAGE CIRCUIT FOR AN OPEN**

Turn the ignition off to the lock position.

Disconnect the TCM C2 harness connector.

Disconnect the Electrohydraulic Control Unit Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

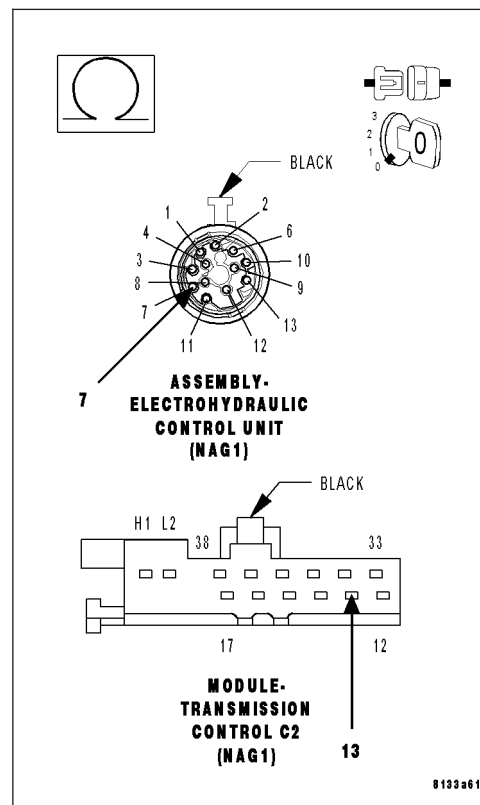
Measure the resistance of the (T72) Sensor Supply Voltage circuit from the TCM C2 harness connector to the Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T72) Sensor Supply Voltage circuit for an open.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. CHECK THE (T71) INPUT SPEED SENSOR 2 (N3) SIGNAL CIRCUIT FOR AN OPEN**

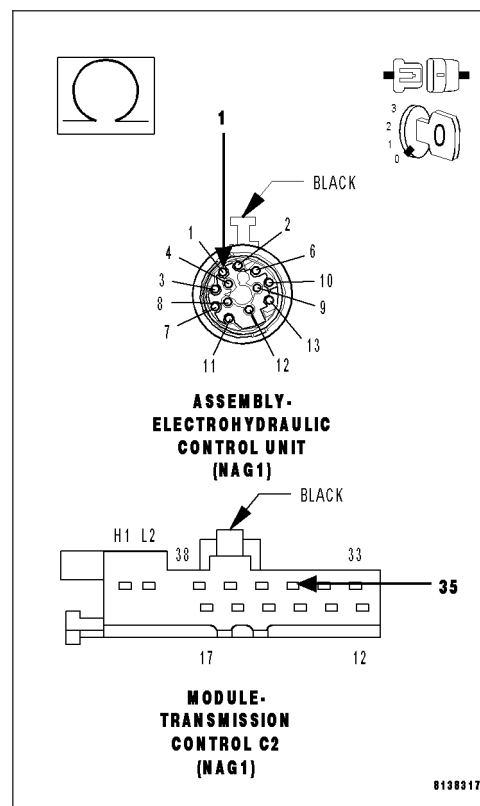
Measure the resistance of the (T71) Input Speed Sensor 2 (N3) Signal circuit from the TCM C2 harness connector to the Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T71) Input Speed Sensor 2 (N3) Signal circuit for an open.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4



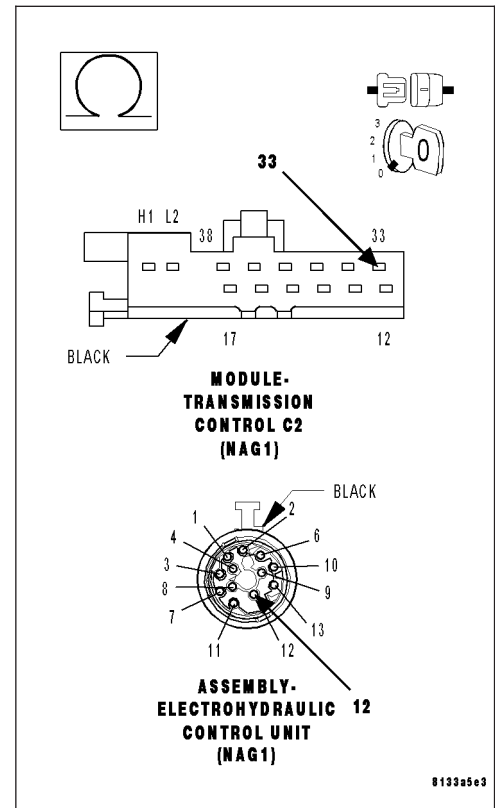
**P2767-INPUT SPEED SENSOR 2 CIRCUIT NO SIGNAL (CONTINUED)****4. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR AN OPEN**

Measure the resistance of the (T13) Sensor Ground circuit from the TCM C2 harness connector to the Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T13) Sensor Ground circuit for an open.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5

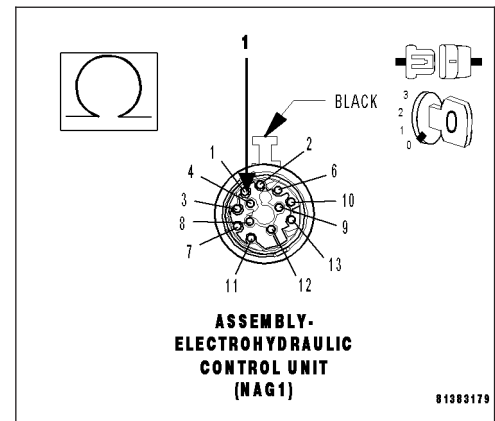
**5. CHECK THE (T71) INPUT SPEED SENSOR 2 (N3) SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT(S)**

Measure the resistance of the (T71) Input Speed Sensor 2 (N3) Signal circuit to all the other circuits in the Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T71) Input Speed Sensor 2 (N3) Signal circuit and any other circuit(s) in the Electrohydraulic Control Unit Assembly harness connector?**

**Yes** >> Repair the (T71) Input Speed Sensor 2 (N3) Signal circuit for a short to another circuit(s).  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 6



**P2767-INPUT SPEED SENSOR 2 CIRCUIT NO SIGNAL (CONTINUED)****6. CHECK THE (T71) INPUT SPEED SENSOR 2 (N3) SIGNAL CIRCUIT FOR A SHORT TO GROUND**

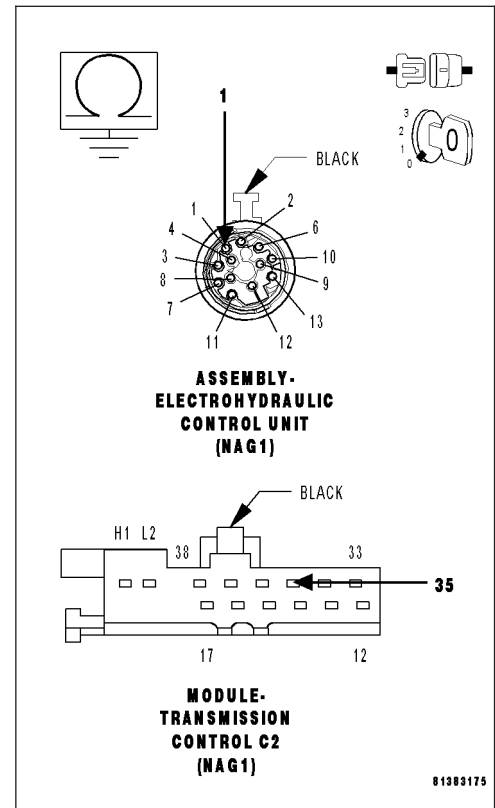
Measure the resistance between ground and the (T71) Input Speed Sensor 2 (N3) Signal circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T71) Input Speed Sensor 2 (N3) Signal circuit for a short to ground.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT(S)**

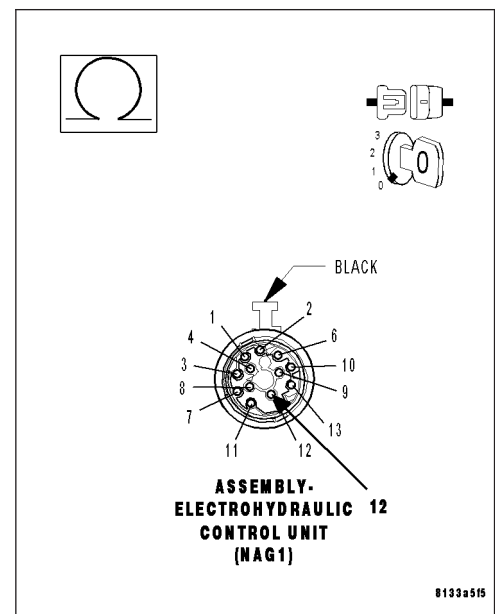
Measure the resistance between the (T13) Sensor Ground circuit to all the other circuits in the Electrohydraulic Control Unit Assembly harness connector.

**Is the resistance below 5.0 ohms between the (T13) Sensor Ground circuit and any other circuit(s) in the Electrohydraulic Control Unit Assembly harness connector.**

**Yes** >> Repair the (T13) Sensor Ground circuit for a short to another circuit(s)

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 8



**P2767-INPUT SPEED SENSOR 2 CIRCUIT NO SIGNAL (CONTINUED)****8. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR A SHORT TO GROUND**

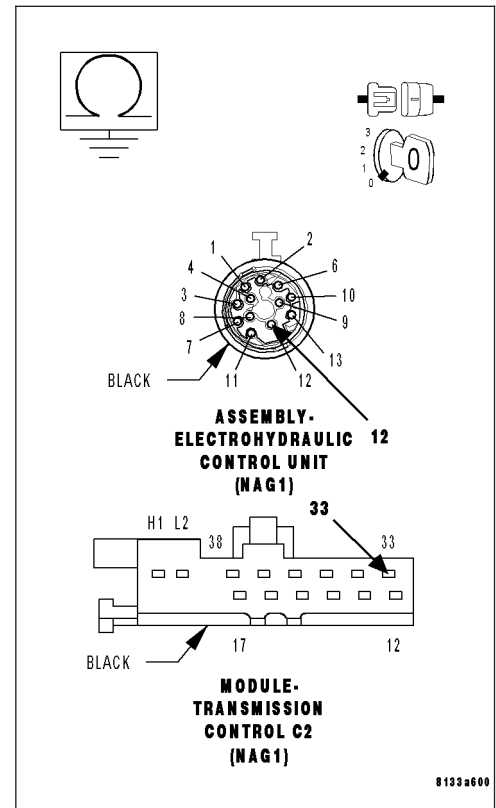
Measure the resistance between ground and the (T13) Sensor Ground circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T13) Sensor Ground circuit for a short to ground.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 9



**P2767-INPUT SPEED SENSOR 2 CIRCUIT NO SIGNAL (CONTINUED)****9. CHECK THE INPUT SPEED SENSOR 2 (N3) SIGNAL**

Reconnect the Electrohydraulic Control Unit Assembly harness connector.

Using a Lab Scope, backprobe the (T71) Input Speed Sensor 2 (N3) Signal circuit at the TCM C2 harness connector.

**WARNING: Properly support the vehicle.**

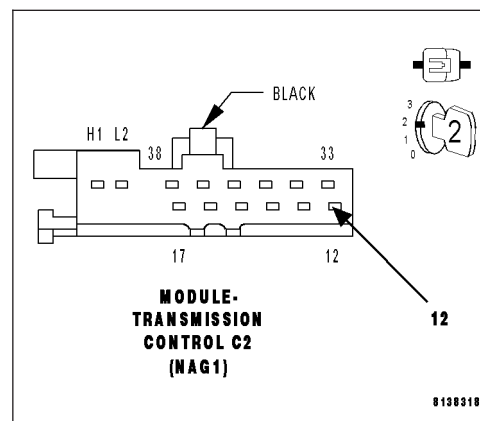
Raise all drive wheels off the ground.

Start the engine.

**WARNING: To avoid personal injury or death, keep hands and feet clear of rotating wheels.**

Place gear selector in drive and increase vehicle speed to engage 2nd gear.

Compare the scope pattern on the Lab Scope with a typical 5-volt square wave pattern.



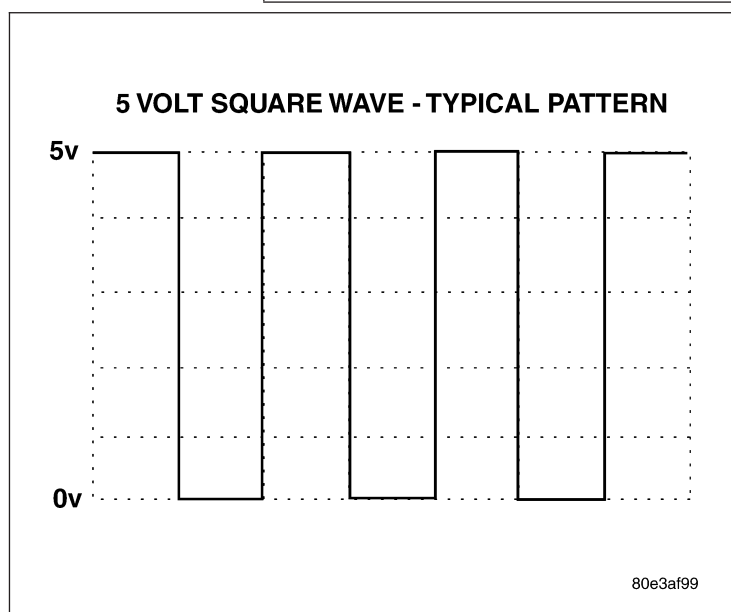
**Is the scope pattern comparable to the typical 5-volt square wave signal scope pattern?**

**Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Replace the Input Speed Sensor 2 (N3). Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**10. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.



P2783-TORQUE CONVERTER TEMPERATURE TOO HIGH

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The Transmission Control Module (TCM) monitors the friction loss of the torque converter clutch while it is in slipping mode. The TCM calculates friction loss using CAN communication signals such as, engine speed and engine torque, as well as the torque converter turbine speed computed by the TCM. Depending on the friction loss calculated in each program cycle, a corresponding value is added to a factor as long as the torque converter clutch is in slipping mode. The factor is set to 0 when the clutch is opened. If the factor reaches a specified value a DTC is set.

- **When Monitored:**  
When the solenoid supply voltage is active. With no reporting Input Speed Sensor 1 or 2 (N2 - N3), CAN Bus, PCM, CAN Engine, and/or CAN Engine Speed DTCs present. Torque Converter Clutch in slip mode.
- **Set Condition:**  
When the friction loss factor reaches threshold.

Possible Causes
INTERNAL TRANSMISSION OR TORQUE CONVER CLUTCH PROBLEM

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR AN INTERNAL TRANSMISSION PROBLEM

This DTC is an informational DTC.  
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.  
This is usually a sign of Torque Converter Clutch failure or an internal transmission problem.  
Check the Engine and Transmission Cooling Systems for proper operation.

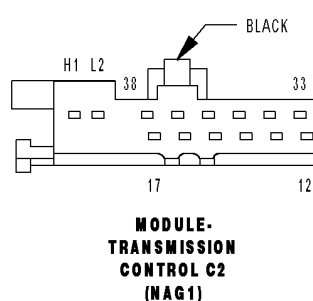
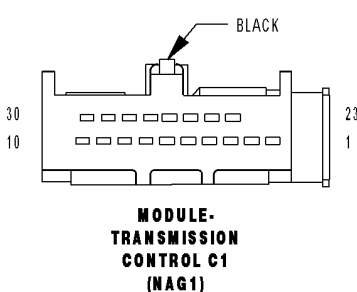
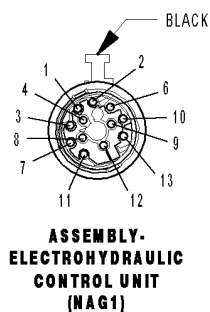
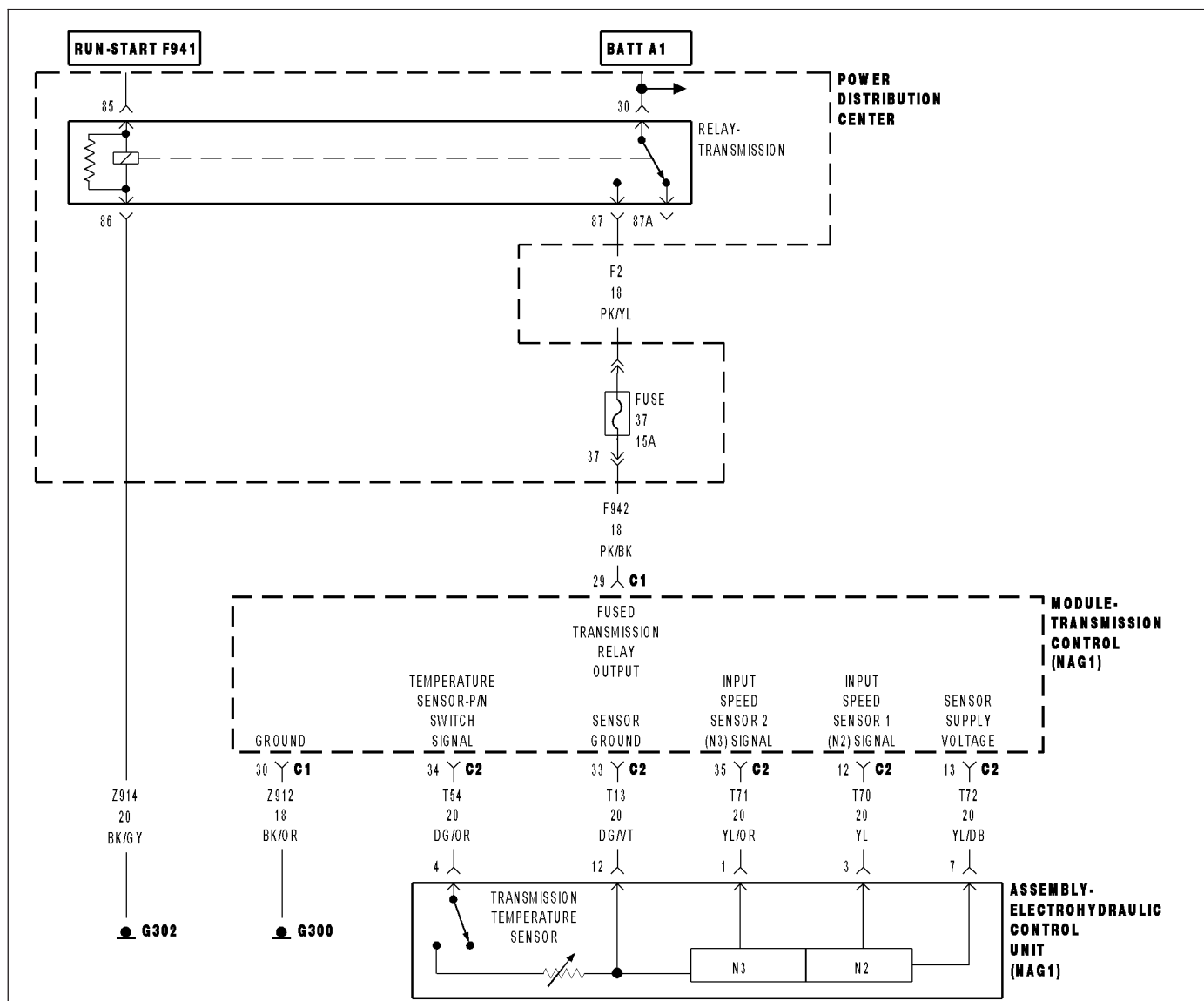
**View repair.**

Repair

Repair internal Transmission, Torque Converter, and/or Transmission and Engine Cooling systems as necessary. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/SERVICE INFORMATION and/or 7 - COOLING for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



# P2784-INPUT SPEED SENSOR 1/2 CORRELATION



**P2784-INPUT SPEED SENSOR 1/2 CORRELATION (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Input Speed Sensors 1 and 2 (N2 - N3) will report the same speed in 2nd, 3rd and 4th gears. If the Input Speed Sensor 1 and 2 signals are not the same in these gears, the DTC will set.

- **When Monitored:**  
Engine speed greater than 450 RPM, no engine speed DTCs, no TCM undervoltage system operation, no output speed sensor DTCs (CAN signal from the ABS system), all wheel speeds above 250 RPM (CAN signal from the ABS system), no rear wheel speed DTCs (signal from the ABS system), and no wheel slip detected (CAN signal from the ABS system), no shifting operation, Input Speed Sensor 2 (N3) greater than 800 RPM and Input Speed Sensor 1 (N2) greater than 0 RPM and the TCM not in reset.
- **Set Condition:**  
If the speed difference between the Input Speed Sensors 1 and 2 (N2 - N3) is greater than 150 RPM.

Possible Causes
INTERNAL TRANSMISSION
TRANSMISSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

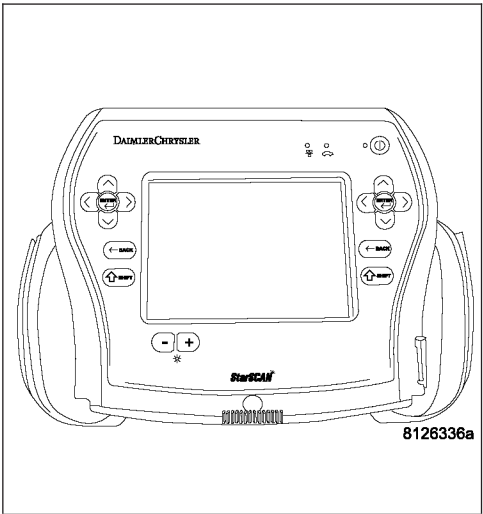
**Diagnostic Test**

**1. CHECK FOR SPEED SENSOR OR SENSOR SUPPLY VOLTAGE DTCs**

With the scan tool, check for other transmission DTCs.

**Are any Input Speed Sensor and/or Sensor Supply Voltage DTCs present?**

- Yes**    >> Refer to 21 - AUTOMATIC TRANSMISSION - AUTOMATIC TRANSMISSION NAG1 - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No**    >> Go To 2



**P2784-INPUT SPEED SENSOR 1/2 CORRELATION (CONTINUED)****2. CHECK TO SEE IF INPUT SENSOR MISMATCH IS CURRENT**

**Note:** If the TCM detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set and is located in scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

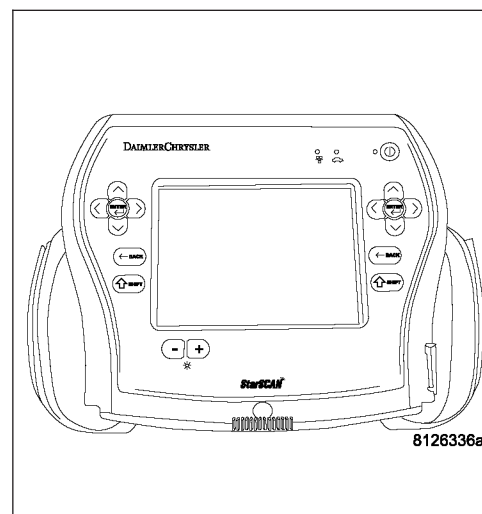
With the scan tool, record the Environmental Data and erase Transmission DTCs.

Using the Environmental Data recorded earlier, test drive the vehicle while trying to duplicate the conditions in which the DTC originally set.

**Did the DTC P2784-INPUT SPEED SENSOR 1/2 CORRELATION reset?**

**Yes** >> Go To 3

**No** >> Go To 4

**3. INTERNAL TRANSMISSION**

Turn the ignition off to the lock position.

Remove the Transmission Oil Pan and inspect for debris, a plugged Transmission Oil Filter, or any sign of an internal transmission problem.

**Is there any debris, plugged Transmission Oil Filter, or any sign of an internal transmission problem?**

**Yes** >> Repair as necessary. Refer to 21- AUTOMATIC TRANSMISSION-AUTOMATIC TRANSMISSION NAG1/ SERVICE INFORMATION for the appropriate service procedures.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**4. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

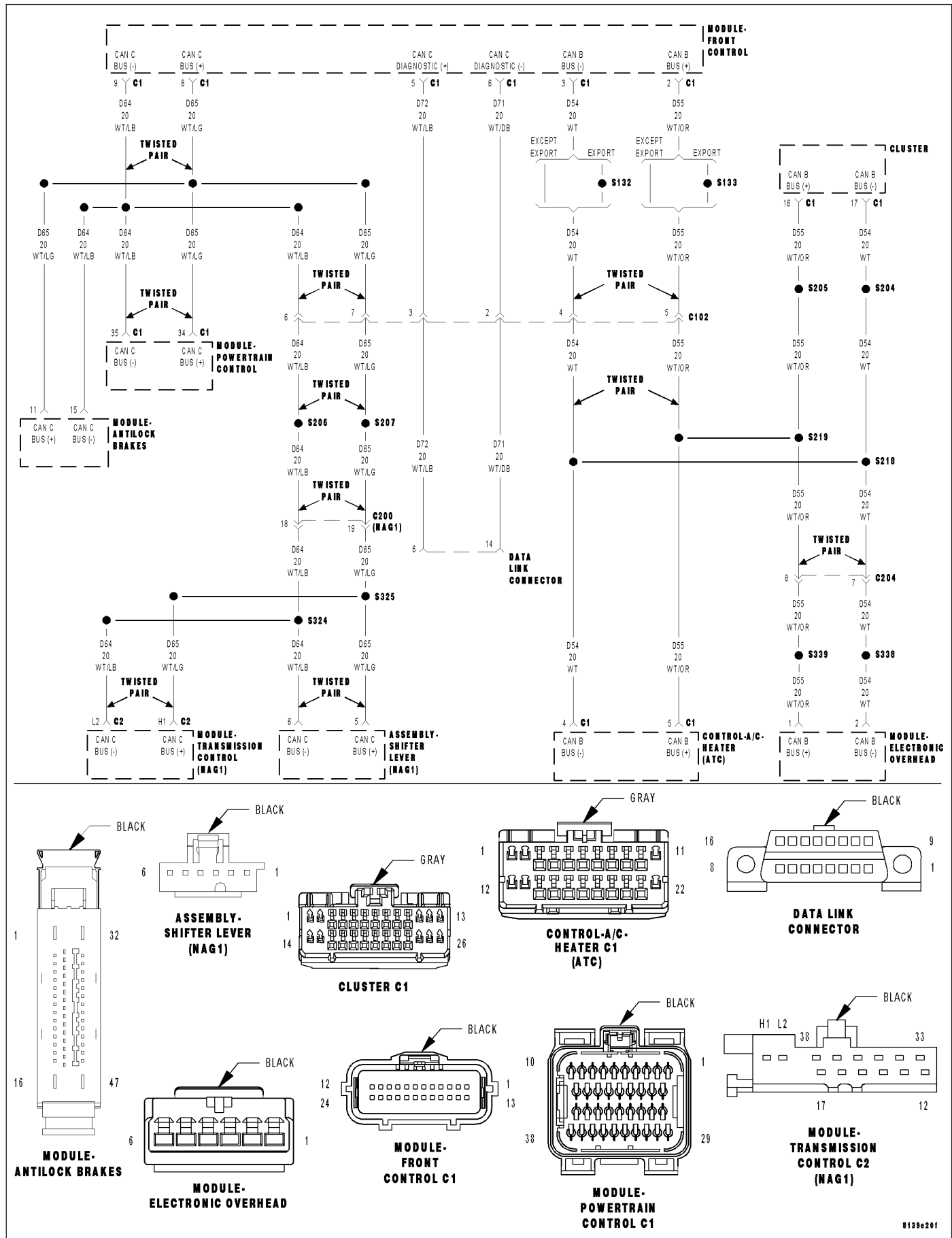
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

# U0002-CAN C BUS OFF PERFORMANCE



**U0002-CAN C BUS OFF PERFORMANCE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) receives information from the Engine, Anti-lock Brake System, and the Electronic Gear Shift control modules over the CAN C bus. The CAN C bus is a high speed communication bus that allows real time control capability between various controllers. Most messages are sent every 20 mSec, this means critical information can be shared between controllers. The CAN C bus is a two wire bus with a CAN (+) and a CAN (-) circuit. To reduce the potential of radio and other electrical noise interference, the CAN Bus circuit wiring is manufactured in a twisted pair within the electrical harness.

- **When Monitored:**

Continuously with the ignition on.

- **Set Condition:**

The TCM detects an: open, short to ground, short to voltage of the CAN C (+) or CAN C (-) circuits, short between the CAN C (+) or CAN C (-) circuits.

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

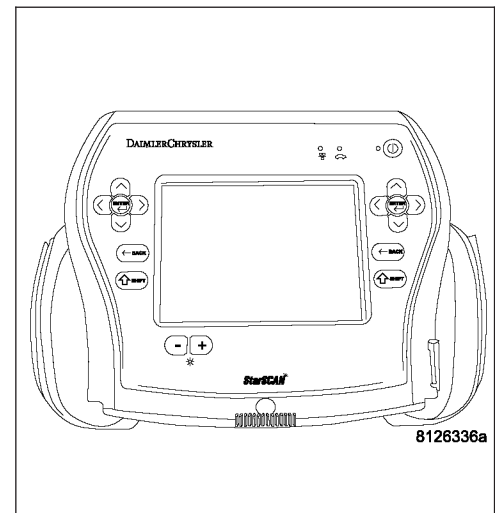
**Diagnostic Test****1. CHECK FCM FOR AN OVERALL CAN COMMUNICATION BUS FAILURE**

With the scan tool, check for FCM DTCs.

**Does the FCM report a CAN C Bus failure, or one or more CAN C Bus DTCs?**

**Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom. Perform the diagnostic procedure for U0001-CAN C BUS DTC first if it is present. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2



**U0002-CAN C BUS OFF PERFORMANCE (CONTINUED)****2. CHECK IF THE DTC IS CURRENT**

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Ignition on, engine not running.

With the scan tool, erase Transmission DTC's.

Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

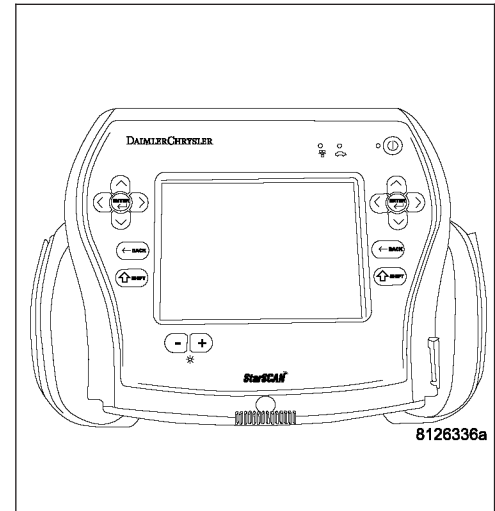
With the scan tool, read Transmission DTC's.

**Did the DTC U0002-CAN C BUS OFF PERFORMANCE reset?**

**Yes**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 3

**3. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

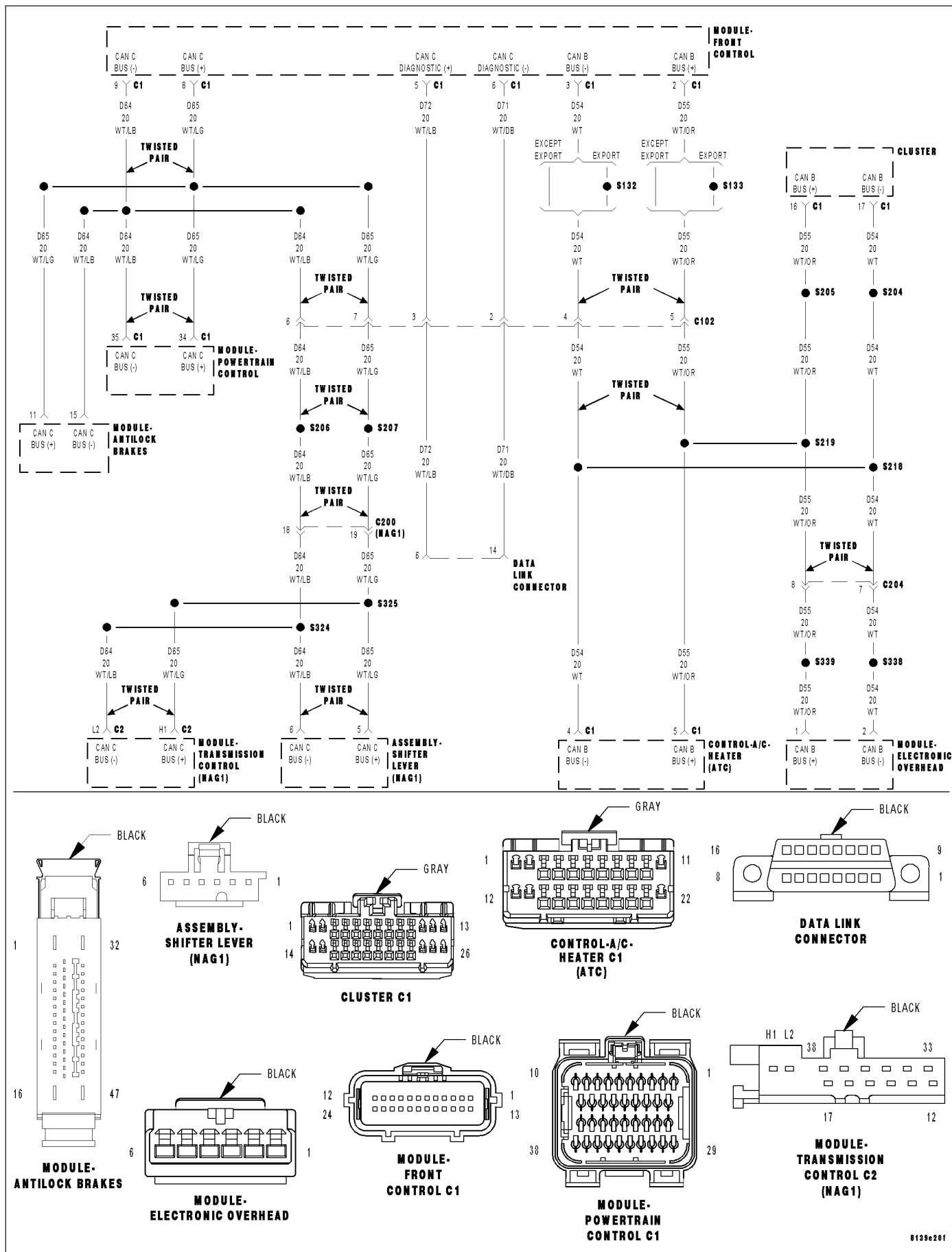
**Were there any problems found?**

**Yes**    >> Repair as necessary.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.

# U0100-LOST COMMUNICATION WITH ECM/PCM





U0100-LOST COMMUNICATION WITH ECM/PCM (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The Transmission Control Module (TCM) receives information from the Engine, Anti-lock Brake System, and the Electronic Gear Shift control modules over the CAN C bus. The CAN C bus is a high speed communication bus that allows real time control capability between various controllers. Most messages are sent every 20 mSec, this means critical information can be shared between multiple controllers almost instantaneously. The CAN C bus is a two wire bus with a CAN (+) and a CAN (-) circuit. To reduce the potential of radio and other electrical noise interference, the CAN Bus circuit wiring is manufactured using a twisted pair configuration within the electrical wiring harness.

- **When Monitored:**  
U0002-CAN C BUS OFF PERFORMANCE not present. One second after ignition on and not in Park or Neutral, no System Overvoltage or System Undervoltage condition present, or the transmission in Park or Neutral and engine RPM greater than 850 RPM.
- **Set Condition:**  
The DTC will set if a CAN ID was not received in the required time from the ECM or PCM.

Possible Causes
TRANSMISSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

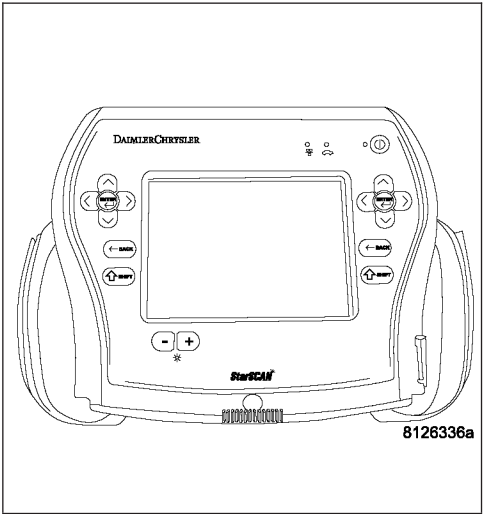
Diagnostic Test

1. CHECK THE FCM FOR CAN C BUS COMMUNICATION DTCS

With the scan tool, check for FCM DTCs.

Does the FCM report the DTC U0001-CAN C BUS or U0100-LOST COMMUNICATION WITH ECM/PCM?

- Yes**    >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom. Perform the diagnostic procedure for U0001-CAN C BUS first if it is present. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Go To 2



**U0100-LOST COMMUNICATION WITH ECM/PCM (CONTINUED)****2. CHECK IF THE DTC IS CURRENT**

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Ignition on, engine not running.

With the scan tool, erase Transmission DTC's.

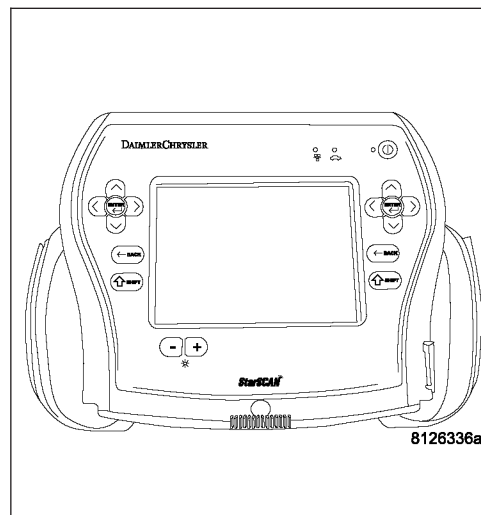
Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

**Did the DTC U0100-LOST COMMUNICATION WITH ECM/PCM reset?**

**Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3



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**3. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

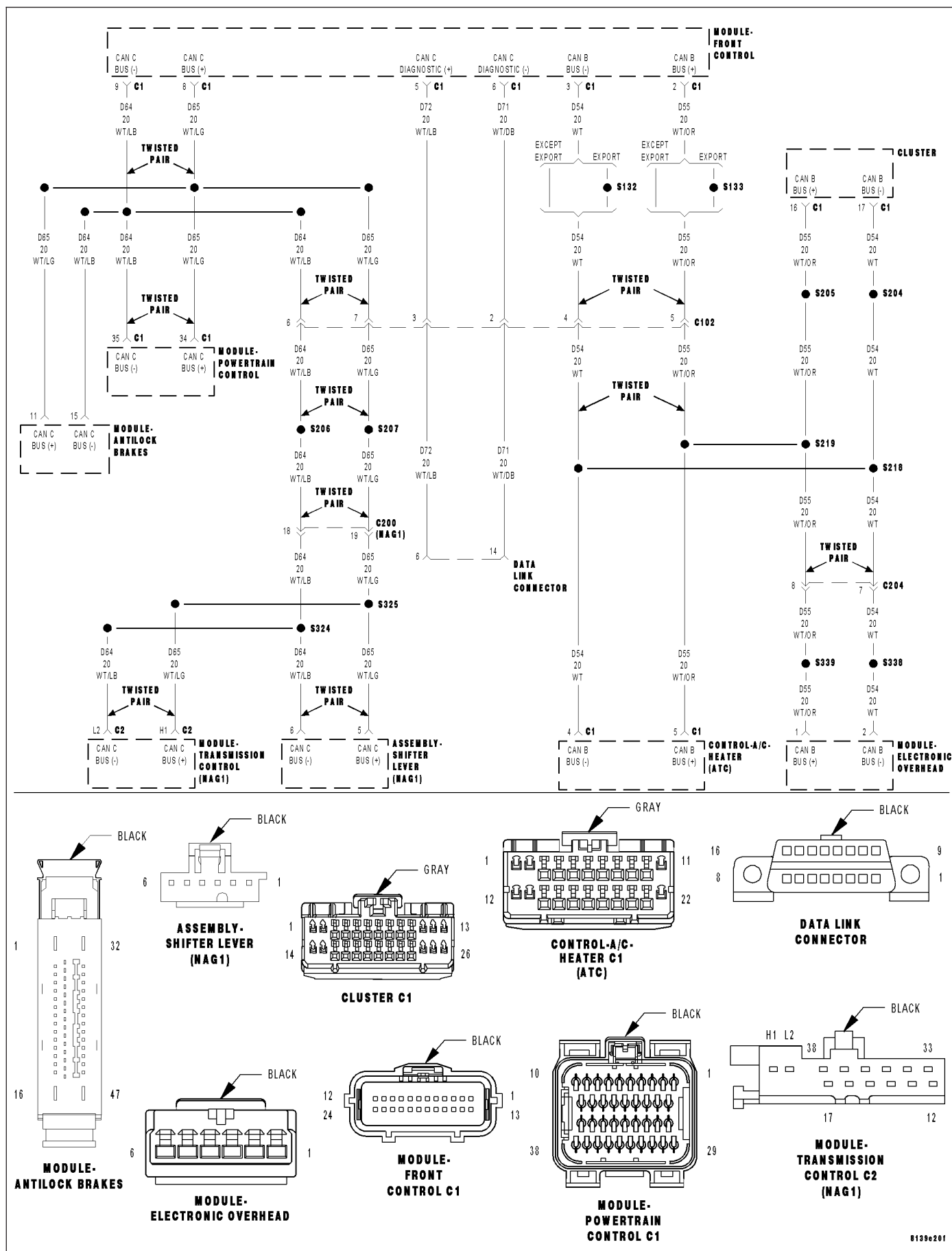
**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

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## U0103-LOST COMMUNICATION WITH ELECTRIC GEAR SHIFT MODULE



**U0103-LOST COMMUNICATION WITH ELECTRIC GEAR SHIFT MODULE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) receives information from the Engine, Anti-lock Brake System, and the Electronic Gear Shift control modules over the CAN C bus. The CAN C bus is a high speed communication bus that allows real time control capability between various controllers. Most messages are sent every 20 mSec, this means critical information can be shared between multiple controllers almost instantaneously. The CAN C bus is a two wire bus with a CAN (+) and a CAN (-) circuit. To reduce the potential of radio and other electrical noise interference, the CAN Bus circuit wiring is manufactured using a twisted pair configuration within the electrical wiring harness.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The DTC will set if a valid CAN ID was not received in the required time from the Electronic Gear Shift Module.

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

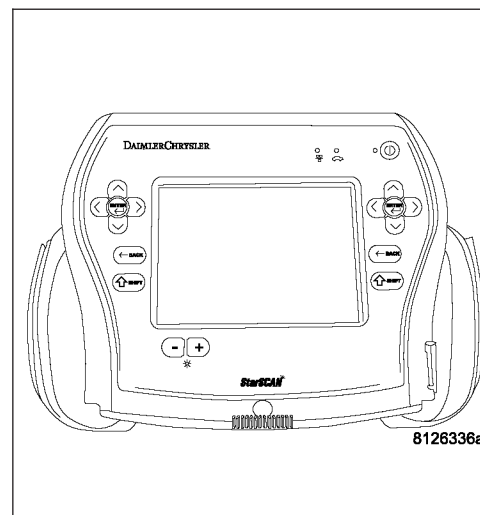
**Diagnostic Test****1. CHECK THE FCM FOR CAN C BUS COMMUNICATION DTCS**

With the scan tool, check for FCM DTCs.

**Does the FCM report the DTC U0001-CAN C BUS DTC or U0100-LOST COMMUNICATION WITH ECM/PCM?**

**Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom. Perform the diagnostic procedure for U0001-CAN C BUS first if it is present.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2



**U0103-LOST COMMUNICATION WITH ELECTRIC GEAR SHIFT MODULE (CONTINUED)****2. CHECK IF THE DTC IS CURRENT**

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Ignition on, engine not running.

With the scan tool, erase Transmission DTC's.

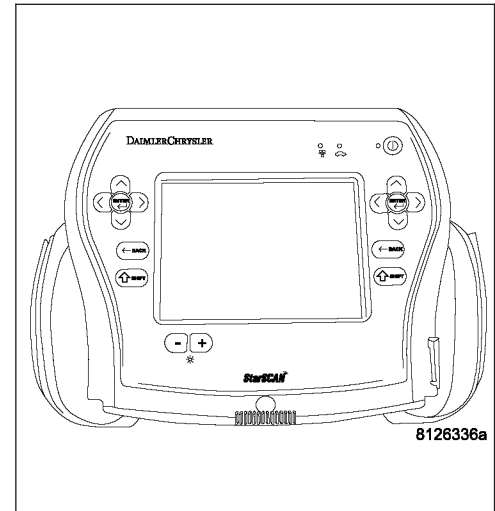
Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

**Did the DTC U0100-LOST COMMUNICATION WITH ECM/PCM reset?**

**Yes**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 3



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**3. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

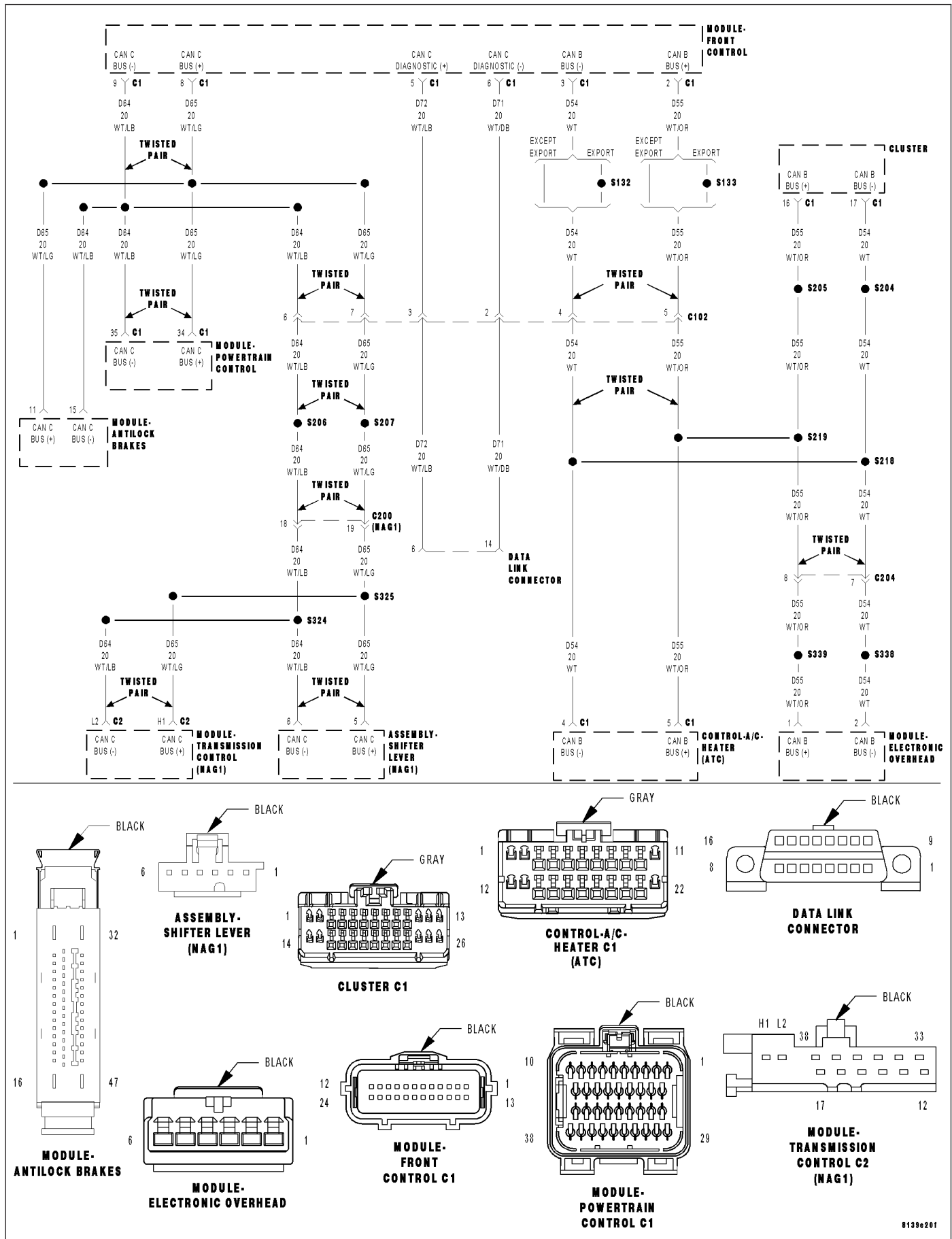
**Were there any problems found?**

**Yes**    >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.

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## U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE



**U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) receives information from the Engine, Anti-lock Brake System, and the Electronic Gear Shift control modules over the CAN C bus. The CAN C bus is a high speed communication bus that allows real time control capability between various controllers. Most messages are sent every 20 mSec, this means critical information can be shared between multiple controllers almost instantaneously. The CAN C bus is a two wire bus with a CAN (+) and a CAN (-) circuit. To reduce the potential of radio and other electrical noise interference, the CAN Bus circuit wiring is manufactured using a twisted pair configuration within the electrical wiring harness.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The DTC will set if a valid CAN ID was not received in the required time from the ABS.

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

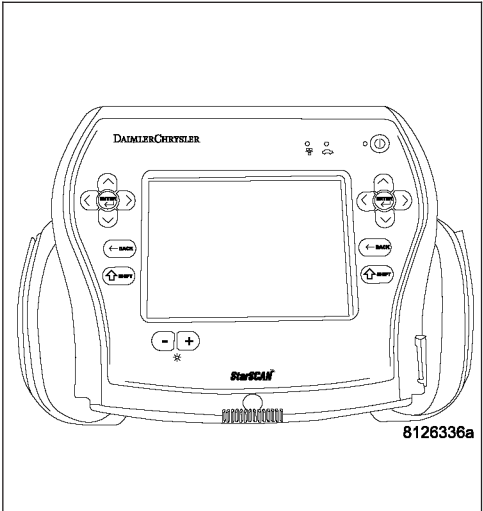
**Diagnostic Test**

**1. CHECK THE FCM FOR CAN C BUS COMMUNICATION DTCS**

With the scan tool, check for FCM DTCs.

**Does the FCM report the DTC U0001-CAN C BUS DTC or U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE?**

- Yes**    >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom. Perform the diagnostic procedure for U0001-CAN C BUS first if it is present.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Go To 2



**U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE (CONTINUED)****2. CHECK IF THE DTC IS CURRENT**

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Ignition on, engine not running.

With the scan tool, erase Transmission DTC's.

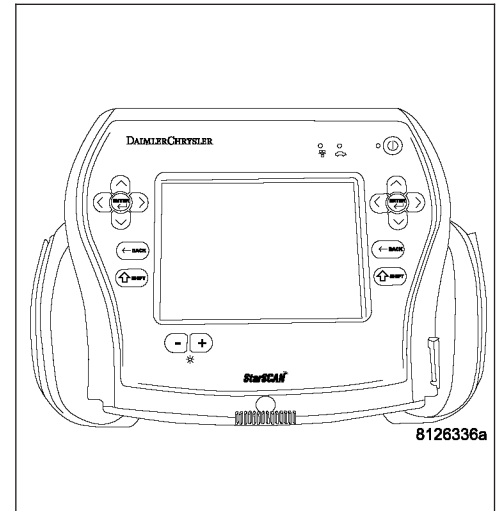
Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

**Did the DTC U0121-LOST COMMUNICATION WITH ANTILOCK BRAKE MODULE reset?**

**Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3



---

**3. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

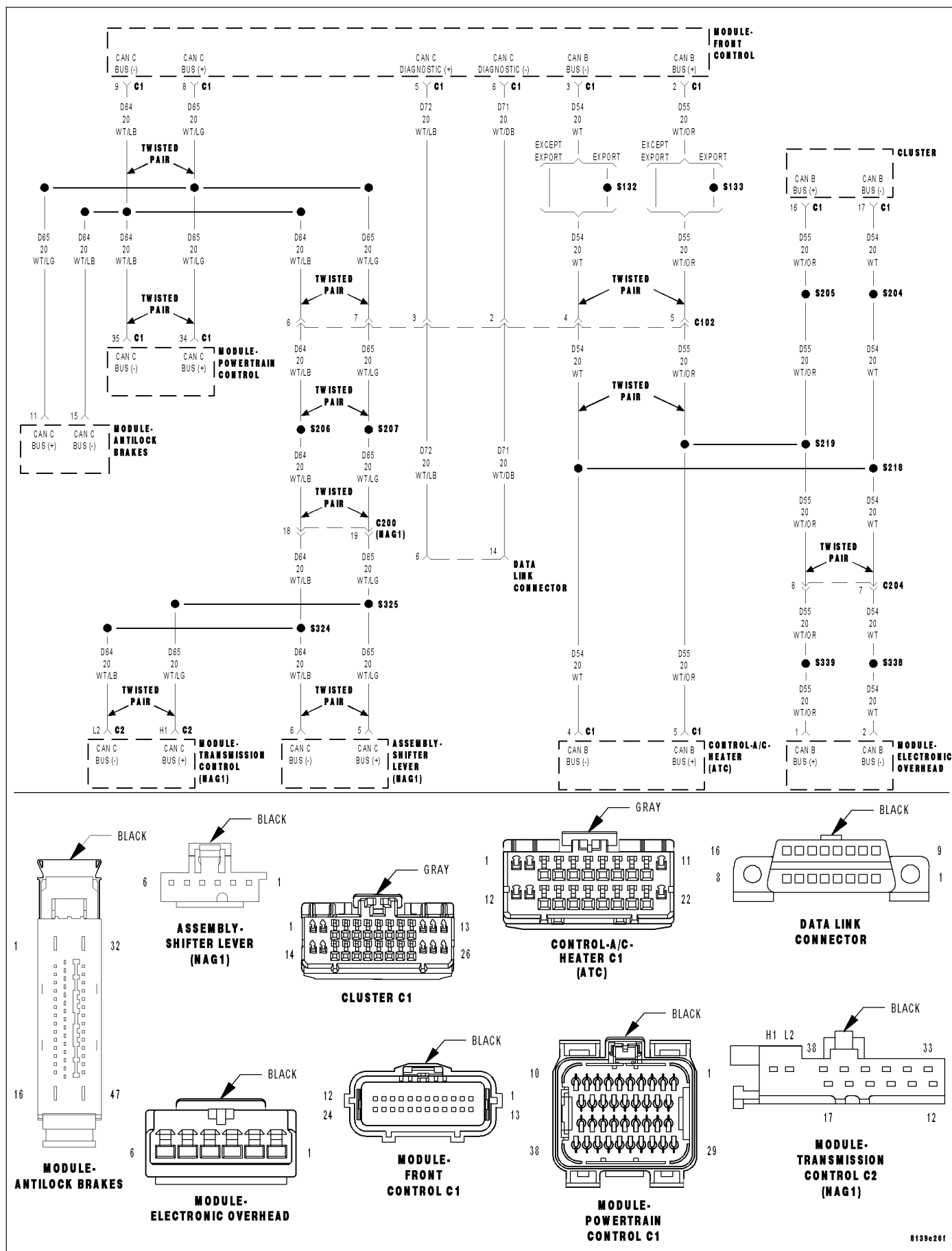
**Yes** >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

---



# U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE



**U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) receives information from the Engine, Anti-lock Brake System, and the Electronic Gear Shift control modules over the CAN C bus. The CAN C bus is a high speed communication bus that allows real time control capability between various controllers. Most messages are sent every 20 mSec, this means critical information can be shared between multiple controllers almost instantaneously. The CAN C bus is a two wire bus with a CAN (+) and a CAN (-) circuit. To reduce the potential of radio and other electrical noise interference, the CAN Bus circuit wiring is manufactured using a twisted pair configuration within the electrical wiring harness.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The DTC will set if a valid CAN ID was not received in the required time from the Front Control Module (FCM).

Possible Causes
TRANSMISSION CONTROL MODULE

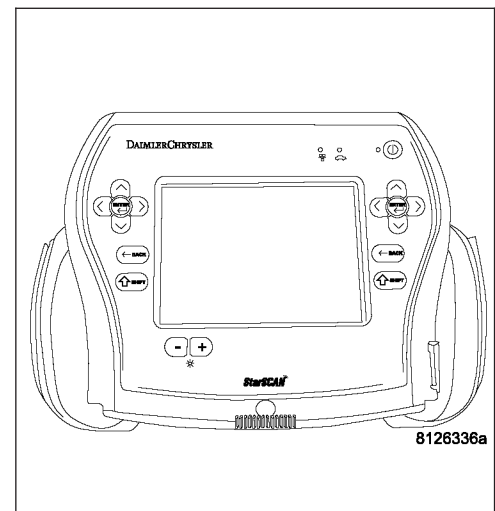
**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK THE FCM FOR CAN C BUS COMMUNICATION DTCS**

With the scan tool, check for FCM DTCs.

**Does the FCM report the DTC U0001-CAN C BUS DTC or U0101-LOST COMMUNICATION WITH TCM?**

- Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom. Perform the diagnostic procedure for U0001-CAN C BUS first if it is present.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Go To 2



**U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE (CONTINUED)****2. CHECK IF THE DTC IS CURRENT**

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Ignition on, engine not running.

With the scan tool, erase Transmission DTC's.

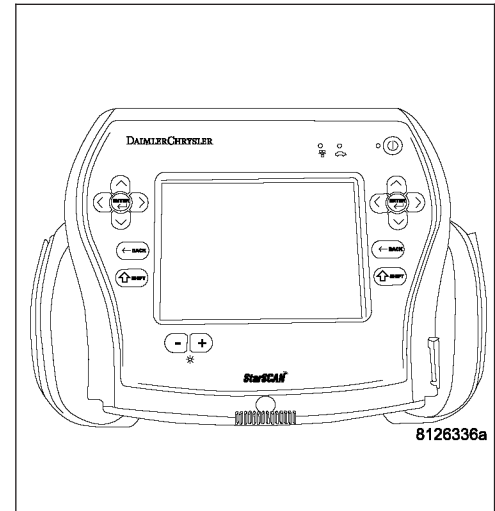
Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

**Did the DTC U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE reset?**

**Yes**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 3



---

**3. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

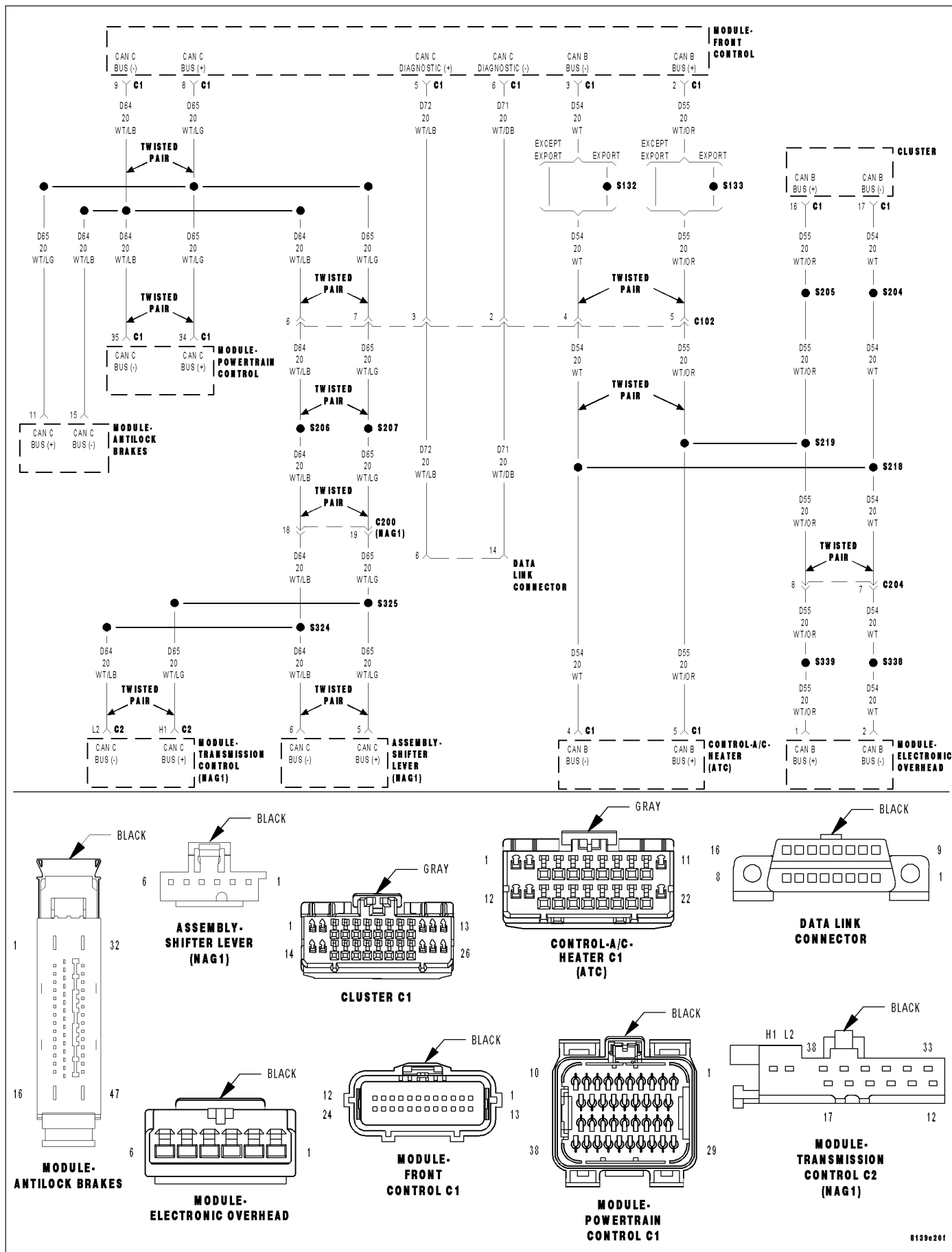
**Were there any problems found?**

**Yes**    >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.

---

# U0155-LOST COMMUNICATION WITH CLUSTER/CCN



U0155-LOST COMMUNICATION WITH CLUSTER/CCN (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The Transmission Control Module (TCM) receives information from the Engine, Anti-lock Brake System, and the Electronic Gear Shift control modules over the CAN C bus. The CAN C bus is a high speed communication bus that allows real time control capability between various controllers. Most messages are sent every 20 mSec, this means critical information can be shared between multiple controllers almost instantaneously. The CAN C bus is a two wire bus with a CAN (+) and a CAN (-) circuit. To reduce the potential of radio and other electrical noise interference, the CAN Bus circuit wiring is manufactured using a twisted pair configuration within the electrical wiring harness.

- **When Monitored:**  
Continuously with the ignition on.
  - **Set Condition:**  
The DTC will set if a valid CAN ID was not received in the required time from the Cluster/CCN.

Possible Causes
TRANSMISSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK THE FCM FOR CAN C BUS COMMUNICATION DTCS

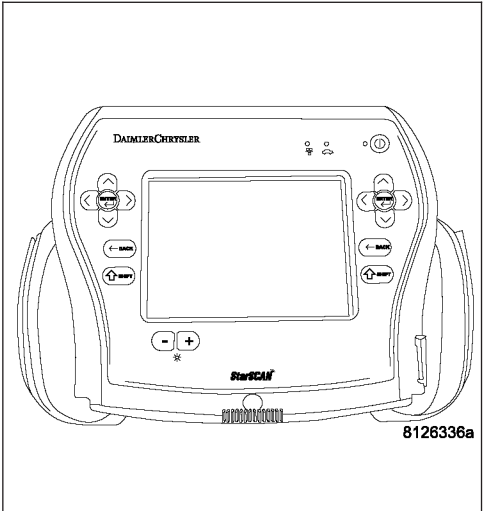
With the scan tool, check for FCM DTCs.

Does the FCM report the DTC U0001-CAN C BUS DTC or U0155-LOST COMMUNICATION WITH CLUSTER/CCN?

- Yes

>> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom. Perform the diagnostic procedure for U0001-CAN C BUS first if it is present.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No

>> Go To 2



**U0155-LOST COMMUNICATION WITH CLUSTER/CCN (CONTINUED)****2. CHECK IF THE DTC IS CURRENT**

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Ignition on, engine not running.

With the scan tool, erase Transmission DTC's.

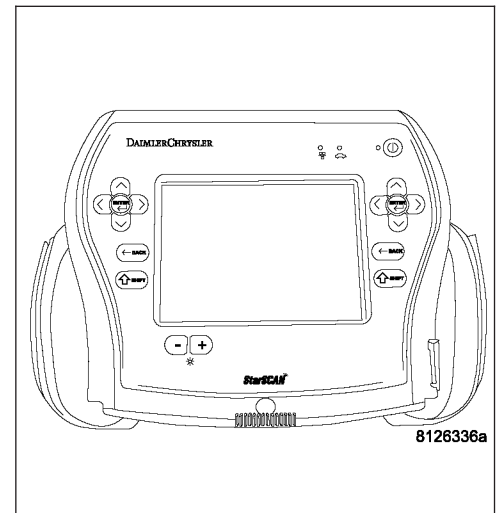
Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

**Did the DTC U0155-LOST COMMUNICATION WITH CLUSTER/CCN reset?**

**Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3



---

**3. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

---



**U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) receives information from the Engine, Anti-lock Brake System, and the Electronic Gear Shift control modules over the CAN C bus. The CAN C bus is a high speed communication bus that allows real time control capability between various controllers. Most messages are sent every 20 mSec, this means critical information can be shared between multiple controllers almost instantaneously. The CAN C bus is a two wire bus with a CAN (+) and a CAN (-) circuit. To reduce the potential of radio and other electrical noise interference, the CAN Bus circuit wiring is manufactured using a twisted pair configuration within the electrical wiring harness.

- **When Monitored:**

Continuously with the ignition on.

- **Set Condition:**

The DTC will set if a valid CAN ID was not received in the required time from the HVAC Control Module.

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

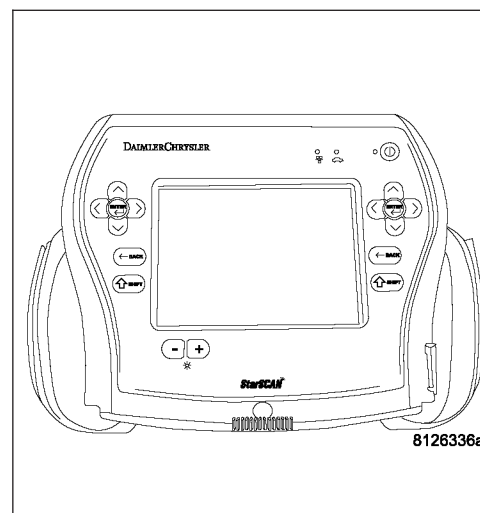
**Diagnostic Test****1. CHECK THE FCM FOR CAN C BUS COMMUNICATION DTCS**

With the scan tool, check for FCM DTCs.

**Does the FCM report the DTC U0001-CAN C BUS DTC or U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE?**

**Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom. Perform the diagnostic procedure for U0001-CAN C BUS first if it is present. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2





**U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE (CONTINUED)****2. CHECK IF THE DTC IS CURRENT**

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Ignition on, engine not running.

With the scan tool, erase Transmission DTC's.

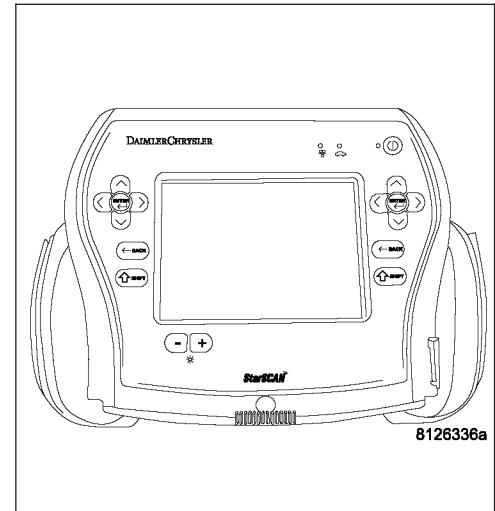
Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

With the scan tool, read Transmission DTC's.

**Did the DTC U0164-LOST COMMUNICATION WITH HVAC CONTROL MODULE reset?**

**Yes**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 3



---

**3. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

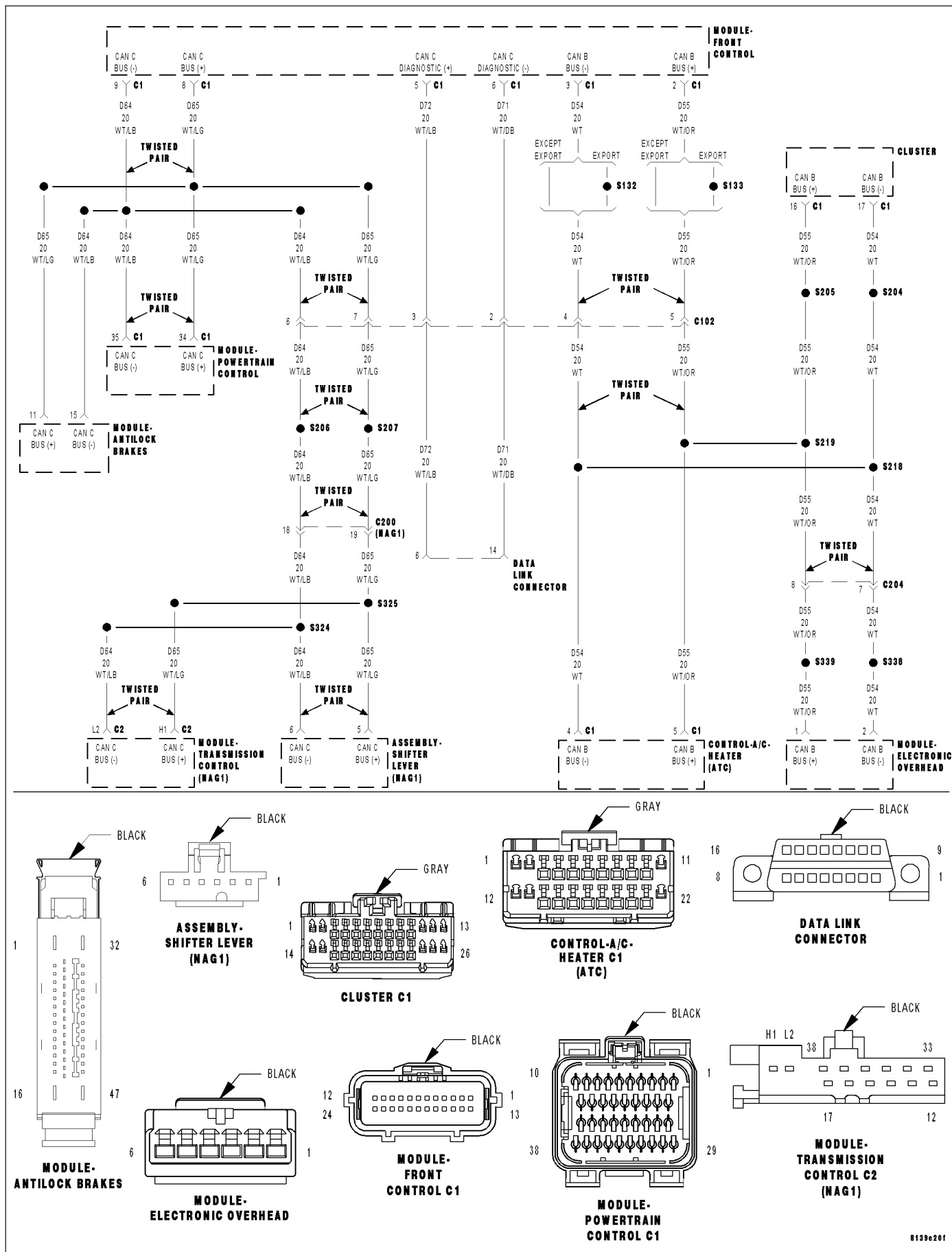
**Were there any problems found?**

**Yes**    >> Repair as necessary.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.

---

# U0401-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM



U0401-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN message received at least once, and no U0002-CAN C Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN message from the Engine Control Module (ECM).

Possible Causes
FCM CAN BUS DTCS ENGINE DTCS TRANSMISSION CONTROL MODULE

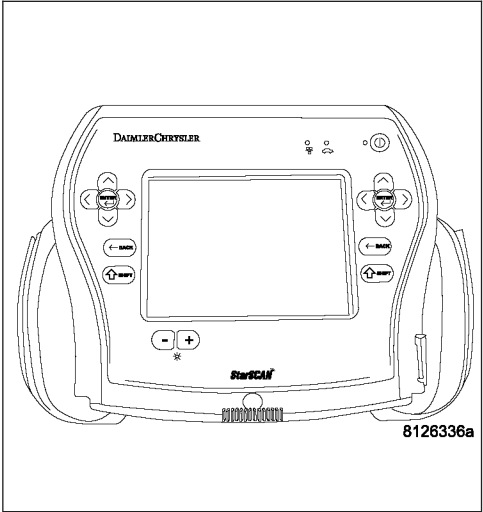
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK IF FCM CAN BUS DTC'S ARE PRESENT

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?
- Yes**    >> Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING and diagnose the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Go To 2

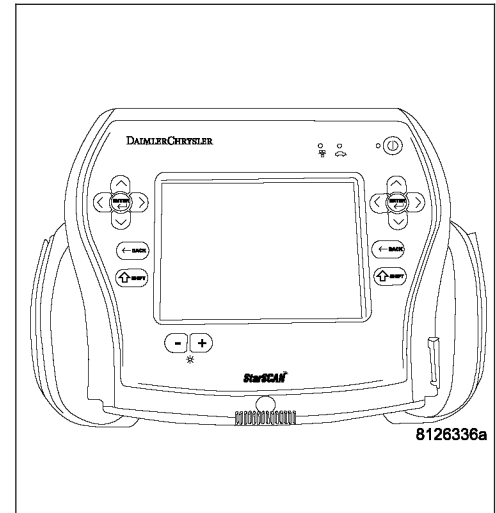


**U0401-IMPLAUSIBLE DATA RECEIVED FROM ECM/PCM (CONTINUED)****2. CHECK IF ENGINE DTC'S ARE PRESENT**

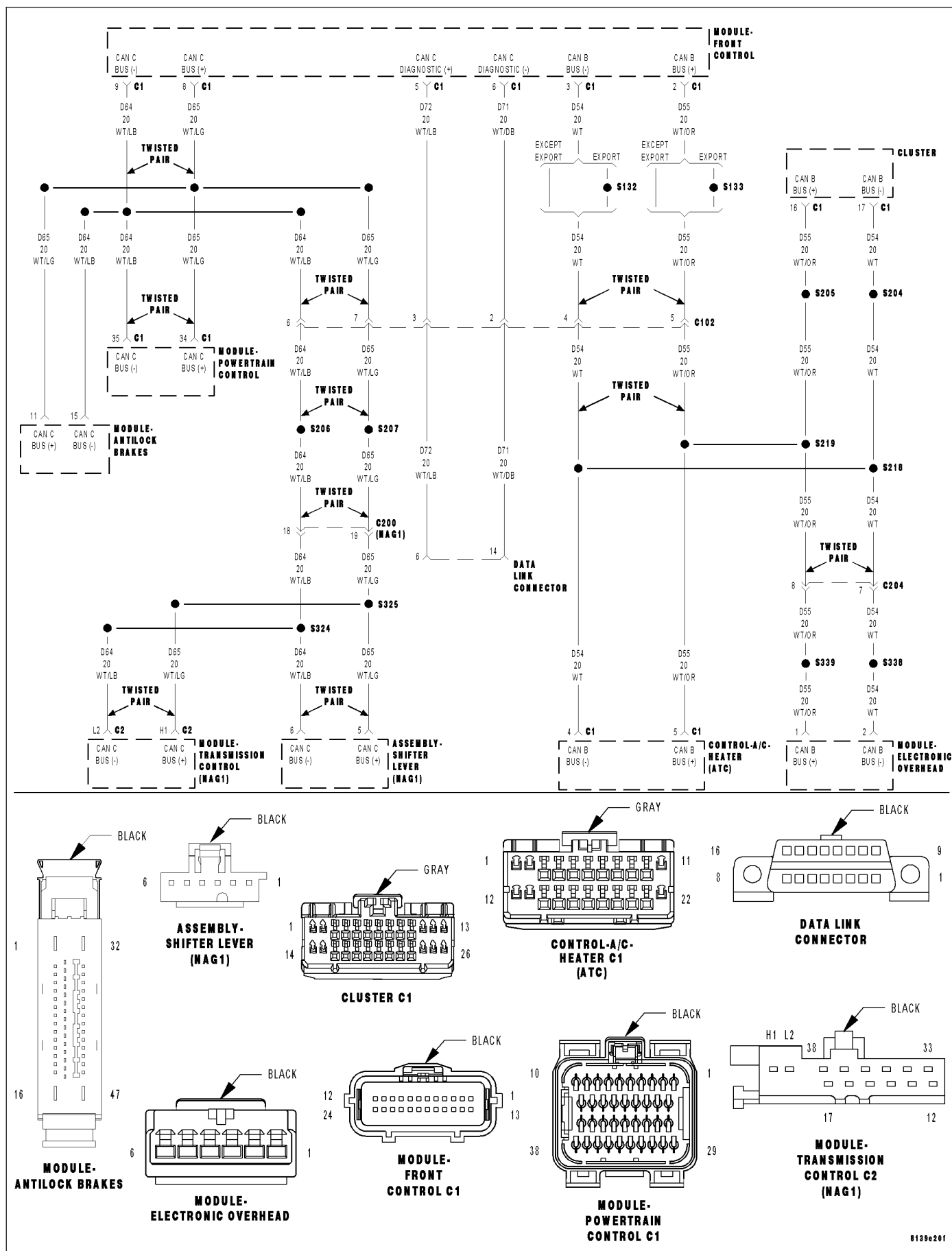
With the scan tool, read Engine DTCs.

**Are there any Engine DTC's present?**

- Yes** >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



## U0404-IMPLAUSIBLE DATA RECEIVED FROM ESM



**U0404-IMPLAUSIBLE DATA RECEIVED FROM ESM (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the Electronic Shift Module (ESM).

Possible Causes
FCM CAN BUS DTC'S PRESENT ELECTRONIC SHIFT MODULE DTC'S PRESENT TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

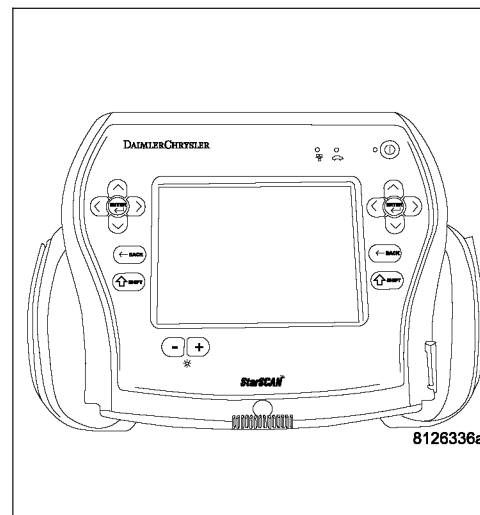
**Diagnostic Test****1. CHECK FOR FCM CAN BUS DTCS**

With the scan tool, read FCM DTCs.

**Are there any FCM CAN BUS DTC's present?**

**Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2

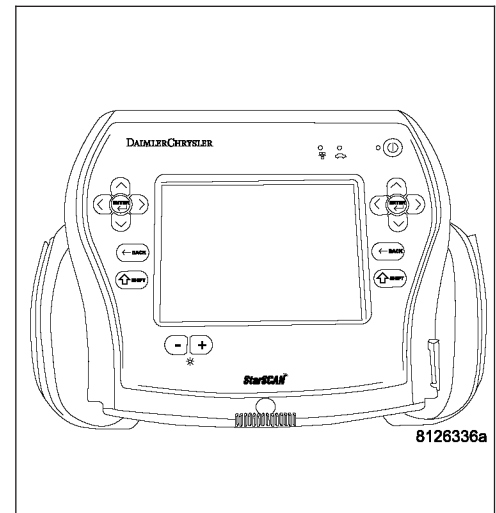


**U0404-IMPLAUSIBLE DATA RECEIVED FROM ESM (CONTINUED)****2. ELECTRONIC SHIFT MODULE DTC'S PRESENT**

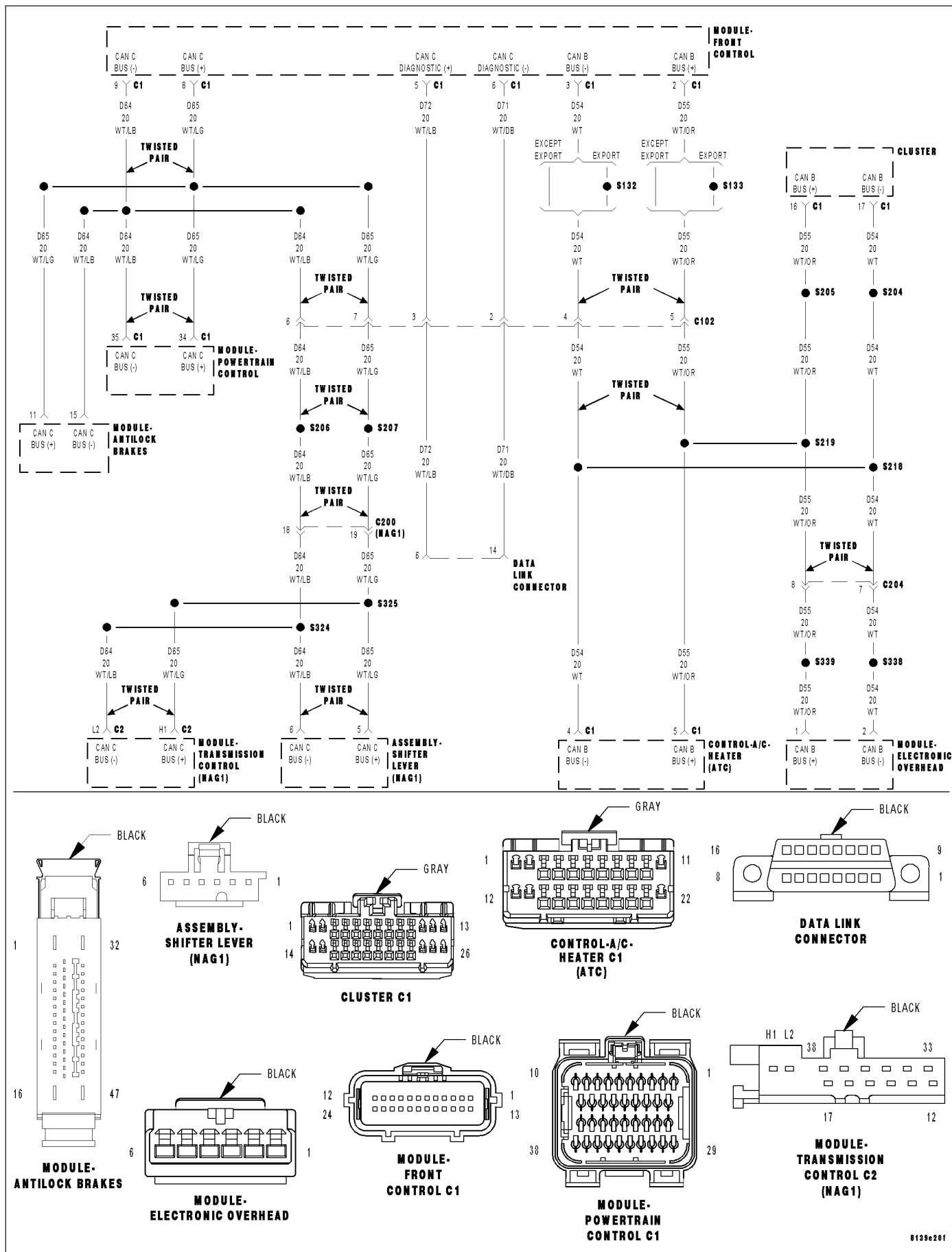
With the scan tool, read Electronic Shift Module (ESM) DTCs.

**Are there any ESM DTC's present?**

- Yes**    >> Refer to Section 21 – AUTOMATIC TRANSMISSION NAG1 - SHIFTER DIAGNOSTICS and perform the appropriate diagnostic procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



# U0415-IMPLAUSIBLE DATA RECEIVED FROM ABS





U0415-IMPLAUSIBLE DATA RECEIVED FROM ABS (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the ABS control module.

Possible Causes
FCM CAN BUS DTC'S PRESENT ABS DTC'S PRESENT TRANSMISSION CONTROL MODULE

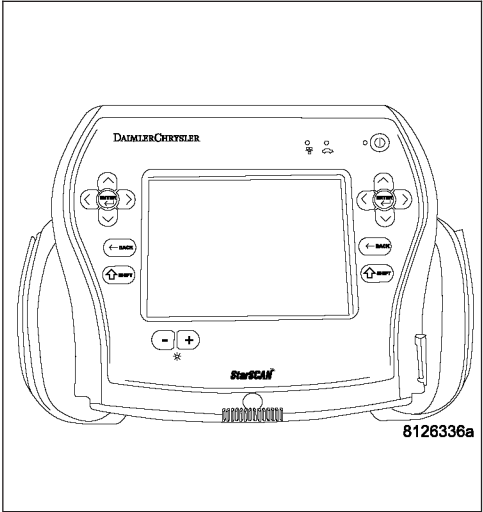
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR FCM CAN BUS DTCS

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?
- Yes**    >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No**     >> Go To 2

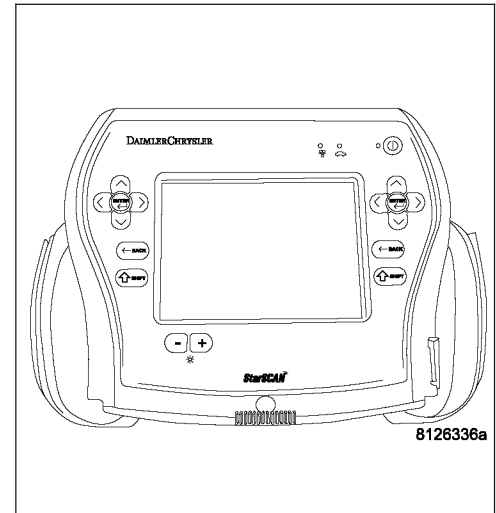


**U0415-IMPLAUSIBLE DATA RECEIVED FROM ABS (CONTINUED)****2. CHECK IF ABS DTC'S ARE PRESENT**

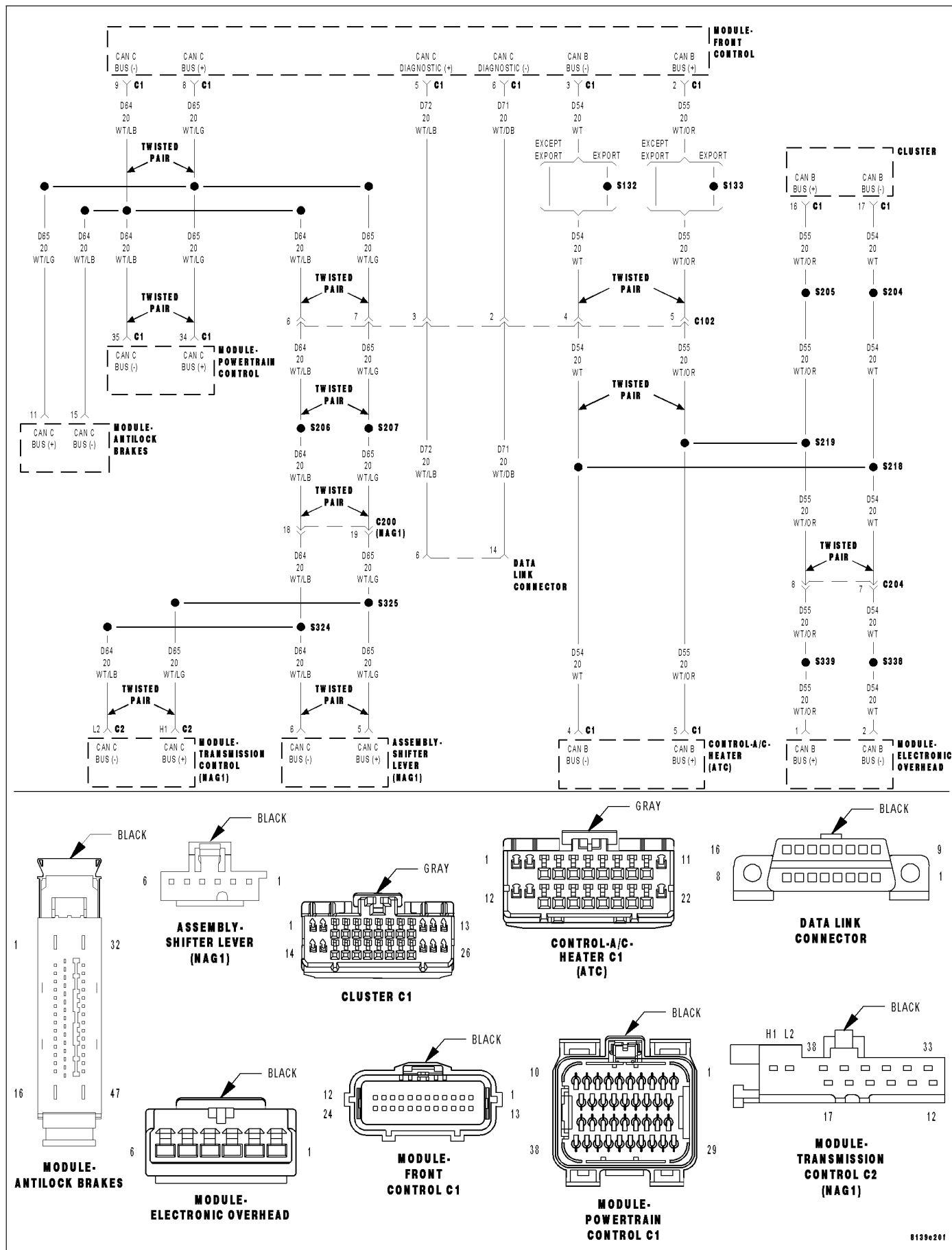
With the scan tool, read ABS DTCs.

**Are there any ABS DTC's present?**

- Yes** >> Refer to Section 5 - BRAKES - ABS ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



# U0423-IMPLAUSIBLE DATA RECEIVED FROM CLUSTER/CCN



**U0423-IMPLAUSIBLE DATA RECEIVED FROM CLUSTER/CCN (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the CLUSTER/CCN.

Possible Causes
CAN BUS DTC'S PRESENT CLUSTER/CCN MODULE DTC'S PRESENT TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

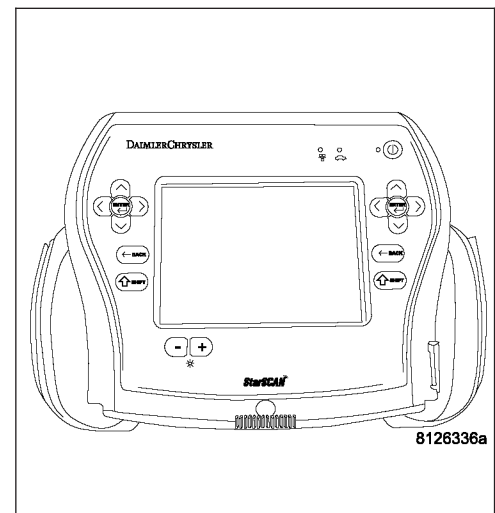
**Diagnostic Test****1. CHECK FOR FCM CAN BUS DTCS**

With the scan tool, read FCM DTCs.

**Are there any FCM CAN BUS DTC's present?**

**Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2



**U0423-IMPLAUSIBLE DATA RECEIVED FROM CLUSTER/CCN (CONTINUED)****2. CHECK IF CLUSTER/CCN DTC'S ARE PRESENT**

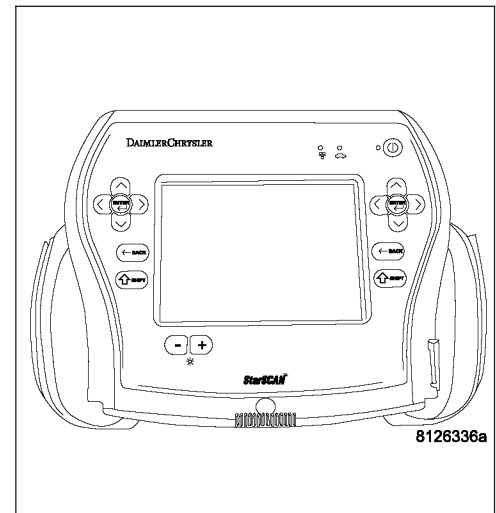
With the scan tool, read CLUSTER/CCN DTCs.

**Are there any CLUSTER/CCN DTC's present?**

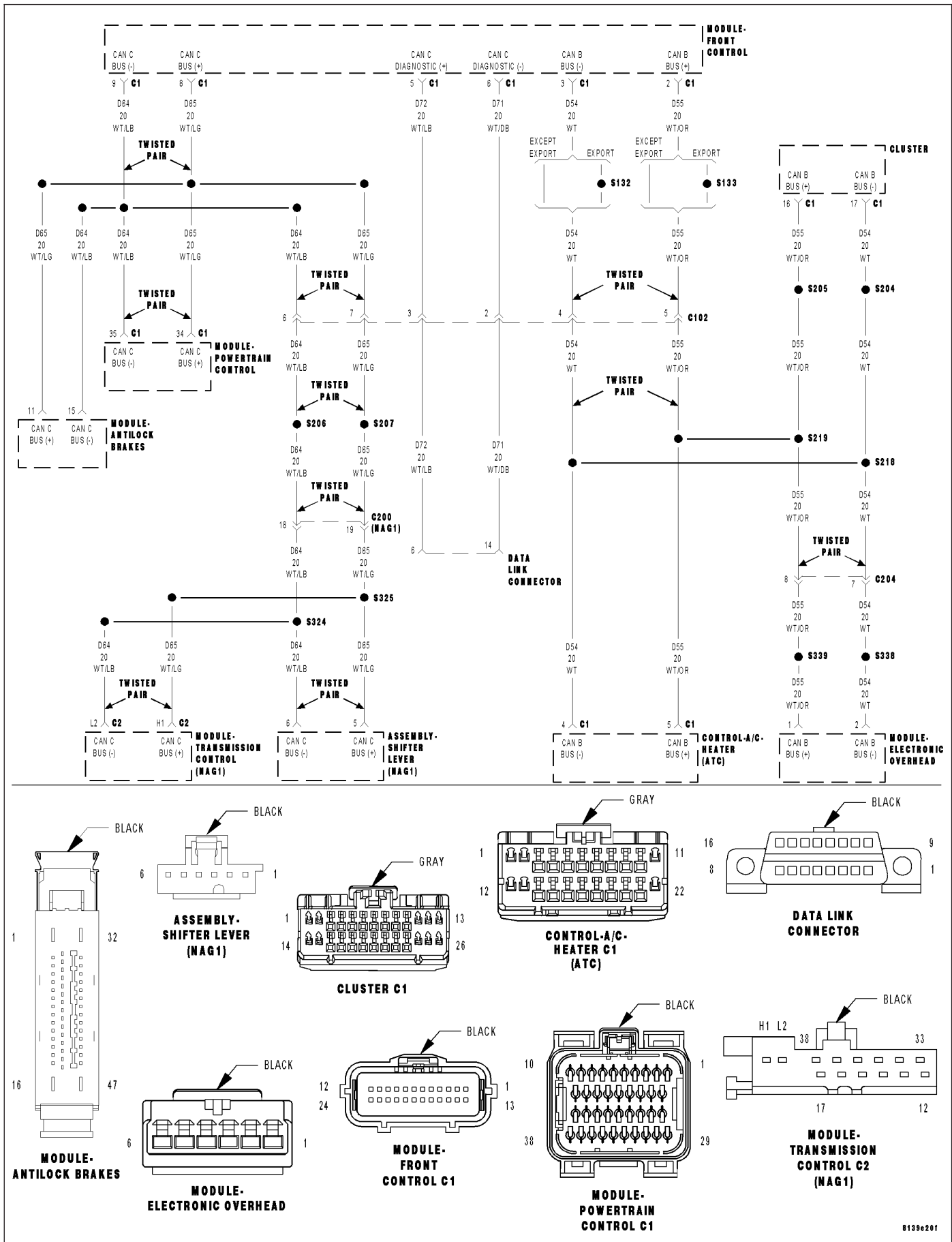
**Yes**    >> Refer to Section Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/INSTRUMENT CLUSTER - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



## U0424-IMPLAUSIBLE DATA RECEIVED FROM HVAC CONTROL MODULE



U0424-IMPLAUSIBLE DATA RECEIVED FROM HVAC CONTROL MODULE (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the HVAC control module.

Possible Causes
CAN BUS DTC'S PRESENT HVAC DTC'S PRESENT TRANSMISSION CONTROL MODULE

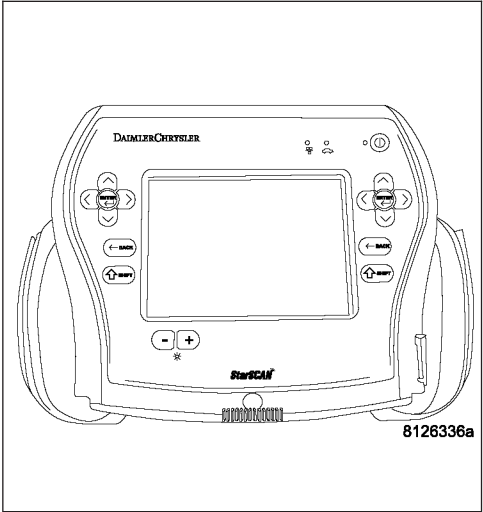
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR FCM CAN BUS DTCS

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?
- Yes**    >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No**     >> Go To 2

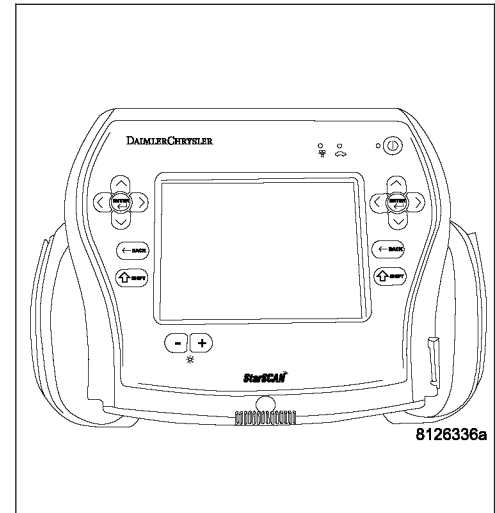


**U0424-IMPLAUSIBLE DATA RECEIVED FROM HVAC CONTROL MODULE (CONTINUED)****2. CHECK IF HVAC DTC'S ARE PRESENT**

With the scan tool, read HVAC DTCs.

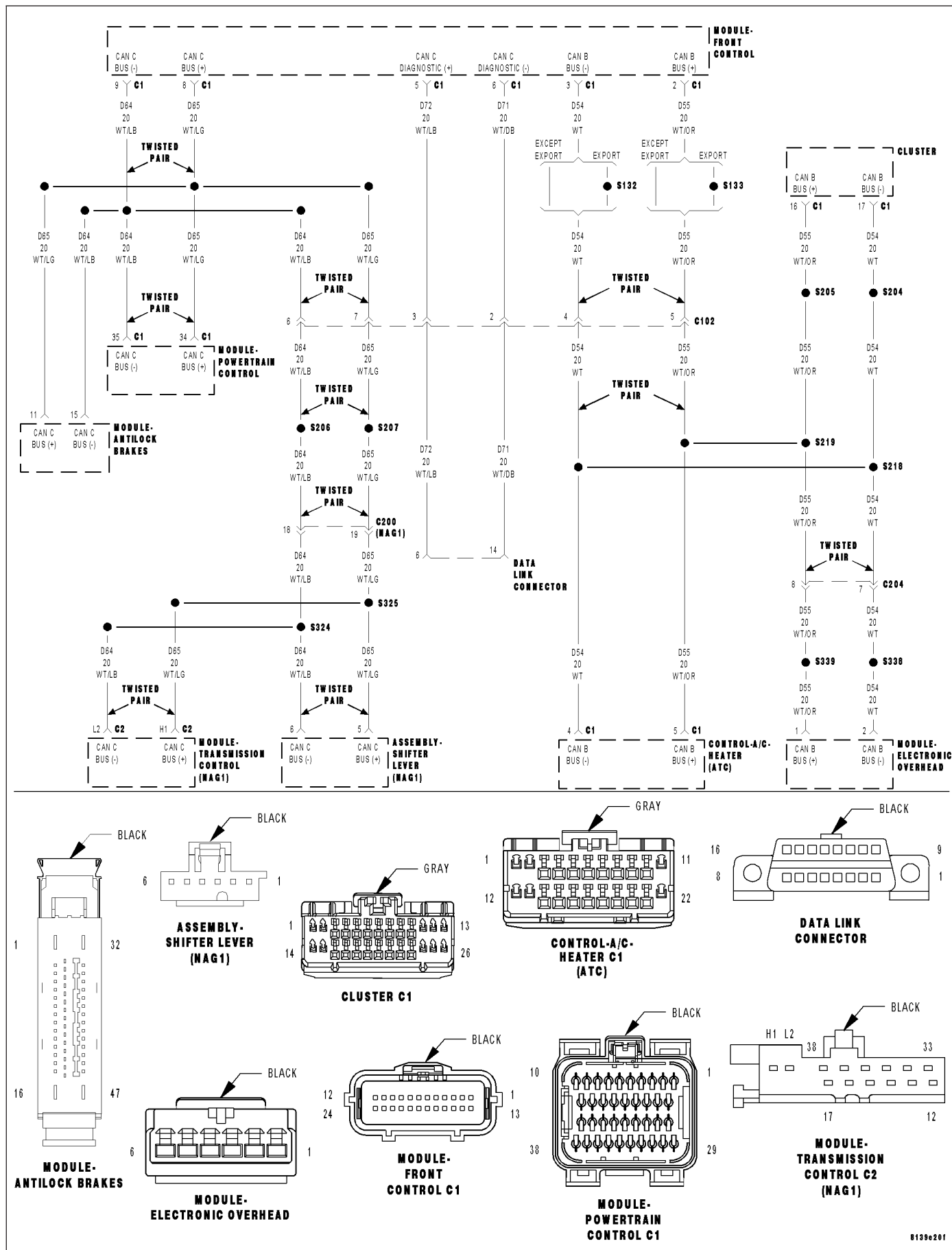
**Are there any HVAC DTC's present?**

- Yes** >> Refer to Section 24 - HVAC - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.





# U0431-IMPLAUSIBLE DATA FROM FCM



**U0431-IMPLAUSIBLE DATA FROM FCM (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the FCM.

Possible Causes
FCM CAN BUS DTC'S PRESENT TRANSMISSION CONTROL MODULE

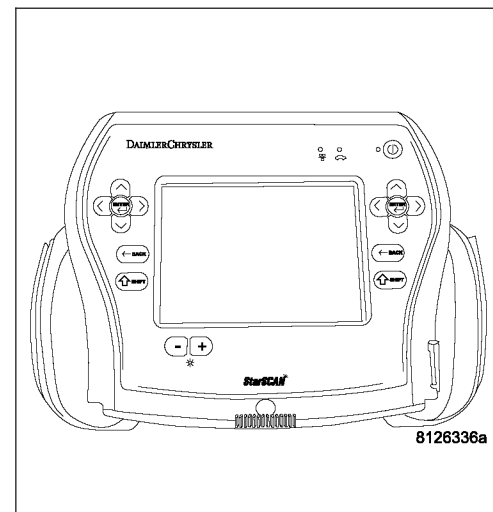
**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK FOR FCM CAN BUS DTCS**

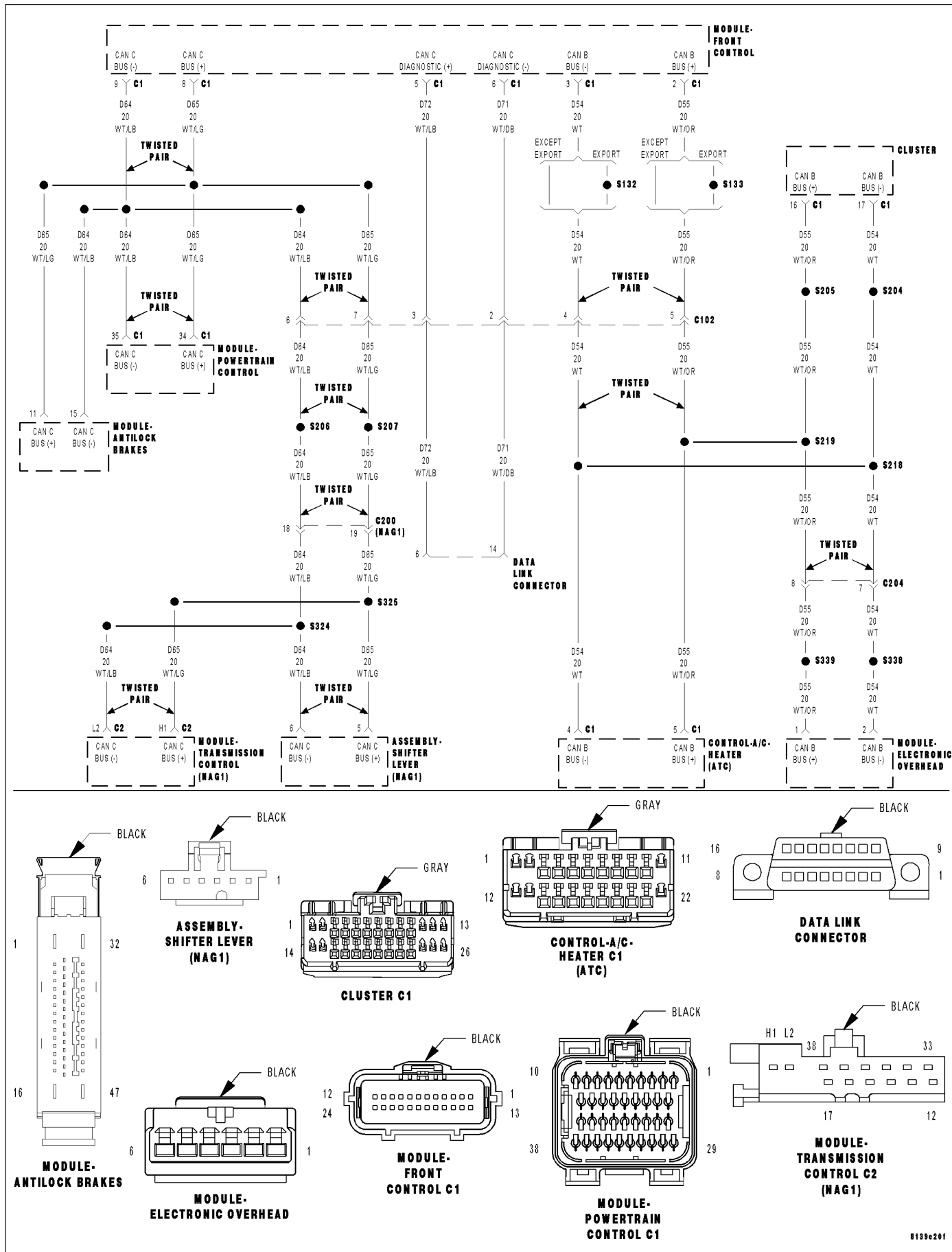
With the scan tool, read FCM DTCs.

**Are there any FCM CAN BUS DTC's present?**

- Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



## U110B-LOST ENGINE COOLANT MESSAGE



**U110B-LOST ENGINE COOLANT MESSAGE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) receives information from the Engine, Anti-lock Brake System, and the Electronic Gear Shift control modules over the CAN C bus. The CAN C bus is a high speed communication bus that allows real time control capability between various controllers. Most messages are sent every 20 mSec, this means critical information can be shared between multiple controllers almost instantaneously. The CAN C bus is a two wire bus with a CAN (+) and a CAN (-) circuit. To reduce the potential of radio and other electrical noise interference, the CAN Bus circuit wiring is manufactured using a twisted pair configuration within the electrical wiring harness.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The DTC will set if a valid CAN ID was not received in the required time from the ECM/PCM.

Possible Causes
TRANSMISSION CONTROL MODULE

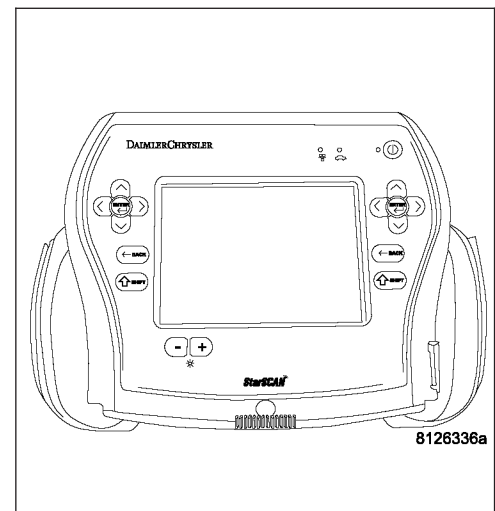
**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test****1. CHECK THE FCM FOR CAN C BUS COMMUNICATION DTCS**

With the scan tool, check for FCM DTCs.

**Does the FCM report the DTC U0001-CAN C BUS DTC or U0100-LOST COMMUNICATION WITH ECM/PCM?**

- Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom. Perform the diagnostic procedure for U0001-CAN C BUS first if it is present.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Go To 2



**U110B-LOST ENGINE COOLANT MESSAGE (CONTINUED)****2. CHECK IF THE DTC IS CURRENT**

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Ignition on, engine not running.

With the scan tool, erase Transmission DTC's.

Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

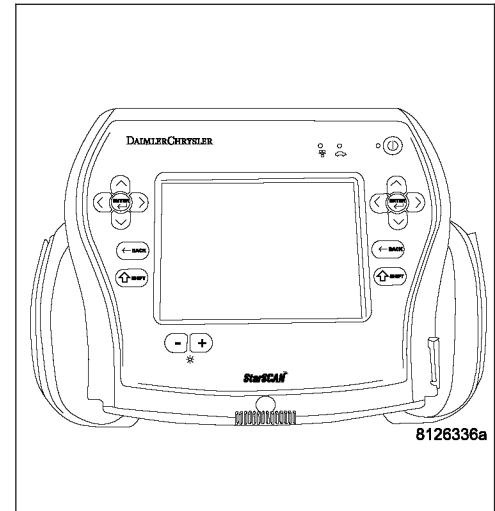
With the scan tool, read Transmission DTC's.

**Did the DTC U110B-LOST ENGINE COOLANT MESSAGE reset?**

**Yes**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 3

**3. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

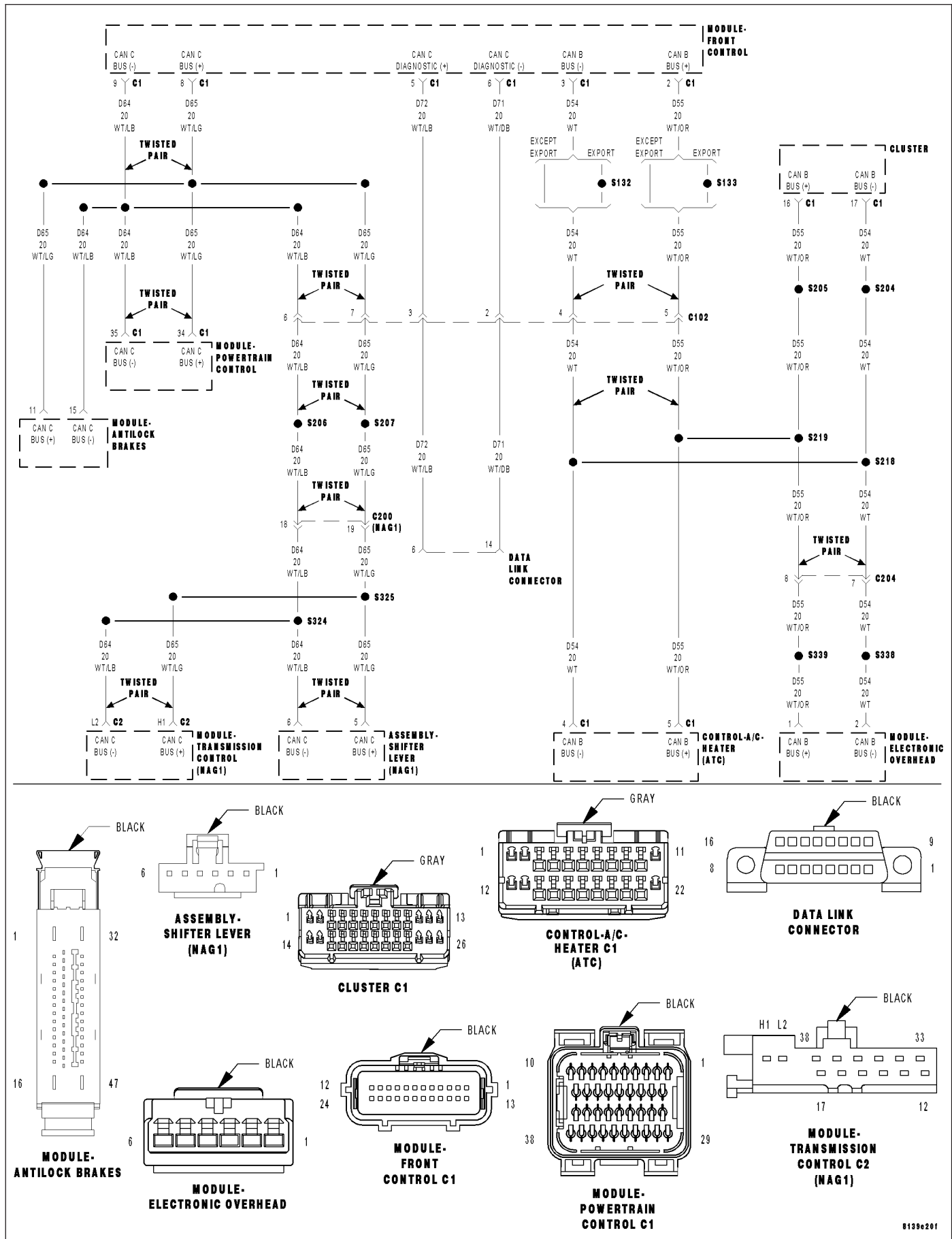
**Were there any problems found?**

**Yes**    >> Repair as necessary.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.

# U1118-LOST ENGINE MESSAGE



U1118-LOST ENGINE MESSAGE (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The Transmission Control Module (TCM) receives information from the Engine, Anti-lock Brake System, and the Electronic Gear Shift control modules over the CAN C bus. The CAN C bus is a high speed communication bus that allows real time control capability between various controllers. Most messages are sent every 20 mSec, this means critical information can be shared between multiple controllers almost instantaneously. The CAN C bus is a two wire bus with a CAN (+) and a CAN (-) circuit. To reduce the potential of radio and other electrical noise interference, the CAN Bus circuit wiring is manufactured using a twisted pair configuration within the electrical wiring harness.

- **When Monitored:**  
Continuously with the ignition on.
  - **Set Condition:**  
The DTC will set if a valid CAN ID was not received in the required time from the ECM/PCM.

Possible Causes
TRANSMISSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK THE FCM FOR CAN C BUS COMMUNICATION DTCS

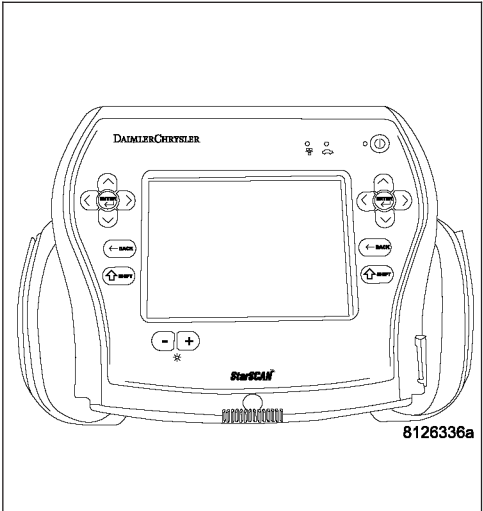
With the scan tool, check for FCM DTCs.

Does the FCM report the DTC U0001-CAN C BUS or U0100-LOST COMMUNICATION WITH ECM/PCM?

- Yes

>> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom. Perform the diagnostic procedure for U0001-CAN C BUS first if it is present.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No

>> Go To 2



**U1118-LOST ENGINE MESSAGE (CONTINUED)****2. CHECK IF THE DTC IS CURRENT**

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Ignition on, engine not running.

With the scan tool, erase Transmission DTC's.

Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

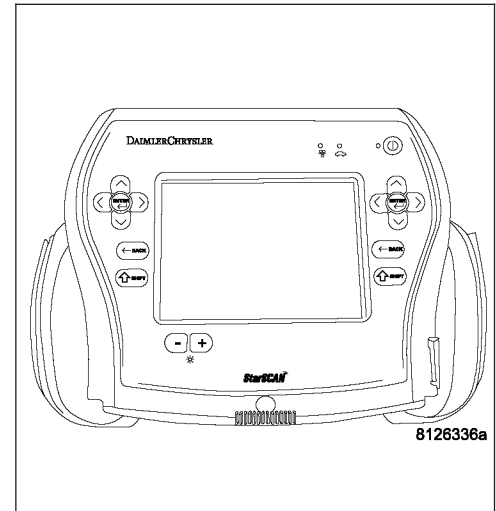
With the scan tool, read Transmission DTC's.

**Did the DTC U1118-LOST ENGINE MESSAGE reset?**

**Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

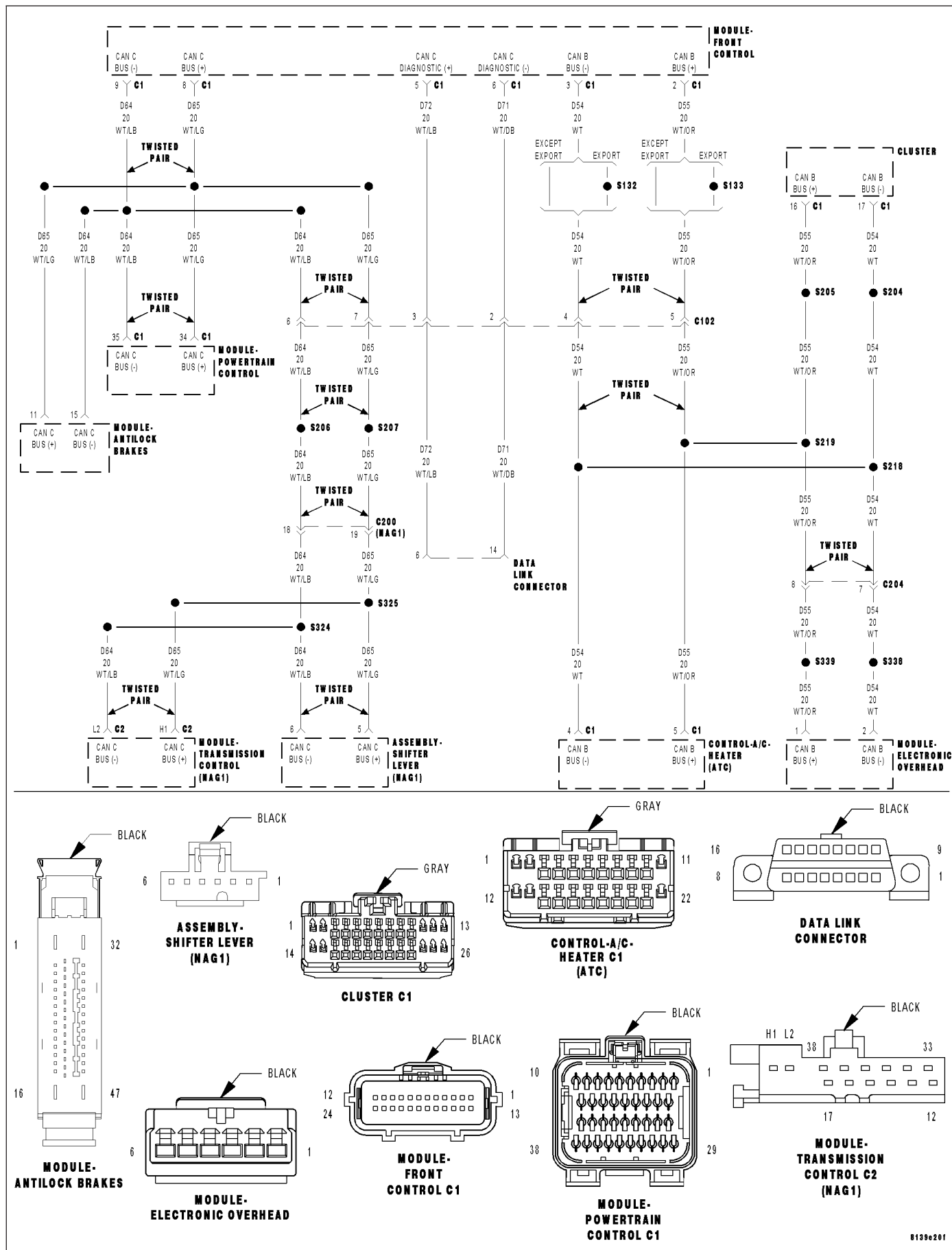
**Yes** >> Repair as necessary.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.



# U1119-LOST FCM MESSAGE



**U1119-LOST FCM MESSAGE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The Transmission Control Module (TCM) receives information from the Engine, Anti-lock Brake System, and the Electronic Gear Shift control modules over the CAN C bus. The CAN C bus is a high speed communication bus that allows real time control capability between various controllers. Most messages are sent every 20 mSec, this means critical information can be shared between multiple controllers almost instantaneously. The CAN C bus is a two wire bus with a CAN (+) and a CAN (-) circuit. To reduce the potential of radio and other electrical noise interference, the CAN Bus circuit wiring is manufactured using a twisted pair configuration within the electrical wiring harness.

- **When Monitored:**

Continuously with the ignition on.

- **Set Condition:**

The DTC will set if a valid CAN ID was not received in the required time from the FCM.

Possible Causes
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

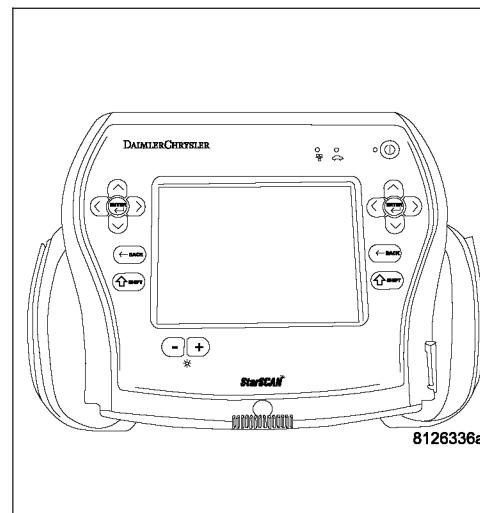
**Diagnostic Test****1. CHECK THE FCM FOR CAN C BUS COMMUNICATION DTCS**

With the scan tool, check for FCM DTCs.

**Does the FCM report the DTC U0001-CAN C BUS or U0101-LOST COMMUNICATION WITH TCM?**

**Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom. Perform the diagnostic procedure for U0001-CAN C BUS first if it is present. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2



**U1119-LOST FCM MESSAGE (CONTINUED)****2. CHECK IF THE DTC IS CURRENT**

**Note:** When the Transmission Control Module (TCM) detects and stores a DTC, the TCM also stores the vehicles operating conditions under which the DTC originally set. This information is located in the scan tool under Environmental Data. Before erasing any stored DTCs, record any available data to assist in duplicating the conditions in which the DTC originally set.

Ignition on, engine not running.

With the scan tool, erase Transmission DTC's.

Using the Environmental Data recorded earlier, try to duplicate the conditions in which the DTC originally set. It may be necessary to test drive the vehicle.

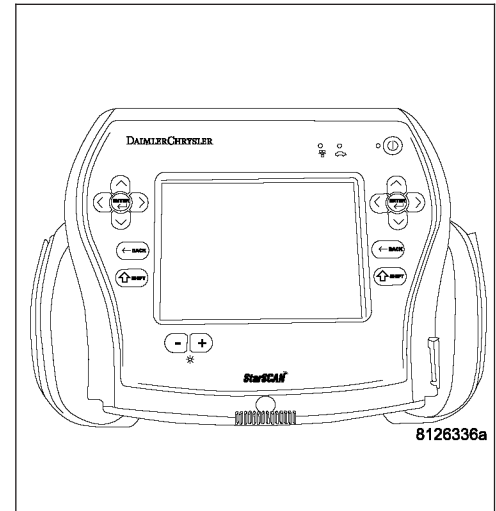
With the scan tool, read Transmission DTC's.

**Did the DTC U1119-LOST FCM MESSAGE reset?**

**Yes** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3



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**3. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

**Were there any problems found?**

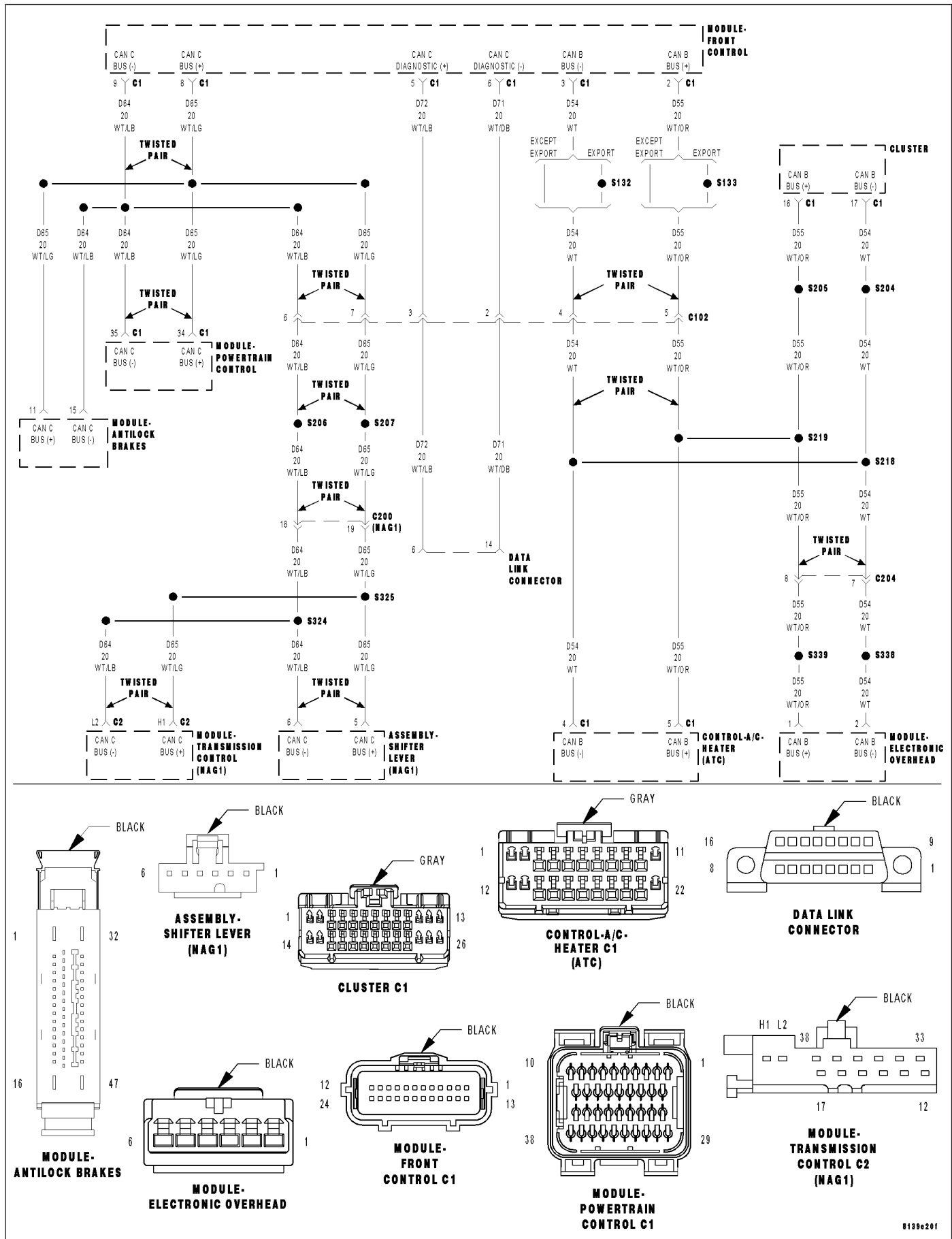
**Yes** >> Repair as necessary.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

---

# U1400-IMPLAUSIBLE TPS SIGNAL RECEIVED



U1400-IMPLAUSIBLE TPS SIGNAL RECEIVED (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the ECM/PCM.

Possible Causes
FCM CAN BUS DTC'S PRESENT ECM/PCM DTC'S PRESENT TRANSMISSION CONTROL MODULE

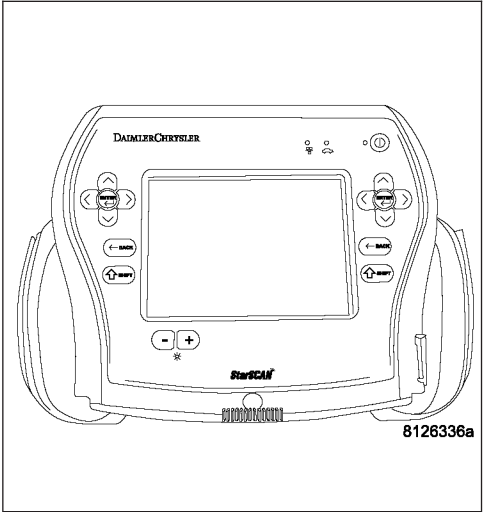
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR FCM CAN BUS DTCS

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?
- Yes**    >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No**     >> Go To 2

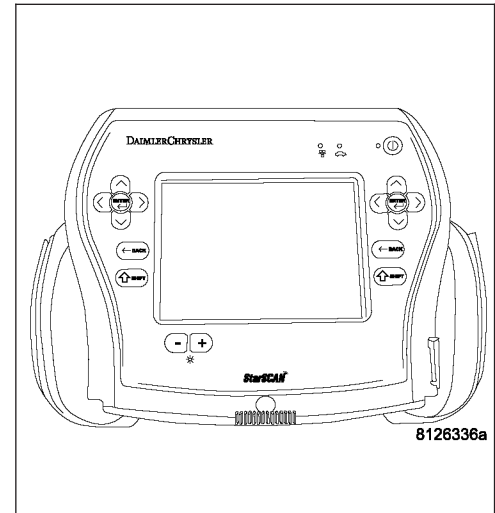


**U1400-IMPLAUSIBLE TPS SIGNAL RECEIVED (CONTINUED)****2. CHECK IF ECM/PCM DTC'S ARE PRESENT**

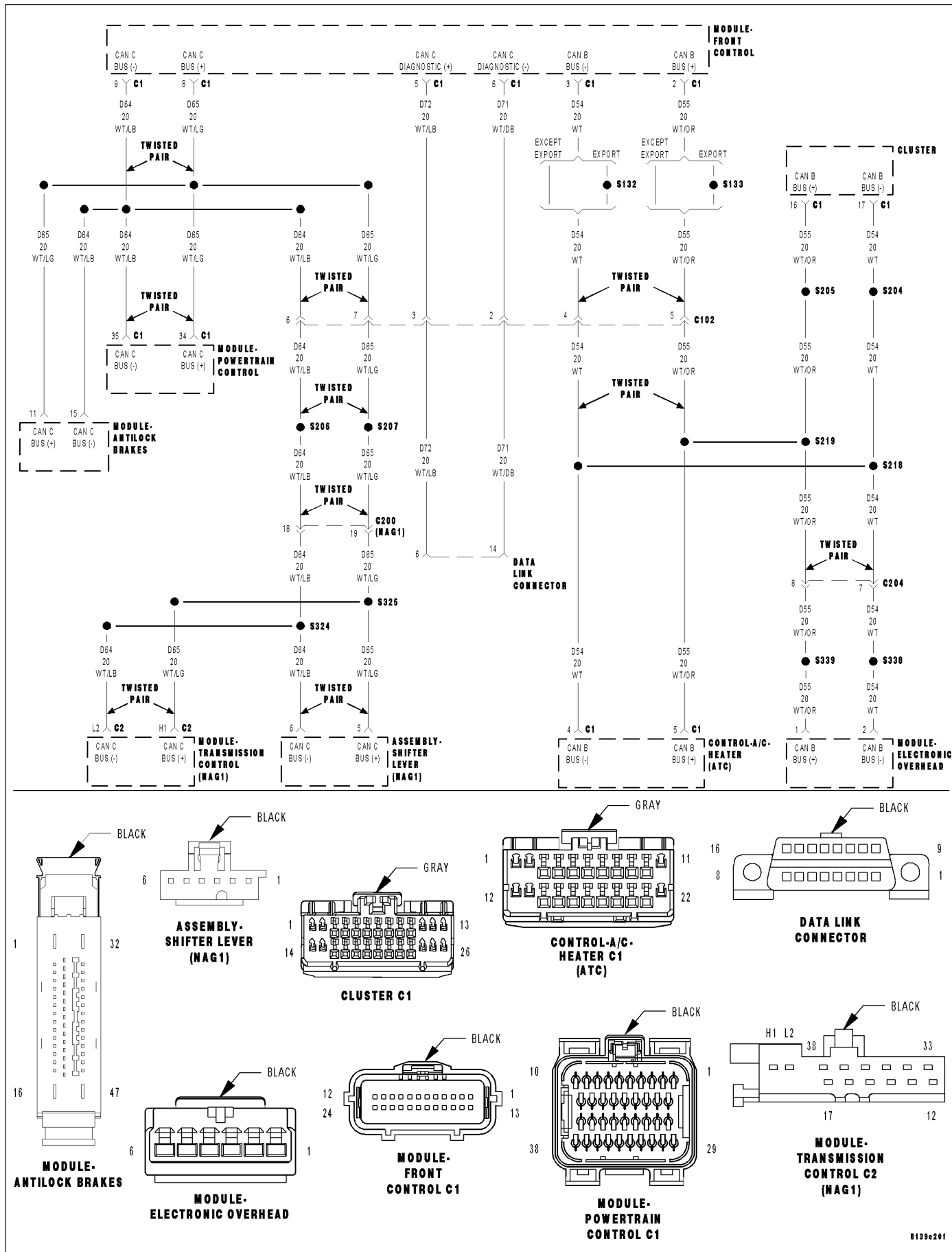
With the scan tool, read engine DTCs.

**Are there any engine DTC's present?**

- Yes** >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



## U1401-IMPLAUSIBLE ENGINE SPEED SIGNAL RECEIVED



**U1401-IMPLAUSIBLE ENGINE SPEED SIGNAL RECEIVED (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the ECM/PCM.

Possible Causes
FCM CAN BUS DTC'S PRESENT ENGINE MODULE DTC'S PRESENT TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

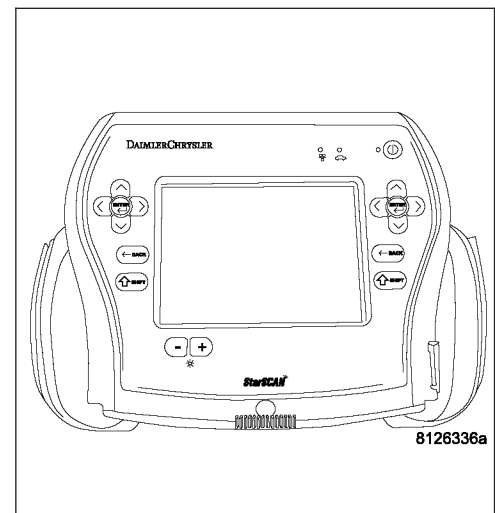
**Diagnostic Test****1. CHECK FOR FCM CAN BUS DTCS**

With the scan tool, read FCM DTCs.

**Are there any FCM CAN BUS DTC's present?**

**Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2



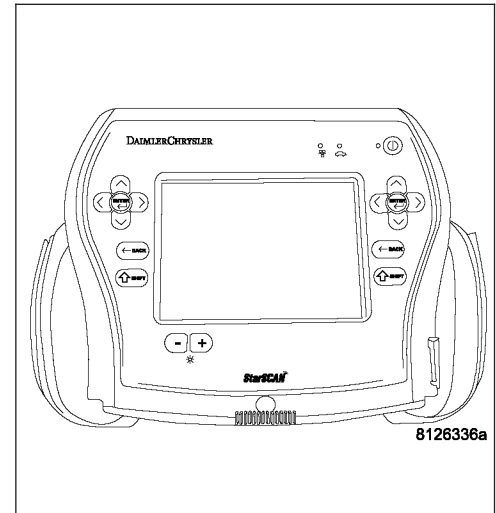


**U1401-IMPLAUSIBLE ENGINE SPEED SIGNAL RECEIVED (CONTINUED)****2. CHECK IF ENGINE DTC'S ARE PRESENT**

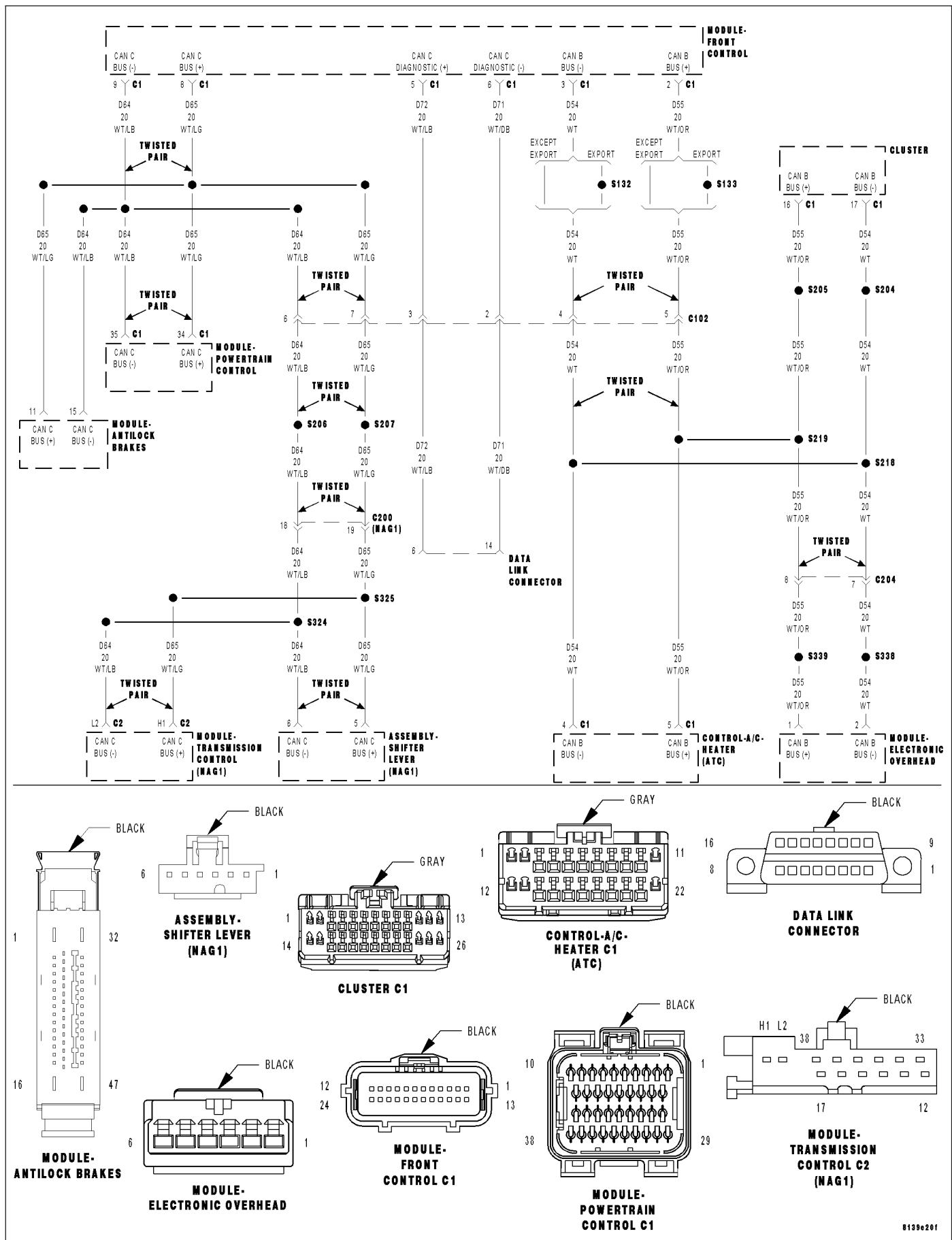
With the scan tool, read engine DTCs.

**Are there any engine DTC's present?**

- Yes**    >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



# U1402-IMPLAUSIBLE ENGINE TEMPERATURE SIGNAL RECEIVED



U1402-IMPLAUSIBLE ENGINE TEMPERATURE SIGNAL RECEIVED (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the ECM/PCM.

Possible Causes
FCM CAN BUS DTC'S PRESENT ECM/PCM DTC'S PRESENT TRANSMISSION CONTROL MODULE

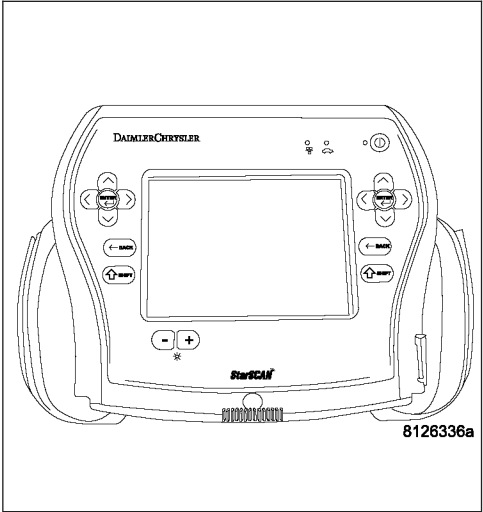
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR FCM CAN BUS DTCS

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?
- Yes**    >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No**    >> Go To 2

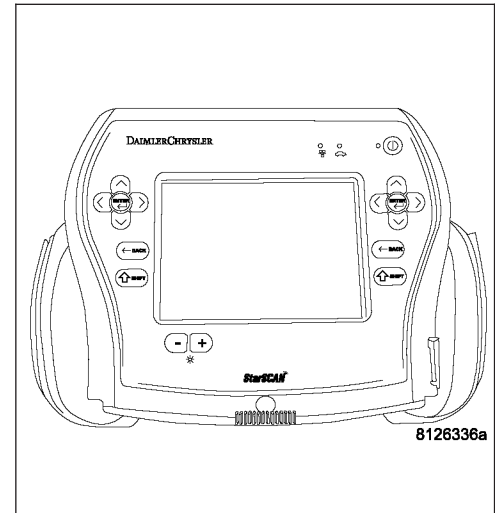


**U1402-IMPLAUSIBLE ENGINE TEMPERATURE SIGNAL RECEIVED (CONTINUED)****2. CHECK IF ENGINE DTC'S ARE PRESENT**

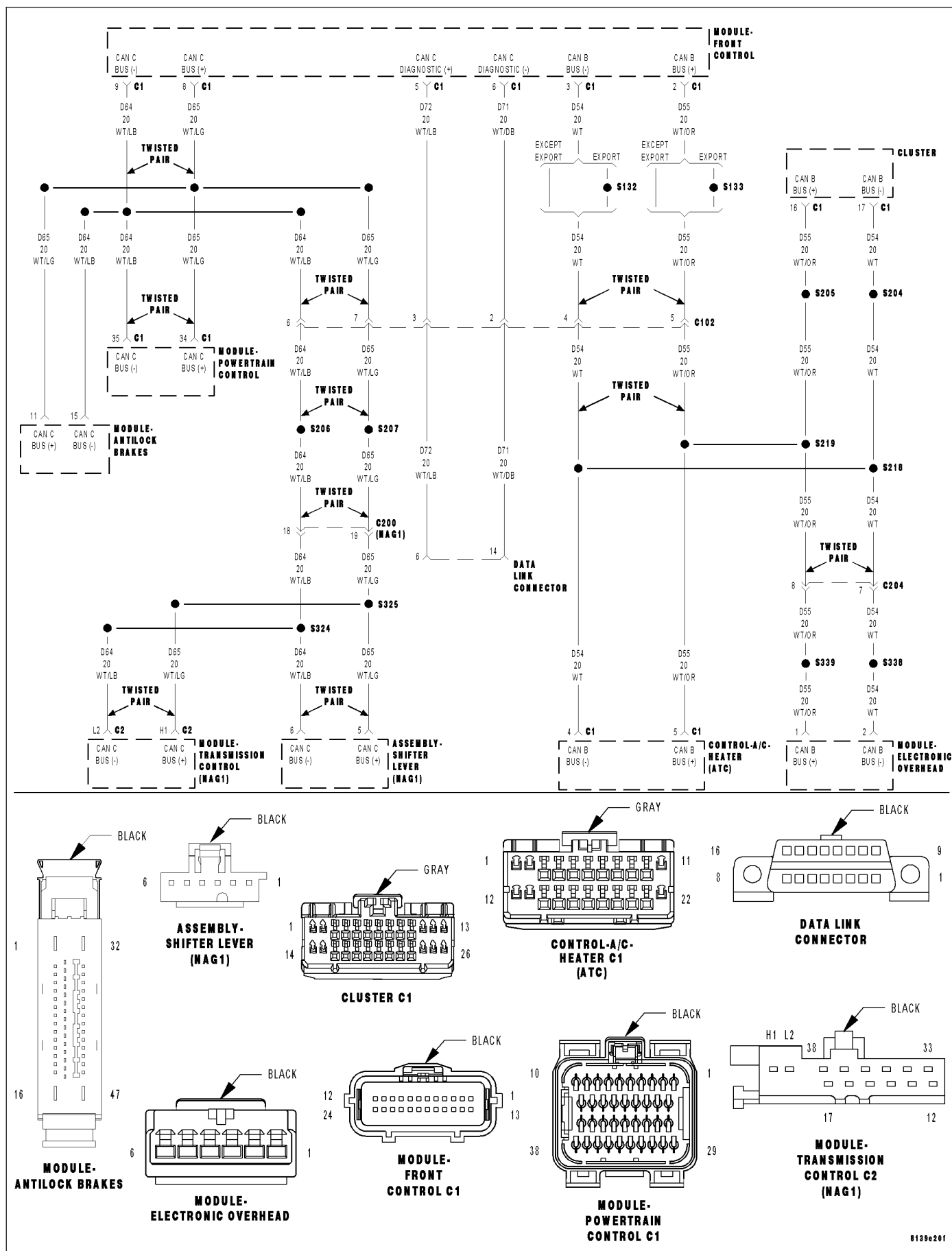
With the scan tool, read engine DTCs.

**Are there any engine DTC's present?**

- Yes** >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



## U1404-IMPLAUSIBLE STATIC ENGINE TORQUE SIGNAL RECEIVED



**U1404-IMPLAUSIBLE STATIC ENGINE TORQUE SIGNAL RECEIVED (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**

Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.

- **Set Condition:**

When the TCM detects an incorrect CAN ID from the ECM/PCM.

Possible Causes
FCM CAN BUS DTC'S PRESENT ECM/PCM DTC'S PRESENT TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

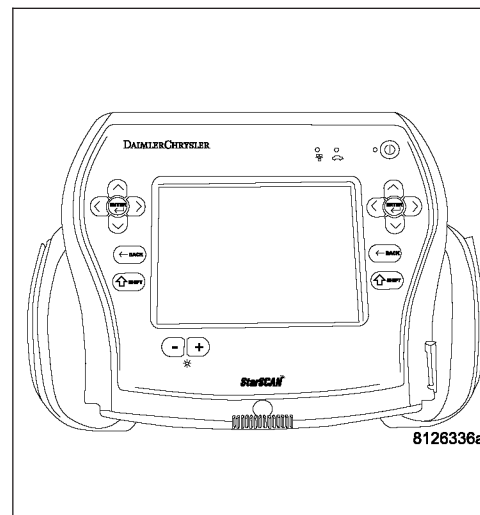
**Diagnostic Test****1. CHECK FOR FCM CAN BUS DTCS**

With the scan tool, read FCM DTCs.

**Are there any FCM CAN BUS DTC's present?**

**Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2

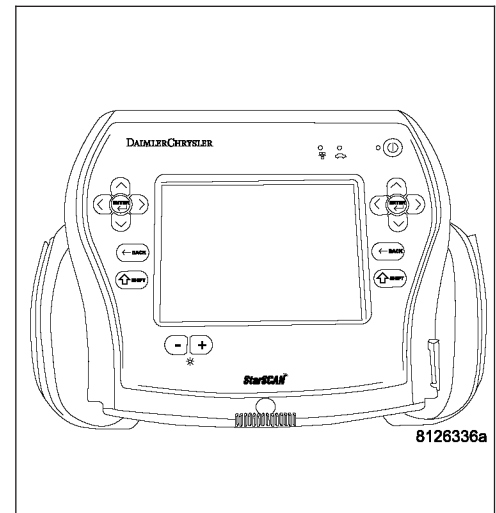


**U1404-IMPLAUSIBLE STATIC ENGINE TORQUE SIGNAL RECEIVED (CONTINUED)****2. CHECK IF ENGINE DTC'S ARE PRESENT**

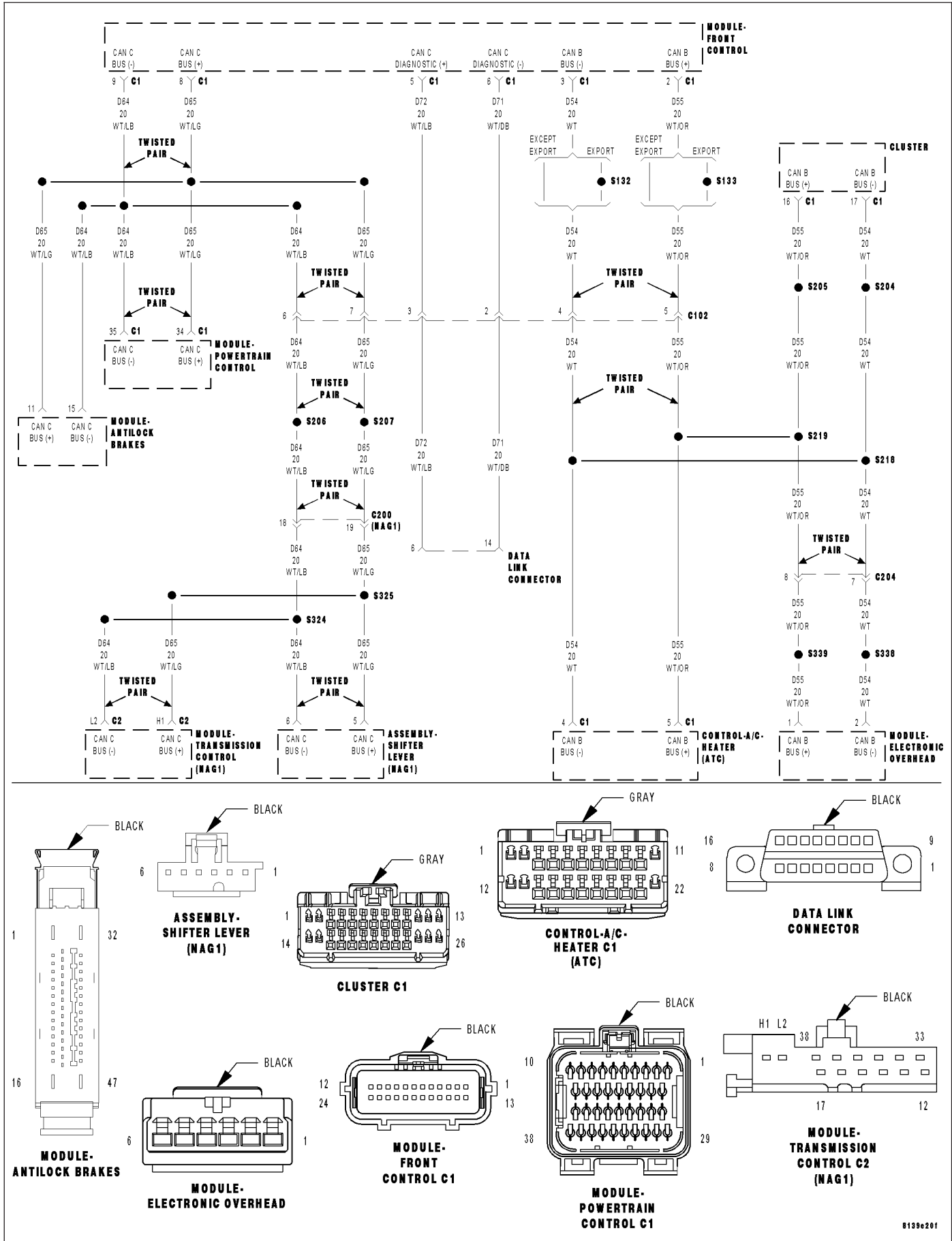
With the scan tool, read engine DTCs.

**Are there any engine DTC's present?**

- Yes**    >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



## U1405-IMPLAUSIBLE MINIMUM ENGINE TORQUE SIGNAL RECEIVED





U1405-IMPLAUSIBLE MINIMUM ENGINE TORQUE SIGNAL RECEIVED (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the ECM/PCM.

Possible Causes
FCM CAN BUS DTC'S PRESENT ECM/PCM DTC'S PRESENT TRANSMISSION CONTROL MODULE

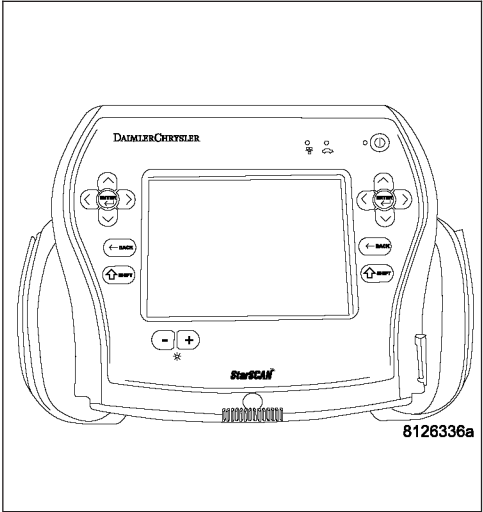
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR FCM CAN BUS DTCS

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?
- Yes**    >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No**    >> Go To 2

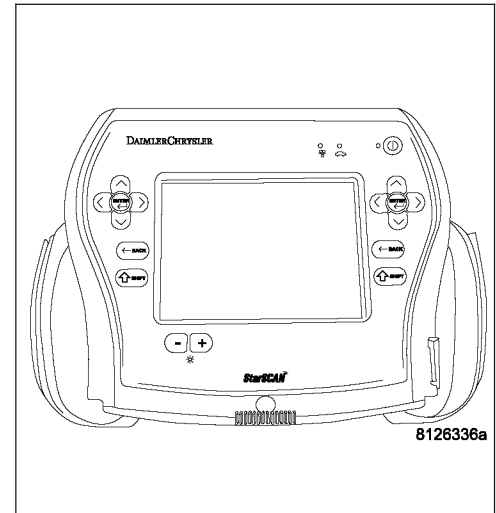


**U1405-IMPLAUSIBLE MINIMUM ENGINE TORQUE SIGNAL RECEIVED (CONTINUED)****2. CHECK IF ENGINE DTC'S ARE PRESENT**

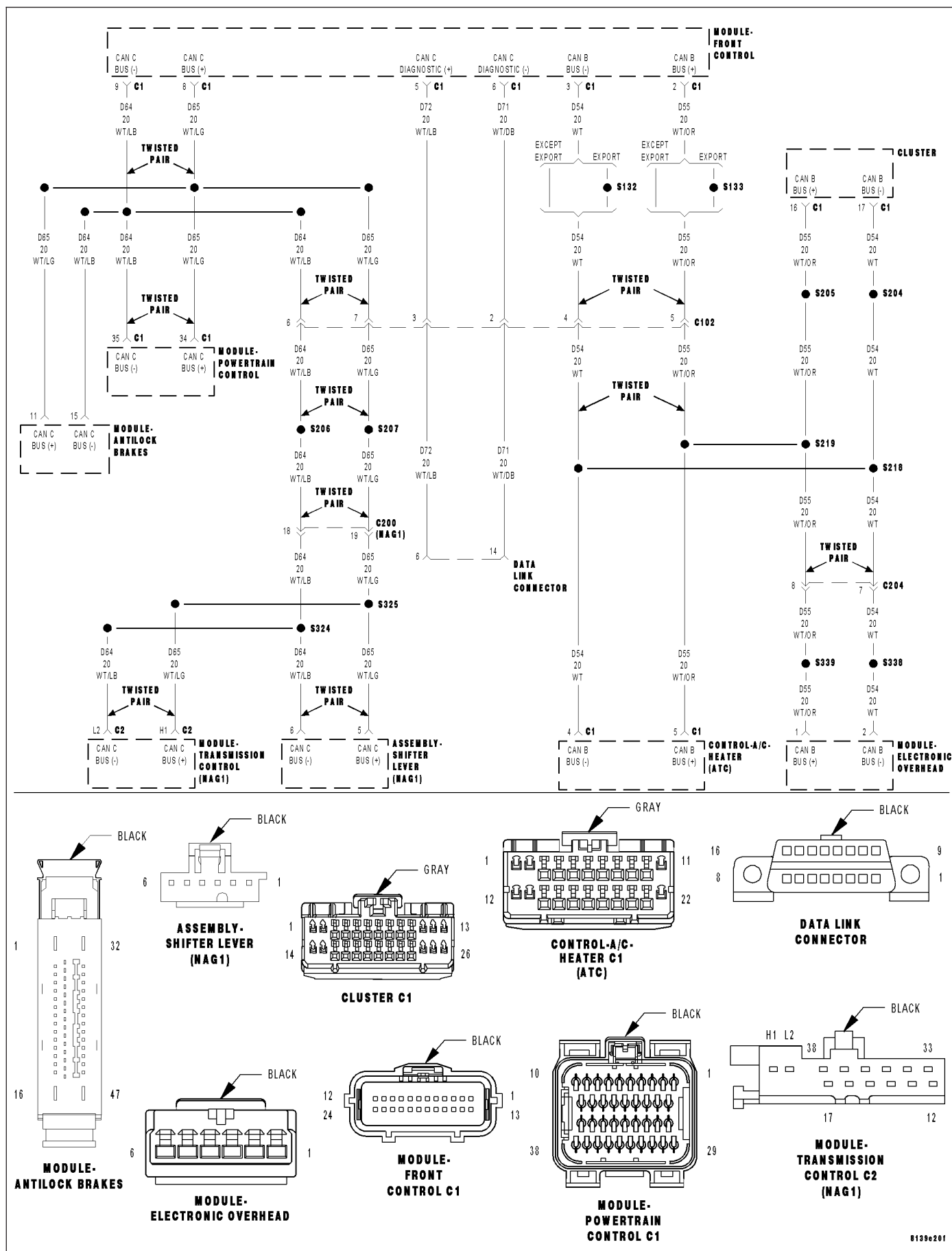
With the scan tool, read engine DTCs.

**Are there any engine DTC's present?**

- Yes** >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.</>  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



## U1406-IMPLAUSIBLE MAXIMUM ENGINE TORQUE SIGNAL RECEIVED



**U1406-IMPLAUSIBLE MAXIMUM ENGINE TORQUE SIGNAL RECEIVED (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the ECM/PCM.

Possible Causes
FCM CAN BUS DTC'S PRESENT ECM/PCM DTC'S PRESENT TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

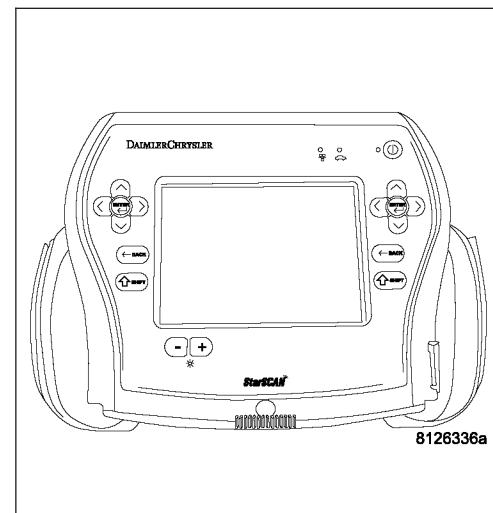
**Diagnostic Test****1. CHECK FOR FCM CAN BUS DTCS**

With the scan tool, read FCM DTCs.

**Are there any FCM CAN BUS DTC's present?**

**Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2

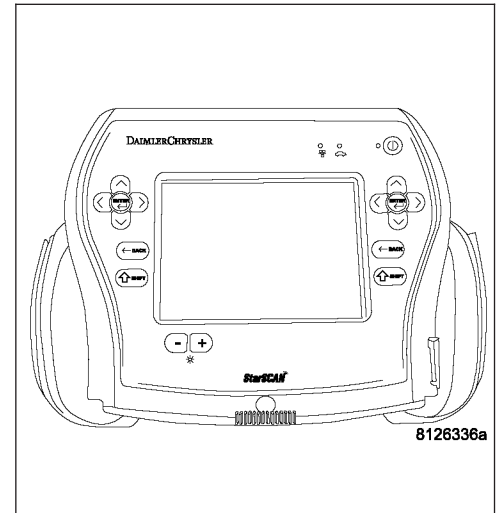


**U1406-IMPLAUSIBLE MAXIMUM ENGINE TORQUE SIGNAL RECEIVED (CONTINUED)****2. CHECK IF ENGINE DTC'S ARE PRESENT**

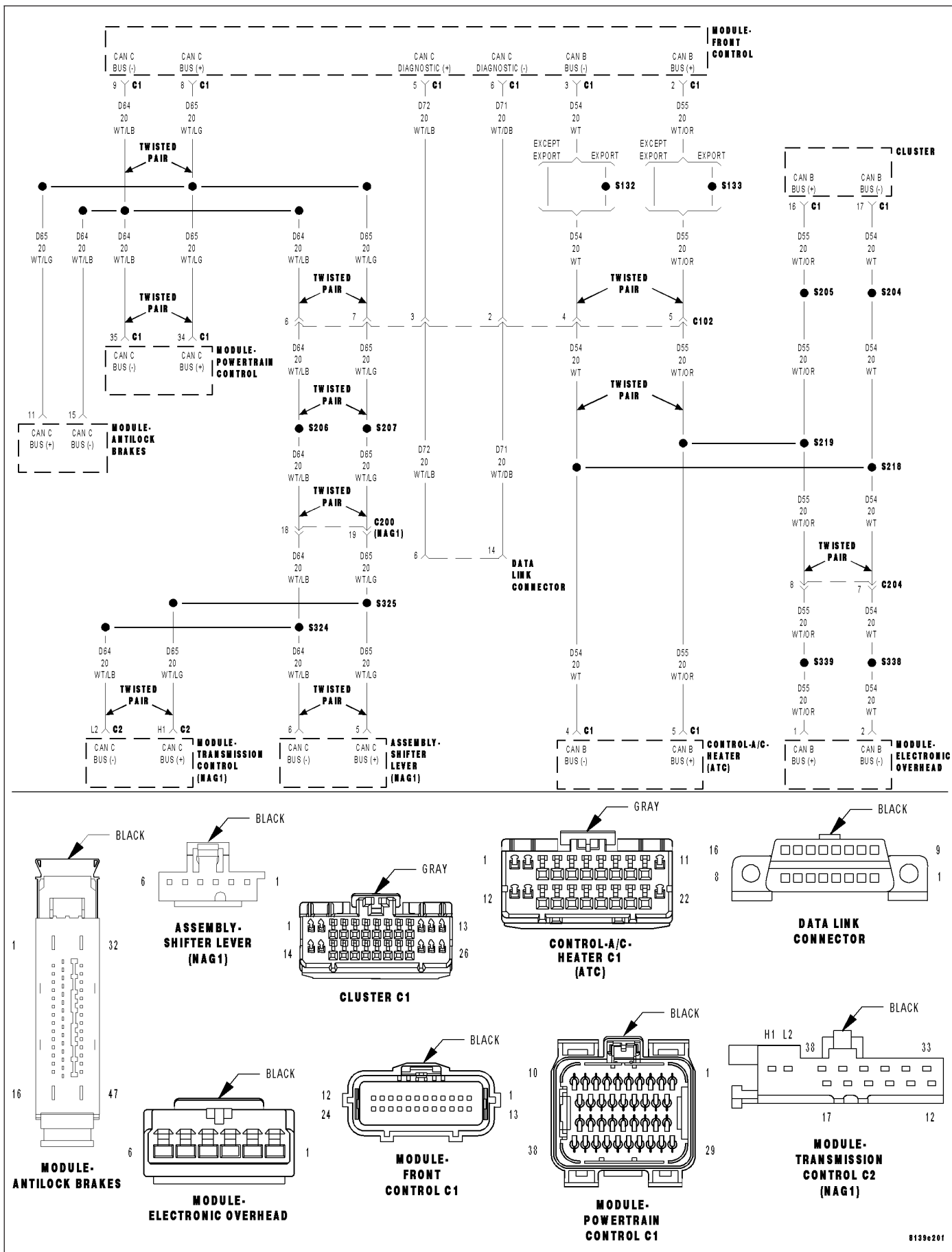
With the scan tool, read engine DTCs.

**Are there any engine DTC's present?**

- Yes** >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



## U1407-IMPLAUSIBLE ENGINE TORQUE REQUEST SIGNAL RECEIVED



**U1407-IMPLAUSIBLE ENGINE TORQUE REQUEST SIGNAL RECEIVED (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the ECM/PCM.

Possible Causes
FCM CAN BUS DTC'S PRESENT ECM/PCM DTC'S PRESENT TRANSMISSION CONTROL MODULE

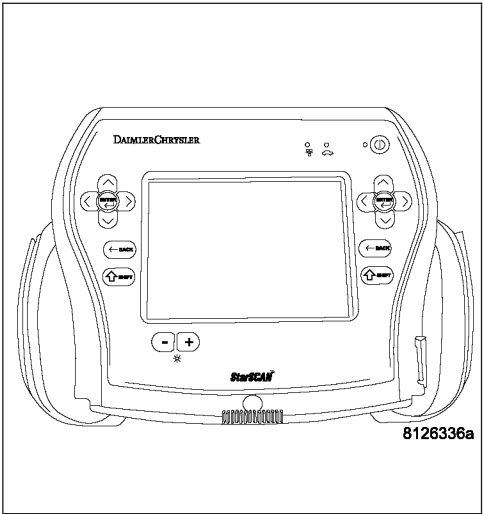
**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test**

**1. CHECK FOR FCM CAN BUS DTCS**

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?**
- Yes**    >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No**     >> Go To 2

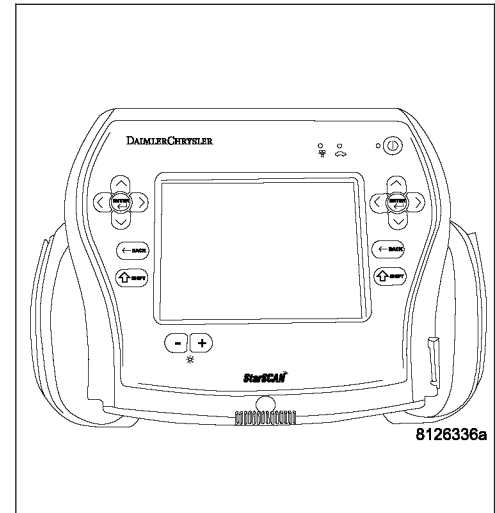


**U1407-IMPLAUSIBLE ENGINE TORQUE REQUEST SIGNAL RECEIVED (CONTINUED)****2. CHECK IF ENGINE DTC'S ARE PRESENT**

With the scan tool, read engine DTCs.

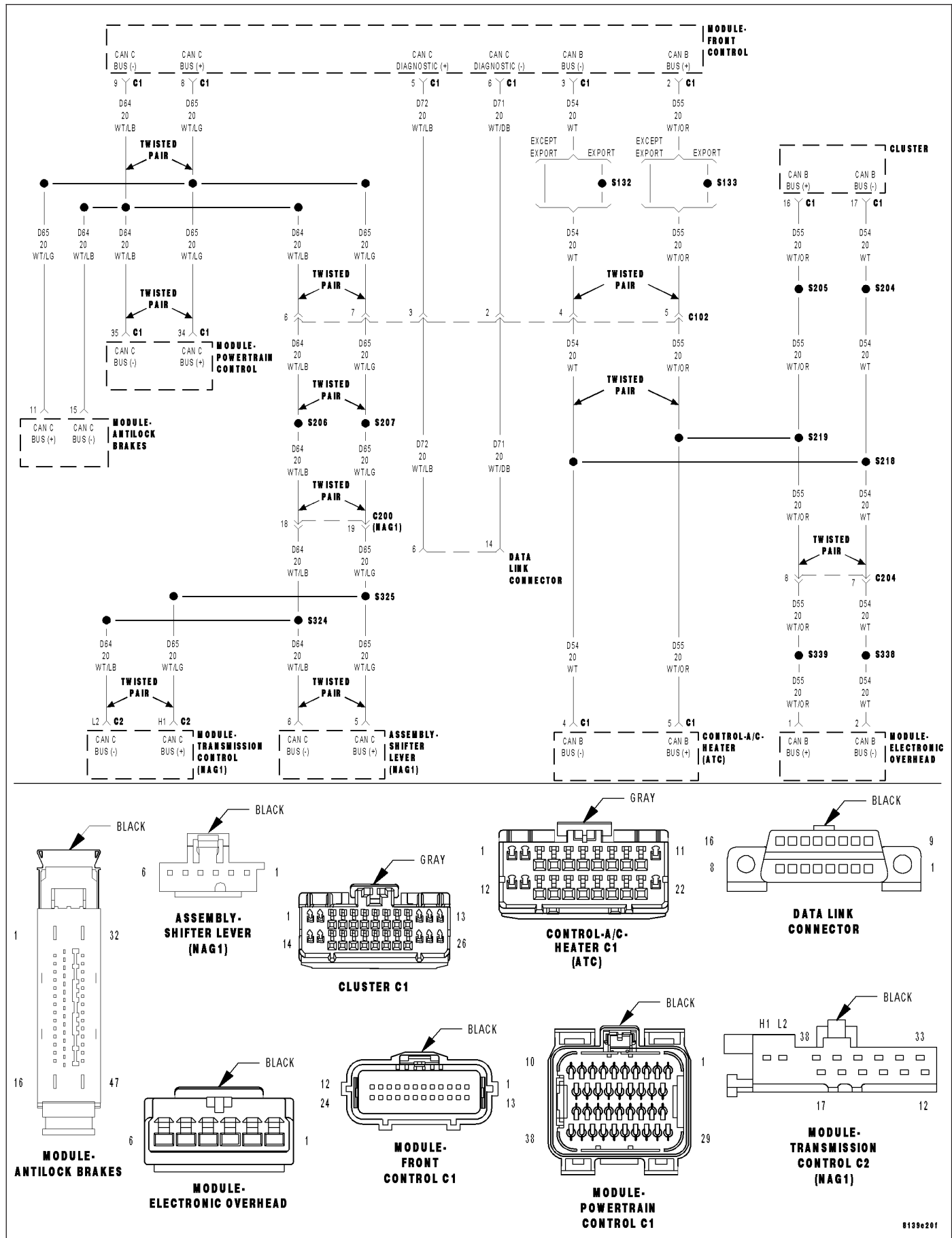
**Are there any engine DTC's present?**

- Yes** >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and diagnose the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.





# U1408-IMPLAUSIBLE BRAKE SIGNAL RECEIVED



**U1408-IMPLAUSIBLE BRAKE SIGNAL RECEIVED (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the ABS control module.

Possible Causes
FCM CAN BUS DTC'S PRESENT ABS DTC'S PRESENT TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

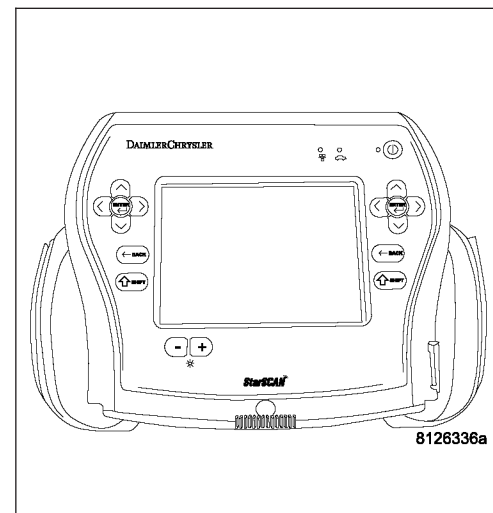
**Diagnostic Test****1. CHECK FOR FCM CAN BUS DTCS**

With the scan tool, read FCM DTCs.

**Are there any FCM CAN BUS DTC's present?**

**Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2

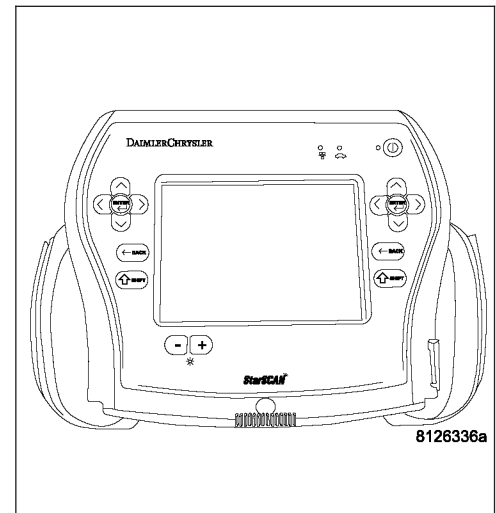


**U1408-IMPLAUSIBLE BRAKE SIGNAL RECEIVED (CONTINUED)****2. CHECK IF ABS DTC'S ARE PRESENT**

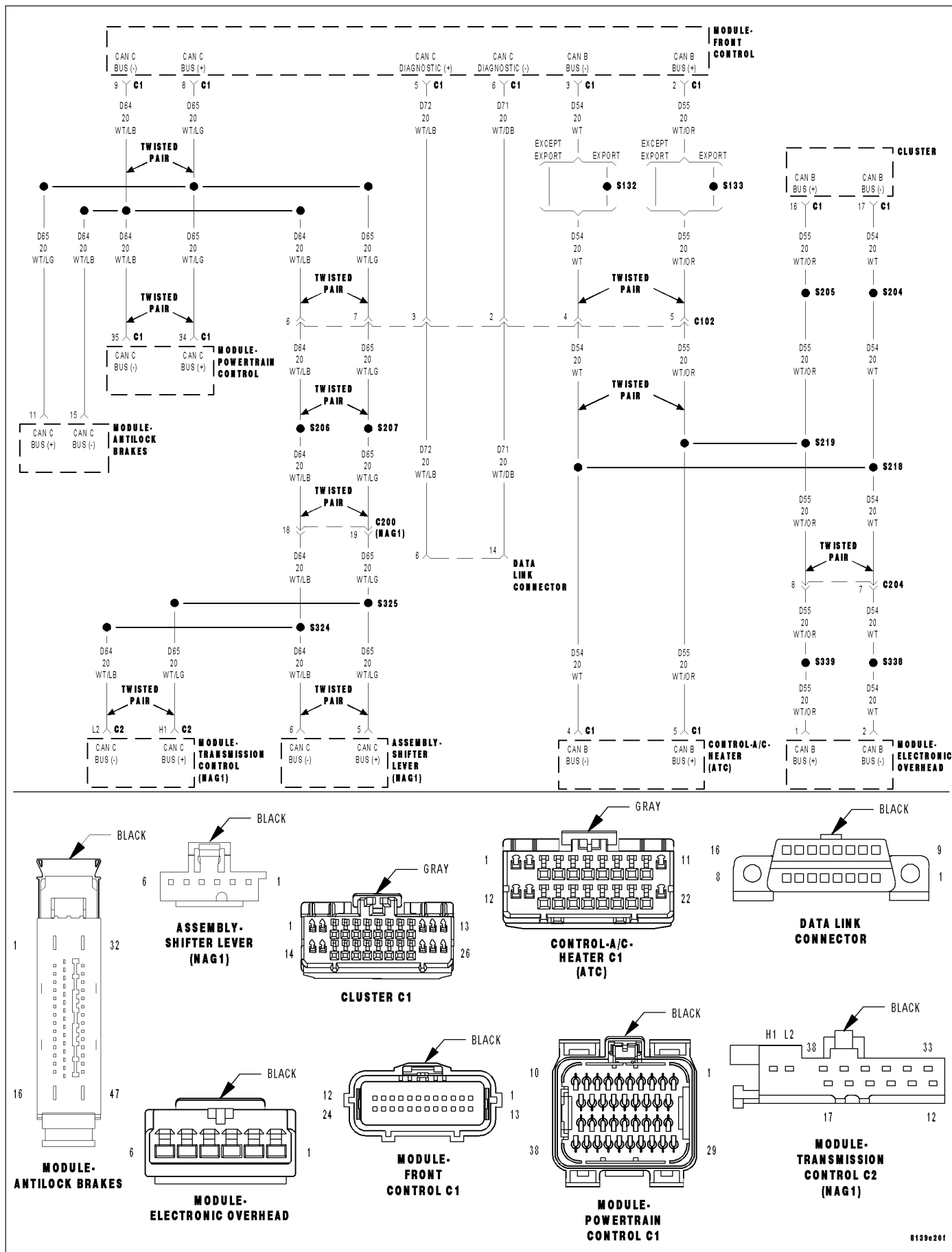
With the scan tool, read ABS DTCs.

**Are there any ABS DTC's present?**

- Yes**    >> Refer to 5 - BRAKES - ABS ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



# U1409-IMPLAUSIBLE LEFT FRONT WHEEL SPEED SIGNAL RECEIVED



U1409-IMPLAUSIBLE LEFT FRONT WHEEL SPEED SIGNAL RECEIVED (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the ABS control module.

Possible Causes
FCM CAN BUS DTC'S PRESENT ABS CONTROL MODULE DTC'S PRESENT TRANSMISSION CONTROL MODULE

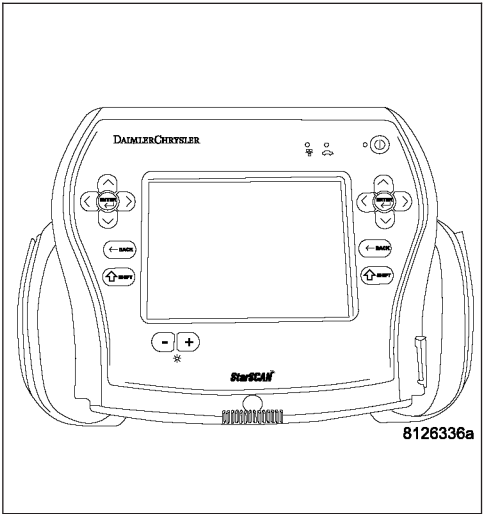
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR FCM CAN BUS DTCS

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?
- Yes**    >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No**    >> Go To 2

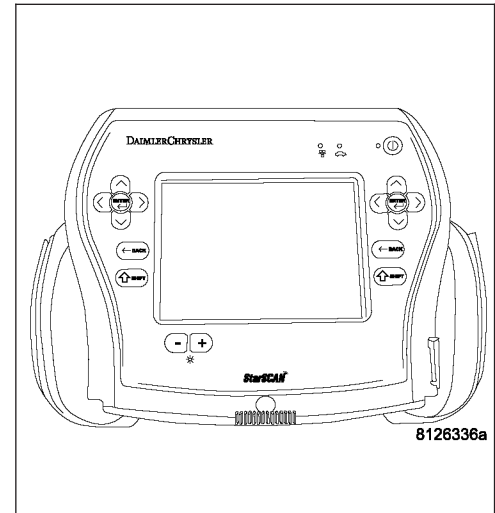


**U1409-IMPLAUSIBLE LEFT FRONT WHEEL SPEED SIGNAL RECEIVED (CONTINUED)****2. CHECK IF ABS DTC'S ARE PRESENT**

With the scan tool, read ABS DTCs.

**Are there any ABS DTC's present?**

- Yes** >> Refer to 5 - BRAKES - ABS ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.





**U140A-IMPLAUSIBLE RIGHT FRONT WHEEL SPEED SIGNAL RECEIVED (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**

Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.

- **Set Condition:**

When the TCM detects an incorrect CAN ID from the ABS control module.

Possible Causes
FCM CAN BUS DTC'S PRESENT
ABS CONTROL MODULE DTC'S PRESENT
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

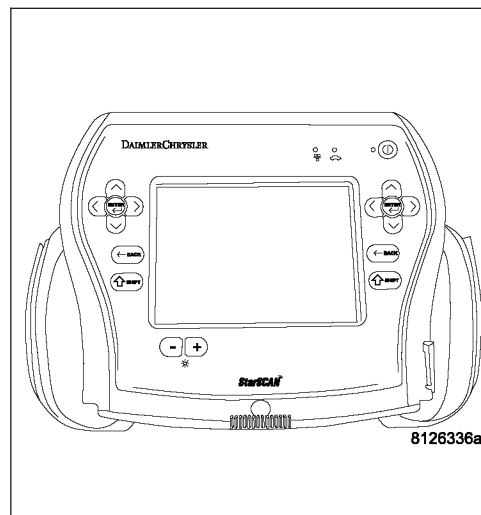
**Diagnostic Test****1. CHECK FOR FCM CAN BUS DTCS**

With the scan tool, read FCM DTCs.

**Are there any FCM CAN BUS DTC's present?**

**Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2



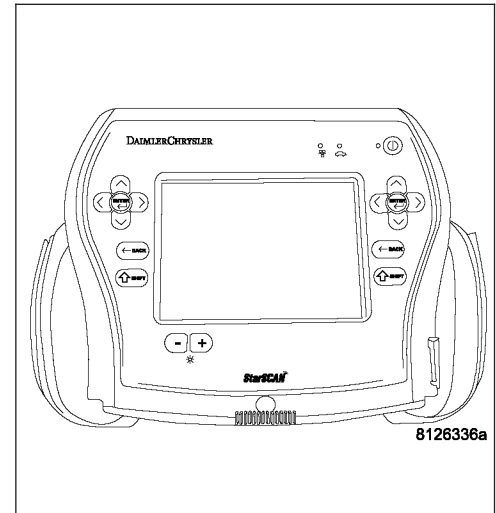


**U140A-IMPLAUSIBLE RIGHT FRONT WHEEL SPEED SIGNAL RECEIVED (CONTINUED)****2. CHECK IF ABS DTC'S ARE PRESENT**

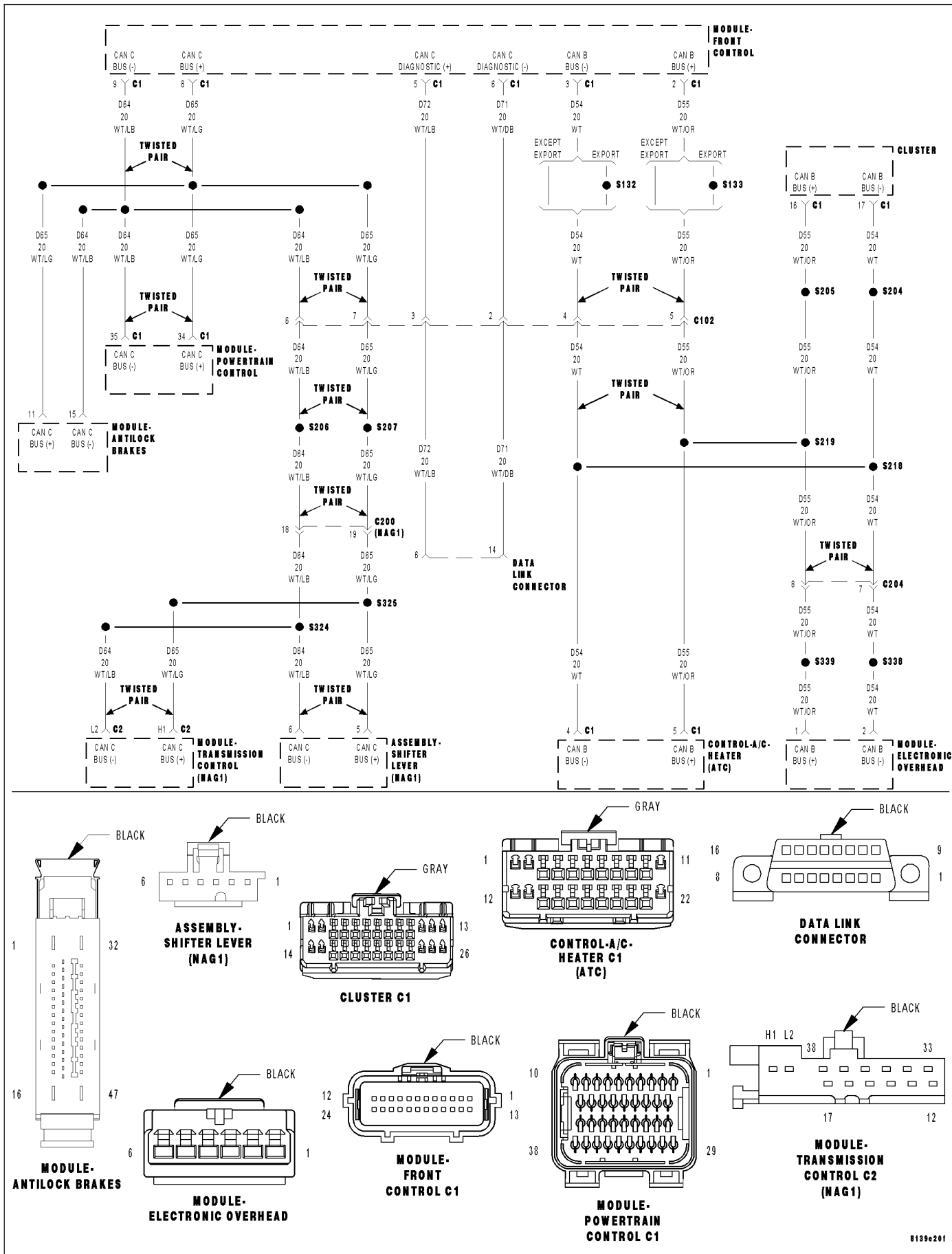
With the scan tool, read ABS DTCs.

**Are there any ABS DTC's present?**

- Yes**    >> Refer to 5 - BRAKES - ABS ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



# U140B-IMPLAUSIBLE LEFT REAR WHEEL SPEED SIGNAL RECEIVED



**U140B-IMPLAUSIBLE LEFT REAR WHEEL SPEED SIGNAL RECEIVED (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the ABS control module.

Possible Causes
FCM CAN BUS DTC'S PRESENT ABS CONTROL MODULE DTC'S PRESENT TRANSMISSION CONTROL MODULE

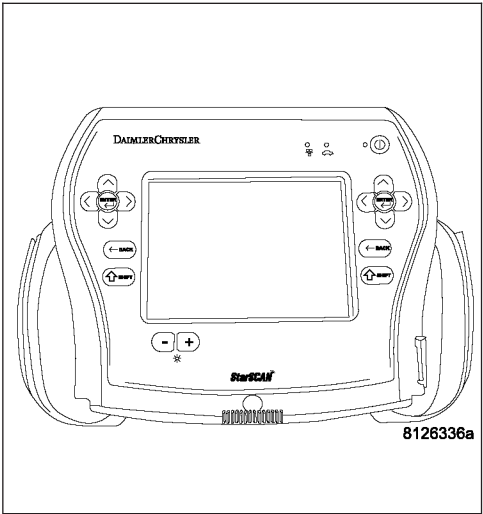
**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

**Diagnostic Test**

**1. CHECK FOR FCM CAN BUS DTCS**

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?**
- Yes**    >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No**     >> Go To 2

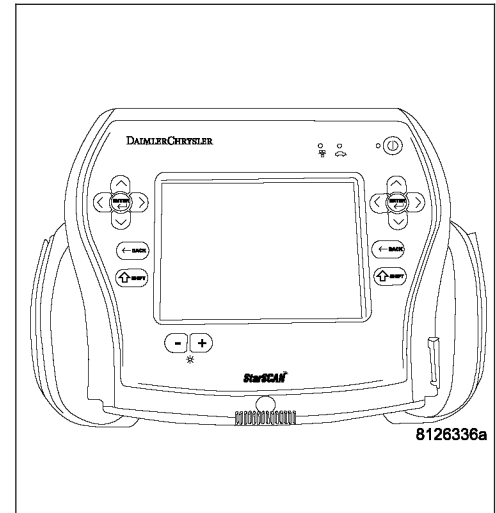


**U140B-IMPLAUSIBLE LEFT REAR WHEEL SPEED SIGNAL RECEIVED (CONTINUED)****2. CHECK IF ABS DTC'S ARE PRESENT**

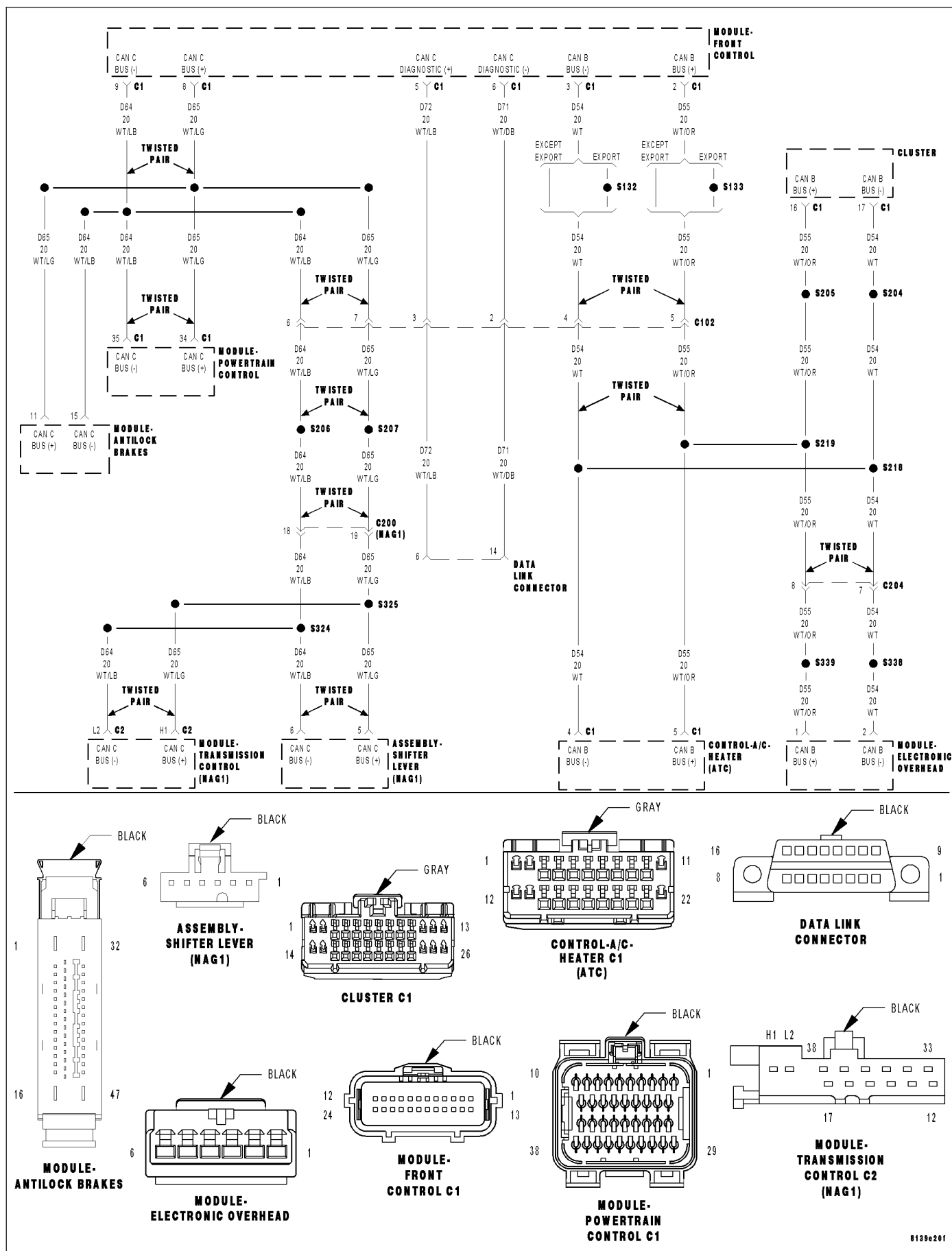
With the scan tool, read ABS DTCs.

**Are there any ABS DTC's present?**

- Yes** >> Refer to 5 - BRAKES - ABS ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



# U140C-IMPLAUSIBLE RIGHT REAR WHEEL SPEED SIGNAL RECEIVED



**U140C-IMPLAUSIBLE RIGHT REAR WHEEL SPEED SIGNAL RECEIVED (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**

Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.

- **Set Condition:**

When the TCM detects an incorrect CAN ID from the ABS control module.

Possible Causes
FCM CAN BUS DTC'S PRESENT
ABS CONTROL MODULE DTC'S PRESENT
TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

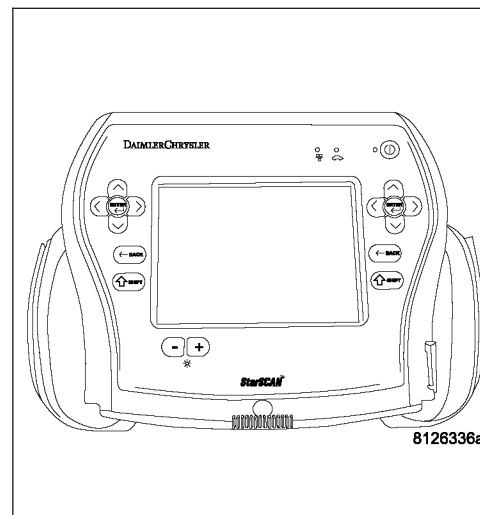
**Diagnostic Test****1. CHECK FOR FCM CAN BUS DTCS**

With the scan tool, read FCM DTCs.

**Are there any FCM CAN BUS DTC's present?**

**Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2

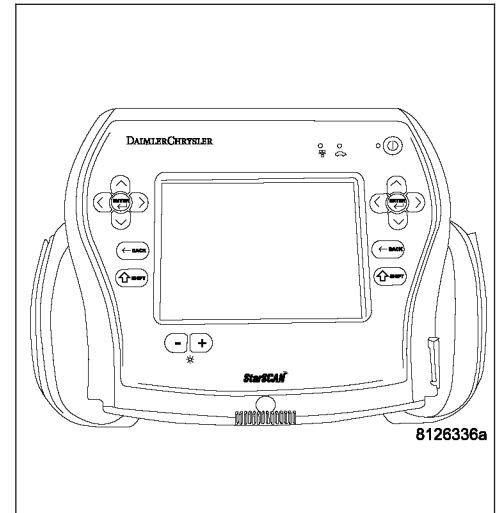


**U140C-IMPLAUSIBLE RIGHT REAR WHEEL SPEED SIGNAL RECEIVED (CONTINUED)****2. CHECK IF ABS DTC'S ARE PRESENT**

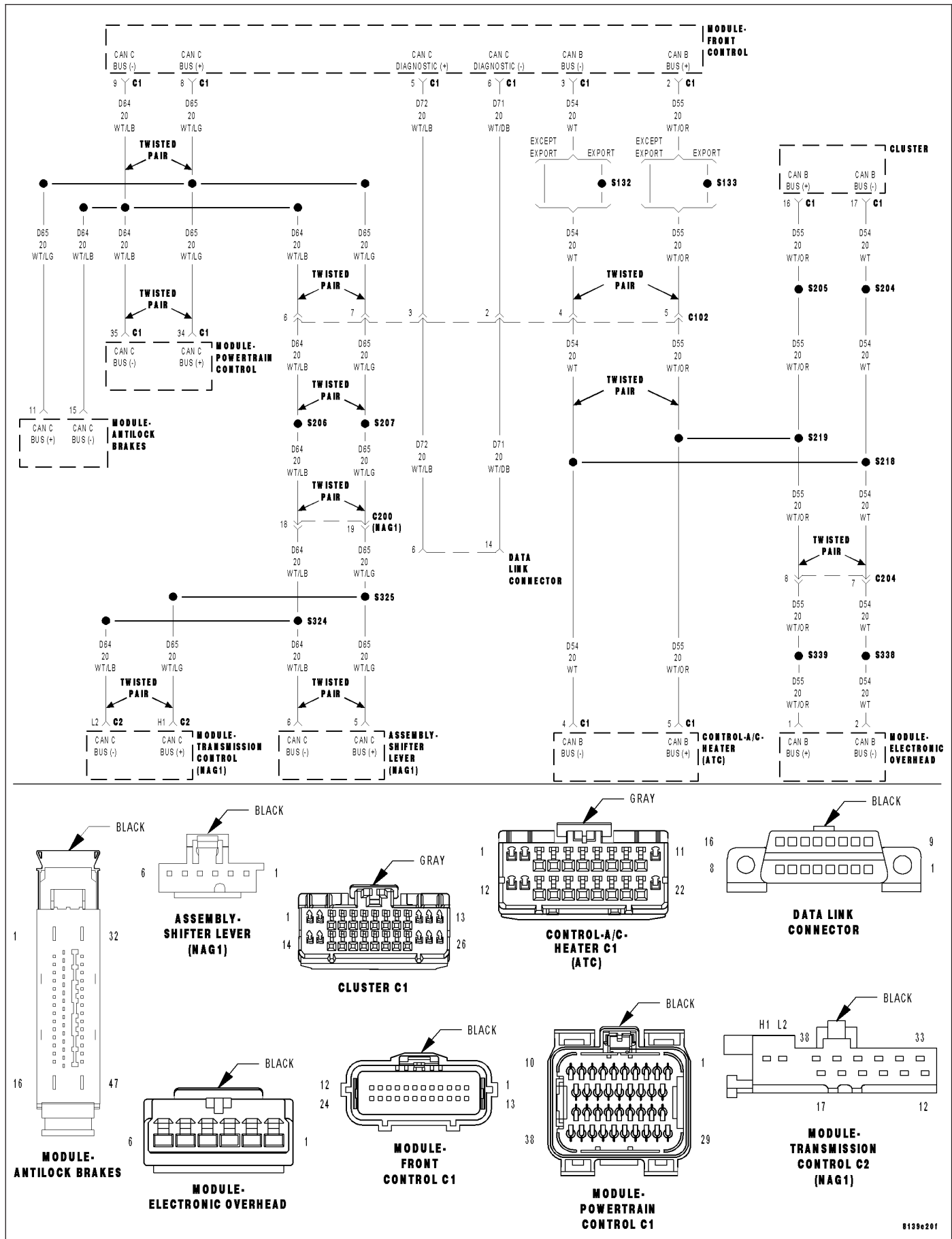
With the scan tool, read ABS DTCs.

**Are there any ABS DTC's present?**

- Yes**    >> Refer to 5 - BRAKES - ABS ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



# U140D-IMPLAUSIBLE WHEEL SPEED SIGNALS RECEIVED





U140D-IMPLAUSIBLE WHEEL SPEED SIGNALS RECEIVED (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the ABS control module.

Possible Causes
FCM CAN BUS DTC'S PRESENT ABS CONTROL MODULE DTC'S PRESENT TRANSMISSION CONTROL MODULE

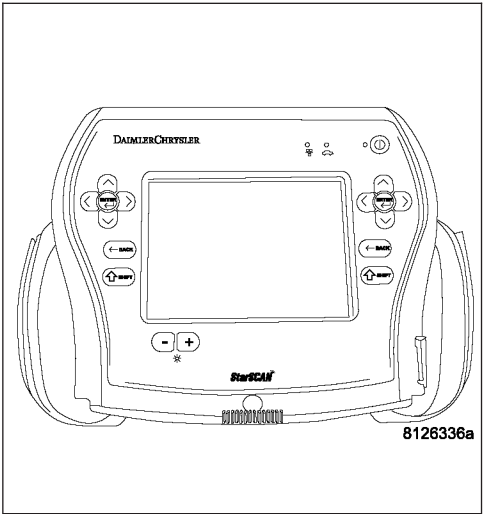
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR FCM CAN BUS DTCS

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?
- Yes**    >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No**    >> Go To 2

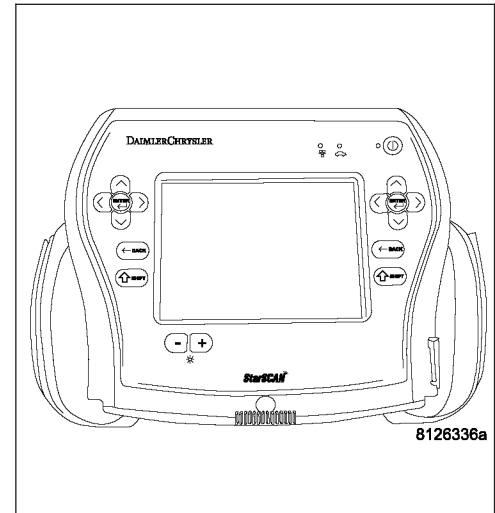


**U140D-IMPLAUSIBLE WHEEL SPEED SIGNALS RECEIVED (CONTINUED)****2. CHECK IF ABS DTC'S ARE PRESENT**

With the scan tool, read ABS DTCs.

**Are there any ABS DTC's present?**

- Yes** >> Refer to 5 - BRAKES - ABS ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.





**U140F-IMPLAUSIBLE ENGINE VARIANT DATA (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the ECM/PCM.

Possible Causes
FCM CAN BUS DTC'S PRESENT ECM/PCM DTC'S PRESENT TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

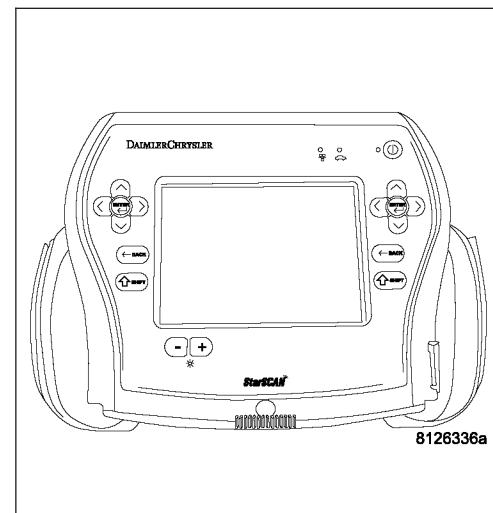
**Diagnostic Test****1. CHECK FOR FCM CAN BUS DTCS**

With the scan tool, read FCM DTCs.

**Are there any FCM CAN BUS DTC's present?**

**Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2



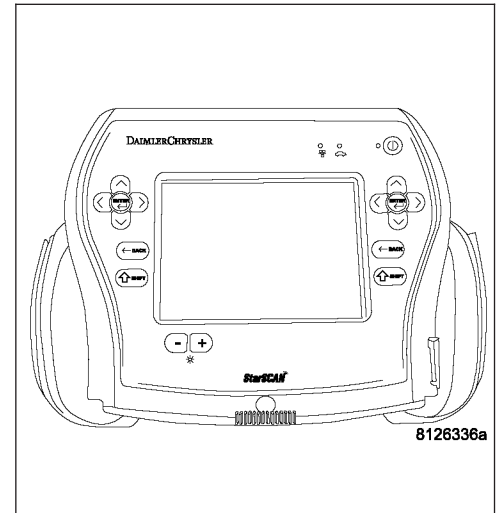
## U140F-IMPLAUSIBLE ENGINE VARIANT DATA (CONTINUED)

**2. CHECK IF ECM/PCM DTC'S ARE PRESENT**

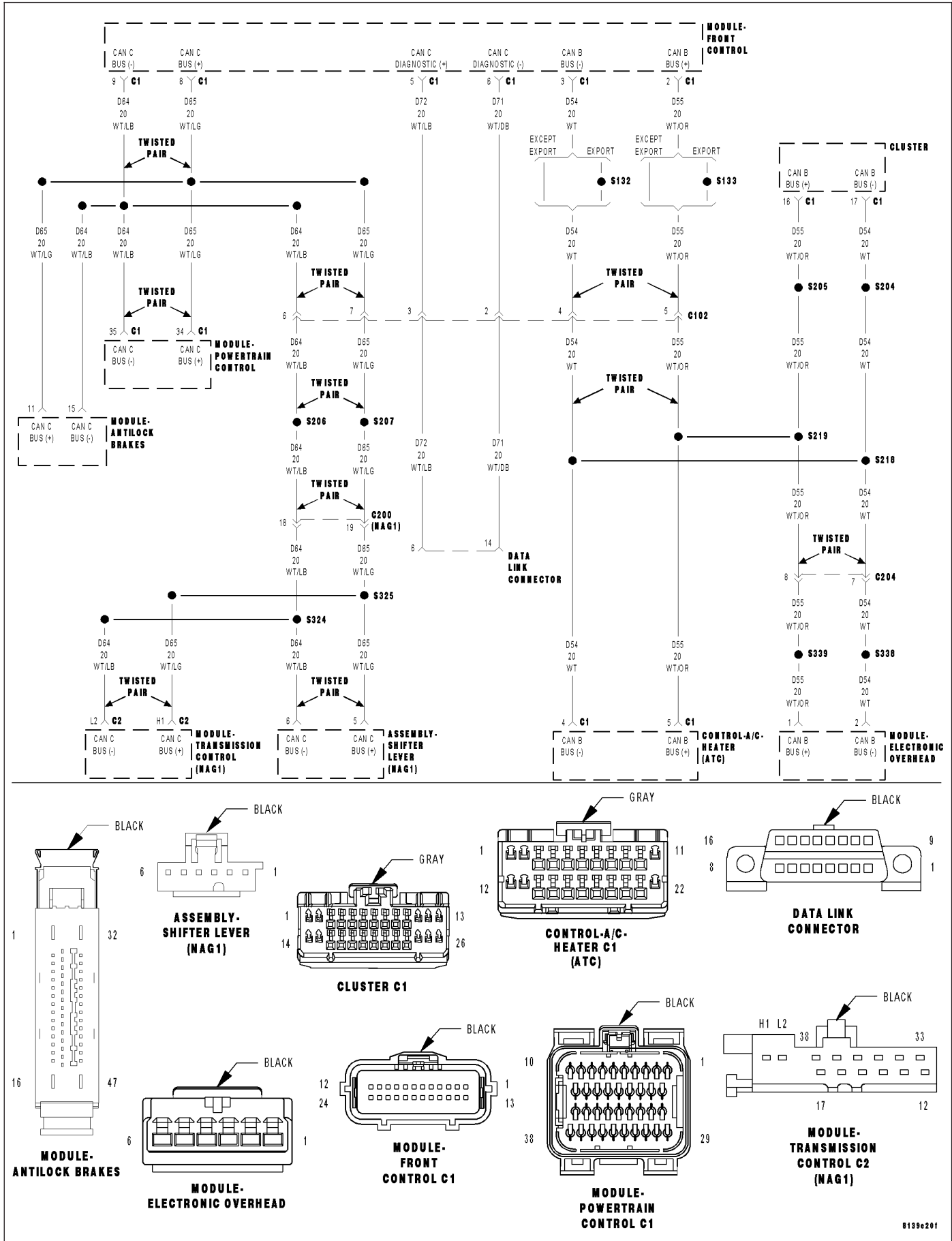
With the scan tool, read ECM/PCM DTCs.

**Are there any ECM/PCM DTC's present?**

- Yes** >> Refer to 9 - ENGINE ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



## U1410-IMPLAUSIBLE/MISSING FCM VARIANT DATA



U1410-IMPLAUSIBLE/MISSING FCM VARIANT DATA (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the FCM.

Possible Causes
FCM CAN BUS DTC'S PRESENT
TRANSMISSION CONTROL MODULE

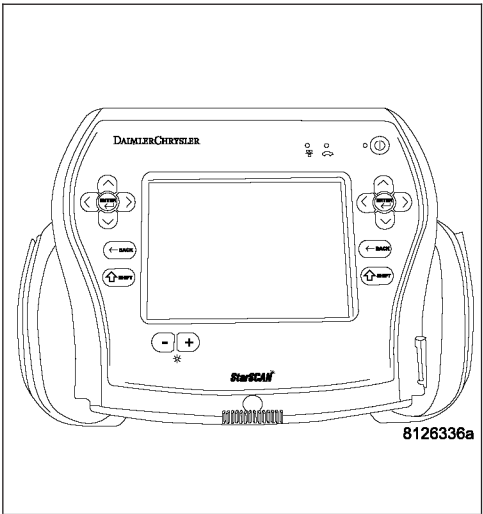
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

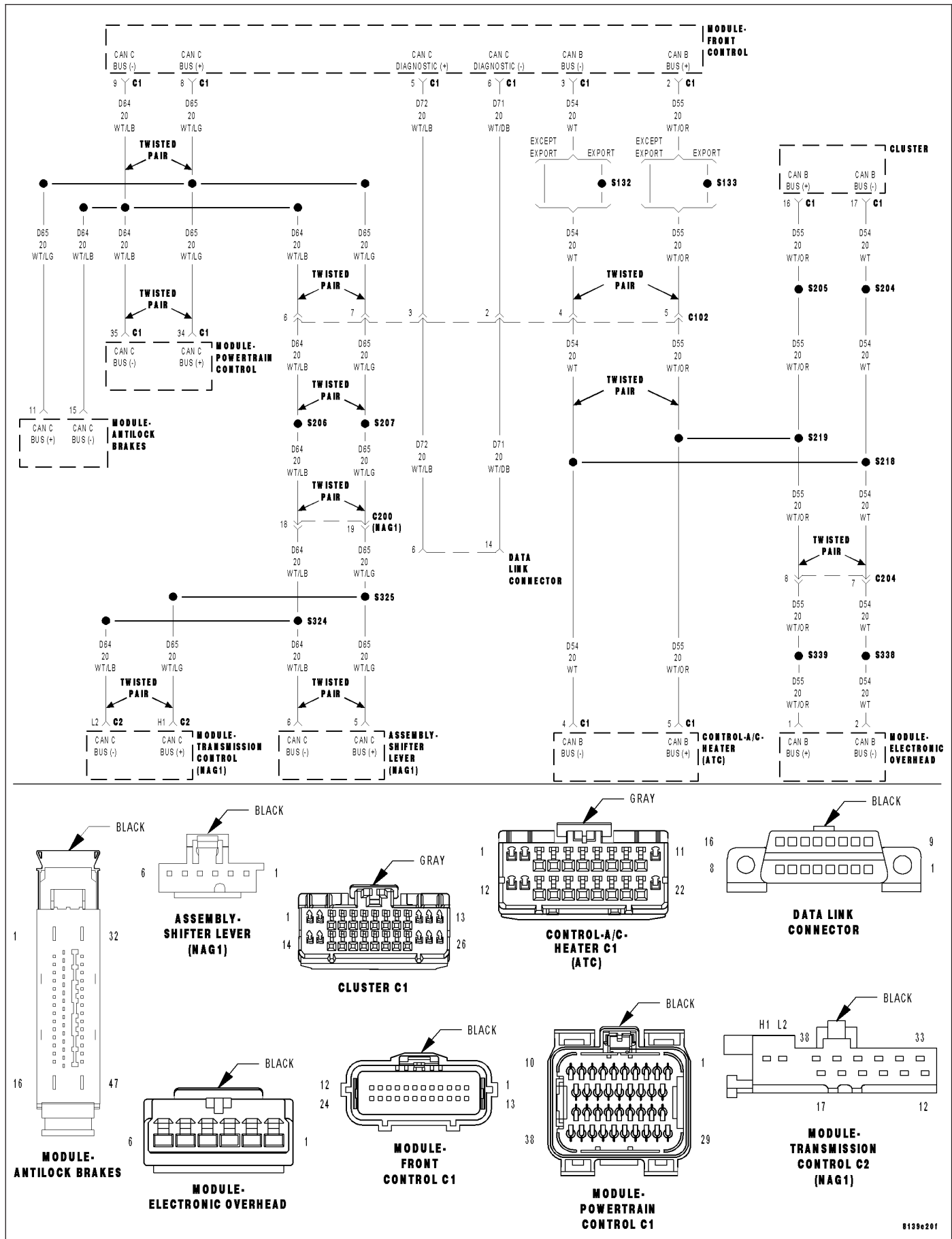
1. CHECK FOR FCM CAN BUS DTCS

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?**
- Yes**    >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



# U1507-IMPLAUSIBLE ENGINE TEMPERATURE MESSAGE DATA LENGTH RECEIVED





U1507-IMPLAUSIBLE ENGINE TEMPERATURE MESSAGE DATA LENGTH RECEIVED (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the ECM/PCM.

Possible Causes
FCM CAN BUS DTC'S PRESENT ECM/PCM DTC'S PRESENT TRANSMISSION CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

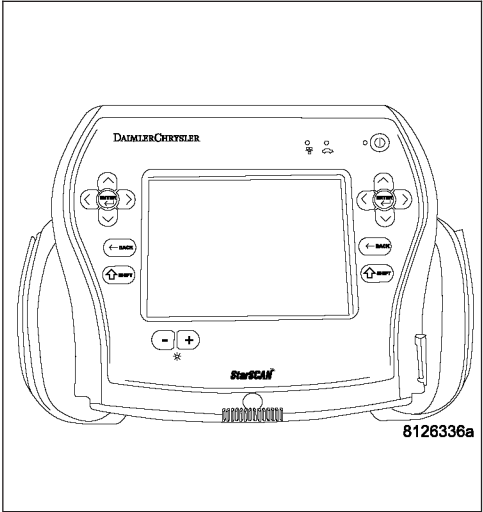
1. CHECK FOR FCM CAN BUS DTCS

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?
- Yes

>> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No

>> Go To 2

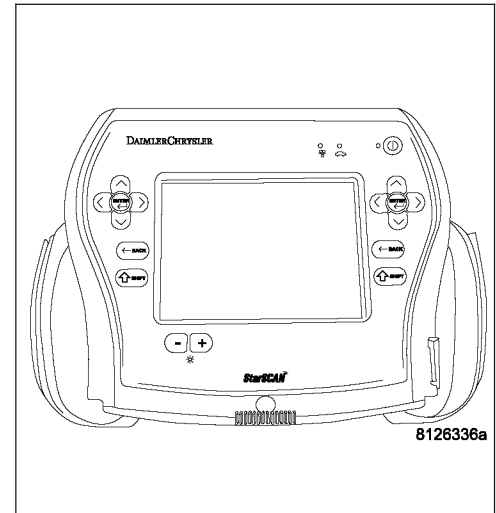


**U1507-IMPLAUSIBLE ENGINE TEMPERATURE MESSAGE DATA LENGTH RECEIVED (CONTINUED)****2. CHECK IF ECM/PCM DTC'S ARE PRESENT**

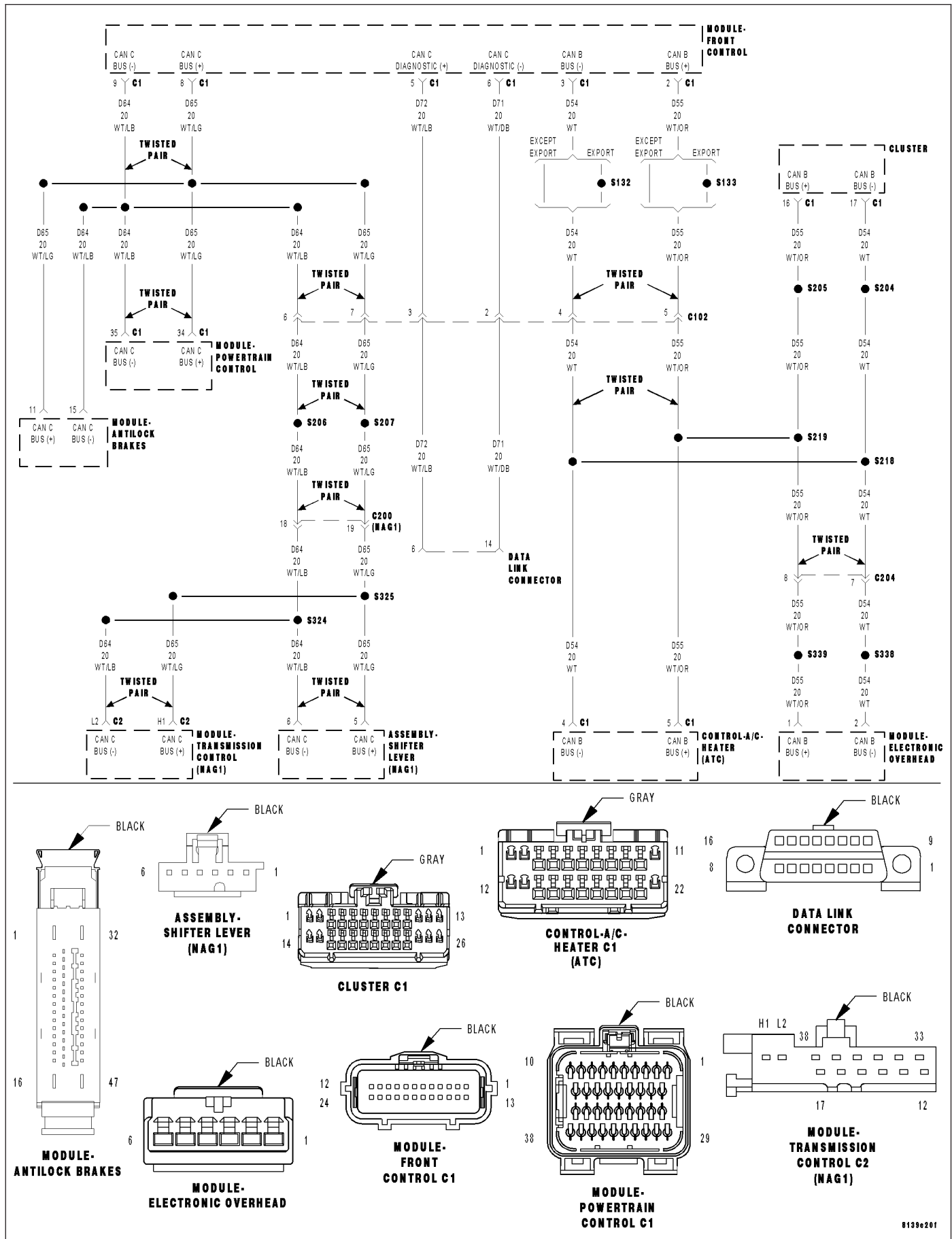
With the scan tool, read ECM/PCM DTCs.

**Are there any ECM/PCM DTC's present?**

- Yes** >> Refer to 9 - ENGINE ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



## U1509-IMPLAUSIBLE ENGINE VARIANT MESSAGE DATA LENGTH RECEIVED



**U1509-IMPLAUSIBLE ENGINE VARIANT MESSAGE DATA LENGTH RECEIVED (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**

Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.

- **Set Condition:**

When the TCM detects an incorrect CAN ID from the ECM/PCM.

Possible Causes
FCM CAN BUS DTC'S PRESENT ECM/PCM DTC'S PRESENT TRANSMISSION CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)**

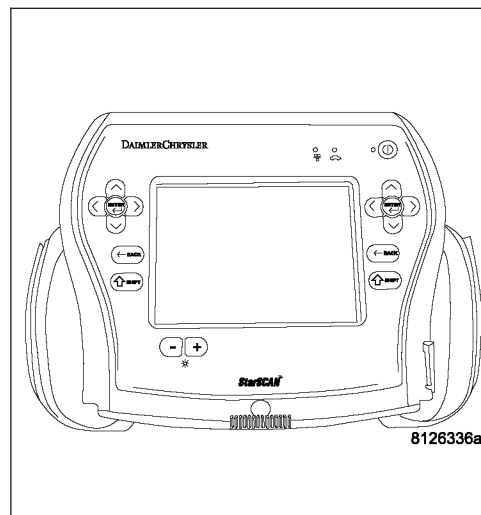
**Diagnostic Test****1. CHECK FOR FCM CAN BUS DTCS**

With the scan tool, read FCM DTCs.

**Are there any FCM CAN BUS DTC's present?**

**Yes** >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.

**No** >> Go To 2

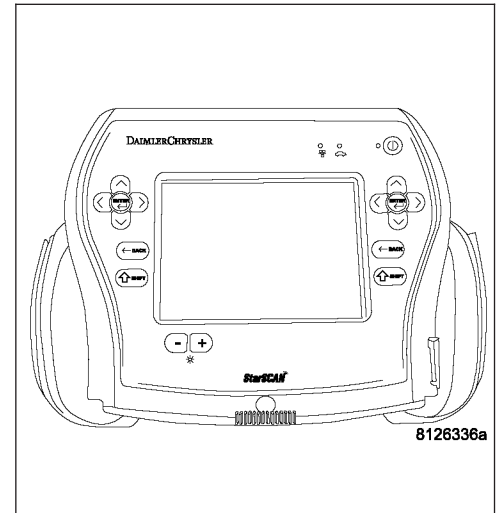


**U1509-IMPLAUSIBLE ENGINE VARIANT MESSAGE DATA LENGTH RECEIVED (CONTINUED)****2. CHECK IF ECM/PCM DTC'S ARE PRESENT**

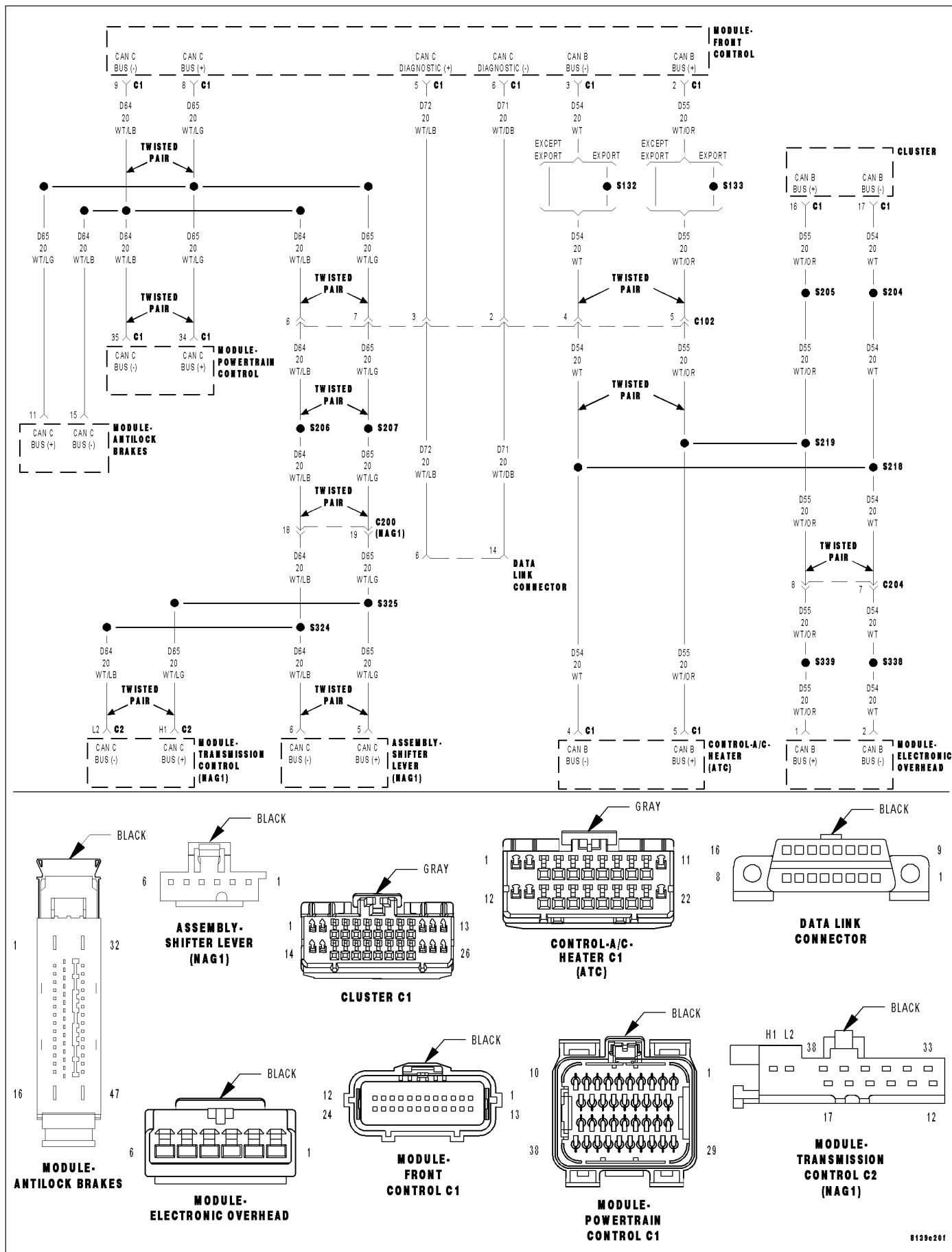
With the scan tool, read ECM/PCM DTCs.

**Are there any ECM/PCM DTC's present?**

- Yes**    >> Refer to 9 - ENGINE ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



# U150A-IMPLAUSIBLE FCM VARIANT MESSAGE DATA LENGTH RECEIVED



U150A-IMPLAUSIBLE FCM VARIANT MESSAGE DATA LENGTH RECEIVED (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

Theory of Operation

The messages sent on the CAN bus are distinguished by an identifier (ID). Each CAN ID is defined to contain a certain number of bytes. The Transmission Control Module (TCM) verifies that it has received the proper number of bytes for each ID.

- **When Monitored:**  
Continuously with the ignition on, one valid CAN ID received at least once, and no U0002-CAN Bus Off Performance DTC present.
- **Set Condition:**  
When the TCM detects an incorrect CAN ID from the FCM.

Possible Causes
FCM CAN BUS DTC'S PRESENT
TRANSMISSION CONTROL MODULE

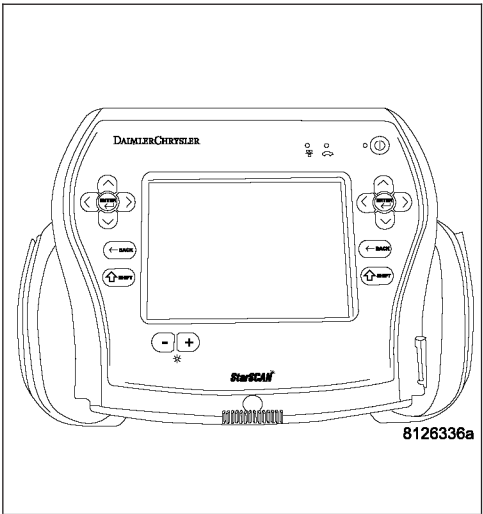
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

1. CHECK FOR FCM CAN BUS DTCS

With the scan tool, read FCM DTCs.

- Are there any FCM CAN BUS DTC's present?**
- Yes**    >> Refer to 8-ELECTRICAL - ELECTRONIC CONTROL MODULES - ELECTRICAL DIAGNOSTICS category and perform the appropriate symptom.
- No**    >> Using the schematics as a guide, check the Transmission Control Module (TCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the TCM per the Service Information. Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE for the appropriate service procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



**NAG1 TRANSMISSION VERIFICATION TEST - VER 1****1.**

Reconnect any disconnected components.

Connect the scan tool to the Data Link Connector.

With the scan tool, erase ABS DTCs.

With the scan tool, erase PCM DTCs.

With the scan tool, erase TCM DTCs.

With the scan tool, display the Transmission temperature. Start and run the engine until the Transmission temperature is above 43° C (110° F).

Check the Transmission fluid and adjust if necessary. Refer to the Service Information for the proper Fluid Fill procedure.

**Note: If internal repairs were performed and the shift quality is still poor, it may be necessary to check the internal repair.**

If internal transmission repairs are performed or replacement of the Transmission Control Module, perform a TCM ADAPTATION procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

**ROAD TEST PROCEDURE**

Road test the vehicle. Make fifteen to twenty 1–2, 2–3, 3–4, and 4–5 upshifts.

Perform these shifts from a standing start to 72 km/h (45 MPH) with a constant throttle opening of 20 to 25 degrees.

With speeds below 40 km/h (25 MPH), make five to eight wide open throttle kickdowns to 1st gear. Allow at least 5 seconds each in 2nd and 3rd gear between each kickdown.

With the scan tool, read Transmission DTCs.

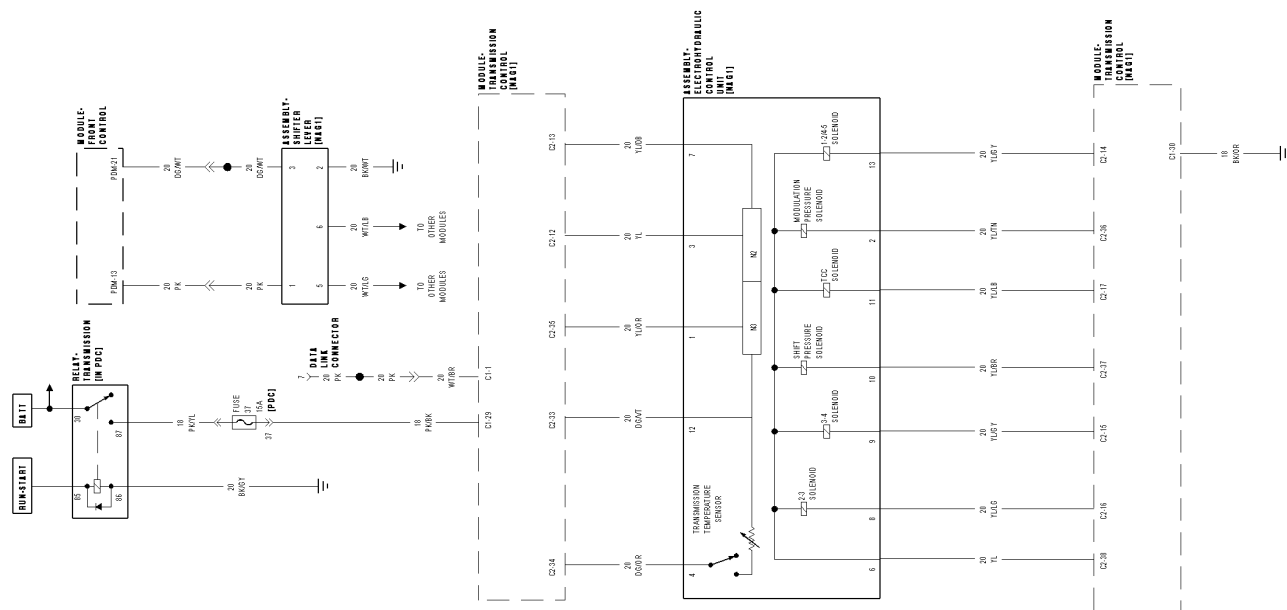
**Were any Diagnostic Trouble Codes set?**

**Yes** >> Repair is not complete, refer to appropriate symptom.

**No** >> Repair is complete.

---





AUTOMATIC TRANSMISSION NAG1 - SHIFTER  
DIAGNOSTICS

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AUTOMATIC TRANSMISSION NAG1 - SHIFTER DIAGNOSTICS

DIAGNOSIS AND TESTING

P0562–BATTERY VOLTAGE LOW

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagramRefer to Section 8W

Theory of Operation

The Shift Lever Assembly monitors ignition voltage. The DTC will set if the monitored battery voltage drops below 6.0 volts and a temporary limp in will be activated. If the voltage rises above 9.0 volts, normal operations is resumed.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
When monitored battery voltage drops below 6.0 volts.

Possible Causes
VEHICLE CHARGING SYSTEM (F902) IGNITION UNLOCK RUN START CIRCUIT (Z911) GROUND CIRCUIT SHIFT LEVER ASSSEMBLY

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

Diagnostic Test

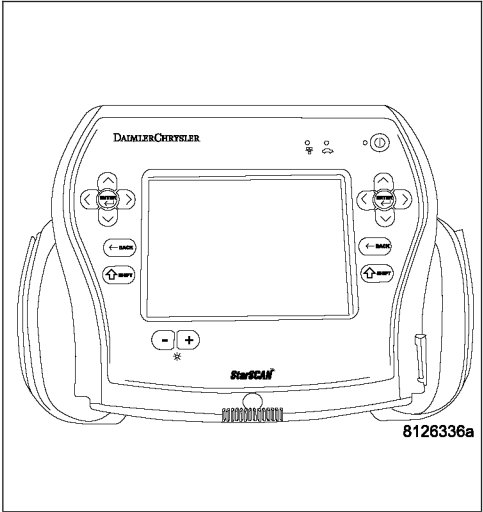
1. CHECK FOR ENGINE CHARGING SYSTEM DTCS

With the scan tool, read Engine DTCs.

- Are there any Engine Charging System DTCs present?
- Yes

>> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and perform the appropriate symptom.
- No

>> Go To 3



**P0562-BATTERY VOLTAGE LOW (CONTINUED)****2. CHECK (F902) IGNITION UNLOCK RUN START CIRCUIT**

Turn the ignition off to the lock position.

Disconnect the Shift Lever Assembly harness connector.

Turn the ignition on.

Using a 12-volt test light connected to ground, check the (F902) Ignition Unlock Run Start circuit in the Shift Lever Assembly harness connector.

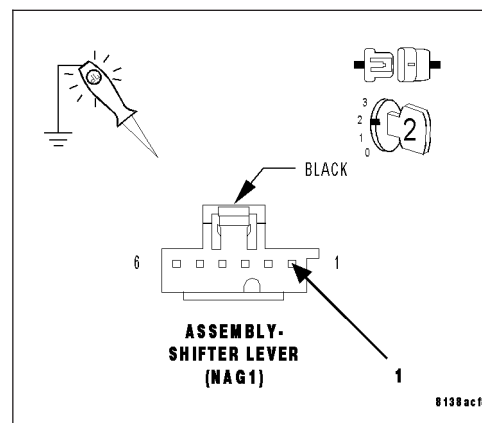
**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly?**

**Yes** >> Go To 6

**No** >> Repair the (F902) Ignition Unlock Run Start circuit for high resistance.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**3. CHECK (Z911) GROUND CIRCUIT**

Turn the ignition off to the lock position.

Using a 12-volt test light connected to 12-volts, check the (Z911) Ground circuit in the Shift Lever Assembly harness connector.

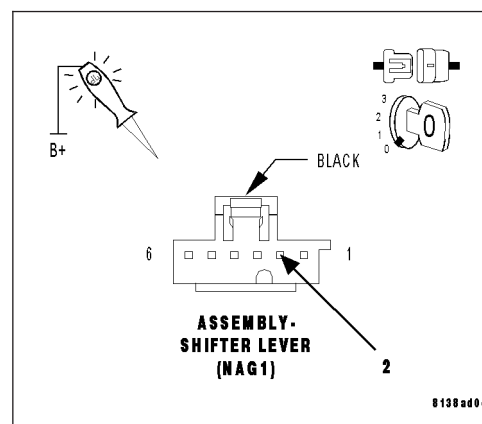
**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly?**

**Yes** >> Go To 7

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Repair the (Z911) Ground circuit for high resistance.

**4. SHIFT LEVER ASSEMBLY**

Reconnect all disconnected harness connectors.

With the scan tool, erase Shift Lever DTC's.

Start the engine and raise the engine speed to 2000 RPM.

With the scan tool, read Shift Lever DTC's.

**Did the P0562-BATTERY VOLTAGE LOW DTC reset?**

**Yes** >> Replace the Shift Lever Assembly per the Service Information  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

P0563–BATTERY VOLTAGE HIGH

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagramRefer to Section 8W

Theory of Operation

The Shift Lever Assembly monitors ignition voltage. The DTC will set, if the monitored battery voltage rises above 16.0 volts.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
When the monitored battery voltage rises above 16.0 volts.

Possible Causes
CHARGING SYSTEM DTCS VEHICLE WAS JUMP STARTED INCORRECTLY SHIFT LEVER ASSEMBLY

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

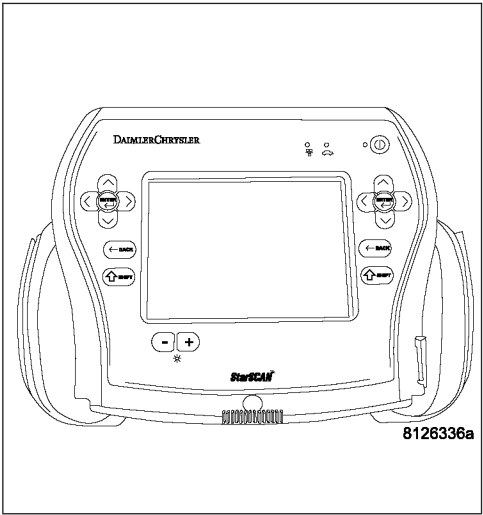
Diagnostic Test

1. CHECK FOR CHARGING SYSTEM DTCS

With the scan tool, read Engine DTCs.

Note: This includes any one trip faults.

- Are there any Engine Charging System DTCS present?
- Yes >> Refer to the 9 - ENGINE ELECTRICAL DIAGNOSTICS and perform the appropriate symptom.
- No >> Go To 3



2. VEHICLE WAS JUMP STARTED INCORRECTLY

Verify if the vehicle was jump started by another vehicle using a 24-volt charging system or incorrectly jump started with the 12 volt battery in series.

- Was the vehicle jump started by another vehicle?
- Yes >> This is the cause of the DTC. Erase the DTC and return the vehicle to the customer.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No >> Go To 3

## **P0563-BATTERY VOLTAGE HIGH (CONTINUED)**

### **3. SHIFT LEVER ASSEMBLY**

Reconnect all disconnected harness connectors.

With the scan tool, erase Shift Lever DTC's.

Start the engine and raise the engine speed to 2000 RPM.

With the scan tool, read Shift Lever DTC's.

#### **Did the P0562-BATTERY VOLTAGE HIGH DTC reset?**

**Yes**    >> Replace the Shift Lever Assembly per the Service Information  
            Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No**     >> Test Complete.

---

P0607–ECU INTERNAL PERFORMANCE

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagramRefer to Section 8W

Theory of Operation

The Shifter Lever Assembly performs various internal tests to verify proper controller operation. This DTC indicates that there is an issue with the Shifters internal processor.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
If the Shift Lever Assembly controller detects an error with the optical sensors or internal checksum value is not correct.

Possible Causes
SHIFTER LEVER ASSEMBLY

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

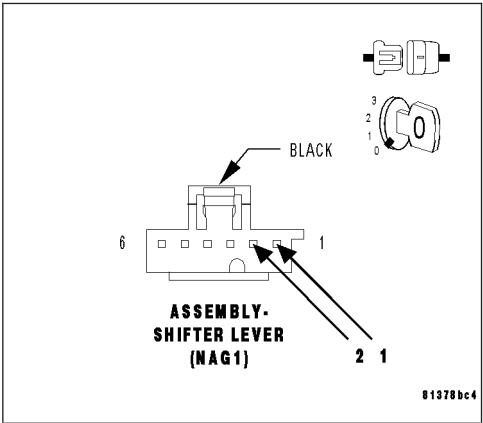
Diagnostic Test

1. SHIFT LEVER ASSEMBLY

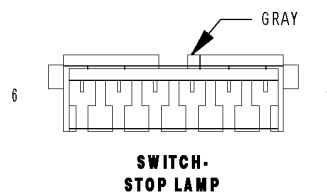
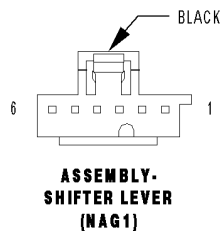
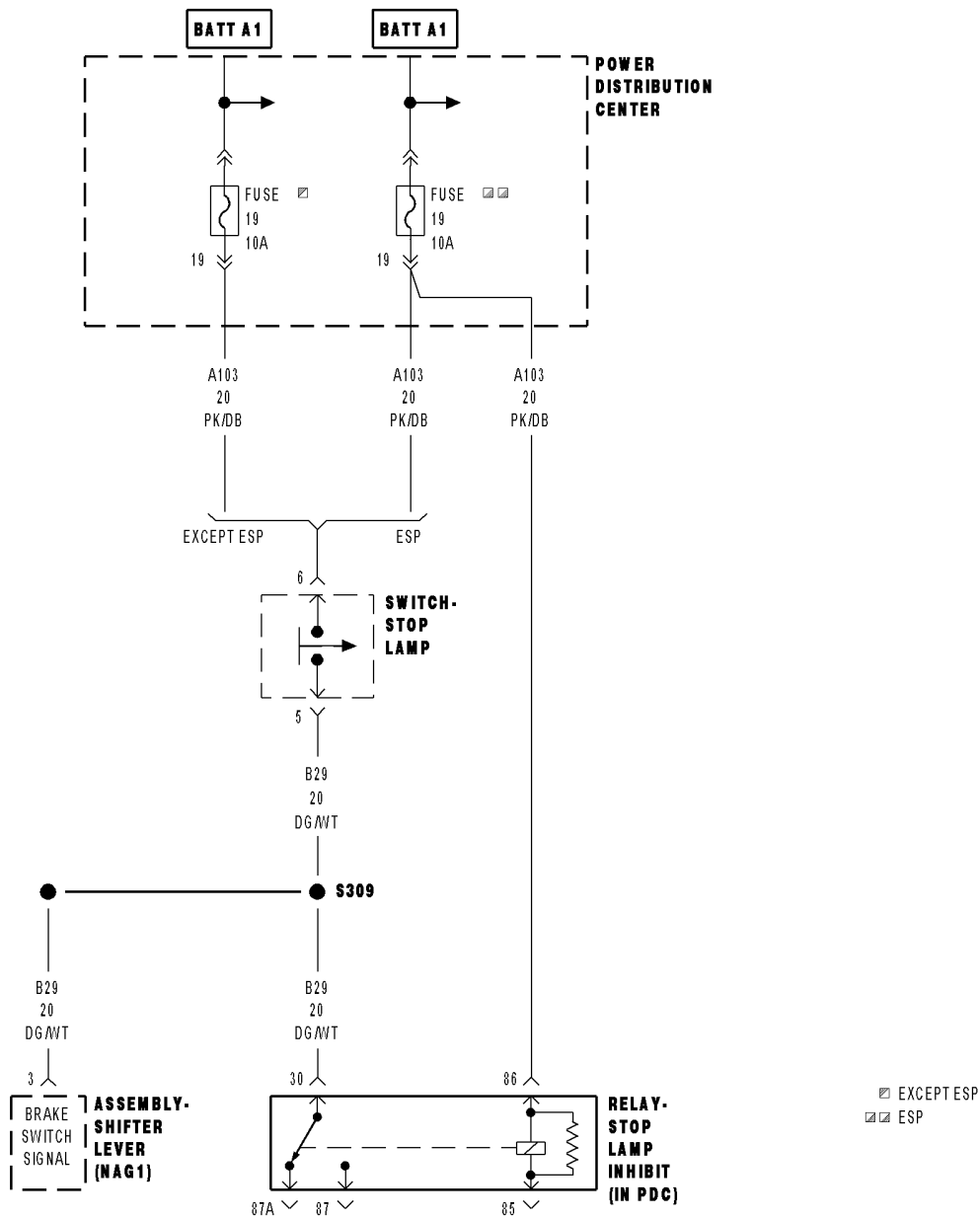
View repair

Repair

Using the schematics as a guide, check the Shifter Lever Assembly Control Module terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the Shift Lever Assembly per the Service Information. Refer to the 21 — AUTOMATIC TRANSMISSION NAG1 — Shift Mechanism for the appropriate service procedures. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



# P0930-BTSI CONTROL CIRCUIT LOW





**P0930-BTSI CONTROL CIRCUIT LOW (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagramRefer to **Section 8W**

**Theory of Operation**

The brake switch signal must be active before the shift lever can be moved out of the park position. The Shifter lever assembly receives two brake switch signals. The first signal is a CAN C Bus message sent to the shift lever assembly. The second signal is a hardwired brake switch signal to the shift lever assembly. The CAN C Bus message is the primary brake switch signal and the hardwired signal serves as the backup brake switch signal.

- **When Monitored:**  
Continuously with the ignition on.
- **Set Condition:**  
The DTC will set if the high side driver detects a short to ground for 10 seconds.

Possible Causes
ENGINE BRAKE DTC'S PRESENT ABS DTC'S PRESENT (B29) BRAKE SWITCH SIGNAL SHORT TO GROUND SHIFT LEVER ASSEMBLY

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

**Diagnostic Test**

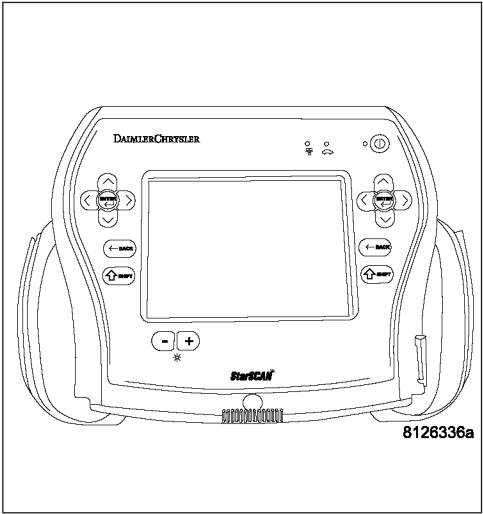
**1. ENGINE DTC'S PRESENT**

With the scan tool, read Engine DTCs.

- Are there any Engine brake DTC's present?
- Yes

>> Refer to 9 — ENGINE ELECTRICAL DIAGNOSTICS and perform the appropriate diagnostic procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No

>> Go To 2



**P0930-BTSI CONTROL CIRCUIT LOW (CONTINUED)****2. ABS MODULE DTC'S PRESENT**

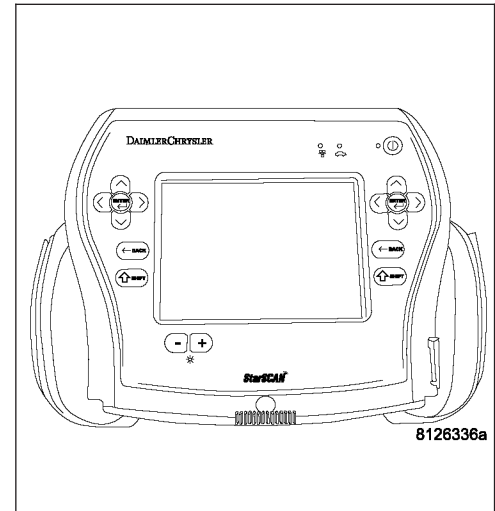
With the scan tool, read ABS Module DTCs.

**Are there any ABS DTC's present?**

**Yes** >> Refer to Section 5 - BRAKES - ABS ELECTRICAL DIAGNOSTICS and perform the appropriate diagnostic procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. (B29) BRAKE SWITCH SIGNAL SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the Shift Lever Assembly harness connector.

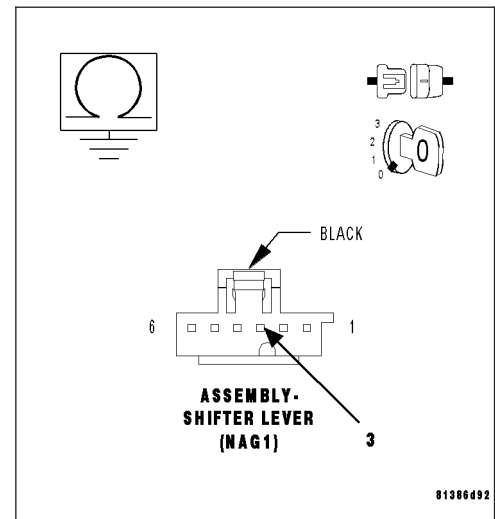
**Note: Check connectors - Clean/repair as necessary.**

Measure the resistance between ground and the (B29) Brake Switch Signal circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (B29) Brake Switch Signal for a short to ground.

**No** >> Go To 4

**4. SHIFT LEVER ASSEMBLY**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

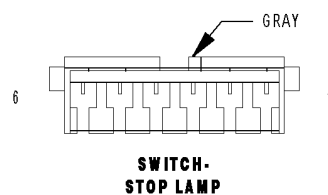
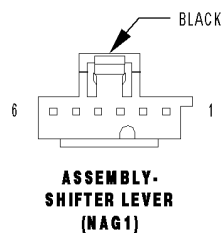
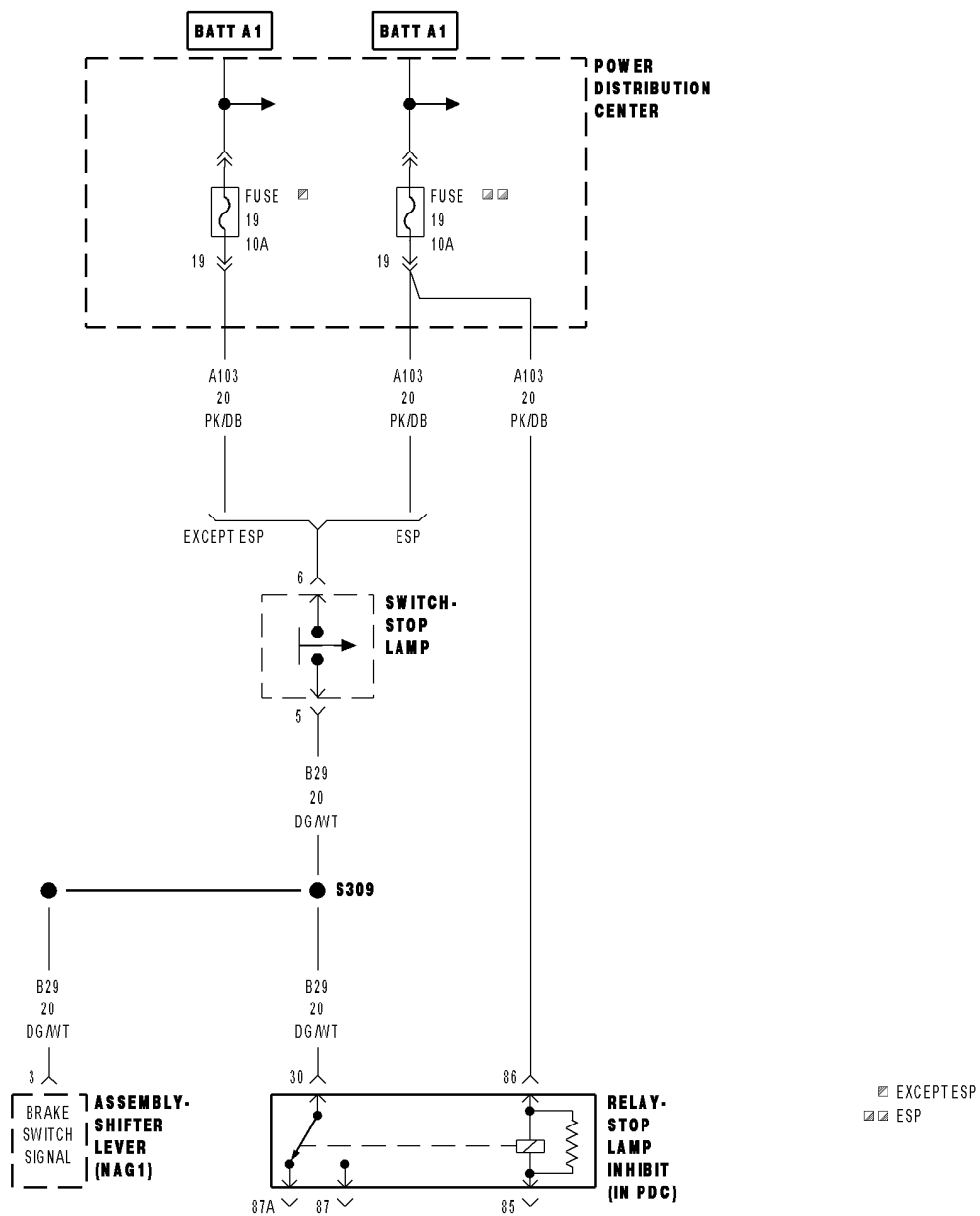
**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Shift Lever Assembly per the Service Information.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

## P0931-BTSI CONTROL CIRCUIT HIGH



**P0931-BTSI CONTROL CIRCUIT HIGH (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

**Theory of Operation**

The brake switch signal must be active before the shift lever can be moved out of the park position. The Shifter lever assembly receives two brake switch signals. The first signal is a CAN C Bus message sent to the shift lever assembly. The second signal is a hardwired brake switch signal to the shift lever assembly. The CAN C Bus message is the primary brake switch signal and the hardwired signal serves as the backup brake switch signal. These two brake switch signals are compared against each other to verify proper brake switch operation.

- **When Monitored:**  
Continuously with the ignition key on.
- **Set Condition:**  
The DTC will set if the high side driver detects an open load for 10 seconds.

Possible Causes
ENGINE BRAKE DTC'S PRESENT ABS DTC'S PRESENT (B29) BRAKE SWITCH SIGNAL OPEN (B29) BRAKE SWITCH SIGNAL SHORT TO VOLTAGE SHIFT LEVER ASSEMBLY

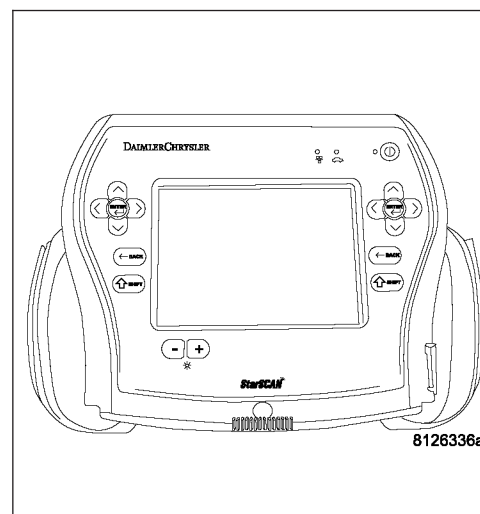
Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

**Diagnostic Test****1. ENGINE DTC'S PRESENT**

With the scan tool, read Engine DTCs.

**Are there any Engine brake DTC's present?**

- Yes** >> Refer to 9 — ENGINE ELECTRICAL DIAGNOSTICS and perform the appropriate diagnostic procedure.  
Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Go To 2



**P0931-BTSI CONTROL CIRCUIT HIGH (CONTINUED)****2. ABS MODULE DTC'S PRESENT**

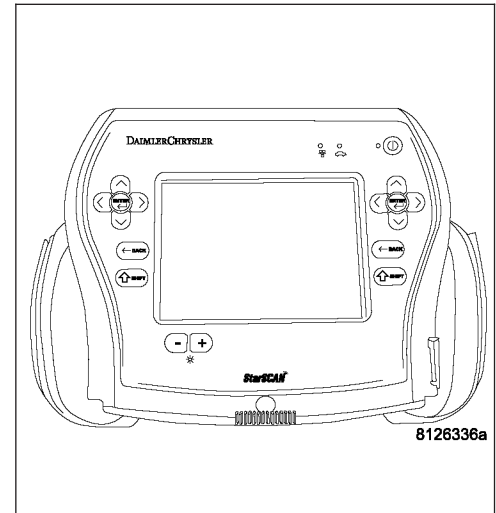
With the scan tool, read ABS Module DTCs.

**Are there any ABS DTC's present?**

**Yes** >> Refer to Section 5 - BRAKES - ABS ELECTRICAL DIAGNOSTICS and perform the appropriate diagnostic procedure.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. (B29) BRAKE SWITCH SIGNAL OPEN**

Turn the ignition off to the lock position.

Disconnect the Shift Lever Assmbly harness connector.

Disconnect the Stop Lamp Switch harness connector.

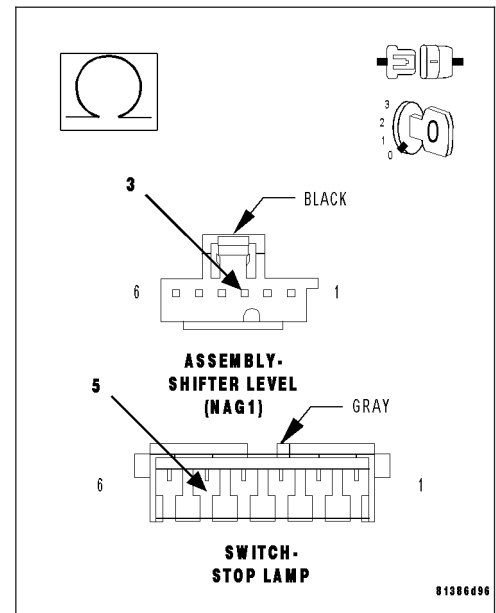
**Note: Check connectors - Clean/repair as necessary.**

Measure the resistance of the (B29) Brake Switch Signal circuit between the Shift Lever Assembly harness connector and the Stop Lamp Switch.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (B29) Brake Switch Signal for an open.

**No** >> Go To 4



**P0931-BTSI CONTROL CIRCUIT HIGH (CONTINUED)****4. (B29) BRAKE SWITCH SIGNAL SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the Shift Lever Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

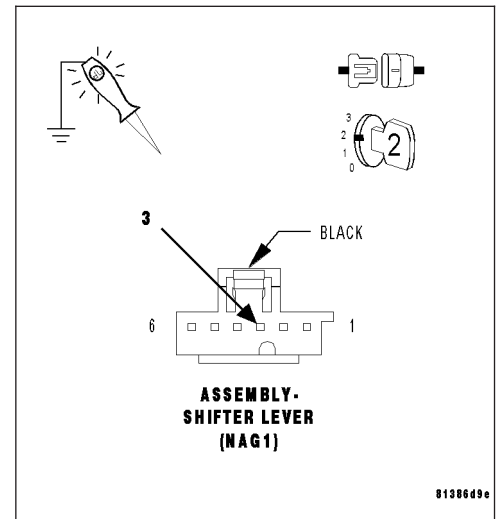
Turn the ignition on..

Measure the voltage of the (B29) Brake Switch Signal circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (B29) Brake Switch Signal for a short to voltage.

**No** >> Go To 5

**5. SHIFT LEVER ASSEMBLY**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Shift Lever Assembly per the Service Information.

Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

P2775–AUTOSTICK UPSHIFT SWITCH CIRCUIT PERFORMANCE

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagramRefer to Section 8W

Theory of Operation

The AutoStick Switch is integrated into the Shift Lever Assembly. The gear requested by the AutoStick selection is then sent over the CAN C bus to the TCM to engage the requested gear.

- **When Monitored:**  
When in AutoStick mode.
- **Set Condition:**  
When the expected switch state is not correctly sensed by the Shift Lever Assembly. If the upshift switch signal is detected as active in gear position other than drive or both upshift and downshift signals are active at the same time.

Possible Causes
SHIFTER LEVER ASSEMBLY

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

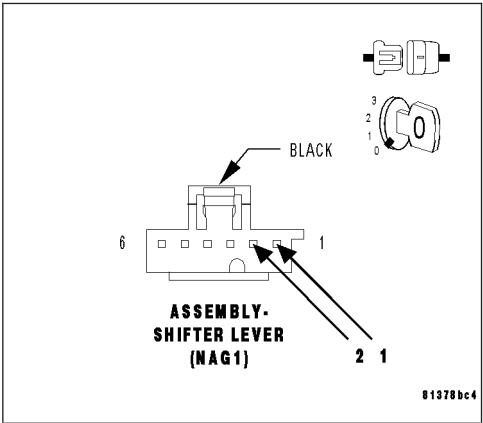
1. SHIFTER LEVER ASSEMBLY

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Using the schematics as a guide, check the Shifter Lever Assembly Control Module terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the Shift Lever Assembly per the Service Information. Refer to Shift Mechanism for the appropriate service procedures. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.



## P2779–AUTOSTICK DOWNSHIFT SWITCH CIRCUIT PERFORMANCE

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W

### Theory of Operation

The AutoStick Switch is integrated into the Shift Lever Assembly. The gear requested by the AutoStick selection is then sent over the CAN C bus to the TCM to engage the requested gear.

- **When Monitored:**  
When in AutoStick mode.
- **Set Condition:**  
When the expected switch state is not correctly sensed by the Shift Lever Assembly. If the upshift switch signal is detected as active in gear position other than drive or both upshift and downshift signals are active at the same time.

Possible Causes
SHIFTER LEVER ASSEMBLY

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - DIAGNOSIS AND TESTING)

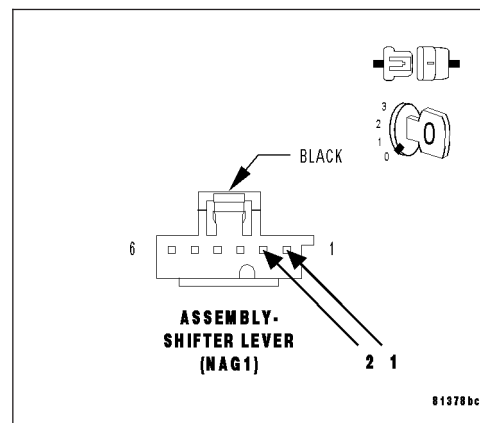
### 1. SHIFTER LEVER ASSEMBLY

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

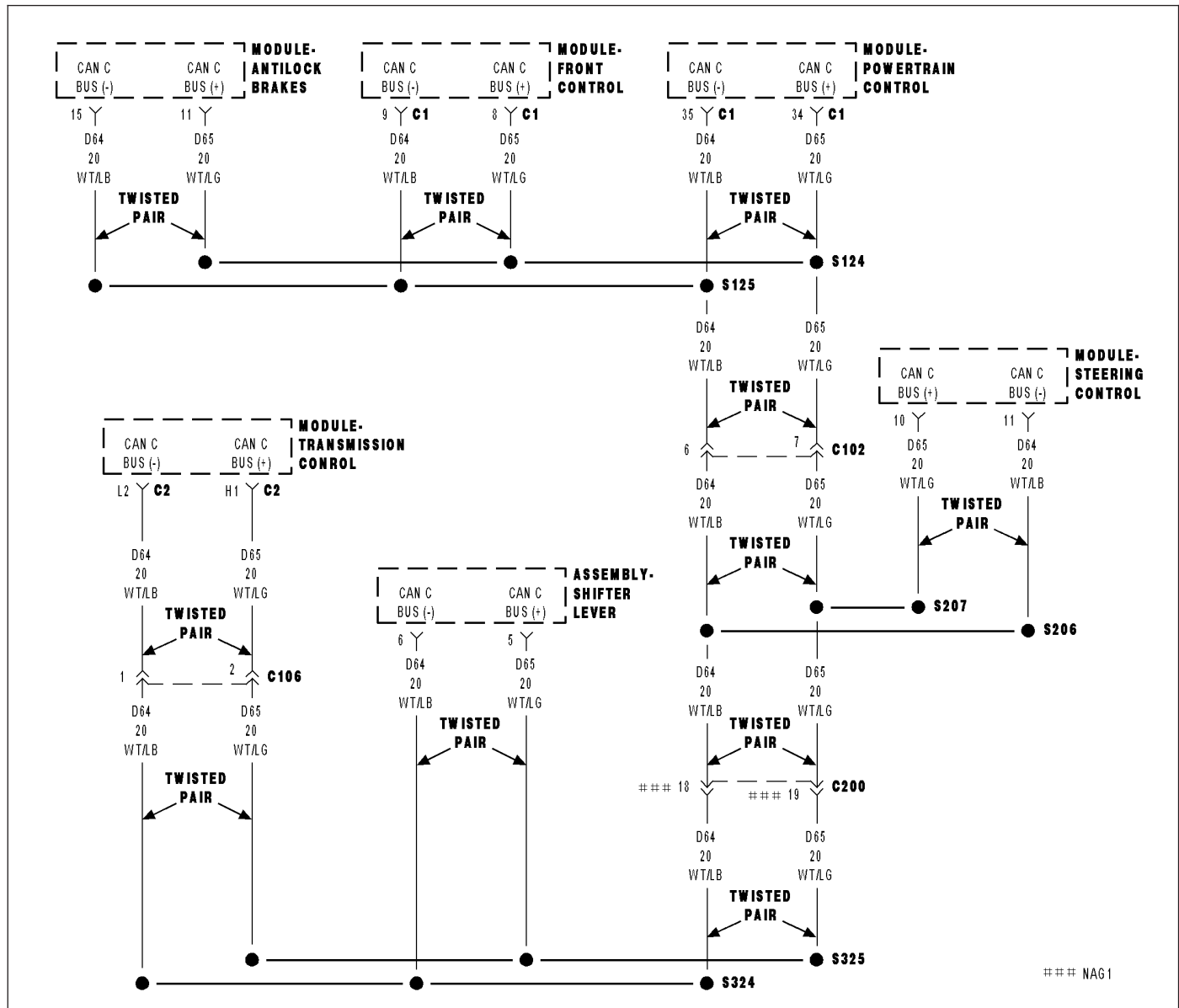
#### Repair

Using the schematics as a guide, check the Shifter Lever Assembly Control Module terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the Shift Lever Assembly per the Service Information. Refer to Shift Mechanism for the appropriate service procedures. Perform NAG1 TRANSMISSION VERIFICATION TEST - VER 1.

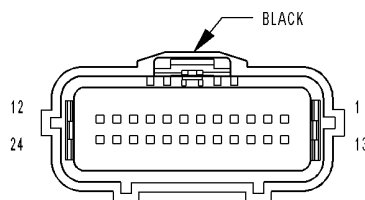




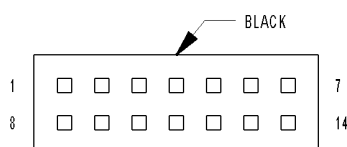
# U0002-CAN C BUS OFF PERFORMANCE



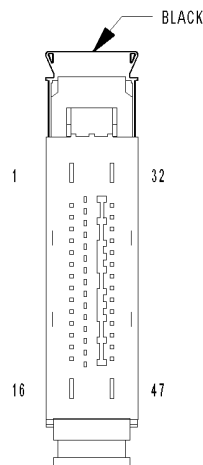
### NAG1



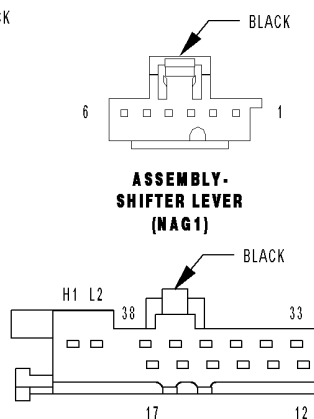
**MODULE-FRONT CONTROL C1**



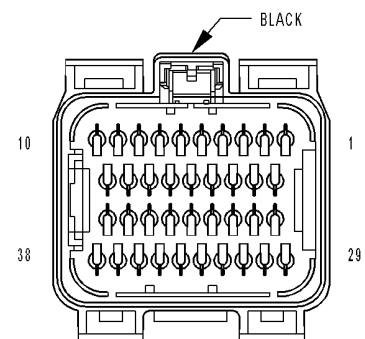
**MODULE-STEERING CONTROL**



**MODULE-ANTILOCK BRAKES**



**ASSEMBLY-SHIFTER LEVER (NAG1)**



**MODULE-POWERTRAIN CONTROL C1**

**U0002-CAN C BUS OFF PERFORMANCE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

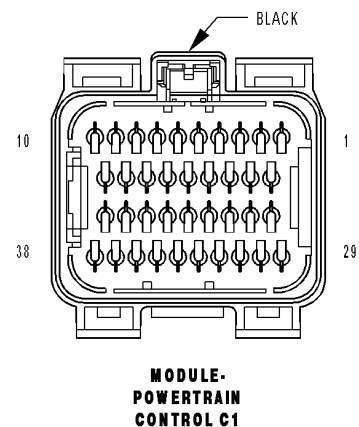
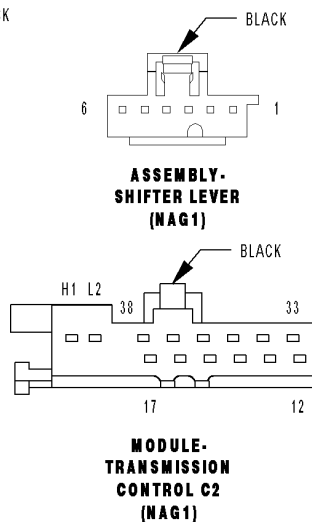
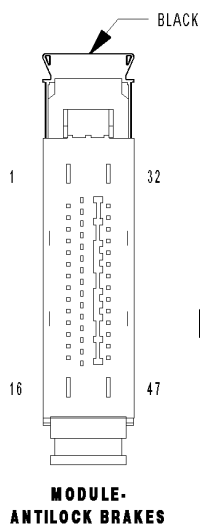
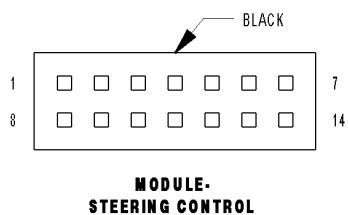
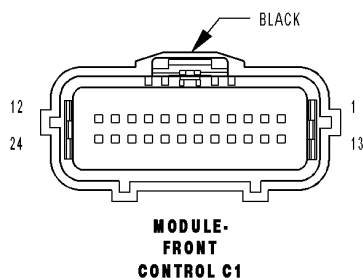
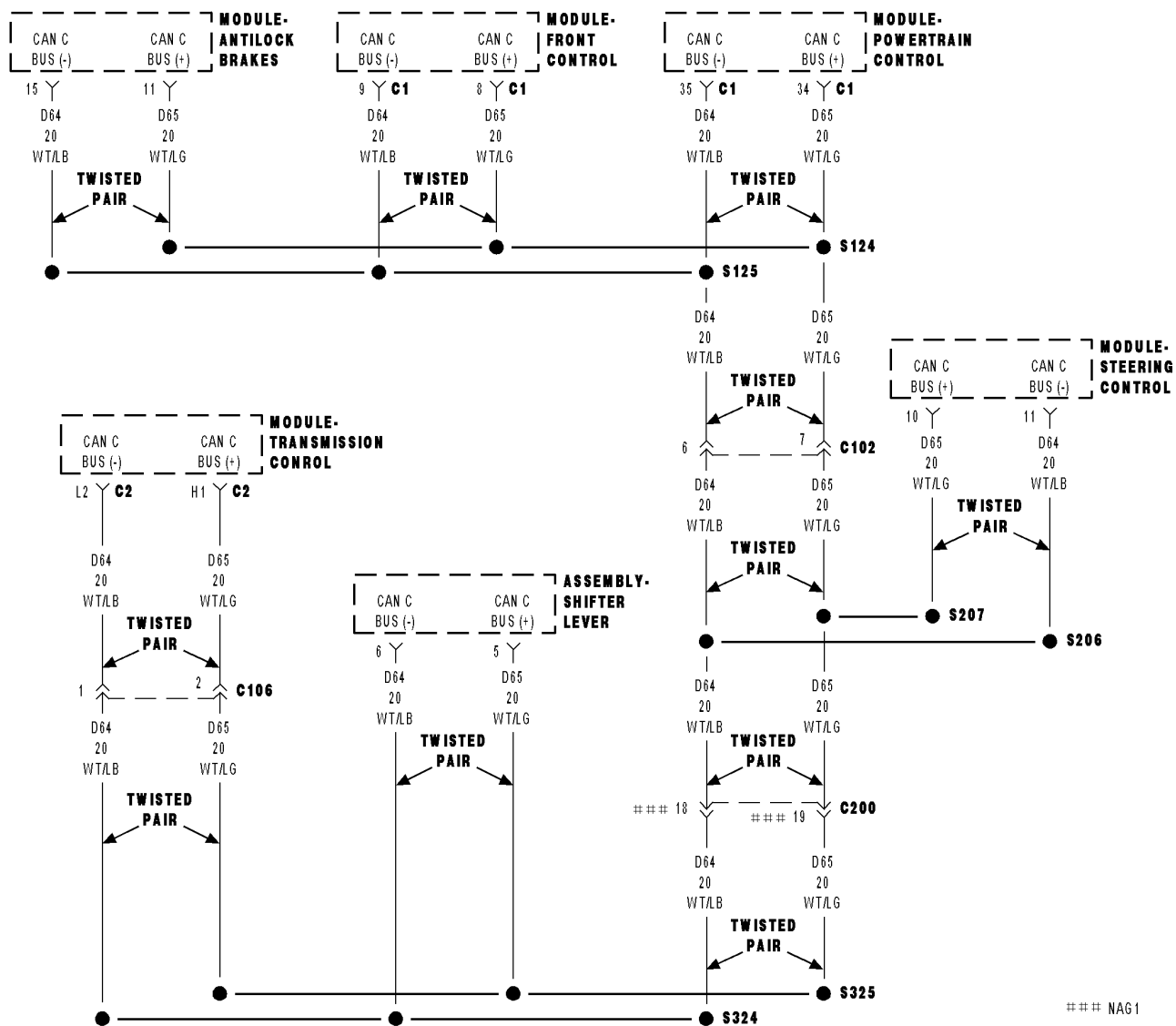
For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

Some controllers communicate with other controllers over the CAN C bus. The Shifter controller continuously monitors the bus activity and receives the messages it needs. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller.

**Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.**

## U0100-LOST COMMUNICATION WITH ECM/PCM



**U0100—LOST COMMUNICATION WITH ECM/PCM (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

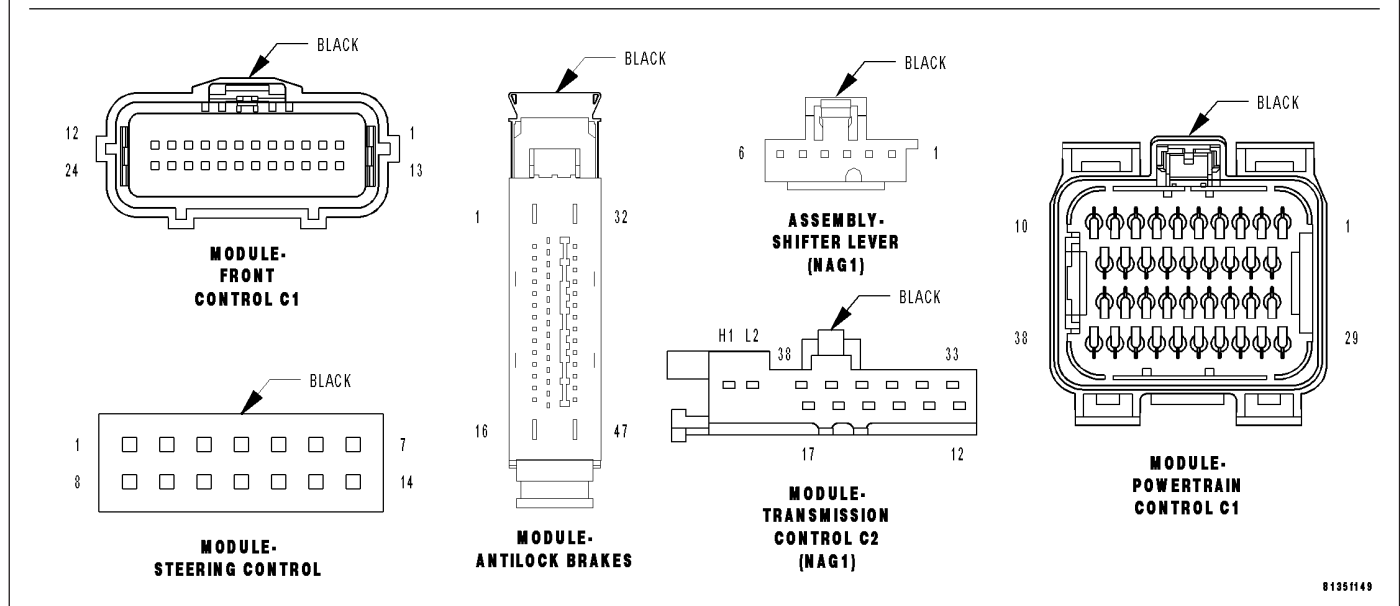
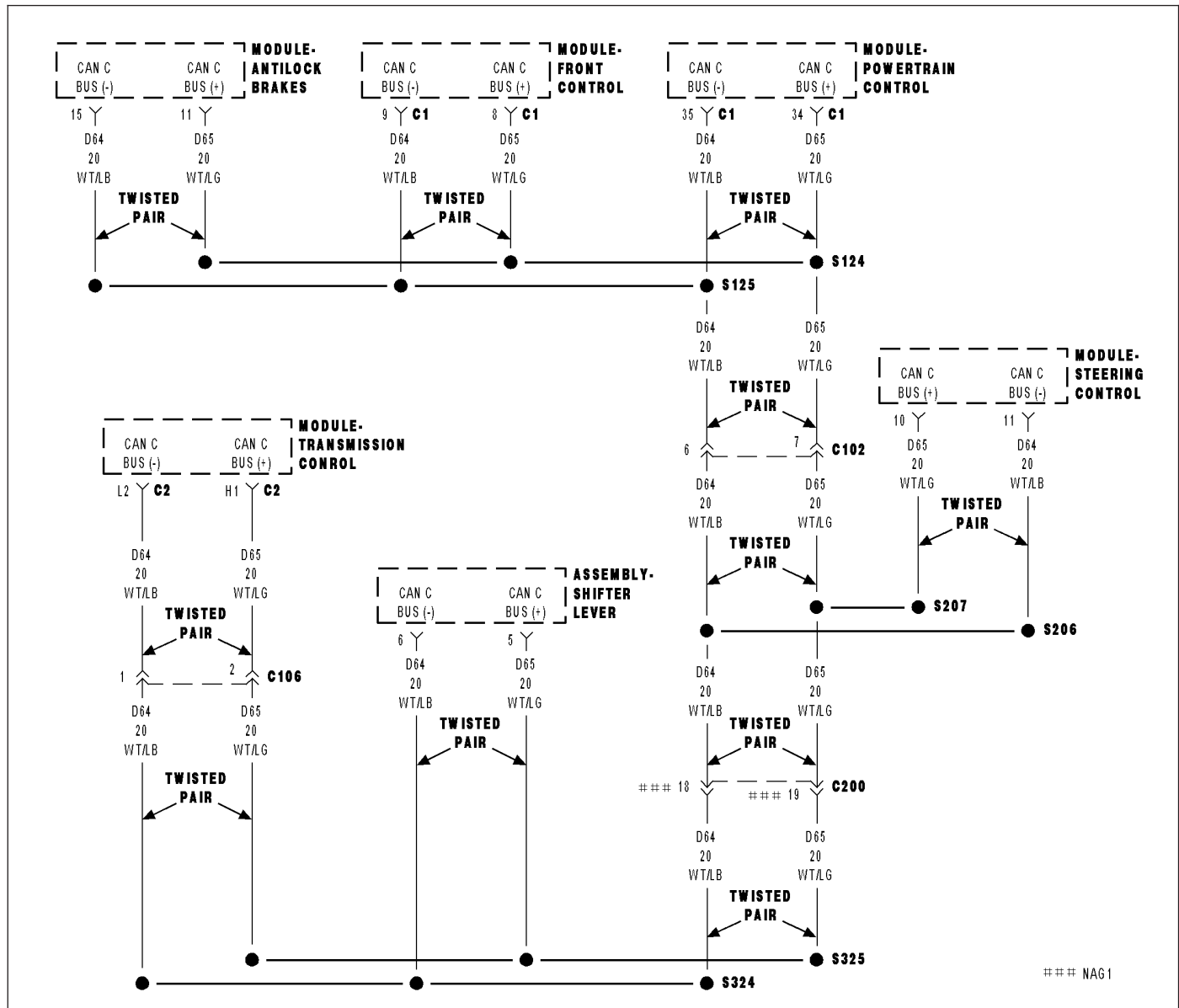
For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

Some controllers communicate with other controllers over the CAN C bus. The Shifter controller continuously monitors the bus activity and receives the messages it needs. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller.

**Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.**

# U0121-LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE



**U0121—LOST COMMUNICATION WITH ANTI-LOCK BRAKE MODULE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

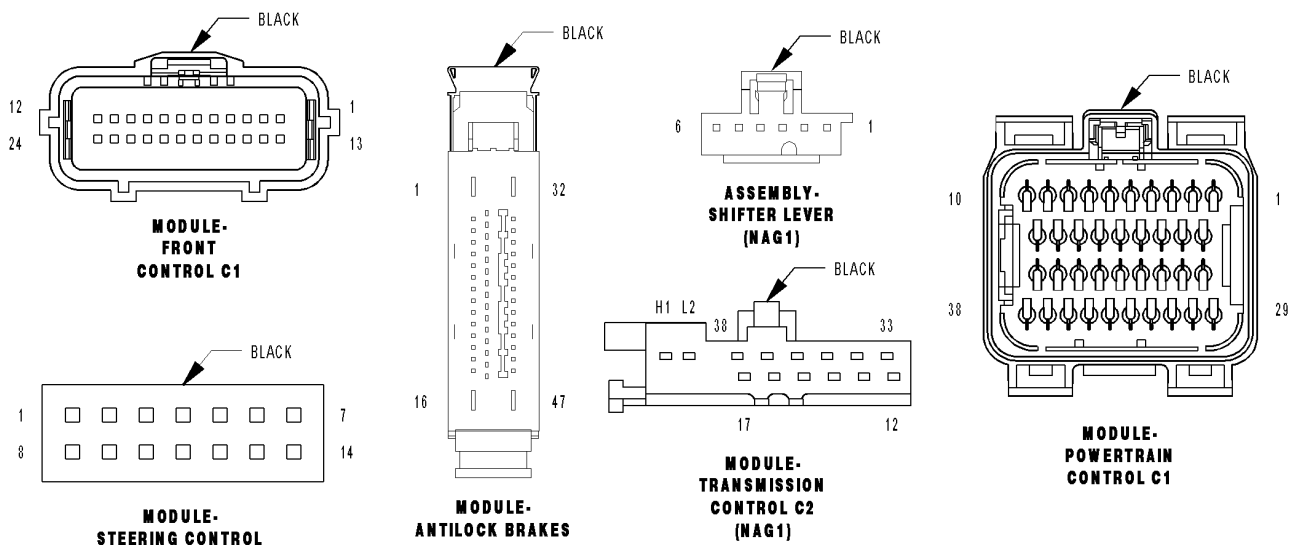
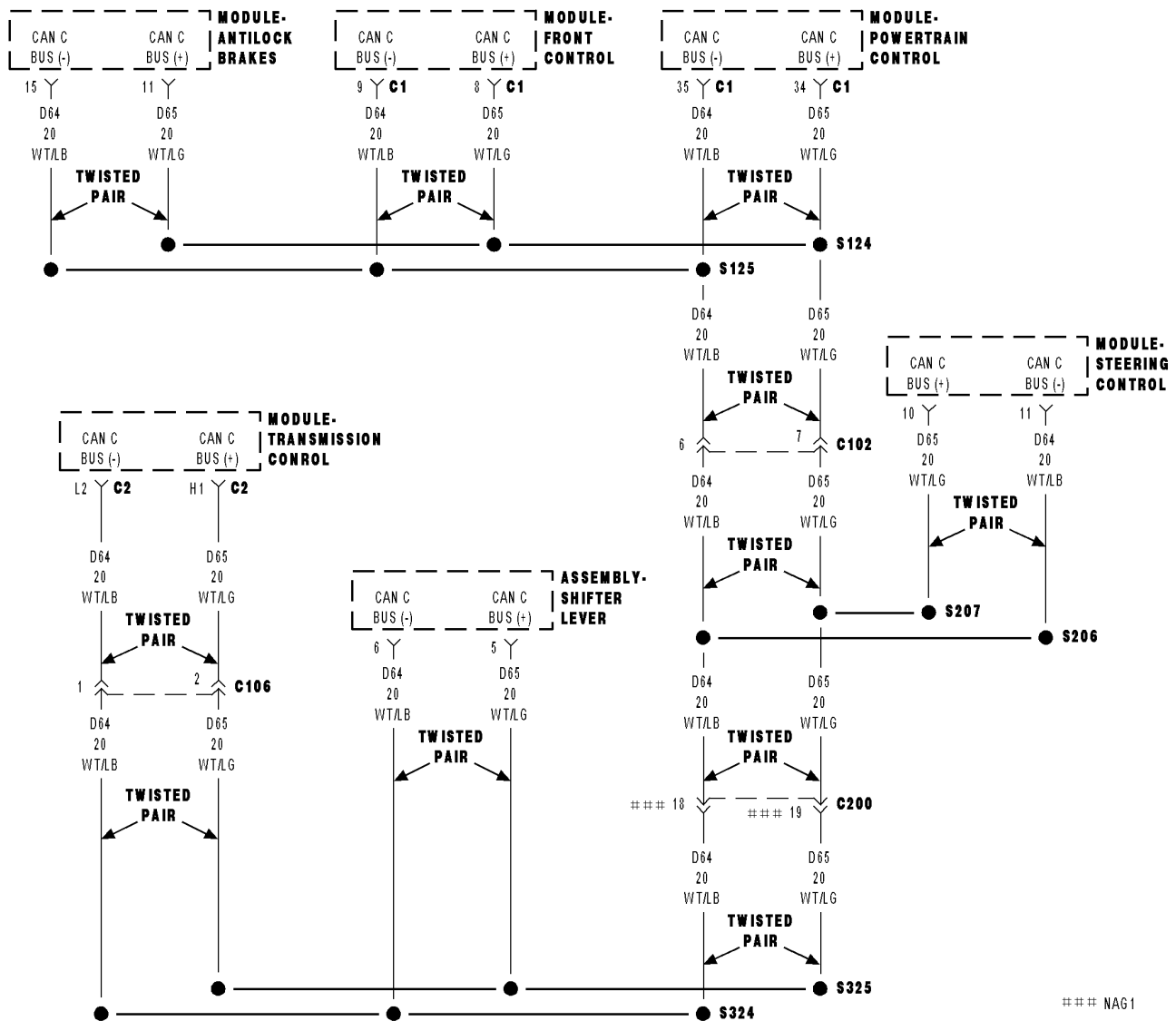
For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

Some controllers communicate with other controllers over the CAN C bus. The ABS controller continuously monitors the bus activity and receives the messages it needs. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller.

**Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.**

# U0141-LOST COMMUNICATION WITH FRONT CONTROL MODULE



**U0141—LOST COMMUNICATION WITH FRONT CONTROL MODULE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - NAG1 - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

**Theory of Operation**

Some controllers communicate with other controllers over the CAN C bus. The FCM controller continuously monitors the bus activity and receives the messages it needs. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller.

**Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.**



## AUTOMATIC TRANSMISSION 42RLE - ELECTRICAL DIAGNOSTICS

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## **AUTOMATIC TRANSMISSION 42RLE - ELECTRICAL DIAGNOSTICS**

### **DIAGNOSIS AND TESTING**

## PRE-DIAGNOSTIC CHECK OUT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

### Diagnostic Test

#### 1. PRE-DIAGNOSTIC CHECK OUT

**Note:** Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.

**Note:** Always perform diagnostics with a fully charged battery to avoid false symptoms.

With the scan tool, read Engine DTC's. Check and repair all Engine DTC's prior to performing any transmission symptom diagnostics.

With the scan tool, read Transmission DTC's. Record all DTC's and 1 Trip Failures.

**Note:** Diagnose 1 Trip Failures as a fully matured DTC.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary.

Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal.

For Gear Ratio DTC's, check and record all CVI's.

Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run.

**Note:** Verify flash level of Powertrain Control Module. Some problems are corrected by software upgrades to the Transmission and Engine software.

**Note:** Check for applicable TSB's related to the problem.

**Were any repairs made that fixed the customer's complaint?**

**Yes** >> Testing complete.

**No** >> Refer to the diagnostic test procedure related to the DTC.

---

P0122-TPS/APP CIRCUIT LOW

For the Transmission circuit diagram(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously with the ignition on and engine running.
- **Set Condition:**  
This DTC will set if the monitored TPS voltage drops below .078 volts for the period of 0.48 seconds.

Possible Causes
RELATED TPS ENGINE DTC'S PRESENT
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

Theory of Operation

The transmission controller receives the throttle position signal and its ground from the Throttle Position Sensor (TPS). The TPS has a 5 volt pull up supplied by the engine controller. The throttle signal is checked for out of range as well as intermittent operation (excessive signal changes). The engine controller transmits the throttle value via the Bus. Most engine controllers can synthesize the throttle value if the throttle position sensor signal is lost. If a throttle error is detected by the transmission controller and the throttle value is available via the Bus, the Bus throttle value will be used and normal operation will continue, however a throttle fault code will be set. If a throttle error is detected and the throttle value is not available via the Bus, normal operation will be discontinued, a throttle fault code will be set, and the MIL will be turned on after 5 min. of substituted operation.

Diagnostic Test

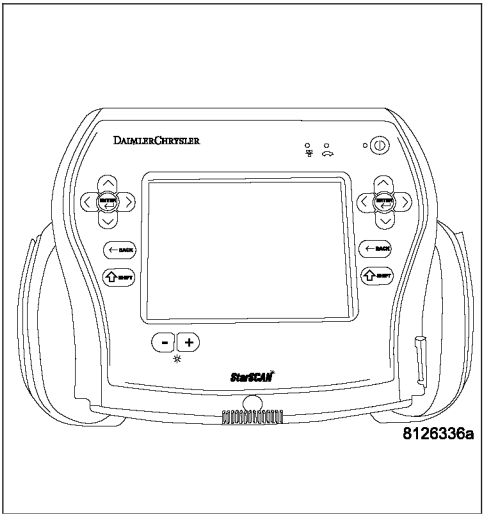
1. DETERMINING IF RELATED ENGINE TPS DTC'S ARE PRESENT

With the scan tool, check Engine DTC's, this includes all one trip failures.

- Are there any Engine TPS DTC's present?
- Yes

>> Refer to the Driveability category and perform the appropriate symptom.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No

>> Go To 2



**P0122-TPS/APP CIRCUIT LOW (CONTINUED)****2. CHECK TO SEE IF DTC IS CURRENT**

With the scan tool, record the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

With the scan tool, erase Transmission DTCs.

**Note:** To erase EATX EVENT DATA information, a **BATTERY DISCONNECT** must be performed. Performing a **BATTERY DISCONNECT** will reset all learned Transmission values to controller defaults which may lead to erratic shift schedules.

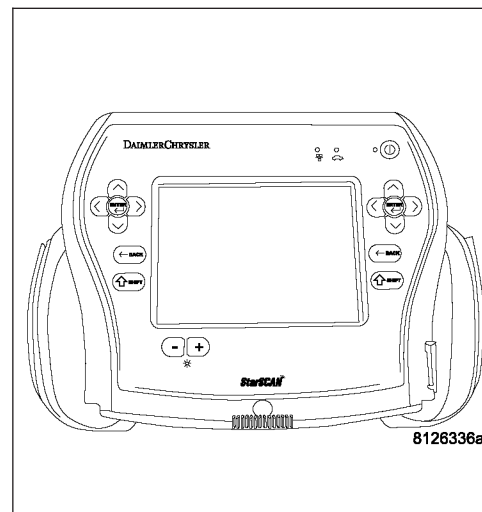
Drive the vehicle and try to duplicate the conditions in which the DTC was reported by the EATX DTC EVENT DATA.

With the scan tool, read Transmission DTCs.

**Did the DTC P0122 THROTTLE POSITION SENSOR LOW, reset?**

**Yes** >> Go To 3

**No** >> Go To 4

**3. POWERTRAIN CONTROL MODULE**

**Note:** Due to the integration of the Powertrain and Transmission Control Modules, bus communication between the modules is internal.

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

Verify the flash level of the controller and update the controller if available.

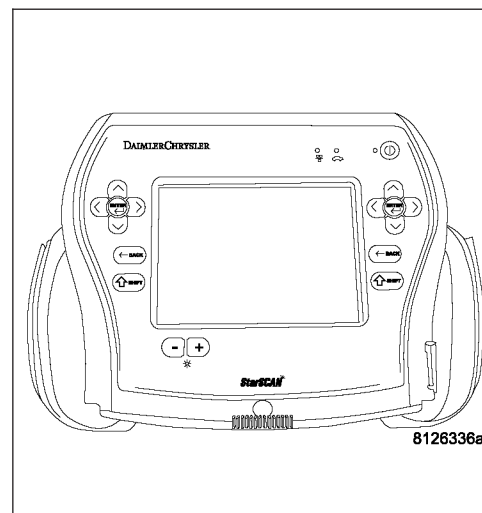
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool PERFORM QUICK LEARN, then program Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0122-TPS/APP CIRCUIT LOW (CONTINUED)****4. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

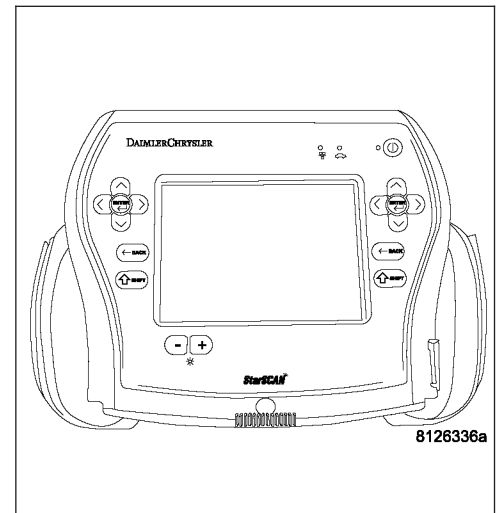
Pay particular attention to the TPS signal and sensor ground circuits.

With the scan tool, check the EATX EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

**Yes**    >> Repair as necessary.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST -  
          VER 1.

**No**      >> Test Complete.



## P0123-TPS/APP CIRCUIT HIGH

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**  
Continuously with the ignition on and engine running.
- **Set Condition:**  
This DTC will set if the monitored TPS voltage rises above 4.94 volts for the period of 0.48 seconds.

Possible Causes
RELATED TPS ENGINE DTC'S PRESENT
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The powertrain controller receives the throttle position signal and its ground from the Throttle Position Sensor (TPS). The TPS has a 5 volt pull up. The throttle signal is checked for out of range as well as intermittent operation (excessive signal changes). The engine controller transmits the throttle value via the Bus. Most engine controllers can synthesize the throttle value if the throttle position sensor signal is lost. If a throttle error is detected by the transmission control system and the throttle value is available via the Bus. The Bus throttle value will be used and normal operation will continue, however a throttle fault code will be set. If a throttle error is detected and the throttle value is not available via the Bus, normal operation will be discontinued, a throttle fault code will be set, and the MIL will be turned on after 5 min. of substituted operation.

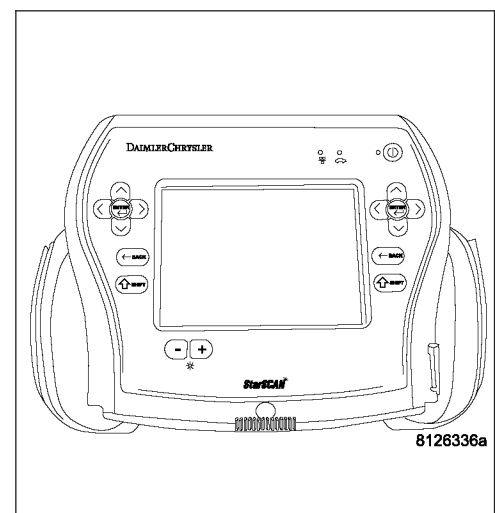
## Diagnostic Test

### 1. DETERMINING IF RELATED ENGINE TPS DTC'S ARE PRESENT

With the scan tool, check Engine DTC's, this includes all one trip failures.

**Are there any Engine TPS DTCs present?**

- Yes** >> Refer to the Driveability category and perform the appropriate symptom.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Go To 2



**P0123-TPS/APP CIRCUIT HIGH (CONTINUED)****2. CHECK TO SEE IF DTC IS CURRENT**

With the scan tool, record the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

With the scan tool, erase Transmission DTCs.

**Note:** To erase EATX EVENT DATA information, a BATTERY DISCONNECT must be performed. Performing a BATTERY DISCONNECT will reset all learned Transmission values to controller defaults which may lead to erratic shift schedules.

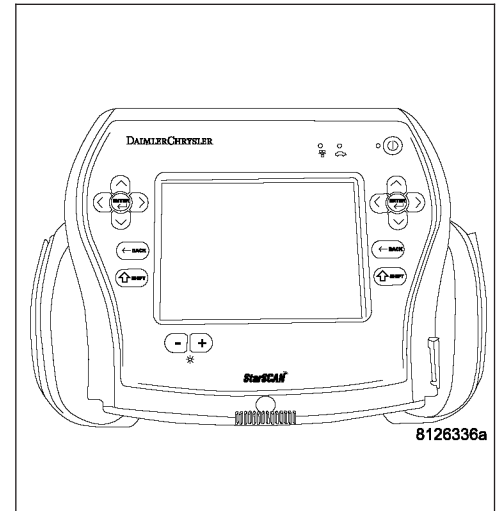
Drive the vehicle and try to duplicate the conditions in which the DTC was reported by the EATX DTC EVENT DATA.

With the scan tool, read Transmission DTCs.

**Did the DTC P0123 THROTTLE POSITION SENSOR HIGH, reset?**

**Yes** >> Go To 3

**No** >> Go To 4

**3. POWERTRAIN CONTROL MODULE**

**Note:** Due to the integration of the Powertrain and Transmission Control Modules, communication between the modules is internal.

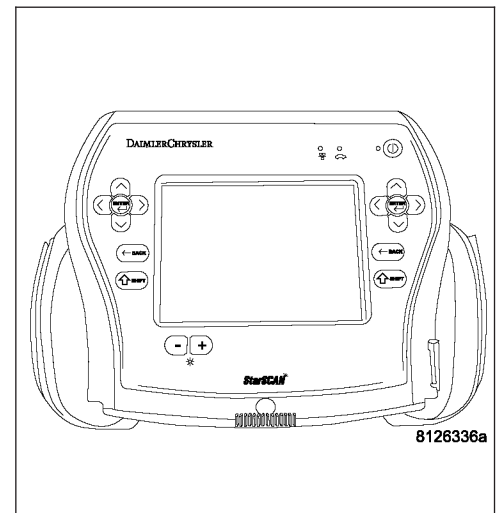
Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool PERFORM QUICK LEARN, then program Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0123-TPS/APP CIRCUIT HIGH (CONTINUED)****4. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

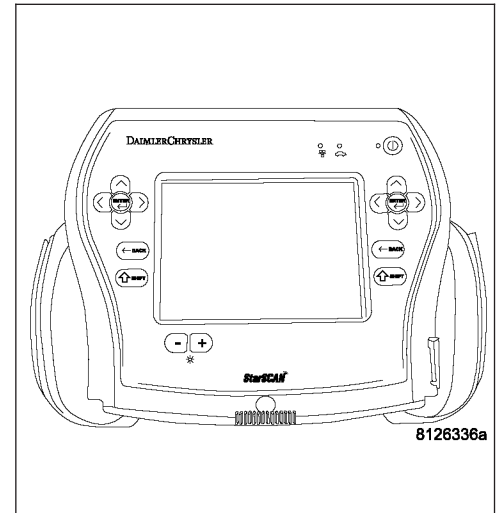
Pay particular attention to the TPS signal and sensor ground circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform 42RLE TRANSMISSION VERIFICATION TEST -  
VER 1.

**No** >> Test Complete.





## P0124-TPS/APP INTERMITTENT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously with the ignition on and engine running.
- **Set Condition:**  
This DTC will set if the monitored TPS throttle angle between the angles of 6° and 120° and the degree change is greater than 5° within a period of less than 7.0 ms.

Possible Causes
RELATED TPS ENGINE DTC'S PRESENT THROTTLE POSITION SENSOR POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The powertrain controller receives the throttle position signal and its ground from the Throttle Position Sensor (TPS). The TPS has a 5 volt pull up. The throttle signal is checked for out of range as well as intermittent operation (excessive signal changes). The engine controller transmits the throttle value via the Bus. Most engine controllers can synthesize the throttle value if the throttle position sensor signal is lost. If a throttle error is detected by the transmission control system and the throttle value is available via the Bus. The Bus throttle value will be used and normal operation will continue, however a throttle fault code will be set. If a throttle error is detected and the throttle value is not available via the Bus, normal operation will be discontinued, a throttle fault code will be set, and the MIL will be turned on after 5 min. of substituted operation.

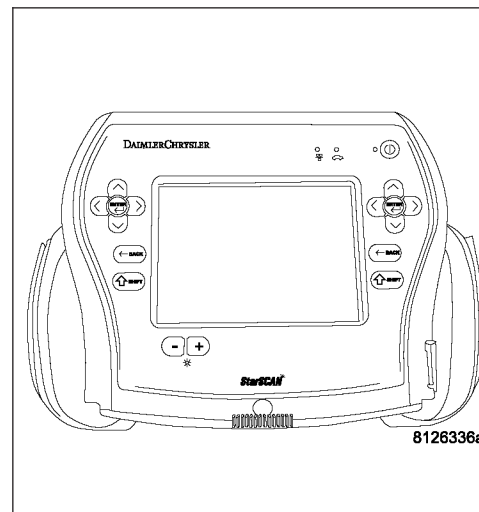
## Diagnostic Test

### 1. DETERMINING IF RELATED ENGINE TPS DTC'S ARE PRESENT

With the scan tool, check Engine DTC's, this includes all one trip failures.

**Are there any Engine TPS DTCs present?**

- Yes**    >> Refer to the Driveability category and perform the appropriate symptom.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No**     >> Go To 2



**P0124-TPS/APP INTERMITTENT (CONTINUED)****2. CHECK TO SEE IF DTC IS CURRENT**

With the scan tool, record the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

With the scan tool®, erase Transmission DTCs.

**Note:** To erase EATX EVENT DATA information, a **BATTERY DISCONNECT** must be performed. Performing a **BATTERY DISCONNECT** will reset all learned Transmission values to controller defaults which may lead to erratic shift schedules.

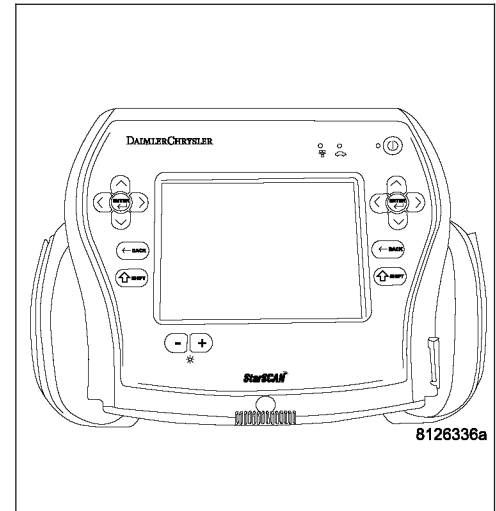
Drive the vehicle and try to duplicate the conditions in which the DTC was reported by the EATX EVENT DATA.

With the scan tool, read Transmission DTCs.

**Did the DTC P0124 THROTTLE POSITION SENSOR INTERMITTENT, reset?**

**Yes** >> Go To 3

**No** >> Go To 5

**3. CHECK THROTTLE POSITION SENSOR OPERATION**

Ignition On, Engine Not Running.

With the scan tool, under Transmission Sensors, monitor the TPS voltage in the following step.

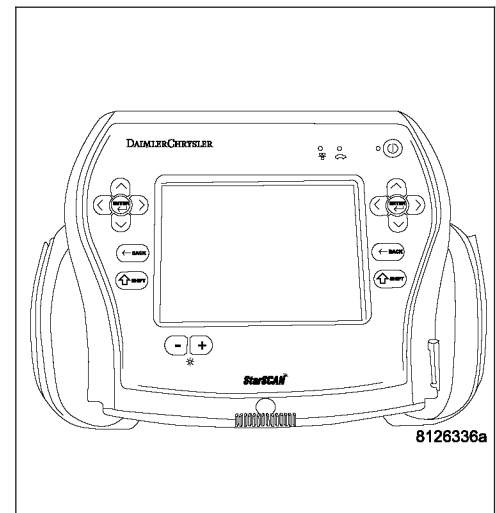
Slowly open and close the throttle while checking for erratic voltage changes.

**Did the TPS voltage change smooth and consistent?**

**Yes** >> Go To 4

**No** >> Replace the Throttle Position Sensor per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0124-TPS/APP INTERMITTENT (CONTINUED)****4. POWERTRAIN CONTROL MODULE**

**Note:** Due to the integration of the Powertrain and Transmission Control Modules, communication between the modules is internal.

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

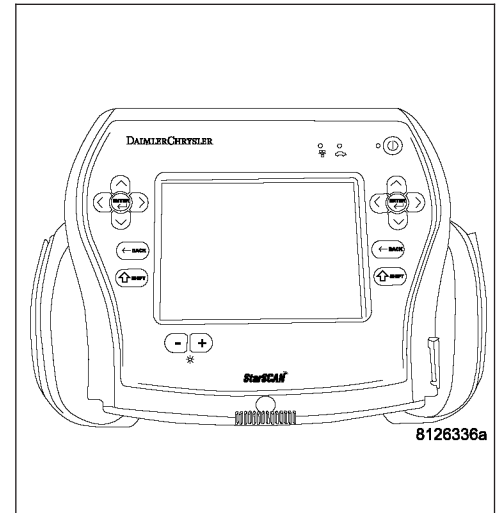
Check for any Service Bulletins for any possible causes that may apply.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program the Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**5. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Pay particular attention to the TPS signal and sensor ground circuits.

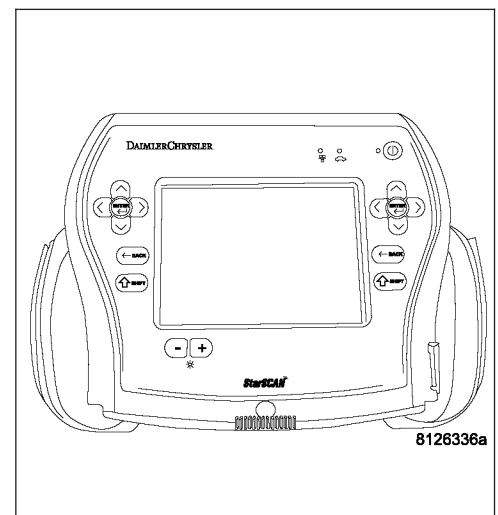
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.



## P0218-HIGH TEMPERATURE OPERATION ACTIVATED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the engine is running.
- **Set Condition:**  
Immediately when a Overheat shift schedule is activated when the Transmission Oil Temperature reaches 155° C or 240° F.

Possible Causes
ENGINE COOLING SYSTEM MALFUNCTION
TRANSMISSION OIL COOLER PLUGGED
HIGH TEMPERATURE OPERATIONS ACTIVATED

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

If the transmission oil temperature rises above 115 C (240 F), the overheat shift schedule is activated refer to Transmission Operation as a function of Transmission Oil Temperature and the code is set. The DTC is an informational code only and is being set to aid the technician in determining root cause of a customer driveability issue. The code is also intended to alert the technician to determine if a cooling system malfunction has occurred or if an additional transmission air to oil cooler should be added to the vehicle if the customer regularly drives in a manner that overheats the transmission. Extended operation above 115 C (240 F) will reduce the durability of the transmission and should be avoided. Correcting the cooling system malfunction or installing an additional transmission oil cooler will improve transmission durability especially for customers who operate in city/construction stop and go traffic, tow trailers regularly, drive aggressively in low gear or drive regularly in mountainous areas.

## Diagnostic Test

### 1. CHECK ENGINE COOLING SYSTEM

Perform Engine Cooling System diagnostics per the Service Information.

**Is the Engine Cooling System functioning properly?**

**Yes** >> Go To 2

**No** >> Repair the cause of the engine overheating. Refer to the Service Information for the related symptoms or repair procedures.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

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### 2. TRANSMISSION OIL COOLER RESTRICTED

Check the Transmission Oil Cooler Flow.

**Is the transmission oil cooler restricted or plugged?**

**Yes** >> Go To 3

**No** >> Repair or replace the plugged Transmission Oil Cooler per the Service Information. Repair the cause of the plugged Transmission Oil Cooler as necessary.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

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**P0218-HIGH TEMPERATURE OPERATION ACTIVATED (CONTINUED)****3. HIGH TEMPERATURE OPERATION**

This DTC is an informational DTC designed to aid the Technician in diagnosing shift quality complaints.

This DTC indicates that the transmission has been operating in the "Overheat" shift schedule which may generate a customer complaint.

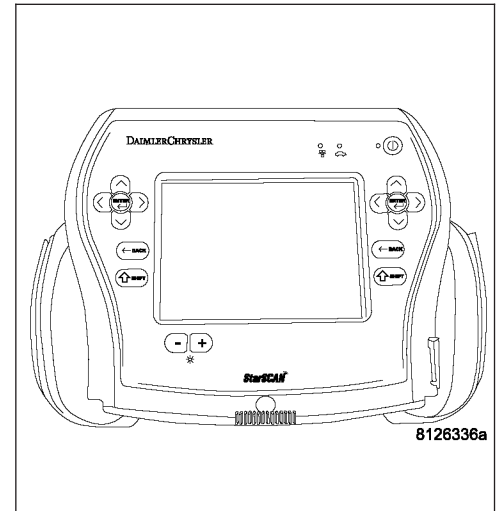
The customer driving patterns may indicate the need for an additional transmission oil cooler.

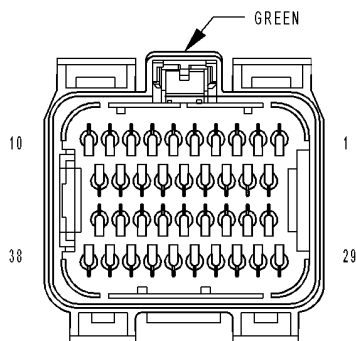
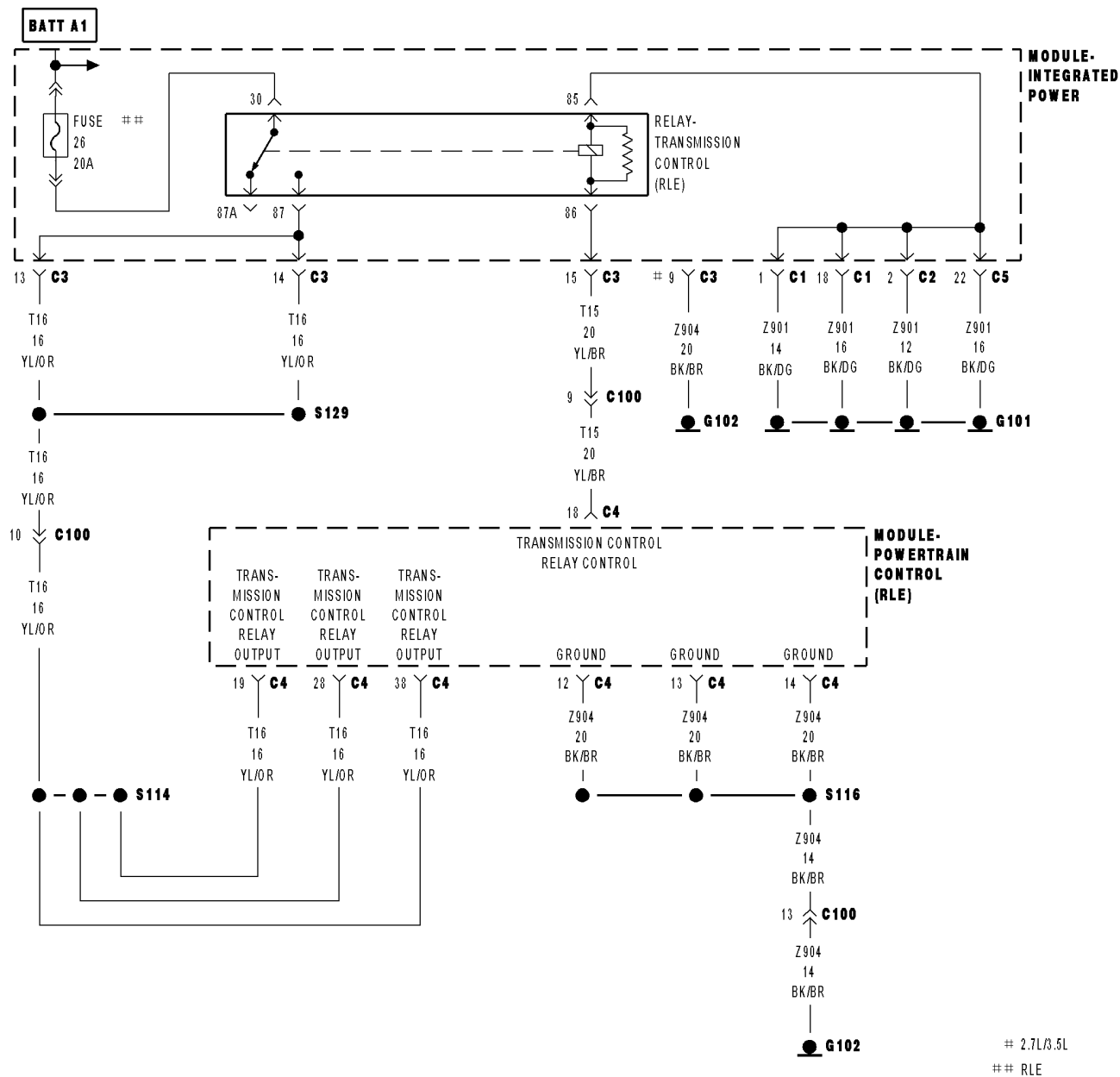
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**View repair options.****Repair**

Repair the cause of transmission overheating per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0562-BATTERY VOLTAGE LOW**

**P0562-BATTERY VOLTAGE LOW (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the engine running and the PCM has closed the Transmission Control Relay.
- **Set Condition:**  
If the battery voltage of the Transmission Control Relay Output Sense circuit(s) to the PCM is less than 10.0 volts for the period of 15 seconds. Note: P0562 generally indicates a gradually falling battery voltage or a resistive connection(s) to the PCM. The DTC will also set if the battery voltage sensed at the PCM is less than 6.5v for 200ms or where Transmission Control Relay Output circuits is less than 7.2v for 200ms.

Possible Causes
RELATED CHARGING SYSTEM DTC'S (Z904) GROUND CIRCUIT OPEN OR HIGH RESISTANCE (INTERNAL) FUSED B+ CIRCUIT TO PCM HIGH RESISTANCE (T16) TRANSMISSION CONTROL RELAY OUTPUT TO TCM OPEN OR HIGH RESISTANCE TRANSMISSION CONTROL RELAY POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

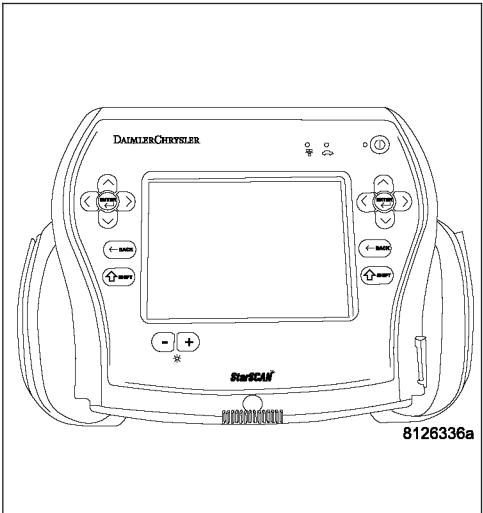
Transmission damage may occur if there is insufficient supply voltage to properly control the solenoids. To prevent this possibility, the battery voltage is monitored and the system is placed in logical limp-in if the battery voltage drops below the limit.

**Diagnostic Test**

**1. RELATED CHARGING SYSTEM DTC'S**

With the scan tool, read the Engine DTC's.

- Are there any Charging System related DTC's present also?**
- Yes**    >> Refer to the Charging System category and repair any PCM Charging System DTC's, before proceeding. NOTE: After repairing the PCM Charging System DTC's, perform the Transmission Verification test to verify the transmission was not damaged.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Go To 2



**P0562-BATTERY VOLTAGE LOW (CONTINUED)****2. CONDITION P0562 PRESENT**

**Note:** Generator, battery, and charging system must be fully functional before performing this test.

With the scan tool, read Transmission DTC's.

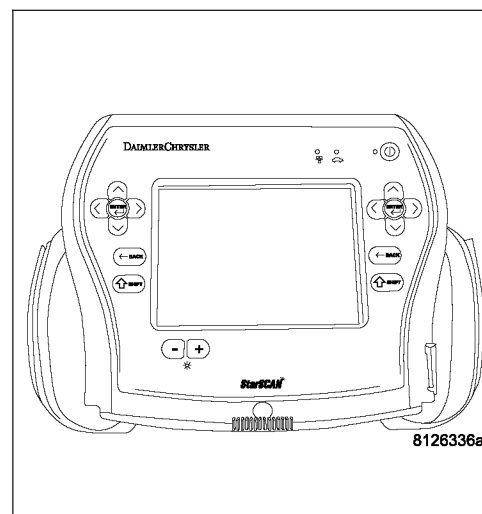
With the scan tool, Check the STARTS SINCE SET counter for P0562.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter set at 0?**

**Yes** >> Go To 3

**No** >> Go To 8

**3. CHECKING (Z904) GROUND CIRCUIT**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

**Note:** Check connectors - Clean/repair as necessary.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Tool #8815 to perform diagnosis.

Using a 12-volt test light connected to 12-volts, check the (Z904) Ground circuits in the appropriate terminal of MILLER TOOL #8815.

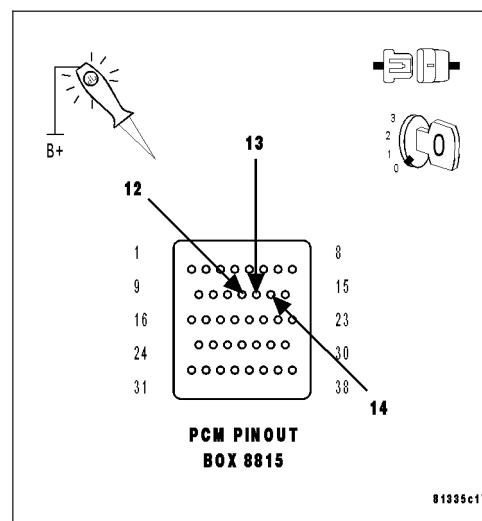
**Note:** The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

**Does the test light illuminate brightly for all the Ground circuits?**

**Yes** >> Go To 4

**No** >> Repair the (Z908, Z977) Ground circuit and/or circuits for an open or high resistance.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.





**P0562-BATTERY VOLTAGE LOW (CONTINUED)****4. CHECKING (INTERNAL) FUSED B+ CIRCUIT**

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check the (INTERNAL) Fused B+ circuit in the Transmission Control Relay connector.

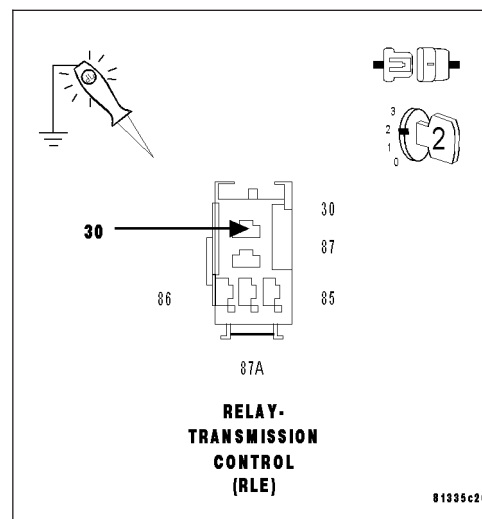
**Note: The Test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly?**

**Yes** >> Go To 5

**No** >> Repair the (INTERNAL) Fused B+ circuit for an open or high resistance.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**5. CHECKING THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

**CAUTION: DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER TOOL #8815 TO PERFORM DIAGNOSIS.**

Connect a jumper wire between (INTERNAL) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check all (T16) Transmission Control Relay Output circuits in the appropriate terminal of MILLER TOOL #8815.

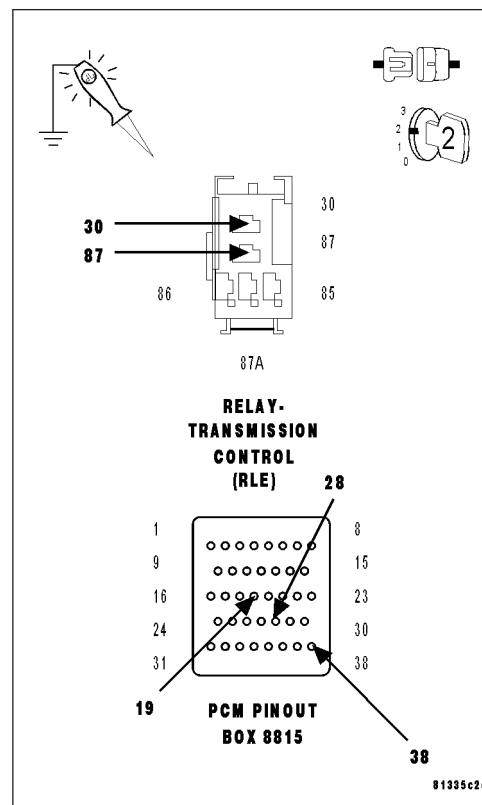
**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly?**

**Yes** >> Go To 6

**No** >> Repair the (T16) Transmission Control Relay Output circuit(s) for an open or high resistance.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0562-BATTERY VOLTAGE LOW (CONTINUED)****6. TRANSMISSION CONTROL RELAY**

Turn the ignition off to the lock position.

Install a substitute Relay in place of the Transmission Control Relay.

Start the engine.

Using a voltmeter, measure the battery voltage.

With the scan tool, monitor the Transmission Switched Battery Voltage.

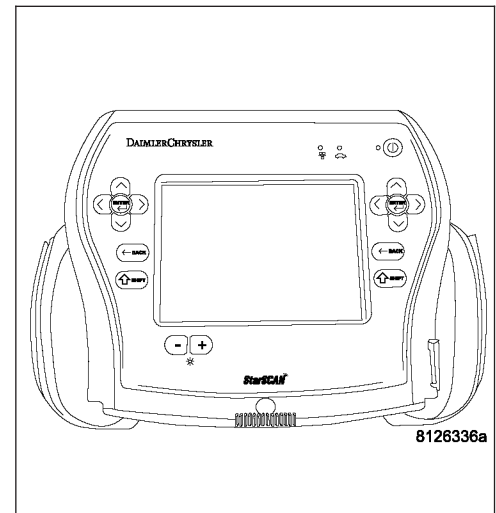
Compare the scan tool Transmission Switched Battery voltage to the actual battery voltage.

**Is the scan tool voltage within 2.0 volts of the battery voltage?**

**Yes** >> Replace the Transmission Control Relay.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

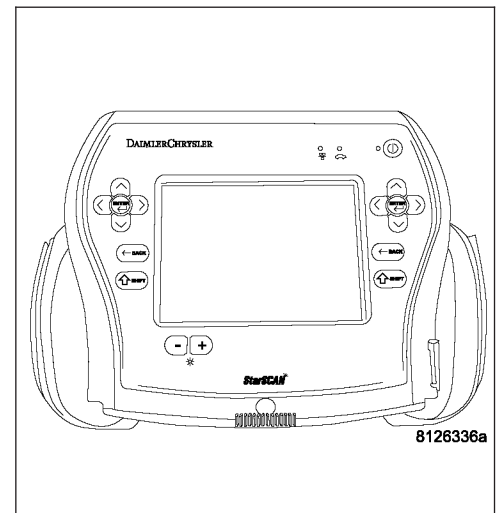
Check for any Service Bulletins and S.T.A.R. ON-LINE for any possible causes that may apply.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program the Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0562-BATTERY VOLTAGE LOW (CONTINUED)****8. INTERMITTENT WIRING AND CONNECTORS**

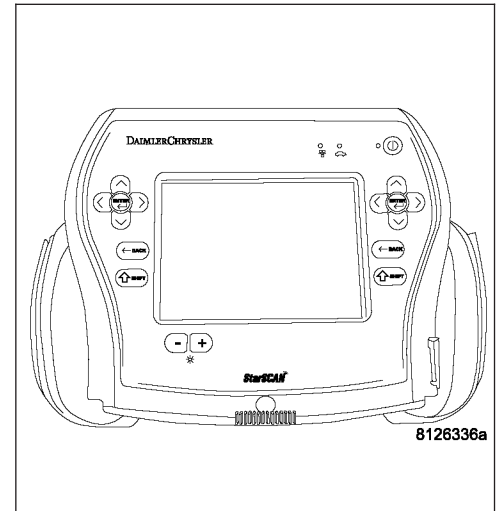
The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorts and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST -  
          VER 1.
- No**      >> Test Complete.



## P0602-CONTROL MODULE PROGRAMMING ERROR/NOT PROGRAMMED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Check for generic software is made at power-up.
- **Set Condition:**  
If generic software is found , the MIL will light immediately. This DTC is designed to signal the technician that the controller still has generic software installed.

Possible Causes
PCM - PROGRAMMING ERROR

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

### Theory of Operation

The controller is programmed during manufacturing with generic software to facilitate testing. This software does not have the proper calibrations to control a transmission in a vehicle. The check for generic software is made at power-up. If generic software is found , the MIL will light immediately and the MIL will stay on even if the fault is cleared, until the proper software is installed. Note: Transmission will be placed in limp-in mode.

### Diagnostic Test

#### 1. CONTROL MODULE PROGRAMMING ERROR

**Note: Controller is programmed with generic software and will not allow the correct vehicle Powertrain management.**

With the scan tool.

Record the vehicles controller part number.

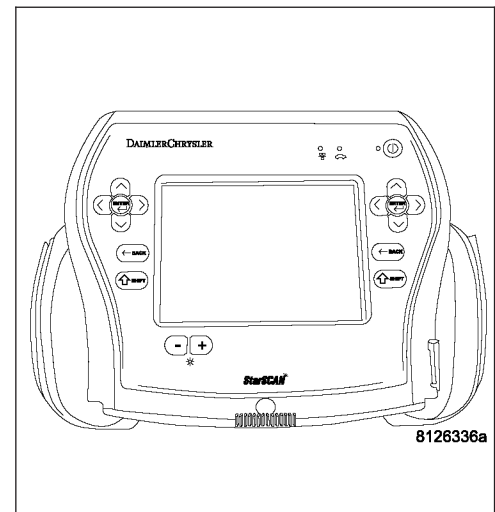
Select Use Controller Part Number under the Flash Tab.

Flash the controller with the correct software.

**Verify the controller flashed successfully.**

#### Test Complete

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



P0604-INTERNAL CONTROL MODULE RAM

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
One time after the ignition key is turned to the run position.
- **Set Condition:**  
The read value does not match the written value in any RAM location.

Possible Causes
PCM - INTERNAL ERROR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING.

Theory of Operation

After the controller is reset, the microprocessor checks the integrity of each RAM location by writing to it and reading back from it. The read value should be the same as the written value. MIL on after 10 seconds of vehicle operation and transmission will be placed in limp-in.

Diagnostic Test

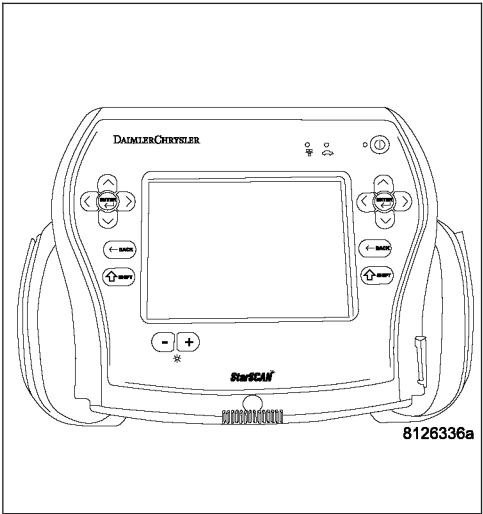
1. PCM - INTERNAL ERROR

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



## P0605-INTERNAL CONTROL MODULE ROM

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
One time after the ignition key is turned to the run position.
- **Set Condition:**  
If the ROM checksum does not match a known constant.

Possible Causes
PCM - INTERNAL ERROR

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

After the controller is reset, the microprocessor checks the integrity of the program memory (ROM). A checksum is calculated by adding all used bytes in the program memory. The sum should be the same as a known constant stored in memory. MIL on after 10 seconds of vehicle operation and transmission will be placed in limp-in.

## Diagnostic Test

### 1. PCM - INTERNAL ERROR

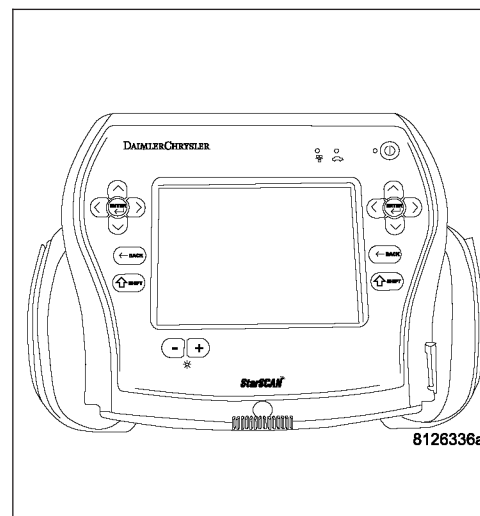
Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

### Repair

Replace the Powertrain Control Module. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



P0613-INTERNAL TRANSMISSION PROCESSOR

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
After the ignition key is turned to the run position and 60 seconds thereafter.
- **Set Condition:**  
Either of the following conditions occur 3 times in less than 590 milliseconds: The watchdog line remains high after the watchdog test or the transmission relay coil is energized and remains on after the watchdog delay expires.

Possible Causes
PCM - INTERNAL ERROR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The internal watchdog is a separate hardware circuit which continuously monitors the microprocessor. To make sure the transmission is operating properly, the watchdog must receive a signal from the microprocessor within a specific time window. MIL on after 10 seconds of vehicle operation and transmission will be placed in limp-in.

Diagnostic Test

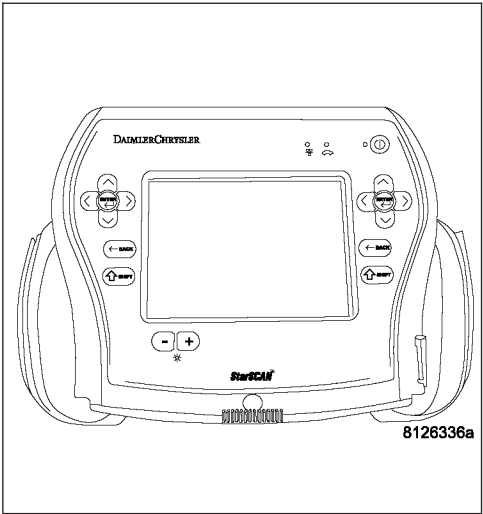
1. PCM - INTERNAL ERROR

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

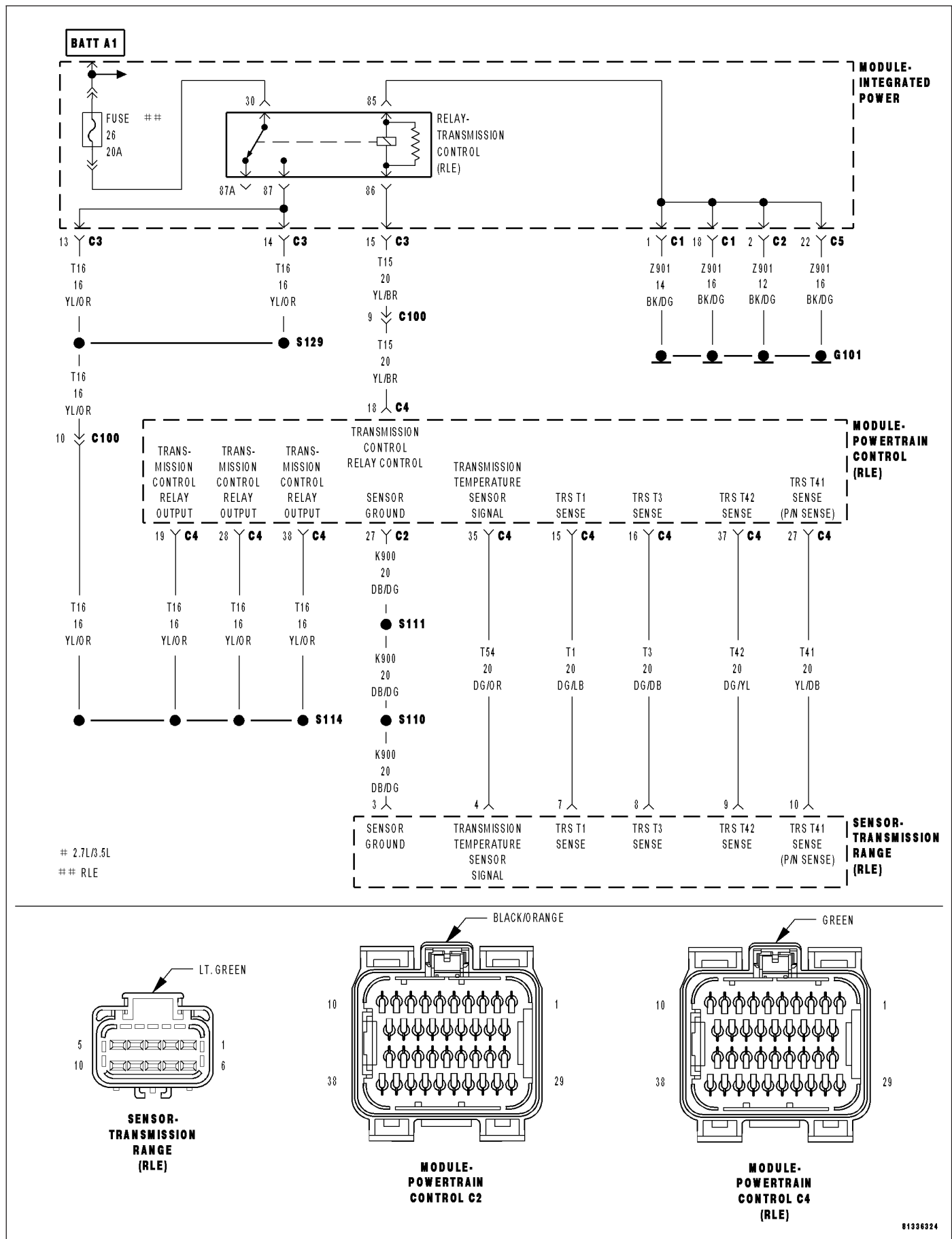
If there are no possible causes remaining, view repair.

Repair

Replace the Powertrain Control Module. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



## P0706-TRANSMISSION RANGE SENSOR RATIONALITY



## 2.7L/3.5L  
## RLE

**81336324**



**P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously with the ignition in the run position.
- **Set Condition:**  
The DTC will set if an invalid PRNDL code which lasts for more than 100 milliseconds and within 1 second of power-up or the PRNDL code error does not correct itself before a change in input occurs.

Possible Causes
SHIFTER OUT OF ADJUSTMENT TRS (T1) SENSE CIRCUIT OPEN TRS (T3) SENSE CIRCUIT OPEN TRS (T41) SENSE CIRCUIT OPEN TRS (T42) SENSE CIRCUIT OPEN TRS (T1) SENSE CIRCUIT SHORT TO GROUND TRS (T3) SENSE CIRCUIT SHORT TO GROUND TRS (T41) SENSE CIRCUIT SHORT TO GROUND TRS (T42) SENSE CIRCUIT SHORT TO GROUND TRS (T1) SENSE CIRCUIT SHORT TO VOLTAGE TRS (T3) SENSE CIRCUIT SHORT TO VOLTAGE TRS (T41) SENSE CIRCUIT SHORT TO VOLTAGE TRS (T42) SENSE CIRCUIT SHORT TO VOLTAGE TRANSMISSION RANGE SENSOR POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The C1 through C4 (T1, T3, T41, and T42) sense circuits communicate the shift lever position to the PCM. Each circuit is terminated at the transmission with a switch. Each switch can be either open or closed, depending on the shift lever position. The PCM can decode this information and determine the shift lever position. Each shift lever position has a certain combination of switches, which will be open and closed, this is called a PRNDL code. There are 4 switches, therefore: there are many possible combinations of open and closed switches (codes). However, there are only 9 valid codes (8 for AutoStick), one for each gear position and three recognized between gear codes. The remainder of the codes should never occur, these are called invalid codes. The following chart shows the normal switch states for each shift lever position.

**TRS SWITCH STATES**

SLP	T42	T41	T3	T1
P	CL	CL	CL	OP
R	CL	OP	OP	OP
N	CL	CL	OP	CL
OD	OP	OP	OP	CL
3	OP	OP	CL	OP
L	CL	OP	CL	CL

**P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)****Diagnostic Test****1. CHECK IF THE DTC P0706 IS CURRENT**

With the scan tool, erase Transmission DTCs.

Cycle the ignition off, then start the vehicle.

Firmly apply the brakes and shift into Overdrive.

**Note: Vehicle must remain in Overdrive for at least three seconds.**

With the brakes firmly applied, shift slowly through all gears (PRNDL) as least three times, pausing momentarily in each gear.

**Note: If all the PRNDL lights box individually then the error was cleared.**

Shift into park and turn the ignition off to the lock position.

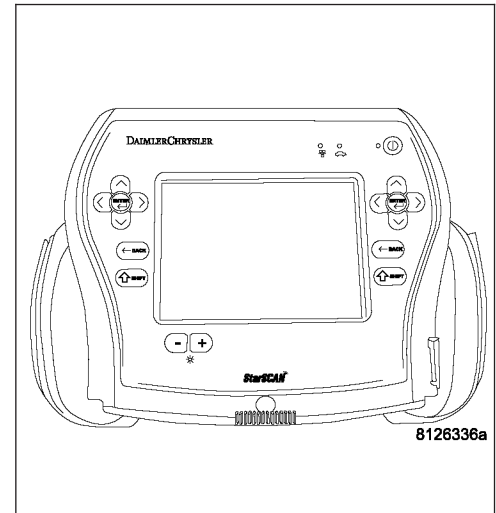
Ignition on, engine not running.

With the scan tool, read Transmission DTCs.

**Does the DTC P0706 reset, or do all the PRNDL indicators remain boxed in park or neutral?**

**Yes** >> Go To 2

**No** >> Go To 19

**2. CHECK SHIFTER OPERATION**

With the scan tool, perform the Shift Lever Position Test.

**Select the test outcome from the following:**

**Test passes**

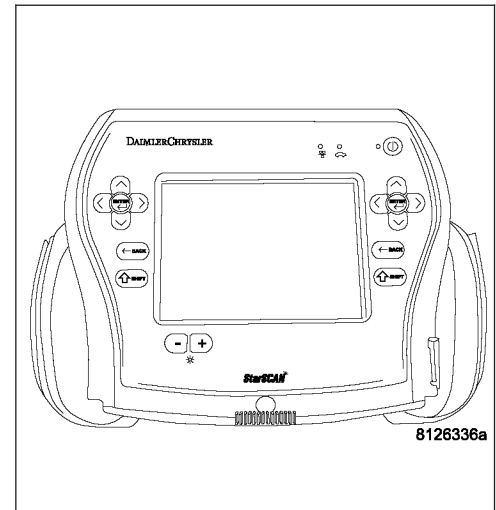
Go To 19

**Test fails with error code**

Go To 3

**Test fails without error code**

Go To 18



**P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)****3. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

With the scan tool, perform the Shift Lever Position Test.

When the scan tool instructs you to put the Gear Selector in a particular position, you must do so using the Transmission Simulator.

The LED for the gear position in question must be illuminated on the Transmission Simulator, prior to pressing the ENTER key on the scan tool.

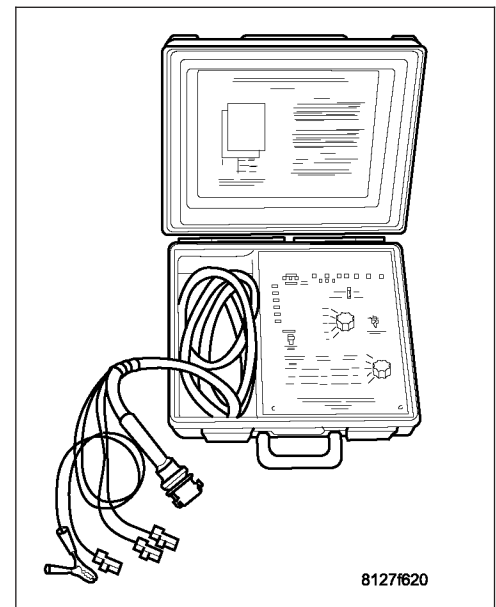
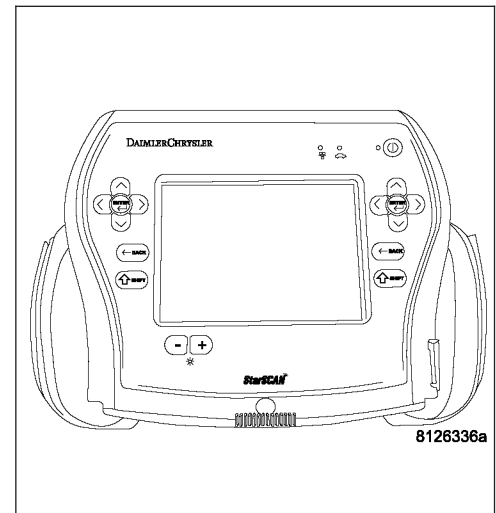
**Note: After completion of this procedure, make sure to disconnect the Transmission Simulator, Miller tool #8333 and Electronic Transmission adaptor cable kit, Miller tool #8333-1A and reconnect all connectors.**

**Did the Shift Lever Position Test pass?**

**Yes**    >> Replace the Transmission Range Sensor per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 4



**P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)****4. IDENTIFY FAULTY CIRCUIT**

Reconnect all disconnected connectors. Turn the ignition on, engine not running.

With the scan tool, monitor the TRS Sense circuits on the Input/Output screen - C1 through C4.

Move the shift lever through all gear positions, pausing momentarily in each gear position and watch for one of the circuits to not change state.

**Pick the one that did not change state.**

**TRS (T1)sense (C4)**

Go To 5

**TRS (T3)sense (C3)**

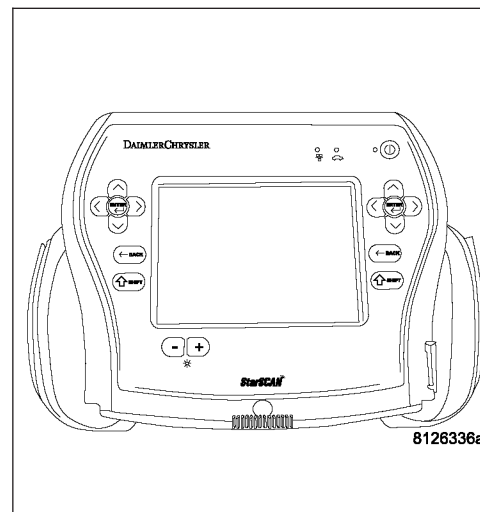
Go To 8

**TRS (T41)sense (C1)**

Go To 11

**TRS (T42)sense (C2)**

Go To 14

**5. TRS (T1) SENSE CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the TRS harness connector.

Disconnect the PCM C4 harness connector.

**Note: Check connectors - Clean/repair as necessary.**

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Tool #8815 to perform diagnosis.**

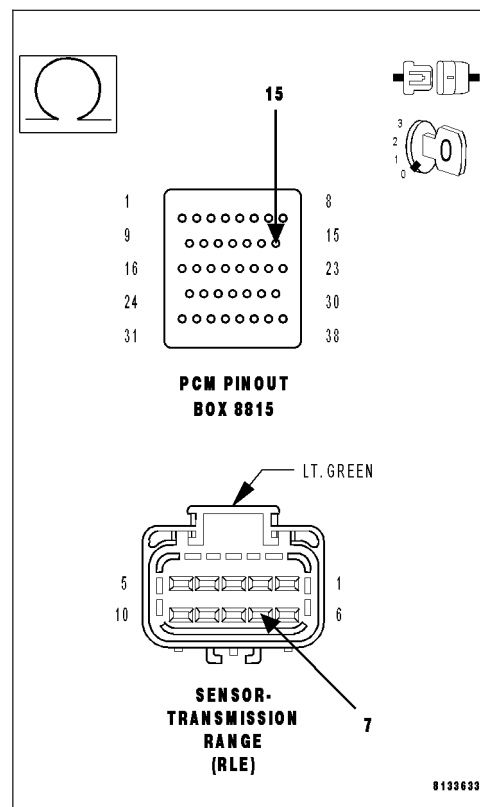
Measure the resistance of the TRS (T1) Sense circuit from the appropriate terminal of special tool #8815 to the TRS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the TRS (T1) Sense circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 6



## P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

## 6. TRS (T1) SENSE CIRCUIT SHORT TO GROUND

Turn the ignition off to the lock position.  
 Disconnect the TRS harness connector.  
 Disconnect the PCM C4 harness connector.

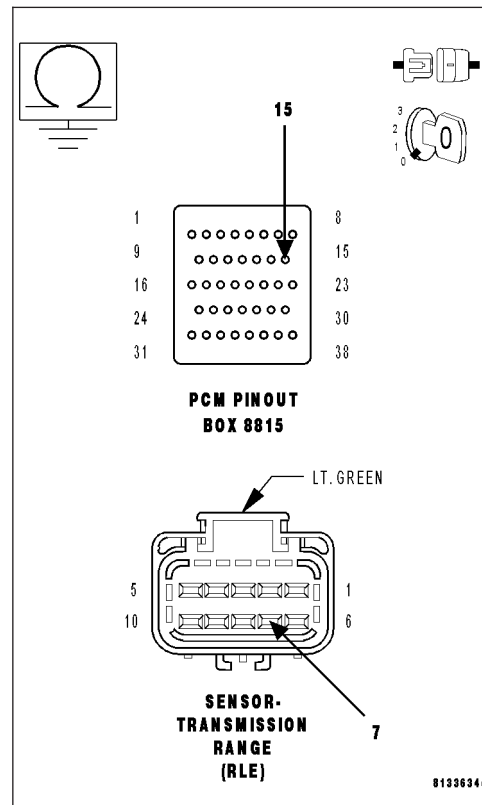
**Note: Check connectors - Clean/repair as necessary.**

Measure the resistance between ground and the TRS (T1) Sense circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the TRS (T1) Sense circuit for a short to ground.  
 Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7



## 7. TRS (T1) SENSE CIRCUIT SHORT TO VOLTAGE

Turn the ignition off to the lock position.  
 Disconnect the TRS harness connector.  
 Disconnect the PCM C4 harness connector.  
 Remove the Transmission Control Relay from the PDC.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

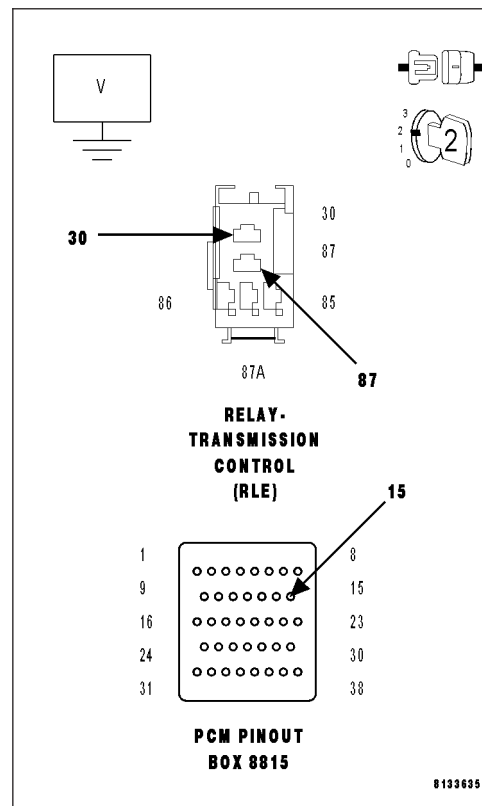
Ignition on, engine not running.

Measure the voltage of the TRS (T1) Sense circuit at the appropriate terminal of special tool #8815.

**Is the voltage above 0.5 volt?**

**Yes** >> Repair the TRS (T1) Sense circuit for a short to voltage.  
 Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 17



**P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)****8. TRS (T3) SENSE CIRCUIT OPEN**

Turn the ignition off to the lock position.  
 Disconnect the TRS harness connector.  
 Disconnect the PCM C4 harness connector.

**Note: Check connectors - Clean/repair as necessary.**

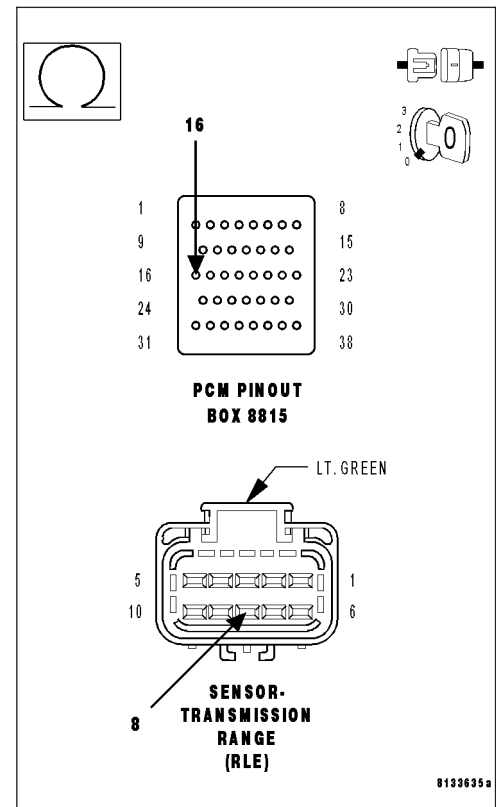
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Tool #8815 to perform diagnosis.**

Measure the resistance of the TRS (T3) Sense circuit from the appropriate terminal of special tool #8815 to the TRS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the TRS (T3) Sense circuit for an open.  
 Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 9

**9. TRS (T3) SENSE CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.  
 Disconnect the TRS harness connector.  
 Disconnect the PCM C4 harness connector.

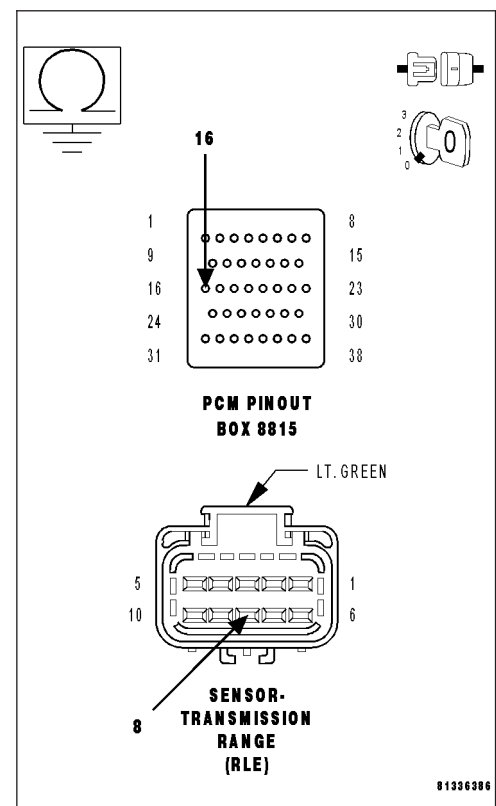
**Note: Check connectors - Clean/repair as necessary.**

Measure the resistance between ground and the TRS (T3) Sense circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the TRS (T3) Sense circuit for a short to ground.  
 Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 10



## P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

## 10. TRS (T3) SENSE CIRCUIT SHORT TO VOLTAGE

Turn the ignition off to the lock position.  
 Disconnect the TRS harness connector.  
 Disconnect the PCM C4 harness connector.  
 Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

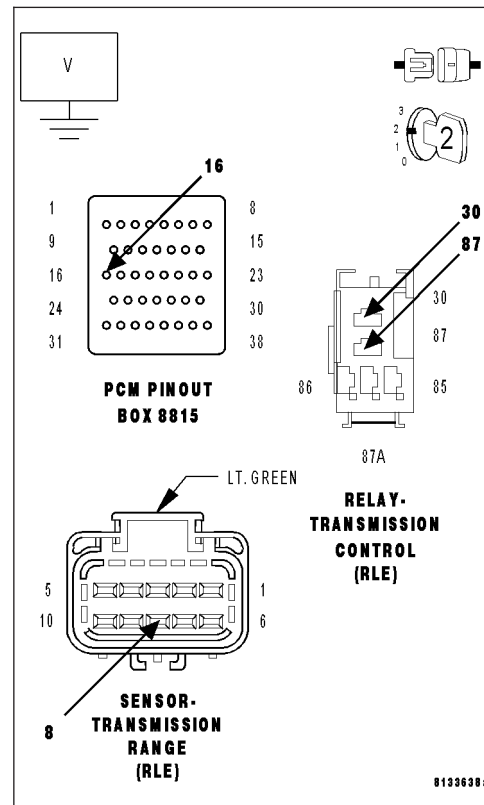
Ignition on, engine not running.

Measure the voltage of the TRS (T3) Sense circuit.

**Is the voltage above 0.5 volt?**

**Yes** >> Repair the TRS (T3) Sense circuit for a short to voltage.  
 Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 17



## 11. TRS (T41) SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.  
 Disconnect the TRS harness connector.  
 Disconnect the PCM C3 harness connector.

**Note: Check connectors - Clean/repair as necessary.**

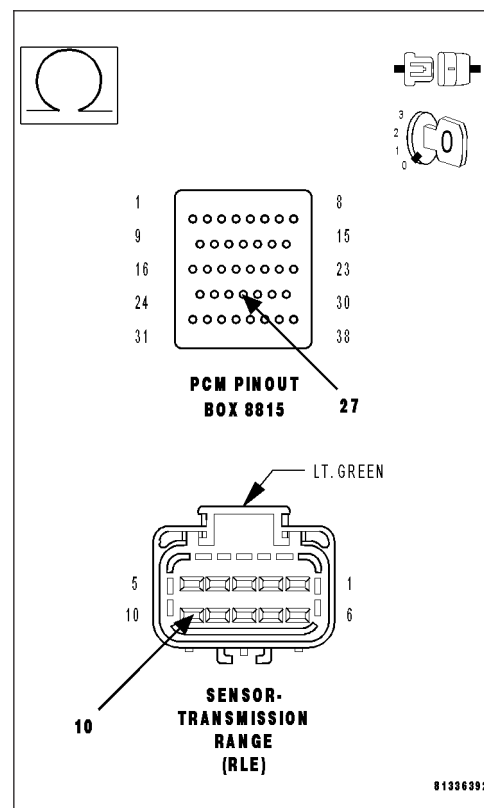
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Tool #8815 to perform diagnosis.**

Measure the resistance of the TRS (T41) Sense circuit from the appropriate terminal of special tool #8815 to the TRS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the TRS (T41) Sense circuit for an open.  
 Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 12



**P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)****12. TRS (T41) SENSE CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.  
 Disconnect the TRS harness connector.  
 Disconnect the PCM C3 harness connector.

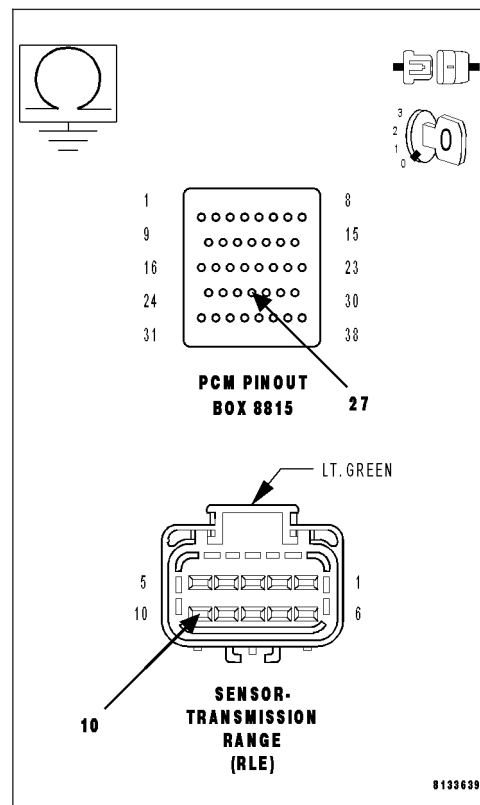
**Note: Check connectors - Clean/repair as necessary.**

Measure the resistance between ground and the TRS (T41) Sense circuit

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the TRS (T41) Sense circuit for a short to ground.  
 Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 13

**13. TRS (T41) SENSE CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.  
 Disconnect the TRS harness connector.  
 Disconnect the PCM C3 harness connector.  
 Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

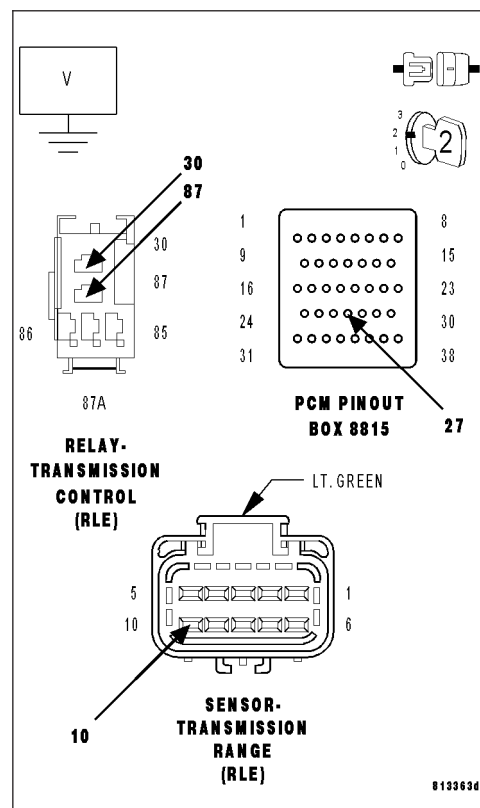
Connect a jumper wire between the (Internal) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running.

Measure the voltage of the TRS (T41) Sense circuit.

**Is the voltage above 0.5 volt?**

**Yes** >> Repair the TRS (T1) Sense circuit for a short to voltage.  
 Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 17





## P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

## 14. TRS (T42) SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.  
 Disconnect the TRS harness connector.  
 Disconnect the PCM C4 harness connector.

**Note: Check connectors - Clean/repair as necessary.**

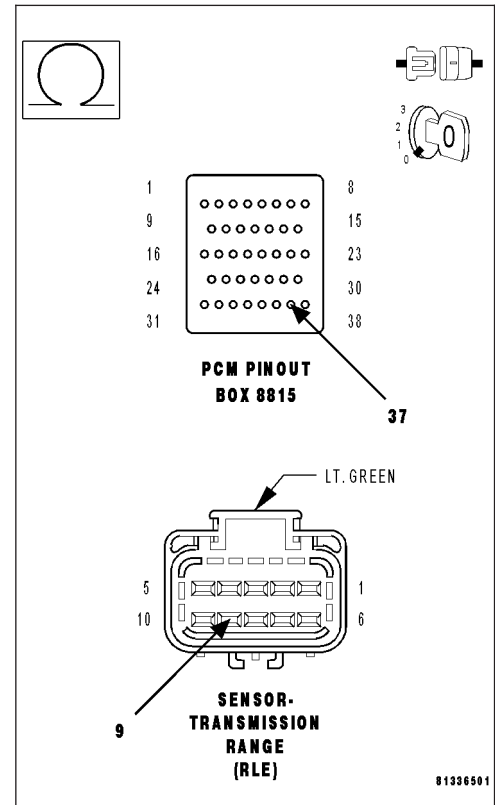
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Tool #8815 to perform diagnosis.**

Measure the resistance of the TRS (T42) Sense circuit from the appropriate terminal of special tool #8815 to the TRS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the TRS (T42) Sense circuit for an open.  
 Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 15



## 15. TRS (T42) SENSE CIRCUIT SHORT TO GROUND

Turn the ignition off to the lock position.  
 Disconnect the TRS harness connector.  
 Disconnect the PCM C4 harness connector.

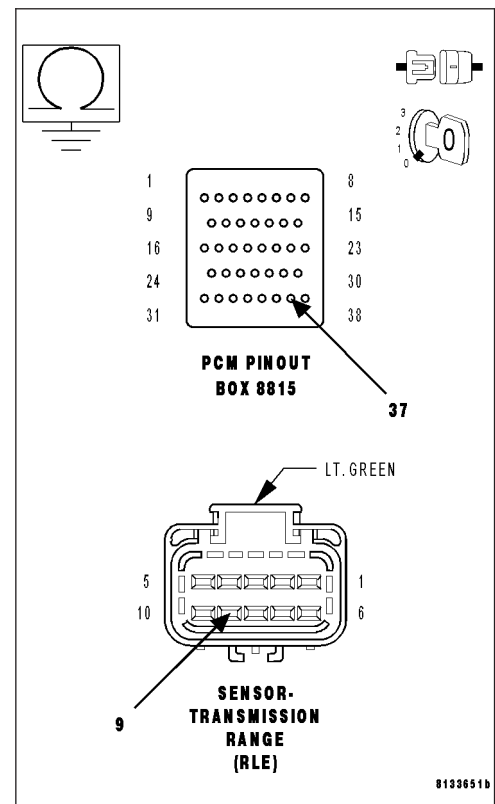
**Note: Check connectors - Clean/repair as necessary.**

Measure the resistance between ground and the TRS (T42) Sense circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the TRS (T42) Sense circuit for a short to ground.  
 Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 16



**P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)****16. TRS (T42) SENSE CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the TRS harness connector.

Disconnect the PCM C4 harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

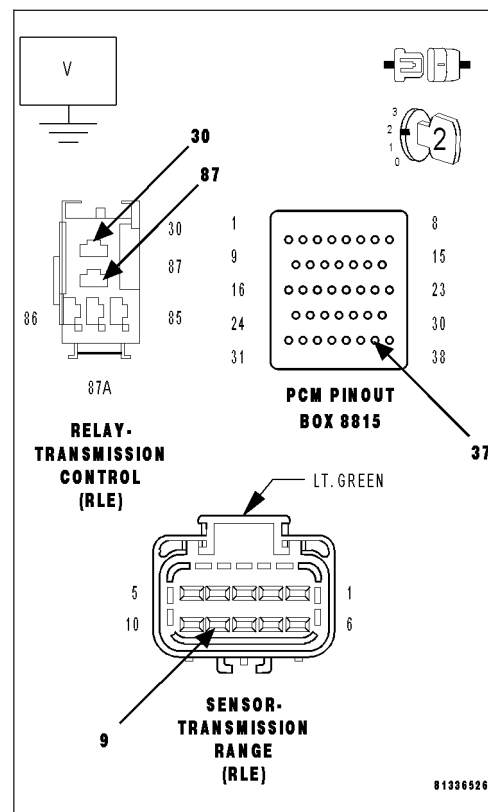
Ignition on, engine not running.

Measure the voltage of the TRS (T42) Sense circuit.

**Is the voltage above 0.5 volt?**

**Yes** >> Repair the TRS (T42) Sense circuit for a short to voltage.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 17

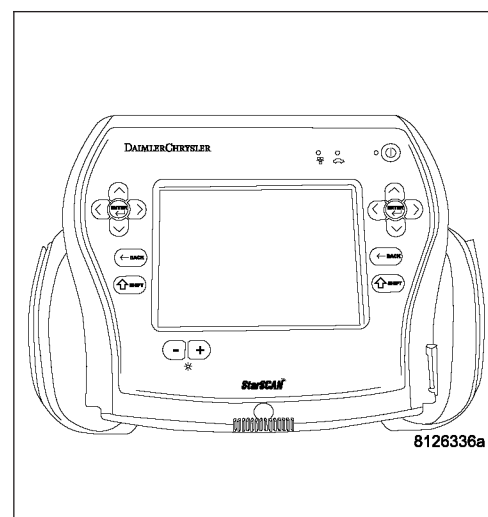
**17. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)****18. CHECK AND ADJUST SHIFTER**

If there are no possible causes remaining, view repair.

**Repair**

Adjust the Shift Linkage and/or cable per the Service Information.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

**19. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set the DTC are not present at this time.  
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

Check the Shift Linkage and cable for proper operation per the Service Information.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

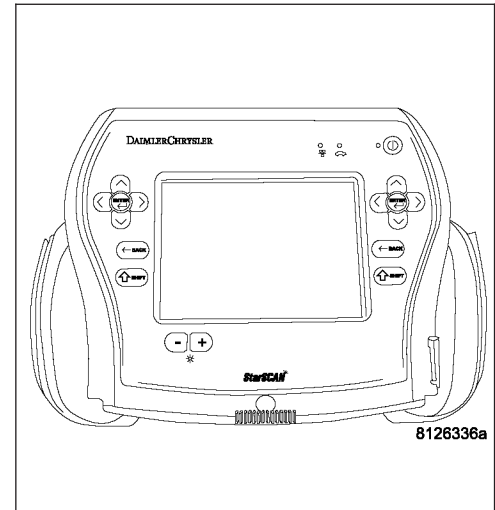
Perform \*PRNDL FAULT CLEARING PROCEDURE after completion of any repairs.

**Were there any problems found?**

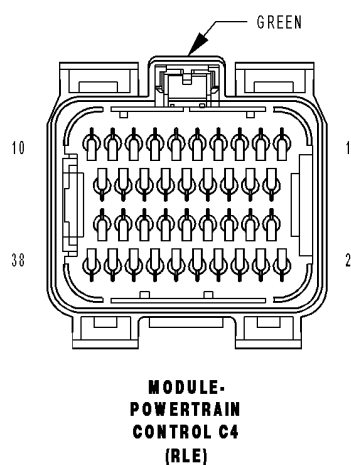
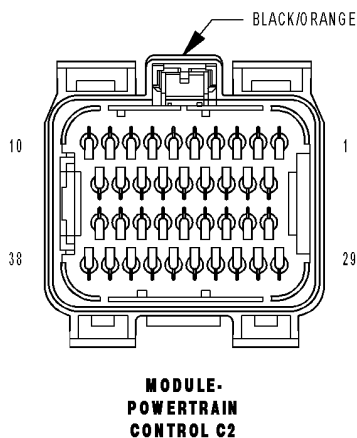
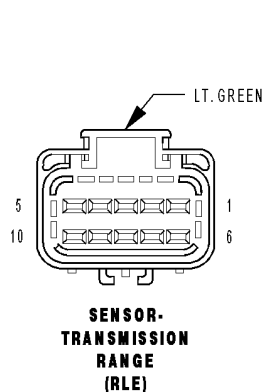
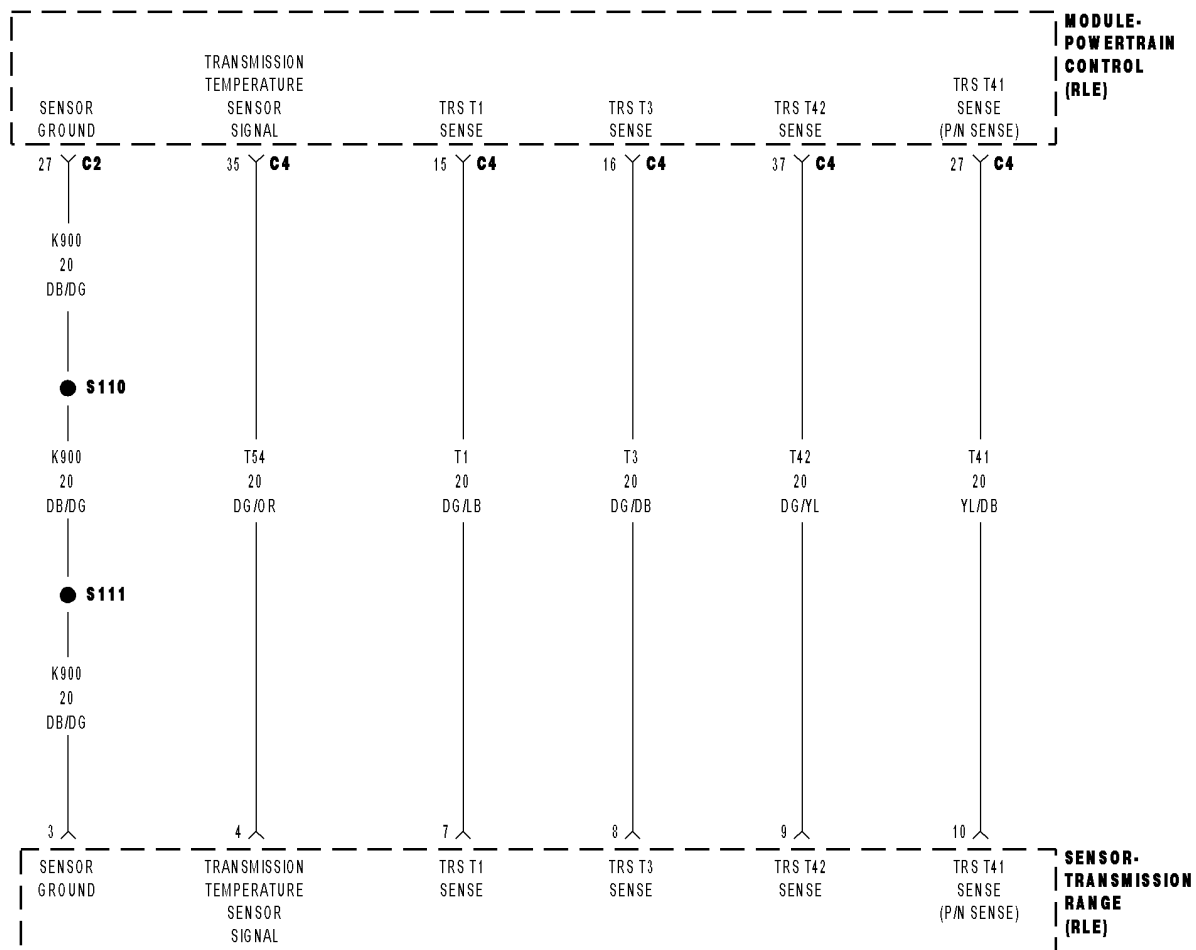
**Yes** >> Repair as necessary.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

---



# P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE



**P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously with the ignition on and engine running.
- **Set Condition:**  
is DTC will set when the desired transmission temperature does not reach a normal operating temperature within a given time frame. Time is variable due to ambient temperature. Approximate DTC set time is 10 to 35 minutes. The following are starting temperature to warm up times to set this DTC: starting temp -40° C (-40° F) warm up time 35 minuets, starting temp -28° C ( -20° F) 25 min, starting temp -6.6° C (20° F) 20 minuets, starting temp 15.5 ° C (60° F) 10 minuets. When the fault is set, calculated temperature is substituted for measured temperature, however the fault code is stored only after three consecutive occurrences of the fault.

Possible Causes
RELATED TRANSMISSION TEMPERATURE DTC'S PRESENT
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The temperature sensor is used to sense the temperature of the transmission fluid. Transmission fluid temperature can affect shift quality, torque converter operation and when or if some diagnostics are run. A failed temperature sensor could affect the OBD diagnostics. If a problem occurs in the transmission temperature sensor circuit, transmission temperature will be based on a calculated value.

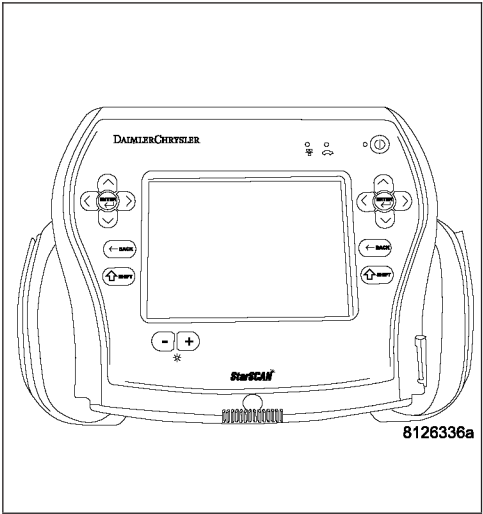
**Diagnostic Test**

**1. DETERMINE IF RELATED TRANSMISSION TEMPERATURE DTC'S ARE PRESENT**

With the scan tool, check Transmission DTC's.

**Are there any other Transmission Temperature Sensor related DTCs present?**

- Yes**    >> Refer to the Transmission category and perform the appropriate symptom.  
            Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No**      >> Go To 2



**P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE (CONTINUED)****2. CHECK TO SEE IF DTC IS CURRENT**

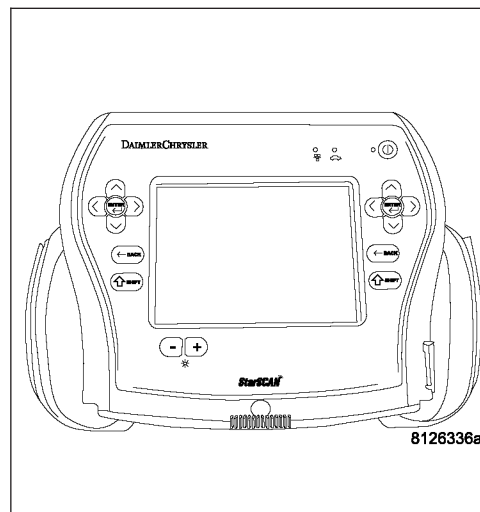
With the scan tool, Check the STARTS SINCE SET counter for P0711.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter 2 or less?**

**Yes** >> Go To 3

**No** >> Go To 6



**P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE (CONTINUED)****3. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

**Note: Check connectors - Clean/repair as necessary.**

Ignition on, engine not running.

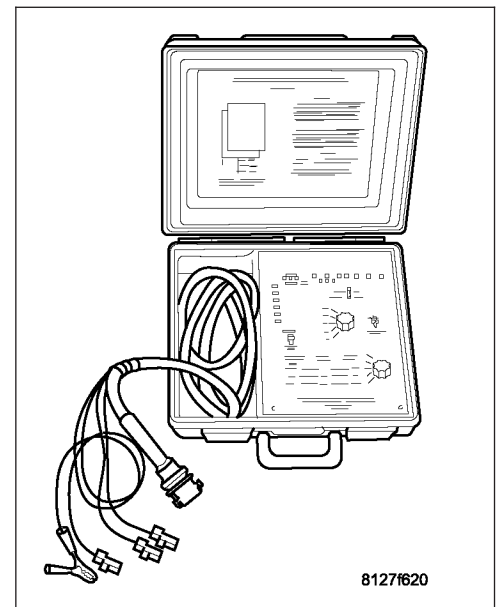
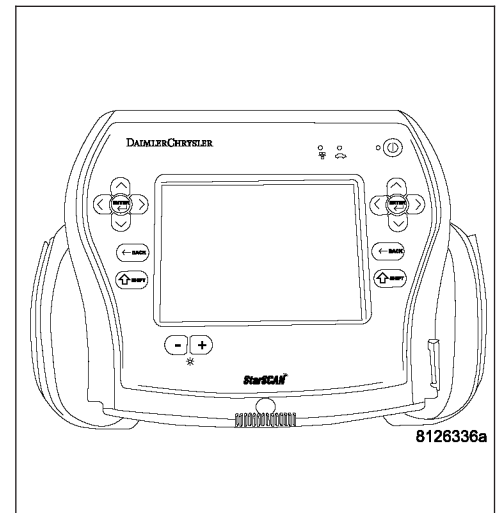
With the Transmission Simulator, turn the Input/Output switch to OFF. With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings with the numbers listed on the Transmission Simulator.

**Do the readings on the Transmission Simulator match the scan tool readings  $\pm 0.2$  volts?**

**Yes**    >> Go To 4

**No**    >> Go To 5

**4. TRANSMISSION TEMPERATURE SENSOR**

**If there are no possible causes remaining, view repair.**

**Repair**

Replace Transmission Solenoid/TRS Assembly per the Service Information.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

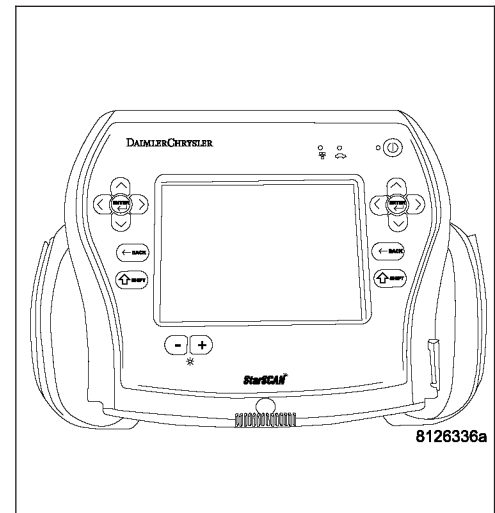
**P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE (CONTINUED)****5. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**6. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

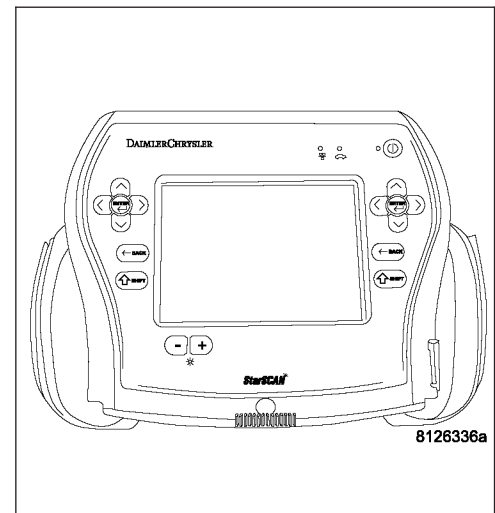
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

**Yes** >> Repair as necessary.

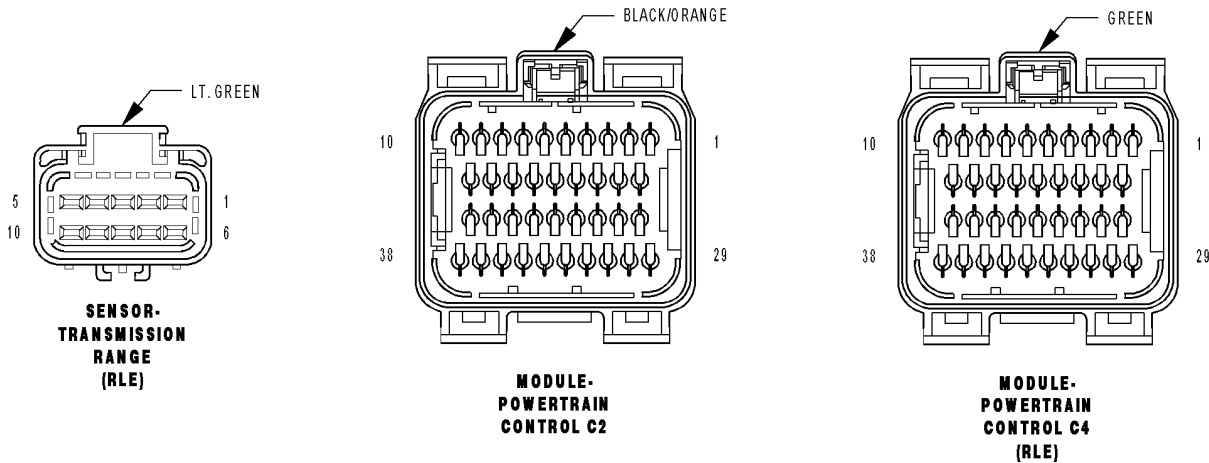
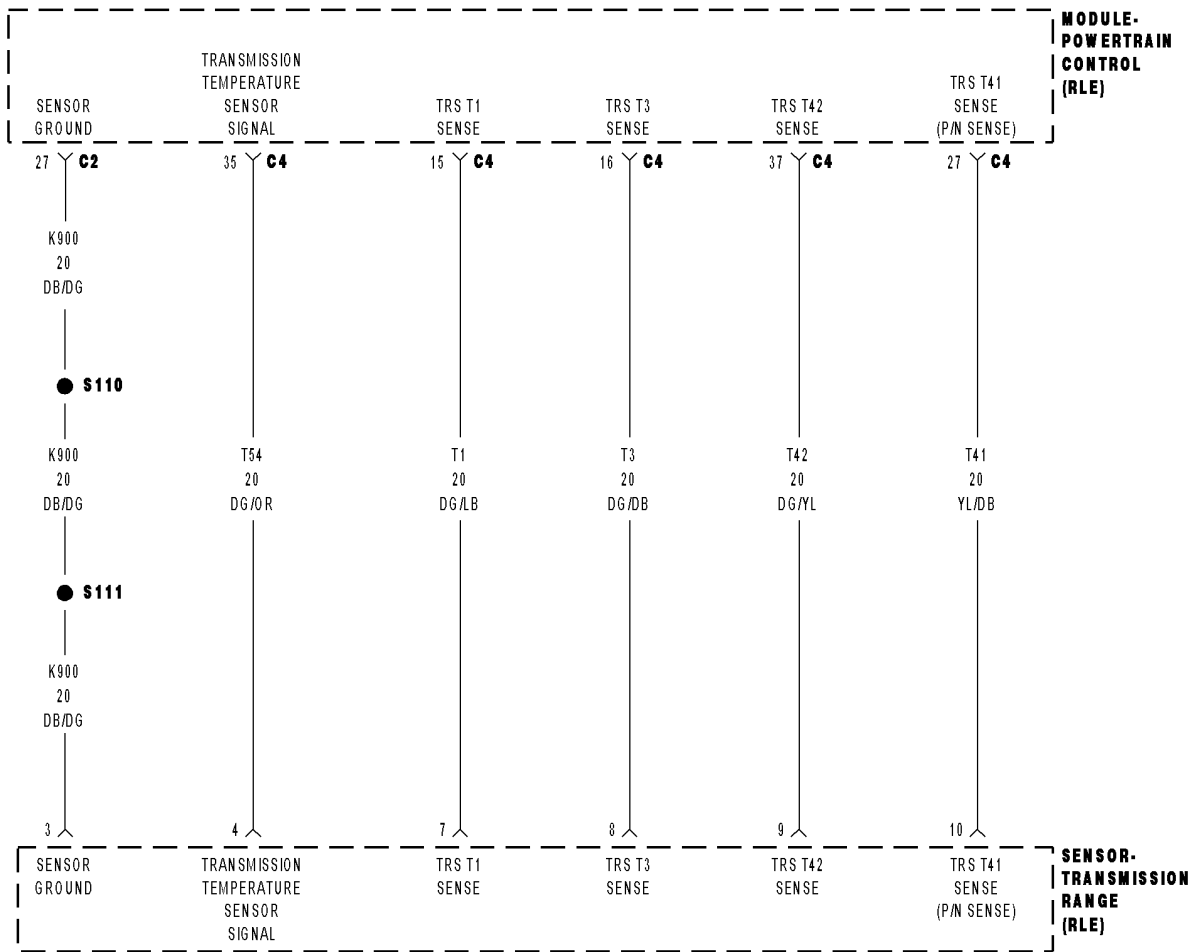
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.





P0712-TRANSMISSION TEMPERATURE SENSOR LOW



**P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Continuously with the ignition on and engine running.

- **Set Condition:**

The DTC will set when the monitored Temperature Sensor voltage drops below 0.078 volts for the period of 1.45 seconds. When the fault is set, calculated temperature is substituted for measured temperature, however the fault code is stored only after three consecutive occurrences of the fault.

Possible Causes
RELATED DTC'S PRESENT (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND TRANSMISSION TEMPERATURE SENSOR POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The temperature sensor is used to sense the temperature of the transmission fluid. Transmission fluid temperature can affect shift quality, torque converter operation and when or if some diagnostics are run. A failed temperature sensor could affect the OBD diagnostics. If a problem occurs in the transmission temperature sensor circuit, transmission temperature will be based on a calculated value.

## Diagnostic Test

### 1. DETERMINE IF RELATED DTC'S ARE PRESENT

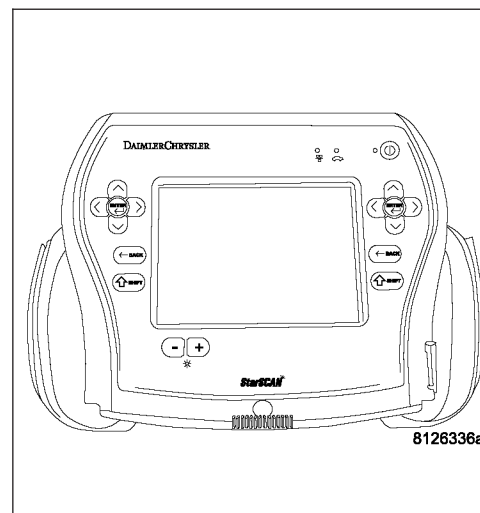
With the scan tool, check Transmission DTC's.

**Are there any Speed Sensor DTCs present?**

**Yes** >> Refer to the Transmission category and perform the appropriate symptom.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2



**P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)****2. CHECK TO SEE IF DTC IS CURRENT**

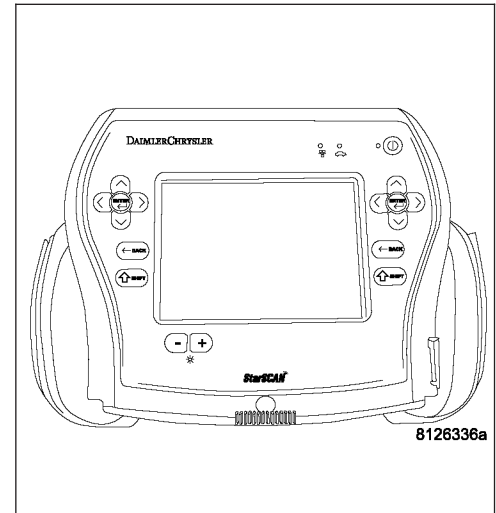
With the scan tool, Check the STARTS SINCE SET counter for P0712.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter 2 or less?**

**Yes** >> Go To 3

**No** >> Go To 7



**P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)****3. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

**Note: Check connectors - Clean/repair as necessary.**

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

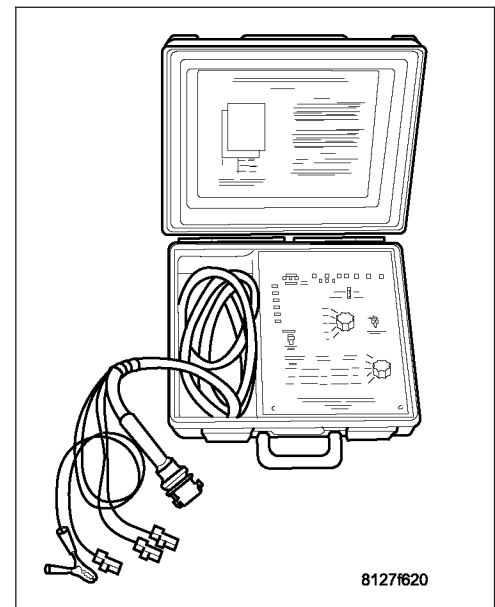
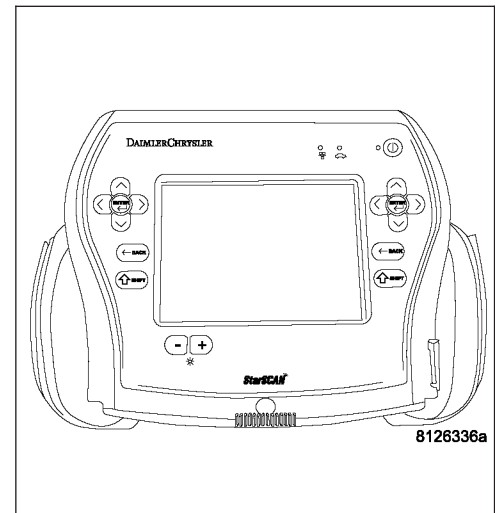
With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings with the numbers listed on the Transmission Simulator.

**Do the readings on the Transmission Simulator match the scan tool readings  $\pm 0.2$  volts?**

**Yes** >> Go To 4

**No** >> Go To 5

**4. TRANSMISSION TEMPERATURE SENSOR**

**If there are no possible causes remaining, view repair.**

**Repair**

Replace Transmission Solenoid/TRS Assembly per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)****5. (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the TRS harness connector.

**Note:** Check connectors - Clean/repair as necessary.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Tool #8815 to perform diagnosis.

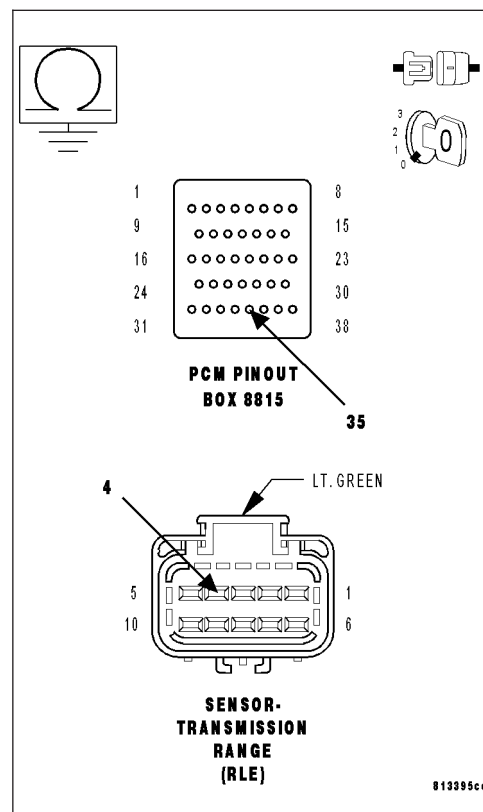
Measure the resistance between ground and the (T54) Transmission Temperature Sensor Signal circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 6

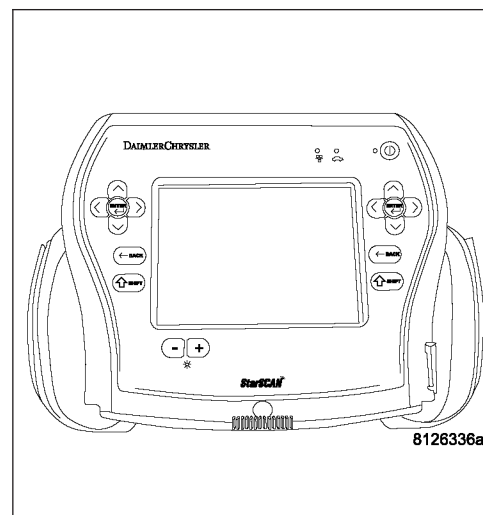
**6. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)****7. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

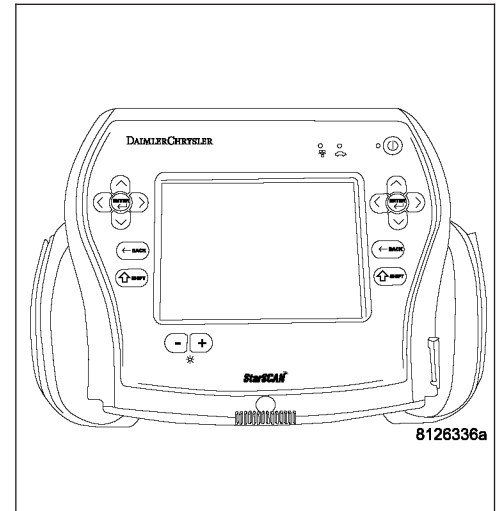
Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

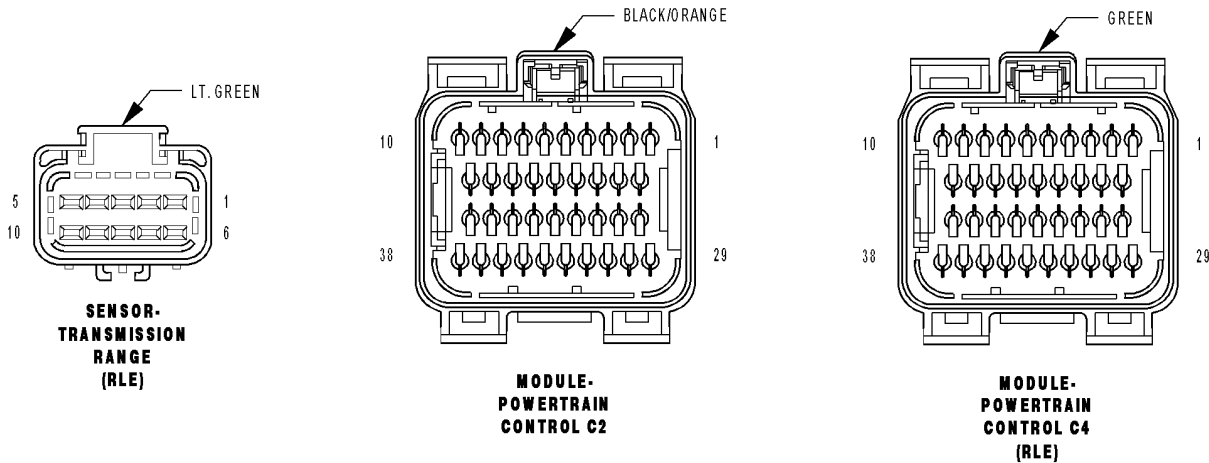
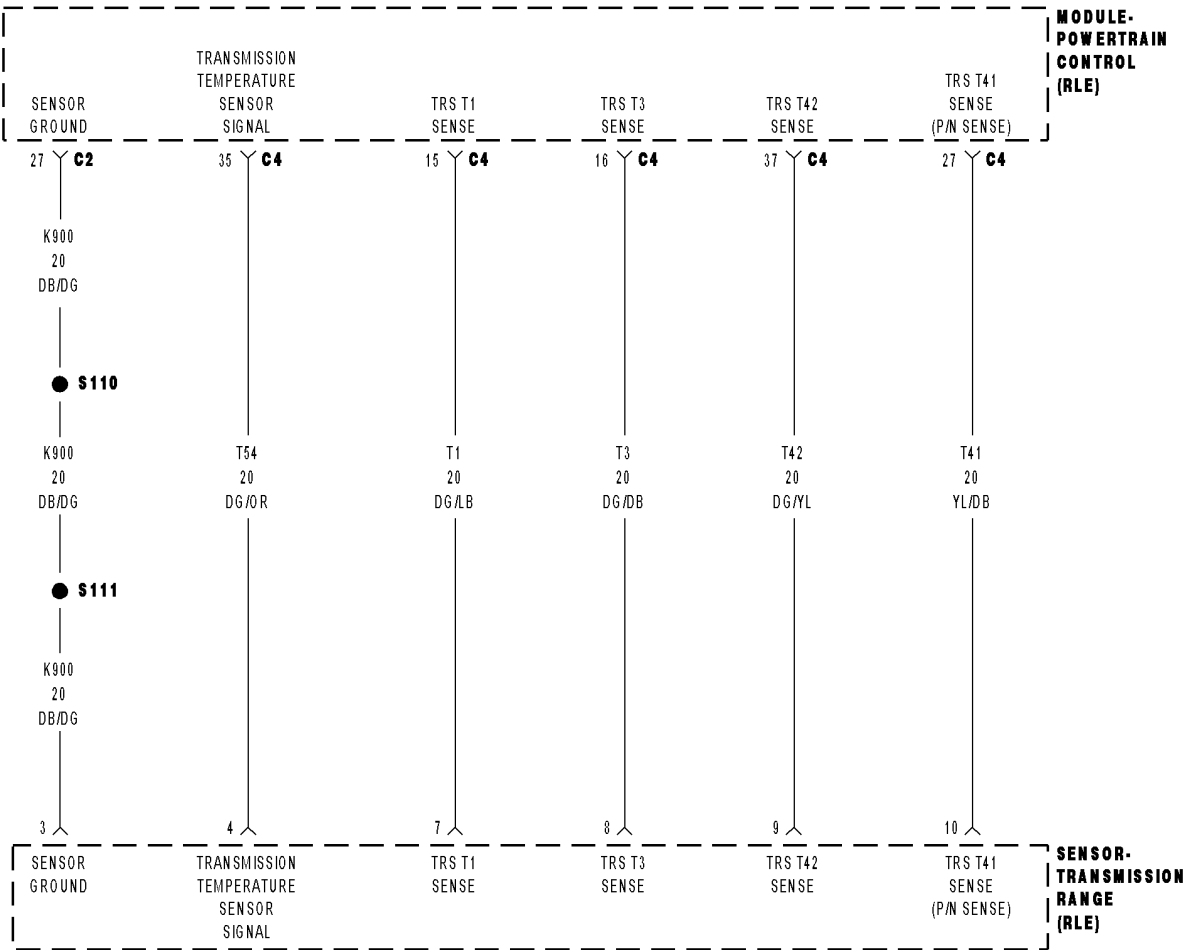
**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.



P0713-TRANSMISSION TEMPERATURE SENSOR HIGH



**P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Continuously with the ignition on and engine running.

- **Set Condition:**

The DTC will set when the monitored Temperature Sensor voltage rises above 4.94 volts for the period of 1.45 seconds. When the fault is set, calculated temperature is substituted for measured temperature, however the fault code is stored only after three consecutive occurrences of the fault.

Possible Causes
(K900) SENSOR GROUND OPEN
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The temperature sensor is used to sense the temperature of the transmission fluid. Transmission fluid temperature can affect shift quality, torque converter operation and when or if some diagnostics are run. A failed temperature sensor could affect the OBD diagnostics. If a problem occurs in the transmission temperature sensor circuit, transmission temperature will be based on a calculated value.

## 1. CHECK TO SEE IF DTC IS CURRENT

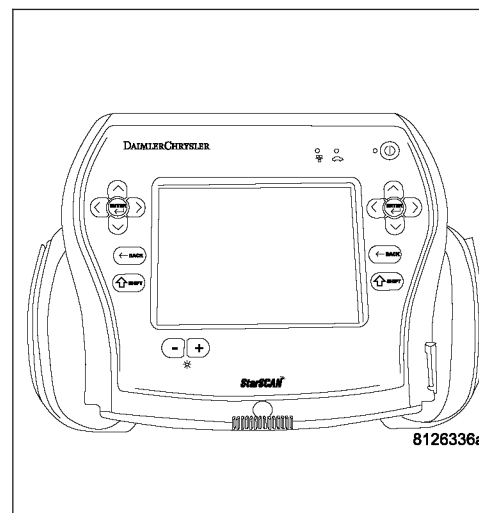
With the scan tool, Check the STARTS SINCE SET counter for P0713.

**Note: This counter only applies to the last DTC set.**

**Is the STARTS SINCE SET counter 2 or less?**

**Yes** >> Go To 2

**No** >> Go To 8





**P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)****2. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

**Note: Check connectors - Clean/repair as necessary.**

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

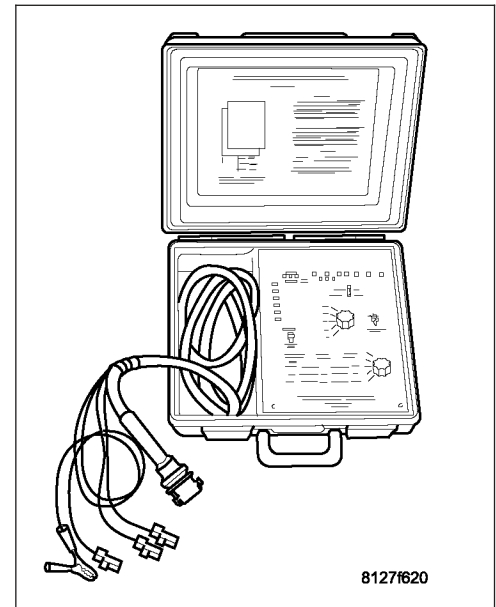
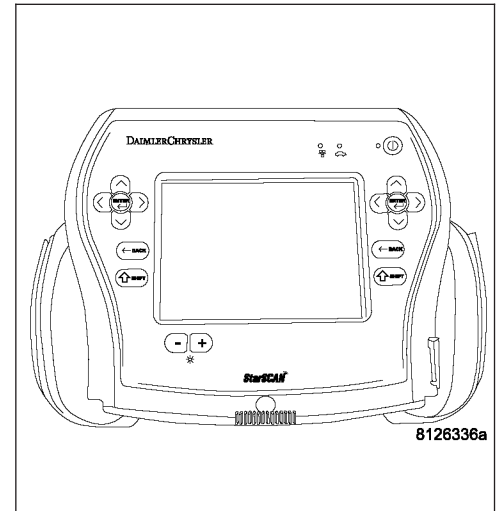
With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings with the numbers listed on the Transmission Simulator.

**Do the readings on the Transmission Simulator match the scan tool readings  $\pm 0.2$  volts?**

**Yes**    >> Go To 3

**No**    >> Go To 4

**3. TRANSMISSION TEMPERATURE SENSOR**

**If there are no possible causes remaining, view repair.**

**Repair**

Replace TRS Assembly per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)****4. (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the TRS harness connector

**Note: Check connectors - Clean/repair as necessary.**

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Tool #8815 to perform diagnosis.**

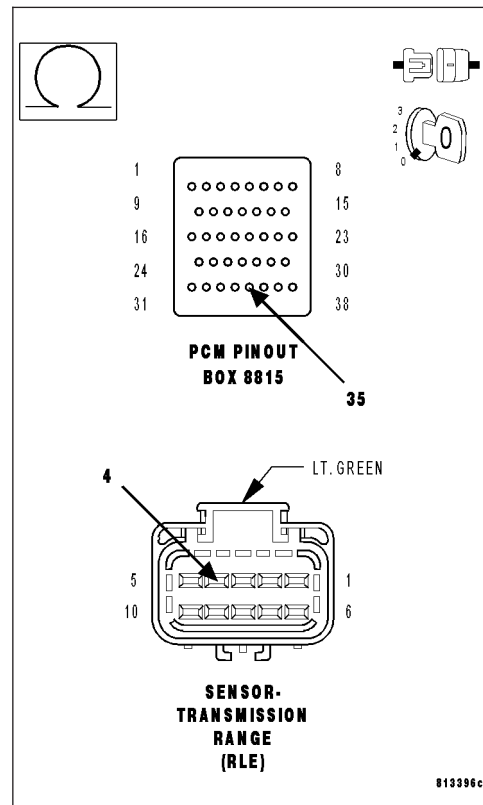
Measure the resistance of the Transmission Temperature Sensor Signal circuit from the appropriate terminal of special tool #8815 to the TRS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the Transmission Temperature Sensor Signal circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. (K900) SENSOR GROUND CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the TRS harness connector

Disconnect the PCM C2 harness connector

**Note: Check connectors - Clean/repair as necessary.**

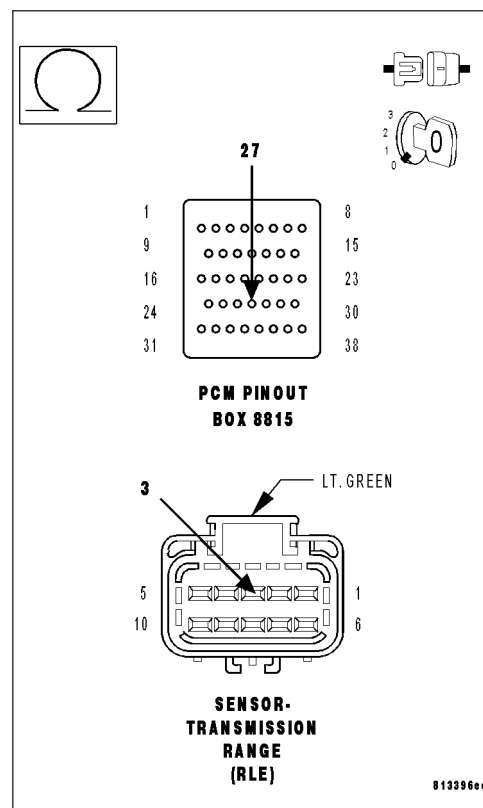
Measure the resistance of the (K900) Sensor Ground circuit from the appropriate terminal of special tool #8815 to the TRS harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (K900) Sensor Ground circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 6



**P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)****6. (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

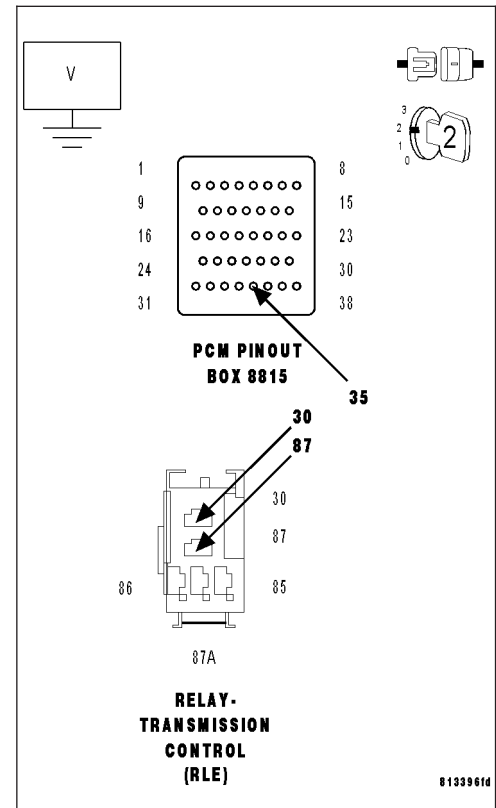
Measure the voltage of the (T54) Transmission Temperature Sensor Signal circuit in the appropriate terminal of special tool #8815.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7

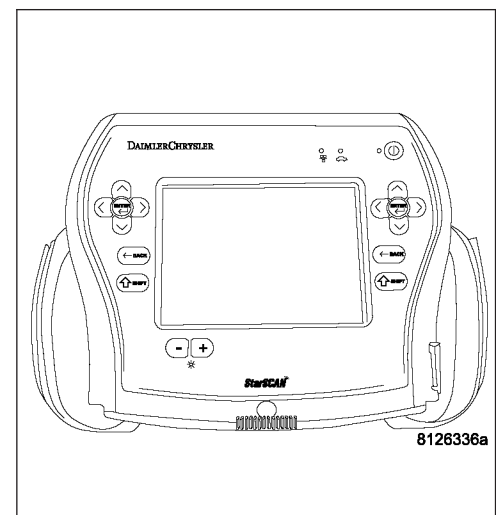
**7. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)****8. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

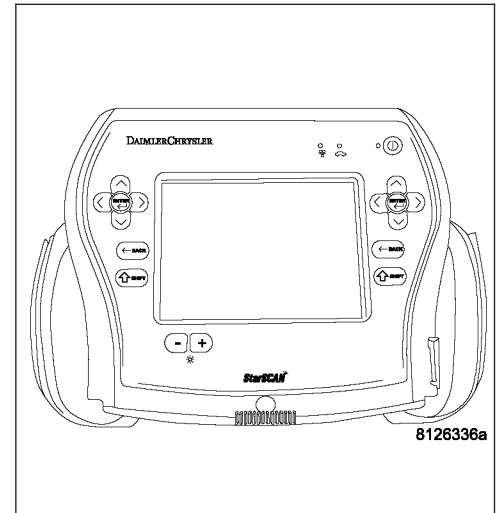
Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

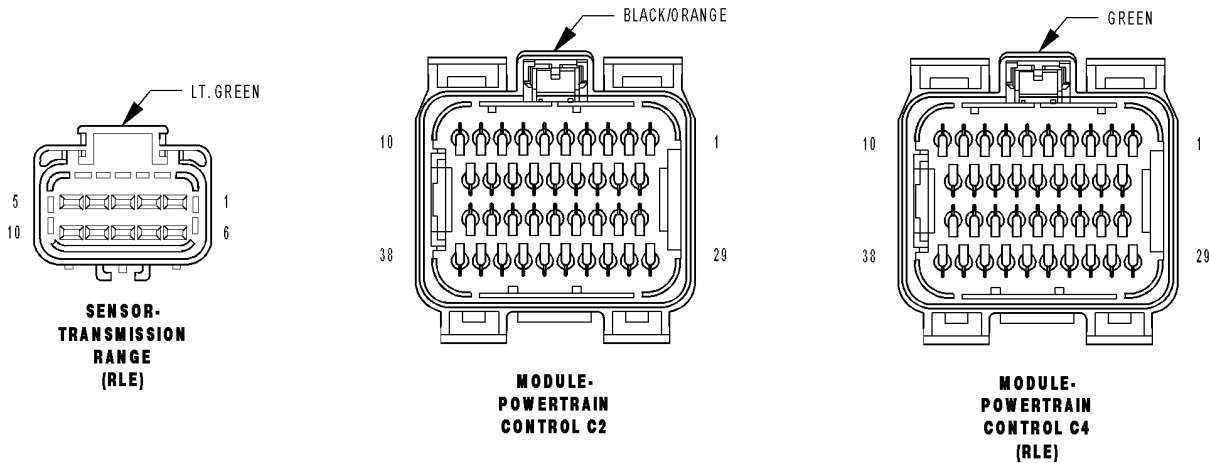
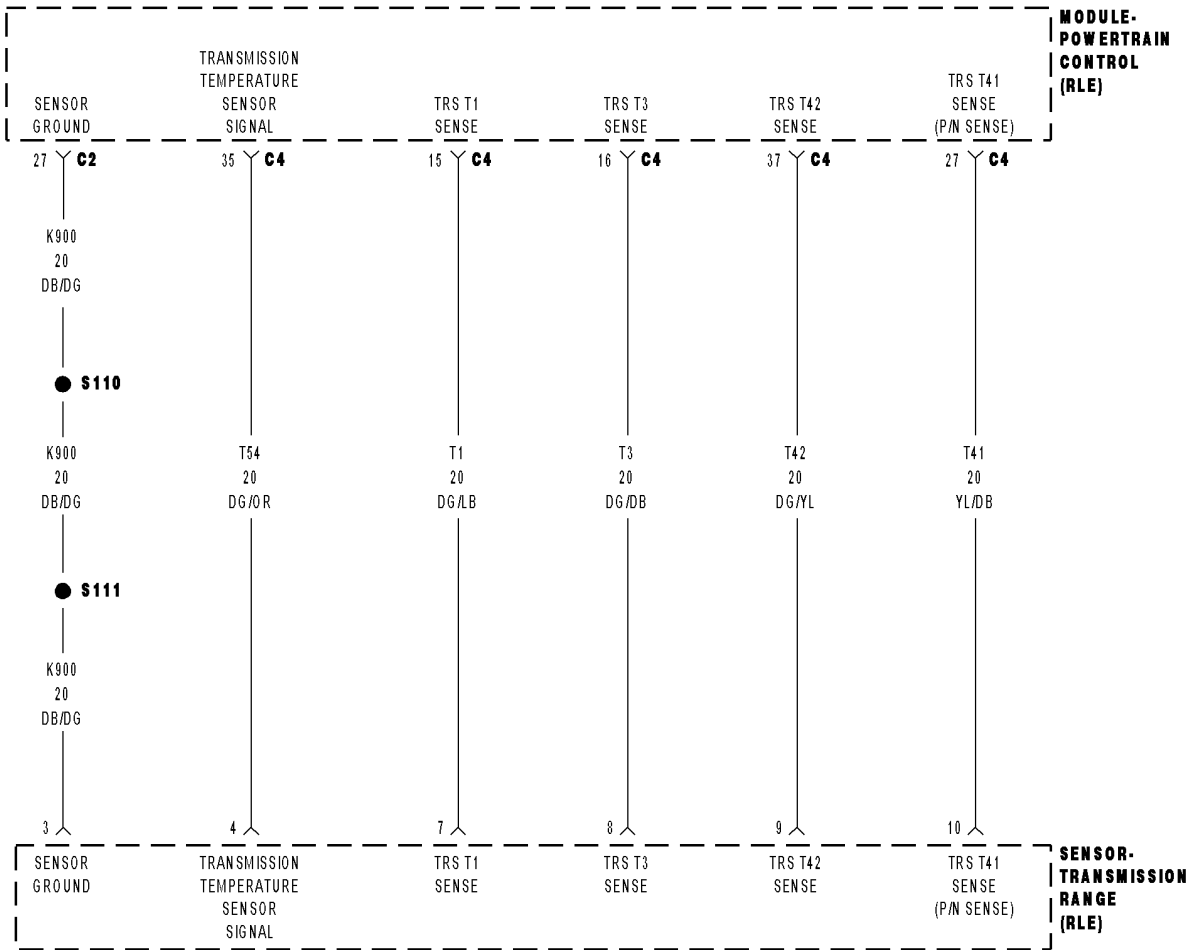
**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform 42RLE TRANSMISSION VERIFICATION TEST -  
VER 1.

**No** >> Test Complete.



P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT



**P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously with the ignition on and engine running.
- **Set Condition:**  
The DTC will set when the monitored Temperature Sensor voltage fluctuates or changes abruptly within a pre-determined period of time.

Possible Causes
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The temperature sensor is used to sense the temperature of the transmission fluid. Transmission fluid temperature can affect shift quality, torque converter operation and when or if some diagnostics are run. A failed temperature sensor could affect the OBD diagnostics. If a problem occurs in the transmission temperature sensor circuit, transmission temperature will be based on a calculated value.

**1. CHECK TO SEE IF DTC IS CURRENT**

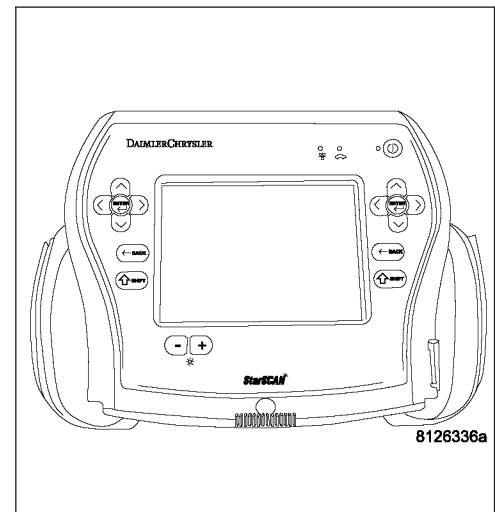
With the scan tool , check the STARTS SINCE SET counter for P0714.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter 2 or less?**

**Yes** >> Go To 2

**No** >> Go To 5



**P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT (CONTINUED)****2. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

**Note: Note: Check connectors - Clean/repair as necessary.**

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

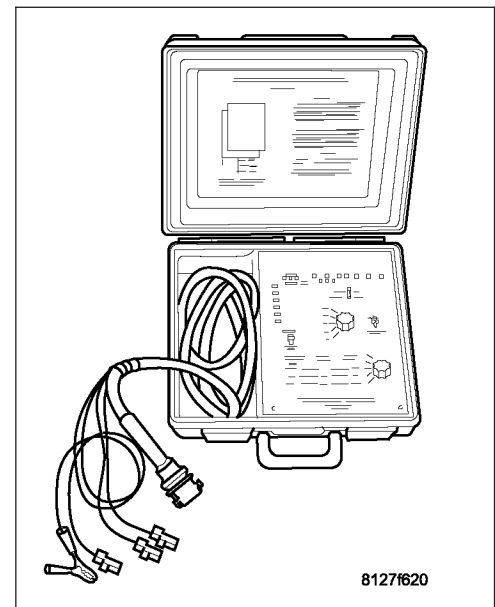
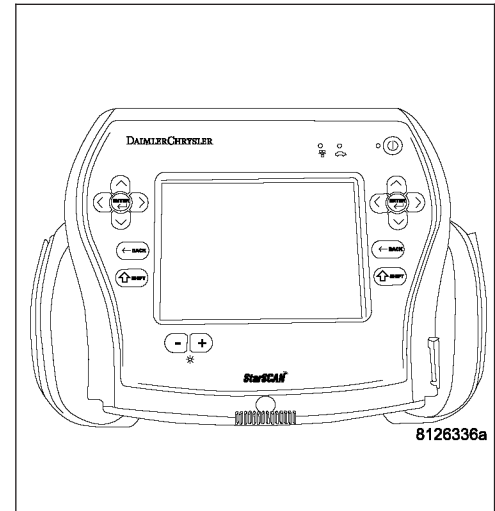
With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings with the numbers listed on the Transmission Simulator.

**Do the readings on the Transmission Simulator match a non-fluctuating scan tool reading  $\pm 0.2$  volts?**

**Yes** >> Go To 3

**No** >> Go To 4

**3. TRANSMISSION TEMPERATURE SENSOR**

**If there are no possible causes remaining, view repair.**

**Repair**

Replace TRS Assembly per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

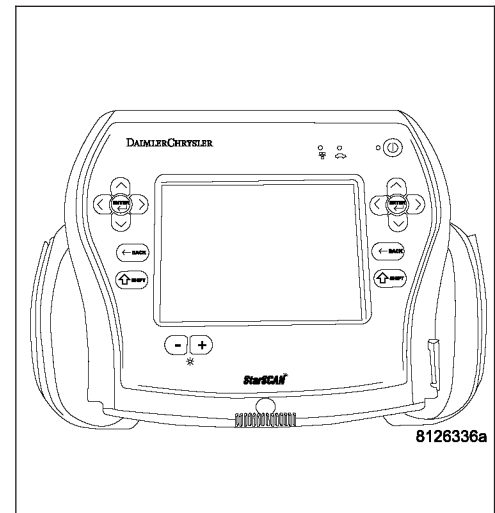
**P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT (CONTINUED)****4. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**5. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

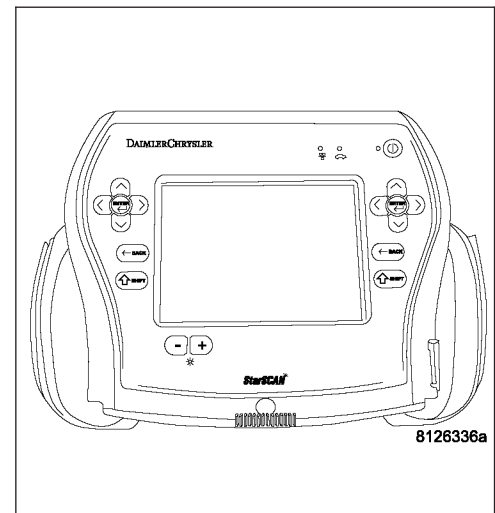
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

**Yes** >> Repair as necessary.

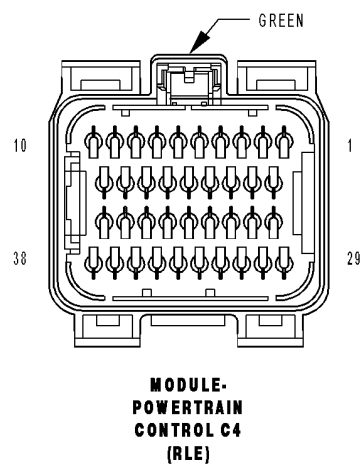
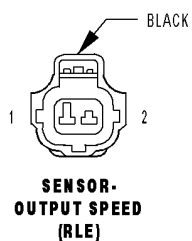
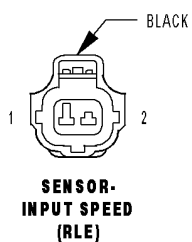
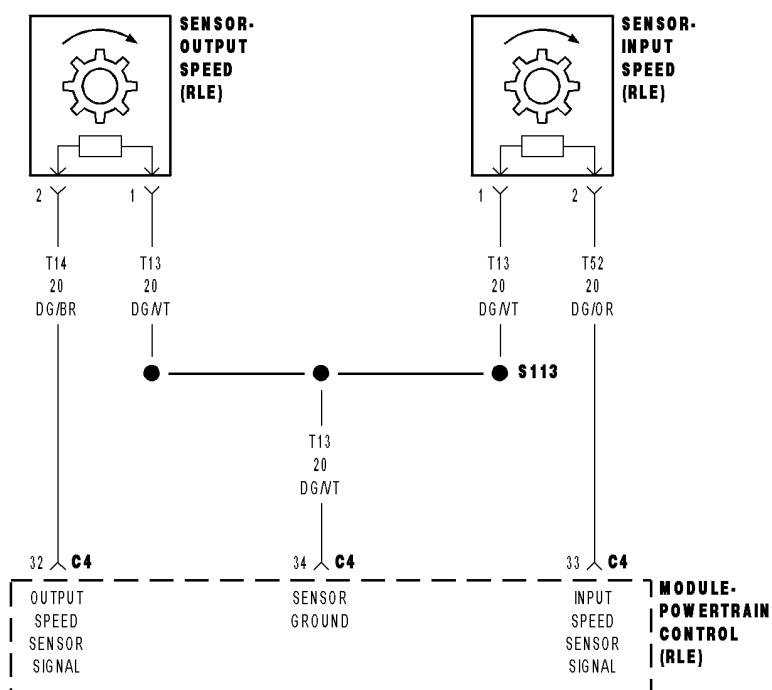
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.





## P0715-INPUT SPEED SENSOR 1 CIRCUIT



**P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The transmission gear ratio is monitored continuously while the transmission is in gear.

- **Set Condition:**

If there is an excessive change in the Input RPM in any gear. the vehicle must be in a valid gear R, 1st, 2nd, 3rd, or 4th.

Possible Causes
(T52) INPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
(T13) SPEED SENSOR GROUND CIRCUIT OPEN
(T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T13) SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
INPUT SPEED SENSOR
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through system checks.

## Diagnostic Test

### 1. CHECK TO SEE IF DTC P0715 IS CURRENT

Start the engine.

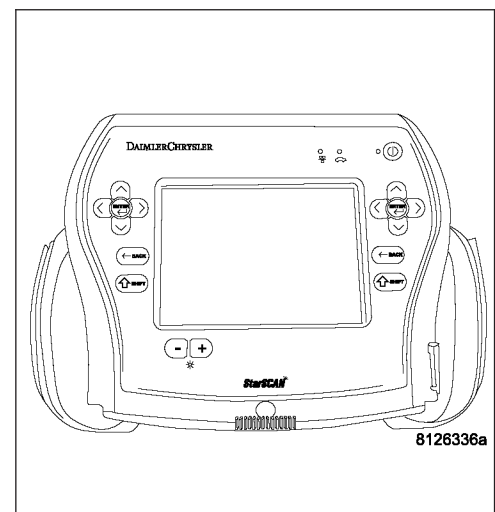
Place the shifter in park.

With the scan tool , read the Input Speed Sensor RPM.

**Is the Input Speed Sensor reading below 400 RPM?**

**Yes** >> Go To 2

**No** >> Go To 10



**P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)****2. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

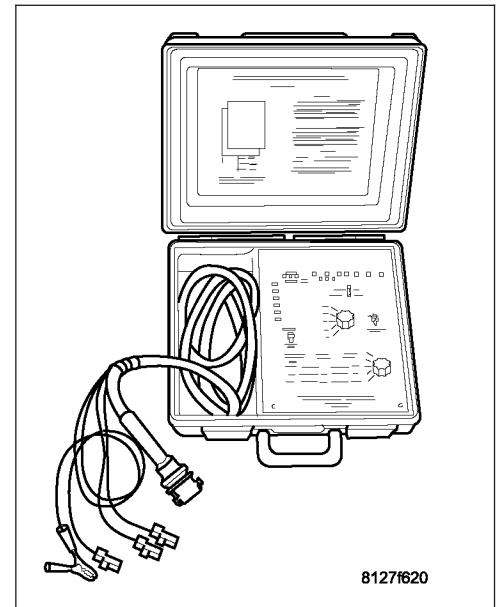
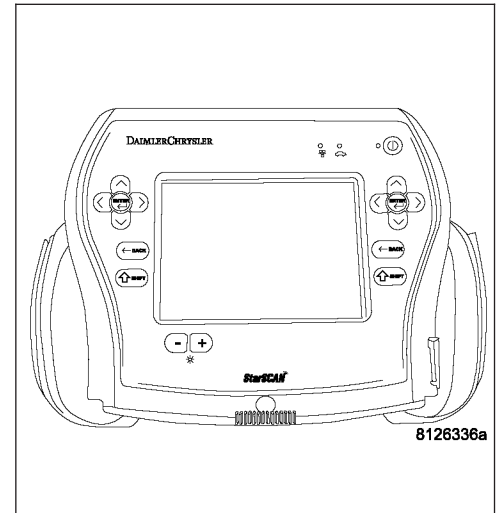
With the Transmission Simulator, set the "Input/Output Speed" switch to "ON" and the rotary switch to the "3000/1250" position.

With the scan tool, read the Input and Output RPM.

**Does the Input speed read 3000 RPM and the Output speed read 1250 RPM  $\pm$  50 RPM?**

**Yes**    >> Go To 3

**No**    >> Go To 4

**3. INPUT SPEED SENSOR**

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Input Speed Sensor per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)****4. (T52) INPUT SPEED SENSOR SIGNAL CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Input Speed Sensor harness connector.

**Note: Check connectors - Clean/repair as necessary.**

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

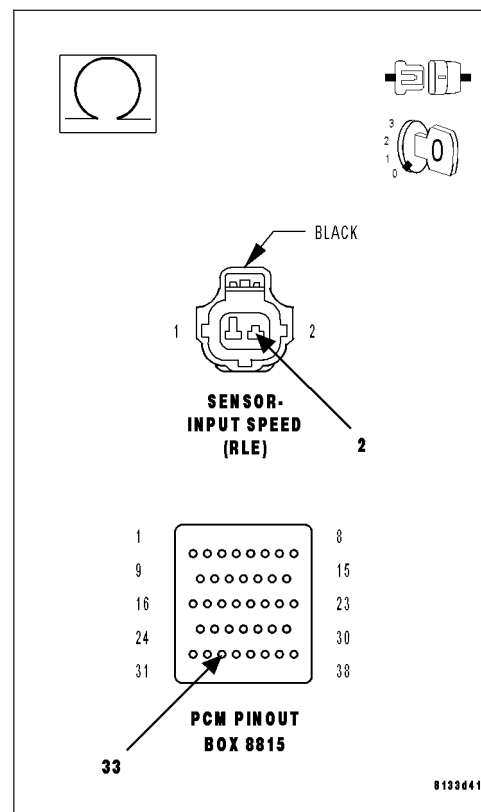
Measure the resistance of the (T52) Input Speed Sensor Signal circuit from the appropriate terminal of special tool #8815 to the Input Speed Sensor connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T52) Input Speed Sensor Signal circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. (T13) SENSOR GROUND CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Input Speed Sensor harness connector.

**Note: Check connectors - Clean/repair as necessary.**

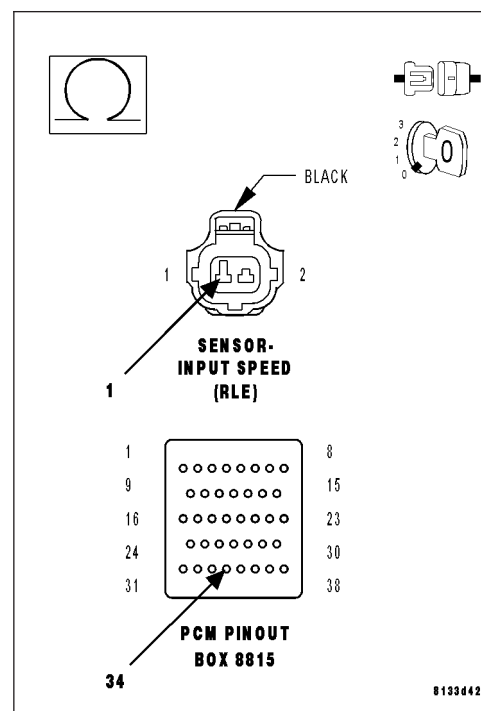
Measure the resistance of the (T13) Sensor Ground circuit from the from the appropriate terminal of special tool #8815 to the Input Speed Sensor harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T13) Sensor Ground circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 6



**P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)****6. (T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Input Speed Sensor harness connector.

**Note: Check connectors - Clean/repair as necessary.**

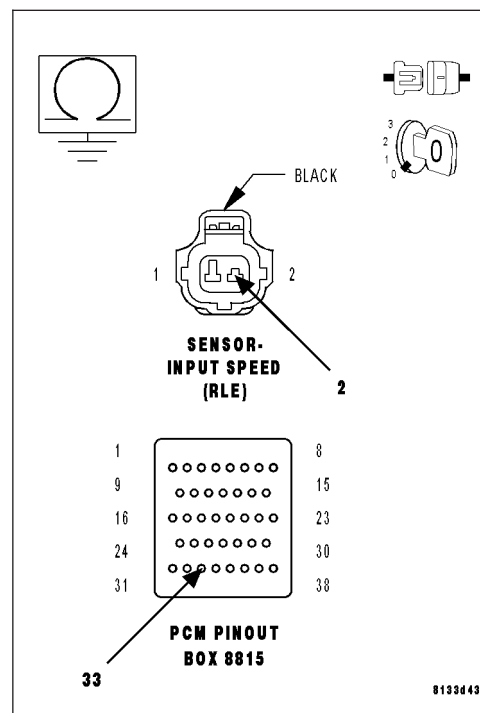
Measure the resistance between ground and the (T52) Input Speed Sensor Signal circuit.

**Is the resistance Below 5.0 ohms?**

**Yes** >> Repair the (T52) Input Speed Sensor Signal circuit for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. (T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Output Speed Sensor harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

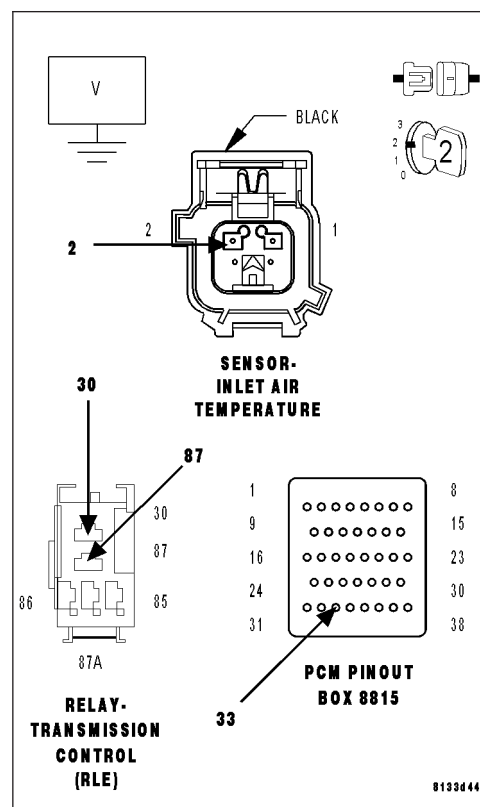
Measure the voltage of the (T52) Input Speed Sensor Signal circuit.

**Is the voltage above 0.5 volt?**

**Yes** >> Repair the (T52) Input Speed Sensor Signal circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 8



**P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)****8. (T13) SENSOR GROUND CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ and (T16) Transmission Control Relay Output circuits in the Transmission Control Relay connector.

Ignition on, engine not running.

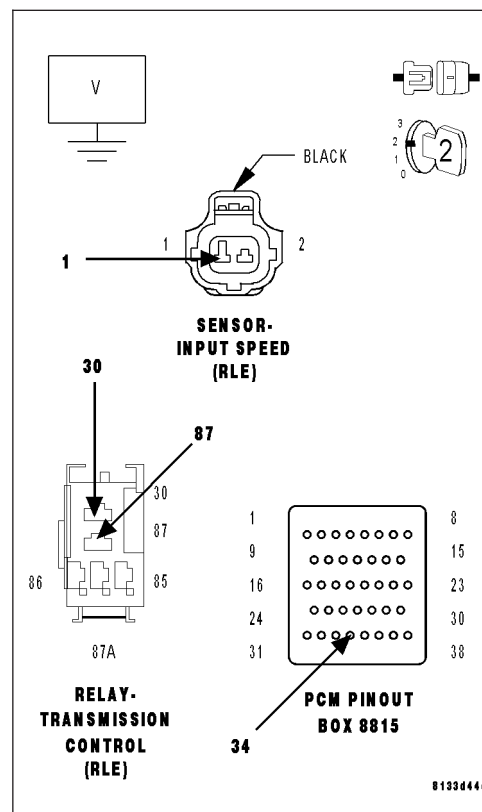
Measure the voltage of the (T13) Sensor Ground circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T13) Sensor Ground circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 9

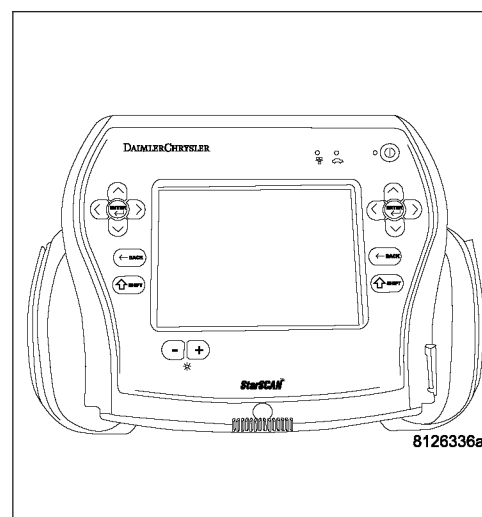
**9. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)****10. INTERMITTENT WIRING AND CONNECTORS**

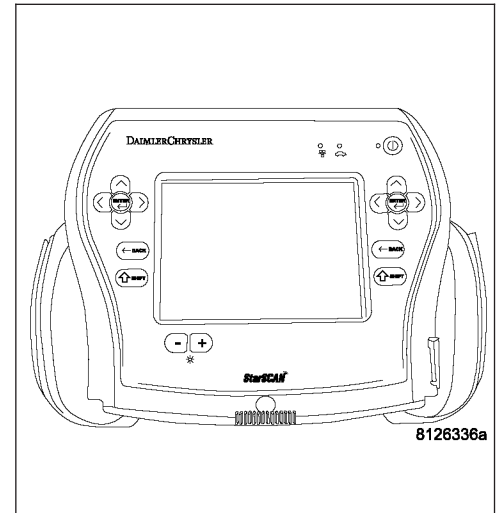
The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

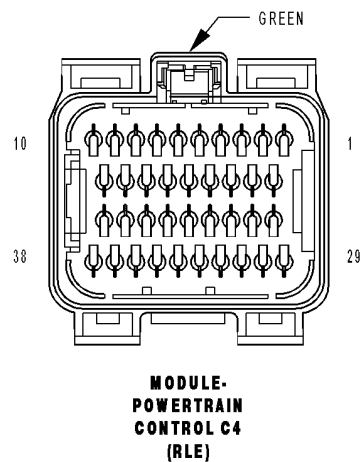
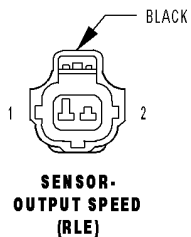
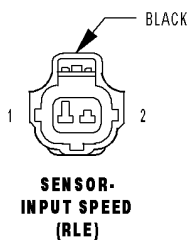
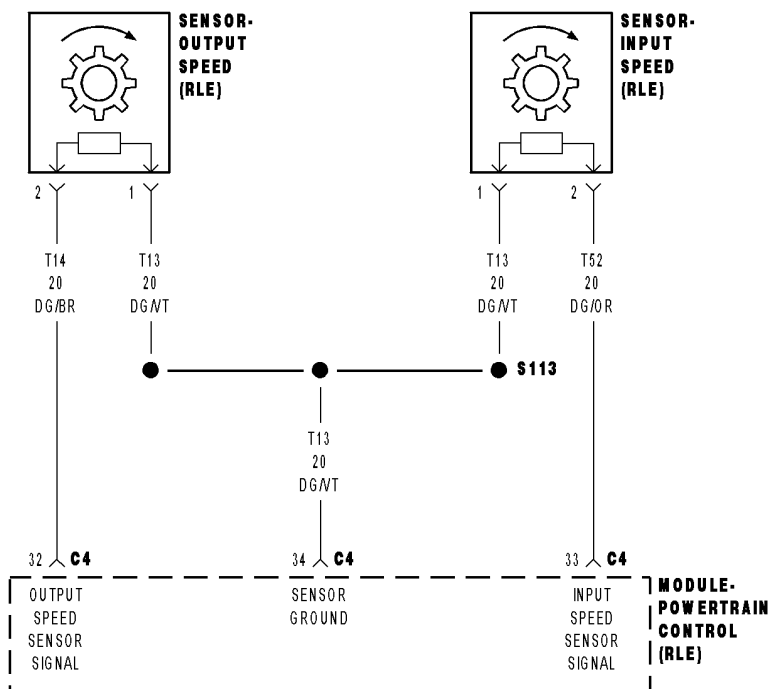
With the scan tool , check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST -  
          VER 1.
- No**      >> Test Complete.



## P0720-OUTPUT SPEED SENSOR CIRCUIT





**P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The transmission gear ratio is monitored continuously while the transmission is in gear.

- **Set Condition:**

If there is an excessive change in the Output RPM in any gear.

Possible Causes
(T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
(T13) SENSOR GROUND CIRCUIT OPEN
(T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T13) SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
OUTPUT SPEED SENSOR
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through system checks.

## Diagnostic Test

### 1. CHECK TO SEE IF DTC P0720 IS CURRENT

Start the engine in park.

Raise the drive wheels off of the ground.

**WARNING: Properly support the vehicle.**

Firmly apply the brakes and place the transmission selector in drive.

**WARNING: Be sure to keep hands and feet clear of rotating wheels.**

Release the brakes and allow the drive wheels to spin freely.

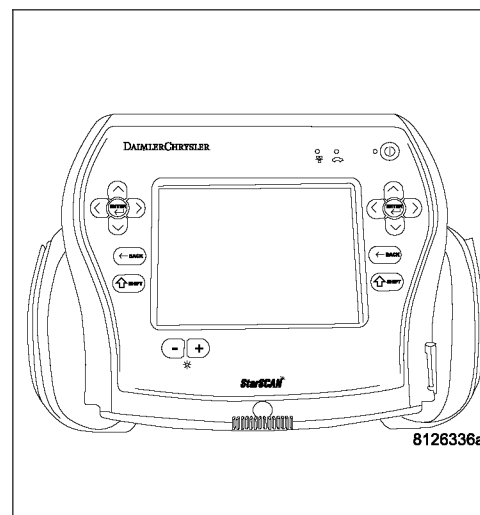
**Note: The drive wheels must be turning at this point.**

With the scan tool, read the Output RPM

**Is the Output RPM below 100?**

**Yes**    >> Go To 2

**No**    >> Go To 10



**P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)****2. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

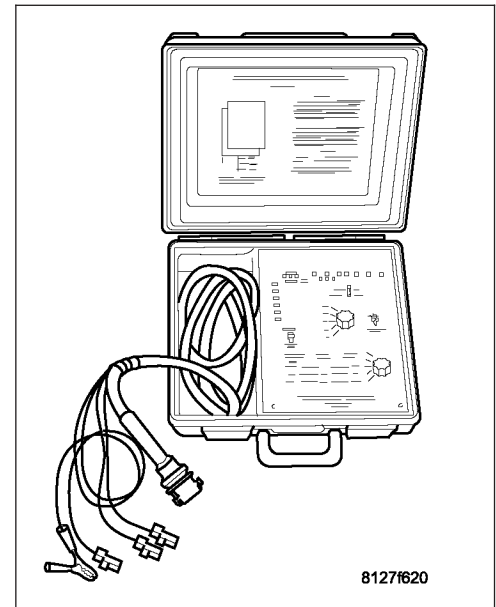
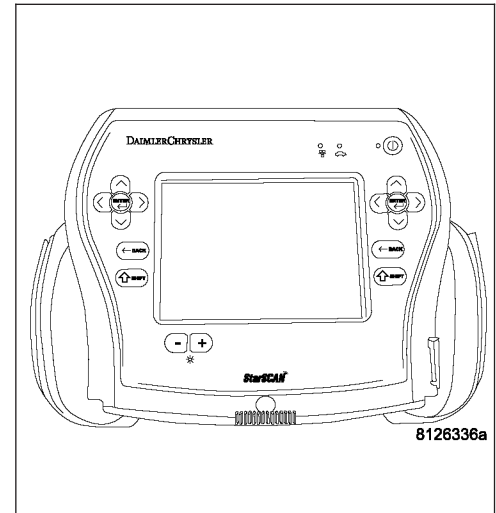
With the Transmission Simulator, set the "Input/Output Speed" switch to "ON" and the rotary switch to the "3000/1250" position.

With the scan tool , read the Input and Output RPM.

**Does the Input RPM read 3000 and the Output RPM read 1250 (within 50 RPM)?**

**Yes** >> Go To 3

**No** >> Go To 4

**3. OUTPUT SPEED SENSOR**

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Output Speed Sensor per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)****4. (T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Output Speed Sensor harness connector.

**Note: Check connectors - Clean/repair as necessary.**

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

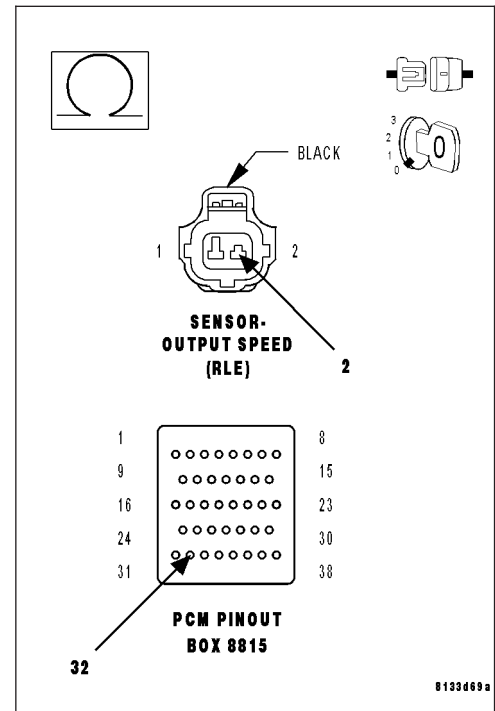
Measure the resistance of the (T14) Output Speed Sensor Signal circuit from appropriate terminal of special tool #8815 to the Output Speed Sensor harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T14) Output Speed Sensor Signal circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. (T13) SENSOR GROUND CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Output Speed Sensor harness connector.

**Note: Check connectors - Clean/repair as necessary.**

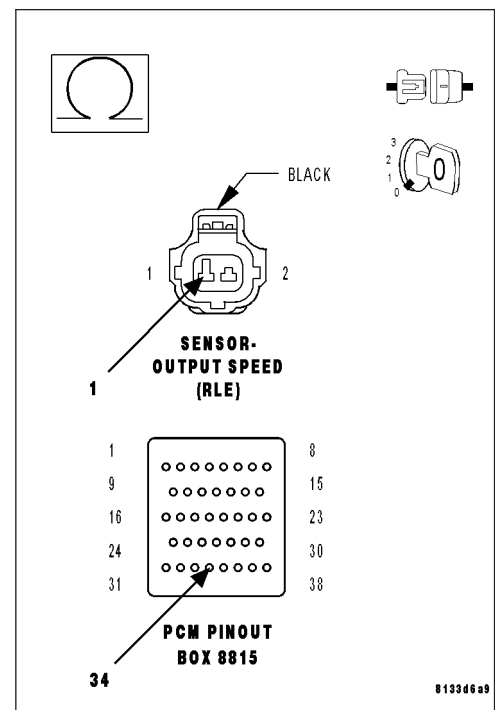
Measure the resistance of the Sensor Ground circuit from the appropriate terminal of special tool #8815 to the Output Speed Sensor harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T13) Sensor Ground circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 6



**P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)****6. (T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Output Speed Sensor harness connector.

**Note: Check connectors - Clean/repair as necessary.**

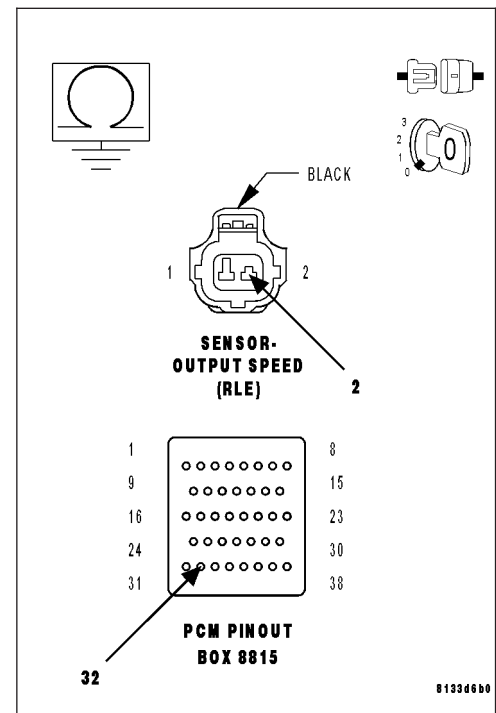
Measure the resistance between ground and the (T14) Output Speed Sensor Signal circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T14) Output Speed Sensor Signal circuit for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. (T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Output Speed Sensor harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

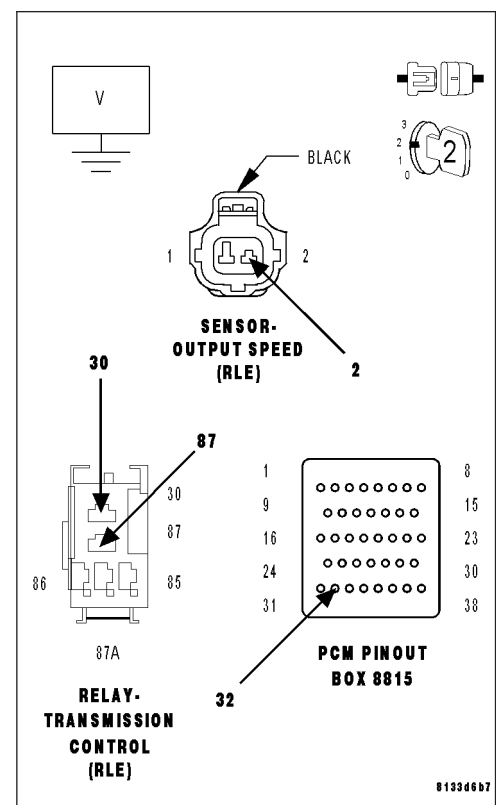
Measure the voltage of the (T14) Output Speed Sensor Signal circuit.

**Is the voltage above 0.5 volt?**

**Yes** >> Repair the (T14) Output Speed Sensor Signal circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 8



**P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)****8. (T13) SENSOR GROUND CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ and (T16) Transmission Control Relay Output circuits in the Transmission Control Relay connector.

Ignition on, engine not running.

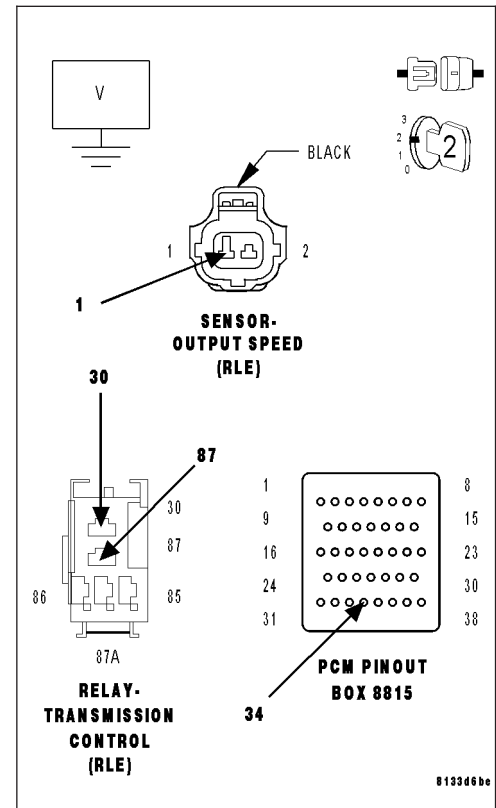
Measure the voltage of the (T13) Sensor Ground circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T13) Sensor Ground circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 9

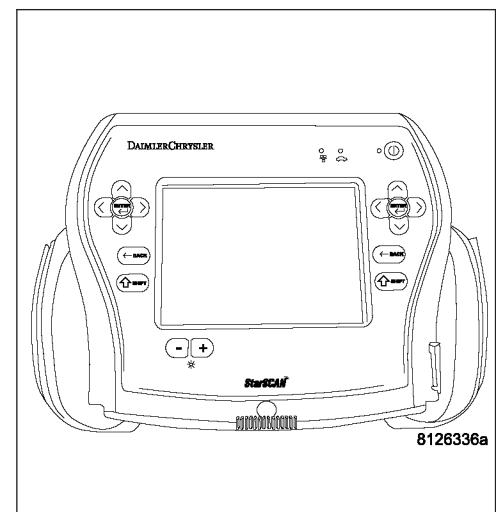
**9. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)****10. INTERMITTENT WIRING AND CONNECTORS**

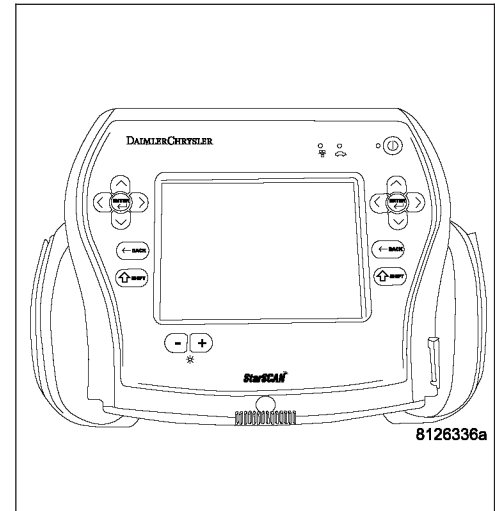
The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

With the scan tool , check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST -  
          VER 1.
- No**     >> Test Complete.



## P0725-ENGINE SPEED SENSOR CIRCUIT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the engine is running.
- **Set Condition:**  
The Engine RPM is less than 390 or greater than 8000 for more than 2 seconds while the engine is running.

Possible Causes
ENGINE DTCS PRESENT
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The PCM uses a dual port RAM internal to the controller to send the engine speed signal to the Transmission Control System. The calculated engine RPM is compared to a minimum and maximum value. If the PCM interprets this signal to be out of range when the engine is running the code is set. The MIL illuminates after 10 seconds of vehicle operation and the transmission system defaults to Limp-in mode.

## Diagnostic Test

### 1. CONDITION P0725 PRESENT

Start the engine.

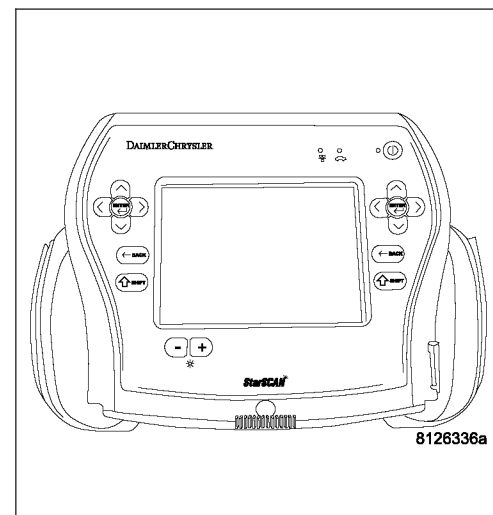
**Note: This DTC is not a Transmission Input Speed Sensor DTC.**  
With the scan tool, Check the STARTS SINCE SET counter for P0725.

**Note: This counter only applies to the last DTC set.**

**Is the STARTS SINCE SET counter for P0725 set at 0?**

**Yes**    >> Go To 2

**No**    >> Go To 4

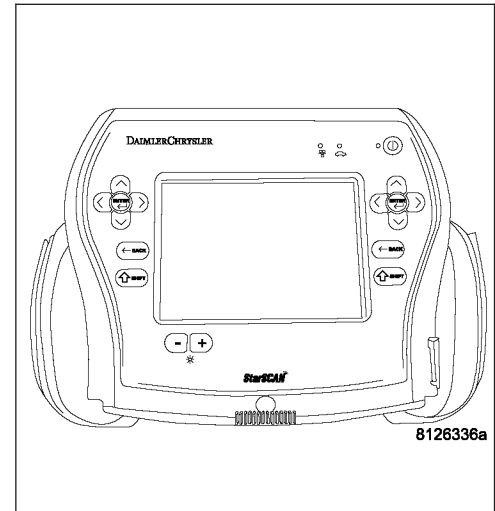


**P0725-ENGINE SPEED SENSOR CIRCUIT (CONTINUED)****2. ENGINE DTCS PRESENT**

With the scan tool, read Engine DTCs.

**Are there any Engine DTC's present?**

- Yes** >> Refer to Section 9 – Engine Electrical Diagnostics and perform the appropriate diagnostic procedure.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Go To 3

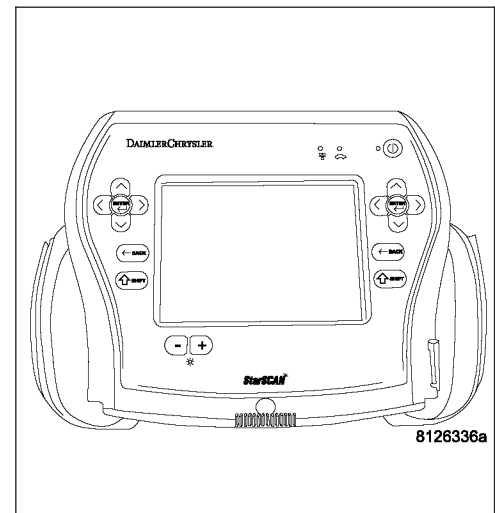
**3. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.****Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program the Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.





**P0725-ENGINE SPEED SENSOR CIRCUIT (CONTINUED)****4. INTERMITTENT WIRING AND CONNECTORS**

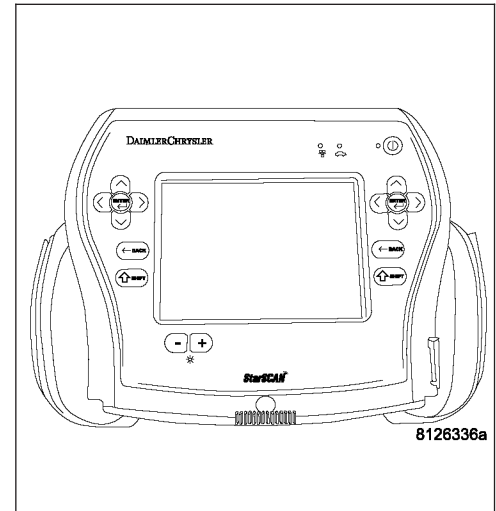
The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST -  
          VER 1.
- No**     >> Test Complete.



## P0731-GEAR RATIO ERROR IN 1ST

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The Transmission gear ratio is monitored continuously while the transmission is in gear.

- **Set Condition:**

If the ratio of the Input RPM to the Output RPM does not match the current gear ratio when compared to the known gear ratio.

Possible Causes
RELATED TRANSMISSION DTC'S PRESENT
INTERMITTENT GEAR RATIO ERRORS
INTERNAL TRANSMISSION

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through data checks. When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding gear ratio error trouble code is set. The transmission will go into Limp-in mode after four gear ratio error events occur in a given driving cycle.

**P0731-GEAR RATIO ERROR IN 1ST (CONTINUED)****Diagnostic Test****1. DETERMINING IF RELATED TRANSMISSION DTC'S ARE PRESENT**

With the scan tool, read Transmission DTC's.

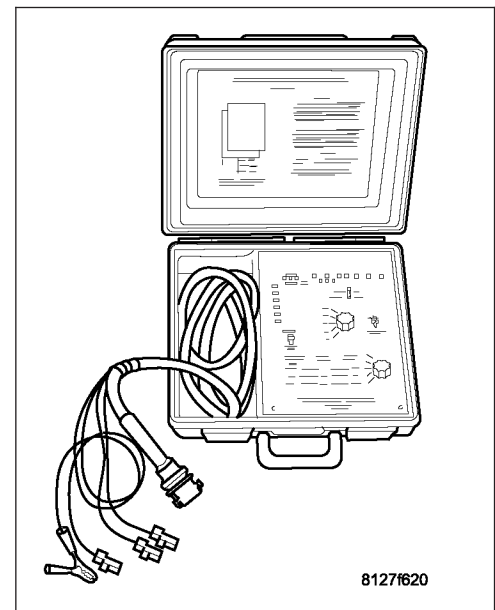
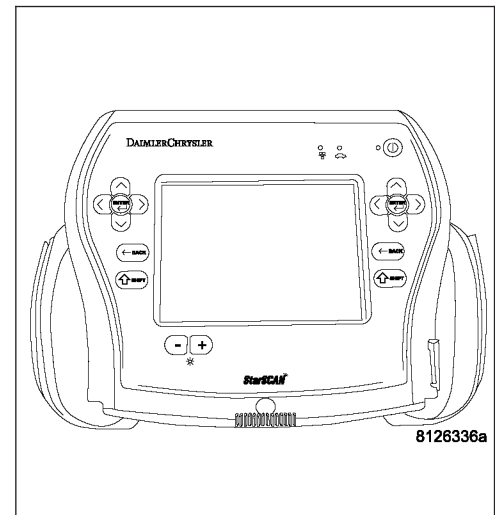
If any of these DTC's are present, perform their respective tests first.

**Are there any Loss of Prime, Line Pressure Sensor and/or Speed Sensor DTCs present?**

**Yes**    >> Refer to appropriate diagnostic procedure in the Transmission category. If any of these DTC's are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 2



**P0731-GEAR RATIO ERROR IN 1ST (CONTINUED)****2. CHECK TO SEE IF P0731 IS CURRENT**

With the scan tool, perform the 1st gear clutch test. Follow the instructions on the scan tool.

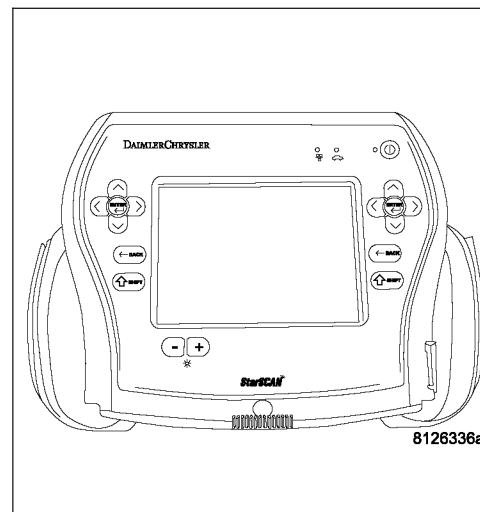
Increase the throttle angle or TPS Degree to 30° for no more than a few seconds.

**CAUTION: Do not overheat the transmission.**

**Did the Clutch Test pass, Input Speed remain at zero?**

**Yes** >> Go To 3

**No** >> Go To 4

**3. CHECK FOR INTERMITTENT OPERATION**

The conditions to set this DTC are not current at this time.

Check the gearshift linkage adjustment.

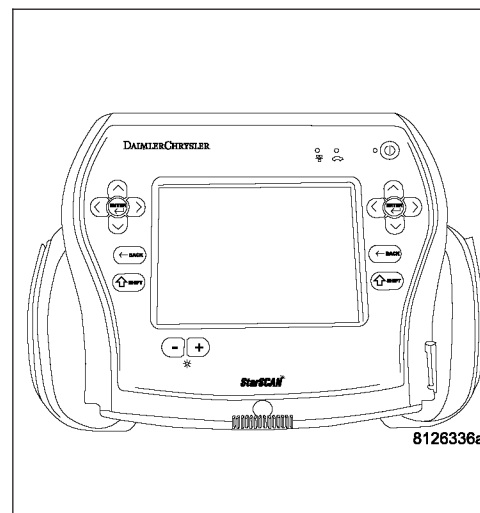
Gear ratio DTC's can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the Clutch Test and still sets Gear Ratio DTC, check the Speed Sensors for proper operation. Remove the Starter Relay.

**CAUTION: removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Check the wiring and connectors for the Speed Sensors for a good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.



**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

**4. INTERNAL TRANSMISSION**

**If there are no possible causes remaining, view repair.**

**Repair**

Repair internal Transmission per the Service Information. Check all of the components related to the UD and LR clutches. Inspect the Oil Pump and repair or replace per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

P0732-GEAR RATIO ERROR IN 2ND

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
The Transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**  
If the ratio of the Input RPM to the Output RPM does not match the current gear ratio when compared to the known gear ratio.

Possible Causes
RELATED TRANSMISSION DTC'S PRESENT
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
INTERMITTENT GEAR RATIO ERRORS
INTERNAL TRANSMISSION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through data checks. When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding gear ratio error trouble code is set. The transmission will go into Limp-in mode after four gear ratio error events occur in a given driving cycle.

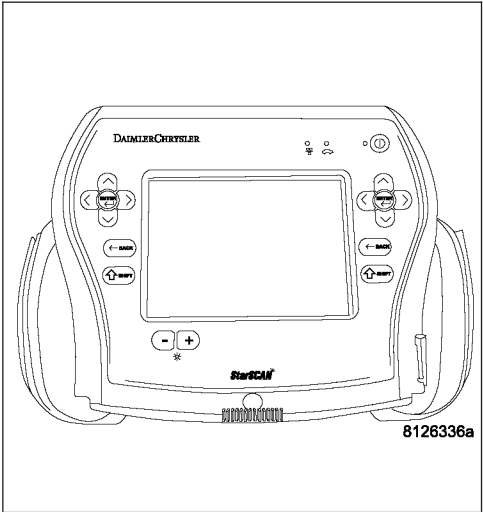
Diagnostic Test

1. DETERMINING IF RELATED TRANSMISSION DTC'S ARE PRESENT

With the scan tool, read Transmission DTC's.  
If any of these DTC's are present, perform their respective tests first.

Are there any Loss of Prime, Line Pressure Sensor and/or Speed Sensor DTCs present?

- Yes**    >> Refer to appropriate diagnostic procedure in the Transmission category. If any of these DTC's are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Go To 2



**P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)****2. CHECK TO SEE IF P0732 IS CURRENT**

With the scan tool, perform the 2nd gear clutch test. Follow the instructions on the scan tool.

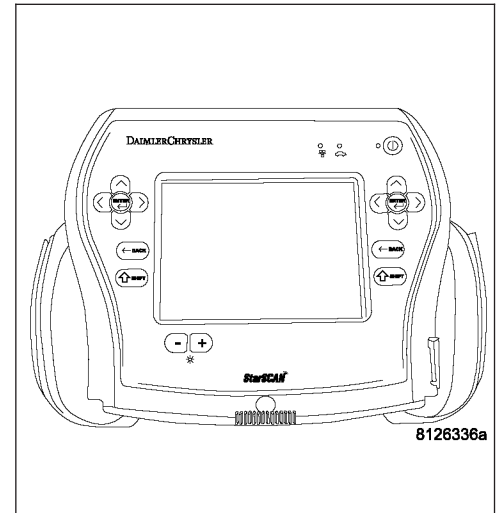
Increase the throttle angle or TPS Degree to 30° for no more than a few seconds.

**CAUTION: Do not overheat the transmission.**

**Did the Clutch Test pass, Input Speed remain at zero?**

**Yes** >> Go To 3

**No** >> Go To 4



**P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)****3. CHECK FOR INTERMITTENT OPERATION**

The conditions to set this DTC are not current at this time.

Check the gearshift linkage adjustment.

Gear ratio DTC's can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the Clutch Test and still sets Gear Ratio DTC, check the Speed Sensors for proper operation.

Remove the Starter Relay.

**CAUTION: removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Check the wiring and connectors for the Speed Sensors for a good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

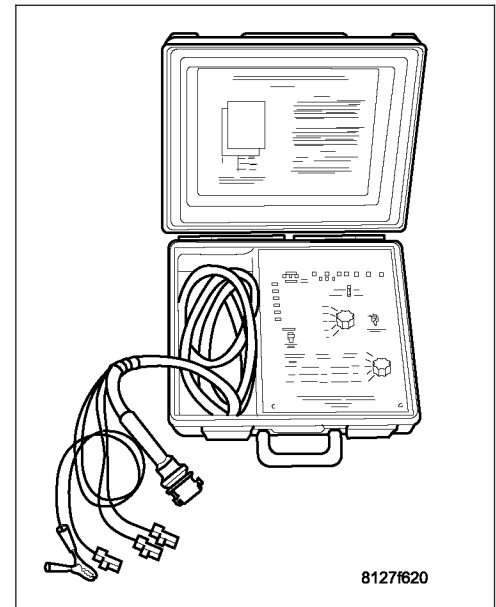
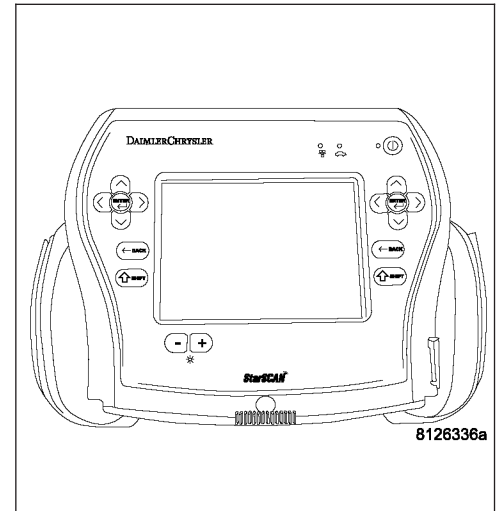
This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

**Yes**    >> Repair as necessary.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST -  
          VER 1.

**No**      >> Test Complete.

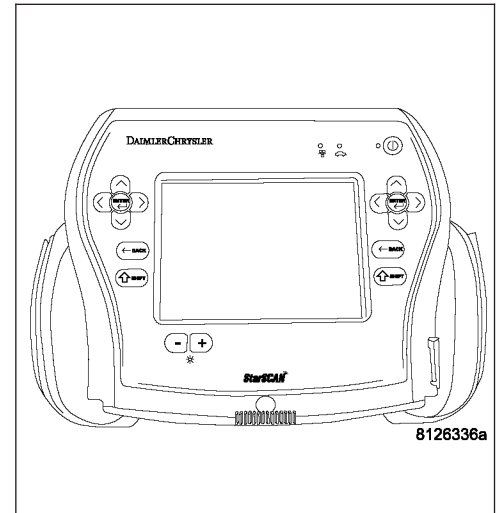


**P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)****4. CHECK FOR RELATED PRESSURE SWITCH DTC'S**

With the scan tool, read Transmission DTC's.

**Are the DTC's P0845 and/or P0846 present also?**

- Yes** >> Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Go To 5



---

**5. INTERNAL TRANSMISSION**

**If there are no possible causes remaining, view repair.**

**Repair**

Repair internal Transmission per the Service Information. Check all of the components related to the UD and 2/4 clutches. Inspect the Oil Pump and repair or replace per the Service Information.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---



**P0733-GEAR RATIO ERROR IN 3RD**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
The Transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**  
If the ratio of the Input RPM to the Output RPM does not match the current gear ratio when compared to the known gear ratio.

Possible Causes
RELATED TRANSMISSION DTC'S PRESENT
INTERMITTENT GEAR RATIO ERRORS
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
INTERNAL TRANSMISSION

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through data checks. When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding gear ratio error trouble code is set. The transmission will go into Limp-in mode after four gear ratio error events occur in a given driving cycle.

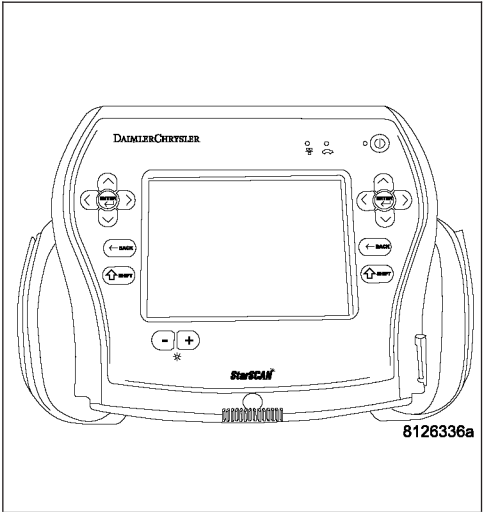
**Diagnostic Test**

**1. DETERMINING IF RELATED TRANSMISSION DTC'S ARE PRESENT**

With the scan tool, read Transmission DTC's.  
If any of these DTC's are present, perform their respective tests first.

**Are there any Loss of Prime, Line Pressure Sensor and/or Speed Sensor DTCs present?**

- Yes**    >> Refer to appropriate diagnostic procedure in the Transmission category. If any of these DTC's are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Go To 2



**P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)****2. CHECK TO SEE IF P0733 IS CURRENT**

With the scan tool, perform the 3rd gear clutch test. Follow the instructions on the scan tool.

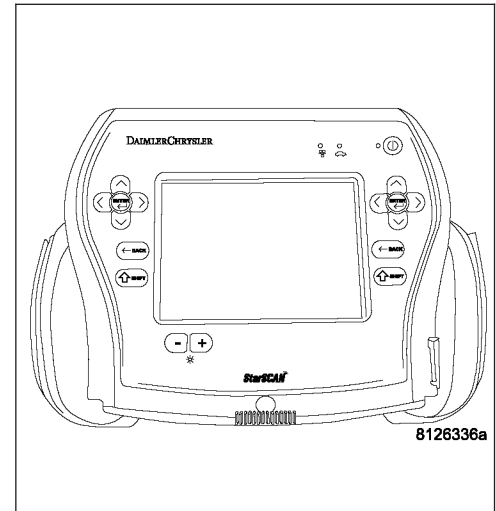
Increase the throttle angle or TPS Degree to 30° for no more than a few seconds.

**CAUTION: Do not overheat the transmission.**

**Did the Clutch Test pass, Input Speed remain at zero?**

**Yes** >> Go To 3

**No** >> Go To 4



**P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)****3. CHECK FOR INTERMITTENT OPERATION**

The conditions to set this DTC are not current at this time.

Check the gearshift linkage adjustment.

Gear ratio DTC's can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the Clutch Test and still sets Gear Ratio DTC, check the Speed Sensors for proper operation.

Remove the Starter Relay.

**CAUTION: removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Check the wiring and connectors for the Speed Sensors for a good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

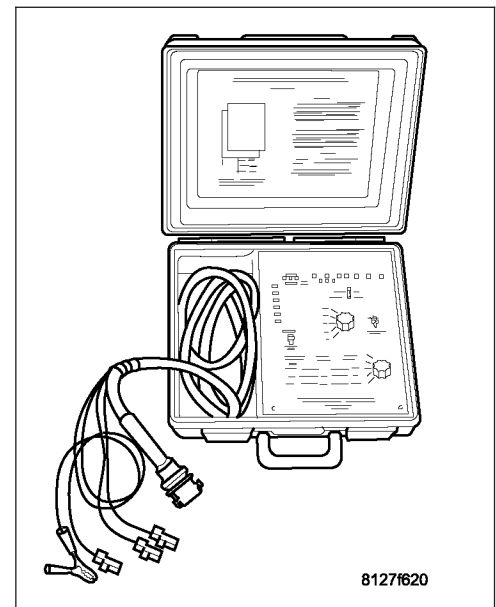
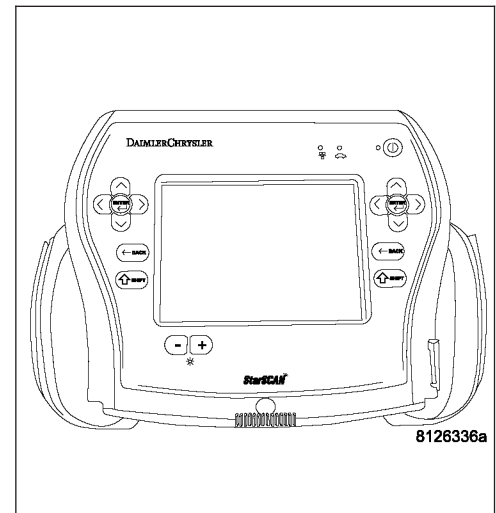
This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

**Yes**    >> Repair as necessary.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST -  
          VER 1.

**No**      >> Test Complete.



**P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)****4. CHECK FOR RELATED PRESSURE SWITCH DTC'S**

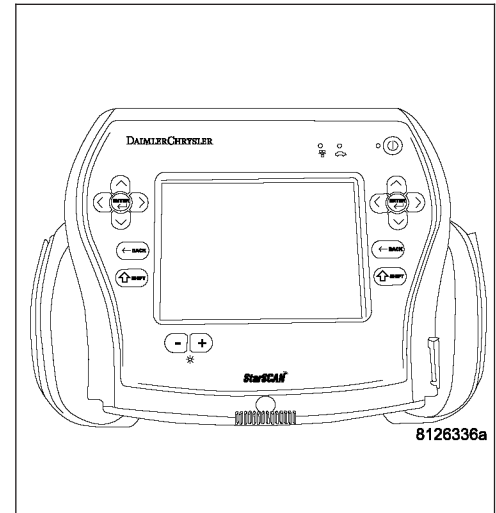
With the scan tool, read Transmission DTC's.

**Are the DTC's P0870 and/or P0871 present also?**

**Yes** >> Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5



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**5. INTERNAL TRANSMISSION**

**If there are no possible causes remaining, view repair.**

**Repair**

Repair internal Transmission per the Service Information. Check all of the components related to the UD and O/D clutches. Inspect the Oil Pump and repair or replace per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

**P0734-GEAR RATIO ERROR IN 4TH**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
The Transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**  
If the ratio of the Input RPM to the Output RPM does not match the current gear ratio when compared to the known gear ratio.

Possible Causes
RELATED TRANSMISSION DTC'S PRESENT
INTERMITTENT GEAR RATIO ERRORS
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
INTERNAL TRANSMISSION

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through data checks. When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding gear ratio error trouble code is set. The transmission will go into Limp-in mode after four gear ratio error events occur in a given driving cycle.

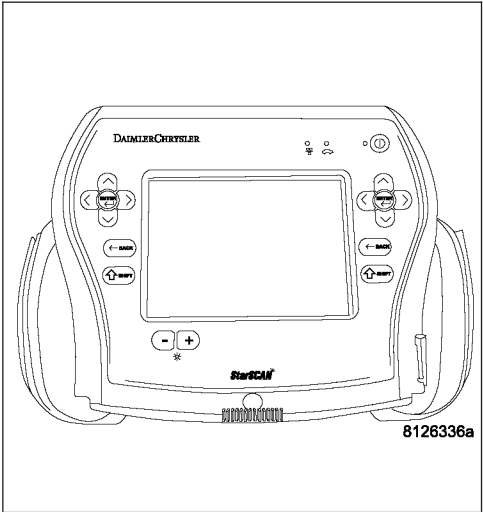
**Diagnostic Test**

**1. DETERMINING IF RELATED TRANSMISSION DTC'S ARE PRESENT**

With the scan tool, read Transmission DTC's.  
If any of these DTC's are present, perform their respective tests first.

**Are there any Loss of Prime, Line Pressure Sensor and/or Speed Sensor DTCs present?**

- Yes**    >> Refer to appropriate diagnostic procedure in the Transmission category. If any of these DTC's are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Go To 2



**P0734-GEAR RATIO ERROR IN 4TH (CONTINUED)****2. CHECK TO SEE IF P0733 IS CURRENT**

With the scan tool, perform the 4th gear clutch test. Follow the instructions on the scan tool.

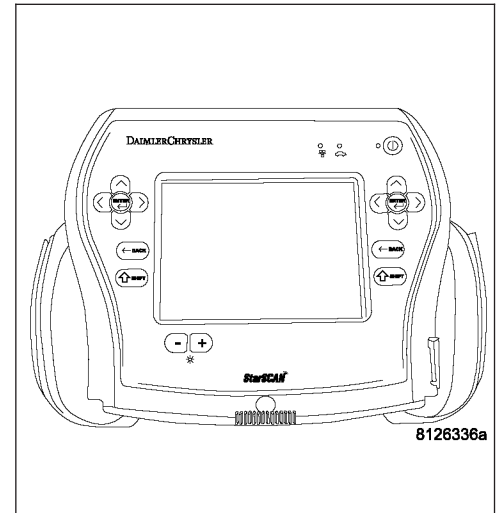
Increase the throttle angle or TPS Degree to 30° for no more than a few seconds.

**CAUTION: Do not overheat the transmission.**

**Did the Clutch Test pass, Input Speed remain at zero?**

**Yes** >> Go To 3

**No** >> Go To 4



**P0734-GEAR RATIO ERROR IN 4TH (CONTINUED)****3. CHECK FOR INTERMITTENT OPERATION**

The conditions to set this DTC are not current at this time.

Check the gearshift linkage adjustment.

Gear ratio DTC's can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the Clutch Test and still sets Gear Ratio DTC, check the Speed Sensors for proper operation.

Remove the Starter Relay.

**CAUTION: removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Check the wiring and connectors for the Speed Sensors for a good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

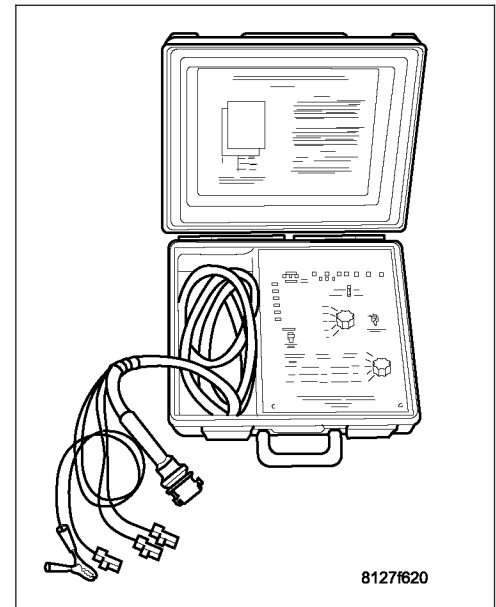
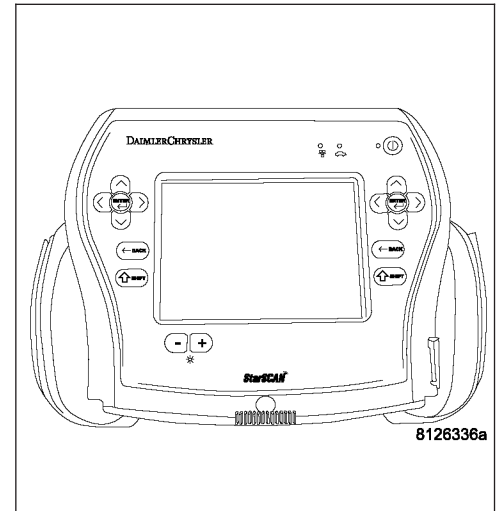
This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

**Yes**    >> Repair as necessary.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST -  
          VER 1.

**No**      >> Test Complete.



**P0734-GEAR RATIO ERROR IN 4TH (CONTINUED)****4. CHECK FOR RELATED PRESSURE SWITCH DTC'S**

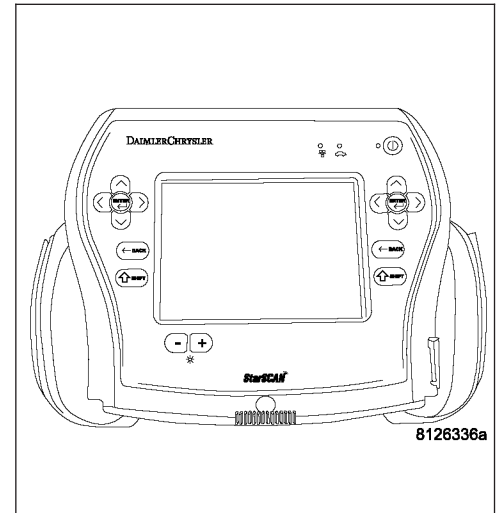
With the scan tool, read Transmission DTC's.

**Are the DTC's P0870 and/or P0871 present also?**

**Yes** >> Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5



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**5. INTERNAL TRANSMISSION**

**If there are no possible causes remaining, view repair.**

**Repair**

Repair internal Transmission per the Service Information. Check all of the components related to the O/D and 2/4 clutches. Inspect the Oil Pump and repair or replace per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---



**P0736-GEAR RATIO ERROR IN REVERSE**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
The Transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**  
If the ratio of the Input RPM to the Output RPM does not match the current gear ratio when compared to the known gear ratio.

Possible Causes
RELATED TRANSMISSION DTC'S PRESENT
INTERMITTENT GEAR RATIO ERRORS
INTERNAL TRANSMISSION

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through data checks. When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding gear ratio error trouble code is set. The transmission will go into Limp-in mode after four gear ratio error events occur in a given driving cycle.

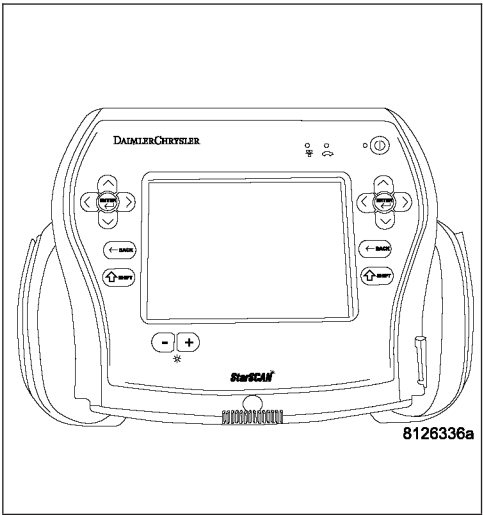
**Diagnostic Test**

**1. DETERMINING IF RELATED TRANSMISSION DTC'S ARE PRESENT**

With the scan tool, read Transmission DTC's.  
If any of these DTC's are present, perform their respective tests first.

**Are there any Loss of Prime, Line Pressure Sensor and/or Speed Sensor DTCs present?**

- Yes**    >> Refer to appropriate diagnostic procedure in the Transmission category. If any of these DTC's are present, they will cause a gear ratio error. Perform the test for Loss of Prime first if it is present.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No**    >> Go To 2



**P0736-GEAR RATIO ERROR IN REVERSE (CONTINUED)****2. CHECK TO SEE IF P0731 IS CURRENT**

With the scan tool, perform the Reverse gear clutch test. Follow the instructions on the scan tool.

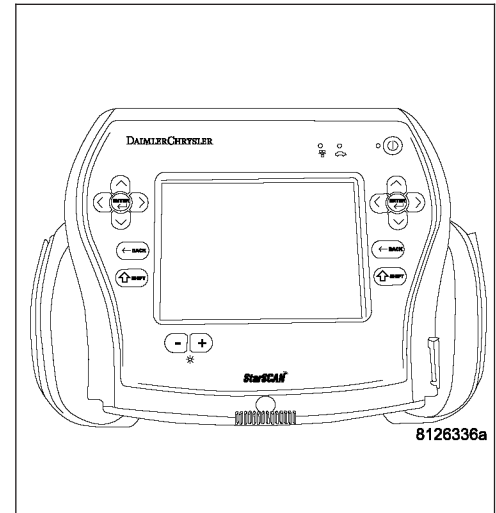
Increase the throttle angle or TPS Degree to 30° for no more than a few seconds.

**CAUTION: Do not overheat the transmission.**

**Did the Clutch Test pass, Input Speed remain at zero?**

**Yes** >> Go To 3

**No** >> Go To 4



**P0736-GEAR RATIO ERROR IN REVERSE (CONTINUED)****3. CHECK FOR INTERMITTENT OPERATION**

The conditions to set this DTC are not current at this time.

Check the gearshift linkage adjustment.

Gear ratio DTC's can be set by problems in the Input and Output Speed Sensor circuits. If the vehicle passes the Clutch Test and still sets Gear Ratio DTC, check the Speed Sensors for proper operation.

Remove the Starter Relay.

**CAUTION: removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Check the wiring and connectors for the Speed Sensors for a good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

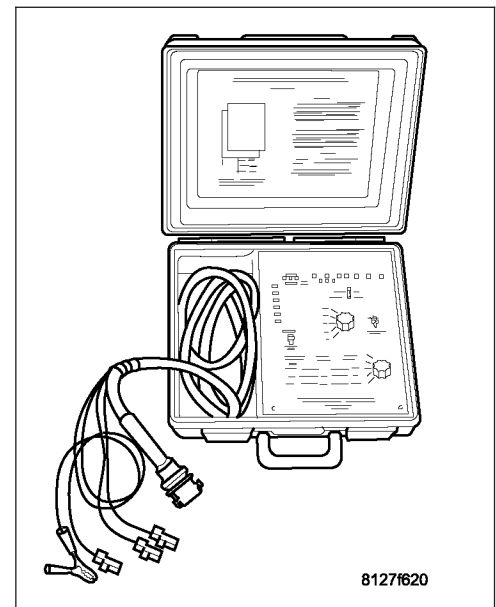
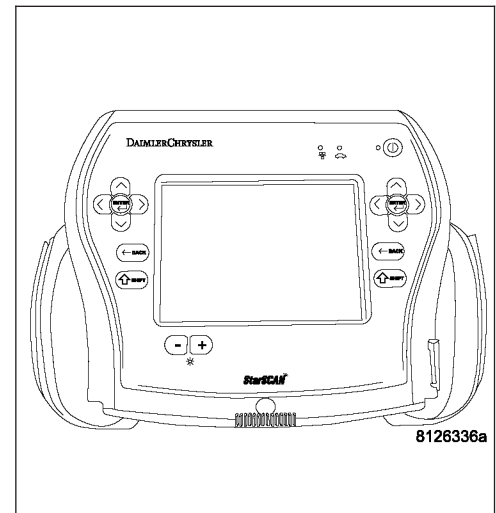
This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.

**4. INTERNAL TRANSMISSION**

If there are no possible causes remaining, view repair.

**Repair**

Repair internal Transmission per the Service Information. Check all of the components related to the Reverse and LR clutches. Inspect the Oil Pump and repair or replace per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

## P0740-TCC OUT OF RANGE

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

The Torque Converter Clutch (TCC) is in FEMCC or PEMCC, Transmission temperature is hot, Engine temperature is greater than 38° C or 100° F, Transmission Input Speed greater than engine speed, Transmission temperature is hot, TPS less than 30°, and brake not applied.

- **Set Condition:**

The TCC is modulated by controlling the duty cycle of the L/R Solenoid until the difference between the Engine and the Transmission Input Speed RPM or duty cycle is within a desired range. The DTC is set after the period of 10 seconds and 3 occurrences of either: FEMCC - with slip greater than 100 RPM or PEMCC - duty cycle greater than 85%.

Possible Causes
RELATED L/R SOLENOID OR PRESSURE SWITCH DTC'S PRESENT
INTERNAL TRANSMISSION

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

When in 2nd, 3rd, or 4th gear, the torque converter clutch (TCC) can be locked or partially locked when certain conditions are met. The TCC piston is electronically modulated by increasing the duty cycle of the LR/TCC solenoid until the torque converter slip difference (difference between engine and turbine speed) is within 60 RPM. Then the LR/TCC solenoid is fully energized (FEMCC / 100% duty cycle). Torque converter slip is monitored in FEMCC to ensure adequate clutch capacity. The transmission will attempt normal EMCC operation (not in Limp-in) even after the MIL is illuminated. MIL will illuminate after 5 minutes of accumulated slip in FEMCC.

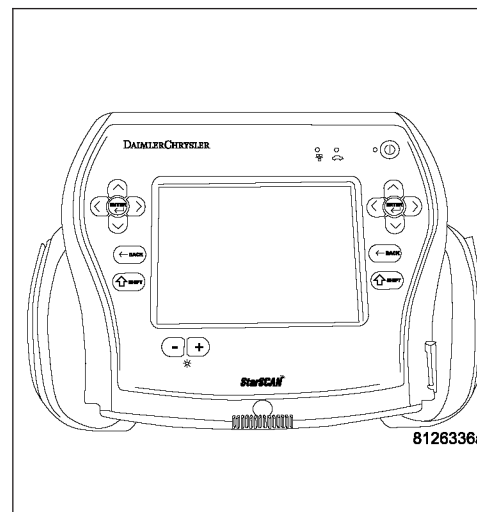
## Diagnostic Test

### 1. DETERMINING IF RELATED L/R SOLENOID OR PRESSURE SWITCH DTC'S ARE PRESENT

With the scan tool, read Transmission DTC's

**Are the DTC's P0750 and/or P0841 present also?**

- Yes** >> Refer to the Transmission category and perform the appropriate diagnostic procedure.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Go To 2



**P0740-TCC OUT OF RANGE (CONTINUED)****2. CHECK TO SEE IF DTC P0740 IS CURRENT**

Ignition on, engine not running.

With the scan tool, record and erase DTC's.

Drive the vehicle until it is fully warmed up. At least 110 degrees.

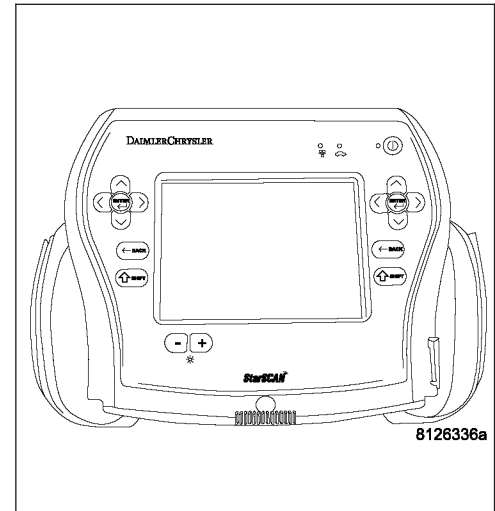
Perform the following step 3 times.

Drive the vehicle at 50 MPH and allow 4th gear to engage for at least 10 seconds. Close the throttle, then tip back in until the throttle angle is between 25 and 29 degrees. Note that if you go over 30 degrees, you must back off of the throttle and retry.

**Did the TCC engage during any of the attempts?**

**Yes** >> Go To 4

**No** >> Go To 3

**3. INTERNAL TRANSMISSION**

**If there are no possible causes remaining, view repair.**

**Repair**

Perform the Hydraulic Pressure test per the Service Information and repair the internal transmission components and Torque converter as necessary.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**4. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

This DTC can also be set under extreme temperature conditions, this is usually caused by an internal problem. Verify if the problem is only experienced under extreme hot or cold conditions.

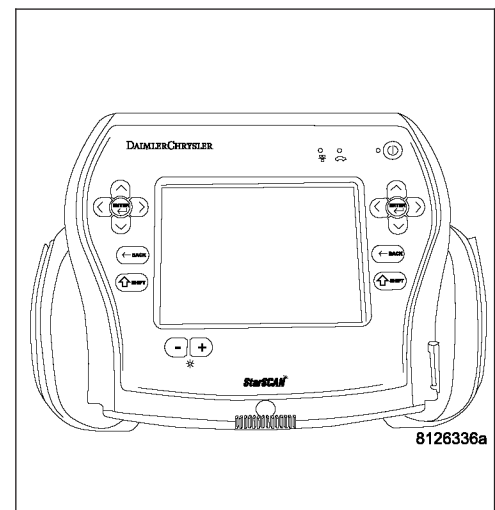
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

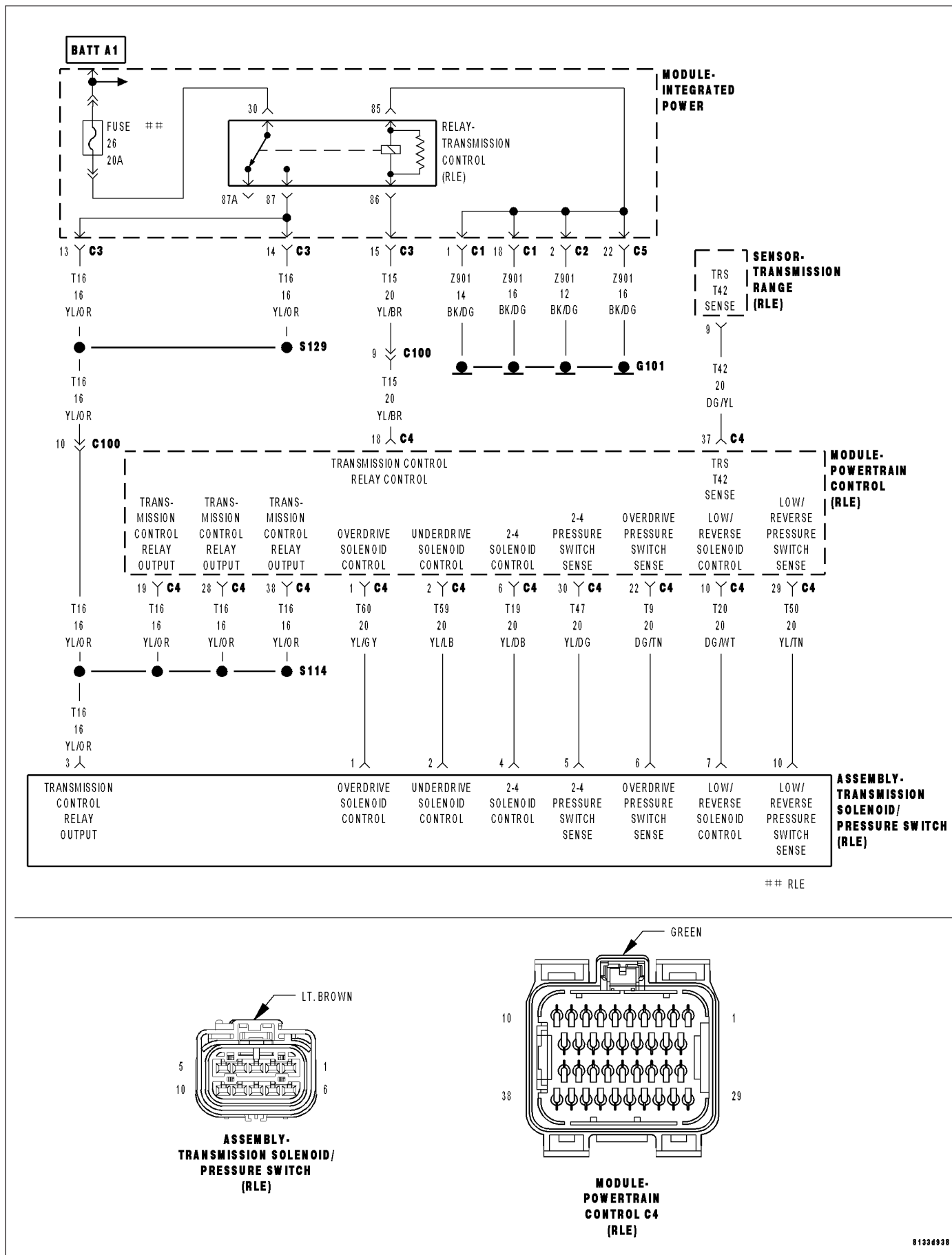
**Yes** >> Repair as necessary.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.



# P0750-LR SOLENOID CIRCUIT



**P0750-LR SOLENOID CIRCUIT (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Initially at ignition on, then every 10 seconds thereafter. The solenoids will also be tested immediately after a gear ratio error or pressure switch error is detected.
- **Set Condition:**  
Three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error.

Possible Causes
RELATED TRANSMISSION RELAY DTC'S PRESENT (T20) LR SOLENOID CONTROL CIRCUIT OPEN (T20) LR SOLENOID CONTROL CIRCUIT SHORT TO GROUND (T20) LR SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

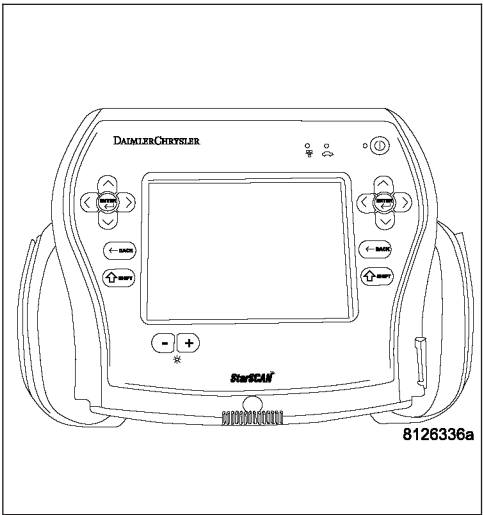
Four solenoids are used to control the friction elements (clutches). The continuity of the solenoids circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the PCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a gear ratio or pressure switch error occurs. In this case, one failure will result in the appropriate DTC being set. The MIL will illuminate and the transmission goes into neutral, if the DTC is set above 35 Km/h (22 MPH), Limp-in mode when vehicle speed is below 35 Km/h (22 MPH).

**Diagnostic Test**

**1. DETERMINING IF RELATED RELAY DTC'S ARE PRESENT**

With the scan tool, read Transmission DTC's

- Are there any Transmission Control Relay DTC's present also?**
- Yes**    >> Refer to the Transmission category and perform the appropriate diagnostic procedure.  
             Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No**      >> Go To 2



**P0750-LR SOLENOID CIRCUIT (CONTINUED)****2. CHECK TO SEE IF P0750 IS CURRENT**

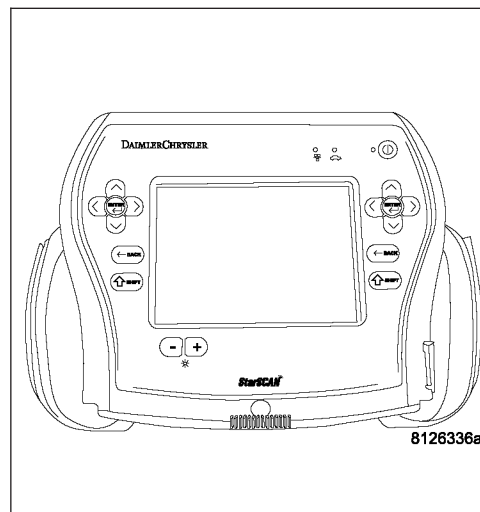
With the scan tool, Check the STARTS SINCE SET counter.

**Note:** This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter for P0750 set at 0?

**Yes** >> Go To 3

**No** >> Go To 9





**P0750-LR SOLENOID CIRCUIT (CONTINUED)****3. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

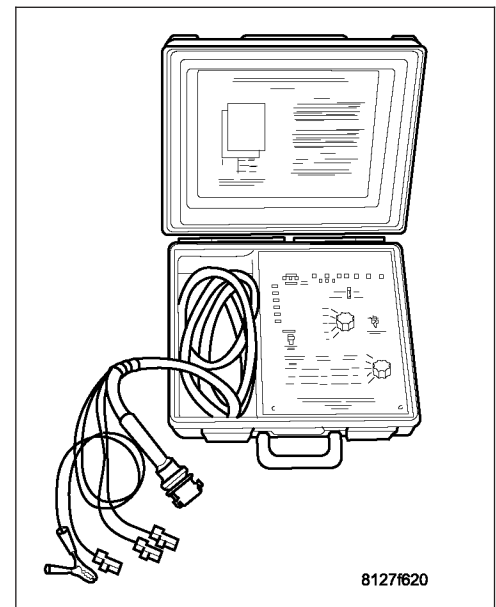
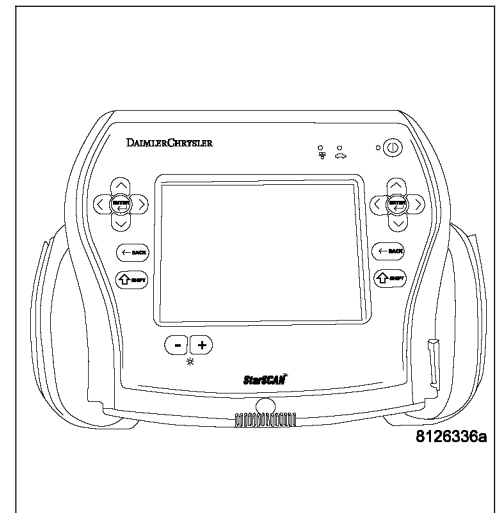
With the scan tool, actuate the L/R Solenoid.

Monitor the L/R Solenoid LED on the Transmission Simulator.

**Did the L/R Solenoid LED on the Transmission Simulator blink on and off during actuation?**

**Yes**    >> Go To 7

**No**    >> Go To 4



**P0750-LR SOLENOID CIRCUIT (CONTINUED)****4. (T20) LR SOLENOID CONTROL CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

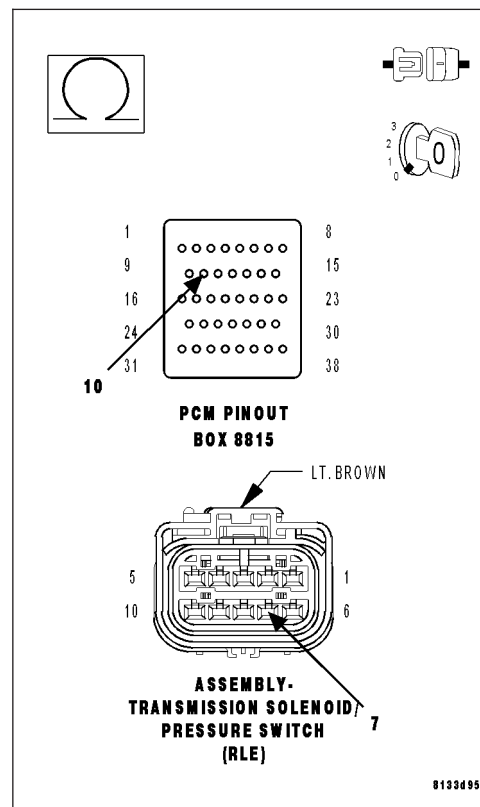
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (T20) LR Solenoid Control circuit from the appropriate terminal of special tool #8815 to the Solenoid/Pressure Switch Assembly harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T20) LR Solenoid Control circuit for an open.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. (T20) LR SOLENOID CONTROL CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

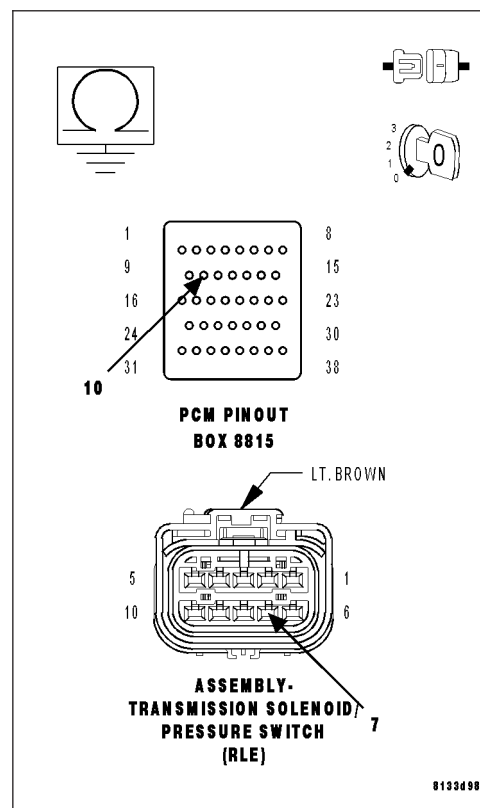
Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Measure the resistance between ground and the (T20) LR Solenoid Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T20) LR Solenoid Control circuit for a short to ground.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 6



**P0750-LR SOLENOID CIRCUIT (CONTINUED)****6. (T20) LR SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

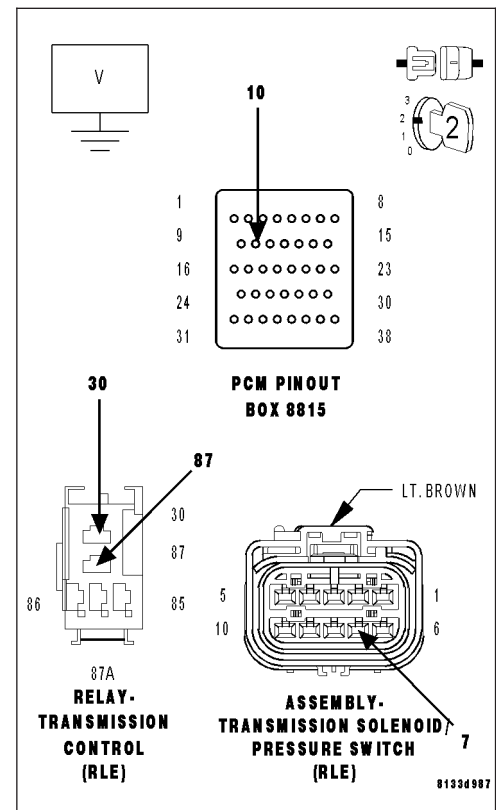
Measure the voltage of the (T20) LR Solenoid Control circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T20) LR Solenoid Control circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 8

**7. LR SOLENOID/PRESSURE SWITCH ASSEMBLY**

If there are no possible causes remaining, view repair.

**Repair**

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**P0750-LR SOLENOID CIRCUIT (CONTINUED)****8. POWERTRAIN CONTROL MODULE**

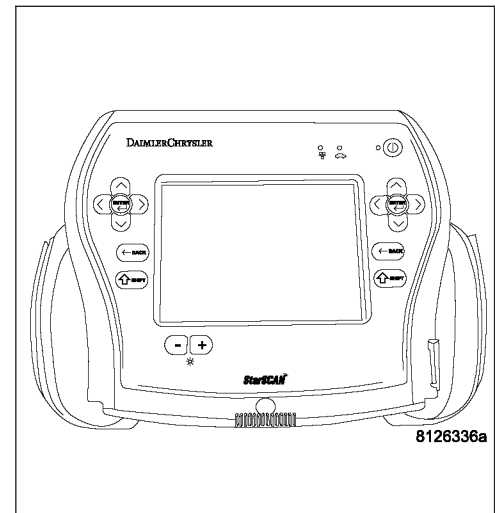
Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program the Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**9. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

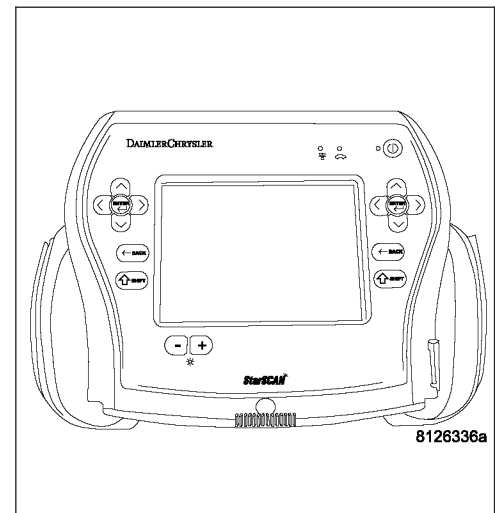
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

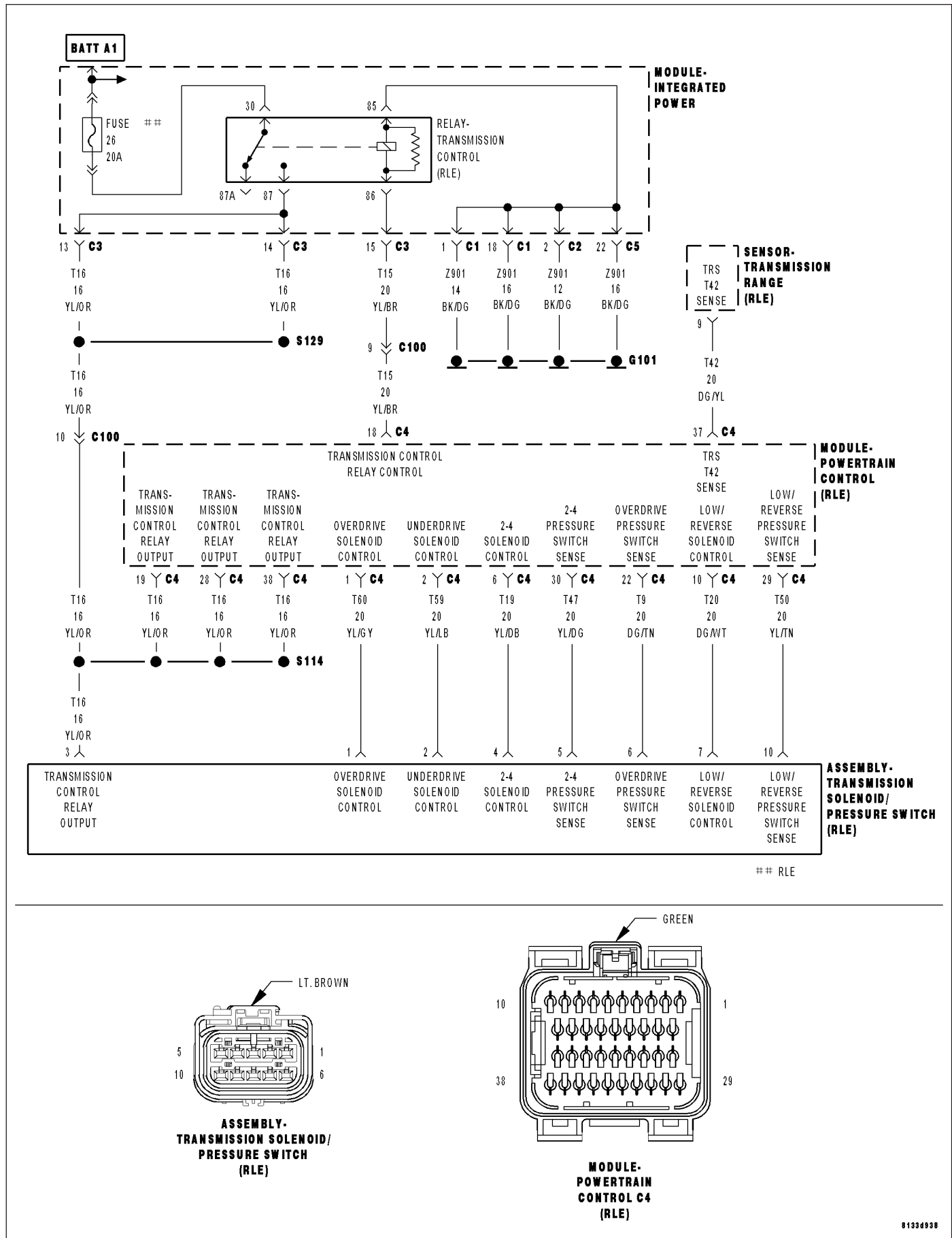
**Yes** >> Repair as necessary.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.



# P0755-2/4 SOLENOID CIRCUIT



**P0755-2/4 SOLENOID CIRCUIT (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Initially at ignition on, then every 10 seconds thereafter. The solenoids will also be tested immediately after a gear ratio error or pressure switch error is detected.

- **Set Condition:**

Three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error.

Possible Causes
RELATED TRANSMISSION RELAY DTC'S PRESENT
(T19) 2/4 SOLENOID CONTROL CIRCUIT OPEN
(T19) 2/4 SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T19) 2/4 SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

Four solenoids are used to control the friction elements (clutches). The continuity of the solenoids circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the PCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a gear ratio or pressure switch error occurs. In this case, one failure will result in the appropriate DTC being set. The MIL will illuminate and the transmission goes into neutral, if the DTC is set above 35 Km/h (22 MPH), Limp-in mode when vehicle speed is below 35 Km/h (22 MPH).

## Diagnostic Test

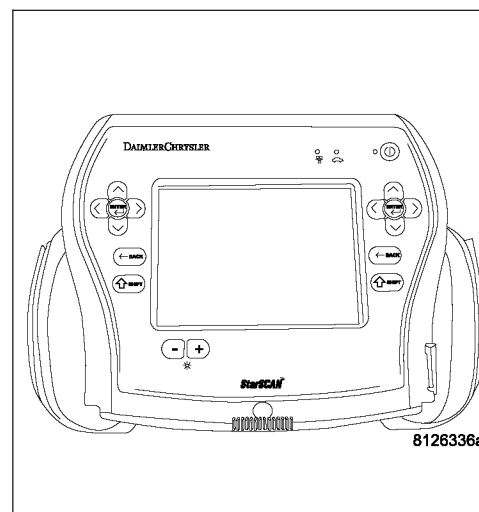
### 1. DETERMINING IF RELATED TRANSMISSION RELAY DTC'S ARE PRESENT

With the scan tool, read Transmission DTC's

**Are there any Transmission Control Relay DTC's present also?**

**Yes** >> Refer to the Transmission category and perform the appropriate diagnostic procedure.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2



**P0755-2/4 SOLENOID CIRCUIT (CONTINUED)****2. CHECK TO SEE IF P0755 IS CURRENT**

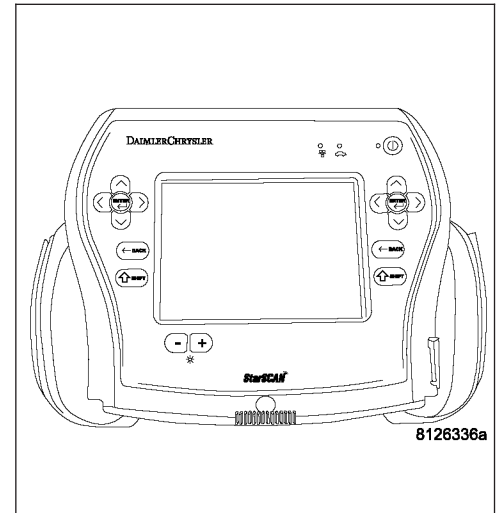
With the scan tool, Check the STARTS SINCE SET counter.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter for P0755 set at 0?**

**Yes**    >> Go To 3

**No**    >> Go To 9



**P0755-2/4 SOLENOID CIRCUIT (CONTINUED)****3. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

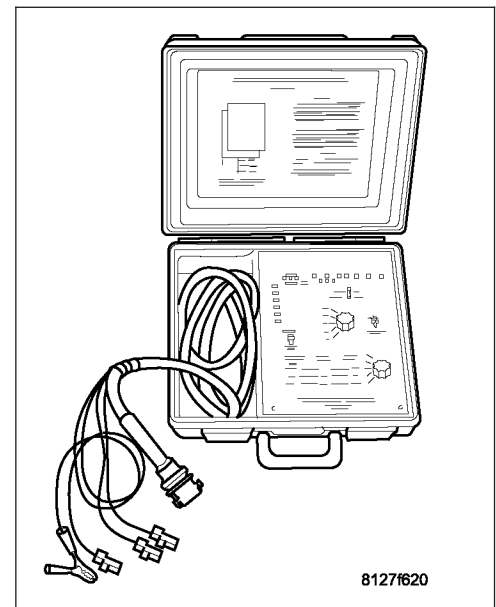
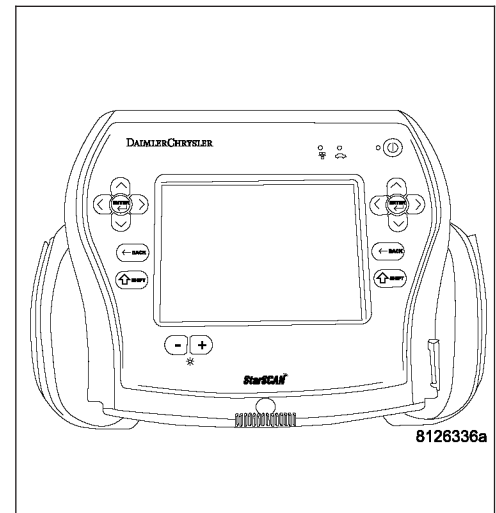
With the scan tool, actuate the 2/4 Solenoid.

Monitor the 2/4 Solenoid LED on the Transmission Simulator.

**Did the 2/4 Solenoid LED on the Transmission Simulator blink on and off during actuation?**

**Yes** >> Go To 7

**No** >> Go To 4





**P0755-2/4 SOLENOID CIRCUIT (CONTINUED)****4. (T19) 2/4 SOLENOID CONTROL CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

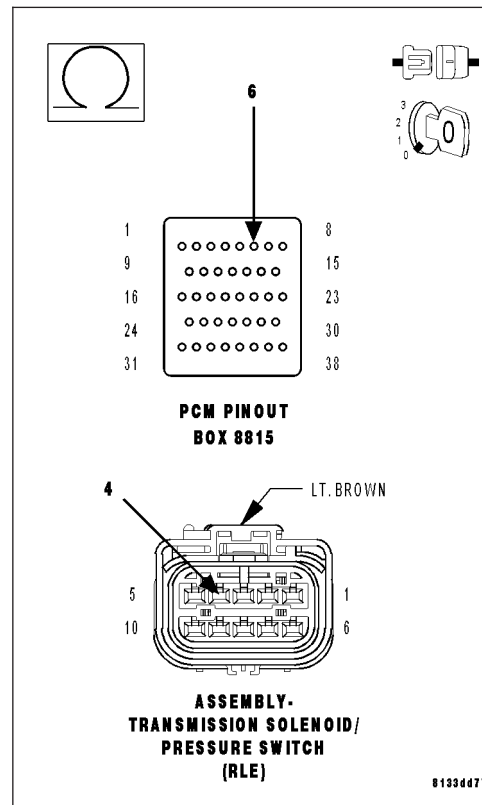
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (T19) 2/4 Solenoid Control circuit from the appropriate terminal of special tool #8815 to the Solenoid/Pressure Switch Assembly harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T19) 2/4 Solenoid Control circuit for an open.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. (T19) 2/4 SOLENOID CONTROL CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

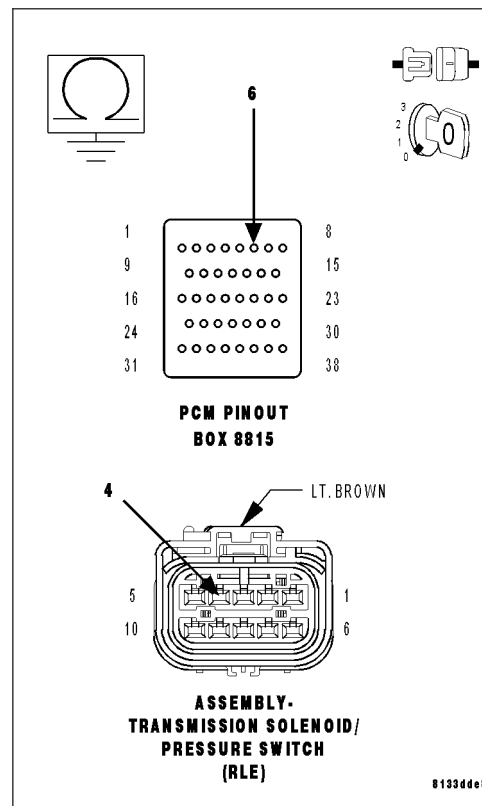
Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Measure the resistance between ground and the (T19) 2/4 Solenoid Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T19) 2/4 Solenoid Control circuit for a short to ground.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 6



**P0755-2/4 SOLENOID CIRCUIT (CONTINUED)****6. (T19) 2/4 SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

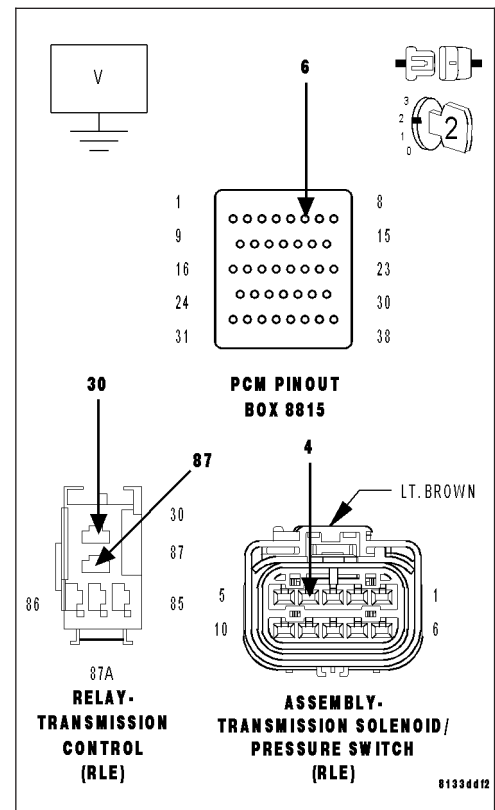
Measure the voltage of the (T19) 2/4 Solenoid Control circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T19) 2/4 Solenoid Control circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 8

**7. 2/4 SOLENOID/PRESSURE SWITCH ASSEMBLY**

If there are no possible causes remaining, view repair.

**Repair**

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

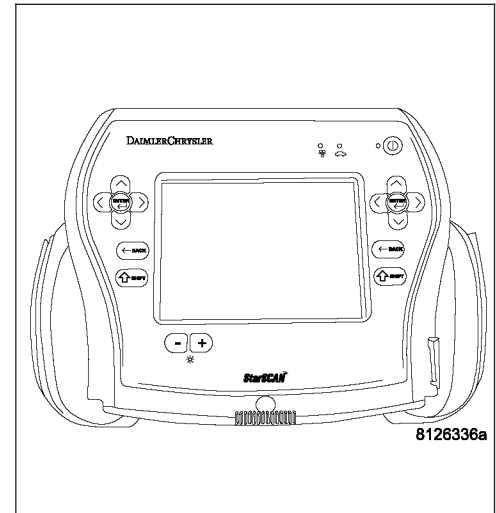
**P0755-2/4 SOLENOID CIRCUIT (CONTINUED)****8. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**9. INTERMITTENT WIRING AND CONNECTORS**

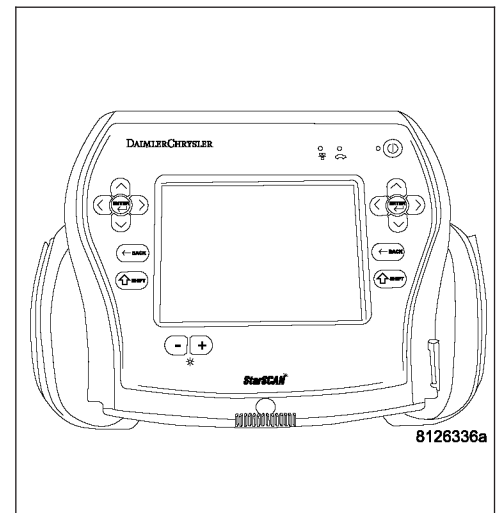
The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

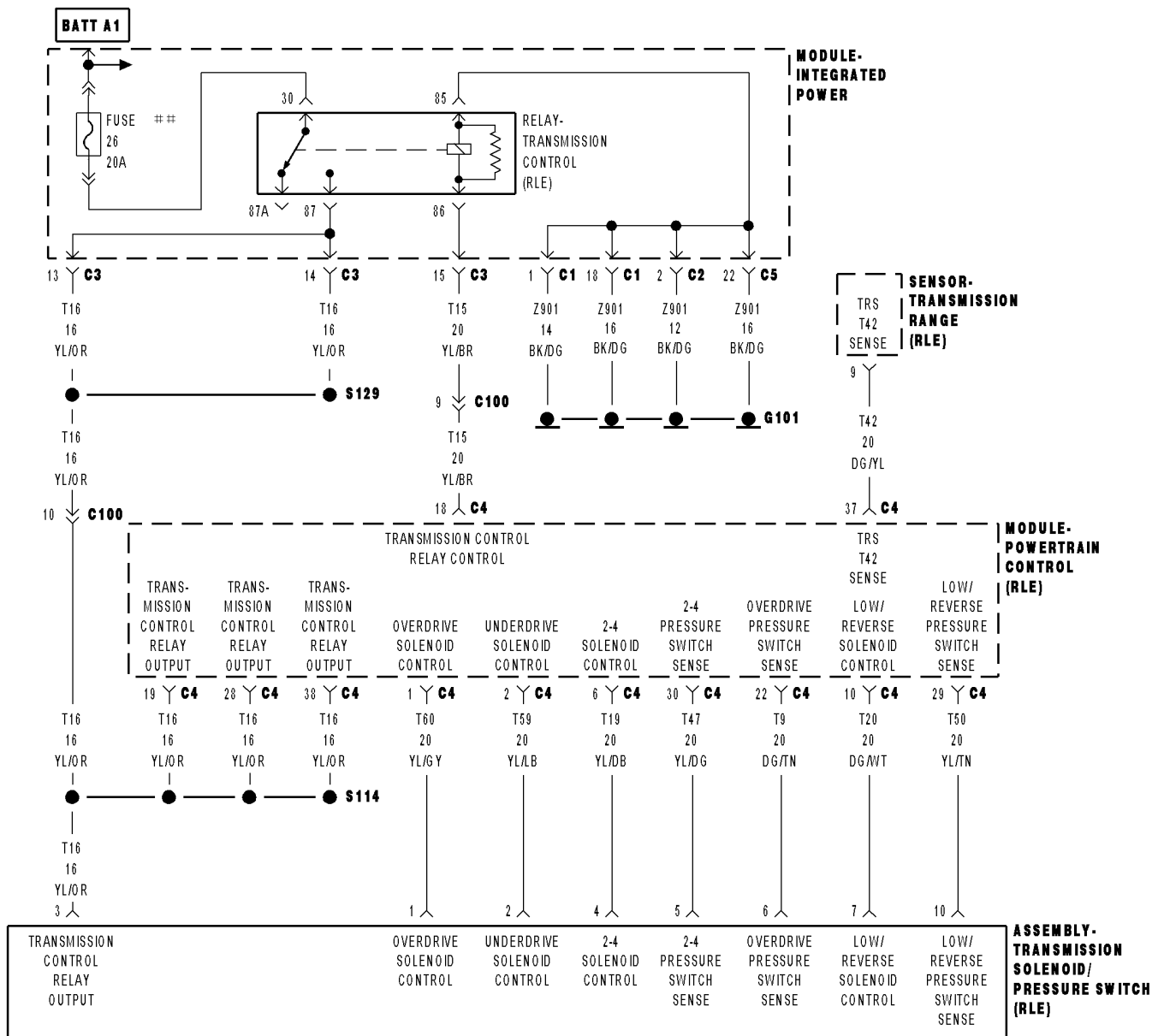
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

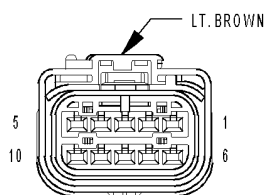
- Yes**    >> Repair as necessary.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No**     >> Test Complete.



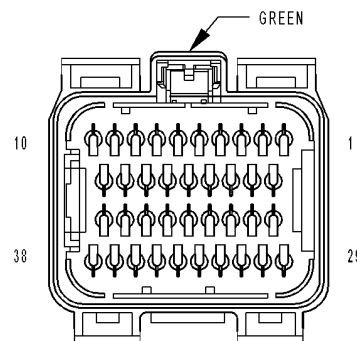
## P0760-OD SOLENOID CIRCUIT



```
## RLE
```



### ASSEMBLY- TRANSMISSION SOLENOID/ PRESSURE SWITCH (RLE)



**MODULE-  
POWERTRAIN  
CONTROL C4  
(RLE)**

**P0760-OD SOLENOID CIRCUIT (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Initially at ignition on, then every 10 seconds thereafter. The solenoids will also be tested immediately after a gear ratio error or pressure switch error is detected.
- **Set Condition:**  
Three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error.

Possible Causes
RELATED TRANSMISSION RELAY DTC'S PRESENT (T60) OD SOLENOID CONTROL CIRCUIT OPEN (T60) OD SOLENOID CONTROL CIRCUIT SHORT TO GROUND (T60) OD SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

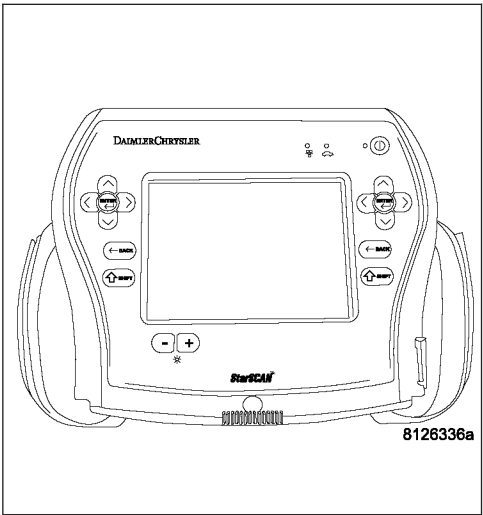
Four solenoids are used to control the friction elements (clutches). The continuity of the solenoids circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the PCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a gear ratio or pressure switch error occurs. In this case, one failure will result in the appropriate DTC being set. The MIL will illuminate and the transmission goes into neutral, if the DTC is set above 35 Km/h (22 MPH), Limp-in mode when vehicle speed is below 35 Km/h (22 MPH).

**Diagnostic Test**

**1. DETERMINING IF RELATED RELAY DTC'S ARE PRESENT**

With the scan tool, read Transmission DTC's

- Are there any Transmission Control Relay DTC's present also?**
- Yes**    >> Refer to the Transmission category and perform the appropriate diagnostic procedure.  
                    Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No**        >> Go To 2



**P0760-OD SOLENOID CIRCUIT (CONTINUED)****2. CHECK TO SEE IF P0760 IS CURRENT**

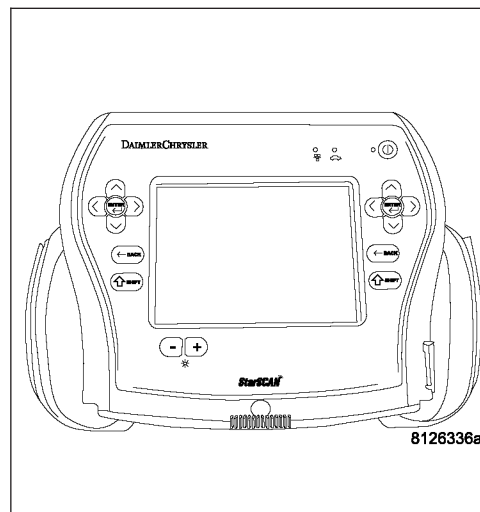
With the scan tool, Check the STARTS SINCE SET counter.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter for P0760 set at 0?**

**Yes** >> Go To 3

**No** >> Go To 9



**P0760-OD SOLENOID CIRCUIT (CONTINUED)****3. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

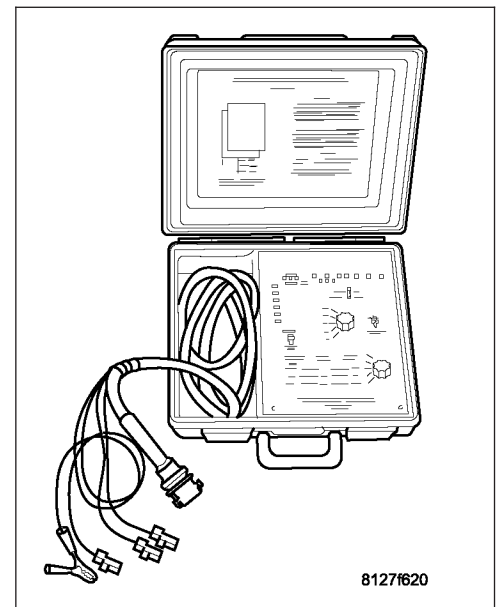
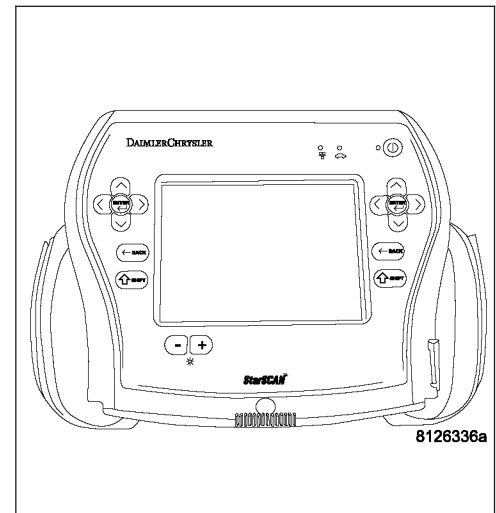
With the scan tool, actuate the OD Solenoid.

Monitor the OD Solenoid LED on the Transmission Simulator.

**Did the OD Solenoid LED on the Transmission Simulator blink on and off during actuation?**

**Yes** >> Go To 7

**No** >> Go To 4



**P0760-OD SOLENOID CIRCUIT (CONTINUED)****4. (T60) OD SOLENOID CONTROL CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

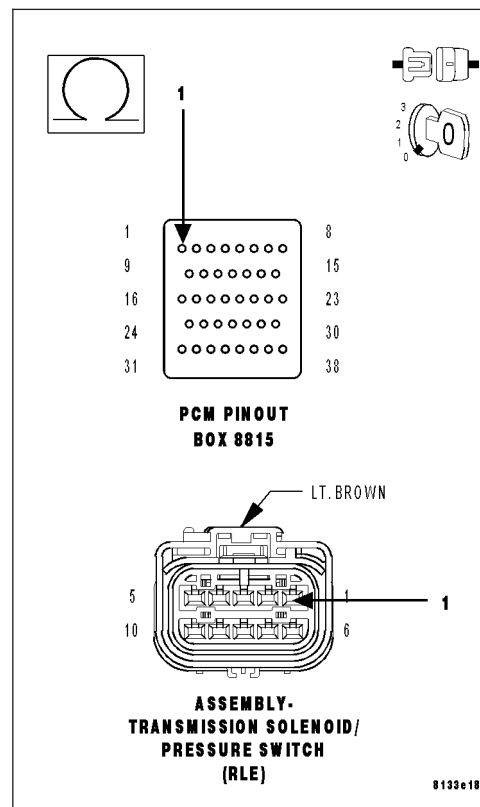
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (T60) OD Solenoid Control circuit from the appropriate terminal of special tool #8815 to the Solenoid/Pressure Switch Assembly harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T60) OD Solenoid Control circuit for an open.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5

**5. (T60) OD SOLENOID CONTROL CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

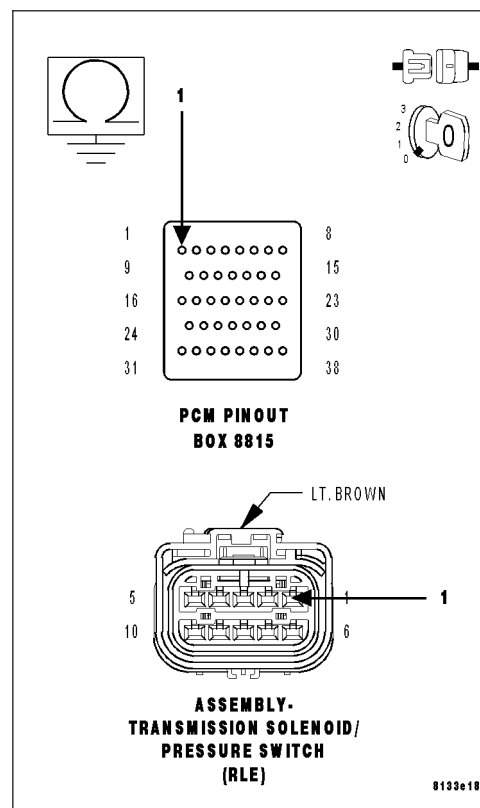
Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Measure the resistance between ground and the (T60) OD Solenoid Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T60) OD Solenoid Control circuit for a short to ground.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 6





**P0760-OD SOLENOID CIRCUIT (CONTINUED)****6. (T60) OD SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

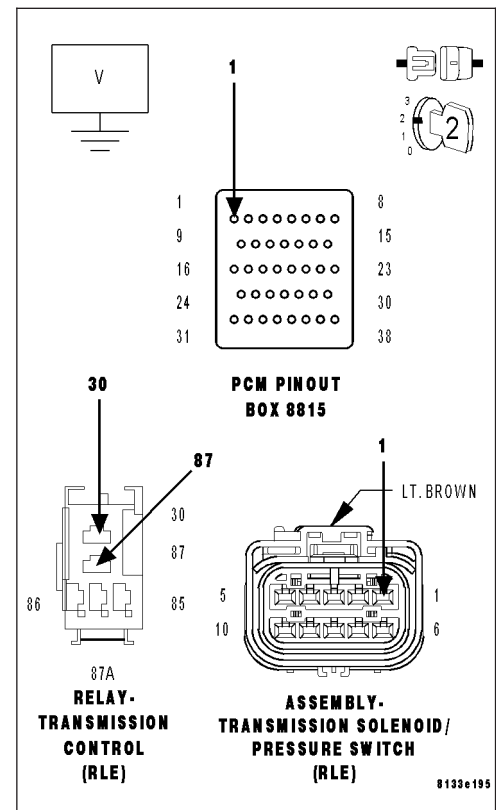
Measure the voltage of the (T60) OD Solenoid Control circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T60) OD Solenoid Control circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 8

**7. OD SOLENOID/PRESSURE SWITCH ASSEMBLY**

If there are no possible causes remaining, view repair.

**Repair**

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

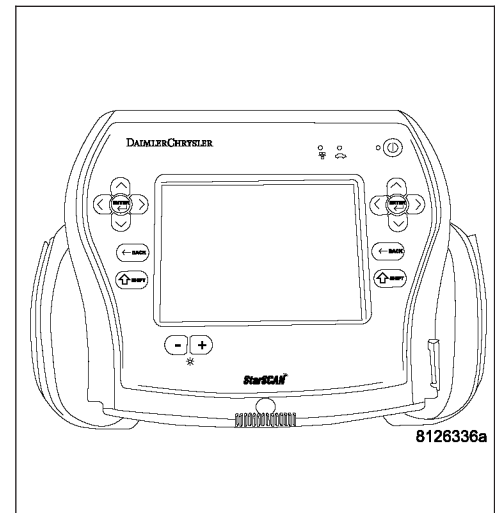
**P0760-OD SOLENOID CIRCUIT (CONTINUED)****8. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**9. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

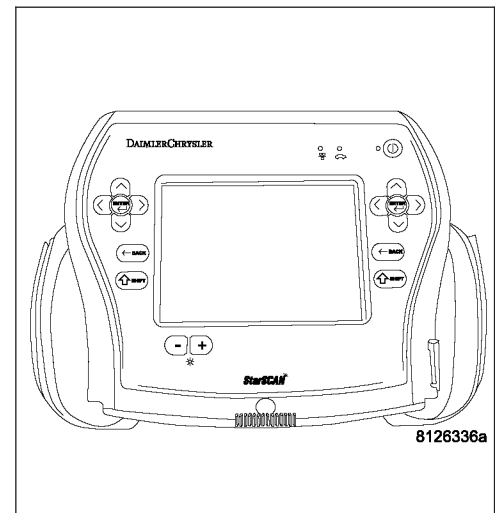
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.





**P0765-UD SOLENOID CIRCUIT (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Initially at ignition on, then every 10 seconds thereafter. The solenoids will also be tested immediately after a gear ratio error or pressure switch error is detected.

- **Set Condition:**

Three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error.

Possible Causes
RELATED TRANSMISSION RELAY DTC'S PRESENT (T59) UD SOLENOID CONTROL CIRCUIT OPEN (T59) UD SOLENOID CONTROL CIRCUIT SHORT TO GROUND (T59) UD SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

Four solenoids are used to control the friction elements (clutches). The continuity of the solenoids circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the PCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a gear ratio or pressure switch error occurs. In this case, one failure will result in the appropriate DTC being set. The MIL will illuminate and the transmission goes into neutral, if the DTC is set above 35 Km/h (22 MPH), Limp-in mode when vehicle speed is below 35 Km/h (22 MPH).

## Diagnostic Test

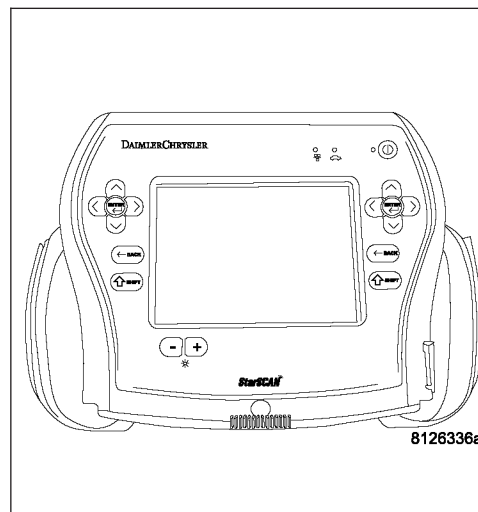
### 1. DETERMINING IF RELATED RELAY DTC'S ARE PRESENT

With the scan tool, read Transmission DTC's

**Are there any Transmission Control Relay DTC's present also?**

**Yes** >> Refer to the Transmission category and perform the appropriate diagnostic procedure.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2



**P0765-UD SOLENOID CIRCUIT (CONTINUED)****2. CHECK TO SEE IF P0765 IS CURRENT**

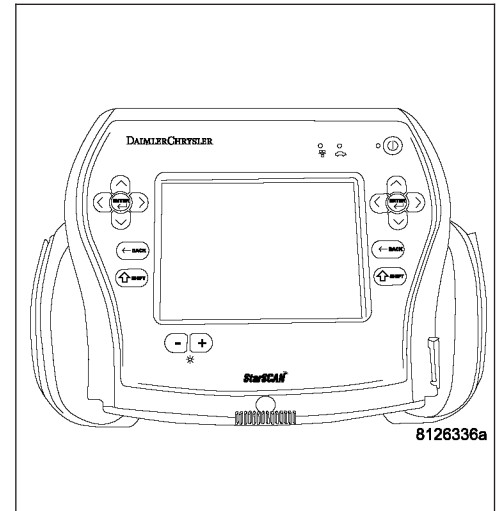
With the scan tool, Check the STARTS SINCE SET counter.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter for P0765 set at 0?**

**Yes**    >> Go To 3

**No**    >> Go To 9



**P0765-UD SOLENOID CIRCUIT (CONTINUED)****3. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

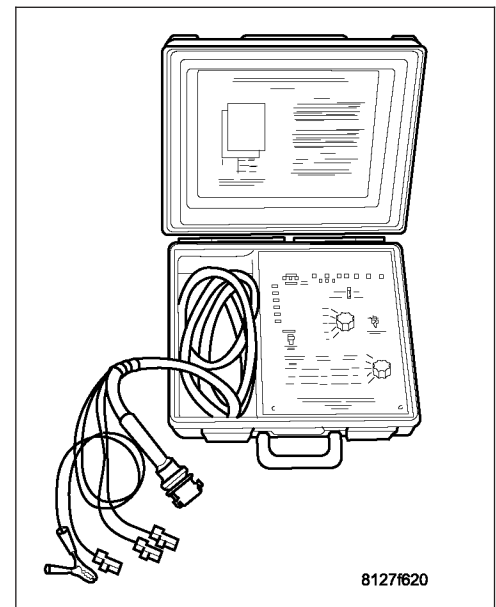
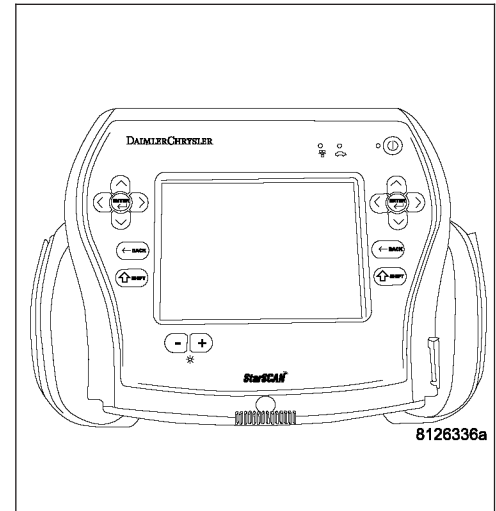
With the scan tool, actuate the UD Solenoid.

Monitor the UD Solenoid LED on the Transmission Simulator.

**Did the UD Solenoid LED on the Transmission Simulator blink on and off during actuation?**

**Yes** >> Go To 7

**No** >> Go To 4



**P0765-UD SOLENOID CIRCUIT (CONTINUED)****4. (T59) UD SOLENOID CONTROL CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

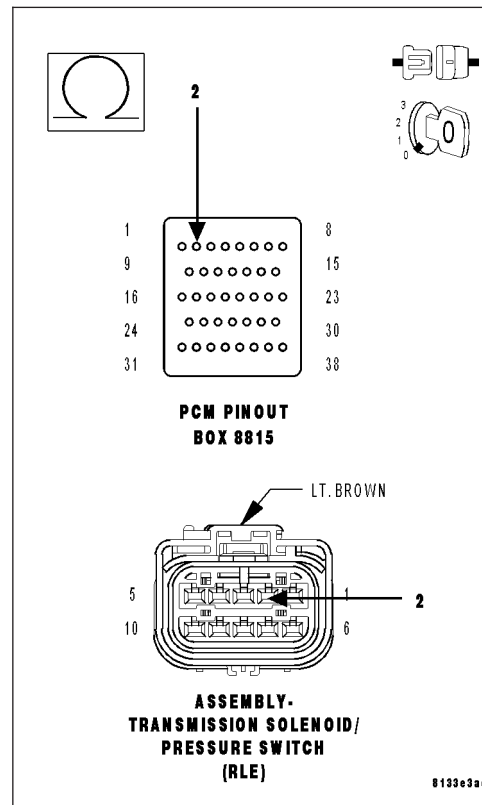
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (T59) UD Solenoid Control circuit from the appropriate terminal of special tool #8815 to the Solenoid/Pressure Switch Assembly harness connector.

**Is the resistance above 5.0 ohms?**

**Yes**    >> Repair the (T59) UD Solenoid Control circuit for an open.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 5

**5. (T59) UD SOLENOID CONTROL CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

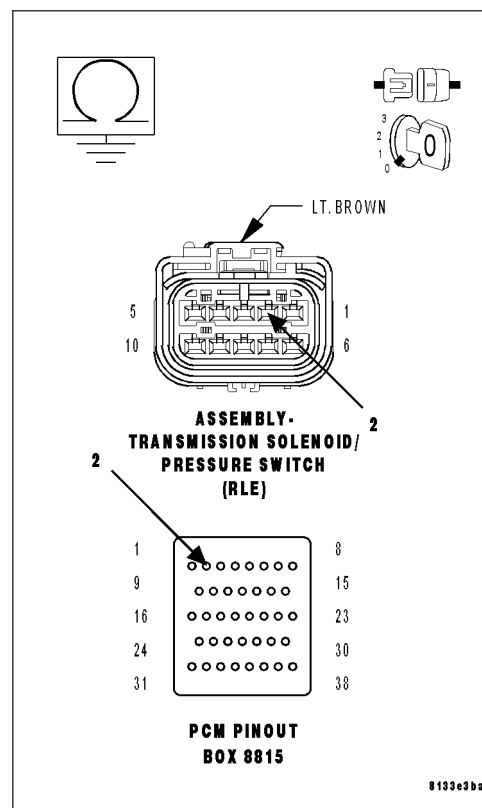
Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Measure the resistance between ground and the (T59) UD Solenoid Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes**    >> Repair the (T59) UD Solenoid Control circuit for a short to ground.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 6



**P0765-UD SOLENOID CIRCUIT (CONTINUED)****6. (T59) UD SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

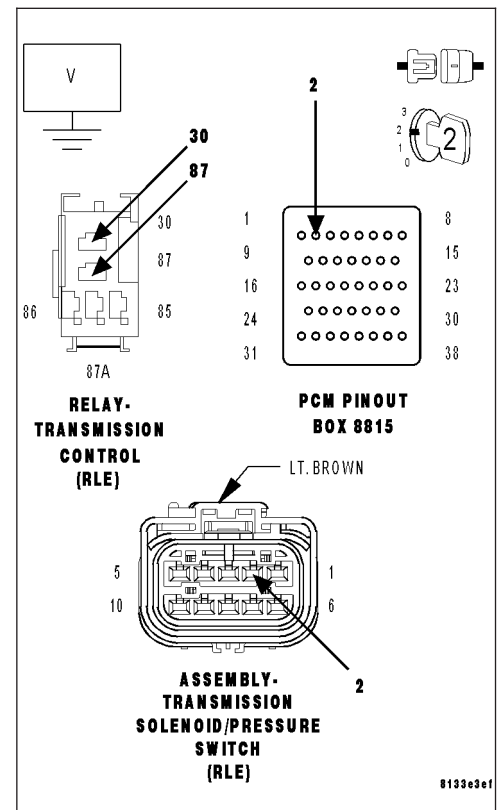
Measure the voltage of the (T59) UD Solenoid Control circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T59) UD Solenoid Control circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 8

**7. UD SOLENOID/PRESSURE SWITCH ASSEMBLY**

If there are no possible causes remaining, view repair.

**Repair**

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



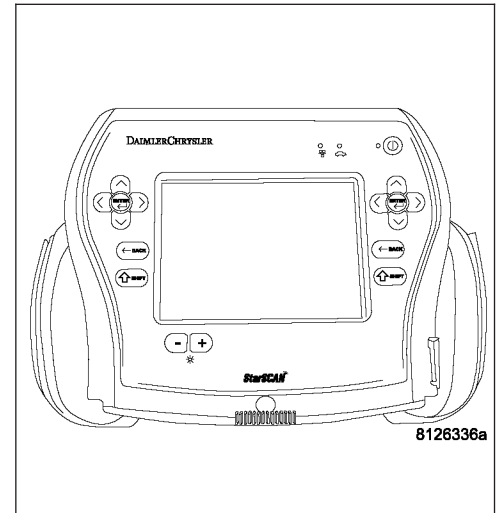
**P0765-UD SOLENOID CIRCUIT (CONTINUED)****8. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**9. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

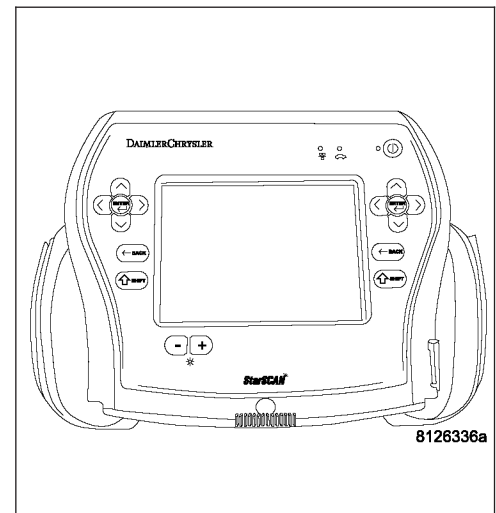
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

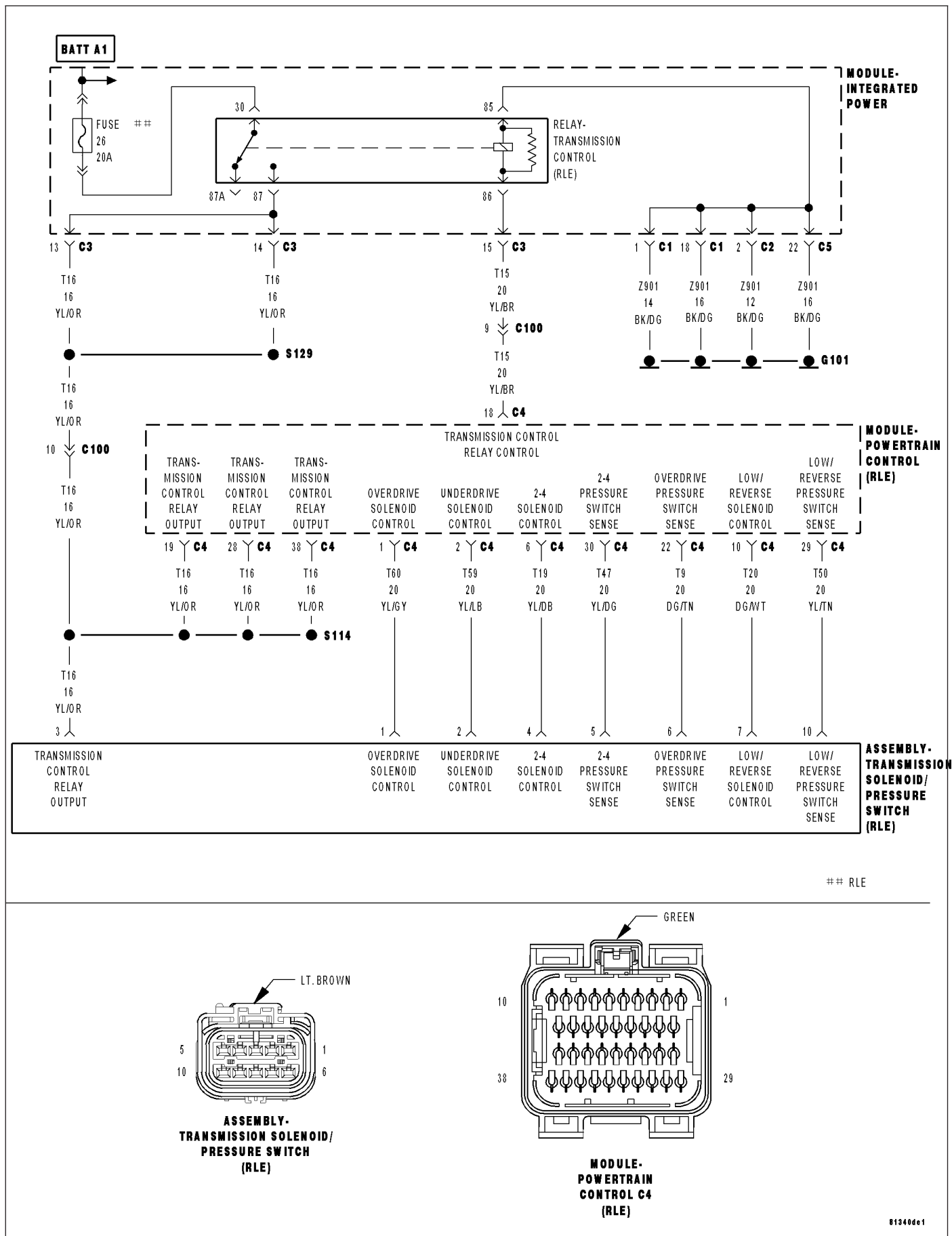
**Yes**    >> Repair as necessary.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Test Complete.



# P0841-LR PRESSURE SWITCH RATIONALITY



**P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Whenever the engine is running.
- **Set Condition:**  
The DTC is set if one of the pressure switches are open or closed at the wrong time in a given gear. If the problem is identified for 3 successive key starts, the transmission will go into Limp-in mode a MIL will turn on after 10 seconds of vehicle operation.

Possible Causes
RELATED TRANSMISSION RELAY DTC'S PRESENT
LOSS OF PRIME DTC PRESENT
(T50) L/R PRESSURE SWITCH SENSE CIRCUIT OPEN
(T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The Transmission system uses three pressure switches to monitor the fluid pressure in the LR, 2/4, and OD elements. The pressure switches are continuously monitored for the correct states in each gear. If a set condition is identified, 1st gear and torque converter lock-up (EMCC) will be inhibited. The vehicle will launch in 2nd gear and shift normally through the gears without allowing EMCC. If during the same key start, the set condition is no longer valid, the transmission will return to normal operation (1st and EMCC available). Limp-in will not occur unless DTC P0841 is accompanied by a code P0706 and the MIL will illuminate after 5 minutes of substituted operation.

**PRESSURE SWITCH STATES**

GEAR	L/R	2/4	OD
R	OP	OP	OP
P/N	CL	OP	OP
1st	CL	OP	OP
2nd	OP	CL	OP
D	OP	OP	CL
OD	OP	CL	CL

**OP = OPEN**  
**CL = CLOSED**

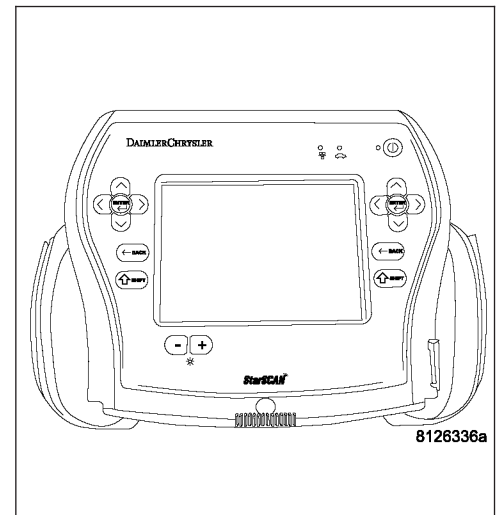
**P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)****Diagnostic Test****1. DETERMINING IF RELATED TRANSMISSION RELAY DTC'S ARE PRESENT**

With the scan tool, read Transmission DTC's

**Are there any Transmission Control Relay DTC's present also?**

**Yes** >> Refer to the Transmission category and perform the appropriate diagnostic procedure.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2

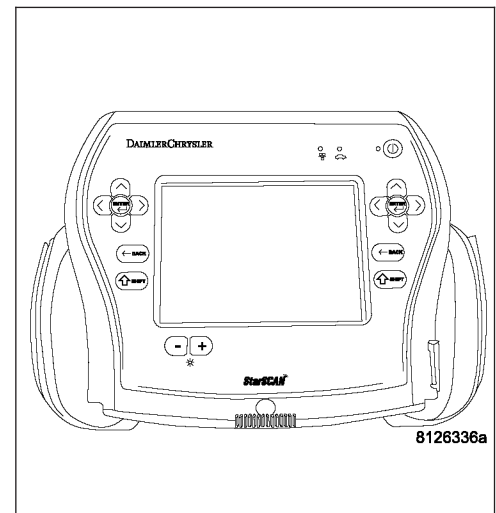
**2. CHECK FOR LOSS OF PRIME DTC**

With the scan tool, check for other Transmission DTC's.

**Is the DTC P0944 present also?**

**Yes** >> Refer to the Transmission category and perform the appropriate diagnostic procedure.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3



**P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)****3. CHECK TO SEE IF P0841 IS CURRENT**

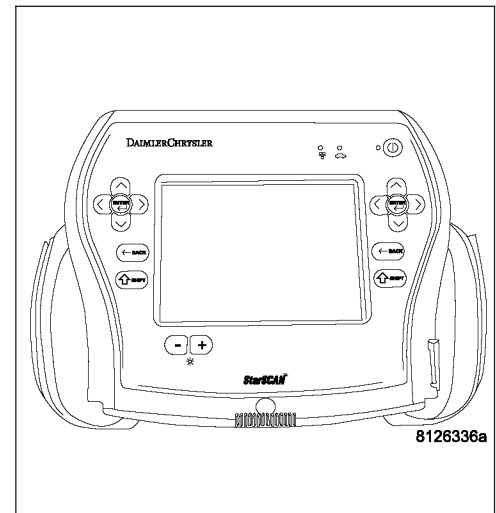
With the scan tool, Check the STARTS SINCE SET counter for P0841.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter 2 or less?**

**Yes**    >> Go To 4

**No**    >> Go To 10



**P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)****4. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

**Note: Check connectors - Clean/repair as necessary.**

Ignition on, engine not running.

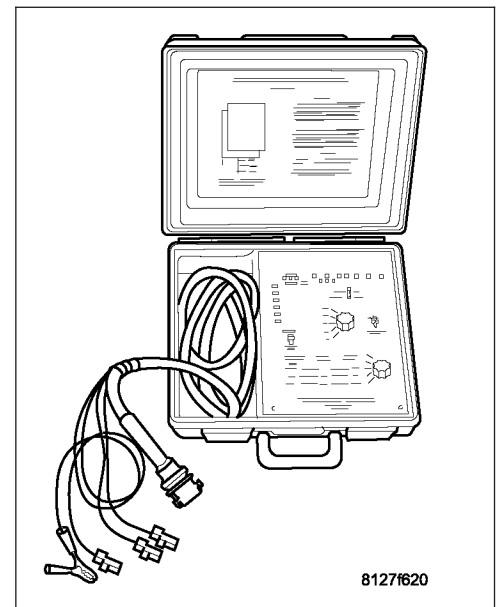
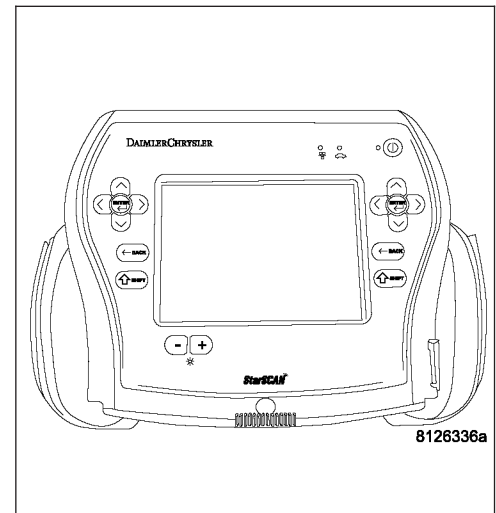
With the Transmission Simulator, turn the Pressure Switch selector to L/R.

With the scan tool, monitor the L/R Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

**Did the L/R Pressure Switch state change?**

**Yes** >> Go To 8

**No** >> Go To 5



## P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

**5. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

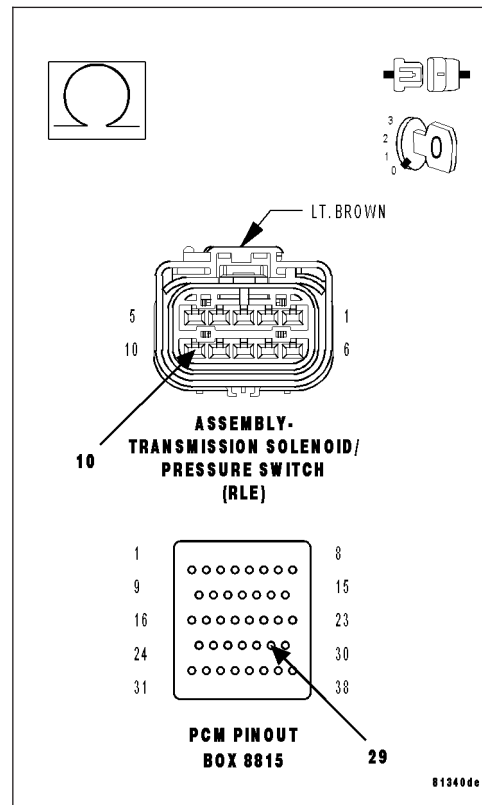
Measure the resistance of the (T50) L/R Pressure Switch Sense circuit from the appropriate terminal of special tool #8815 to the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T50) L/R Pressure Switch Sense circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 6

**6. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

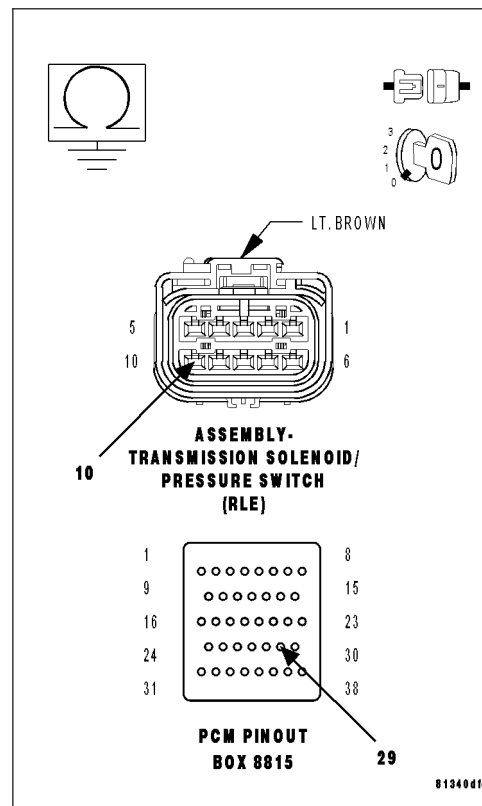
Measure the resistance between ground and the (T50) L/R Pressure Switch Sense circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7



**P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)****7. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (A104)Fused B+ circuit and (T16) Transmission Control Relay Output circuit.

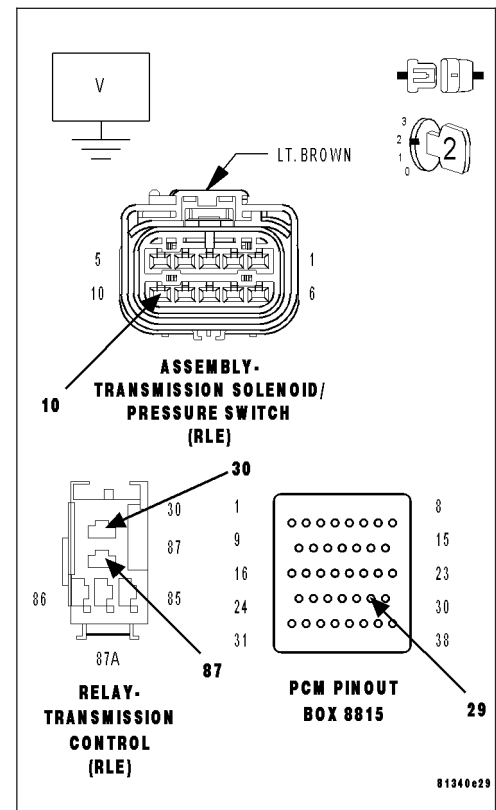
Ignition on, engine not running.

Measure the voltage of the (T50) L/R Pressure Switch Sense circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to voltage.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 9

**8. L/R PRESSURE SWITCH**

If there are no possible causes remaining, view repair.

**Repair**

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



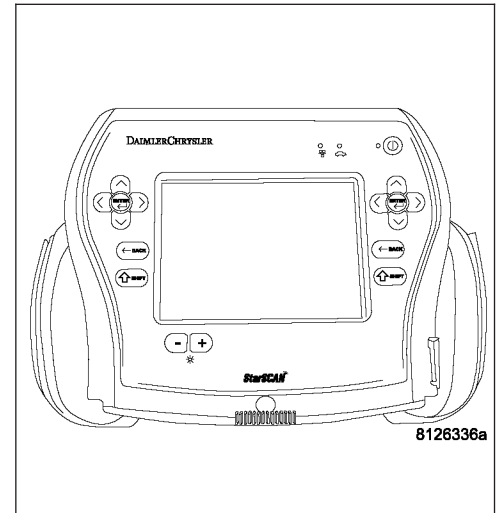
**P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)****9. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**10. INTERMITTENT WIRING AND CONNECTORS**

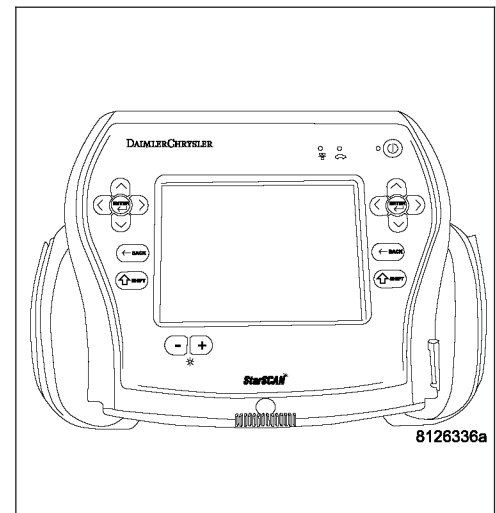
The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

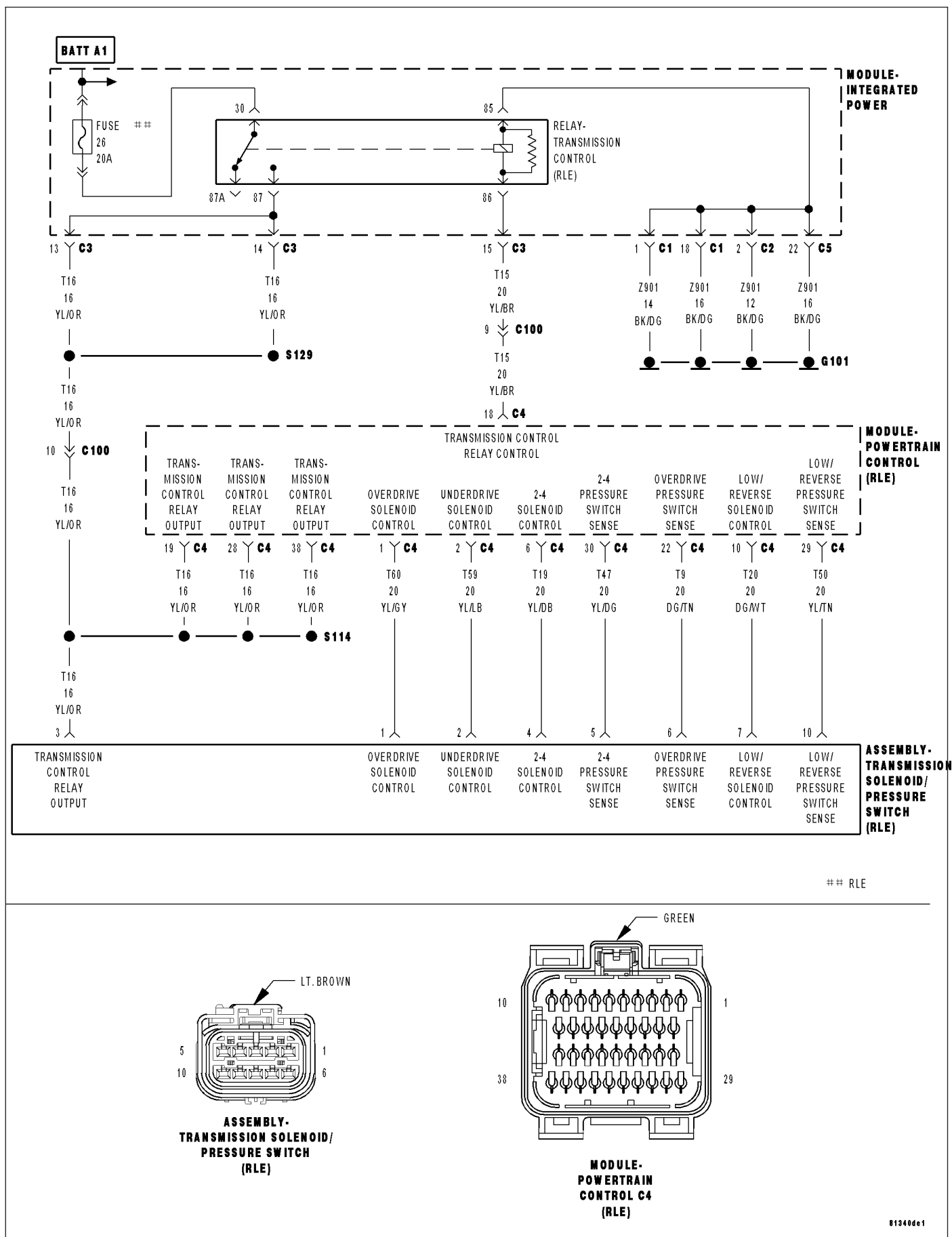
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No**     >> Test Complete.



# P0845-2/4 HYDRAULIC PRESSURE TEST



**P0845-2/4 HYDRAULIC PRESSURE TEST (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

In any forward gear with engine speed above 1000 RPM, shortly after a shift and every minute thereafter.

- **Set Condition:**

After a shift into a forward gear, with engine speed greater than 1000 RPM, the PCM momentarily turns on element pressure to the clutch circuits that don't have pressure to identify the correct pressure switch closes. If the pressure switch does not close 2 times the DTC sets

Possible Causes
LOSS OF PRIME P0944 PRESENT
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT OPEN
(T47) 2/4 PRESSURE SWITCH CIRCUIT SHORT TO GROUND
(T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

Background: Pressure switches are normally off or open (no pressure applied) and read high (+12 volts). When an element is applied the corresponding pressure switch closes to ground (0 volts) or turns on. The controller tests the OD and 24 pressure switches when they are off (ie. when the corresponding friction element is not applied) by briefly applying the OD and 24 elements which will cause the corresponding pressure switch to close. The test verifies that the switches are operational and that the switch will close when the corresponding element is applied. If a switch fails to respond, it is re-tested. The MIL illuminates and the transmission system defaults to Limp-in mode.

### PRESSURE SWITCH STATES

GEAR	L/R	2/4	OD
R	OP	OP	OP
P/N	CL	OP	OP
1st	CL	OP	OP
2nd	OP	CL	OP
D	OP	OP	CL
OD	OP	CL	CL

**OP = OPEN**

**CL = CLOSED**

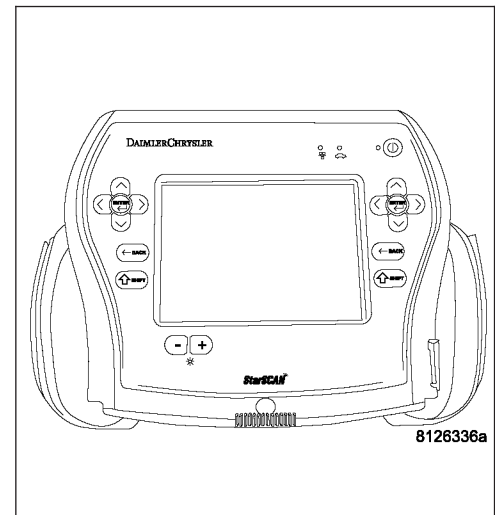
**P0845-2/4 HYDRAULIC PRESSURE TEST (CONTINUED)****Diagnostic Test****1. CHECKING FOR LOSS OF PRIME DTC**

With the scan tool, check for other Transmission DTC's.

**Is the DTC P0944 present also?**

**Yes** >> Refer to the Transmission category and perform the appropriate diagnostic procedure.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2

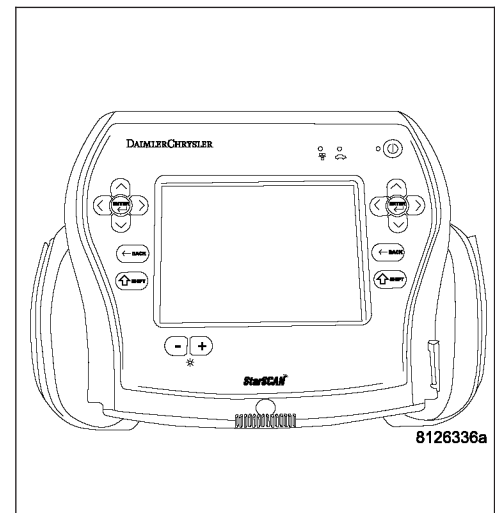
**2. CHECK FOR RELATED TRANSMISSION DTC'S**

With the scan tool, read Transmission DTC's.

**Are any of the DTCs P0732, P0734 and/or P0846 present also?**

**Yes** >> Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3



**P0845-2/4 HYDRAULIC PRESSURE TEST (CONTINUED)****3. CHECK TO SEE IF DTC P0845 IS CURRENT**

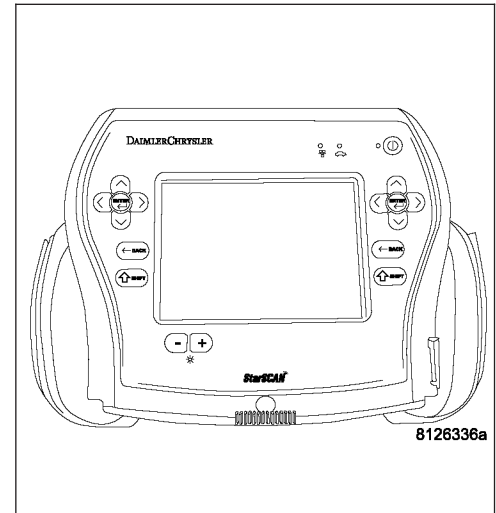
With the scan tool, Check the STARTS SINCE SET counter for P0845.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter 2 or less?**

**Yes**    >> Go To 4

**No**    >> Go To 11



**P0845-2/4 HYDRAULIC PRESSURE TEST (CONTINUED)****4. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

**Note: Check connectors - Clean/repair as necessary.**

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to 2/4.

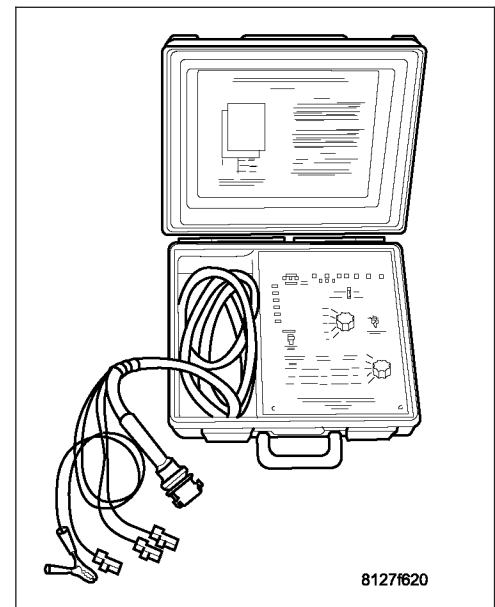
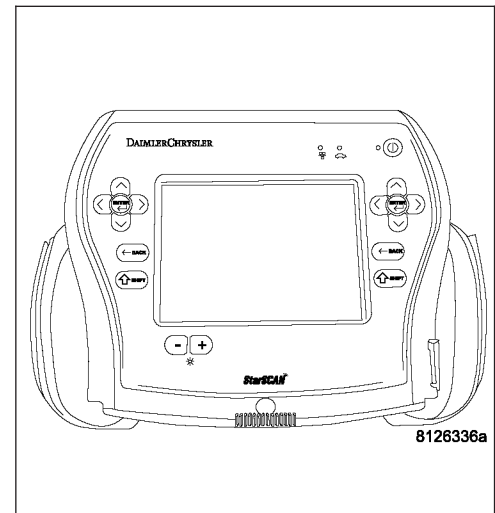
With the scan tool, monitor the UD Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Wiggle the wires leading to the PCM while pressing and holding the Pressure Switch Test button.

**Did the 2/4 Pressure Switch state change to closed and remain closed while wiggling the wires?**

**Yes** >> Go To 5

**No** >> Go To 6

**5. INTERNAL TRANSMISSION**

**If there are no possible causes remaining, view repair.**

**Repair**

Disassemble and inspect the Valve Body per the Service Information and repair or replace as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid/Pressure Switch Assembly.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**P0845-2/4 HYDRAULIC PRESSURE TEST (CONTINUED)****6. (T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

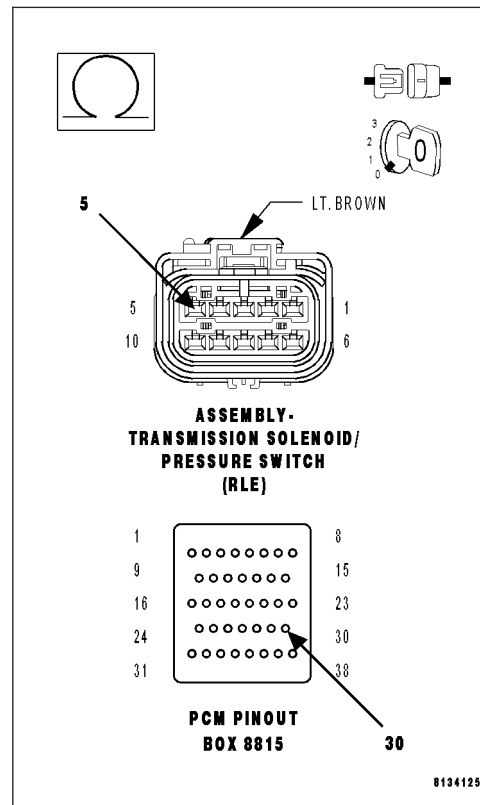
Measure the resistance of the (T47) 2/4 Pressure Switch Sense circuit from the appropriate terminal of special tool #8815 to the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T47) 2/4 Pressure Switch Sense circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. (T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

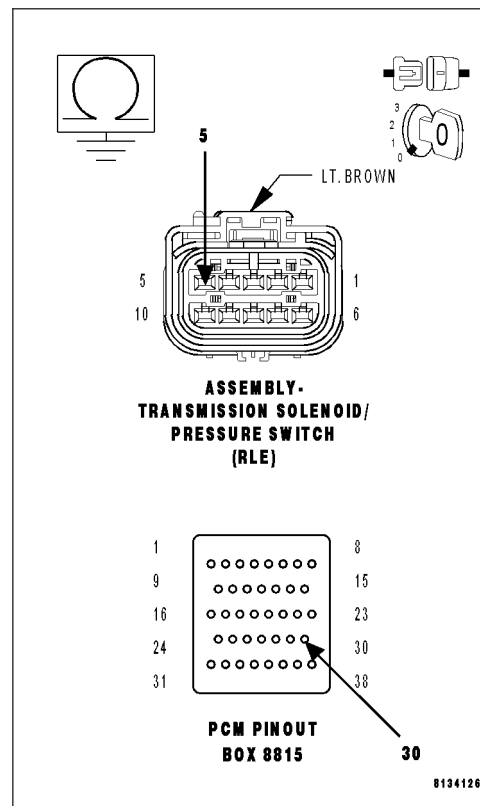
Measure the resistance between ground and the (T47) 2/4 Pressure Switch Sense circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T47) 2/4 Pressure Switch Sense circuit for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 8



**P0845-2/4 HYDRAULIC PRESSURE TEST (CONTINUED)****8. (T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit.

Ignition on, engine not running.

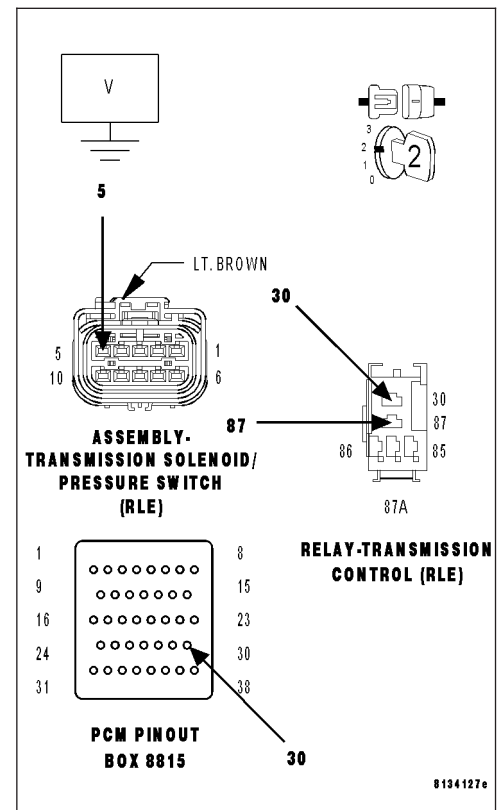
Measure the voltage of the (T47) 2/4 Pressure Switch Sense circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T47) 2/4 Pressure Switch Sense circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 9





**P0845-2/4 HYDRAULIC PRESSURE TEST (CONTINUED)****9. TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check (T16) Transmission Control Relay Output circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

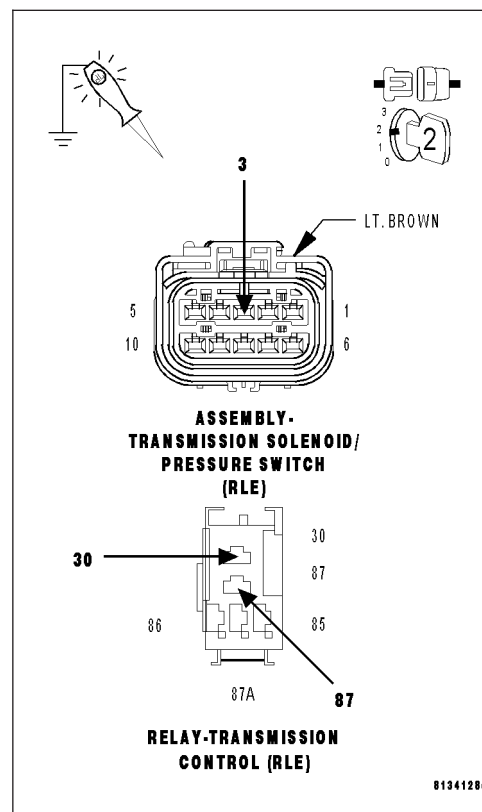
**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly?**

**Yes** >> Go To 10

**No** >> Repair the Transmission Control Relay Output circuit for an open or high resistance. If the fuse is open make sure to check for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

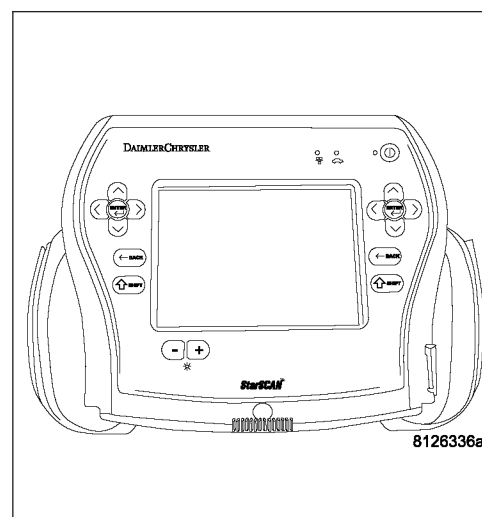
**10. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0845-2/4 HYDRAULIC PRESSURE TEST (CONTINUED)****11. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

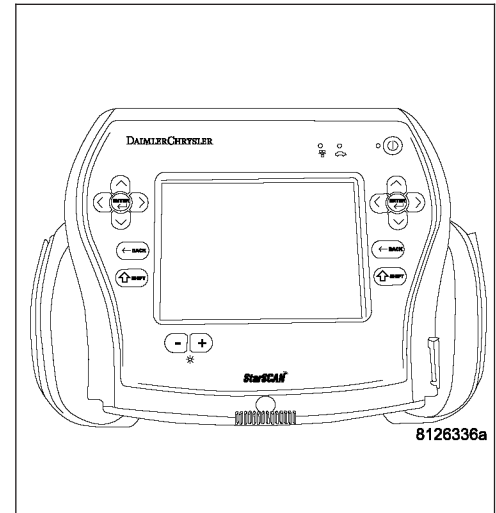
Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform 42RLE TRANSMISSION VERIFICATION TEST -  
VER 1.

**No** >> Test Complete.





**P0846-2/4 PRESSURE SWITCH RATIONALITY (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Whenever the engine is running.

- **Set Condition:**

The DTC is set if one of the pressure switches are open or closed at the wrong time in a given gear. If the problem is identified for 3 successive key starts, the transmission will go into Limp-in mode a MIL will turn on after 10 seconds of vehicle operation.

Possible Causes
RELATED TRANSMISSION RELAY DTC'S PRESENT
LOSS OF PRIME DTC PRESENT
(T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT OPEN
(T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The Transmission system uses three pressure switches to monitor the fluid pressure in the LR, 2/4, and OD elements. The pressure switches are continuously monitored for the correct states in each gear. The 2/4 pressure switch monitors the fluid pressure to the 2/4 clutch to confirm proper operation of the 2/4 solenoid. If the 2/4 pressure switch is identified as closed in P or N, the code will immediately be set and normal operation will be allowed for that given key start. If the problem is identified for 3 successive ignition cycles, the transmission will go into Limp-in mode.

### PRESSURE SWITCH STATES

GEAR	L/R	2/4	OD
R	OP	OP	OP
P/N	CL	OP	OP
1st	CL	OP	OP
2nd	OP	CL	OP
D	OP	OP	CL
OD	OP	CL	CL

**OP = OPEN**

**CL = CLOSED**

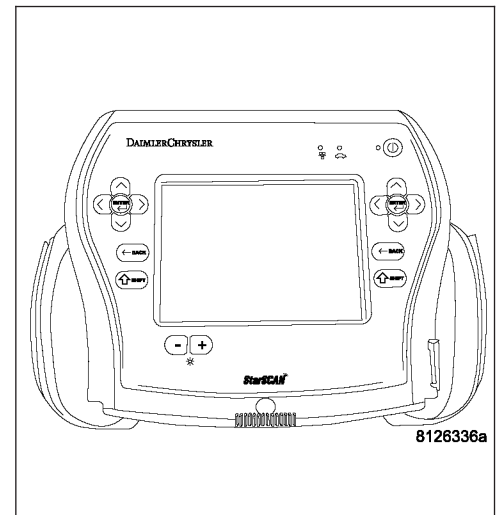
**P0846-2/4 PRESSURE SWITCH RATIONALITY (CONTINUED)****Diagnostic Test****1. DETERMINING IF RELATED TRANSMISSION RELAY DTC'S ARE PRESENT**

With the scan tool, read Transmission DTC's

**Are there any Transmission Control Relay DTC's present also?**

**Yes** >> Refer to the Transmission category and perform the appropriate symptom.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2

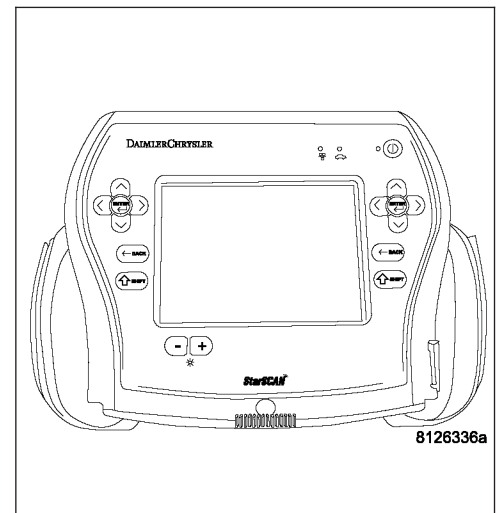
**2. CHECK FOR LOSS OF PRIME DTC**

With the scan tool, check for other Transmission DTC's.

**Is the DTC P0944 present also?**

**Yes** >> Refer to the Transmission category and perform the appropriate diagnostic procedure.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3



**P0846-2/4 PRESSURE SWITCH RATIONALITY (CONTINUED)****3. CHECK TO SEE IF P0846 IS CURRENT**

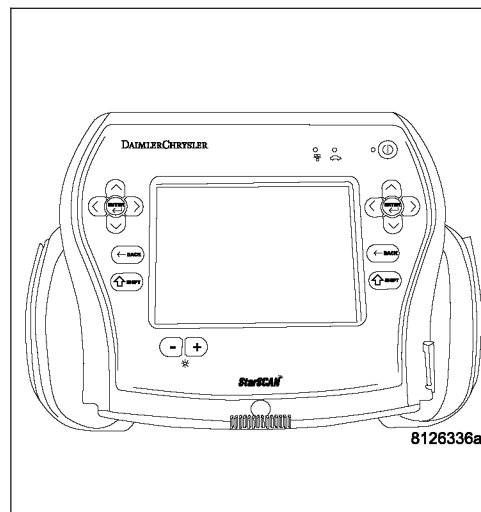
With the scan tool, Check the STARTS SINCE SET counter for P0846.

**Note:** This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

**Yes** >> Go To 4

**No** >> Go To 10



**P0846-2/4 PRESSURE SWITCH RATIONALITY (CONTINUED)****4. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

**Note: Check connectors - Clean/repair as necessary.**

Ignition on, engine not running.

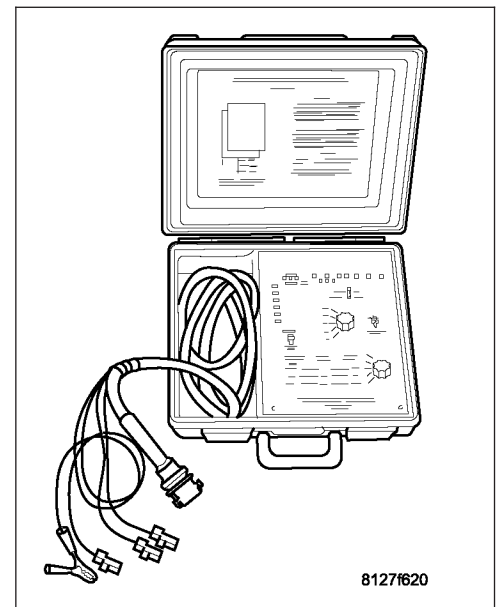
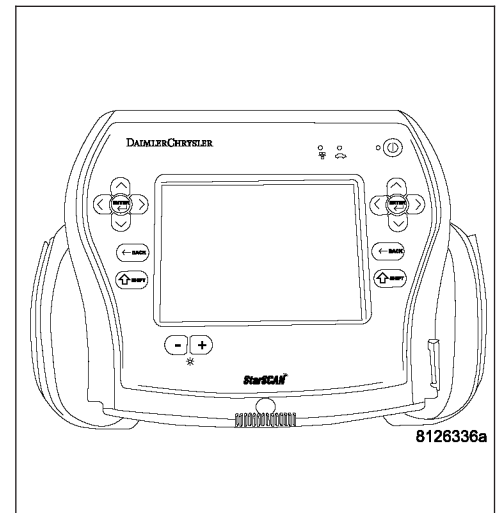
With the Transmission Simulator, turn the Pressure Switch selector to 2/4.

With the scan tool, monitor the 2/4Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

**Did the 2/4 Pressure Switch state change?**

**Yes** >> Go To 8

**No** >> Go To 5



**P0846-2/4 PRESSURE SWITCH RATIONALITY (CONTINUED)****5. (T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

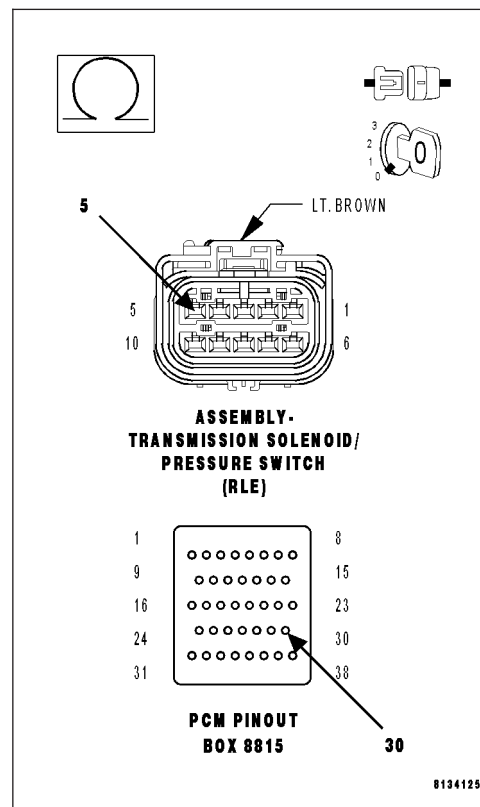
Measure the resistance of the (T47) 2/4 Pressure Switch Sense circuit from the appropriate terminal of special tool #8815 to the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T47) 2/4 Pressure Switch Sense circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 6

**6. (T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

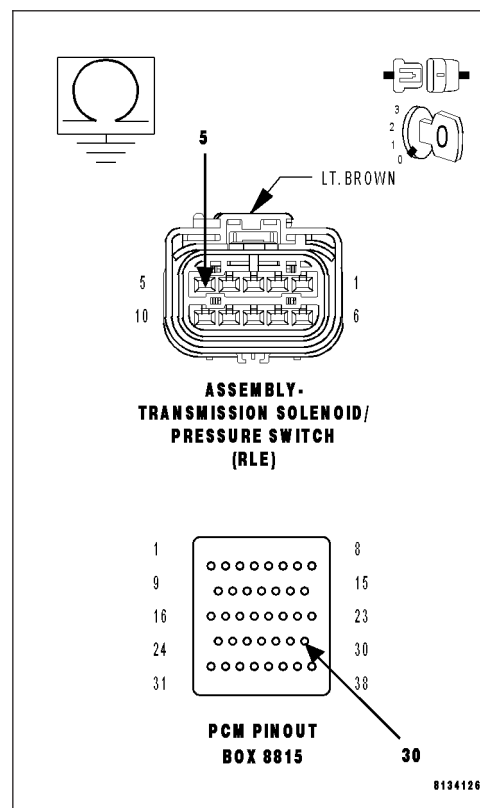
Measure the resistance between ground and the (T47) 2/4 Pressure Switch Sense circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T47) 2/4 Pressure Switch Sense circuit for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7





**P0846-2/4 PRESSURE SWITCH RATIONALITY (CONTINUED)****7. (T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and (T16) Transmission Control Relay Output circuit.

Ignition on, engine not running.

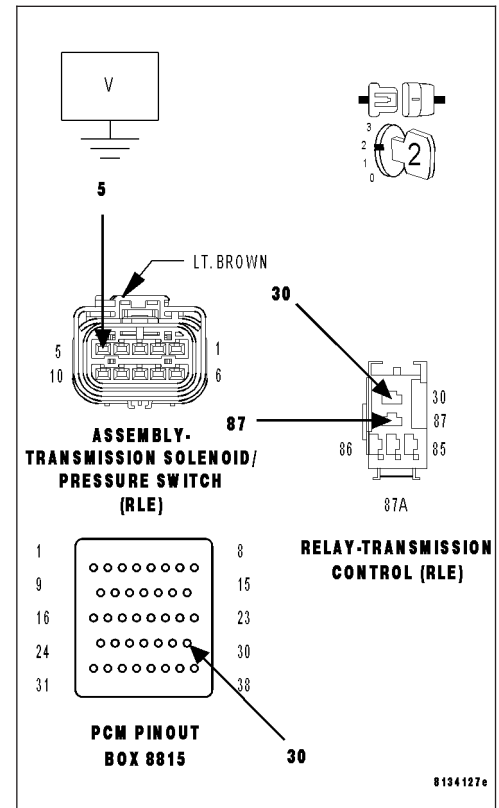
Measure the voltage of the (T47) 2/4 Pressure Switch Sense circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T47) 2/4 Pressure Switch Sense circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 9

**8. 2/4 PRESSURE SWITCH**

If there are no possible causes remaining, view repair.

**Repair**

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

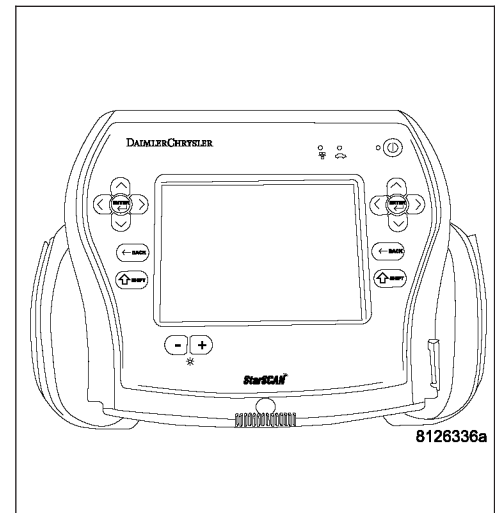
**P0846-2/4 PRESSURE SWITCH RATIONALITY (CONTINUED)****9. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**10. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

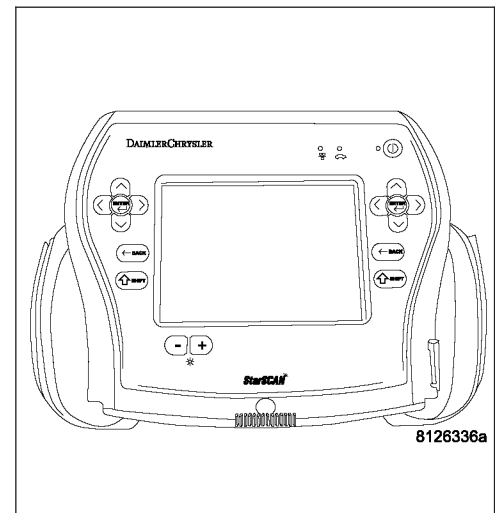
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

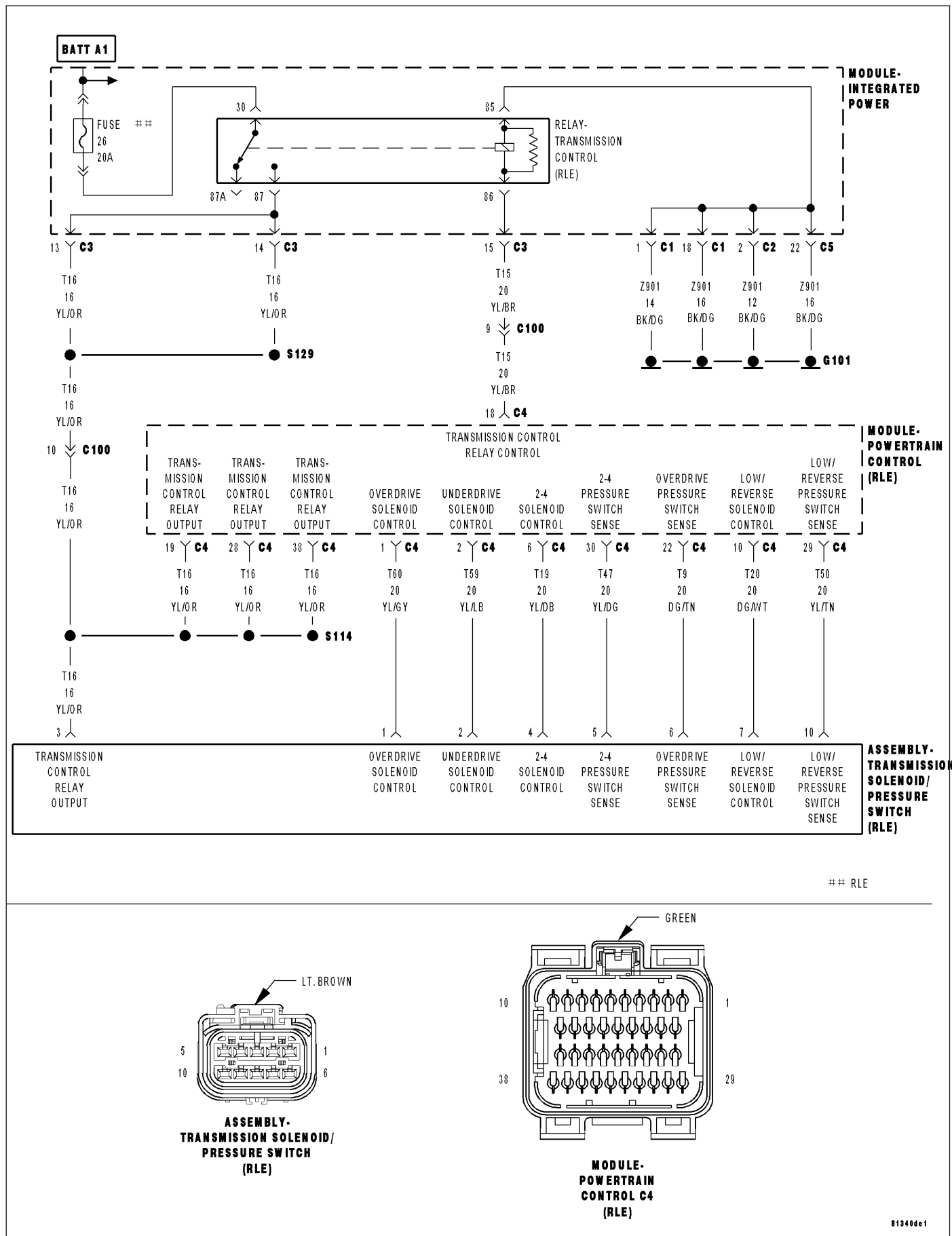
**Yes** >> Repair as necessary.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.



# P0870-OD HYDRAULIC PRESSURE TEST



**P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

In any forward gear with engine speed above 1000 RPM, shortly after a shift and every minute thereafter.

- **Set Condition:**

After a shift into a forward gear, with engine speed greater than 1000 RPM, the PCM momentarily turns on element pressure to the clutch circuits that don't have pressure to identify the correct pressure switch closes. If the pressure switch does not close 2 times the DTC sets.

Possible Causes
LOSS OF PRIME P0944 PRESENT
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN
(T9) OD PRESSURE SWITCH CIRCUIT SHORT TO GROUND
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**PRESSURE SWITCH STATES**

GEAR	L/R	2/4	OD
R	OP	OP	OP
P/N	CL	OP	OP
1st	CL	OP	OP
2nd	OP	CL	OP
D	OP	OP	CL
OD	OP	CL	CL

**OP = OPEN**

**CL = CLOSED**

**Theory of Operation**

Background: Pressure switches are normally off or open (no pressure applied) and read high (+12 volts). When an element is applied the corresponding pressure switch closes to ground (0 volts) or turns on. The controller tests the OD and 24 pressure switches when they are off (ie. when the corresponding friction element is not applied) by briefly applying the OD and 24 elements which will cause the corresponding pressure switch to close. The test verifies that the switches are operational and that the switch will close when the corresponding element is applied. If a switch fails to respond, it is re-tested. The MIL illuminates and the transmission system defaults to Limp-in mode.

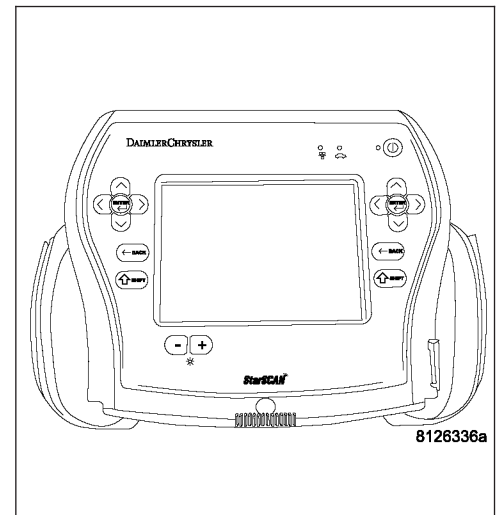
**P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)****Diagnostic Test****1. CHECKING FOR LOSS OF PRIME DTC**

With the scan tool, check for other Transmission DTC's.

**Is the DTC P0944 present also?**

**Yes** >> Refer to the Transmission category and perform the appropriate diagnostic procedure.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2

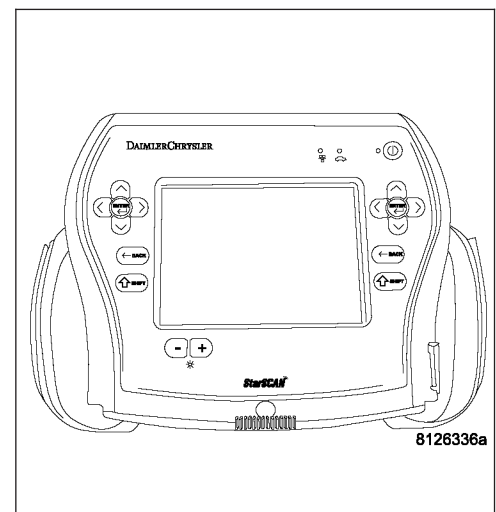
**2. CHECK FOR RELATED TRANSMISSION DTC'S**

With the scan tool, read Transmission DTC's.

**Are any of the DTCs P0732, P0734 and/or P0846 present also?**

**Yes** >> Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3



**P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)****3. CHECK TO SEE IF DTC P0870 IS CURRENT**

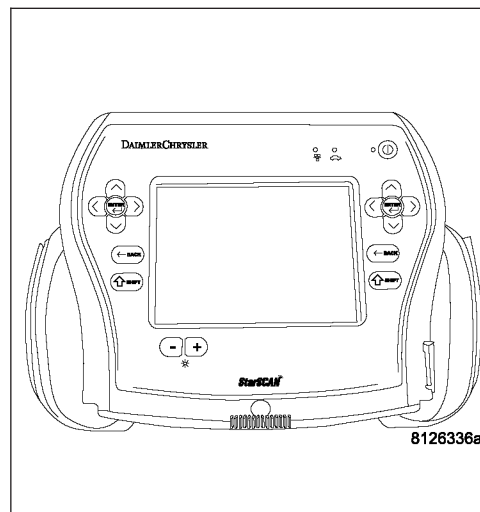
With the scan tool, Check the STARTS SINCE SET counter for P0870.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter 2 or less?**

**Yes** >> Go To 4

**No** >> Go To 11



**P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)****4. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

**Note: Check connectors - Clean/repair as necessary.**

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to OD.

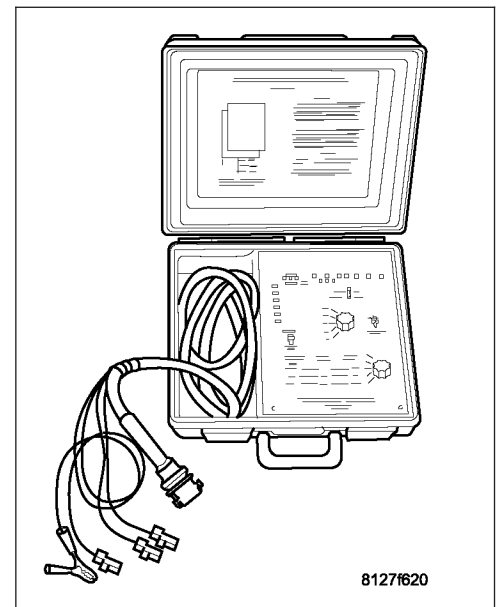
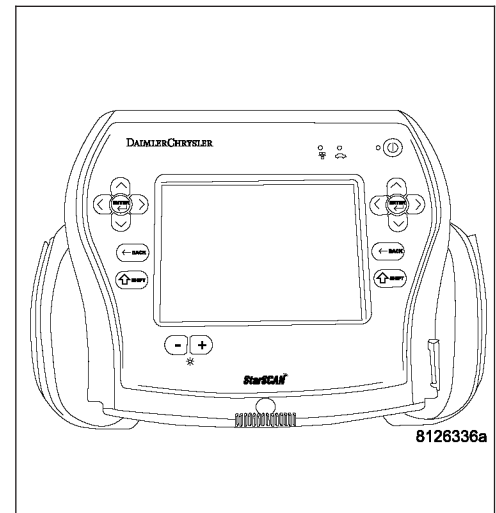
With the scan tool, monitor the UD Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Wiggle the wires leading to the PCM while pressing and holding the Pressure Switch Test button.

**Did the OD Pressure Switch state change to closed and remain closed while wiggling the wires?**

**Yes** >> Go To 5

**No** >> Go To 6

**5. INTERNAL TRANSMISSION**

**If there are no possible causes remaining, view repair.**

**Repair**

Disassemble and inspect the Valve Body per the Service Information and repair or replace as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid/Pressure Switch Assembly.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

**P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)****6. (T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

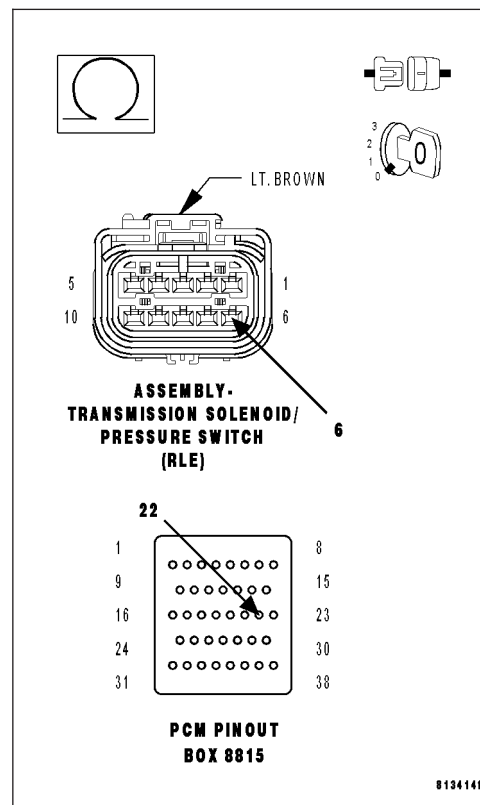
Measure the resistance of the (T9)OD Pressure Switch Sense circuit from the appropriate terminal of special tool #8815 to the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T9) OD Pressure Switch Sense circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. (T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

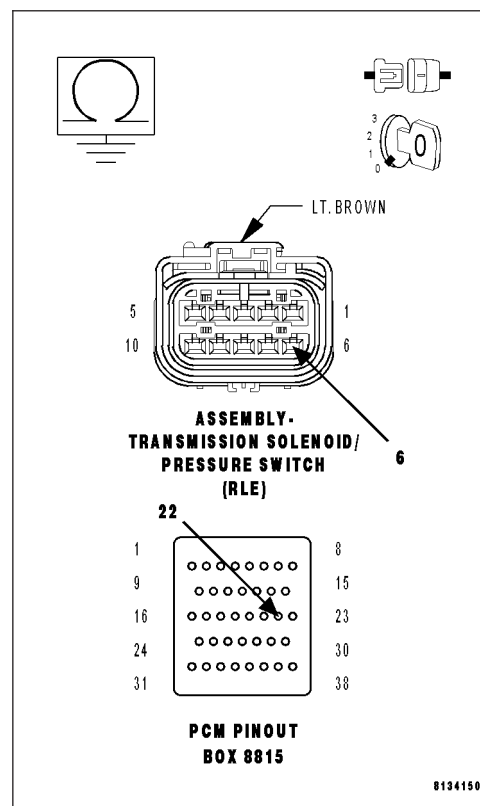
Measure the resistance between ground and the (T9) OD Pressure Switch Sense circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T9) OD Pressure Switch Sense circuit for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 8





## P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

**8. (T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit.

Ignition on, engine not running.

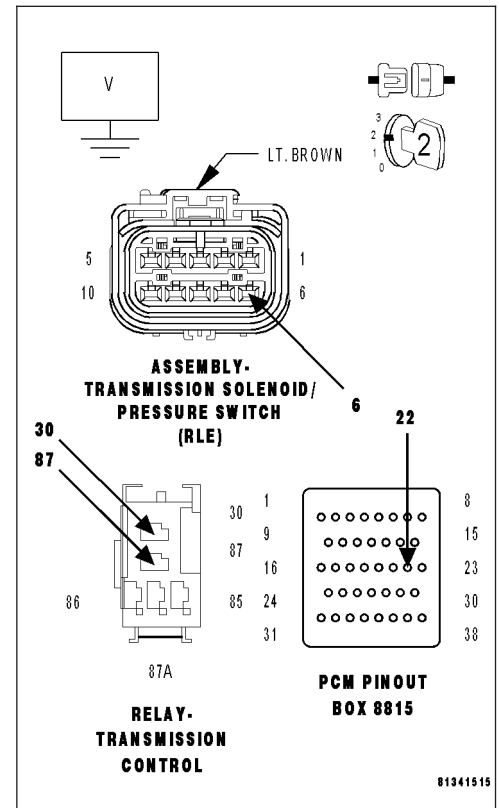
Measure the voltage of the (T9) OD Pressure Switch Sense circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T9) OD Pressure Switch Sense circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 9



**P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)****9. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check (T16) Transmission Control Relay Output circuit in the Transmission Solenoid/Pressure Switch Assembly harness connector.

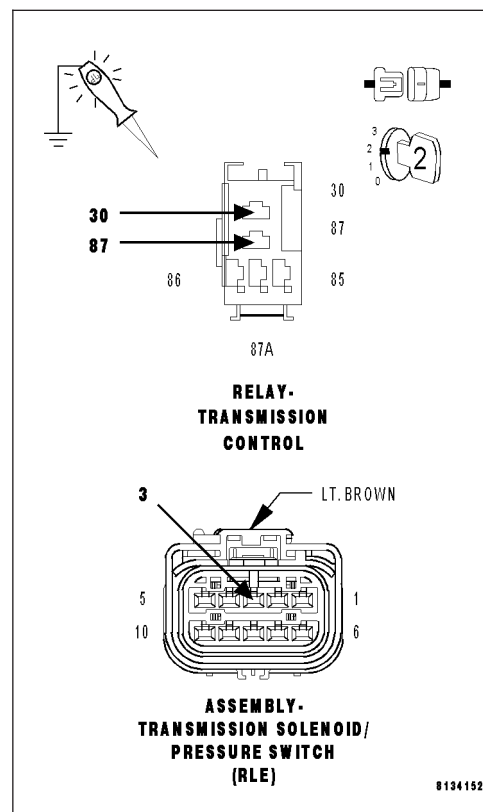
**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly?**

**Yes** >> Go To 10

**No** >> Repair the (T16) Transmission Control Relay Output circuit for an open. If the fuse is open make sure to check for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

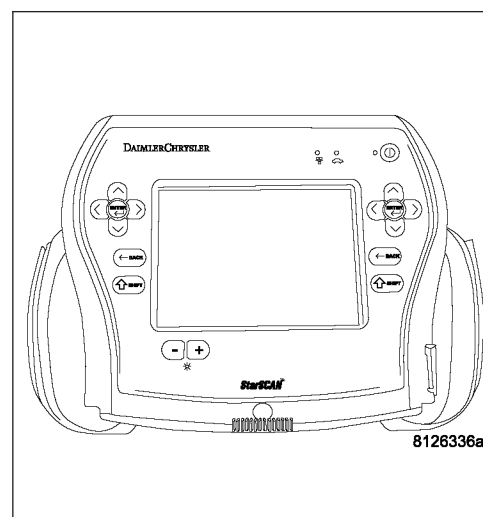
**10. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)****11. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

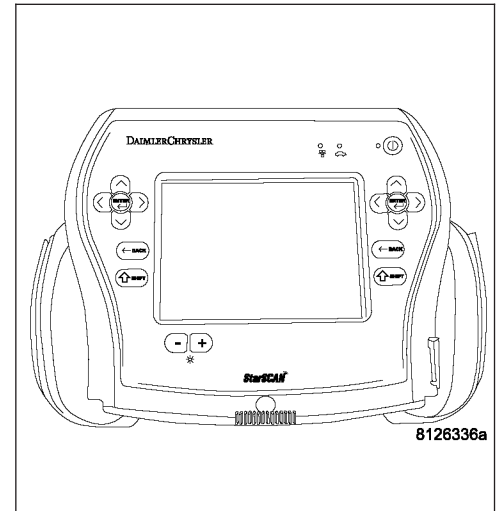
Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

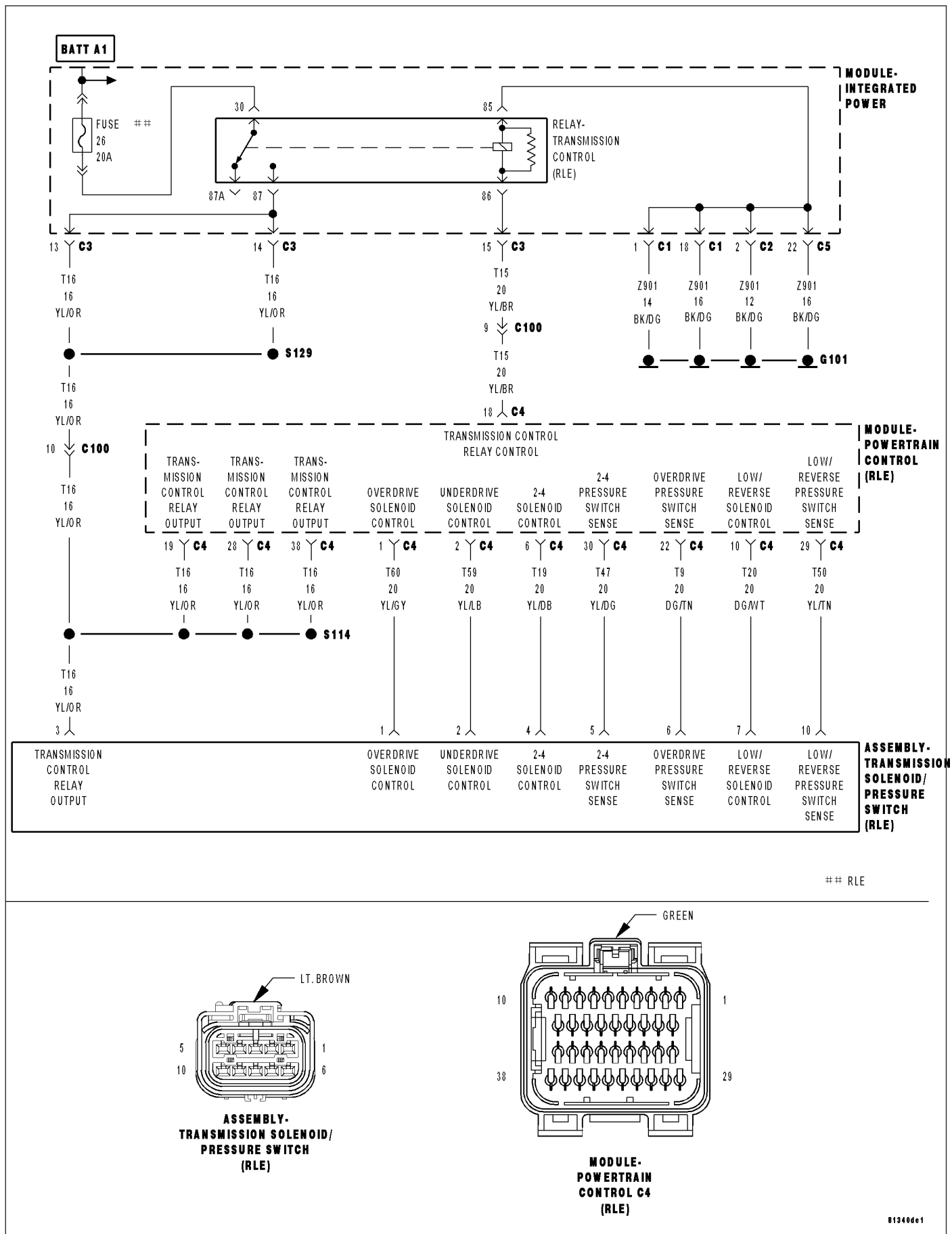
**Were there any problems found?**

**Yes**    >> Repair as necessary.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST -  
          VER 1.

**No**     >> Test Complete.



## P0871-OD PRESSURE SWITCH RATIONALITY



**P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Whenever the engine is running.

- **Set Condition:**

The DTC is set if one of the pressure switches are open or closed at the wrong time in a given gear. If the problem is identified for 3 successive key starts, the transmission will go into Limp-in mode a MIL will turn on after 10 seconds of vehicle operation.

Possible Causes
RELATED TRANSMISSION RELAY DTC'S PRESENT
LOSS OF PRIME DTC PRESENT
(T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The Transmission system uses three pressure switches to monitor the fluid pressure in the LR, 2/4, and OD elements. The pressure switches are continuously monitored for the correct states in each gear. Normal operation will be experienced if no other codes are present. Transmission Control System will ignore the code. Limp-in condition will only occur if DTC P0871 is present with a DTC P0706.

### PRESSURE SWITCH STATES

GEAR	L/R	2/4	OD
R	OP	OP	OP
P/N	CL	OP	OP
1st	CL	OP	OP
2nd	OP	CL	OP
D	OP	OP	CL
OD	OP	CL	CL

**OP = OPEN**

**CL = CLOSED**

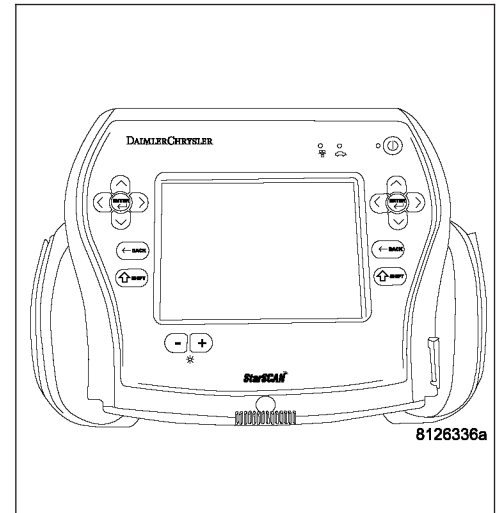
**P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)****Diagnostic Test****1. DETERMINING IF RELATED TRANSMISSION RELAY DTC'S ARE PRESENT**

With the scan tool, read Transmission DTC's

**Are there any Transmission Control Relay DTC's present also?**

**Yes** >> Refer to the Transmission category and perform the appropriate diagnostic procedure.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2

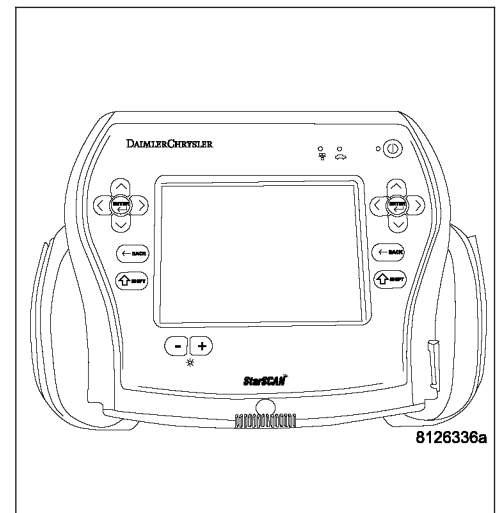
**2. CHECK FOR LOSS OF PRIME DTC**

With the scan tool, check for other Transmission DTC's.

**Is the DTC P0944 present also?**

**Yes** >> Refer to the Transmission category and perform the appropriate diagnostic procedure.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3



**P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)****3. CHECK TO SEE IF P0841 IS CURRENT**

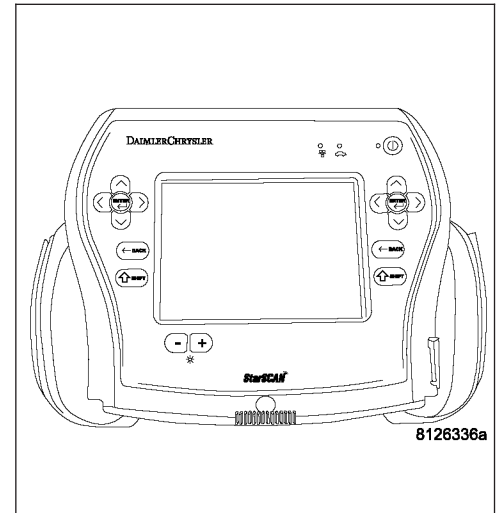
With the scan tool, Check the STARTS SINCE SET counter for P0841.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter 2 or less?**

**Yes**    >> Go To 4

**No**    >> Go To 10



**P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)****4. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

**Note: Check connectors - Clean/repair as necessary.**

Ignition on, engine not running.

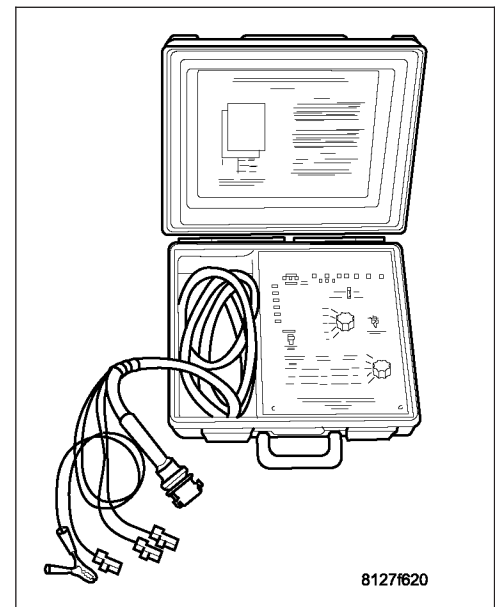
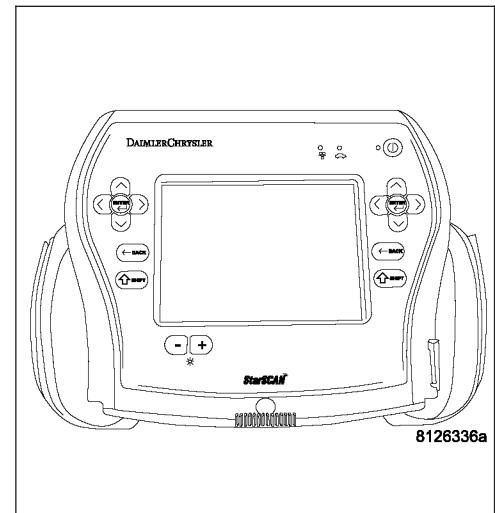
With the Transmission Simulator, turn the Pressure Switch selector to OD.

With the scan tool, monitor the OD Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

**Did the OD Pressure Switch state change?**

**Yes** >> Go To 8

**No** >> Go To 5





## P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

## 5. (T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Note:** Check connectors - Clean/repair as necessary.

**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

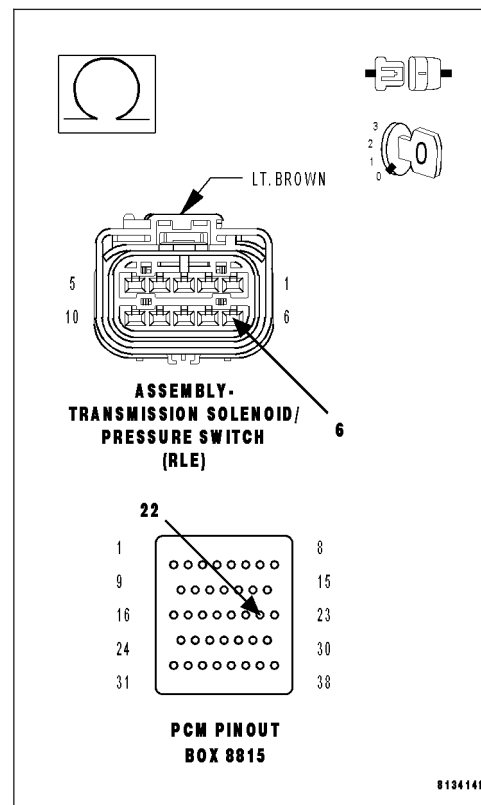
Measure the resistance of the (T9) OD Pressure Switch Sense circuit from the appropriate terminal of special tool #8815 to the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T9) OD Pressure Switch Sense circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 6



## 6. (T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Note:** Check connectors - Clean/repair as necessary.

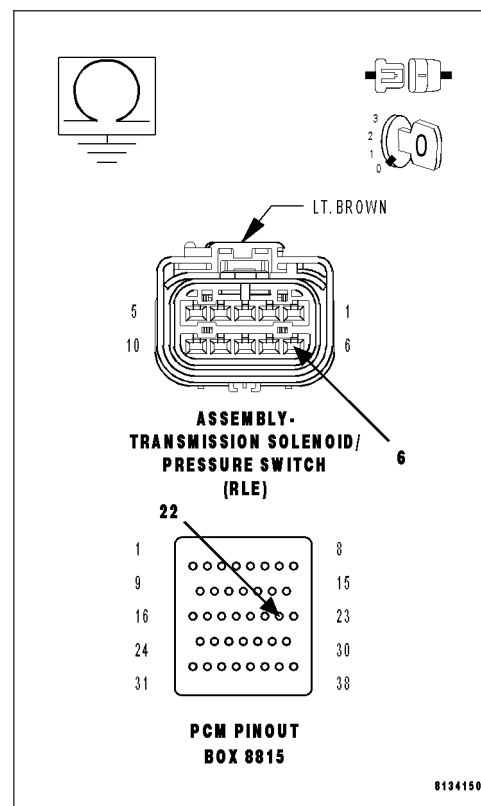
Measure the resistance between ground and the (T9) OD Pressure Switch Sense circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T9) OD Pressure Switch Sense circuit for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7



**P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)****7. (T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and (T16) Transmission Control Relay Output circuit.

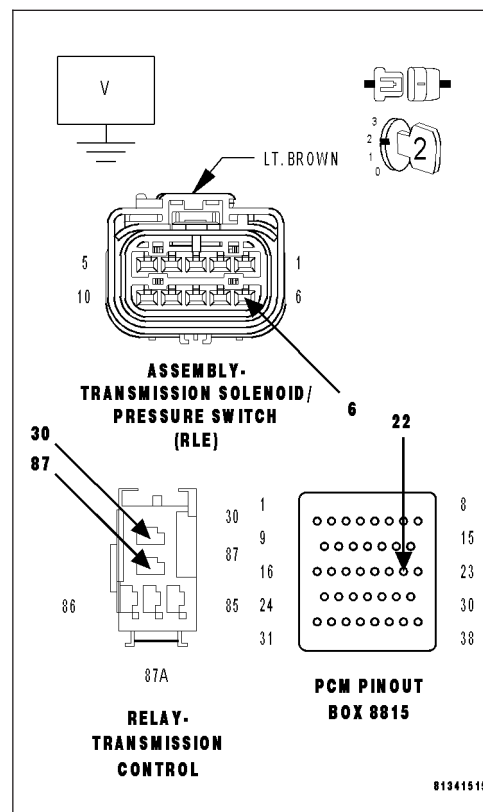
Ignition on, engine not running.

Measure the voltage of the (T9) OD Pressure Switch Sense circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T9) OD Pressure Switch Sense circuit for a short to voltage.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 9

**8. OD PRESSURE SWITCH**

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

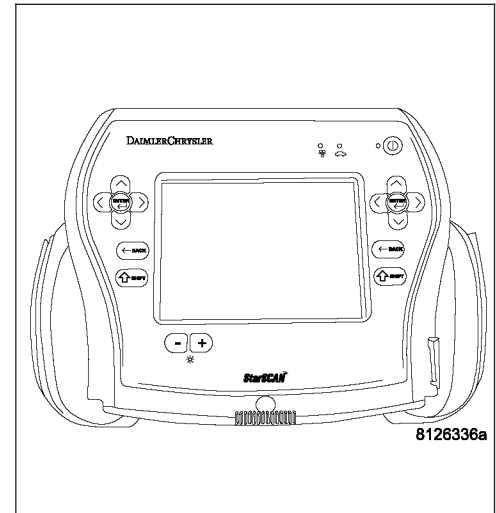
**P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)****9. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**10. INTERMITTENT WIRING AND CONNECTORS**

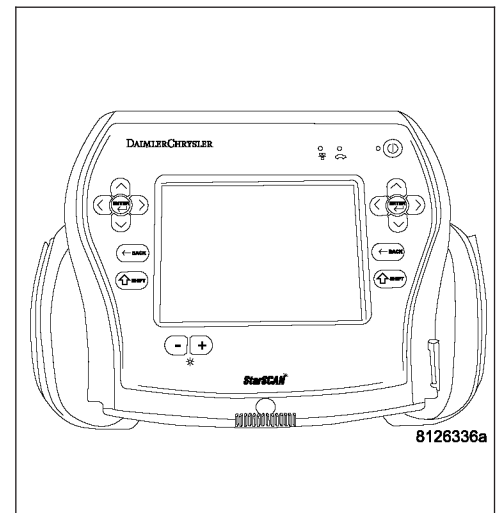
The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No**     >> Test Complete.



## P0884-POWER UP AT SPEED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

One time after each controller reset. Note: the Transmission Control Module is integrated with Powertrain Control Module. The Transmission Control Module has separate powers and grounds specifically to its portion of the PCM.

- **Set Condition:**

This DTC will set if the PCM powers up and senses the vehicle in a valid forward gear (no PRNDL DTCs) with a output speed above 800 RPM, approximately 32Km/h or 20 MPH.

Possible Causes
INTERMITTENT POWER AND GROUND CIRCUITS

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

If a vehicle loses power to the PCM, the vehicle will go to the 2nd gear mode since there is no power available to control the transmission solenoids. However if power is restored, the PCM will power-up and normal operation will be restored. This DTC identifies that power to the PCM was restored when the gear selector was in a "Drive" position while the vehicle was moving at speeds above 32 Km/h (20 MPH). If a customer shifts to Neutral and cycles the ignition key and quickly shifts to "Drive" while moving before the PCM comes out of its START ROUTINE, the DTC can be set. Therefore it is critical that this DTC diagnosis repair procedure should only be used if the vehicle is experiencing intermittent 2nd gear operation and subsequently a return to normal operation during normal driving. the transmission will not be placed in Limp-in. This is an informational DTC only, when attempting to diagnosis intermittent 2nd gear operation and subsequently a return to normal transmission operation.

**P0884-POWER UP AT SPEED (CONTINUED)****Diagnostic Test****1. CHECK FOR INTERMITTENT POWER AND GROUND CIRCUITS**

This DTC is set when the PCM is initialized while the vehicle is moving down the road in a valid forward gear. This is usually a momentarily loss of power to the Transmission portion of the PCM.

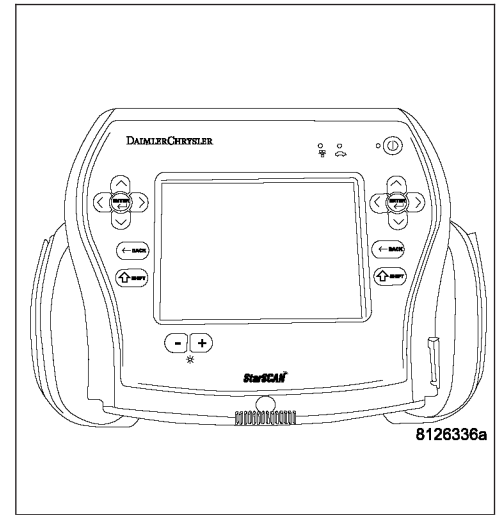
**CAUTION:** Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.

**Note:** Due to the integration of the Powertrain and Transmission Control Modules, the transmission part of the PCM has its own specific power and ground circuits.

Check all of the Fused B+, Fused Ignition Switch Output, and Ground circuits related to the PCM for an intermittent open or short to ground.

Perform a wiggle test on all wiring and connectors pertaining to the PCM while looking for shorts and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.



If there are no possible causes remaining, view repair.

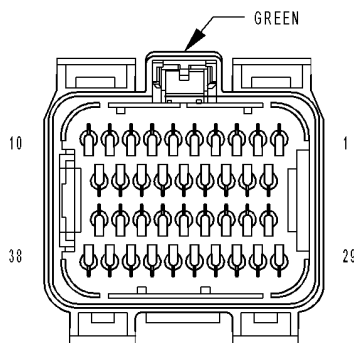
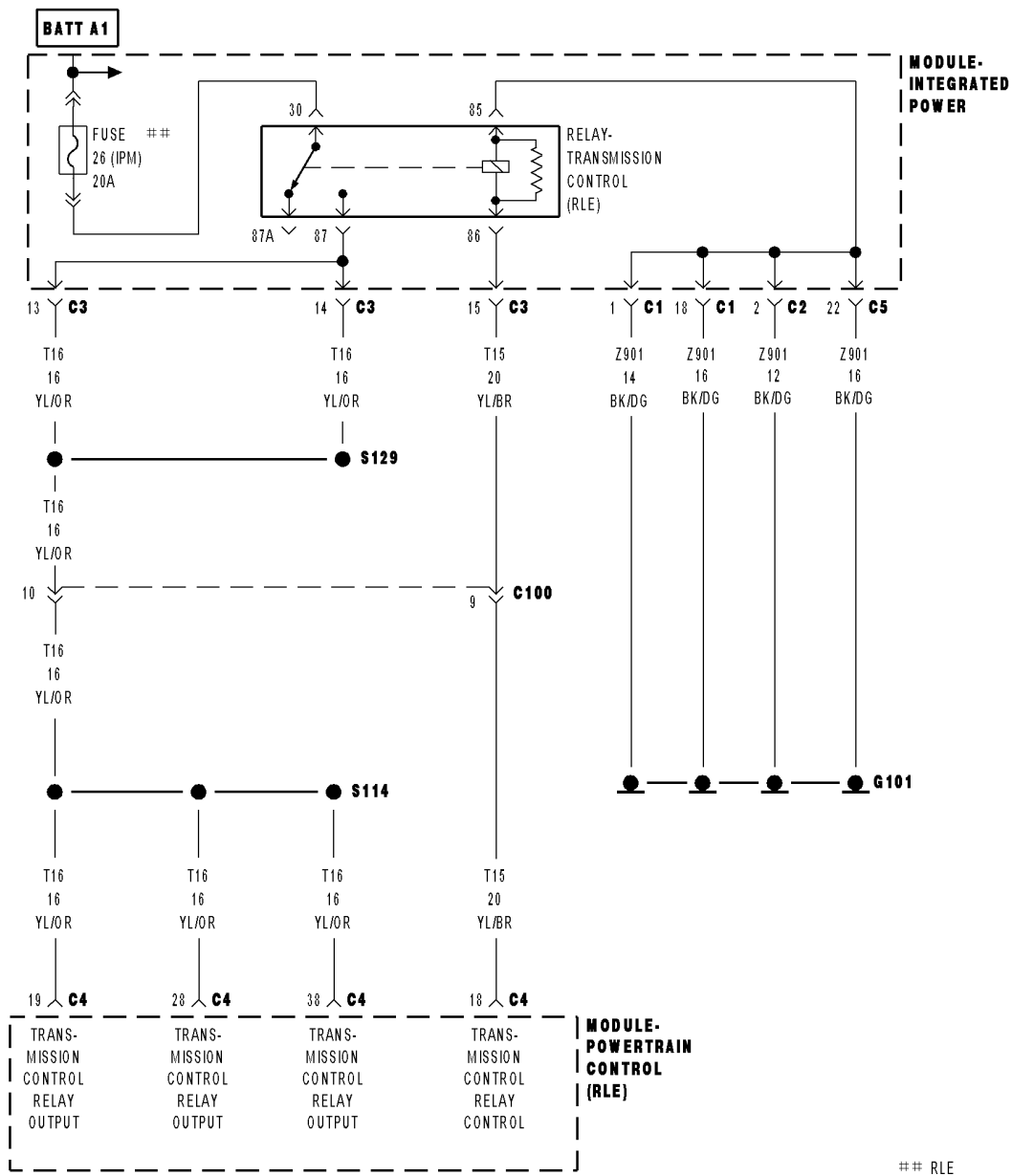
**Repair**

Repair as necessary.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

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# P0888-TRANSMISSION RELAY ALWAYS OFF



**MODULE-  
POWERTRAIN  
CONTROL C4  
(RLE)**

**P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Continuously

- **Set Condition:**

This DTC is set when less than 3 volts are present at the Transmission Control Relay output circuits at the Powertrain Control Module when the PCM is energizing the relay. Note: Due to the integration of the Powertrain and Transmission Control Modules, the transmission part of the PCM has its own specific power and ground circuits.

Possible Causes
(Internal) FUSED B+ CIRCUIT OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT OPEN
(Z901) TRANSMISSION CONTROL RELAY GROUND CIRCUIT OPEN
(T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO GROUND
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO GROUND
TRANSMISSION CONTROL RELAY
TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The transmission control relay is used to supply power to the solenoid pack when the transmission is in normal operating mode. When the relay is off, no power is supplied to the solenoid pack and the transmission is in Limp-in mode. The relay output is fed back to the PCM. It is referred to as the Trans Relay Output circuit or switched battery. After a controller reset (ignition key turned to the run position or after cranking engine), the controller energizes the relay. Prior to this, the PCM verifies that the contacts are open by checking for no voltage at the transmission control relay outputs (switched battery) terminals. After the relay is energized, the PCM monitors the terminals to verify that the voltage is greater than 3 volts. The MIL illuminates and the transmission will be placed in Limp-in.

**P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)****Diagnostic Test****1. CHECK TO SEE IF DTC P0888 IS CURRENT**

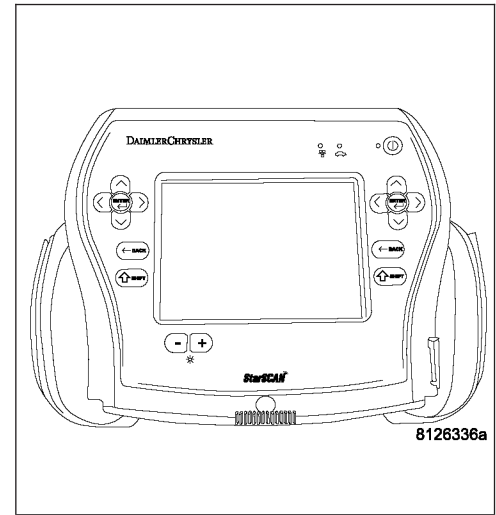
With the scan tool, Check the STARTS SINCE SET counter for P0888.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter equal to 0?**

**Yes** >> Go To 2

**No** >> Go To 12

**2. CHECK THE (INTERNAL) FUSED B+ CIRCUIT**

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

**Note:** Check connectors - Clean/repair as necessary.

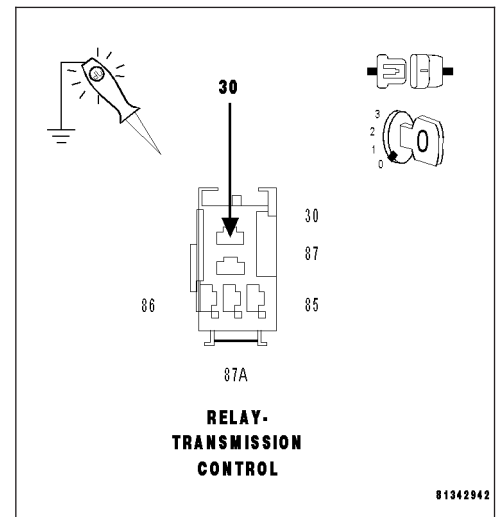
Using a 12-volt test light connected to ground, check the (Internal) Fused B+ circuit in the Transmission Control Relay connector.

**Note:** The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

**Does the test light illuminate brightly?**

**Yes** >> Go To 3

**No** >> Go To 9





**P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)****3. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN**

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and the (T16) Transmission Control Relay Output circuits.

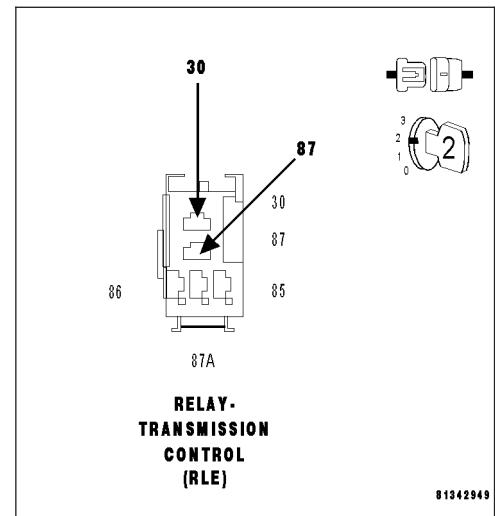
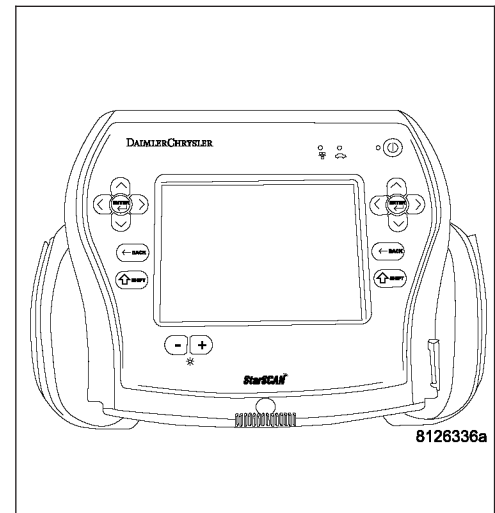
Ignition on, engine not running.

With the scan tool in Transmission Sensors, read the Switched Battery voltage.

**Does the Switched Battery voltage read battery voltage?**

**Yes** >> Go To 4

**No** >> Repair the (T16) Transmission Control Relay Output circuits for an open or high resistance. Note: There are multiple Transmission Control Relay Output circuits.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**4. TRANSMISSION CONTROL RELAY**

Turn the ignition off to the lock position.

Install a substitute Relay in place of the Transmission Control Relay.

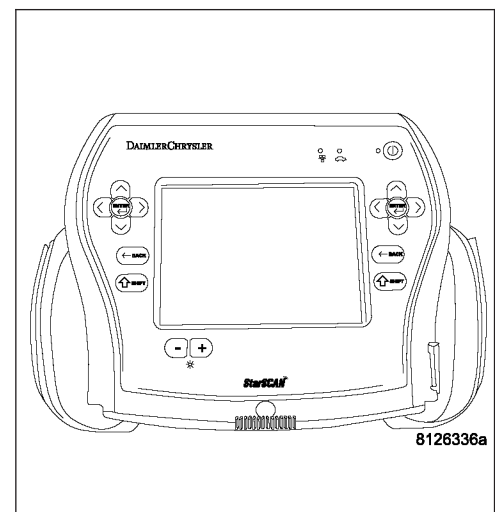
Ignition on, engine not running.

With the scan tool in Transmission Sensors, read the Switched Battery voltage.

**Does the Switched Battery voltage read battery voltage?**

**Yes** >> Replace the Transmission Control Relay.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5



**P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)****5. (Z901) TRANSMISSION CONTROL RELAY GROUND CIRCUIT OPEN**

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

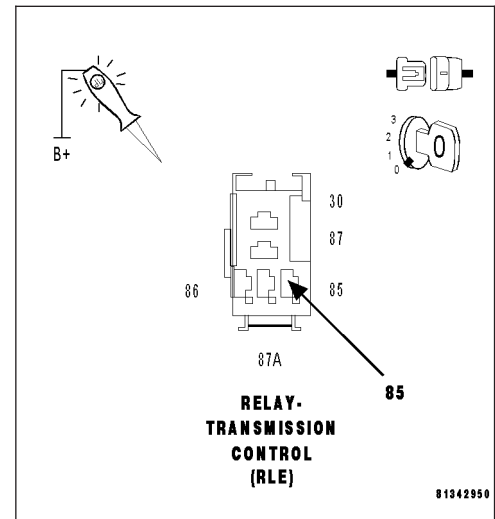
Using a 12-volt test light connected to 12-volts, check the (Z901) Transmission Control Relay Ground circuit.

**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly?**

**Yes** >> Go To 6

**No** >> Repair the (Z901) Transmission Control Relay Ground circuit for an open.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**6. (T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT OPEN**

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

Disconnect the PCM C4 harness connector.

**Note: Check connectors - Clean/repair as necessary.**

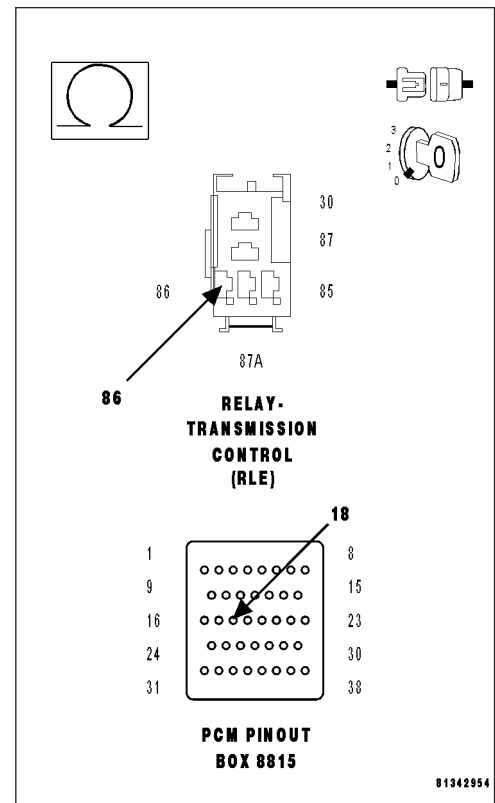
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance of the (T15) Transmission Control Relay Control circuit between the Transmission Control Relay connector and the appropriate terminal of special tool #8815.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T15) Transmission Control Relay Control circuit for an open.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7



**P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)****7. (T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

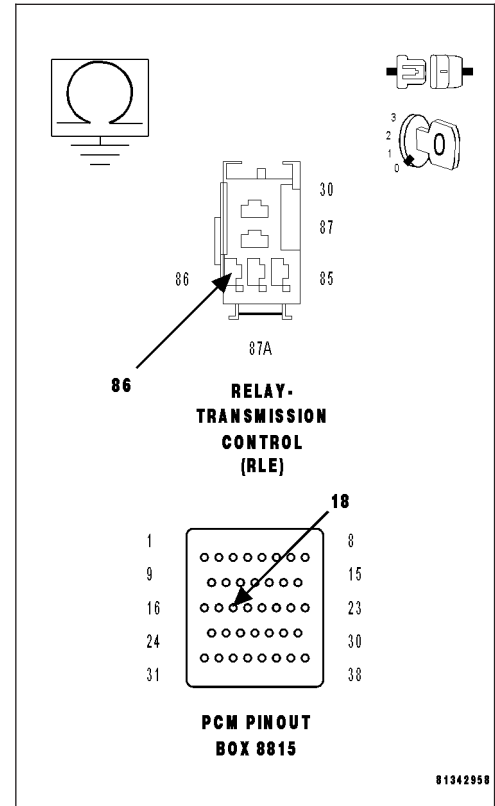
Measure the resistance between ground and the (T15) Transmission Control Relay Control circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T15) Transmission Control Relay Control circuit for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 8

**8. POWERTRAIN CONTROL MODULE**

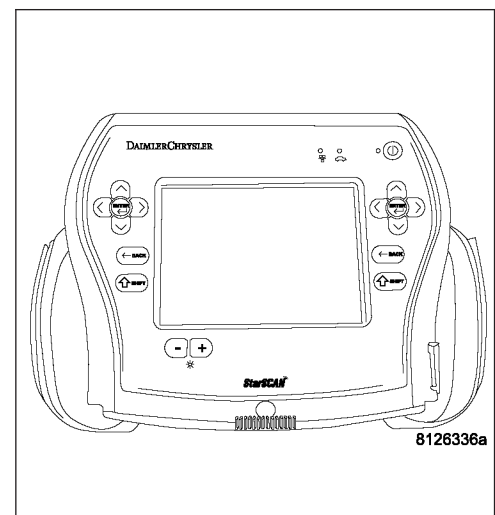
Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool PERFORM QUICK LEARN, then program Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)****9. OPEN FUSE**

Turn the ignition off to the lock position.  
 Remove the Transmission Control Relay.  
 Disconnect the PCM C4 harness connectors.

**Note: Check connectors - Clean/repair as necessary.**

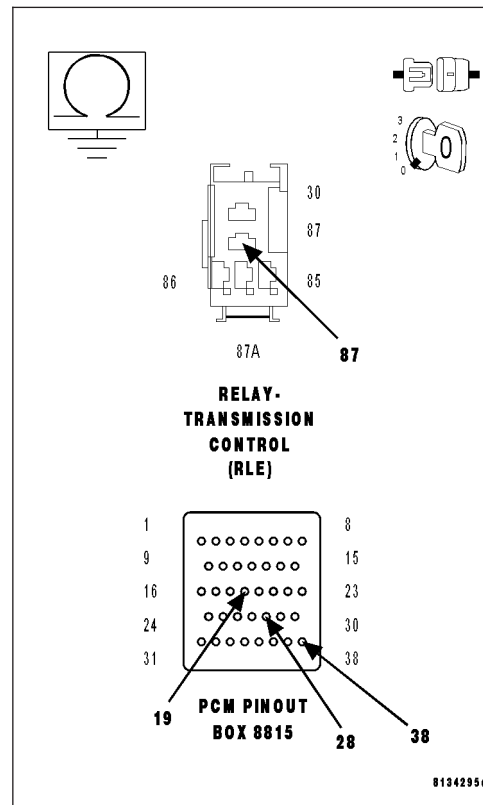
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the resistance between ground and the (T16) Transmission Control Relay Output circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 10

**No** >> Repair the Fused B+ circuit for an open.  
 Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**10. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.  
 Disconnect the PCM C4 harness connector.  
 Disconnect the Transmission Solenoid/Pressure Switch harness connector.  
 Remove the Transmission Control Relay.

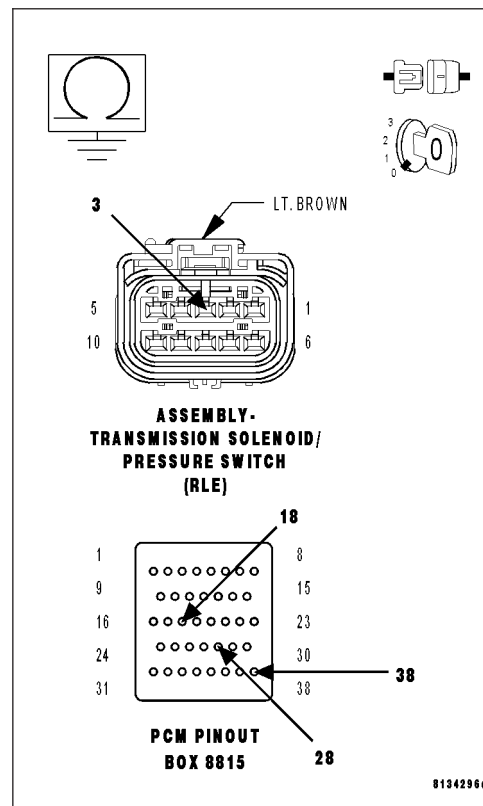
**Note: Check connectors - Clean/repair as necessary.**

Measure the resistance between ground and the (T16) Transmission Control Relay Output circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T16) Transmission Control Relay Output circuit for a short to ground.  
 Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 11



**P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)****11. TRANSMISSION SOLENOID/PRESSURE SWITCH ASSEMBLY**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Transmission Solenoid/Pressure Switch Assembly per the Service Information.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

**12. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set the DTC are not present at this time.  
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

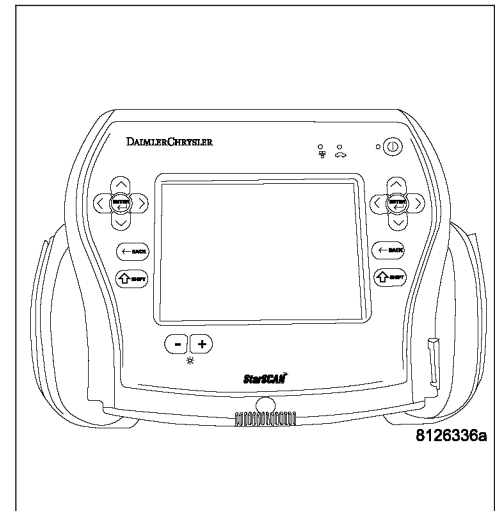
Wiggle the wiring and connectors while checking for shorted and open circuits.

With the scan tool, check the EATX EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.



## P0890-SWITCHED BATTERY



**P0890-SWITCHED BATTERY (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

One time after a reset (ignition key turned to the RUN position or after cranking engine).

- **Set Condition:**

Fault Set If: A voltage is greater than 4.5 volts is detected on any of the pressure switches, before the relay is energized. Fault Set Time: Less than 7 msec, transmission placed in Limp-In. MIL on after 10 sec. of vehicle operation).

Possible Causes
(T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
(T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The transmission relay is used to supply power to the solenoid pack when in normal operating mode, and to turn off power to produce transmission "limp-in" mode. The relay output (which supplies power to the solenoid pack) is fed back to the controller. It is referred to as SWITCHED BATTERY. After a controller reset (ignition key turned to the RUN position or after cranking engine), the controller verifies that the relay contacts are open by checking for no voltage on Switched battery line (ie. transmission control relay output) before the relay is energized. After switched battery is verified for no voltage, the voltage of each of the solenoid pack pressure switches is also checked. Since the solenoid pack is not powered up, there should be no voltage on any of the pressure switches.

## Diagnostic Test

### 1. CHECK TO SEE IF DTC P0890 IS PRESENT

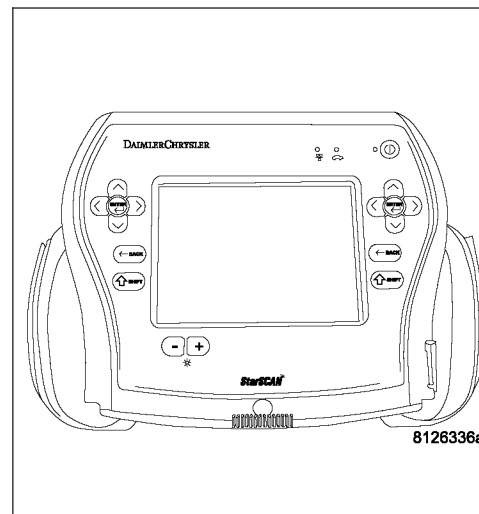
With the scan tool, Check the STARTS SINCE SET counter for P0890.

**Note:** This counter only applies to the last DTC set.

Is the "STARTS SINCE SET" counter set at 0?

**Yes**    >> Go To 2

**No**     >> Go To 6



**P0890-SWITCHED BATTERY (CONTINUED)****2. (T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

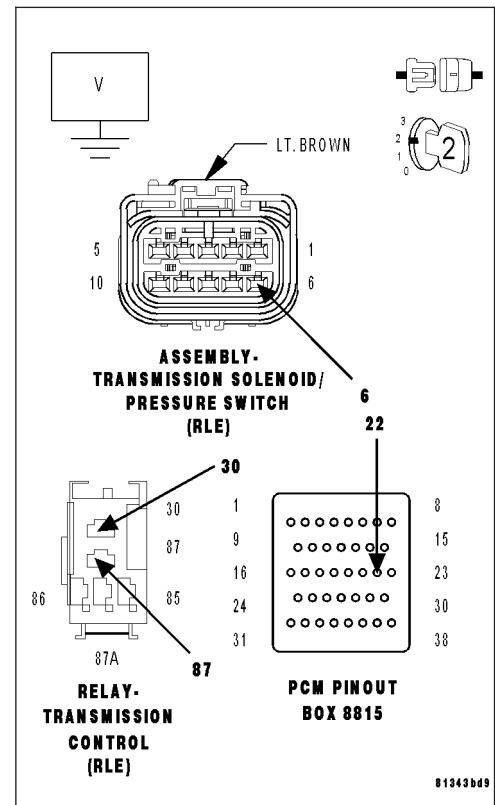
Measure the voltage of the (T9) OD Pressure Switch Sense circuit.

**Is the voltage above 0.5 volt?**

**Yes** >> Repair the (T9) OD Pressure Switch Sense circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. (T47) 2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

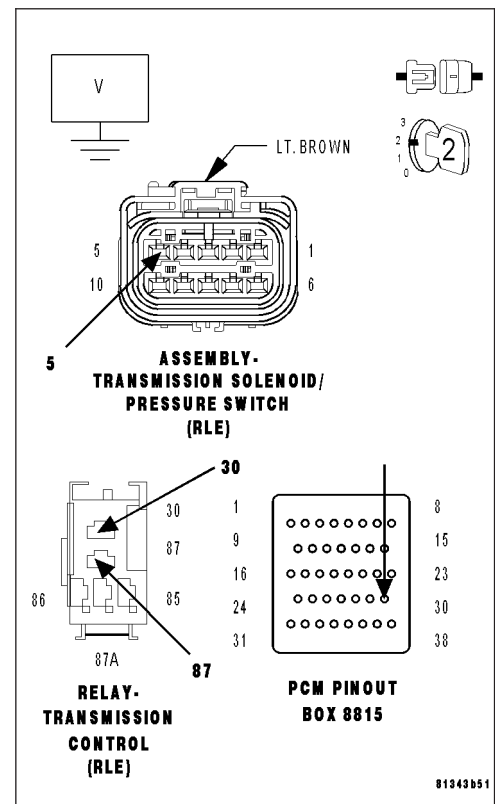
Measure the voltage of the (T47) 2/4 Pressure Switch Sense circuit.

**Is the voltage above 0.5 volt?**

**Yes** >> Repair the (T47) 2/4 Pressure Switch Sense circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4





**P0890-SWITCHED BATTERY (CONTINUED)****4. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

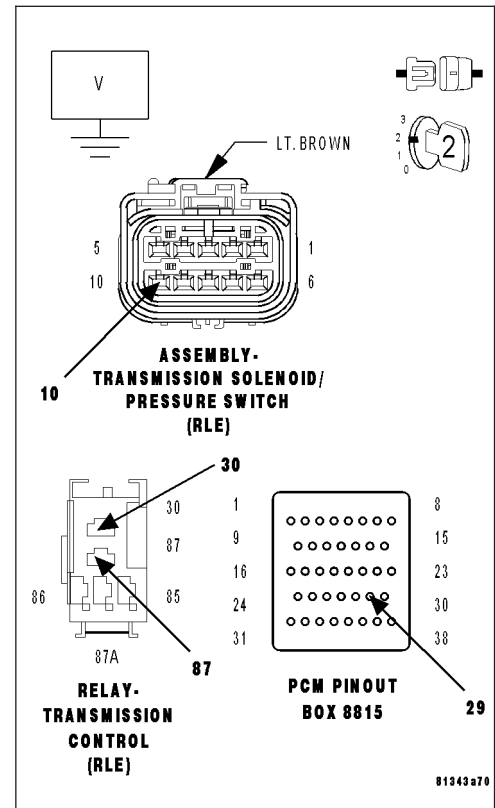
**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Measure the voltage of the (T50) L/R Pressure Switch Sense circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to voltage.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5

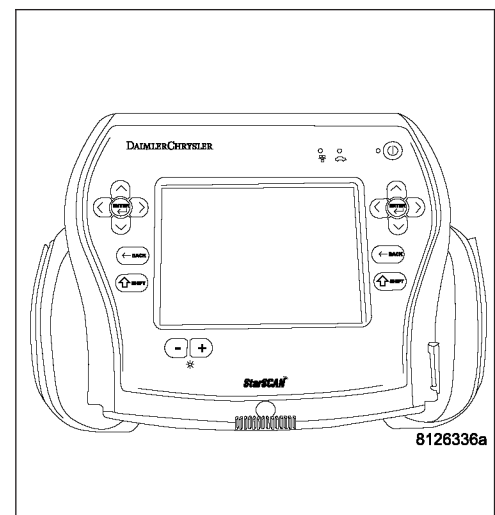
**5. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0890-SWITCHED BATTERY (CONTINUED)****6. INTERMITTENT WIRING AND CONNECTORS**

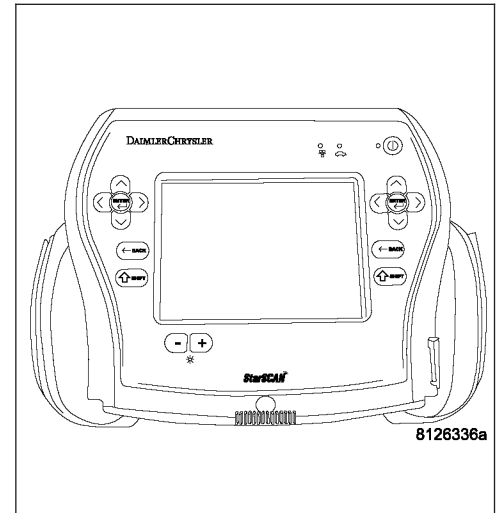
The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

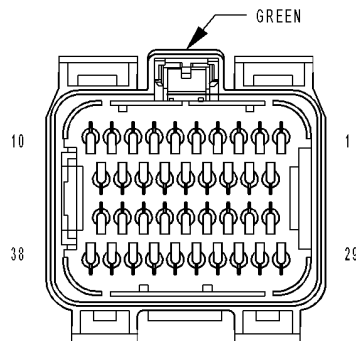
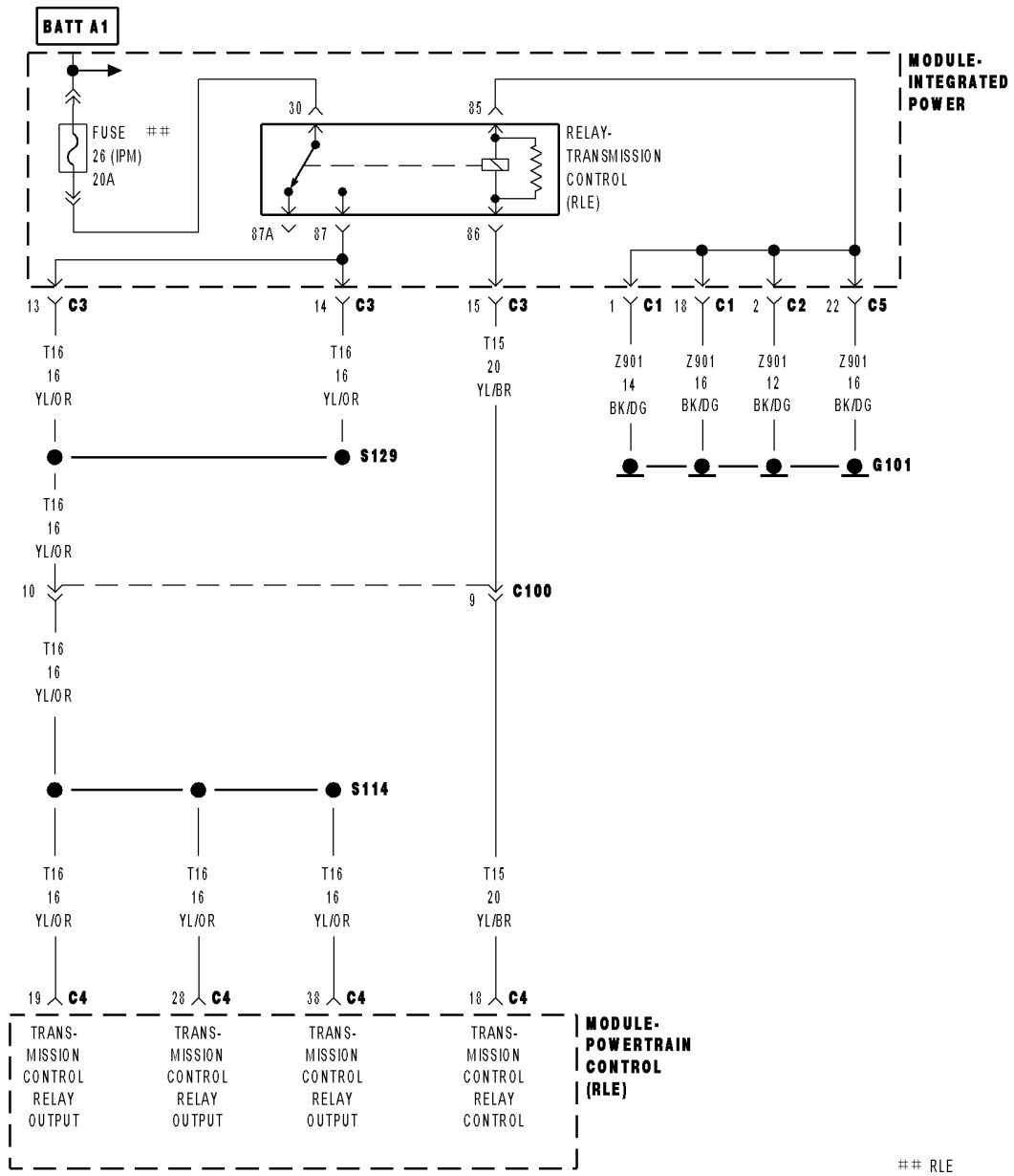
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

- Yes** >> Repair as necessary.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Test Complete.



# P0891-TRANSMISSION RELAY ALWAYS ON



**MODULE-  
POWERTRAIN  
CONTROL C4  
(RLE)**

**P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
After a reset (ignition key turned to the RUN position) and after a power down.
- **Set Condition:**  
Relay output (Switched Battery) is higher than 3 volts when relay is not energized by controller. Fault Set Time:  
Less than 100 msec

Possible Causes
TRANSMISSION CONTROL RELAY STUCK CLOSED (T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO VOLTAGE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUITS SHORT TO VOLTAGE POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The transmission relay is used to supply power to the solenoid pack when in normal operating mode, and to turn off power to produce transmission "limp-in" mode. The relay output (which supplies power to the solenoid pack) is fed back to the controller. This is referred to as SWITCHED BATTERY. After a controller reset (ignition key turned to the RUN position or after cranking engine), the controller verifies that the relay contacts are open by checking for no voltage on Switched battery line (ie. relay output) before the relay is energized. Transmission locked in Limp-In. MIL on after 10 sec. of vehicle operation.

**Diagnostic Test****1. CHECK TO SEE IF DTC P0891 IS CURRENT**

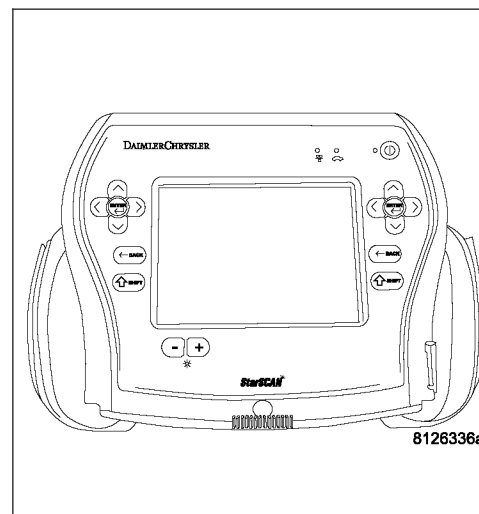
With the scan tool, Check the STARTS SINCE SET counter for P0891.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter equal to 0?**

**Yes** >> Go To 2

**No** >> Go To 6



**P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)****2. TRANSMISSION CONTROL RELAY CONTACTS STUCK CLOSED**

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Measure the resistance between the Fused B+ circuit and the Transmission Control Relay Output Circuit of the Transmission Control Relay.

**Is the resistance above 5.0 ohms?**

**Yes** >> Go To 3

**No** >> Replace the Transmission Control Relay.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

---

**3. (T16) TRANSMISSION RELAY OUTPUT CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

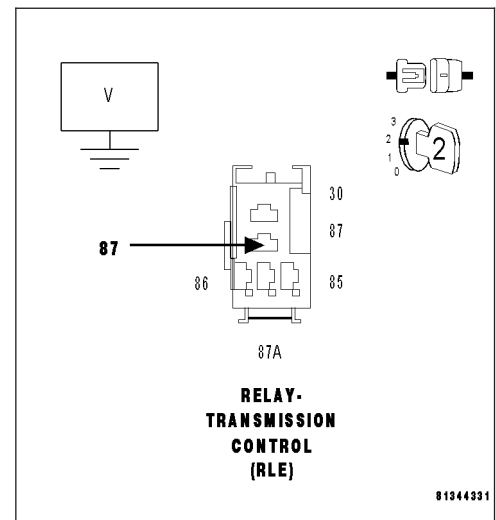
Ignition on, engine not running.

Measure the voltage at the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T16) Transmission Control Relay Output circuit for a short to voltage.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 4



**P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)****4. (T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Ignition on, engine not running.

**Note: The Transmission Controller will power up the Transmission Control Relay Control circuit for approximately 3.0 seconds after initial ignition on. Wait at least 3.0 seconds before performing the following voltage check.**

**Note: A One-trip fault may set for P0888 Relay Always Off, disregard the DTC.**

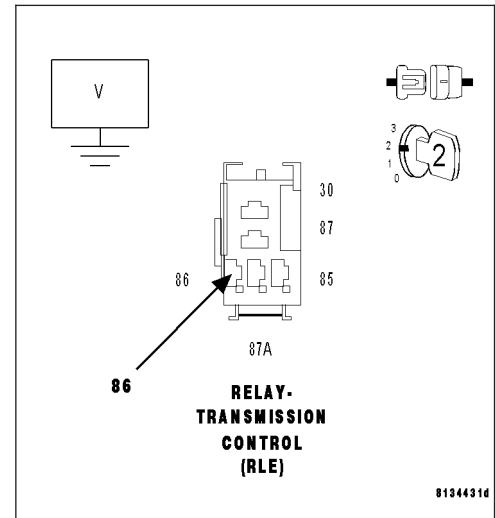
Measure the voltage at the (T15) Transmission Control Relay Control circuit after a 3.0 second wait period.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T15) Transmission Control Relay Control circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 5

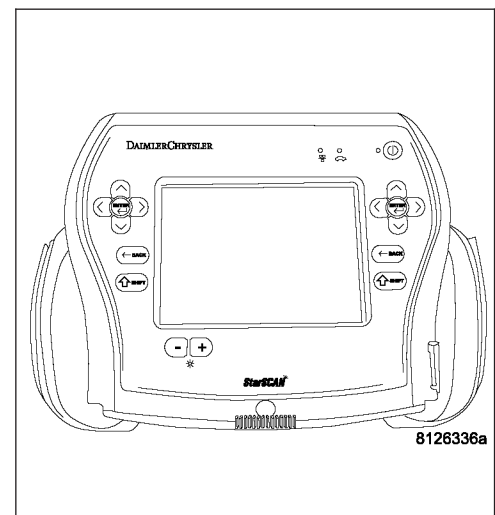
**5. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)****6. INTERMITTENT WIRING AND CONNECTORS**

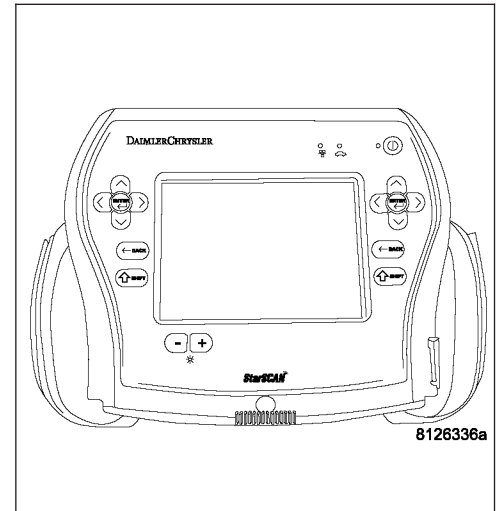
The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

- Yes**    >> Repair as necessary.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST -  
          VER 1.
- No**     >> Test Complete.



## P0897-TRANSMISSION FLUID DETERIORATED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Each transition from full EMCC to partial EMCC for A/C bump prevention.
- **Set Condition:**  
DTC set if 20 occurrences of a turbine acceleration sum. Fault Set Time: 20 transitions from full EMCC to partial EMCC. transmission will not use partial EMCC established for A/C bump prevention.

Possible Causes
WORN OUT/ BURNT TRANSAXLE FLUID

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

To prevent an objectionable bump due to A/C clutch engagement, a temporary torque converter partial EMCC condition is established prior to A/C clutch engagement. A message is received over the vehicles bus indicating that A/C clutch engagement is imminent. Partial EMCC is then established and a reply message, "ok to engage A/C clutch" is sent via the vehicles bus. Partial EMCC will be held for 450 ms before returning to full EMCC. During the transition from full to partial EMCC a turbine acceleration sum is calculated, if this value exceeds a threshold value for several transitions, degraded transmission fluid is indicated.

## Diagnostic Test

### 1. WORN OUT/ BURNT TRANSMISSION FLUID

Turn the ignition off to the lock position.

Flush the Transmission Oil Cooler and lines, replace the Transmission Oil Filter, refill with new Transmission Fluid, start the engine, and adjust the fluid per the Service Information.

**Note: The Transmission Cooler must be flushed before proceeding.**

Allow the engine to idle for 10 minutes, in Park.

Turn the ignition off to the lock position.

Again, flush the Transmission Oil Cooler and lines, replace the Transmission Oil Filter, refill with new Transmission Fluid, start the engine, and adjust the fluid per the Service Information.

With the scan tool, perform a Battery Disconnect.

**Note: The Battery Disconnect must be done to re-enable EMCC during an A/C Clutch engagement.**

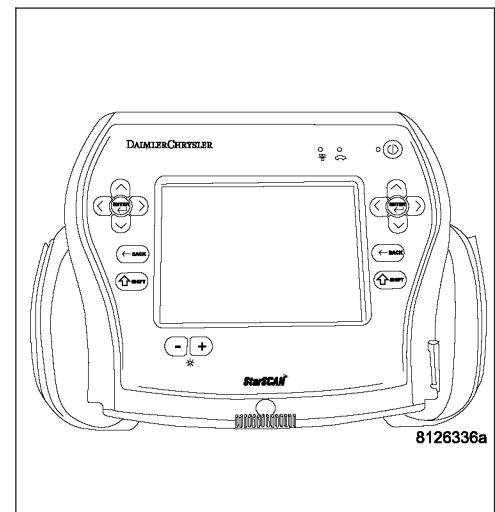
**Note: The vehicle may exhibit intermittent shudder during the first few hundred miles. The new Transmission Fluid will gradually penetrate the Torque Converter Clutch friction material and the shudder should disappear.**

Erase the DTC and return the vehicle to the customer.

**Did the DTC reset and/or does the vehicle still shudder after a few thousand miles?**

**Yes** >> Replace the Torque Converter per the Service Information.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.





## P0944-LOSS OF HYDRAULIC PUMP PRIME

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**

Every 350 msec

- **Set Condition:**

If the transmission begins to slip in any forward gear, and the pressure switch or switches that should be closed for a given gear are open, a loss of prime test begins. All available elements (in 1st gear LR, 2/4 and OD, in 2nd, 3rd, and 4th gear 2/4 and OD) are turned on by the PCM to see if pump prime exists. The code is set if none of the pressure switches respond. The PCM will continue to run the loss of prime test until pump pressure returns. The vehicle will not move or transmission slips. Normal operation will continue if pump prime returns.

Possible Causes
LOW TRANSMISSION FLUID LEVEL SHIFT LEVER POSITION PLUGGED TRANSMISSION OIL FILTER TRANSMISSION OIL PUMP

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

The Loss of prime test is used to prevent transmission defaults and erroneous fault codes during temporary loss of pump prime that may occur with low transmission fluid under severe braking conditions, start-up, etc. and to point towards more subtle problems such as a plugged or ruptured oil filter. The Loss of Prime fault is set by a loss of hydraulic pressure in the transmission system. This condition, if sustained, will result in the vehicle being unable to move.

## Diagnostic Test

### 1. CHECK TO SEE IF DTC P0944 IS CURRENT

Place the gear selector in park.

Start the engine.

**Note: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.**

The Transmission must be at operating temperature prior to checking pressure. A cold Transmission will give higher readings.

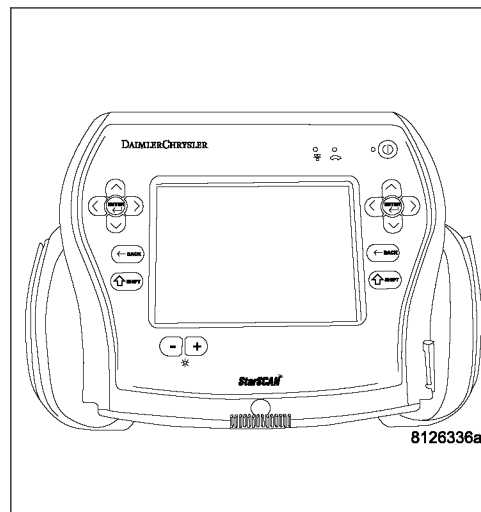
Place the Transmission in Reverse.

With the scan tool, observe the Transmission Pressure Switch states.

**Are any of the Pressure Switches closed?**

**Yes** >> Go To 2

**No** >> Go To 4



**P0944-LOSS OF HYDRAULIC PUMP PRIME (CONTINUED)****2. INTERMITTENT OPERATION**

The conditions necessary to set this DTC are not present at this time.

Test drive the vehicle. Allow the Transmission to shift through all gears and ranges.

**Did you experience a delayed engagement and/or a no drive condition?**

**Yes** >> Go To 4

**No** >> Go To 3

**3. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring while checking for shorted and open circuits.

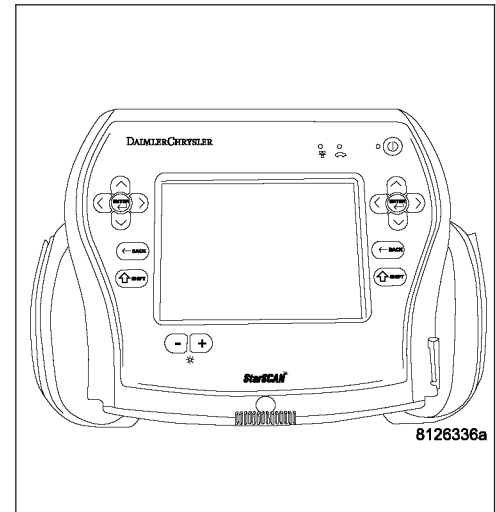
With the scan tool, check the EATX EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

**Yes** >> Repair as necessary.

Perform 42RLE TRANSMISSION VERIFICATION TEST -  
VER 1.

**No** >> Test Complete.

**4. SHIFT LEVER POSITION TEST**

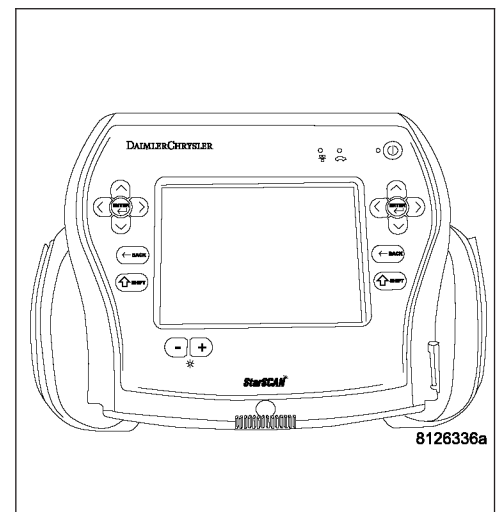
With the scan tool, perform a Shift Lever Position test. Follow the instructions on the scan tool.

**Did the Shift Lever Position Test pass?**

**Yes** >> Go To 5

**No** >> Refer to Table of Contents in this category and perform test for DTC P0706.

Perform 42RLE TRANSMISSION VERIFICATION TEST -  
VER 1.



## **P0944-LOSS OF HYDRAULIC PUMP PRIME (CONTINUED)**

### **5. CHECK FOR PLUGGED TRANSMISSION OIL FILTER**

Remove and inspect the Transmission Oil Pan and Transmission Oil Filter per the Service Information.

**Does the Transmission Oil Pan contain excessive debris and/or is the Oil Filter plugged?**

**Yes**    >> Repair the cause of the plugged Transmission Oil Filter. Refer to the Service Information for the proper repair procedure.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No**    >> Go To 6

---

### **6. TRANSMISSION OIL PUMP**

**If there are no possible causes remaining, view repair.**

#### **Repair**

Replace the Transmission Oil Pump per the Service Information.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

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## P0992-2/4/OD HYDRAULIC PRESSURE TEST

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

In any forward gear with engine speed above 1000 RPM, shortly after a shift and every minute thereafter.

- **Set Condition:**

After a shift into a forward gear, with engine speed greater than 1000 RPM, the PCM momentarily turns on element pressure to the clutch circuits that don't have pressure to identify the correct pressure switch closes.

If the pressure switch does not close 2 times the DTC sets.

Possible Causes
CONDITION P0992 PRESENT

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

Background: Pressure switches are normally off or open (no pressure applied) and read high (+12 volts). When an element is applied the corresponding pressure switch closes to ground (0 volts) or turns on. The controller tests the OD and 24 pressure switches when they are off (ie. when the corresponding friction element is not applied) by briefly applying the OD and 24 elements which will cause the corresponding pressure switch to close. The test verifies that the switches are operational and that the switch will close when the corresponding element is applied. If a switch fails to respond, it is re-tested. The MIL illuminates and the transmission system defaults to Limp-in mode.

### 1. CHECK TO SEE IF DTC P0992 IS CURRENT

**Note: The vehicle must be driven to set this DTC. The transmission must be warm or hot with the Engine RPM above 1000 RPM.** This DTC is an indication of both the 2/4 and the O/D Hydraulic Pressure Switch DTCs present.

Perform diagnostics for both P0870 and P0845 to determine which switch is failing.

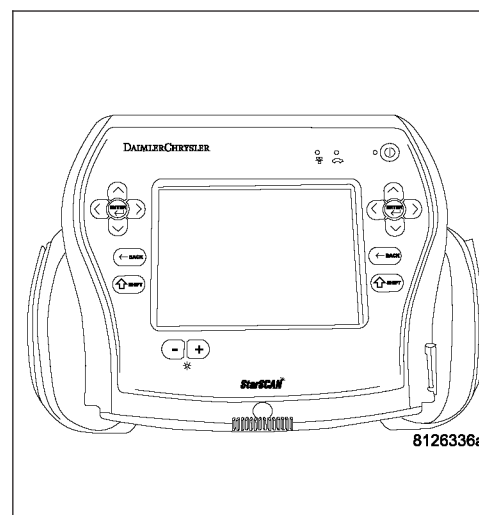
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**If there are no possible causes remaining, view repair.**

#### Repair

Refer to the Transmission category and perform the diagnostic procedures for P0845 and P0870.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



## P1684-BATTERY WAS DISCONNECTED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
After a reset (ignition key turned to the RUN position).
- **Set Condition:**  
The checksum of the battery backed RAM does not match the stored checksum. Set Time: Less than 7 msec.

Possible Causes
BATTERY WAS DISCONNECTED PCM WAS REPLACED OR DISCONNECTED QUICK LEARN WAS PERFORMED (A209) FUSED B+ CIRCUIT TO PCM OPEN (Z904) GROUND CIRCUITS OPEN

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

## Theory of Operation

Note: This is not a fault code. It exists to provide reference information only. A battery backed RAM is used to maintain some learned values. When the battery is disconnected, this memory is lost. When the battery is reconnected, the loss of learned values will be detected by the controller. The code will be set and the learned values will be initialized to known constants and the learning process will continue. Setting the code has no effect except for re-initialization of learned values.

## Diagnostic Test

### 1. BATTERY WAS DISCONNECTED

**Has the battery been disconnected, lost it's charge, or been replaced recently?**

**Yes**    >> Disconnecting or replacing the battery will set this DTC. Erase the DTC.  
          Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No**     >> Go To 2

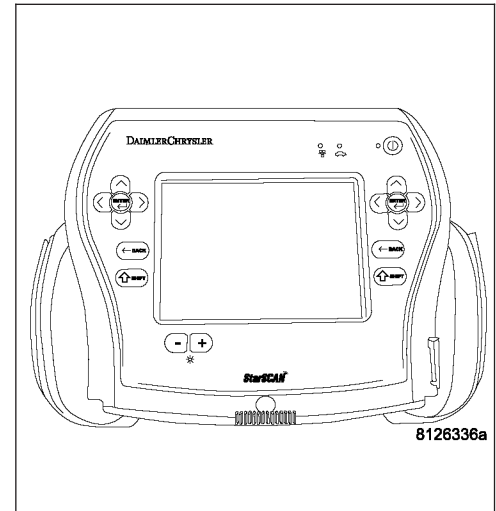
---

**P1684-BATTERY WAS DISCONNECTED (CONTINUED)****2. WAS QUICK LEARN PERFORMED**

**Has a Quick Learn procedure been performed?**

**Yes** >> Performing Quick Learn will set this DTC. Erase the DTC.  
Perform 42RLE TRANSMISSION VERIFICATION TEST -  
VER 1.

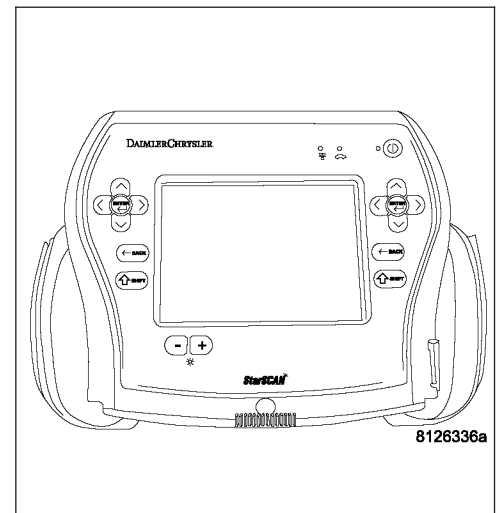
**No** >> Go To 3

**3. PCM REPLACED OR DISCONNECTED**

**Has the PCM been replaced or disconnected?**

**Yes** >> Replacing or disconnecting the PCM will set this DTC.  
Erase the DTC.  
Perform 42RLE TRANSMISSION VERIFICATION TEST -  
VER 1.

**No** >> Go To 4



**P1684-BATTERY WAS DISCONNECTED (CONTINUED)****4. (A209) FUSED B+ CIRCUIT**

Turn the ignition off to the lock position.

Disconnect the PCM C1 harness connector.

**Note: Check connectors - Clean/repair as necessary.**

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Using a 12-volt test light connected to ground, check the (A209) Fused B+ circuit.

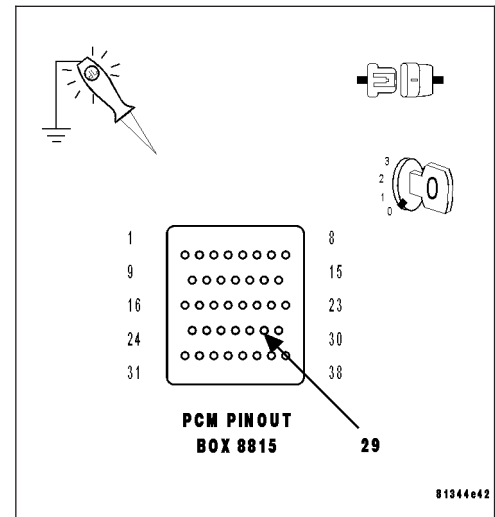
**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly?**

**Yes** >> Go To 5

**No** >> Repair the Fused B+ circuit for an open. If the fuse is open make sure to check for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**5. (Z904) GROUND CIRCUITS**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

**Note: Check connectors - Clean/repair as necessary.**

Using a 12-volt test light connected to 12-volts, check the (Z904) Ground circuits in the appropriate terminal of special tool #8815.

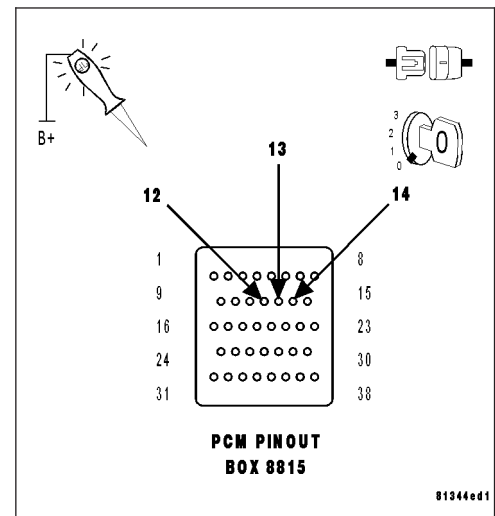
**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly for all the ground circuits?**

**Yes** >> Go To 6

**No** >> Repair the Ground circuits for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P1684-BATTERY WAS DISCONNECTED (CONTINUED)****6. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

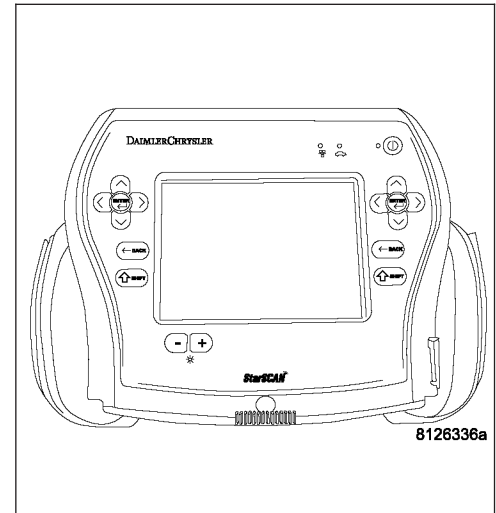
Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

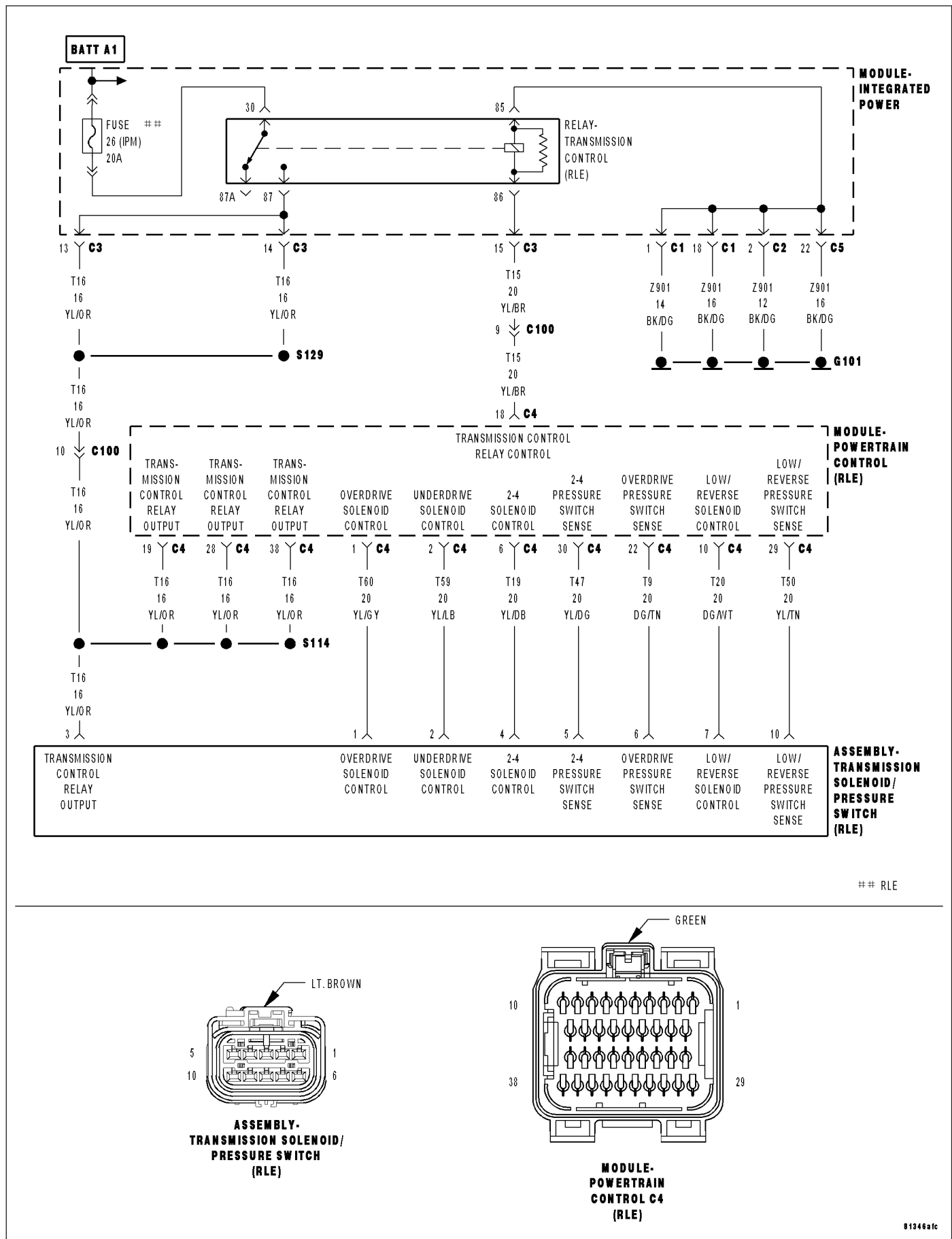
**Yes** >> Repair as necessary.  
Perform 42RLETRANSMISSION VERIFICATION TEST -  
VER 1.

**No** >> Test Complete.





# P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION



**P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Prior to a shift into 1st gear.
- **Set Condition:**  
Transmission temperature must be HOT. DTC is set after six unsuccessful attempts to shift into 1st gear.

Possible Causes
RELATED DTC P0841 PRESENT (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN (T50) L/R PRESSURE SWITCH SENSE CIRCUIT OPEN (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE INTERNAL TRANSMISSION POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The Solenoid Switch Valve, an internal, hydraulically operated valve, controls the direction of the transmission fluid when the LR solenoid is energized. When the solenoid switch valve is in the downshifted position and the LR solenoid is energized, fluid is directed to the LR element for 1st gear. When the solenoid switch valve is in the upshifted position (2nd, 3rd, and 4th gear) and the LR solenoid is energized, fluid is directed into the Lockup Switch Valve which controls the Torque Converter Clutch. When shifting into 1st gear, a special sequence is followed to insure solenoid switch valve movement into the downshifted position. The LR pressure switch is monitored to confirm switch valve movement. If the solenoid switch valve movement is not confirmed (i.e. no LR pressure when the LR solenoid is energized), 2nd gear is substituted for 1st. No 1st gear (2nd gear is substituted). The transmission Torque converter FEMCC operation is inhibited. MIL on after 5 min. of substituted operation.

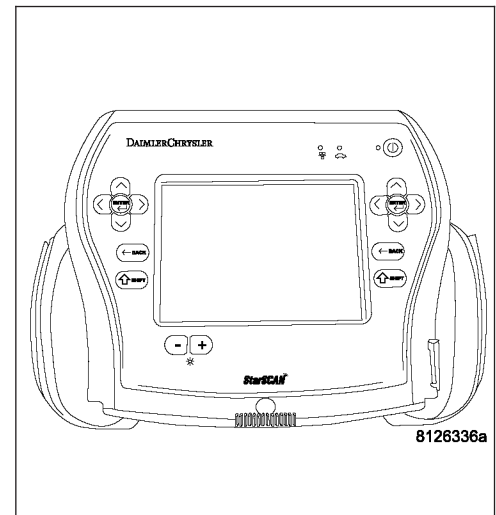
**P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)****Diagnostic Test****1. DETERMINING IF RELATED DTC'S ARE PRESENT**

With the scan tool, check for other Transmission DTC's

**Is the DTC P0841 present also?**

**Yes** >> Refer to the Transmission category and perform the appropriate diagnostic procedure.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2

**2. CHECK TO SEE IF DTC P1775 IS CURRENT**

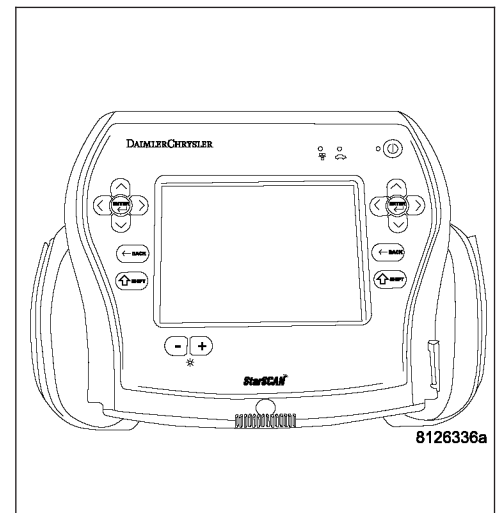
With the scan tool, check the STARTS SINCE SET counter for P1775.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter 2 or less?**

**Yes** >> Go To 3

**No** >> Go To 10



**P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)****3. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

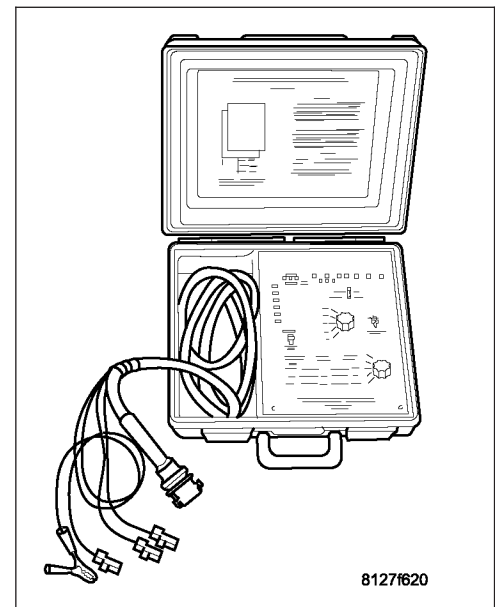
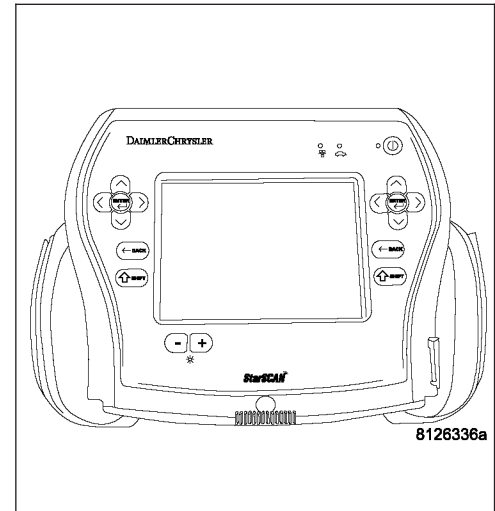
With the Transmission Simulator, turn the Pressure Switch selector switch to L/R.

With the scan tool, monitor the L/R Pressure Switch State while pressing the Pressure Switch Test button.

**Did the Pressure Switch state change from open to closed when the test button was pressed?**

**Yes** >> Go To 4

**No** >> Go To 5

**4. INTERNAL TRANSMISSION**

**If there are no possible causes remaining, view repair.**

**Repair**

Repair internal transmission as necessary per the Service Information. Inspect the Solenoid Switch Valve per the Service Information and repair or replace as necessary. If no problems are found, replace the Transmission Solenoid/Pressure Switch Assembly.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)****5. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit.

**Note: Check connectors - Clean/repair as necessary.**

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Disconnect the PCM C4 harness connector.

Remove the Starter Relay.

Using a 12-volt test light connected to ground, check all (T16) Transmission Control Relay Output circuits in the appropriate terminals of special tool #8815.

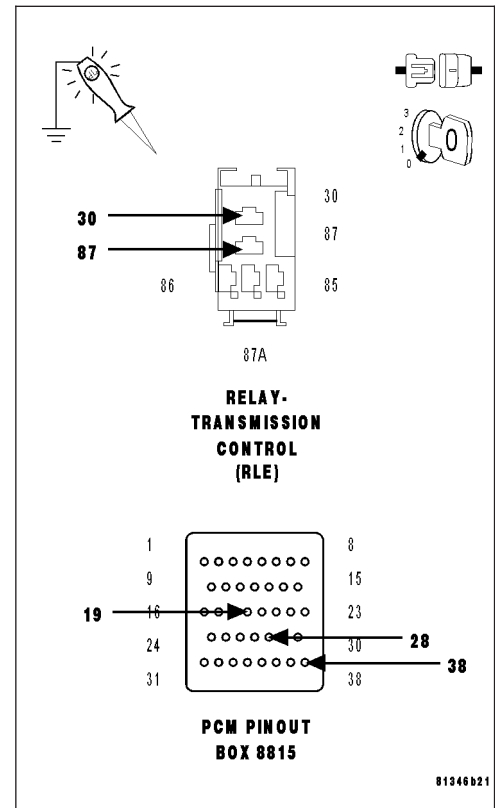
**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly on all Transmission Control Relay Output circuits?**

**Yes** >> Go To 6

**No** >> Repair the (T16) Transmission Control Relay Output circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)****6. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

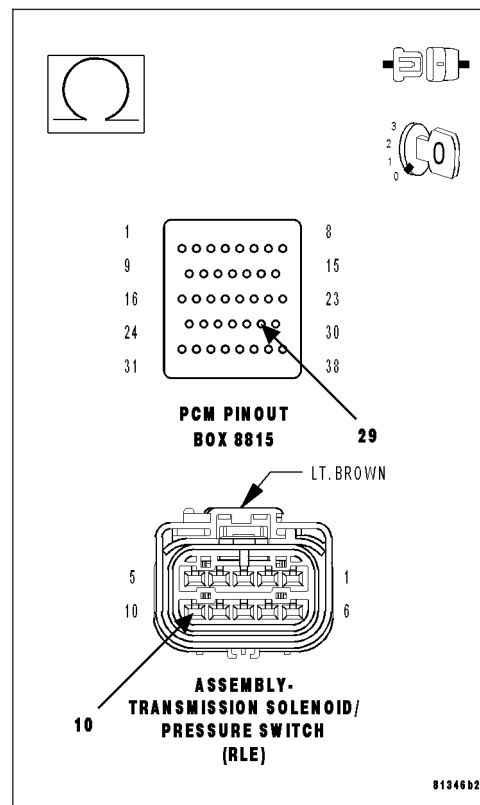
Measure the resistance of the (T50) L/R Pressure Switch Sense circuit from the appropriate terminal of special tool #8815 to the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T50) L/R Pressure Switch Sense circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

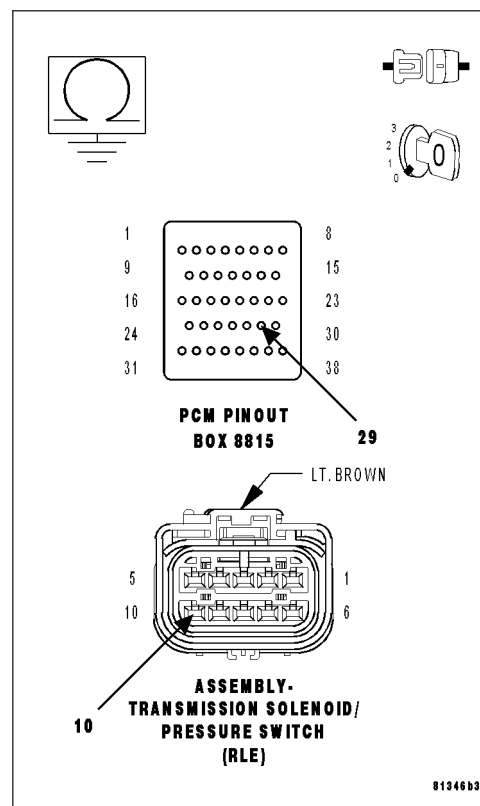
Measure the resistance between ground and the (T50) L/R Pressure Switch Sense circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 8



**P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)****8. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

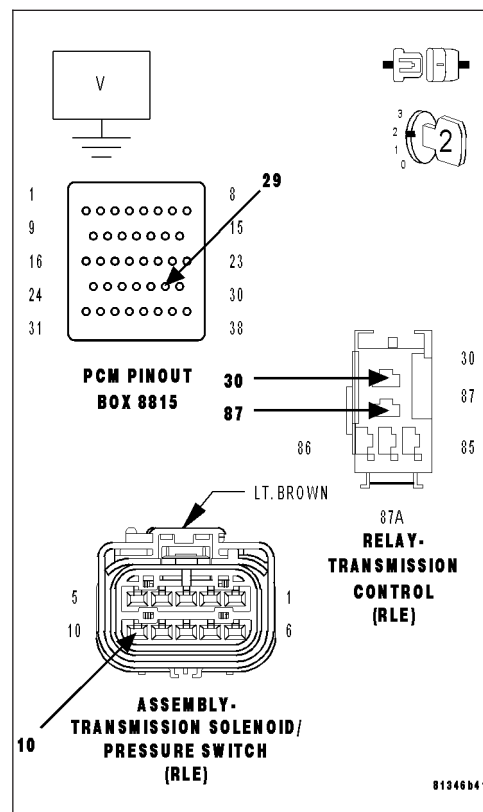
Measure the voltage of the (T50) L/R Pressure Switch Sense circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 9

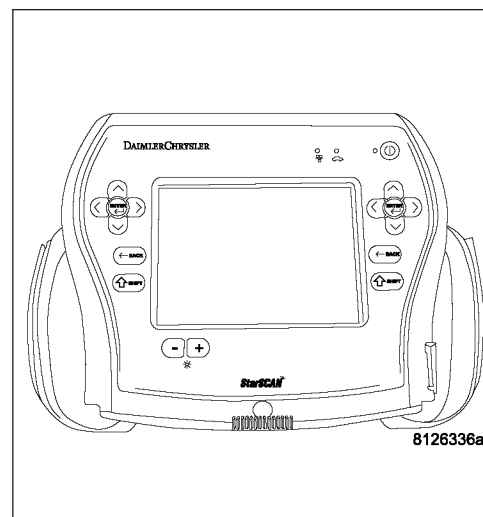
**9. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)****10. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time. Test drive and verify if the transmission is launching in 2nd gear and/or no TCC engagement.

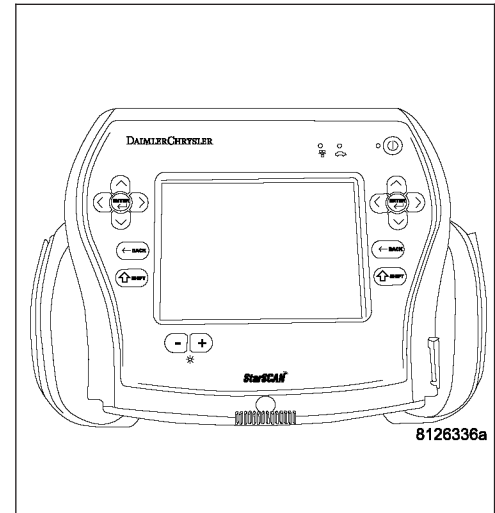
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Are there 2nd gear launches and/or no TCC engagement?**

**Yes** >> Disassemble and inspect the Valve Body per the Service Information and repair or replace as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid Pressure Switch Assembly.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.







**P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Every 7 ms when doing PEMCC or FEMCC.
- **Set Condition:**  
Must be in partial or full EMCC. The DTC is set if LR pressure is detected high for the fourth time.

Possible Causes
RELATED DTC P0841 PRESENT (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN (T50) L/R PRESSURE SWITCH SENSE CIRCUIT OPEN (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE INTERNAL TRANSMISSION POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The Solenoid Switch Valve, an internal, hydraulically operated valve, controls the direction of the transmission fluid when the LR solenoid is energized. When the solenoid switch valve is in the downshifted position and the LR solenoid is energized, fluid is directed to the LR element for 1st gear. When the solenoid switch valve is in the upshifted position (2nd, 3rd, and 4th gear) and the LR solenoid is energized, fluid is directed into the Lockup Switch Valve which controls the Torque Converter Clutch. When doing PEMCC or FEMCC, the LR pressure switch should indicate no pressure if the solenoid switch valve is in the LU position. If the LR pressure switch indicates pressure for some time while in partial or full EMCC, the EMCC operation is aborted and momentarily inhibited to avoid accidental application of the LR clutch. EMCC is attempted again when there is no LR pressure. The fourth detection of LR pressure while in PEMCC or FEMCC will result in setting the DTC. Torque converter EMCC operation inhibited. MIL on after 5 min. of substituted operation.

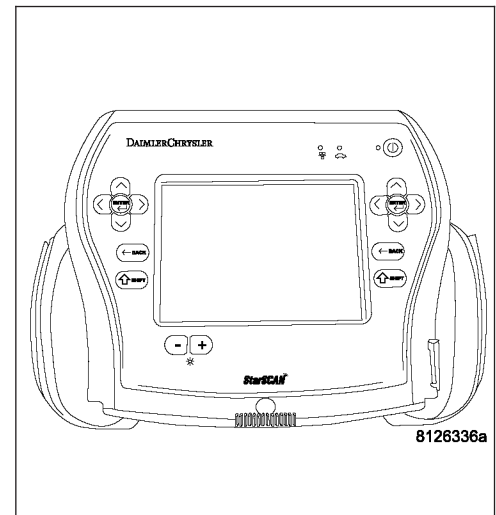
**P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)****Diagnostic Test****1. DETERMINING IF RELATED DTC'S ARE PRESENT**

With the scan tool, check for other Transmission DTC's

**Is the DTC P0841 present also?**

**Yes** >> Refer to the Transmission category and perform the appropriate diagnostic procedure.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 2

**2. CHECK TO SEE IF DTC P1776 IS CURRENT**

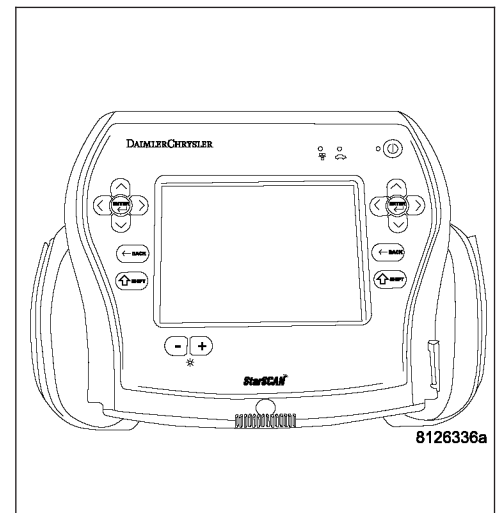
With the scan tool, check the STARTS SINCE SET counter for P1776.

**Note:** This counter only applies to the last DTC set.

**Is the STARTS SINCE SET counter 2 or less?**

**Yes** >> Go To 3

**No** >> Go To 10



**P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)****3. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

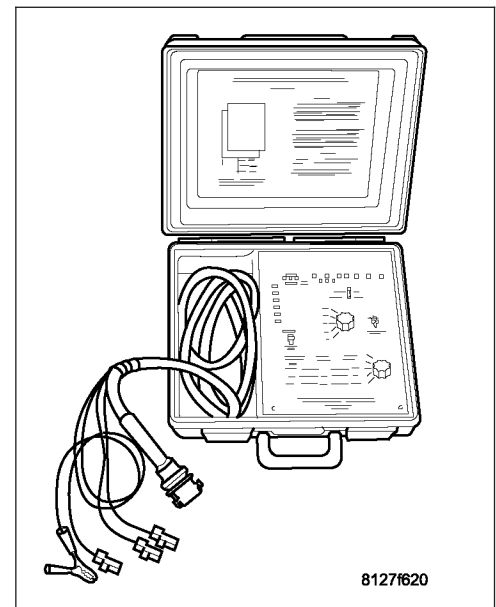
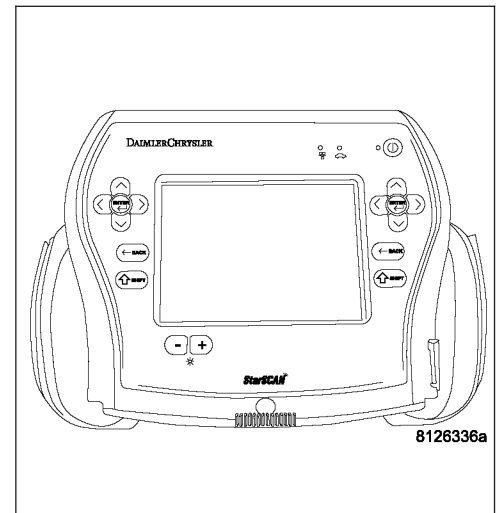
With the Transmission Simulator, turn the Pressure Switch selector switch to L/R.

With the scan tool, monitor the L/R Pressure Switch State while pressing the Pressure Switch Test button.

**Did the Pressure Switch state change from open to closed when the test button was pressed?**

**Yes** >> Go To 4

**No** >> Go To 5

**4. INTERNAL TRANSMISSION**

**If there are no possible causes remaining, view repair.**

**Repair**

Repair internal transmission as necessary per the Service Information. Inspect the Solenoid Switch Valve per the Service Information and repair or replace as necessary. If no problems are found, replace the Transmission Solenoid/Pressure Switch Assembly.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)****5. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit.

**Note: Check connectors - Clean/repair as necessary.**

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

Disconnect the PCM C4 harness connector.

Remove the Starter Relay.

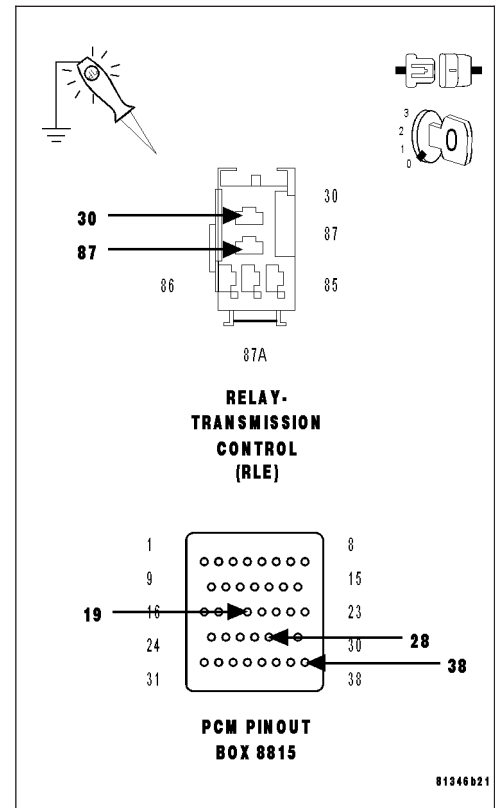
Using a 12-volt test light connected to ground, check all (T16) Transmission Control Relay Output circuits in the appropriate terminals of special tool #8815.

**Note: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.**

**Does the test light illuminate brightly on all Transmission Control Relay Output circuits?**

**Yes** >> Repair the (T16) Transmission Control Relay Output circuit(s) for an open.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 6



**P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)****6. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

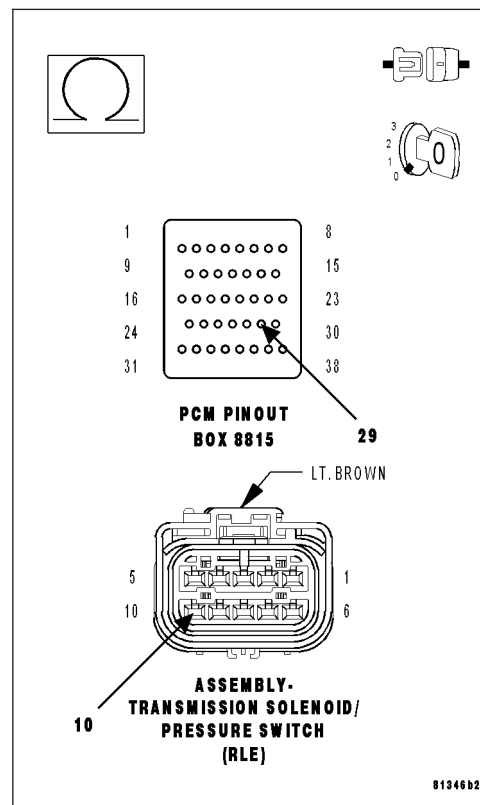
Measure the resistance of the (T50) L/R Pressure Switch Sense circuit from the appropriate terminal of special tool #8815 to the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Is the resistance above 5.0 ohms?**

**Yes** >> Repair the (T50) L/R Pressure Switch Sense circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 7

**7. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

**Note: Check connectors - Clean/repair as necessary.**

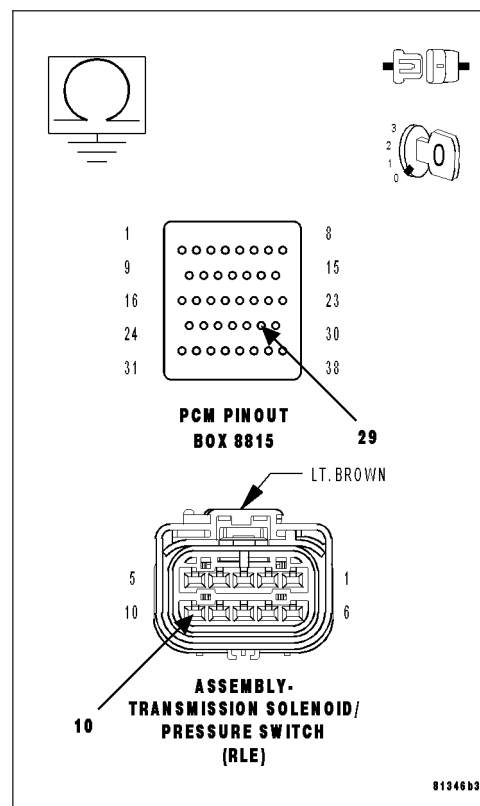
Measure the resistance between ground and the (T50) L/R Pressure Switch Sense circuit.

**Is the resistance below 5.0 ohms?**

**Yes** >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to ground.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 8



**P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)****8. (T50) L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Transmission Solenoid/Pressure Switch Assembly harness connector.

Remove the Transmission Control Relay.

**Note: Check connectors - Clean/repair as necessary.**

Connect a jumper wire between the (Internal) Fused B+ circuit and (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

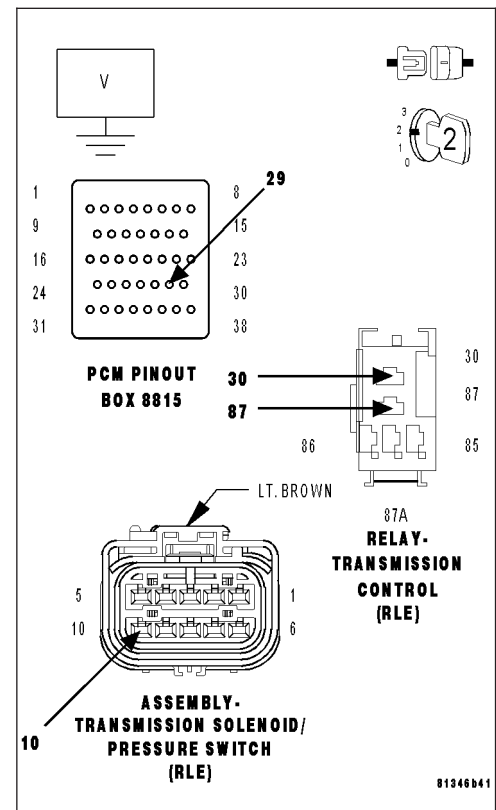
Measure the voltage of the (T50) L/R Pressure Switch Sense circuit.

**Is the voltage above 0.5 volts?**

**Yes** >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to voltage.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 9

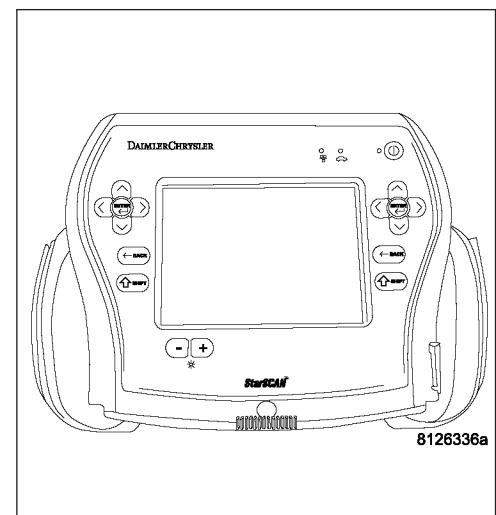
**9. POWERTRAIN CONTROL MODULE**

Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)****10. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set this DTC are not present at this time. Test drive and verify if the transmission is launching in 2nd gear and/or no TCC engagement.

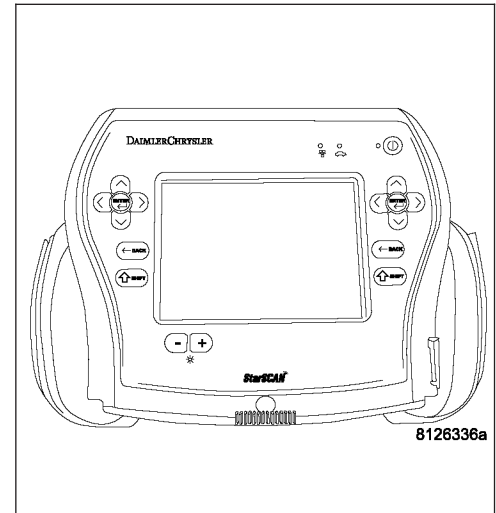
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Are there 2nd gear launches and/or no TCC engagement?**

**Yes** >> Disassemble and inspect the Valve Body per the Service Information and repair or replace as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid Pressure Switch Assembly.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Test Complete.





P1790-FAULT IMMEDIATELY AFTER SHIFT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
After a Gear Ratio Error code is stored.
- **Set Condition:**  
Gear Ratio Error DTC have already been set. The DTC is set if the fault happened within 1.3 seconds of a shift. The DTC set time will vary from 1.214 seconds to 15 seconds.

Possible Causes
FAULT AFTER SHIFT

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

Theory of Operation

This DTC is not stored alone. It is stored if a Gear Ratio DTC is detected immediately after shift. The existence of DTC P1790 indicates a mechanical or hydraulic (non-electrical) related problems. It should be noted, however, that all mechanical problems don't necessarily result in DTC P1790. When this DTC exists, diagnosing the system should be based on the associated DTC and only mechanical causes should be considered.

Diagnostic Test

1. FAULT AFTER SHIFT

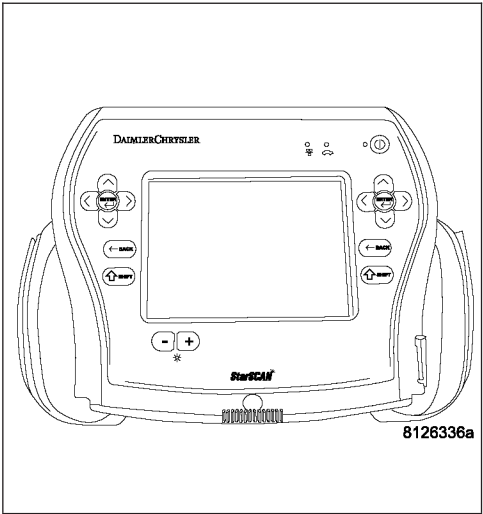
This DTC is set along with a Gear Ratio DTC. Perform the appropriate test for the Gear Ratio DTC stored.

**Note: Check 1 trip failures if there are no Gear Ratio DTCs current.**

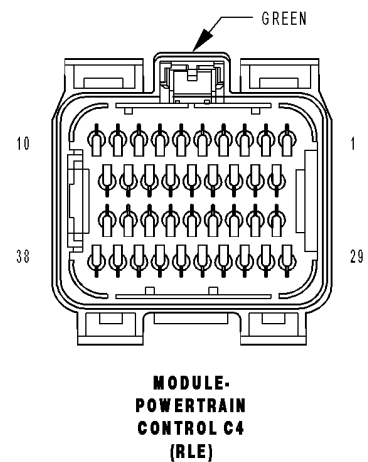
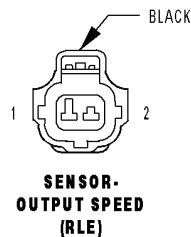
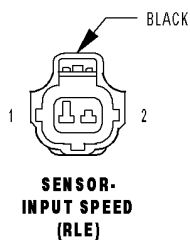
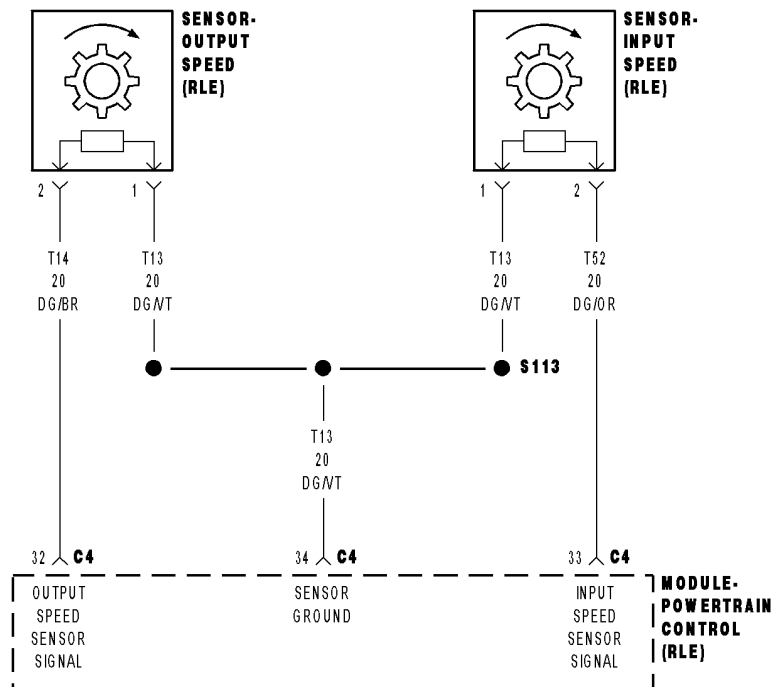
**If there are no possible causes remaining, view repair.**

Repair

Refer to the Transmission category and perform the appropriate diagnostic procedure.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



## P1794-SPEED SENSOR GROUND ERROR



**P1794-SPEED SENSOR GROUND ERROR (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Every 7ms after a controler reset with transmission range in neutral.
- **Set Condition:**  
After a PCM reset in neutral and Input/Output Ratio equals a ratio of 2.50 to 1.0 ± 50.0 RPM.

Possible Causes
SPEED SENSOR GROUND CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

**Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).**

**Theory of Operation**

The two speed sensors in the transmission system and use a common ground circuit. The loss of this common ground results in the input signal being sensed by both sensors. After a reset and in neutral, and observing a certain Output/Input ratio will increment the Speed Check Fault Counter. Because the speed sensors and the thermistor share the same ground wire, this DTC may indicate a loss of the common speed sensor ground. In some cases this fault will cause a Gear Ratio Error DTC to be set.

**P1794-SPEED SENSOR GROUND ERROR (CONTINUED)****Diagnostic Test****1. PCM AND WIRING**

Turn the ignition off to the lock position.

Remove the Starter Relay.

**CAUTION: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.**

Install the Transmission Simulator, Miller tool #8333 and the Electronic Transmission Adapter kit 8333-1A.

Ignition on, engine not running.

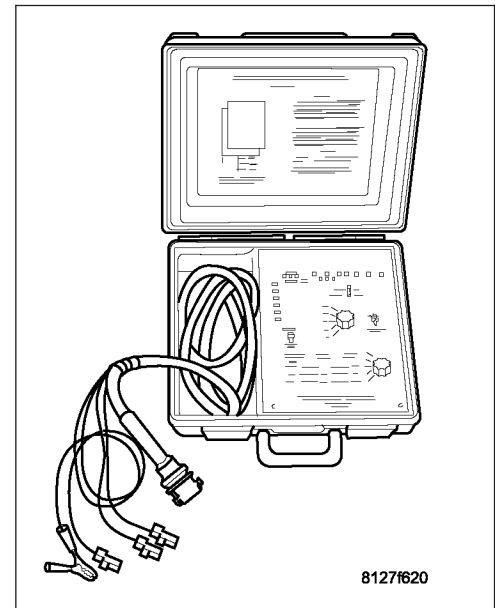
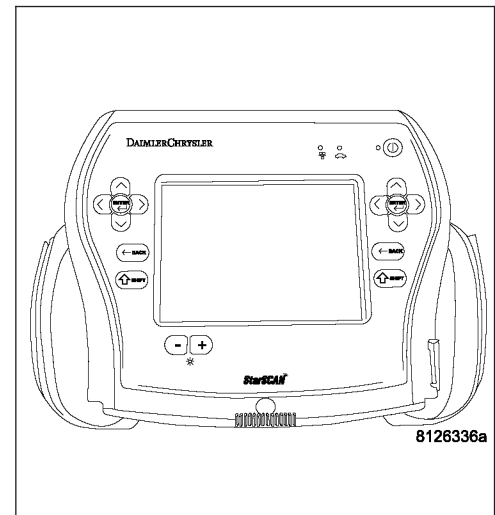
With the Transmission Simulator, set the "Input/Output Speed" switch to "ON" and the rotary switch to the "3000/1250" position.

With the scan tool, monitor the Input and Output Speed Sensor readings.

**Does the Input Speed read 3000 RPM and the Output Speed read 1250 RPM,  $\pm$  50 RPM?**

**Yes** >> Go To 2

**No** >> Go To 4



**P1794-SPEED SENSOR GROUND ERROR (CONTINUED)****2. (T13) SPEED SENSOR GROUND CIRCUIT OPEN**

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector.

Disconnect the Input and Output Speed Sensor harness connectors.

**Note: Check connectors - Clean/repair as necessary.**

**CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller Special Tool #8815 to perform diagnosis.**

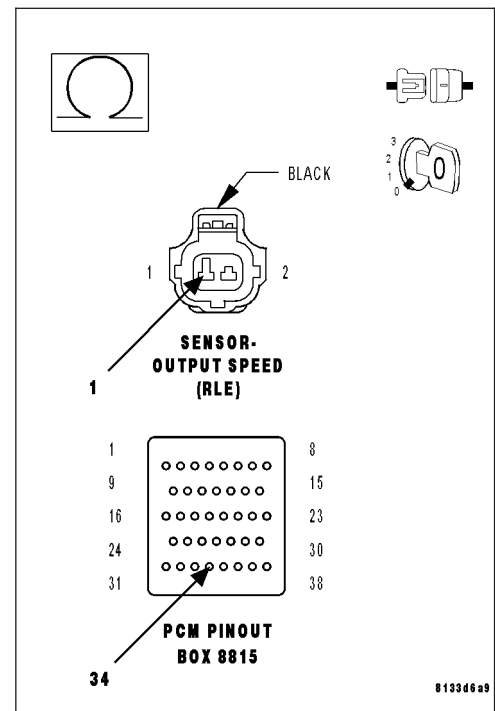
Measure the resistance of the (T13) Speed Sensor Ground circuit from the appropriate terminal of special tool #8815 to the Input and Output Speed Sensor harness connectors.

**Is the resistance above 5.0 ohms on either circuit?**

**Yes** >> Repair the (T13) Speed Sensor Ground circuit for an open.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.

**No** >> Go To 3

**3. POWERTRAIN CONTROL MODULE**

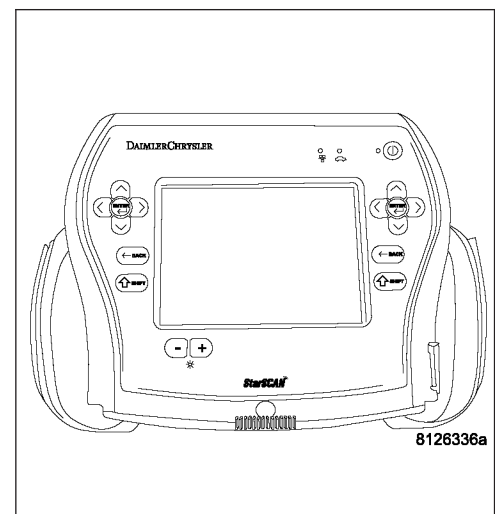
Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits.

**If there are no possible causes remaining, view repair.**

**Repair**

Replace and program the Powertrain Control Module per the Service Information. With the scan tool perform QUICK LEARN, then program Pinion Factor in the Front Control Module.

Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



**P1794-SPEED SENSOR GROUND ERROR (CONTINUED)****4. INTERMITTENT WIRING AND CONNECTORS**

The conditions necessary to set the DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

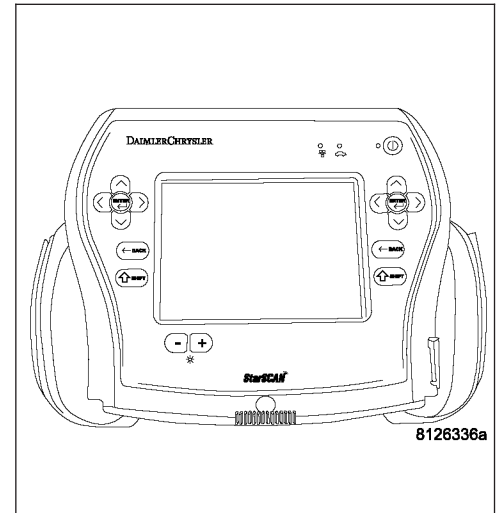
Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

**Were there any problems found?**

**Yes** >> Repair as necessary.  
Perform 42RLE TRANSMISSION VERIFICATION TEST -  
VER 1.

**No** >> Test Complete.



P1797-MANUAL SHIFT OVERHEAT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Continuously with engine running.
- **Set Condition:**  
If the Engine Temperature exceeds 123° C or 255° F, or the Transmission Temperature exceeds 135° C or 275° F while in AutoStick® mode. Note: Aggressive driving or driving in low for extended periods of time will set this DTC.

Possible Causes
MANUAL SHIFT OVERHEAT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING).

Theory of Operation

The major cause of heat build up in the transmission is torque converter slip. With the transmission in the autostick mode, the torque converter can slip during aggressive driving or heavy loading conditions such as trailer tow or steep grades. In the non autostick mode the controller logic prevents the transmission from overheating by managing the shift and EMCC schedule. In the autostick mode when the transmission or engine temperature approaches an overheat condition, the manual shift overheat DTC is set and the autostick mode is temporarily suspended until the temperature returns to a normal condition.

Diagnostic Test

1. MANUAL SHIFT OVERHEAT

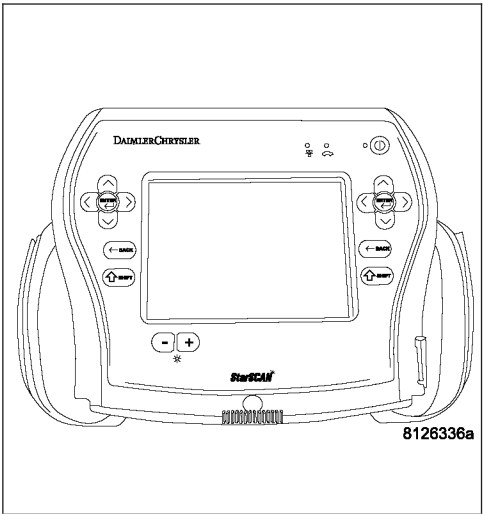
- This is an informational DTC only.
- With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.
- Check the engine and transmission cooling system for proper operation.
- Check the Radiator Cooling Fan operation.
- Check the Transmission Cooling operation.
- Check the Transmission Fluid Level per the Service Information. Make sure it is not overfilled.

**Note:** Aggressive driving or driving in low for extended periods of time will set this DTC.

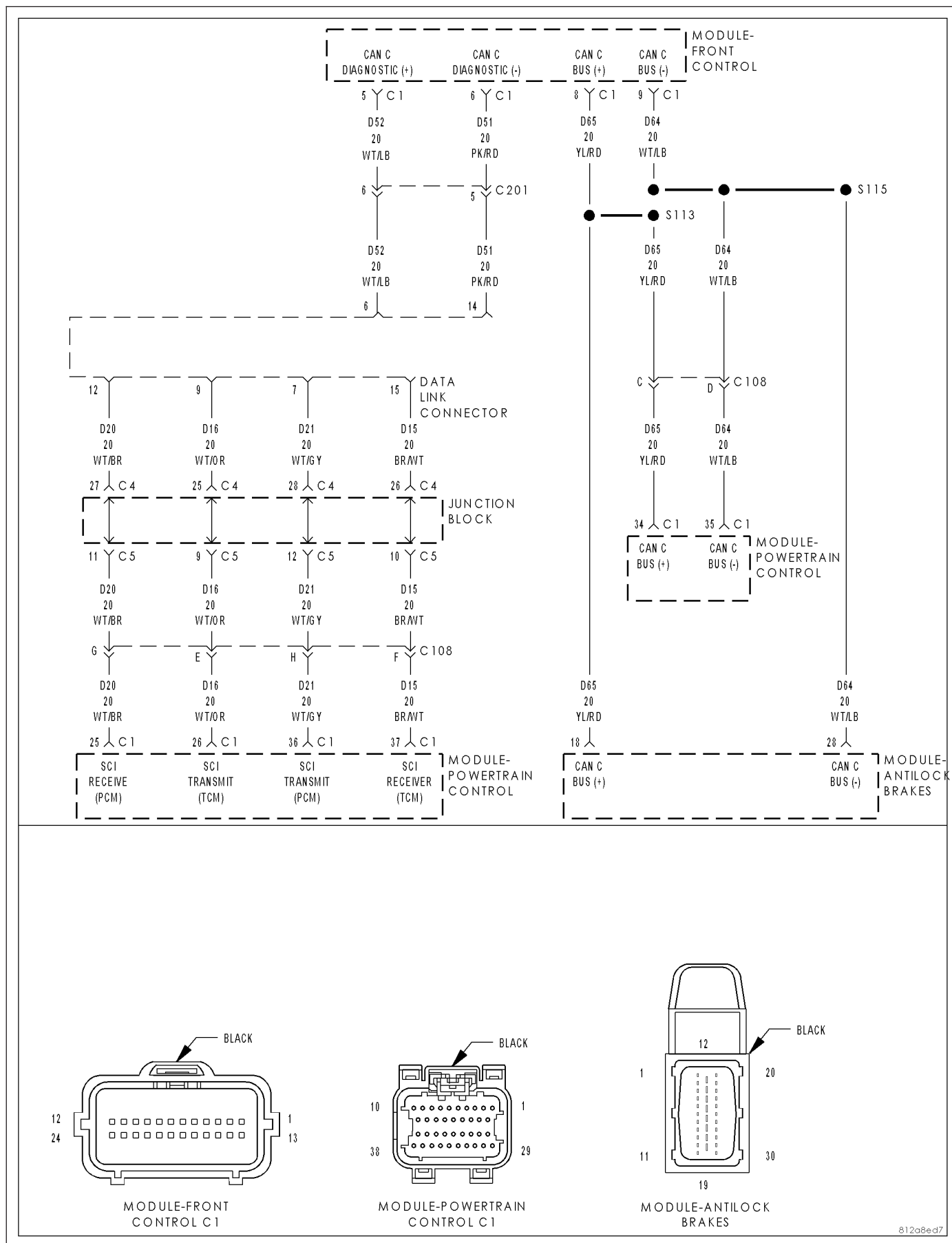
If there are no possible causes remaining, view repair.

Repair

- If the Transmission Fluid is low, repair any Transmission Fluid leak as necessary and adjust the Transmission Fluid Level per the Service Information. Refer to Service Information for the related symptoms and repair as necessary.
- Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.



# U0002 CAN C BUS OFF PERFORMANCE





**U0002 CAN C BUS OFF PERFORMANCE (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

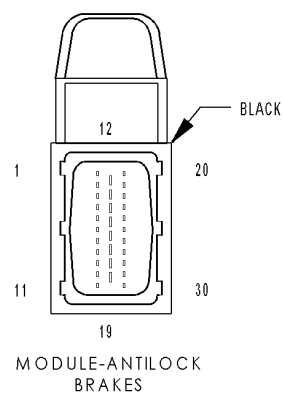
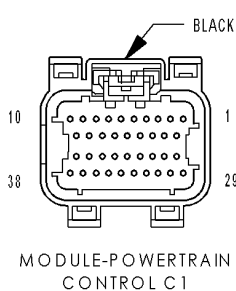
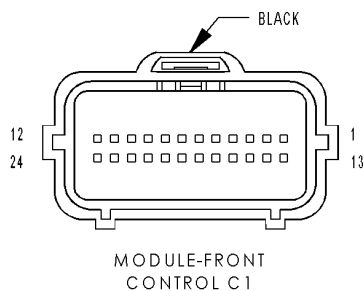
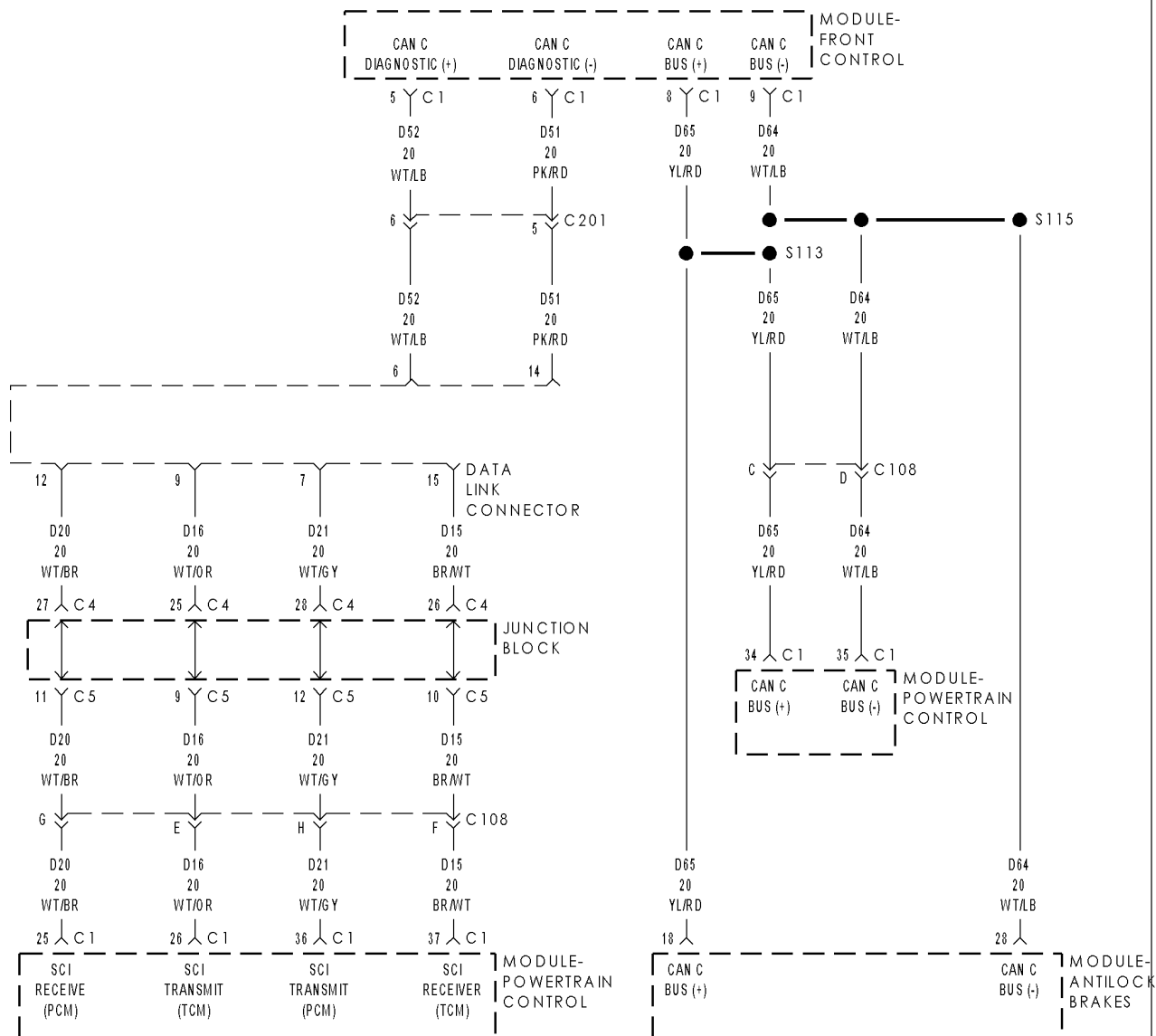
- **When Monitored:**  
Every 7 msec. Conditions: 1) Engine speed greater than 500 RPM. 2) Battery voltage greater than 10v but less than 16v.
- **Set Condition:**  
CAN C bus messages not received for 10 seconds.

**Theory of Operation**

Some NGC controllers communicate with other controllers over the CAN C bus. The transmission controller continuously monitors the bus activity and receives the messages it needs. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller, therefore if the Engine Controller is unable to communicate with the Transmission Controller, the Engine Controller will light the MIL.

**Diagnose the U0002 CAN C BUS OFF PERFORMANCE as the U0001 CAN C BUS CIRCUIT test in 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.**

# U0100 LOST COMMUNICATION WITH ECM/PCM



**U0100 LOST COMMUNICATION WITH ECM/PCM (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Every 7 msec. Conditions: 1) Engine speed greater than 500 RPM. 2) Battery voltage greater than 10v but less than 16v.

- **Set Condition:**

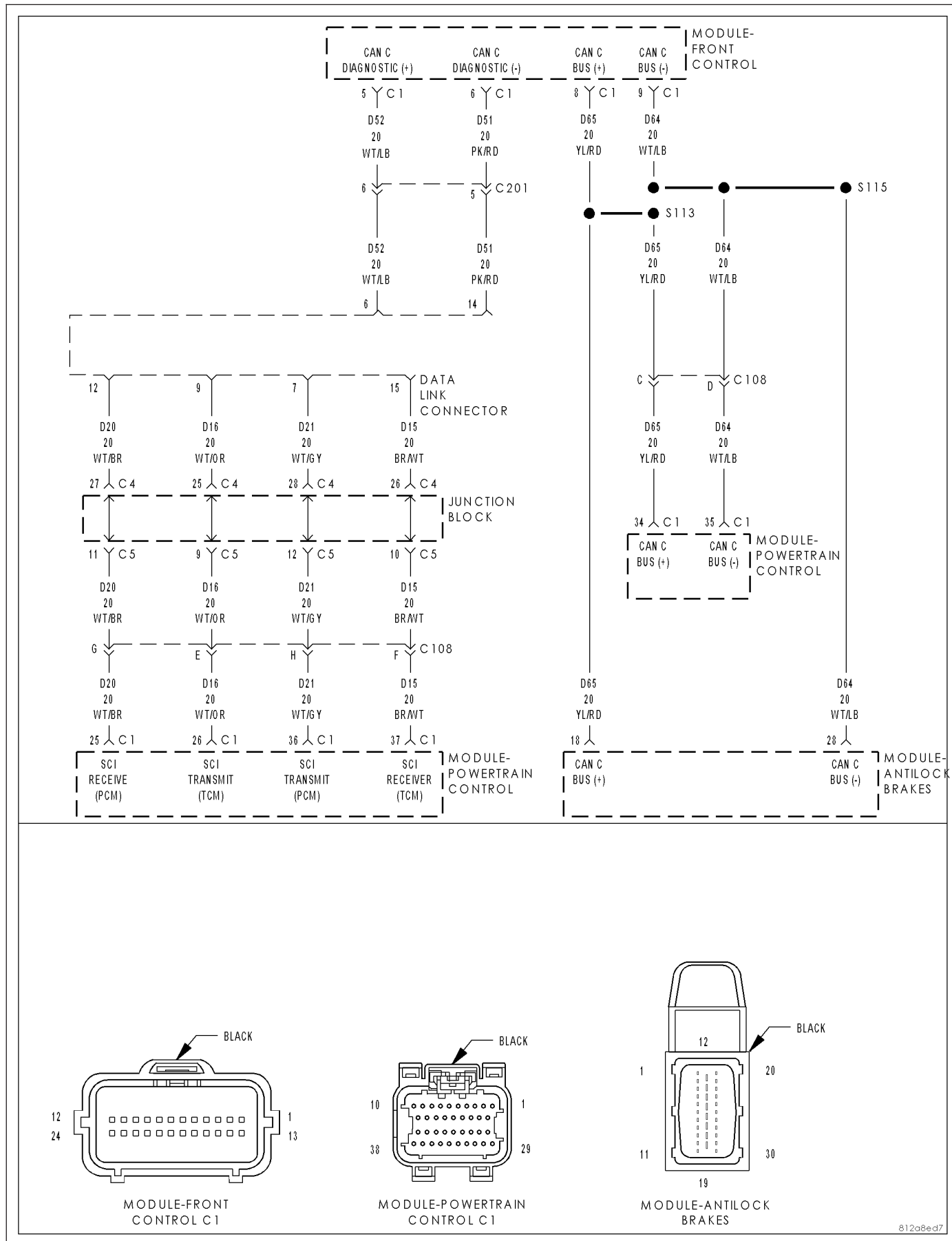
CAN C bus messages not received for 10 seconds.

## **Theory of Operation**

Some NGC controllers communicate with other controllers over the CAN C bus. The transmission controller continuously monitors the bus activity and receives the messages it needs. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller, therefore if the Engine Controller is unable to communicate with the Transmission Controller, the Engine Controller will light the MIL.

**Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.**

# U0121 LOST COMMUNICATION WITH ABS



**U0121 LOST COMMUNICATION WITH ABS (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Every 7 msec. Conditions: 1) Engine speed greater than 500 RPM. 2) Battery voltage greater than 10v but less than 16v.

- **Set Condition:**

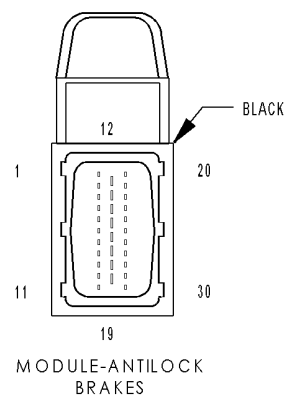
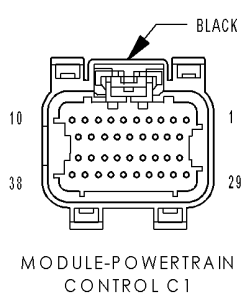
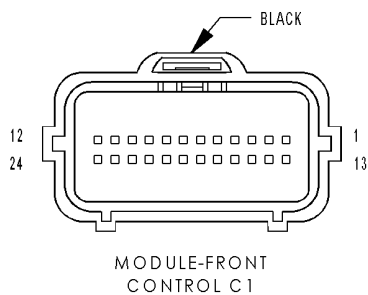
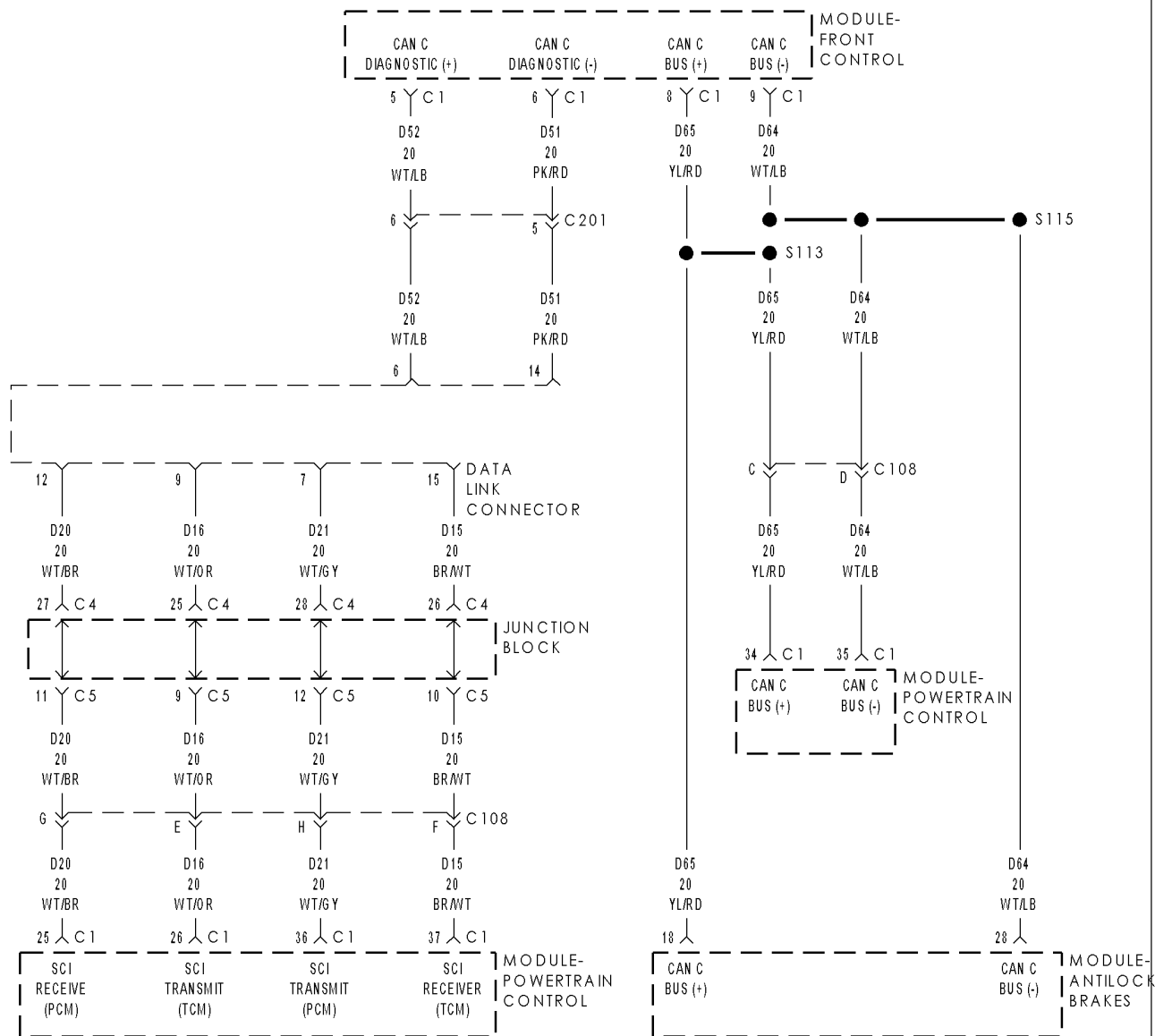
CAN C bus messages not received for 10 seconds.

**Theory of Operation**

Some NGC controllers communicate with other controllers over the CAN C bus. The transmission controller continuously monitors the bus activity and receives the messages it needs. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller, therefore if the Engine Controller is unable to communicate with the Transmission Controller, the Engine Controller will light the MIL.

**Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.**

# U0141 LOST COMMUNICATION WITH FCM



**U0141 LOST COMMUNICATION WITH FCM (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Every 7 msec. Conditions: 1) Engine speed greater than 500 RPM. 2) Battery voltage greater than 10v but less than 16v.
- **Set Condition:**  
CAN C bus messages not received for 10 seconds.

**Theory of Operation**

Some NGC controllers communicate with other controllers over the CAN C bus. The transmission controller continuously monitors the bus activity and receives the messages it needs. The CAN C bus is also used to communicate transmission MIL status to the Engine Controller, therefore if the Engine Controller is unable to communicate with the Transmission Controller, the Engine Controller will light the MIL.

**Refer to 8-ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING for diagnostic procedures and for further possible causes.**

## 42RLE TRANSMISSION VERIFICATION TEST - VER 1

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W.**

### Diagnostic Test

#### 1. 42RLE TRANSMISSION VERIFICATION TEST - VER 1

**Note: 1. After completion of the Transmission Verification Test, the Powertrain Verification Test must be performed. Refer to the Engine Category.**

2. Connect the scan tool to the Data Link Connector (DLC).
3. Reconnect any disconnected components.
4. With the scan tool, erase all Transmission DTC's, also erase the PCM DTC's.
5. Perform \*PRNDL FAULT CLEARING PROCEDURE after completion of repairs for P0706 CHECK SHIFTER SIGNAL.
6. With the scan tool, display Transmission Temperature. Start and run the engine until the Transmission Temperature is HOT, above 43° C or 110° F.
7. Check the transmission fluid and adjust if necessary. Refer to the Service Information for the Fluid Fill procedure.

**Note: 8. If the Powertrain Control Module or Torque Converter has been replaced, or if the Transmission has been repaired or replaced, it is necessary to perform the scan tool Quick Learn Procedure.**

**Note: 9. If the Powertrain Control Module or Front Control Module has been replaced you must reset the Pinion Factor in the Front Control Module.**

10. Road test the vehicle. With the scan tool, monitor the engine RPM. Make 15 to 20 1-2, 2-3, 3-4 upshifts. Perform these shifts from a standing start to 45 MPH with a constant throttle opening of 20 to 25 degrees.
11. Below 25 MPH, make 5 to 8 wide open throttle kickdowns to 1st gear. Allow at least 5 seconds each in 2nd and 3rd gear between each kickdown.
12. For a specific DTC, drive the vehicle to the Symptom's When Monitored/When Set conditions to verify the DTC is repaired.
13. If equipped with AutoStick®, upshift and downshift several times using the AutoStick® feature during the road test.

**Note: 14. Use the EATX OBDII task manager to run Good Trip time in each gear, this will confirm the repair and to ensure that the DTC has not re-matured.**

15. Check for Diagnostic Trouble Codes (DTC's) during the road test. If a DTC sets during the road test, return to the Symptom list and perform the appropriate symptom.

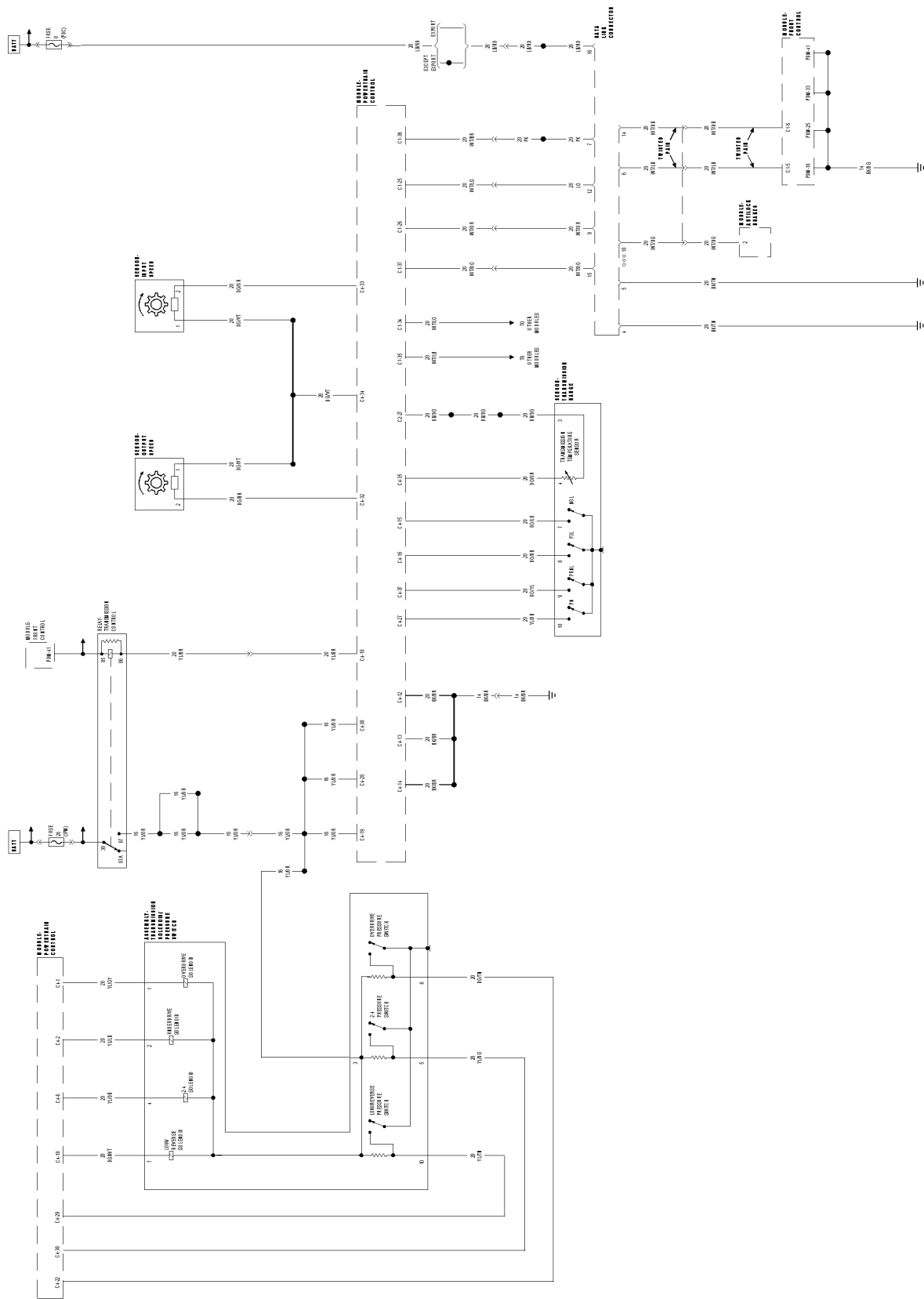
**Note: 16. Erase P0700 DTC in the PCM to turn the MIL light off after making transmission repairs.**

**Were there any Diagnostic Trouble Codes set during the road test?**

- Yes** >> Repair is not complete, refer to the appropriate symptom.  
Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.
- No** >> Repair is complete.
-



SCHEMATICS AND DIAGRAMS



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TRANSMISSION SCHEMATIC ELECTRICAL

# AUTOMATIC TRANSMISSION NAG1 - SERVICE INFORMATION

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**CONVERTER-TORQUE**

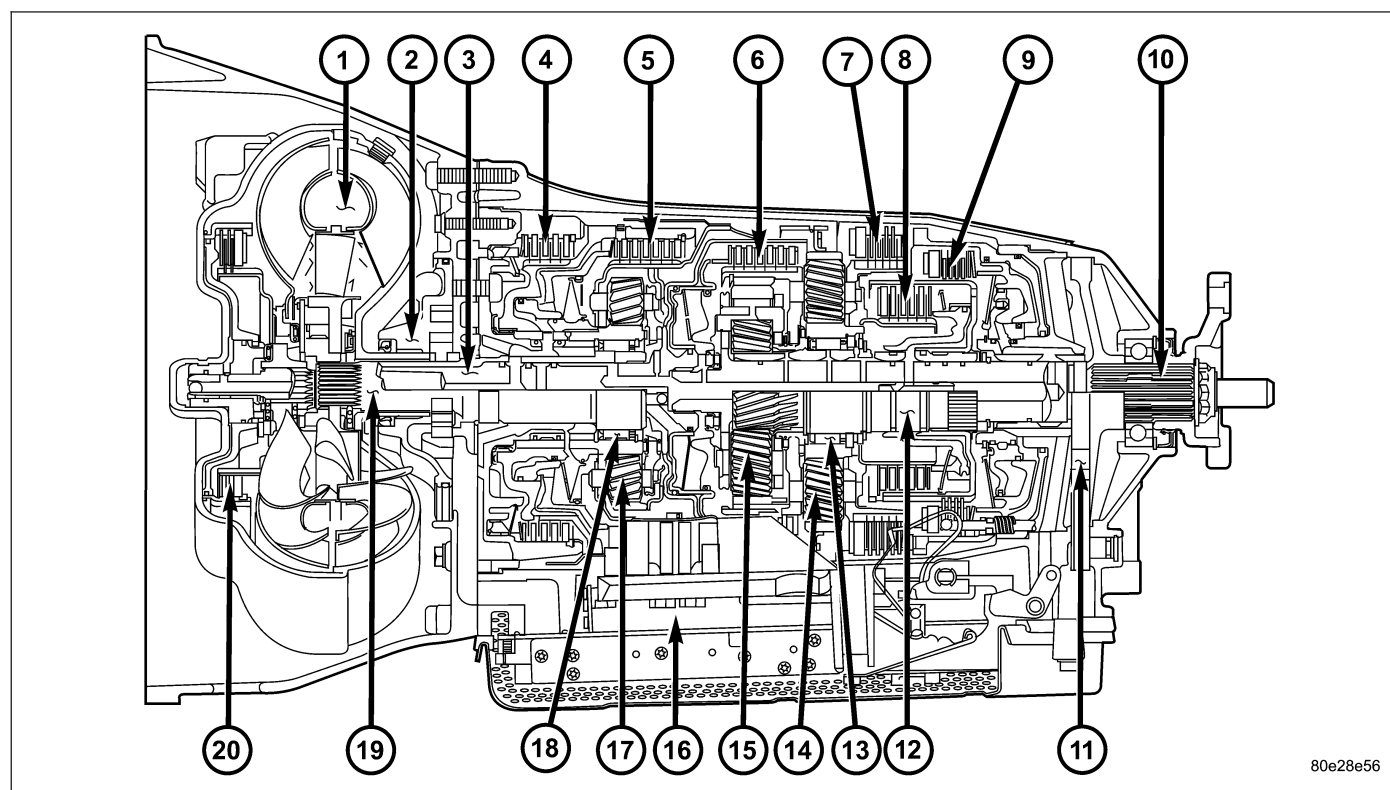
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## **AUTOMATIC TRANSMISSION NAG1 - SERVICE INFORMATION**

### **DESCRIPTION**



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***NAG1 Automatic Transmission***

- |                                  |                                      |
|----------------------------------|--------------------------------------|
| 1 - TORQUE CONVERTER             | 11 - PARKING LOCK GEAR               |
| 2 - OIL PUMP                     | 12 - INTERMEDIATE SHAFT              |
| 3 - DRIVESHAFT                   | 13 - FREEWHEEL F2                    |
| 4 - MULTI-DISC HOLDING CLUTCH B1 | 14 - REAR PLANETARY GEAR SET         |
| 5 - DRIVING CLUTCH K1            | 15 - CENTER PLANETARY GEAR SET       |
| 6 - DRIVING CLUTCH K2            | 16 - ELECTROHYDRAULIC CONTROL UNIT   |
| 7 - MULTI-DISC HOLDING CLUTCH B3 | 17 - FRONT PLANETARY GEAR SET        |
| 8 - DRIVING CLUTCH K3            | 18 - FREEWHEEL F1                    |
| 9 - MULTI-DISC HOLDING CLUTCH B2 | 19 - STATOR SHAFT                    |
| 10 - OUTPUT SHAFT                | 20 - TORQUE CONVERTER LOCK-UP CLUTCH |

The NAG1 automatic transmission is an electronically controlled 5-speed transmission with a lock-up clutch in the torque converter. The ratios for the gear stages are obtained by 3 planetary gear sets. Fifth gear is designed as an overdrive with a high-speed ratio.

NAG1 identifies a family of transmissions and means “N”ew “A”utomatic “G”earbox, generation 1. Various marketing names are associated with the NAG1 family of transmissions, depending on the transmission variation being used in a specific vehicle. Some examples of the marketing names are: W5A300, W5A380, and W5A580. The marketing name can be interpreted as follows:

- W = A transmission using a hydraulic torque converter.
- 5 = 5 forward gears.
- A = Automatic Transmission.
- 580 = Maximum input torque capacity in Newton meters.

The gears are actuated electronically/hydraulically. The gears are shifted by means of an appropriate combination of three multi-disc holding clutches, three multi-disc driving clutches, and two freewheeling clutches.

Electronic transmission control enables precise adaptation of pressures to the respective operating conditions and to the engine output during the shift phase which results in a significant improvement in shift quality.

Furthermore, it offers the advantage of a flexible adaptation to various vehicle and engines.

Basically, the automatic transmission with electronic control offers the following advantages:

- Reduces fuel consumption.
- Improved shift comfort.
- More favourable step-up through the five gears.
- Increased service life and reliability.
- Lower maintenance costs.

## TRANSMISSION IDENTIFICATION

The transmission can be generically identified visually by the presence of a round 13-way connector located near the front corner of the transmission oil pan, on the right side. Specific transmission information can be found stamped into a pad on the left side of the transmission, above the oil pan rail.

## TRANSMISSION GEAR RATIOS

The gear ratios for the NAG1 automatic transmission are as follows:

1st Gear . . . . .	3.59:1
2nd Gear . . . . .	2.19:1
3rd Gear . . . . .	1.41:1
4th Gear . . . . .	1.00:1
5th Gear . . . . .	0.83:1
Reverse . . . . .	3.16:1

## TRANSMISSION HOUSING

The converter housing and transmission are made from a light alloy. These are bolted together and centered via the outer multi-disc carrier of multi-disc holding clutch, B1. A coated intermediate plate provides the sealing. The oil pump and the outer multi-disc carrier of the multi-disc holding clutch, B1, are bolted to the converter housing. The stator shaft is pressed into it and prevented from rotating by splines. The electrohydraulic unit is bolted to the transmission housing from underneath. A sheet metal steel oil pan forms the closure.

## MECHANICAL SECTION

The mechanical section consists of a input shaft, output shaft, a sun gear shaft, and three planetary gear sets which are coupled to each other. The planetary gear sets each have four planetary pinion gears. The oil pressure for the torque converter lock-up clutch and clutch K2 is supplied through bores in the input shaft. The oil pressure to clutch K3 is transmitted through the output shaft. The lubricating oil is distributed through additional bores in both shafts. All the bearing points of the gear sets, as well as the freewheeling clutches and actuators, are supplied with lubricating oil. The parking lock gear is connected to the output shaft via splines.

Freewheeling clutches F1 and F2 are used to optimize the shifts. The front freewheel, F1, is supported on the extension of the stator shaft on the transmission side and, in the locking direction, connects the sun gear of the front planetary gear set to the transmission housing. In the locking direction, the rear freewheeling clutch, F2, connects the sun gear of the center planetary gear set to the sun gear of the rear planetary gear set.

## **ELECTROHYDRAULIC CONTROL UNIT**

The electrohydraulic control unit comprises the shift plate made from light alloy for the hydraulic control and an electrical control unit. The electrical control unit comprises of a supporting body made of plastic, into which the electrical components are assembled. The supporting body is mounted on the shift plate and screwed to it.

Strip conductors inserted into the supporting body make the connection between the electrical components and a plug connector. The connection to the wiring harness on the vehicle and the transmission control module (TCM) is produced via this 13-pin plug connector with a bayonet lock.

## **SHIFT GROUPS**

The hydraulic control components (including actuators) which are responsible for the pressure distribution before, during, and after a gear change are described as a shift group. Each shift group contains a command valve, a holding pressure shift valve, a shift pressure shift valve, overlap regulating valve, and a solenoid.

The hydraulic system contains three shift groups: 1-2/4-5, 2-3, and 3-4. Each shift group can also be described as being in one of two possible states. The active shift group is described as being in the shift phase when it is actively engaging/disengaging a clutch combination. The 1-2/4-5 shift group control the B1 and K1 clutches. The 2-3 shift group controls the K2 and K3 clutches. The 3-4 shift group controls the K3 and B2 clutches.

## **OPERATION**

The transmission control is divided into the electronic and hydraulic transmission control functions. While the electronic transmission control is responsible for gear selection and for matching the pressures to the torque to be transmitted, the transmission's power supply control occurs via hydraulic elements in the electrohydraulic control module. The oil supply to the hydraulic elements, such as the hydrodynamic torque converter, the shift elements and the hydraulic transmission control, is provided by way of an oil pump connected with the torque converter.

The Transmission Control Module (TCM) allows for the precise adaptation of pressures to the corresponding operating conditions and to the engine output during the gearshift phase, resulting in a noticeable improvement in shift quality. The engine speed limit can be reached in the individual gears at full throttle and kickdown. The shift range can be changed in the forward gears while driving, but the TCM employs a downshift safeguard to prevent over-revving the engine. The system offers the additional advantage of flexible adaptation to different vehicle and engine variants.

## **EMERGENCY RUNNING FUNCTION**

In order to ensure a safe driving state and to prevent damage to the automatic transmission, the TCM control module switches to limp-home mode in the event of critical faults. A diagnostic trouble code (DTC) assigned to the fault is stored in memory. All solenoid and regulating valves are thus de-energized.

The net effect is:

- The last engaged gear remains engaged.
- The modulating pressure and shift pressures rise to the maximum levels.
- The torque converter lockup clutch is deactivated.

In order to preserve the operability of the vehicle to some extent, the hydraulic control can be used to engage 2nd gear or reverse using the following procedure:

- Stop the vehicle.
- Switch off engine.
- Move selector lever to "P".
- Wait at least 10 seconds.
- Start engine.
- Move selector lever to D: 2nd gear.
- Move selector lever to R: Reverse gear.

The limp-home function remains active until the DTC is rectified or the stored DTC is erased with the appropriate scan tool. Sporadic faults can be reset via ignition OFF/ON.

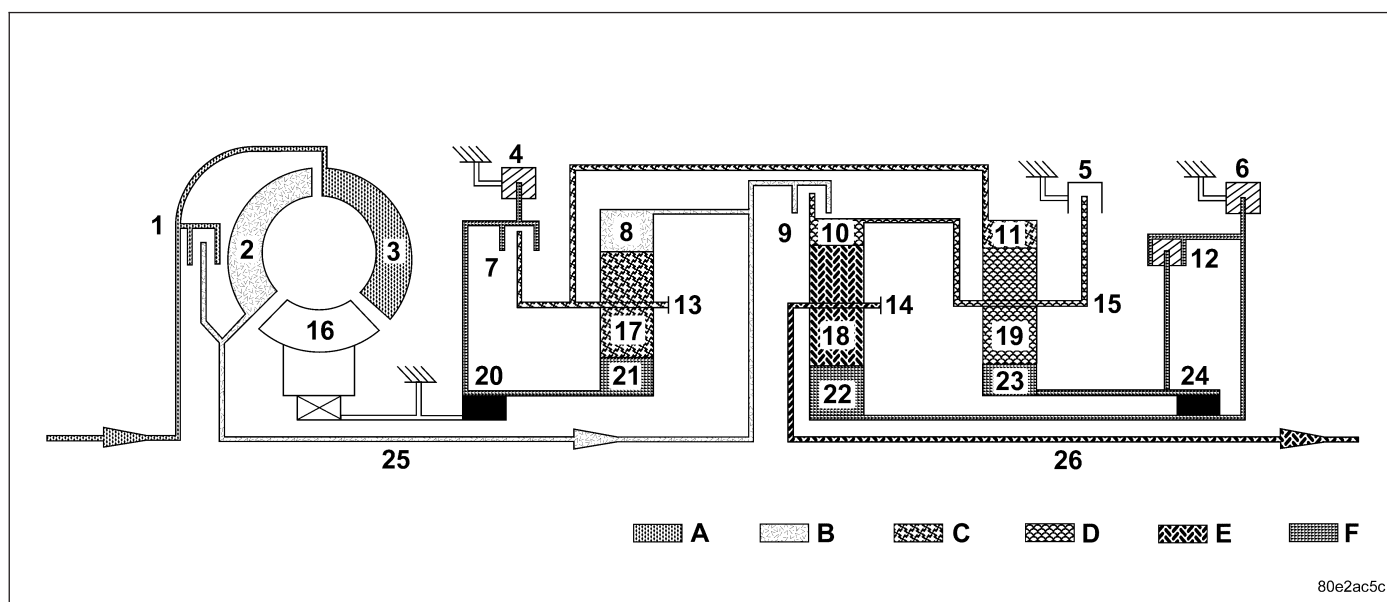
## **CLUTCH APPLICATION**

Refer to CLUTCH APPLICATION for which shift elements are applied in each gear position.

**CLUTCH APPLICATION**

GEAR	RATIO	B1	B2	B3	K1	K2	K3	F1	F2
1	3.59	X*	X				X*	X	X
2	2.19		X		X		X*		X
3	1.41		X		X	X			
4	1.00				X	X	X		
5	0.83	X				X	X	X*	
N	N/A	X					X		
R	3.16	X*		X			X	X	
R - Limp In	1.93			X	X		X		

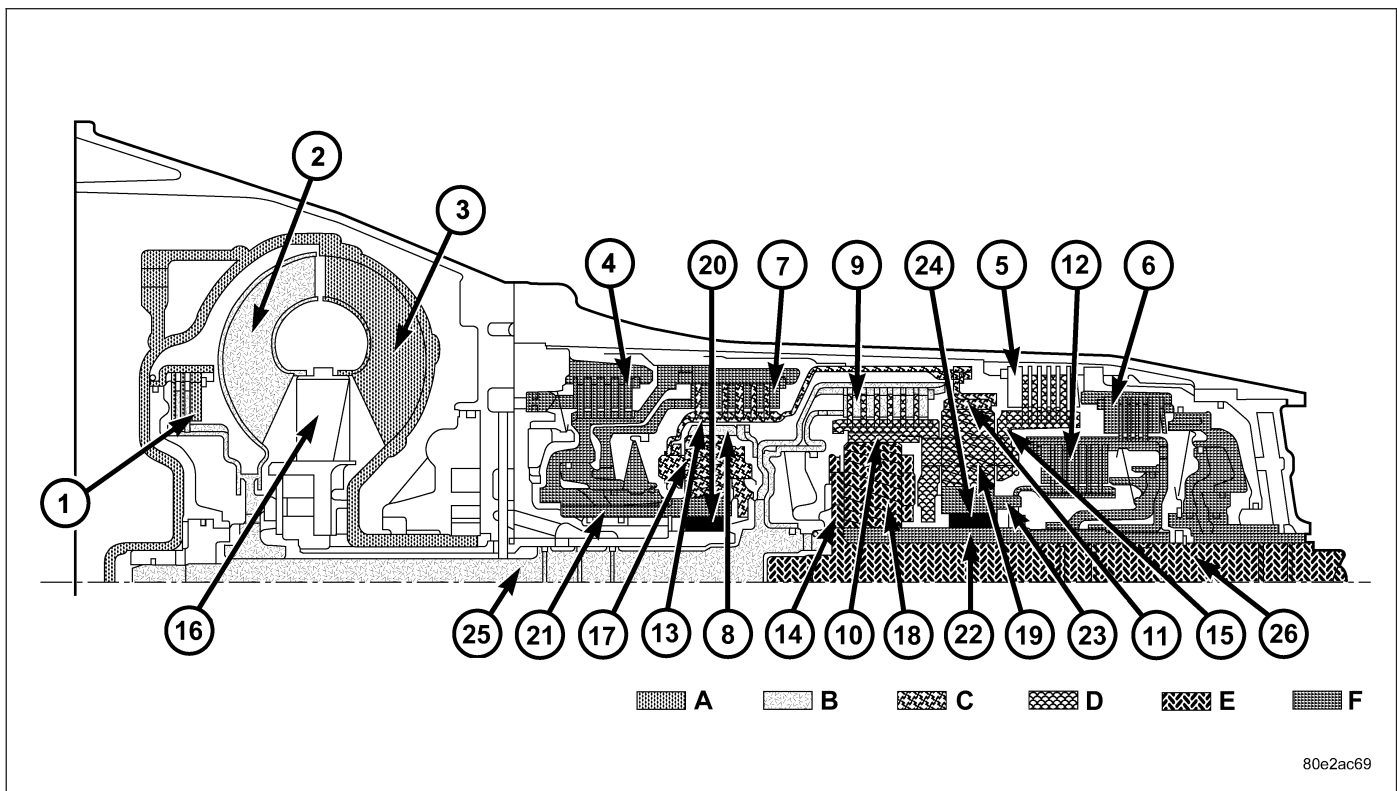
\* = The shift components required during coast.

**FIRST GEAR POWERFLOW*****First Gear Powerflow***

- 1 - TORQUE CONVERTER LOCK-UP CLUTCH
- 2 - TORQUE CONVERTER TURBINE
- 3 - TORQUE CONVERTER IMPELLER
- 4 - HOLDING CLUTCH B1
- 5 - HOLDING CLUTCH B3
- 6 - HOLDING CLUTCH B2
- 7 - DRIVING CLUTCH K1
- 8 - FRONT PLANETARY ANNULUS GEAR
- 9 - DRIVING CLUTCH K2
- 10 - CENTER PLANETARY ANNULUS GEAR
- 11 - REAR PLANETARY ANNULUS GEAR
- 12 - DRIVING CLUTCH K3
- 13 - FRONT PLANETARY CARRIER
- A - ENGINE SPEED
- B - TRANSMISSION INPUT SPEED
- C - FIRST GEAR RATIO

- 14 - CENTER PLANETARY CARRIER
- 15 - REAR PLANETARY CARRIER
- 16 - TORQUE CONVERTER STATOR
- 17 - FRONT PLANETARY PINION GEARS
- 18 - CENTER PLANETARY PINION GEARS
- 19 - REAR PLANETARY PINION GEARS
- 20 - FREEWHEELING CLUTCH F1
- 21 - FRONT PLANETARY SUN GEAR
- 22 - CENTER PLANETARY SUN GEAR
- 23 - REAR PLANETARY SUN GEAR
- 24 - FREEWHEELING CLUTCH F2
- 25 - INPUT SHAFT
- 26 - OUTPUT SHAFT
- D - SECOND GEAR RATIO
- E - THIRD GEAR RATIO
- F - FIXED PARTS





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### First Gear Powerflow

- |                                     |                                    |
|-------------------------------------|------------------------------------|
| 1 - TORQUE CONVERTER LOCK-UP CLUTCH | 14 - CENTER PLANETARY CARRIER      |
| 2 - TORQUE CONVERTER TURBINE        | 15 - REAR PLANETARY CARRIER        |
| 3 - TORQUE CONVERTER IMPELLER       | 16 - TORQUE CONVERTER STATOR       |
| 4 - HOLDING CLUTCH B1               | 17 - FRONT PLANETARY PINION GEARS  |
| 5 - HOLDING CLUTCH B3               | 18 - CENTER PLANETARY PINION GEARS |
| 6 - HOLDING CLUTCH B2               | 19 - REAR PLANETARY PINION GEARS   |
| 7 - DRIVING CLUTCH K1               | 20 - FREEWHEELING CLUTCH F1        |
| 8 - FRONT PLANETARY ANNULUS GEAR    | 21 - FRONT PLANETARY SUN GEAR      |
| 9 - DRIVING CLUTCH K2               | 22 - CENTER PLANETARY SUN GEAR     |
| 10 - CENTER PLANETARY ANNULUS GEAR  | 23 - REAR PLANETARY SUN GEAR       |
| 11 - REAR PLANETARY ANNULUS GEAR    | 24 - FREEWHEELING CLUTCH F2        |
| 12 - DRIVING CLUTCH K3              | 25 - INPUT SHAFT                   |
| 13 - FRONT PLANETARY CARRIER        | 26 - OUTPUT SHAFT                  |
| A - ENGINE SPEED                    | D - SECOND GEAR RATIO              |
| B - TRANSMISSION INPUT SPEED        | E - THIRD GEAR RATIO               |
| C - FIRST GEAR RATIO                | F - FIXED PARTS                    |

Torque from the torque converter is increased via the input shaft (25) and all three planetary gearsets and transferred to the output shaft (26).

### Front Planetary Gear Set

The annulus gear (8) is driven by the input shaft (25). The sun gear (21) is held against the housing by the locked freewheel F1 (20) during acceleration and via the engaged multiple-disc holding clutch B1 (4) during deceleration. The planetary pinion gears (17) turn on the fixed sun gear (21) and increase the torque from the annulus gear (8) to the planetary carrier (13). The planetary carrier (13) moves at a reduced speed in the running direction of the engine.

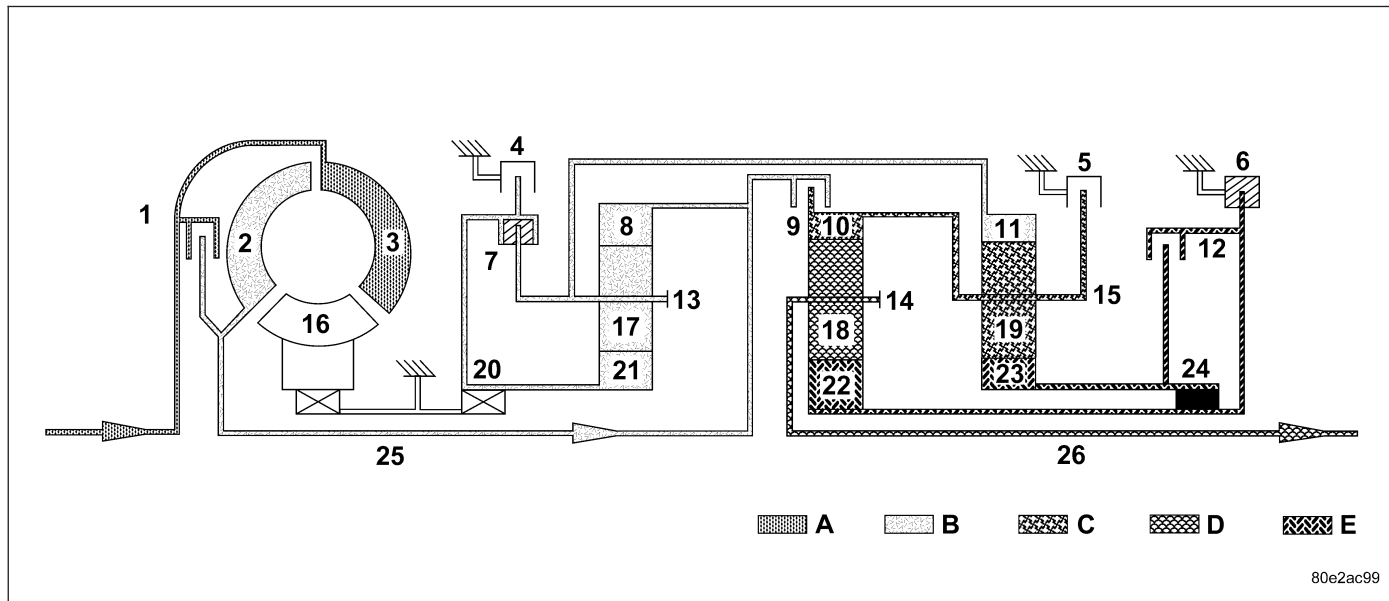
### Rear Planetary Gear Set

The annulus gear (11) turns at a reduced speed due to the mechanical connection to the front planetary carrier (15). The sun gear (23) is held against the housing by the engaged multiple-disc holding clutch B2 (6), by the locked freewheel F2 (24) during acceleration and by the engaged multiple-disc clutch K3 (12) during deceleration. The planetary gears (19) turn on the fixed sun gear (23) and increase the torque from the annulus gear (11) to the planetary carrier (15). The planetary carrier (15) moves at a reduced speed in the running direction of the engine.

### Center Planetary Gear Set

The annulus gear (10) is driven at the same speed as the rear planetary carrier (15) as a result of a mechanical connection. The sun gear (22) is held against the housing by the multiple-disc holding clutch B2 (6). The planetary pinion gears (18) turn on the fixed sun gear (22) and increase the torque from the annulus gear (10) to the planetary carrier (14). The output shaft (26) connected to the planetary carrier (14) turns at a reduced speed in the running direction of the engine.

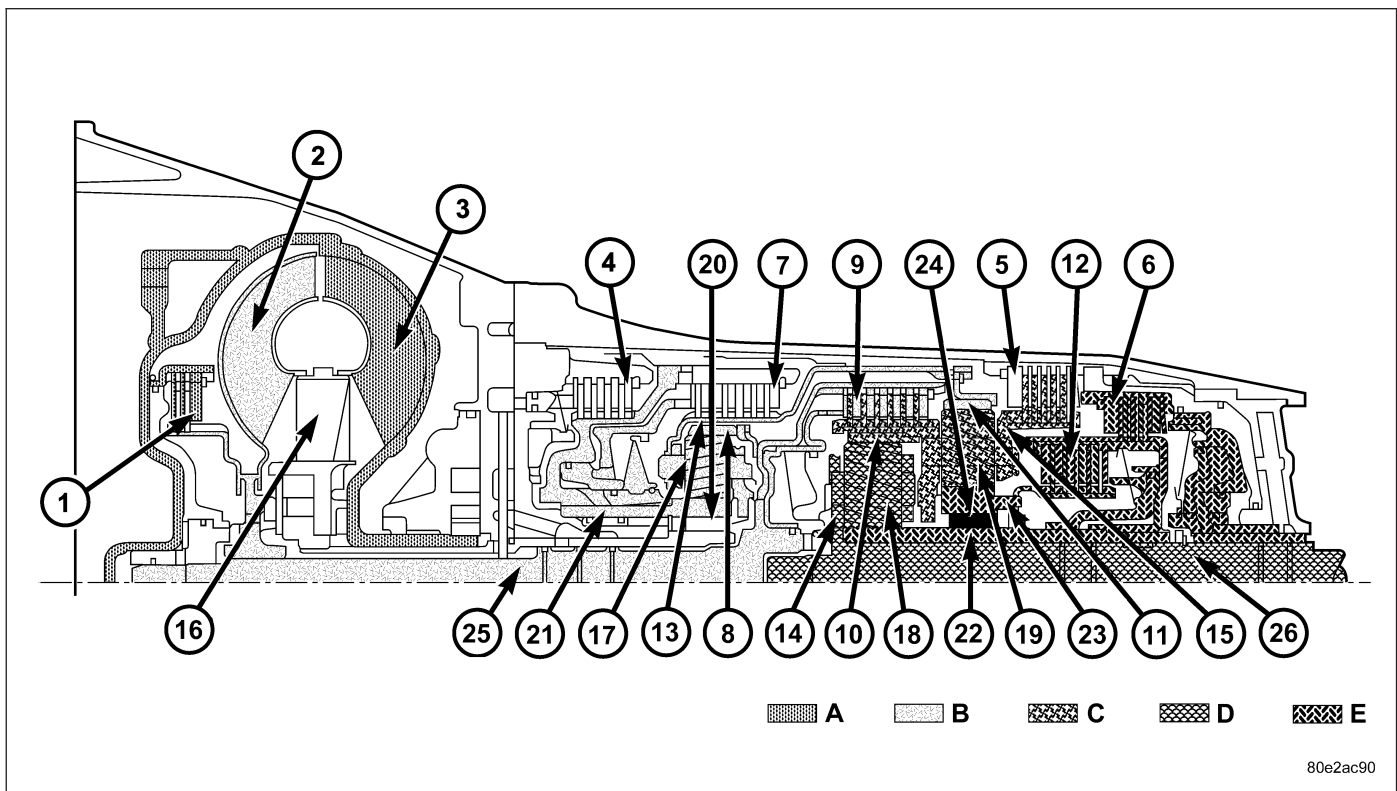
## SECOND GEAR POWERFLOW



### Second Gear Powerflow

- |                                     |                                    |
|-------------------------------------|------------------------------------|
| 1 - TORQUE CONVERTER LOCK-UP CLUTCH | 14 - CENTER PLANETARY CARRIER      |
| 2 - TORQUE CONVERTER TURBINE        | 15 - REAR PLANETARY CARRIER        |
| 3 - TORQUE CONVERTER IMPELLER       | 16 - TORQUE CONVERTER STATOR       |
| 4 - HOLDING CLUTCH B1               | 17 - FRONT PLANETARY PINION GEARS  |
| 5 - HOLDING CLUTCH B3               | 18 - CENTER PLANETARY PINION GEARS |
| 6 - HOLDING CLUTCH B2               | 19 - REAR PLANETARY PINION GEARS   |
| 7 - DRIVING CLUTCH K1               | 20 - FREEWHEELING CLUTCH F1        |
| 8 - FRONT PLANETARY ANNULUS GEAR    | 21 - FRONT PLANETARY SUN GEAR      |
| 9 - DRIVING CLUTCH K2               | 22 - CENTER PLANETARY SUN GEAR     |
| 10 - CENTER PLANETARY ANNULUS GEAR  | 23 - REAR PLANETARY SUN GEAR       |
| 11 - REAR PLANETARY ANNULUS GEAR    | 24 - FREEWHEELING CLUTCH F2        |
| 12 - DRIVING CLUTCH K3              | 25 - INPUT SHAFT                   |
| 13 - FRONT PLANETARY CARRIER        | 26 - OUTPUT SHAFT                  |
| A - ENGINE SPEED                    | D - SECOND GEAR RATIO              |
| B - TRANSMISSION INPUT SPEED        | E - FIXED PARTS                    |
| C - FIRST GEAR RATIO                |                                    |





### Second Gear Powerflow

- |                                     |                                    |
|-------------------------------------|------------------------------------|
| 1 - TORQUE CONVERTER LOCK-UP CLUTCH | 14 - CENTER PLANETARY CARRIER      |
| 2 - TORQUE CONVERTER TURBINE        | 15 - REAR PLANETARY CARRIER        |
| 3 - TORQUE CONVERTER IMPELLER       | 16 - TORQUE CONVERTER STATOR       |
| 4 - HOLDING CLUTCH B1               | 17 - FRONT PLANETARY PINION GEARS  |
| 5 - HOLDING CLUTCH B3               | 18 - CENTER PLANETARY PINION GEARS |
| 6 - HOLDING CLUTCH B2               | 19 - REAR PLANETARY PINION GEARS   |
| 7 - DRIVING CLUTCH K1               | 20 - FREEWHEELING CLUTCH F1        |
| 8 - FRONT PLANETARY ANNULUS GEAR    | 21 - FRONT PLANETARY SUN GEAR      |
| 9 - DRIVING CLUTCH K2               | 22 - CENTER PLANETARY SUN GEAR     |
| 10 - CENTER PLANETARY ANNULUS GEAR  | 23 - REAR PLANETARY SUN GEAR       |
| 11 - REAR PLANETARY ANNULUS GEAR    | 24 - FREEWHEELING CLUTCH F2        |
| 12 - DRIVING CLUTCH K3              | 25 - INPUT SHAFT                   |
| 13 - FRONT PLANETARY CARRIER        | 26 - OUTPUT SHAFT                  |
| A - ENGINE SPEED                    | D - SECOND GEAR RATIO              |
| B - TRANSMISSION INPUT SPEED        | E - FIXED PARTS                    |
| C - FIRST GEAR RATIO                |                                    |

Torque from the torque converter is increased via the input shaft (25) and the center and rear planetary gearset and transferred to the output shaft (26).

### Front Planetary Gear Set

The planetary carrier (13) and sun gear (21) are connected via the engaged multiple-disc clutch K1 (7). The planetary gearset is therefore blocked and turns as a closed unit at the input speed due to the mechanical connection of the annulus gear (8) and input shaft.

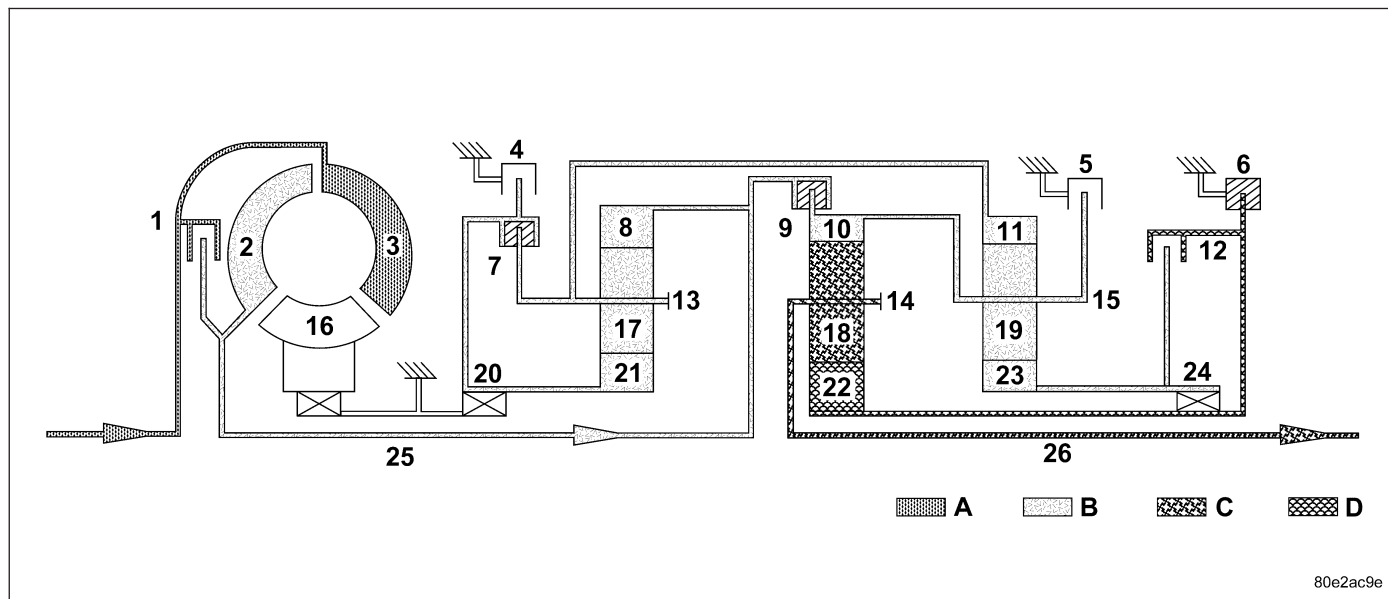
### Rear Planetary Gear Set

The annulus gear (11) turns at the input speed as a result of the mechanical connection to the front planetary carrier (13). The sun gear (23) is held against the housing by the engaged multiple-disc holding clutch B2 (6), by the locked freewheel F2 (24) during acceleration and by the engaged multiple-disc clutch K3 (12) during deceleration. The planetary pinion gears (19) turn on the fixed sun gear (23) and increase the torque from the annulus gear (11) to the planetary carrier (15). The planetary carrier (15) moves at a reduced speed in the running direction of the engine.

### Center Planetary Gear Set

The annulus gear (10) is driven at the same speed as the rear planetary carrier (15) as a result of a mechanical connection. The sun gear (22) is held against the housing by the multiple-disc holding clutch B2 (6). The planetary pinion gears (18) turn on the fixed sun gear (22) and increase the torque from the annulus gear (10) to the planetary carrier (14). The output shaft (5) connected to the planetary carrier (14) turns at a reduced speed in the running direction of the engine.

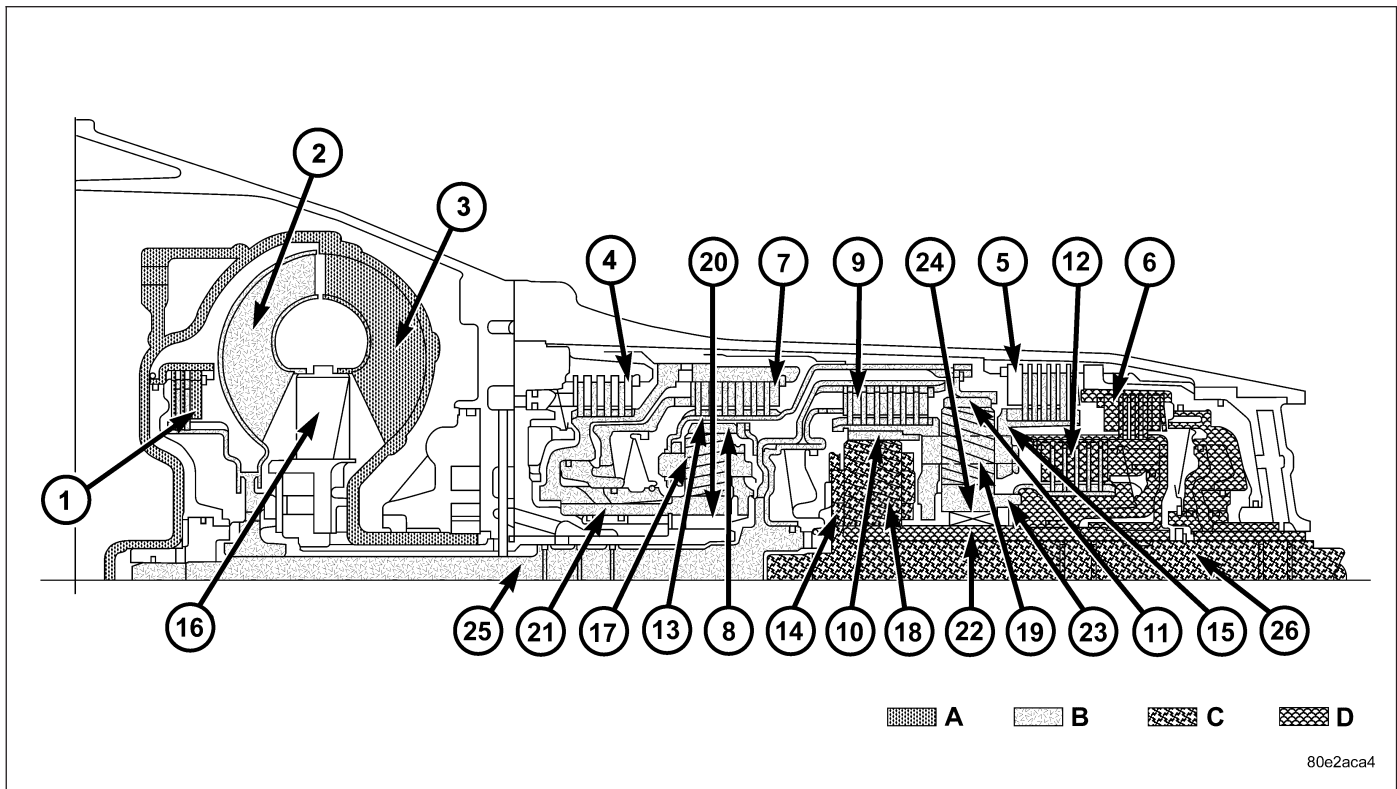
### THIRD GEAR POWERFLOW



**Third Gear Powerflow**

- 1 - TORQUE CONVERTER LOCK-UP CLUTCH
- 2 - TORQUE CONVERTER TURBINE
- 3 - TORQUE CONVERTER IMPELLER
- 4 - HOLDING CLUTCH B1
- 5 - HOLDING CLUTCH B3
- 6 - HOLDING CLUTCH B2
- 7 - DRIVING CLUTCH K1
- 8 - FRONT PLANETARY ANNULUS GEAR
- 9 - DRIVING CLUTCH K2
- 10 - CENTER PLANETARY ANNULUS GEAR
- 11 - REAR PLANETARY ANNULUS GEAR
- 12 - DRIVING CLUTCH K3
- 13 - FRONT PLANETARY CARRIER
- A - ENGINE SPEED
- B - TRANSMISSION INPUT SPEED

- 14 - CENTER PLANETARY CARRIER
- 15 - REAR PLANETARY CARRIER
- 16 - TORQUE CONVERTER STATOR
- 17 - FRONT PLANETARY PINION GEARS
- 18 - CENTER PLANETARY PINION GEARS
- 19 - REAR PLANETARY PINION GEARS
- 20 - FREEWHEELING CLUTCH F1
- 21 - FRONT PLANETARY SUN GEAR
- 22 - CENTER PLANETARY SUN GEAR
- 23 - REAR PLANETARY SUN GEAR
- 24 - FREEWHEELING CLUTCH F2
- 25 - INPUT SHAFT
- 26 - OUTPUT SHAFT
- C - FIRST GEAR RATIO
- D - FIXED PARTS



### Third Gear Powerflow

- |                                     |                                    |
|-------------------------------------|------------------------------------|
| 1 - TORQUE CONVERTER LOCK-UP CLUTCH | 14 - CENTER PLANETARY CARRIER      |
| 2 - TORQUE CONVERTER TURBINE        | 15 - REAR PLANETARY CARRIER        |
| 3 - TORQUE CONVERTER IMPELLER       | 16 - TORQUE CONVERTER STATOR       |
| 4 - HOLDING CLUTCH B1               | 17 - FRONT PLANETARY PINION GEARS  |
| 5 - HOLDING CLUTCH B3               | 18 - CENTER PLANETARY PINION GEARS |
| 6 - HOLDING CLUTCH B2               | 19 - REAR PLANETARY PINION GEARS   |
| 7 - DRIVING CLUTCH K1               | 20 - FREEWHEELING CLUTCH F1        |
| 8 - FRONT PLANETARY ANNULUS GEAR    | 21 - FRONT PLANETARY SUN GEAR      |
| 9 - DRIVING CLUTCH K2               | 22 - CENTER PLANETARY SUN GEAR     |
| 10 - CENTER PLANETARY ANNULUS GEAR  | 23 - REAR PLANETARY SUN GEAR       |
| 11 - REAR PLANETARY ANNULUS GEAR    | 24 - FREEWHEELING CLUTCH F2        |
| 12 - DRIVING CLUTCH K3              | 25 - INPUT SHAFT                   |
| 13 - FRONT PLANETARY CARRIER        | 26 - OUTPUT SHAFT                  |
| A - ENGINE SPEED                    | C - FIRST GEAR RATIO               |
| B - TRANSMISSION INPUT SPEED        | D - FIXED PARTS                    |

Torque from the torque converter is increased via the input shaft (25) and the center planetary gearset and transferred to the output shaft (26).

### Front Planetary Gear Set

The planetary carrier (13) and sun gear (21) are connected via the engaged multiple-disc clutch K1 (7). The planetary gearset is therefore locked and turns as a closed unit at the input speed due to the mechanical connection of the annulus gear (8) and input shaft (25).

### Rear Planetary Gear Set

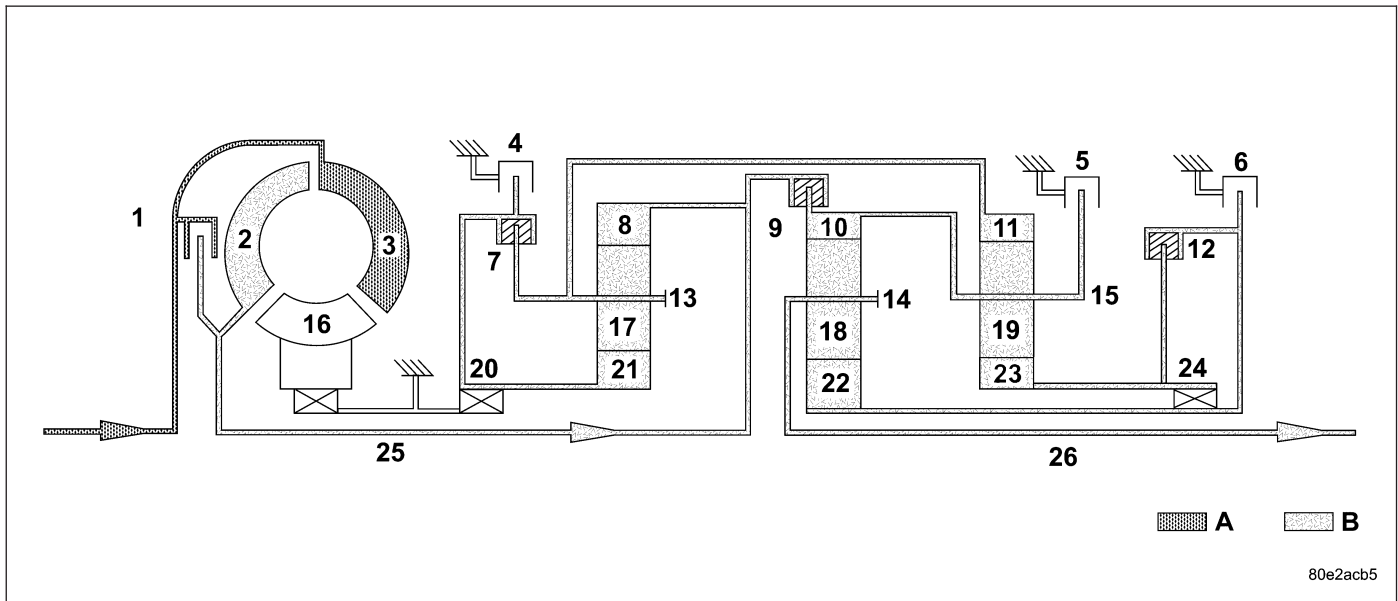
The multiple-disc clutch K2 (9) is engaged and transfers the input speed of the input shaft (25) to the planetary carrier (15) via the annulus gear (10). The annulus gear (11) turns in the same way as the planetary carrier (15) due to the mechanical connection with the locked front planetary gearset. This planetary gearset is therefore locked and turns as a closed unit.

### Center Planetary Gear Set

The annulus gear (10) turns at the input speed as a result of the engaged multiple-disc clutch K2 (9). The sun gear (22) is held against the housing by the multiple-disc holding clutch B2 (6). The planetary pinion gears (18) turn on

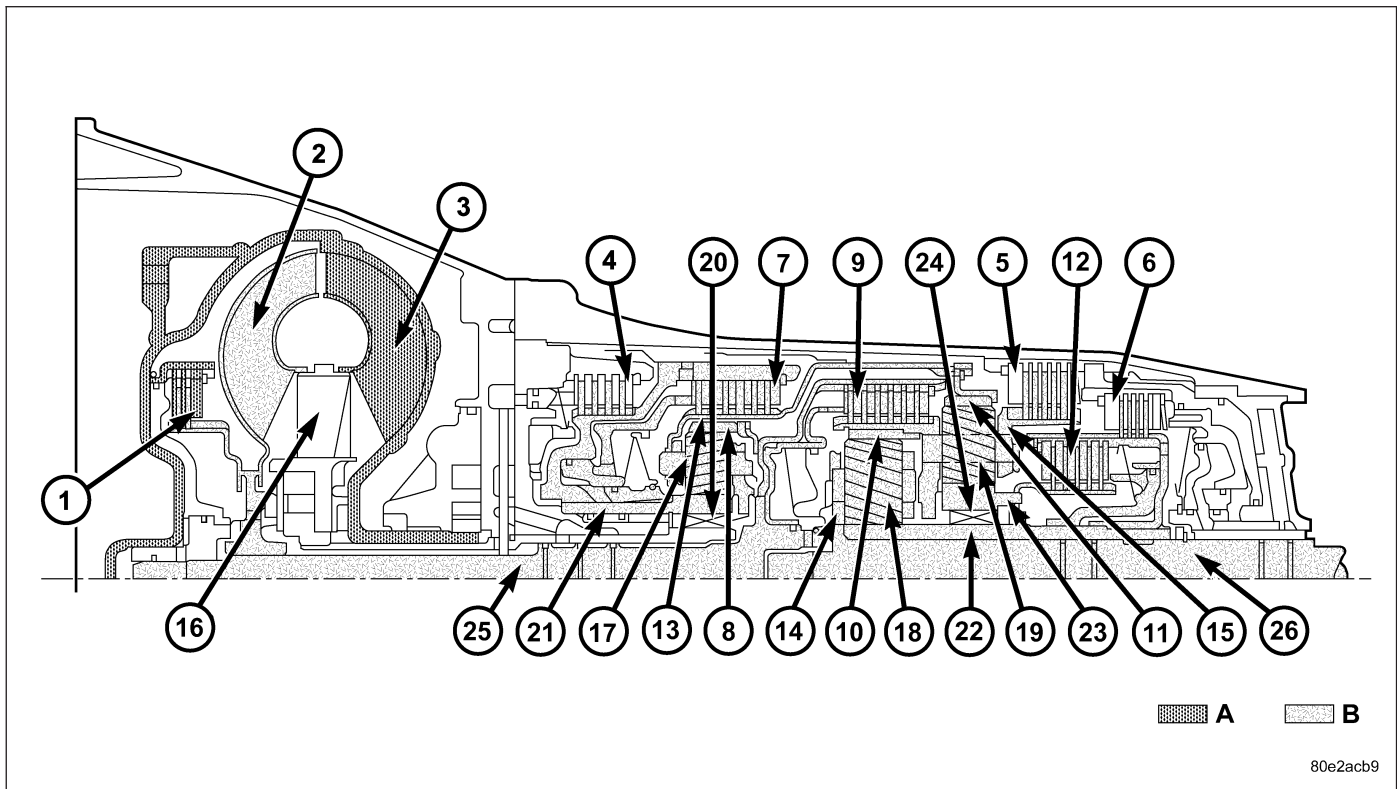
the fixed sun gear (22) and increase the torque from the annulus gear (10) to the planetary carrier (14). The output shaft (26) connected to the planetary carrier (14) turns at a reduced speed in the running direction of the engine.

## FOURTH GEAR POWERFLOW



### Fourth Gear Powerflow

- |                                     |                                    |
|-------------------------------------|------------------------------------|
| 1 - TORQUE CONVERTER LOCK-UP CLUTCH | 14 - CENTER PLANETARY CARRIER      |
| 2 - TORQUE CONVERTER TURBINE        | 15 - REAR PLANETARY CARRIER        |
| 3 - TORQUE CONVERTER IMPELLER       | 16 - TORQUE CONVERTER STATOR       |
| 4 - HOLDING CLUTCH B1               | 17 - FRONT PLANETARY PINION GEARS  |
| 5 - HOLDING CLUTCH B3               | 18 - CENTER PLANETARY PINION GEARS |
| 6 - HOLDING CLUTCH B2               | 19 - REAR PLANETARY PINION GEARS   |
| 7 - DRIVING CLUTCH K1               | 20 - FREEWHEELING CLUTCH F1        |
| 8 - FRONT PLANETARY ANNULUS GEAR    | 21 - FRONT PLANETARY SUN GEAR      |
| 9 - DRIVING CLUTCH K2               | 22 - CENTER PLANETARY SUN GEAR     |
| 10 - CENTER PLANETARY ANNULUS GEAR  | 23 - REAR PLANETARY SUN GEAR       |
| 11 - REAR PLANETARY ANNULUS GEAR    | 24 - FREEWHEELING CLUTCH F2        |
| 12 - DRIVING CLUTCH K3              | 25 - INPUT SHAFT                   |
| 13 - FRONT PLANETARY CARRIER        | 26 - OUTPUT SHAFT                  |
| A - ENGINE SPEED                    | B - TRANSMISSION INPUT SPEED       |



**Fourth Gear Powerflow**

- 1 - TORQUE CONVERTER LOCK-UP CLUTCH
- 2 - TORQUE CONVERTER TURBINE
- 3 - TORQUE CONVERTER IMPELLER
- 4 - HOLDING CLUTCH B1
- 5 - HOLDING CLUTCH B3
- 6 - HOLDING CLUTCH B2
- 7 - DRIVING CLUTCH K1
- 8 - FRONT PLANETARY ANNULUS GEAR
- 9 - DRIVING CLUTCH K2
- 10 - CENTER PLANETARY ANNULUS GEAR
- 11 - REAR PLANETARY ANNULUS GEAR
- 12 - DRIVING CLUTCH K3
- 13 - FRONT PLANETARY CARRIER
- A - ENGINE SPEED

- 14 - CENTER PLANETARY CARRIER
- 15 - REAR PLANETARY CARRIER
- 16 - TORQUE CONVERTER STATOR
- 17 - FRONT PLANETARY PINION GEARS
- 18 - CENTER PLANETARY PINION GEARS
- 19 - REAR PLANETARY PINION GEARS
- 20 - FREEWHEELING CLUTCH F1
- 21 - FRONT PLANETARY SUN GEAR
- 22 - CENTER PLANETARY SUN GEAR
- 23 - REAR PLANETARY SUN GEAR
- 24 - FREEWHEELING CLUTCH F2
- 25 - INPUT SHAFT
- 26 - OUTPUT SHAFT
- B - TRANSMISSION INPUT SPEED

Speed and torque are not converted by the direct gear ratio of the 4th gear. Power is transferred from the input shaft (25) to the output shaft (26) via three locked planetary gearsets.

### Front Planetary Gear Set

The planetary carrier (13) and sun gear (21) are connected via the engaged multiple-disc clutch K1 (7). The planetary gearset is therefore locked and turns as a closed unit at the input speed due to the mechanical connection of the annulus gear (8) and the input shaft (25).

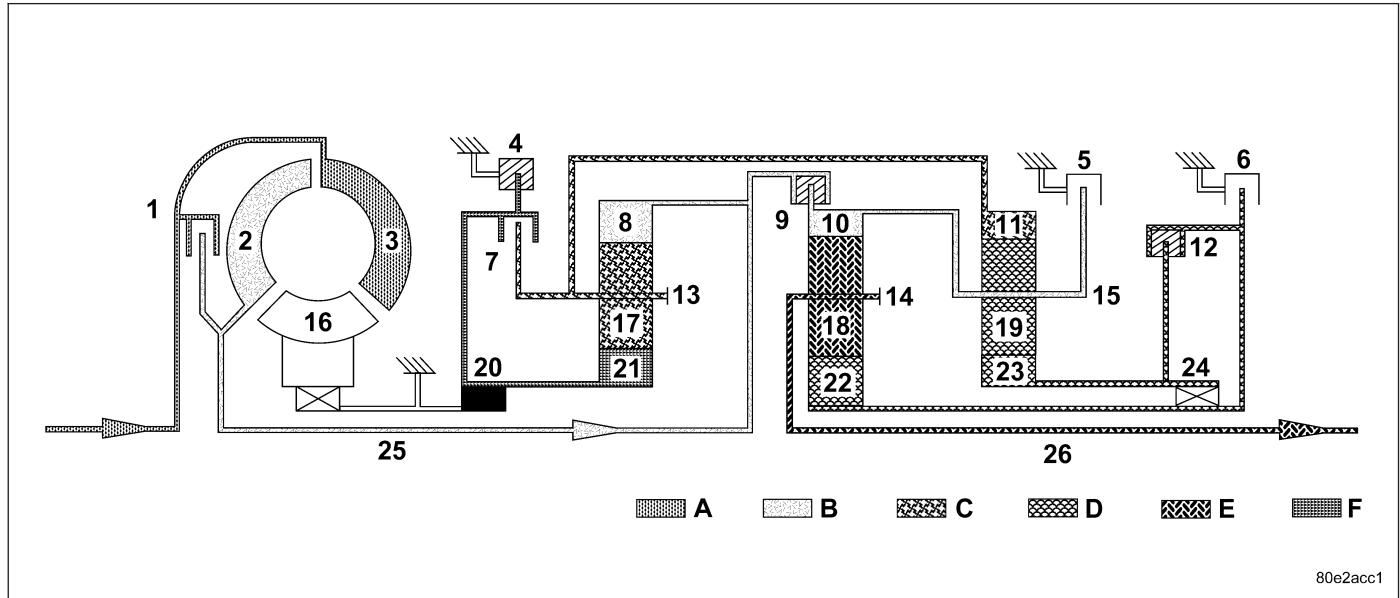
### Rear Planetary Gear Set

The multiple-disc clutch K2 (9) is engaged and transfers the input speed of the input shaft (25) to the planetary carrier (15) via the annulus gear (10). The annulus gear (11) turns in the same way as the planetary carrier (15) due to the mechanical connection with the locked front planetary gearset. The planetary gearset is therefore locked and turns as a closed unit.

### Center Planetary Gear Set

The annulus gear (10) turns at the input speed as a result of the engaged multiple-disc clutch K2 (9). The multiple-disc clutch K3 (12) connects the sun gears (22) and (23) of the rear and center planetary gearset. The planetary gearset is locked by the same speeds of the annulus gear (10) and the sun gear (22) and it turns as a closed unit.

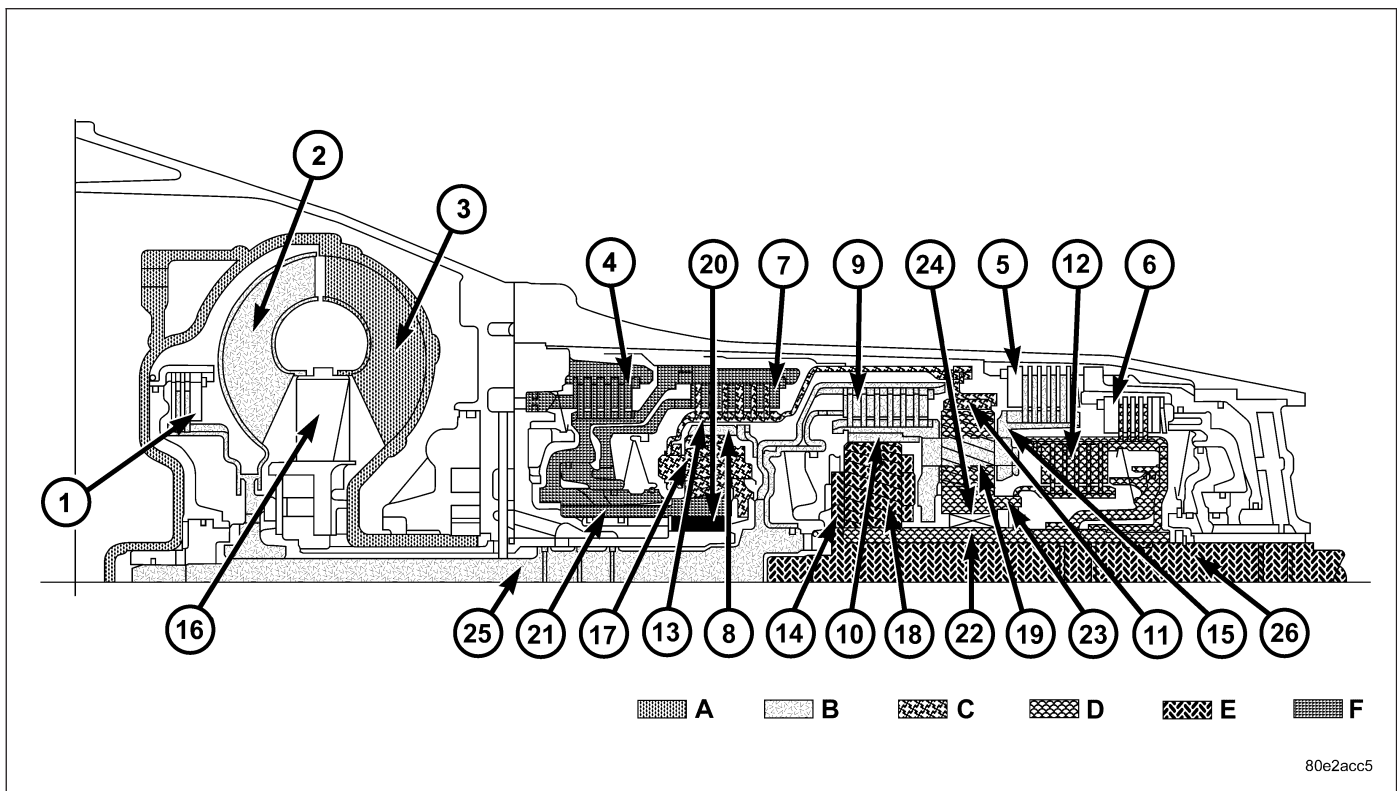
## FIFTH GEAR POWERFLOW



### ***Fifth Gear Powerflow***

- |                                     |                                    |
|-------------------------------------|------------------------------------|
| 1 - TORQUE CONVERTER LOCK-UP CLUTCH | 14 - CENTER PLANETARY CARRIER      |
| 2 - TORQUE CONVERTER TURBINE        | 15 - REAR PLANETARY CARRIER        |
| 3 - TORQUE CONVERTER IMPELLER       | 16 - TORQUE CONVERTER STATOR       |
| 4 - HOLDING CLUTCH B1               | 17 - FRONT PLANETARY PINION GEARS  |
| 5 - HOLDING CLUTCH B3               | 18 - CENTER PLANETARY PINION GEARS |
| 6 - HOLDING CLUTCH B2               | 19 - REAR PLANETARY PINION GEARS   |
| 7 - DRIVING CLUTCH K1               | 20 - FREEWHEELING CLUTCH F1        |
| 8 - FRONT PLANETARY ANNULUS GEAR    | 21 - FRONT PLANETARY SUN GEAR      |
| 9 - DRIVING CLUTCH K2               | 22 - CENTER PLANETARY SUN GEAR     |
| 10 - CENTER PLANETARY ANNULUS GEAR  | 23 - REAR PLANETARY SUN GEAR       |
| 11 - REAR PLANETARY ANNULUS GEAR    | 24 - FREEWHEELING CLUTCH F2        |
| 12 - DRIVING CLUTCH K3              | 25 - INPUT SHAFT                   |
| 13 - FRONT PLANETARY CARRIER        | 26 - OUTPUT SHAFT                  |
| A - ENGINE SPEED                    | D - SECOND GEAR RATIO              |
| B - TRANSMISSION INPUT SPEED        | E - THIRD GEAR RATIO               |
| C - FIRST GEAR RATIO                | F - FIXED PARTS                    |





### *Fifth Gear Powerflow*

- |                                     |                                    |
|-------------------------------------|------------------------------------|
| 1 - TORQUE CONVERTER LOCK-UP CLUTCH | 14 - CENTER PLANETARY CARRIER      |
| 2 - TORQUE CONVERTER TURBINE        | 15 - REAR PLANETARY CARRIER        |
| 3 - TORQUE CONVERTER IMPELLER       | 16 - TORQUE CONVERTER STATOR       |
| 4 - HOLDING CLUTCH B1               | 17 - FRONT PLANETARY PINION GEARS  |
| 5 - HOLDING CLUTCH B3               | 18 - CENTER PLANETARY PINION GEARS |
| 6 - HOLDING CLUTCH B2               | 19 - REAR PLANETARY PINION GEARS   |
| 7 - DRIVING CLUTCH K1               | 20 - FREEWHEELING CLUTCH F1        |
| 8 - FRONT PLANETARY ANNULUS GEAR    | 21 - FRONT PLANETARY SUN GEAR      |
| 9 - DRIVING CLUTCH K2               | 22 - CENTER PLANETARY SUN GEAR     |
| 10 - CENTER PLANETARY ANNULUS GEAR  | 23 - REAR PLANETARY SUN GEAR       |
| 11 - REAR PLANETARY ANNULUS GEAR    | 24 - FREEWHEELING CLUTCH F2        |
| 12 - DRIVING CLUTCH K3              | 25 - INPUT SHAFT                   |
| 13 - FRONT PLANETARY CARRIER        | 26 - OUTPUT SHAFT                  |
| A - ENGINE SPEED                    | D - SECOND GEAR RATIO              |
| B - TRANSMISSION INPUT SPEED        | E - THIRD GEAR RATIO               |
| C - FIRST GEAR RATIO                | F - FIXED PARTS                    |

Torque from the torque converter is increased via the input shaft (25) and all three planetary gearsets and transferred to the output shaft (26).

### **Front Planetary Gear Set**

The annulus gear (8) is driven by the input shaft (25). The sun gear (21) is held against the housing by the locked freewheel F1 (20) during acceleration and via the engaged multiple-disc holding clutch B1 (4) during deceleration. The planetary pinion gears (17) turn on the fixed sun gear (21) and increase the torque from the annulus gear (8) to the planetary carrier (13). The planetary carrier (13) moves at a reduced speed in the running direction of the engine.

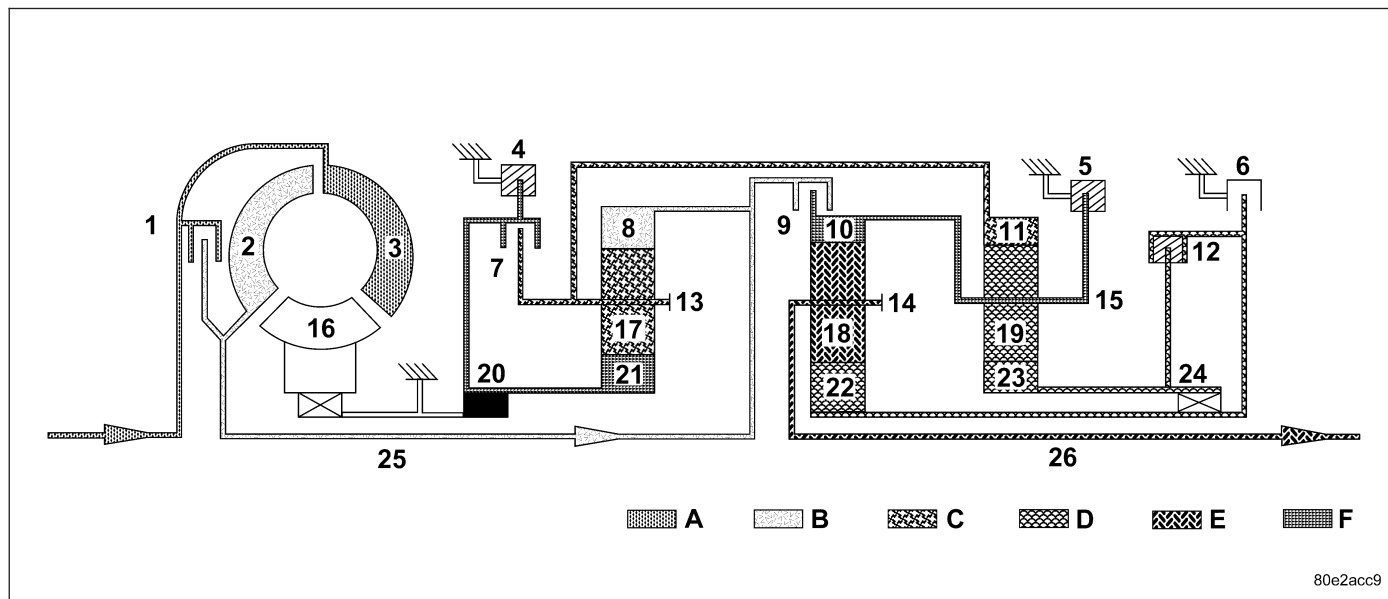
### **Rear Planetary Gear Set**

The multiple-disc clutch K2 (9) is engaged and transfers the input speed of the input shaft (25) to the planetary carrier (15) via the annulus gear (10). The annulus gear (11) turns at a reduced speed due to the mechanical connection with the front planetary carrier (13). The planetary pinion gears (19) turn between the annulus gear (11) and the sun gear (23). The sun gear (23) moves at an increased speed in the running direction of the engine.

## Center Planetary Gear Set

The annulus gear (10) turns at the input speed as a result of the engaged multiple-disc clutch K2 (9). The multiple-disc clutch K3 (12) transfers an increased speed to the sun gear (22) due to the connection with the sun gear (23). The planetary pinion gears (18) turn between the annulus gear (10) and the sun gear (22). The speed of the planetary carrier (14) and the output shaft connected to the planetary carrier (5) lies between that of the annulus gear (10) and the sun gear (22). This provides a step-up ratio.

## REVERSE GEAR POWERFLOW

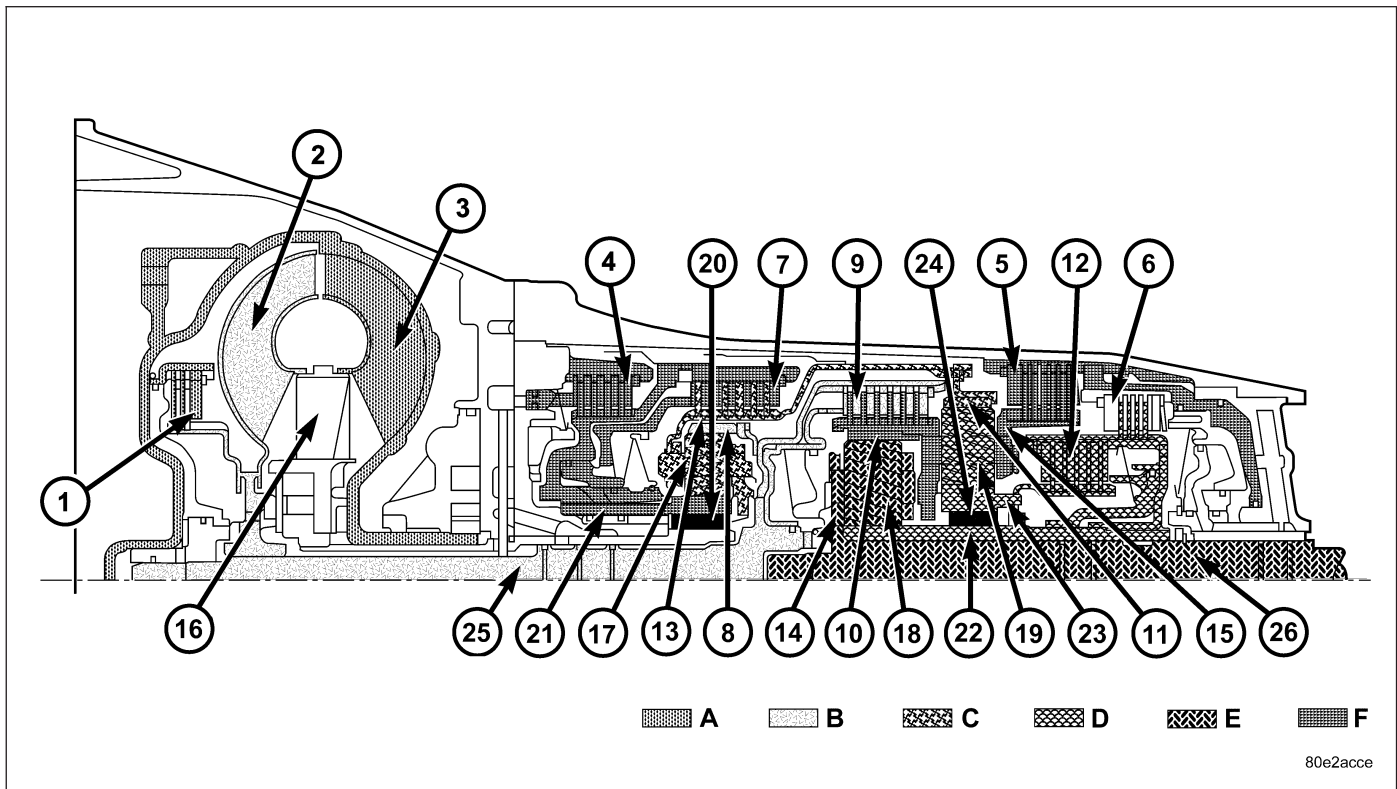


**Reverse Gear Powerflow**

- 1 - TORQUE CONVERTER LOCK-UP CLUTCH
- 2 - TORQUE CONVERTER TURBINE
- 3 - TORQUE CONVERTER IMPELLER
- 4 - HOLDING CLUTCH B1
- 5 - HOLDING CLUTCH B3
- 6 - HOLDING CLUTCH B2
- 7 - DRIVING CLUTCH K1
- 8 - FRONT PLANETARY ANNULUS GEAR
- 9 - DRIVING CLUTCH K2
- 10 - CENTER PLANETARY ANNULUS GEAR
- 11 - REAR PLANETARY ANNULUS GEAR
- 12 - DRIVING CLUTCH K3
- 13 - FRONT PLANETARY CARRIER
- A - ENGINE SPEED
- B - TRANSMISSION INPUT SPEED
- C - FIRST GEAR RATIO

- 14 - CENTER PLANETARY CARRIER
- 15 - REAR PLANETARY CARRIER
- 16 - TORQUE CONVERTER STATOR
- 17 - FRONT PLANETARY PINION GEARS
- 18 - CENTER PLANETARY PINION GEARS
- 19 - REAR PLANETARY PINION GEARS
- 20 - FREEWHEELING CLUTCH F1
- 21 - FRONT PLANETARY SUN GEAR
- 22 - CENTER PLANETARY SUN GEAR
- 23 - REAR PLANETARY SUN GEAR
- 24 - FREEWHEELING CLUTCH F2
- 25 - INPUT SHAFT
- 26 - OUTPUT SHAFT
- D - SECOND GEAR RATIO
- E - THIRD GEAR RATIO
- F - FIXED PARTS



**Reverse Gear Powerflow**

- |                                     |                                    |
|-------------------------------------|------------------------------------|
| 1 - TORQUE CONVERTER LOCK-UP CLUTCH | 14 - CENTER PLANETARY CARRIER      |
| 2 - TORQUE CONVERTER TURBINE        | 15 - REAR PLANETARY CARRIER        |
| 3 - TORQUE CONVERTER IMPELLER       | 16 - TORQUE CONVERTER STATOR       |
| 4 - HOLDING CLUTCH B1               | 17 - FRONT PLANETARY PINION GEARS  |
| 5 - HOLDING CLUTCH B3               | 18 - CENTER PLANETARY PINION GEARS |
| 6 - HOLDING CLUTCH B2               | 19 - REAR PLANETARY PINION GEARS   |
| 7 - DRIVING CLUTCH K1               | 20 - FREEWHEELING CLUTCH F1        |
| 8 - FRONT PLANETARY ANNULUS GEAR    | 21 - FRONT PLANETARY SUN GEAR      |
| 9 - DRIVING CLUTCH K2               | 22 - CENTER PLANETARY SUN GEAR     |
| 10 - CENTER PLANETARY ANNULUS GEAR  | 23 - REAR PLANETARY SUN GEAR       |
| 11 - REAR PLANETARY ANNULUS GEAR    | 24 - FREEWHEELING CLUTCH F2        |
| 12 - DRIVING CLUTCH K3              | 25 - INPUT SHAFT                   |
| 13 - FRONT PLANETARY CARRIER        | 26 - OUTPUT SHAFT                  |
| A - ENGINE SPEED                    | D - SECOND GEAR RATIO              |
| B - TRANSMISSION INPUT SPEED        | E - THIRD GEAR RATIO               |
| C - FIRST GEAR RATIO                | F - FIXED PARTS                    |

Torque from the torque converter is increased via the input shaft (25) and all three planetary gearsets and transferred with reversed direction of rotation to the output shaft (26).

### Front Planetary Gear Set

The annulus gear (8) is driven by the input shaft (25). The sun gear (21) is held against the housing by the locked freewheel F1 (20) during acceleration and via the engaged multiple-disc holding clutch B1 (4) during deceleration. The planetary pinion gears (17) turn on the fixed sun gear (21) and increase the torque from the annulus gear (8) to the planetary carrier (13). The planetary carrier (13) moves at a reduced speed in the running direction of the engine.

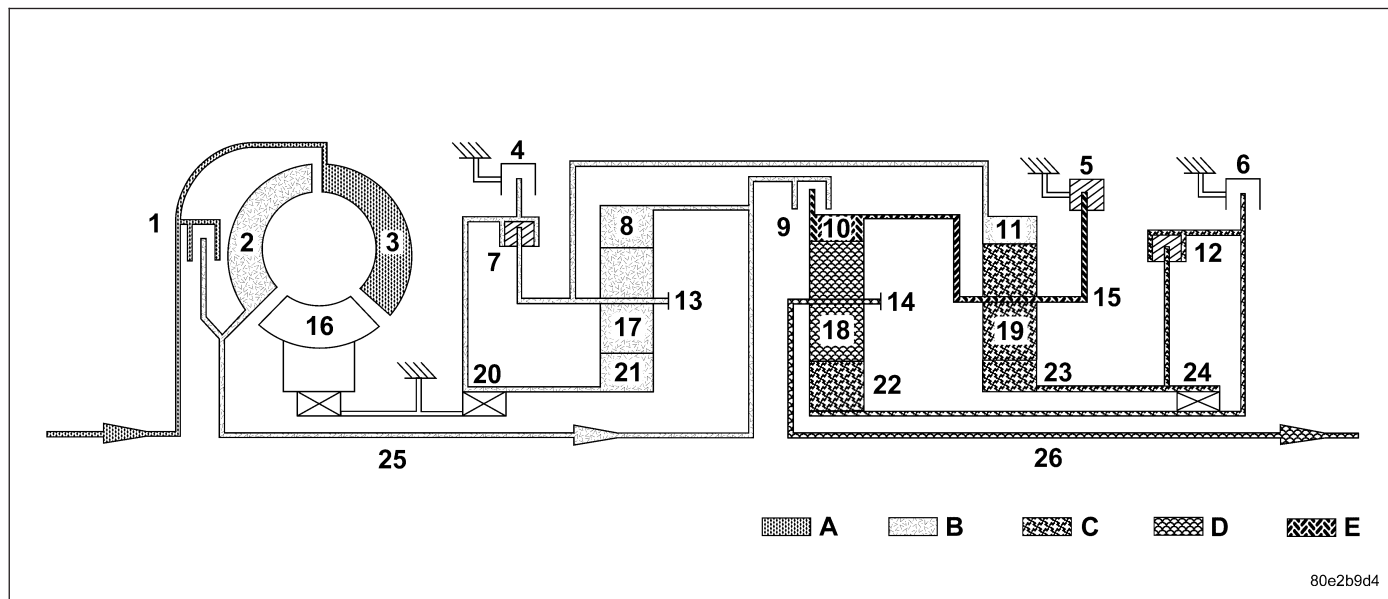
### Rear Planetary Gear Set

The planetary carrier (15) is held against the housing by the engaged multiple-disc holding clutch B3 (5). The annulus gear (11) turns at a reduced speed due to the mechanical connection to the front planetary carrier (13). The planetary gears (19) turn between the annulus gear (11) and the sun gear (23). The direction is reversed by the held planetary carrier (15) so that the sun gear (23) turns in the opposite direction to the running direction of the engine.

## Center Planetary Gear Set

The annulus gear (10) is held against the housing by the multiple-disc holding clutch B3 (5) via the mechanical connection to the planetary carrier (15). The sun gear (22) turns backwards due to the engaged multiple-disc clutch K3 (12). The planetary gears (18) turn on the fixed annulus gear (10) and increase the torque from the sun gear (22) to the planetary carrier (14). The output shaft (26) connected to the planetary carrier (14) turns at a reduced speed in the opposite direction to the running direction of the engine.

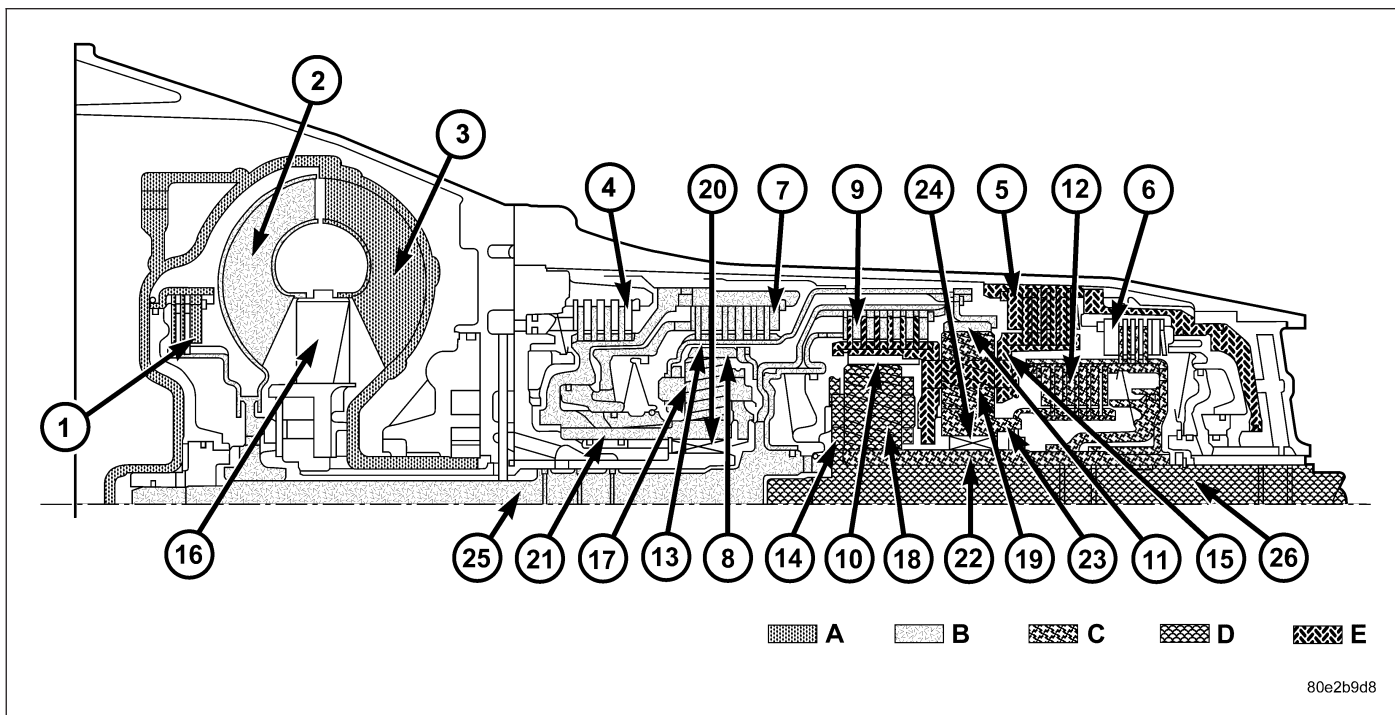
## REVERSE GEAR POWERFLOW - LIMP IN



**Reverse Gear Powerflow - Limp In**

- 1 - TORQUE CONVERTER LOCK-UP CLUTCH
- 2 - TORQUE CONVERTER TURBINE
- 3 - TORQUE CONVERTER IMPELLER
- 4 - HOLDING CLUTCH B1
- 5 - HOLDING CLUTCH B3
- 6 - HOLDING CLUTCH B2
- 7 - DRIVING CLUTCH K1
- 8 - FRONT PLANETARY ANNULUS GEAR
- 9 - DRIVING CLUTCH K2
- 10 - CENTER PLANETARY ANNULUS GEAR
- 11 - REAR PLANETARY ANNULUS GEAR
- 12 - DRIVING CLUTCH K3
- 13 - FRONT PLANETARY CARRIER
- A - ENGINE SPEED
- B - TRANSMISSION INPUT SPEED
- C - FIRST GEAR RATIO

- 14 - CENTER PLANETARY CARRIER
- 15 - REAR PLANETARY CARRIER
- 16 - TORQUE CONVERTER STATOR
- 17 - FRONT PLANETARY PINION GEARS
- 18 - CENTER PLANETARY PINION GEARS
- 19 - REAR PLANETARY PINION GEARS
- 20 - FREEWHEELING CLUTCH F1
- 21 - FRONT PLANETARY SUN GEAR
- 22 - CENTER PLANETARY SUN GEAR
- 23 - REAR PLANETARY SUN GEAR
- 24 - FREEWHEELING CLUTCH F2
- 25 - INPUT SHAFT
- 26 - OUTPUT SHAFT
- D - SECOND GEAR RATIO
- E - FIXED PARTS



**Reverse Gear Powerflow - Limp In**

- 1 - TORQUE CONVERTER LOCK-UP CLUTCH
- 2 - TORQUE CONVERTER TURBINE
- 3 - TORQUE CONVERTER IMPELLER
- 4 - HOLDING CLUTCH B1
- 5 - HOLDING CLUTCH B3
- 6 - HOLDING CLUTCH B2
- 7 - DRIVING CLUTCH K1
- 8 - FRONT PLANETARY ANNULUS GEAR
- 9 - DRIVING CLUTCH K2
- 10 - CENTER PLANETARY ANNULUS GEAR
- 11 - REAR PLANETARY ANNULUS GEAR
- 12 - DRIVING CLUTCH K3
- 13 - FRONT PLANETARY CARRIER
- A - ENGINE SPEED
- B - TRANSMISSION INPUT SPEED
- C - FIRST GEAR RATIO

- 14 - CENTER PLANETARY CARRIER
- 15 - REAR PLANETARY CARRIER
- 16 - TORQUE CONVERTER STATOR
- 17 - FRONT PLANETARY PINION GEARS
- 18 - CENTER PLANETARY PINION GEARS
- 19 - REAR PLANETARY PINION GEARS
- 20 - FREEWHEELING CLUTCH F1
- 21 - FRONT PLANETARY SUN GEAR
- 22 - CENTER PLANETARY SUN GEAR
- 23 - REAR PLANETARY SUN GEAR
- 24 - FREEWHEELING CLUTCH F2
- 25 - INPUT SHAFT
- 26 - OUTPUT SHAFT
- D - SECOND GEAR RATIO
- E - FIXED PARTS

Torque from the torque converter is increased via the input shaft (25) and all three planetary gearsets and transferred with reversed direction of rotation to the output shaft (26) and.

### Front Planetary Gear Set

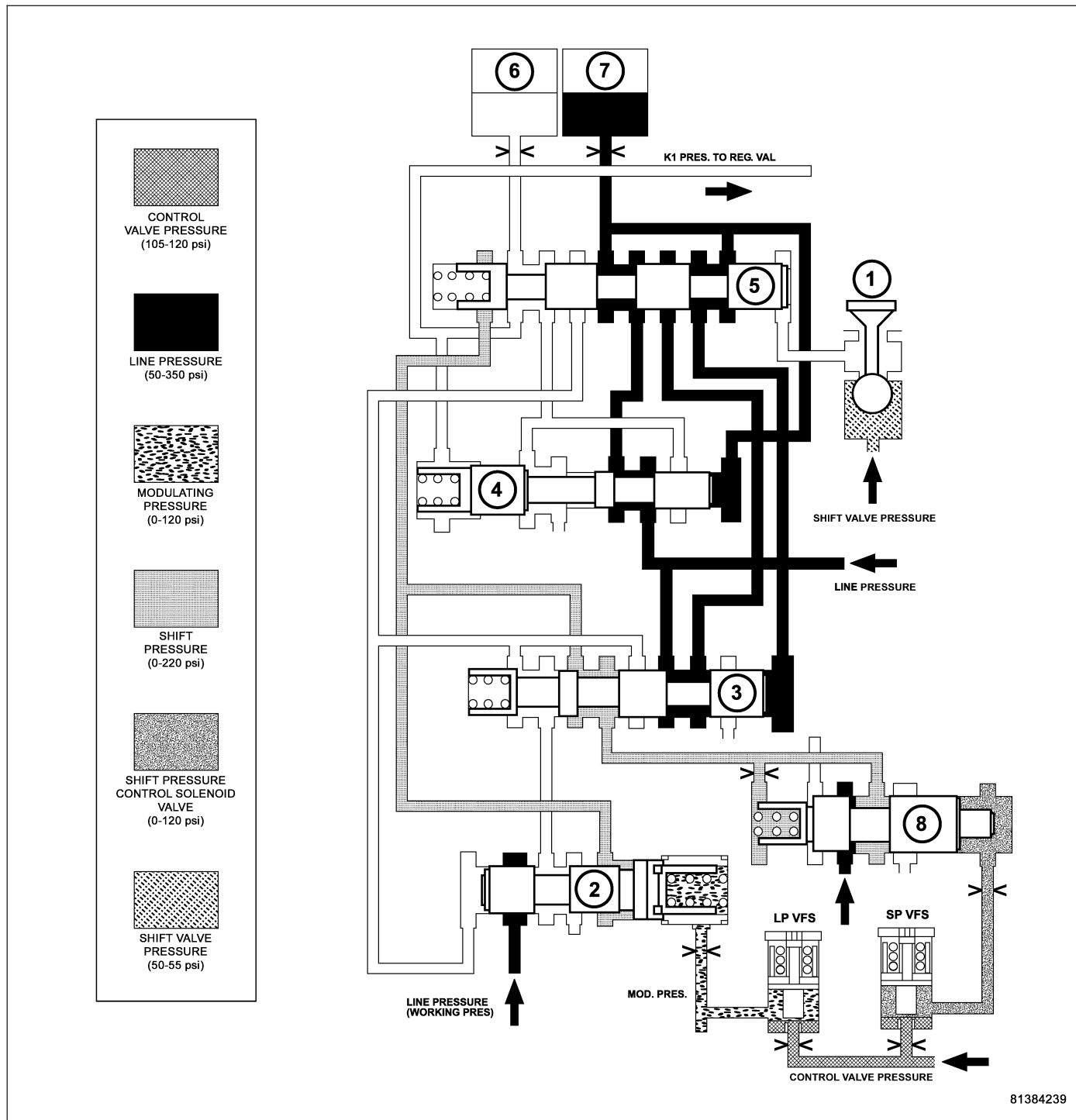
The clutch K1 (7) is shifted. The planetary carrier (13) and sun gear (21) are connected to each other as a result. The annulus gear (8) is driven via the input shaft (25). The planetary gear set is locked and turns as a unit.

### Rear Planetary Gear Set

The planetary carrier (15) is held against the housing by the engaged multiple-disc holding clutch B3 (5). The annulus gear (11) turns at a reduced speed due to the mechanical connection to the front planetary carrier (13). The planetary pinion gears (19) turn between the annulus gear (11) and the sun gear (23). The direction is reversed by the held planetary carrier (15) so that the sun gear (23) turns in the opposite direction to the running direction of the engine.

### Center Planetary Gear Set

The annulus gear (10) is held against the housing by the multiple-disc holding clutch B3 (5) via the mechanical connection to the planetary carrier (15). The sun gear (22) turns backwards due to the engaged multiple-disc clutch K3 (12). The planetary gears (18) turn on the fixed annulus gear (10) and increase the torque from the sun gear (22) to the planetary carrier (14). The output shaft (26) connected to the planetary carrier (14) turns at a reduced speed in the opposite direction to the running direction of the engine.

**SHIFT GROUPS/ SHIFT SEQUENCE****1-2 Shift - First Gear Engaged**

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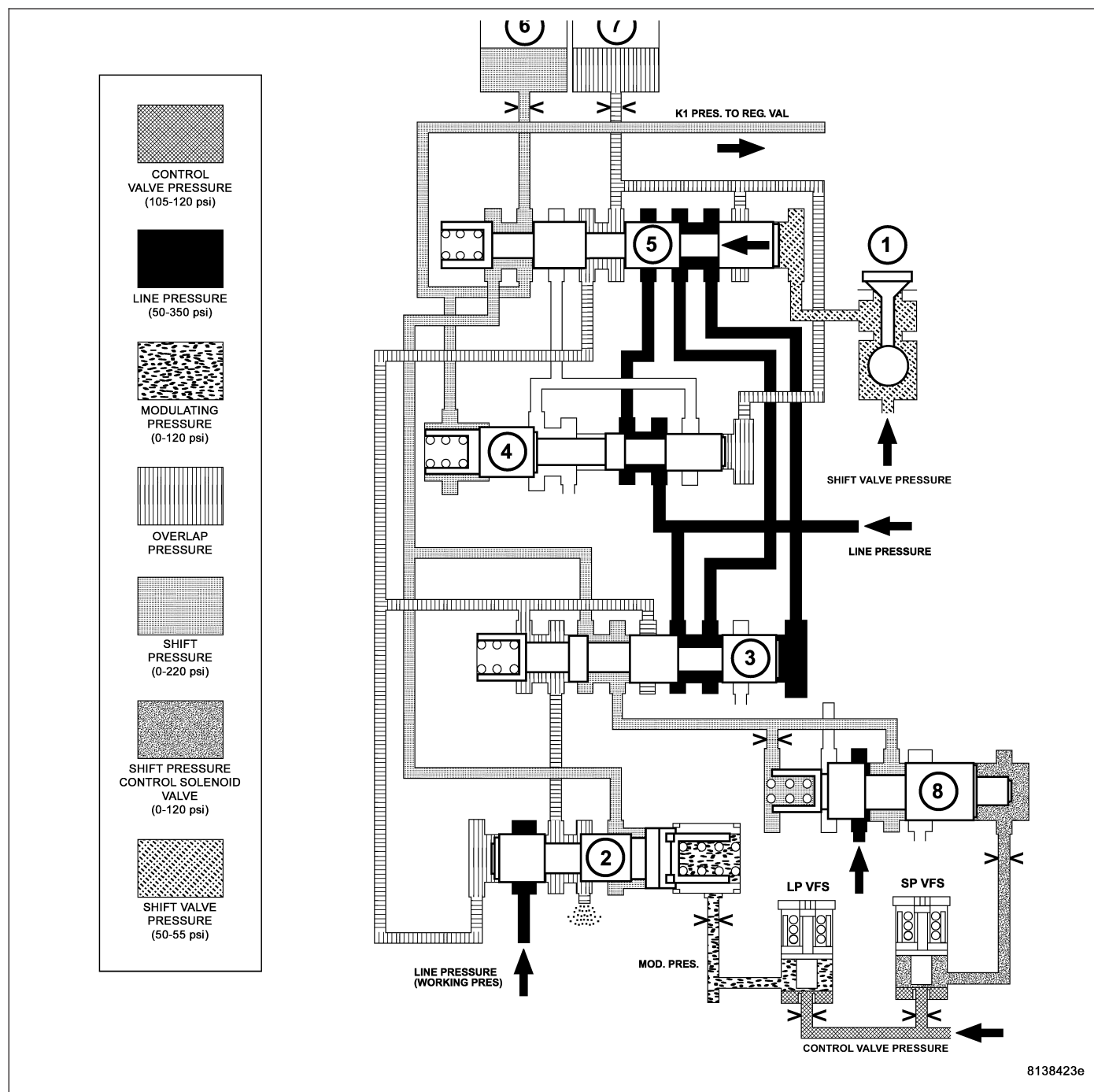
***First Gear Engaged***

- 1 - 1-2/4-5 SHIFT SOLENOID
- 2 - 1-2/4-5 OVERLAP VALVE
- 3 - 1-2/4-5 SHIFT PRESSURE SHIFT VALVE
- 4 - 1-2/4-5 HOLDING PRESSURE SHIFT VALVE

- 5 - 1-2/4-5 COMMAND VALVE
- 6 - DRIVING CLUTCH K1
- 7 - HOLDING CLUTCH B1

The end face of the command valve (5) is kept unpressurized via the solenoid valve for 1-2 and 4-5 shift (1). Because of the holding pressure shift valve (4), the working pressure (p-A) is present at the multiple-disc holding clutch B1 (7). Clutch K1 (6) is unpressurized.

## Shift Phase - 1-2 Shift Phase 1

**Shift Phase - 1-2 Shift Phase 1**

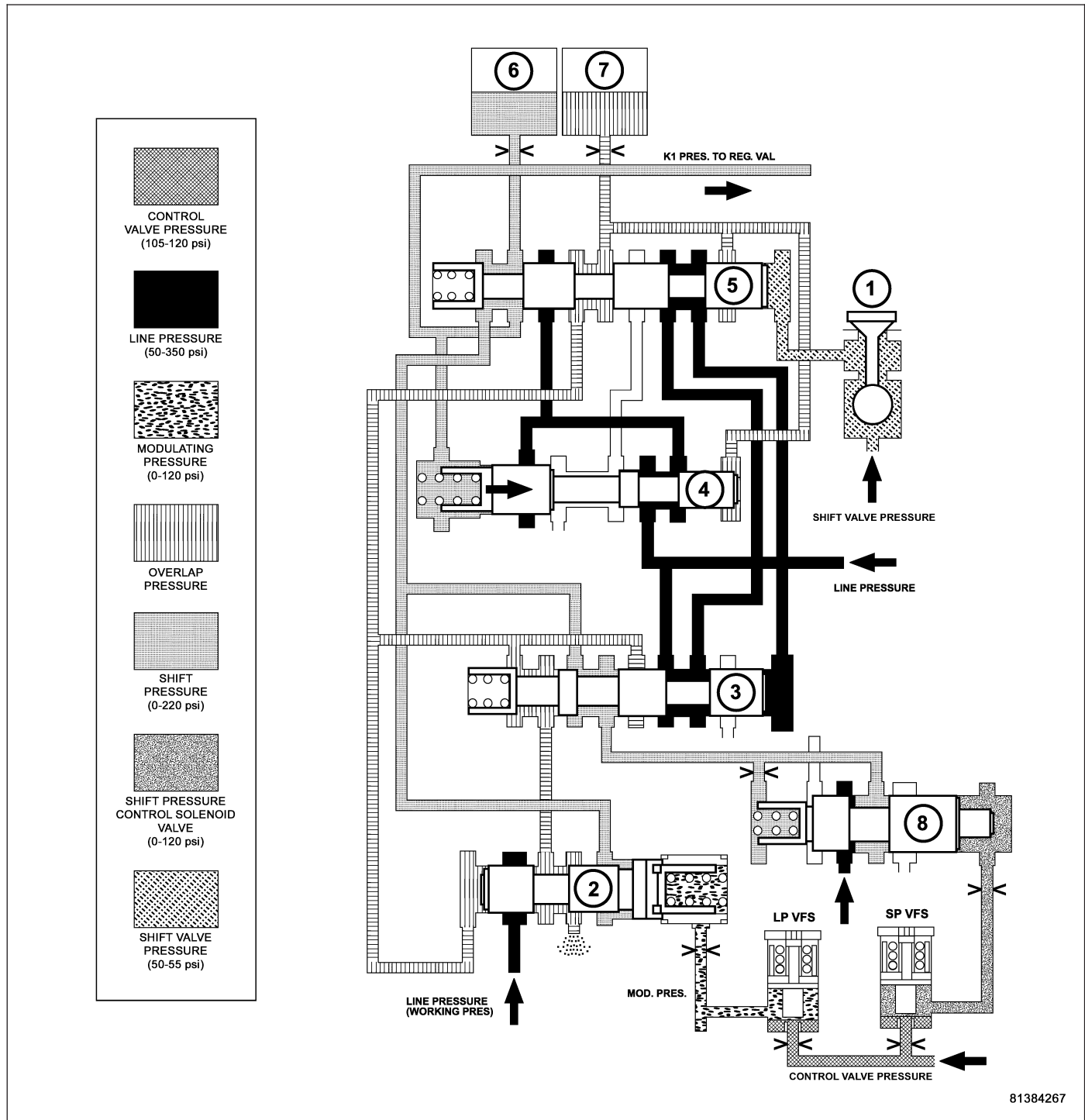
- 1 - 1-2/4-5 SHIFT SOLENOID
- 2 - 1-2/4-5 OVERLAP VALVE
- 3 - 1-2/4-5 SHIFT PRESSURE SHIFT VALVE
- 4 - 1-2/4-5 HOLDING PRESSURE SHIFT VALVE

- 5 - 1-2/4-5 COMMAND VALVE
- 6 - DRIVING CLUTCH K1
- 7 - HOLDING CLUTCH B1

When the 1-2 and 4-5 shift solenoid valve (1) is turned on, the shift valve pressure (p-SV) is directed onto the end face of the command valve (5). The command valve is moved and the shift pressure (p-S) coming from the shift pressure shift valve (3) is directed via the command valve (5) onto clutch K1 (6).

Simultaneously the clutch B1 (7) is subjected to overlap pressure by the overlap regulating valve (2). The pressure in the clutch B1 (7) as it disengages is controlled during the shift phase depending on engine load by the modulating pressure and the applying clutch pressure (the shift pressure in clutch K1). The controlled pressure in clutch B1 (7) is inversely proportional to the capacity of the clutch being engaged. The rising shift pressure (p-S) at clutch K1 (6) acts on the annular face of the overlap regulating valve (2) and reduces the overlap pressure regulated by the overlap regulating valve (2). When a corresponding pressure level is reached at the holding pressure shift valve (4), this valve switches over.

## Shift Phase - 1-2 Shift Phase 2



## Shift Phase - 1-2 Shift Phase 2

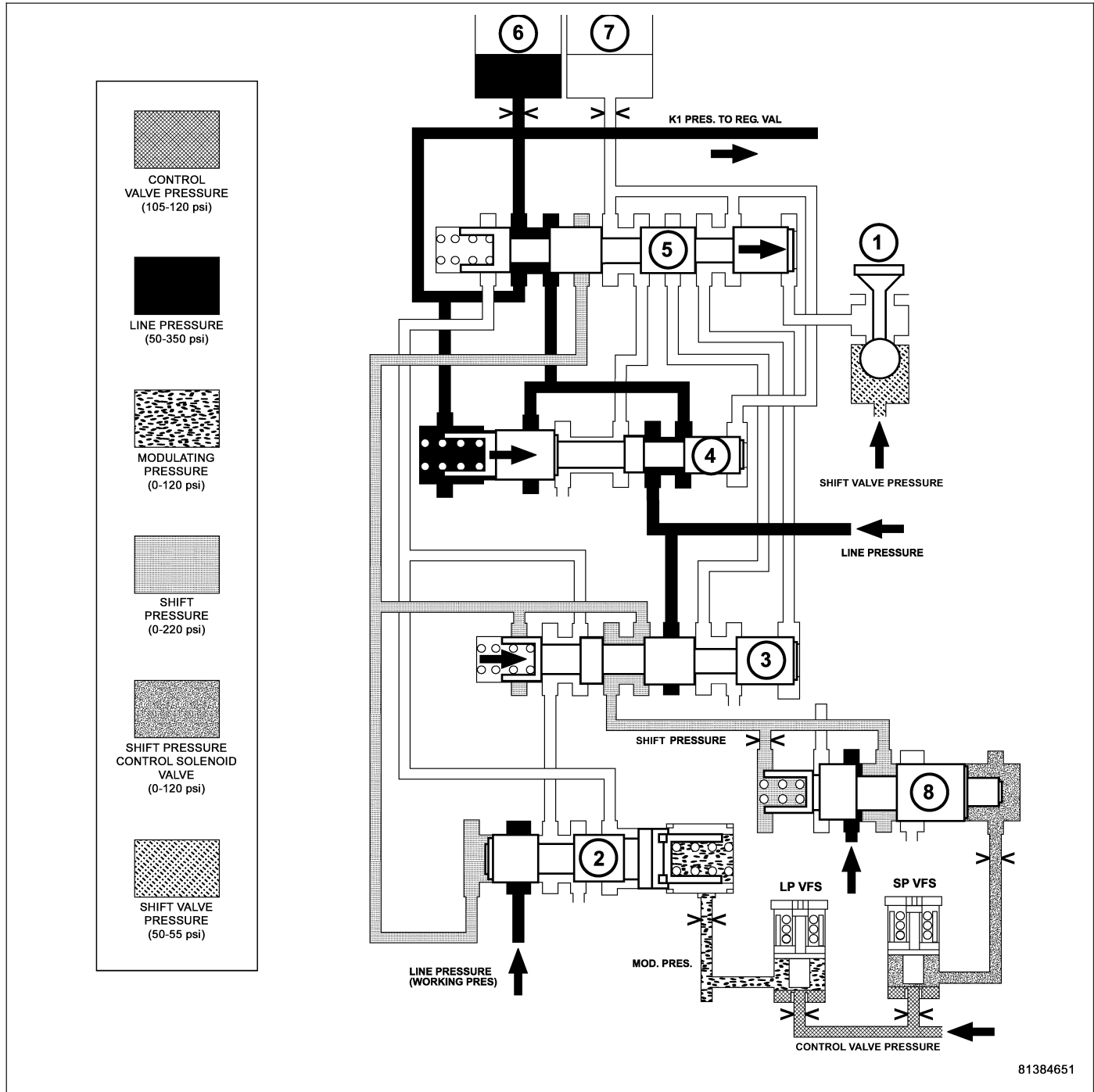
- 1 - 1-2/4-5 SHIFT SOLENOID
- 2 - 1-2/4-5 OVERLAP VALVE
- 3 - 1-2/4-5 SHIFT PRESSURE SHIFT VALVE
- 4 - 1-2/4-5 HOLDING PRESSURE SHIFT VALVE

- 5 - 1-2/4-5 COMMAND VALVE
- 6 - DRIVING CLUTCH K1
- 7 - HOLDING CLUTCH B1

The B1 (7) pressure acting on the end face of the shift pressure shift valve (3) is replaced by the working pressure (p-A). The shift pressure is also routed to the spring end of the holding valve (4) and the holding valve downshifts. The line pressure is then routed to the command valve (5).



## Second Gear Engaged



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## Second Gear Engaged

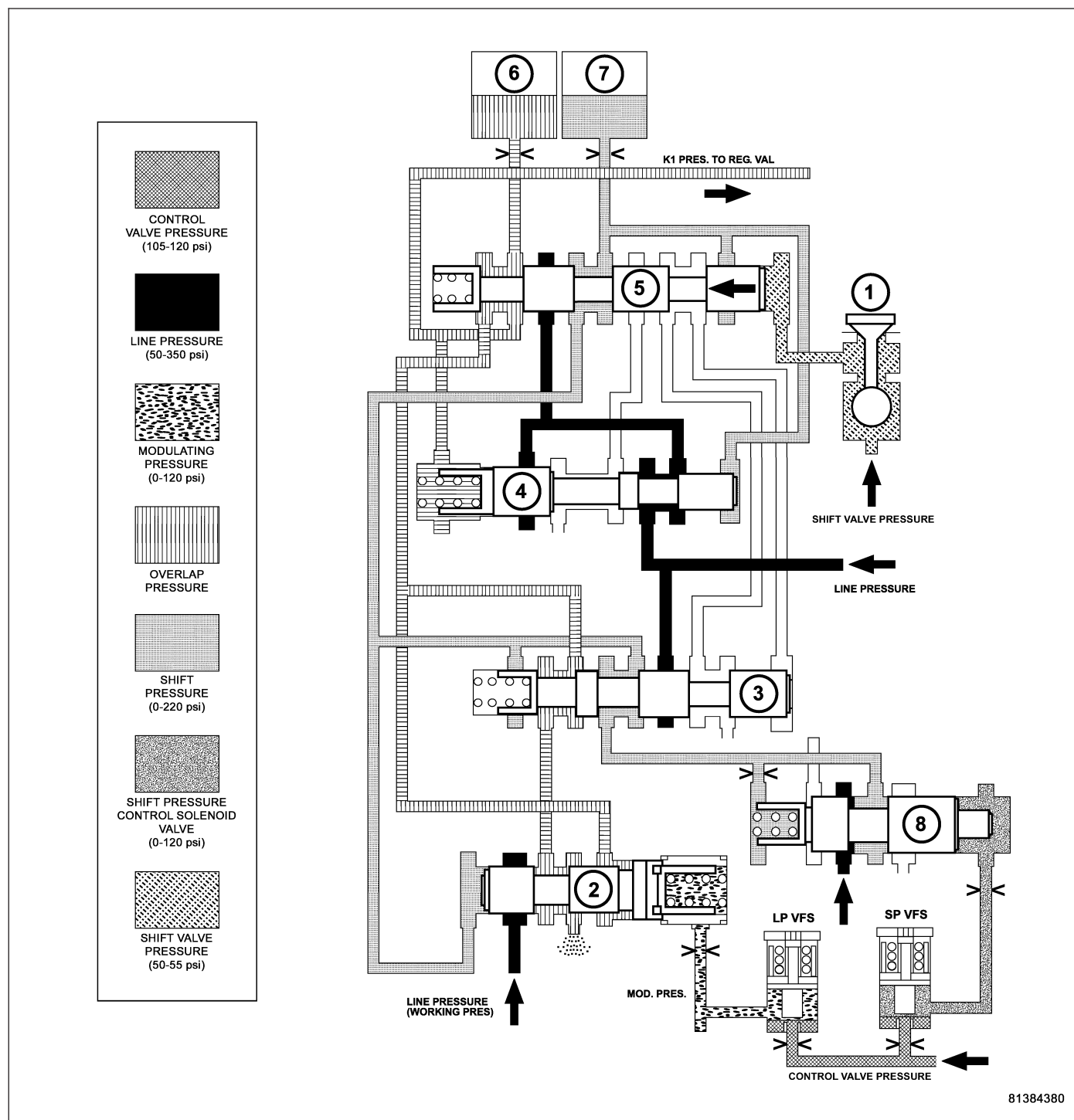
- 1 - 1-2/4-5 SHIFT SOLENOID
- 2 - 1-2/4-5 OVERLAP VALVE
- 3 - 1-2/4-5 SHIFT PRESSURE SHIFT VALVE
- 4 - 1-2/4-5 HOLDING PRESSURE SHIFT VALVE

- 5 - 1-2/4-5 COMMAND VALVE
- 6 - DRIVING CLUTCH K1
- 7 - HOLDING CLUTCH B1

After the gearchange is complete, the pressure on the end face of the command valve (5) is reduced via the 1-2 and 4-5 shift solenoid valve (1), and the command valve (5) is pushed back to its basic position. Via the holding pressure shift valve (4) the working pressure (p-A) now passes via the command valve (5) to clutch K1 (6). The multiple-disc holding clutch B1 (7) is deactivated (unpressurized). The spring of the shift pressure shift valve (3) pushes the valve back to its basic position.



## Shift Phase - 2-1 Shift Phase 1

*Shift Phase - 2-1 Shift Phase 1*

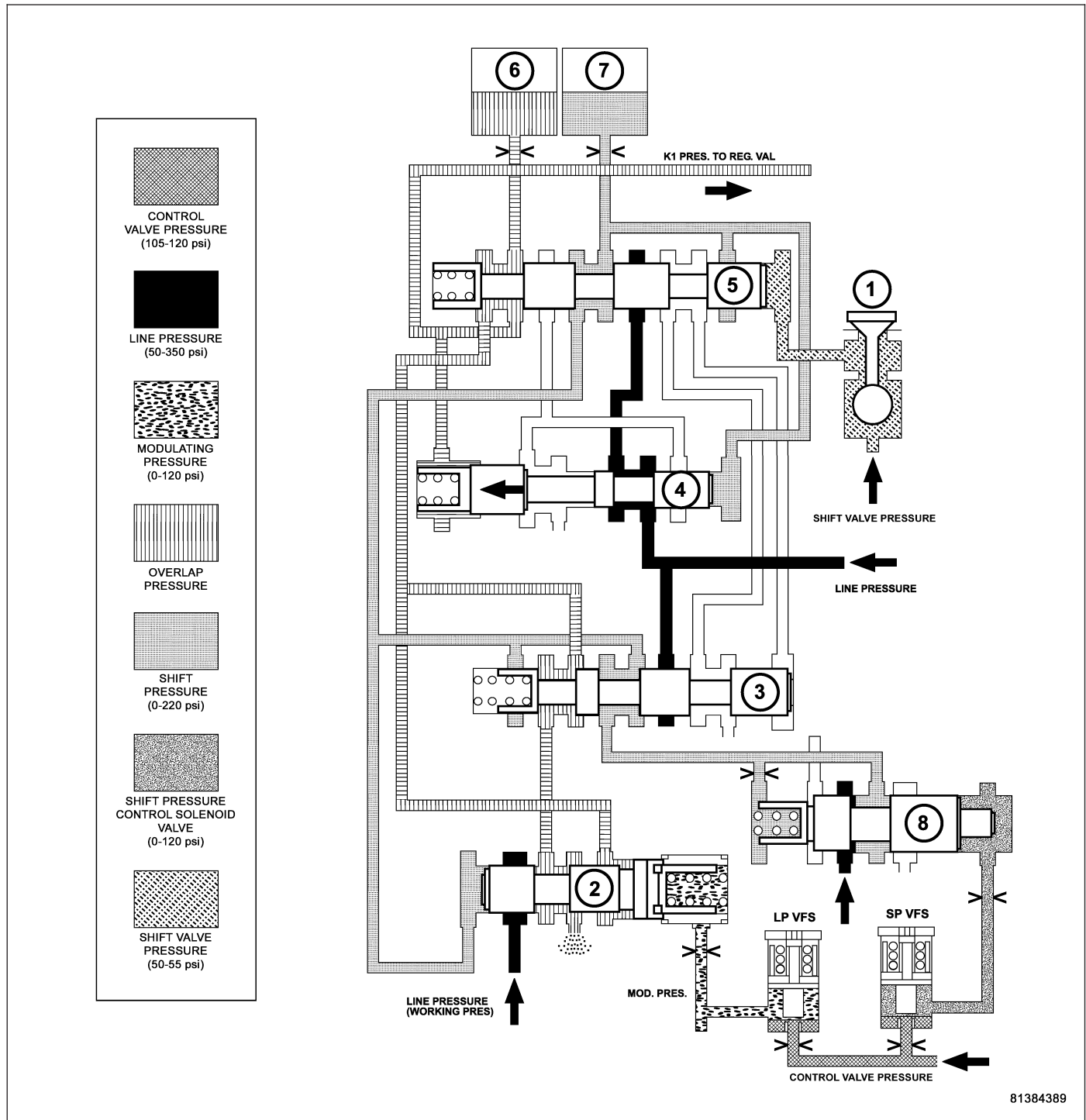
- 1 - 1-2/4-5 SHIFT SOLENOID
- 2 - 1-2/4-5 OVERLAP VALVE
- 3 - 1-2/4-5 SHIFT PRESSURE SHIFT VALVE
- 4 - 1-2/4-5 HOLDING PRESSURE SHIFT VALVE

- 5 - 1-2/4-5 COMMAND VALVE
- 6 - DRIVING CLUTCH K1
- 7 - HOLDING CLUTCH B1

The 1-2/4-5 shift solenoid (1) is turned ON to apply shift pressure (p-S) to the end face of the 1-2/4-5 command valve (5). This allows the command valve to up-shift and the shift pressure coming from the 1-2/4-5 shift valve (3) is routed to the holding clutch B1 (7) via the command valve.

Simultaneously, the pressure in the releasing clutch, K1 (6), is regulated at the 1-2/4-5 overlap valve (2). The pressure in the K1 clutch as it disengages is controlled during the shift phase depending on engine load, via the modulating pressure (p-MOD), and the shift pressure in clutch B1 (7). The increasing shift pressure in clutch B1, which also acts on the end face of the overlap valve, reduces the overlap pressure.

# Shift Phase - 2-1 Shift Phase 2



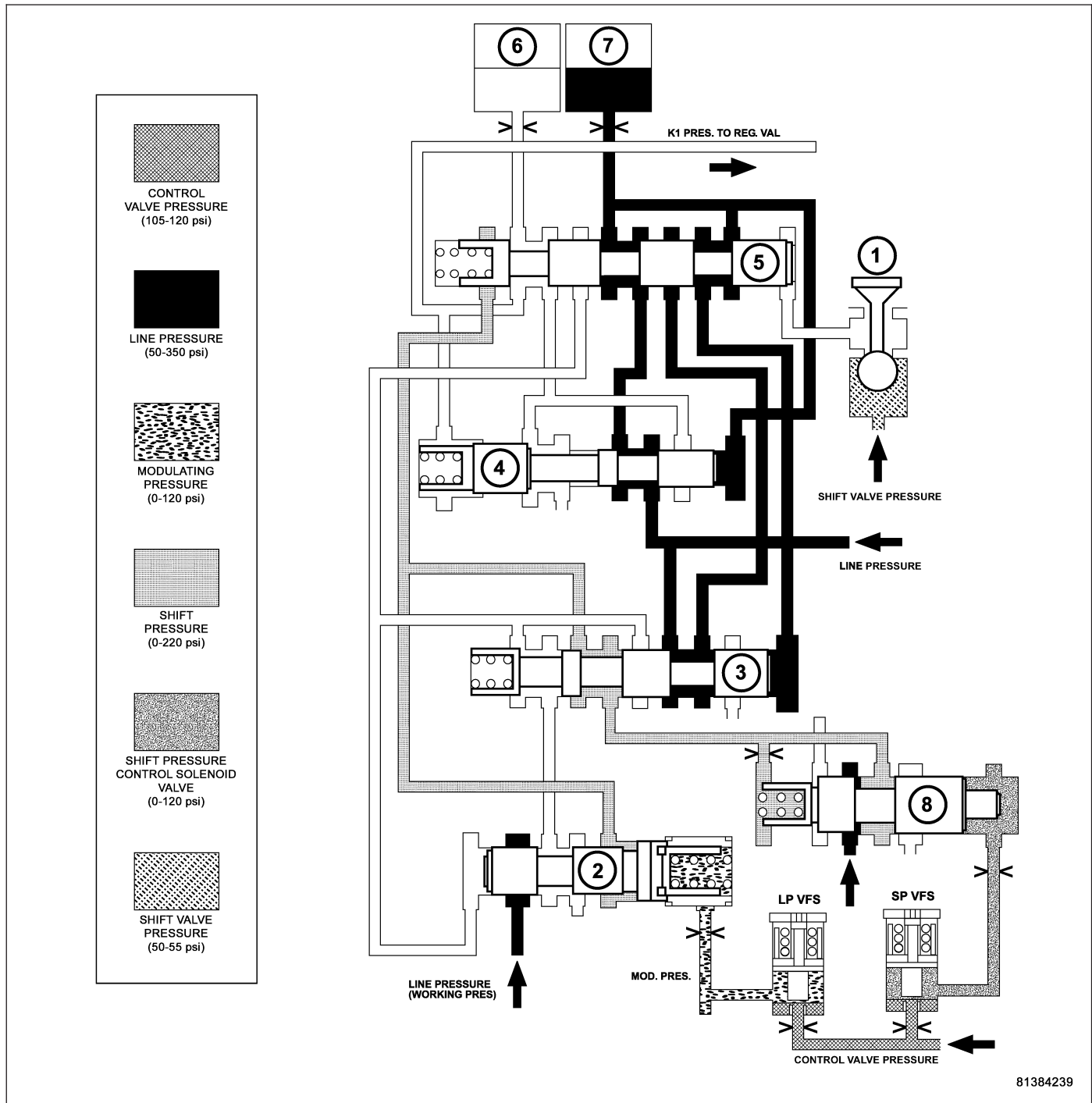
## Shift Phase - 2-1 Shift Phase 2

- 1 - 1-2/4-5 SHIFT SOLENOID
- 2 - 1-2/4-5 OVERLAP VALVE
- 3 - 1-2/4-5 SHIFT PRESSURE SHIFT VALVE
- 4 - 1-2/4-5 HOLDING PRESSURE SHIFT VALVE

- 5 - 1-2/4-5 COMMAND VALVE
- 6 - DRIVING CLUTCH K1
- 7 - HOLDING CLUTCH B1

The pressure in clutch B1 (7) acting on the end face of the 1-2/4-5 holding valve (4) forces the valve to up-shift against the spring pressure and allows line pressure (p-A) to pass through the command valve (5).

## 2-1 Shift - First Gear Engaged



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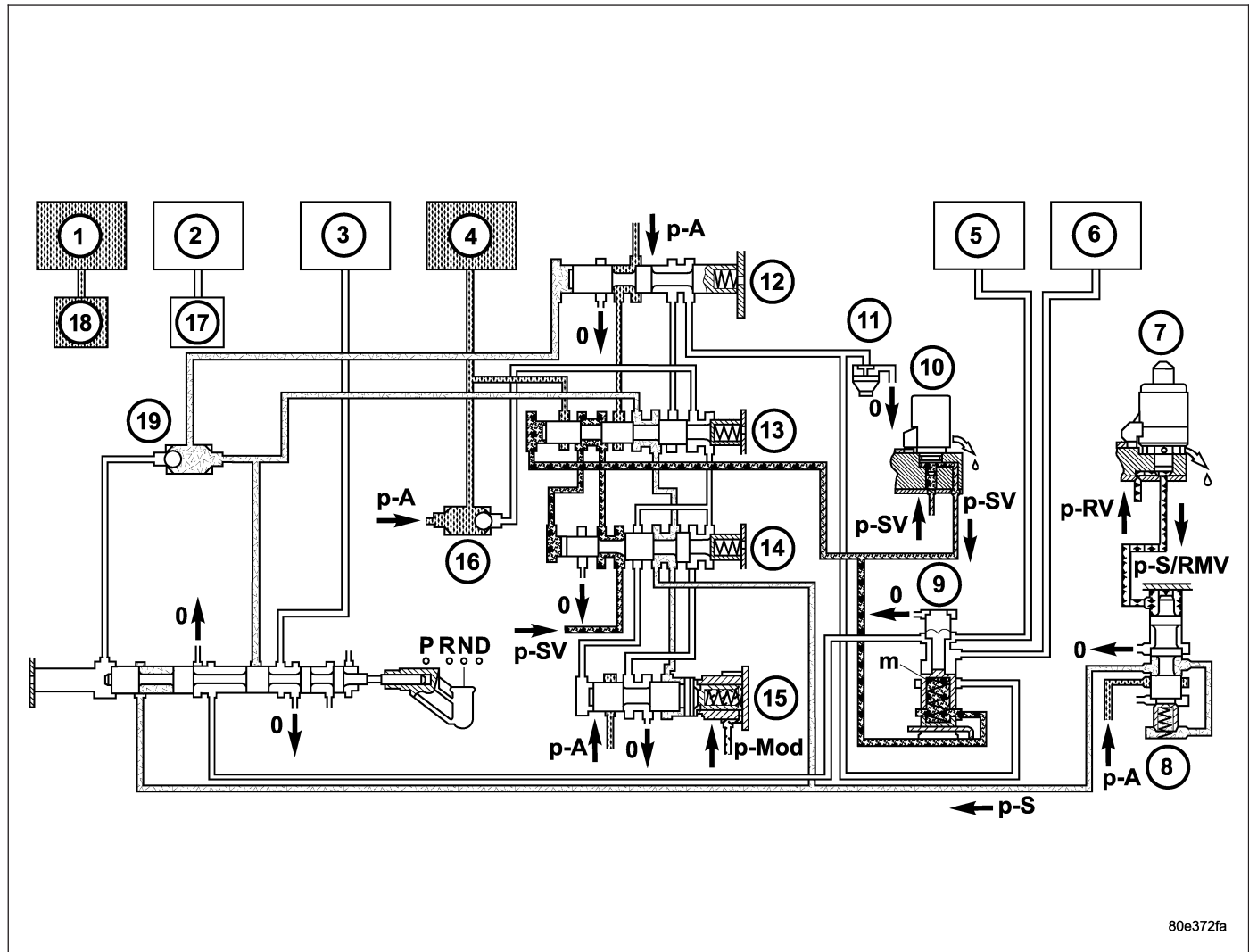
### First Gear Engaged

- 1 - 1-2/4-5 SHIFT SOLENOID
- 2 - 1-2/4-5 OVERLAP VALVE
- 3 - 1-2/4-5 SHIFT PRESSURE SHIFT VALVE
- 4 - 1-2/4-5 HOLDING PRESSURE SHIFT VALVE

- 5 - 1-2/4-5 COMMAND VALVE
- 6 - DRIVING CLUTCH K1
- 7 - HOLDING CLUTCH B1

After the gear change is complete, the 1-2/4-5 shift solenoid (1) is turned off. This reduces the pressure on the end face of the 1-2/4-5 command valve (5) to 0 psi and the spring pressure downshifts the valve to its initial position. The line pressure (p-A) is switched to the holding clutch B1 (7) and the end face of the holding valve by the downshifted command valve. The upshifted holding valve also allows the remaining pressure in clutch K1 (6) to be vented.

## Gear Shift N to D (1st gear) - Engine Started



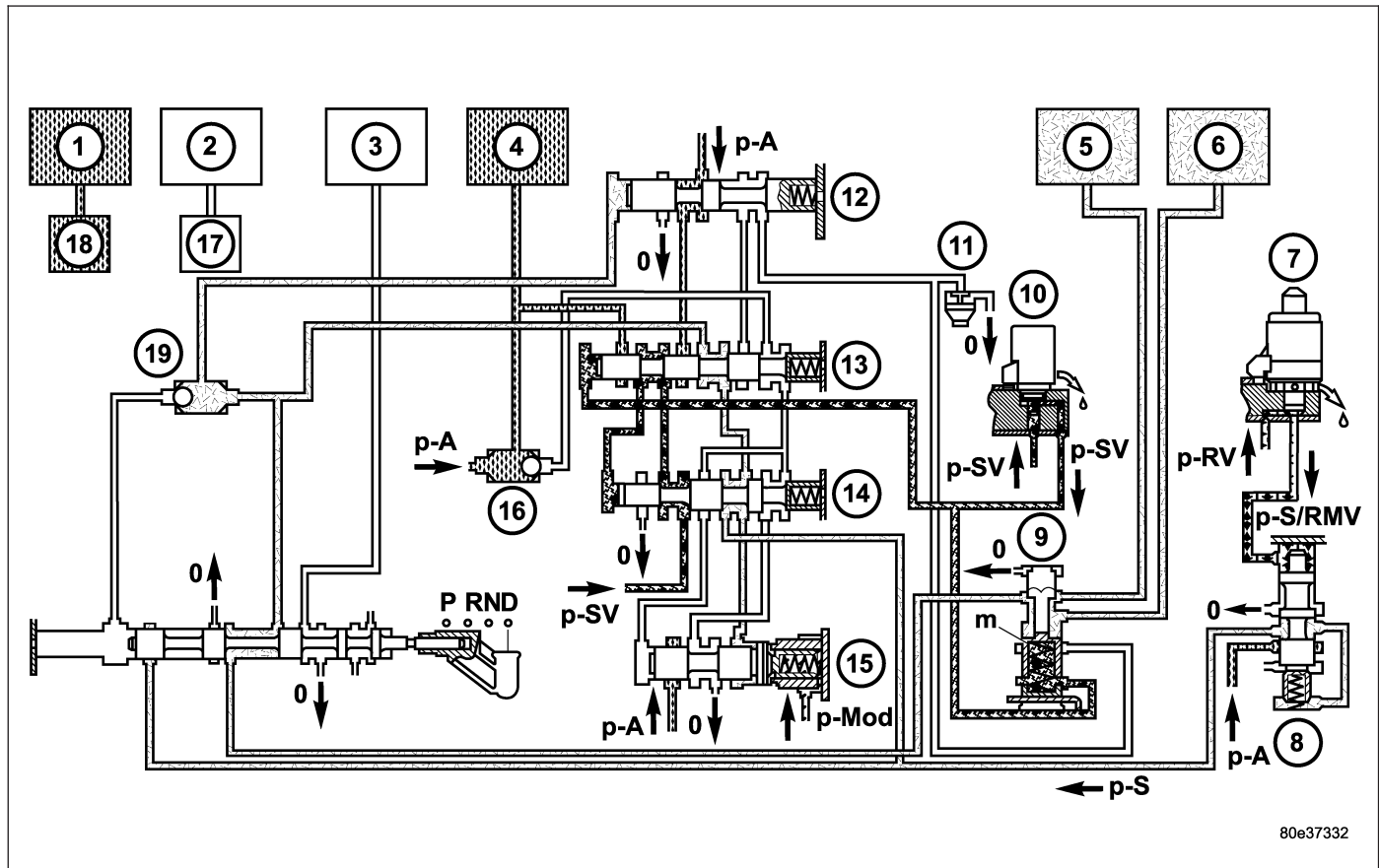
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**Engine Started**

- |  |                                       |
|--|---------------------------------------|
| 1 - HOLDING CLUTCH B1                      | 11 - PRESSURE HOLDING VALVE           |
| 2 - DRIVING CLUTCH K1                      | 12 - 3-4 HOLDING PRESSURE SHIFT VALVE |
| 3 - HOLDING CLUTCH B3                      | 13 - 3-4 COMMAND VALVE                |
| 4 - DRIVING CLUTCH K3                      | 14 - 3-4 SHIFT PRESSURE SHIFT VALVE   |
| 5 - HOLDING CLUTCH B2 PISTON               | 15 - 3-4 OVERLAP REGULATING VALVE     |
| 6 - HOLDING CLUTCH B2 PISTON OPPOSING FACE | 16 - BALL VALVE                       |
| 7 - SHIFT PRESSURE REGULATING SOLENOID     | 17 - 1-2/4-5 COMMAND VALVE            |
| 8 - SHIFT PRESSURE REGULATING VALVE        | 18 - 1-2/4-5 COMMAND VALVE            |
| 9 - SHIFT VALVE B2                         | 19 - BALL VALVE                       |
| 10 - 3-4 SHIFT SOLENOID                    |                                       |

With the engine started and the gearshift lever in the NEUTRAL or PARK positions, holding clutch B1 (1) and driving clutch K3 (4) are applied and the various valves in the 1-2/4-5 shift group are positioned to apply pressure to the holding clutch B2.

## Activation Sequence

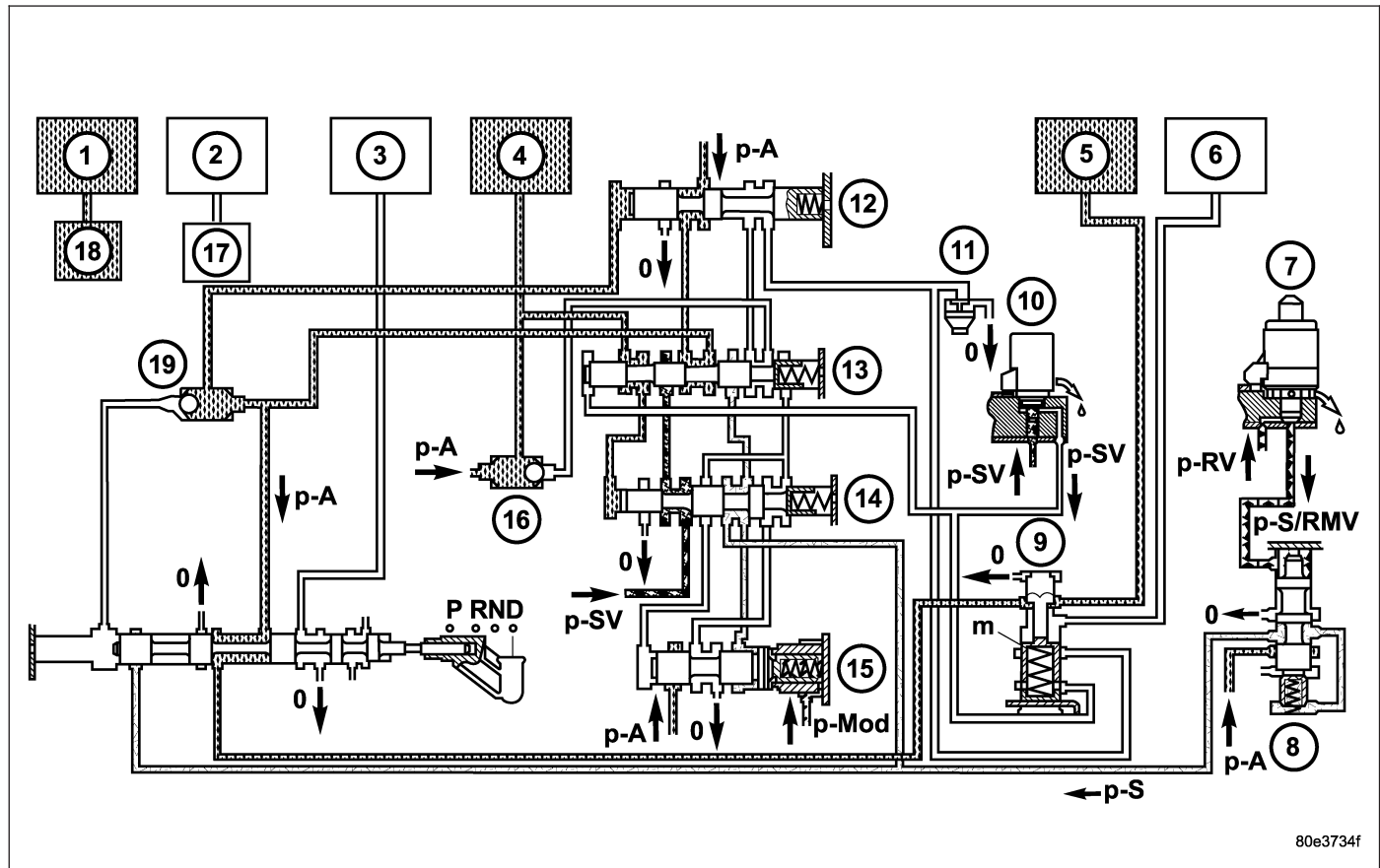


### Activation Sequence

- |  |                                       |
|--|---------------------------------------|
| 1 - HOLDING CLUTCH B1                      | 11 - PRESSURE HOLDING VALVE           |
| 2 - DRIVING CLUTCH K1                      | 12 - 3-4 HOLDING PRESSURE SHIFT VALVE |
| 3 - HOLDING CLUTCH B3                      | 13 - 3-4 COMMAND VALVE                |
| 4 - DRIVING CLUTCH K3                      | 14 - 3-4 SHIFT PRESSURE SHIFT VALVE   |
| 5 - HOLDING CLUTCH B2 PISTON               | 15 - 3-4 OVERLAP REGULATING VALVE     |
| 6 - HOLDING CLUTCH B2 PISTON OPPOSING FACE | 16 - BALL VALVE                       |
| 7 - SHIFT PRESSURE REGULATING SOLENOID     | 17 - 1-2/4-5 COMMAND VALVE            |
| 8 - SHIFT PRESSURE REGULATING VALVE        | 18 - 1-2/4-5 COMMAND VALVE            |
| 9 - SHIFT VALVE B2                         | 19 - BALL VALVE                       |
| 10 - 3-4 SHIFT SOLENOID                    |                                       |

The selector valve opens the shift pressure (p-S) feed connection from the ball valve (19) with the shift valve B2 (9). With the shift valve B2 (9) in the upper position, shift pressure (p-S) travels behind the piston B2 (5) and simultaneously to the opposing face of the piston B2 (6). The multiple-disc holding clutch B2 begins to close.

The pressure on the opposing face of the piston B2 (6) ensures a soft activation of the multiple-disc holding clutch B2.

**First Gear Engaged**

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**First Gear Engaged**

- 1 - HOLDING CLUTCH B1
- 2 - DRIVING CLUTCH K1
- 3 - HOLDING CLUTCH B3
- 4 - DRIVING CLUTCH K3
- 5 - HOLDING CLUTCH B2 PISTON
- 6 - HOLDING CLUTCH B2 PISTON OPPOSING FACE
- 7 - SHIFT PRESSURE REGULATING SOLENOID
- 8 - SHIFT PRESSURE REGULATING VALVE
- 9 - SHIFT VALVE B2
- 10 - 3-4 SHIFT SOLENOID

- 11 - PRESSURE HOLDING VALVE
- 12 - 3-4 HOLDING PRESSURE SHIFT VALVE
- 13 - 3-4 COMMAND VALVE
- 14 - 3-4 SHIFT PRESSURE SHIFT VALVE
- 15 - 3-4 OVERLAP REGULATING VALVE
- 16 - BALL VALVE
- 17 - 1-2/4-5 COMMAND VALVE
- 18 - 1-2/4-5 COMMAND VALVE
- 19 - BALL VALVE

The TCM monitors the activation sequence via the speed of the input shaft, which slows down as the frictional connection in the multiple-disc holding clutch increases. When the speed drops to the specified level, the TCM shuts off the power to the 3-4 shift solenoid valve (10). The spring chamber of the shift valve B2 (9) is depressurized and switches downwards. This connects the line to the opposing face of the piston B2 (6) with the pressure holding valve (11). The pressure on the opposing face of the piston B2 (6) drops to a residual pressure.

The working pressure (p-A) is formed and travels via the 2-3 holding pressure shift valve, the 2-3 command valve and the ball valve (16) to multi-plate clutch K3 (4) and via the 3-4 command valve (13) to the end face of the 3-4 shift pressure shift valve (14). The 3-4 shift pressure shift valve (14) is moved against the force of the spring towards the right. At the same time the 3-4 solenoid valve (10) is energized. This allows shift valve pressure (p-SV) to enter the spring chamber of the shift valve B2 (9) and to reach the end face of the 3-4 command valve (13). The shift valve B2 (9) is held in the upper position and the 3-4 command valve (13) switches towards the right. At the end face of the 3-4 shift pressure shift valve (14) the working pressure (p-A) is replaced by shift valve pressure (p-SV).

The 3-4 command valve (13) moves to the left. Working pressure (p-A) travels via the holding pressure shift valve (12) and the 3-4 command valve (13) to the piston of multiple-disc holding clutch B2 (5).

## DIAGNOSIS AND TESTING

### AUTOMATIC TRANSMISSION

**CAUTION:** Before attempting any repair on a NAG1 automatic transmission, check for Diagnostic Trouble Codes with the appropriate scan tool.

Transmission malfunctions may be caused by these general conditions:

- Poor engine performance.
- Improper adjustments.
- Hydraulic malfunctions.
- Mechanical malfunctions.
- Electronic malfunctions.
- Transfer case performance (if equipped).

Diagnosis of these problems should always begin by checking the easily accessible variables: fluid level and condition, gearshift cable adjustment. Then perform a road test to determine if the problem has been corrected or if more diagnosis is necessary.

### PRELIMINARY

Two basic procedures are required. One procedure for vehicles that are drivable and an alternate procedure for disabled vehicles (will not back up or move forward).

#### VEHICLE IS DRIVABLE

1. Check for transmission fault codes using the appropriate scan tool.
2. Check fluid level and condition.
3. Adjust gearshift cable if complaint was based on delayed, erratic, or harsh shifts.
4. Road test and note how transmission upshifts, downshifts, and engages.

#### VEHICLE IS DISABLED

1. Check fluid level and condition.
2. Check for broken or disconnected gearshift cable.
3. Check for cracked, leaking cooler lines, or loose or missing pressure-port plugs.
4. Raise and support vehicle on safety stands, start engine, shift transmission into gear, and note following:
  - a. If propeller shaft turns but wheels do not, problem is with differential or axle shafts.
  - b. If propeller shaft does not turn and transmission is noisy, stop engine. Remove oil pan, and check for debris. If pan is clear, remove transmission and check for damaged driveplate, converter, oil pump, or input shaft.
  - c. If propeller shaft does not turn and transmission is not noisy, perform hydraulic-pressure test to determine if problem is hydraulic or mechanical.

### ROAD TESTING

Before road testing, be sure the fluid level and control cable adjustments have been checked and adjusted if necessary. Verify that all diagnostic trouble codes have been resolved.

Observe engine performance during the road test. A poorly tuned engine will not allow accurate analysis of transmission operation.

Operate the transmission in all gear ranges. Check for shift variations and engine flare which indicates slippage. Note if shifts are harsh, spongy, delayed, early, or if part throttle downshifts are sensitive.

Slippage indicated by engine flare, usually means clutch, overrunning clutch, or line pressure problems.

A slipping clutch can often be determined by comparing which internal units are applied in the various gear ranges. The Clutch Application chart CLUTCH APPLICATION provides a basis for analyzing road test results.



**CLUTCH APPLICATION**

GEAR	RATIO	B1	B2	B3	K1	K2	K3	F1	F2
1	3.59	X*	X				X*	X	X
2	2.19		X		X		X*		X
3	1.41		X		X	X			
4	1.00				X	X	X		
5	0.83	X				X	X	X*	
N	N/A	X					X		
R	3.16	X*		X			X	X	
R - Limp In	1.93			X	X		X		

\* = The shift components required during coast.

**AUTOMATIC TRANSMISSION**

CONDITION	POSSIBLE CAUSES	CORRECTION
Harsh N-D Engagement Harsh N-R Engagement	1. Transmission adaptation/calibration.	1. Check for latest level TCM software. Perform the TCM adaptation procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)
	2. Transmission in limp-home mode.	2. Check TCM for DTCs. Repair as needed.
	3. Driveline lash/movement.	3. Check engine mounts, transmission mount, driveshaft couplings, rear crossmember mounts, axle mounts and axle lash.
	4. Converter clutch or lock up control valve malfunction.	4. Perform converter clutch diagnostics test. Inspect valve body for stuck or sticky lock up control valve. If valve motion is free, replace lock up solenoid and retest.
	5. Valve Body Malfunction.	5. Inspect valve body for stuck or sticky regulator valve.
	6. Clutch or planetary component damage.	6. Remove, disassemble and repair transmission as necessary.

CONDITION	POSSIBLE CAUSES	CORRECTION
Delayed N-D or N-R Engagement	1. Transmission adaptation/calibration.	1. Check for latest level TCM software. Perform the TCM adaptation procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)
	2. Torque converter fluid drain back, delayed soft engagement.	2. If vehicle moves normally after 3 seconds of shifting into gear, no repair is necessary. If longer, inspect pump for worn bushing.
	3. Fluid Level Low.	3. Check and adjust fluid level. (Refer to 21 - TRANSMISSION/ AUTOMATIC - NAG1/FILTER - STANDARD PROCEDURE)
	4. Filter plugged.	4. Check TC out pressure, if < 10psi, check for plugged filter. Replace if needed.
	5. Filter damaged or missing, missing o-ring.	5. Check for damaged/missing filter or cut/missing o-ring.
	6. Valve Body Malfunction.	6. Inspect valve body for stuck/ sticky regulator valve or shift group valves.
	7. Oil pump gears worn/damaged.	7. Inspect pump for damage or excessive clearances. Replace if needed.
No Drive or Reverse Engagement (vehicle will not move)	1. Fluid level low.	1. Check and adjust fluid level. (Refer to 21 - TRANSMISSION/ AUTOMATIC - NAG1/FILTER - STANDARD PROCEDURE)
	2. Misadjusted/damaged shift cable.	2. Inspect shift system. Adjust and/or replace worn/damaged parts.
	3. Filter plugged.	3. Check TC out pressure, if < 10psi, check for plugged filter. Replace if needed.
	4. Filter damaged or missing, missing filter o-ring.	4. Check for damaged/missing filter or cut/missing o-ring.
	5 Hydraulic system-Low/no line pressure.	5. Remove valve body. Inspect or sticky/stuck regulator valve. If valve motion is free, replace line pressure solenoid and retest. If condition still exists check for worn/damaged pump. Replace pump assembly if needed.

CONDITION	POSSIBLE CAUSES	CORRECTION
Shudder garage shift R-D or D-R	1. Transmission adaptation/calibration.	1. Check for latest level TCM software. Perform the TCM adaptation procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)
	2. Customer applying throttle while shift is in progress.	2. Instruct customer to wait until shift is complete prior to applying throttle.
Harsh rolling garage shift R-D or D-R	1. Transmission adaptation/calibration.	1. Check for latest level TCM software. Perform the TCM adaptation procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)
	2. Customer shifting into desired range with vehicle motion.	2. Instruct customer to only shift into the desired range with the vehicle stopped and the service brake applied.
	3. Transmission in limp-home mode.	3. Check TCM for DTCs. Repair as needed.
Engine stalls when transmission is shifted into R or D.	1. Converter clutch or lock up control valve malfunction.	1. Perform converter clutch diagnostics test. Inspect valve body for stuck or sticky lock up control valve. If valve motion is free, replace lock up solenoid and retest.
	2. Defective torque converter.	2. Replace torque converter.
Clunk/click noise during garage shift from R-D or D-R	1. Stick-slip condition between output flange and output shaft nut upon torque reversal from R to D or D to R. Click on first launch.	1. Replace output flange and nut.
Harsh Upshift or downshift	1. Transmission adaptation/calibration.	1. Check for latest level TCM software. Perform the TCM adaptation procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)
	2. Valve body malfunction.	2. Inspect valve body for sticky/stuck valves. Repair as needed. If valve motion is free, replace shift pressure solenoid and line pressure solenoid and retest.
	3. Damaged or misbuilt clutch.	3. Remove, disassemble and repair transmission as needed.

CONDITION	POSSIBLE CAUSES	CORRECTION
EMCC Shudder	1. Transmission adaptation/calibration.	1. Check for latest level TCM software. Perform the TCM adaptation procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)
	2. Fluid condition, contamination or wrong type.	2. Change fluid per service manual procedures. (Refer to 21 - TRANSMISSION/ AUTOMATIC - NAG1/FILTER - STANDARD PROCEDURE)
	3. Valve body malfunction.	3. Remove valve body. Inspect for sticky/stuck lock up control valve. If valve motion is free, replace the lock up solenoid and retest.
	4. Defective torque converter.	4. Replace torque converter.
Grating or Scraping Noise proportional to engine speed	1. Torque converter bolts contacting dust shield.	1. Dust shield bent. Replace if needed. Torque converter bolt backed out. Replace with new bolt and torque to proper level.
	2. Damaged/broken drive plate.	2. Inspect driveplate. Replace if needed.
Grating or Scraping Noise proportional to transmission output speed	1. Driveshaft or rear axle noise.	1. Check driveshaft, center bearing and axle for noise or contact with other components.
	2. Transmission output bearing noise.	2. Replace output bearing and retest.
	3. Internal transmission damage.	3. Remove, disassemble and repair transmission as needed.
High pitched whine/noise related to engine speed	1. Fluid level low.	1. Check and adjust fluid level. (Refer to 21 - TRANSMISSION/ AUTOMATIC - NAG1/FILTER - STANDARD PROCEDURE)
	2. Transmission in limp-home mode.	2. Check TCM for DTCs. Repair as needed.
	3. Filter plugged.	3. Check TC out pressure, if < 10psi, check for plugged filter. Replace if needed.
	4. Filter damaged or missing.	4. Check for damaged/missing filter or cut/missing o-ring.
	5. Oil pump bushing worn/ damaged.	5. Visually inspect for worn or damaged pump bushing. Replace pump assembly if needed.
	6. Oil pump gears worn/ damaged.	6. Inspect for worn or damaged pump gears. Replace pump assembly if needed.

CONDITION	POSSIBLE CAUSES	CORRECTION
Slips on 1-2 upshift	1. Transmission adaptation/calibration.	1. Check for latest level TCM software. Perform the TCM adaptation procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)
	2. Fluid level low.	2. Check and adjust fluid level. (Refer to 21 - TRANSMISSION/ AUTOMATIC - NAG1/FILTER - STANDARD PROCEDURE)
	3. Filter damaged or missing.	3. Check for damaged/missing filter or cut/missing o-ring.
	4. Valve body malfunction.	4. Check for sticky/stuck 2-3 shift pressure valve or regulator valve.
	5. F1 or K1 clutch damaged.	5. Disassemble transmission inspect for damaged F1 or K1 clutch. Repair as needed.
Slips on 2-3 upshift	1. Transmission adaptation/calibration.	1. Check for latest level TCM software. Perform the TCM adaptation procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)
	2. Fluid level low.	2. Check and adjust fluid level. (Refer to 21 - TRANSMISSION/ AUTOMATIC - NAG1/FILTER - STANDARD PROCEDURE)
	3. Filter damaged or missing.	3. Check for damaged/missing filter or cut/missing o-ring.
	4. Valve body malfunction.	4. Check for sticky/stuck 2-3 shift pressure valve or regulator valve.
	5. F2 or B2 clutch damaged.	5. Disassemble transmission, inspect for damaged F2 or B2 clutch. Repair as needed.

CONDITION	POSSIBLE CAUSES	CORRECTION
Slips on 3-4 upshift	1. Transmission adaptation/calibration.	1. Check for latest level TCM software. Perform the TCM adaptation procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)
	2. Fluid level low.	2. Check and adjust fluid level. (Refer to 21 - TRANSMISSION/ AUTOMATIC - NAG1/FILTER - STANDARD PROCEDURE)
	3. Filter damaged or missing.	3. Check for damaged/missing filter or cut/missing o-ring.
	4. Valve body malfunction.	4. Check for sticky/stuck 2-3 shift pressure valve or regulator valve.
	5. K3 or B2 clutch damaged.	5. Disassemble transmission, inspect for damaged K3 or B2 clutch. Repair as needed.
Slips on 4-5 upshift	1. Transmission adaptation/calibration.	1. Check for latest level TCM software. Perform the TCM adaptation procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)
	2. Fluid level low.	2. Check and adjust fluid level. (Refer to 21 - TRANSMISSION/ AUTOMATIC - NAG1/FILTER - STANDARD PROCEDURE)
	3. Filter damaged or missing.	3. Check for damaged/missing filter or cut/missing o-ring.
	4. Valve body malfunction.	4. Check for sticky/stuck 2-3 shift pressure valve or regulator valve.
	5. B1 or K1 clutch damaged.	5. Disassemble transmission, inspect for damaged B1 or K1 clutch. Repair as needed.
In-gear shudder on heavy acceleration	1. Fluid level low.	1. Check and adjust fluid level. (Refer to 21 - TRANSMISSION/ AUTOMATIC - NAG1/FILTER - STANDARD PROCEDURE)
	2. Filter damaged or missing.	2. Check for damaged/missing filter or cut/missing o-ring.
No Drive engagement following a shift to N	1. Customer shifting into N at vehicle speeds greater than 25mph and tipping in on the throttle.	1. Instruct the customer that they should not shift into N at vehicle speeds greater 25mph.
	2. Shift system malfunction.	2. Inspect shift system for proper adjustment or damage. Check shifter for DTCs. Repair as needed.

CONDITION	POSSIBLE CAUSES	CORRECTION
Reverse gear position blocked engagement when moving shift lever from D position	1. Customer shifting into R at vehicle speeds greater than 7mph.	1. Instruct customer that R shifter position is blocked at vehicle speeds greater than 7mph.
	2. Shift system malfunction.	2. Inspect shift system for proper adjustment or damage. Check shifter for DTCs. Repair as needed.
No Engine Cranking in P or N	1. Gearshift cable adjustment.	1. Adjust shift cable and retest.
	2. Shift system malfunction.	2. Check shifter DTCs. Inspect shift cable and lever assembly. Adjust and/or replace worn/damaged parts.
	3. Valve body malfunction.	3. Starter lockout contact malfunction. Remove valve body, replace lead frame assembly.

CONDITION	POSSIBLE CAUSES	CORRECTION
Fluid Leak	1. Leak in area of bell housing.	1. Check bolt torque on internal bell housing bolts. If loose, replace fastener and torque to proper level. If bolts are to proper torque level, check pump outer seal and impeller seal. Replace if needed.
	2. Leak in area of control unit(valve body) electrical connector.	2. Check connector for damaged(cut) or missing o-rings. Replace as needed.
	3. Leak in area of pan gasket.	3. Check for proper torque on oil pan clamps. Check for mis-positioned or rolled gasket. Repair as needed.
	3. Free Wheeling Clutch F2 Defective.	3. Replace Free Wheeling Clutch F2, Hollow Shaft, and Rear Sun Gear/Inner Disc Carrier K3.
	4. Leak in area of park guide plug.	4. Remove park guide plug. Check for damaged(cut) or missing o-ring. If o-ring is in good condition, install new plug.
	5. Leak in area of shift lever.	5. Check for damaged shift lever seal or damaged lever. Repair as needed.
	6. Leak in area of output flange.	6. Check for worn/damaged slinger seal and output seal. Visually inspect output flange seal surface for damage. Repair as needed.
	7. Leak in area of transmission vent.	7. Check fluid level for overfill condition. Adjust as needed. If fluid level is within specification, ride check vehicle. Monitor transmission temperature. If high operating temperatures are observed, fluid may be contaminated or cooling system malfunctioning. Change fluid per service manual procedures. Refer to cooling system diagnostics if needed.
	8. Leak in area of transmission fill tube.	8. Inspect fill tube cap for proper installation. Inspect fill tube grommet between case and fill tube for leakage. Repair as needed.



## STANDARD PROCEDURE - ALUMINUM THREAD REPAIR

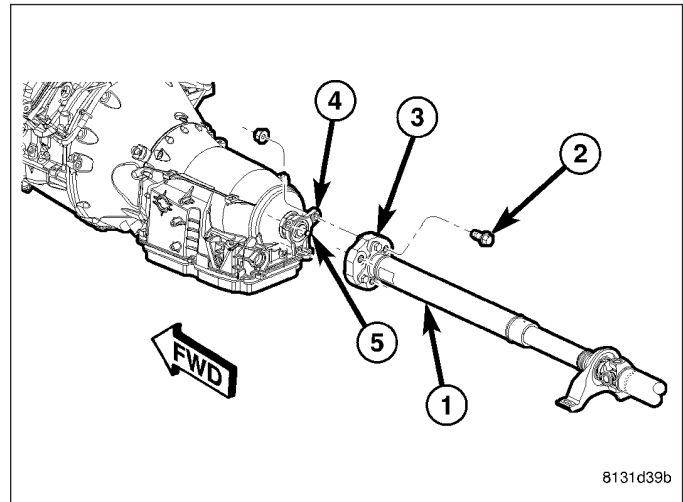
Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils™, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil™ tap, or equivalent, and installing a Heli-Coil™ insert, or equivalent, into the hole. This brings the hole back to its original thread size.

Heli-Coil™, or equivalent, tools and inserts are readily available from most automotive parts suppliers.

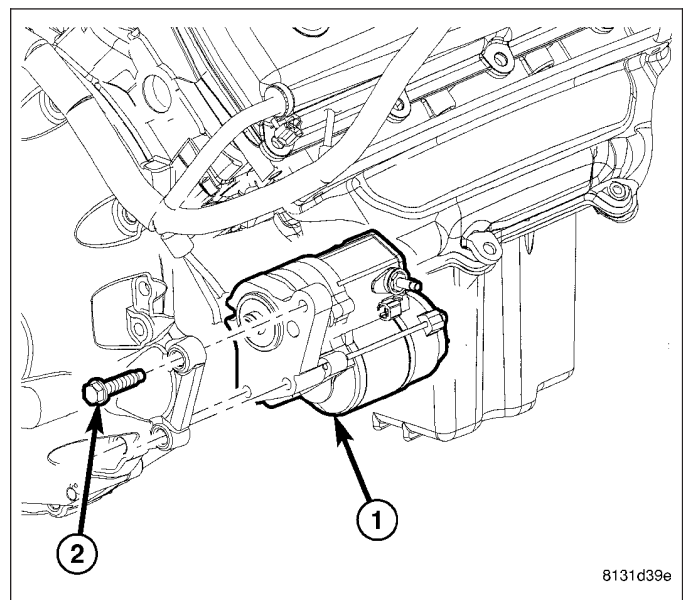
## REMOVAL

**Note:** If the transmission is being reconditioned (clutch/seal replacement) or replaced, it is necessary to perform the TCM Adaptation Procedure using the scan tool (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE).

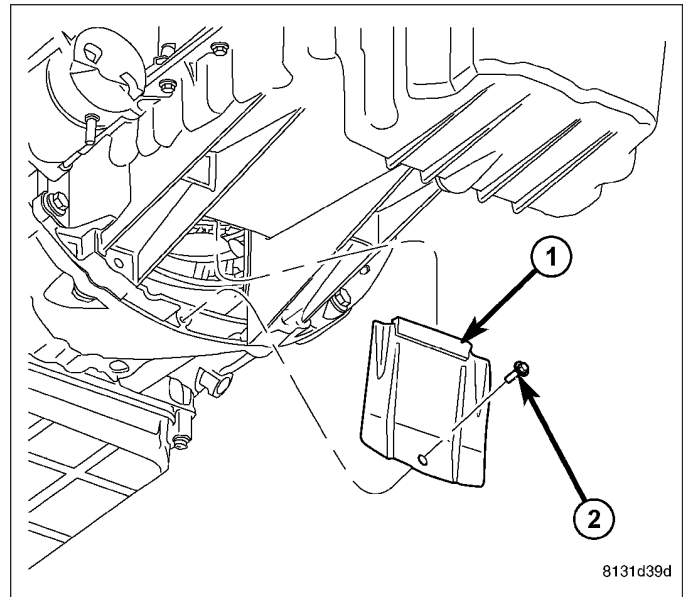
1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Mark propeller shaft (1) and the transmission flange (4) for assembly alignment.
4. Remove the bolts (2) holding the rear propeller shaft coupler (3) to the transmission flange (4).
5. Slide the propeller shaft (1) rearward until the coupler clears the propeller shaft pilot (5) on the transmission output shaft.



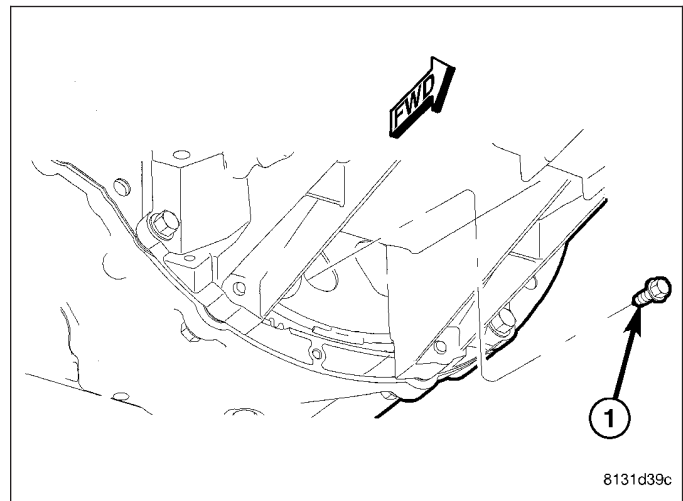
6. Remove the bolts (2) holding the starter motor (1) to the transmission. (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - REMOVAL)
7. Remove the starter (1) from the transmission starter pocket and safely relocate.



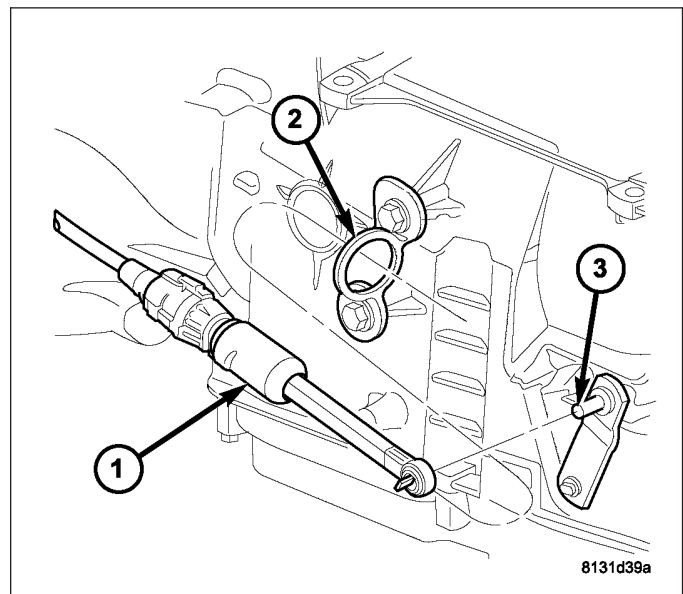
8. Remove the bolt (2) holding the torque converter access cover (1) to the transmission.
9. Remove the torque converter access cover (1) from the transmission.



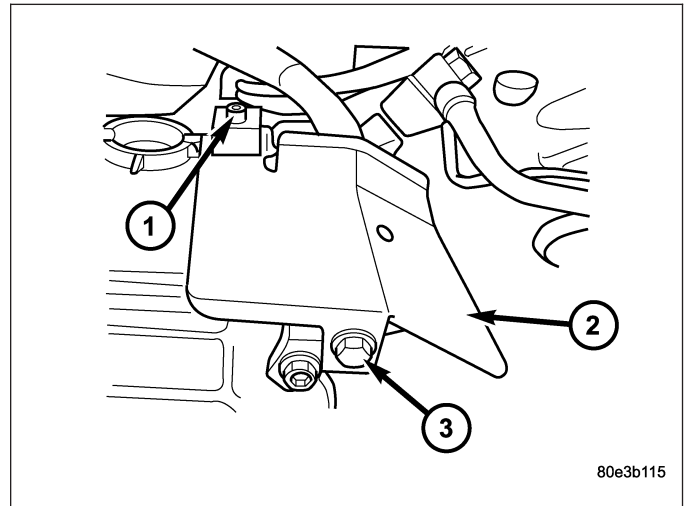
10. Rotate crankshaft in clockwise direction until converter bolts (1) are accessible. Then remove bolts (1) one at a time. Rotate crankshaft with socket wrench on dampener bolt.



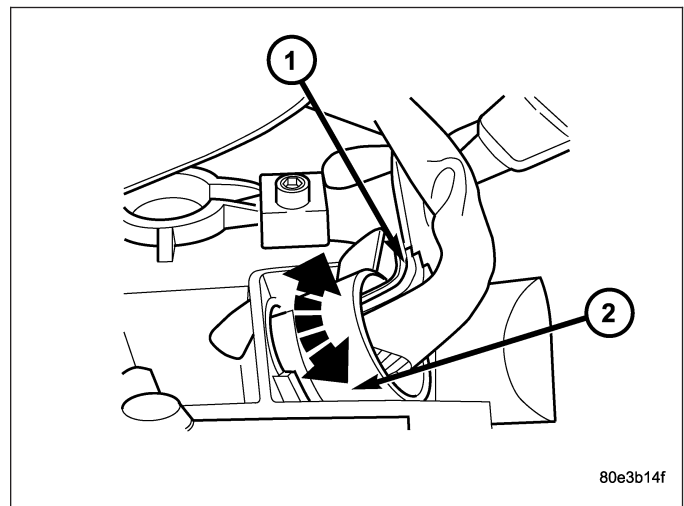
11. Disconnect the gearshift cable (1) from the transmission manual valve lever (3).
12. Loosen the bolts holding the shift cable retaining strap (2) to the transmission.



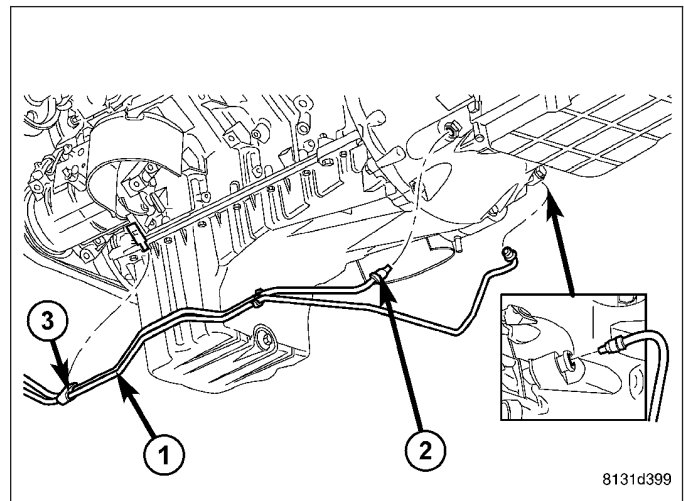
13. Remove the shift cable (1) from the transmission.
14. Remove bolt (3) and screw (1) holding the heat shield (2) to the transmission.
15. Remove the heat shield (2) from the transmission.



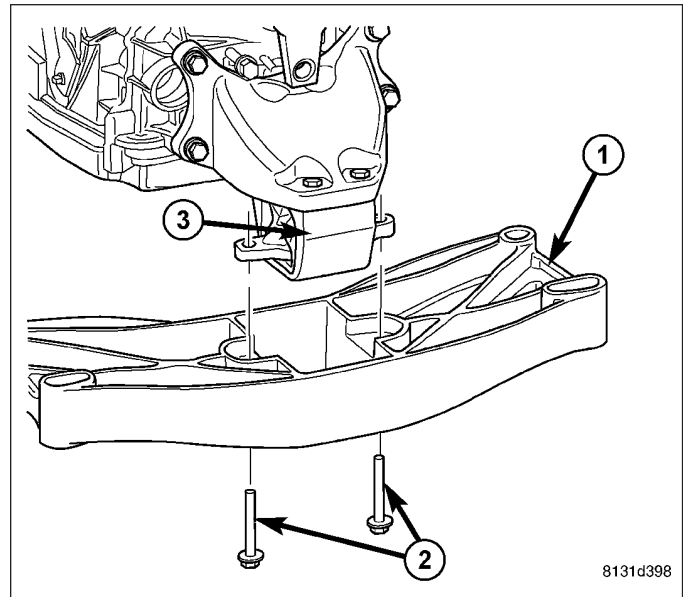
16. Disconnect 13-pin plug connector (1). Turn bayonet lock of guide bushing (2) anti-clockwise.
17. Remove the 13-pin connector (1) from the transmission.



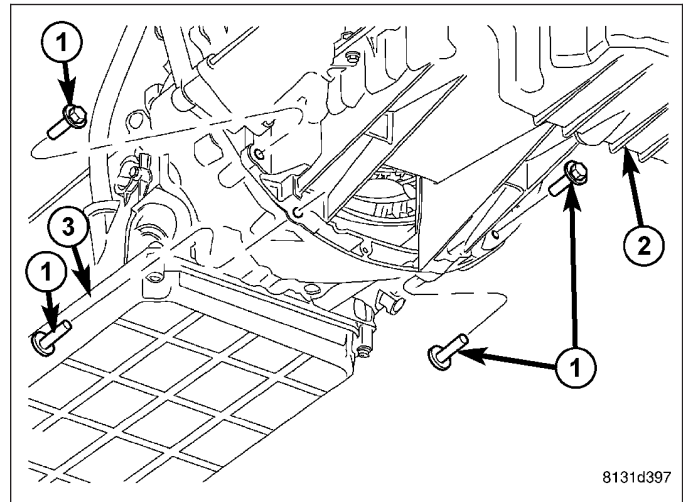
18. Disconnect transmission fluid cooler lines (1) at transmission fittings (2) and clips (3).
19. Disconnect the transmission vent hose from the transmission.



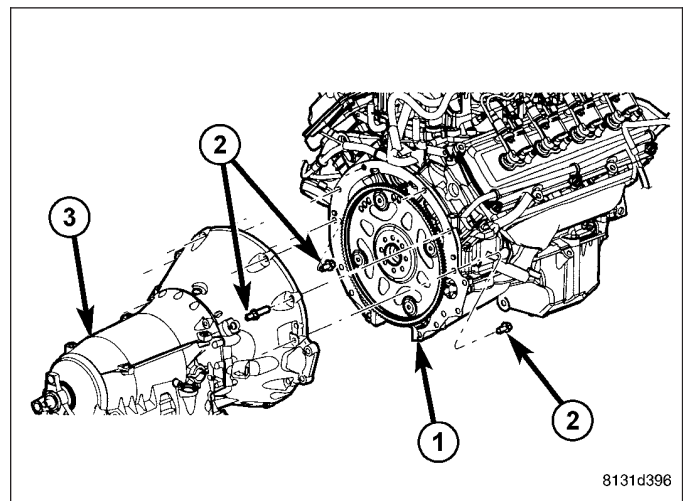
20. Support rear of engine with safety stand or jack.
21. Raise transmission slightly with service jack to relieve load on crossmember and supports.
22. Remove bolts (2) securing rear support and cushion (3) to transmission crossmember (1).
23. Remove bolts attaching crossmember (1) to frame and remove crossmember.



24. Remove the bolts (1) holding the engine oil pan (2) to the transmission (3).



25. Remove all remaining bolts (2) holding the engine (1) to the transmission (3).
26. Carefully work transmission and torque converter assembly rearward off engine block dowels.
27. Hold torque converter in place during transmission removal.
28. Lower transmission and remove assembly from under the vehicle.
29. To remove torque converter, carefully slide torque converter out of the transmission.

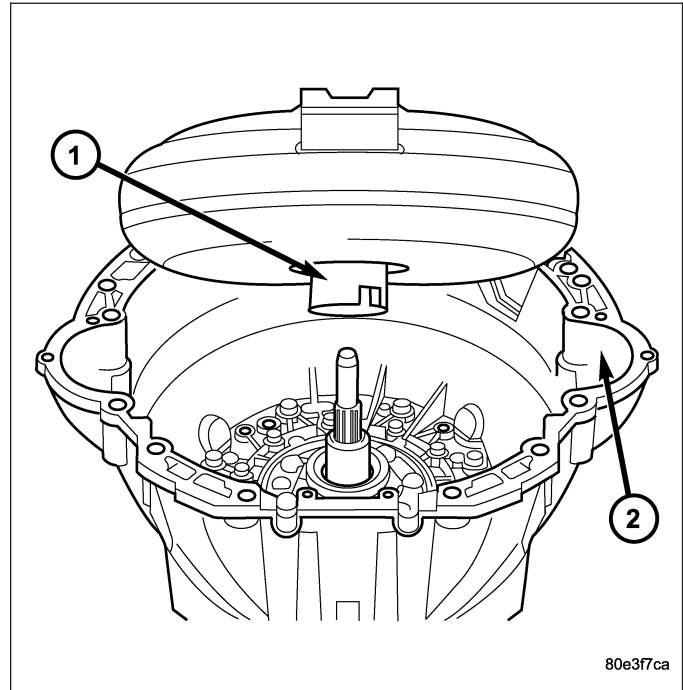


## DISASSEMBLY

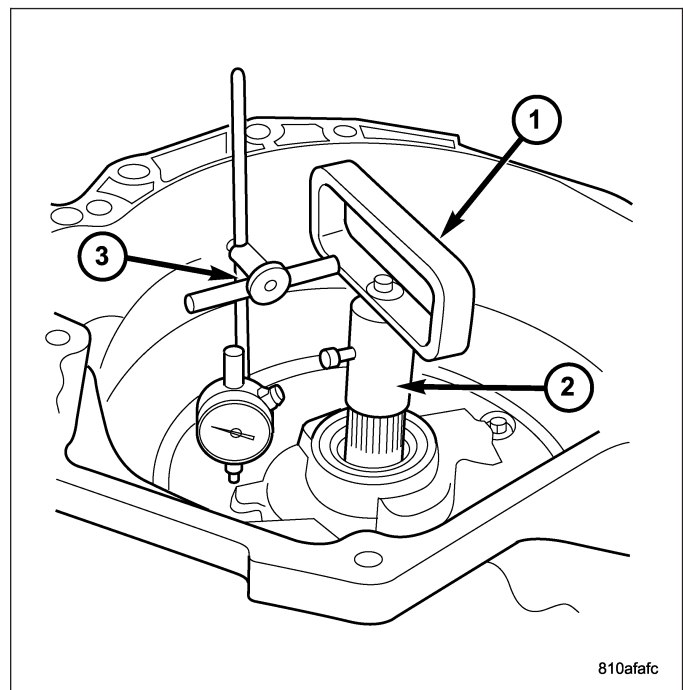
**Note:** If the transmission is being reconditioned (clutch/seal replacement) or replaced, it is necessary to perform the TCM Adaptation Procedure using the scan tool (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE).

**Note:** Tag all clutch pack assemblies, as they are removed, for reassembly identification.

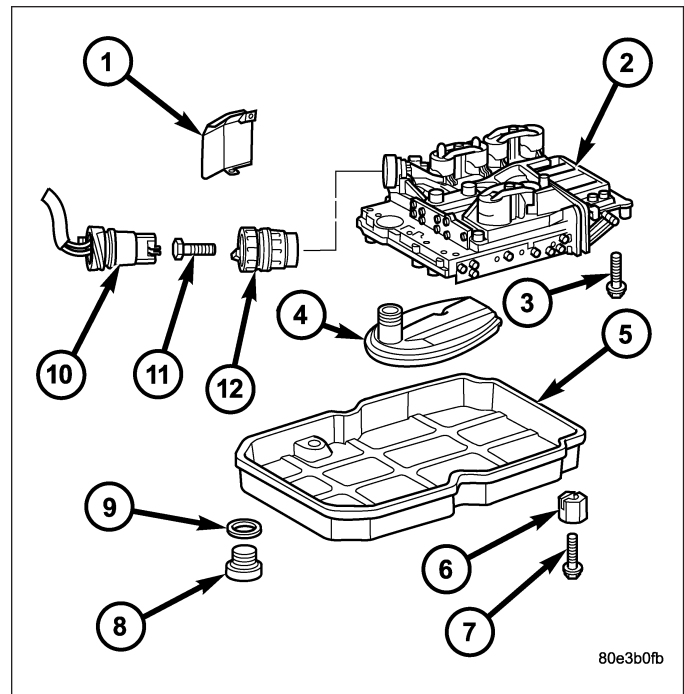
1. Remove the torque converter (1).



2. Place transmission in a vertical position.
3. Measure input shaft end play as follows:
  - a. Attach Adapter 8266-18 (2) to Handle 8266-8 (1).
  - b. Attach dial indicator C-3339 (3) to Handle 8266-8 (1).
  - c. Install the assembled tool onto the input shaft of the transmission and tighten the retaining screw on Adapter 8266-18 (2) to secure it to the input shaft.
  - d. Position the dial indicator plunger against a flat spot on the oil pump and zero the dial indicator.
  - e. Move the input shaft in and out. Record the maximum travel for assembly reference.



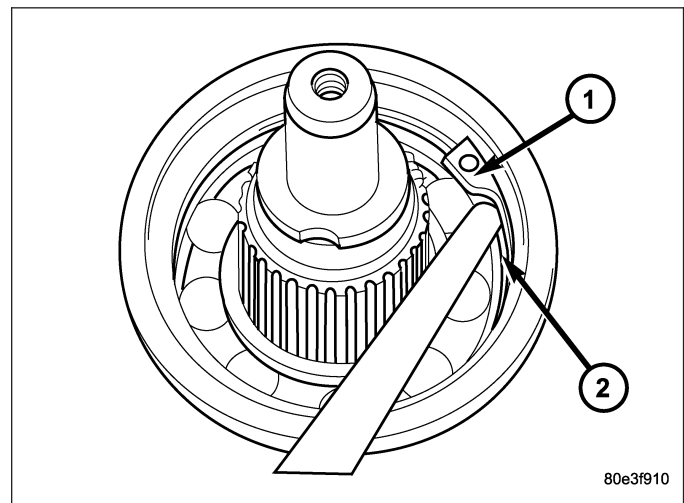
4. Loosen guide bushing (12) and remove from transmission housing.
5. Detach oil pan (5).
6. Remove oil filter (4).
7. Unscrew Torx socket bolts (3) and remove electrohydraulic unit (2).



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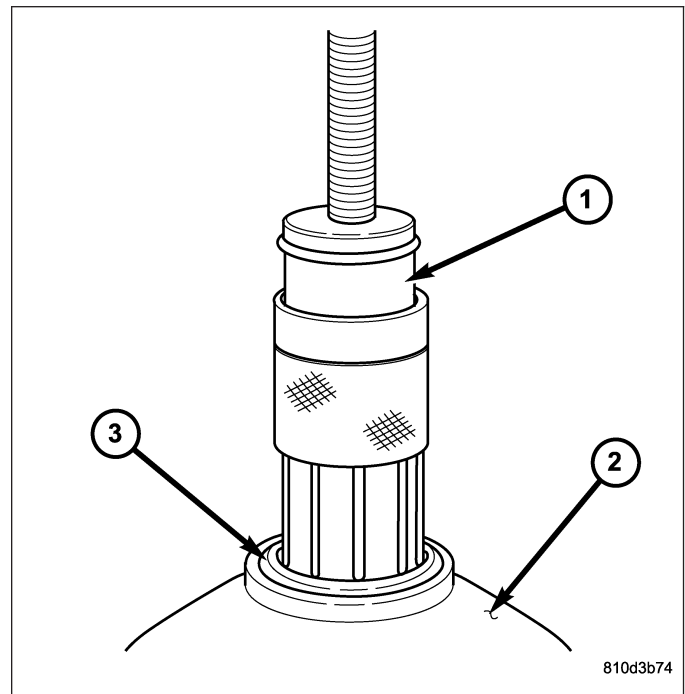
- 1 - HEAT SHIELD
- 2 - ELECTROHYDRAULIC UNIT
- 3 - BOLT
- 4 - OIL FILTER
- 5 - OIL PAN
- 6 - CLAMPING ELEMENT
- 7 - BOLT
- 8 - DRAIN PLUG
- 9 - DRAIN PLUG GASKET
- 10 - 13-PIN PLUG CONNECTOR
- 11 - BOLT
- 12 - GUIDE BUSHING

8. Place the transmission in PARK to prepare for the removal of the output shaft nut.
9. Remove the nut holding the propeller shaft flange to the output shaft and remove the flange.
10. Remove the transmission rear oil seal with a suitable slide hammer and screw.
11. Remove the transmission output shaft washer. Be sure to tag the washer since it is very similar to the geartrain end-play shim and they must not be interchanged.
12. Remove the transmission rear output shaft bearing retaining ring (1).

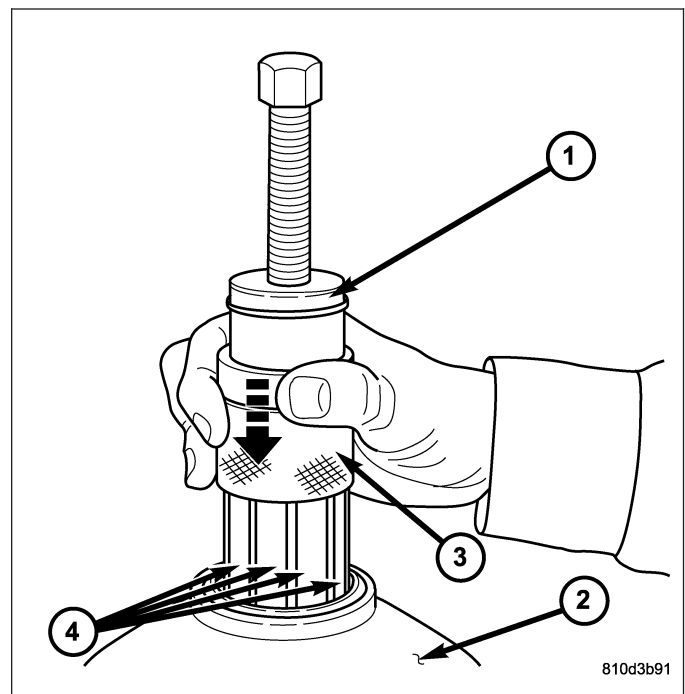


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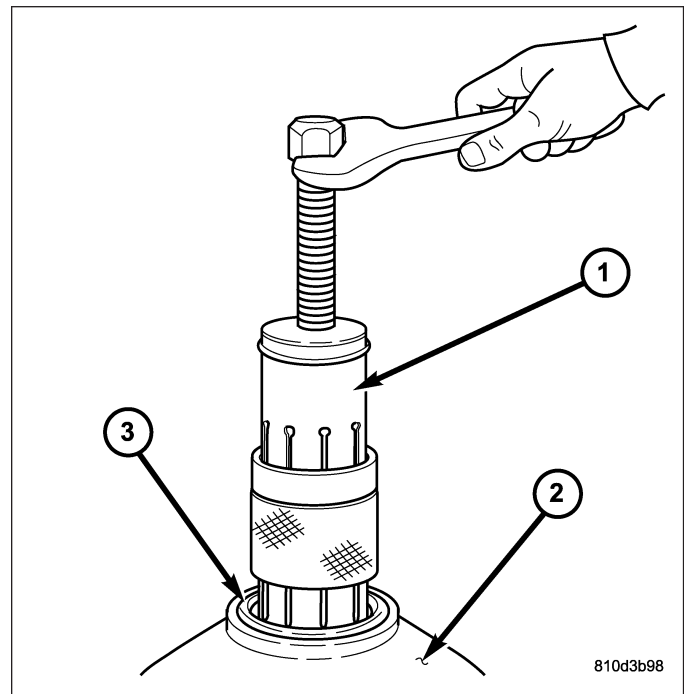
13. Position Bearing Remover 9082 (1) over the inner race of the output shaft bearing (3).



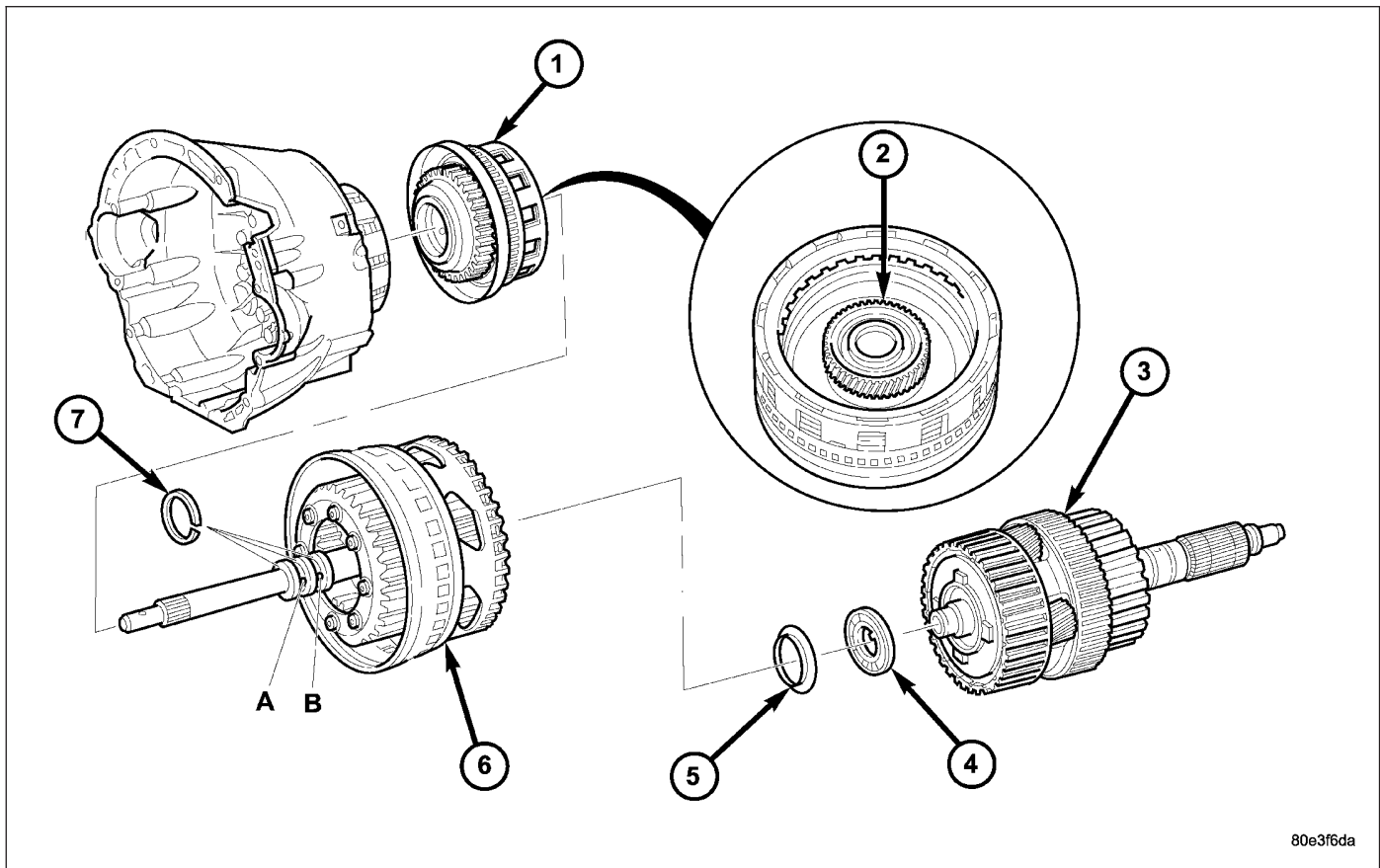
14. Slide the collar (3) on the Bearing Remover 9082 (1) downward over the fingers (4) of the tool.



15. Remove the output shaft bearing (3).
16. Remove the geartrain end-play shim from the output shaft. Be sure to tag the shim since it is very similar to the output shaft washer and they must not be interchanged.





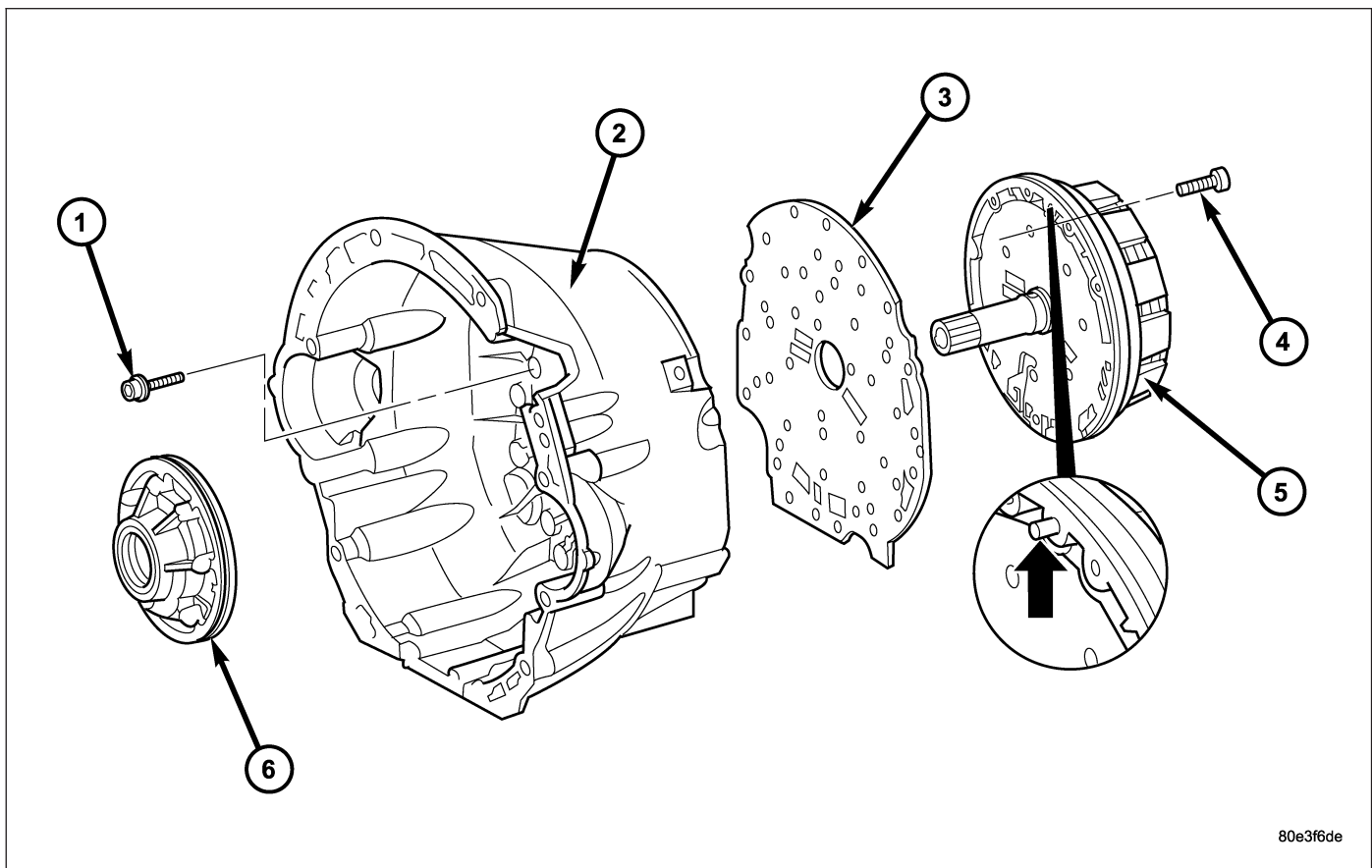


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### ***Remove K1, K2, and K3 Clutches***

- |  |  |
|--|--|
| 1 - DRIVING CLUTCH K1  | 5 - THRUST WASHER  |
| 2 - SUN GEAR OF FRONT PLANETARY GEAR SET                                     | 6 - FRONT PLANETARY GEAR SET, DRIVING CLUTCH K2, AND INPUT SHAFT |
| 3 - DRIVING CLUTCH K3, OUTPUT SHAFT, AND CENTER AND REAR PLANETARY GEAR SETS | 7 - SEALING RINGS  |
| 4 - THRUST NEEDLE BEARING  |  |

17. Remove the bolts holding the transmission housing to the converter housing from inside the converter housing.
18. Stand the transmission upright on the converter housing. Be sure to use suitable spacers between the bench surface and the converter housing since the input shaft protrudes past the front surface of the housing.
19. Remove the remaining bolts holding the transmission housing to the converter housing.
20. Remove the transmission housing from the converter housing.
21. Remove output shaft with center and rear gear set and clutch K3 (3).
22. Remove thrust needle bearing (4) and thrust washer (5).
23. Remove input shaft with clutch K2 and front gear set (6).
24. Remove clutch K1 (1).

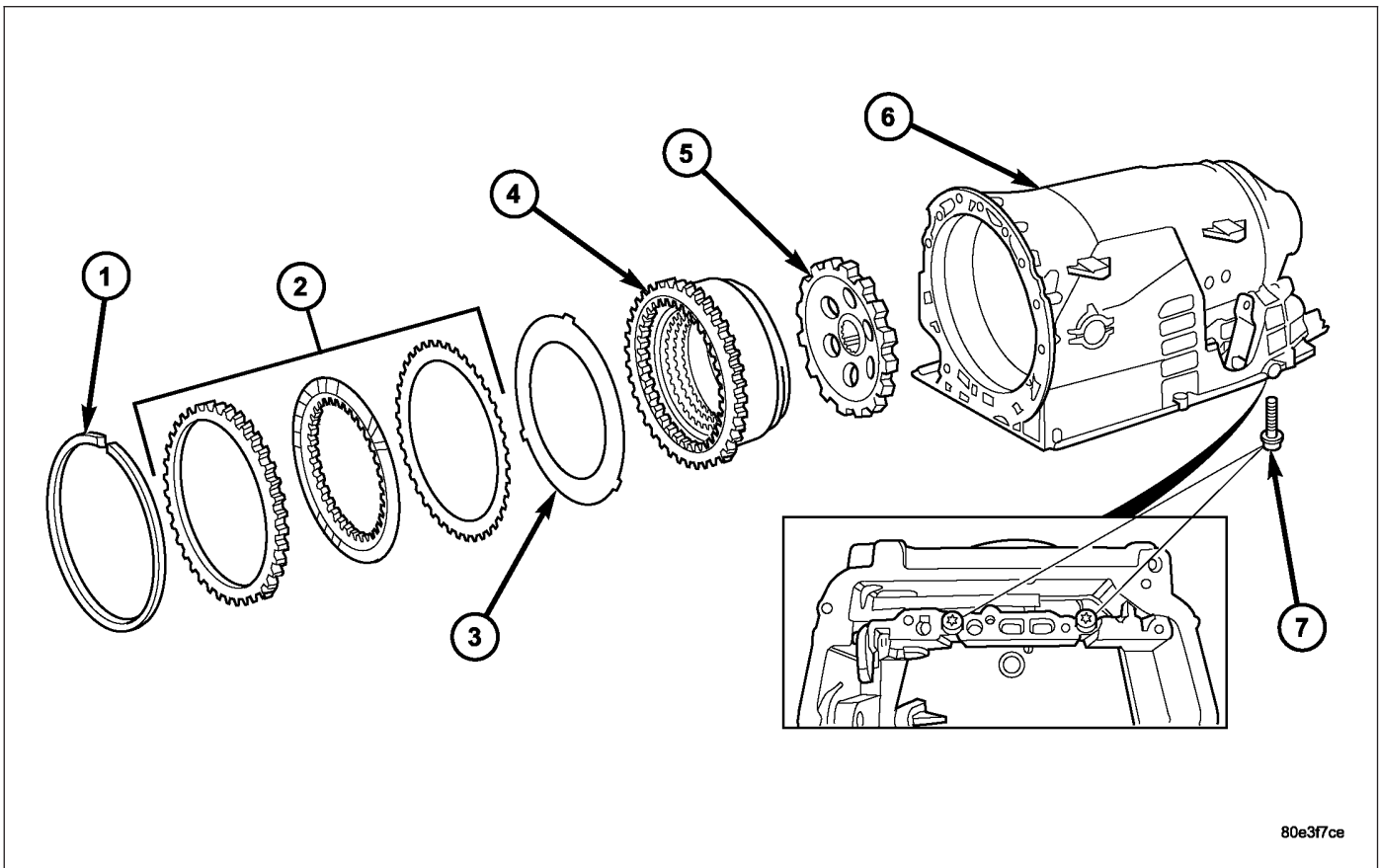


***Remove Holding Clutch B1 and Oil Pump***

1 - BOLTS - M6X32  
2 - CONVERTER HOUSING  
3 - INTERMEDIATE PLATE

4 - BOLTS - M8X35  
5 - HOLDING CLUTCH B1  
6 - OIL PUMP

25. Unscrew Torx socket bolts (4) and remove oil pump (6). Screw two opposed bolts into the oil pump housing and press the oil pump out of the converter housing by applying light blows with a plastic hammer.
26. Remove and discard the torque converter hub seal and the oil pump outer o-ring seal from the oil pump.
27. Unscrew Torx socket bolts (1) and remove multiple-disc holding clutch B1 (5) from converter housing. Screw two opposed bolts into the multiple-disc holding clutch B1 (5) and separate from the converter housing by applying light blows with a plastic hammer.
28. Detach intermediate plate (3) from converter housing (2).



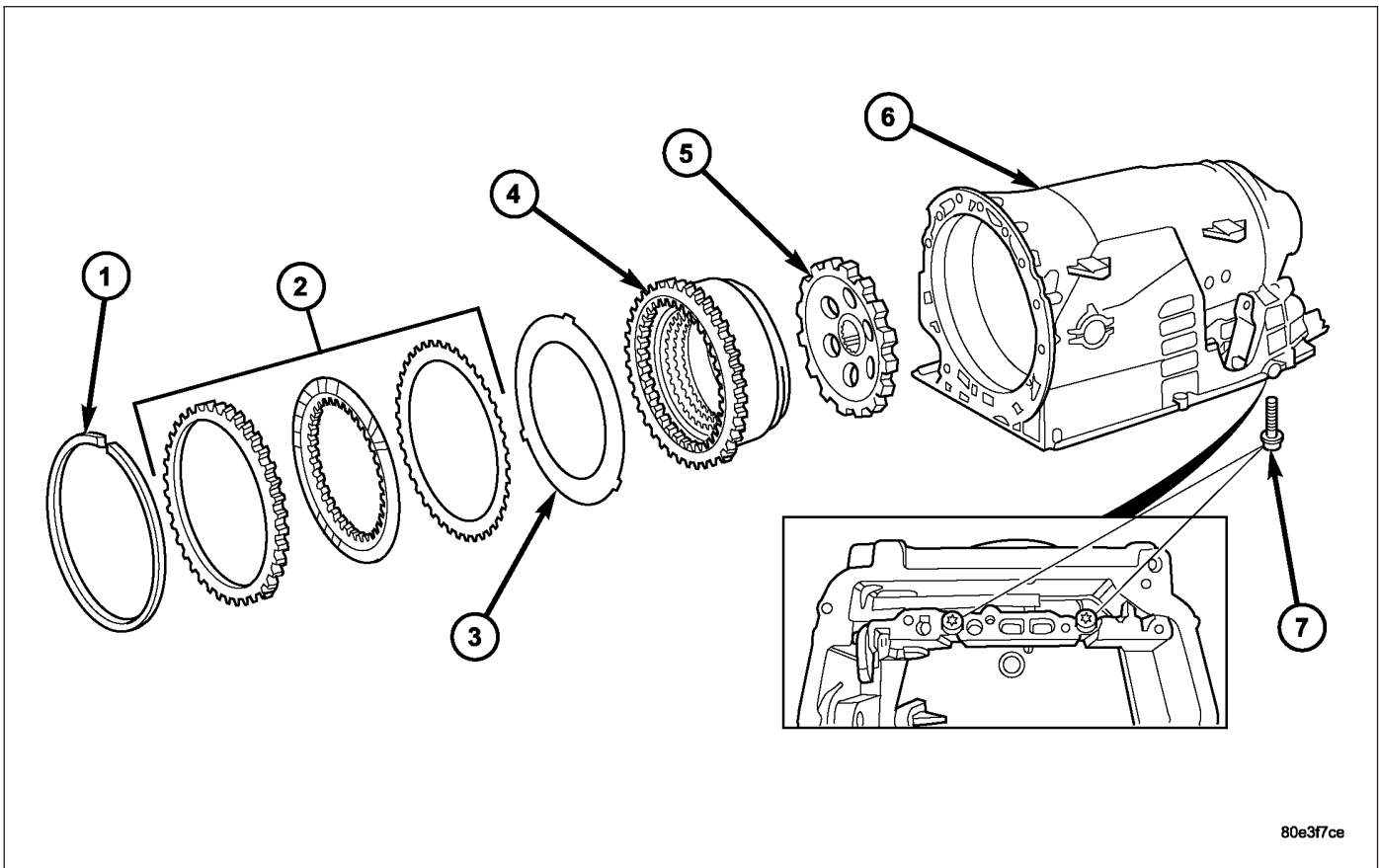
### ***Remove B2, B3, and Parking Gear***

- |                             |                          |
|-----------------------------|--------------------------|
| 1 - SNAP-RING               | 5 - PARK GEAR            |
| 2 - HOLDING CLUTCH B3 DISCS | 6 - TRANSMISSION HOUSING |
| 3 - SPRING WASHER           | 7 - BOLTS - M8X60        |
| 4 - HOLDING CLUTCH B2       |                          |

29. Remove multiple-disc pack B3 (2) and spring washer (3) by removing snap-ring (1) in transmission housing. To facilitate removal of the snap-ring (1), compress the multiple-disc pack B3 (2). Note which clutch disc is removed just prior to the spring washer (3) for re-assembly. If the clutch discs are re-used, this disc must be returned to its original position on top of the spring washer.
30. Unscrew Torx socket bolts (7).
31. Remove multiple-disc holding clutch B2 (4) from transmission housing. The externally toothed disc carrier for multiple-disc holding clutch B2 is also the piston for multiple-disc holding clutch B3.
32. Remove parking lock gear (5).

## **ASSEMBLY**

**Note:** If the transmission is being reconditioned (clutch/seal replacement) or replaced, it is necessary to perform the TCM Adaptation Procedure using the scan tool (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE).



***Install B2, B3, and Parking Gear***

- |                             |                          |
|-----------------------------|--------------------------|
| 1 - SNAP-RING               | 5 - PARK GEAR            |
| 2 - HOLDING CLUTCH B3 DISCS | 6 - TRANSMISSION HOUSING |
| 3 - SPRING WASHER           | 7 - BOLTS - M8X60        |
| 4 - HOLDING CLUTCH B2       |                          |

1. Insert parking lock gear (5).
2. Install multiple-disc holding clutch B2 (4) in transmission housing (6).
3. Screw in both Torx socket bolts (7). Tighten the bolts to 16 N·m (141 in.lbs.).

**Note:** During the measurement the snap ring (7) must contact the upper bearing surface of the groove in the outer multiple-disc carrier (8).

**Note:** Pay attention to sequence of discs. If the original clutch discs are reused, be sure to return the disc identified on disassembly as belonging on top of the spring washer (4) to its original location. Place new friction multiple-discs in ATF fluid for one hour before installing.

4. Insert and measure spring washer (4) and multiple-disc pack B3 (2, 6).

- a. Put multiple-discs for multiple-disc holding clutch B3 together in the sequence shown in the illustration and insert individually.

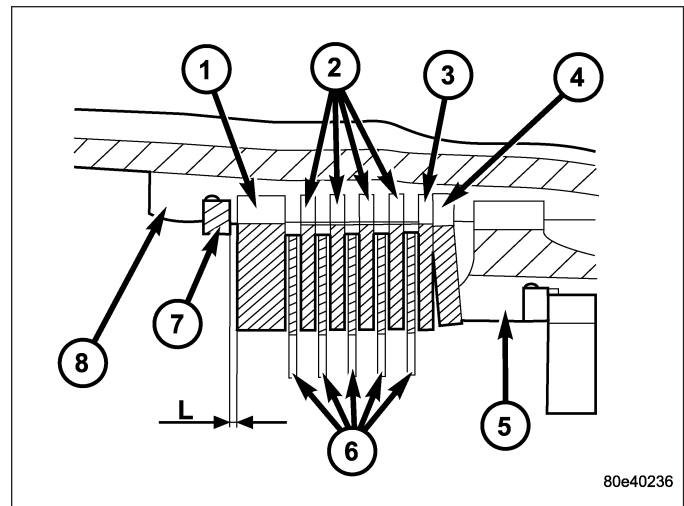
b.

**CAUTION:** Apply only light pressure (less than 10 N (3 lbs.) of force) to the clutch pack when measuring the clutch clearance with the feeler gauge.

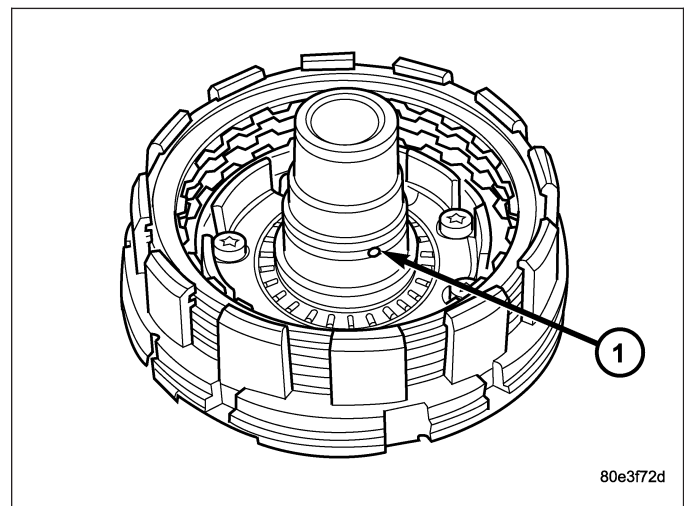
Applying excessive force to the clutch will give an incorrect reading and lead to a transmission failure. Using a feeler gauge, determine the play "L" at three points between the snap ring (7) and outer multiple-disc (1). B3 clutch clearance should be 1.0-1.4 mm (0.039-0.055 in.). Adjust the clearance as necessary.

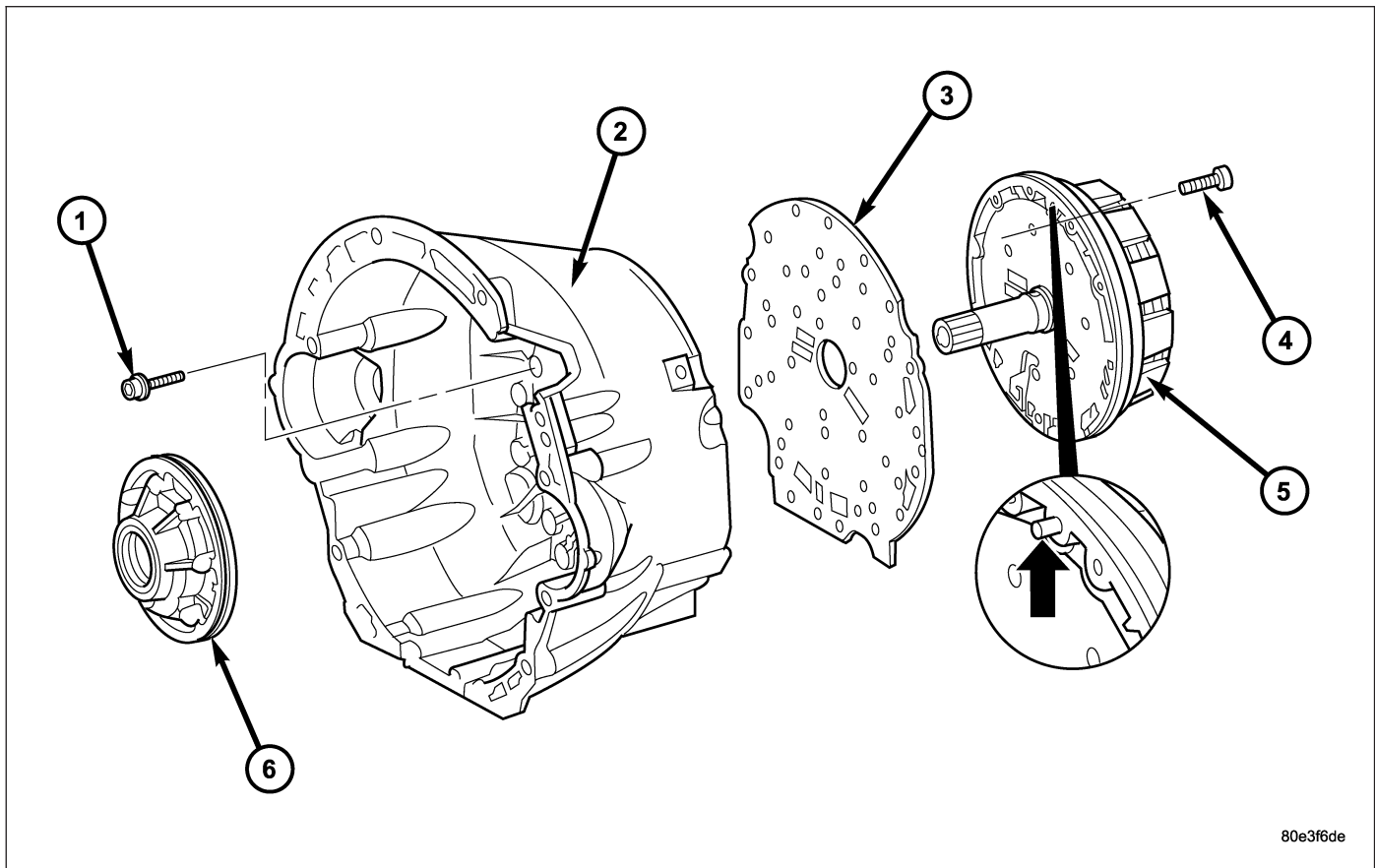
- c. Adjust with snap-ring (7), if necessary. Snap-rings are available in thicknesses of 3.2 mm (0.126 in.), 3.5 mm (0.138 in.), 3.8 mm (0.150 in.), 4.1 mm (0.162 in.), 4.4 mm (0.173 in.), and 4.7 mm (0.185 in.).

5. Check that the K1 clutch feed hole (1) in the inner hub of clutch B1 is free before installing clutch B1.



1 - OUTER DISC - 6.5 MM (0.256 IN.)	5 - PISTON
2 - OUTER DISCS - 1.8 MM (0.071 IN.)	6 - FRICTION DISCS
3 - OUTER DISCS - 1.8 MM (0.071 IN.)	7 - SNAP-RING
4 - SPRING WASHER	8 - B3 DISC CARRIER





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### *Install Holding Clutch B1 and Oil Pump*

1 - BOLTS - M6X32  
 2 - CONVERTER HOUSING  
 3 - INTERMEDIATE PLATE

4 - BOLTS - M8X35  
 5 - HOLDING CLUTCH B1  
 6 - OIL PUMP

6. Place intermediate plate (3) on converter housing (2) and align.

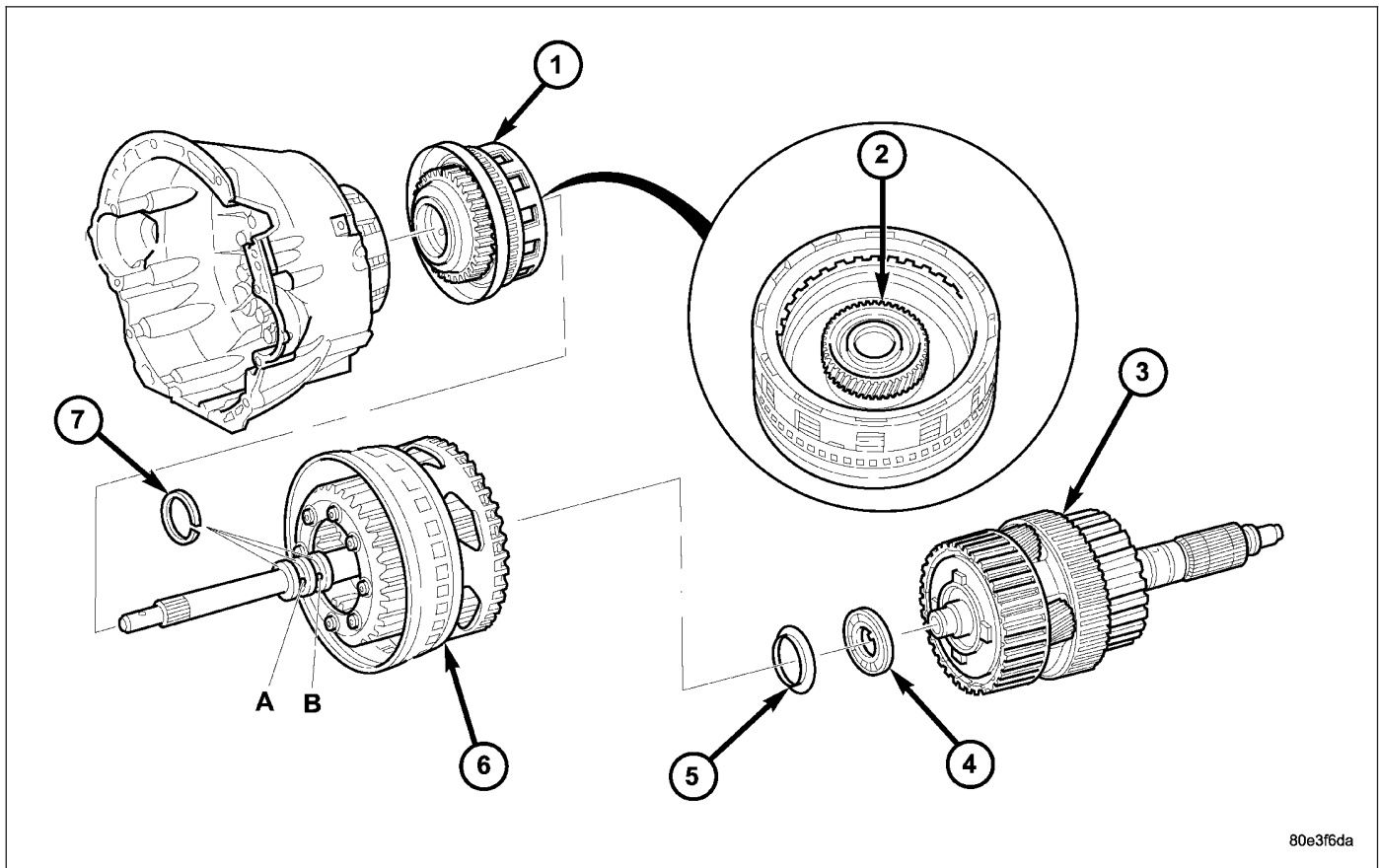
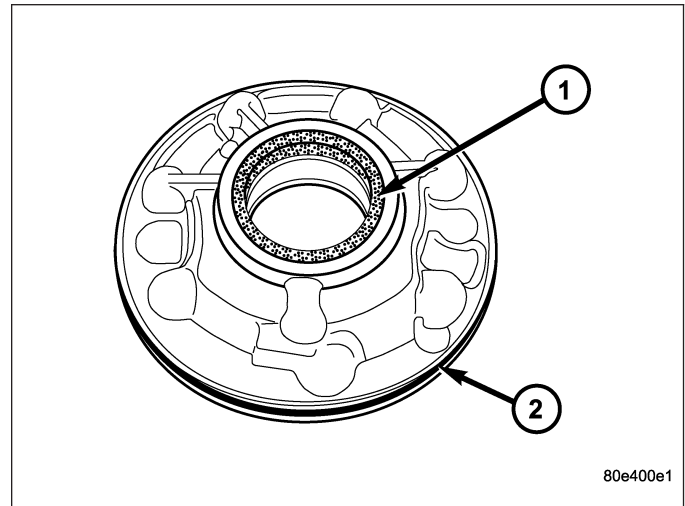
**Note: The intermediate plate can generally be used several times. The plate must not be coated with additional sealant**

7. Install the holding clutch B1 (5) onto the converter housing and intermediate plate. Installed position of clutch B1 in relation to converter housing is specified by a plain dowel pin in clutch B1 (arrow).

8. Install the bolts to hold clutch B1 (5) to the converter housing.

9. Securely tighten multiple-disc holding clutch B1 (5) on converter housing (2) to 10 N·m (88.5 in.lbs.).

10. Install new torque converter hub seal (1) into the oil pump using Seal Installer 8902A.
11. Install new oil pump outer o-ring seal onto oil pump.
12. Install oil pump (6) and securely tighten. Tighten the oil pump bolts to 20 N·m (177 in.lbs.).



### Install K1, K2, and K3 Clutches

- |  |  |
|--|--|
| 1 - DRIVING CLUTCH K1  | 5 - THRUST WASHER  |
| 2 - SUN GEAR OF FRONT PLANETARY GEAR SET                                     | 6 - FRONT PLANETARY GEAR SET, DRIVING CLUTCH K2, AND INPUT SHAFT |
| 3 - DRIVING CLUTCH K3, OUTPUT SHAFT, AND CENTER AND REAR PLANETARY GEAR SETS | 7 - SEALING RINGS  |
| 4 - THRUST NEEDLE BEARING  |  |

13. Using grease, insert sealing rings (7) in the groove so that the joint remains together.
14. Install the K1 (1) clutch onto the B1 clutch.
15. Install input shaft with clutch K2 (6) and front gear set (1).
16. Install front washer (5) and thrust needle bearing (4).



17. Install output shaft with center and rear gear set and clutch K3 (3).

18. Using grease, install both Teflon rings in the groove at the rear of the output shaft so that the joint stays together.

19. Mount transmission housing on converter housing.

20. Screw in Torx socket bolts through the transmission housing into the converter housing. Tighten the bolts to 20 N·m (177 in.lbs.).

**Note: Verify that there are no nicks or other irregularities in the surface of the transmission case that will cause an inaccurate measurement.**

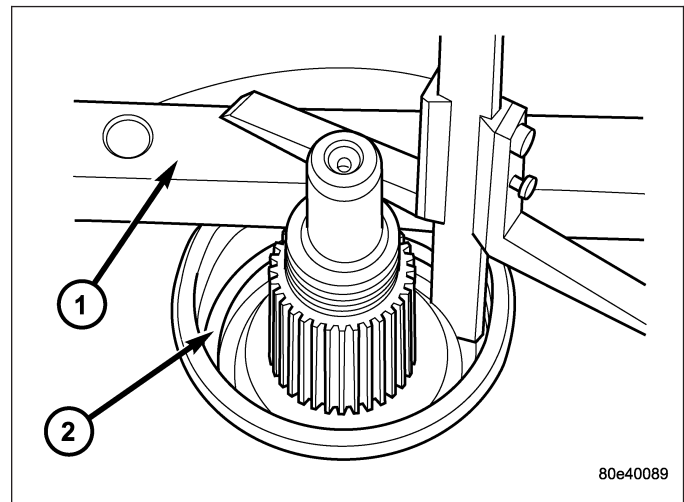
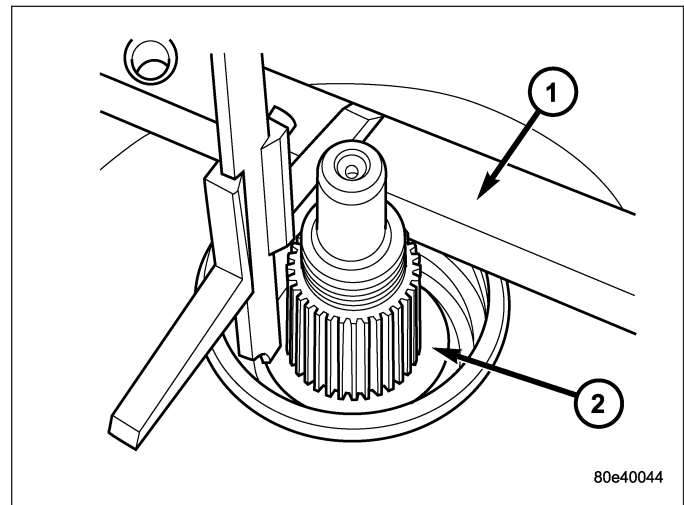
21. Measure end-play between park pawl gear and grooved ball bearing in order to select the proper geartrain end-play shim.

22. Place Gauge Bar 6311 (1) on transmission housing. Using a depth gauge, measure from the gauge bar (1) to the parking lock gear (2).

23. Using a depth gauge, measure from the Gauge Bar 6311 (1) to the contact surface of the output shaft bearing (2) in the transmission housing.

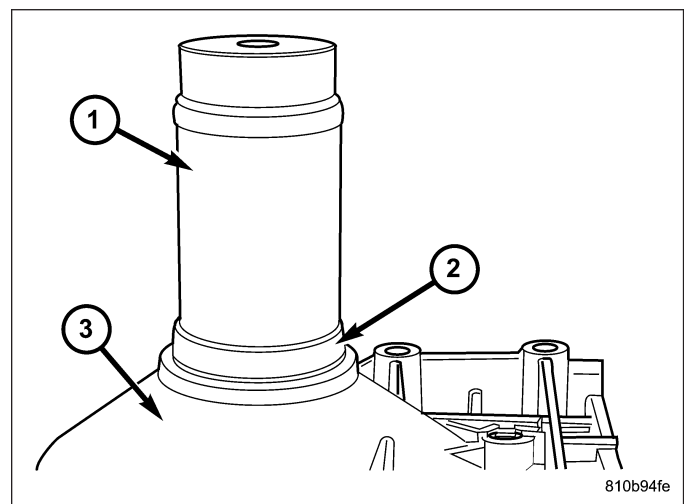
24. Subtract the first figure from the second figure to determine the current end-play of the transmission. Select a shim such that the end-play will be 0.3-0.5 mm (0.012-0.020 in.). Shims are available in thicknesses of 0.2 mm (0.008 in.), 0.3 mm (0.012 in.), 0.4 mm (0.016 in.), and 0.5 mm (0.020 in.).

25. Install the selected end-play shim.



26. Screw in Torx socket bolts through the converter housing into the transmission housing. Tighten the bolts to 20 N·m (177 in.lbs.).

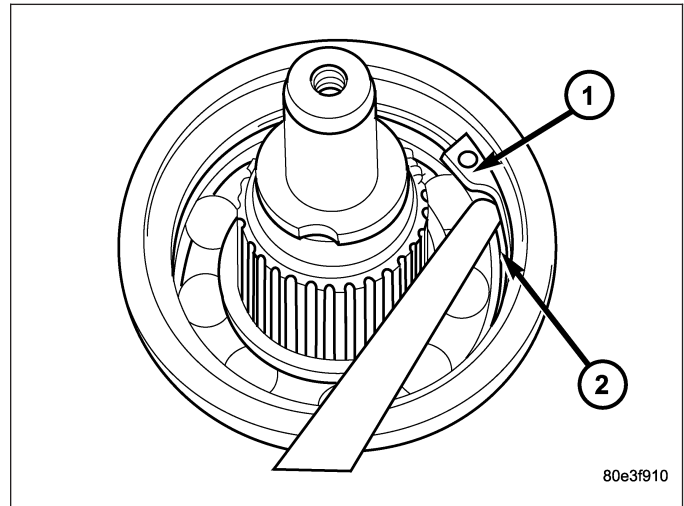
27. Install output shaft bearing (2) in rear transmission housing. Using Bearing Installer 9287 (1), install the output shaft bearing (2) into the transmission housing. **The closed side of the plastic cage**





must point towards the parking lock gear.

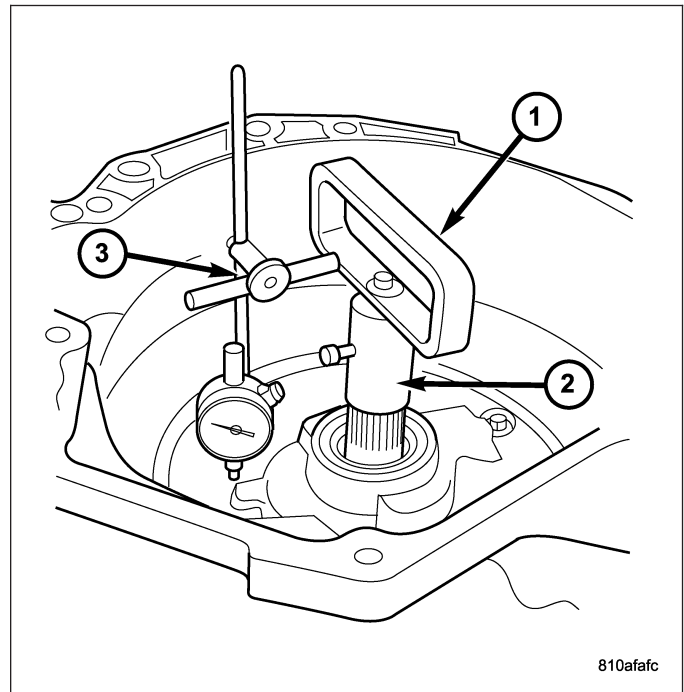
28. Install the retaining ring (1). Ensure that the retaining ring is seated correctly in the groove.
29. Check that there is no play between the bearing and the retaining ring using feeler gauge.
30. There must be no play between the retaining ring and the bearing. If the ring cannot be installed, a thinner ring must be used. If there is play between the ring and the bearing, a thicker ring must be installed. Retaining rings are available in thicknesses of 2.0 mm (0.079 in.), 2.1 mm (0.083 in.), and 2.2 mm (0.087 in.).



31. Rotate the transmission so that the bellhousing is pointed upward and ensuring that the output shaft is allowed to move freely.
32. Measure input shaft end-play.

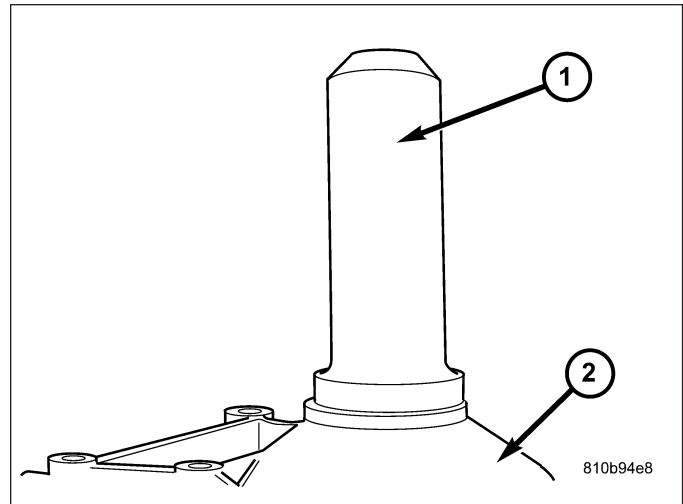
**Note: If end-play is incorrect, transmission is incorrectly assembled, or the geartrain end-play shim is incorrect. The geartrain end-play shim is selective.**

- a. Attach Adapter 8266-18 (2) to Handle 8266-8 (1).
- b. Attach dial indicator C-3339 (3) to Handle 8266-8 (1).
- c. Install the assembled tool onto the input shaft of the transmission and tighten the retaining screw on Adapter 8266-18 to secure it to the input shaft.
- d. Position the dial indicator plunger against a flat spot on the oil pump and zero the dial indicator.

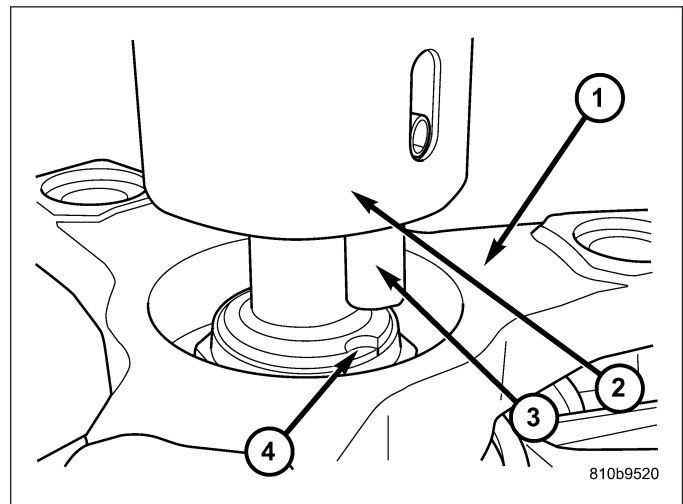


- e. Move input shaft in and out and record reading. End play should be 0.3-0.5 mm (0.012-0.020 in.). Adjust as necessary.

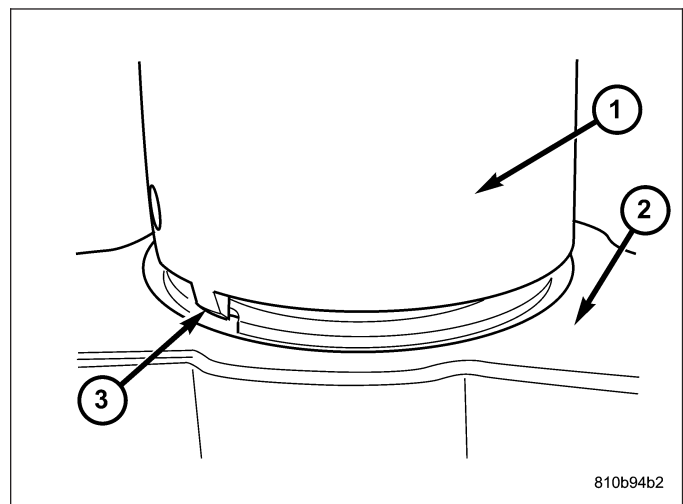
33. Install the output shaft washer onto the output shaft.
34. Install a new transmission rear seal into the transmission case with Seal Installer 8902A (1).



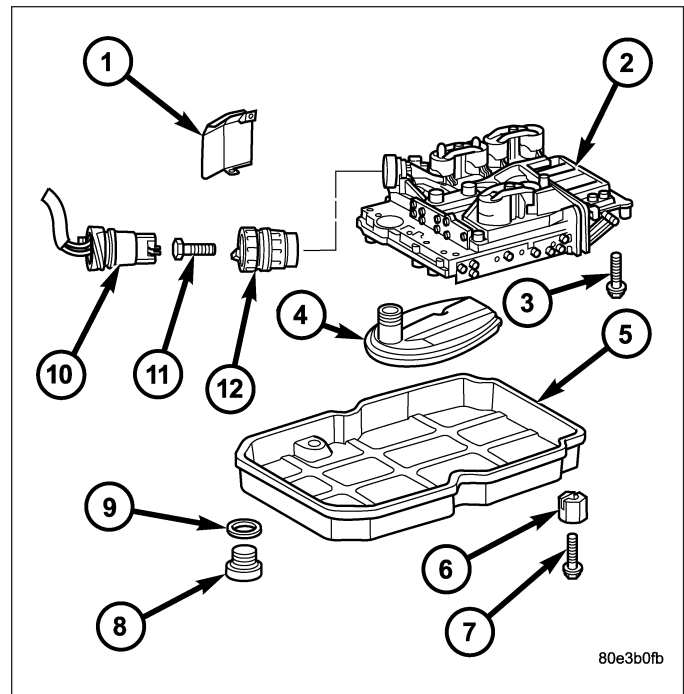
35. Place the transmission in PARK to prepare for the installation of the output shaft nut.
36. Install the propeller shaft flange onto the output shaft and install an new flange nut. Tighten the flange nut to 120 N·m (88.5 ft.lbs.).
37. Place the Staking Tool 9078 (2) and Driver Handle C-4171 onto the output shaft.
38. Rotate the Staking Tool 9078 (2) until the alignment pin (3) engages the output shaft notch (4).



39. Press downward on the staking tool (1) until the staking pin (3) contacts the output shaft nut flange (2).
40. Strike the Driver handle C-4171 with a suitable hammer until the output shaft nut is securely staked to the output shaft.

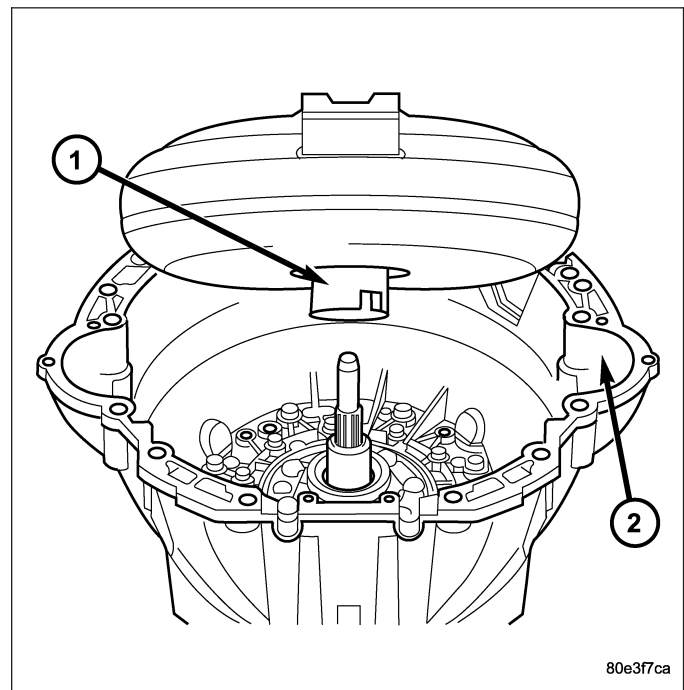


41. Install electrohydraulic unit (2). Tighten the bolts to 8 N·m (71 in.lbs.).
42. Install oil filter (4).
43. Install oil pan (5). Tighten the bolts to 8 N·m (71 in.lbs.).
44. Install guide bushing (12).



- 1 - HEAT SHIELD
- 2 - ELECTROHYDRAULIC UNIT
- 3 - BOLT
- 4 - OIL FILTER
- 5 - OIL PAN
- 6 - CLAMPING ELEMENT
- 7 - BOLT
- 8 - DRAIN PLUG
- 9 - DRAIN PLUG GASKET
- 10 - 13-PIN PLUG CONNECTOR
- 11 - BOLT
- 12 - GUIDE BUSHING

45. Install the torque converter.

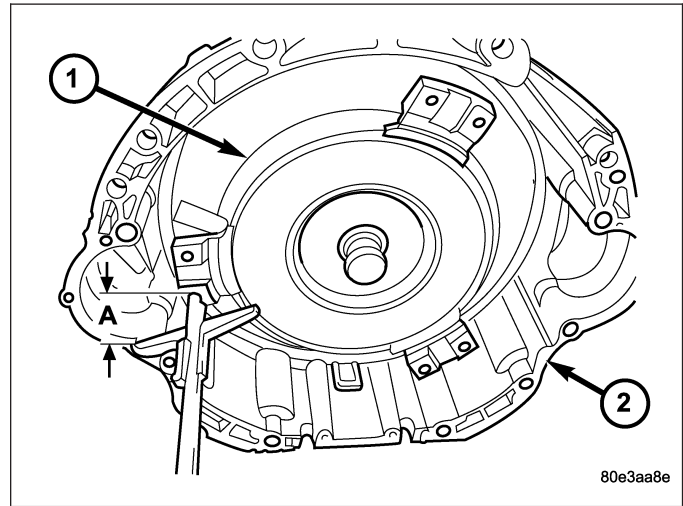


## INSTALLATION

1. Check torque converter hub and hub drive flats for sharp edges burrs, scratches, or nicks. Polish the hub and flats with 320/400 grit paper and crocus cloth if necessary. The hub must be smooth to avoid damaging pump seal at installation.
2. If a replacement transmission is being installed, transfer any components necessary, such as the manual shift lever and shift cable bracket, from the original transmission onto the replacement transmission.
3. Lubricate oil pump seal lip with transmission fluid.
4. Place torque converter (1) in position in transmission (2).

**CAUTION:** Do not damage oil pump seal or converter hub while inserting torque converter into the front of the transmission.

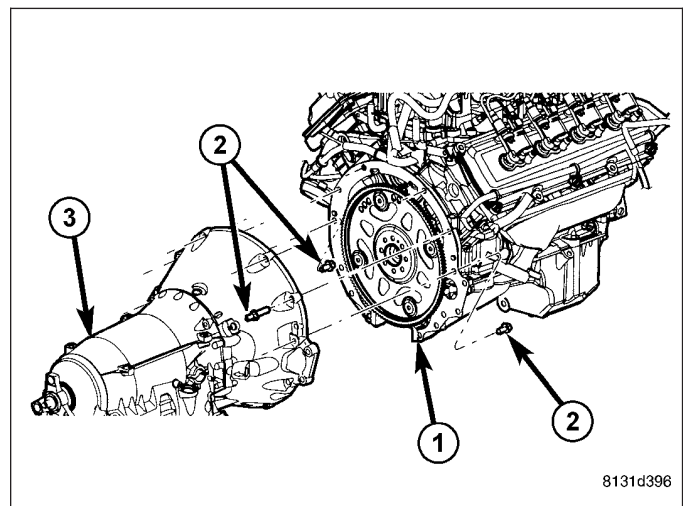
5. Align torque converter to oil pump seal opening.
6. Insert torque converter hub into oil pump.
7. While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.
8. Check converter seating with a scale and straight-edge (A). Surface of converter lugs should be at least 19 mm (3/4 in.) to rear of straightedge when converter is fully seated.



9. If necessary, temporarily secure converter with C-clamp attached to the converter housing.

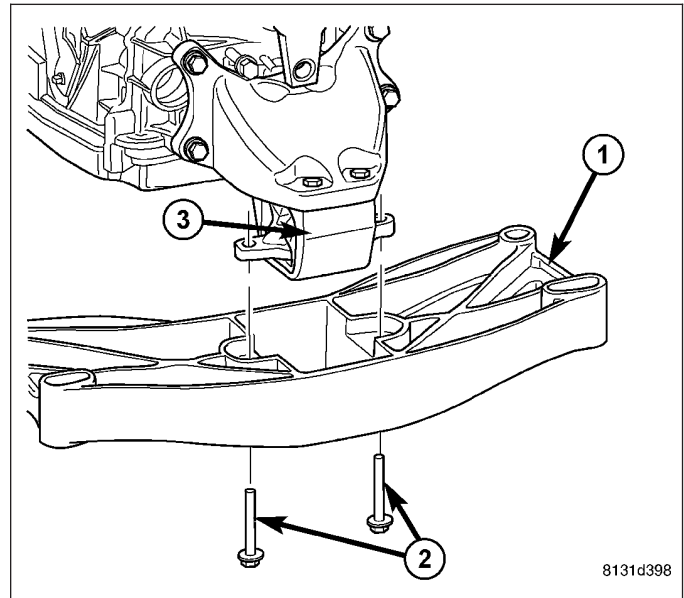
10. Check condition of converter driveplate. Replace the plate if cracked, distorted or damaged. **Also be sure transmission dowel pins are seated in engine block and protrude far enough to hold transmission in alignment.**
11. Apply a light coating of Mopar® High Temp Grease to the torque converter hub pocket in the rear pocket of the engine's crankshaft.

12. Raise transmission (3) and align the torque converter with the drive plate and the transmission converter housing with the engine block (1).
13. Move transmission forward. Then raise, lower, or tilt transmission to align the converter housing with the engine block dowels.

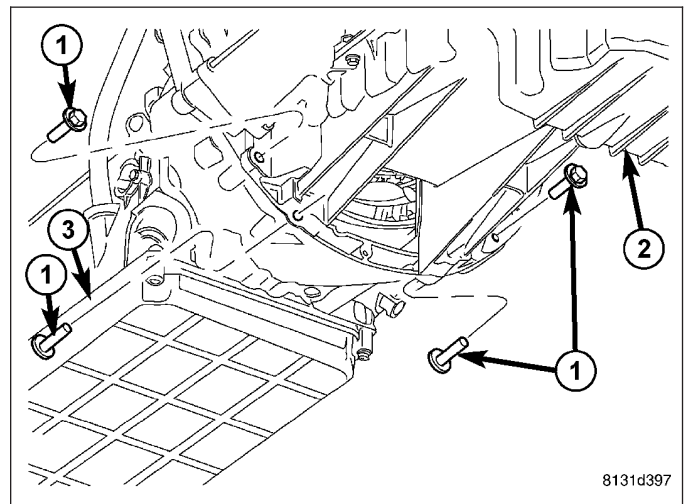


14. Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft. Verify that no wires, or the transmission vent hose, have become trapped between the engine block and the transmission.
15. Install two bolts (2) to attach the transmission to the engine.

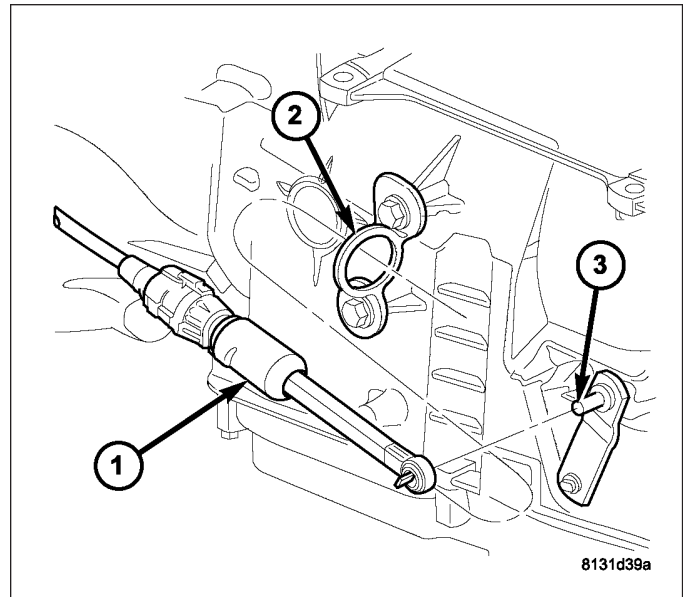
16. Install remaining torque converter housing to engine bolts (2). Tighten to 39 N·m (29 ft.lbs.).
17. Install rear transmission crossmember (1). Tighten crossmember to frame bolts to 68 N·m (50 ft.lbs.).
18. Install rear support (3) to transmission. Tighten bolts to 47 N·m (35 ft.lbs.).
19. Lower transmission onto crossmember and install bolts attaching transmission mount to crossmember. Tighten clevis bracket to crossmember bolts(2) to 47 N·m (39 ft.lbs.).
20. Remove engine support fixture.



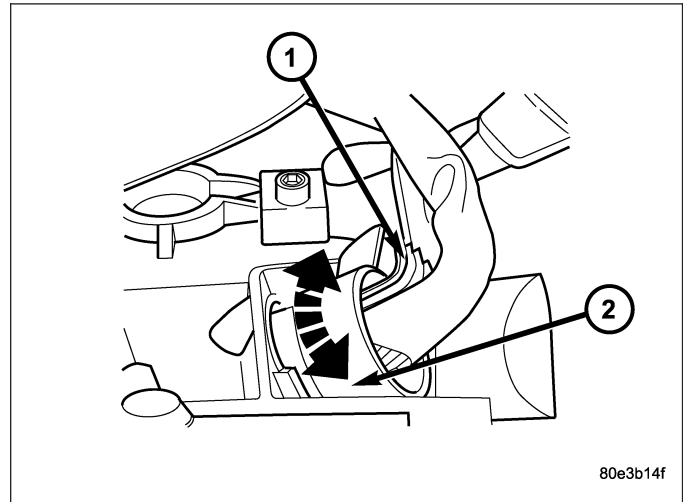
21. Install the transmission (3) to engine oil pan (2) bolts (1). Tighten to 39 N·m (29 ft.lbs.).



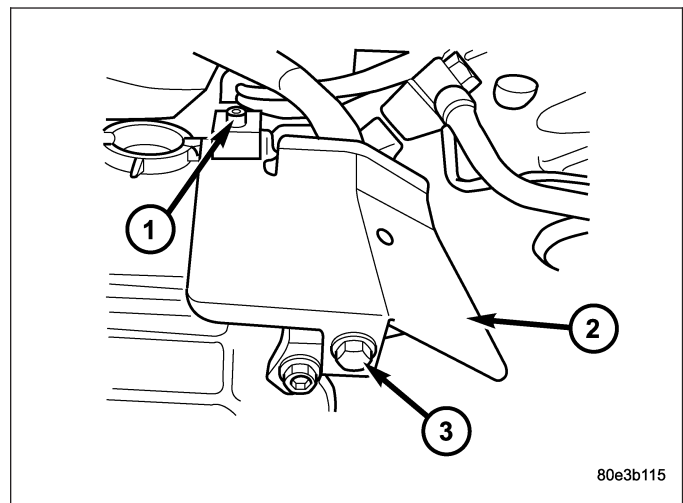
22. Connect the gearshift cable (1) to the transmission manual shift lever (3).



23. Check O-ring on plug connector (1) , and replace if necessary.
24. Install the plug connector (1) into the guide bushing (2). Turn bayonet lock of guide bushing (2) clockwise to connect plug connector (1).

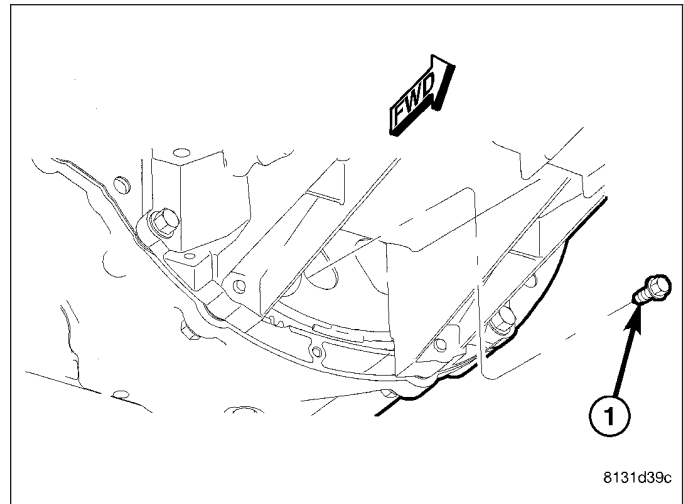


25. Position the heat shield (2) onto the transmission housing and install the screw (1) and bolt (3) to hold the shield in place.

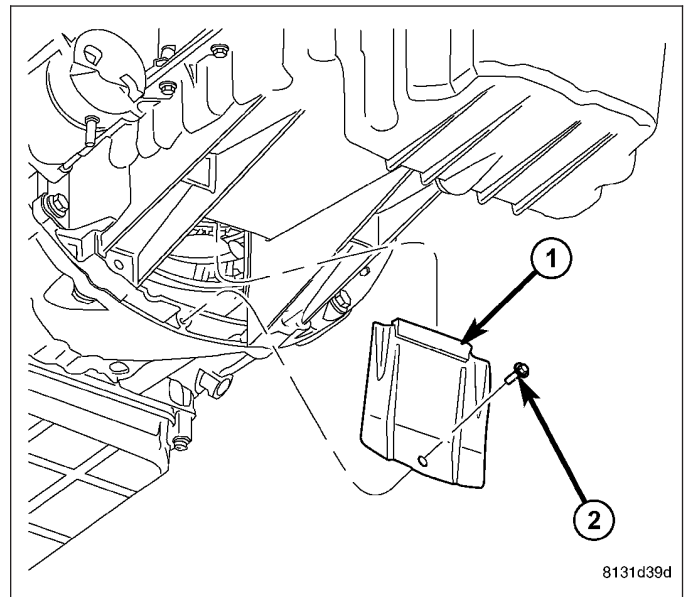


**CAUTION:** It is essential that correct length bolts be used to attach the converter to the driveplate. Bolts that are too long will damage the clutch surface inside the converter.

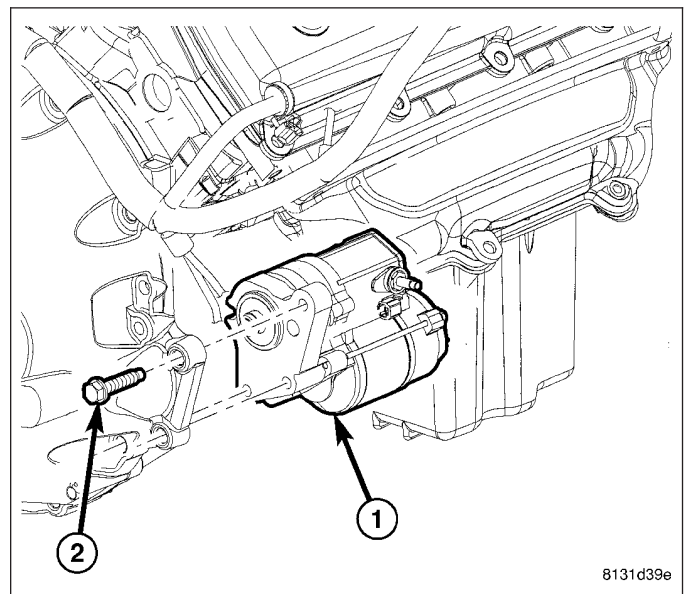
26. Install all torque converter-to-driveplate bolts (1) by hand.
27. Verify that the torque converter is pulled flush to the driveplate. Tighten bolts to 42 N·m (30.5 ft. lbs.).



28. Install the torque converter bolt access cover (1) onto the transmission. Install the access cover bolt (2) and tighten to 11 N·m (8 ft. lbs.).



29. Install starter motor (1). (Refer to 8 - ELECTRICAL/ STARTING/STARTER MOTOR - INSTALLATION)

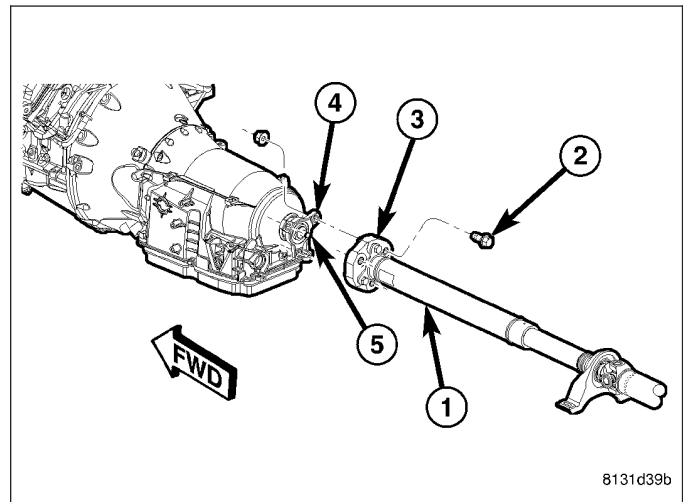
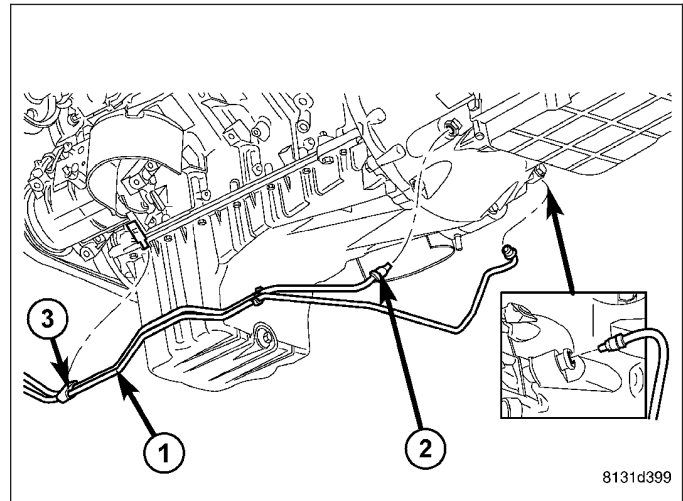




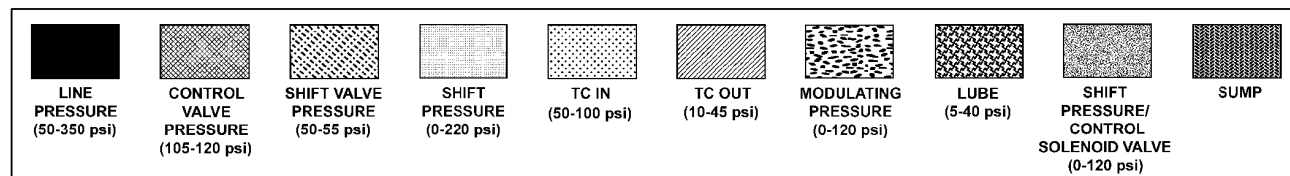
30. Connect the cooler line fittings (2) and cooler lines (1) to the transmission.
31. Install transmission fill tube.
32. Install exhaust components.
33. Align and connect the propeller shaft (1). (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - INSTALLATION)
34. Adjust gearshift cable if necessary.
35. Lower vehicle.
36. Connect negative battery cable.
37. Fill the transmission with the appropriate transmission fluid (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION) according to the standard procedure (Refer to 21 - TRANSMISSION/AUTOMATIC - NAG1/FLUID AND FILTER - STANDARD PROCEDURE).

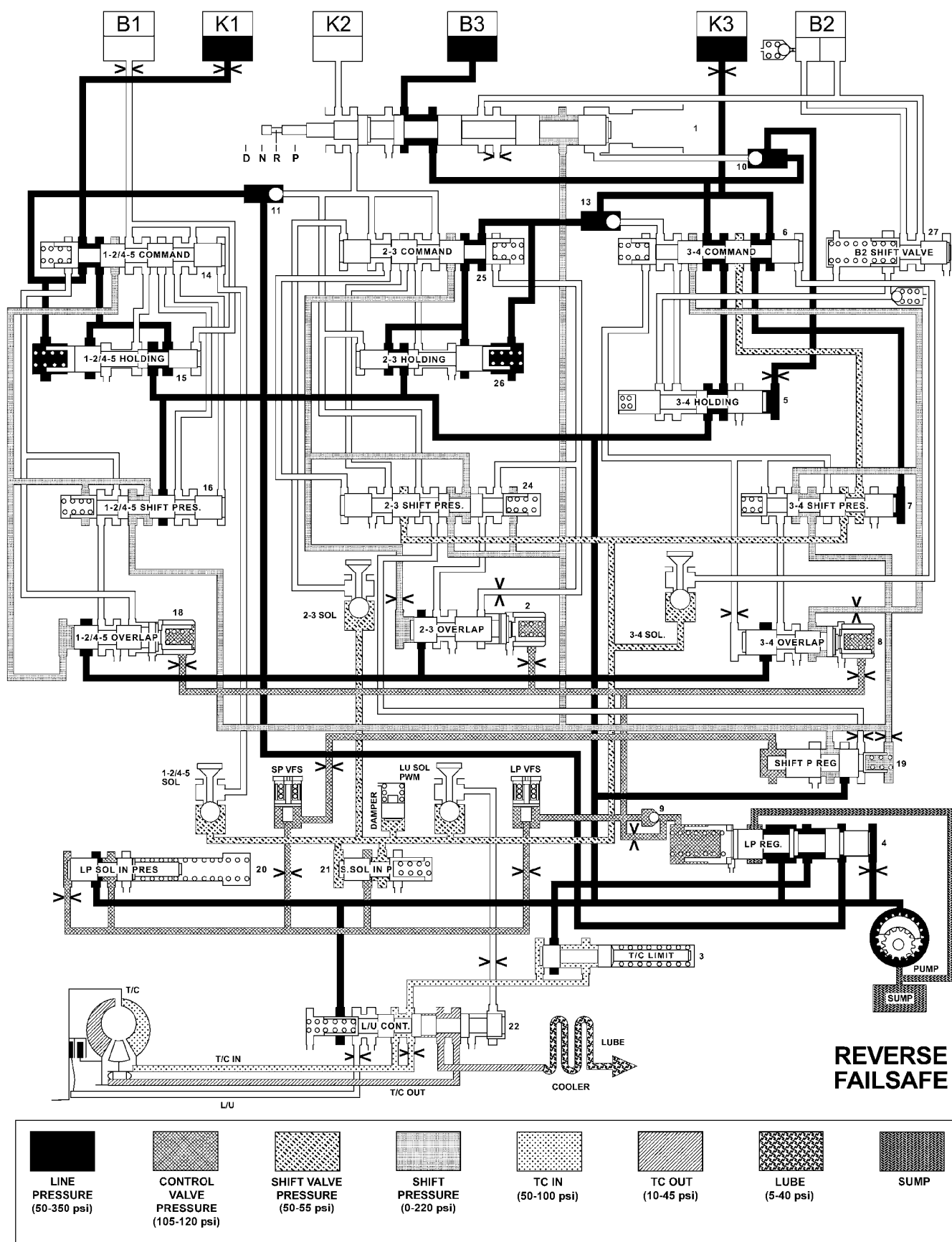
**Note:** If the transmission is being reconditioned (clutch/seal replacement) or replaced, it is necessary to perform the TCM Adaptation Procedure using the scan tool (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE).

38. Verify proper operation.



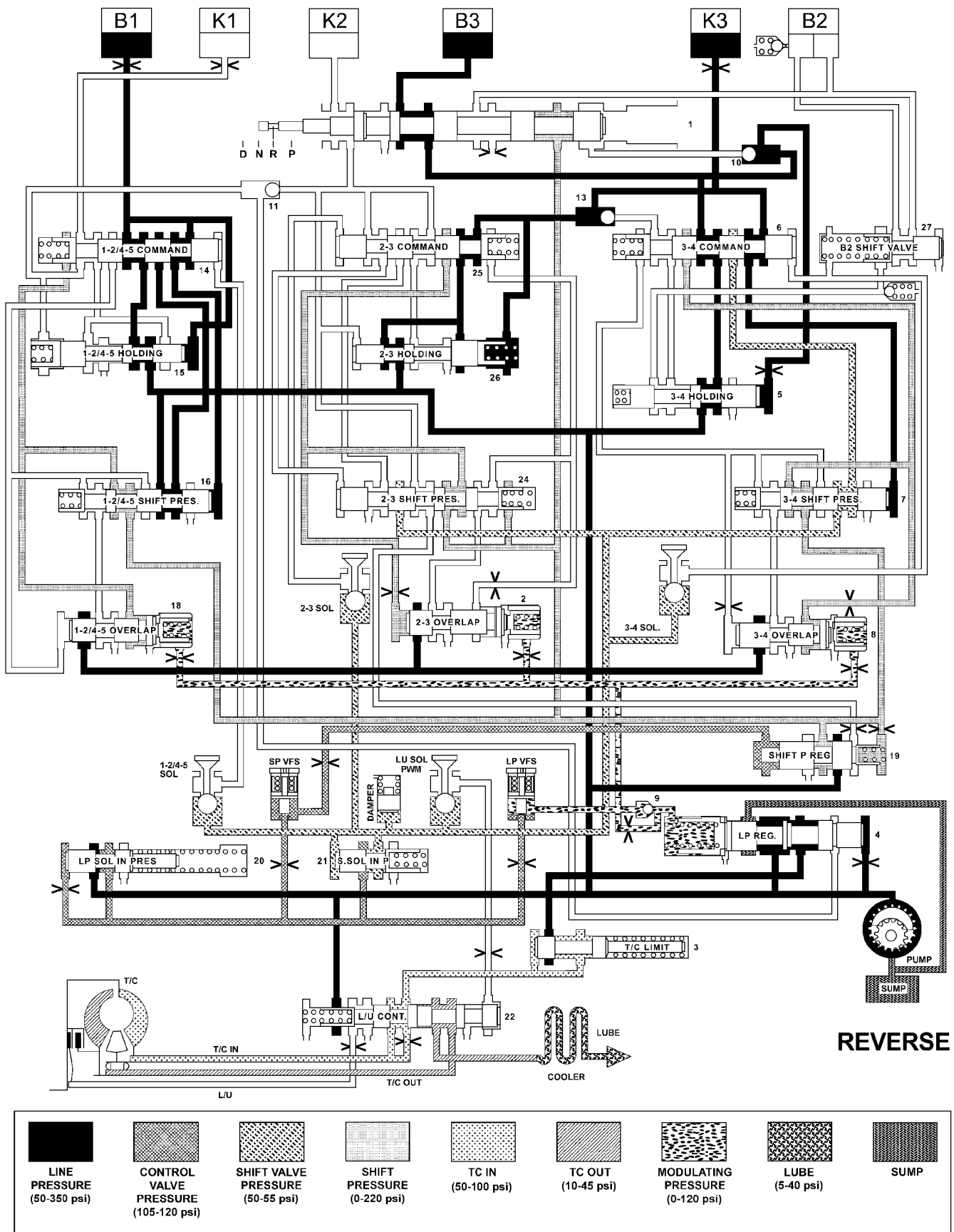






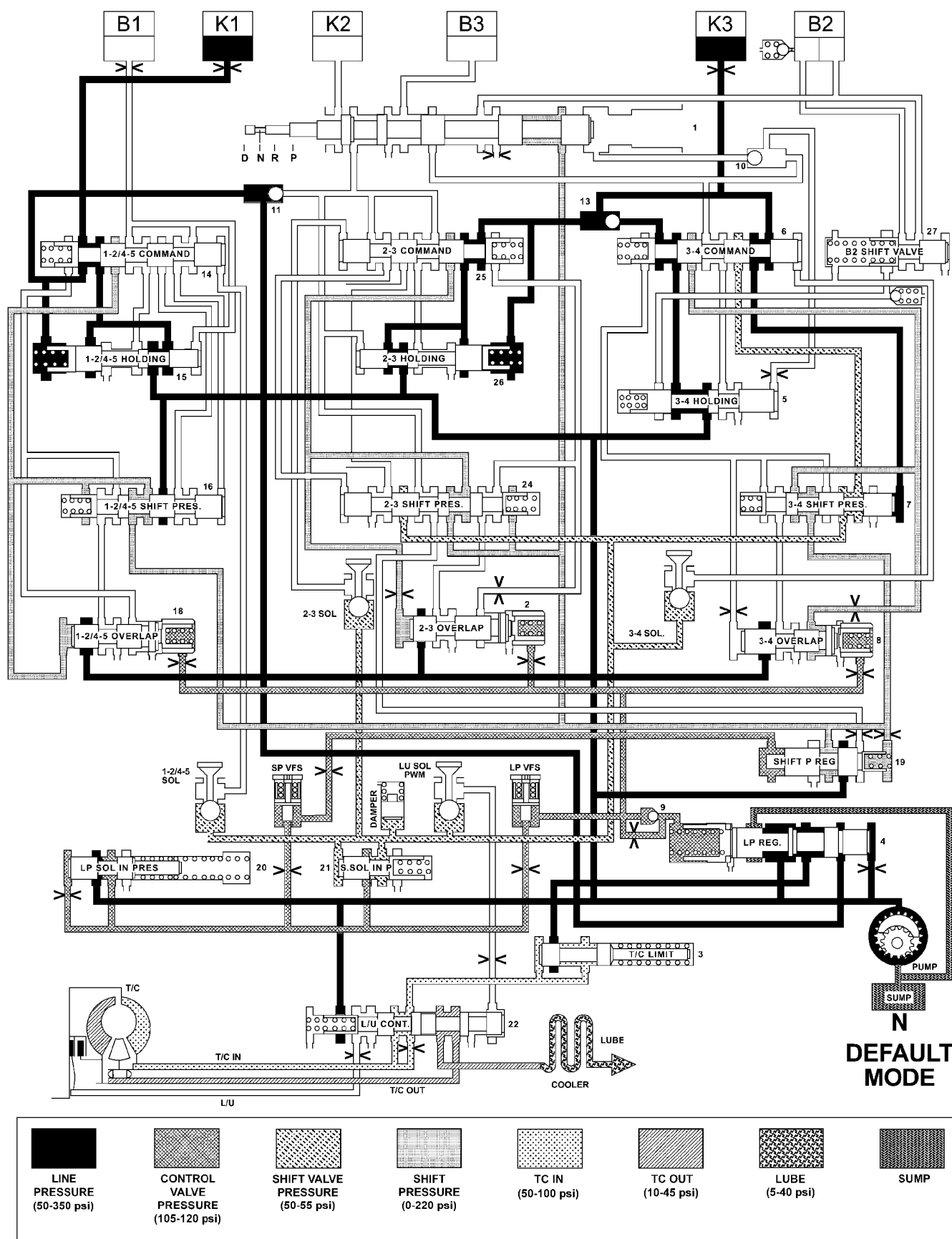
810bae77

HYDRAULIC FLOW IN REVERSE - FAILSAFE



810baf23

HYDRAULIC FLOW IN REVERSE

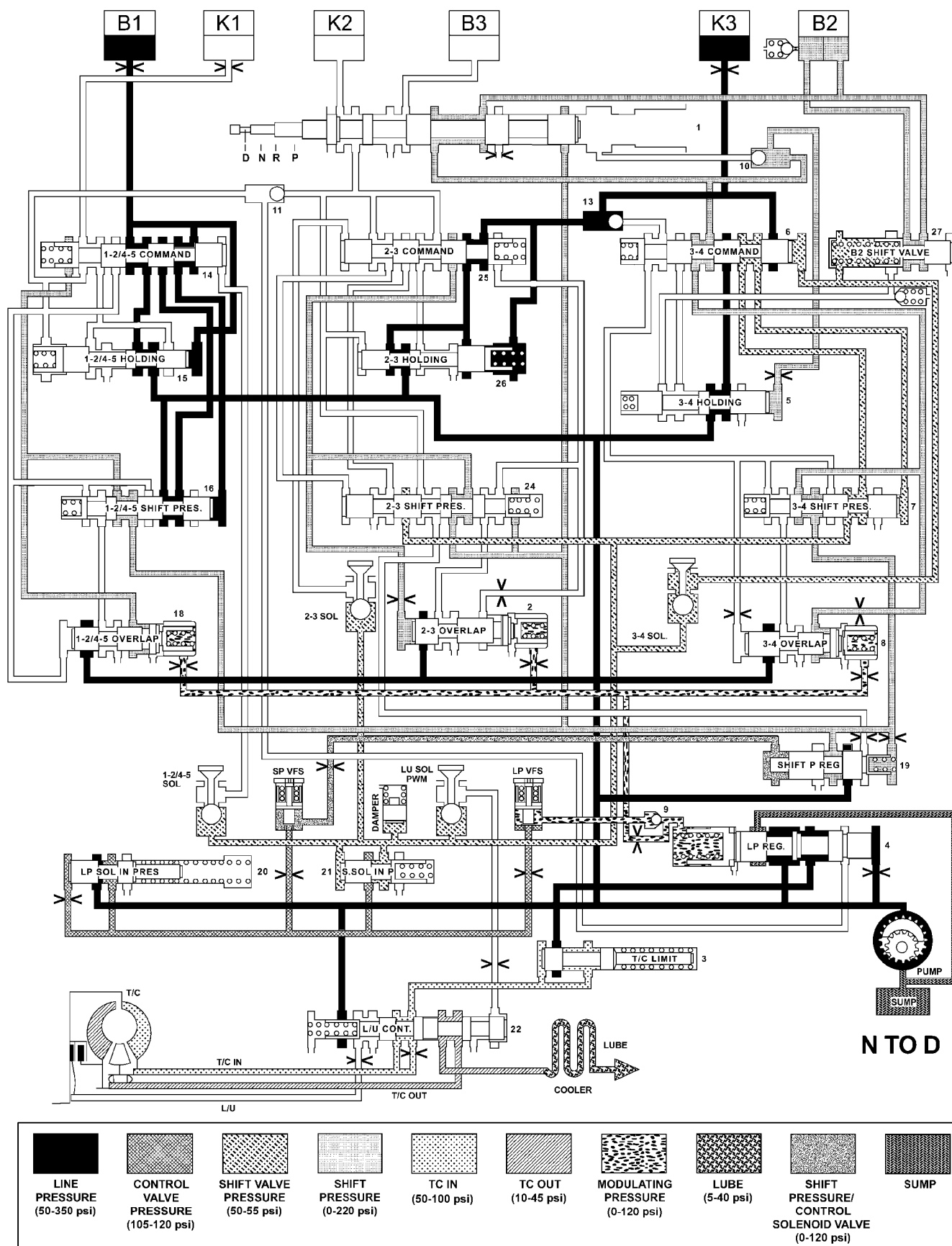


810baf1e

HYDRAULIC FLOW IN NEUTRAL - DEFAULT



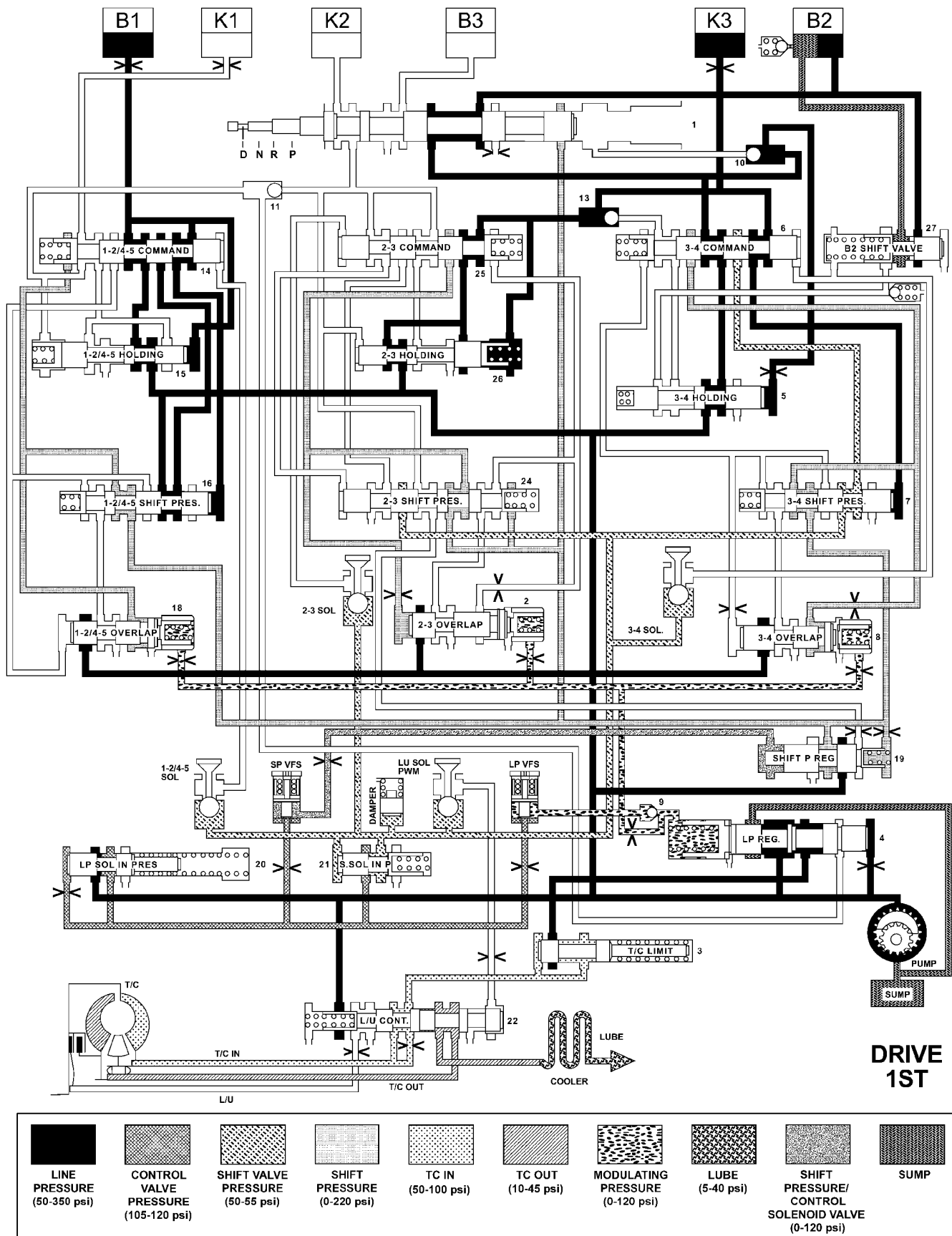




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HYDRAULIC FLOW IN NEUTRAL TO DRIVE TRANSITION

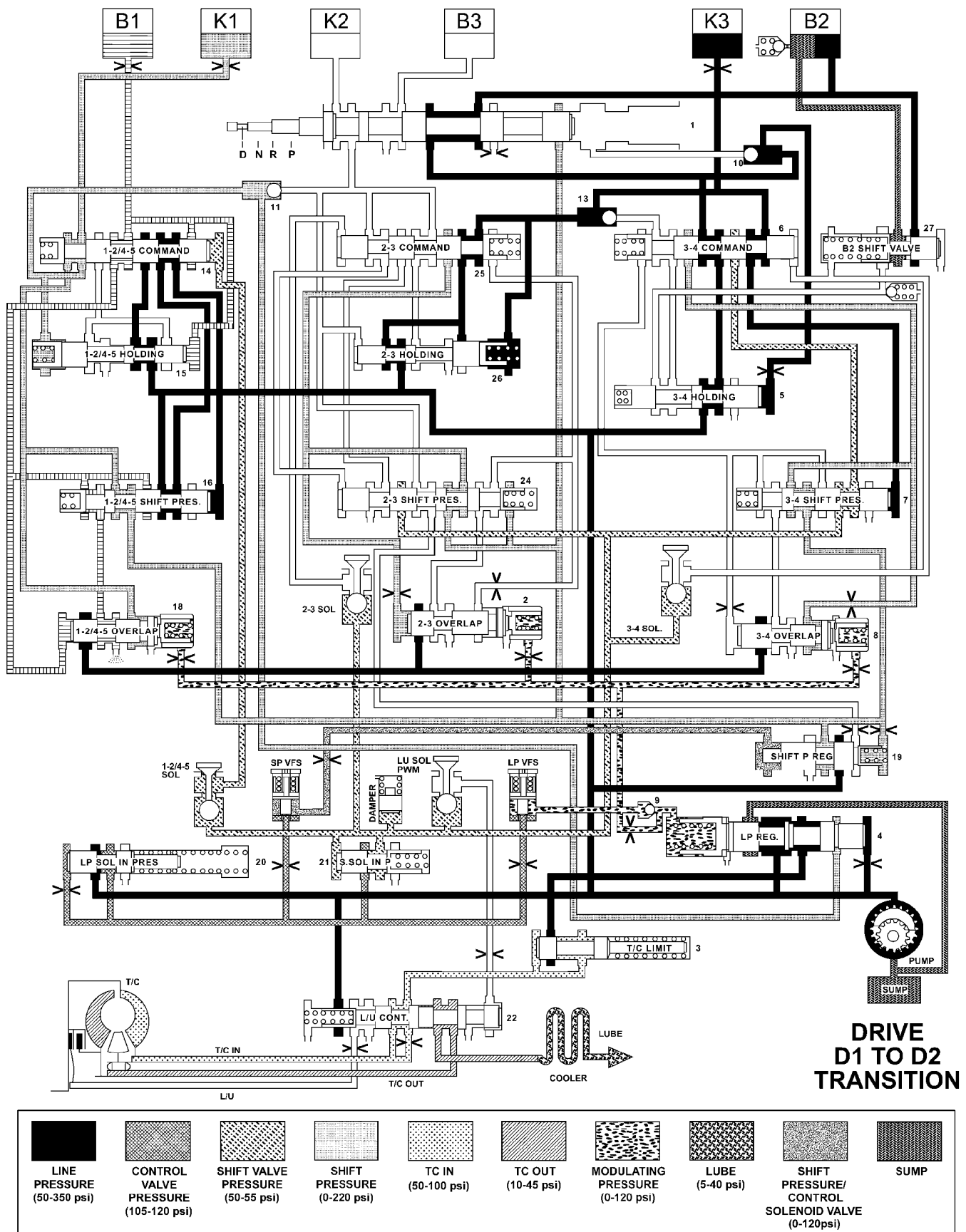




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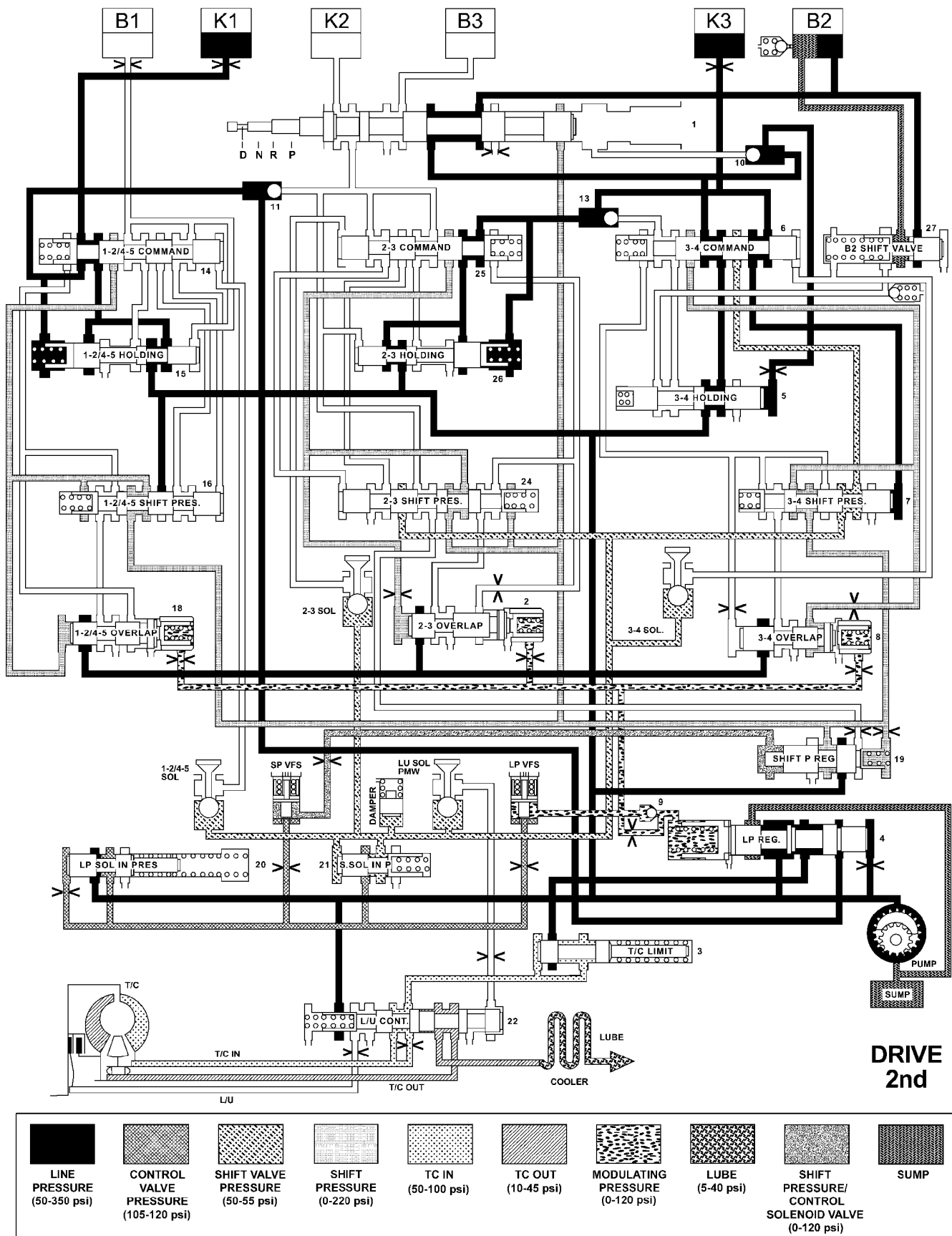
**HYDRAULIC FLOW IN DRIVE - FIRST GEAR**





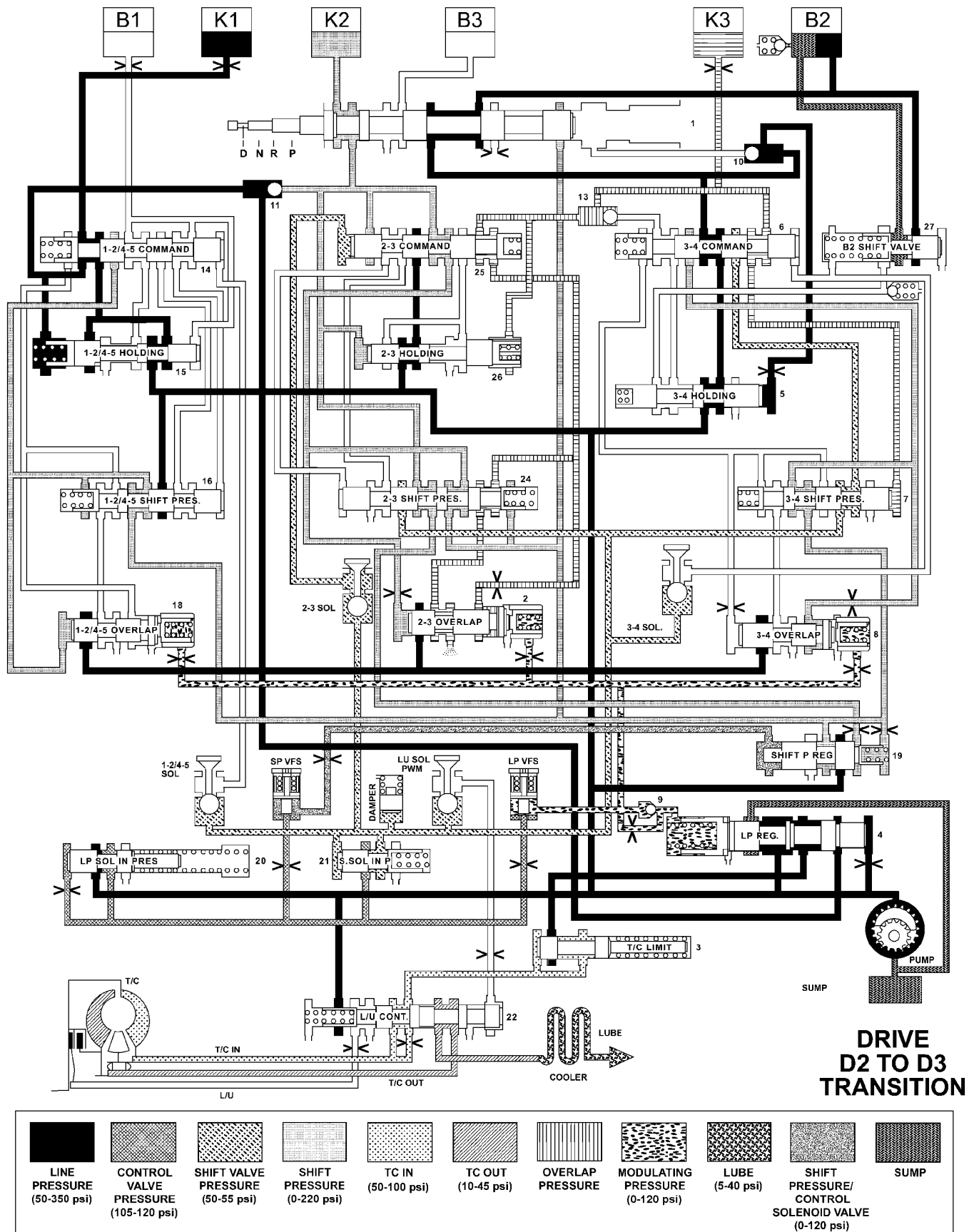
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HYDRAULIC FLOW IN DRIVE - FIRST TO SECOND GEAR TRANSITION



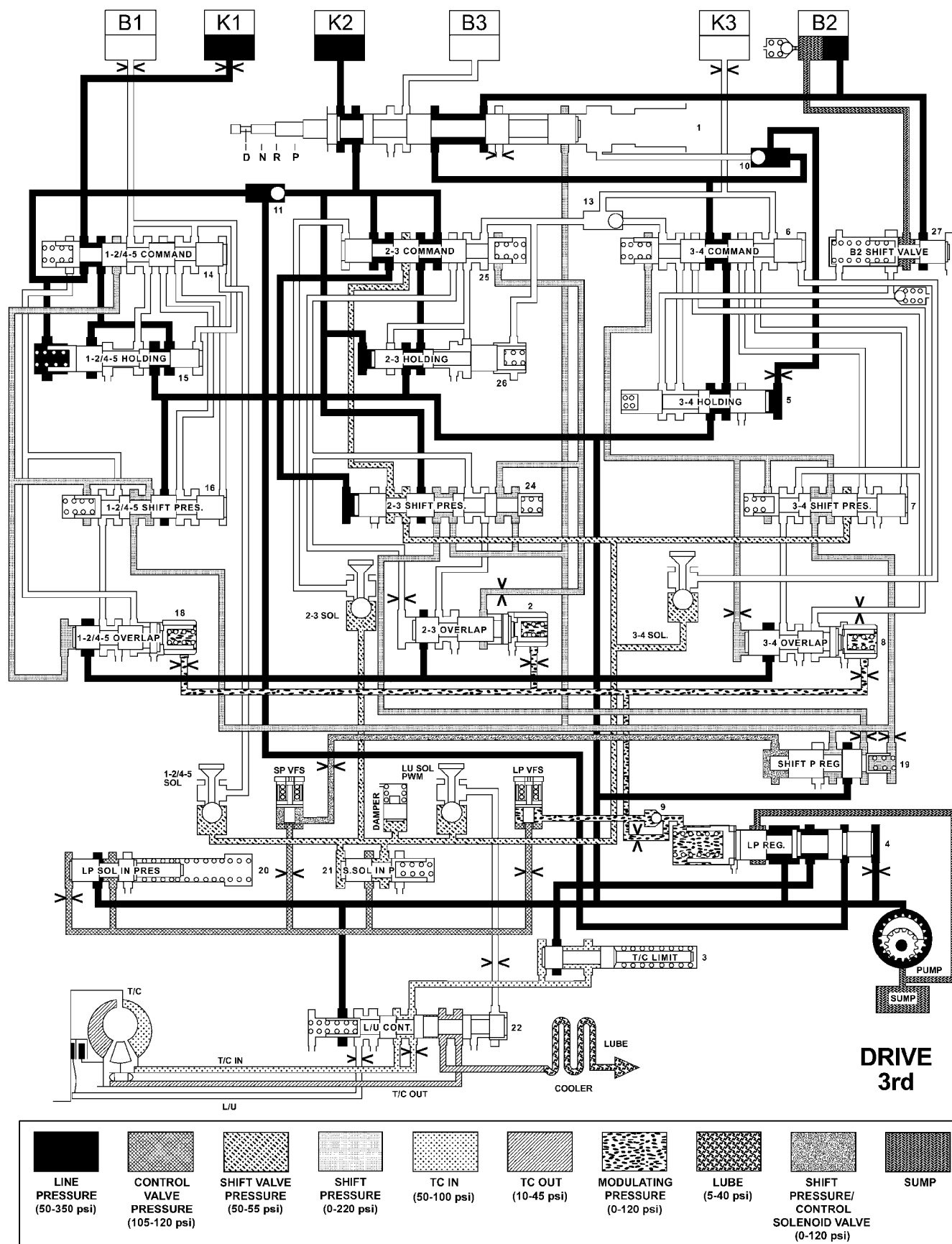
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**HYDRAULIC FLOW IN DRIVE - SECOND GEAR**



810baff2

HYDRAULIC FLOW IN DRIVE - SECOND TO THIRD GEAR TRANSITION



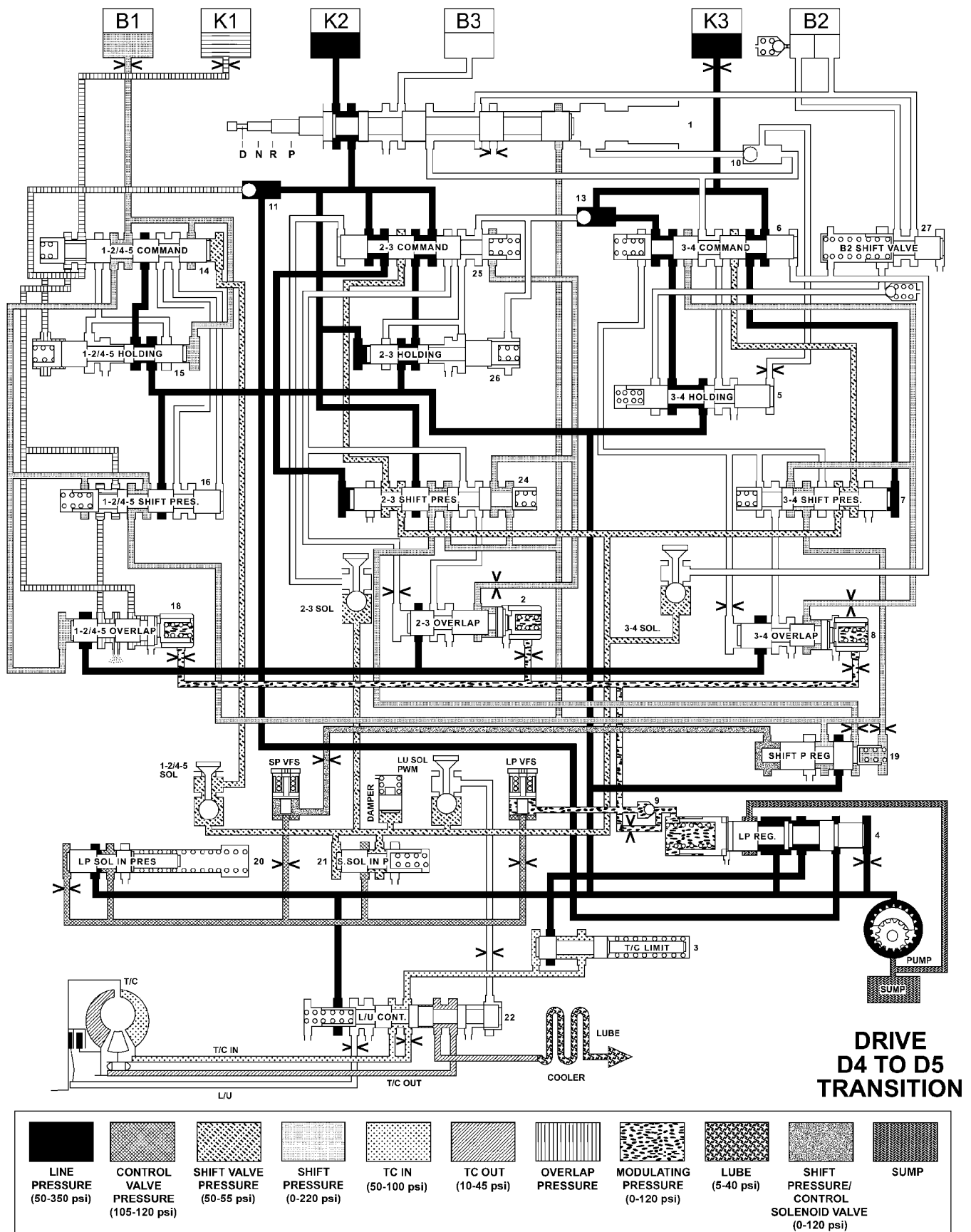
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HYDRAULIC FLOW IN DRIVE - THIRD GEAR



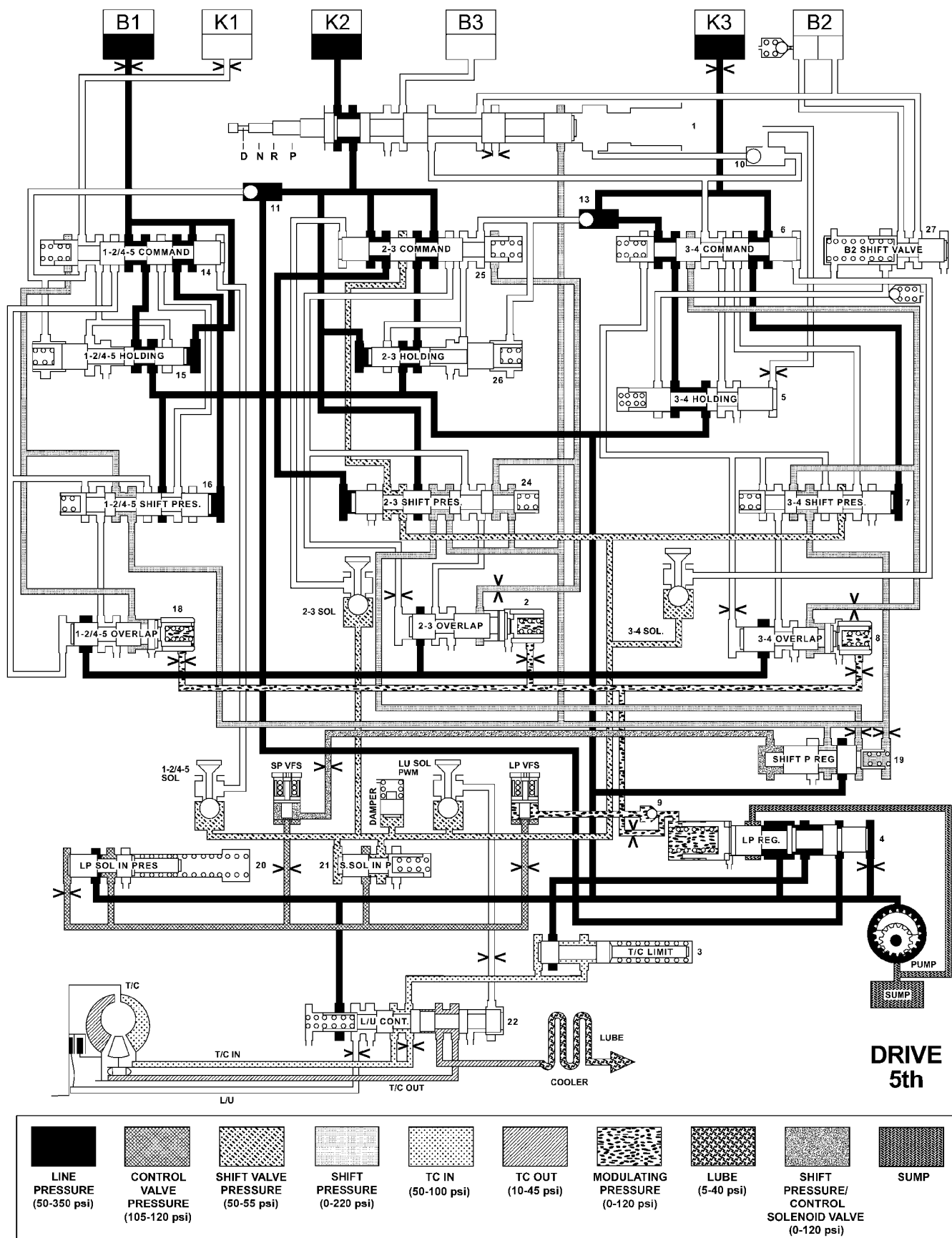






810bb20a

HYDRAULIC FLOW IN DRIVE - FOURTH TO FIFTH GEAR TRANSITION

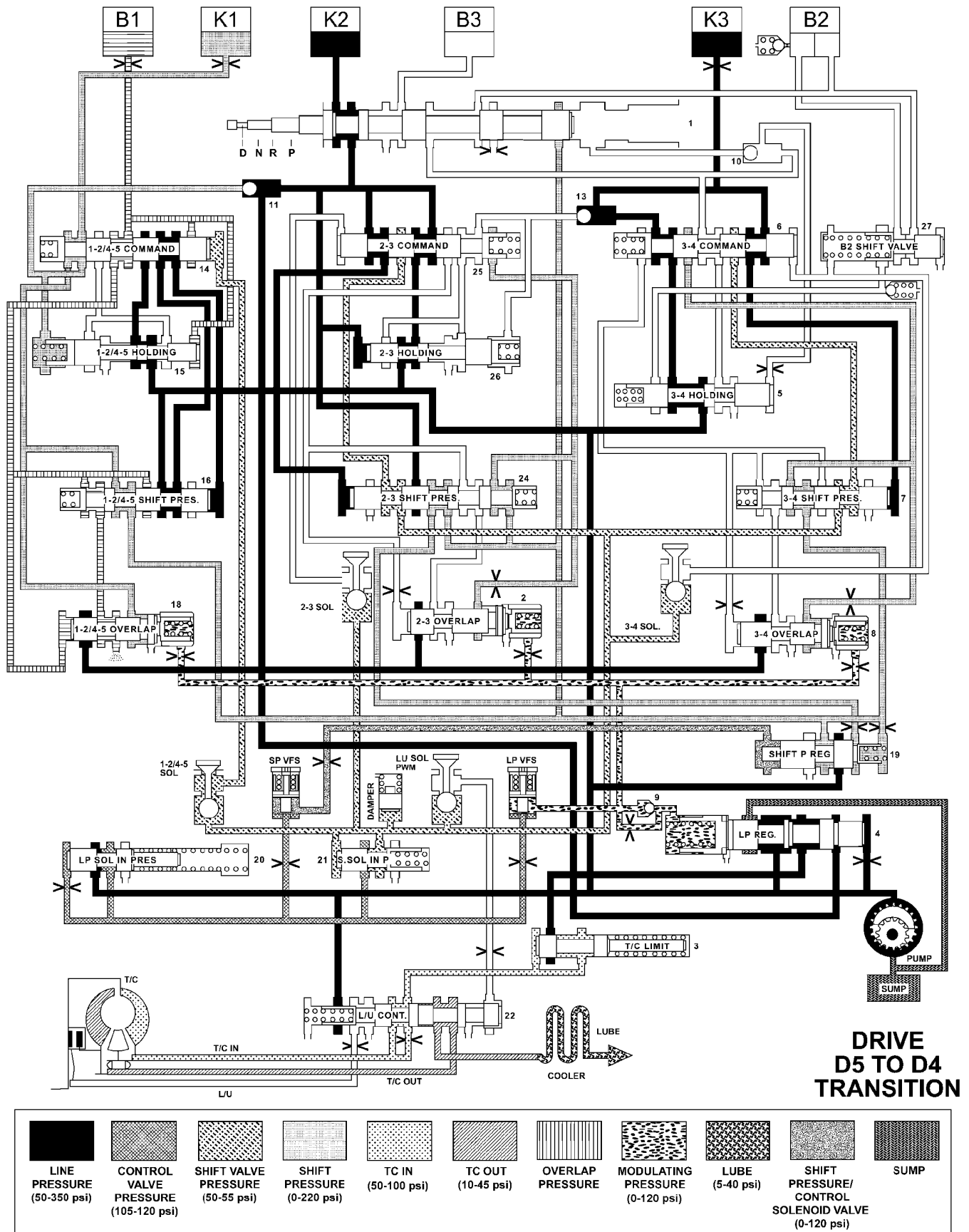


810bb210

HYDRAULIC FLOW IN DRIVE - FIFTH GEAR

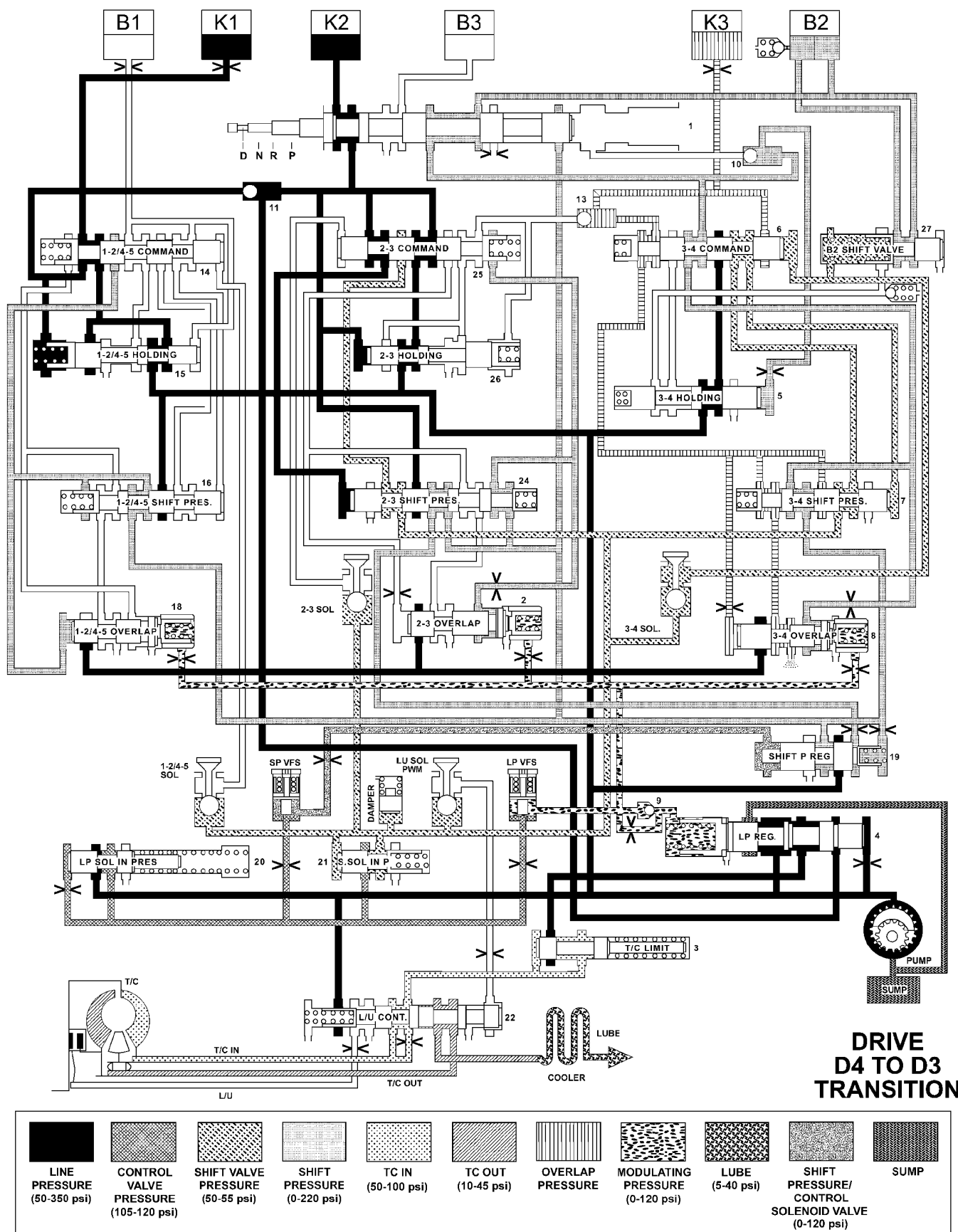


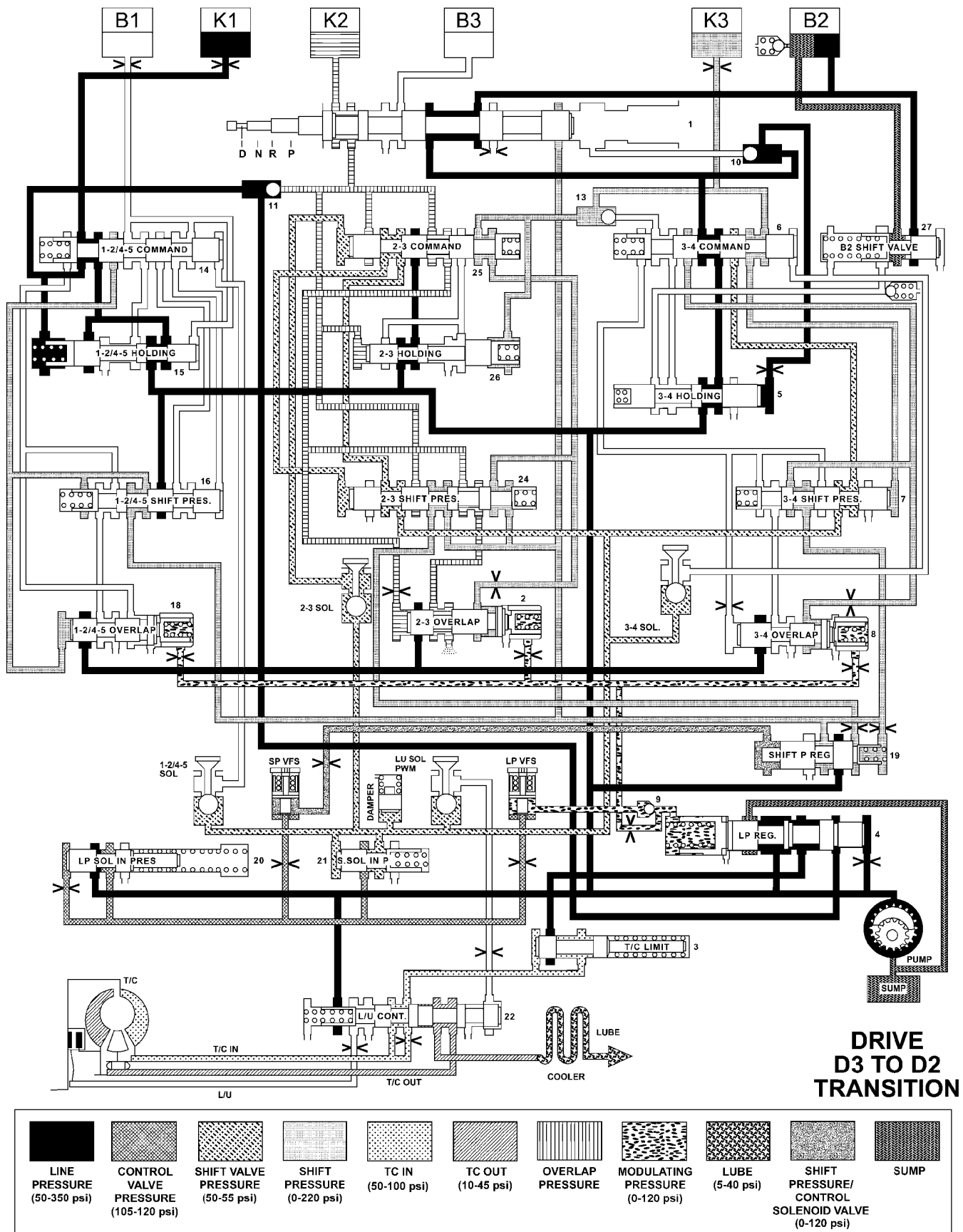




810bb261

**HYDRAULIC FLOW IN DRIVE - FIFTH TO FOURTH GEAR TRANSITION**





810bb2ec

HYDRAULIC FLOW IN DRIVE - THIRD TO SECOND GEAR TRANSITION





## SPECIFICATIONS

### GEAR RATIOS

1ST	3.59:1
2ND	2.19:1
3RD	1.41:1
4TH	1.00:1
5TH	0.83:1
REVERSE	3.16:1

### SPECIFICATIONS

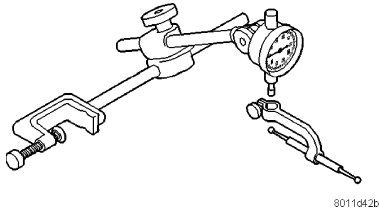
COMPONENT		METRIC (mm)	INCH (in.)
Geartrain End-play		0.3-0.5	0.012-0.020
Geartrain End-play Shim		0.2, 0.3, 0.4, and 0.5	0.008, 0.012, 0.016, 0.020
Rear Planetary Gear Set End-play		0.15-0.6	0.006-0.024
Rear Planetary Gear Set Snap-rings		3.0, 3.4, and 3.7	0.118, 0.134, 0.146
B1 Clutch Clearance - Double Sided Friction Discs	2 Disc	2.3-2.7	0.091-0.106
	3 Disc	2.7-3.1	0.106-0.122
	4 Disc	3.0-3.4	0.118-0.134
B1 Clutch Clearance - Single Sided Friction Discs	4 Disc	2.2-2.6	0.087-0.102
	6 Disc	2.4-2.8	0.095-0.110
	8 Disc	2.6-3.0	0.102-0.118
B1 Clutch Snap-rings		2.6, 2.9, 3.2, 3.5, 3.8, and 4.1	0.102, 0.114, 0.126, 0.138, 0.150, 0.162
B2 Clutch Clearance	4 Disc	1.9-2.3	0.075-0.091
	5 Disc	2.0-2.4	0.079-0.095
B2 Clutch Snap-rings		2.9, 3.2, 3.5, 3.8, and 4.1	0.114, 0.126, 0.138, 0.150, 0.162
B3 Clutch Clearance		1.0-1.4	0.039-0.055
B3 Clutch Snap-rings		3.2, 3.5, 3.8, 4.1, 4.4, and 4.7	0.126, 0.138, 0.150, 0.162, 0.173, 0.185
K1 Clutch Clearance - Double Sided Friction Discs	3 Disc	2.7-3.1	0.106-0.122
	4 Disc	3.0-3.4	0.118-0.134
	5 Disc	3.3-3.7	0.13-0.146
	6 Disc	3.6-4.0	0.142-0.158
K1 Clutch Clearance - Single Sided Friction Discs	6 Disc	2.4-2.8	0.095-0.110
	8 Disc	2.6-3.0	0.102-0.118
	10 Disc	2.8-3.2	0.110-0.126
	12 Disc	2.9-3.3	0.114-0.130
K1 Clutch Snap-rings		2.6, 2.9, 3.2, 3.5, 3.8, and 4.1	0.102, 0.114, 0.126, 0.138, 0.150, 0.162
K2 Clutch Clearance	3 Disc	2.3-2.7	0.091-0.106
	4 Disc	2.4-2.8	0.095-0.110
	5 Disc	2.5-2.9	0.099-0.114
	6 Disc	2.7-3.1	0.106-0.122

COMPONENT		METRIC (mm)	INCH (in.)
K2 Clutch Snap-rings		2.3, 2.6, 2.9, 3.2, 3.5, and 3.8	0.091, 0.102, 0.114, 0.126, 0.138, 0.150
K3 Clutch Clearance - Double Sided Friction Discs	3 Disc	2.3-2.7	0.091-0.106
	4 Disc	2.4-2.8	0.095-0.110
	5 Disc	2.5-2.9	0.099-0.114
K3 Clutch Clearance - Single Sided Friction Discs	6 Disc	2.3-2.7	0.091-0.106
	8 Disc	2.4-2.8	0.095-0.110
	10 Disc	2.5-2.9	0.099-0.114
K3 Clutch Snap-rings		2.0, 2.3, 2.6, 2.9, 3.2, and 3.5	0.079, 0.091, 0.102, 0.114, 0.126, 0.138

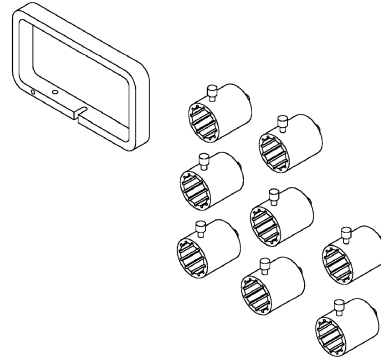
**TORQUE SPECIFICATIONS**

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Bolt, B2 Clutch Carrier	16	-	141
Bolt, B1 Carrier to Converter Housing	10	-	88.5
Bolt, Oil Pump	20	-	177
Nut, Propeller Flange	120	88.5	-
Bolt, Electrohydraulic Unit	8	-	71
Bolt, Transmission Housing to Converter Housing	20	-	177
Bolts, Oil Pan	8	-	71
Screws, Valve Body/Housing Side Cover	4	-	35
Bolt, Shift Plate	8	-	71
Bolt, Solenoid Leaf Spring	8	-	71
Nut, Shifter Mechanism to Floor Pan	7	-	65

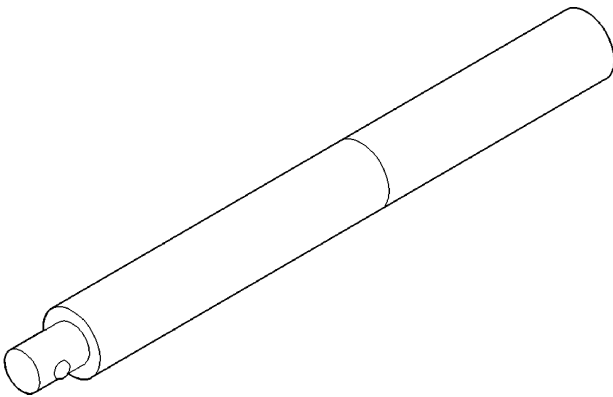
## SPECIAL TOOLS - AUTOMATIC TRANSMISSION - NAG1



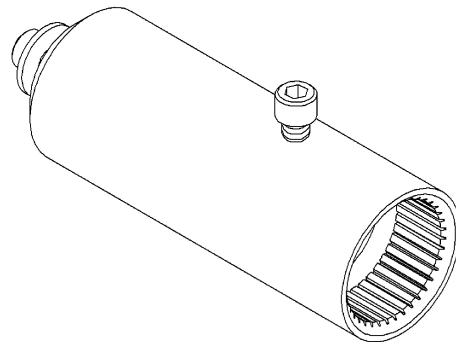
**Dial Indicator - C-3339**



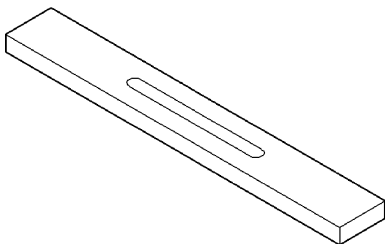
**End Play Set - 8266**



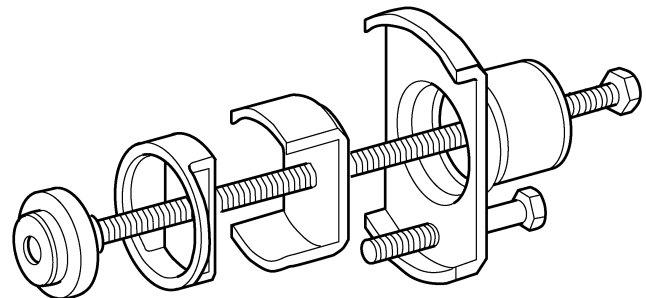
**Driver Handle C-4171**



**Adapter, Geartrain End-play - 8266-18**



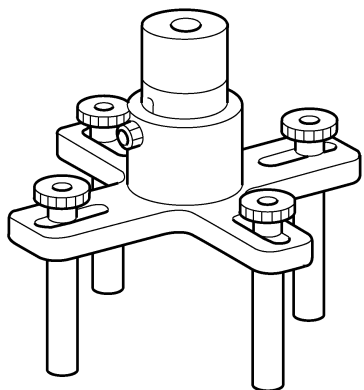
**Bar, Gauge - 6311**



80e490db

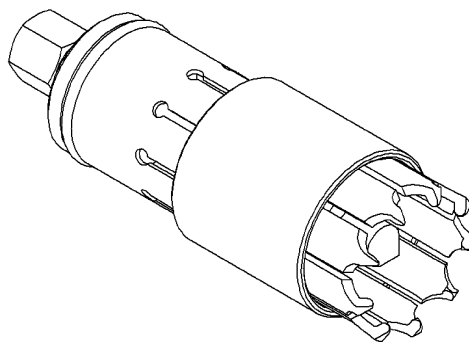
**Compressor, Multi-use Spring - 8900**



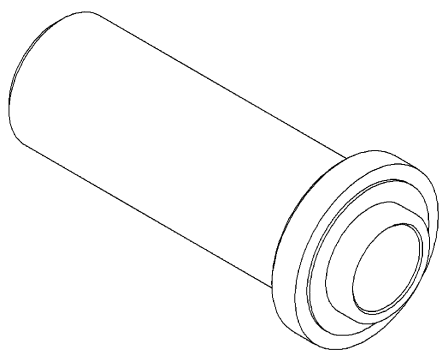


**Tool, Pressing - 8901**

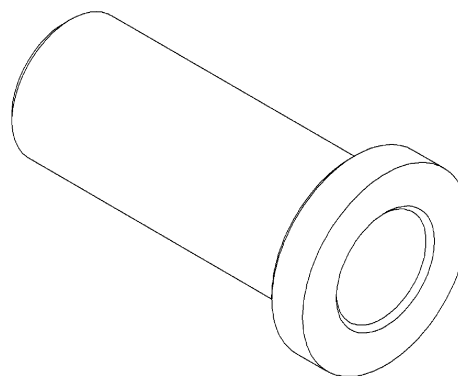
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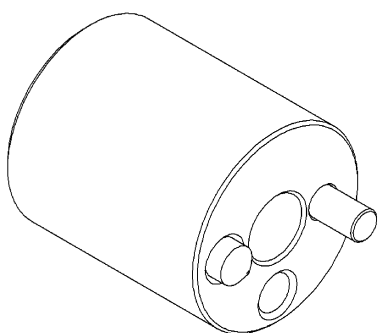
**Remover, Bearing - 9082**



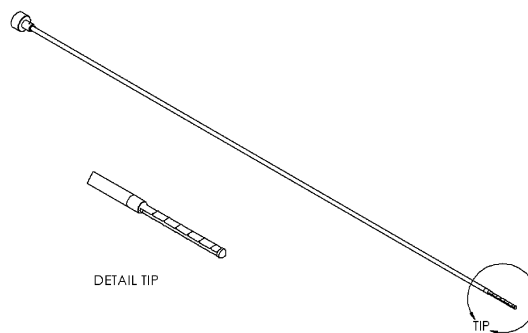
**Installer, Seal - 8902A**



**Installer, Bearing - 9287**



**Tool, Staking - 9078**

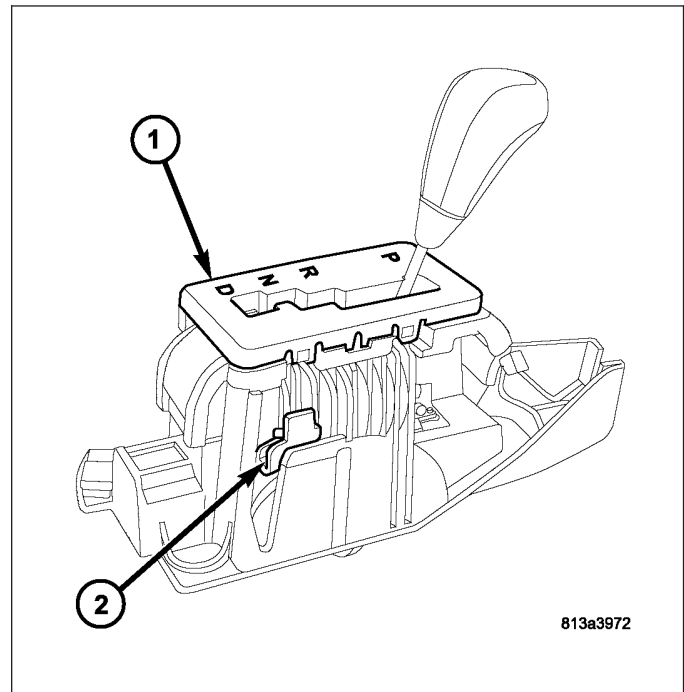


## MECHANISM-BRAKE TRANSMISSION SHIFT INTERLOCK

### DESCRIPTION

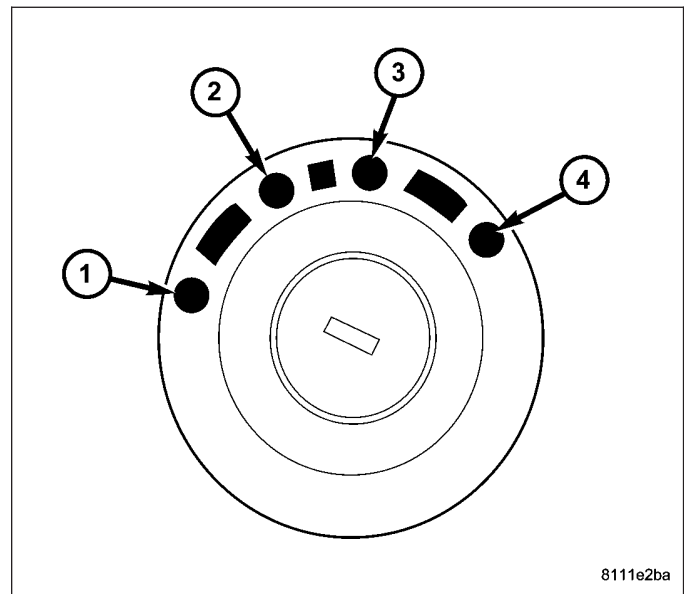
The Brake Transmission Shifter/Ignition Interlock (BTSI) is a cable operated system that prevents the transmission gear shifter from being moved out of PARK without the proper driver inputs. The system also contains a solenoid that is integral to the shifter assembly. The solenoid works in conjunction with the park lock cable to permit shifter movement out of PARK when the brake is depressed and prevents shifter movement into REVERSE unless a shift into REVERSE is permitted.

A BTSI override (2) is provided on the side of the shifter mechanism (1) to allow the vehicle to be shifted out of PARK in the event of an electrical failure.



### OPERATION

The Brake Transmission Shifter/Ignition Interlock (BTSI) is engaged whenever the ignition switch is in the LOCK (1) position. An additional electrically activated feature will prevent shifting out of the PARK position unless the brake pedal is depressed at least one-half inch. A solenoid in the shifter assembly is energized when the ignition is in the ON position and the brake pedal is depressed. When the key is in the ON position and the brake pedal is depressed, the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to the LOCK position, unless the shifter is in the gated PARK position.



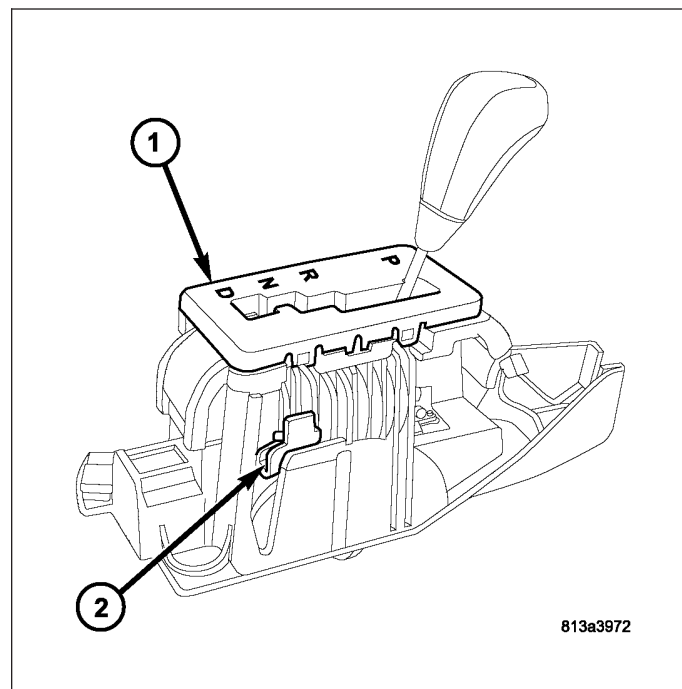
The following chart describes the normal operation of the Brake Transmission Shift Interlock (BTSI) system. If the "expected response" differs from the vehicle's response, then system repair and/or adjustment is necessary.

<b>ACTION</b>	<b>EXPECTED RESPONSE</b>
1. Turn key to the "ACC" position and depress brake pedal.	1. Shifter CAN be shifted out of park.
2. Turn key to the "ON" position, with foot off of brake pedal.	2. Shifter CANNOT be shifted out of park.
3. Turn key to the "ON" position and depress the brake pedal.	3. Shifter CAN be shifted out of park.
4. Leave shifter in any gear, except "PARK", and try to return key to the "LOCK" position.	4. Key cannot be returned to the "LOCK" position.
5. Return shifter to "PARK" and try to remove the key.	5. Key can be removed (after returning to "LOCK" position).
6. With the key removed, and the brake depressed, try to shift out of "PARK".	6. Shifter cannot be shifted out of "PARK".
<b>NOTE: Any failure to meet these expected responses requires system adjustment or repair.</b>	

### **BTSI Override**

In the event of an electrical failure, the vehicle can be shifted out of PARK by using the following procedure.

1. Turn the key to the ACC or ON position.
2. Remove the liner to the cubby bin to the right side of the shifter.
3. Depress the BTSI override (2) on the side of the shifter assembly (1).
4. While the override is depressed, move the shifter out of the PARK position.
5. Return the cubby bin liner to its original location.



## **DIAGNOSIS AND TESTING - BRAKE TRANSMISSION SHIFT INTERLOCK**

### **SYSTEM VERIFICATION**

1. Verify that the key can only be removed in the PARK position
2. When the shift lever is in PARK, the ignition key cylinder should rotate freely from ACC to LOCK. When the shifter is in any other gear or neutral position, the ignition key cylinder should not rotate to the LOCK position.
3. Shifting out of PARK should not be possible when the ignition key cylinder is in the ACC position and the brake pedal is not depressed.
4. Shifting out of PARK should not be possible while applying normal force on the shift lever and ignition key cylinder is in the ACC, ON, or START positions unless the foot brake pedal is depressed approximately 1/2 inch (12mm).

5. Shifting out of PARK should not be possible when the ignition key cylinder is in the LOCK position, regardless of the brake pedal position.
6. Shifting between any gears, NEUTRAL or into PARK may be done without depressing foot brake pedal with ignition switch in ACC, ON, or START positions.

### DIAGNOSTIC CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
KEY WILL NOT ROTATE TO THE LOCK POSITION.	1. Misadjusted Park Lock cable.	1. Adjust Park Lock cable. (Refer to 21 - TRANSMISSION AND TRANSFER CASE/AUTOMATIC TRANSMISSION/BRAKE TRANSMISSION SHIFT INTERLOCK SYSTEM - ADJUSTMENTS)
	2. Misadjusted gearshift cable.	2. Adjust gearshift cable. (Refer to 21 - TRANSMISSION AND TRANSFER CASE/AUTOMATIC TRANSMISSION/GEAR SHIFT CABLE - ADJUSTMENTS)
	3. Burrs on ignition key.	3. Remove burrs and cycle key several times to verify operation.
	4. Binding or broken components.	4. Inspect system components and repair/replace components as necessary.
VEHICLE WILL NOT START UNLESS SHIFTER IS HELD FORWARD, OR REARWARD, OF THE PARK POSITION.	1. Misadjusted gearshift cable.	1. Adjust gearshift cable. (Refer to 21 - TRANSMISSION AND TRANSFER CASE/AUTOMATIC TRANSMISSION/GEAR SHIFT CABLE - ADJUSTMENTS)

### ADJUSTMENTS - BRAKE TRANSMISSION SHIFT INTERLOCK

The park interlock cable is part of the brake/shift lever interlock system. Correct cable adjustment is important to proper interlock operation. The gear shift and park lock cables must both be correctly adjusted in order to shift out of PARK.

#### ADJUSTMENT PROCEDURE

1. Remove floor console as necessary for access to the park lock cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)
2. Shift the transmission into the PARK position.
3. Turn ignition switch to LOCK position. **Be sure ignition key cylinder is in the LOCK position. Cable will not adjust correctly in any other position.**

**Note: If the key will not turn to the LOCK position, pull up on the cable lock button and manually move the cable in and out until the key can be turned to the LOCK position.**

4. Pull cable lock button up to release cable, if necessary.
5. Remove and discard the cable adjuster lock pin, if a new cable is being installed.
6. Ensure that the cable is free to self-adjust by pushing cable rearward and releasing.
7. Push lock button down until it snaps in place. The lock should be 1-2mm below the surface of the cylindrical portion of the cable adjustment housing.

**BTSI FUNCTION CHECK**

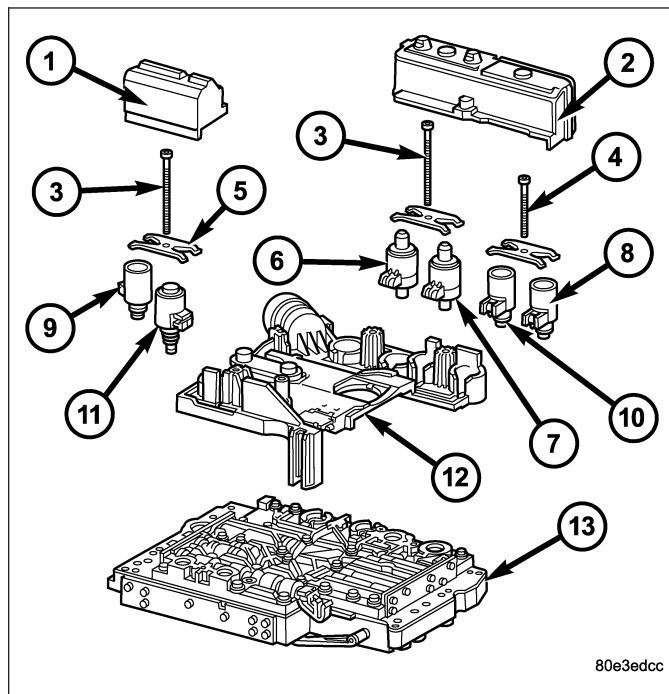
1. Verify removal of ignition key allowed in PARK position only.
2. When the shift lever is in PARK, the ignition key cylinder should rotate freely LOCK position. When the shifter is in any other position, the ignition key should not rotate to the LOCK position.
3. Shifting out of PARK should not be possible when the ignition key cylinder is in the ACC position and the brake pedal is not depressed.
4. Shifting out of PARK should not be possible while applying normal force on the shift lever and ignition key cylinder is in the ACC, ON, or START positions unless the foot brake pedal is depressed approximately 1/2 inch (12mm).
5. Shifting out of PARK should not be possible when the ignition key cylinder is in the LOCK position, regardless of the brake pedal position.
6. Shifting between any gears, NEUTRAL or into PARK may be done without depressing foot brake pedal with ignition switch in ACC, ON, or START positions.
7. The floor shifter lever and gate positions should be in alignment with all transmission detent positions.
8. Engine starts must be possible with shifter lever in PARK or NEUTRAL gate positions only. Engine starts must not be possible in any other gate positions other than PARK or NEUTRAL.
9. With the shifter lever handle in the:
  - PARK position- apply forward force on center of handle and remove pressure. Engine start must be possible.
  - PARK position- apply rearward force on center of handle and remove pressure. Engine start must be possible.
  - NEUTRAL position- engine start must be possible.
  - NEUTRAL position, engine running and brakes applied- Apply forward force on center of shift handle. Transmission should not be able to shift into REVERSE detent.

## UNIT-ELECTROHYDRAULIC CONTROL

### DESCRIPTION

The electrohydraulic control unit comprises the shift plate (13) made from light alloy for the hydraulic control and an electrical control unit (12). The electrical control unit (12) comprises of a supporting body made of plastic, into which the electrical components (1 - 11) are assembled. The supporting body is mounted on the shift plate (13) and screwed to it.

Strip conductors inserted into the supporting body make the connection between the electrical components and a plug connector. The connection to the wiring harness on the vehicle and the transmission control module (TCM) is produced via this 13-pin plug connector with a bayonet lock.

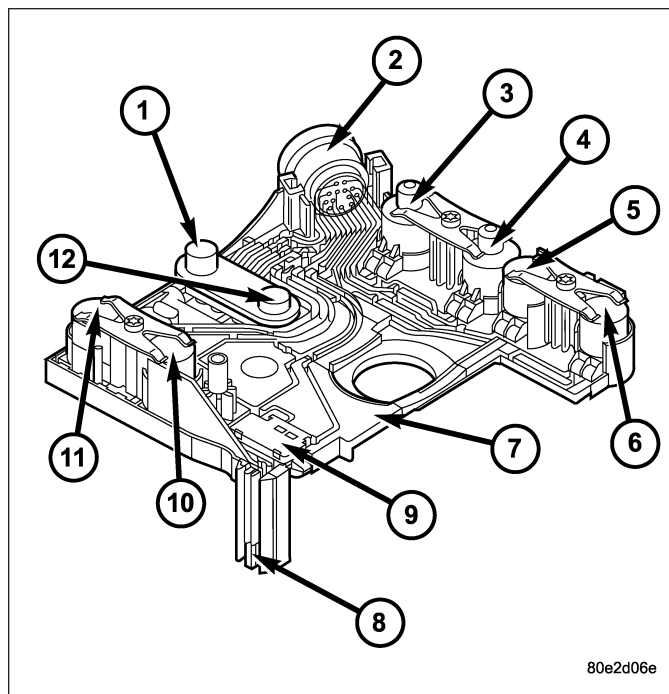


**Electrical Unit Components**

- 1 - SOLENOID CAP
- 2 - SOLENOID CAP
- 3 - BOLT - M6X32
- 4 - BOLT - M6X30
- 5 - LEAF SPRING
- 6 - MODULATING PRESSURE REGULATING SOLENOID VALVE
- 7 - SHIFT PRESSURE REGULATING SOLENOID
- 8 - 3-4 SHIFT SOLENOID
- 9 - TORQUE CONVERTER LOCK-UP SOLENOID
- 10 - 1-2/4-5 SHIFT SOLENOID
- 11 - 2-3 SHIFT SOLENOID
- 12 - ELECTRICHYDRAULIC CONTROL MODULE
- 13 - SHIFT PLATE

## ELECTRICAL CONTROL UNIT

The electric valve control unit (7) consists of a plastic shell which houses the RPM sensors (1,12), regulating solenoid valves (3, 4), solenoid valves (5, 6, 10), the TCC solenoid valve (11), the park/neutral contact (9), and the transmission oil temperature sensor (8). Conductor tracks integrated into the shell connect the electric components to a plug connection (2). This 13-pin plug connection (2) establishes the connection to the vehicle-side cable harness and to the transmission control module (TCM). With the exception of the solenoid valves, all other electric components are fixed to the conductor tracks.



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## HYDRAULIC CONTROL UNIT

### Working Pressure (Line Pressure or Operating Pressure) (p-A)

The working pressure provides the pressure supply to the hydraulic control and the transmission shift elements. It is the highest hydraulic pressure in the entire hydraulic system. The working pressure is regulated at the working pressure regulating valve in relation to the load and gear. All other pressures required for the transmission control are derived from the working pressure.

### Lubrication Pressure (p-Sm)

At the working pressure regulating valve surplus oil is diverted to the lubrication pressure regulating valve, from where it is used in regulated amounts to lubricate and cool the mechanical transmission components and the torque converter. Furthermore, the lubrication pressure (p-Sm) is also used to limit the pressure in the torque converter.

### Shift Pressure (p-S)

The shift pressure is determined by the shift pressure regulating solenoid valve and the shift pressure regulating valve. The shift pressure:

- Regulates the pressure in the activating shift element during the shift phase.
- Determines together with the modulating pressure the pressure reduction at the deactivating shift element as regulated by the overlap regulating valve.
- Initializes 2nd gear in limp-home mode.

### Modulating Pressure (p-Mod)

The modulating pressure influences the size of the working pressure and determines together with the shift pressure the pressure regulated at the overlap regulating valve. The modulating pressure is regulated at the modulating pressure regulating solenoid valve, which is under regulating valve pressure. The modulating pressure is variable and relative to the engine load.

### Regulating Valve/Control Valve Pressure (p-RV)

The regulating valve pressure is regulated at the regulating valve pressure regulating valve in relation to the working pressure (p-A) up to a maximum pressure of 8 bar (116 psi). It supplies the modulating pressure regulating solenoid valve, the shift pressure regulating solenoid valve and the shift valve pressure regulating valve.

### Shift Valve Pressure (p-SV)

The shift valve pressure (p-SV) is derived from the regulating valve pressure (p-RV), is regulated at the shift valve pressure regulating valve and is then present at the:

- 1-2 and 4-5 shift solenoid valve.
- 3-4 shift solenoid valve.
- 2-3 shift solenoid valve.
- Torque converter lockup solenoid valve.
- 3-4 and 2-3 shift pressure shift valve.

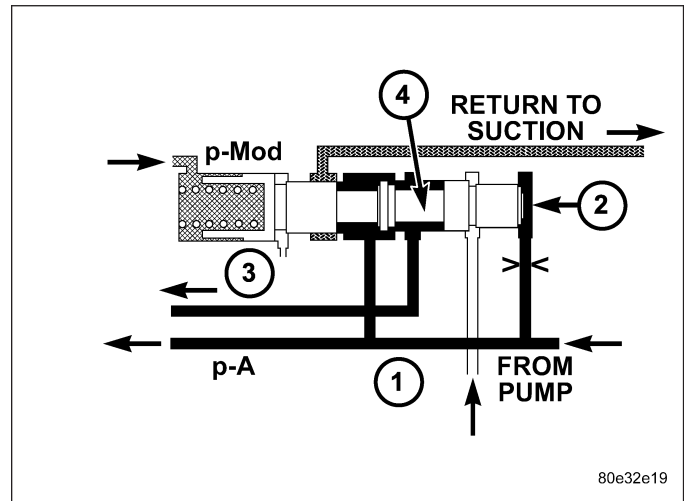
The shift valve pressure (p-SV) controls the command valves via the upshift/downshift solenoid valves.

### Overlap Pressure (p-Ü)

The overlap pressure controls the shift component pressure reduction during a shift phase. The pressure in a shift element as it disengages is controlled during the shift phase depending on engine load (modulating pressure) and the pressure in the shift element as it engages. The adjusted pressure is inversely proportional to the transmission capability of the shift element being engaged (controlled overlap).

### Working Pressure Regulating Valve (Operating Pressure)

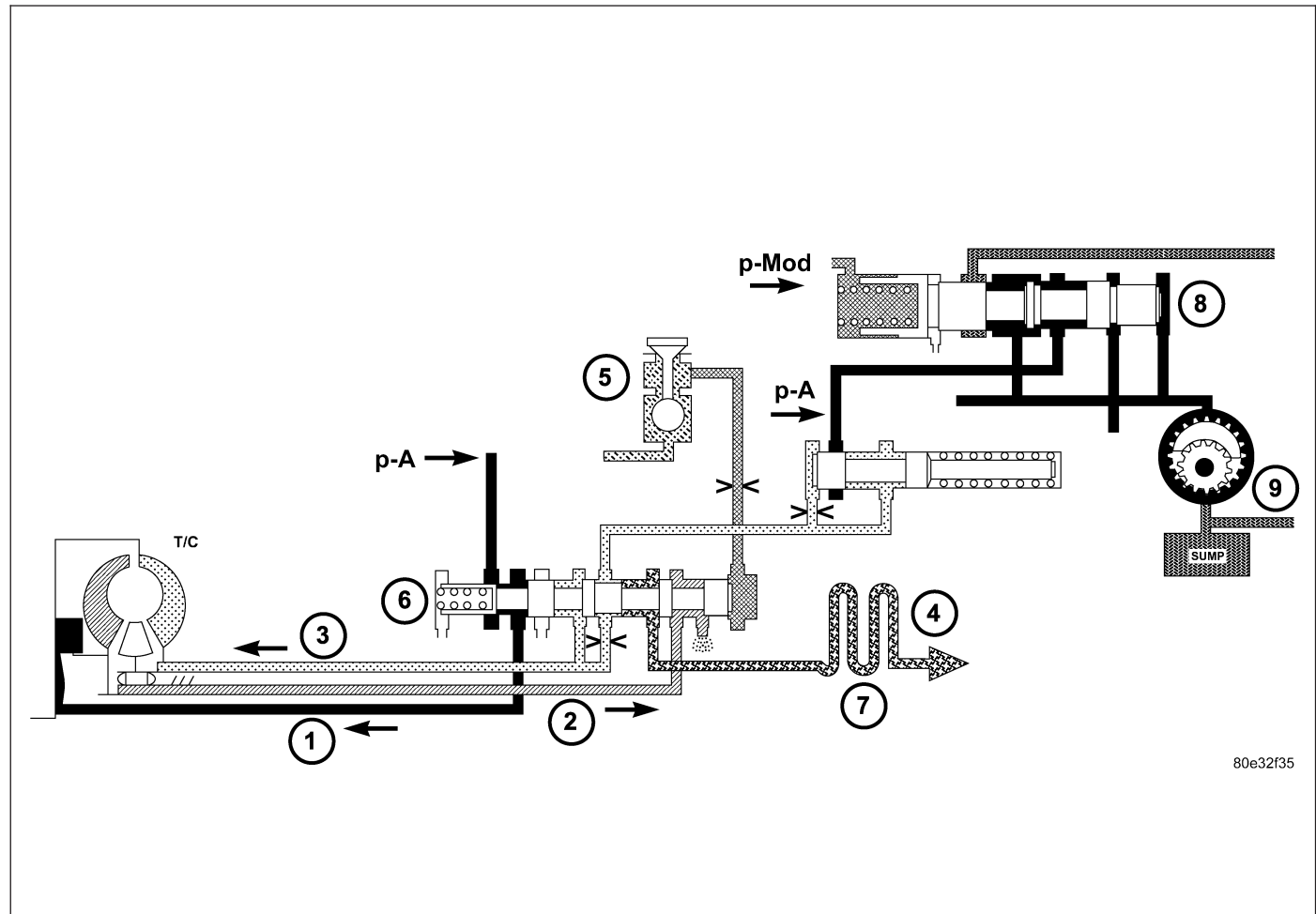
The working pressure regulating valve (4) is located in the valve housing of the shift plate. It regulates the primary pressure of the hydraulic system.



- 1 - PRESSURE FROM K1/K2
- 2 - END FACE
- 3 - TO TORQUE CONVERTER REGULATING VALVE
- 4 - WORKING PRESSURE REGULATING VALVE



## Torque Converter Lockup Clutch Regulating Valve

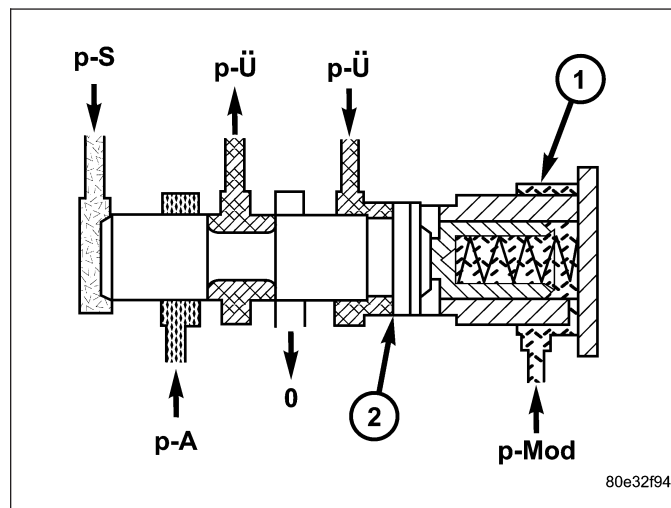


- |                                       |  |
|---------------------------------------|--|
| 1 - TORQUE CONVERTER LOCK-UP CLUTCH   | 6 - TORQUE CONVERTER LOCK-UP CLUTCH REGULATING VALVE |
| 2 - TORQUE CONVERTER OUTPUT           | 7 - OIL COOLER                                       |
| 3 - TORQUE CONVERTER INPUT            | 8 - LINE PRESSURE REGULATING VALVE                   |
| 4 - LUBRICATION                       | 9 - OIL PUMP   |
| 5 - TORQUE CONVERTER LOCK-UP SOLENOID |  |

The torque converter lock-up clutch regulating valve (6) is located in the valve housing of the electrohydraulic control module. The valve is responsible for the hydraulic control of the torque converter lockup clutch and distribution of the lubricating oil.

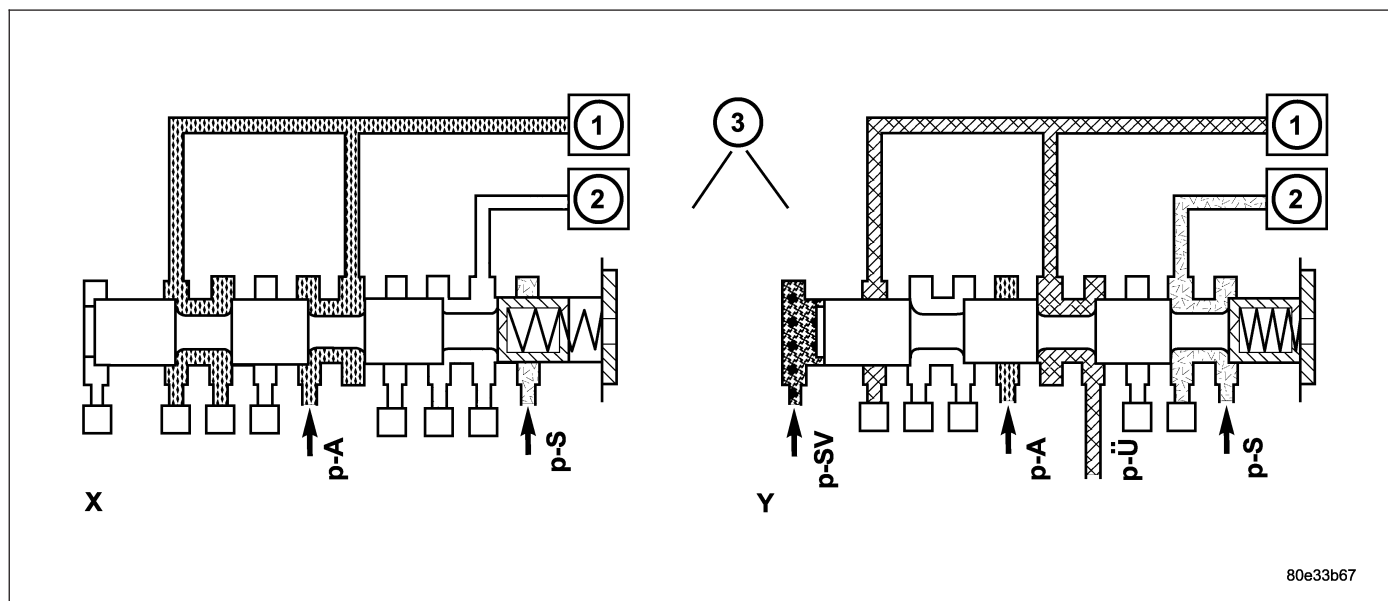
## Overlap Regulating Valve

Each shift group is assigned one overlap regulating valve (1). The 1-2 / 4-5 overlap regulating valve is installed in the shift valve housing; the 2-3 and 3-4 overlap regulating valves are installed in the valve housing. The overlap regulating valve regulates the pressure reduction during a shift phase.



1 - OVERLAP REGULATING VALVE  
2 - ANNULAR SURFACE ON OVERLAP REGULATING VALVE

## Command Valve

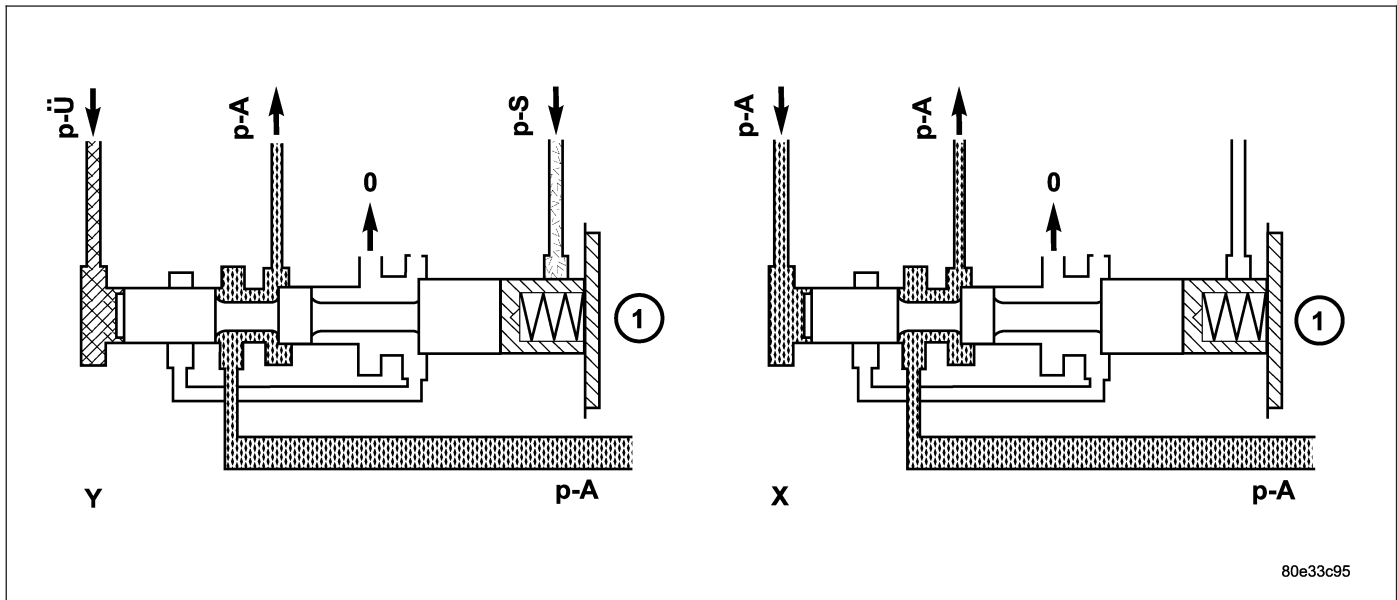


### Command Valve

1 - HOLDING CLUTCH B1  
2 - DRIVING CLUTCH K1

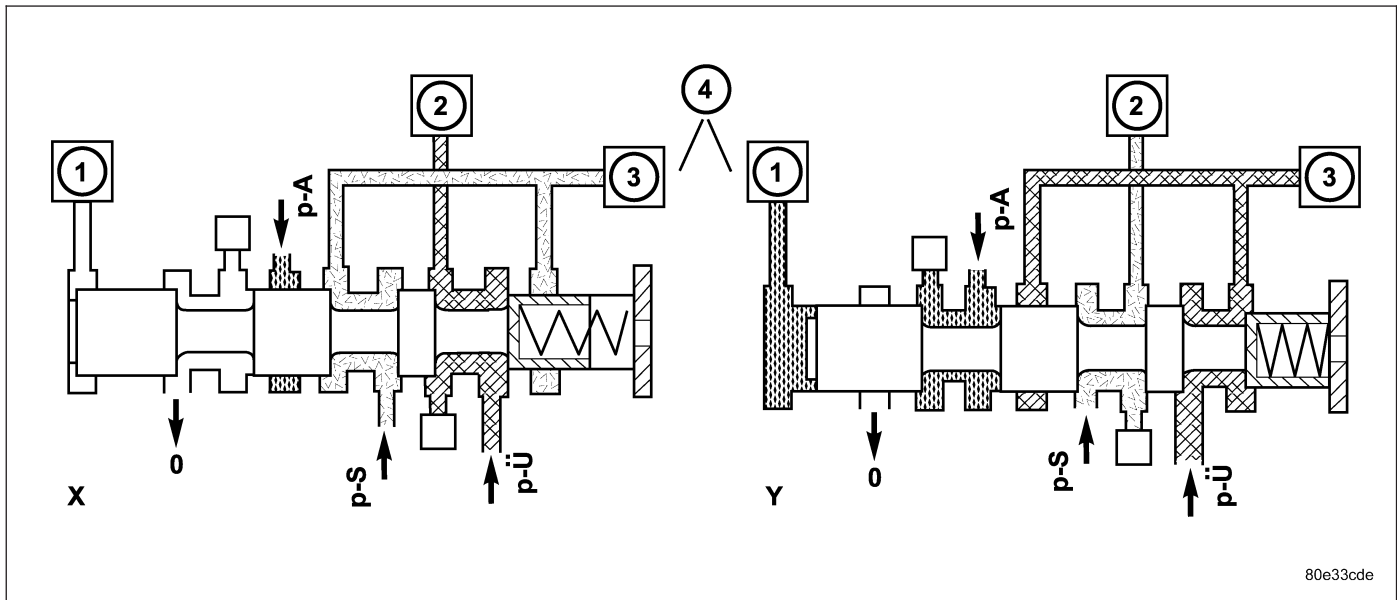
3 - 1-2/4-5 COMMAND VALVE

Each shift group possesses one command valve (3). The 1-2 / 4-5 and 2-3 command valves are installed in the shift valve housing, the 3-4 command valve is installed in the valve housing. The command valve switches the shift group from the stationary phase to the shift phase and back again.

**Holding Pressure Shift Valve*****Holding Pressure Shift Valve***

1 - HOLDING PRESSURE SHIFT VALVE

Each shift group possesses one holding pressure shift valve (1). The 1-2 / 4-5 and 2-3 holding pressure shift valves are installed in the shift valve housing; the 3-4 holding pressure shift valve is installed in the valve housing. The holding pressure shift valve allocates the working pressure to one actuator of a shift group.

**Shift Pressure Shift Valve****Shift Pressure Shift Valve**

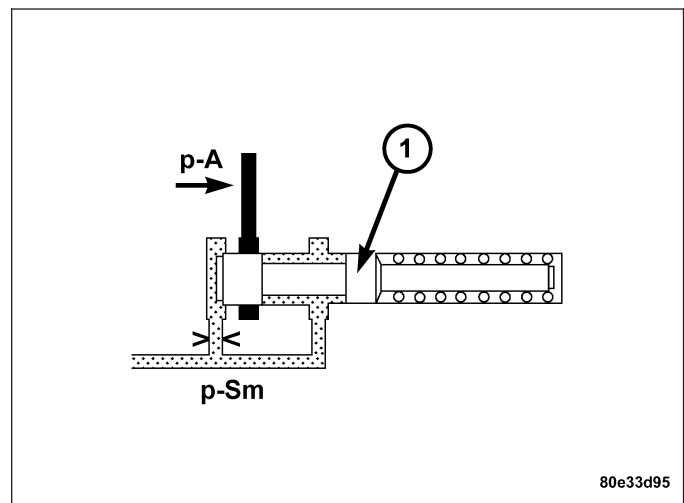
1 - 1-2/4-5 COMMAND VALVE  
2 - DRIVING CLUTCH K1

3 - HOLDING CLUTCH B1  
4 - 1-2/4-5 SHIFT PRESSURE SHIFT VALVE

Each shift group possesses one shift pressure shift valve (4). The 1-2 / 4-5 and 2-3 shift pressure shift valves are installed in the shift valve housing; the 3-4 shift pressure shift valve is installed in the valve housing. It assigns the shift pressure (p-S) to the activating actuator and the overlap pressure (p-Ü) regulated by the overlap regulating valve to the deactivating actuator.

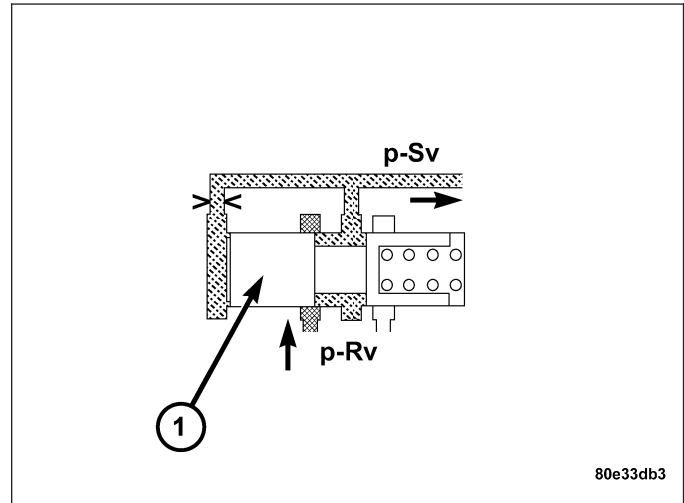
**Lubrication Pressure Regulating Valve**

The lubrication pressure regulating valve (1) is located in the valve housing of the electrohydraulic control module. The valve controls the fluid to lubricate and cool the mechanical part of the transmission, and limits the pressure in the torque converter.



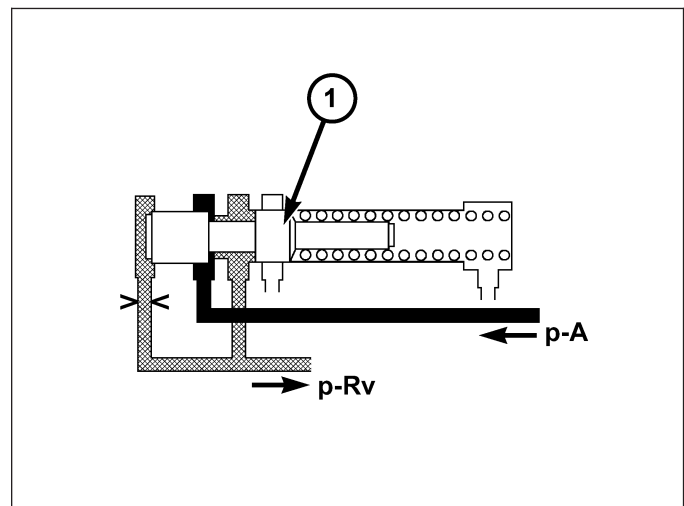
### Shift Pressure Regulating Valve

The shift pressure regulating valve (1) is located in the valve housing of the shift plate. It regulates the shift pressure ( $p-S$ ).



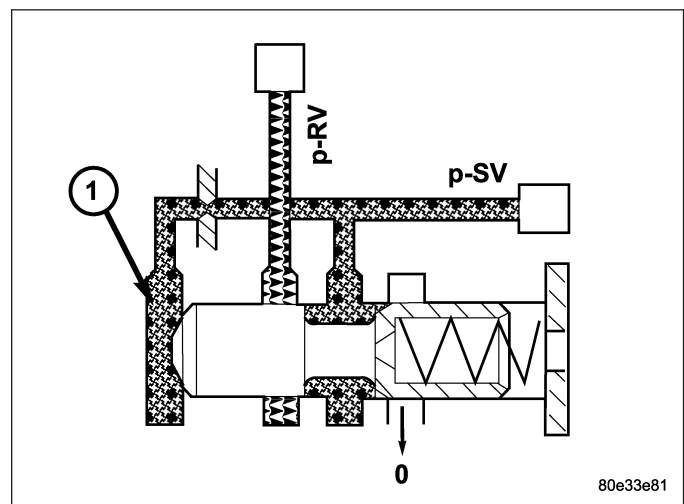
### Regulating Valve Pressure Regulating Valve

The regulating valve pressure regulating valve (1) is located in the valve housing of the electrohydraulic control module. It regulates the regulating valve/control valve pressure ( $p-RV$ ).



### Shift Valve Pressure Regulating Valve

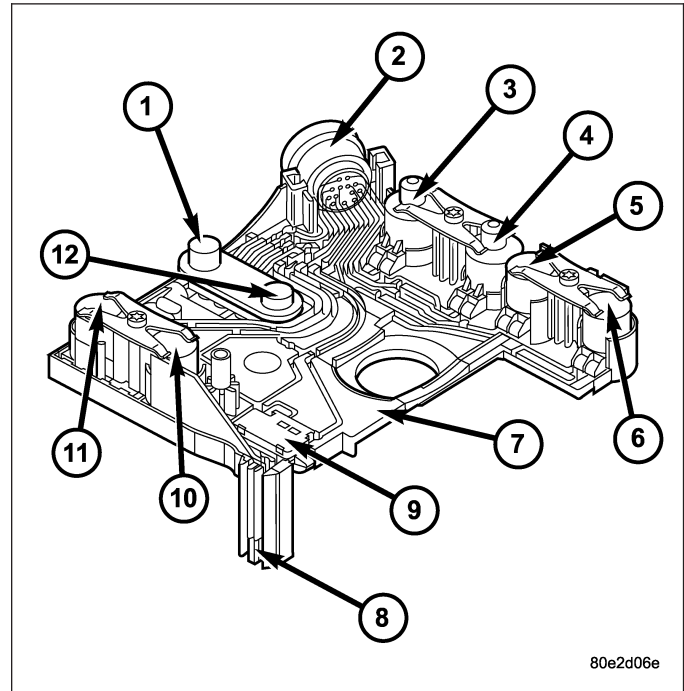
The shift valve pressure regulating valve (1) is located in the valve housing of the electrohydraulic control module. It regulates the shift valve pressure ( $p-SV$ ).



## OPERATION

### ELECTRICAL CONTROL UNIT

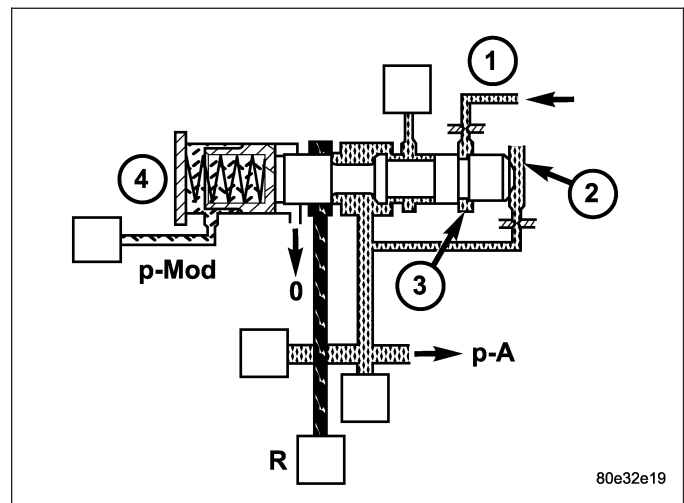
Signals from the transmission control module (TCM) are converted into hydraulic functions in the electric valve control unit (7). The RPM sensors (1, 12), starter interlock contact (9), and transmission oil temperature sensor (8) of the electric valve control unit (7) supply the TCM with input signals. The solenoid valves are controlled by the TCM and trigger the hydraulic functions.



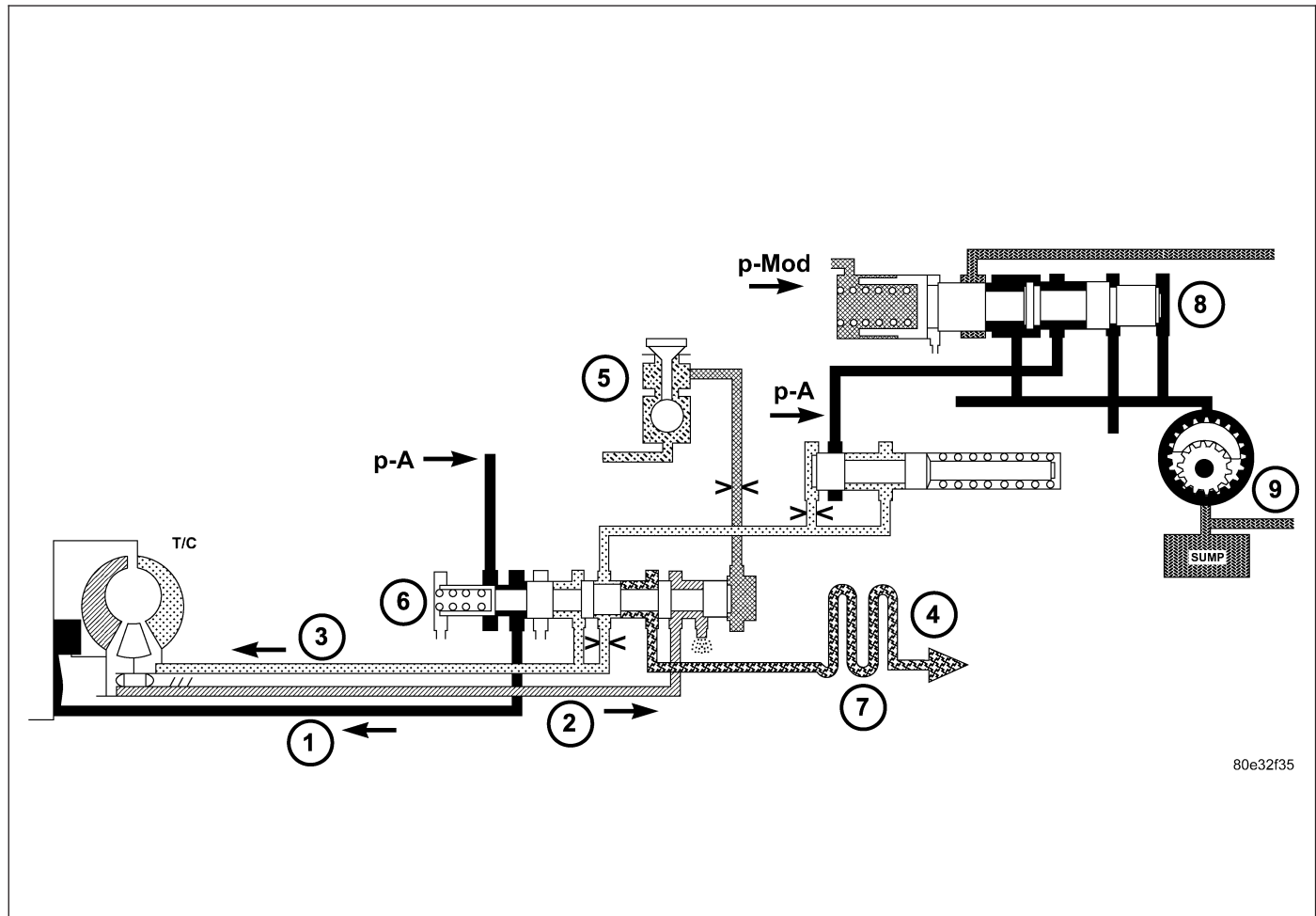
### HYDRAULIC CONTROL UNIT

#### Working Pressure Regulating Valve (Line Pressure or Operating Pressure)

The working pressure ( $p-A$ ) is regulated at the working pressure regulating valve (4) in relation to load (modulating pressure,  $p-Mod$ ) and gear ( $K1$  or  $K2$  pressure) (1). The spring in the working pressure regulating valve sets a minimum pressure level (basic pressure).



## Torque Converter Lockup Clutch Regulating Valve



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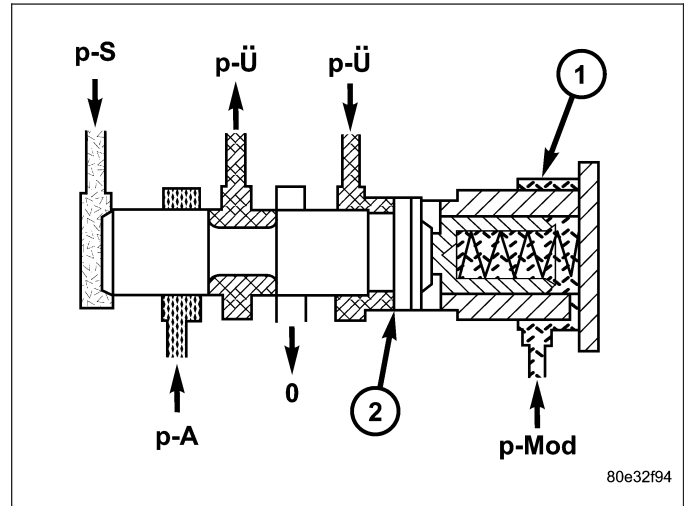
- 1 - TORQUE CONVERTER LOCK-UP CLUTCH
- 2 - TORQUE CONVERTER OUTPUT
- 3 - TORQUE CONVERTER INPUT
- 4 - LUBRICATION
- 5 - TORQUE CONVERTER LOCK-UP SOLENOID

- 6 - TORQUE CONVERTER LOCK-UP CLUTCH REGULATING VALVE
- 7 - OIL COOLER
- 8 - LINE PRESSURE REGULATING VALVE
- 9 - OIL PUMP

The torque converter lockup clutch regulating valve (6) regulates the torque converter lockup clutch working pressure (p-TCC) in relation to the torque converter clutch control pressure (p-S/TCC). According to the size of the working pressure (p-A), the torque converter lockup clutch is either Engaged, Disengaged, or Slipping. When the regulating valve (6) is in the lower position, lubricating oil flows through the torque converter and oil cooler (8) into the transmission (torque converter lockup clutch unpressurized). In its regulating position (slipping, torque converter lockup clutch pressurized), a reduced volume of lubricating oil flows through the annular passage (7) bypassing the torque converter and passing direct through the oil cooler into the transmission. The rest of the lubricating oil is directed via the throttle "a" into the torque converter in order to cool the torque converter lockup clutch.

## Overlap Regulating Valve

During the shift phase the pressure in the deactivating shift actuator is regulated in relation to the engine load (modulating pressure, p-Mod) and the pressure in the activating actuator. The regulated pressure is inversely proportional to the transfer capacity of the activating shift actuator (regulated overlap).

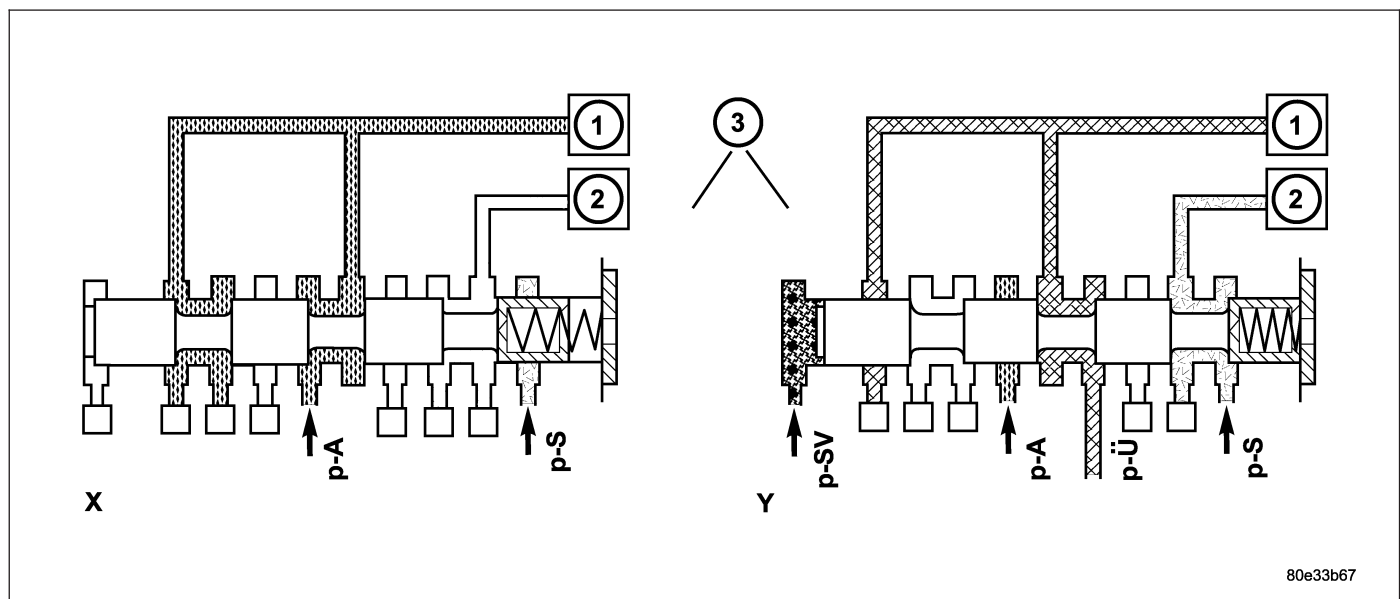


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1 - OVERLAP REGULATING VALVE

2 - ANNULAR SURFACE ON OVERLAP REGULATING VALVE

## Command Valve



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### Command Valve

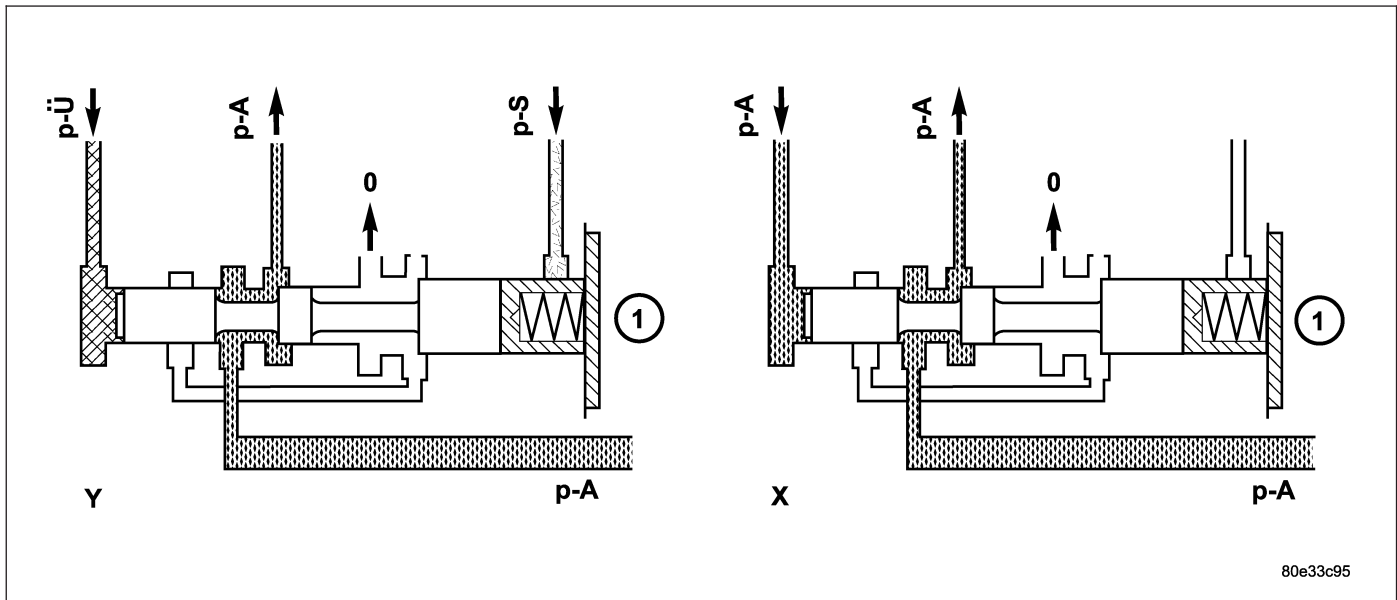
1 - HOLDING CLUTCH B1  
2 - DRIVING CLUTCH K1

3 - 1-2/4-5 COMMAND VALVE

When the end face is unpressurized (stationary phase), the working pressure (p-A) is directed to the actuated shift element. If the end face of the command valve is subjected to the shift valve pressure (p-SV) (shift phase), then the shift pressure (p-S) is switched to the activating element and the overlap pressure (p-Ü) is switched to the deactivating element.

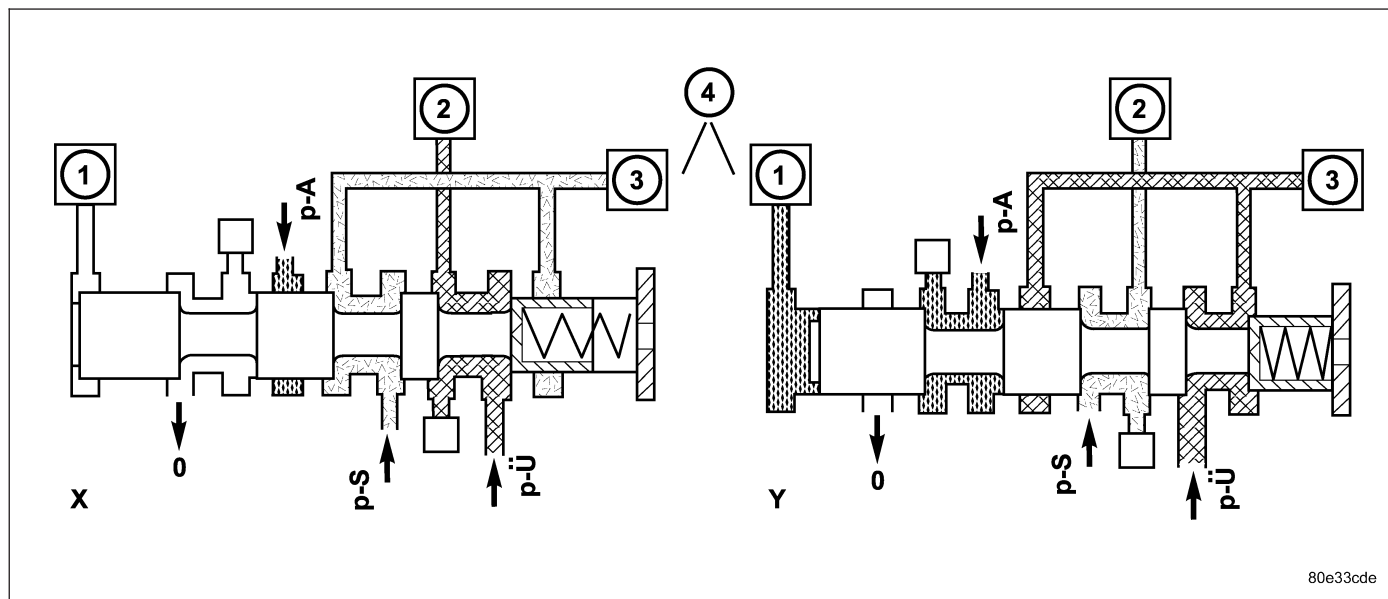


## Shift Valve Holding Pressure

**Shift Valve Holding Pressure**

## 1 - HOLDING PRESSURE SHIFT VALVE

The holding pressure shift valve (1) is actuated by the pressures present at the end face in the actuators and a spring. It assigns the working pressure ( $p-A$ ) to the actuator with the higher pressure (taking into account the spring force and the effective surface area). The other element of the shift group is then unpressurized. The valve switches over only during the shift phase and only at a certain pressure ratio between the overlap pressure ( $p-\ddot{U}$ ) and the shift pressure ( $p-S$ ).

**Shift Pressure Shift Valve**

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**Shift Pressure Shift Valve**

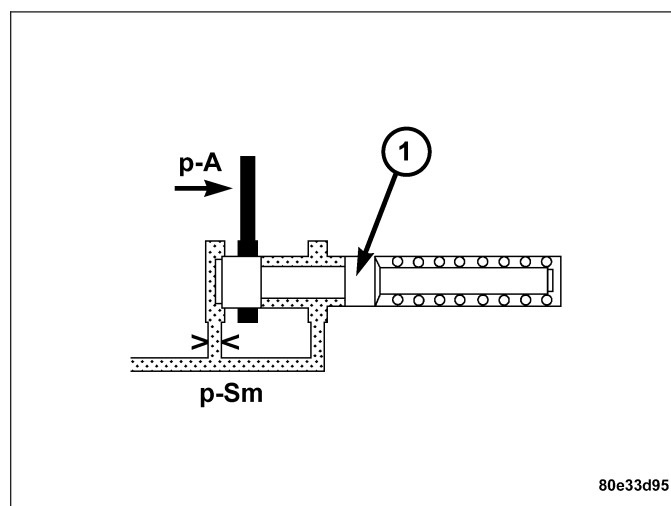
1 - 1-2/4-5 COMMAND VALVE  
2 - DRIVING CLUTCH K1

3 - HOLDING CLUTCH B1  
4 - 1-2/4-5 SHIFT PRESSURE SHIFT VALVE

When the multiple-disc brake B1 (3) is activated, the working pressure (p-A) is applied to the end face of the 1-2 / 4-5 shift pressure shift valve (4) via the command valve (1). Its shift state is maintained during the shift phase by substituting the shift element pressure acting on its end face (and which is variable during the shift phase) with a corresponding constant pressure. When the multi-plate clutch K1 (2) is activated, the end face of the shift valve is unpressurized during the stationary and shift phases, so the shift state is maintained during the shift phase in this case too.

**Lubrication Pressure Regulating Valve**

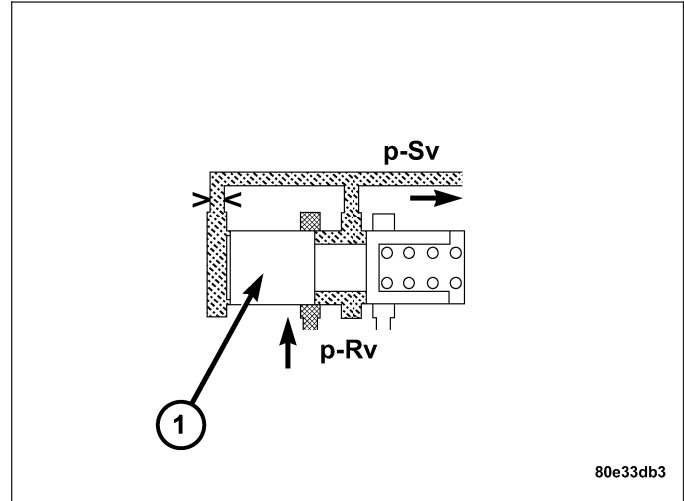
At the working pressure regulating valve surplus oil is diverted to the lubrication pressure regulating valve (1), from where the lubrication pressure (p-Sm) is used in regulated amounts to supply the transmission lubrication system including the torque converter.



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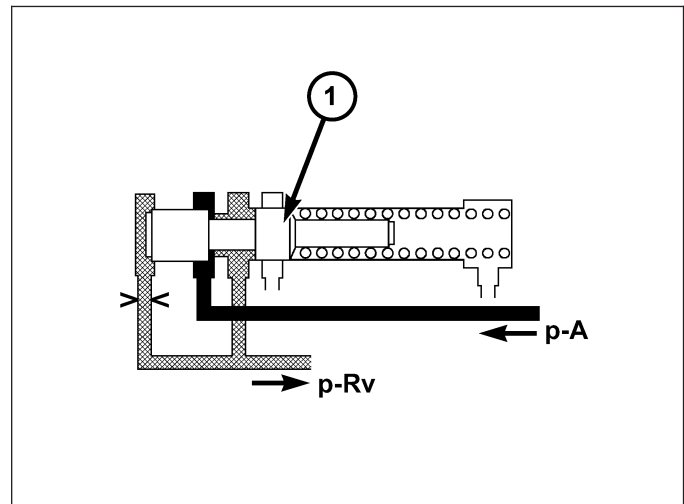
### Shift Pressure Regulating Valve

The shift pressure is determined by the shift pressure regulating solenoid valve and the shift pressure regulating valve (3). In addition, pressure from the clutch K2 (1) is also present at the annular surface (2) of the shift pressure regulating valve (3). This reduces the shift pressure in 2nd gear.



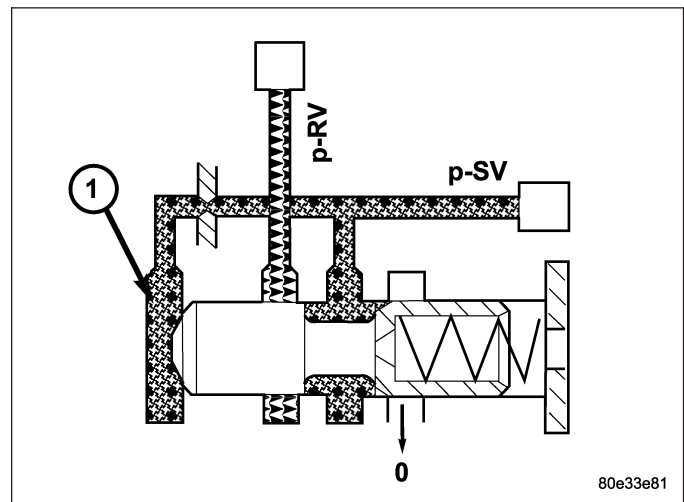
### Regulating Valve Pressure Regulating Valve

The regulating valve pressure (p-RV) is set at the regulating valve pressure regulating valve (1) in relation to the working pressure (p-A) as far as the maximum pressure.



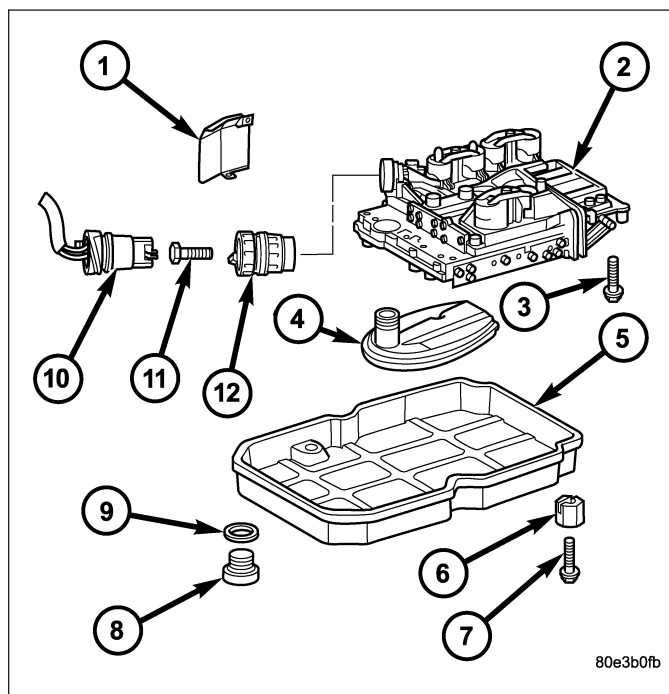
### Shift Valve Pressure Regulating Valve

The non-constant regulating valve pressure (p-RV) is regulated to a constant shift valve pressure (p-SV) at the shift valve pressure regulating valve (1) and is used to supply the 1-2 and 4-5 / 3-4 / 2-3 solenoid valves and the torque converter lockup clutch PWM solenoid valve.



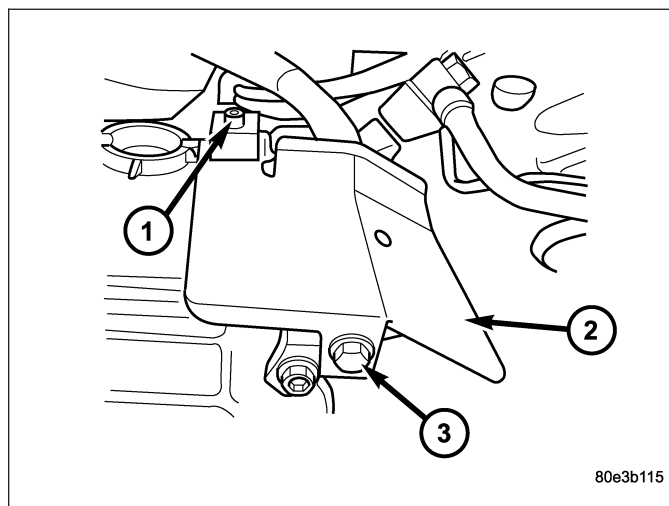
## REMOVAL

1. Drain transmission oil by unscrewing oil drain plug (8), if equipped.

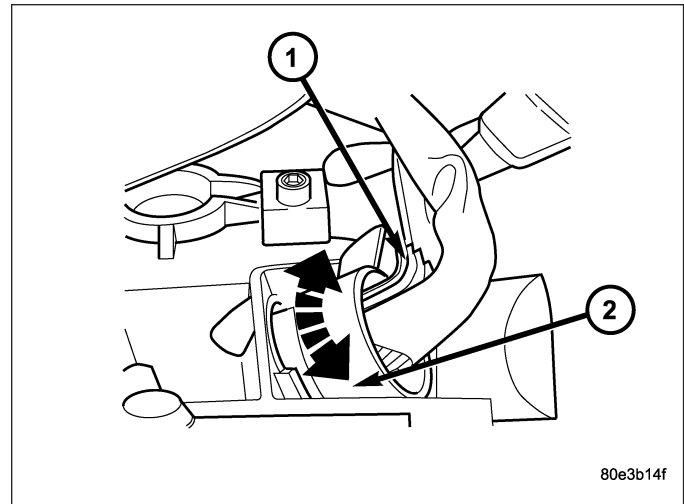


- 1 - HEAT SHIELD
- 2 - ELECTROHYDRAULIC UNIT
- 3 - BOLT
- 4 - OIL FILTER
- 5 - OIL PAN
- 6 - CLAMPING ELEMENT
- 7 - BOLT
- 8 - DRAIN PLUG
- 9 - DRAIN PLUG GASKET
- 10 - 13-PIN PLUG CONNECTOR
- 11 - BOLT
- 12 - GUIDE BUSHING

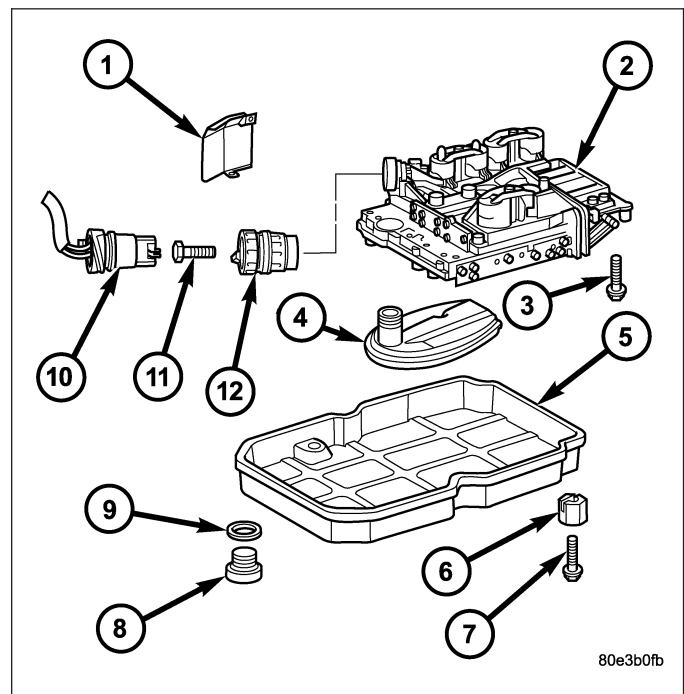
2. Move selector lever to position "P".
3. Raise vehicle.
4. Remove bolt (3) and screw (1) holding the heat shield (2) to the transmission.



5. Disconnect 13-pin plug connector (1). Turn bayonet lock of guide bushing (2) anti-clockwise.
6. Loosen guide bushing (2) and remove from transmission housing.



7. Detach oil pan (5).
8. Remove oil filter (4).
9. Unscrew Torx socket bolts (3) and remove electro-hydraulic control module (2).



- 1 - HEAT SHIELD
- 2 - ELECTROHYDRAULIC UNIT
- 3 - BOLT
- 4 - OIL FILTER
- 5 - OIL PAN
- 6 - CLAMPING ELEMENT
- 7 - BOLT
- 8 - DRAIN PLUG
- 9 - DRAIN PLUG GASKET
- 10 - 13-PIN PLUG CONNECTOR
- 11 - BOLT
- 12 - GUIDE BUSHING

## DISASSEMBLY

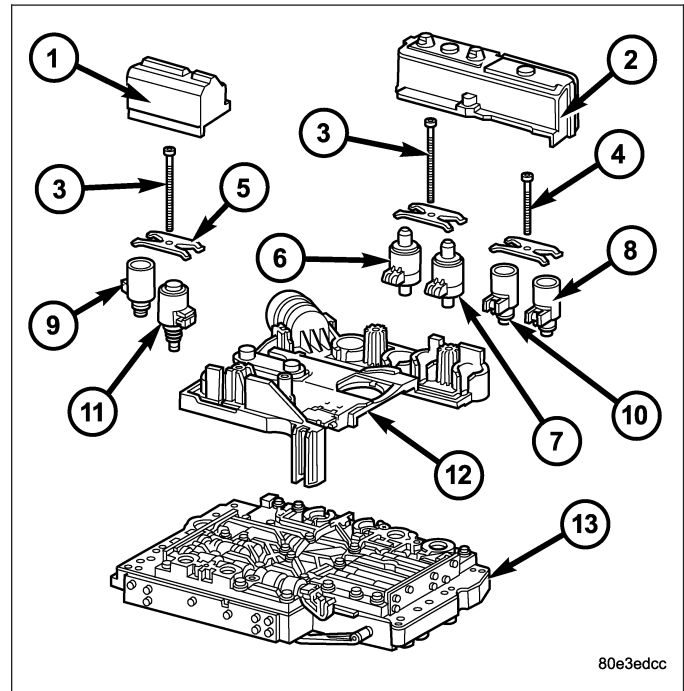
1. Remove electrohydraulic unit from the vehicle.  
(Refer to 21 - TRANSMISSION/AUTOMATIC TRANSMISSION - NAG1/ELECTROHYDRAULIC UNIT - REMOVAL)
2. Remove solenoid caps (1, 2).
3. Unscrew Torx® socket bolts (3, 4).

**Note:** Pay attention to the different lengths of the Torx® socket bolts.

4. Remove leaf springs (5).
5. Withdraw solenoid valves (6 - 11) from shift plate (13).

**Note:** Check O-rings on solenoid valves for damage and replace if necessary.

6. Bend away retaining lug on stiffening rib on transmission oil temperature sensor.
7. Remove electrohydraulic control module (12) from the shift plate (13).



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**Electrical Unit Components**

- 1 - SOLENOID CAP
- 2 - SOLENOID CAP
- 3 - BOLT - M6X32
- 4 - BOLT - M6X30
- 5 - LEAF SPRING
- 6 - MODULATING PRESSURE REGULATING SOLENOID VALVE
- 7 - SHIFT PRESSURE REGULATING SOLENOID
- 8 - 3-4 SHIFT SOLENOID
- 9 - TORQUE CONVERTER LOCK-UP SOLENOID
- 10 - 1-2/4-5 SHIFT SOLENOID
- 11 - 2-3 SHIFT SOLENOID
- 12 - ELECTRICHYDRAULIC CONTROL MODULE
- 13 - SHIFT PLATE

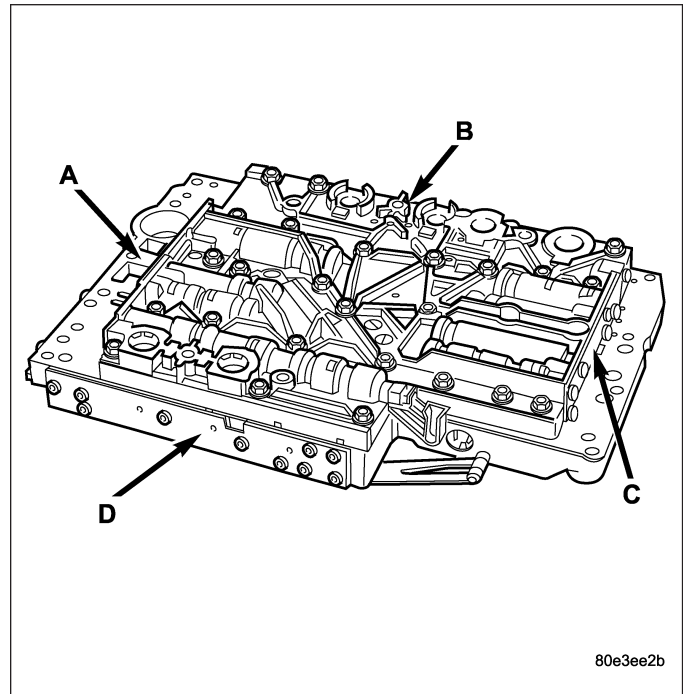
8. Note the locations of the major shift valve group components for assembly reference.

A - Operating and Lubricating Pressure Regulating valves and 2-3 Overlap valve

B - 1-2/4-5 Shift Group and Shift, Shift Valve, and Regulating Valve Pressure Regulating Valves

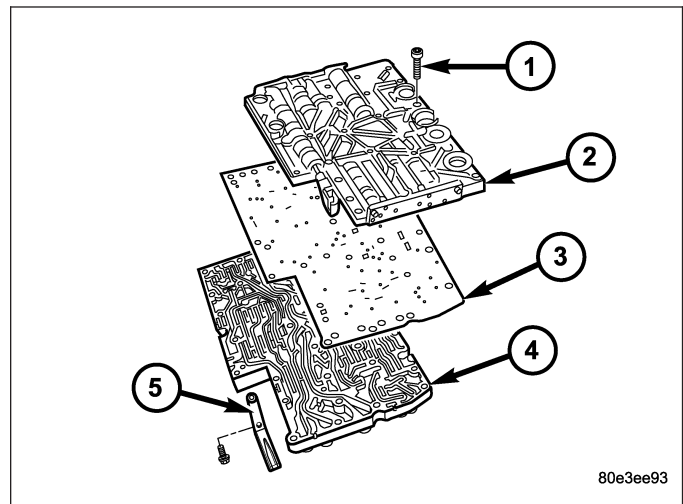
C - 3-4 Shift Group

D - 2-3 Shift Group, TCC Lock-up, and B2 Regulating Valves

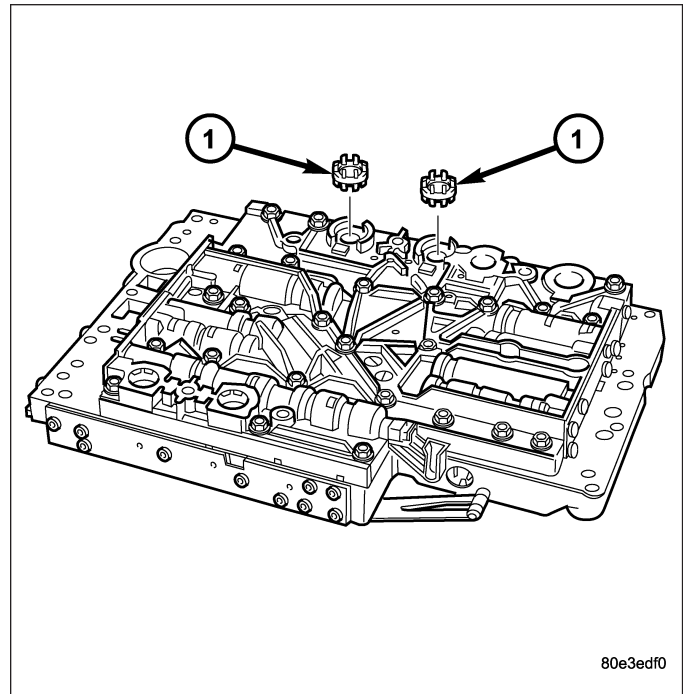


**Note:** Pay great attention to cleanliness for all work on the shift plate. Fluffy cloths must not be used. Leather cloths are particularly good. After dismantling, all parts must be washed and blown out with compressed-air, noting that parts may be blown away.

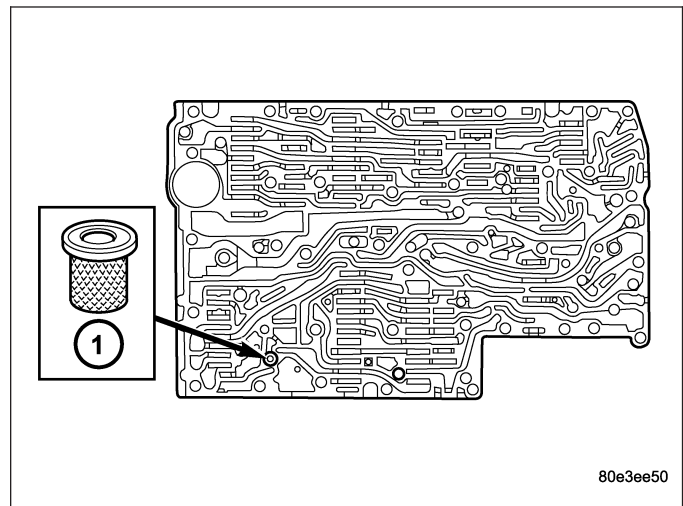
9. Unbolt leaf spring (5).
10. Unscrew Torx® bolts (1).
11. Remove valve housing (2) from valve body (4).
12. Remove sealing plate (3).



13. Remove the strainers (1, 2) for the modulating pressure and shift pressure control solenoid valves from the valve housing.

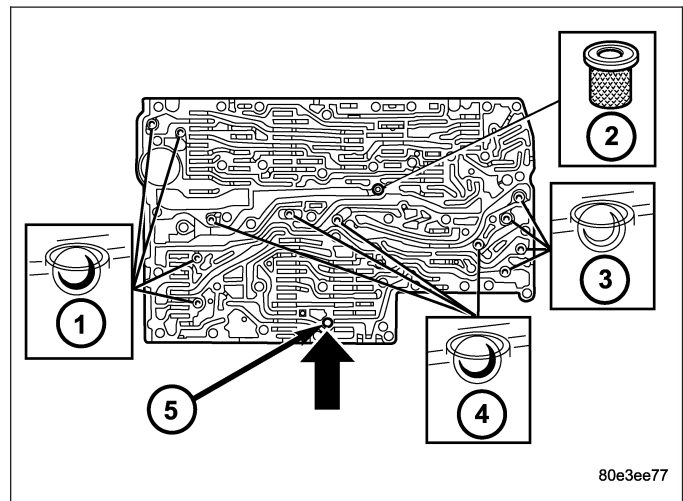


14. Remove the strainer (1) in the inlet to torque converter lock-up control solenoid valve.



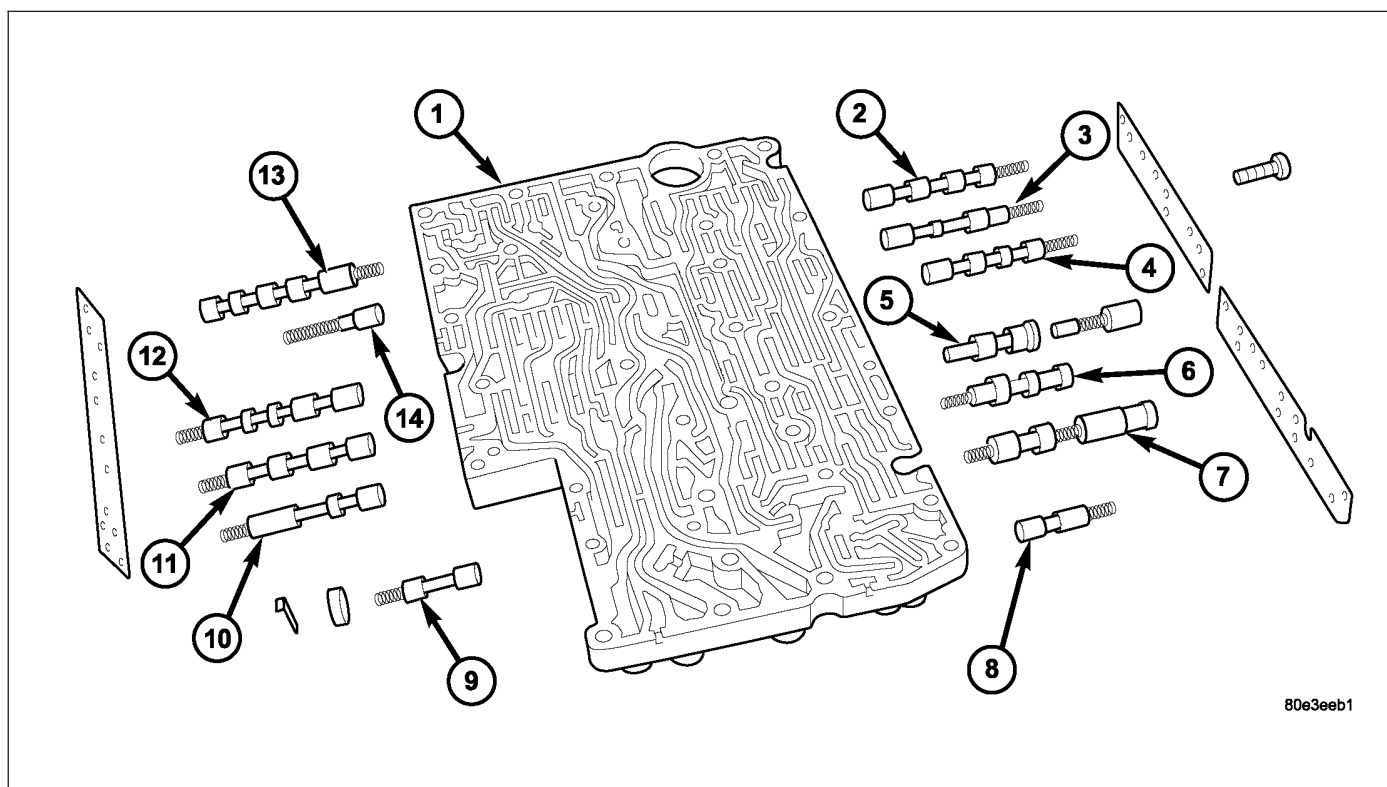
**Note:** A total of 12 valve balls are located in the valve body, four made from plastic (4) and eight from steel (1, 3).

15. Note the location of all check balls (1, 3, 4) and the central strainer (2) for re-installation. Remove all check balls (1, 3, 4) and the central strainer





(2).

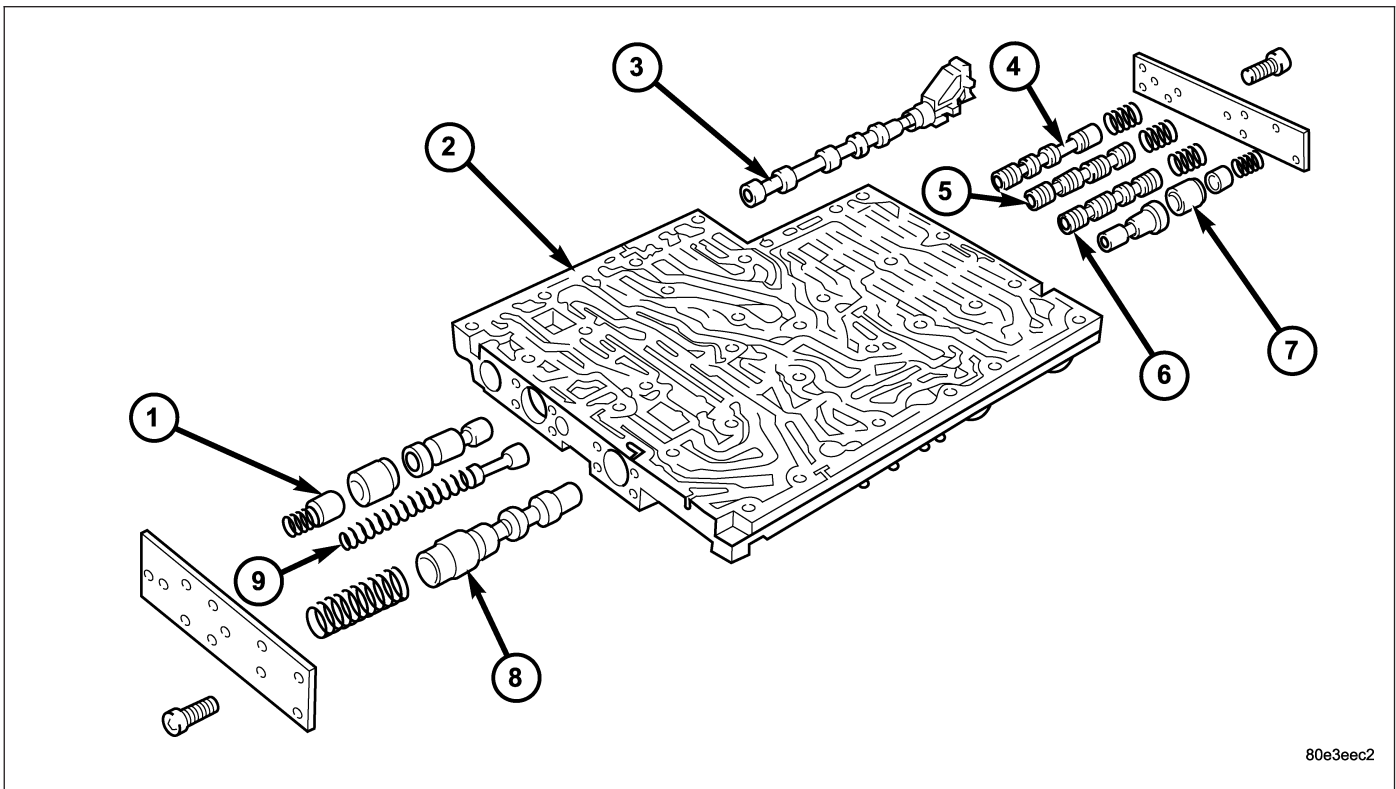
**Valve Body Components**

- |  |   |
|--|---|
| 1 - VALVE BODY   | 8 - SHIFT VALVE PRESSURE REGULATING VALVE |
| 2 - 1-2/4-5 COMMAND VALVE                                | 9 - B2 SHIFT VALVE                        |
| 3 - 1-2/4-5 HOLDING PRESSURE SHIFT VALVE                 | 10 - 2-3 HOLDING PRESSURE SHIFT VALVE     |
| 4 - 1-2/4-5 SHIFT PRESSURE SHIFT VALVE                   | 11 - 2-3 COMMAND VALVE                    |
| 5 - 1-2/4-5 OVERLAP REGULATING VALVE, SLEEVE, AND PISTON | 12 - 2-3 SHIFT PRESSURE SHIFT VALVE       |
| 6 - SHIFT PRESSURE REGULATING VALVE                      | 13 - TCC LOCK-UP REGULATING VALVE         |
| 7 - REGULATING VALVE PRESSURE REGULATING VALVE           | 14 - TCC DAMPER VALVE - if equipped       |

16. Remove the screws holding the side covers to the valve body and valve housing.

17. Remove all valves and springs from the valve body (1). Check all valves for ease of movement and shavings.

**Note:** The sleeves and pistons of the overlap regulating valves must not be mixed up.



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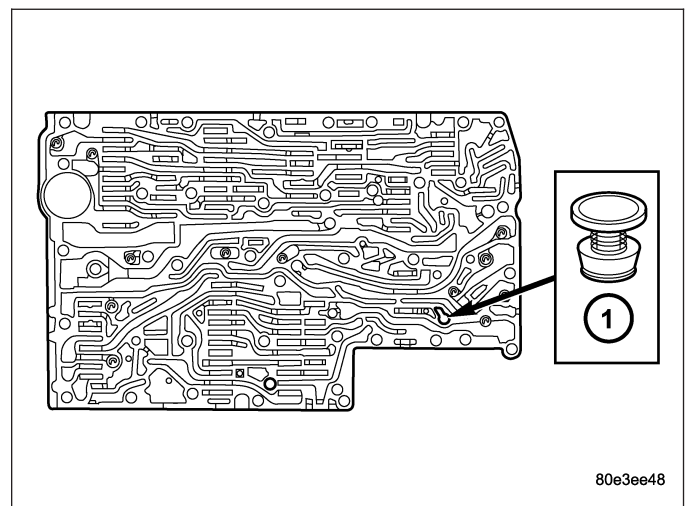
### Valve Housing Components

- 1 - 2-3 OVERLAP REGULATING VALVE, SLEEVE, AND PISTON
- 2 - VALVE HOUSING
- 3 - SELECTOR VALVE
- 4 - 3-4 HOLDING PRESSURE SHIFT VALVE
- 5 - 3-4 COMMAND VALVE

- 6 - 3-4 SHIFT PRESSURE SHIFT VALVE
- 7 - 3-4 OVERLAP REGULATING VALVE, SLEEVE, AND PISTON
- 8 - OPERATING PRESSURE REGULATING VALVE
- 9 - LUBRICATING PRESSURE REGULATING VALVE

18. Remove all valves and springs from the valve housing (2). Check all valves for ease of movement and shavings.

19. Remove the pressure supply valve (1) from the valve body.

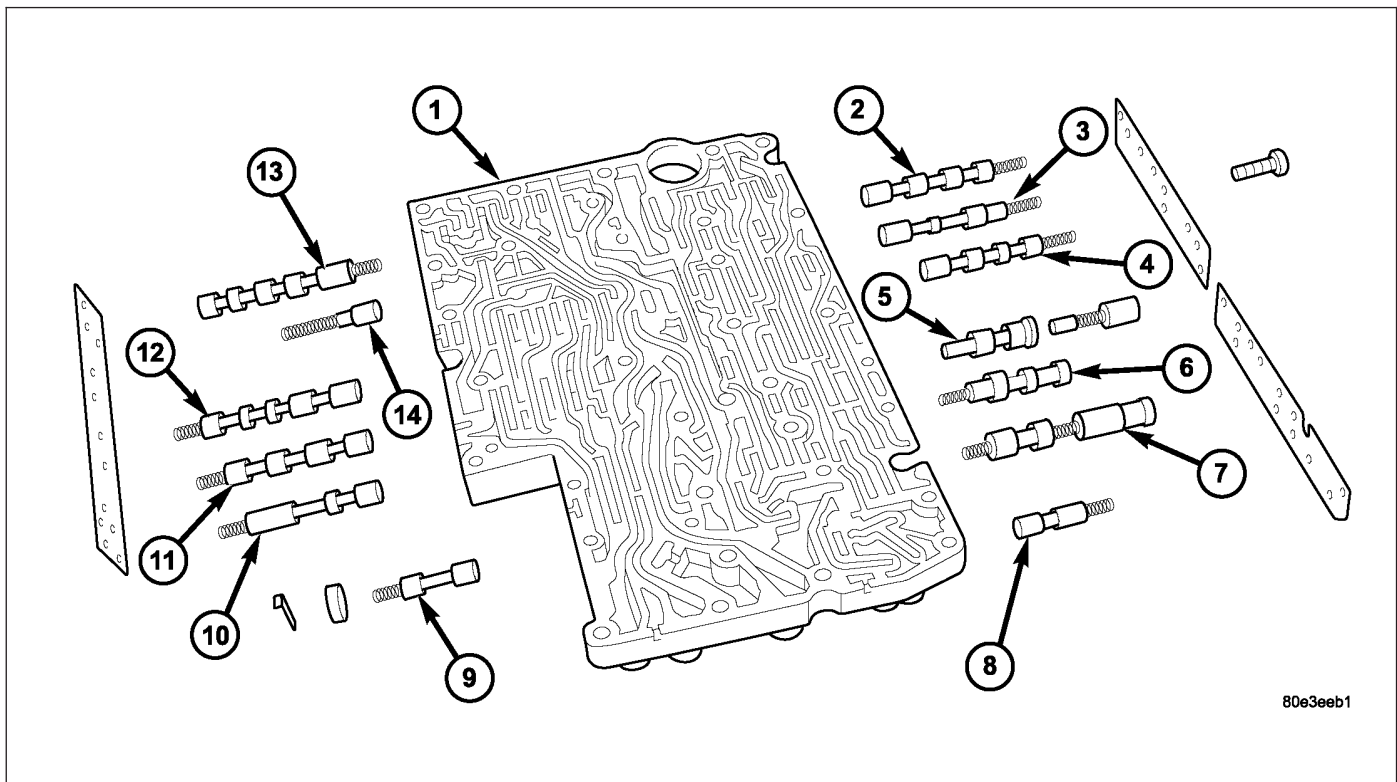
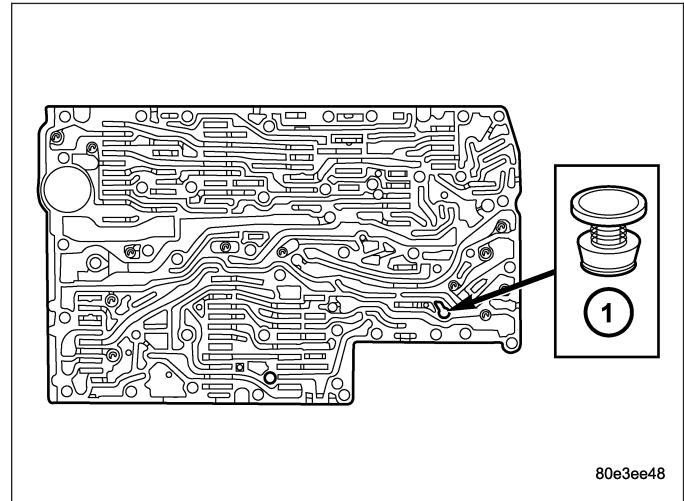


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## ASSEMBLY

**Note:** Pay great attention to cleanliness for all work on the shift plate. Fluffy cloths must not be used. Leather cloths are particularly good. After dismantling, all parts must be washed and blown out with compressed-air, noting that parts may be blown away.

1. Install the pressure supply valve (1) into the valve body.

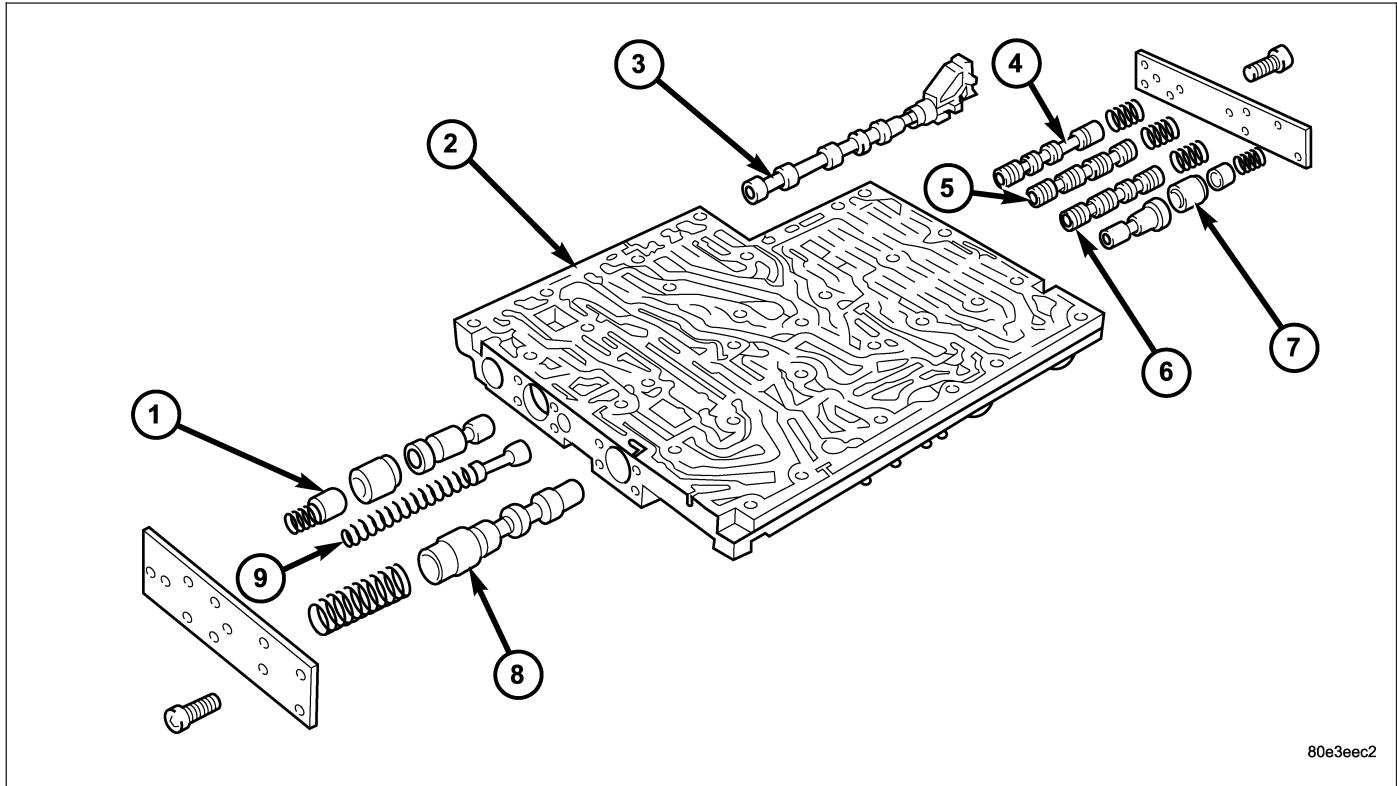


### Valve Body Components

- |  |   |
|--|---|
| 1 - VALVE BODY   | 8 - SHIFT VALVE PRESSURE REGULATING VALVE |
| 2 - 1-2/4-5 COMMAND VALVE                                | 9 - B2 SHIFT VALVE                        |
| 3 - 1-2/4-5 HOLDING PRESSURE SHIFT VALVE                 | 10 - 2-3 HOLDING PRESSURE SHIFT VALVE     |
| 4 - 1-2/4-5 SHIFT PRESSURE SHIFT VALVE                   | 11 - 2-3 COMMAND VALVE                    |
| 5 - 1-2/4-5 OVERLAP REGULATING VALVE, SLEEVE, AND PISTON | 12 - 2-3 SHIFT PRESSURE SHIFT VALVE       |
| 6 - SHIFT PRESSURE REGULATING VALVE                      | 13 - TCC LOCK-UP REGULATING VALVE         |
| 7 - REGULATING VALVE PRESSURE REGULATING VALVE           | 14 - TCC DAMPER VALVE - if equipped       |

**Note:** The sleeves and pistons of the overlap regulating valves must not be mixed up.

2. Install all valves and springs from the valve body (1). Check all valves for ease of movement and shavings.
3. Install the screws to hold the side covers to the valve body. Tighten the screws to 4 N·m (35 in.lbs.).



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### Valve Housing Components

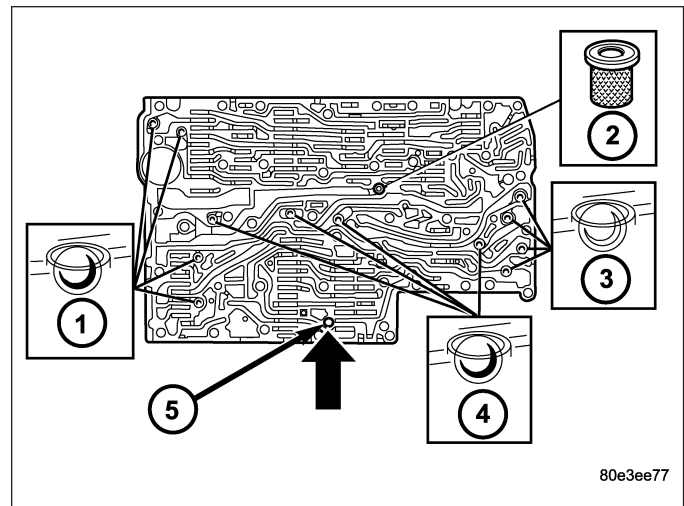
- 1 - 2-3 OVERLAP REGULATING VALVE, SLEEVE, AND PISTON
- 2 - VALVE HOUSING
- 3 - SELECTOR VALVE
- 4 - 3-4 HOLDING PRESSURE SHIFT VALVE
- 5 - 3-4 COMMAND VALVE

- 6 - 3-4 SHIFT PRESSURE SHIFT VALVE
- 7 - 3-4 OVERLAP REGULATING VALVE, SLEEVE, AND PISTON
- 8 - OPERATING PRESSURE REGULATING VALVE
- 9 - LUBRICATING PRESSURE REGULATING VALVE

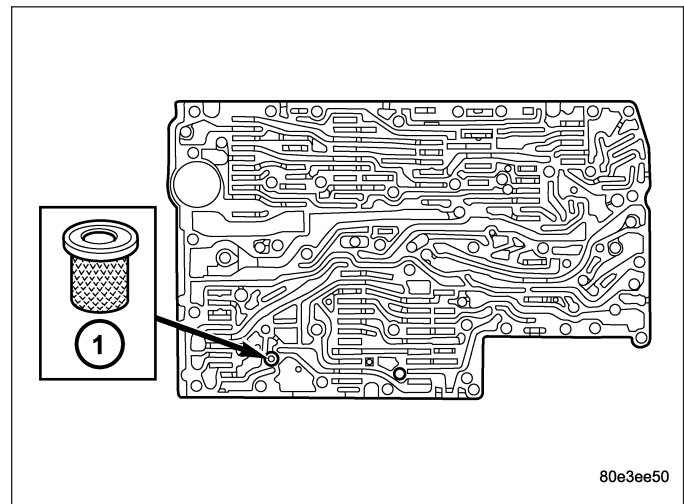
4. Install all valves and springs into the valve housing (2). Check all valves for ease of movement and shavings.
5. Install the screws to hold the side covers to the valve housing. Tighten the screws to 4 N·m (35 in.lbs.).

**Note:** A total of 12 valve balls are located in the valve body, four made from plastic (4) and eight from steel (1, 3).

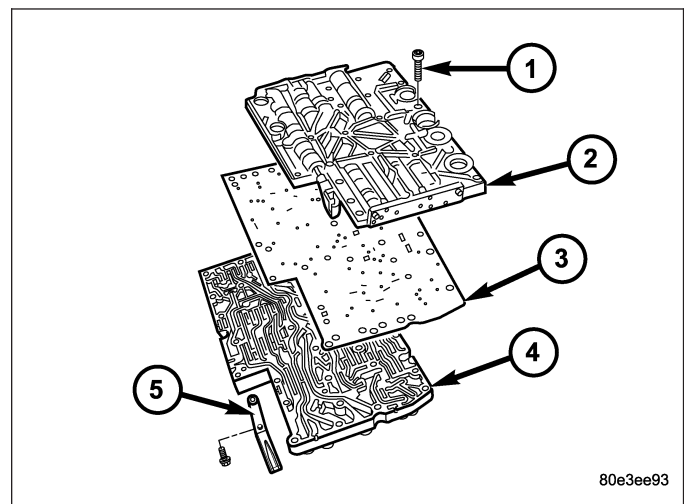
6. Install all check balls (1, 3, 4) and the central strainer (2).



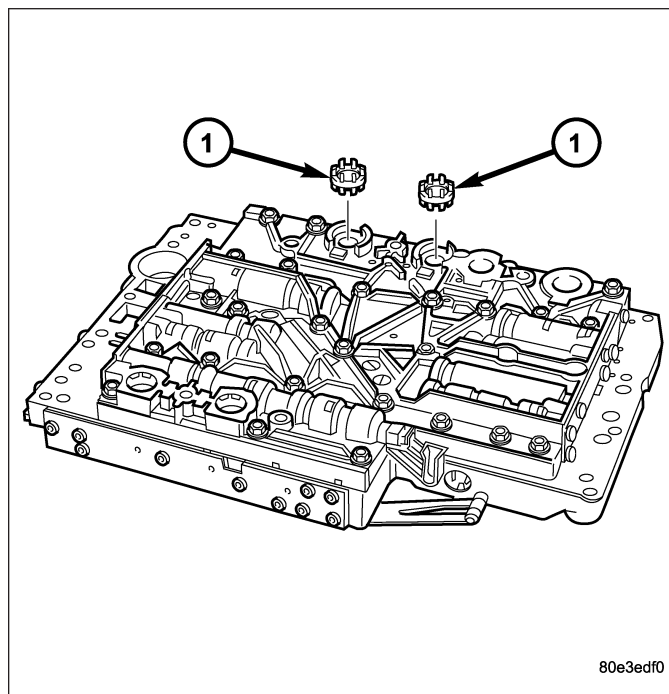
7. Install the strainer (1) in the inlet to torque converter lock-up control solenoid valve.



8. Position the sealing plate (3) onto the valve body (4).
9. Install the valve housing (2) onto the valve body (4) and sealing plate (3).
10. Install the shift plate Torx® bolts (1). Tighten the bolts to 8 N·m (71 in.lbs.).
11. Install leaf spring (5).



12. Install the strainers (1, 2) for the modulating pressure and shift pressure control solenoid valves into the valve housing.



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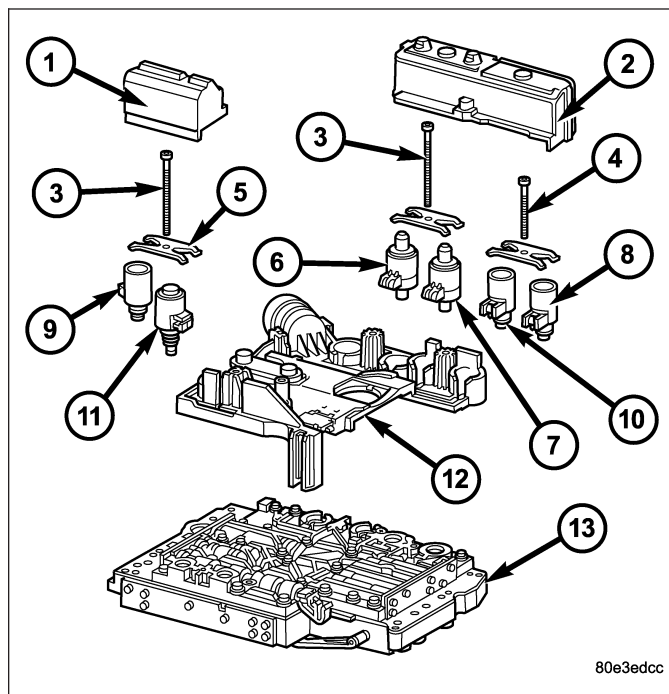
13. Install the electrohydraulic control module (12) onto the shift plate (13).
14. Bend the retaining lug on stiffening rib on transmission oil temperature sensor to retain the electrohydraulic control module.
15. Install the solenoid valves (6 - 11) into shift plate (13).

**Note: Check O-rings on solenoid valves for damage and replace if necessary.**

16. Install the leaf springs (5).
17. Install the Torx® socket bolts (3, 4). Tighten the bolts to 8 N·m (71 in.lbs.).

**Note: Pay attention to the different lengths of the Torx® socket bolts.**

18. Install the solenoid caps (1, 2).
19. Install the electrohydraulic unit into the vehicle.



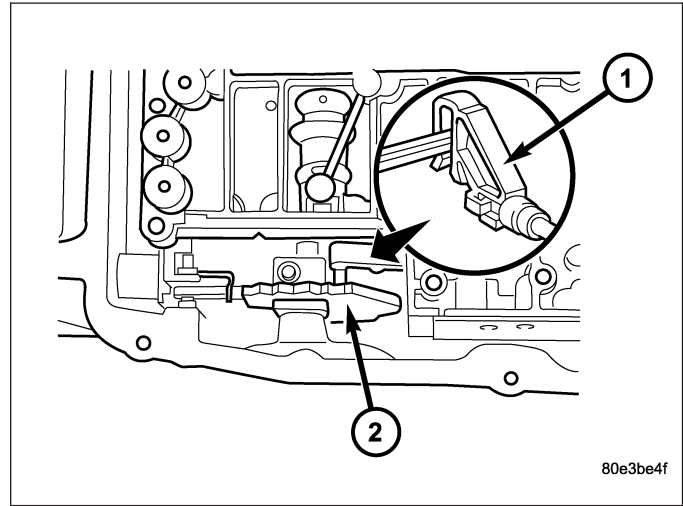
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### Electrical Unit Components

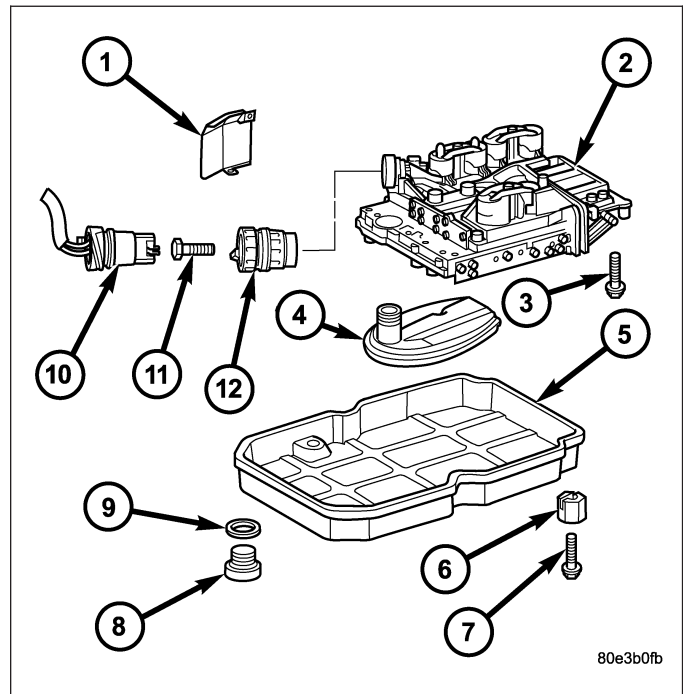
- 1 - SOLENOID CAP
- 2 - SOLENOID CAP
- 3 - BOLT - M6X32
- 4 - BOLT - M6X30
- 5 - LEAF SPRING
- 6 - MODULATING PRESSURE REGULATING SOLENOID VALVE
- 7 - SHIFT PRESSURE REGULATING SOLENOID
- 8 - 3-4 SHIFT SOLENOID
- 9 - TORQUE CONVERTER LOCK-UP SOLENOID
- 10 - 1-2/4-5 SHIFT SOLENOID
- 11 - 2-3 SHIFT SOLENOID
- 12 - ELECTRICHYDRAULIC CONTROL MODULE
- 13 - SHIFT PLATE

## INSTALLATION

1. Position the electrohydraulic unit in the transmission housing.
2. Insert selector valve (1) in driver of detent plate (2). When installing the electrohydraulic control module in the transmission housing, the plastic part of the selector valve (1) must engage in the driver of the detent plate (2).



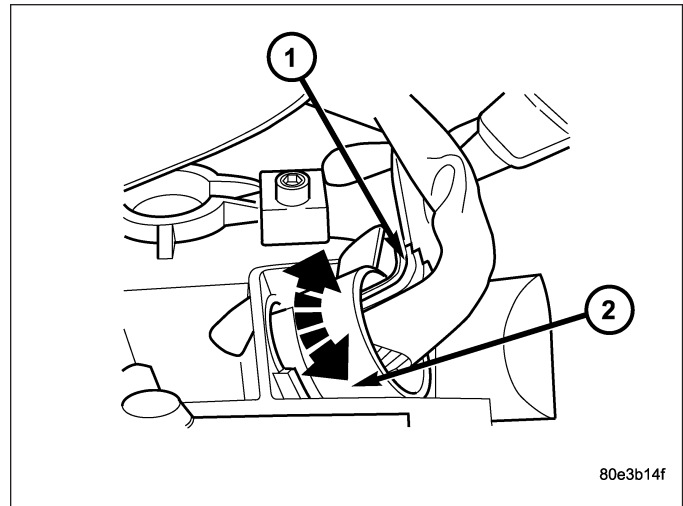
3. Install the Torx® socket bolts (3) and torque to 8 N·m (71 in.lbs.).
4. Install a new oil filter (4).
5. Install oil pan (5) and torque the oil pan bolts to 8 N·m (71 in.lbs.).
6. Install the oil drain plug (8) with a new drain plug gasket (9). Torque the drain plug to 20 N·m (177 in.lbs.).
7. Install the guide bushing (2) into the transmission housing and install the bolt (11) to hold the guide bushing in place.



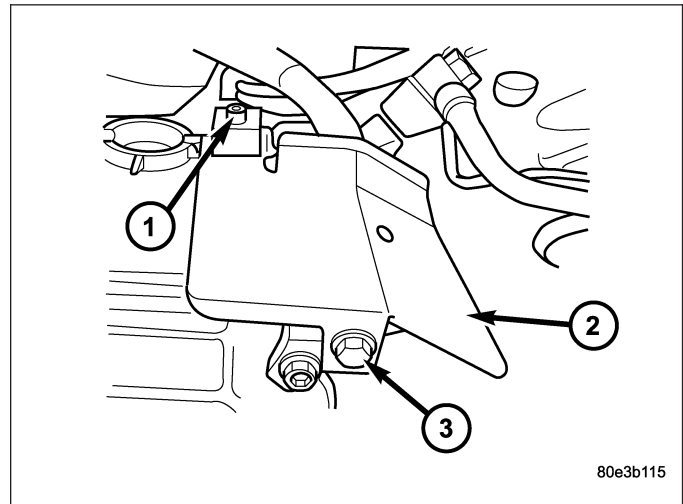
- 1 - HEAT SHIELD
- 2 - ELECTROHYDRAULIC UNIT
- 3 - BOLT
- 4 - OIL FILTER
- 5 - OIL PAN
- 6 - CLAMPING ELEMENT
- 7 - BOLT
- 8 - DRAIN PLUG
- 9 - DRAIN PLUG GASKET
- 10 - 13-PIN PLUG CONNECTOR
- 11 - BOLT
- 12 - GUIDE BUSHING



8. Check O-ring on plug connector (1), and replace if necessary.
9. Install the plug connector (1) into the guide bushing (2). Turn bayonet lock of guide bushing (2) clockwise to connect plug connector (1).



10. Position the heat shield (2) onto the transmission housing and install the screw (1) and bolt (3) to hold the shield in place.
11. Fill the transmission with the correct oil (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION) using the standard procedure (Refer to 21 - TRANSMISSION/AUTOMATIC - NAG1/FLUID AND FILTER - STANDARD PROCEDURE - TRANSMISSION FILL).

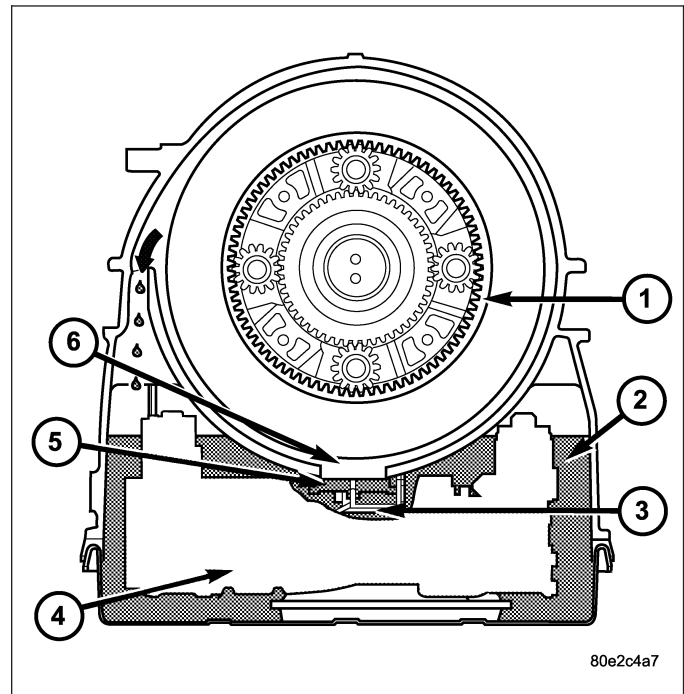




## FLUID AND FILTER

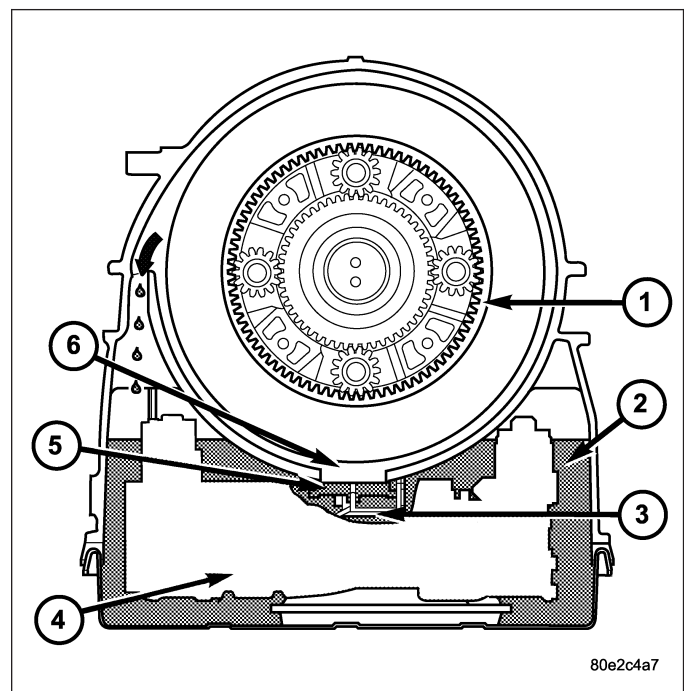
### DESCRIPTION

The oil level control is located on the electrohydraulic unit (4) and consists of the float (5) which is integrated into the electrohydraulic unit. The float is positioned to plug the opening (6) between the oil gallery (2) and gearset chamber (1) so that the rotating gearsets do not splash about in oil as the oil level rises. The oil level control reduces power loss and prevents oil from being thrown out of the transmission housing at high oil temperatures.



### OPERATION

With low oil levels, the lubricating oil which flows constantly out of the gearset, flows back to oil gallery (2) through the opening (6). If the oil level rises, the oil presses the float (5) against the housing opening (6). The float (5) therefore separates the oil gallery (2) from the gearset chamber (1). The lubricating oil which continues to flow out of the gearsets is thrown against the housing wall, incorporated by the rotating parts and flows back into the oil gallery (2) through the upper opening (arrow).



## DIAGNOSIS AND TESTING

### EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation, and varnish buildup which interferes with valve and clutch operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

### CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has three primary causes.

1. Internal clutch slippage, usually caused by low line pressure, inadequate clutch apply pressure, or clutch seal failure.
2. A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or improperly installed drainback valve, a damaged oil cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.
3. Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

### FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to replace contaminated converter after repair

The use of non-recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission, an overhaul is necessary.

The torque converter should be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

## STANDARD PROCEDURE

### CHECK OIL LEVEL

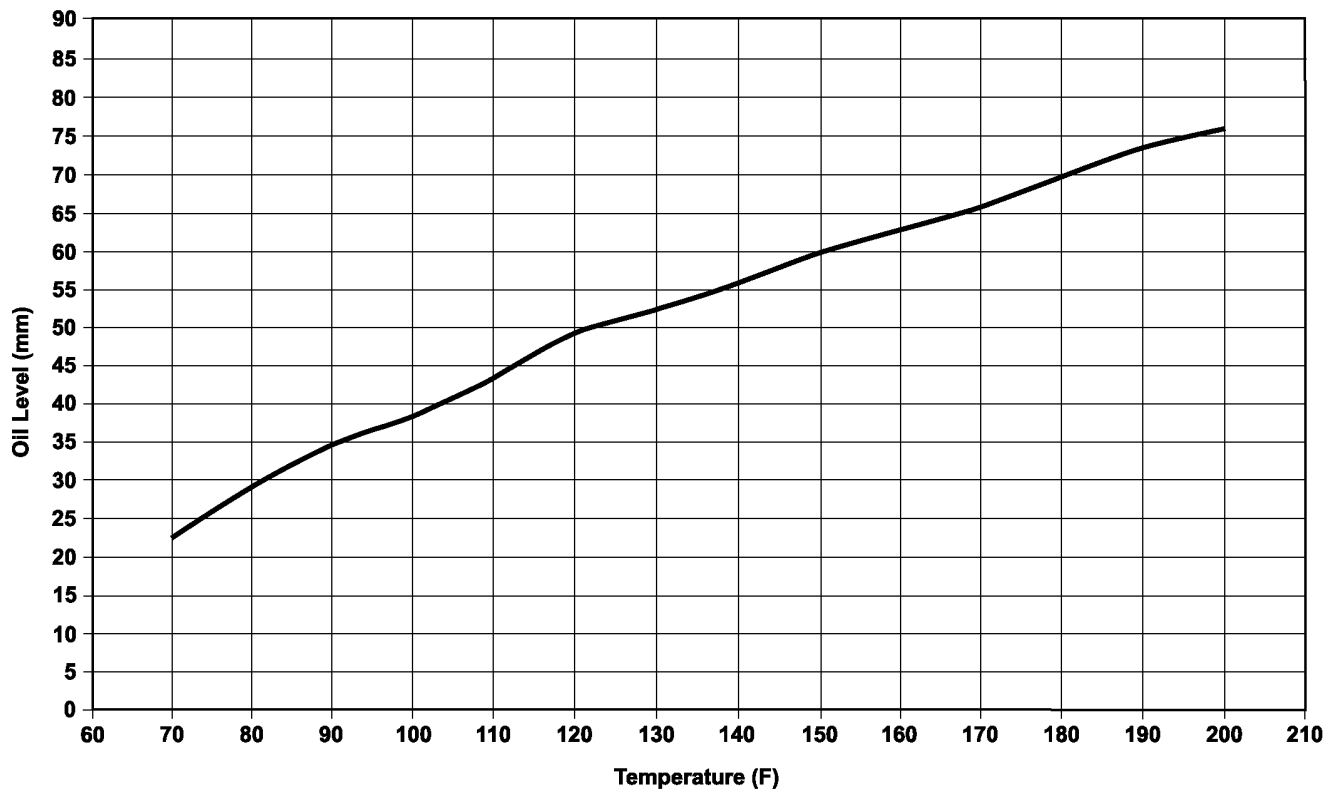
1. Verify that the vehicle is parked on a level surface.
2. Remove the dipstick tube cap.

**WARNING: Risk of accident from vehicle starting off by itself when engine running. Risk of injury from contusions and burns if you insert your hands into the engine when it is started or when it is running. Secure vehicle to prevent it from moving off by itself. Wear properly fastened and close-fitting work clothes. Do not touch hot or rotating parts.**

3. Actuate the service brake. Start engine and let it run at idle speed in selector lever position "P".

4. Shift through the transmission modes several times with the vehicle stationary and the engine idling
5. Warm up the transmission, wait at least 2 minutes and check the oil level with the engine running. Push the Oil Dipstick 9336 into transmission fill tube until the dipstick tip contacts the oil pan and pull out again, read off oil level, repeat if necessary.

**Note:** The dipstick will protrude from the fill tube when installed.



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***NAG1 Transmission Fill Graph***

6. Check transmission oil temperature using the appropriate scan tool.

**Note:** The true transmission oil temperature can only be read by a scan tool in REVERSE or any forward gear position. (Refer to 21 - AUTOMATIC TRANSMISSION- NAG1/TRANSMISSION TEMPERATURE SENSOR/ PARK-NEUTRAL SWITCH - OPERATION)

7. The transmission Oil Dipstick 9336 has indicator marks every 10mm. Determine the height of the oil level on the dipstick and using the height, the transmission temperature, and the Transmission Fluid Graph, determine if the transmission oil level is correct.
8. Add or remove oil as necessary and recheck the oil level.
9. Once the oil level is correct, install the dipstick tube cap.

## TRANSMISSION FILL

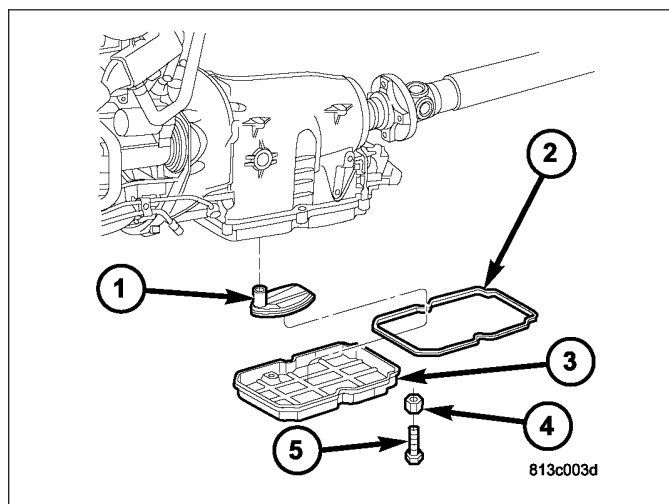
To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:

1. Verify that the vehicle is parked on a level surface.
2. Remove the dipstick tube cap.

3. Add following initial quantity of Mopar® ATF +4, Automatic Transmission Fluid, to the transmission:
  - a. If only fluid and filter were changed, add **7.4 L (14.8 pts.)** of transmission fluid to transmission.
  - b. If the transmission was completely overhauled or the torque converter was replaced or drained, add **8.1 L (17.1 pts.)** of transmission fluid to transmission.
4. Check the transmission fluid (Refer to 21 - TRANSMISSION/AUTOMATIC - NAG1/FLUID AND FLUID - STANDARD PROCEDURE - CHECK OIL LEVEL) and adjust as required.

## FLUID/FILTER SERVICE

1. Run the engine until the transmission oil reaches operating temperature.
2. Raise and support vehicle.
3. Remove the bolts (5) and retainers (4) holding the oil pan to the transmission.
4. Remove the transmission oil pan (3) and gasket (2) from the transmission.
5. Remove the transmission oil filter (1) and o-ring from the electrohydraulic control unit.
6. Clean the inside of the oil pan (3) of any debris. Inspect the oil pan gasket (2) and replace if necessary.
7. Install a new oil filter (1) and o-ring into the electrohydraulic control unit.
8. Install the oil pan (3) and gasket (2) onto the transmission.
9. Install the oil pan bolts (5) and retainers (4). Torque the bolts to 8 N·m (70 in.lbs.).
10. Lower the vehicle and add 7.0 L (7.4 qts.) of transmission fluid to the transmission.
11. Check the oil level (Refer to 21 - TRANSMISSION/AUTOMATIC - NAG1/FLUID AND FILTER - STANDARD PROCEDURE - CHECK OIL LEVEL).



**Fluid/Filter Service Points**

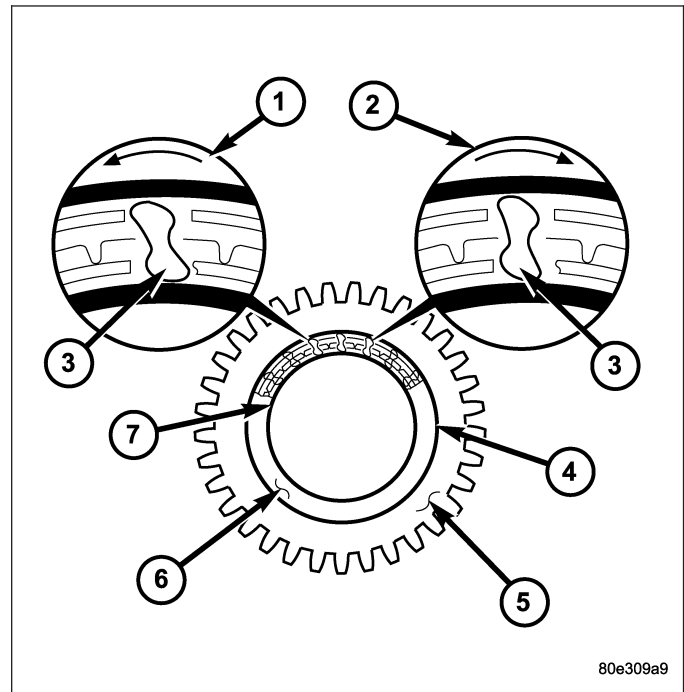
- 1 - OIL FILTER
- 2 - OIL PAN GASKET
- 3 - OIL PAN
- 4 - RETAINER
- 5 - BOLT

## CLUTCH-FREEWHEELING

### DESCRIPTION

Freewheeling clutches are installed in the front planetary gear set between the sun gear and the stator shaft, and in the rear planetary gear set between the sun gear and the intermediate shaft.

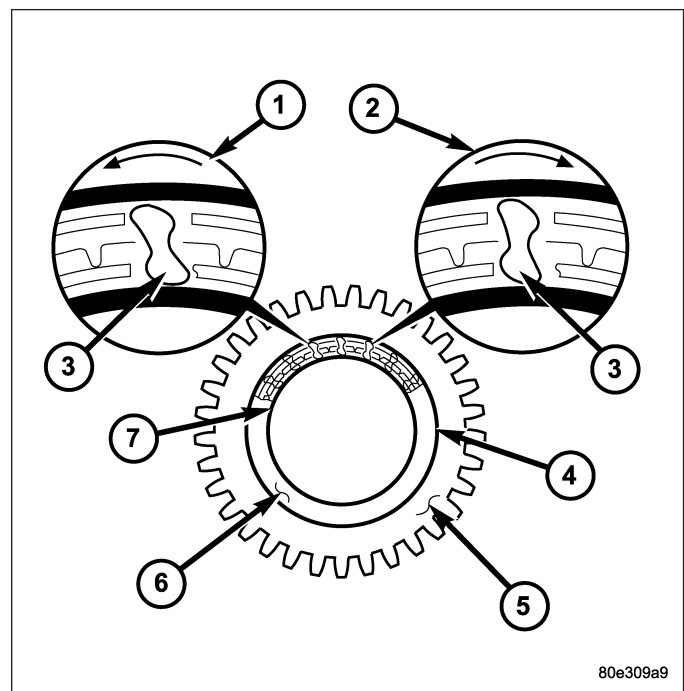
The freewheel consists of an outer race (4), an inner race (7), a number of locking elements (3) and a cage (6) for these locking elements.

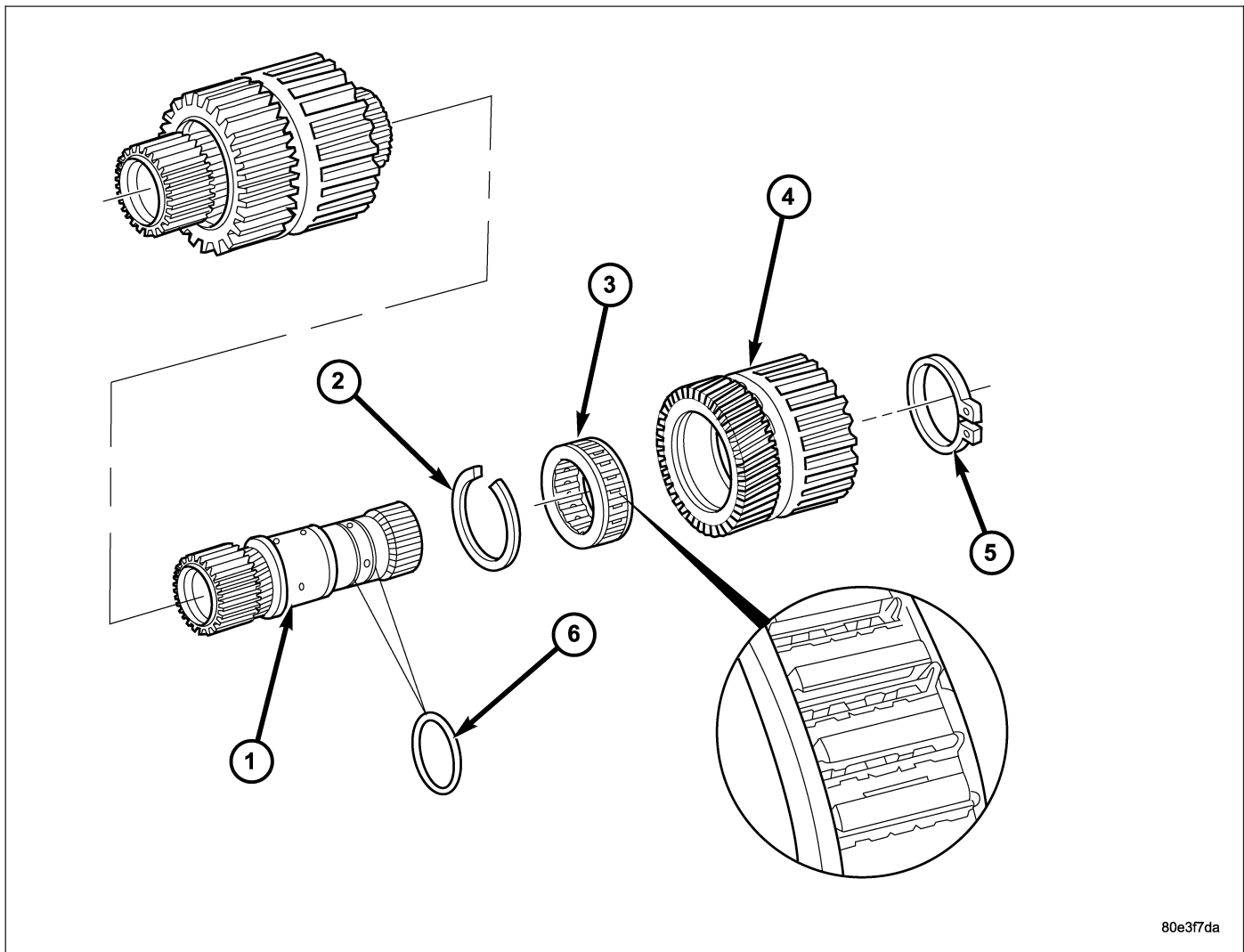


### OPERATION

The freewheeling clutch optimizes individual gear-shifts. They lock individual elements of a planetary gear set together or against the transmission housing in one direction of rotation to allow the torque to be transmitted.

If the inner race (7) of the freewheeling clutch is locked and the outer race (4) turns counter-clockwise (1), the locking elements (3) adopt a diagonal position on account of their special contours, allowing the free-wheel function. The inner race (4) slides under the locking elements (3) with minimal friction. If the rotation of the outer race (4) changes to clockwise (2), the locking elements (3) stand up and lock the outer and inner races (4, 7) together.



**DISASSEMBLY**

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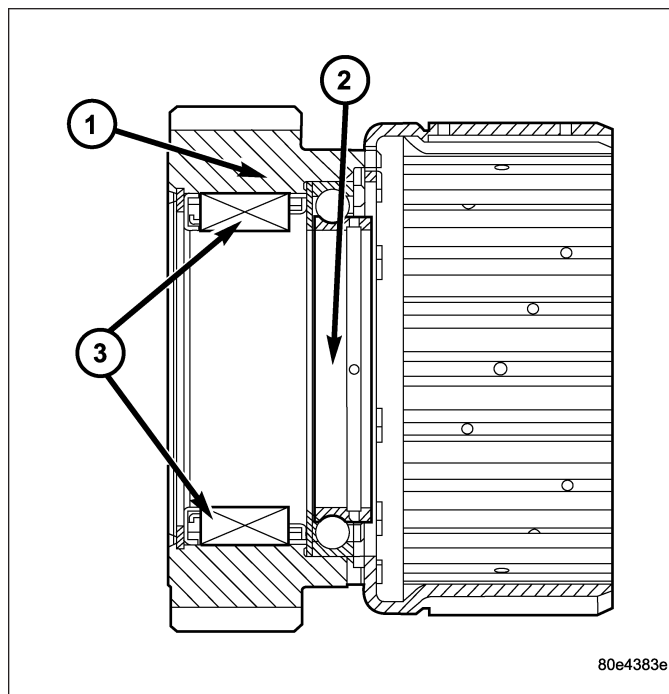
***Freewheeling Clutch F2***

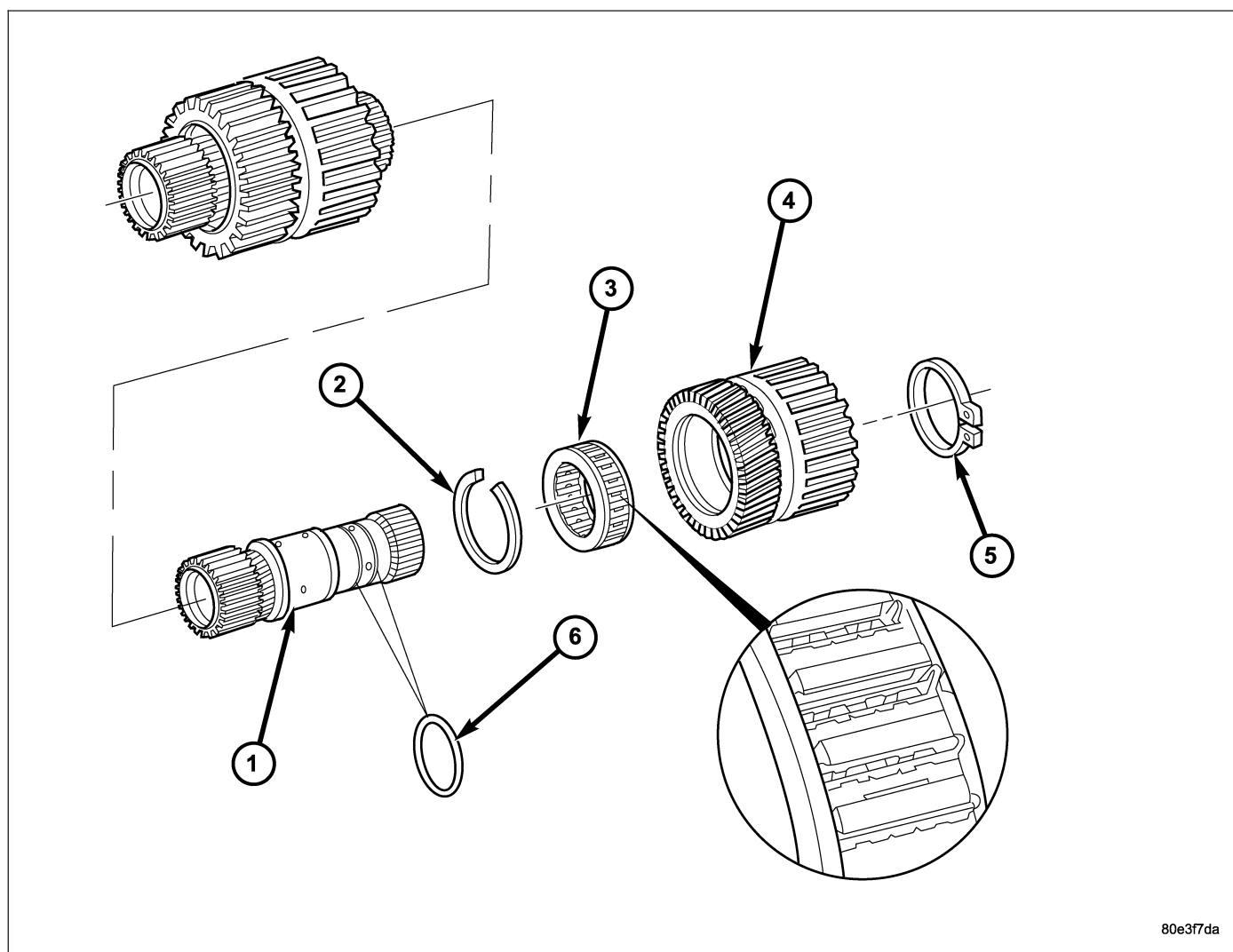
1 - HOLLOW SHAFT  
 2 - F2 CLUTCH SNAP-RING  
 3 - FREEWHEELING CLUTCH F2

4 - K3 INNER DISC CARRIER AND REAR PLANETARY SUN GEAR  
 5 - RETAINING RING  
 6 - O-RINGS

1. Remove retaining ring (5) from hollow shaft (1).
2. Remove rear sun gear (4) with the K3 internally toothed disk carrier and rear freewheeling clutch F2 (3).
3. Remove snap-ring (2) for freewheel.
4. Press freewheeling clutch (3) out of sun gear.
5. Check O-rings (6), replace if necessary.

6. Check the anti-friction bearing (2) in the rear planetary sun gear for damage. Replace as necessary.



**ASSEMBLY**

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***Freewheeling Clutch F2***

1 - HOLLOW SHAFT  
 2 - F2 CLUTCH SNAP-RING  
 3 - FREEWHEELING CLUTCH F2

4 - K3 INNER DISC CARRIER AND REAR PLANETARY SUN GEAR  
 5 - RETAINING RING  
 6 - O-RINGS

**Note:** The side of the freewheeling clutch F2 (3) with the markings (directional arrow, part number, etc.) must be up when the clutch is installed in the sun gear (4).

1. Press freewheeling clutch F2 (3) into sun gear (4).
2. Install snap-ring (2) for freewheeling clutch.
3. Check O-rings (6) on hollow shaft, replace if necessary.
4. Install rear sun gear (4) with K3 internally toothed disc carrier and rear freewheeling clutch (3) onto the hollow shaft.
5. Verify proper operation of the freewheeling clutch F2. When the assembly is held with the F2 clutch snap-ring upward, it should be possible to rotate the hollow shaft counter-clockwise.
6. Install retaining ring (5) onto hollow shaft (1).



## CABLE-GEARSHIFT

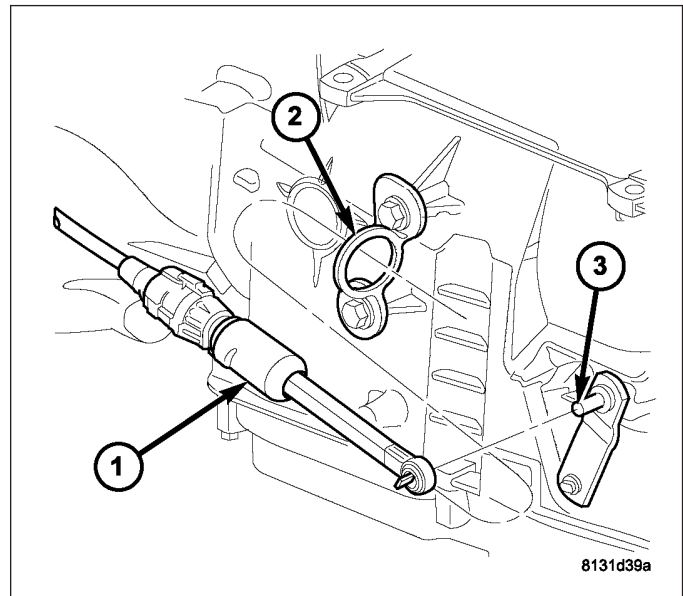
### DIAGNOSIS AND TESTING

#### GEARSHIFT CABLE

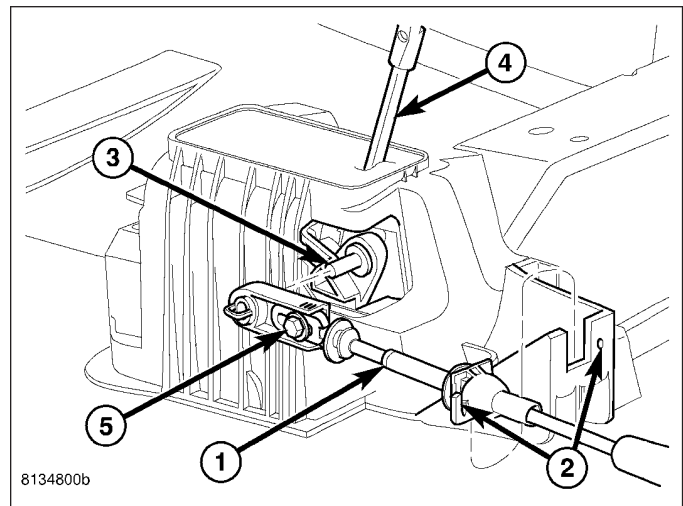
1. The floor shifter lever and gate positions should be in alignment with all transmission PARK, NEUTRAL, and gear detent positions.
2. Engine starts must be possible with floor shift lever in PARK or NEUTRAL gate positions only. Engine starts must not be possible in any other gear position.
3. With floor shift lever handle push-button not depressed and lever in:
  - a. PARK position - Apply forward force on center of handle and remove pressure. Engine starts must be possible.
  - b. PARK position - Apply rearward force on center of handle and remove pressure. Engine starts must be possible.
  - c. NEUTRAL position - Normal position. Engine starts must be possible.
  - d. NEUTRAL position - Engine running and brakes applied, apply forward force on center of shift handle. Transmission shall not be able to shift from NEUTRAL to REVERSE.

### REMOVAL

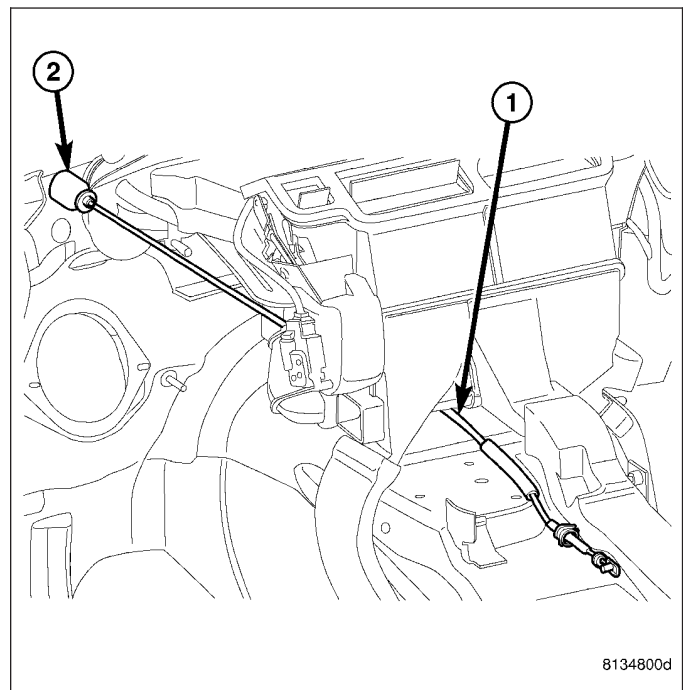
1. Shift transmission into PARK.
2. Raise vehicle.
3. Disengage the gearshift cable (1) eyelet at transmission manual shift lever (3) and pull cable out of the mounting bracket (2).



4. Lower the vehicle.
5. Remove the floor console (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL) as necessary to access the shift mechanism and cables.
6. If necessary, remove the bolts holding the shield, covering the gearshift and park lock cables, to the floorpan and remove the shield.
7. Remove the gearshift cable (1) from the shift lever pin (3).
8. Remove the gearshift cable retainer (2) from the notch (2) in the shifter assembly.

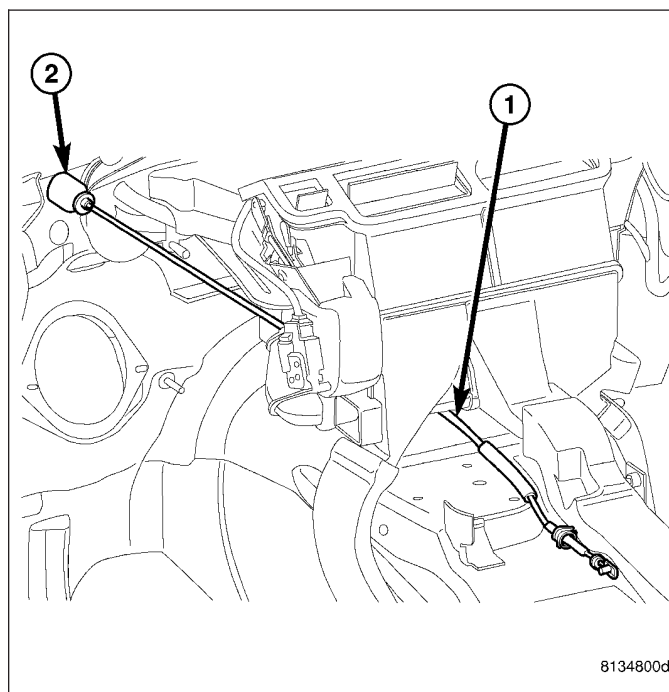


9. From under the hood, remove the shift cable grommet (2) from the dash panel.
10. Remove gearshift cable (1) from vehicle.

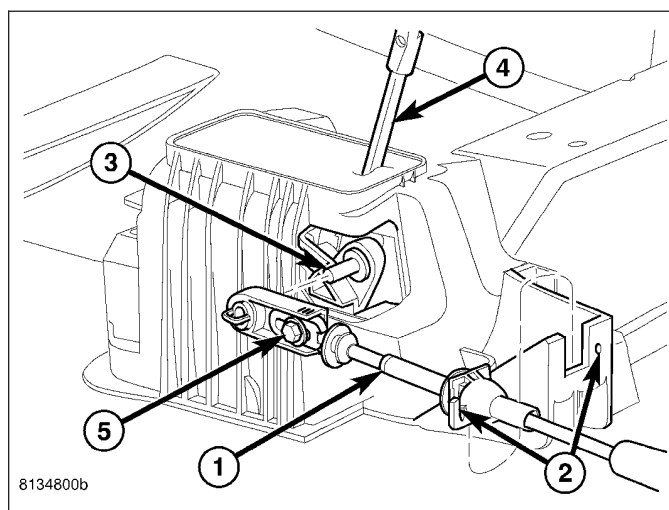


## INSTALLATION

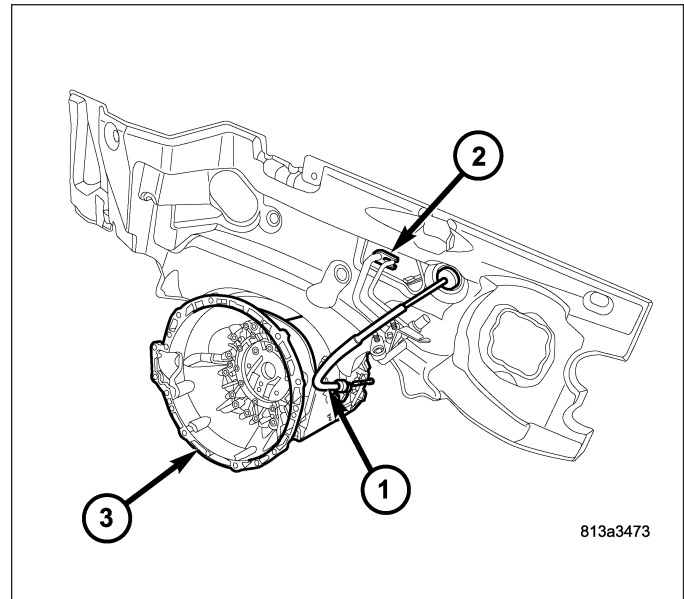
1. From under the hood, route the gearshift cable (1) through the dash panel and toward the shifter assembly.
2. From under the hood, install the grommet (2) to the dash panel.



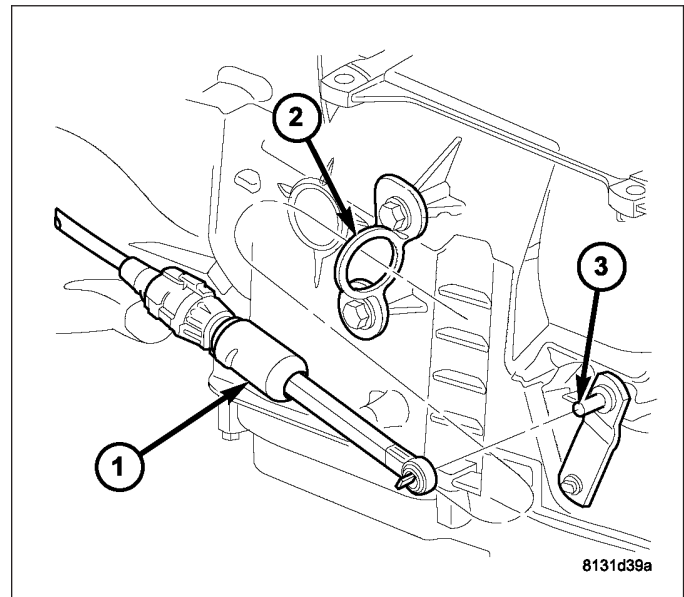
3. Engage the gearshift cable retainer (2) into the notch (2) in the shifter assembly.
4. Install the gearshift cable (1) onto the shift lever pin (3).
5. Loosen the cable adjustment screw (5), if necessary.



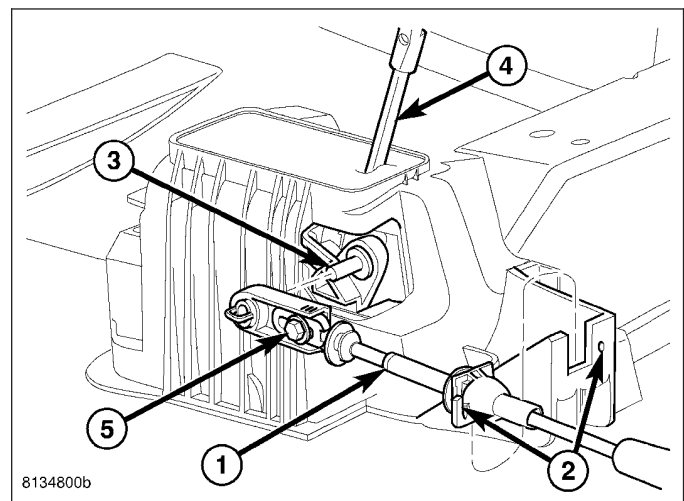
6. From under the hood, route the gearshift cable (1) forward of the air conditioning lines and the heater hoses (2) and toward the transmission (3) manual lever.



7. Raise vehicle.
8. Verify that the transmission is in the PARK position by trying to rotate the propeller shaft. If the propeller shaft rotates, move the transmission manual shift lever to the full rearward position and turn the propeller shaft until the PARK system is engaged.
9. Route the gearshift cable (1) through the mounting bracket (2).
10. Engage the gearshift cable (1) eyelet onto the transmission manual shift lever (3).



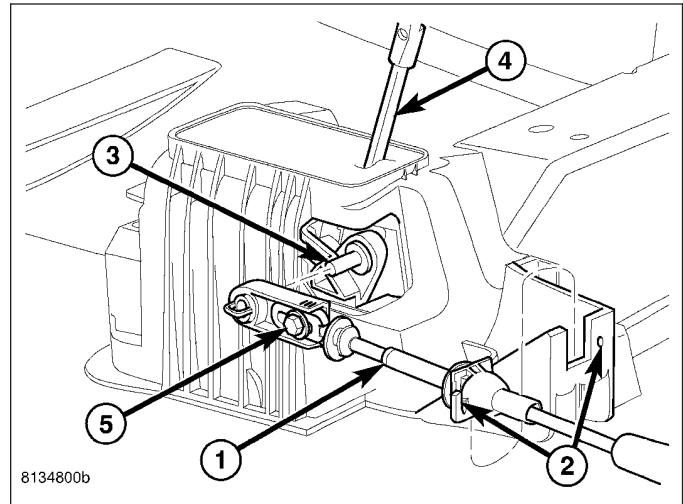
11. Lower vehicle.
12. Verify that the shifter is in the PARK position.
13. Tighten the adjustment screw (5) to 7 N-m (65 in.lbs.).
14. Verify correct shifter operation.
15. If necessary, install the shield, covering the gearshift and park lock cables, to the floorpan and install the bolts to hold the shield to the floorpan.
16. Install the floor console (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION), lower instrument panel components (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION) and dash panel insulation pad as necessary.



## ADJUSTMENTS - GEARSHIFT CABLE

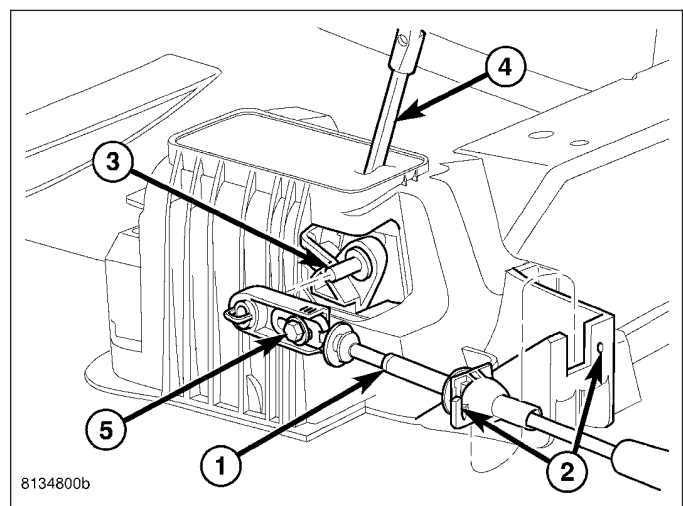
Check adjustment by starting the engine in PARK and NEUTRAL. Adjustment is CORRECT if the engine starts only in these positions. Adjustment is INCORRECT if the engine starts in one but not both positions. If the engine starts in any position other than PARK or NEUTRAL, or if the engine will not start at all, the park/neutral position contact may be faulty.

1. Shift transmission into PARK.
2. Remove floor console as necessary for access to the shift cable adjustment. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)
3. Loosen the shift cable adjustment screw (5).



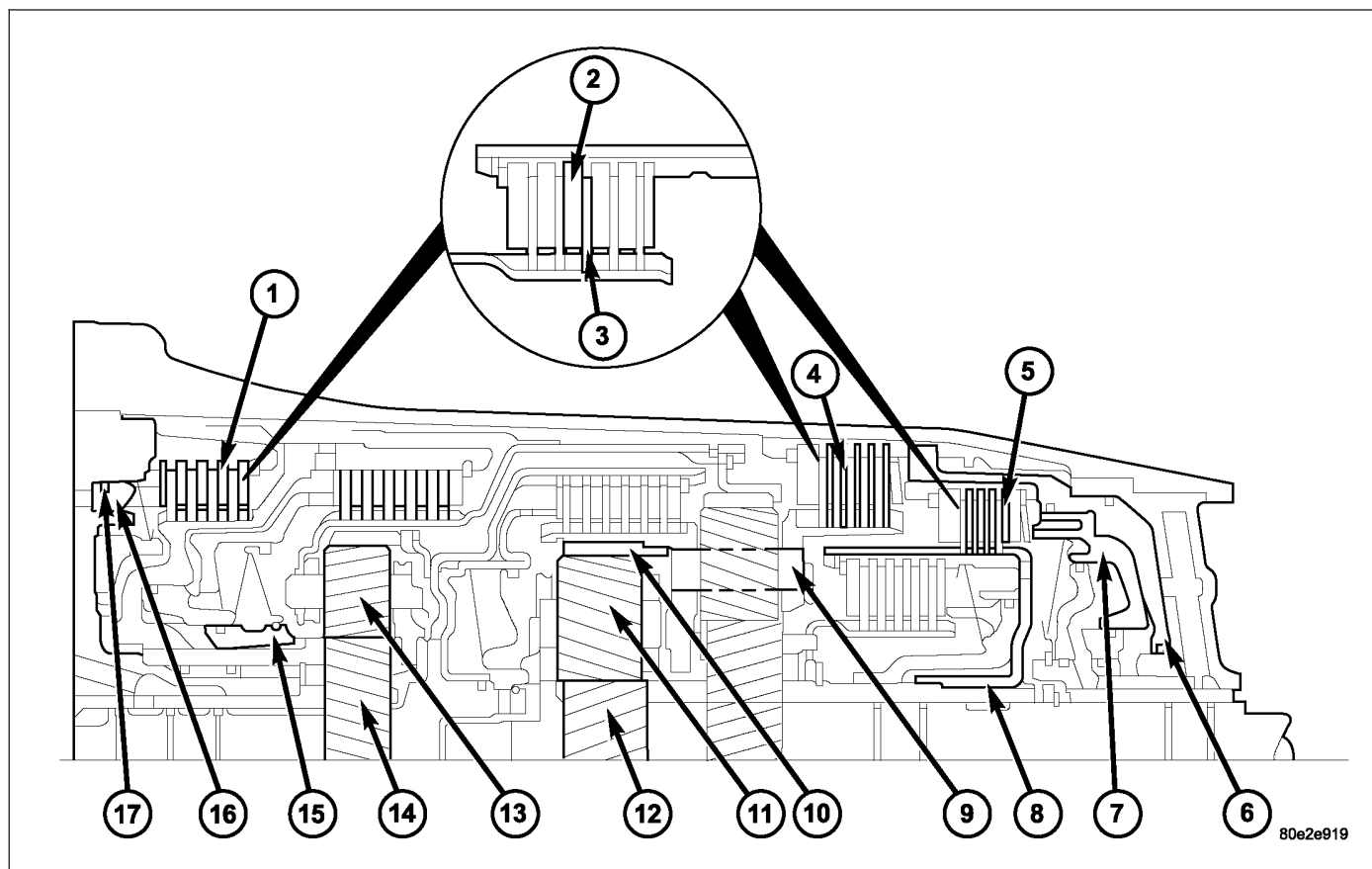
4. Raise vehicle.
5. Unsnap cable eyelet from transmission shift lever.
6. Verify transmission shift lever is in PARK detent by moving lever fully rearward. Last rearward detent is PARK position.
7. Verify positive engagement of transmission park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.
8. Snap cable eyelet onto transmission shift lever.

9. Lower vehicle
10. Tighten the shift cable adjustment screw (5) to 7 N·m (65 in.lbs.).
11. Verify correct operation.
12. Install any floor console components removed for access. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)



## CLUTCHES-HOLDING

### DESCRIPTION



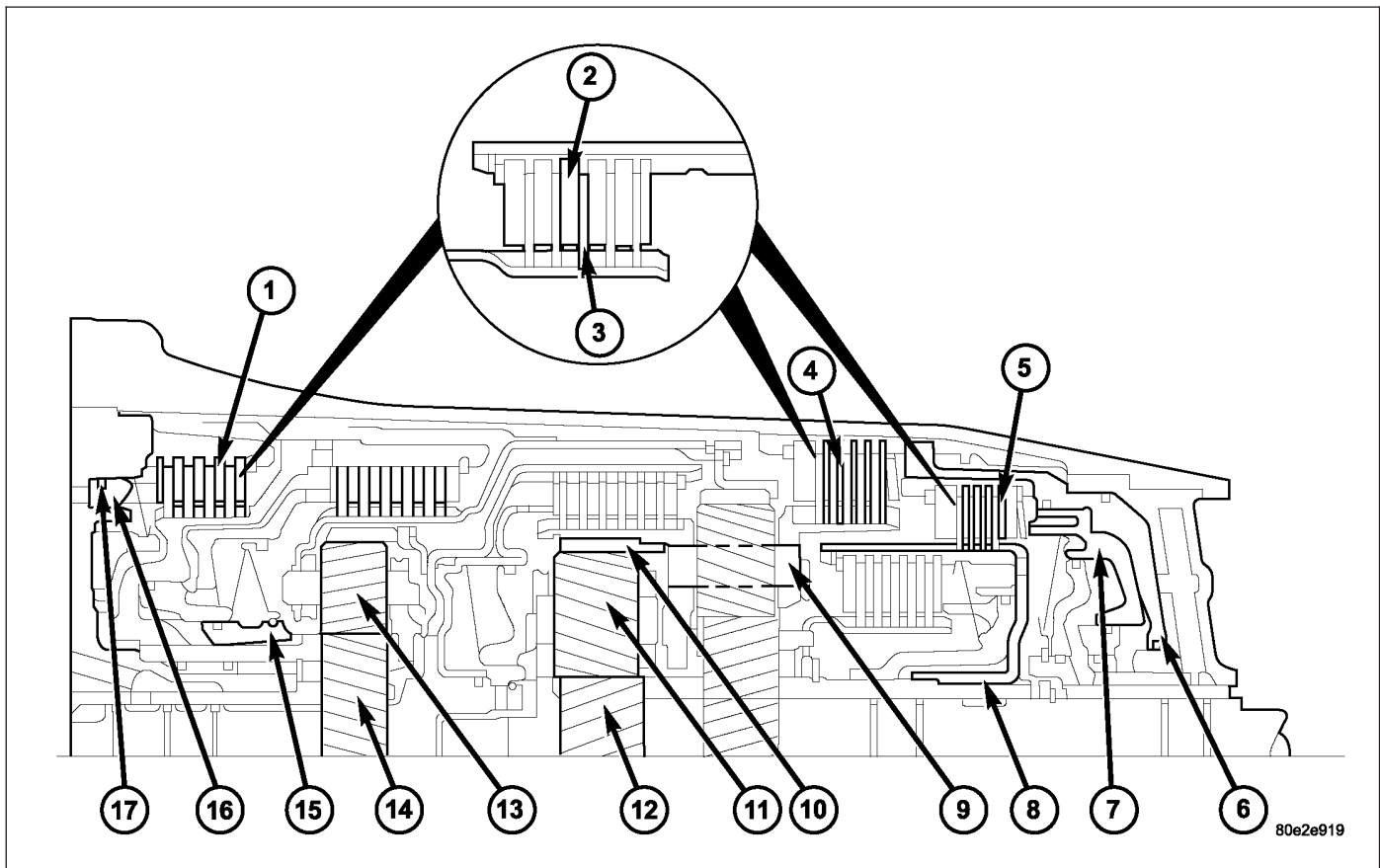
#### *Holding Clutches*

- |   |  |
|---|--|
| 1 - B1 CLUTCH                                 | 10 - CENTER PLANETARY GEARSET ANNULUS GEAR     |
| 2 - EXTERNALLY TOOTHED DISC                   | 11 - CENTER PLANETARY GEARSET PINION GEARS     |
| 3 - INTERNALLY TOOTHED DISC                   | 12 - CENTER PLANETARY GEARSET SUN GEAR         |
| 4 - B3 CLUTCH                                 | 13 - FRONT PLANETARY GEARSET PINION GEARS      |
| 5 - B2 CLUTCH                                 | 14 - FRONT PLANETARY GEARSET SUN GEAR          |
| 6 - B3 CLUTCH PISTON                          | 15 - B1 CLUTCH INTERNALLY TOOTHED DISC CARRIER |
| 7 - B2 CLUTCH PISTON                          | 16 - B1 CLUTCH PISTON                          |
| 8 - B2 CLUTCH INTERNALLY TOOTHED DISC CARRIER | 17 - B1 CLUTCH EXTERNALLY TOOTHED DISC CARRIER |
| 9 - REAR PLANETARY GEARSET PLANETARY CARRIER  |  |

Three multiple-disc holding clutches, the front, B1 (1), middle, B3 (4), and rear multiple disc clutches, B2 (5), are located in the planetary gear sets in the transmission housing.

A multiple-disc holding clutch consists of a number of internally toothed discs (10) on an internally toothed disc carrier and externally toothed discs (9) on an externally toothed disc carrier, which is rigidly connected to the transmission housing.

## OPERATION



**Holding Clutches**

- |   |  |
|---|--|
| 1 - B1 CLUTCH                                 | 10 - CENTER PLANETARY GEARSET ANNULUS GEAR     |
| 2 - EXTERNALLY TOOTHED DISC                   | 11 - CENTER PLANETARY GEARSET PINION GEARS     |
| 3 - INTERNALLY TOOTHED DISC                   | 12 - CENTER PLANETARY GEARSET SUN GEAR         |
| 4 - B3 CLUTCH                                 | 13 - FRONT PLANETARY GEARSET PINION GEARS      |
| 5 - B2 CLUTCH                                 | 14 - FRONT PLANETARY GEARSET SUN GEAR          |
| 6 - B3 CLUTCH PISTON                          | 15 - B1 CLUTCH INTERNALLY TOOTHED DISC CARRIER |
| 7 - B2 CLUTCH PISTON                          | 16 - B1 CLUTCH PISTON                          |
| 8 - B2 CLUTCH INTERNALLY TOOTHED DISC CARRIER | 17 - B1 CLUTCH EXTERNALLY TOOTHED DISC CARRIER |
| 9 - REAR PLANETARY GEARSET PLANETARY CARRIER  |  |

The holding clutches connect the annulus gear, sun gear, or planetary carrier of a planetary gear set against the transmission housing in order to transmit the drive torque.

If the piston (16) on multiple-disc holding clutch B1 (1) is subjected to oil pressure, it presses the internal (3) and external discs (2) of the disc set together. The internally toothed disc carrier (15) locks the sun gear (14) against the housing. The planetary pinion gears (13) turn on the sun gear (14).

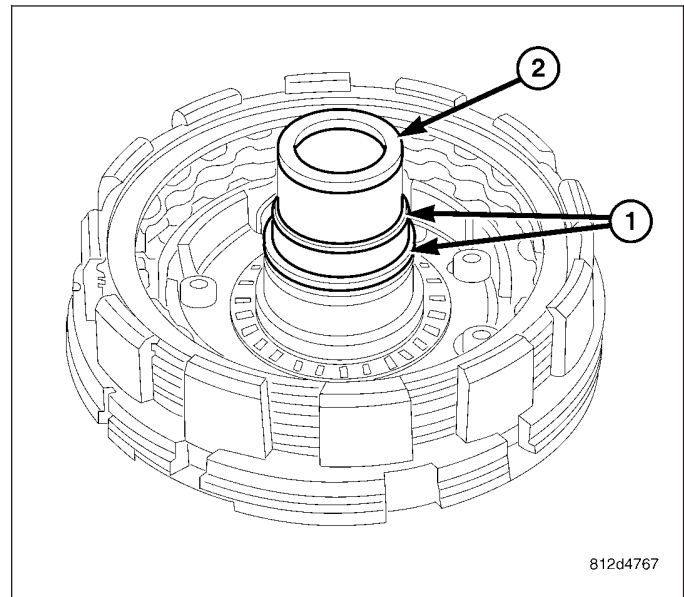
If the multiple-disc holding clutch B2 (5) is actuated via the piston (7), the piston compresses the disc set. The internally toothed disc carrier (8) locks the sun gear (12) against the housing. The planetary pinion gears (11) turn on the sun gear (12).

If the multiple-disc holding clutch B3 (4) is actuated via the piston (6), the planetary carrier (9) and the annulus gear (10) are locked. When the multiple-disc brake B3 (4) is actuated, the direction of rotation is reversed.

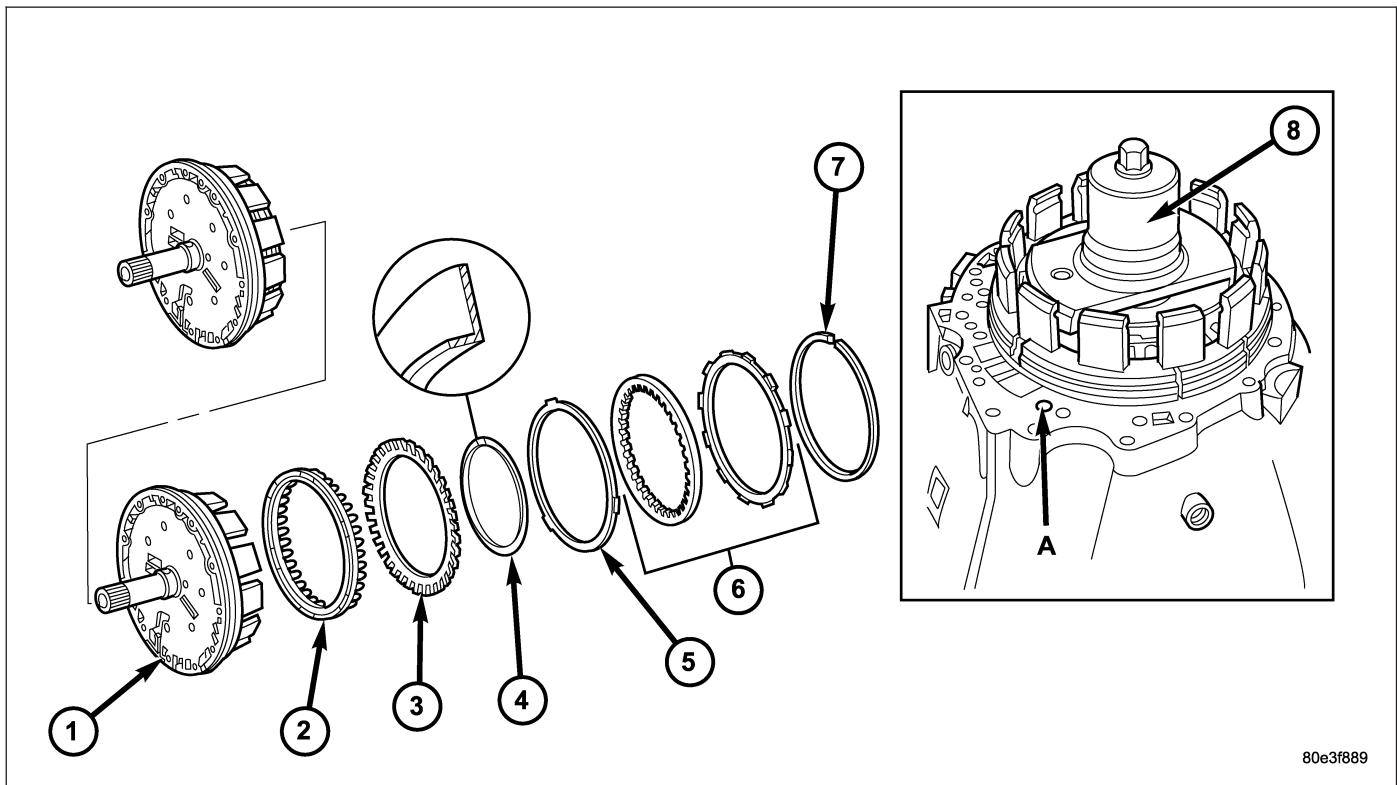
## B1-HOLDING CLUTCH

### DISASSEMBLY

1. Remove the teflon rings (1) from the B1 plate carrier hub (2).



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#### *Holding Clutch B1*

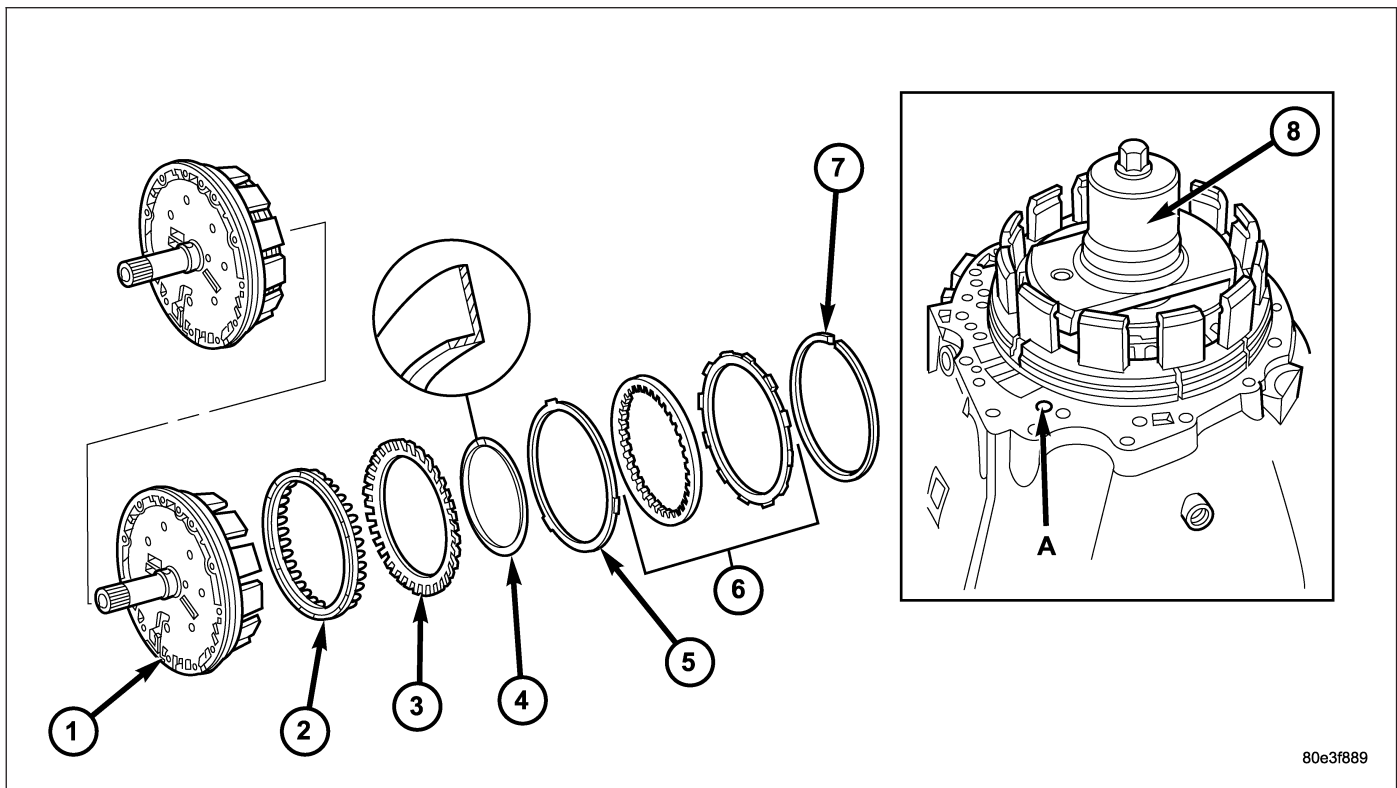
- 1 - HOLDING CLUTCH B1 OUTER CARRIER
- 2 - PISTON
- 3 - DISC SPRING
- 4 - SNAP-RING

- 5 - DISC SPRING
- 6 - MULTIPLE DISC PACK
- 7 - SNAP-RING
- 8 - MULTI-USE SPRING COMPRESSOR 8900



2. Remove snap-ring (7).
3. Remove multiple-disc pack (6) and disc spring (5) from outer multiple-disc carrier. Note which clutch disc is removed just prior to the disc spring (5) for re-assembly. If the clutch discs are re-used, this disc must be returned to its original position on top of the disc spring.
4. Place the Multi-use Spring Compressor 8900 (8) on disc spring (3) and compress the spring until the snap-ring (4) is exposed.
5. Remove snap-ring (4).
6. Remove piston (2) from the outer multiple-disc carrier by carefully blowing compressed air into the bore (A).

## ASSEMBLY



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### *Holding Clutch B1*

1 - HOLDING CLUTCH B1 OUTER CARRIER  
 2 - PISTON  
 3 - DISC SPRING  
 4 - SNAP-RING

5 - DISC SPRING  
 6 - MULTIPLE DISC PACK  
 7 - SNAP-RING  
 8 - MULTI-USE SPRING COMPRESSOR 8900

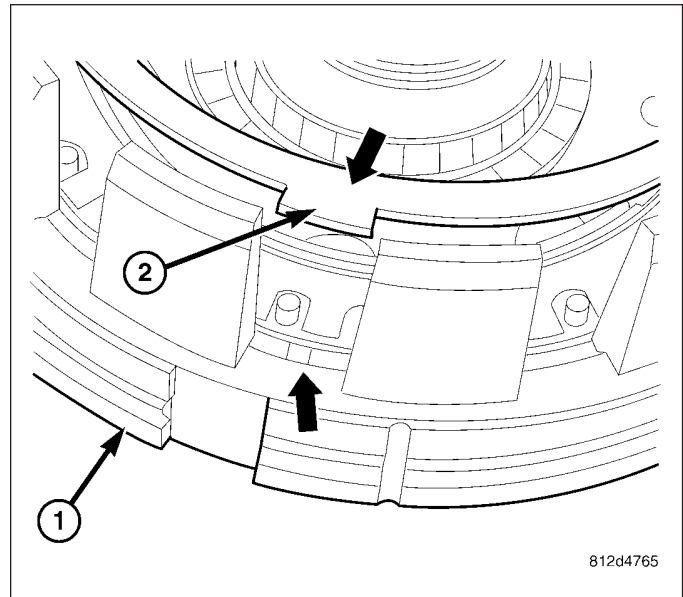
**Note:** Check vulcanized gasket, replace if necessary.

1. Install piston (2) in outer multiple-disc carrier (1).
2. Place compressor (8) on disc spring (3) and compress until the groove of the snap-ring is exposed.

**Note:** The collar of the snap-ring must point towards the multiple-disc pack. After installing, check snap-ring for correct seat.

3. Insert snap-ring (4).

4. Insert disc spring (2) in the outer multiple-disc carrier. Observe the disc spring (2) installation position. The lugs of the disc spring (2) washer must align with the 3 raised pads (arrow) of the B1 multiple-disc carrier (1). The cone of the spring washer must point downwards.

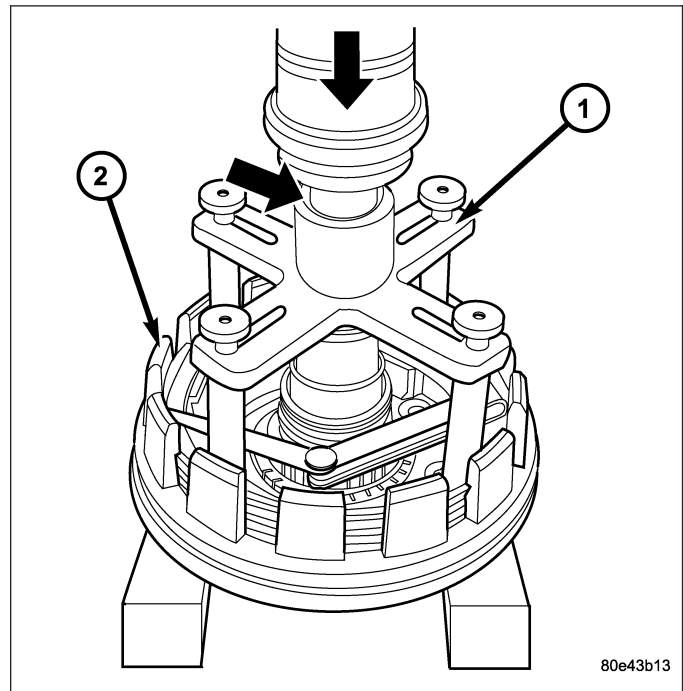


5. Insert the multiple-disc pack (6) in the outer multiple-disc carrier and measure the clutch clearance.

**Note:** Pay attention to the sequence of discs. If the original clutch discs are reused, be sure to return the disc identified on disassembly as belonging on top of the disc spring (5) to its original location.

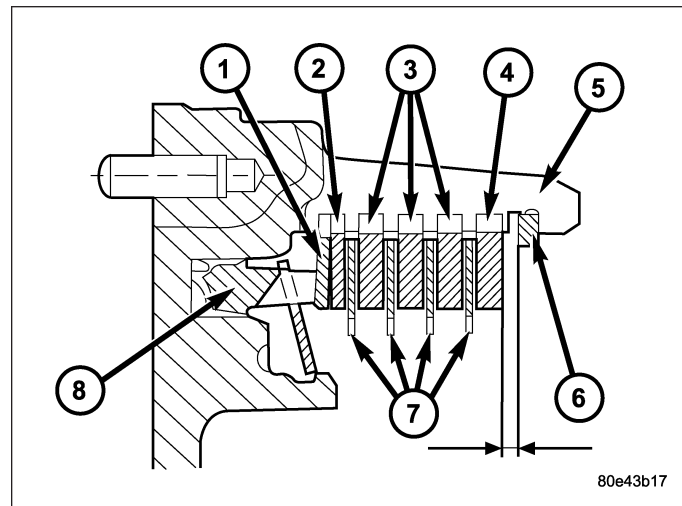
**CAUTION:** When working with double sided friction discs, an externally lugged steel plate is installed first, followed by a friction disc, and continuing on until all the required discs are installed. When working with single sided friction discs, an externally lugged disc is installed first, followed by an internally lugged disc, and continuing on until all the required discs are installed. All single sided discs are installed with the friction side up.

**Note:** Place new friction multiple-discs in ATF fluid for one hour before installing.



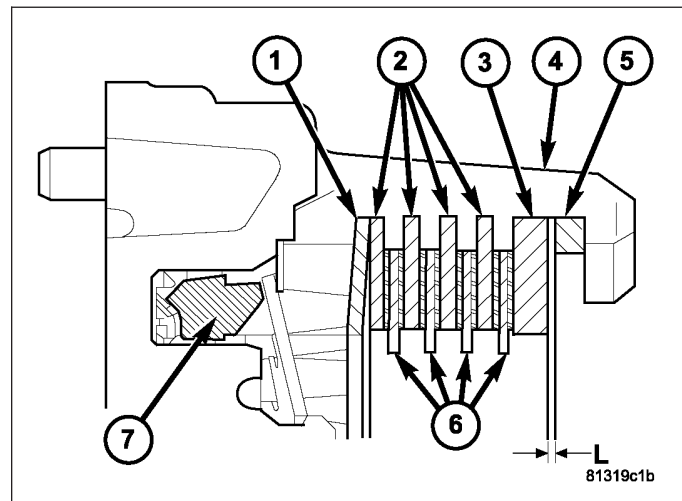
6. Measure B1 clutch clearance by mounting Pressing Tool 8901 (1) on outer multiple disc.
7. Using a lever press , compress pressing tool as far as the stop (then the marking ring is still visible, see small arrow).

8. For transmissions using double sided friction discs, use a feeler gauge to determine the play "L" at three points between the snap-ring (6) and outer multiple-disc (4). During the measurement, the snap-ring (6) must contact the upper bearing surface of the groove in the outer multiple-disc carrier (5). The correct clearance for transmissions using double sided friction discs is 2.3-2.7 mm (0.091-0.106 in.) for two friction disc versions, 2.7-3.1 mm (0.106-0.122 in.) for three disc versions, and 3.0-3.4 mm (0.118-0.134 in.) for four disc versions.
9. Adjust with snap-ring (6), if necessary. Snap-rings are available in thicknesses of 2.6 mm (0.102 in.), 2.9 mm (0.114 in.), 3.2 mm (0.126 in.), 3.5 mm (0.138 in.), 3.8 mm (0.150 in.), and 4.1 mm (0.162 in.).



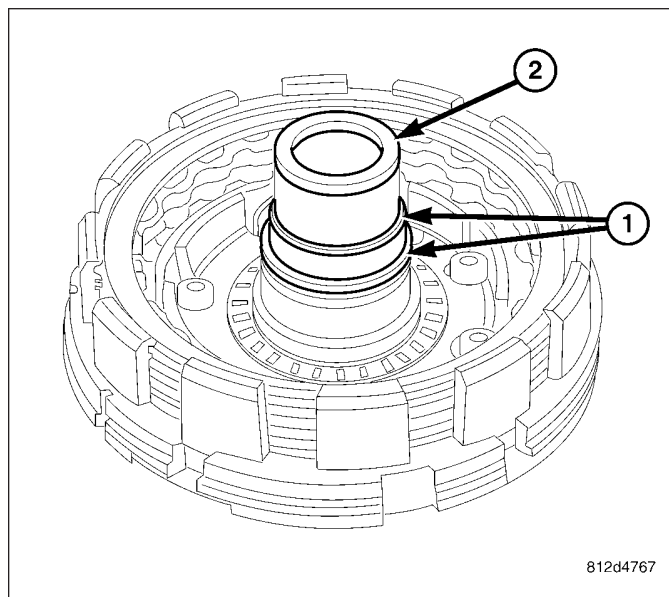
- 1 - DISC SPRING  
 2 - OUTER MULTIPLE DISC - 1.8 mm (0.071 IN.)  
 3 - OUTER MULTIPLE DISC - 2.8 mm (0.110 IN.)  
 4 - OUTER MULTIPLE DISC - 4.0 mm (0.158 IN.)  
 5 - B1 OUTER CARRIER  
 6 - SNAP-RING  
 7 - INNER MULTIPLE DISCS  
 8 - PISTON

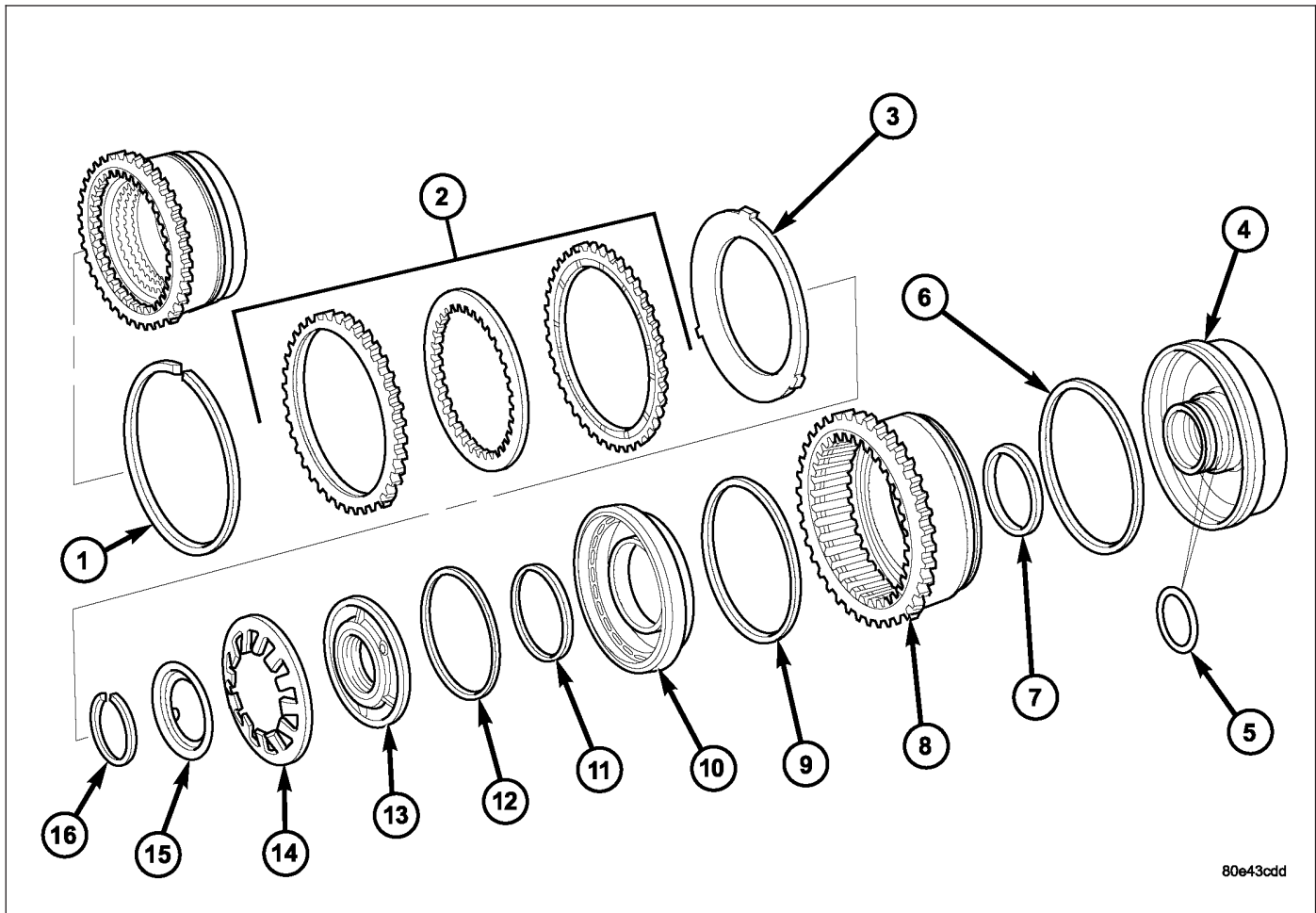
10. For transmissions using single sided friction discs, use a feeler gauge to determine the play "L" at three points between the snap-ring (5) and outer multiple-disc (3). During the measurement, the snap-ring (5) must contact the upper bearing surface of the groove in the outer multiple-disc carrier (4). The correct clearance is 2.2-2.6 mm (0.087-0.102 in.) for four friction disc versions, 2.4-2.8 mm (0.095-0.110 in.) for six disc versions, and 2.6-3.0 mm (0.102-0.118 in.) for eight disc versions.
11. Adjust with snap-ring (5), if necessary. Snap-rings are available in thicknesses of 2.6 mm (0.102 in.), 2.9 mm (0.114 in.), 3.2 mm (0.126 in.), 3.5 mm (0.138 in.), 3.8 mm (0.150 in.), and 4.1 mm (0.162 in.).



- 1 - DISC SPRING  
 2 - OUTER MULTIPLE DISC  
 3 - OUTER MULTIPLE DISC - 4.0 mm (0.158 IN.)  
 4 - B1 OUTER CARRIER  
 5 - SNAP-RING  
 6 - INNER MULTIPLE DISCS  
 7 - PISTON

12. Install the teflon rings (1) onto the B1 plate carrier hub (2).
13. Coat Teflon rings (1) lightly with grease and insert in the groove so that the joint remains together.



**B2-HOLDING CLUTCH****DISASSEMBLY**

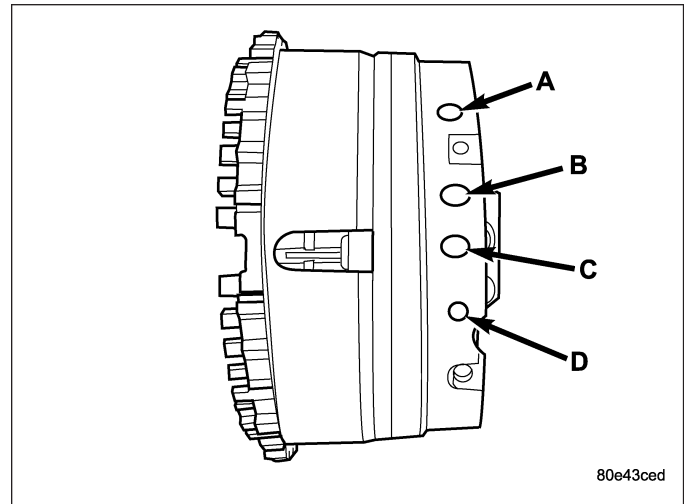
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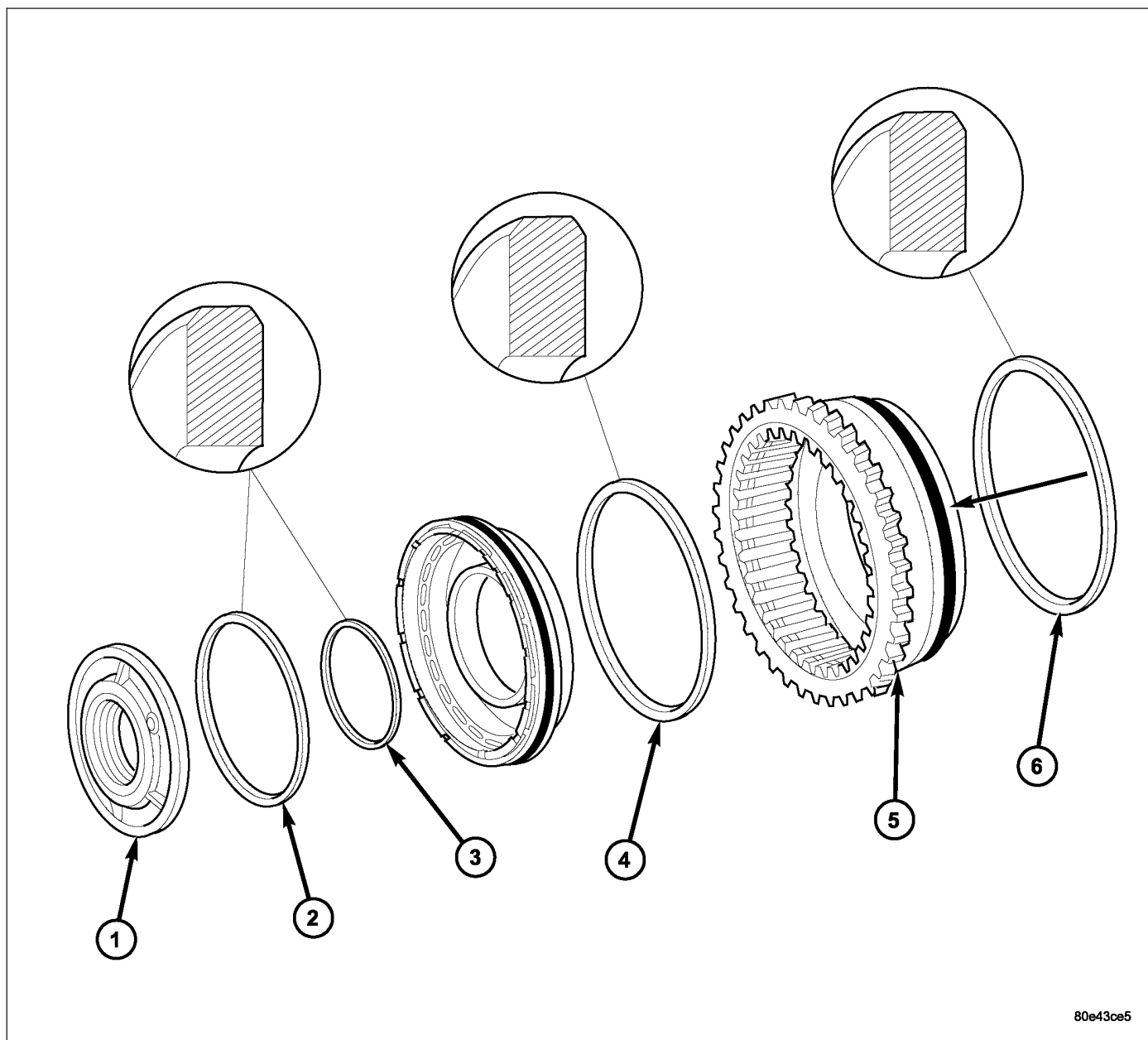
**Holding Clutch B2**

- |                                     |                                       |
|-------------------------------------|---------------------------------------|
| 1 - SNAP-RING                       | 9 - B2 PISTON SEALING RING            |
| 2 - MULTIPLE DISC PACK              | 10 - B2 PISTON                        |
| 3 - DISC SPRING                     | 11 - PISTON GUIDE SEALING RING        |
| 4 - B2 AND B3 PISTON GUIDE          | 12 - PISTON GUIDE SEALING RING        |
| 5 - O-RING                          | 13 - PISTON GUIDE RING                |
| 6 - B3 PISTON SEALING RING          | 14 - PISTON BACK PRESSURE DISC SPRING |
| 7 - B3 PISTON SEALING RING          | 15 - SPRING PLATE                     |
| 8 - B3 PISTON/B2 OUTER DISC CARRIER | 16 - SNAP-RING                        |

1. Remove snap ring (1).
2. Take multiple-disc pack B2 (2) and disc spring (3) out of the outer multiple-disc carrier B2 (8). The outer multiple-disc carrier for the multi-disc holding clutch B2 is the piston for the multiple-disc holding clutch B3 at the same time. Note which clutch disc is removed just prior to the disc spring (3) for re-assembly. If the clutch discs are re-used, this disc must be returned to its original position on top of the disc spring.
3. Place the Multi-use Spring Compressor 8900 on the spring disc (14) and compress the spring until the groove for the snap-ring is exposed.
4. Remove snap-ring (16).
5. Remove spring plate (15) and disc spring (14).

6. Separate piston guide ring (13) and the B2 piston (10) from the B3 piston (8) by blowing compressed air into the bore (**D**).
7. Press piston guide ring (13) out of the B2 piston (10).
8. Separate piston guide (4) from the B3 piston (8) by blowing compressed air into the bore (**A**).



**ASSEMBLY**

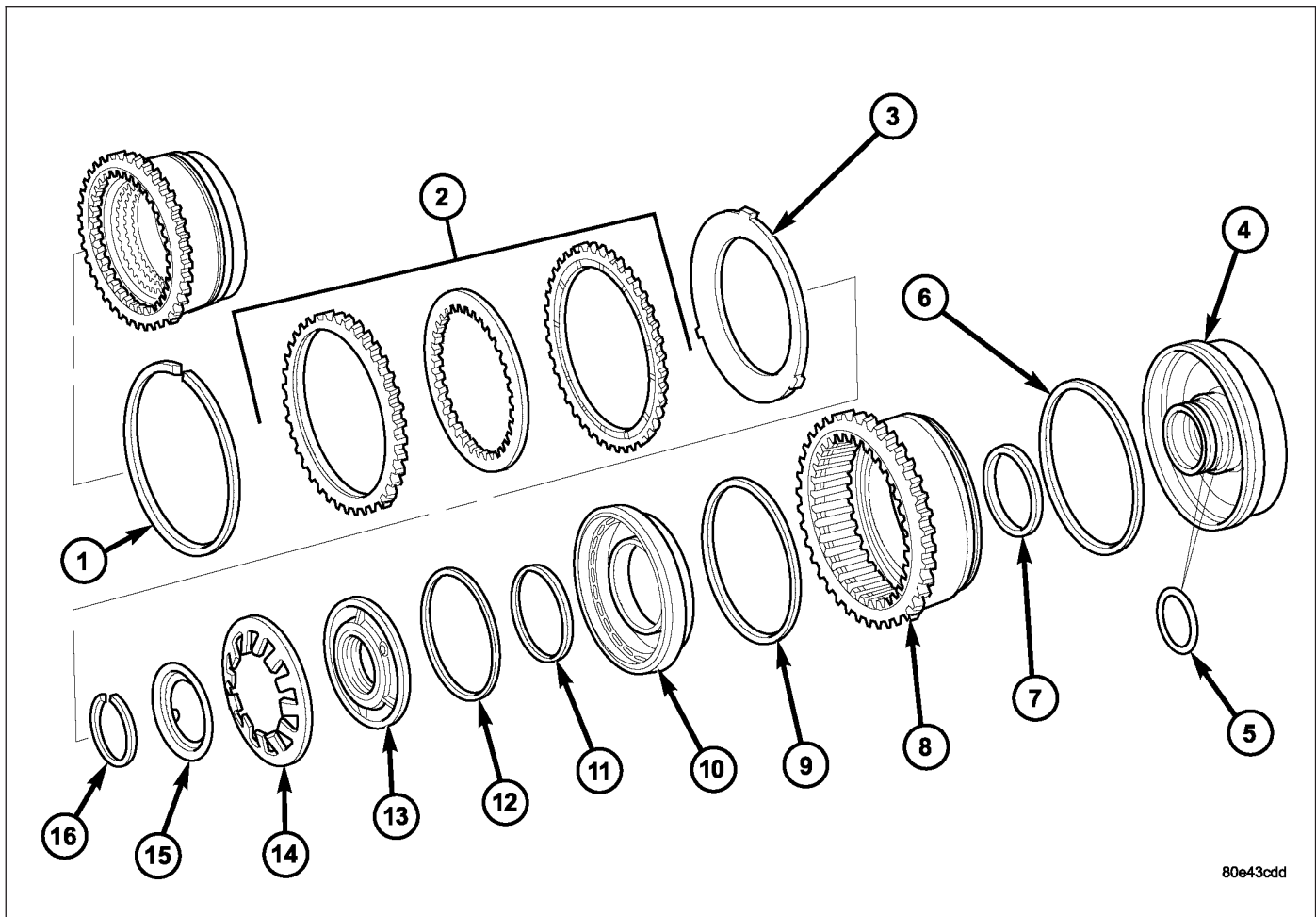
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***Holding Clutch B2/B3 Seals***

- 1 - PISTON GUIDE RING
- 2 - PISTON GUIDE RING SEALING RING
- 3 - PISTON GUIDE RING SEALING RING

- 4 - B2 PISTON SEALING RING
- 5 - B3 PISTON/B2 OUTER DISC CARRIER
- 6 - B3 PISTON SEALING RING

1. Check all sealing rings (2-4, 6), replace if necessary. The rounded off edges on the sealing rings (2, 4, 6) must point outwards.



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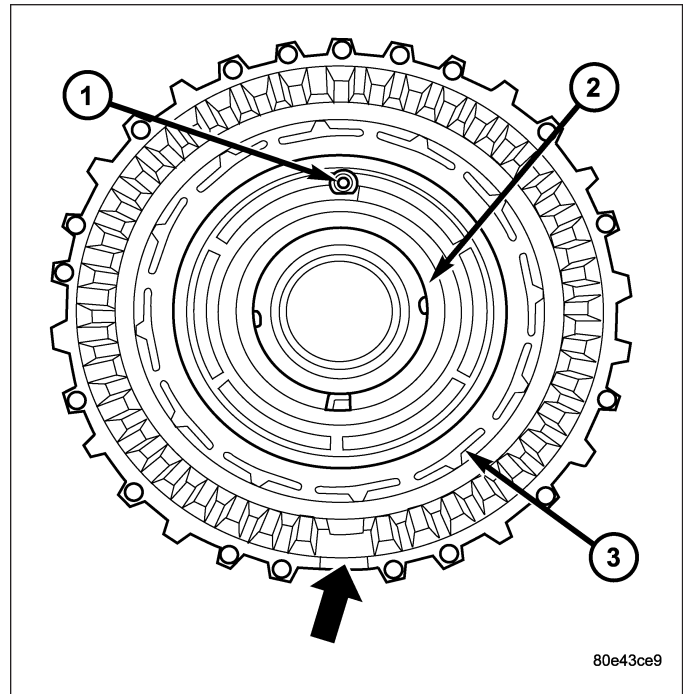
### Holding Clutch B2

- |                                     |                                       |
|-------------------------------------|---------------------------------------|
| 1 - SNAP-RING                       | 9 - B2 PISTON SEALING RING            |
| 2 - MULTIPLE DISC PACK              | 10 - B2 PISTON                        |
| 3 - DISC SPRING                     | 11 - PISTON GUIDE SEALING RING        |
| 4 - B2 AND B3 PISTON GUIDE          | 12 - PISTON GUIDE SEALING RING        |
| 5 - O-RING                          | 13 - PISTON GUIDE RING                |
| 6 - B3 PISTON SEALING RING          | 14 - PISTON BACK PRESSURE DISC SPRING |
| 7 - B3 PISTON SEALING RING          | 15 - SPRING PLATE                     |
| 8 - B3 PISTON/B2 OUTER DISC CARRIER | 16 - SNAP-RING                        |

2. Assemble piston guide (4) and B3 piston (8) in the correct position. Verify that the missing tooth in the B3 piston/B2 outer disc carrier (8) is aligned with the centerline of the two threaded holes in the B2 and B3 piston guide (4).
3. Insert B2 piston (10) in B3 piston (8).



4. Insert piston guide ring (2). The valve (1) in the piston guide ring must be on top.



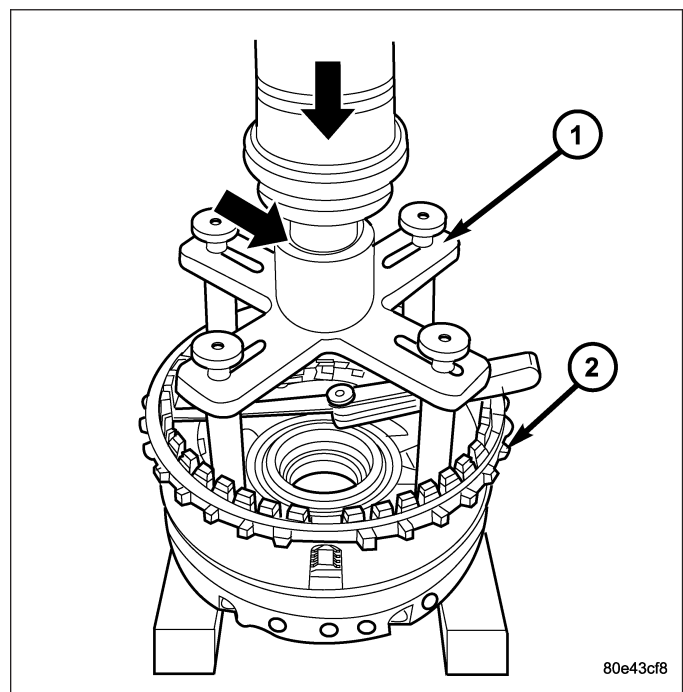
5. Insert disc spring (14) and spring plate (15). Insert disc spring with the curvature towards the spring plate  
 6. Place Multi-use Spring Compressor 8900 on the disc spring (14) and compress the spring until the groove for the snap-ring is exposed.  
 7. Insert snap-ring (16).

**Note:** Pay attention to sequence of discs. If the original clutch discs are reused, be sure to return the disc identified on disassembly as belonging on top of the disc spring (3) to its original location. Place new friction multiple-discs in ATF fluid for one hour before installing.

8. Insert disc spring (3) and multiple-disc pack (2) in the B2 outer multiple-disc carrier.  
 9. Insert snap-ring (1).

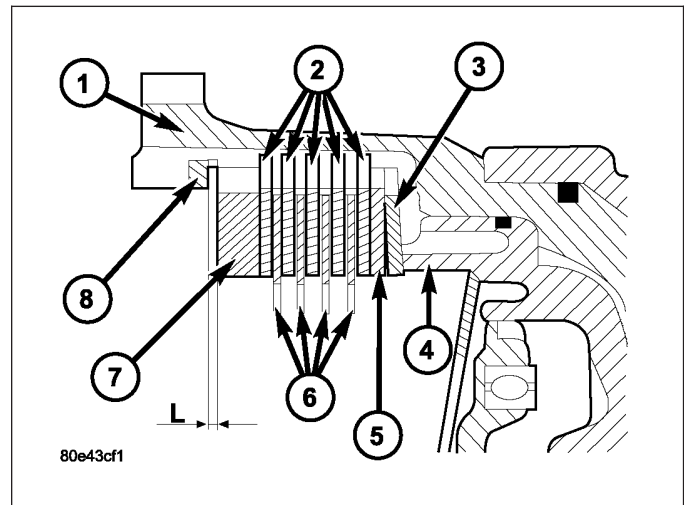
**Note:** During the measurement the snap-ring (8) must contact the upper bearing surface of the groove in the outer multiple-disc carrier.

10. Measure the B2 clutch pack clearance by mounting the Pressing Tool 8901 (1) on outer multiple disc.  
 11. Using a lever press, compress the pressing tool as far as the stop (then the marking ring is still



visible, see small arrow).

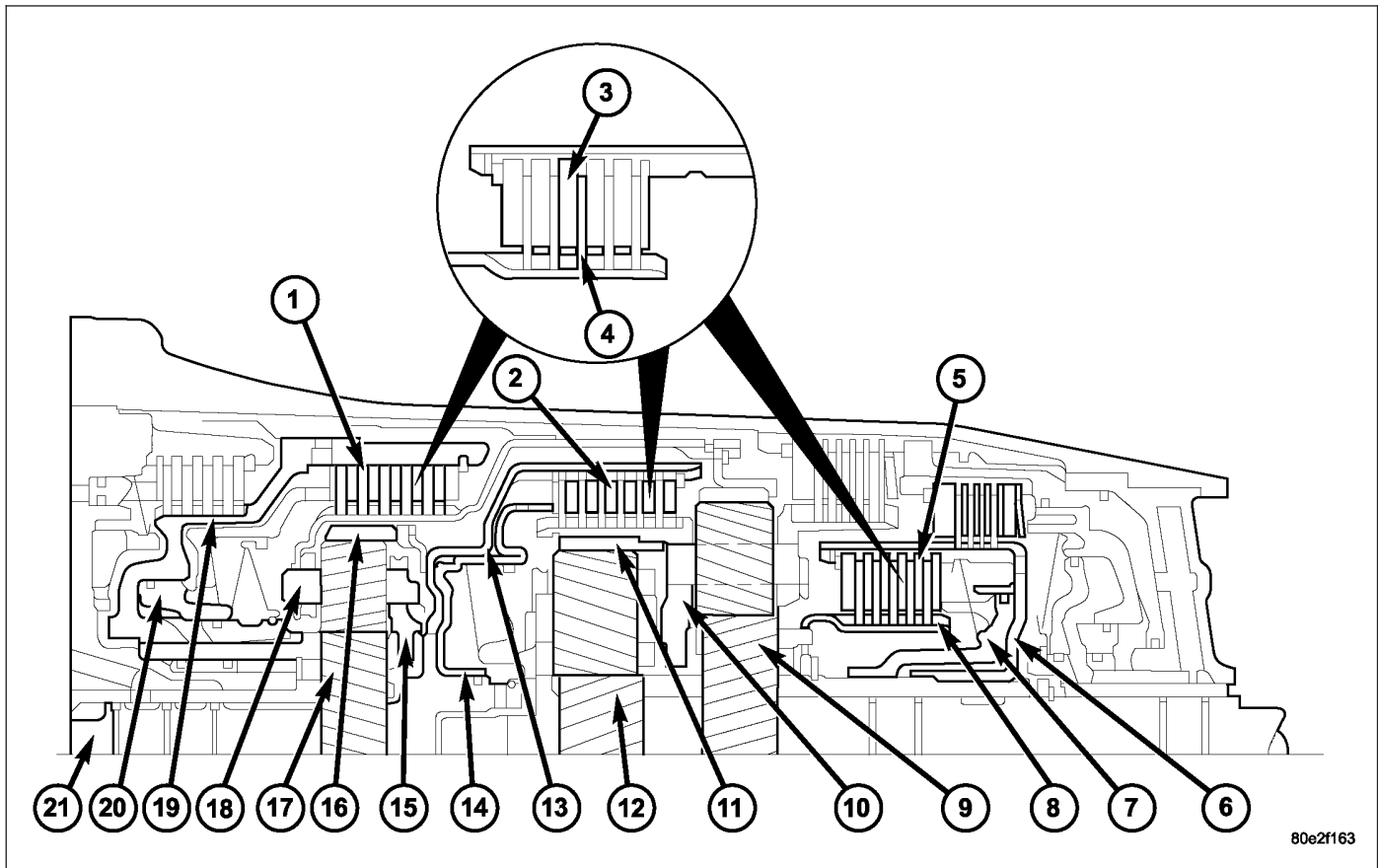
12. Using a feeler gauge, determine the play "L" at three points between the snap-ring (8) and outer multiple-disc (7).
13. The correct clutch clearance is 1.9-2.3 mm (0.075-0.091 in.) for the four friction disc versions and 2.0-2.4 mm (0.079-0.095 in.) for the five disc versions.
14. Adjust with snap-ring (8), if necessary. Snap-rings are available in thicknesses of 2.9 mm (0.114 in.), 3.2 mm (0.126 in.), 3.5 mm (0.138 in.), 3.8 mm (0.150 in.), and 4.1 mm (0.162 in.).



- 1 - B2 OUTER DISC CARRIER
- 2 - FRICTION DISCS
- 3 - DISC SPRING
- 4 - B2 PISTON
- 5 - OUTER MULTIPLE DISC - 1.8 MM (0.071 IN.)
- 6 - OUTER MULTIPLE DISC - 1.8 MM (0.071 IN.)
- 7 - OUTER MULTIPLE DISC - 6.5 MM (0.256 IN.)
- 8 - SNAP-RING

## CLUTCHES-INPUT

### DESCRIPTION

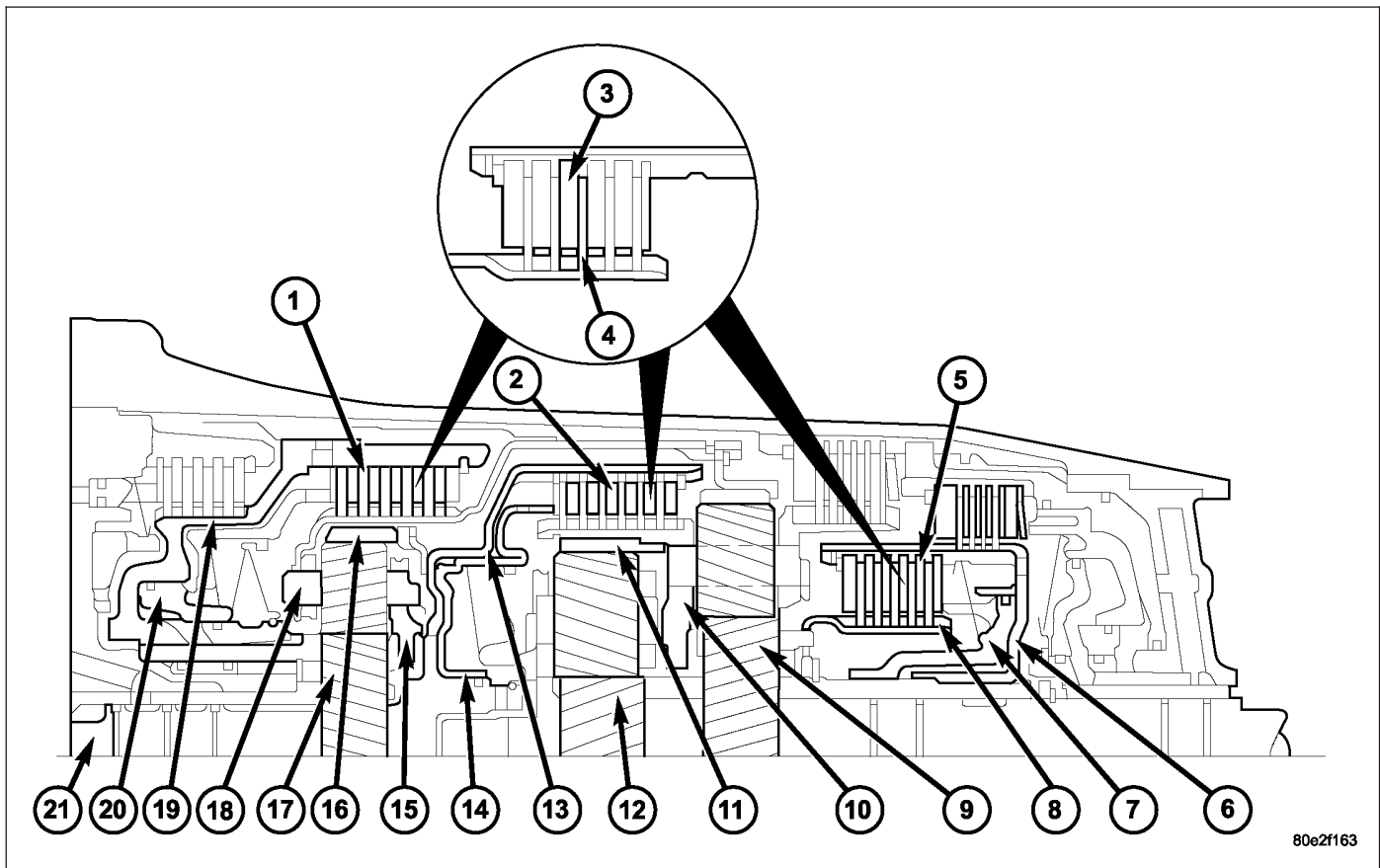


*Input Clutches*

- |   |  |
|---|--|
| 1 - K1 CLUTCH                                   | 12 - CENTER PLANETARY GEARSET SUN GEAR         |
| 2 - K2 CLUTCH                                   | 13 - K2 CLUTCH EXTERNALLY TOOTHED DISC CARRIER |
| 3 - EXTERNALLY TOOTHED DISC                     | 14 - K2 CLUTCH PISTON                          |
| 4 - INTERNALLY TOOTHED DISC                     | 15 - FRONT PLANETARY GEARSET PLANETARY CARRIER |
| 5 - K3 CLUTCH                                   | 16 - FRONT PLANETARY GEARSET ANNULUS GEAR      |
| 6 - K3 CLUTCH EXTERNALLY TOOTHED DISC CARRIER   | 17 - FRONT PLANETARY GEARSET SUN GEAR          |
| 7 - K3 CLUTCH PISTON                            | 18 - K1 CLUTCH INTERNALLY TOOTHED DISC CARRIER |
| 8 - K3 CLUTCH INTERNALLY TOOTHED DISC CARRIER   | 19 - K1 CLUTCH EXTERNALLY TOOTHED DISC CARRIER |
| 9 - REAR PLANETARY GEARSET SUN GEAR             | 20 - K1 CLUTCH PISTON                          |
| 10 - CENTER PLANETARY GEARSET PLANETARY CARRIER | 21 - DRIVE SHAFT                               |
| 11 - CENTER PLANETARY GEARSET ANNULUS GEAR      |  |

Three multi-plate input clutches (1, 2, 5), the front, middle and rear multi-plate clutches K1 (1), K2 (2), and K3 (5), are located in the planetary gear sets in the transmission housing.

A multi-plate input clutch consists of a number of internally toothed discs (4) on an internally toothed disc carrier and externally toothed discs (3) on an externally toothed disc carrier.

**OPERATION****Input Clutches**

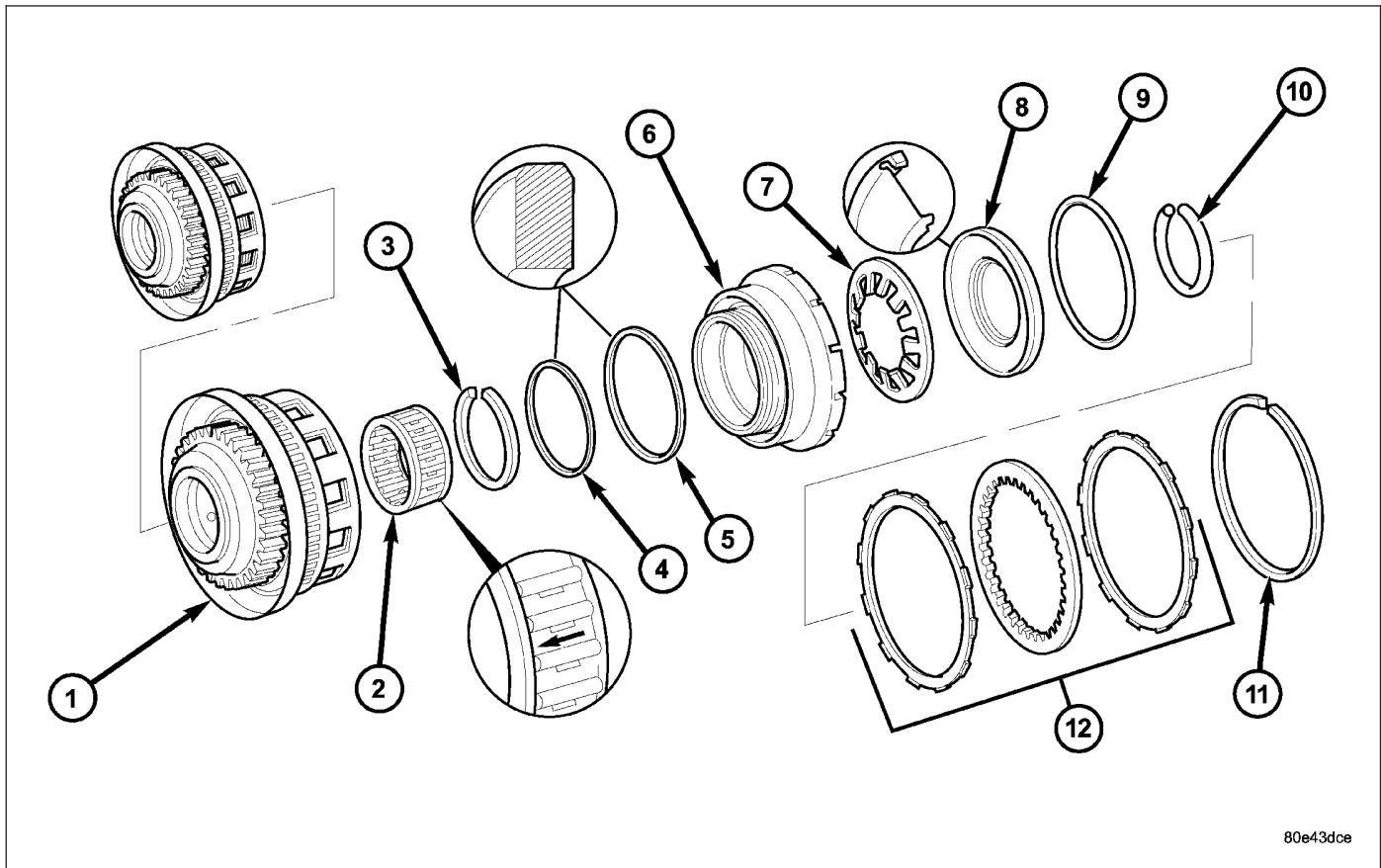
- |   |  |
|---|--|
| 1 - K1 CLUTCH                                   | 12 - CENTER PLANETARY GEARSET SUN GEAR         |
| 2 - K2 CLUTCH                                   | 13 - K2 CLUTCH EXTERNALLY TOOTHED DISC CARRIER |
| 3 - EXTERNALLY TOOTHED DISC                     | 14 - K2 CLUTCH PISTON                          |
| 4 - INTERNALLY TOOTHED DISC                     | 15 - FRONT PLANETARY GEARSET PLANETARY CARRIER |
| 5 - K3 CLUTCH                                   | 16 - FRONT PLANETARY GEARSET ANNULUS GEAR      |
| 6 - K3 CLUTCH EXTERNALLY TOOTHED DISC CARRIER   | 17 - FRONT PLANETARY GEARSET SUN GEAR          |
| 7 - K3 CLUTCH PISTON                            | 18 - K1 CLUTCH INTERNALLY TOOTHED DISC CARRIER |
| 8 - K3 CLUTCH INTERNALLY TOOTHED DISC CARRIER   | 19 - K1 CLUTCH EXTERNALLY TOOTHED DISC CARRIER |
| 9 - REAR PLANETARY GEARSET SUN GEAR             | 20 - K1 CLUTCH PISTON                          |
| 10 - CENTER PLANETARY GEARSET PLANETARY CARRIER | 21 - DRIVE SHAFT                               |
| 11 - CENTER PLANETARY GEARSET ANNULUS GEAR      |  |

The input clutches produce a non-positive locking connection between two elements of a planetary gear set or between one element from each of two planetary gear sets in order to transmit the drive torque.

If the piston (20) on multi-plate clutch K1 (1) is subjected to oil pressure, it presses the internal and external discs of the disc set together. The sun gear (17) is locked with the planetary carrier (15) via the externally toothed disc carrier (19) and the internally toothed disc carrier (18). The front planetary gear set is thus locked and turns as a closed unit.

If the multi-plate clutch K2 (2) is actuated via the piston (14), the piston compresses the disc set. The annulus gear (16) of the front planetary gear set is locked with the annulus gear (11) of the center planetary gear set via the externally toothed disc carrier (13) and the center planetary carrier (10) on which the internally toothed discs are seated. Annulus gear (16) and annulus gear (11) turn at the same speed as the input shaft (21)

If the multi-plate clutch K3 (5) is actuated via the piston (7), the piston compresses the disc set. The sun gear (12) of the center planetary gear set is locked with the sun gear (9) of the rear planetary gear set via the externally toothed disc carrier (6) and the internally toothed disc carrier (8). Sun gear (12) and sun gear (9) turn at the same speed.

**K1-INPUT CLUTCH****DISASSEMBLY**

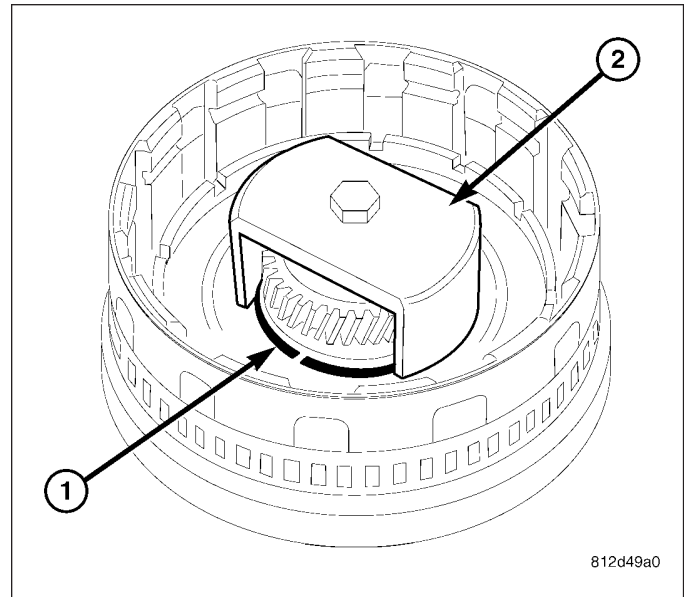
80e43dce

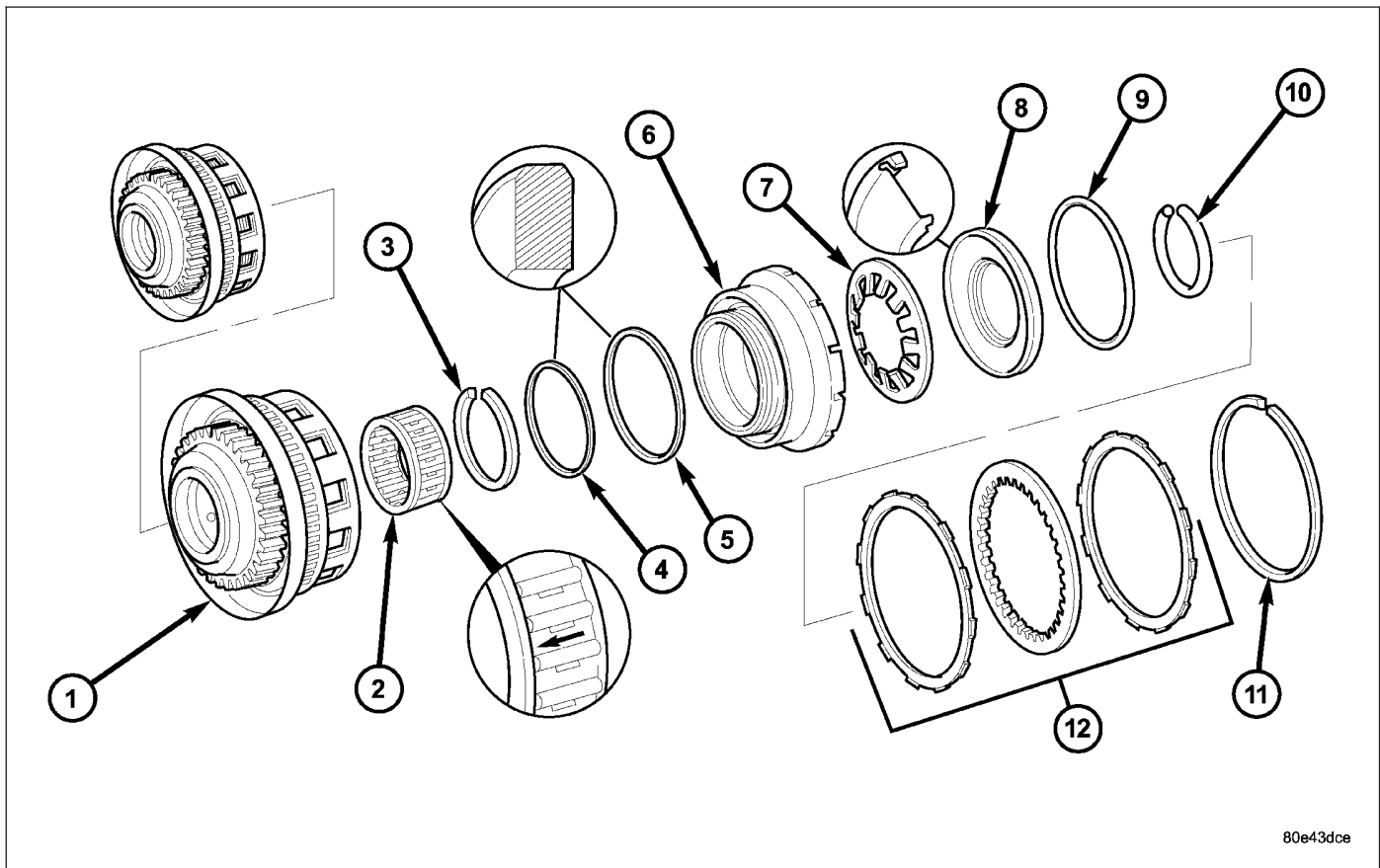
***Input Clutch K1 Components***

- |                                     |  |
|-------------------------------------|--|
| 1 - K1 OUTER DISC CARRIER           | 7 - DISC SPRING  |
| 2 - FREEWHEELING CLUTCH F1          | 8 - SPRING PLATE   |
| 3 - SNAP-RING                       | 9 - SPRING PLATE SEALING RING                                      |
| 4 - OUTER DISC CARRIER SEALING RING | 10 - SNAP-RING   |
| 5 - PISTON SEALING RING             | 11 - SNAP-RING   |
| 6 - PISTON                          | 12 - MULTIPLE DISC PACK - REFER TO TEXT FOR CORRECT ASSEMBLY ORDER |

1. Remove snap-ring (11) from outer multiple-disc carrier (6).
2. Take multiple-disc pack (12) out of outer multiple-disc carrier (6). Note which clutch disc is removed just prior to the spring plate (8) for re-assembly. If the clutch discs are re-used, this disc must be returned to its original position on top of the spring plate.

3. Place Multi-use Spring Compressor 8900 (2) on the spring plate and compress the spring until the snap-ring (1) is exposed.
4. Remove snap-ring (1).
5. Take out disc spring (7) and remove piston (6) by carefully blowing compressed air into the drilled oil feed passage.
6. Remove snap-ring (3) and take out front freewheeling clutch F1 (2). Take care when removing the F1 clutch to prevent the clutch sprags from falling out. If this occurs, the clutch must be replaced.



**ASSEMBLY**

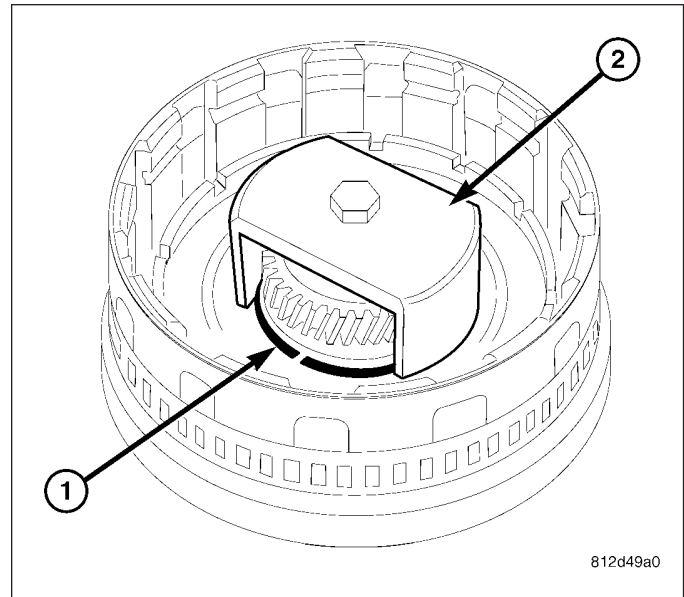
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***Input Clutch K1 Components***

- |                                     |  |
|-------------------------------------|--|
| 1 - K1 OUTER DISC CARRIER           | 7 - DISC SPRING  |
| 2 - FREEWHEELING CLUTCH F1          | 8 - SPRING PLATE   |
| 3 - SNAP-RING                       | 9 - SPRING PLATE SEALING RING                                      |
| 4 - OUTER DISC CARRIER SEALING RING | 10 - SNAP-RING   |
| 5 - PISTON SEALING RING             | 11 - SNAP-RING   |
| 6 - PISTON                          | 12 - MULTIPLE DISC PACK - REFER TO TEXT FOR CORRECT ASSEMBLY ORDER |

1. Install piston (6) in the outer multiple-disc carrier (1). Check sealing rings (4 and 5), replace if necessary. The rounded off edges of the sealing rings must point outwards.
2. Insert disc spring (7). Insert disc spring with the curvature towards the piston.
3. Insert spring plate (8). Insert spring plate with the curvature towards the sun gear. Check sealing ring (9), replace if necessary.

4. Place Multi-use Spring Compressor 8900 (2) on spring plate and compress the spring until the groove of the snap-ring (1) is exposed.
5. Insert snap-ring (1). After installing, check snap-ring for correct seat.

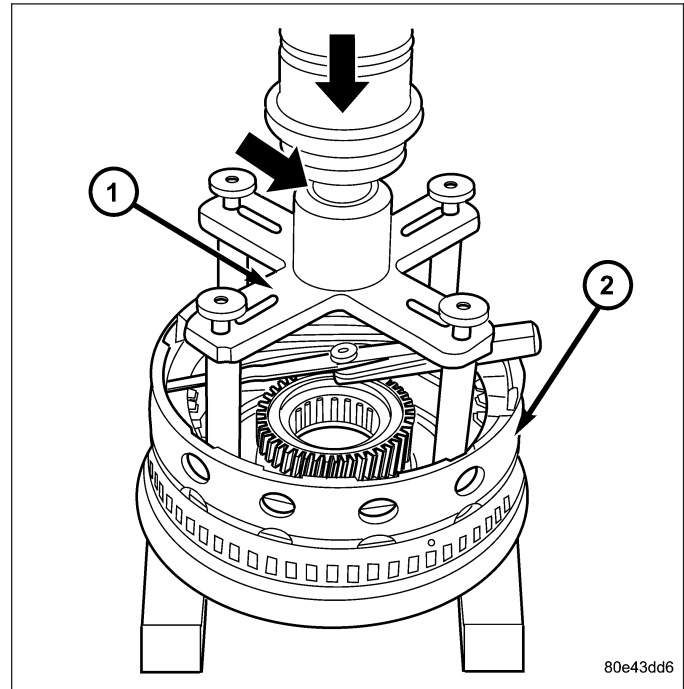


**CAUTION:** When working with double sided friction discs, an externally lugged steel plate is installed first, followed by a friction disc, and continuing on until all the required discs are installed. When working with single sided friction discs, an externally lugged disc is installed first, followed by an internally lugged disc, and continuing on until all the required discs are installed. All single sided discs are installed with the friction side up.

**Note:** Pay attention to the sequence of discs. If the original clutch discs are reused, be sure to return the disc identified on disassembly as belonging on top of the spring plate (8) to its original location.

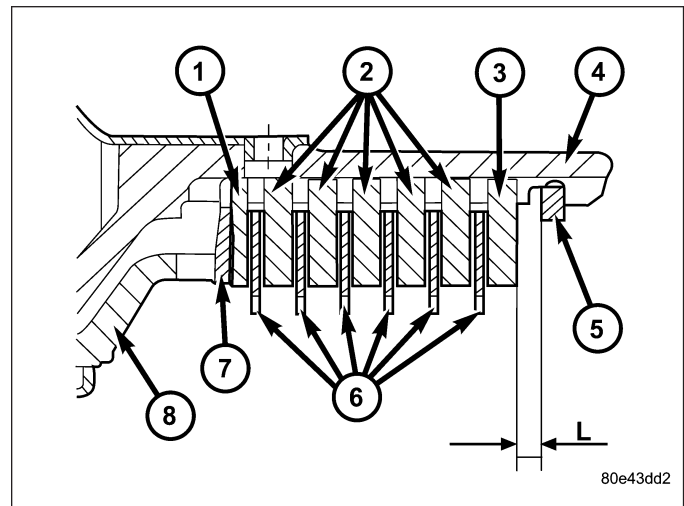
**Note:** Place new friction multiple-discs in ATF fluid for one hour before installing.

6. Insert multiple-disc pack (12) in the outer multiple-disc carrier.
7. Insert snap-ring (11).
8. Measure the K1 clutch pack clearance by mounting Pressing Tool 8901 (1) on outer multiple disc.
9. Using a lever press, compress pressing tool as far as the stop (then the marking ring is still visible, see small arrow).



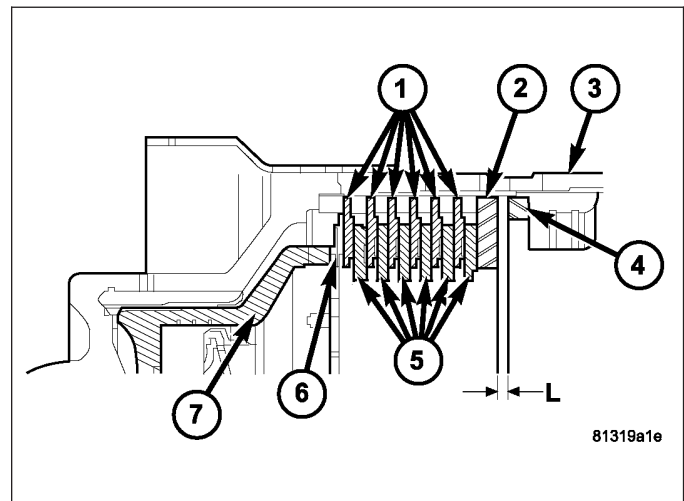


10. For transmissions using double sided friction discs, use a feeler gauge to determine the play "L" at three points between the snap-ring (5) and outer multiple-disc (3).
11. During the measurement the snap-ring (5) must contact the upper bearing surface of the groove in the outer multiple-disc carrier (4).
12. The correct clutch clearance for transmissions with double sided friction discs is 2.7-3.1 mm (0.106-0.122 in.) for three friction disc versions, 3.0-3.4 mm (0.118-0.134 in.) for four disc versions, 3.3-3.7 mm (0.130-0.146 in.) for five disc versions, and 3.6-4.0 mm (0.142-0.158 in.) for six disc versions.
13. Adjust with snap-ring (5), if necessary. Snap-rings are available in thicknesses of 2.6 mm (0.102 in.), 2.9 mm (0.114 in.), 3.2 mm (0.126 in.), 3.5 mm (0.138 in.), 3.8 mm (0.150 in.), and 4.1 mm (0.162 in.).
14. Insert front freewheeling clutch F1 (2) and fit snap-ring (3). The freewheeling clutch F1 (2) must be installed in the direction of the arrow.

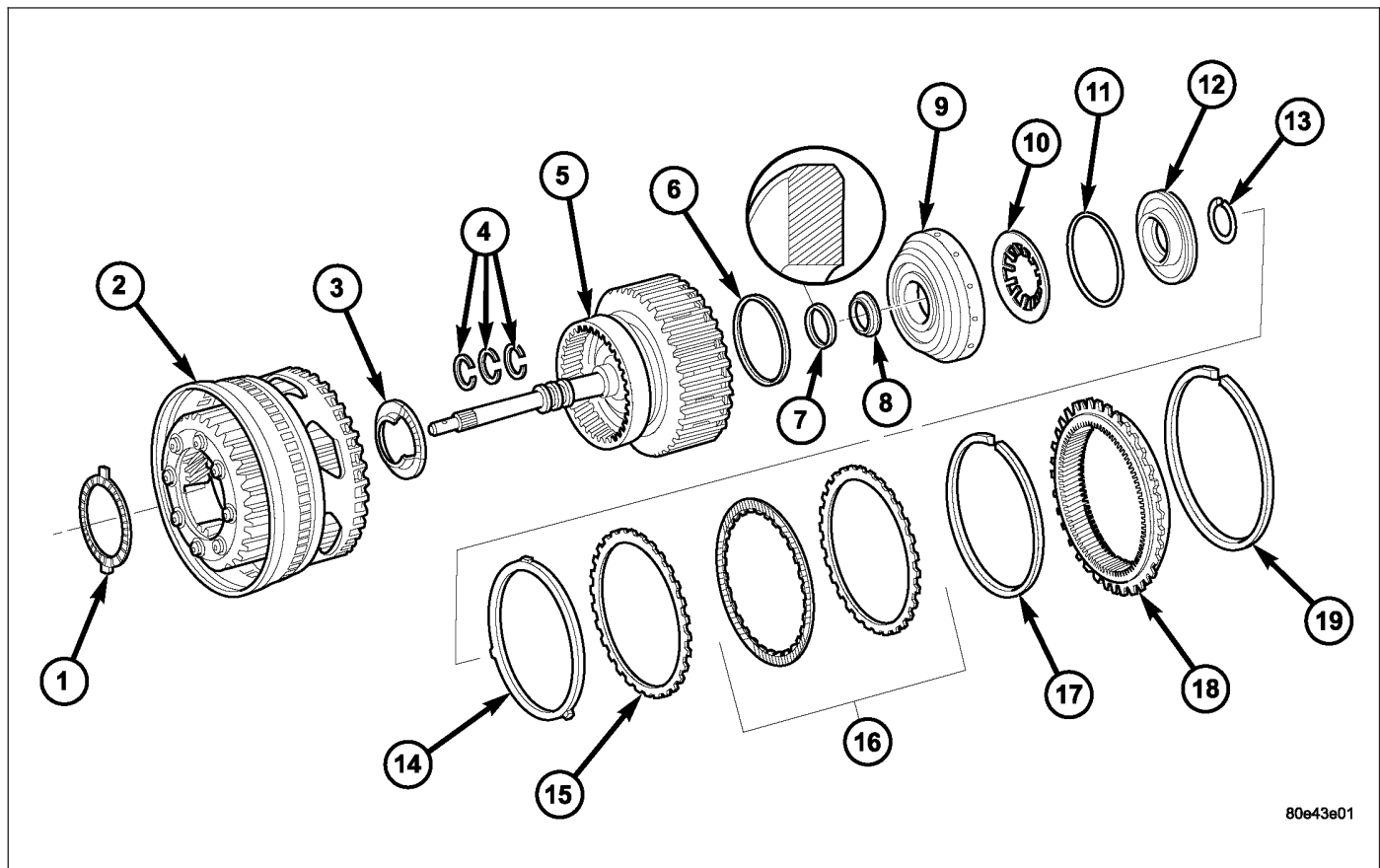


- 1 - OUTER MULTIPLE DISC - 1.8MM (0.071 IN.)
- 2 - OUTER MULTIPLE DISC - 2.8MM (0.110 IN.)
- 3 - OUTER MULTIPLE DISC - 4.0MM (0.158 IN.)
- 4 - K1 OUTER DISC CARRIER
- 5 - SNAP-RING
- 6 - FRICTION DISCS
- 7 - DISC SPRING
- 8 - PISTON

15. For transmissions using single sided friction discs, use a feeler gauge to determine the play "L" at three points between the snap-ring (4) and outer multiple-disc (2).
16. During the measurement the snap-ring (4) must contact the upper bearing surface of the groove in the outer multiple-disc carrier (3).
17. The correct clutch clearance for transmissions with single sided friction discs is 2.4-2.8 mm (0.095-0.110 in.) for six friction disc versions, 2.6-3.0 mm (0.102-0.118 in.) for eight disc versions, 2.8-3.2 mm (0.110-0.126 in.) for ten disc versions, and 2.9-3.3 mm (0.114-0.130 in.) for twelve disc versions.
18. Adjust with snap-ring (4), if necessary. Snap-rings are available in thicknesses of 2.6 mm (0.102 in.), 2.9 mm (0.114 in.), 3.2 mm (0.126 in.), 3.5 mm (0.138 in.), 3.8 mm (0.150 in.), and 4.1 mm (0.162 in.).
19. Insert front freewheeling clutch F1 (2) and fit snap-ring (3). The freewheeling clutch F1 (2) must be installed in the direction of the arrow.



- 1 - OUTER MULTIPLE DISCS
- 2 - OUTER MULTIPLE DISC - 4.0MM (0.158 IN.)
- 3 - K1 OUTER DISC CARRIER
- 4 - SNAP-RING
- 5 - INNER MULTIPLE DISCS
- 6 - DISC SPRING
- 7 - PISTON

**K2-INPUT CLUTCH****DISASSEMBLY**

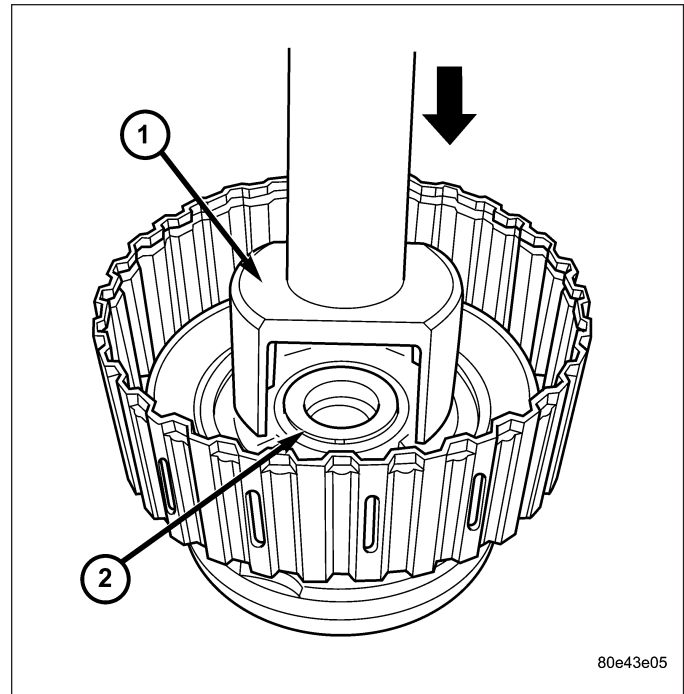
80e43e01

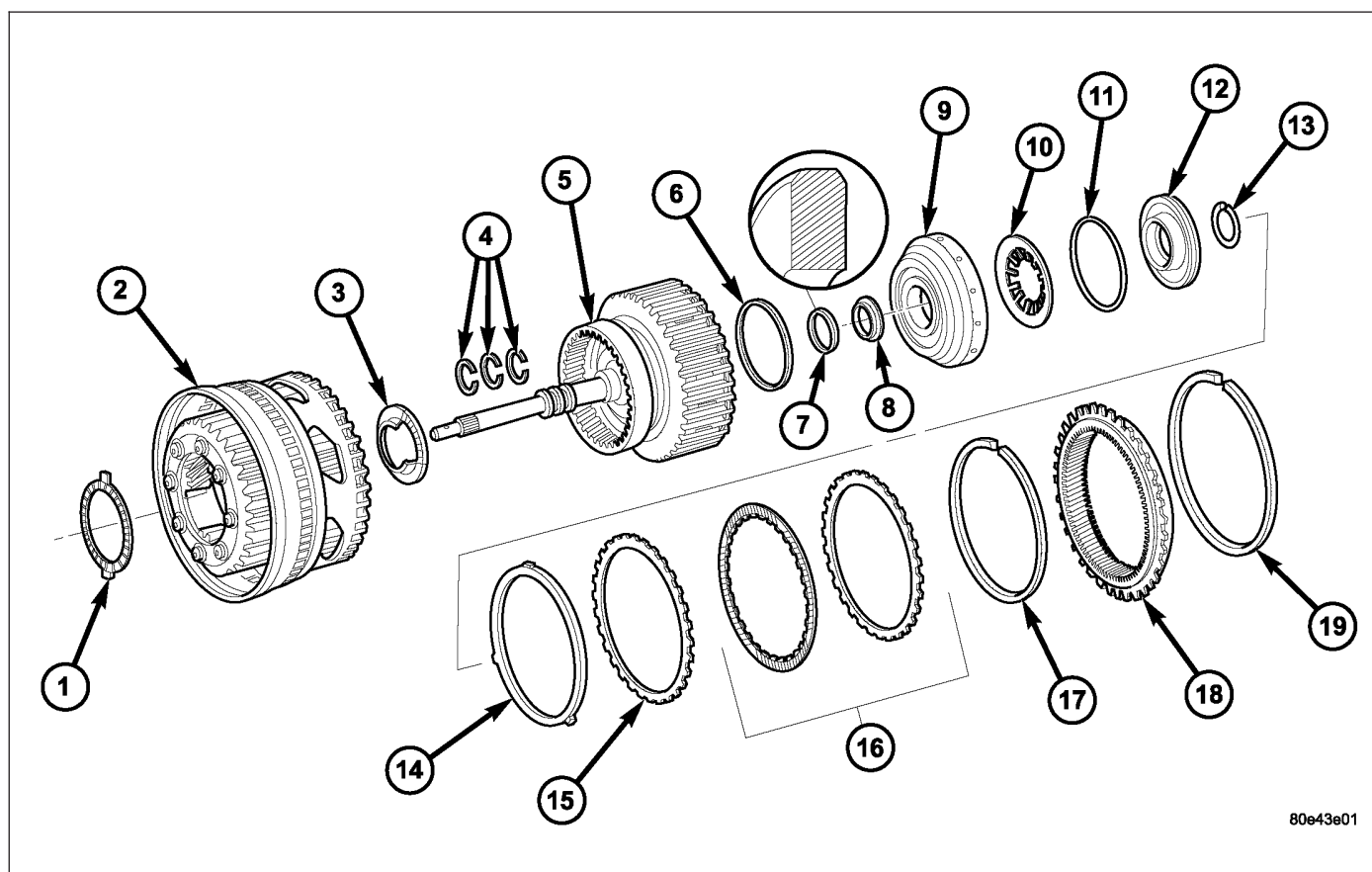
***Input Clutch K2 Components***

- |  |  |
|--|--|
| 1 - NEEDLE ROLLER BEARING                                | 11 - SPRING RETAINER SEALING - O-RING              |
| 2 - K1 INNER DISC CARRIER WITH INTEGRATED FRONT GEAR SET | 12 - SPRING RETAINER                               |
| 3 - THRUST BEARING                                       | 13 - SNAP-RING                                     |
| 4 - TORLON SEAL RINGS                                    | 14 - DISC SPRING                                   |
| 5 - INPUT SHAFT AND K2 CLUTCH                            | 15 - EXTERNALLY TOOTHED PLATE - 1.8 MM (0.071 IN.) |
| 6 - PISTON OUTER SEAL RING - O-RING                      | 16 - MULTIPLE DISC PACK                            |
| 7 - PISTON INNER SEAL RING                               | 17 - SNAP-RING                                     |
| 8 - THRUST WASHER  | 18 - HOLLOW GEAR                                   |
| 9 - PISTON   | 19 - SNAP-RING                                     |
| 10 - DISC SPRING   |  |

1. Remove snap-ring (19) from the K1 inner multiple-disc carrier with integrated front gear set (2) and take off hollow gear (18).
2. Remove input shaft with clutch K2 (5).
3. Remove needle thrust bearing (3).
4. Remove snap-ring (17) from K2 outer multiple-disc carrier.
5. Take out multiple-disc pack (16). Note which clutch disc is removed just prior to the disc spring (14) for re-assembly. If the clutch discs are re-used, this disc must be returned to its original position on top of the disc spring.
6. Take out disc spring (14).

7. Fit Multi-use Spring Compressor 8900 (1) onto spring retainer (12) and press until snap-ring (2) is released.
8. Remove snap-ring (2).
9. Take out disc spring (10) and pull piston (9) out of outer multiple-disc carrier.



**ASSEMBLY**

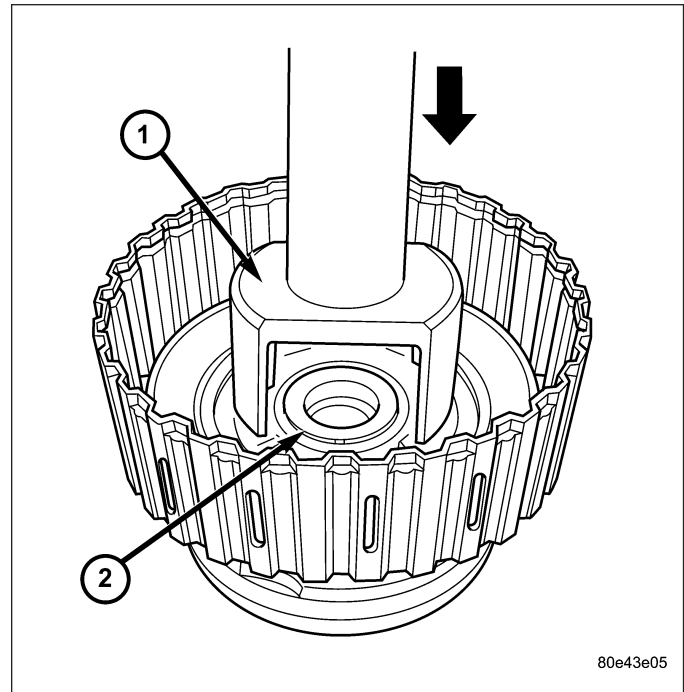
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***Input Clutch K2 Components***

- |  |  |
|--|--|
| 1 - NEEDLE ROLLER BEARING                                | 11 - SPRING RETAINER SEALING - O-RING              |
| 2 - K1 INNER DISC CARRIER WITH INTEGRATED FRONT GEAR SET | 12 - SPRING RETAINER                               |
| 3 - THRUST BEARING                                       | 13 - SNAP-RING                                     |
| 4 - TORLON SEAL RINGS                                    | 14 - DISC SPRING                                   |
| 5 - INPUT SHAFT AND K2 CLUTCH                            | 15 - EXTERNALLY TOOTHED PLATE - 1.8 MM (0.071 IN.) |
| 6 - PISTON OUTER SEAL RING - O-RING                      | 16 - MULTIPLE DISC PACK                            |
| 7 - PISTON INNER SEAL RING                               | 17 - SNAP-RING                                     |
| 8 - THRUST WASHER  | 18 - HOLLOW GEAR                                   |
| 9 - PISTON   | 19 - SNAP-RING                                     |
| 10 - DISC SPRING   |  |

1. Install piston (9) in outer multiple-disc carrier. Inspect seals (6 and 7), replace if necessary. The rounded edges of the inner piston seal (7) must point to the outside.
2. Insert disk spring (10) and spring retainer (12). Insert disk spring (10) with curved side pointing toward spring retainer (12). Inspect seal (11), replace if necessary.

3. Place Multi-use Spring Compressor 8900 (1) on spring plate and press until the groove (2) of the snap-ring is exposed.
4. Insert snap-ring.

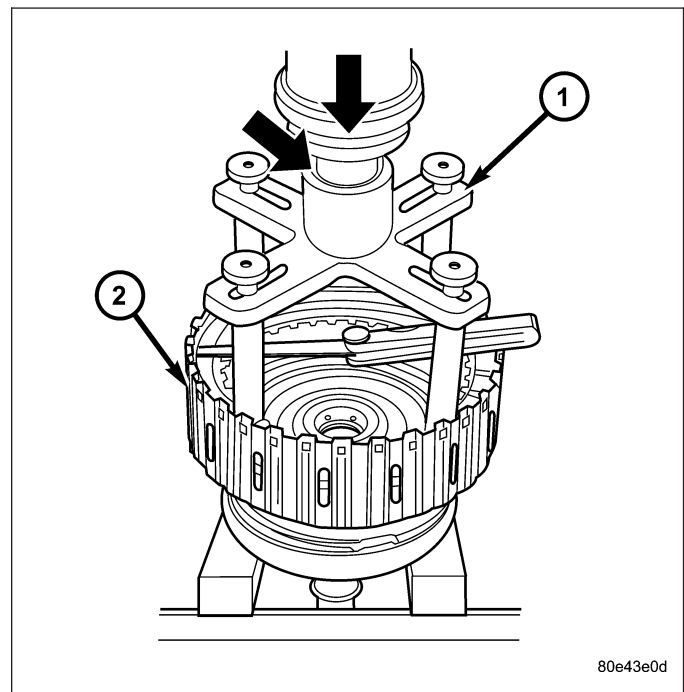


5. Insert disk spring (14).

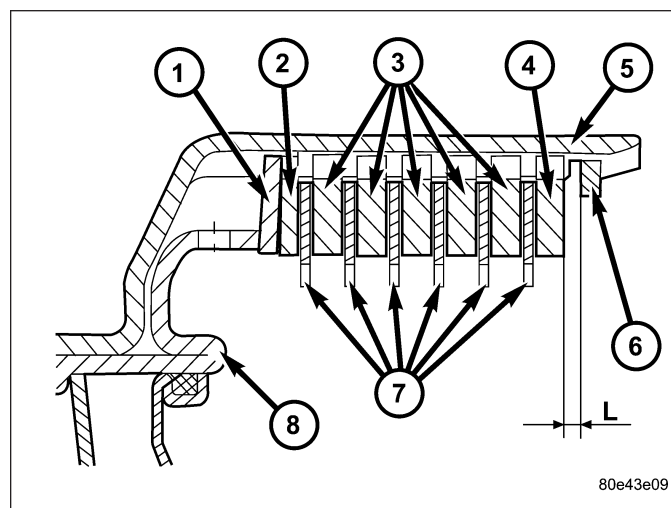
**Note:** Pay attention to the sequence of discs. If the original clutch discs are reused, be sure to return the disc identified on disassembly as belonging on top of the disc spring (14) to its original location.

6. Insert multiple-disk set (16) into outer multiple-disk carrier.
7. Fit snap-ring (17).

8. Measure K2 clutch clearance by mounting Pressing Tool 8901 (1) on outer multiple disc.
9. Using a lever press, compress pressing tool as far as the stop (then the marking ring is still visible, see small arrow).



10. Using a feeler gauge, determine the play "L" at three points between the snap-ring (6) and outer multiple-disc (4).
11. During the measurement the snap-ring (6) must contact the upper bearing surface of the groove in the outer multiple-disc carrier.
12. The correct clutch clearance is 2.3-2.7 mm (0.091-0.106 in.) for three friction disc versions, 2.4-2.8 mm (0.095-0.110 in.) for four disc versions, 2.5-2.9 mm (0.099-0.114 in.) for five disc versions, and 2.7-3.1 mm (0.106-0.122 in.) for six disc versions.
13. Adjust with snap-ring (6), if necessary. Snap-rings are available in thicknesses of 2.3 mm (0.091 in.), 2.6 mm (0.102 in.), 2.9 mm (0.114 in.), 3.2 mm (0.126 in.), 3.5 mm (0.138 in.), and 3.8 mm (0.150 in.).

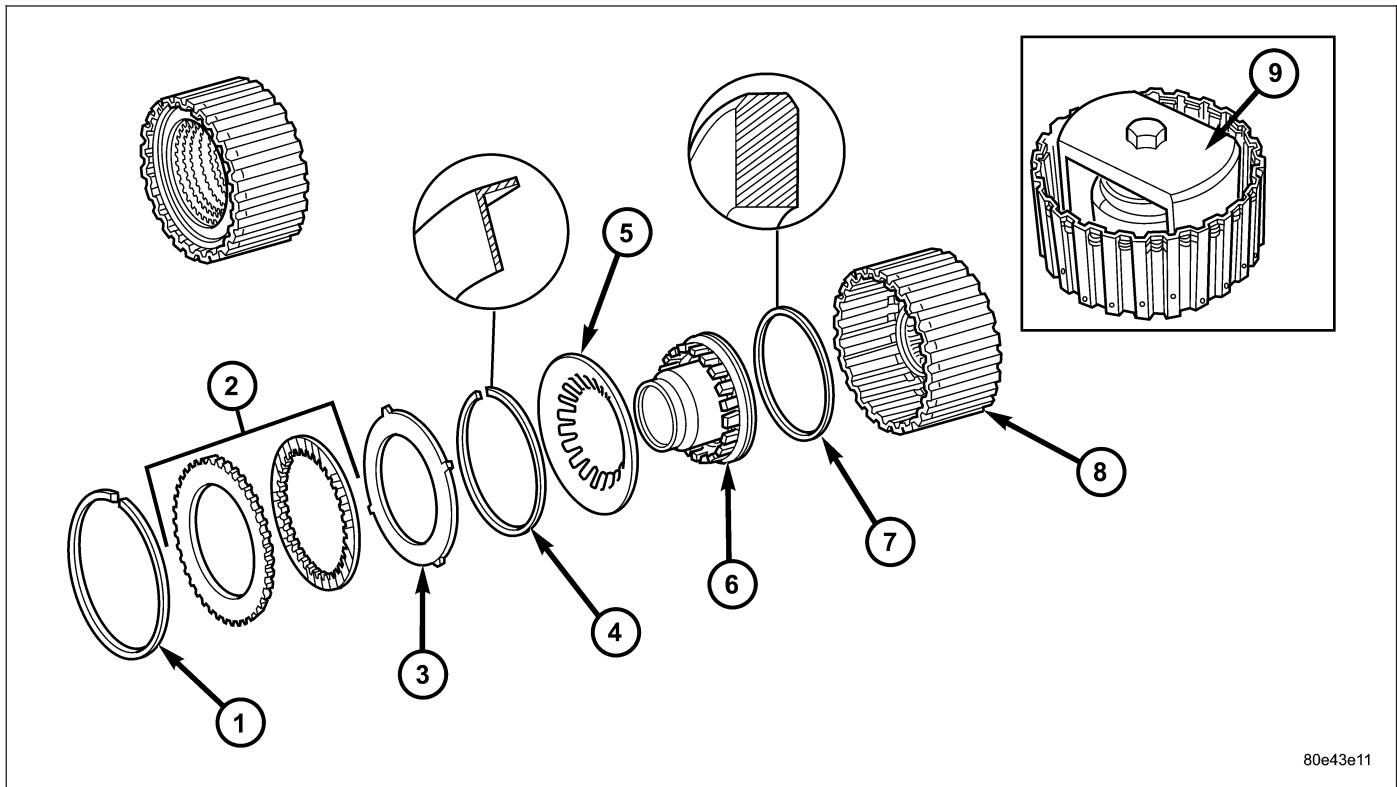


- 1 - DISC SPRING
- 2 - OUTER MULTIPLE DISC - 1.8 MM (0.071 IN.)
- 3 - OUTER MULTIPLE DISC - 3.5 MM (0.138 IN.)
- 4 - OUTER MULTIPLE DISC - 4.0 MM (0.158 IN.)
- 5 - K2 OUTER DISC CARRIER
- 6 - SNAP-RING
- 7 - FRICTION DISCS
- 8 - PISTON

14. Insert axial needle bearing (3) into K1 inner multiple-disc carrier. Insert axial needle bearing (3) with a little grease to prevent it slipping.
15. Install input shaft in K1 inner multiple-disc carrier with integrated front gear set (2).
16. Fit internally-geared wheel (18) and install snap-ring (19). Pay attention to installation position.

## K3-INPUT CLUTCH

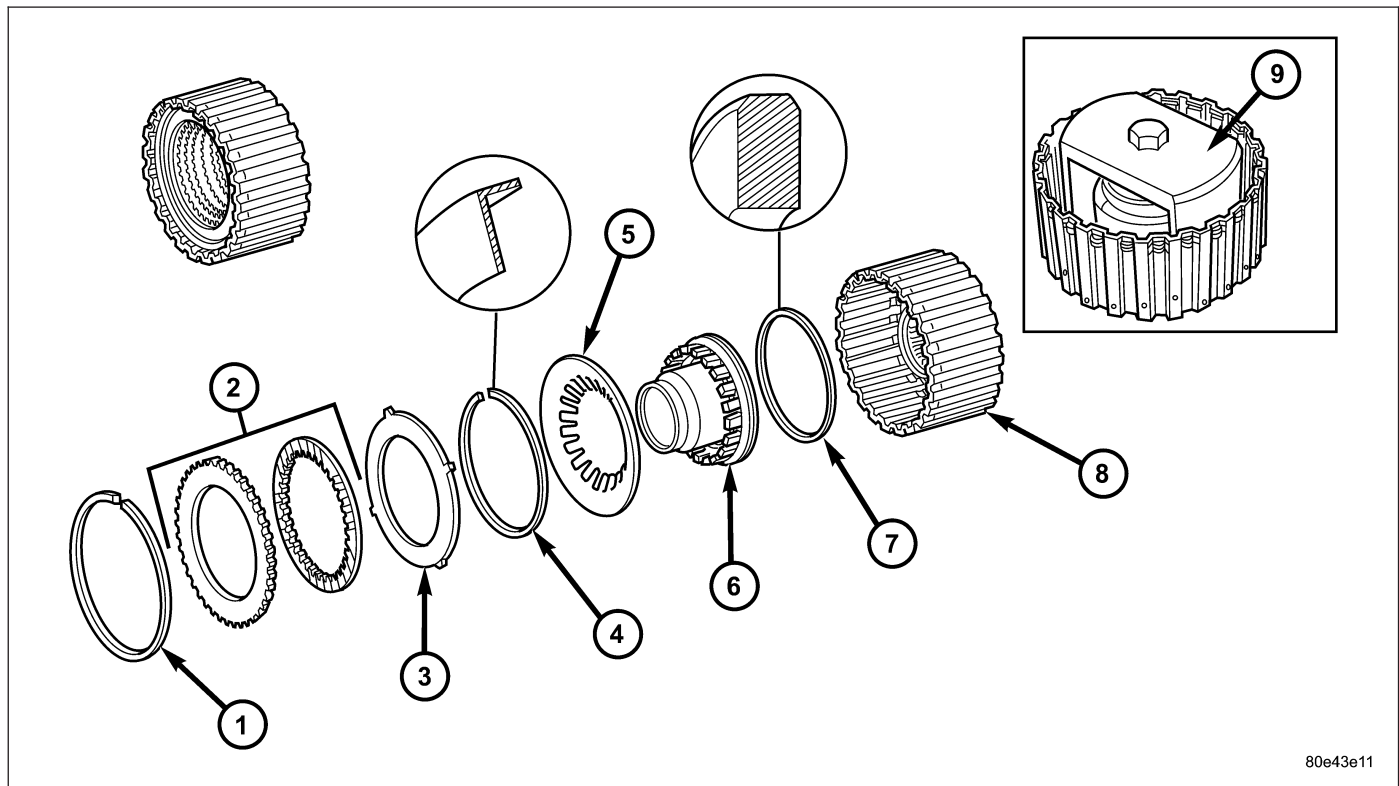
### DISASSEMBLY



**Input Clutch K3 Components**

- |                        |                                      |
|------------------------|--------------------------------------|
| 1 - SNAP-RING          | 6 - PISTON                           |
| 2 - MULTIPLE DISC PACK | 7 - SEALING RING                     |
| 3 - DISC SPRING        | 8 - OUTER DISC CARRIER               |
| 4 - SNAP-RING          | 9 - MULTI-USE SPRING COMPRESSOR 8900 |
| 5 - SPRING PLATE       |                                      |

1. Remove snap-ring (1) from outer multiple-disc carrier.
2. Remove multiple-disc pack (2) and disk spring (3) from outer multiple-disc carrier. Note which clutch disc is removed just prior to the spring plate (3) for re-assembly. If the clutch discs are re-used, this disc must be returned to its original position on top of the spring plate.
3. Place Multi-use Spring Compressor 8900 (9) on disc spring (5) and compress the spring until the snap-ring (4) is exposed.
4. Remove snap-ring (4).
5. Remove spring plate (5) and piston (6) from outer multiple-disc carrier.

**ASSEMBLY*****Input Clutch K3 Components***

- 1 - SNAP-RING
- 2 - MULTIPLE DISC PACK
- 3 - DISC SPRING
- 4 - SNAP-RING
- 5 - SPRING PLATE

- 6 - PISTON
- 7 - SEALING RING
- 8 - OUTER DISC CARRIER
- 9 - MULTI-USE SPRING COMPRESSOR 8900

1. Install piston (6) in the outer multiple-disc carrier (8). Check sealing ring (7), replace if necessary. The rounded off edges of the sealing ring must point outwards.
2. Insert disc spring (5). Insert disc spring with the curvature towards the piston.
3. Mount the Multi-use Spring Compressor 8900 (9) on the spring plate and clamp until the snap-ring groove is exposed.
4. Insert snap-ring (4). The collar of the snap-ring must point towards the multiple-disc pack.

**CAUTION:** When working with double sided friction discs, an externally lugged steel plate is installed first, followed by a friction disc, and continuing on until all the required discs are installed. When working with single sided friction discs, an externally lugged disc is installed first, followed by an internally lugged disc, and continuing on until all the required discs are installed. All single sided discs are installed with the friction side up.

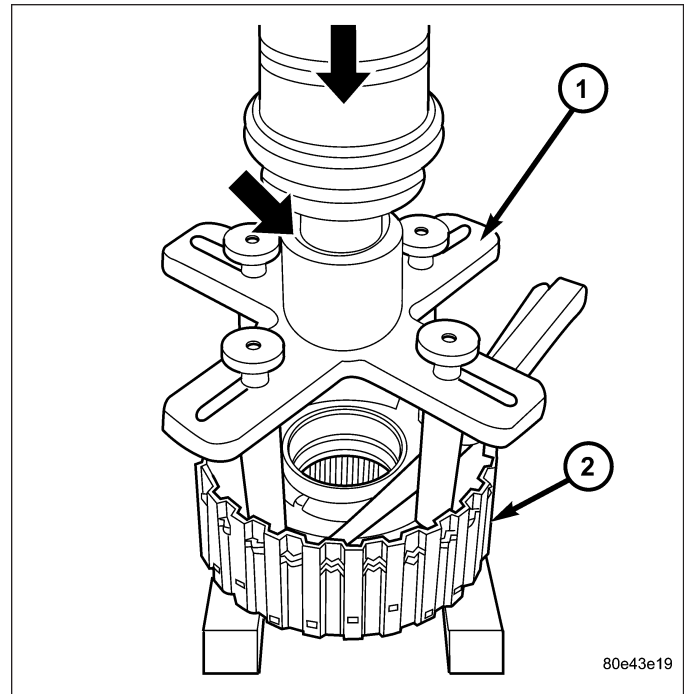
**Note:** Pay attention to the sequence of discs. If the original clutch discs are reused, be sure to return the disc identified on disassembly as belonging on top of the spring plate (3) to its original location.

**Note:** Place new friction multiple-discs in ATF fluid for one hour before installing.

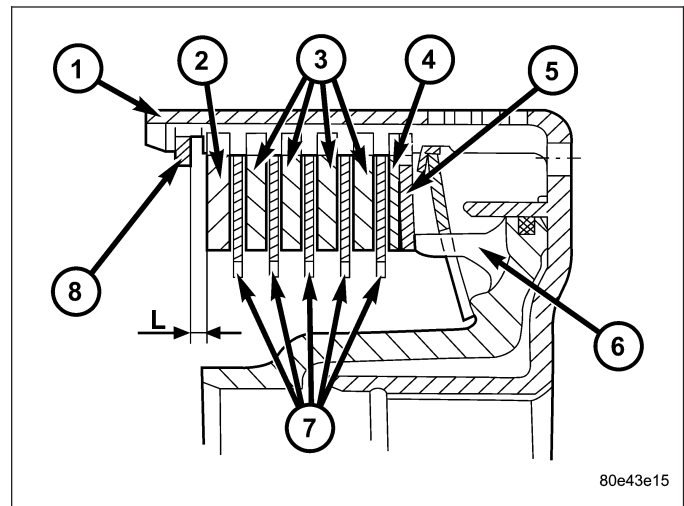
5. Install disk spring (3) and multiple-disc pack (2) in outer multiple-disc carrier (8).
6. Insert snap-ring (1).



7. Measure the K3 clutch clearance by mounting Pressing Tool 8901 (1) on outer multiple disc.
8. Using a lever press, compress pressing tool as far as the stop (then the marking ring is still visible, see small arrow).

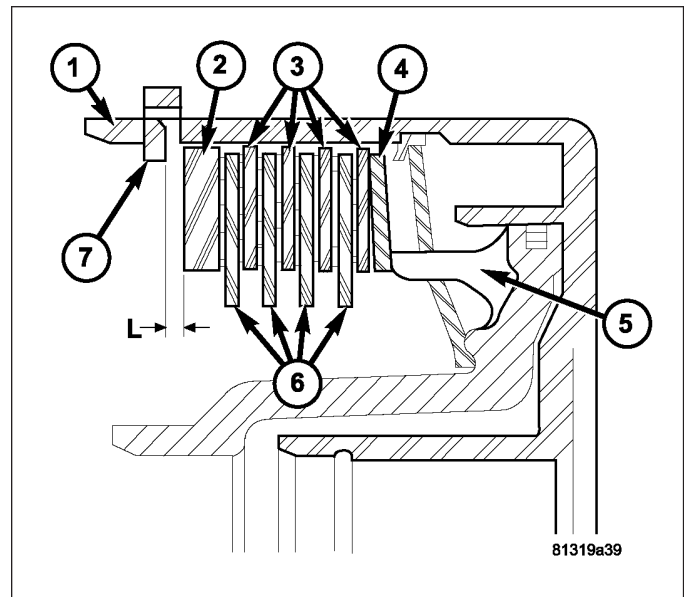


9. For transmissions using double sided friction discs, use a feeler gauge to determine the play "L" at three points between the snap-ring (8) and outer multiple-disc (2).
10. During the measurement the snap-ring (8) must contact the upper bearing surface of the groove in the outer multiple-disc carrier.
11. The correct clutch clearance for transmissions with double sided friction discs is 2.3-2.7 mm (0.091-0.106 in.) for three friction disc versions, 2.4-2.8 mm (0.095-0.110 in.) for four disc versions, and 2.5-2.9 mm (0.099-0.114 in.) for five disc versions.
12. Adjust with snap-ring (8), if necessary. Snap-rings are available in thicknesses of 2.0 mm (0.079 in.), 2.3 mm (0.091 in.), 2.6 mm (0.102 in.), 2.9 mm (0.114 in.), 3.2 mm (0.126 in.), and 3.5 mm (0.138 in.).



- 1 - OUTER DISC CARRIER
- 2 - OUTER MULTIPLE DISC - 4.0 MM (0.158 IN.)
- 3 - OUTER MULTIPLE DISC - 2.8 MM (0.110 IN.)
- 4 - OUTER MULTIPLE DISC - 1.8 MM (0.079 IN.)
- 5 - DISC SPRING
- 6 - PISTON
- 7 - FRICTION DISCS - 2.1 MM (0.083 IN.)
- 8 - SNAP-RING

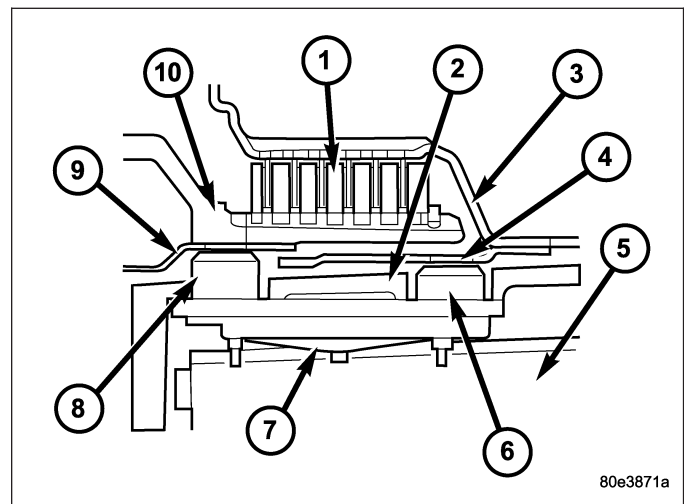
13. For transmissions using single sided friction discs, use a feeler gauge to determine the play "L" at three points between the snap-ring (7) and outer multiple-disc (2).
14. During the measurement the snap-ring (7) must contact the upper bearing surface of the groove in the outer multiple-disc carrier.
15. The correct clutch clearance for transmissions with single sided friction discs is 2.3-2.7 mm (0.091-0.106 in.) for six friction disc versions, 2.4-2.8 mm (0.095-0.110 in.) for eight disc versions, and 2.5-2.9 mm (0.099-0.114 in.) for ten disc versions.
16. Adjust with snap-ring (7), if necessary. Snap-rings are available in thicknesses of 2.0 mm (0.079 in.), 2.3 mm (0.091 in.), 2.6 mm (0.102 in.), 2.9 mm (0.114 in.), 3.2 mm (0.126 in.), and 3.5 mm (0.138 in.).



## SENSORS-INPUT SPEED

### DESCRIPTION

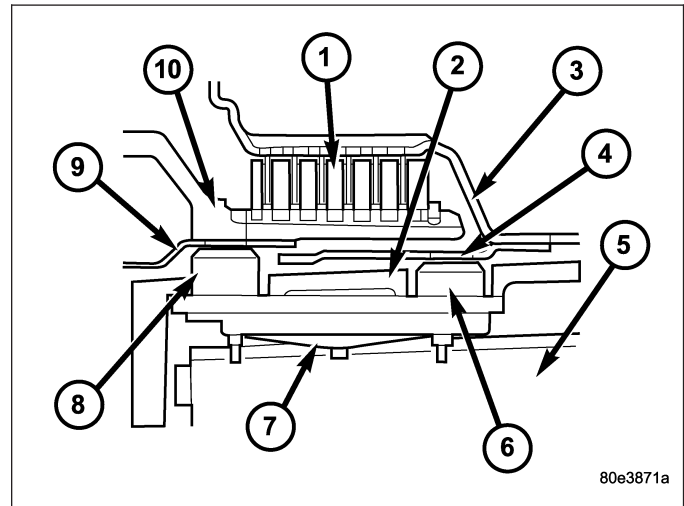
The input speed sensors (6, 8) are fixed to the shell of the control unit via contact blades. The speed sensors are pressed against the transmission housing (2) by a spring (7) which is held against the valve housing of the shift plate (5). This ensures a defined distance between the speed sensors and the exciter ring (4).



## OPERATION

Signals from the input speed sensors (6, 8) are recorded in the transmission control module (TCM) together with the wheel and engine speeds and other information and are processed into an input signal for electronic control.

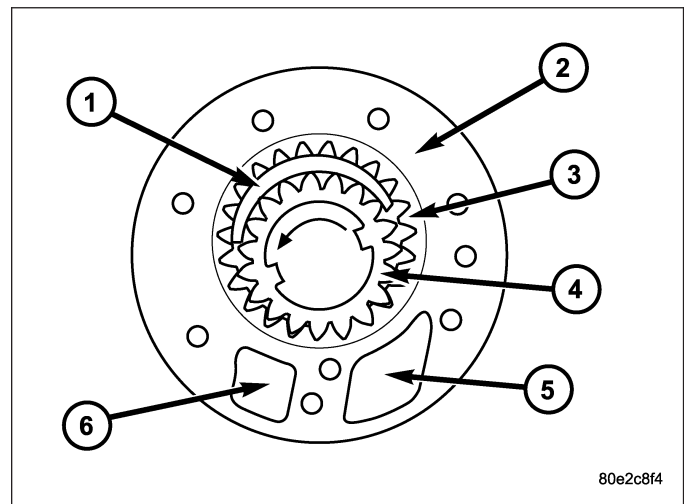
Input speed sensor N2 (6) records the speed of the front sun gear via the externally toothed disc carrier of the multiple-disc clutch K1 (10) and input speed sensor N3 (8) records the speed of the front planet carrier via the internally toothed disc carrier of multiple-disc clutch K1 (3).



## PUMP-OIL

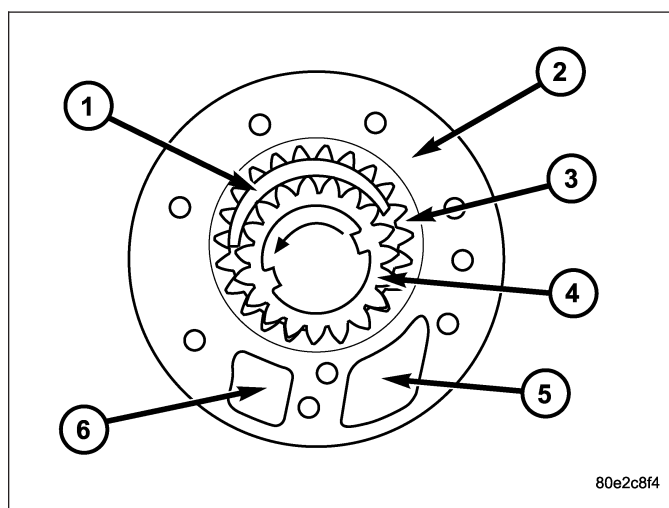
### DESCRIPTION

The oil pump (2) (crescent-type pump) is installed in the bellhousing behind the torque converter and is driven by the drive flange of the torque converter. The pump creates the oil pressure required for the hydraulic procedures.



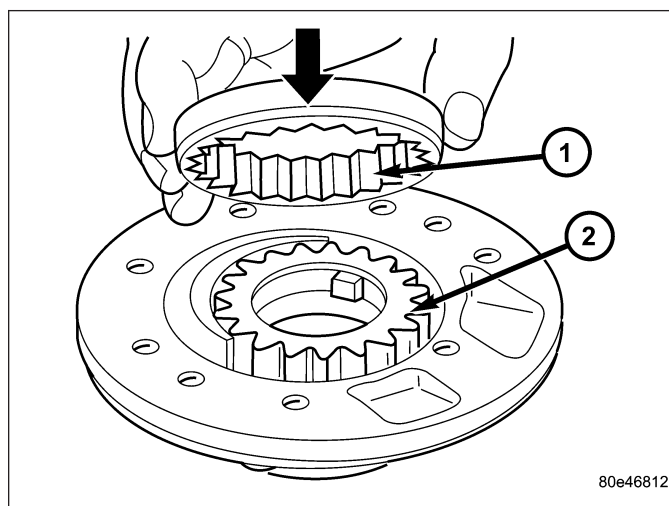
## OPERATION

When the engine is running, the oil is pumped through the inlet chamber (5) along the upper and lower side of the crescent (1) to the pressure chamber (6) of the housing. The meshing of the teeth prevents oil flowing from the delivery side to the intake side. An external gear (3) is eccentrically mounted in the pump housing. The external gear is driven by the internal gear (4) which is connected to the torque converter hub.

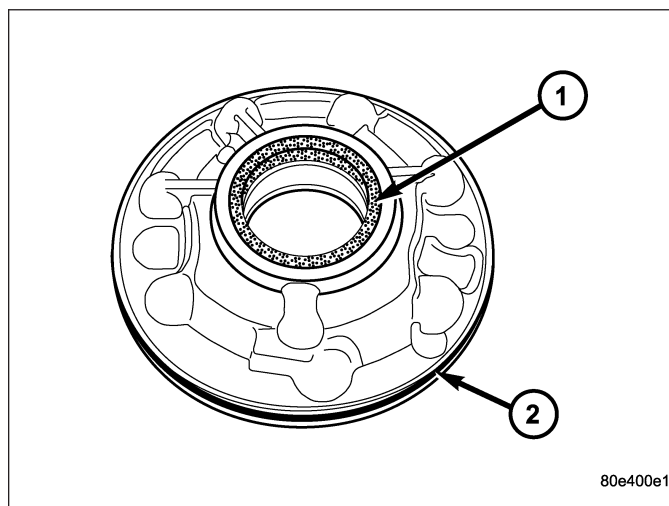


## DISASSEMBLY

1. Remove pump gears (1 and 2) from pump housing.



2. Remove the inner oil pump seal (1).
3. Replace the outer oil pump O-ring (2).



## INSPECTION

Before measuring any oil pump components, perform a thorough visual inspection of all the components. If any sign of scoring, scratches, or other damage is seen, replace the oil pump as an assembly.

## SIDE CLEARANCE

Side clearance is the difference between the thickness of the pump gears and the depth of the pocket in the pump housing. Side clearance can be measured by laying a flat plate across the mounting face of the pump housing, and measuring the distance between the plate and the gears.

### *Acceptable side clearance:*

- Inner gear: 0.064 mm (0.0025 in) max
- Outer gear: 0.069 mm (0.0027 in) max

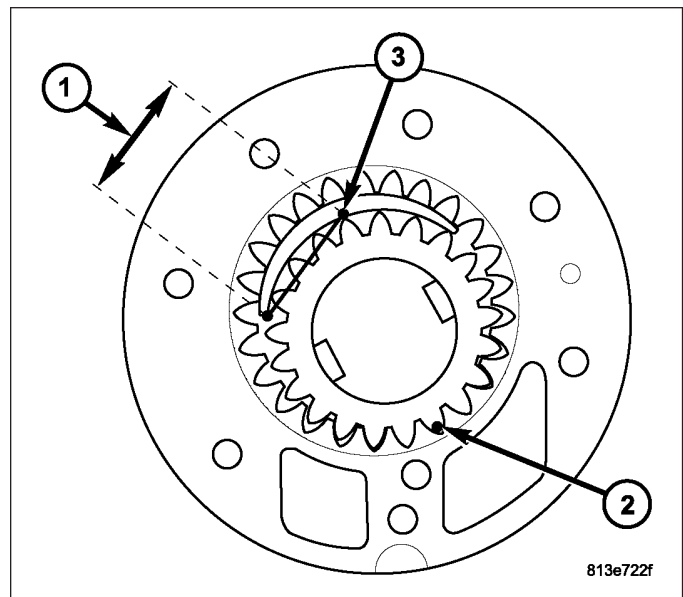
## TIP CLEARANCE

Tip clearance is the difference between the tip diameters of the gear teeth and the corresponding diameters of the pocket in the pump housing.

Tip clearance for the inner gear can be checked by moving the inner gear into tight mesh (2) with the outer gear as shown. Clearance between the ID of the crescent feature of the housing and the OD of the teeth of the inner gear (3) should then be measured at a point 37 mm from the corner of the crescent (1) feature, as shown below.

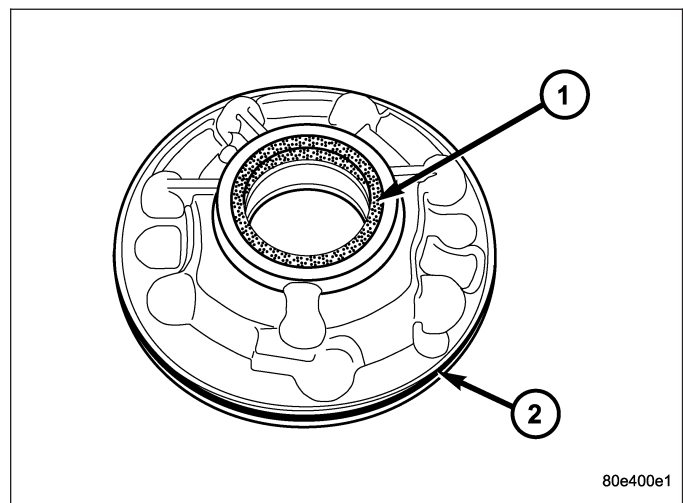
### *Acceptable tip clearance for inner gear:*

- 0.85 mm (0.033 in) max

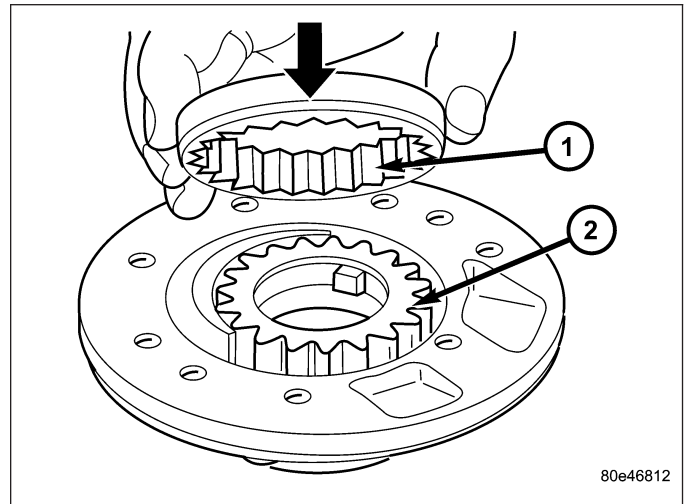


## ASSEMBLY

1. Install new inner oil pump seal (1) with Seal Installer 8902-A.
2. Replace O-ring (2).



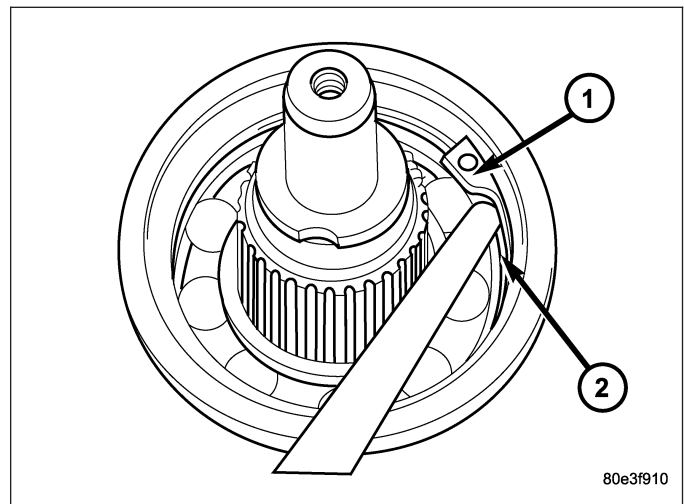
3. Lubricate pump gears and place in the pump housing. Insert pump gear (1) so that the chamfer (arrow) points towards the pump housing.



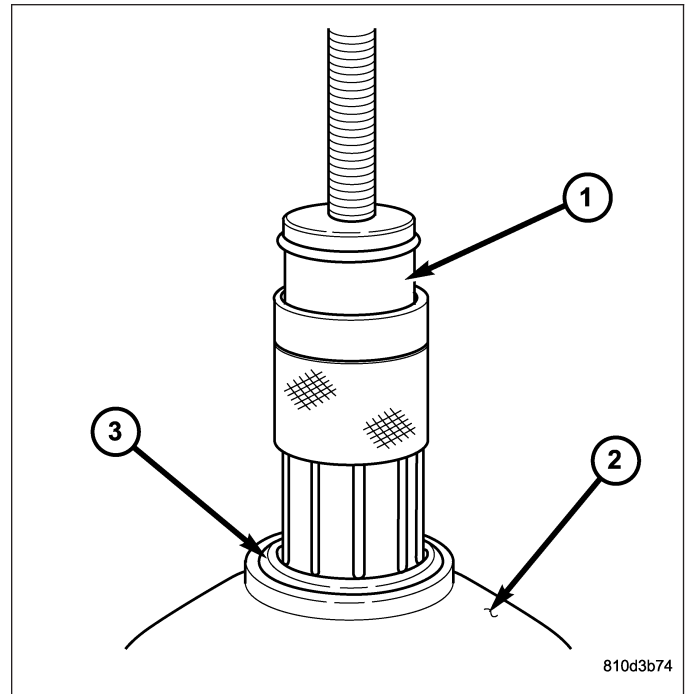
## BEARING-OUTPUT SHAFT

### REMOVAL

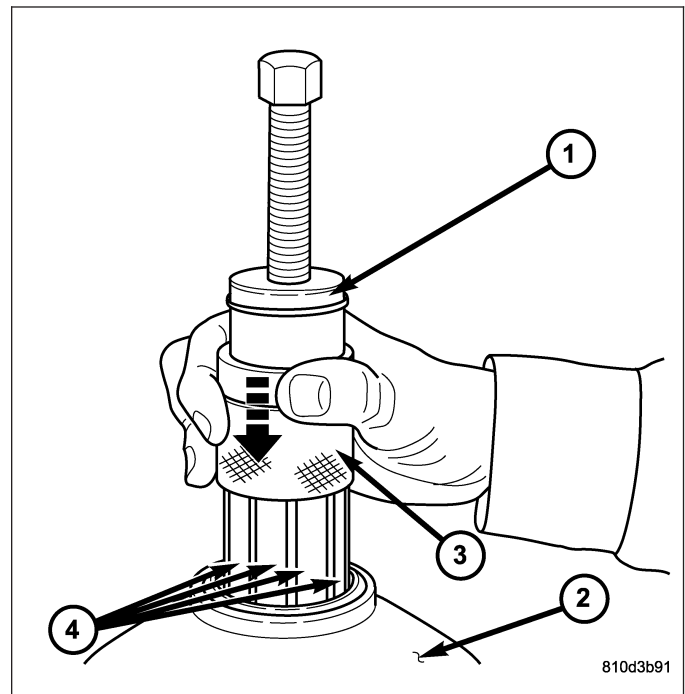
1. Raise and support vehicle.
2. Remove the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL).
3. Verify that the transmission is in PARK in order to prepare for the removal of the output shaft nut.
4. Remove the nut holding the propeller shaft flange to the output shaft and remove the flange.
5. Remove the transmission rear oil seal with a suitable slide hammer and screw.
6. Remove the transmission output shaft washer. Be sure to tag the washer since it is very similar to the geartrain end-play shim and they must not be interchanged.
7. Remove the transmission rear output shaft bearing retaining ring (1).



8. Position Bearing Remover 9082 (1) over the inner race of the output shaft bearing.

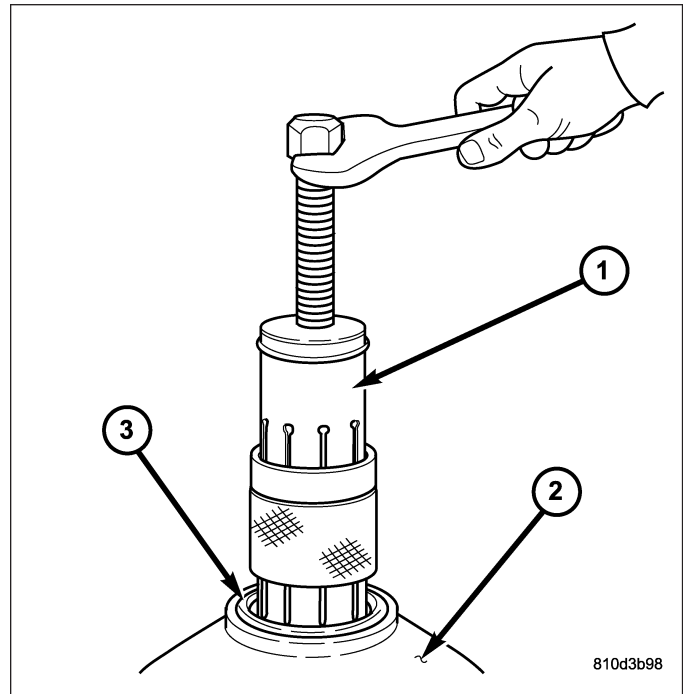


9. Slide the collar (3) on the Bearing Remover 9082 (1) downward over the fingers (3) of the tool.



**CAUTION:** Verify that the geartrain end-play shim has remained on the output shaft and against the park gear. The shim may be adhered to the bearing inner race. Retrieve the shim from the bearing and install over the output shaft and against the park gear.

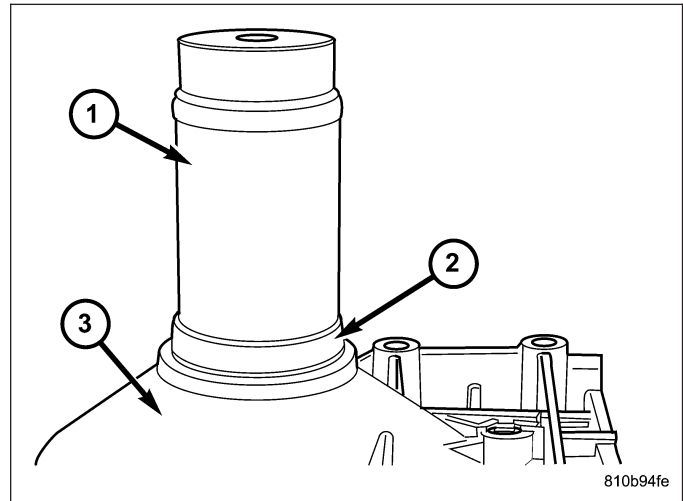
10. Remove the output shaft bearing (3).



## INSTALLATION

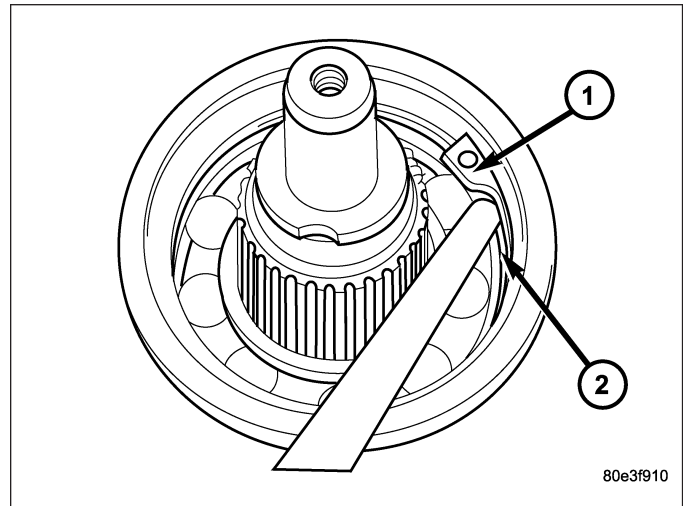
**CAUTION:** Verify that the geartrain end-play shim is properly installed over the output shaft and against the park gear.

1. Install output shaft bearing in the rear transmission housing. Using Bearing Installer 9287 (1), install the output shaft bearing (2) into the transmission housing. **The closed side of the plastic cage must point towards the parking lock gear.**

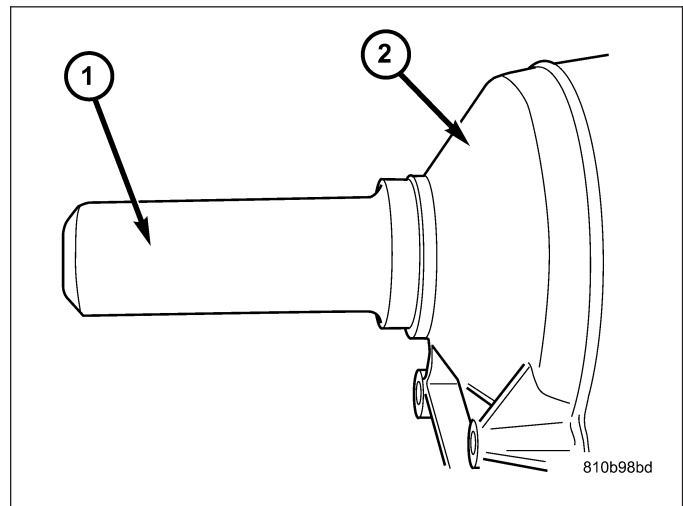




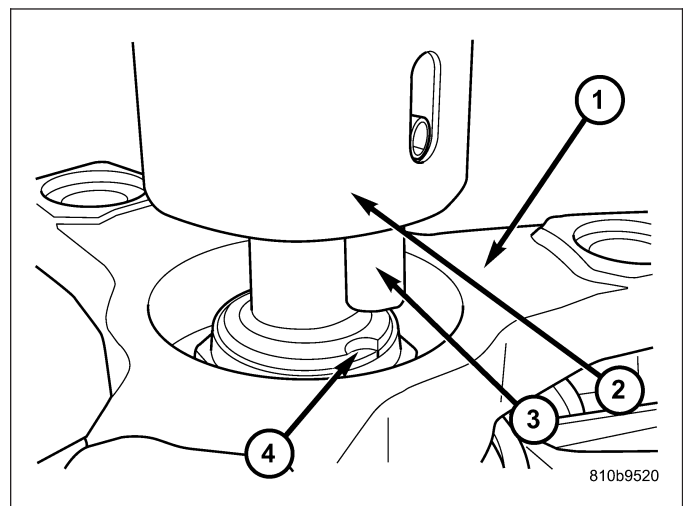
2. Install the retaining ring (1). Ensure that the retaining ring is seated correctly in the groove.
3. Check that there is no play between the bearing and the retaining ring using feeler gauge.
4. There must be no play between the retaining ring and the bearing. If the ring cannot be installed, a thinner ring must be used. If there is play between the ring and the bearing, a thicker ring must be installed. Retaining rings are available in thicknesses of 2.0 mm (0.079 in.), 2.1 mm (0.083 in.), and 2.2 mm (0.087 in.).
5. Install the output shaft washer onto the output shaft.



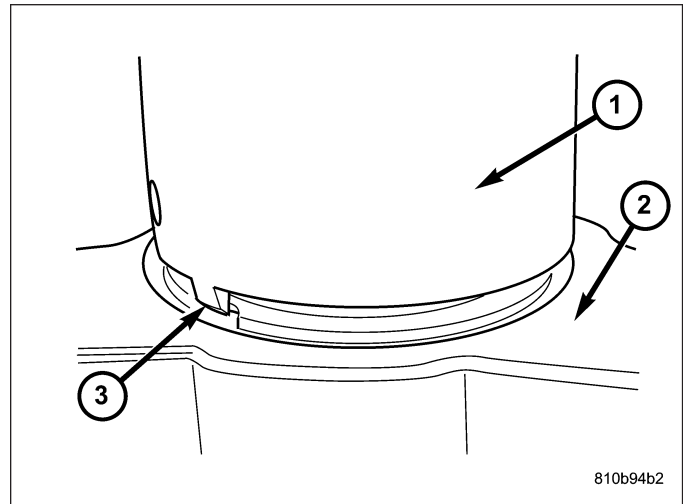
6. Install a new transmission rear seal into the transmission case with Seal Installer 8902A (1).
7. Verify that the transmission is in PARK in order to prepare for the installation of the output shaft nut.
8. Install the propeller shaft flange onto the output shaft and install a new flange nut. Tighten the flange nut to 120 N·m (88.5 ft.lbs.).



9. Stake the output shaft nut to the output shaft as follows. Place the Staking Tool 9078 (2) and Driver Handle C-4171 onto the output shaft.
10. Rotate the Staking Tool 9078 (2) until the alignment pin (3) engages the output shaft notch (4).



11. Press downward on the staking tool (1) until the staking pin (3) contacts the output shaft nut flange (2).
12. Strike the Driver handle C-4171 with a suitable hammer until the output shaft nut is securely staked to the output shaft.
13. Install the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).



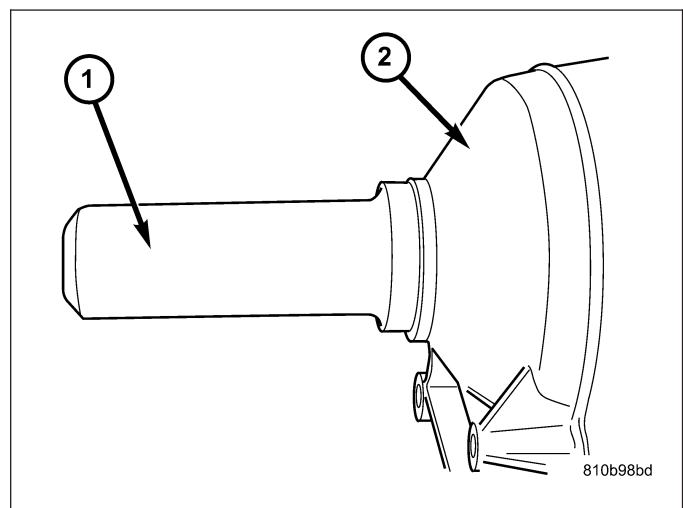
## SEAL-OUTPUT SHAFT

### REMOVAL

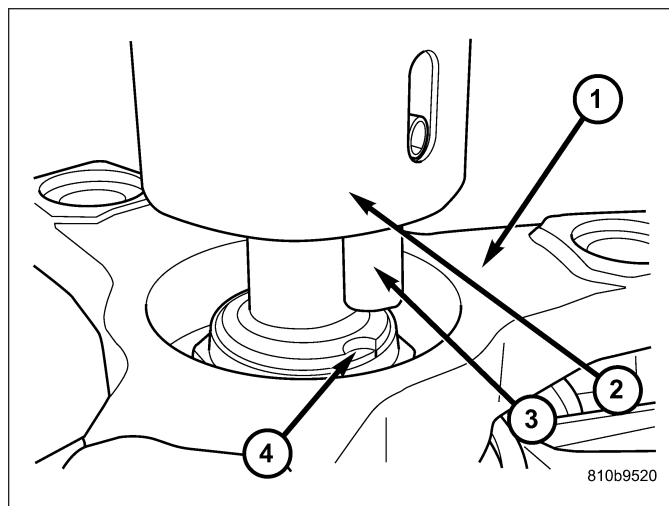
1. Remove the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL). Move propeller shaft to the right and tie up.
2. Verify that the transmission is in PARK in order to prepare for the removal of the output shaft nut.
3. Remove the nut holding the propeller shaft flange to the output shaft and remove the flange.
4. Remove the output shaft seal with suitable screw and slide hammer.

### INSTALLATION

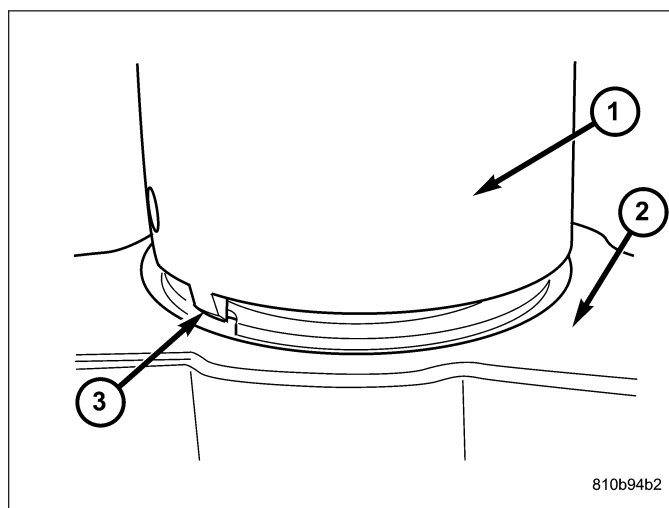
1. Position the new output shaft seal over the output shaft and against the transmission case.
2. Use Seal Installer 8902A (1) to install the seal.
3. Verify that the transmission is in PARK in order to prepare for the installation of the output shaft nut.
4. Install the propeller shaft flange onto the output shaft and install an new flange nut. Tighten the flange nut to 120 N·m (88.5 ft.lbs.).



5. Stake the output shaft nut to the output shaft as follows. Place the Staking Tool 9078 (2) and Driver Handle C-4171 onto the output shaft.
6. Rotate the Staking Tool 9078 (2) until the alignment pin (3) engages the output shaft notch (4).



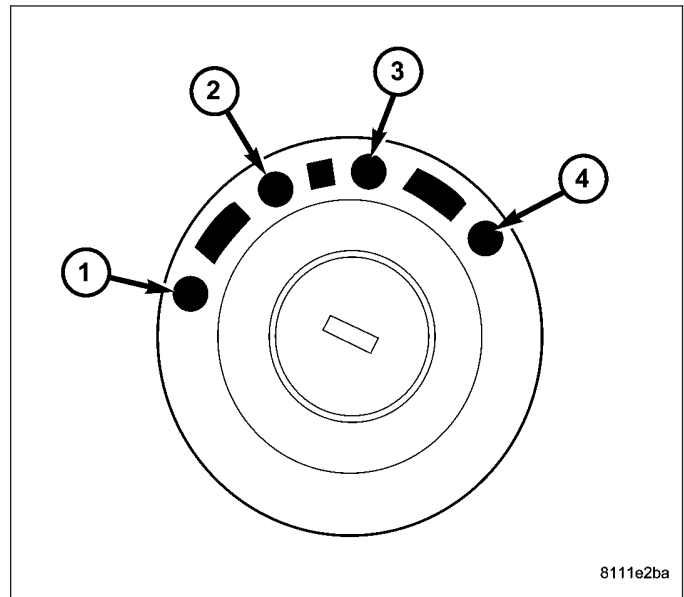
7. Press downward on the staking tool until the staking pin (3) contacts the output shaft nut flange (2).
8. Strike the Driver handle C-4171 with a suitable hammer until the output shaft nut is securely staked to the output shaft.
9. Install the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).



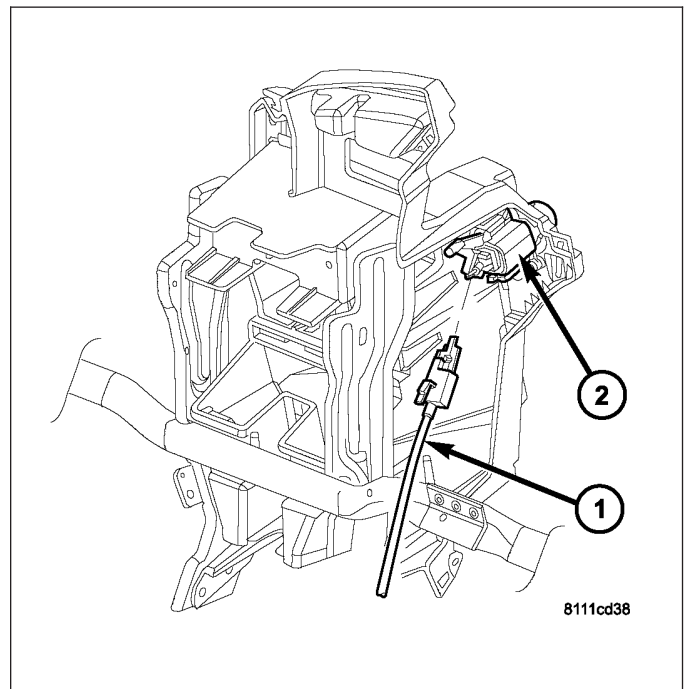
## CABLE-PARK LOCK

### REMOVAL

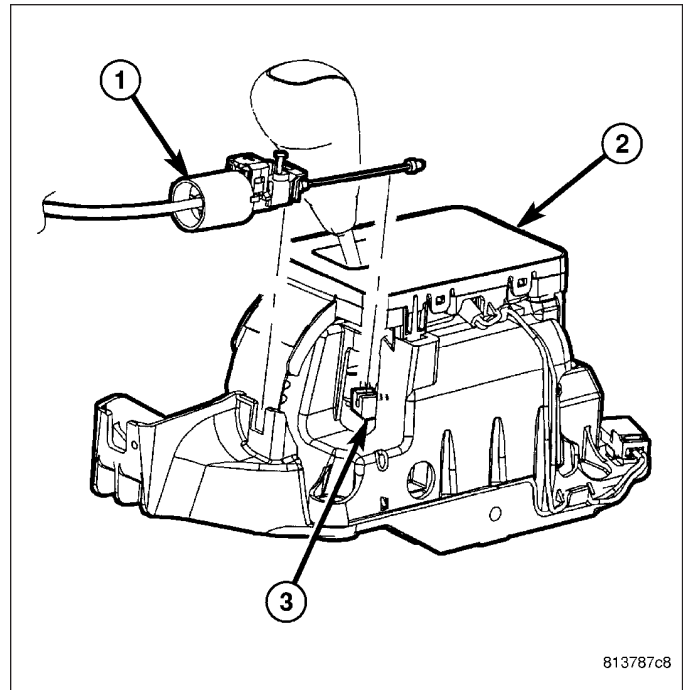
1. Place ignition key in the ACC (2) position.



2. Remove the lower instrument panel trim as necessary to access the park lock cable.
3. Disconnect park lock cable (4) from ignition cylinder (3).

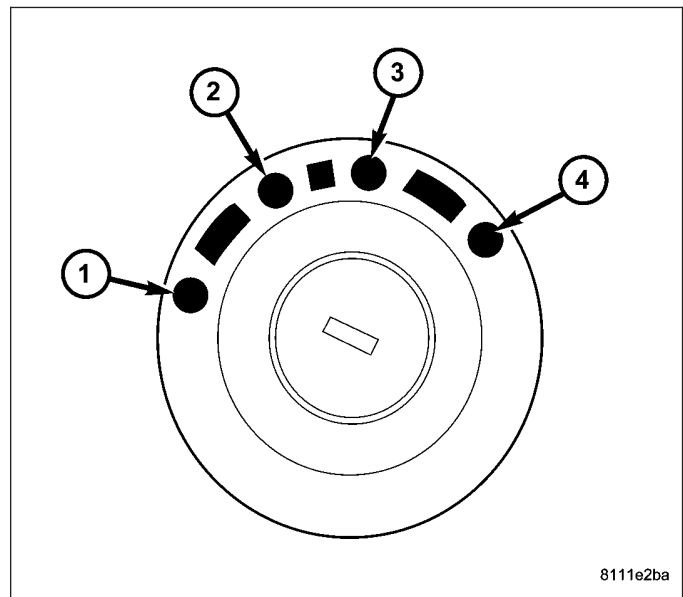


4. Remove the floor console as necessary for access to the park lock cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)
5. If necessary, remove the bolts holding the shield, covering the gearshift and park lock cables, to the floorpan and remove the shield.
6. Disconnect the park lock cable from the shift mechanism. Release retention tab using suitable screwdriver.

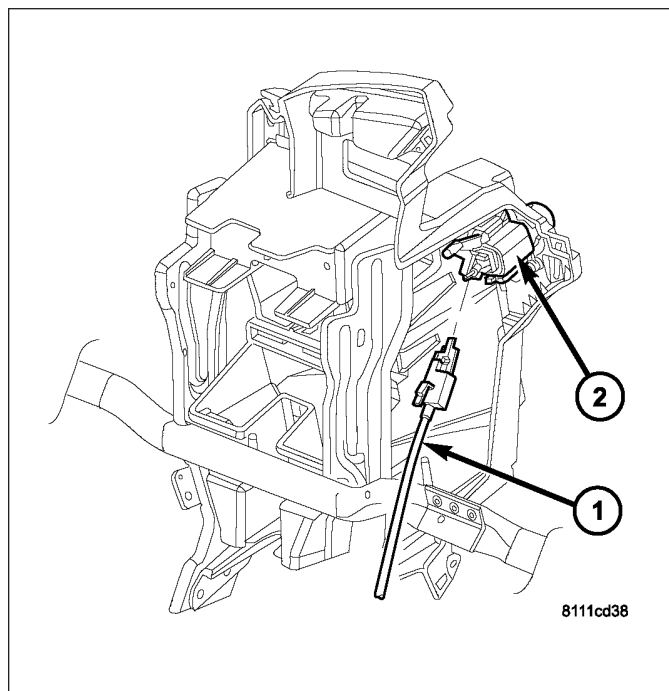


## INSTALLATION

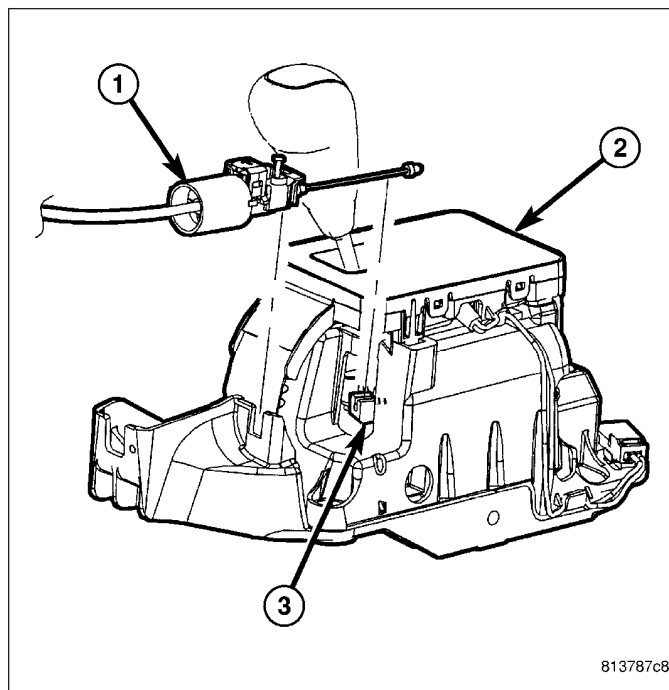
1. Verify that ignition key is in ACC (2) position.



2. Install the park lock cable (4) to the ignition cylinder (3). Secure the cable to instrument panel at retainer.
3. Install any instrument panel trim that was removed to access the park lock cable.



4. Route park lock cable towards shift mechanism.
5. Connect the park lock cable core to shift mechanism cam (3), and then secure cable housing to shift mechanism.

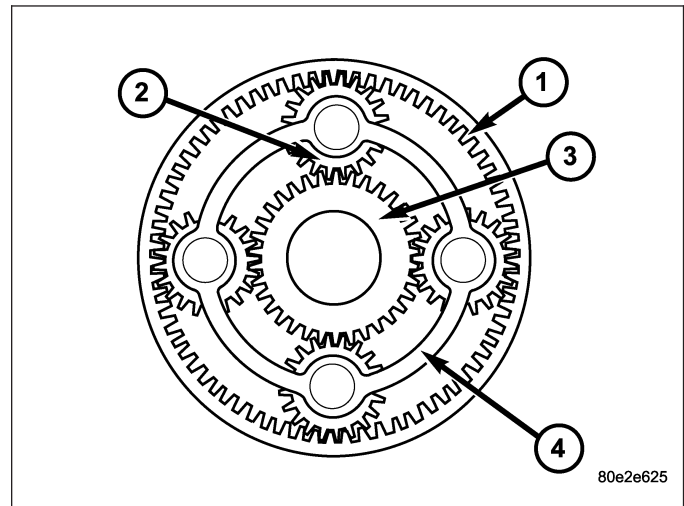


6. Adjust the park lock cable. (Refer to 21 - TRANSMISSION/AUTOMATIC TRANSMISSION/SHIFT INTERLOCK MECHANISM - ADJUSTMENTS)
7. If necessary, install the shield, covering the gearshift and park lock cables, to the floorpan and install the bolts to hold the shield to the floorpan.
8. Install the floor console assembly. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

## GEARTRAIN-PLANETARY

### DESCRIPTION

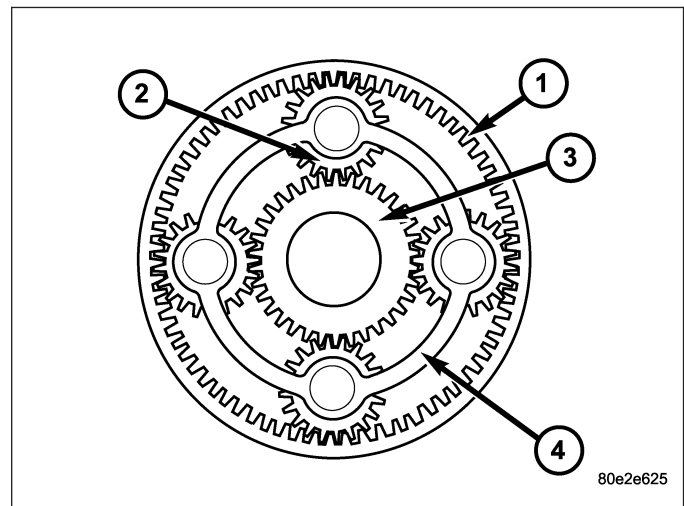
Three planetary gear sets are used to produce the different gear ratios. These are located in the mechanical part of the transmission as the front, middle and rear planetary gear sets.

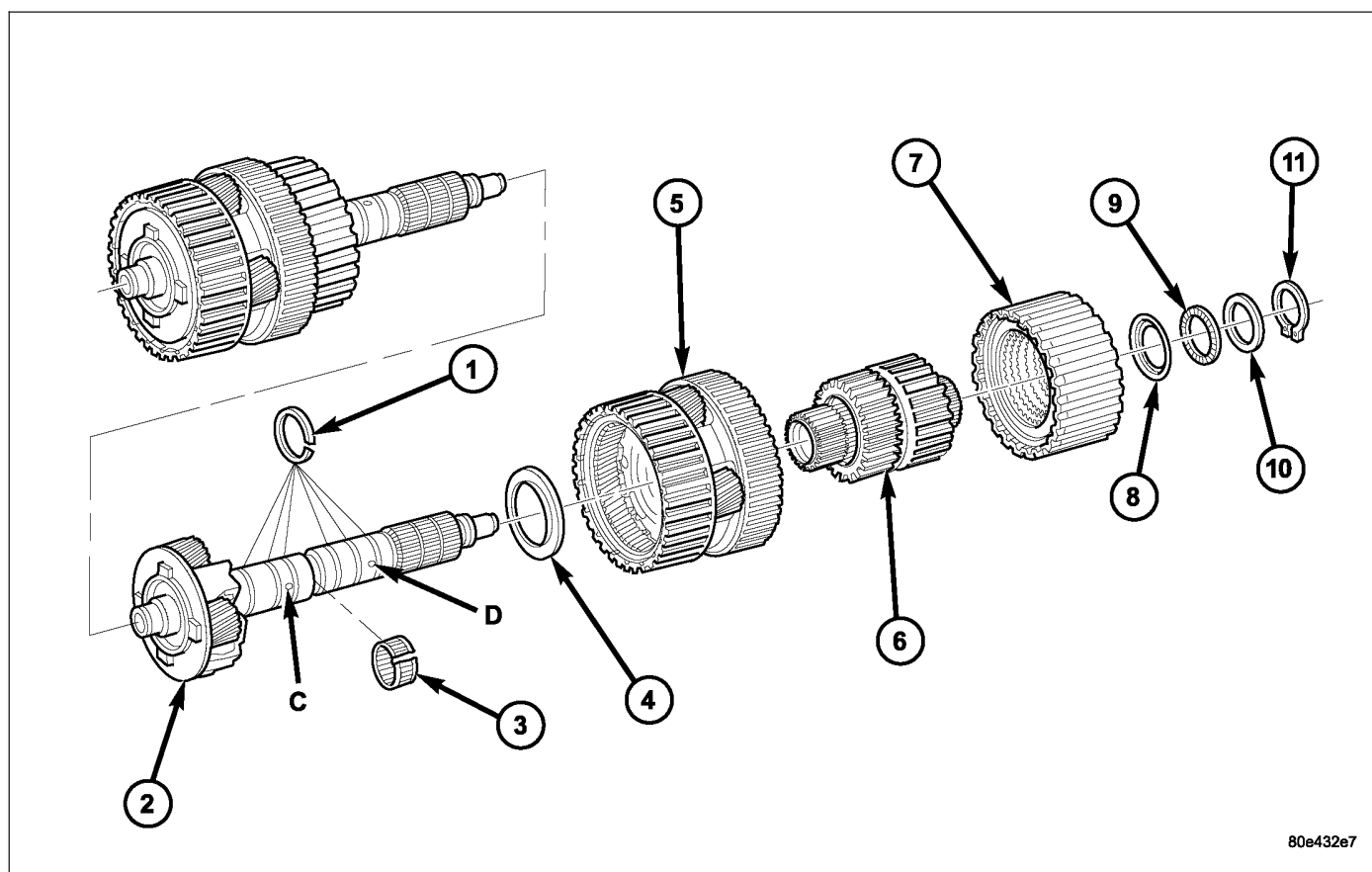


### OPERATION

The annulus gear (1) and sun gear (3) elements of a planetary gear system are alternately driven and braked by the actuating elements of the multi-plate clutch and multiple-disc brake. The planetary pinion gears (2) can turn on the internal gearing of the annulus gear (1) and on the external gearing of the sun gear (3). This allows for a variety of gear ratios and the reversal of the rotation direction without the need for moving gear wheels or shift collars. When two components of the planetary gear set are locked together, the planetary gear set is locked and turns as a closed unit.

The torque and engine speed are converted according to the lever ratios and the ratio of the number of teeth on the driven gears to that on the drive gears, and is referred to as the gear ratio. The overall ratio of a number of planetary gear sets connected in series is obtained by multiplying the partial ratios.



**DISASSEMBLY**

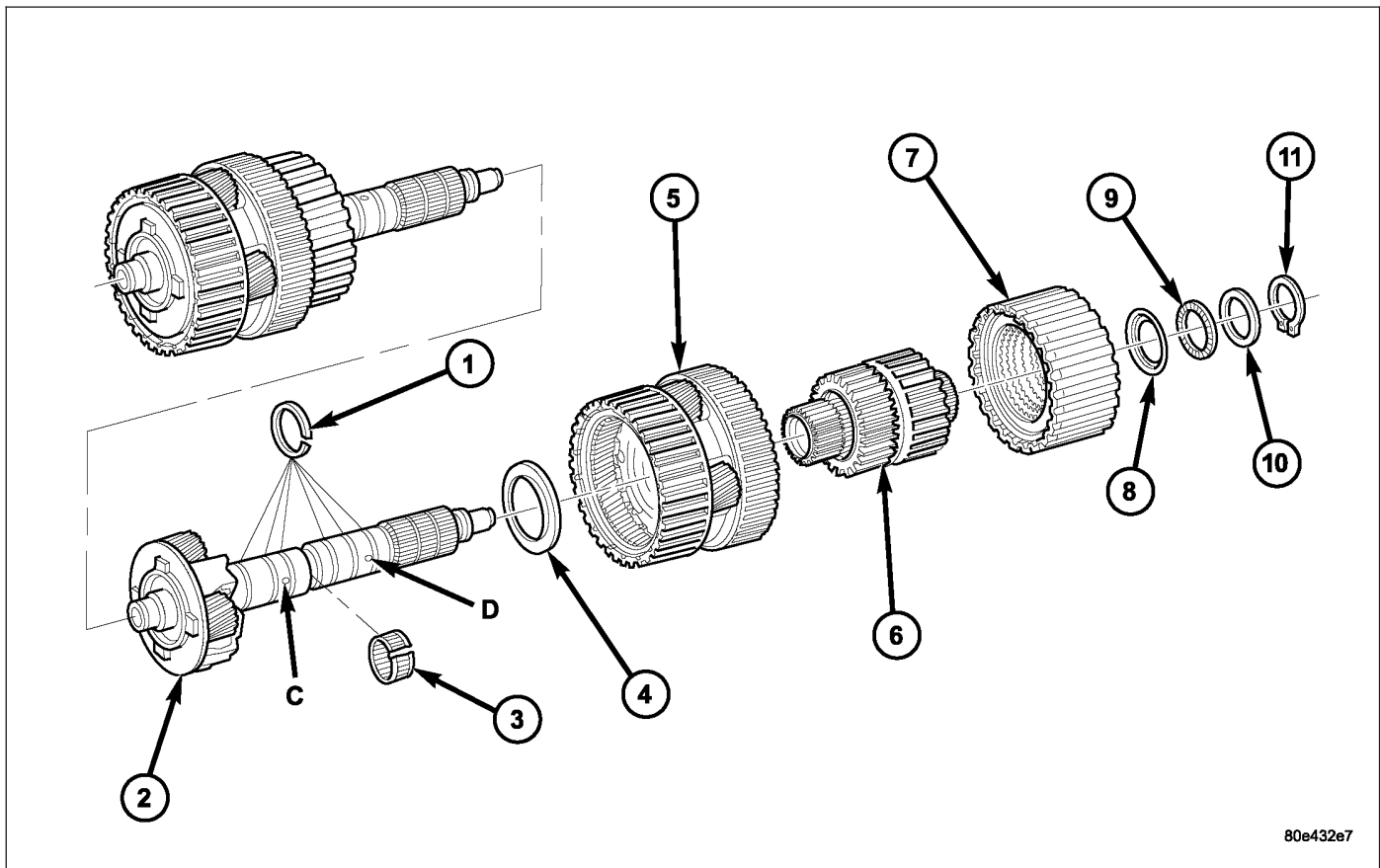
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***Output Shaft with Center and Rear Planetary Geartrain***

- |  |                          |
|--|--------------------------|
| 1 - TEFLON RINGS                               | 7 - DRIVING CLUTCH K3    |
| 2 - OUTPUT SHAFT WITH CENTER PLANETARY CARRIER | 8 - THRUST WASHER        |
| 3 - NEEDLE BEARING                             | 9 - AXIAL NEEDLE BEARING |
| 4 - THRUST WASHER                              | 10 - SHIM                |
| 5 - REAR PLANETARY GEAR SET                    | 11 - RETAINING RING      |
| 6 - REAR HOLLOW SHAFT/FREEWHEELING CLUTCH F2   |                          |

1. Remove upper two visible Teflon rings (1) from output shaft.
2. Remove retaining ring (11), shim (10), thrust needle bearing (9) and thrust washer (8) from output shaft.
3. Remove clutch K3 (7).
4. Remove rear tubular shaft/freewheeling clutch F2 (6) from output shaft.
5. Remove rear gear set (5) with integrated tubular shaft of center gear set from output shaft.
6. Remove thrust washer (4).



**ASSEMBLY**

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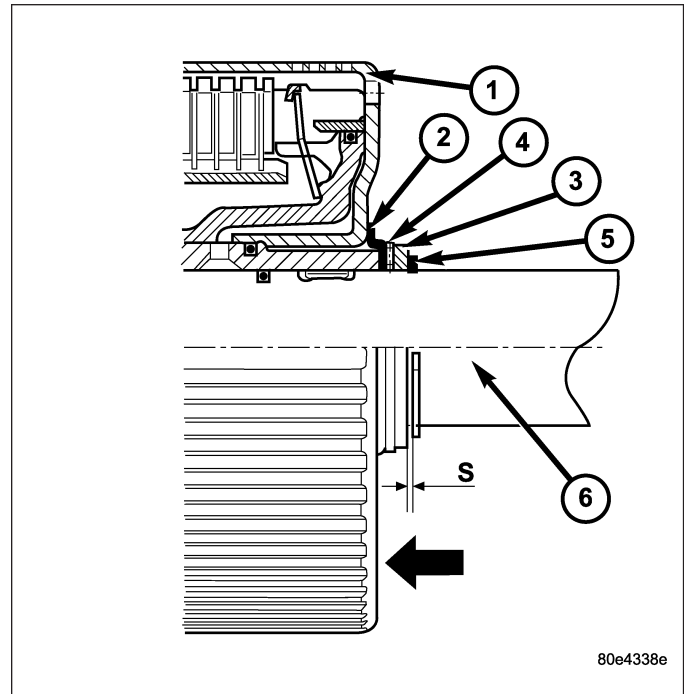
***Output Shaft with Center and Rear Planetary Geartrain***

- |  |                          |
|--|--------------------------|
| 1 - TEFLON RINGS                               | 7 - DRIVING CLUTCH K3    |
| 2 - OUTPUT SHAFT WITH CENTER PLANETARY CARRIER | 8 - THRUST WASHER        |
| 3 - NEEDLE BEARING                             | 9 - AXIAL NEEDLE BEARING |
| 4 - THRUST WASHER                              | 10 - SHIM                |
| 5 - REAR PLANETARY GEAR SET                    | 11 - RETAINING RING      |
| 6 - REAR HOLLOW SHAFT/FREEWHEELING CLUTCH F2   |                          |

1. Mount thrust washer (4) with the collar pointing towards the planet carrier.
2. Mount the rear gear set (5) on the rear hollow shaft (6).
3. Using grease, install lower three Teflon rings (1) in the groove so that the joint stays together
4. Put rear hollow shaft/freewheeling clutch F2 (6) with rear gear set (5) onto output shaft.
5. Install clutch K3 (7).
6. Mount retaining ring, shim, thrust needle bearing and thrust washer (8 - 11).
7. Using grease, insert the upper two Teflon rings (1) in the groove so that the joint remains together.

**Note:** During the test, apply a contact force by hand to K3 in the direction of the arrow.

8. Inspect axial play between shim (10) and retaining ring (11). Check axial play "S" between shim (10) and retaining ring (1) using a feeler gauge. Clearance should be 0.15-0.6 mm (0.006-0.024 in.). Shims are available in thicknesses of 3.0 mm (0.118 in.), 3.4 mm (0.134 in.), and 3.7 mm (0.146 in.). Adjust as necessary



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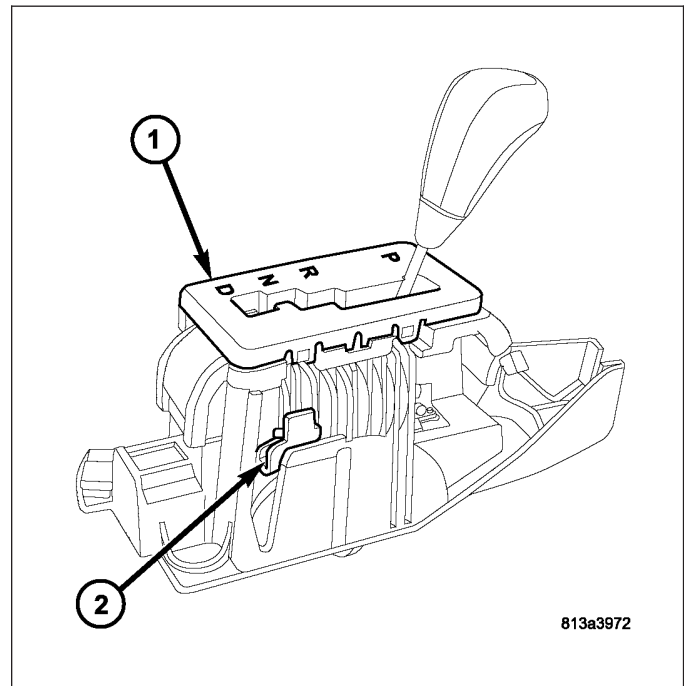
- 1 - DRIVING CLUTCH K3
- 2 - THRUST WASHER
- 3 - SHIM
- 4 - AXIAL NEEDLE BEARING
- 5 - RETAINING RING
- 6 - OUTPUT SHAFT WITH CENTER PLANETARY CARRIER

## MECHANISM-SHIFT

### DESCRIPTION

The automatic transmission is operated with the help of a shift lever assembly (SLA) (1) located in the floor console. There are four positions to which the selection lever can be shifted: P, R, N, D. In addition, the selector lever can be moved sideways (+/-) in position "D" to adjust the shift range.

All selector lever positions, as well as selected shift ranges in position "D", are identified by the SLA. The information is then sent to the transmission control module (TCM) via a hardwire connection. At the same time, the selector lever positions "P", "R", "N" and "D" are transmitted by a shift cable to the selector shaft in the transmission.



813a3972

The SLA is comprised of the following functions:

- **Key lock:** Depending on the selector lever position, the ignition cylinder is locked/unlocked, i.e., the ignition key can be removed only if the selector lever is in position "P". A park lock cable is used to perform this function.
- **Park lock:** The selector lever is not released from position "P" until the brake pedal has been applied and the ignition key is in "ACC" or "ON" positions. Shift lock is controlled by the brake light switch in conjunction with a locking solenoid in the SLA. As soon as the brake pedal is applied firmly, the locking solenoid is energized and retracted to unlock the selector lever. If the selector lever cannot be moved out of position "P" due to a malfunction, the shift lock function can be overridden (2). (Refer to 21 - TRANSMISSION/AUTOMATIC TRANSMISSION - NAG1/SHIFT INTERLOCK MECHANISM - OPERATION)
- **Reverse inhibitor:** As soon as the vehicle speed exceeds approximately 4-7 mph, it is no longer possible to move the selector lever from position "N" to position "R". The reverse inhibit functionality is controlled by the same solenoid as the park lock. As the vehicle accelerates past the calibrated speed threshold, the solenoid is energized to block the sideways motion of the shift lever necessary to move from NEUTRAL to REVERSE. The reverse inhibit is not released until the vehicle speed falls below approximately 4-7 mph and the shifter is moved out of the "D" shifter position.

## OPERATION

With the selector lever in position "D", the transmission control module (TCM) automatically shifts the gears that are best-suited to the current operating situation. This means that shifting of gears is continuously adjusted to current driving and operating conditions in line with the selected shift range and the accelerator pedal position. Starting off is always performed in 1st gear.

The selector lever positions are determined by a sensor assembly internal to the shift lever assembly (SLA). The sensor assembly identifies the various positions of the SLA according to the following table.

Shift Lever Position	Bit 0	Bit 1	Bit 2	Bit 3
Default	0	0	0	0
"D"	1	0	1	0
"N"	0	1	1	0
"R"	1	1	1	0
"P"	0	0	0	1
"+"	1	0	0	1
"_"	0	1	0	1
"ND"	1	1	0	1
"RN"	0	0	1	1
"PR"	1	0	1	1
Implausible	1	1	1	1

The current selector lever position or, if the shift range has been limited, the current shift range is indicated in the instrument cluster display.

The permissible shifter positions and transmission operating ranges are:

- P = Parking lock and engine starting.
- R = Reverse.
- N = Neutral and engine starting (no power is transmitted to the axles).
- D = The shift range includes all forward gears.
- 4= Shift range is limited to gears 1 to 4.
- 3= Shift range is limited to gears 1 to 3.
- 2= Shift range is limited to gears 1 to 2.
- 1= Shift range is limited to the 1st gear.

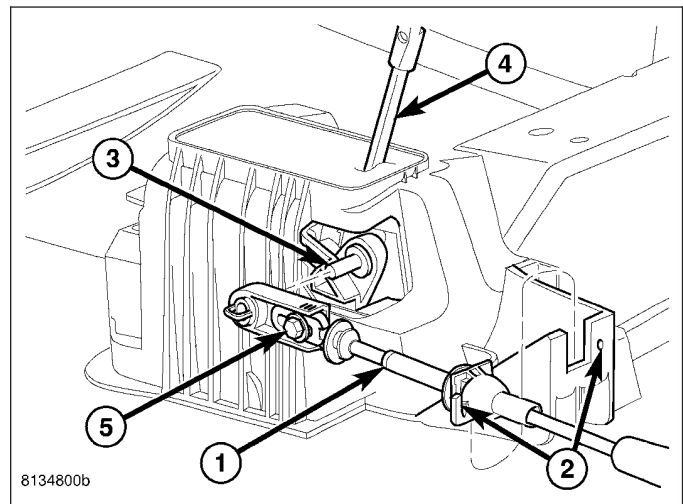
The shift range can be adjusted to the current operating conditions by tipping the selector lever to the left-hand side ("\_-") or the right-hand side ("+\_") when in position "D". If the shift range is limited, the display in the instrument cluster indicates the selected shift range and not the currently engaged gear.

Tipping the shift lever will have the following results:

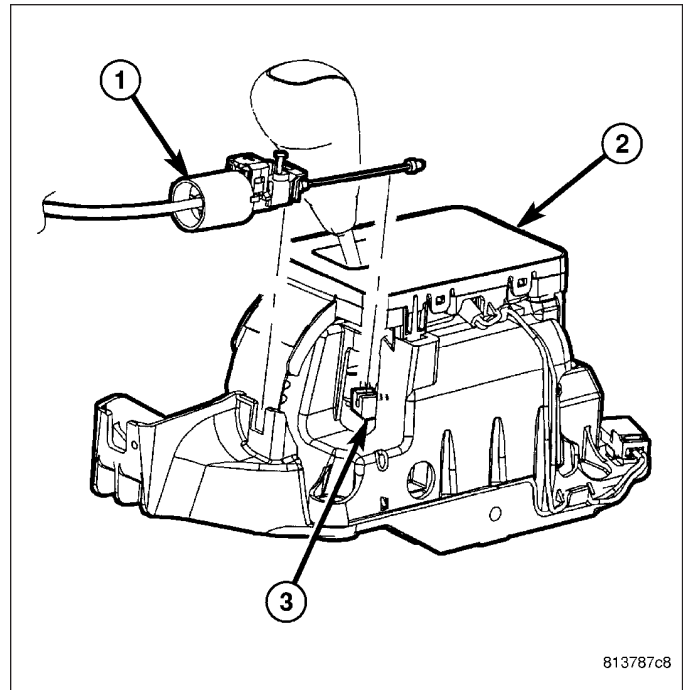
- **Tipping the selector lever toward "-" one time after another:** The shift range is reduced in descending sequence by one gear each time, i.e., from D - 4 - 3 - 2 - 1. If the selected limitation of the shift range would result in a downshift causing excessive engine speed, the shifting is not executed and the engaged gear as well as the shift range remain unchanged. This is to prevent the engine from overspeeding. Engine retardation is low with the selector lever in position "D". To make use of the full braking power of the engine, "manual" downshifting by tipping the lever towards the left-hand side is recommended. If this has been done, subsequent upshifting must be carried out manually as well.
- **Tipping the selector lever toward "-" and holding it in this position:** The currently engaged gear in range "D" is indicated in the instrument cluster display and the shift range is limited to this gear.
- **Tipping the selector lever toward "+" one time after another:** The shift range is increased by one gear each time and the increased shift range is displayed in the instrument cluster; possibly, the transmission upshifts to a faster gear.
- **Tipping the selector lever toward "+" several times:** The shift range is increased by one gear each time the lever is tipped until the shift range ends up in "D".
- **Tipping the selector lever toward "+" and holding it in this position:** The shift range is extended immediately to "D", shift ranges are indicated in ascending sequence; possibly, the transmission upshifts to a faster gear due to the extension of the shift range.

## REMOVAL

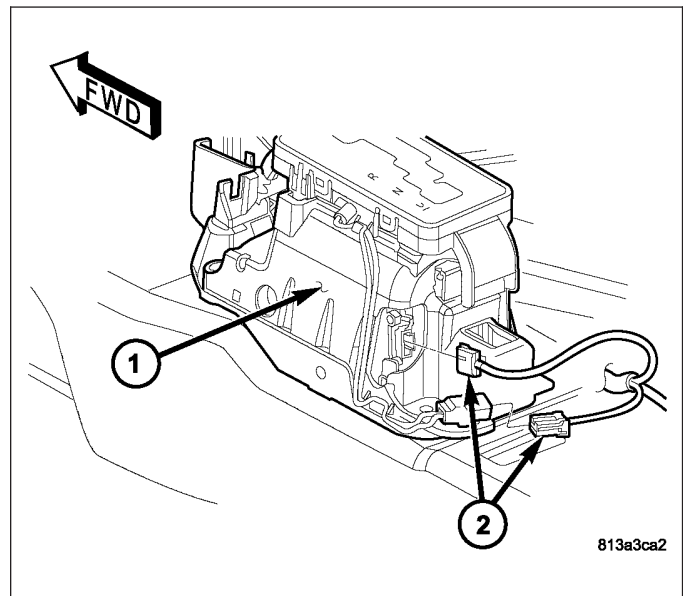
1. Remove any necessary console parts for access to shift lever assembly and shifter cables. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)
2. If necessary, remove the bolts holding the shield, covering the gearshift and park lock cables, to the floorpan and remove the shield.
3. Shift transmission into PARK.
4. Disconnect the transmission shift cable (1) at shift lever (3) and shifter assembly bracket (2).
5. Remove the shift cable retainer (2) from the notch in the shifter assembly (2).



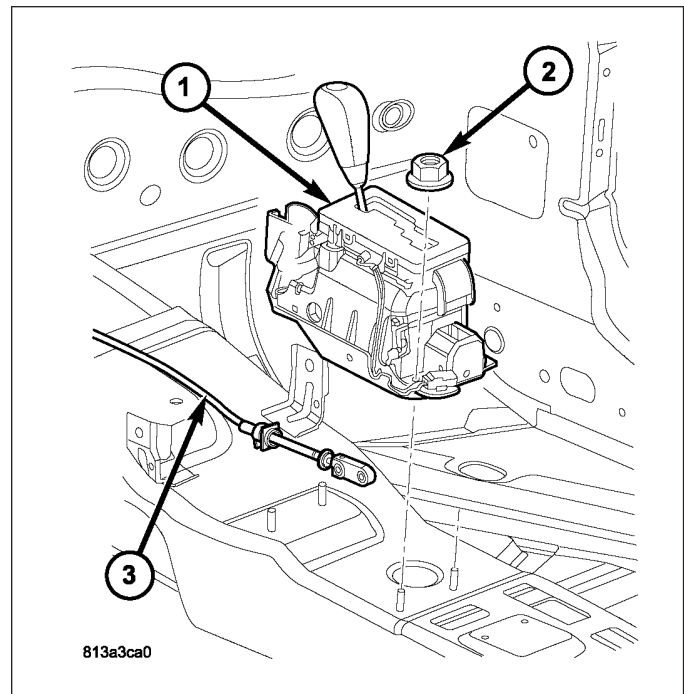
6. Verify the key is in the LOCK position and disconnect the park lock cable (1) from the shifter mechanism cam (3) and the notch in the shifter assembly (3).



7. Disengage all wiring connectors (2) from the shifter assembly (1).

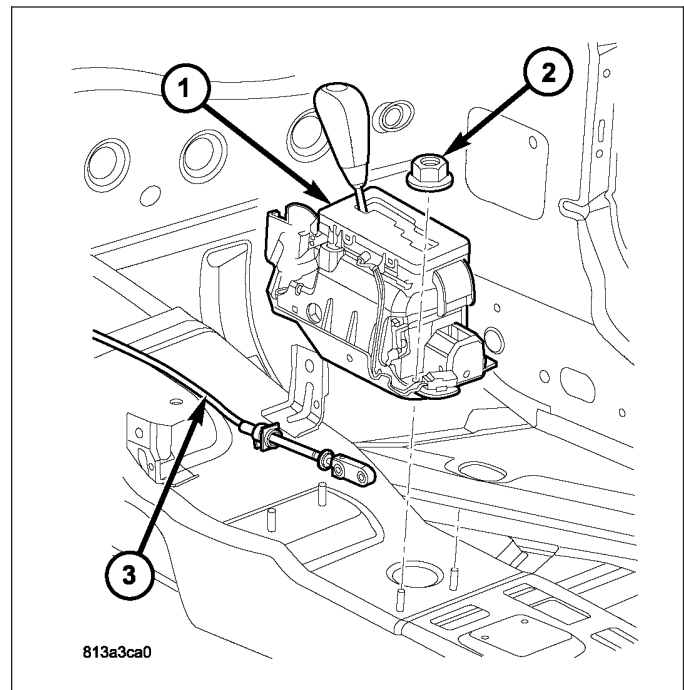


8. Remove all nuts (2) holding the shifter assembly (1) to the floor pan.
9. Remove the shifter assembly (1) from the vehicle.

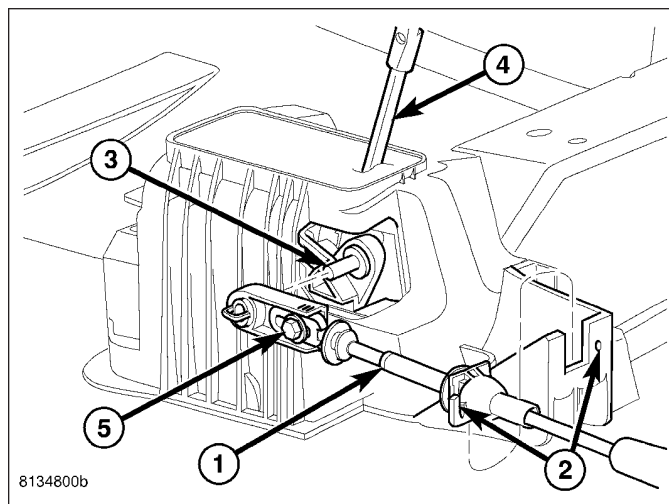


## INSTALLATION

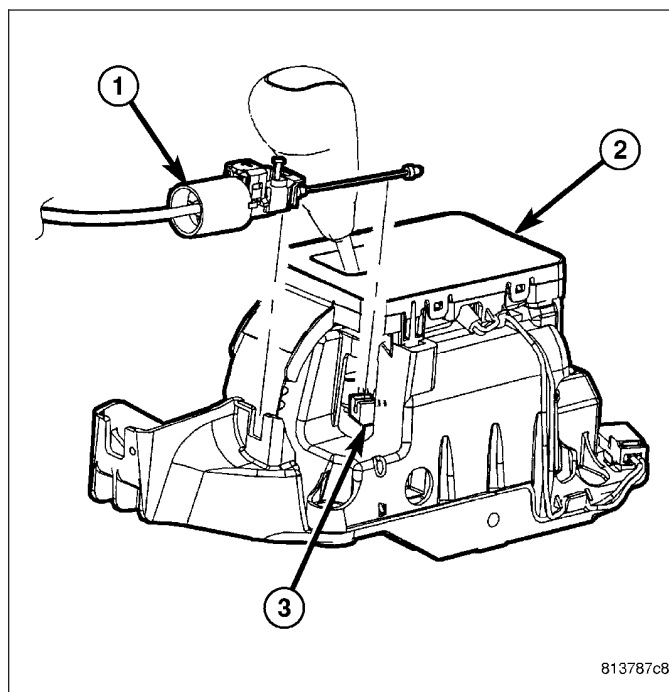
1. Install shifter assembly (1) onto the shifter assembly studs on the floor pan.
2. Install the nuts (2) to hold the shifter assembly (1) onto the floor pan. Tighten nuts to 7 N·m (652 in.lbs.).



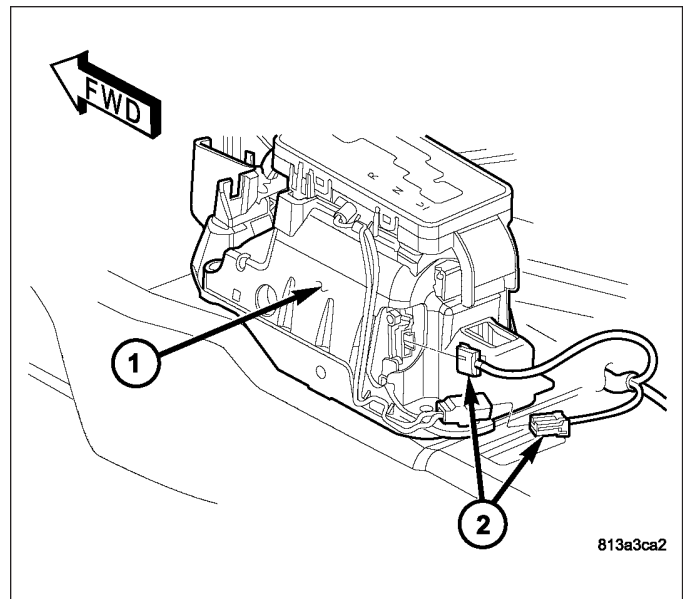
3. Place the floor shifter lever in PARK position.
4. Loosen the adjustment screw (5) on the gearshift cable (1).
5. Install the gearshift cable (1) to the shift lever pin (3).



6. Install the park lock cable (1) to the shift mechanism cam (3) and the notch in the shifter assembly (2).
7. Verify that the key is in the LOCK position and remains there until the cable is fully adjusted.
8. Verify that the park lock cable adjustment tab is pulled upward to the unlocked position.



9. Install the wiring harness connectors (2) to the shifter assembly.
10. Verify that the shift lever is in the PARK position.
11. Tighten the adjustment screw to 7 N·m (65 in.lbs.).
12. Verify that the key in the LOCK position and the shifter is in PARK.
13. Push downward on the park lock cable adjustment tab to lock the adjustment.
14. Verify correct shifter, park lock, and BTSI operation.
15. If necessary, install the shield, covering the gear-shift and park lock cables, to the floorpan and install the bolts to hold the shield to the floorpan.
16. Install any console parts removed for access to shift lever assembly and shift cables. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)



## SOLENOID

### DESCRIPTION

The typical electrical solenoid used in automotive applications is a linear actuator. It is a device that produces motion in a straight line. This straight line motion can be either forward or backward in direction, and short or long distance.

A solenoid is an electromechanical device that uses a magnetic force to perform work. It consists of a coil of wire, wrapped around a magnetic core made from steel or iron, and a spring loaded, movable plunger, which performs the work, or straight line motion.

The solenoids used in transmission applications are attached to valves which can be classified as **normally open** or **normally closed**. The **normally open** solenoid valve is defined as a valve which allows hydraulic flow when no current or voltage is applied to the solenoid. The **normally closed** solenoid valve is defined as a valve which does not allow hydraulic flow when no current or voltage is applied to the solenoid. These valves perform hydraulic control functions for the transmission and must therefore be durable and tolerant of dirt particles. For these reasons, the valves have hardened steel poppets and ball valves. The solenoids operate the valves directly, which means that the solenoids must have very high outputs to close the valves against the sizable flow areas and line pressures found in current transmissions. Fast response time is also necessary to ensure accurate control of the transmission.

The strength of the magnetic field is the primary force that determines the speed of operation in a particular solenoid design. A stronger magnetic field will cause the plunger to move at a greater speed than a weaker one. There are basically two ways to increase the force of the magnetic field:

1. Increase the amount of current applied to the coil or
2. Increase the number of turns of wire in the coil.

The most common practice is to increase the number of turns by using thin wire that can completely fill the available space within the solenoid housing. The strength of the spring and the length of the plunger also contribute to the response speed possible by a particular solenoid design.

A solenoid can also be described by the method by which it is controlled. Some of the possibilities include variable force, pulse-width modulated, constant ON, or duty cycle. The variable force and pulse-width modulated versions utilize similar methods to control the current flow through the solenoid to position the solenoid plunger at a desired position somewhere between full ON and full OFF. The constant ON and duty cycled versions control the voltage across the solenoid to allow either full flow or no flow through the solenoid's valve.

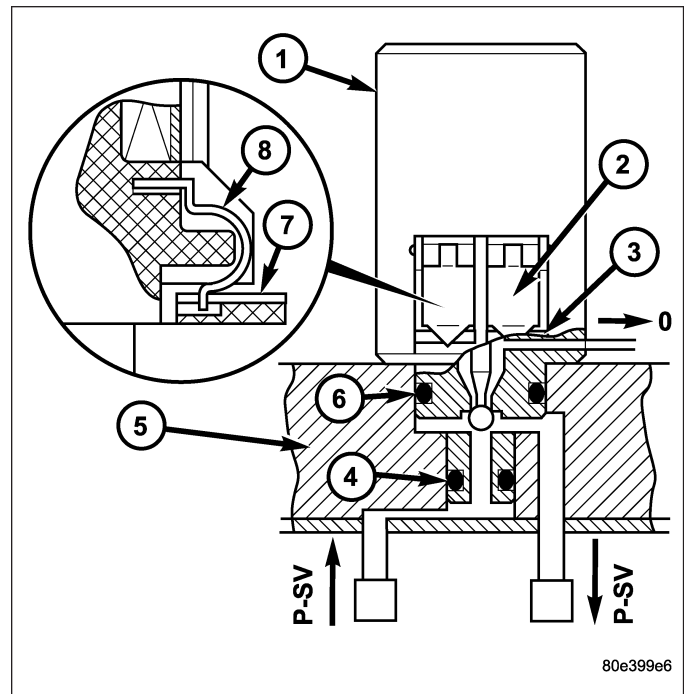


## UPSHIFT/DOWNSHIFT SOLENOID VALVES

The solenoid valves (1) for upshifts and downshifts are located in the shell of the electric control unit and pressed against the shift plate with a spring.

The solenoid valves (1) initiate the upshift and downshift procedures in the shift plate.

The solenoid valves (1) are sealed off from the valve housing of the shift plate (5) by two O-rings (4, 6). The contact springs (8) at the solenoid valve engage in a slot in the conductor tracks (7). The force of the contact spring (8) ensures safe contacts.

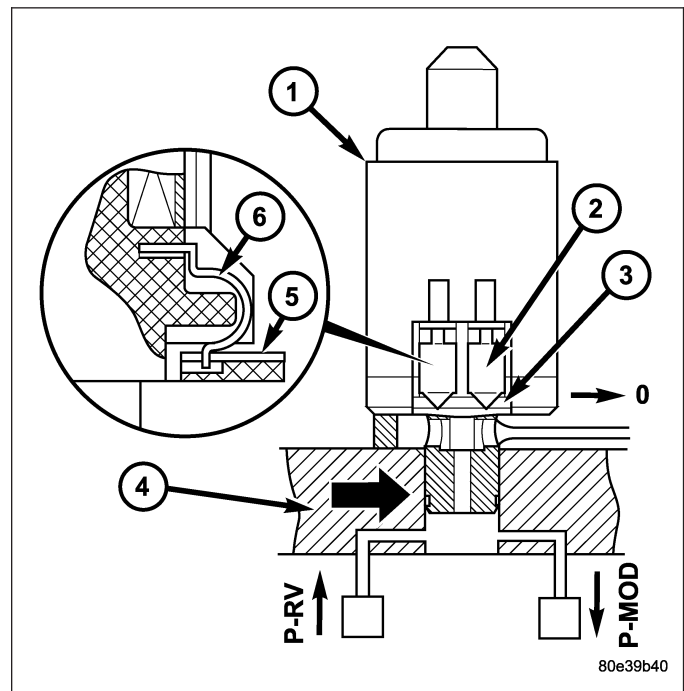


## MODULATING PRESSURE CONTROL SOLENOID VALVE

The modulating pressure control solenoid valve (1) is located in the shell of the electric valve control unit and pressed against the shift plate by a spring.

Its purpose is control the modulating pressure depending on the continuously changing operating conditions, such as load and gear change.

The modulating pressure regulating solenoid valve (1) has an interference fit and is sealed off to the valve body of the shift plate (4) by a seal (arrow). The contact springs (2) at the solenoid valve engage in a slot in the conductor tracks (3). The force of the contact springs (2) ensures secure contacts.

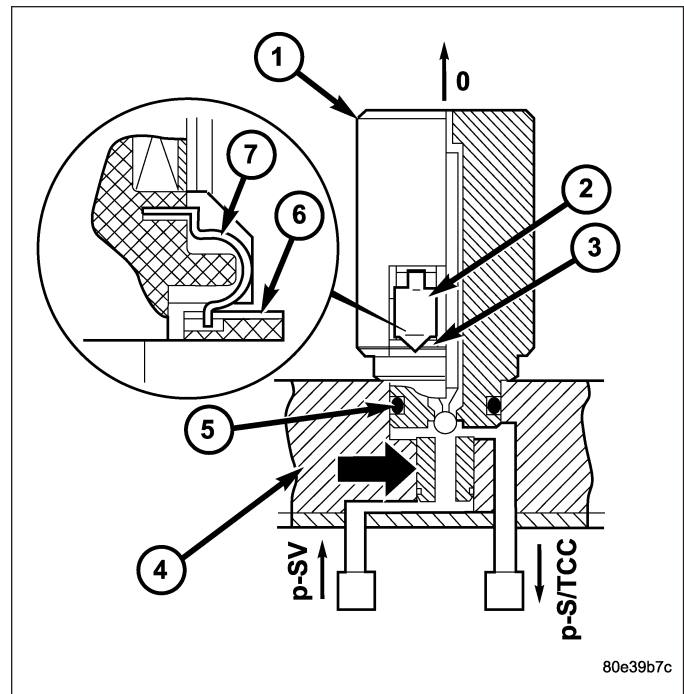


## TORQUE CONVERTER LOCKUP CLUTCH PWM SOLENOID VALVE

The torque converter lockup clutch PWM solenoid valve (1) is located in the shell of the electric valve control unit and pressed against the shift plate by a spring.

The PWM solenoid valve (1) for the torque converter lockup controls the pressure for the torque converter lockup clutch.

The torque converter lockup PWM solenoid valve (1) is sealed off to the valve body of the shift plate (4) by an O-ring (5) and a seal (arrow). The contact springs (2) at the solenoid valve engage in a slot in the conductor tracks (3). The force of the contact springs (2) ensures secure contacts.

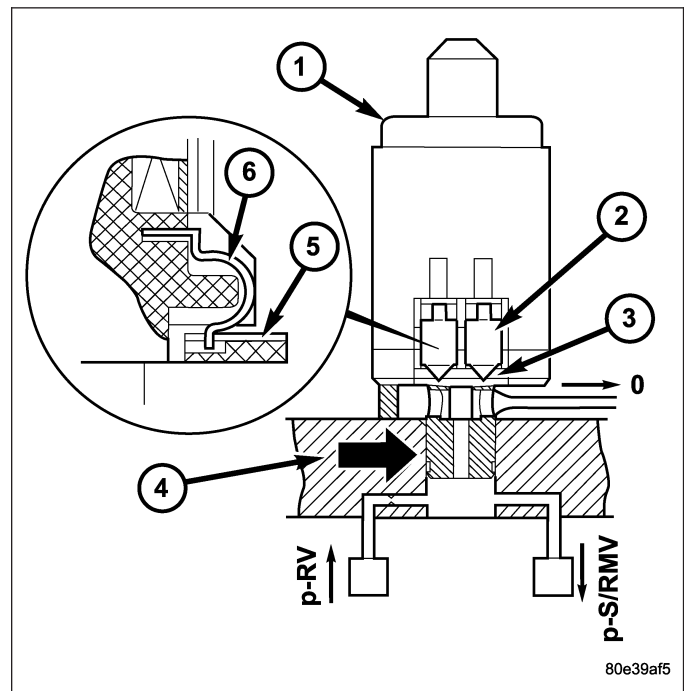


## SHIFT PRESSURE CONTROL SOLENOID VALVE

The shift pressure control solenoid valve (1) is located in the shell of the electric valve control unit and pressed against the shift plate by a spring.

Its purpose is to control the shift pressure depending on the continuously changing operating conditions, such as load and gear change.

The shift pressure regulating solenoid valve (1) has an interference fit and is sealed off to the valve body of the shift plate (4) by a seal (arrow). The contact springs (2) at the solenoid valve engage in a slot in the conductor tracks (3). The force of the contact springs (2) ensures secure contacts.



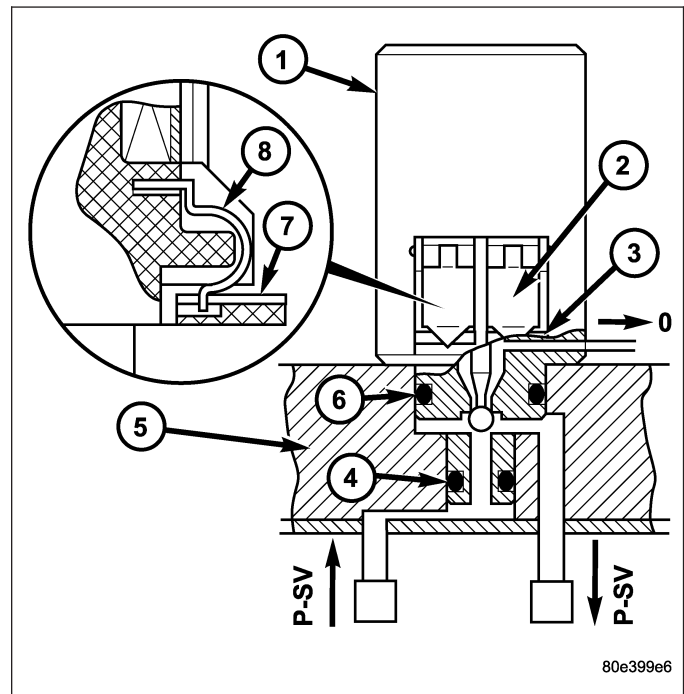
## OPERATION

When an electrical current is applied to the solenoid coil, a magnetic field is created which produces an attraction to the plunger, causing the plunger to move and work against the spring pressure and the load applied by the fluid the valve is controlling. The plunger is normally directly attached to the valve which it is to operate. When the current is removed from the coil, the attraction is removed and the plunger will return to its original position due to spring pressure.

The plunger is made of a conductive material and accomplishes this movement by providing a path for the magnetic field to flow. By keeping the air gap between the plunger and the coil to the minimum necessary to allow free movement of the plunger, the magnetic field is maximized.

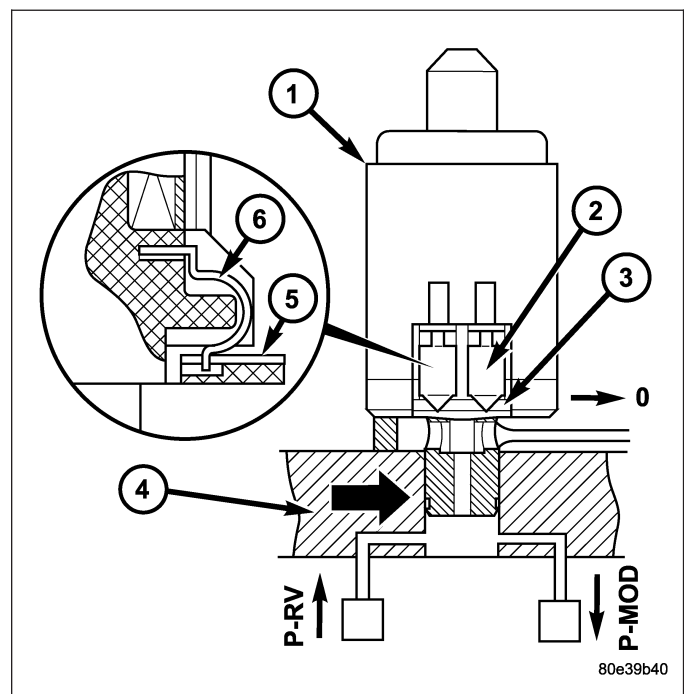
## UPSHIFT/DOWNSHIFT SOLENOID VALVES

If a solenoid valve (1) is actuated by the TCM, it opens and guides the control pressure (p-SV) to the assigned command valve. The solenoid valve remains actuated and therefore open until the shifting process is complete. The shift pressure (p-SV) to the command valve is reduced to zero as soon as the power supply to the solenoid valve is interrupted.



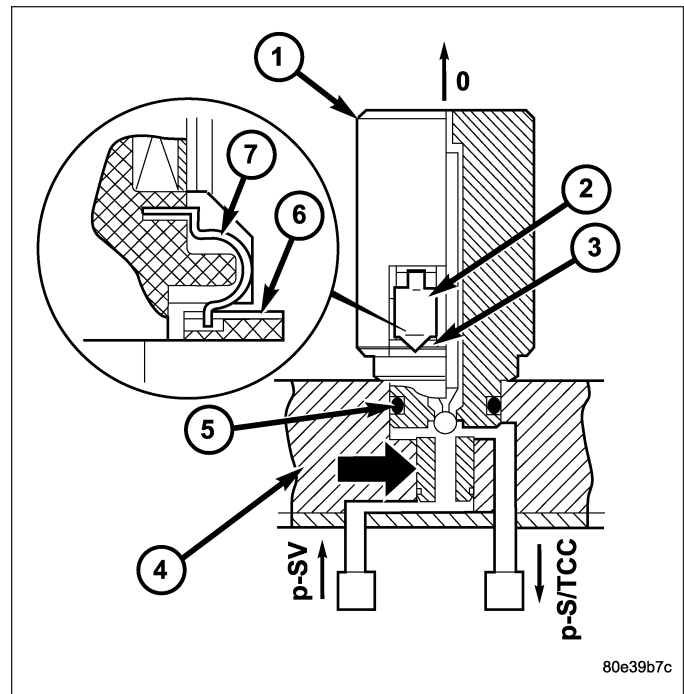
## MODULATING PRESSURE CONTROL SOLENOID VALVE

The modulating pressure regulating solenoid valve (1) assigns a proportional pressure to the current which is controlled by the TCM according to the load.



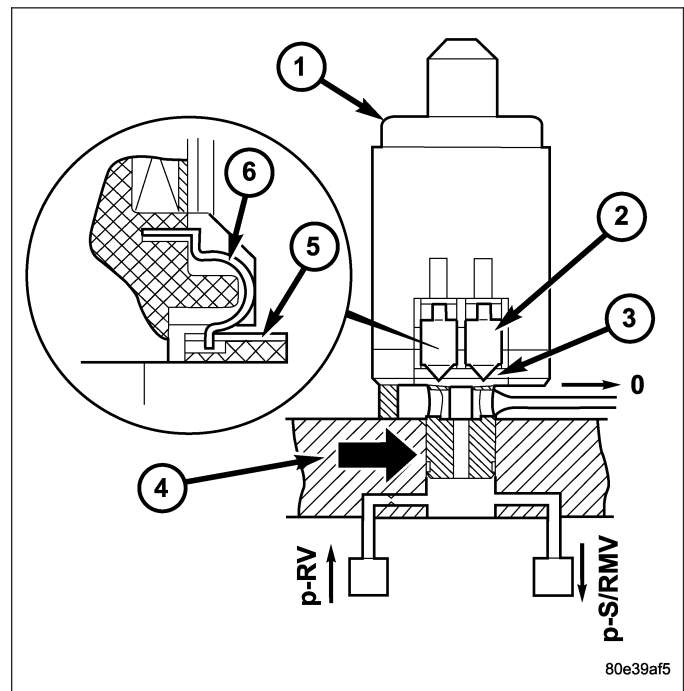
## TORQUE CONVERTER LOCKUP CLUTCH PWM SOLENOID VALVE

The torque converter lockup PWM solenoid (1) valve converts pulse-wave-modulated current controlled by the TCM into the appropriate hydraulic control pressure (p-S/TCC).



## SHIFT PRESSURE CONTROL SOLENOID VALVE

The shift pressure regulating solenoid valve (1) assigns a proportional pressure to the current which is controlled by the TCM according to the load.



## CONTACT-TEMPERATURE SENSOR/PARK-NEUTRAL

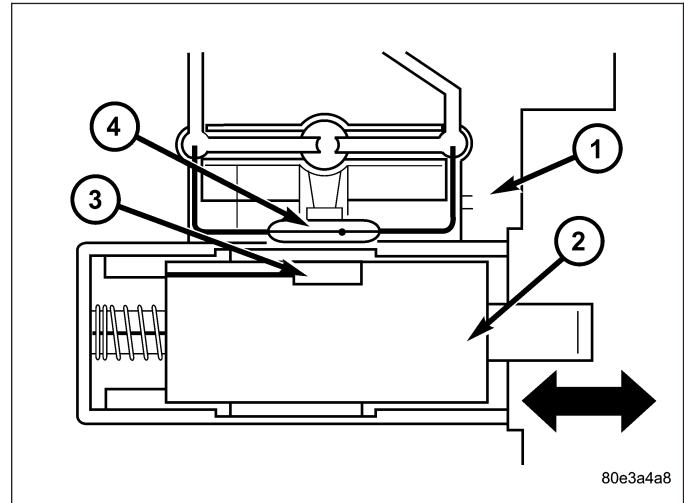
### DESCRIPTION

#### PARK/NEUTRAL CONTACT

The park/neutral contact (4) is located in the shell of the electric control unit and is fixed to the conductor tracks.

Its purpose is to recognize selector valve and selector lever positions "P" and "N". The park/neutral contact consists of:

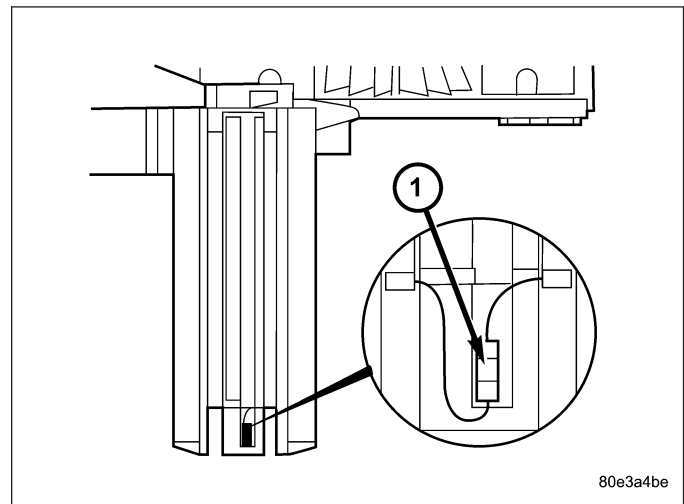
- the plunger (2).
- the permanent magnet (3).
- the dry-reed contact (4).



#### TRANSMISSION TEMPERATURE SENSOR

The transmission oil temperature sensor (1) is located in the shell of the electric valve control unit and is fixed to the conductor tracks.

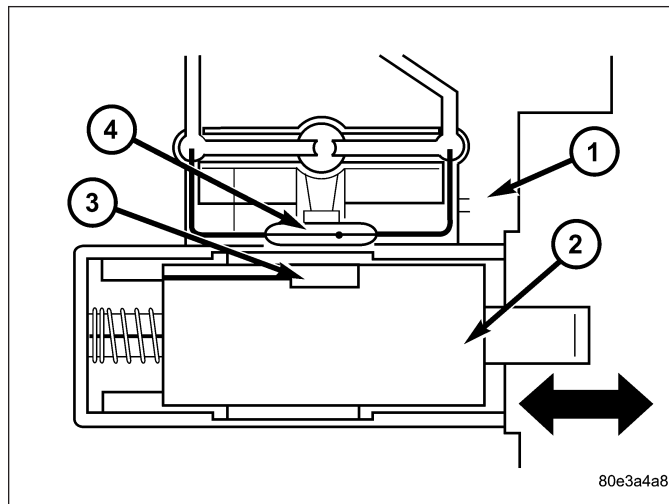
Its purpose is to measure the temperature of the transmission oil and pass the temperature to the TCM as an input signal. It is a temperature-dependent resistor (PTC).



## OPERATION

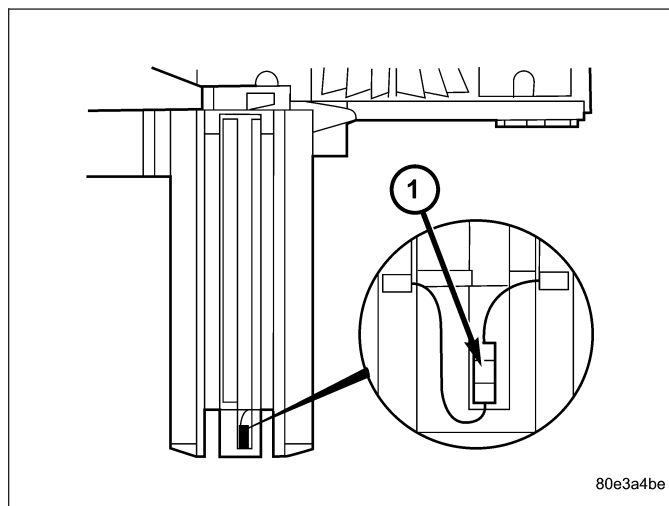
### PARK/NEUTRAL CONTACT

In selector lever positions "P" and "N" the park/neutral contact (4) is actuated by a cam track which is located on the detent plate. The permanent magnet (3) is moved away from the dry-reed contact (4). The dry-reed contact (4) is opened. The TCM receives an electric signal. The circuit to the starter in the selector lever positions "P" and "N" is closed.



### TRANSMISSION TEMPERATURE SENSOR

The temperature of the transmission oil has a considerable effect on the shifting time and therefore the shift quality. By measuring the oil temperature, shift operations can be optimized in all temperature ranges. The transmission oil temperature sensor (1) is switched in series with the park/neutral contact. The temperature signal is transferred to the TCM only when the dry-reed contact of the park/neutral contact is closed in REVERSE or a forward gear position.



Refer to the Transmission Temperature Sensor Specifications table for the relationship between transmission temperature, sensor voltage, and sensor resistance.

### TRANSMISSION TEMP SENSOR SPECIFICATIONS TEMPERATURE/VOLTAGE/RESISTANCE CHART

TEMPERATURE (C)	TEMPERATURE (F)	VOLTAGE	RESISTANCE
-50	-58	0.73	506.0
-45	-49	0.77	534.0
-40	-40	0.80	564.0
-35	-31	0.84	593.0
-30	-22	0.88	624.0
-25	-13	0.91	654.0
-20	-4	0.95	686.0
-15	5	0.98	718.0
-10	14	1.02	750.0
-5	23	1.05	783.0
0	32	1.09	817.0
5	41	1.12	851.0
10	50	1.16	886.0
15	59	1.19	921.0
20	68	1.23	957.0
25	77	1.26	994.0
30	86	1.30	1032.0
35	95	1.33	1070.0
40	104	1.37	1109.0
45	113	1.40	1149.0
50	122	1.44	1189.0
55	131	1.48	1231.0
60	140	1.51	1273.0
65	149	1.55	1316.0
70	158	1.58	1360.0
75	167	1.62	1405.0
80	176	1.65	1450.0
85	185	1.69	1497.0
90	194	1.72	1545.0
95	203	1.76	1594.0
100	212	1.79	1644.0
105	221	1.83	1695.0
110	230	1.86	1747.0
115	239	1.90	1800.0
120	248	1.93	1855.0
125	257	1.97	1911.0
130	266	2.00	1968.0
135	275	2.04	2027.0
140	284	2.08	2087.0
145	293	2.11	2148.0
150	302	2.15	2211.0
155	311	2.18	2276.0
160	320	2.22	2342.0
165	329	2.25	2410.0
170	338	2.29	2479.0
175	347	2.32	2551.0

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## CONVERTER-TORQUE

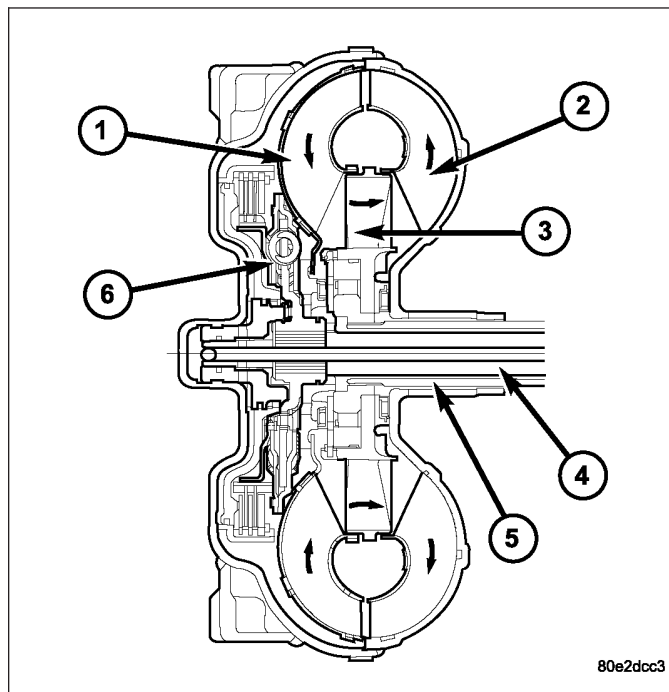
### DESCRIPTION

**CAUTION:** The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid.

The torque converter is a hydraulic device that couples the engine crankshaft to the transmission. The torque converter consists of an outer shell with an internal turbine (1), a stator (3), an overrunning clutch, an impeller (2), and an electronically applied converter clutch. The converter clutch provides reduced engine speed and greater fuel economy when engaged. Clutch engagement also provides reduced transmission fluid temperatures. The converter clutch engages in third through fifth gears. The torque converter hub drives the transmission oil (fluid) pump.

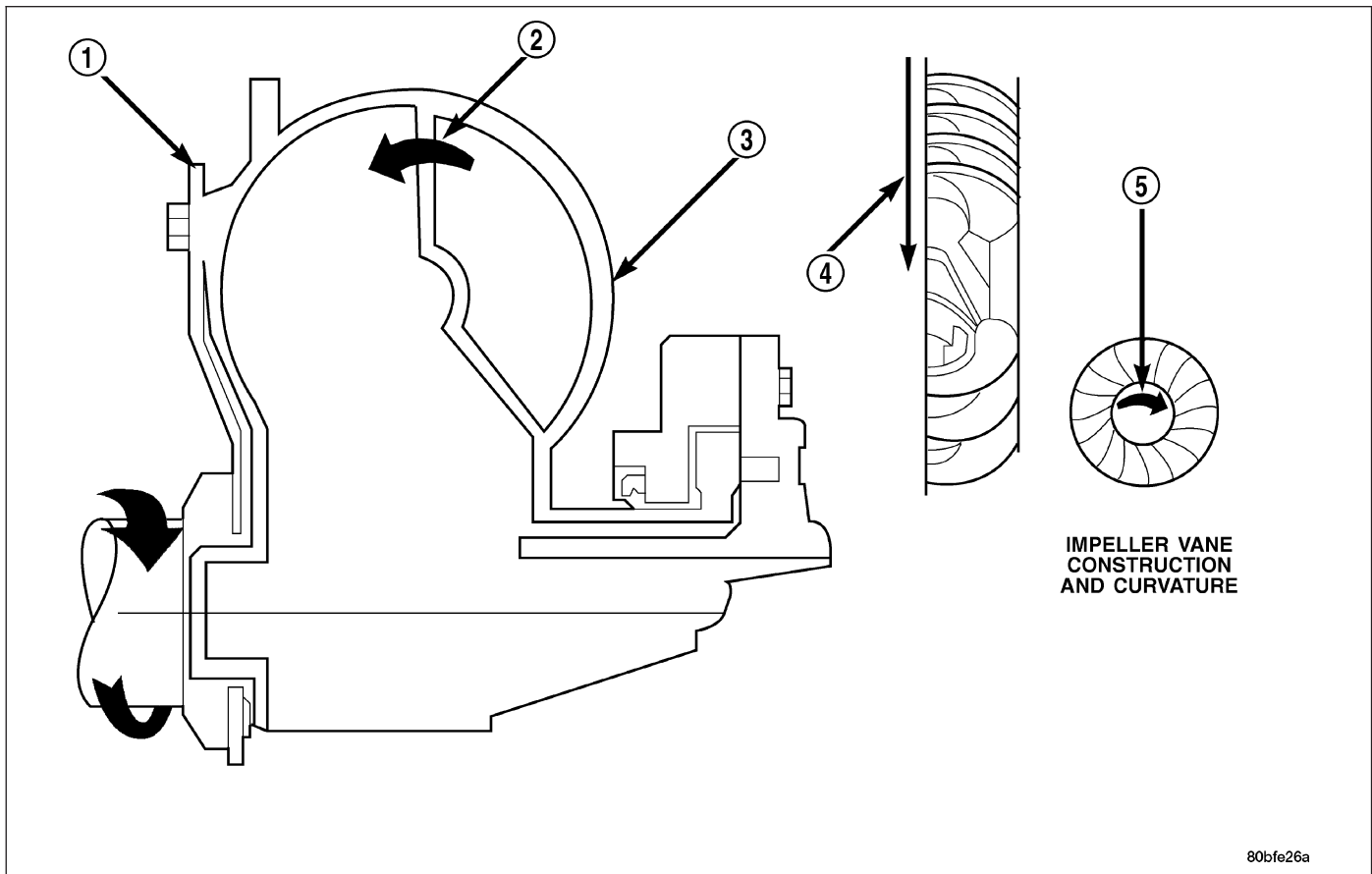
A turbine damper (6) has been added for some applications to help improve vehicle noise, vibration, and harshness (NVH) characteristics.

The torque converter is a sealed, welded unit that is not repairable and is serviced as an assembly.



- 1 - TURBINE
- 2 - IMPELLER
- 3 - STATOR
- 4 - INPUT SHAFT
- 5 - STATOR SHAFT
- 6 - TURBINE DAMPER

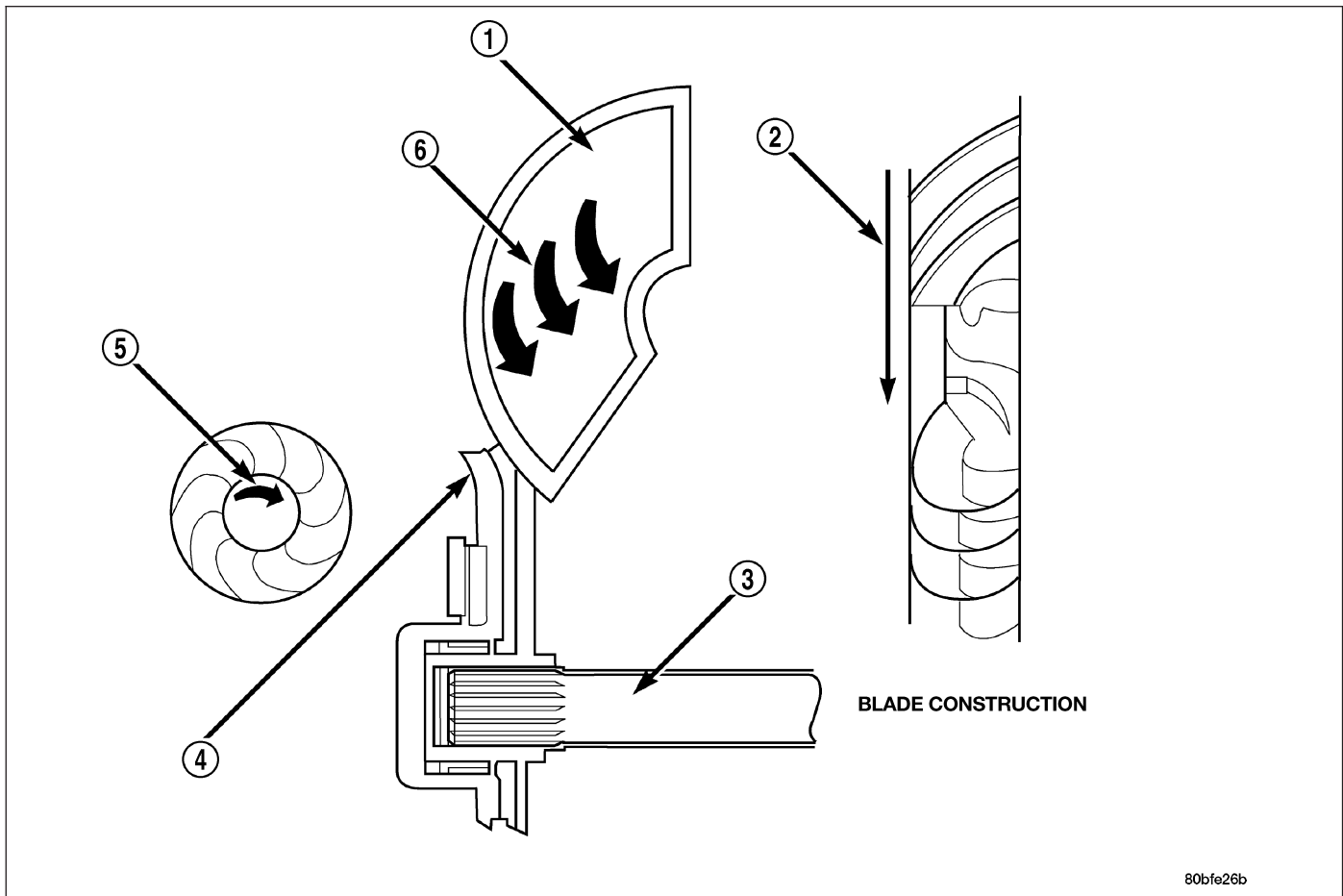


**IMPELLER*****Impeller***

- 1 - ENGINE FLEXPLATE
- 2 - OIL FLOW FROM IMPELLER SECTION INTO TURBINE SECTION
- 3 - IMPELLER VANES AND COVER ARE INTEGRAL

- 4 - ENGINE ROTATION
- 5 - ENGINE ROTATION

The impeller (3) is an integral part of the converter housing. The impeller consists of curved blades placed radially along the inside of the housing on the transmission side of the converter. As the converter housing is rotated by the engine, so is the impeller, because they are one and the same and are the driving members of the system.

**TURBINE*****Turbine***

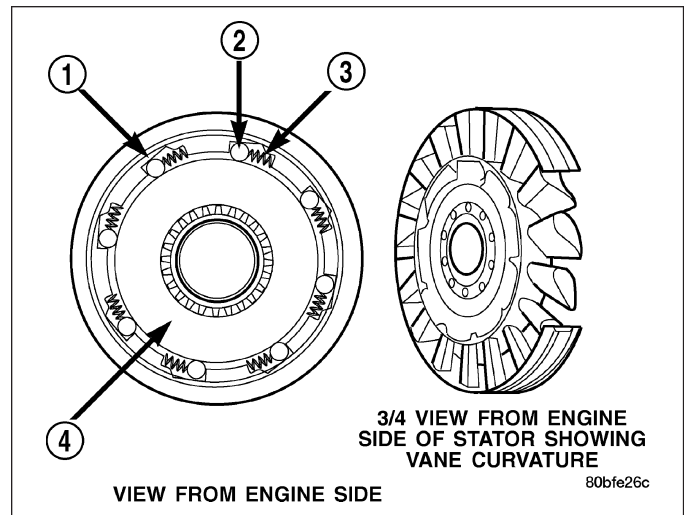
- 1 - TURBINE VANE
- 2 - ENGINE ROTATION
- 3 - INPUT SHAFT

- 4 - PORTION OF TORQUE CONVERTER COVER
- 5 - ENGINE ROTATION
- 6 - OIL FLOW WITHIN TURBINE SECTION

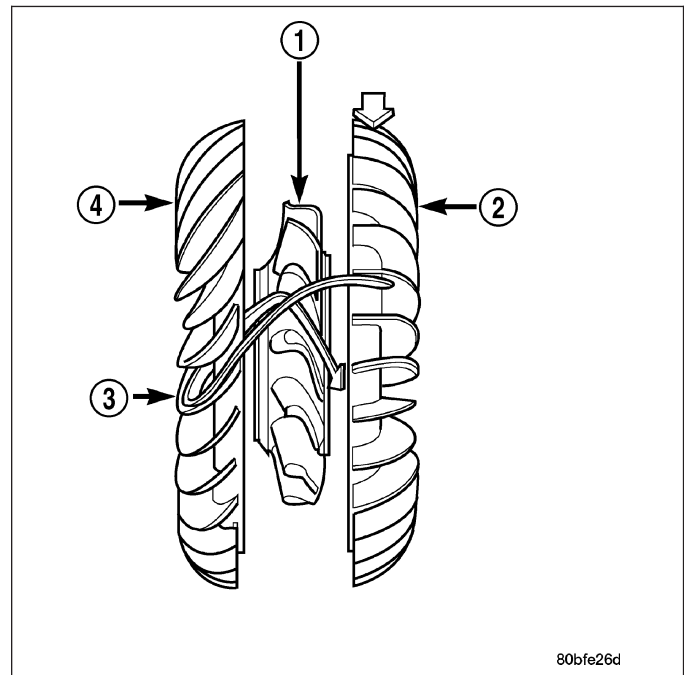
The turbine (1) is the output, or driven, member of the converter. The turbine is mounted within the housing opposite the impeller, but is not attached to the housing. The input shaft is inserted through the center of the impeller and splined into the turbine. The design of the turbine is similar to the impeller, except the blades of the turbine are curved in the opposite direction.

## STATOR

The stator assembly (1-4) is mounted on a stationary shaft which is an integral part of the oil pump.



The stator (1) is located between the impeller (2) and turbine (4) within the torque converter case. The stator contains a freewheeling clutch, which allows the stator to rotate only in a clockwise direction. When the stator is locked against the freewheeling clutch, the torque multiplication feature of the torque converter is operational.

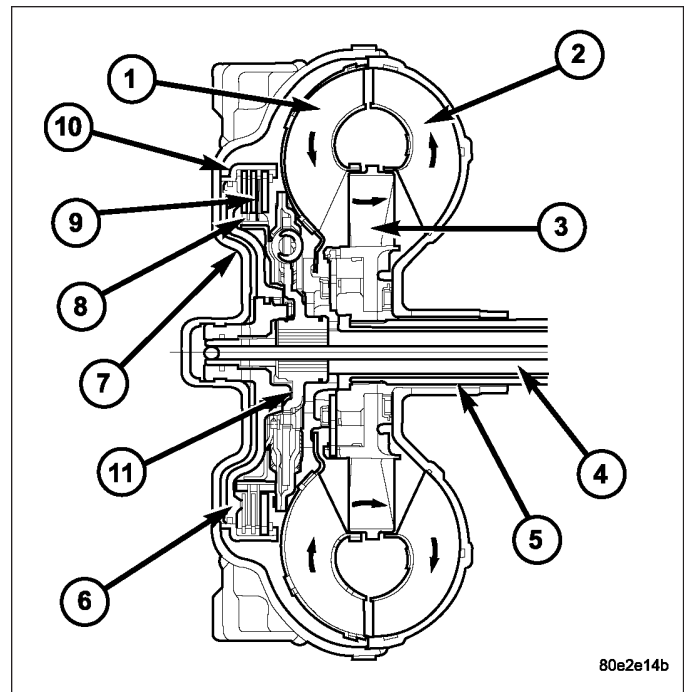


## TORQUE CONVERTER CLUTCH (TCC)

The TCC (9) was installed to improve the efficiency of the torque converter that is lost to the slippage of the fluid coupling. Although the fluid coupling provides smooth, shock-free power transfer, it is natural for all fluid couplings to slip. If the impeller and turbine were mechanically locked together, a zero slippage condition could be obtained. A hydraulic piston with friction material was added to the turbine assembly to provide this mechanical lock-up.

In order to reduce heat build-up in the transmission and buffer the powertrain against torsional vibrations, the TCM can duty cycle the torque converter lock-up solenoid to achieve a smooth application of the torque converter clutch. This function, referred to as Electronically Modulated Converter Clutch (EMCC) can occur at various times depending on the following variables:

- Shift lever position
- Current gear range
- Transmission fluid temperature
- Engine coolant temperature
- Input speed
- Throttle angle
- Engine speed

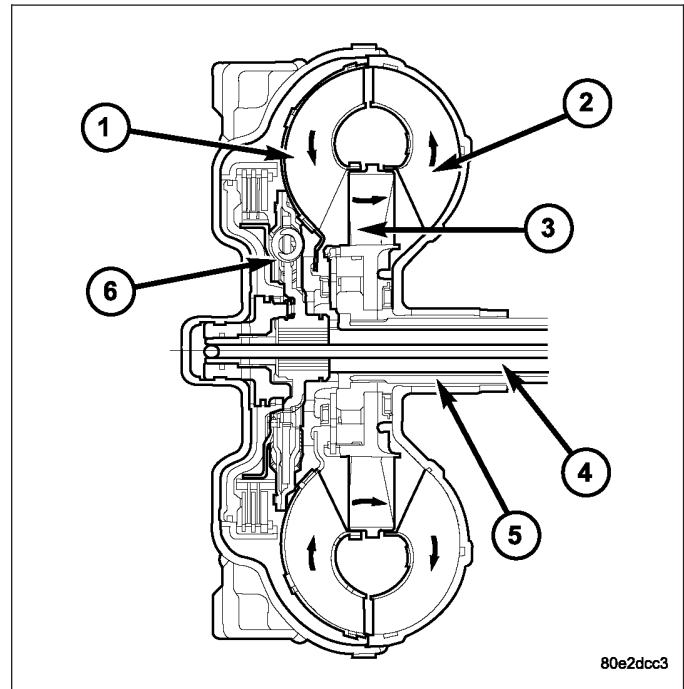


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- 1 - TURBINE
- 2 - IMPELLER
- 3 - STATOR
- 4 - INPUT SHAFT
- 5 - STATOR SHAFT
- 6 - PISTON
- 7 - COVER SHELL
- 8 - INTERNALLY TOOTHED DISC CARRIER
- 9 - CLUTCH PLATE SET
- 10 - EXTERNALLY TOOTHED DISC CARRIER
- 11 - TURBINE DAMPER

## OPERATION

The converter impeller (driving member) (2), which is integral to the converter housing and bolted to the engine drive plate, rotates at engine speed. The converter turbine (driven member) (1), which reacts from fluid pressure generated by the impeller, rotates and turns the transmission input shaft (4).



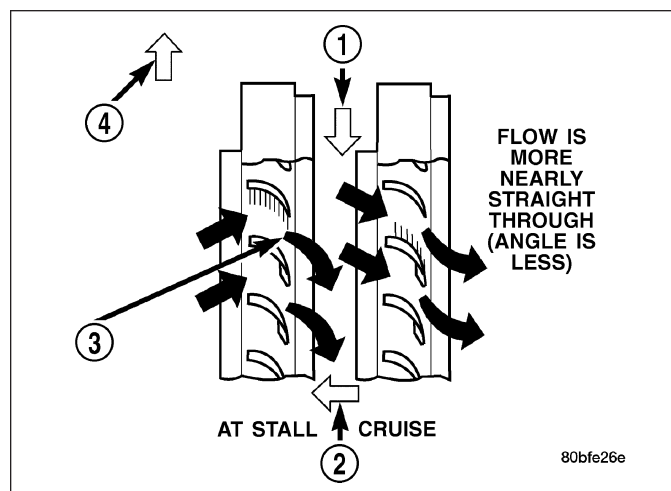
- 1 - TURBINE
- 2 - IMPELLER
- 3 - STATOR
- 4 - INPUT SHAFT
- 5 - STATOR SHAFT
- 6 - TURBINE DAMPER

## TURBINE

As the fluid that was put into motion by the impeller blades strikes the blades of the turbine, some of the energy and rotational force is transferred into the turbine and the input shaft. This causes both of them (turbine and input shaft) to rotate in a clockwise direction following the impeller. As the fluid is leaving the trailing edges of the turbine's blades it continues in a "hindering" direction back toward the impeller. If the fluid is not redirected before it strikes the impeller, it will strike the impeller in such a direction that it would tend to slow it down.

## STATOR

Torque multiplication is achieved by locking the stator's over-running clutch to its shaft. Under stall conditions (the turbine is stationary), the oil leaving the turbine blades strikes the face of the stator blades and tries to rotate them in a counterclockwise direction. When this happens the over-running clutch of the stator locks and holds the stator from rotating. With the stator locked, the oil strikes the stator blades and is redirected into a "helping" direction before it enters the impeller. This circulation of oil from impeller to turbine, turbine to stator, and stator to impeller, can produce a maximum torque multiplication of about 2.0:1. As the turbine begins to match the speed of the impeller, the fluid that was hitting the stator in such a way as to cause it to lock-up is no longer doing so. In this condition of operation, the stator begins to free wheel and the converter acts as a fluid coupling.



- 1 - DIRECTION STATOR WILL FREE WHEEL DUE TO OIL PUSHING ON BACKSIDE OF VANES
- 2 - FRONT OF ENGINE
- 3 - INCREASED ANGLE AS OIL STRIKES VANES
- 4 - DIRECTION STATOR IS LOCKED UP DUE TO OIL PUSHING AGAINST STATOR VANES

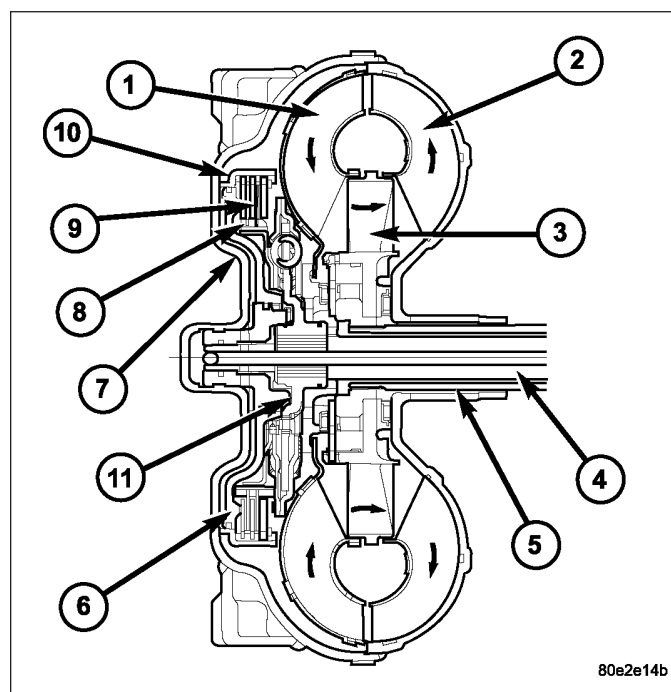
## TORQUE CONVERTER CLUTCH (TCC)

In a standard torque converter, the impeller (2) and turbine (1) are rotating at about the same speed and the stator (3) is freewheeling, providing no torque multiplication. By applying the turbine's piston and friction material (9), a total converter engagement can be obtained. The result of this engagement is a direct 1:1 mechanical link between the engine and the transmission.

The clutch can be engaged in second, third, fourth, and fifth gear ranges.

The TCM controls the torque converter by way of internal logic software. The programming of the software provides the TCM with control over the torque converter solenoid. There are four output logic states that can be applied as follows:

- No EMCC
- Partial EMCC
- Full EMCC
- Gradual-to-no EMCC



- 1 - TURBINE
- 2 - IMPELLER
- 3 - STATOR
- 4 - INPUT SHAFT
- 5 - STATOR SHAFT
- 6 - PISTON
- 7 - COVER SHELL
- 8 - INTERNALLY TOOTHED DISC CARRIER
- 9 - CLUTCH PLATE SET
- 10 - EXTERNALLY TOOTHED DISC CARRIER
- 11 - TURBINE DAMPER

## NO EMCC

Under No EMCC conditions, the TCC Solenoid is OFF. There are several conditions that can result in NO EMCC operations. No EMCC can be initiated due to a fault in the transmission or because the TCM does not see the need for EMCC under current driving conditions.

## PARTIAL EMCC

Partial EMCC operation modulates the TCC Solenoid (duty cycle) to obtain partial torque converter clutch application. Partial EMCC operation is maintained until Full EMCC is called for and actuated. During Partial EMCC some slip does occur. Partial EMCC will usually occur at low speeds, low load and light throttle situations.

## FULL EMCC

During Full EMCC operation, the TCM increases the TCC Solenoid duty cycle to full ON after Partial EMCC control brings the engine speed within the desired slip range of transmission input speed relative to engine rpm.

## GRADUAL-TO-NO EMCC

This operation is to soften the change from Full or Partial EMCC to No EMCC. This is done at mid-throttle by decreasing the TCC Solenoid duty cycle.

## REMOVAL

1. Remove transmission and torque converter from vehicle.
2. Place a suitable drain pan under the converter housing end of the transmission.

**CAUTION:** Verify that transmission is secure on the lifting device or work surface, the center of gravity of the transmission will shift when the torque converter is removed creating an unstable condition. The torque converter is a heavy unit. Use caution when separating the torque converter from the transmission.

3. Pull the torque converter forward until the center hub clears the oil pump seal.
4. Separate the torque converter from the transmission.

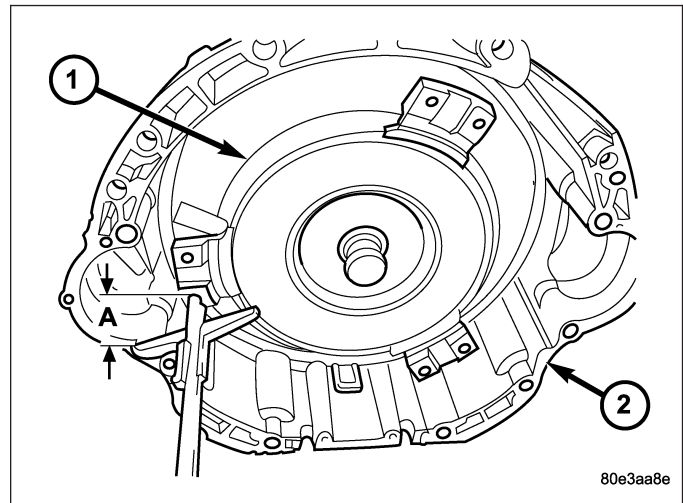
## INSTALLATION

Check converter hub and drive flats for sharp edges, burrs, scratches, or nicks. Polish the hub and flats with 320/400 grit paper or crocus cloth if necessary. The hub must be smooth to avoid damaging the pump seal at installation.

1. Lubricate oil pump seal lip with transmission fluid.
2. Place torque converter in position on transmission.

**CAUTION:** Do not damage oil pump seal or converter hub while inserting torque converter into the front of the transmission.

3. Align torque converter to oil pump seal opening.
4. Insert torque converter hub into oil pump.
5. While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.
6. Check converter seating with a scale and straightedge. Surface of converter lugs should be at least 19 mm (3/4 in.) to rear of straightedge when converter is fully seated.
7. If necessary, temporarily secure converter with C-clamp attached to the converter housing.
8. Install the transmission in the vehicle.
9. Fill the transmission with the recommended fluid.



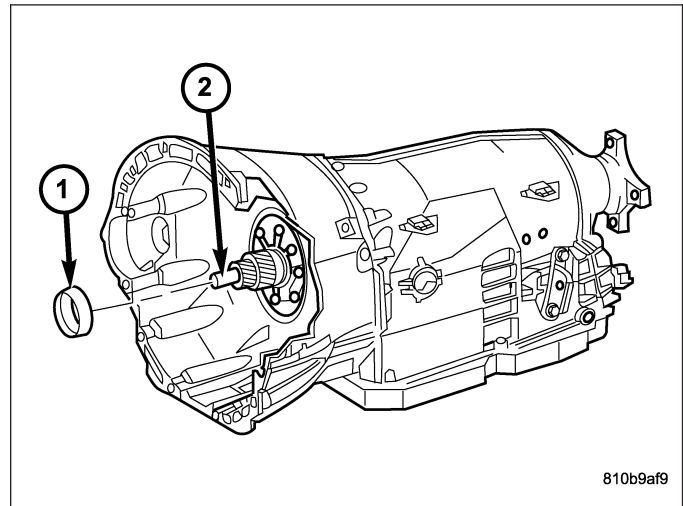
## SEAL-TORQUE CONVERTER HUB

### REMOVAL

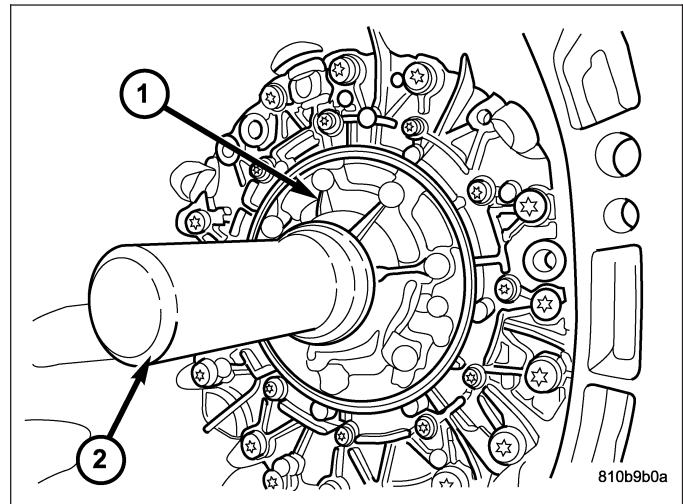
1. Remove the torque converter (Refer to 21 - TRANSMISSION/AUTOMATIC - NAG1/TORQUE CONVERTER - REMOVAL).
2. Remove the torque converter hub seal with suitable screw and slide hammer.

### INSTALLATION

1. Position the torque converter hub seal (1) over the input shaft and against the transmission oil pump.



2. Using Seal Installer 8902A (2), install a new torque converter hub seal.
3. Install the torque converter (Refer to 21 - TRANSMISSION/AUTOMATIC - NAG1/TORQUE CONVERTER - INSTALLATION).





## AUTOMATIC TRANSMISSION 42RLE - SERVICE INFORMATION

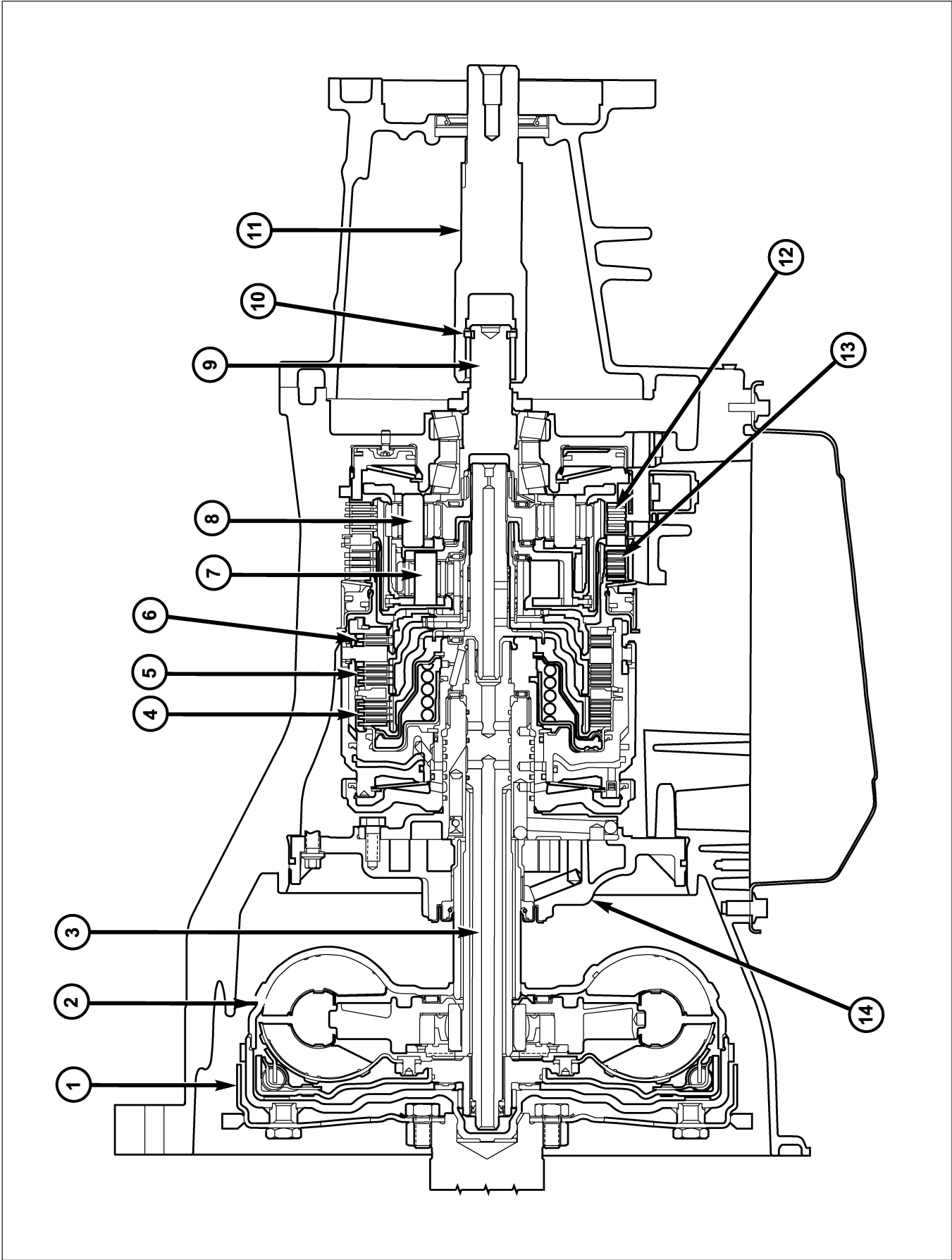
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## AUTOMATIC TRANSMISSION 42RLE - SERVICE INFORMATION

### DESCRIPTION



80180141

42RLE Automatic Transmission

The 42RLE is a four-speed transmission that is a conventional hydraulic/mechanical assembly controlled with adaptive electronic controls and monitors. The hydraulic system of the transmission consists of the transmission fluid, fluid passages, hydraulic valves, and various line pressure control components. An input clutch assembly which houses the underdrive, overdrive, and reverse clutches is used. It also utilizes separate holding clutches: 2nd/4th gear and Low/Reverse. The primary mechanical components of the transmission consist of the following:

- Three multiple disc input clutches
- Two multiple disc holding clutches
- Four hydraulic accumulators
- Two planetary gear sets
- Hydraulic oil pump
- Valve body
- Solenoid/Pressure switch assembly

Control of the transmission is accomplished by fully adaptive electronics. Optimum shift scheduling is accomplished through continuous real-time sensor feedback information provided to the Transmission Control Module (TCM) portion of the Powertrain Control Module (PCM).

The TCM is the heart of the electronic control system and relies on information from various direct and indirect inputs (sensors, switches, etc.) to determine driver demand and vehicle operating conditions. With this information, the TCM can calculate and perform timely and quality shifts through various output or control devices (solenoid pack, transmission control relay, etc.).

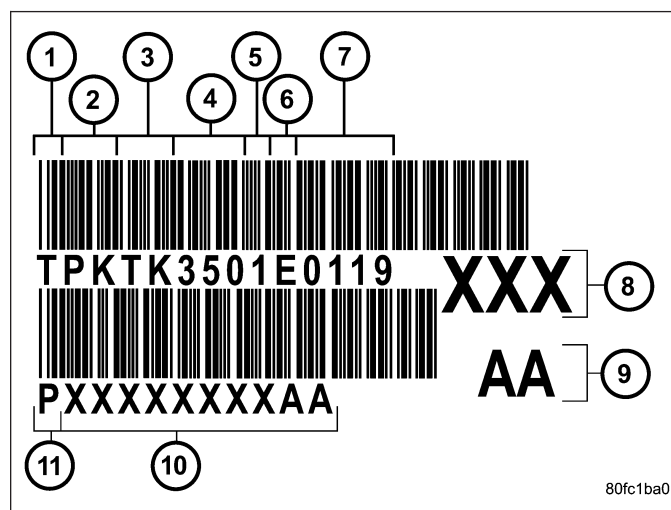
The TCM also performs certain self-diagnostic functions and provides comprehensive information (sensor data, DTC's, etc.) which is helpful in proper diagnosis and repair. This information can be viewed with the scan tool.

## TRANSMISSION IDENTIFICATION

The 42RLE transmission can be identified by a bar-code label that is affixed to the upper left area of the bellhousing.

The label contains a series of digits that can be translated into useful information such as transmission part number (10), date of manufacture (4, 5), manufacturing origin (2), assembly line identifier (6), build sequence number (7), etc..

If the tag is not legible or is missing, the "PK" number, which is stamped into the left rear flange of the transmission case, can be referred to for identification. The entire part number, build code, and sequence number are stamped into the flange.



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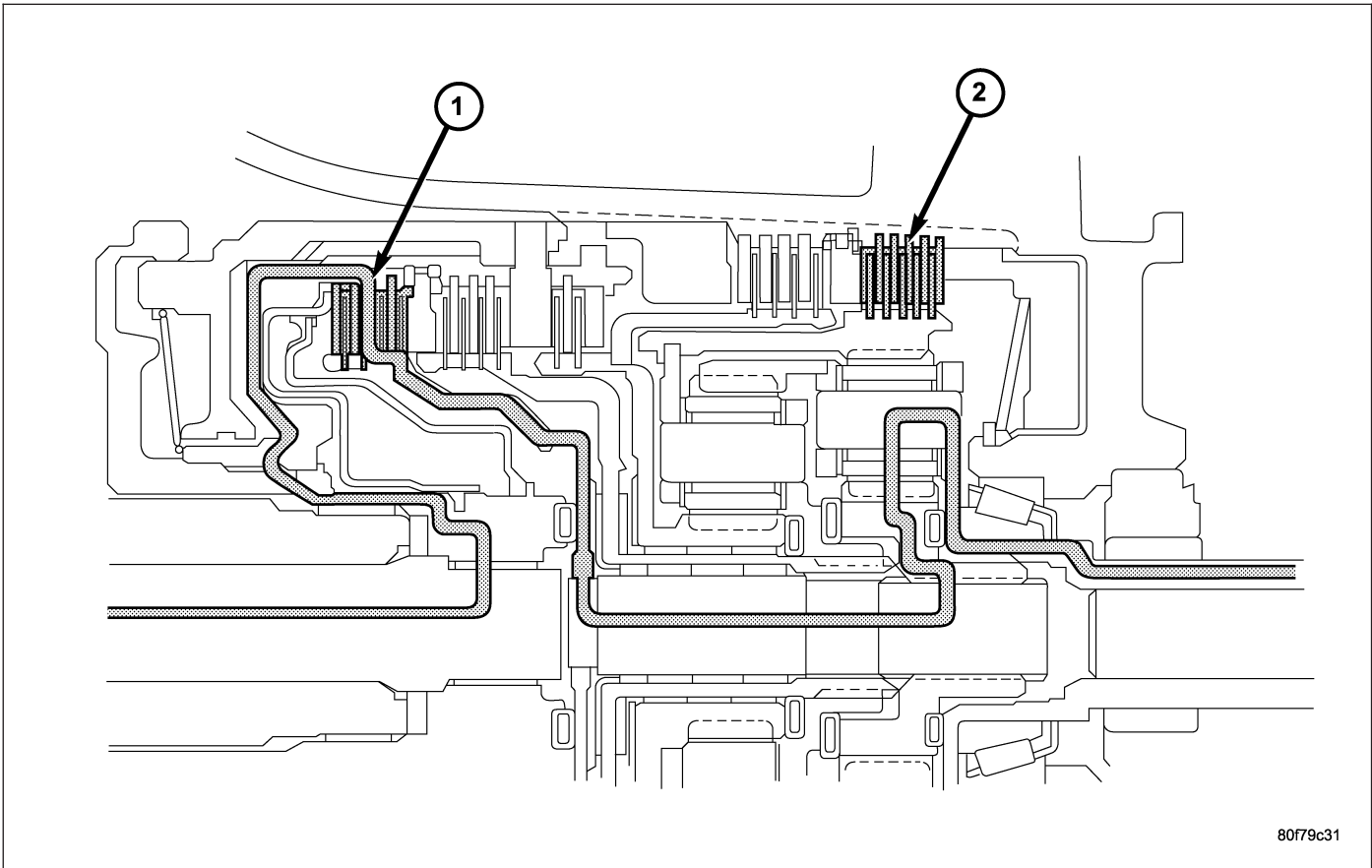
- 1 - T=TRACEABILITY
- 2 - SUPPLIER CODE (PK=KOKOMO)
- 3 - COMPONENT CODE (TK=KOKOMO TRANSMISSION)
- 4 - BUILD DAY (350=DEC. 15)
- 5 - BUILD YEAR (1=2001)
- 6 - ASSEMBLY LINE CODE
- 7 - BUILD SEQUENCE NUMBER
- 8 - LAST THREE OF P/N
- 9 - CHANGE LEVEL
- 10 - TRANSMISSION PART NUMBER
- 11 - P=PART NUMBER

OPERATION

The 42RLE transmission ratios are:

First	2.84 : 1
Second	1.57 : 1
Third	1.00 : 1
Overdrive	0.69 : 1
Reverse	2.21 : 1

FIRST GEAR POWERFLOW

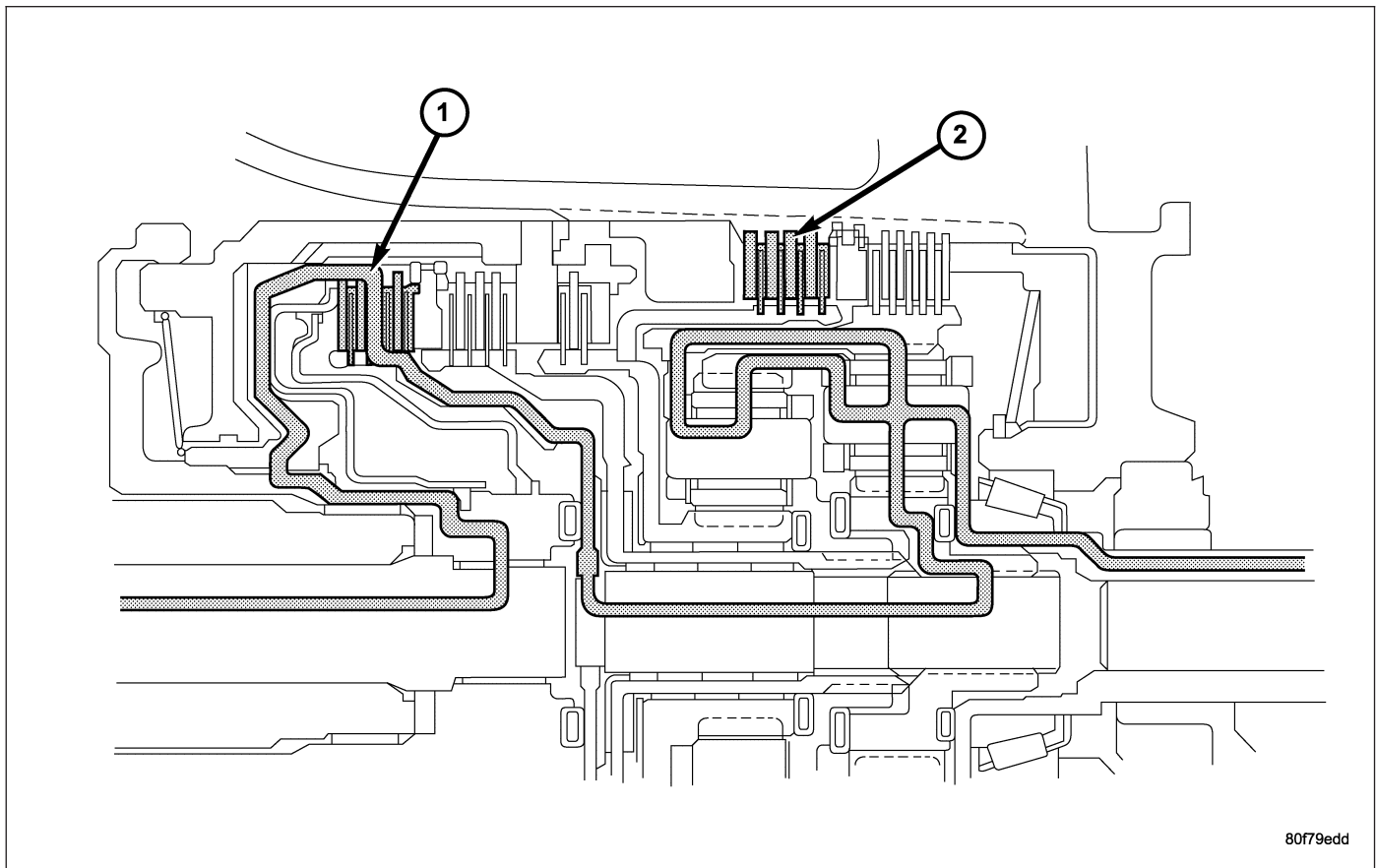


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First Gear Powerflow

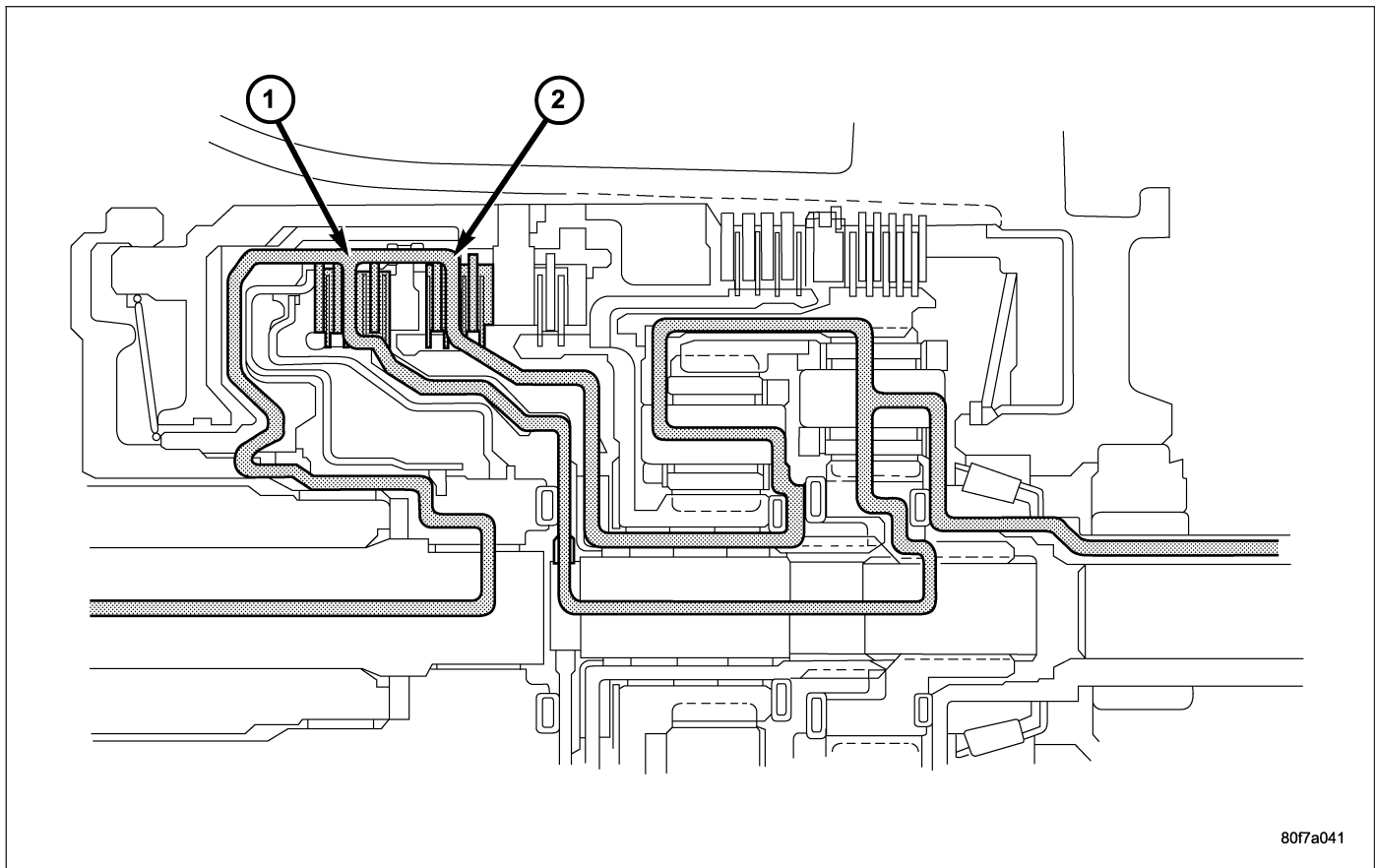
- 1 - UNDERDRIVE CLUTCH APPLIED (Turns Rear Sun)
- 2 - LOW-REVERSE CLUTCH APPLIED (Holds Rear Annulus/Front Carrier)

In first gear range, torque input is through the underdrive clutch (1) to the underdrive hub assembly. The underdrive hub is splined to the rear sun gear. When the underdrive clutch is applied, it rotates the underdrive hub and rear sun gear. The L/R clutch (2) is applied to hold the front carrier/rear annulus assembly. The rear sun gear drives the rear planetary pinion gears. The rear planetary pinion gears are forced to walk around the inside of the stationary rear annulus gear. The pinions are pinned to the rear carrier and cause the rear carrier assembly to rotate as they walk around the annulus gear. This provides the torque output for first gear. The other planetary gearset components are freewheeling. The first gear ratio is 2.84:1.

**SECOND GEAR POWERFLOW*****Second Gear Powerflow***

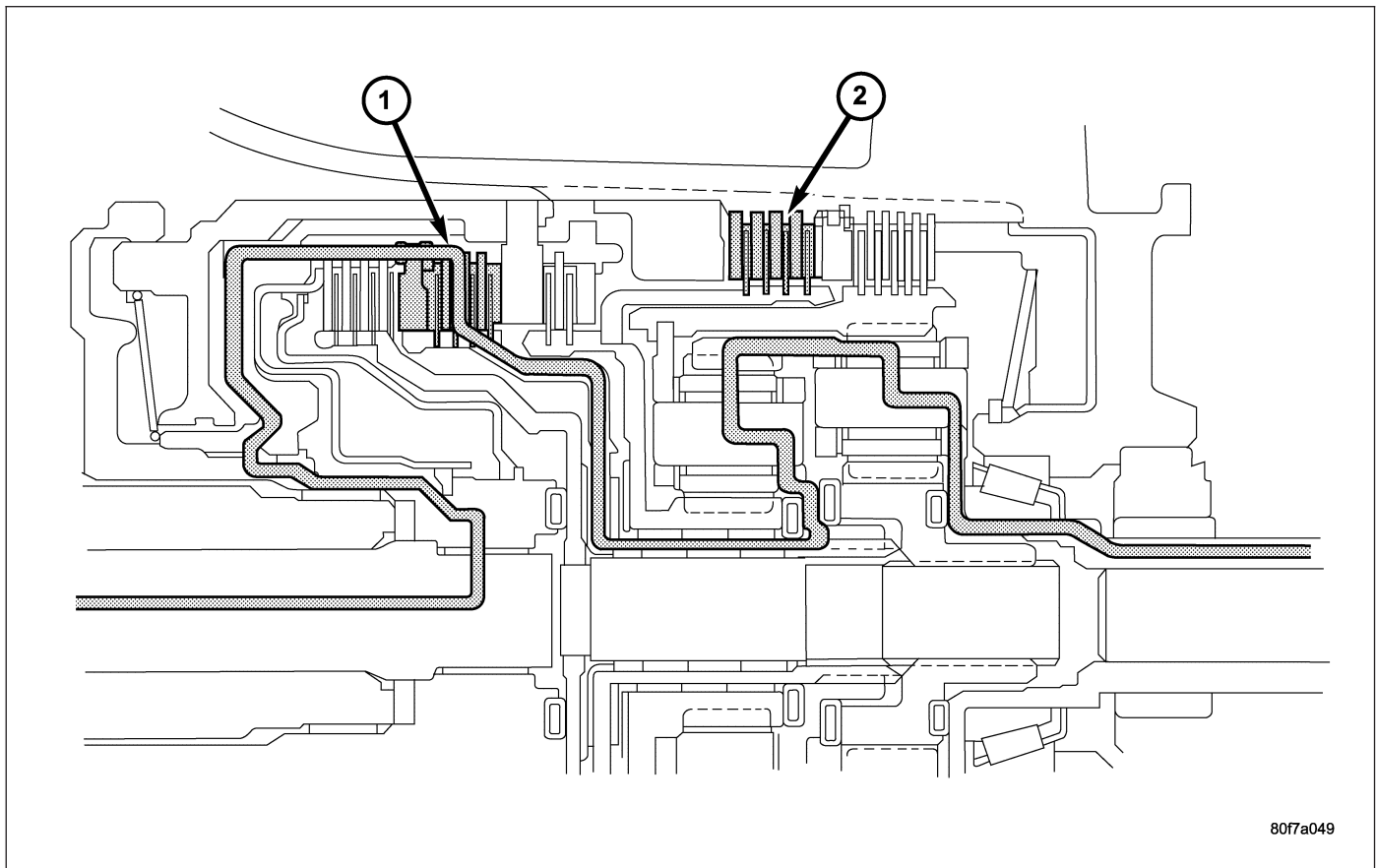
- 1 - UNDERDRIVE CLUTCH APPLIED (Turns Rear Sun)  
2 - 2-4 CLUTCH APPLIED (Holds Front Sun)

Second gear is achieved by having both planetary gear sets contribute to torque multiplication. As in first gear, torque input is through the underdrive clutch (1) to the rear sun gear. The 2/4 clutch (2) is applied to hold the front sun gear stationary. The rotating rear sun gear turns the rear planetary pinions. The rear pinions rotate the rear annulus/front carrier assembly. The pinions of the front carrier walk around the stationary front sun gear. This transmits torque to the front annulus/rear carrier assembly, which provides output torque and a gear ratio of 1.57:1.

**THIRD GEAR POWERFLOW*****Third Gear Powerflow***

- 1 - UNDERDRIVE CLUTCH APPLIED (Turns Rear Sun)  
2 - OVERDRIVE CLUTCH APPLIED (Turns Front Carrier/Rear Annulus)

In third gear, two input clutches are applied to provide torque input: the underdrive clutch (1) and overdrive clutch (2). The underdrive clutch rotates the rear sun gear, while the overdrive clutch rotates the front carrier/rear annulus assembly. The result is two components (rear sun gear and rear annulus gear) rotating at the same speed and in the same direction. This effectively locks the entire planetary gearset together and is rotated as one unit. The gear ratio in third is 1:1.

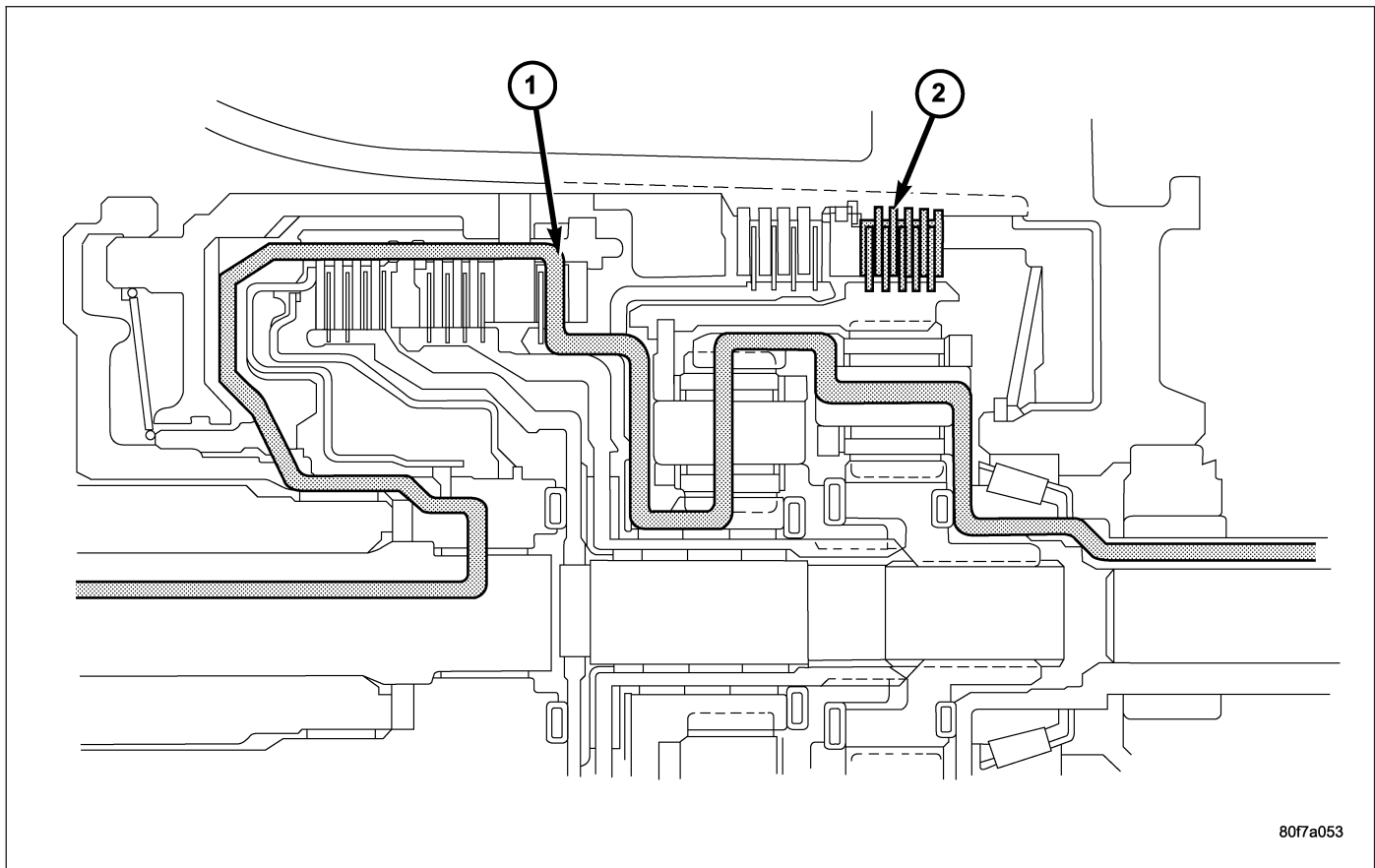
**FOURTH GEAR POWERFLOW*****Fourth Gear Powerflow***

- 1 - OVERDRIVE CLUTCH APPLIED (Turns Rear Sun)  
2 - 2-4 CLUTCH APPLIED (Holds Front Sun)

In fourth gear input torque is through the overdrive clutch (1) which drives the front carrier. The 2/4 clutch (2) is applied to hold the front sun gear. As the overdrive clutch rotates the front carrier, it causes the pinions of the front carrier to walk around the stationary front sun gear. This causes the front carrier pinions to turn the front annulus/rear carrier assembly which provides output torque. In fourth gear, transmission output speed is more than engine input speed. This situation is called overdrive and the gear ratio is 0.69:1.



## REVERSE GEAR POWERFLOW



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**Reverse Gear Powerflow**

- 1 - LOW-REVERSE CLUTCH APPLIED (Holds Rear Annulus Front Carrier)  
2 - REVERSE CLUTCH APPLIED (Turns Front Sun)

In reverse, input power is through the reverse clutch (1). When applied, the reverse clutch drives the front sun gear through the overdrive hub and shaft. The L/R clutch (2) is applied to hold the front carrier/rear annulus assembly stationary. The front carrier is being held by the L/R clutch so the pinions are forced to rotate the front annulus/rear carrier assembly in the reverse direction. Output torque is provided, in reverse, with a gear ratio of 2.21:1.

## DIAGNOSIS AND TESTING

### AUTOMATIC TRANSMISSION

**CAUTION:** Before attempting any repair on the 42RLE Four Speed Automatic Transmission, always check for proper shift cable adjustment. Also check for diagnostic trouble codes with the scan tool and the 42RLE Transmission Diagnostic information.

42RLE automatic transmission malfunctions may be caused by these general conditions:

- Poor engine performance
- Improper adjustments
- Hydraulic malfunctions
- Mechanical malfunctions
- Electronic malfunctions

When diagnosing a problem always begin with recording the complaint. The complaint should be defined as specific as possible. Include the following checks:

- Temperature at occurrence (cold, hot, both)
- Dynamic conditions (acceleration, deceleration, upshift, cornering)
- Elements in use when condition occurs (what gear is transmission in during condition)
- Road and weather conditions
- Any other useful diagnostic information.

After noting all conditions, check the easily accessible variables:

- Fluid level and condition
- Shift cable adjustment
- Diagnostic trouble code inspection

Then perform a road test to determine if the problem has been corrected or that more diagnosis is necessary. If the problem exists after the preliminary tests and corrections are completed, hydraulic pressure checks should be performed.

## ROAD TEST

Prior to performing a road test, verify that the fluid level, fluid condition, and linkage adjustment have been approved.

During the road test, the transmission should be operated in each position to check for slipping and any variation in shifting.

If the vehicle operates properly at highway speeds, but has poor acceleration, the converter stator overrunning clutch may be slipping. If acceleration is normal, but high throttle opening is needed to maintain highway speeds, the converter stator clutch may have seized. Both of these stator defects require replacement of the torque converter and thorough transmission cleaning.

Slipping clutches can be isolated by comparing the "Elements in Use" chart with clutch operation encountered on a road test. This chart identifies which clutches are applied at each position of the selector lever.

A slipping clutch may also set a DTC and can be determined by operating the transmission in all selector positions.

### ELEMENTS IN USE AT EACH POSITION OF SELECTOR LEVER

Shift Lever Position	INPUT CLUTCHES			HOLDING CLUTCHES	
	Underdrive	Overdrive	Reverse	2/4	Low/Reverse
P - PARK					X
R - REVERSE			X		X
N - NEUTRAL					X
OD - OVERDRIVE					
First	X				X
Second	X			X	
Direct	X	X			
Overdrive		X		X	
D - DRIVE*					
First	X				X
Second	X			X	
Direct	X	X			
L - LOW*					
First	X				X
Second	X			X	
Direct	X	X			

\* Vehicle upshift and downshift speeds are increased when in these selector positions.

The process of elimination can be used to detect any unit which slips and to confirm proper operation of good units. Road test analysis can diagnose slipping units, but the cause of the malfunction cannot be determined. Practically any condition can be caused by leaking hydraulic circuits or sticking valves.

## HYDRAULIC PRESSURE TESTS

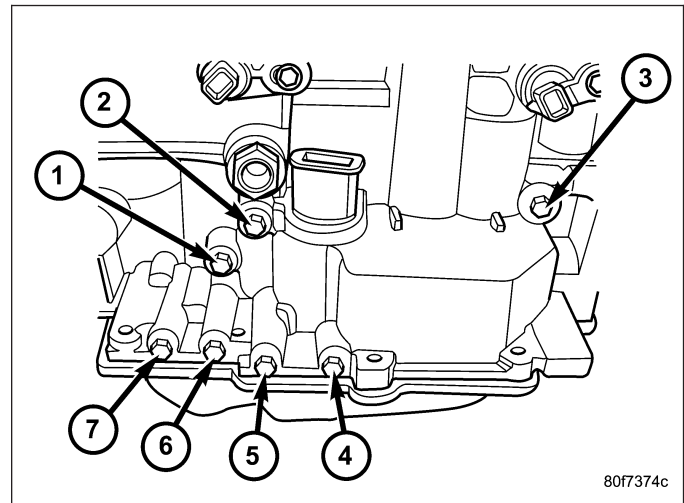
Pressure testing is a very important step in the diagnostic procedure. These tests usually reveal the cause of most transmission problems.

Before performing pressure tests, be certain that fluid level and condition, and shift cable adjustments have been checked and approved. Fluid must be at operating temperature (150 to 200 degrees F.).

Install an engine tachometer, raise vehicle on hoist which allows the wheels to turn, and position tachometer so it can be read.

Using special adapters L-4559, attach 300 psi gauge(s) C-3293SP to the port(s) required for test being conducted.

Test port locations are shown in the Pressure Taps graphic.



**Pressure Taps**

- 1 - TORQUE CONVERTER CLUTCH OFF
- 2 - REVERSE
- 3 - LOW/REVERSE
- 4 - 2/4
- 5 - UNDERDRIVE
- 6 - TORQUE CONVERTER CLUTCH ON
- 7 - OVERDRIVE

### TEST ONE - SELECTOR IN MANUAL 1 (1st Gear)

**Note:** This test checks pump output, pressure regulation and condition of the low/reverse clutch hydraulic circuit and shift schedule.

1. Attach pressure gauge to the low/reverse clutch tap.
2. Move selector lever to the MANUAL 1 position.
3. Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed to 20 mph.
4. Low/reverse clutch pressure should read 115 to 145 psi.

### TEST TWO - SELECTOR IN MANUAL 2 (Second Gear)

**Note:** This test checks the underdrive clutch hydraulic circuit as well as the shift schedule.

1. Attach gauge to the underdrive clutch tap.
2. Move selector lever to the MANUAL 2 position.
3. Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 30 mph.
4. In second gear the underdrive clutch pressure should read 110 to 145 psi.

### TEST TWO A - SELECTOR IN DRIVE (OD ON - Fourth Gear)

**Note:** This test checks the underdrive clutch hydraulic circuit as well as the shift schedule.

1. Attach gauge to the underdrive clutch tap.
2. Move selector lever to the DRIVE position. Verify that the OD switch is ON.

3. Allow wheels to rotate freely and increase throttle opening to achieve an indicated speed of 40 mph.
4. Underdrive clutch pressure should read below 5 psi. If not, then either the solenoid assembly or controller is at fault.

### **TEST THREE - SELECTOR IN DRIVE (OD OFF - Third and Second Gear)**

**Note: This test checks the overdrive clutch hydraulic circuit as well as the shift schedule.**

1. Attach gauge to the overdrive clutch tap.
2. Move selector lever to the DRIVE position.
3. Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 20 mph.
4. Overdrive clutch pressure should read 74 to 95 psi.
5. Move selector lever to the DRIVE position and increase indicated vehicle speed to 30 mph.
6. The vehicle should be in second gear and overdrive clutch pressure should be less than 5 psi.

### **TEST FOUR - SELECTOR IN DRIVE (OD ON - Fourth Gear)**

**Note: This test checks the 2/4 clutch hydraulic circuit.**

1. Attach gauge to the 2/4 clutch tap.
2. Move selector lever to the DRIVE position.
3. Allow vehicle front wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 30 mph. Vehicle should be in fourth gear.
4. The 2/4 clutch pressure should read 75 to 95 psi.

### **TEST FIVE-SELECTOR IN DRIVE (OD ON - Fourth Gear, CC on)**

**Note: These tests check the torque converter clutch hydraulic circuit.**

1. Attach gauge to the torque converter clutch off pressure tap.
2. Move selector lever to the DRIVE position.
3. Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 50 mph. Vehicle should be in 4th gear, CC on.

**CAUTION: Both wheels must turn at the same speed.**

4. Torque converter clutch off pressure should be less than 5 psi.
5. Now attach the gauge to the torque converter clutch on pressure tap.
6. Move selector to the OD position.
7. Allow vehicle wheels to turn and increase throttle opening to achieve an indicated vehicle speed of 50 mph.
8. Verify the torque converter clutch is applied mode using the RPM display of the scan tool.
9. Torque converter clutch on pressure should be 60-90 psi.

### **TEST SIX-SELECTOR IN REVERSE**

**Note: This test checks the reverse clutch hydraulic circuit.**

1. Attach gauge to the reverse and low/reverse clutch tap.
2. Move selector lever to the REVERSE position.
3. Read reverse clutch pressure with output stationary (foot on brake) and throttle opened to achieve 1500 rpm.
4. Reverse and low/reverse clutch pressure should read 165 to 235 psi.

### **TEST RESULT INDICATIONS**

1. If proper line pressure is found in any one test, the pump and pressure regulator are working properly.
2. Low pressure in all positions indicates a defective pump, a clogged filter, or a stuck pressure regulator valve.

3. Clutch circuit leaks are indicated if pressures do not fall within the specified pressure range.
4. If the overdrive clutch pressure is greater than 5 psi in Step 6 of Test Three, a worn reaction shaft seal ring or a defective solenoid assembly is indicated.
5. If the underdrive clutch pressure is greater than 5 psi in Step 4 of Test Two-A, a defective solenoid/pressure switch assembly or controller is the cause.

**ALL PRESSURE SPECIFICATIONS ARE PSI (on hoist, with wheels free to turn)**

Gear Selector Position	Actual Gear	PRESSURE TAPS						
		Under-drive Clutch	Over-drive Clutch	Reverse Clutch	Torque Converter Clutch Off	Torque Converter Clutch On	2/4 Clutch	Low/ Reverse Clutch
PARK - 0 mph *	PARK	0-2	0-5	0-2	60-110	45-100	0-2	115-145
REVERSE - 0 mph *	REVERSE	0-2	0-7	165-235	50-100	35-85	0-2	165-235
NEUTRAL - 0 mph *	NEUTRAL	0-2	0-5	0-2	60-110	45-100	0-2	115-145
Low - 20 mph #	FIRST	110-145	0-5	0-2	60-110	45-100	0-2	115-145
Third - 30 mph #	SECOND	110-145	0-5	0-2	60-110	45-100	115-145	0-2
Third - 45 mph #	DIRECT	75-95	75-95	0-2	60-90	45-80	0-2	0-2
OD - 30 mph #	OVERDRIVE	0-2	75-95	0-2	60-90	45-80	75-95	0-2
OD - 50 mph #	OVERDRIVE WITH TCC	0-2	75-95	0-2	0-5	60-95	75-95	0-2

\* Engine Speed at 1500 rpm

# CAUTION: Both wheels must be turning at same speed.

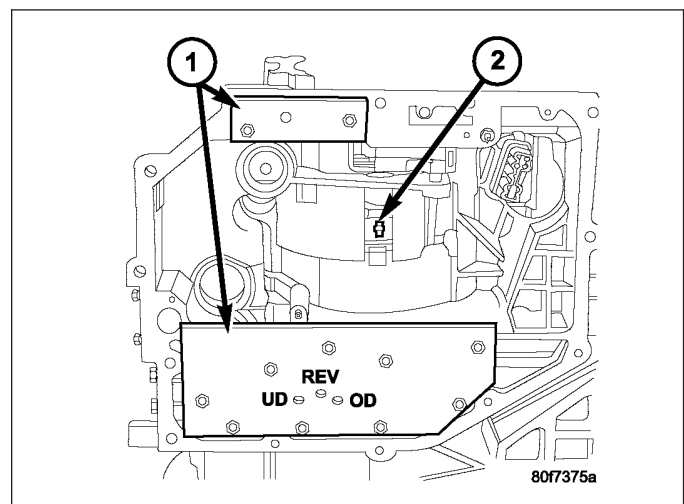
## CLUTCH AIR PRESSURE TESTS

Inoperative clutches can be located by substituting air pressure for fluid pressure. The clutches may be tested by applying air pressure to their respective passages after the valve body has been removed. Use Special Tool 6599-1 (1) and 6599-2 (1) to perform test.

To make air pressure tests, proceed as follows:

**Note:** The compressed air supply must be free of all dirt and moisture. Use a pressure of 30 psi.

1. Remove oil pan and valve body.(Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE/VALVE BODY - REMOVAL)
2. Apply air pressure to the holes in the special tool (1), one at a time.
3. Listen for the clutch to apply. It will give a slight thud sound. If a large amount of air is heard escaping, the transmission must be removed from vehicle, disassembled and all seals inspected.



**Air Pressure Test Plate**

- 1 - AIR PRESSURE TEST PLATES  
2 - 2/4 CLUTCH RETAINER HOLE

## 2/4 CLUTCH

Apply air pressure to the feed hole located on the 2/4 clutch retainer (2). Look in the area where the 2/4 piston contacts the first separator plate and watch carefully for the 2/4 piston to move rearward. The piston should return to its original position after the air pressure is removed.

## OVERDRIVE CLUTCH

Apply air pressure to the overdrive clutch apply passage and watch for the push/pull piston to move forward. The piston should return to its starting position when the air pressure is removed.

## REVERSE CLUTCH

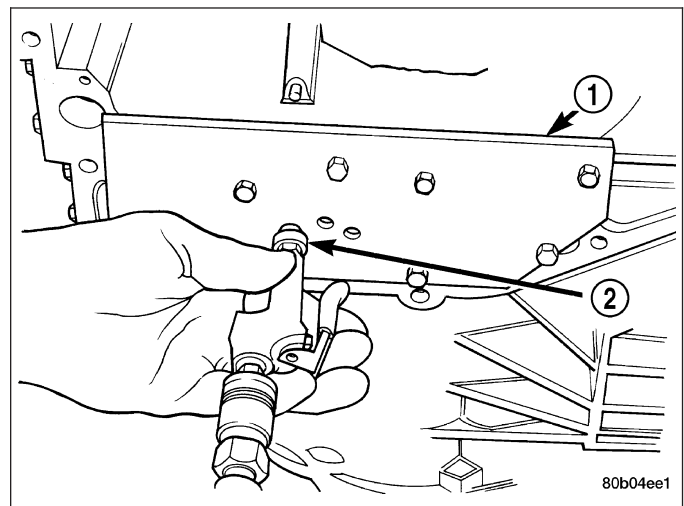
Apply air pressure to the reverse clutch apply passage and watch for the push/pull piston to move rearward. The piston should return to its starting position when the air pressure is removed.

## LOW/REVERSE CLUTCH

Apply air pressure to the low/reverse clutch feed hole passage. Look in the area where the low/reverse piston contacts the first separator plate. Watch carefully for the piston to move forward. The piston should return to its original position after the air pressure is removed.

## UNDERDRIVE CLUTCH

Because this clutch piston cannot be seen, its operation is checked by function. Use an air nozzle (2) to apply air pressure to the low/reverse or the 2/4 clutch opening in Test Plate 6599-1 (2). This locks the output shaft. Use a piece of rubber hose wrapped around the input shaft and a pair of clamp-on pliers to turn the input shaft. Next apply air pressure to the underdrive clutch. The input shaft should not rotate with hand torque. Release the air pressure and confirm that the input shaft will rotate.



## FLUID LEAKAGE

### FLUID LEAKAGE - TORQUE CONVERTER HOUSING AREA

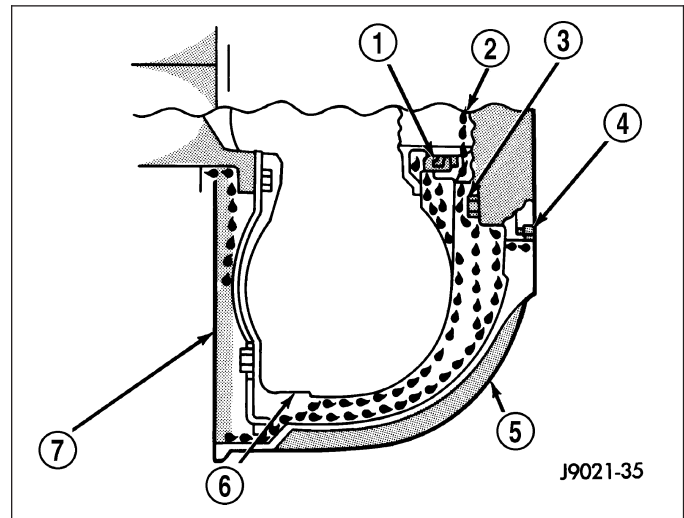
When diagnosing converter housing (5) fluid leaks, three actions must be taken before repair:

1. Verify proper transmission fluid level.
2. Verify that the leak originates from the converter housing area and is transmission fluid.
3. Determine the true source of the leak.

Fluid leakage at or around the torque converter area may originate from an engine oil leak (7). The area should be examined closely. Factory fill fluid is red and, therefore, can be distinguished from engine oil.

Some suspected converter housing fluid leaks may not be leaks at all. They may only be the result of residual fluid in the converter housing, or excess fluid spilled during factory fill, or fill after repair. Converter housing leaks have several potential sources. Through careful observation, a leak source can be identified before removing the transmission for repair.

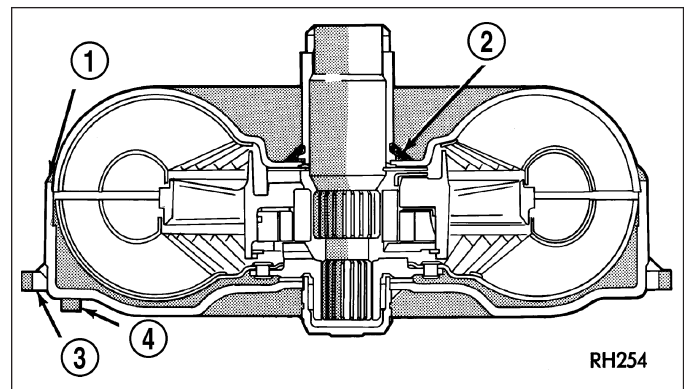
Pump seal (1) leaks tend to move along the drive hub and onto the rear of the converter. Pump o-ring or pump body leaks follow the same path as a seal leak. Pump attaching bolt (3) leaks are generally deposited on the inside of the converter housing (5) and not on the converter itself. Pump seal (1) or gasket (4) leaks usually travel down the inside of the converter housing.



### TORQUE CONVERTER LEAKAGE

Possible sources of torque converter leakage are:

- Torque converter weld leaks at the outside diameter weld (1).
- Torque converter hub weld (2).



## STANDARD PROCEDURE - ALUMINUM THREAD REPAIR

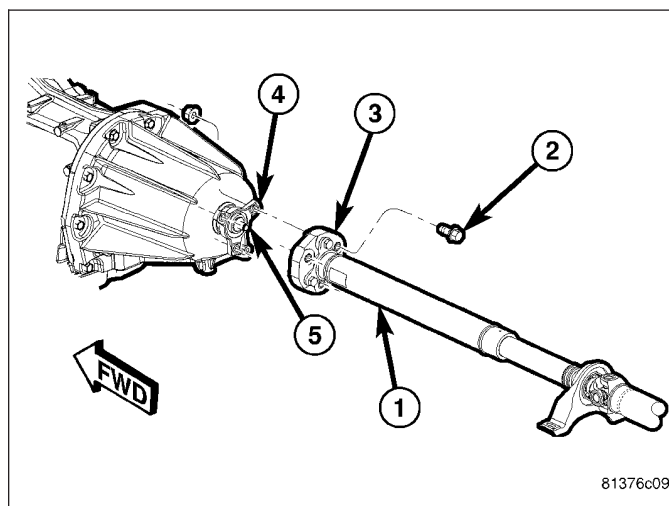
Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils®, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil® tap, or equivalent, and installing a Heli-Coil® insert, or equivalent, into the hole. This brings the hole back to its original thread size.

Heli-Coil®, or equivalent, tools, and inserts are readily available from most automotive parts suppliers.

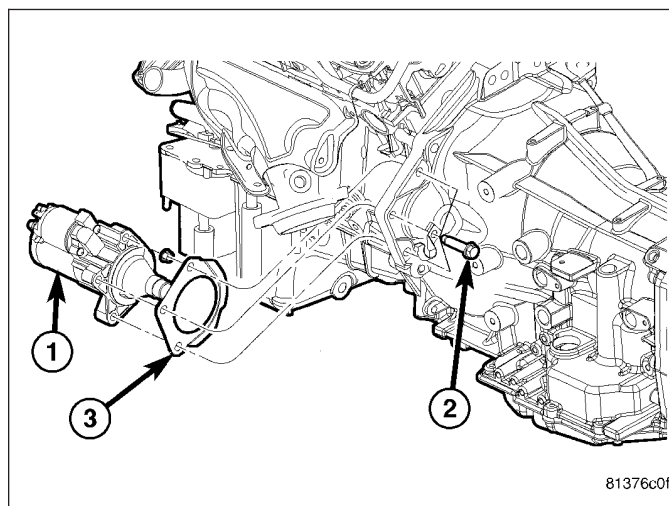


## REMOVAL

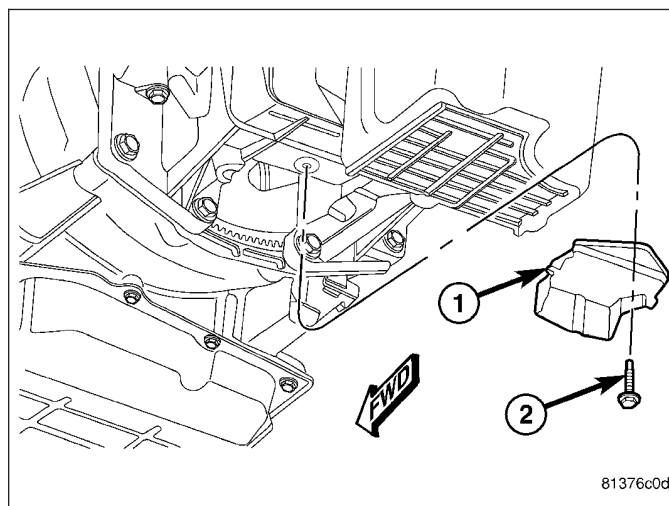
1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Mark propeller shaft (1) and the transmission flange (4) for assembly alignment.
4. Remove the bolts (2) holding the rear propeller shaft coupler (3) to the transmission flange (4).
5. Slide the propeller shaft (1) rearward until the coupler clears the propeller shaft pilot (5) on the transmission output shaft.



6. Remove the bolts (2) holding the starter motor (1) to the transmission. (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - REMOVAL)
7. Remove the starter (1) from the transmission starter pocket and safely relocate.

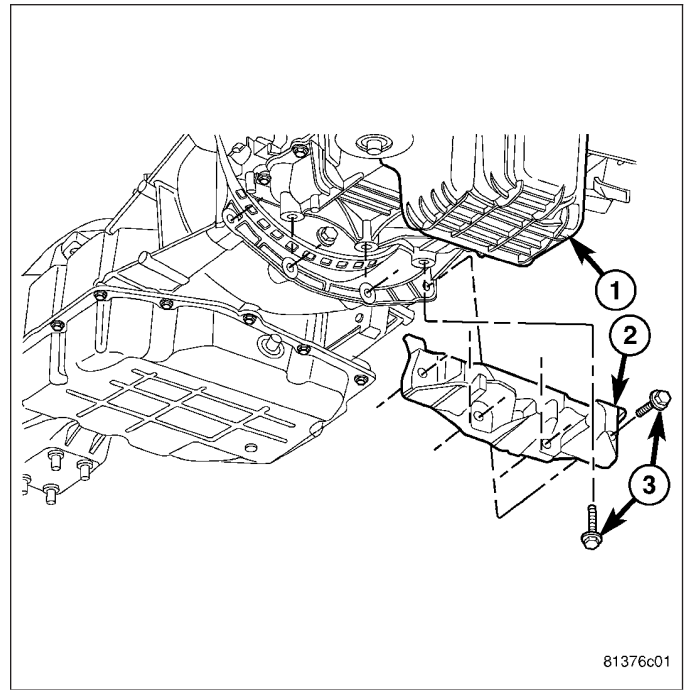


8. Remove the bolt (2) holding the torque converter access cover (1) to the transmission, 3.5L engines.
9. Remove the torque converter access cover (1) from the transmission.

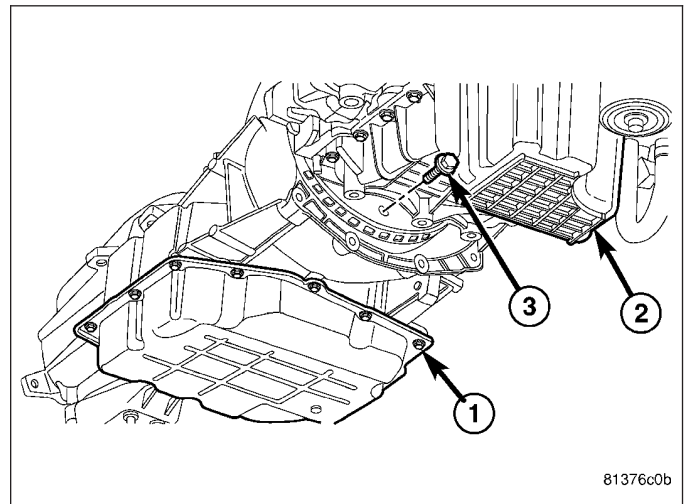




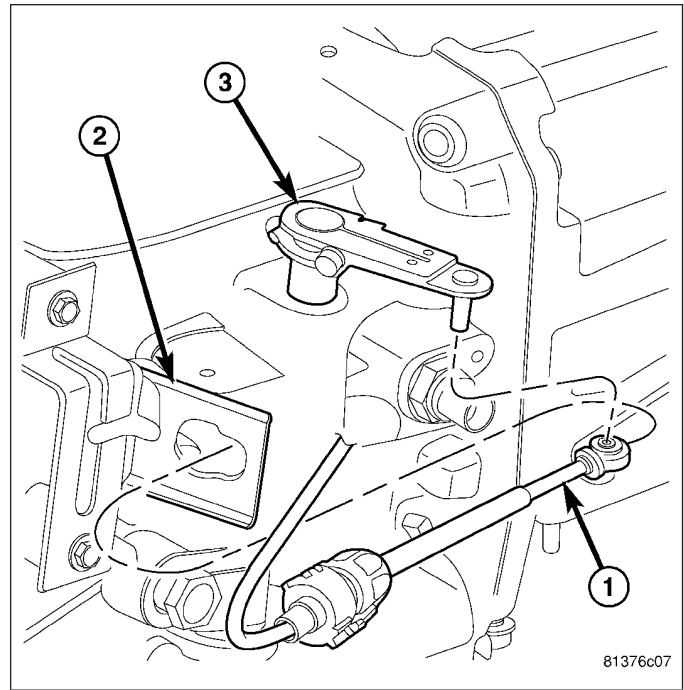
10. Remove the structural collar bolts (3, 4) and structural collar (2) on vehicles equipped with 2.7L engines. (Refer to 9 - ENGINE - 2.7L/ENGINE BLOCK/STRUCTURAL COVER - REMOVAL)



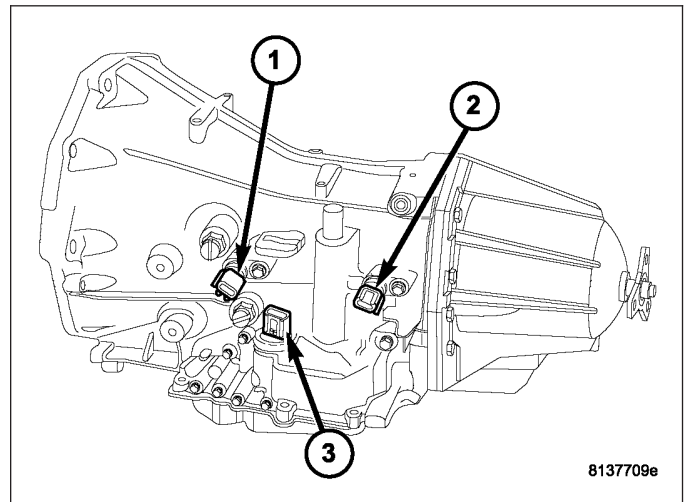
11. Rotate crankshaft in clockwise direction until converter bolts (1) are accessible. Then remove bolts (1) one at a time. Rotate crankshaft with socket wrench on dampener bolt.



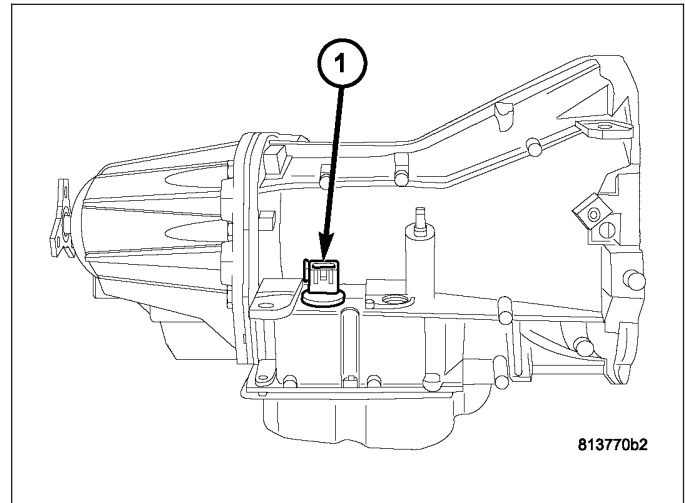
12. Disconnect the gearshift cable (1) from the transmission manual valve lever (3).
13. Loosen the bolts holding the shift cable retaining strap (2) to the transmission.
14. Remove the shift cable (1) from the transmission.



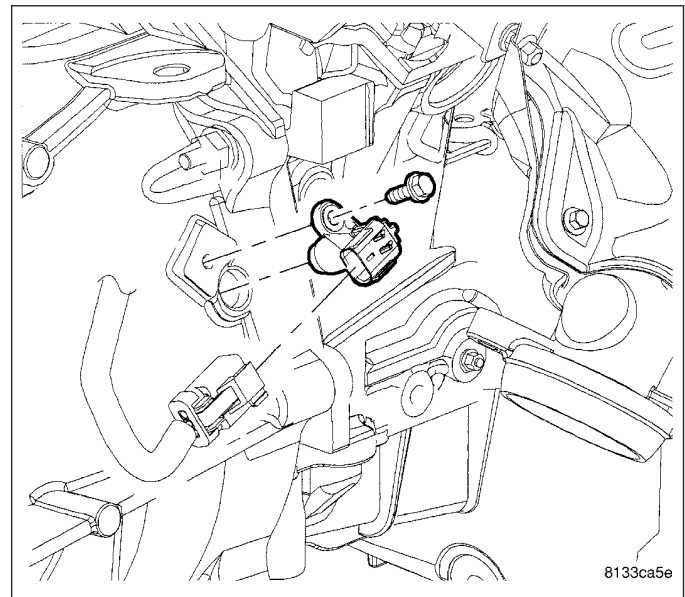
15. Disconnect wires from the input (1) and output (2) speed sensors.



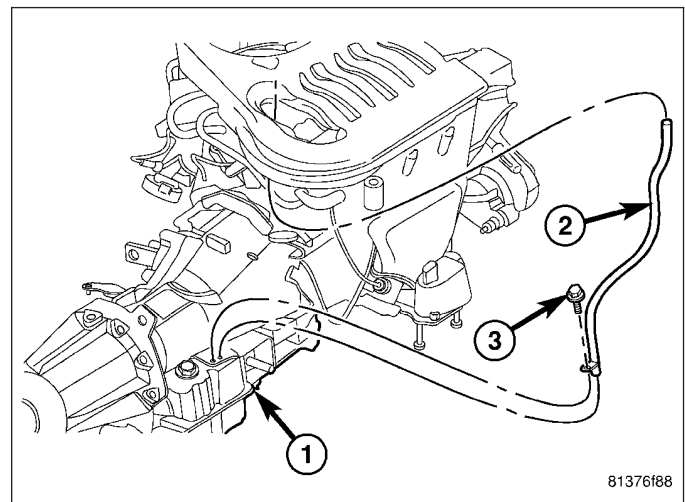
16. Disconnect wires from the transmission range sensor (3).
17. Disconnect wires from the solenoid/pressure switch assembly (1).



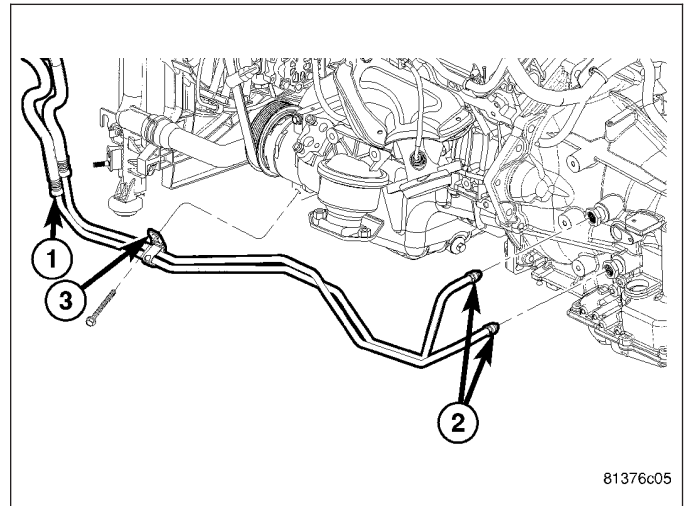
18. Remove the crankshaft position sensor. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/CRANKSHAFT POSITION SENSOR - REMOVAL)



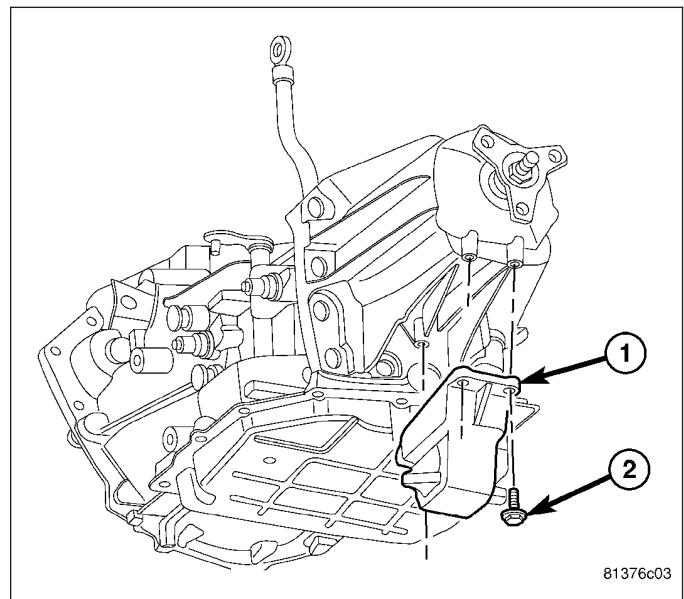
19. Remove the bolt (3) holding the transmission fill tube (2) to the transmission (1).



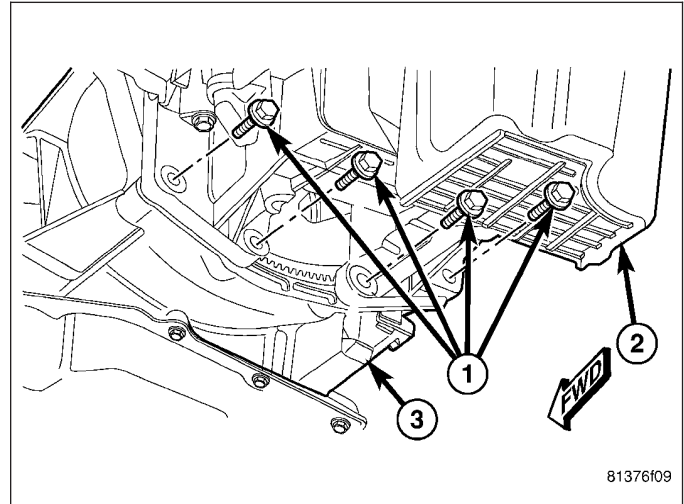
20. Remove the transmission fill tube (2).
21. Disconnect transmission fluid cooler lines (1) at transmission fittings (2) and clips (3).
22. Disconnect the transmission vent hose from the transmission.



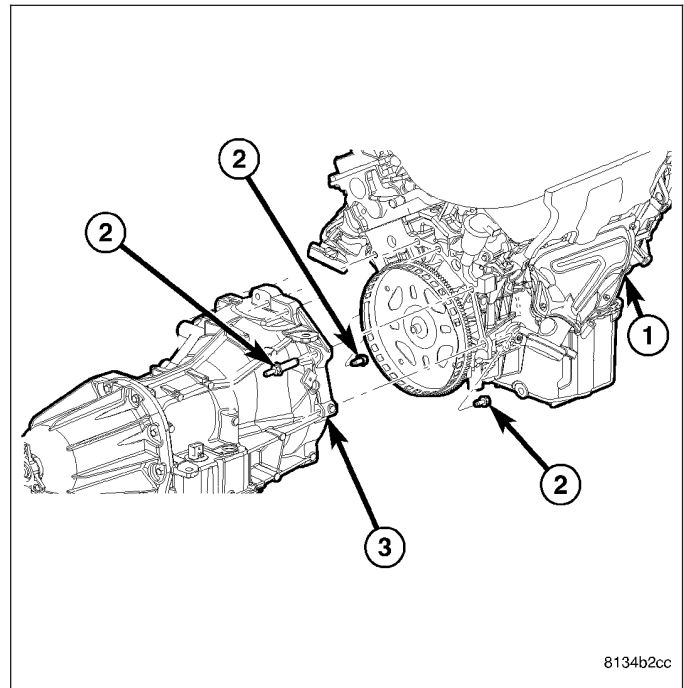
23. Support rear of engine with safety stand or jack.
24. Raise transmission slightly with service jack to relieve load on crossmember and supports.
25. Remove bolts (2) securing rear support and cushion (3) to transmission crossmember (1).



26. Remove bolts attaching crossmember (1) to frame and remove crossmember.
27. Remove the bolts (1) holding the engine oil pan (2) to the transmission (3).



28. Remove all remaining bolts (2) holding the engine (1) to the transmission (3).
29. Carefully work transmission and torque converter assembly rearward off engine block dowels.
30. Hold torque converter in place during transmission removal.
31. Lower transmission and remove assembly from under the vehicle.
32. To remove torque converter, carefully slide torque converter out of the transmission.



## DISASSEMBLY

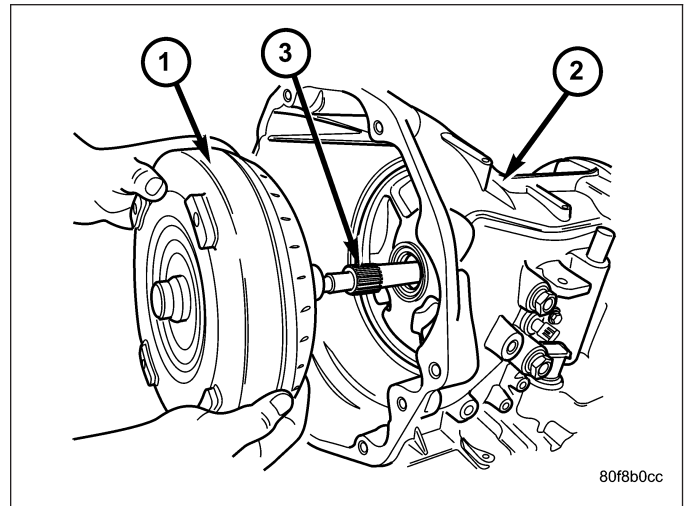
**Note:** If the transmission is being reconditioned (clutch/seal replacement) or replaced, it is necessary to perform the Quick Learn Procedure using the scan tool (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE).

**Note:** Tag all clutch pack assemblies, as they are removed, for reassembly identification.

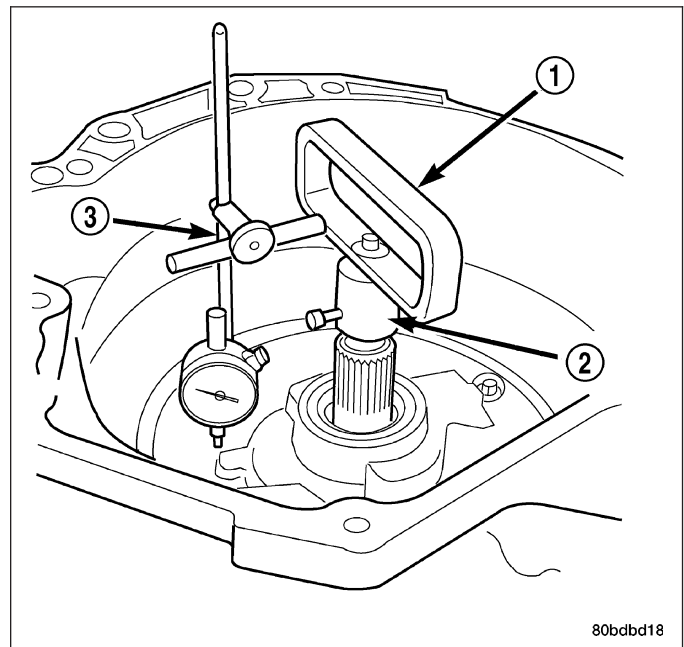
**CAUTION:** Do not intermix clutch discs or plates as the unit might then fail.

Before disassembling transmission, move the shift lever clockwise as far as it will go and then remove the shift lever.

1. Remove the torque converter (1) from the transmission input shaft (3).

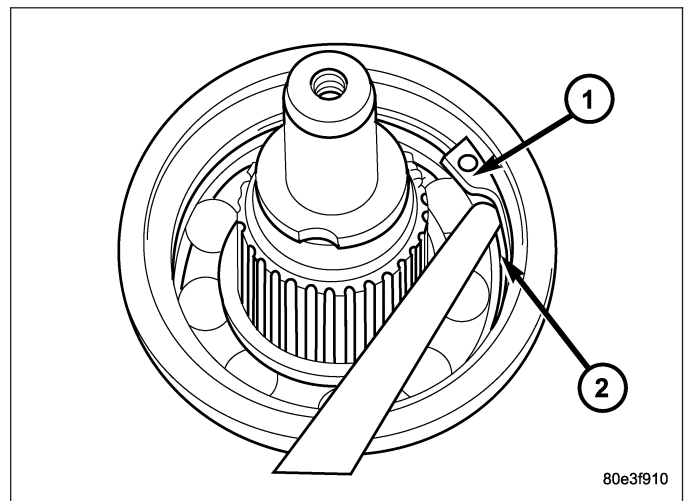


2. Measure input shaft end play using Tool 8266 (1, 2). Set up Tool 8266 and a dial indicator as shown.
3. Move input shaft in and out to obtain end play reading. End play specifications are 0.13 to 0.64 mm (0.005 to 0.025 inch). Record indicator reading for reference when reassembling the transmission. If endplay exceeds the specified range, the #4 thrust plate needs to be inspected and changed if necessary.

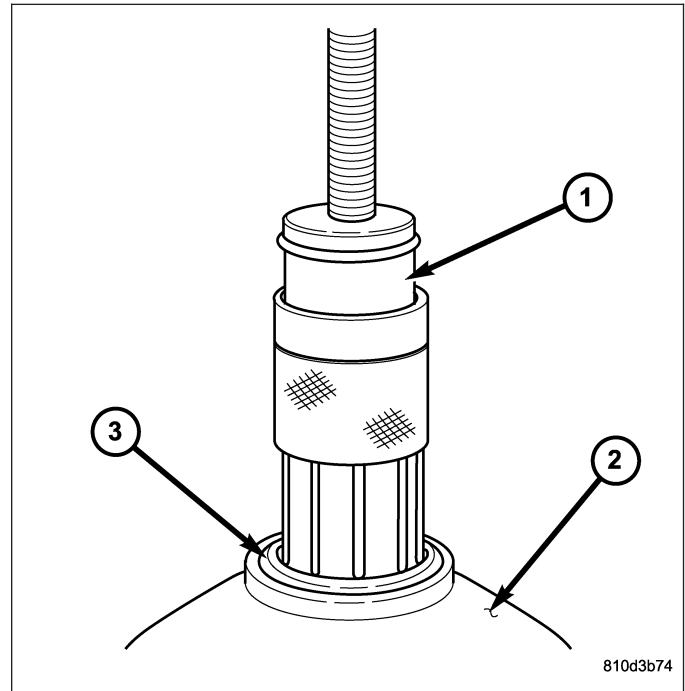


**Note:** It is not necessary to remove the output shaft flange to disassemble the transmission. Perform the following steps only if it necessary to replace a component in the extension housing assembly.

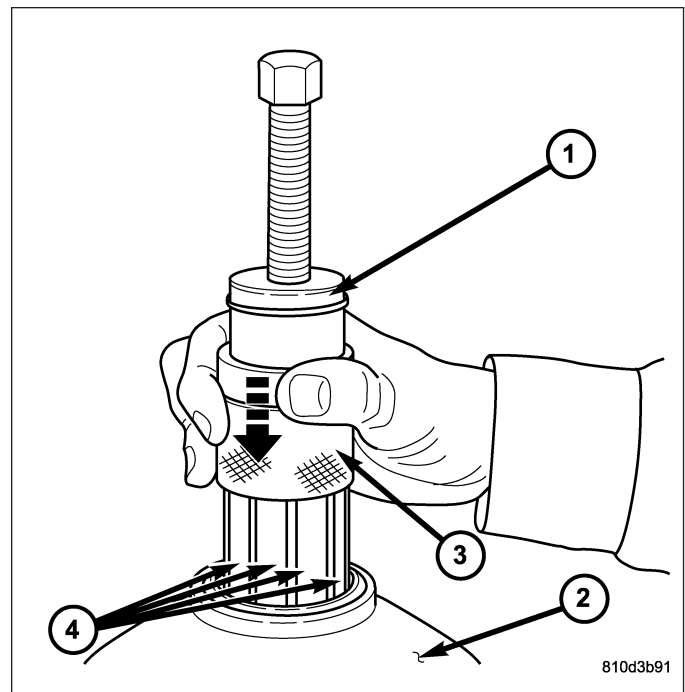
4. Place the transmission in PARK to prepare for the removal of the output shaft nut.
5. Remove the nut holding the propeller shaft flange to the output shaft and remove the flange.
6. Remove the transmission rear oil seal with a suitable slide hammer and screw.
7. Remove the transmission output shaft washer.



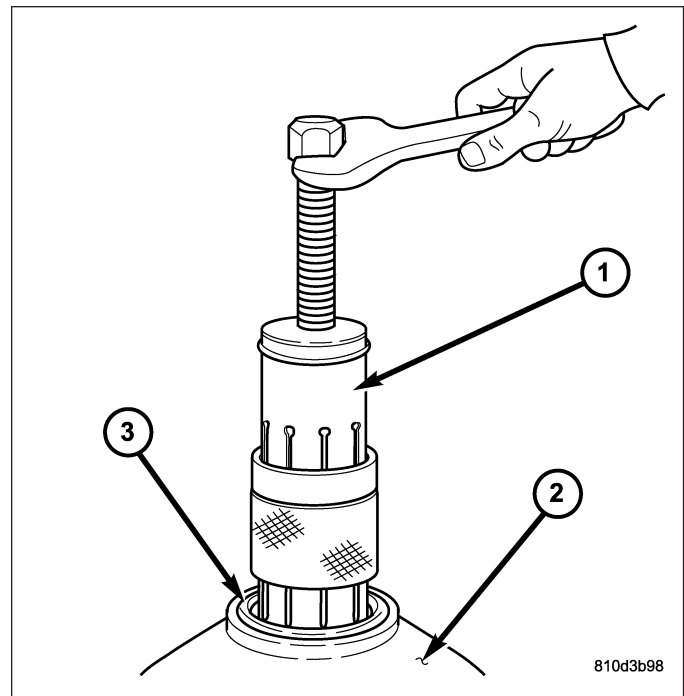
8. Remove the transmission rear output shaft bearing retaining ring (1).
9. Position Bearing Remover 9082 (1) over the inner race of the output shaft bearing (3).



10. Slide the collar (3) on the Bearing Remover 9082 (1) downward over the fingers (4) of the tool.

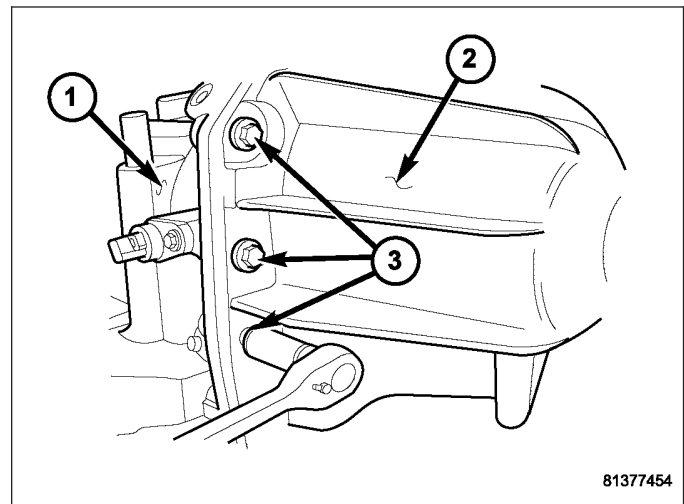


11. Remove the output shaft bearing (3).
12. Remove the geartrain end-play shim from the output shaft. Be sure to tag the shim since it is very similar to the output shaft washer and they must not be interchanged.

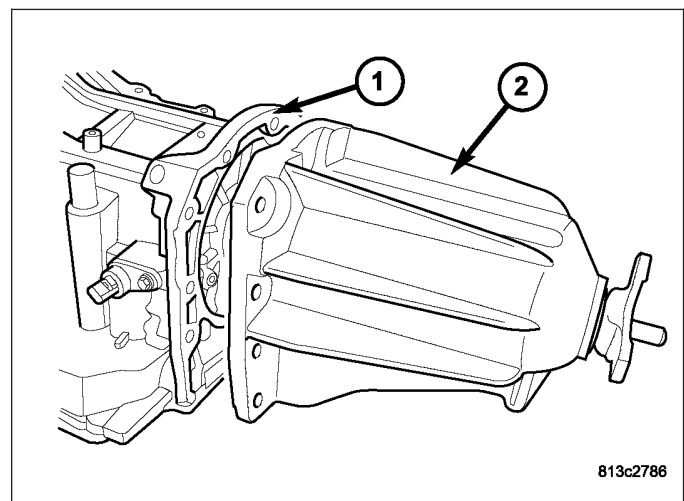


**Note:** The four bolts (3) along the bottom of the extension housing (2) have a sealing patch applied from the factory. Note the locations of these bolts and separate these bolts for reuse.

13. Remove the bolts that hold the extension housing (2) onto the transmission case.



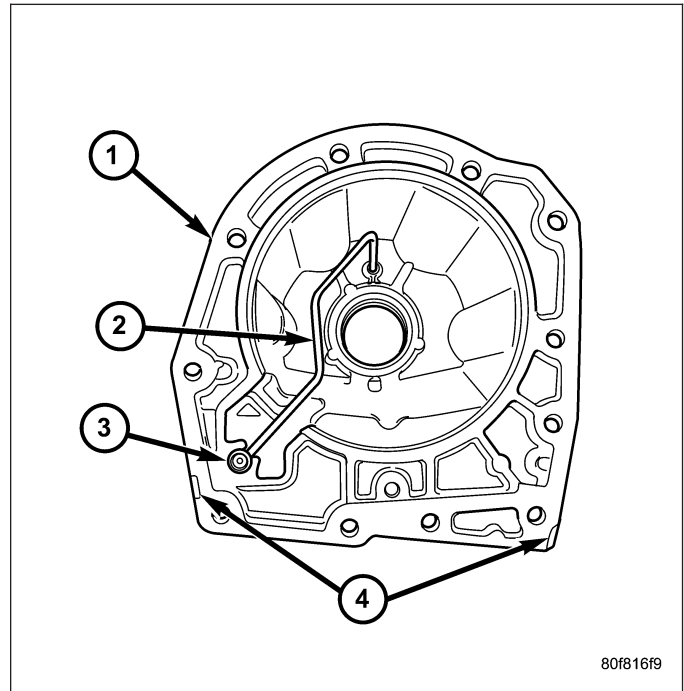
14. Remove the extension (2) housing from the transmission case. There are two pry slots located near the bottom corners of the housing for separation.





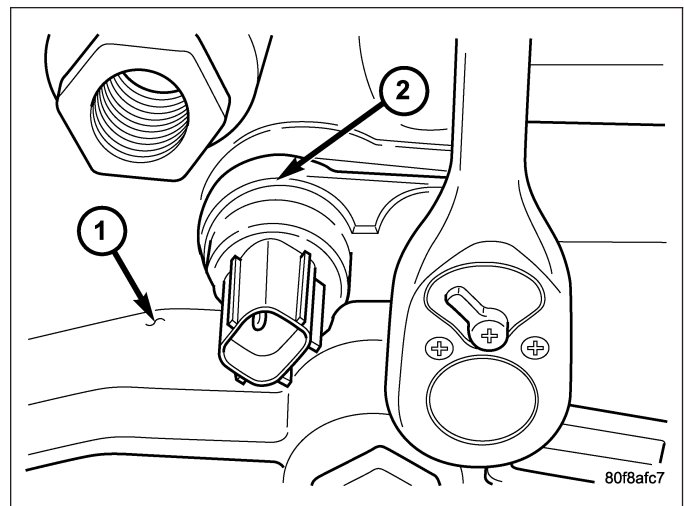
rating the housing from the transmission case.

15. Inspect the lube tube grommet (3) for damage. If the grommet lip is damaged, it will need to be replaced.



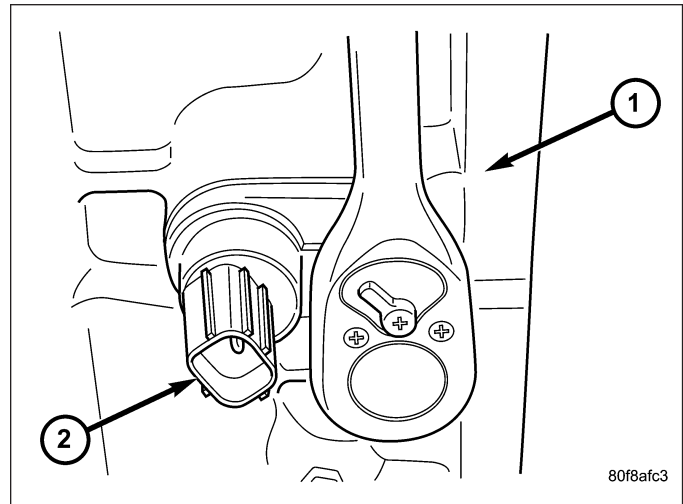
**Note:** The speed sensor bolts have a sealing patch applied from the factory. Separate these bolts for reuse.

16. Remove the input speed sensor bolt.

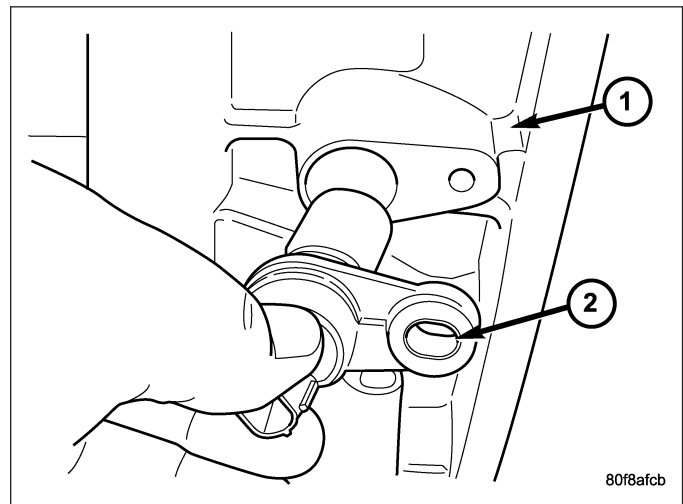


**Note:** The speed sensor bolts have a sealing patch applied from the factory. Separate these bolts for reuse.

17. Remove the output speed sensor bolt.

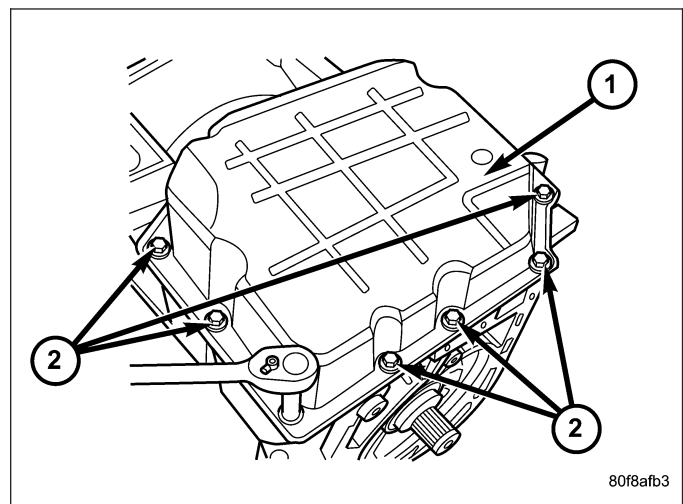


18. Remove the input and output (2) speed sensors. Identify the speed sensors for re-installation since they are not interchangeable.

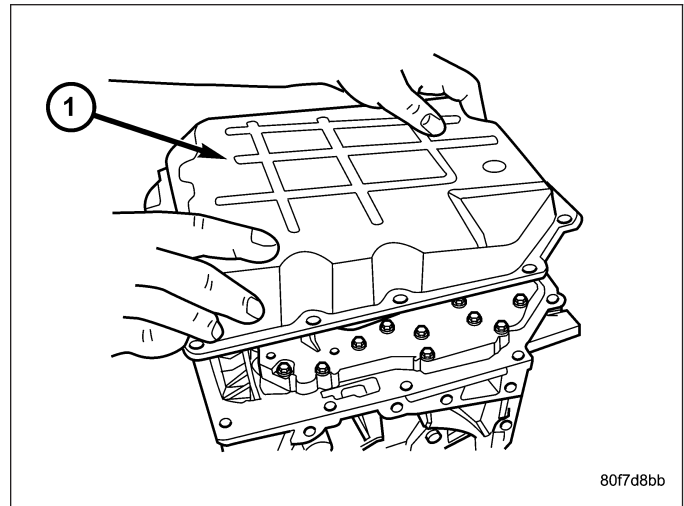


**Note:** One of the oil pan bolts has a sealing patch applied from the factory. Separate this bolt for reuse.

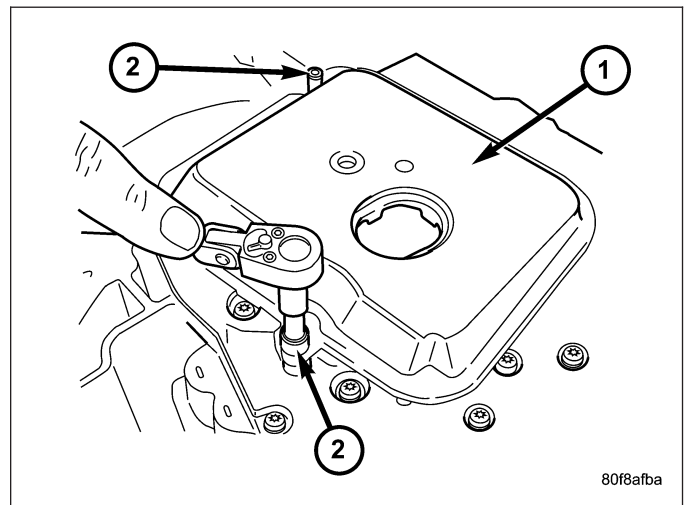
19. Remove the transmission oil pan bolts (2).



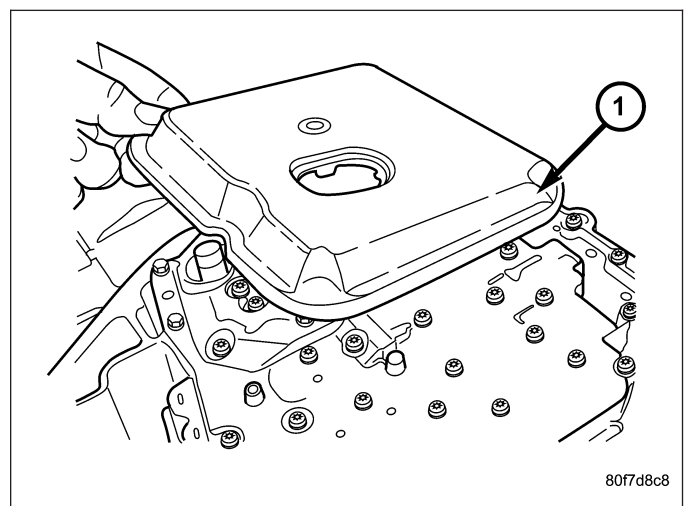
20. Remove the transmission oil pan (1).



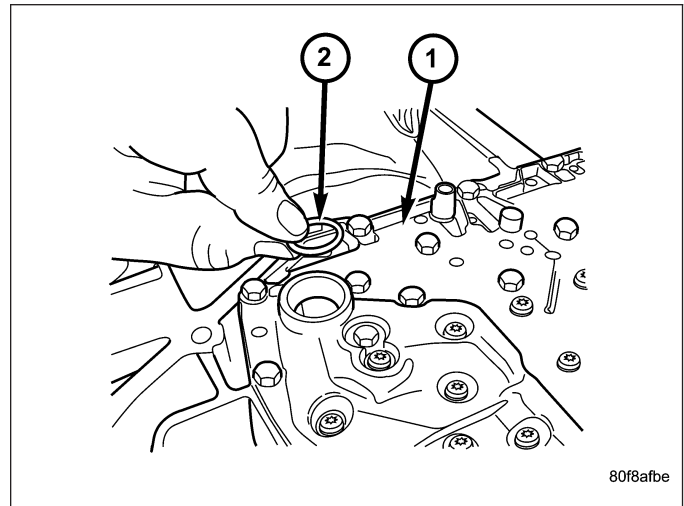
21. Remove the transmission oil filter screws (2).



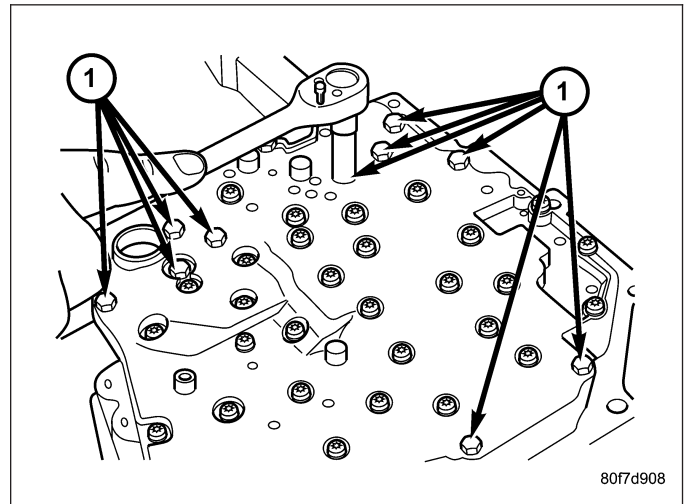
22. Remove transmission oil filter (1).



23. Remove the oil filter o-ring (2) from the valve body.
24. If necessary, use a suitable tool to push the transmission fill tube grommet and extension from the transmission case from the bottom.

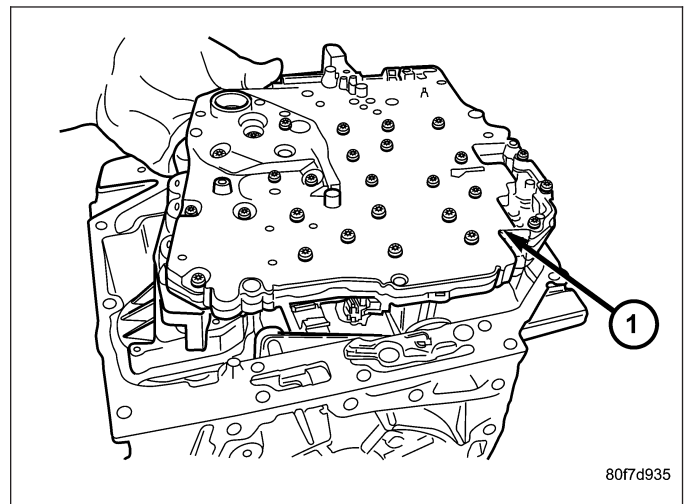


25. Remove valve body-to-case bolts (1).

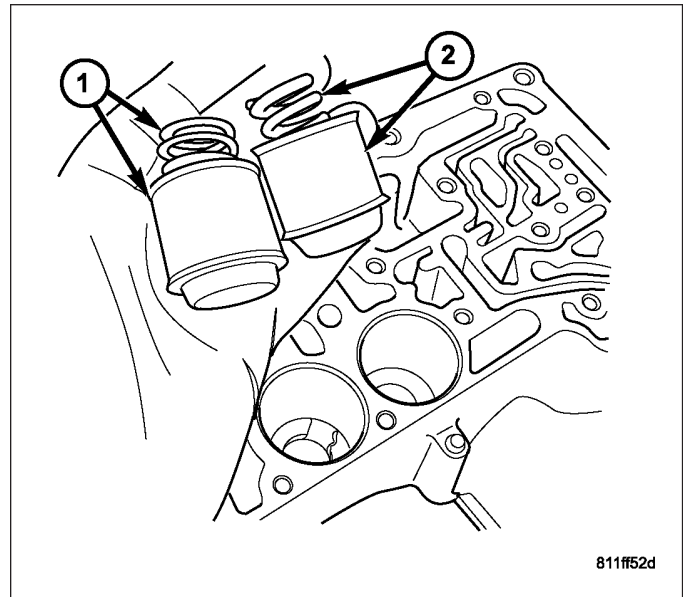


**CAUTION:** Do not handle the valve body by the manual shaft. Damage could result.

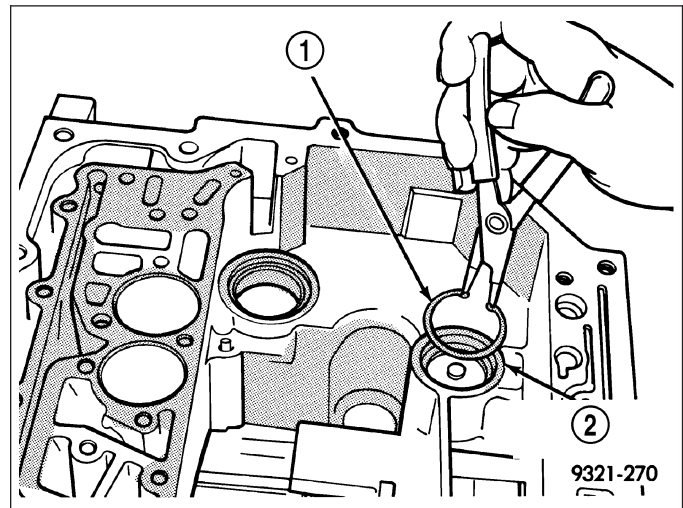
26. Remove valve body (1) from transmission.



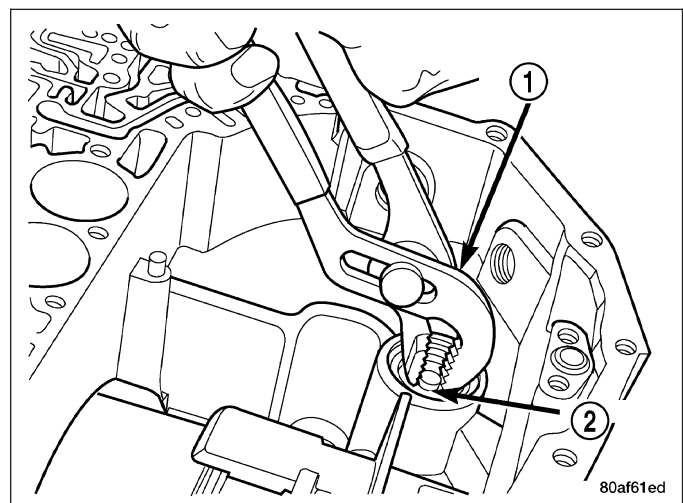
27. Remove underdrive and overdrive accumulators (1, 2).



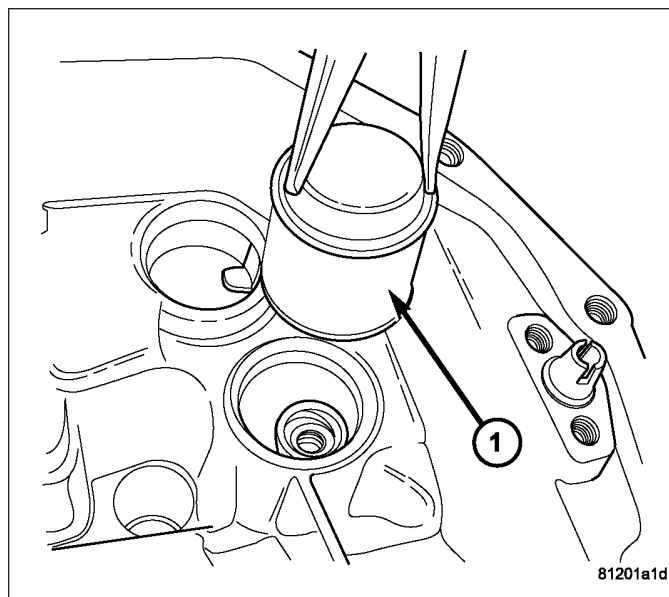
28. Remove the low/reverse accumulator snap ring (1).



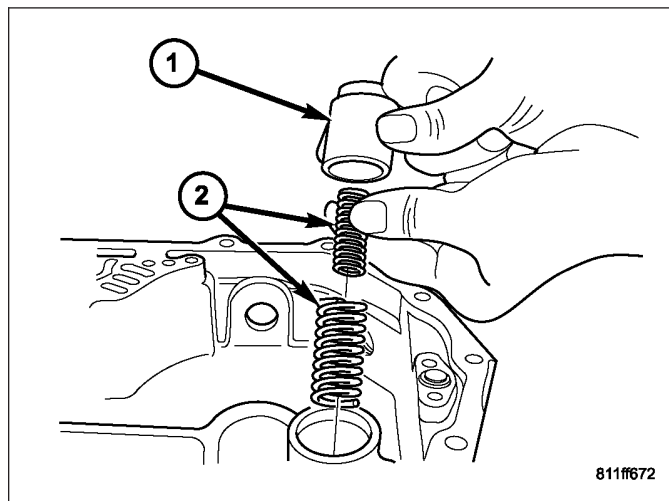
29. Remove the low/reverse accumulator plug (2).



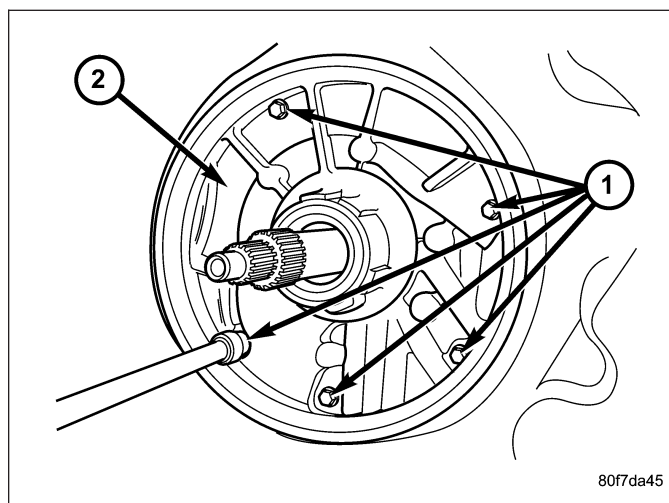
30. Remove low/reverse accumulator piston (1) using suitable pliers.



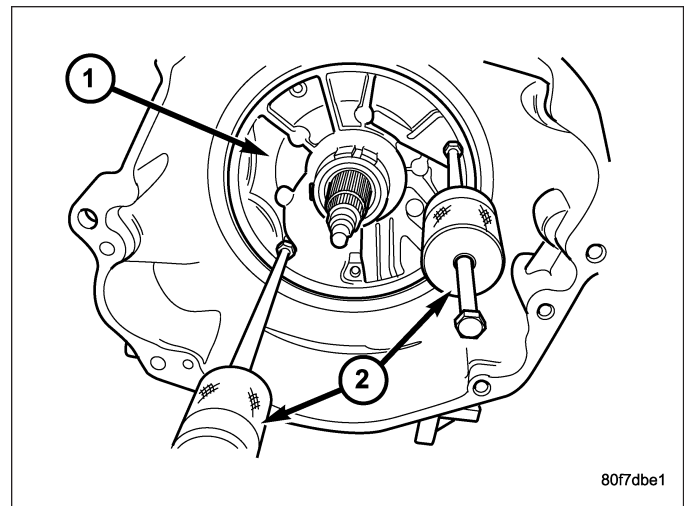
31. Remove piston (1) and springs (2).



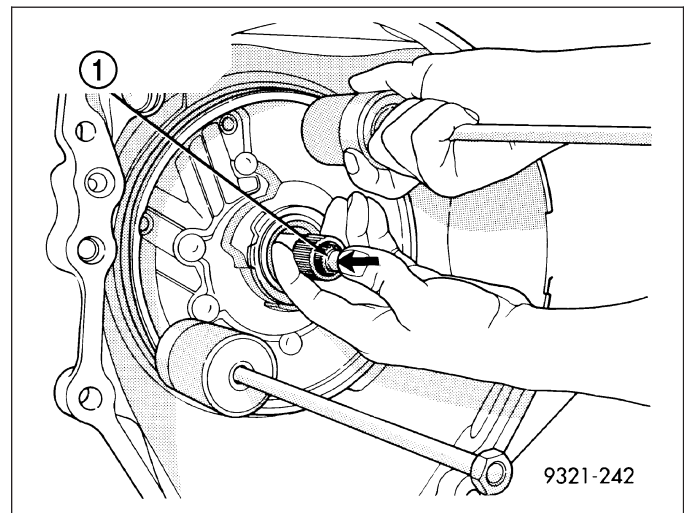
32. Remove and discard the oil pump-to-case bolts (1). The oil pump bolts are not to be reused.



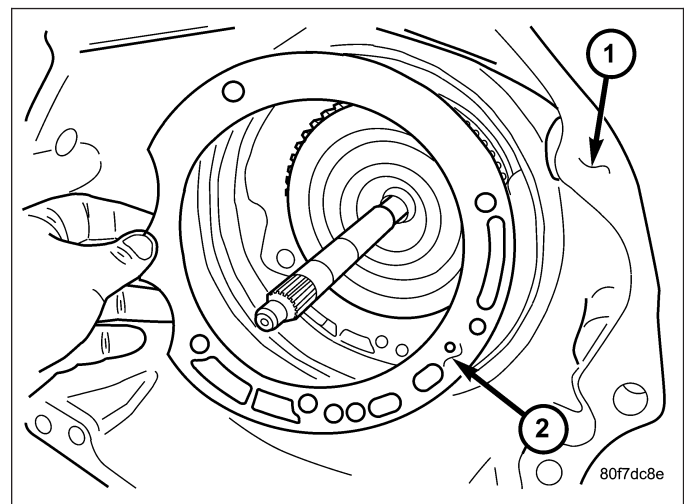
33. Remove oil pump using C-3752 Pullers (2).



34. Remove oil pump while pushing in on input shaft (1).



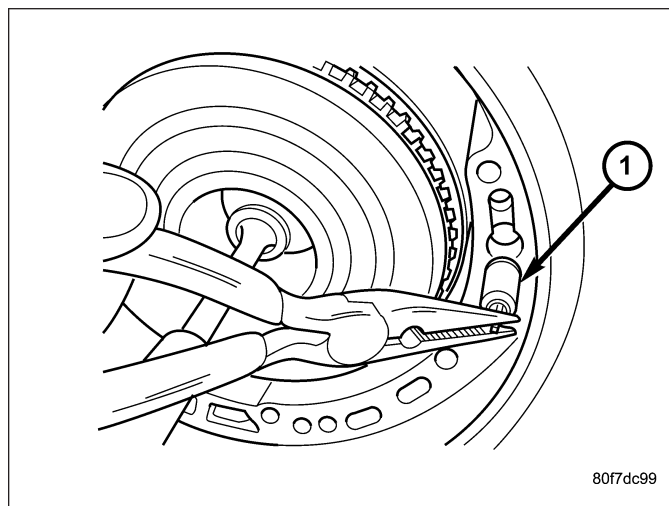
35. Remove oil pump gasket (2).



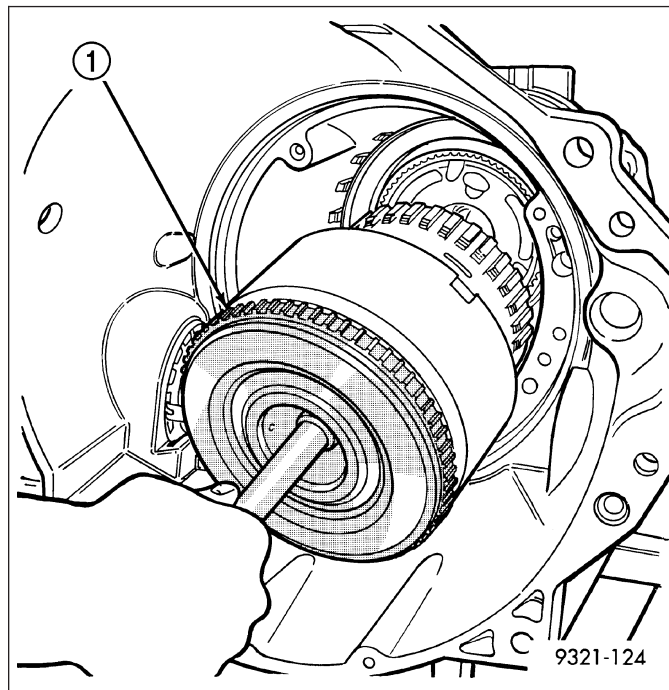
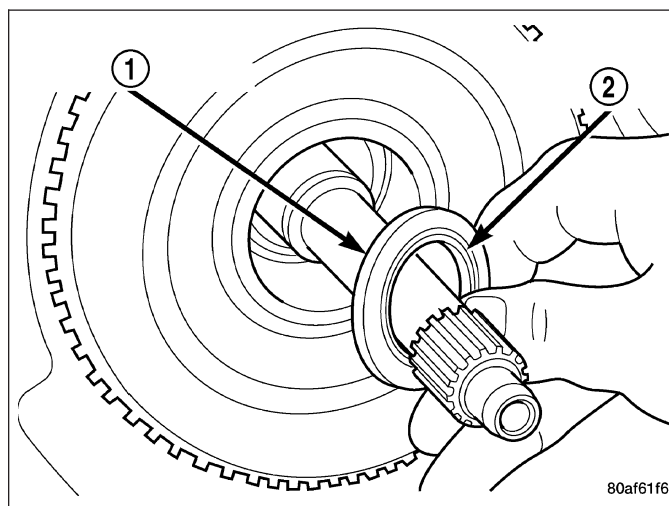
**CAUTION:** By-pass valve must be replaced if transmission failure occurs.

36. Remove the cooler by-pass valve (1).

37. Remove the #1 caged needle bearing (1).

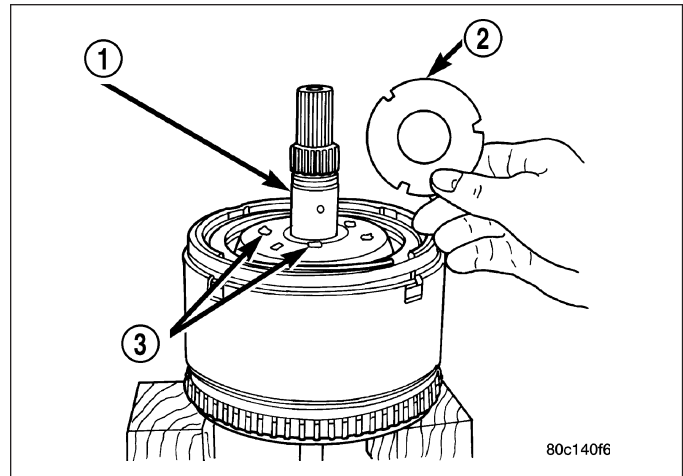


38. Remove the input clutch assembly (1).

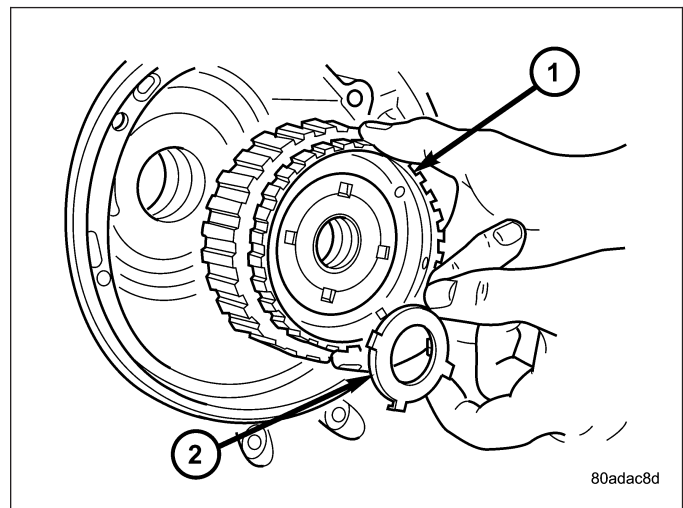




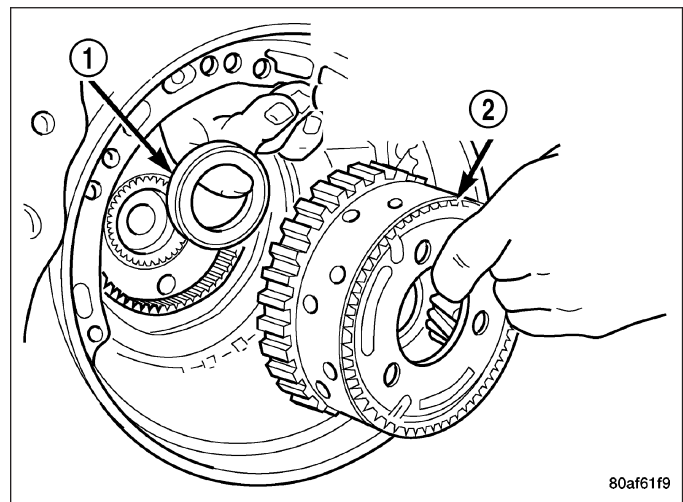
39. Remove the #4 thrust plate (2).



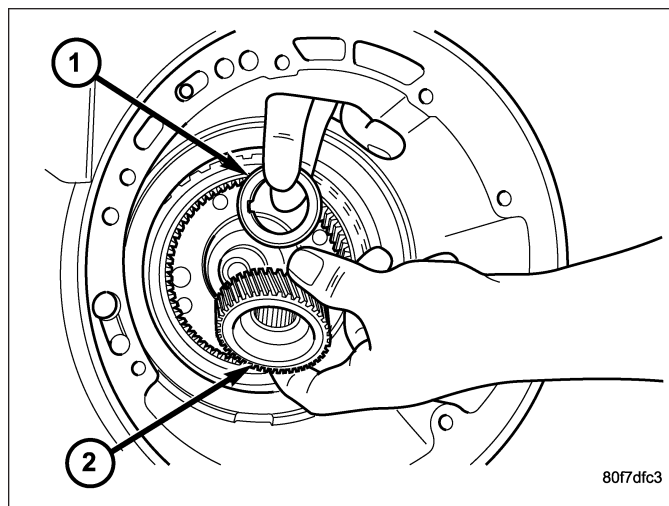
40. Remove the front sun gear assembly (1) and #4 thrust washer (if still in place).



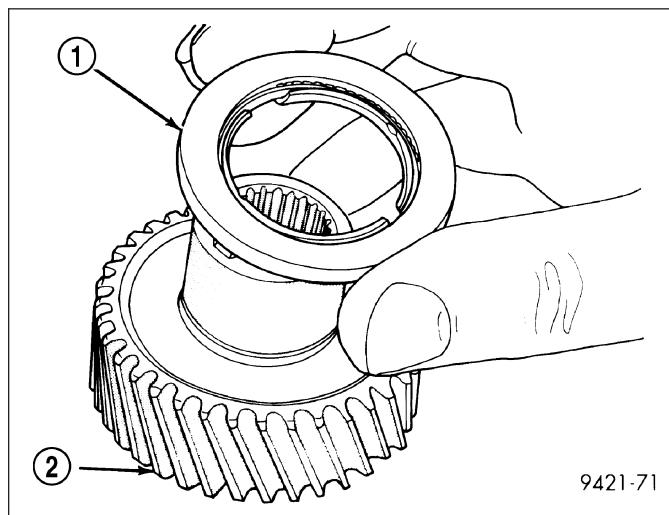
41. Remove the front carrier/rear annulus (2) and #6 needle bearing (1).



42. Remove the rear sun gear (2) and #7 needle bearing (1).

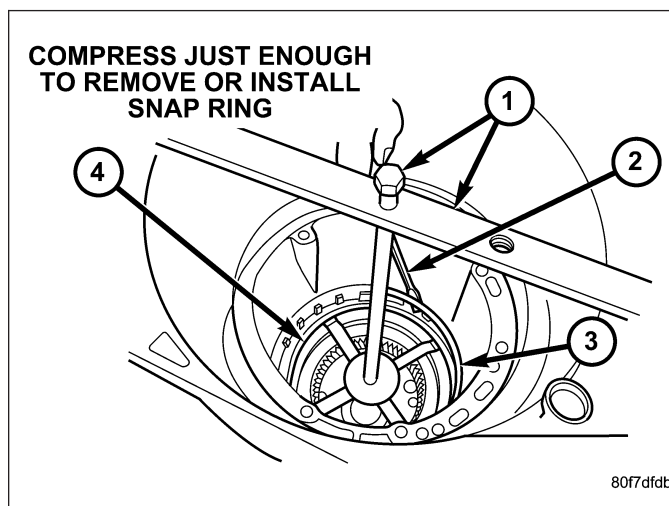


**Note:** The number seven needle bearing (1) has three antireversal tabs and is common with the number five and number two position. The orientation should allow the bearing to seat flat against the rear sun gear. A small amount of petrolatum can be used to hold the bearing to the rear sun gear.



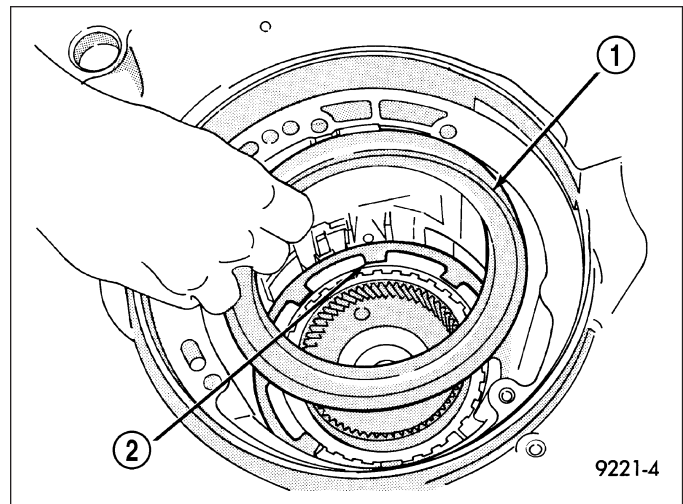
**Note:** Verify that Tool 5058A (1) is centered properly over the 2/4 clutch retainer (4) before compressing. If necessary, fasten the 5058A bar to the bellhousing flange with any combination of locking pliers and bolts to center the tool properly.

43. Install and load Tool 5058A to remove the 2/4 clutch retainer snap ring (3).

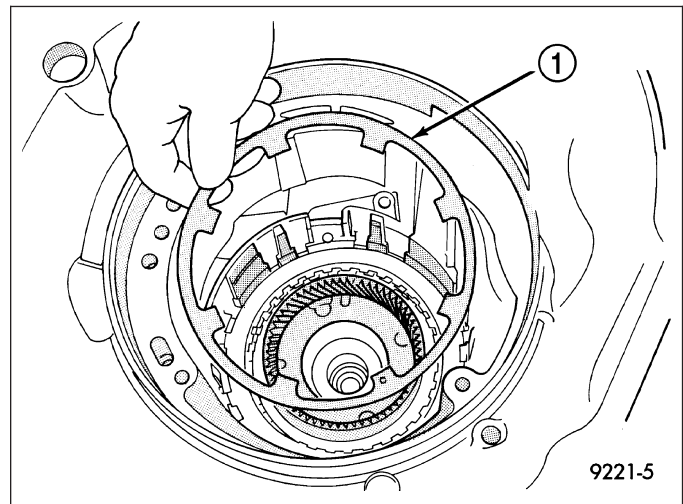


**Note:** The 2/4 Clutch Piston has bonded seals which are not individually serviceable. Seal replacement requires replacement of the piston assembly.

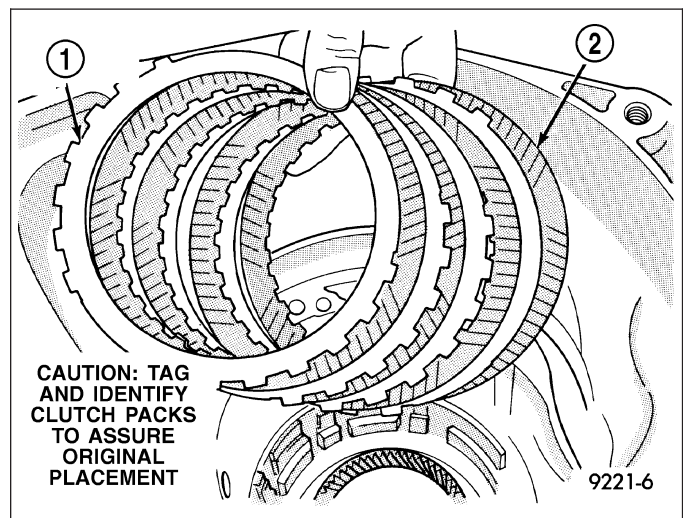
44. Remove the 2/4 clutch retainer (1).



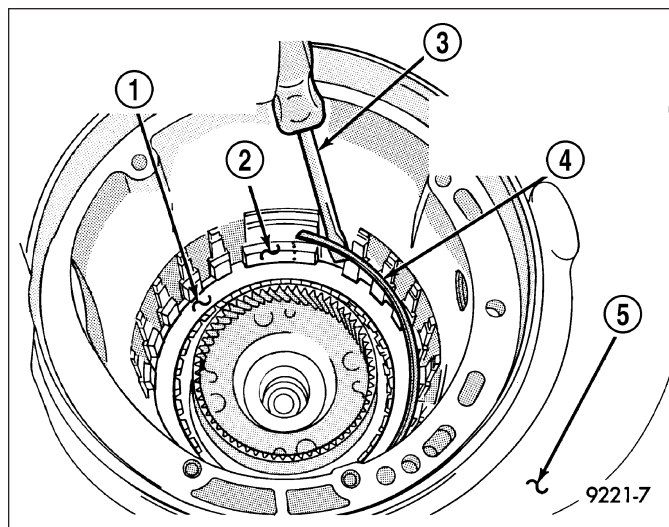
45. Remove the 2/4 clutch return spring (1).



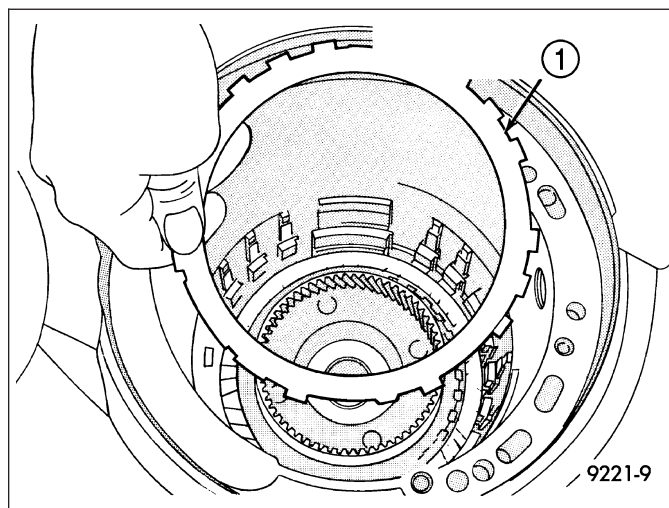
46. Remove the 2/4 clutch pack (1, 2).



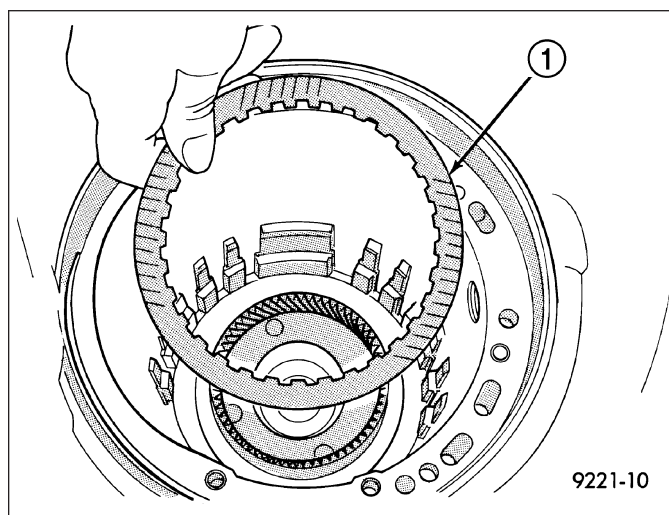
47. Remove the tapered snap ring (4).



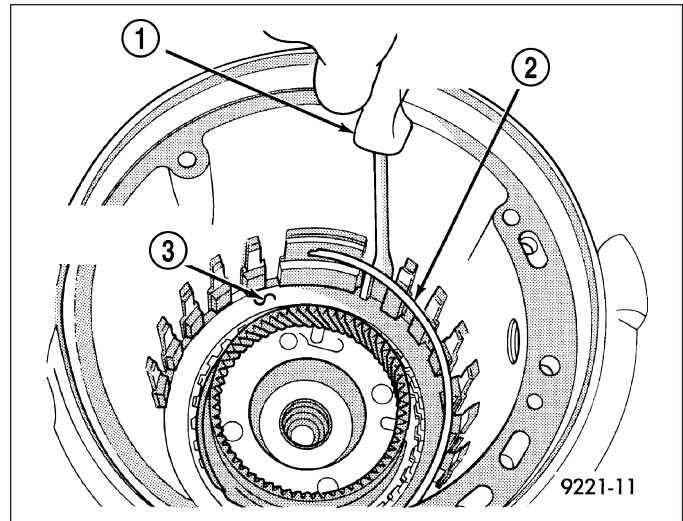
48. Remove the low/reverse reaction plate (1).



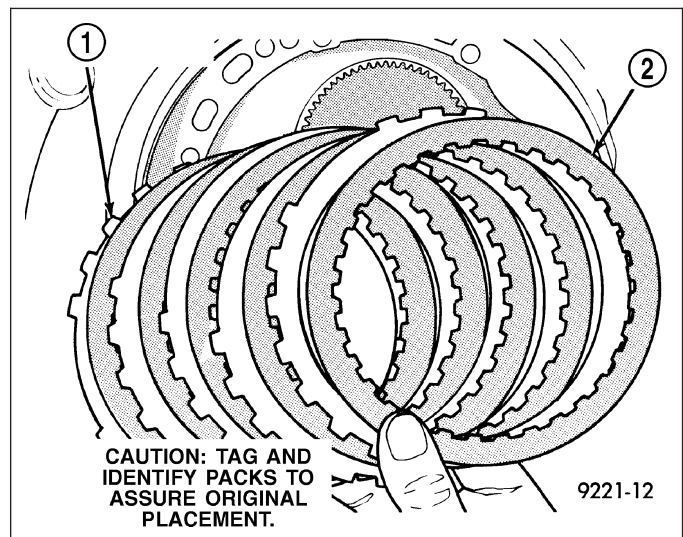
49. Remove one (1) low/reverse clutch disc to facilitate snap ring removal.



50. Remove the low/reverse reaction plate snap ring (2).

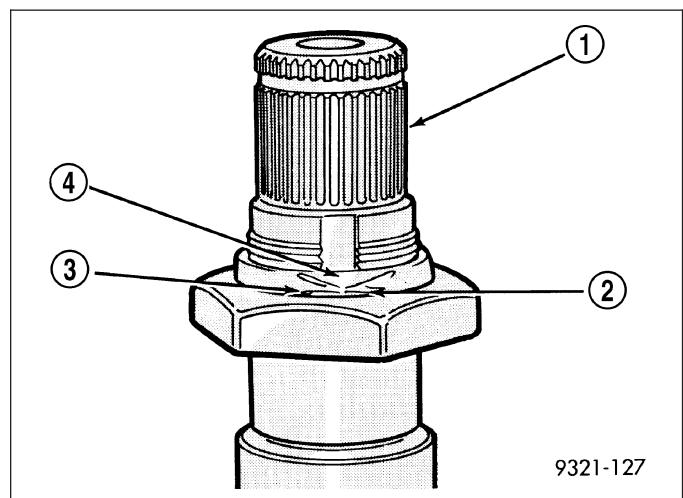


51. Remove the low/reverse clutch pack (1, 2).

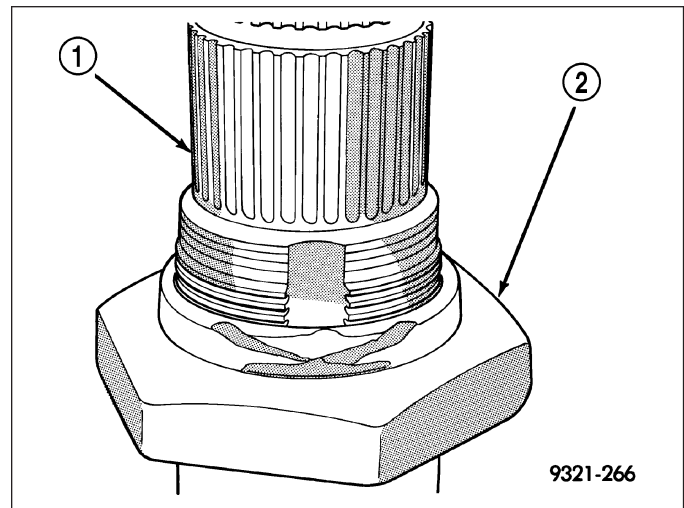


**CAUTION:** Failure to grind and open stakes (4) of the output shaft nut will result in thread damage to the shaft during nut removal.

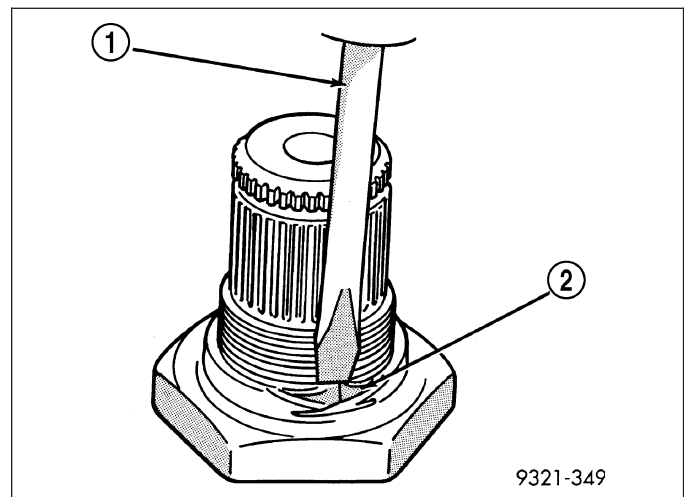
**WARNING:** WEAR SAFETY GOGGLES WHILE GRINDING STAKE NUTS.



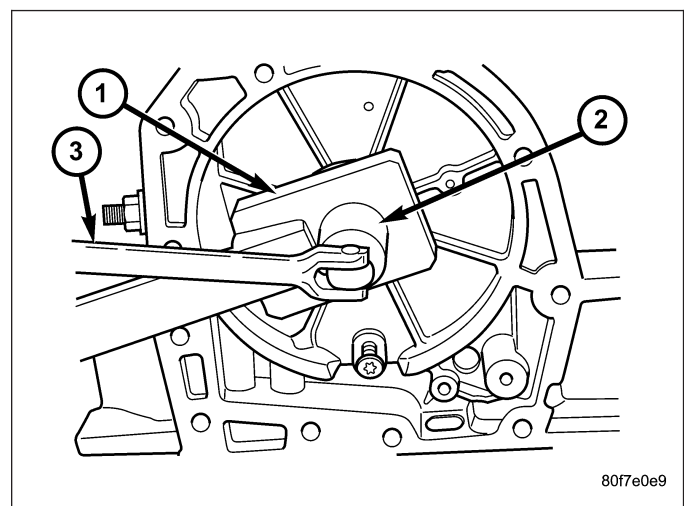
52. Using a die grinder or equivalent, grind the stakes in the shoulder of the shaft nut (2) as shown. Do not grind all the way through the nut and into the shaft. There are two stakes on each nut.



53. Using a small chisel (1), carefully open the stakes on nut (2).

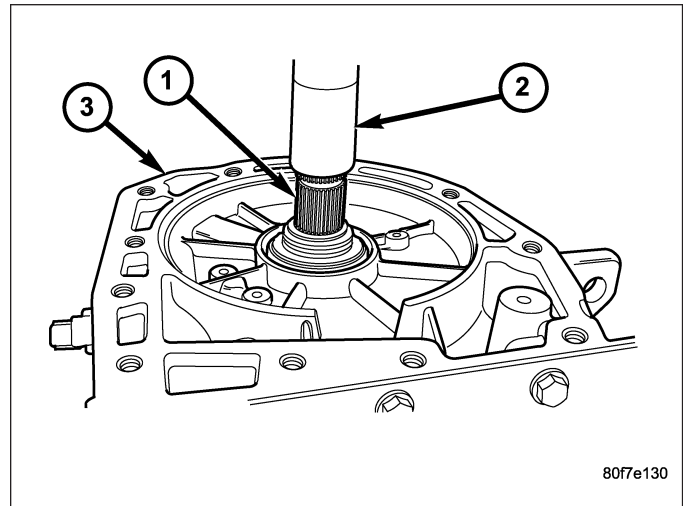


54. Use special tool 6497 (1) and 6498A (2) to remove the output shaft nut.

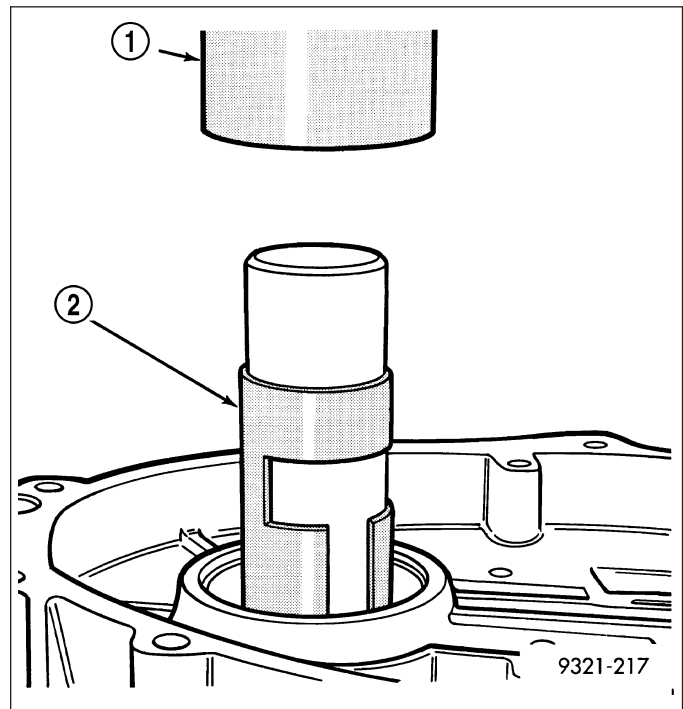




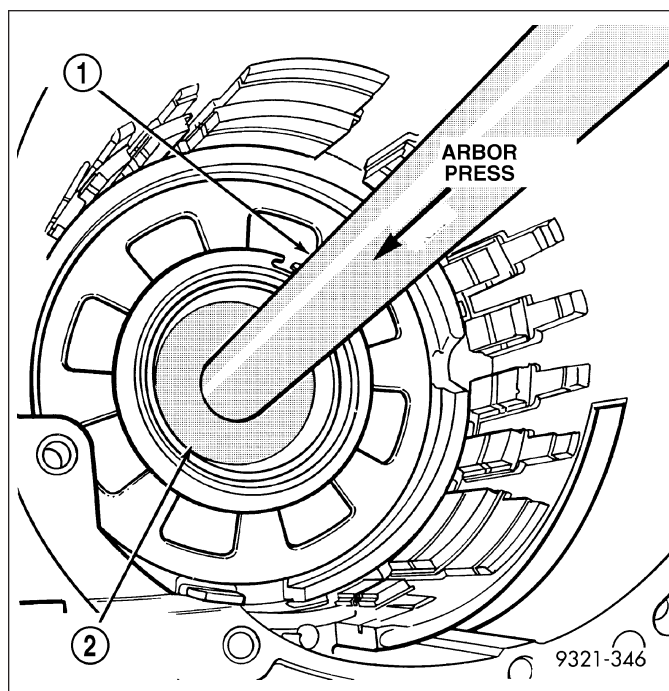
55. Remove the output shaft (1) from case (3) using a shop press (2).



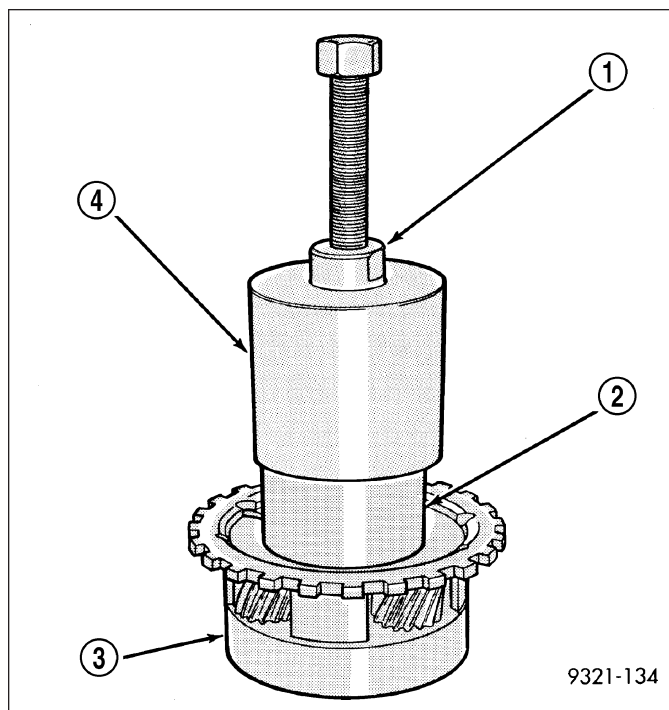
56. Use special tool 6596 (2) with a shop press (1) to remove the front output shaft bearing cup.



57. Use special tool 6597 (2) and handle C-4171 (1) and C-4171-2 to press the rear output shaft bearing cup rearward.

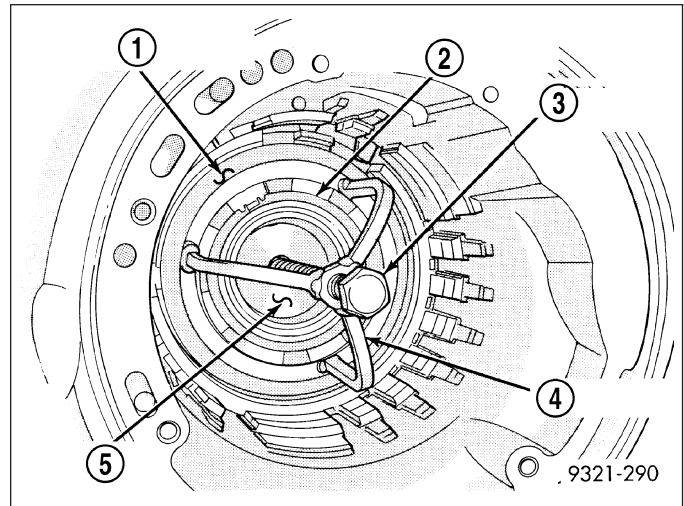


58. Remove the rear carrier front bearing cone (3).

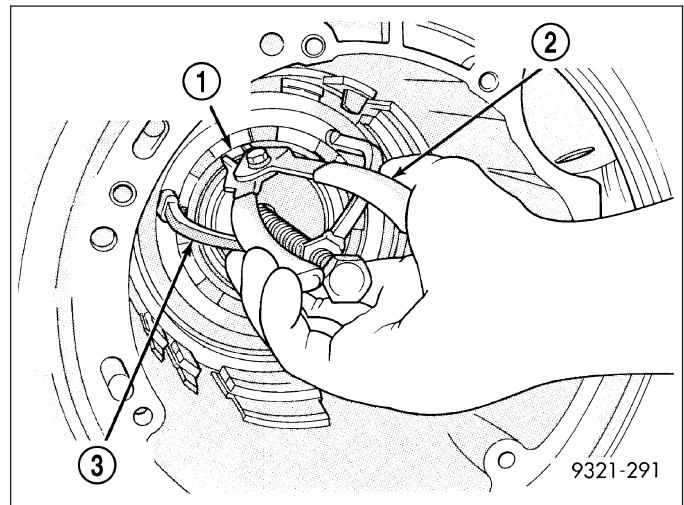




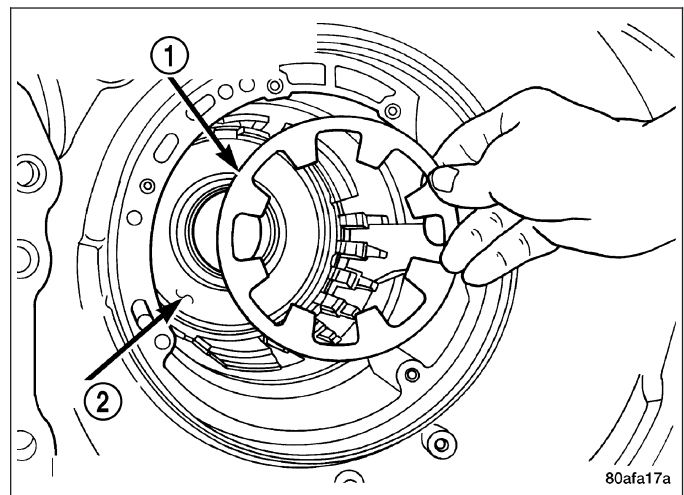
59. Install and load compressor 5059A (4) as shown.



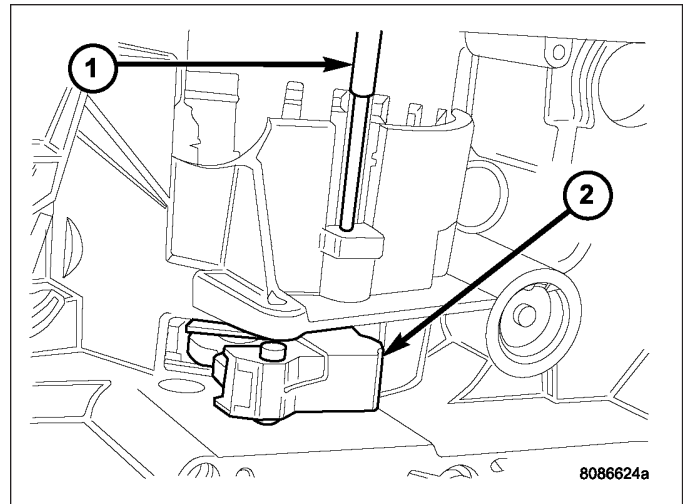
60. Remove the low/reverse belleville spring snap ring (1).



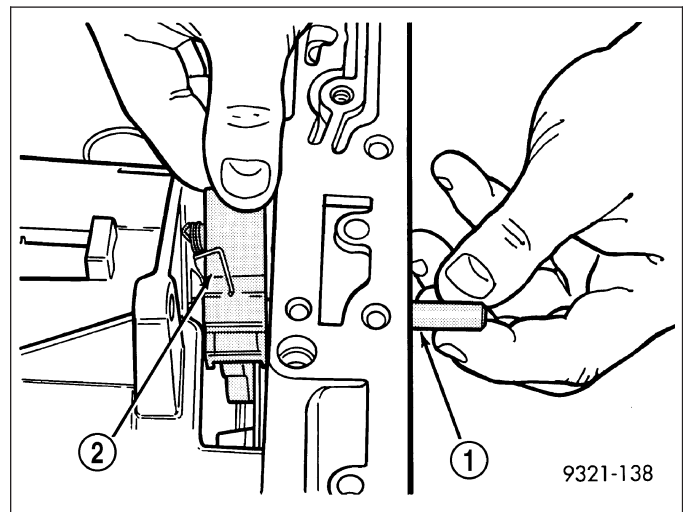
61. Remove the low/reverse piston belleville spring (1).



62. Remove the park sprag pivot retaining screw.
63. Drive out the anchor shaft using suitable punch (1).

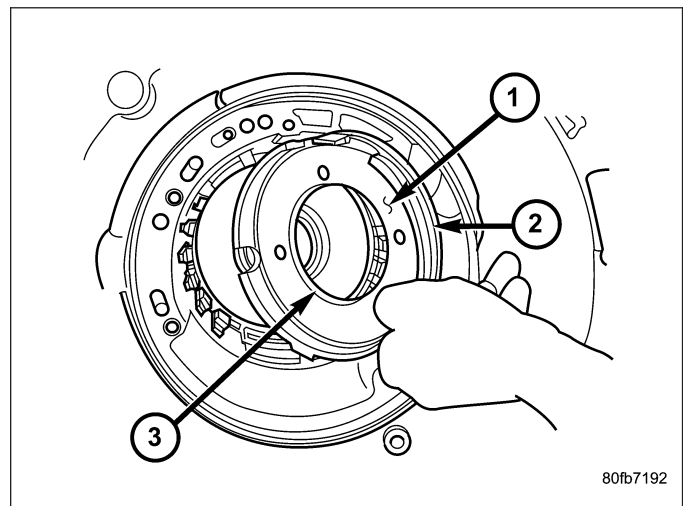


64. Remove the guide bracket pivot pin (1). Inspect all components for wear and replace if necessary.

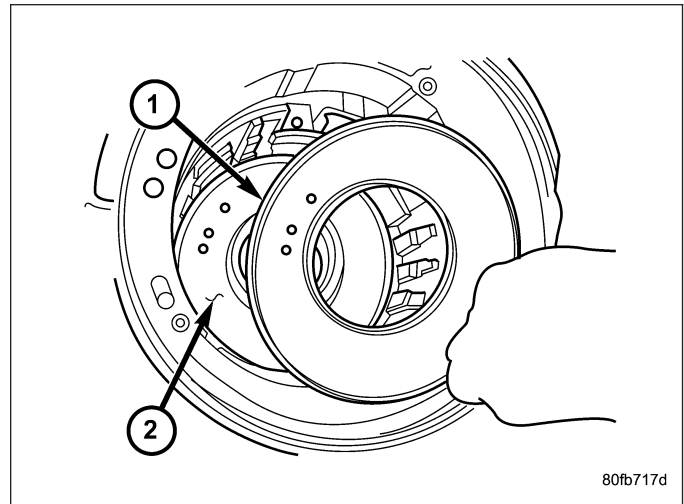


**Note: The Low/Reverse Clutch Piston has bonded seals which are not individually serviceable. Seal replacement requires replacement of the piston assembly.**

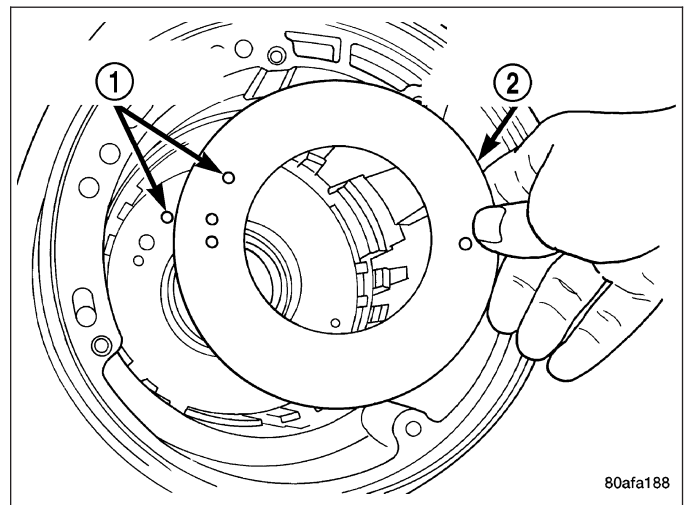
65. Remove the low/reverse clutch piston (1).
66. Remove the low/reverse piston retainer screws.



67. Remove low/reverse piston retainer (1).



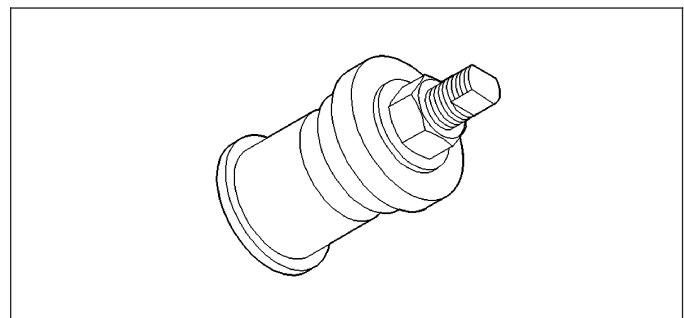
68. Remove the low/reverse piston retainer gasket (2).



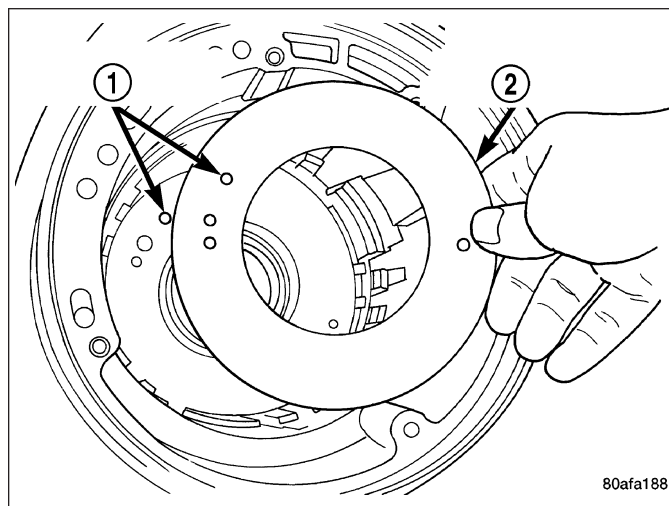
## ASSEMBLY

**Note:** If the transmission assembly is being reconditioned (clutch/seal replacement) or replaced, it is necessary to perform the Quick Learn Procedure using the scan tool (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE).

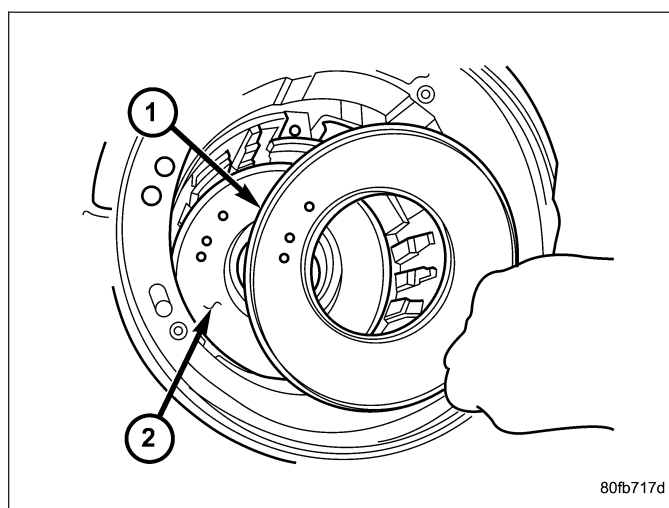
1. Install the output bearing cups using Special Tool - 5050A.



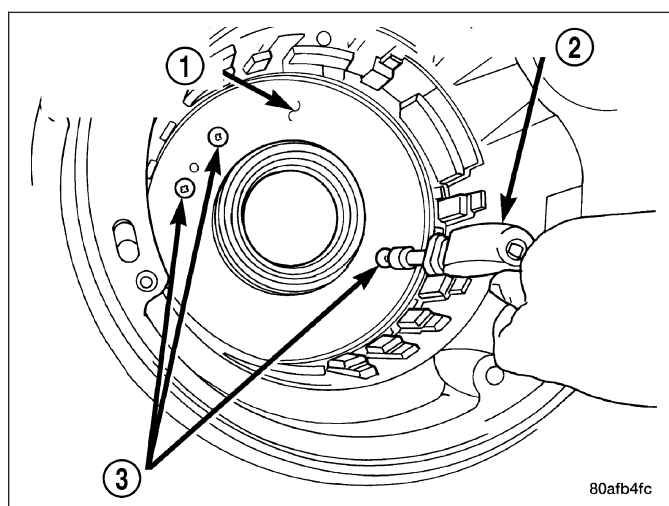
2. Install low/reverse piston retainer gasket (2).



3. Install low/reverse piston retainer (1).

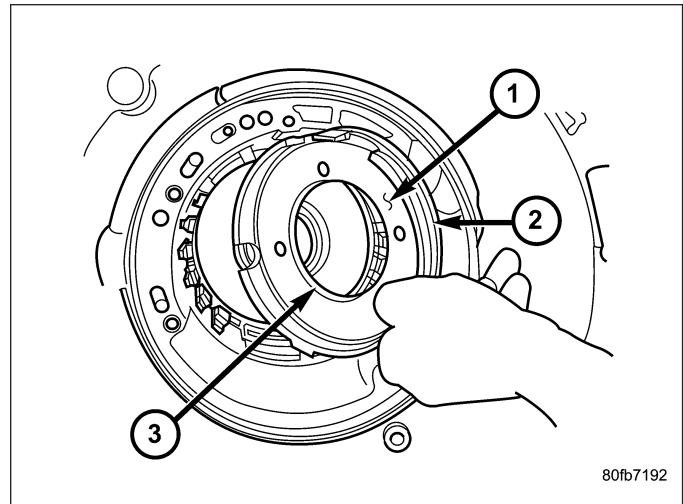


4. Install low/reverse piston retainer-to-case screws (3) and torque to 5 N·m (45 in. lbs.).

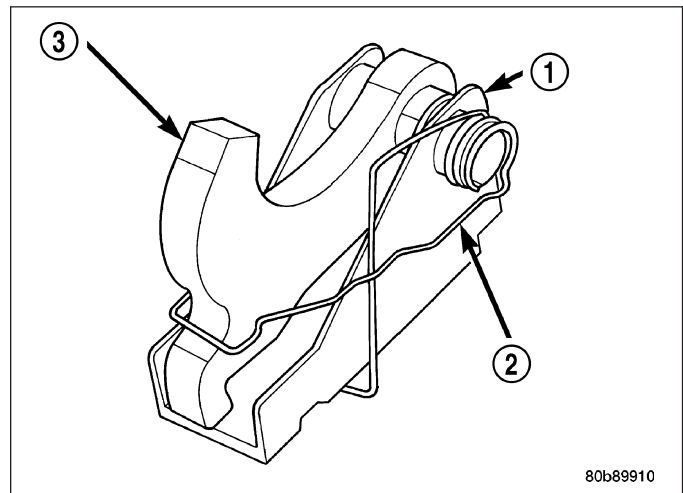


**Note:** The Low/Reverse Clutch Piston has bonded seals which are not individually serviceable. Seal replacement requires replacement of the piston assembly.

5. Install low/reverse clutch piston (1).

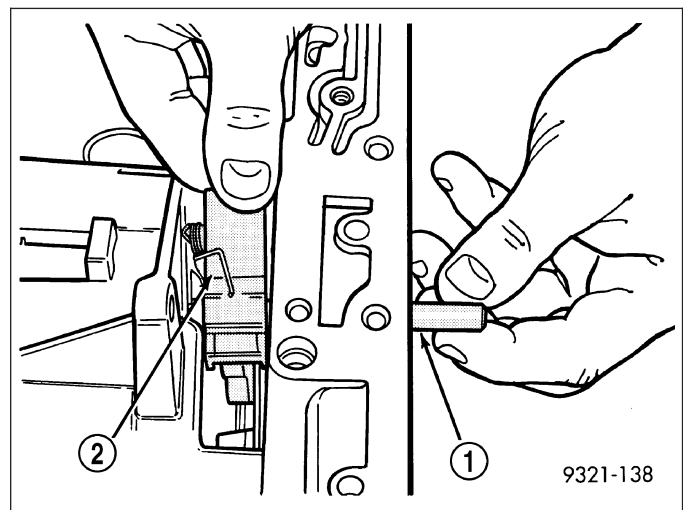


6. Assemble guide bracket (1) assembly as shown, if necessary.

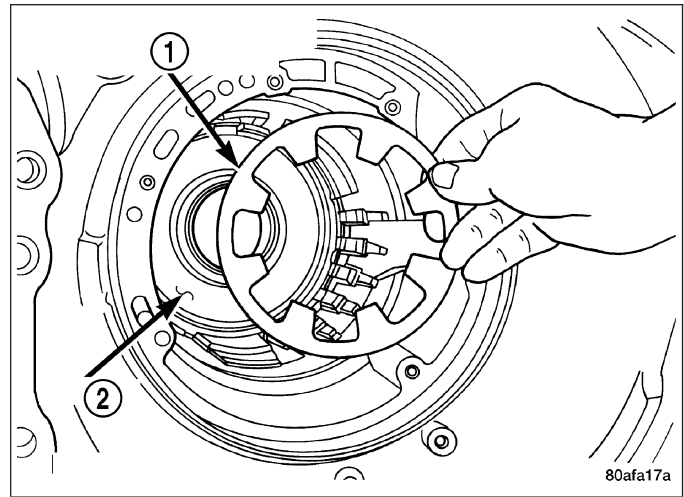


**CAUTION:** When installing, be sure guide bracket and split sleeve touch the rear of the transmission case.

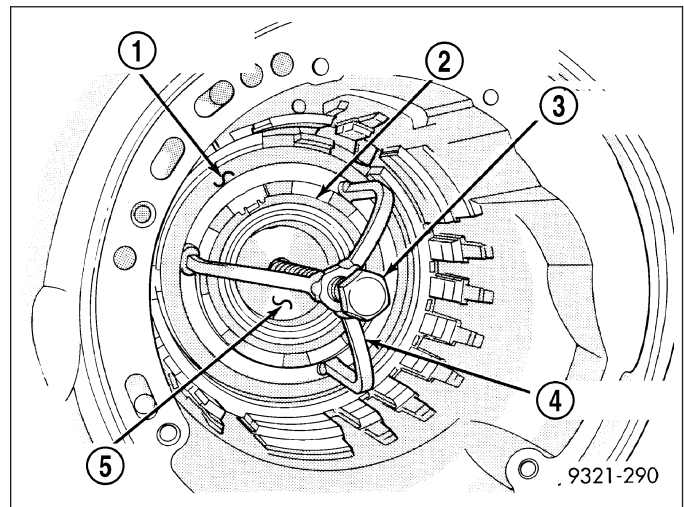
7. Install guide bracket pivot pin (1).
8. Install park sprag pivot retaining screw and torque to 4.5 N·m (40 in. lbs.).



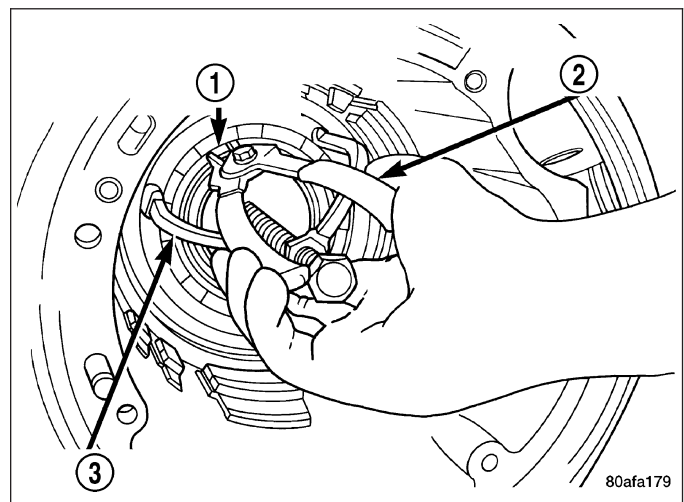
9. Install low/reverse piston belleville spring (1) into position.



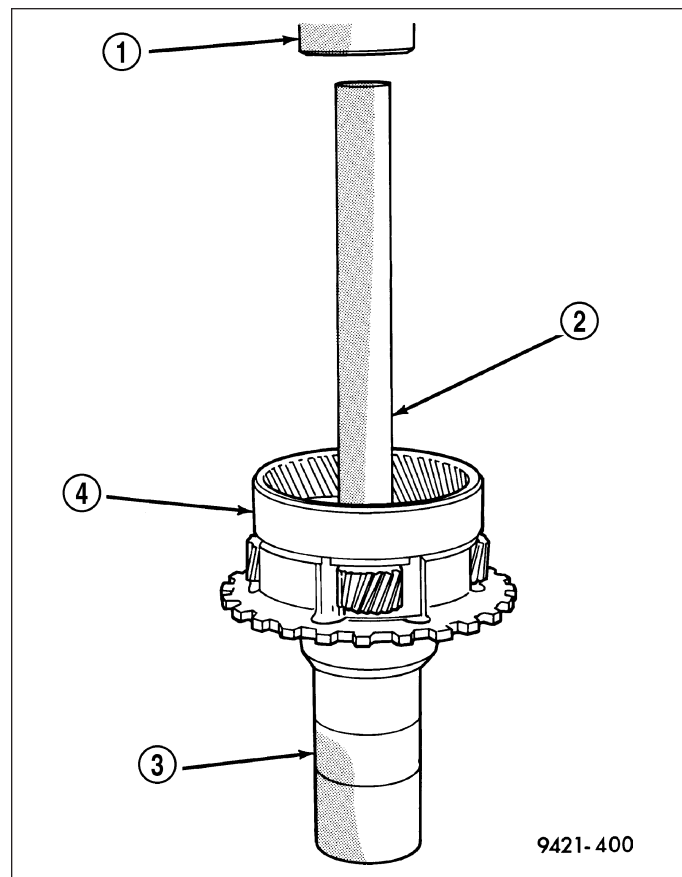
10. Install and load low/reverse spring compressor tool (3, 4, 5) as shown to facilitate snap ring (2) installation.



11. Install snap ring (1) and remove compressor tool.



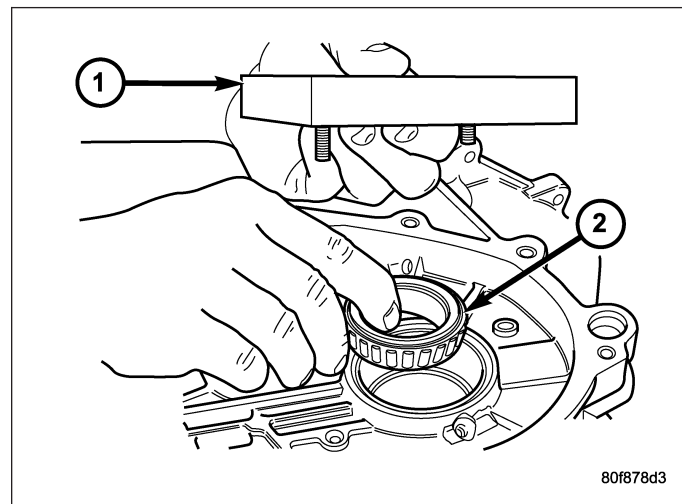
12. Install rear carrier (4) front bearing cone.



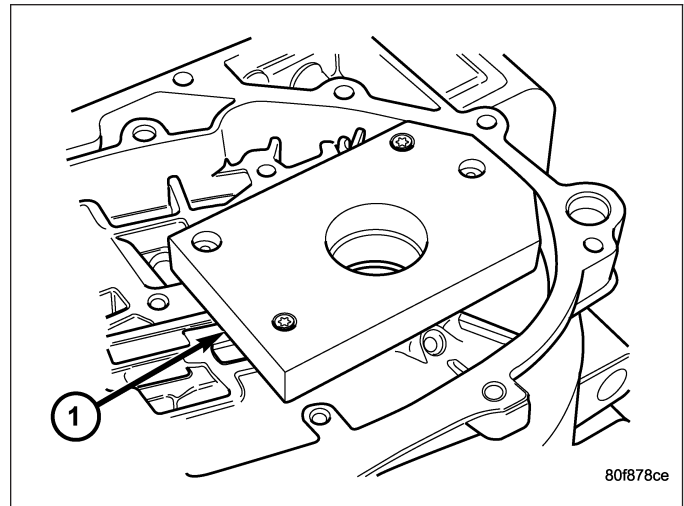
Check output bearing preload. **Output bearing preload must be checked and/or adjusted if any of the following items have been replaced:**

- Output shaft (rear carrier assembly)
- Output shaft bearings
- Transmission case

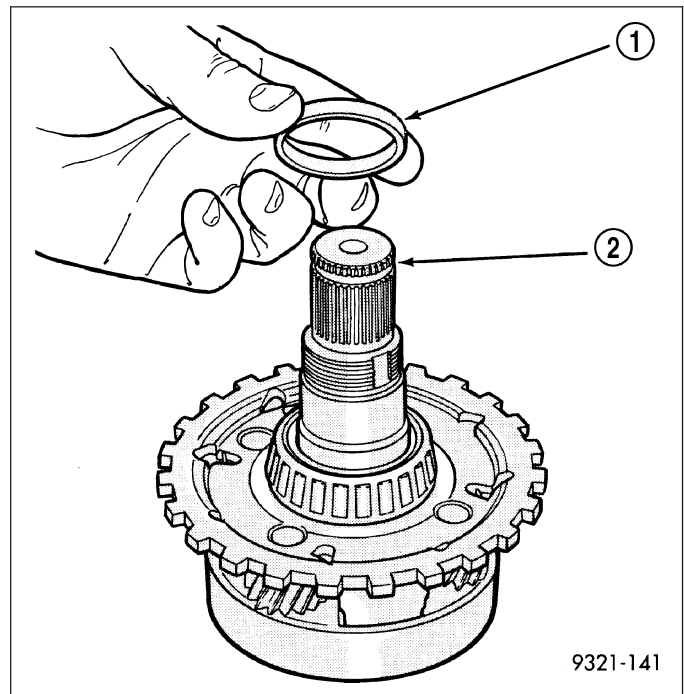
13. **PRELOAD CHECK/SHIM SELECTION:** Install rear output shaft bearing cone and special tool 6618A (1).



14. Install special tool 6618A (1). Lightly tighten retaining screws. Screws should be below the plate surface, but do not snug screws.
15. Turn case over on arbor press so that the plate is resting on the press base. **CAUTION: The output shaft will extend through the hole of tool 6618A. Ensure your press table has clearance for the output shaft.**

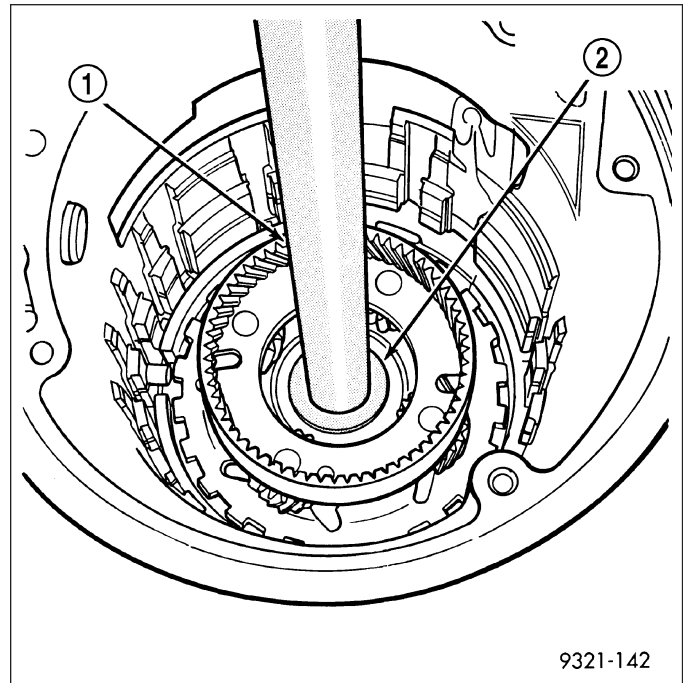


16. Install shim (1) on output shaft (2). Apply small amount of petrolatum onto the shim to hold it in place. Use the original shim as a starting point. If original shim is not available, use the thickest shim available.



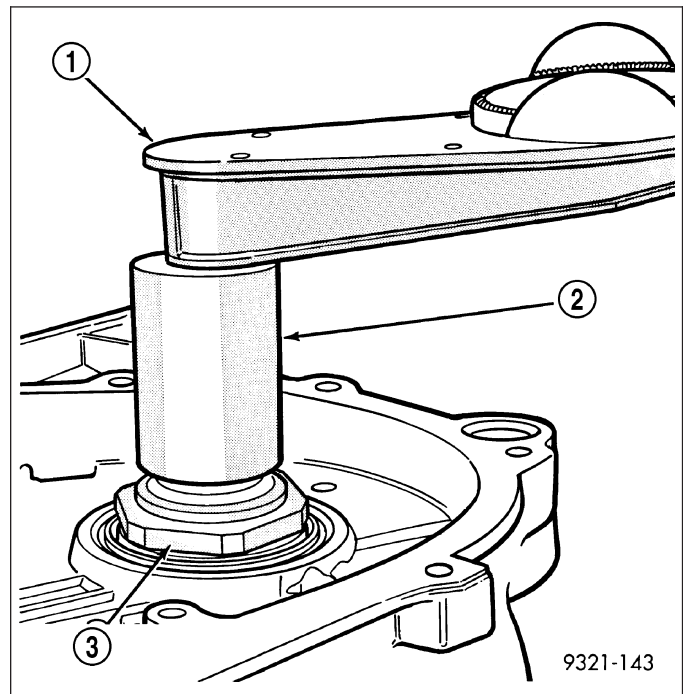


17. Install output shaft/rear carrier into rear bearing. The shaft must be pressed into position. Use special tool MD-998911 (Disc) (2) and C- 4171 and C4171-2 (Handle) (1) to press shaft into rear bearing.



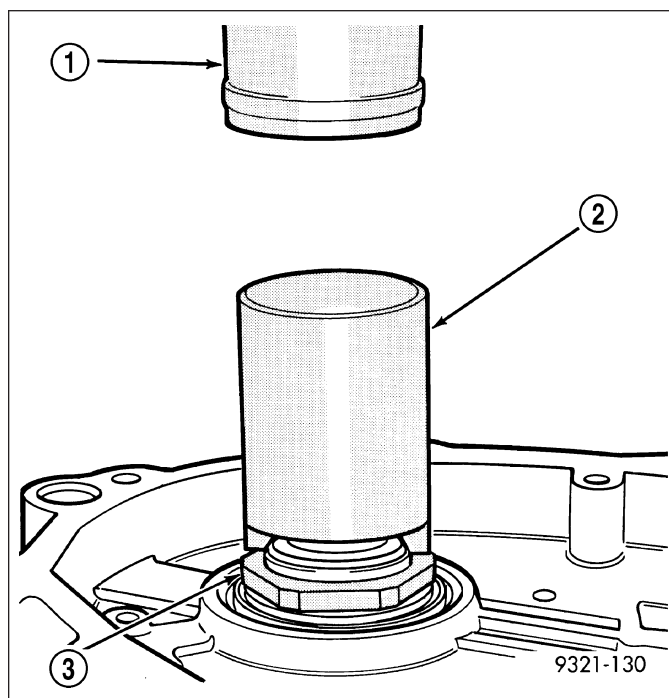
**CAUTION:** Do not re-use old output shaft nut because the removed stake weakens the nut flange. Using special tools 6497 and 6498-A, install new output shaft nut. Tighten new output shaft nut to 271 N·m (200 ft. lbs.).

18. Check the turning torque (1) of the output shaft. The shaft should have 1 to 8 in. lbs. of turning torque. If the turning torque is **higher than** 8 in. lbs., install a thicker shim. If turning torque is **less than** 1 in. lb., install a thinner shim. Make sure there is no end play.

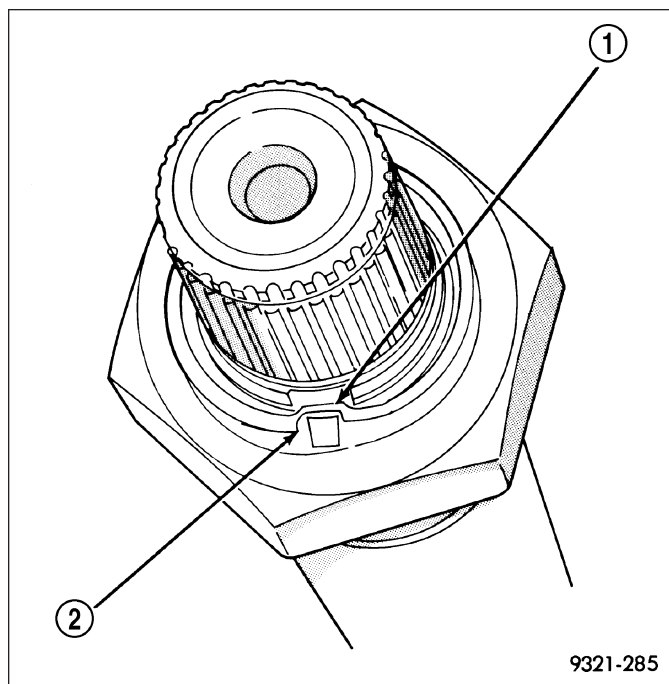


**CAUTION:** Failure to stake nut could allow the nut to back-off during use.

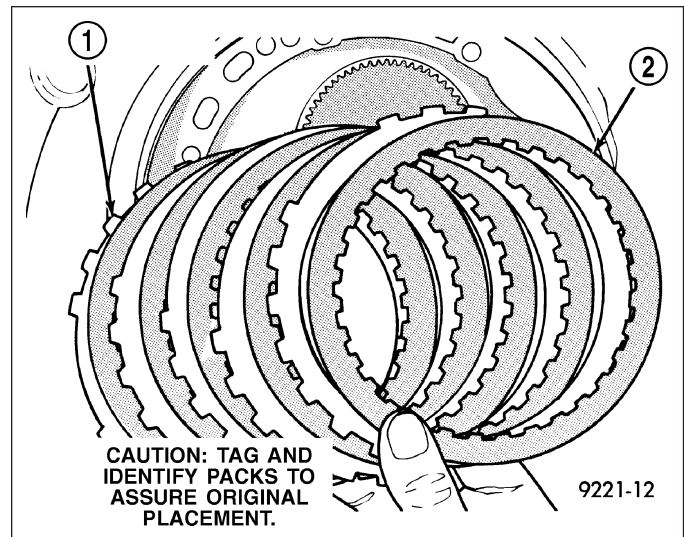
19. The new nut (3) must be staked after the correct turning torque is obtained. Use special tool 6639 (2) to stake output shaft nut.



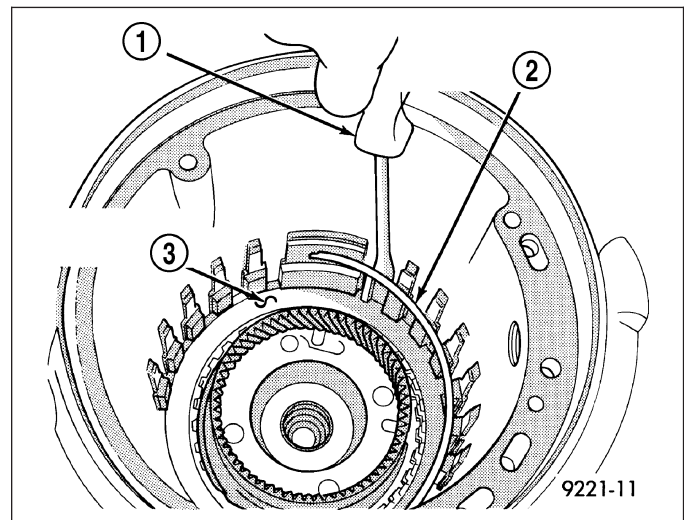
20. Verify that the nut has been properly staked to the output shaft.



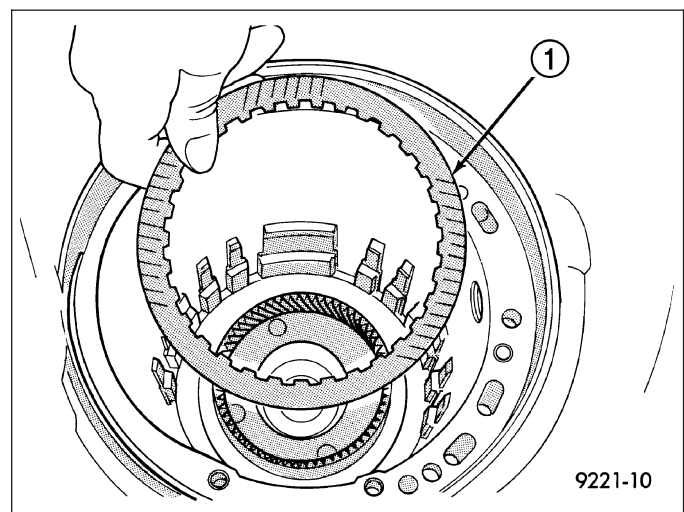
21. Install low/reverse clutch pack (1, 2). Leave uppermost disc out to facilitate snap ring installation.



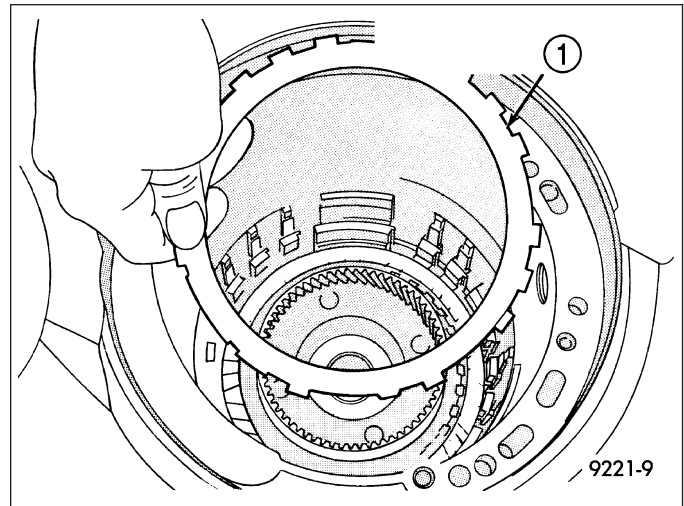
22. Install low/reverse reaction plate snap ring (2).



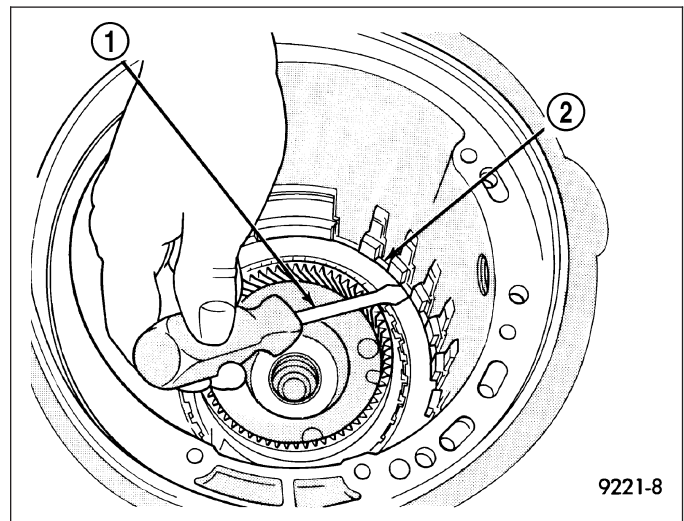
23. Install one low/reverse clutch disc (1).



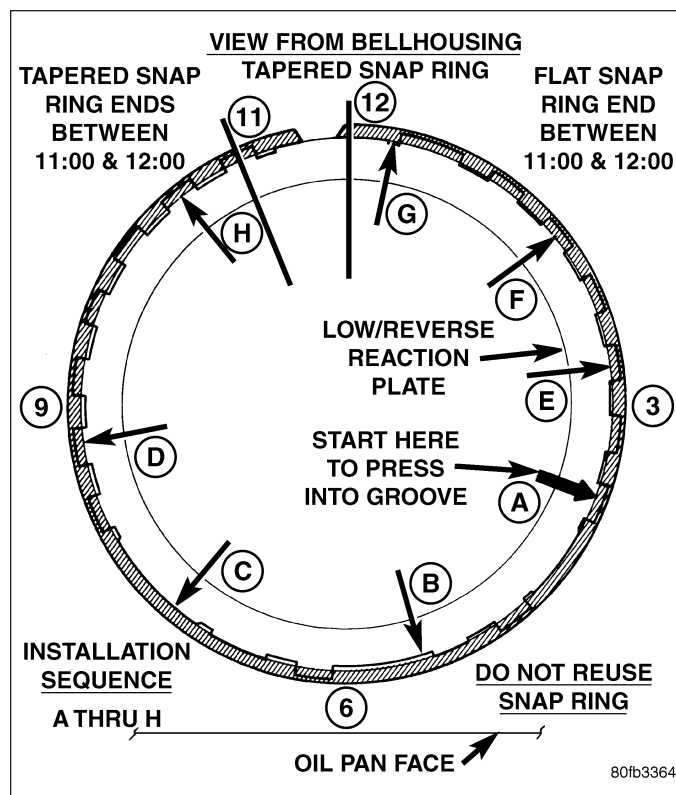
24. Install low/reverse reaction plate (1) with flat side up.



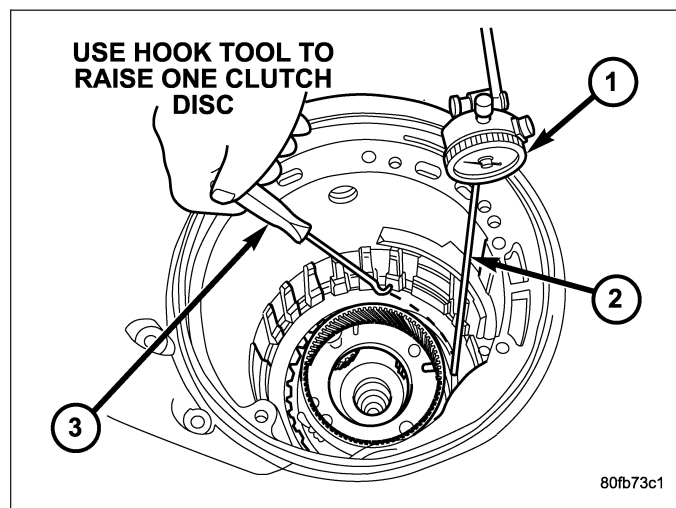
25. Install a new tapered snap ring (2) (tapered side out).



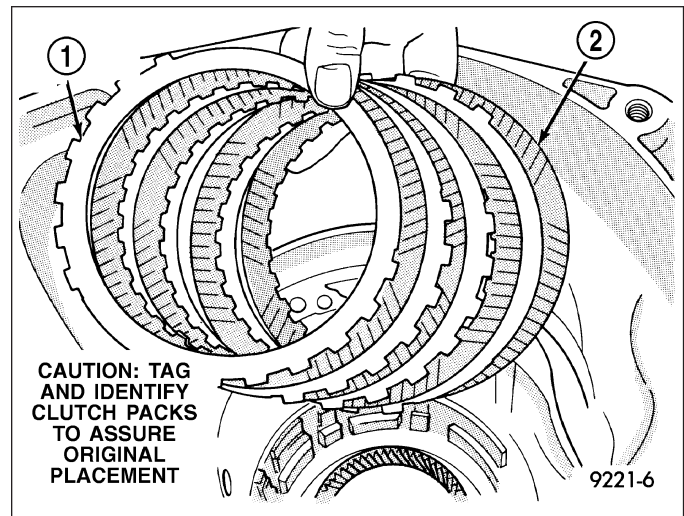
26. Make sure that the snap ring ends are oriented as shown.



27. Measure low/reverse clutch pack. Set up dial indicator (1) as shown. Press down clutch pack with finger and zero dial indicator. Record measurement in four (4) places and take average reading. **Low/Reverse clutch pack clearance is 0.84 to 1.60 mm (0.033 to 0.063 inch).**
28. Select the proper low/reverse reaction plate to achieve specifications.

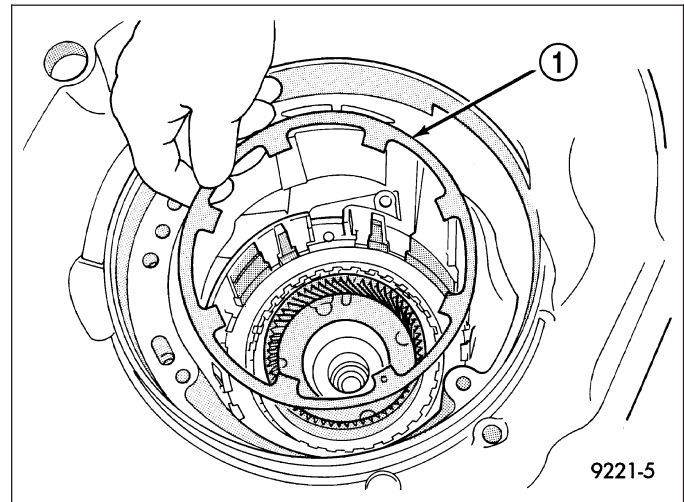


29. Install 2/4 clutch pack (1, 2).

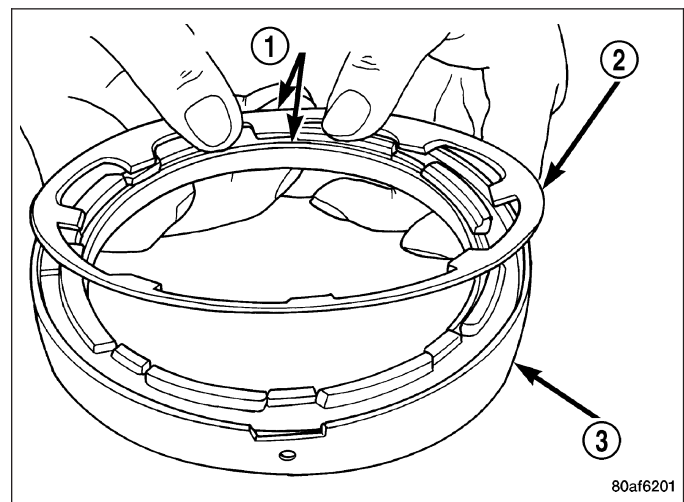


**Note:** The 2/4 Clutch Piston has bonded seals which are not individually serviceable. Seal replacement requires replacement of the piston assembly.

30. Install 2/4 clutch belleville spring (1).

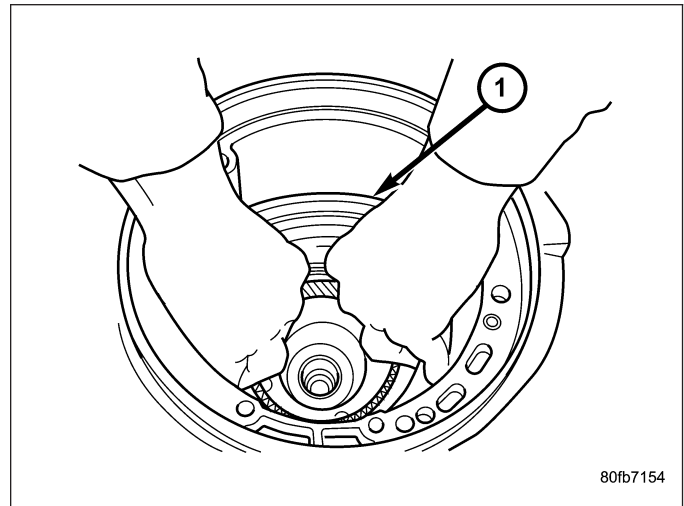


31. Verify the proper orientation of the return spring (2) to the 2/4 retainer (3).



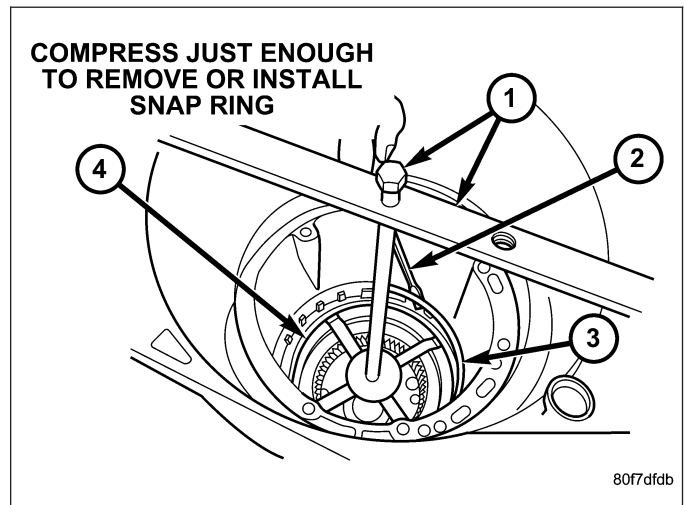


32. Install 2/4 clutch retainer (1).

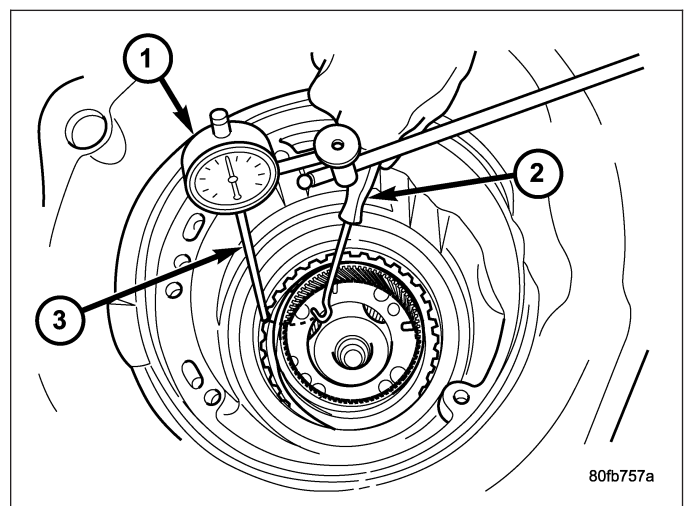


**Note:** Verify that Tool 5058A (1) is centered properly over the 2/4 clutch retainer (4) before compressing. If necessary, fasten the 5058A bar to the bellhousing flange with any combination of locking pliers and bolts to center the tool properly.

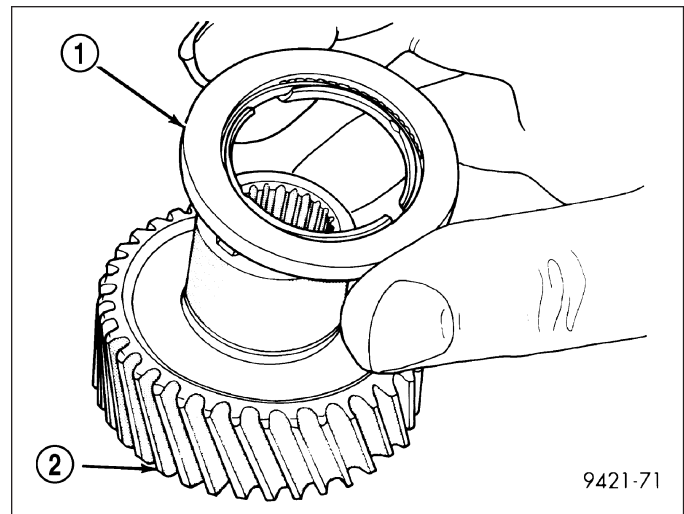
33. Set up Tool 5058 (1) as shown. Compress 2/4 clutch just enough to facilitate snap ring installation.



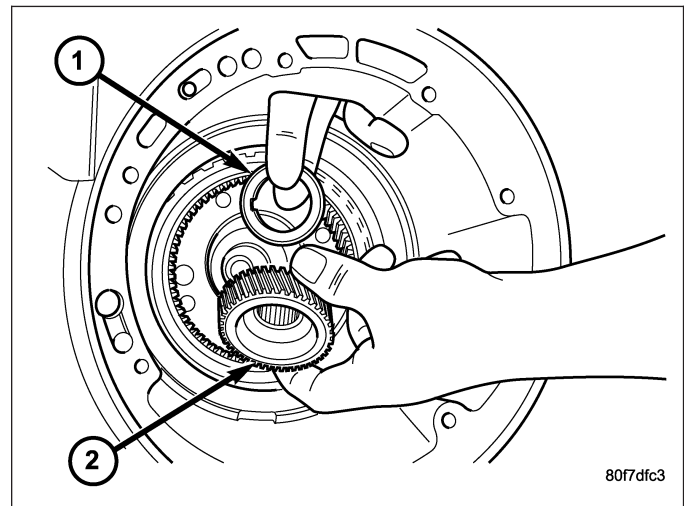
34. **Measure 2/4 clutch clearance:** Set up dial indicator (1) as shown. Press down clutch pack with finger and zero dial indicator. Record measurement in four (4) places and take average reading. **The 2/4 clutch pack clearance is 0.76 to 2.64 mm (0.030 to 0.104 inch).** If not within specifications, the clutch is not assembled properly or is excessively worn. **There is no adjustment for the 2/4 clutch clearance.**



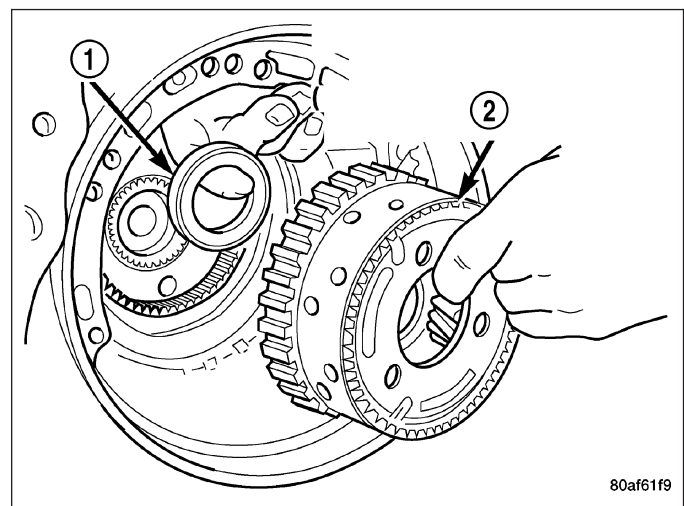
35. Install the #7 needle bearing (1) to the rear sun gear (2). The number 7 needle bearing has three antireversal tabs and is common with the number 5 and number 2 position. The orientation should allow the bearing to seat flat against the rear sun gear. A small amount of petrolatum can be used to hold the bearing to the rear sun gear.



36. Install rear sun gear (2) and #7 needle bearing (1).

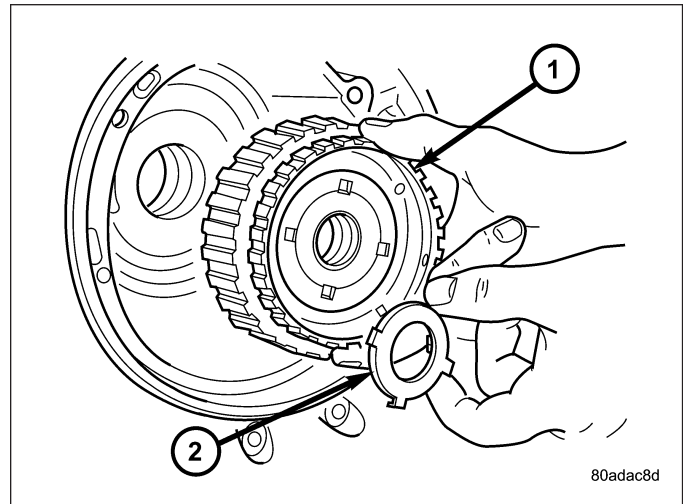


37. Install front carrier/rear annulus assembly (2) and #6 needle bearing (1).

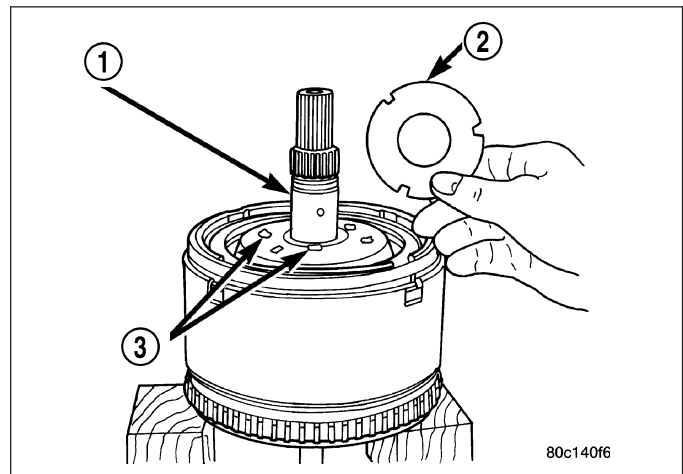




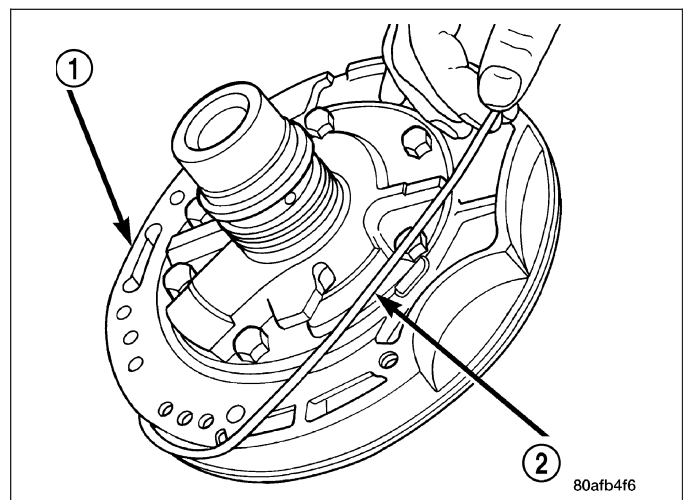
38. Install front sun gear assembly (1) and #4 thrust washer (2).



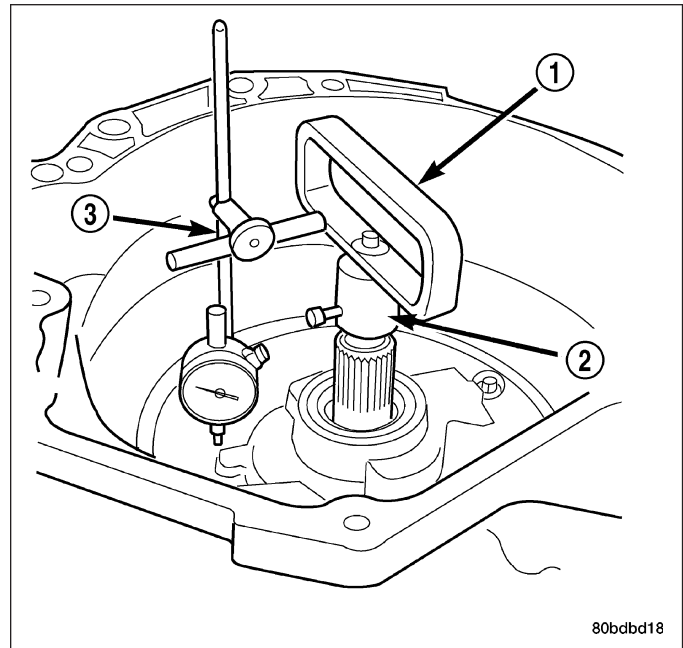
39. Determine proper #4 thrust plate thickness. Select the thinnest available #4 thrust plate.
40. Install #4 thrust plate (2) using petrolatum to hold into position.
41. Install input clutch assembly. Ensure the input clutch assembly is completely seated by viewing position through input speed sensor hole. **If the speed sensor tone wheel is not centered in the opening, the input clutches assembly is not seated properly.**



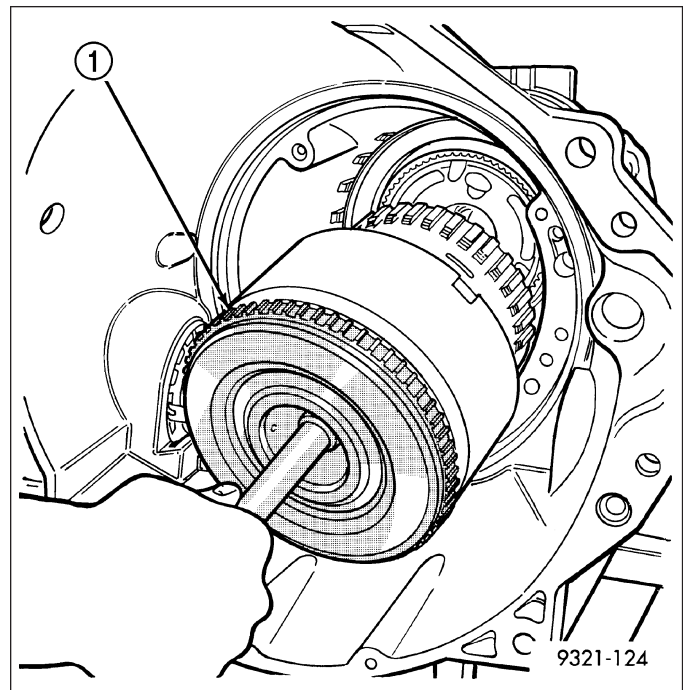
42. Remove the oil pump o-ring (2) and install oil pump and gasket to transmission. **Use screw-in dowels or phillips-head screwdrivers to align pump to case. Be sure to reinstall O-ring on oil pump after selecting the proper No. 4 thrust plate.**



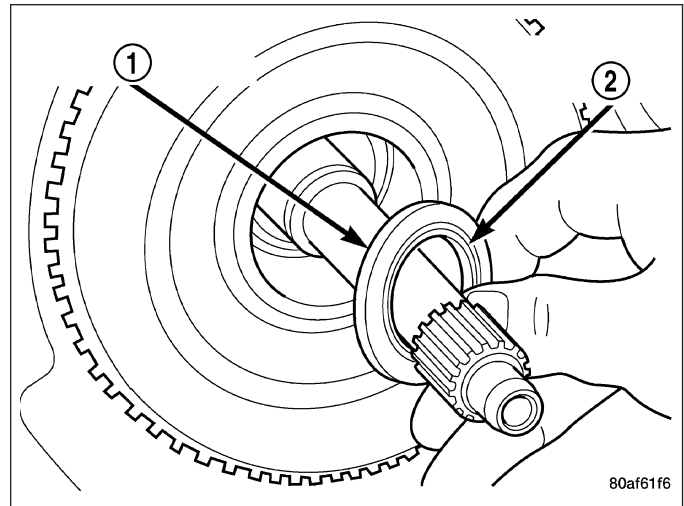
43. Measure the input shaft end play with the transmission in the vertical position. This will ensure that the measurement will be accurate.
44. Set up and measure endplay using End Play Set 8266 (1, 2) and Dial Indicator Set C3339 (3) as shown.
45. Measure input shaft end play. **Input shaft end play must be 0.127 to 0.635 mm (0.005 to 0.025 inch).** For example, if end play reading is 0.055 inch, select No. 4 Thrust Plate which is 0.071 to 0.074 thick. This should provide an input shaft end play reading of 0.020 inch, which is within specifications.



46. Remove oil pump, gasket, and input clutch assembly to gain access to and install proper #4 thrust plate.
47. Install input clutch assembly (1) with proper thrust plate.

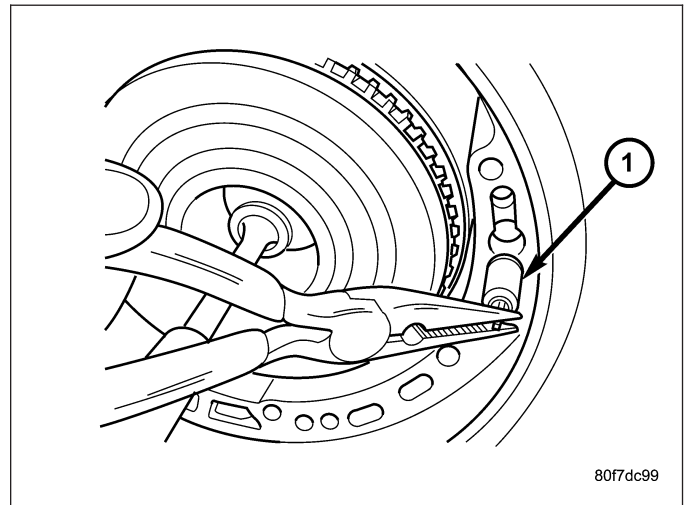


48. Install #1 caged needle bearing (1).



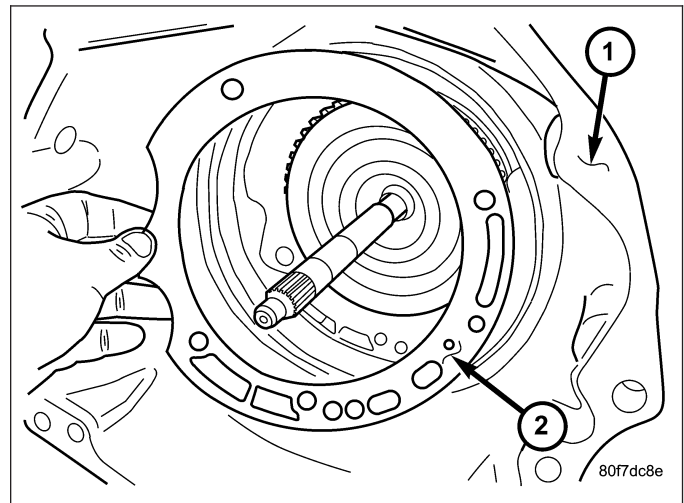
**CAUTION: By-pass valve MUST be replaced if transmission failure occurs.**

49. Replace cooler by-pass valve (1) if transmission failure has occurred.

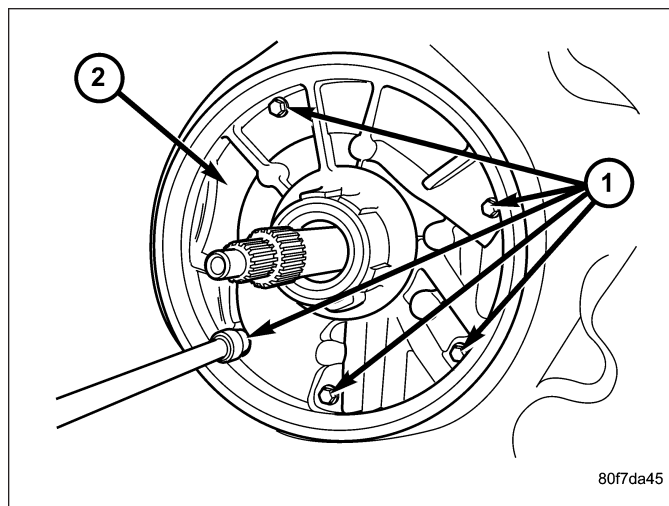


**Note: To align oil pump, gasket, and case during installation, use threaded dowels or phillips screwdrivers.**

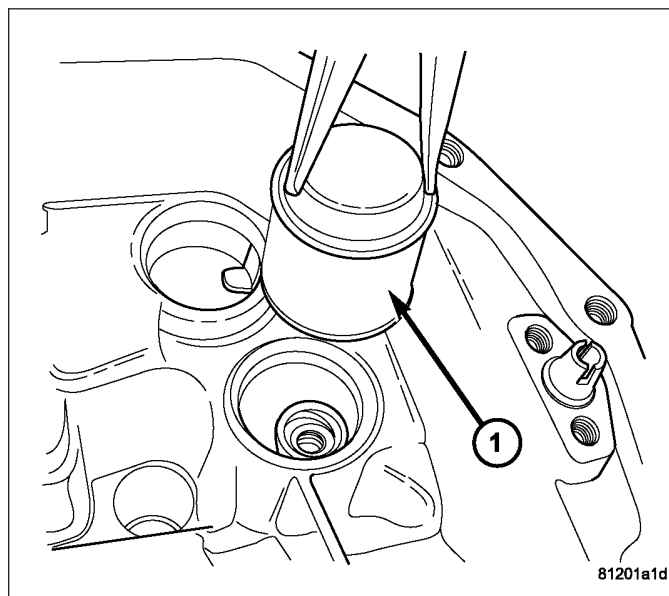
50. Install oil pump gasket (2).



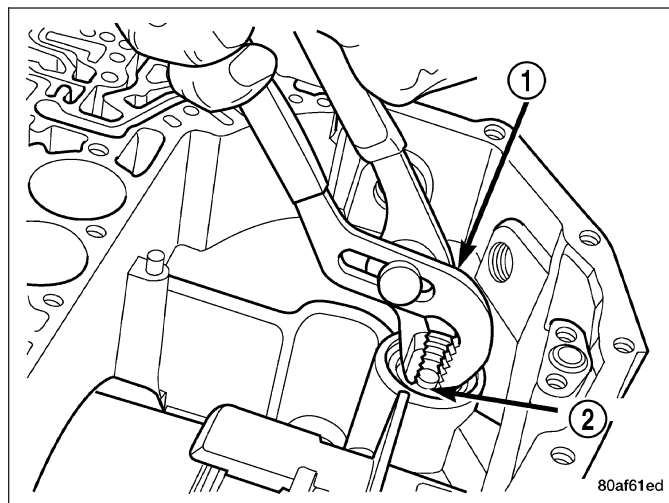
51. Install oil pump (2) and torque oil pump-to-case bolts (1) to 30 N·m (265 in. lbs.). Do not reuse original oil pump bolts.



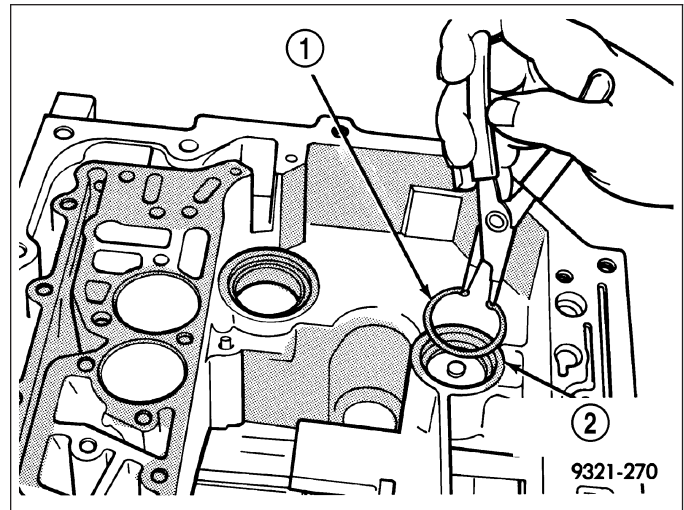
52. Install low/reverse accumulator (1) as shown.



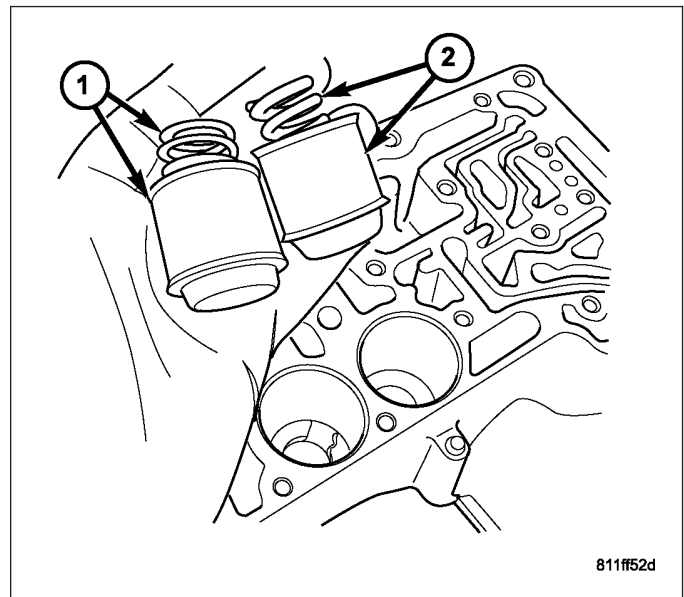
53. Install low/reverse accumulator plug (2).



54. Install low/reverse accumulator snap ring (1).

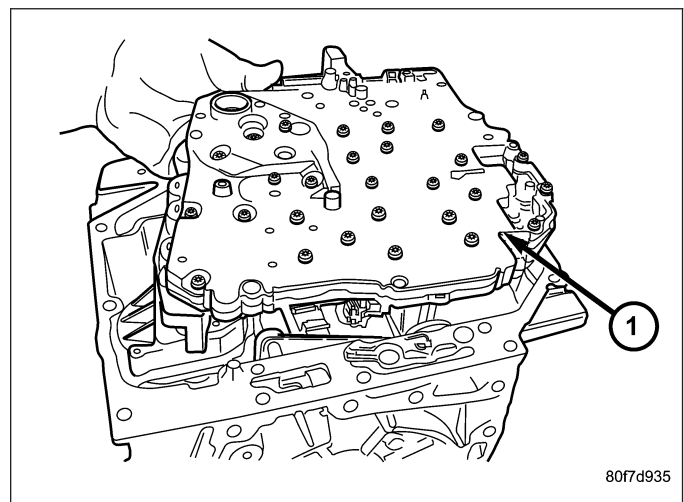


55. Install underdrive (2) and overdrive (1) accumulators and springs.

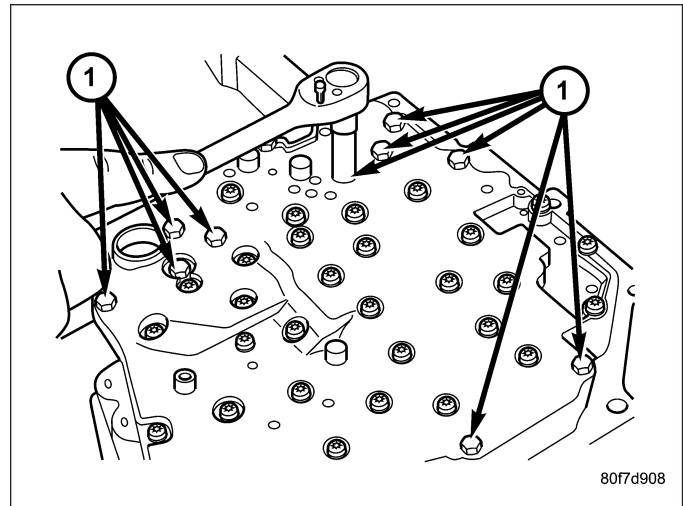


**CAUTION:** Do not handle the valve body by the manual shaft. Damage could result.

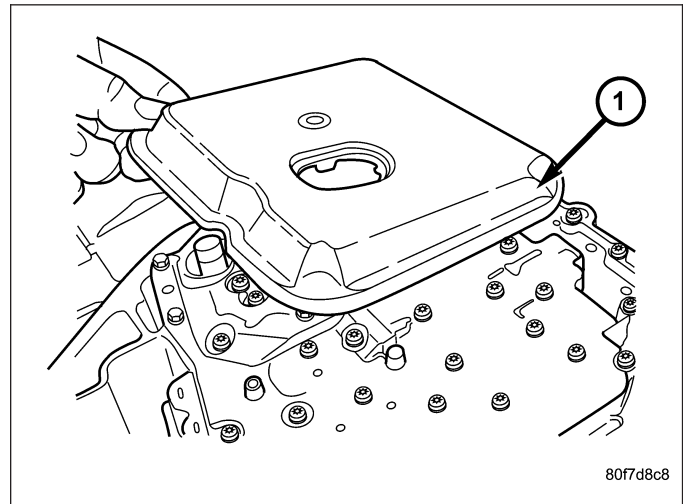
56. Install valve body (1) into place as shown.



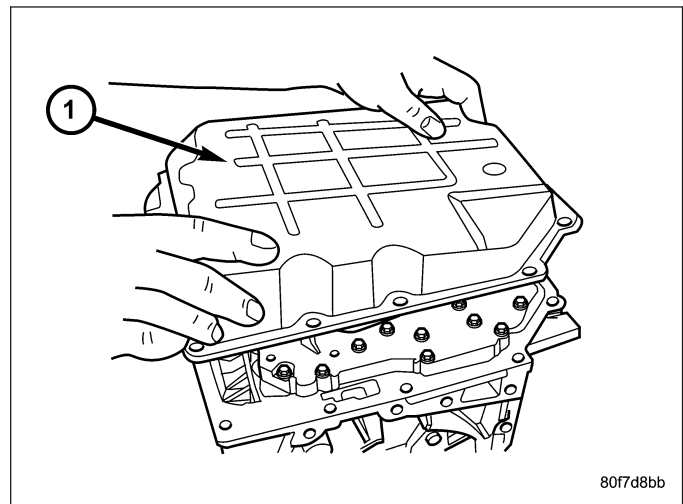
57. Install seven (7) valve body-to-case bolts (1) and torque to 12 N·m (105 in. lbs.).



58. Install transmission oil filter (1) and o-ring. Tighten the bolts to 5 N·m (45 in. lbs.).
59. If necessary, install a new transmission fill tube grommet and extension into the transmission case with Installer 8254.

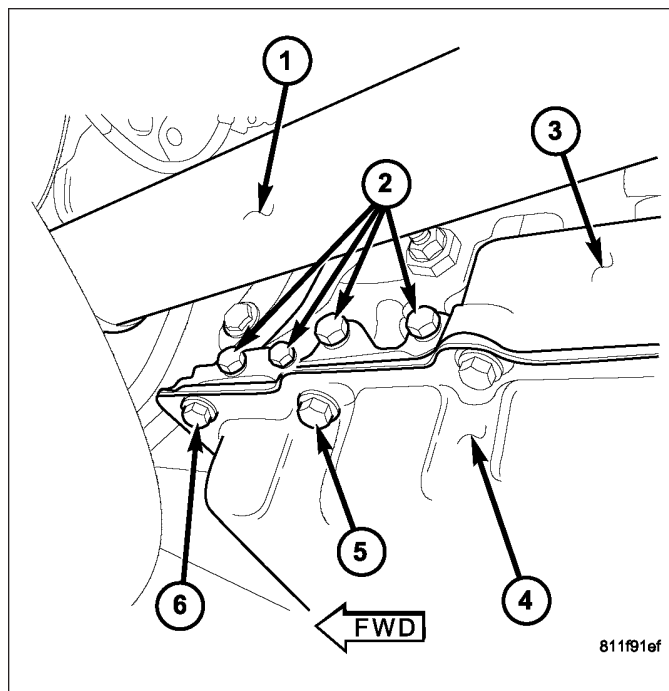


60. Install transmission oil pan (1) with a bead of Mopar® ATF RTV.



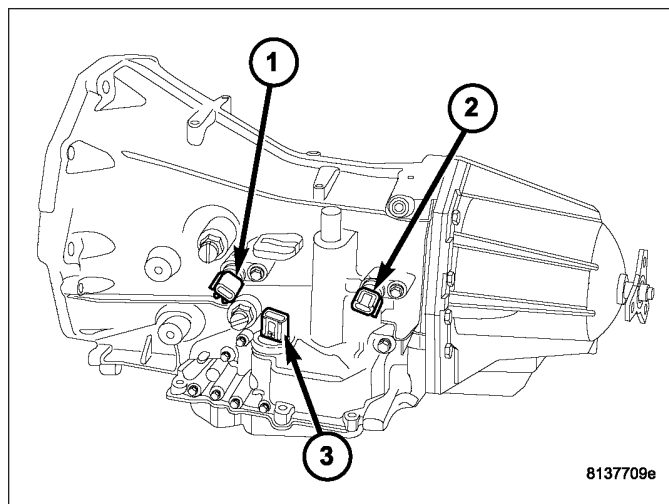
**Note:** Before installing the oil pan bolt in the bolt hole located between the torque converter clutch on and U/D clutch pressure tap circuits , it will be necessary to replentish the sealing patch on the bolt using Mopar® Lock & Seal Adhesive.

61. Install and torque the oil pan-to-case bolts to 20 N·m (14.5 ft. lbs.).

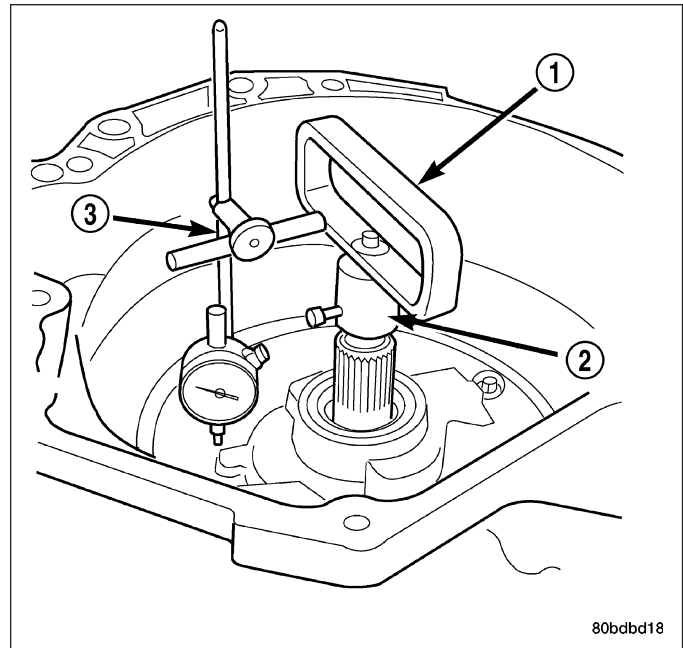


**Note:** Before installing either speed sensor bolt, it will be necessary to replentish the sealing patch on the bolt using Mopar® Lock & Seal Adhesive.

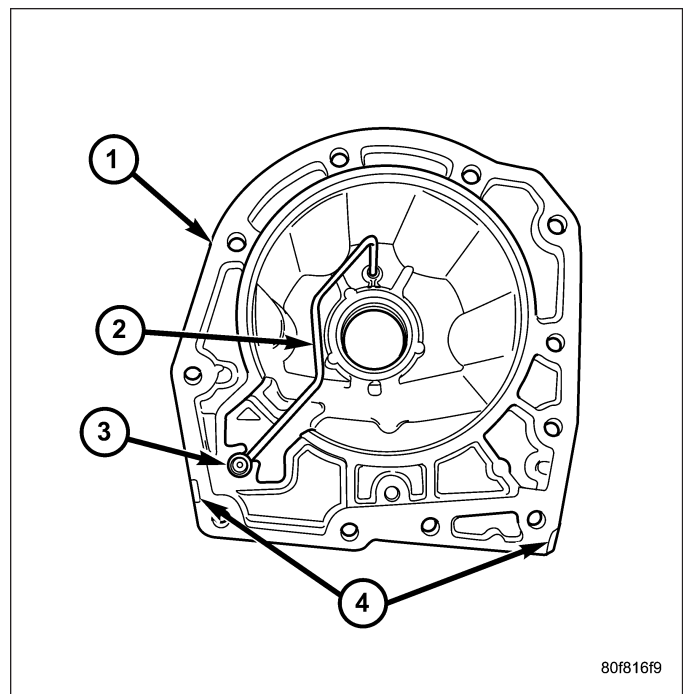
62. Install both speed sensors (1, 2) into the transmission case. Torque the speed sensor bolts to 9 N·m (80 in. lbs.).



63. As a final check of the transmission, measure the input shaft end play. This will indicate when a #4 thrust plate change is required. The #4 thrust plate is located behind the overdrive clutch hub. Attach a dial indicator to transmission bell housing with its plunger seated against end of input shaft. Move input shaft in and out to obtain end play reading. **Input shaft end play must be 0.127 to 0.635 mm (0.005 to 0.025 inch).** If not within specifications, make the necessary thrust plate adjustment.

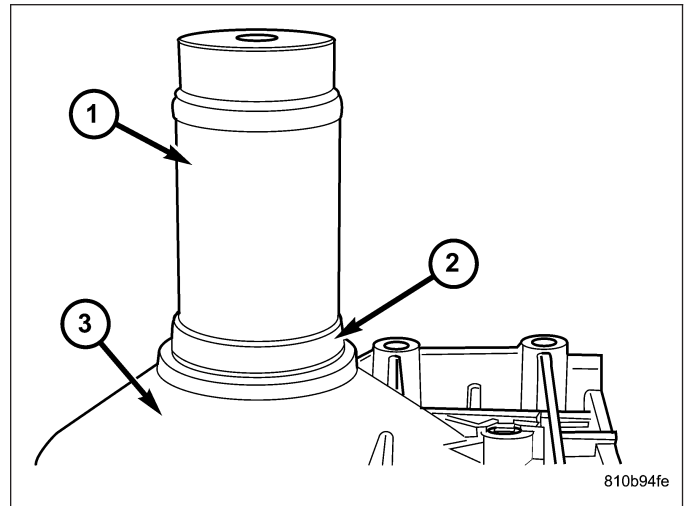


64. Inspect the lube tube grommet (2) for damage. If the grommet lip is damaged, it will need to be replaced.

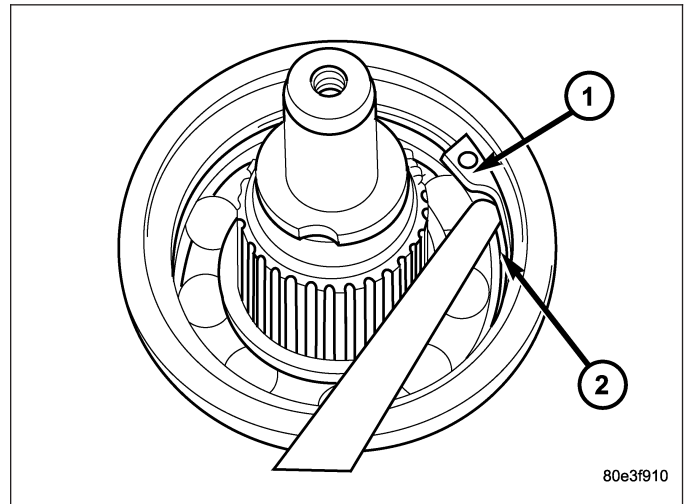




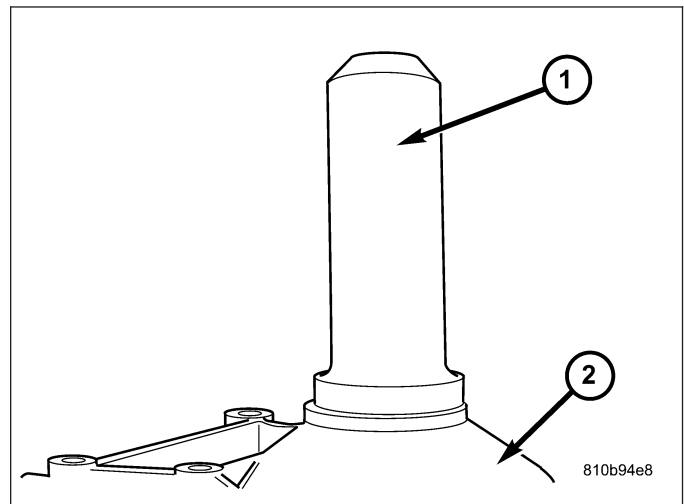
65. Install output shaft bearing in the rear transmission housing. Using Bearing Installer 9287 (1), install the output shaft bearing (2) into the transmission housing. **The closed side of the plastic cage must point towards the transmission.**



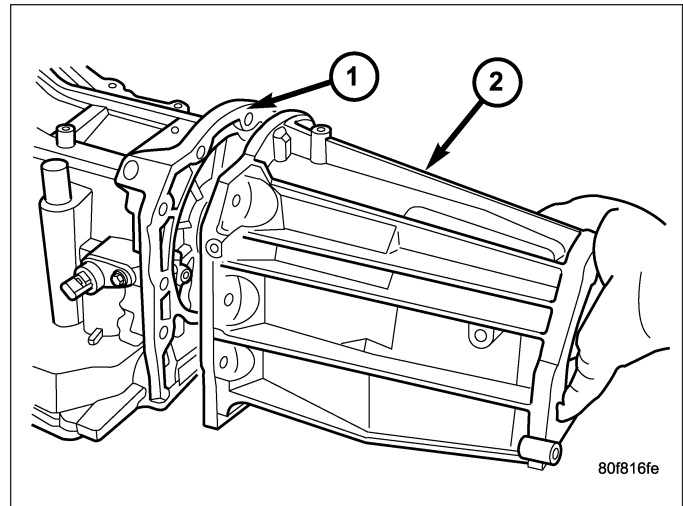
66. Install the snap-ring into the groove in the output shaft.
67. Install the output shaft into the output shaft bearing.
68. Install the retaining ring (1). Ensure that the retaining ring is seated correctly in the groove.
69. Install the output shaft washer onto the output shaft.



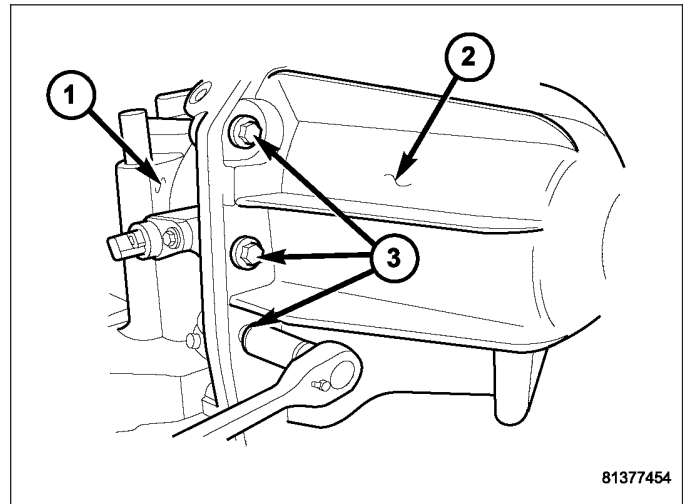
70. Install a new transmission rear seal into the transmission case with Seal Installer 8902A (1).
71. Install the propeller shaft flange onto the output shaft and install an new flange nut finger tight.



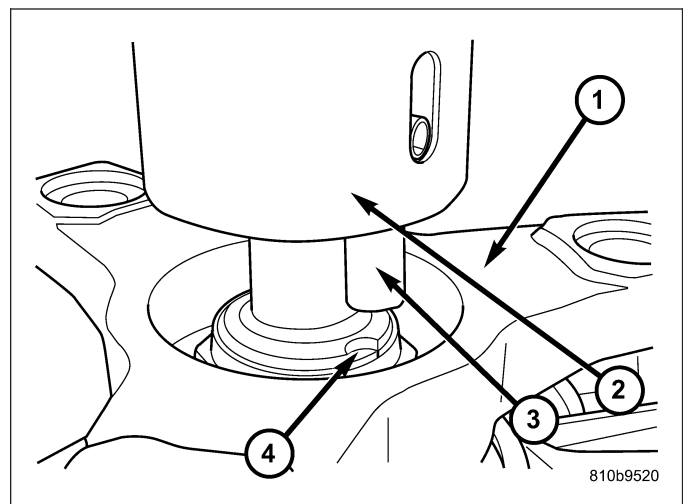
72. Install the extension housing (2) onto the transmission case.



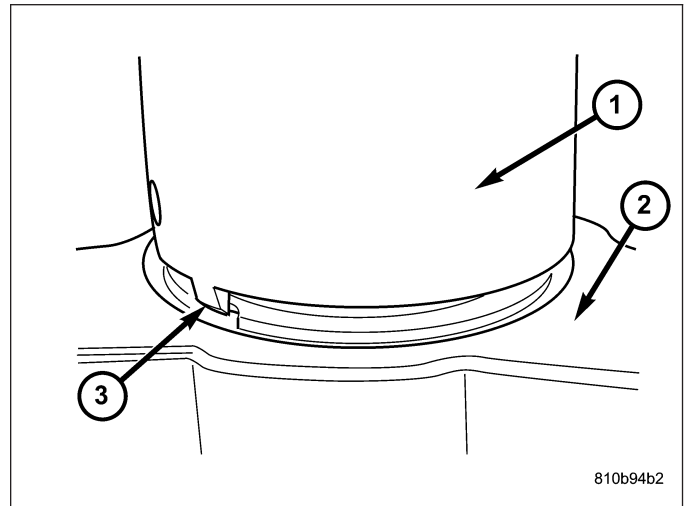
**Note:** Before installing the lowermost four extension housing bolts, it will be necessary to replenish the sealing patch on the bolts using Mopar® Lock & Seal Adhesive.



73. Install the bolts that hold the extension housing onto the transmission case. Be sure to install any stud bolts to their original locations. Tighten the bolts to 54 N·m (40 ft.lbs.).
74. Verify that the transmission is in PARK in order to prepare for the installation of the output shaft nut. Tighten the flange nut to 120 N·m (88.5 ft.lbs.).
75. Stake the output shaft nut to the output shaft as follows. Place the Staking Tool 9078 (2) and Driver Handle C-4171 onto the output shaft.
76. Rotate the Staking Tool 9078 (2) until the alignment pin (3) engages the output shaft notch (4).



77. Press downward on the staking tool (1) until the staking pin (3) contacts the output shaft nut flange (2).
78. Strike the Driver handle C-4171 with a suitable hammer until the output shaft nut is securely staked to the output shaft.



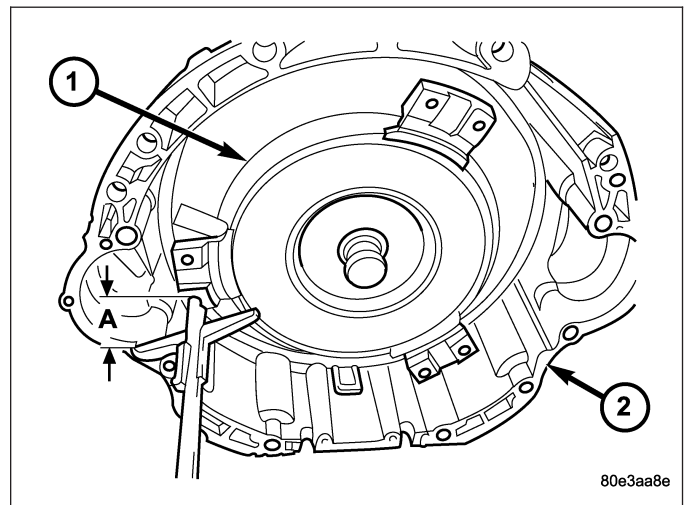
## INSTALLATION

1. Check torque converter hub and hub drive flats for sharp edges burrs, scratches, or nicks. Polish the hub and flats with 320/400 grit paper and crocus cloth if necessary. The hub must be smooth to avoid damaging pump seal at installation.
2. If a replacement transmission is being installed, transfer any components necessary, such as the manual shift lever and shift cable bracket, from the original transmission onto the replacement transmission.
3. Lubricate oil pump seal lip with transmission fluid.

4. Place torque converter (1) in position in transmission (2).

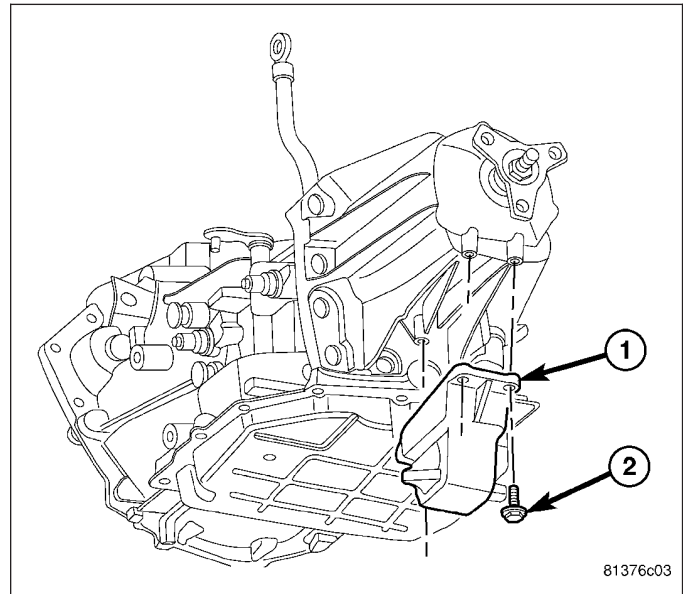
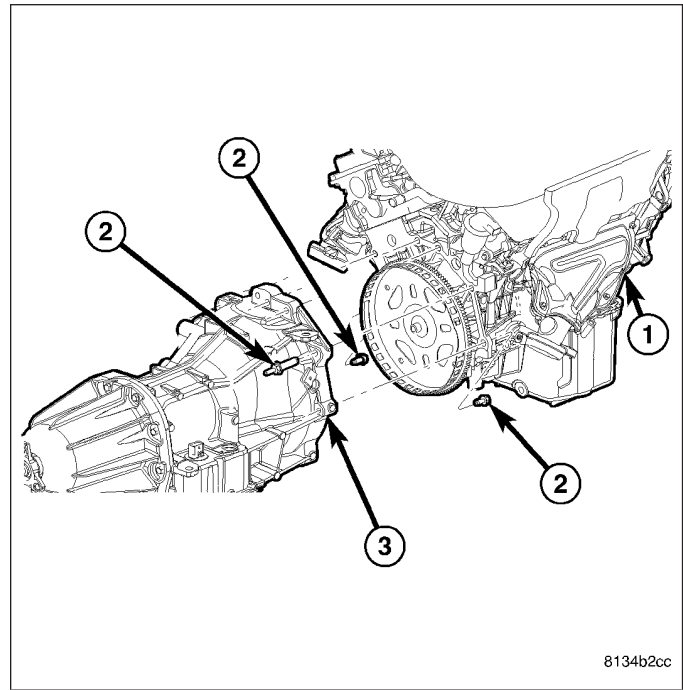
**CAUTION: Do not damage oil pump seal or converter hub while inserting torque converter into the front of the transmission.**

5. Align torque converter to oil pump seal opening.
6. Insert torque converter hub into oil pump.
7. While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.
8. Check converter seating with a scale and straight-edge (A). Surface of converter lugs should be at least 19 mm (3/4 in.) to rear of straightedge when converter is fully seated.

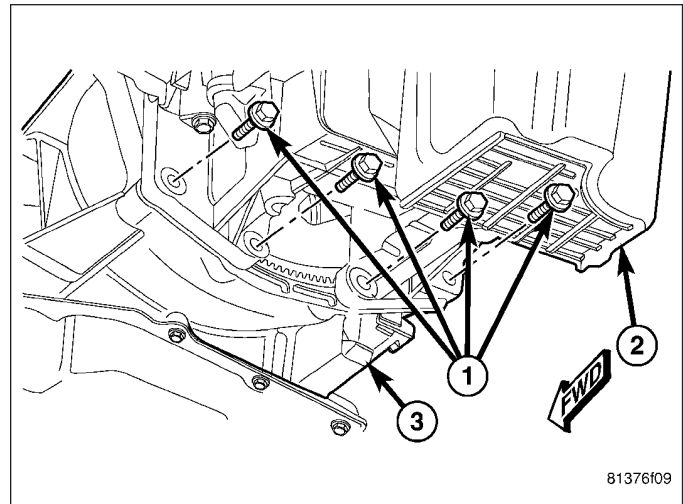


9. If necessary, temporarily secure converter with C-clamp attached to the converter housing.

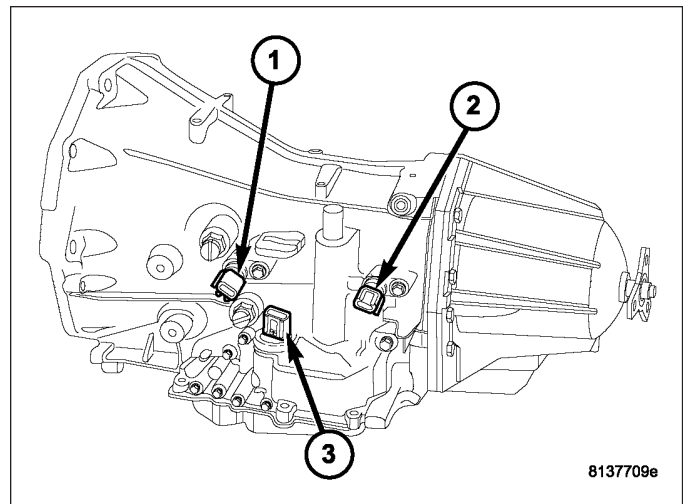
10. Check condition of converter driveplate. Replace the plate if cracked, distorted or damaged. **Also be sure transmission dowel pins are seated in engine block and protrude far enough to hold transmission in alignment.**
11. Apply a light coating of Mopar® High Temp Grease to the torque converter hub pocket in the rear pocket of the engine's crankshaft.
12. Raise transmission (3) and align the torque converter with the drive plate and the transmission converter housing with the engine block (1).
13. Move transmission forward. Then raise, lower, or tilt transmission to align the converter housing with the engine block dowels.
14. Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft. Verify that no wires, or the transmission vent hose, have become trapped between the engine block and the transmission.
15. Install two bolts (2) to attach the transmission to the engine.
16. Install remaining torque converter housing to engine bolts (2). Tighten to 39 N·m (29 ft.lbs.).
17. Install rear transmission crossmember (1). Tighten crossmember to frame bolts to 68 N·m (50 ft.lbs.).
18. Install rear support (3) to transmission. Tighten bolts to 47 N·m (35 ft.lbs.).
19. Lower transmission onto crossmember and install bolts attaching transmission mount to crossmember. Tighten clevis bracket to crossmember bolts(2) to 47 N·m (39 ft.lbs.).
20. Remove engine support fixture.



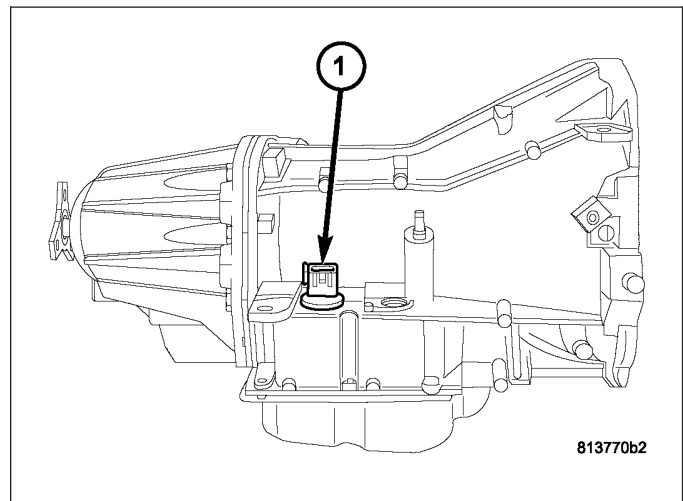
21. Install the transmission (3) to engine oil pan (2) bolts (1). Tighten to 39 N·m (29 ft.lbs.).



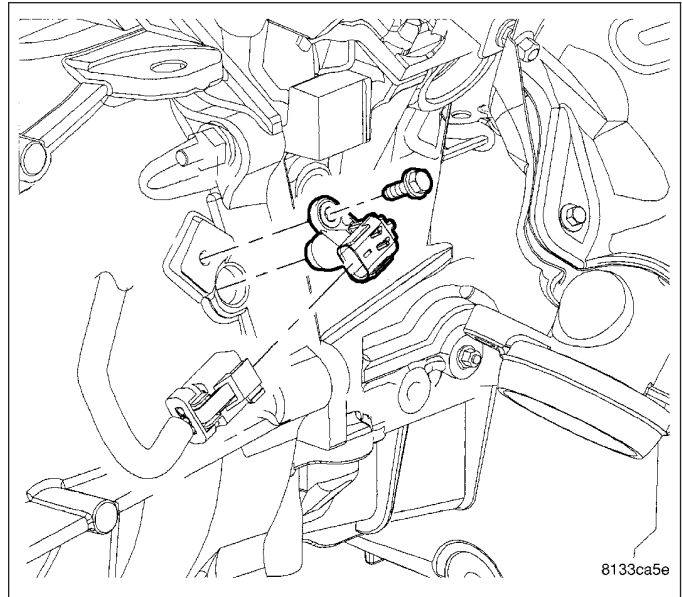
22. Connect input (1) and output (2) speed sensor wires and the transmission range sensor (3).



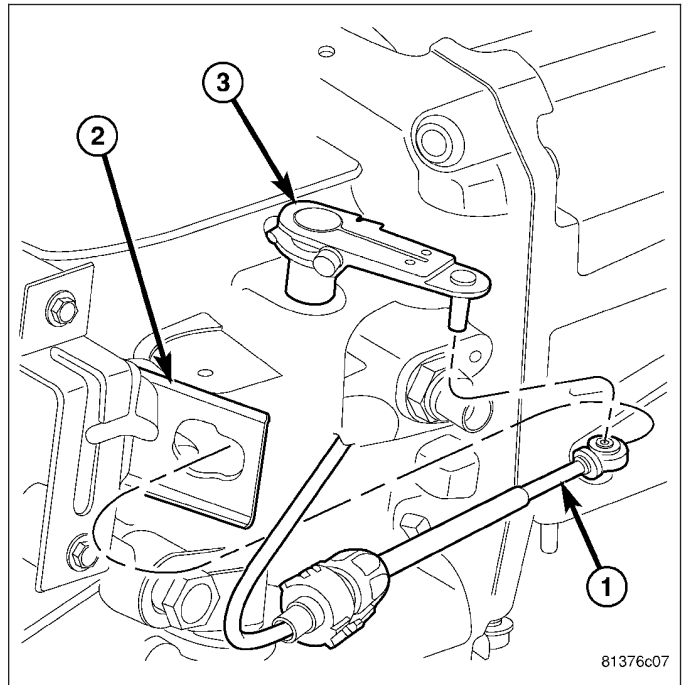
23. Connect wires to the solenoid/pressure switch assembly (1).



24. Install the crankshaft position sensor. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/CRANKSHAFT POSITION SENSOR - INSTALLATION)

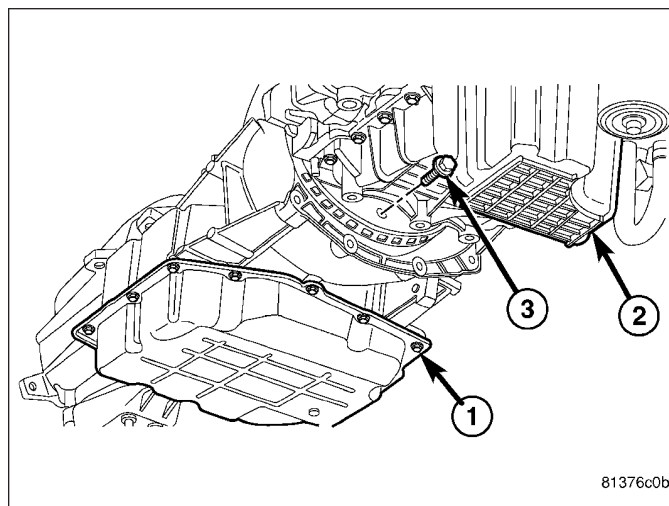


25. Connect the gearshift cable (1) to the transmission manual shift lever (3).

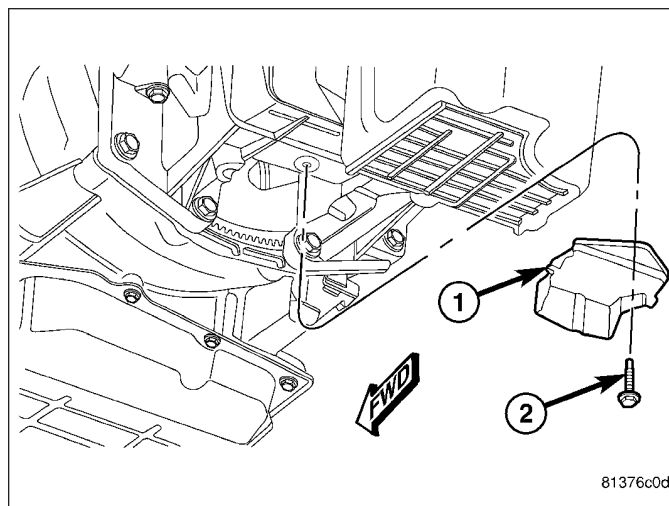


**CAUTION:** It is essential that correct length bolts be used to attach the converter to the driveplate. Bolts that are too long will damage the clutch surface inside the converter.

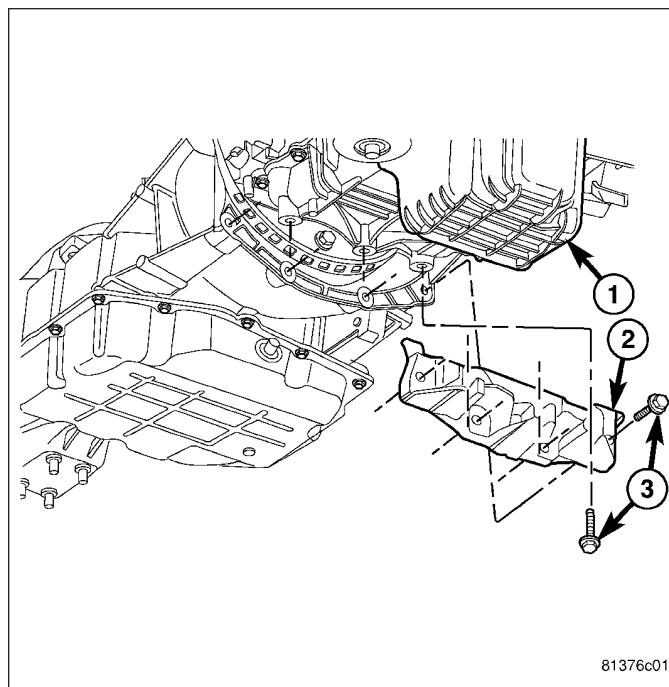
26. Install all torque converter-to-driveplate bolts (1) by hand.
27. Verify that the torque converter is pulled flush to the driveplate. Tighten bolts to 42 N·m (30.5 ft. lbs.).



28. Install the torque converter bolt access cover (1) onto the transmission, for vehicles equipped with 3.5L engines. Install the access cover bolt (2) and tighten to 11 N·m (8 ft.lbs.).



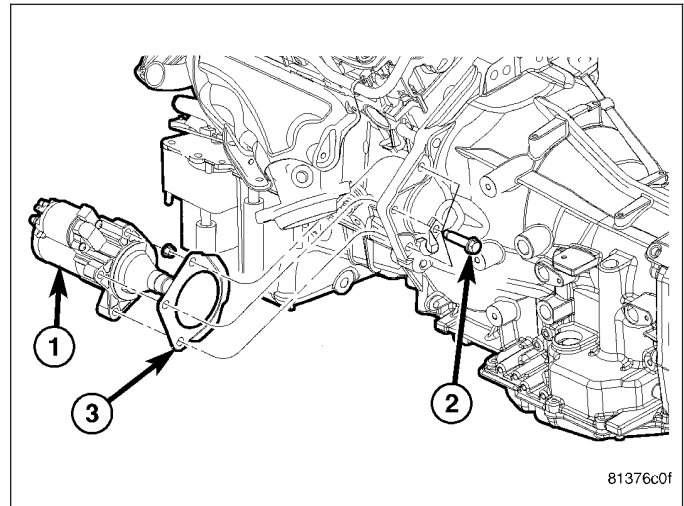
29. Install the structural collar (2) and bolts (3, 4) for vehicles equipped with a 2.7L engine. (Refer to 9 - ENGINE - 2.7L/ENGINE BLOCK/STRUCTURAL



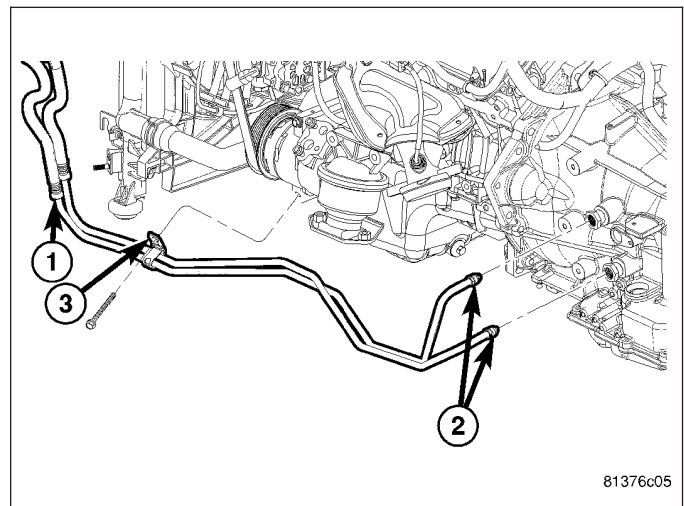


# COVER - INSTALLATION)

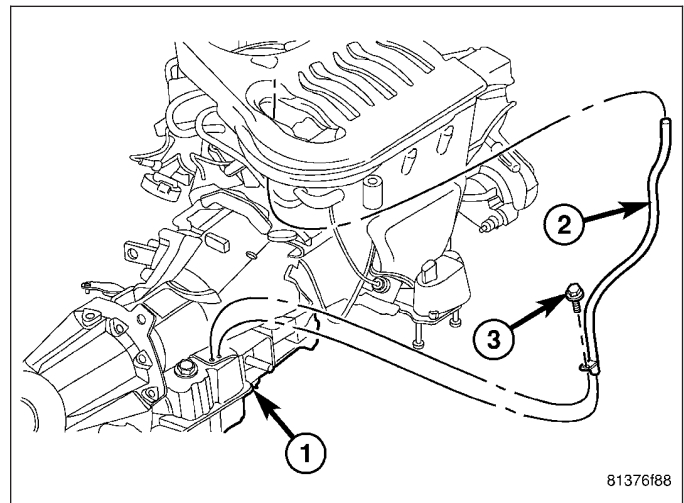
30. Install starter motor (1). (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - INSTALLATION)



31. Connect the cooler line fittings (2) and cooler lines (1) to the transmission.

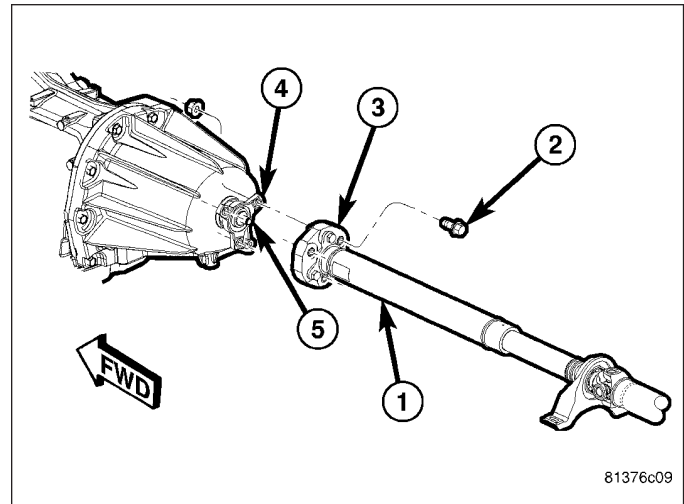


32. Install the transmission fill tube (2).
33. Install exhaust components.

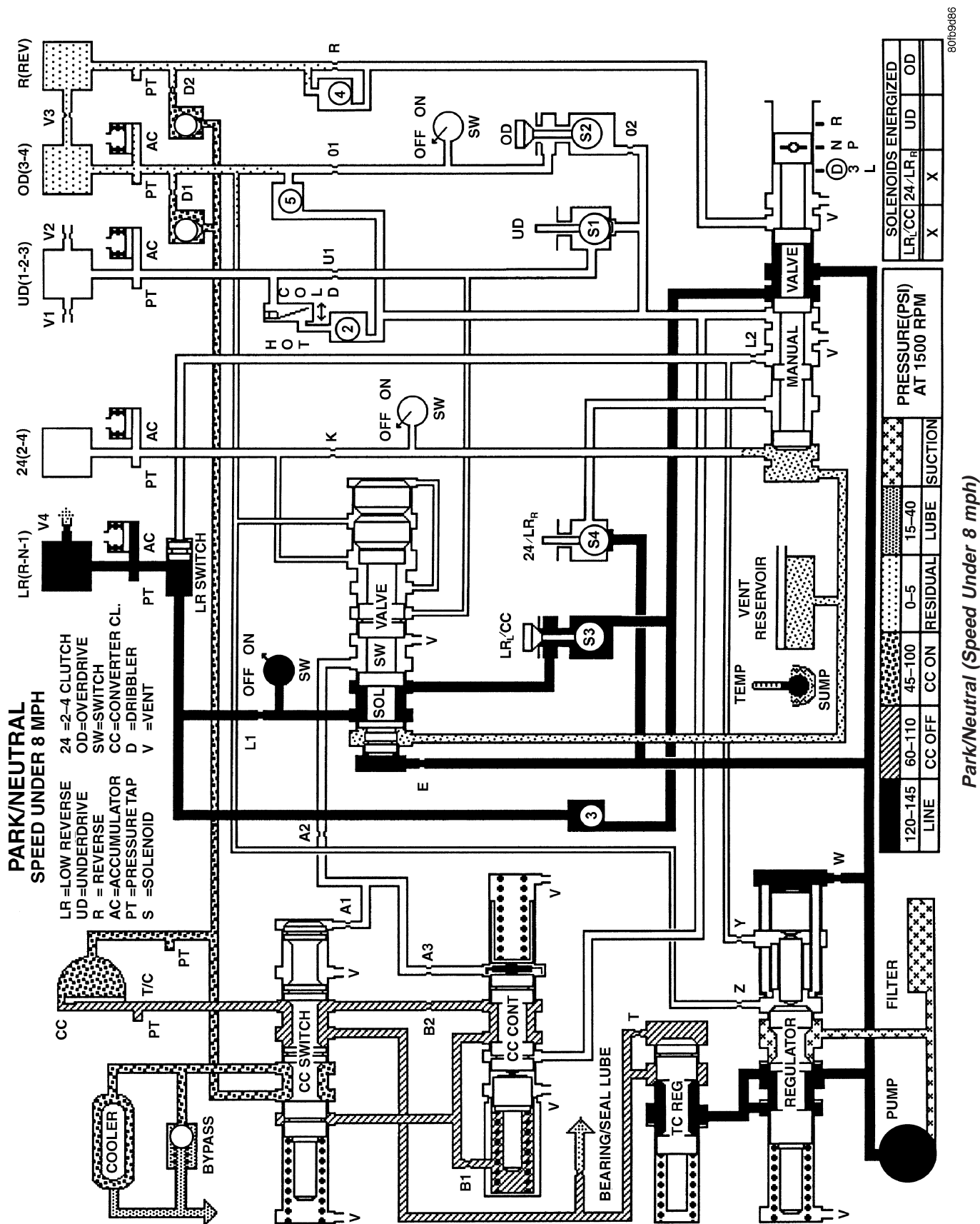




34. Align and connect the propeller shaft (1). (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT - INSTALLATION)
35. Adjust gearshift cable if necessary.
36. Lower vehicle.
37. Connect negative battery cable.
38. Fill transmission with appropriate transmission fluid (Refer to LUBRICATION & MAINTENANCE/ FLUID TYPES - DESCRIPTION) according to the standard procedure (Refer to 21 - TRANSMISSION/AUTOMATIC - NAG1/FILTER - STANDARD PROCEDURE).
39. Verify proper operation.



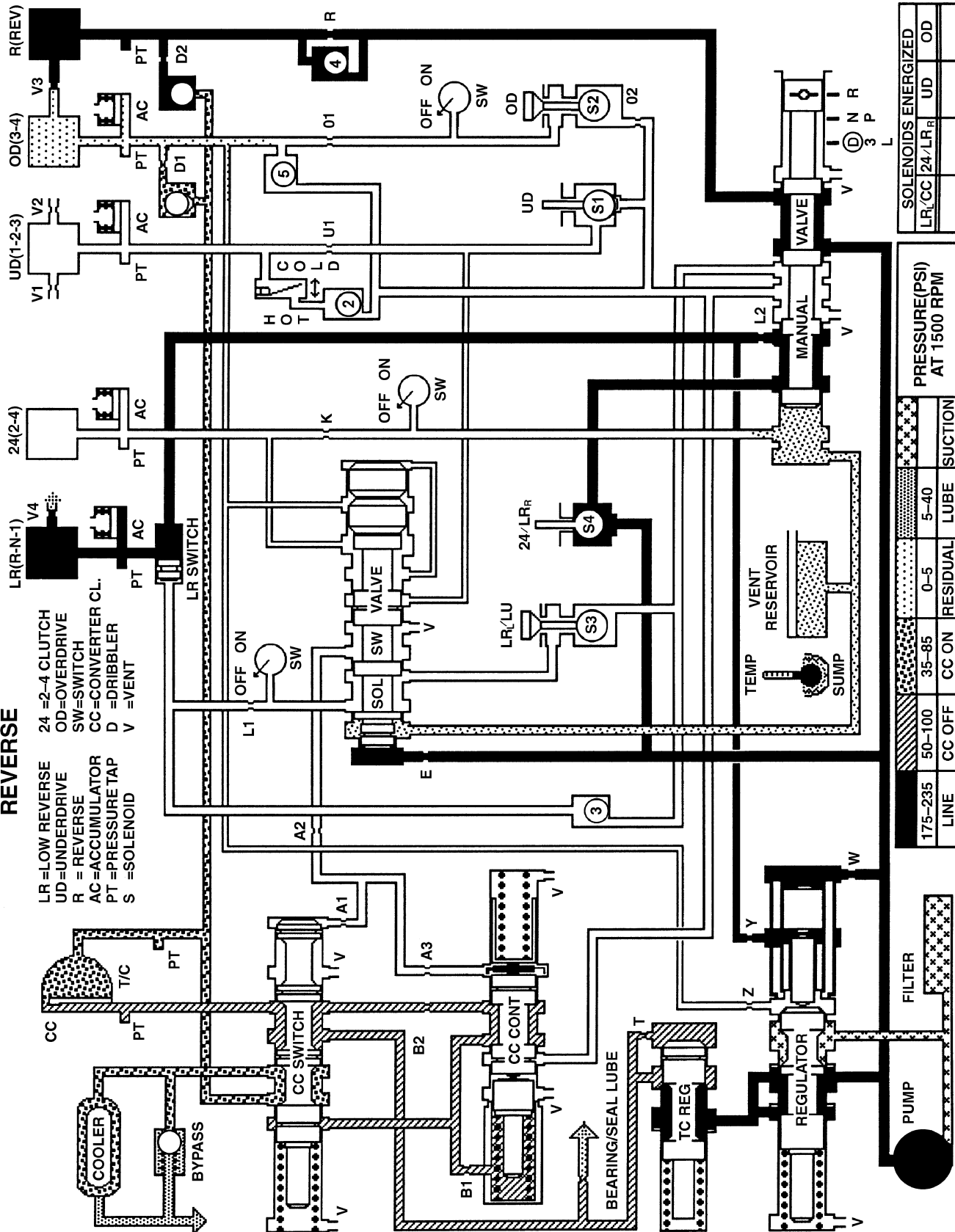
# SCHEMATICS AND DIAGRAMS - 42RLE TRANSMISSION





**REVERSE**

LR = LOW REVERSE  
 UD = UNDERDRIVE  
 R = REVERSE  
 AC = ACCUMULATOR  
 PPT = PRESSURE TAP  
 S = SOLENOID  
 24 = 2-4 CLUTCH  
 OD = OVERDRIVE  
 SW = SWITCH  
 CC = CONVERTER CL.  
 D = DRIBBLER  
 V = VENT



				PRESSURE (PSI) AT 1500 RPM		SOLENOIDS ENERGIZED			
						LR <sub>1</sub> /CC	24/LR <sub>B</sub>	UD	OD
175-235									
	50-100	35-85	0-5	5-40					
LINE	CC OFF	CC ON	RESIDUAL	LUBE	SUCTION				

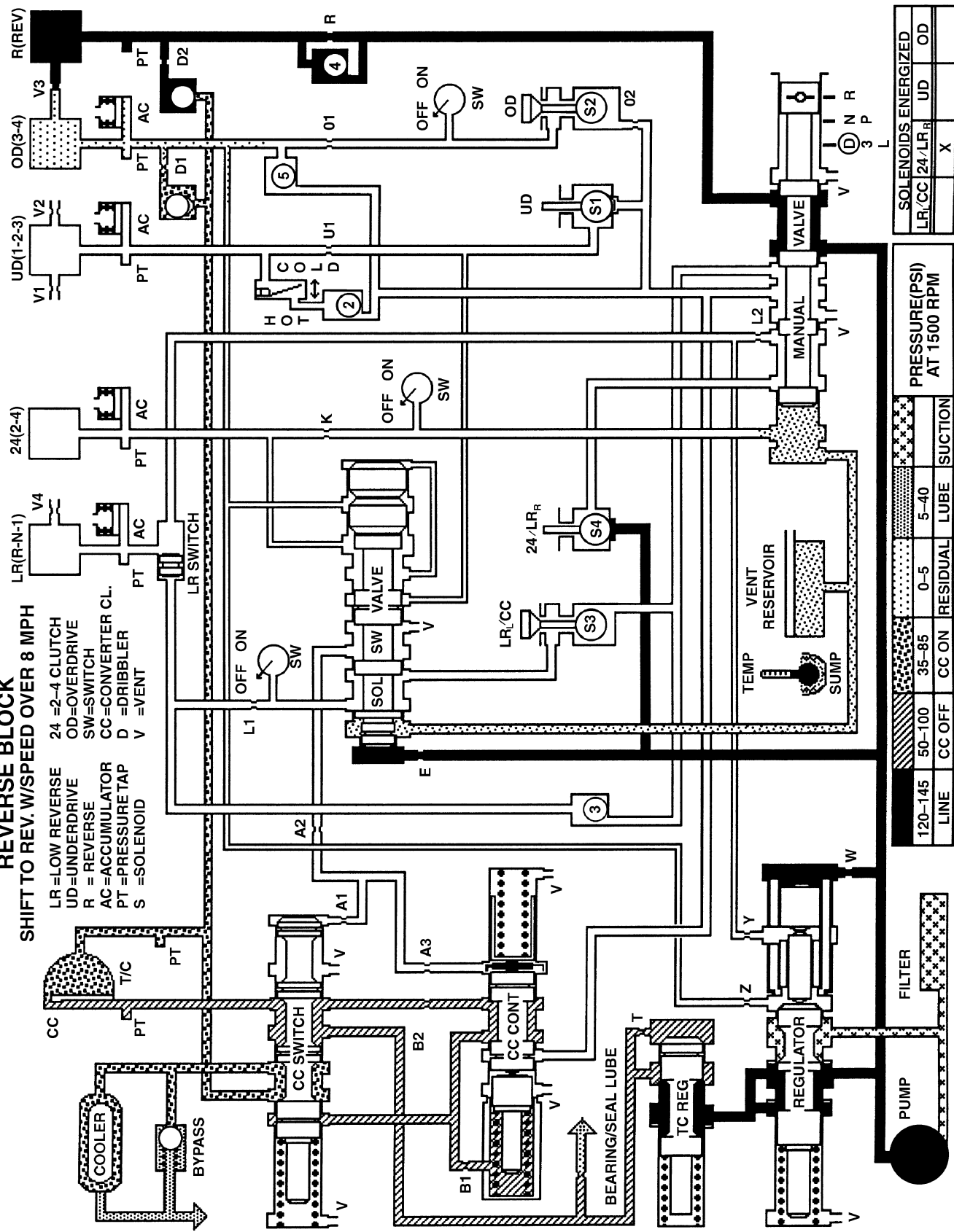
## Reverse

80fb9dab

REVERSE BLOCK

SHIFT TO REV. W/SPEED OVER 8 MPH

- LR=LOW REVERSE  
UD=UNDERDRIVE  
R = REVERSE  
AC = ACCUMULATOR  
PT = PRESSURE TAP  
S = SOLENOID
- 24 =2-4 CLUTCH  
OD=OVERDRIVE  
SW=SWITCH  
CC=CONVERTER CL.  
D =DRIBBLER  
V =VENT



SOLENOIDS ENERGIZED			
LR/CC	24/LR <sub>R</sub>	UD	OD
	X		

PRESSURE (PSI) AT 1500 RPM				
LINE	CC OFF	CC ON	RESIDUAL	SUCTION
120-145	50-100	35-85	0-5	5-40

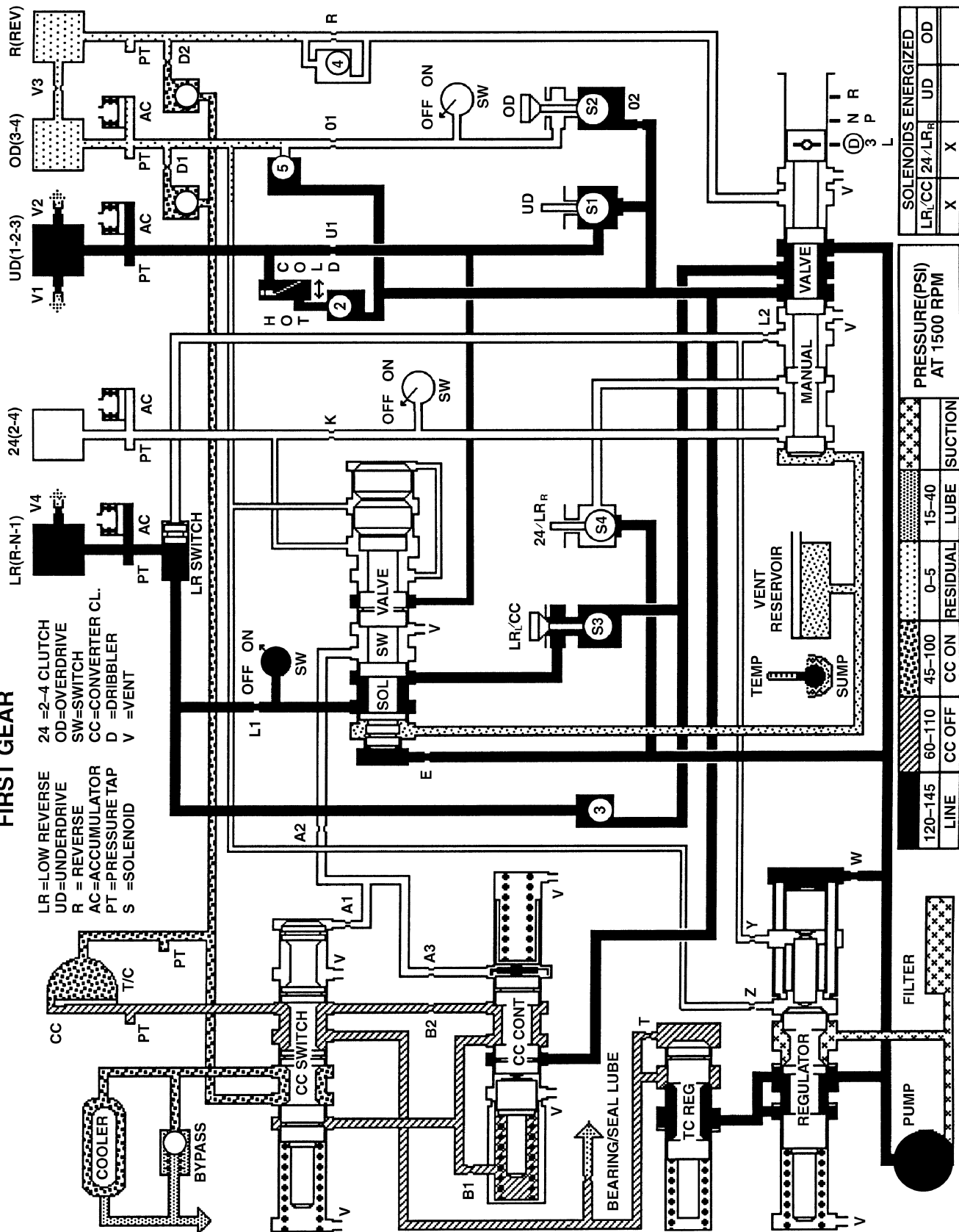
Reverse Block (Shift to Reverse w/Speed Over 8 mph)

80f09ub9

# FIRST GEAR

LR=LOW REVERSE  
UD=UNDERDRIVE  
R = REVERSE  
AC=ACCUMULATOR  
PT=PRESSURE TAP  
S =SOLENOID

24 =2-4 CLUTCH  
OD=OVERDRIVE  
SW=SWITCH  
CC=CONVERTER CL.  
D =DRIBBLER  
V =VENT



First Gear

PRESSURE (PSI) AT 1500 RPM				SOLENOIDS ENERGIZED			
LINE	CC OFF	CC ON	RESIDUAL	LUBE	SUCTION	LR/CC 24/LR <sub>R</sub>	UD OD
120-145	60-110	45-100	0-5	15-40		X	
	CC OFF	CC ON	RESIDUAL	LUBE	SUCTION		
						X	

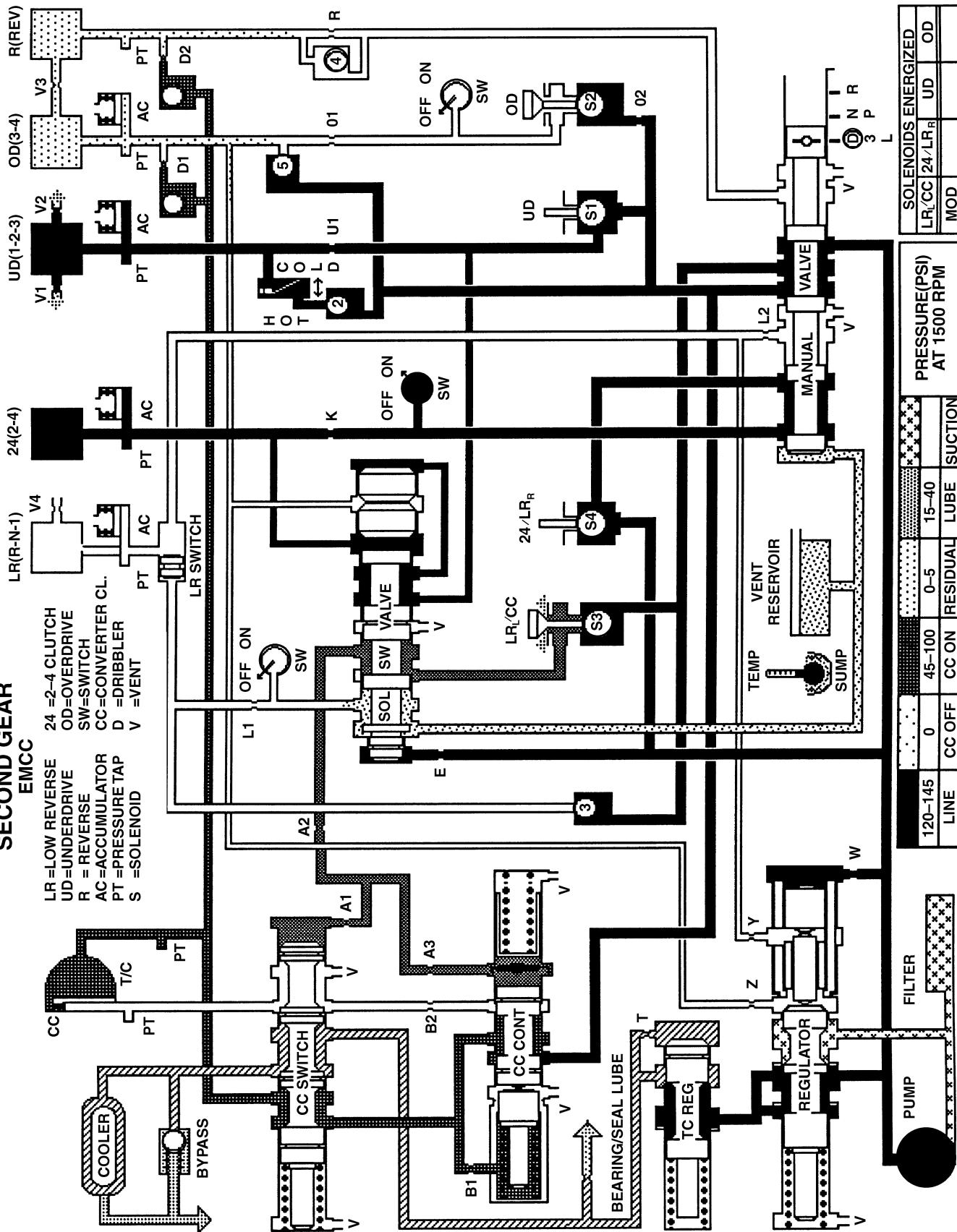
80fb9dc2





## SECOND GEAR

LR = LOW REVERSE  
UD = UNDERDRIVE  
R = REVERSE  
AC = ACCUMULATOR  
PT = PRESSURE TAP  
S = SOLENOID  
24 = 2-4 CLUTCH  
OD = OVERDRIVE  
SW = SWITCH  
CC = CONVERTER  
D = DRIBBLER  
V = VENT



PRESSURE (PSI) AT 1500 RPM						SOLENOIDS ENERGIZED	
LR/CC		24/LR <sub>B</sub>		UD		OD	
MOD							
120-145	0	45-100	0-5	15-40			
LINE	CC OFF	CC ON	RESIDUAL	LUBE	SUCTION		

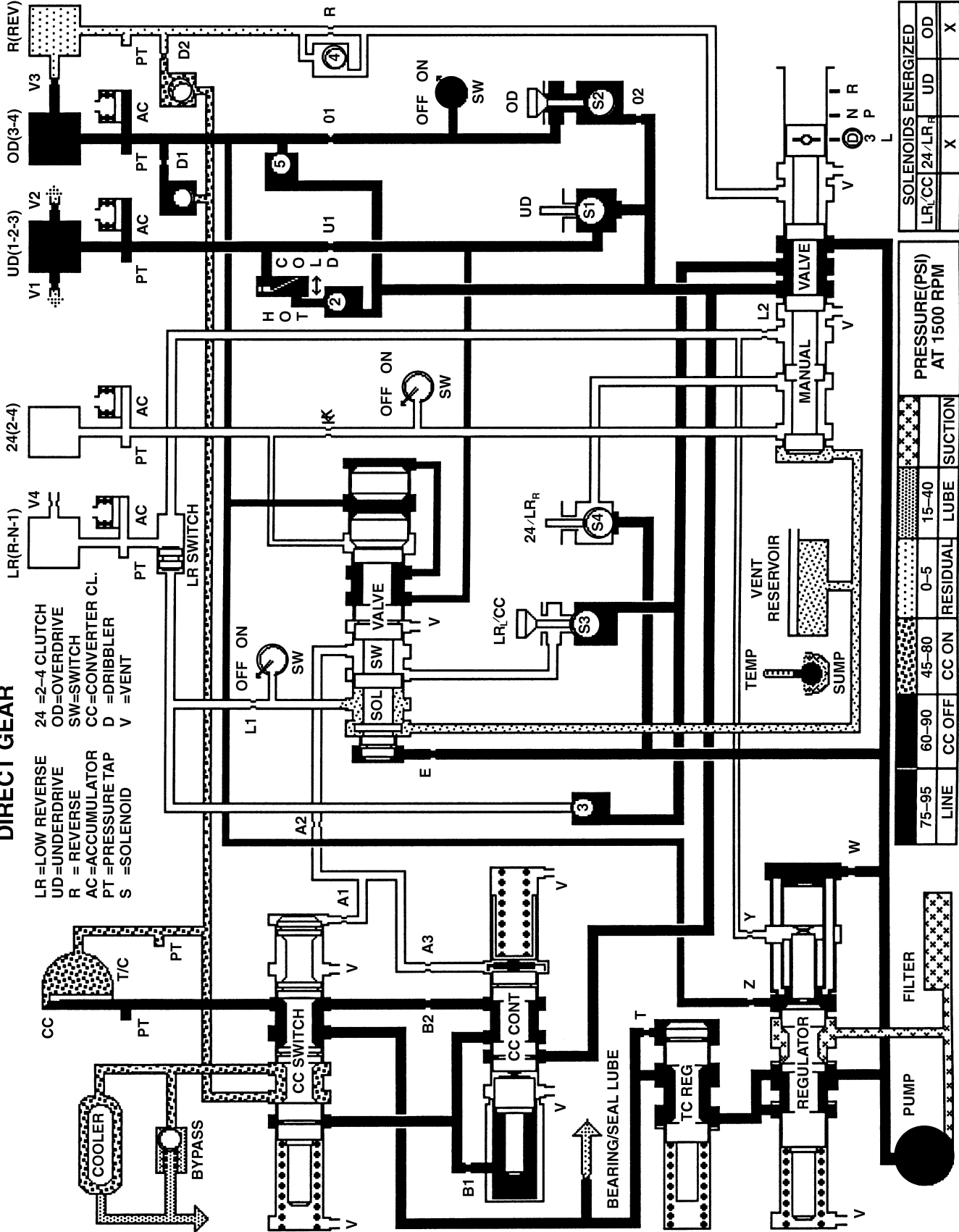
### **Second Gear (EMCC)**

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DIRECT GEAR

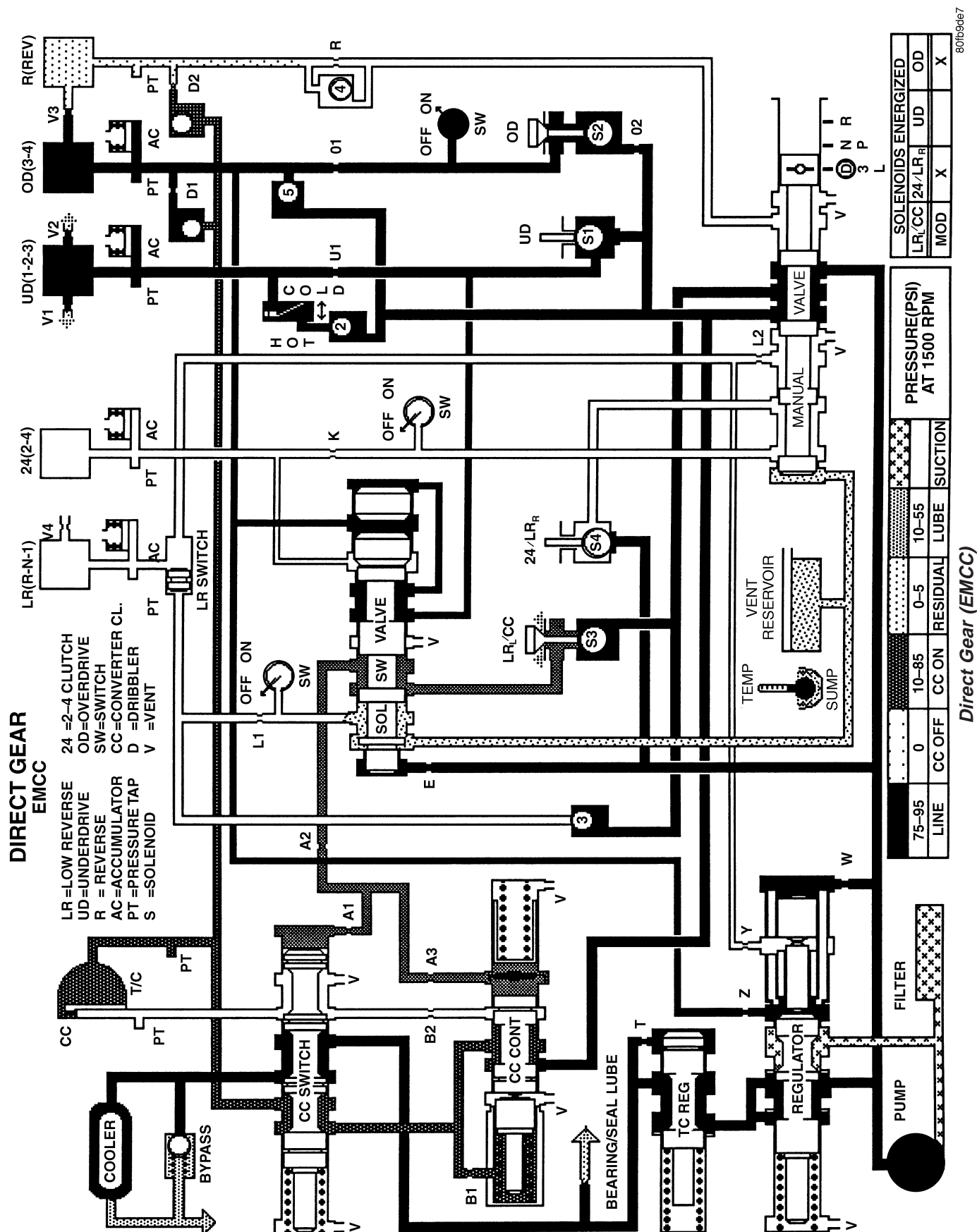
LR = LOW REVERSE    24 = 2-4 CLUTCH  
UD = UNDERDRIVE    OD = OVERDRIVE  
R = REVERSE    SW = SWITCH  
AC = ACCUMULATOR    CC = CONVERTER CL.  
PT = PRESSURE TAP    D = DRIBBLER  
S = SOLENOID    V = VENT



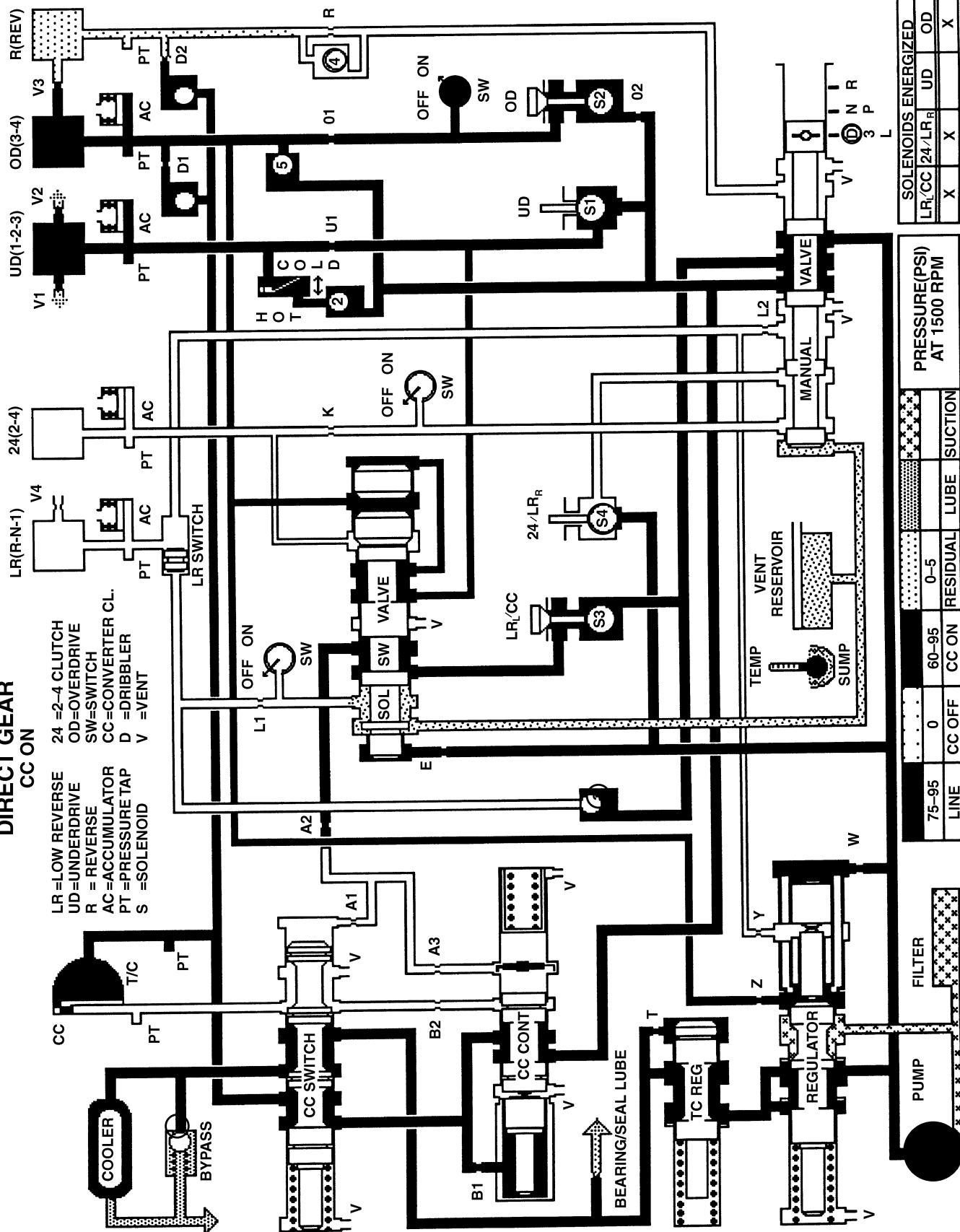
PRESSURE (PSI) AT 1500 RPM				SOLENOIDS ENERGIZED			
75-95	60-90	45-80	0-5	15-40	LR/CC	24/LR <sub>R</sub>	UD
LINE	CC OFF	CC ON	RESIDUAL	LUBE			
				SUCTION	X	X	X

Direct Gear

801b9c66



**DIRECT GEAR  
CC ON**



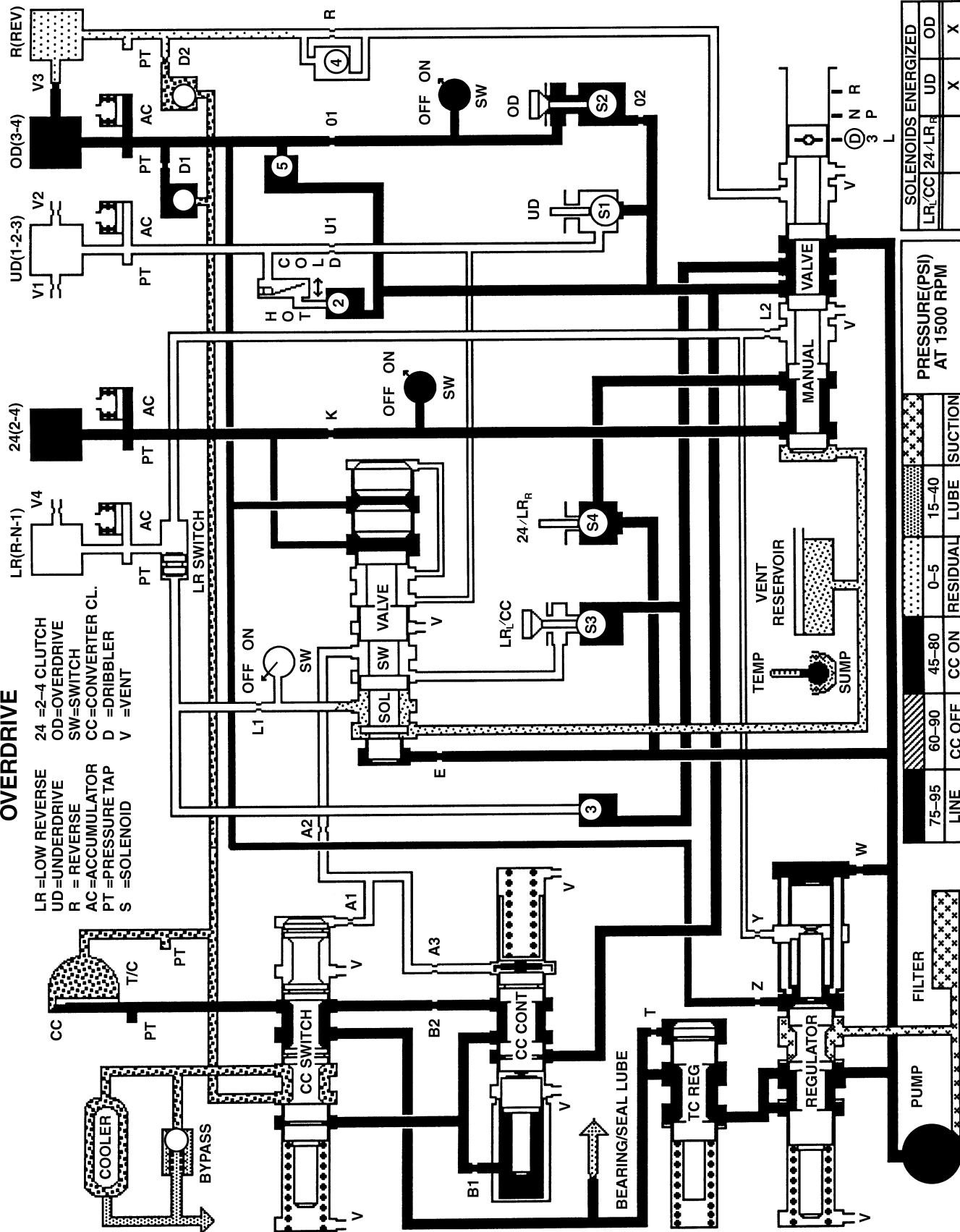
**Direct Gear (CC On)**

80fb9df4

# OVERDRIVE

LR=LOW REVERSE  
UD=UNDERDRIVE  
R = REVERSE  
AC=ACCUMULATOR  
PT=PRESSURE TAP  
S =SOLENOID

24 =2-4 CLUTCH  
OD=OVERDRIVE  
SW=SWITCH  
CC=CONVERTER CL.  
D =DRIFFLER  
V =VENT



SOLENOIDS ENERGIZED			
LR/CC	24/LR <sub>R</sub>	UD	OD
		X	X

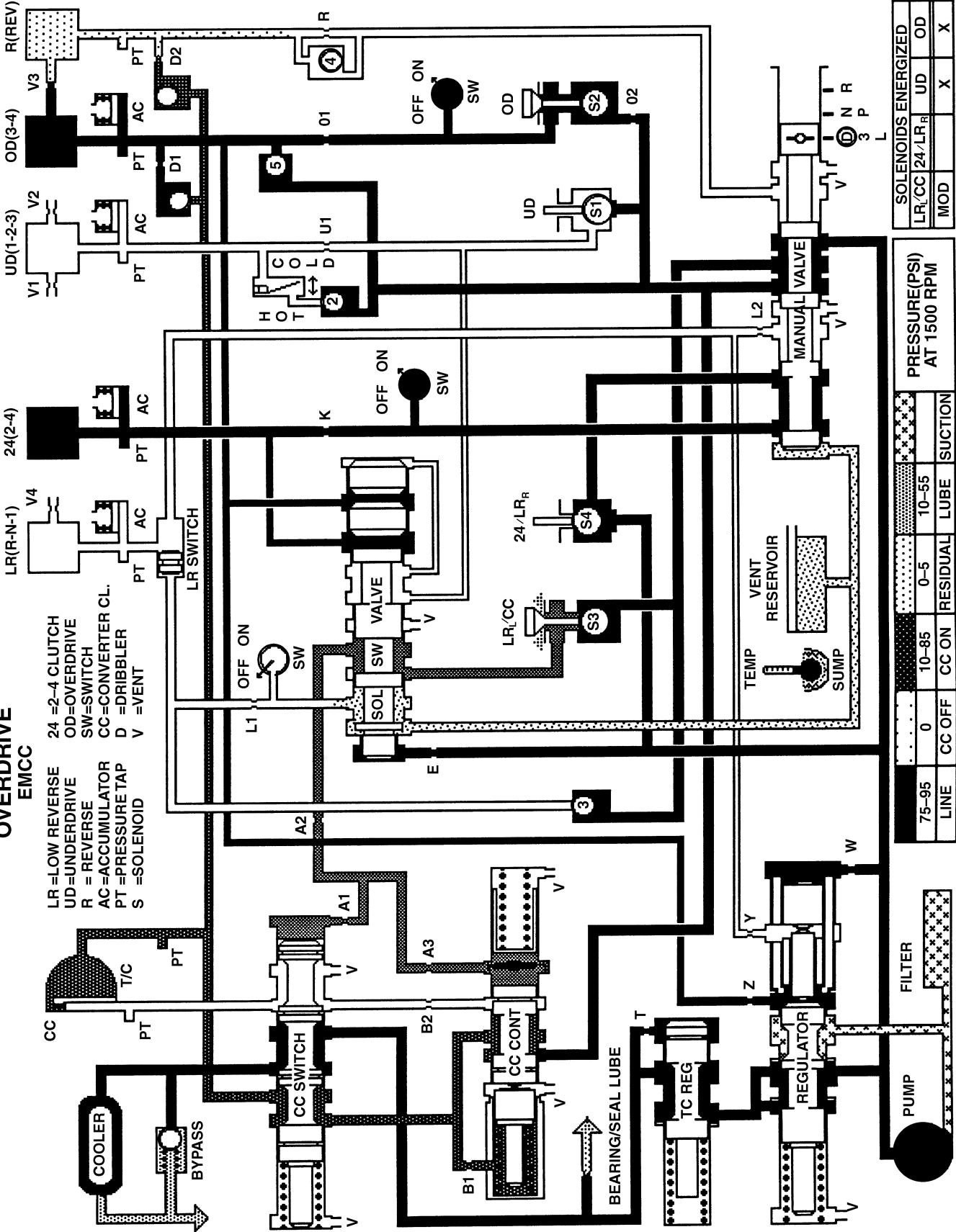
PRESSURE(PSI) AT 1500 RPM			
LINE	CC OFF	CC ON	SUCTION
75-95	60-90	45-80	0-5
			15-40

Overdrive

801b9d18

OVERDRIVE  
EMCC

LR = LOW REVERSE    24 = 2-4 CLUTCH  
UD = UNDERDRIVE    OD = OVERDRIVE  
R = REVERSE    SW = SWITCH  
AC = ACCUMULATOR    CC = CONVERTER CL.  
PT = PRESSURE TAP    D = DRIBBLER  
S = SOLENOID    V = VENT



PRESSURE(PSI) AT 1500 RPM					SOLENOIDS ENERGIZED				
75-95	LINE	CC OFF	CC ON	RESIDUAL	LUBE	SUCTION	LR/CC 24/LR <sub>R</sub>		OD
							MOD		
		0	10-85	0-5	10-55				
</									

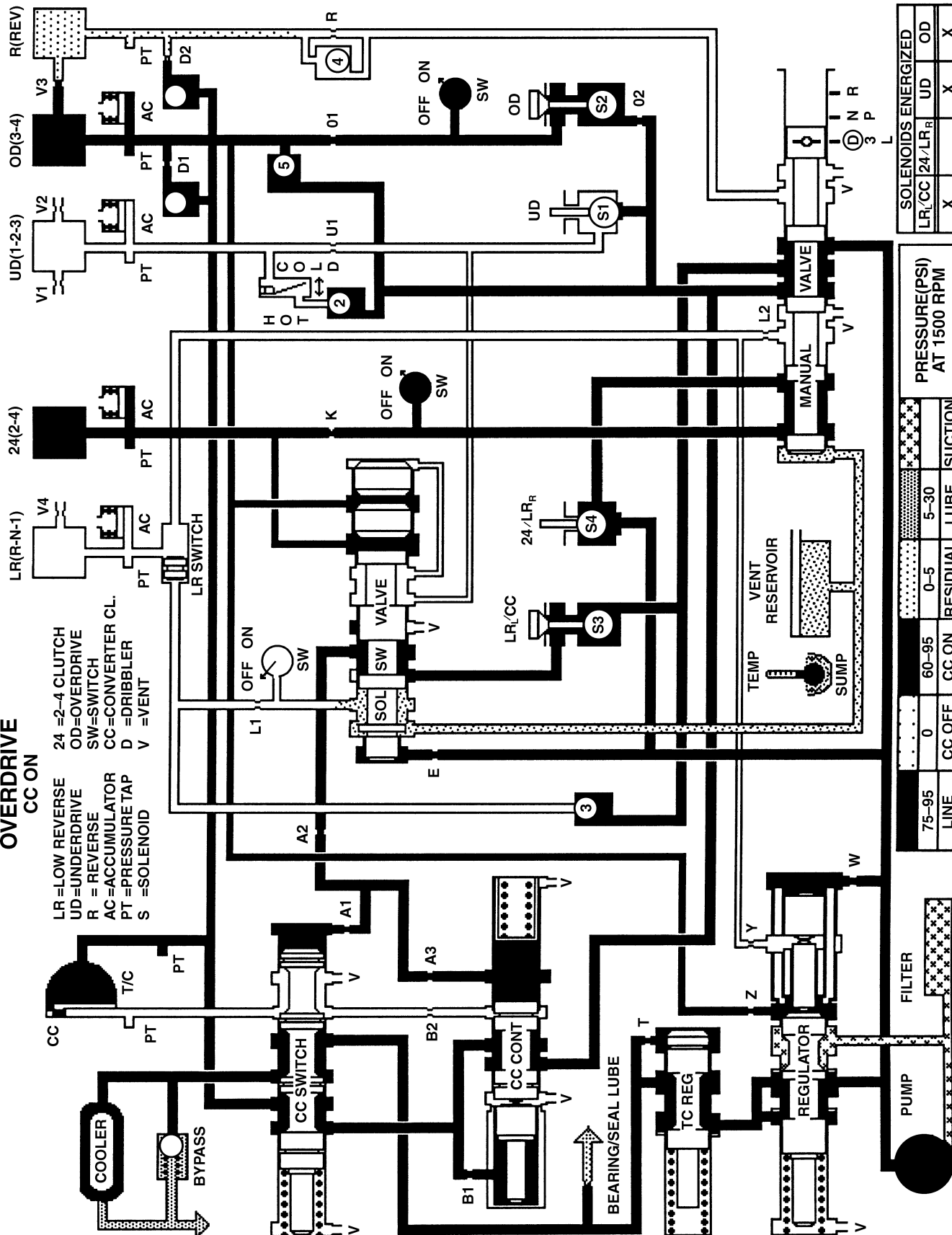
Overdrive (EMCC)

801b9e20

# OVERDRIVE CC ON

LR=LOW REVERSE  
UD=UNDERDRIVE  
R = REVERSE  
AC=ACCUMULATOR  
PT=PRESSURE TAP  
S =SOLENOID

24 =2-4 CLUTCH  
OD=OVERDRIVE  
SW=SWITCH  
CC=CONVERTER CL.  
D =DRIBBLER  
V =VENT



PRESSURE (PSI) AT 1500 RPM										SOLENOIDS ENERGIZED							
										LR/CC		24/LR <sub>a</sub>		UD		OD	
										X		X		X		X	
										X		X		X		X	
										X		X		X		X	
										X		X		X		X	
										X		X		X		X	
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										X		X		X		X	
										X		X		X		X	
										X		X		X		X	
										X		X					

Overdrive (CC On)

801695c

## SPECIFICATIONS

### 42RLE AUTOMATIC TRANSMISSION

#### GENERAL SPECIFICATIONS

Transmission Type	Four-Speed Automatic, Electronically Controlled, Fully Adaptive, Electronically Modulated Torque Converter
Lubrication Method	Pump (internal - external gear-type)
Cooling Method	Water Heat Exchanger and/or Air-to-Oil Heat Exchanger

#### GEAR RATIOS

1st Gear	2.84:1
2nd Gear	1.57:1
3rd Gear (Direct)	1.00:1
4th Gear (Overdrive)	0.69:1
Reverse Gear	2.21:1

#### BEARING PRELOAD (Drag Torque)

Description	Metric	Standard
Output Shaft	0.22-0.903 N·m	1-8 in. lbs.

#### CLUTCH PACK

Description	Metric	Standard
Low/Reverse Clutch (Select Reaction Plate)	0.84-1.60 mm	0.033-0.063 in.
Two/Four Clutch (No Select)	0.76-2.64 mm	0.030-0.104 in.
Reverse Clutch (Select Snap Ring)	0.89-1.37 mm	0.035-0.054 in.
Overdrive Clutch (No Select)	1.07-3.25 mm	0.042-0.128 in.
Underdrive Clutch (Select Reaction Plate)	0.94-1.50 mm	0.037-0.059 in.

#### INPUT SHAFT

Description	Metric	Standard
End Play	0.127-0.635 mm	0.005-0.025 in.

#### OIL PUMP CLEARANCES

DESCRIPTION	METRIC	STANDARD
Outer Gear-to-Crescent	0.060-0.298 mm	0.0023-0.0117 in.
Inner Gear-to-Crescent	0.093-0.385 mm	0.0036-0.0151 in.
Outer Gear-to-Pocket	0.089-0.202 mm	0.0035-0.0079 in.
Outer Gear Side Clearance	0.020-0.046 mm	0.0008-0.0018 in.



DESCRIPTION	METRIC	STANDARD
Inner Gear Side Clearance	0.020-0.046 mm	0.0008-0.0018 in.

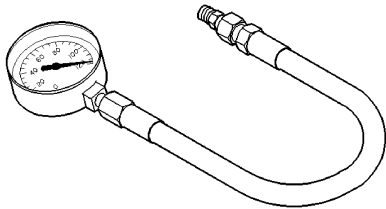
**TORQUE SPECIFICATIONS**

Description	N-m	Ft. Lbs.	In. Lbs.
Bolt, Torque Converter Housing to Engine	68	50	-
Bolt, Converter-to-Driveplate	88	65	-
Bolt, Fluid Filter-to-Valve Body	5	-	45
Bolt, L/R Clutch Retainer-to-Case	5	-	45
Bolt, Adapter/Extension Housing	54	40	-
Bolt, Manual Valve Lever-to-Manual Valve	5	-	45
Bolt, Oil Pan-to-Case	20	14.5	-
Bolt, Oil Pump-to-Case	30	-	265
Bolt, Park Sprag Retainer	4.5	-	40
Bolt, Reaction Shaft Support Halves	28	-	250
Bolt, Solenoid/Pressure Switch Assy-to-Valve Body	5.5	-	50
Bolt, Valve Body-to-Case	12	-	105
Bolt, Valve Body-to-Transfer Plate	5	-	45
Fitting, Cooler Line	47.5	35	-
Nut, Output Shaft	271	200	-
Plug, Pressure Tap	5	-	45
Bolt, Input Speed-to-Case Sensor	9	-	80
Bolt, Output Speed-to-Case Sensor	9	-	80

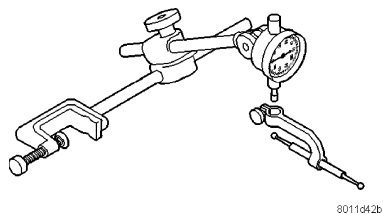


## SPECIAL TOOLS

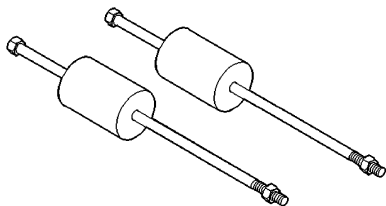
### AUTOMATIC TRANSMISSION – 42RLE



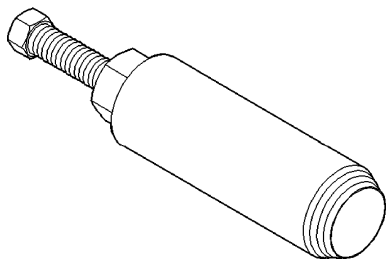
***Gauge , Pressure (High) - C-3293SP***



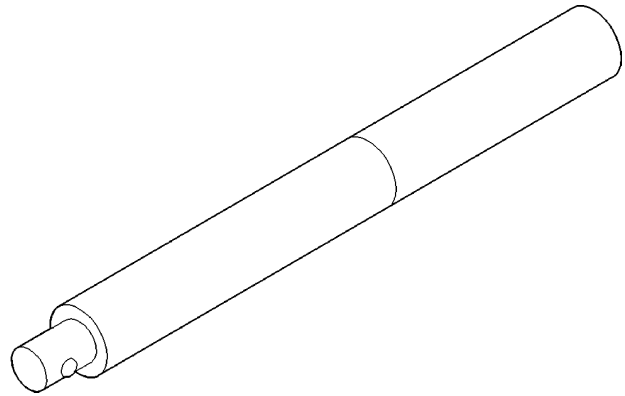
***Indicator, Dial - C-3339***



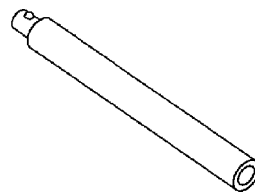
***Hammer, Slide - C-3752***



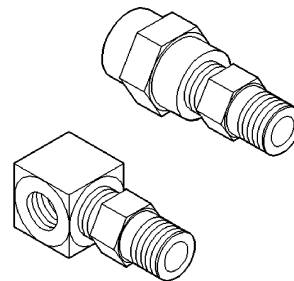
***Puller, Seal - C-3981B***



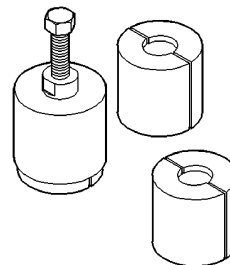
***Handle, Universal - C-4171***



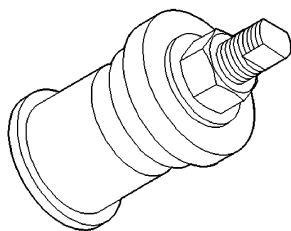
***Extension, Handle - C-4171-2***



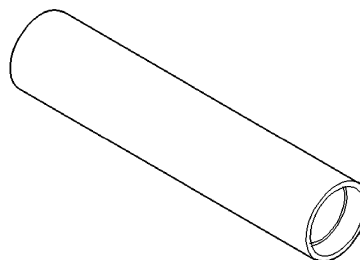
***Adapter Set - L-4559***



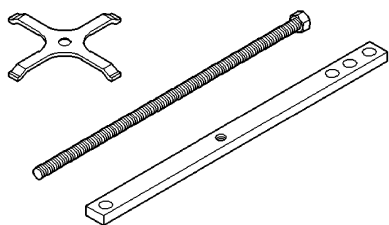
***Puller Set - 5048***



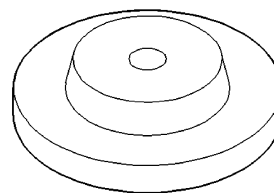
***Installer - 5050A***



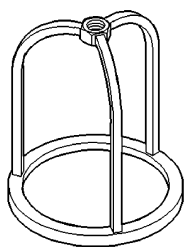
***Installer - 6052***



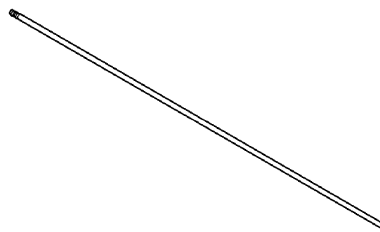
***Compressor - 5058A***



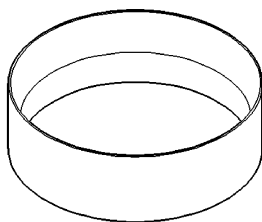
***Disk - 6057***



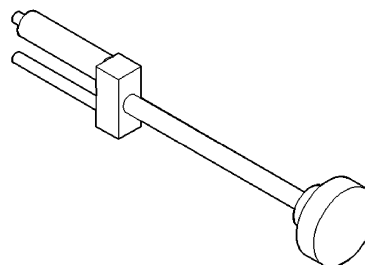
***Compressor - 5059-A***



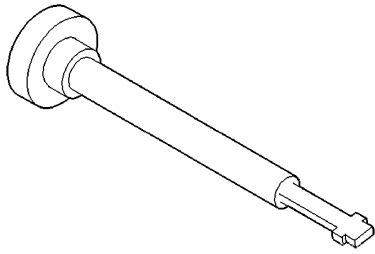
***Tip - 6268***



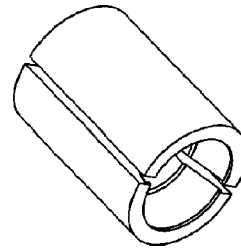
***Installer - 5067***



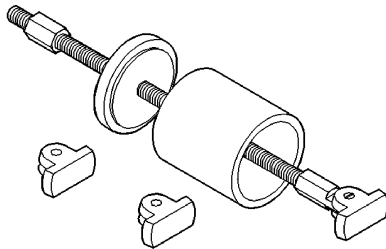
***Remover/Installer - 6301***



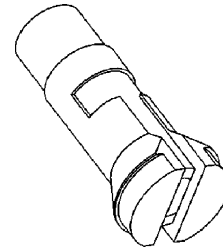
***Remover/Installer - 6302***



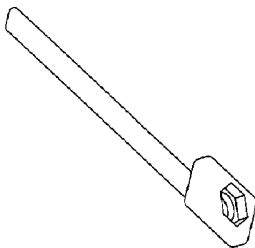
***Puller Jaws - 6545***



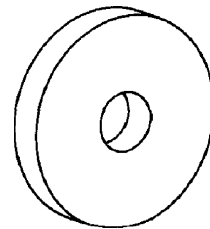
***Remover - 6310***



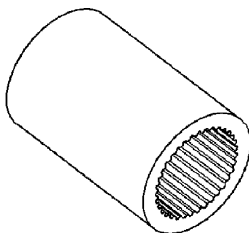
***Remover - 6596***



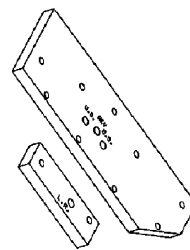
***Wrench - 6497***



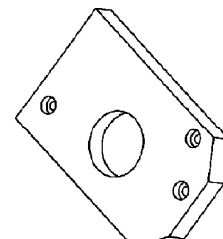
***Remover - 6597***



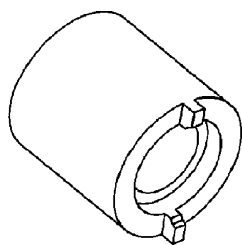
***Wrench - 6498-A***



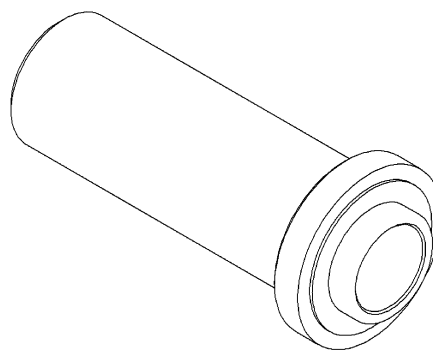
***Plate Set - 6599***



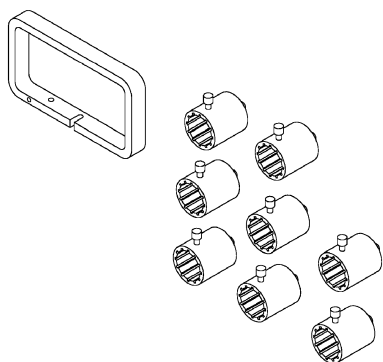
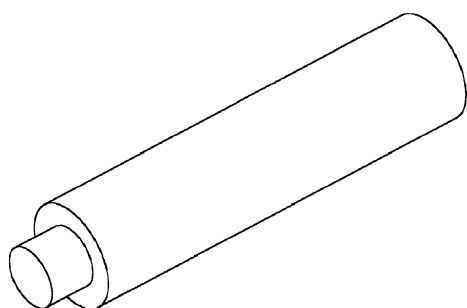
***Plate, Support - 6618A***



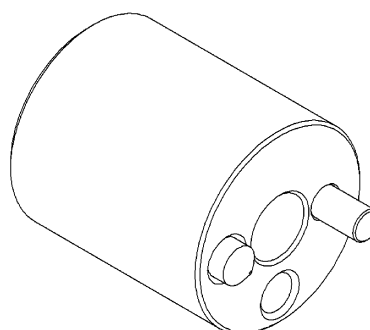
***Tool, Staking - 6639***



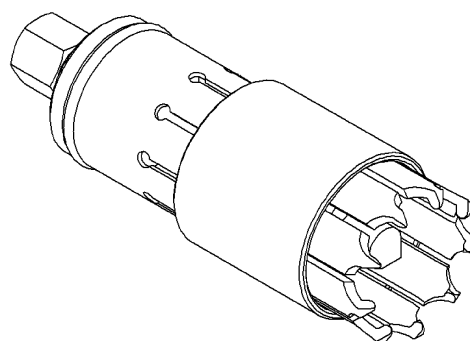
***Installer, Seal - 8902A***



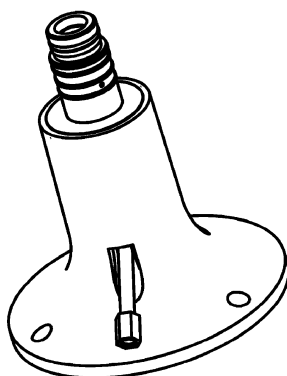
***End Play Set - 8266***



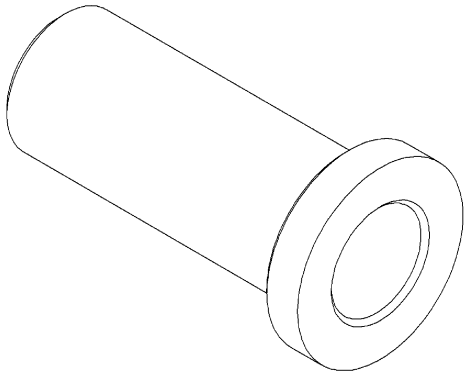
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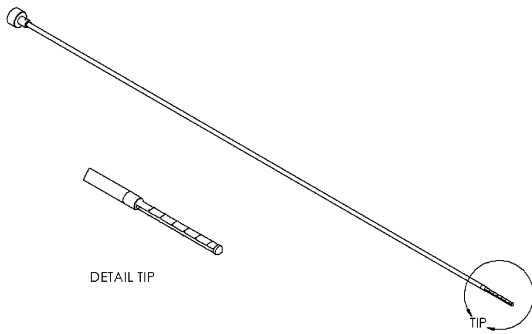
***Remover, Bearing - 9082***



***Fixture, Pressure - 8391***



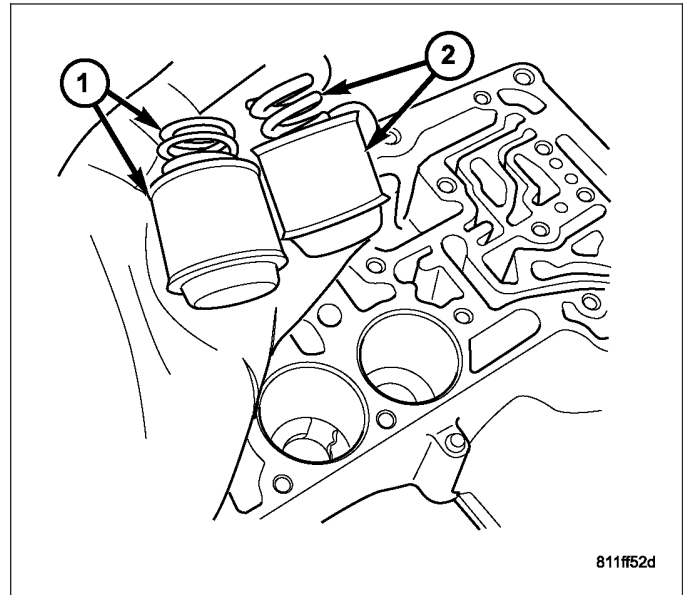
***Installer, Bearing - 9287***



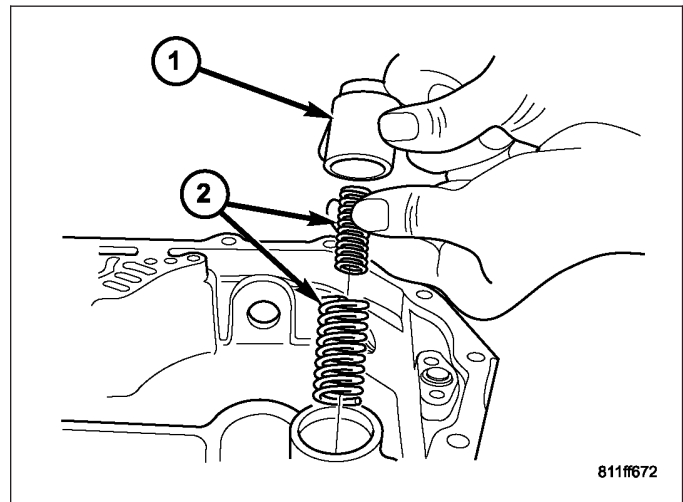
## ACCUMULATOR

### DESCRIPTION

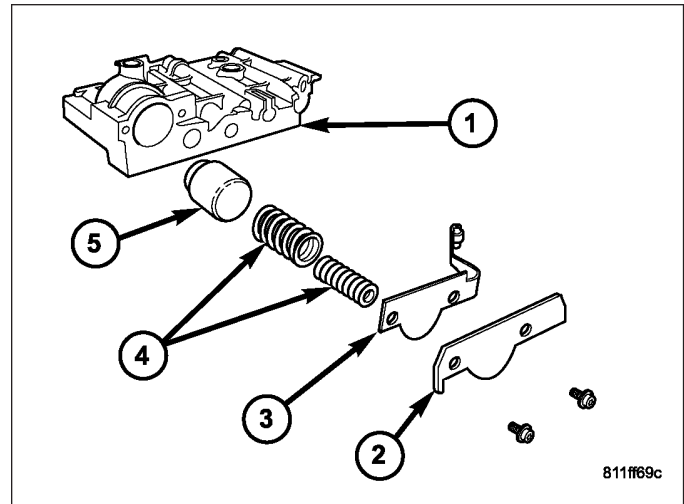
The 42RLE underdrive, overdrive, low/reverse, and 2/4 clutch hydraulic circuits each contain an accumulator. An accumulator typically consists of a piston, return spring(s), and a cover or plug. The overdrive (1) and underdrive (2) accumulators are located within the transmission case, and are retained by the valve body.



The low reverse (1) accumulator is also located within the transmission case, but the assembly is retained by a cover and a snap-ring.



The 2/4 accumulator (5) is located in the valve body. It is retained by a cover and retaining screws.



## OPERATION

The function of an accumulator is to cushion the application of a frictional clutch element. When pressurized fluid is applied to a clutch circuit, the application force is dampened by fluid collecting in the respective accumulator chamber against the piston and springs. The intended result is a smooth, firm clutch application.

## BEARINGS

### ADJUSTMENTS

#### BEARING ADJUSTMENT PROCEDURES

Take extreme care when removing and installing bearing cups and cones. **Use only an arbor press for installation**, as a hammer may not properly align the bearing cup or cone. Burrs or nicks on the bearing seat will give a false end play reading, while gauging for proper shims. Improperly seated bearing cup and cones are subject to low-mileage failure.

Bearing cups and cones should be replaced if they show signs of pitting or heat distress.

If distress is seen on either the cup or bearing rollers, both cup and cone must be replaced.

**Note: Bearing drag torque specifications must be maintained to avoid premature bearing failures.**

Used (original) bearing may lose up to 50 percent of the original drag torque after break-in.

**Note: All bearing adjustments must be made with no other component interference or gear inter-mesh.**

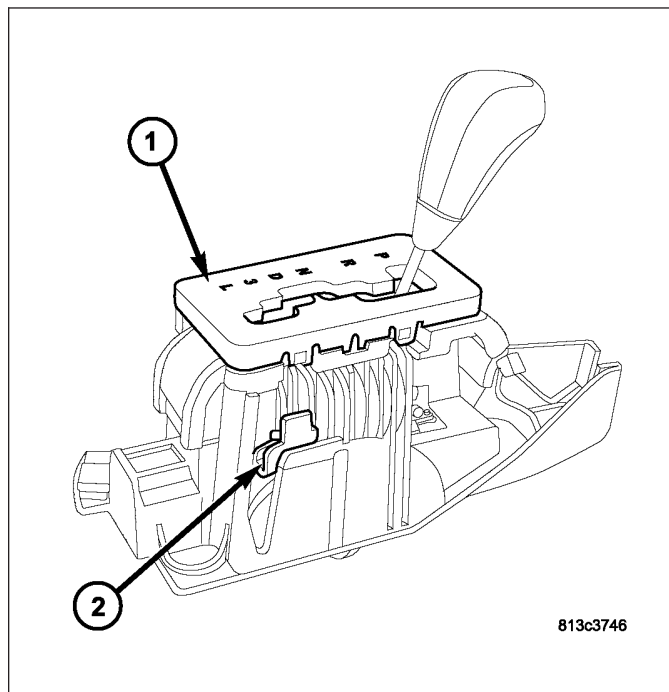
Oil all bearings before checking turning torque.

## MECHANISM-BRAKE TRANSMISSION SHIFT INTERLOCK

### DESCRIPTION

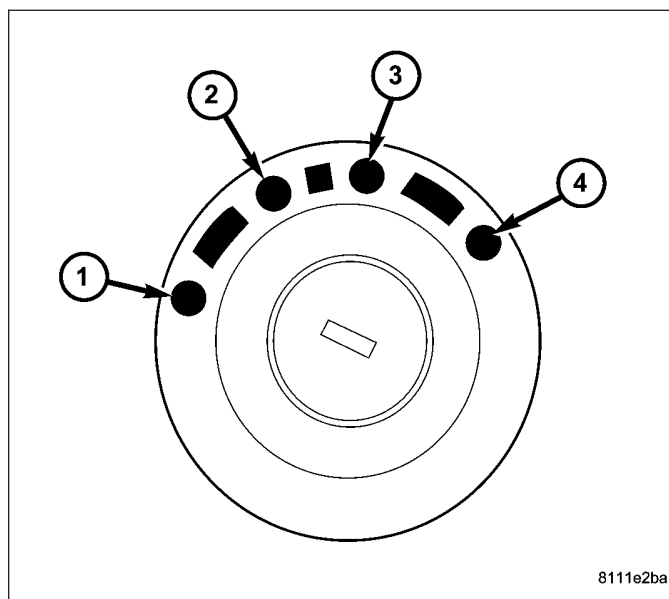
The Brake Transmission Shifter/Ignition Interlock (BTSI) is a cable operated system that prevents the transmission gear shifter from being moved out of PARK without the proper driver inputs. The system also contains a solenoid that is integral to the shifter assembly. The solenoid works in conjunction with the park lock cable to permit shifter movement out of PARK when the brake is depressed.

A BTSI override (2) is provided on the side of the shifter mechanism (1) to allow the vehicle to be shifted out of PARK in the event of an electrical failure.



### OPERATION

The Brake Transmission Shifter/Ignition Interlock (BTSI) is engaged whenever the ignition switch is in the LOCK (1) position. An additional electrically activated feature will prevent shifting out of the PARK position unless the brake pedal is depressed at least one-half inch. A solenoid in the shifter assembly is energized when the brake pedal is depressed. When the key is in the ON position and the brake pedal is depressed, the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to the LOCK position, unless the shifter is in the gated PARK position.





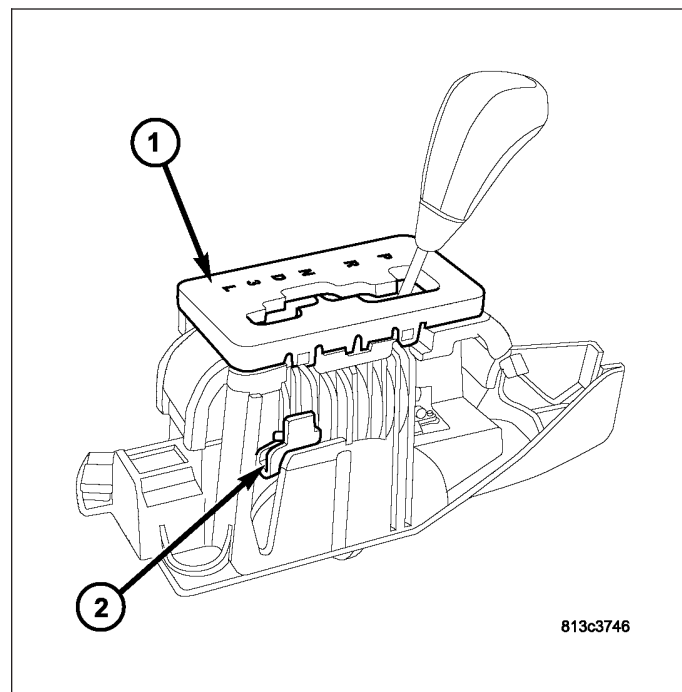
The following chart describes the normal operation of the Brake Transmission Shift Interlock (BTSI) system. If the "expected response" differs from the vehicle's response, then system repair and/or adjustment is necessary.

<b>ACTION</b>	<b>EXPECTED RESPONSE</b>
1. Turn key to the "ACC" position and depress brake pedal.	1. Shifter CAN be shifted out of park.
2. Turn key to the "ON" position, with foot off of brake pedal.	2. Shifter CANNOT be shifted out of park.
3. Turn key to the "ON" position and depress the brake pedal.	3. Shifter CAN be shifted out of park.
4. Leave shifter in any gear position, except PARK, and try to return key to the "LOCK" position.	4. Key cannot be returned to the "LOCK" position.
5. Return shifter to "PARK" and try to remove the key.	5. Key can be removed (after returning to "LOCK" position).
6. With the key removed, and the brake depressed, try to shift out of "PARK".	6. Shifter cannot be shifted out of "PARK".
<b>NOTE: Any failure to meet these expected responses requires system adjustment or repair.</b>	

### **BTSI Override**

In the event of an electrical failure, the vehicle can be shifted out of PARK by using the following procedure.

1. Turn the key to the ACC or ON position.
2. Remove the liner to the cubby bin to the right side of the shifter.
3. Depress the BTSI override (2) on the side of the shifter assembly (1).
4. While the override is depressed, move the shifter out of the PARK position.
5. Return the cubby bin liner to its original location.



## **DIAGNOSIS AND TESTING - BRAKE TRANSMISSION SHIFT INTERLOCK**

### **SYSTEM VERIFICATION**

1. Verify that the key can only be removed in the PARK position
2. When the shift lever is in PARK, the ignition key cylinder should rotate freely from ACC to LOCK. When the shifter is in any other gear or neutral position, the ignition key cylinder should not rotate to the LOCK position.
3. Shifting out of PARK should not be possible when the ignition key cylinder is in the ACC position and the brake pedal is not depressed.
4. Shifting out of PARK should not be possible while applying normal force on the shift lever and ignition key cylinder is in the ACC, ON, or START positions unless the foot brake pedal is depressed approximately 1/2 inch (12mm).

5. Shifting out of PARK should not be possible when the ignition key cylinder is in the LOCK position, regardless of the brake pedal position.
6. Shifting between any gears, NEUTRAL or into PARK may be done without depressing foot brake pedal with ignition switch in ACC, ON, or START positions.

### DIAGNOSTIC CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
KEY WILL NOT ROTATE TO THE LOCK POSITION.	1. Misadjusted Park Lock cable.	1. Adjust Park Lock cable. (Refer to 21 - TRANSMISSION AND TRANSFER CASE/AUTOMATIC TRANSMISSION/BRAKE TRANSMISSION SHIFT INTERLOCK SYSTEM - ADJUSTMENTS)
	2. Misadjusted gearshift cable.	2. Adjust gearshift cable. (Refer to 21 - TRANSMISSION AND TRANSFER CASE/AUTOMATIC TRANSMISSION/GEAR SHIFT CABLE - ADJUSTMENTS)
	3. Burrs on ignition key.	3. Remove burrs and cycle key several times to verify operation.
	4. Binding or broken components.	4. Inspect system components and repair/replace components as necessary.
VEHICLE WILL NOT START UNLESS SHIFTER IS HELD FORWARD, OR REARWARD, OF THE PARK POSITION.	1. Misadjusted gearshift cable.	1. Adjust gearshift cable. (Refer to 21 - TRANSMISSION AND TRANSFER CASE/AUTOMATIC TRANSMISSION/GEAR SHIFT CABLE - ADJUSTMENTS)

### ADJUSTMENTS - BRAKE TRANSMISSION SHIFT INTERLOCK

The park interlock cable is part of the brake/shift lever interlock system. Correct cable adjustment is important to proper interlock operation. The gear shift and park lock cables must both be correctly adjusted in order to shift out of PARK.

#### ADJUSTMENT PROCEDURE

1. Remove floor console as necessary for access to the park lock cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)
2. Shift the transmission into the PARK position.
3. Turn ignition switch to LOCK position. **Be sure ignition key cylinder is in the LOCK position. Cable will not adjust correctly in any other position.**

**Note: If the key will not turn to the LOCK position, pull up on the cable lock button and manually move the cable in and out until the key can be turned to the LOCK position.**

4. Pull cable lock button up to release cable, if necessary.
5. Remove and discard the cable adjuster lock pin, if a new cable is being installed.
6. Ensure that the cable is free to self-adjust by pushing cable rearward and releasing.
7. Push lock button down until it snaps in place. The lock should be 1-2mm below the surface of the cylindrical portion of the cable adjustment housing.

## BTSI FUNCTION CHECK

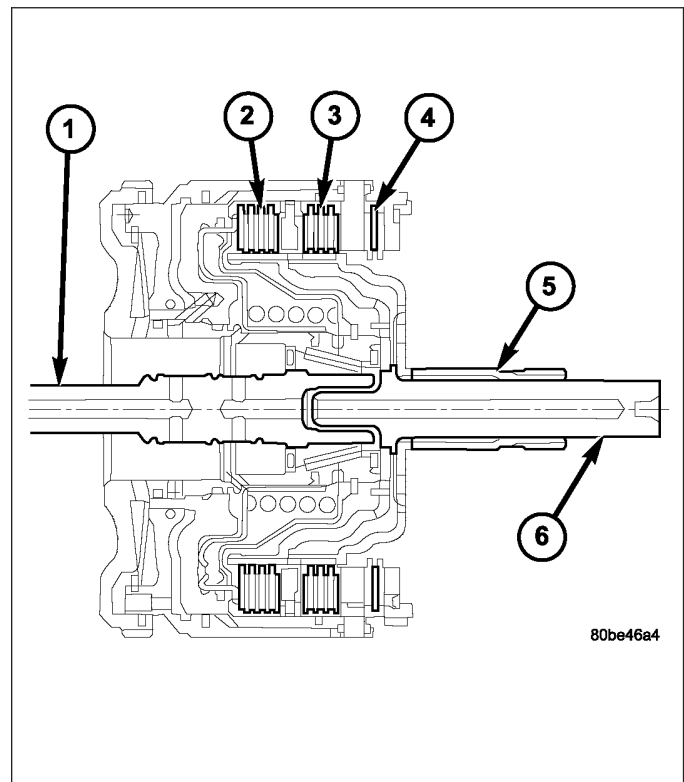
1. Verify removal of ignition key allowed in PARK position only.
2. When the shift lever is in PARK, the ignition key cylinder should rotate freely LOCK position. When the shifter is in any other position, the ignition key should not rotate to the LOCK position.
3. Shifting out of PARK should not be possible when the ignition key cylinder is in the ACC position and the brake pedal is not depressed.
4. Shifting out of PARK should not be possible while applying normal force on the shift lever and ignition key cylinder is in the ACC, ON, or START positions unless the foot brake pedal is depressed approximately 1/2 inch (12mm).
5. Shifting out of PARK should not be possible when the ignition key cylinder is in the LOCK position, regardless of the brake pedal position.
6. Shifting between any gears, NEUTRAL or into PARK may be done without depressing foot brake pedal with ignition switch in ACC, ON, or START positions.
7. The floor shifter lever and gate positions should be in alignment with all transmission detent positions.
8. Engine starts must be possible with shifter lever in PARK or NEUTRAL gate positions only. Engine starts must not be possible in any other gate positions other than PARK or NEUTRAL.
9. With the shifter lever handle in the:
  - PARK position- apply forward force on center of handle and remove pressure. Engine start must be possible.
  - PARK position- apply rearward force on center of handle and remove pressure. Engine start must be possible.
  - NEUTRAL position- engine start must be possible.
  - NEUTRAL position, engine running and brakes applied- Apply forward force on center of shift handle. Transmission should not be able to shift into REVERSE detent.

## CLUTCHES-DRIVING

### DESCRIPTION

Three hydraulically applied input clutches are used to drive planetary components. The underdrive (2), overdrive (3), and reverse (4) clutches are considered input/driving clutches and are contained within the input clutch assembly. The input clutch assembly also contains:

- Input shaft
- Input hub
- Clutch retainer
- Underdrive piston
- Overdrive/reverse piston
- Overdrive hub
- Underdrive hub



## OPERATION

The three input clutches are responsible for driving different components of the planetary geartrain.

**Note: (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING) for a collective view of which clutch elements are applied at each position of the selector lever.**

## UNDERDRIVE CLUTCH

The underdrive clutch is hydraulically applied in first, second, and third (direct) gears by pressurized fluid against the underdrive piston. When the underdrive clutch is applied, the underdrive hub drives the rear sun gear.

## OVERDRIVE CLUTCH

The overdrive clutch is hydraulically applied in third (direct) and overdrive gears by pressurized fluid against the overdrive/reverse piston. When the overdrive clutch is applied, the overdrive hub drives the front planet carrier.

## REVERSE CLUTCH

The reverse clutch is hydraulically applied in reverse gear only by pressurized fluid against the overdrive/reverse piston. When the reverse clutch is applied, the front sun gear assembly is driven.

## FLUID AND FILTER

## DIAGNOSIS AND TESTING

### CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has two primary causes.

1. A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or improperly installed drainback valve, a damaged oil cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.
2. Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

### EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation, and varnish buildup which interferes with valve and clutch operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

### FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to replace contaminated converter after repair

The use of non-recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission, an overhaul is necessary.

The torque converter should be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

## **STANDARD PROCEDURE**

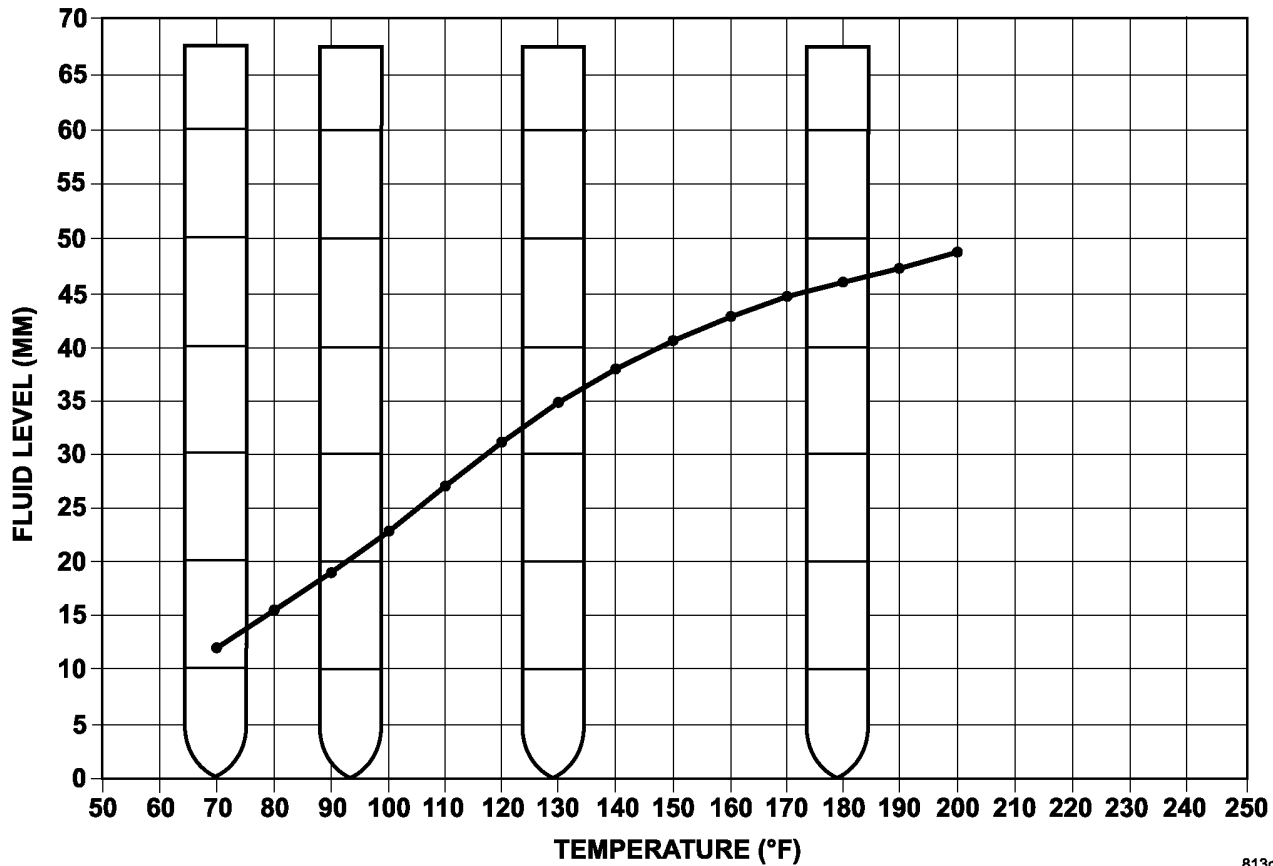
### **CHECK OIL LEVEL**

1. Verify that the vehicle is parked on a level surface.
2. Remove the dipstick tube cap.

**WARNING: Risk of accident from vehicle starting off by itself when engine running. Risk of injury from contusions and burns if you insert your hands into the engine when it is started or when it is running. Secure vehicle to prevent it from moving off by itself. Wear properly fastened and close-fitting work clothes. Do not touch hot or rotating parts.**

3. Actuate the service brake. Start engine and let it run at idle speed in selector lever position "P".
4. Shift through the transmission modes several times with the vehicle stationary and the engine idling
5. Warm up the transmission, wait at least 2 minutes and check the oil level with the engine running. Push the Oil Dipstick 9336 into transmission fill tube until the dipstick tip contacts the oil pan and pull out again, read off oil level, repeat if necessary.

**Note: The dipstick will protrude from the fill tube when installed.**



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**42RLE Fluid Temperature Chart**

6. Check transmission oil temperature using the appropriate scan tool.
7. The transmission Oil Dipstick 9336 has indicator marks every 10mm. Determine the height of the oil level on the dipstick and using the height, the transmission temperature, and the Transmission Fluid Graph, determine if the transmission oil level is correct.
8. Add or remove oil as necessary and recheck the oil level.
9. Once the oil level is correct, install the dipstick tube cap.

## FLUID/FILTER SERVICE

**Note:** Only fluids of the type labeled Mopar® ATF+4, Automatic Transmission Fluid, should be used in the transmission sump. A filter change should be made at the time of the transmission oil change. The magnet (on the inside of the oil pan) should also be cleaned with a clean, dry cloth.

**Note:** If the transmission is disassembled for any reason, the fluid and filter should be changed.

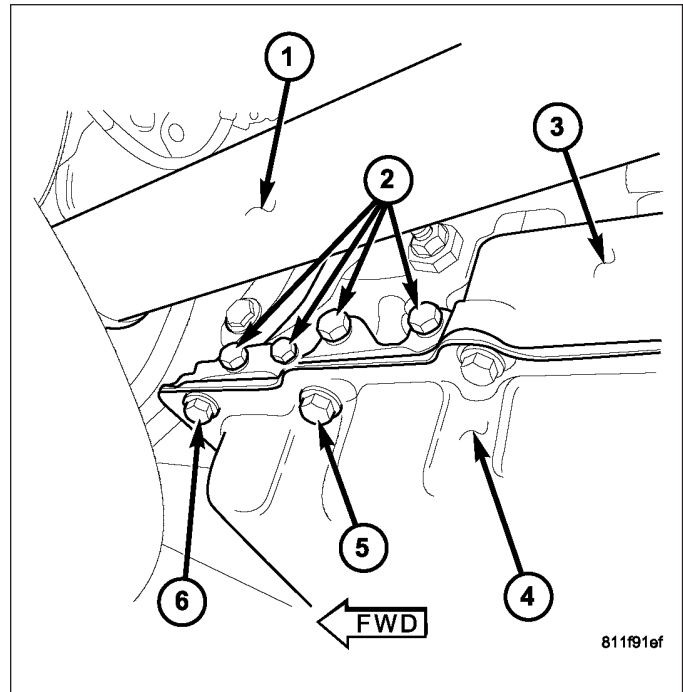
1. Raise vehicle on a hoist. Place a drain container with a large opening, under transmission oil pan.

**Note:** One of the oil pan bolts (5) has a sealing patch applied from the factory. Separate this bolt for reuse.

2. Loosen pan bolts and tap the pan at one corner to break it loose allowing fluid to drain, then remove the oil pan.
3. Install a new filter and o-ring on bottom of the valve body and tighten retaining screws to 5 N·m (40 in. lbs.).

**Note:** Before installing the oil pan bolt (5) in the bolt hole located between the torque converter clutch on and U/D clutch pressure tap circuits, it will be necessary to replenish the sealing patch on the bolt using Mopar® Lock & Seal Adhesive.

4. Clean the oil pan and magnet. Reinstall pan using new Mopar® Silicone Adhesive sealant. Tighten oil pan bolts to 19 N·m (165 in. lbs.).
5. Pour four quarts of Mopar® ATF+4, Automatic Transmission Fluid, through the dipstick opening.
6. Start engine and allow to idle for at least one minute. Then, with parking and service brakes applied, move selector lever momentarily to each position, ending in the park or neutral position.
7. Check the transmission fluid level and add an appropriate amount to bring the transmission fluid level to 3mm (1/8 in.) below the lowest mark on the dipstick.
8. Recheck the fluid level after the transmission has reached normal operating temperature (180°F.).
9. To prevent dirt from entering transmission, make certain that dipstick is fully seated into the dipstick opening.



## TRANSMISSION FILL

To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:

1. Remove dipstick and insert clean funnel in transmission fill tube.
2. Add following initial quantity of Mopar® ATF +4, Automatic Transmission Fluid, to transmission:
  - a. If only fluid and filter were changed, add **3 pints (1-1/2 quarts)** of ATF +4 to transmission.
  - b. If transmission was completely overhauled, or torque converter was replaced or drained, add **12 pints (6 quarts)** of ATF +4 to transmission.
3. Apply parking brakes.
4. Start and run engine at normal curb idle speed.
5. Apply service brakes, shift transmission through all gear ranges then back to NEUTRAL, set parking brake, and leave engine running at curb idle speed.
6. Remove funnel, insert dipstick and check fluid level. If level is low, **add fluid to bring level to MIN mark on dipstick**. Check to see if the oil level is equal on both sides of the dipstick. If one side is noticeably higher than the other, the dipstick has picked up some oil from the dipstick tube. Allow the oil to drain down the dipstick tube and re-check.
7. Drive vehicle until transmission fluid is at normal operating temperature.
8. With the engine running at curb idle speed, the gear selector in NEUTRAL, and the parking brake applied, check the transmission fluid level.

**CAUTION:** Do not overfill transmission, fluid foaming and shifting problems can result.

9. Add fluid to bring level up to MAX arrow mark.

When fluid level is correct, shut engine off, release park brake, remove funnel, and install dipstick in fill tube.



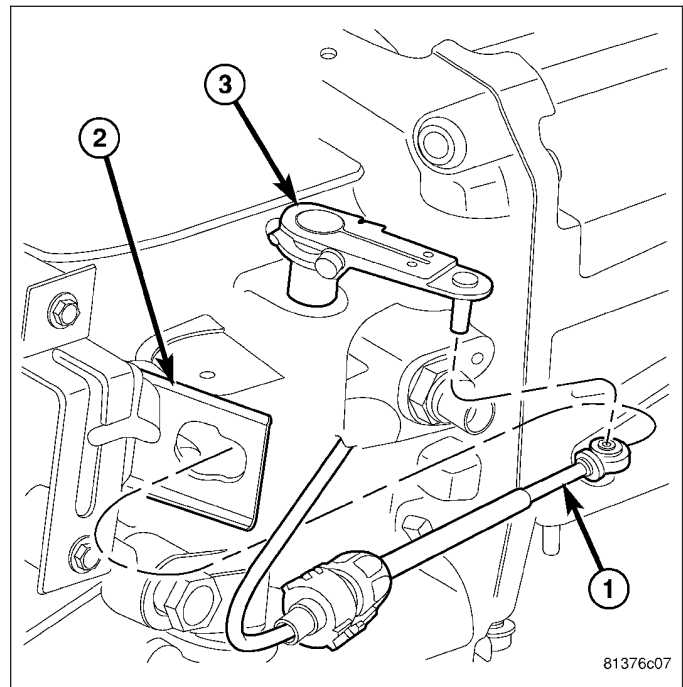
## CABLE-GEARSHIFT

### DIAGNOSIS AND TESTING - GEARSHIFT CABLE

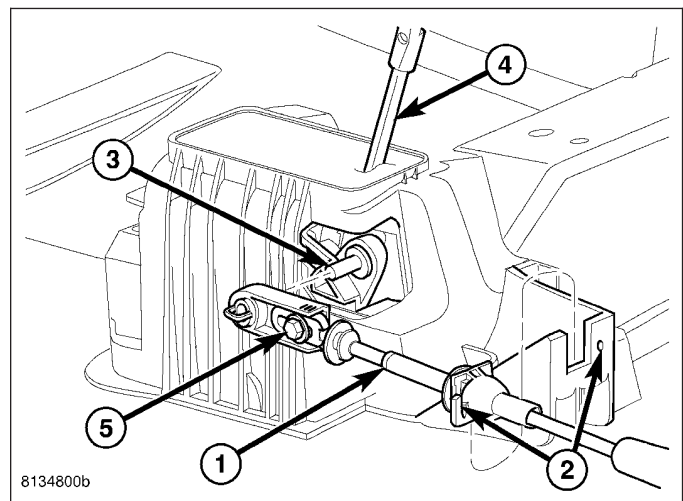
1. Engine starts must be possible with shift lever in PARK or NEUTRAL positions only. Engine starts must not be possible in any other gear position.
2. With the shift lever in the:
  - a. PARK position - Apply upward force on the shift arm and remove pressure. Engine starts must be possible.
  - b. PARK position - Apply downward force on the shift arm and remove pressure. Engine starts must be possible.
  - c. NEUTRAL position - Normal position. Engine starts must be possible.
  - d. NEUTRAL position - Engine running and brakes applied, apply upward force on the shift arm. Transmission shall not be able to shift from neutral to reverse.

### REMOVAL

1. Shift transmission into PARK.
2. Raise vehicle.
3. Disengage the gearshift cable (1) eyelet at transmission manual shift lever (3) and pull cable out of mounting bracket (2).

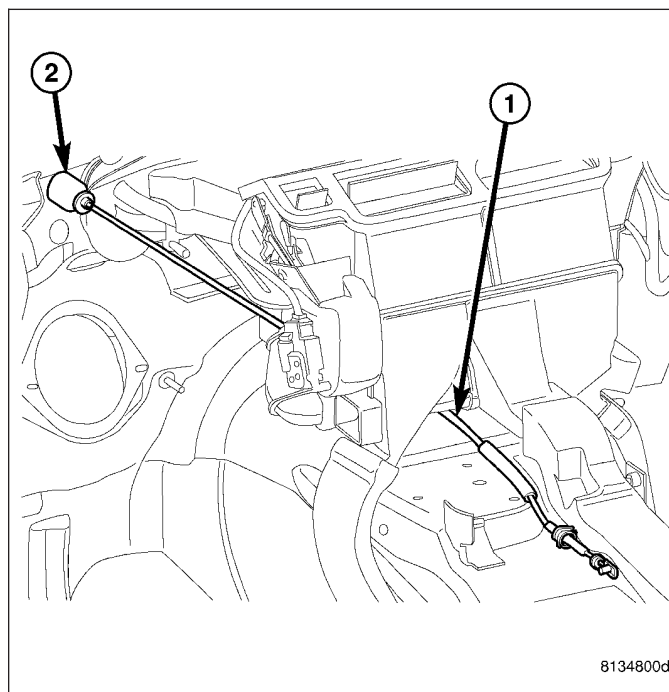


4. Lower the vehicle.
5. Remove the floor console (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL) as necessary to access the shift mechanism and cables.
6. If necessary, remove the bolts holding the shield, covering the gearshift and park lock cables, to the floorpan and remove the shield.
7. Remove the gearshift cable (1) from the shift lever pin (3).



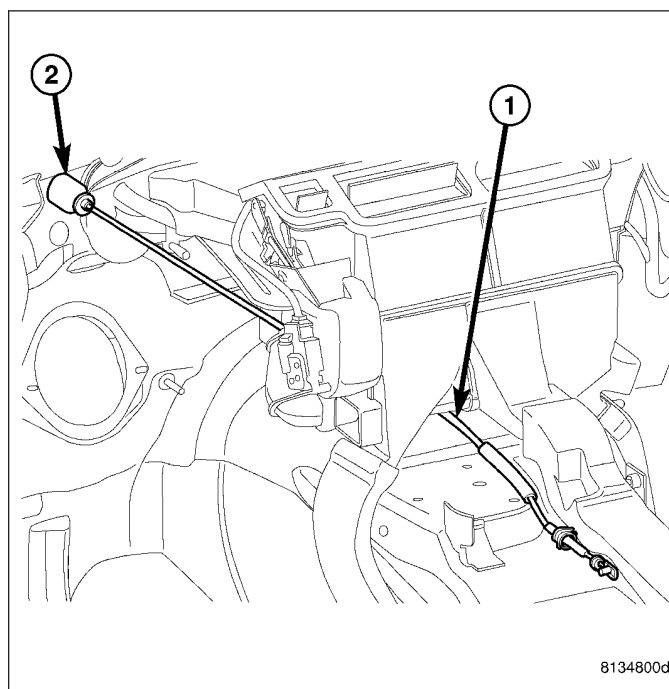


8. Remove the gearshift cable retainer (2) from the notch (2) in the shifter assembly.
9. From under the hood, remove the shift cable grommet (2) from the dash panel.
10. Remove gearshift cable (1) from vehicle.

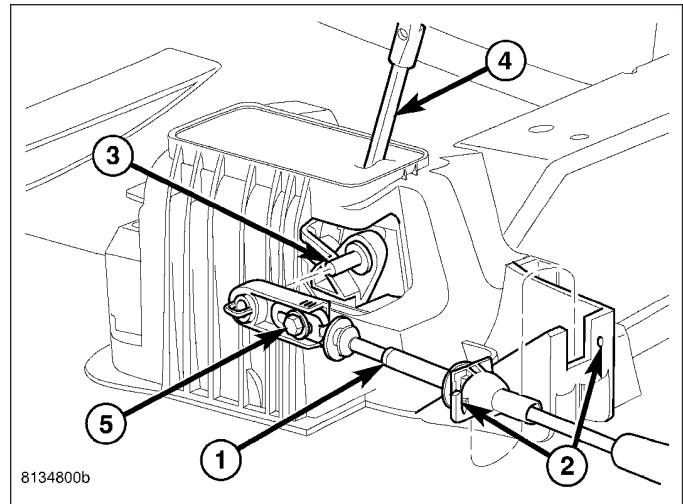


## INSTALLATION

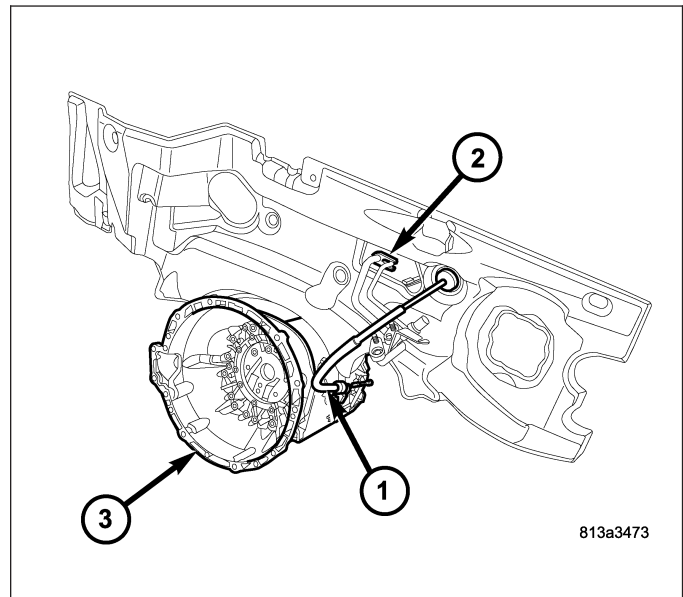
1. From under the hood, route the gearshift cable (1) through the dash panel and toward the shifter assembly.
2. Install the grommet (2) to the dash panel.



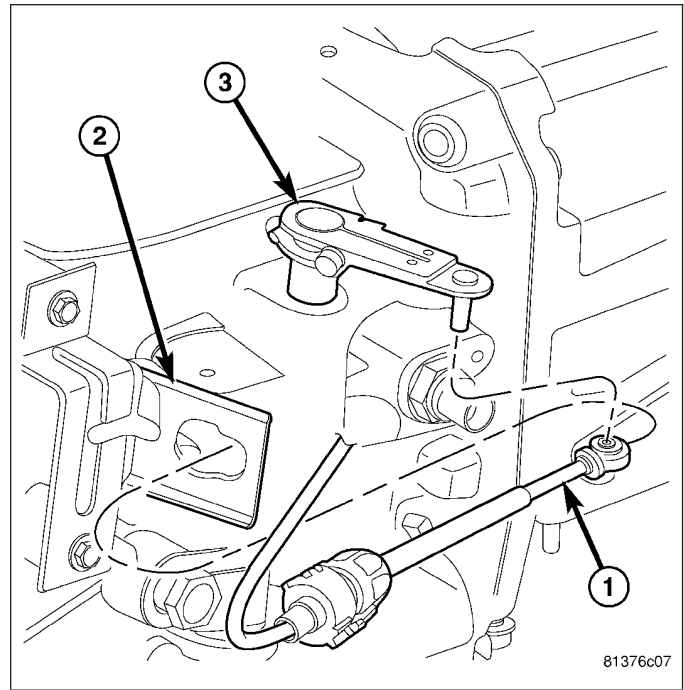
3. Engage the gearshift cable retainer (2) into the notch (2) in the shifter assembly.
4. Install the gearshift cable (1) onto the shift lever pin (3).
5. Loosen the cable adjustment screw (5), if necessary.



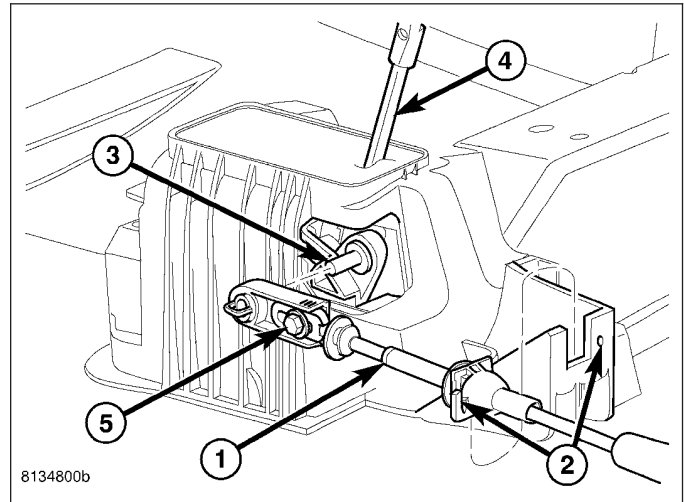
6. From under the hood, route the gearshift cable (1) forward of the air conditioning lines and the heater hoses (2) and toward the transmission (3) manual lever.



7. Raise vehicle.
8. Verify that the transmission is in the PARK position by trying to rotate the propeller shaft. If the propeller shaft rotates, move the transmission manual shift lever until the PARK system is engaged.
9. Route the gearshift cable (1) through the mounting bracket (2).
10. Engage the gearshift cable (1) eyelet onto the transmission manual shift lever (3).



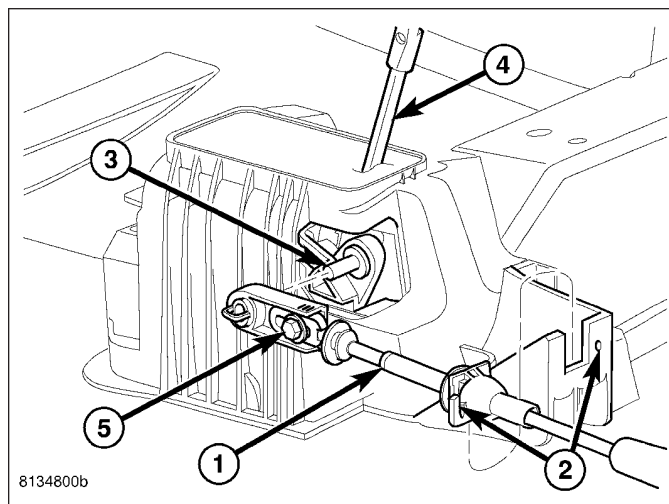
11. Lower vehicle.
12. Verify that the shifter is in the PARK position and tighten the adjustment screw (5) to 7 N·m (65 in.lbs.).
13. Verify correct shifter operation.
14. If necessary, install the shield, covering the gearshift and park lock cables, to the floorpan and install the bolts to hold the shield to the floorpan.
15. Install the floor console (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION) as necessary.



## ADJUSTMENTS - GEARSHIFT CABLE

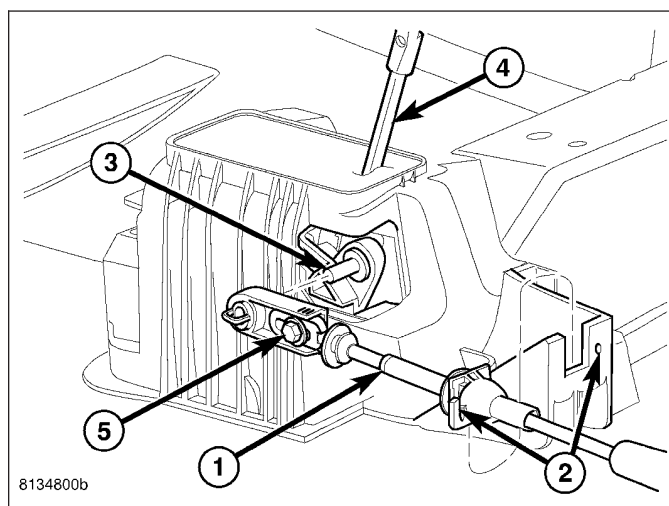
Check adjustment by starting the engine in PARK and NEUTRAL. Adjustment is CORRECT if the engine starts only in these positions. Adjustment is INCORRECT if the engine starts in one but not both positions. If the engine starts in any position other than PARK or NEUTRAL, or if the engine will not start at all, the park/neutral position contact may be faulty.

1. Shift transmission into PARK.
2. Remove floor console as necessary for access to the shift cable adjustment. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)
3. Loosen the shift cable adjustment screw (5).



4. Raise vehicle.
5. Unsnap cable eyelet from transmission shift lever.
6. Verify transmission shift lever is in PARK detent by moving lever fully rearward. Last rearward detent is PARK position.
7. Verify positive engagement of transmission park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.
8. Snap cable eyelet onto transmission shift lever.

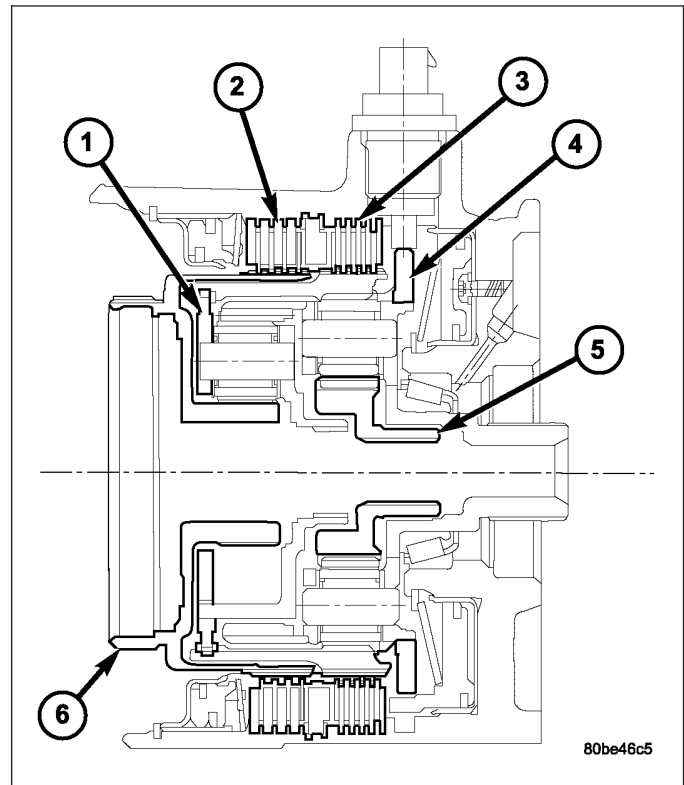
9. Lower vehicle
10. Tighten the shift cable adjustment screw (5) to 7 N·m (65 in.lbs.).
11. Verify correct operation.
12. Install any floor console components removed for access. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)



## CLUTCHES-HOLDING

### DESCRIPTION

Two hydraulically applied multi-disc clutches are used to hold planetary geartrain components stationary while the input clutches drive others. The 2/4 (2) and Low/Reverse (3) clutches are considered holding clutches and are contained at the rear of the transmission case.



### OPERATION

**Note:** (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE - DIAGNOSIS AND TESTING) for a collective view of which clutch elements are applied at each position of the selector lever.

#### 2/4 CLUTCH

The 2/4 clutch is hydraulically applied in second and fourth gears by pressurized fluid against the 2/4 clutch piston. When the 2/4 clutch is applied, the front sun gear assembly is held or grounded to the transmission case.

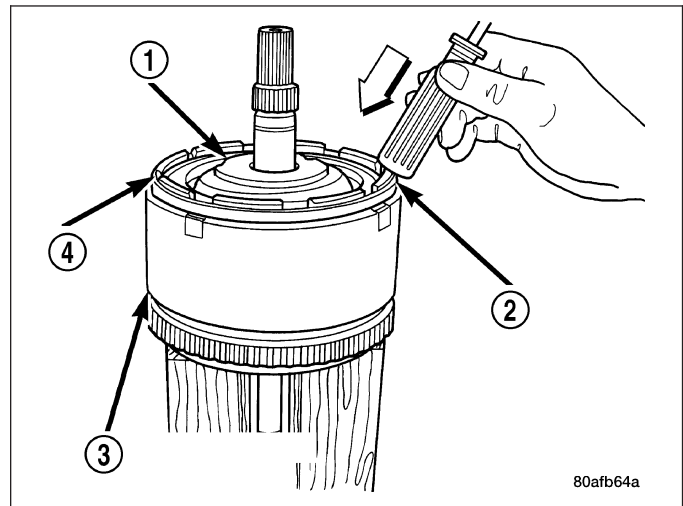
#### LOW/REVERSE CLUTCH

The Low/Reverse clutch is hydraulically applied in park, reverse, neutral, and first gears by pressurized fluid against the Low/Reverse clutch piston. When the Low/Reverse clutch is applied, the front planet carrier/rear annulus assembly is held or grounded to the transmission case.

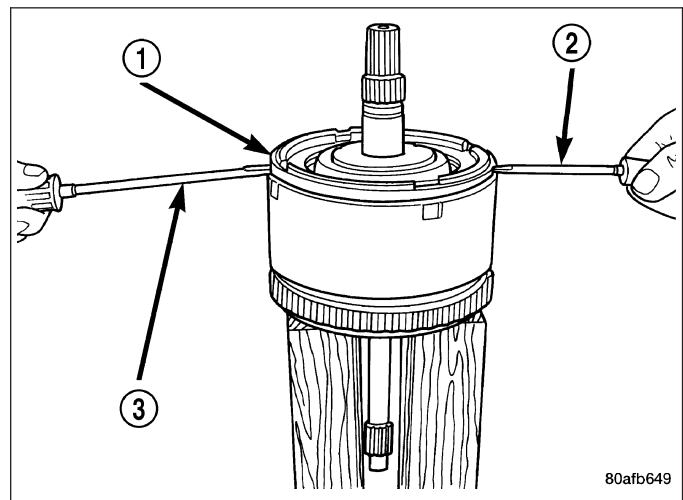
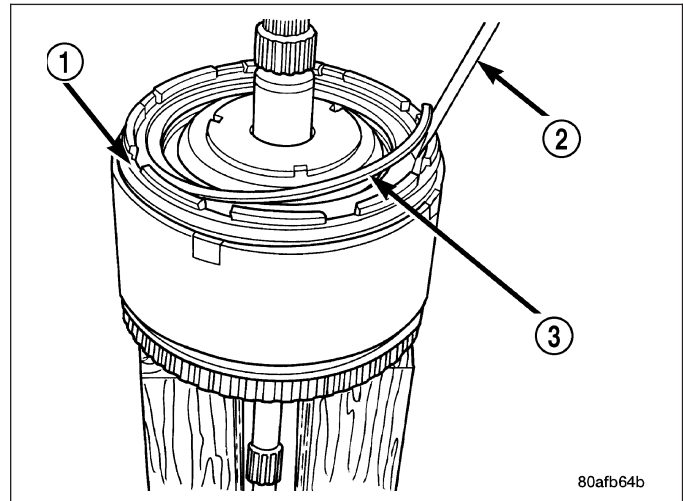
## ASSEMBLY-INPUT CLUTCH

### DISASSEMBLY

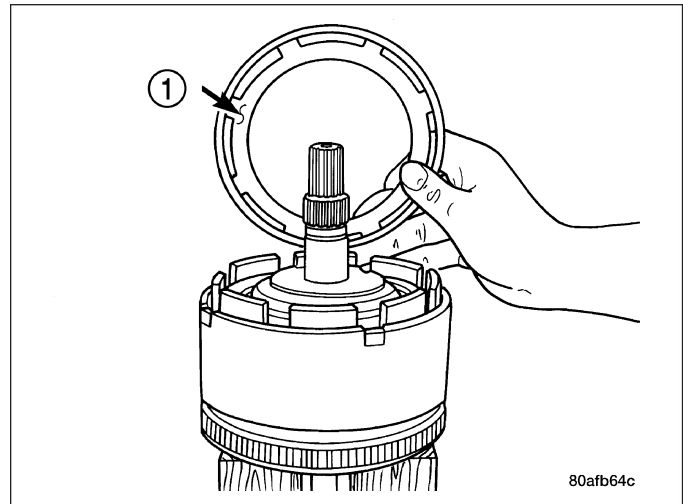
1. Mount input clutch assembly to Input Clutch Pressure Fixture (Tool 8391).
2. Tap down (2) reverse clutch reaction plate (4) to release pressure from snap ring.
3. Remove reverse clutch snap ring (3).



4. Pry up reverse clutch reaction plate (1).

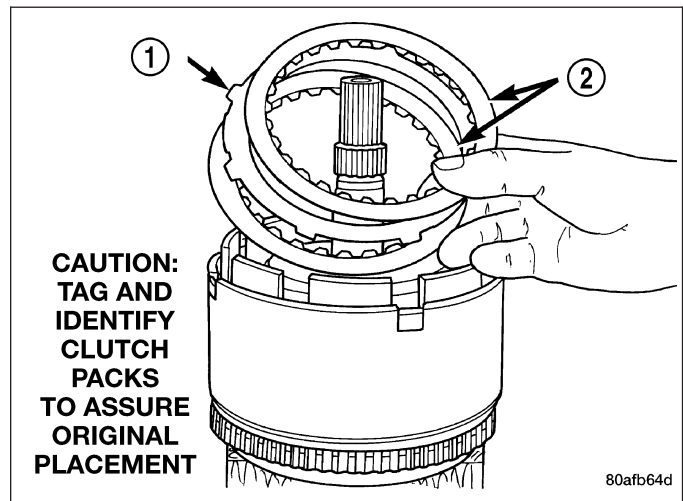


5. Remove reverse clutch reaction plate (1).

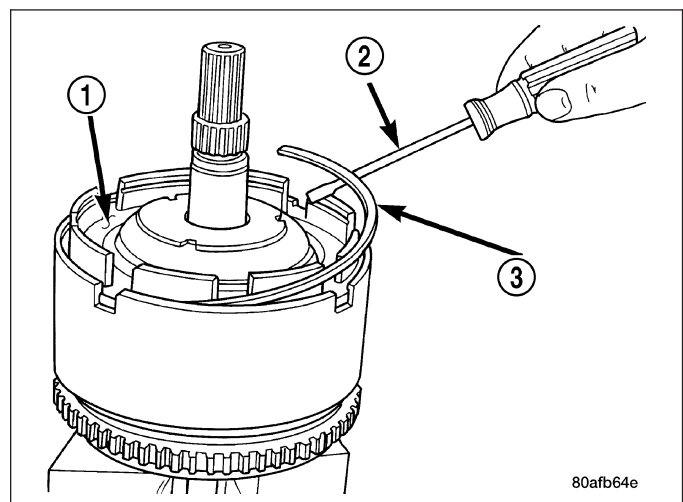


**Note:** Tag reverse clutch pack for reassembly identification.

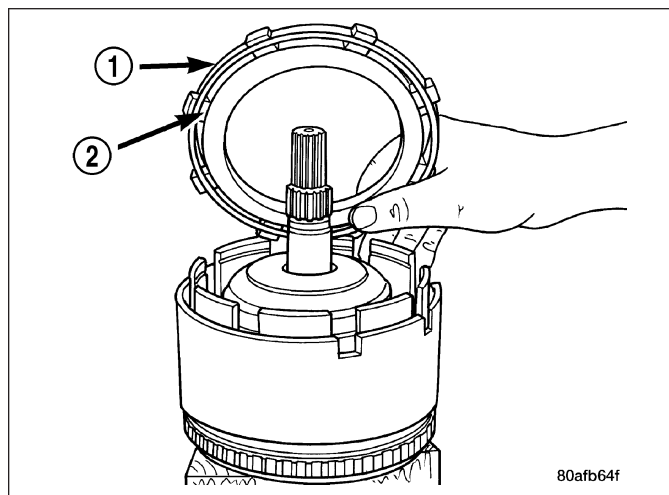
6. Remove the reverse clutch pack (two fibers/one steel) (1, 2).



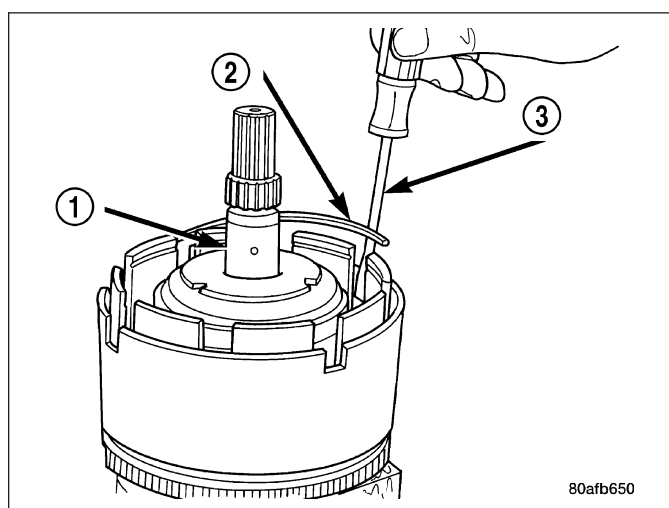
7. Remove the OD/Reverse reaction plate (1) snap ring (3).



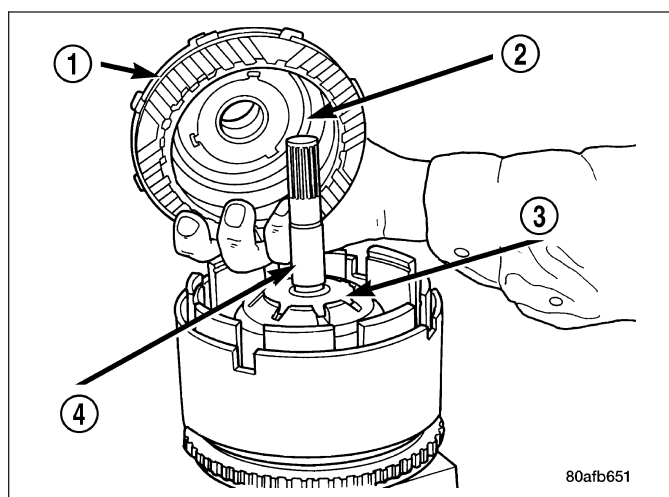
8. Remove OD/Reverse pressure plate (1).



9. Remove OD/Reverse reaction plate wave snap ring (2).



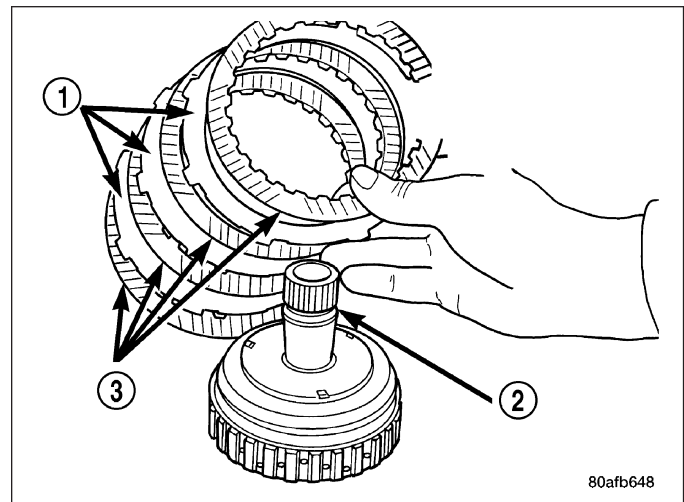
10. Remove OD shaft/hub and OD clutch pack (1).



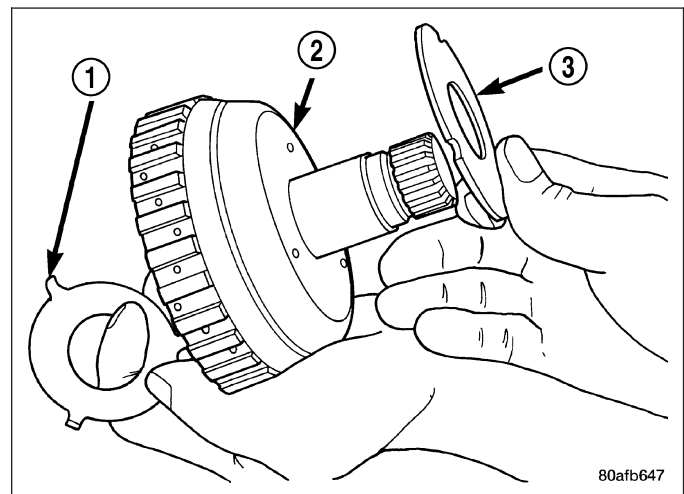


**Note:** Tag overdrive clutch pack for reassembly identification.

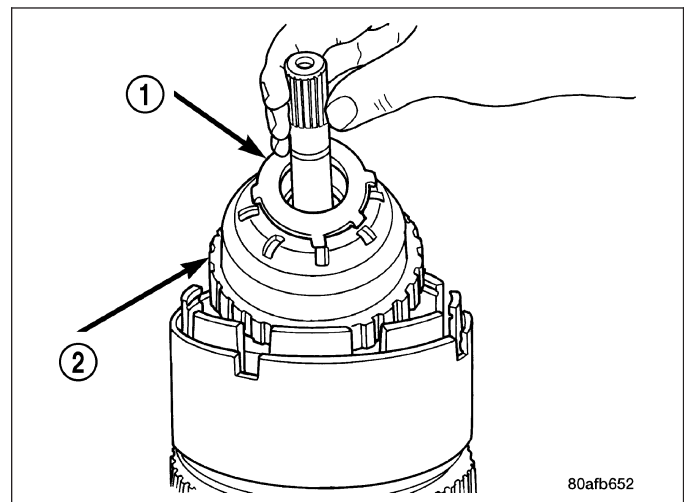
11. Remove the overdrive clutch (1, 3) from the overdrive hub/shaft (2).



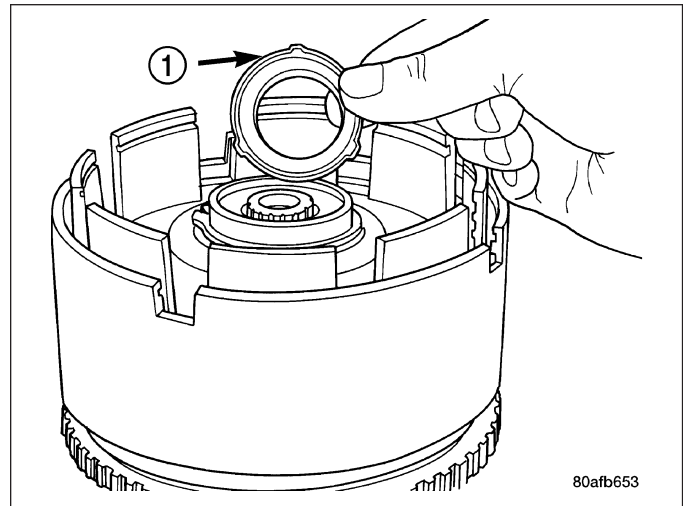
12. Remove and inspect number 3 and 4 thrust plates (1, 3).



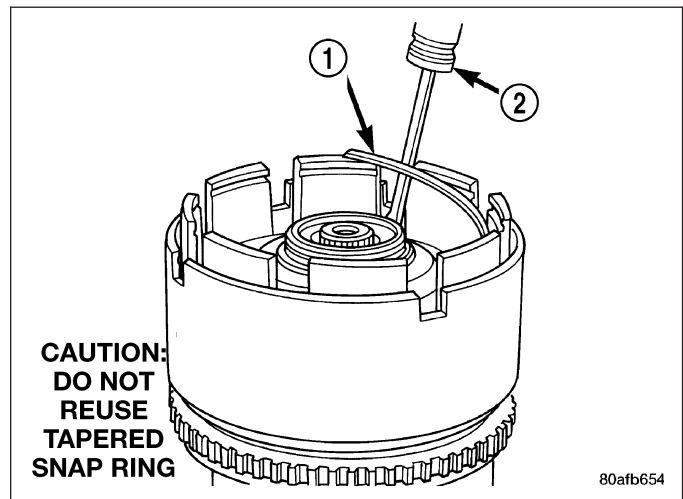
13. Remove the underdrive shaft assembly (2).



14. Remove the number 2 needle bearing (1).

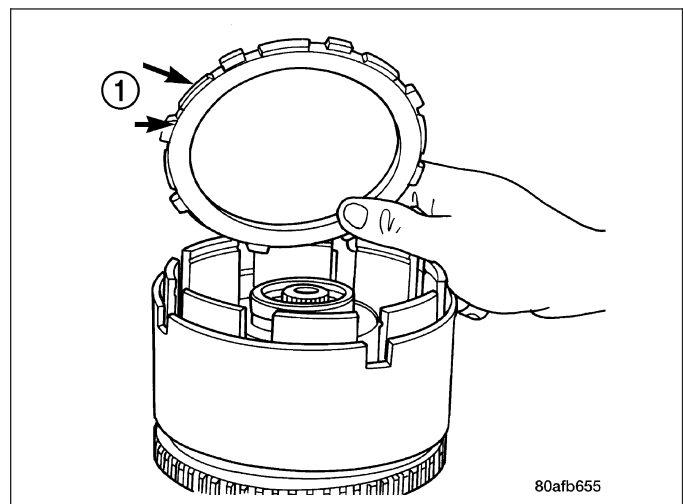


15. Remove the OD/UD reaction plate tapered snap ring (1).

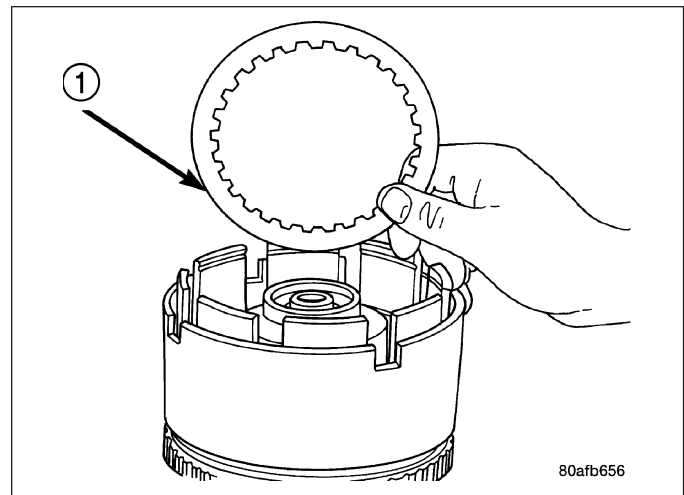


**Note:** The OD/UD clutch reaction plate has a step on both sides. The OD/UD clutches reaction plate goes tapered step side up.

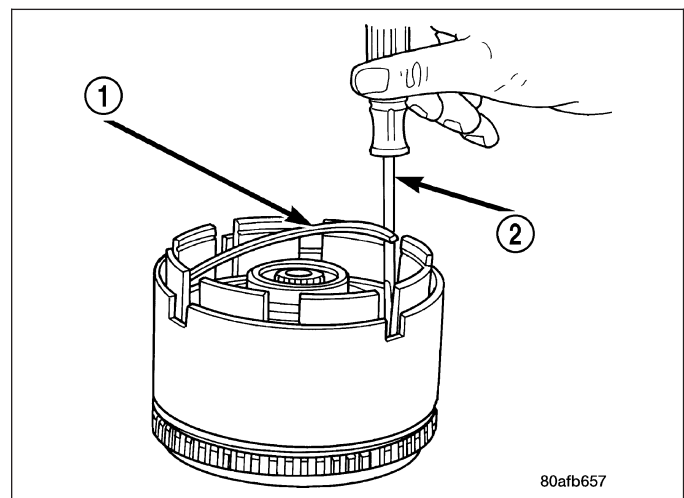
16. Remove the OD/UD reaction plate (1).



17. Remove the first UD clutch disc (1).

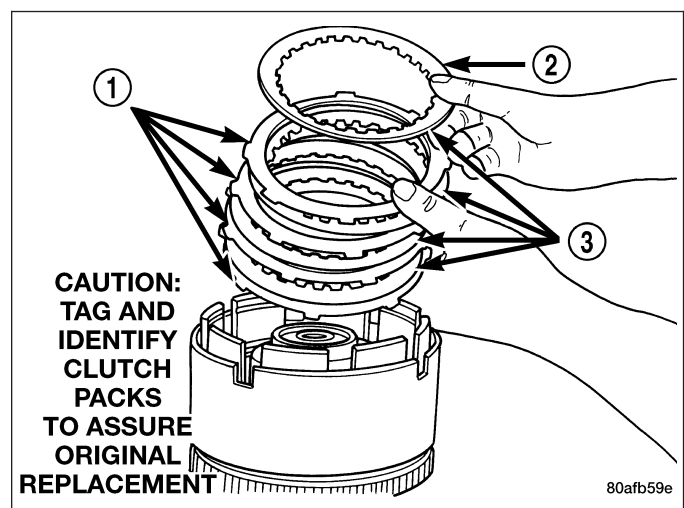


18. Remove the UD clutch flat snap ring (1).



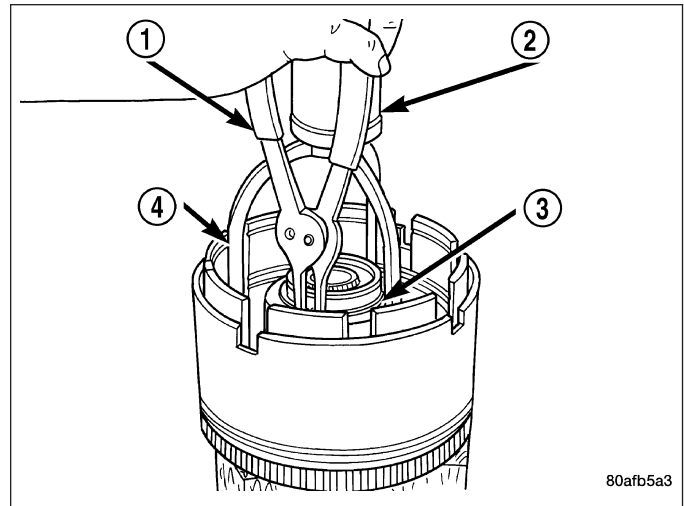
**Note: Tag underdrive clutch pack for reassembly identification.**

19. Remove the UD clutch pack (1, 3).

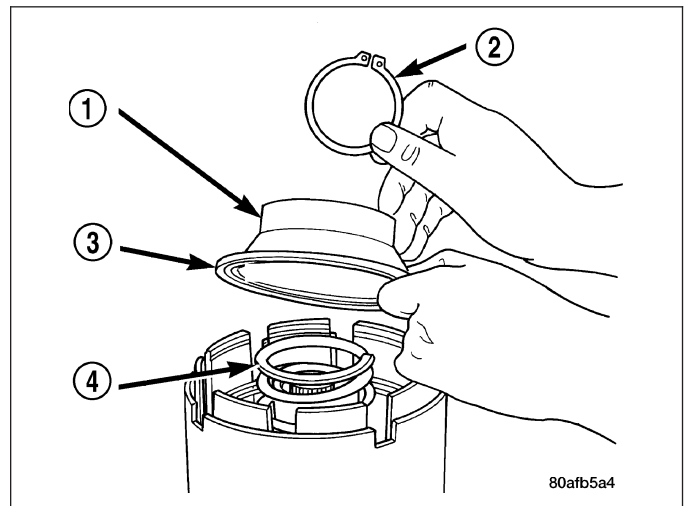


**CAUTION:** Compress return spring just enough to remove or install snap ring.

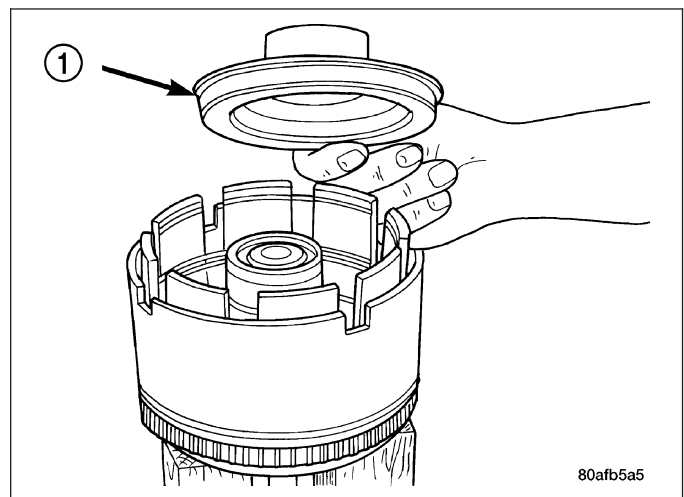
20. Using Tool 5059A (4) and an arbor press (2), compress UD clutch piston enough to remove snap ring (3).



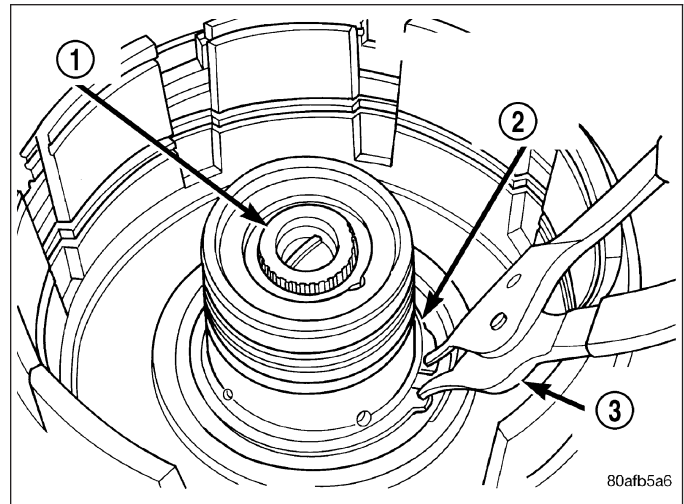
21. Remove the underdrive spring retainer snap ring (2), spring retainer (1), and spring (4).



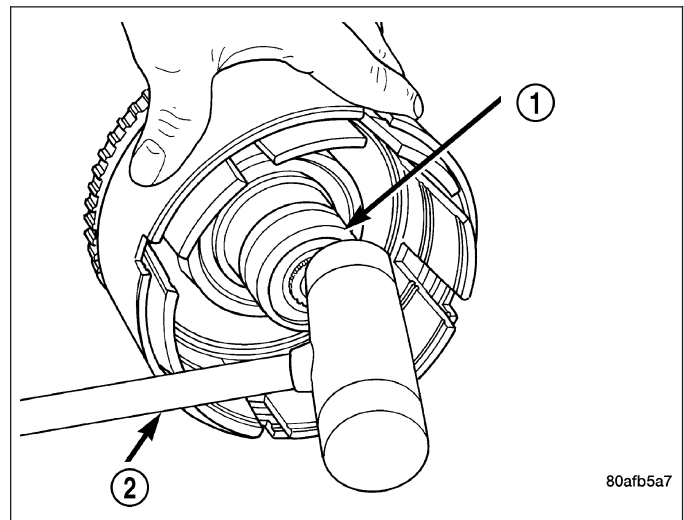
22. Remove the UD clutch piston (1).



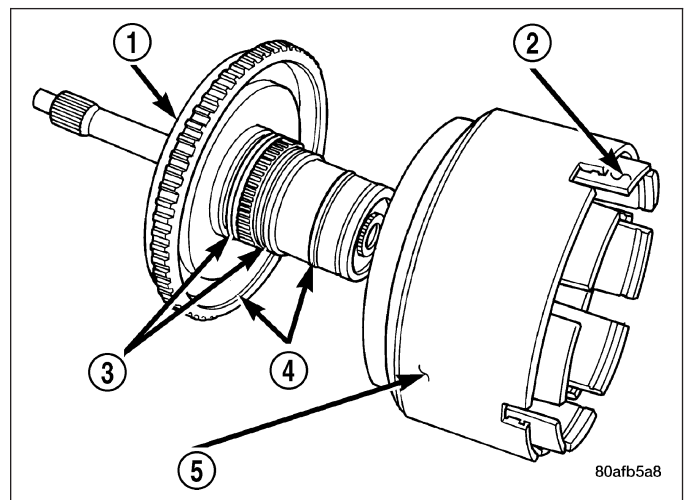
23. Remove the input hub tapered snap ring (2).



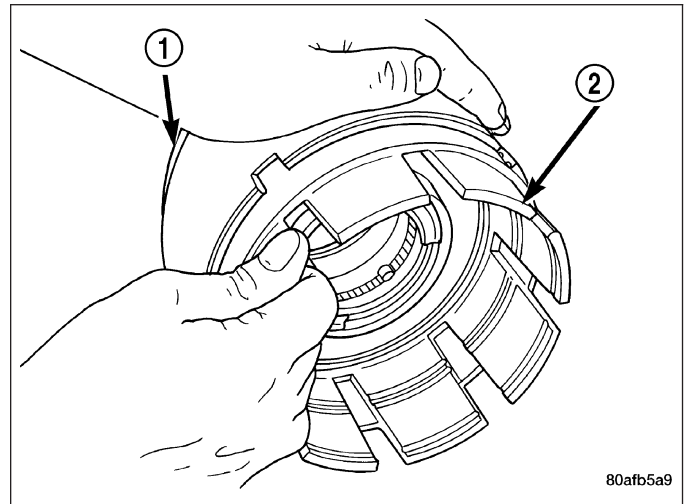
24. Tap on input hub (1) with soft faced hammer (2) and separate input hub from OD/Reverse piston and clutch retainer.



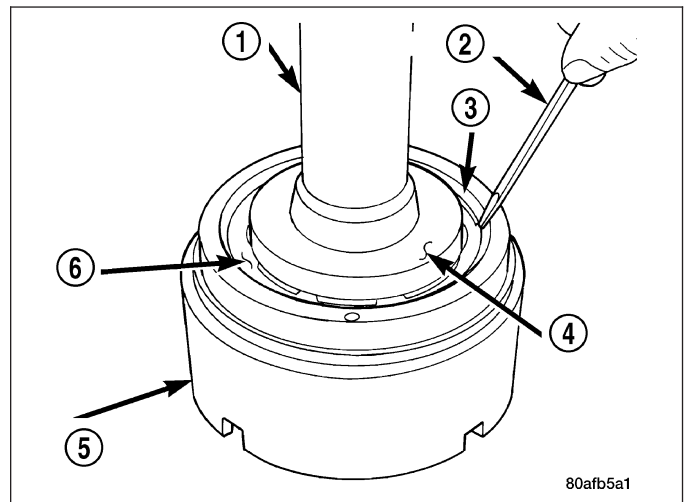
25. Separate the input hub from OD/Reverse piston (5) and clutch retainer (2).



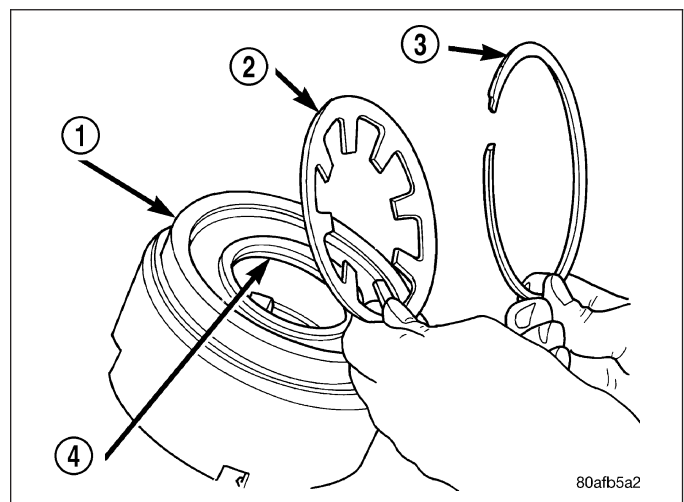
26. Separate clutch retainer (2) from OD/Reverse piston (1).



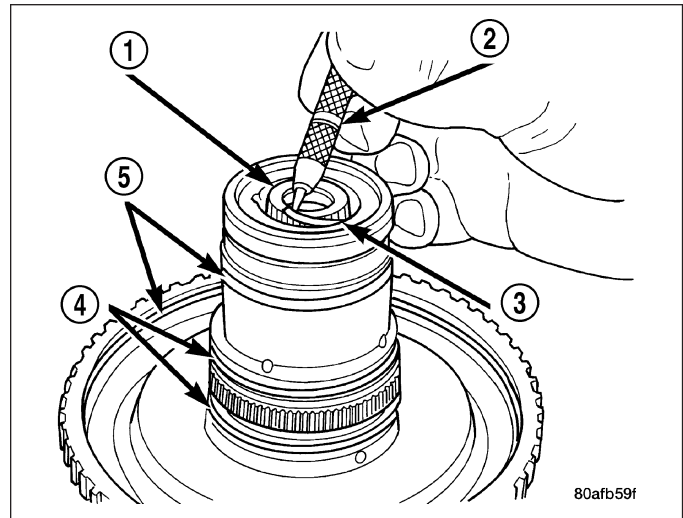
27. Using Tool 6057 (4) and an arbor press (1), compress OD/Reverse piston (5) return spring just enough to remove snap ring (3).



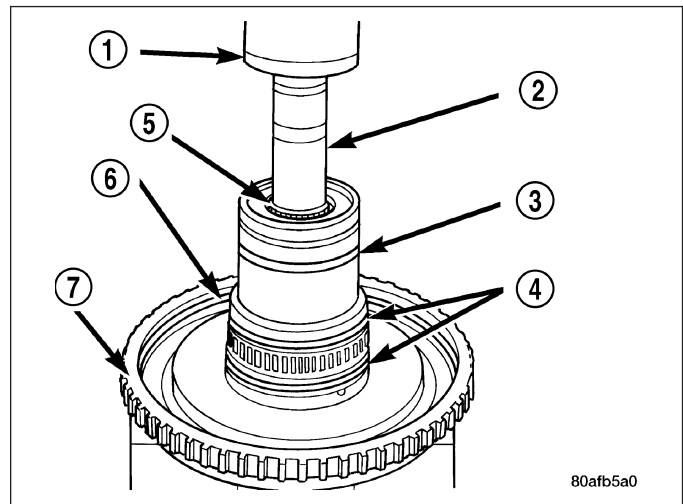
28. Remove the OD/Reverse piston (5) return spring and snap ring (3).



29. Remove input shaft (1) to input clutch hub snap ring (3).



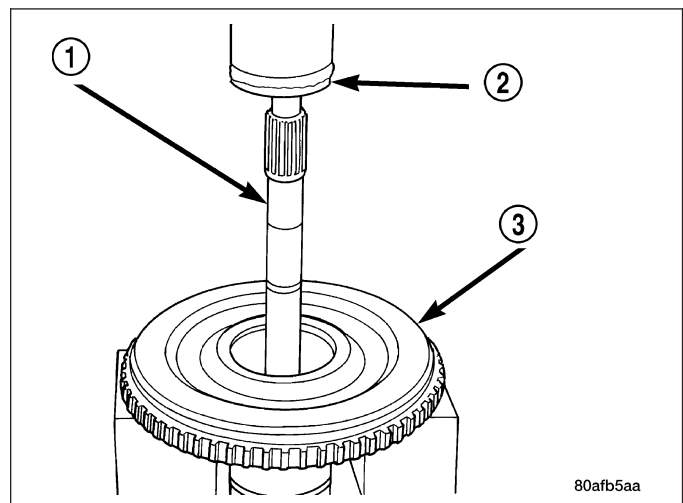
30. Using a suitably sized socket (2) and an arbor press (1), remove input shaft (5) from input shaft hub.



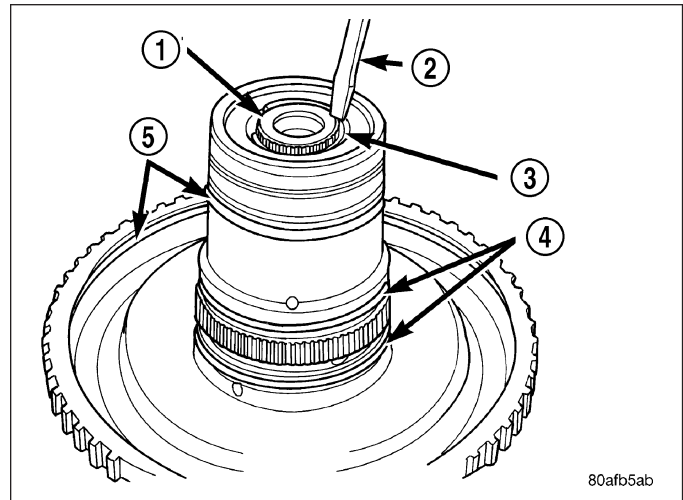
## ASSEMBLY

Use petrolatum on all seals to ease assembly of components.

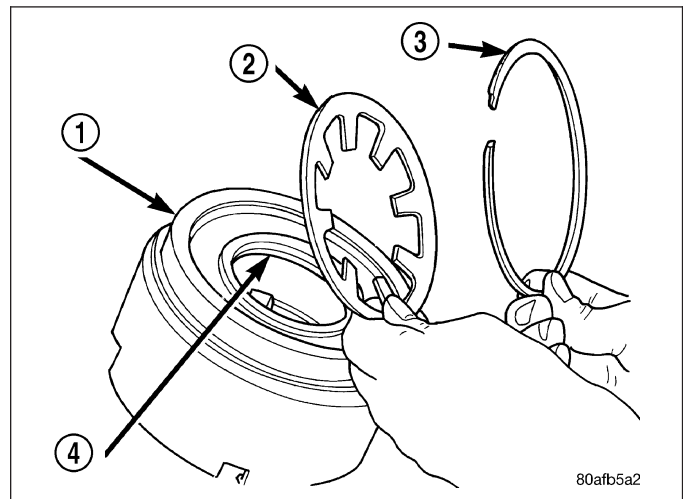
1. Using an arbor press(2), install input shaft (1) to input shaft hub (2).



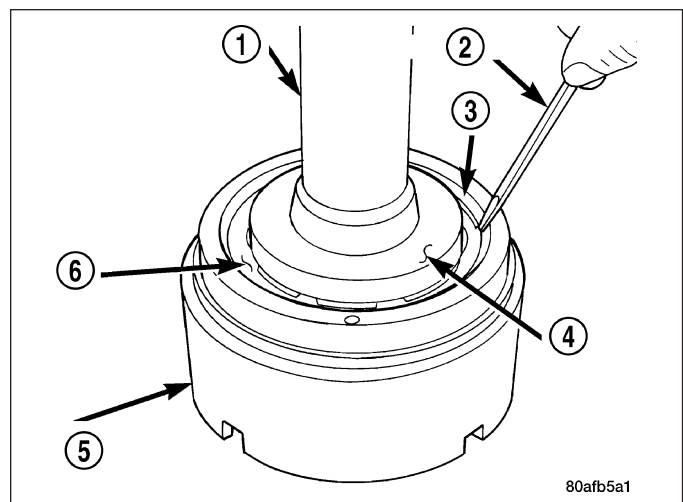
2. Install input shaft snap ring (3).



3. Position the OD/Reverse piston return spring (2) and snap ring (3) onto the OD/Reverse piston (1).

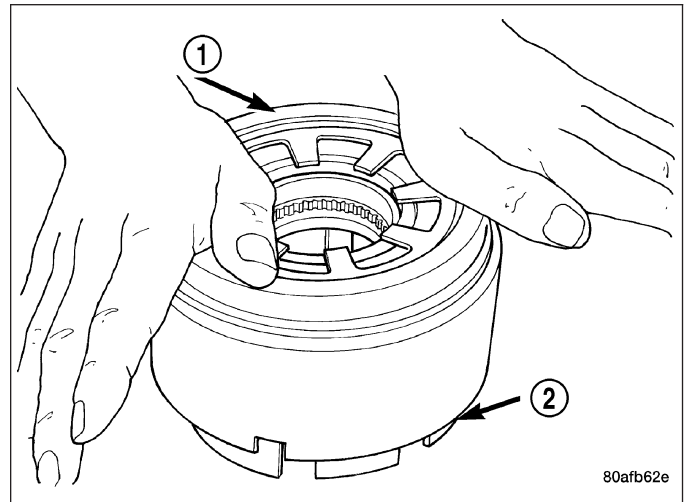


4. Using an arbor press (1) and Tool 6057 (4), install the OD/Reverse piston return spring (6) and snap ring (3).

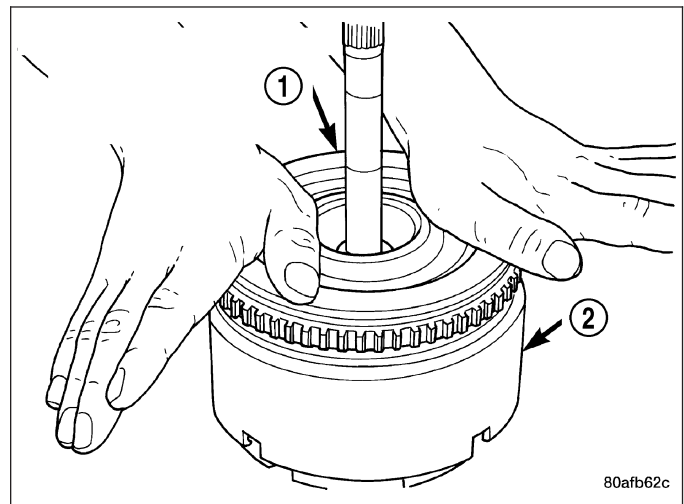




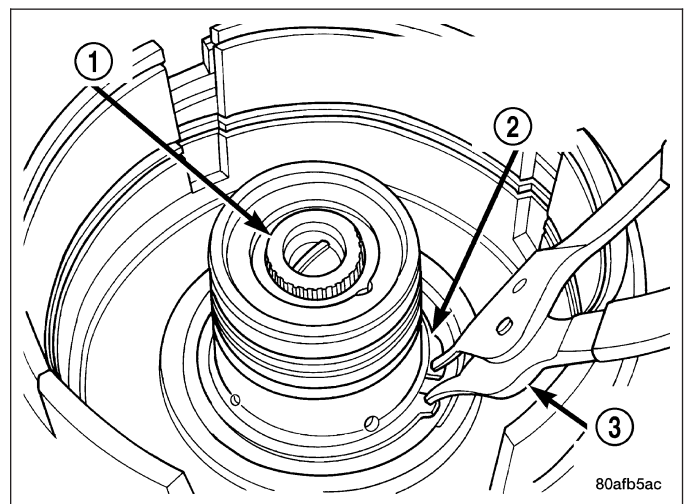
5. Install the OD/Reverse piston (1) assembly to the input clutch retainer (2).



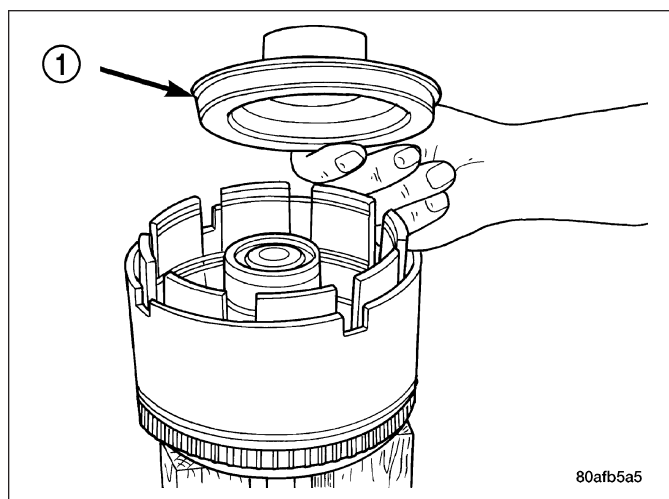
6. Install the input hub/shaft assembly (1) to the OD/Reverse piston/clutch retainer assembly (2).



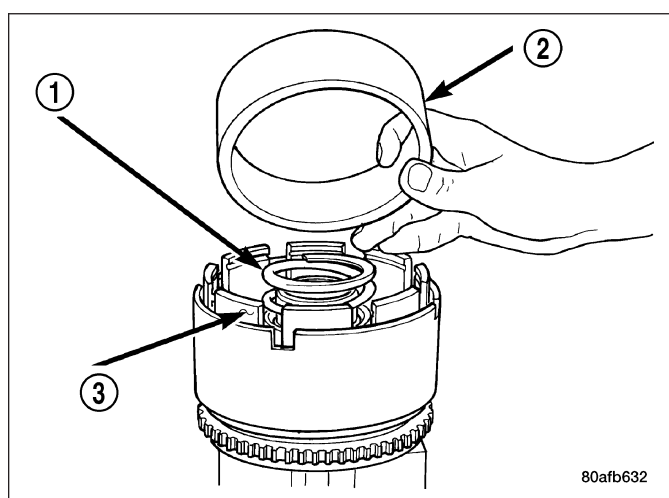
7. Install input hub tapered snap ring (2). **Make sure snap ring is fully seated.**



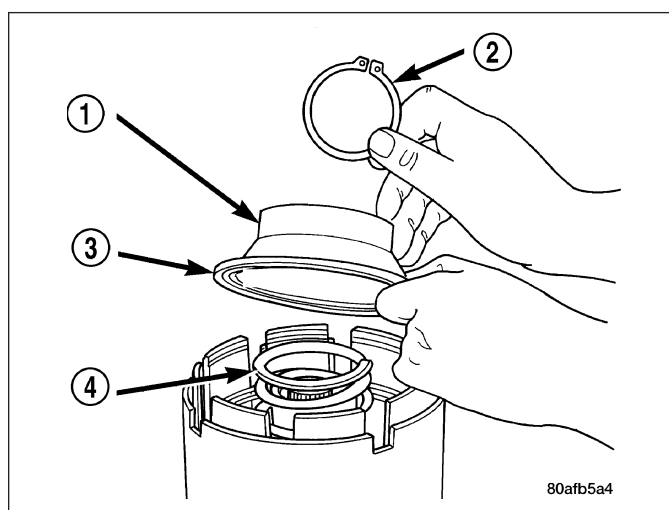
8. Install the UD clutch piston (1).



9. Install UD piston return spring (1) and Tool 5067 (2).

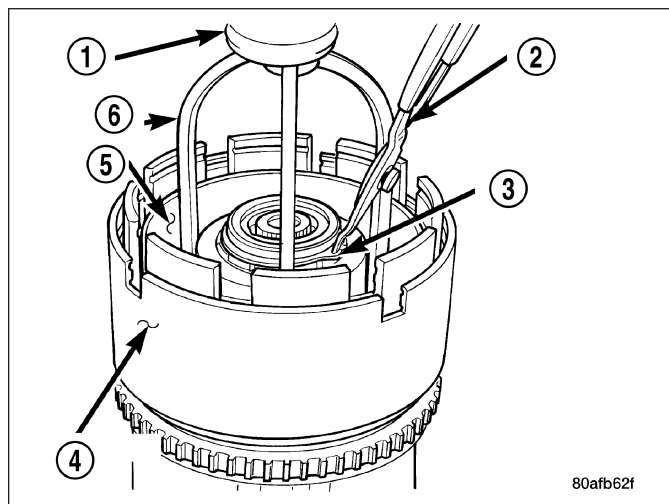


10. Position the UD spring retainer (1) and snap ring (2) on the piston return spring (4).

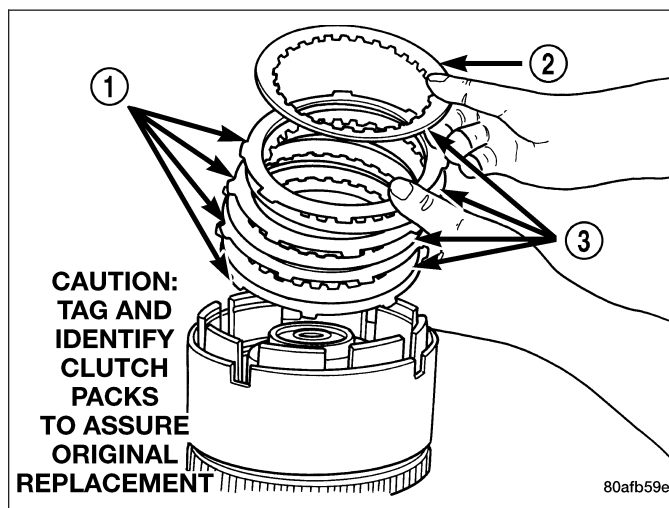


**CAUTION:** Compress return spring just enough to install snap ring.

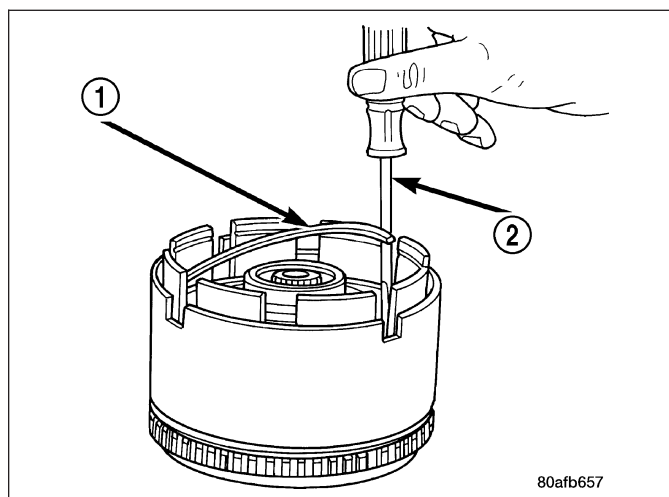
11. Using Tool 5059A (6) and an arbor press (1), install the UD spring retainer and snap ring (3).



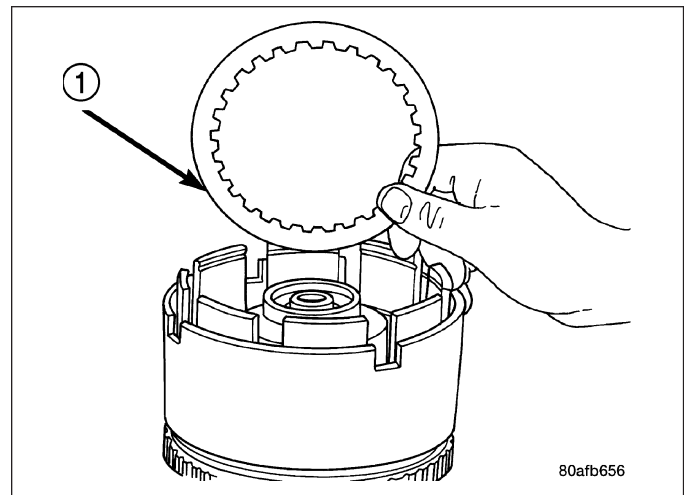
12. Install the UD clutch pack (four fibers/four steels) (1, 3). Leave the top disc (2) out until after the snap ring is installed.



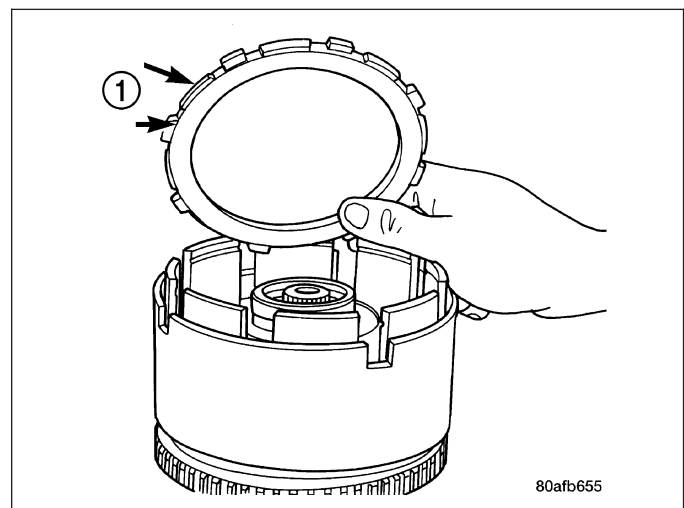
13. Install the UD clutch flat snap ring (1).



14. Install the last UD clutch disc (1).

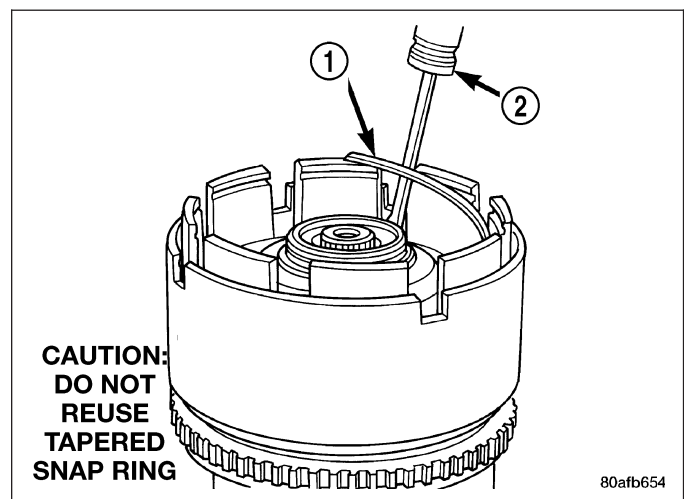


15. Install the OD/UD clutch reaction plate (1). The OD/UD clutches reaction plate has a step on both sides. Install the OD/UD clutches reaction plate tapered step side up.

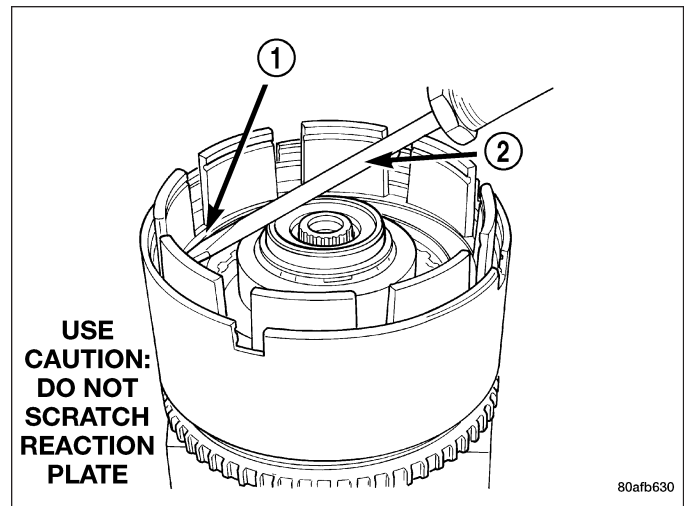


**Note:** Snap ring ends must be located within one finger of the input clutch hub. Be sure that snap ring is fully seated, by pushing with screwdriver, into snap ring groove all the way around.

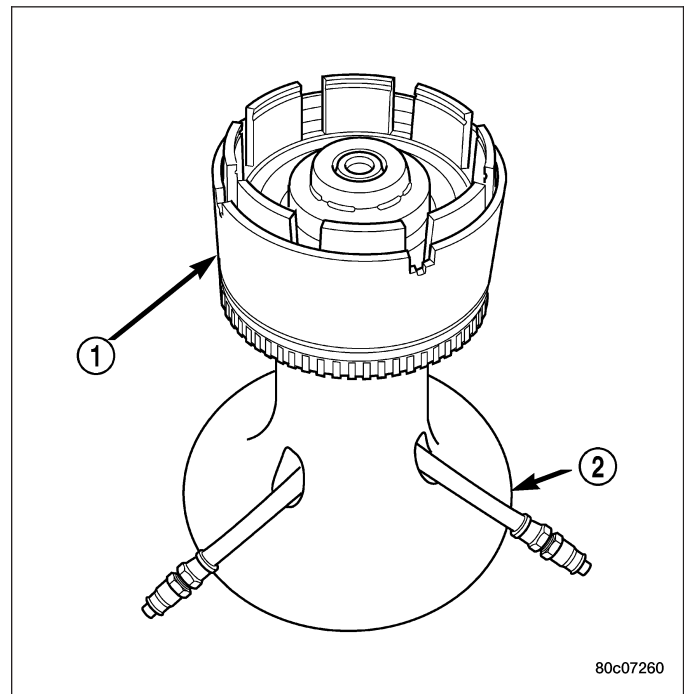
16. Install the UD/OD tapered snap ring (1).



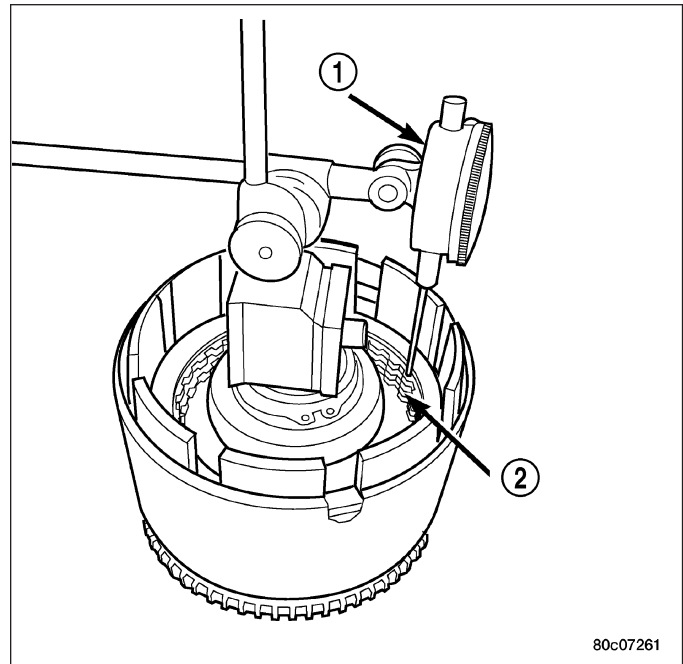
17. Seat tapered snap ring (1) to ensure proper installation.



18. Install input clutch assembly (1) to the Input Clutch Pressure Fixture 8391 (2).



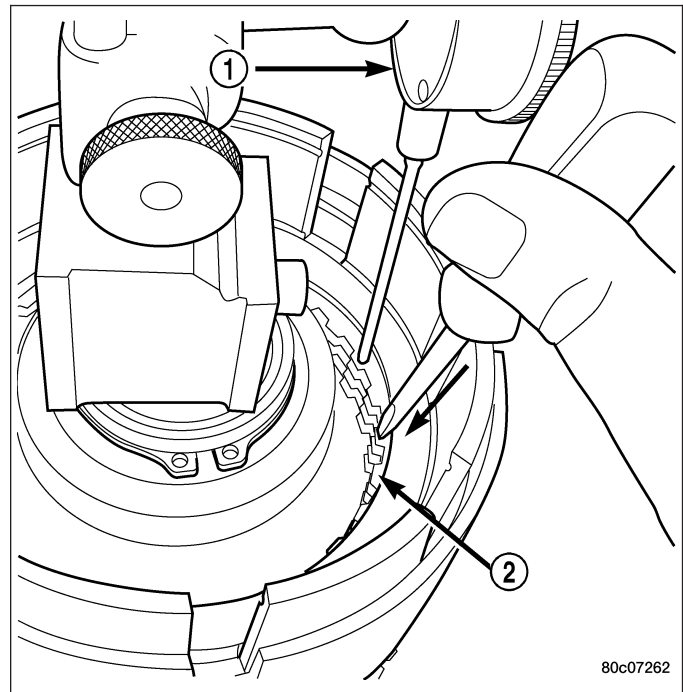
19. Set up dial indicator (1) on the UD clutch pack (2).



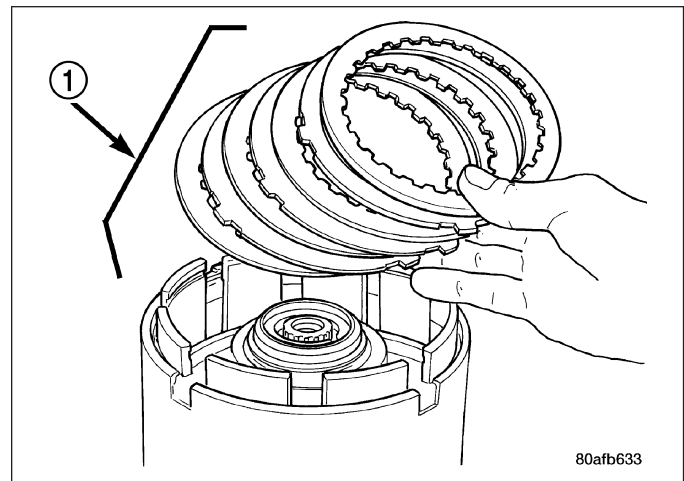
20. Using moderate pressure, press down and hold (near indicator) the UD clutch pack (2) with screwdriver or suitable tool and zero dial indicator (1). When releasing pressure on clutch pack, indicator reading should advance 0.005-0.010 inches.

**CAUTION: Do not apply more than 30 psi (206 kPa) to the underdrive clutch pack.**

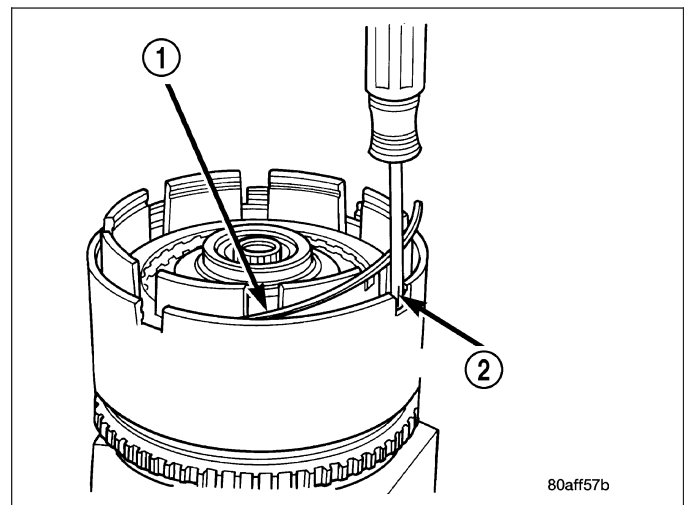
21. Apply 30 psi (206 kPa) to the underdrive hose on Tool 8391 and measure UD clutch clearance. Measure and record UD clutch pack measurement in four (4) places, 90° apart.
22. Take average of four measurements and compare with UD clutch pack clearance specification. **Underdrive clutch pack clearance must be 0.94-1.50 mm (0.037-0.059 in.).**
23. If necessary, select the proper reaction plate to achieve specifications.



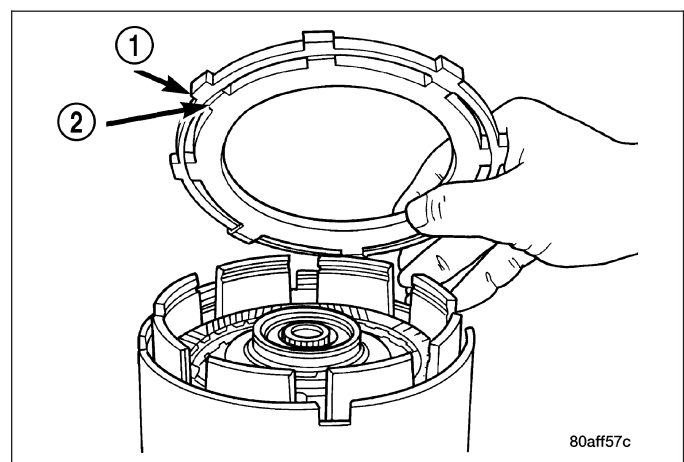
24. Install the OD clutch pack (four fibers/three steels) (1).



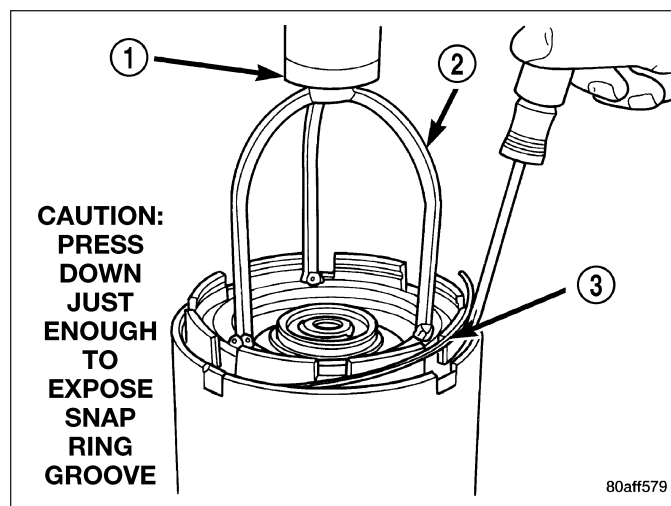
25. Install OD reaction plate waved snap ring (1).



26. Install the OD/Reverse reaction plate (1) with large step down (towards OD clutch pack).



27. Install OD reaction plate flat snap ring (3).

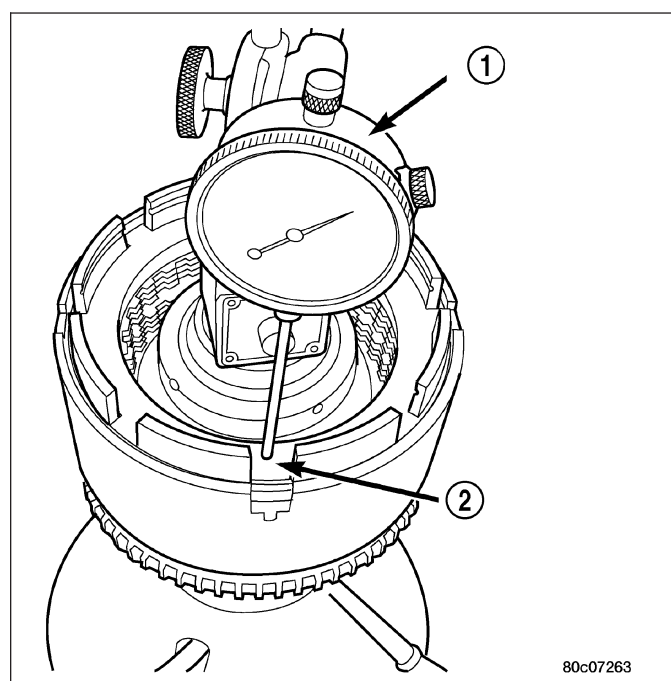


28. Measure OD clutch pack clearance. Set up dial indicator (1) on top of the OD/Reverse reaction plate (2).

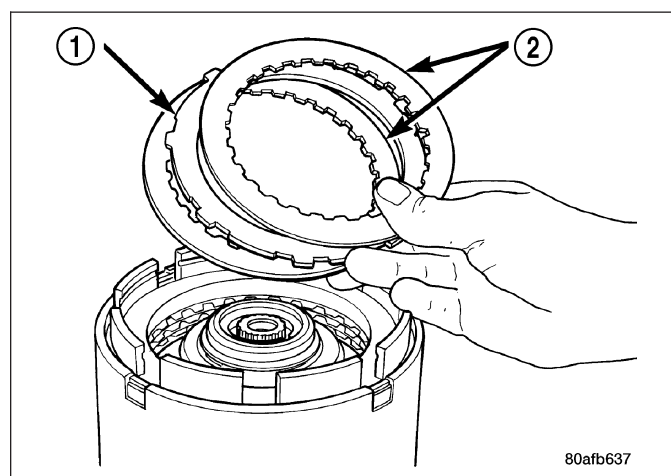
29. Zero dial indicator and apply 30 psi (206 kPa) air pressure to the overdrive clutch hose on Tool 8391. Measure and record OD clutch pack measurement in four (4) places, 90° apart.

30. Take average of four measurements and compare with OD clutch pack clearance specification. **The overdrive (OD) clutch pack clearance is 1.07-3.25 mm (0.042-0.128 in.).**

If not within specifications, the clutch is not assembled properly. There is no adjustment for the OD clutch clearance.

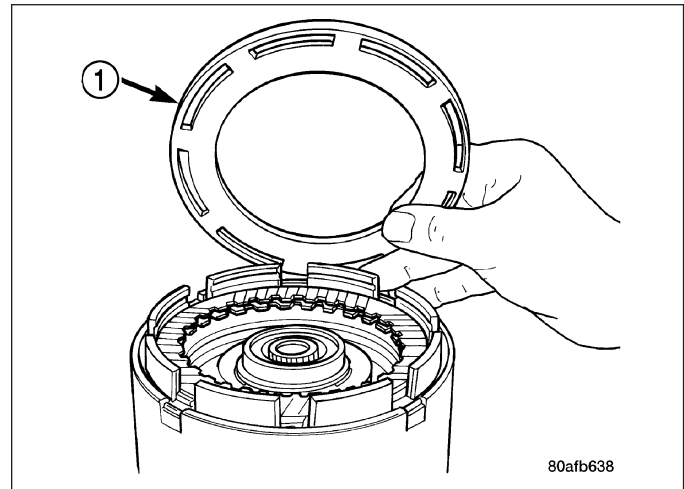


31. Install reverse clutch pack (two fibers/one steel) (1, 2).

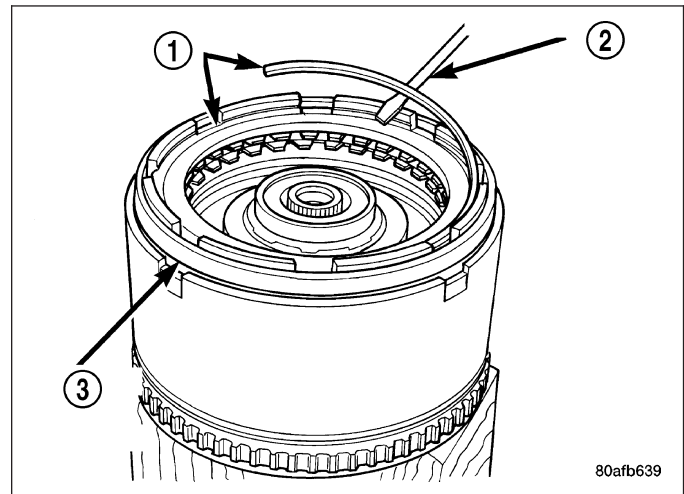




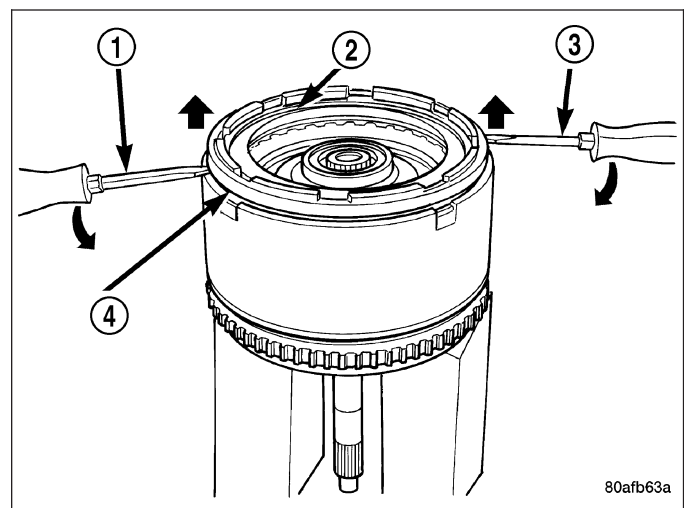
32. Install reverse clutch reaction plate (1) with the flat side down towards reverse clutch.



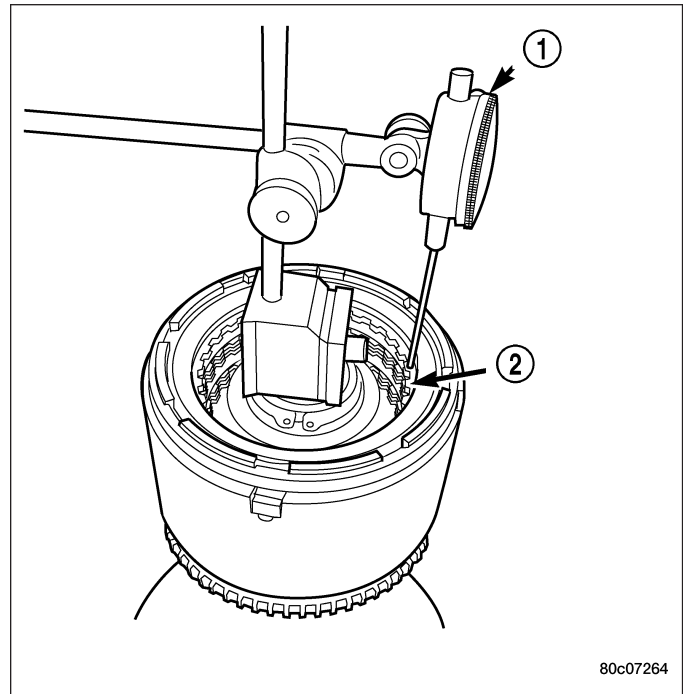
33. Tap reaction plate (3) down to allow installation of the reverse clutch snap ring (1). Install reverse clutch snap ring (1).



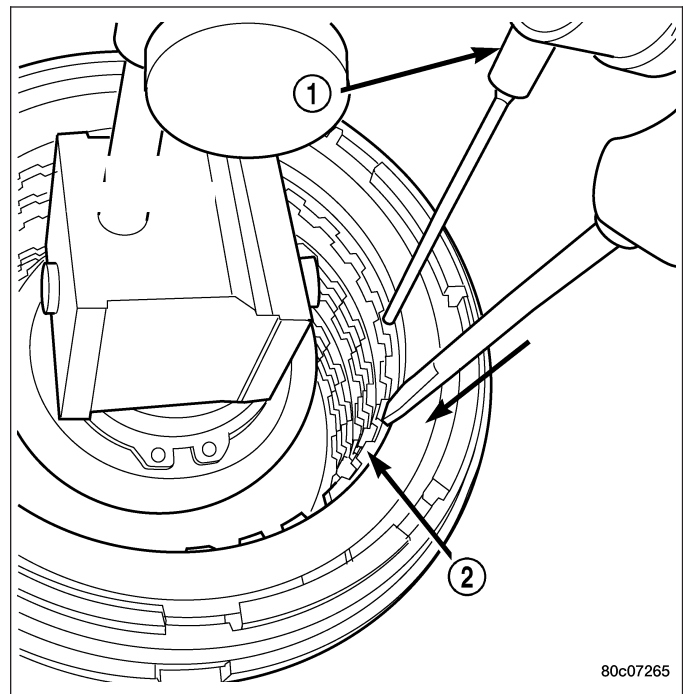
34. Pry up reverse reaction plate (4) to seat against snap ring (2).



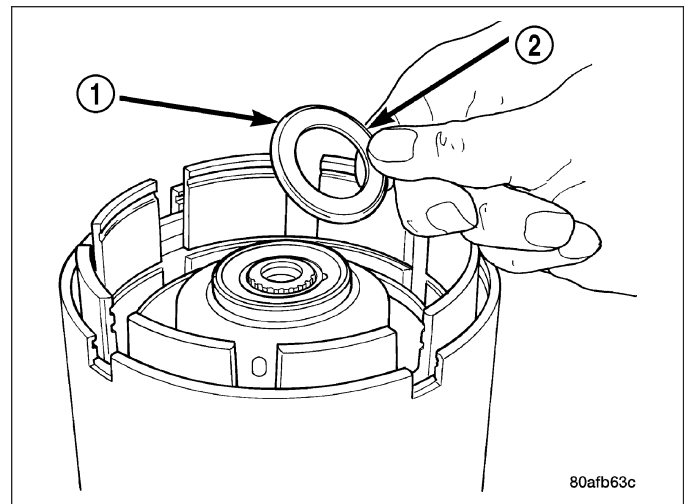
35. Set up a dial indicator (1) on the reverse clutch pack (2).



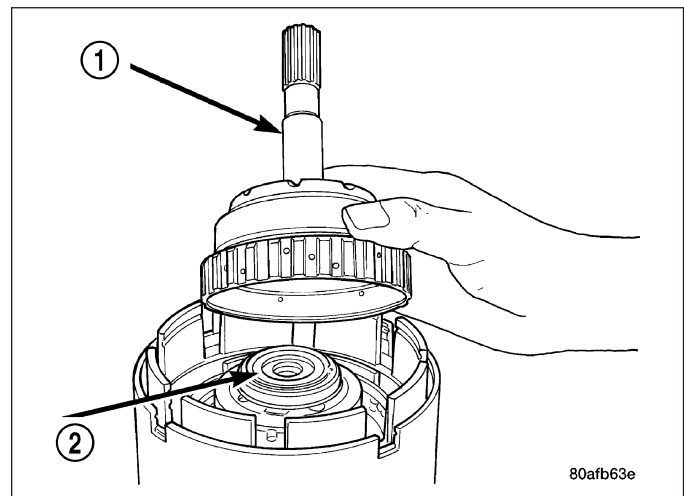
36. Using moderate pressure, press down and hold (near indicator) reverse clutch disc (2) with screwdriver or suitable tool and zero dial indicator (1). When releasing pressure, indicator should advance 0.005-0.010 inches as clutch pack relaxes.
37. Apply 30 psi (206 kPa) air pressure to the reverse clutch hose on Tool 8391. Measure and record reverse clutch pack measurement in four (4) places, 90° apart.
38. Take average of four measurements and compare with reverse clutch pack clearance specification. **The reverse clutch pack clearance is 0.89-1.37 mm (0.035-0.054 in.).** Select the proper reverse clutch snap ring to achieve specifications.
39. To complete the assembly, reverse clutch and overdrive clutch must be removed.



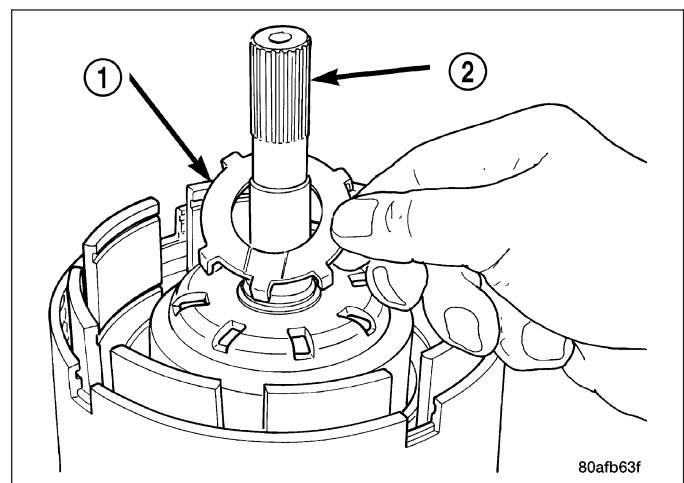
40. Install the number 2 needle bearing (1).



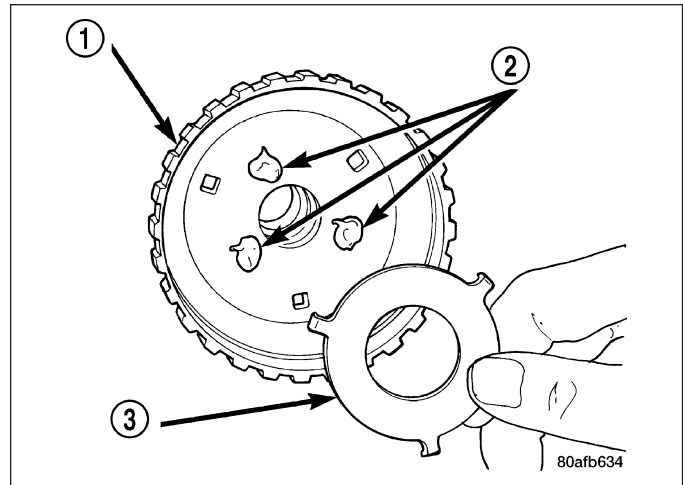
41. Install the underdrive shaft assembly (1).



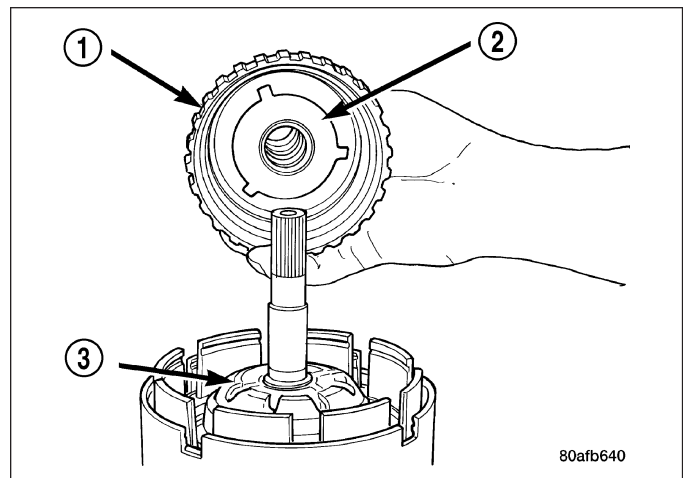
42. Install the number 3 thrust washer (1) to the underdrive shaft assembly (2). Be sure five tabs are seated properly.



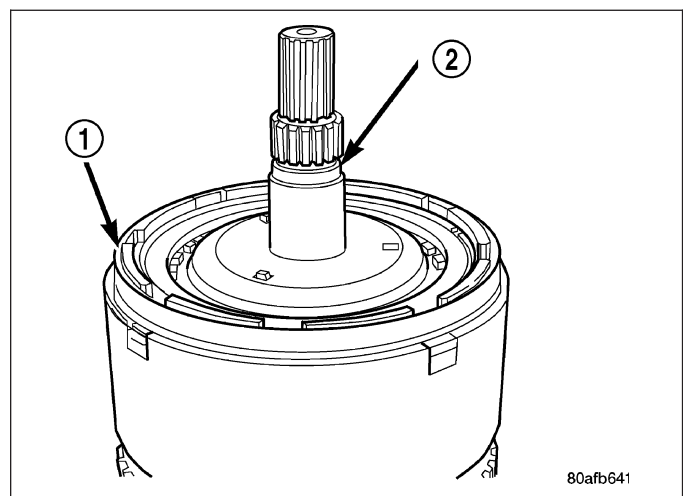
43. Install the number 3 thrust plate (3) to the bottom of the overdrive shaft assembly (1). Retain with petrolatum or transmission assembly gel (2).



44. Install the overdrive shaft assembly (1).



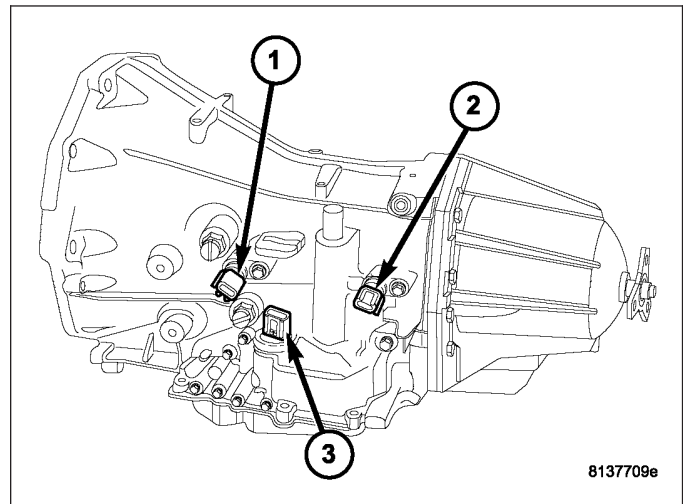
45. Reinstall overdrive and reverse clutch. **Rechecking these clutch clearances is not necessary.**



## SENSOR-INPUT SPEED

### DESCRIPTION

The Input (1) and Output (2) Speed Sensors are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).



### OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

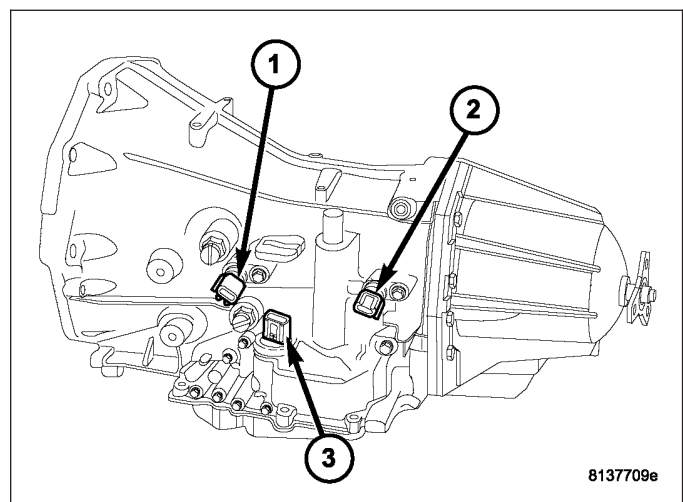
- Torque converter clutch slippage
- Torque converter element speed ratio

### REMOVAL

1. Raise vehicle.
2. Place a suitable fluid catch pan under the transmission.
3. Remove the wiring connector from the input speed sensor 91).

**Note:** The speed sensor bolt has a sealing patch applied from the factory. Be sure to reuse the same bolt.

4. Remove the bolt holding the input speed sensor (1) to the transmission case.
5. Remove the input speed sensor (1) from the transmission case.

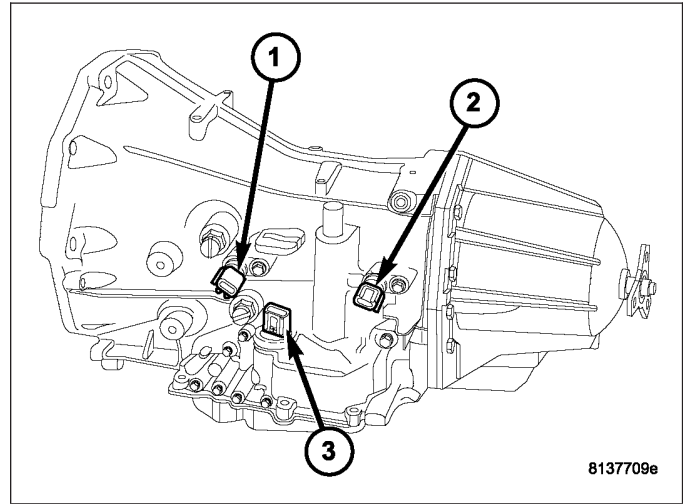


## INSTALLATION

1. Install the input speed sensor (1) into the transmission case.

**Note:** Before installing the speed sensor bolt, it will be necessary to replenish the sealing patch on the bolt using Mopar® Lock & Seal Adhesive.

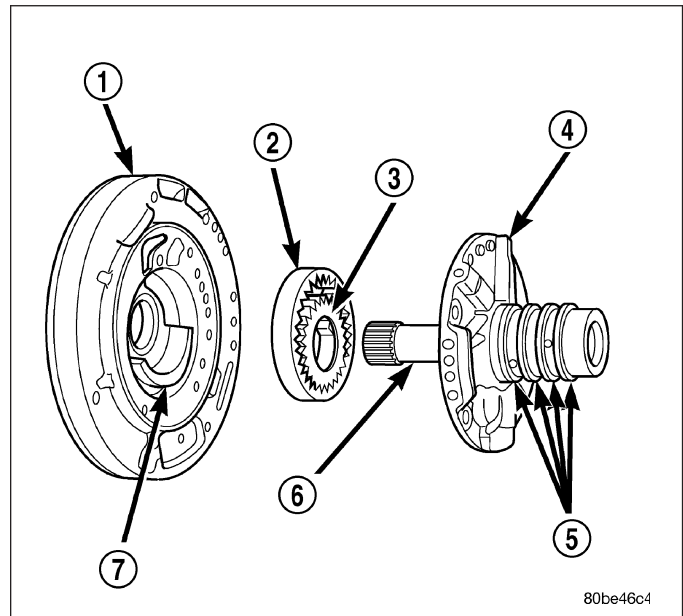
2. Install the bolt to hold the input speed sensor (1) into the transmission case. Tighten the bolt to 9 N·m (80 in.lbs.).
3. Install the wiring connector onto the input speed sensor
4. Verify the transmission fluid level. Add fluid as necessary. (Refer to 21 - TRANSMISSION/AUTOMATIC TRANSMISSION - 42RLE/FLUID - STANDARD PROCEDURE)
5. Lower vehicle.



## PUMP-OIL

### DESCRIPTION

The oil pump is located in the pump housing inside the bell housing of the transmission case. The oil pump assembly consists of an inner (3) and outer (2) gear, a housing (1), and a cover that also serves as the reaction shaft support (6).

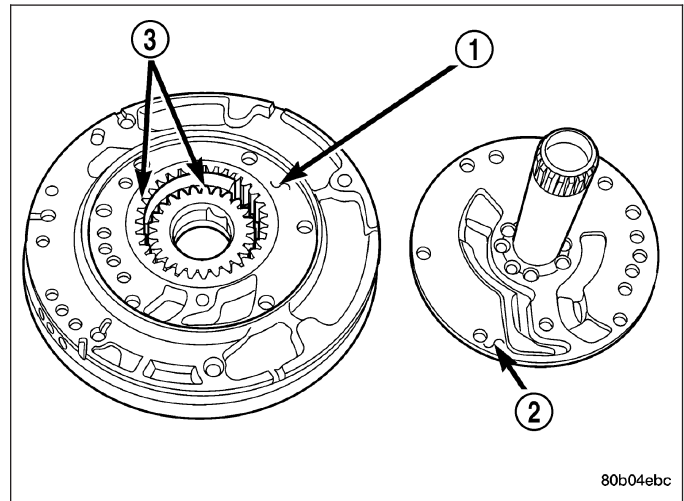


### OPERATION

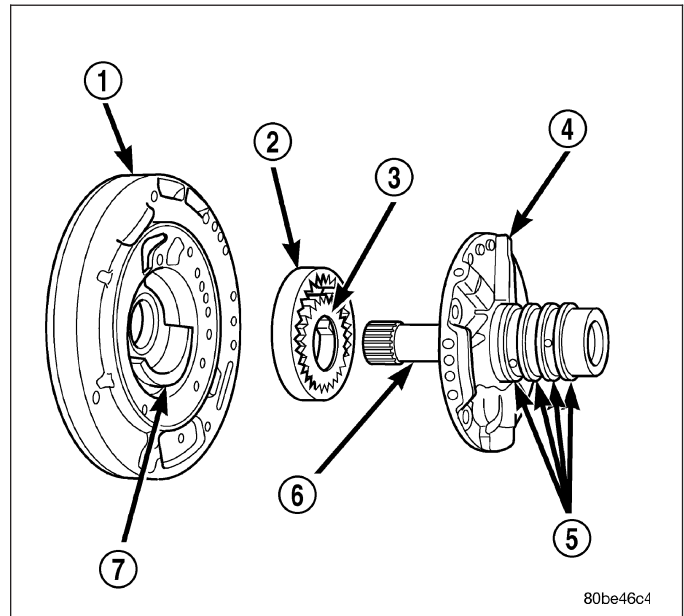
As the torque converter rotates, the converter hub rotates the inner and outer gears. As the gears rotate, the clearance between the gear teeth increases in the crescent area, and creates a suction at the inlet side of the pump. This suction draws fluid through the pump inlet from the oil pan. As the clearance between the gear teeth in the crescent area decreases, it forces pressurized fluid into the pump outlet and to the valve body.

## DISASSEMBLY

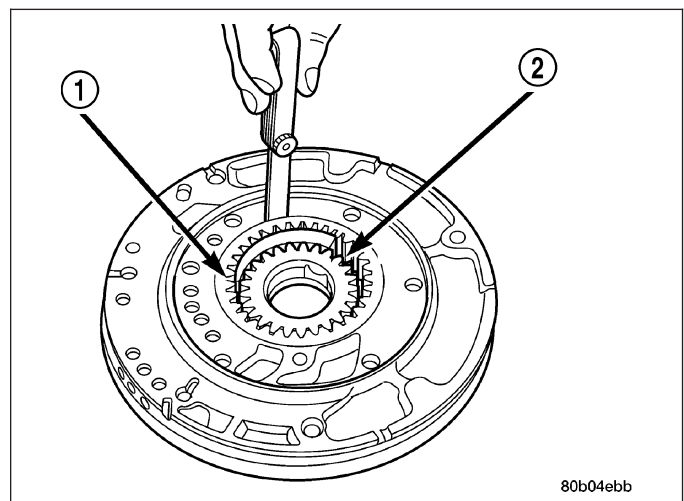
1. Remove the reaction shaft support bolts.
2. Remove the reaction shaft support(2) from the pump housing (1).



3. Remove the pump gears (2, 3) and check for wear and damage on pump housing (1) and gears (2, 3).



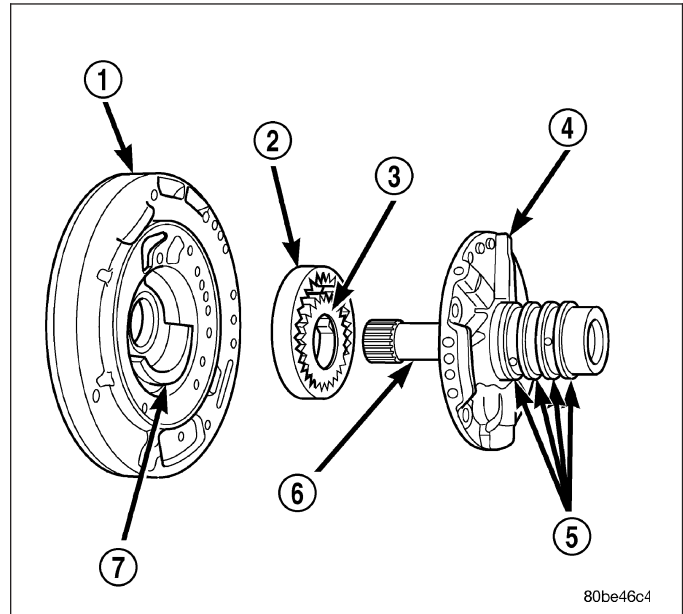
4. Re-install the gears and check clearances.
5. Measure the clearance between the outer gear (1) and the pump pocket (2). Clearance should be 0.089-0.202 mm (0.0035-0.0079 in.).
6. Measure clearance between outer gear and crescent. Clearance should be 0.060-0.298 mm (0.0023-0.0117 in.).
7. Measure clearance between inner gear and crescent. Clearance should be 0.093-0.385 mm (0.0036-0.0151 in.).
8. Position an appropriate piece of Plastigage across both pump gears.
9. Align the Plastigage to a flat area on the reaction shaft support housing.



10. Install the reaction shaft to the pump housing. Tighten the bolts to 27 N·m (20 ft. lbs.).
11. Remove bolts and carefully separate the housings. Measure the Plastigage following the instructions supplied.
12. Clearance between outer gear side and the reaction shaft support should be 0.020-0.046 mm (0.0008-0.0018 in.). Clearance between inner gear side and the reaction shaft support should be 0.020-0.046 mm (0.0008-0.0018 in.).

## ASSEMBLY

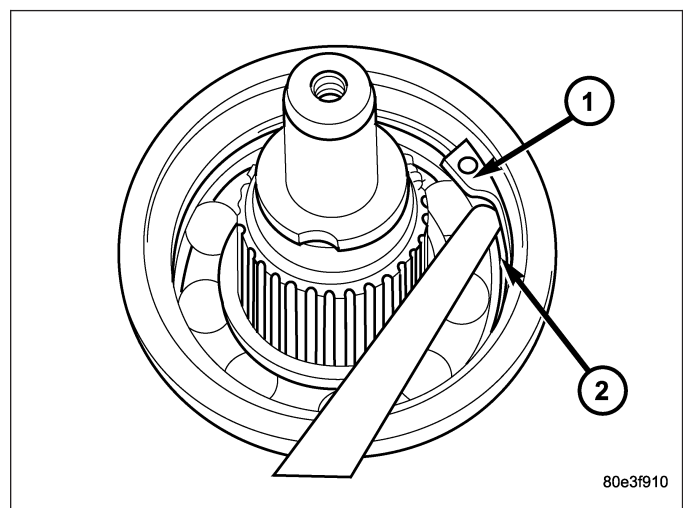
1. Assemble oil pump as shown
2. Install and torque reaction shaft support-to-oil pump housing bolts to 28 N·m (20 ft. lbs.) torque.



## BEARING-OUTPUT SHAFT

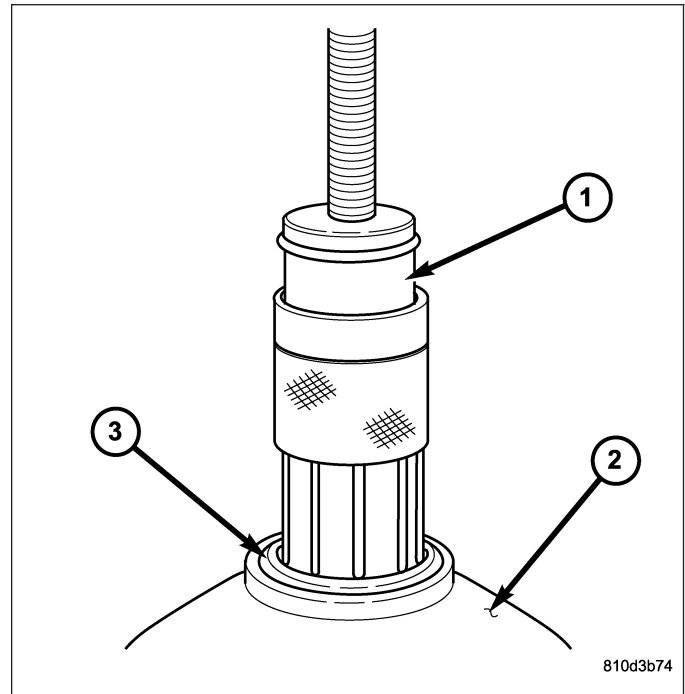
### REMOVAL

1. Raise and support vehicle.
2. Remove the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL).
3. Verify that the transmission is in PARK in order to prepare for the removal of the output shaft nut.
4. Remove the nut holding the propeller shaft flange to the output shaft and remove the flange.
5. Remove the transmission rear oil seal with a suitable slide hammer and screw.
6. Remove the transmission rear output shaft bearing retaining ring (1).

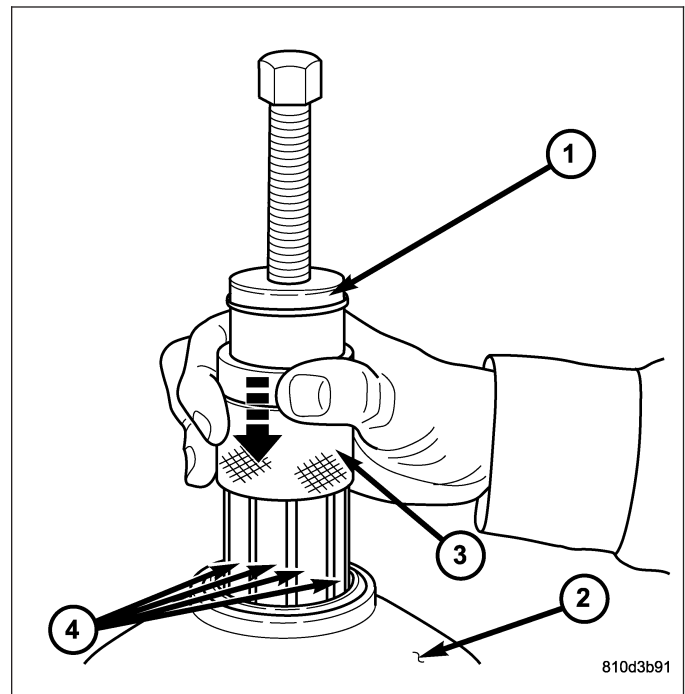




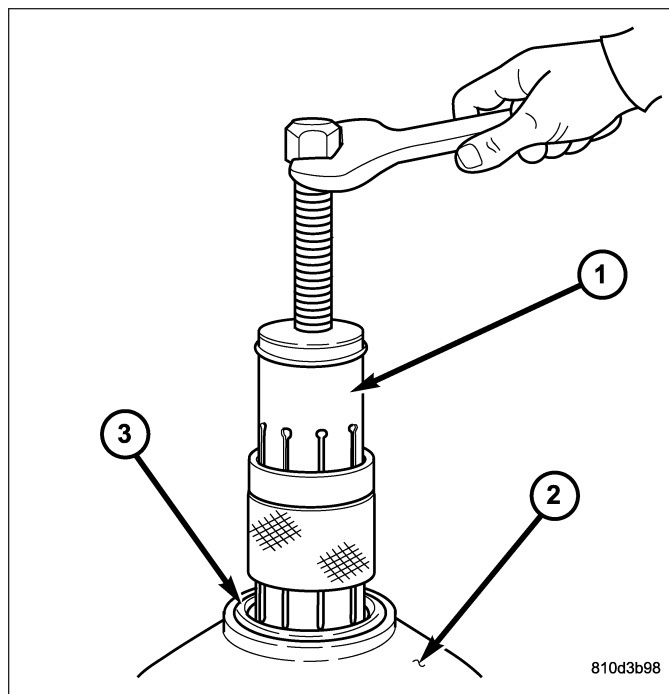
7. Position Bearing Remover 9082 (1) over the inner race of the output shaft bearing.



8. Slide the collar (3) on the Bearing Remover 9082 (1) downward over the fingers (3) of the tool.

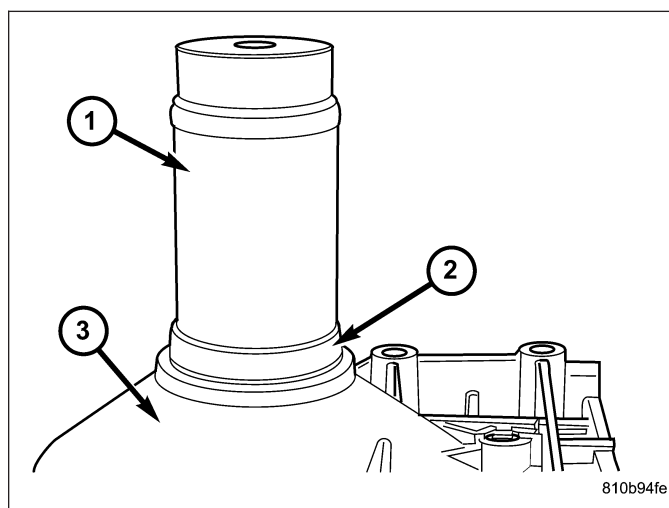


9. Remove the output shaft bearing (3).

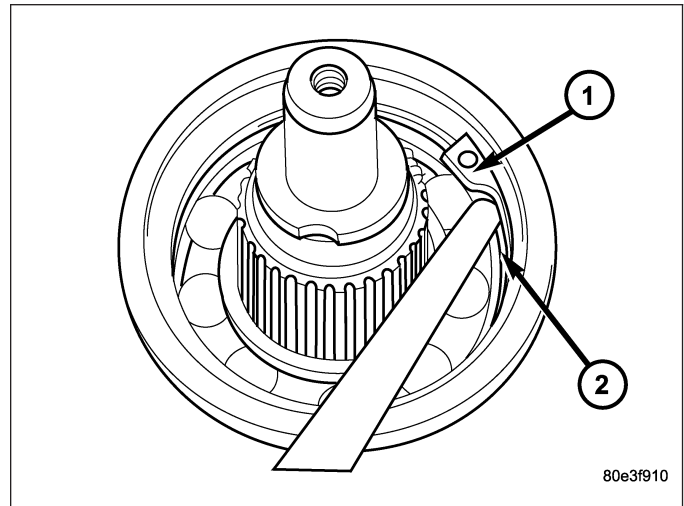


## INSTALLATION

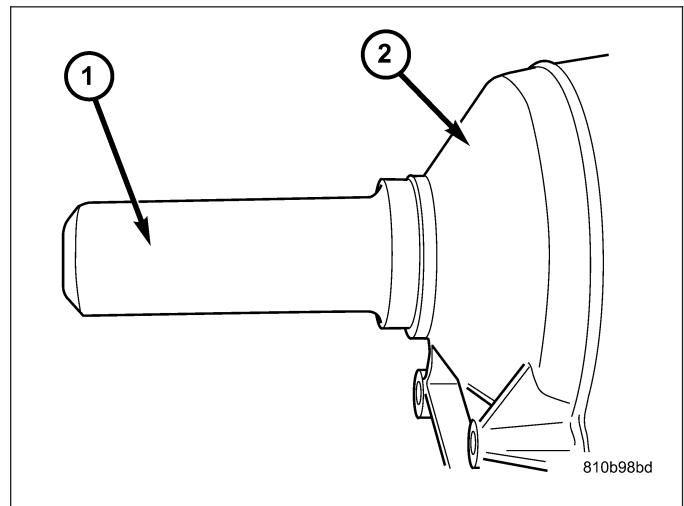
1. Install output shaft bearing in the rear transmission housing. Using Bearing Installer 9287 (1), install the output shaft bearing (2) into the transmission housing. **The closed side of the plastic cage must point towards the transmission.**



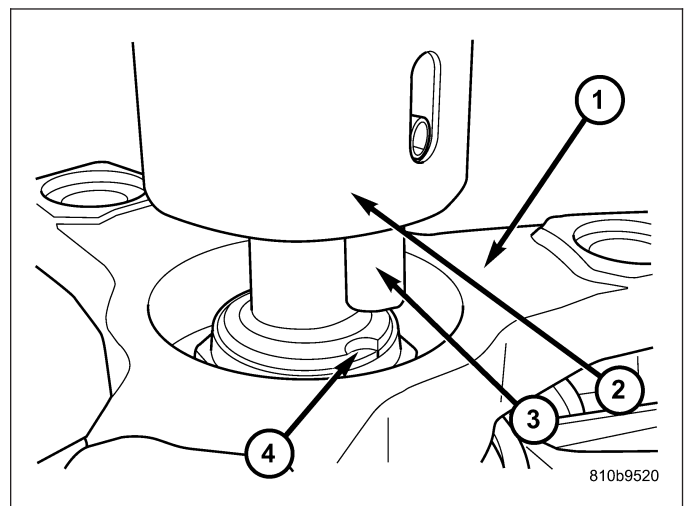
2. Install the retaining ring (1). Ensure that the retaining ring is seated correctly in the groove.
3. Install the output shaft washer onto the output shaft.



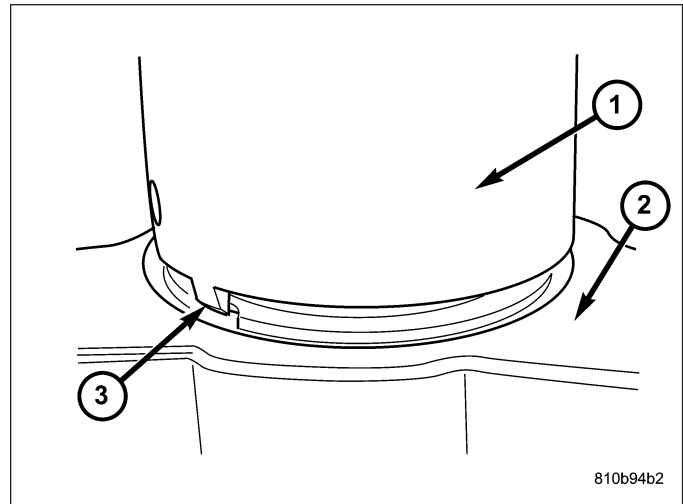
4. Install a new transmission rear seal into the transmission case with Seal Installer 8902A (1).
5. Verify that the transmission is in PARK in order to prepare for the installation of the output shaft nut.
6. Install the propeller shaft flange onto the output shaft and install a new flange nut. Tighten the flange nut to 120 N·m (88.5 ft.lbs.).



7. Stake the output shaft nut to the output shaft as follows. Place the Staking Tool 9078 (2) and Driver Handle C-4171 onto the output shaft.
8. Rotate the Staking Tool 9078 (2) until the alignment pin (3) engages the output shaft notch (4).



9. Press downward on the staking tool (1) until the staking pin (3) contacts the output shaft nut flange (2).
10. Strike the Driver handle C-4171 with a suitable hammer until the output shaft nut is securely staked to the output shaft.
11. Install the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).



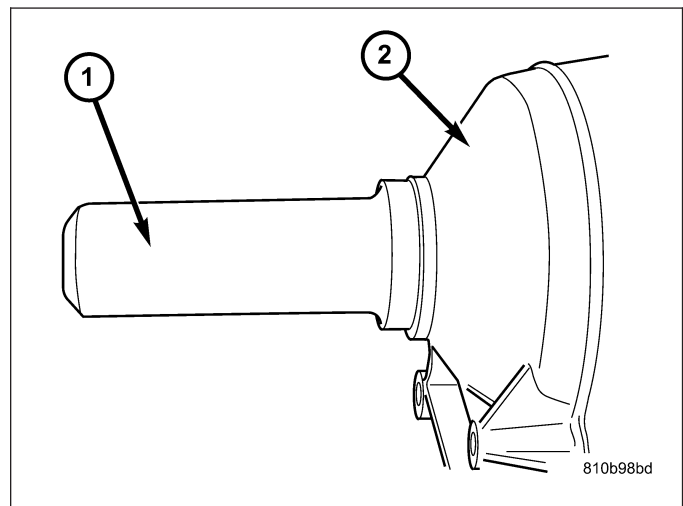
## SEAL-OUTPUT SHAFT

### REMOVAL

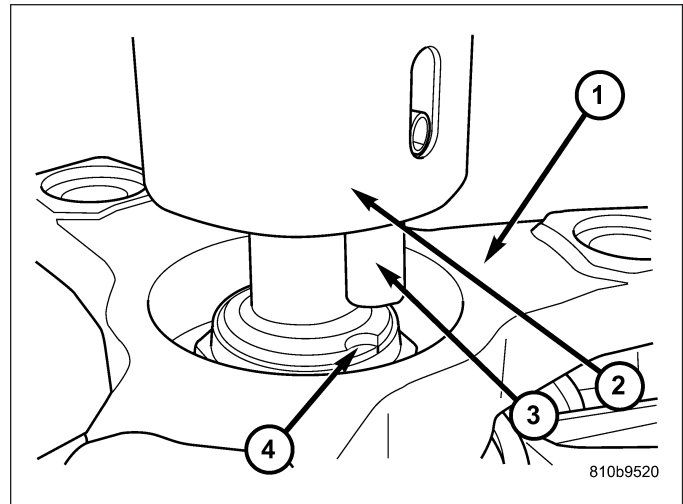
1. Remove the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL). Move propeller shaft to the right and tie up.
2. Verify that the transmission is in PARK in order to prepare for the removal of the output shaft nut.
3. Remove the nut holding the propeller shaft flange to the output shaft and remove the flange.
4. Remove the output shaft seal with suitable screw and slide hammer.

### INSTALLATION

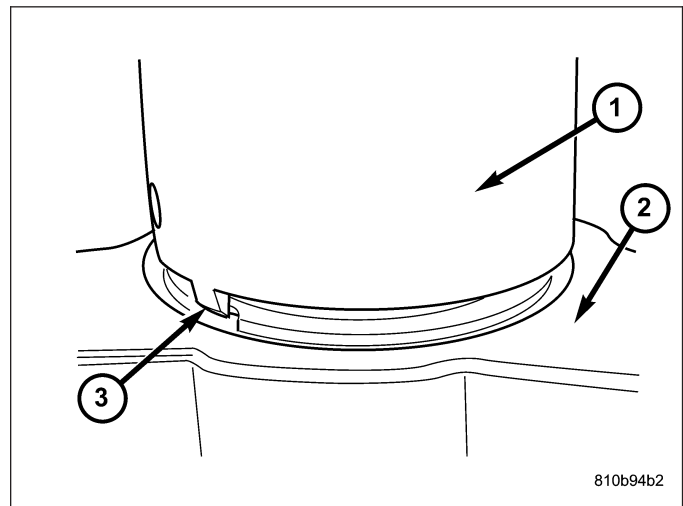
1. Position the new output shaft seal over the output shaft and against the transmission case.
2. Use Seal Installer 8902A (1) to install the seal.
3. Verify that the transmission is in PARK in order to prepare for the installation of the output shaft nut.
4. Install the propeller shaft flange onto the output shaft and install an new flange nut. Tighten the flange nut to 120 N·m (88.5 ft.lbs.).



5. Stake the output shaft nut to the output shaft as follows. Place the Staking Tool 9078 (2) and Driver Handle C-4171 onto the output shaft.
6. Rotate the Staking Tool 9078 (2) until the alignment pin (3) engages the output shaft notch (4).



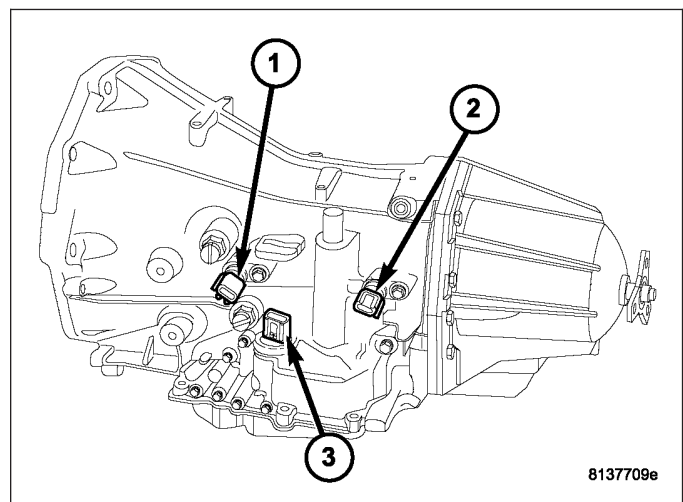
7. Press downward on the staking tool until the staking pin (3) contacts the output shaft nut flange (2).
8. Strike the Driver handle C-4171 with a suitable hammer until the output shaft nut is securely staked to the output shaft.
9. Install the propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).



## SENSOR-OUTPUT SPEED

### DESCRIPTION

The Input (1) and Output (2) Speed Sensors are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).



## OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

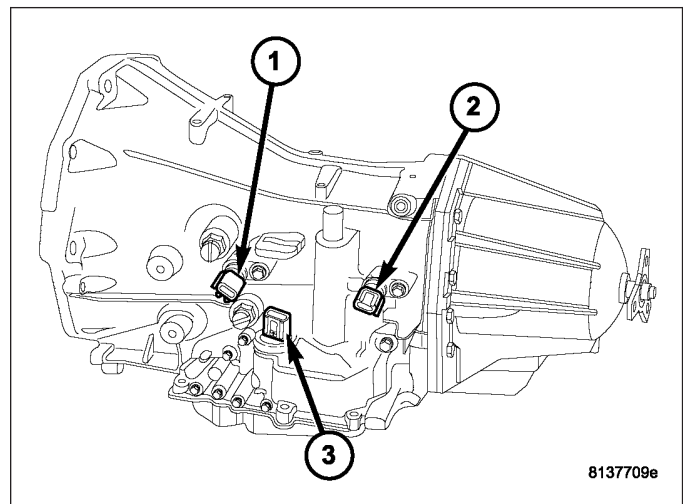
- Torque converter clutch slippage
- Torque converter element speed ratio

## REMOVAL

1. Raise vehicle.
2. Place a suitable fluid catch pan under the transmission.
3. Remove the wiring connector from the output speed sensor (2).

**Note:** The speed sensor bolt has a sealing patch applied from the factory. Be sure to reuse the same bolt.

4. Remove the bolt holding the output speed sensor (2) to the transmission case.
5. Remove the output speed sensor (2) from the transmission case.

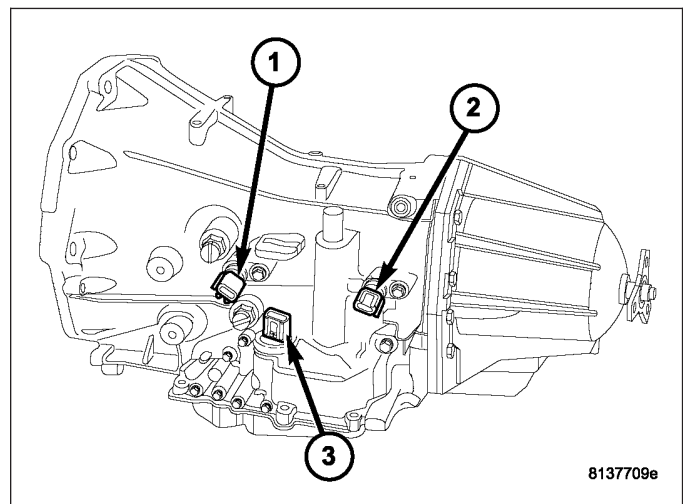


## INSTALLATION

1. Install the output speed sensor (2) into the transmission case.

**Note:** Before installing the speed sensor bolt, it will be necessary to replenish the sealing patch on the bolt using Mopar® Lock & Seal Adhesive.

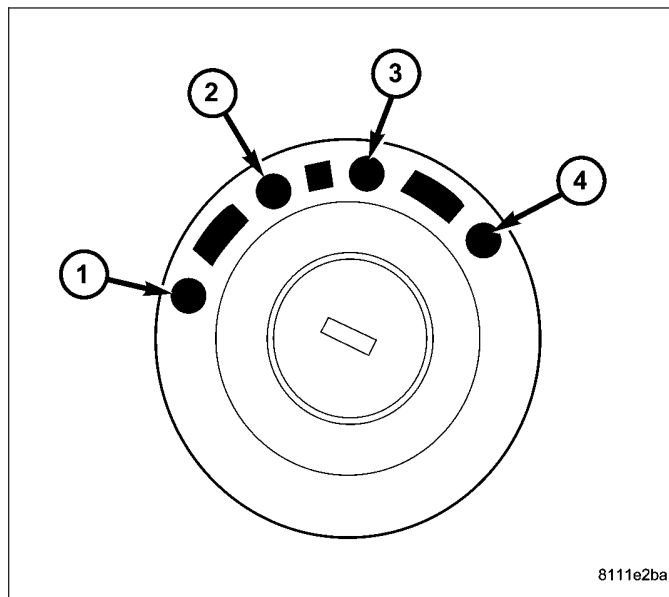
2. Install the bolt to hold the output speed sensor (2) into the transmission case. Tighten the bolt to 9 N·m (80 in.lbs.).
3. Install the wiring connector onto the output speed sensor (2).
4. Verify the transmission fluid level. Add fluid as necessary. (Refer to 21 - TRANSMISSION/AUTOMATIC TRANSMISSION - 42RLE/FLUID - STANDARD PROCEDURE)
5. Lower vehicle.



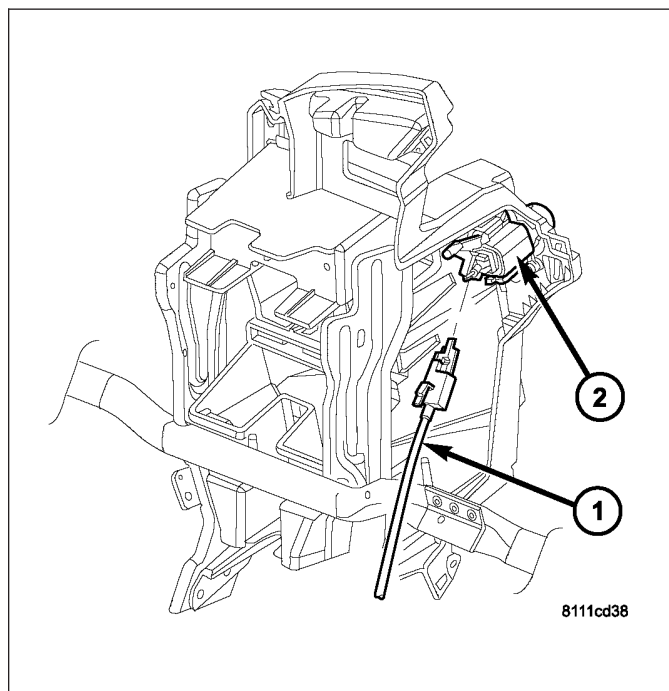
## CABLE-PARK LOCK

### REMOVAL

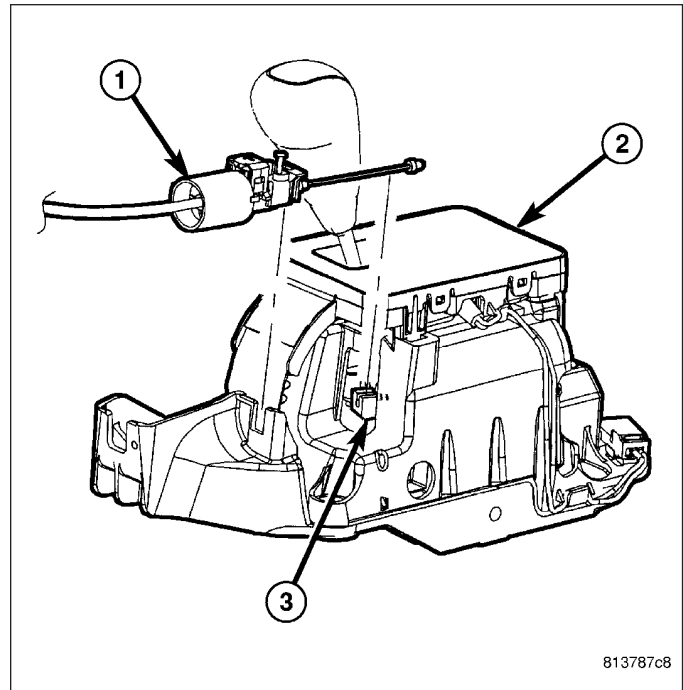
1. Place ignition key in the ACC (2) position.



2. Remove the lower instrument panel trim as necessary to access the park lock cable.
3. Disconnect park lock cable (4) from ignition cylinder (3).

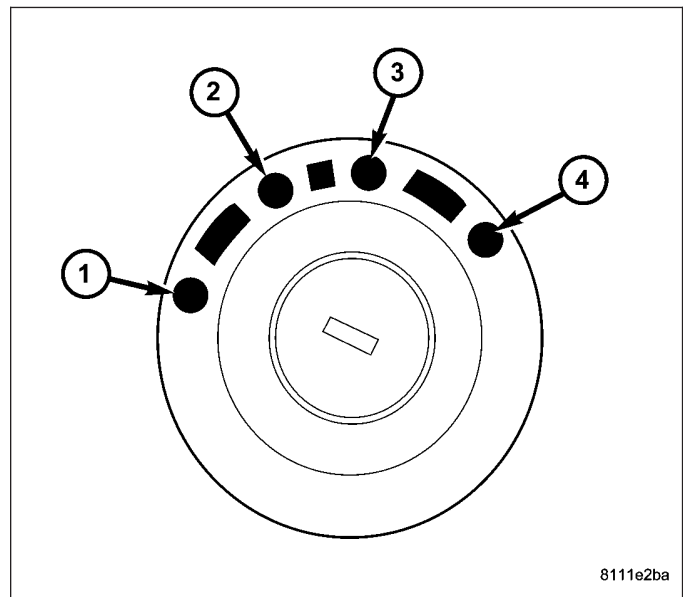


4. Remove the floor console as necessary for access to the park lock cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)
5. If necessary, remove the bolts holding the shield, covering the gearshift and park lock cables, to the floorpan and remove the shield.
6. Disconnect the park lock cable from the shift mechanism. Release retention tab using suitable screwdriver.



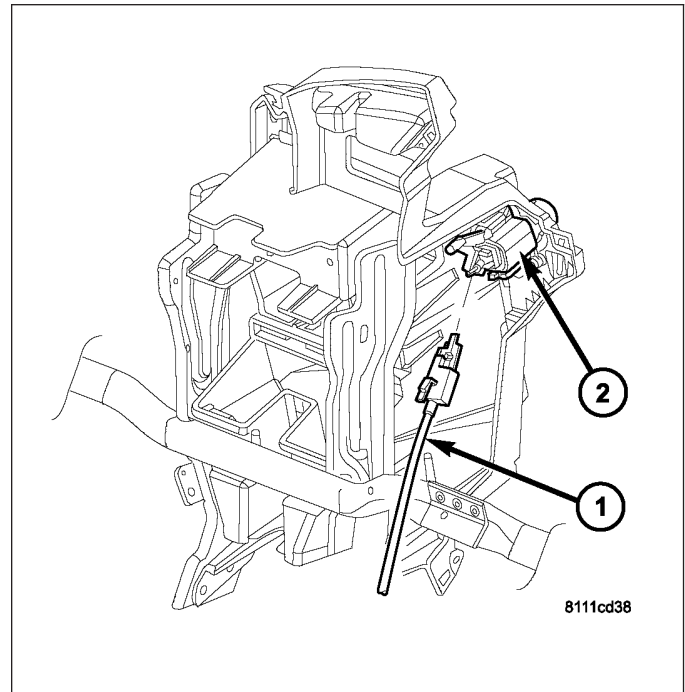
## INSTALLATION

1. Verify that ignition key is in ACC (2) position.

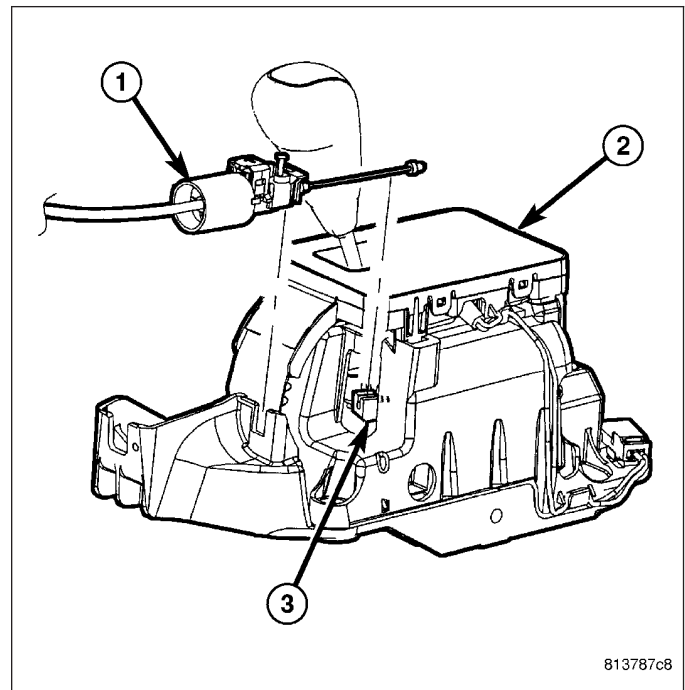




2. Install the park lock cable (4) to the ignition cylinder (3). Secure the cable to instrument panel at retainer.
3. Install any instrument panel trim that was removed to access the park lock cable.



4. Route park lock cable towards shift mechanism.
5. Connect the park lock cable core to shift mechanism cam (3), and then secure cable housing to shift mechanism.

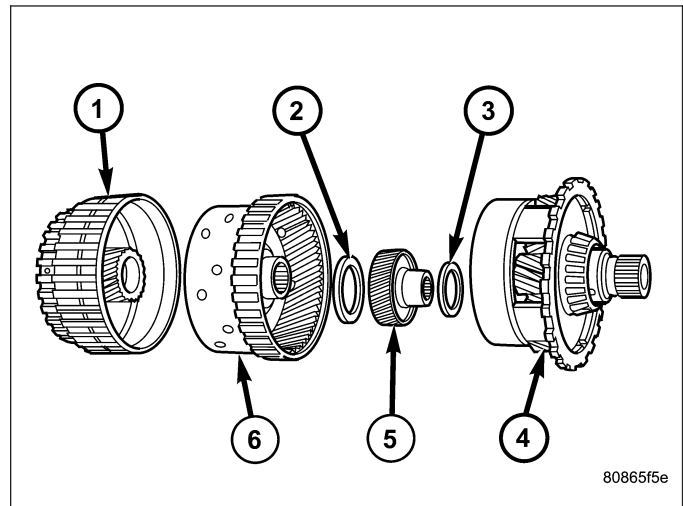


6. Adjust the park lock cable. (Refer to 21 - TRANSMISSION/AUTOMATIC TRANSMISSION/SHIFT INTERLOCK MECHANISM - ADJUSTMENTS)
7. If necessary, install the shield, covering the gearshift and park lock cables, to the floorpan and install the bolts to hold the shield to the floorpan.
8. Install the floor console assembly. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

## GEARTRAIN-PLANETARY

### DESCRIPTION

The planetary geartrain is located between the input clutch assembly and the rear of the transmission case. The planetary geartrain consists of two sun gears, two planetary carriers, two annulus (ring) gears, and one output shaft.



### OPERATION

The planetary geartrain utilizes two planetary gear sets that connect the transmission input shaft to the output shaft. Input and holding clutches drive or lock different planetary members to change output ratio or direction.

## SEAL-OIL PUMP

### REMOVAL

1. Remove the transmission from the vehicle (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE - REMOVAL).
2. Remove the torque converter from the transmission bellhousing.
3. Use special tool C-3981B to remove oil pump seal.

### INSTALLATION

1. Clean and inspect oil pump seal seat. Then install seal using special tool C-4193-A.
2. Clean and inspect torque converter hub. If nicks, scratches or hub wear are found, torque converter replacement will be required.

**CAUTION:** If the torque converter is being replaced, apply a light coating of grease to the crankshaft pilot hole. Also inspect the engine drive plate for cracks. If any cracks are found replace the drive plate. Do not attempt to repair a cracked drive plate. Always use new torque converter to drive plate bolts.

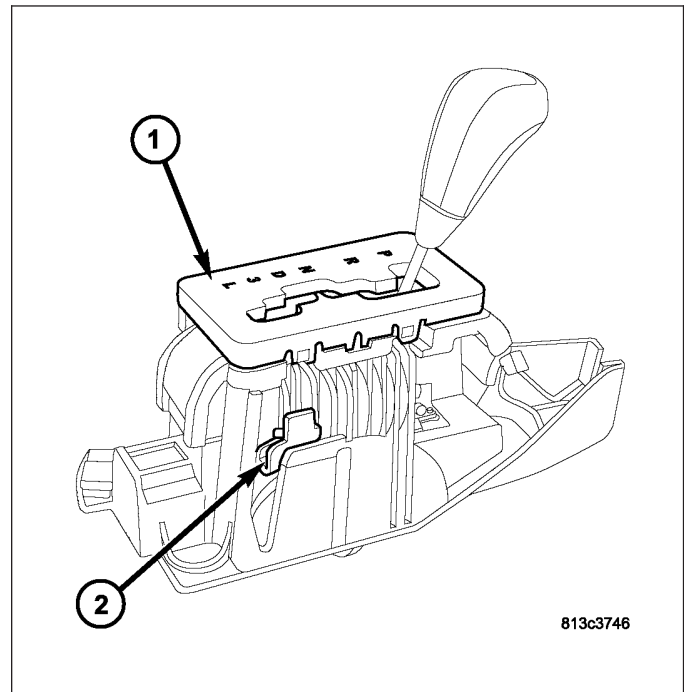
3. Apply a light film of transmission oil to the torque converter hub and oil seal lips. Then install torque converter into transmission. Be sure that the hub lugs mesh with the front pump lugs when installing.
4. Reinstall the transmission into the vehicle.(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RLE - INSTALLATION)

## MECHANISM-SHIFT

### DESCRIPTION

The automatic transmission is operated with the help of a shift lever assembly (SLA) (1) located in the floor console. There are six positions to which the selection lever can be shifted: P, R, N, D, 3, L.

All selector lever positions are identified by the SLA and transmitted by a shift cable to the selector shaft in the transmission.



The SLA is comprised of the following functions:

- **Key lock:** Depending on the selector lever position, the ignition cylinder is locked/unlocked, i.e., the ignition key can be removed only if the selector lever is in position "P". A park lock cable is used to perform this function.
- **Park lock:** The selector lever is not released from position "P" until the brake pedal has been applied and the ignition key is in "ACC" or "ON" positions. Shift lock is controlled by the brake light switch in conjunction with a locking solenoid in the SLA. As soon as the brake pedal is applied firmly, the locking solenoid is energized and retracted to unlock the selector lever. If the selector lever cannot be moved out of position "P" due to a malfunction, the shift lock function can be overridden (2). (Refer to 21 - TRANSMISSION/AUTOMATIC TRANSMISSION - NAG1/SHIFT INTERLOCK MECHANISM - OPERATION)

### OPERATION

With the selector lever in position "D", the transmission control module (TCM) automatically shifts the gears that are best-suited to the current operating situation. This means that shifting of gears is continuously adjusted to current driving and operating conditions in line with the selected shift range and the accelerator pedal position. Starting off is always performed in 1st gear.

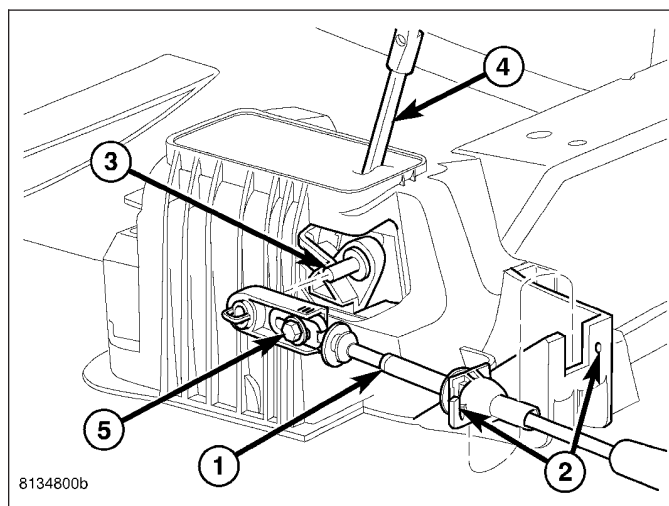
The current selector lever position or, if the shift range has been limited, the current shift range is indicated in the instrument cluster display.

The permissible shifter positions and transmission operating ranges are:

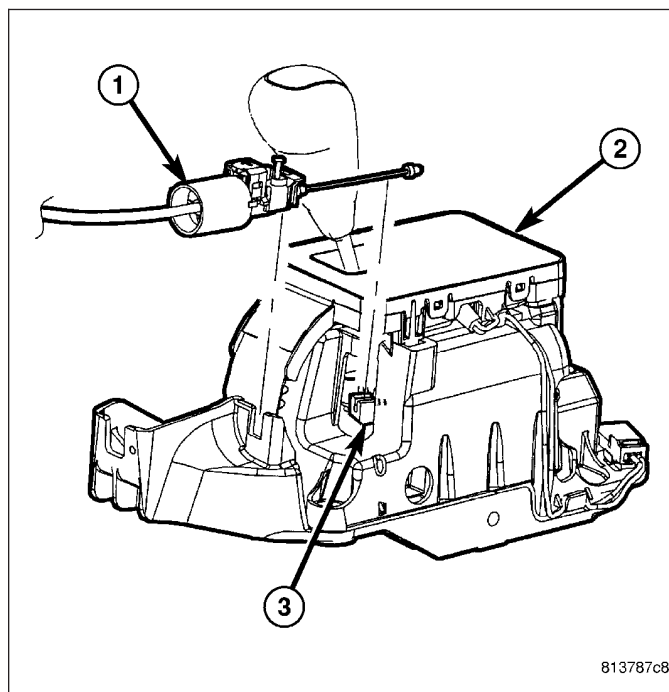
- P = Parking lock and engine starting.
- R = Reverse.
- N = Neutral and engine starting (no power is transmitted to the axles).
- D = The shift range includes all forward gears.
- 3= Shift range is limited to gears 1 to 3.
- 1= Shift range is limited to the 1st gear.

## REMOVAL

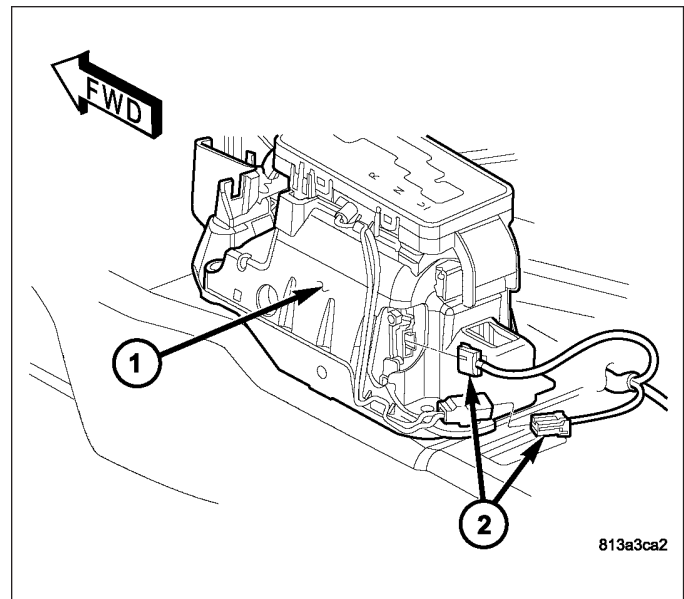
1. Remove any necessary console parts for access to shift lever assembly and shifter cables. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)
2. If necessary, remove the bolts holding the shield, covering the gearshift and park lock cables, to the floorpan and remove the shield.
3. Shift transmission into PARK.
4. Disconnect the transmission shift cable (1) at shift lever (3) and shifter assembly bracket (2).
5. Remove the shift cable retainer (2) from the notch in the shifter assembly (2).



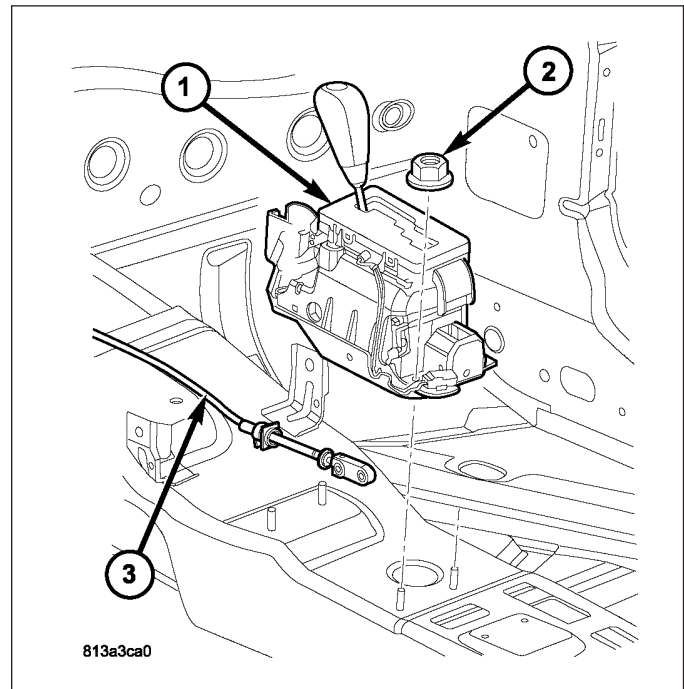
6. Verify the key is in the LOCK position and disconnect the park lock cable (1) from the shifter mechanism cam (3) and the notch in the shifter assembly (3).



7. Disengage all wiring connectors (2) from the shifter assembly (1).

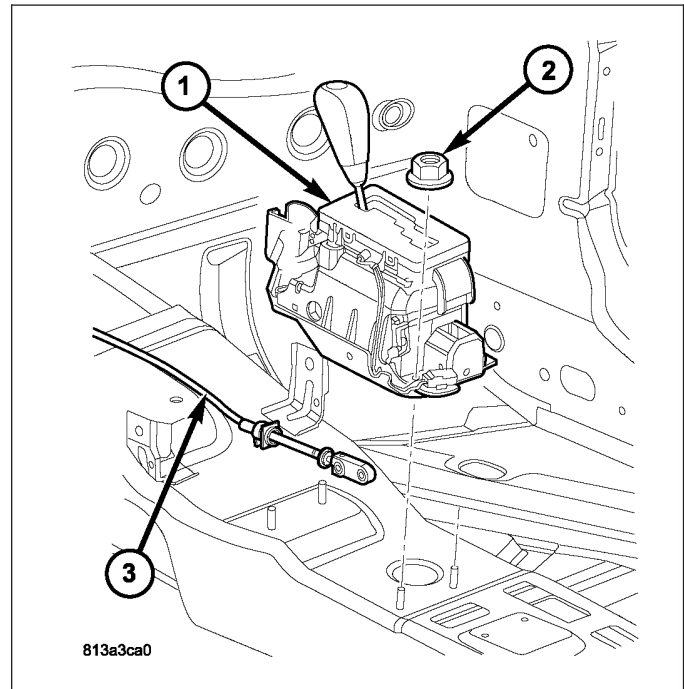


8. Remove all nuts (2) holding the shifter assembly (1) to the floor pan.
9. Remove the shifter assembly (1) from the vehicle.

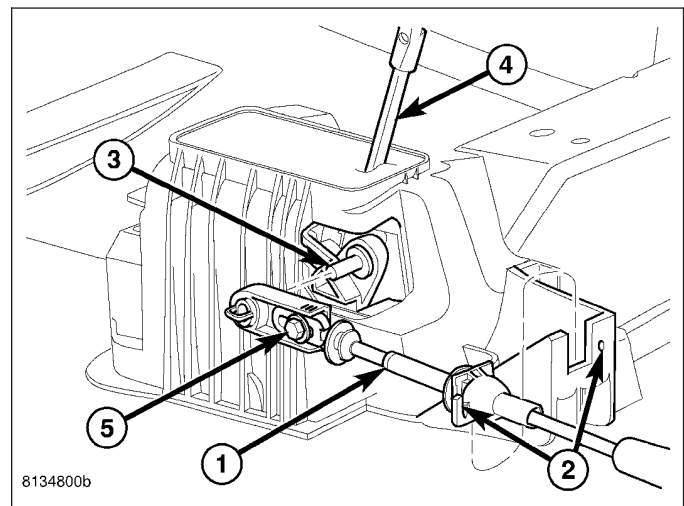


## INSTALLATION

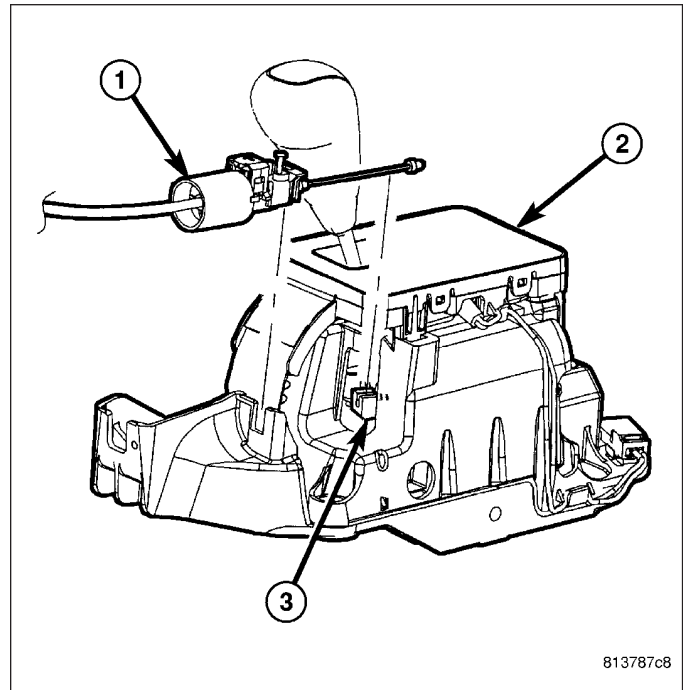
1. Install shifter assembly (1) onto the shifter assembly studs on the floor pan.
2. Install the nuts (2) to hold the shifter assembly (1) onto the floor pan. Tighten nuts to 7 N·m (652 in.lbs.).



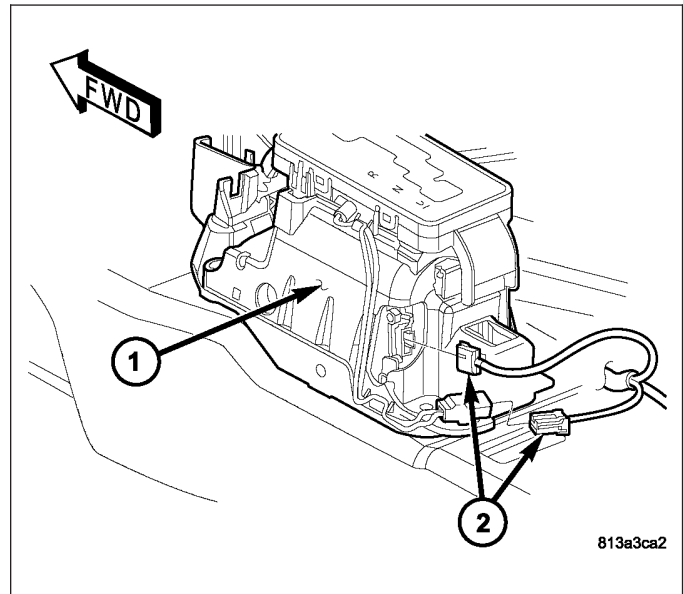
3. Place the floor shifter lever in PARK position.
4. Loosen the adjustment screw (5) on the gearshift cable (1).
5. Install the gearshift cable (1) to the shift lever pin (3).



6. Install the park lock cable (1) to the shift mechanism cam (3) and the notch in the shifter assembly (2).
7. Verify that the key is in the LOCK position and remains there until the cable is fully adjusted.
8. Verify that the park lock cable adjustment tab is pulled upward to the unlocked position.



9. Install the wiring harness connectors (2) to the shifter assembly.
10. Verify that the shift lever is in the PARK position.
11. Tighten the adjustment screw to 7 N·m (65 in.lbs.).
12. Verify that the key in the LOCK position and the shifter is in PARK.
13. Push downward on the park lock cable adjustment tab to lock the adjustment.
14. Verify correct shifter, park lock, and BTSI operation.
15. If necessary, install the shield, covering the gear-shift and park lock cables, to the floorpan and install the bolts to hold the shield to the floorpan.
16. Install any console parts removed for access to shift lever assembly and shift cables. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)



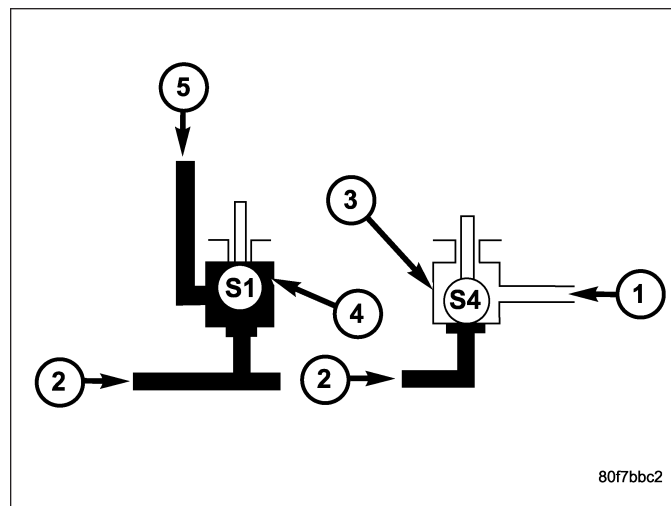
## SOLENOID

### DESCRIPTION

The typical electrical solenoid used in automotive applications is a linear actuator. It is a device that produces motion in a straight line. This straight line motion can be either forward or backward in direction, and short or long distance.

A solenoid is an electromechanical device that uses a magnetic force to perform work. It consists of a coil of wire, wrapped around a magnetic core made from steel or iron, and a spring loaded, movable plunger, which performs the work, or straight line motion.

The solenoids used in transmission applications are attached to valves which can be classified as **normally open** or **normally closed**. The **normally open** solenoid valve is defined as a valve which allows hydraulic flow when no current or voltage is applied to the solenoid. The **normally closed** solenoid valve is defined as a valve which does not allow hydraulic flow when no current or voltage is applied to the solenoid. These valves perform hydraulic control functions for the transmission and must therefore be durable and tolerant of dirt particles. For these reasons, the valves have hardened steel poppets and ball valves. The solenoids operate the valves directly, which means that the solenoids must have very high outputs to close the valves against the sizable flow areas and line pressures found in current transmissions. Fast response time is also necessary to ensure accurate control of the transmission.



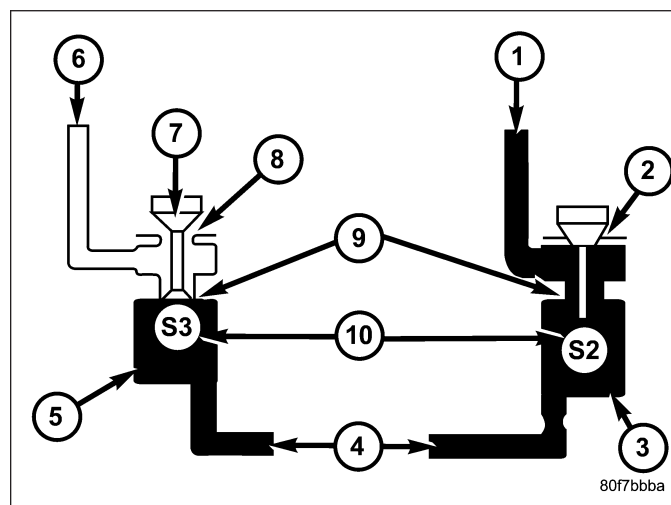
- 1 - MANUAL VALVE
- 2 - LINE PRESSURE
- 3 - 2/4 - LOW REVERSE SOLENOID ENERGIZED
- 4 - UNDERDRIVE SOLENOID DE-ENERGIZED
- 5 - UNDERDRIVE CLUTCH

The strength of the magnetic field is the primary force that determines the speed of operation in a particular solenoid design. A stronger magnetic field will cause the plunger to move at a greater speed than a weaker one. There are basically two ways to increase the force of the magnetic field:

1. Increase the amount of current applied to the coil or
2. Increase the number of turns of wire in the coil.

The most common practice is to increase the number of turns by using thin wire that can completely fill the available space within the solenoid housing. The strength of the spring and the length of the plunger also contribute to the response speed possible by a particular solenoid design.

A solenoid can also be described by the method by which it is controlled. Some of the possibilities include variable force, pulse-width modulated, constant ON, or duty cycle. The variable force and pulse-width modulated versions utilize similar methods to control the current flow through the solenoid to position the solenoid plunger at a desired position somewhere between full ON and full OFF. The constant ON and duty cycled versions control the voltage across the solenoid to allow either full flow or no flow through the solenoid's valve.



- 1 - OVERDRIVE CLUTCH
- 2 - NO VENT
- 3 - OVERDRIVE SOLENOID ENERGIZED
- 4 - MANUAL VALVE
- 5 - LOW REVERSE/CONVERTER CLUTCH SOLENOID DE-ENERGIZED
- 6 - SOLENOID SWITCH VALVE
- 7 - TAPER
- 8 - VENT TO SUMP
- 9 - ORIFICE
- 10 - CHECK BALL

## OPERATION

When an electrical current is applied to the solenoid coil, a magnetic field is created which produces an attraction to the plunger, causing the plunger to move and work against the spring pressure and the load applied by the fluid the valve is controlling. The plunger is normally directly attached to the valve which it is to operate. When the current is removed from the coil, the attraction is removed and the plunger will return to its original position due to spring pressure.



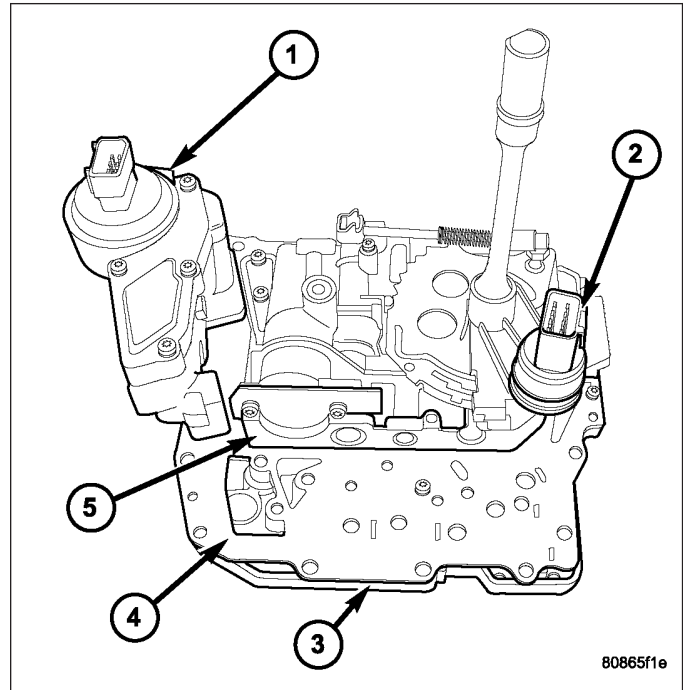
The plunger is made of a conductive material and accomplishes this movement by providing a path for the magnetic field to flow. By keeping the air gap between the plunger and the coil to the minimum necessary to allow free movement of the plunger, the magnetic field is maximized.

## **ASSEMBLY-TRANSMISSION SOLENOID/PRESSURE SWITCH**

### **DESCRIPTION**

The Solenoid/Pressure Switch Assembly (1) is inside the transmission and mounted to the valve body assembly. The assembly consists of four solenoids that control hydraulic pressure to the L/R, 2/4, OD, and UD friction elements (transmission clutches), and the torque converter clutch. The reverse clutch is controlled by line pressure from the manual valve in the valve body. The solenoids are contained within the Solenoid/Pressure Switch Assembly, and can only be serviced by replacing the assembly.

The solenoid assembly also contains pressure switches that monitor and send hydraulic circuit information to the TCM. Likewise, the pressure switches can only be serviced by replacing the assembly.



### **OPERATION**

#### **SOLENOIDS**

The solenoids receive electrical power from the Transmission Control Relay through a single wire. The TCM energizes or operates the solenoids individually by grounding the return wire of the solenoid needed. When a solenoid is energized, the solenoid valve shifts, and a fluid passage is opened or closed (vented or applied), depending on its default operating state. The result is an apply or release of a frictional element.

The 2/4 and UD solenoids are normally applied, which allows fluid to pass through in their relaxed or "off" state. By design, this allows transmission limp-in (P,R,N,2) in the event of an electrical failure.

The continuity of the solenoids and circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the TCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a speed ratio or pressure switch error occurs.

#### **PRESSURE SWITCHES**

The TCM relies on three pressure switches to monitor fluid pressure in the L/R, 2/4, and OD hydraulic circuits. The primary purpose of these switches is to help the TCM detect when clutch circuit hydraulic failures occur. The range for the pressure switch closing and opening points is 11-23 psi. Typically the switch opening point will be approximately one psi lower than the closing point. For example, a switch may close at 18 psi and open at 17 psi. The switches are continuously monitored by the TCM for the correct states (open or closed) in each gear as shown in the following chart:

**PRESSURE SWITCH STATES**

GEAR	L/R	2/4	OD
R	OP	OP	OP
P/N	CL	OP	OP
1st	CL	OP	OP
2nd	OP	CL	OP
D	OP	OP	CL
OD	OP	CL	CL

**OP = OPEN****CL = CLOSED**

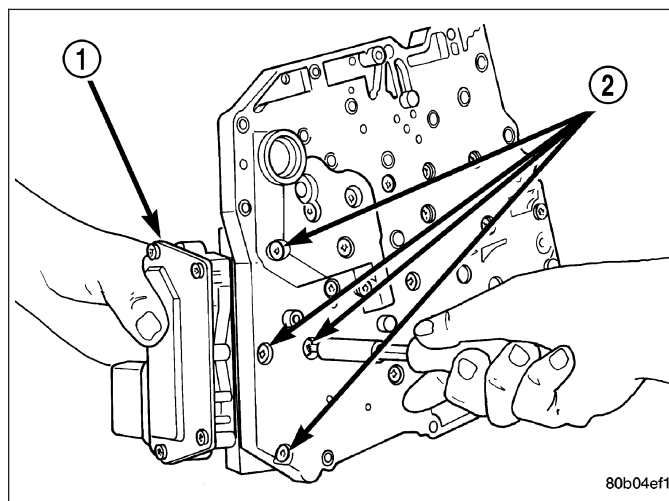
A Diagnostic Trouble Code (DTC) will set if the TCM senses any switch open or closed at the wrong time in a given gear.

The TCM also tests the 2/4 and OD pressure switches when they are normally off (OD and 2/4 are tested in 1st gear, OD in 2nd gear, and 2/4 in 3rd gear). The test simply verifies that they are operational, by looking for a closed state when the corresponding element is applied. Immediately after a shift into 1st, 2nd, or 3rd gear with the engine speed above 1000 rpm, the TCM momentarily turns on element pressure to the 2/4 and/or OD clutch circuits to identify that the appropriate switch has closed. If it doesn't close, it is tested again. If the switch fails to close the second time, the appropriate Diagnostic Trouble Code (DTC) will set.

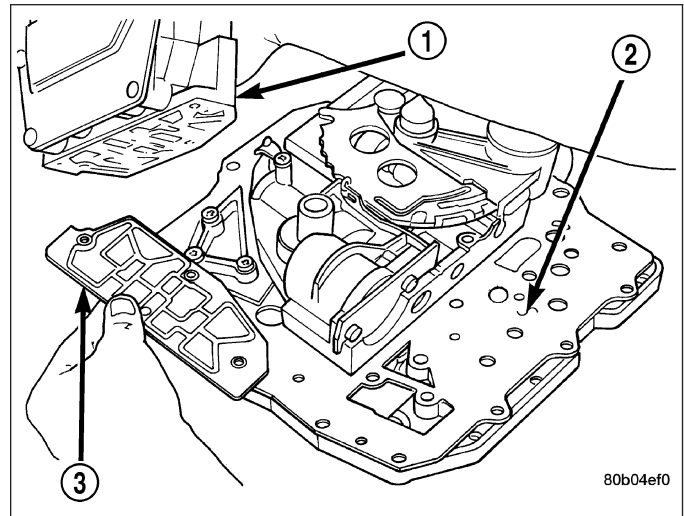
**REMOVAL**

**Note:** If the Solenoid/Pressure Switch Assembly is being replaced, the Quick Learn Procedure must be performed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

1. Raise vehicle on hoist.
2. Remove valve body assembly from transmission.  
(Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE/VALVE BODY - REMOVAL)
3. Remove Solenoid/Pressure Switch Assembly retaining screws (2) from solenoid.



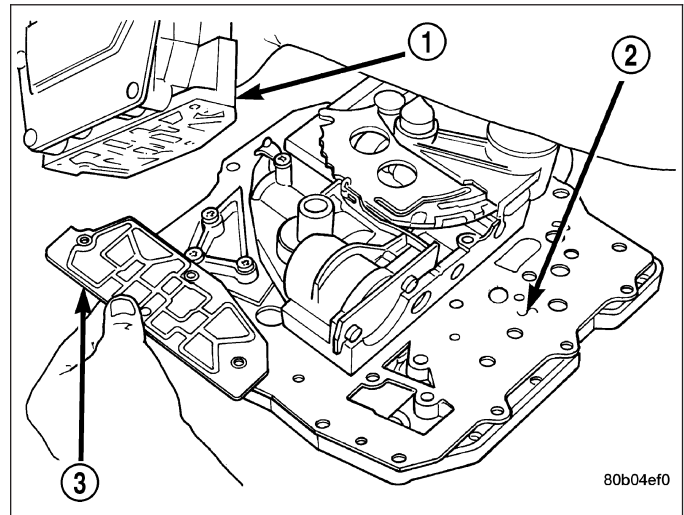
4. Remove Solenoid/Pressure Switch Assembly (1) and screen from valve body (2).



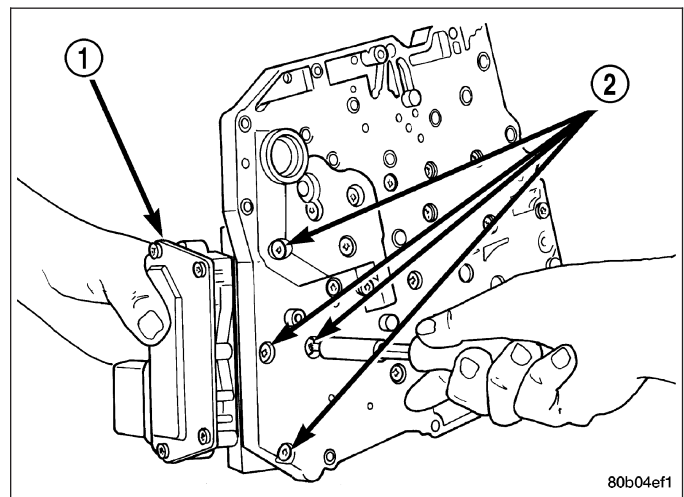
## INSTALLATION

**Note:** If the Solenoid/Pressure Switch assembly is being replaced, the Quick Learn Procedure must be performed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

1. Install Solenoid/Pressure Switch Assembly (1) and screen (3) to the separator and transfer plates.



2. Install and tighten retaining screws (2) to 5.5 N·m (50 in. lbs.) torque.
3. Install valve body. (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE/VALVE BODY - INSTALLATION)



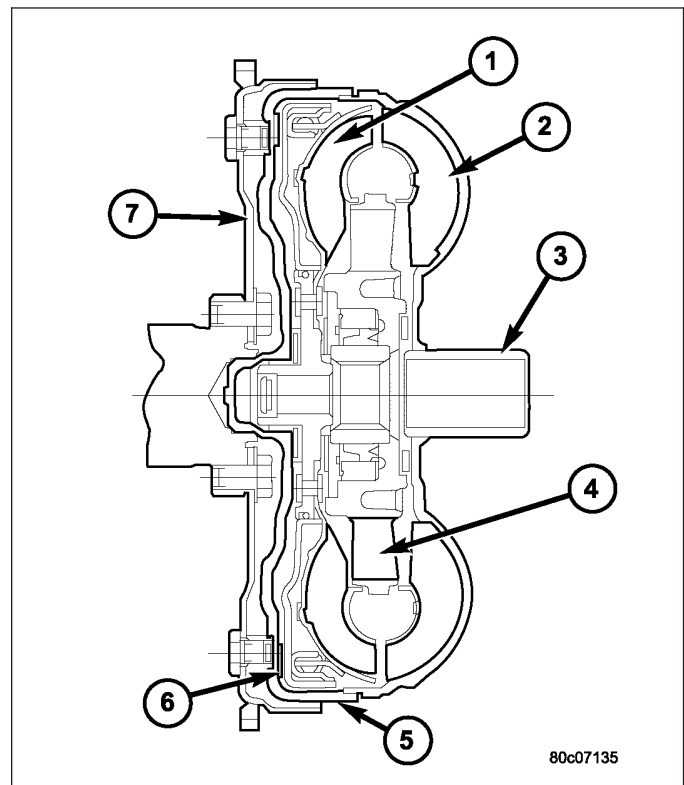
## CONVERTER-TORQUE

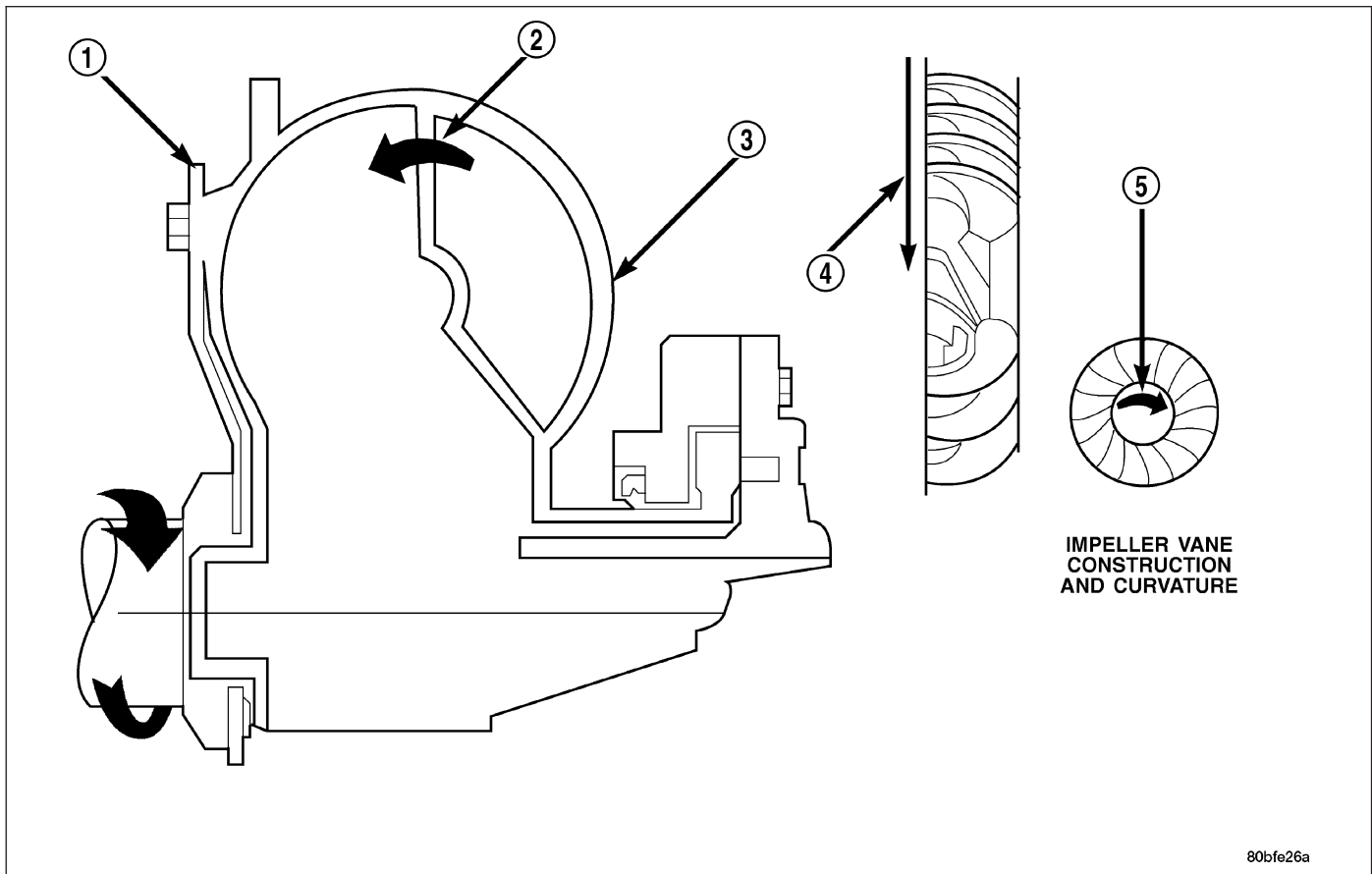
### DESCRIPTION

The torque converter is a hydraulic device that couples the engine crankshaft to the transmission. The torque converter consists of an outer shell with an internal turbine, a stator, an overrunning clutch, an impeller and an electronically applied converter clutch. The converter clutch provides reduced engine speed and greater fuel economy when engaged. Clutch engagement also provides reduced transmission fluid temperatures. The torque converter hub drives the transmission oil (fluid) pump.

The torque converter is a sealed, welded unit that is not repairable and is serviced as an assembly.

**CAUTION:** The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid.

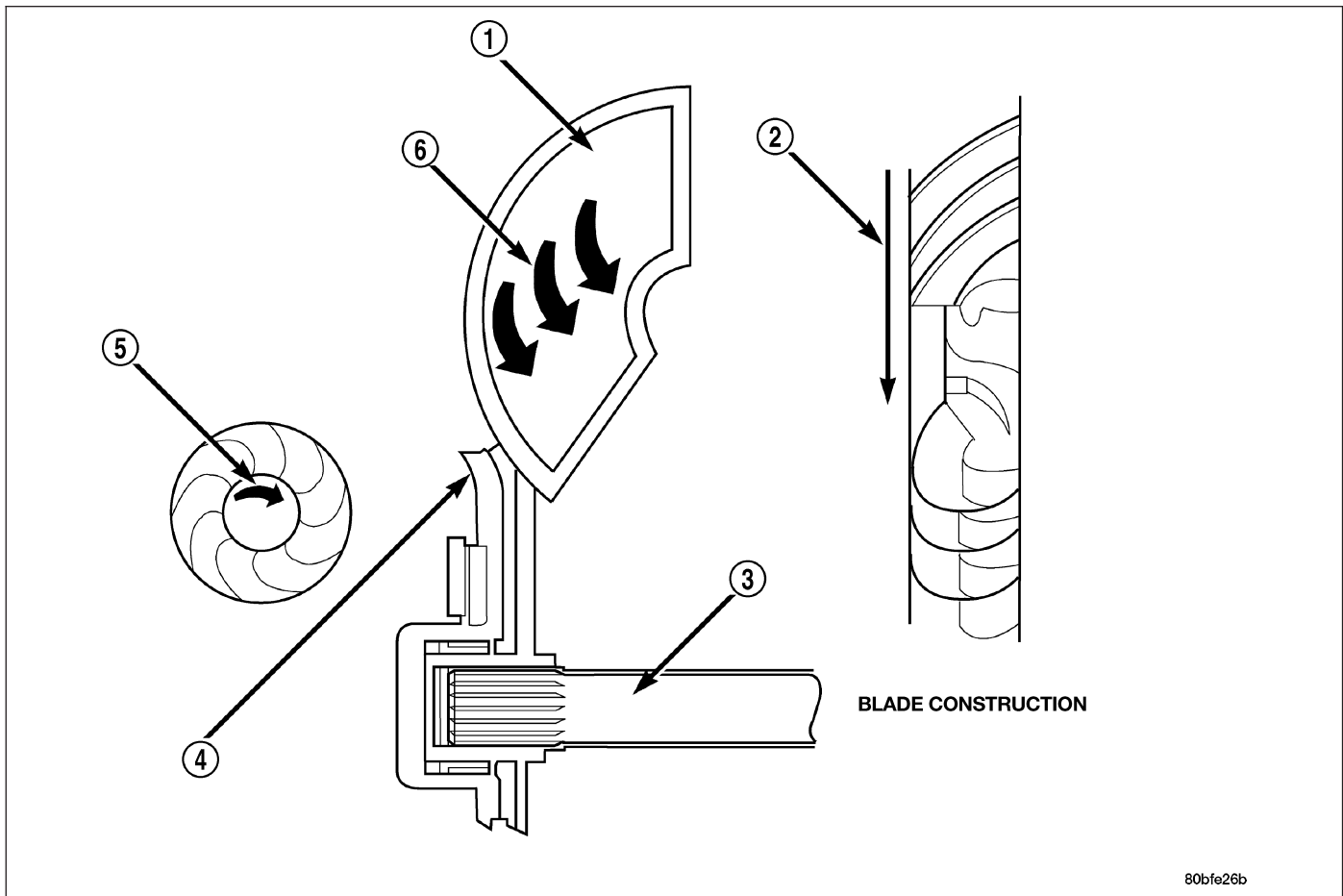


**IMPELLER*****Impeller***

- 1 - ENGINE FLEXPLATE
- 2 - OIL FLOW FROM IMPELLER SECTION INTO TURBINE SECTION
- 3 - IMPELLER VANES AND COVER ARE INTEGRAL

- 4 - ENGINE ROTATION
- 5 - ENGINE ROTATION

The impeller is an integral part of the converter housing. The impeller consists of curved blades placed radially along the inside of the housing on the transmission side of the converter. As the converter housing is rotated by the engine, so is the impeller, because they are one and the same and are the driving members of the system.

**TURBINE*****Turbine***

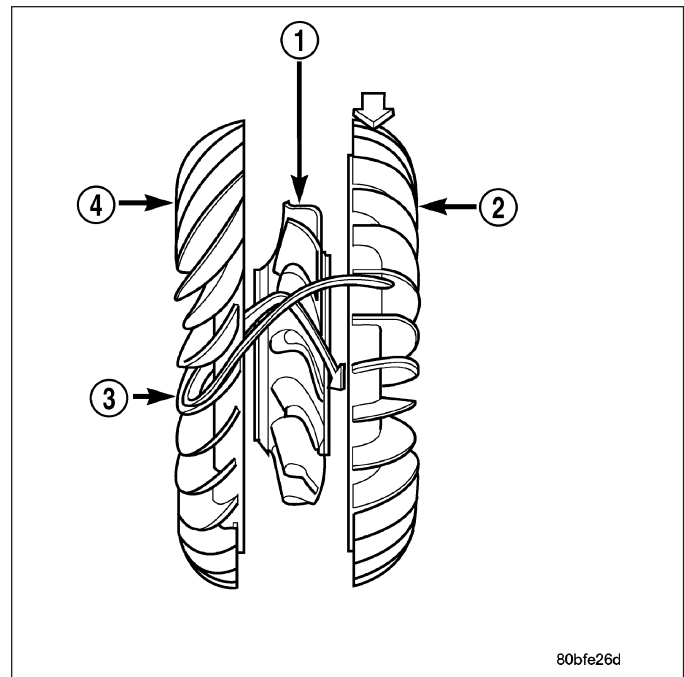
- 1 - TURBINE VANE
- 2 - ENGINE ROTATION
- 3 - INPUT SHAFT

- 4 - PORTION OF TORQUE CONVERTER COVER
- 5 - ENGINE ROTATION
- 6 - OIL FLOW WITHIN TURBINE SECTION

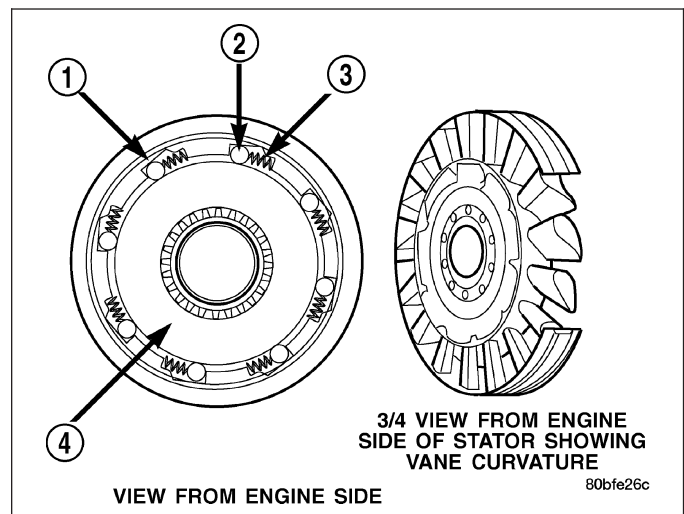
The turbine is the output, or driven, member of the converter. The turbine is mounted within the housing opposite the impeller, but is not attached to the housing. The input shaft is inserted through the center of the impeller and splined into the turbine. The design of the turbine is similar to the impeller, except the blades of the turbine are curved in the opposite direction.

## STATOR

The stator assembly is mounted on a stationary shaft which is an integral part of the oil pump. The stator (1) is located between the impeller (2) and the turbine (4) within the torque converter case.



The stator contains an over-running clutch (1-4), which allows the stator to rotate only in a clockwise direction. When the stator is locked against the over-running clutch, the torque multiplication feature of the torque converter is operational.

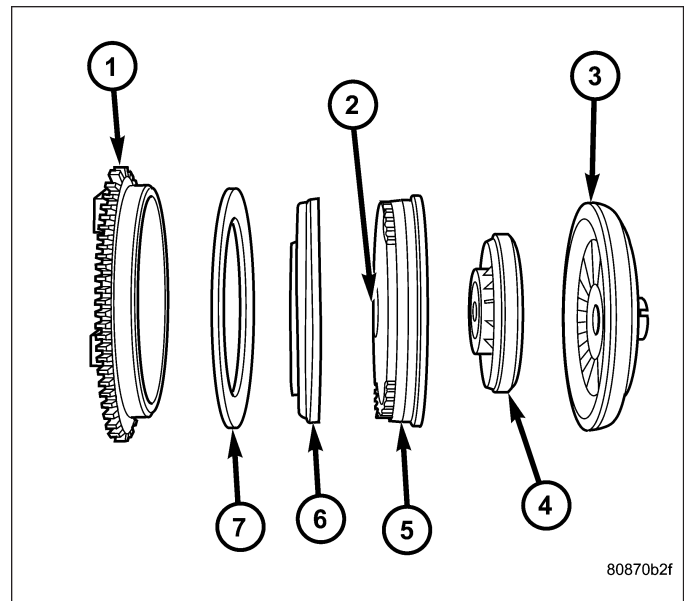


## TORQUE CONVERTER CLUTCH (TCC)

The TCC was installed to improve the efficiency of the torque converter that is lost to the slippage of the fluid coupling. Although the fluid coupling provides smooth, shock-free power transfer, it is natural for all fluid couplings to slip. If the impeller (3) and turbine (5) were mechanically locked together, a zero slippage condition could be obtained. A hydraulic piston (6) with friction material (7) was added to the turbine assembly (5) to provide this mechanical lock-up.

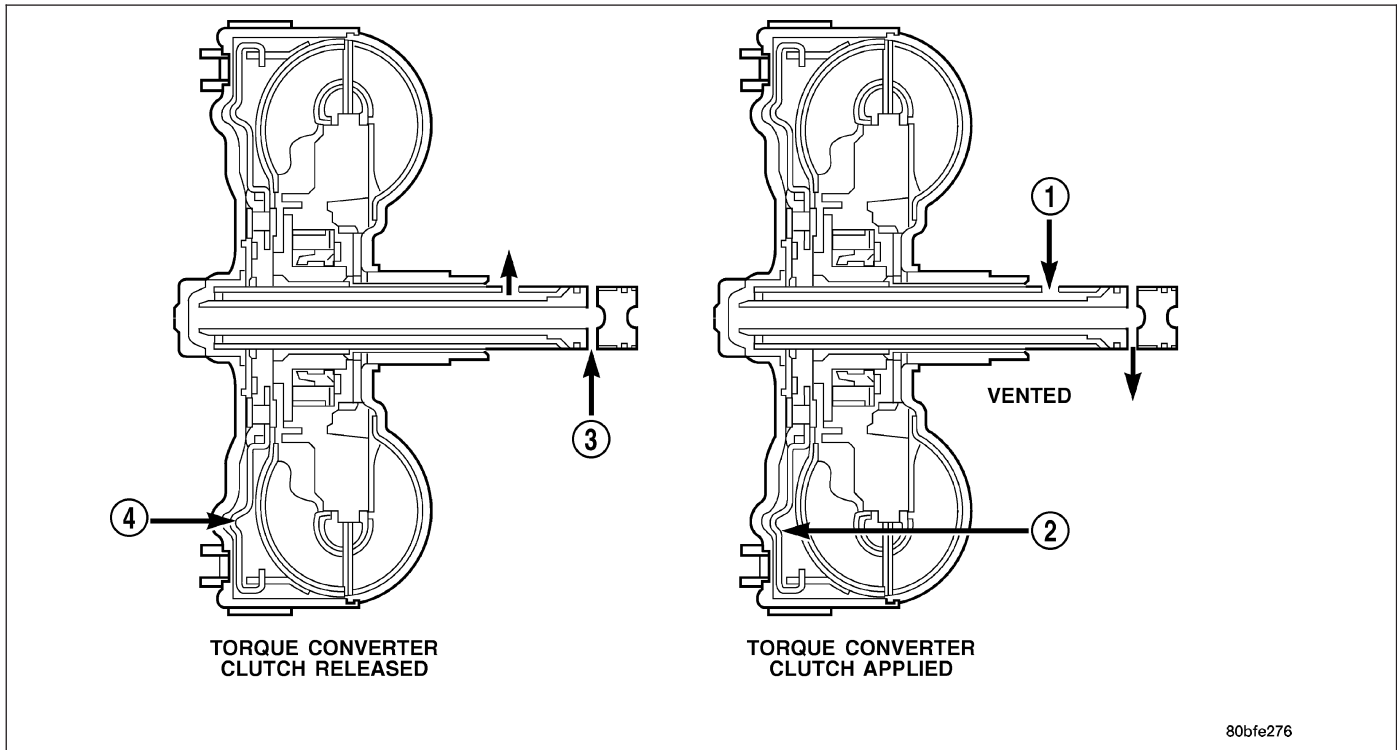
In order to reduce heat build-up in the transmission and buffer the powertrain against torsional vibrations, the TCM can duty cycle the L/R-CC Solenoid to achieve a smooth application of the torque converter clutch. This function, referred to as Electronically Modulated Converter Clutch (EMCC) can occur at various times depending on the following variables:

- Shift lever position
- Current gear range
- Transmission fluid temperature
- Engine coolant temperature
- Input speed
- Throttle angle
- Engine speed





## OPERATION



***Torque Converter Fluid Operation - Typical***

1 - APPLY PRESSURE  
2 - THE PISTON MOVES SLIGHTLY FORWARD

3 - RELEASE PRESSURE  
4 - THE PISTON MOVES SLIGHTLY REARWARD

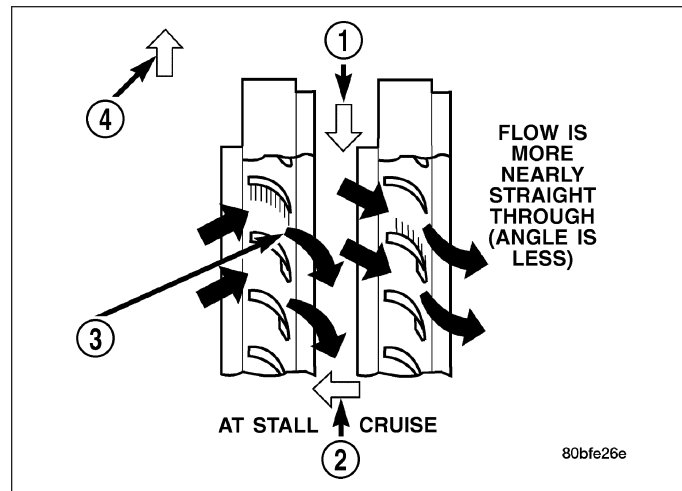
The converter impeller (driving member), which is integral to the converter housing and bolted to the engine drive plate, rotates at engine speed. The converter turbine (driven member), which reacts from fluid pressure generated by the impeller, rotates and turns the transmission input shaft.

## TURBINE

As the fluid that was put into motion by the impeller blades strikes the blades of the turbine, some of the energy and rotational force is transferred into the turbine and the input shaft. This causes both of them (turbine and input shaft) to rotate in a clockwise direction following the impeller. As the fluid is leaving the trailing edges of the turbine's blades it continues in a "hindering" direction back toward the impeller. If the fluid is not redirected before it strikes the impeller, it will strike the impeller in such a direction that it would tend to slow it down.

## STATOR

Torque multiplication is achieved by locking the stator's over-running clutch to its shaft. Under stall conditions (the turbine is stationary), the oil leaving the turbine blades strikes the face of the stator blades and tries to rotate them in a counterclockwise direction. When this happens the over-running clutch of the stator locks and holds the stator from rotating. With the stator locked, the oil strikes the stator blades and is redirected into a "helping" direction before it enters the impeller. This circulation of oil from impeller to turbine, turbine to stator, and stator to impeller, can produce a maximum torque multiplication of about 2.4:1. As the turbine begins to match the speed of the impeller, the fluid that was hitting the stator in such a way as to cause it to lock-up is no longer doing so. In this condition of operation, the stator begins to free wheel and the converter acts as a fluid coupling.



- 1 - DIRECTION STATOR WILL FREE WHEEL DUE TO OIL PUSHING ON BACKSIDE OF VANES
- 2 - FRONT OF ENGINE
- 3 - INCREASED ANGLE AS OIL STRIKES VANES
- 4 - DIRECTION STATOR IS LOCKED UP DUE TO OIL PUSHING AGAINST STATOR VANES

## TORQUE CONVERTER CLUTCH (TCC)

In a standard torque converter, the impeller and turbine are rotating at about the same speed and the stator is freewheeling, providing no torque multiplication. By applying the turbine's piston and friction material to the front cover, a total converter engagement can be obtained. The result of this engagement is a direct 1:1 mechanical link between the engine and the transmission.

The clutch can be engaged in second, third, and fourth gear ranges depending on overdrive control switch position. If the overdrive control switch is in the normal ON position, the clutch will engage after the shift to fourth gear. If the control switch is in the OFF position, the clutch will engage after the shift to third gear.

The TCM controls the torque converter by way of internal logic software. The programming of the software provides the TCM with control over the L/R-CC Solenoid. There are four output logic states that can be applied as follows:

- No EMCC
- Partial EMCC
- Full EMCC
- Gradual-to-no EMCC

### NO EMCC

Under No EMCC conditions, the L/R Solenoid is OFF. There are several conditions that can result in NO EMCC operations. No EMCC can be initiated due to a fault in the transmission or because the TCM does not see the need for EMCC under current driving conditions.

### PARTIAL EMCC

Partial EMCC operation modulates the L/R Solenoid (duty cycle) to obtain partial torque converter clutch application. Partial EMCC operation is maintained until Full EMCC is called for and actuated. During Partial EMCC some slip does occur. Partial EMCC will usually occur at low speeds, low load and light throttle situations.

### FULL EMCC

During Full EMCC operation, the TCM increases the L/R Solenoid duty cycle to full ON after Partial EMCC control brings the engine speed within the desired slip range of transmission input speed relative to engine rpm.

## GRADUAL-TO-NO EMCC

This operation is to soften the change from Full or Partial EMCC to No EMCC. This is done at mid-throttle by decreasing the L/R Solenoid duty cycle.

## REMOVAL

1. Remove transmission and torque converter from vehicle.(Refer to 21 - TRANSMISSION/AUTOMATIC - 545RFE/42RLE - REMOVAL)
2. Place a suitable drain pan under the converter housing end of the transmission.

**CAUTION:** Verify that transmission is secure on the lifting device or work surface, the center of gravity of the transmission will shift when the torque converter is removed creating an unstable condition. The torque converter is a heavy unit. Use caution when separating the torque converter from the transmission.

3. Pull the torque converter forward until the center hub clears the oil pump seal.
4. Separate the torque converter from the transmission.

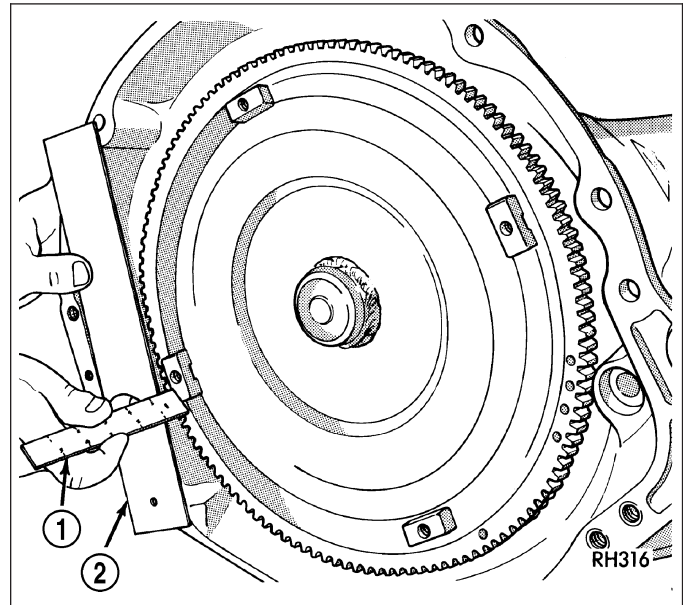
## INSTALLATION

**Note:** Check converter hub and drive notches for sharp edges, burrs, scratches, or nicks. Polish the hub and notches with 320/400 grit paper or crocus cloth if necessary. The hub must be smooth to avoid damaging the pump seal at installation.

1. Lubricate oil pump seal lip with transmission fluid.
2. Place torque converter in position on transmission.

**CAUTION:** Do not damage oil pump seal or bushing while inserting torque converter into the front of the transmission.

3. Align torque converter to oil pump seal opening.
4. Insert torque converter hub into oil pump.
5. While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.
6. Check converter seating with a scale (1) and straightedge (2). Surface of converter lugs should be 1/2 in. to rear of straightedge when converter is fully seated.
7. If necessary, temporarily secure converter with C-clamp attached to the converter housing.
8. Install the transmission in the vehicle.
9. Fill the transmission with the recommended fluid.



## RELAY-TRANSMISSION CONTROL

### DESCRIPTION

The relay is supplied fused B+ voltage, energized by the TCM, and is used to supply power to the solenoid pack when the transmission is in normal operating mode.

### OPERATION

When the relay is "off", no power is supplied to the solenoid pack and the transmission is in "limp-in" mode. After a controller reset, the TCM energizes the relay. Prior to this, the TCM verifies that the contacts are open by checking for no voltage at the switched battery terminals. After this is verified, the voltage at the solenoid pack pressure

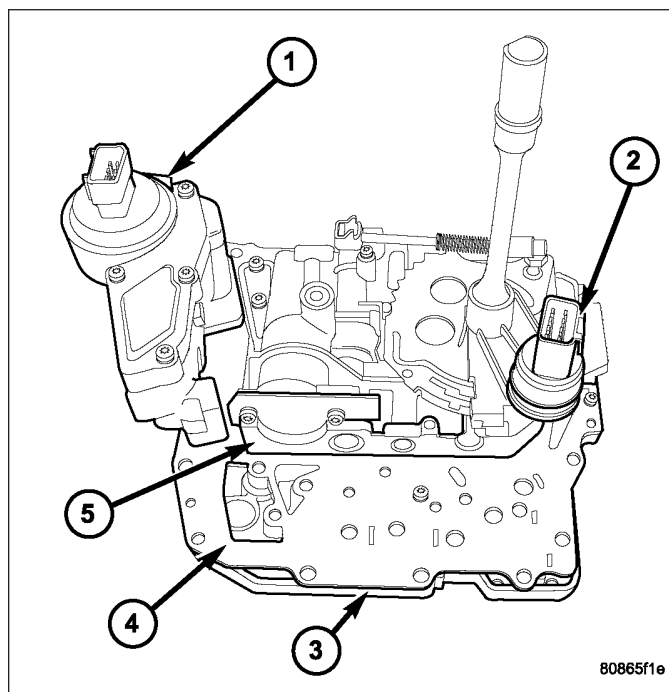
switches is checked. After the relay is energized, the TCM monitors the terminals to verify that the voltage is greater than 3 volts.

## SENSOR-TRANSMISSION RANGE

### DESCRIPTION

The Transmission Range Sensor (TRS) (2) is mounted to the top of the valve body inside the transmission and can only be serviced by removing the valve body assembly. The electrical connector extends through the transmission case.

The Transmission Range Sensor (TRS) has four switch contacts that monitor shift lever position and send the information to the PCM.



### OPERATION

The Transmission Range Sensor (TRS) communicates shift lever position (SLP) to the TCM as a combination of open and closed switches. Each shift lever position has an assigned combination of switch states (open/closed) that the TCM receives from four sense circuits. The TCM interprets this information and determines the appropriate transmission gear position and shift schedule.

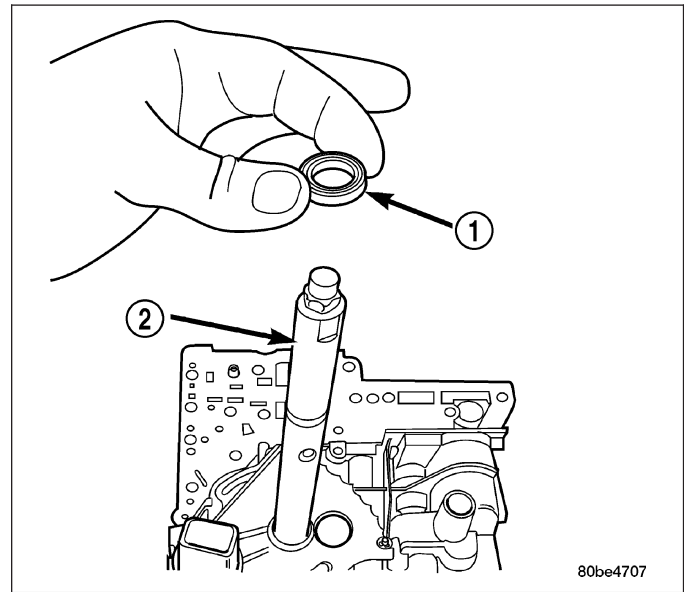
Since there are four switches, there are 16 possible combinations of open and closed switches (codes). Seven of these codes are related to gear position and three are recognized as “between gear” codes. This results in six codes which should never occur. These are called “invalid” codes. An invalid code will result in a DTC, and the TCM will then determine the shift lever position based on pressure switch data. This allows reasonably normal transmission operation with a TRS failure.

### TRS SWITCH STATES

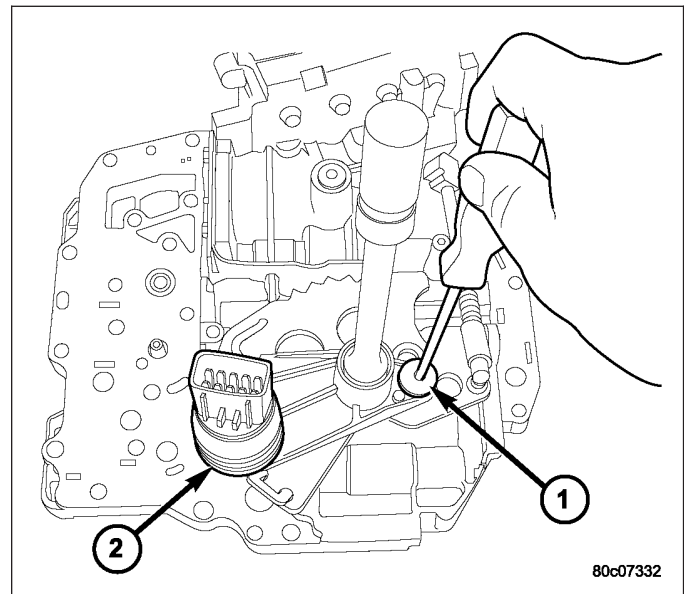
SLP	T42	T41	T3	T1
P	CL	CL	CL	OP
R	CL	OP	OP	OP
N	CL	CL	OP	CL
D	OP	OP	OP	CL
2	OP	OP	CL	OP
1	CL	OP	CL	CL

## REMOVAL

1. Remove valve body assembly from vehicle.(Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE/ VALVE BODY - REMOVAL)
2. Remove the manual shaft seal (1).

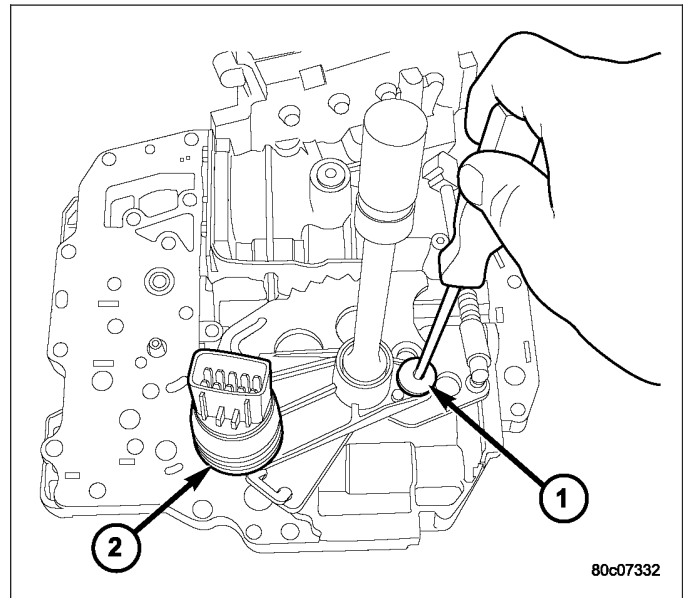


3. Remove manual shaft/TRS retaining screw (1).
4. Slide TRS off of manual valve shaft.

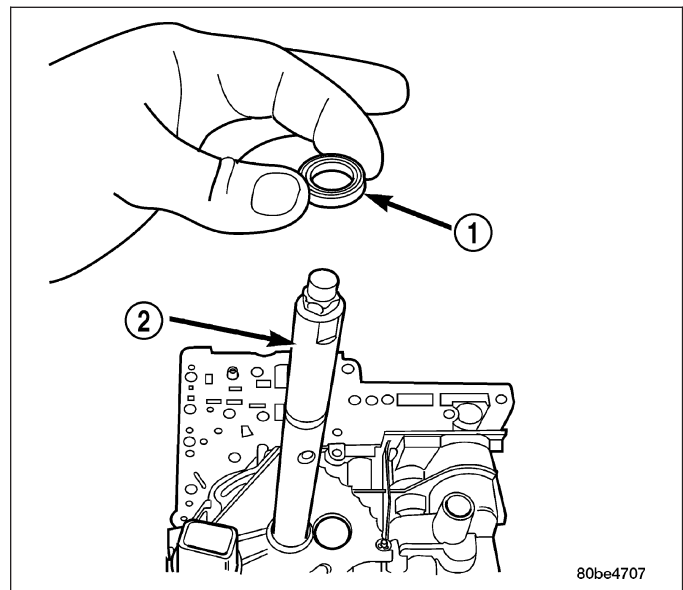


## INSTALLATION

1. Install the TRS (2) to the manual shaft. Make sure TRS locating pin rests in manual valve bore slot.
2. Install the TRS/manual shaft retaining screw (1) and torque to 5 N·m (45 in. lbs.) torque.



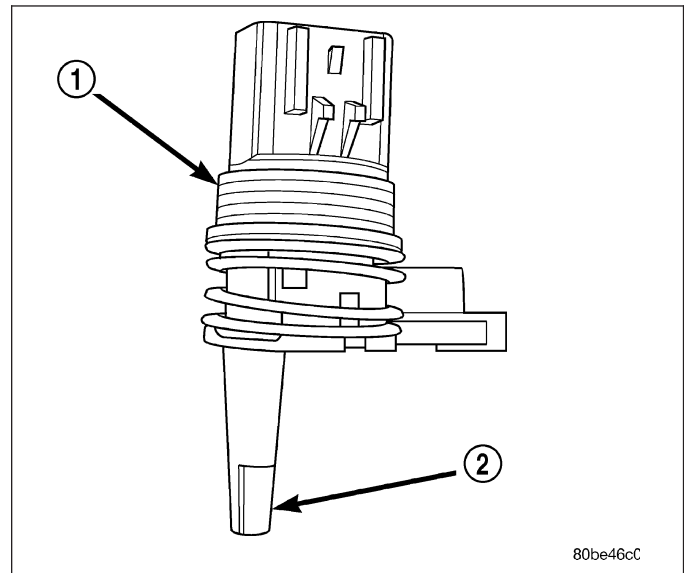
3. Install the manual shaft seal (1).
4. Install valve body to the transmission.(Refer to 21 - TRANSMISSION//AUTOMATIC - 42RLE/VALVE BODY - INSTALLATION)



## SENSOR-TRANSMISSION TEMPERATURE

### DESCRIPTION

The transmission temperature sensor (2) is located in the transmission range sensor (1) and communicates transmission sump temperature to the TCM.



### OPERATION

The transmission range sensor (TRS) has an integrated thermistor that the TCM uses to monitor the transmission's sump temperature. Since fluid temperature can affect transmission shift quality and convertor lock up, the TCM requires this information to determine which shift schedule to operate in. The TCM also monitors this temperature data so it can energize the vehicle cooling fan(s) when a transmission "overheat" condition exists. If the thermistor circuit fails, the TCM will revert to calculated oil temperature usage.

### CALCULATED TEMPERATURE

A failure in the temperature sensor or circuit will result in calculated temperature being substituted for actual temperature. Calculated temperature is a predicted fluid temperature which is calculated from a combination of inputs:

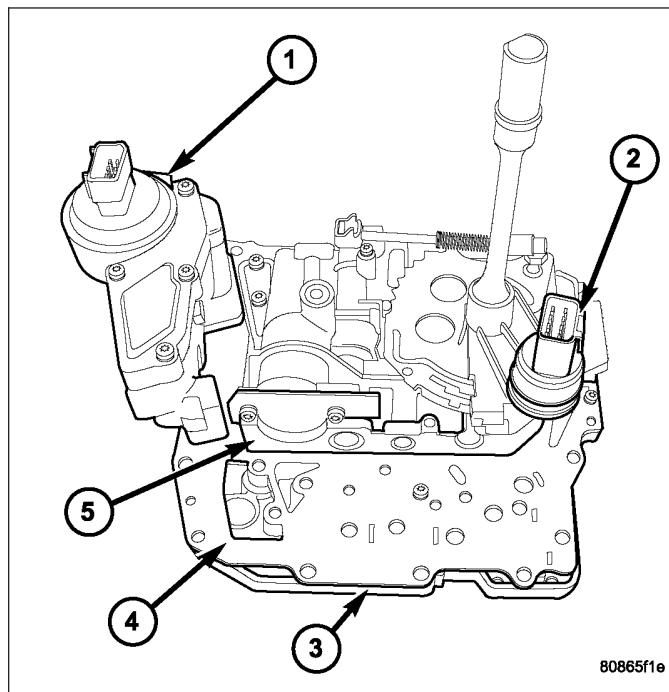
- Battery (ambient) temperature
- Engine coolant temperature
- In-gear run time since start-up

## BODY-VALVE

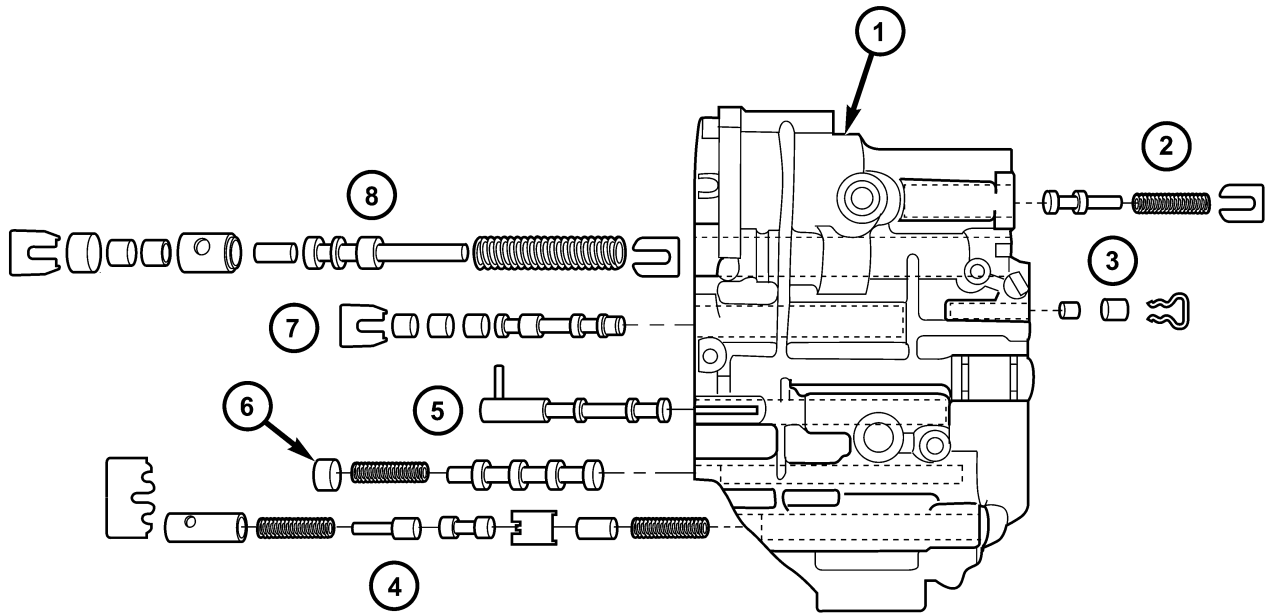
### DESCRIPTION

The valve body assembly consists of a cast aluminum valve body (5), separator plate (4), and transfer plate (3). The valve body contains valves and check balls that control fluid delivery to the torque converter clutch, solenoid/pressure switch assembly, and frictional clutches.

Also mounted to the valve body assembly are the solenoid/pressure switch assembly and the transmission range sensor (2).







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**Valve Body - Exploded**

- 1 - VALVE BODY
- 2 - T/C REGULATOR VALVE
- 3 - L/R SWITCH VALVE
- 4 - CONVERTER CLUTCH CONTROL VALVE
- 5 - MANUAL VALVE
- 6 - CONVERTER CLUTCH SWITCH VALVE
- 7 - SOLENOID SWITCH VALVE
- 8 - REGULATOR VALVE

The valves contained within the valve body (1) include the following :

- Regulator valve(2)
- Solenoid switch valve(7)
- Manual valve(5)
- Converter clutch switch valve(6)
- Converter clutch control valve(4)
- Torque converter regulator valve(2)
- Low/Reverse switch valve(3)

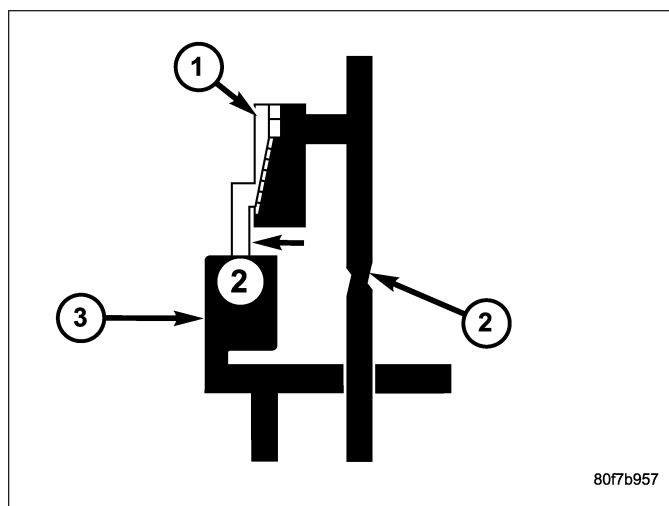
In addition, the valve body also contains the thermal valve, #2, 3, 4 & 5 check balls and the 2/4 accumulator assembly.

## OPERATION

**Note:** (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE - SCHEMATICS AND DIAGRAMS) for a visual aid in determining valve location, operation and design.

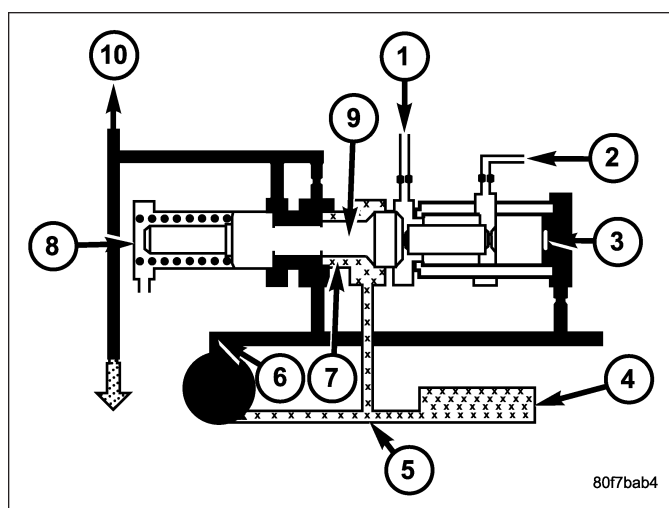
## THERMAL VALVE

The thermal valve (1) is a bi-metallic shudder valve that helps control the venting rate of oil pressure in the underdrive clutch passage during release of the clutch. When the oil temperature is approximately 20 degrees Fahrenheit or less, the valve is fully open to assist in venting oil past the U1 orifice (2). At temperatures above 20 degrees, the valve starts to close and becomes fully closed at approximately 140 degrees. The thermal valve is located in the transfer plate of the valve body.



## REGULATOR VALVE

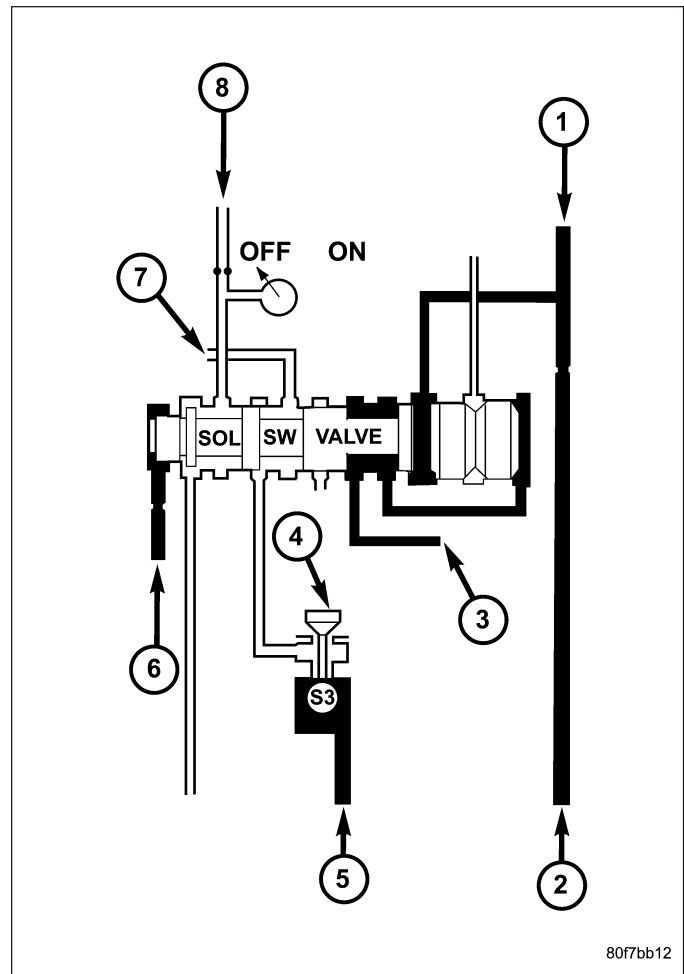
The regulator valve (9) controls hydraulic pressure in the transmission. It receives unregulated pressure from the pump (6), which works against spring tension (8) to maintain oil at specific pressures. A system of sleeves and ports allows the regulator valve to work at one of three predetermined pressure levels. Regulated oil pressure is also referred to as "line pressure."



- 1 - FROM OVERDRIVE CLUTCH CIRCUIT
- 2 - FROM MANUAL VALVE
- 3 - HYDRAULIC PRESSURE
- 4 - FILTER
- 5 - PUMP INLET
- 6 - PUMP OUTLET
- 7 - OIL PRESSURE REGULATED AT THIS POINT
- 8 - SPRING TENSION
- 9 - REGULATOR VALVE
- 10 - TORQUE CONVERTER CONTROL VALVE

## SOLENOID SWITCH VALVE

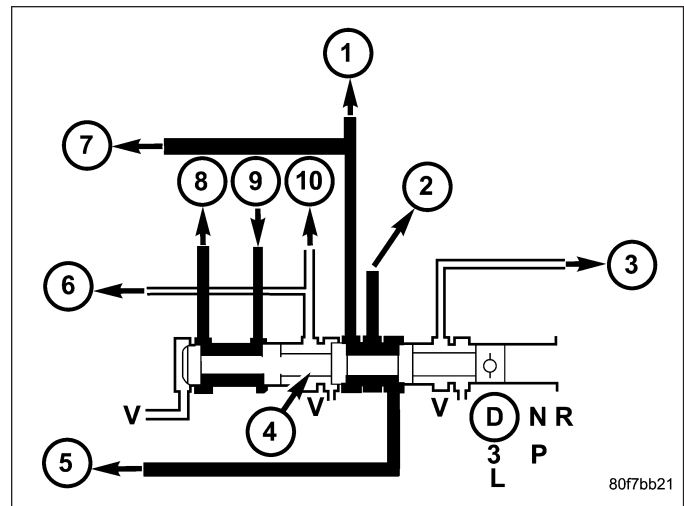
The solenoid switch valve controls line pressure from the LR/CC solenoid (4). In one position, it allows the low/reverse clutch to be pressurized. In the other, it directs line pressure to the converter control and converter clutch valves (7).



- 1 - 2/4 CLUTCH
- 2 - MANUAL VALVE
- 3 - UD CLUTCH
- 4 - LR/CC SOLENOID DE-ENERGIZED
- 5 - MANUAL VALVE
- 6 - LINE PRESSURE
- 7 - CONVERTER CLUTCH SWITCH AND CONTROL VALVES
- 8 - LR CLUTCH

## MANUAL VALVE

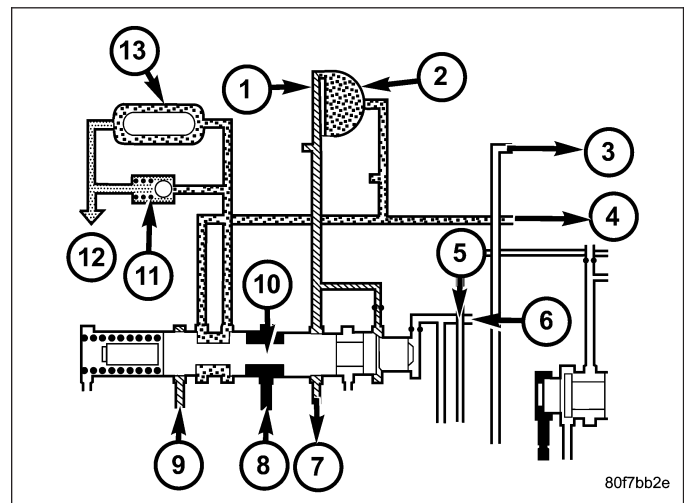
The manual valve (4) is operated by the mechanical shift linkage. Its primary responsibility is to send line pressure to the appropriate hydraulic circuits and solenoids. The valve has three operating ranges or positions.



- 1 - UD CLUTCH
- 2 - LR/CC CLUTCH
- 3 - REVERSE CLUTCH
- 4 - MANUAL VALVE
- 5 - REGULATOR VALVE
- 6 - REGULATOR VALVE
- 7 - CONVERTER CLUTCH CONTROL VALVE
- 8 - 2/4 CLUTCH
- 9 - 2/4 - L/R SOLENOID
- 10 - L/R CLUTCH

## CONVERTER CLUTCH SWITCH VALVE

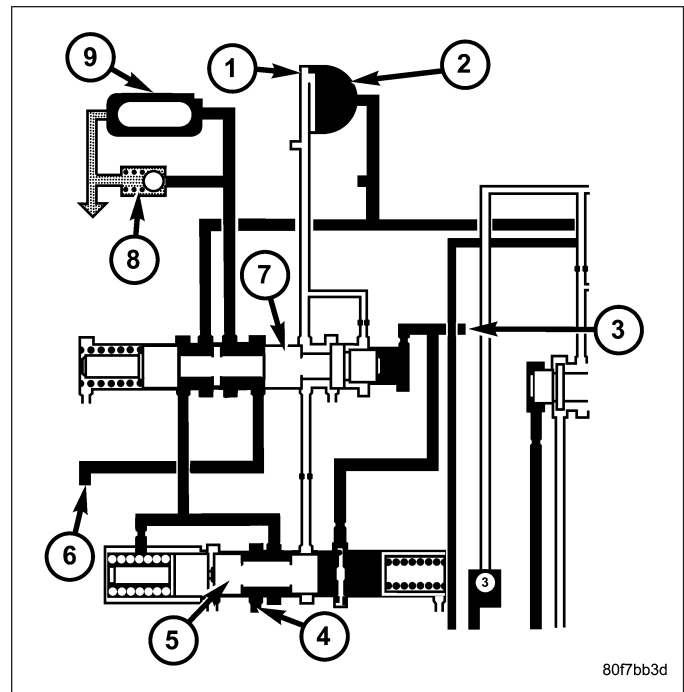
The main responsibility of the converter clutch switch valve (10) is to control hydraulic pressure applied to the front (off) side of the converter clutch piston. Line pressure from the regulator valve (5) is fed to the torque converter regulator valve (8). The pressure is then directed to the converter clutch switch valve (10) and to the front side of the converter clutch piston. This pressure pushes the piston back and disengages the converter clutch.



- 1 - CONVERTER CLUTCH
- 2 - TORQUE CONVERTER
- 3 - LR CLUTCH
- 4 - DRIBBLERS
- 5 - REGULATOR VALVE
- 6 - SOLENOID SWITCH VALVE
- 7 - CONVERTER CLUTCH CONTROL VALVE
- 8 - TORQUE CONVERTER REGULATOR VALVE
- 9 - CONVERTER CLUTCH CONTROL VALVE
- 10 - CONVERTER CLUTCH SWITCH VALVE
- 11 - BYPASS VALVE
- 12 - LUBE
- 13 - COOLER

## CONVERTER CLUTCH CONTROL VALVE

The converter clutch control valve (5) controls the back (on) side of the torque converter clutch (1). When the controller energizes or modulates the LR/CC solenoid to apply the converter clutch piston, both the converter clutch control valve (5) and the converter control valve move, allowing pressure to be applied to the back side of the clutch.



80f7bb3d

- 1 - CONVERTER CLUTCH
- 2 - TORQUE CONVERTER
- 3 - LR/CC SOLENOID
- 4 - FROM MANUAL VALVE
- 5 - CONVERTER CLUTCH CONTROL VALVE
- 6 - TORQUE CONVERTER REGULATOR VALVE
- 7 - CONVERTER CLUTCH SWITCH VALVE
- 8 - BYPASS VALVE
- 9 - COOLER

## T/C REGULATOR VALVE

The torque converter regulator valve slightly regulates the flow of fluid to the torque converter.

## LOW/REVERSE SWITCH VALVE

The low/reverse clutch is applied from different sources, depending on whether low (1st) gear or reverse is selected. The low/reverse switch valve alternates positions depending on from which direction fluid pressure is applied. By design, when the valve is shifted by fluid pressure from one channel, the opposing channel is blocked. The switch valve alienates the possibility of a sticking ball check, thus providing consistent application of the low/reverse clutch under these operating conditions.

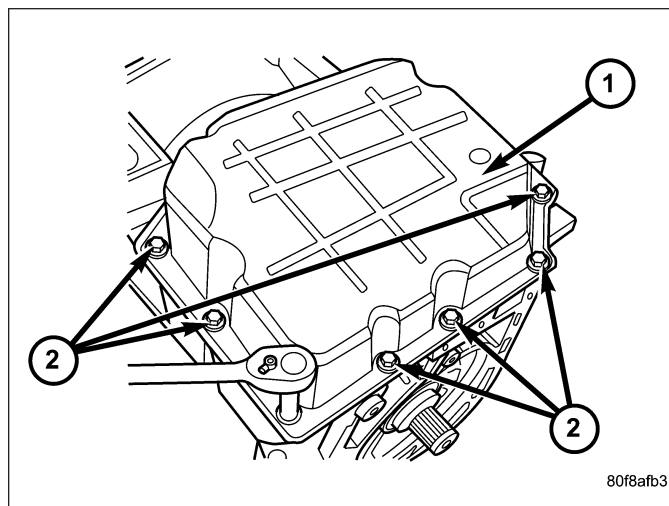
## REMOVAL

**Note:** If valve body is being reconditioned or replaced, it is necessary to perform the Quick Learn Procedure.(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

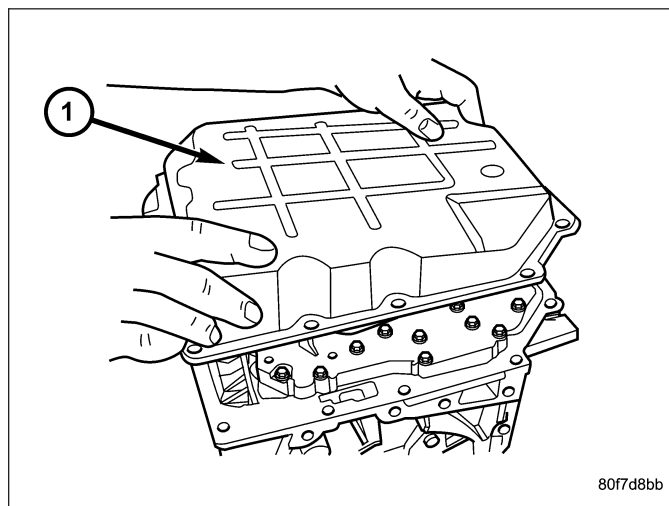
1. Disconnect the TRS and solenoid wiring connectors.
2. Disconnect the shift cable from the shift lever (at the transmission).
3. Move the manual shift lever clockwise as far as it will go. This should be one position past the L position. Then remove the manual shift lever.

**Note:** One of the oil pan bolts has a sealing patch applied from the factory. Separate this bolts for reuse.

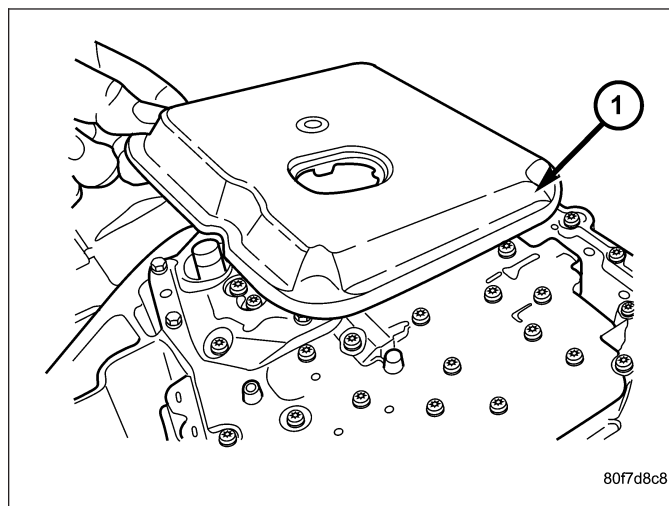
4. Remove transmission pan bolts (2).



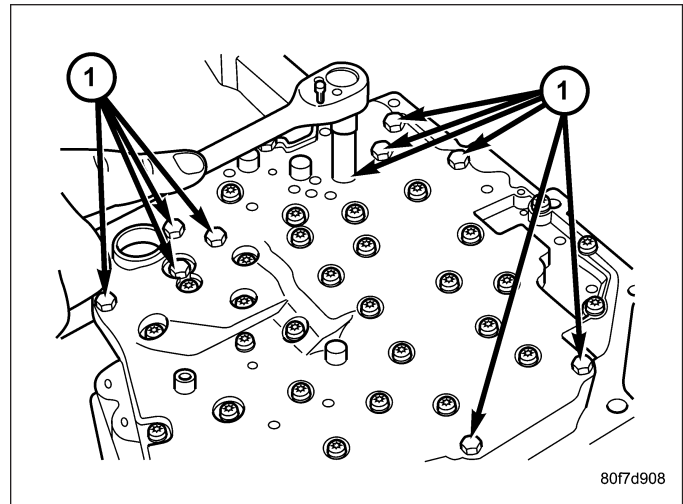
5. Remove transmission oil pan (1).



6. Remove oil filter (1) from valve body. It is held in place by two screws.

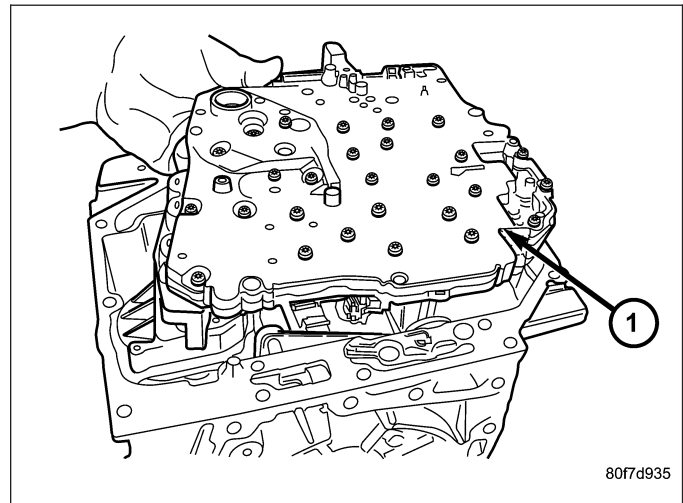


7. Remove valve body bolts-to-case (1).



**CAUTION:** The overdrive and underdrive accumulators and springs may fall out when removing the valve body.

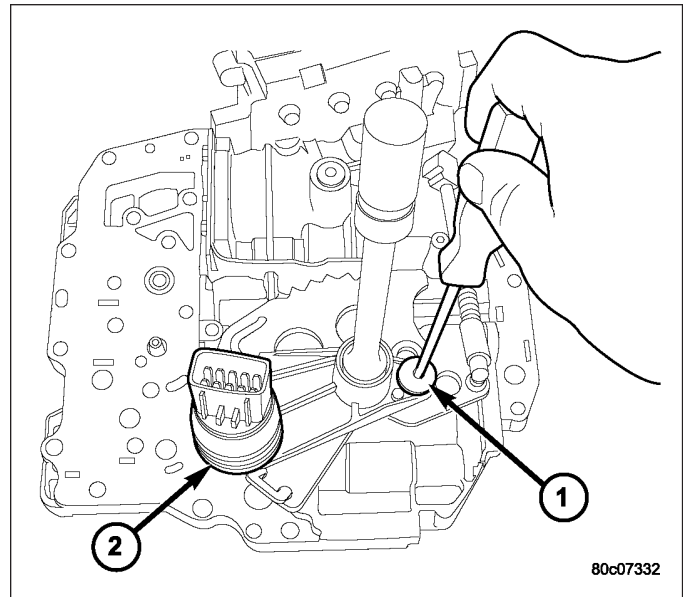
8. Carefully remove valve body assembly (1) from the transmission.



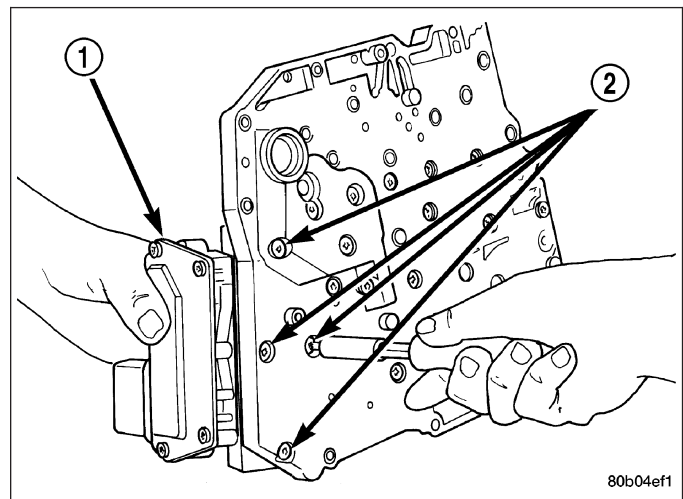
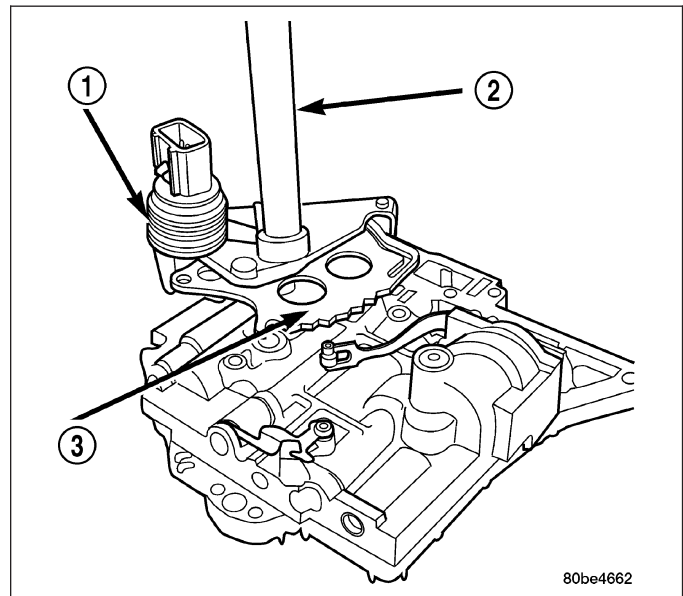
## DISASSEMBLY

**Note:** If the valve body is being reconditioned or replaced, it is necessary to perform the Quick Learn Procedure using the scan tool (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

1. Remove manual shaft seal.
2. Remove manual shaft screw (1).
3. Remove Transmission Range Sensor (TRS) (1) and manual shaft (2).

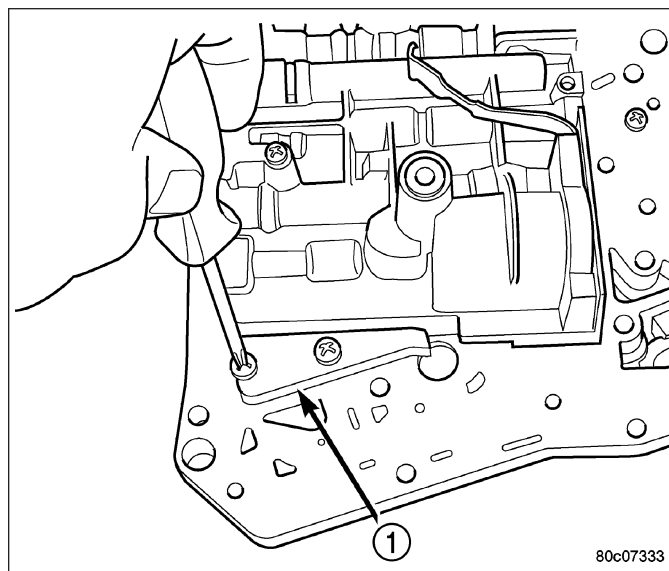


4. Remove Solenoid/Pressure Switch Assembly (1) from valve body.

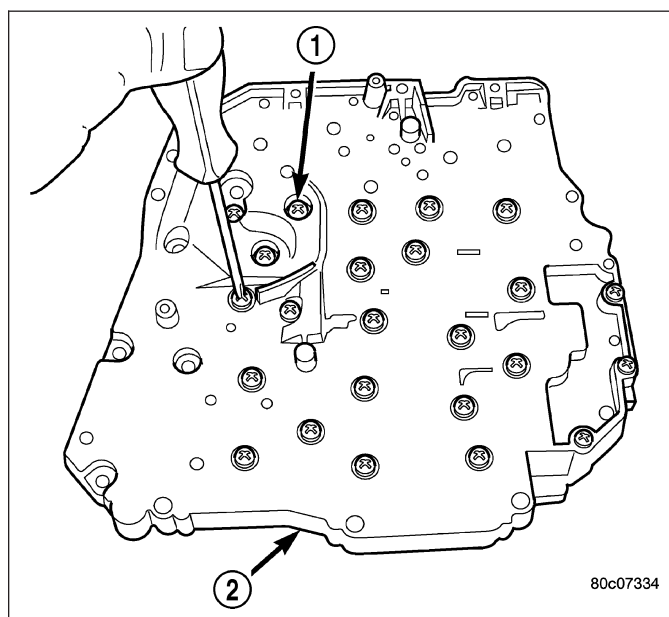




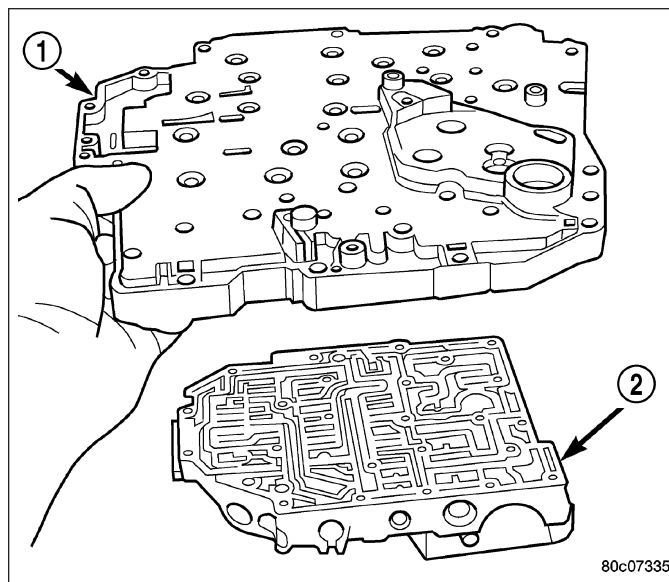
5. Remove valve body stiffener plate (1).



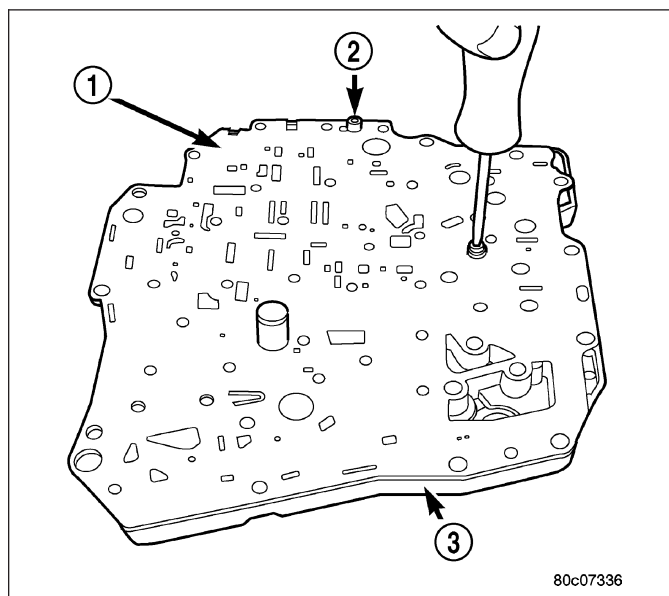
6. Invert valve body assembly and remove transfer plate-to-valve body screws (1).



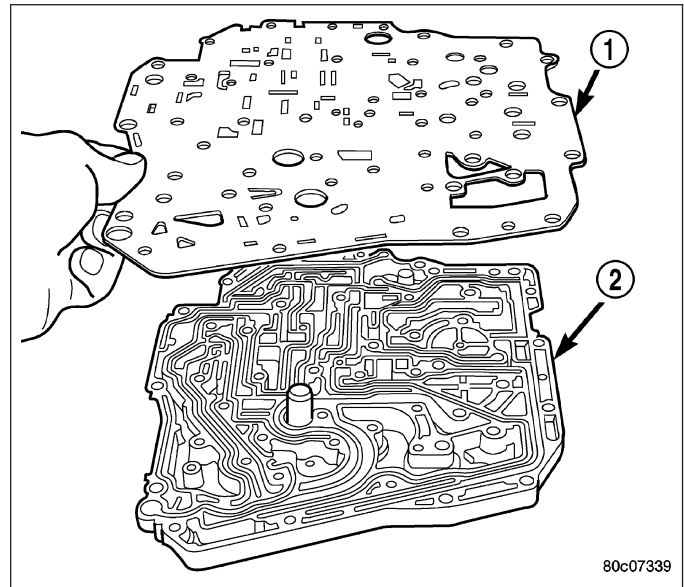
7. Remove transfer/seperator plate (1) from valve body (2)



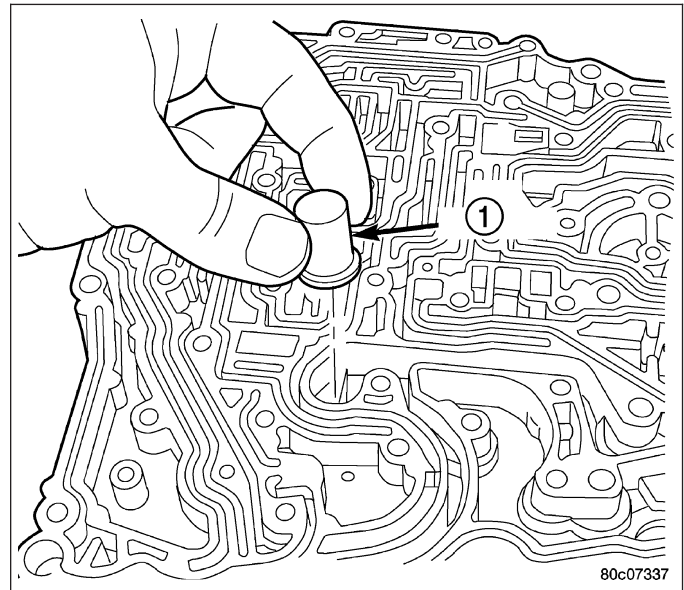
8. Remove separator plate-to-transfer plate screws (2).



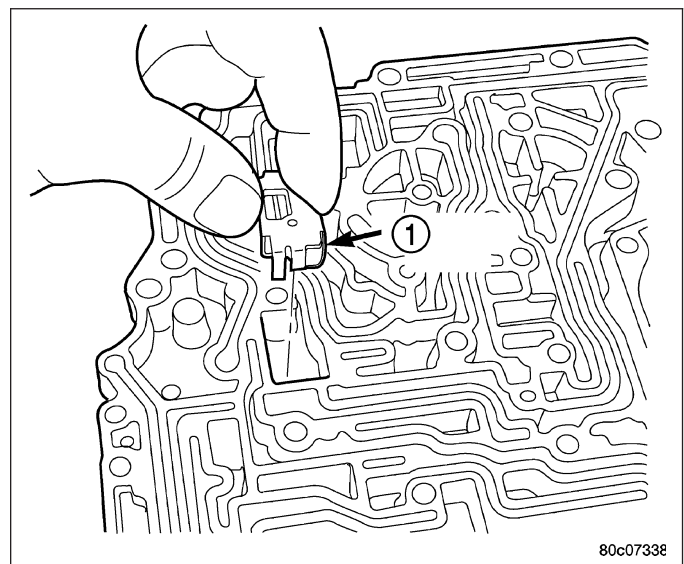
9. Remove separator plate (1) from transfer plate (2).

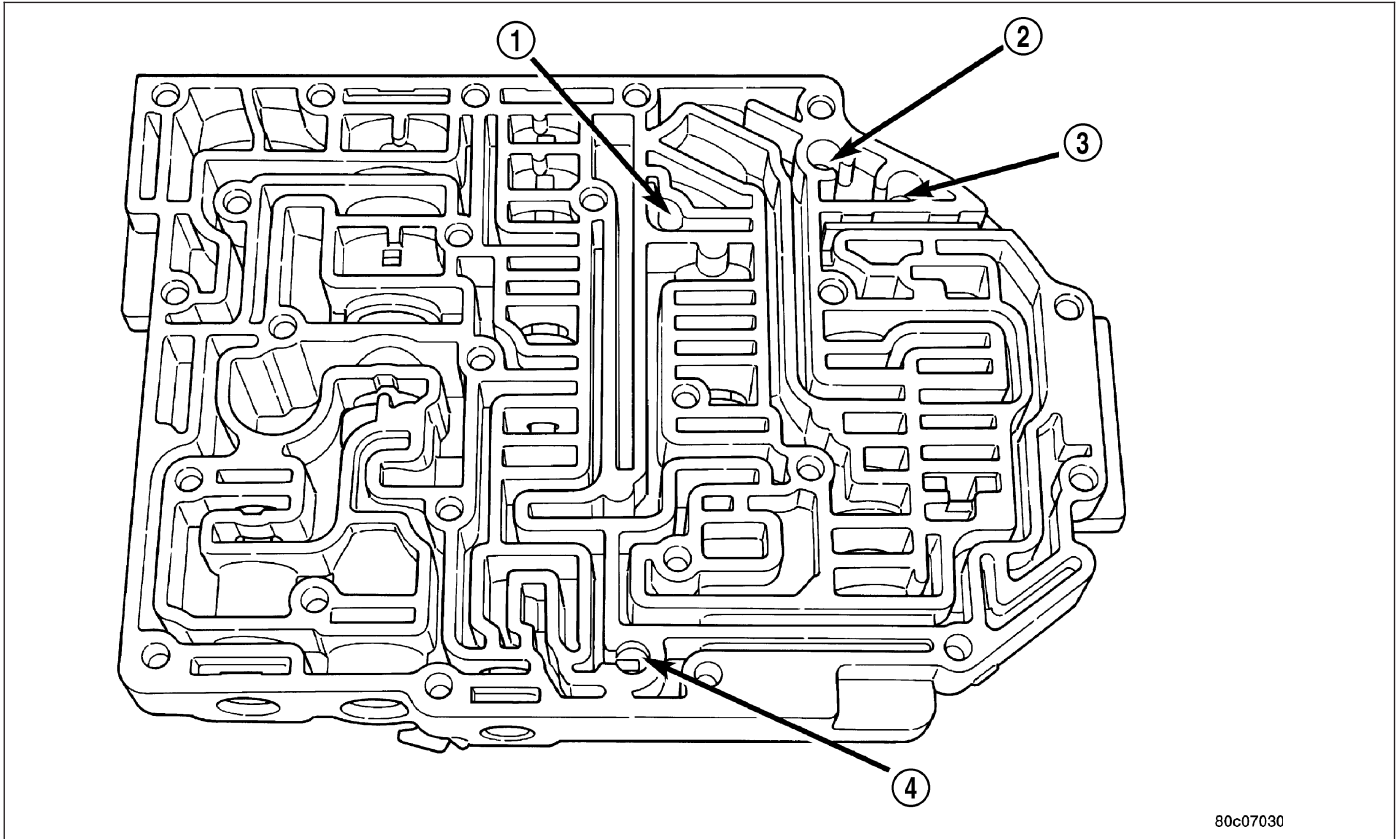


10. Remove the oil screen (1) from the transfer plate.



11. Remove thermal valve (1) from transfer plate.





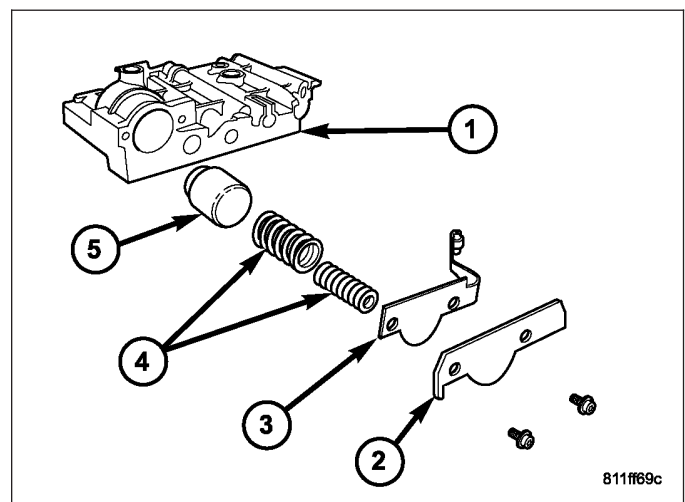
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**Ball Check Location**

- 1 - (#4) BALL CHECK LOCATION
- 2 - (#2) BALL CHECK LOCATION
- 3 - (#5) BALL CHECK LOCATION
- 4 - (#3) BALL CHECK LOCATION

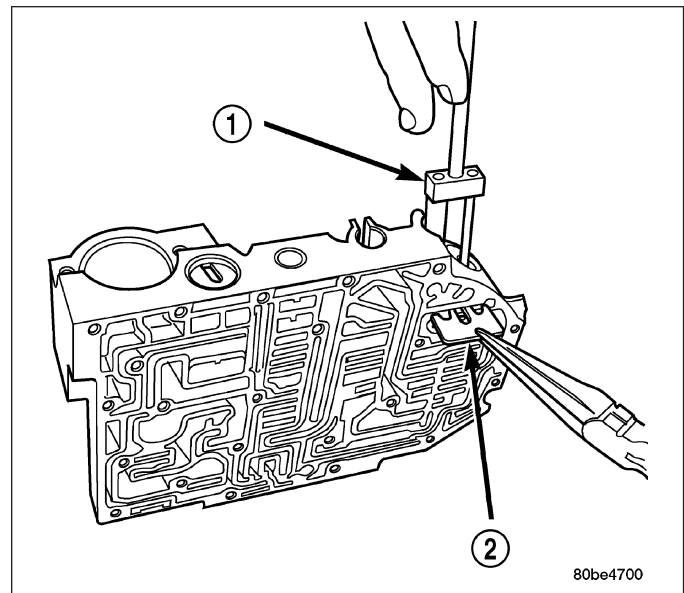
12. Remove valve body check balls (1-4). Note their location for assembly ease.

13. Remove 2/4 accumulator assembly (1-5).

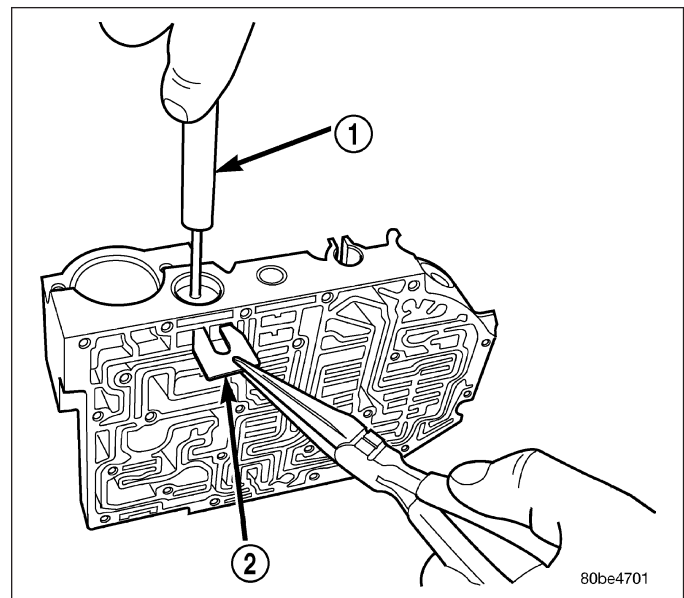


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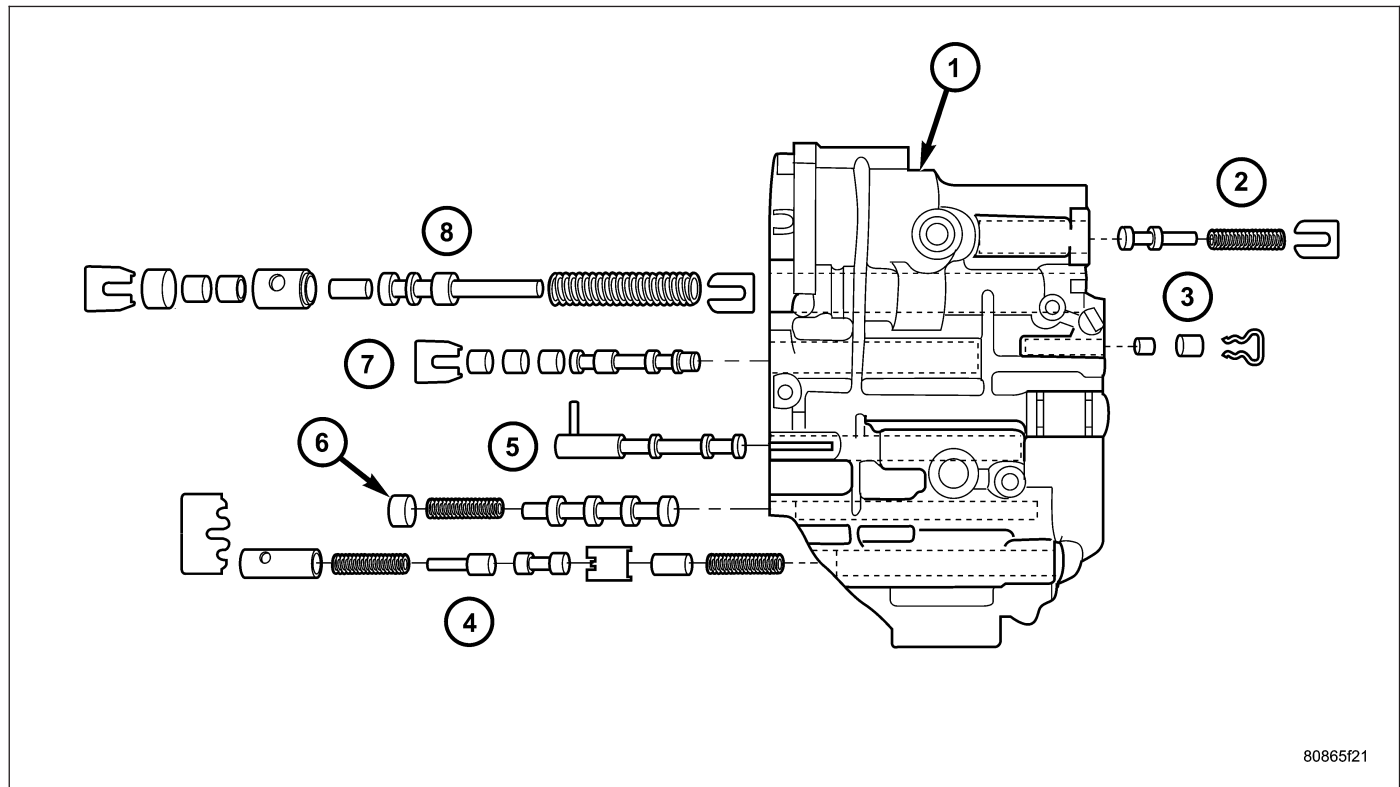
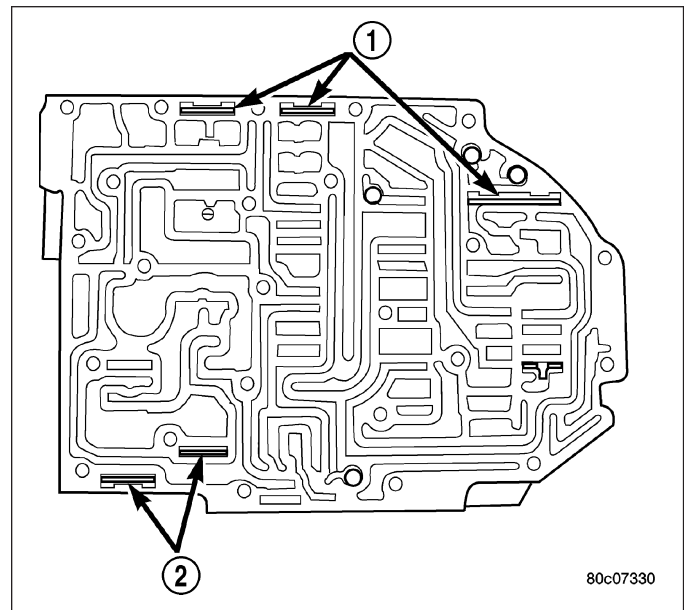
14. Remove dual retainer plate (2) from valve body.  
Use special tool 6301 (1) to remove plate (2).



15. Remove regulator valve spring retainer (2).



16. Remove remaining retainers (1, 2).



**Valve Body Assembly**

- 1 - VALVE BODY
- 2 - T/C REGULATOR VALVE
- 3 - L/R SWITCH VALVE
- 4 - CONVERTER CLUTCH CONTROL VALVE
- 5 - MANUAL VALVE
- 6 - CONVERTER CLUTCH SWITCH VALVE
- 7 - SOLENOID SWITCH VALVE
- 8 - REGULATOR VALVE

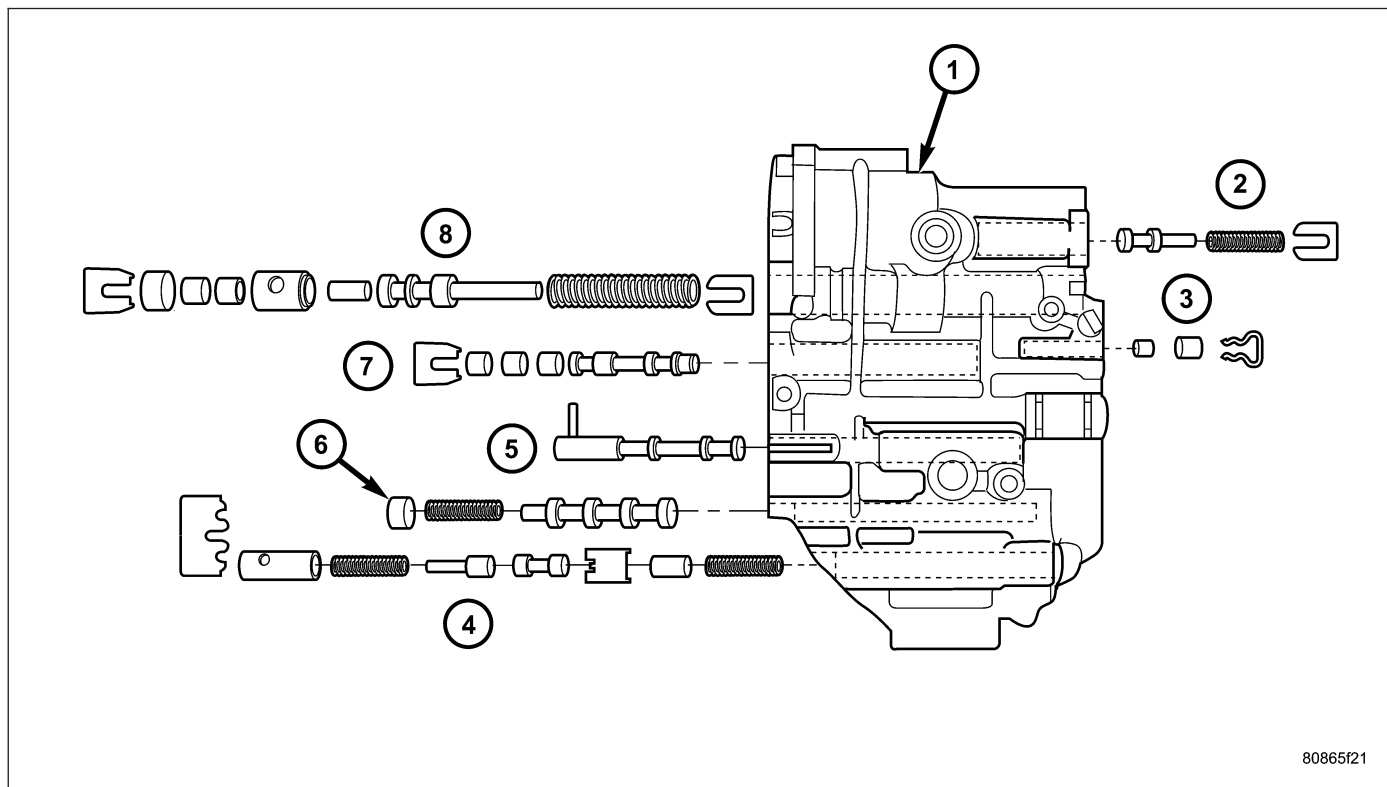
17. Remove all valves and springs.

18. Cleanliness through entire disassembly and assembly of the valve body cannot be overemphasized. When disassembling, each part should be washed in a suitable solvent, then dried by compressed air. **Do not wipe**

**parts with shop towels.** All mating surfaces in the valve body are accurately machined; therefore, careful handling of all parts must be exercised to avoid nicks or burrs.

## ASSEMBLY

**Note:** If the valve body assembly is being reconditioned or replaced, it is necessary to perform the Quick Learn Procedure using the scan tool. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)



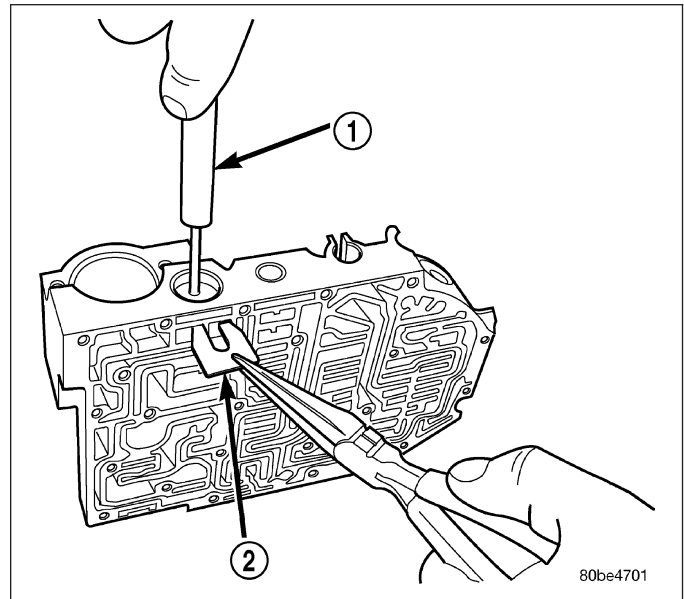
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**Valve Body Assembly**

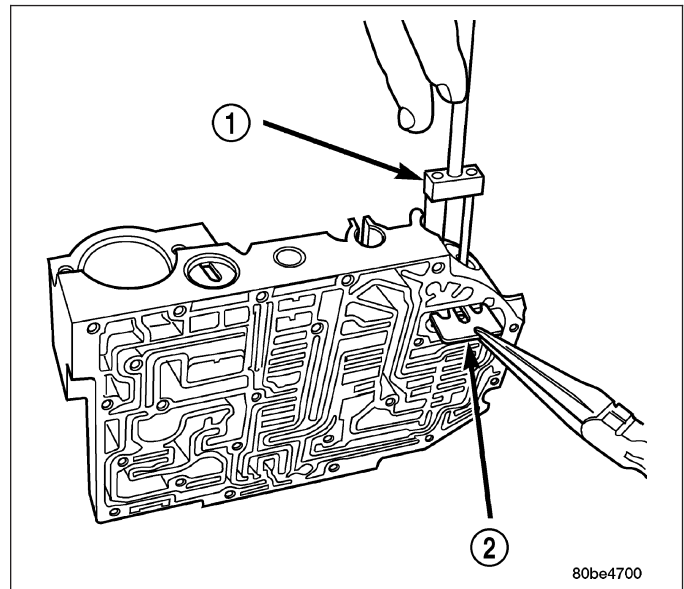
- 1 - VALVE BODY
- 2 - T/C REGULATOR VALVE
- 3 - L/R SWITCH VALVE
- 4 - CONVERTER CLUTCH CONTROL VALVE
- 5 - MANUAL VALVE
- 6 - CONVERTER CLUTCH SWITCH VALVE
- 7 - SOLENOID SWITCH VALVE
- 8 - REGULATOR VALVE

1. Install all valves and springs as shown.

2. Install regulator valve spring retainer (2).

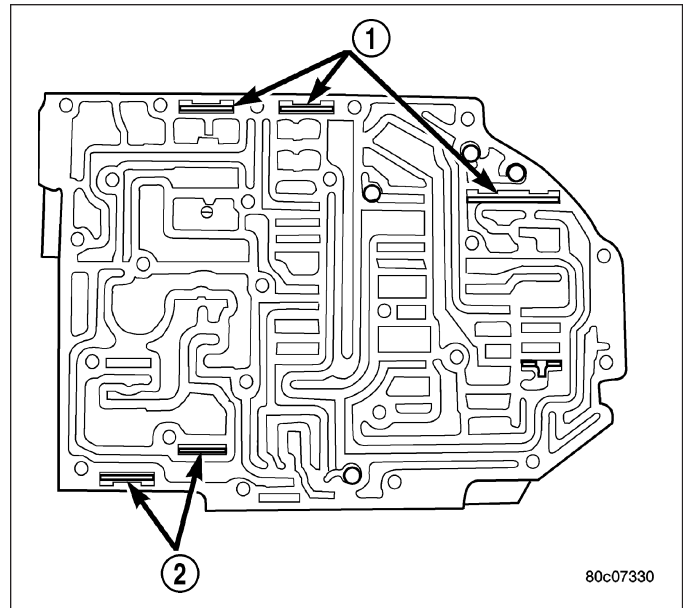


3. Install dual retainer plate (2) using Tool 6301 (1).

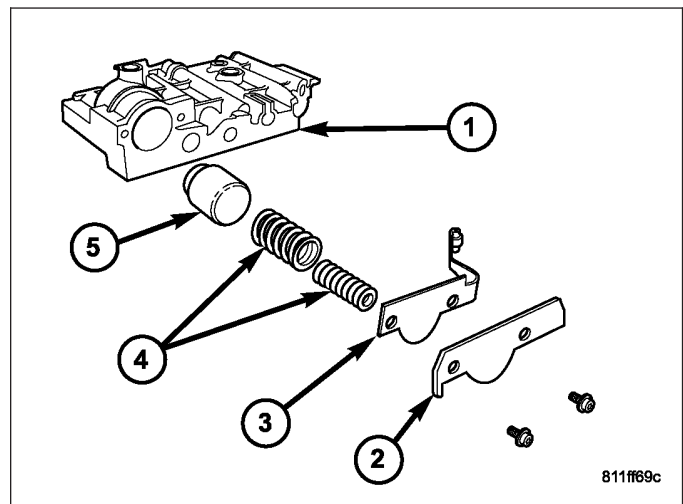


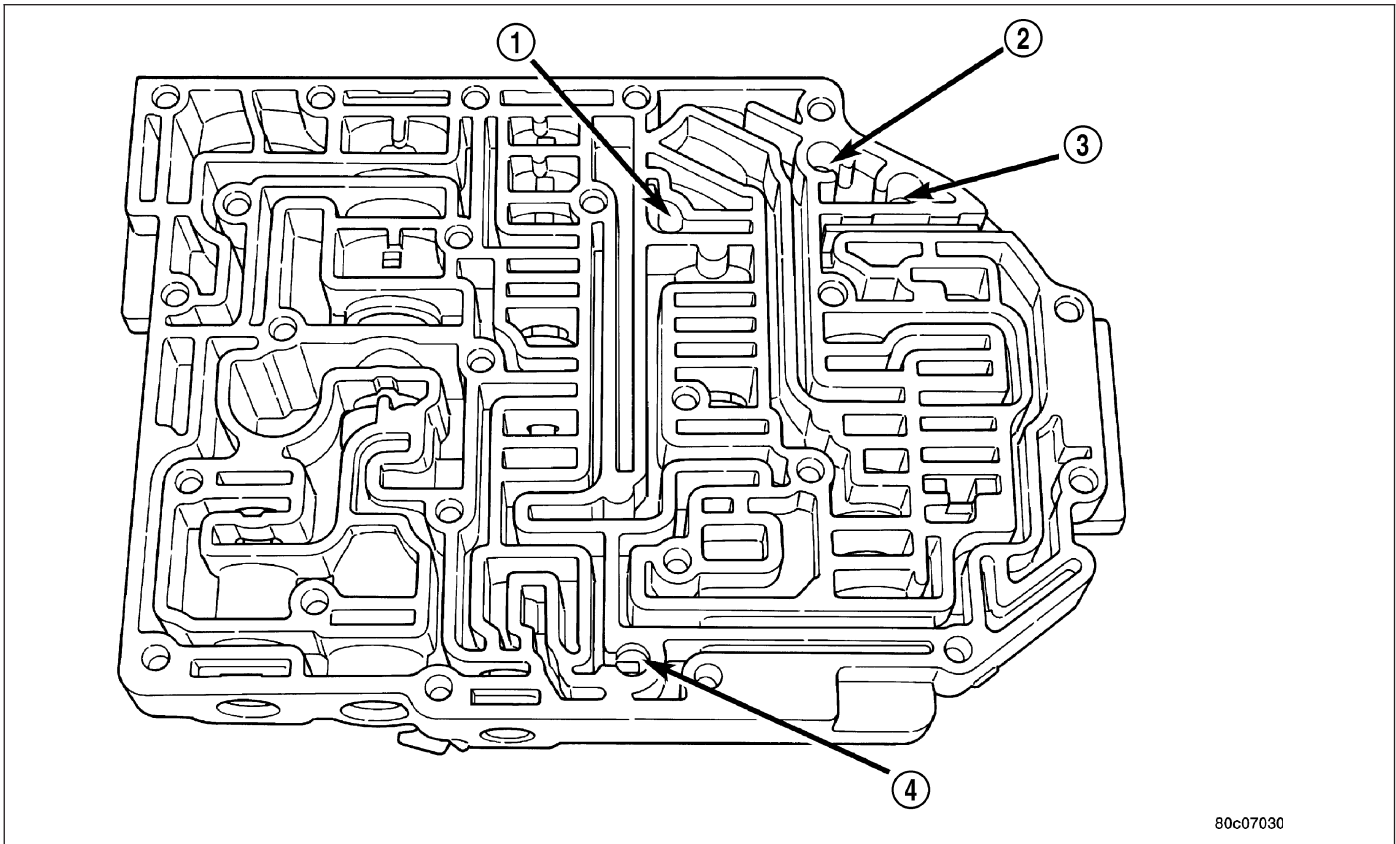


4. Verify that all retainers (1, 2) are installed as shown. Retainers should be flush or below valve body surface.



5. Install 2/4 Accumulator components (1-5) as shown. Torque 2/4 Accumulator retainer plate to 5 N·m (45 in. lbs.).





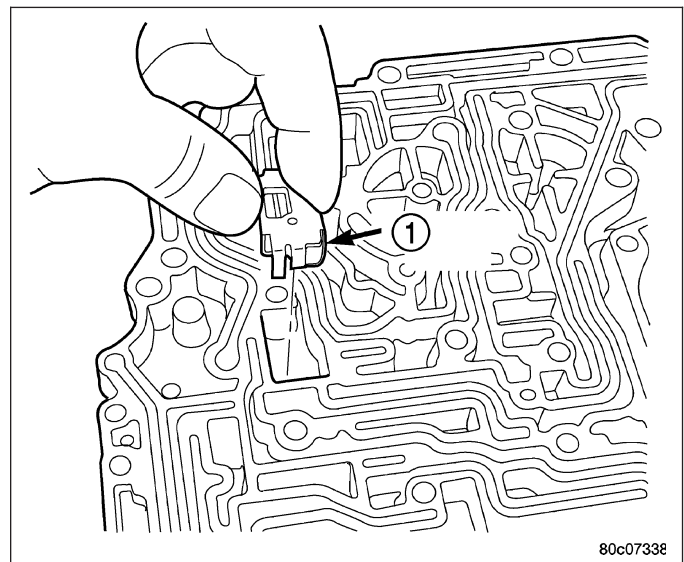
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**Ball Check Location**

- 1 - (#4) BALL CHECK LOCATION
- 2 - (#2) BALL CHECK LOCATION
- 3 - (#5) BALL CHECK LOCATION
- 4 - (#3) BALL CHECK LOCATION

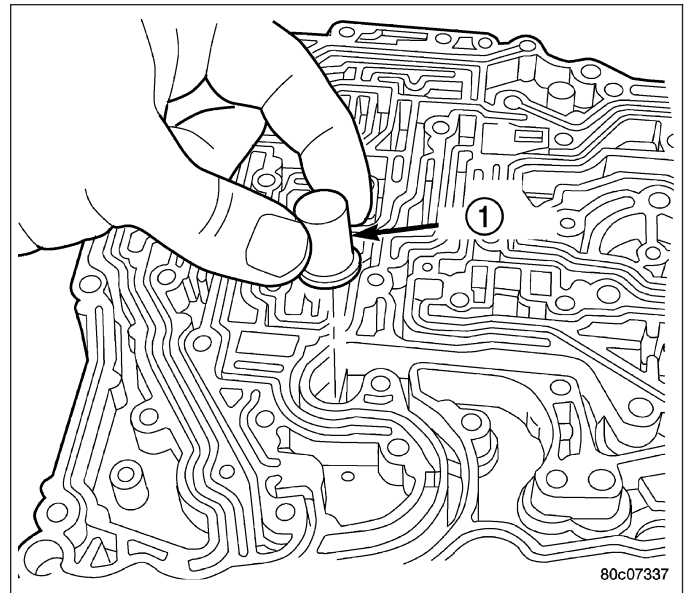
6. Install check balls into position as shown. If necessary, secure them with petrolatum or transmission assembly gel for assembly ease.

7. Install thermal valve (1) to the transfer plate.

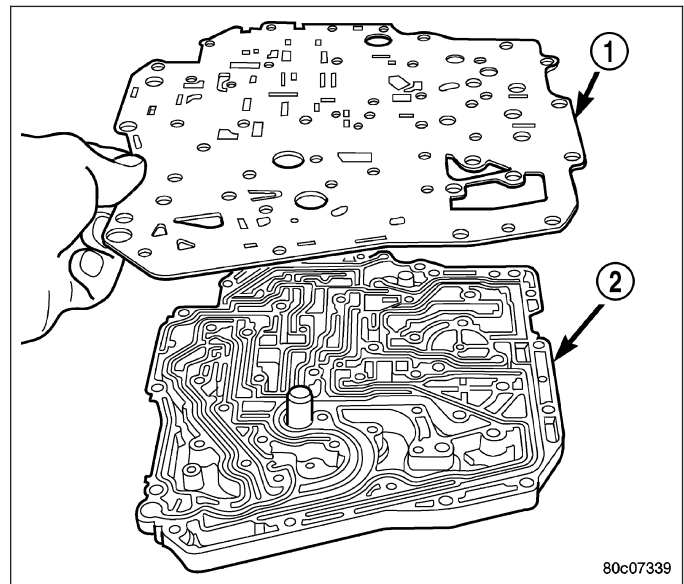


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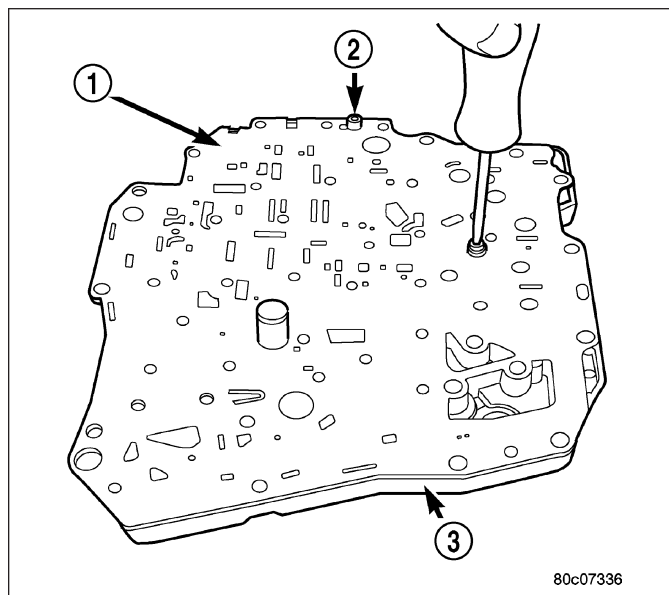
8. Install the oil screen (1) to the transfer plate.



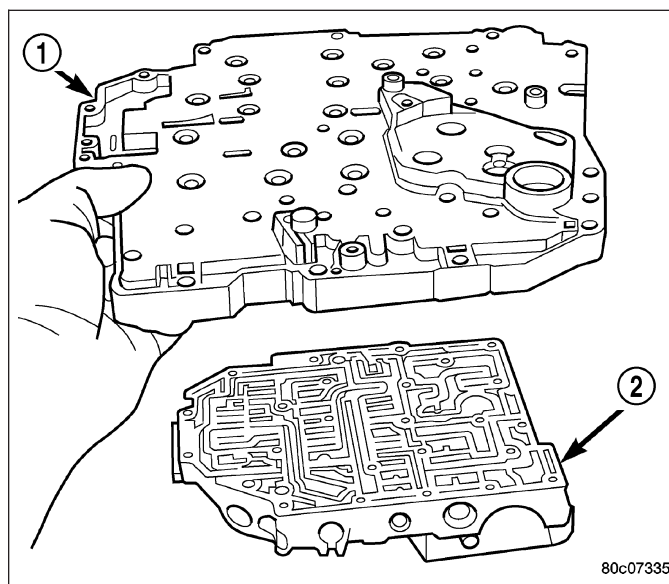
9. Install separator plate (1) to transfer plate (2).



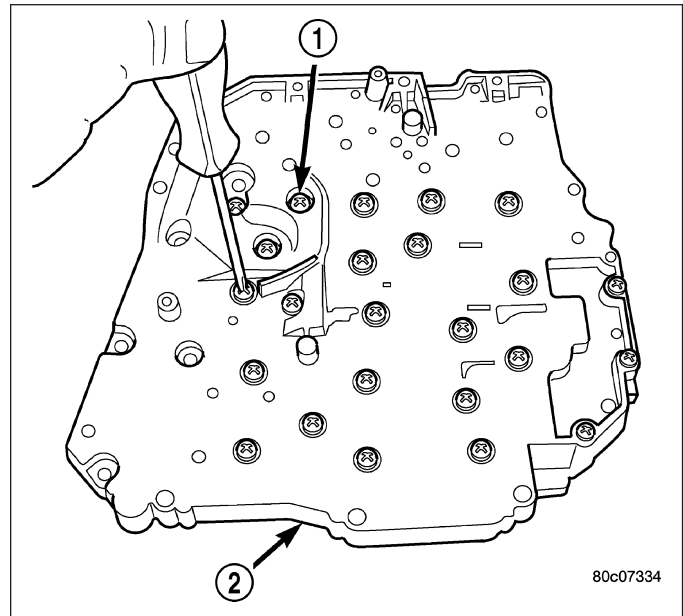
10. Install the two separator plate-to-transfer plate screws (2).



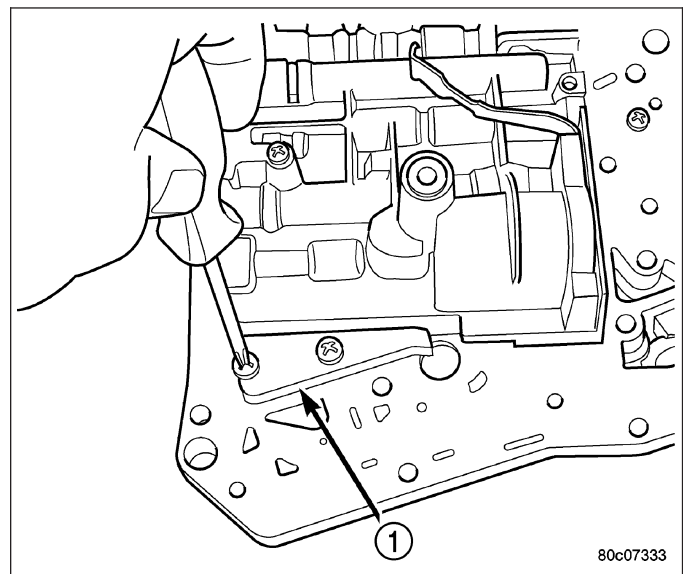
11. Install the transfer plate (1) to the valve body (2).



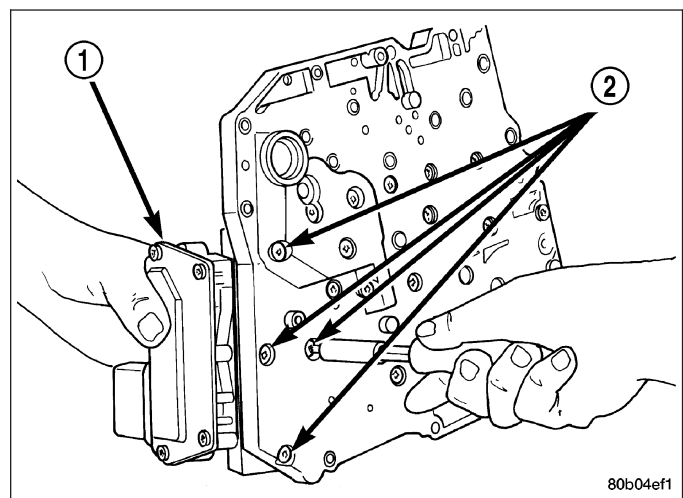
12. Install the transfer plate-to-valve body screws (1) and torque to 5 N·m (45 in. lbs.).



13. Install the stiffener plate (1).

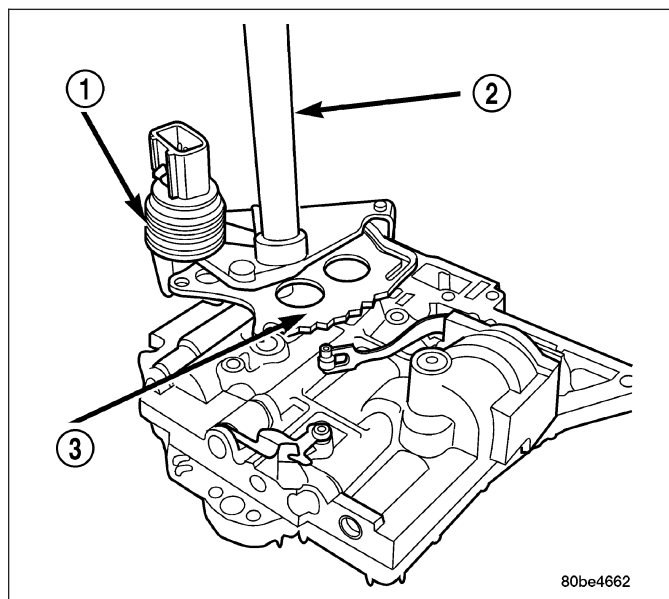


14. Install the solenoid/pressure switch assembly (1) and screws to the transfer plate and torque to 5.5

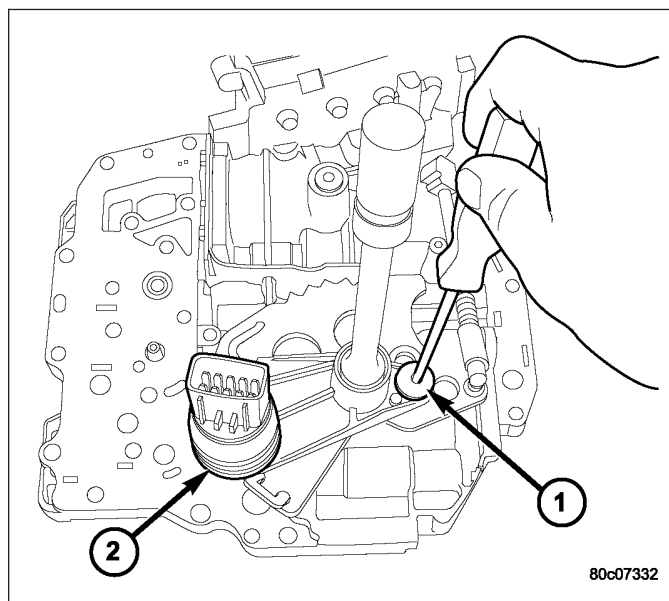


N·m (50 in. lbs.).

15. Install the manual shaft/rooster comb (3) and transmission range sensor (1) to the valve body.

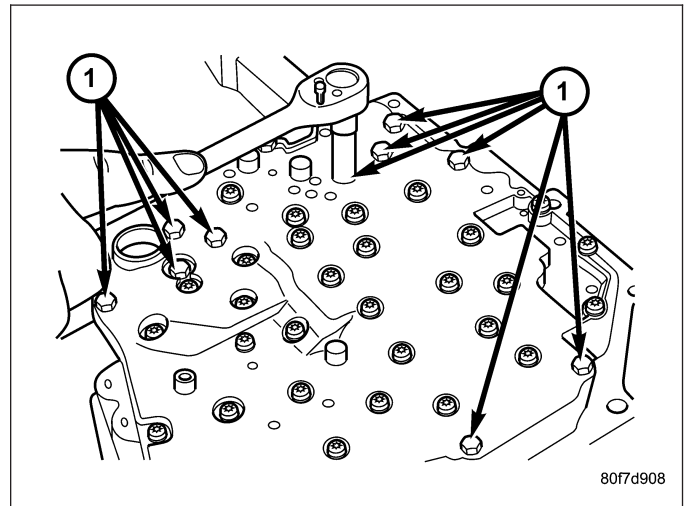


16. Install the TRS/manual shaft retaining screw (1) and torque to 5 N·m (45 in. lbs.).
17. Install manual shaft seal.

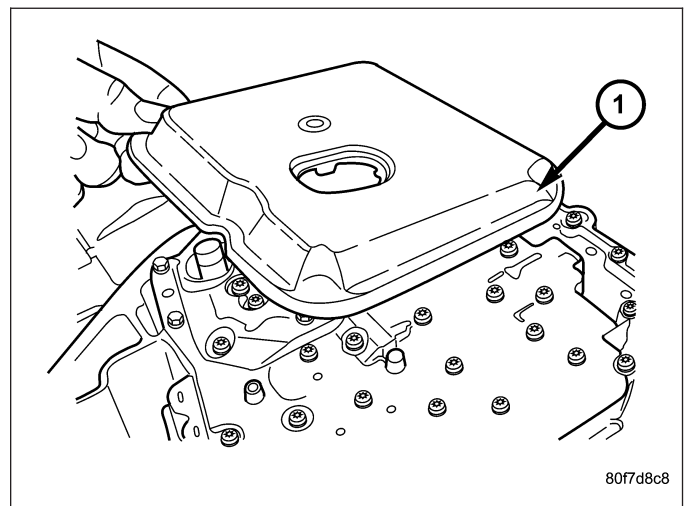


## INSTALLATION

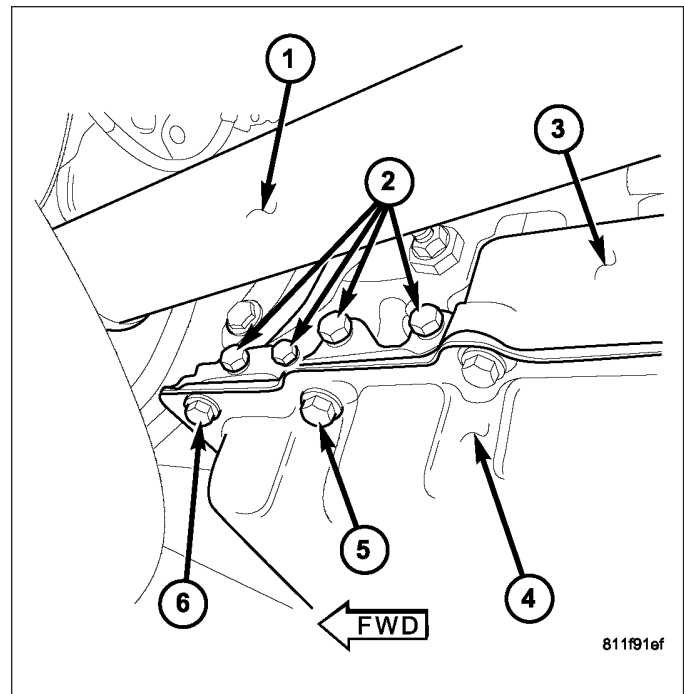
1. Install valve body into position and start bolts (1).  
Torque valve body to transmission case bolts (1) to 12 N·m (105 in. lbs.) torque.



2. Install transmission oil filter (1).

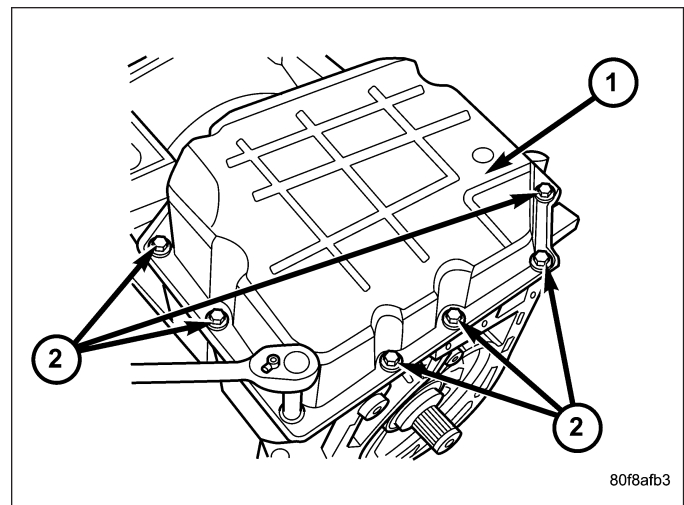


**Note:** Before installing the oil pan bolt in the bolt hole (5) located between the torque converter clutch on and U/D clutch pressure tap circuits , it will be necessary to replenish the sealing patch on the bolt using Mopar® Lock & Seal Adhesive.



3. Make sure oil pan (1) and case rail are clean and dry. Install an 1/8" bead of RTV to the transmission oil pan and install to case. Tighten bolts (2) to 20 N·m (14.5 ft. lbs.).
4. Lower vehicle and connect the TRS connector.
5. Connect solenoid/pressure switch assembly connector.
6. Lower vehicle.
7. Fill transmission with ATF+4, Automatic Transmission Fluid. Verify proper fluid level. (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE/FLUID - STANDARD PROCEDURE)

**Note:** If the valve body has been reconditioned or replaced, it is necessary to perform the Quick Learn Procedure. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)







TIRES/WHEELS

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TIRES/WHEELS

DIAGNOSIS AND TESTING

TIRE AND WHEEL VIBRATION

Tire and wheel imbalance, runout and force variation can cause vehicles to exhibit steering wheel vibration.

VISUAL INSPECTION

Visual inspection of the vehicle is recommended prior to road testing or performing any other procedure. Raise the vehicle on a suitable hoist. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)

Inspect for the following:

- Verify correct (OEM) wheel and tire, as well as correct wheel weights.
- Inspect tires and wheels for damage, mud packing and unusual wear; correct as necessary.
- Check and adjust tire air pressure to the pressure listed on the label attached to the driver's door opening.

ROAD TEST

Road test vehicle on a smooth road for a least five miles to warm tires (remove any flat spots). Lightly place hands on steering wheel at the 10:00 and 2:00 positions while slowly sweeping up and down from 90 to 110 km/h (55 to 70 mph) where legal speed limits allow.

Observe the steering wheel for:

- Visual Nibble (oscillation: clockwise/counterclockwise, usually due to tire imbalance)

- Visual Buzziness (high frequency, rapid vibration up and down)

To rule out vibrations due to brakes or powertrain:

- Lightly apply brakes at speed; if vibration occurs or is enhanced, vibration is likely due to causes other than tire and wheel assemblies.
- Shift transmission into neutral while vibration is occurring; if vibration is eliminated, vibration is likely due to causes other than tire and wheel assemblies.

For brake vibrations, (Refer to 5 - BRAKES - BASE/HYDRAULIC/MECHANICAL/ROTOR - DIAGNOSIS AND TESTING).

For powertrain vibrations, (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING).

For tire and wheel assembly vibrations, continue with this diagnosis and testing procedure.

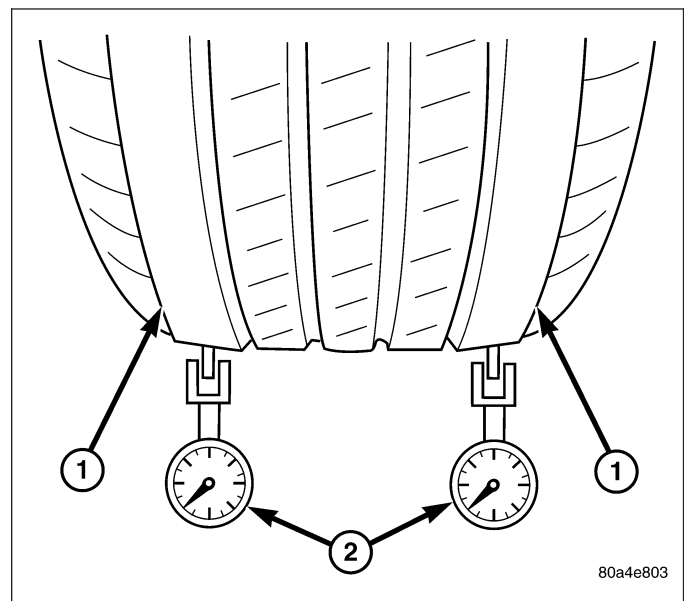
## TIRE AND WHEEL BALANCE

1. Balance the tire and wheel assemblies as necessary following the wheel balancer manufacturer's instructions and using the information listed in Tire And Wheel Balance. (Refer to 22 - TIRES/WHEELS - STANDARD PROCEDURE)
2. Road test the vehicle for at least 5 miles, following the format described in Road Test.
3. If the vibration persists, continue with this diagnosis and testing procedure.

## TIRE AND WHEEL RUNOUT/MATCH MOUNTING

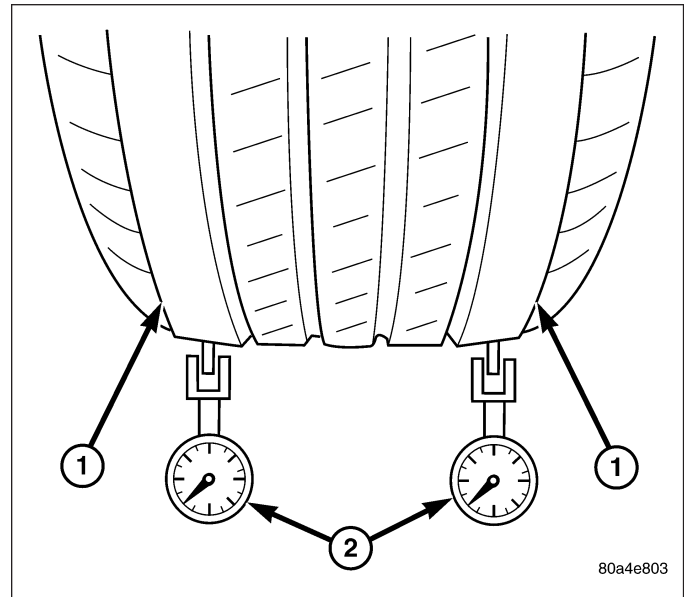
1. **System Radial Runout.** This on-the-vehicle system check will measure the radial runout including the hub, wheel and tire.

- a. Raise vehicle so tires clear floor. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
- b. Apply masking tape around the circumference of the tire in the locations to be measured (1). Do not overlap the tape.
- c. Check system runout using Dial Indicator Set, Special Tool C-3339A with 25-W wheel, or equivalent. Place the end of the indicator against each taped area (one at a time) (2) and rotate the tire and wheel. System radial runout should not exceed 0.76 mm (0.030 inch) with no tread "dips" or "steps." Tread "dips" and "steps" can be identified by spikes of the dial indicator gauge.

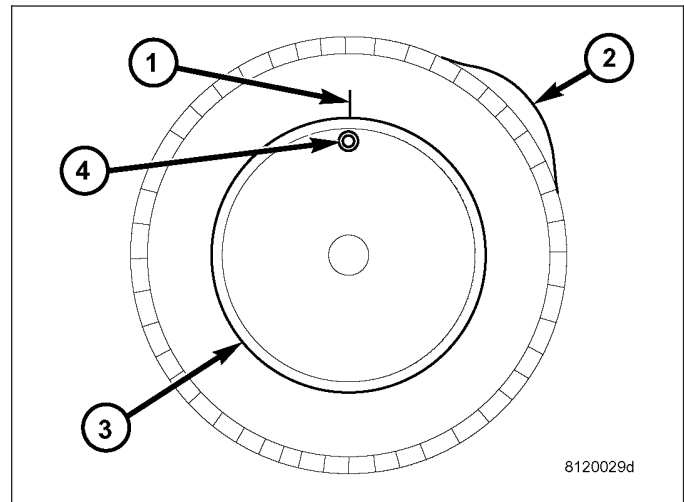


- Tread "dips"; Rapid decrease then increase in dial indicator reading over 101.6 mm (4.0 inch) of tread circumference.
  - Tread "steps"; Rapid decrease or increase in dial indicator reading over 101.6 mm (4.0 inch) of tread circumference.
- d. If system runout is excessive, re-index the tire and wheel assembly on the hub. Remove assembly from vehicle and install it back on the hub two studs over from original mounting position. If re-indexing the tire and wheel assembly corrects or reduces system runout, check hub runout and repair as necessary (Refer to 5 - BRAKES - BASE/HYDRAULIC/MECHANICAL/ROTORS - DIAGNOSIS AND TESTING).
  - e. If system runout is still excessive, continue with this diagnosis and testing procedure.
2. **Tire and Wheel Assembly Radial Runout.** This radial runout check is performed with the tire and wheel assembly off the vehicle.
    - a. Remove tire and wheel assembly from vehicle and install it on a suitable wheel balancer.

- b. Check system runout using Dial Indicator Set, Special Tool C-3339A with 25-W wheel, or equivalent. Place the end of the indicator against each taped area (one at a time) and rotate the tire and wheel. Radial runout should not exceed 0.76 mm (0.030 inch) with no tread “dips” or “steps.” Tread “dips” and “steps” can be identified by spikes of the dial indicator gauge.

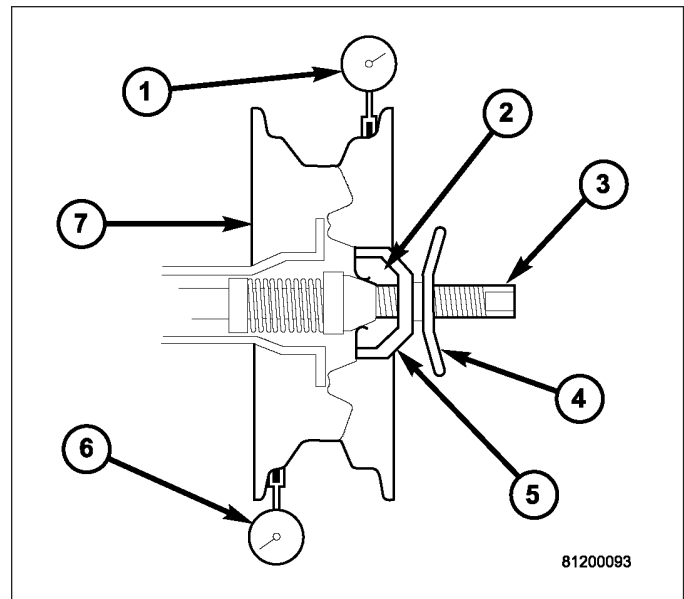


- c. If runout exceeds limits, mark the original location of the tire on the wheel at the valve stem (1)(4). Also, mark the tire and wheel to indicate the original high spot (2) of the assembly and record the runout measurement.
- d. If runout exceeds limits, the tire will need to be dismantled from the wheel to verify wheel vs. tire contribution. Refer to Wheel Runout below.

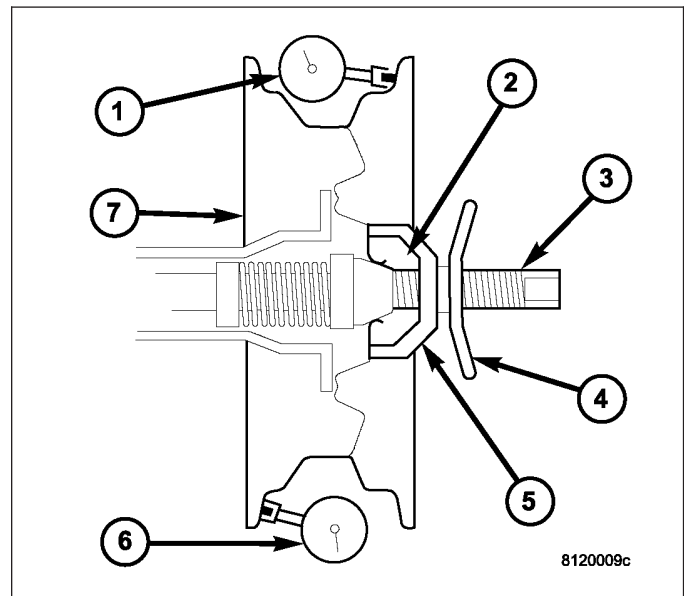


3. **Lateral Runout.** Lateral runout for the vehicle system as well as the tire and wheel assembly should be less than 0.76 mm (0.030 inch). The same procedure and theory described for radial runout can also be applied to identify and reduce lateral runout.
4. **Wheel Runout.** This runout check is performed as follows:
  - a. Dismount the tire from the wheel.
  - b. Mount the wheel back on the wheel balancer.

- c. Measure radial runout of the wheel at the tire bead seat (1, 6). Runout should not exceed 0.254 mm (0.010 inch) for aluminum wheels and 0.508 mm (.020 inch) for steel wheels. Replace the wheel if it exceeds the limit.

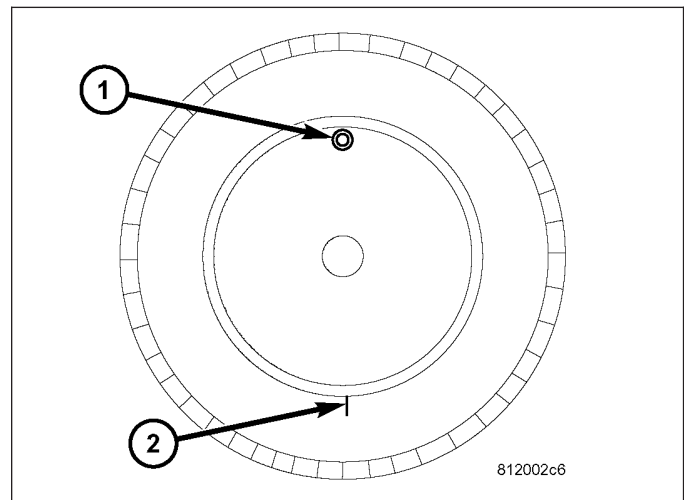


- d. Measure lateral runout of the wheel at the tire bead seat (1, 6). Runout should not exceed 0.762 mm (0.030 inch) for all wheels. Replace the wheel if it exceeds the limit.



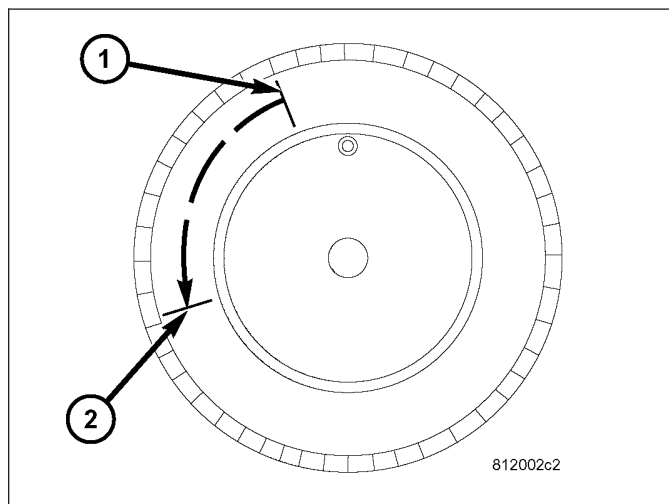
5. **Match Mounting.** If the wheel runout is within specifications, tire and wheel assembly runout can be improved by re-indexing (match mounting) the tire to the wheel as described below.

- Remount the tire on the rim 180 degrees from its original location. Ensure the tire bead is properly seated.
- Re-measure the total runout. Mark the tire at the high spot and record the measurement.



If runout is still excessive, perform the following:

- If the new high spot is within 102 mm (4.0 inch) of the first high spot on the tire, replace the tire.
- If the new high spot is within 102 mm (4.0 inch) of the first high spot on the wheel, the wheel may be out of specification. Refer to Wheel Runout above.
- If the new high spot is NOT within 102 mm (4.0 inch) of either high spot, draw an arrow on the tread from new high spot toward the original (2). Break down the tire and remount it 90 degrees on rim in that direction, then re-measure runout. This will normally reduce the runout to an acceptable amount.



6. Once back together, road test the vehicle for at least 5 miles, following the format described in Road Test. If vibration persists, and all components tested are within specification, the tires may have an excessive radial force condition. Radial force variation can only be checked as indicated below. If this equipment is not available, consult with the tire manufacturer.

## RADIAL FORCE VARIATION

Radial Force Variation can be checked using the Hunter GSP 9700 Vibration Control System (Wheel Balancer) or equivalent, if available. This type of equipment helps to correct ride disturbances by reducing the radial force variation of an assembly through re-indexing of the tire to wheel.

The equipment manufacturer or DaimlerChrysler Corporation may supply reference values as guidelines. Radial force measurements above the reference value may not always result in a ride disturbance, nor do they automatically mean the assembly components are out of specification. Do not replace components based on radial force values alone. Balancing, runout diagnosis, re-indexing, and subjective road testing must be performed as outlined in previous sections of this diagnosis and testing procedure.

Use the Radial Force equipment to identify suspect assemblies and minimize the radial forces. After all suspect assemblies are optimized, reinstall the assemblies and road test the vehicle. If a disturbance still exists and all other vibration diagnostic procedures have been completed, replace one tire or one wheel at a time, starting with the assembly having the highest force variation. Be sure to minimize each new assembly. Road test the vehicle following each replacement. Continue this process until the disturbance is resolved.

**Note:** When using Radial Force equipment, it is critically important to set proper tire inflation pressure and ensure centering of the wheel on the equipment spindle.

## RADIAL FORCE VARIATION REFERENCE VALUES

DESCRIPTION	SPECIFICATION
Total Radial Force Variation (RFV)	Less Than 22 Lbs. $\pm$ 2 Lbs.
Radial First Harmonic (R1H)	Less Than 16 Lbs. $\pm$ 2 Lbs.
Radial Second Harmonic (R2H)	Less Than 12 Lbs. $\pm$ 2 Lbs.

## STANDARD PROCEDURE

### TIRE AND WHEEL BALANCE

**Note:** Balance equipment must be calibrated and maintained per equipment manufacturer's specifications.

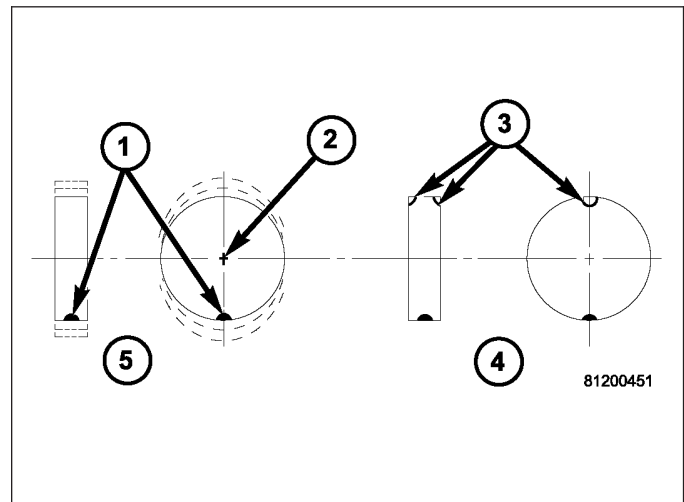
Wheel balancing can be accomplished with either on-vehicle or off-vehicle equipment.

**Note:** If using on-vehicle balancing equipment, on the driving axle, remove the opposite wheel and tire assembly.

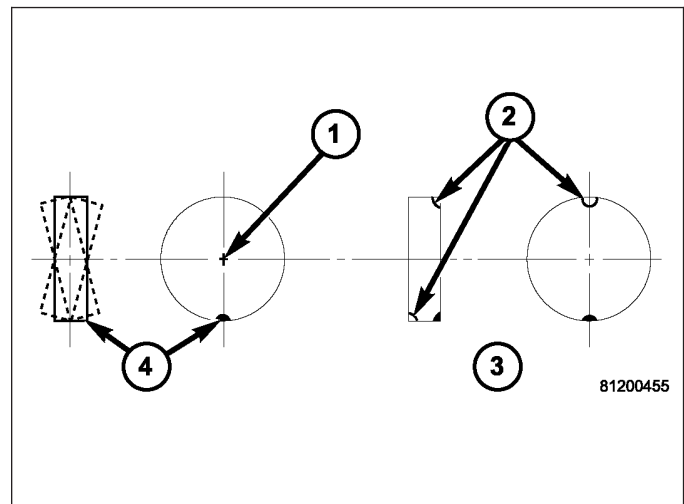
It is recommended that a two-plane dynamic balancer be used when a tire and wheel assembly requires balancing. A static balancer should only be used when a two-plane balancer is not available.

Balance wheel and tire assemblies dynamically and statically to less than 0.25 (1/4) ounce.

For static balancing, find the location of the heavy spot causing the imbalance (1). Counter balance the wheel directly opposite the heavy spot (3). Determine weight required to counterbalance the area of imbalance. Place half of this weight on the **inner** rim flange and the other half on the **outer** rim flange (3).



For dynamic balancing, the balance equipment is designed to indicate the location and amount of weight to be applied to both the inner and outer rim flanges (2).



The aluminum wheels on this vehicle use a different wheel weight than do the steel wheels. Be sure to use the correct wheel weight for the wheel type.

Always verify the Balance. When using off-vehicle equipment, remount the tire and wheel assembly 180 degrees on the balancer spindle and recheck balance. Balance variation from one spot to the other should not be more than 0.125 (1/8) ounce. If variation is more than 0.125 ounce, balancing equipment could be malfunctioning.

If difficult to balance, break down the tire and wheel assembly and check for loose debris inside the tire. Prior to disassembly, mark (index) the tire at the valve stem. Use this mark in order to remount the tire in its original orientation with respect to the wheel.

## TIRE AND WHEEL MATCH MOUNTING

Wheels and tires are match mounted at the factory. This means that the high spot of the tire is matched to the low spot on the wheel rim. This technique is used to reduce runout in the wheel and tire assembly. The high spot on the tire is marked with a paint mark or a bright colored adhesive label on the outboard sidewall. The low spot on the wheel is identified with a label on the outside of the rim and a dot or line in the drop well area of the rim (inside where the tire mounts). If the outside label has been removed, the tire will have to be removed to locate the dot or line on the inside of the rim. The tire can then be match mounted to the tire.

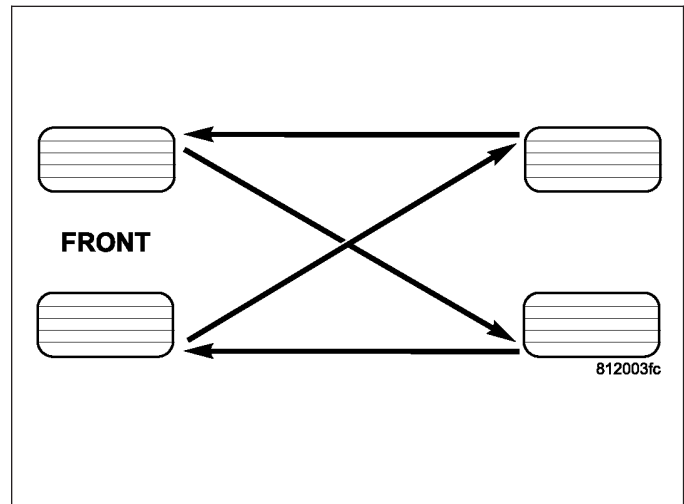
Information on match mounting the tire to the wheel can be found in Tire and Wheel Runout/Match Mounting, items (2) through (5), within Diagnosis And Testing - Tire And Wheel Vibration. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

## TIRE AND WHEEL ROTATION

Tires on the front and rear operate at different loads and perform different steering, driving, and braking functions. For these reasons they wear at unequal rates and tend to develop irregular wear patterns. These effects can be reduced by rotating the tires at regular intervals. The benefits of tire rotation are:

- Increase tread life
- Maintain traction levels
- A smooth, quiet ride

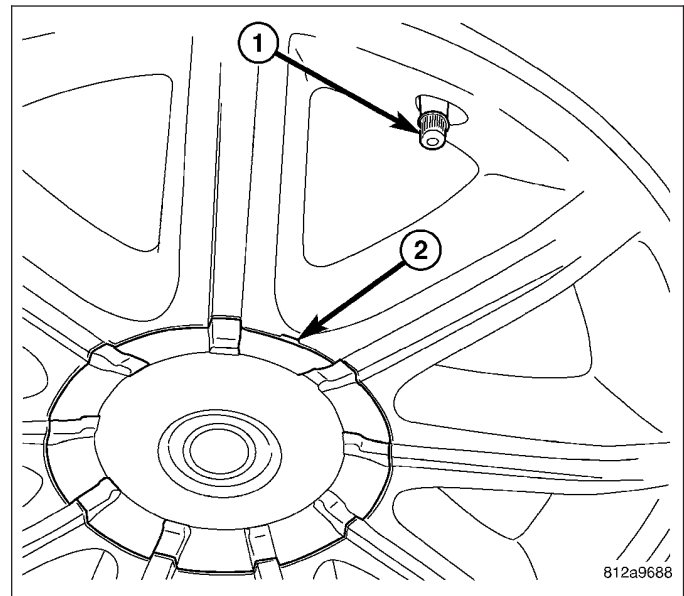
The suggested method of tire rotation is shown in graphic. Other rotation methods can be used, but they will not provide all the tire longevity benefits.



## REMOVAL

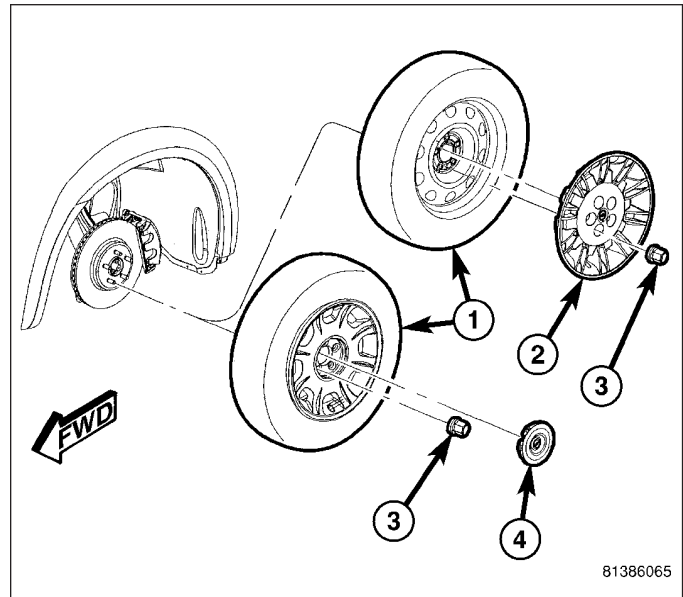
### TIRE AND WHEEL ASSEMBLY (ALUMINUM WHEEL)

1. Raise the vehicle so the tire and wheel assembly clears ground level.
2. If the vehicle is equipped with wheel center caps, remove the cap with an appropriate removal tool utilizing the notch formed into the wheel (2) near the valve stem (1). Use care not to damage the wheel coating while doing so.





3. Remove the five wheel mounting (lug) nuts (3) from the studs.
4. Remove the tire and wheel assembly (1) from the hub.

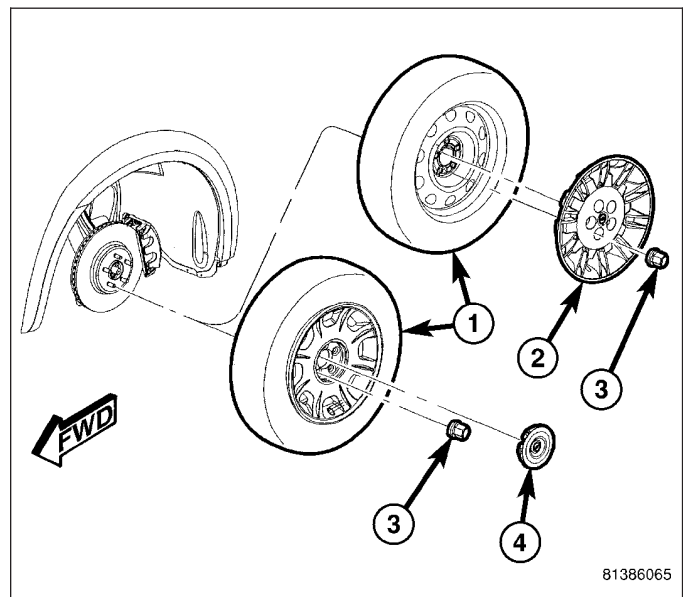


### TIRE AND WHEEL ASSEMBLY (STEEL WHEEL)

1. Raise and support the vehicle so the tire and wheel assembly clears ground level.

**CAUTION:** When removing the wheel cover, do not pry the wheel cover from the wheel. This can result in damage to the wheel cover. The wheel cover is attached using the wheel mounting nuts.

2. Remove the five wheel mounting (lug) nuts (3) from the studs.
3. Remove the wheel cover (2) using care not to let the tire and wheel assembly (1) fall off the vehicle.
4. Remove the tire and wheel assembly (1) from the hub.



## INSTALLATION

### TIRE AND WHEEL ASSEMBLY (ALUMINUM WHEEL)

**WARNING: INSTALLING WHEELS WITHOUT GOOD METAL-TO-METAL CONTACT WITH THE MOUNTING SURFACE COULD CAUSE LOOSENING OF THE WHEEL MOUNTING (LUG) NUTS. THIS COULD ADVERSELY AFFECT THE SAFETY AND HANDLING OF THE VEHICLE.**

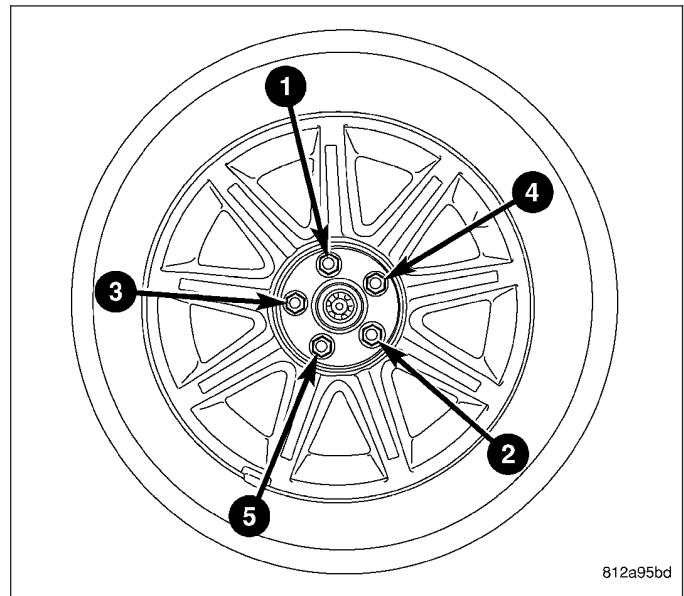
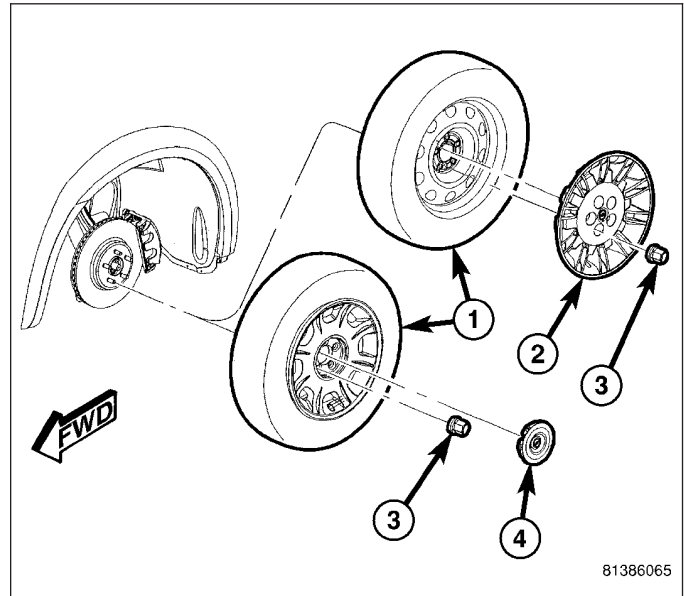
**Note: Never use oil or grease on studs or wheel mounting (lug) nuts.**

1. Clean the wheel mounting surfaces, removing any build-up of corrosion. It is important to have good metal-to-metal contact between the wheel and the vehicle.
2. Position the tire and wheel assembly (1) on the wheel mounting studs using the hub pilot as a guide. Place and hold the wheel flush up against the mounting surface.

**Note: Always use the original (OEM) style wheel mounting (lug) nuts. Do not use replacement parts of lesser quality or substitute design.**

3. Loosely install all five wheel mounting (lug) nuts (3).

4. Lightly snug the wheel mounting nuts, then progressively tighten them in the proper sequence shown. Tighten nuts to 150 N·m (110 ft. lbs.).
5. Lower the vehicle.

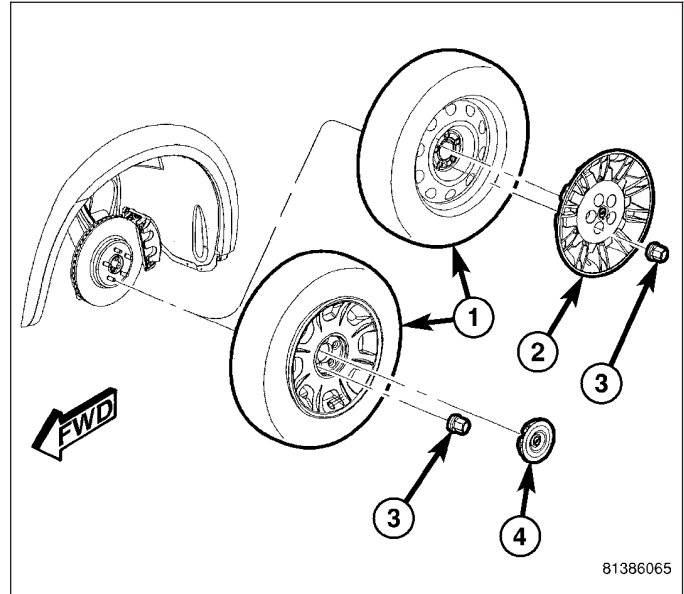


## TIRE AND WHEEL ASSEMBLY (STEEL WHEEL)

**WARNING: INSTALLING WHEELS WITHOUT GOOD METAL-TO-METAL CONTACT WITH THE MOUNTING SURFACE COULD CAUSE LOOSENING OF THE WHEEL MOUNTING (LUG) NUTS. THIS COULD ADVERSELY AFFECT THE SAFETY AND HANDLING OF THE VEHICLE.**

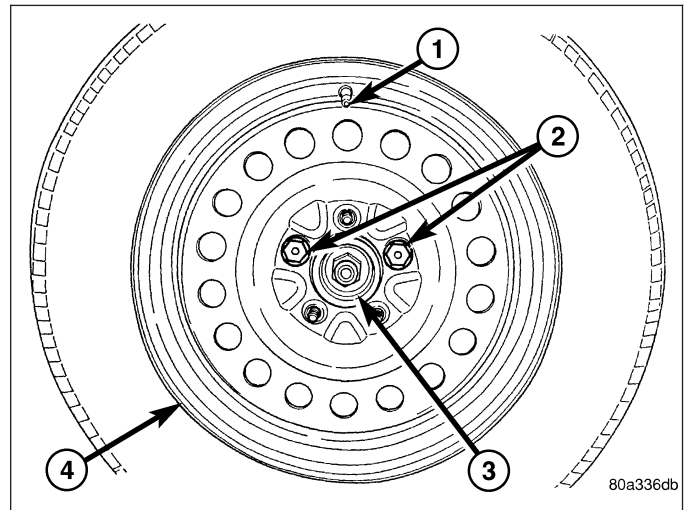
**Note: Never use oil or grease on studs or wheel mounting nuts.**

1. Clean the wheel mounting surfaces, removing any corrosion build-up. It is important to have good metal-to-metal contact between the wheel and the vehicle.
2. Position the tire and wheel assembly (1) on the wheel mounting studs using the hub pilot as a guide. Place and hold the wheel flush up against the mounting surface.

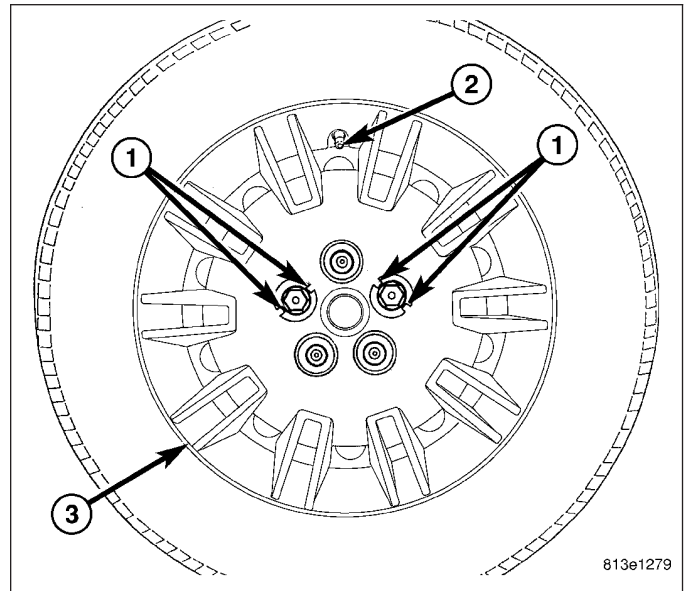


**Note: Wheel mounting nuts must be installed on the studs as shown (2) to allow proper installation of the wheel cover.**

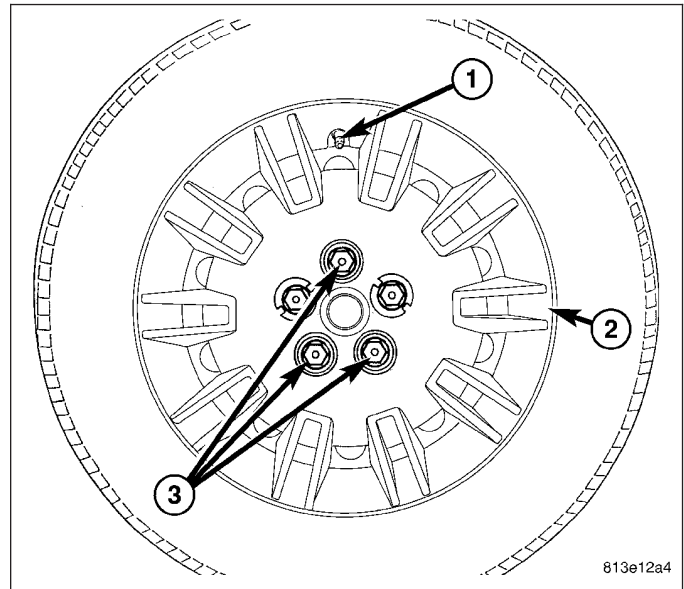
3. Using the valve stem as an index placed at the 12 O'clock position (1), install and **lightly tighten** two wheel mounting nuts on the studs located at the 2 O'clock and 10 O'clock positions as shown (2).



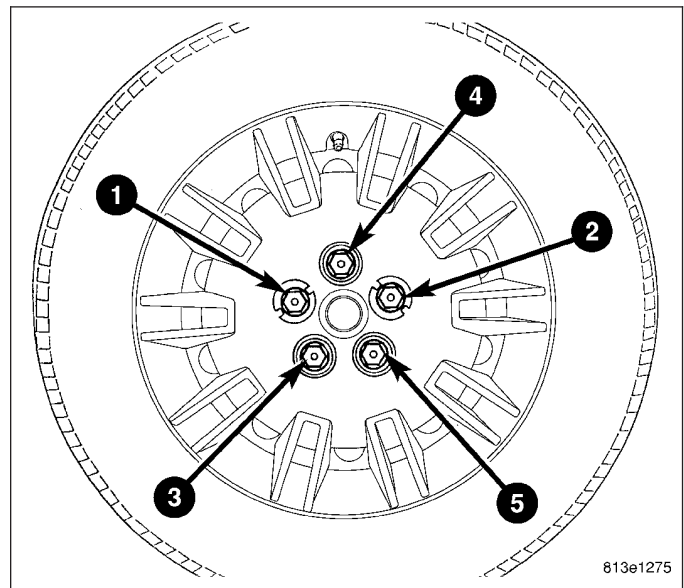
4. Place the wheel cover (3) on the wheel in the following fashion:
  - a. Align the valve notch in the wheel cover with the valve stem on the wheel (2).
  - b. At the same time, align the two holes in the wheel cover having the retaining tabs (1) with the two installed wheel nuts.
  - c. Press in on center of wheel cover until wheel cover retaining tabs (1) push past and engage rear of previously installed wheel mounting nuts. This will hold the wheel cover in place.



5. Install and **lightly tighten** the three remaining wheel mounting nuts (3) securing the wheel cover in place.



6. Progressively tighten all five wheel mounting nuts in the proper sequence. Tighten wheel nuts to 150 N·m (110 ft. lbs.) torque.
7. Lower the vehicle.



## TIRES

### DESCRIPTION

#### TIRE

Tires are designed and engineered for each specific vehicle. They provide the best overall performance for normal operation. The ride and handling characteristics match the vehicle's requirements. With proper care they will give excellent reliability, traction, skid resistance, and tread life.

Driving habits have more effect on tire life than any other factor. Careful drivers will obtain, in most cases, much greater mileage than severe use or careless drivers. A few of the driving habits which will shorten the life of any tire are:

- Rapid acceleration
- Severe application of brakes
- High-speed driving
- Taking turns at excessive speeds
- Striking curbs and other obstacles
- Operating vehicle with over or under inflated tire pressures

Radial ply tires are more prone to irregular tread wear. It is important to follow the tire rotation interval shown in the section on Tire Rotation. This will help to achieve a greater tread-life potential.

#### TIRE IDENTIFICATION

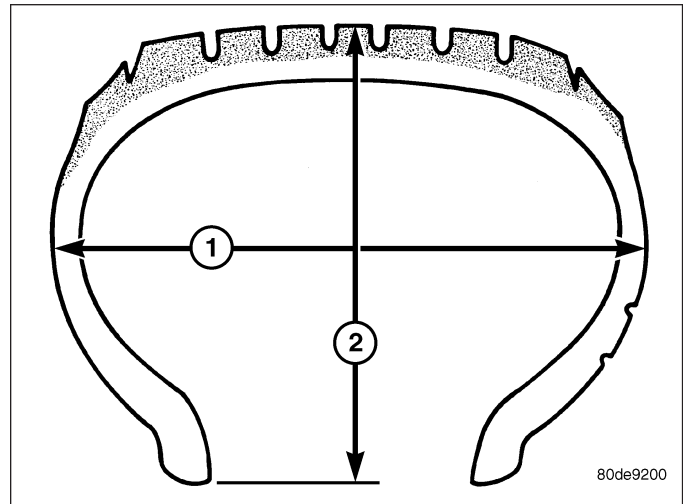
Tire type, size, load index and speed rating are encoded in the letters and numbers imprinted on the side wall of the tire. Refer to the Tire Identification chart to decipher the code. For example purposes, the tire size P225/60 R 16 97 T is used in the chart. An All Season type tire will also have either M + S, M & S or M - S (indicating mud and snow traction) imprinted on the side wall. An Extra or Light Load marking "XL" or "LL" may also be listed on the sidewall. The absence of an "XL" or "LL" marking infers a standard load tire.

#### TIRE IDENTIFICATION

<b>P</b>	TIRE TYPE (Not present on all tires)	P - Passenger T - Temporary C - Commercial LT - Light Truck
<b>225</b>	SECTIONAL WIDTH	SHOWN IN MILLIMETERS
<b>60</b>	ASPECT RATIO	SECTIONAL HEIGHT ÷ SECTIONAL WIDTH *
<b>R</b>	CONSTRUCTION TYPE	R - RADIAL B - BIAS BELTED D - DIAGONAL (BIAS)
<b>16</b>	WHEEL DIAMETER	SHOWN IN INCHES
<b>97</b>	LOAD INDEX	**
<b>T</b>	SPEED RATING	**

\* note: Height (2) ÷ Width (1) = Aspect Ratio.

**\*\* note: Consult the tire manufacturer regarding any questions on tire specifications or capabilities.**



## TIRE CHAINS

Refer to the owners manual supplied with the vehicle to determine whether the use of tire chains is permitted on this vehicle.

## REPLACEMENT TIRES

**WARNING: FAILURE TO EQUIP THE VEHICLE WITH TIRES HAVING ADEQUATE SPEED CAPABILITY CAN RESULT IN SUDDEN TIRE FAILURE.**

**WARNING: IN ORDER TO MAINTAIN THE SPEED CAPABILITY OF THE VEHICLE, REPLACEMENT TIRES MUST HAVE SPEED RATINGS EQUAL TO OR HIGHER THAN THOSE FITTED TO THE VEHICLE AS ORIGINAL EQUIPMENT. IF TIRES WITH LOWER SPEED RATINGS ARE FITTED, THE VEHICLE'S HANDLING MAY BE AFFECTED AND THE SPEED CAPABILITY OF THE VEHICLE MAY BE LOWERED TO THE MAXIMUM SPEED CAPABILITY OF THE REPLACEMENT TIRES. TO AVOID AN ACCIDENT RESULTING IN SEVERE OR FATAL INJURY, CONSULT THE TIRE MANUFACTURER IN REGARDS TO MAXIMUM SPEED RATINGS.**

It is recommended that tires equivalent to the original equipment tires be used when replacement is needed.

Failure to use equivalent replacement tires may adversely affect the safety and handling of the vehicle.

The original equipment tires provide a proper combination of many characteristics such as:

- Ride
- Noise
- Handling
- Durability
- Tread life
- Traction
- Rolling resistance
- Speed capability

The use of tires smaller than the minimum tire size approved for the vehicle can result in tire overloading and failure.

Use tires that have the approved load rating for the vehicle and never overload them. Failure to equip the vehicle with tires having adequate speed capability can result in sudden tire failure and loss of vehicle control.

The use of oversize tires may cause interference with vehicle components. Under extremes of suspension and steering travel, interference with vehicle components may cause tire damage.

SPARE TIRE

This vehicle comes with a compact spare tire and wheel assembly as standard equipment. A full-size spare is not available.

The tire and wheel diameters and the wheel offsets match those of the road wheels on the vehicle.

The compact (temporary) spare tire is designed for emergency use only. The original tire should be repaired or replaced at the first opportunity, then reinstalled. Do not exceed speeds of 80 km/h (50 mph) when using the compact (temporary) spare tire and wheel assembly. Refer to the Owner’s Manual for complete details.

DIAGNOSIS AND TESTING

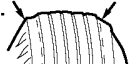

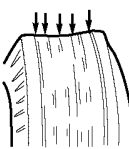

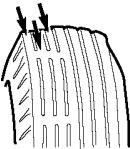
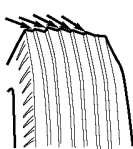
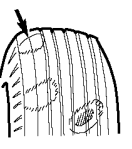
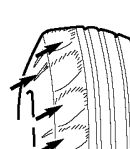
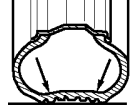
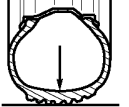
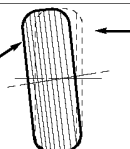
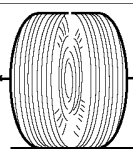
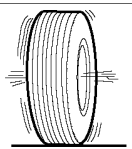
TIRE NOISE

Unusual tire noise can be associated with tire and wheel vibration or irregular tire wear. For vibration issues, (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING). For irregular tire wear issues, (Refer to 22 - TIRES/WHEELS/TIRES - DIAGNOSIS AND TESTING).

TIRE/VEHICLE LEAD

(Refer to 2 - SUSPENSION/WHEEL ALIGNMENT - DIAGNOSIS AND TESTING)

TIRE WEAR PATTERNS

CONDITION	RAPID WEAR AT SHOULDERS	RAPID WEAR AT CENTER	CRACKED TREADS	WEAR ON ONE SIDE	FEATHERED EDGE	BALD SPOTS	SCALLOPED WEAR
EFFECT	<div>1.</div> <div>2.</div>						
CAUSE	UNDER-INFLATION OR LACK OF ROTATION 	OVER-INFLATION OR LACK OF ROTATION 	UNDER-INFLATION OR EXCESSIVE SPEED*	EXCESSIVE CAMBER 	INCORRECT TOE 	UNBALANCED WHEEL 	LACK OF ROTATION OF TIRES OR WORN OR OUT-OF-ALIGNMENT SUSPENSION.
						OR TIRE DEFECT*	
CORRECTION	ADJUST PRESSURE TO SPECIFICATIONS WHEN TIRES ARE COOL ROTATE TIRES			ADJUST CAMBER TO SPECIFICATIONS	ADJUST TOE-IN TO SPECIFICATIONS	DYNAMIC OR STATIC BALANCE WHEELS	ROTATE TIRES AND INSPECT SUSPENSION SEE GROUP 2

\* HAVE TIRE INSPECTED FOR FUTURE USE.

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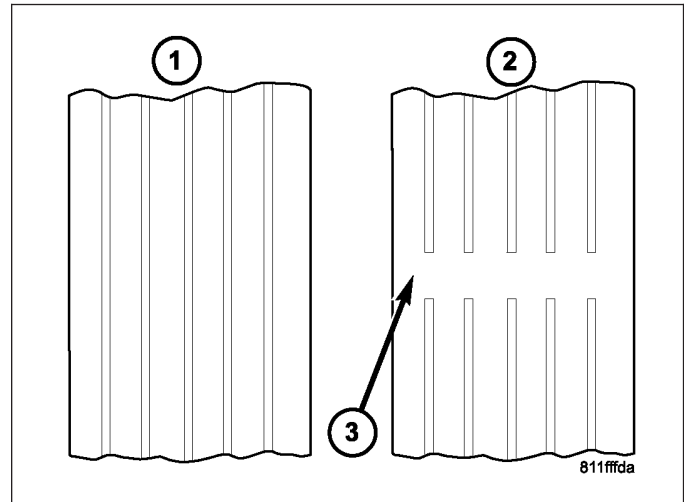
Under inflation will cause wear on the shoulders of tire. Over inflation will cause wear at the center of tire. Excessive camber causes the tire to run at an angle to the road. One side of tread is then worn more than the other.

Excessive toe-in or toe-out causes wear on the tread edges and a feathered effect across the tread.

## TREAD WEAR INDICATORS

Tread wear indicators are molded into the bottom of the tread grooves. When tread depth is 1.6 mm (1/16 in.), the tread wear indicators will appear as a 13 mm (1/2 in.) band (3).

Tire replacement is necessary when indicators appear in two or more grooves or if localized balding occurs.



## STANDARD PROCEDURE

### TIRE INFLATION PRESSURES

The specified tire pressures have been chosen to provide safe operation, vehicle stability, and a smooth ride. The proper tire pressure specification can be found on the Tire Inflation Pressure Label provided with the vehicle (usually on the driver's door opening).

A quality air pressure gauge is recommended to check tire air pressure. Tire pressure should be checked cold once per month. Check tire pressure more frequently when the weather temperature varies widely. Tire pressure will decrease when the outdoor temperature drops. After checking the air pressure, replace valve cap finger tight.

Inflation pressures specified on the Tire Inflation Pressure Label are always the cold inflation pressure of the tire. Cold inflation pressure is obtained after the vehicle has not been operated for at least 3 hours, or the vehicle is driven less than one mile after being inoperative for 3 hours. Tire inflation pressures may increase from 2 to 6 pounds per square inch (psi) during operation. Do not reduce this normal pressure buildup.

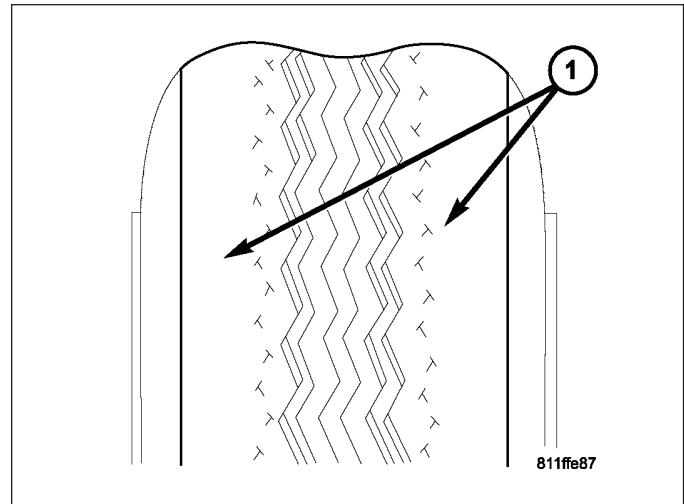
Improper inflation can cause:

- Uneven wear patterns
- Reduced tread life
- Reduced fuel economy
- Unsatisfactory ride
- The vehicle to drift.

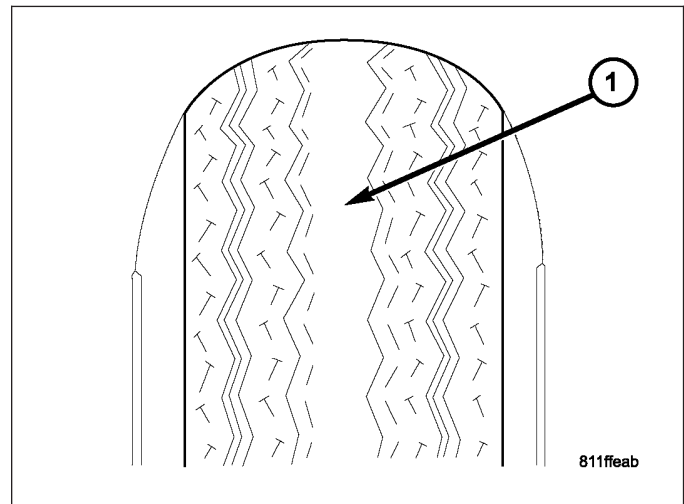
**WARNING: OVER OR UNDER INFLATED TIRES CAN AFFECT VEHICLE HANDLING. THE TIRE CAN FAIL SUDDENLY, RESULTING IN LOSS OF VEHICLE CONTROL.**



Under inflation causes rapid shoulder wear, tire flexing, and can result in tire failure (1).



Over inflation causes rapid center wear and loss of the tire's ability to cushion shocks (1).



## TIRE PRESSURE FOR HIGH SPEED OPERATION

Refer to the vehicle's Owners Manual Package.

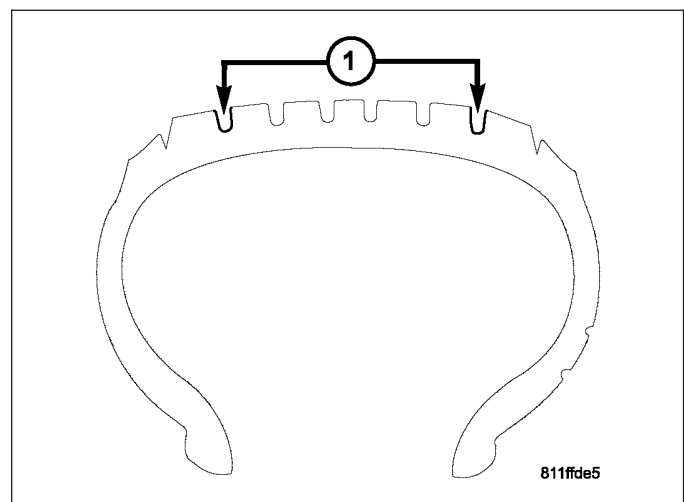
## TIRE LEAK REPAIRING

For proper repairing, a radial tire must be removed from the wheel. Repairs should only be made if the defect, or puncture, is in the tread area (1). The tire should be replaced if the puncture is located in the sidewall.

Deflate tire completely before attempting to dismount the tire from the wheel. **Use a lubricant such as a mild soap solution when dismounting or mounting tire.** Use tools free of burrs or sharp edges which could damage the tire or wheel rim.

Before mounting tire on wheel, make sure all rust is removed from the rim bead and repaint if necessary.

Install wheel on vehicle, and progressively tighten the 5 wheel nuts to a torque of 150 N·m (110 ft. lbs.).



## CLEANING

### TIRE CLEANING

Before delivery of a vehicle, remove the protective coating on the tires with white sidewalls or raised white letters. To remove the protective coating, apply warm water and let it soak for a few minutes. Afterwards, scrub the coating away with a soft bristle brush. Steam cleaning may also be used to remove the coating.

**CAUTION: DO NOT use gasoline, mineral oil, oil-based solvent or a wire brush for cleaning.**

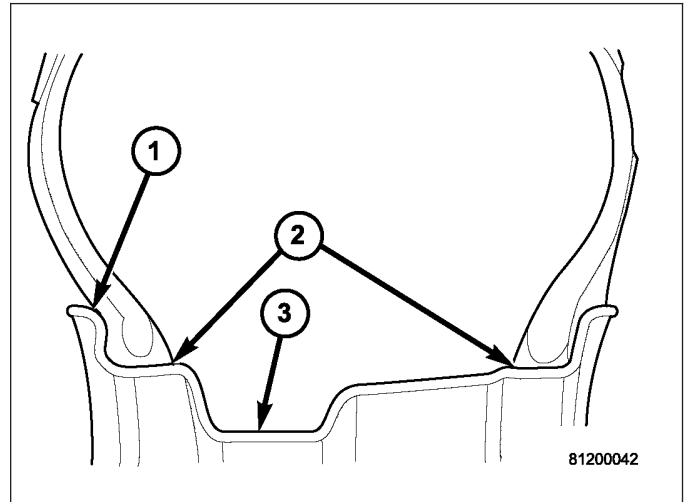
## WHEELS

### DESCRIPTION

All vehicles use either steel or cast aluminum drop center wheels. The original equipment wheels are designed for proper operation at all loads up to the specified maximum vehicle capacity.

Every wheel has raised sections between the rim flanges (1) and drop well (3) called safety humps (2). In case of air loss, these raised sections help hold the tire in position on the wheel until the vehicle can be brought to a safe stop. When being installed on the wheel, initial inflation of the tire forces the tire bead over these raised sections into place.

The wheels used on All-Wheel-Drive (AWD) vehicles have a shallower dish (larger offset) than Rear-Wheel-Drive (RWD) wheels to accommodate the AWD suspension geometry and half shaft package, while maintaining the same track as RWD vehicles.



The wheel studs and nuts are designed for specific wheel applications and must be replaced with equivalent parts. Do not use replacement parts of lesser quality or of a substitute design. All aluminum and steel wheels have wheel stud nuts with an enlarged nose. This enlarged nose is necessary to ensure proper retention of the wheels.

## DIAGNOSIS AND TESTING

### WHEEL INSPECTION

Inspect wheels for:

- Excessive runout
- Dents, cracks or irregular bends
- Damaged wheel stud (lug) holes
- Air Leaks

**Note: Do not attempt to repair a wheel by hammering, heating or welding.**

If a wheel is damaged, an original equipment replacement wheel should be used. When obtaining replacement wheels, they should be equivalent in load carrying capacity. The diameter, width, offset, pilot hole and bolt circle of the wheel should be the same as the original wheel.

**WARNING: FAILURE TO USE EQUIVALENT REPLACEMENT WHEELS MAY ADVERSELY AFFECT THE SAFETY AND HANDLING OF THE VEHICLE.**

**WARNING: REPLACEMENT WITH USED WHEELS IS NOT RECOMMENDED. THE SERVICE HISTORY OF THE WHEEL MAY HAVE INCLUDED SEVERE TREATMENT OR VERY HIGH MILEAGE. THE RIM COULD FAIL WITHOUT WARNING.**

## CLEANING

### WHEEL AND WHEEL TRIM CARE

All wheels and wheel trim, especially aluminum and chrome plated, should be cleaned regularly using mild soap and water to maintain their luster and to prevent corrosion. Wash them with the same soap solution recommended for the body of the vehicle.

When cleaning extremely dirty wheels, care must be taken in the selection of tire and wheel cleaning chemicals and equipment to prevent damage to the wheels. Mopar® Wheel Treatment or Mopar® Chrome Cleaner is recommended. Any of the "DO NOT USE" items listed below can damage wheels and wheel trim.

#### DO NOT USE:

- Any abrasive cleaner
- Any abrasive cleaning pad (such as steel wool) or abrasive brush
- Any cleaner that contains an acid which can react with and discolor the chrome surface. **Many wheel cleaners contain acids that can harm the wheel surface.**
- Oven cleaner
- A car wash that uses carbide-tipped wheel cleaning brushes or acidic solutions.

## SPECIFICATIONS

### WHEEL

#### SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Wheel Mounting (Lug) Nut Hex Size	21 mm
Wheel Mounting Stud Size	M14 x 1.5 mm

#### TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Wheel Mounting (Lug ) Nut	150	110	—

## STUDS - FRONT

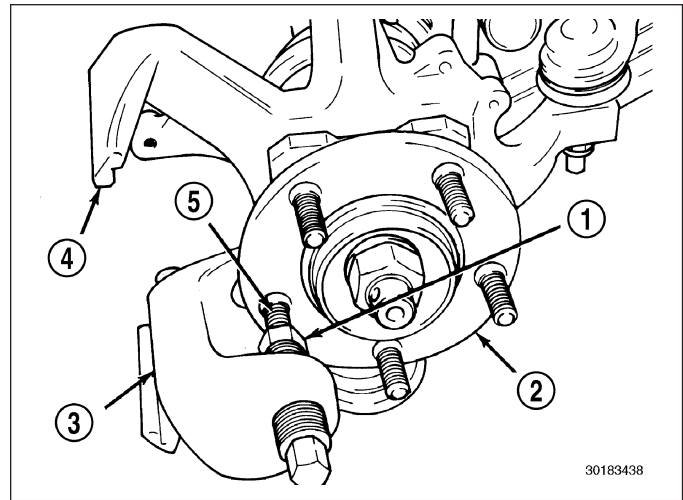
### REMOVAL

**Note:** Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

**CAUTION:** Wheel mounting studs **MUST NOT** be hammered out of hub flange of hub and bearing assembly. If a stud is removed by hammering it out, damage to hub and bearing assembly will occur leading to premature bearing failure.

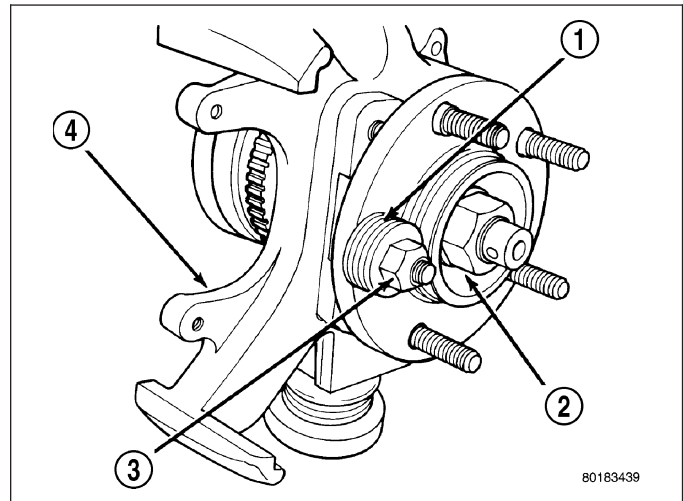
1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove front wheel and tire assembly. (Refer to 22 - TIRES/WHEELS - REMOVAL)
3. Access and remove front brake rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - REMOVAL)

4. On wheel mounting stud to be removed, install a wheel mounting (lug) nut (1) far enough so the threads on the stud are even with end of nut. Install Remover (3), Special Tool C-4150A, on hub and bearing flange and wheel stud (5).
5. Tighten screw on Remover, pushing wheel stud (5) out of hub flange. Once shoulder of wheel stud is past flange, remove special tool. Remove nut from stud and remove stud from hub flange.



## INSTALLATION

1. Install replacement wheel stud into flange of hub and bearing from rear. Install stack of washers (1) on wheel stud, then install a standard type wheel mounting (lug) nut (3) on stud with flat side of lug nut against washers.
2. Tighten nut (3), pulling wheel stud into hub flange. Once head of stud is fully seated against rear of hub flange, remove nut and washers from stud.
3. Install brake rotor and caliper. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - INSTALLATION)
4. Install wheel and tire assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten wheel mounting (lug) nuts in proper sequence to 150 N·m (110 ft. lbs.) torque.
5. Lower vehicle.
6. Road test vehicle to ensure proper operation of the brakes.



## STUDS - REAR

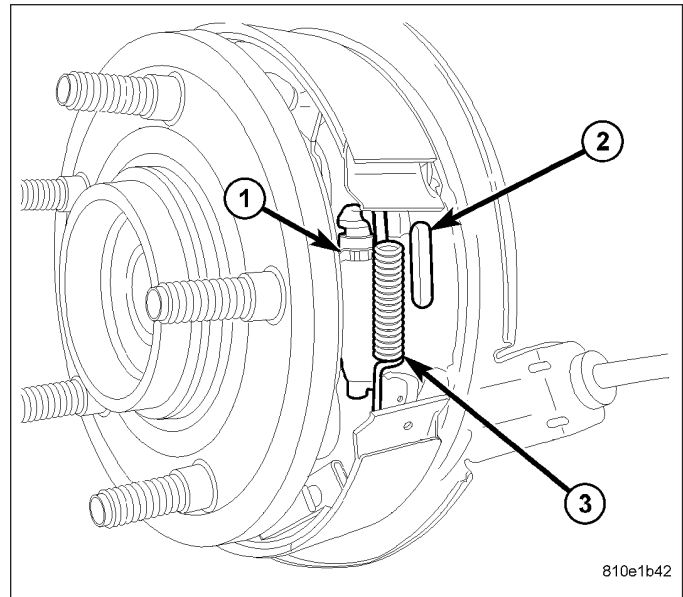
### REMOVAL

**Note:** Before proceeding, (Refer to 5 - BRAKES - WARNING)(Refer to 5 - BRAKES - CAUTION).

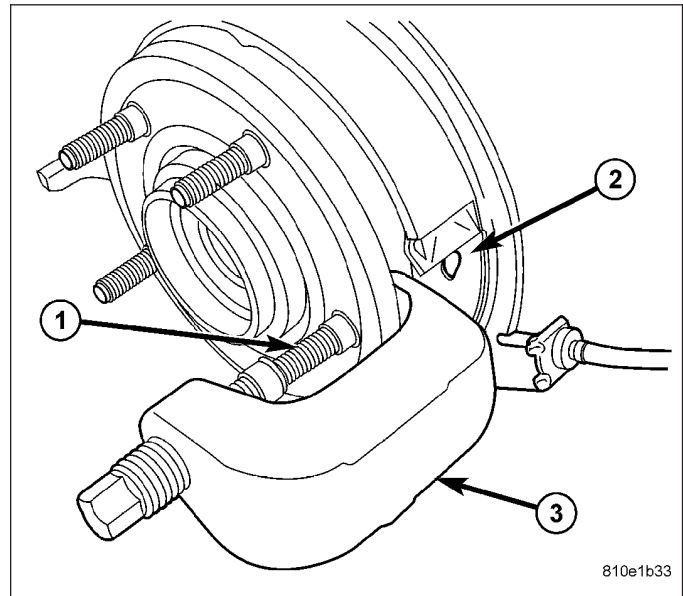
**CAUTION:** Wheel mounting studs **MUST NOT** be hammered out of hub flange of hub and bearing assembly. If a stud is removed by hammering it out, damage to hub and bearing assembly will occur leading to premature bearing failure.

1. Raise and support vehicle. (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE)
2. Remove rear wheel and tire assembly. (Refer to 22 - TIRES/WHEELS - REMOVAL)
3. Access and remove rear brake rotor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - REMOVAL)

4. Back off shoe adjustment until adjuster (1) threads bottom.
5. Using appropriate tools, remove spring (3) at adjuster.
6. Pull upward on upper shoe near adjuster to provide enough slack to remove adjuster from shoes, then remove adjuster (1).

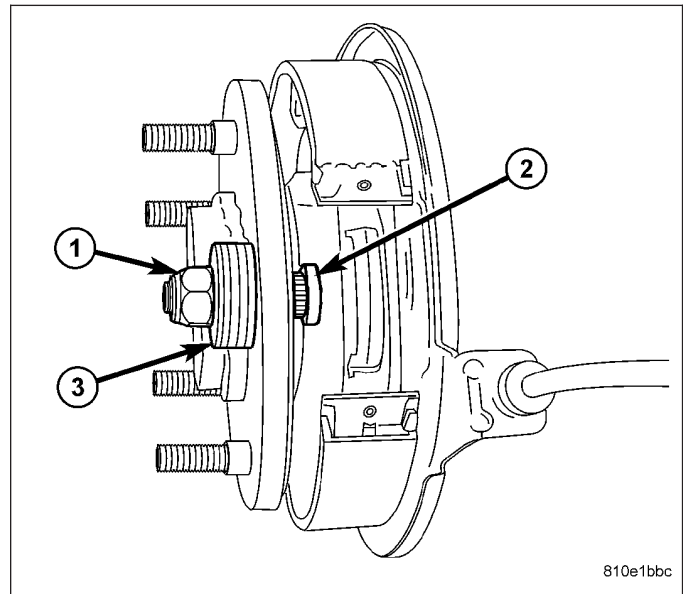


7. Install Remover (3), Special Tool C-4150A, on hub and bearing flange and wheel stud (1).
8. Tighten Remover forcing screw, pushing wheel stud (1) out of hub and bearing flange. Remove tool (1).
9. Remove stud from rear of hub flange. It may be necessary to rock hub flange back and forth to ease stud removal.

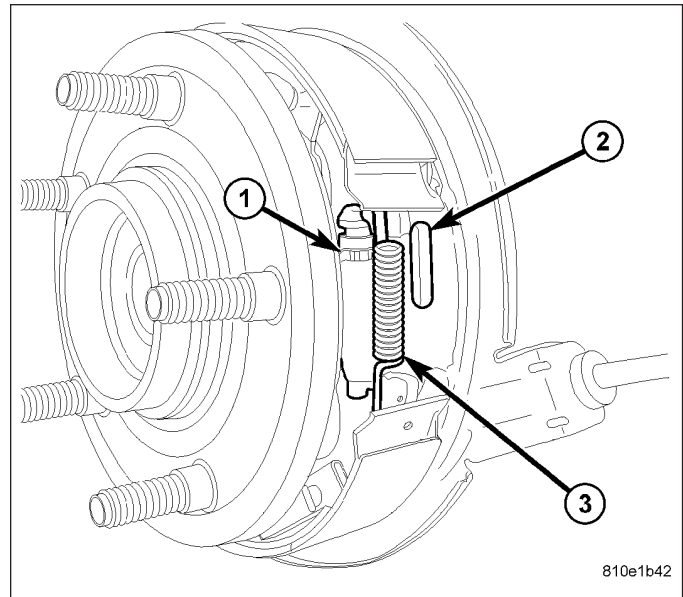


## INSTALLATION

1. Install replacement wheel stud into flange of hub and bearing from rear (2). Install a stack of washers (3) (approximately 5, depending on thickness) over stud, then install a standard wheel mounting (lug) nut (1) on stud with flat side of nut against washers.
2. Tighten wheel mounting nut (1), pulling wheel stud into flange of hub and bearing. Once head of stud (2) is fully seated against rear of hub flange, remove nut and washers from wheel stud.

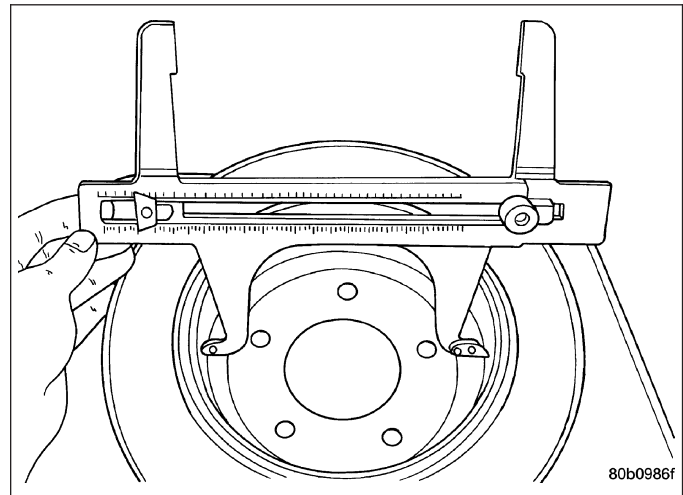


3. Install parking brake shoe adjuster (1) between upper and lower parking brake shoes. Position end of adjuster with star wheel upward. Once in place, slide upper shoe downward against adjuster mounting slot, taking up any slack between two pieces.
4. Using appropriate tools, install spring (3) at adjuster.

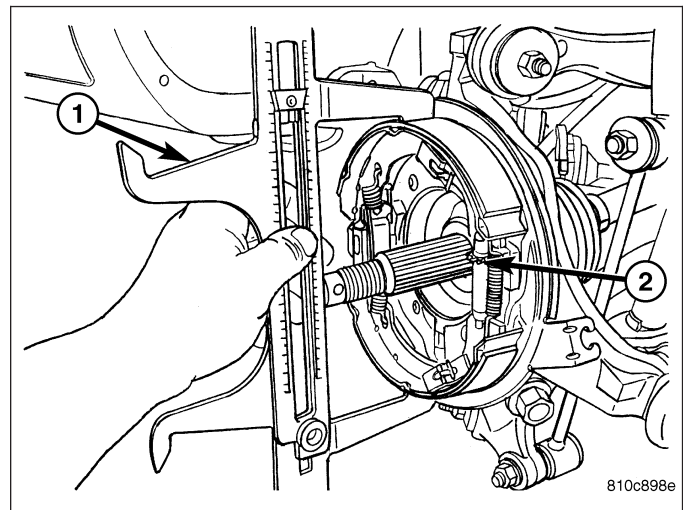


**Note: When measuring brake drum diameter, diameter should be measured in center of shoe contact surface area.**

5. Using Brake Shoe Gauge, Special Tool C-3919, or equivalent, measure inside diameter of parking brake drum portion of rotor.



6. Place Gauge (1) over parking brake shoes at widest point.
7. Using adjuster star wheel (2), adjust parking brake shoes until linings on both park brake shoes just touch jaws on gauge. This will give a good preliminary adjustment of parking brake shoes, before a final adjustment is made at end of this procedure.
8. Install brake rotor and components removed to access it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTOR - INSTALLATION)
9. Install wheel and tire assembly (Refer to 22 - TIRES/WHEELS - INSTALLATION). Tighten wheel mounting (lug) nuts in proper sequence to 150 N·m (110 ft. lbs.) torque.
10. Adjust parking brake shoes. (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENT)
11. Lower vehicle.
12. Road test vehicle to ensure proper operation of the brakes.





# BODY

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## BODY

### DESCRIPTION - VEHICLE IDENTIFICATION

Throughout this group, references to the DaimlerChrysler Corporation vehicle family identification code are used when describing a procedure that is unique to that vehicle. Refer to Introduction Group of this manual for detailed information on vehicle identification. If a procedure is common to all vehicles covered in this manual, no reference will be made to a vehicle family code.

## WARNING

### SAFETY PRECAUTIONS AND WARNINGS

**WARNING: USE A OSHA APPROVED BREATHING FILTER WHEN SPRAYING PAINT OR SOLVENTS IN A CONFINED AREA. PERSONAL INJURY CAN RESULT.**  
**AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.**  
**DO NOT STAND UNDER A HOISTED VEHICLE THAT IS NOT PROPERLY SUPPORTED ON SAFETY STANDS. PERSONAL INJURY CAN RESULT.**



**CAUTION:** When holes must be drilled or punched in an inner body panel, verify depth of space to the outer body panel, electrical wiring, or other components. Damage to vehicle can result.

Do not weld exterior panels unless combustible material on the interior of vehicle is removed from the repair area. Fire or hazardous conditions, can result.

Always have a fire extinguisher ready for use when welding.

Disconnect the negative (-) cable clamp from the battery when servicing electrical components that are live when the ignition is OFF. Damage to electrical system can result.

Do not use abrasive chemicals or compounds on painted surfaces. Damage to finish can result.

Do not use harsh alkaline based cleaning solvents on painted or upholstered surfaces. Damage to finish or color can result.

Do not hammer or pound on plastic trim panel when servicing interior trim. Plastic panels can break.

## DIAGNOSIS AND TESTING

### DIAGNOSIS AND TESTING - WATER LEAKS

Water leaks can be caused by poor sealing, improper body component alignment, body seam porosity, missing plugs, or blocked drain holes. Centrifugal and gravitational force can cause water to drip from a location away from the actual leak point, making leak detection difficult. All body sealing points should be water tight in normal wet-driving conditions. Water flowing downward from the front of the vehicle should not enter the passenger or luggage compartment. Moving sealing surfaces will not always seal water tight under all conditions. At times, side glass or door seals will allow water to enter the passenger compartment during high pressure washing or hard driving rain (severe) conditions. Overcompensating on door or glass adjustments to stop a water leak that occurs under severe conditions can cause premature seal wear and excessive closing or latching effort. After completing a repair, water test vehicle to verify leak has stopped before returning vehicle to use.

### VISUAL INSPECTION BEFORE WATER LEAK TESTS

Verify that floor and body plugs are in place, body drains are clear, and body components are properly aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

### WATER LEAK TESTS

**WARNING: DO NOT USE ELECTRIC SHOP LIGHTS OR TOOLS IN WATER TEST AREA. PERSONAL INJURY CAN RESULT.**

When the conditions causing a water leak have been determined, simulate the conditions as closely as possible.

- If a leak occurs with the vehicle parked in a steady light rain, flood the leak area with an open-ended garden hose.
- If a leak occurs while driving at highway speeds in a steady rain, test the leak area with a reasonable velocity stream or fan spray of water. Direct the spray in a direction comparable to actual conditions.
- If a leak occurs when the vehicle is parked on an incline, hoist the end or side of the vehicle to simulate this condition. This method can be used when the leak occurs when the vehicle accelerates, stops or turns. If the leak occurs on acceleration, hoist the front of the vehicle. If the leak occurs when braking, hoist the back of the vehicle. If the leak occurs on left turns, hoist the left side of the vehicle. If the leak occurs on right turns, hoist the right side of the vehicle. For hoisting recommendations (Refer to LUBRICATION & MAINTENANCE/HOISTING - STANDARD PROCEDURE).

### WATER LEAK DETECTION

To detect a water leak point-of-entry, do a water test and watch for water tracks or droplets forming on the inside of the vehicle. If necessary, remove interior trim covers or panels to gain visual access to the leak area. If the hose cannot be positioned without being held, have someone help do the water test.

Some water leaks must be tested for a considerable length of time to become apparent. When a leak appears, find the highest point of the water track or drop. The highest point usually will show the point of entry. After leak point has been found, repair the leak and water test to verify that the leak has stopped.

Locating the entry point of water that is leaking into a cavity between panels can be difficult. The trapped water may splash or run from the cavity, often at a distance from the entry point. Most water leaks of this type become apparent after accelerating, stopping, turning, or when on an incline.

### **MIRROR INSPECTION METHOD**

When a leak point area is visually obstructed, use a suitable mirror to gain visual access. A mirror can also be used to deflect light to a limited-access area to assist in locating a leak point.

### **BRIGHT LIGHT LEAK TEST METHOD**

Some water leaks in the luggage compartment can be detected without water testing. Position the vehicle in a brightly lit area. From inside the darkened luggage compartment inspect around seals and body seams. If necessary, have a helper direct a drop light over the suspected leak areas around the luggage compartment. If light is visible through a normally sealed location, water could enter through the opening.

### **PRESSURIZED LEAK TEST METHOD**

When a water leak into the passenger compartment cannot be detected by water testing, pressurize the passenger compartment and soap test exterior of the vehicle. To pressurize the passenger compartment, close all doors and windows, start engine, and set heater control to high blower in HEAT position. If engine can not be started, connect a charger to the battery to ensure adequate voltage to the blower. With interior pressurized, apply dish detergent solution to suspected leak area on the exterior of the vehicle. Apply detergent solution with spray device or soft bristle brush. If soap bubbles occur at a body seam, joint, seal or gasket, the leak entry point could be at that location.

## **DIAGNOSIS AND TESTING - WIND NOISE**

Wind noise is the result of most air leaks. Air leaks can be caused by poor sealing, improper body component alignment, body seam porosity, or missing plugs in the engine compartment or door hinge pillar areas. All body sealing points should be airtight in normal driving conditions. Moving sealing surfaces will not always seal airtight under all conditions. At times, side glass or door seals will allow wind noise to be noticed in the passenger compartment during high cross winds. Over compensating on door or glass adjustments to stop wind noise that occurs under severe conditions can cause premature seal wear and excessive closing or latching effort. After a repair procedure has been performed, test vehicle to verify noise has stopped before returning vehicle to use.

### **VISUAL INSPECTION BEFORE TESTS**

Verify that floor and body plugs are in place and body components are aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

### **ROAD TESTING WIND NOISE**

1. Drive the vehicle to verify the general location of the wind noise.
2. Apply 50 mm (2 in.) masking tape in 150 mm (6 in.) lengths along weatherstrips, weld seams or moldings. After each length is applied, drive the vehicle. If noise goes away after a piece of tape is applied, remove tape, locate, and repair defect.

### **POSSIBLE CAUSE OF WIND NOISE**

- Moldings standing away from body surface can catch wind and whistle.
- Gaps in sealed areas behind overhanging body flanges can cause wind-rushing sounds.
- Misaligned movable components.
- Missing or improperly installed plugs in pillars.
- Weld burn through holes.

## STANDARD PROCEDURE

### STANDARD PROCEDURE - PLASTIC BODY PANEL REPAIR

There are many different types of plastics used in today's automotive environment. We group plastics in three different categories: Rigid, Semi-Rigid, and Flexible. Any of these plastics may require the use of an adhesion promoter for repair. These types of plastic are used extensively on DaimlerChrysler Motors vehicles. Always follow repair material manufacturer's plastic identification and repair procedures.

#### Rigid Plastics:

Examples of rigid plastic use: Fascias, Hoods, Doors, and other Body Panels, which include SMC, ABS, and Polycarbonates.

#### Semi-Rigid Plastics:

Examples of semi-rigid plastic use: Interior Panels, Under Hood Panels, and other Body Trim Panels.

#### Flexible Plastics:

Examples of flexible plastic use: Fascias, Body Moldings, and upper and lower Fascia Covers.

#### Repair Procedure:

The repair procedure for all three categories of plastics is basically the same. The one difference is the material used for the repair. The materials must be specific for each substrate, rigid repair material for rigid plastic repair, semi-rigid repair material for semi-rigid plastic repair and flexible repair material for flexible plastic repair.

#### Adhesion Promoter/Surface Modifier:

Adhesion Promoters/Surface Modifiers are required for certain plastics. All three categories may have plastics that require the use of adhesion promoter/surface modifiers. Always follow repair material manufacturer's plastic identification and repair procedures.

## SAFETY PRECAUTION AND WARNINGS

#### WARNING:

- EYE PROTECTION SHOULD BE USED WHEN SERVICING COMPONENTS. PERSONAL INJURY CAN RESULT.
- USE AN OSHA APPROVED BREATHING MASK WHEN MIXING EPOXY, GRINDING, AND SPRAYING PAINT OR SOLVENTS IN A CONFINED AREA. PERSONAL INJURY CAN RESULT.
- AVOID PROLONGED SKIN CONTACT WITH RESIN, PETROLEUM, OR ALCOHOL BASED SOLVENTS. PERSONAL INJURY CAN RESULT.
- DO NOT VENTURE UNDER A HOISTED VEHICLE THAT IS NOT PROPERLY SUPPORTED ON SAFETY STANDS. PERSONAL INJURY CAN RESULT.

#### Note:

- When holes must be drilled or cut in body panels, verify locations of internal body components and electrical wiring. Damage to vehicle can result.
- Do not use abrasive chemicals or compounds on undamaged painted surfaces around repair areas. Damage to finish can result.

**RIGID, SEMI-RIGID, AND FLEXIBLE PLASTIC PARTS TYPES**

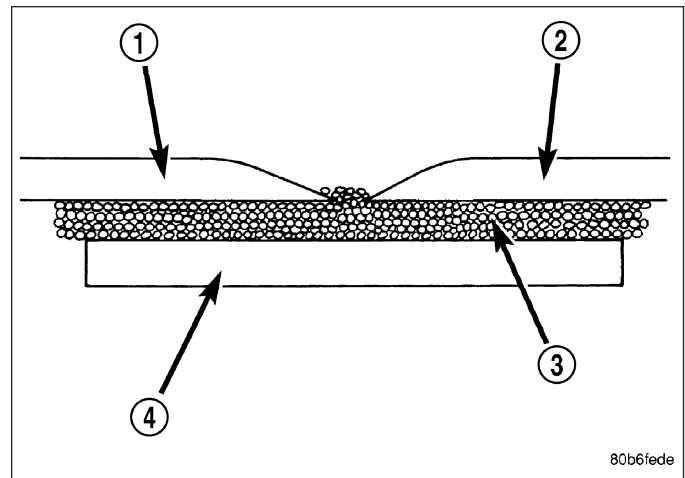
CODE	FAMILY NAME	COMMON TRADE NAME	TYPICAL APPLICATION
ASA	ACRYLONITRILE STYRENE ACRYLITE	LURAN S	CONSOLES, GRILLES
ABS	ACRYLONITRILE BUTADIENE STYRENE	TERLURAN	"A" PILLARS, CONSOLES, GRILLES
ABS/PC	ABS/PC ALLOY	PULSE, PROLOY, BAYBLEND	DOORS, INSTRUMENT PANELS
ABS/PVC	ABS/PV ALLOY	PROLOY, PULSE, LUSTRAN, CYCLOVIN	DOOR PANELS, GRILLES, TRIM
BMC	BULK MOLDING COMPOUND	BMC	FENDER EXTENSIONS
EMA	EHTYLENE METHYL ACRYLATE/IONOMER	SURLYN, EMA, IONOMER	BUMPER GUARDS, PADS
METTON	METTON	METTON	GRILLES, KICK PANELS, RUNNING BOARDS
MPPO	MODIFIED POLYPHENYLENE OXIDE	MPPO	SPOILER ASSEMBLY
PA	POLYAMID	ZYTEL, VYDYNE, PA, MINLON	FENDERS, QUARTER PANELS
PET	THERMOPLASTIC POLYESTER	RYNITE	TRIM
PBT/PPO	PBT/PPO ALLOY	GERMAX	CLADDINGS
PBTP	POLYBUTYLENE THEREPHTHALATE	PBT, PBTP, POCAN, VALOX	WHEEL COVERS, FENDERS, GRILLES
PBTP/EEBC	POLYBUTYLENE THEREPHTHALATE/EEBC ALLOY	BEXLOY, "M", PBTP/EEBC	FASCIAS, ROCKER PANEL, MOLDINGS
PC	POLYCARBONATE	LEXAN, MERLON, CALIBRE, MAKROLON PC	TAIL LIGHT LENSES, IP TRIM, VALANCE PANELS
PC/ABS	PC/ABS ALLOY	GERMAX, BAY BLENDS, PULSE	DOORS, INSTRUMENT PANELS
PPO	POLYPHENYLENE OXIDE	AZDEL, HOSTALEN, MARLEX, PRFAX, NORYL, GTX, PPO	INTERIOR TRIM, DOOR PANELS, SPLASH SHIELDS, STEERING COLUMN SHROUD
PPO/PA	POLYPHENYLENE/ POLYAMID	PPO/PA, GTX 910	FENDERS, QUARTER PANELS
PR/FV	FIBERGLASS REINFORCED PLASTIC	FIBERGLASS, FV, PR/FV	BODY PANELS
PS	POLYSTYRENE	LUSTREX, STYRON, PS	DOOR PANELS, DASH PANELS
RTM	RESIN TRANSFER MOLDING COMPOUND	RTM	BODY PANELS
SMC	SHEET MOLDED COMPOUND	SMC	BODY PANELS
TMC	TRANSFER MOLDING COMPOUND	TMC	GRILLES

CODE	FAMILY NAME	COMMON TRADE NAME	TYPICAL APPLICATION
UP	UNSATURATED POLYESTER (THERMOSETTING)	SMC, BMC, TMC, ZMC, IMC, XSMC, UP	GRILLE OPENING PANEL, LIFTGATES, FLARESIDE FENDERS, FENDER EXTENSIONS
EEBC	ETHER/ESTER BLOCKED CO-POLYMER	EEBC	BUMPERS
EEBC/PBTP	EEBC/POLYBUTYLENE TEREPHTHALATE	EEBC, PBTP, BEXLOY	BUMPER, ROCKER PANELS
EMPP	ETHYLENE MODIFIED POLYPROPYLENE	EMPP	BUMPER COVERS
EPDM	ETHYLENE/ PROPPYLYENE DIENE MONOMER	EPDM, NORDEL, VISTALON	BUMPERS
EPM	ETHYLENE/ PROPPYLYENE CO-POLYMER	EPM	FENDERS
MPU	FOAM POLYURETHANE	MPU	SPOILERS
PE	POLYETHYLENE	ALATHON, DYLAN, LUPOLEN, MARLEX	-
PP	POLYPROPYLENE (BLENDS)	NORYL, AZDEL, MARLOX, DYLAN, PRAVEX	INNER FENDER, SPOILERS, KICK PANELS
PP/EPDM	PP/EPDM ALLOY	PP/EPDM	SPOILERS, GRILLES
PUR	POLYURETHANE	COLONELS, PUR, PU	FASCIAS, BUMPERS
PUR/PC	PUR/PC ALLOY	TEXIN	BUMPERS
PVC	POLYVINYL CHLORIDE	APEX, GEON, VINYLITE	BODY MOLDINGS, WIRE INSULATION, STEERING WHEELS
RIM	REACTION INJECTED MOLDED POLYURETHANE	RIM, BAYFLEX	FRONT FASCIAS, MODULAR WINDOWS
RRIM	REINFORCED REACTION INJECTED MOLDED	PUR, RRIM	FASCIAS, BODY PANELS, BODY TRIMS
TPE	THERMO POLYETHYLENE	TPE, HYTREL, BEXLOY-V	FASCIAS, BUMPERS, CLADDINGS
TPO	THERMOPOLYOLEFIN	POLYTROPE, RENFLEX, SANTOPRENE, VISAFLEX, ETA, APEX, TPO, SHIELDS, CLADDINGS	BUMPERS, END CAPS, TELCAR, RUBBER, STRIPS, SIGHT, INTERIOR B POST
TPP	THERMO-POLYPROPYLENE	TPP	BUMPERS
TPU	THERMOPOLYURETHANE, POLYESTER	TPU, HYTREL, TEXIN, ESTANE	BUMPERS, BODY SIDE, MOLDINGS, FENDERS, FASCIAS

## PANEL SECTIONING

If it is required to section a large panel for a plastic repair, it will be necessary to reinforce the panel. To bond two plastic panels together, a reinforcement must overlap both panels. The panels must be "V'd" at a 20 degree angle. The area to be reinforced should be washed, then sanded. Be sure to wipe off any excess soap and water when finished. Lightly sand or abrade the plastic with an abrasive pad or sandpaper. Blow off any dust with compressed air or wipe with a clean dry rag.

When bonding plastic panels, Follow repair material manufacturers recommendations. Be sure that enough adhesive has been applied to allow squeeze out and to fill the full bond line. Once the pieces have been brought together, do not move them until the adhesive is cured. The assembly can be held together with clamps, rivets, etc. A faster cure can be obtained by heating with a heat lamp or heat gun. After the parts have been bonded and have had time to cure, rough sand the seam and apply the final adhesive filler to the area being repaired. Smooth the filler with a spreader, wooden tongue depressor, or squeegee. For fine texturing, a small amount of water can be applied to the filler surface while smoothing. The cured filler can be sanded as necessary and, as a final step, cleanup can be done with soapy water. Wipe the surface clean with a dry cloth allowing time for the panel to dry before moving on with the repair.

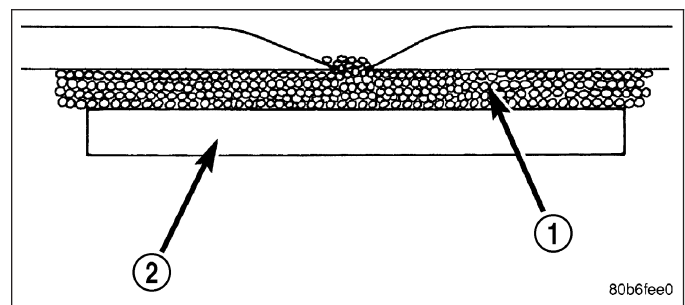
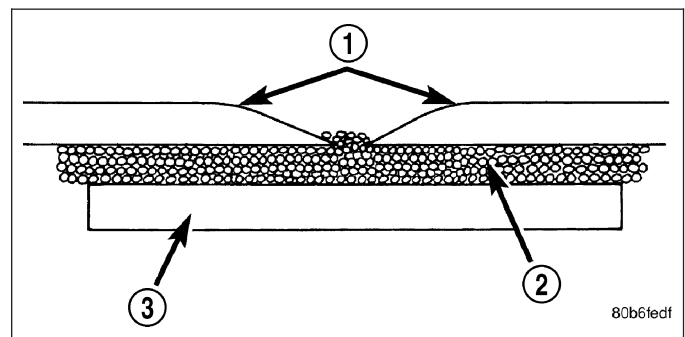


## PANEL REINFORCEMENT

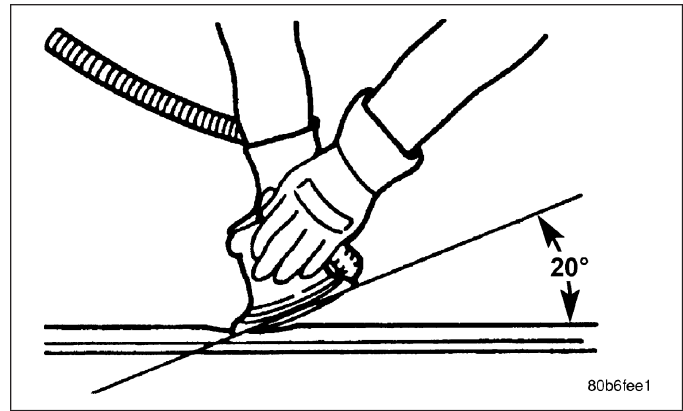
Structural repair procedures for rigid panels with large cracks and holes will require a reinforcement backing. Reinforcements can be made with several applications of glass cloth saturated with structural adhesive. Semi-rigid or flexible repair materials should be used for semi-rigid or flexible backing reinforcement and. Open meshed fiberglass dry wall tape can be used to form a reinforcement. The dry wall tape allows the resin to penetrate through and make a good bond between the panel and the adhesive. Structurally, the more dry wall tape used, the stronger the repair.

Another kind of repair that can be done to repair large cracks and holes is to use a scrap piece of similar plastic and bond with structural adhesive. The reinforcement should cover the entire break and should have a generous amount of overlap on either side of the cracked or broken area.

When repairing plastic, the damaged area is first “V’d” out, or beveled. Large bonding areas are desirable when repairing plastic because small repairs are less likely to hold permanently. Beveling the area around a crack at a 20 degree angle will increase the bonding surface for a repair. It is recommended that sharp edges be avoided because the joint may show through after the panel is refinished.



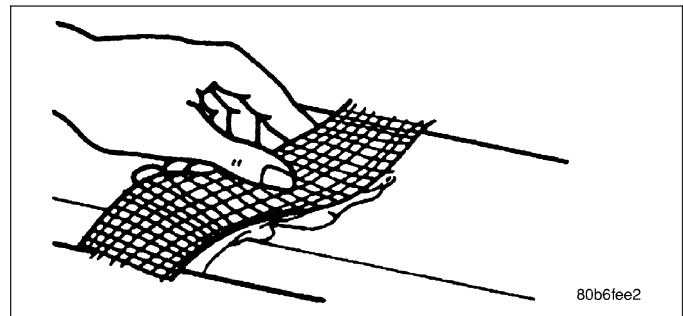
- Panel repair for both flexible and rigid panels are basically the same. The primary difference between flexible panel repair and rigid panel repair is in the adhesive materials used.
- The technician should first decide what needs to be done when working on any type of body panel. One should determine if it is possible to return the damage part to its original strength and appearance without exceeding the value of the replacement part.
- When plastic repairs are required, it is recommended that the part be left on the vehicle when every possible. That will save time, and the panel will remain stationary during the repair. Misalignment can cause stress in the repair areas and can result in future failure.



## VISUAL INSPECTION

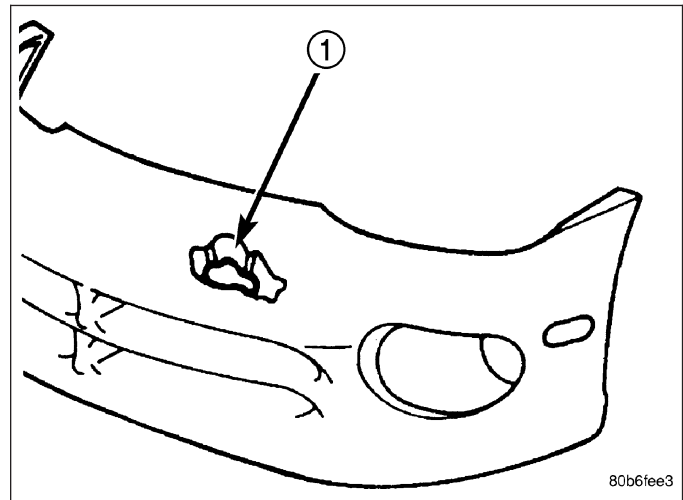
Composite materials can mask the severity of an accident. Adhesive bond lines, interior structure of the doors, and steel structures need to be inspected carefully to get a true damage assessment. Close inspection may require partial removal of interior trim or inner panels.

Identify the type of repair: Puncture or Crack - Damage that has penetrated completely through the panel. Damage is confined to one general area; a panel section is not required. However, a backer panel, open fiberglass tape, or matted material must be bonded from behind (Fig. 7).



## PANEL SURFACE PREPARATION

If a body panel has been punctured, cracked, or crushed, the damaged area must be removed from the panel to achieve a successful repair. All spider web cracks leading away from a damaged area must be stopped or removed. To stop a running crack in a panel, drill a 6 mm (0.250 in.) hole at the end of the crack farthest away from the damage. If spider web cracks can not be stopped, the panel would require replacement. The surfaces around the damaged area should be stripped of paint and freed from wax and oil. Scuff surfaces around repair area with 360 grit wet/dry sandpaper, or equivalent, to assure adhesion of repair materials.



## PATCHING PANELS

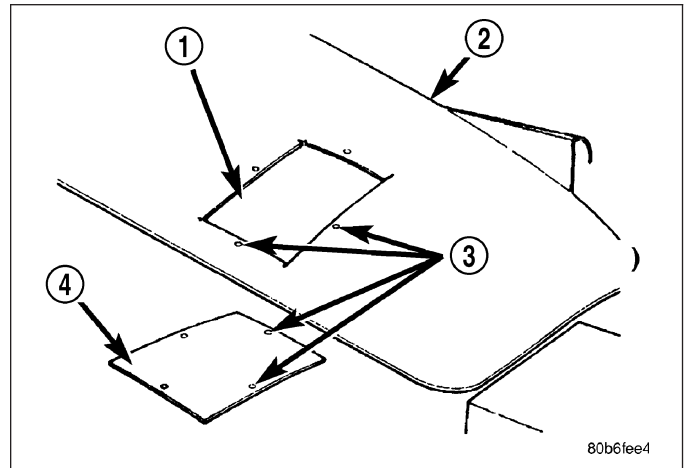
An panel that has extensive puncture type damage can be repaired by cutting out the damaged material. Use a suitable reciprocating saw or cut off wheel to remove the section of the panel that is damaged. The piece cut out can be used as a template to shape the new patch. It is not necessary to have access to the back of the panel to install a patch. Bevel edges of cutout at 20 degrees to expose a larger bonding area on the outer side. This will allow for an increased reinforcement areas.



## PANEL PATCH FABRICATIONS

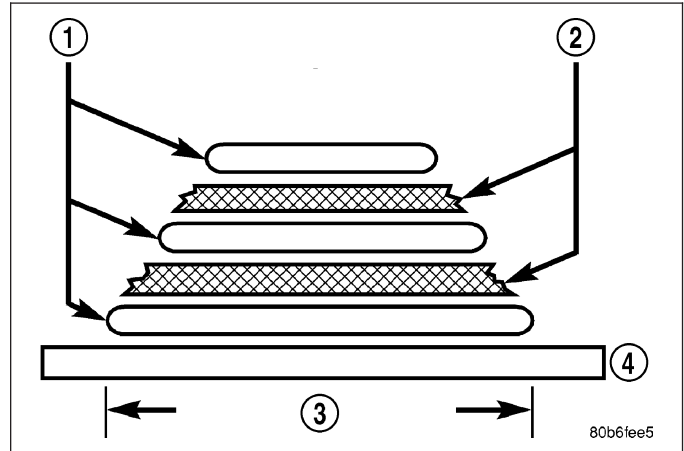
A patch can be fabricated from any rigid fiberglass panel that has comparable contour with the repair area. Lift gates and fenders can be used to supply patch material. If existing material is not available or compatible, a patch can be constructed with adhesive and reinforcement mesh (dry wall tape). Perform the following operation if required:

1. Cover waxed paper or plastic with adhesive backed nylon mesh (dry wall tape) larger than the patch required.
2. Tape waxed paper or plastic sheet with mesh to a surface that has a compatible contour to the repair area.
3. Apply a liberal coat of adhesive over the reinforcement mesh. If necessary apply a second or third coat of adhesive and mesh after first coat has cured. The thickness of the patch should be the same as the repair area.
4. After patch has cured, peel waxed paper or plastic from the back of the patch.
5. If desired, a thin film coat of adhesive can be applied to the back of the patch to cover mesh for added strength.



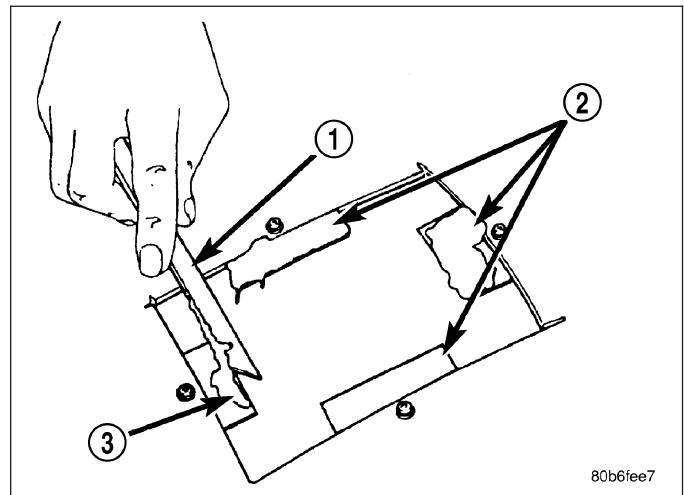
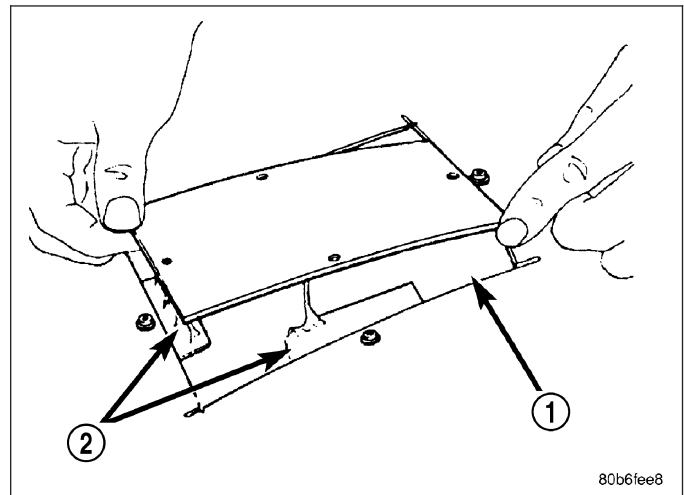
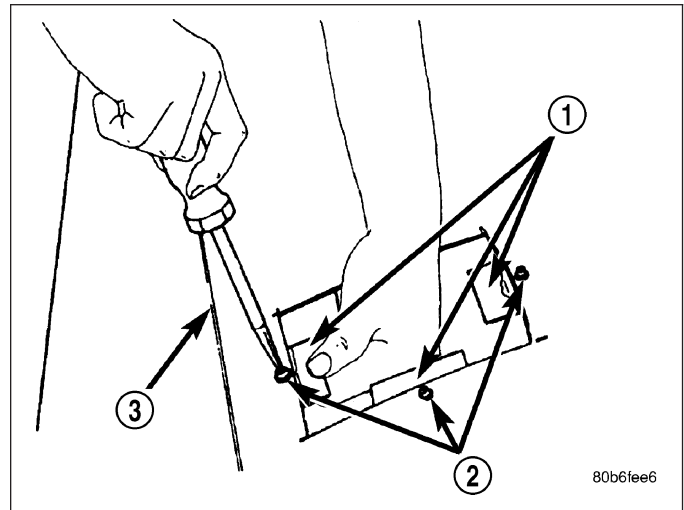
## PANEL PATCH INSTALLATION

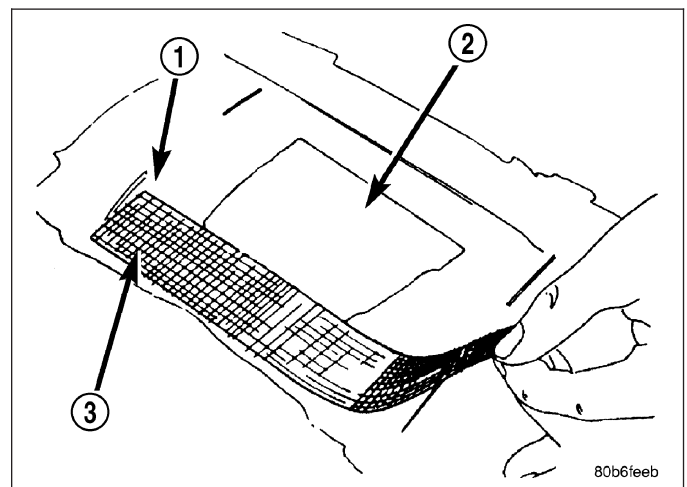
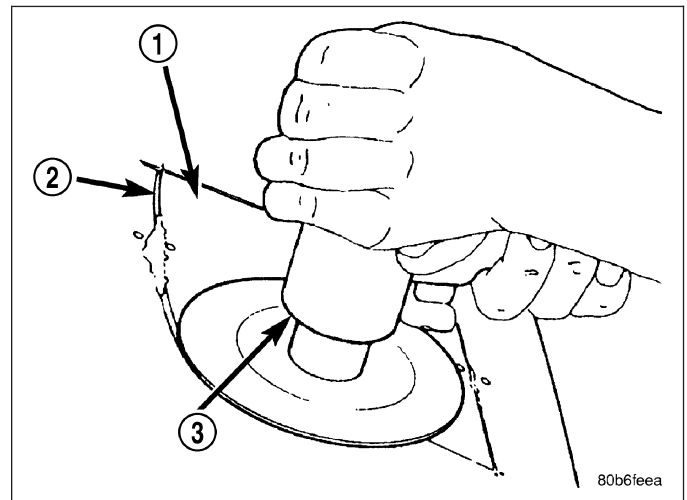
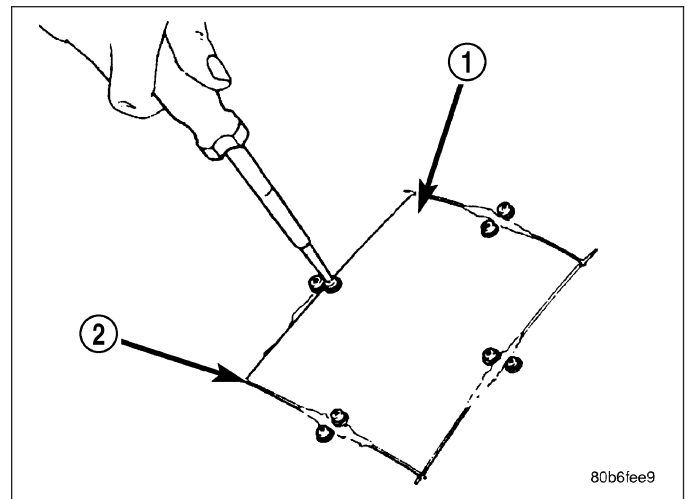
1. Make a paper or cardboard pattern the size and shape of the cutout hole in the panel.
2. Trim 3 mm (0.125 in.) from edges of pattern so patch will have a gap between connecting surfaces.
3. Using the pattern as a guide, cut the patch to size.
4. Cut scrap pieces of patch material into 50 mm (2 in.) squares to use as patch supports to sustain the patch in the cutout.
5. Drill 4 mm (0.160 in.) holes 13 mm (0.5 in.) in from edge of cutout hole.
6. Drill 4 mm (0.160 in.) holes 13 mm (0.5 in.) away from edge of patch across from holes drilled around cutout.
7. Drill 3 mm (0.125 in.) holes in the support squares 13 mm (0.5 in.) from the edge in the center of one side.
8. Scuff the backside of the body panel around the cutout hole with a scuff pad or sandpaper.
9. Mix enough adhesive to cover one side of all support squares.
10. Apply adhesive to cover one side of all support squares.
11. Using number 8 sheet metal screws, secure support squares to back side of body panel with adhesive sandwiched between the panel and squares.





12. Position patch in cutout against support squares and adjust patch until the gap is equal along all sides.
13. Drill 3 mm (0.125 in.) holes in the support squares through the pre-drilled holes in the patch.
14. Apply a coat of adhesive to the exposed ends of the support squares.
15. Install screws to hold the patch to support squares. Tighten screws until patch surface is flush with panel surface.
16. Allow adhesive to cure, and remove all screws.
17. Using a 125 mm (5 in.) 24 grit disc grinder, grind a 50 mm (2 in.) to 75 mm (3 in.) wide and 2 mm (0.080 in.) deep path across the gaps around the patch. With compressed air, blow dust from around patch.
18. Apply adhesive backed nylon mesh (dry wall tape) over gaps around patch.
19. Mix enough adhesive to cover the entire patch area.
20. Apply adhesive over the mesh around patch, and smooth epoxy with a wide spreader to reduce finish grinding. Use two to three layers of mesh and adhesive to create a stronger repair.



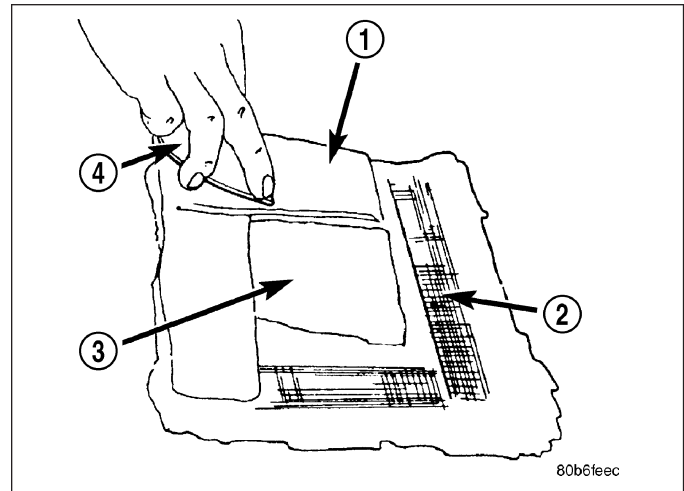


## PATCHED PANEL SURFACING

After patch panel is installed, the patch area can be finished using the same methods as finishing other types of body panels. If mesh material is exposed in the patched area, grind surface down, and apply a coat of high quality rigid plastic body filler. Prime, block sand, and paint as required.

## STANDARD PROCEDURE - HEAT STAKING

1. Remove trim panel.
2. Bend or move the trim panel components at the heat staked joints. Observe the heat staked locations and/or component seams for looseness.
3. Heat stake the components.
  - a. If the heat staked or component seam location is loose, hold the two components tightly together and using a soldering gun with a flat tip, melt the material securing the components together. Do not over heat the affected area, damage to the exterior of the trim panel may occur.
  - b. If the heat staked material is broken or missing, use a hot glue gun to apply new material to the area to be repaired. The panels that are being heat staked must be held together while the applying the glue. Once the new material is in place, it may be necessary to use a soldering gun to melt the newly applied material. Do not over heat the affected area, damage to the exterior of the trim panel may occur.
4. Allow the repaired area to cool and verify the repair.
5. Install trim panel.



## SPECIFICATIONS

## BODY LUBRICATION

### LUBRICATION REQUIREMENTS

Body mechanisms and linkages should be inspected, cleaned, and lubricated, as required, to maintain ease of operation and to provide protection against rust and wear. When performing other under hood services, the hood latch release mechanism and safety catch should be inspected, cleaned, and lubricated. During the winter season, external door lock cylinders should be lubricated to assure proper operation when exposed to water and ice.

Prior to the application of any lubricant, the parts concerned should be wiped clean to remove dust and grit. If necessary, a suitable solvent can be used to clean the item to be lubricated. After lubricating a component, any excess oil or grease should be removed.

### LUBRICANT APPLICATION

#### DOOR LOCK CYLINDERS

1. Apply a small amount of lubricant directly into the lock cylinder.
2. Apply a small amount of lubricant to the key.
3. Insert key into lock cylinder and cycle the mechanism from the locked to the unlocked position.

**Note: Do not add more lubricant.**

4. Cycle the lock cylinder mechanism several times to allow the lubricant to flow throughout the cylinder.
5. Wipe all lubricant from exterior of lock cylinder and key.

#### ALL OTHER BODY MECHANISMS

1. Clean component as described above.
2. Apply specified lubricant to all pivoting and sliding contact areas of component.

## LUBRICANT USAGE

### **ENGINE OIL**

- Door Hinges – Hinge Pin and Pivot Contact Areas
- Hood Hinges – Pivot Points
- Liftgate Hinges

### **MOPAR® SPRAY WHITE LUBE OR EQUIVALENT**

- Door Check Straps
- Liftgate Latches
- Liftgate Prop Pivots
- Ash Receiver
- Fuel Filler Door Remote Control Latch Mechanism
- Parking Brake Mechanism
- Sliding Seat Tracks
- Liftgate Latch

### **MOPAR® Multipurpose GREASE OR EQUIVALENT**

- All Other Hood Mechanisms

### **MOPAR® LOCK CYLINDER LUBRICANT OR EQUIVALENT**

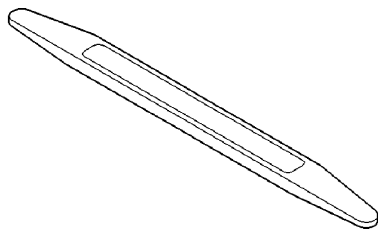
- Door Lock Cylinders
- Liftgate Lock Cylinder

## TORQUE SPECIFICATIONS

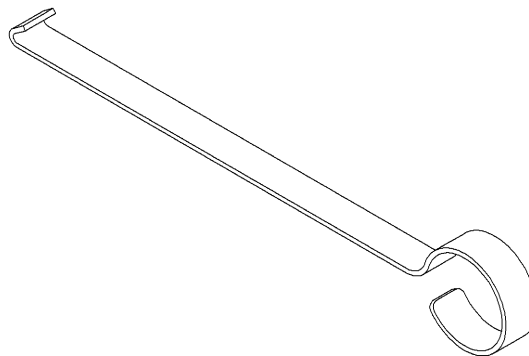
DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Front seat track to floor pan bolts	61	45	—
Front seat inboard pivot bolt	40	30	—
Front seat recliner to seat cushion frame	12	9	—
Front seat track to cushion frame bolt	12	9	—
Front seat back	40	30	—
Front seat back to seat cushion	30	22	—
Front seat arm rest - 60/40	12	9	—
Front arm rest - 50/50 split	25	18	—
Front seat back recliner to seat back	12	9	—
Front seat belt buckle anchor nut	40	29	—
Front seat belt retractor bolt	38	28	—
Front seat belt buckle anchor bolt	40	29	—
Front door hinge to hinge pillar bolt	28	21	—
Front door hinge to door nuts and bolt	28	21	—
Front door latch striker	28	20	—
Front seat rear outboard seat track to floor pan bolts	28	20	—
Front strut tower to tower brace bolts	38	28	—
Decklid latch striker	22	16	—
Door hinge bolt and nut	28	21	—
Door hinge double ended stud	14	—	120
Hood latch release cable handle to the cowl side	2.3 to 3.4	—	20 to 30
Hood latch to crossmember	22.6 to 33.9	—	200 to 300
Hood hinges	22.6 to 33.9	—	200 to 300
Rear Child Tether anchor	20	15	—
Rear door glass to regulator bolt	11	—	105
Rear seat arm rest to seat back with ski pass	5	—	46
Rear seat back and belts to floor	44	32	—
Rear seat back 40 section to collar section	60	44	—
Rear seat back 60 section	16	12	—
Rear seat back collar assembly	60	44	—
Rear door hinge to B-pillar bolt	28	20	—
Rear door hinge to door bolt	28	20	—
Rear door latch striker	28	20	—
Sunroof module to roof panel	11	—	97

## SPECIAL TOOLS

### BODY



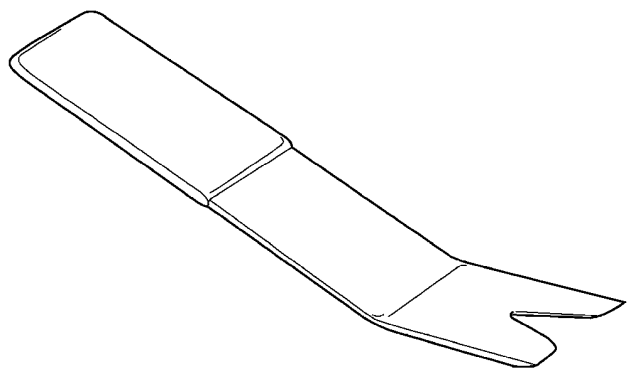
*Trim Stick C-4755*



*Outer Belt Molding Remover - 9093*



*TORX BIT SET C-4794-B*



8119f95e

*REMOVER, MOLDINGS C-4829-A*

DECKLID

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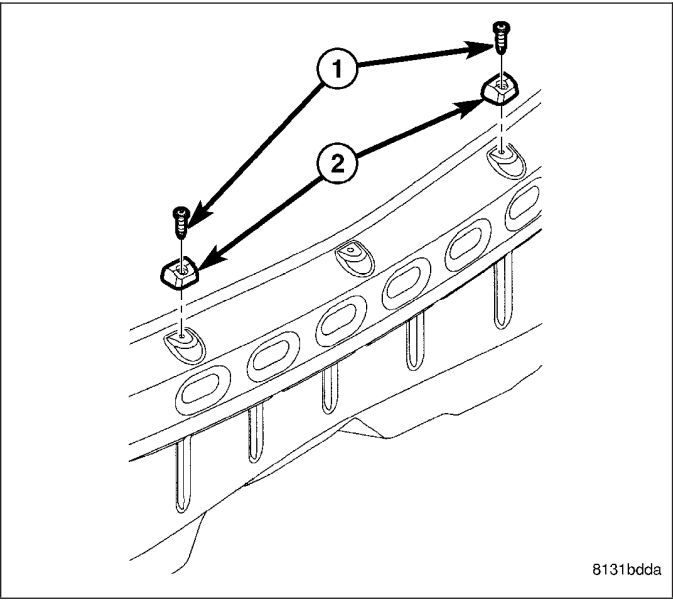
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BUMPER

REMOVAL

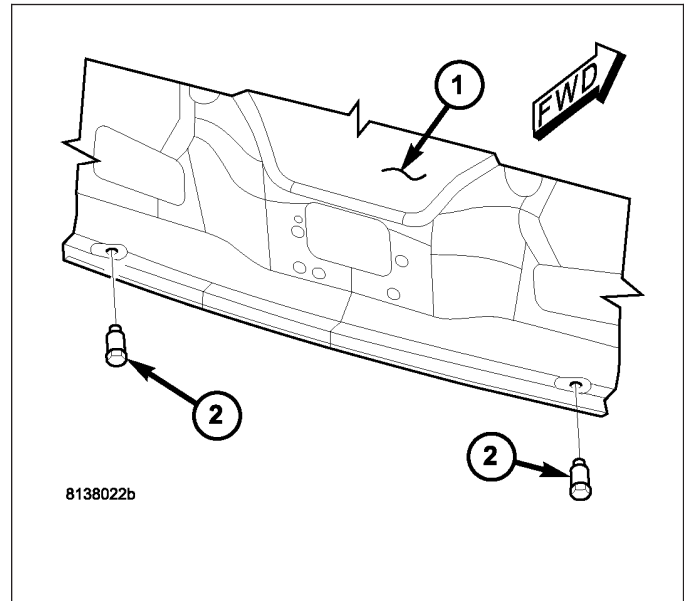
LOWER

- 1. Open the deck lid.
- 2. Remove the push-pin fastener (1) that secures the lower bumper (2) to the rear fascia flange that extends over the deck opening lower panel.
- 3. Remove the bumper.



## UPPER

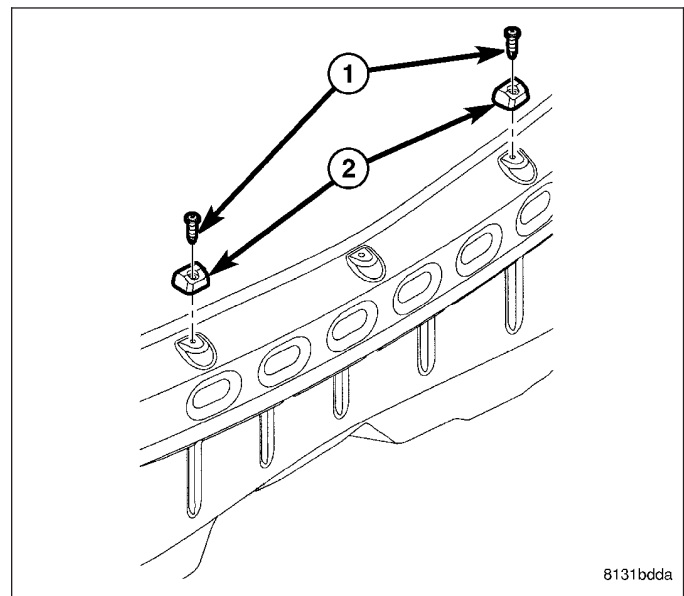
1. Open the deck lid.
2. Unscrew the upper bumper (2) from the lower flange of the deck lid inner panel (1).



## INSTALLATION

### LOWER

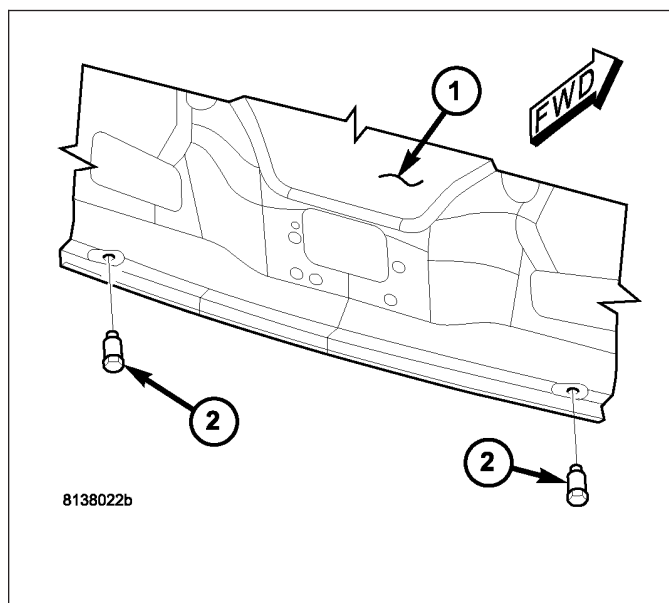
1. Position the lower bumper (2) to the rear fascia flange that extends over the deck opening lower panel.
2. Secure the bumper with a push-pin fastener.
3. Close the deck lid.





## UPPER

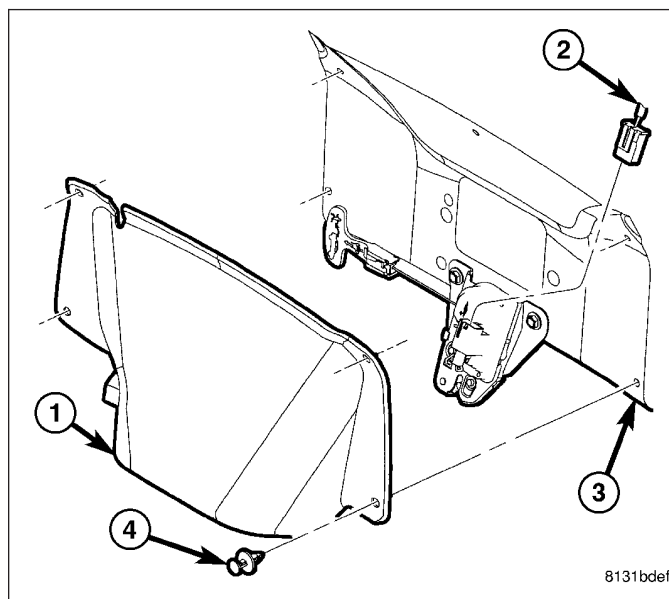
1. Screw the upper bumper (2) into the hole in the lower flange of the deck lid inner panel (1).
2. Thread the bumper in or out of the deck lid as necessary to achieve proper deck lid closing and alignment.
3. Close the deck lid.



## COVER

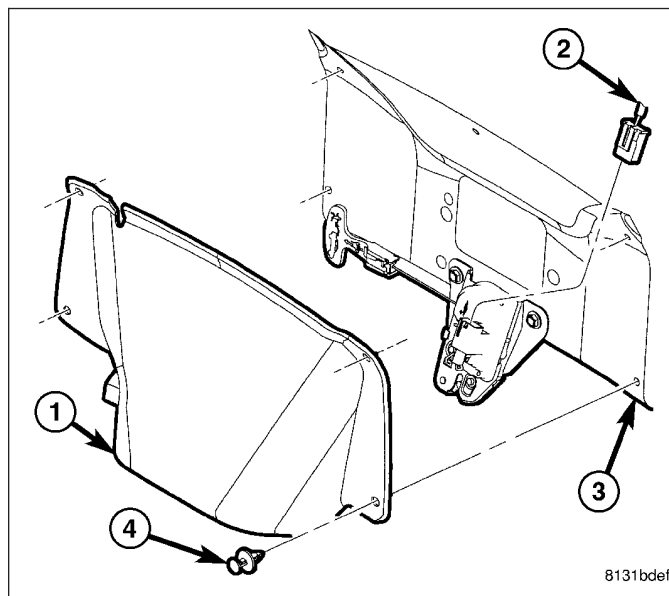
### REMOVAL

1. Open the deck lid.
2. Remove the four push-pin fasteners (4) that secure the latch cover (1) to the deck lid inner panel (3).
3. Disengage the emergency latch release T-handle from the cover.
4. Remove the cover from the deck lid inner panel.



## INSTALLATION

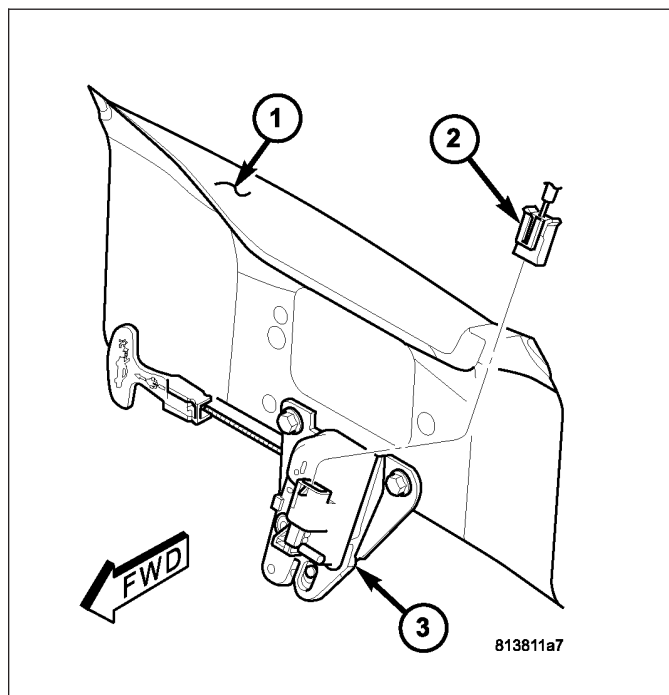
1. Position the latch cover (1) over the latch on the deck lid inner panel (3).
2. Engage the emergency latch release T-handle through the slit in the cover.
3. Align the mounting holes in the cover to the holes in the deck lid inner panel.
4. Install the four push-pin fasteners that secure the cover to the deck lid.
5. Close the deck lid.



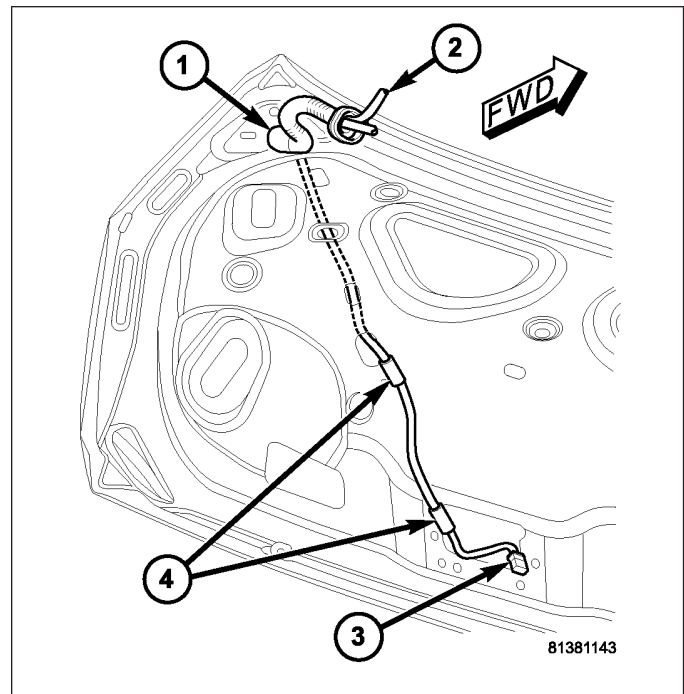
## DECKLID

### REMOVAL

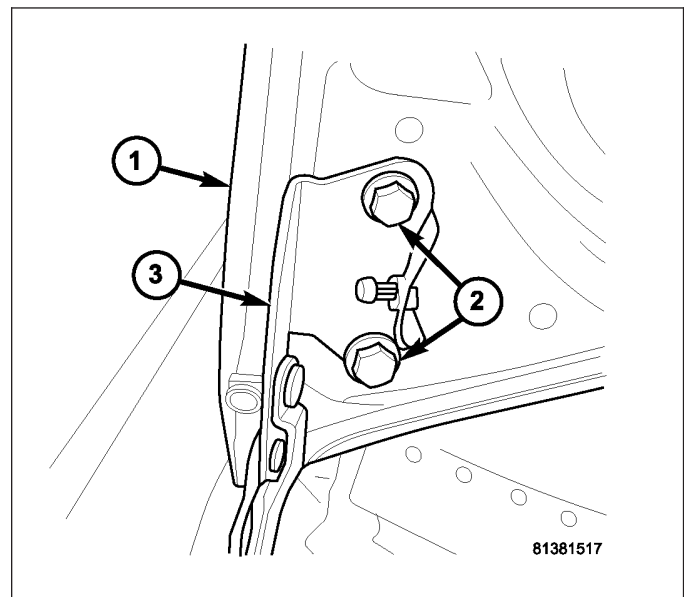
1. Open the deck lid.
2. Disconnect and isolate the battery negative cable.
3. Remove the cover from over the latch on the inside of the deck lid. (Refer to 23 - BODY/DECKLID/COVER - DECKLID LATCH - REMOVAL).
4. Disconnect the connector (2) of the body wire harness take out for the deck lid (1) from the latch connector receptacle (3).



5. Disengage the two retainers (4) that secure the deck lid take out (2) of the body wire harness to the underside of the deck lid.
6. Disengage the wire grommet (1) near the right hinge from the underside of the deck lid.
7. Carefully remove the deck lid take out of the body wire harness from between the inner and outer deck lid panels.

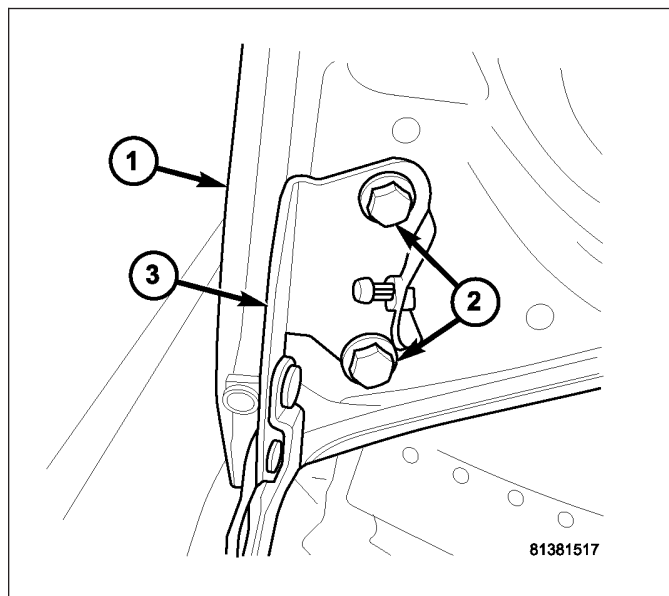


8. Mark both upper hinge bracket (3) locations on the deck lid inner panel (1) to aid reinstallation.
9. With the aid of an assistant, support the deck lid while removing the two screws (2) that secure each upper hinge bracket to the deck lid.
10. Remove the deck lid from the vehicle.

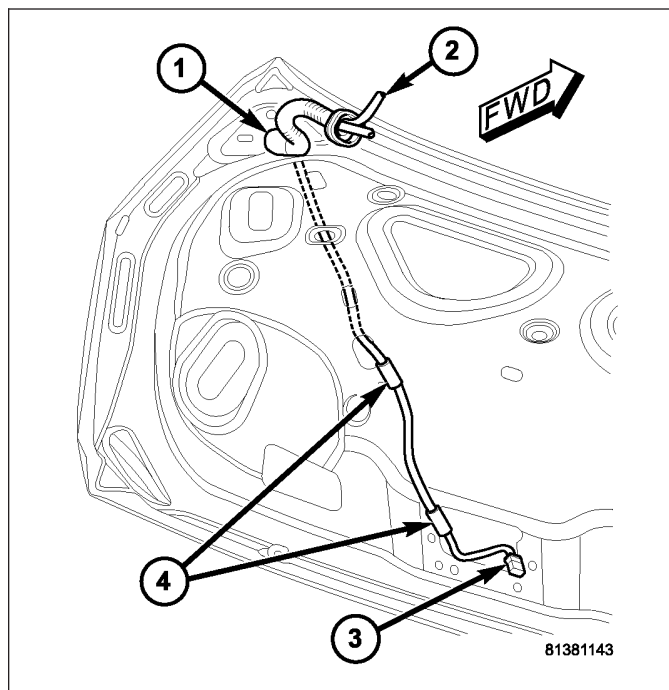


## INSTALLATION

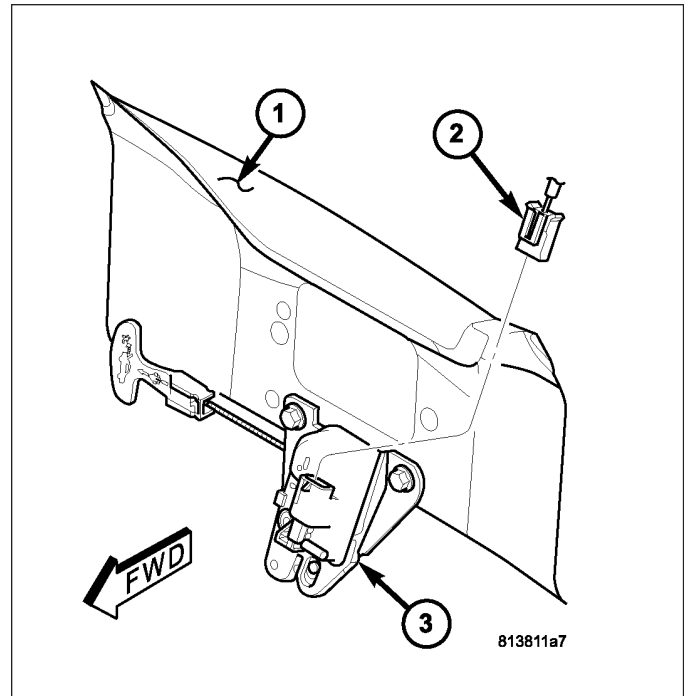
1. With the aid of an assistant, support and position the deck lid (1) to the two upper hinge brackets (3) on the vehicle.
2. Install and tighten the two screws (2) that secure each upper hinge bracket to the deck lid. Tighten the screws to 28 N·m (21 ft. lbs.).



3. Carefully route the deck lid take out (2) of the body wire harness between the inner and outer deck lid panels.
4. Engage the wire grommet (1) into the hole near the right hinge on the underside of the deck lid.
5. Engage the two retainers (4) that secure the deck lid take out (2) of the body wire harness to the underside of the deck lid.



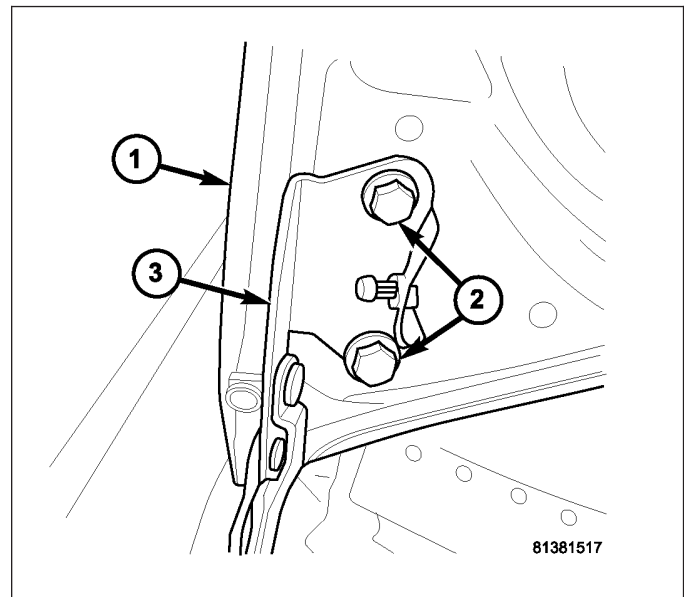
6. Reconnect the connector (2) of the body wire harness take out for the deck lid (1) to the latch connector receptacle (3).
7. Reinstall the cover over the latch on the inside of the deck lid. (Refer to 23 - BODY/DECKLID/COVER - DECKLID LATCH - INSTALLATION).
8. Reconnect the battery negative cable.
9. Close the deck lid.
10. Adjust the deck lid hinge positions and upper overslam bumpers as necessary to achieve proper spacing and operation.



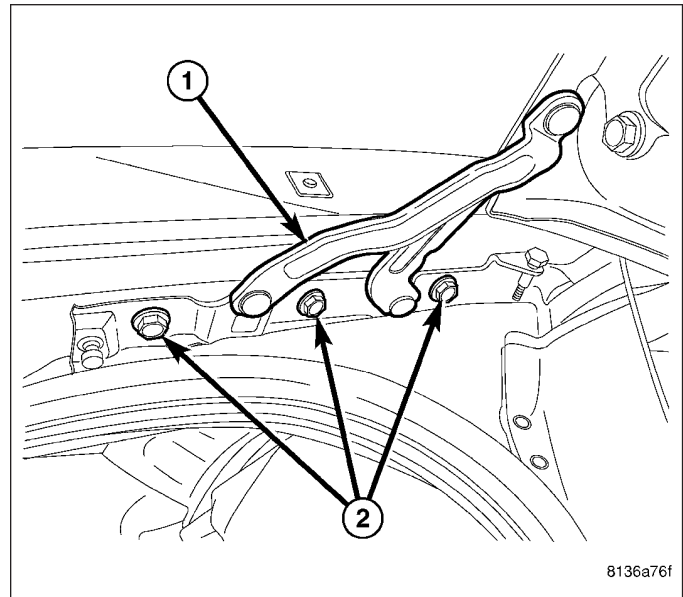
## HINGE

### REMOVAL

1. Open and support the deck lid (1) with a suitable prop or block.
2. Remove the support cylinder from the deck lid hinge. (Refer to 23 - BODY/DECKLID/CYLINDER - DECKLID SUPPORT - REMOVAL).
3. Mark the upper hinge bracket (3) location on the deck lid inner panel to aid reinstallation.
4. Remove the two screws (2) that secure the hinge to the deck lid.

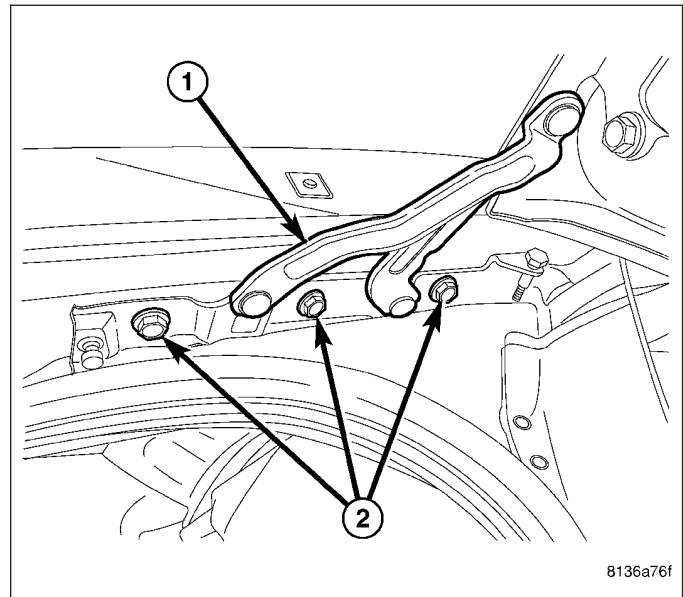


5. Mark the lower hinge bracket (1) location on the deck lid opening drain trough to aid reinstallation.
6. Remove the three screws (2) that secure the hinge to the drain trough.
7. Remove the deck lid hinge from the vehicle.

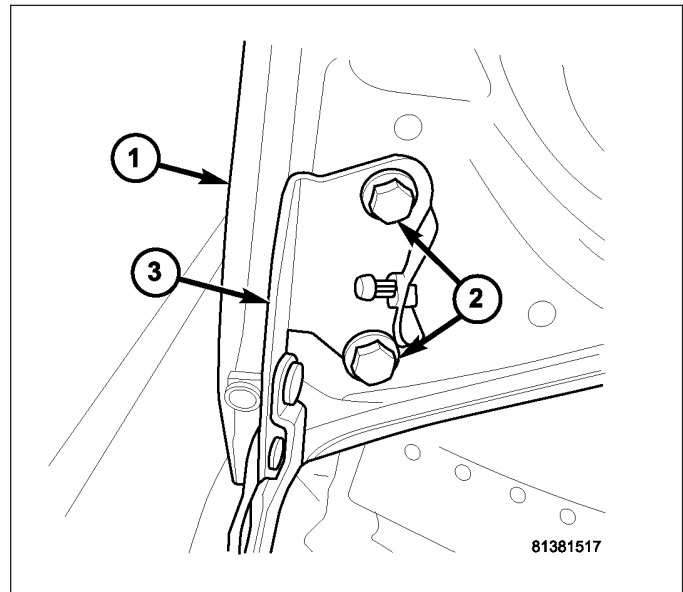


## INSTALLATION

1. Position the lower bracket of the deck lid hinge (1) to the drain trough on the vehicle.
2. Install and tighten the three screws (2) that secure the hinge to the drain trough. Tighten the screws to 28 N·m (21 ft. lbs.).



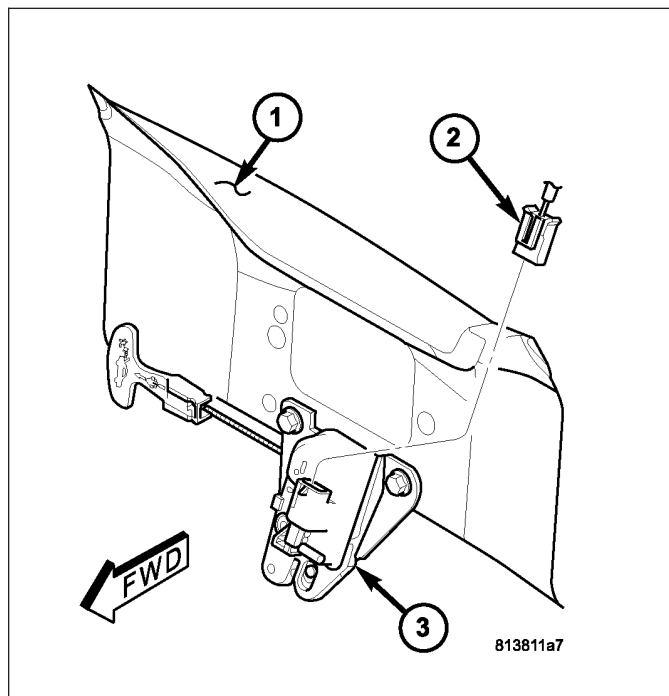
3. Position the deck lid (1) to the upper hinge bracket (3) on the vehicle.
4. Install and tighten the two screws (2) that secure the hinge to the deck lid. Tighten the screws to 28 N·m (21 ft. lbs.).
5. Reinstall the support cylinder onto the deck lid hinge. (Refer to 23 - BODY/DECKLID/CYLINDER - DECKLID SUPPORT - INSTALLATION).
6. Remove the fixture being used to support the deck lid for service and close the deck lid.
7. Adjust the deck lid hinge position as necessary to achieve proper spacing and operation.



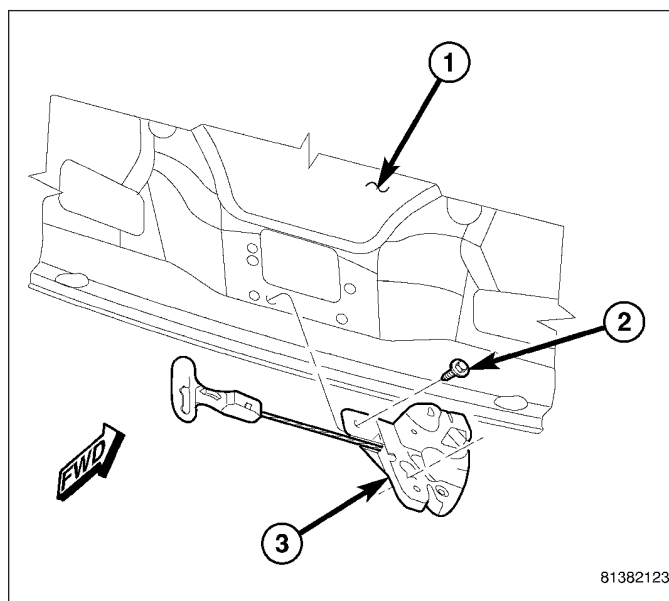
## LATCH

### REMOVAL

1. Open the deck lid.
2. Disconnect and isolate the battery negative cable.
3. Remove the cover from over the latch on the inside of the deck lid. (Refer to 23 - BODY/DECKLID/COVER - DECKLID LATCH - REMOVAL).
4. Disconnect the connector (2) of the body wire harness take out for the deck lid (1) from the latch connector receptacle (3).

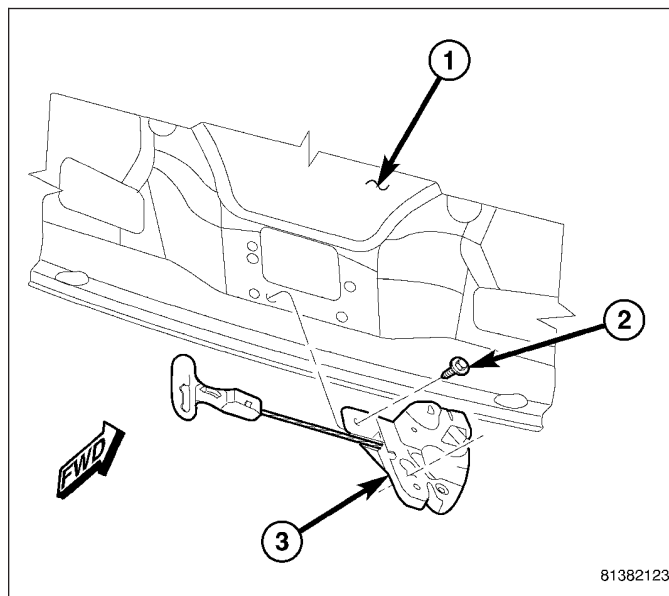


5. Remove the two screws (2) that secure the latch (3) to the inside of the deck lid (1).
6. Remove the latch from the inside of the deck lid.

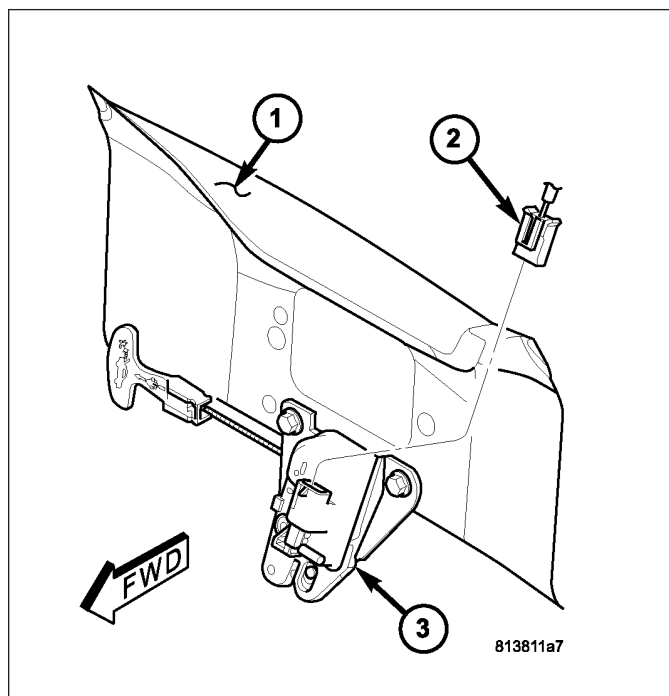


## INSTALLATION

1. Position the latch (3) to the inside of the deck lid (1).
2. Install and tighten the two screws (2) that secure the latch to the inside of the deck lid. Tighten the screws to 8 N·m (71 in. lbs.).



3. Reconnect the connector (2) of the body wire harness take out for the deck lid (1) to the latch connector receptacle (3).
4. Reinstall the cover over the latch on the inside of the deck lid. (Refer to 23 - BODY/DECKLID/COVER - DECKLID LATCH - INSTALLATION).
5. Reconnect the battery negative cable.
6. Close the deck lid.

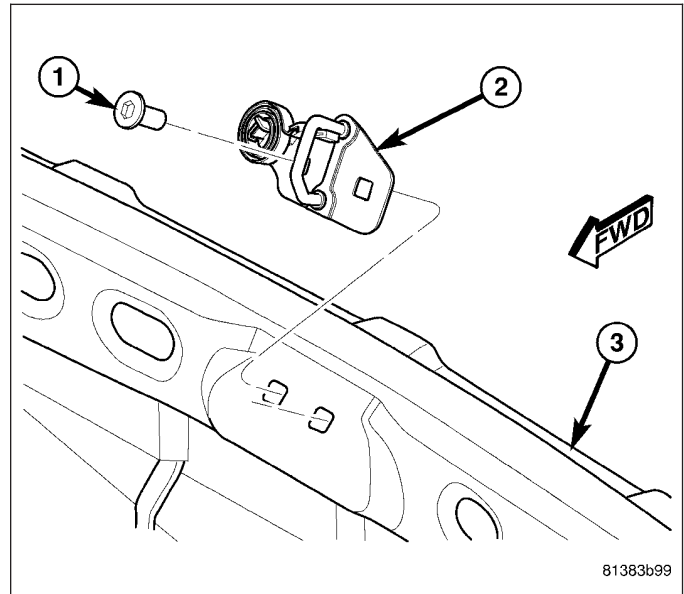




## LATCH STRIKER

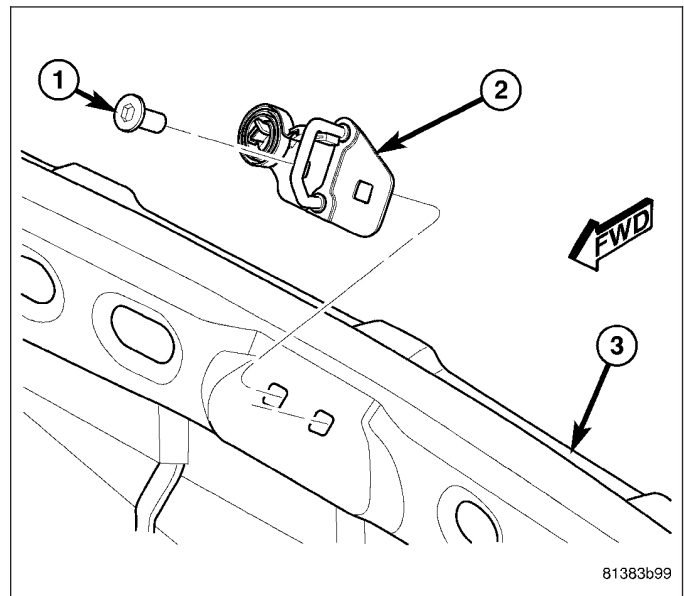
### REMOVAL

1. Open the deck lid.
2. Remove the trunk rear trim panel from the inside of the deck opening lower panel (3). (Refer to 23 - BODY/INTERIOR/TRUNK REAR TRIM PANEL - REMOVAL).
3. Mark the deck lid latch striker (2) location on the inside of the deck opening lower panel to aid reinstallation.
4. Remove the two screws (1) that secure the latch striker to the inside of the deck opening lower panel.
5. Remove the latch striker from the vehicle.



### INSTALLATION

1. Position the deck lid latch striker (2) to the inside of the deck opening lower panel (3).
2. Install and tighten the two screws (1) that secure the latch striker to the deck opening lower panel. Tighten the screws to 28 N·m (21 ft. lbs.).
3. Adjust the latch striker position as necessary to achieve proper deck lid latch operation.
4. Reinstall the trunk rear trim panel to the deck opening lower panel. (Refer to 23 - BODY/INTERIOR/TRUNK REAR TRIM PANEL - INSTALLATION).
5. Close the deck lid.



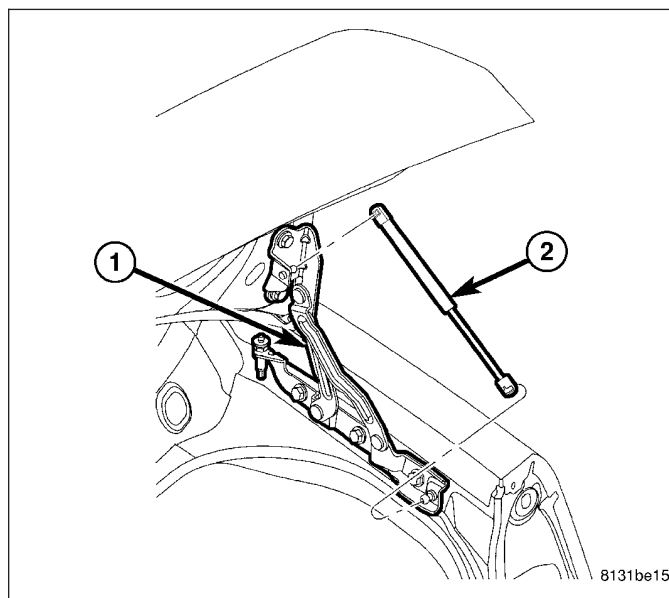
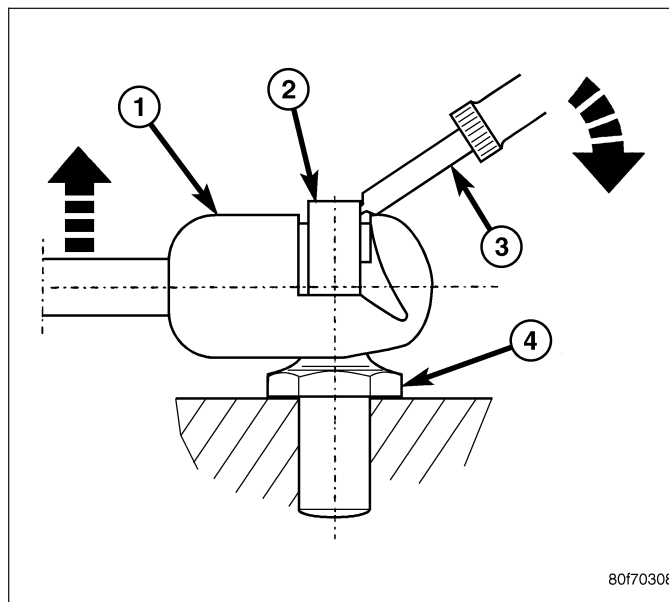
## SUPPORT CYLINDER

### REMOVAL

1. Open and support the deck lid with a suitable prop or block.

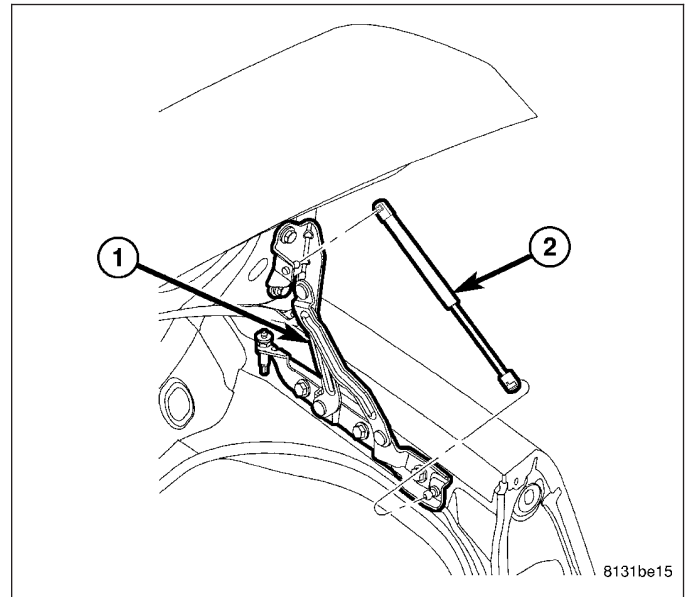
**WARNING:** To avoid personal injury or death, during service lift the ball socket end retaining clip only far enough to release the socket from the ball stud. Excessive prying or removal of the clip may result in improper clip spring tension. Improper clip tension may result in the support cylinder separating from the ball stud causing sudden, unexpected loss of deck lid support.

2. Insert a small flat-bladed tool (3) into the notch on the outer face of one ball socket end (1) of the support cylinder and carefully pry the retaining clip (2) outward while pulling the ball socket away from the ball stud (4) on the deck lid hinge.
3. Release the retaining clip to its installed position.
4. Repeat Step 2 and Step 3 for the opposite end of the support cylinder.
5. Remove the support cylinder (2) from the deck lid hinge (1).



## INSTALLATION

1. Position the ball socket on the cylinder end of the support cylinder (2) to the ball stud on the upper bracket of the deck lid hinge (1).
2. Using hand pressure, press the ball socket onto the ball stud until the retainer clip snaps into place.
3. Position the ball socket on the rod end of the support cylinder to the ball stud on the lower bracket of the deck lid hinge.
4. Using hand pressure, press the ball socket onto the ball stud until the retainer clip snaps into place.
5. Inspect to be certain that the retaining clip on each of the support cylinder ball socket ends is fully seated.
6. Remove the service prop or block and close the deck lid.



## DOOR - FRONT

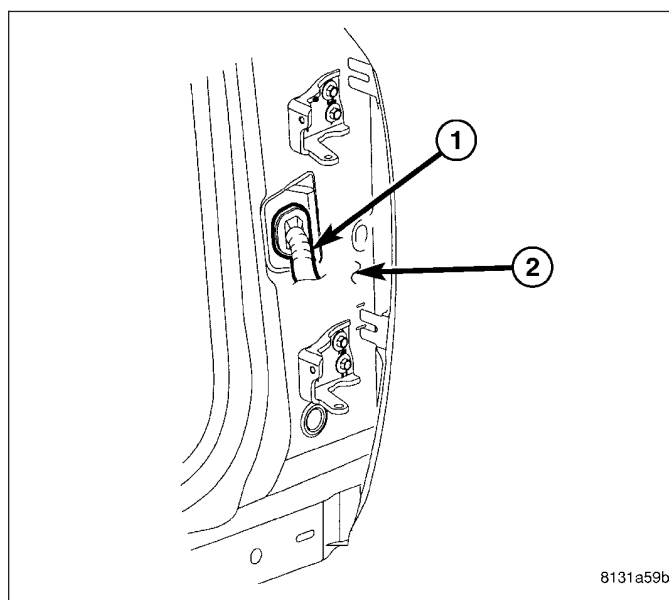
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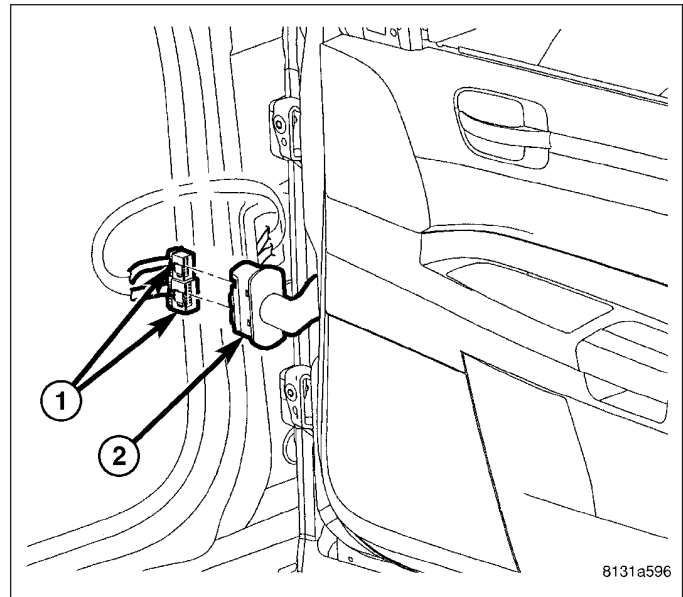
## DOOR

## REMOVAL

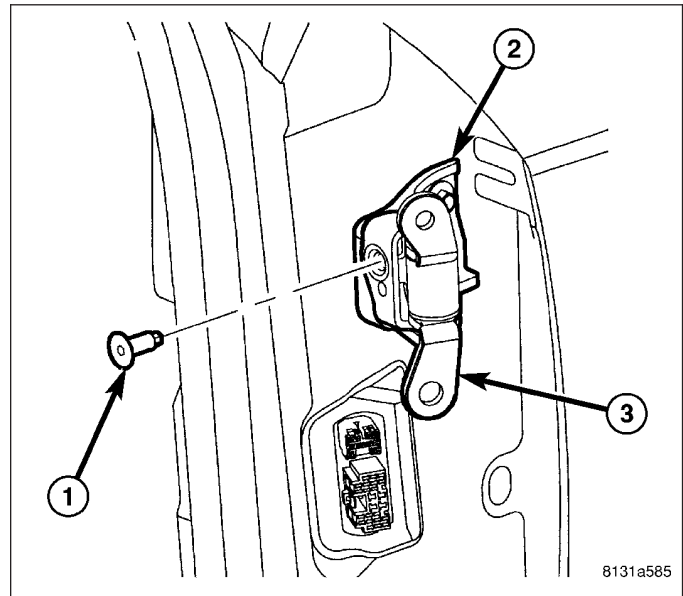
1. Disconnect and isolate the battery negative cable.
2. Open the front door.
3. Disengage the front door wire harness boot and connector (1) from the outside of the lower A-pillar (2).



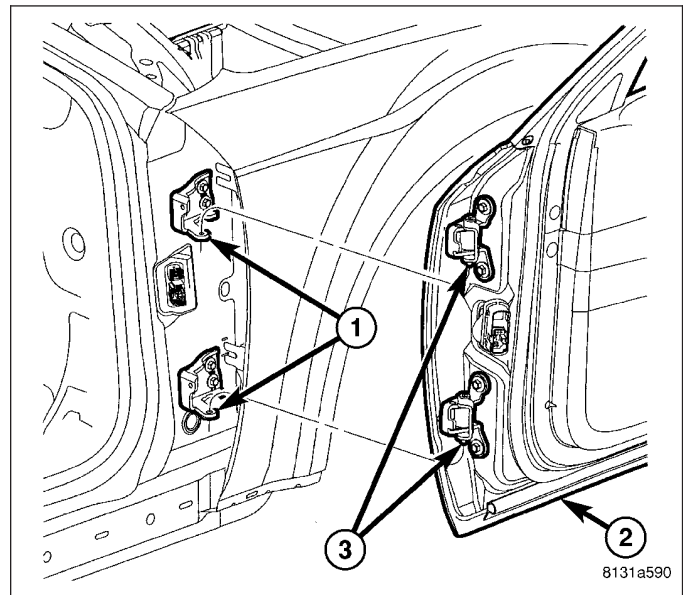
4. Carefully pull the door wire harness boot and connector (2) out from the A-pillar far enough to access and disconnect the body wire harness connector(s) (1).
5. Open the door to the full open position.
6. Support the door with a suitable lifting device.



7. Remove the screw (1) from both the upper and lower front door hinges that secures the door hinge bracket (3) to the body hinge bracket (2).
8. While still supporting the door, close the door to the intermediate detent position (one detent from the full open position).

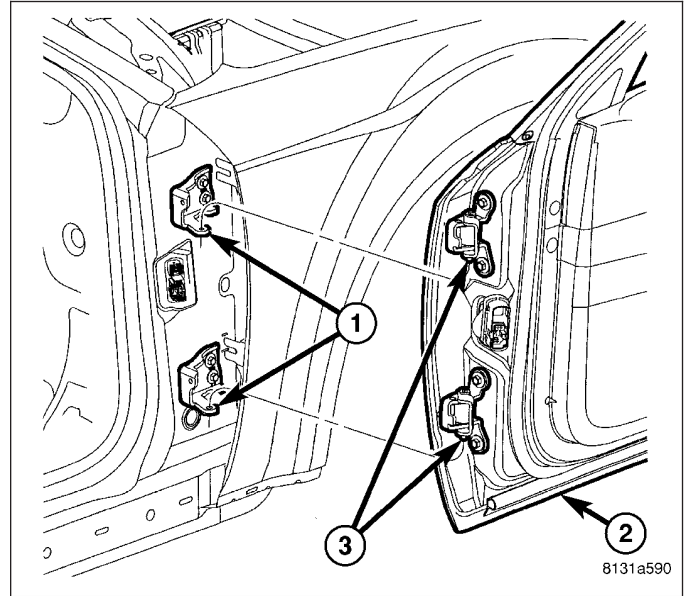


9. Raise the front door (2) upward far enough to disengage the upper and lower hinge pins (3) from the pivots (1) on the upper and lower body hinge brackets.
10. Remove the front door from the vehicle.

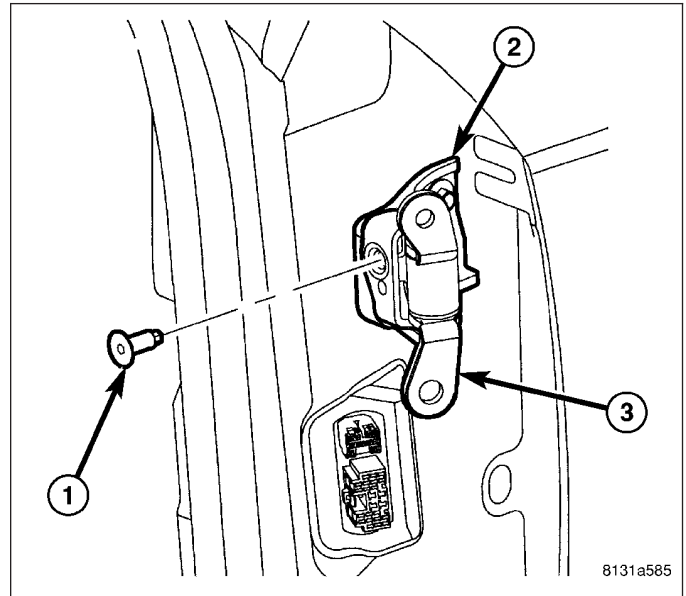


## INSTALLATION

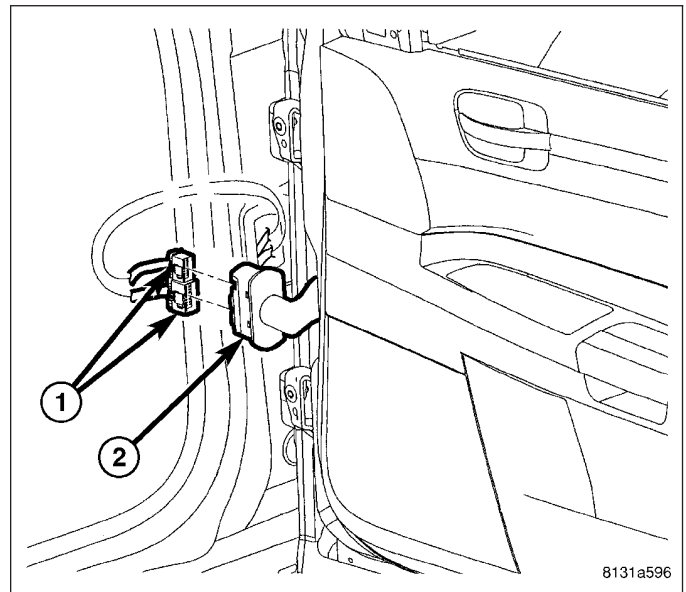
1. Support the front door (2) with a suitable lifting device.
2. Position the door with the upper and lower hinge pins (3) aligned over the pivots (1) on the upper and lower body hinge brackets.
3. Lower the door far enough to engage the hinge pins into the pivot holes.
4. While still supporting the door, open the door to the full open position.



5. Align the holes in the upper and lower front door hinge brackets (3) with those in the body hinge brackets (2).
6. Install and tighten the screw (1) into both the upper and lower front door hinge to secure the door hinge brackets to the body hinge brackets. Tighten the screws to 42 N·m (31 ft. lbs.).
7. Remove the lifting device supporting the door.



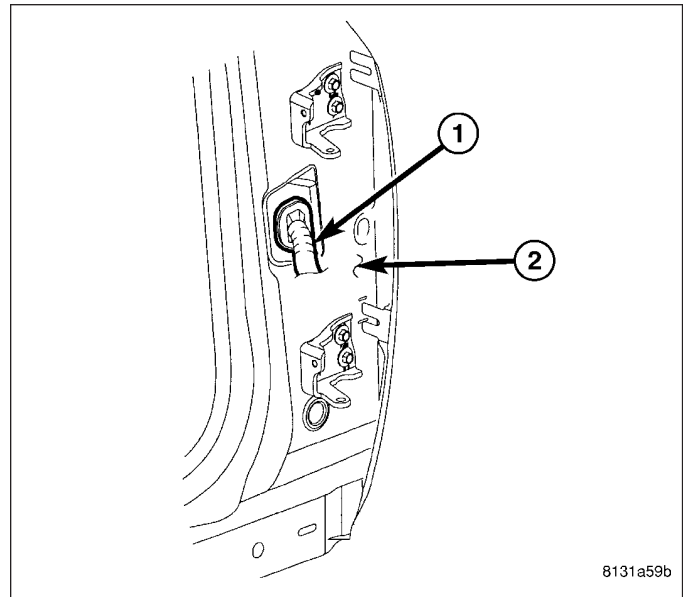
8. Carefully pull the body wire harness connector(s) (1) out from the A-pillar far enough to reconnect them to the door wire harness boot and connector (2).



9. Engage the front door wire harness boot and connector (1) into the wiring clearance hole on the outside of the lower A-pillar (2).
10. Reconnect the battery negative cable.

**Note:** For vehicles equipped with the optional Automatic Express Up power window feature, recalibration of this feature is required whenever power to the door module is disrupted. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE - BATTERY CONNECTION).

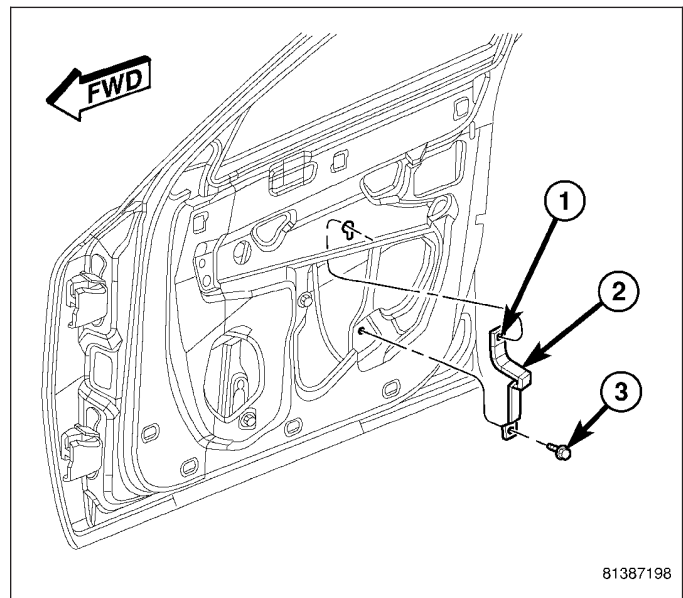
11. Adjust the door hinge positions as necessary to achieve proper door spacing and operation.



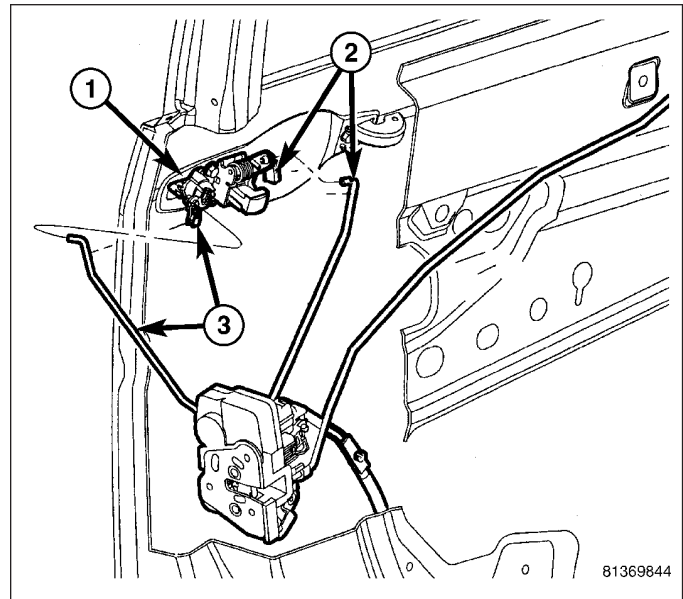
## EXTERIOR HANDLE

### REMOVAL

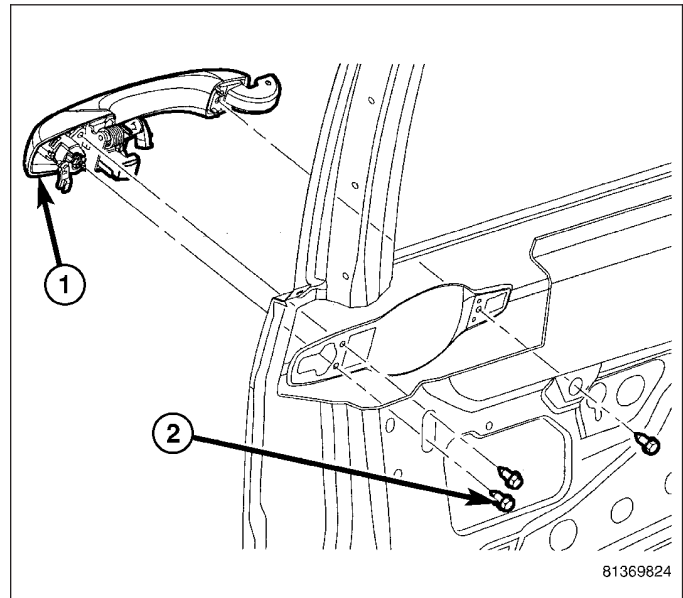
1. Remove the trim panel from the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
2. Remove the speaker from the inside of the front door. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - REMOVAL).
3. Remove the watershield from the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - REMOVAL).
4. Remove the screw (3) that secures the bottom of the pull cup bracket (2) and the bottom of the window regulator rear rail to the inside of the front door.
5. Loosen the screw (1) that secures the top of the pull cup bracket to the inside of the front door.
6. Disengage the upper pull cup bracket screw from the keyed hole and remove the bracket from the inside of the front door.



7. Reach up into the back of the door shell to unsnap the plastic clip (2) that secures the end of the latch release link to the exterior door handle (1) and disengage the latch release link from the handle.
8. For the driver side handle only, reach up into the back of the door shell to unsnap the plastic clip (3) that secures the end of the lock actuator link to the lock cylinder and disengage the link from the lock cylinder.

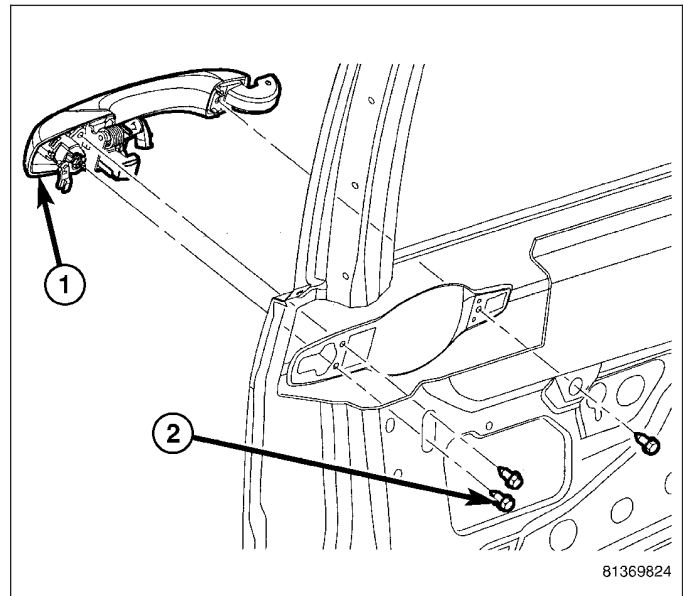


9. Remove the three screws (2) from the inside of the door that secure that exterior handle to the door.
10. Remove the handle from the outside of the door.



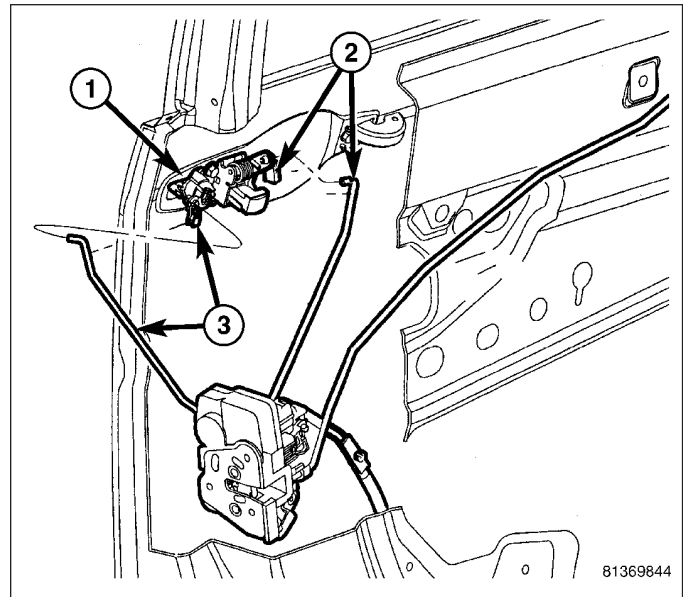
## INSTALLATION

1. Position the exterior handle (1) to the mounting holes on the outside of the door.
2. From the inside of the door, install and tighten the three screws (2) that secure that exterior handle to the door. Tighten the screws to 5 N·m (44 in. lbs.).

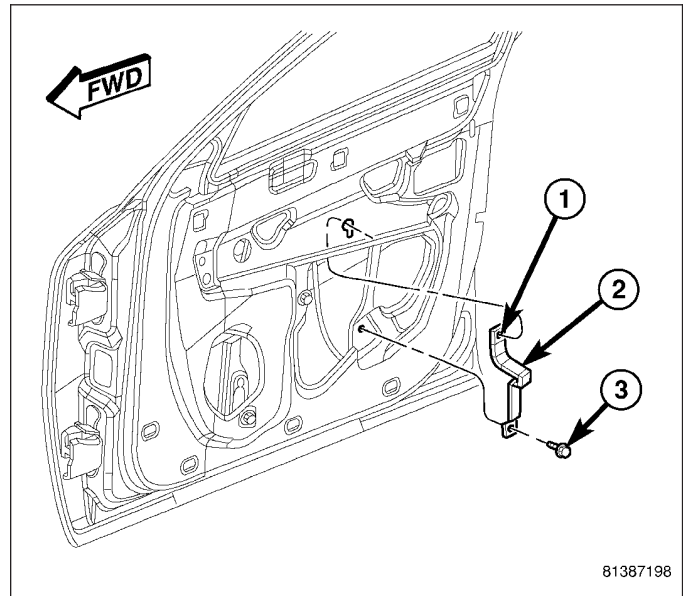




3. For the driver side handle only, reach up into the back of the door shell to engage the lock actuator link (3) to the lock cylinder and snap the plastic clip over the link to secure it to the lock cylinder.
4. Reach up into the back of the door shell to engage the latch release link (2) to the exterior door handle (1) and snap the plastic clip over the link to secure it to the handle.



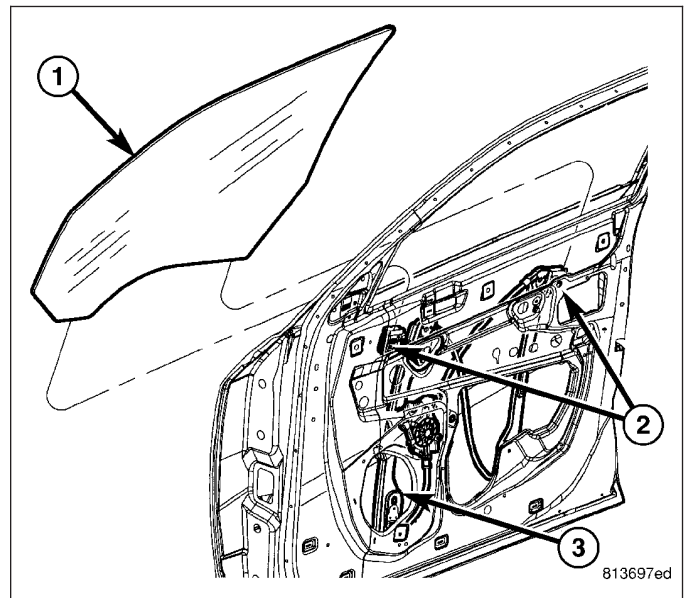
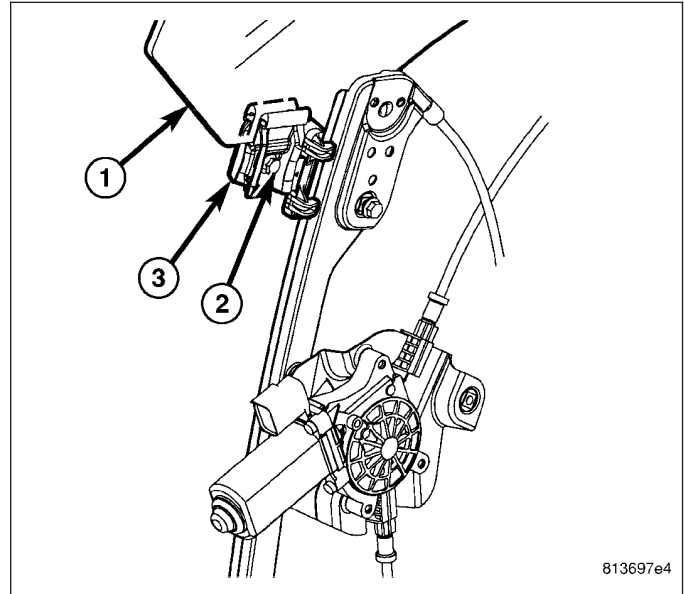
5. With the upper screw (1) hand-started into the pull cup bracket (2), position the screw into the keyed hole on the inside of the front door.
6. Install and tighten the screw (3) that secures the bottom of the pull cup bracket and the bottom of the window regulator rear rail to the inside of the front door. Tighten the screw to 11 N·m (100 in. lbs.).
7. Tighten the screw that secures the top of the pull cup bracket to the inside of the front door. Tighten the screw to 10 N·m (90 in. lbs.).
8. Reinstall the watershield onto the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - INSTALLATION).
9. Reinstall the speaker onto the inside of the front door. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - INSTALLATION).
10. Reinstall the trim panel onto the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).



## GLASS

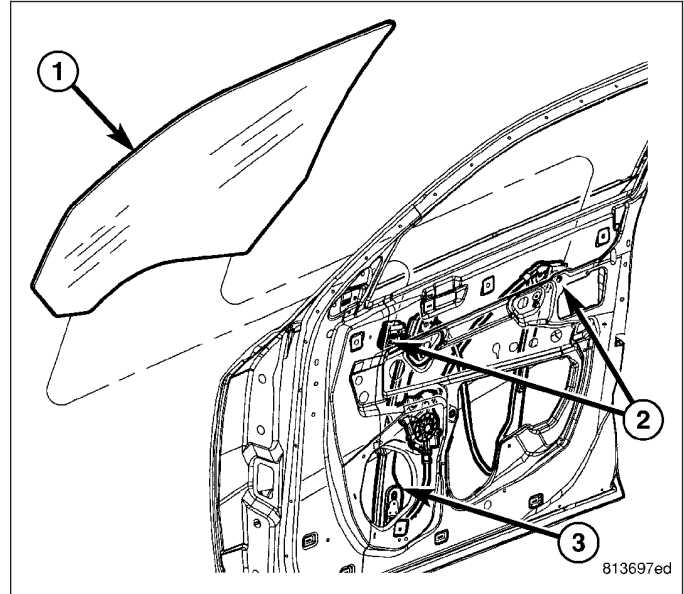
### REMOVAL

1. Remove the trim panel from the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
2. Remove the speaker from the inside of the front door. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - REMOVAL).
3. Remove the inner belt weatherstrip from the front door. (Refer to 23 - BODY/WEATHERSTRIP/SEALS/DOOR INNER BELT WEATHERSTRIP - REMOVAL - FRONT).
4. Remove the watershield from the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - REMOVAL).
5. Using the regulator, adjust the front door glass (1) position up or down as required for access to the two window regulator glass clamps (3).
6. Loosen the screw (2) in each of the glass clamps far enough to release the glass.
7. From the outside of the front door, lift the glass (1) upward far enough to disengage it from the two glass clamps (2).
8. Lift the rear side of the glass upward and out from the top of the door shell first to unload the glass from the door.

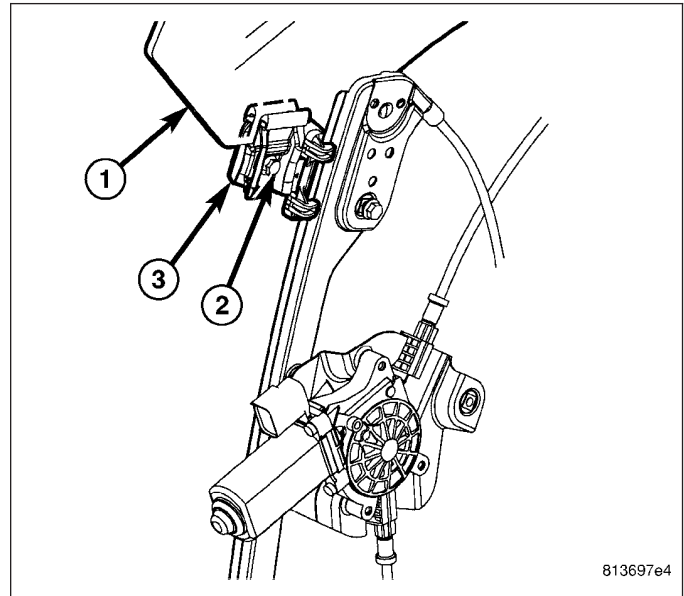


## INSTALLATION

1. From the outside of the front door, insert the front side of the glass (1) into the top of the door shell first to load the glass into the door.
2. Engage the glass into the two window regulator glass clamps (2).



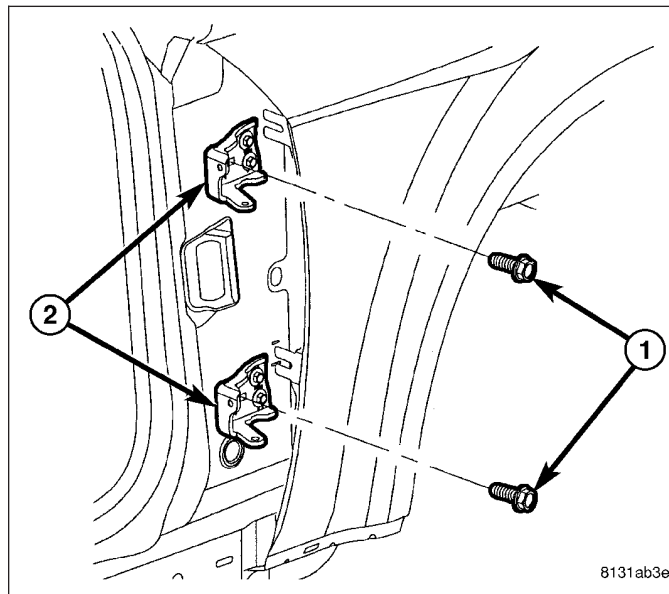
3. Using the regulator, lower the window as required for access to the two window regulator glass clamp screws (2).
4. Tighten the screw in each of the glass clamps. Tighten the screws to 10 N·m (90 in. lbs.).
5. Reinstall the watershield onto the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - INSTALLATION).
6. Reinstall the inner belt weatherstrip onto the front door. (Refer to 23 - BODY/WEATHERSTRIP/SEALS/DOOR INNER BELT WEATHERSTRIP - INSTALLATION - FRONT).
7. Reinstall the speaker onto the inside of the front door. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - INSTALLATION).
8. Reinstall the trim panel onto the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).



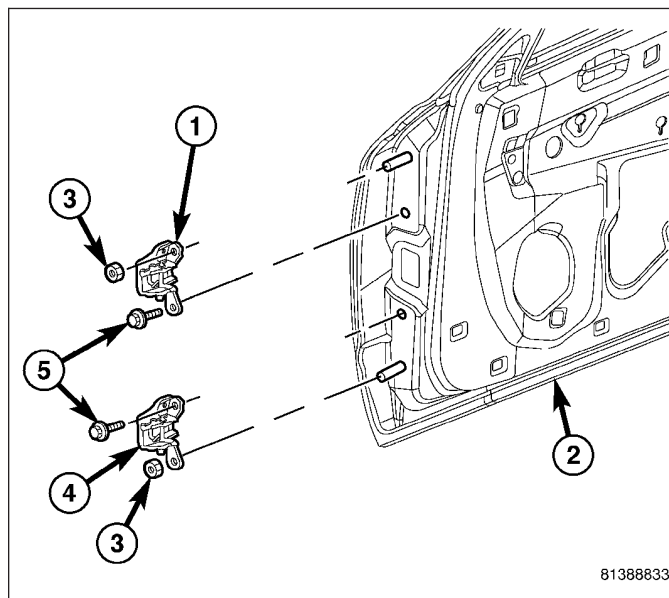
## HINGE

### REMOVAL

1. Remove the front door from the vehicle. (Refer to 23 - BODY/DOOR - FRONT/DOOR - REMOVAL).
2. Mark the upper or lower hinge bracket (2) location on the outside of the lower A-pillar to aid reinstallation.
3. Remove the three screws (1) that secure the hinge bracket to the outside of the lower A-pillar.
4. Remove the hinge bracket from the A-pillar.

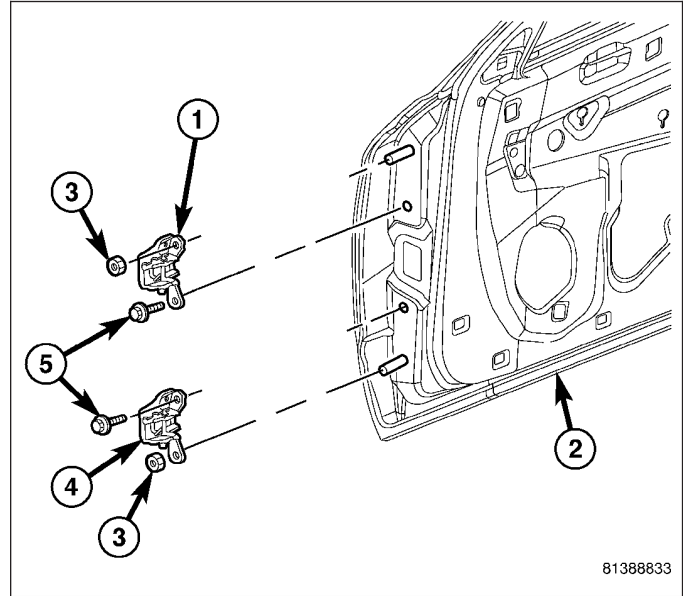


5. Mark the upper (1) or lower (4) door hinge location on the hinge face of the front door (2) to aid reinstallation.
6. Remove the screw (5) that secures the hinge to the door.
7. Remove the nut (3) that secures the hinge to the stud on the door.
8. Remove the upper or lower hinge from the hinge face of the door.

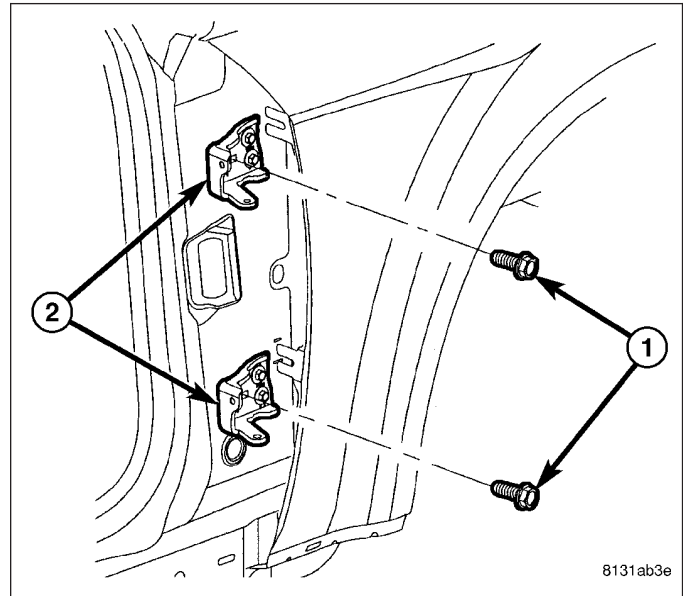


## INSTALLATION

1. Position the upper (1) or lower (4) hinge to the hinge face of the front door.
2. Install and tighten the nut (3) that secures the hinge to the stud on the door. Tighten the nut to 28 N·m (21 ft. lbs.).
3. Install and tighten the screw (5) that secures the hinge to the door. Tighten the screw to 28 N·m (21 ft. lbs.).



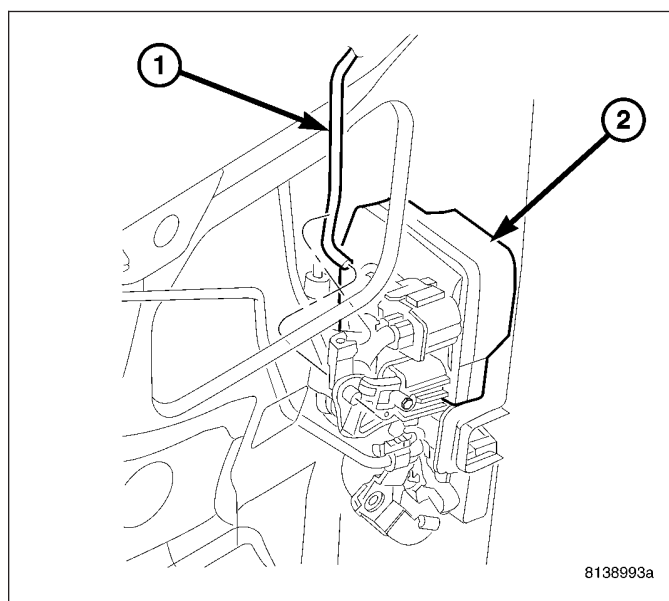
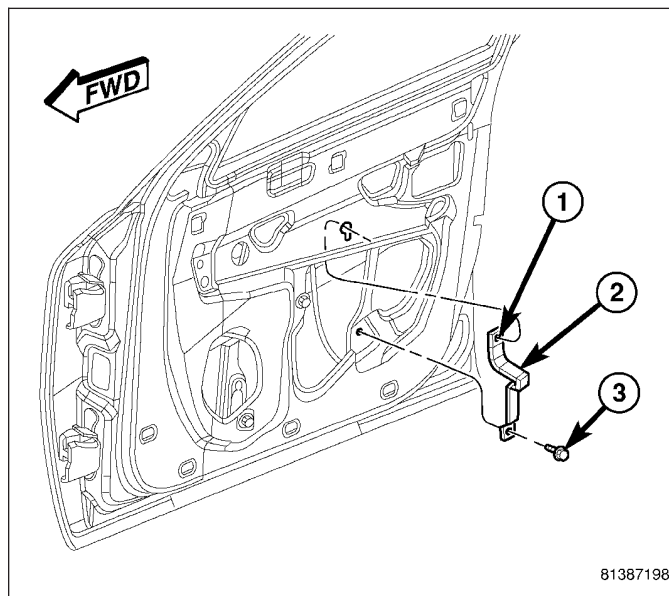
4. Position the upper or lower hinge bracket (2) onto the outside of the lower A-pillar.
5. Install and tighten the three screws (1) that secure the hinge bracket to the outside of the lower A-pillar. Tighten the screws to 30 N·m (22 ft. lbs.).
6. Reinstall the front door onto the vehicle. (Refer to 23 - BODY/DOOR - FRONT/DOOR - INSTALLATION).



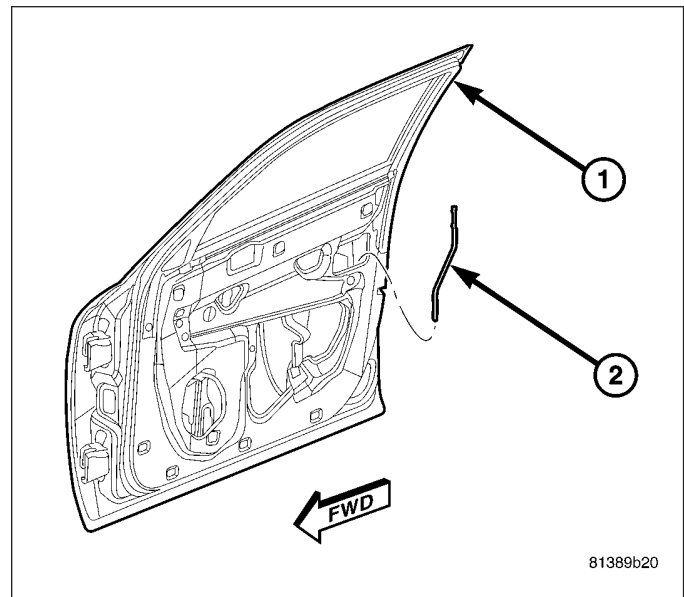
## LATCH

### REMOVAL

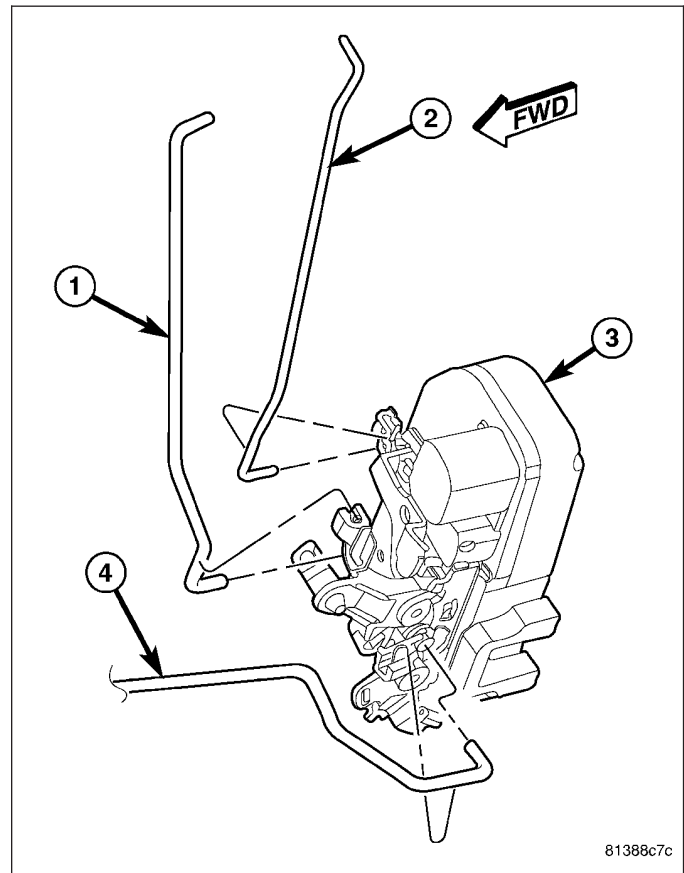
1. Remove the trim panel from the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
2. Remove the speaker from the inside of the front door. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - REMOVAL).
3. Remove the watershield from the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - REMOVAL).
4. Remove the screw (3) that secures the bottom of the pull cup bracket (2) and the bottom of the window regulator rear rail to the inside of the front door.
5. Loosen the screw (1) that secures the top of the pull cup bracket to the inside of the front door.
6. Disengage the upper pull cup bracket screw from the keyed hole and remove the bracket from the inside of the front door.
7. Reach into the back of the door shell to unsnap the plastic clip that secures the end of the interior door latch lock link (1) to the latch lever and disengage the link from the latch (2).



8. Remove the interior door latch lock link and knob unit (2) from the front door (1).

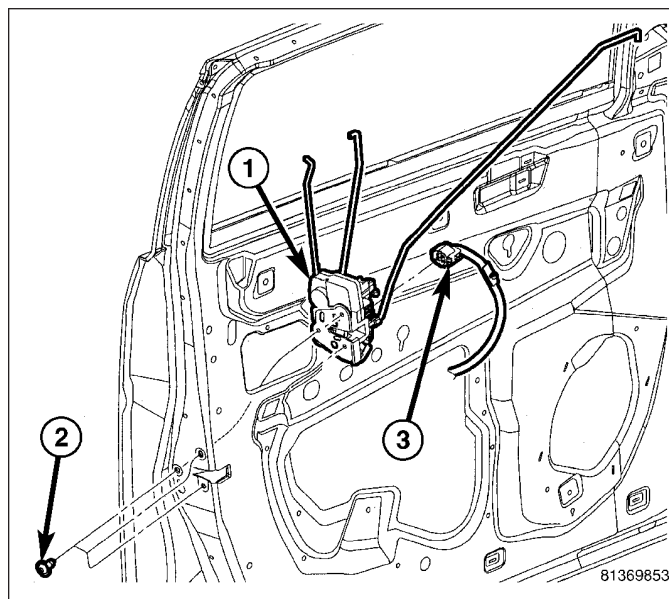


9. Reach into the back of the door shell to unsnap the plastic clip that secures the end of the interior door handle latch release link (4) to the latch lever and disengage the link from the latch (3).
10. Reach into the back of the door shell to unsnap the plastic clip that secures the end of the exterior door handle latch release link (1) to the latch lever and disengage the link from the latch.
11. For the driver side front door only, reach into the back of the door shell to unsnap the plastic clip that secures the end of the lock cylinder lock actuator link (2) to the latch lever and disengage the link from the latch.



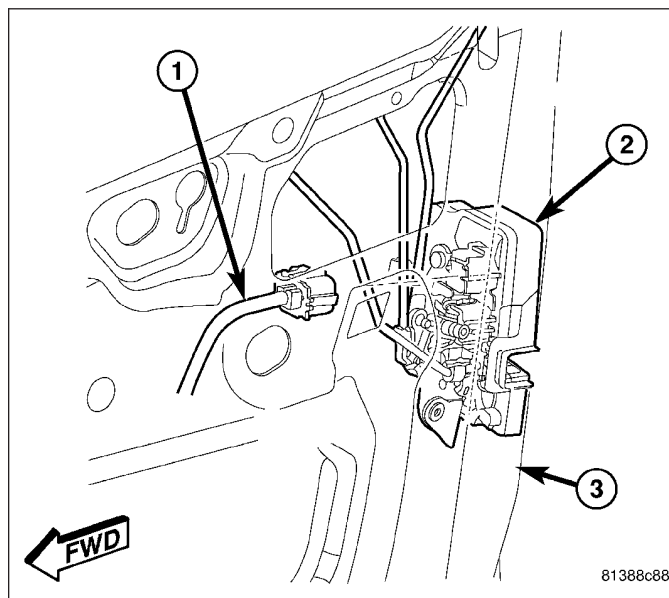


12. Remove the three screws (2) that secure the latch (1) to the outer latch face of the front door.



**Note:** Wiring connector can be disconnected much easier after all links are disconnected from latch and latch is unscrewed from door.

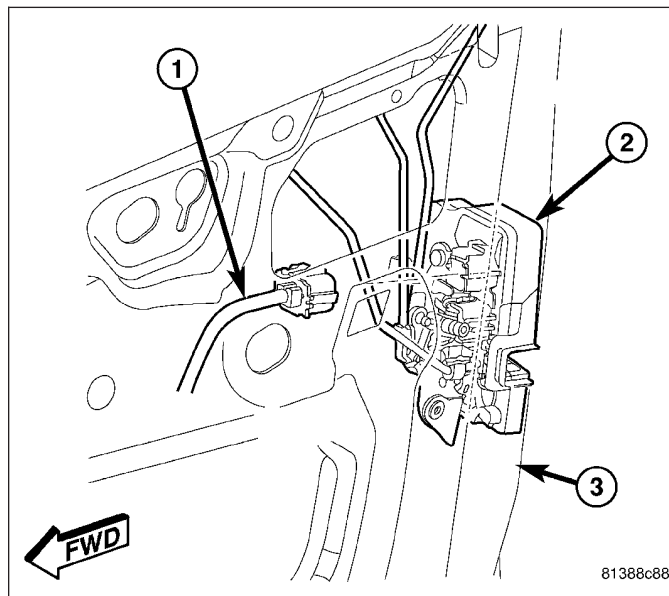
13. Reach into the back of the door shell (3) and pull the latch forward far enough to access and disconnect the door wire harness connector (1) from the front door latch (2) connector receptacle.
14. Remove the latch from the interior of the door shell.



## INSTALLATION

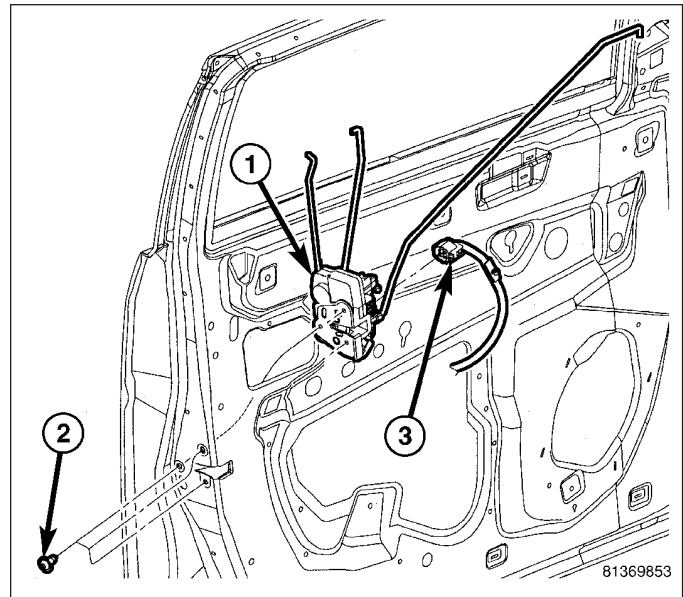
**Note:** Wiring connector can be connected much easier with all links disconnected from latch and latch is unscrewed from door.

1. Connect the door wire harness connector (1) to the door latch (2).

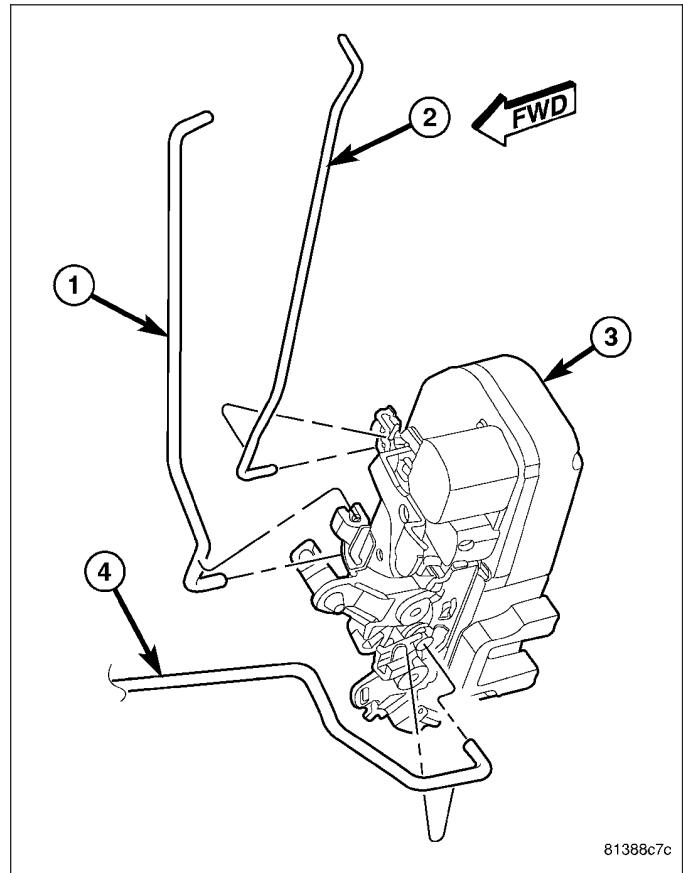




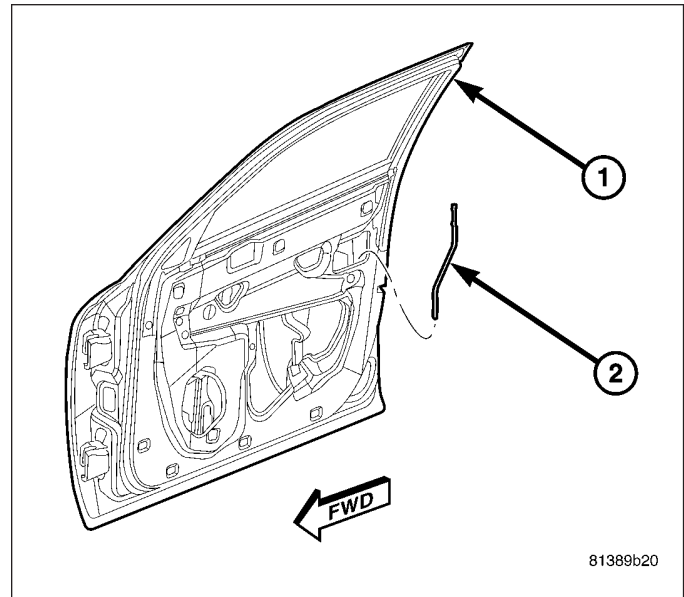
2. Position the latch (1) to the latch face on the interior of the front door shell.
3. Install and tighten the three screws (2) that secure the latch to the outer latch face of the front door. Tighten the screws to 12 N·m (108 in. lbs.).



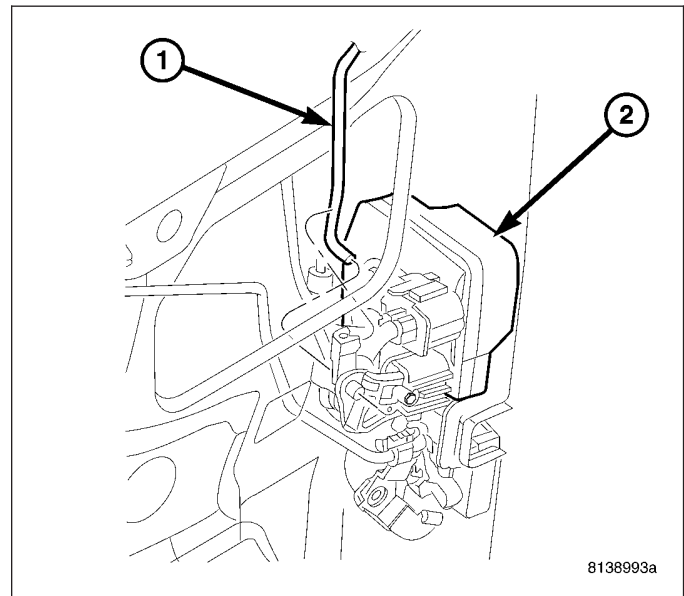
4. For the driver side front door only, reach into the back of the door shell to engage the lock cylinder actuator link (2) to the latch lever and snap the plastic clip over the link to secure it to the latch (3).
5. Reach into the back of the door shell to engage the exterior door handle latch release link (1) to the latch lever and snap the plastic clip over the link to secure it to the latch.
6. Reach into the back of the door shell to engage the end of the interior door handle latch release link (4) to the latch lever and snap the plastic clip over the link to secure it to the latch.



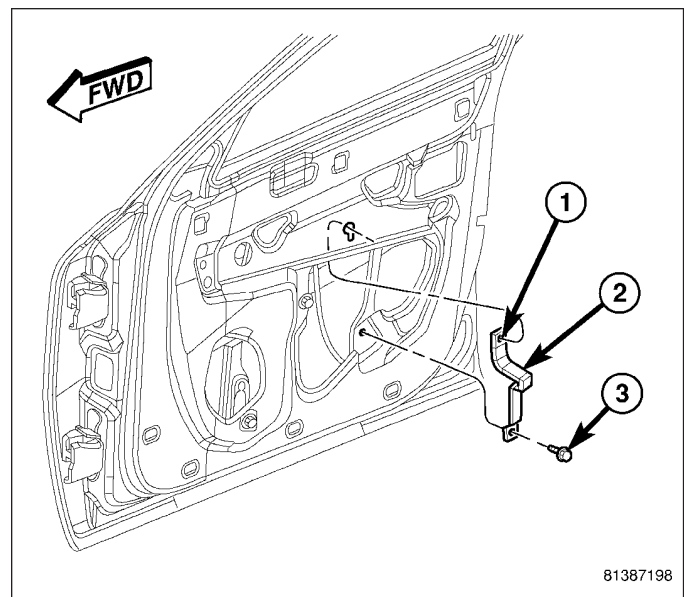
7. Position the interior door latch lock link and knob unit (2) into the front door (1).



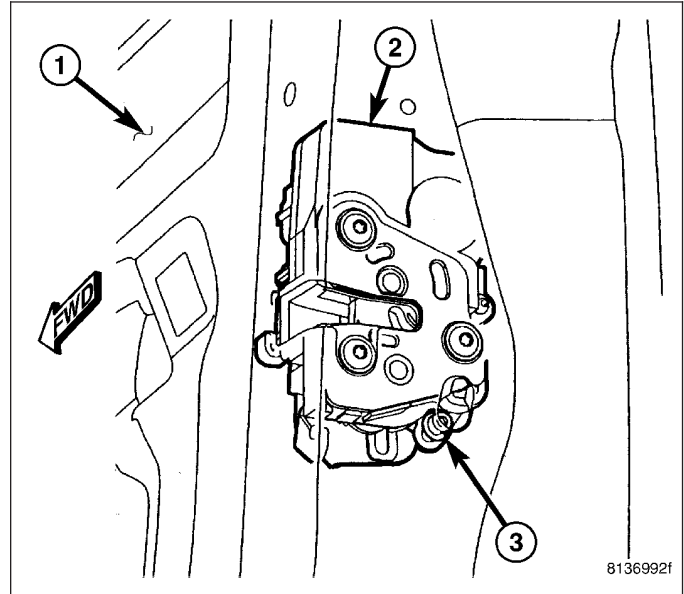
8. Reach into the back of the door shell to engage the end of the interior door latch lock link (1) to the latch lever and snap the plastic clip over the link to secure it to the latch (2).



9. With the upper screw (1) hand-started into the pull cup bracket (2), position the screw into the keyed hole on the inside of the front door.
10. Install and tighten the screw (3) that secures the bottom of the pull cup bracket and the bottom of the window regulator rear rail to the inside of the front door. Tighten the screw to 11 N·m (100 in. lbs.).
11. Tighten the screw that secures the top of the pull cup bracket to the inside of the front door. Tighten the screw to 10 N·m (90 in. lbs.).
12. Reinstall the watershield onto the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/ WATERSHIELD - INSTALLATION).
13. Reinstall the speaker onto the inside of the front door. (Refer to 8 - ELECTRICAL/AUDIO/ SPEAKER - INSTALLATION).



14. Reinstall the trim panel onto the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).
15. Use a wrench inserted through the access slot on the outer latch face of the front door shell (1) to loosen the hex socket latch release adjusting screw (3) on the latch (2).
16. Cycle the door outside latch release handle through its full travel two or three times.
17. Tighten the adjusting screw.

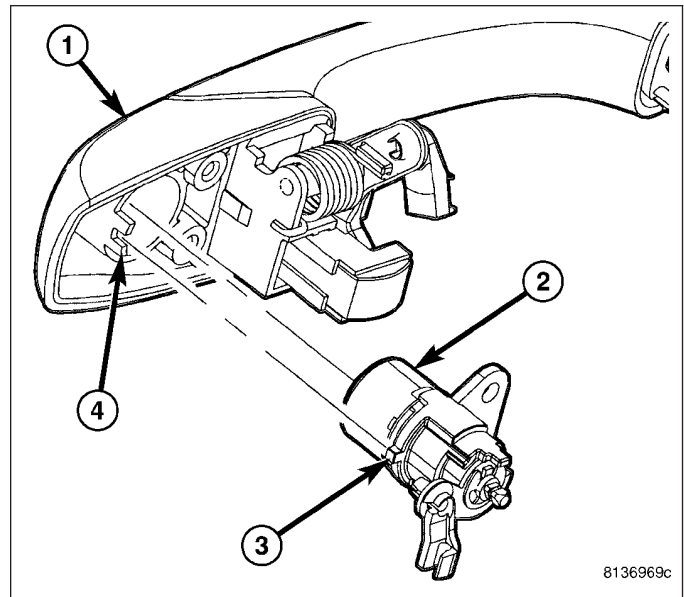


## LOCK CYLINDER

### REMOVAL

**Note:** A door lock cylinder is used only on the driver side front door exterior handle.

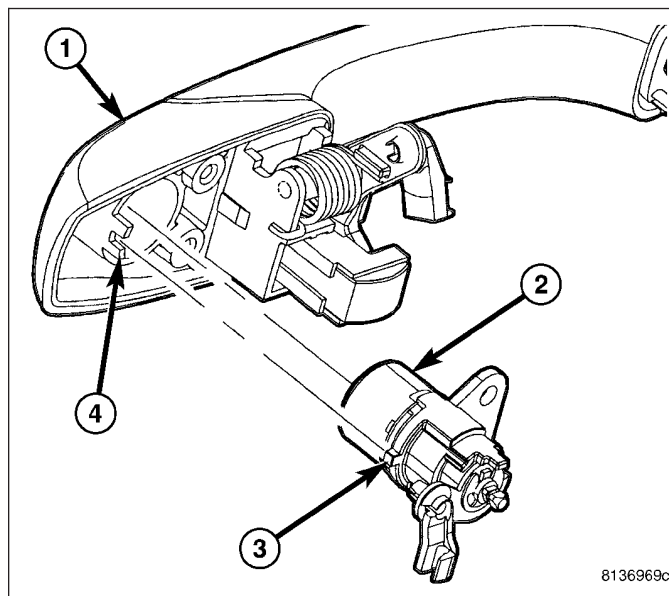
1. Remove the handle (1) from the outside of the driver side front door. (Refer to 23 - BODY/DOOR - FRONT/EXTERIOR HANDLE - REMOVAL).
2. Using hand pressure, push on the face of the lock cylinder (2) until it pops out of the cavity in the back of the door handle.



## INSTALLATION

**Note:** A door lock cylinder is used only on the driver side front door exterior handle.

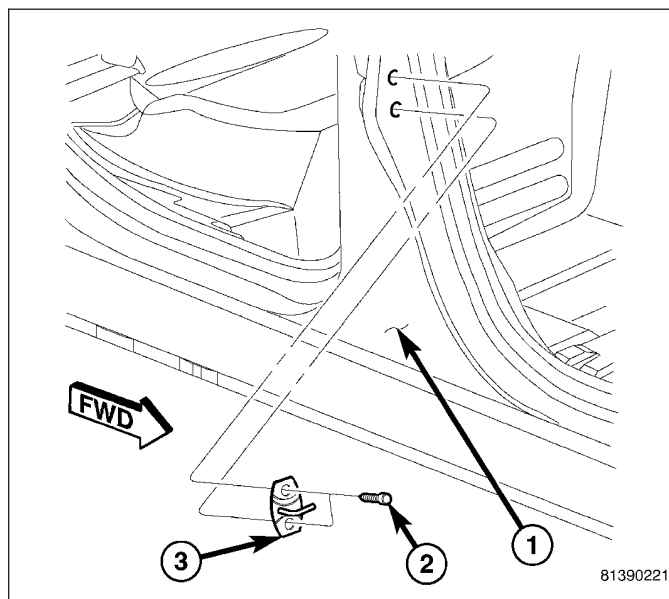
1. Insert the lock cylinder (2) into the cavity on the back of the door handle (1).
2. Align the lock cylinder in the handle by engaging the tab (3) on the outer circumference of the cylinder in the slot of the tab (4) on the wall of the handle cavity.
3. Reinstall the handle onto the outside of the driver side front door. (Refer to 23 - BODY/DOOR - FRONT/EXTERIOR HANDLE - INSTALLATION).



## STRIKER

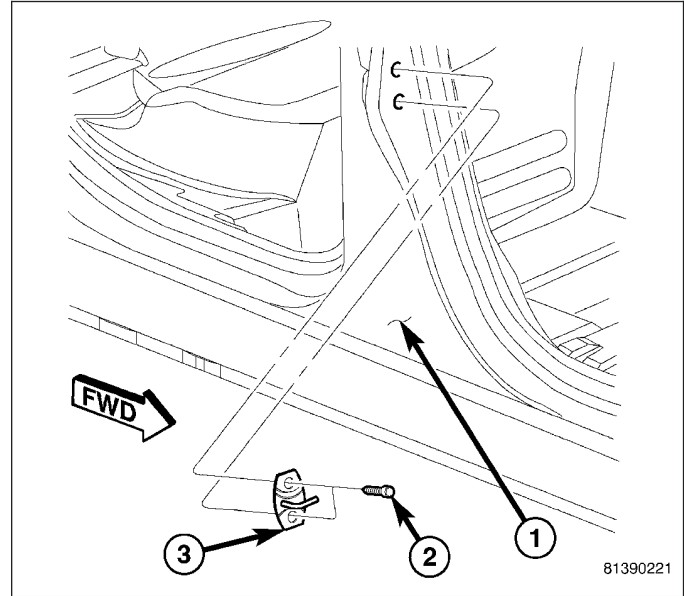
### REMOVAL

1. Open the front door.
2. Mark the front door latch striker (3) location on the face of the outer B-pillar (1) to aid reinstallation.
3. Remove the two screws (2) that secure the striker to the B-pillar.
4. Remove the striker from the B-pillar.



## INSTALLATION

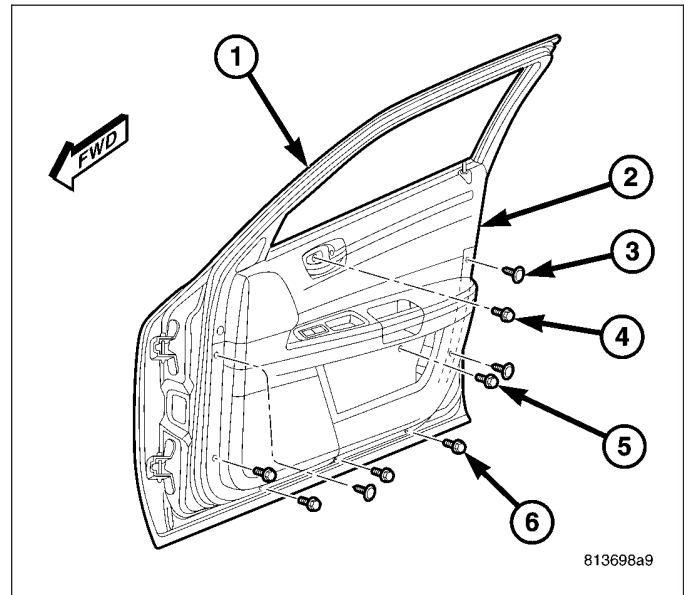
1. Position the front door latch striker (3) on the face of the outer B-pillar (1).
2. Install and tighten the two screws (2) that secure the striker to the B-pillar. Tighten the screws to 33 N·m (24 ft. lbs.).
3. Adjust the latch striker position as necessary to achieve proper door spacing and latch operation.



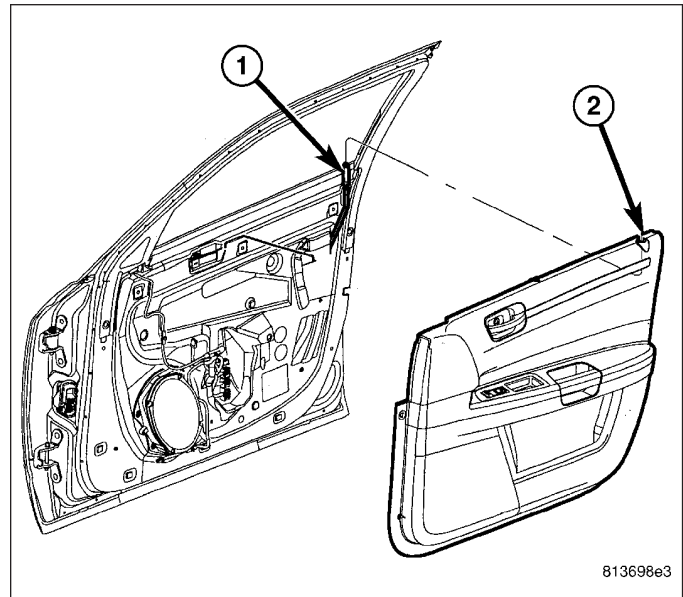
## TRIM PANEL

### REMOVAL

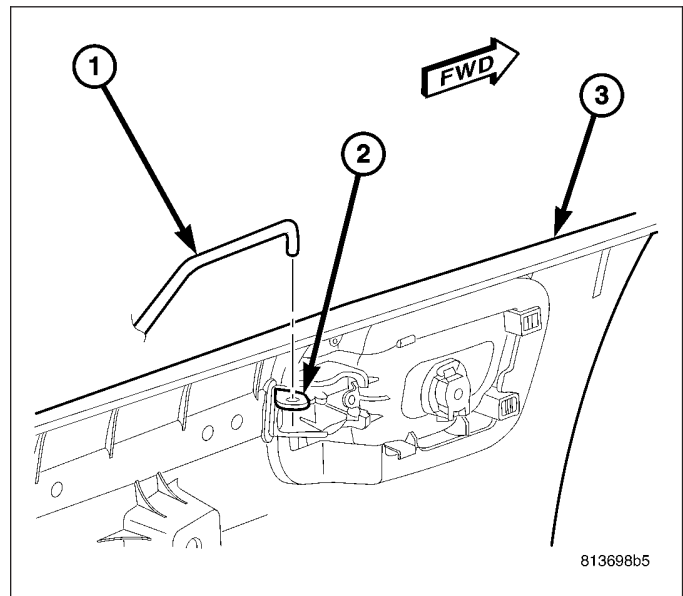
1. Disconnect and isolate the battery negative cable.
2. Unsnap and fold back the screw cap below the trim panel pull cup to access and remove the screw (5) that secures the panel (2) to the pull cup bracket.
3. Unsnap and fold back the screw cap within the interior remote handle recess of the trim panel to access and remove the screw (4) that secures the panel to the inside of the door (1).
4. Remove the four screws (6) that secure the bottom and front lower corner of the trim panel to the inside of the door.
5. Remove the three push-pin retainers (3) that secure the trim panel to the inside of the door.



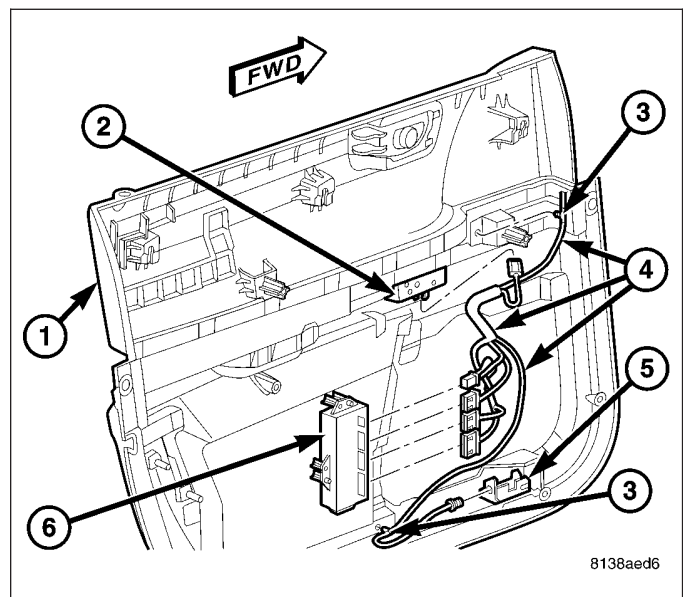
6. Pull the trim panel (2) away from the inside of the door far enough to disengage the locator pins near the top of the panel from the door, then lift the rear of the panel upward far enough to disengage the interior door latch lock link and knob (1) from the clearance hole at the upper rear corner of the panel.



7. Reach between the top of the trim panel (3) and the inside of the door shell to unsnap the plastic clip that secures the end of the interior door handle latch release link (1) to the handle lever (2) and disengage the link from the handle.

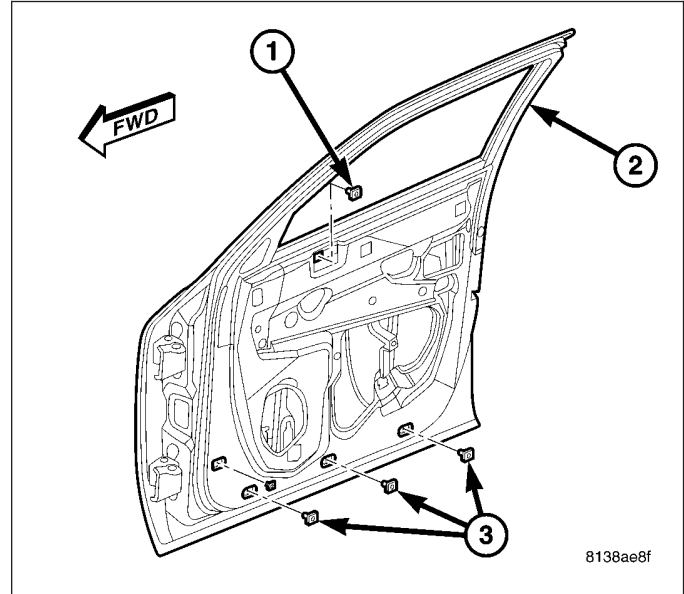


8. Pull the trim panel (1) away from the inside of the door shell far enough to access and disconnect the door wire harness (4) connectors from the power window/lock/mirror switches (2), the door module (6), and the door courtesy lamp (5) as the vehicle is equipped.
9. Disengage the retainers (3) that secure the door wire harness to the inside of the trim panel.
10. Remove the trim panel from the inside of the door.

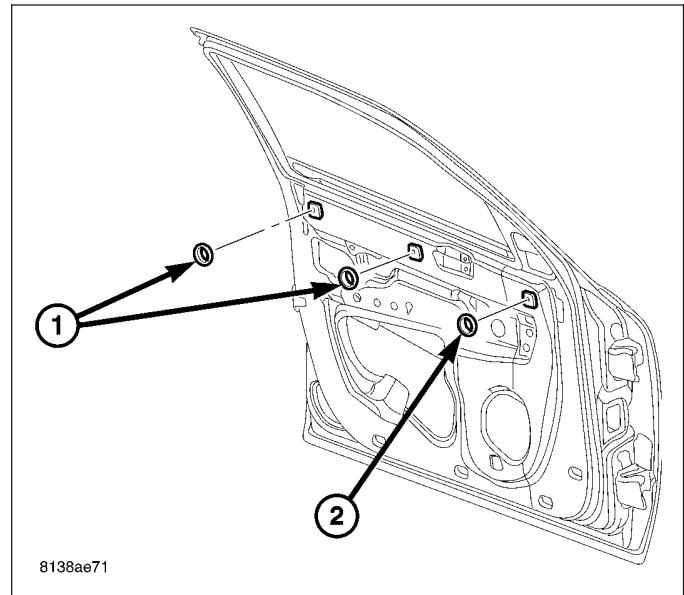


## INSTALLATION

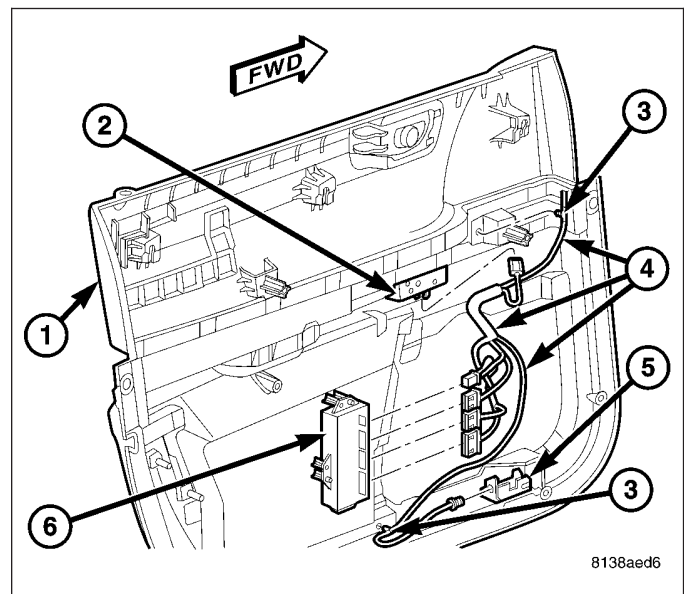
1. Check to be certain that the five spring nuts (1 and 3) are properly installed and in good condition on the inside of the door (2).



2. Check to be certain that the three plug grommets (1 and 2) are properly installed and in good condition on the inside of the door.

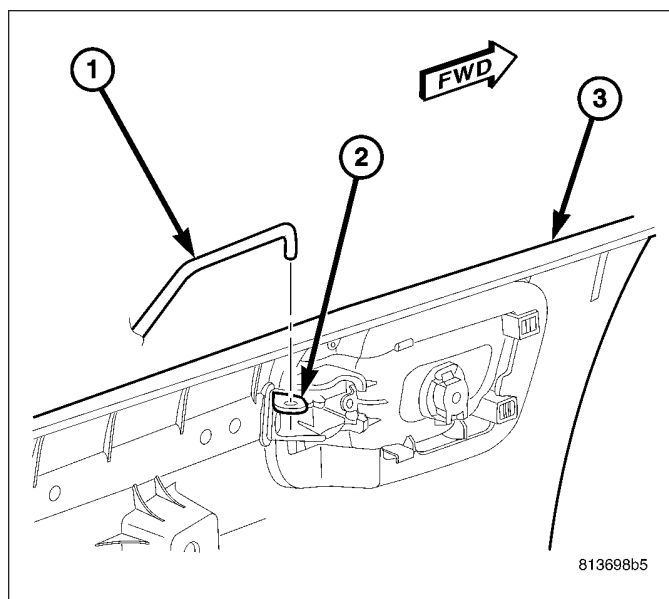


3. Position the trim panel (1) close enough to the inside of the door to engage the retainers (3) that secure the door wire harness (4) to the inside of the trim panel.
4. Reconnect the door wire harness connectors to the power window/lock/mirror switches (2), the door module (6), and the door courtesy lamp (5) as the vehicle is equipped.

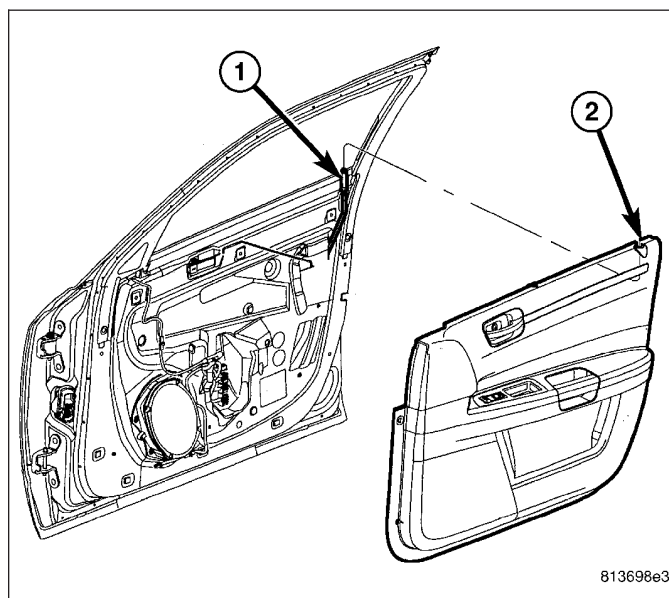




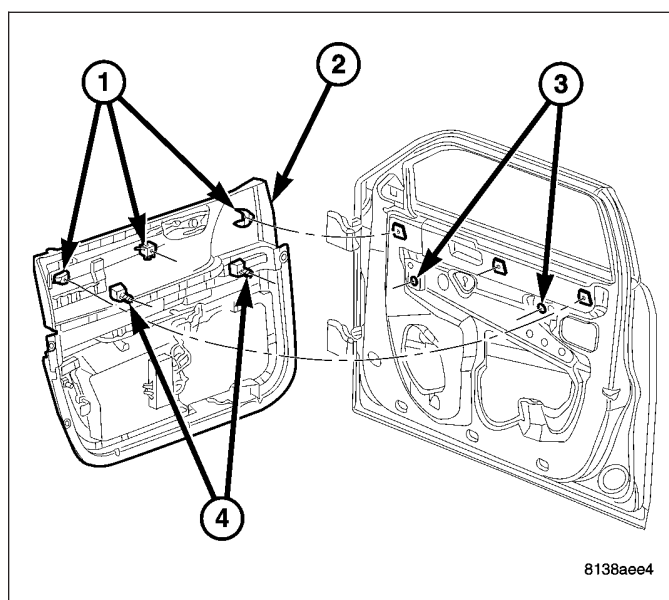
5. Reach between the top of the trim panel (3) and the inside of the door shell to engage the end of the interior door handle latch release link (1) to the handle lever (2) and snap the plastic clip over the link to secure it to the handle.



6. Lift the trim panel (2) over the inside of the door far enough to engage the interior door latch lock link and knob (1) into the clearance hole at the upper rear corner of the panel.



7. Position the two locator pins (4) on the back of the trim panel (2) to the locator holes (3) on the inside of the door panel and simultaneously push the three upper pins (1) into the grommet plugs near the top of the door. Make certain that the upper edges of the trim panel are engaged in the grooves of the window moldings.

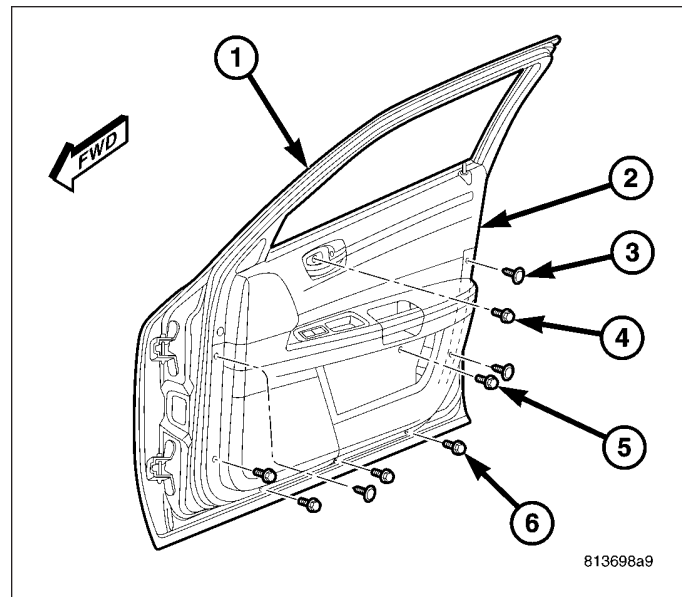




8. Install and tighten the screw (4) that secures the interior remote handle recess of the trim panel (2) to the inside of the door (1). Tighten the screw to 2 N·m (16 in. lbs.). Fold and snap the screw cap over the screw.
9. Install and tighten the screw (5) that secures the trim panel (2) to the pull cup bracket below the trim panel pull cup. Tighten the screw to 2 N·m (16 in. lbs.). Fold and snap the screw cap over the screw.
10. Install the three push-pin retainers (3) that secure the trim panel to the inside of the door.
11. Install and tighten the four screws (6) that secure the bottom and front lower corner of the trim panel to the inside of the door. Tighten the screws to 2 N·m (16 in. lbs.).

**Note:** For vehicles equipped with the optional Automatic Express Up power window feature, recalibration of this feature is required whenever power to the door module is disrupted. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - STANDARD PROCEDURE - BATTERY CONNECTION).

12. Reconnect the battery negative cable.



## WATERSHIELD

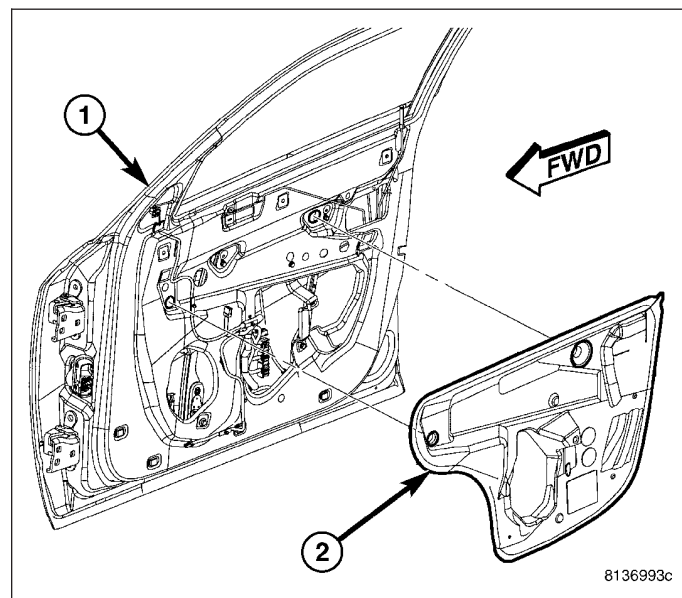
### REMOVAL

**CAUTION:** Do not allow the watershield or adhesive to become contaminated with dirt or other foreign substances.

Do not damage the watershield during removal and installation.

If the watershield becomes contaminated or damaged, replace the watershield.

1. Remove the trim panel from the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
2. Carefully separate the lower half of the watershield (2) from the inside of the door (1).
3. Lift the lower half of the watershield upward far enough to access and pull the trim panel take outs of the door wire harness out of the slit near the center of the watershield.
4. Carefully separate the upper half of the watershield from the inside of the door.
5. Lift the upper half of the watershield upward far enough to disengage the inside latch lock knob and link and the inside remote latch release handle link from the slit near the upper rear corner of the watershield.
6. Remove the watershield from the door.



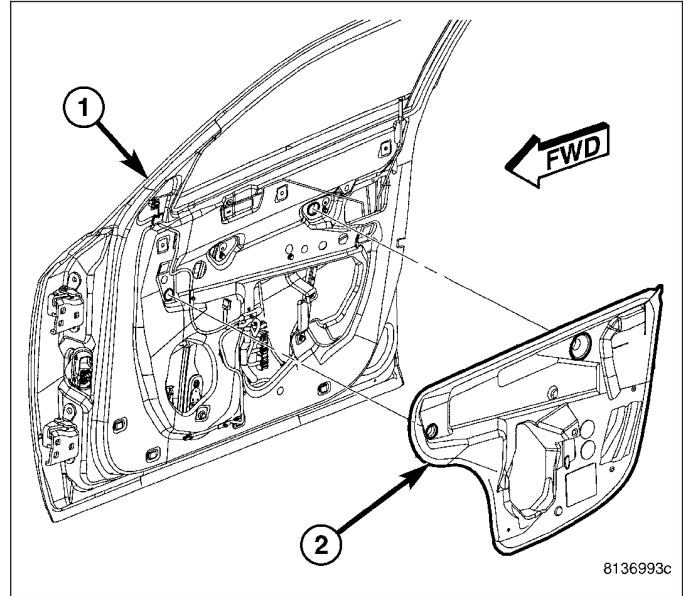
## INSTALLATION

**CAUTION:** Do not allow the watershield or adhesive to become contaminated with dirt or other foreign substances.

Do not damage the watershield during removal and installation.

If the watershield becomes contaminated or damaged, replace the watershield.

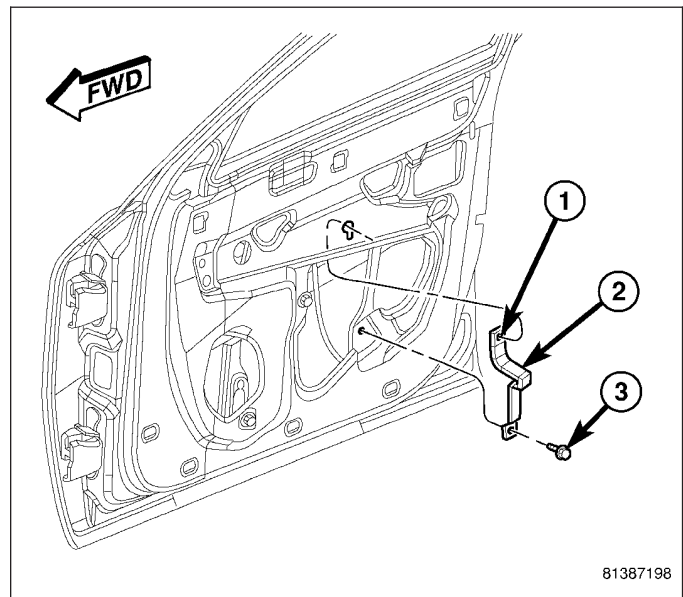
1. Thread the inside latch lock knob and link and the inside remote latch release handle link through the slit near the upper rear corner of the watershield (2).
2. Place the front and rear dimple formations located in the upper watershield into their respective locator holes in the door (1) inner panel.
3. Apply firm and even pressure to the adhesive bead along the upper edge of the watershield to seal it to the inside of the door.
4. Lift the lower half of the watershield upward far enough to access and pull the trim panel take outs of the door wire harness out of through the slit near the center of the watershield.
5. Apply firm and even pressure to the adhesive bead along the remaining edges of the watershield to seal it to the inside of the door. Be certain that the watershield is sealed to the inside of the door.
6. Reinstall the trim panel onto the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).



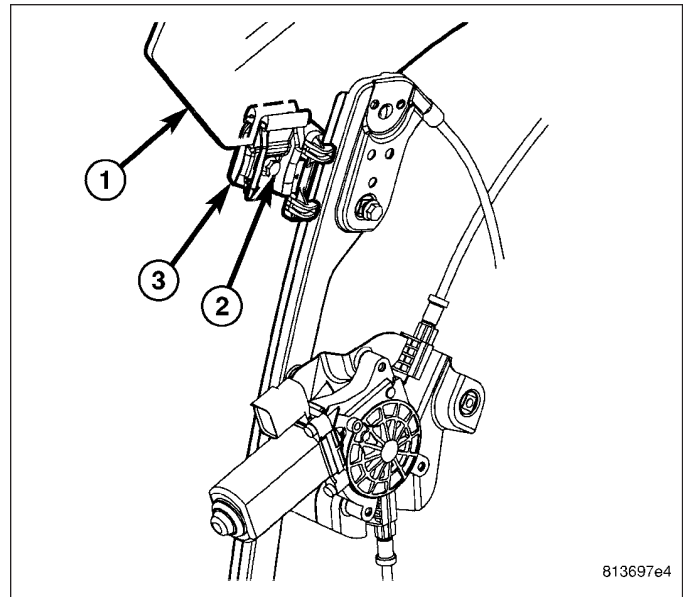
## WINDOW REGULATOR

### REMOVAL

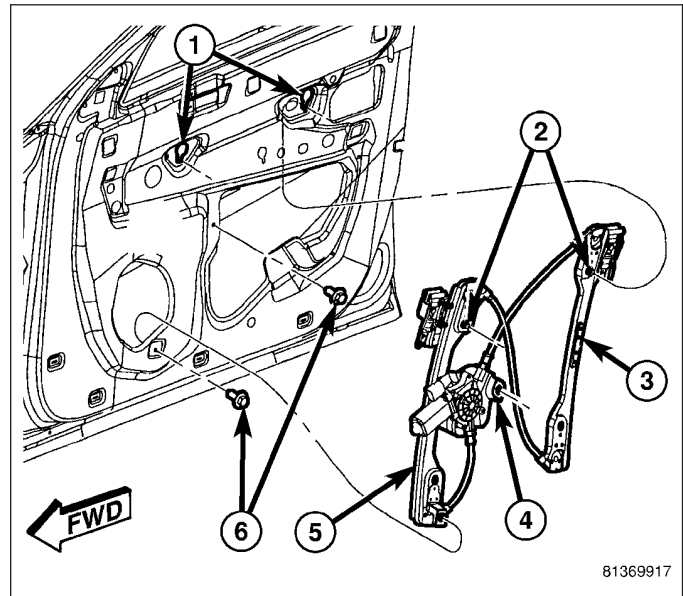
1. Remove the trim panel from the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
2. Remove the speaker from the inside of the front door. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - REMOVAL).
3. Remove the watershield from the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - REMOVAL).
4. Remove the screw (3) that secures the bottom of the pull cup bracket (2) and the bottom of the window regulator rear rail to the inside of the front door.
5. Loosen the screw (1) that secures the top of the pull cup bracket to the inside of the front door.
6. Disengage the upper pull cup bracket screw from the keyed hole and remove the bracket from the inside of the front door.



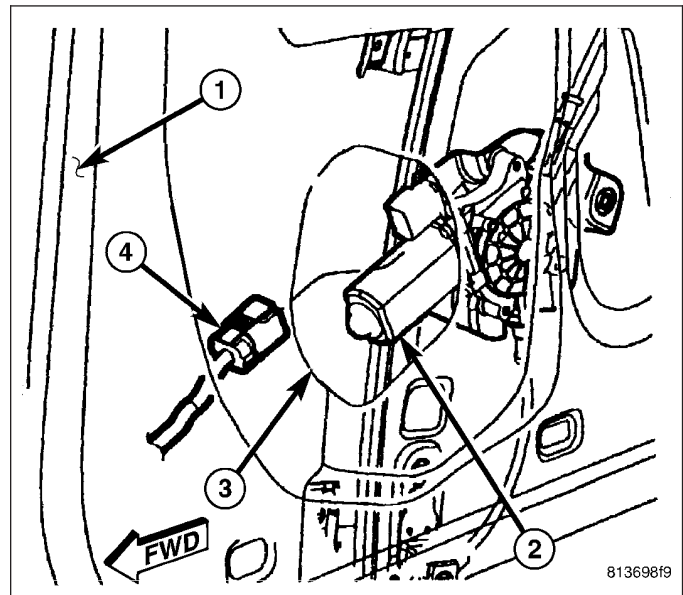
7. Using the regulator, adjust the front door glass (1) position up or down as required for access to the two window regulator glass clamps (3).
8. Loosen the screw (2) in each of the glass clamps far enough to release the glass.
9. Lift the glass out of the regulator clamps and into its full up position, then tape the glass securely into place.



10. Remove the two screws (6) that secure the bottom of the front regulator rail (5) and the regulator motor support bracket (4) to the inside of the door.
11. Loosen the two screws (2) that secure the tops of both regulator rails to the keyed holes (1) on the inside of the door.
12. Lift the front regulator rail upward within the door far enough to disengage the screw from the keyed hole in the door.

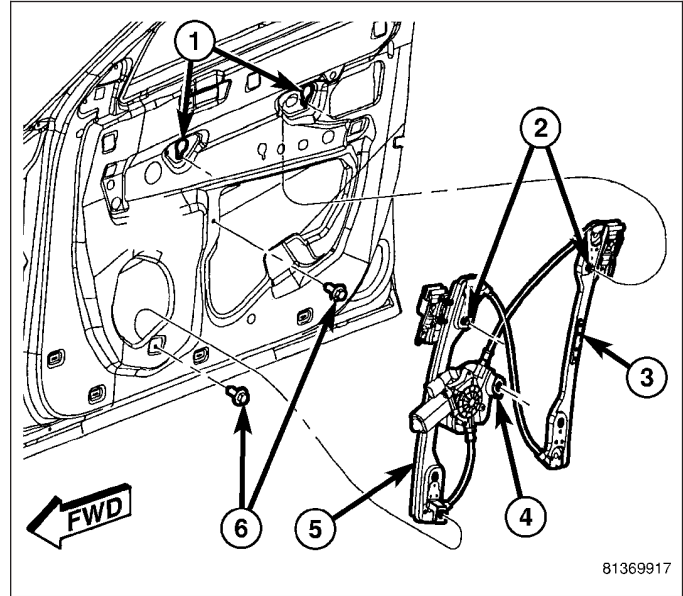


13. Lower the front regulator rail within the door (1) far enough to access and disconnect the door wire harness connector (4) from the regulator motor (2) through the speaker mounting hole (3) on the inside of the door near the front.
14. Lift the rear regulator rail upward within the door far enough to disengage the screw from the keyed hole in the door.
15. Remove the regulator through the large access hole on the inside of the door near the rear.

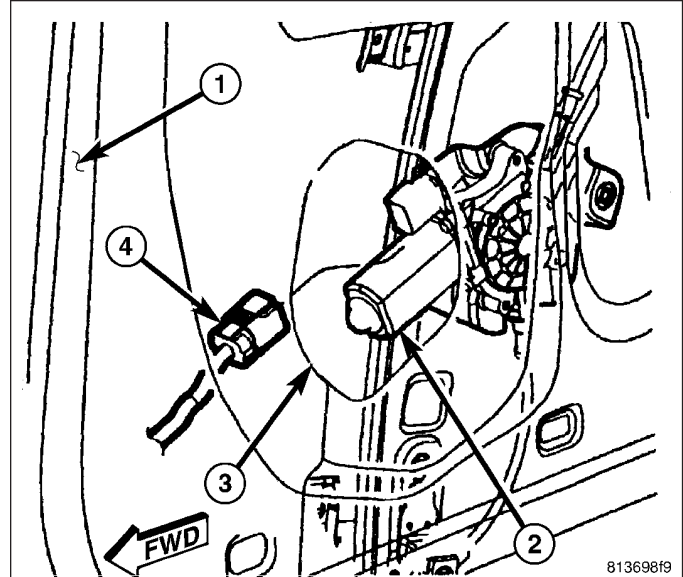


## INSTALLATION

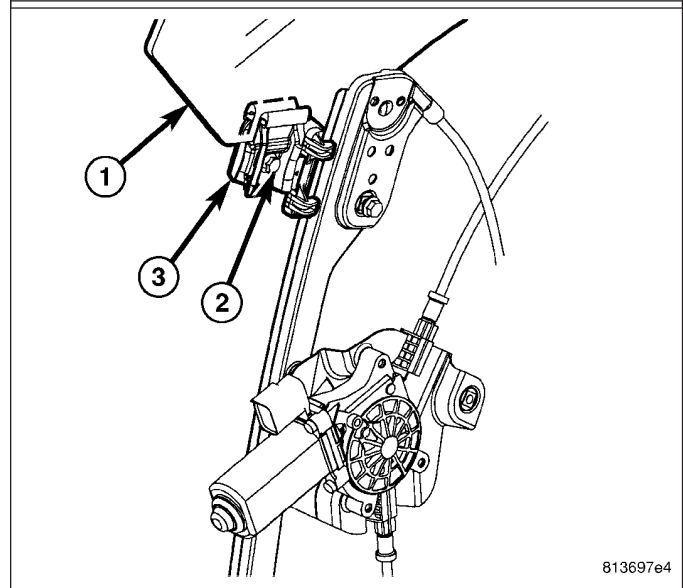
1. Load the regulator into the door through the large access hole on the inside of the door near the rear.
2. Engage the screw (2) at the top of the rear regulator rail (3) into the keyed hole (1) on the inside of the door near the rear.



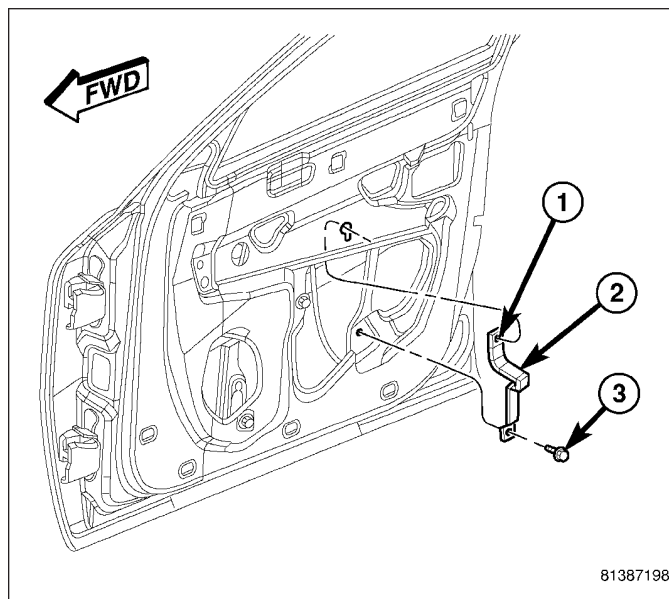
3. Position the front regulator rail within the door (1) so that the door wire harness connector (4) can be reconnected to the regulator motor (2) through the speaker mounting hole (3) on the inside of the door near the front.
4. Engage the screw at the top of the front regulator rail into the keyed hole on the inside of the door near the front.
5. Install and tighten the two screws that secure the bottom of the front regulator rail and the regulator motor support bracket to the inside of the door. Tighten the screws to 10 N·m (90 in. lbs.).
6. Tighten the two screws that secure the tops of both regulator rails to the keyed holes on the inside of the door. Tighten the screws to 10 N·m (90 in. lbs.).



7. Remove the tape securing the door glass in its full up position, then lower the glass to engage it into the two window regulator glass clamps (3).
8. Using the regulator, lower the glass far enough to access the two window regulator glass clamp screws (2).
9. Tighten the screw in each of the glass clamps. Tighten the screws to 10 N·m (90 in. lbs.).



10. With the upper screw (1) hand-started into the pull cup bracket (2), position the screw into the keyed hole on the inside of the front door.
11. Install and tighten the screw (3) that secures the bottom of the pull cup bracket and the bottom of the window regulator rear rail to the inside of the front door. Tighten the screw to 11 N·m (100 in. lbs.).
12. Tighten the screw that secures the top of the pull cup bracket to the inside of the front door. Tighten the screw to 10 N·m (90 in. lbs.).
13. Install the watershield onto the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/WATERSHIELD - INSTALLATION).
14. Install the speaker onto the inside of the front door. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - INSTALLATION).
15. Install the trim panel onto the inside of the front door. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).



## DOOR - REAR

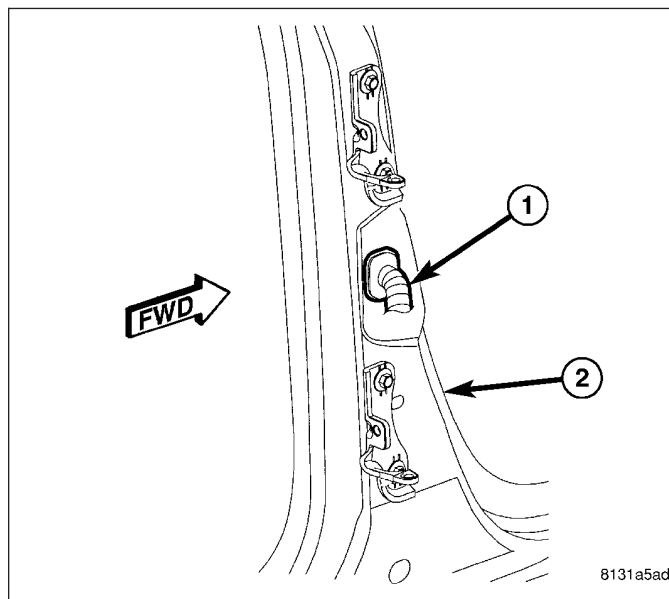
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## DOOR

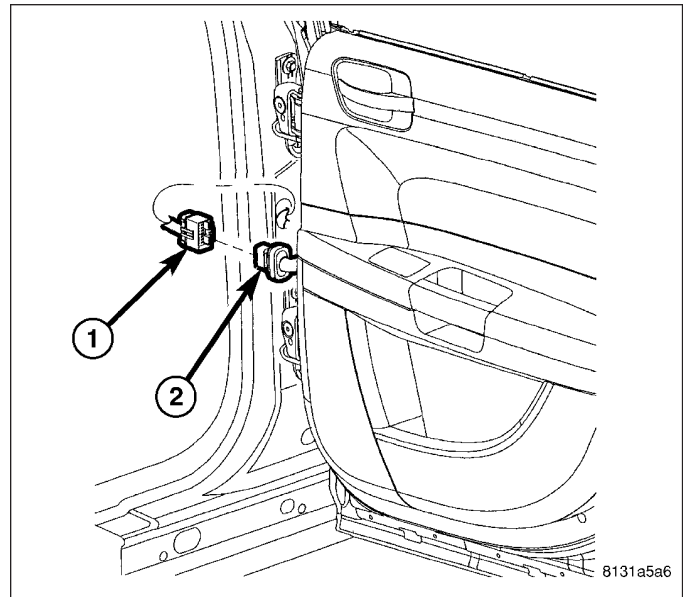
## REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Open the rear door.
3. Disengage the rear door wire harness boot and connector (1) from the outside of the lower B-pillar (2).

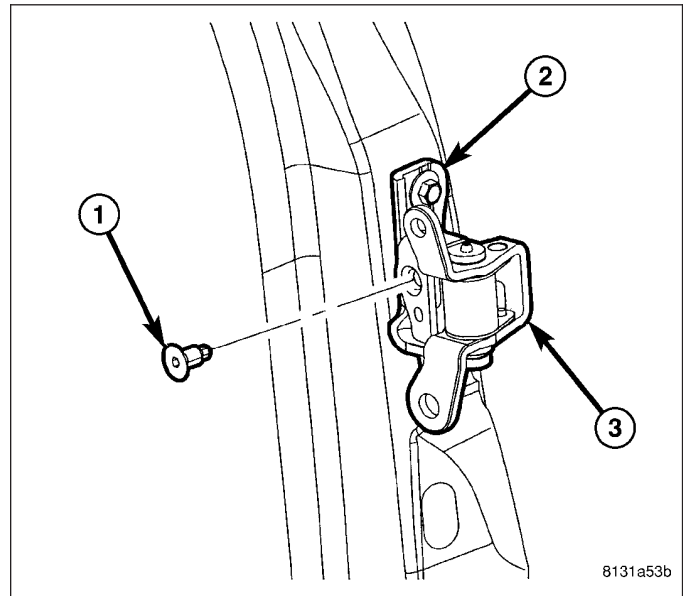




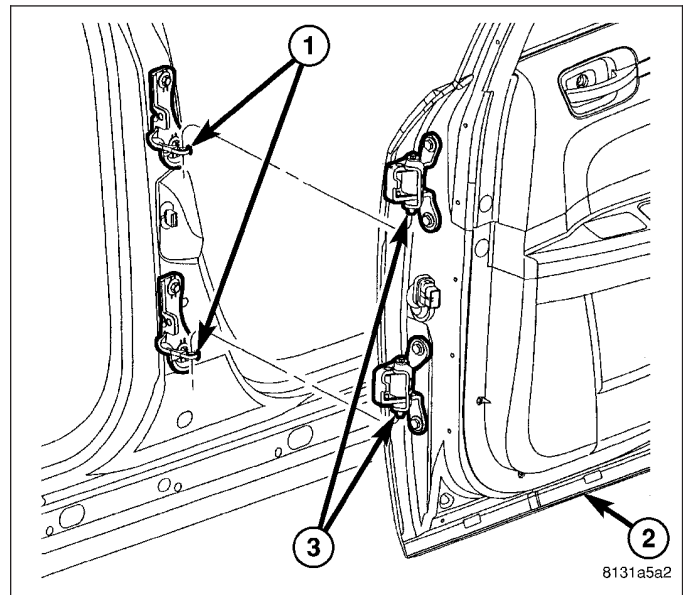
4. Carefully pull the door wire harness boot and connector (2) out from the B-pillar far enough to access and disconnect the body wire harness connector (1).
5. Open the door to the full open position.
6. Support the door with a suitable lifting device.



7. Remove the screw (1) from both the upper and lower rear door hinges that secures the door hinge bracket (3) to the body hinge bracket (2).
8. While still supporting the door, close the door to the intermediate detent position (one detent from the full open position).

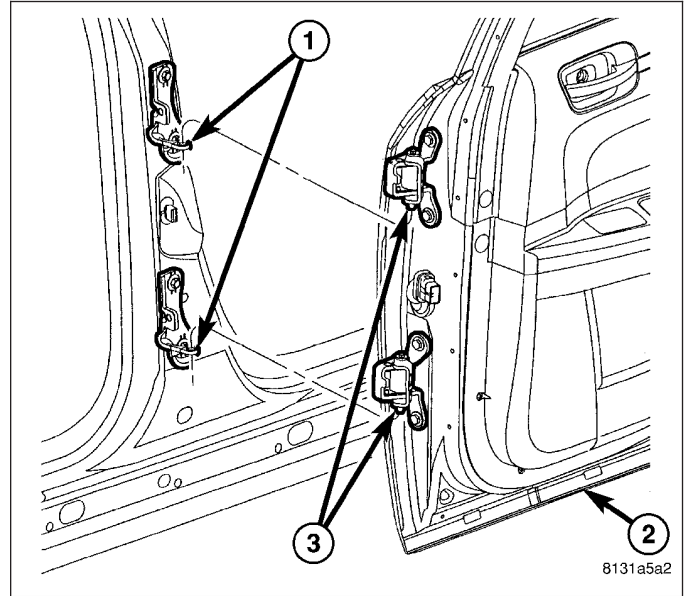


9. Raise the rear door (2) upward far enough to disengage the upper and lower hinge pins (3) from the pivots (1) on the upper and lower body hinge brackets.
10. Remove the rear door from the vehicle.

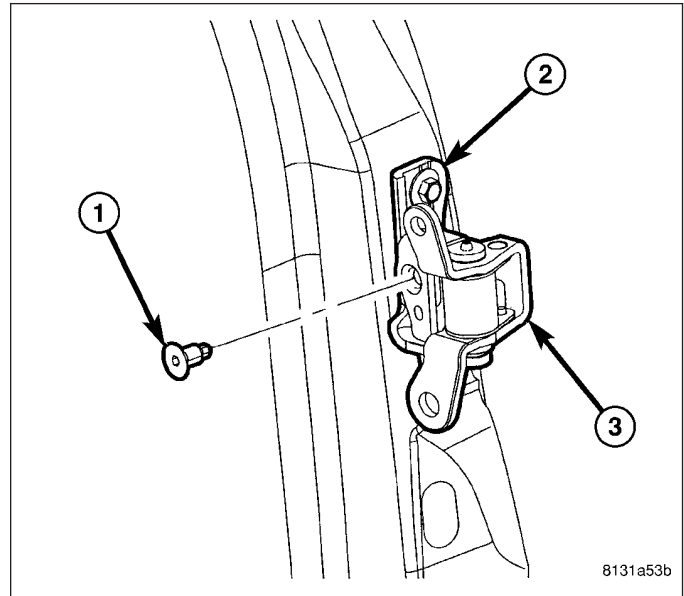


## INSTALLATION

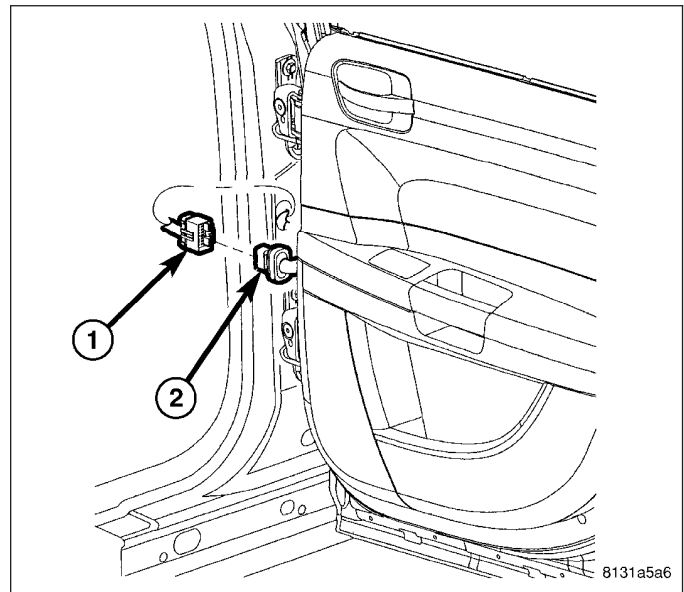
1. Support the rear door (2) with a suitable lifting device.
2. Position the door with the upper and lower hinge pins (3) aligned over the pivots (1) on the upper and lower body hinge brackets.
3. Lower the door far enough to engage the hinge pins into the pivot holes.
4. While still supporting the door, open the door to the full open position.



5. Align the holes in the upper and lower rear door hinge brackets (3) with those in the body hinge brackets (2).
6. Install and tighten the screw (1) into both the upper and lower rear door hinge to secure the door hinge brackets to the body hinge brackets. Tighten the screws to 42 N·m (31 ft. lbs.).
7. Remove the lifting device supporting the door.

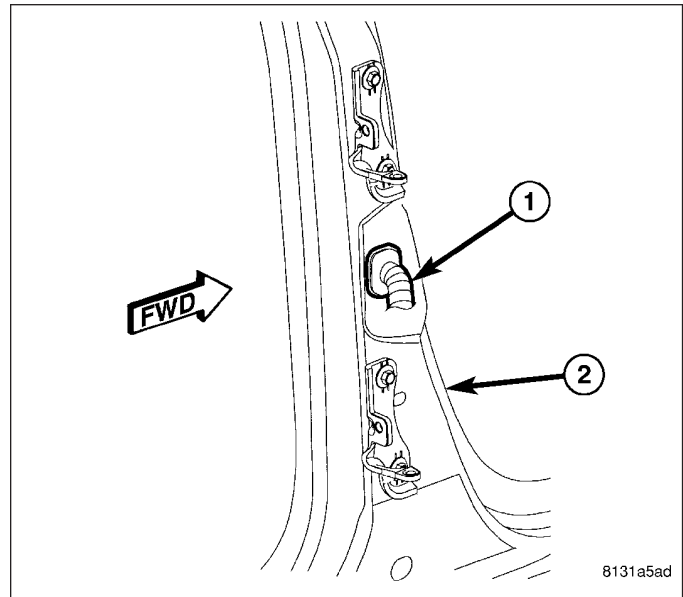


8. Carefully pull the body wire harness connector (1) out from the B-pillar far enough to reconnect it to the door wire harness boot and connector (2).





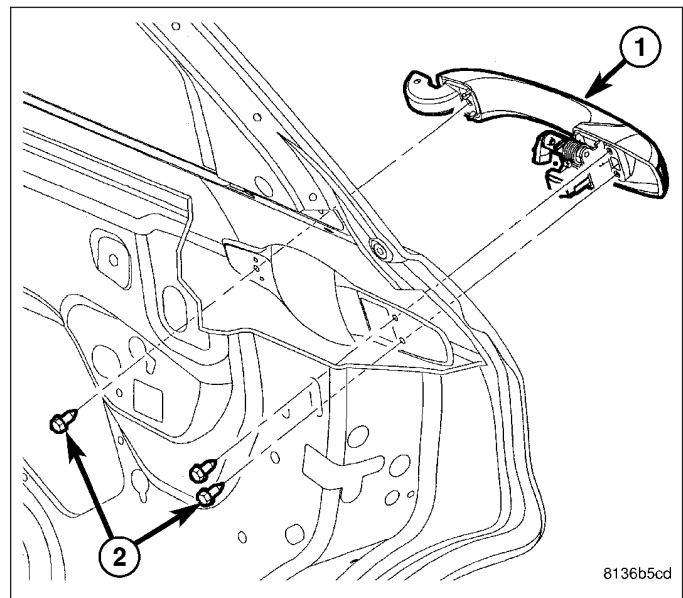
9. Engage the rear door wire harness boot and connector (1) into the wiring clearance hole on the outside of the lower B-pillar (2).
10. Reconnect the battery negative cable.
11. Adjust the door hinge positions as necessary to achieve proper door spacing and operation.



## EXTERIOR HANDLE

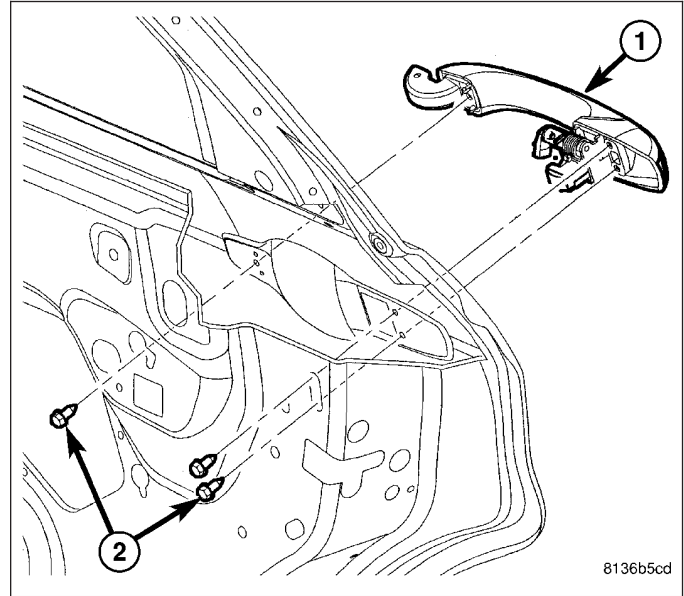
### REMOVAL

1. Remove the trim panel from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/TRIM PANEL - REMOVAL).
2. Remove the watershield from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/WATER-SHIELD - REMOVAL).
3. Remove the door glass channel and bracket from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/GLASS RUN CHANNEL - REMOVAL).
4. Remove the latch from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/LATCH - REMOVAL).
5. Remove the three screws (2) from the inside of the door that secure that exterior handle (1) to the door.
6. Remove the handle from the outside of the door.



## INSTALLATION

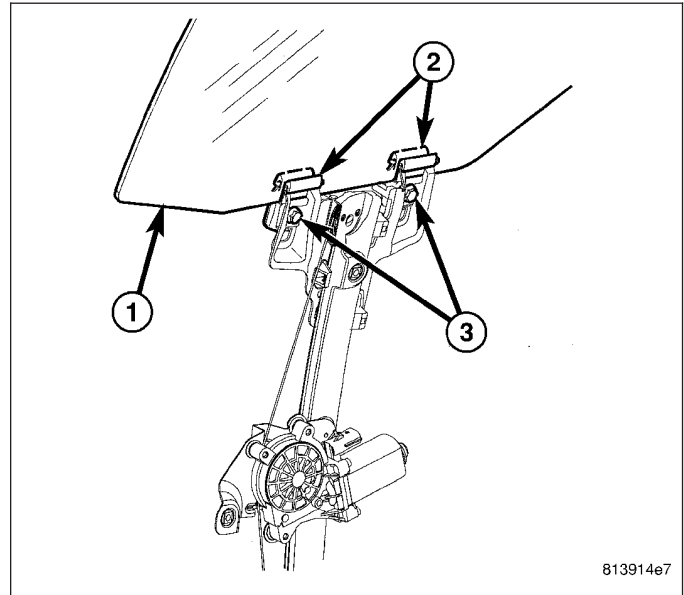
1. Position the exterior handle (1) to the mounting holes on the outside of the door.
2. From the inside of the door, install and tighten the three screws (2) that secure that exterior handle to the door. Tighten the screws to 5 N·m (44 in. lbs.).
3. Reinstall the latch to the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/LATCH - INSTALLATION).
4. Reinstall the door glass channel and bracket to the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/GLASS RUN CHANNEL - INSTALLATION).
5. Reinstall the watershield onto the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/WATER-SHIELD - INSTALLATION).
6. Reinstall the trim panel onto the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/TRIM PANEL - INSTALLATION).



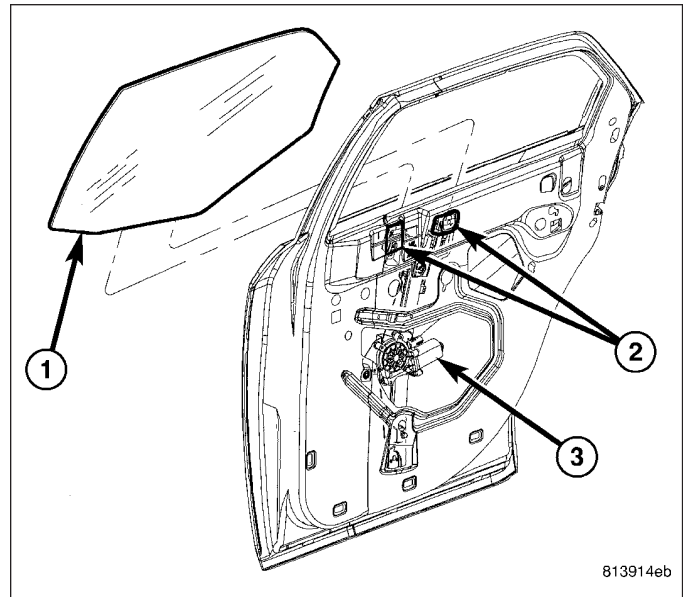
## GLASS

### REMOVAL

1. Remove the trim panel from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/TRIM PANEL - REMOVAL).
2. Remove the inner belt weatherstrip from the rear door. (Refer to 23 - BODY/WEATHERSTRIP/SEALS/DOOR INNER BELT WEATHERSTRIP - REMOVAL-REAR).
3. Remove the watershield from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/WATER-SHIELD - REMOVAL).
4. Remove the glass channel and bracket from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/GLASS RUN CHANNEL - REMOVAL).
5. Using the regulator, adjust the rear door glass (1) position up or down as required for access to the two window regulator glass clamps (2).
6. Loosen the screw (2) in each of the glass clamps far enough to release the glass.

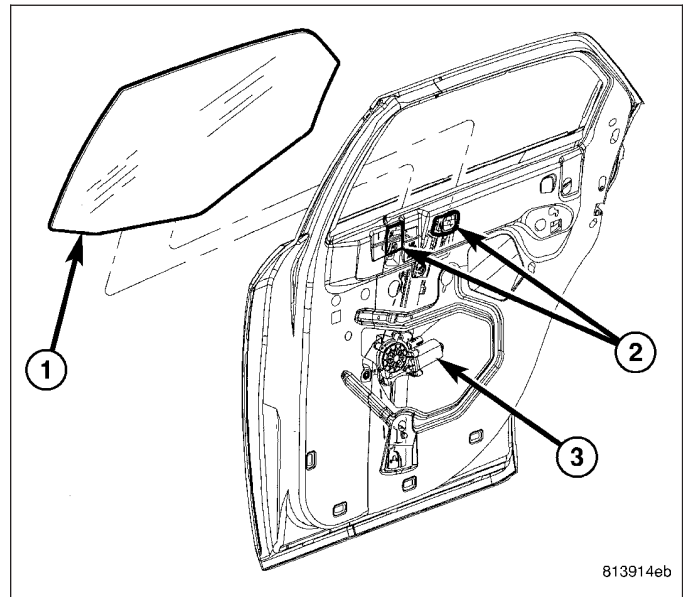


7. From the outside of the rear door, lift the glass (1) upward far enough to disengage it from the two glass clamps (2).
8. Lift the glass upward and out from the top of the door shell to unload the glass from the door.

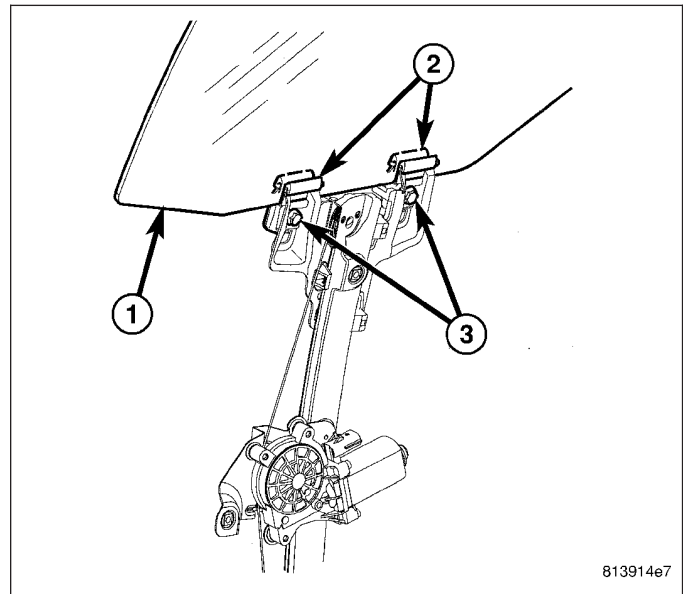


## INSTALLATION

1. From the outside of the rear door, insert the rear door glass (1) into the top of the door shell to load the glass into the door.
2. Engage the glass into the two window regulator glass clamps (2).



3. Using the regulator, lower the window as required for access to the two window regulator glass clamp screws (3).
4. Tighten the screw in each of the glass clamps. Tighten the screws to 10 N·m (90 in. lbs.).
5. Reinstall the glass channel and bracket onto the inside of the rear door. (Refer to 23 - BODY/DOORS - REAR/GLASS RUN CHANNEL - INSTALLATION).
6. Reinstall the watershield onto the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/WATER-SHIELD - INSTALLATION).
7. Reinstall the inner belt weatherstrip onto the rear door. (Refer to 23 - BODY/WEATHERSTRIP/SEALS/DOOR INNER BELT WEATHERSTRIP - INSTALLATION-REAR).

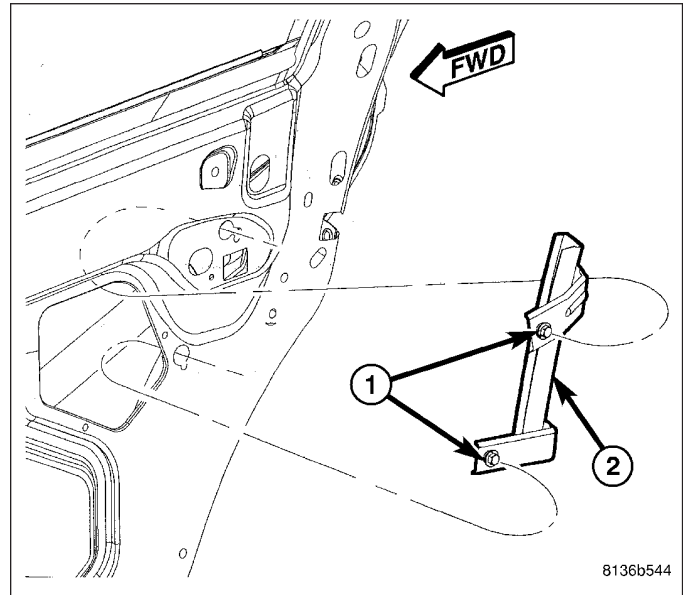


8. Reinstall the trim panel onto the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/TRIM PANEL - INSTALLATION).

## GLASS RUN CHANNEL

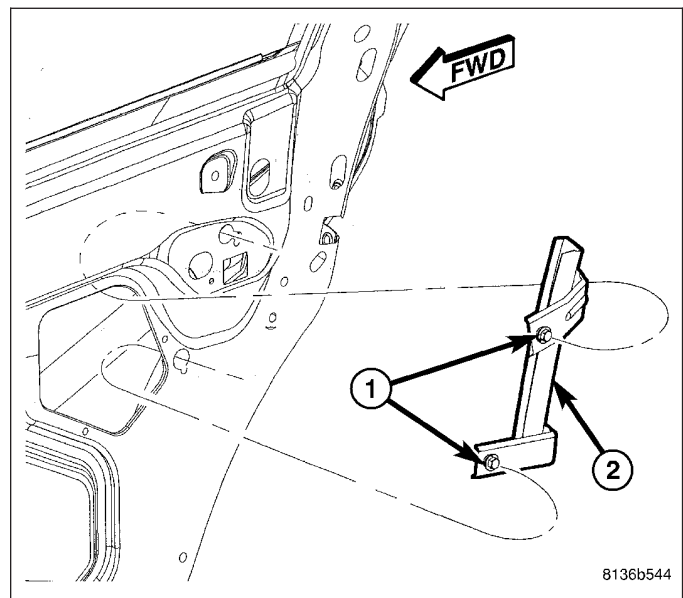
### REMOVAL

1. Remove the trim panel from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/TRIM PANEL - REMOVAL).
2. Remove the watershield from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/WATER-SHIELD - REMOVAL).
3. Loosen the two screws (1) that secure the rear door glass channel and bracket (2) to the inside of the rear door.
4. Disengage the two screws from the keyed holes near the back of the inner door panel and remove the channel and bracket from the interior of the rear door.



### INSTALLATION

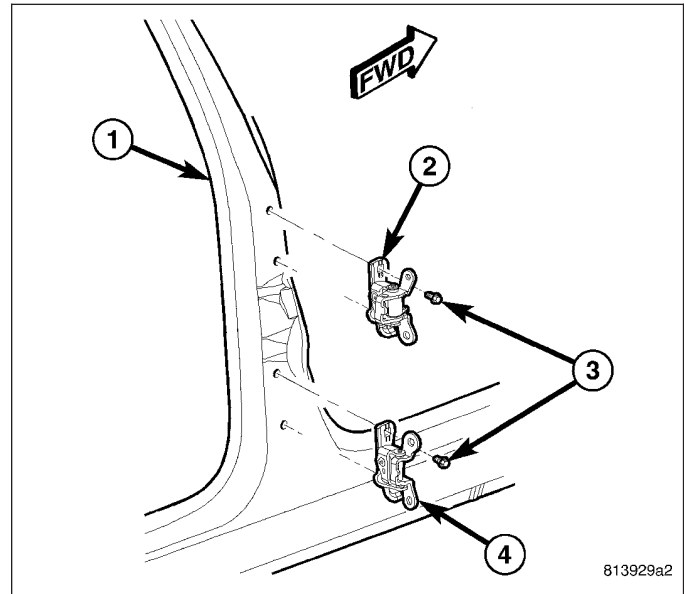
1. Position the rear door glass channel and bracket (2) into the interior of the rear door.
2. Engage the two screws (1) into the keyed holes near the back of the inner door panel.
3. Tighten the two screws that secure the channel and bracket to the inside of the rear door. Tighten the screws to 10 N·m (90 in. lbs.).
4. Reinstall the watershield onto the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/WATER-SHIELD - INSTALLATION).
5. Reinstall the trim panel onto the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/TRIM PANEL - INSTALLATION).



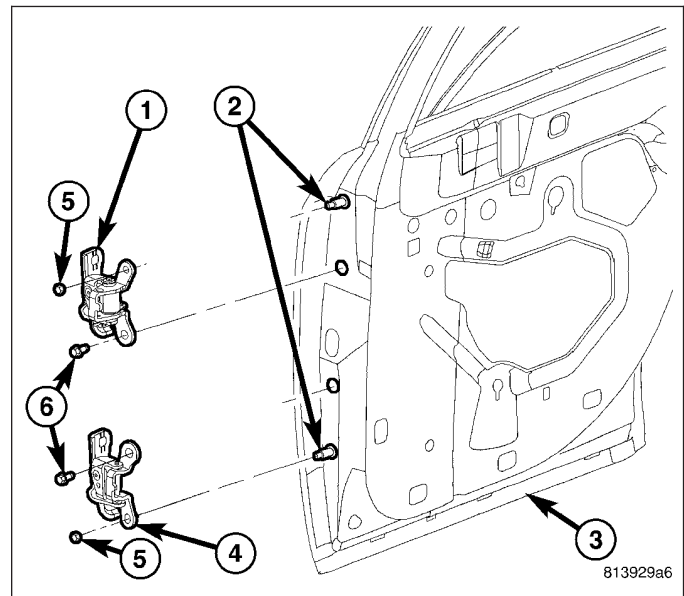
## HINGE

### REMOVAL

1. Remove the rear door from the vehicle. (Refer to 23 - BODY/DOOR - REAR/DOOR - REMOVAL).
2. Mark the upper (2) or lower (4) hinge bracket location on the outside of the lower B-pillar (1) to aid reinstallation.
3. Remove the two screws (3) that secure the hinge bracket to the outside of the lower B-pillar.
4. Remove the hinge bracket from the B-pillar.

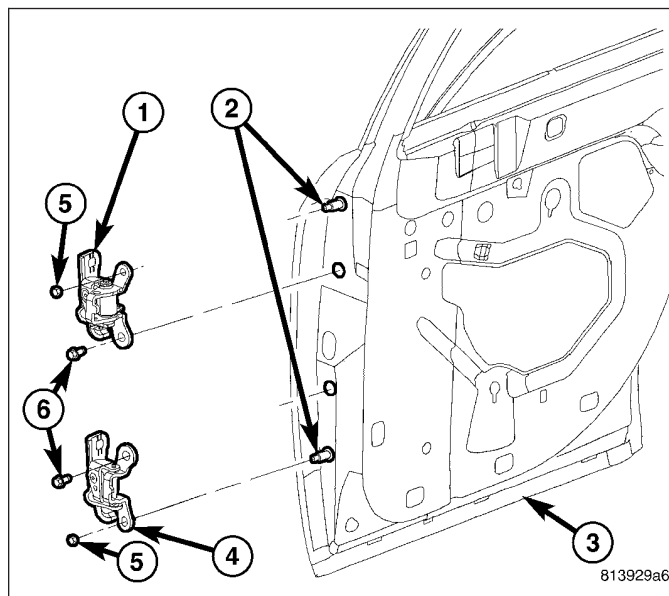


5. Mark the upper (1) or lower (4) door hinge location on the hinge face of the rear door (3) to aid reinstallation.
6. Remove the screw (6) that secures the hinge to the door.
7. Remove the nut (5) that secures the hinge to the stud (2) on the door.
8. Remove the upper or lower hinge from the hinge face of the door.

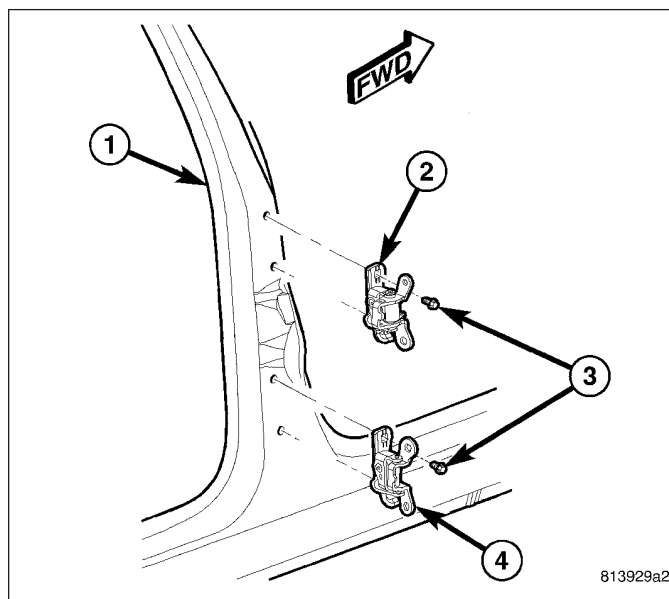


## INSTALLATION

1. Position the upper (1) or lower (4) hinge to the hinge face of the rear door (3).
2. Install and tighten the nut (5) that secures the hinge to the stud (2) on the door. Tighten the nut to 28 N·m (21 ft. lbs.).
3. Install and tighten the screw (6) that secures the hinge to the door. Tighten the screw to 28 N·m (21 ft. lbs.).



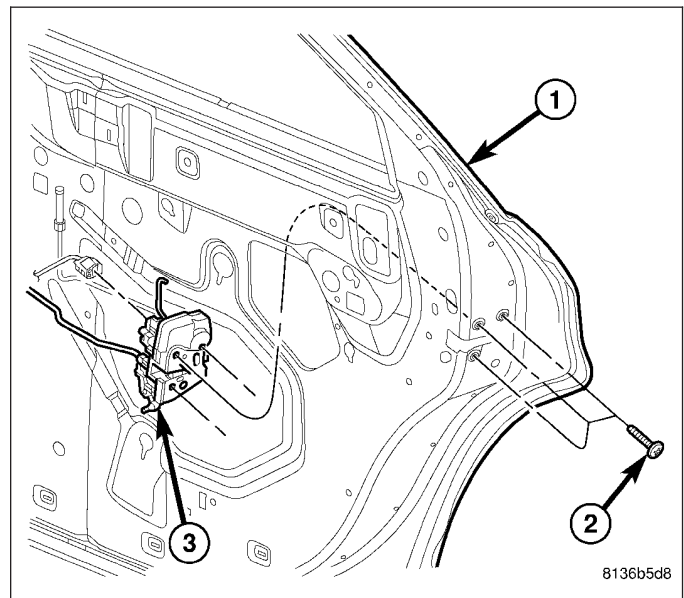
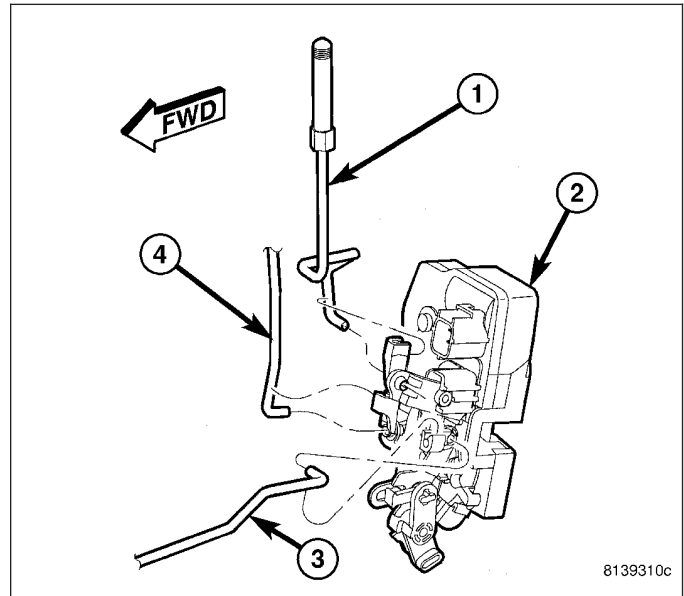
4. Position the upper (2) or lower (4) hinge bracket onto the outside of the lower B-pillar (1).
5. Install and tighten the two screws (3) that secure the hinge bracket to the outside of the lower B-pillar. Tighten the screws to 30 N·m (22 ft. lbs.).
6. Reinstall the rear door onto the vehicle. (Refer to 23 - BODY/DOOR - REAR/DOOR - INSTALLATION).



## LATCH

### REMOVAL

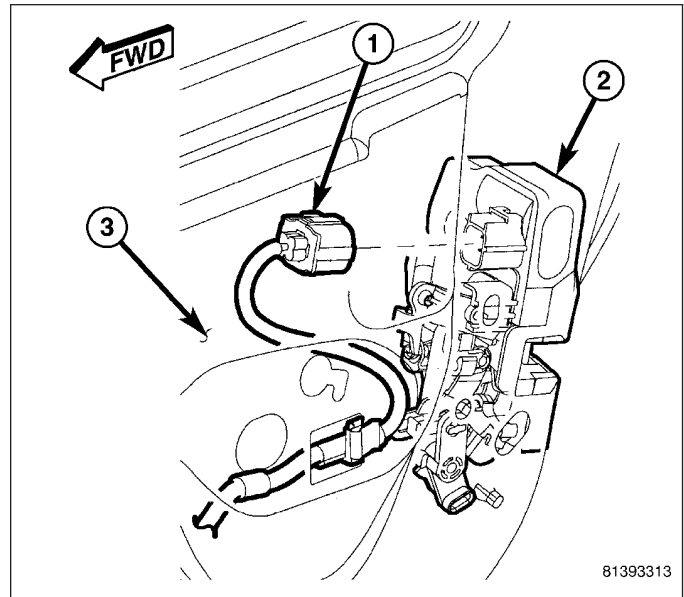
1. Remove the trim panel from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/TRIM PANEL - REMOVAL).
2. Remove the watershield from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/WATER-SHIELD - REMOVAL).
3. Remove the door glass channel and bracket from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/GLASS RUN CHANNEL - REMOVAL).
4. Reach into the back of the door shell to unsnap the plastic clip that secures the end of the interior door latch lock link (1) to the latch lever and disengage the link from the latch (2).
5. Remove the interior door latch lock link and knob unit from the rear door.
6. Reach into the back of the door shell to unsnap the plastic clip that secures the end of the interior door handle latch release link (3) to the latch lever and disengage the link from the latch.
7. Reach into the back of the door shell to unsnap the plastic clip that secures the end of the exterior door handle latch release link (4) to the latch lever and disengage the link from the latch.
8. Remove the three screws (2) that secure the latch (3) to the outer latch face of the rear door (1).





**Note:** Wiring connector can be disconnected much easier after all links are disconnected from latch and latch is unscrewed from door.

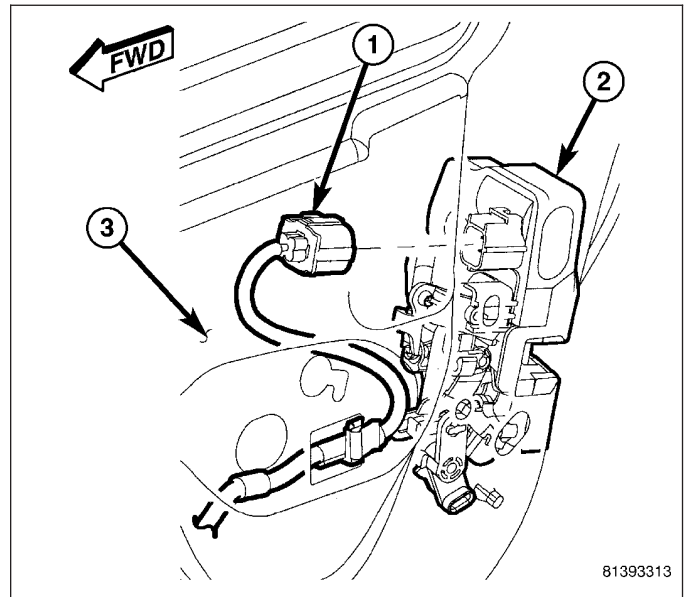
9. Reach into the back of the door shell (3) and pull the latch forward far enough to access and disconnect the door wire harness connector (1) from the front door latch (2).
10. Remove the latch from the interior of the door shell.



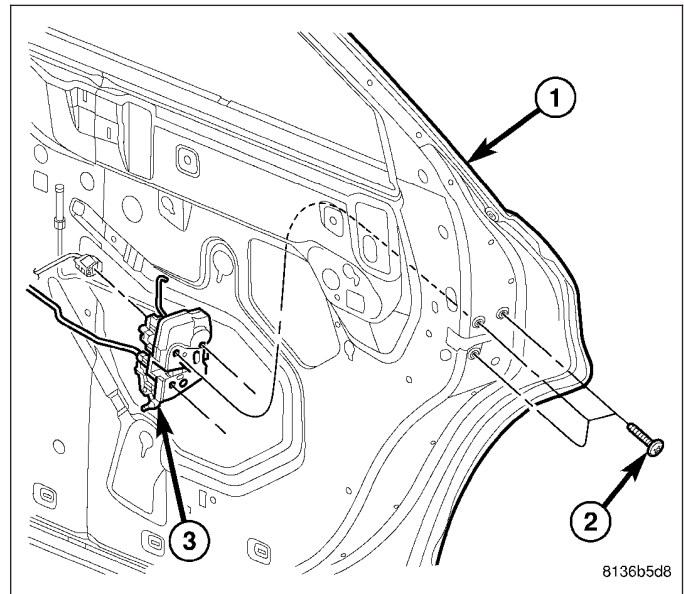
## INSTALLATION

**Note:** Wiring connector can be connected much easier with all links disconnected from latch and latch is unscrewed from door.

1. Connect the door wire harness connector (1) to the door latch (2).

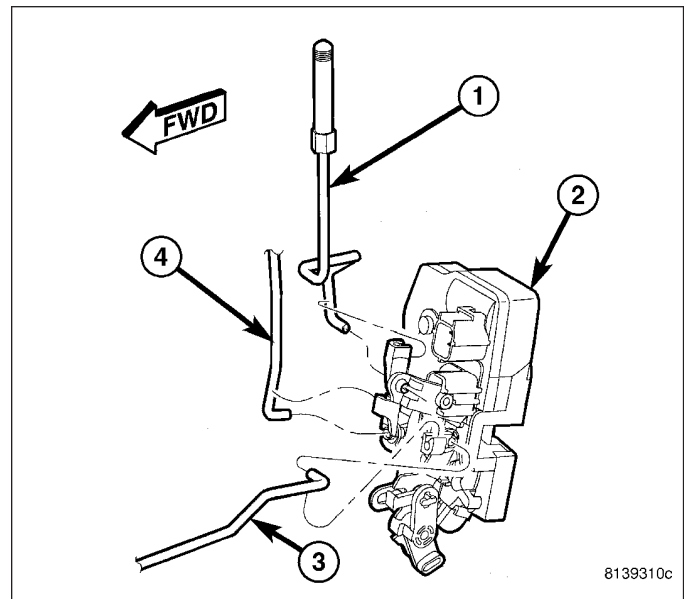


2. Position the latch (3) to the latch face on the interior of the rear door shell (1).
3. Install and tighten the three screws (2) that secure the latch to the outer latch face of the rear door. Tighten the screws to 12 N-m (108 in. lbs.).

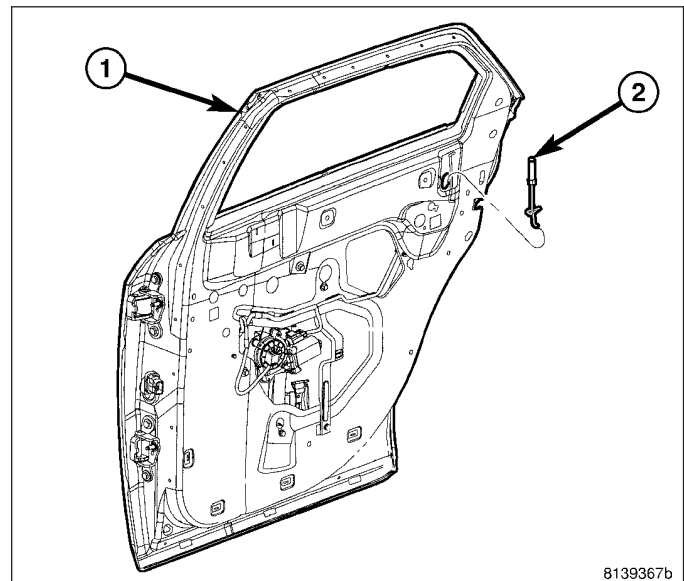




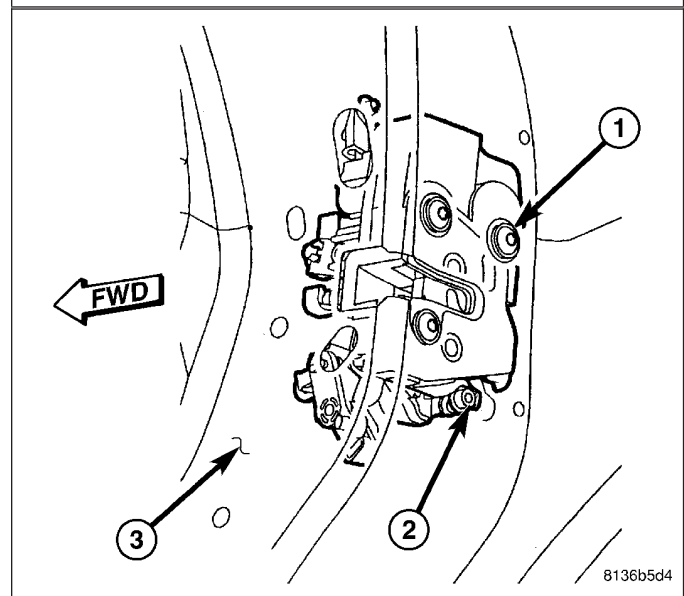
4. Reach into the back of the door shell to engage the exterior door handle latch release link (4) to the latch (2) lever and snap the plastic clip over the link to secure it to the latch.
5. Reach into the back of the door shell to engage the end of the interior door handle latch release link (3) to the latch lever and snap the plastic clip over the link to secure it to the latch.



6. Position the interior door latch lock link and knob unit (2) into the rear door (1).
7. Reach into the back of the door shell to engage the end of the interior door latch lock link to the latch lever and snap the plastic clip over the link to secure it to the latch.
8. Reinstall the door glass channel and bracket to the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/GLASS RUN CHANNEL - INSTALLATION).
9. Reinstall the watershield onto the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/WATER-SHIELD - INSTALLATION).
10. Reinstall the trim panel onto the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/TRIM PANEL - INSTALLATION).



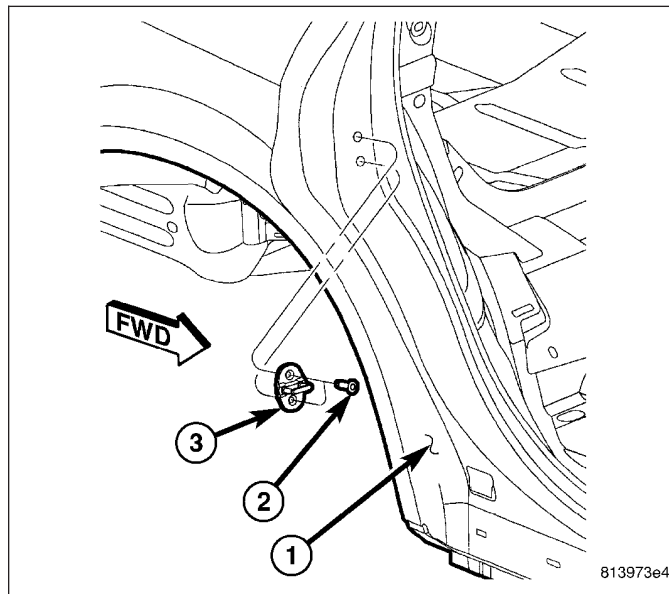
11. Use a wrench inserted through the access slot on the outer latch face of the rear door shell to loosen the hex socket latch release adjusting screw (2) on the latch (1).
12. Cycle the door outside latch release handle through its full travel two or three times.
13. Tighten the adjusting screw.



## STRIKER

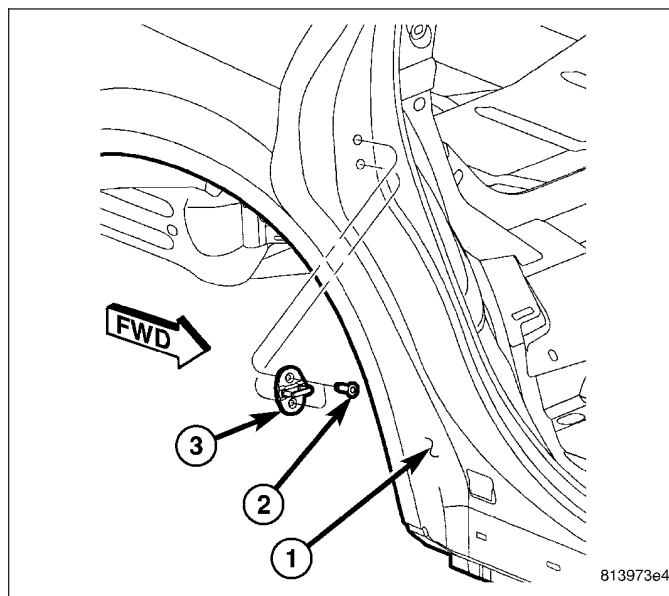
### REMOVAL

1. Open the rear door.
2. Mark the rear door latch striker (3) location on the face of the outer C-pillar (1) to aid reinstallation.
3. Remove the two screws (2) that secure the striker to the C-pillar.
4. Remove the striker from the C-pillar.



### INSTALLATION

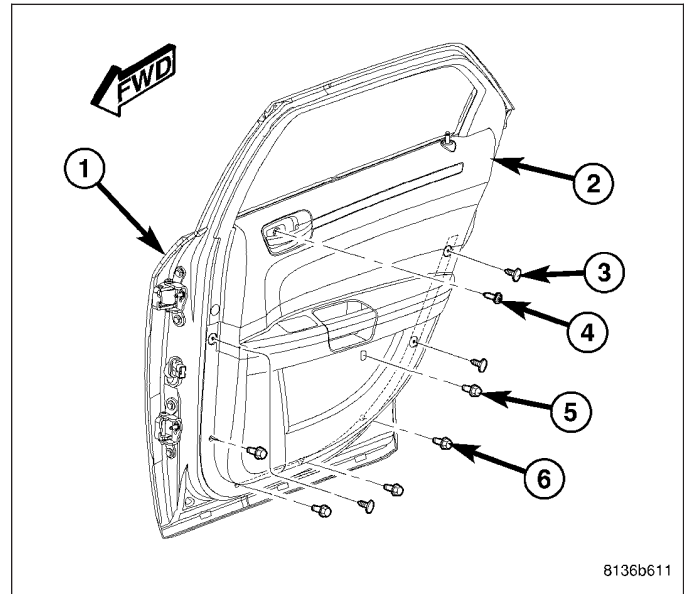
1. Position the rear door latch striker (3) on the face of the outer C-pillar (1).
2. Install and tighten the two screws (2) that secure the striker to the C-pillar. Tighten the screws to 33 N·m (24 ft. lbs.).
3. Adjust the latch striker position as necessary to achieve proper door spacing and latch operation.



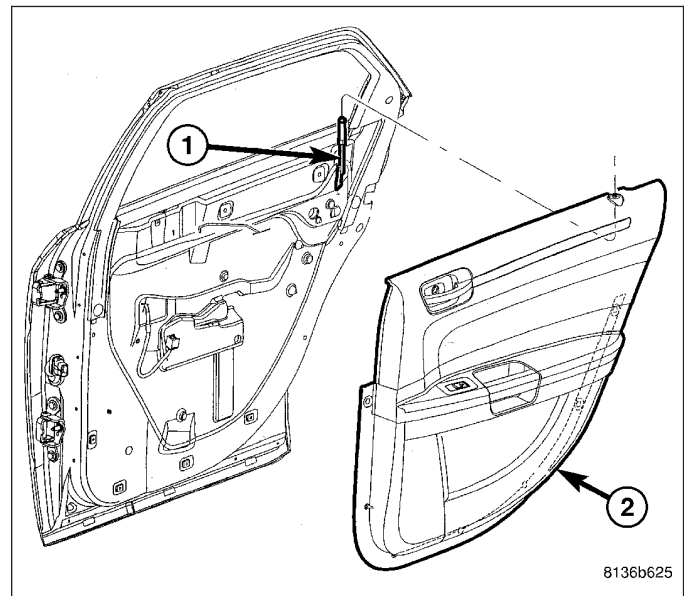
## TRIM PANEL

### REMOVAL

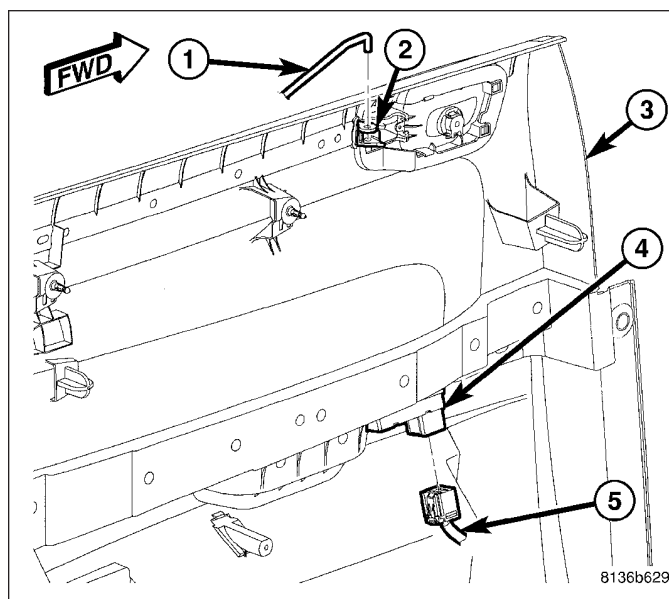
1. Disconnect and isolate the battery negative cable.
2. Unsnap and fold back the screw cap below the trim panel pull cup to access and remove the screw (5) that secures the panel (2) to the pull cup bracket.
3. Unsnap and fold back the screw cap within the interior remote handle recess of the trim panel to access and remove the screw (4) that secures the panel to the inside of the door (1).
4. Remove the four screws (6) that secure the bottom and front lower corner of the trim panel to the inside of the door.
5. Remove the three push-pin retainers (3) that secure the trim panel to the inside of the door.



6. Pull the trim panel (2) away from the inside of the door far enough to disengage the locator pins near the top of the panel from the door, then lift the rear of the panel upward far enough to disengage the interior door latch lock link and knob (1) from the clearance hole at the upper rear corner of the panel.

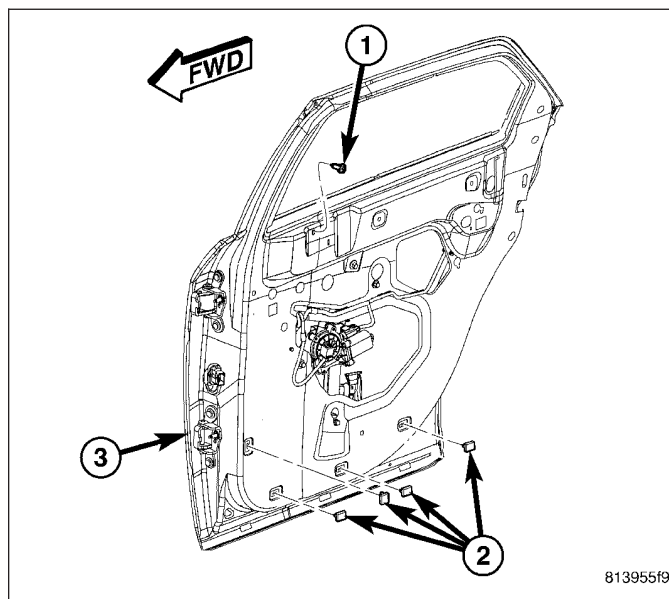


7. Reach between the top of the trim panel (3) and the inside of the door shell to unsnap the plastic clip that secures the end of the interior door handle latch release link (1) to the handle lever (2) and disengage the link from the handle.
8. Pull the trim panel away from the inside of the door shell far enough to access and disconnect the door wire harness connector (5) from the power window switch (4).
9. Remove the trim panel from the inside of the door.

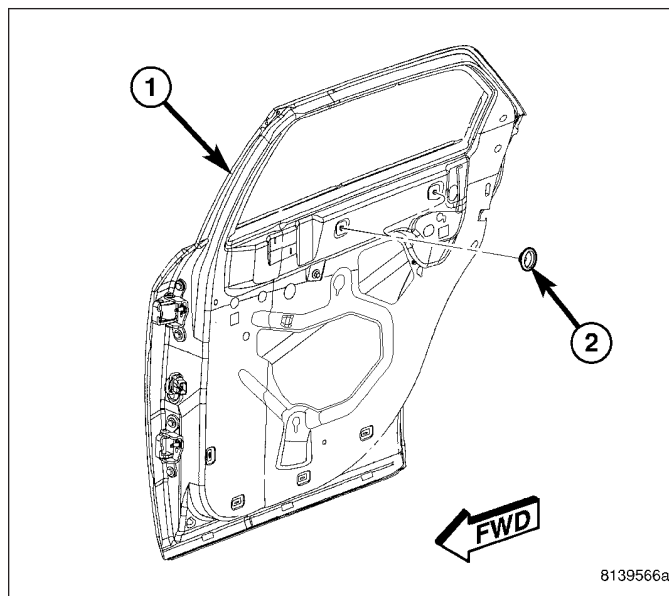


## INSTALLATION

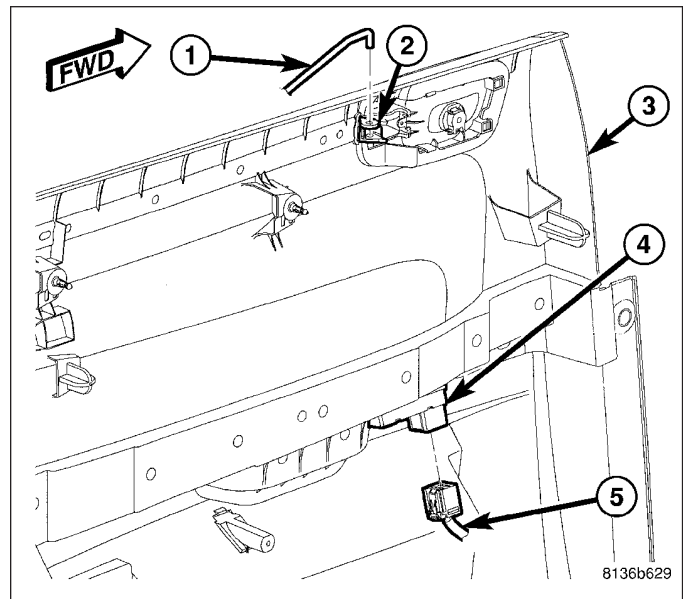
1. Check to be certain that the five spring nuts (1 and 2) are properly installed and in good condition on the inside of the door (3).



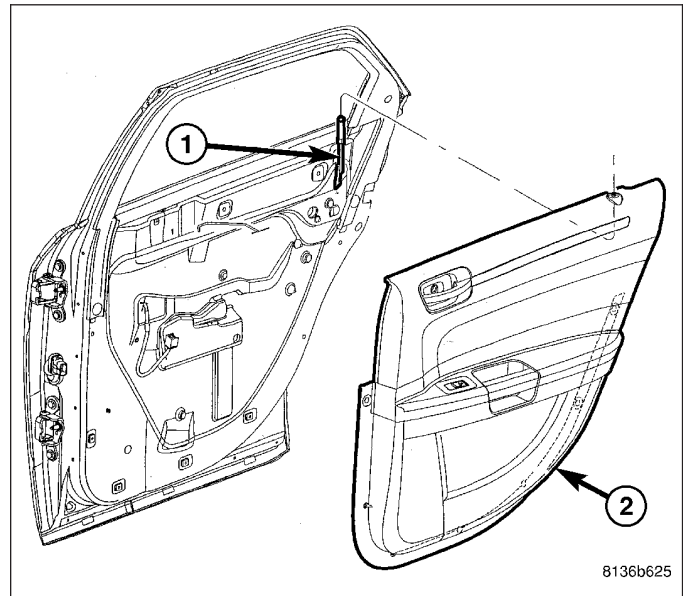
2. Check to be certain that the two plug grommets (2) are properly installed and in good condition on the inside of the door (1).



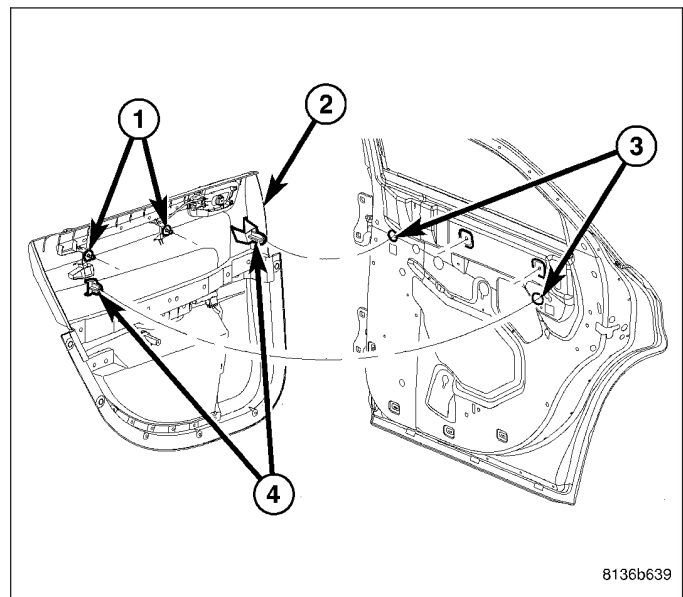
3. Position the trim panel (3) close enough to the inside of the door to reconnect the door wire harness connector (5) to the power window switch (4).
4. Reach between the top of the trim panel and the inside of the door shell to engage the end of the interior door handle latch release link (1) to the handle lever (2) and snap the plastic clip over the link to secure it to the handle.



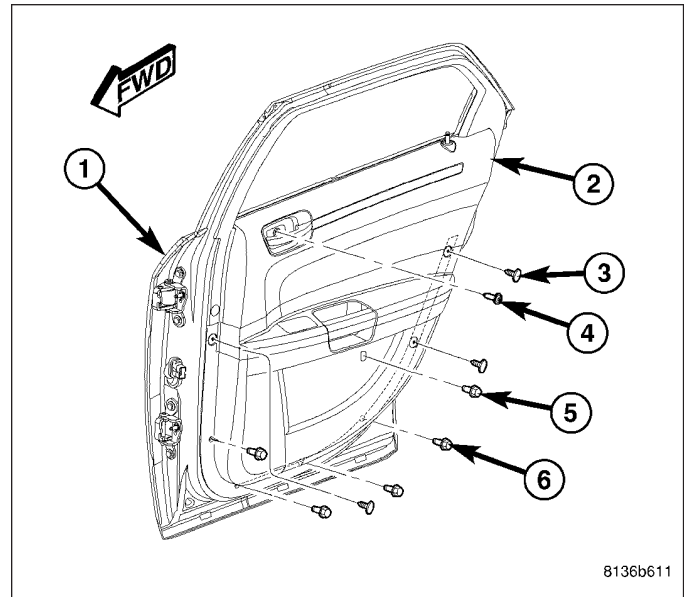
5. Lift the trim panel (2) over the inside of the door far enough to engage the interior door latch lock link and knob (1) into the clearance hole at the upper rear corner of the panel.



6. Position the two locator pins (4) on the back of the trim panel (2) to the locator holes (3) on the inside of the door panel and simultaneously push the two upper pins (1) into the grommet plugs near the top of the door. Make certain that the upper edges of the trim panel are engaged in the grooves of the window moldings.



7. Install and tighten the screw (4) that secures the interior remote handle recess of the trim panel (2) to the inside of the door (1). Tighten the screw to 2 N·m (16 in. lbs.). Fold and snap the screw cap over the screw.
8. Install and tighten the screw (5) that secures the trim panel (2) to the pull cup bracket below the trim panel pull cup. Tighten the screw to 2 N·m (16 in. lbs.). Fold and snap the screw cap over the screw.
9. Install the three push-pin retainers (3) that secure the trim panel to the inside of the door.
10. Install and tighten the four screws (6) that secure the bottom and front lower corner of the trim panel to the inside of the door. Tighten the screws to 2 N·m (16 in. lbs.).
11. Reconnect the battery negative cable.



## WATERSHIELD

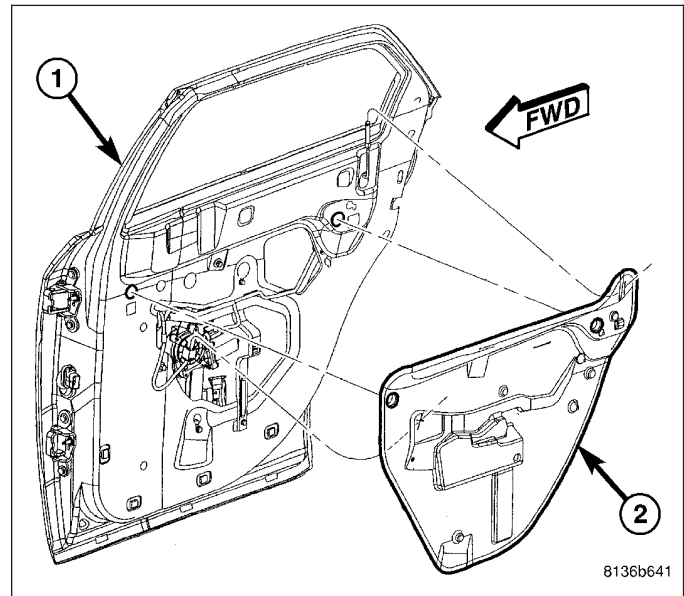
### REMOVAL

**CAUTION:** Do not allow the watershield or adhesive to become contaminated with dirt or other foreign substances.

**Do not damage the watershield during removal and installation.**

**If the watershield becomes contaminated or damaged, replace the watershield.**

1. Remove the trim panel from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/TRIM PANEL - REMOVAL).
2. Carefully separate the lower half of the watershield (2) from the inside of the door (1).
3. Lift the lower half of the watershield upward far enough to access and pull the trim panel take out of the door wire harness out of the slit near the front of the watershield.
4. Carefully separate the upper half of the watershield from the inside of the door.
5. Pull the upper front half of the watershield away from the inside of the door far enough to disengage the inside remote latch release handle link from the slit in the upper center area of the watershield.
6. Lift the upper half of the watershield upward far enough to disengage the inside latch lock knob and link from the slit in the upper rear corner of the watershield.
7. Remove the watershield from the door.





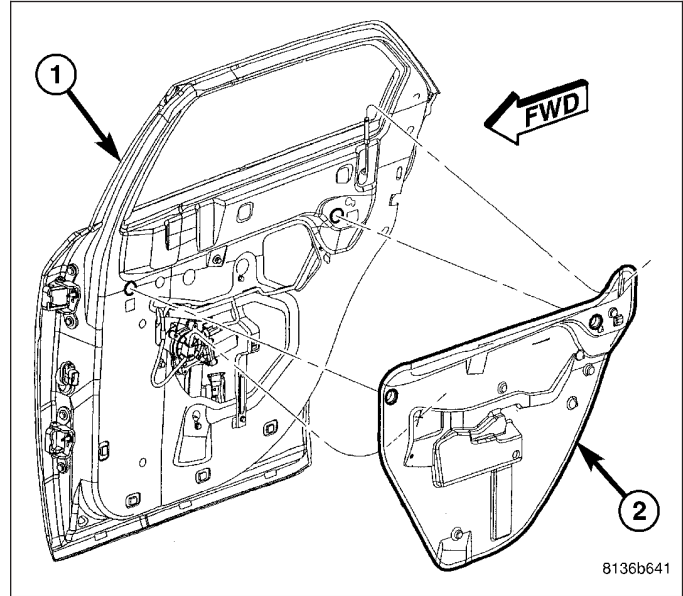
## INSTALLATION

**CAUTION:** Do not allow the watershield or adhesive to become contaminated with dirt or other foreign substances.

Do not damage the watershield during removal and installation.

If the watershield becomes contaminated or damaged, replace the watershield.

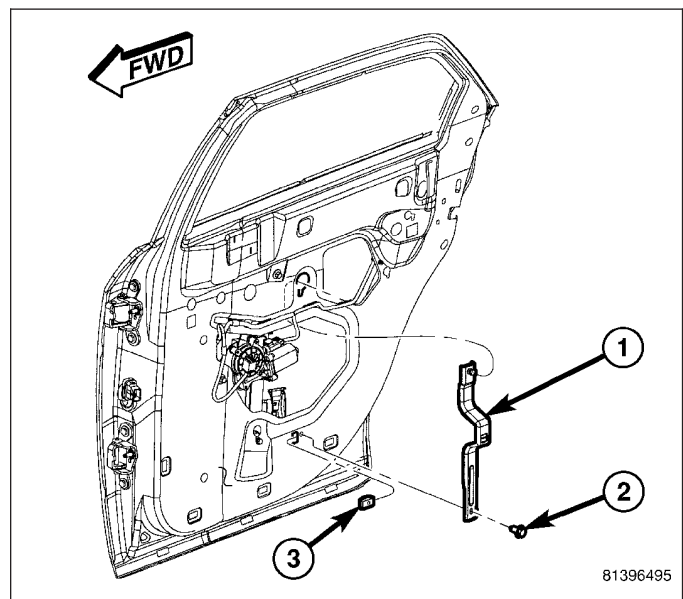
1. Thread the inside latch lock knob and link through the slit near the upper rear corner of the watershield (2).
2. Thread the inside remote latch release handle link through the slit in the upper center area of the watershield.
3. Place the front and rear dimple formations located in the upper watershield into their respective locator holes in the door (1) inner panel.
4. Apply firm and even pressure to the adhesive bead along the upper edge of the watershield to seal it to the inside of the door.
5. Lift the lower half of the watershield upward far enough to access and pull the trim panel take out of the door wire harness out of through the slit near the front of the watershield.
6. Apply firm and even pressure to the adhesive bead along the remaining edges of the watershield to seal it to the inside of the door. Be certain that the watershield is sealed to the inside of the door.
7. Reinstall the trim panel onto the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/TRIM PANEL - INSTALLATION).



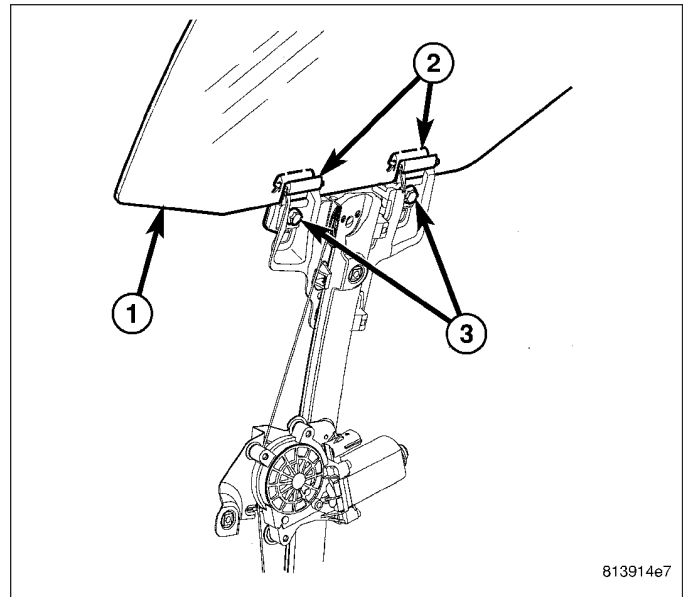
## WINDOW REGULATOR

### REMOVAL

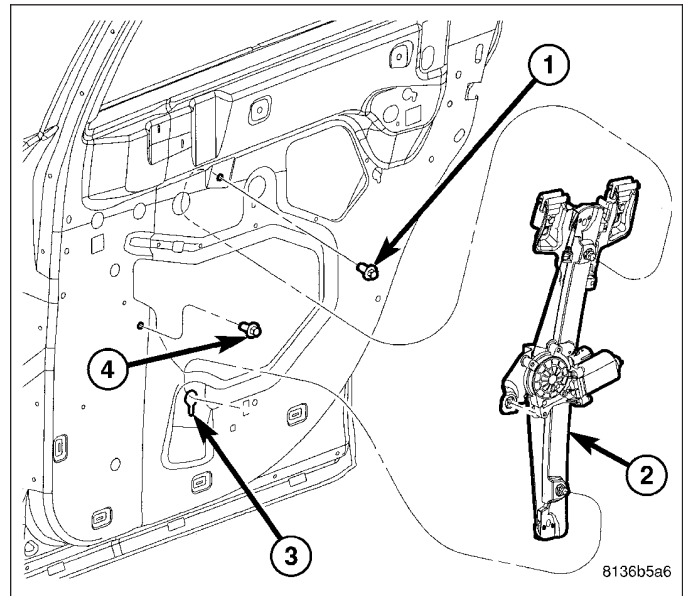
1. Remove the trim panel from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/TRIM PANEL - REMOVAL).
2. Remove the watershield from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/WATER-SHIELD - REMOVAL).
3. Remove the door glass channel and bracket from the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/GLASS RUN CHANNEL - REMOVAL).
4. Remove the screw (2) that secures the bottom of the pull cup bracket (1) to the inside of the rear door.
5. Loosen the screw that secures the top of the pull cup bracket to the inside of the rear door.
6. Disengage the upper pull cup bracket screw from the keyed hole and remove the bracket from the inside of the rear door.



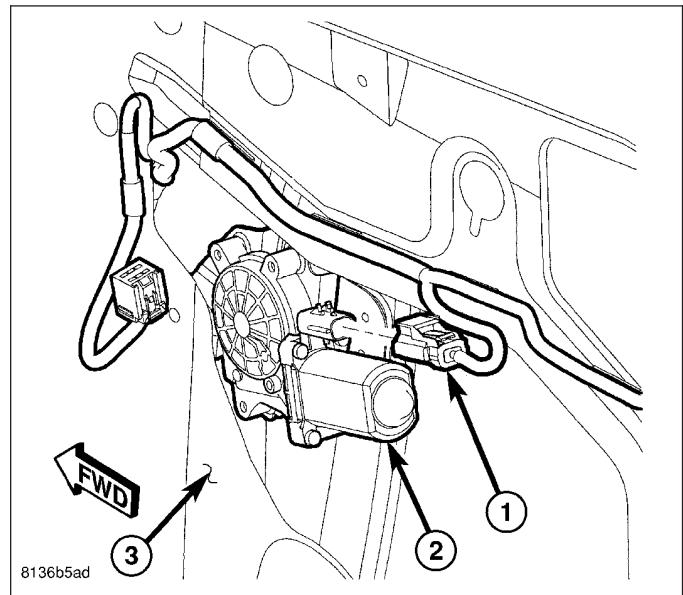
7. Using the regulator, adjust the rear door glass (1) position up or down as required for access to the two window regulator glass clamps (2).
8. Loosen the screw (2) in each of the glass clamps far enough to release the glass.
9. Lift the glass out of the regulator clamps and into its full up position, then tape the glass securely into place.



10. Remove the screw (1) that secures the top of the rear regulator rail (2) to the inside of the door.
11. Remove the screw (4) that secures the regulator motor support bracket to the inside of the door.
12. Loosen the screw that secures the bottom of the regulator rail to the keyed hole (3) on the inside of the door.
13. Lift the rear regulator rail upward within the door far enough to disengage the screw from the keyed hole in the door.



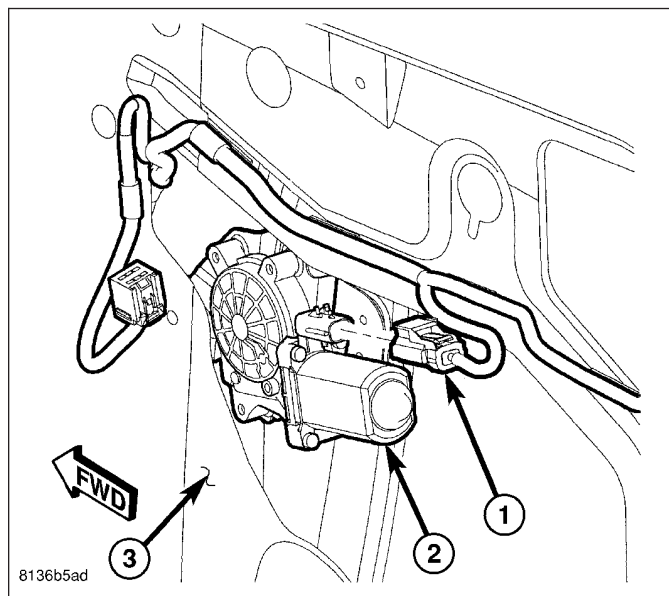
14. Lower the rear regulator within the door (3) far enough to access and disconnect the door wire harness connector (1) from the regulator motor (2) through the large access hole on the inside of the door near the front.
15. Remove the regulator through the large access hole on the inside of the door.



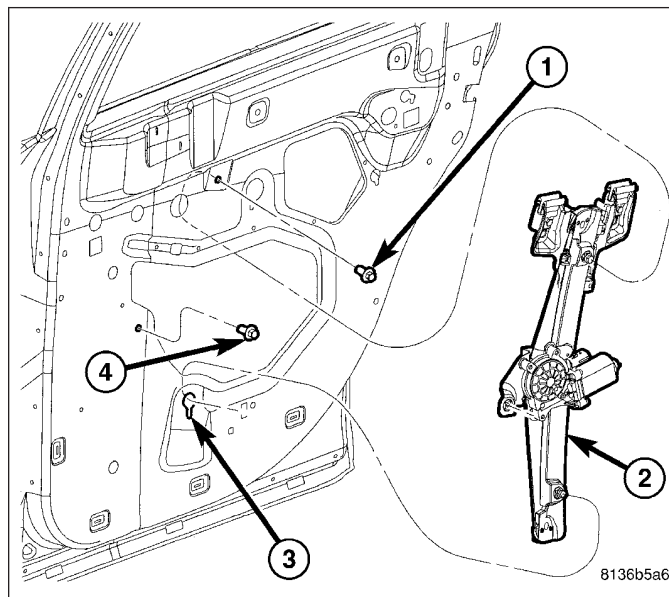


## INSTALLATION

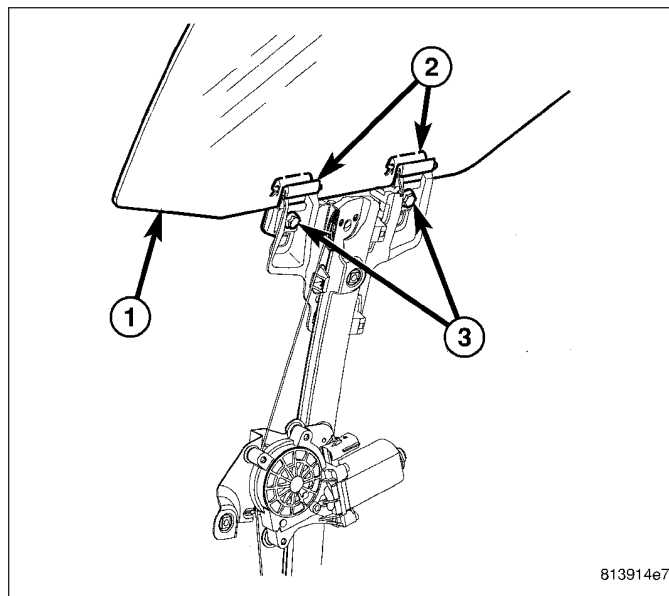
1. Load the regulator into the door (3) through the large access hole on the inside of the door near the front.
2. Position the rear regulator within the door so that the door wire harness connector (1) can be reconnected to the regulator motor (2) through the large access hole on the inside of the door.



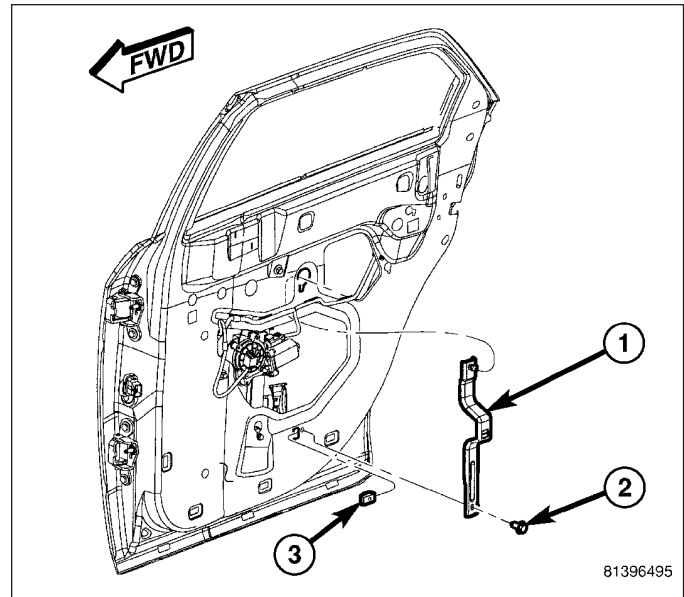
3. Engage the screw at the bottom of the rear regulator rail (2) into the keyed hole (3) on the inside of the door near the bottom.
4. Install and tighten the screw (1) that secures the top of the rear regulator rail to the inside of the door. Tighten the screw to 10 N·m (90 in. lbs.).
5. Install and tighten the screw (4) that secures the regulator motor support bracket to the inside of the door. Tighten the screw to 10 N·m (90 in. lbs.).
6. Tighten the screw that secures the bottom of the regulator rail to the keyed hole on the inside of the door. Tighten the screw to 10 N·m (90 in. lbs.).



7. Remove the tape securing the door glass in its full up position, then lower the glass to engage it into the two window regulator glass clamps (2).
8. Using the regulator, lower the glass far enough to access the two window regulator glass clamp screws (3).
9. Tighten the screw in each of the glass clamps. Tighten the screws to 10 N·m (90 in. lbs.).



10. With the upper screw hand-started into the pull cup bracket (1), position the screw into the keyed hole on the inside of the rear door.
11. Install and tighten the screw (2) that secures the bottom of the pull cup bracket to the U-nut (3) on the inside of the rear door. Tighten the screw to 11 N·m (100 in. lbs.).
12. Tighten the screw that secures the top of the pull cup bracket to the inside of the rear door. Tighten the screw to 10 N·m (90 in. lbs.).
13. Reinstall the glass channel and bracket onto the inside of the rear door. (Refer to 23 - BODY/DOORS - REAR/GLASS RUN CHANNEL - INSTALLATION).
14. Reinstall the watershield onto the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/WATERSHIELD - INSTALLATION).
15. Reinstall the inner belt weatherstrip onto the rear door. (Refer to 23 - BODY/WEATHERSTRIP/SEALS/DOOR INNER BELT WEATHERSTRIP - INSTALLATION-REAR).
16. Reinstall the trim panel onto the inside of the rear door. (Refer to 23 - BODY/DOOR - REAR/TRIM PANEL - INSTALLATION).



EXTERIOR

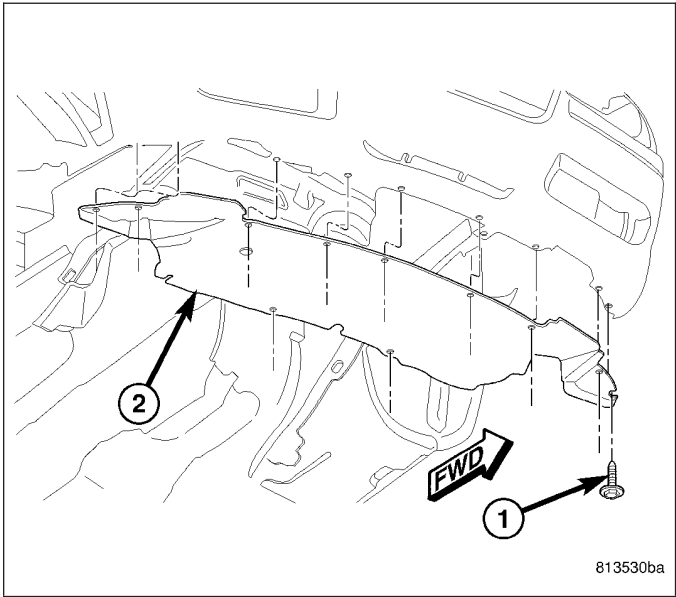
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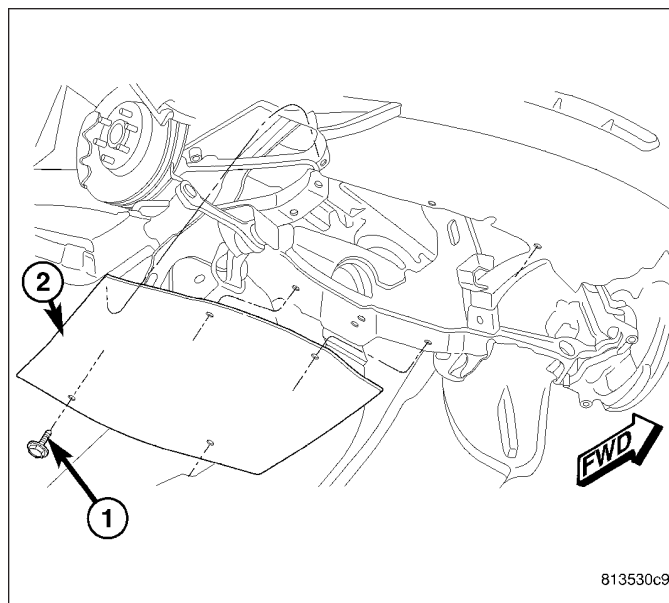
BELLY PAN

REMOVAL

1. Raise and support the vehicle.
2. Remove the screws (1) that secure the front belly pan (2) to the underside of the vehicle.
3. Remove the front belly pan from the underside of the vehicle.

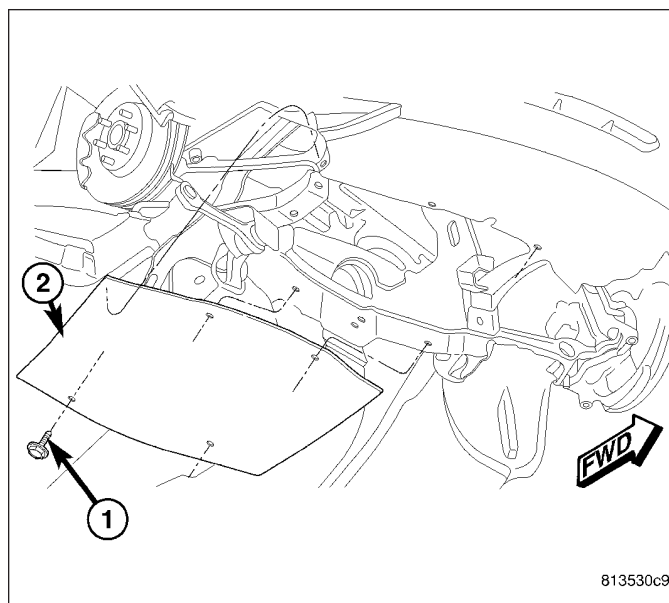


4. Remove the screws (1) that secure the rear belly pan (2) to the underside of the vehicle.
5. Remove the rear belly pan from the underside of the vehicle.

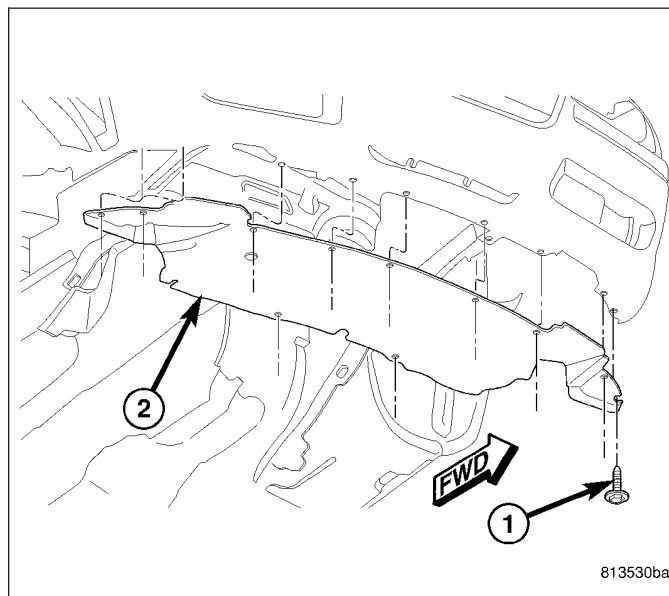


## INSTALLATION

1. Position the rear belly pan (2) to the underside of the vehicle.
2. Install the screws (1) that secure the rear belly pan to the underside of the vehicle. Tighten the screws securely.



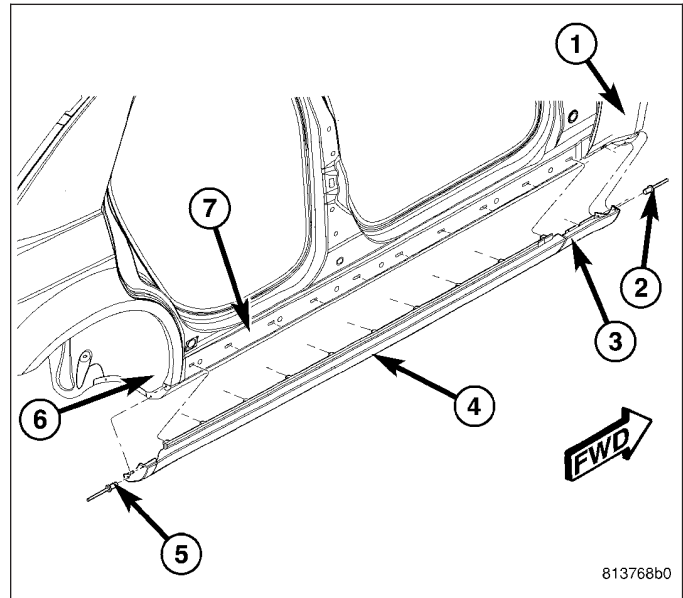
3. Position the front belly pan (2) to the underside of the vehicle.
4. Install the screws (1) that secure the front belly pan to the underside of the vehicle. Tighten the screws securely.
5. Lower the vehicle.



## CLADDING-BODY SIDE

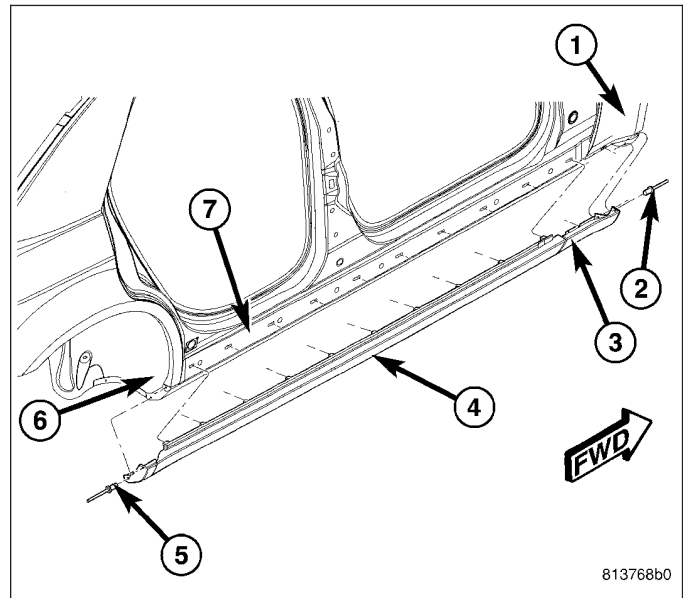
### REMOVAL

1. Raise and support the vehicle.
2. Remove the wheels from the side of the vehicle being serviced (Refer to 22 - TIRES/WHEELS - REMOVAL).
3. Remove the pop rivets (2 and 5) from the front fender (1) and rear quarter panel (6).
4. Remove the rear body side cladding (4) by disengaging the cladding retaining clips from the rocker panel (7).
5. Remove the front body side cladding (3) by disengaging the retaining clip from the front fender.



### INSTALLATION

1. Position the front body side cladding (3) to the front fender (1).
2. Engaging the front cladding retaining clip to the front fender.
3. Position the rear body side cladding (4) to the rocker panel (6).
4. Engaging the rear cladding retaining clips to the rocker panel.
5. Install the pop rivets (2 and 5).

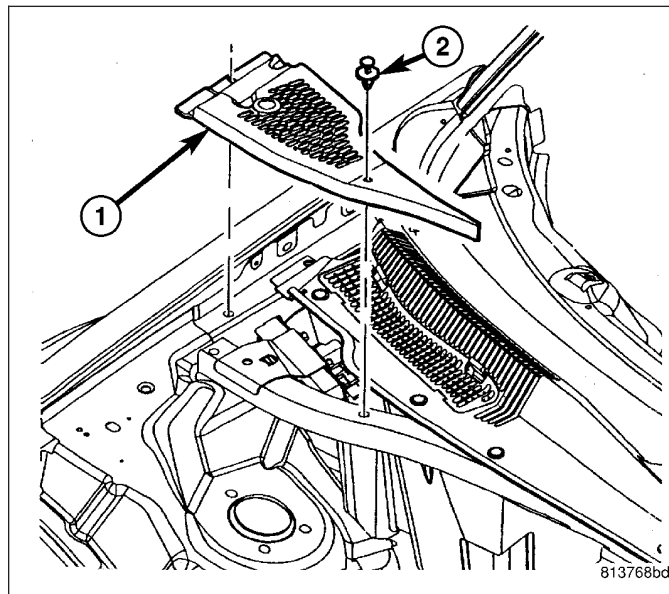


6. Install the wheels (Refer to 22 - TIRES/WHEELS - INSTALLATION).
7. Lower the vehicle.

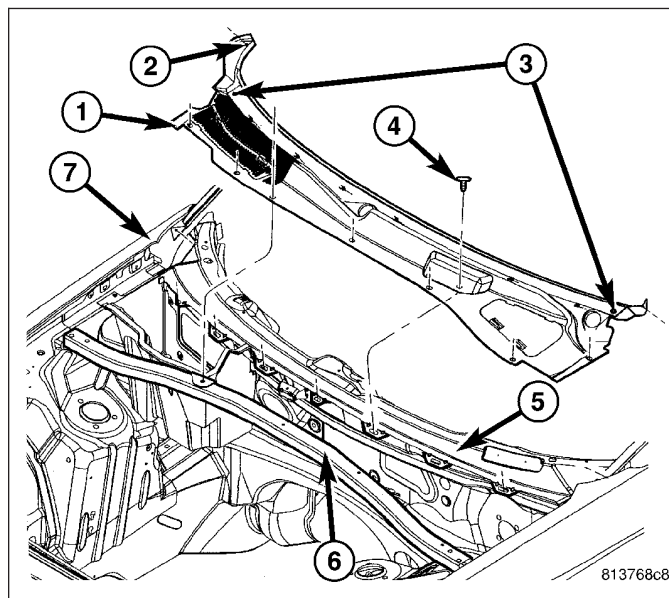
## PANEL-COWL TOP

### REMOVAL

1. Remove the two push pins (2) that secure the front cowl top panel (1) to the right rear corner of the engine compartment
2. Remove the front cowl top panel.

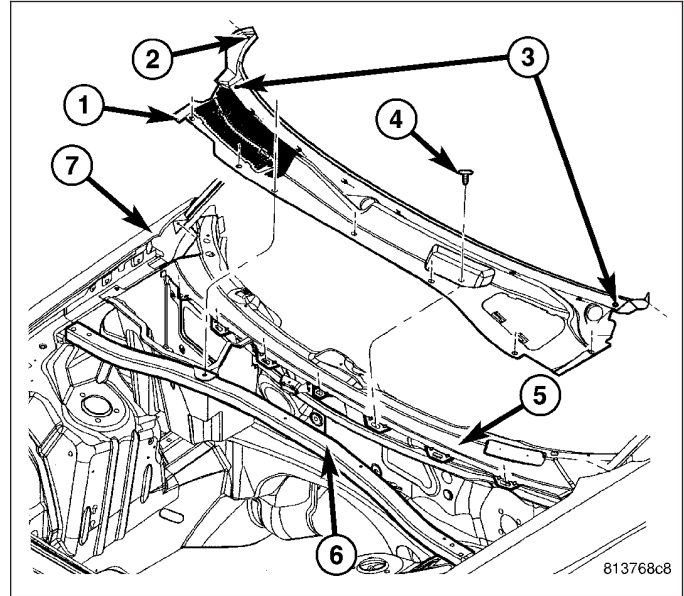


3. Remove the windshield wiper arms (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - REMOVAL).
4. Remove the push-pin (2) that secures each end of the cowl top panel (1) to each front fender (7).
5. Disengage the two 1/4-turn fasteners (3) that secure the cowl top panel to the dash panel (5).
6. Remove the six push-pins (4) that secure the cowl top panel to the strut tower support (6).
7. Disengage the integral retaining clips that secure the cowl top panel to the dash panel and remove the cowl panel from the engine compartment.

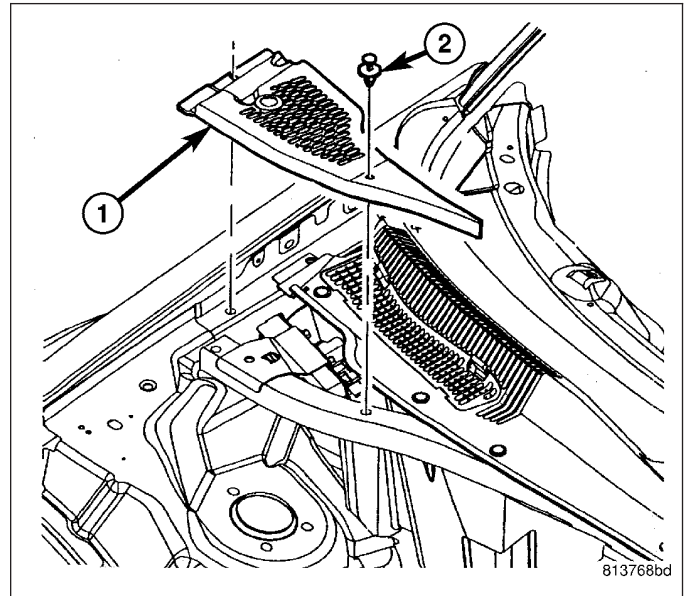


## INSTALLATION

1. Position the cowl top panel (1) into the engine compartment.
2. Engage the integral retaining clips that secure the cowl top panel to the dash panel (5).
3. Install the six push-pins (4) that secure the cowl top panel to the strut tower support (6).
4. Engage the 1/4-turn fasteners (3) that secure cowl top panel to the dash panel.
5. Install the push-pin (2) that secures each end of the cowl top panel to each front fender (7).
6. Install the windshield wiper arms (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - INSTALLATION).



7. Position the front cowl top panel (1) to the right rear corner of the engine compartment.
8. Install the two push-pins (2) that secure the front cowl top panel.



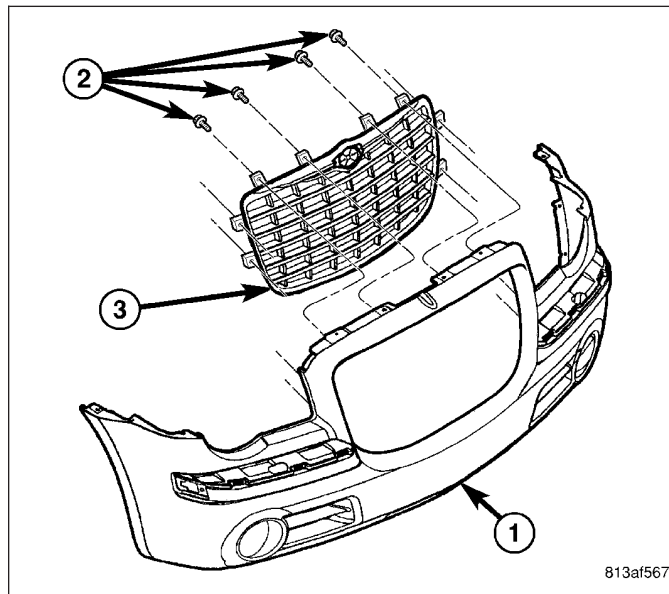


## GRILLE

### REMOVAL

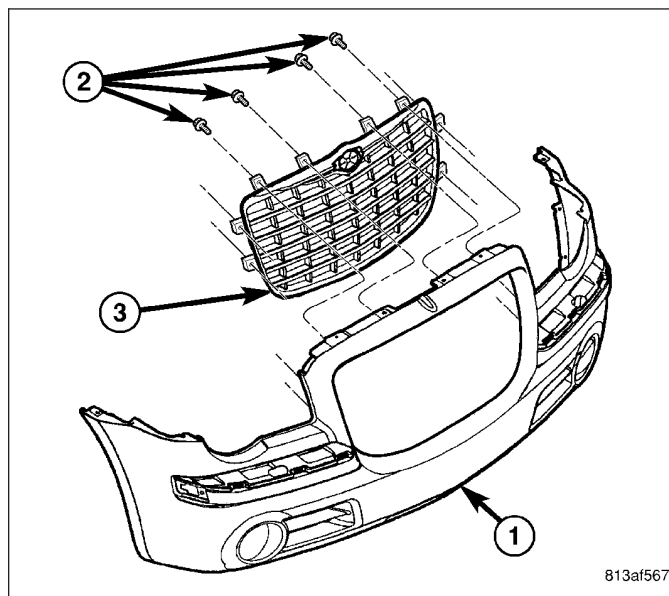
**Note:** Take the proper precautions to protect the face of the front fascia from cosmetic damage.

1. Remove the front fascia (1) and place it on a work-bench (Refer to 13 - FRAME & BUMPERS/BUMPERS/Front fascia - Removal).
2. Remove the screws (2) that secure the grille (3) to the inside of the front fascia.
3. Remove the grille from the front fascia.



### INSTALLATION

1. Position the grille into the front fascia.
2. Install the screws that secure the grille to the front fascia. Tighten the screws securely.
3. Install the front fascia (Refer to 13 - FRAME & BUMPERS/BUMPERS/Front fascia - Installation).

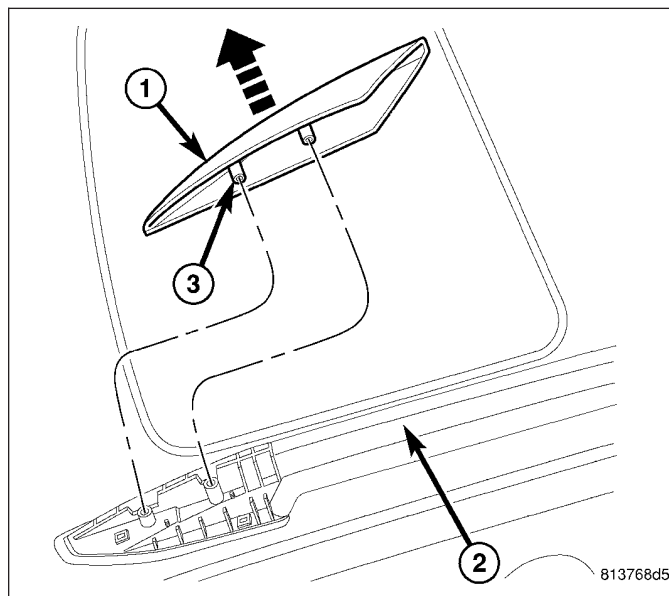




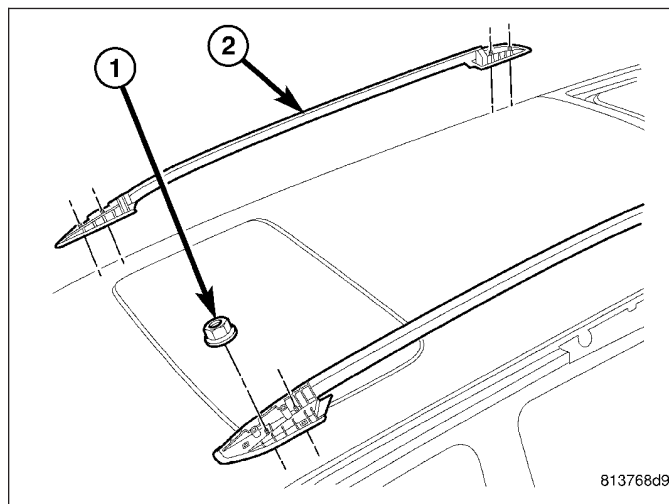
## RACK-LUGGAGE

### REMOVAL

1. If equipped, remove the luggage rack crossbars (Refer to 23 - BODY/EXTERIOR/LUGGAGE RACK CROSSBAR - REMOVAL).
2. Remove the end caps (1) from the luggage rack bars (2) by gently prying up on the end cap to disengage the two integral retainers (3).

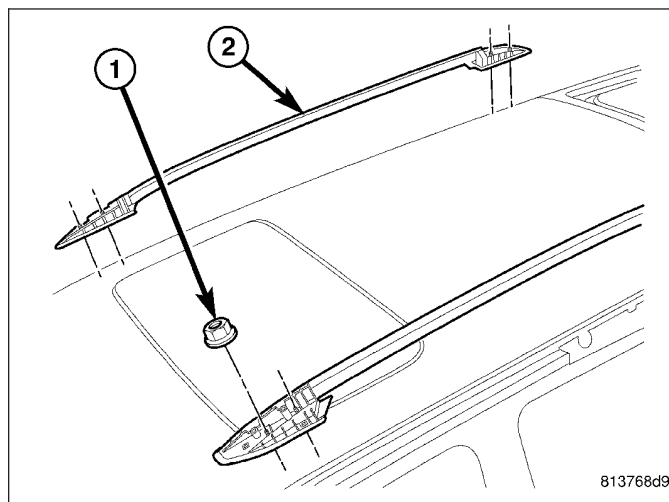


3. Remove the two nuts (1) that secure each end of the luggage rack crossbars (2) to the top of the vehicle.
4. Remove the luggage rack crossbars from the top of the vehicle.

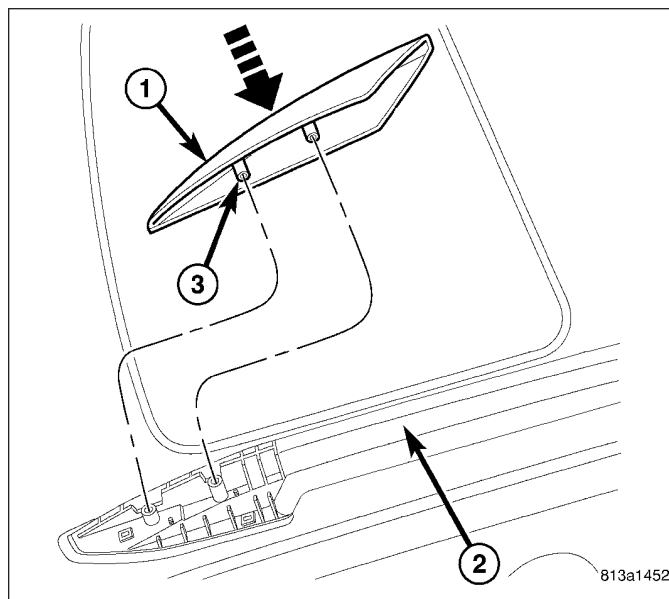


### INSTALLATION

1. Position the luggage rack crossbars (2) onto the top of the vehicle.
2. Install the two nuts (1) that secure each end of the luggage rack crossbars to the top of the vehicle. Tighten the nuts to 7 N·m (60 in. lbs.).



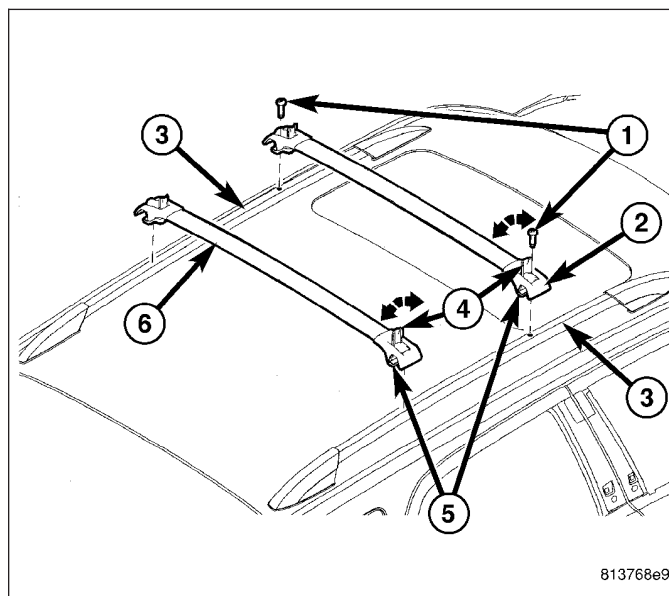
3. Position the end cap (1) onto each end of the luggage rack crossbars (2).
4. Push down firmly on the end caps until the integral retainers (3) fully engage the crossbars.
5. If removed, install the luggage rack crossbars (Refer to 23 - BODY/EXTERIOR/LUGGAGE RACK CROSSBAR - INSTALLATION).



## RACK-LUGGAGE - CROSSBAR

### REMOVAL

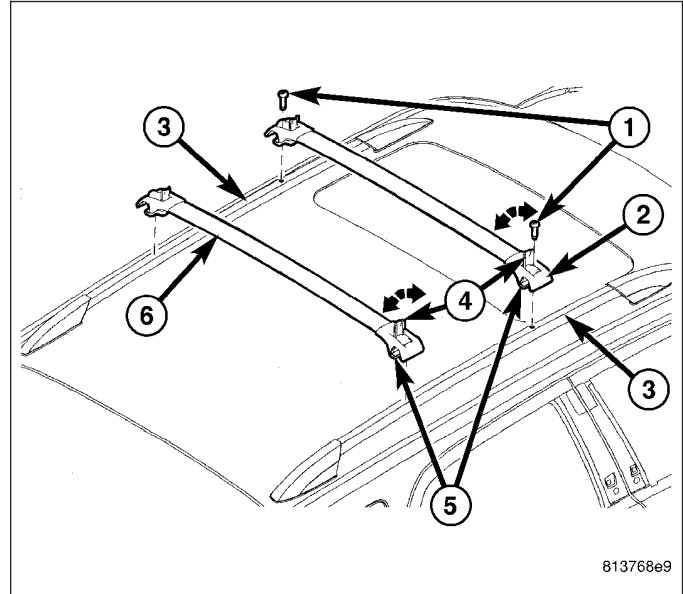
1. Remove the two screws (1) that secure the front luggage rack crossbar (2) to the luggage rack bars (3).
2. Lift the handle on the four luggage rack crossbar levers (4) and then turn the levers counter - clock-wise to loosen lower clamps (5).
3. Turn the lower clamps towards the center of the vehicle.
4. Remove the front luggage rack crossbar and the rear luggage rack crossbar (6) from the luggage rack bars.



## INSTALLATION

**Note:** Do not place the front luggage rack crossbar directly over the sunroof glass, if equipped.

1. Position the front luggage rack crossbar (2) onto the luggage rack bars (3).
2. Install the two screws (1) that secure the front luggage rack crossbar to the luggage rack bars. Tighten the screws securely.
3. Position the rear luggage rack crossbar (6) onto the luggage rack bars.
4. Turn the lower clamps (5) towards the outside of vehicle.
5. Turn the handle on the four luggage rack crossbar levers (4) clockwise until the lower clamps are tight on the luggage rack bars.
6. Flip the handle on the four luggage rack crossbar levers down and attempt to move the crossbars to ensure that they are properly locked into position.

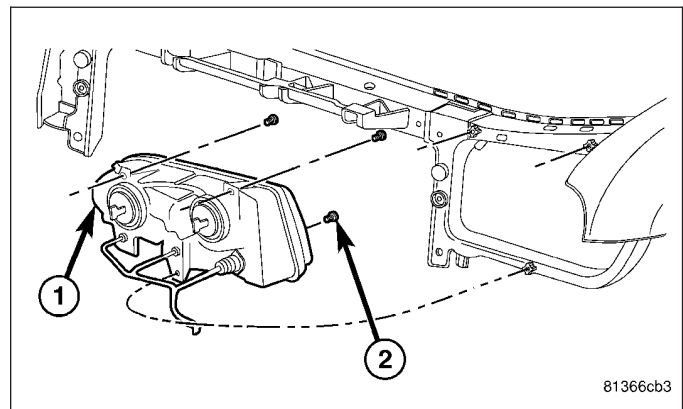


7.

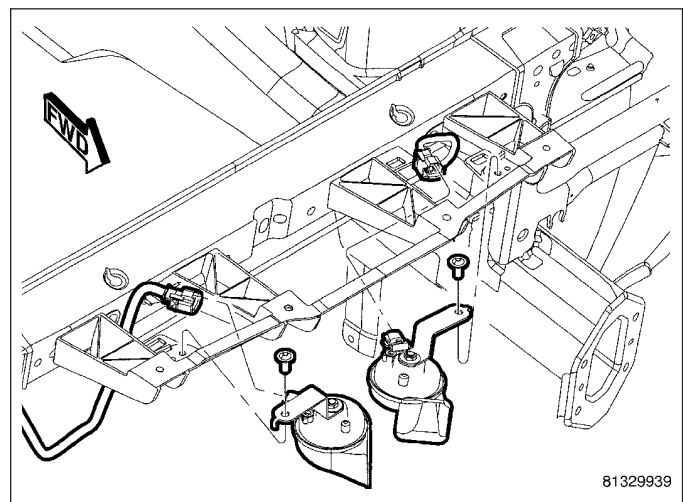
## CROSSMEMBER-HEADLAMP MOUNTING

### REMOVAL

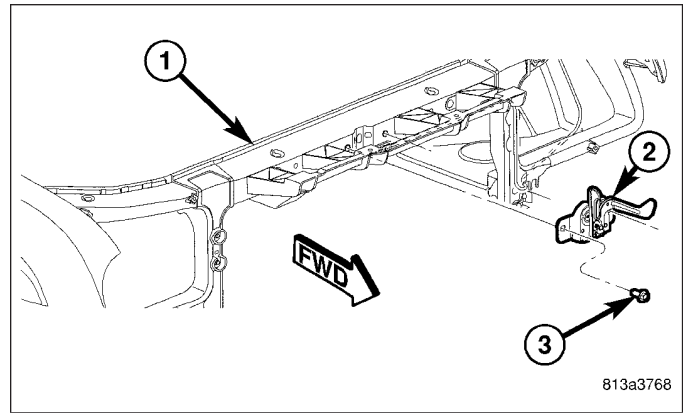
1. Disconnect and isolate the negative battery cable.
2. Remove the front fascia (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).
3. Remove the headlamp units (1) (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - REMOVAL).



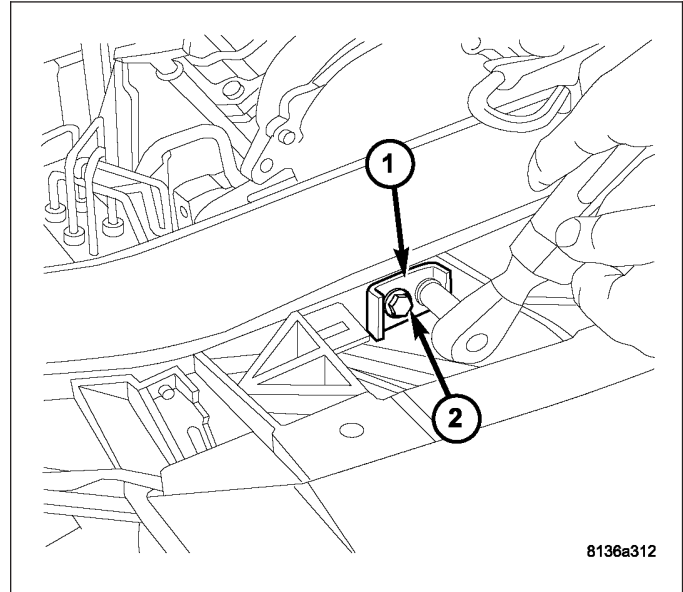
4. Disconnect the headlamp wire harness from the horns.
5. Remove the bolts that secure the horns to the headlamp mounting crossmember and remove the horns.



6. Mark the location of the hood latch (2) on the front of the headlamp mounting crossmember (1) to aid in reinstallation.
7. Remove the two bolts (3) that secure the hood latch to the headlamp mounting crossmember and position the hood latch and cable out of the way.

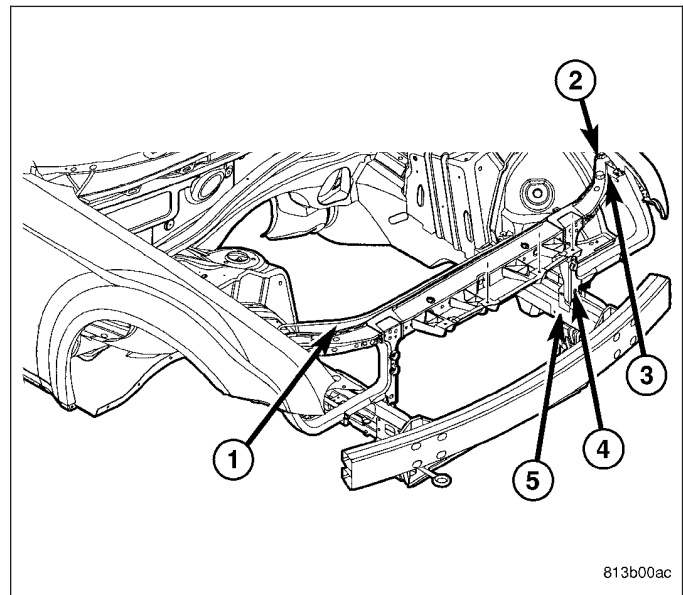


8. Remove the bolts (2) that secure the radiator mounting brackets (1) to the headlamp mounting crossmember.



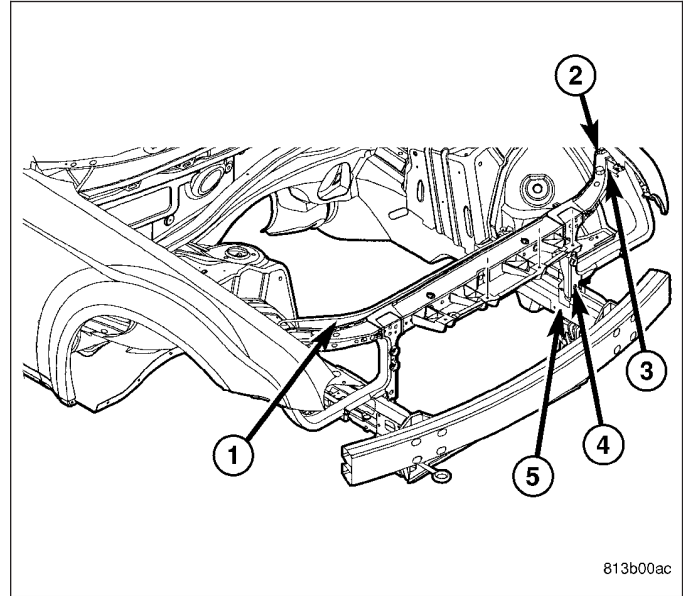
**Note:** Mark the location of the headlamp mounting crossmember to the other body components prior to removal of the crossmember to aid in reinstallation.

9. Mark the location of the headlamp mounting crossmember (1) to the front fenders.
10. Remove the bolts (2 and 3) that secure the headlamp mounting crossmember to the front fenders.
11. Remove the bolts (4) that secure the headlamp mounting crossmember to the front frame rails (5).
12. Remove the headlamp mounting crossmember from the engine compartment.

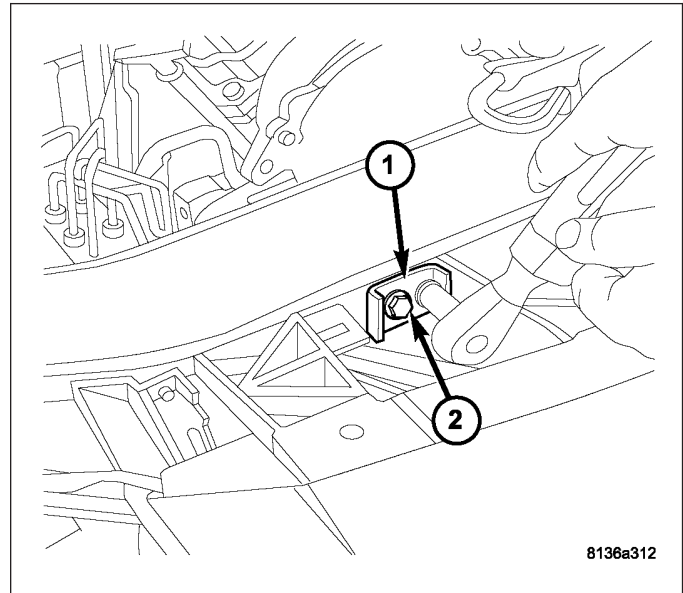


## INSTALLATION

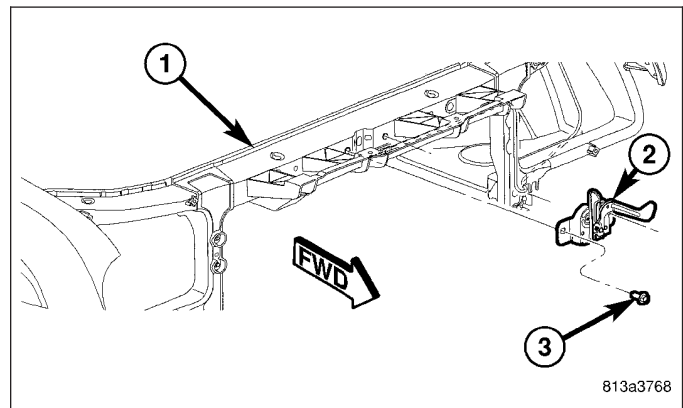
1. Position the headlamp mounting crossmember (1) into the engine compartment.
2. Loosely install the bolts (2 and 3) that secure the headlamp mounting crossmember to the front fenders.
3. Loosely install the bolts (4) that secure the headlamp mounting crossmember to the front frame rails (5).
4. Align the headlamp mounting crossmember using the alignment marks previously indicated and tighten all of the retaining bolts to 28 N·m (21 ft. lbs.).



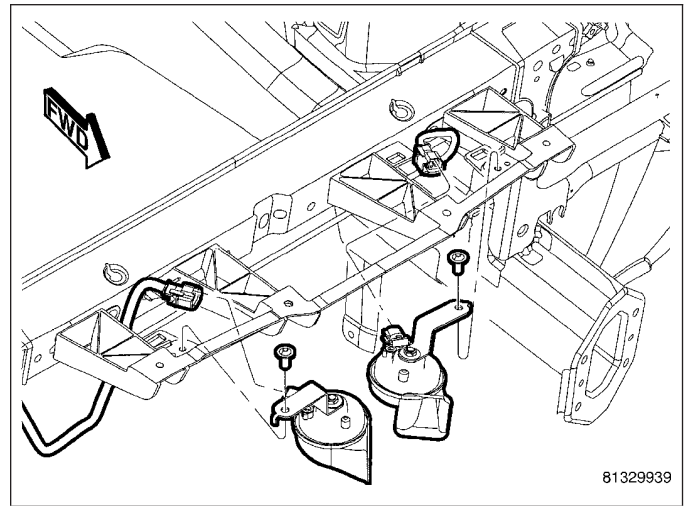
5. Install the bolts (2) that secure the radiator mounting bracket (1) to the headlamp mounting crossmember. Tighten the bolts to 5 N·m (45 in. lbs.).



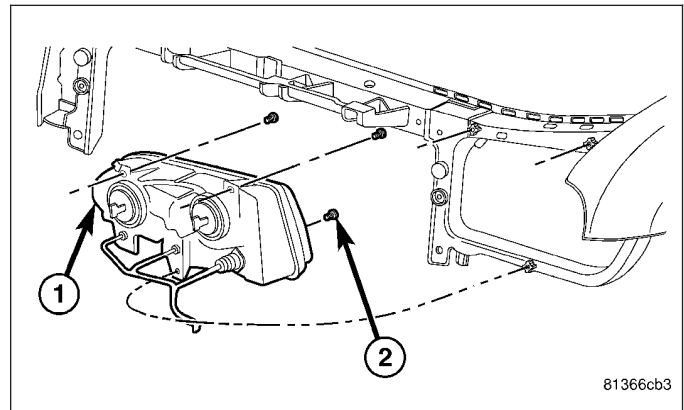
6. Position the latch (2) to the front of the crossmember (1).
7. Loosely install the two bolts (3) that secure the hood latch to the headlamp mounting crossmember.
8. Align the hood latch using the alignment marks previously indicated and tighten the hood latch bolts to 28 N·m (21 ft. lbs. ).



9. Install the horns onto the headlamp mounting crossmember. Tighten the bolts to 28 N·m (21 ft. lbs. ).
10. Connect the headlamp wire harness to the horns.



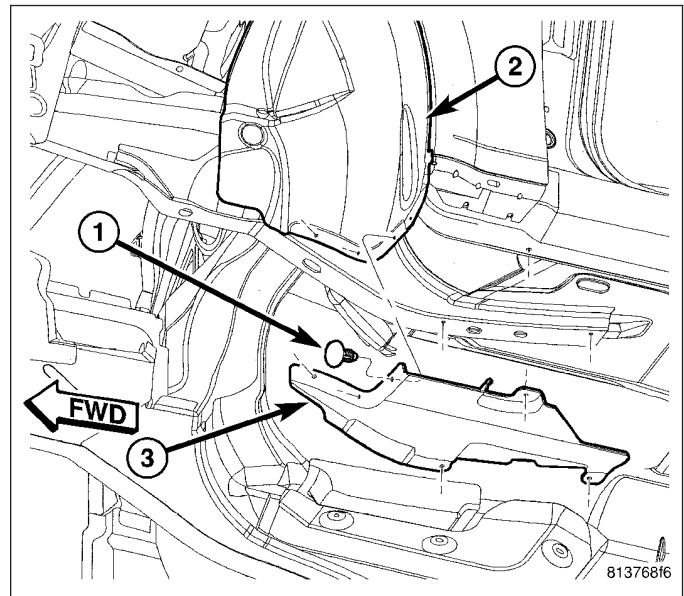
11. Install the headlamp units (1) (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION).
12. Install the front fascia (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).
13. Reconnect the negative battery cable.
14. Carefully close the hood and verify hood latch and panel alignment. Adjust as necessary.



## SHIELD-WHEELHOUSE - FRONT

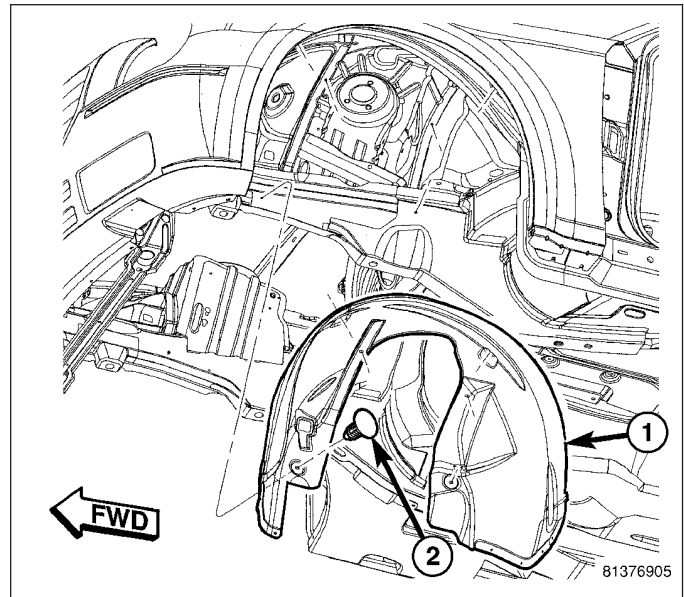
### REMOVAL

1. Raise and support the vehicle.
2. Remove the wheels from the side of the vehicle being serviced (Refer to 22 - TIRES/WHEELS - REMOVAL).
3. Remove the body side cladding from the side of the vehicle being serviced (Refer to 23 - BODY/EXTERIOR/BODY SIDE CLADDING - REMOVAL).
4. Remove the push-pins (1) that secure the lower front wheelhouse shield (3) to the front wheelhouse shield (3) and the body.
5. Remove lower front wheelhouse shield from the vehicle.



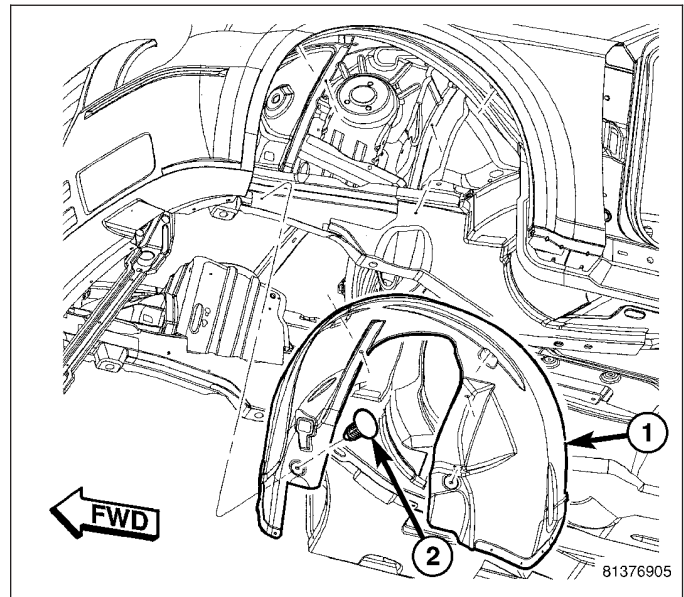


6. Remove the front belly pan (Refer to 23 - BODY/EXTERIOR/BELLY PAN - REMOVAL).
7. Remove the push-pins (2) that secure the front wheelhouse shield (1) to the body.
8. Remove the front wheelhouse shield from the vehicle.

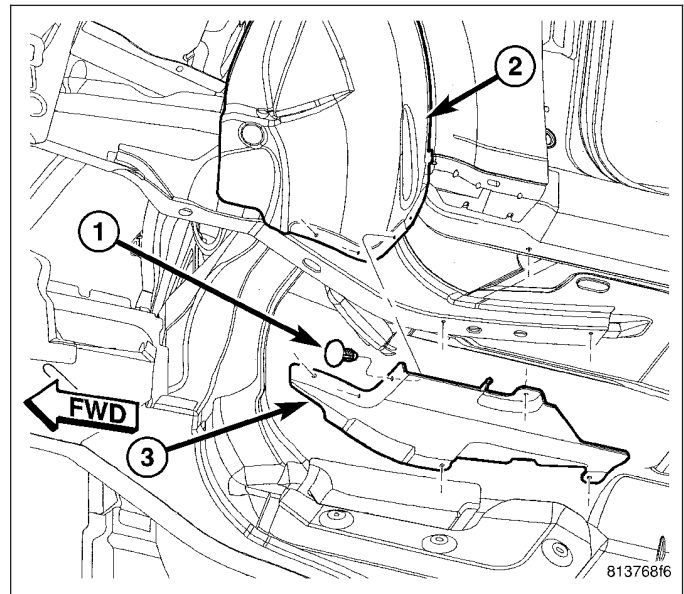


## INSTALLATION

1. Position the front wheelhouse shield (1) into the front fenderwell.
2. Install the push-pin (2) that secure the front wheelhouse shield to the body.
3. Install the front belly pan (Refer to 23 - BODY/EXTERIOR/BELLY PAN - INSTALLATION).



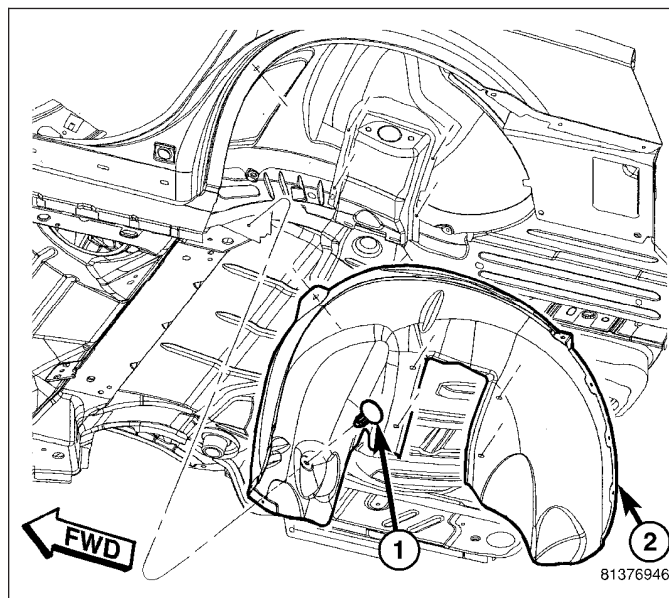
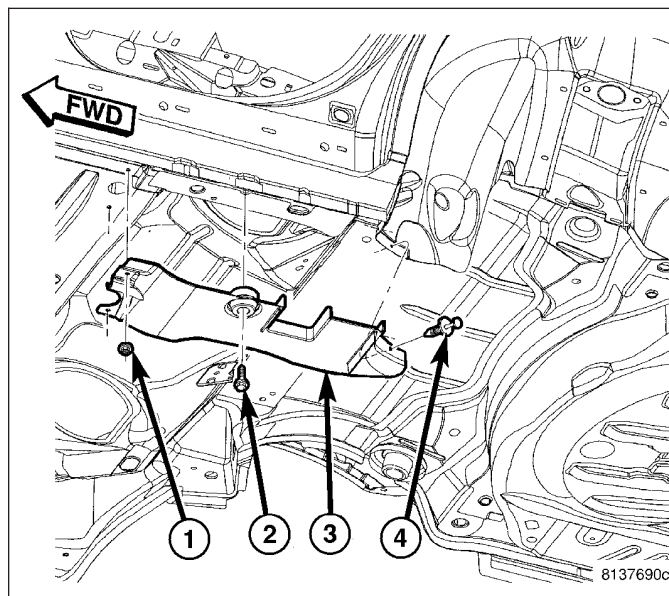
4. Position the lower front wheelhouse shield (3) onto the body.
5. Install the push-pins (1) that secure the lower front wheelhouse shield to the front wheelhouse shield (2) and the body.
6. Install the body side cladding (Refer to 23 - BODY/EXTERIOR/BODY SIDE CLADDING - INSTALLATION).
7. Install the front wheels (Refer to 22 - TIRES/WHEELS - INSTALLATION).
8. Lower the vehicle.



## SHIELD-WHEELHOUSE - REAR

### REMOVAL

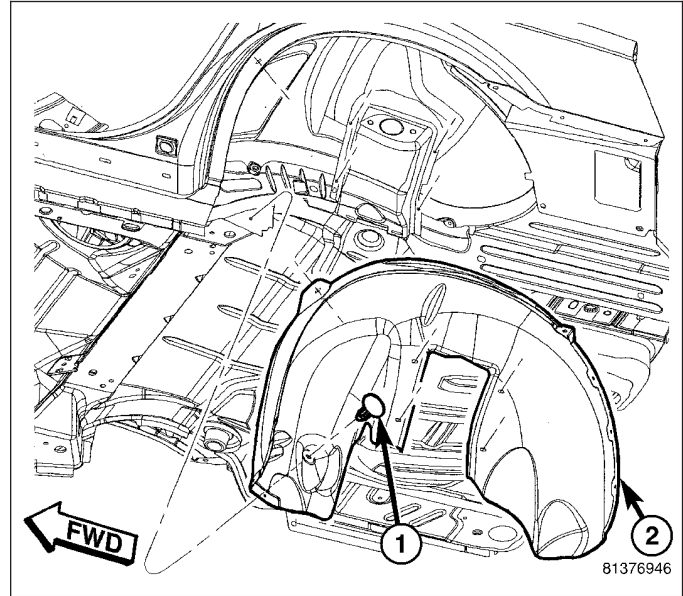
1. Raise and support the vehicle.
  2. Remove the wheels from the side of the vehicle being serviced (Refer to 22 - TIRES/WHEELS - REMOVAL).
  3. Remove the rear portion of the body side cladding from the side of the vehicle being serviced (Refer to 23 - BODY/EXTERIOR/BODY SIDE CLADDING - REMOVAL).
  4. Remove the nuts (1), bolt (2) and the push-pins (4), that secure the lower rear wheelhouse shield (3) to the body.
  5. Remove lower rear wheelhouse shield from the vehicle.
- 
6. Remove the push-pins (1) that secure the rear wheelhouse shield (2) to the body.
  7. Remove the rear wheelhouse shield from the vehicle.



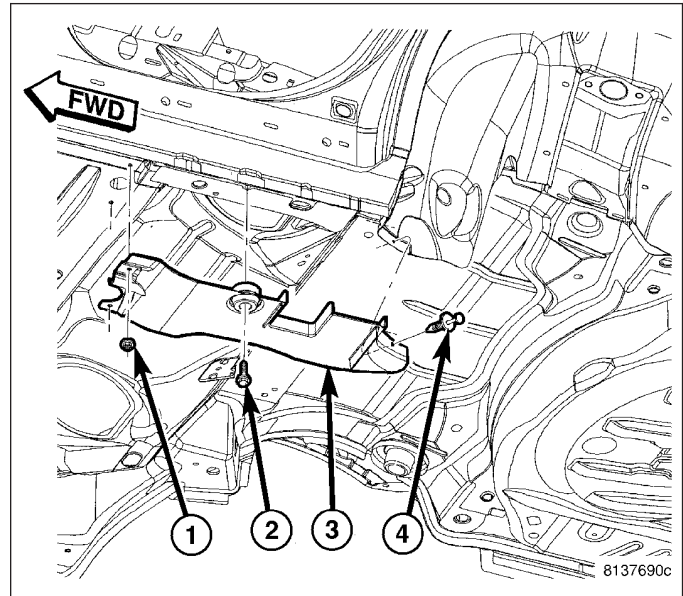


## INSTALLATION

1. Position the rear wheelhouse shield (2) into the rear wheelwell.
2. Install the push-pins (1) that secure the rear wheelhouse shield to the body.



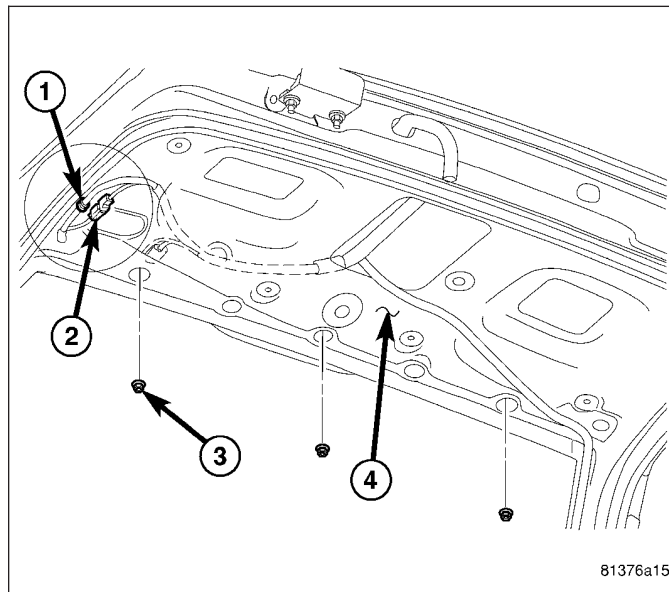
3. Position the lower rear wheelhouse shield (3) onto the body.
4. Install the nuts (1), bolt (2) and the push-pins (4) that secure the lower rear wheelhouse shield to the body. Tighten the nuts and the bolt securely.
5. Install the rear portion of the body side cladding (Refer to 23 - BODY/EXTERIOR/BODY SIDE CLADDING - INSTALLATION).
6. Install the wheels (Refer to 22 - TIRES/WHEELS - INSTALLATION).
7. Lower the vehicle.



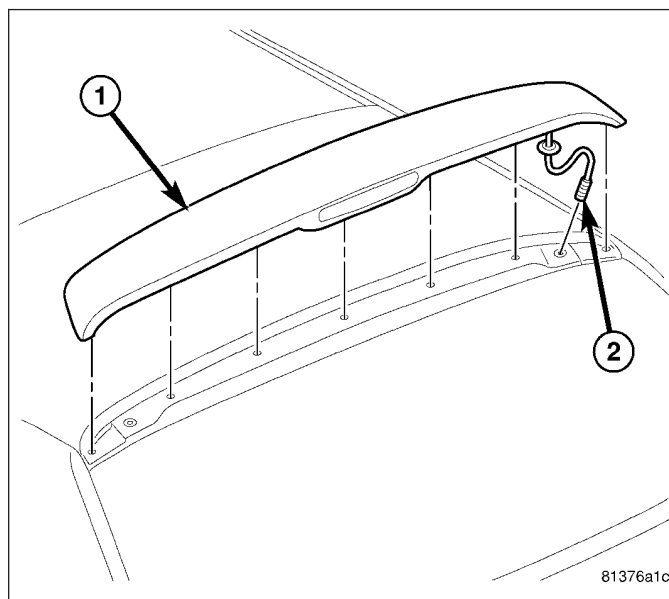
## SPOILER

### REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove the lift gate upper trim panel (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - REMOVAL).
3. Disconnect the rear washer fluid supply hose (1).
4. Disconnect the CHMSL wire harness connector (2).
5. Remove the nuts (3) that secure the rear spoiler to the liftgate (4).

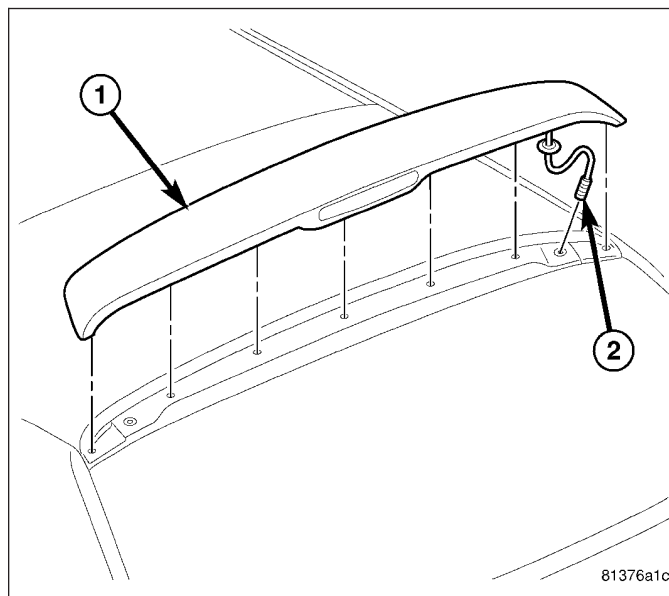


6. Partially remove the rear spoiler (1) from the liftgate to access the wire harness and washer fluid supply hose (2).
7. Remove the rubber grommet from the right top of the lift gate and route the wire harness and washer fluid supply hose through the opening in the liftgate.
8. Remove rear spoiler from the vehicle.

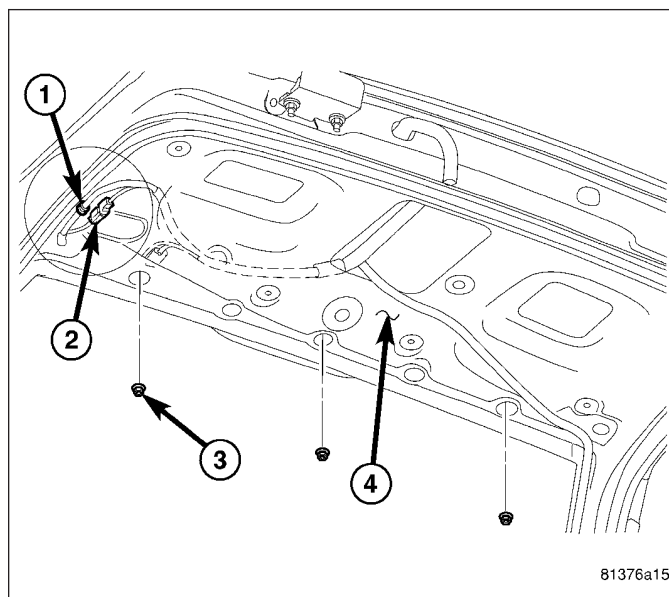


## INSTALLATION

1. Position the rear spoiler (1) to the vehicle.
2. Route the wire harness and rear washer fluid supply hose (2) through the opening in the liftgate and install the grommet to the liftgate.
3. Install the rear spoiler onto the liftgate.



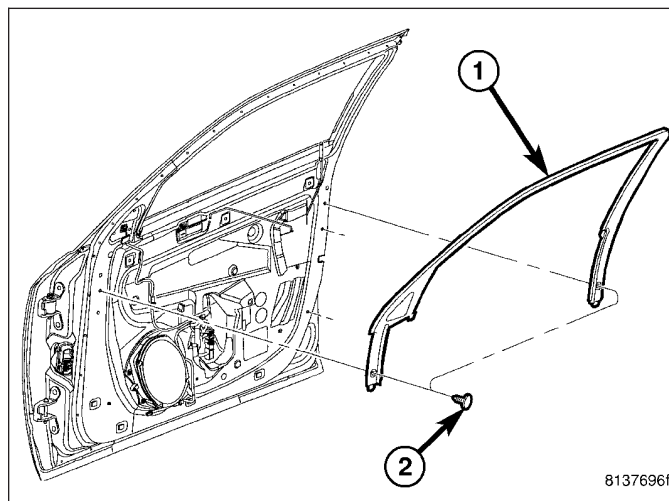
4. Install the nuts (3) that secure the rear spoiler to the liftgate (4). Tighten the nuts securely.
5. Connect the CHMSL wire harness connector (2) and the washer fluid supply hose (1).
6. Install the liftgate upper trim panel (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - INSTALLATION).
7. Connect the negative battery cable.



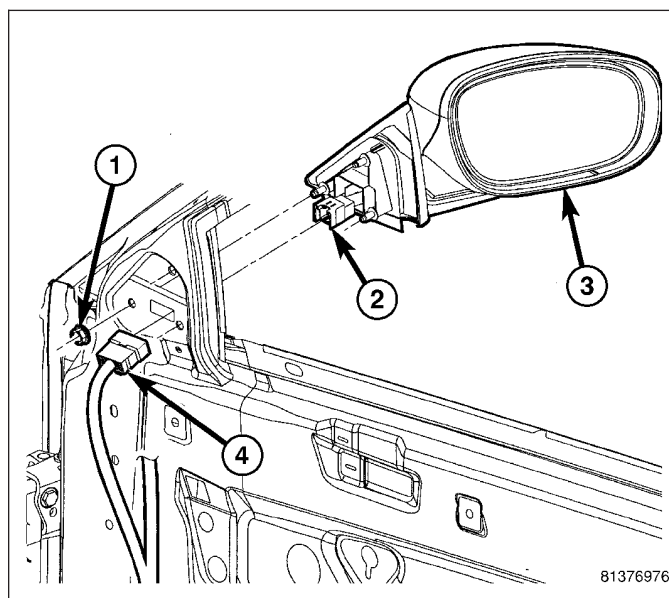
## MIRROR-SIDE VIEW

### REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Remove the trim panel from the inside of the front door (Refer to 23 - BODY/DOOR - FRONT/PANEL-TRIM - REMOVAL).
3. Remove the two push pins (2) that secure the window trim molding (1) to the front door.
4. Remove the window trim molding to gain access to the mirror fasteners.

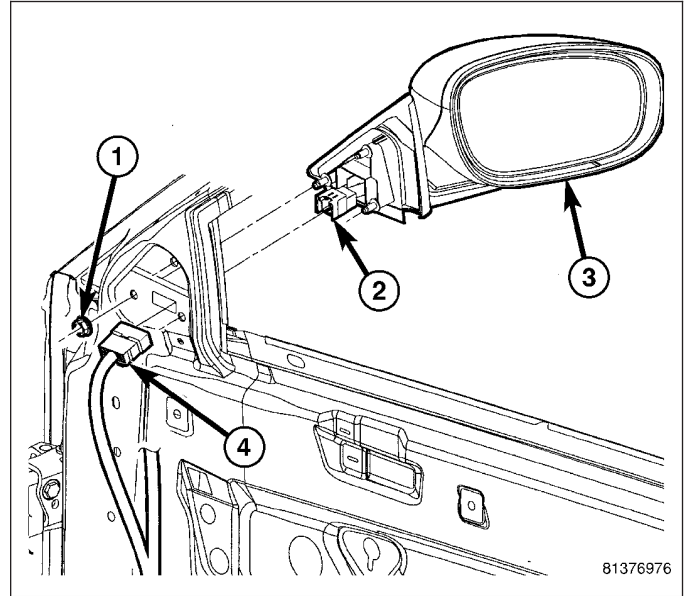


5. Disconnect the door wire harness connector (4) from the mirror electrical connector (2).
6. Remove the three nuts (1) that secure the outside rearview mirror (3) to the front door.
7. Remove the outside rearview mirror from the front door.

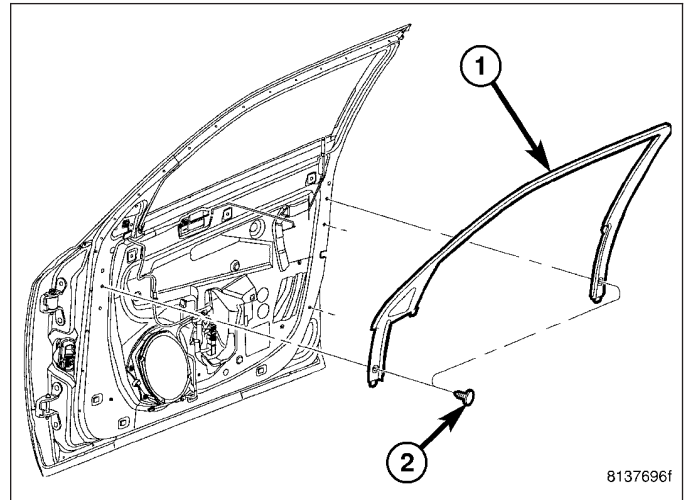


## INSTALLATION

1. Position the outside rearview mirror (3) to the front door.
2. Install the three nuts (1) that secure the mirror to the front door. Tighten the nuts to 7 N·m (60 in. lbs.).
3. Connect the door wire harness connector (4) to the mirror electrical connector (2).



4. Install the window trim molding (1) onto the front door.
5. Install the two push pins (2) that secure the window trim molding to the front door.
6. Install the trim panel to the inside of the front door (Refer to 23 - BODY/DOOR - FRONT/PANEL-TRIM - INSTALLATION).
7. Reconnect the negative battery cable.

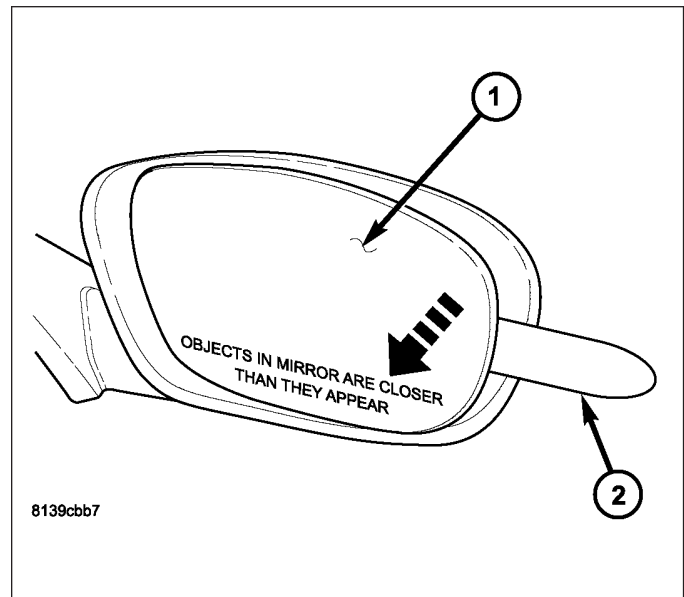


## GLASS-SIDE VIEW MIRROR

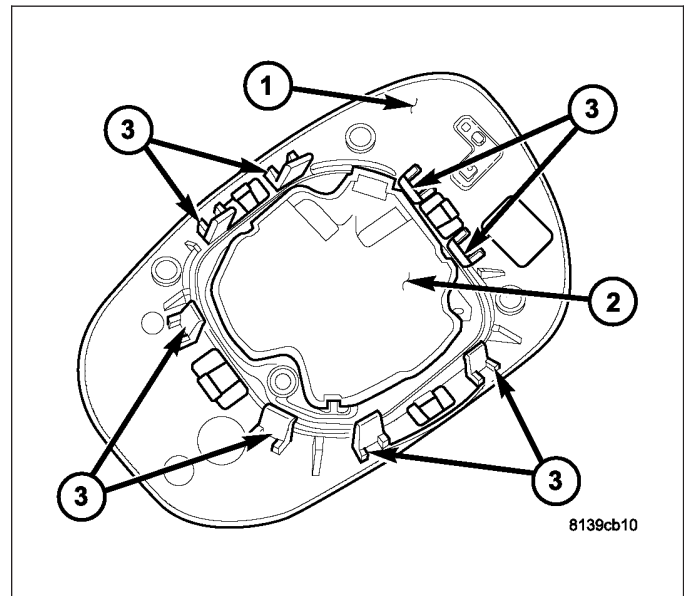
### REMOVAL

**WARNING:** Always wear eye and hand protection when servicing the mirror glass. Failure to observe these warnings may result in personal injury from broken glass.

1. Position the mirror glass (1) so that it is facing in toward the vehicle as far as possible.
2. Disconnect and isolate the negative battery cable.
3. Using a trim stick C-4755 or equivalent flat bladed tool (2), release the two outer mirror glass holder retaining clips from the mirror motor by inserting the trim stick between the mirror glass holder and the mirror motor.

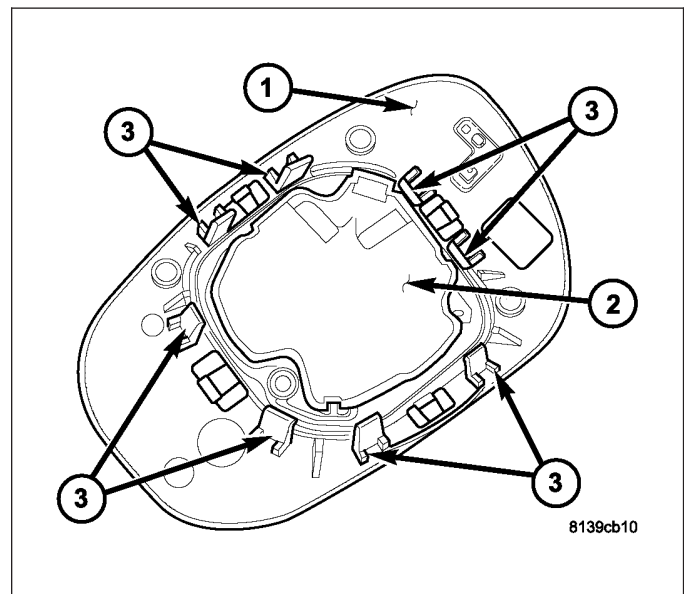


4. Carefully pull/pry the outside edges of the mirror glass holder (1) away from the mirror motor (2) to disengage the remaining six mirror glass retaining clips (3) from the mirror motor.
5. Separate the mirror glass holder from the mirror motor and disconnect the mirror wire harness from the heated glass electrical connector, if equipped.



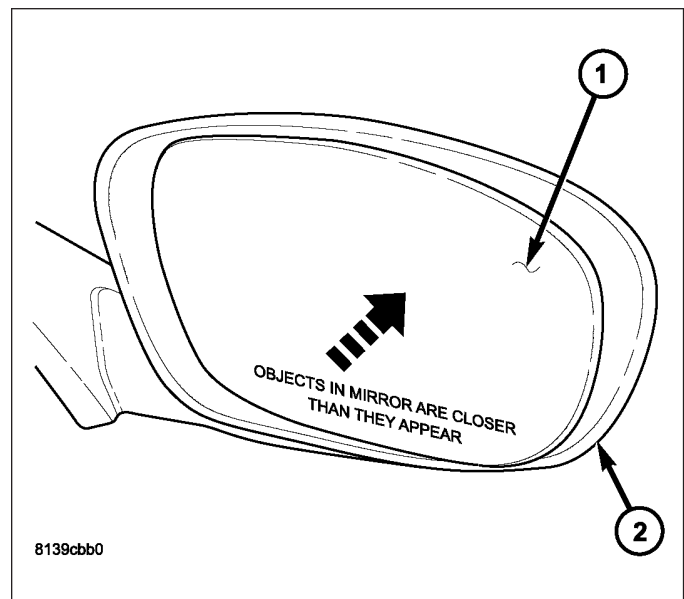
## INSTALLATION

1. Connect the mirror wire harness to the heated glass electrical connector, if equipped.
2. Position the mirror glass holder (1) to the mirror assembly and align the eight mirror glass retaining clips (3) to the mirror motor (2).



**Note:** Pressure must be applied equally over the center portion of the mirror glass to fully engage the mirror glass retaining clips to the mirror motor.

3. Using one hand, carefully push the mirror glass holder (1) onto the mirror motor, while at the same time supporting the mirror housing (2) from the backside with the other hand. Firmly push on the mirror glass holder until all eight mirror glass retaining clips are fully engaged.
4. Verify retention of the mirror glass holder by gently pulling outward on the glass.
5. Reconnect the negative battery cable.



# HOOD

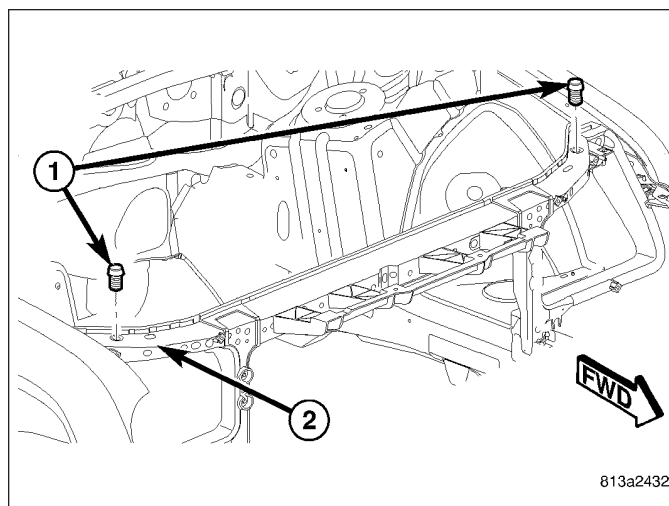
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## ADJUSTMENT BUMPER

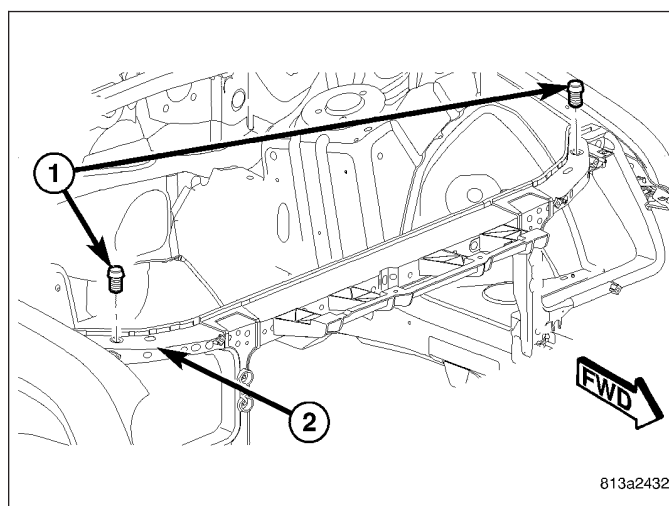
### REMOVAL

1. Open and support the hood.
2. Unscrew the hood adjuster bumper (1) from the mounting hole in the top of the headlamp mounting crossmember (2).
3. Remove the bumper from the vehicle.



### INSTALLATION

1. Screw the hood adjuster bumper (1) into the mounting hole in the top of the headlamp mounting crossmember (2).
2. Thread the bumper in or out of the crossmember as necessary to achieve proper hood closing and alignment.
3. Close the hood.

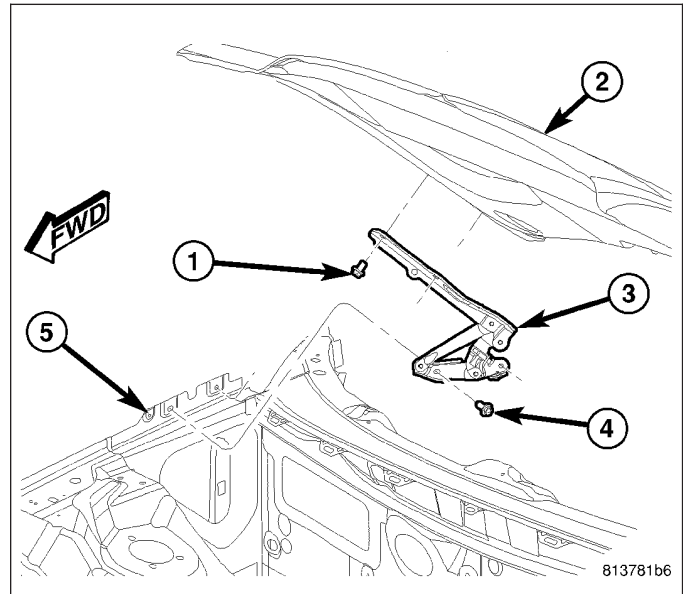




## HINGE

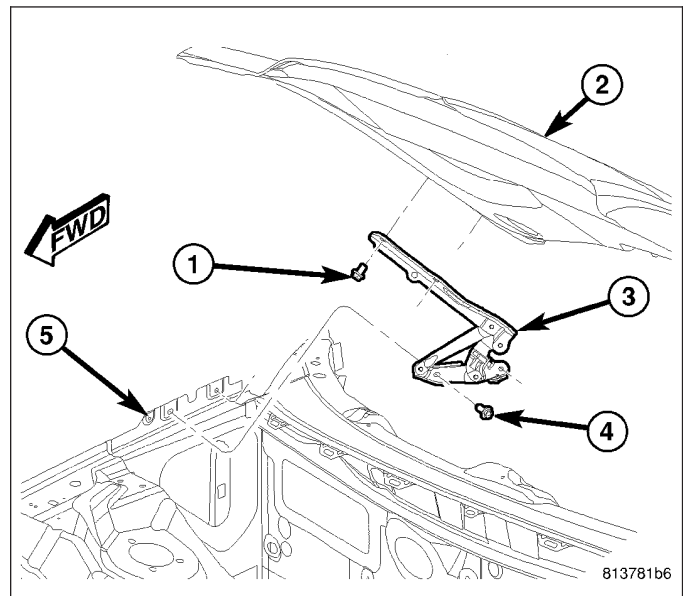
### REMOVAL

1. Open and support the hood (2) with a suitable prop or block.
2. If the vehicle is so equipped, disconnect the upper end of the gas support cylinder from the upper bracket of the hood hinge (3). (Refer to 23 - BODY/HOOD/SUPPORT CYLINDER - REMOVAL).
3. Mark the location of the hood hinge upper bracket on the hood (2) inner panel to aid reinstallation.
4. Remove the two screws (1) that secure the hinge to the hood.
5. Mark the hinge lower bracket location on the inside of the front fender ledge (5) to aid reinstallation.
6. Remove the two screws (4) that secure the hinge to the fender.
7. Remove the hood hinge from the vehicle.



### INSTALLATION

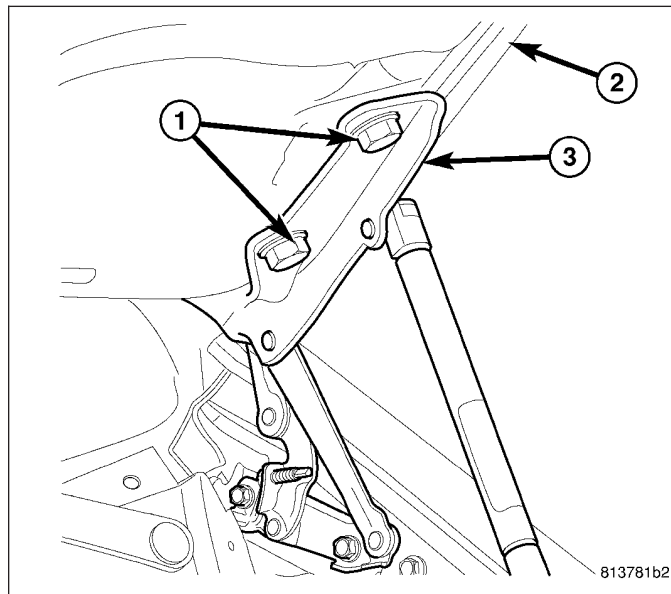
1. Position the lower bracket of the hood hinge (3) to the inside of the front fender ledge (5) on the vehicle.
2. Install and tighten the two screws (4) that secure the hinge to the fender. Tighten the screws to 28 N·m (21 ft. lbs.).
3. Position the hood panel (2) to the upper hinge bracket on the vehicle.
4. Install and tighten the two screws (2) that secure the hinge to the hood. Tighten the screws to 28 N·m (21 ft. lbs.).
5. If the vehicle is so equipped, reinstall the upper end of the gas support cylinder to the upper hinge bracket. (Refer to 23 - BODY/HOOD/SUPPORT CYLINDER - INSTALLATION).
6. Remove the fixture being used to support the hood for service and close the hood.
7. Adjust the hood hinge position as necessary to achieve proper spacing and operation.



## HOOD

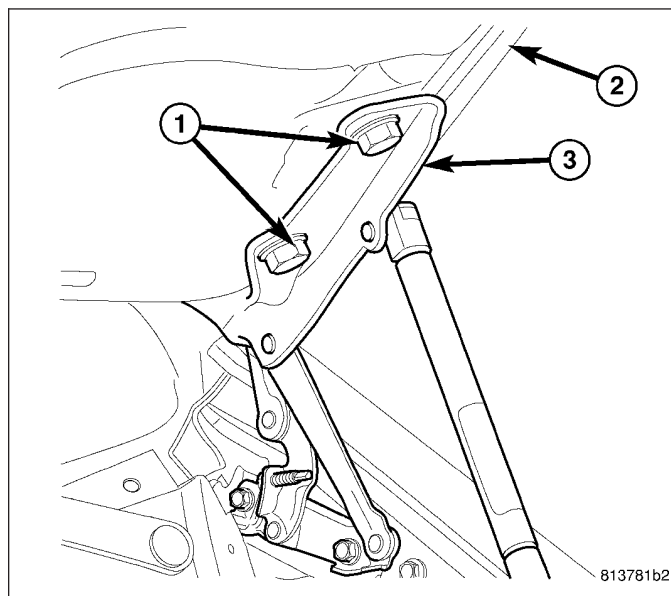
### REMOVAL

1. Open and support the hood (2).
2. Disconnect the washer supply hose between the body and the two washer nozzles on the underside of the hood.
3. Mark both upper hinge bracket (3) locations on the hood inner panel to aid reinstallation.
4. With the aid of an assistant, support the hood while removing the two screws (1) that secure each upper hinge bracket to the hood.
5. Remove the hood from the vehicle.



### INSTALLATION

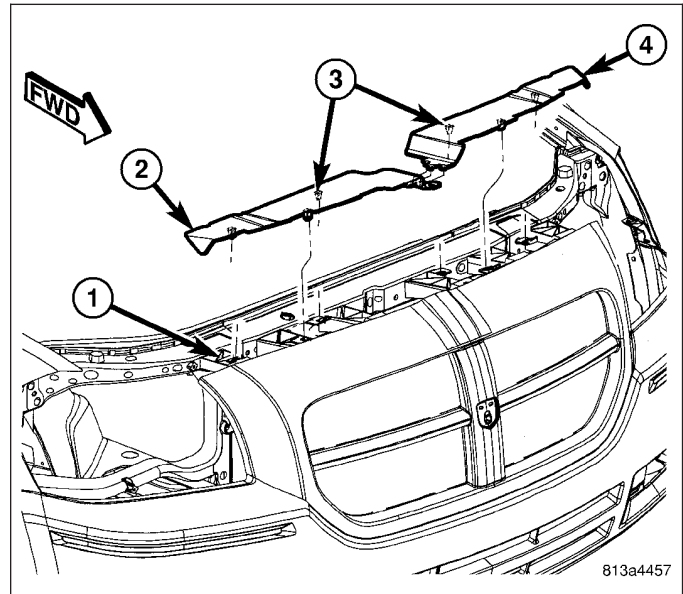
1. With the aid of an assistant, support and position the hood panel (2) to the two upper hinge brackets (3) on the vehicle.
2. Install and tighten the two screws (1) that secure each upper hinge bracket to the hood. Tighten the screws to 28 N·m (21 ft. lbs.).
3. Reconnect the washer supply hose between the body and the two washer nozzles on the underside of the hood.
4. Close the hood.
5. Adjust the hood hinge positions and the hood adjuster bumpers as necessary to achieve proper spacing and operation.



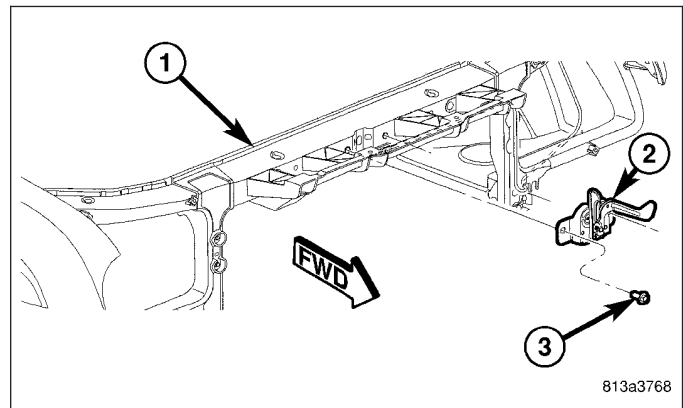
## LATCH

### REMOVAL

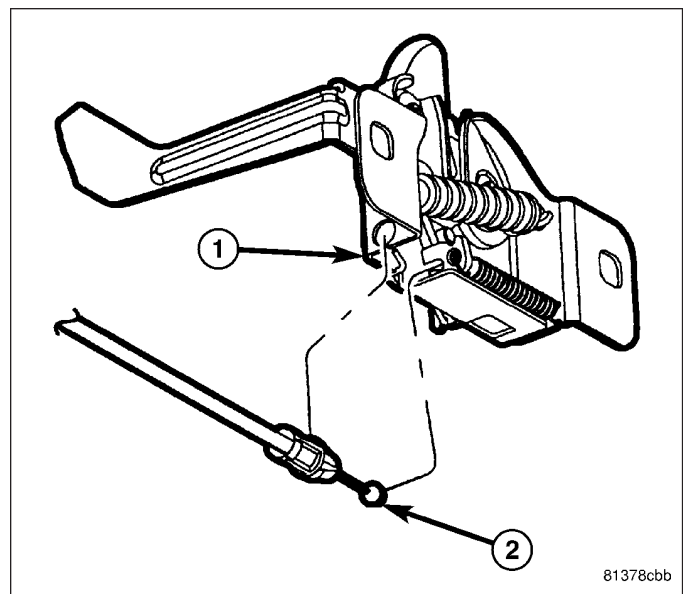
1. Disconnect and isolate the battery negative cable.
2. Unsnap the left underhood appearance cover (4) from the headlamp mounting crossmember (1).
3. Disengage the interlocking feature on the inboard end of the left underhood appearance cover from the inboard end of the right cover (2) and remove it from the vehicle.
4. Unsnap the right underhood appearance cover from the headlamp mounting crossmember and remove it from the vehicle.



5. Mark the location of the hood latch (2) on the front of the headlamp mounting crossmember (1) to aid reinstallation.
6. Remove the two screws (3) that secure the latch to the front of the crossmember.

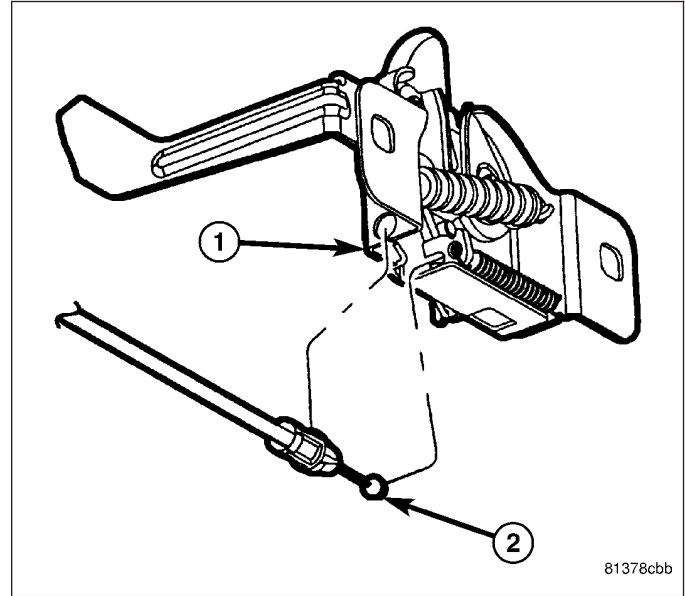


7. Pull the latch (1) away from the front of the crossmember far enough to access and disengage the hood latch release cable housing from the latch and the cable ball end (2) from the latch lever.
8. Remove the hood latch from the vehicle.

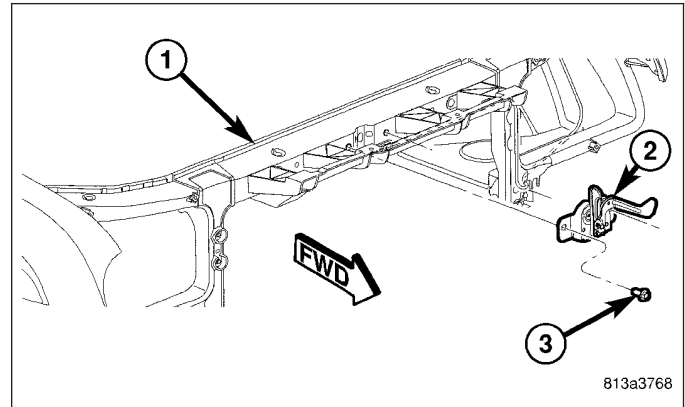


## INSTALLATION

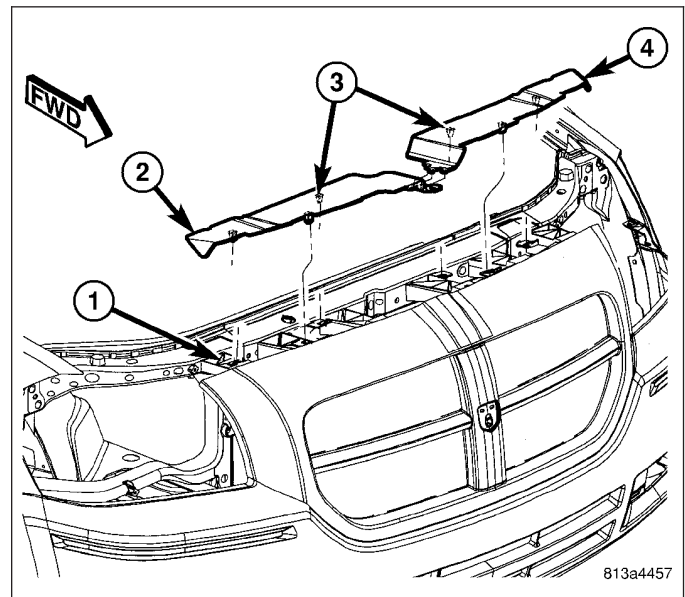
1. Position the hood latch (1) close enough to the front of the headlamp mounting crossmember to access and engage the hood latch release cable ball end (2) to the latch lever and the cable housing to the latch.



2. Position the latch (2) to the front of the crossmember (1).
3. Install and tighten the two screws (3) that secure the latch to the crossmember. Tighten the screws to 28 N·m (21 ft. lbs.).
4. Adjust the latch position as necessary to achieve proper hood latch operation.



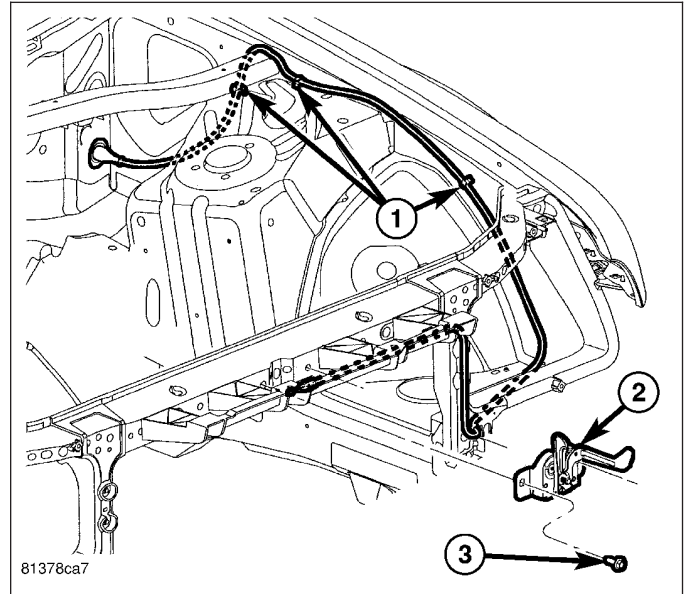
5. Position the right underhood appearance cover (2) to the headlamp mounting crossmember (1).
6. Using hand pressure, press the right appearance cover downward until each of the integral clips (3) snaps into the receptacles in the headlamp mounting crossmember.
7. Engage the interlocking feature on the inboard end of the left appearance cover (4) with the inboard end of the right cover and position it to the headlamp mounting crossmember.
8. Using hand pressure, press the left appearance cover downward until each of the integral clips snaps into the receptacles in the headlamp mounting crossmember.
9. Reconnect the battery negative cable.



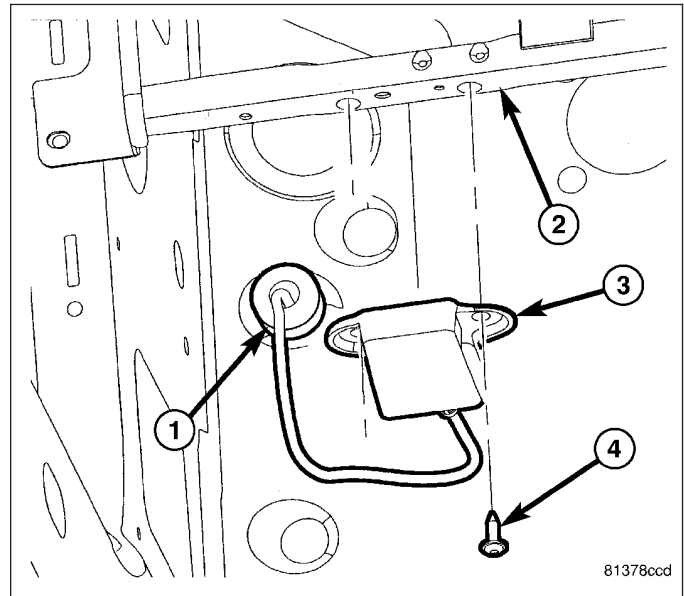
## LATCH RELEASE CABLE

### REMOVAL

1. Remove the hood latch (2) from the vehicle. (Refer to 23 - BODY/HOOD/LATCH - REMOVAL).
2. Remove the left headlamp unit from the vehicle. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - REMOVAL).
3. Disengage the hood latch release cable from the integral routing clips on the headlamp mounting crossmember and the routing clips (1) along the left side of the engine compartment.

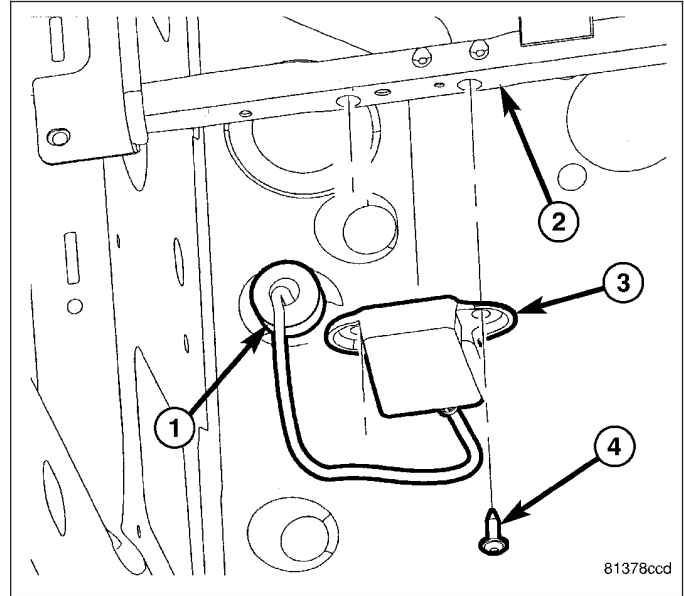


4. From the passenger compartment, remove the closeout panel from beneath the left side of the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL SILENCER - REMOVAL).
5. Unseat the hood latch release cable grommet (1) from the dash panel.
6. Remove the two screws (4) that secure the hood latch release handle (3) to the lower instrument panel reinforcement (2).
7. Remove the hood latch release handle and cable through the passenger compartment of the vehicle.

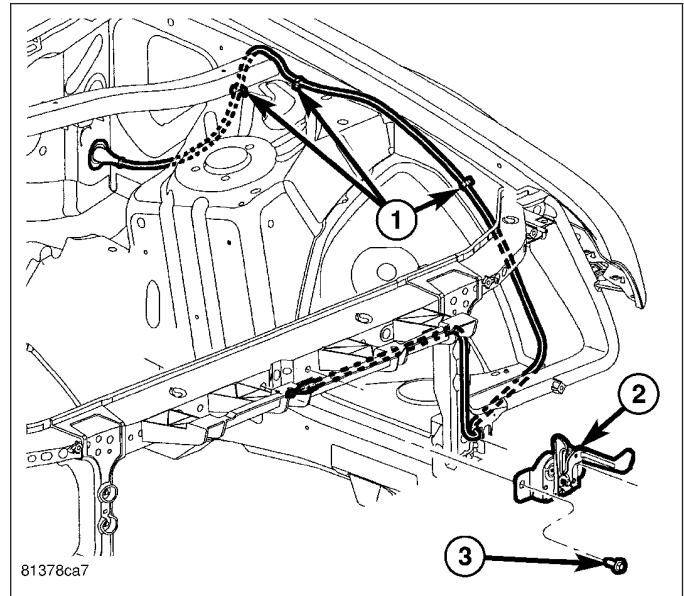


## INSTALLATION

1. Position the hood latch release handle and cable (3) under the left side of the instrument panel in the passenger compartment of the vehicle.
2. Thread the cable through the appropriate hole in the dash panel far enough to seat the cable grommet (1) into the hole.
3. Position the hood latch release handle to the lower instrument panel reinforcement (2).
4. Install and tighten the two screws (4) that secure the handle to the reinforcement. Tighten the screws to 5 N·m (45 in. lbs.).
5. Reinstall the closeout panel beneath the left side of the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL SILENCER - INSTALLATION).



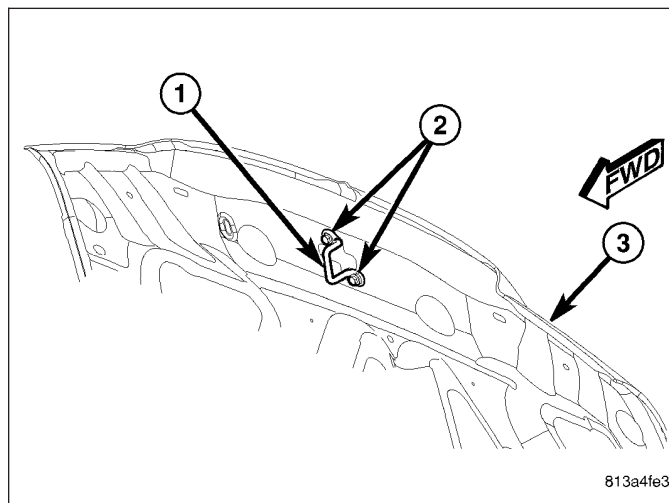
6. Route the hood latch release cable from the dash panel along the left side of the engine compartment to the center of the headlamp mounting crossmember as shown.
7. Fully engage the cable into the integral routing clips on the headlamp mounting crossmember and the routing clips (1) along the left side of the engine compartment.
8. Reinstall the left headlamp unit to the vehicle. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP UNIT - INSTALLATION).
9. Reinstall the hood latch (2) to the vehicle. (Refer to 23 - BODY/HOOD/LATCH - INSTALLATION).



## LATCH STRIKER

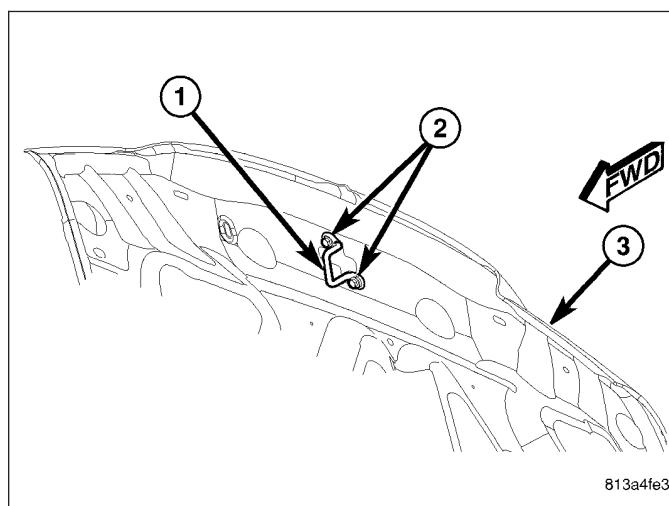
### REMOVAL

1. Open and support the hood (3).
2. Remove the two screws (2) that secure the latch striker (1) to the hood inner reinforcement.
3. Remove the striker from the vehicle.



### INSTALLATION

1. Position the latch striker (1) to the underside of the hood (3).
2. Install and tighten the two screws (2) that secure the striker to the hood inner reinforcement. Tighten the screws to 28 N·m (21 ft. lbs.).
3. Close the hood.

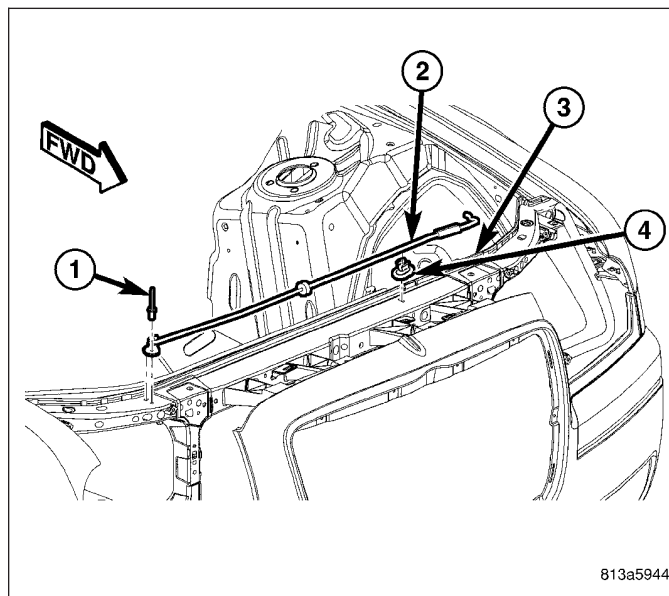




## PROP ROD

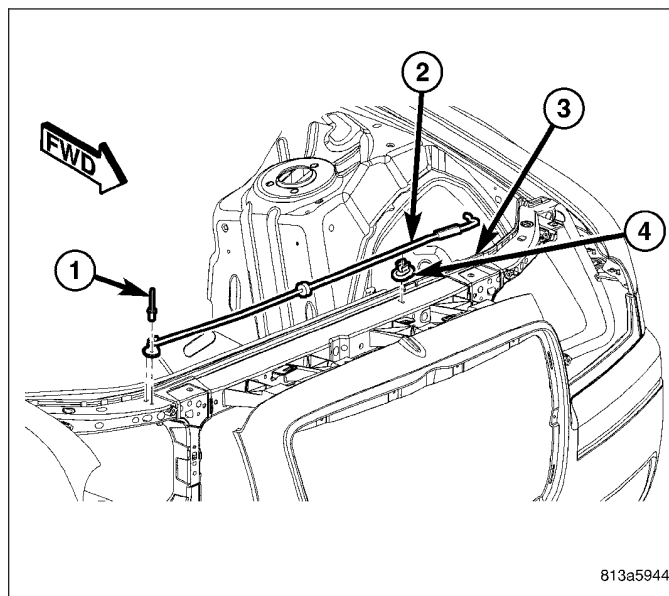
### REMOVAL

1. Open and support the hood.
2. Remove the blind rivet (1) that secures the hood prop rod (2) pivot bracket to the right side of the headlamp mounting crossmember (3).
3. Disengage the prop rod from the rod clip (4) on the left side of the headlamp mounting crossmember.
4. Remove the hood prop rod from the vehicle.



### INSTALLATION

1. Position the hood prop rod (2) pivot bracket to the right side of the headlamp mounting crossmember (3).
2. Secure the pivot bracket to the headlamp mounting crossmember with a new blind rivet (1).
3. Engage the prop rod into the rod clip (4) on the left side of the headlamp mounting crossmember.
4. Close the hood.

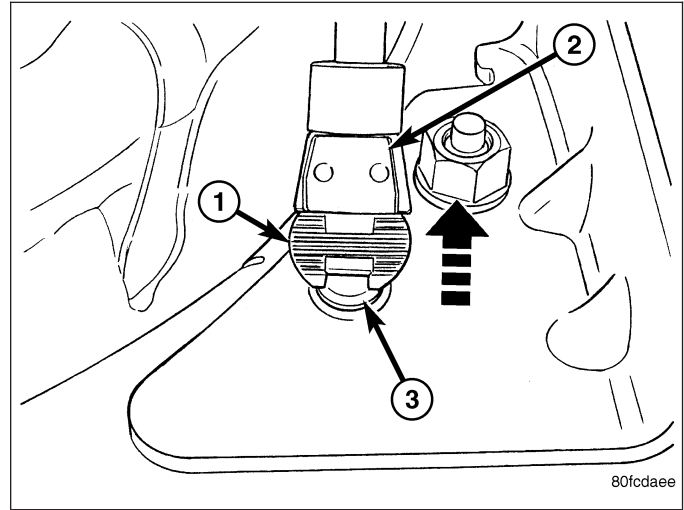




## SUPPORT CYLINDER

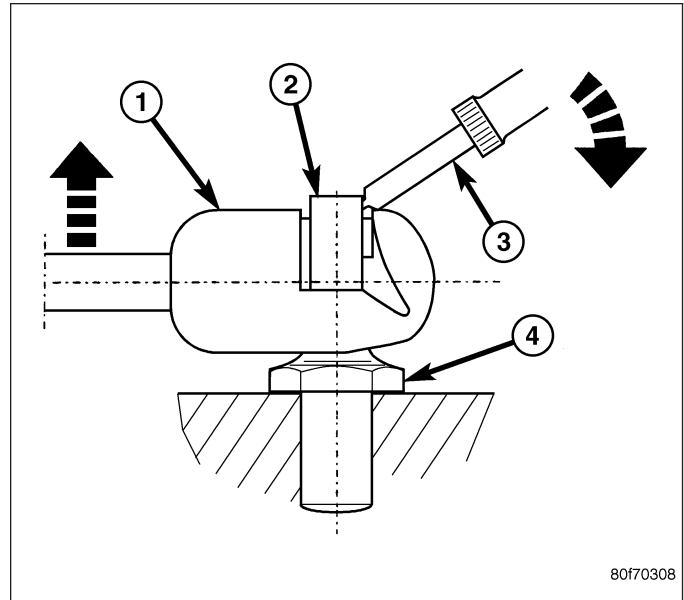
### REMOVAL

1. Open and support the hood with a suitable prop or block.
2. Insert a small flat-bladed tool into the lower notch of the retainer (1) of the lower ball socket end (2) of the support cylinder on the top of the fender load beam and carefully pry the retaining clip upward to the installation position.



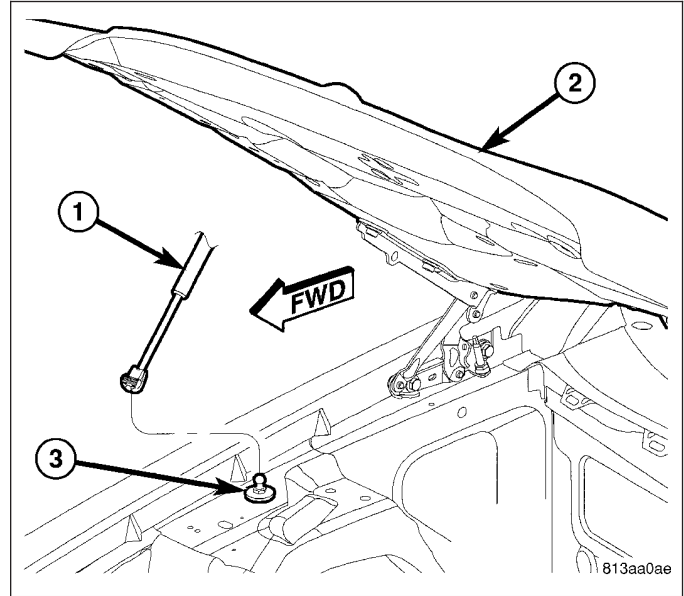
**WARNING:** To avoid personal injury or death, during service lift the ball socket end retaining clip only far enough to release the socket from the ball stud. Excessive prying or removal of the clip may result in improper clip spring tension. Improper clip tension may result in the support cylinder separating from the ball stud causing sudden, unexpected loss of hood support.

3. Insert a small flat-bladed tool (3) into the notch on the outer face of the upper ball socket end (1) of the support cylinder and carefully pry the retaining clip (2) outward while pulling the ball socket away from the ball stud (4) on the upper hood hinge bracket.
4. Release the retaining clip to its installed position.
5. Disengage the lower ball socket from the ball stud.
6. Remove the support cylinder from the vehicle.

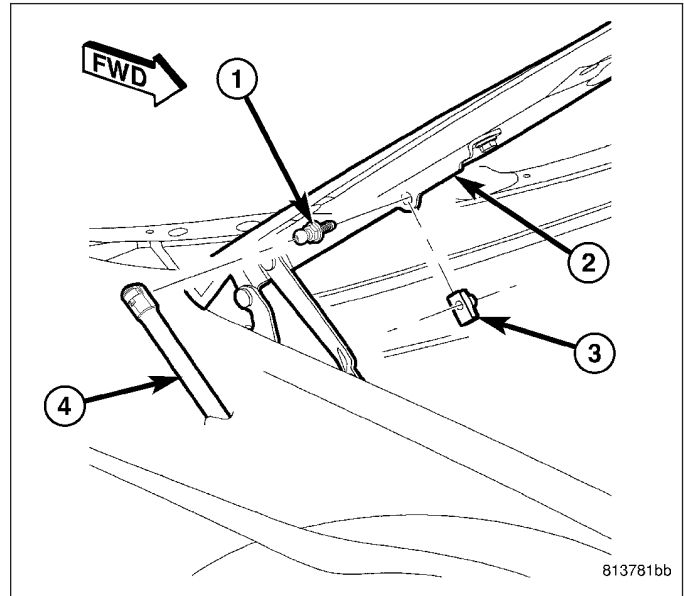


## INSTALLATION

1. Check to be certain that the ball stud (3) on the top of the fender load beam is in good condition and properly installed. Tighten the ball stud to 28 N·m (21 ft. lbs.).
2. Position the ball socket on the rod end of the support cylinder (1) to the ball stud on the top of the fender load beam.



3. Check to be certain that the ball stud (1) secured by a U-nut (3) to the upper bracket (2) of the hood hinge is in good condition and properly installed. Tighten the ball stud to 28 N·m (21 ft. lbs.).
4. Position the ball socket on the cylinder end of the support cylinder (4) to the ball stud on the upper bracket of the hood hinge.
5. Using hand pressure, press the ball socket onto the ball stud until the retainer clip snaps into place.
6. Inspect to be certain that the retaining clip on each of the support cylinder ball socket ends is fully seated.
7. Remove the service prop or block and close the hood.



INSTRUMENT PANEL

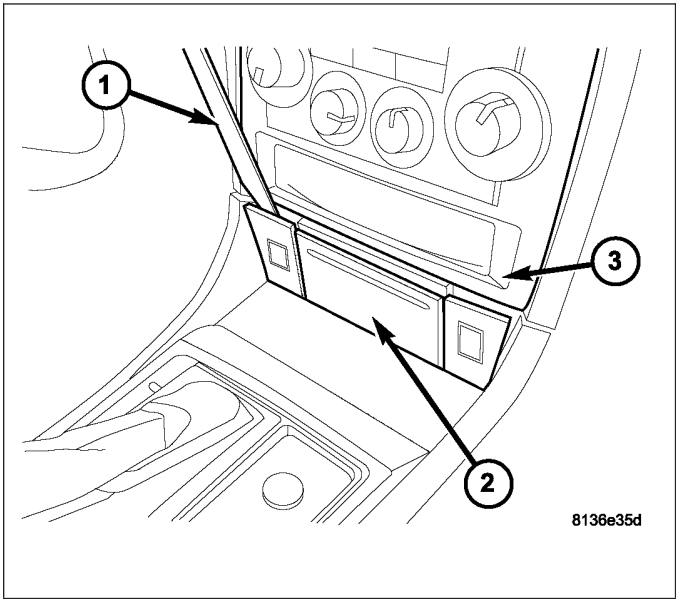
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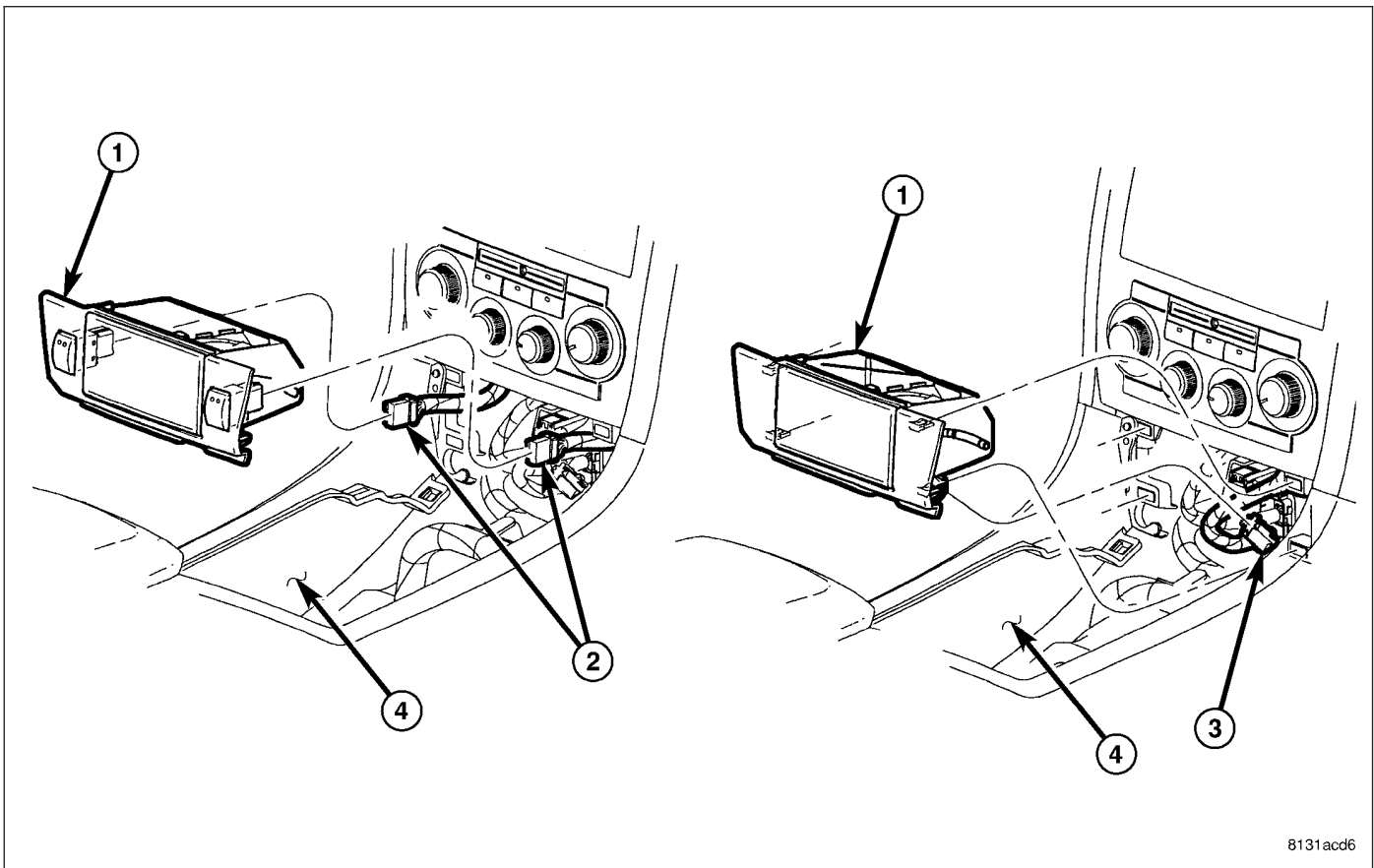
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ASH RECEIVER

REMOVAL

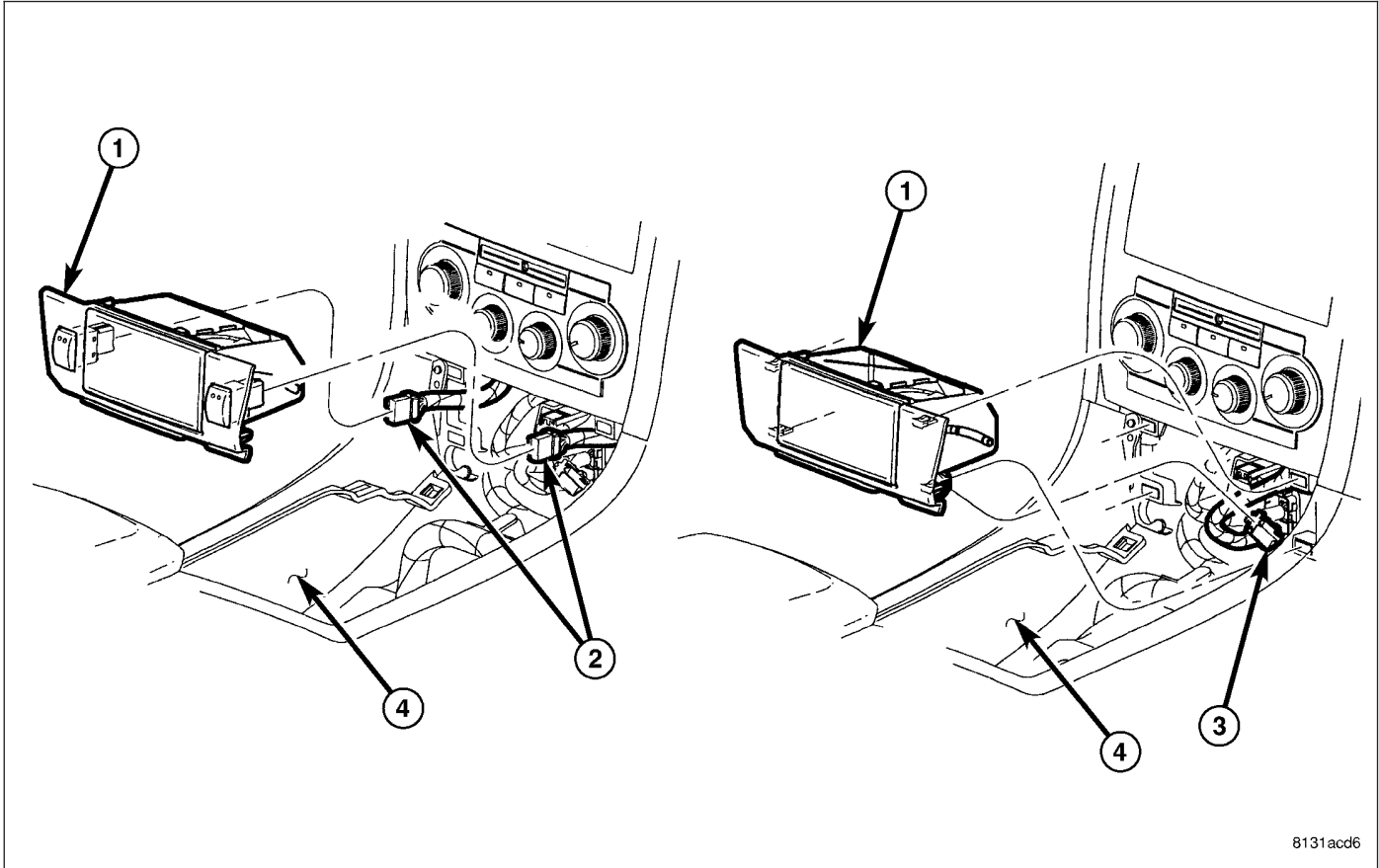
1. Disconnect and isolate the negative battery cable.
2. Remove the gear shift center bezel from the floor console (4) (Refer to 23 - BODY/INTERIOR/CONSOLE-FLOOR - REMOVAL).
3. Set the emergency brake and place the gear shift lever into Low gear.
4. Using a trim stick C-4755 or equivalent (1), remove the ash receiver (2) from the instrument panel (3) by releasing the snap retainers from the instrument panel.





5. If equipped, disconnect the wire harness connectors (2) from the heated seat switches and remove the switches as required(Refer to 8 - ELECTRICAL/HEATED SEATS/SWITCH-HEATED SEAT - REMOVAL).
6. Disconnect the wire harness connector (3) from the lighter and remove the lighter assembly as required.
7. Remove the ash receiver from the vehicle.

## INSTALLATION



1. If equipped and removed, install the heated seat switches into the ash receiver (Refer to 8 - ELECTRICAL/ HEATED SEATS/SEAT SWITCH - INSTALLATION) and connect the wire harness connectors (2) to the switches.
2. If removed, install the lighter assembly into the ash receiver and connect the wire harness connector (3) to the lighter.
3. Install the ash receiver assembly (1) into the instrument panel by carefully pushing the receiver housing into the instrument panel until the snap retainers are fully seated.
4. Install the gear shift center bezel onto the floor console (4)
5. Place the gear shift lever into Park and release the emergency brake.
6. Reconnect the negative battery cable.

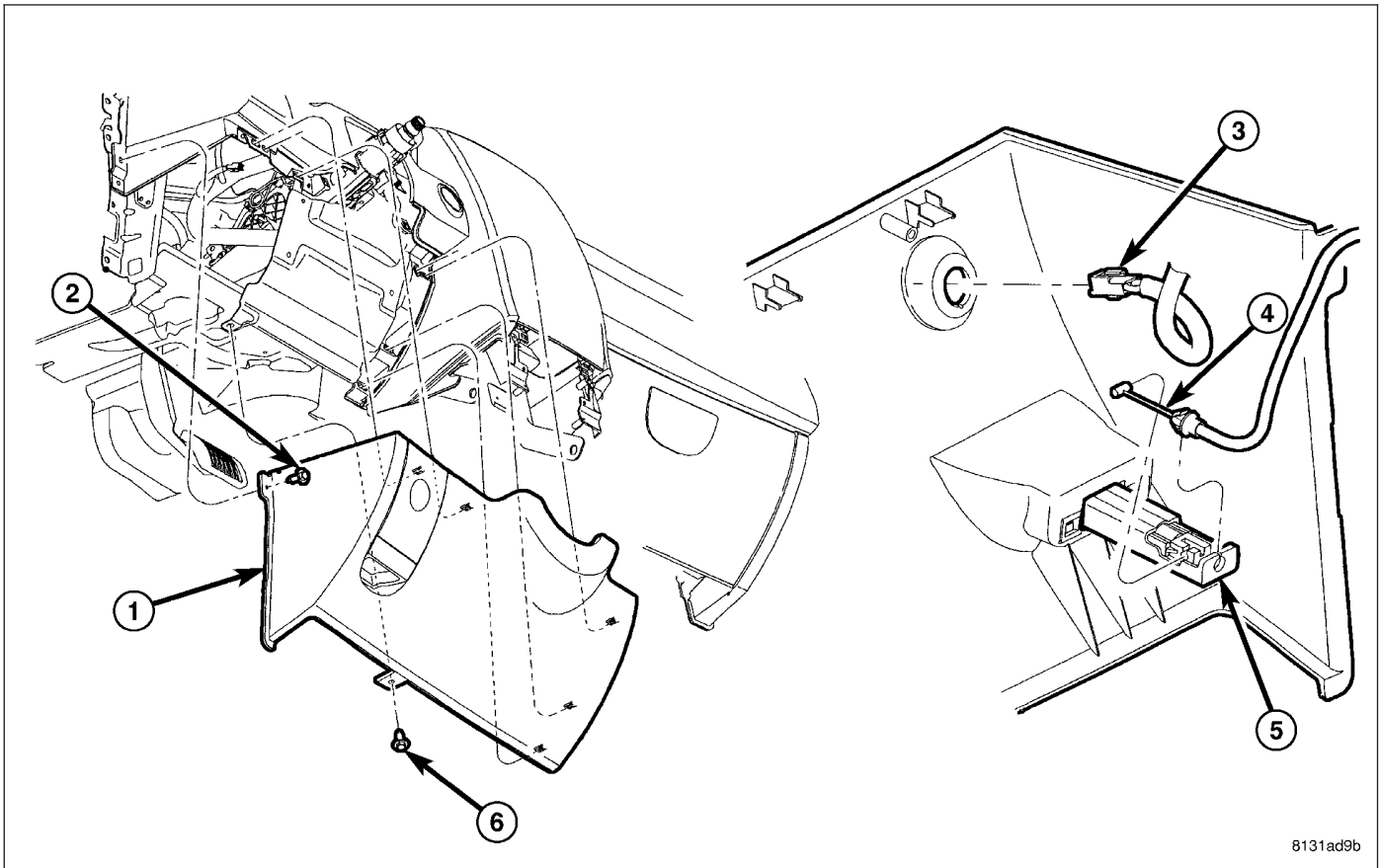
## ASSEMBLY-INSTRUMENT PANEL

### REMOVAL

**WARNING:** To avoid personal injury or death, on vehicles equipped with air bags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

**WARNING:** To avoid personal injury or death, never strike or drop the occupant restraint controller, as it can damage the impact sensor or affect its calibration. The occupant restraint controller contains the impact sensor, which enables the system to deploy the supplemental restraints. If an airbag control module is accidentally dropped during service, the module must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper supplemental restraint deployment.

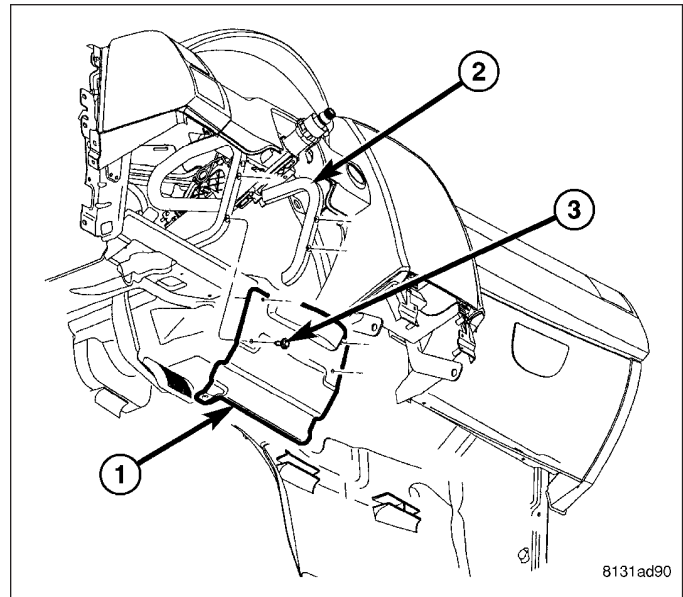
**CAUTION:** On vehicles equipped with the Occupant Classification System (OCS), never replace both the Occupant Restraint Controller (ORC) and the Occupant Classification Module (OCM) at the same time. If both require replacement, replace one. Then perform the supplemental restraint verification test before replacing the other. Both the ORC and the OCM store OCS calibration data, which they transfer to one another when one of them is replaced. If both are replaced at the same time, an irreversible fault will be set in both modules.



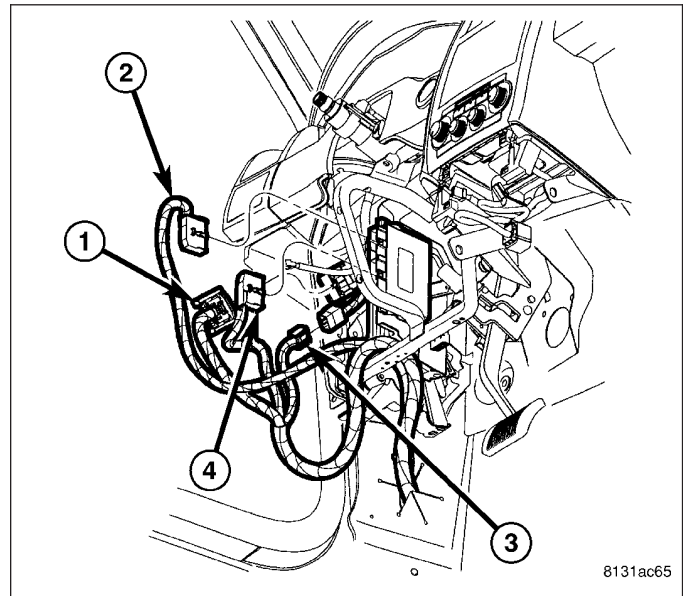
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1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING).
2. Disconnect and isolate negative battery cable.
3. Raise and support the vehicle.
4. Disconnect the steering column from the steering coupling (Refer to 19 - STEERING/COLUMN/STEERING COUPLING - REMOVAL).
5. Lower the vehicle.
6. Remove the left and right side instrument panel silencers (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL SILENCER - REMOVAL).
7. Remove the screws (2 and 6) that secure the steering column cover (1) to the instrument panel.
8. Disconnect the wire harness connector (3) from the trunk release switch.
9. Disconnect the hood release cable (4) from the hood release handle (5) and remove the steering column cover from the vehicle.

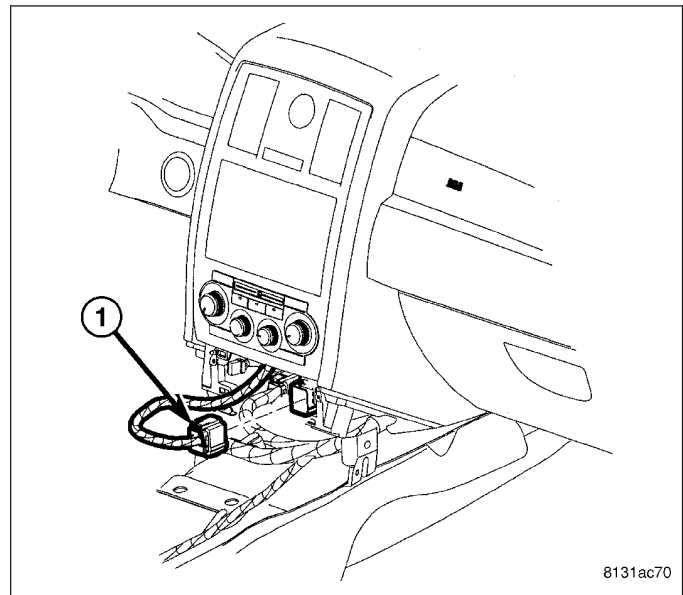
10. Remove the screws (3) that secure the instrument panel steering column cover reinforcement (1) to the bracket (2) and remove the reinforcement from the vehicle.



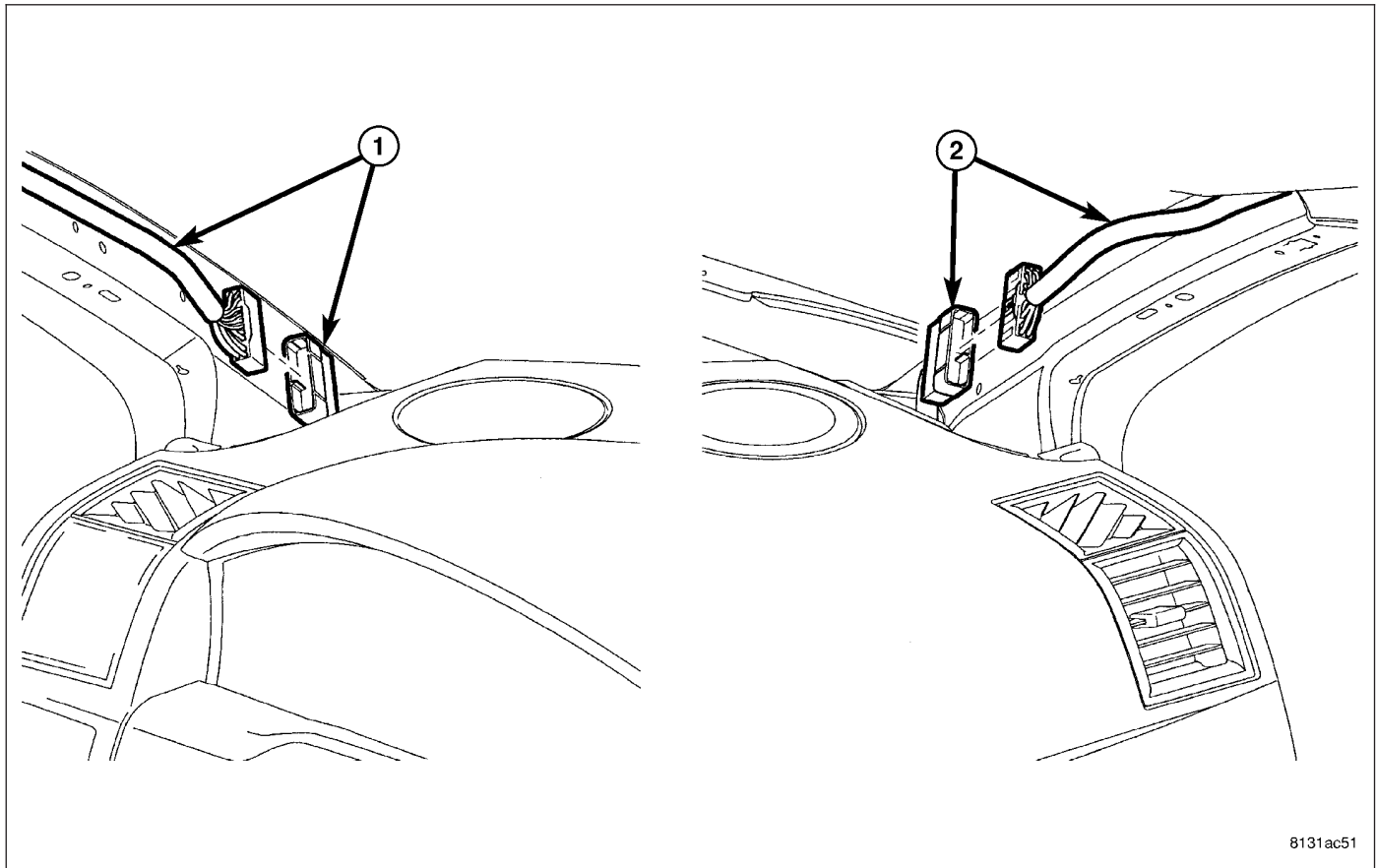
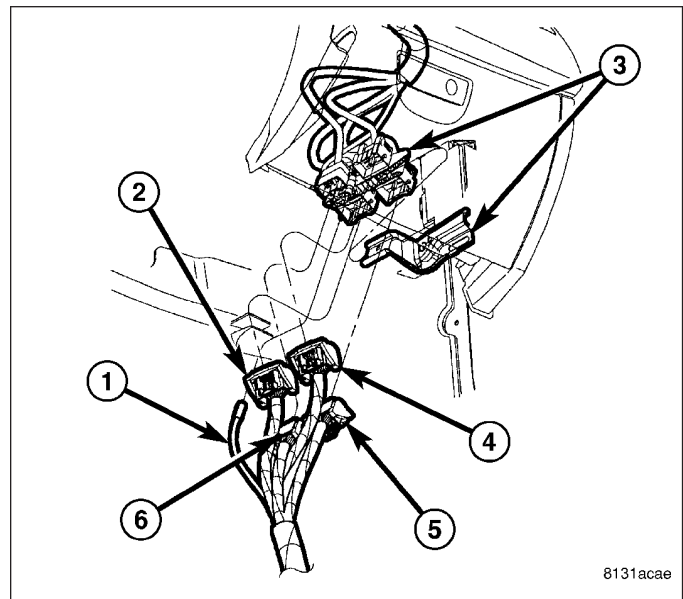
11. Disconnect the body wire harness connectors (1 and 3) from the instrument panel wire harness connectors.
12. Disconnect the body wire harness connectors (2 and 4) from the transmission control module.



13. Remove the center floor console (Refer to 23 - BODY/INTERIOR/CONSOLE-FLOOR - REMOVAL).
14. Remove the ash receiver from the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/ASH RECEIVER - REMOVAL).
15. Disconnect the instrument panel wire harness connector (1) from the occupant restraint controller (ORC) module.

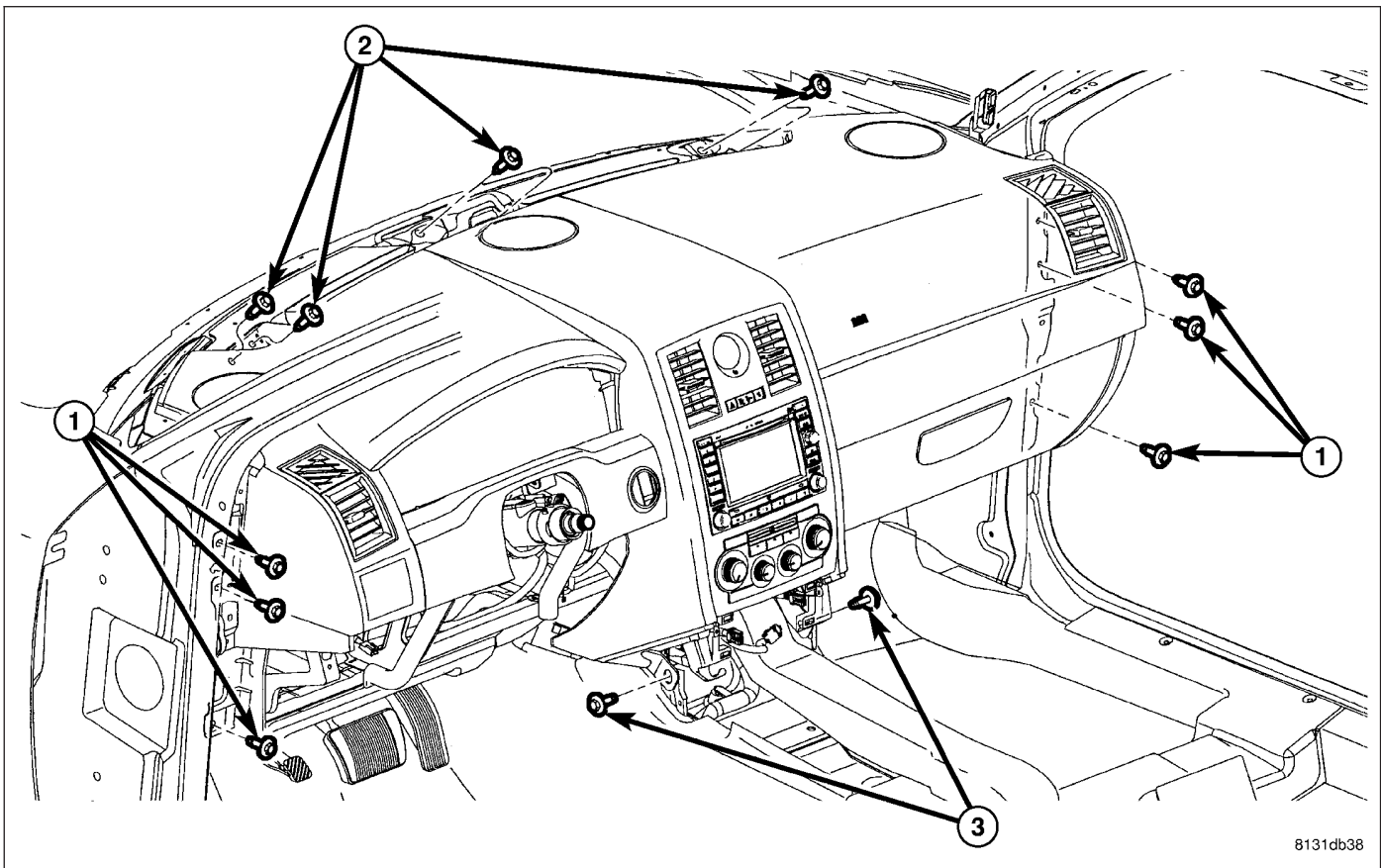


16. Disconnect the antenna coax (1) from the instrument panel coax extension.
17. Disconnect the wire harness connectors (2, 4, 5 and 6) from the instrument panel wire harness connectors (3).

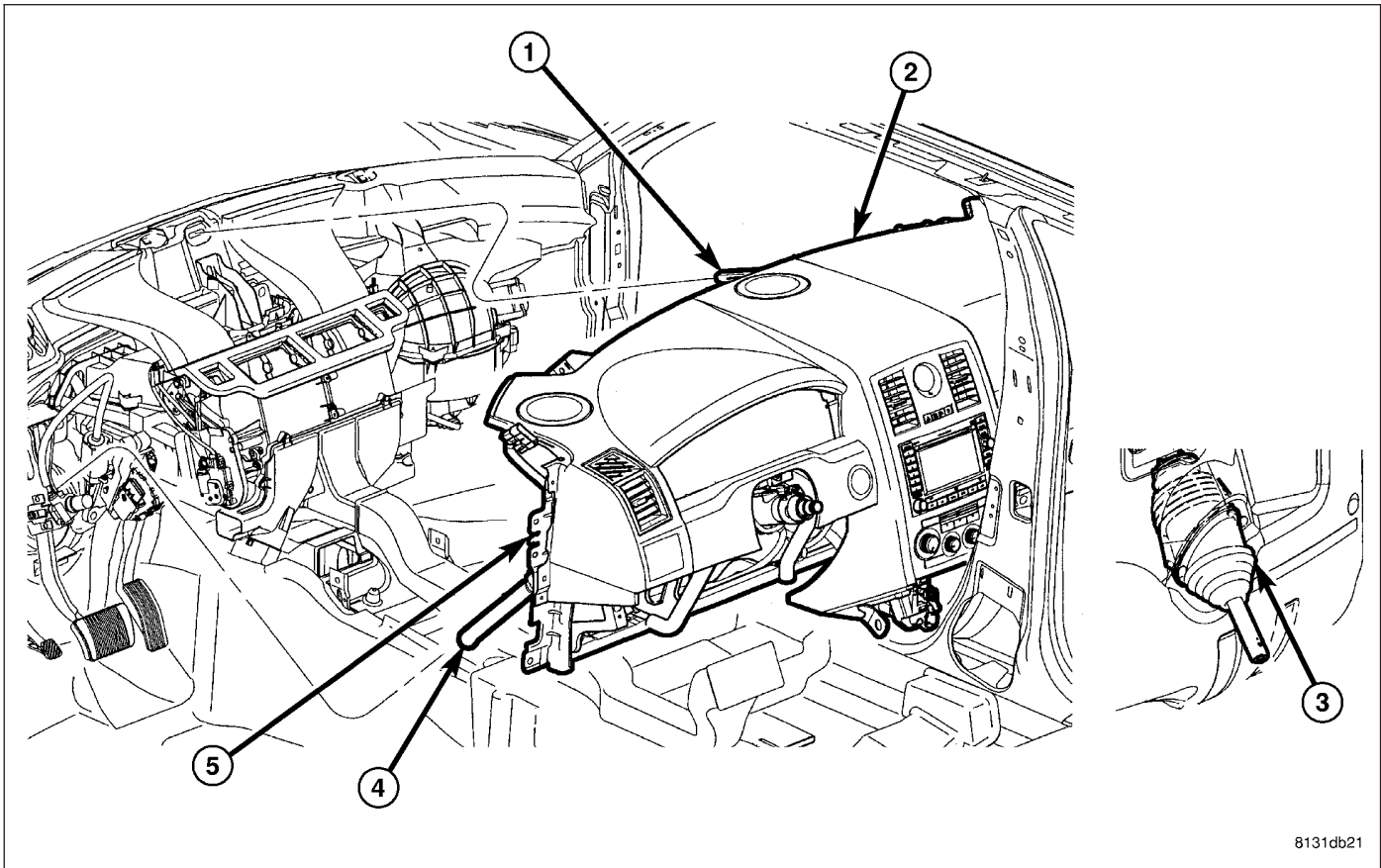


18. Remove the A-pillar trim panels (Refer to 23 - BODY/INTERIOR/PANEL-A-PILLAR TRIM - REMOVAL).
19. Disconnect the wire harness connectors (1 and 2) located on the A-pillars.

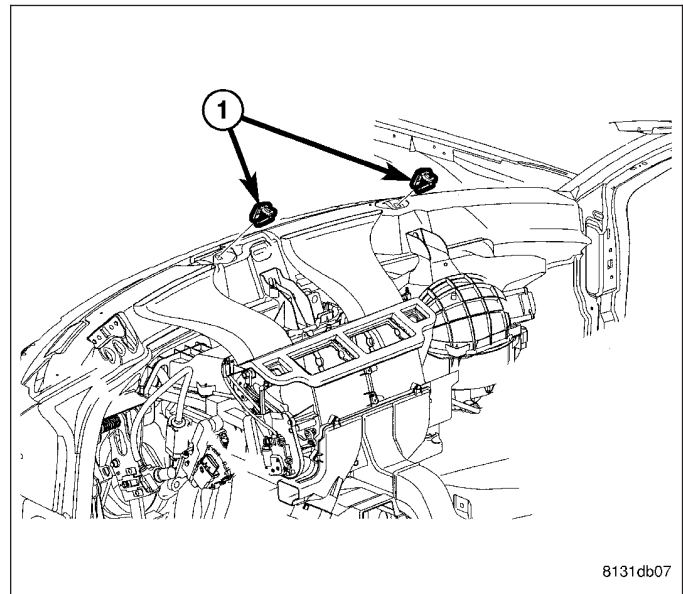




20. Remove the end caps from the left and right side of the instrument panel to access the instrument panel side support bolts (1) and remove the bolts.
21. Remove the defroster grille to access the instrument panel top retaining bolts (2) and remove the bolts (Refer to 23 - BODY/INSTRUMENT PANEL/GRILLE-DEFROSTER - REMOVAL).
22. Remove the bolts (3) that secure the bottom of the instrument panel.



23. Lift the instrument panel assembly (2) off of the supports (1 and 5). Guide the steering column end (4) through the opening in the dash panel (3) and remove the instrument panel through the passenger door.
24. If required, remove the spring nuts (1) from the dash panel.



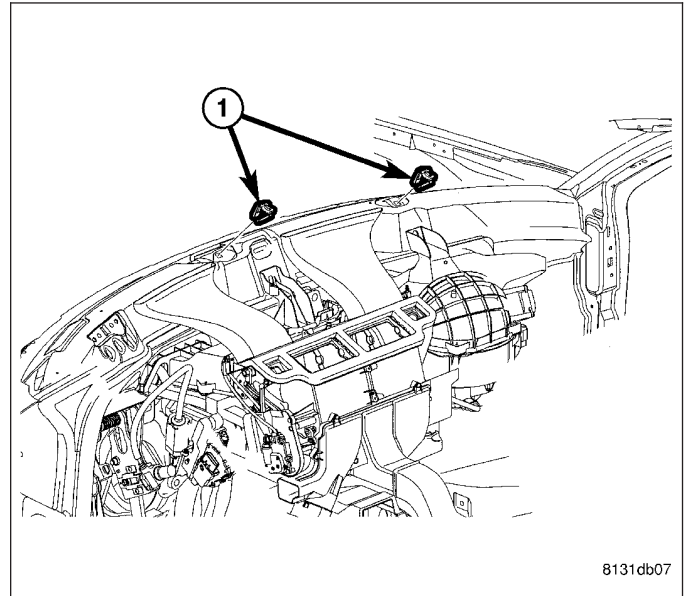
## INSTALLATION

**WARNING:** To avoid personal injury or death, on vehicles equipped with air bags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment.

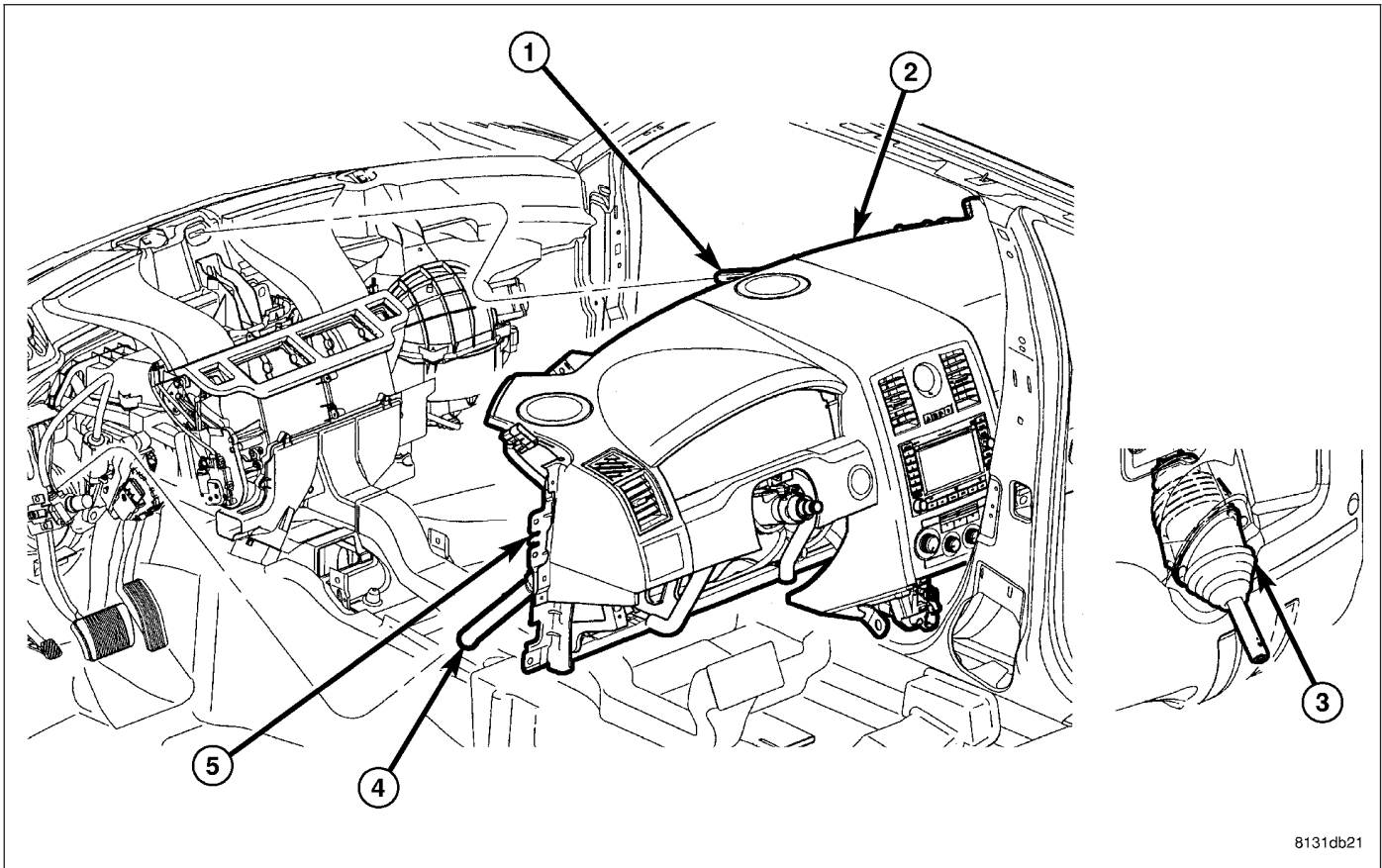
**WARNING:** To avoid personal injury or death, never strike or drop the occupant restraint controller, as it can damage the impact sensor or affect its calibration. The occupant restraint controller contains the impact sensor, which enables the system to deploy the supplemental restraints. If an airbag control module is accidentally dropped during service, the module must be scrapped and replaced with a new unit. Failure to observe this warning could result in accidental, incomplete, or improper supplemental restraint deployment.

**CAUTION:** On vehicles equipped with the Occupant Classification System (OCS), never replace both the Occupant Restraint Controller (ORC) and the Occupant Classification Module (OCM) at the same time. If both require replacement, replace one. Then perform the supplemental restraint verification test before replacing the other. Both the ORC and the OCM store OCS calibration data, which they transfer to one another when one of them is replaced. If both are replaced at the same time, an irreversible fault will be set in both modules.

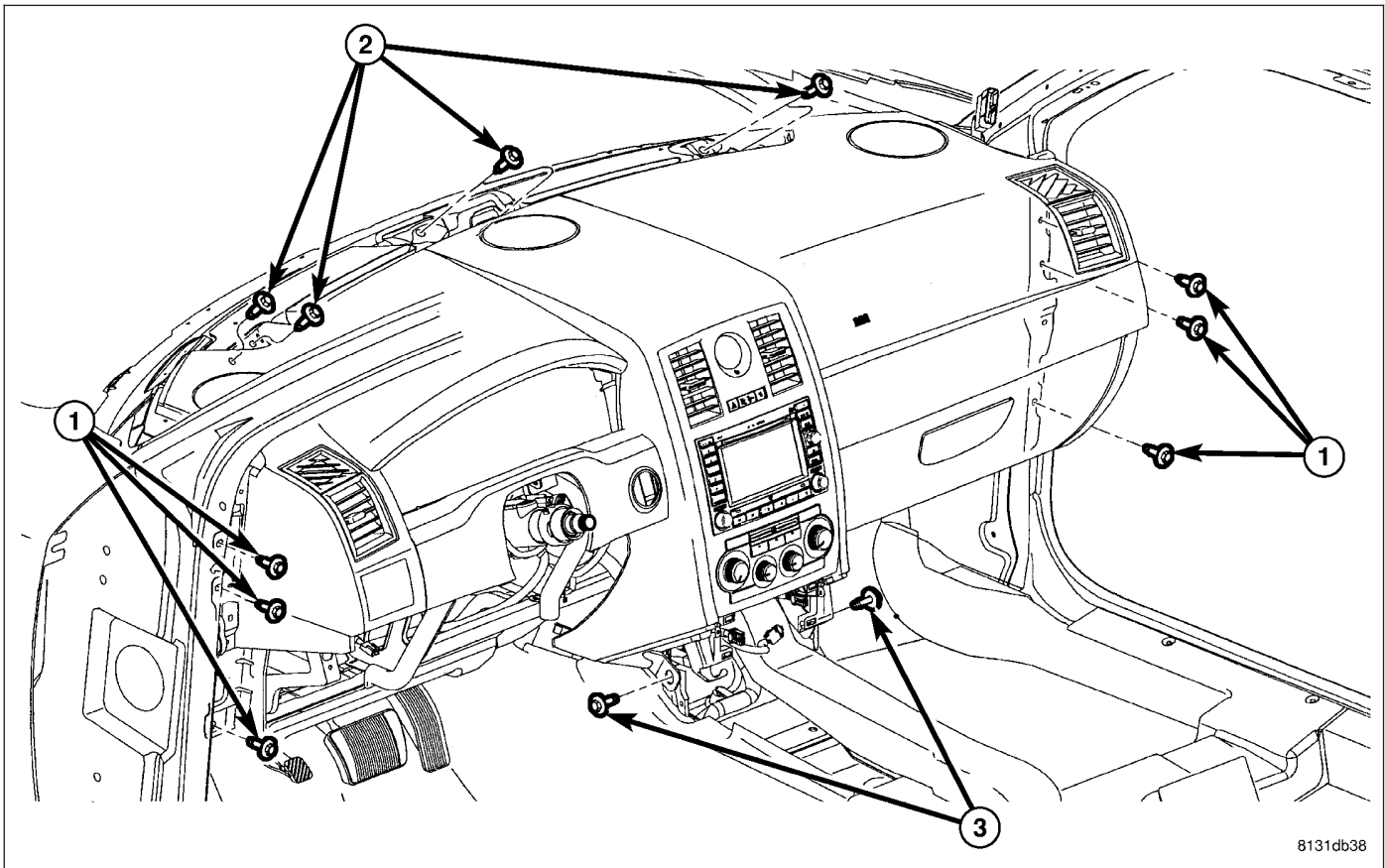
1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING).
2. If required, install new spring nuts (1) into the dash panel.



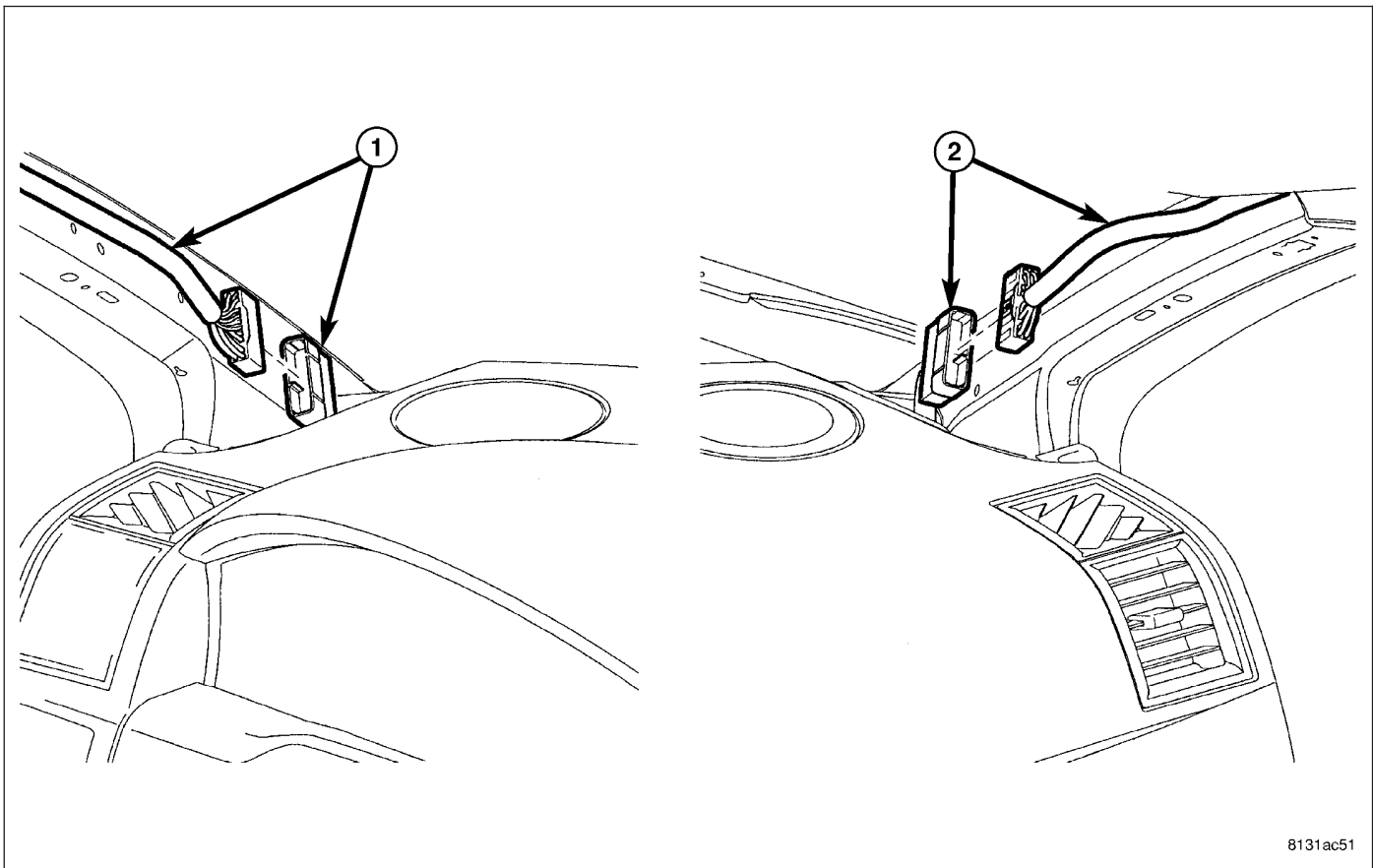
8131db07



3. Position the instrument panel assembly (3) into the vehicle through the drivers side door. Guide the steering column end (4) through the opening in the dash panel (3) and install the instrument panel onto the supports (1 and 5).



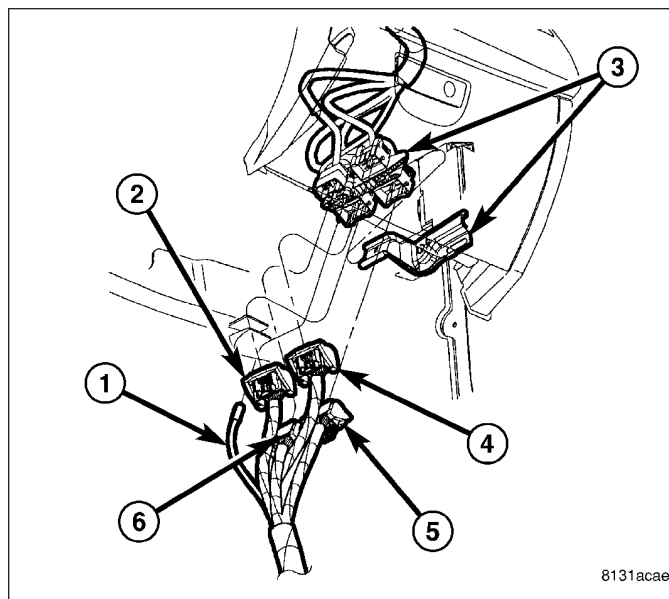
4. Loosely install all the bolts that secure the instrument panel to the body. Then tighten the bolts in the following order:
  - Top of instrument panel (2) to 8 N·m (70 in. lbs.).
  - Side support bolts (1) to 27 N·m (20 ft. lbs.).
  - Bottom of instrument panel (3) to 6 N·m (55 in. lbs.).
5. Install the end caps to the left and right side of the instrument panel.
6. Install the defroster grille to the top of the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/GRILLE-DEFROSTER - INSTALLATION).



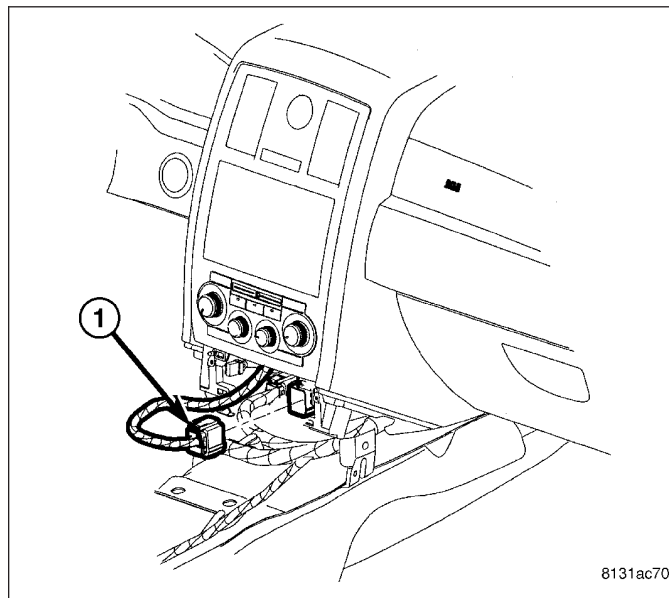
8131ac51

7. Connect the wire harness connectors (1 and 2) located on the A-pillars.
8. Install the A-pillar trim panels (Refer to 23 - BODY/INTERIOR/PANEL-A-PILLAR TRIM - INSTALLATION).

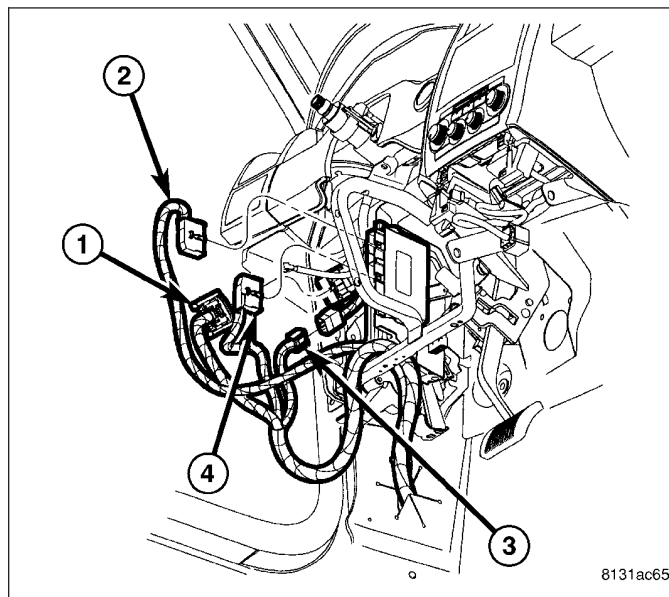
9. Connect the wire harness connectors (2, 4, 5 and 6) to the instrument panel wire harness connector (3).
10. Connect the antenna coax (1) to the instrument panel coax extension.



11. Connect the instrument panel wire harness connector (1) to the occupant restraint controller (ORC) module.
12. Install the ash receiver into the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/ASH RECEIVER - INSTALLATION).
13. Install the center floor console (Refer to 23 - BODY/INTERIOR/CONSOLE-FLOOR - INSTALLATION).

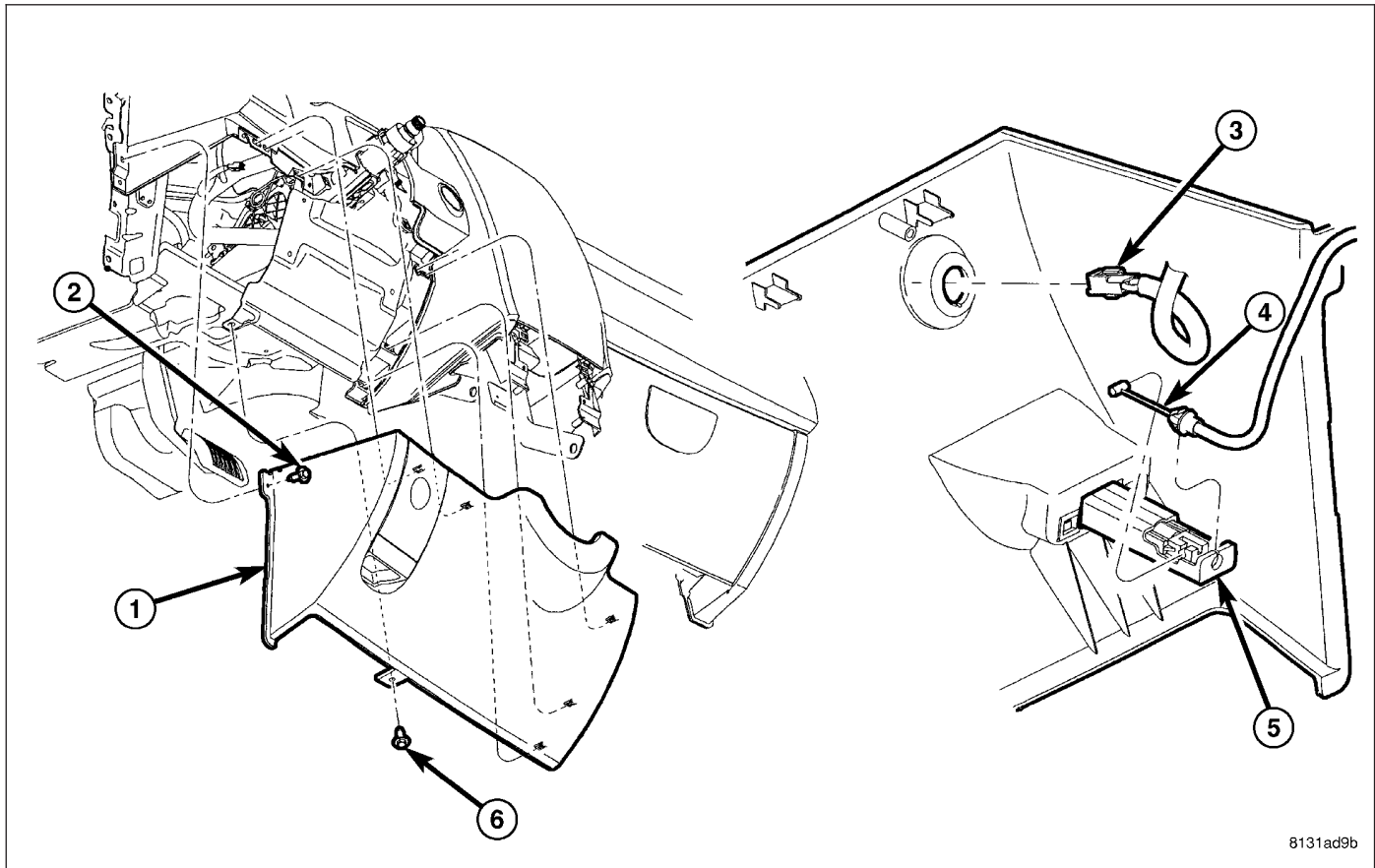
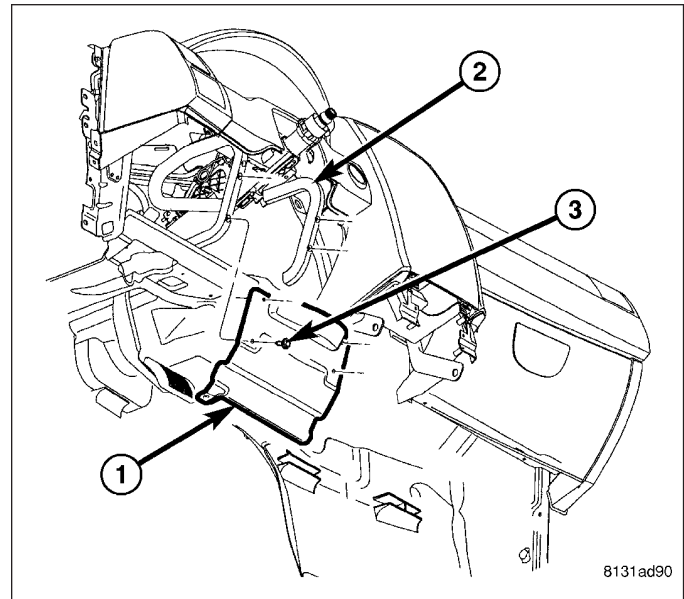


14. Connect the body wire harness connectors (2 and 4) to the transmission control module.
15. Connect the body wire harness connectors (1 and 3) to the instrument panel wire harness connectors.





16. Position the instrument panel steering column cover reinforcement (1) onto the bracket (2).
17. Install the screws (3) that secure the instrument panel steering column cover reinforcement to the bracket. Tighten the screws securely.



18. Position the steering column cover (1) into the vehicle.
19. Connect the hood release cable (4) to the hood release handle (5).
20. Connect the wire harness connector (3) to the trunk release switch.
21. Install the screws (2 and 6) that secure the steering column cover (1) to the instrument panel. Tighten the screws securely.
22. Install the left and right side instrument panel silencers (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL SILENCER - INSTALLATION.)
23. Raise and support the vehicle.
24. Connect the steering column to the steering coupling (Refer to 19 - STEERING/COLUMN/STEERING COUPLING - INSTALLATION).

25. Lower the vehicle.

**CAUTION:** Do not reconnect the negative battery cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component.

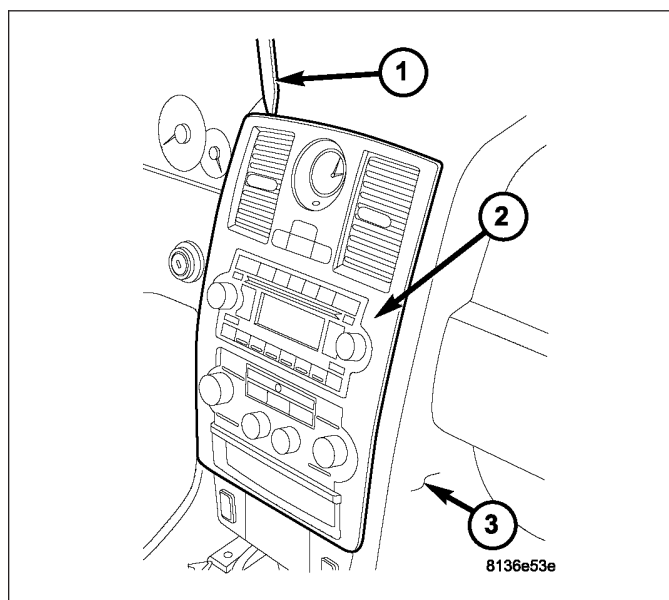
26. Perform the supplemental restraint system verification test (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

## BEZEL-CENTER

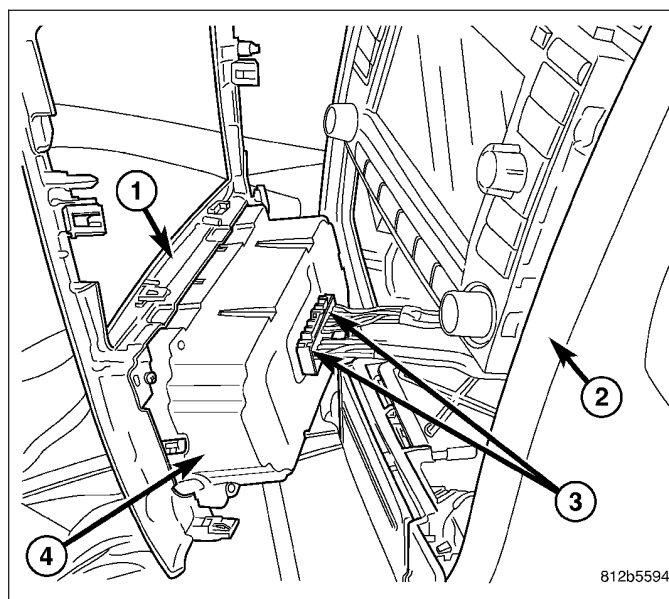
### REMOVAL

#### CHRYSLER

1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING).
2. Using a trim stick C-4755 or equivalent (1), remove the center bezel (2) from the instrument panel (3) by releasing the snap retainers from the instrument panel.



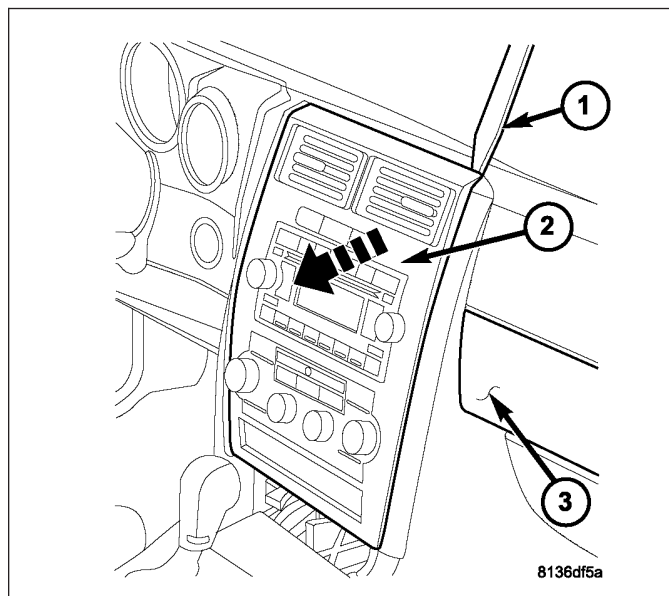
3. Disconnect the electrical connectors (3) from the A/C - heater control (4) and the clock and remove the center bezel (1) from the vehicle.



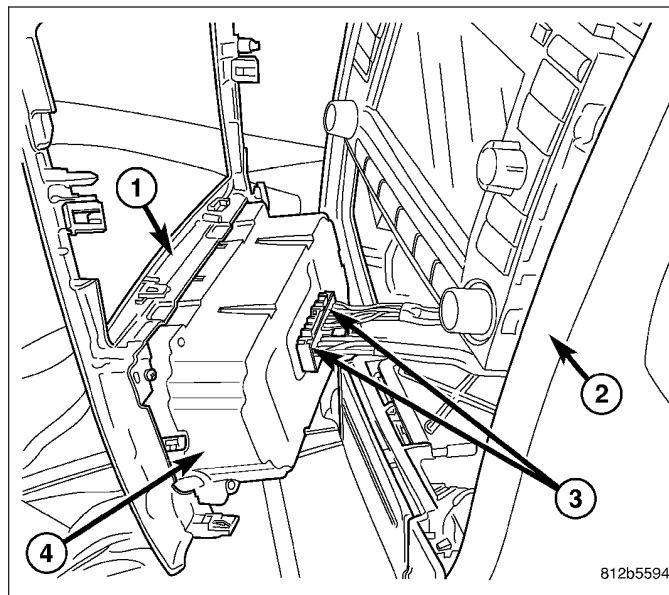


**DODGE**

1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING).
2. Using a trim stick C-4755 or equivalent (1), remove the center bezel (2) from the instrument panel (3) by releasing the snap retainers from the instrument panel.



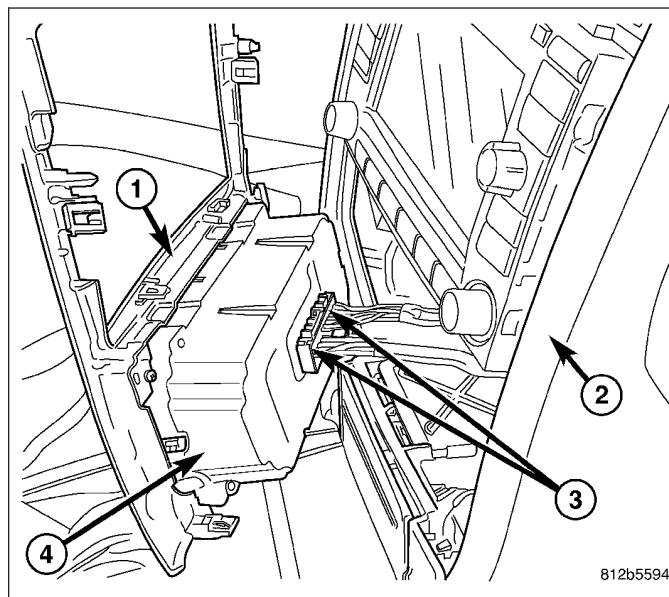
3. Disconnect the electrical connectors (3) from the A/C - heater control (4) and the switch pod and remove the center bezel (1) from the vehicle.



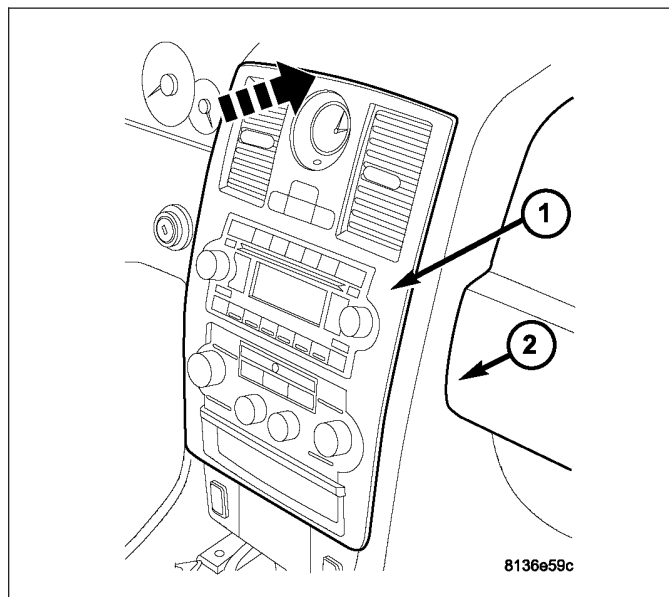
## INSTALLATION

### CHRYSLER

1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING).
2. Position the center bezel (1) near the instrument panel (2).
3. Connect the electrical connectors (3) to the A/C - heater control (4) and the clock.

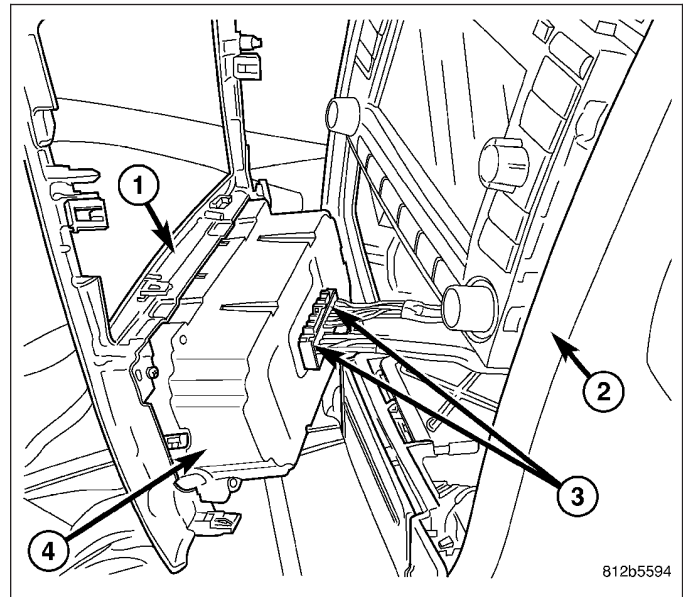


4. Install the center bezel (1) onto the instrument panel (2) and carefully push on the outside edges of the center bezel to fully seat the snap clip retainers into the instrument panel.

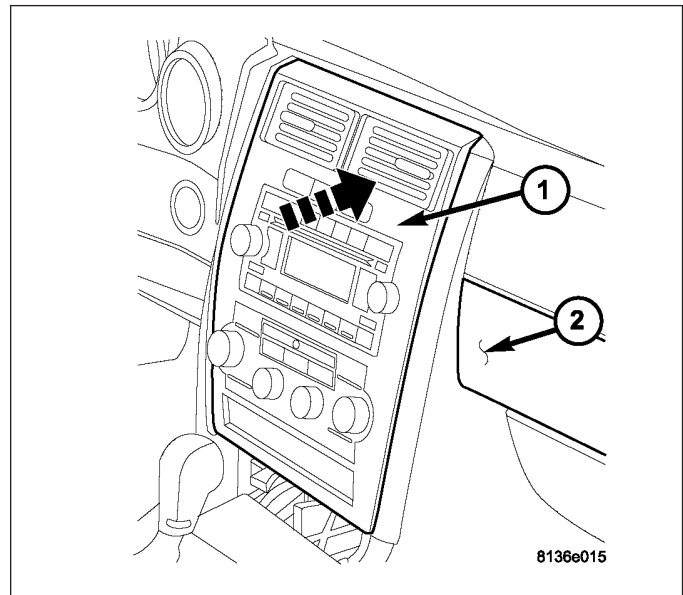


**DODGE**

1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING).
2. Position the center bezel (1) near the instrument panel (2).
3. Connect the electrical connectors (3) to the A/C - heater control (4) and the switch pod.



4. Install the center bezel (1) onto the instrument panel (2) and carefully push on the outside edges of the center bezel to fully seat the snap clip retainers into the instrument panel.

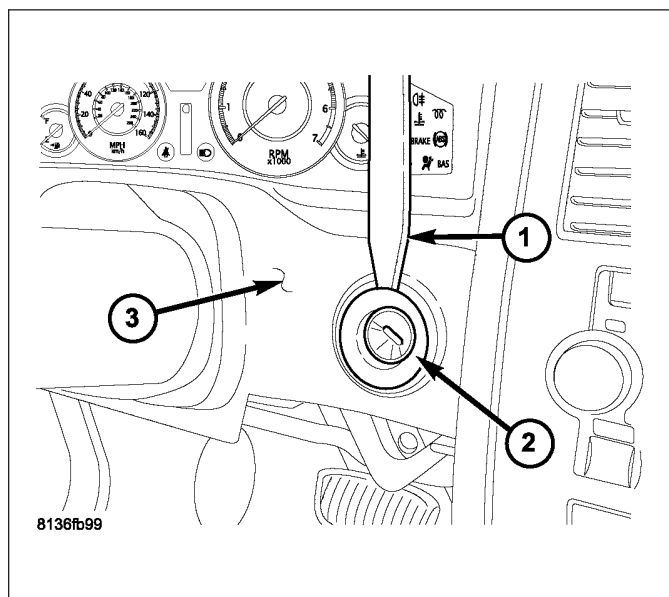


## BEZEL-CLUSTER

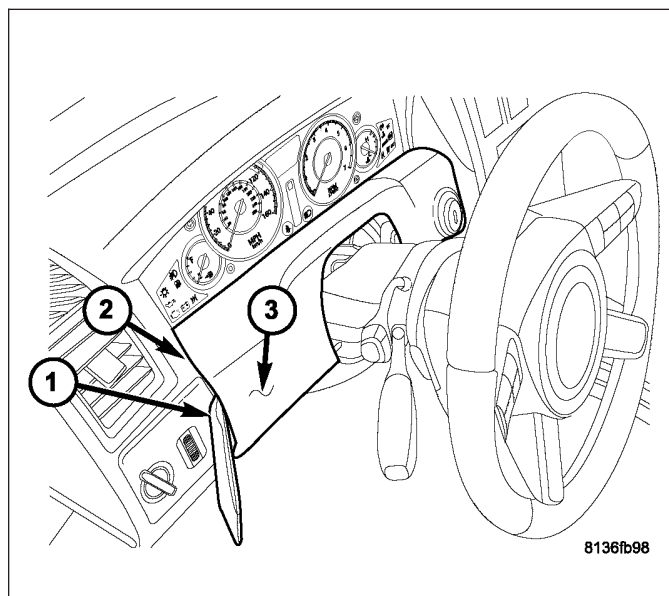
### REMOVAL

#### REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING).
2. Using a trim stick C-4755 or equivalent (1), gently pry between the ignition switch bezel (2) and the instrument cluster bezel (3) to release the snap retainers that secure the switch bezel.
3. Remove the ignition switch bezel from the vehicle.

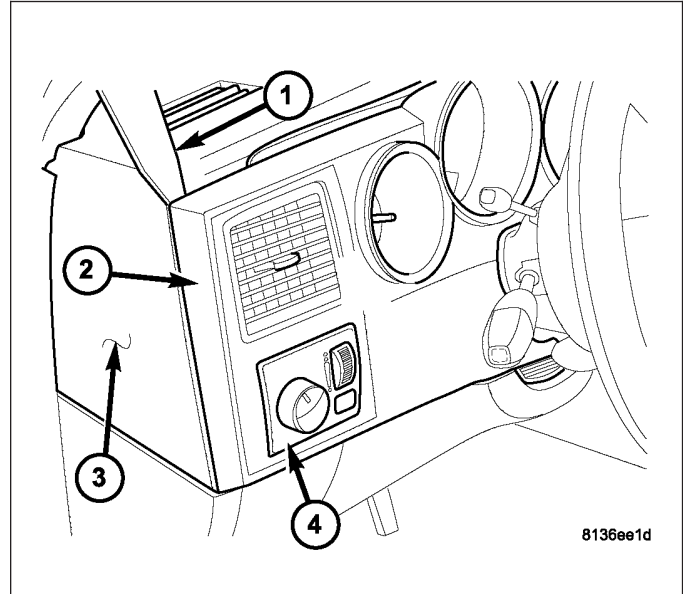


4. Using a trim stick C-4755 or equivalent (1), gently pry between the instrument panel (2) and the cluster bezel (3) to release the snap clip retainers that secure the cluster bezel.

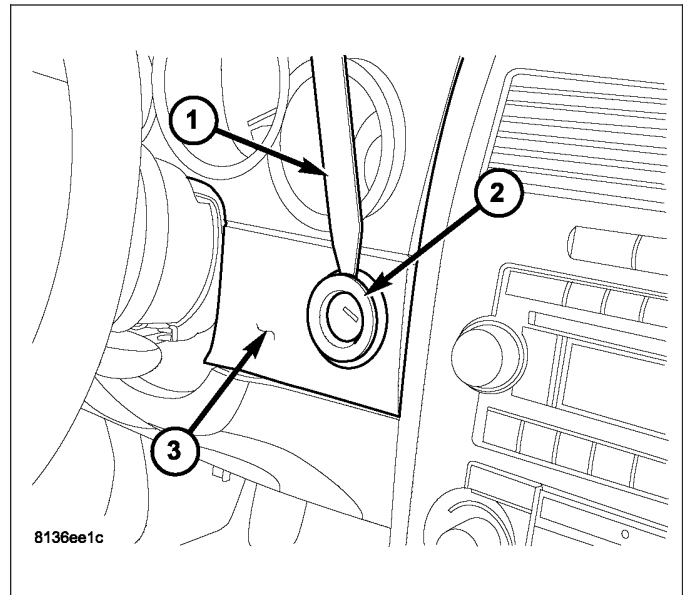


**DODGE**

1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING).
2. Using a trim stick C-4755 or equivalent (1), gently pry between the ignition switch bezel (2) and the instrument cluster bezel (3) to release the snap retainers that secure the switch bezel.
3. Remove the ignition switch bezel from the vehicle.



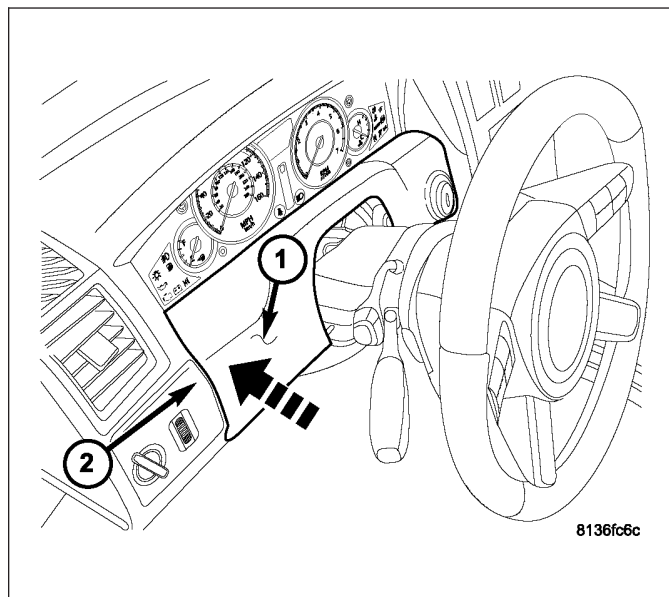
4. Using a trim stick C-4755 or equivalent (1), gently pry between the cluster bezel (2) and the instrument panel (3) to release the snap clip retainers that secure the cluster bezel.
5. Disconnect the wire harness connector from the headlamp switch (4) and remove the cluster bezel from the vehicle.
6. If required, remove the headlamp switch from the cluster bezel (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP SWITCH - REMOVAL).



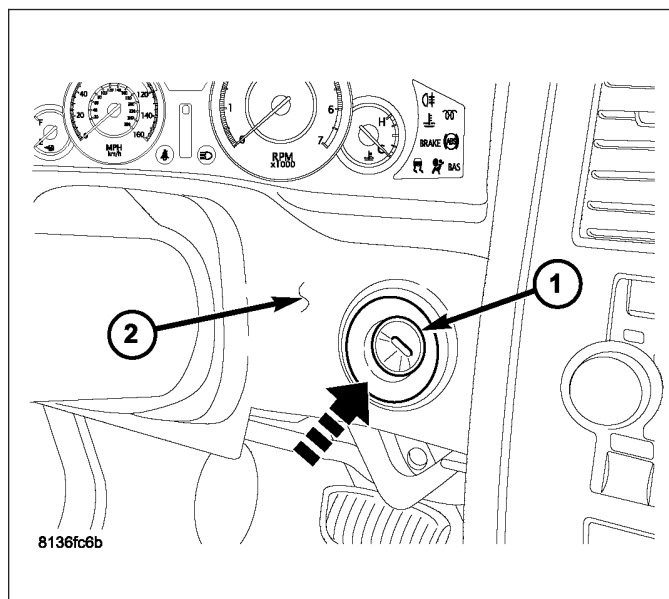
## INSTALLATION

### INSTALLATION

1. Position the cluster bezel (1) onto the instrument panel (2).
2. Carefully push on the cluster bezel to fully seat the snap clip retainers into the instrument panel.

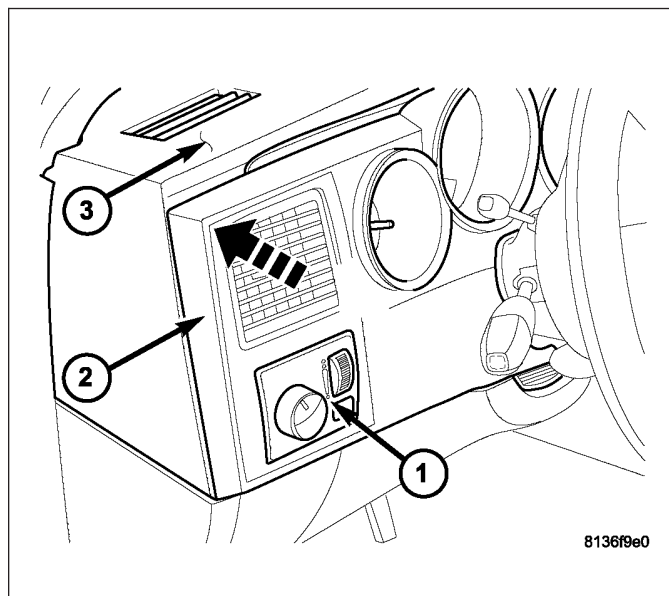


3. Position the ignition switch bezel (1) into the cluster bezel (2).
4. Carefully push on the ignition switch bezel to engage the snap retainers that secure the switch bezel.

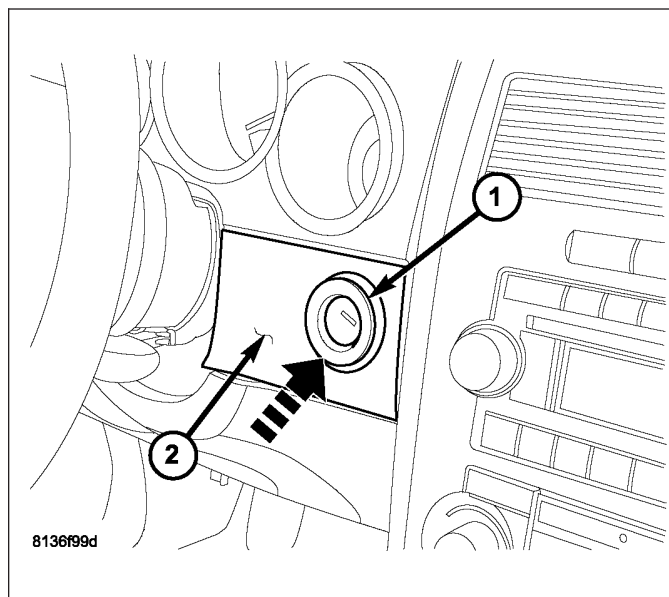


## INSTALLATION

1. If removed, install the headlamp switch (1) into the cluster bezel (2) (Refer to 8 - ELECTRICAL/ LAMPS/LIGHTING - EXTERIOR/HEADLAMP SWITCH - INSTALLATION).
2. Position the cluster bezel into the vehicle and connect the wire harness connector to the headlamp switch.
3. Install the cluster bezel onto the instrument panel (3) and carefully push on the cluster bezel to fully seat the snap clip retainers into the instrument panel.



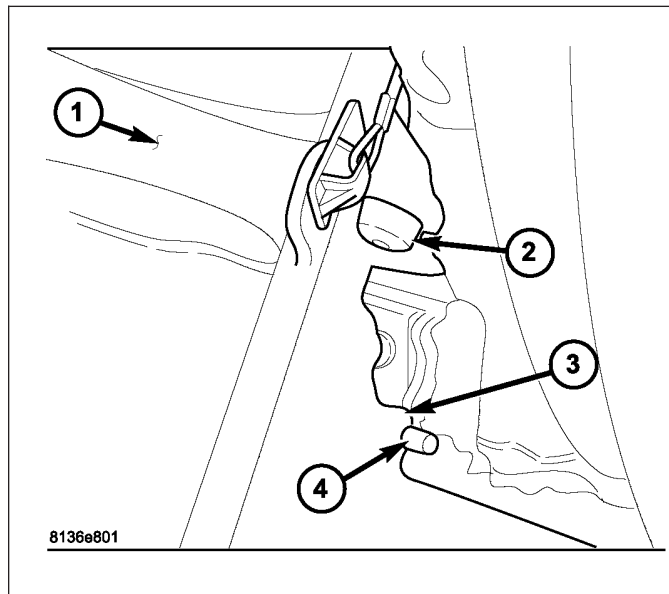
4. Position the ignition switch bezel (1) into the cluster bezel (2).
5. Carefully push on the ignition switch bezel to engage the snap retainers that secure the switch bezel.



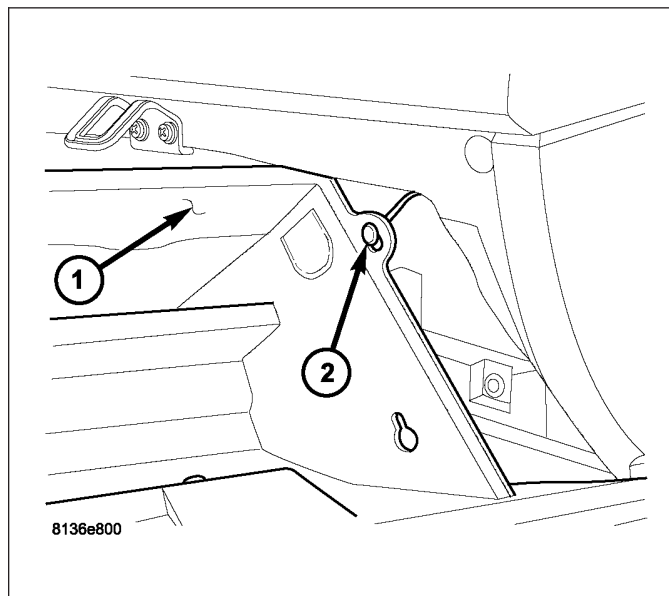
## BIN-GLOVE BOX

### REMOVAL

1. Open the glove box bin (1).
2. Push in on both sides of glove box bin to disengage the glove box stops (2) and lower the bin.
3. Pivot the glove box bin downward and disengage the bin hinge hooks (3) from the instrument panel hinge brackets (4) located at each end of the bin.



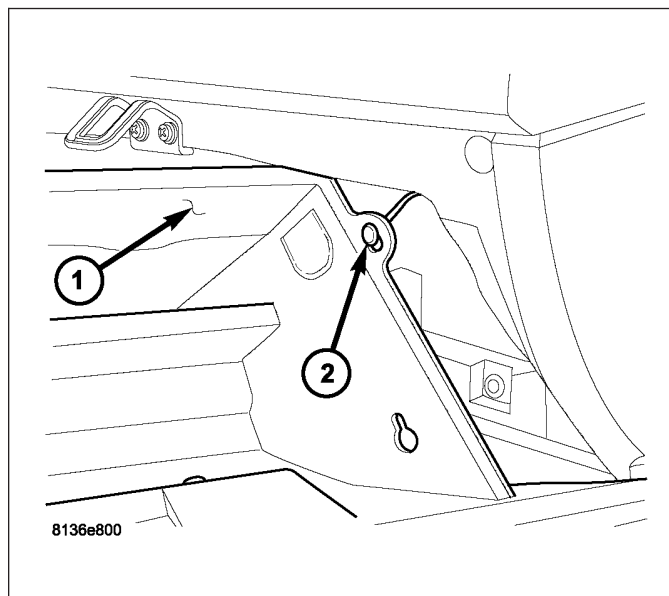
4. Turn the glove box bin (1) sideways and remove the support strap and retainer assembly (2) from the outboard end of the bin.
5. Remove the glove box bin from the vehicle.



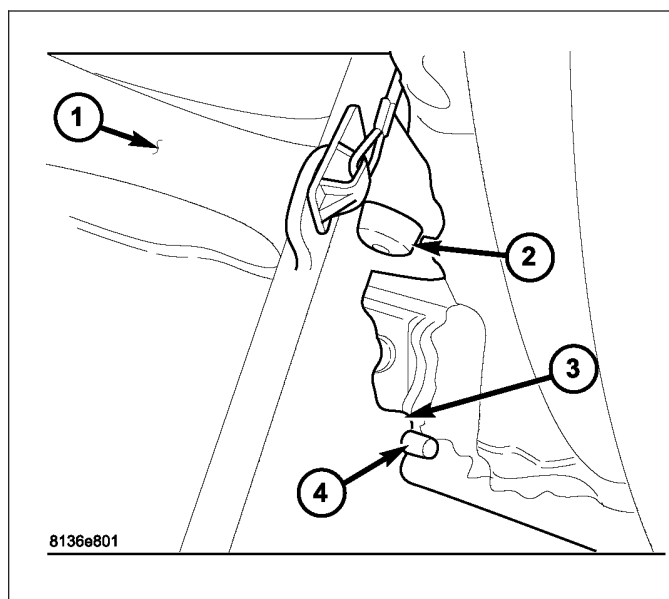


## INSTALLATION

1. Position the glove box bin (1) into the vehicle.
2. Turn the glove box bin sideways and install the support strap and retainer assembly (2) onto the outboard end of the bin.

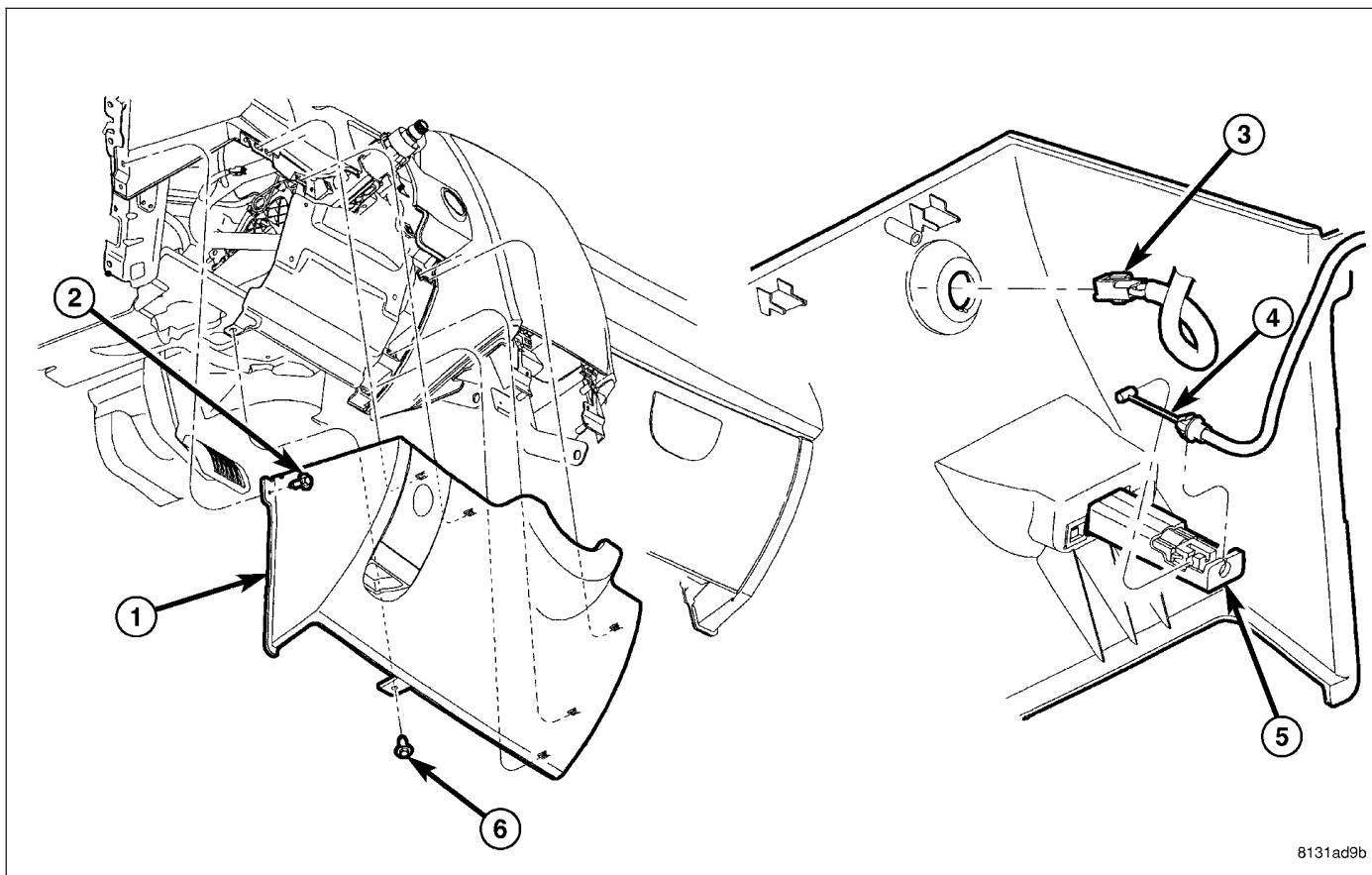


3. Engage the glove box bin hinge hooks (3) onto the instrument panel hinge brackets (4) located at each end of the glove box bin (1) and pivot the bin upward.
4. To engage the glove box stops (2), push inward on both sides of the glove box bin and pivot the bin into the instrument panel.
5. Close the glove box bin.



## COVER-STEERING COLUMN OPENING

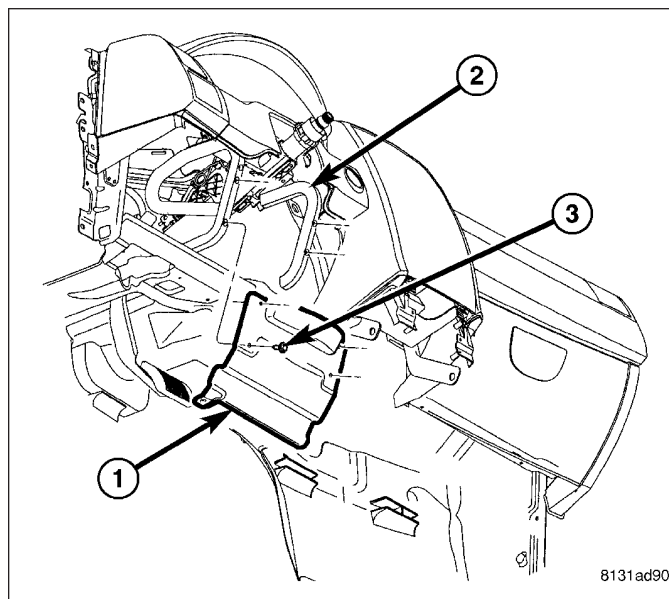
### REMOVAL



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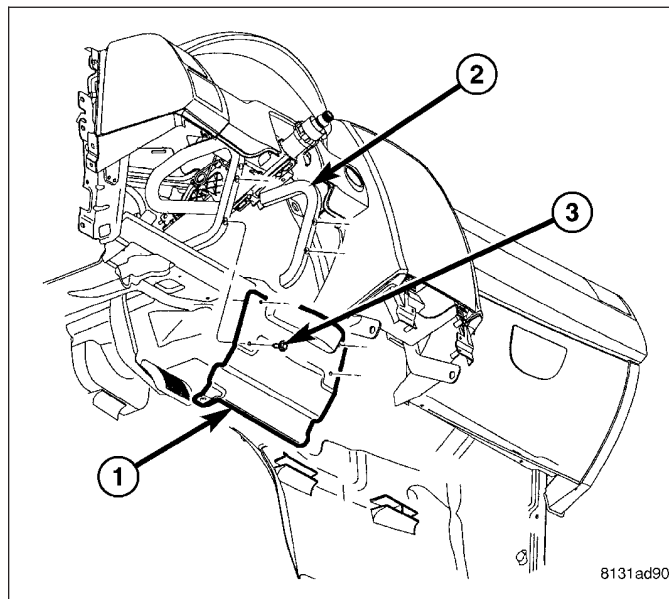
1. Disconnect and isolate negative battery cable.
2. Remove the screws (2 and 6) that secure the steering column cover (1) to the instrument panel.
3. Pull the steering column cover rearward at the top and right side of the cover to release the snap retainers from the instrument panel.
4. Disconnect the wire harness connector (3) from the trunk release switch, if equipped.
5. Disconnect the release cable (4) from the emergency brake release handle (5) and remove the steering column cover from the vehicle.

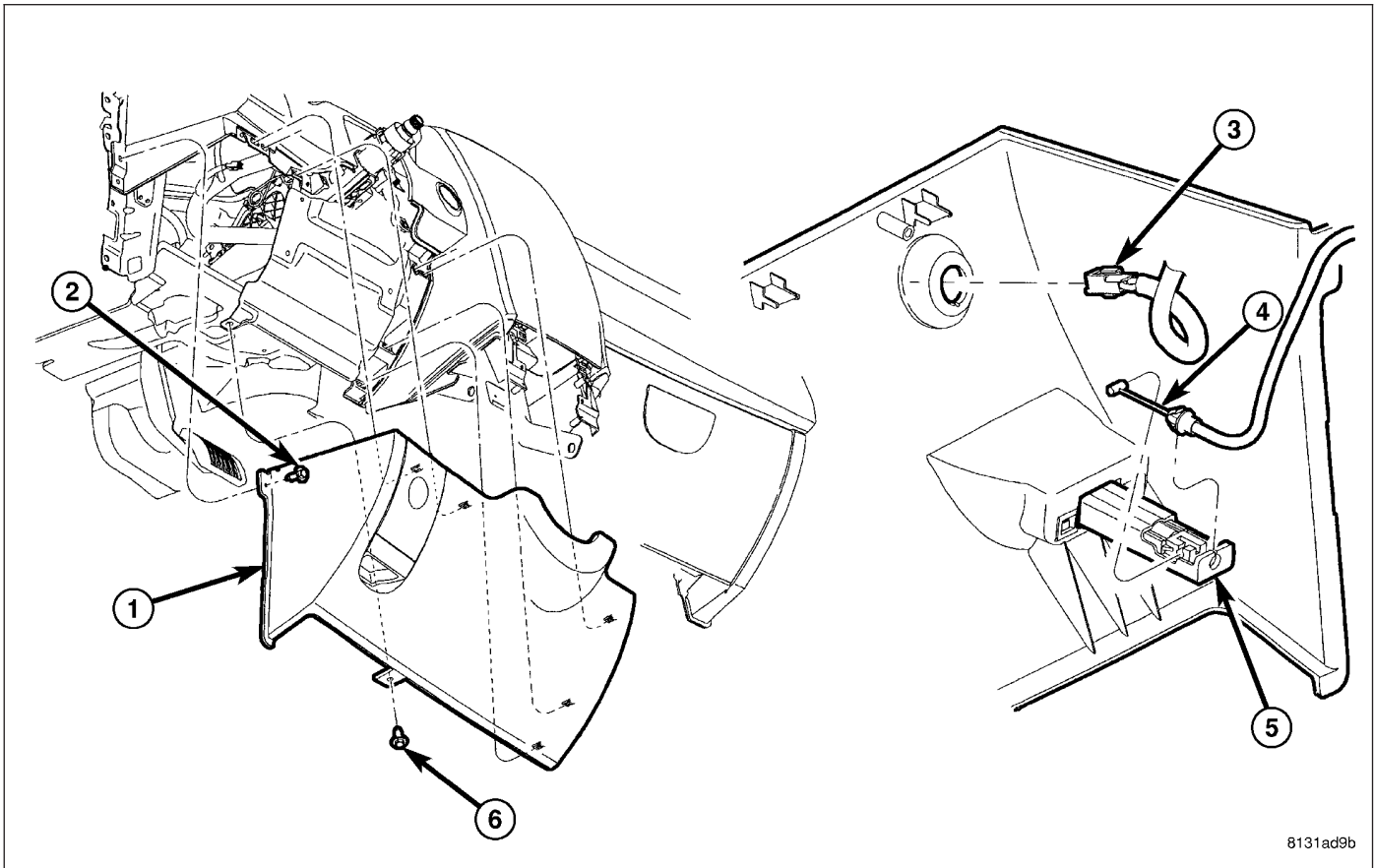
6. If required, remove the screws (3) that secure the instrument panel steering column cover reinforcement (1) to the bracket (2) and remove the reinforcement from the vehicle.



## INSTALLATION

1. If removed, position the instrument panel steering column cover reinforcement (1) onto the bracket (2).
2. Install the screws (3) that secure the instrument panel steering column cover reinforcement to the bracket. Tighten the screws securely.





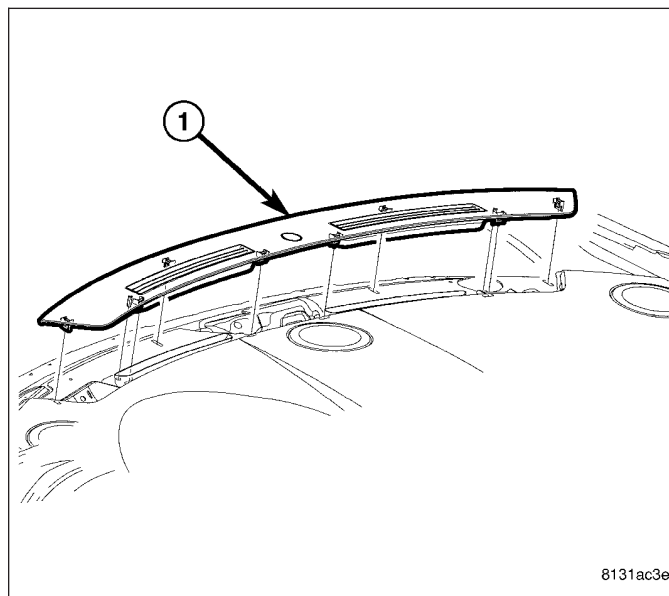
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3. Position the steering column cover (1) into the vehicle.
4. Connect the release cable (4) to the emergency brake release handle (5).
5. Connect the wire harness connector (3) to the trunk release switch, if equipped.
6. Install the steering column cover onto the instrument panel and carefully push on the top and right side of the cover to fully seat the snap clip retainers into the instrument panel.
7. Install the screws (2 and 6) that secure the steering column cover (1) to the instrument panel. Tighten the screws securely.

## GRILLE-DEFROSTER

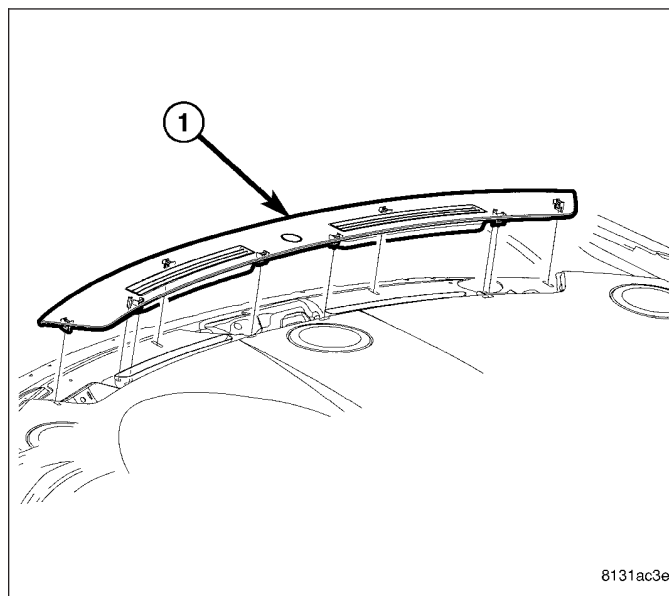
### REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING).
2. Using a trim stick C-4755 or equivalent, gently pry between the instrument panel top cover and the defroster grille (1) to release the snap clip retainers that secure the defroster grille.
3. Remove the defroster grille.



### INSTALLATION

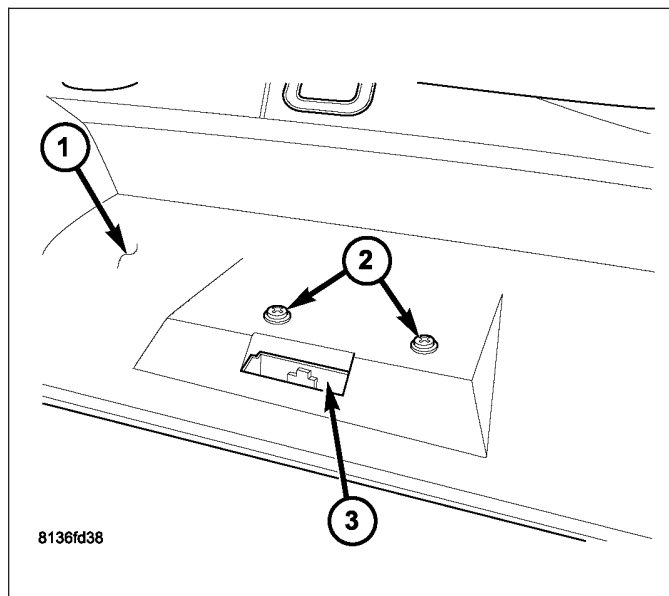
1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/INSTRUMENT PANEL - WARNING).
2. Position the defroster grille (1) onto the top of the instrument panel.
3. Carefully push down on the defroster grille to fully seat the snap clip retainers into the instrument panel top cover.



## LATCH-GLOVE BOX

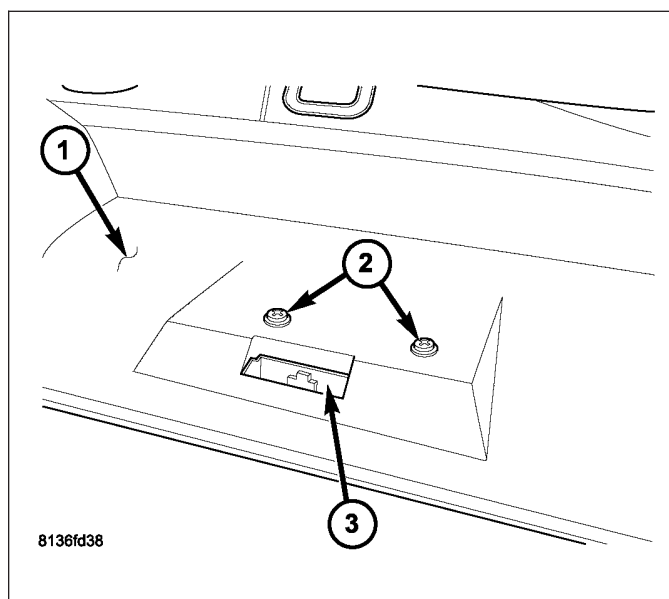
### REMOVAL

1. Open the glove box bin.
2. Remove the two screws (2) that secure the latch assembly (3) to the glove box door (1) and remove the latch assembly.
3. If required, remove the glove box lock cylinder from the latch (Refer to 23 - BODY/INSTRUMENT PANEL/LOCK CYLINDER-GLOVE BOX - REMOVAL).



### INSTALLATION

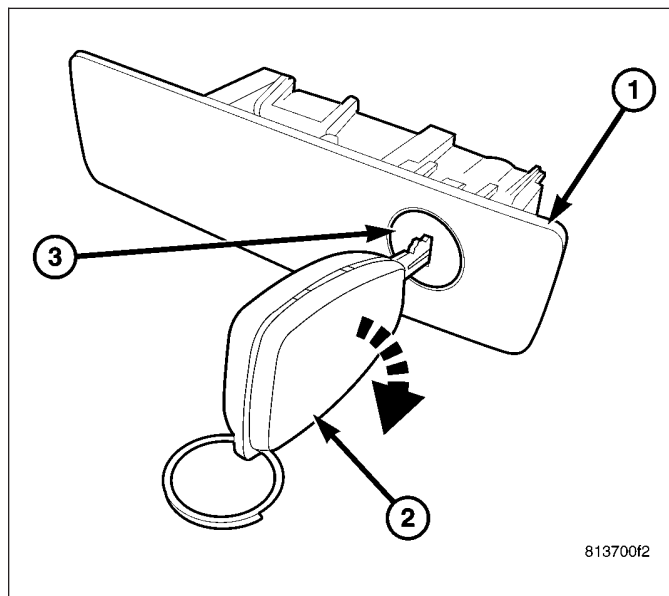
1. If removed, install the glove box lock cylinder into the latch (Refer to 23 - BODY/INSTRUMENT PANEL/LOCK CYLINDER-GLOVE BOX - INSTALLATION).
2. Install the latch assembly (3) into the glove box door (1).
3. Install the two screws (2) that secure the latch assembly to the glove box door. Tighten the screws securely.
4. Close the glove box bin.



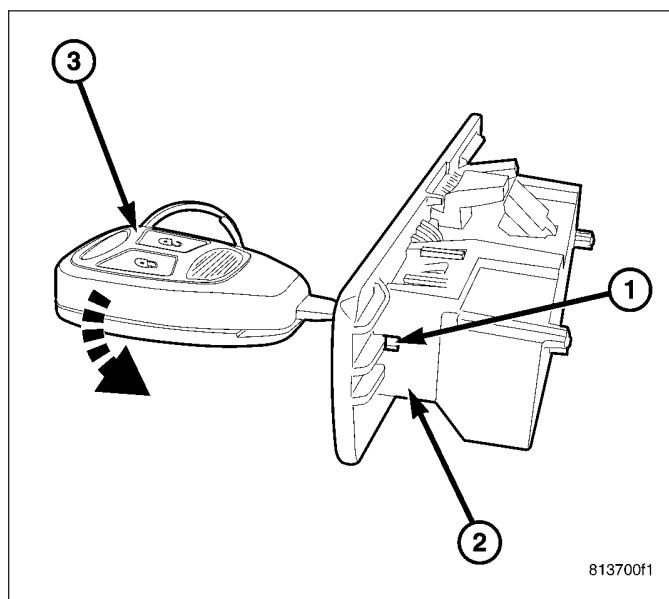
## LOCK CYLINDER-GLOVE BOX

### REMOVAL

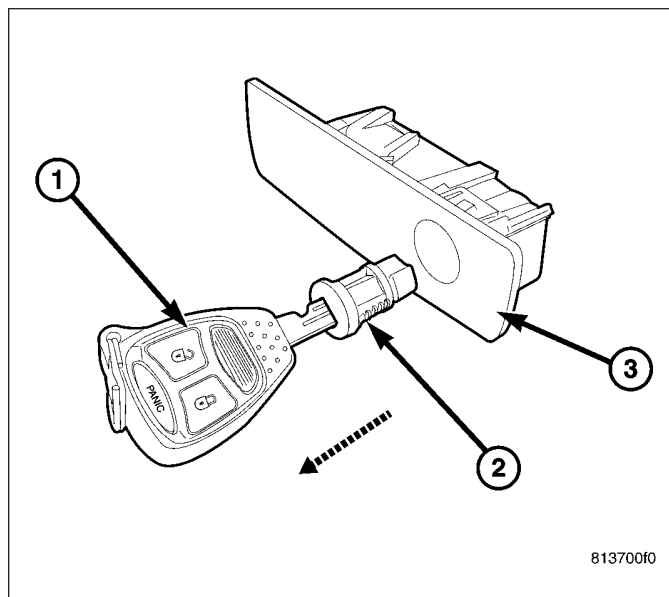
1. Remove the glove box latch (1) from the glove box door and place it on a workbench (Refer to 23 - BODY/INSTRUMENT PANEL/LATCH-GLOVE BOX - REMOVAL).
2. Insert the ignition key (2) into the glove box lock cylinder (3) and rotate the ignition key 90 degrees clockwise.



3. Using a small pointed tool, press in on the lock pin (1) showing through the opening in the glove box latch housing (2) and rotate the ignition key (3) an additional 45 degrees clockwise.

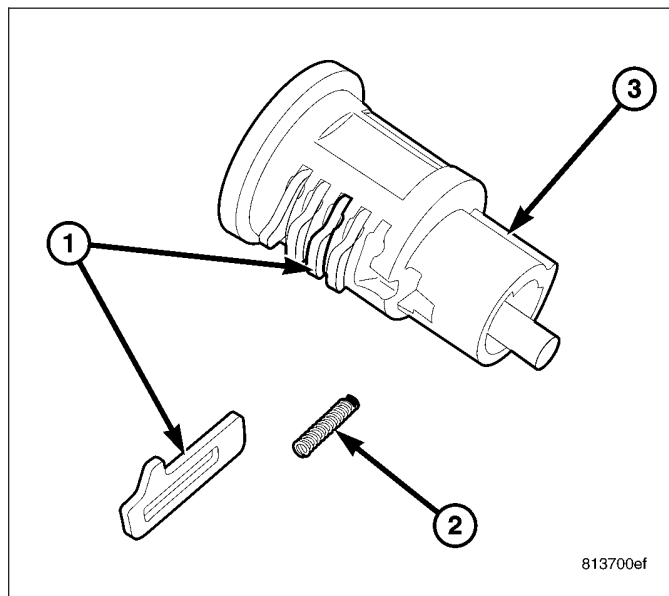


4. Pull the ignition key (1) and the glove box lock cylinder (2) out of the glove box latch (3) as an assembly.



**Note:** For reinstallation purposes, when removing the tumblers from the glove box lock, be sure to make note of the location of each tumbler within the lock cylinder.

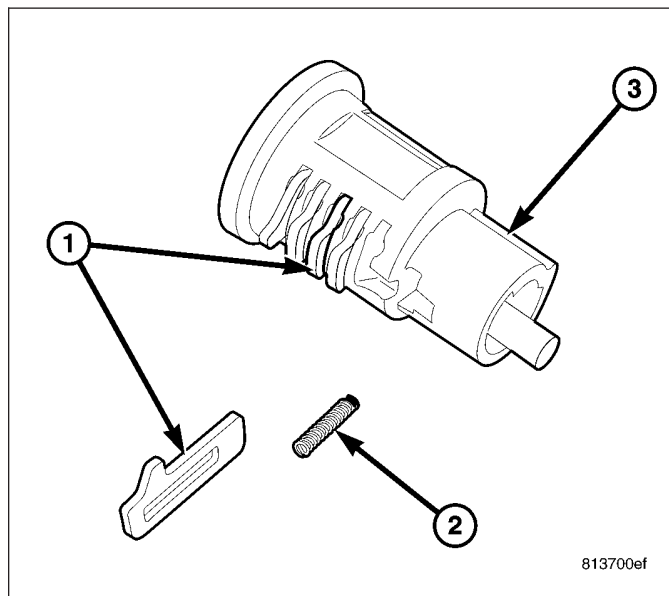
5. If required, remove the tumblers (1) and the springs (2) from the glove box lock cylinder (3). Note the location of each tumbler within the lock.



## INSTALLATION

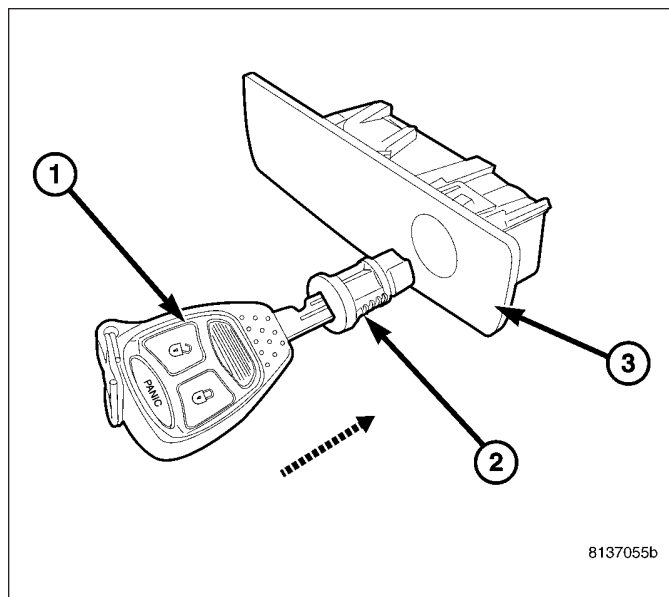
**Note:** Be sure to install each tumble into their correct location within the lock cylinder.

1. If removed, install the springs (2) and the tumblers (1) into the glove box lock cylinder (3) in the order in which they were removed.

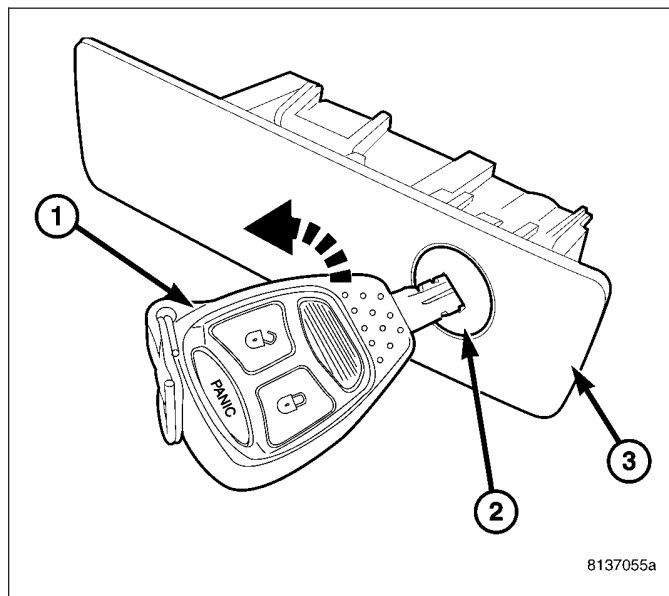




2. Install the ignition key (1) and the glove box lock cylinder (2) into the glove box latch (3) as an assembly.



3. Rotate the ignition key (1) counterclockwise until the lock cylinder (2) is fully retained in the glove box latch (3).
4. Install the glove box latch onto the glove box door (Refer to 23 - BODY/INSTRUMENT PANEL/LATCH-GLOVE BOX - INSTALLATION).

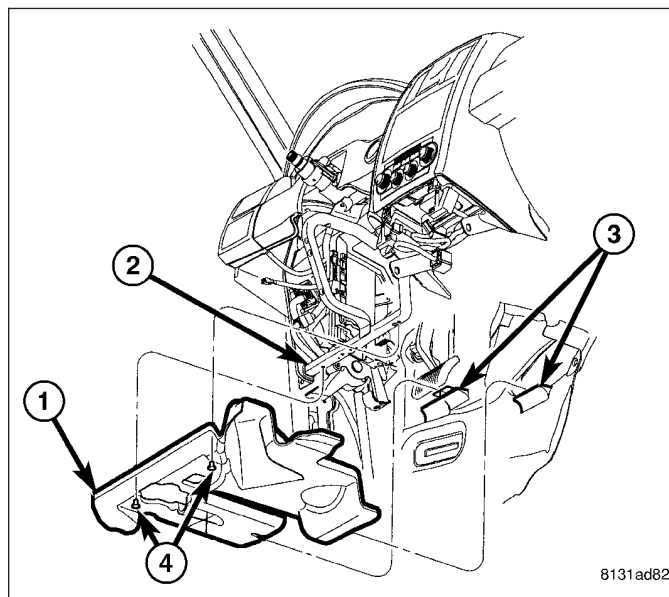


## SILENCER-INSTRUMENT PANEL

### REMOVAL

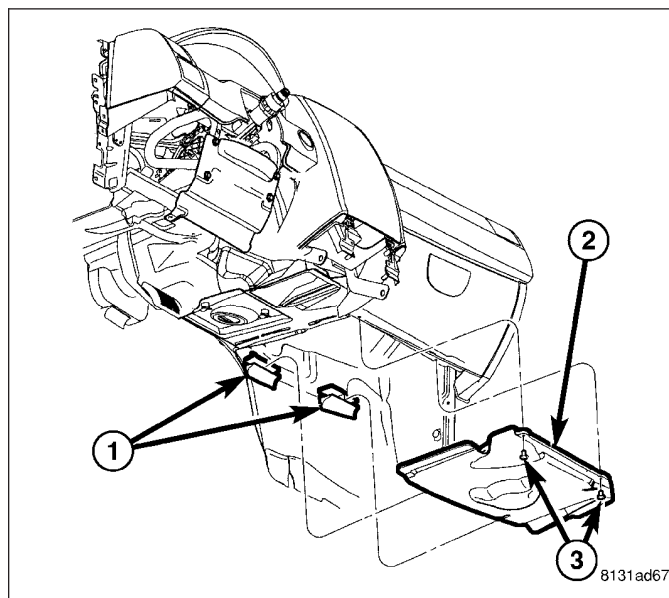
#### DRIVER SIDE

1. Remove the two push-pins (4) that secure the instrument panel silencer (1) to the instrument panel bracket (2).
2. Pull the instrument panel silencer rearward to disengage it from the brackets (3) located near the dash panel.
3. Remove the instrument panel silencer from the vehicle.



#### PASSENGER SIDE

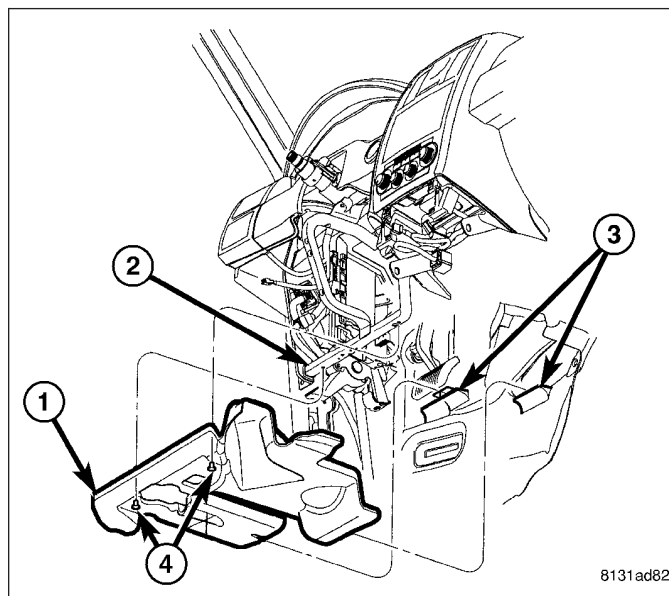
1. Remove the two push-pins (3) that secure the instrument panel silencer (2) to the instrument panel.
2. Pull the instrument panel silencer rearward to disengage it from the brackets (1) located near the dash panel.
3. Remove the instrument panel silencer from the vehicle.



## INSTALLATION

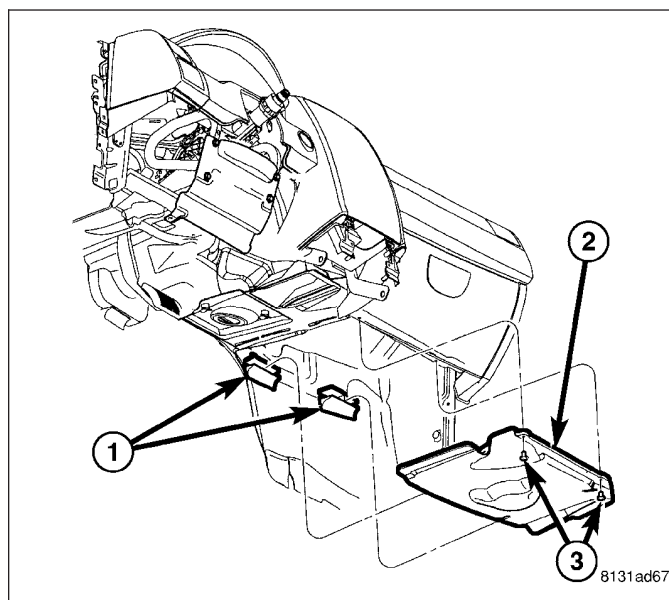
### DRIVER SIDE

1. Position the instrument panel silencer (1) into the vehicle.
2. Install the instrument panel silencer above the brackets (3) located near the dash panel.
3. Install the two push-pins (4) that secure the instrument panel silencer to the instrument panel bracket (2).



### PASSENGER SIDE

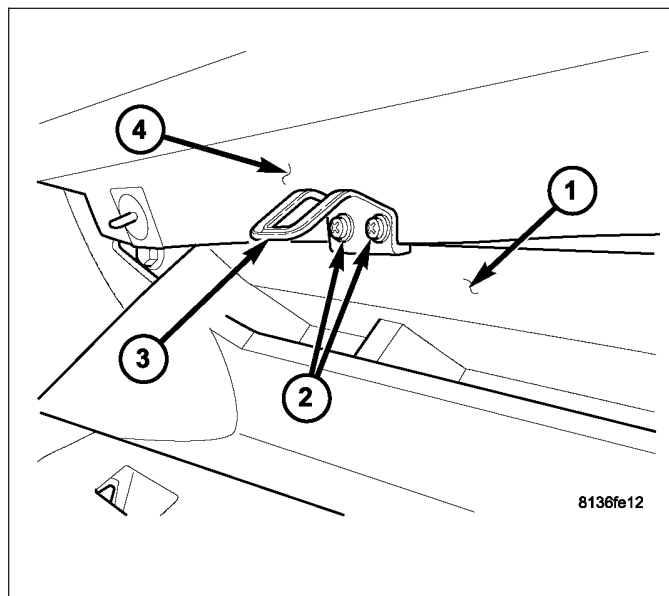
1. Position the instrument panel silencer (2) into the vehicle.
2. Install the instrument panel silencer above the brackets (1) located near the dash panel.
3. Install the two push-pins (3) that secure the instrument panel silencer to the instrument panel.



## STRIKER-LATCH-GLOVE BOX

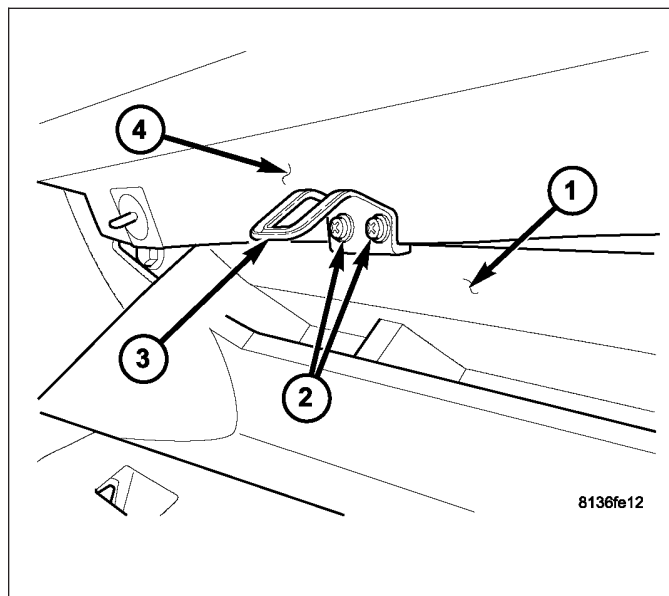
### REMOVAL

1. Open the glove box door (1).
2. Remove the two screws (2) that secure the glove box latch striker (3) to the instrument panel (4).
3. Remove the glove box latch striker from the instrument panel.



### INSTALLATION

1. Position the glove box latch striker (3) onto the instrument panel (4).
2. Install the two screws (2) that secure the glove box latch striker onto the instrument panel. Tighten the screws securely.
3. Close glove box door (1).



# INTERIOR

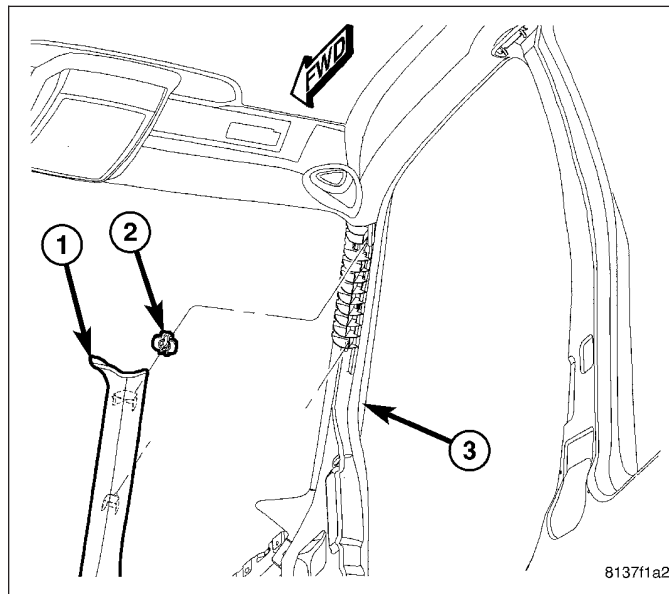
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## A-PILLAR TRIM

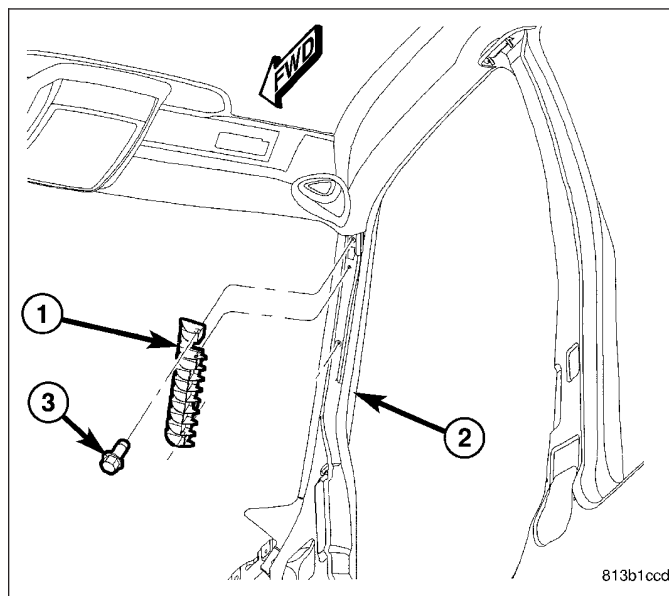
### REMOVAL

1. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the upper end of the A-pillar trim (1) rearward from the inside of the A-pillar (3) far enough to disengage the two spring clip retainers that secure the trim to the slots in the pillar.
2. Disengage the base of the A-pillar trim from the end of the instrument panel top cover.
3. Remove the A-pillar trim from the vehicle.

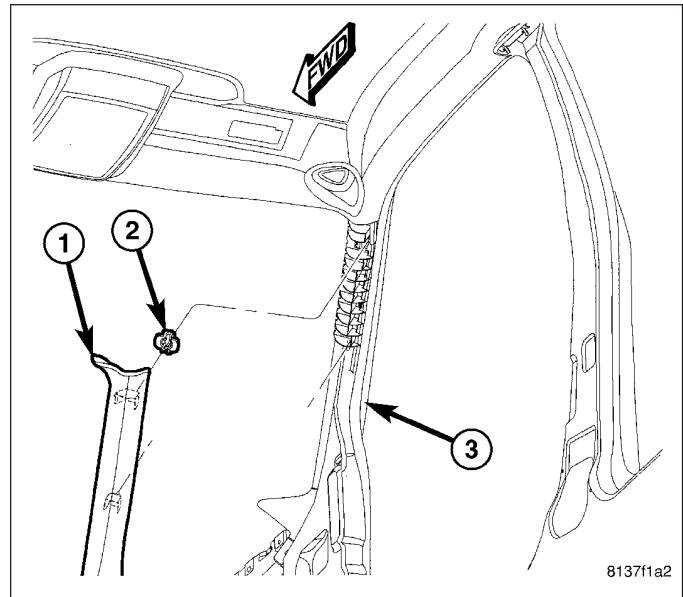


### INSTALLATION

1. Check to be certain that the energy absorbing cartridge (1) is properly installed and in good condition on the inside of the A-pillar (2). Replace the cartridge if any damage is evident. Tighten the screws (3) to 3 N·m (25 in. lbs.).



2. Check to be certain that the grommet (2) for the front tether of the side curtain airbag is properly installed and in good condition. Replace the grommet if any damage is evident. (Refer to 8 - ELECTRICAL/RESTRAINTS/CURTAIN AIRBAG - REMOVAL).
3. Engage the base of the A-pillar trim (1) to the end of the instrument panel top cover.
4. Align the two spring clip retainers on the trim with the slots in the inner A-pillar (3).
5. Using hand pressure, press firmly and evenly forward on the trim over each of the spring clip locations until the retainers snap into place.

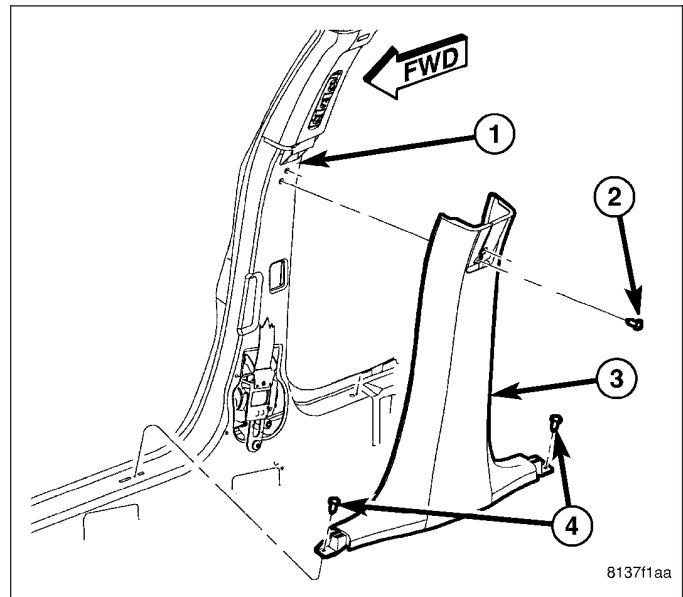


## B-PILLAR TRIM

### REMOVAL

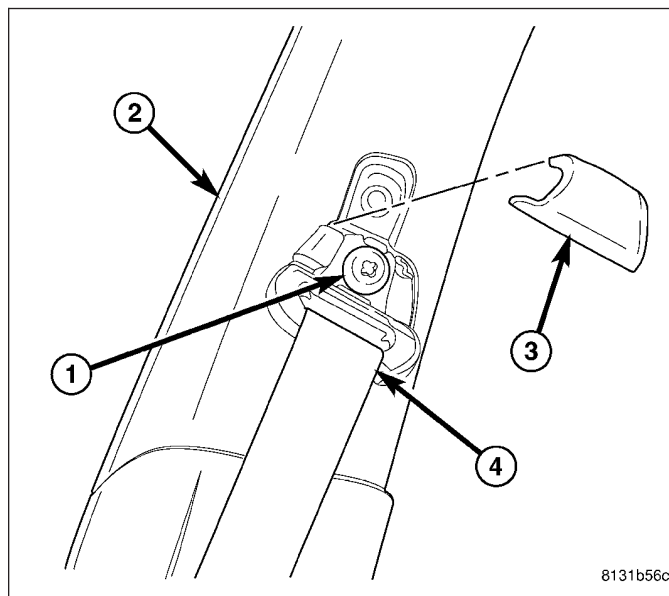
#### LOWER

1. Loosen the front door sill portion of the lower cowl trim at the rear of the front door opening for access to the forward lower B-pillar trim screw. (Refer to 23 - BODY/INTERIOR/COWL TRIM - REMOVAL).
2. Loosen the front of the scuff plate trim from the rear door sill for access to the rearward lower B-pillar trim screw. (Refer to 23 - BODY/INTERIOR/DOOR SILL SCUFF PLATE - REMOVAL).
3. Move aside the seat belt webbing to access and remove the two screws (2) that secure the upper end of the lower B-pillar trim (3) to the inside of the B-pillar (1).
4. Remove the two screws (4) that secure the lower end of the B-pillar trim to the front and rear door sills.
5. Disengage the seat belt webbing from the slot in the upper end of the lower B-pillar trim through the slit in the trim and remove the trim from the inside of the B-pillar.

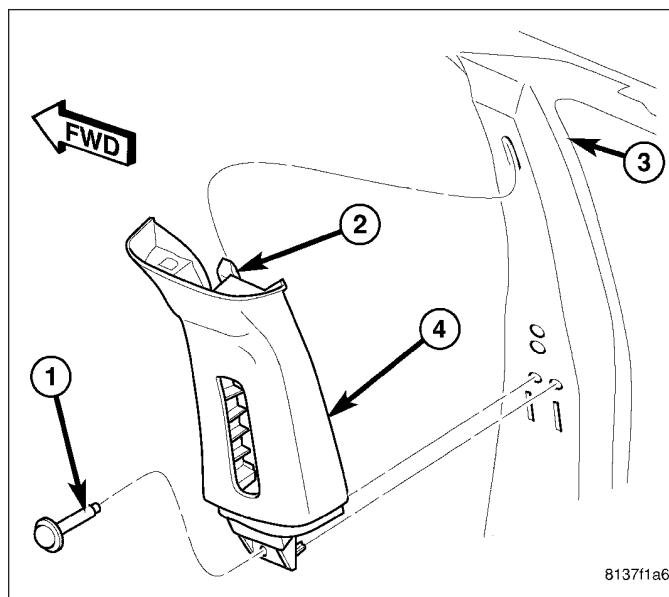


## UPPER

1. Remove the lower trim from the inside of the B-pillar (2). (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - REMOVAL).
2. Unsnap and remove the trim cover (3) from the seat belt turning loop on the inside of the upper B-pillar.
3. Remove the screw (1) that secures the turning loop to the seat belt height adjuster on the upper B-pillar.
4. Lower the seat belt (4) and turning loop from the B-pillar.



5. Remove the screw (1) that secures the lower end of the upper trim (4) to the inside of the B-pillar (3).
6. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the lower end of the upper B-pillar trim away from the inside of the B-pillar far enough to disengage the two spring clip retainers that secure the trim to the slots in the pillar.
7. Lift the lower end of the upper trim upward to disengage the locator tab (2) from the locator hole and remove the trim from the inside of the B-pillar.

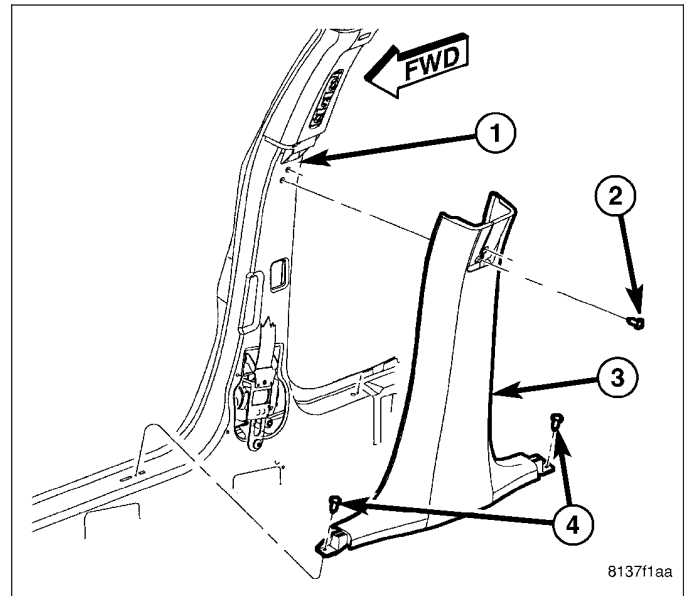




## INSTALLATION

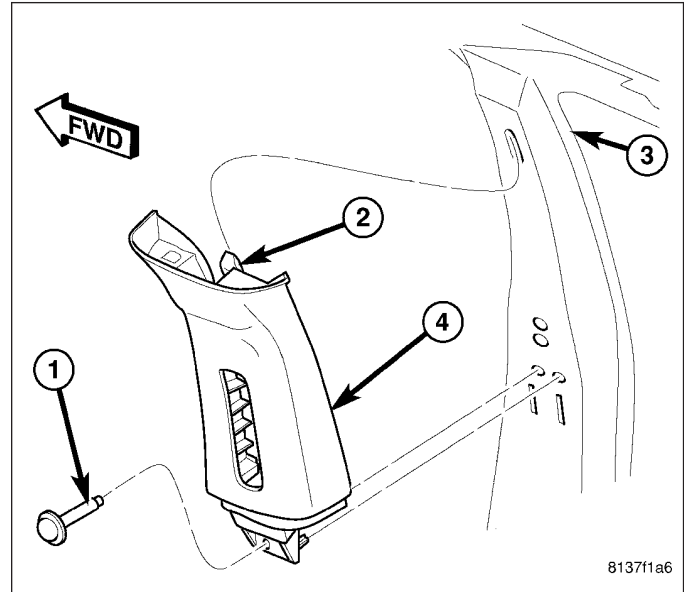
### LOWER

1. Engage the seat belt webbing through the slit and into the slot in the upper end of the lower B-pillar trim (3) and position the trim to the inside of the B-pillar (1). Be certain the webbing is not twisted.
2. Press fit the lower end of the lower B-pillar trim to the front and rear door opening sills.
3. Install and tighten the two screws (4) that secure the lower end of the B-pillar trim to the front and rear door sills. Tighten the screws to 2 N·m (22 in. lbs.).
4. Move aside the seat belt webbing to install and tighten the two screws (2) that secure the upper end of the lower B-pillar trim to the inside of the B-pillar. Tighten the screws to 2 N·m (22 in. lbs.).
5. Reinstall the scuff plate trim onto the rear door sill. (Refer to 23 - BODY/INTERIOR/DOOR SILL SCUFF PLATE - INSTALLATION).
6. Reinstall the lower cowl trim onto the front door opening sill. (Refer to 23 - BODY/INTERIOR/COWL TRIM - INSTALLATION).

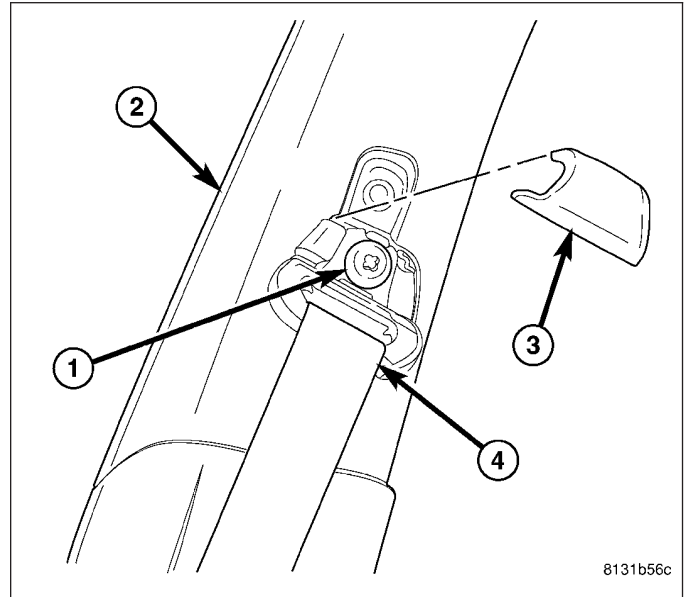


### UPPER

1. Engage the locator tab (2) on the back of the upper trim (4) into the locator hole on the inside of the B-pillar (3).
2. Align the two spring clip retainers on the trim with the slots in the inner B-pillar.
3. Using hand pressure, press firmly and evenly on the trim over each of the spring clip locations until the retainers snap into place.
4. Install and tighten the screw (1) that secures the lower end of the upper trim to the inside of the B-pillar. Tighten the screw to 3 N·m (25 in. lbs.).



5. Position the seat belt (4) and turning loop to the height adjuster on the upper B-pillar (2). Be certain that the webbing is not twisted.
6. Install and tighten the screw (1) that secures the turning loop to the seat belt height adjuster on the upper B-pillar. Tighten the screw to 40 N·m (30 ft. lbs.).
7. Position the trim cover (3) over the seat belt turning loop on the inside of the upper B-pillar.
8. Using hand pressure, press the trim cover and turning loop together until the cover snaps into place.
9. Reinstall the lower trim onto the inside of the B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - INSTALLATION).

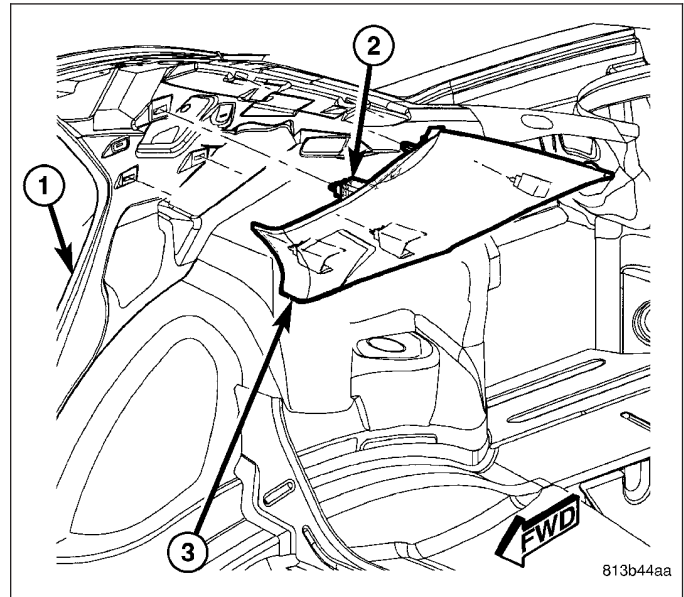


## C-PILLAR TRIM

### REMOVAL

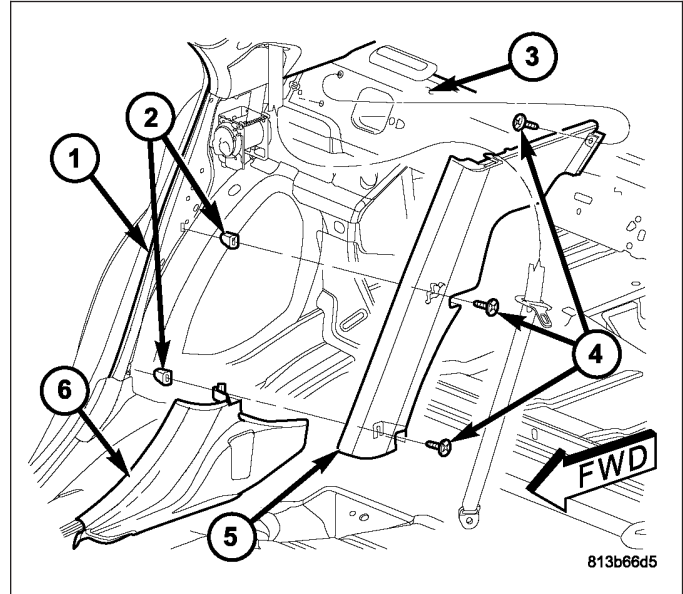
#### UPPER - SEDAN

1. Remove the rear seat cushion from the vehicle. (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - REMOVAL).
2. Remove the lower trim from the inside of the C-pillar. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL-LOWER).
3. Remove the screw that secures the outboard rear seat belt lower anchor to the quarter inner panel.
4. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the upper edge of the upper C-pillar trim (3) away from the quarter inner panel (1) far enough to disengage the upper spring clip retainers that secure the trim to the slots in the quarter inner panel and (if equipped) the curtain airbag support.
5. Rotate the upper edge of the upper C-pillar trim downward to disengage the locator pin (2) on the back of the panel from the locator hole in the quarter inner panel.
6. Pull the outboard rear seat belt webbing and lower anchor through the slot in the upper C-pillar trim.
7. Carefully pry the lower edge of the upper C-pillar trim away from the quarter inner panel far enough to disengage the lower spring clip retainers that secure the trim to the slots in the quarter inner panel and remove the trim from the vehicle.



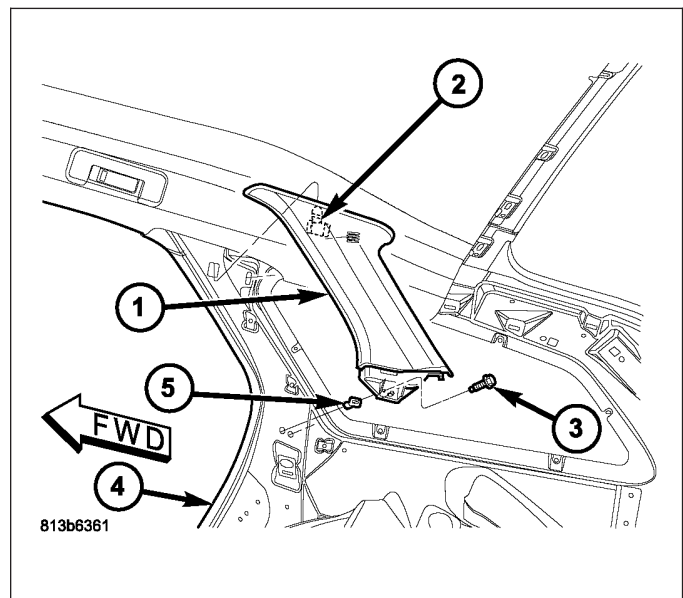
## LOWER

1. Remove the rear seat cushion from the vehicle. (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - REMOVAL).
2. Remove the rear seat back side bolster from the quarter inner panel (1). (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION/COVER - REMOVAL).
3. Remove the screw (4) that secures the upper end of the lower C-pillar trim (5) to the rear shelf panel (3).
4. Remove the two screws that secure the lower C-pillar trim to the quarter inner panel.
5. Remove the lower C-pillar trim from the quarter inner panel.



## UPPER - WAGON

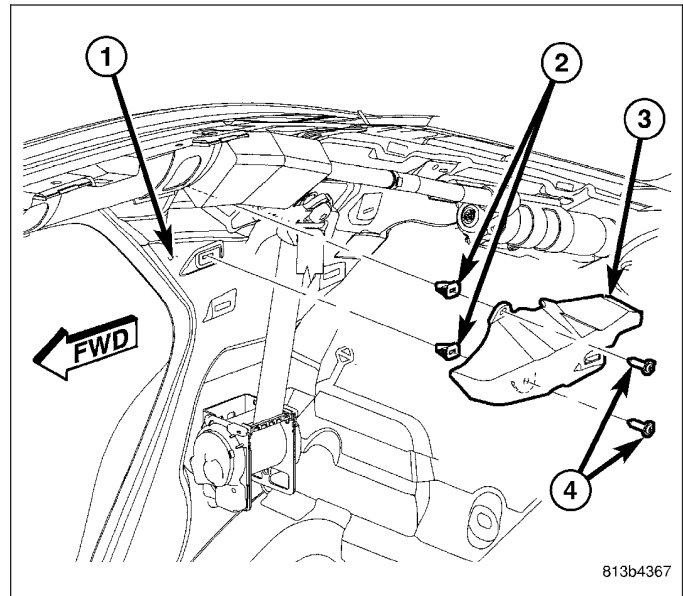
1. Remove the rear seat cushion from the vehicle. (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - REMOVAL).
2. Loosen the front edge of the quarter trim panel from the inside of the lower C-pillar. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL).
3. Remove the screw (3) that secures the lower end of the upper C-pillar trim (1) to the quarter inner panel (4).
4. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the rear edge of the upper C-pillar trim away from the quarter inner panel far enough to disengage the upper spring clip retainer that secures the trim to the slot in the quarter inner panel.
5. Pull the lower edge of the upper C-pillar trim away and down to disengage the locator tab (2) on the back of the panel from the locator hole in the quarter inner panel.
6. Remove the upper C-pillar trim from the vehicle.



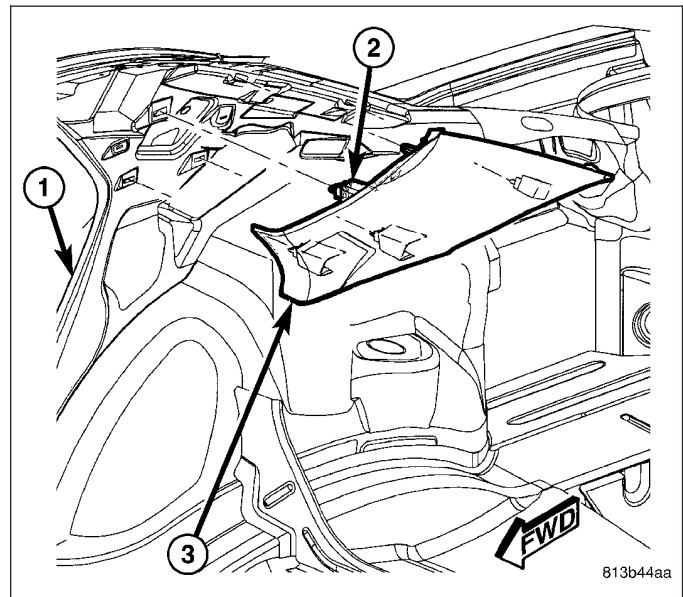
## INSTALLATION

### UPPER - SEDAN

1. If the vehicle is so equipped, be certain that the curtain airbag support (3) is properly installed and in good condition on the quarter inner panel (1). Replace the support if any damage is evident. Tighten the screws (4) into the spring nuts (2) to 2 N·m (15 in. lbs.).



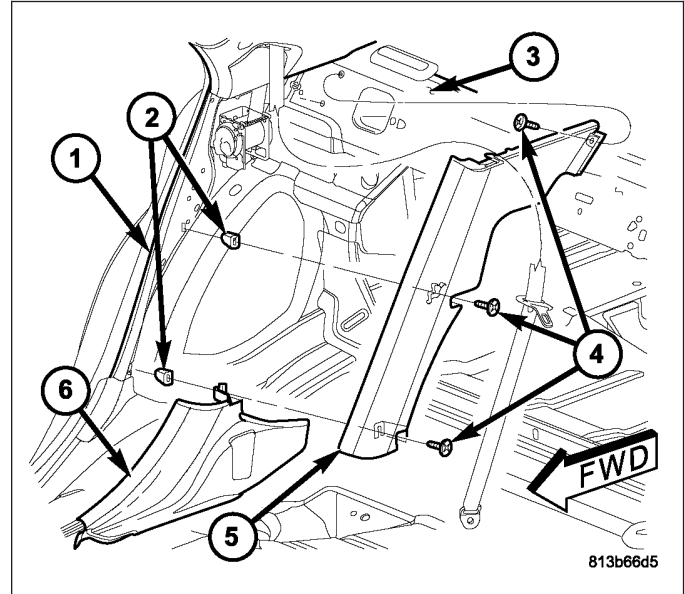
2. Align the spring clip retainers on the lower edge of the upper C-pillar trim (3) with the installation holes in the quarter inner panel (1) and pull the outboard rear seat belt webbing and lower anchor through the slot in the trim.
3. Rotate the top of the upper C-pillar trim upwards far enough to engage the locating pin (2) into the locating hole in the quarter inner panel.
4. Align the spring clip retainers on the trim with the slots in the quarter inner panel and (if equipped) the curtain airbag support..
5. Using hand pressure, press firmly and evenly on the trim over each of the spring clip locations until the retainers snap into place.
6. Reinstall the lower trim onto the inside of the C-pillar. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION-LOWER).



7. Position the outboard rear seat belt lower anchor to the quarter inner panel.
8. Install and tighten the screw that secures the outboard rear seat belt lower anchor to the quarter inner panel. Tighten the screw to 32 N·m (24 ft. lbs.).
9. Reinstall the rear seat cushion into the vehicle. (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - INSTALLATION).

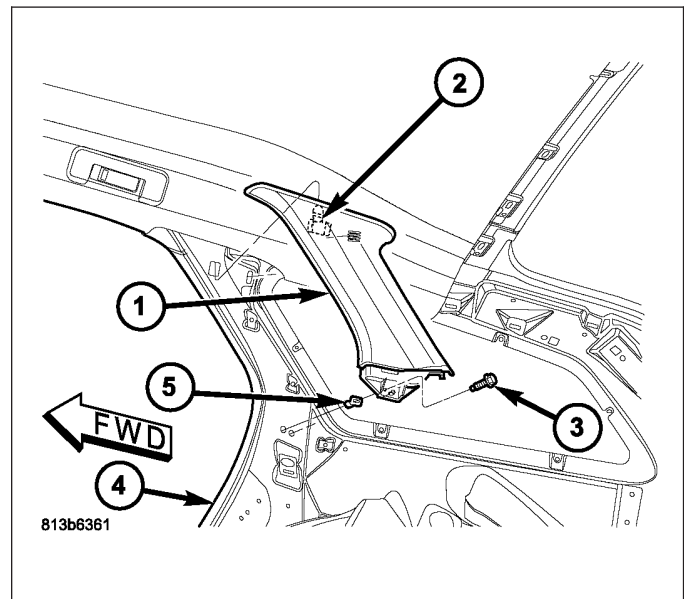
## LOWER

1. Check to be certain that the spring nuts (2) are properly installed and in good condition on the quarter inner panel (1). Replace the spring nut if any damage is evident.
2. Position the lower C-pillar trim (5) onto the quarter inner panel with the lower edge sequenced over the rear extension of the rear door sill scuff plate (6).
3. Install and tighten the two screws (4) that secure the lower C-pillar trim to the quarter inner panel. Tighten the screws to 1 N·m (11 in. lbs.).
4. Install and tighten the screw that secures the lower C-pillar trim to the rear shelf panel (3). Tighten the screw to 1 N·m (11 in. lbs.).
5. Reinstall the rear seat back side bolster onto the quarter inner panel. (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION/COVER - INSTALLATION).
6. Reinstall the rear seat cushion into the vehicle. (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - INSTALLATION).



## UPPER - WAGON

1. Check to be certain that the spring nut (5) is properly installed and in good condition on the quarter inner panel (4). Replace the spring nut if any damage is evident.
2. Position the upper C-pillar trim (1) to the quarter inner panel in the vehicle.
3. Engage the locator tab (2) on the back of the upper C-pillar trim into the locator hole in the quarter inner panel.
4. Align the spring clip retainer on the upper rear corner of the upper C-pillar trim with the installation hole in the quarter inner panel.
5. Using hand pressure, press firmly and evenly on the trim over the spring clip location until the retainer snaps into place.
6. Install and tighten the screw (3) that secures the lower end of the upper C-pillar trim to the quarter inner panel. Tighten the screw to 2 N·m (15 in. lbs.).
7. Reinstall the front edge of the quarter trim panel onto the inside of the lower C-pillar. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - INSTALLATION).
8. Reinstall the rear seat cushion into the vehicle. (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - INSTALLATION).



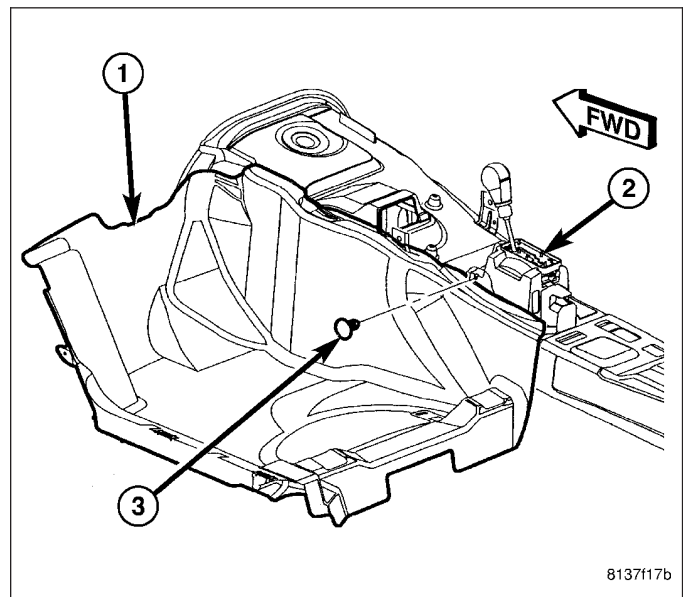
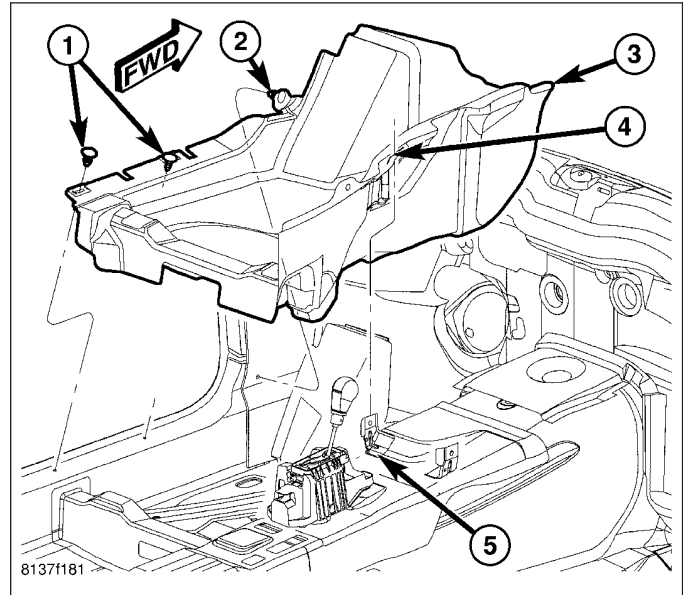
## CARPET

### REMOVAL

#### FRONT

**Note:** The front carpet consists of two individual carpets, one for the driver side and one for the passenger side. These carpets can be removed from and installed into the vehicle individually.

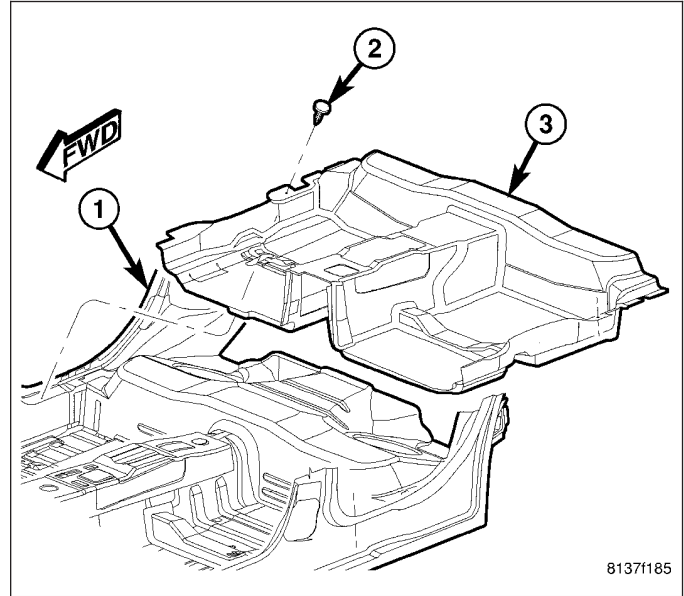
1. Remove the driver and/or passenger front seat from the vehicle as appropriate. (Refer to 23 - BODY/SEATS/SEAT-FRONT - REMOVAL).
2. Remove the center console from the front floor panel transmission tunnel. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).
3. Remove the trim from the driver or passenger side lower cowl side inner panel as appropriate. (Refer to 23 - BODY/INTERIOR/COWL TRIM - REMOVAL-LOWER).
4. Remove the two push-pin fasteners (1) that secure the outboard edge of the front carpet (3) to the front door opening sill.
5. On the driver side only, remove the push-pin fastener (2) that secures the front carpet to the cowl side inner panel above the foot rest.
6. On the driver side only, remove the push-pin fastener (3) that secures the inboard edge of the front carpet (1) to the transmission shifter bracket (2).
7. Remove the front carpet from the floor panel.





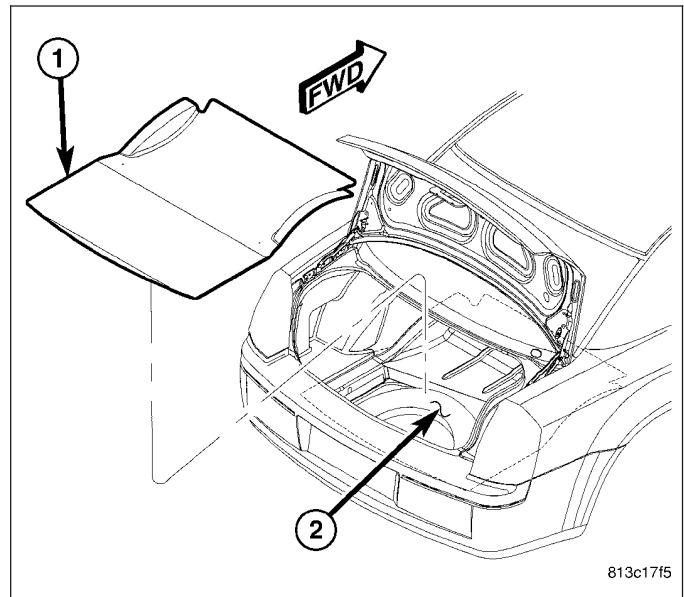
## REAR

1. Remove the driver and passenger front seats from the vehicle. (Refer to 23 - BODY/SEATS/SEAT-FRONT - REMOVAL).
2. Remove the center console from the front floor panel transmission tunnel. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).
3. Remove the trim from the inside of both lower B-pillars. (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - REMOVAL-LOWER).
4. Remove the rear seat cushion from the vehicle. (Refer to 23 - BODY/SEATS/REAR SEAT CUSHION COVER - REMOVAL).
5. Remove the scuff plate from both rear door sills. (Refer to 23 - BODY/INTERIOR/REAR DOOR SILL SCUFF PLATE - REMOVAL).
6. Remove the push-pin fasteners (2) that secure the outboard edges of the rear carpet (3) near the front of each rear door opening (1) sill.
7. Lift the rear carpet from the floor panel far enough to extract the body wire harness take outs and connectors through the appropriate slits in the carpeting.
8. Remove the rear carpet from the vehicle through one of the rear door openings.



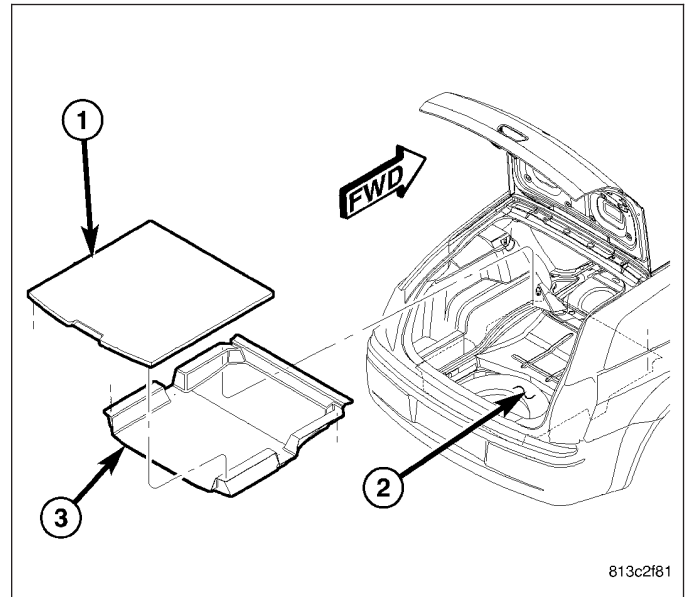
## TRUNK - SEDAN

1. If equipped, remove the cargo liner and/or cargo net from the luggage compartment.
2. Fold and remove the spare tire cover/trunk floor carpet (1) from over the spare tire well (2).



## CARGO AREA - WAGON

1. If equipped, remove the cargo net from the rear cargo area.
2. Fold and remove the cargo floor carpet (1) from the rear cargo area.
3. If equipped, remove the cargo liner and/or the cargo organizer from the cargo compartment.
4. Fold and remove the spare tire cover/cargo compartment carpet (3) from over the spare tire well (2).

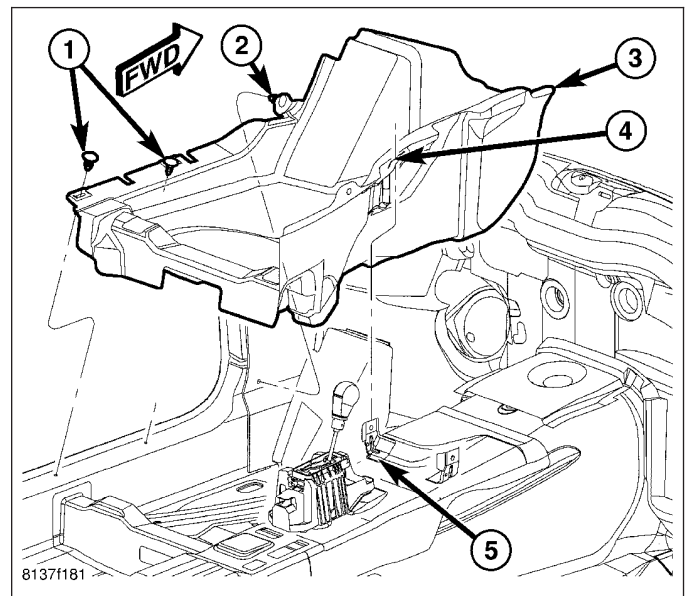


## INSTALLATION

### FRONT

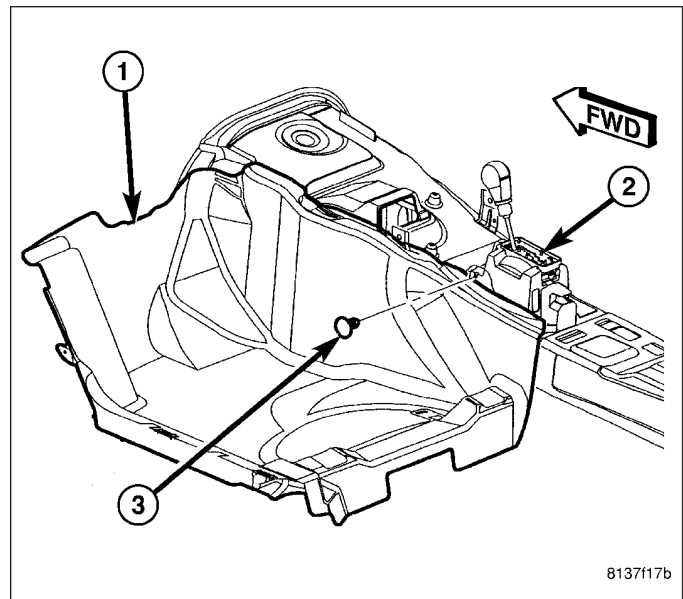
**Note:** The front carpet consists of two individual carpets, one for the driver side and one for the passenger side. These carpets can be removed from and installed into the vehicle individually.

1. Position and fit the front carpet (3) onto the floor panel. Be certain that the rear of the front carpet is fitted over the floor panel front crossmember and butts up against the front of the rear carpet without interference with the rear floor air duct opening. Be certain that the front of the front carpet is fitted to the dash panel without interference with the steering column, the accelerator or the heater and air conditioner unit. On the driver side only, be certain the slit (4) on the inboard edge of the carpet is engaged around the left instrument panel support bracket (5) on the top of the floor panel transmission tunnel.
2. Install the two push-pin fasteners (1) that secure the outboard edge of the front carpet to the front door opening sill.
3. On the driver side only, install the push-pin fastener (2) that secures the front carpet to the cowl side inner panel above the foot rest.



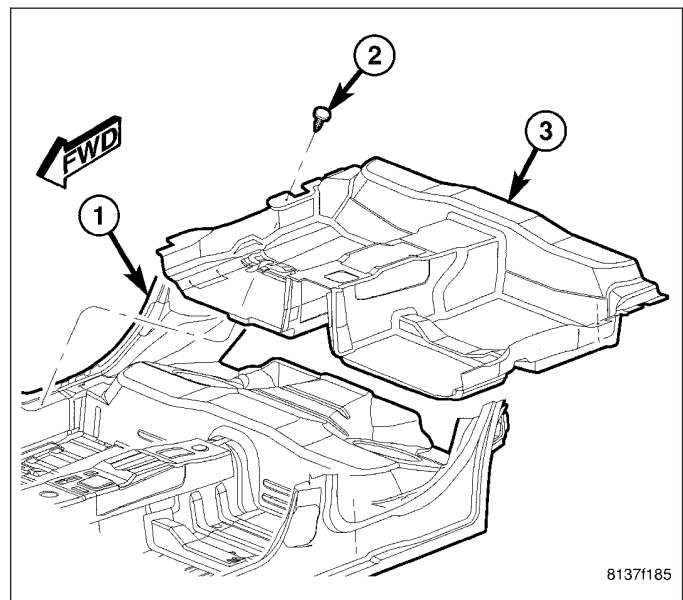


4. On the driver side only, install the push-pin fastener (3) that secures the inboard edge of the front carpet (1) to the transmission shifter bracket (2).
5. Reinstall the trim onto the driver or passenger side lower cowl side inner panel as appropriate. (Refer to 23 - BODY/INTERIOR/COWL TRIM - INSTALLATION-LOWER).
6. Reinstall the center console onto the front floor panel transmission tunnel. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).
7. Reinstall the driver and/or passenger front seat into the vehicle as appropriate. (Refer to 23 - BODY/SEATS/SEAT-FRONT - INSTALLATION).



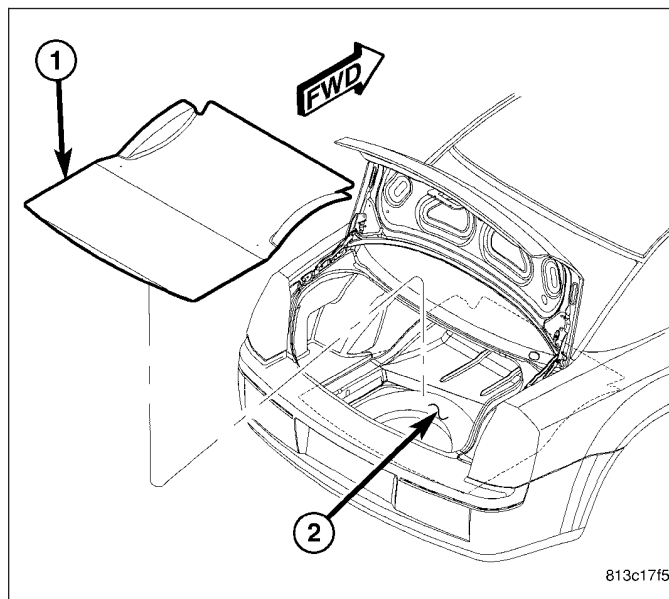
## REAR

1. Position the rear carpet (3) into the vehicle through one of the rear door openings.
2. Pull the body wire harness take outs and connectors through the appropriate slits in the rear carpet.
3. Fit the rear carpet to the floor panel. Be certain to align the holes in the carpet with the corresponding holes in the floor panel. Be certain that the rear edge of the carpet is fitted over the rear seat kick-up area and over the rear seat cushion cups on the top of the kick-up area. Be certain that the front edge of the carpet is fitted over the front seat rear crossmember and butts up against the rear of the front seat front crossmember.
4. Install the push-pin fasteners (2) that secure the outboard edges of the rear carpet near the front of each rear door opening (1) sill.
5. Reinstall the scuff plate onto both rear door sills. (Refer to 23 - BODY/INTERIOR/REAR DOOR SILL SCUFF PLATE - INSTALLATION).
6. Reinstall the rear seat cushion into the vehicle. (Refer to 23 - BODY/SEATS/REAR SEAT CUSHION COVER - INSTALLATION).
7. Reinstall the trim onto the inside of both lower B-pillars. (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - INSTALLATION-LOWER).
8. Reinstall the center console onto the front floor panel transmission tunnel. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).
9. Reinstall the driver and passenger front seats into the vehicle. (Refer to 23 - BODY/SEATS/SEAT-FRONT - INSTALLATION).



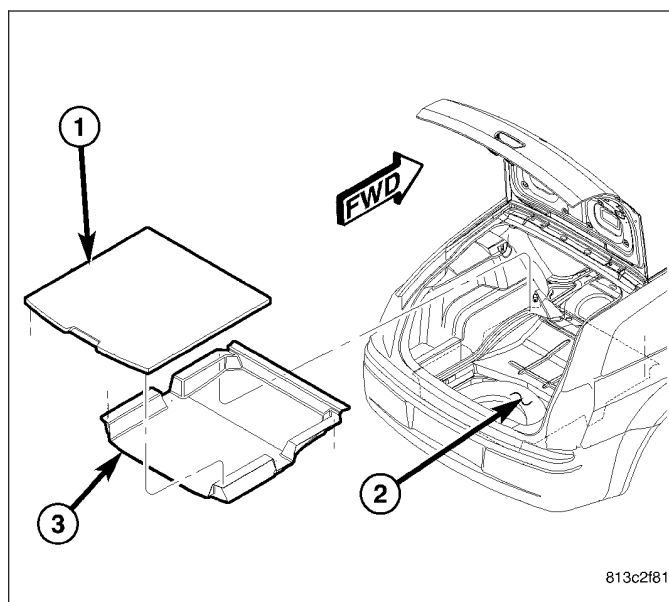
## TRUNK - SEDAN

1. Fold the spare tire cover/trunk floor carpet (1) and place it within the luggage compartment.
2. Unfold, position and fit the spare tire cover/trunk floor carpet over the spare tire well (2) in the luggage compartment.
3. If equipped, reinstall the cargo liner and/or cargo net into the luggage compartment.



## CARGO AREA - WAGON

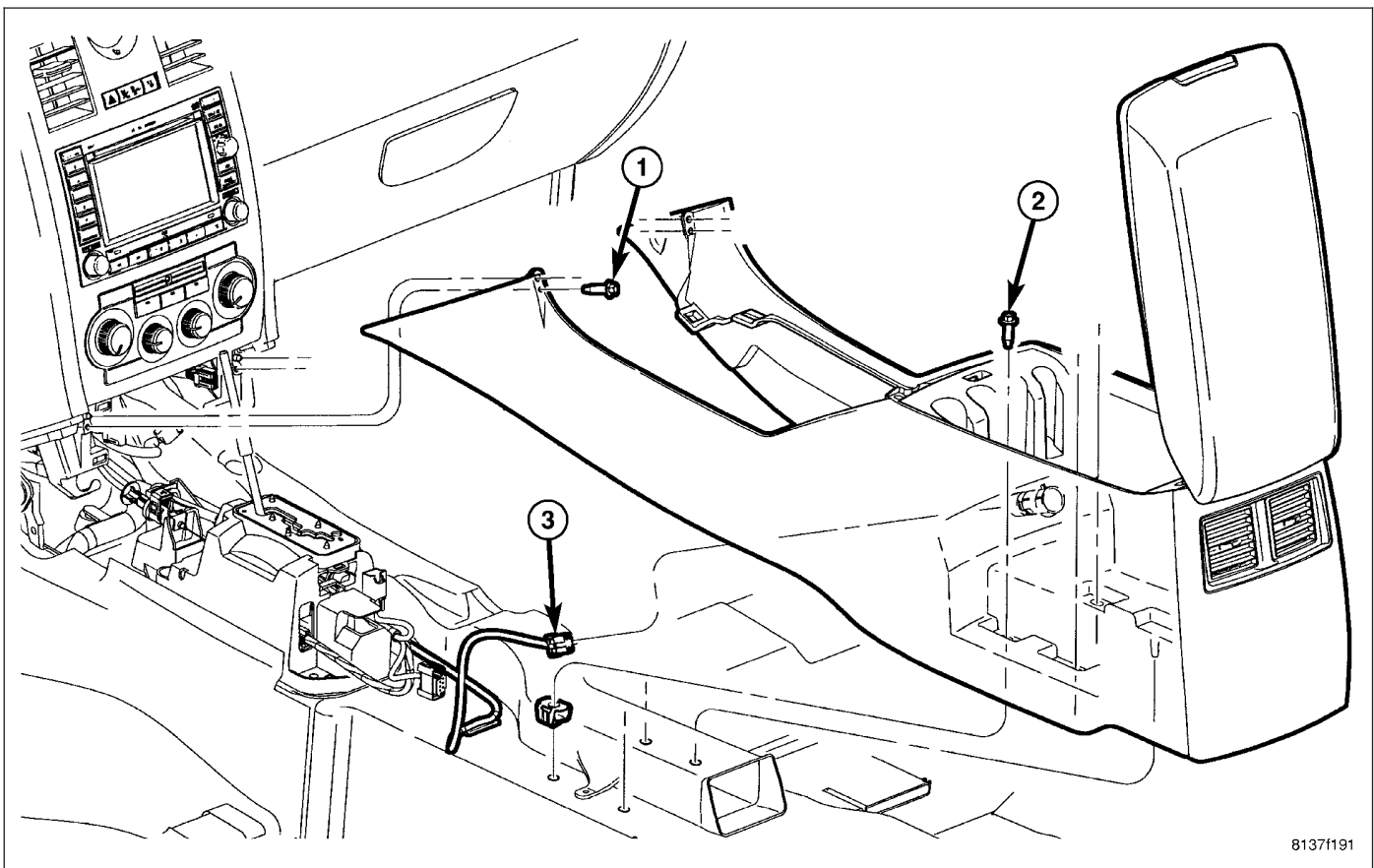
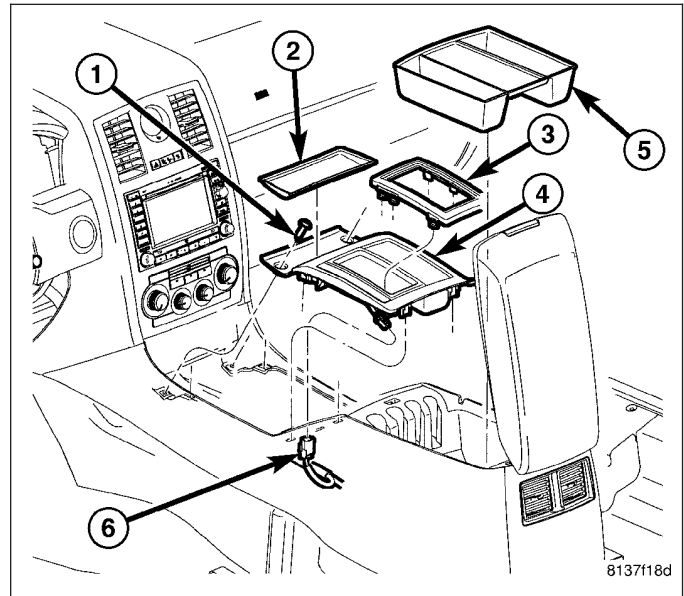
1. Fold the spare tire cover/cargo compartment carpet (3) and place it into the rear cargo area.
2. Unfold, position and fit the spare tire cover/cargo compartment carpet over the spare tire well (2) in the rear cargo area.
3. If equipped, reinstall the cargo liner and/or the cargo organizer into the cargo compartment.
4. Fold the cargo floor carpet (1) and place it into the rear cargo area.
5. Unfold, position and fit the cargo floor carpet into the rear cargo area.
6. If equipped, reinstall the cargo net into the rear cargo area.



## CONSOLE-FLOOR

### REMOVAL

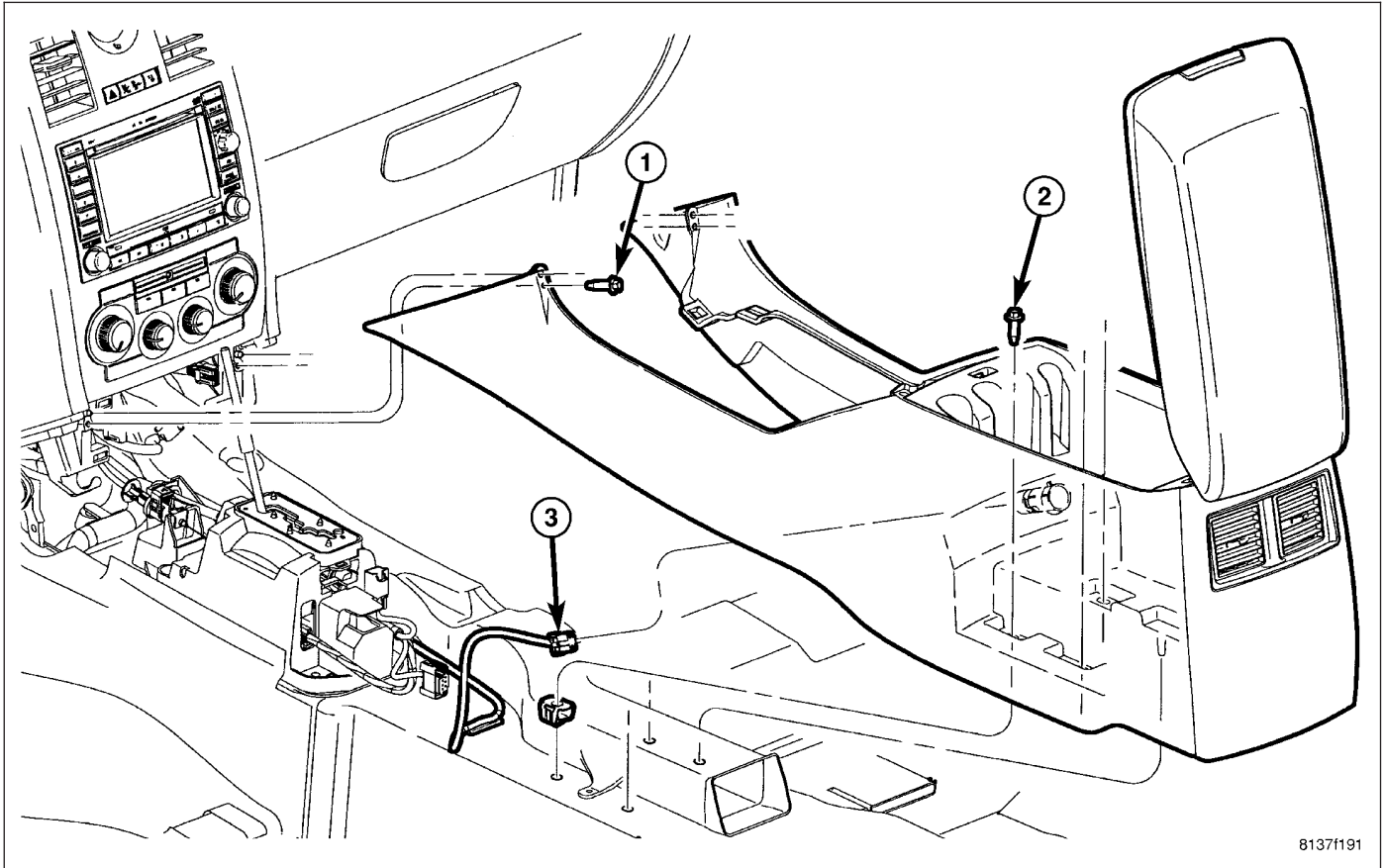
1. Apply the parking brake.
2. Turn the ignition switch to the On position, apply the service brakes and place the gear selector lever into the Neutral position.
3. Turn the ignition switch to the Off position and release the service brakes.
4. Disconnect and isolate the battery negative cable.
5. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the shifter trim ring (3) upward to unsnap it from the console shifter bezel (4).
6. Remove the shifter trim ring from around the gear selector lever.
7. Remove the mat (2) from the cubby bin at the front of the floor console.
8. Open the lid of the console rear bin and remove the mat (5) from the rear bin.
9. Remove the two screws (1) that secure the front of the console shifter bezel to the console.
10. Lift the console shifter bezel upward from the console far enough to access and disconnect the bezel pigtail connector from the takeout of the body wire harness (6).
11. Remove the shifter bezel from around the gear selector lever.



12. Remove the three screws (2) from the rear bin that secure the console to the floor panel transmission tunnel.

13. Remove the two screws (1) that secure the front of the console to the instrument panel.
14. Tip the rear of the console upward far enough to access and disconnect the jumper wire connector (3) from the accessory power outlet on the underside of the console.
15. Remove the floor console from the vehicle.

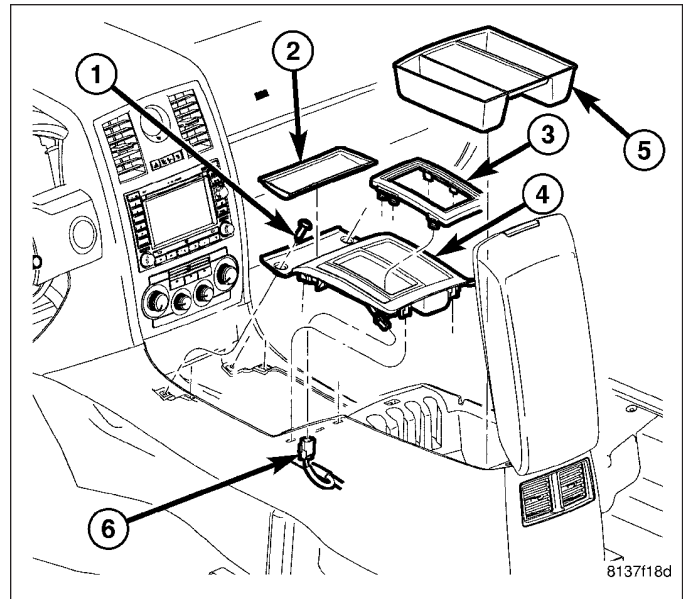
## INSTALLATION



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1. Position the floor console into the vehicle.
2. Tip the rear of the console upward far enough to access and reconnect the jumper wire connector (3) to the accessory power outlet on the underside of the console.
3. Position the console over the center floor duct and engage the two alignment holes at the front of the console over the two alignment pins on the instrument panel.
4. Engage the locating pin on the underside of the console rear bin into the slot in the top of the floor panel transmission tunnel.
5. Install and tighten the two screws (1) that secure the front of the console to the instrument panel. Tighten the screws to 3 N·m (23 in. lbs.).
6. Install and tighten the three screws (2) into the rear bin that secure the console to the floor panel transmission tunnel. Tighten the screws to 5 N·m (40 in. lbs.).

7. Position the console shifter bezel (4) over the gear selector lever.
8. Reconnect the shifter bezel pigtail connector to the takeout of the body wire harness (6).
9. Position the tabs on the underside of the console shifter bezel into the holes in the floor console.
10. Install and tighten the two screws (1) that secure the front of the console shifter bezel to the console. Tighten the screws to 3 N·m (23 in. lbs.).
11. Position the mat (5) into the console rear bin with the curved edge oriented forward in the vehicle.
12. Position the mat (2) into the cubby bin at the front of the floor console.
13. Position the shifter trim ring (3) around the gear selector lever.
14. Position the tabs on the left underside of the shifter trim ring into the console shifter bezel, then use hand pressure to press downward firmly and evenly on the right side of the trim ring to snap the right side tabs into the bezel.
15. Place the gear selector lever into the Park position.
16. Reconnect the battery negative cable.

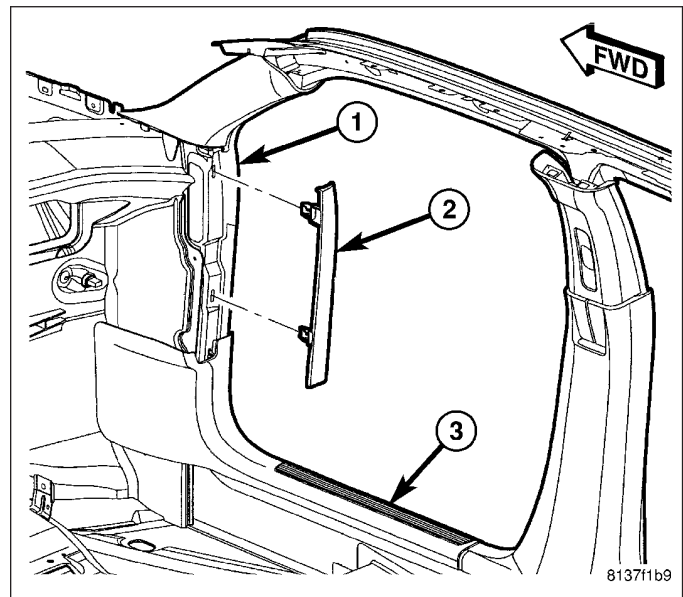


## COWL TRIM

### REMOVAL

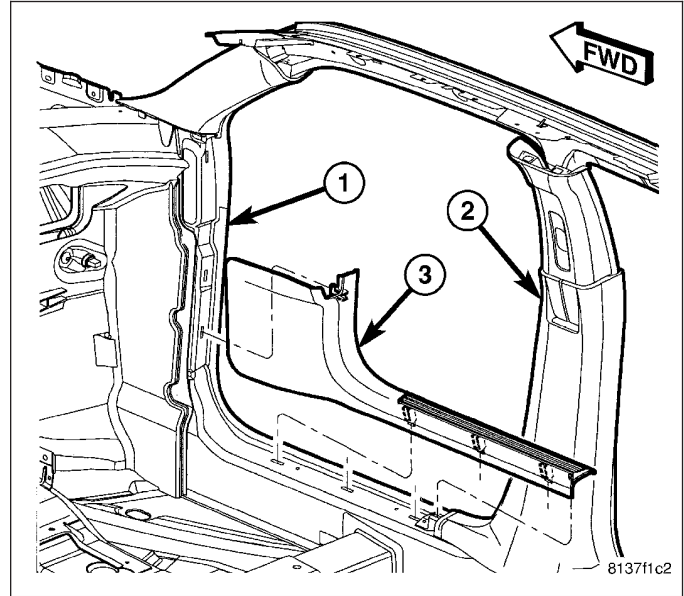
#### UPPER

1. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the upper cowl trim (2) rearward from the front of the front door opening far enough to disengage the two spring clip retainers that secure the trim to the slots in the cowl (1).
2. Remove the upper cowl trim from the vehicle.



## LOWER

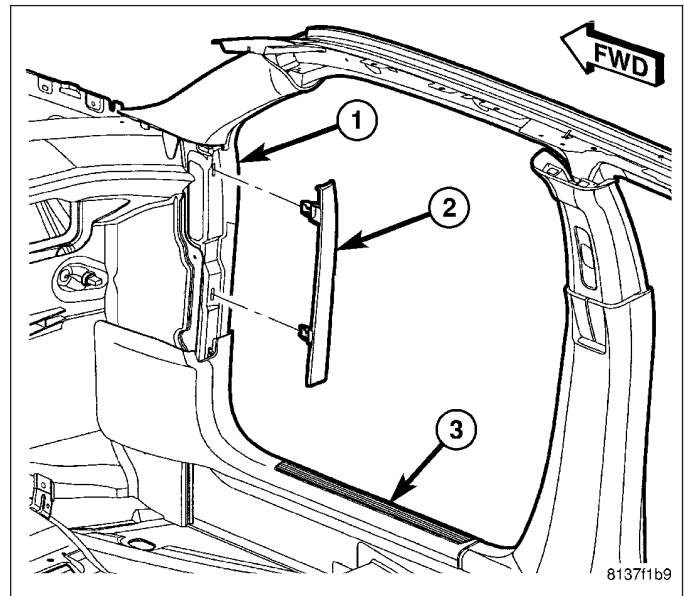
1. Remove the upper cowl trim from the front of the front door opening. (Refer to 23 - BODY/INTERIOR/COWL TRIM - REMOVAL-UPPER).
2. Using a trim stick or another suitable wide flat-bladed tool and starting nearest the B-pillar trim (2), carefully pry the lower cowl trim (3) upward from the front door opening sill far enough to disengage the three spring clip retainers that secure the trim to the slots in the sill.
3. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the lower cowl trim rearward from the front of the front door opening far enough to disengage the spring clip retainer that secures the trim to the slot in the cowl (1).
4. Remove the lower cowl trim from the vehicle.



## INSTALLATION

### UPPER

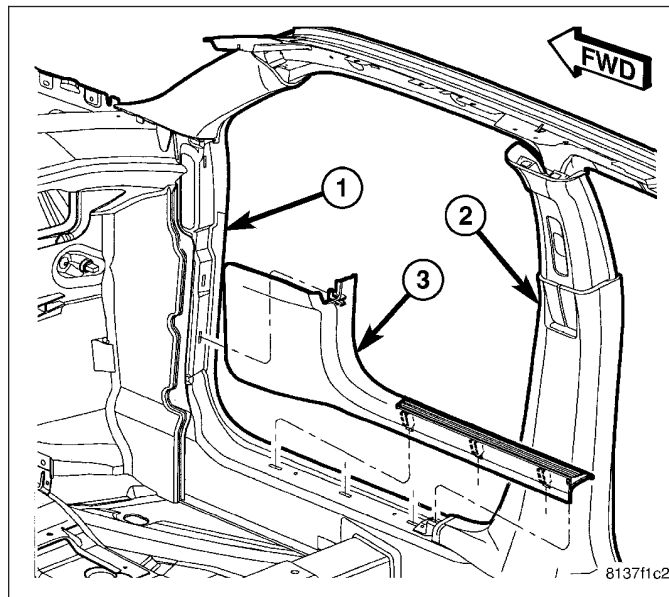
1. Position the upper cowl trim (2) to the cowl (1) at the front of the front door opening and the lower cowl trim (3).
2. Align the two spring clip retainers on the trim with the slots in the cowl.
3. Using hand pressure, press firmly and evenly downward on the trim over each of the spring clip locations until the retainers snap into place.





## LOWER

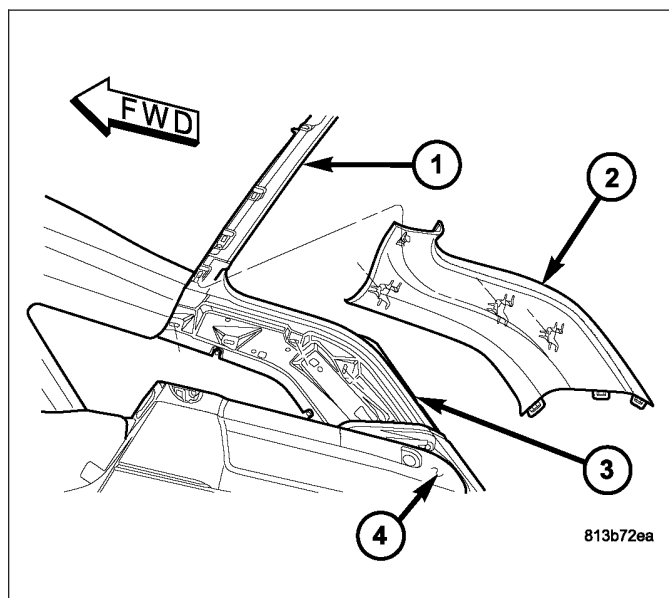
1. Check to be certain that the three plastic nuts are properly installed and in good condition in the slots of the front door opening sill. Replace a plastic nut if any damage is evident.
2. Position the vertical portion of the lower cowl trim (3) to the cowl (1) at the front of the front door opening.
3. Align the spring clip retainer on the trim with the slot in the cowl (1).
4. Using hand pressure, press firmly and evenly forward on the trim over the spring clip location until the retainer snaps into place.
5. Position the horizontal portion of the lower cowl trim to the front door sill and the B-pillar trim (2).
6. Align the three spring clip retainers on the trim with the slots in the sill.
7. Using hand pressure, press firmly and evenly downward on the trim over each of the spring clip locations until the retainers snap into place.
8. Reinstall the upper cowl trim to the front of the front door opening. (Refer to 23 - BODY/INTERIOR/COWL TRIM - INSTALLATION-UPPER).



## D-PILLAR TRIM

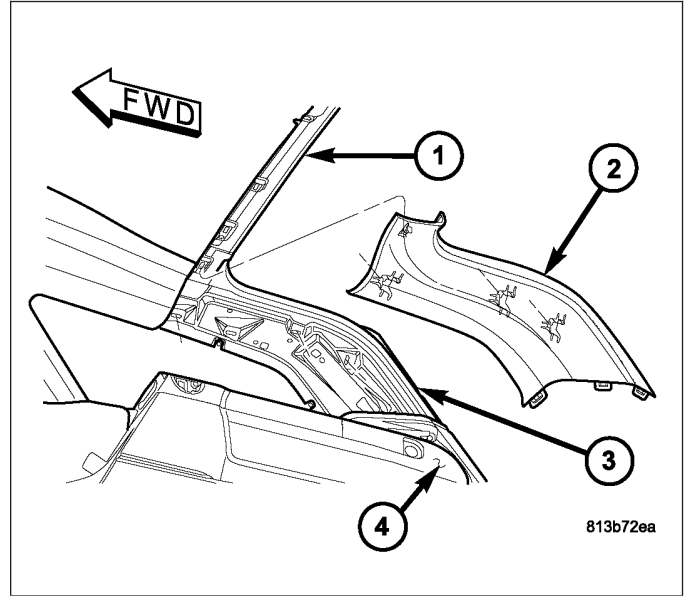
### REMOVAL

1. Remove the trim plate from the upper liftgate opening header (1). (Refer to 23 - BODY/INTERIOR/LIFTGATE OPENING UPPER TRIM - REMOVAL).
2. Loosen the rear edge of the quarter trim panel (4) from the inside of the lower D-pillar. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL).
3. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the upper edge of the upper D-pillar trim (2) away from the headliner far enough to disengage the two upper spring clip retainers that secure the trim to the slots in the upper liftgate opening header and the inside of the D-pillar.
4. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the lower half of the upper D-pillar trim away from the D-pillar far enough to disengage the two lower spring clip retainers that secure the trim to the slots in the pillar.
5. Disengage the lower edge of the upper D-pillar trim from under the quarter trim panel.
6. Remove the upper D-pillar trim from the vehicle.



## INSTALLATION

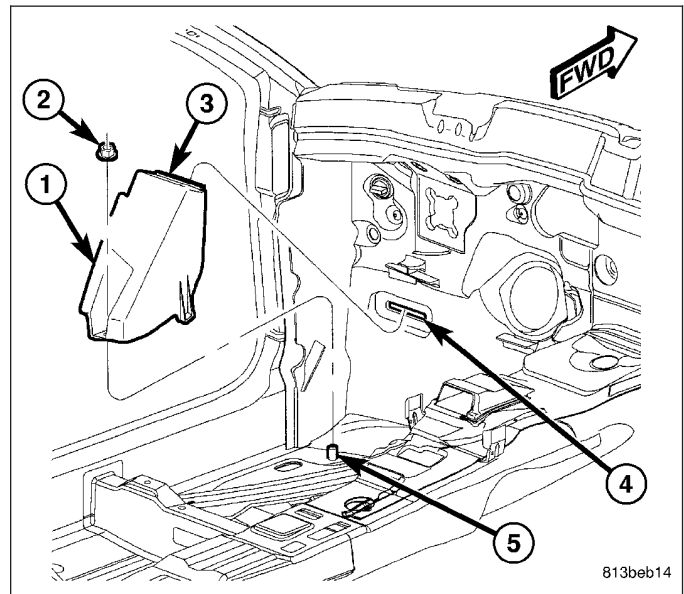
1. Engage the lower edge of the upper D-pillar trim (2) under the upper edge of the quarter trim panel (4) at the inner D-pillar (3).
2. Align the two lower spring clip retainers on the back of the trim with the slots in the inside of the D-pillar.
3. Using hand pressure, press firmly and evenly on the trim over each of the lower spring clip locations until the retainers snap into place.
4. Align the two upper spring clip retainers on the back of the trim with the slots in the inside of the D-pillar and the upper liftgate opening header (1).
5. Using hand pressure, press firmly and evenly on the trim over each of the spring clip locations until the retainers snap into place.
6. Reinstall the rear edge of the quarter trim panel to the inside of the lower D-pillar. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - INSTALLATION).
7. Reinstall the trim plate onto the upper liftgate opening header. (Refer to 23 - BODY/INTERIOR/LIFTGATE OPENING UPPER TRIM - INSTALLATION).



## FRONT FLOOR FOOT REST

### REMOVAL

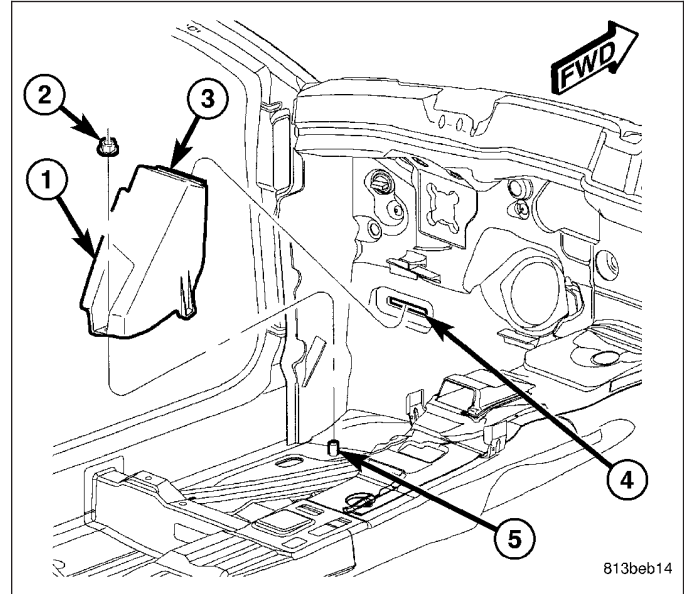
1. Remove the trim from the driver side lower cowl side inner panel. (Refer to 23 - BODY/INTERIOR/COWL TRIM - REMOVAL-LOWER).
2. Remove the three push-pin fasteners that secure the driver side front carpet to the cowl side inner panel and the front door opening sill.
3. Pull the front floor carpet up and away from the foot rest (1) far enough to access and remove the nut (2) that secures the foot rest to the weld stud (5) on the front floor panel.
4. Lift the base of the foot rest upward far enough to disengage the tab (3) at the top of the foot rest from the slot (4) in the dash panel.
5. Remove the foot rest from the vehicle.





## INSTALLATION

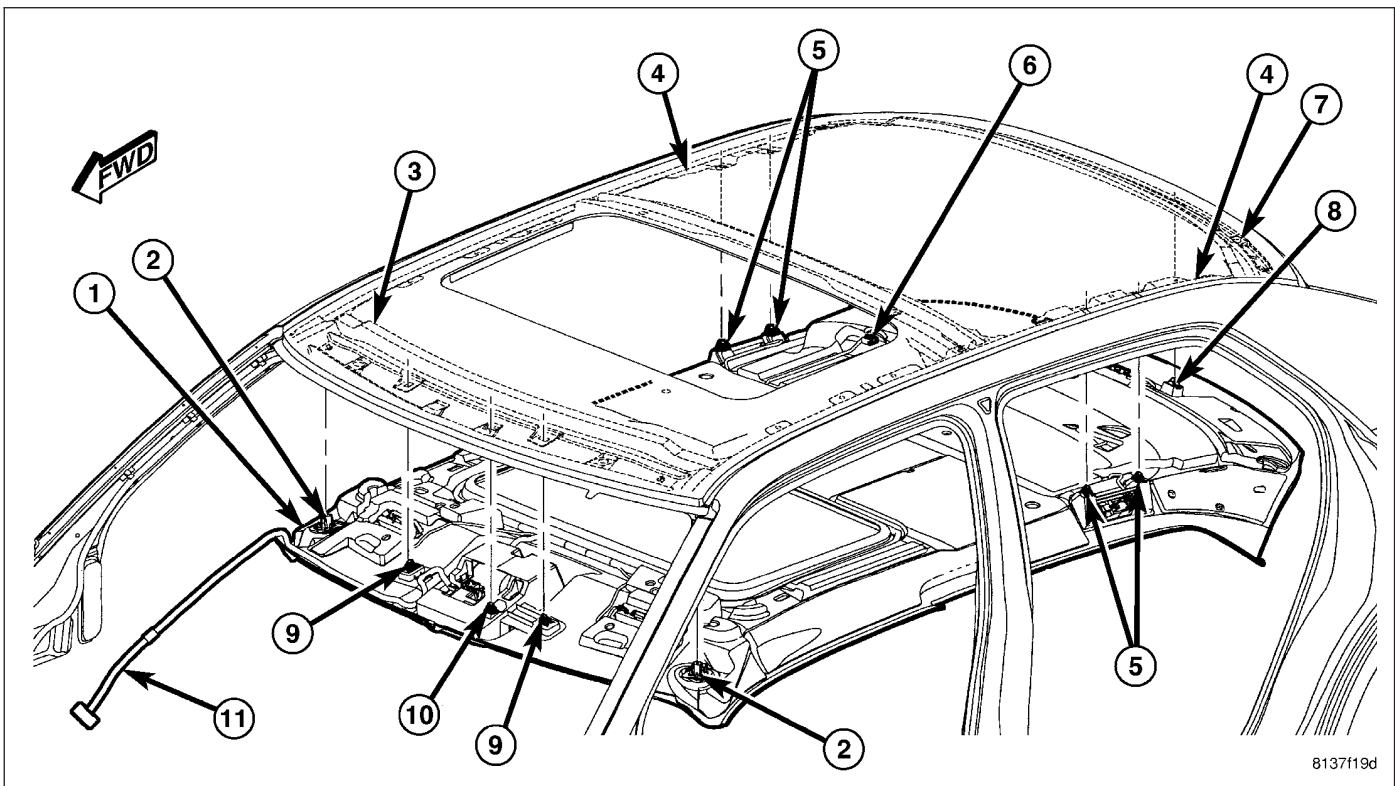
1. Pull the outboard edge of the driver side front floor carpet up and away from the floor far enough to position the foot rest (1) between the front floor panel and the carpet.
2. Engage the tab (3) at the top of the foot rest into the slot (4) in the dash panel.
3. Position the hole at the base of the foot rest over the weld stud (5) on the front floor panel.
4. Install and tighten the nut (2) that secures the foot rest to the weld stud. Tighten the nut to 16 N·m (12 ft. lbs.).
5. Reposition the driver side front carpet to the cowl side inner panel and the front door opening sill and secure with three push-pin fasteners.
6. Reinstall the trim onto the driver side lower cowl side inner panel. (Refer to 23 - BODY/INTERIOR/COWL TRIM - INSTALLATION-LOWER).



## HEADLINER

### REMOVAL

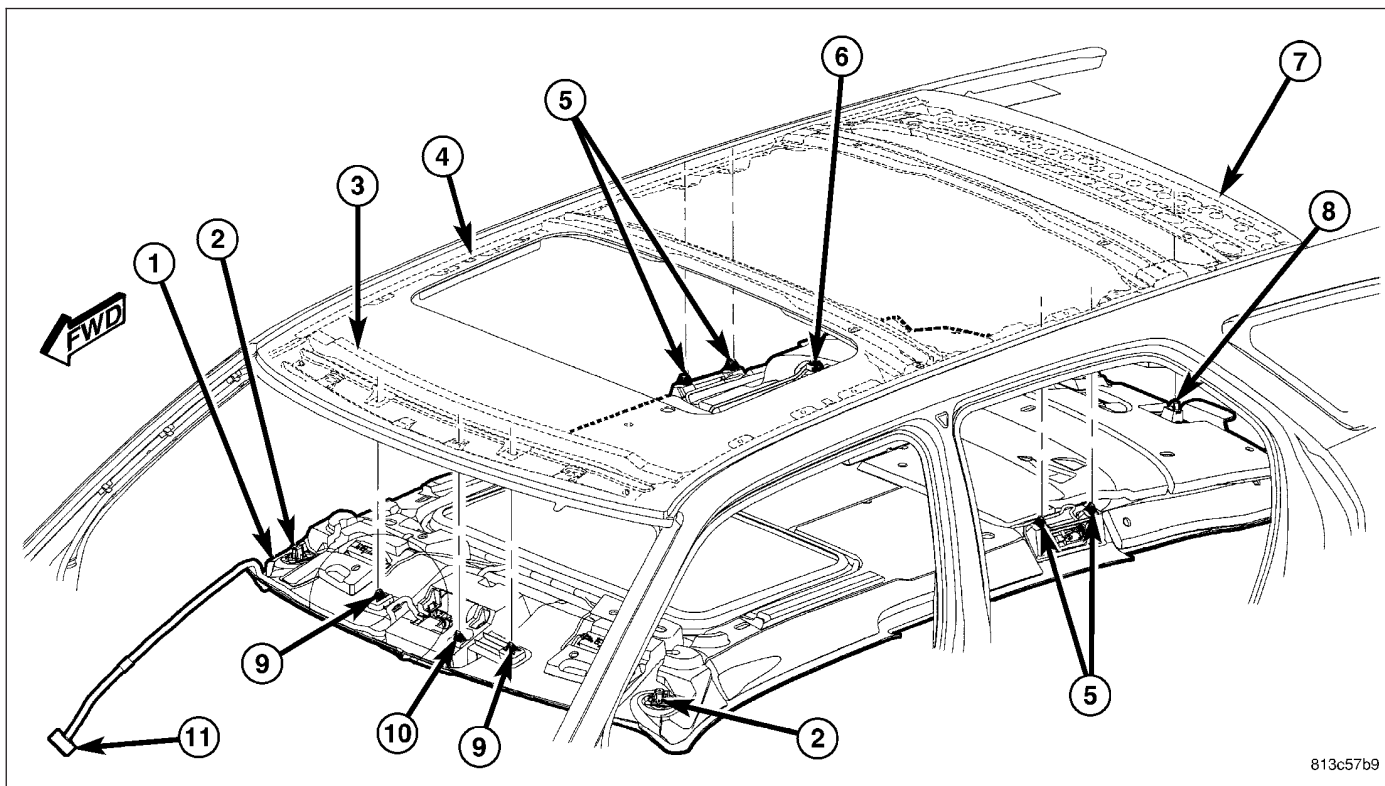
#### SEDAN



1. Disconnect and isolate the battery negative cable.
2. Remove the trim from both upper A-pillars. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL).
3. Disengage the headliner wire harnesses from the retainers on each inner A-pillar and disconnect the connectors (11) from the body wire harness connectors near the base of each A-pillar.

4. Remove the trim from both upper B-pillars. (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - REMOVAL-UPPER).
5. Remove the trim from both upper C-pillars. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL-UPPER-SEDAN).
6. If the vehicle is so equipped, remove the overhead console from the center of the headliner (1) near the windshield header (3). (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).
7. If the vehicle is so equipped, disconnect the electrochromic (automatic dimming) and/or the telematic (hands-free phone) mirror takeout(s) and connector(s) of the headliner wire harness from the connector receptacle(s) on the back (windshield side) of the inside rear view mirror housing.
8. Remove both sun visors and both visor receptacles from the headliner near the windshield header.
9. Remove both grab handle/coat hook/rear dome/reading lamp units from the headliner at the inner rear roof side rails (4).
10. If the vehicle is so equipped, remove the trim welt from the headliner sunroof opening.
11. Fold down both rear seat backs.
12. Recline both front seat backs.
13. Carefully pull the headliner downward at the windshield header far enough to disengage the spring clip retainers at each sun visor mounting location (2), at each visor receptacle location (9), and at the overhead console location (10).
14. Carefully pull the headliner downward at the inner rear roof side rails far enough to disengage the spring clip retainers at each grab handle location (5).
15. Carefully pull the headliner downward near the center of the rear roof header (7) far enough to disengage the rear spring clip retainer (8).
16. If the vehicle is equipped with a sunroof, reach between the headliner and the roof panel from the right rear door opening to access and disconnect the sunroof jumper wire connector from the headliner wire harness sunroof take out and connector (6).
17. Carefully bow the headliner longitudinally as necessary to remove the unit through the right rear door opening.

## WAGON



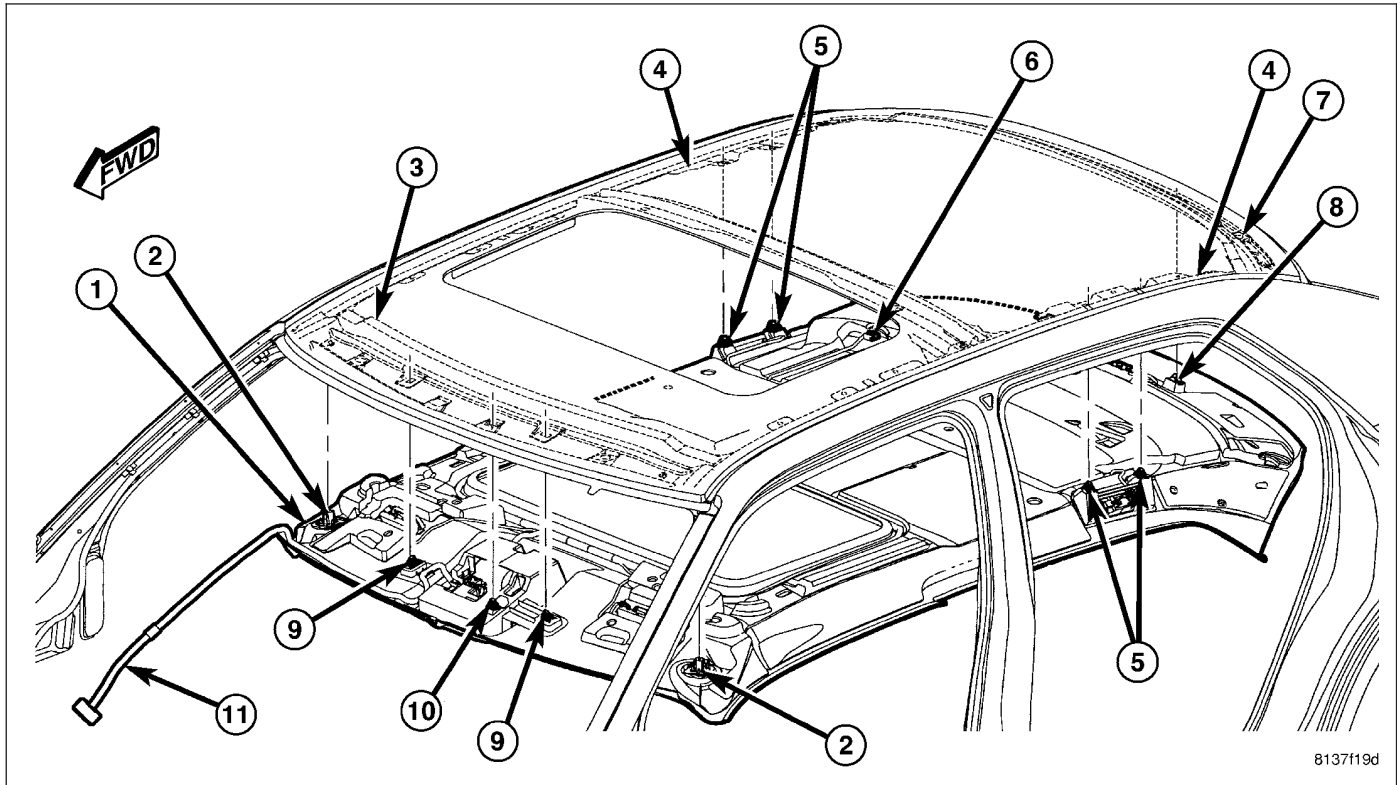
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1. Disconnect and isolate the battery negative cable.
2. Remove the trim from both upper A-pillars. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL).
3. Disengage the headliner wire harnesses from the retainers on each inner A-pillar and disconnect the connectors (11) from the body wire harness connectors near the base of each A-pillar.
4. Remove the trim from both upper B-pillars. (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - REMOVAL-UPPER).
5. Remove the trim from both upper C-pillars. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL-UPPER-WAGON).
6. Remove the trim from both upper D-pillars. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - REMOVAL).
7. If the vehicle is so equipped, remove the overhead console from the center of the headliner (1) near the windshield header (3). (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).
8. If the vehicle is so equipped, disconnect the electrochromic (automatic dimming) and/or the telematic (hands-free phone) mirror takeout(s) and connector(s) of the headliner wire harness from the connector receptacle(s) on the back (windshield side) of the inside rear view mirror housing.
9. Remove both sun visors and both visor receptacles from the headliner near the windshield header.
10. Remove both grab handle/coat hook/rear dome/reading lamp units from the headliner at the inner rear roof side rails (4).
11. If the vehicle is so equipped, remove the trim welt from the headliner sunroof opening.
12. Fold down both rear seat backs.
13. Recline both front seat backs.
14. Carefully pull the headliner downward at the windshield header far enough to disengage the spring clip retainers at each sun visor mounting location (2), at each visor receptacle location (9), and at the overhead console location (10).
15. Carefully pull the headliner downward at the inner rear roof side rails far enough to disengage the spring clip retainers at each grab handle location (5).
16. Carefully pull the headliner downward near the center of the liftgate opening header (7) far enough to disengage the rear spring clip retainer (8).

17. If the vehicle is equipped with a sunroof, reach between the headliner and the roof panel from the right rear door opening to access and disconnect the sunroof jumper wire connector from the headliner wire harness sunroof take out and connector (6).
18. Carefully bow the headliner longitudinally as necessary to remove the unit through the liftgate opening.

## INSTALLATION

### SEDAN



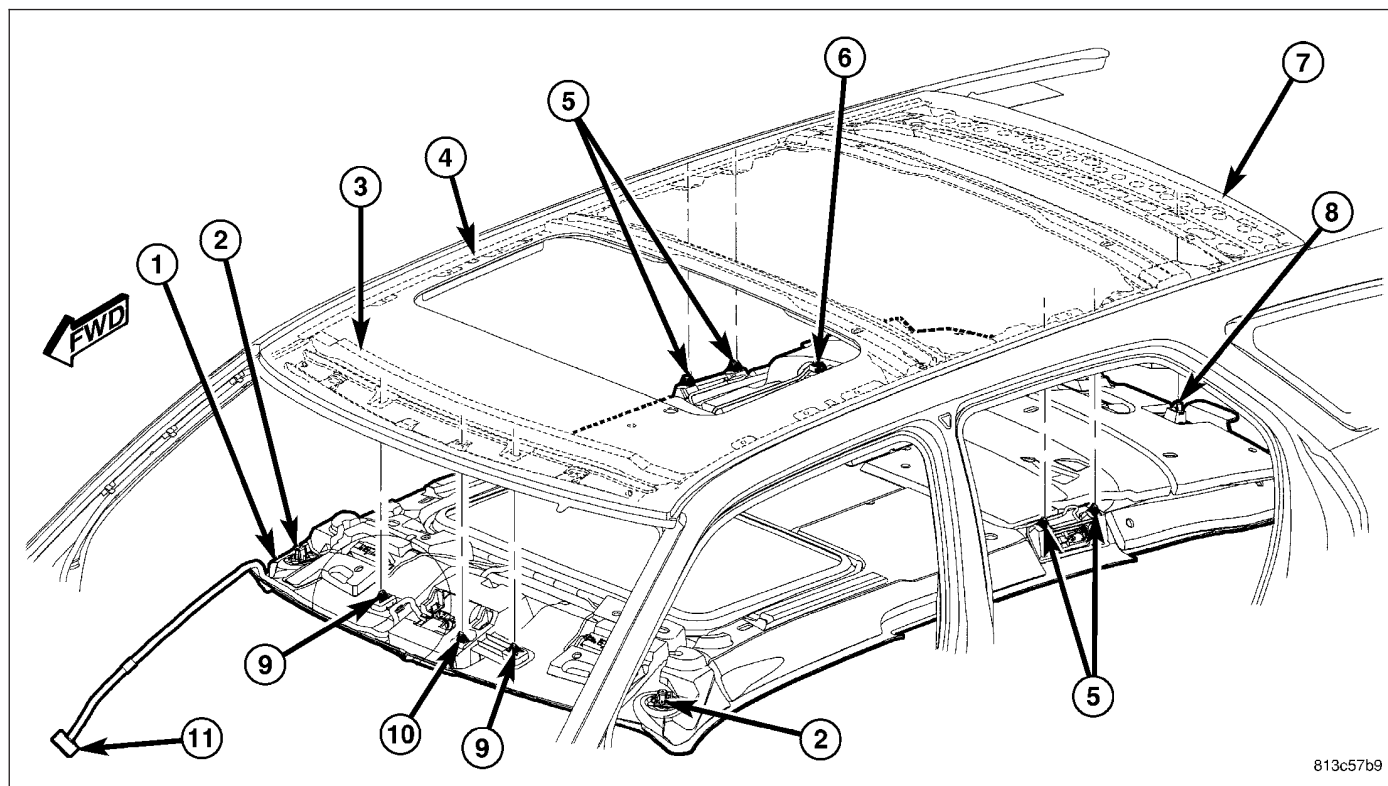
1. Carefully bow the headliner (1) longitudinally as necessary to position the unit into the vehicle through the right rear door opening.
2. If the vehicle is equipped with a sunroof, reach between the headliner and the roof panel from the right rear door opening to access and reconnect the sunroof jumper wire connector to the headliner wire harness sunroof take out and connector (6).

**Note:** In order to ease installation and ensure proper headliner positioning it is important to install the headliner spring clip retainers in the correct sequence as follows.

3. Position the spring clip at the right visor receptacle location (9) to the appropriate hole in the windshield header (3) and press firmly and evenly upward on the headliner over the retainer location until it snaps into place.
4. Position the rear spring clip retainer (8) to the appropriate hole near the center of the rear roof header (7) and press firmly and evenly upward on the headliner over the retainer location until it snaps into place.
5. Position the two spring clip retainers at each grab handle location (5) to the appropriate holes in the inner rear roof side rails (4) and press firmly and evenly upward on the headliner over each retainer location until it snaps into place.
6. Position the spring clip retainers at each sun visor mounting location (2), at the left visor receptacle location (9), and at the overhead console location (10) to the appropriate holes in the windshield header and press firmly and evenly upward on the headliner over each retainer location until it snaps into place.
7. If the vehicle is so equipped, reinstall the trim welt onto the headliner sunroof opening.
8. Reinstall both grab handle/coat hook/rear dome/reading lamp units into the headliner at the inner rear roof side rails.

9. Reinstall both sun visors and both visor receptacles onto the headliner near the windshield header.
10. If the vehicle is so equipped, reconnect the electrochromic (automatic dimming) and/or the telematic (hands-free phone) mirror takeout and connector of the headliner wire harness to the connector receptacle(s) on the back (windshield side) of the inside rear view mirror housing.
11. If the vehicle is so equipped, reinstall the overhead console to the center of the headliner near the windshield header. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION).
12. Reinstall the trim onto both upper C-pillars. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION-UPPER-SEDAN).
13. Reinstall the trim onto both upper B-pillars. (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - INSTALLATION-UPPER).
14. Engage the headliner wire harnesses into the retainers on each inner A-pillar and reconnect the connectors (11) to the body wire harness connectors near the base of each A-pillar. Be certain the harnesses are not twisted and that the connectors are both fully engaged.
15. Reinstall the trim onto both upper A-pillars. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION).
16. Reconnect the battery negative cable.

## WAGON



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1. Carefully bow the headliner (1) longitudinally as necessary to position the unit into the vehicle through the liftgate opening.
2. If the vehicle is equipped with a sunroof, reach between the headliner and the roof panel from the right rear door opening to access and reconnect the sunroof jumper wire connector to the headliner wire harness sunroof take out and connector (6).

**Note:** In order to ease installation and ensure proper headliner positioning it is important to install the headliner spring clip retainers in the correct sequence as follows.

3. Position the spring clip at the right visor receptacle location (9) to the appropriate hole in the windshield header (3) and press firmly and evenly upward on the headliner over the retainer location until it snaps into place.
4. Position the rear spring clip retainer (8) to the appropriate hole near the center of the liftgate opening header (7) and press firmly and evenly upward on the headliner over the retainer location until it snaps into place.

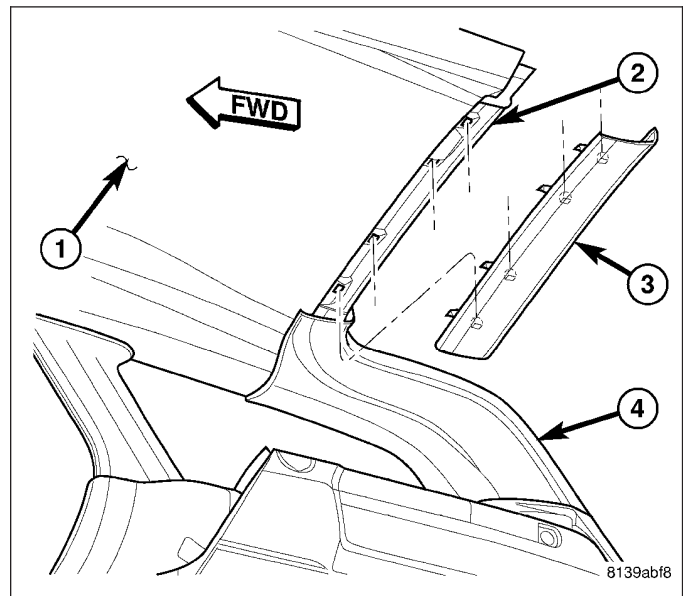


5. Position the two spring clip retainers at each grab handle location (5) to the appropriate holes in the inner rear roof side rails (4) and press firmly and evenly upward on the headliner over each retainer location until it snaps into place.
6. Position the spring clip retainers at each sun visor mounting location (2), at the left visor receptacle location (9), and at the overhead console location (10) to the appropriate holes in the windshield header and press firmly and evenly upward on the headliner over each retainer location until it snaps into place.
7. If the vehicle is so equipped, reinstall the trim welt onto the headliner sunroof opening.
8. Reinstall both grab handle/coat hook/rear dome/reading lamp units into the headliner at the inner rear roof side rails.
9. Reinstall both sun visors and both visor receptacles onto the headliner near the windshield header.
10. If the vehicle is so equipped, reconnect the electrochromic (automatic dimming) and/or the telematic (hands-free phone) mirror takeout and connector of the headliner wire harness to the connector receptacle(s) on the back (windshield side) of the inside rear view mirror housing.
11. If the vehicle is so equipped, reinstall the overhead console to the center of the headliner near the windshield header. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION).
12. Reinstall the trim onto both upper D-pillars. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - INSTALLATION).
13. Reinstall the trim onto both upper C-pillars. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION-UPPER-SEDAN).
14. Reinstall the trim onto both upper B-pillars. (Refer to 23 - BODY/INTERIOR/B-PILLAR TRIM - INSTALLATION-UPPER).
15. Engage the headliner wire harnesses into the retainers on each inner A-pillar and reconnect the connectors (11) to the body wire harness connectors near the base of each A-pillar. Be certain the harnesses are not twisted and that the connectors are both fully engaged.
16. Reinstall the trim onto both upper A-pillars. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION).
17. Reconnect the battery negative cable.

## LIFTGATE OPENING UPPER TRIM

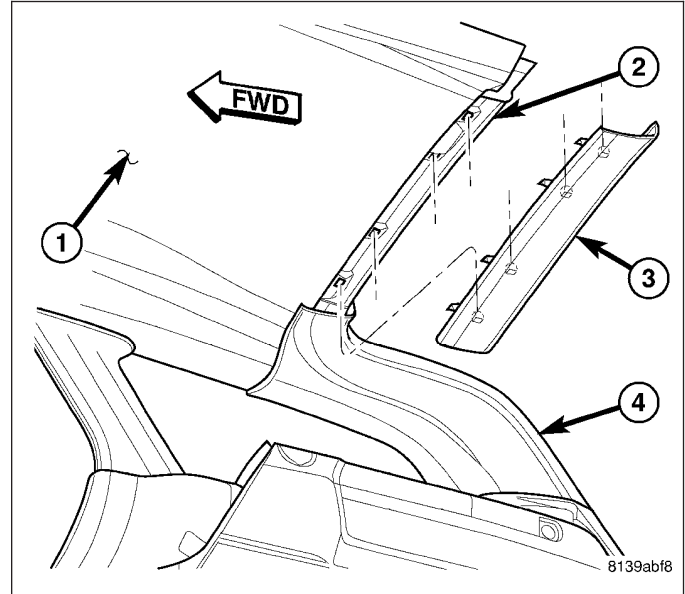
### REMOVAL

1. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the rear edge of the trim plate (3) down from the upper liftgate opening header (2) far enough to disengage the four spring clip retainers from the slots in the header.
2. Pull the trim plate rearward to disengage it from the rear edge of the headliner (1).
3. Remove the trim plate from the vehicle.



## INSTALLATION

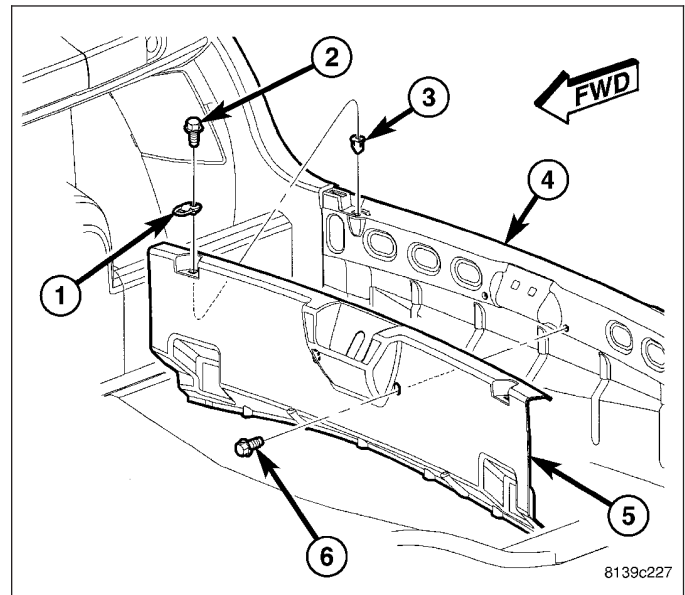
1. Fit the forward edge of the liftgate opening header trim plate (3) to the rear edge of the headliner (1).
2. Align the four spring clip retainers on the trim plate to the slots in the upper liftgate opening header (2).
3. Using hand pressure, press firmly and evenly upward on the trim plate over each of the retainer locations until they snap into place.
4. Be certain that ends of the trim plate are properly engaged over the inboard edges of the right and left upper D-pillar trim.



## LIFTGATE SCUFF PLATE

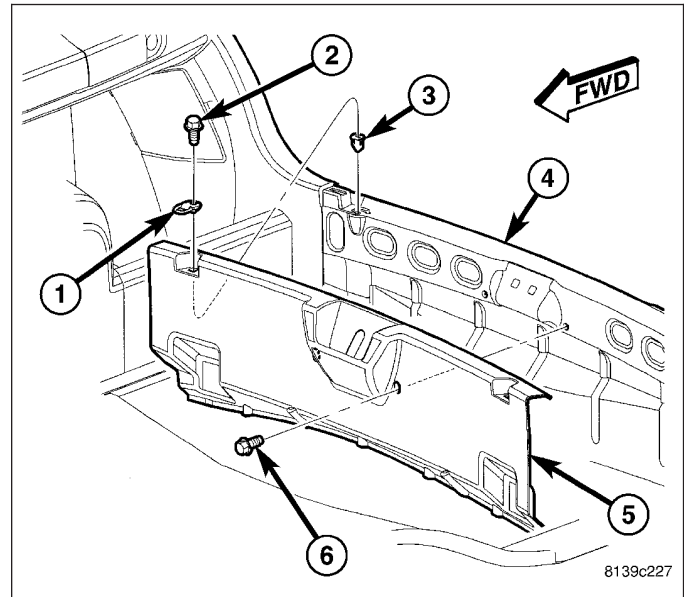
### REMOVAL

1. Remove the two screws (2) that secure the tie-down loops (1) and the scuff plate trim panel (5) to the top of the liftgate opening lower panel (4).
2. Remove the two screws (6) that secure the scuff plate trim panel to the inside of the liftgate opening lower panel.
3. Remove the scuff plate trim panel from the vehicle.



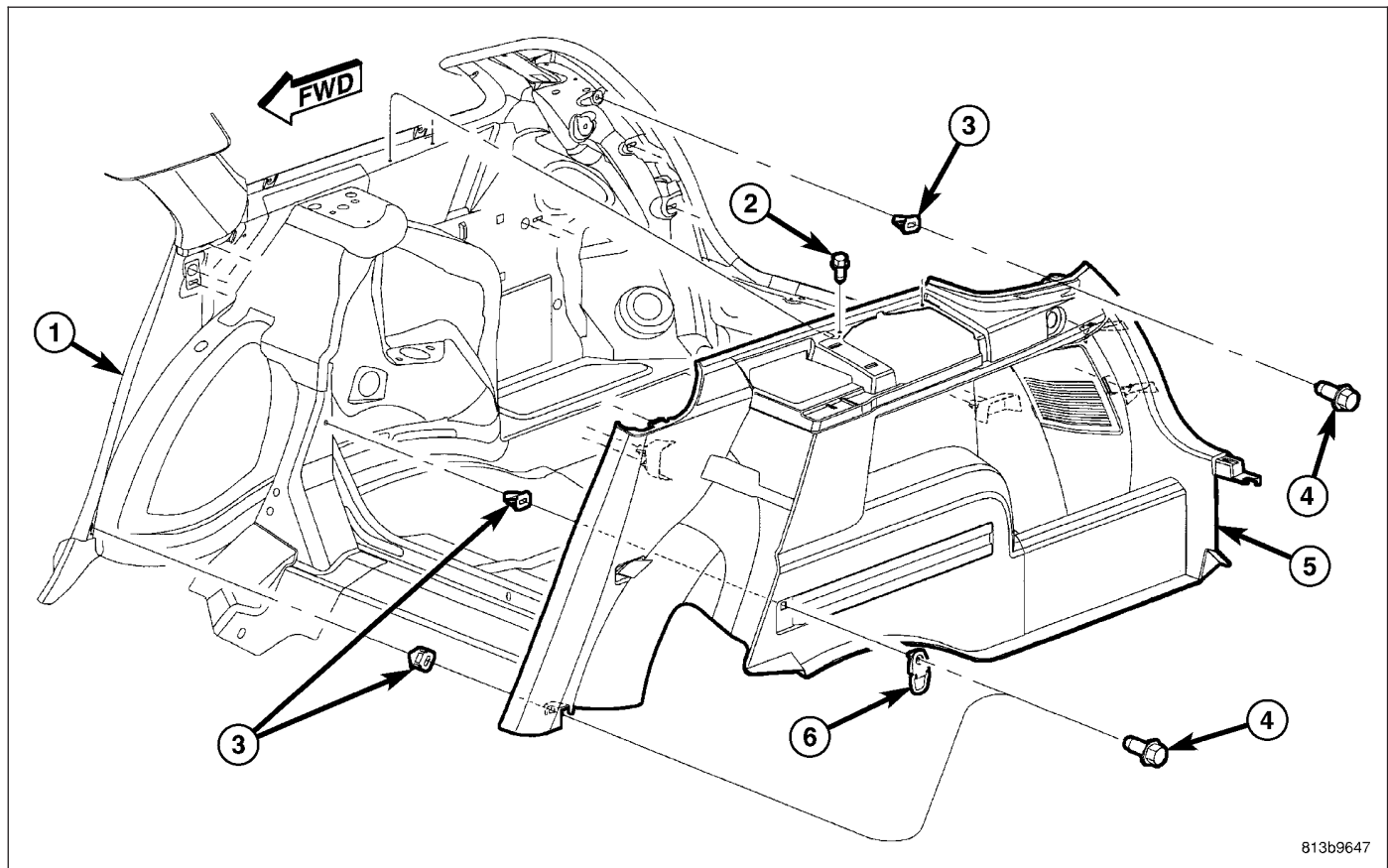
## INSTALLATION

1. Check to be certain that two spring nuts (3) are properly installed and in good condition in the top of the liftgate opening lower panel (4).
2. Position the scuff plate trim panel (5) to the inside of the liftgate opening lower panel.
3. Install and tighten the two screws (6) that secure the trim panel to the inside of the liftgate opening lower panel. Tighten the screws to 11 N·m (8 ft. lbs.).
4. Position the two tie-down loops (1) to the top of the trim panel.
5. Install and tighten the two screws that secure the tie-down loops and the scuff plate trim panel to the top of the liftgate opening lower panel. Tighten the screws to 11 N·m (8 ft. lbs.).



## QUARTER TRIM PANEL

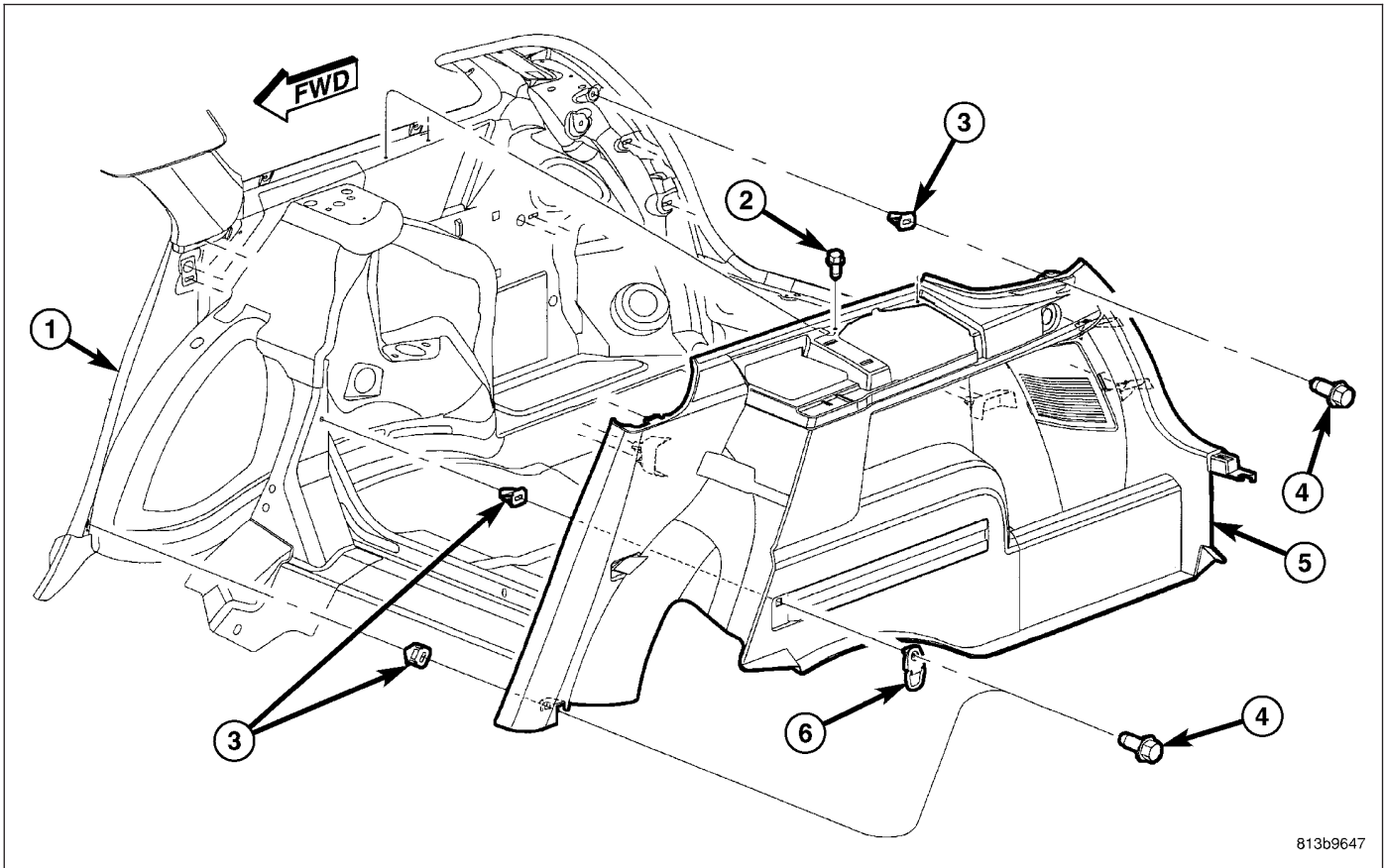
### REMOVAL



1. Disconnect and isolate the battery negative cable.
2. Remove the rear seat cushion from the vehicle. (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - REMOVAL).



3. Remove the rear seat back side bolster from the quarter inner panel (1). (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION/COVER - REMOVAL).
4. Remove the screw that secures the outboard rear seat belt lower anchor to the quarter inner panel.
5. Remove the trim from the upper D-pillar. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - REMOVAL).
6. Remove the speaker bezel from the quarter trim panel. (Refer to 23 - BODY/INTERIOR/SPEAKER BOX TRIM COVER - REMOVAL).
7. Remove the two screws (2) that secure the quarter trim panel (5) to the speaker bracket above the rear wheel house.
8. Remove the screw that secures the tie-down loop, the liftgate scuff plate trim panel and the rear extension of the quarter trim panel to the top of the liftgate opening lower panel.
9. Remove the three screws (3) that secure the tie-down loop (6) and the quarter trim panel to the quarter inner panel.
10. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the quarter trim panel away from the side of the liftgate opening far enough to disengage the three spring clip retainers that secure the trim to the slots in the quarter inner panel behind the rear wheel house.
11. Move the back of the quarter trim panel away from the base of the upper D-pillar trim far enough to access and disconnect the body wire harness connector from the back of the auxiliary power outlet, if equipped.
12. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the quarter trim panel away from the base of the upper C-pillar trim far enough to disengage the spring clip retainer that secures the trim to the slot in the quarter inner panel.
13. Lift the quarter trim panel up and over the outboard rear seat belt retractor on the top of the rear wheel house while feeding the loose belt webbing and lower anchor through the retractor clearance hole in the top of the panel.
14. Remove the quarter trim panel from the vehicle through the liftgate opening.

**INSTALLATION**

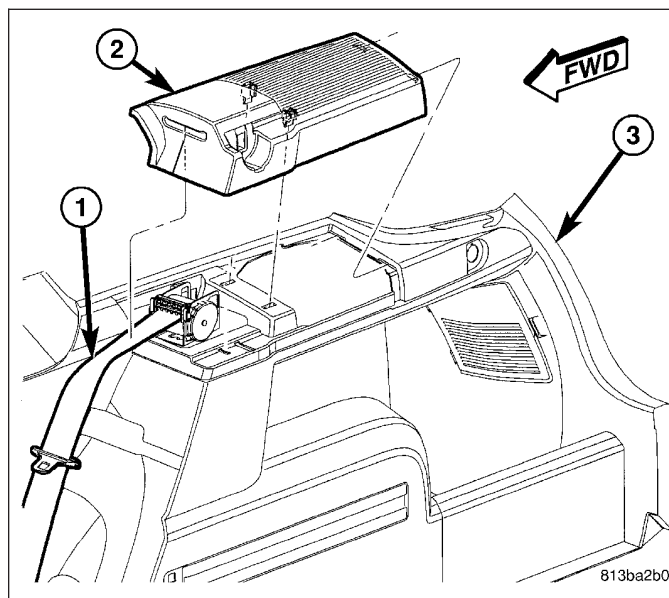
1. Check to be certain that the three spring nuts (3) are properly installed and in good condition on the quarter inner panel (1). Replace a spring nut if any damage is evident.
2. Position the quarter trim panel (5) into the vehicle through the liftgate opening.
3. Lift the quarter trim panel up and over the outboard rear seat belt retractor on the top of the rear wheel house while pulling the loose belt webbing and lower anchor through the retractor clearance hole in the top of the panel.
4. Align the spring clip retainer on the back of the quarter trim panel with the slot in the quarter inner panel at the base of the upper C-pillar trim.
5. Using hand pressure, press firmly and evenly on the trim over the spring clip location until the retainer snaps into place.
6. Move the rear of the quarter trim panel away from the base of the upper D-pillar trim far enough to access and reconnect the body wire harness connector to the back of the auxiliary power outlet, if equipped.
7. Align the three spring clip retainers on the back of the quarter trim panel with the slots in the quarter inner panel behind the rear wheel house.
8. Using hand pressure, press firmly and evenly on the trim over the spring clip locations until the retainers snap into place.
9. Position the rear extension of the quarter trim panel onto the top of the liftgate opening lower panel with the extension sequenced under the end of the liftgate scuff plate.
10. Install and tighten the three screws (4) that secure the tie-down loop (6) and the quarter trim panel to the quarter inner panel. Tighten the screws to 11 N·m (8 ft. lbs.).
11. Install and tighten the screw that secures the tie-down loop, the liftgate scuff plate and the rear extension of the quarter trim panel to the top of the liftgate opening lower panel. Tighten the screw to 11 N·m (8 ft. lbs.).
12. Install and tighten the two screws (2) that secure the quarter trim panel to the speaker bracket above the rear wheel house. Tighten the screws to 11 N·m (8 ft. lbs.).
13. Reinstall the speaker bezel onto the quarter trim panel. (Refer to 23 - BODY/INTERIOR/SPEAKER BOX TRIM COVER - INSTALLATION).

14. Reinstall the trim onto the upper D-pillar. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - INSTALLATION).
15. Install and tighten the screw that secures the outboard rear seat belt lower anchor to the quarter inner panel. Tighten the screw to 32 N·m (24 ft. lbs.).
16. Reinstall the rear seat back side bolster onto the quarter inner panel. (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION/COVER - INSTALLATION).
17. Reinstall the rear seat cushion into the vehicle. (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - INSTALLATION).

## QUARTER TRIM SPEAKER BEZEL

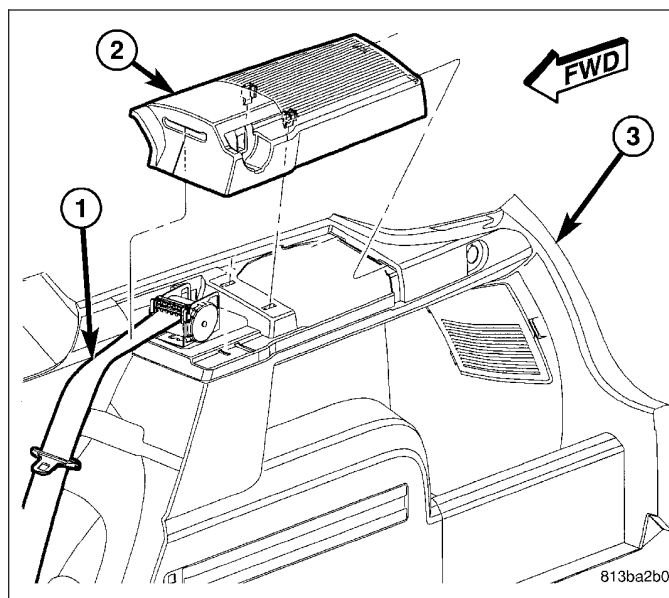
### REMOVAL

1. Remove the screw in the cargo cover cradle formation of the quarter trim speaker bezel (2) that secures the bezel to the quarter trim panel (3) on top of the rear wheel house.
2. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the front edge of the speaker bezel upward from the quarter trim panel far enough to disengage the two spring clip retainers that secure the bezel to the slots in the trim panel.
3. Disengage the rear outboard seat belt webbing (1) from the quarter trim speaker bezel through the slit below the slot at the front of the bezel.
4. Lift the front of the quarter trim speaker bezel upward and pull it forward far enough to disengage the tabs at the back of the bezel from the slots in the back of the quarter trim panel opening.
5. Remove the quarter trim speaker bezel from the vehicle.



### INSTALLATION

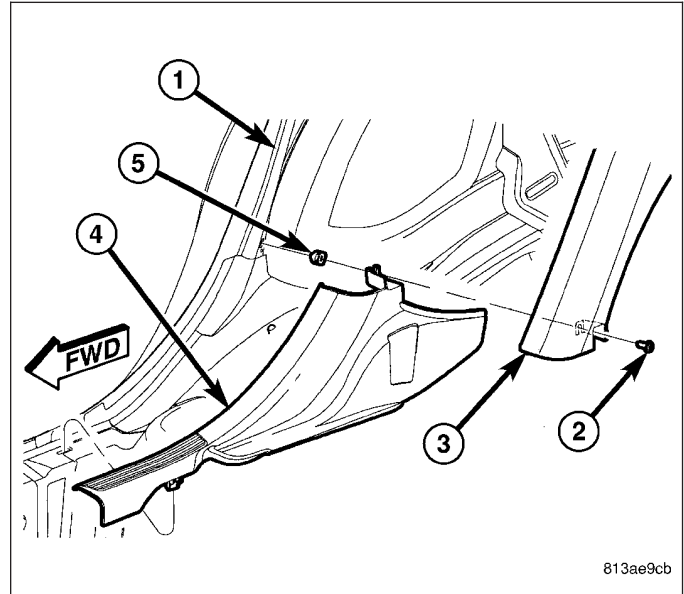
1. Position the quarter trim speaker bezel (2) to the quarter trim panel (3) above the rear wheel house.
2. Engage the rear outboard seat belt webbing (1) into the slot of the quarter trim speaker bezel through the slit below the slot at the front of the bezel. Be certain the webbing is not twisted.
3. Lift the front of the quarter trim speaker bezel upward and engage the tabs at the back of the bezel into the slots in the back of the quarter trim panel opening.
4. Align the two spring clip retainers on the bezel with the slots in the quarter trim panel.
5. Using hand pressure, press firmly and evenly on the bezel over each of the spring clip locations until the retainers snap into place.
6. Install and tighten the screw into the cargo cover cradle formation of the quarter trim speaker bezel that secures the bezel to the quarter trim panel on top of the rear wheel house. Tighten the screw to 2 N·m (15 in. lbs.).



## REAR DOOR SILL SCUFF PLATE

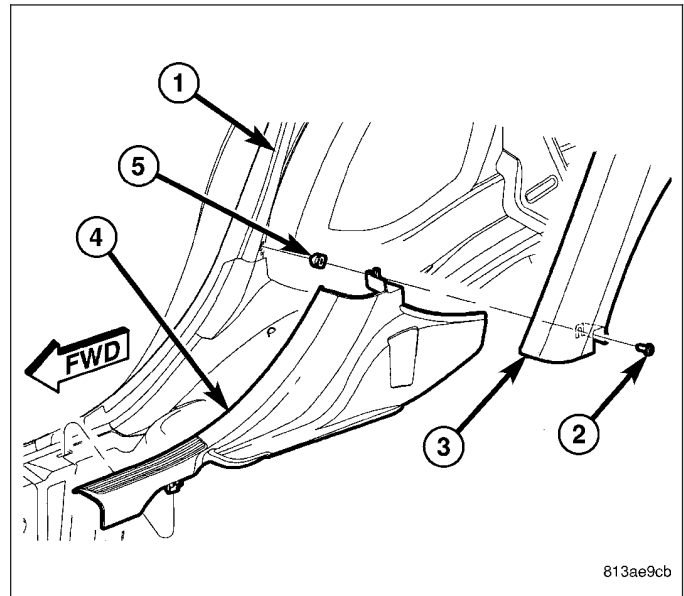
### REMOVAL

1. Remove the screw (2) that secures the rear door scuff plate (4) to the quarter inner panel.
2. Remove the screw that secures the outboard rear seat belt lower anchor to the quarter inner panel.
3. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the scuff plate upwards from the sill far enough to disengage the two spring clip retainers that secure the scuff plate to the slots in the sill.
4. Disengage the rear extension of the scuff plate from under the lower C-pillar trim (Sedan) or quarter trim panel (Wagon) (3).
5. Remove the rear door scuff plate from the vehicle.



### INSTALLATION

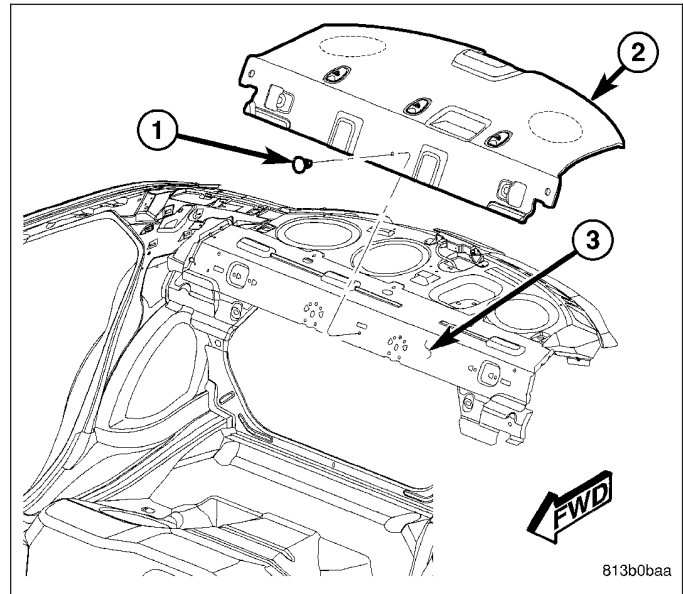
1. Check to be certain that spring nut (5) is properly installed and in good condition in the quarter inner panel (1).
2. Check to be certain that a plastic nut is properly installed and in good condition in the slot of the rear door opening sill. Replace the plastic nut if any damage is evident.
3. Engage the rear extension of the rear door scuff plate (4) under the lower C-pillar trim (Sedan) or quarter trim panel (Wagon) (3) on the quarter inner panel.
4. Align the two spring clip retainers on the scuff plate with the slots in the rear door sill.
5. Using hand pressure, press firmly and evenly downward on the scuff plate over each of the spring clip locations until the retainers snap into place.
6. Position the outboard rear seat belt lower anchor to the quarter inner panel.
7. Install and tighten the screw that secures the outboard rear seat belt lower anchor to the quarter inner panel. Tighten the screw to 32 N·m (24 ft. lbs.).
8. Install and tighten the screw (2) that secures the scuff plate trim panel and the lower C-pillar trim (Sedan) or quarter trim panel (Wagon) to the quarter inner panel. Tighten the screw to 11 N·m (8 ft. lbs.).



## REAR SHELF TRIM PANEL

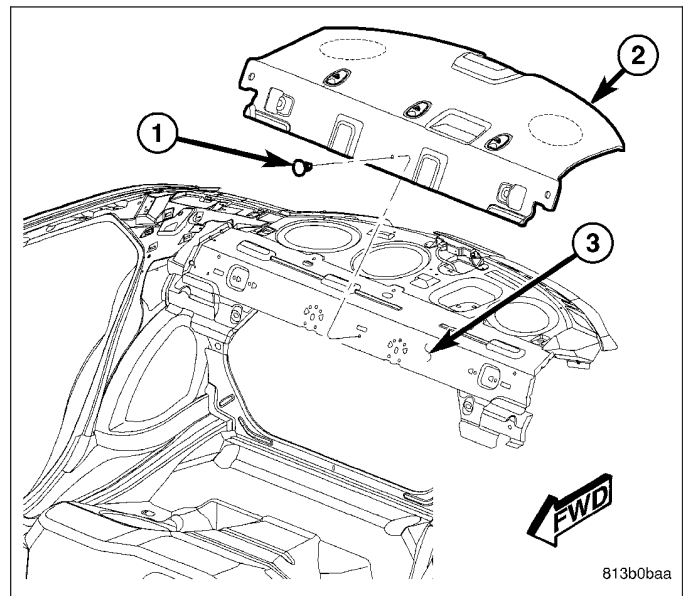
### REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Remove the right and left lower and upper C-pillar trim from the vehicle. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).
3. Remove the nut that secures the center rear seat belt lower anchor to the stud on the floor panel and feed the seat belt webbing back through the opening in the top of the rear shelf panel trim (2) to the retractor.
4. Remove the push-pin fastener (1) that secures the trim to the rear shelf panel (3).
5. Slide the trim forward to disengage the S-clip that secures the underside of the trim to the center of the shelf panel.
6. Remove the trim from the rear shelf panel.



### INSTALLATION

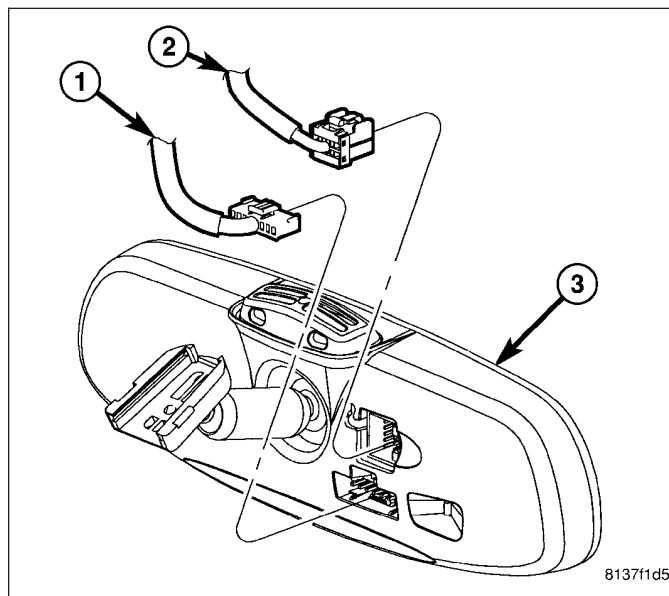
1. Position the trim (2) onto the rear shelf panel (3).
2. Slide the rear edge of the trim rearward to engage the lens bezel of the center high-mounted stop lamp and far enough to engage the S-clip that secures the underside of the trim to the center of the shelf panel.
3. Install the push-pin fastener (1) that secures the trim to the rear shelf panel.
4. Pull the center rear seat belt lower anchor and belt webbing from the retractor through the opening in the top of the rear shelf panel trim and back down to the stud on the floor panel.
5. Install and tighten the nut that secures the seat belt lower anchor to the stud on the floor panel. Tighten the nut to 34 N·m (25 ft. lbs.).
6. Reinstall the right and left upper and lower C-pillar trim to the vehicle. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION).
7. Reconnect the battery negative cable.



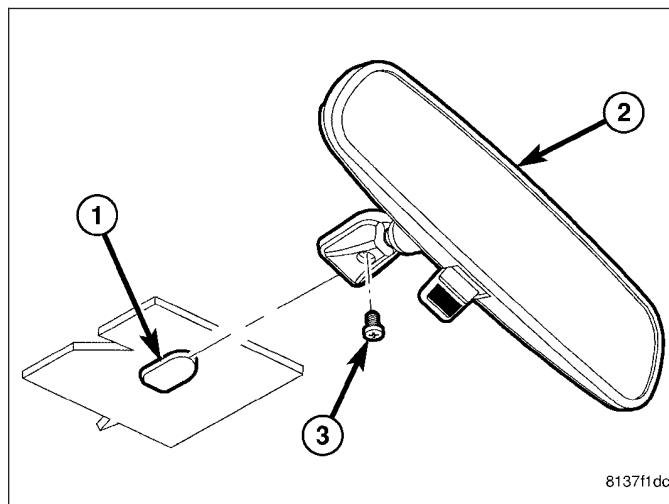
## MIRROR-INSIDE REARVIEW

### REMOVAL

1. If the vehicle is equipped with either the electrochromic (automatic dimming) or the telematic (hands-free phone) mirror option, disconnect and isolate the battery negative cable.
2. If the vehicle is so equipped, disconnect the electrochromic mirror takeout and connector (1) and/or the telematic mirror takeout and connector (2) of the headliner wire harness from the connector receptacle on the back (windshield side) of the mirror housing (3).



3. Remove the set screw (3) that secures the rear view mirror (2) to the support bracket/button (1) on the inside of the windshield glass.
4. Slide the rear view mirror upward far enough to disengage it from the support bracket/button.

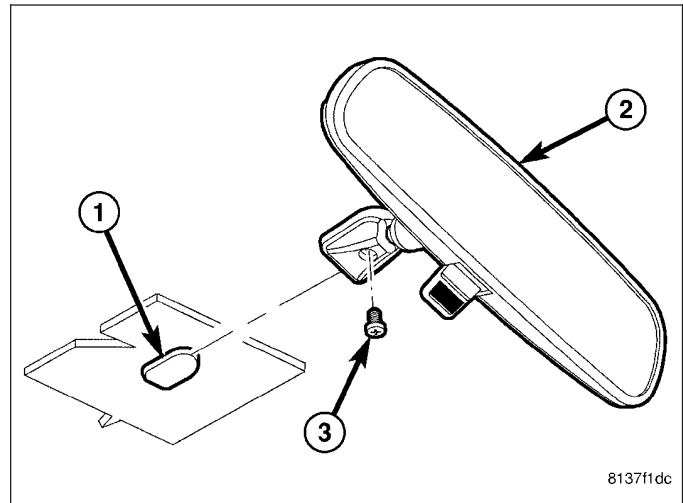




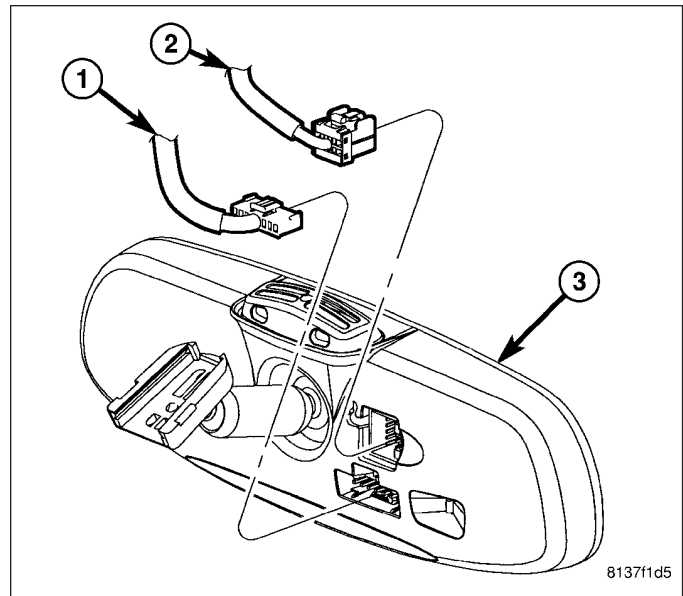
## INSTALLATION

### MIRROR

1. Position and slide the rear view mirror (2) downward over the support bracket/button (1) on the inside of the windshield glass.
2. Install and tighten the set screw (3) that secures the rear view mirror to the support bracket/button. Tighten the screw to 2 N·m (17 in. lbs.).



3. If the vehicle is so equipped, route the electrochromic (automatic dimming) mirror takeout and connector (1) and/or the telematic (hands-free phone) mirror takeout and connector (2) of the headliner wire harness to the left of the mirror support bracket and reconnect it to the connector receptacle on the back (windshield side) of the mirror housing (3).
4. If the vehicle is equipped with either the electrochromic or the telematic mirror option, reconnect the battery negative cable.



### SUPPORT BRACKET

**Note:** The rear view mirror support bracket (or button) is permanently bonded to the inside of the windshield glass. If the bracket should become separated from the glass, it may be rebonded using the following procedure. This procedure requires the use of a Rear View Mirror Adhesive kit that is available through Mopar in single application packages that include a two-part adhesive and an accelerant with applicator.

1. Mark the proper position for the mirror bracket on the outside of the windshield glass with a wax pencil. The residual adhesive on the inside of the glass from the prior mirror bracket installation can be used as a guide.
2. Clean the bracket contact area on the inside of the glass. Use a mild powdered cleanser on a cloth saturated with isopropyl (rubbing) alcohol. Finally, clean the glass with a paper towel dampened with alcohol.
3. Sand the bonding surface (the smaller side) of the support bracket with fine grit-sandpaper. Wipe the bracket surface clean with a paper towel.
4. Apply accelerant to the bonding surface of the bracket according to the following instructions:
  - Crush the accelerant vial to saturate the felt applicator.
  - Remove the paper sleeve.

- Apply accelerant to the bonding surface of the bracket.
  - Allow the accelerant to dry for five minutes.
  - Do not touch the bracket bonding surface after the accelerant has been applied.
5. Apply adhesive accelerant to the bracket contact area on the inside of the windshield glass. Allow the accelerant to dry for one minute. Do not touch the bracket contact area of the glass after the accelerant has been applied.
  6. Install the bracket according to the following instructions:
    - Apply one drop of adhesive at the center of the bracket contact area on the inside of the windshield glass.
    - Apply an even coat of adhesive to the bonding surface of the bracket.
    - Align the bracket with the marked position on the windshield glass.
    - Press and hold the bracket in place for at least one minute.

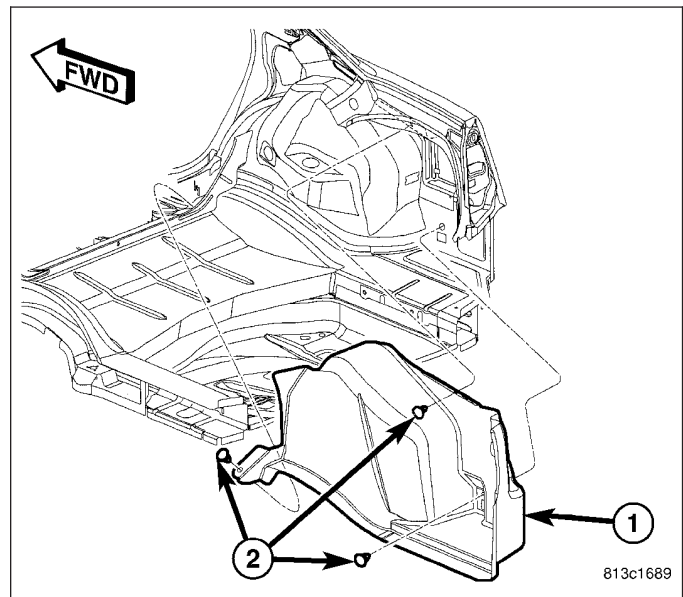
**Note:** Verify that the mirror support bracket is correctly aligned, because the adhesive will cure rapidly.

7. Allow the adhesive to cure for 8-10 minutes. Remove any excess adhesive with an alcohol-dampened cloth.
8. Allow the adhesive to cure for an additional 8-10 minutes before reinstalling the mirror.

## TRUNK LINING

### REMOVAL

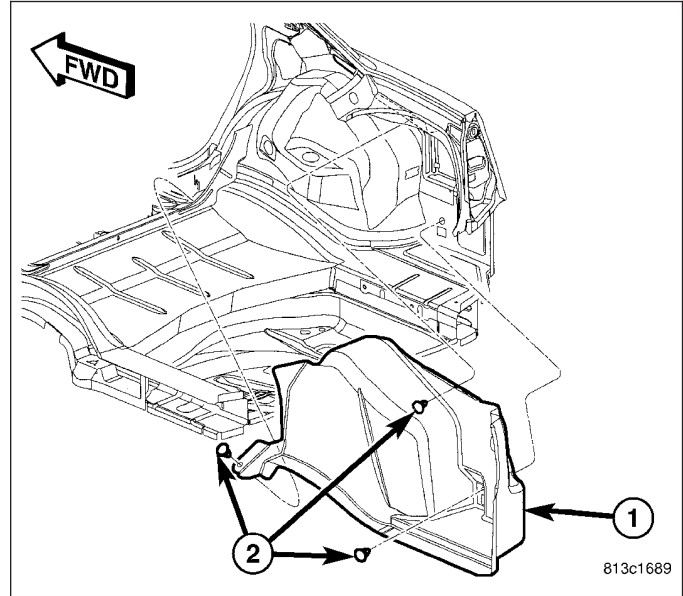
1. Remove the spare tire cover/trunk floor carpet from over the spare tire well. (Refer to 23 - BODY/INTERIOR/CARPETS AND FLOOR MATS - REMOVAL-TRUNK).
2. Remove the trunk rear trim panel from the luggage compartment. (Refer to 23 - BODY/INTERIOR/TRUNK REAR TRIM PANEL - REMOVAL).
3. Remove the three push-pin fasteners (2) that secure the right or the left trunk side trim (1) to the appropriate locations within the luggage compartment.
4. Remove the trunk side trim from the luggage compartment.





## INSTALLATION

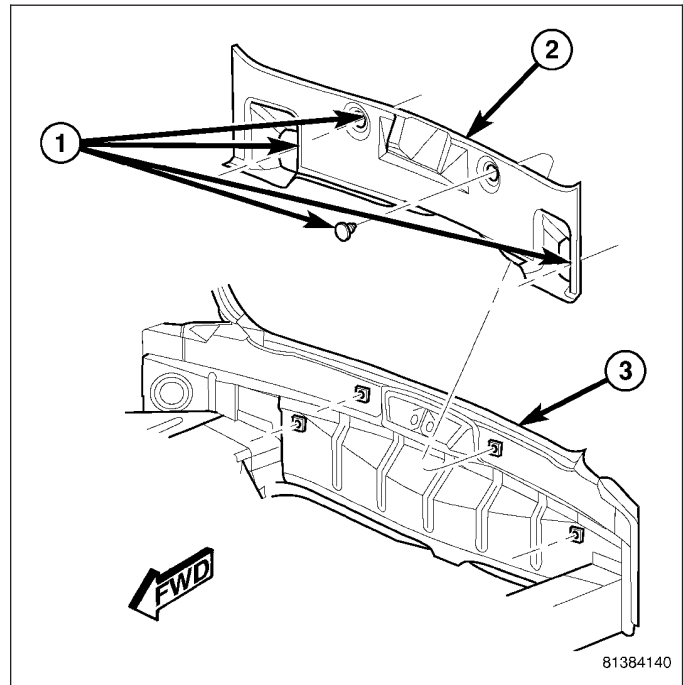
1. Position and fit the right or the left trunk side trim (1) within the luggage compartment.
2. Install the three push-pin fasteners (2) that secure side trim to the appropriate locations within the luggage compartment.
3. Reinstall the trunk rear trim panel into the luggage compartment. (Refer to 23 - BODY/INTERIOR/TRUNK REAR TRIM PANEL - INSTALLATION).
4. Reinstall the spare tire cover/trunk floor carpet over the spare tire well in the luggage compartment. (Refer to 23 - BODY/INTERIOR/CARPETS AND FLOOR MATS - INSTALLATION-TRUNK).



## TRUNK REAR TRIM PANEL

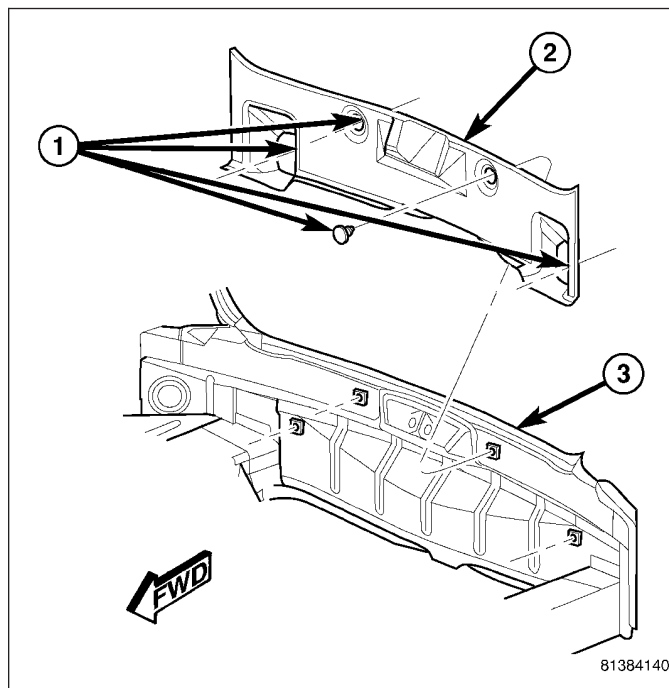
### REMOVAL

1. Remove the four push-pin fasteners (1) that secure the trunk rear trim panel (2) to the inside of the deck opening lower panel (3).
2. Remove the trim panel from the vehicle.



## INSTALLATION

1. Position the trunk rear trim panel (2) to the inside of the deck opening lower panel (3).
2. Reinstall the four push-pin fasteners (1) that secure the trim panel to the deck opening lower panel.



# LIFTGATE

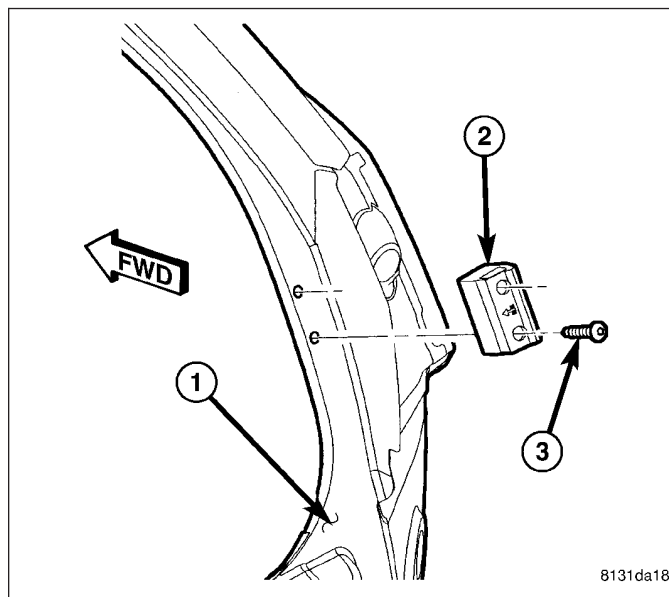
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## BUMPER

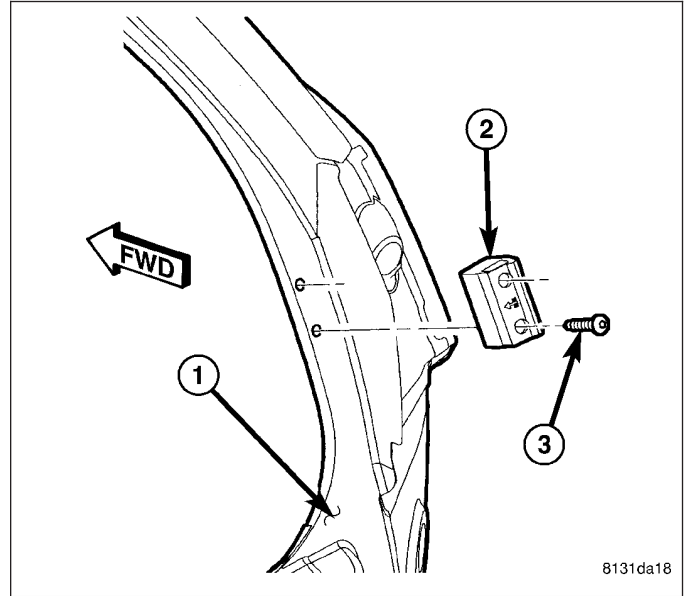
### REMOVAL

1. Open the liftgate.
2. Remove the two screws (3) that secure the stabilizer bumper (2) to the liftgate opening drain trough (1).
3. Remove the bumper from the trough.



## INSTALLATION

1. Position the stabilizer bumper (2) to the two mounting holes on the liftgate opening drain trough (1) with the arrow molded into the bumper pointed inboard.
2. Install and tighten the two screws (3) that secure the bumper to the trough. Tighten the screws to 12 N·m (9 ft. lbs.).
3. Close the liftgate.



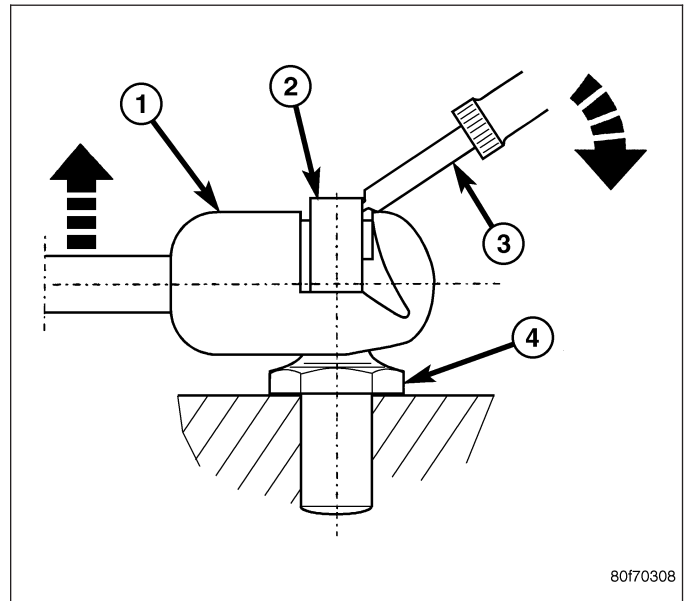
## GAS PROP

### REMOVAL

1. Open and support the liftgate with a suitable prop or block.

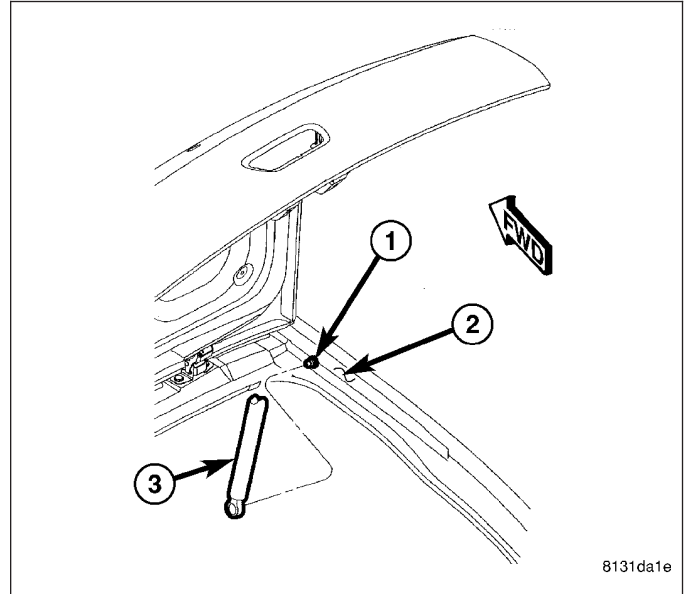
**WARNING:** To avoid personal injury or death, during service lift the ball socket end retaining clip only far enough to release the socket from the ball stud. Excessive prying or removal of the clip may result in improper clip spring tension. Improper clip tension may result in the support cylinder separating from the ball stud causing sudden, unexpected loss of deck lid support.

2. Insert a small flat-bladed tool (3) into the notch on the outer face of one ball socket end (1) of the support cylinder and carefully pry the retaining clip (2) outward while pulling the ball socket away from the ball stud (4) on the liftgate or the liftgate opening trough.
3. Release the retaining clip to its installed position.
4. Repeat Step 2 and Step 3 for the opposite end of the support cylinder.
5. Remove the support cylinder from the liftgate and liftgate opening.

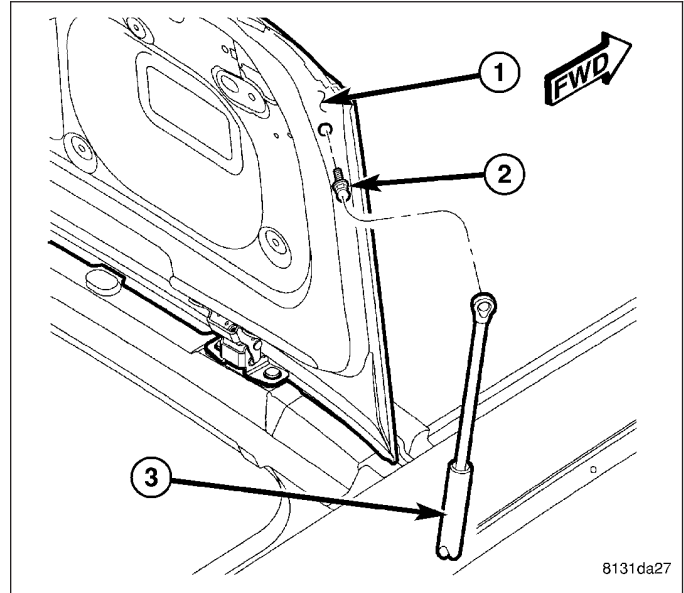


## INSTALLATION

1. Check to be certain that the ball studs (2) on the liftgate and on the liftgate opening trough (3) are in good condition and properly installed. Tighten the ball studs to 28 N·m (21 ft. lbs.).
2. Position the ball socket on the cylinder end of the support cylinder (1) to the ball stud on the liftgate opening trough.
3. Using hand pressure, press the ball socket onto the ball stud until the retainer clip snaps into place.



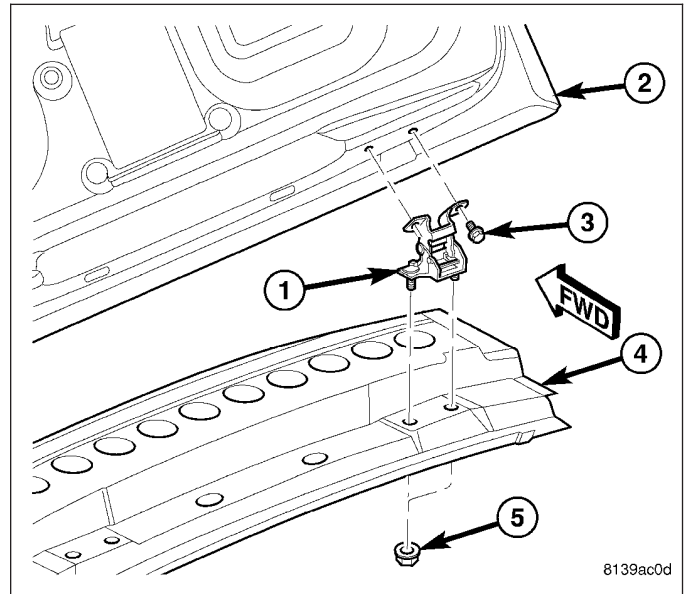
4. Position the ball socket on the rod end of the support cylinder (3) to the ball stud (2) on the liftgate (1).
5. Using hand pressure, press the ball socket onto the ball stud until the retainer clip snaps into place.
6. Inspect to be certain that the retaining clip on each of the support cylinder ball socket ends is fully seated.
7. Remove the service prop or block and close the liftgate.



## HINGE

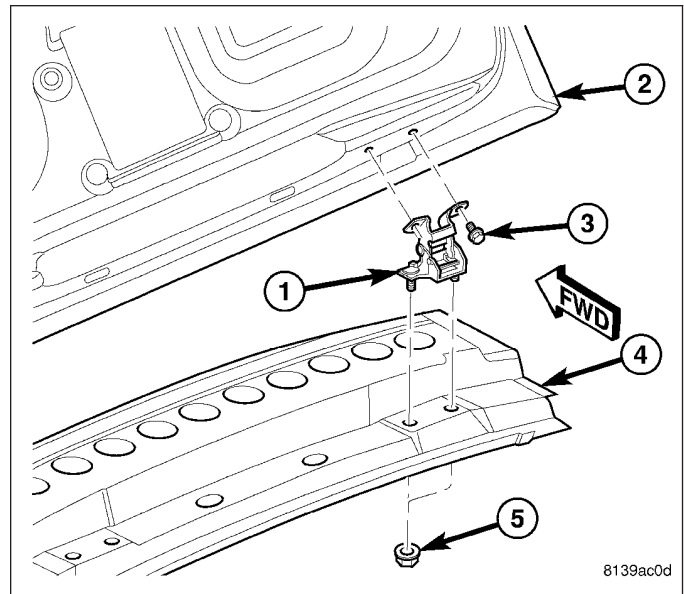
### REMOVAL

1. Open and support the liftgate (2) with a suitable prop or block.
2. Remove the trim plate from the upper liftgate opening header (4). (Refer to 23 - BODY/INTERIOR/LIFTGATE OPENING UPPER TRIM - REMOVAL).
3. Mark the hinge (1) liftgate half location on the liftgate inner panel to aid reinstallation.
4. Remove the two screws (3) that secure the hinge to the liftgate.
5. Mark the hinge body half location on the upper liftgate opening header to aid reinstallation.
6. Carefully pull the rear edge of the headliner downward from the header far enough to access and remove the two nuts (5) that secure the hinge studs to the underside of the header.
7. Remove the hinge from the vehicle.



### INSTALLATION

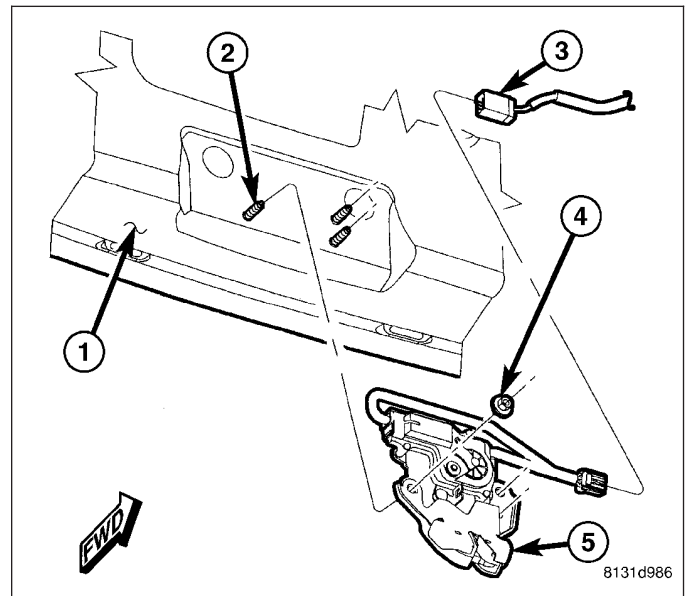
1. Position the body half of the liftgate hinge (1) to the upper liftgate opening header (4) on the vehicle.
2. Carefully pull the rear edge of the headliner downward from the header far enough to install and tighten the two nuts (5) that secure the hinge studs to the underside of the header. Tighten the nuts to 28 N·m (21 ft. lbs.).
3. Position the liftgate (2) to the liftgate half of the hinge on the vehicle.
4. Install and tighten the two screws (3) that secure the hinge to the liftgate. Tighten the screws to 28 N·m (21 ft. lbs.).
5. Remove the fixture being used to support the liftgate for service.
6. Adjust the liftgate hinge position as necessary to achieve proper spacing and operation.
7. Reinstall the trim plate onto the upper liftgate opening header. (Refer to 23 - BODY/INTERIOR/LIFTGATE OPENING UPPER TRIM - INSTALLATION).



## LATCH

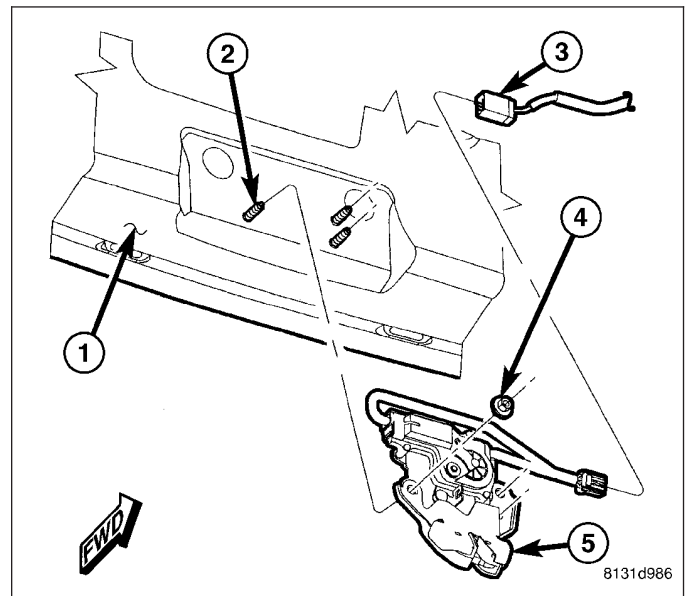
### REMOVAL

1. Open the liftgate.
2. Disconnect and isolate the battery negative cable.
3. Remove the lower trim panel from the inside of the liftgate (1). (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL/LOWER - REMOVAL).
4. Disconnect the pigtail wire connector of the latch (5) from the take out of the liftgate wire harness (3) on the inside of the liftgate.
5. Remove the three nuts (4) that secure the latch to the studs (2) on the inside of the liftgate.
6. Remove the liftgate latch from the vehicle.



### INSTALLATION

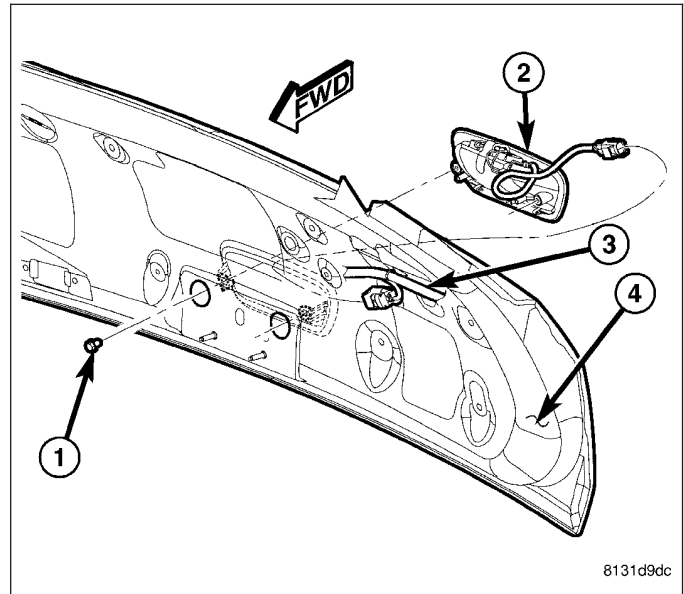
1. Position the latch (5) onto the studs (2) on the inside of the liftgate (1).
2. Install and tighten the three nuts (4) that secure the latch to the studs on the inside of the liftgate. Tighten the nuts to 12 N·m (9 ft. lbs.).
3. Reconnect the pigtail wire connector of the latch to the take out of the liftgate wire harness (3) on the inside of the liftgate.
4. Reinstall the lower trim panel onto the inside of the liftgate. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL/LOWER - INSTALLATION).
5. Reconnect the battery negative cable.
6. Close the liftgate.



## LATCH HANDLE

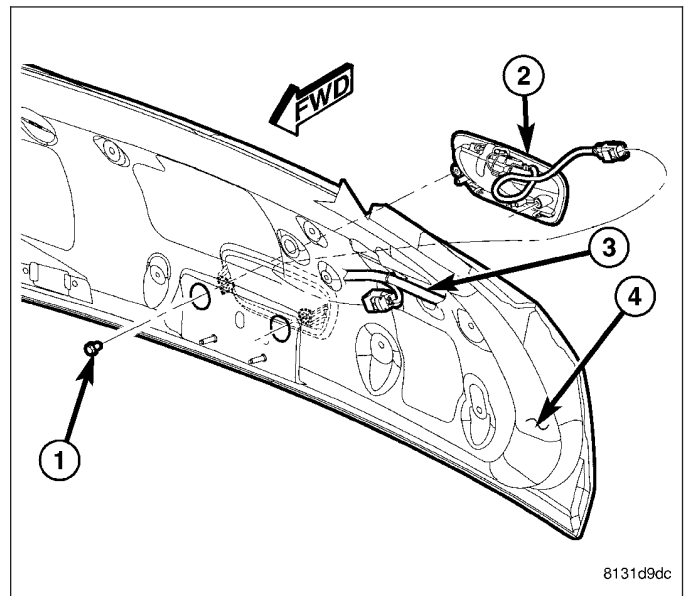
### REMOVAL

1. Open the liftgate (4).
2. Disconnect and isolate the battery negative cable.
3. Remove the lower trim panel from the inside of the liftgate. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL/LOWER - REMOVAL).
4. Disconnect the pigtail wire connector of the latch handle (2) from the take out of the liftgate wire harness (3) on the inside of the liftgate.
5. Reach through the clearance hole in the inside of the liftgate panel on each side of the latch to access and remove the two screws (1) that secure the handle to the liftgate.
6. Remove the latch handle from the outside of the liftgate.



### INSTALLATION

1. Position the latch handle (2) onto the outside of the liftgate (4).
2. Reach through the clearance hole in the inside of the liftgate panel on each side of the latch to install and tighten the two screws (1) that secure the handle to the liftgate. Tighten the screws to 9 N·m (7 ft. lbs.).
3. Reconnect the pigtail wire connector of the latch handle to the take out of the liftgate wire harness (3) on the inside of the liftgate.
4. Reinstall the lower trim panel onto the inside of the liftgate. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL/LOWER - INSTALLATION).
5. Reconnect the battery negative cable.
6. Close the liftgate.

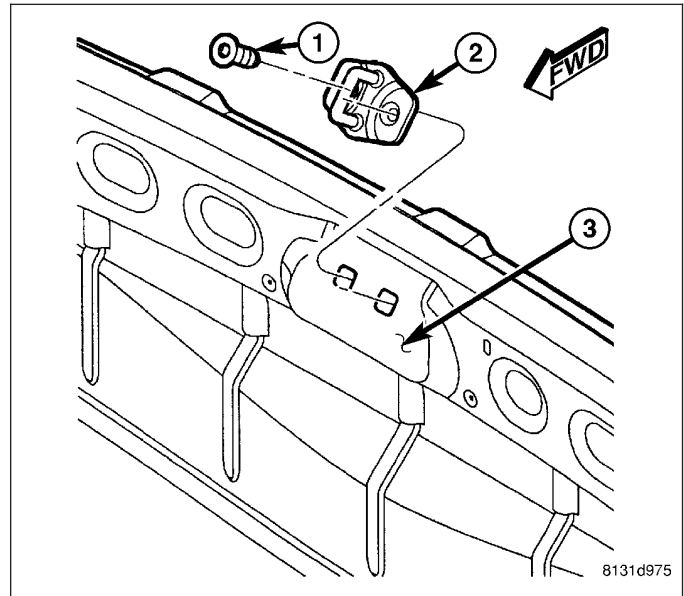




## LATCH STRIKER

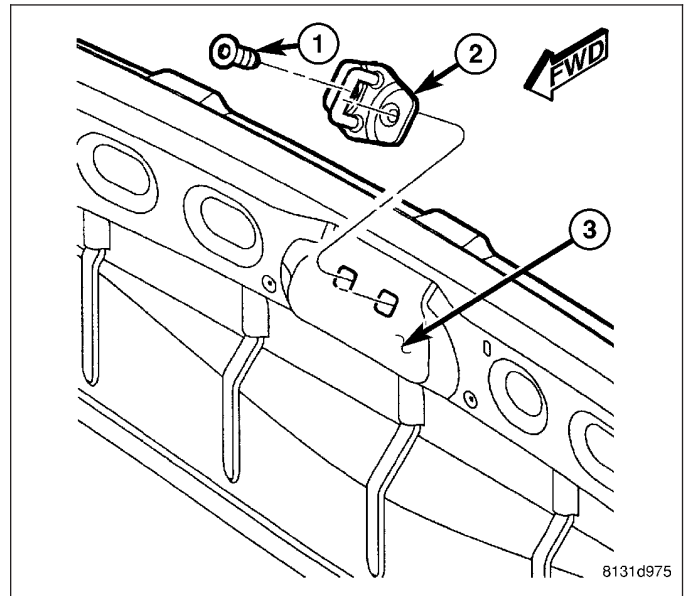
### REMOVAL

1. Open the liftgate.
2. Remove the scuff plate trim panel from the inside of the liftgate opening lower panel (3). (Refer to 23 - BODY/INTERIOR/LIFTGATE SCUFF PLATE - REMOVAL).
3. Mark the latch striker (2) location on the inside of the liftgate opening lower panel to aid reinstallation.
4. Remove the two screws (1) that secure the latch striker to the inside of the liftgate opening lower panel.
5. Remove the latch striker from the vehicle.



### INSTALLATION

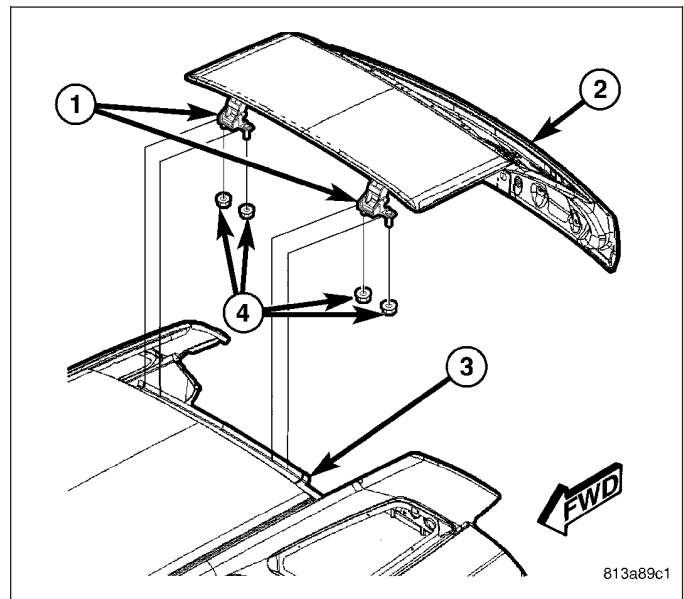
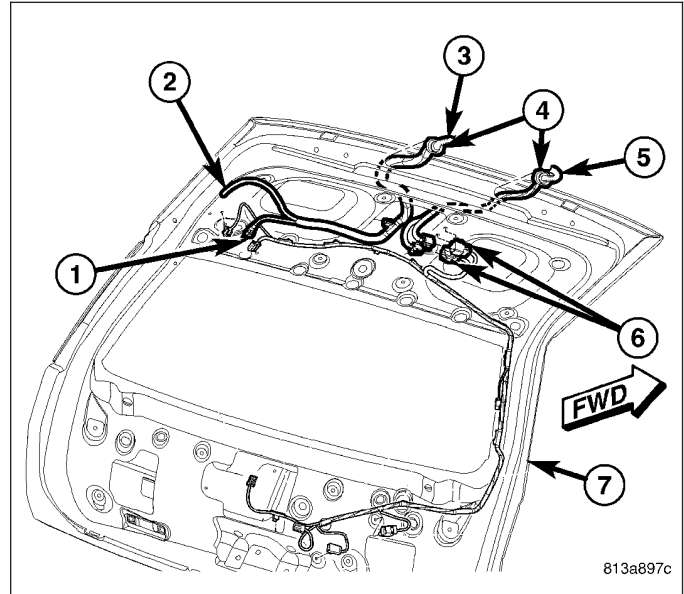
1. Position the liftgate latch striker (2) to the inside of the liftgate opening lower panel (3).
2. Install and tighten the two screws (1) that secure the latch striker to the liftgate opening lower panel. Tighten the screws to 28 N·m (21 ft. lbs.).
3. Adjust the latch striker position as necessary to achieve proper liftgate latch operation.
4. Reinstall the scuff plate trim panel to the liftgate opening lower panel. (Refer to 23 - BODY/INTERIOR/LIFTGATE SCUFF PLATE - INSTALLATION).
5. Close the liftgate.



## LIFTGATE

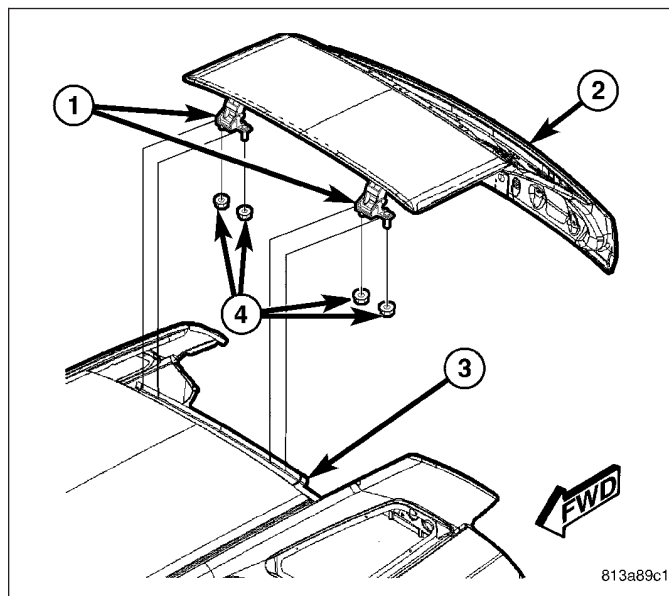
### REMOVAL

1. Open the liftgate (7).
2. Disconnect and isolate the battery negative cable.
3. Remove the upper and lower trim panels from the inside of the liftgate. (Refer to 23 - BODY/DECK-LID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - REMOVAL).
4. Disconnect the washer supply hose (2) in the right body wire harness (3) from the liftgate spoiler washer nozzle hose on the underside of the liftgate.
5. Disconnect the take out and connector (1) of the right body wire harness from the antenna amplifier module on the inside of the liftgate near the right upper corner of the glass opening.
6. Disconnect the two connectors (6) of the liftgate wire harness from the two take outs and connectors of the left body wire harness (5).
7. Disengage the retainers that secure the liftgate take outs of the right and left body wire harnesses to the underside of the liftgate.
8. Disengage the wire grommets (4) of the right and left body wire harnesses inboard of the liftgate hinges from the underside of the liftgate.
9. Carefully remove the liftgate take outs of the right and left body wire harnesses from between the inner and outer liftgate panels.
10. Disconnect the gas props from the ball studs on each side of the liftgate (2). (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/GAS PROP - REMOVAL).
11. Remove the trim plate from the underside of the upper liftgate opening header (3). (Refer to 23 - BODY/INTERIOR/LIFTGATE OPENING UPPER TRIM - REMOVAL).
12. Mark the liftgate hinge body bracket (1) locations on the upper liftgate opening header to aid reinstallation.
13. Carefully pull the rear edge of the headliner downward from the header far enough to access and remove the four nuts (4) that secure the two studs of each hinge to the underside of the header.
14. With the aid of an assistant, lift the liftgate far enough to disengage the hinge studs from the header and remove the liftgate from the vehicle.

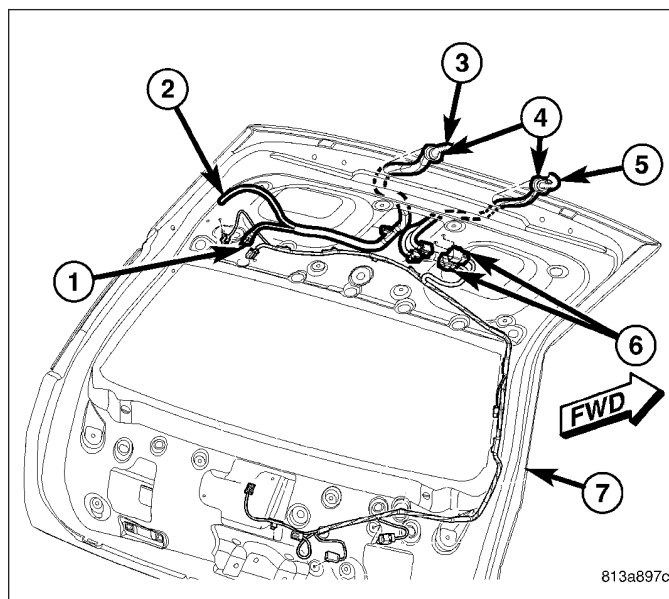


## INSTALLATION

1. With the aid of an assistant, support and position the liftgate (2) with the studs of the two hinge body half brackets (1) inserted into the holes of the upper liftgate opening header (3) on the vehicle.
2. Carefully pull the rear edge of the headliner downward from the header far enough to install and tighten the four nuts (4) that secure the hinge studs to the underside of the header. Tighten the nuts to 28 N·m (21 ft. lbs.).
3. Reinstall the gas props to the ball studs on each side of the liftgate. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/GAS PROP - INSTALLATION).
4. Remove the fixture being used to support the liftgate for service.



5. Carefully route the liftgate take outs of the right (3) and left (5) body wire harnesses between the inner and outer panels of the liftgate (7).
6. Engage the wire grommets (4) of the right and left body wire harnesses into the holes inboard of the liftgate hinges on the underside of the liftgate.
7. Engage the retainers that secure the liftgate take outs of the right and left body wire harnesses to the underside of the liftgate.
8. Reconnect the two connectors (6) of the liftgate wire harness to the two take outs and connectors of the left body wire harness.
9. Reconnect the take out and connector (1) of the right body wire harness to the antenna amplifier module on the inside of the liftgate near the right upper corner of the glass opening.

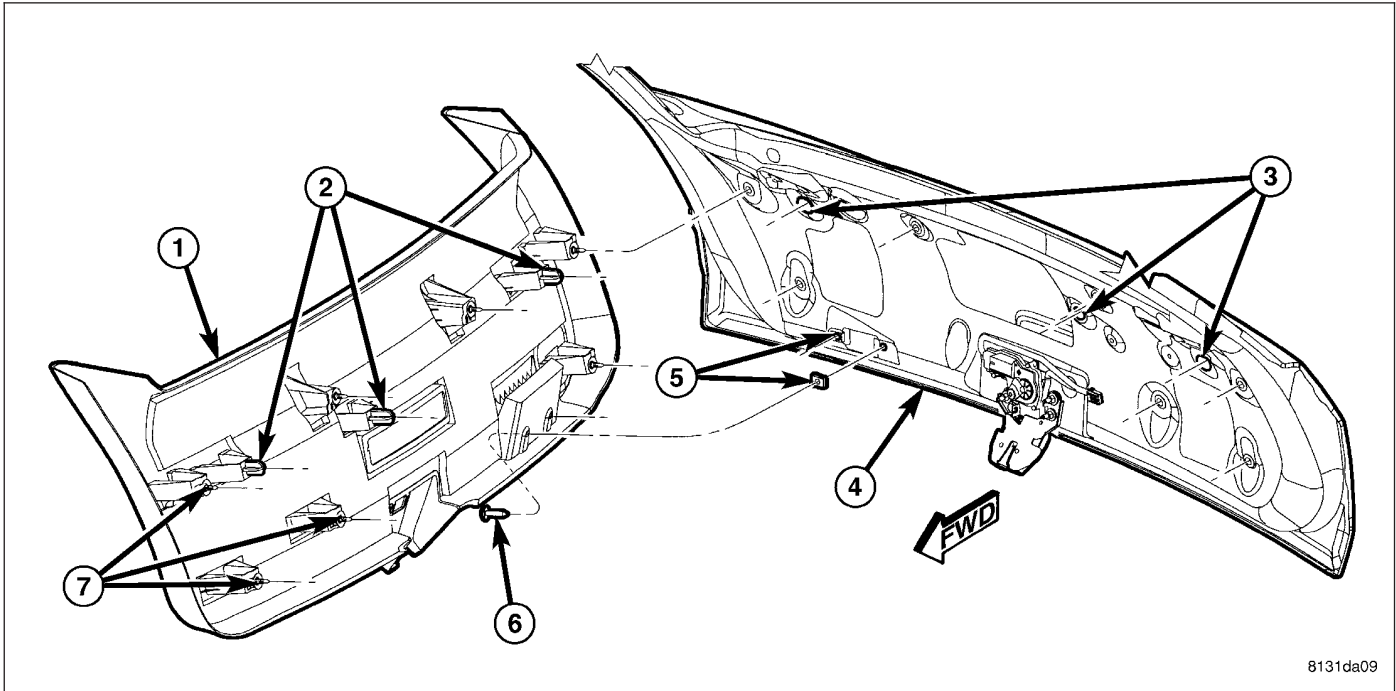


10. Reconnect the washer supply hose (2) in the right body wire harness to the liftgate spoiler washer nozzle hose on the underside of the liftgate.
11. Adjust the liftgate hinge, bumper, latch and latch striker positions as necessary to achieve proper spacing and operation.
12. Reinstall the trim plate onto the upper liftgate opening header. (Refer to 23 - BODY/INTERIOR/LIFTGATE OPENING UPPER TRIM - INSTALLATION).
13. Reinstall the upper and lower trim panels onto the inside of the liftgate. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - INSTALLATION).
14. Reconnect the battery negative cable.
15. Close the liftgate.

## TRIM PANEL

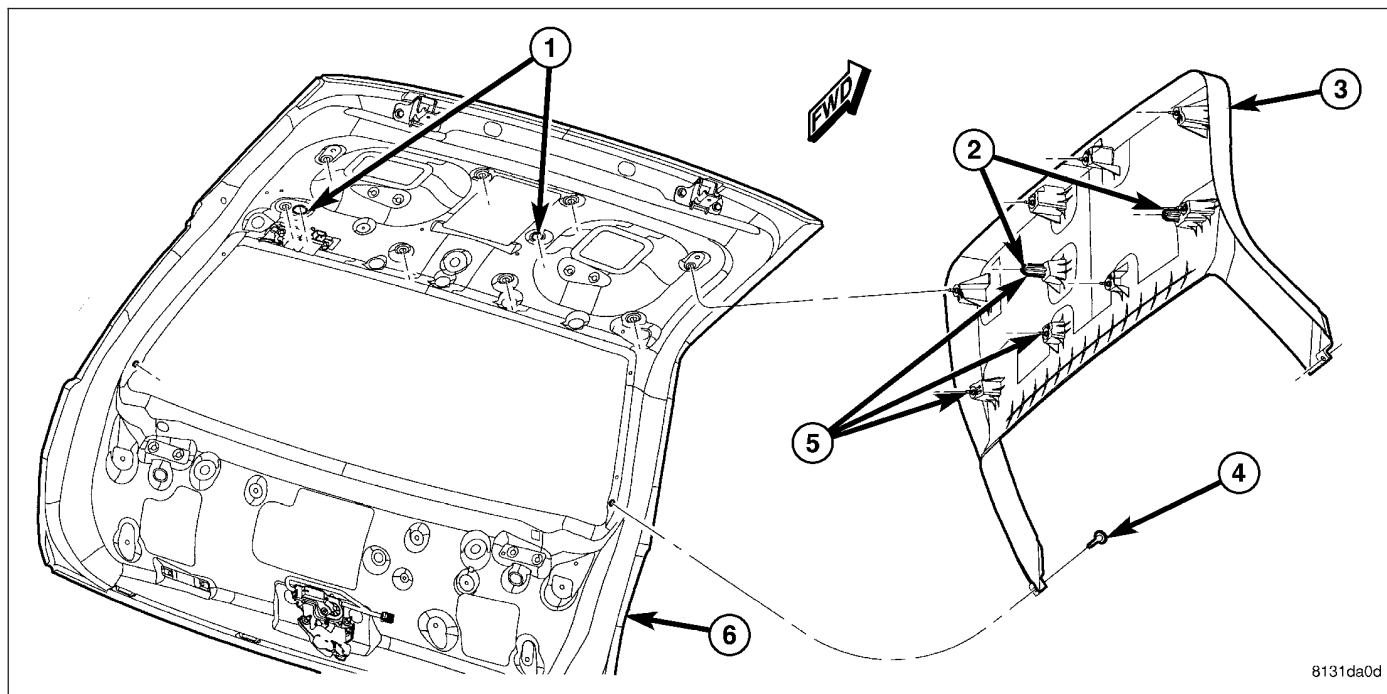
### REMOVAL

#### LOWER



1. Disconnect and isolate the battery negative cable.
2. Remove the lamp from the lower liftgate trim panel.
3. Remove the two screws (6) within the pull cup formation to the right of the latch that secure the lower trim panel (1) to the inside of the liftgate (4).
4. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the trim panel away from the inside of the liftgate to release the seven push-in plastic fasteners (7) that secure the panel to the liftgate.
5. Remove the liftgate lower trim panel from the vehicle.

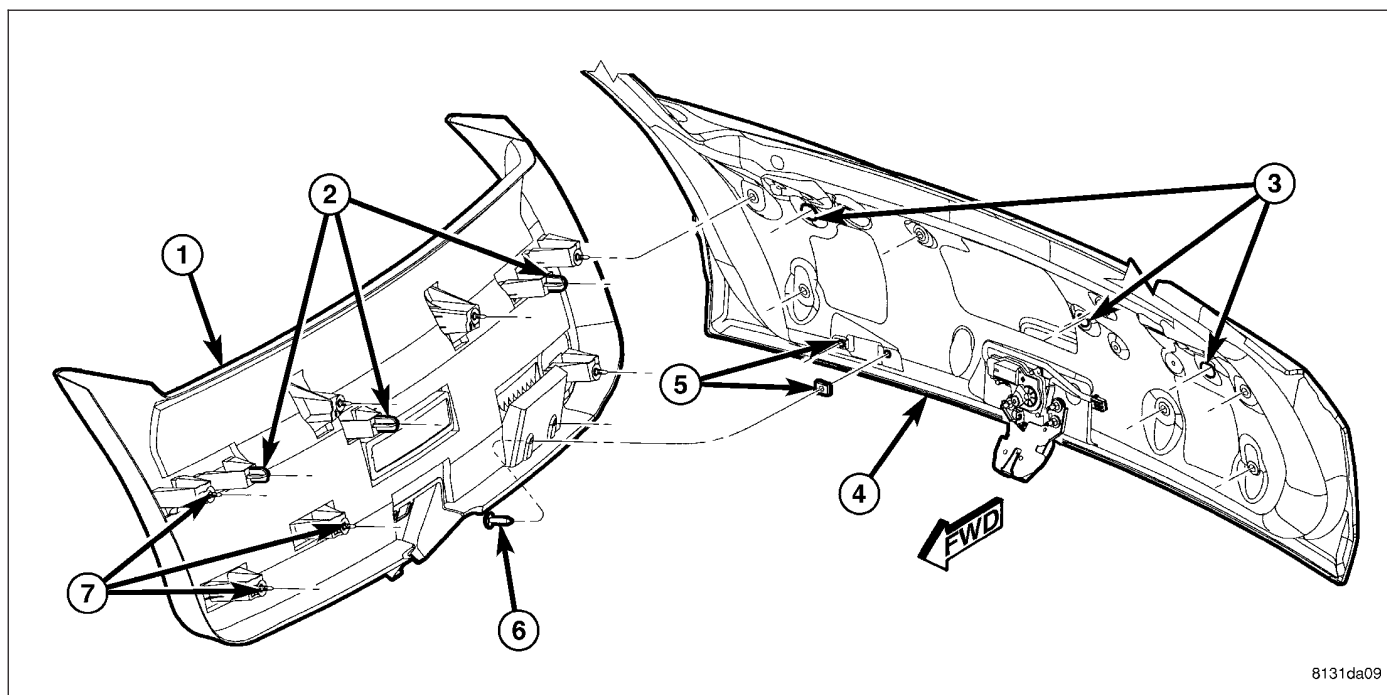
## REMOVAL



1. Open the liftgate (6).
2. Remove the lower trim panel from the inside of the liftgate. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/ TAILGATE/TRIM PANEL/LOWER - REMOVAL).
3. Remove the two screws (4) that secure the lower corners of the upper trim panel (3) to the inside of the liftgate.
4. Using a trim stick or another suitable wide flat-bladed tool, carefully pry the trim panel away from the inside of the liftgate to release the eight push-in plastic fasteners (7) that secure the panel to the liftgate.
5. Remove the liftgate upper trim panel from the vehicle.

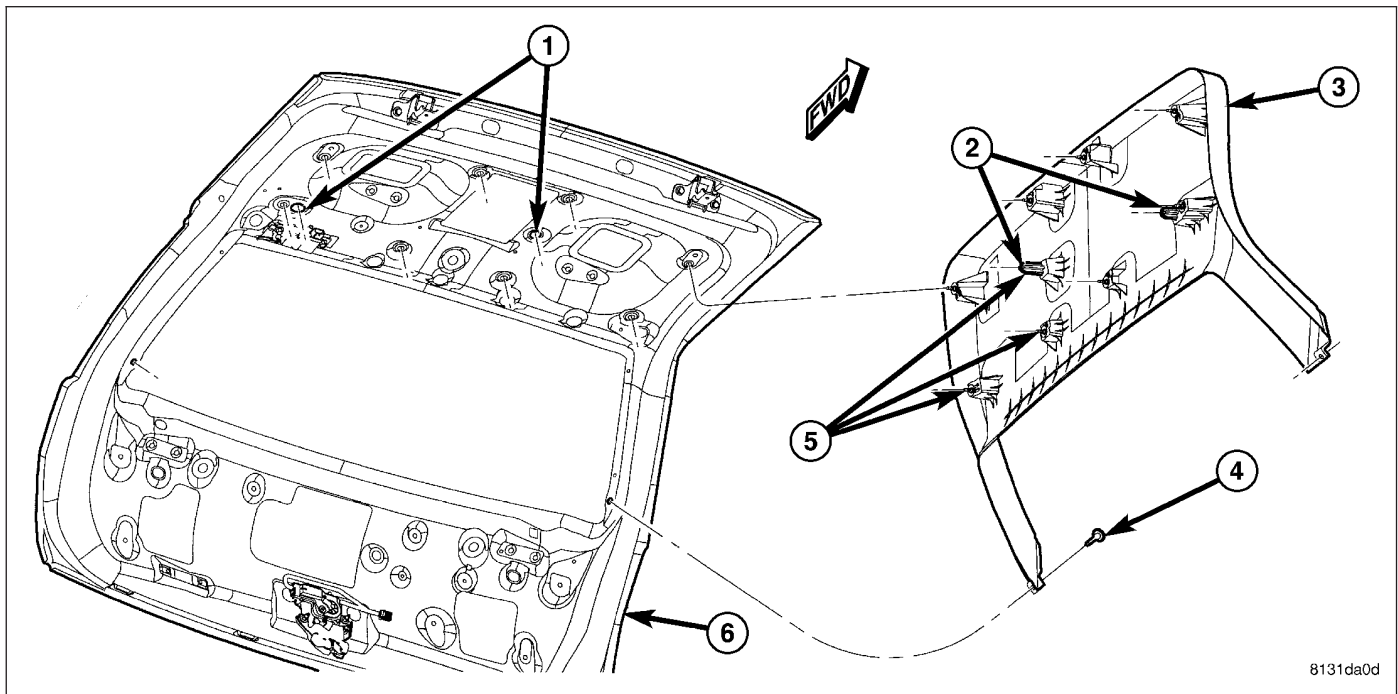
## INSTALLATION

### LOWER



1. Check to be certain that the two U-nuts (5) are properly installed and in good condition on the inside of the liftgate (4).
2. Check to be certain that the seven push-in plastic fasteners (7) are properly installed and in good condition on the inside of the lower trim panel (1).
3. Position the upper corners of the lower trim panel over the lower corners of the upper trim panel on the inside of the liftgate.
4. Align the three locator pins (2) on the back of the trim panel to the locator holes (3) on the inside of the liftgate.
5. Using hand pressure, press firmly and evenly on the trim panel over each of the seven push-in plastic fastener locations until the fasteners are fully engaged in the holes on the inside of the liftgate.
6. Install and tighten the two screws (6) within the pull cup formation to the right of the latch that secure the lower trim panel to the U-nuts on the inside of the liftgate. Tighten the screws to 3 N·m (27 in. lbs.).
7. Reinstall the lamp into the lower liftgate trim panel.
8. Reconnect the battery negative cable.

## UPPER



1. Check to be certain that the eight push-in plastic fasteners (5) are properly installed and in good condition on the inside of the liftgate upper trim panel (3).
2. Position the upper trim panel over the inside of the liftgate (6).
3. Align the two locator pins (2) on the back of the trim panel to the locator holes (1) on the inside of the liftgate.
4. Using hand pressure, press firmly and evenly on the trim panel over each of the eight push-in plastic fastener locations until the fasteners are fully engaged in the holes on the inside of the liftgate.
5. Install and tighten the two screws (6) that secure the lower corners of the upper trim panel to the inside of the liftgate. Tighten the screws to 2 N·m (16 in. lbs.).
6. Reinstall the lower trim panel onto the inside of the liftgate. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/ TAILGATE/TRIM PANEL/LOWER - INSTALLATION).
7. Close the liftgate.

## PAINT

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## PAINT

## SPECIFICATIONS - PAINT CODES

## EXTERIOR COLORS

EXTERIOR COLOR	DAIMLERCHRYSLER CODE
Brilliant Black Pearlcoat	AXR
Bright Silver Metallic Clearcoat	WS2
Cool Vanilla Clearcoat	XWG
Deep Lava Red Pearlcoat	ZMQ
Inferno Red Tinted Pearlcoat	WEL
Magnesium Pearlcoat	BPK
Midnight Blue Pearlcoat	BB8
Mineral Gray Metallic Clearcoat	CDM
Satin Jade Pearlcoat	AP4

## INTERIOR COLORS

INTERIOR COLOR	DAIMLERCHRYSLER CODE
Dark Slate Gray/Medium Slate Gray	DD
Dark Slate Gray/Light Graystone	D1
Deep Jade/Light Greystone	P1
Dark Slate Gray	DV
Deep Jade	P7
Light Greystone	D1

## BASE COAT/CLEAR COAT FINISH

## DESCRIPTION

The original equipment finish is a multi step process that involves cleaning, applying electro de-position (E-coat), anti-chip primer, basecoat, and clearcoat steps.

On most vehicles a two-part paint application (basecoat/clearcoat) is used. Color paint that is applied to primer is called basecoat. The clear coat protects the basecoat from ultraviolet light and provides a durable high-gloss finish.



**CAUTION:** Do not use abrasive chemicals or compounds on painted surfaces. Damage to finish can result. Do not use harsh alkaline based cleaning solvents on painted surfaces. Damage to finish or color can result.

## FINESSE SANDING/BUFFING & POLISHING

### DESCRIPTION

**CAUTION:** Do not remove more than .5 mils of clearcoat finish, if equipped. Basecoat paint must retain clearcoat for durability.

Use a Paint Thickness Gauge #PR-ETG-2X or equivalent to determine film thickness before and after the repair.

Minor acid etching, orange peel, or smudging in clearcoat or single-stage finishes can be reduced with light finesse sanding, hand buffing, and polishing. **If the finish has been finesse sanded in the past, it cannot be repeated. Finesse sanding operation should be performed by a trained automotive paint technician.**

## PAINT CODE

### DESCRIPTION

Exterior vehicle body colors are identified on the Vehicle Certification Label (Refer to VEHICLE DATA/VEHICLE INFORMATION/VEHICLE CERTIFICATION LABEL - DESCRIPTION). The first digit of the paint code listed on the vehicle indicates the sequence of application, i.e.: P = primary coat, Q = secondary coat. The color names provided in the Paint and Trim Code Description chart are the color names used on most repair product containers. (Refer to 23 - BODY/PAINT - SPECIFICATIONS)

## PAINT TOUCH-UP

### DESCRIPTION

When a painted metal surface has been scratched or chipped, it should be touched-up as soon as possible to avoid corrosion. For best results, use MOPAR® Scratch Filler/Primer, Touch-Up Paints and Clear Top Coat.

**WARNING: USE AN OSHA APPROVED RESPIRATOR AND SAFETY GLASSES WHEN SPRAYING PAINT OR SOLVENTS IN A CONFINED AREA. PERSONAL INJURY CAN RESULT.**

### STANDARD PROCEDURE

1. Scrape loose paint and corrosion from inside scratch or chip.
2. Clean affected area with MOPAR® Tar/Road Oil Remover or equivalent, and allow to dry.
3. Fill the inside of the scratch or chip with a coat of filler/primer. Do not overlap primer onto good surface finish. The applicator brush should be wet enough to puddle-fill the scratch or chip without running. Do not stroke brush applicator on body surface. Allow the filler/primer to dry hard.
4. Cover the filler/primer with color touch-up paint. Do not overlap touch-up color onto the original color coat around the scratch or chip. Butt the new color to the original color, if possible. Do not stroke applicator brush on body surface. Allow touch-up paint to dry hard.
5. On vehicles without clearcoat, the touch-up color can be lightly finesse sanded (1500 grit) and polished with rubbing compound.
6. On vehicles with clearcoat, apply clear top coat to touch-up paint with the same technique as described in Step 4. Allow clear top coat to dry hard. If desired, Step 5 can be performed on clear top coat.

**WARNING: AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT. AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.**



SEATS

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SEATS

WARNING

RESTRAINT SYSTEM

**WARNING:** During and following any seat belt or child restraint anchor service, carefully inspect all seat belts, buckles, mounting hardware, retractors, tether straps, and anchors for proper installation, operation, or damage. Replace any belt that is cut, frayed, or torn. Straighten any belt that is twisted. Tighten any loose fasteners. Replace any belt that has a damaged or inoperative buckle or retractor. Replace any belt that has a bent or damaged latch plate or anchor plate. Replace any child restraint anchor or the unit to which the anchor is integral that has been bent or damaged. Never attempt to repair a seat belt or child restraint component. Always replace damaged or faulty seat belt and child restraint components with the correct, new and unused replacement parts listed in the DaimlerChrysler Mopar parts catalog. Failure to follow these instructions may result in personal injury or death.

**WARNING:** On vehicles equipped with airbags, disable the supplemental restraint system before attempting any steering wheel, steering column, airbag, occupant classification system, seat belt tensioner, impact sensor, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the supplemental restraint system. Failure to take the proper precautions could result in accidental airbag deployment. Failure to follow these instructions may result in personal injury or death.

**WARNING:** On vehicles equipped with airbags, before performing any welding operations disconnect and isolate the battery negative (ground) cable and disconnect all wire harness connectors from the airbag control module (acm). Failure to take the proper precautions could result in accidental airbag deployment and other possible damage to the supplemental restraint system circuits and components. Failure to follow these instructions may result in personal injury or death.

**WARNING:** Replace all restraint system components only with parts specified in the DaimlerChrysler Mopar parts catalog. Substitute parts may appear interchangeable, but internal differences may result in inferior occupant protection. Failure to follow these instructions may result in personal injury or death.

**WARNING:** The fasteners, screws, and bolts originally used for the restraint system components must never be replaced with any substitutes. These fasteners have special coatings and are specifically designed for the restraint system. Any time a new fastener is needed, replace it with the correct fasteners provided in the service package or specified in the DaimlerChrysler Mopar parts catalog. Failure to follow these instructions may result in personal injury or death.

**WARNING:** On vehicles equipped with the occupant classification system (ocs) do not hang any after market devices from the front passengers seat back. Do not install a front drivers seat back cover with map pocket onto the passenger seat. Failure to follow these instructions may result in personal injury or death.

**WARNING:** The Seat Weight Sensor is a sensitive, calibrated unit and must be handled carefully. Do not drop or handle roughly. If dropped or damaged, replace with another sensor. Failure to follow these instructions may result in personal injury or death.

**WARNING:** The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

**WARNING:** When the seat is on the floor, no one should sit in the front passenger seat. This uneven force may damage the sensing ability of the seat weight sensors. If sat on and damaged, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

## ADJUSTERS-FRONT

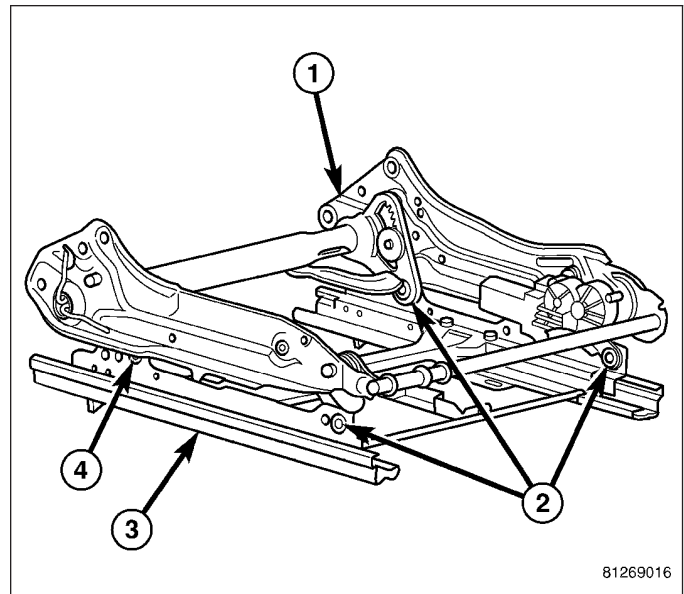
### REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Remove the seat cushion as necessary. (Refer to 23 - BODY/SEATS/SEAT CUSHION / COVER - FRONT - REMOVAL)

### Power

1. Remove the seat risers. (Refer to 23 - BODY/SEATS/SEAT RISER - FRONT - REMOVAL)
2. Remove the bolts and nuts (2 & 4) and separate the height adjuster assembly from the length adjuster assembly (3).

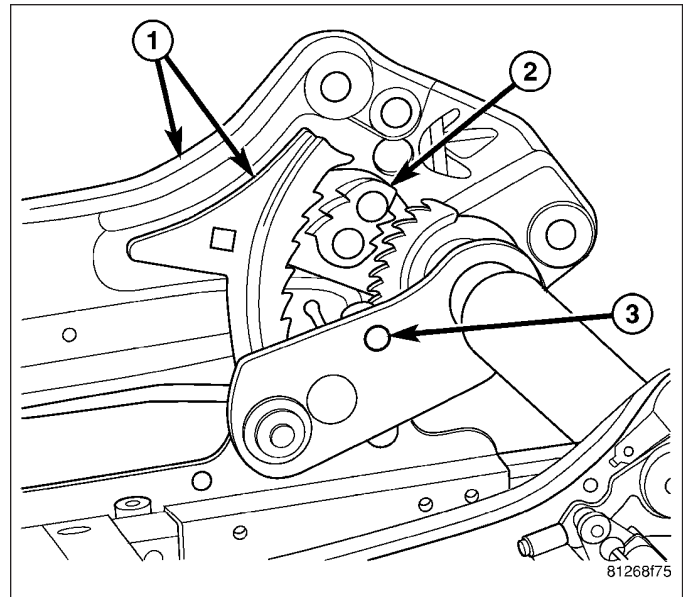
**Note:** Bolt (4) is a different size from the other three bolts (2). Note the location for proper installation.



**WARNING: A SEAT STRUCTURE THAT HAS SEEN SIGNIFICANT LOAD MAY HAVE THE LOCKING MECHANISM ACTIVATED AND MAY EXHIBIT THE FOLLOWING SYMPTOMS:**

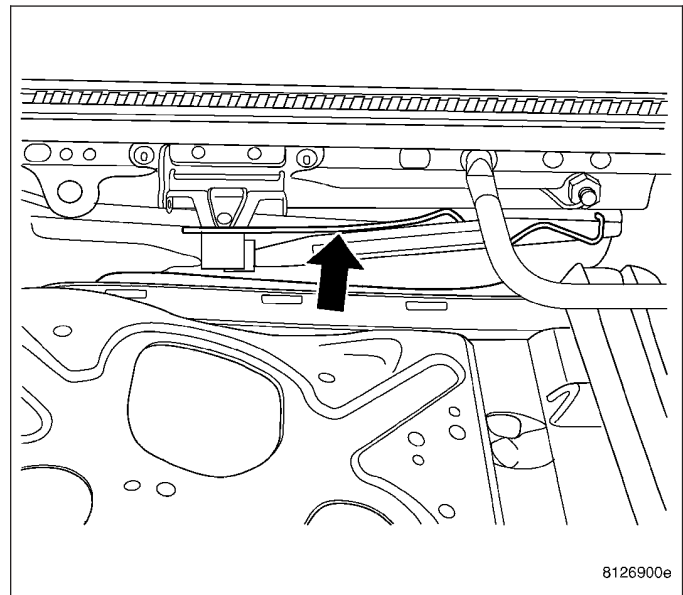
- LOCKING PAWL (2) LOOSE
- LOCKING PAWL (2) ENGAGED INTO THE SEAT FRAME SIDE MEMBER (1)
- HEIGHT ADJUSTER ONLY WORKS ON OUT-BOARD SIDE
- BROKEN OR MISSING SHEAR PIN (3)

**IF ANY ONE OR MORE OF THESE SYMPTOMS EXIST REPLACE THE HEIGHT ADJUSTER ASSEMBLY. DO NOT ATTEMPT ANY REPAIRS. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY OR DEATH.**

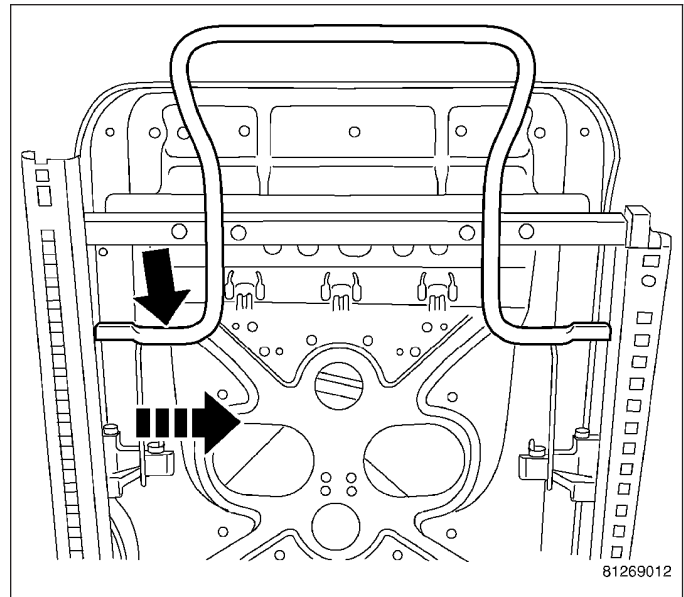


## Manual

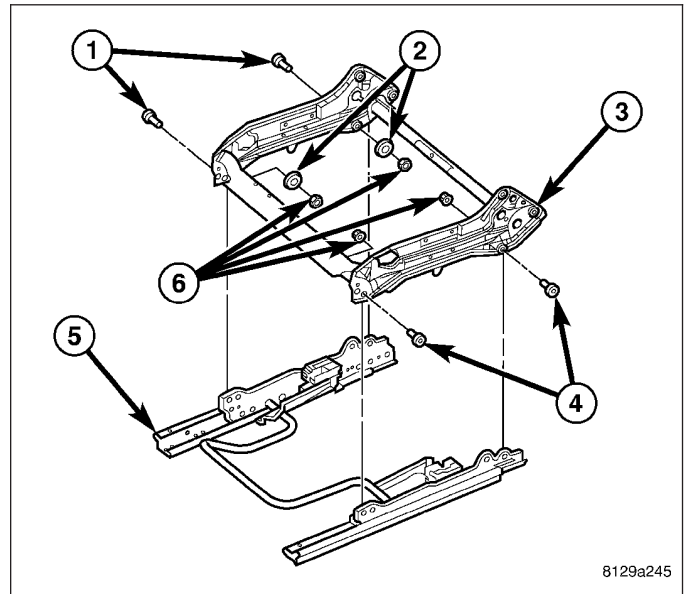
1. Remove the spring clip.



2. Squeeze the towel bar together and pull the towel bar out of the left and right seat tracks.



3. Remove the bolts (1 & 4), nuts (6) and spacers (2) and separate the side member assembly (3) from the length adjuster assembly (5).



## INSTALLATION

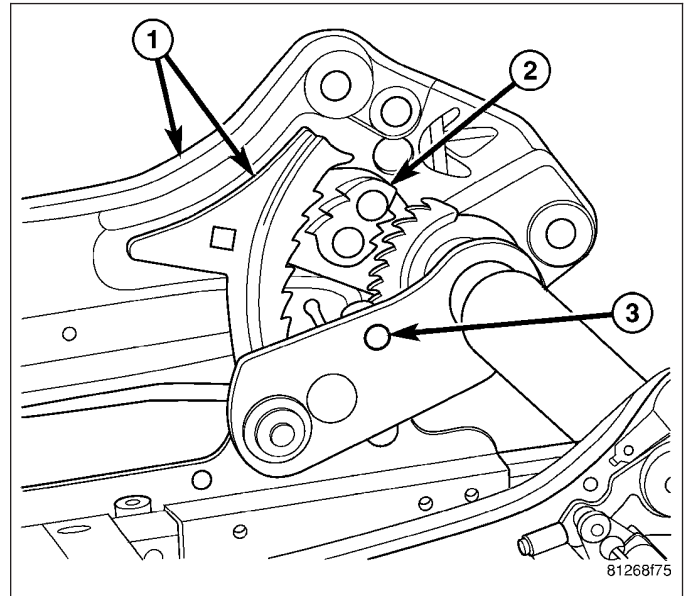
### Power

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)

**WARNING: A SEAT STRUCTURE THAT HAS SEEN SIGNIFICANT LOAD MAY HAVE THE LOCKING MECHANISM ACTIVATED AND MAY EXHIBIT THE FOLLOWING SYMPTOMS:**

- LOCKING PAWL (2) LOOSE
- LOCKING PAWL (2) ENGAGED INTO THE SEAT FRAME SIDE MEMBER (1)
- HEIGHT ADJUSTER ONLY WORKS ON OUT-BOARD SIDE
- BROKEN OR MISSING SHEAR PIN (3)

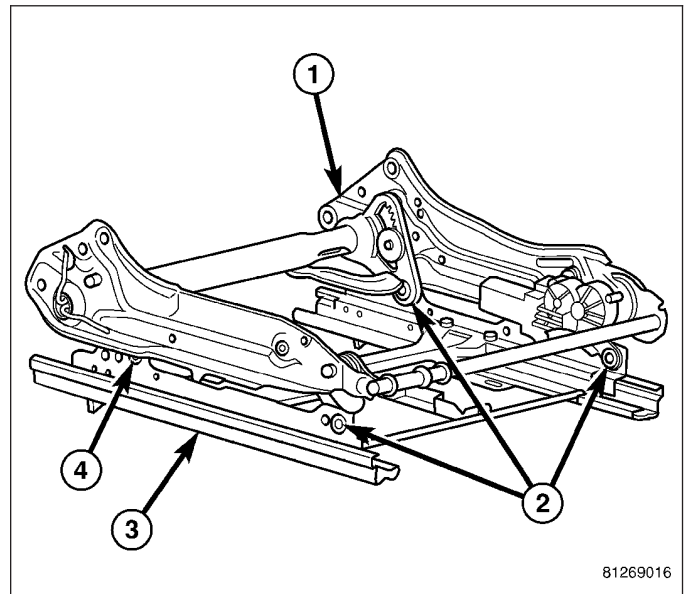
**IF ANY ONE OR MORE OF THESE SYMPTOMS EXIST REPLACE THE HEIGHT ADJUSTER ASSEMBLY. DO NOT ATTEMPT ANY REPAIRS. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY OR DEATH.**



2. Install the seat risers. (Refer to 23 - BODY/SEATS/ SEAT RISER - INSTALLATION)
3. Position the height adjuster assembly (1) onto the length adjuster assembly (3) and install the nuts, bolts and spacers on the inboard side.

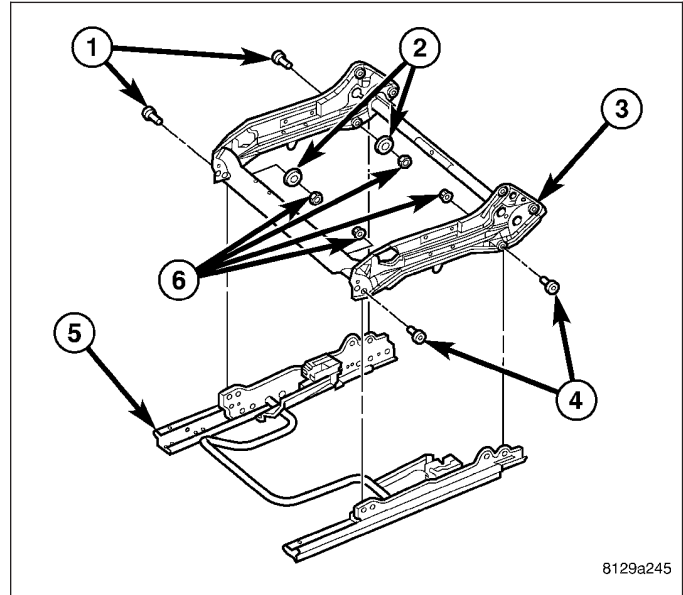
**Note: Bolts (2) and (4) are different and need to be installed into the correct positions.**

4. Tighten the bolts to 21 N·m (15 ft. lbs.).
5. Install the seat cushion and install the seat. (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - INSTALLATION)

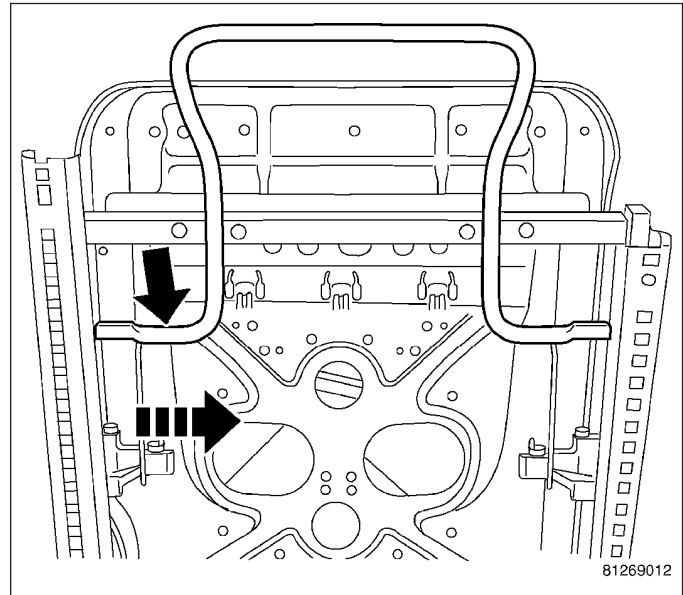


## Manual

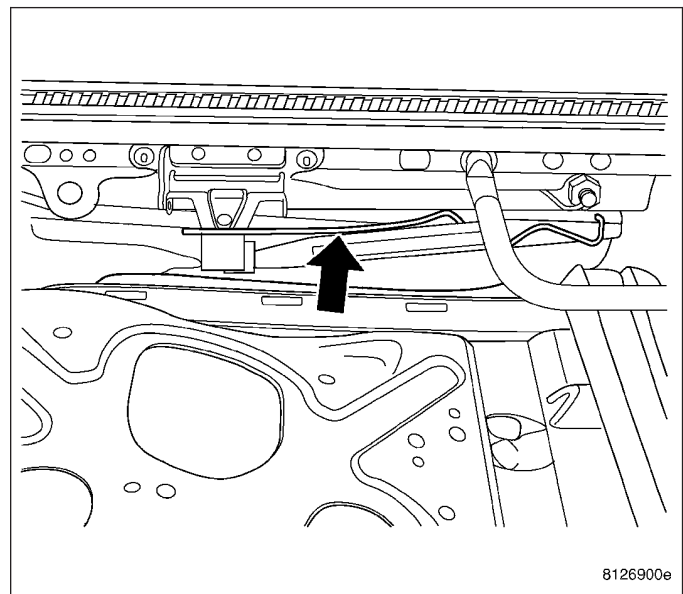
1. Install the seat risers. (Refer to 23 - BODY/SEATS/ SEAT RISER - INSTALLATION)
2. Position the side member assembly (3) onto the length adjuster assembly (5) and install the nuts (6), bolts (1 & 4) and spacers (2) on the inboard side.
3. Tighten the bolts to 42 N·m (31 ft. lbs.).



4. Squeeze the towel bar together and insert the ends into the bushings on both tracks.



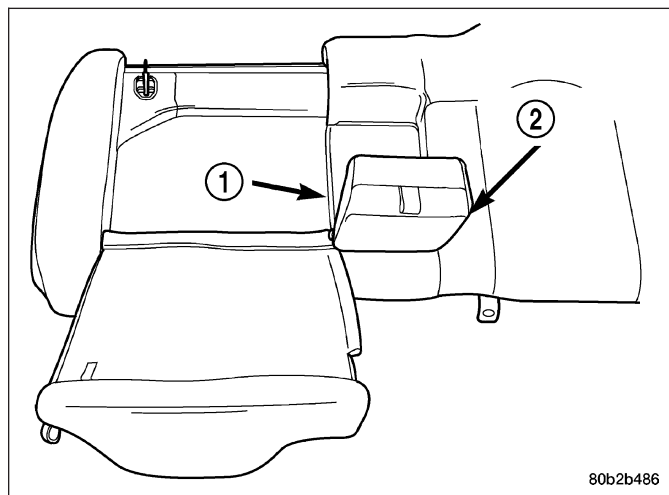
5. Install the spring clip.
6. Install the seat cushion and install the seat. (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - INSTALLATION)



## ARMREST-REAR

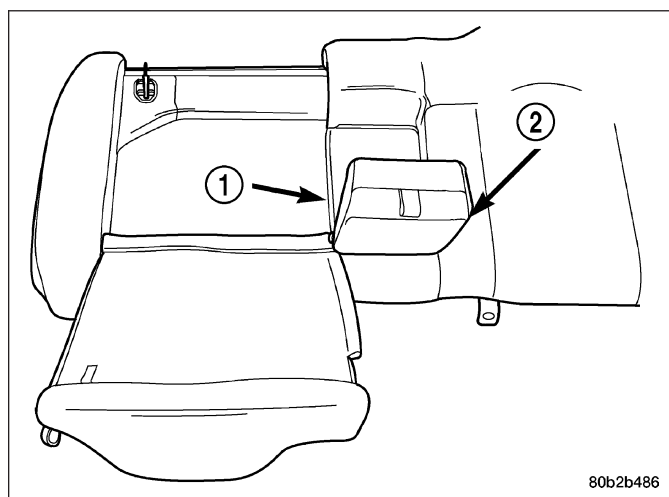
### REMOVAL

1. Fold down 40 side rear seat back.
2. Remove arm rest bolt.
3. Remove retaining C-clip.
4. Remove arm rest.



### INSTALLATION

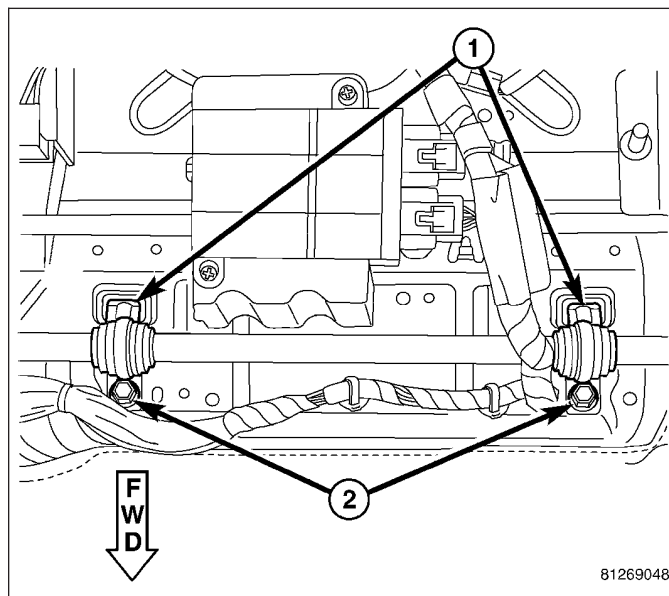
1. Place arm rest in bracket.
2. Install arm rest bolt. Tighten to 12 N·m (9 ft. lbs.) torque.
3. Install retaining C-clip.
4. Reposition the seats.



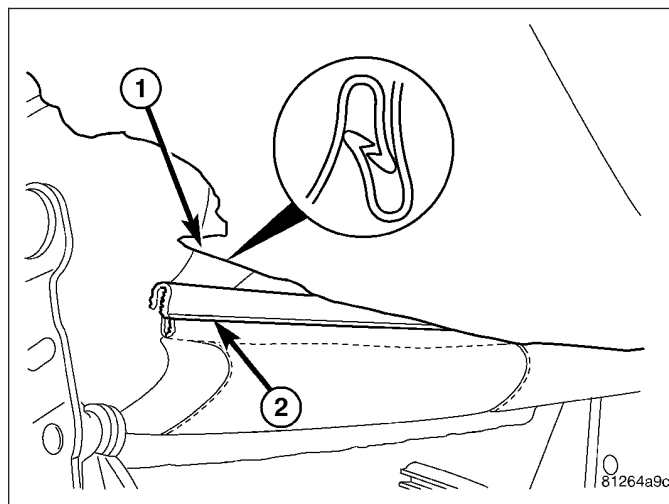
## CUSHION/COVER-CUSHION - FRONT

### REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Move the seat to the forward position and disconnect and isolate the batter negative cable.
3. Remove the bolts (2) and the clamps (1) and remove the seat cushion.
4. Disconnect the electrical connector, if equipped.

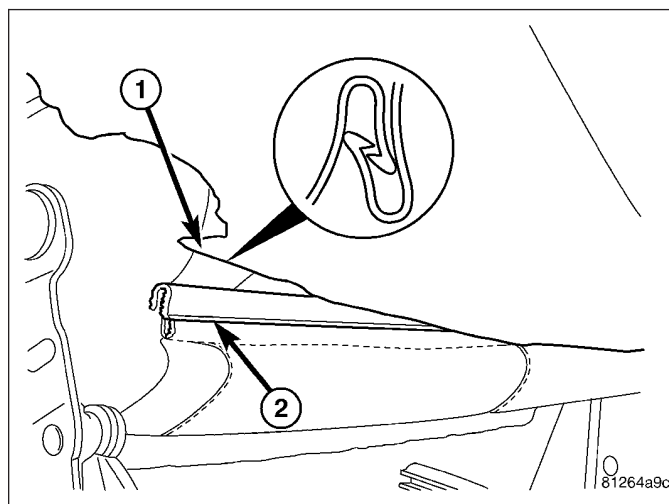


5. Separate the j-straps (1 & 2) and seat cushion cover and foam.



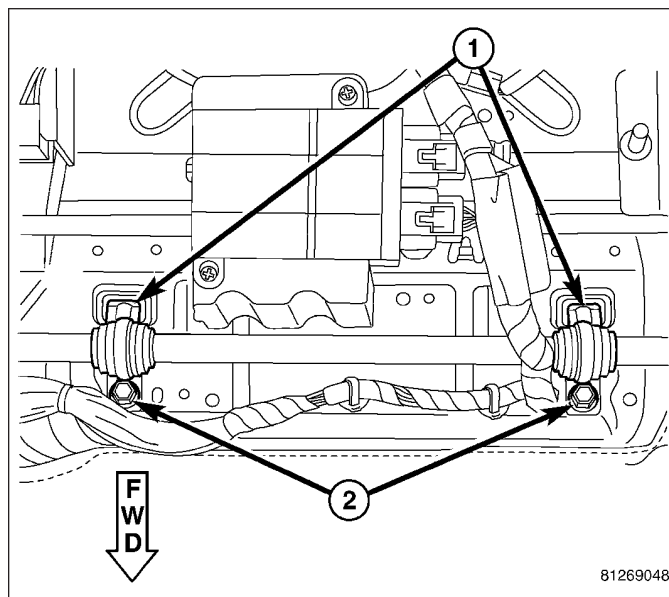
### INSTALLATION

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Position the cushion cover and foam over the seat pan and connect the j-straps (1 & 2).



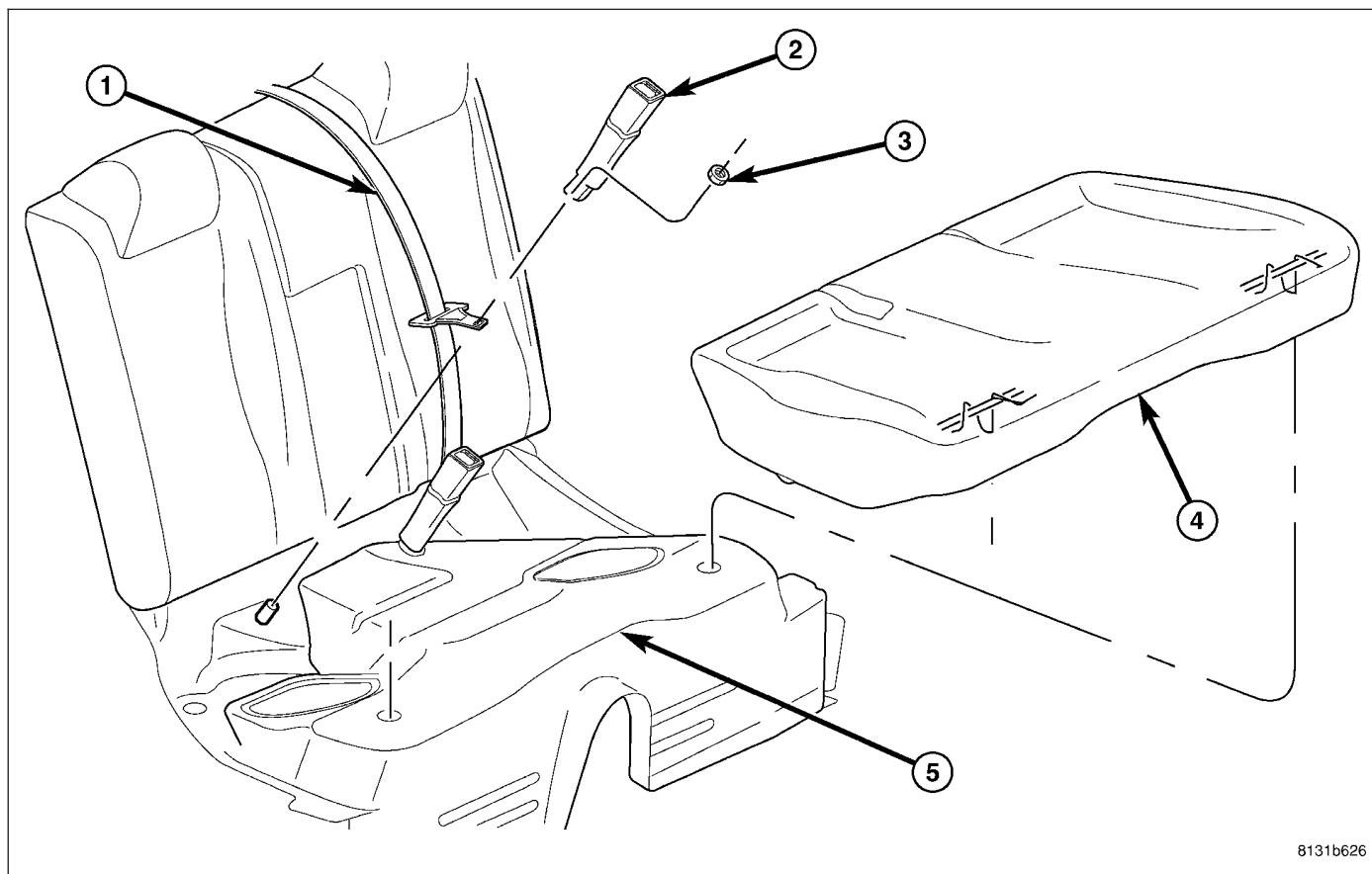


3. Position the seat cushion assembly onto the seat frame and install the clamps (1).
4. Connect the wire harness to the seat cushion pan, if equipped.
5. Install the bolts (2) and tighten to 10 N·m (90 in. lbs.).
6. Connect battery negative cable.

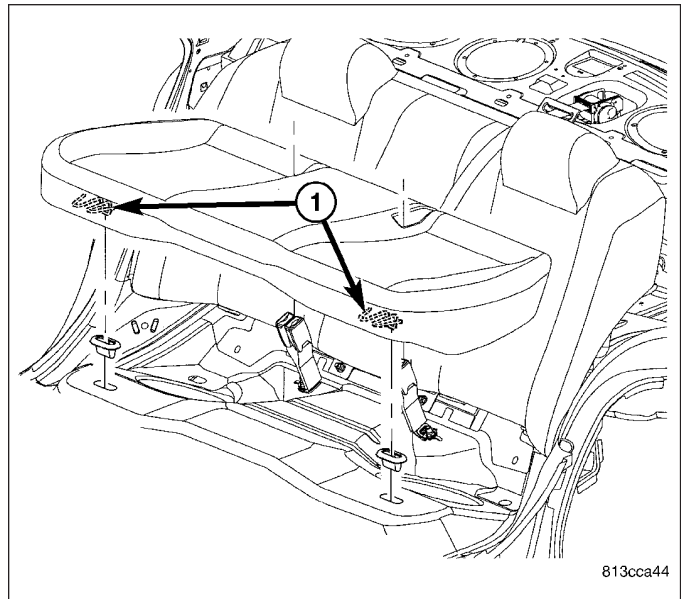


## CUSHION/COVER-CUSHION - SECOND ROW

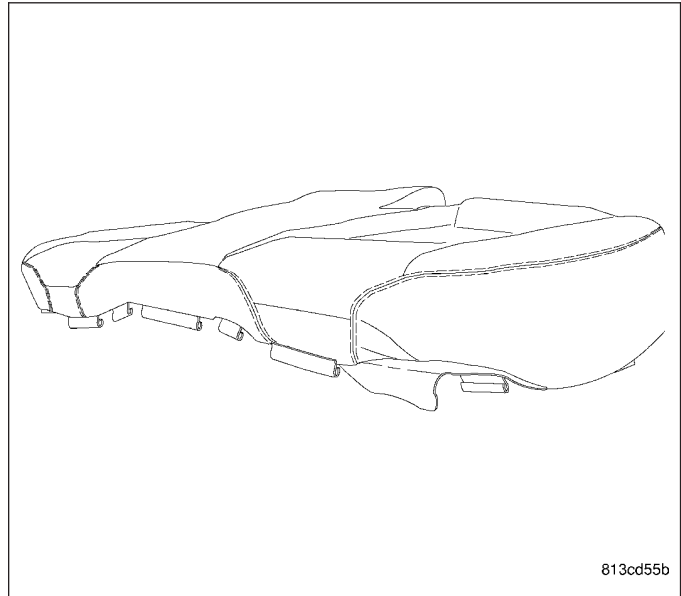
### REMOVAL



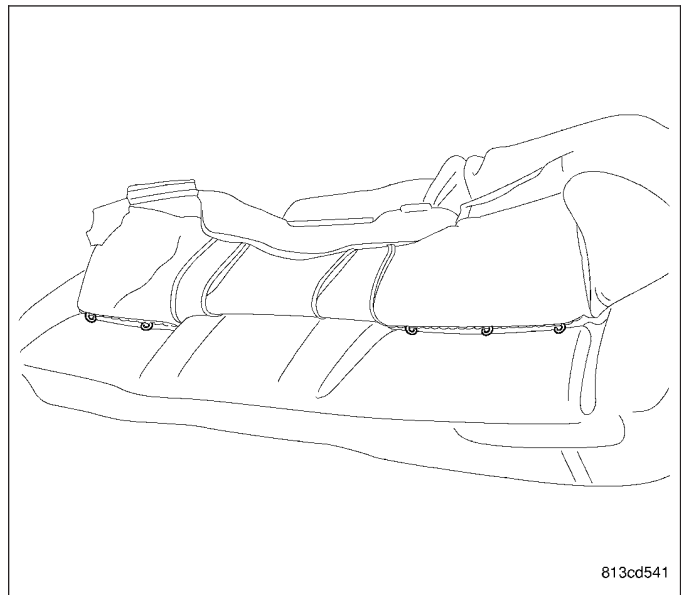
1. Pull upward at forward edge of cushion each retainer loop of the rear seat cushion to disengage retainer loops from cups in floor.
2. Remove rear seat cushion (4) from vehicle.



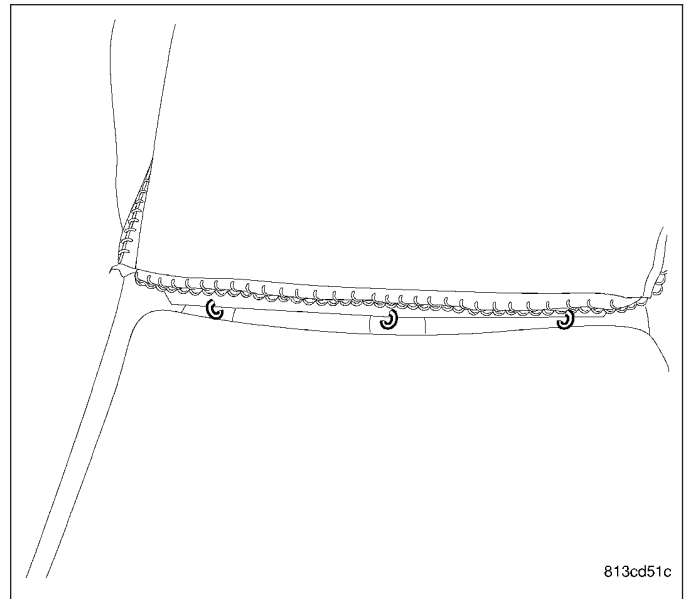
3. Disengage the J-straps attaching seat cover to the cushion.



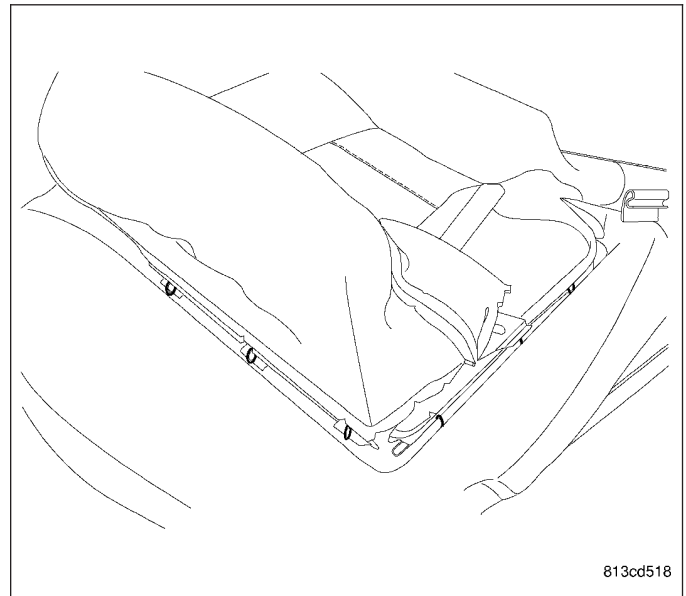
4. Fold rear of the seat cover forward to uncover hog rings.



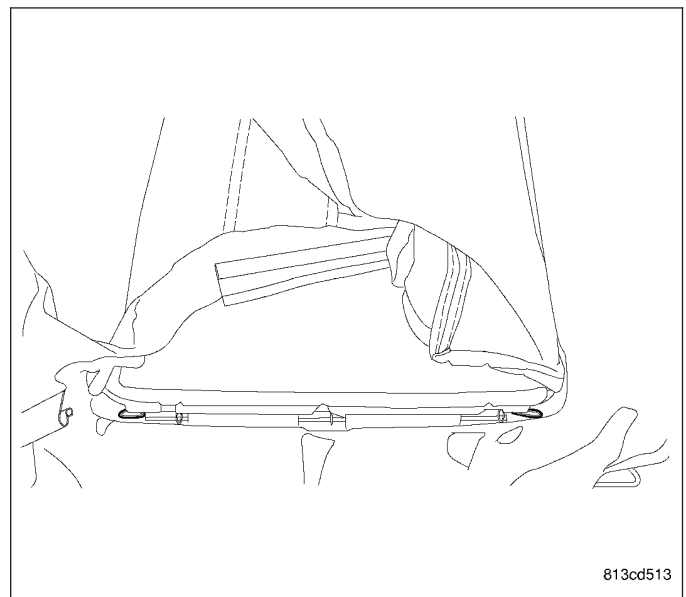
5. Start on the rear side of the cushion and cut hog rings.



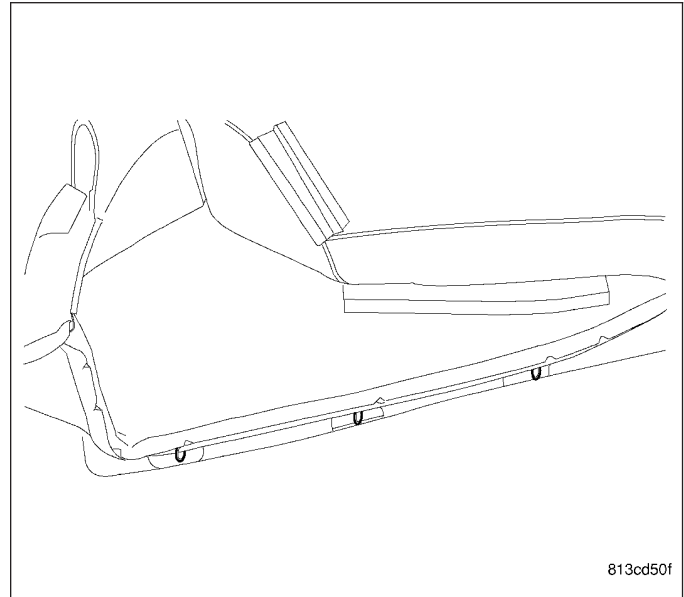
6. Cut the hog rings on the outer side of the cushion.



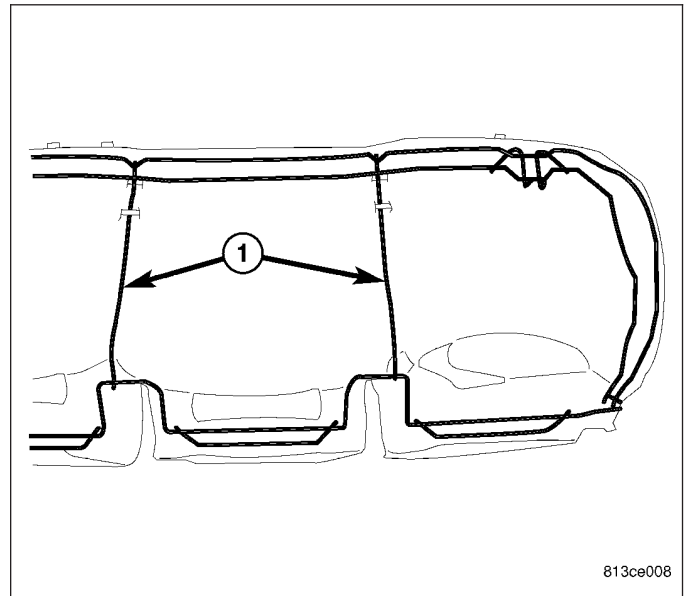
7. Work around the outer edges and cut the hog rings.



8. Fold cover up to access the inner hog rings and cut them.
9. Repeat operation on the other side of cushion.
10. Remove seat cushion cover from seat cushion.

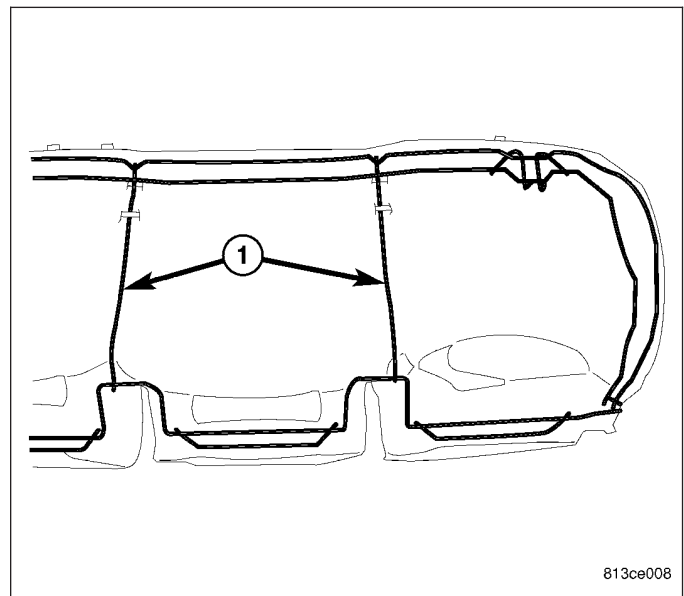


11. If replacing cushion, remove the cushion support by cutting the hog rings attaching it to the foam and remove.

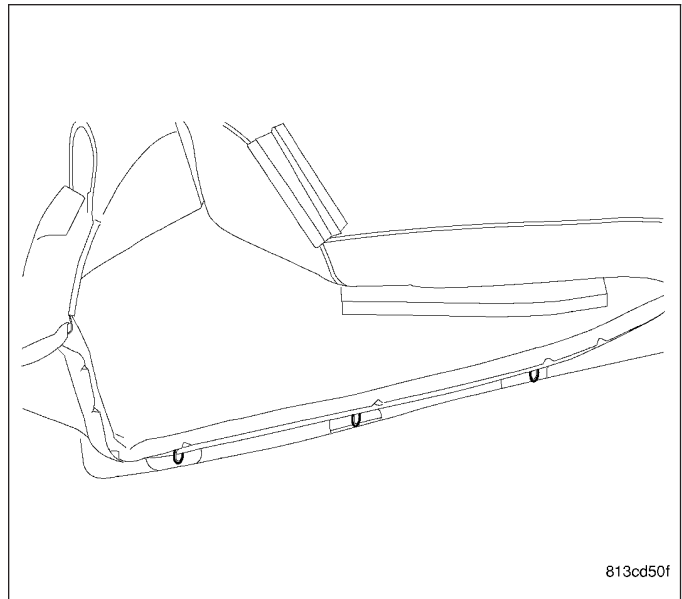


## INSTALLATION

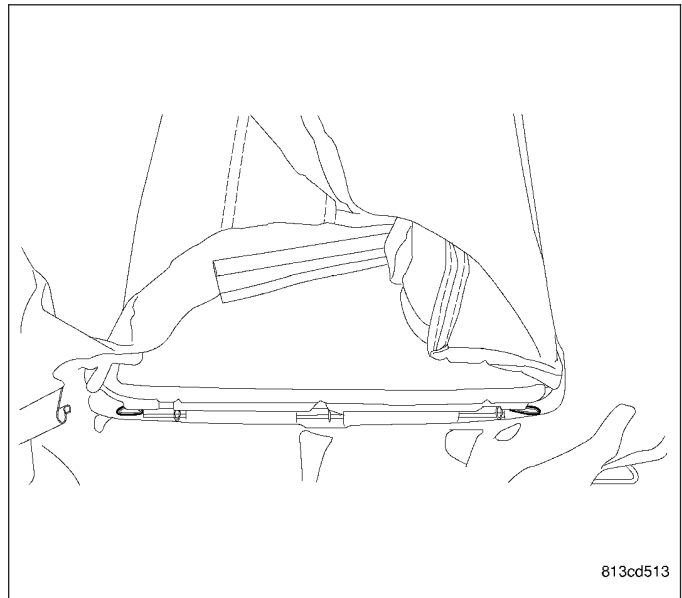
1. Install hog rings attaching cushion support, if remove.



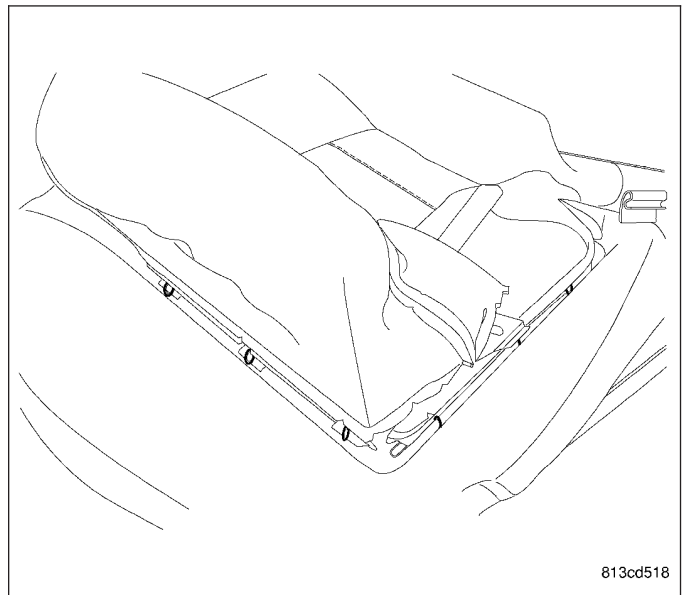
2. Place seat cover into position on the foam.
3. Install the attaching hog rings on the inner side of the seat cover and cushion.



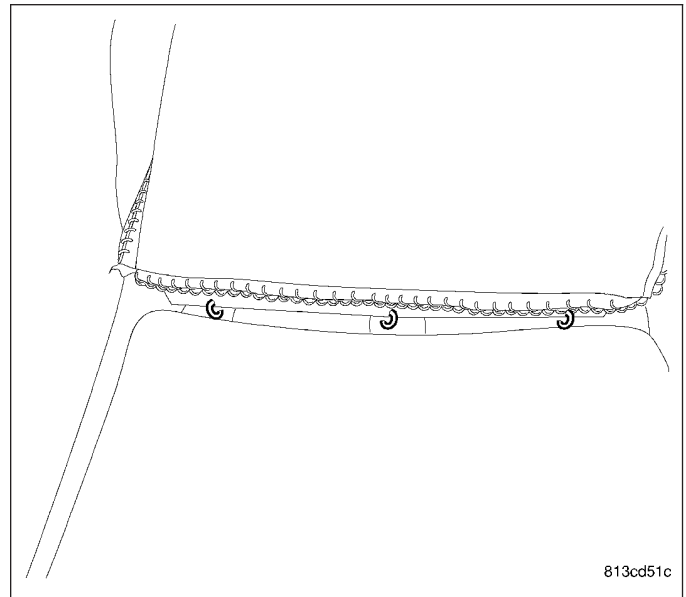
4. Install hog rings on the on the front side the seat cover.



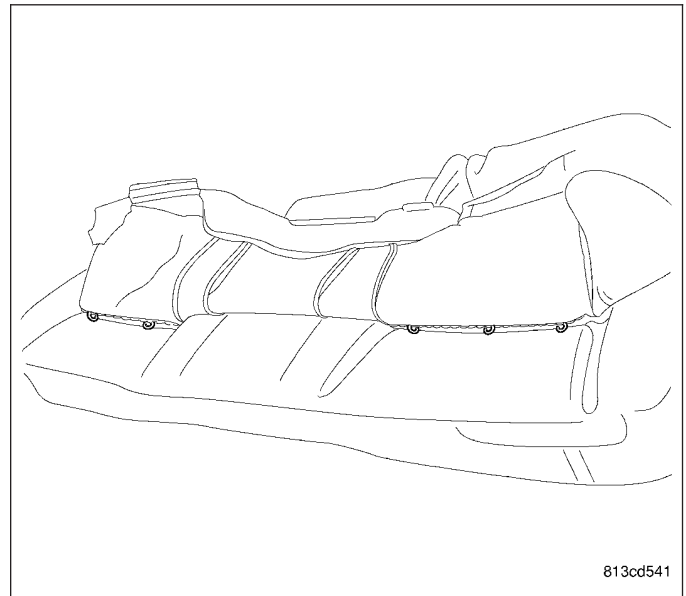
5. Install hog rings on the outer side of the seat cover. Check for seat cover wrinkles.



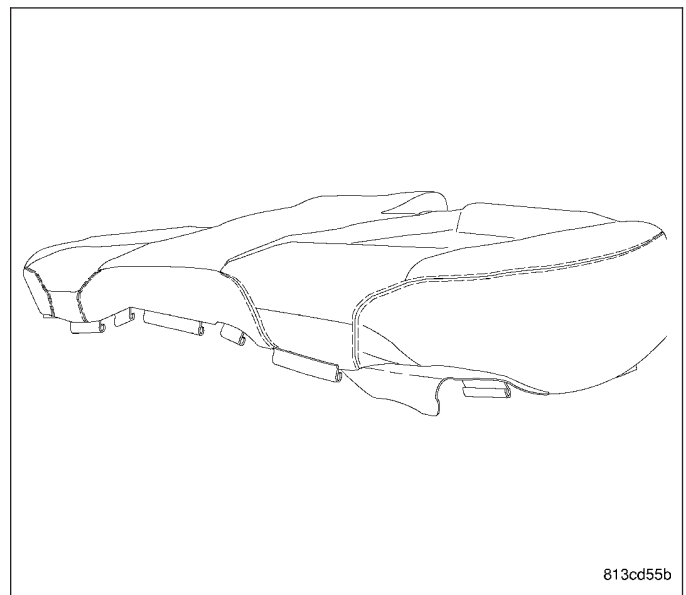
6. Install the hog rings on the rear side of seat cover.
7. Repeat the operation for the other side of cushion.

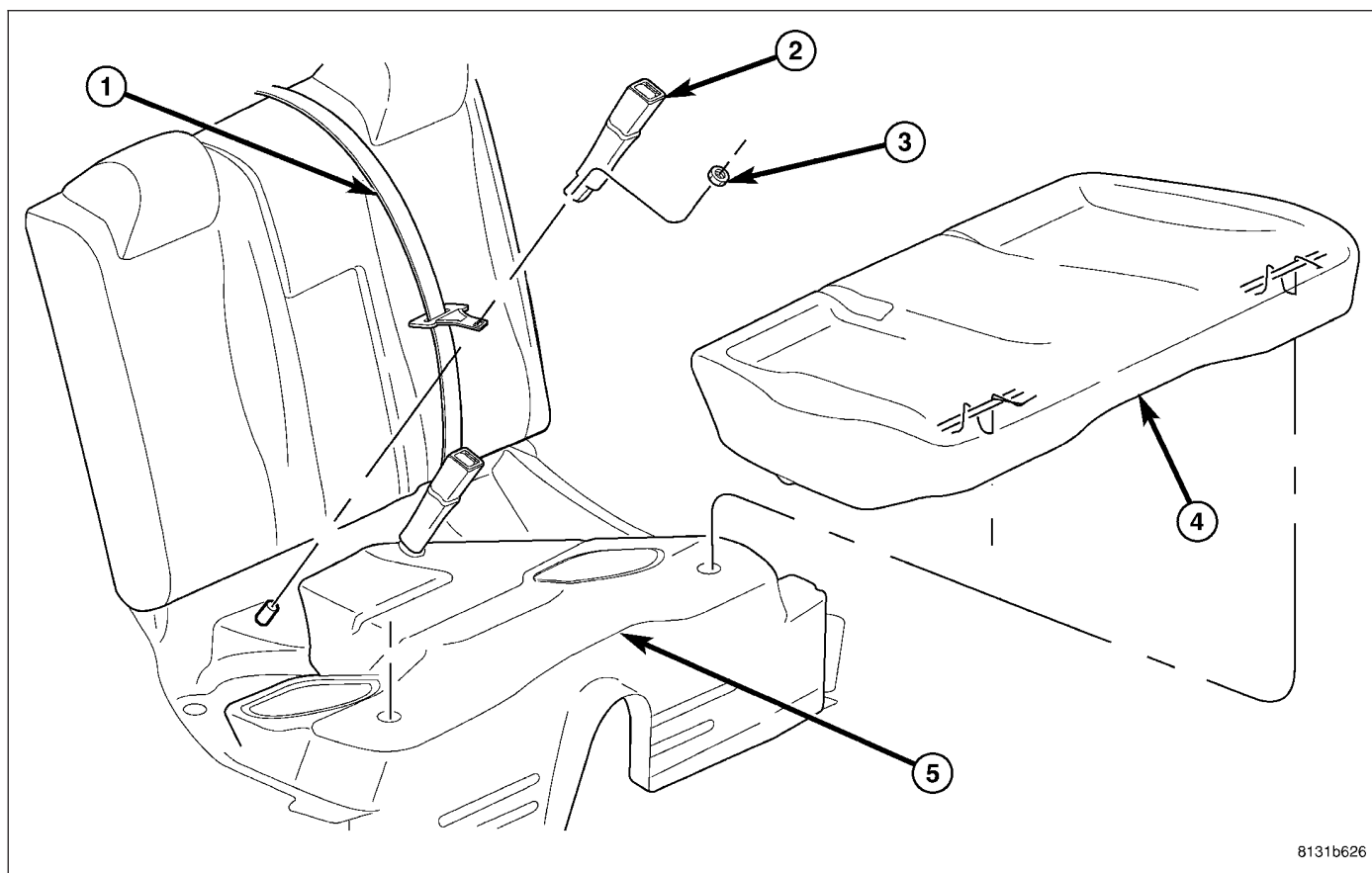


8. Position seat cover in to position on the foam and check for seat cover wrinkles.

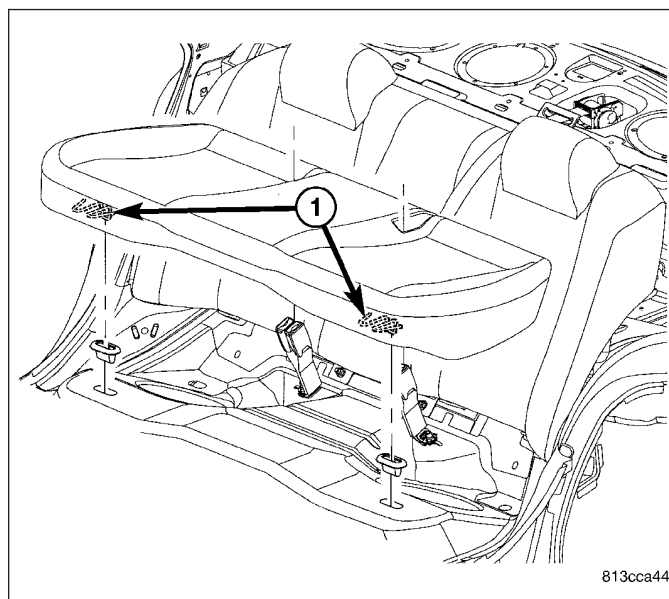


9. Connect the J-straps, and smooth out seat cover.
10. Steam wrinkles from seat cushion, if necessary.





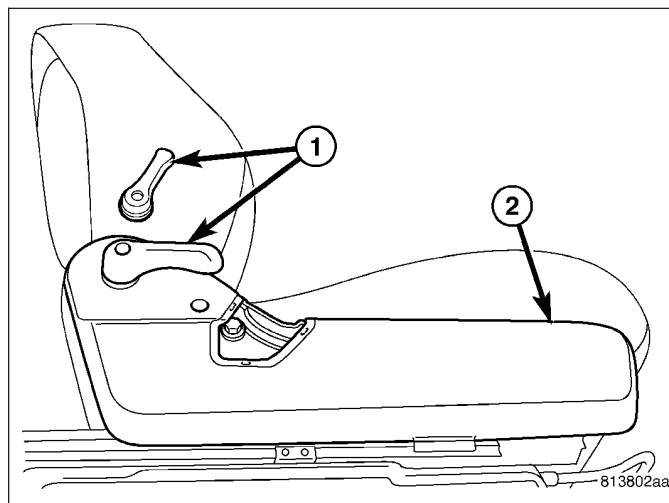
11. Place seat cushion (4) into position.
12. Engage retainer loops into cup on floor kick up.
13. Push downward at forward edge at each retainer loop of the rear seat cushion to engage retainers.



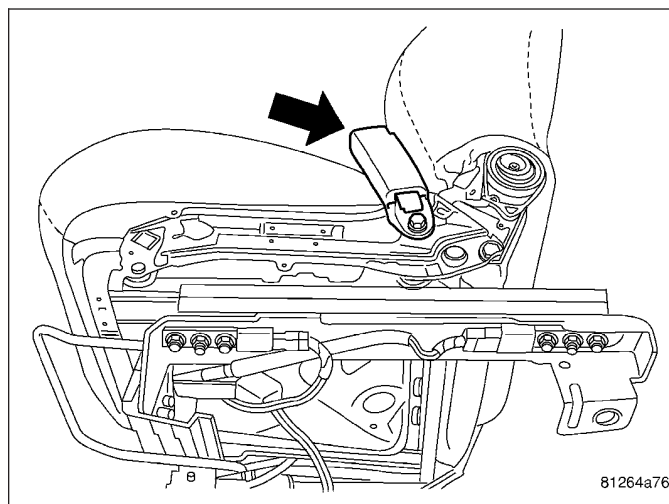
## CUSHION/COVER-SEAT BACK - FRONT

### REMOVAL

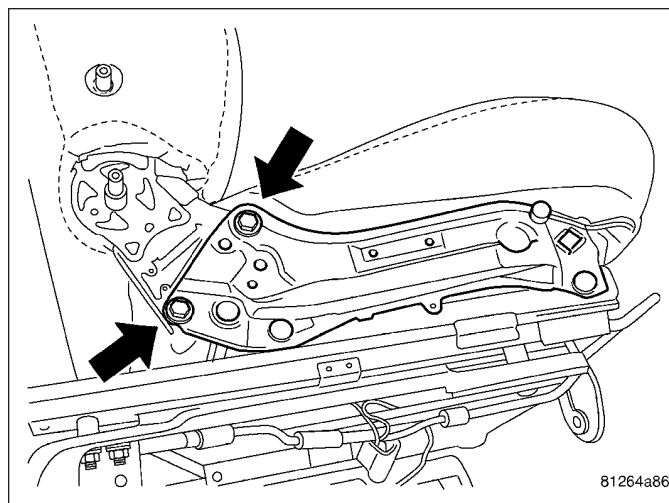
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Remove the front seat. (Refer to 23 - BODY/SEATS/SEAT - FRONT - REMOVAL)
3. Remove the lumbar and recliner handles (1).
4. Remove the screws and remove the side shields (2).



5. Remove the belt buckle.

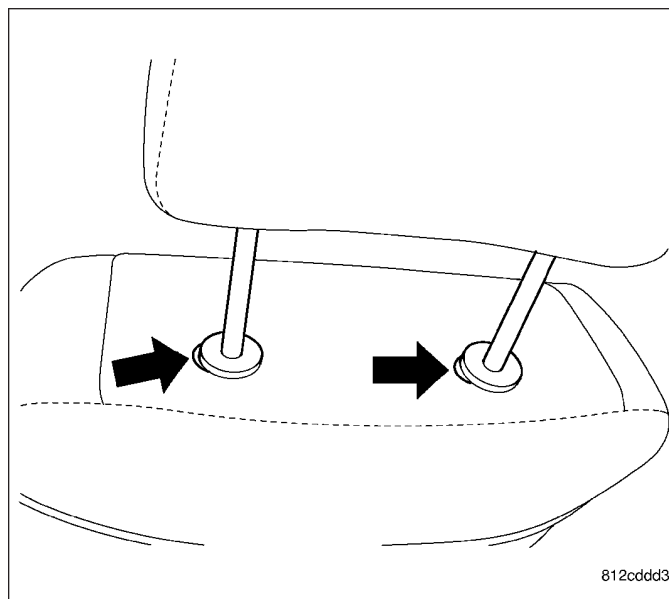


6. Remove the seat back bolts from both sides.

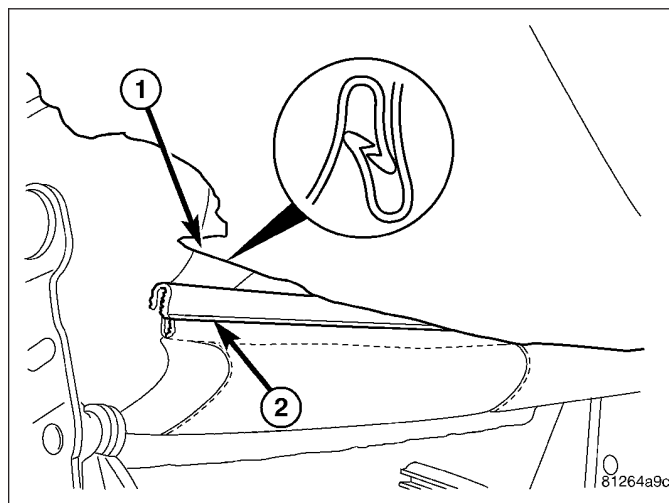




7. Push in the buttons on both headrest sleeves, pull the headrest up and remove.

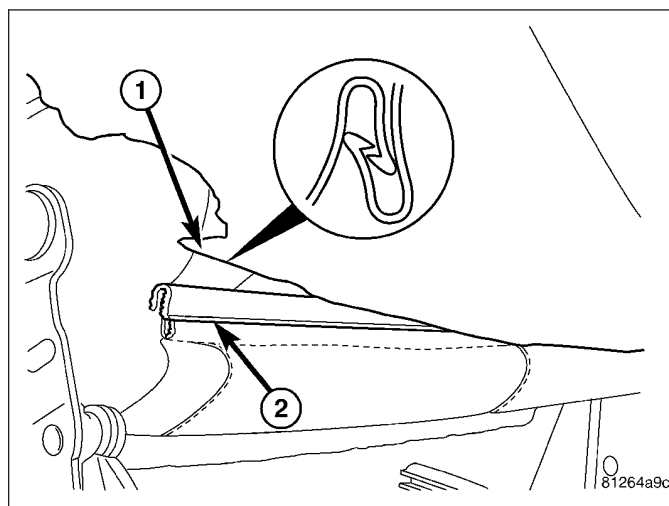


8. Separate the j-straps (1 & 2) and pull cover up over frame and remove cushion.
9. Pinch both headrest sleeve ribs from inside the seat back frame with pliers or equivalent.
10. Strike the bottom of the sleeve with a rubber mallet or equivalent, and remove the headrest sleeves.

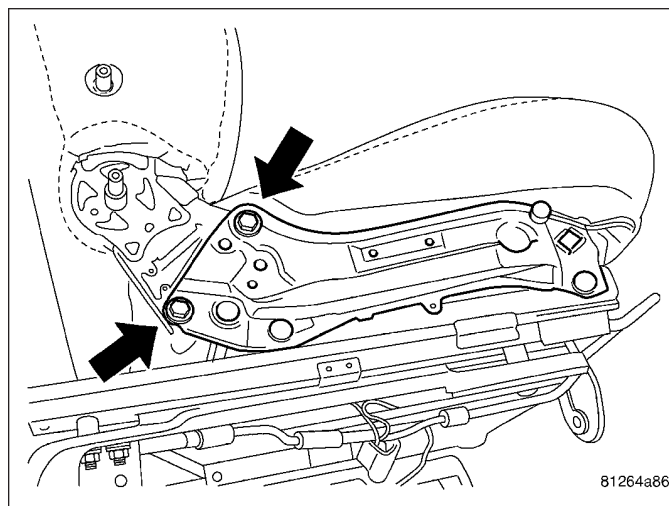


## INSTALLATION

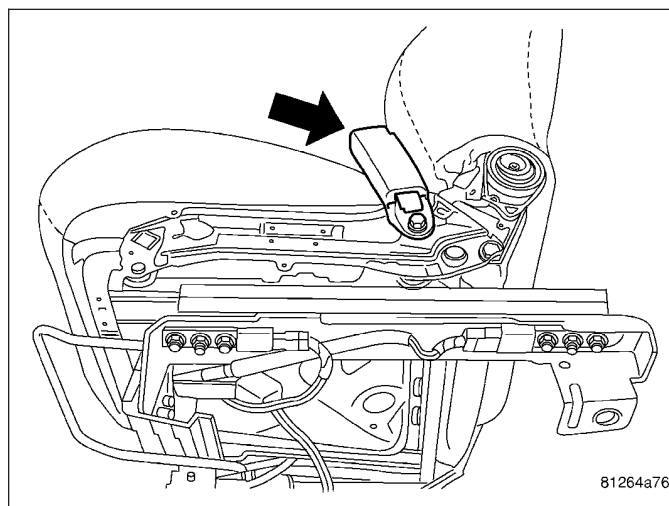
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Position the seat back cover over the seat back frame and install the headrest sleeves.
3. Position the seat back cushion on the frame and position the cover over the cushion.
4. Connect the j-straps (1 & 2).



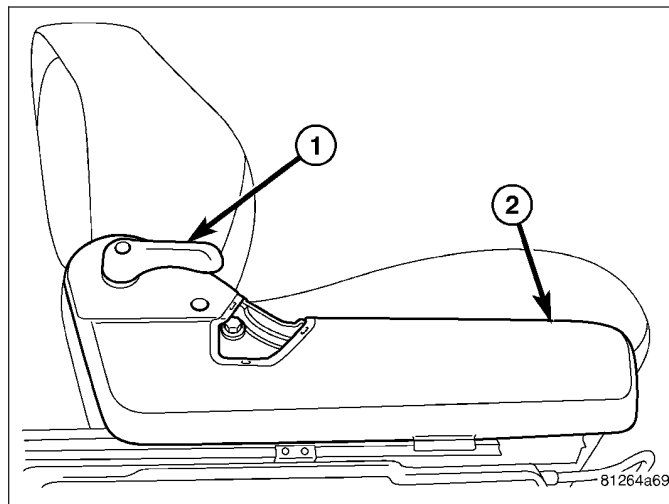
5. Install the seat back bolts and tighten to 40 N·m (30 ft. lbs.).



6. Position the front seat belt buckle lower anchor onto the stud near the rear of the inboard seat cushion frame. Be certain the anti-rotation tab on the anchor is engaged in the clearance hole of the frame.
7. Tighten the nut to 43 N·m (32 ft. lbs.)



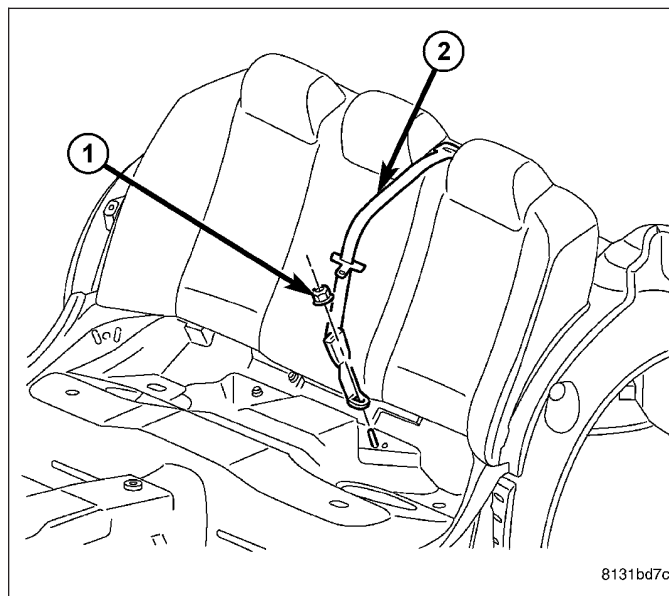
8. Install the side shields (2) and install the screws.
9. Install the lumbar and recliner handles (1 & 4).



## CUSHION/COVER-SEAT BACK - SECOND ROW

### REMOVAL

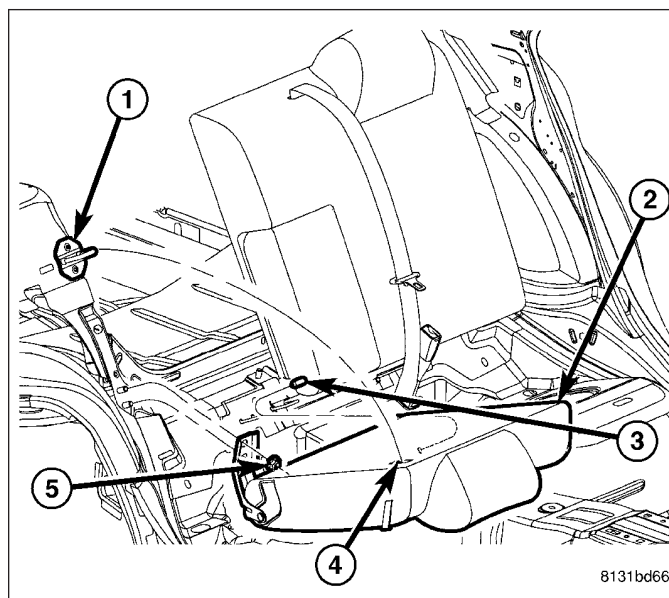
1. Remove the seat cushion. (Refer to 23 - BODY/ SEATS/SEAT CUSHION COVER - REMOVAL)
2. Remove the nut and disconnect the seat belt anchor.



### 60/40 Seat Back - Wagon

#### 40% SEAT BACK SIDE

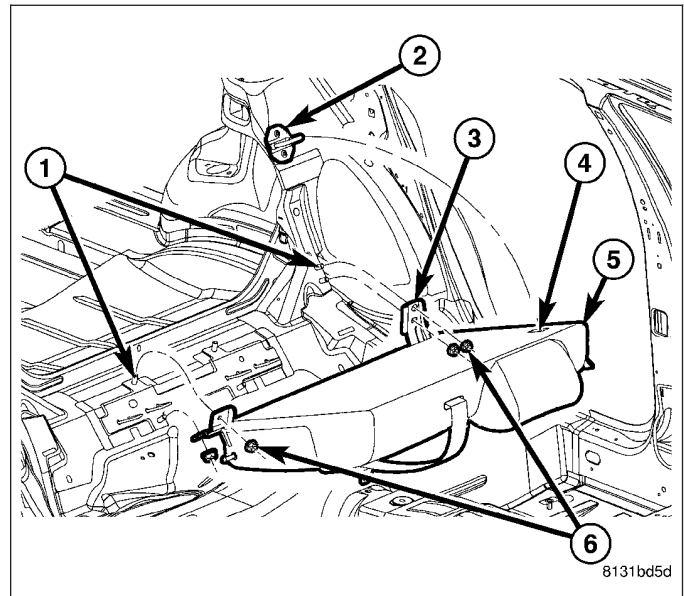
1. Fold the 40% section of the seat (2) down.
2. Remove the nuts (5).
3. Pivot the seat back off the pivot pin (3) located on the 60% seat back.
4. Remove the seat back from vehicle.



## 60/40 Seat Back - Wagon

### 60% SEAT BACK SIDE

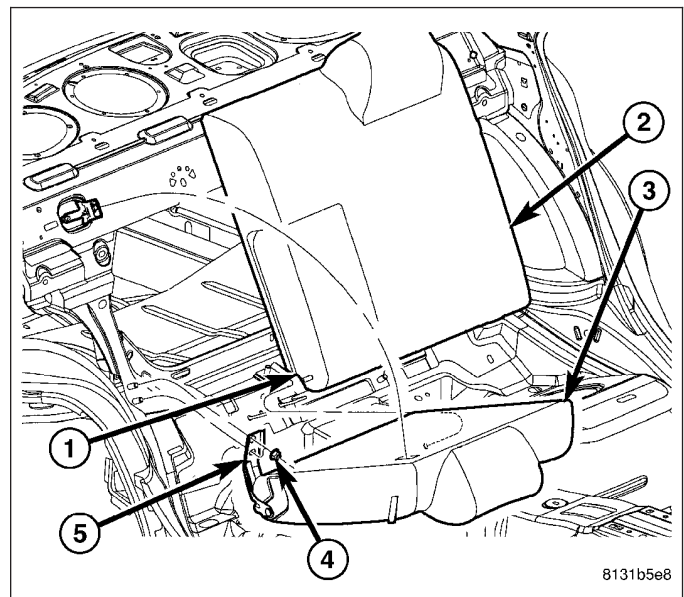
1. With the 40% seat back removed.
2. Fold the 60% section of the seat down.
3. Remove the four nuts attaching seat back (5).
4. Remove the seat back for vehicle.



## 60/40 Seat Back - Domestic Sedan

### 40% SEAT BACK SIDE

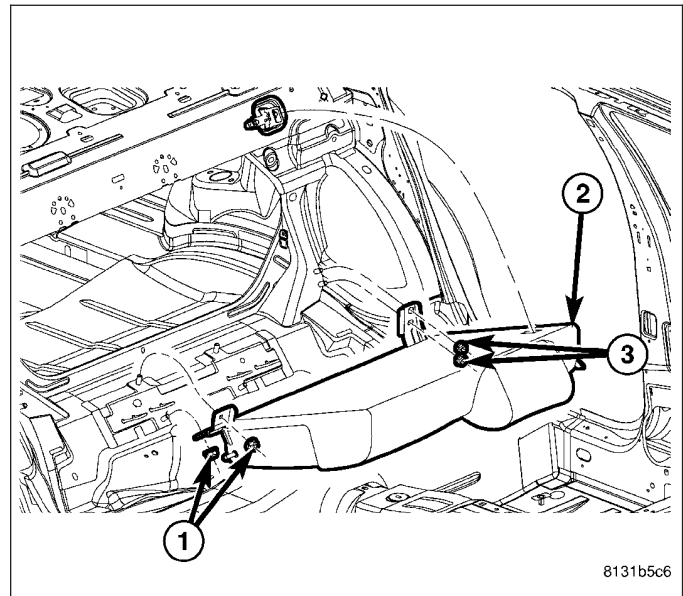
1. Fold the 40% section of the seat (3) down.
2. Remove the two nuts (4) attaching seat back.
3. Pivot the seat back off the pivot pin (1) located on the 60% seat back (2).
4. Remove the seat back from vehicle.



## 60/40 Seat Back - Domestic Sedan

### 60% SEAT BACK SIDE

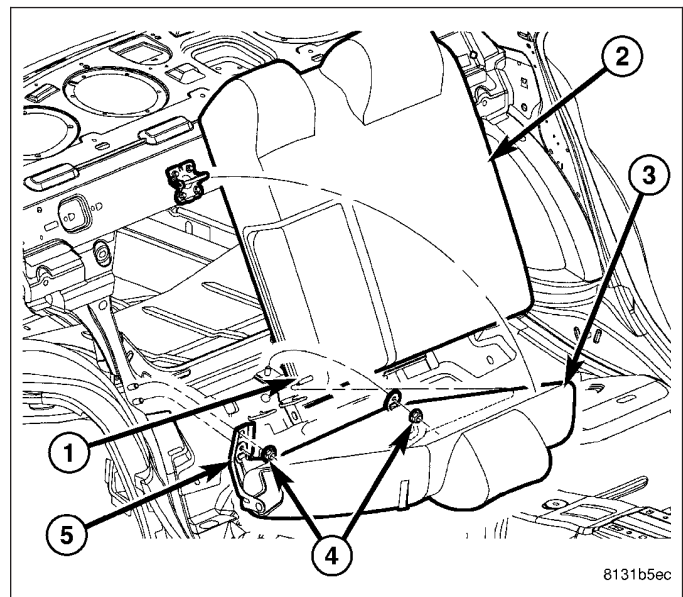
1. With the 40% seat back removed.
2. Fold the 60% section of the seat down.
3. Remove the four nuts attaching seat back (5).
4. Remove the seat back for vehicle.



## 60/40 Seat Back - Export Sedan

### 40% SEAT BACK SIDE

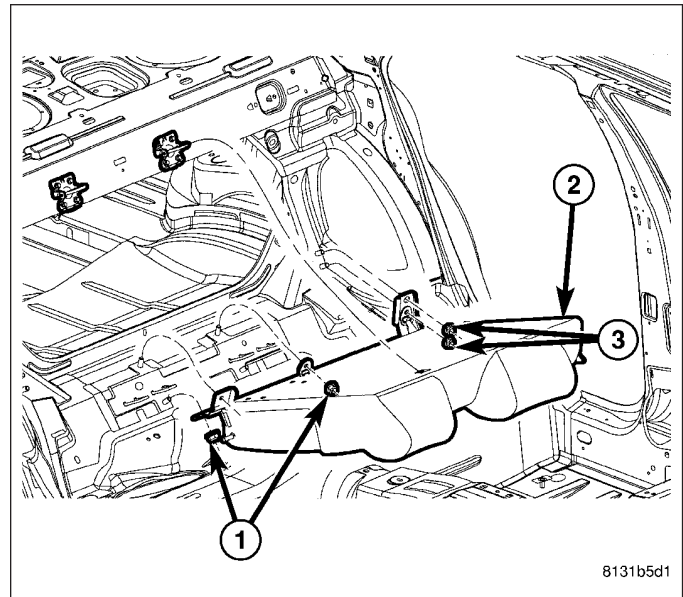
1. Fold the 40% section of the seat (3) down.
2. Remove the three nuts (4) attaching seat back.
3. Remove the seat back from vehicle.



## 60/40 Seat Back - Export Sedan

### 60% SEAT BACK SIDE

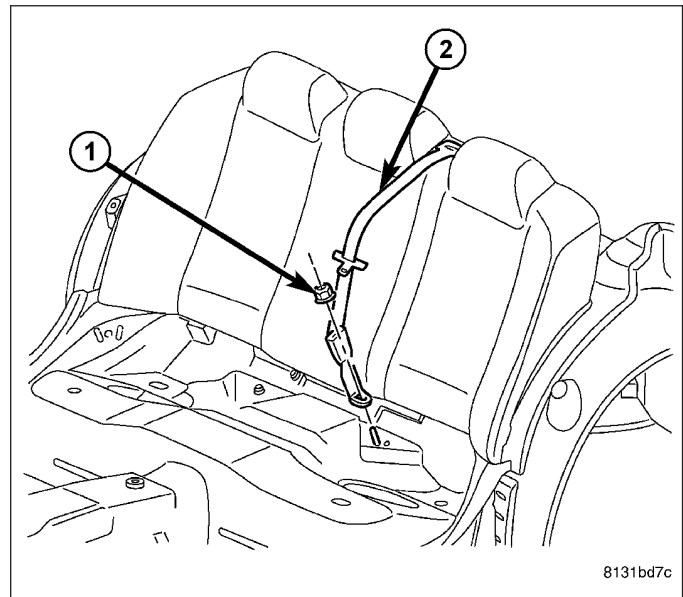
1. With the 40% seat back removed.
2. Remove the four nuts (1) and (3) attaching seat back.
3. Remove the seat back from vehicle.



## INSTALLATION

### REMOVAL

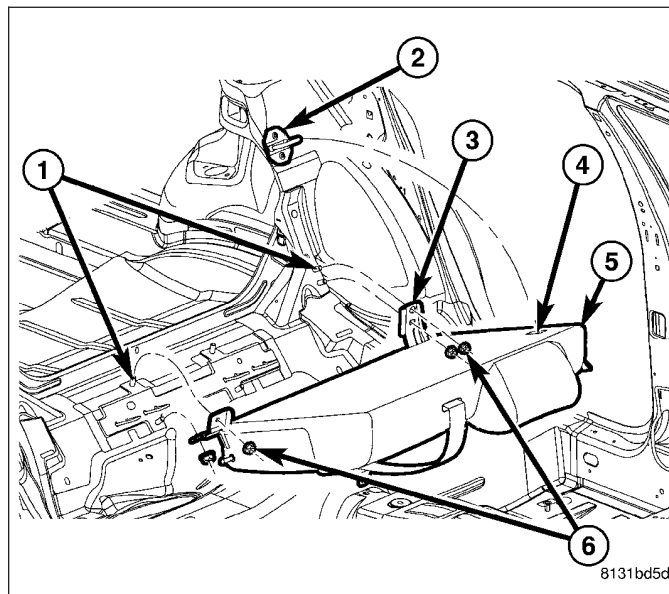
1. Place seat belt into position and install the seat belt anchor nut. Tighten nut to 32 N·m (24 ft. lbs.) torque.
2. Place the seat cushion into position and push downward on the forward edge of the seat cushion to lock into position. (Refer to 23 - BODY/SEATS/ SEAT CUSHION COVER - REMOVAL)



## 60/40 Seat Back - Wagon

### 60% SEAT BACK SIDE

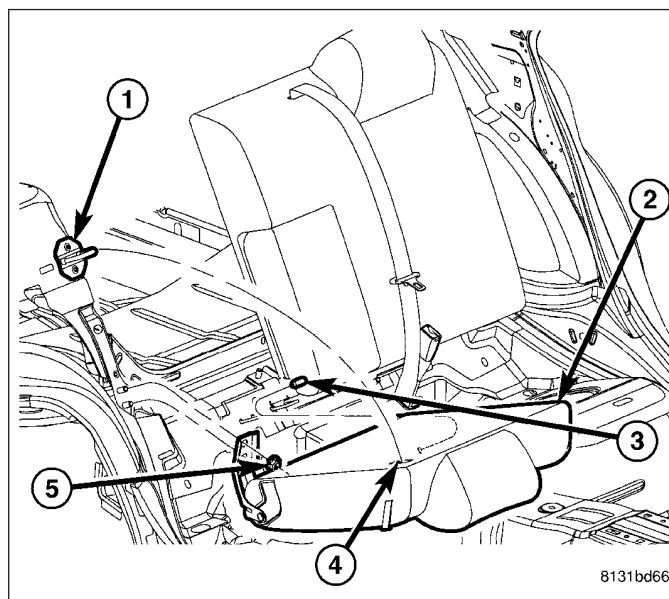
1. With the 40% seat back removed.
2. Place 60% seat back (5) into position on the studs.
3. Fold the 60% section of the seat down.
4. Install the four nuts (6) attaching seat back (5). Tighten nuts to 57 N·m (42 ft. lbs.) torque.



## 60/40 Seat Back - Wagon

### 40% SEAT BACK SIDE

1. Place the 40% section (2) into position.
2. Slide 40% seat back onto the pivot pin (3) located on the 60% seat back.
3. Install the two nuts (5) attaching seat back. Tighten nuts to 57 N·m (42 ft. lbs.) torque.

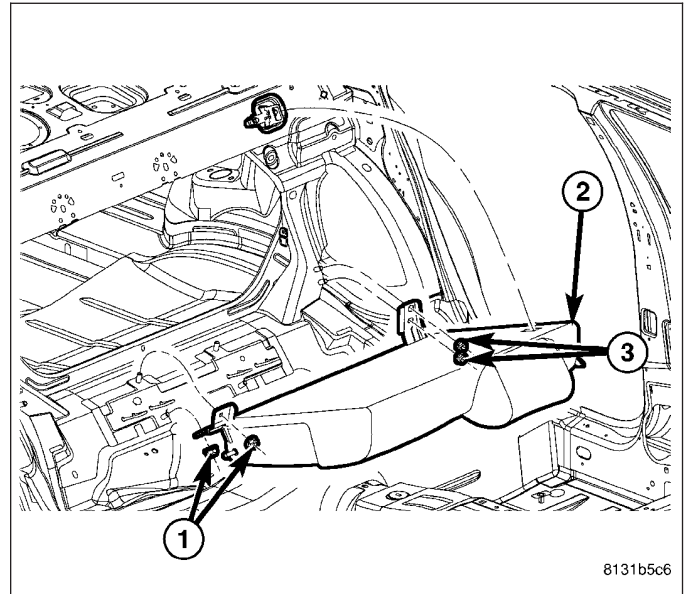




## 60/40 Seat Back Domestic Sedan

### 60% SEAT BACK SIDE

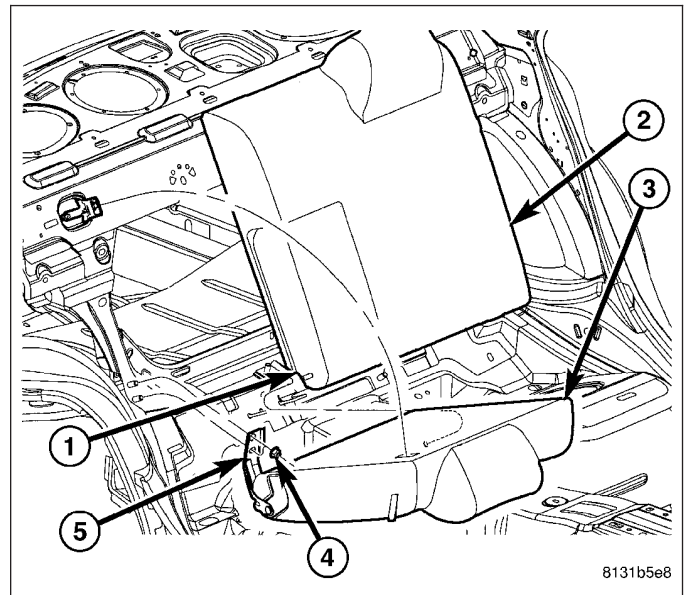
1. With the 40% seat back removed.
2. Place 60% seat back (2) into position on the studs.
3. Fold the 60% section of the seat down.
4. Install the four nuts (1) and (3) attaching seat back (2). Tighten nuts to 57 N·m (42 ft. lbs.) torque.



## 60/40 Seat Back Domestic Sedan

### 40% SEAT BACK SIDE

1. Place the 40% section (3) into position.
2. Slide 40% seat back onto the pivot pin (1) located on the 60% seat back (2).
3. Install the two nuts (5) attaching seat back. Tighten nuts to 57 N·m (42 ft. lbs.) torque.

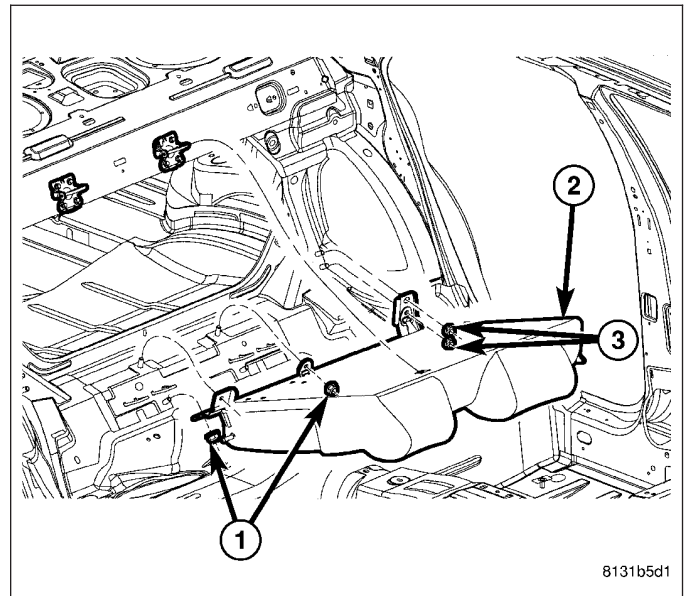




## 60/40 Seat Back Export Sedan

### 60% SEAT BACK SIDE

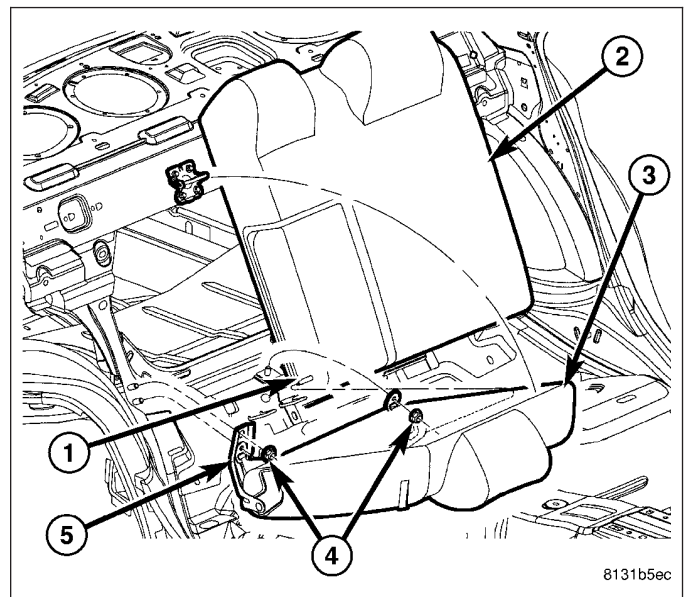
1. With the 40% seat back removed.
2. Place 60% seat back (2) into position on the studs.
3. Fold the 60% section of the seat down.
4. Install the four nuts (1) and (3) attaching seat back (2). Tighten nuts to 57 N·m (42 ft. lbs.) torque.



## 60/40 Seat Back Export Sedan

### 40% SEAT BACK SIDE

1. Place the 40% section (3) into position onto the studs.
2. Fold the 40% section of the seat down.
3. Install the four nuts (4) attaching seat back (3). Tighten nuts to 57 N·m (42 ft. lbs.) torque.



## RISER-FRONT

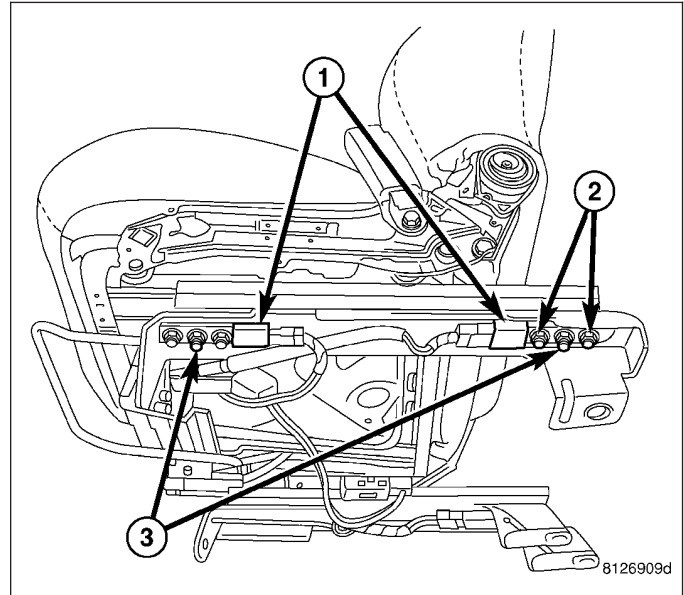
### REMOVAL

#### Manual Length Adjuster

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Remove the seat. (Refer to 23 - BODY/SEATS/SEAT - REMOVAL)
3. Move the seat to the forward position on the tracks and remove the seat adjuster bolts/nuts (3).
4. Move the seat to the reward position on the tracks and remove the front seat adjuster bolts/nuts (3).

**Note:** Passenger seat with strain gauges shown, drivers side seat similar.

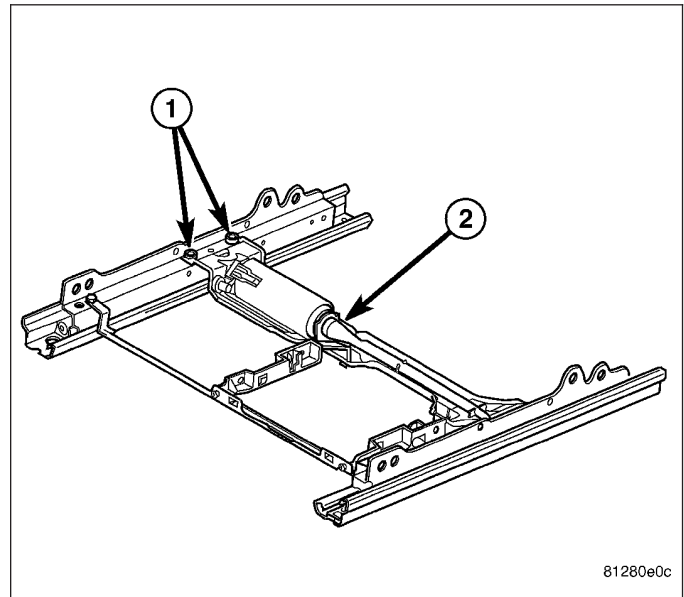
5. Disconnect strain gauge electrical connectors (1), if equipped.
6. If equipped, remove the strain gauge bolts (2) and remove the strain gauges as necessary.



#### Power Length Adjuster

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Unbolt the seat from the floor as necessary to gain access to the riser bolts. (Refer to 23 - BODY/SEATS/SEAT - REMOVAL)
3. Move the seat to the forward position on the tracks, tip the seat backwards in vehicle and remove the seat adjuster bolts/nuts (3).
4. Move the seat to the reward position on the tracks and remove the front seat adjuster bolts/nuts (3).

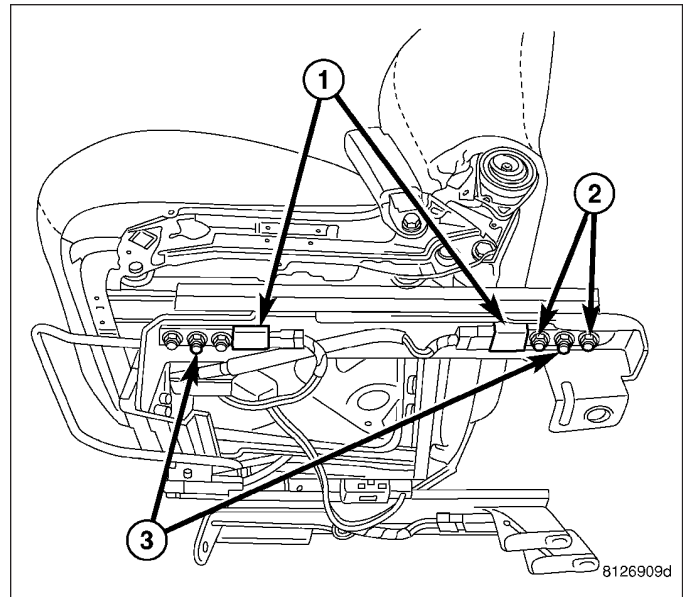
**Note:** Manual seat length adjuster shown, power similar.



5. If the seat cannot be moved forward or backward, remove the seat cushion. (Refer to 23 - BODY/SEATS/SEAT CUSHION COVER - REMOVAL)
6. Remove the four bolts (1) and remove the motor and cable assembly (2) from the length adjuster assembly.

**CAUTION:** When the motor and cable assembly are removed from the tracks discard the length adjuster assembly and replace with a new one.

7. Disconnect and isolate battery negative cable.
8. Remove the seat off of the risers and disconnect the electrical connectors.
9. Disconnect strain gauge electrical connectors (1), if equipped.
10. If equipped, remove the strain gauge bolts (2) and remove the strain gauges as necessary.



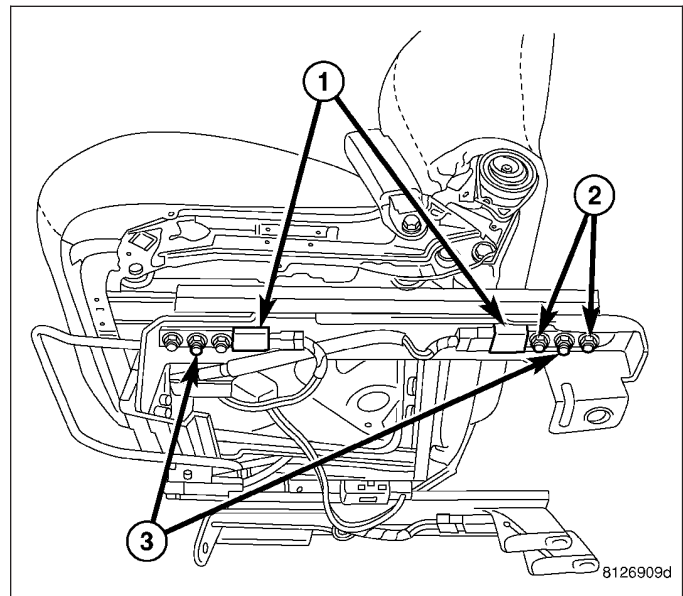
## INSTALLATION

### Manual Length Adjuster

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)

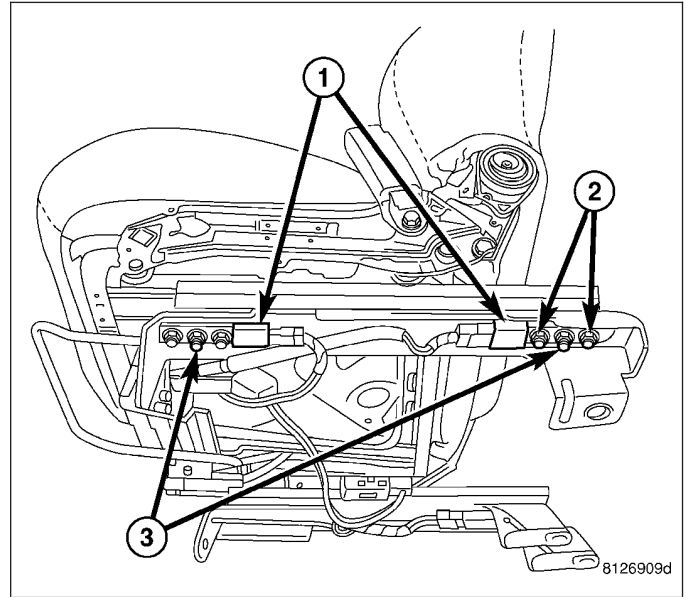
**Note:** Passenger seat with strain gauges shown, drivers side seat similar.

2. If equipped, install the strain gauges and install the bolts (2).
3. Tighten the bolts to 40 N·m (30 ft. lbs.).
4. If necessary, connect the electrical connections (1).
5. Move the seat to the forward position on the tracks and install the rear seat adjuster bolts/nuts (3).
6. Tighten the bolts to 45 N·m (33 ft. lbs.).
7. Move the seat to the reward position on the tracks and install the front seat adjuster bolts/nuts (3).
8. Tighten the bolts to 45 N·m (33 ft. lbs.).
9. Install the seat. (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION)



## Power Length Adjuster

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. If equipped, install the strain gauges and install the bolts (2).
3. Tighten the bolts to 40 N·m (30 ft. lbs.).
4. Position the seat into the vehicle onto the risers and connect the electrical connectors.
5. Move the seat to the forward position on the tracks and install the seat adjuster bolts/nuts (3).
6. Tighten the bolts attaching the adjuster to the risers/strain gauges to 45 N·m (33 ft. lbs.).
7. Move the seat to the reward position on the tracks and install the front seat adjuster bolts/nuts (3).
8. Tighten the bolts attaching the adjuster to the risers/strain gauges to 45 N·m (33 ft. lbs.).
9. If necessary, connect the strain gauge electrical connections (1).



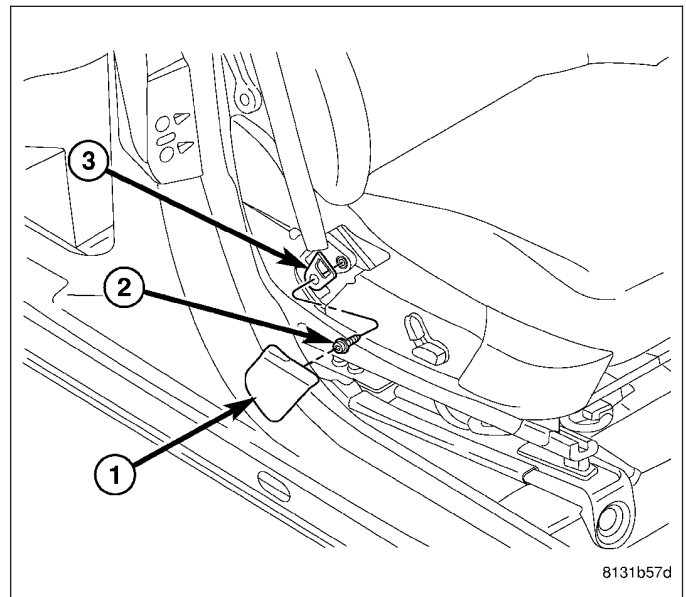
**CAUTION:** When the motor and cable assembly are removed from the tracks discard the length adjuster assembly and replace with a new one.

10. Bolt the seat to the floor. (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION)

## SEAT-FRONT

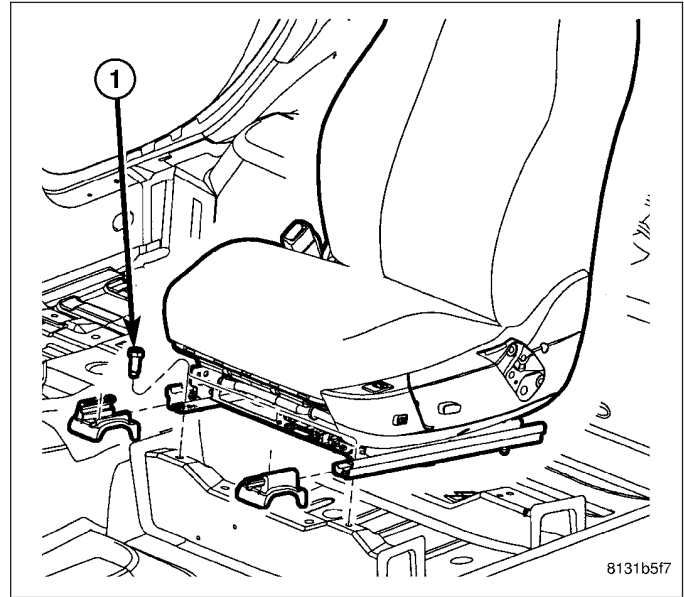
### REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING).
2. Remove the cover (1) and lower seat belt anchor bolt (2).

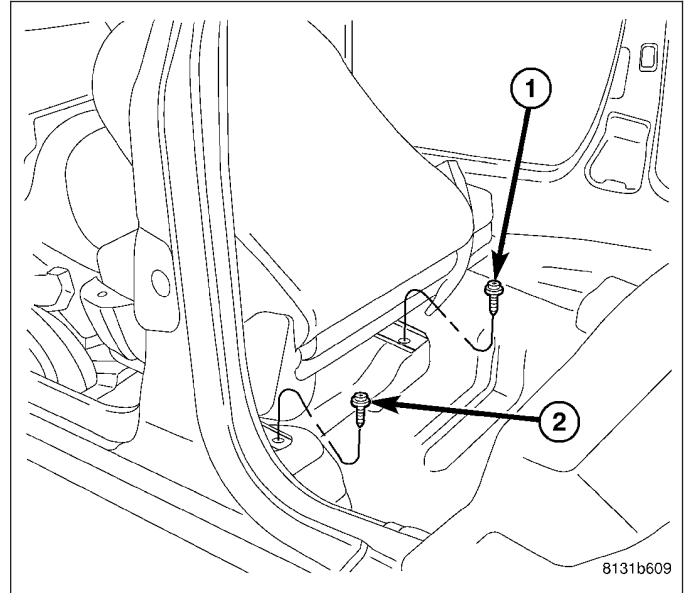


**FRONT SEAT - LEFT SIDE**

1. Remove the left side front seat two front attaching bolts (1).



2. Move the seat forward to gain access to the rear bolts.
3. Remove the left side front seat two rear attaching bolts (1) and (2).
4. Disconnect and isolate battery negative cable.
5. Disconnect the electrical connectors.
6. Remove the seat.

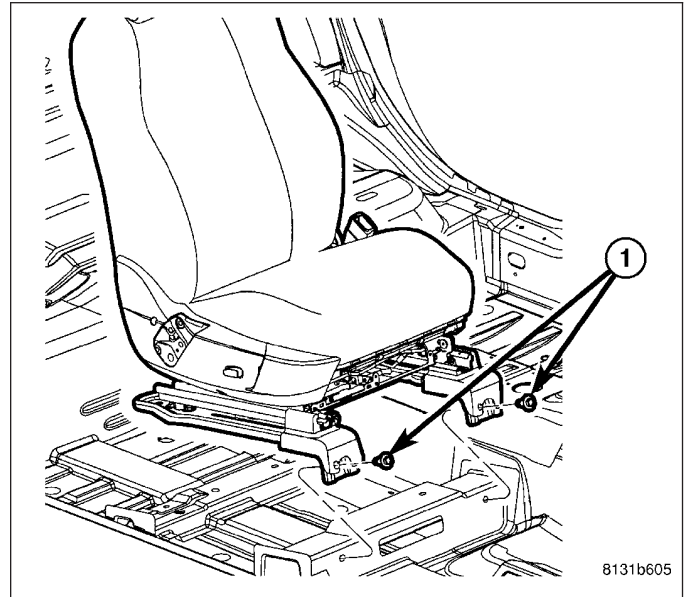
**FRONT SEAT - RIGHT SIDE**

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/ SEATS - WARNING).

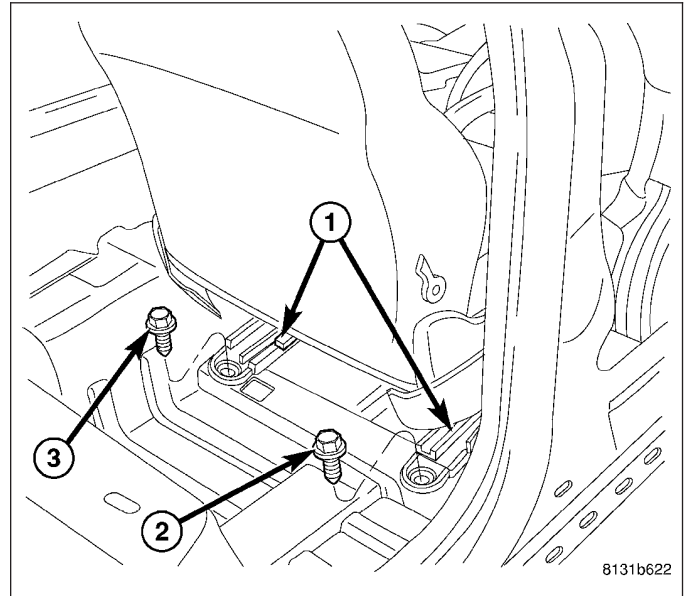
**WARNING:** The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

**WARNING:** When the seat is on the floor, no one should sit in the front passenger seat. This uneven force may damage the sensing ability of the seat weight sensors. If sat on and damaged, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

2. Remove the right side front seat with OCS sensor two front attaching bolts (1).



3. Move the seat forward to gain access to the rear bolts.
4. Remove the right side front seat with OCS sensor two rear attaching bolts (2) and (3).
5. Ensure that the ignition key is in the off position.
6. Disconnect and isolate battery negative cable.
7. Disconnect the electrical connectors.
8. Remove the seat.



## INSTALLATION

### FRONT SEAT - RIGHT SIDE

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/ SEATS - WARNING)

**WARNING:** The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

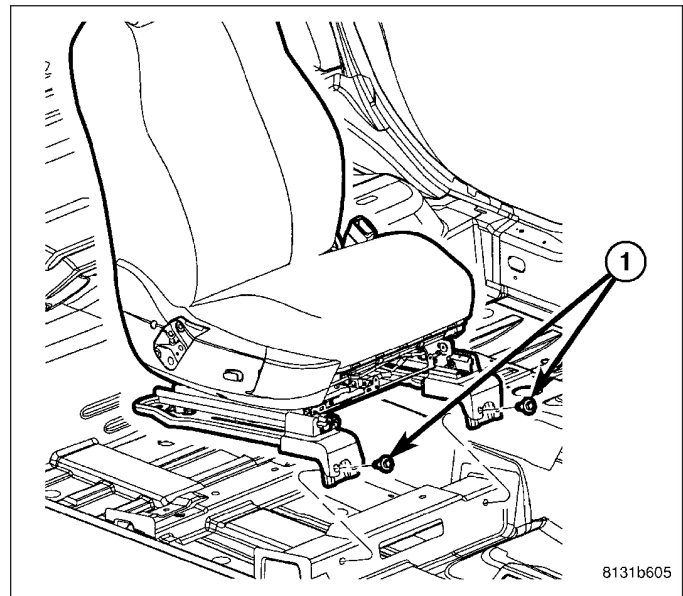
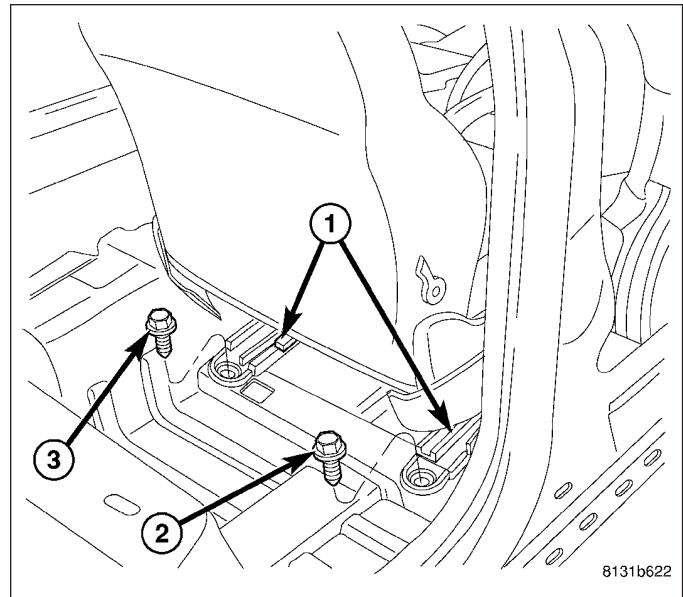
**WARNING:** When the seat is on the floor, no one should sit in the front passenger seat. This uneven force may damage the sensing ability of the seat weight sensors. If sat on and damaged, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.



2. With battery negative cable disconnected.
3. Place seat into position in vehicle.

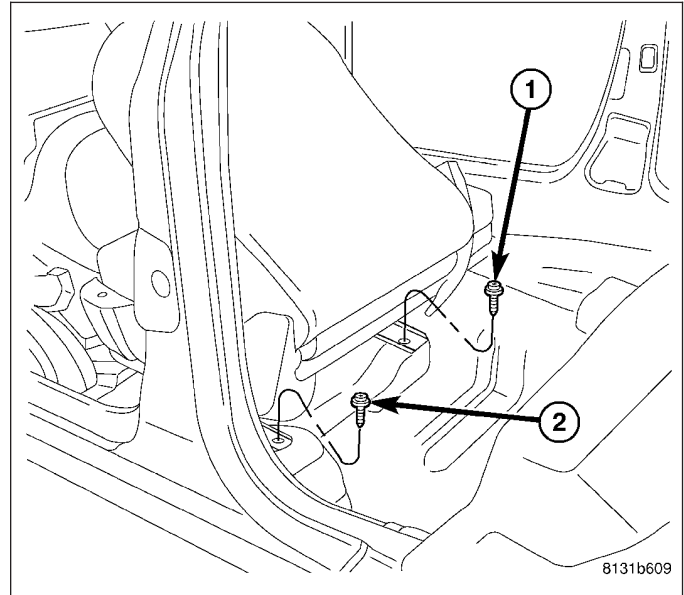
**WARNING:** The front passenger seat must be handled carefully as well. When removing the seat, be careful when setting on floor not to drop. If dropped, the sensor may be inoperative. Failure to follow these instructions may result in personal injury or death.

4. Connect the electrical connectors.
5. Place the ignition key in the run position.
6. Connect battery negative cable.
7. Place ignition key in the off position.
8. Move the seat forward to gain access to the rear bolts, as necessary.
9. Install the front seat attaching rear bolts (1) and (2).
10. Install the front seat front attaching bolts (1).
11. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).
12. Following successful completion of the supplemental restraint system verification test procedure, perform the Occupant Classification System Verification Test using a scan tool. (Refer to 8 - ELECTRICAL/RESTRAINTS - \*OCS VERIFICATION TEST - VER 1)

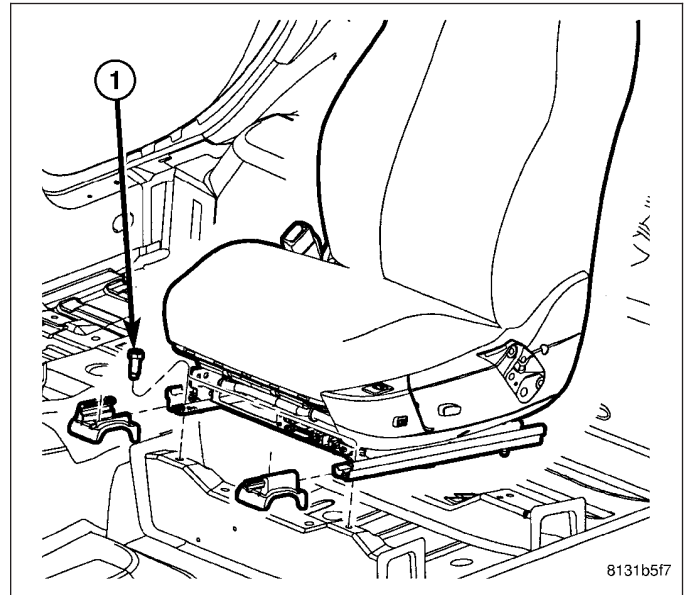


**FRONT SEAT - LEFT SIDE**

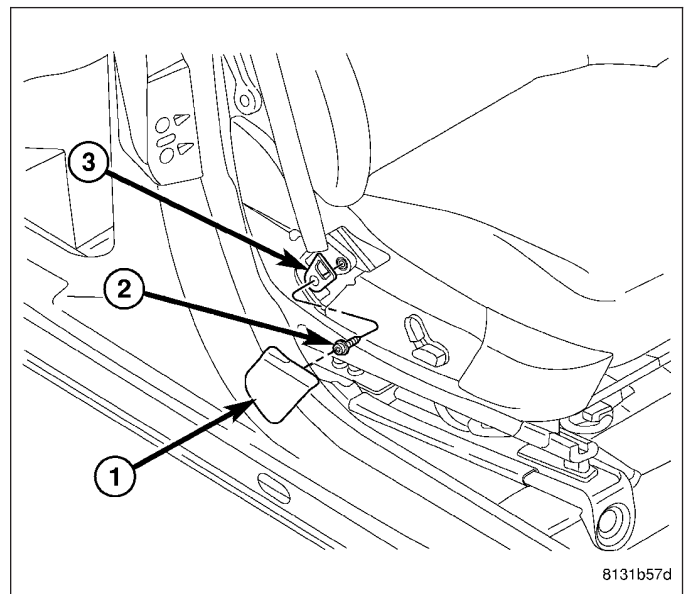
1. Place seat into position in vehicle.
2. Connect the electrical connectors.
3. Connect battery negative cable.
4. Move the seat forward to gain access to the rear bolts.
5. Install the front seat attaching rear bolts (1) and (2).



6. Install the front seat front attaching bolts (1).



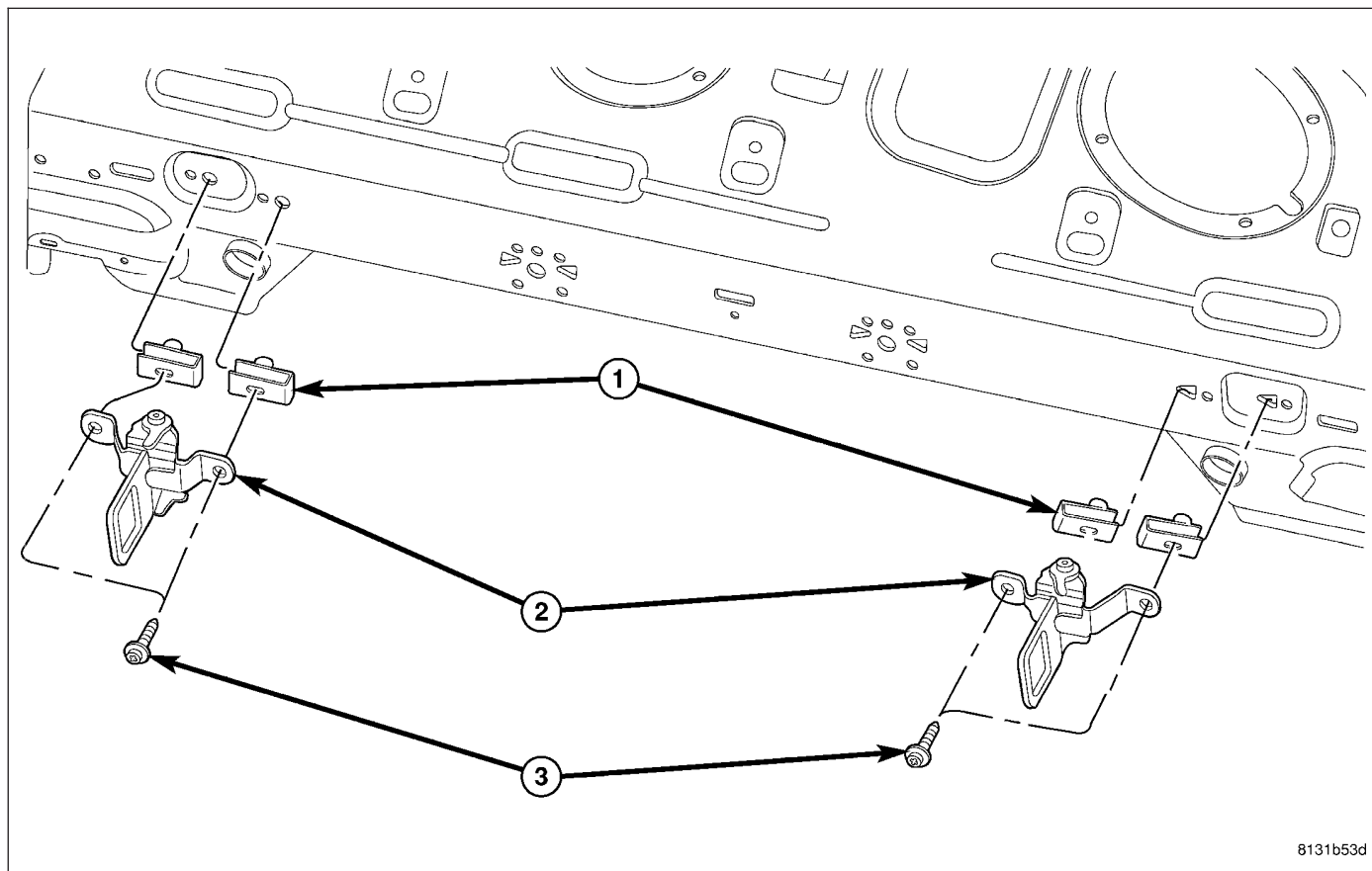
1. Install the cover (1) and lower seat belt anchor bolt (2).



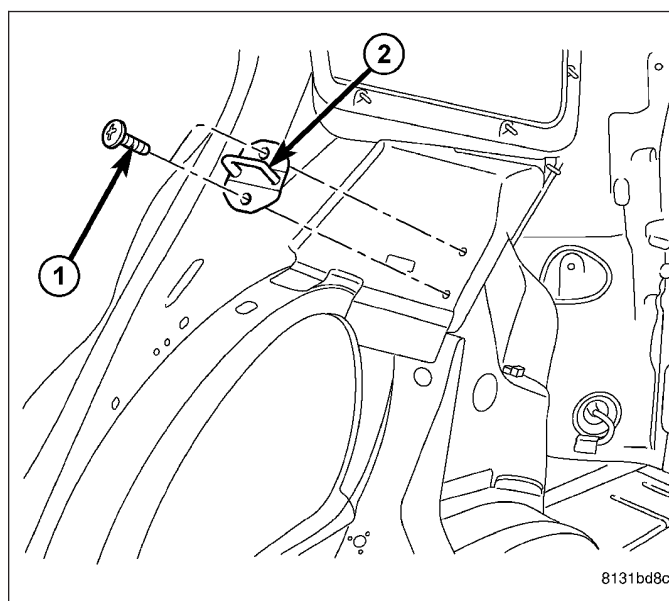


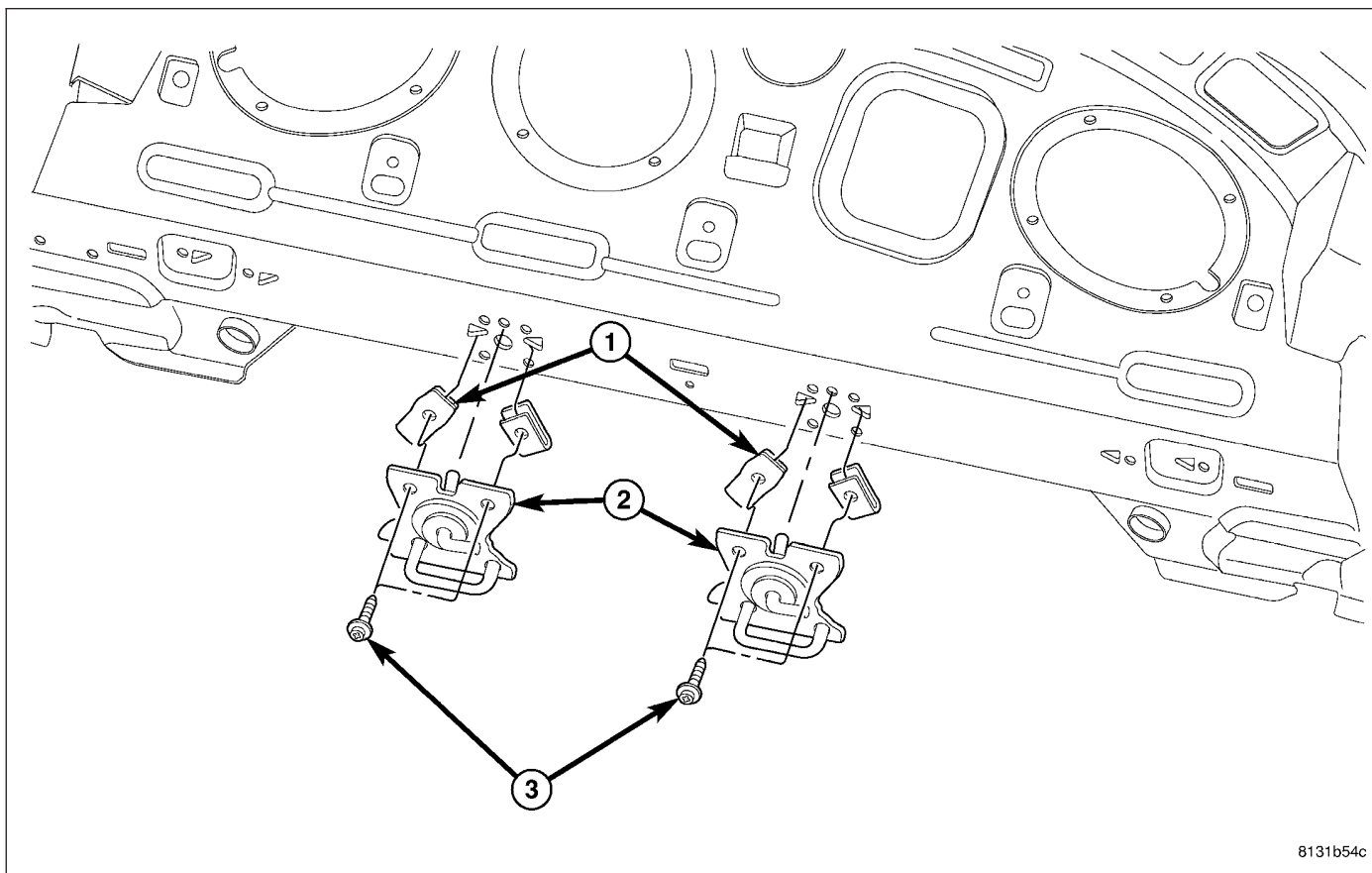
## STRIKER-SEAT BACK LATCH - SECOND ROW

### REMOVAL

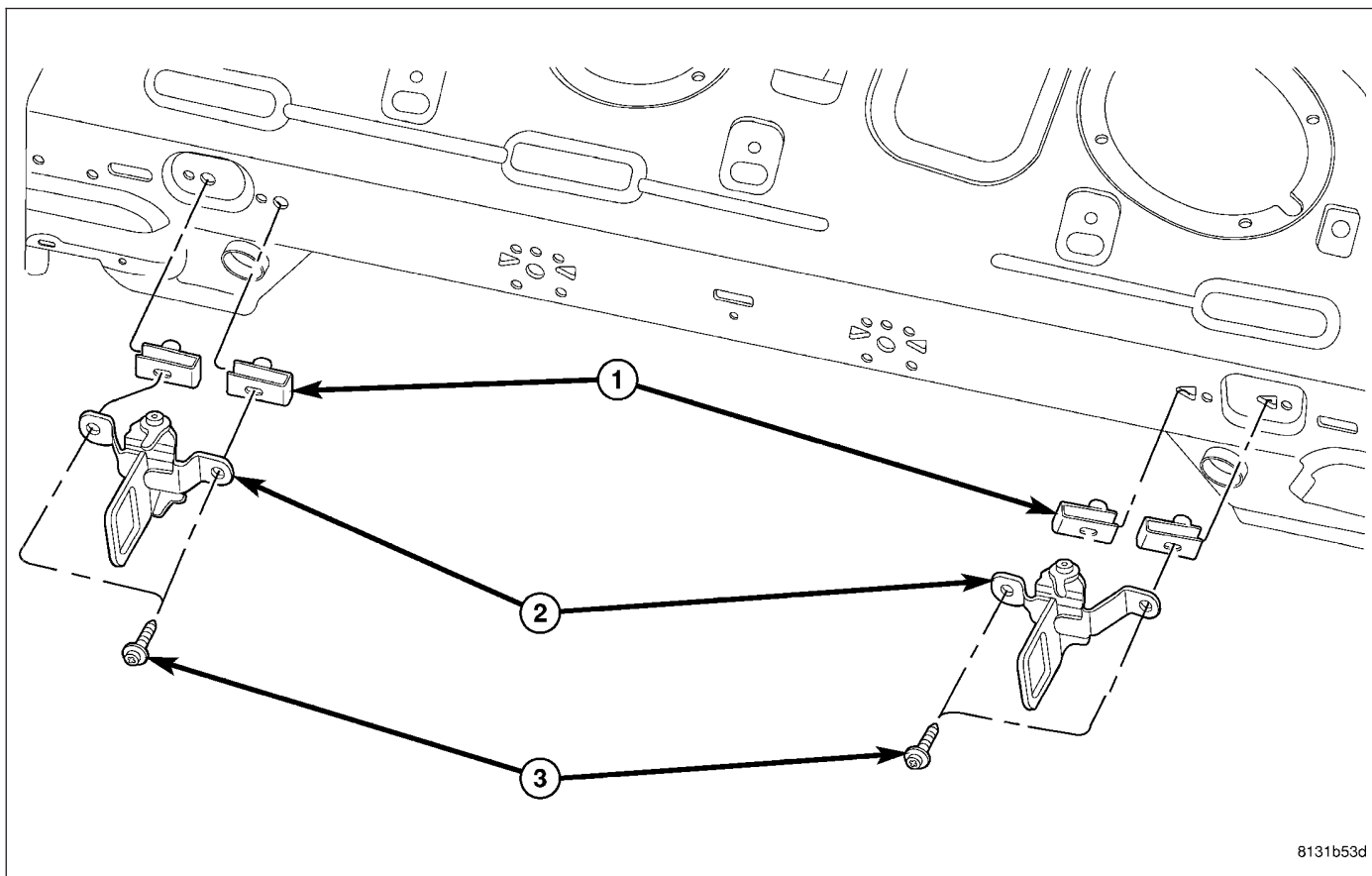


1. Remove the sedan seat back striker (2), remove the attaching screws (3) and remove seat back striker from the vehicle.
2. Remove the wagon seat back striker (2), remove the attaching screws (1) and remove seat back striker from the vehicle.

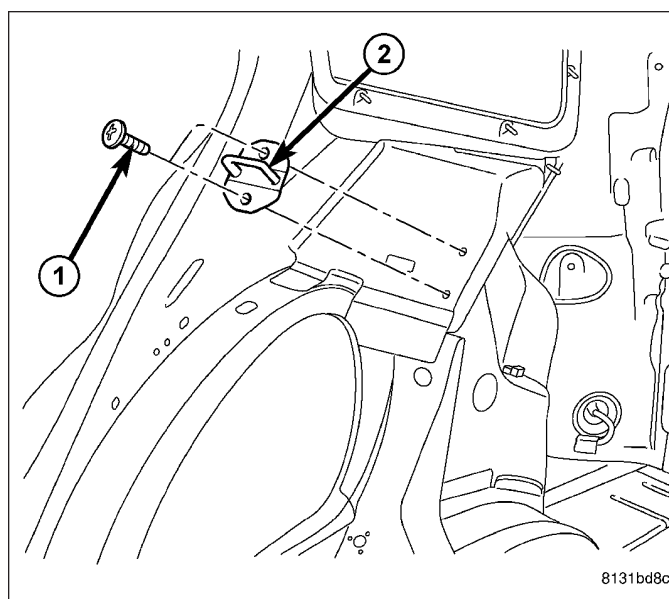


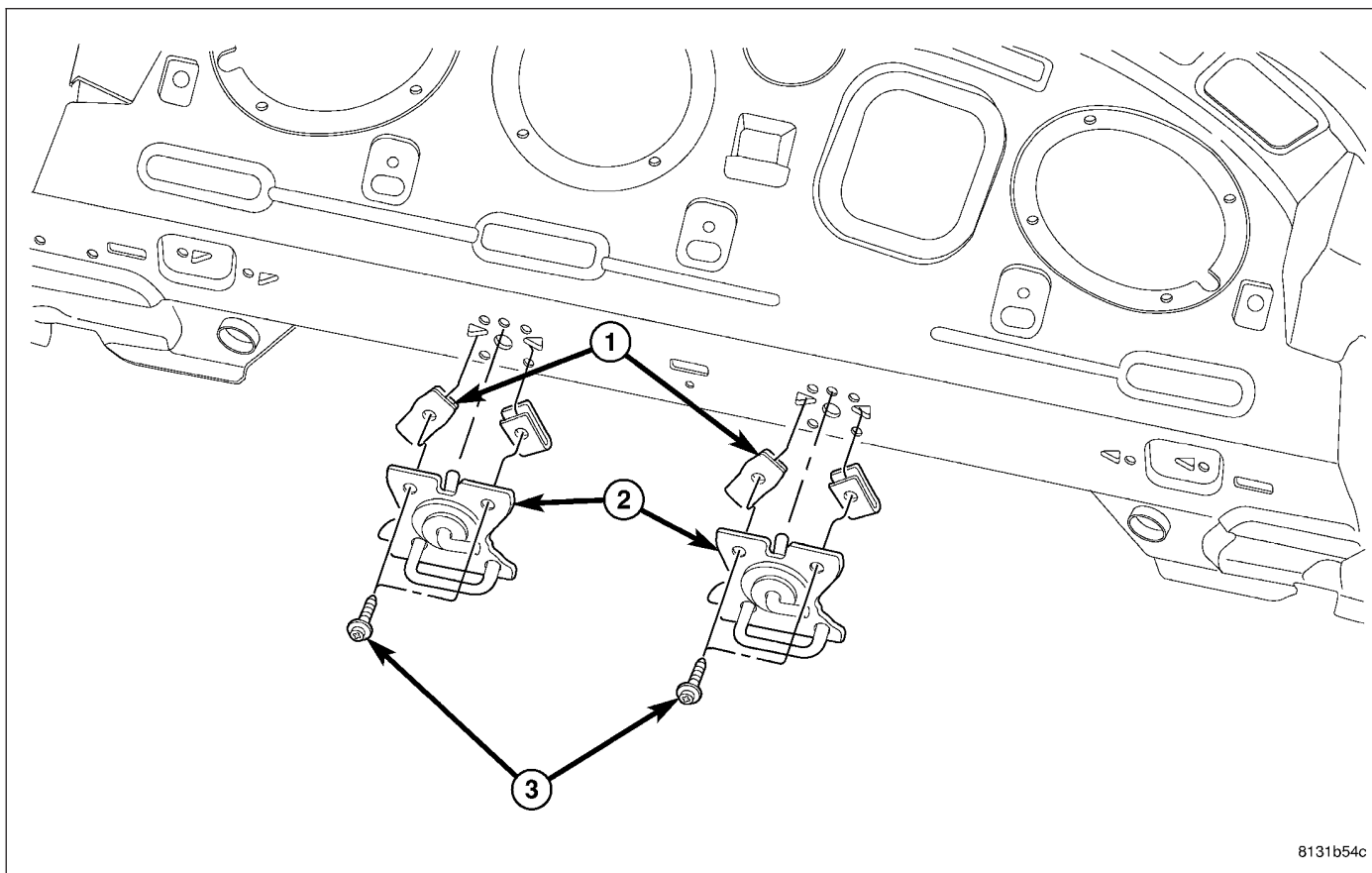


3. Remove the export sedan seat back striker (2), remove the attaching screws (3) and remove seat back striker from the vehicle.

**INSTALLATION**

1. Spring nut(s) (1) replace, if necessary.
2. Place the sedan back seat striker (2) into position and Install attaching screws (3).
3. Place the wagon back seat striker (2) into position and Install attaching screws (1).





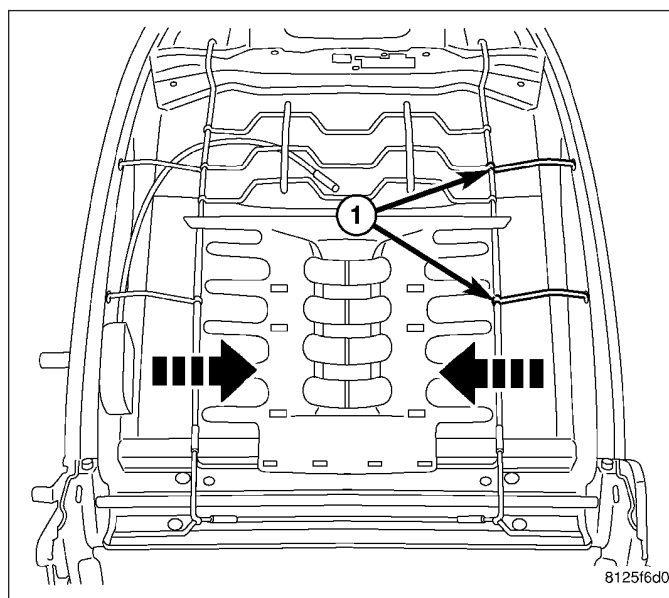
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4. Spring nut(s) (1) replace, if necessary.
5. Place the (Export) sedan back seat striker (2) into position and Install attaching screws (3).

## SUPPORT-LUMBAR

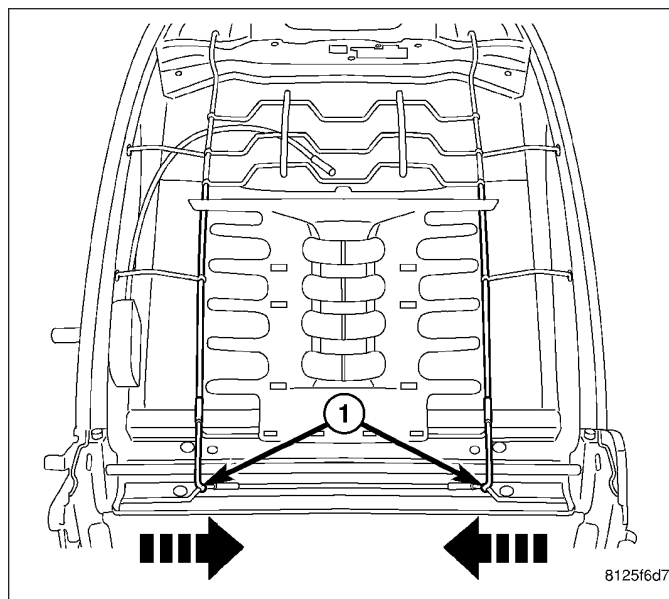
### REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Remove the seat back cushion/cover. (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION / COVER - FRONT - REMOVAL)
3. Release the lumbar mat side wires (1) by pulling out on the wire supports and then pulling them in.

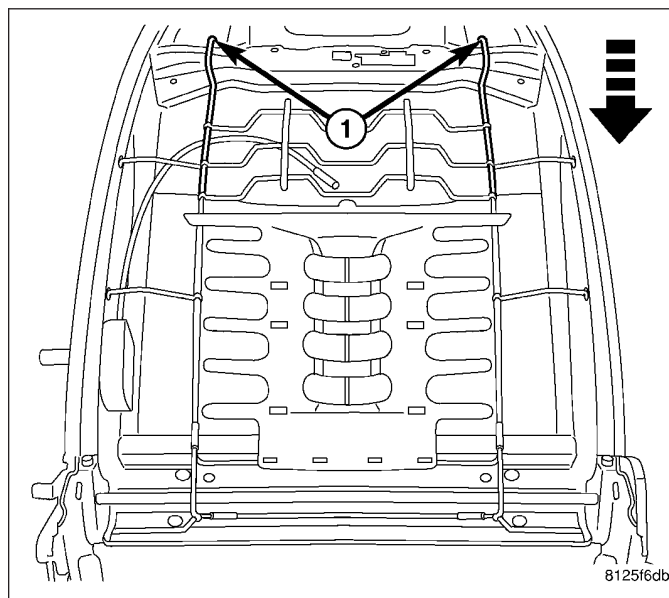


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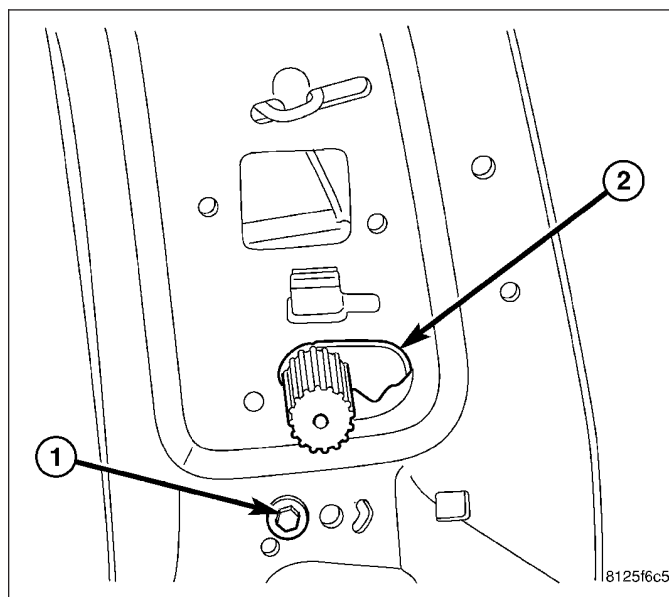
4. Squeeze the lower support wires (1) in and release the lower wires.



5. Pull the upper support wires (1) down and release the lumbar mat from the seat back frame.

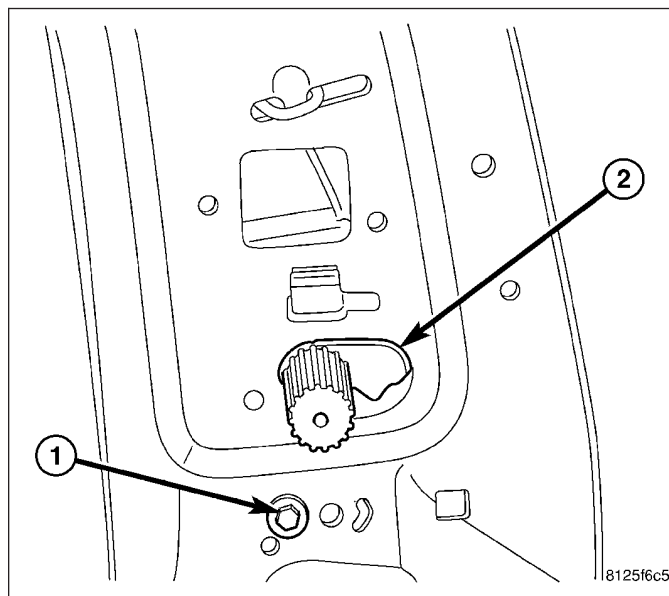


6. Remove the rivet (1) and remove the lumbar mechanism (2).

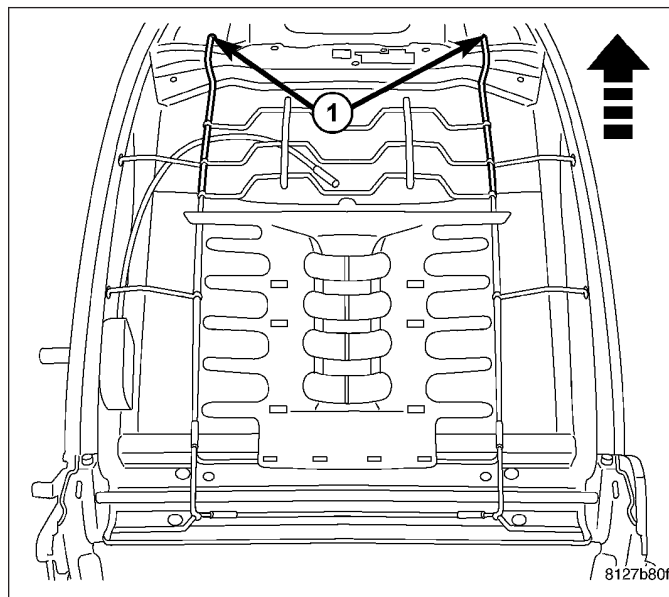


## INSTALLATION

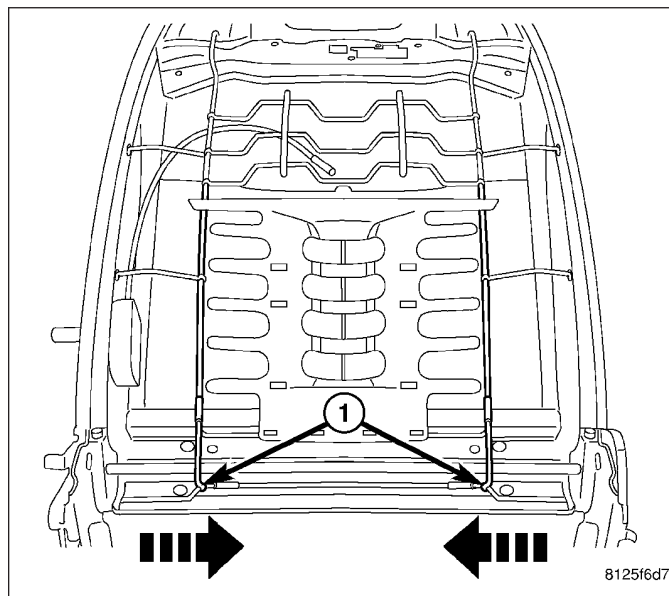
1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/SEATS - WARNING)
2. Install the lumbar mechanism (2) and install a new rivet (1).



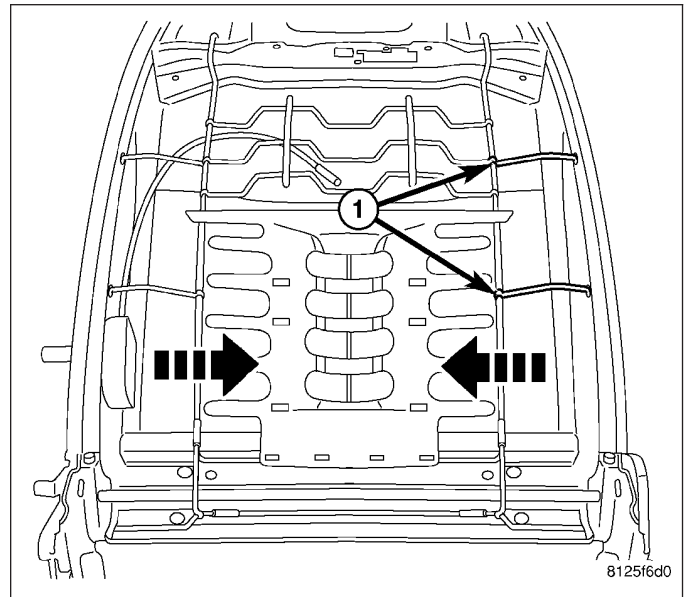
3. Place lumbar mat onto seat back frame and insert the upper support wires (1) into the frame.



4. Squeeze the lower support wires (1) together and insert into the lower frame.



5. Squeeze the side support wires together and insert them into the sides of the seat back frame.
6. Install the seat back cushion/cover. (Refer to 23 - BODY/SEATS/SEAT BACK CUSHION / COVER - FRONT - INSTALLATION)



## STATIONARY GLASS

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## STATIONARY GLASS

## WARNING

## WINDSHIELD SAFETY PRECAUTIONS

**WARNING:** Do not operate the vehicle within 24 hours of windshield installation. It takes at least 24 hours for urethane adhesive to cure. If it is not cured, the windshield may not perform properly in an accident.

- Urethane adhesives are applied as a system. Use glass cleaner, glass prep solvent, glass primer, pvc (vinyl) primer and pinch weld (fence) primer provided by the adhesive manufacturer. If not, structural integrity could be compromised.
- Daimlerchrysler does not recommend glass adhesive by brand. Technicians should review product labels and technical data sheets, and use only adhesives that their manufactures warrant will restore a vehicle to the requirements of fmvss 212. Technicians should also insure that primers and cleaners are compatible with the particular adhesive used.
- Be sure to refer to the urethane manufacturer's directions for curing time specifications, and do not use adhesive after its expiration date.
- Vapors that are emitted from the urethane adhesive or primer could cause personal injury. Use them in a well-ventilated area.
- Skin contact with urethane adhesive should be avoided. Personal injury may result.
- Always wear eye and hand protection when working with glass.



**CAUTION:** Protect all painted and trimmed surfaces from coming in contact with urethane or primers. Be careful not to damage painted surfaces when removing moldings or cutting urethane around windshield.

## BACKLITE

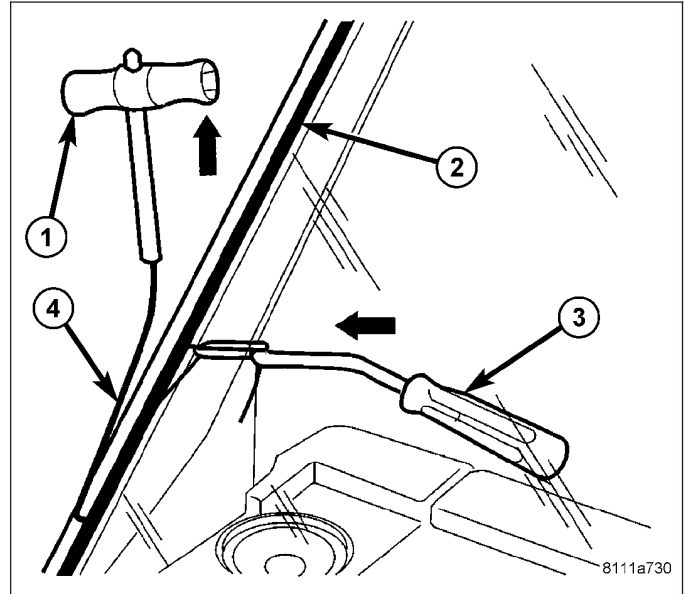
### REMOVAL

**Note:** Windshield removal shown, backlite similar.

1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/STATIONARY GLASS - WARNING).
2. Remove quarter trim panels (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL).
3. Remove the trim panel from the rear shelf (Refer to 23 - BODY/INTERIOR/REAR SHELF TRIM PANEL - REMOVAL).
4. Disconnect the wire connectors from rear window defogger terminals and, rear window mounted radio antenna, if equipped.

**CAUTION:** Be careful not to damage painted surfaces when cutting urethane around the backlight.

5. Using an assistant and a wire-type windshield cut-out tool (1, 3 and 4), cut and separate the urethane adhesive (2) securing the backlite to the backlite fence.
6. Carefully remove the backlite from the vehicle.

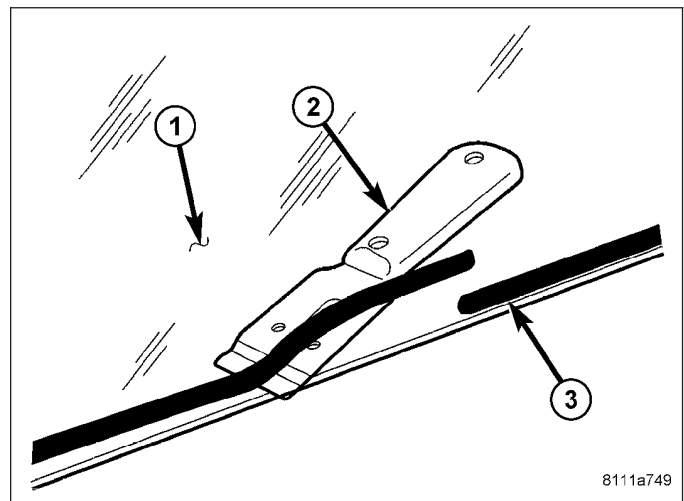


### INSTALLATION

**CAUTION:** To help prevent water leaks, partially roll down the left and right door glass before installing the backlite. This avoids pressurizing the passenger compartment if a door is slammed before the urethane is cured.

**CAUTION:** Protect all painted and trimmed surfaces from coming in contact with urethane or primers.

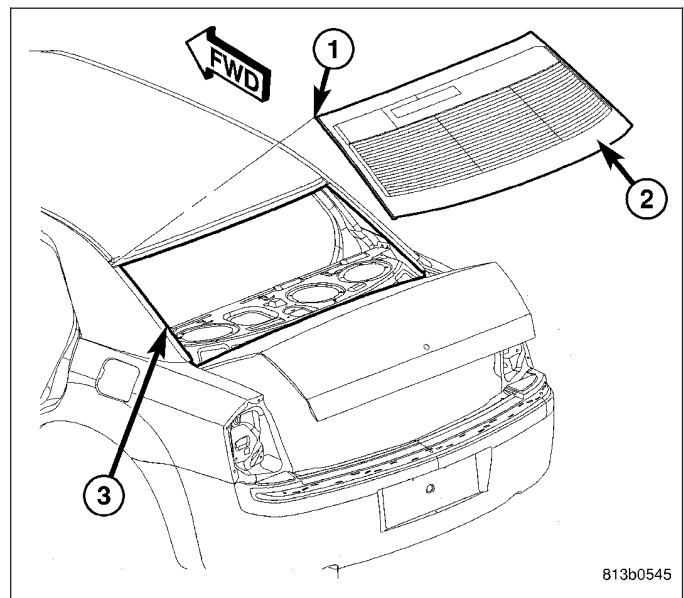
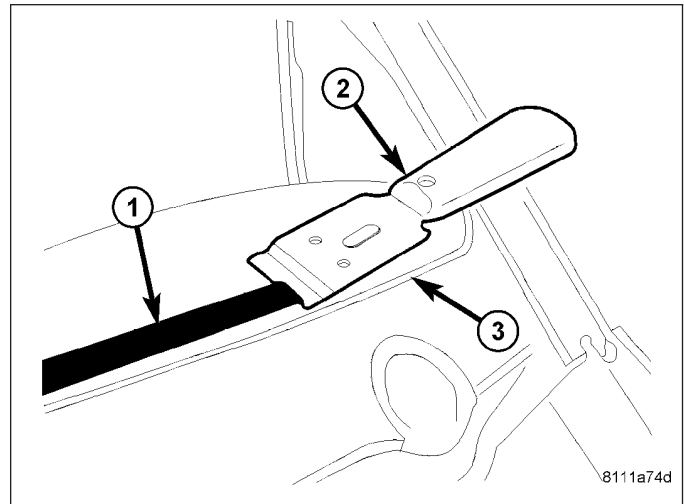
1. If the backlite (1) is being reused, remove the as much original urethane (3) as possible from the glass surface using a razor knife (2).



**Note:** To prevent corrosion, do not damage paint on the backlite fence when removing original urethane.

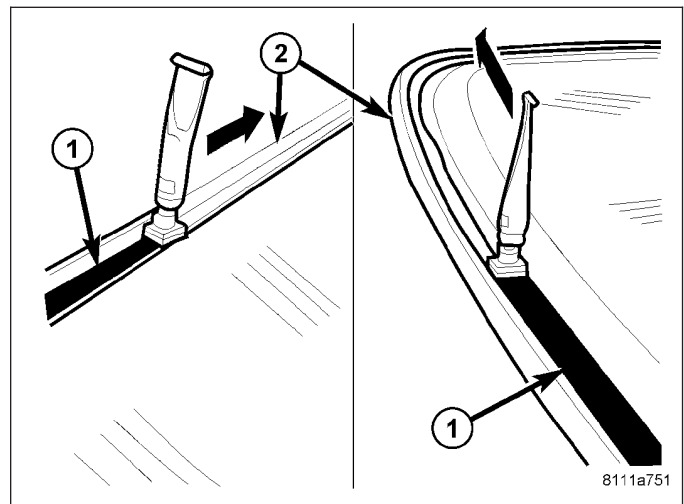
**Note:** The backlite fence should be cleaned of most of its old urethane adhesive. A small amount of old urethane, approximately 1 mm in height should remain on the fence. Do not completely remove all old urethane from the fence, the paint finish and bonding strength will be adversely affected. Replace any missing or damaged spacers around the perimeter of the backlite fence.

2. Using a razor knife (2), level the original bead of urethane (1) on the backlite fence (3) to a thickness of approximately 1 mm (0.04 in.) and remove the loose adhesive.
3. Install a new rubber seal (1) around the top and side edges of backlite (2).
4. Using an assistant, position the backlite into the backlite opening and against the backlite fence (3).
5. Verify the backlite lays evenly against the fence at the top, bottom and sides of the opening. If not, the fence must be formed to the shape of the backlite.
6. Mark the backlite and fence with a grease pencil or pieces of masking tape to use as a reference for installation.
7. Using an assistant, remove the backlite from the backlite opening and place it on a suitable padded work surface.

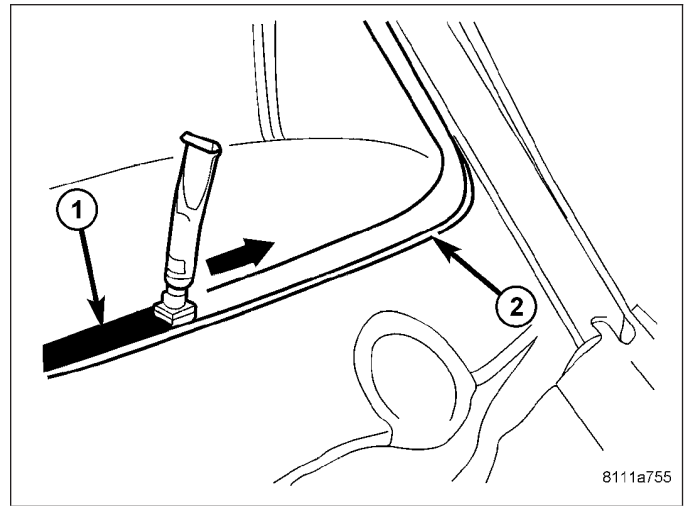


**WARNING:** Do not use solvent based glass cleaners to clean the backlite before applying glass prep and primer or poor glass adhesion may result.

8. Clean the inside of the backlite with an ammonia based glass cleaner and a lint-free cloth.
9. Apply glass prep adhesion promoter 25 mm (1 in.) wide (1) around the perimeter of the backlight (2) and 5 mm (0.2 in.) from the edge of the glass and wipe dry with a clean lint-free cloth until no streaks are visible.
10. Apply glass primer 25 mm (1 in.) wide around the perimeter of the backlight and 5 mm (0.2 in.) from the edge of the glass. Allow at least three minutes drying time.
11. Using a flashlight, verify that the primer is completely and evenly installed along the perimeter of the backlite.
12. Re-prime any area that is not fully and evenly primed.



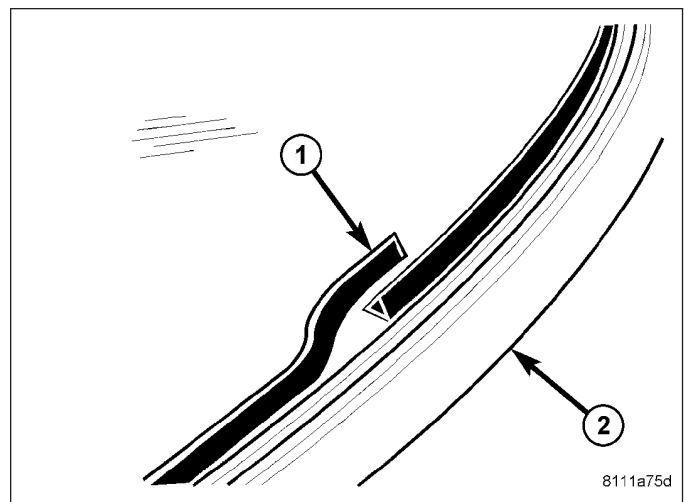
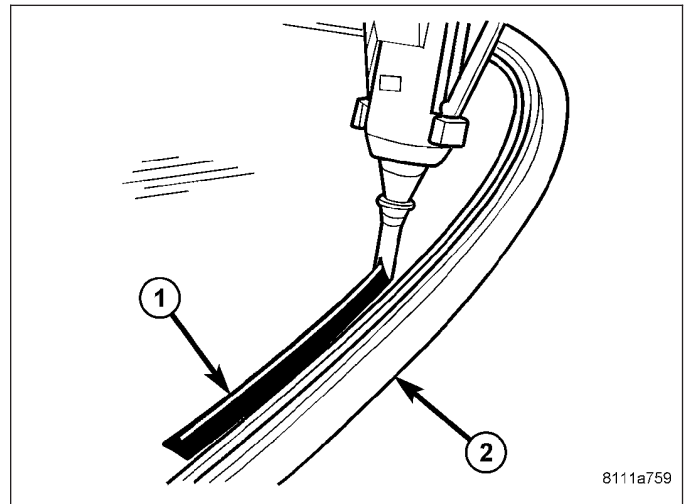
13. Clean the backlite fence with an ammonia based glass cleaner and a lint-free cloth.
14. Apply pinch weld primer 15 mm (0.75 in.) wide (1) around the backlite fence (2). Allow at least three minutes drying time.
15. Using a flashlight, verify that the primer is completely and evenly installed along the backlite fence.
16. Re-prime any area that is not fully and evenly primed.



**CAUTION:** Always apply the bead of adhesive to the backlite. Always install the backlite within 5 minutes after applying the adhesive.

**Note:** If the original urethane adhesive has been exposed for more than 12 hours, the entire adhesive area will need to be re-primed prior to installing new adhesive.

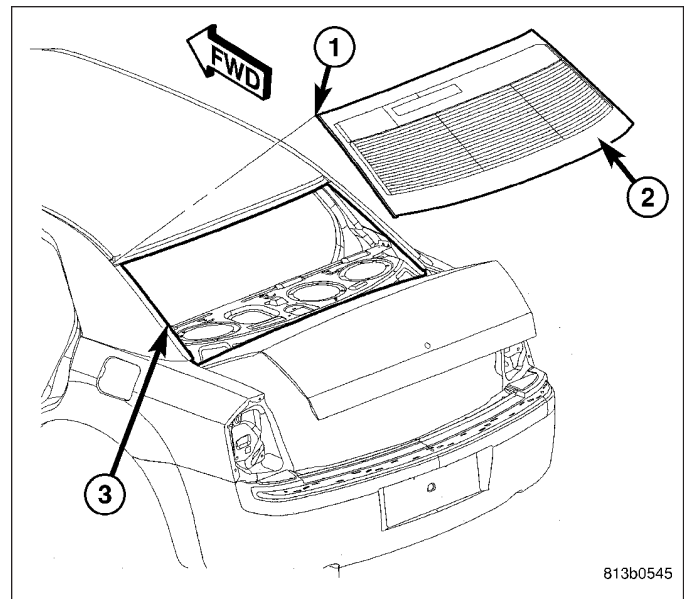
17. Apply approximately a 10 mm (0.4 in.) wide bead of adhesive (1) with a triangular nozzle approximately 6 mm (0.230 in.) from the edge of the glass (2) starting at the bottom center of the backlite.
18. Run the end of the adhesive bead (1) on the backlite (2) parallel to the start of the bead and smooth the ends flush.



19. Using an assistant, position the backlite (2) over the backlite opening.
20. Using the grease pencil marks or tape as reference points, align the backlite to the opening.
21. Carefully lower the backlite onto the backlite fence (3). Guide the backlite and the rubber seal (1) around the backlite into its proper location.

**CAUTION:** It is not possible to move the backlite after installation. The backlite should never be pressed into place by more than one person, because the backlite can break if pressed simultaneously on both sides.

22. Push the backlite inward until the backlite comes into contact with the spacers located on each side of the backlite fence.
23. Connect the wire connectors to the rear window defogger terminals and, rear window mounted radio antenna, if equipped.
24. Install the trim panel to the rear shelf (Refer to 23 - BODY/INTERIOR/REAR SHELF TRIM PANEL - INSTALLATION).
25. Install the quarter trim panels (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - INSTALLATION).

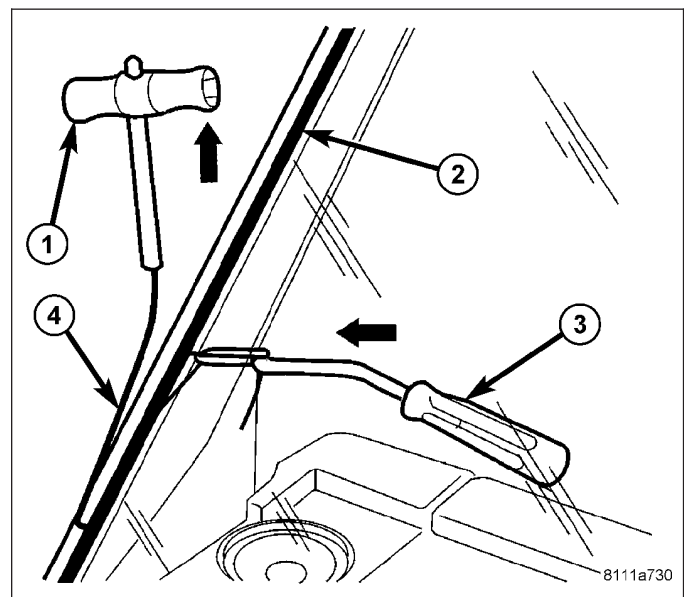


## GLASS-LIFTGATE

### REMOVAL

**Note:** Windshield removal shown, liftgate glass similar.

1. Before proceeding with the following repair procedure, review all warnings and cautions. (Refer to 23 - BODY/STATIONARY GLASS - WARNING)
2. Remove the liftgate trim panels (Refer to 23 - BODY/LIFTGATE/TRIM PANEL - REMOVAL).
3. Remove rear window wiper arm, if equipped (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - REMOVAL).
4. Disconnect the wire connectors from rear window defogger terminals and, rear window mounted radio antenna, if equipped.
5. Using an assistant and a wire-type windshield cut-out tool (1, 3 and 4), cut and separate the urethane adhesive (2) securing the backlite to the liftgate.
6. Carefully remove the backlite from the vehicle.

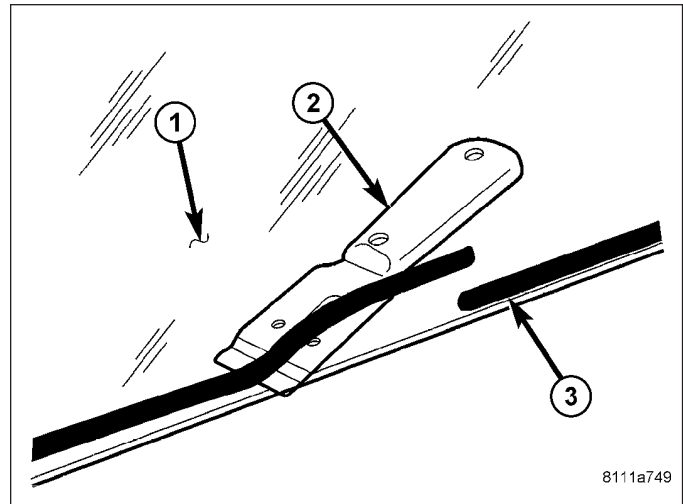


### INSTALLATION

**CAUTION:** To help prevent water leaks, partially roll down the left and right door glass before installing the liftgate glass. This avoids pressurizing the passenger compartment if a door is slammed before the urethane is cured.

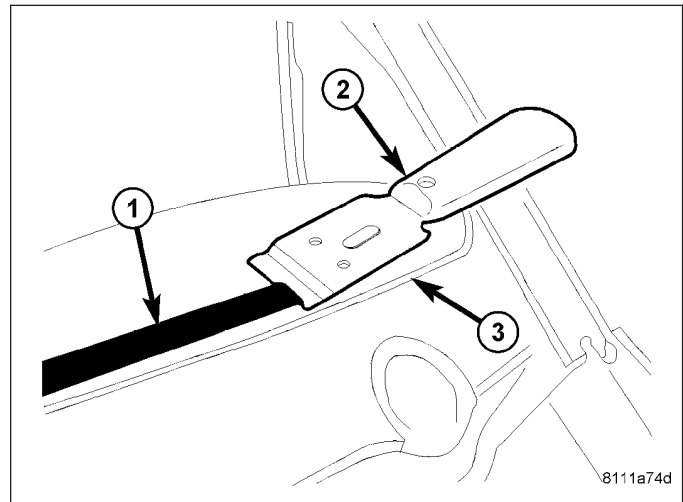
**CAUTION:** Protect all painted and trimmed surfaces from coming in contact with urethane or primers.

1. If the liftgate glass (1) is being reused, remove the as much original urethane (3) as possible from the glass surface using a razor knife (2).

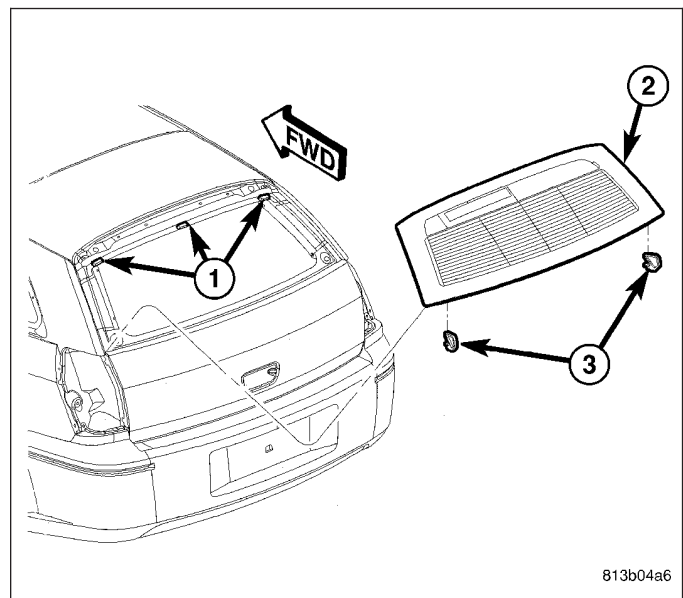


**Note:** To prevent corrosion, do not damage paint on the liftgate glass fence when removing original urethane.

**Note:** The liftgate glass fence should be cleaned of most of its old urethane adhesive. A small amount of old urethane, approximately 1 mm in height should remain on the fence. Do not completely remove all old urethane from the fence, the paint finish and bonding strength will be adversely affected. Replace any missing or damaged spacers around the perimeter of the liftgate glass fence.

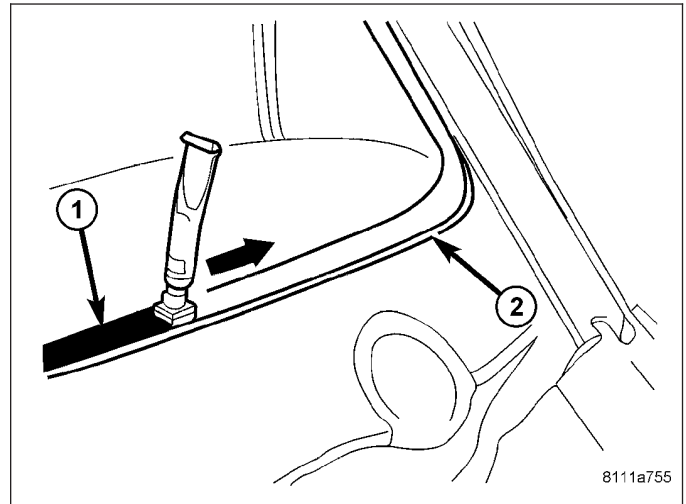
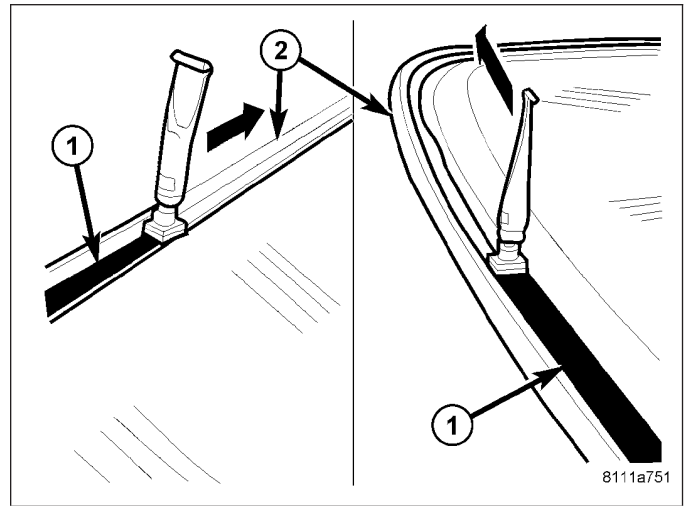


2. Using a razor knife (2), level the original bead of urethane (1) on the liftgate glass fence (3) to a thickness of approximately 1 mm (0.04 in.) and remove the loose adhesive.
3. Replace any damaged or missing spacers (1 and 3).
4. Using an assistant, position the liftgate glass (2) into the liftgate glass opening and against the support spacers.
5. Verify the liftgate glass lays evenly against the liftgate fence at the top, bottom and sides of the opening. If not, the fence must be formed to the shape of the liftgate glass.
6. Mark the liftgate glass and fence with a grease pencil or pieces of masking tape to use as a reference for installation.
7. Using an assistant, remove the liftgate glass from the liftgate glass opening and place it on a suitable padded work surface.



**WARNING:** Do not use solvent based glass cleaners to clean the liftgate glass before applying glass prep and primer or poor glass adhesion may result.

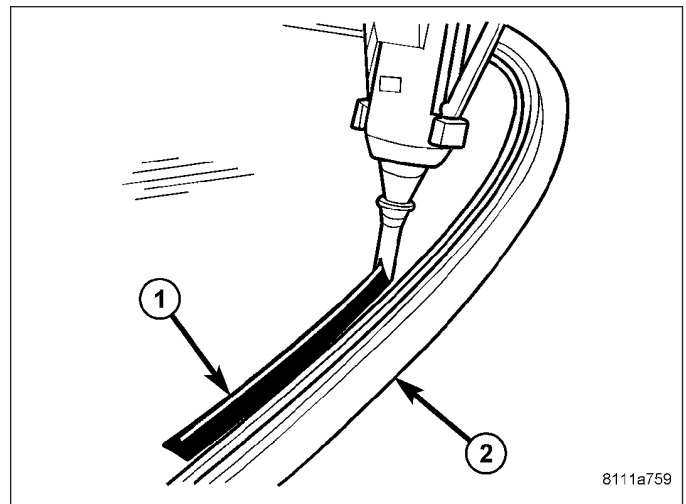
8. Clean the inside of the liftgate glass with an ammonia based glass cleaner and a lint-free cloth.
9. Apply glass prep adhesion promoter 25 mm (1 in.) wide (1) around the perimeter of the liftgate glass (2) and 5 mm (0.2 in.) from the edge of the glass and wipe dry with a clean lint-free cloth until no streaks are visible.
10. Apply glass primer 25 mm (1 in.) wide around the perimeter of the liftgate glass and 5 mm (0.2 in.) from the edge of the glass. Allow at least three minutes drying time.
11. Using a flashlight, verify that the primer is completely and evenly installed along the perimeter of the liftgate glass.
12. Re-prime any area that is not fully and evenly primed.
13. Clean the liftgate glass fence with an ammonia based glass cleaner and a lint-free cloth.
14. Apply pinch weld primer 15 mm (0.75 in.) wide (1) around the liftgate glass fence (2). Allow at least three minutes drying time.
15. Using a flashlight, verify that the primer is completely and evenly installed along the liftgate glass fence.
16. Re-prime any area that is not fully and evenly primed.



**CAUTION:** Always apply the bead of adhesive to the backlite. Always install the backlite within 5 minutes after applying the adhesive.

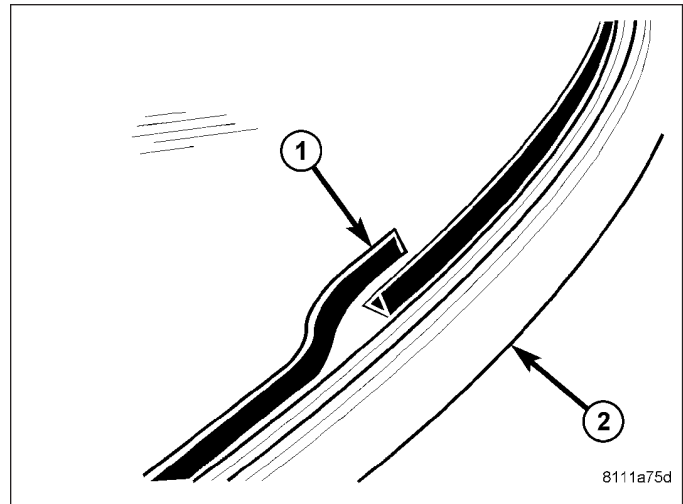
**Note:** If the original urethane adhesive has been exposed for more than 12 hours, the entire adhesive area will need to be re-primed prior to installing new adhesive.

17. Apply approximately a 10 mm (0.4 in.) wide bead of adhesive (1) with a triangular nozzle triangular nozzle approximately 6 mm (0.230 in.) from the edge of the glass (2) starting at the bottom center of the glass.





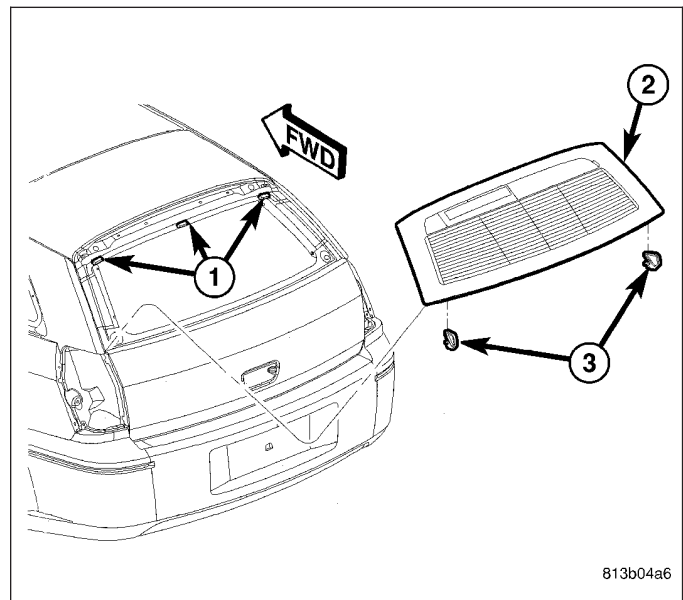
18. Run the end of the adhesive bead (1) on the liftgate glass (2) parallel to the start of the bead and smooth the ends flush.



19. Using an assistant, position the liftgate glass (2) over the liftgate glass opening and against the support spacers (1 and 3).
20. Using the grease pencil marks or tape as reference points, align the liftgate glass to the opening.
21. Carefully lower the liftgate glass onto the liftgate glass fence.

**CAUTION:** It is not possible to move the liftgate glass after installation. The liftgate glass should never be pressed into place by more than one person, because the glass can break if pressed simultaneously on both sides.

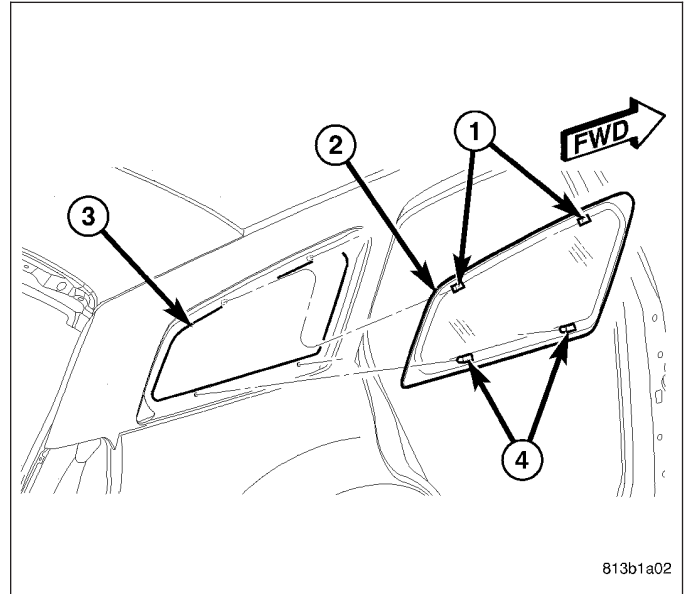
22. Push the liftgate glass inward until the glass comes into contact with the spacers located on each side of the liftgate glass fence.
23. Connect the wire connectors to the rear window defogger terminals and, rear window mounted radio antenna, if equipped.
24. Install the liftgate trim panels (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - INSTALLATION).
25. Install the rear window wiper arm, if equipped (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - INSTALLATION).



## GLASS-QUARTER

### REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/STATIONARY GLASS - WARNING).
2. Remove the quarter panel trim from the side of the vehicle being serviced (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - REMOVAL).
3. Carefully pull down the headliner to access the upper mounting studs (1) that secure the quarter glass (2) to the window fence (3) and, remove the nuts from the studs.
4. Remove the nuts that secure the lower mounting studs (4) to the window fence and, remove the nuts from the studs.
5. Using razor knife, cut butyl sealer between the mounting studs that secure the quarter glass to window fence.
6. Carefully push the quarter window glass from the opening.

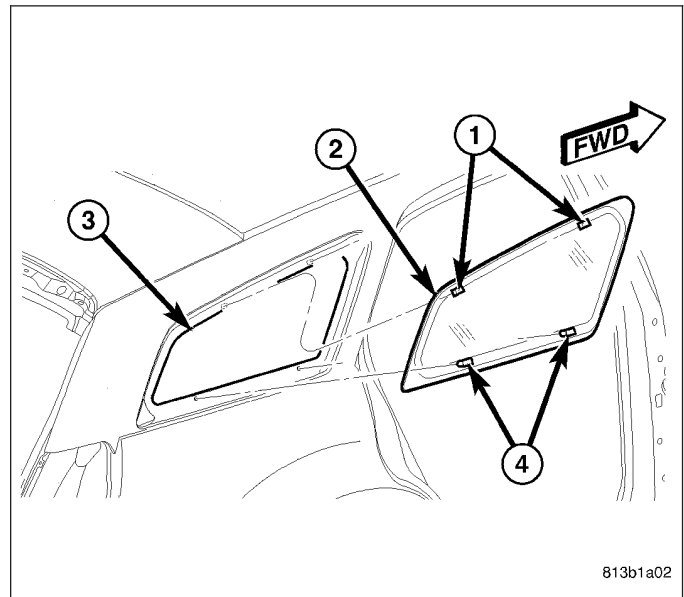


### INSTALLATION

**CAUTION:** Roll down the left and right front door glass and open the rear glass slider (if available) before installing quarter glass to avoid pressurizing the passenger compartment if a door is slammed before urethane is cured. Water leaks can result.

**Note:** The quarter glass fence should be cleaned of all old butyl sealer. Do not grind sealer off the fence, the paint finish will be adversely affected.

1. Apply 6 mm (0.25 in.) wide butyl tape around perimeter of the quarter glass approximately 5 mm (0.2 in.) from the edge of the glass. Ensure the butyl tape is wrapped around the mounting studs.
2. Place the quarter glass into the window opening and insert mounting studs through the holes in the window fence.
3. Install the nuts that secure the quarter glass to the window fence. Tighten the nuts to 4.5 N·m (40 in. lbs.).
4. Install quarter panel trim (Refer to 23 - BODY/INTERIOR/QUARTER PANEL TRIM - INSTALLATION).



## WINDSHIELD

### DESCRIPTION

The windshield is attached to the window frame (fence) with urethane adhesive. The urethane adhesive is applied cold and seals the surface area between the window opening and the glass. The primer adheres the urethane adhesive to the windshield.



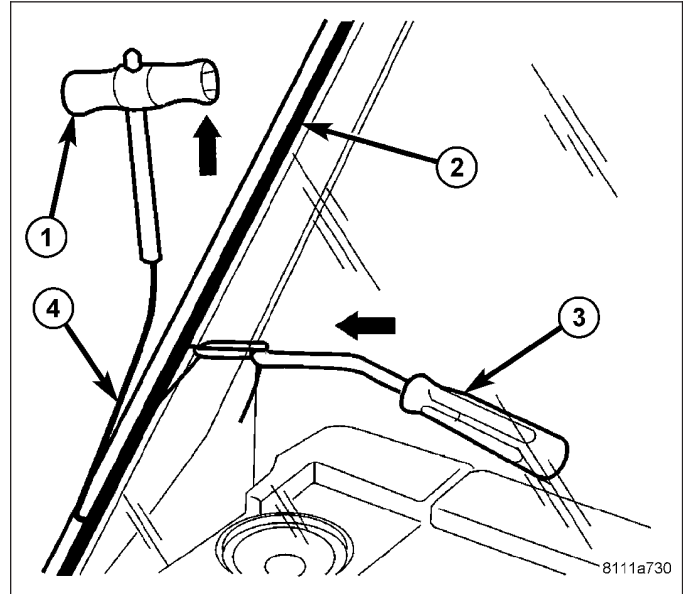
It is difficult to salvage a windshield during the removal operation. The windshield is part of the structural support for the roof. The urethane bonding used to secure the windshield to the fence is difficult to cut or clean from any surface. If the rubber seals are set in urethane, it would also be unlikely they could be salvaged. Before removing the windshield, check the availability of the windshield and seals from the parts supplier.

## REMOVAL

1. Before proceeding with the following repair procedure, review all warnings and cautions (Refer to 23 - BODY/STATIONARY GLASS - WARNING).
2. Remove the rear view mirror (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - REMOVAL).
3. Remove the cowl grille (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - REMOVAL.)

**CAUTION:** Be careful not to damage painted surfaces when removing moldings or cutting urethane around the windshield.

4. Remove the windshield side moldings (Refer to 23 - BODY/WEATHERSTRIP/SEALS/WINDSHIELD A-PILLAR WEATHERSTRIP - INSTALLATION).
5. Using an assistant and a wire-type windshield cut-out tool (1, 3 and 4), cut and separate the urethane adhesive (2) securing the windshield to the windshield fence.
6. Carefully remove the windshield from the vehicle.



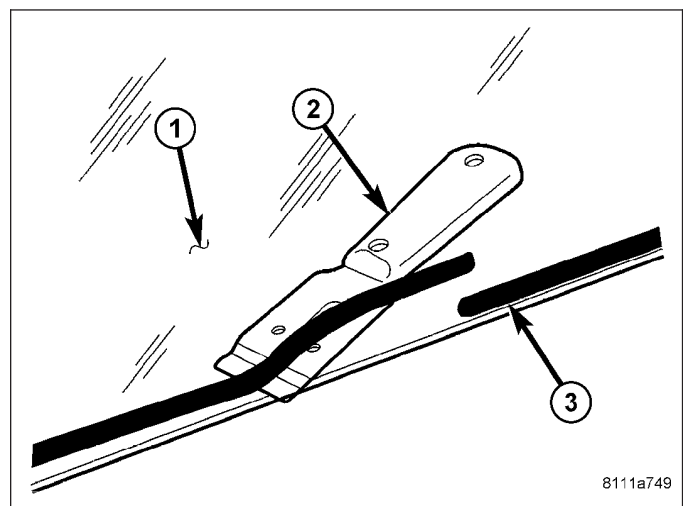
## INSTALLATION

**WARNING:** Do not operate the vehicle within 24 hours of windshield installation. It takes at least 24 hours for urethane adhesive to cure. If it is not cured, the windshield may not perform properly if the vehicle is in an accident.

**CAUTION:** To help prevent water leaks, partially roll down the left and right door glass before installing the windshield. This avoids pressurizing the passenger compartment if a door is slammed before the urethane is cured.

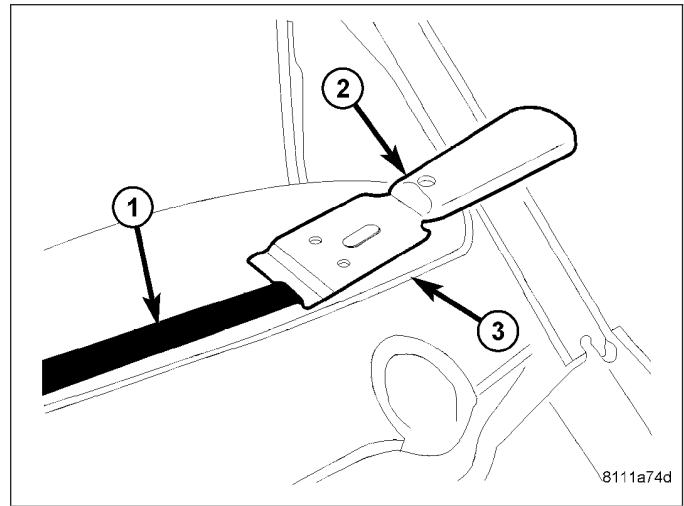
**CAUTION:** Protect all painted and trimmed surfaces from coming in contact with urethane or primers.

1. If the windshield (1) is being reused, remove the as much original urethane (3) as possible from the glass surface using a razor knife (2).

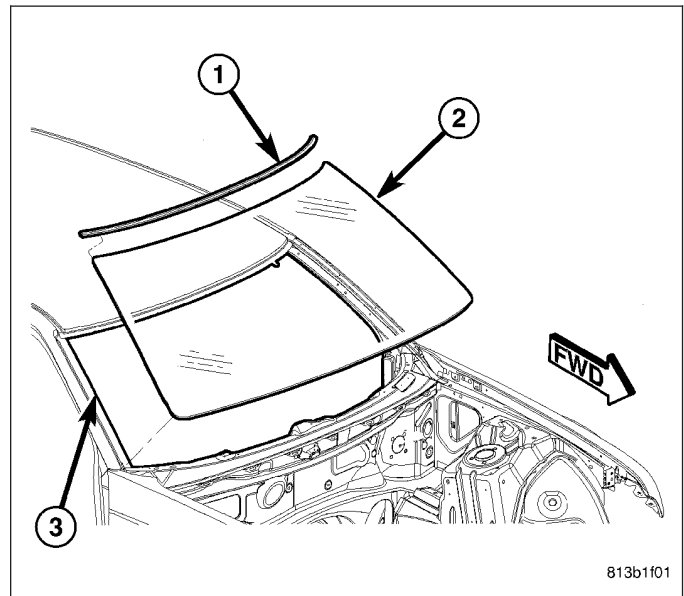


**Note:** To prevent corrosion, do not damage paint on windshield fence when removing original urethane.

**Note:** The windshield fence should be cleaned of most of its old urethane adhesive. A small amount of old urethane, approximately 1 mm in height should remain on the fence. Do not completely remove all old urethane from the fence, the paint finish and bonding strength will be adversely affected. Support spacers located near the cowl at the bottom of the windshield fence should be replaced with new spacers. Replace any missing or damaged spacers around the perimeter of the windshield fence.

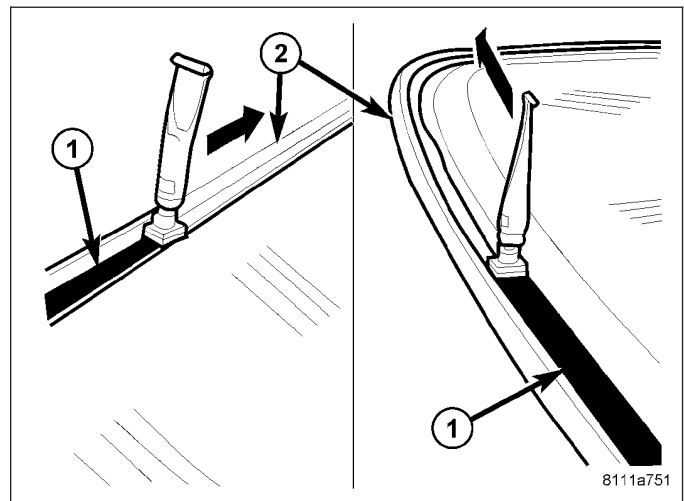


2. Using a razor knife (2), level the original bead of urethane (1) on the windshield fence (3) to a thickness of approximately 1 mm (0.04 in.) and remove the loose adhesive.
3. Install a new rubber seal (1) along the top of the windshield (2).
4. Using an assistant, position the windshield into the windshield opening and against the windshield fence (3).
5. Verify the windshield lays evenly against the fence at the top, bottom and sides of the opening. If not, the fence must be formed to the shape of the windshield.
6. Mark the windshield and the windshield fence with a grease pencil or pieces of masking tape to use as a reference for installation.
7. Using an assistant, remove the windshield from the windshield opening and place it on a suitable padded work surface.

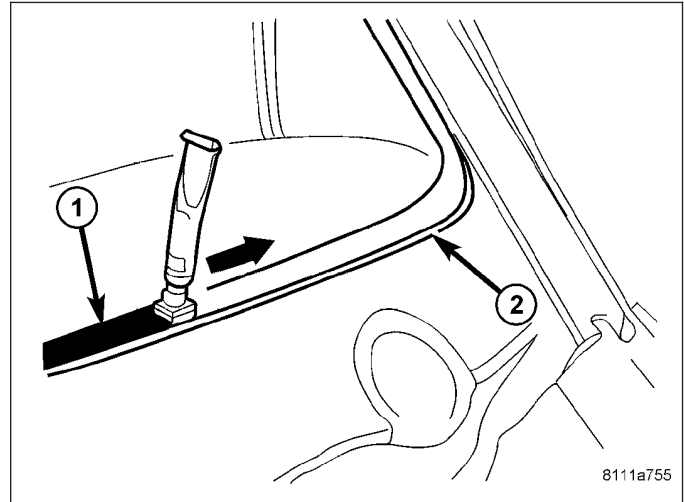


**WARNING:** Do not use solvent based glass cleaners to clean the windshield before applying glass prep and primer or poor glass adhesion may result.

8. Clean the inside of the windshield with an ammonia based glass cleaner and a lint-free cloth.
9. Apply glass prep/adhesion promoter 25 mm (1 in.) wide (1) around the perimeter of the windshield (2) and 5 mm (0.2 in.) from the edge of the glass and wipe dry with a clean lint-free cloth until no streaks are visible.
10. Apply glass primer 25 mm (1 in.) wide (1) around the perimeter of the windshield (2) and 5 mm (0.2 in.) from the edge of the glass. Allow at least three minutes drying time.
11. Using a flashlight, verify that the primer is completely and evenly installed along the perimeter of the windshield.



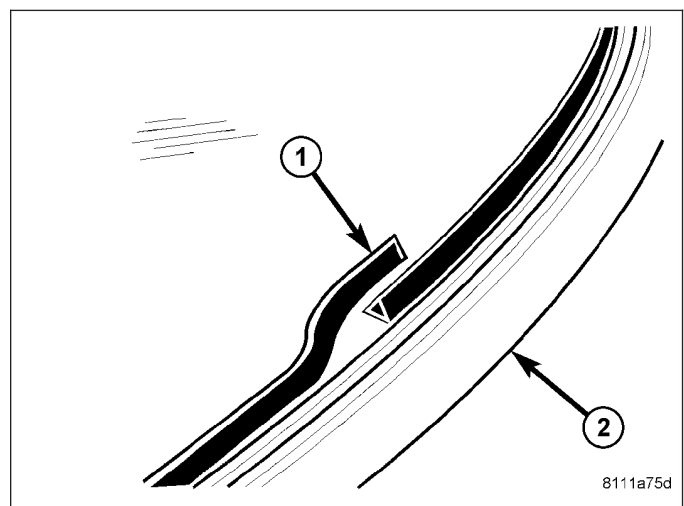
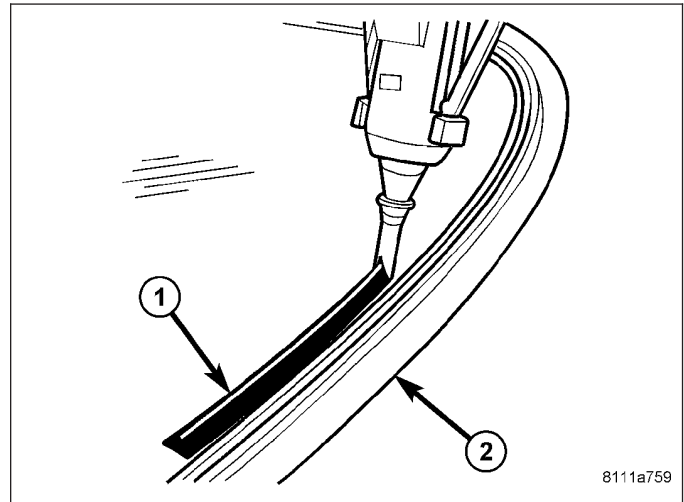
12. Re-prime any area that is not fully and evenly primed.
13. Clean the windshield fence with an ammonia based glass cleaner and a lint-free cloth.
14. Apply pinch weld primer 15 mm (0.75 in.) wide (1) around the windshield fence (2). Allow at least three minutes drying time.
15. Using a flashlight, verify that the primer is completely and evenly installed along the windshield fence.
16. Re-prime any area that is not fully and evenly primed.



**CAUTION:** Always apply the bead of adhesive to the windshield. Always install the windshield within 5 minutes after applying the adhesive.

**Note:** If the original urethane adhesive has been exposed for more than 12 hours, the entire adhesive area will need to be re-primed prior to installing new adhesive.

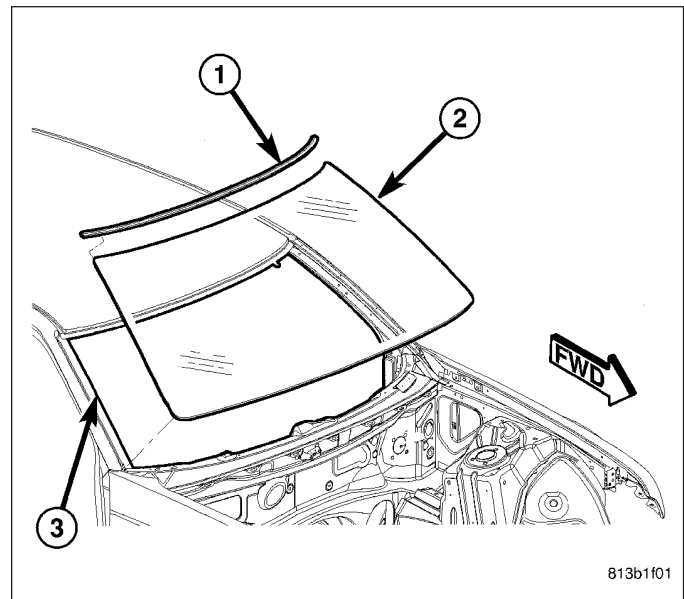
17. Apply approximately a 10 mm (0.4 in.) wide bead of adhesive (1) with a triangular nozzle approximately 6 mm (0.230 in.) from the edge of the glass (2) starting at the bottom center of the windshield.
18. Run the end of the adhesive bead (1) on the windshield (2) parallel to the start of the bead and smooth the ends flush.



19. Using an assistant, position the windshield (2) over the windshield opening.
20. Using the grease pencil marks or tape as reference points, align the windshield to the opening.
21. Carefully lower the windshield onto the windshield fence. Guide the windshield and the rubber seal at the top the windshield into its proper location.

**CAUTION:** It is not possible to move the windshield after installation. The windshield should never be pressed into place by more than one person, because the windshield can break if pressed simultaneously on both sides.

22. Push the windshield inward until the windshield comes into contact with the spacers located on each side of the windshield fence (2).
23. Install the windshield side moldings(Refer to 23 - BODY/WEATHERSTRIP/SEALS/WINDSHIELD A-PILLAR WEATHERSTRIP - INSTALLATION).
24. Install the cowl grill (Refer to 23 - BODY/EXTERIOR/COWL GRILLE - REMOVAL).
25. Install the rear view mirror (Refer to 23 - BODY/INTERIOR/REAR VIEW MIRROR - INSTALLATION).



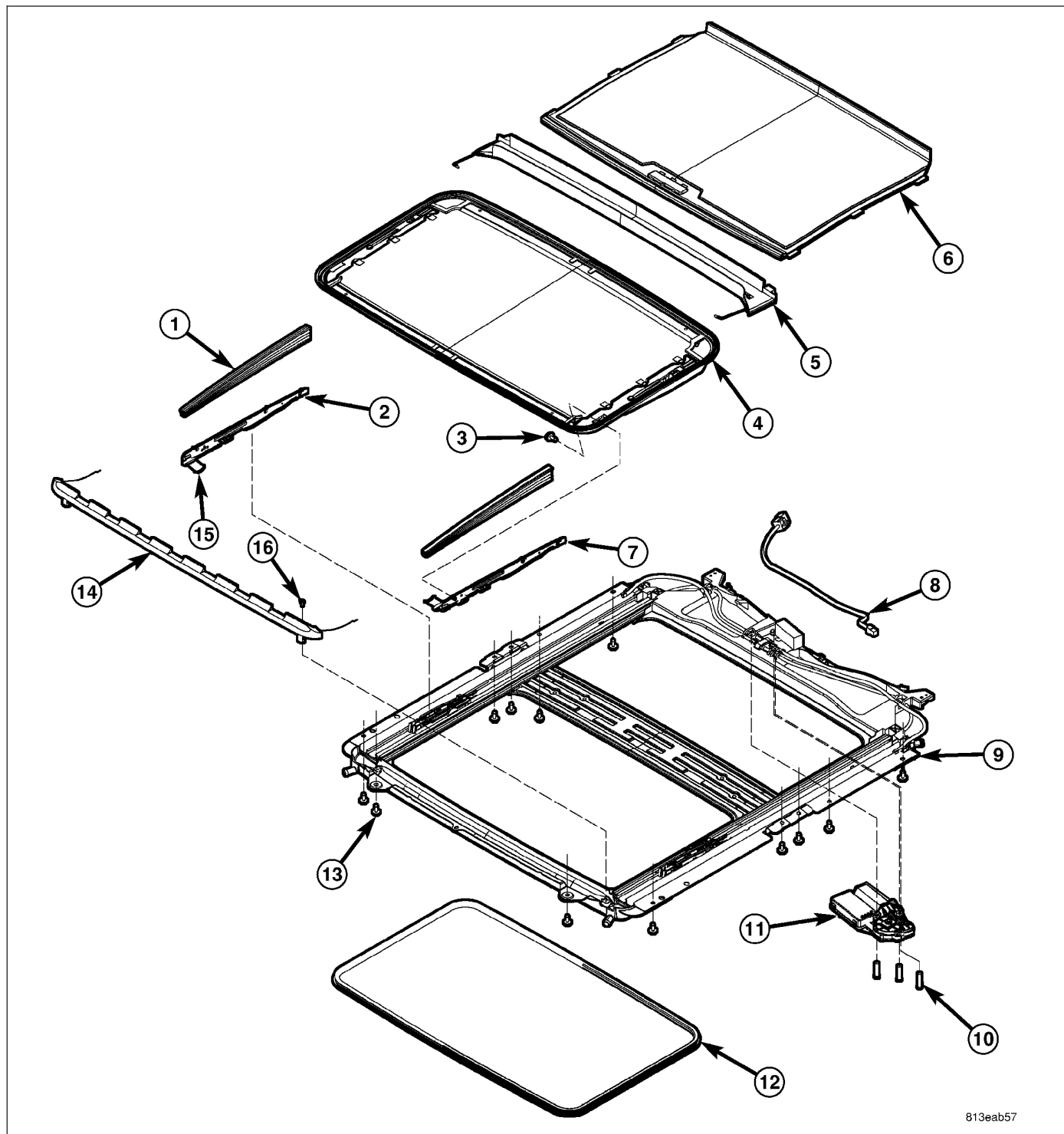
## SUNROOF - SERVICE INFORMATION

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## SUNROOF - SERVICE INFORMATION

### DESCRIPTION



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### EXPLODED VIEW

- 1 - MECHANISM COVERS (2)
- 2 - RIGHT HAND GLASS GUIDE
- 3 - GLASS FASTENERS (4)
- 4 - GLASS ASSEMBLY
- 5 - DRAIN CHANNEL
- 6 - SUNSHADE
- 7 - LEFT SUNROOF GLASS GUIDE
- 8 - WIRE HARNESS

- 9 - SUNROOF ASSEMBLY
- 10 - MOTOR FASTENERS (3)
- 11 - SUNROOF MOTOR/MODULE ASSEMBLY
- 12 - TRIM LACE
- 13 - ASSEMBLY FASTENERS (12)
- 14 - WIND DEFLECTOR
- 15 - RIGHT SUNROOF GLASS GUIDE
- 16 - WIND DEFLECTOR STRAP SCREWS (2)

The power sunroof system allows the sunroof to be opened, closed or placed in the vent position electrically by actuating a switch in the overhead console. The sunroof system receives battery feed through a fuse in the Power Distribution Center (PDC). The sunroof will operate normally with the key in any position while the Accessory Delay system is active.

The sunroof glass panel tilts upward at the rear for ventilation and slides rearward under the roof when open. The panel seals flush with the roof in the closed position to eliminate wind noise. The sunroof includes a manual-sliding sunshade to cover the deep-tinted glass panel.

In addition to the standard power sunroof operation, this vehicle offers several additional features. There is an express (one-touch) opening and closing feature as well as Excessive Force Limitation (EFL). The EFL function detects obstacles trapped between the glass and the vehicle roof during a closing motion. Upon sensing an obstacle the EFL function will reverse direction of the glass to allow removal of the obstacle.

The main components of the power sunroof system are:

- The motor/module assembly
- The power sunroof glass and frame assembly
- The power sunroof switch
- The manual-sliding sunshade

## OPERATION

This vehicle has a vent, tilt and slide power sunroof system with express (one-touch) open and closing feature. The sunroof system receives constant battery feed through a fuse in the Power Distribution Center (PDC). The sunroof will operate normally with the key in any position while the Accessory Delay system is active. If the sunroof is moving when the key is turned to the START position (crank engine), all motions stop until the key is released, then the previously requested sunroof motion will resume. The sunroof will also complete a requested motion if the Accessory Delay system goes inactive while the motion is in progress.

A combination push-button and rocker switch module mounted in the overhead console controls sunroof operation. The sunroof switch is a rocker design with a push button in the center of the two halves of the rocker. Pressing the rocker towards the front of the car commands the sunroof closed. Pressing the rocker towards the rear of the car commands the sunroof open. Pressing the center push button commands the sunroof up into the vent position (Rear of sunroof glass raises above the vehicle roof with glass still covering the sunroof opening). All switch commands operate with the glass starting in any position. (Refer to 8 - ELECTRICAL/POWER TOP/SWITCH - OPERATION) for additional information.

An electronic control system, integral to the motor/module assembly, provides the express open and close functions. Pressing the "open" or "close" end of the rocker switch moves the sunroof glass panel to the full open or full closed position, respectively. During express closing, anytime an obstacle is detected in the way of the glass, the motor will stop and reverse travel to avoid pinching an occupant's finger, ice in the track, etc. This function is called Excessive Force Limitation (EFL). There are two methods of overriding the EFL function.

1. When three EFL events occur without the glass being allowed to fully close, the next close attempt will only move while the close switch is continuously actuated. This allows the sunroof to be forced closed if multiple close attempts fail.
2. If the sunroof close switch is continuously actuated during an EFL event, through the reversal, and during a two second wait time, then continuing to hold the close switch will cause the roof to move towards close with the EFL protection disabled. This allows the sunroof to be forced closed if it is known that a reversal will occur.

While in EFL override, the closing motion will cease if the sunroof switch is released at any time.

The motor/module is programmed to learn the speed required to drive the panel based on position and recalibrates itself as needed. If the sunroof becomes uncalibrated, it will only respond to the vent switch. If the vent switch is pressed, the glass will move toward vent; if the switch is released, all motion stops. In the event that the sunroof system becomes uncalibrated perform the sunroof position calibration procedure, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE -SUNROOF POSITION CALIBRATION).



## DIAGNOSIS AND TESTING

### POWER TOP - SUNROOF

Any diagnosis of the power sunroof system should begin with the use of a scan tool and the proper Diagnostic Procedures Information. The scan tool can provide confirmation that the Controller Area Network (CAN) Data Bus is functional, that all of the electronic modules are sending and receiving the proper messages on the CAN Data Bus, and that the power sunroof motor is being sent the proper hard wired output by the sunroof switch.

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

**Refer to the appropriate diagnostic information.**

### SUNROOF

Refer to SUNROOF DIAGNOSIS CHART for possible causes. Before beginning sunroof diagnostics verify that all other power accessories are in proper operating condition. If not, a common electrical problem may exist. Refer to Wiring Diagrams, in this publication for circuit, splice and component descriptions. Check the condition of the circuit protection (20 amp circuit breaker in the Junction Block). Inspect all wiring connector pins for proper engagement and continuity. Check for battery voltage at the power sunroof controller, refer to Wiring Diagrams, for circuit information. If battery voltage of more than 10 volts is detected at the controller, proceed with the following tests (the controller will not operate at less than 10 volts).

Before beginning diagnosis for wind noise or water leaks, verify that the problem was not caused by releasing the control switch before the sunroof was fully closed. The sunroof module has a water-management system. If however, the sunroof glass is in a partial closed position, high pressure water may be forced beyond the water management system boundaries and onto the headlining.

Every time the sunroof module loses power it must be initialized. This is done by connecting power to the sunroof and moving the sunroof toward the closed position. When initialization occurs a slight "kick" in the sunroof module will be seen and heard. This is the indication that the sunroof module is initialized.



**SUNROOF DIAGNOSIS CHART**

SYMPTOM	POSSIBLE CAUSE
Sunroof motor inoperative.	Faulty control switch. Faulty circuit ground between sunroof module, control switch, and body harness. Faulty power circuit between sunroof module, control switch, and body harness. Faulty sunroof drive motor. Faulty sunroof module.
Audible whine when switch is depressed, sunroof does not operate.	Faulty sunroof drive motor. Binding cable.
Audible clicking or ratcheting when switch is pressed, sunroof does not operate.	Broken or worn drive cable. Worn drive motor gear. Mechanisms not synchronized.
Sunroof vents and opens, but does not close.	Broken or disengaged trough guide Binding cable. Faulty circuit. Faulty control switch. Faulty sunroof module. Faulty drive motor.
Sunroof vents, but does not open.	Binding cable or mechanism. Faulty circuit. Faulty switch. Faulty sunroof module.
Sunroof does not vent	Binding cable or mechanism. Faulty circuit. Faulty control switch. Faulty sunroof module.
Sunroof water leak.	Drain tubes clogged or kinked or disconnected from the sunroof. Glass panel improperly adjusted. Faulty glass panel seal.
Gurgling sound from sunroof	Low spot in drain hose routing, allowing water to stand.
Wind noise from sunroof.	Glass panel compression to the roof opening not consistent. Wind deflector not deploying properly. Glass not installed or adjusted properly. Faulty glass panel seal.
Buzz, Squeak, Rattles from sunroof	Loose or broken attaching hardware. No lubrication in track. Worn or broken mechanism. Cables bunched or kinked.
Sunshade will not function or does not operate smoothly	Sunshade feet are broken.  Sunshade feet are in the wrong track. Track obstructions or interference. Trim lace incorrectly installed in track.
Glass movement not consistent or glass does not operate smoothly	Glass and Track timing.  Glass and Track alignment. Cables and Guide alignment.
Broken or jammed guide mechanism	Mechanism cover was not installed correctly.

## WATER DRAINAGE AND WIND NOISE DIAGNOSIS

The sliding glass panel is designed to seal water entry with a snug fit between the roof and the seal. The fit can be checked by inserting a business card or equivalent, between the roof and the seal. The piece of paper should have some resistance when pulled out when the glass panel is in the closed position. The sunroof housing will drain off a minimum amount of water. Excessive wind noise could result if the gap clearances are exceeded. The sunroof glass panel may need to be adjusted. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS)

Adequate drainage is provided by a drain trough in the sunroof housing which encircles the sliding glass panel and leads to drain hoses. If a wet headliner or other water leak complaints are encountered, before performing any adjustments, first ensure that the drainage system is not plugged or disconnected. Use a pint container to pour water into the sunroof housing drain trough. If water flow is restricted, use compressed air to blow out any material plugging the drain system. Retest system again.

To further check for a disconnected drain hose:

**Note:** Care must be taken not to fold or kink the headliner upon removal.

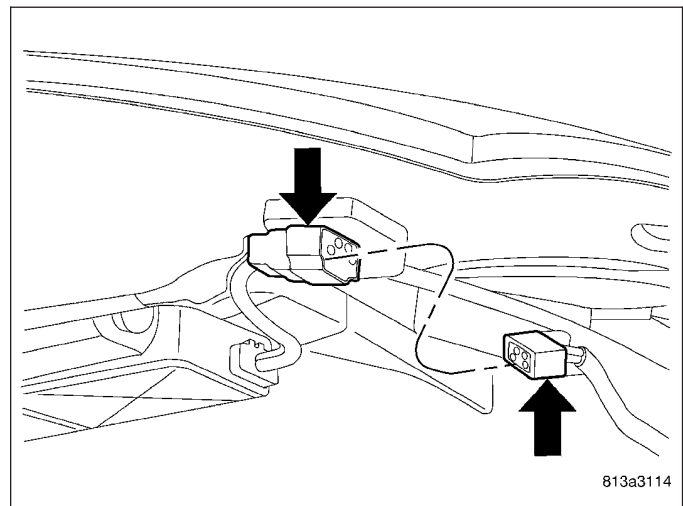
1. Lower headliner as necessary to gain access to sunroof housing drain tubes. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL)
2. Repair as necessary.

## ASSEMBLY-MODULE

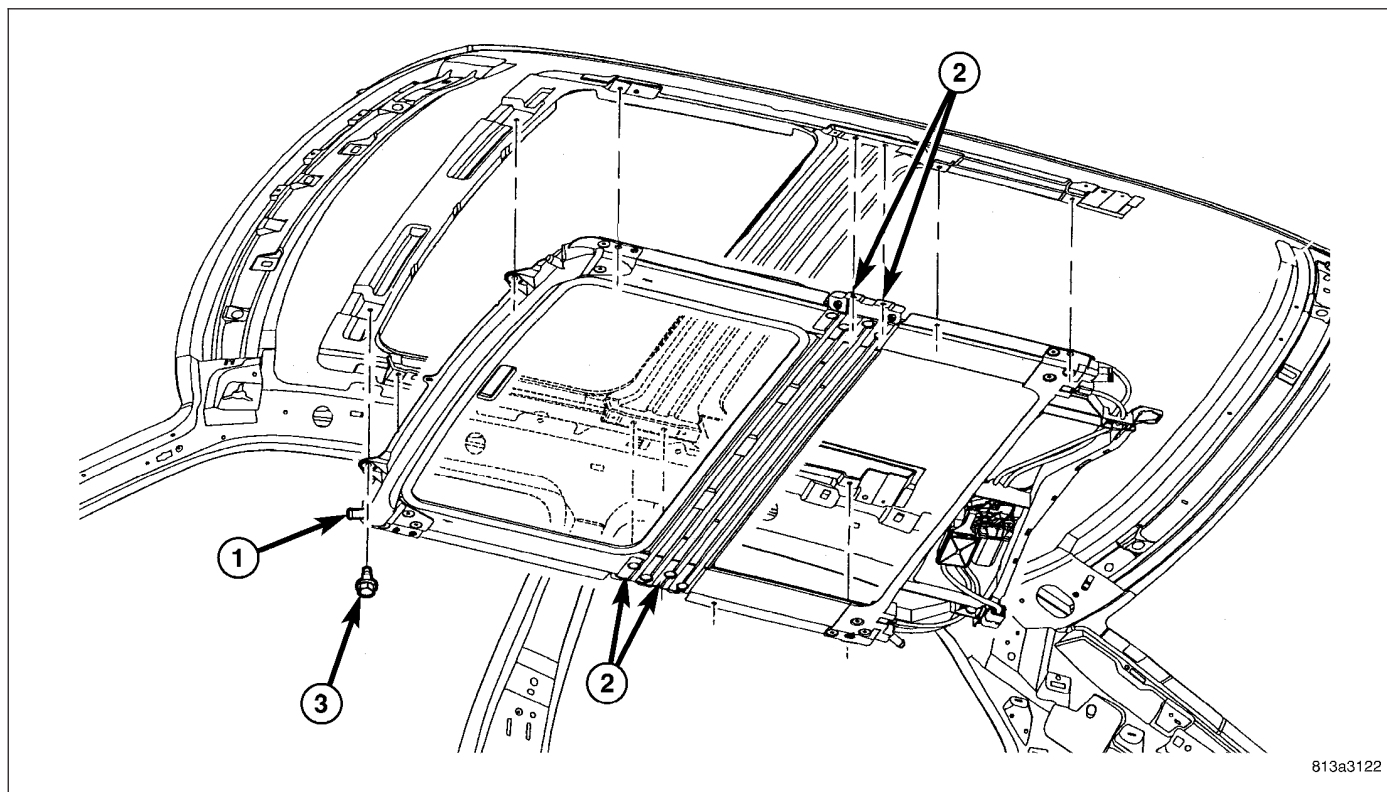
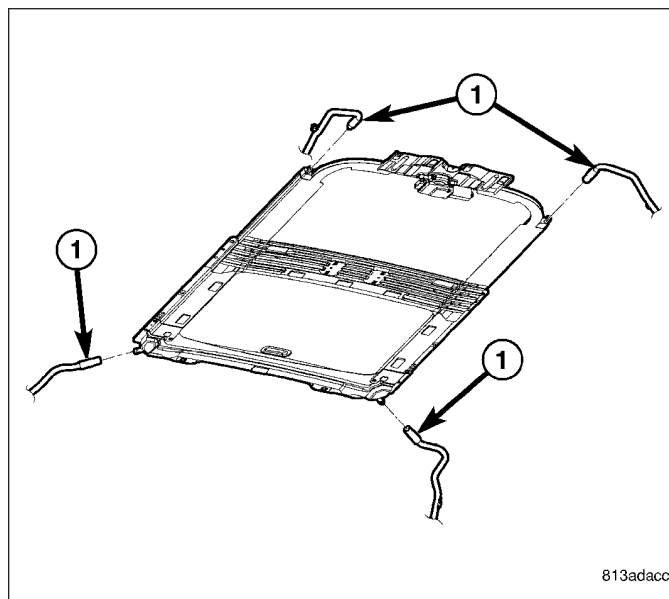
### REMOVAL

**WARNING:** The Excessive Force Limitation (EFL) feature must be calibrated any time a sunroof motor/module is replaced with a new component. Failure to perform this procedure could result in vehicle damage and/or personal injury. (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - EXCESSIVE FORCE LIMITATION (EFL) CALIBRATION) for the appropriate procedure.

1. Move glass panel to the fully closed position.
2. Disconnect and isolate the battery negative cable.
3. Remove headliner (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).
4. Disconnect the sunroof wire harness electrical connector.

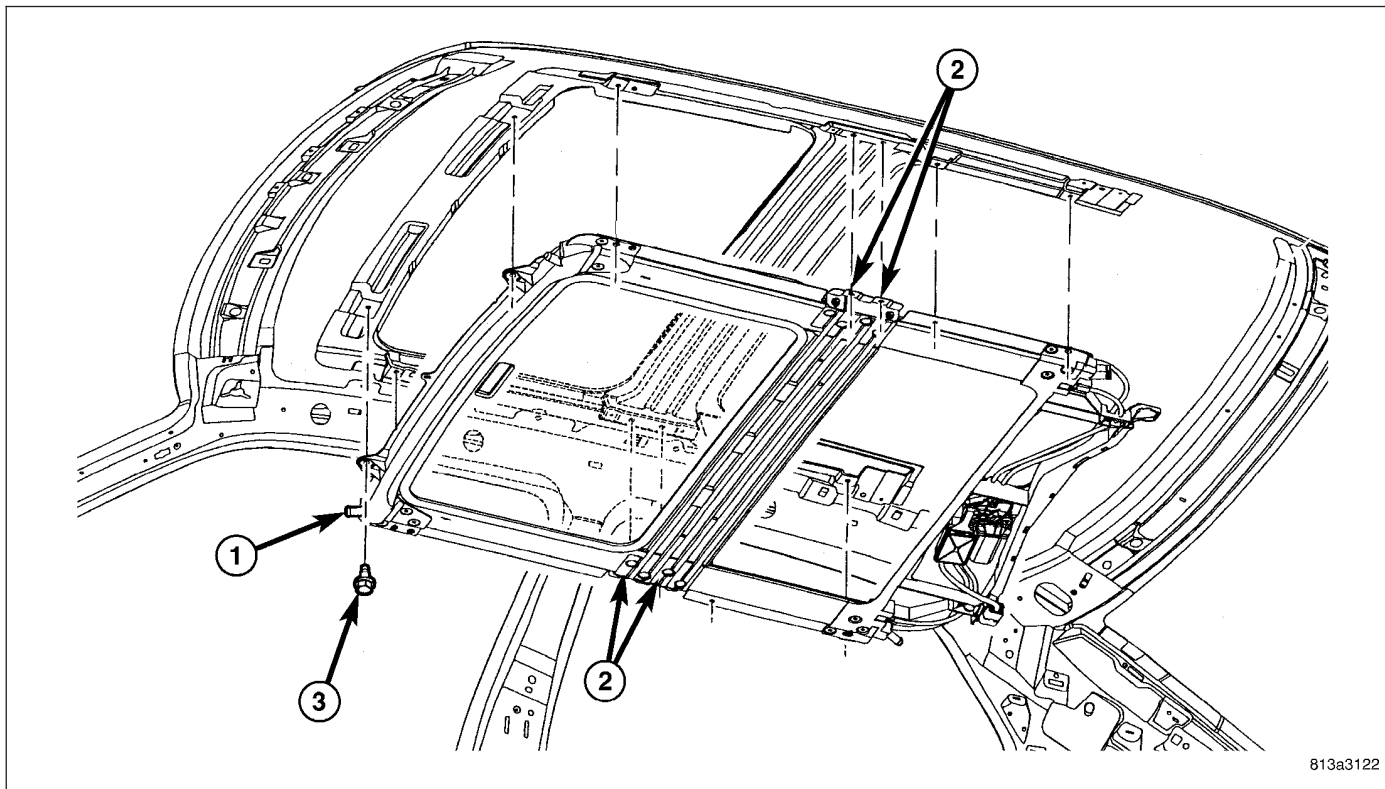


5. Disconnect the four drain tubes (1) from sunroof housing.



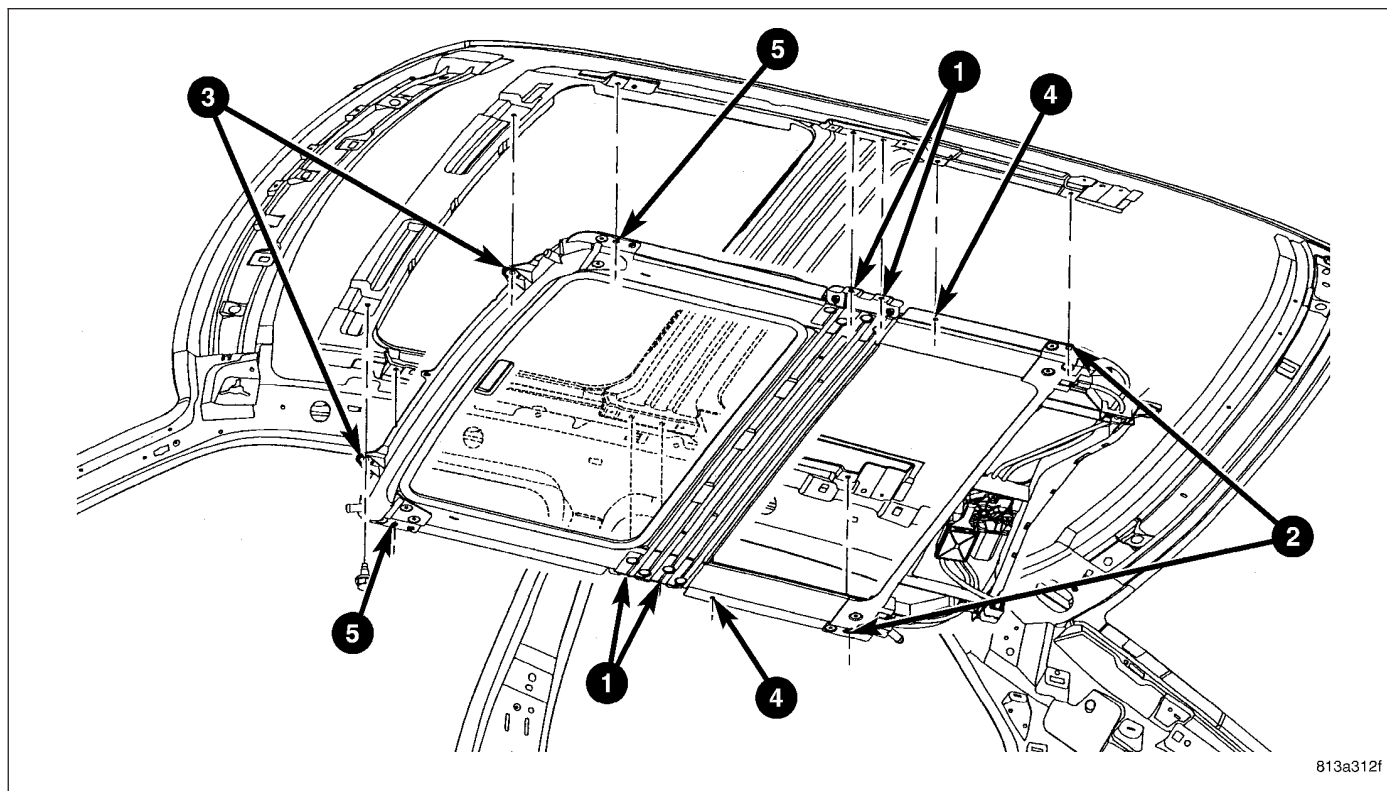
6. Remove the eight fasteners (3) attaching sunroof assembly.
7. With the aid of a helper, support the sunroof and remove the fasteners (2) attaching sunroof assembly (1) to roof panel.
8. Remove the sunroof (1) from vehicle.

## INSTALLATION

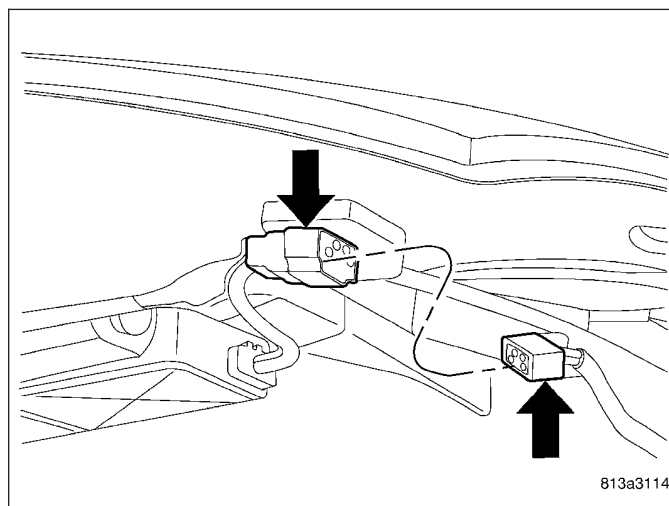


**WARNING:** The Excessive Force Limitation (EFL) feature must be calibrated any time a sunroof motor/module is replaced with a new component. Failure to perform this procedure could result in vehicle damage and/or personal injury. (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - EXCESSIVE FORCE LIMITATION (EFL) CALIBRATION) for the appropriate procedure.

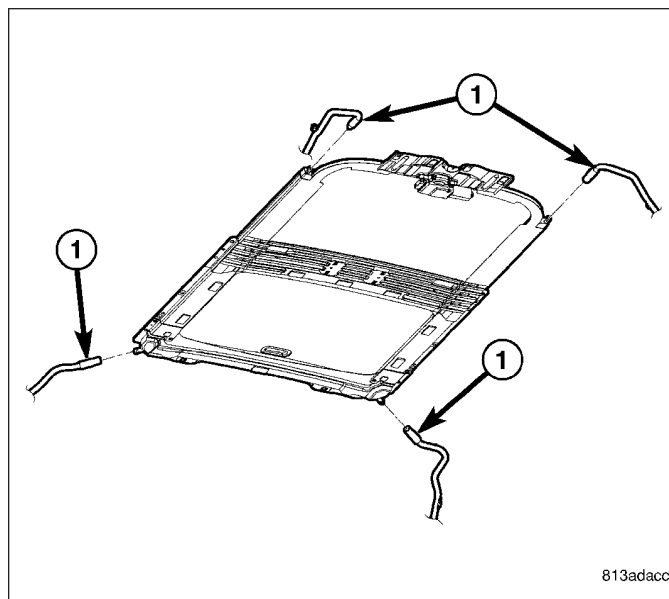
1. Verify that glass panel is loose and slightly retracted.
2. Raise sunroof module assembly (1) and guide it carefully into position.



3. While supporting the sunroof assembly start the 12 attaching screws and tighten the attaching screws to 6 N·m (53 in. lbs.) using the sequence shown.
4. Connect the electrical connector.



5. Connect the drain tubes to the sunroof (1).
6. Adjust the sunroof glass. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS)
7. Connect battery negative cable.
8. Install the vehicle headliner, (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION).
9. Perform the sunroof position calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - SUNROOF POSITION CALIBRATION).
10. Perform the Excessive Force Limitation (EFL) calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - EXCESSIVE FORCE LIMITATION (EFL) CALIBRATION).
11. Verify proper operation of the power sunroof system.

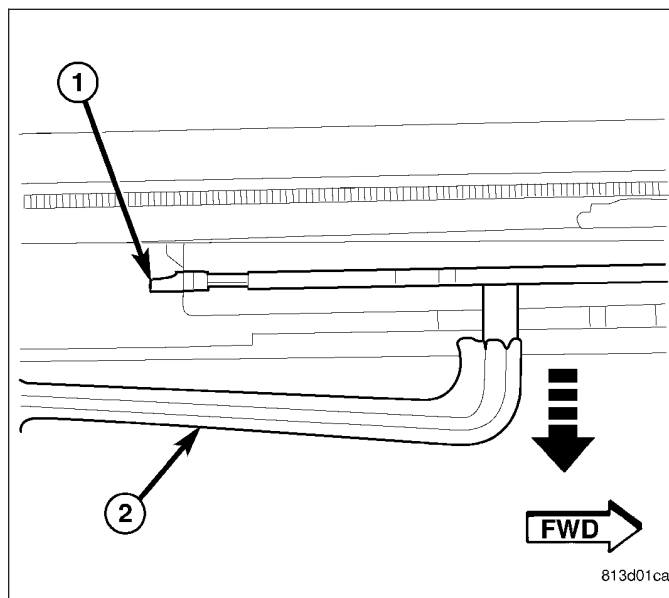


## CHANNEL-DRAIN

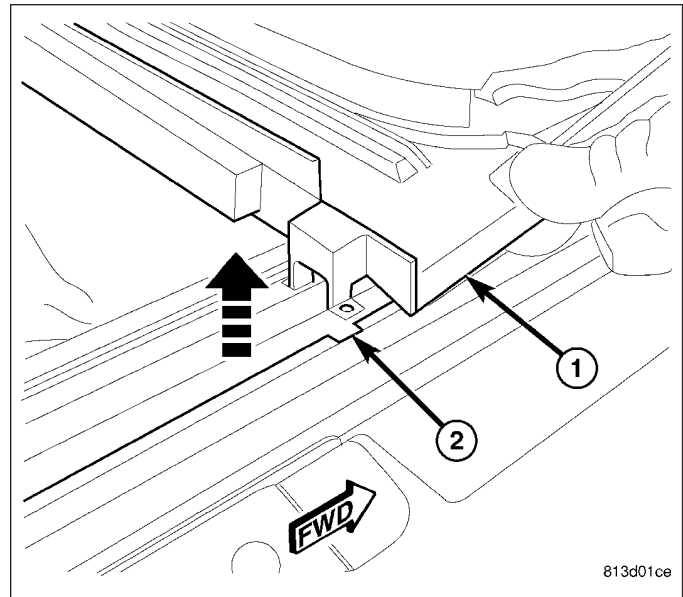
### REMOVAL

1. Remove glass panel (2). (Refer to 23 - BODY/SUNROOF/GLASS PANEL - REMOVAL)
2. Separate the drain channel arms (2) from the guide mechanisms (1) one at a time.

**CAUTION:** Do not pry the channel arms apart at the same time or you could break the drain channel.

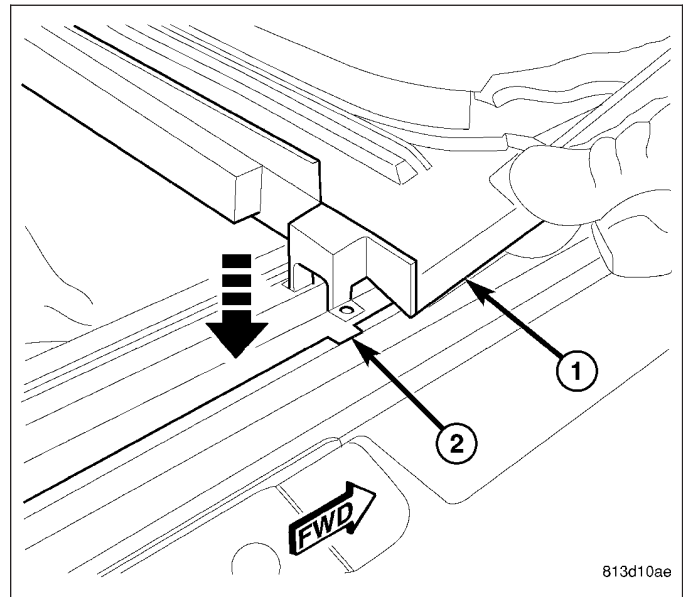


3. Carefully slide the drain channel (1) forward to the notches (2) in the frame and remove from the vehicle.



## INSTALLATION

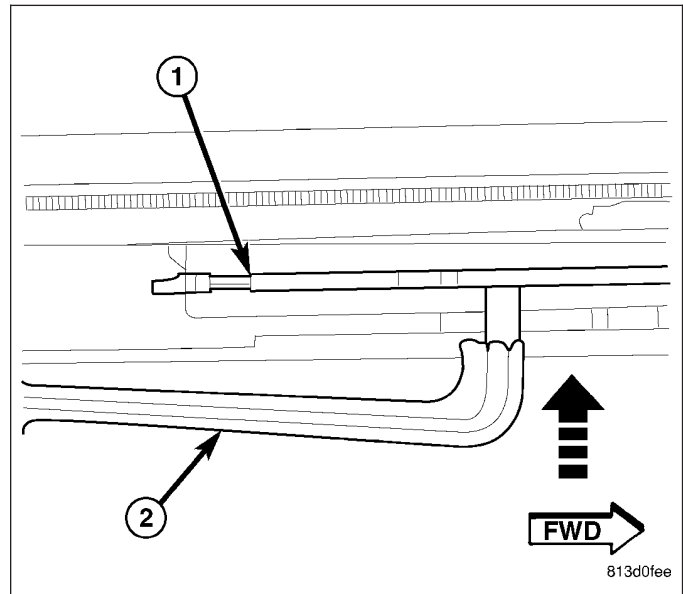
1. Carefully position the drain channel (1) into the notches (2) in the frame and slide rearward.



2. Install the drain channel arms (2) into the mechanism (1) holes one at a time with the reinforcements on the inside of mechanism arms.

**CAUTION: Do not pry the channel arms apart at the same time or you could break the drain channel.**

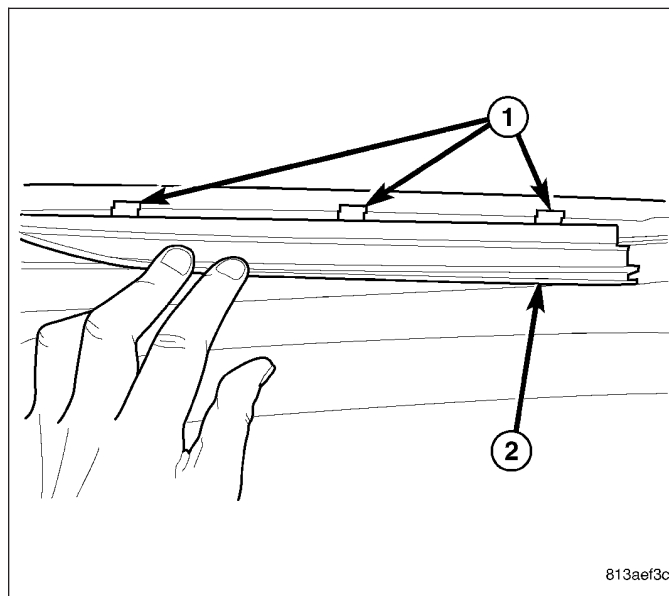
3. Install the sunroof glass. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - INSTALLATION)



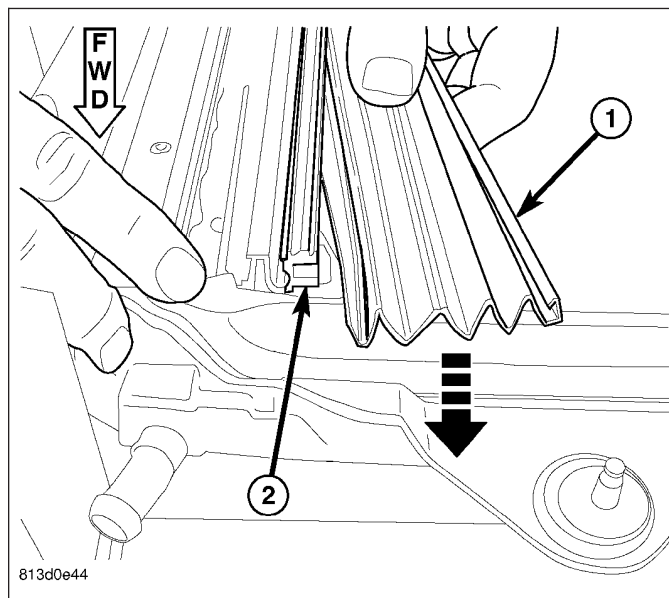
## COVER-GUIDE MECHANISM

### REMOVAL

1. Move the glass panel to the full closed position.
2. Slide sunshade rearward to the open position.
3. Separate the mechanism covers (2) from the tabs (1) on the glass panel.

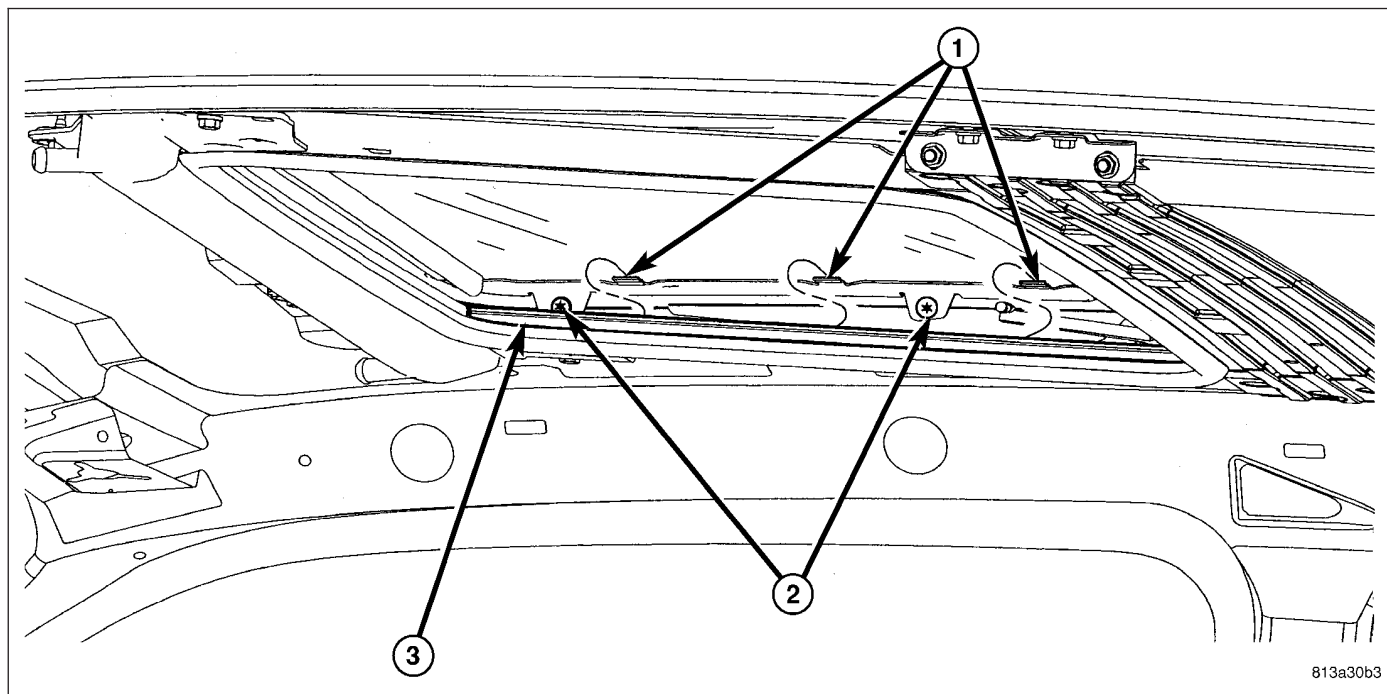


4. Hold both mechanism covers down and open the sunroof fully.
5. Slide the mechanism covers (1) out the front of the guide in the frame (2).





## INSTALLATION

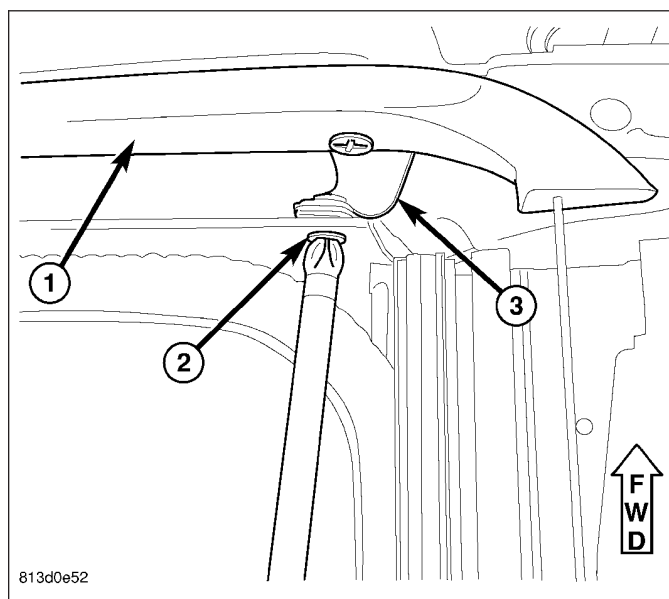


1. With the sunroof in the open position, snap the mechanism cover into the lower guide channel.
2. Hold down each cover and close the sunroof.
3. Snap the upper portion of the cover into the retaining clips (1) on the glass panel between the locating features.

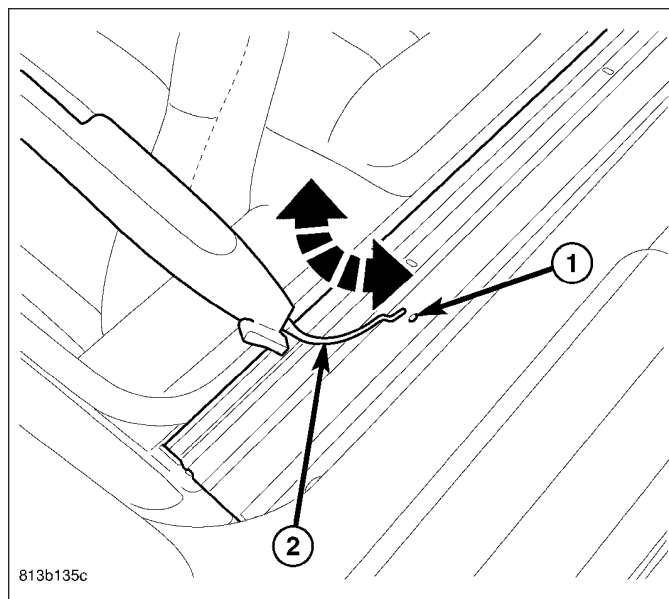
## DEFLECTOR-WIND

### REMOVAL

1. Open the sunroof fully.
2. Remove the strap screws (2) from the beam area release the strap (3).

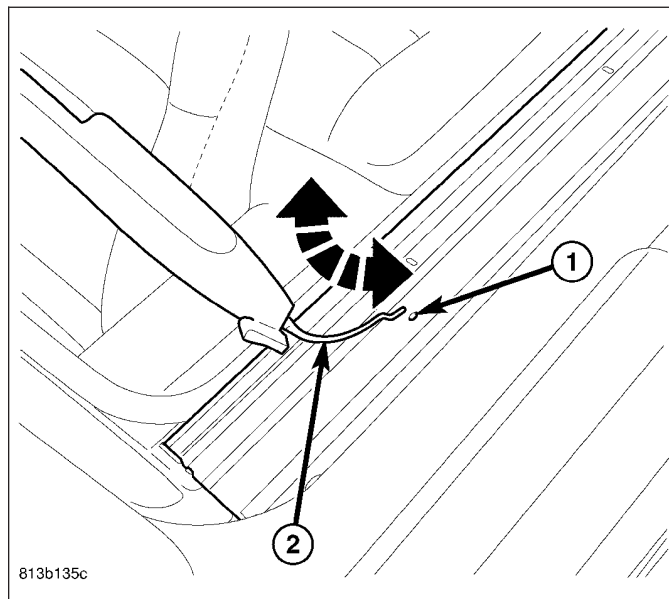


3. Rotate the deflector up and remove springs (2) from the holes in the frame (1).

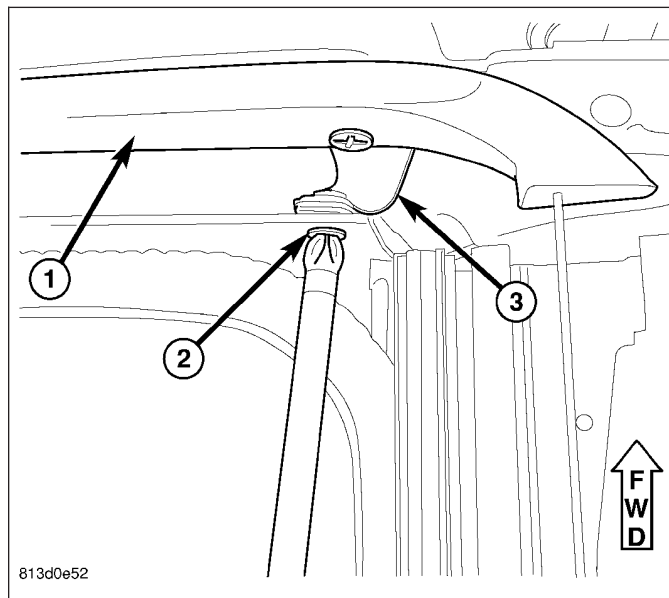


## INSTALLATION

1. Position the deflector spring arms (2) into the holes of the frame (1).



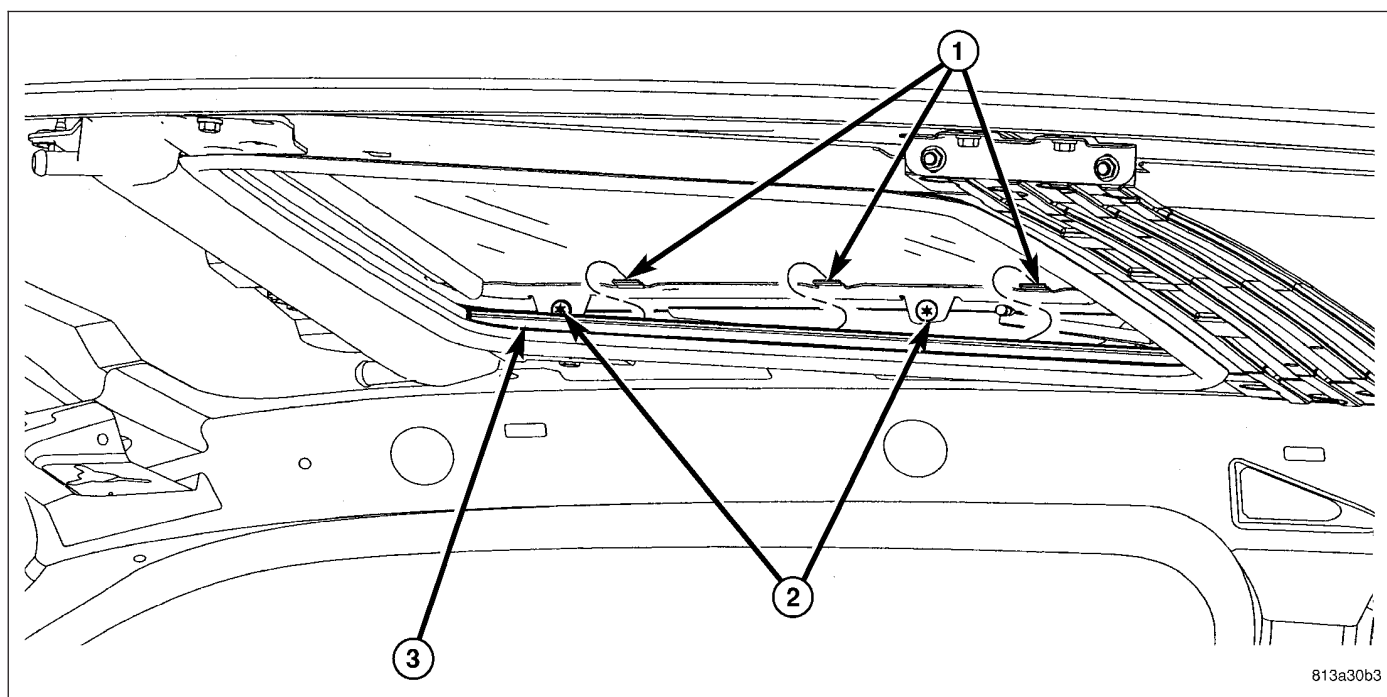
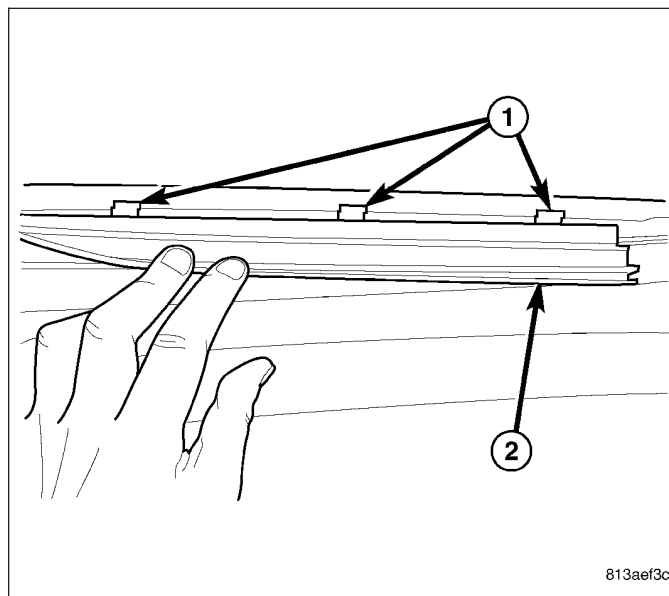
2. Rotate the deflector down, attach the straps (3) and install the strap screws (2) into the front beam.
3. Verify sunroof operation and alignment.



## GLASS

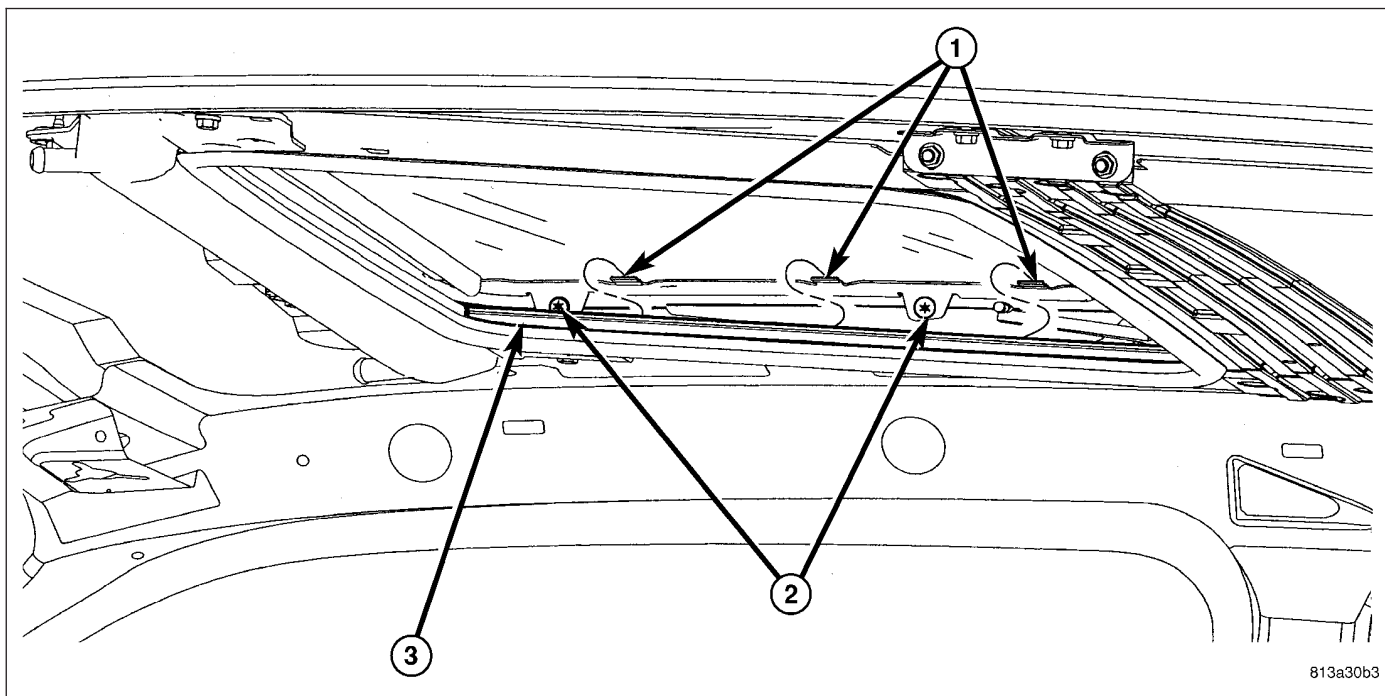
### REMOVAL

1. Move the glass panel (2) to the full closed position.
2. Slide sunshade rearward to the open position.
3. Separate the mechanism covers (2) from the tabs (1) on the glass panel.



4. Remove the glass panel screws (2).
5. Lift off glass panel and remove from vehicle.

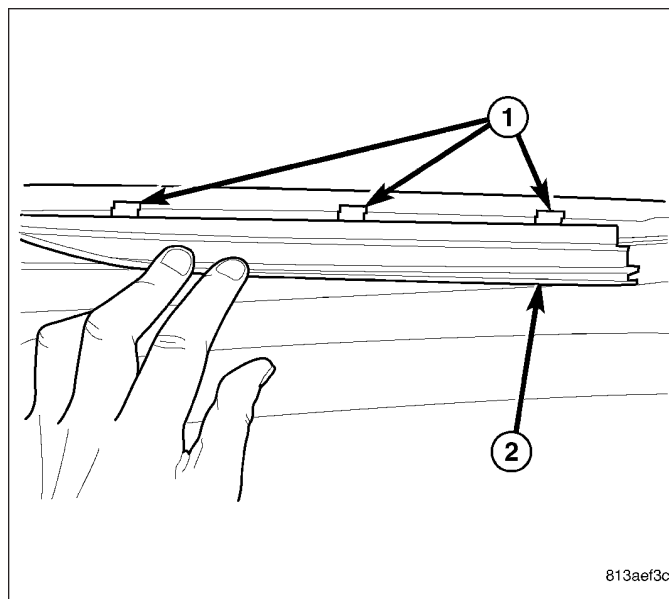
## INSTALLATION



1. Position glass panel on to mechanism lift arms.

**CAUTION:** Verify that the retaining tabs are located on the **INSIDE** of the guide mechanism arms.

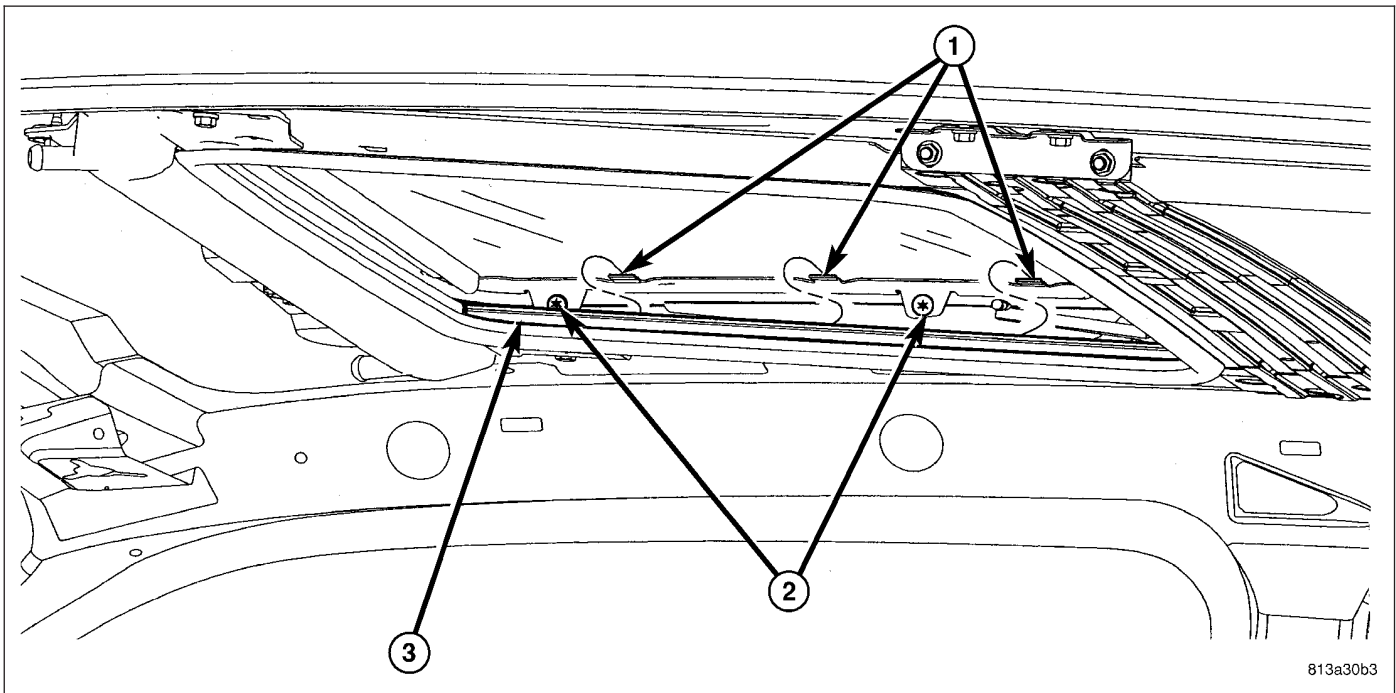
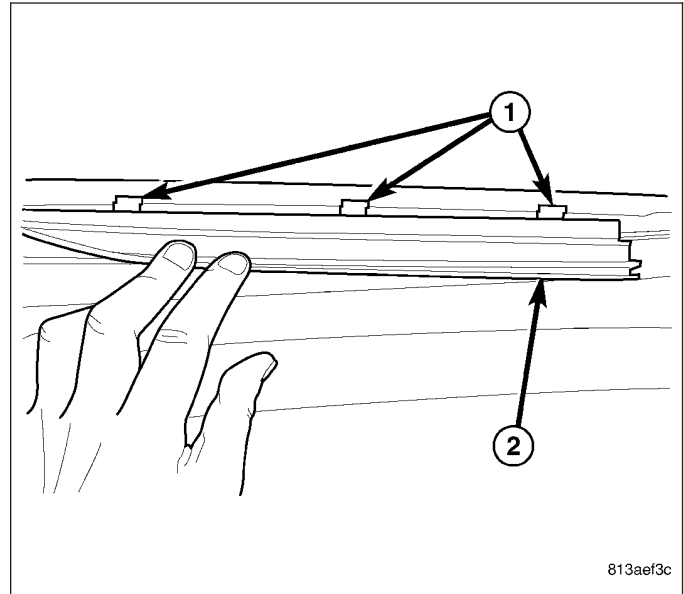
2. Start the attaching screws (2).
3. Connect a 12v power supply and verify that the sunroof is in the closed position.
4. Adjust sunroof glass to fit flush with roof line (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS).
5. Tighten the screws to 5.5 N·m (49 in. lbs.).
6. Position the mechanism covers (2) over the glass tabs (1) between the locating features and seat fully.
7. Verify sunroof operation and alignment.



## ADJUSTMENTS

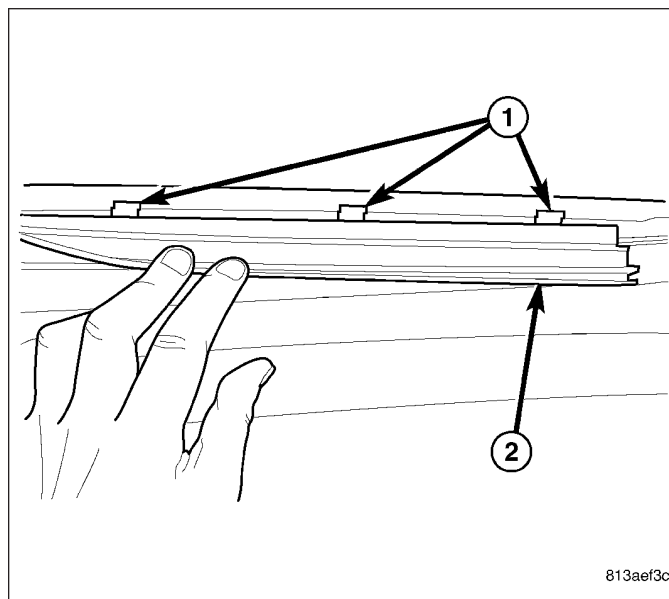
### ADJUSTMENT

1. Move the sunshade rearward to the open position.
2. Separate the mechanism covers (2) from the tabs (1) on the glass panel.



3. Verify the sunroof glass panel is in the fully closed position.
4. Loosen the forward attaching screws (2) on each side enough to permit the front of the glass to adjust up or down.
5. Adjust the front surface of the sunroof glass panel 0.00 mm to 2 mm (0.00 in. to 0.08 in.) **below** the top surface of the roof.
6. Tighten the front glass panel attaching screws to 5.5 N·m (49 in. lbs.).
7. Loosen the rear screws (2) on each side enough to make the rear adjustment.
8. Adjust the rear surface of the sunroof glass panel 0.00 mm to 2 mm (0.03 in. to 0.08 in.) **above** the top surface of the roof.
9. Tighten the rear glass panel attaching screws to 5.5 N·m (49 in. lbs.).
10. Check for proper fit. If not OK, repeat glass panel adjustment.

11. Position the mechanism covers (2) over the glass tabs (1) between the locating features and seat fully.
12. Verify sunroof operation and alignment.



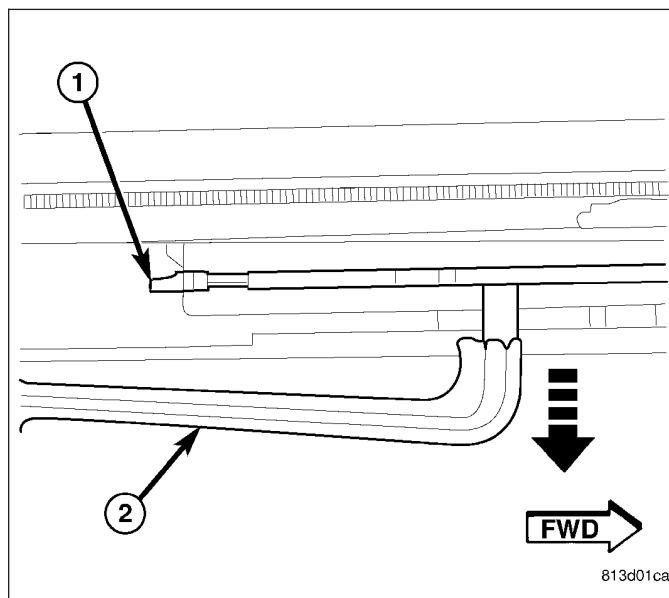
## GUIDE-SUNROOF GLASS

### REMOVAL

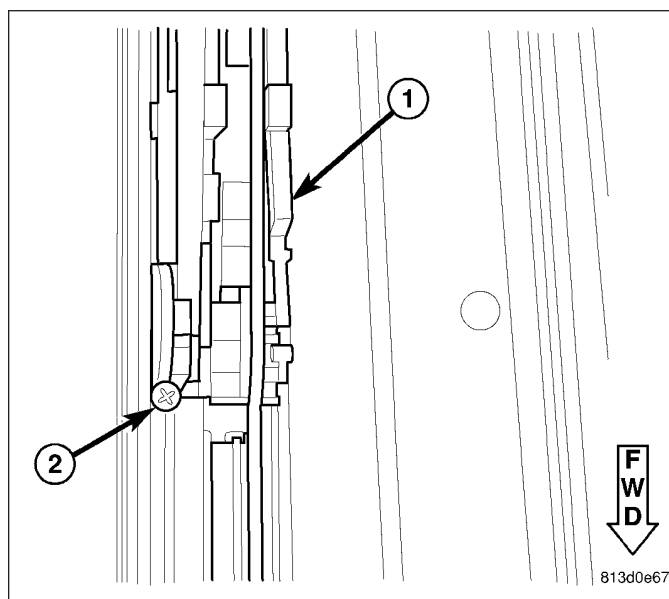
1. Place the sunroof in the vent position.
2. Remove the sunroof assembly. (Refer to 23 - BODY/SUNROOF/ASSEMBLY-MODULE - REMOVAL)
3. Remove the motor. (Refer to 8 - ELECTRICAL/POWER TOP - SUNROOF SERVICE INFO/MOTOR/MODULE-SUNROOF - REMOVAL)
4. Remove the glass. (Refer to 23 - BODY/SUNROOF/GLASS - REMOVAL)
5. Remove the wind deflector. (Refer to 23 - BODY/SUNROOF/DEFLECTOR-WIND - REMOVAL)
6. Separate the drain channel arms (2) from the guide mechanisms (1) one at a time.

**CAUTION:** Do not pry the channel arms apart at the same time or you could break the drain channel.

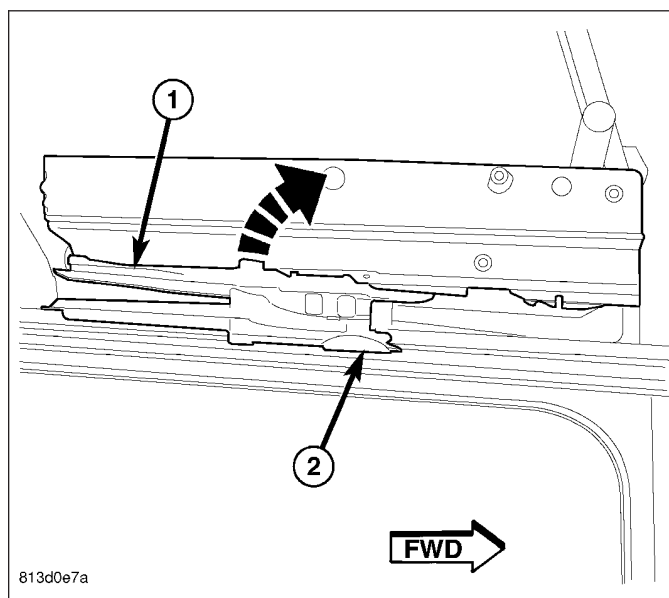
7. Slide the drain channel rearward out of the way.



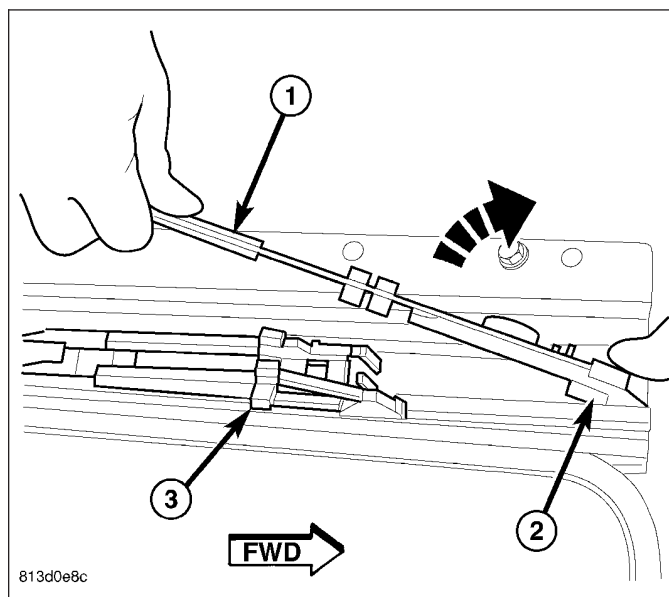
8. Remove the hard stop screw from the frame.



9. push the drive cable and guide plate forward past the hard stop screw location until the glass guide comes loose.

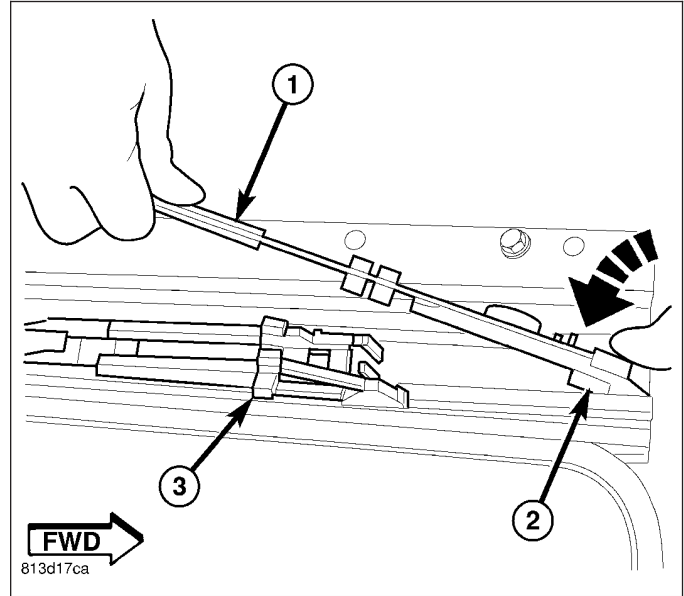


10. Rotate the guide (1) up and out of the front beam (3) and release the front foot (2) from the channel guide.

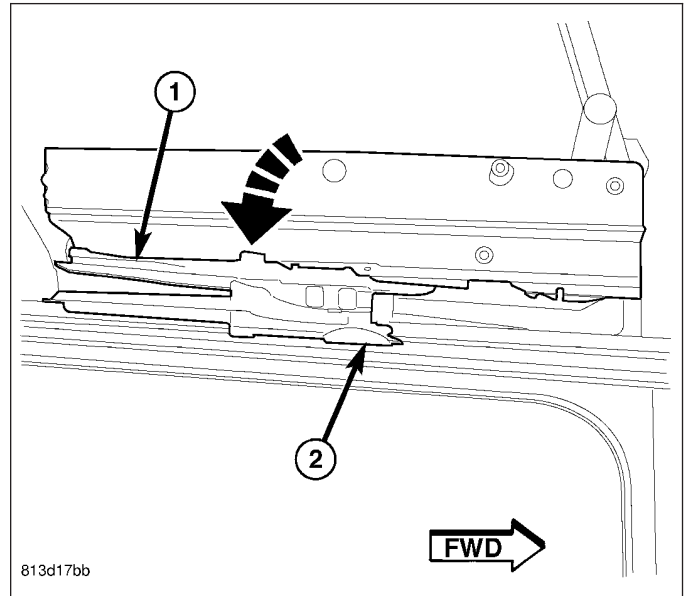


## INSTALLATION

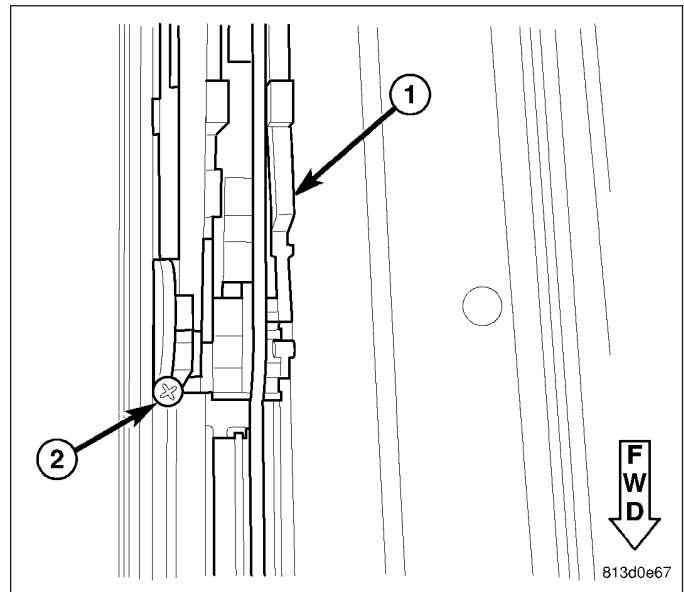
1. With the drive cable plate aligned insert the front foot (2) into the guide channel and engage the feet with the front beam (3).



2. Rotate the guide plate (1) inboard until the feet of the guide are engaged into the front beam (2).



3. Push the guide assembly (1) and drive cable rearward past the hard stop location.
4. Install the hard stop screw (2) and push the drive cable and guide assembly (1) up against the hard stop screw (2).
5. Verify that the opposite guide assembly is also positioned up against the hard stop screw.
6. Install the wind deflector as necessary. (Refer to 23 - BODY/SUNROOF/DEFLECTOR-WIND - INSTALLATION)
7. Install the motor as necessary. (Refer to 8 - ELECTRICAL/POWER TOP - SUNROOF SERVICE INFO/MOTOR/MODULE-SUNROOF - INSTALLATION)

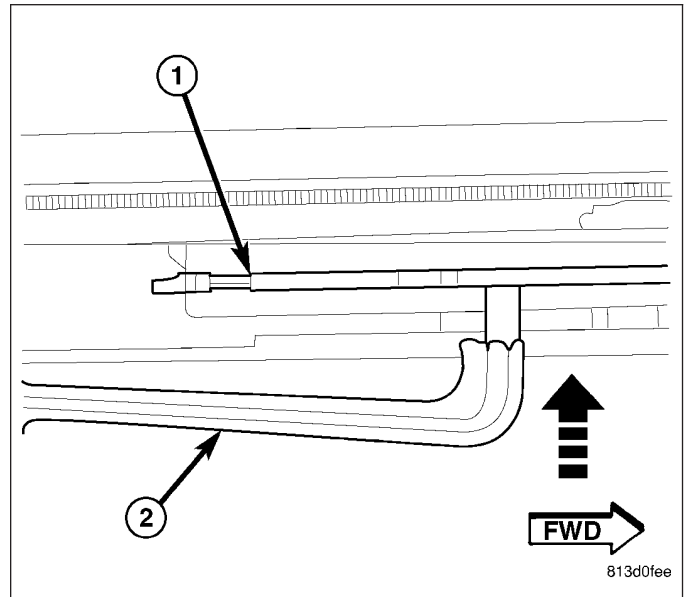




8. Install the drain channel arms (2) into the mechanism (1) holes one at a time with the reinforcements on the inside of mechanism arms.

**CAUTION:** Do not pry the channel arms apart at the same time or you could break the drain channel.

9. Install the sunroof assembly into the vehicle. (Refer to 23 - BODY/SUNROOF/ASSEMBLY-MODULE - INSTALLATION)
10. Perform the sunroof position calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - SUNROOF POSITION CALIBRATION).
11. Perform the Excessive Force Limitation (EFL) calibration, (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - STANDARD PROCEDURE - EXCESSIVE FORCE LIMITATION (EFL) CALIBRATION).
12. Install the glass as necessary. (Refer to 23 - BODY/SUNROOF/GLASS - INSTALLATION)
13. Adjust sunroof glass to fit flush with roof line (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS).
14. Verify proper operation of the power sunroof system.

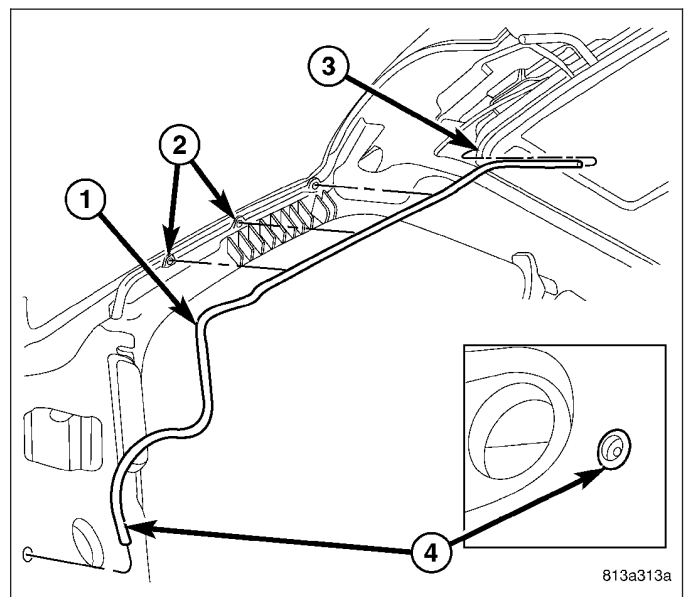


## HOSE-DRAIN

### REMOVAL

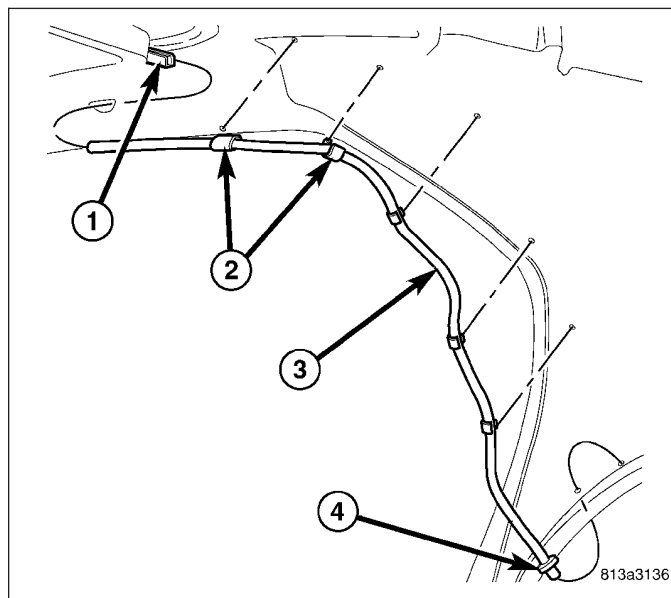
#### FRONT HOSES

1. Remove headliner (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).
2. Disconnect the drain hose from the sunroof housing (3).
3. Separate the lower tube from the grommet in the body (4).
4. Drain any liquid from hose connection, if necessary.
5. Release the clips (2) and remove the tube (1).



## REAR HOUSING HOSE

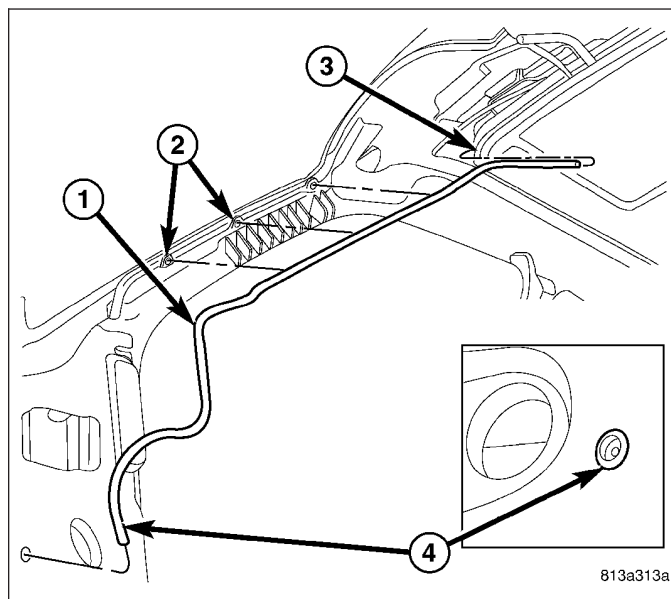
1. Remove headliner (Refer to 23 - BODY/INTERIOR/ HEADLINER - REMOVAL).
2. Disconnect the drain hose from the sunroof housing (1).
3. Drain any liquid from hose connection, if necessary.
4. Release the push pin fasteners (2) and separate the lower tube from the grommet in the body (4).



## INSTALLATION

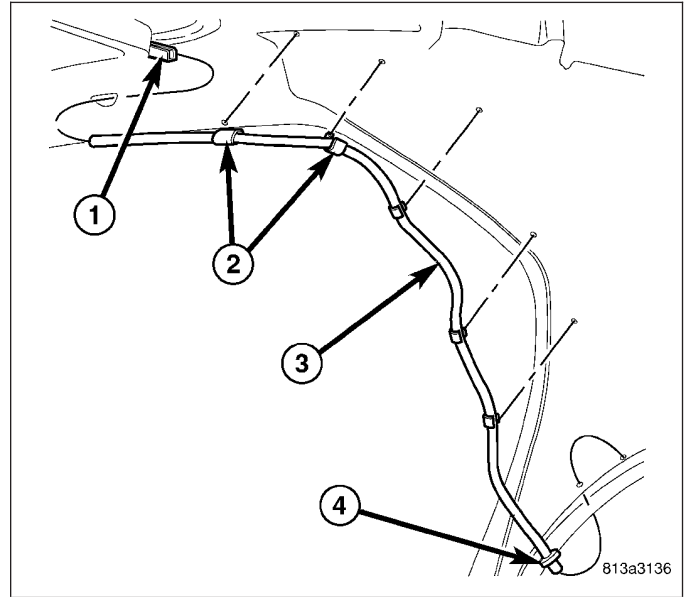
### FRONT HOSES

1. Position the lower portion through the grommet in the body (4).
2. Connect the new drain hose (1) to the sunroof housing (3) and test drainage.
3. Position the hose (1) into the support clips (2).
4. Install headliner (Refer to 23 - BODY/INTERIOR/ HEADLINER - INSTALLATION).



## REAR HOUSING HOSE

1. Install the rear hose (3) and seat the push pin fasteners (2) fully.
2. Position the lower portion through the grommet in the body (4).
3. Connect the new drain hose (3) to the sunroof housing (1) and test drainage.
4. Install headliner (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION).



## MOTOR

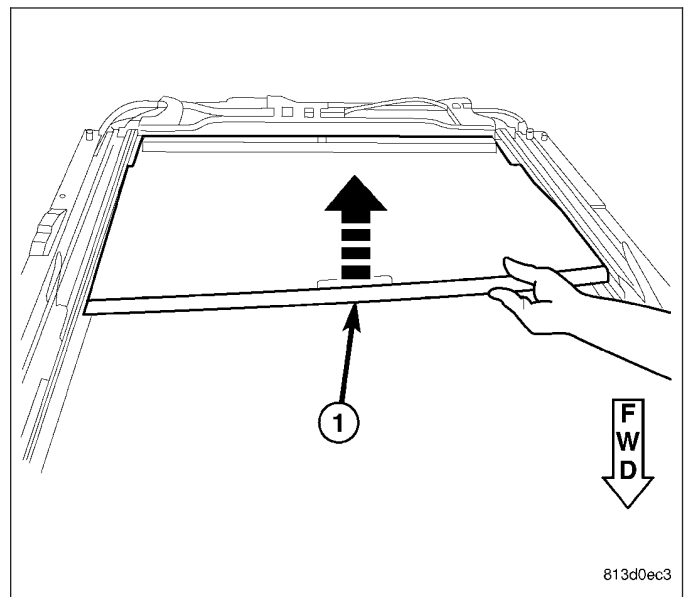
### DESCRIPTION

For service information refer to (Refer to 8 - ELECTRICAL/POWER TOP/MOTOR - DIAGNOSIS AND TESTING).

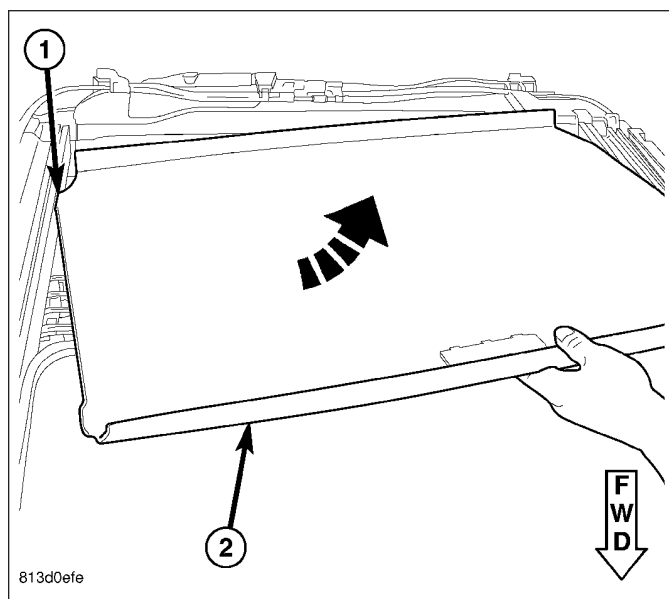
## SUNSHADE

### REMOVAL

1. Remove the drain channel. (Refer to 23 - BODY/SUNROOF/CHANNEL-DRAIN - REMOVAL)
2. Push up the front center of the sunshade (1) to pop out the front two feet.

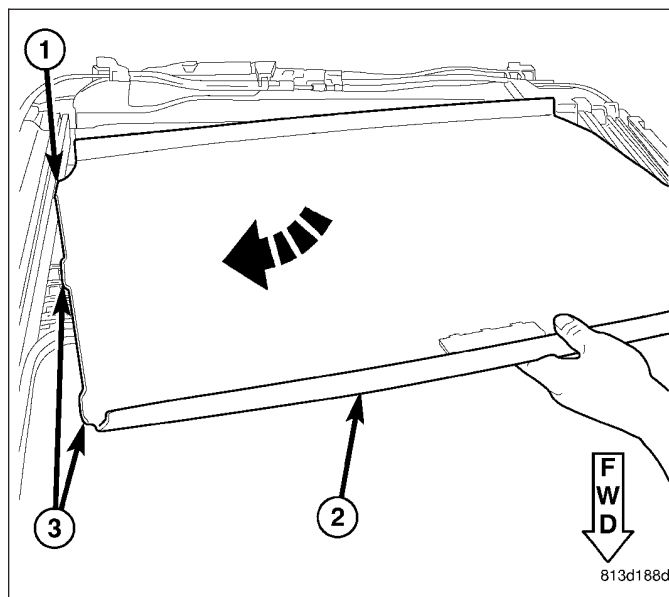


3. Rotate the sunshade (2) so that the other feet (1) are removed from the guide track.

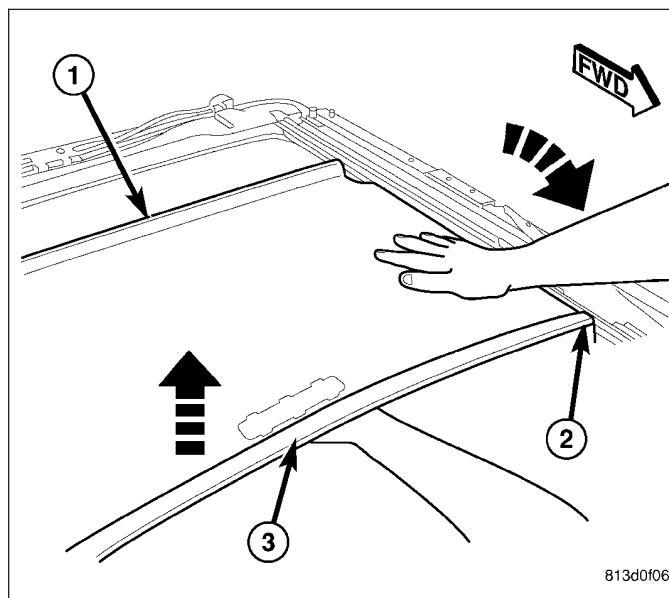


## INSTALLATION

1. Verify the sunshade track is free of obstructions like the trim lace.
2. Start with sunshade (2) at an angle with one foot (1) in the track.
3. Rotate the sunshade so the other rear foot is in the track as well as the 2 other feet (3) on the same side as the first foot.



4. To insert the remaining two feet (2) apply force to the middle front of sunshade (3) and guide them into the track.
5. Check that all the feet are in the right track and verify sunshade operation.
6. Install the drain channel. (Refer to 23 - BODY/SUNROOF/CHANNEL-DRAIN - INSTALLATION)



## SWITCH-SUNROOF

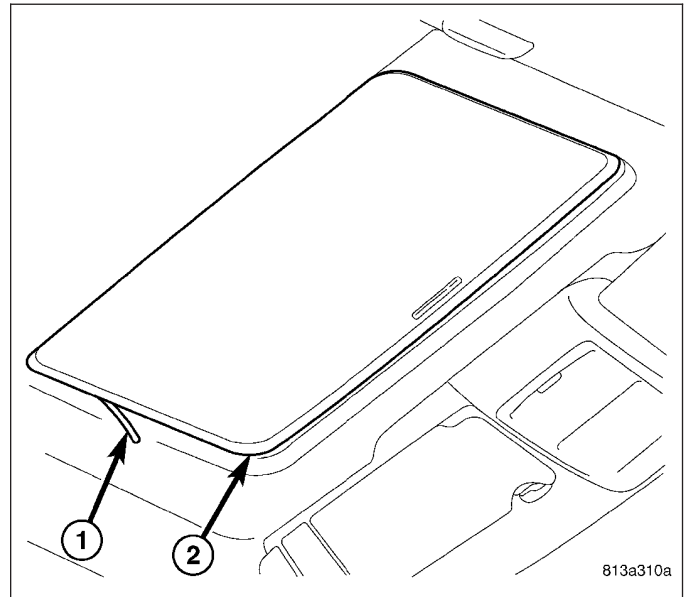
### DESCRIPTION

For service information refer to (Refer to 8 - ELECTRICAL/POWER TOP/SWITCH - DIAGNOSIS AND TESTING).

### TRIM LACE

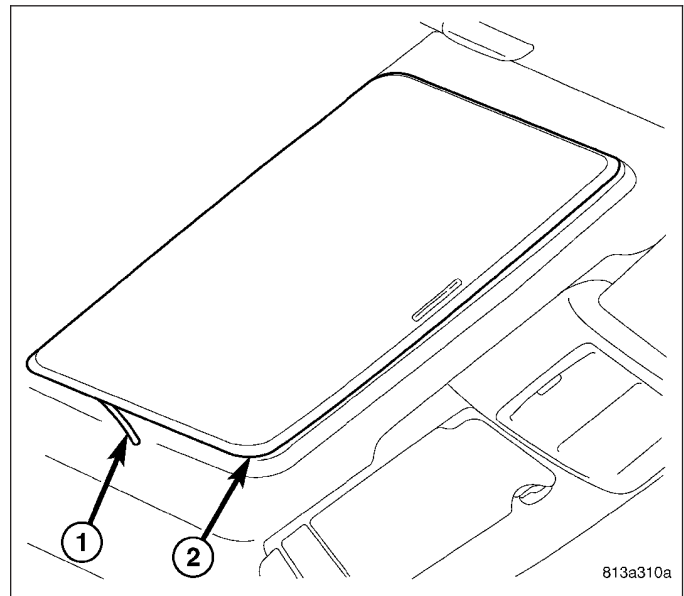
#### REMOVAL

1. Remove trim lace (2) by holding one end of the trim lace at the butt joint and pulling horizontally into the opening until lace is completely loose from the headliner/sunroof joint.



#### INSTALLATION

1. Place butt joint of trim lace into position starting at the drivers side middle of the opening at the butt joint notch in the u-frame.
2. Push lace into position.
3. Ensure that the corner radii is fully engage.
4. Once the trim lace is attached to sunroof module using a trim stick C-4755 or equivalent, begin tucking the headliner under the lip on the trim lace working all the way around the opening. When installing a new trim lace, begin tucking the headliner under the lip as the tear cord (1) is removed working all the way around the opening.



## BODY STRUCTURE

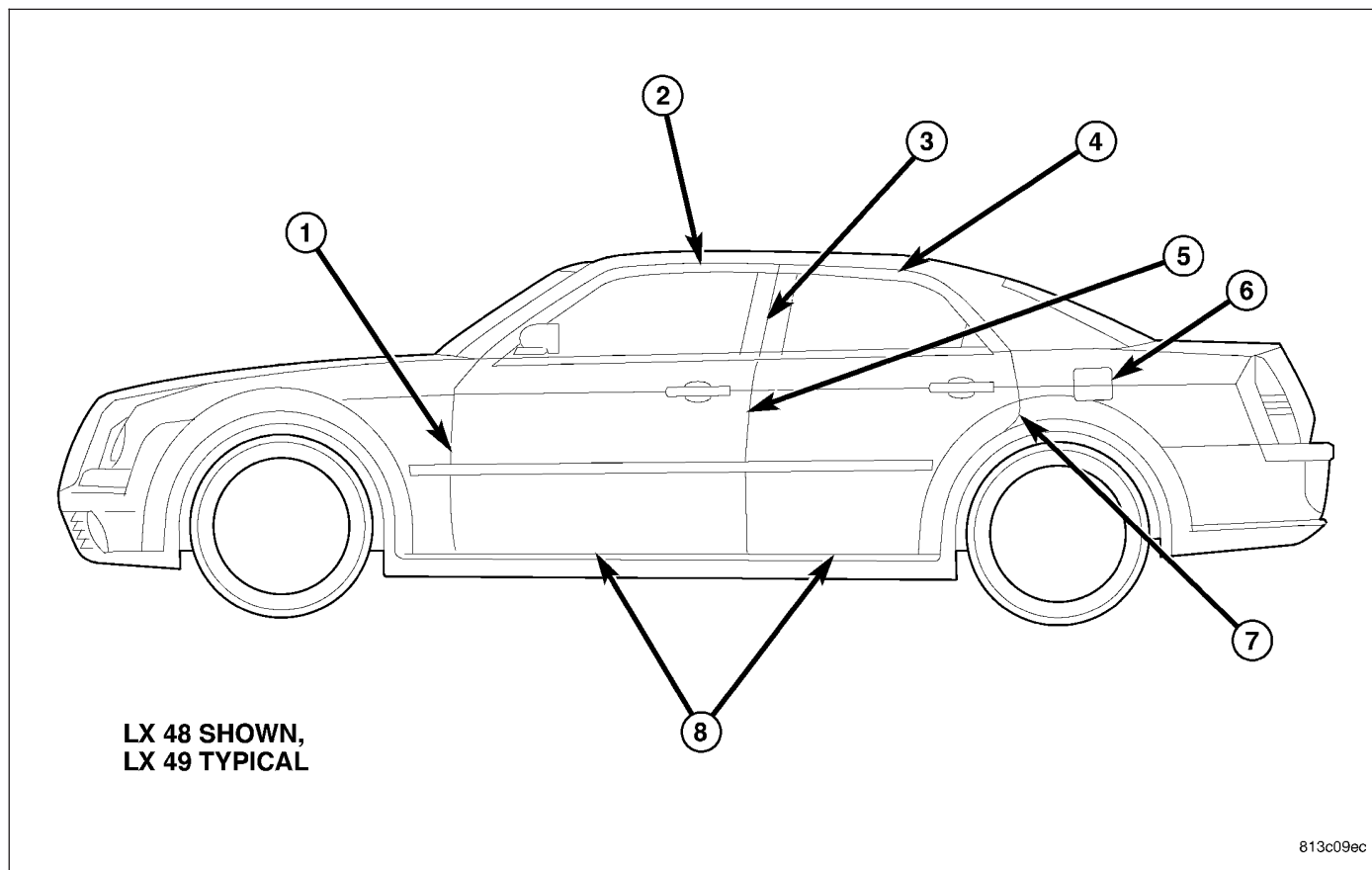
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## GAP AND FLUSH

### SPECIFICATIONS

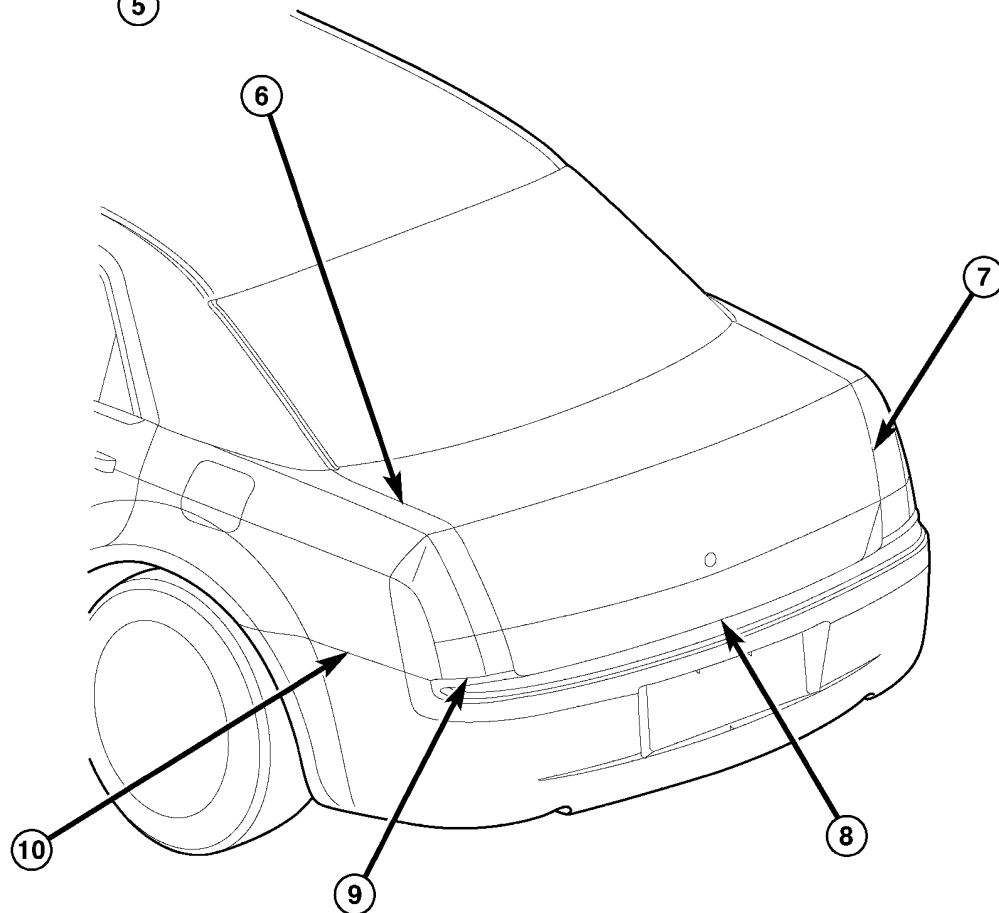
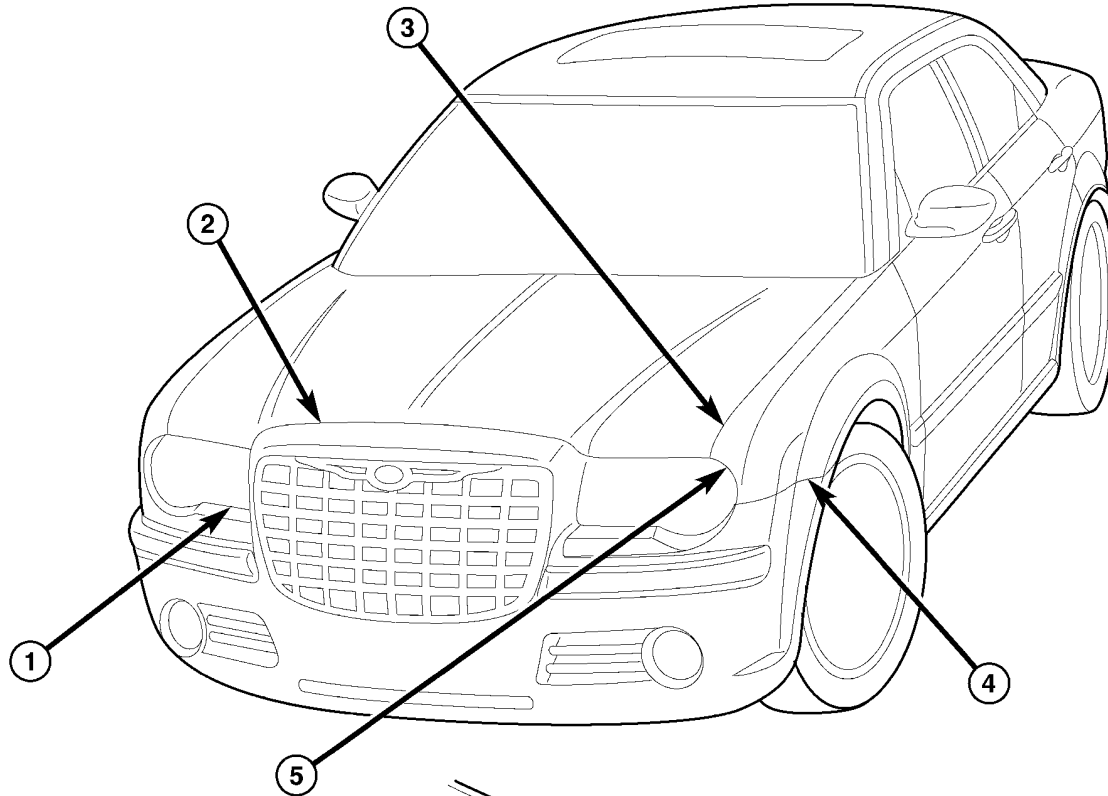
### GAP AND FLUSH



**Note: ALL DIMENSIONS ARE IN MILLIMETERS.**

**WAGON & SEDAN MEASUREMENTS**

DIMENSION	LOCATION	GAP	FLUSH
1	FRONT DOOR TO FENDER	$4.0 \pm 1.0$ PARALLEL WITHIN 1.0	FENDER OVERFLUSH $0.8 \pm 1.0$
2	FRONT DOOR TO ROOF	$4.7 +1.5/-1.0$ PARALLEL WITHIN 1.5	DOOR UNDERFLUSH $1.5 \pm 1.5$
3	FRONT DOOR TO REAR DOOR	$4.0 \pm 1.5$	—
4	REAR DOOR TO ROOF	$4.7 +1.5/-1.0$ CONSISTENT WITHIN 2.0	DOOR UNDERFLUSH $1.5 \pm 1.5$
5	FRONT DOOR TO REAR DOOR	$4.0 \pm 1.0$ PARALLEL WITHIN 1.0	FRONT DOOR OVERFLUSH 0.0 - 2.0
6	FUEL FILLER DOOR TO QUARTER PANEL	$3.0 \pm 1.0$ UNIFORM WITHIN 1.0	FUEL DOOR UNDERFLUSH $0.5 \pm 1.0$
7	REAR DOOR TO QUARTER PANEL	$4.0 \pm 1.0$ PARALLEL WITHIN 1.0	$0.0 \pm 1.0$
8	FRONT AND REAR DOOR TO SILL	$6.0 \pm 2.0$ PARALLEL WITHIN 2.0	—

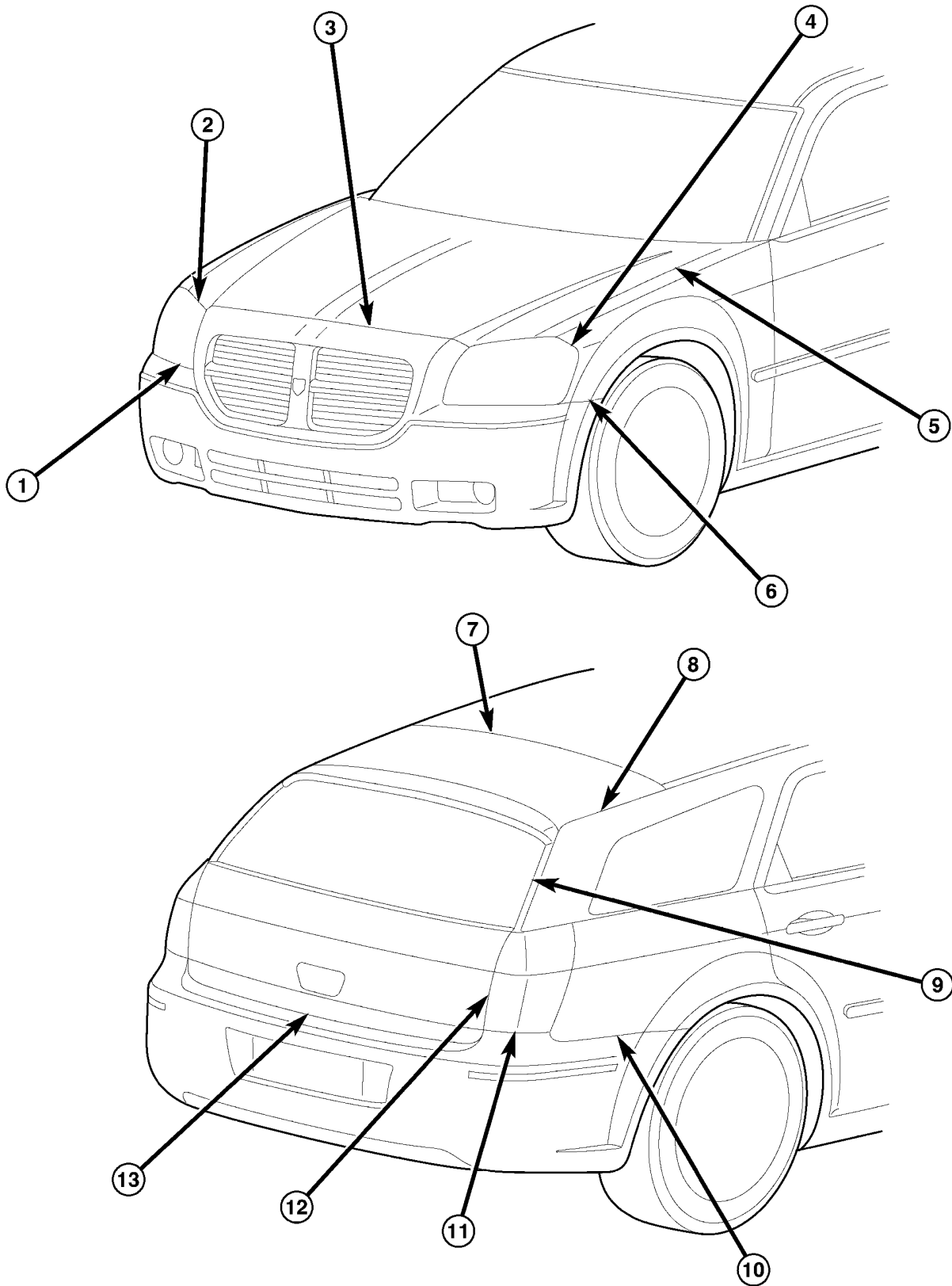




**Note: ALL DIMENSIONS ARE IN MILLIMETERS.**

**SEDAN MEASUREMENTS**

DIMENSION	LOCATION	GAP	FLUSH
1	FASCIA TO HEADLAMP	$3.0 \pm 2.0$ PARALLEL WITHIN 1.5 LH/RH DIFFERENCE WITHIN 2.0	—
2	HOOD TO FASCIA	$3.5 \pm 1.5$ PARALLEL WITHIN 2.0	FASCIA OVERFLUSH $1.0 \pm 1.5$
3	HOOD TO FENDER	$3.5 \pm 1.0$ PARALLEL WITHIN 1.0 LH/RH DIFFERENCE WITHIN 1.0	$0.0 \pm 1.5$
4	FASCIA TO FENDER	$0.0 \pm 1.0$	$0.0 \pm 1.0$
5	HEADLAMP TO FENDER	$3.0 \pm 1.0$ LH/RH DIFFERENCE WITHIN 1.5	—
6	DECKLID TO QUARTER PANEL	$3.5 \pm 1.0$ PARALLEL WITHIN 1.0 LH/RH DIFFERENCE WITHIN 1.0	DECKLID UNDERFLUSH $0.8 \pm 1.5$
7	DECKLID TO TAIL LAMP	$4.0 \pm 2.0$ PARALLEL WITHIN 1.0 LH/RH DIFFERENCE WITHIN 1.0	TAIL LAMP OVERFLUSH $1.0 \pm 2.0$
8	DECKLID TO FASCIA	$6.5 \pm 2.0$ PARALLEL WITHIN 2.0	—
9	TAIL LAMP TO FASCIA	$2.0 \pm 1.5$ PARALLEL WITHIN 1.5	$0.0 \pm 1.5$
10	FASCIA TO QUARTER PANEL	$0.0 \pm 1.0$	$0.0 \pm 1.0$



Note: ALL DIMENSIONS ARE IN MILLIMETERS.

### WAGON MEASUREMENTS

DIMENSION	LOCATION	GAP	FLUSH
1	HEADLAMP TO FASCIA	4.5 ± 2.0 PARALLEL WITHIN 2.0 LH/RH DIFFERENCE WITHIN 2.0	—
2	HEADLAMP TO HOOD	4.5 ± 2.0 PARALLEL WITHIN 2.0 LH/RH DIFFERENCE WITHIN 2.0	HEADLAMP UNDERFLUSH 1.0 ± 1.5
3	HOOD TO FASCIA	3.5 ± 1.5 PARALLEL WITHIN 2.0	FASCIA OVERFLUSH 1.0 ± 1.5
4	HEADLAMP TO FENDER	3.5 ± 1.5 CONSISTENT WITHIN 2.0 LH/RH DIFFERENCE WITHIN 2.0	HEADLAMP UNDERFLUSH 1.0 ± 1.5
5	FENDER TO HOOD	3.5 ± 1.0 PARALLEL WITHIN 1.0 LH/RH DIFFERENCE WITHIN 1.0	0.0 ± 1.5
6	FASCIA TO FENDER	0.0 ± 1.0	0.0 ± 1.0
7	LIFTGATE TO ROOF	7.5 ± 1.5 PARALLEL WITHIN 1.5	LIFTGATE UNDERFLUSH 1.0 ± 1.5
8	LIFTGATE TO BODY SIDE	5.0 ± 1.5 PARALLEL WITHIN 1.5	—
9	LIFTGATE GLASS TO BODY SIDE	5.0 ± 1.5 PARALLEL WITHIN 2.0 LH/RH DIFFERENCE WITHIN 2.0	LIFTGATE GLASS UNDERFLUSH 1.5 ± 1.5
10	FASCIA TO QUARTER PANEL	0.0 ± 1.0	0.0 ± 1.0
11	FASCIA TO TAIL LAMP	2.0 ± 1.5 PARALLEL WITHIN 1.5 LH/RH DIFFERENCE WITHIN 2.0	0.0 ± 1.5
12	LIFTGATE TO TAIL LAMP	5.0 ± 2.0 PARALLEL WITHIN 1.5 LH/RH DIFFERENCE WITHIN 2.0	TAIL LAMP OVERFLUSH 1.0 ± 2.0
13	LIFTGATE TO FASCIA	7.0 ± 2.0 PARALLEL WITHIN 2.0	—

OPENING DIMENSIONS

SPECIFICATIONS

OPENING DIMENSIONS

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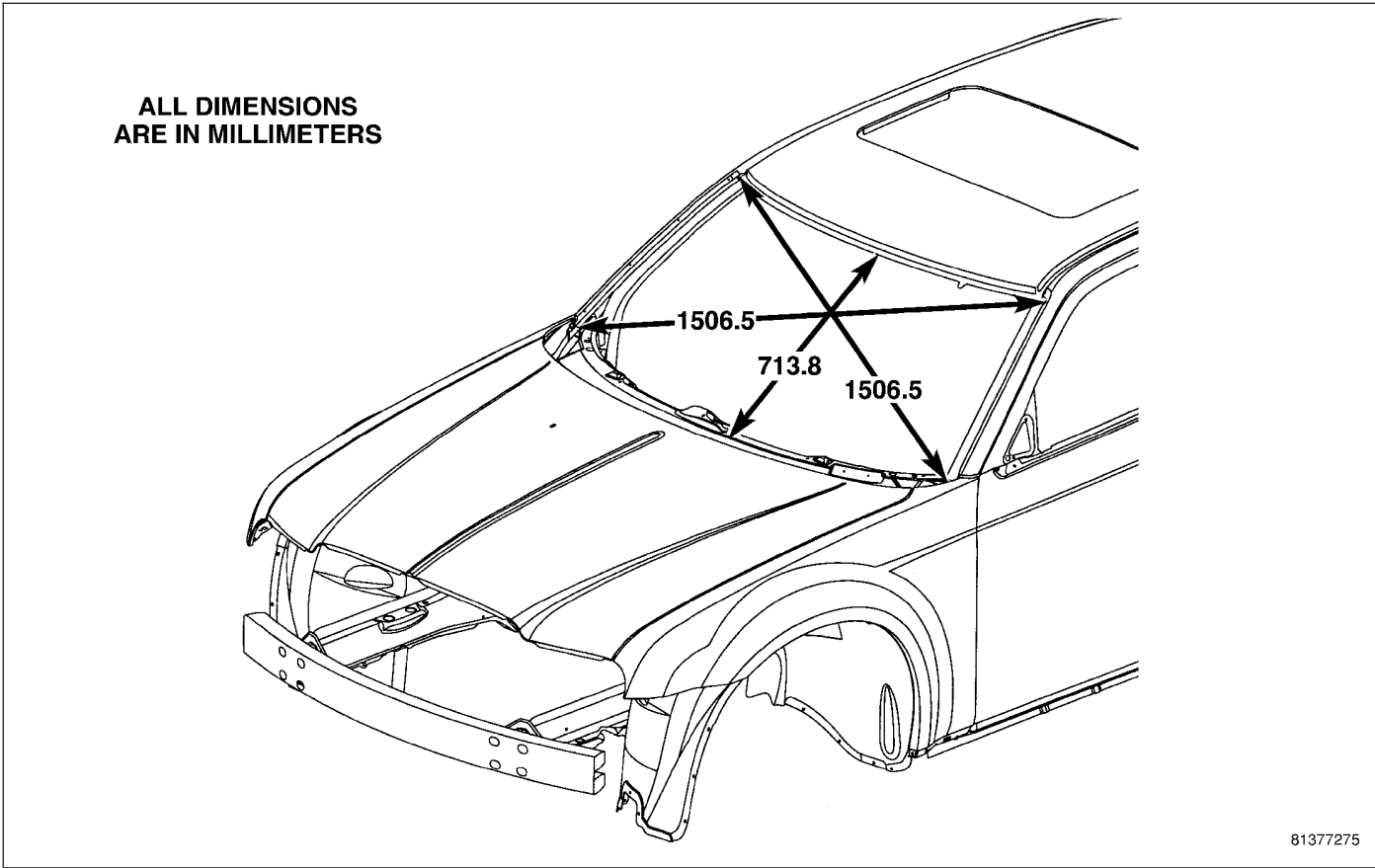
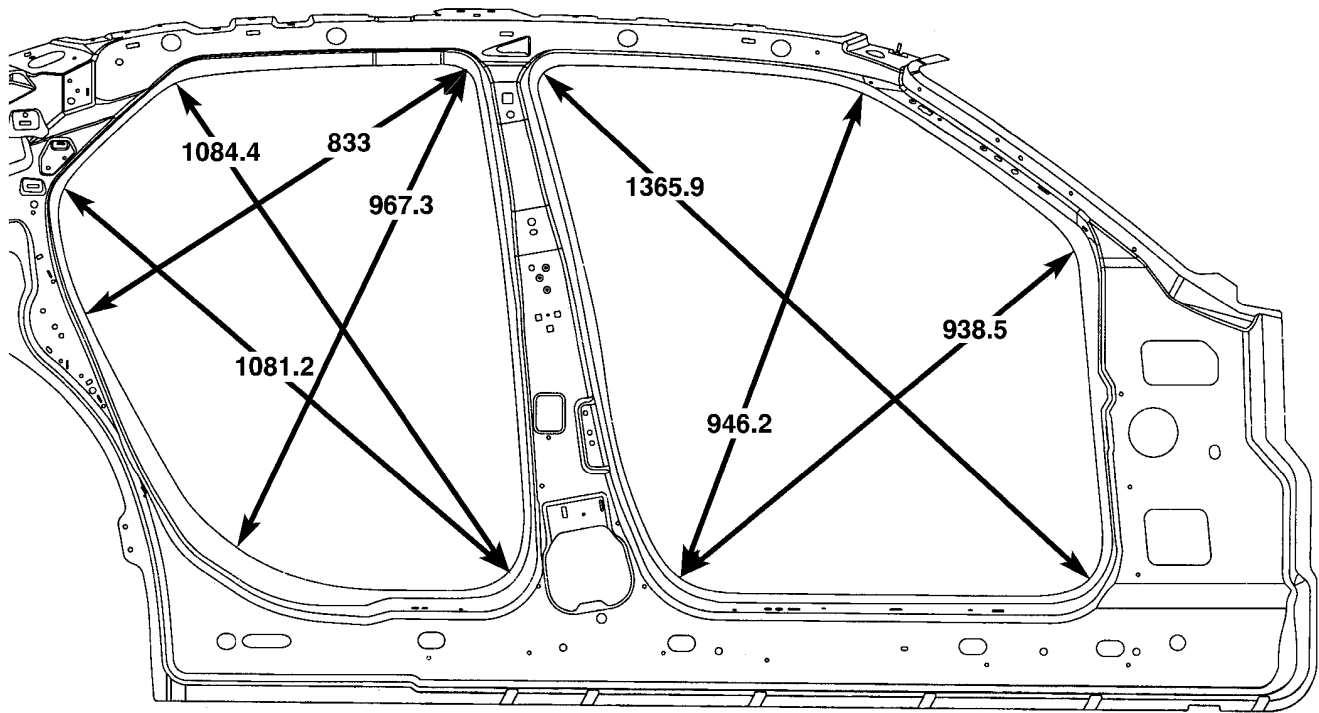


Fig. 1 WINDSHIELD OPENING

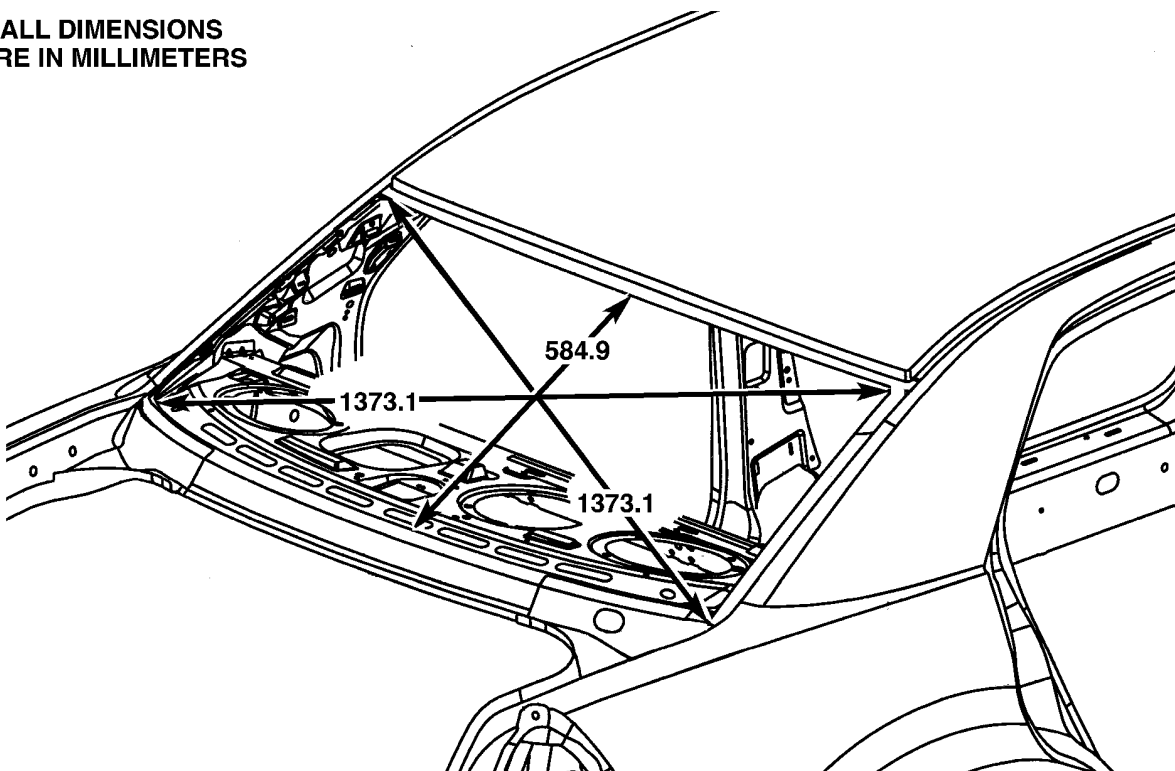


ALL DIMENSIONS ARE IN MILLIMETERS

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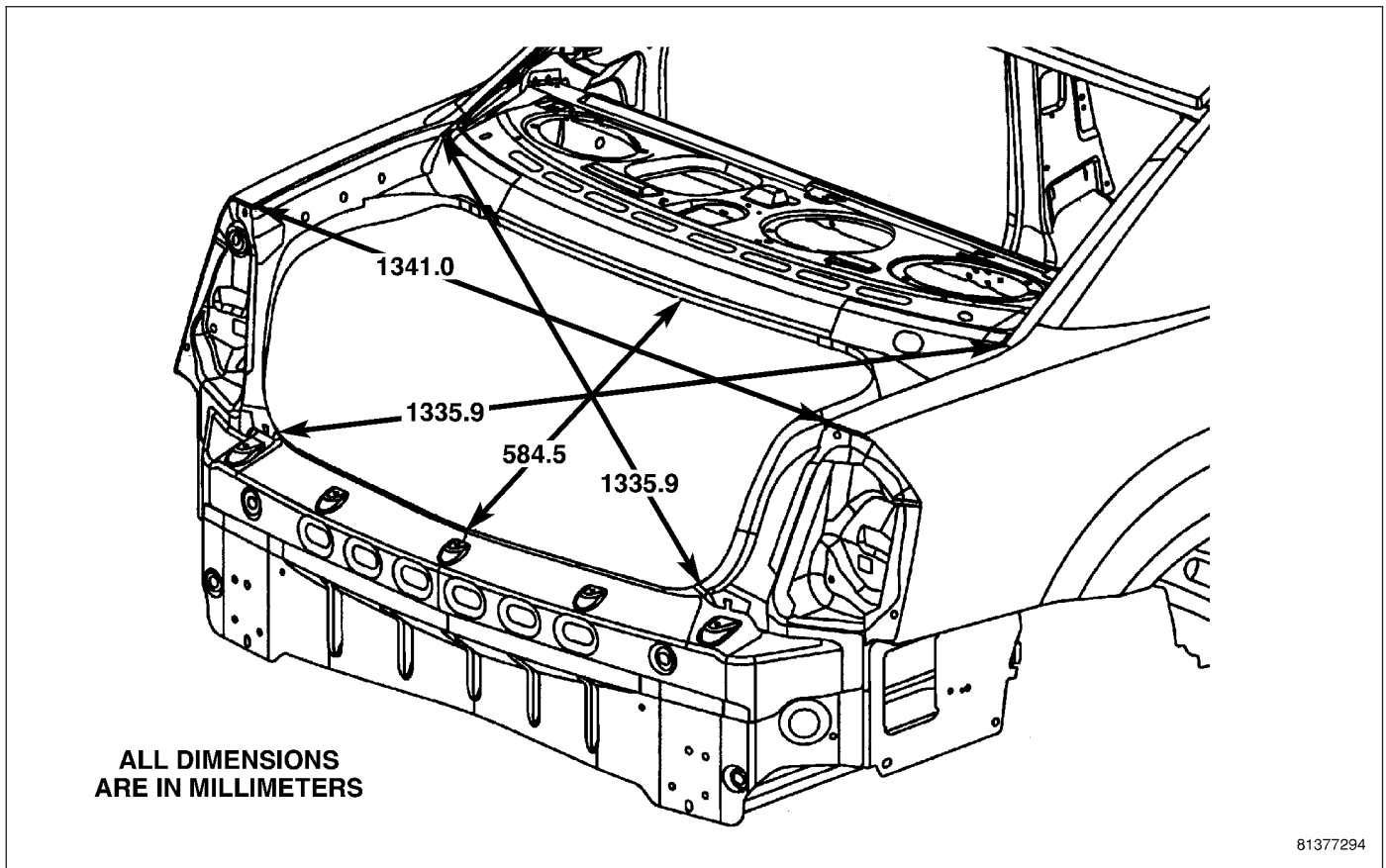
*Fig. 2 FRONT AND REAR DOOR OPENINGS*

ALL DIMENSIONS  
ARE IN MILLIMETERS

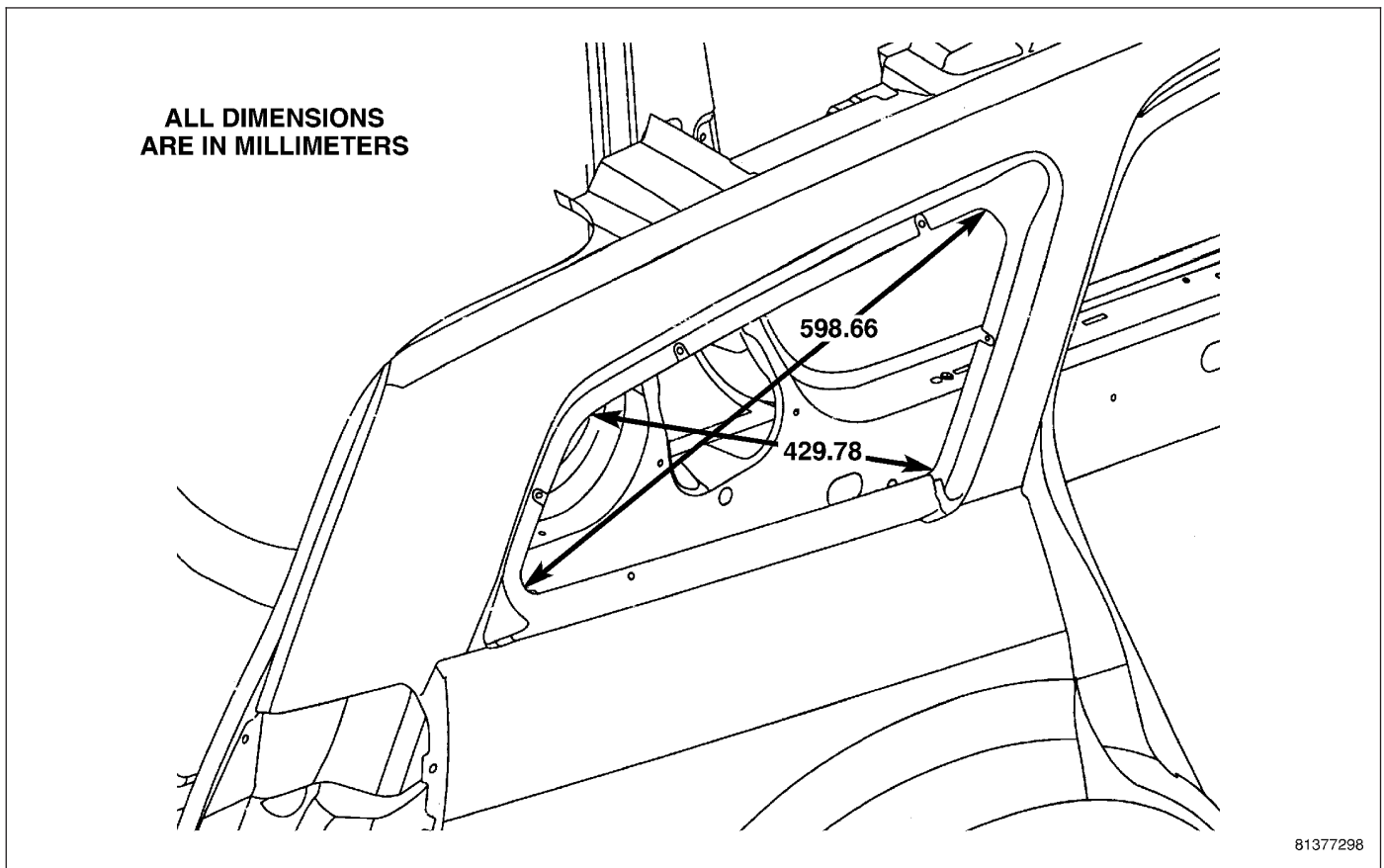


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*Fig. 3 REAR WINDOW OPENING*



**Fig. 4 DECKLID OPENING**



**Fig. 5 QUARTER WINDOW OPENING**

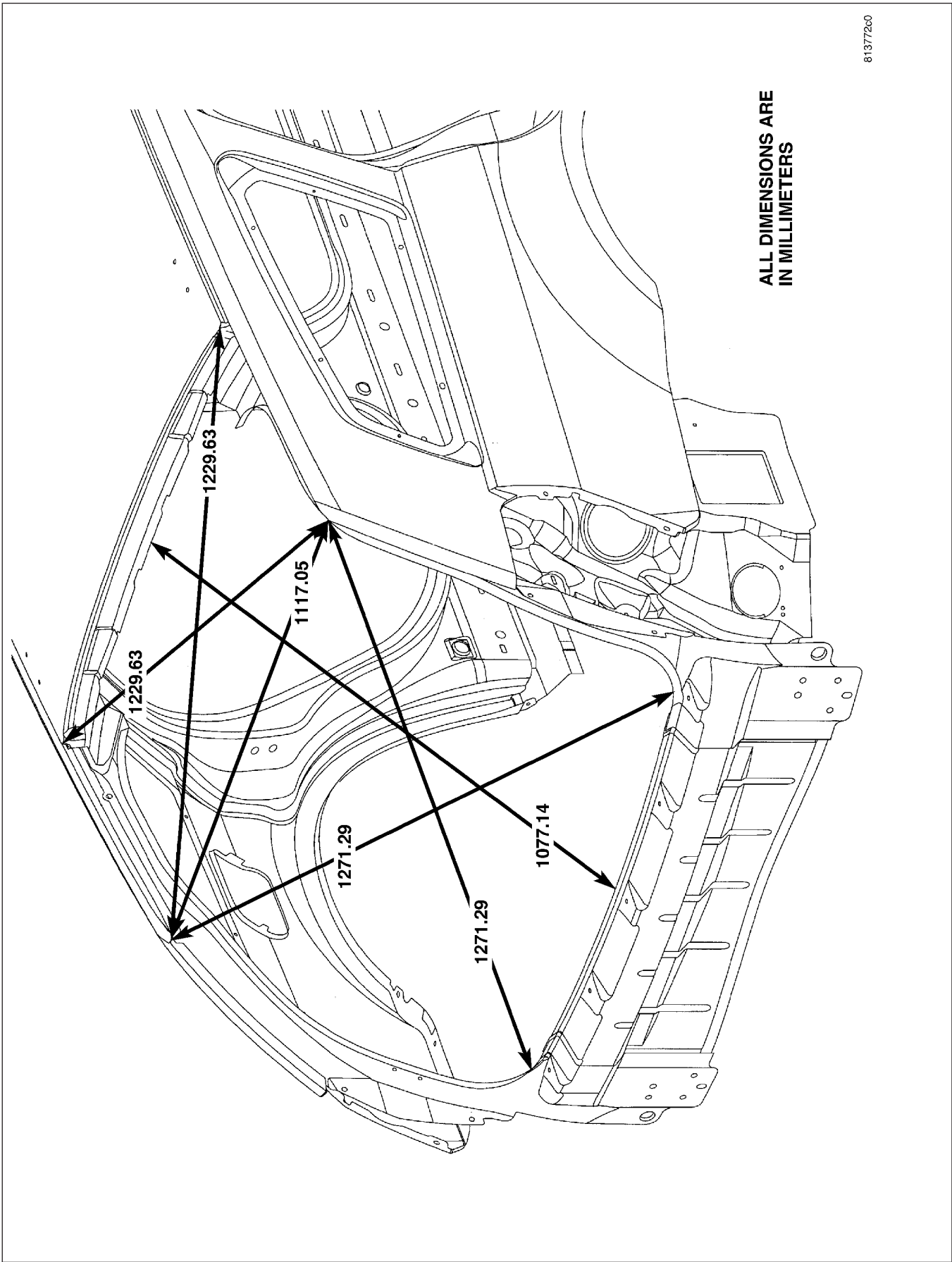


Fig. 6 LIFTGATE OPENING

## SEALER LOCATIONS

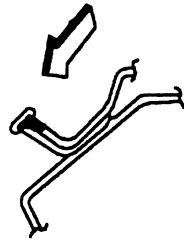
### SPECIFICATIONS

### BODY SEALING LOCATIONS

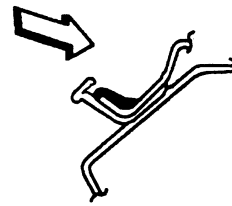
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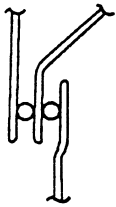




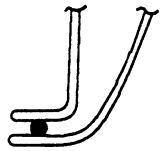
HOLD GUN NOZZLE IN DIRECTION OF ARROW IN ORDER TO EFFECTIVELY SEAL METAL JOINTS.



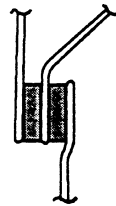
DO NOT HOLD GUN NOZZLE IN DIRECTION OF ARROW. SEALER APPLIED AS SHOWN IS INEFFECTIVE.



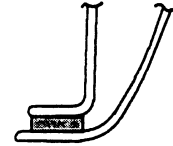
3 METAL THICKNESS



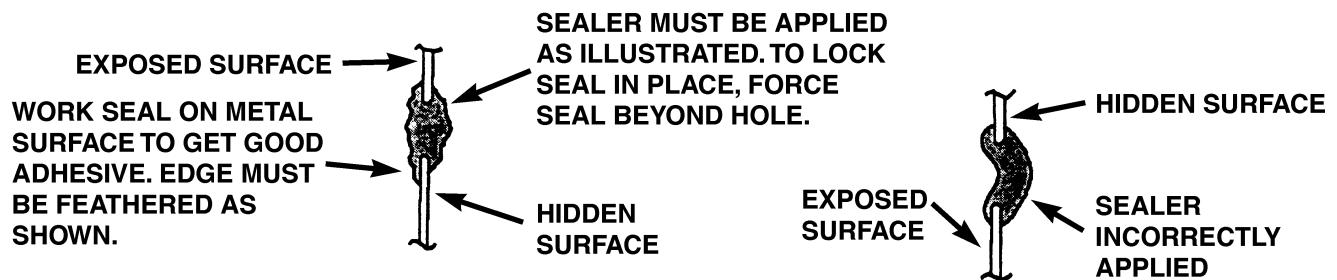
2 METAL THICKNESS



3 METAL THICKNESS



2 METAL THICKNESS



#### SYMBOLS



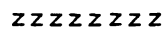
THUMBGRADEABLE SEALER



EXTRUDABLE THERMOPLASTIC



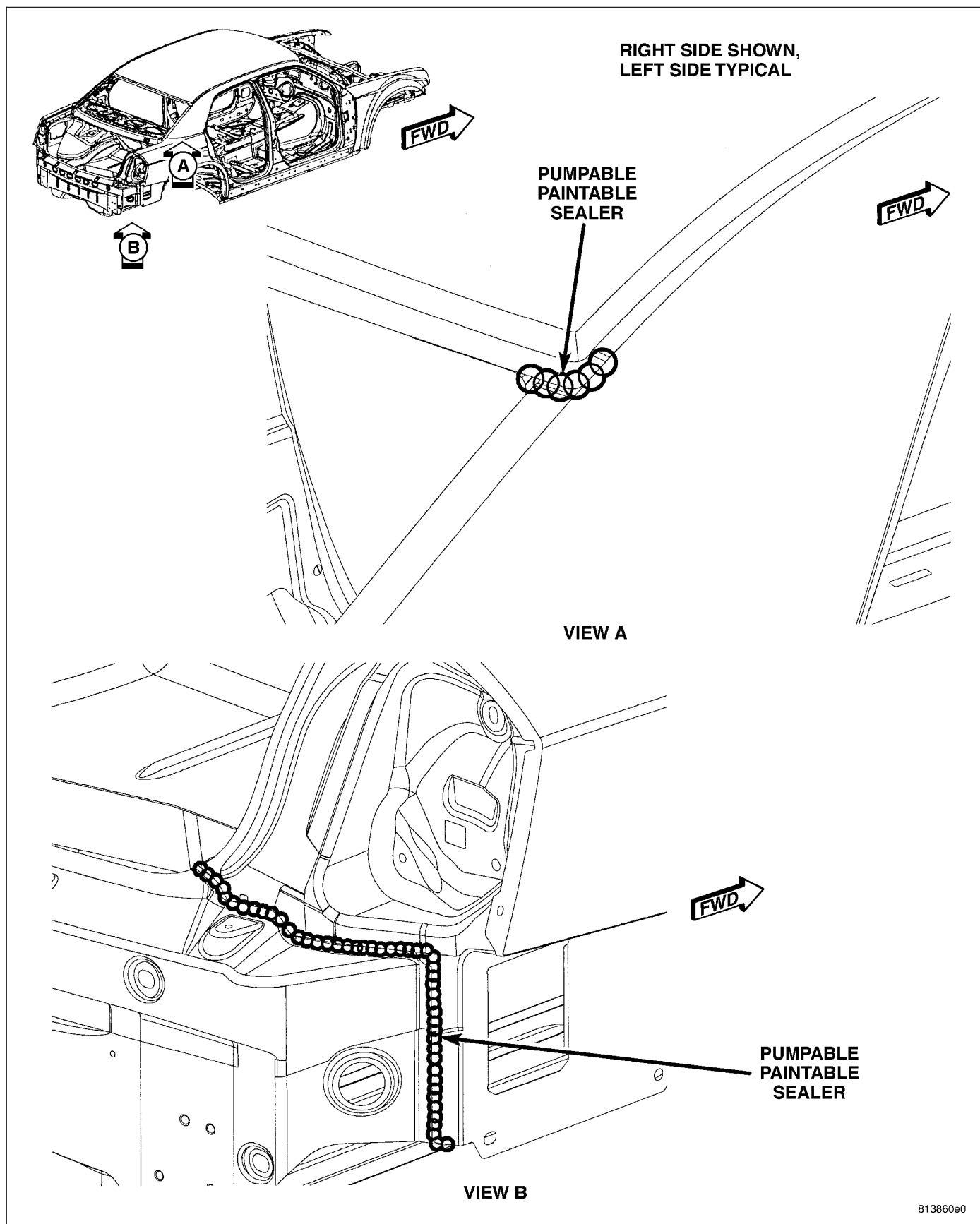
EXPOSED THERMOPLASTIC SEALANT



HIDDEN SEALANT

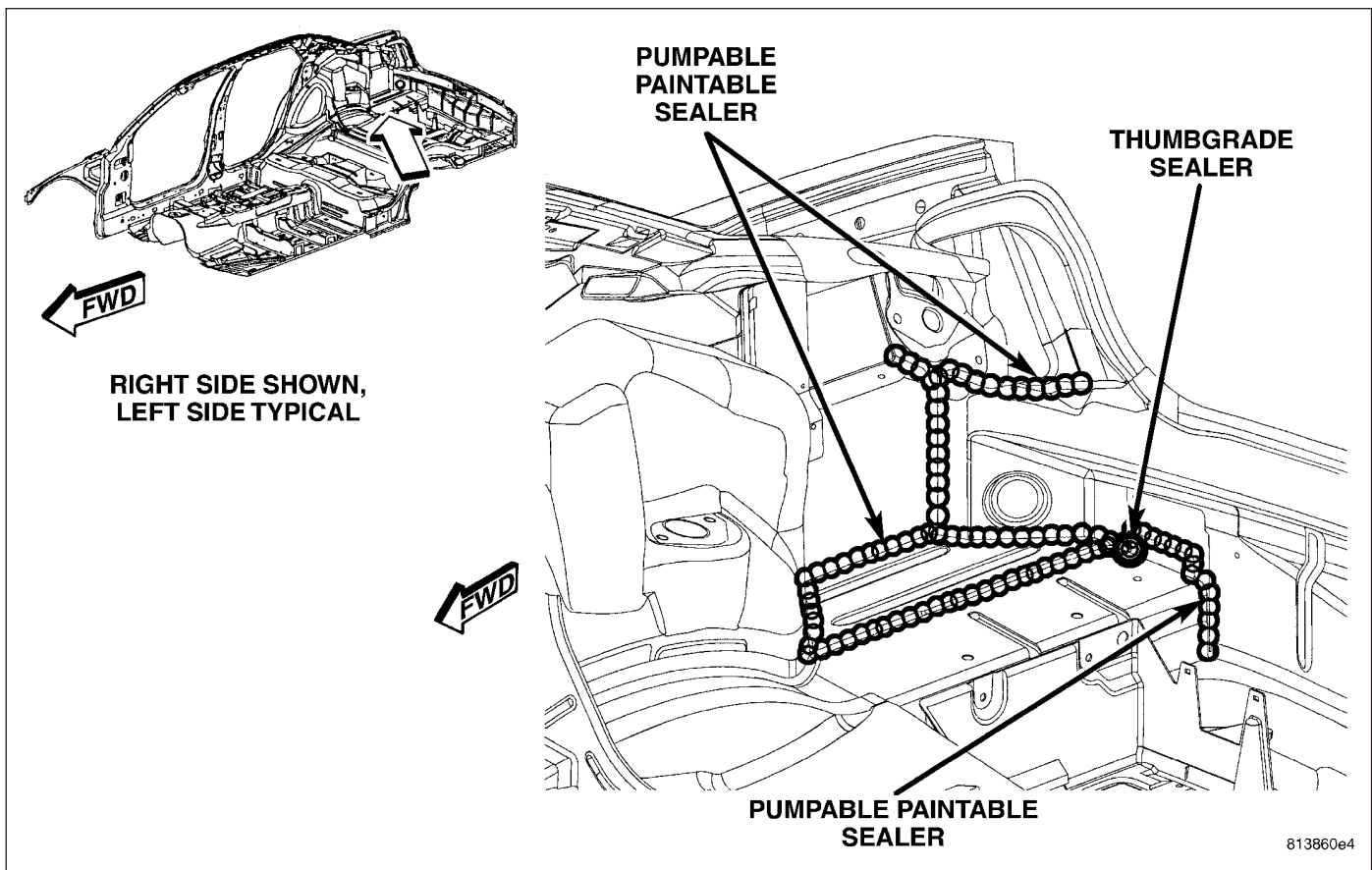
Fig. 7 APPLICATION METHODS

**Sedan Only**



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**Fig. 8 ROOF/C PILLAR AND LOWER DECK PANEL/QUARTER EXTENSION**



**Fig. 9 TAIL LAMP AND LOWER DECK**

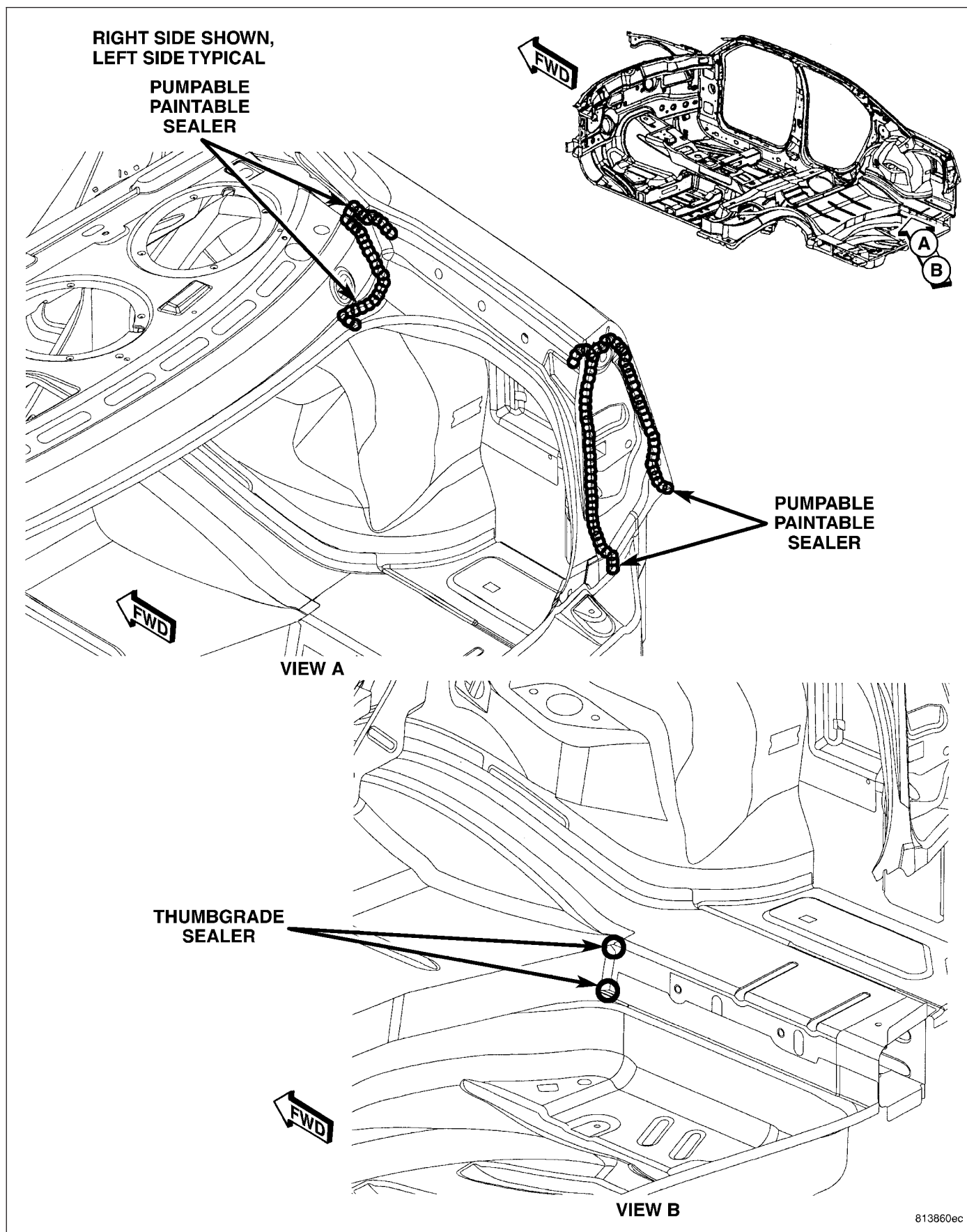
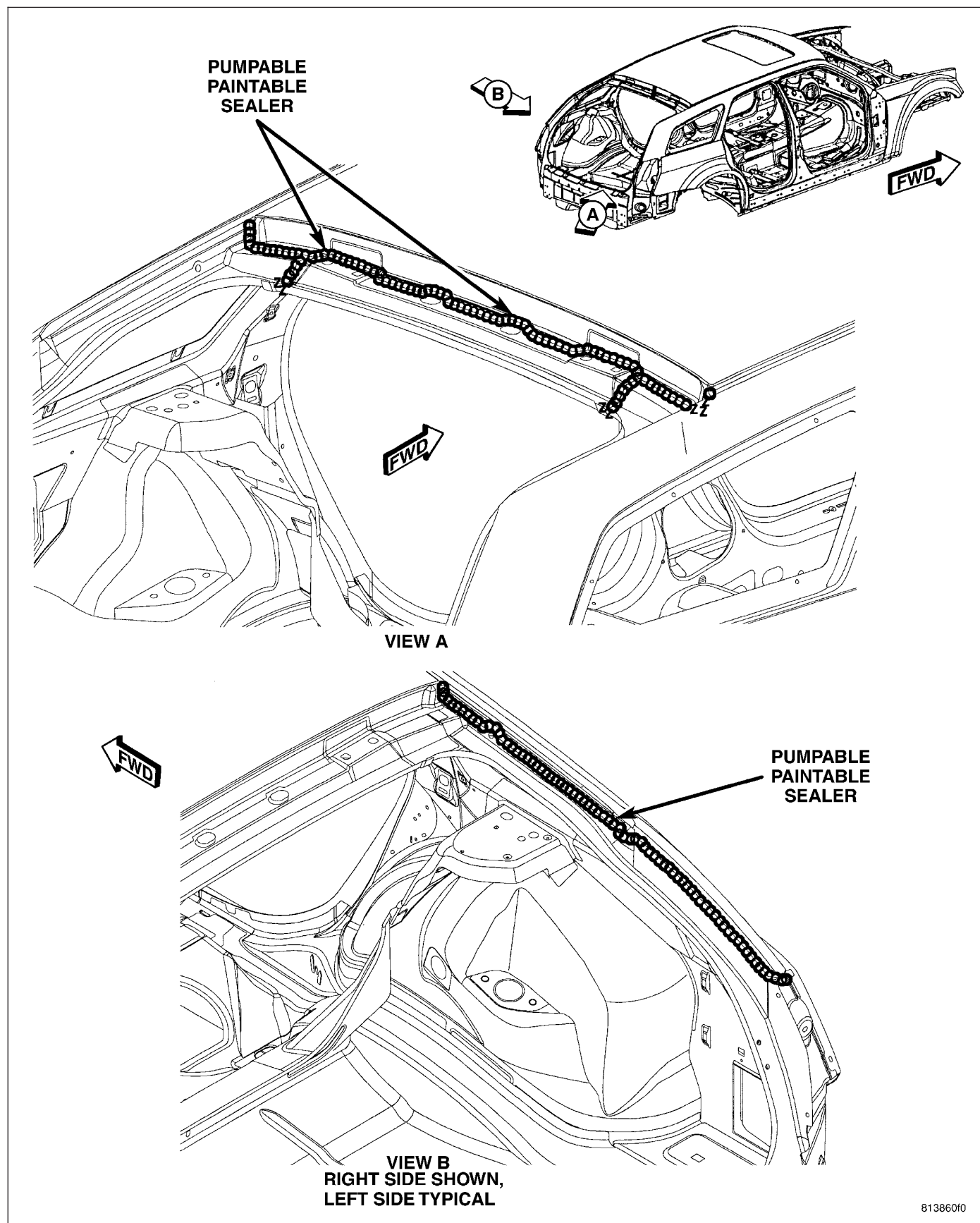


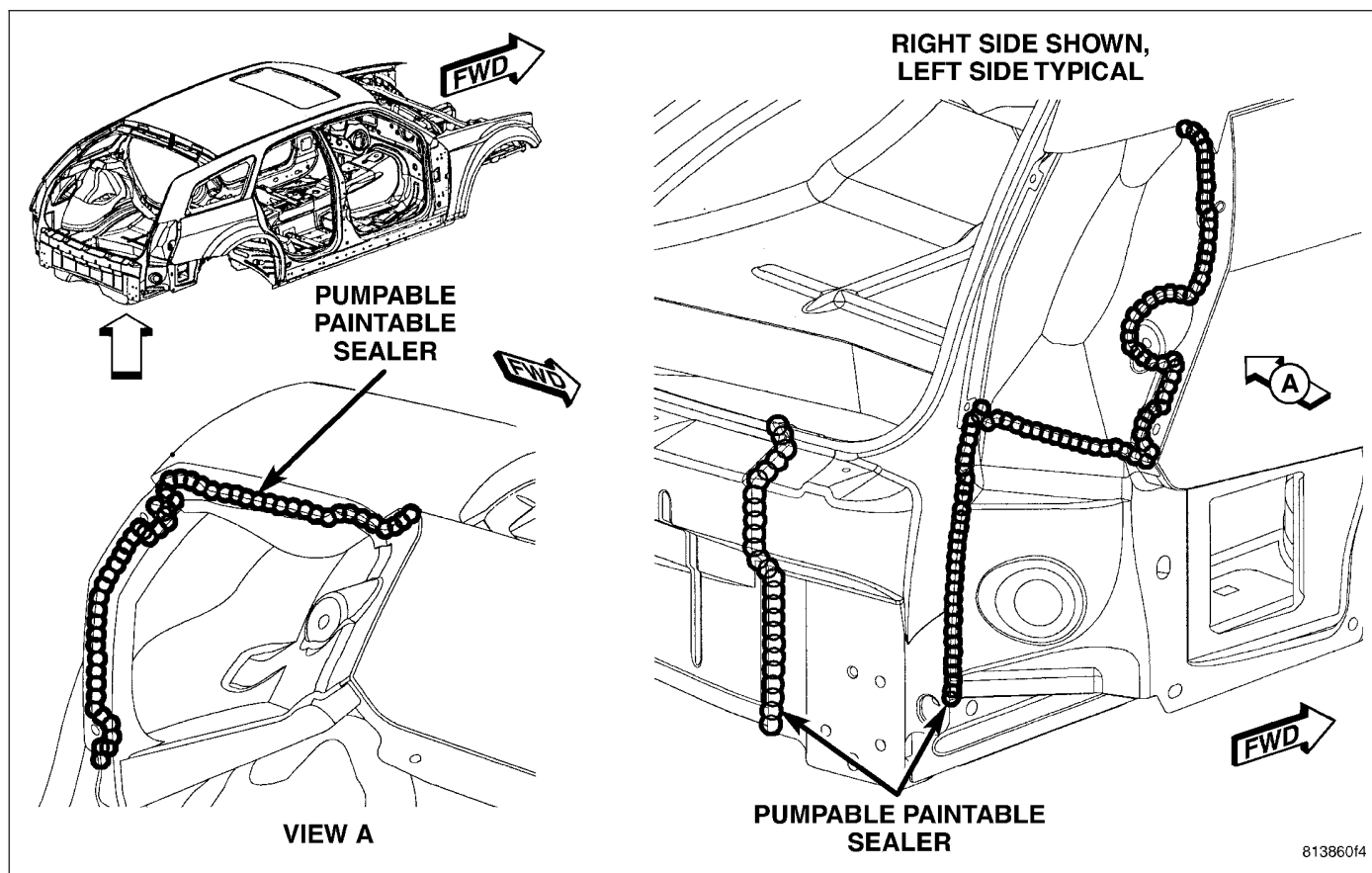
Fig. 10 DECK LID DRAIN TROUGH

## Wagon Only

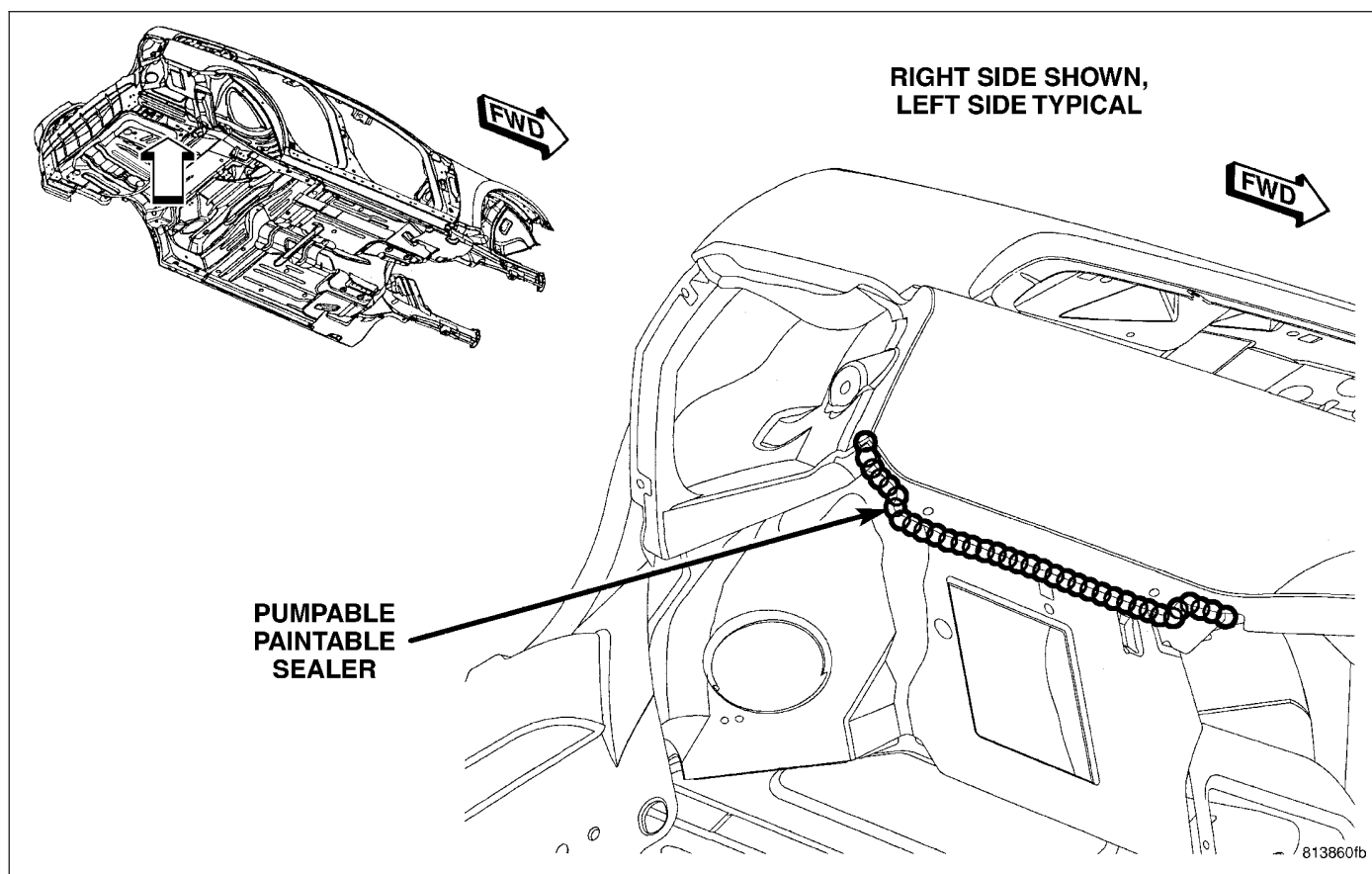


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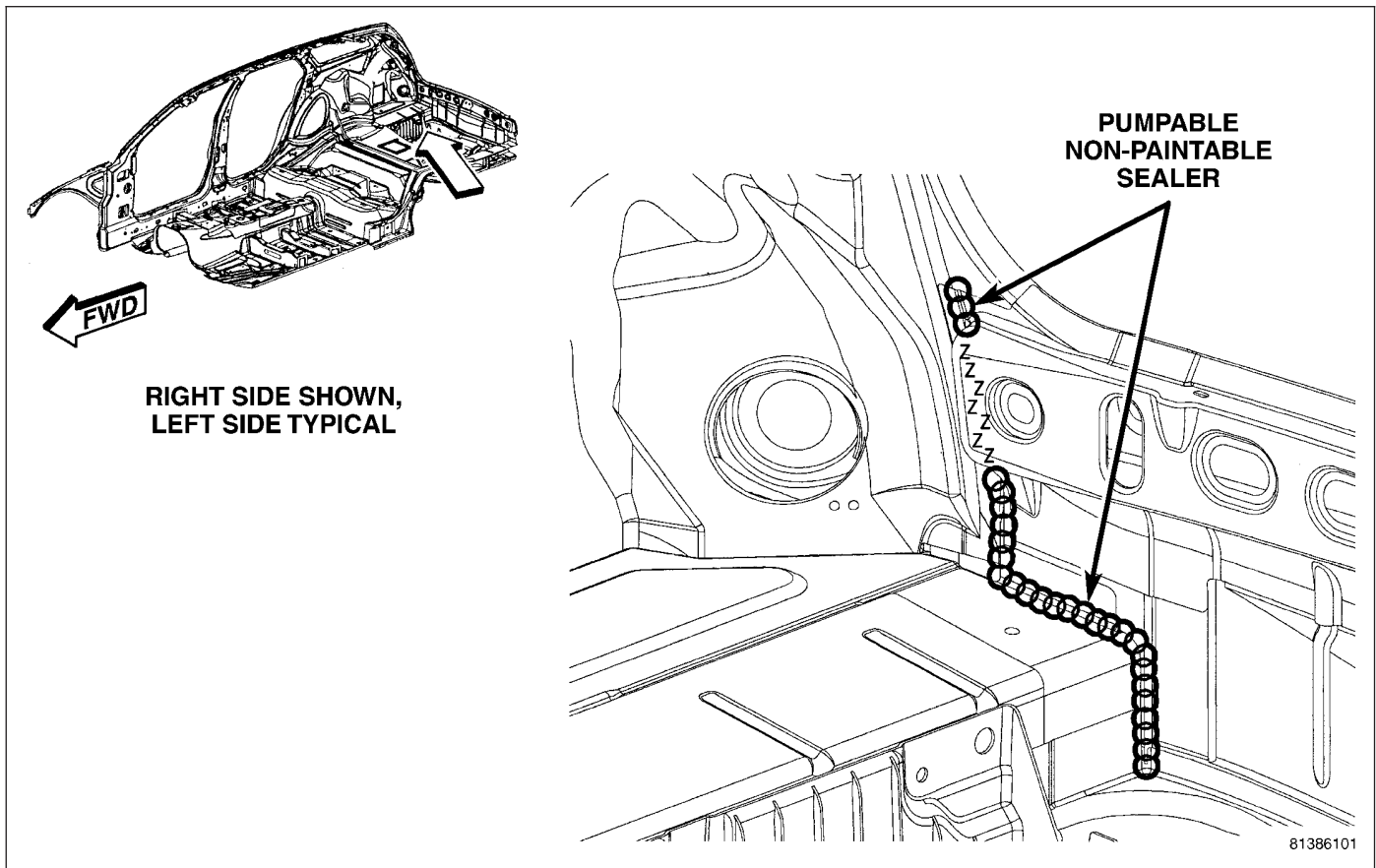
Fig. 11 LIFTGATE OPENING AND DRAIN TROUGH



**Fig. 12 TAIL LAMP OUTER EXTENSION AND LOWER DECK/TROUGH**



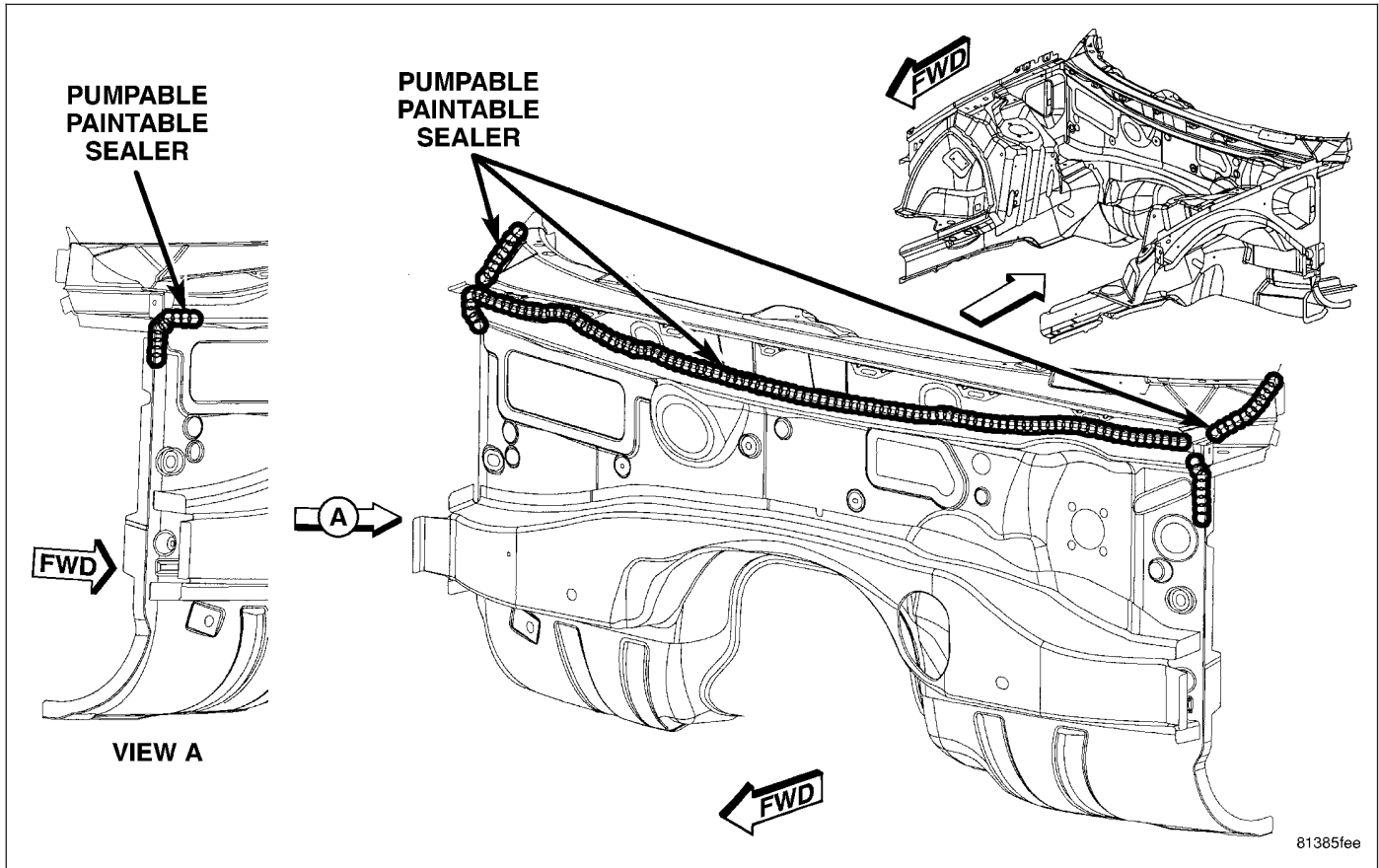
**Fig. 13 REAR FASCIA MOUNTING SURFACE**



**Fig. 14 INNER BODY SIDE APERTURE/LOWER DECK PANEL**

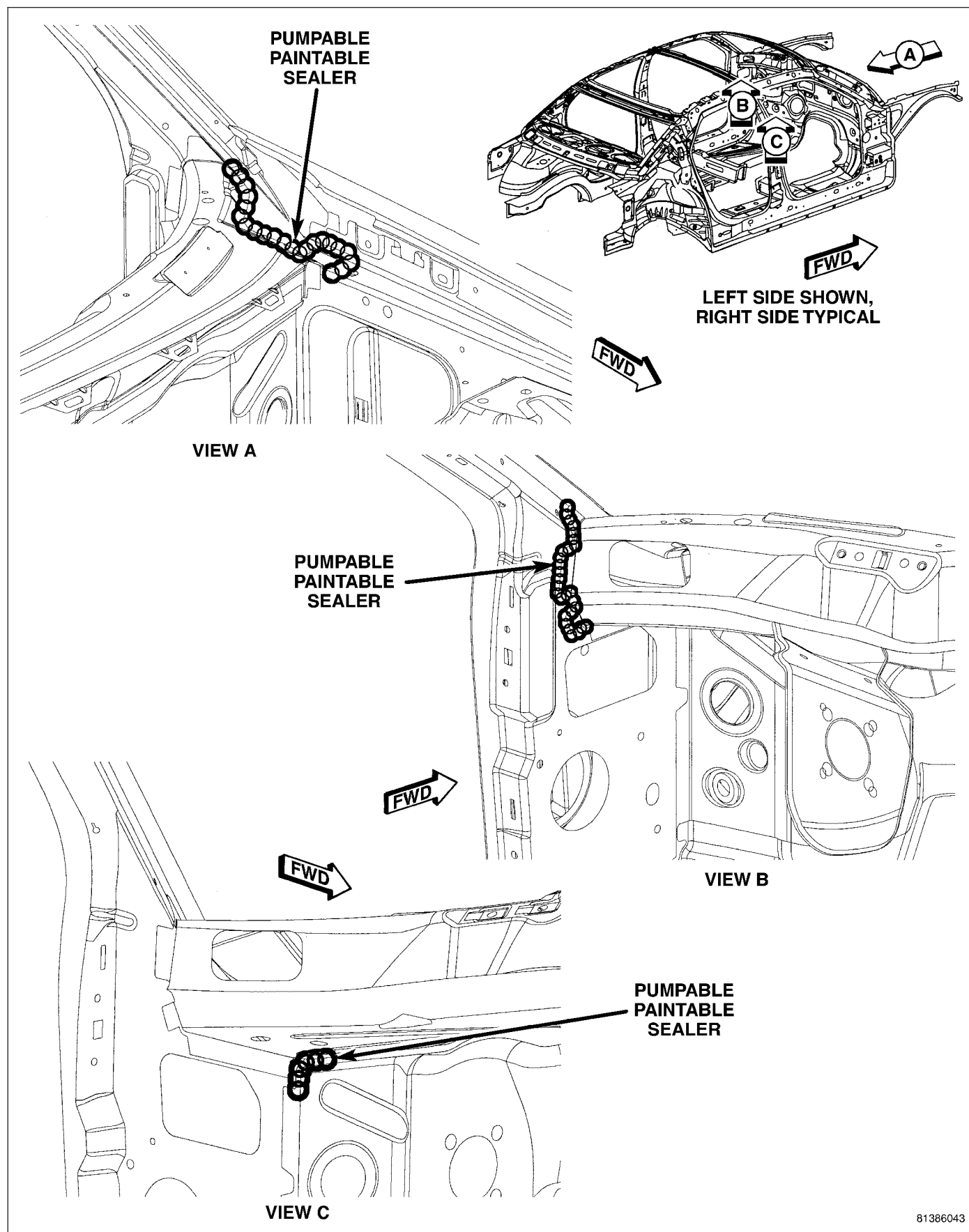


# Sedan & Wagon



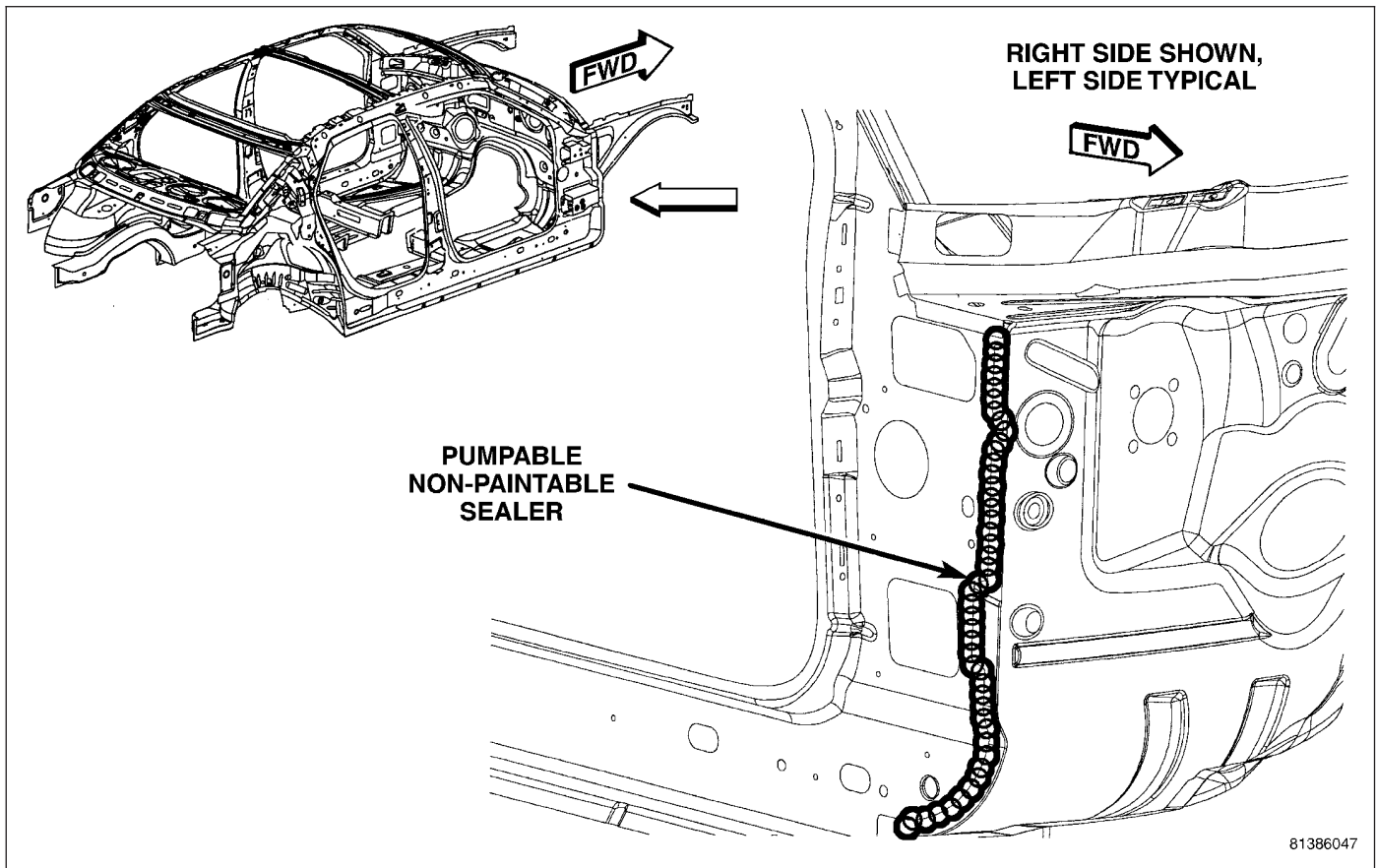
**Fig. 15 COWL AND DASH PANEL**





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**Fig. 16 UPPER AND LOWER COWL, LOAD BEAM AND DASH PANEL**



**Fig. 17 COWL AND INNER BODY SIDE APERTURE**

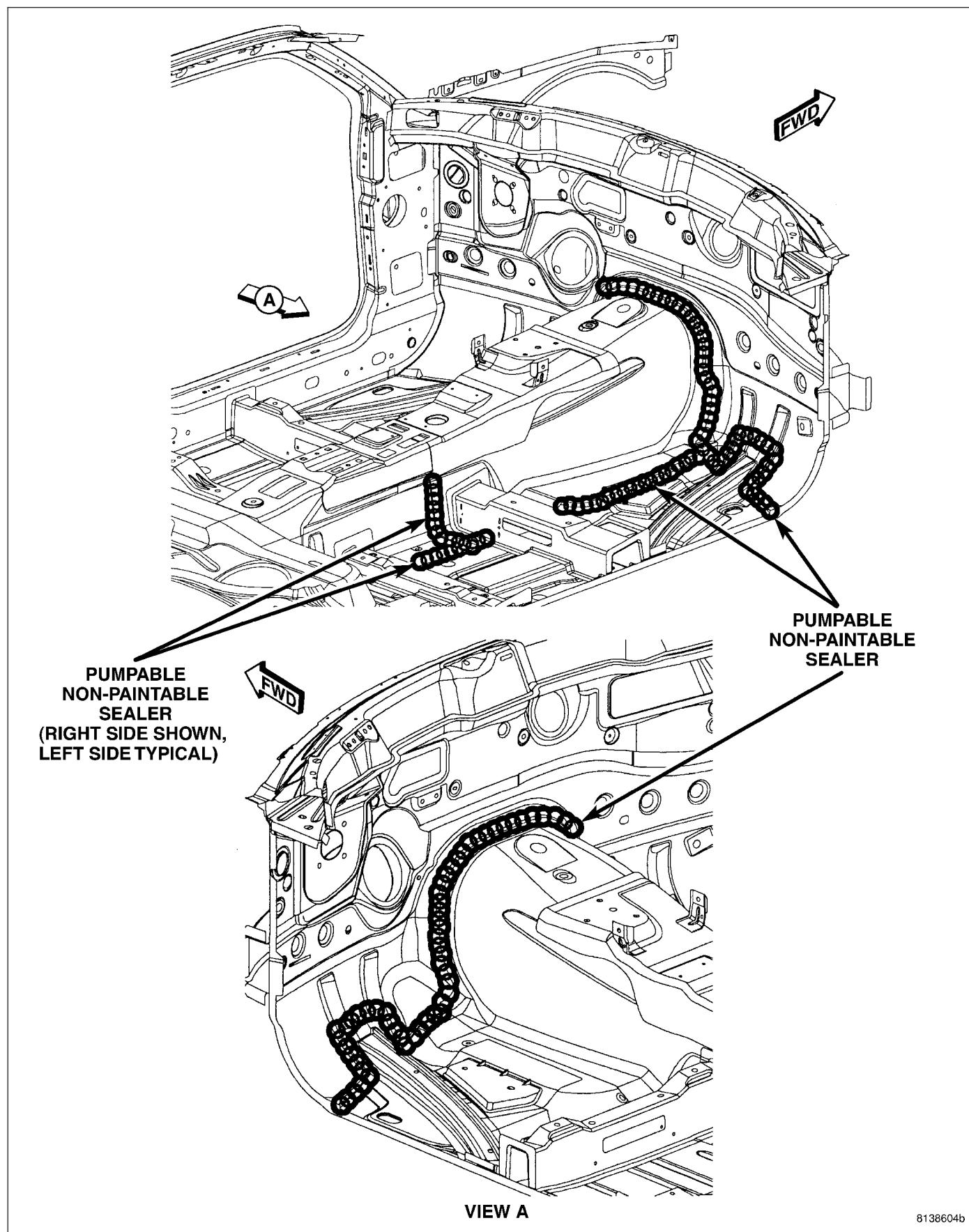
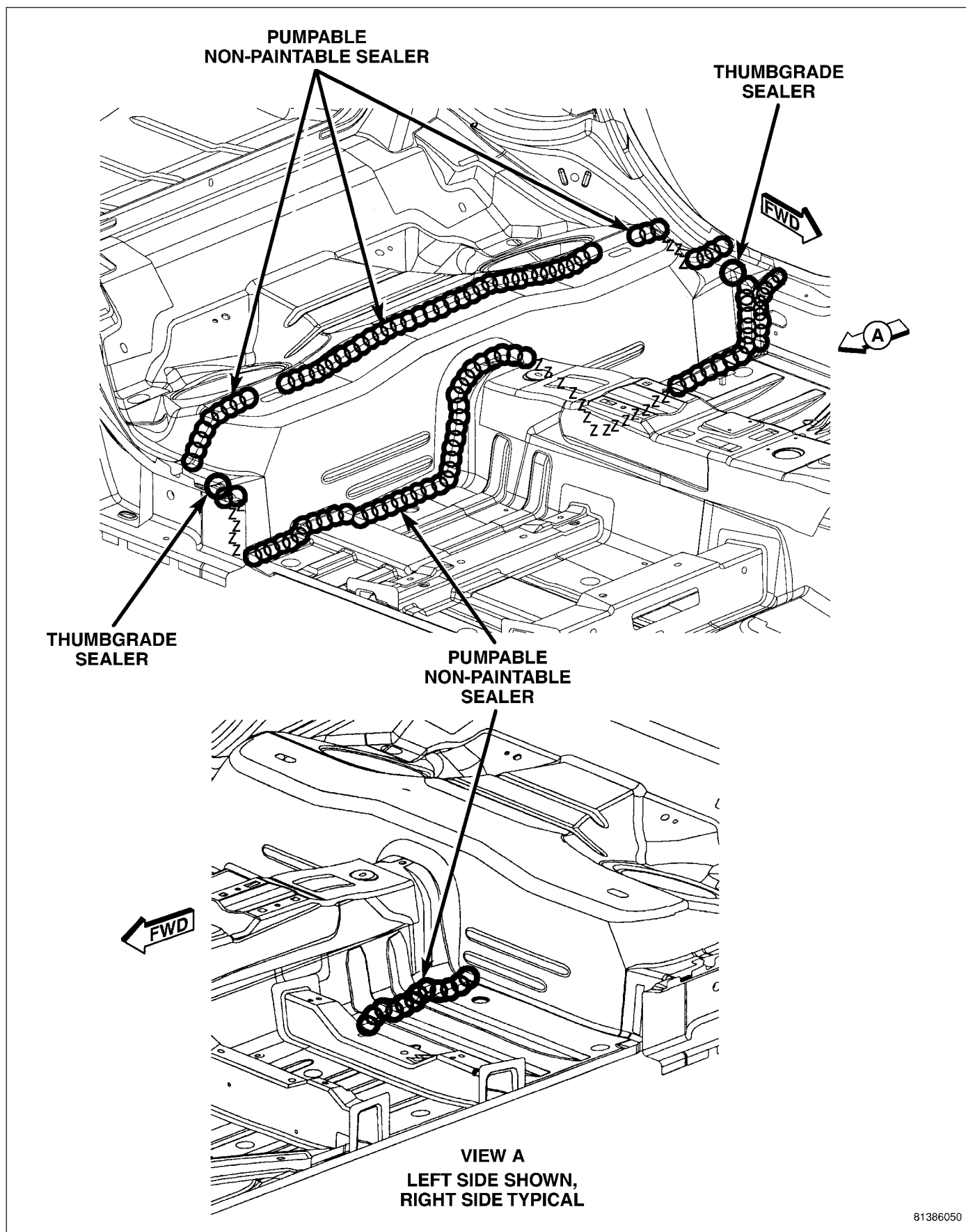
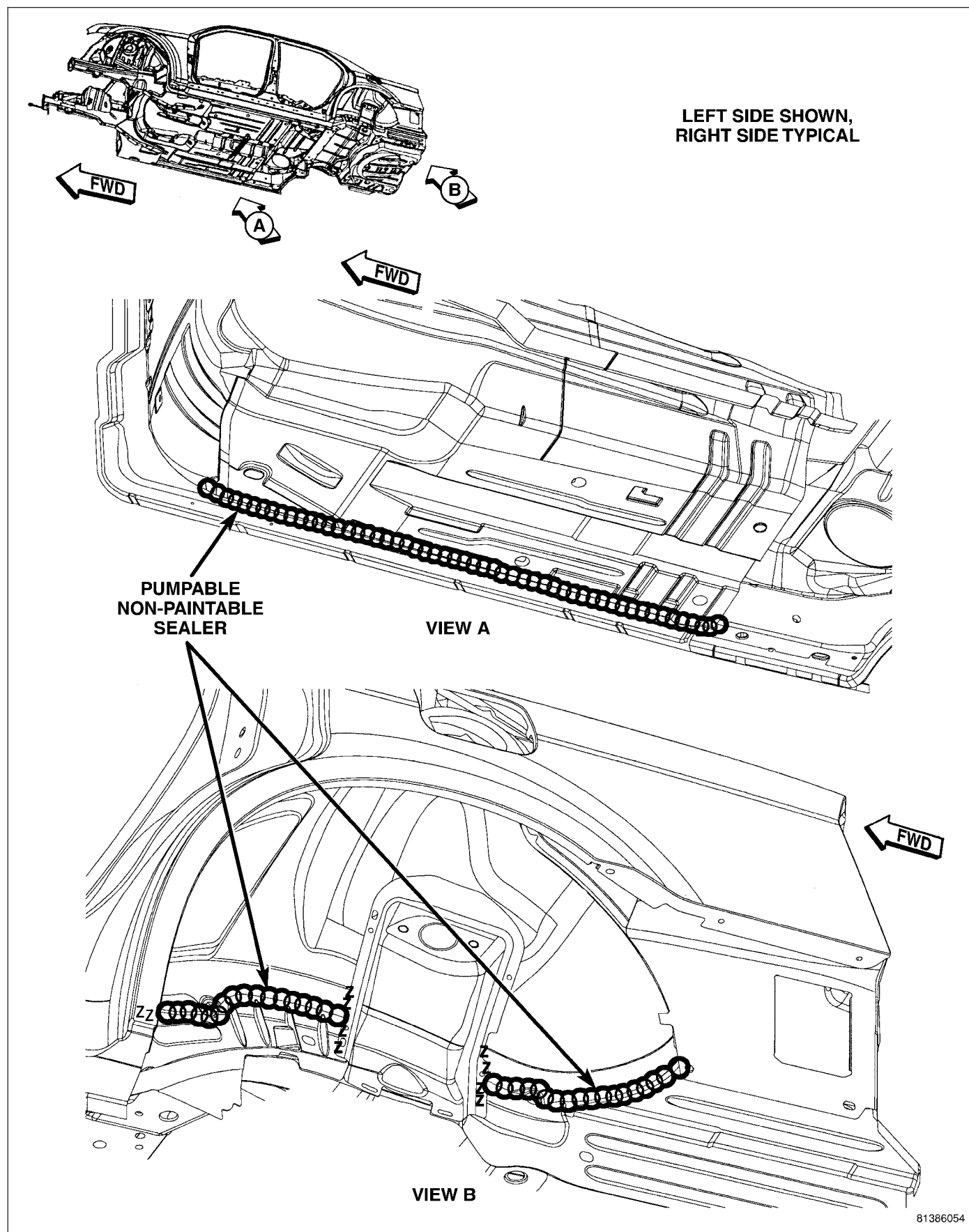


Fig. 18 FLOOR PAN (1 OF 2)



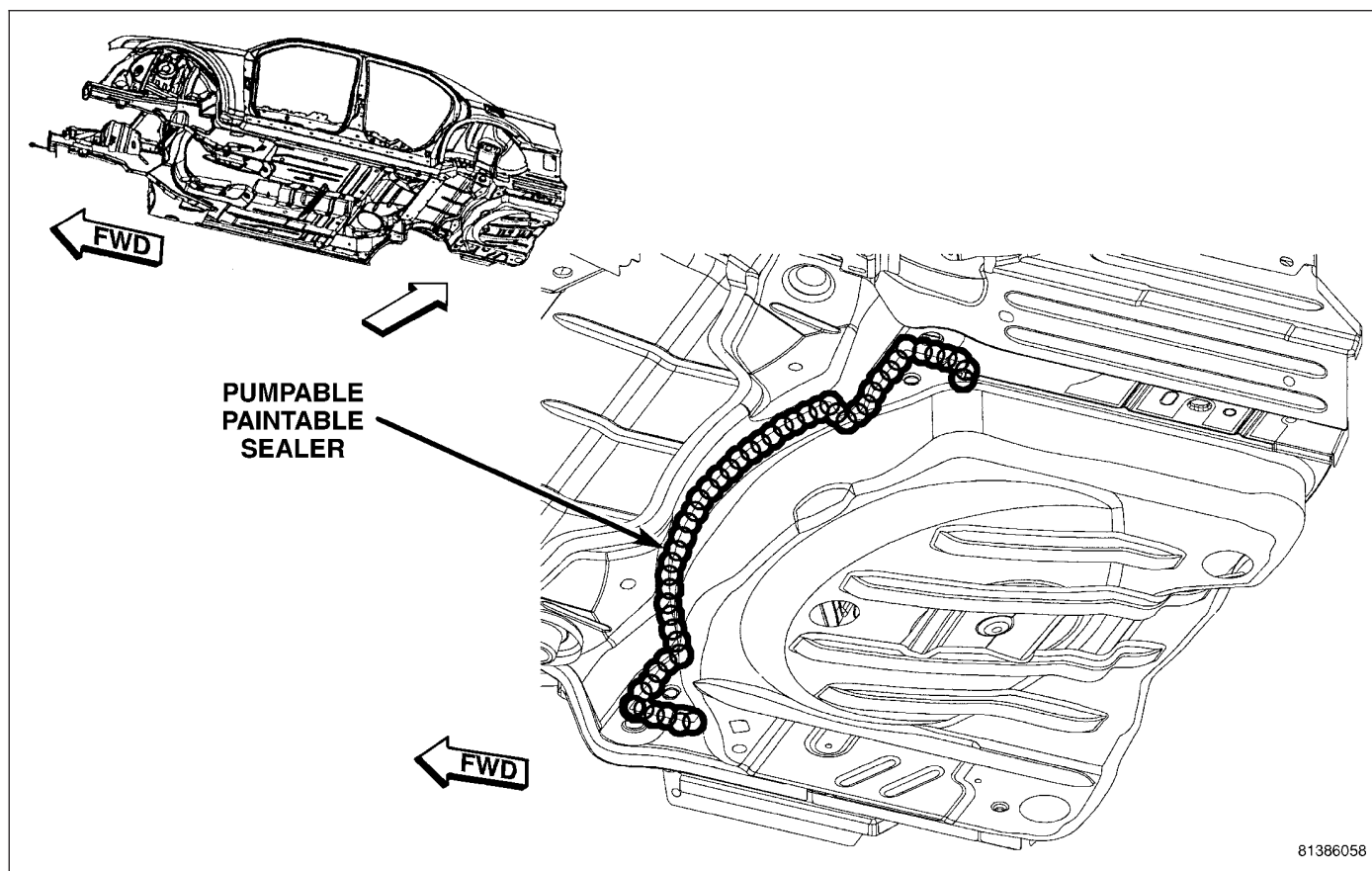
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Fig. 19 FLOOR PAN (2 OF 2)

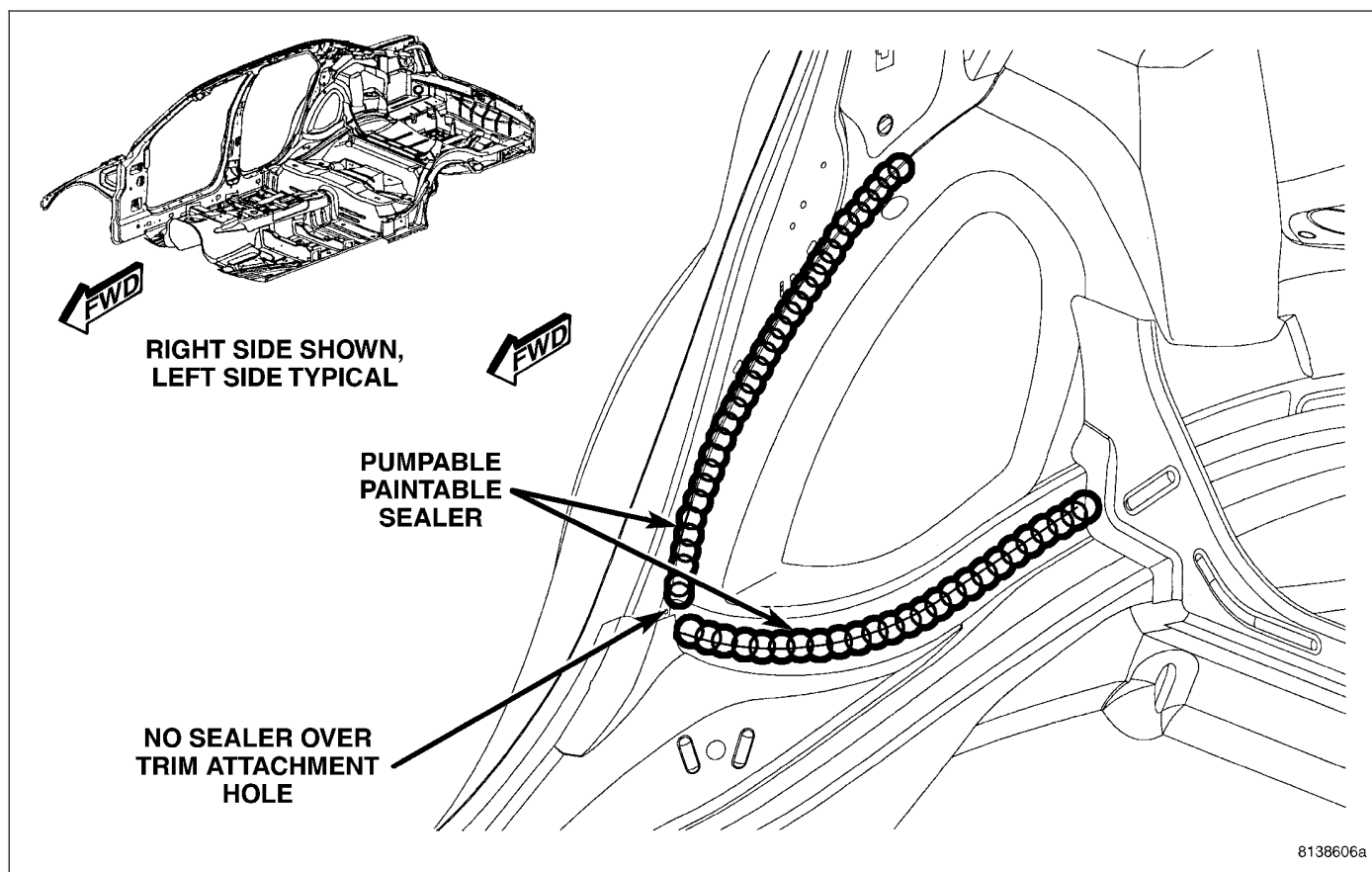


**Fig. 20 FLOOR PAN AND INNER BODY SIDE APERTURE AND REAR INNER WHEELHOUSE**

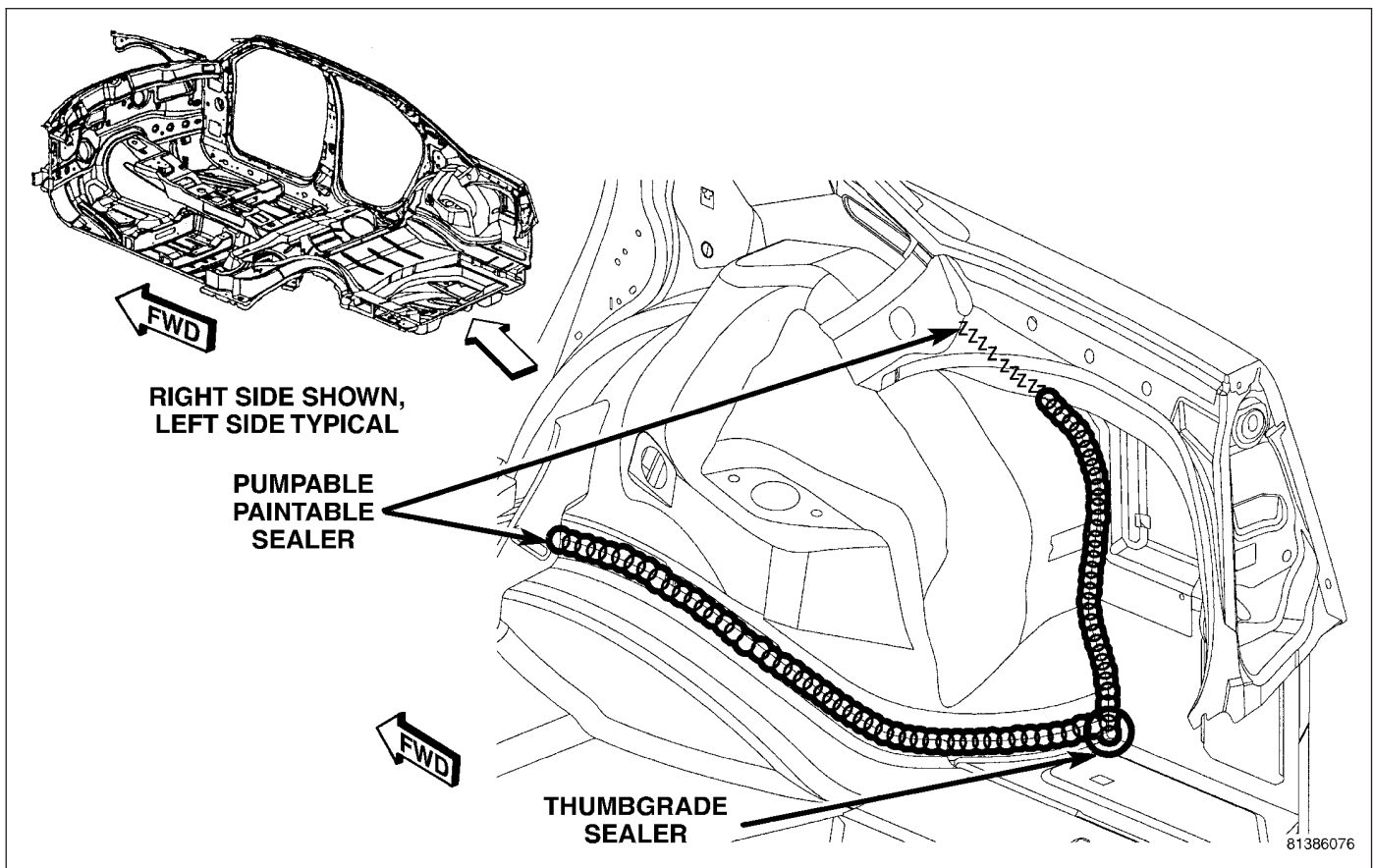




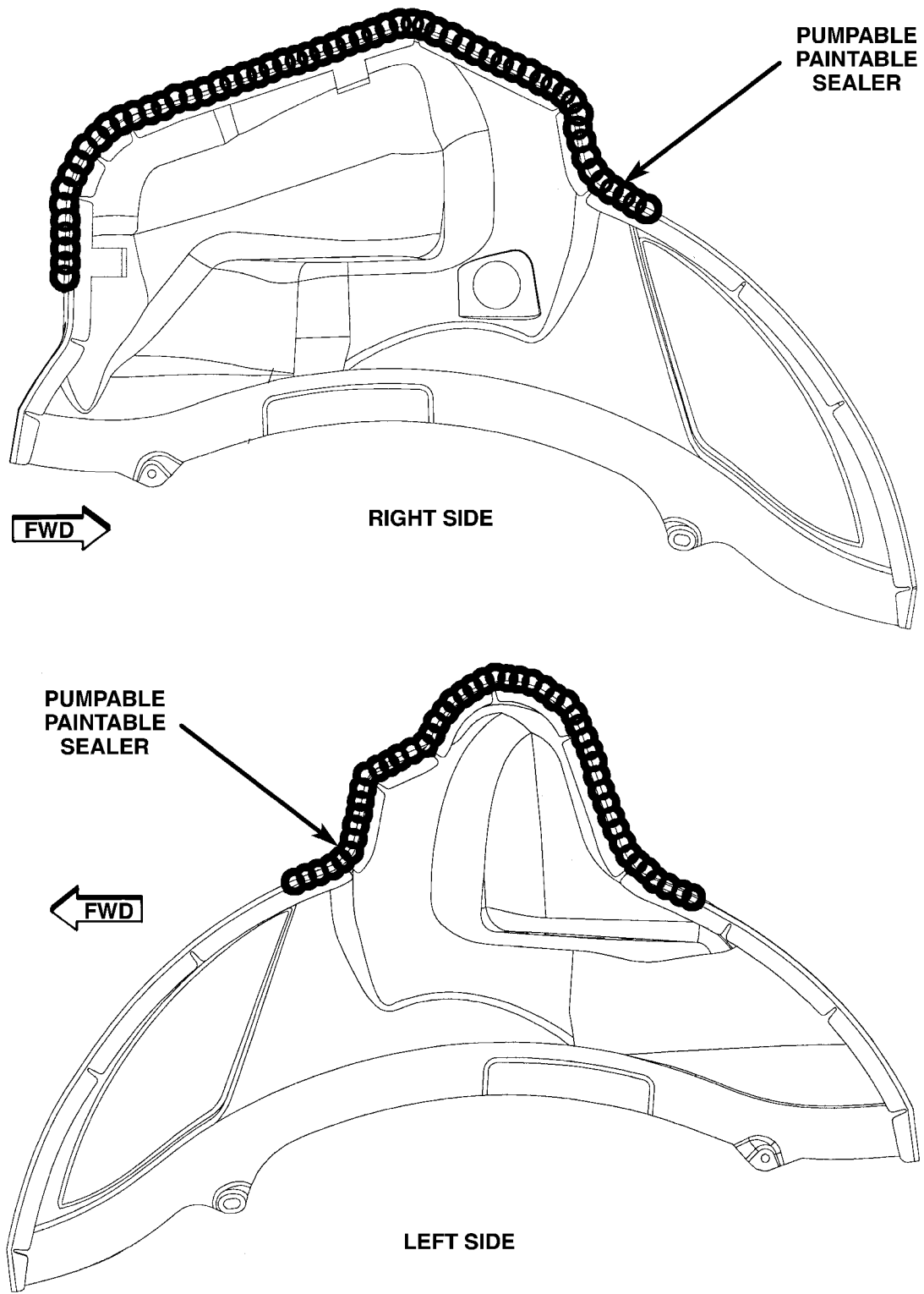
**Fig. 21 REAR FLOOR PAN AND REAR SUSPENSION CROSSMEMBER**



**Fig. 22 INNER REAR WHEELHOUSE AND BODY SIDE APERTURE (1 OF 2)**



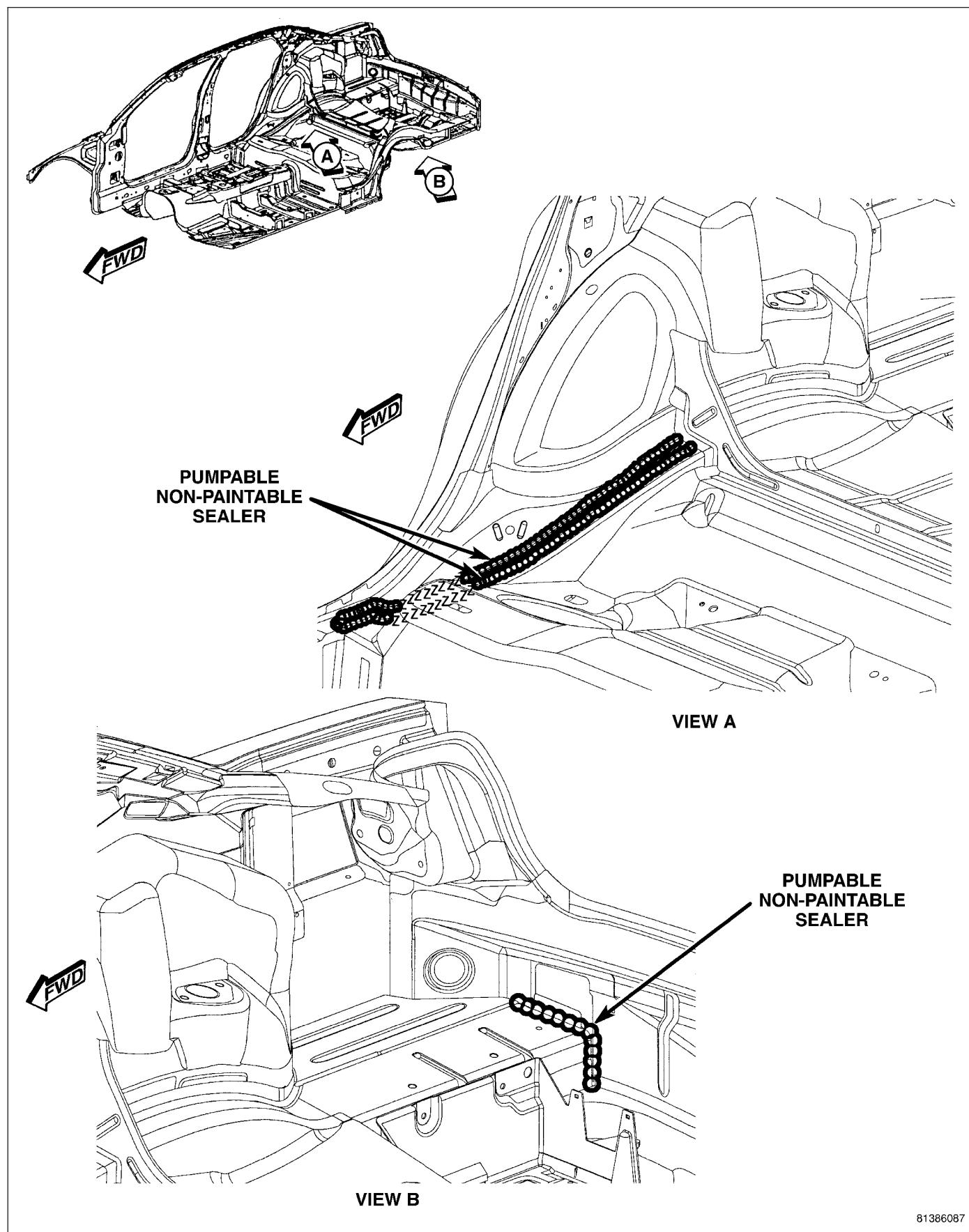
*Fig. 23 INNER REAR WHEELHOUSE AND BODY SIDE APERTURE (2 OF 2)*



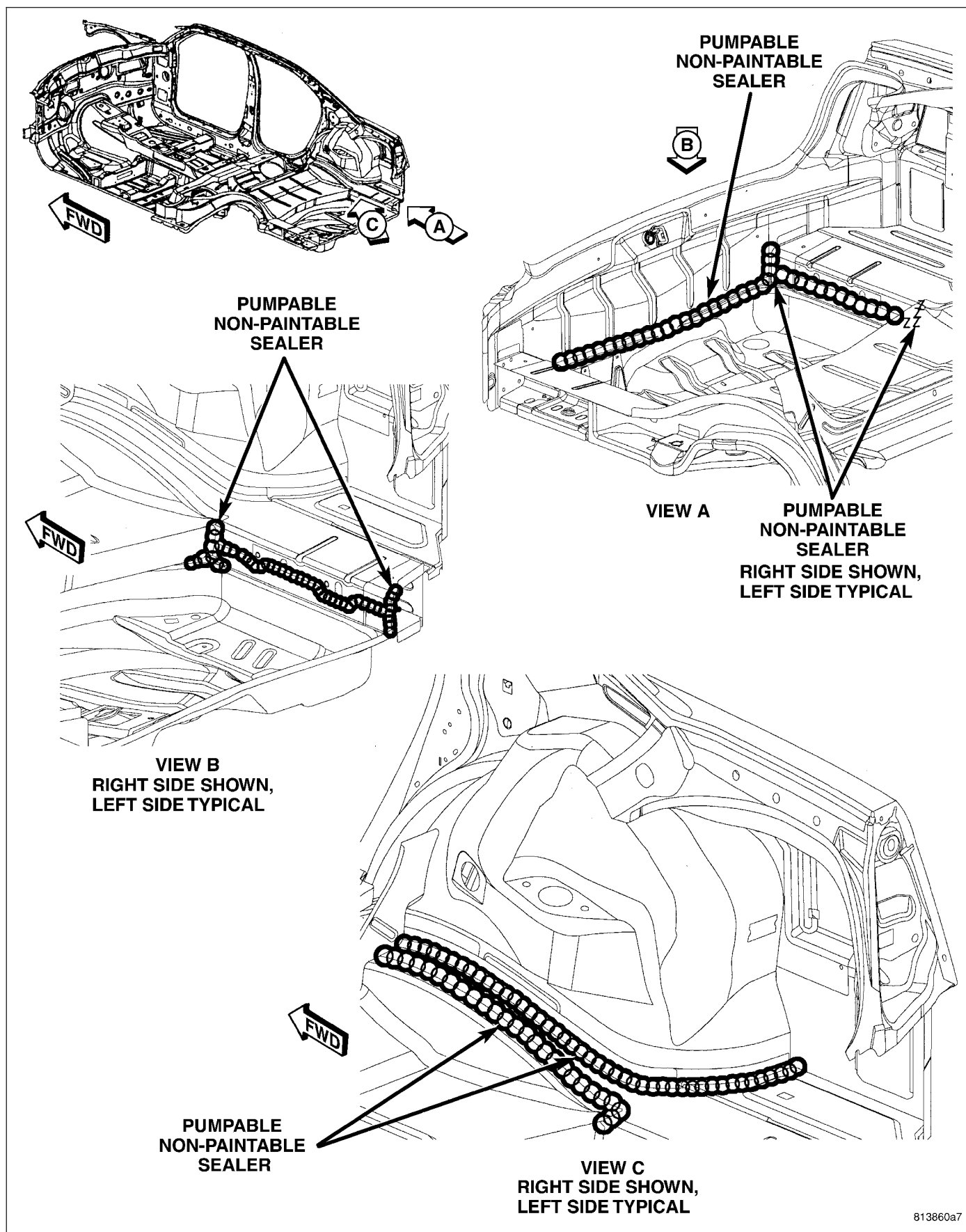
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**Fig. 24 REAR INNER WHEELHOUSE**



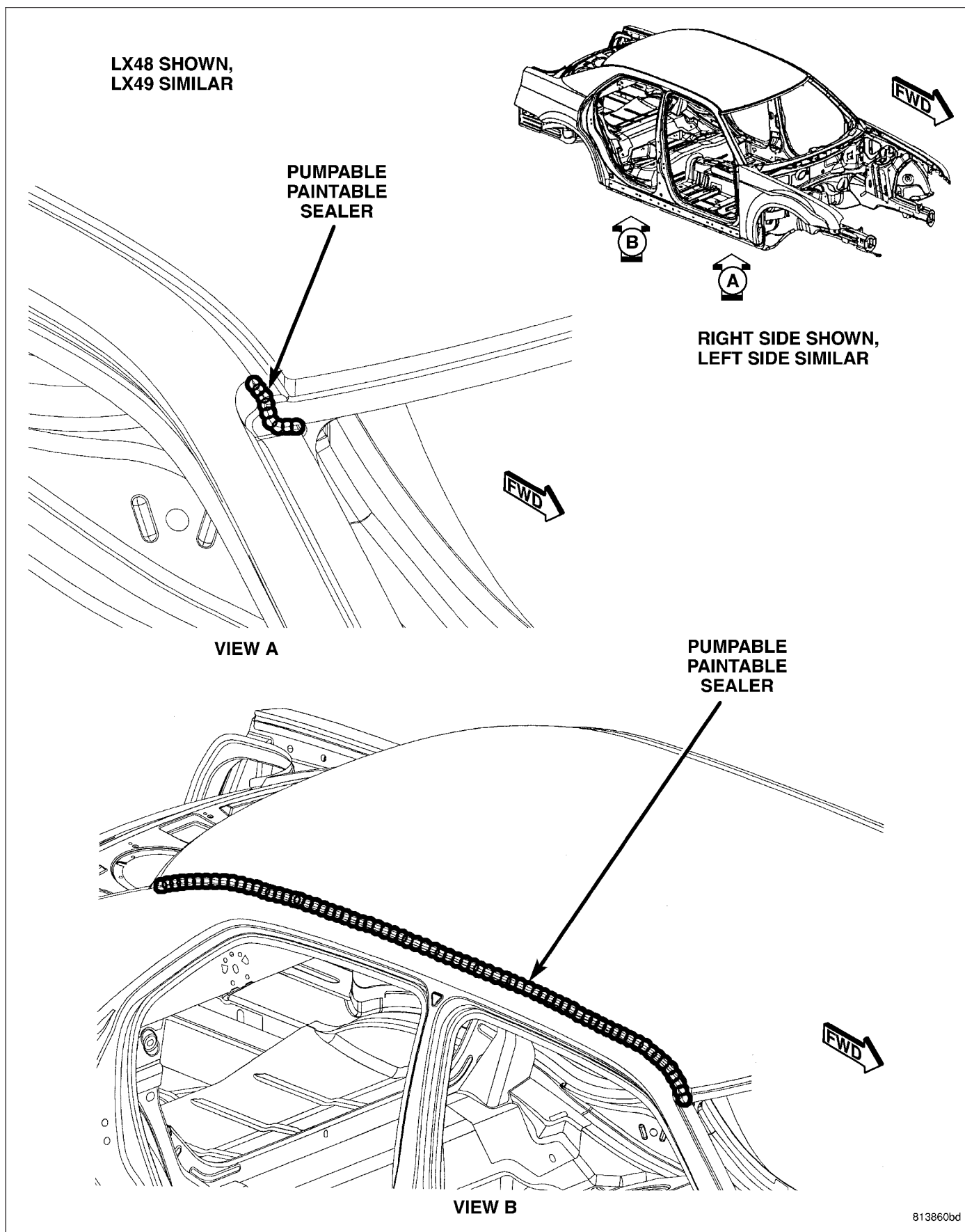


**Fig. 25 INNER/OUTER FRAME RAIL, CENTER FLOOR PAN AND LOWER DECK**



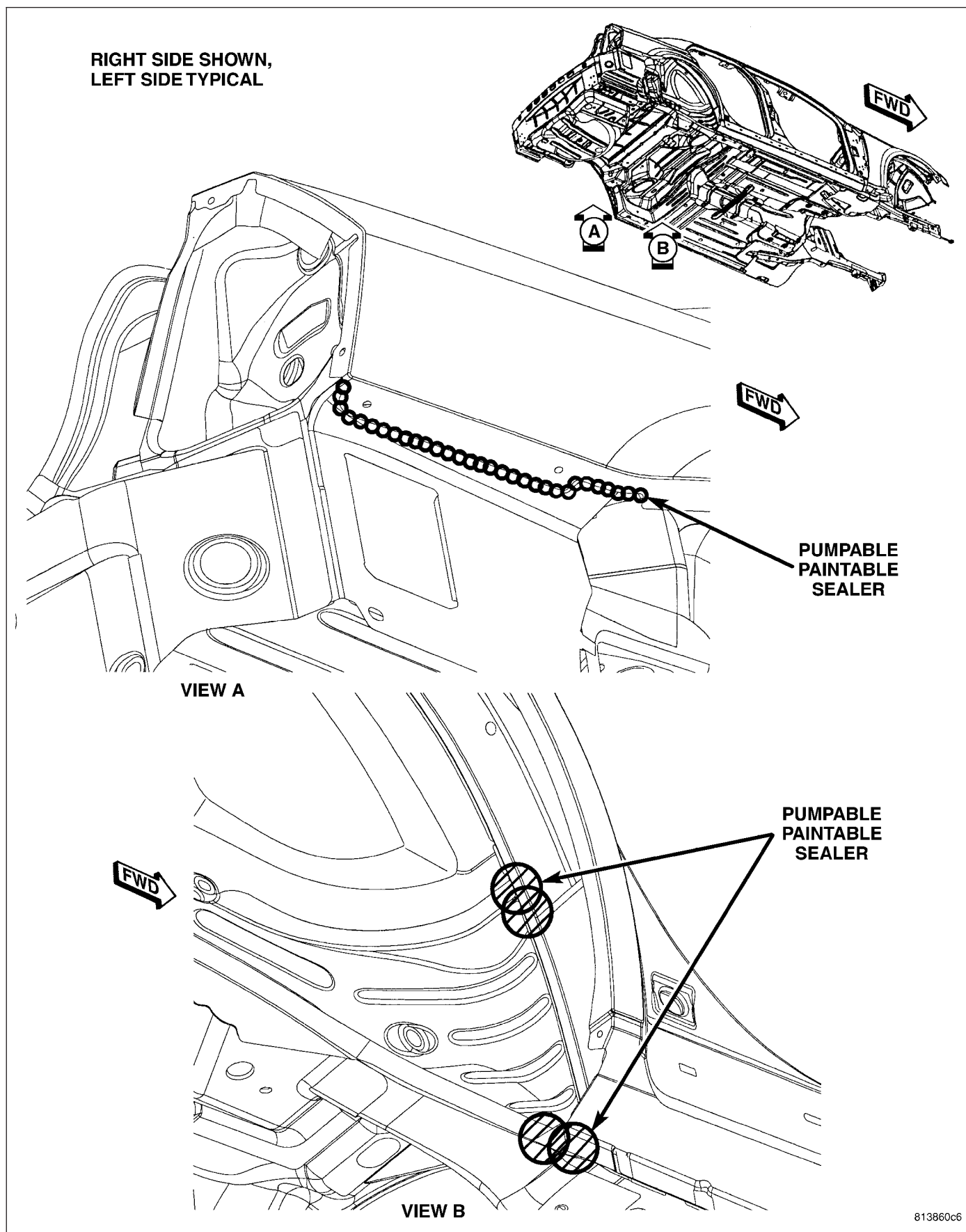
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Fig. 26 INNER/OUTER FRAME RAIL AND CENTER FLOOR PAN

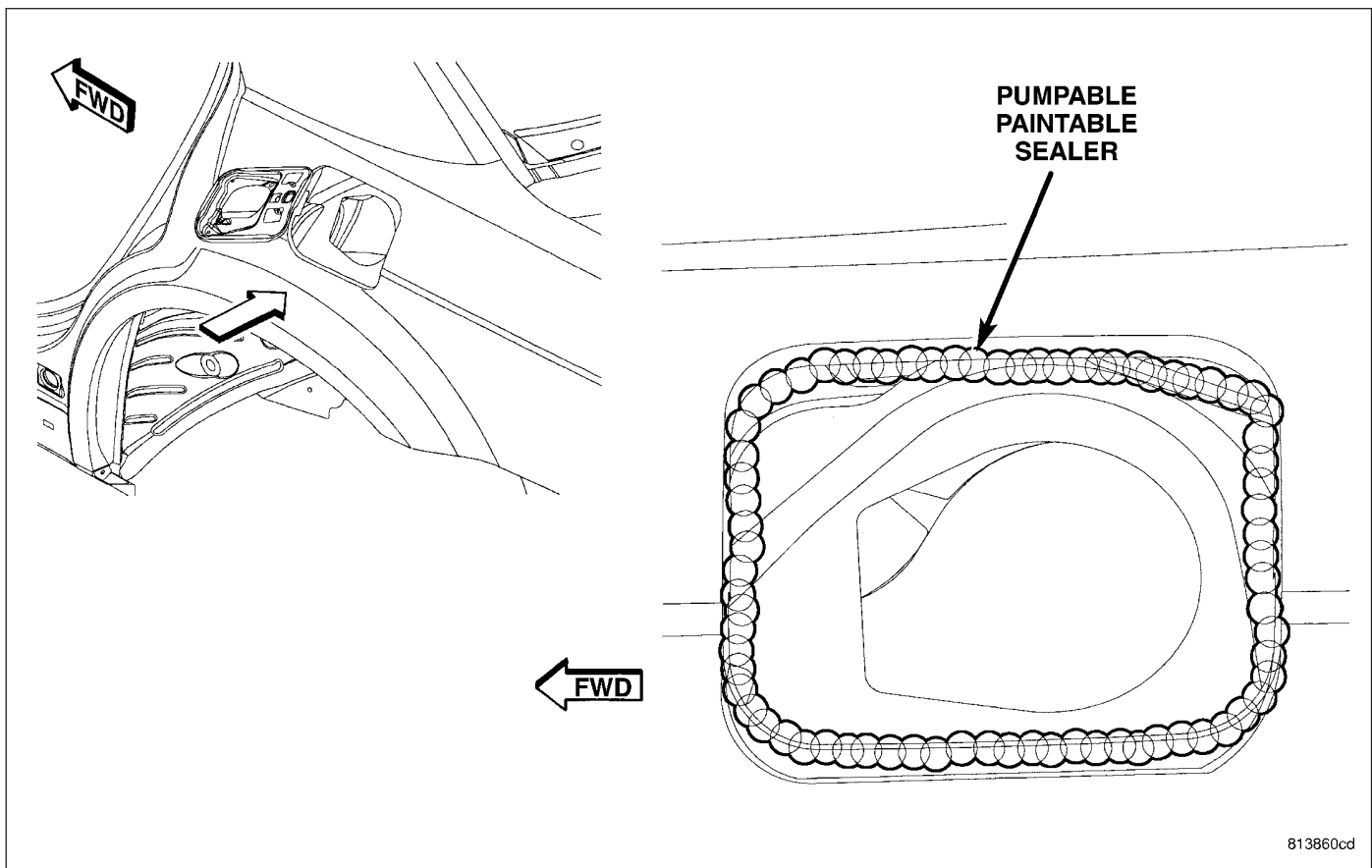
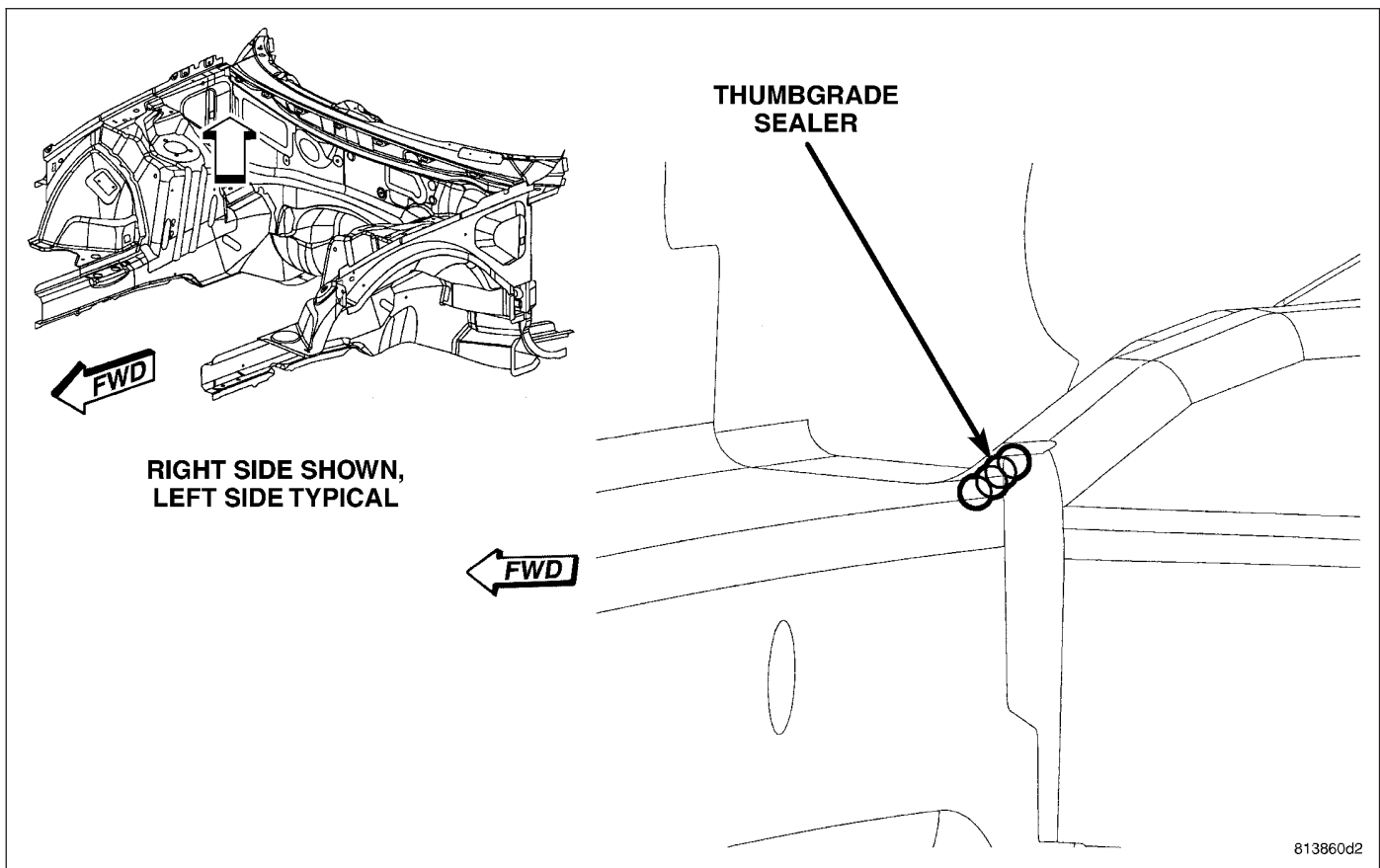


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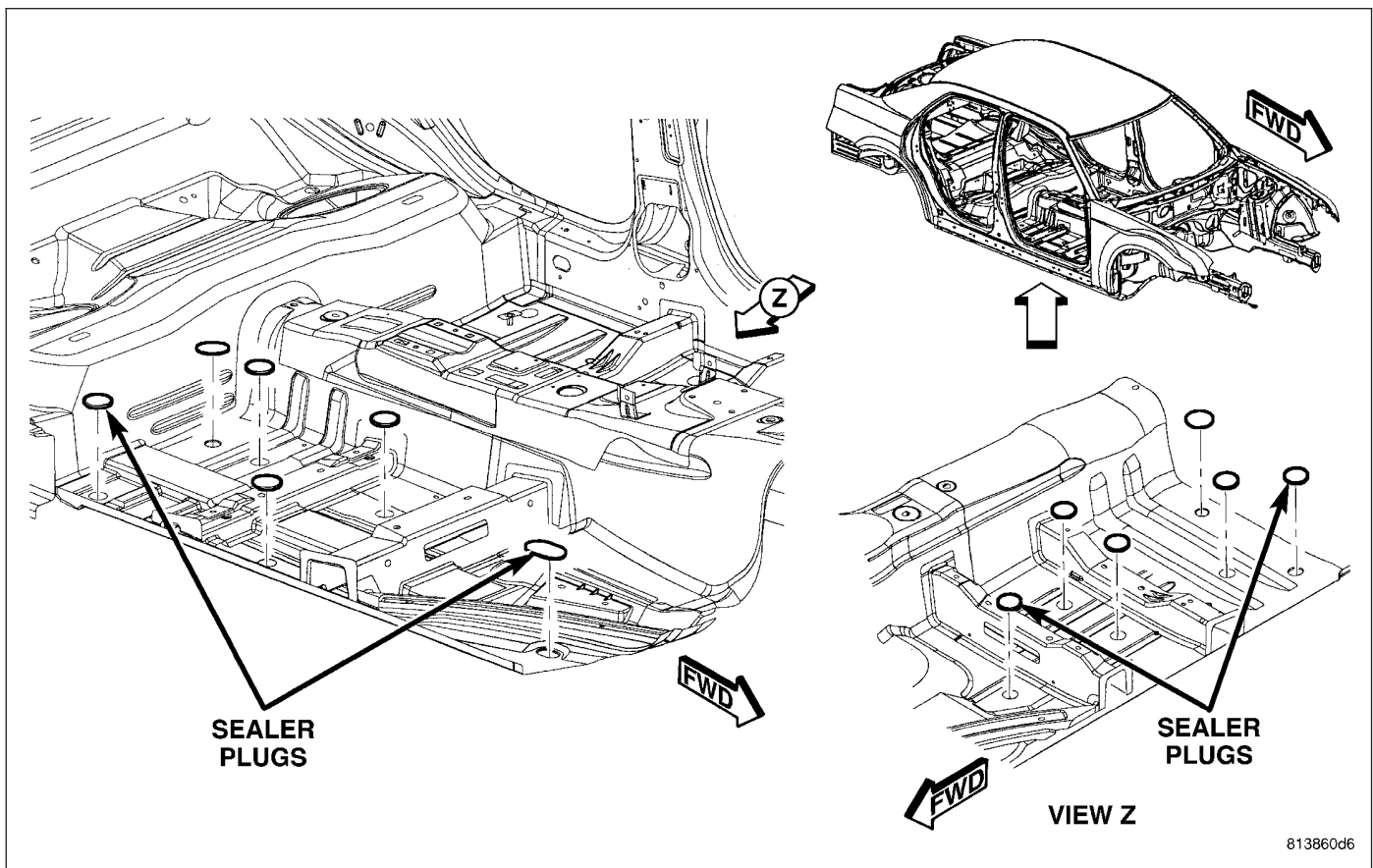
Fig. 27 ROOF PANEL



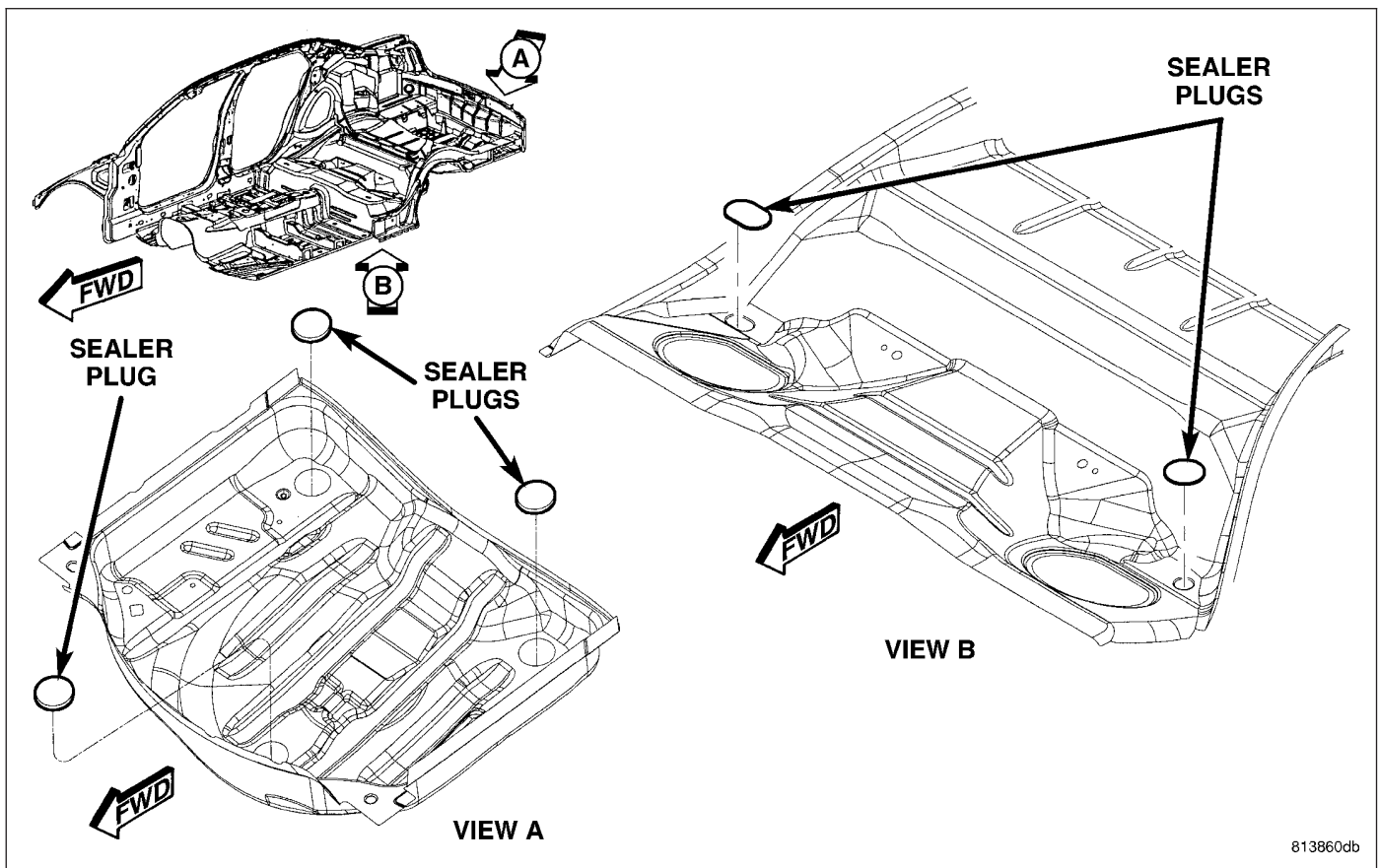
**Fig. 28 REAR QUARTER EXTENSION & WHEELHOUSE**

**Fig. 29 FUEL DOOR OPENING****Fig. 30 UPPER COWL AND LOAD BEAM**





*Fig. 31 FRONT FLOOR PAN*



*Fig. 32 CENTER AND REAR FLOOR PAN*

## STRUCTURAL ADHESIVE LOCATIONS

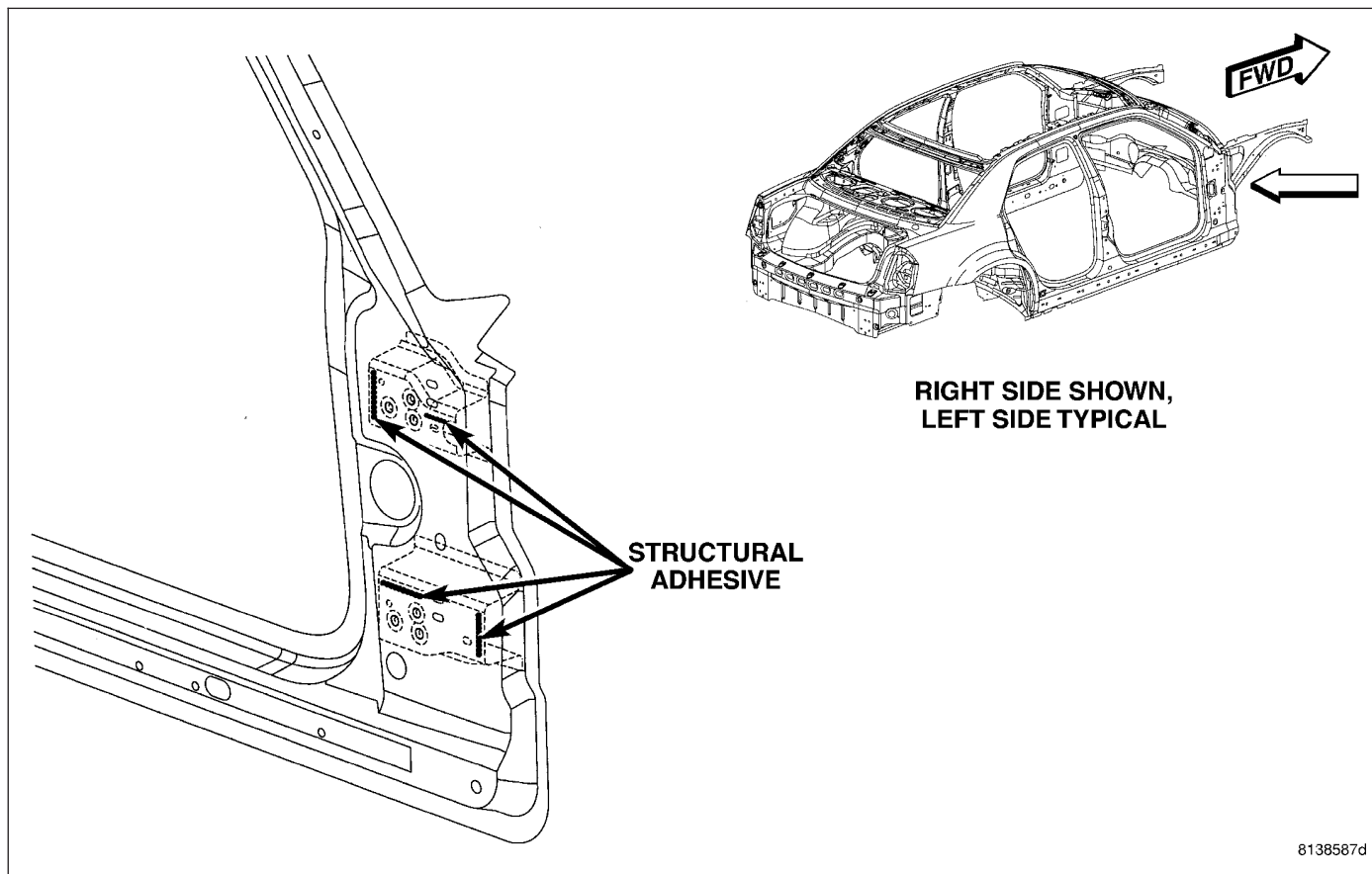
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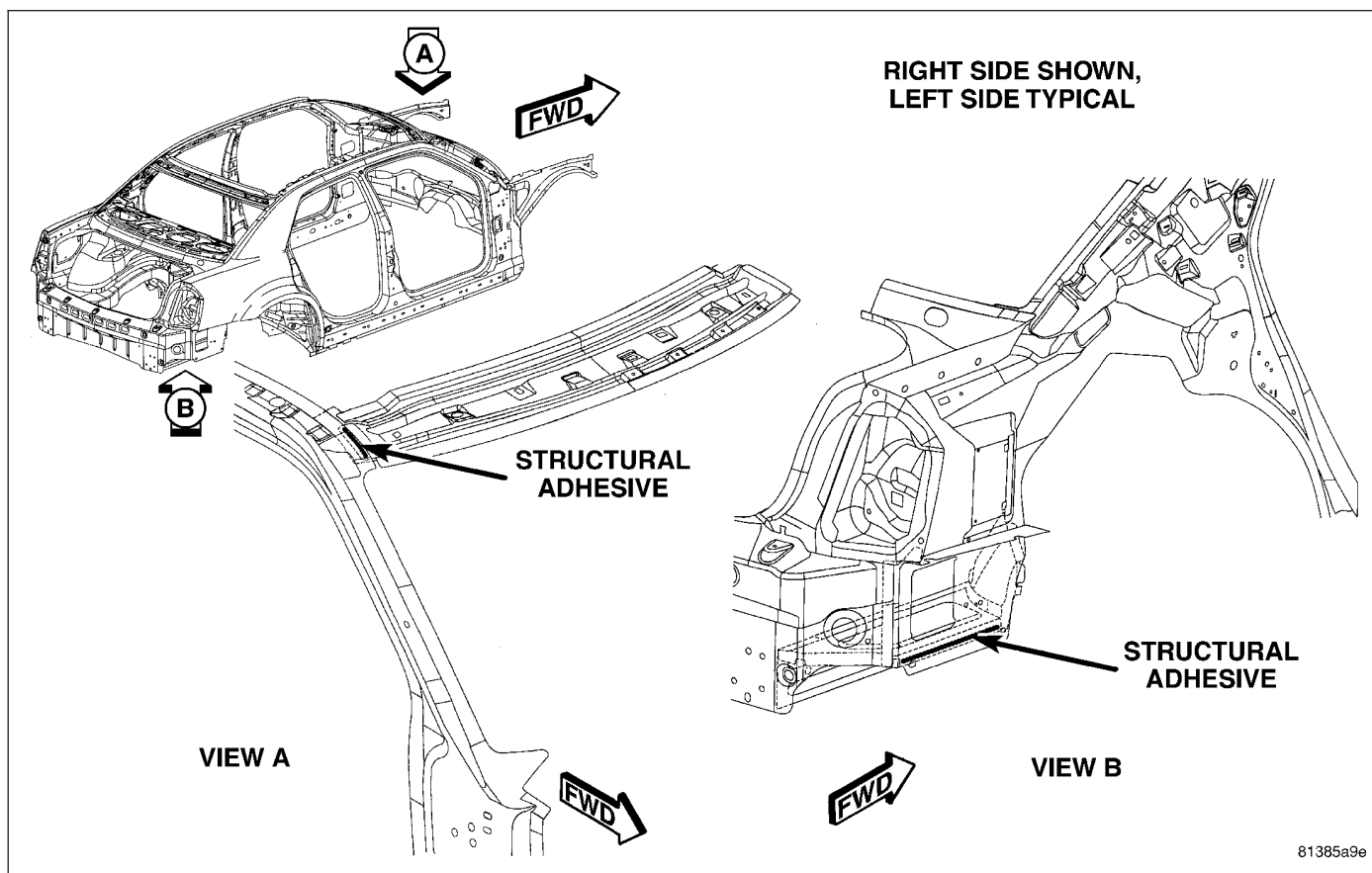
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**Sedan Only**

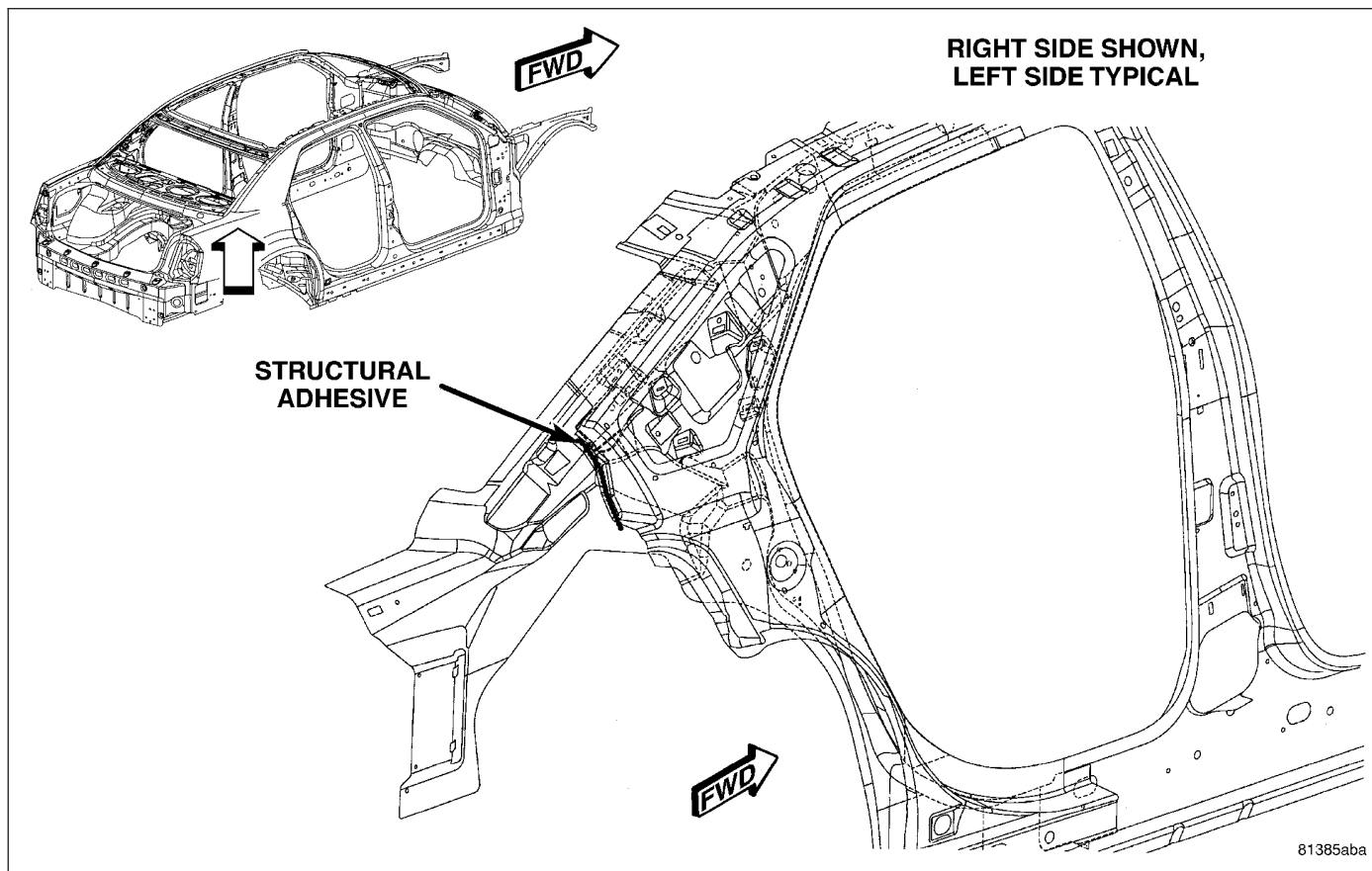


**Fig. 33 FRAMED BODY IN WHITE (1 OF 3)**

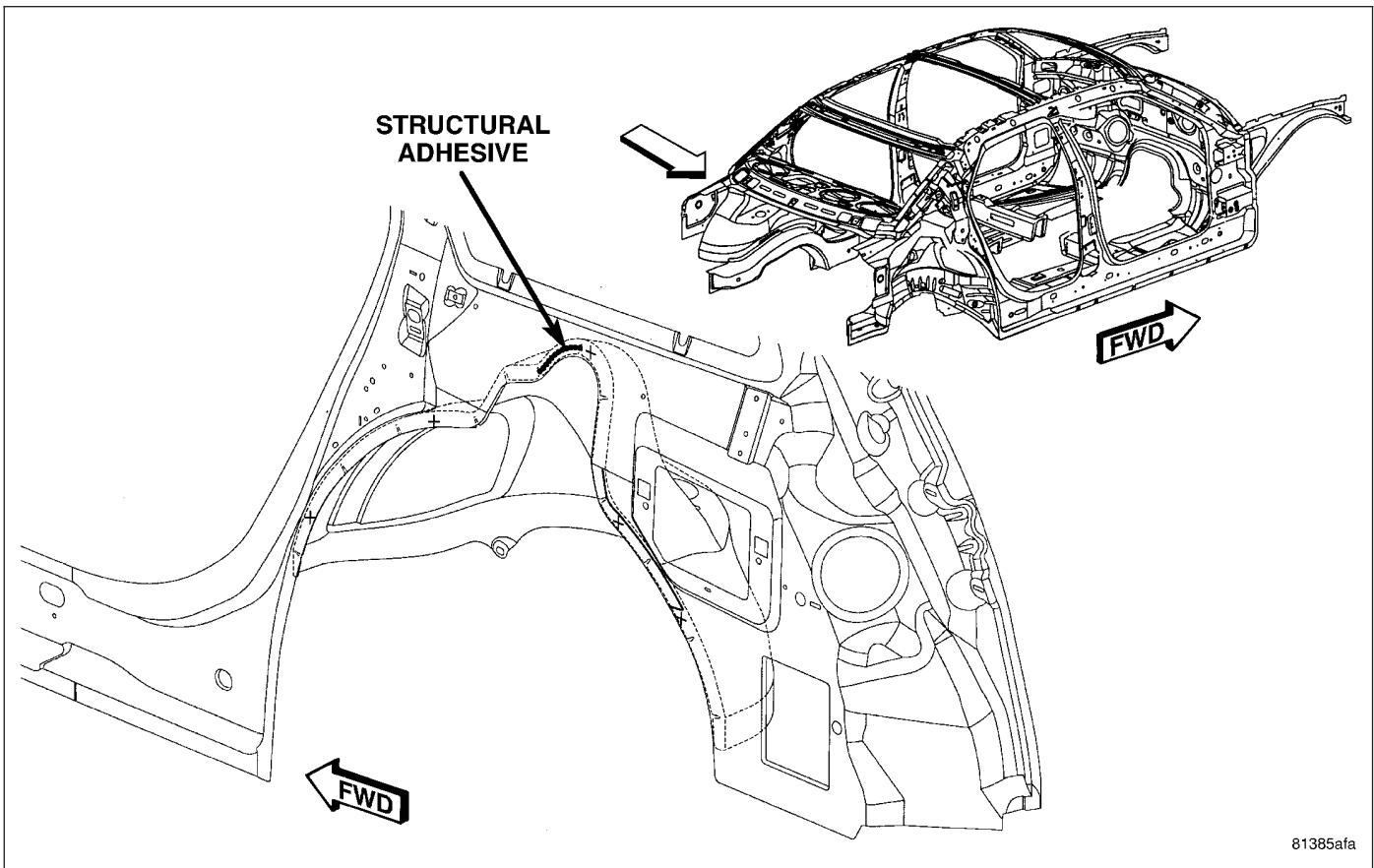




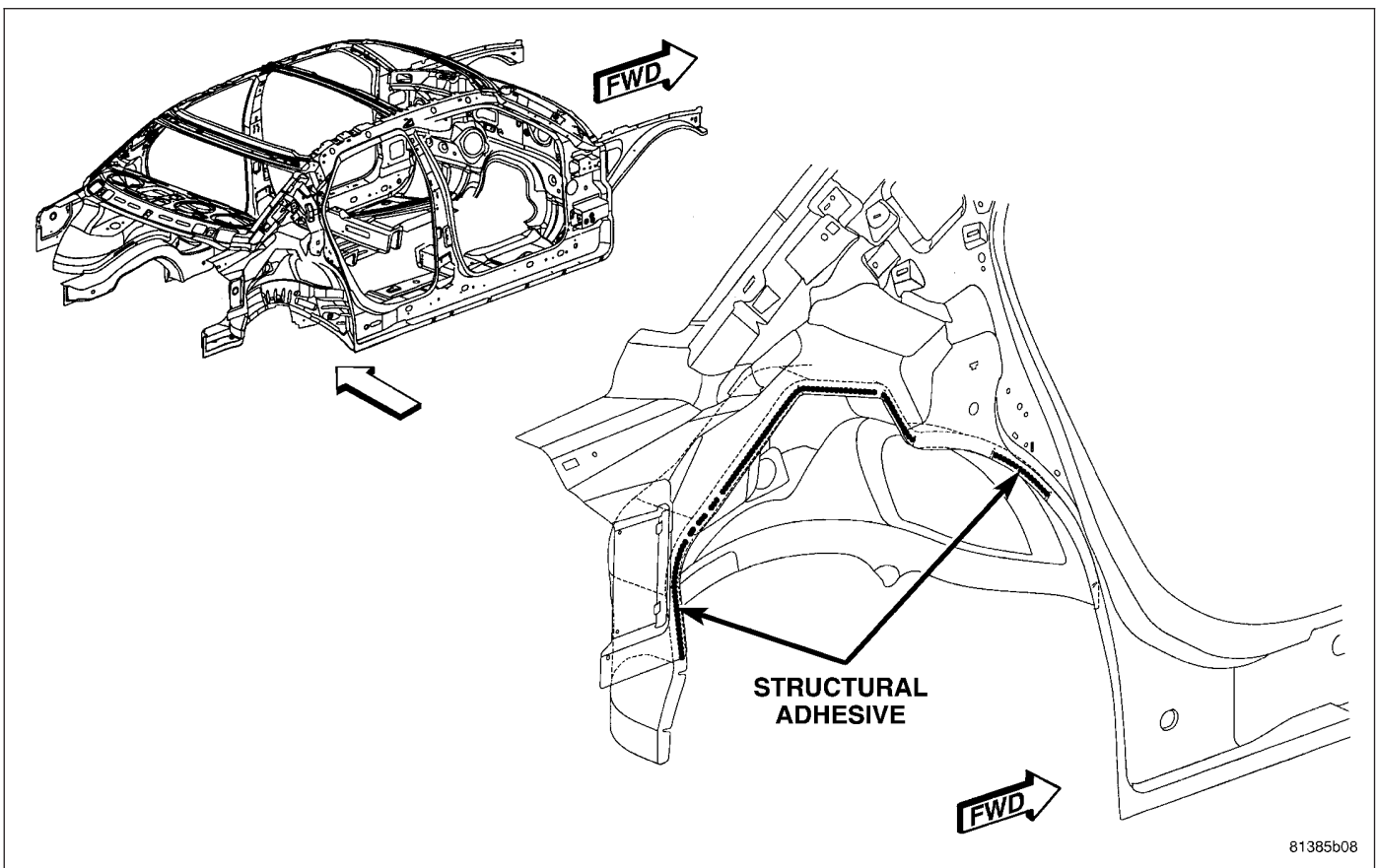
**Fig. 34 FRAMED BODY IN WHITE (2 OF 3)**



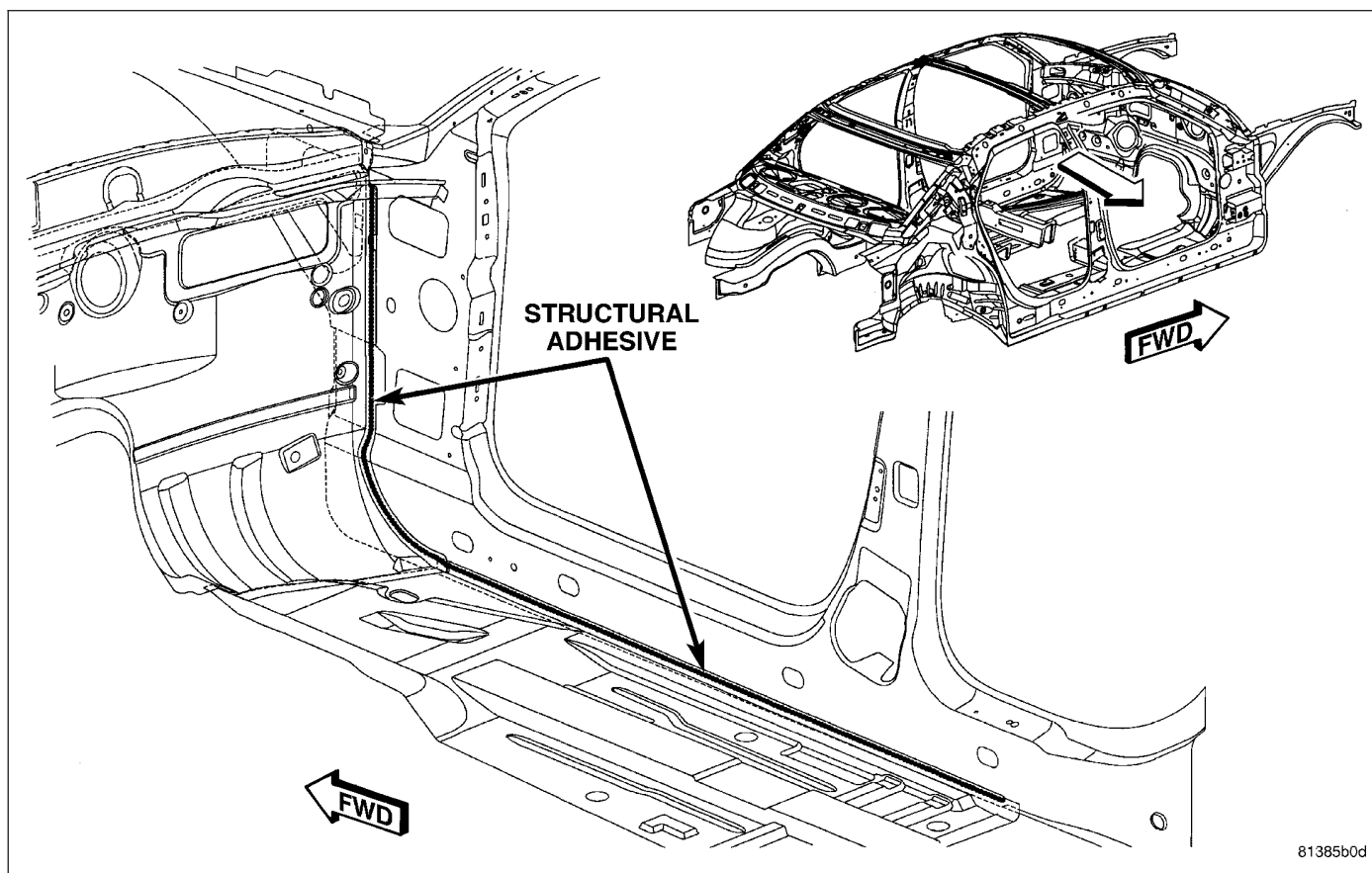
**Fig. 35 FRAMED BODY IN WHITE (3 OF 3)**



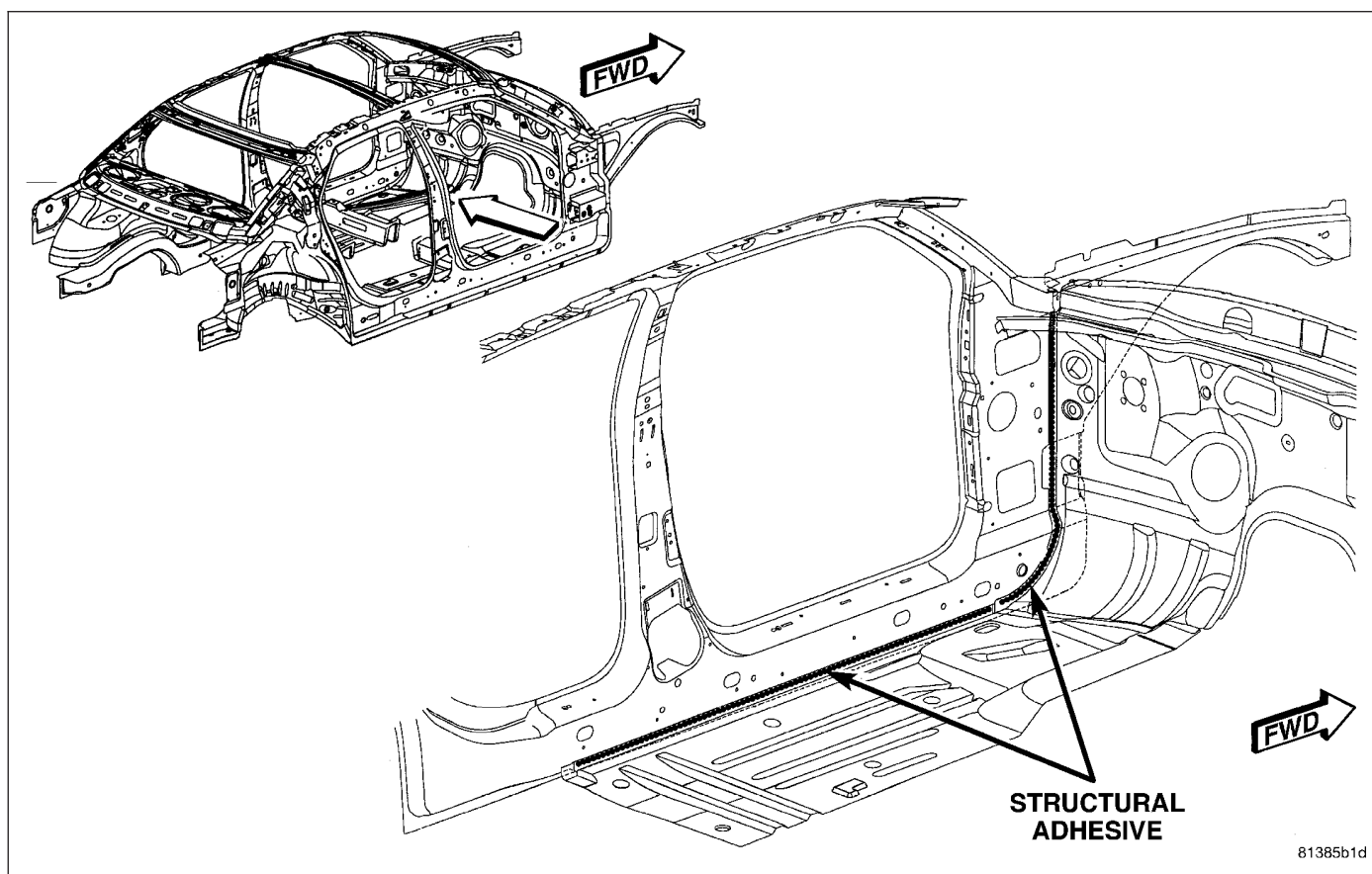
**Fig. 36 FULL FRAMED BODY IN WHITE (1 OF 4)**



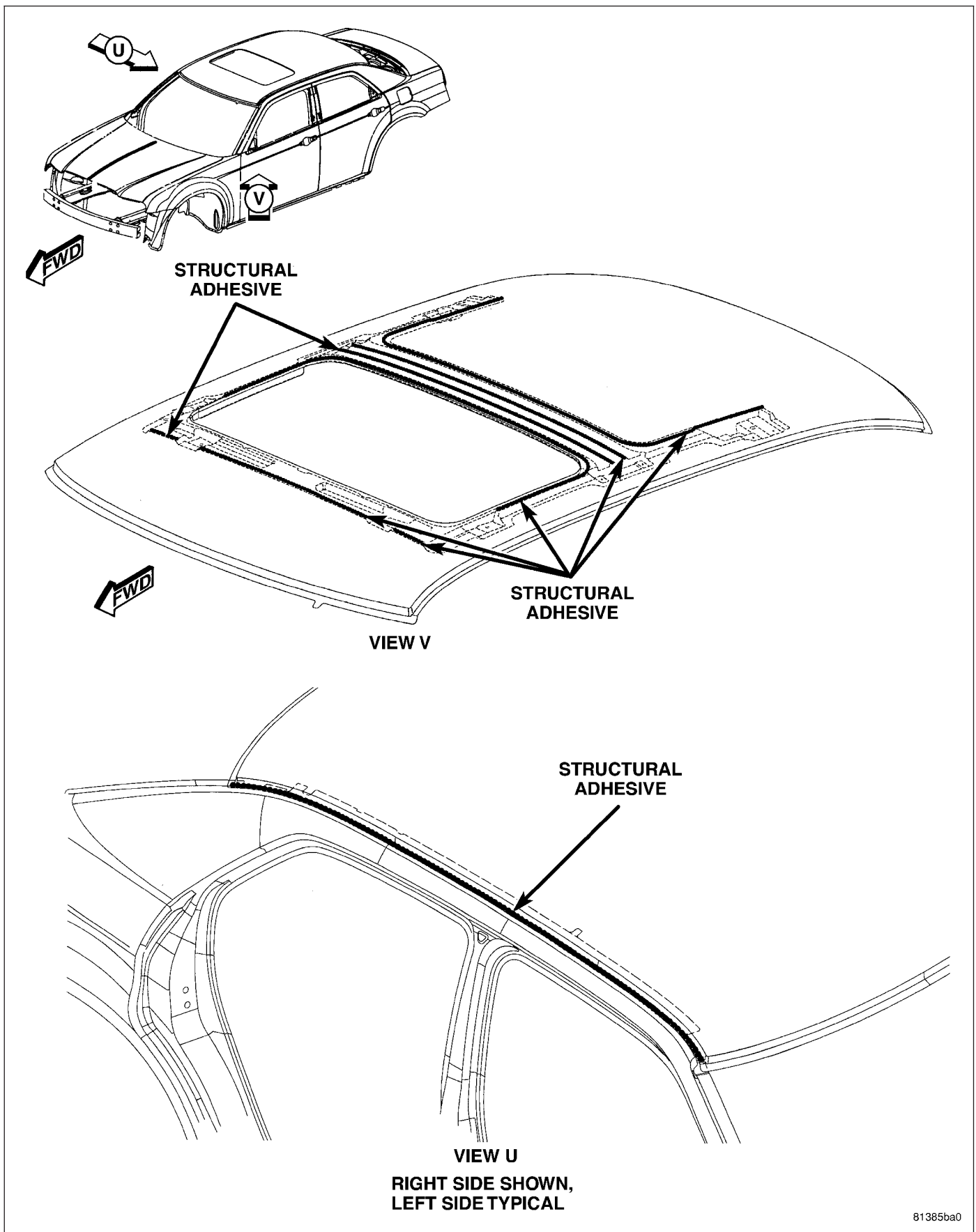
**Fig. 37 FULL FRAMED BODY IN WHITE (2 OF 4)**



**Fig. 38 FULL FRAMED BODY IN WHITE (3 OF 4)**



**Fig. 39 FULL FRAMED BODY IN WHITE (4 OF 4)**



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**Fig. 40 ROOF**

## Wagon Only

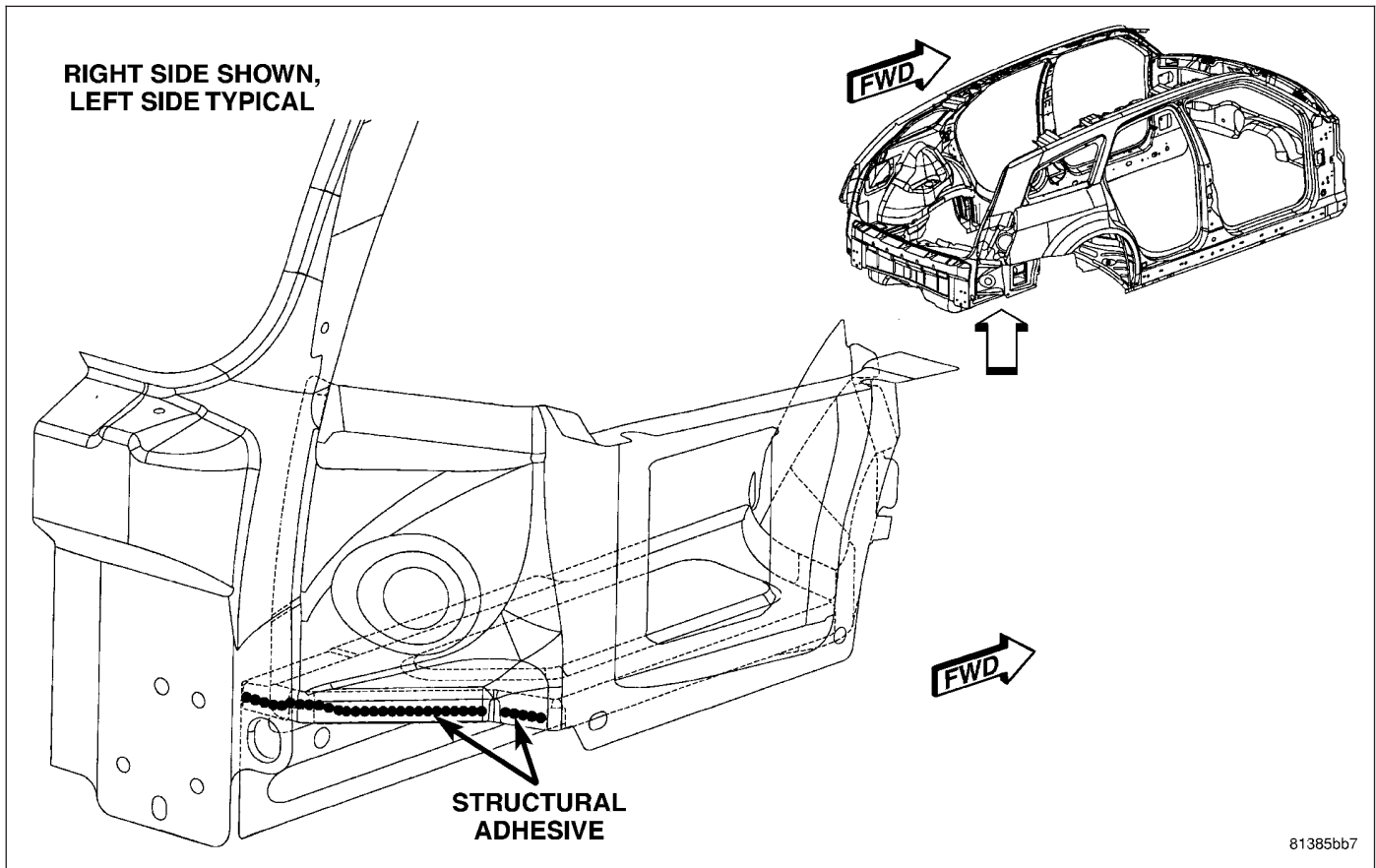
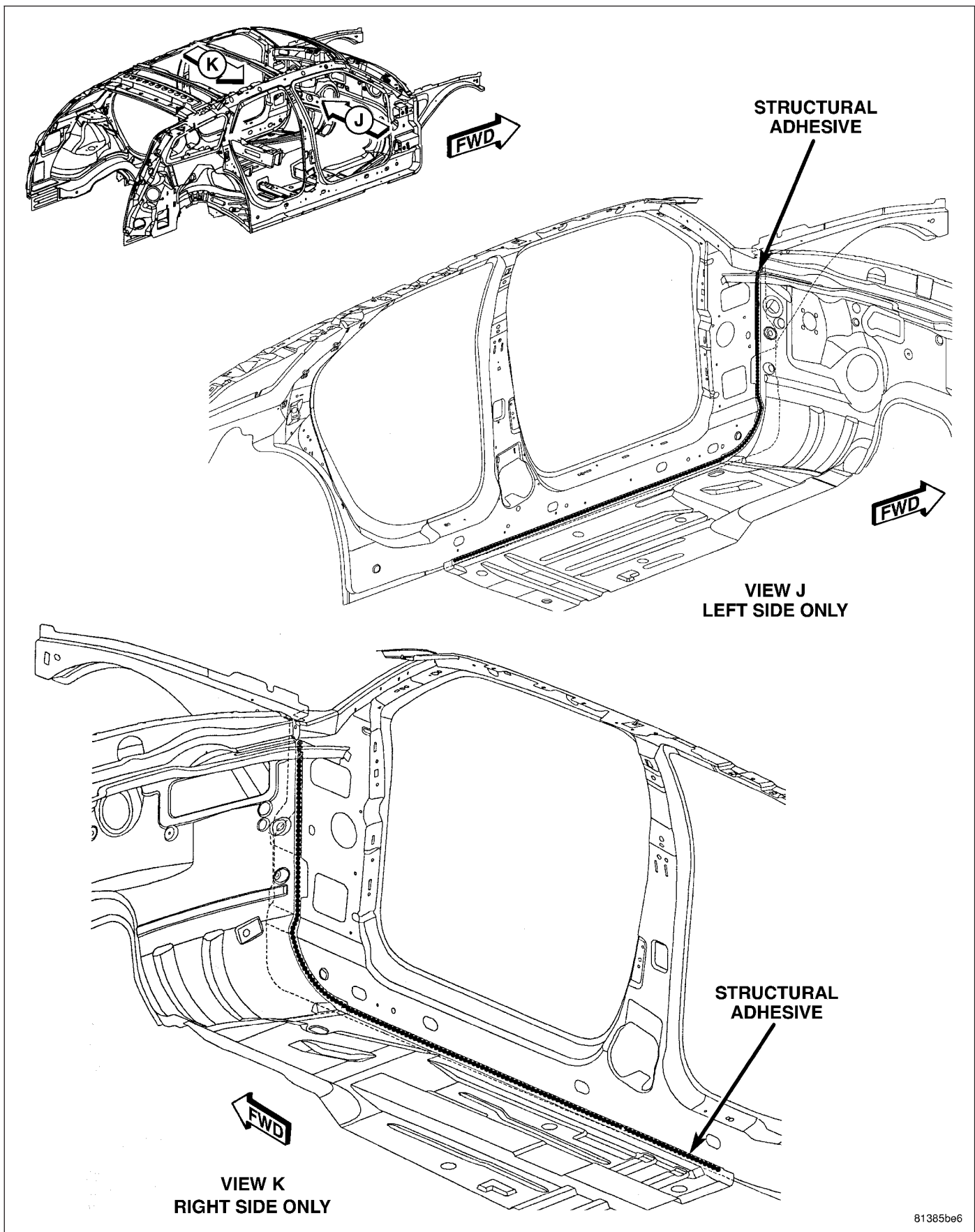


Fig. 41 FRAMED BODY IN WHITE



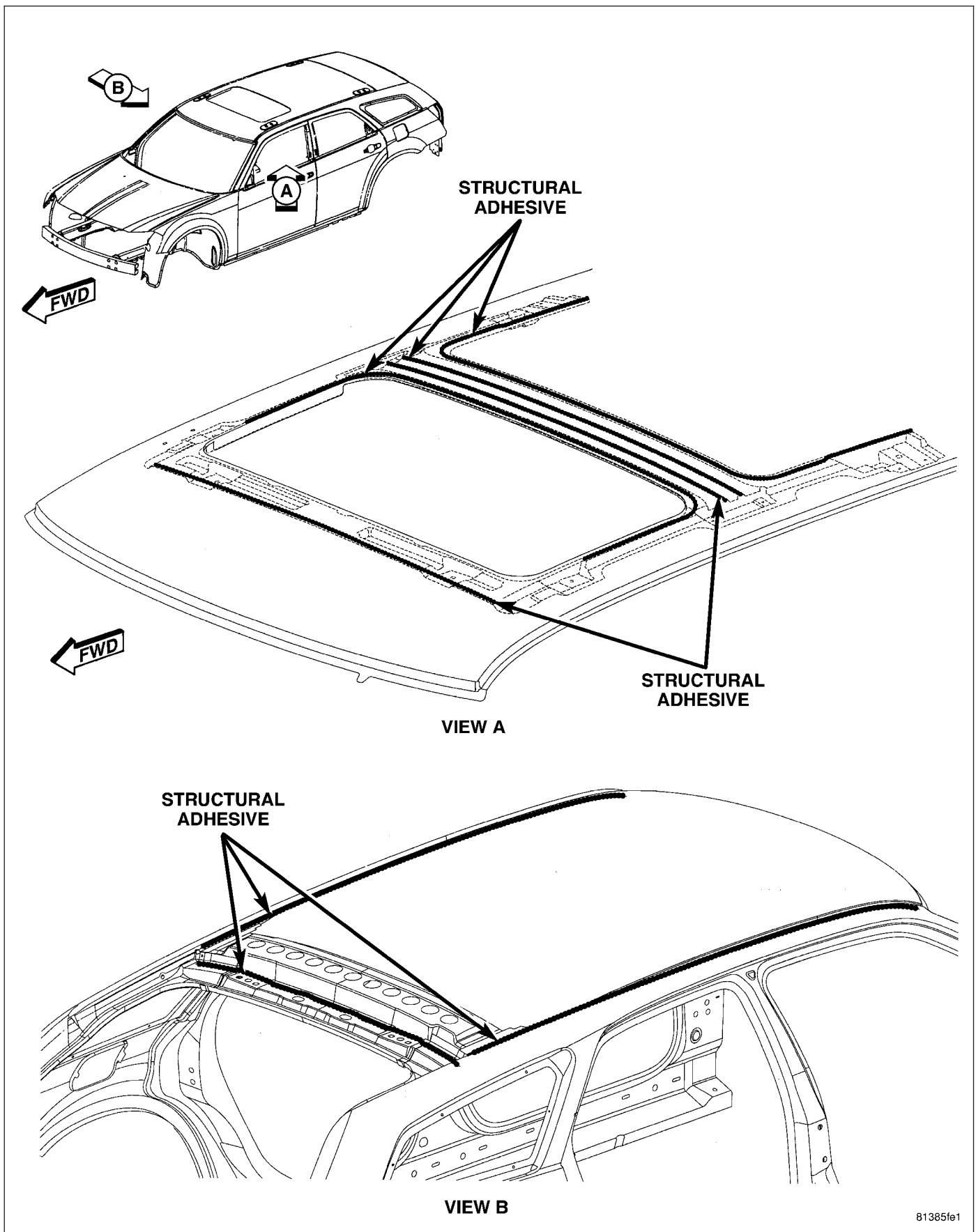
**Fig. 42 FULL FRAMED BODY IN WHITE (1 OF 2)**





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**Fig. 43 FULL FRAMED BODY IN WHITE (2 OF 2)**

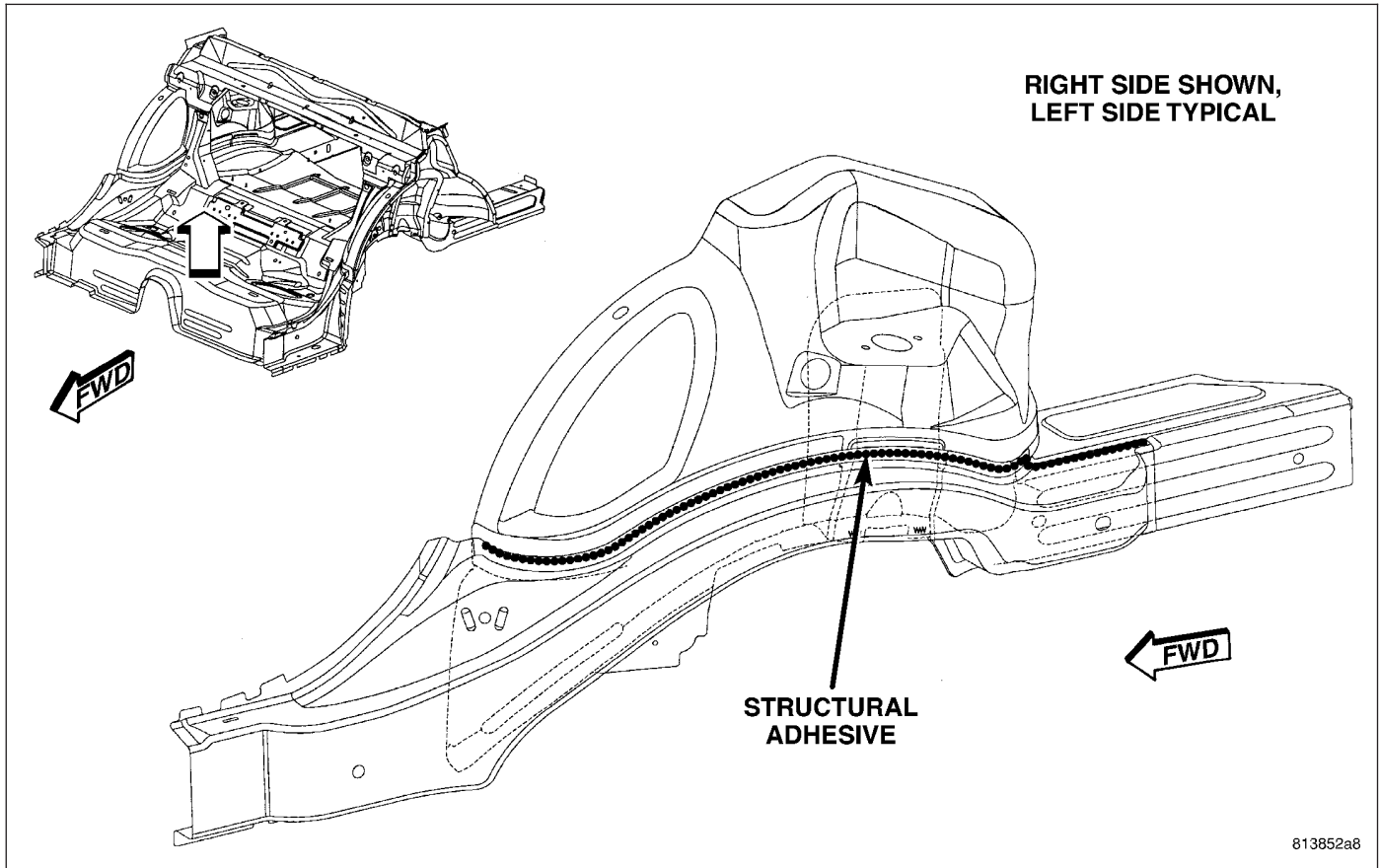


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**Fig. 44 ROOF**



## Sedan and Wagon

*Fig. 45 REAR LADDER AND FLOOR (1 OF 4)*

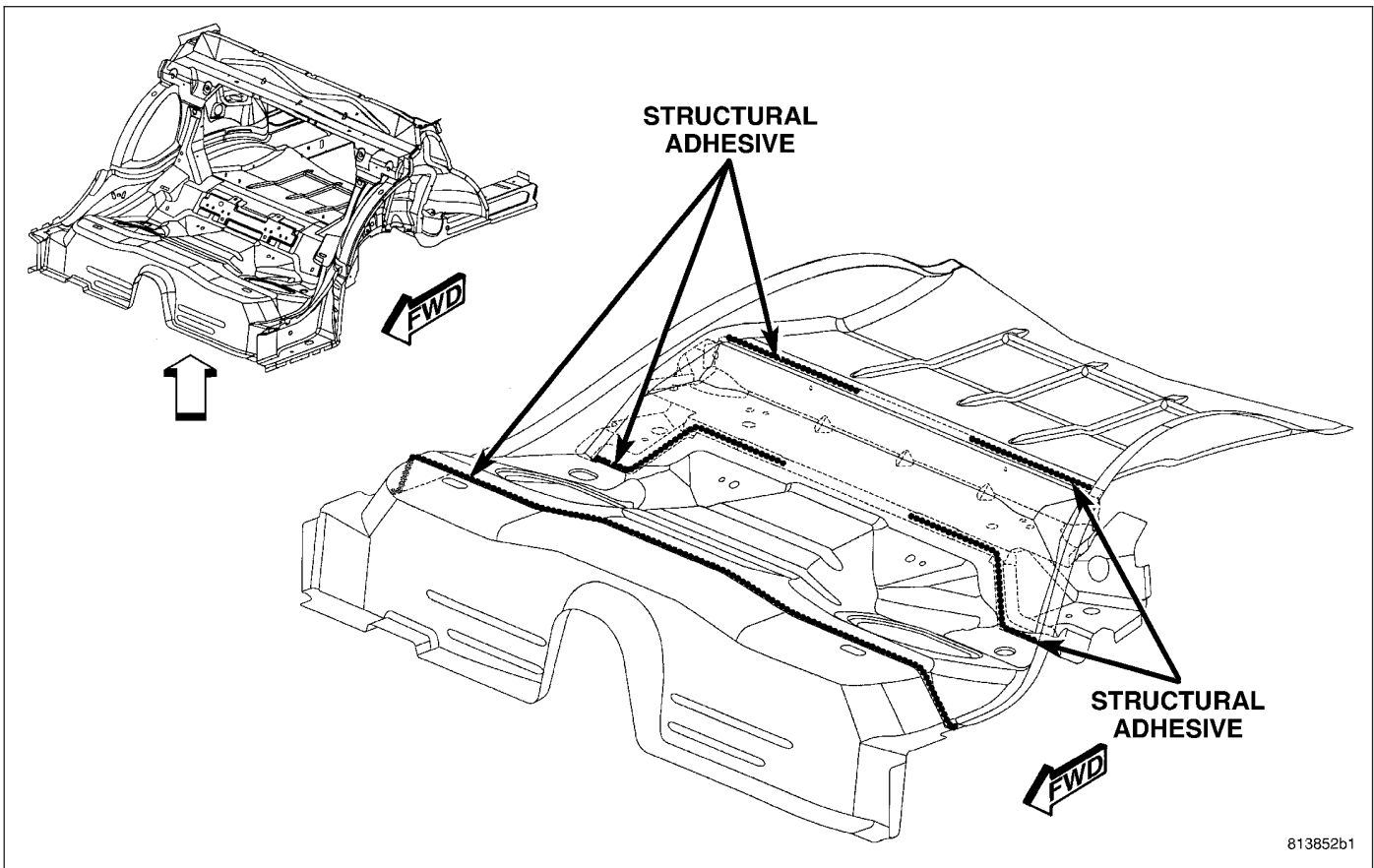


Fig. 46 REAR LADDER AND FLOOR (2 OF 4)

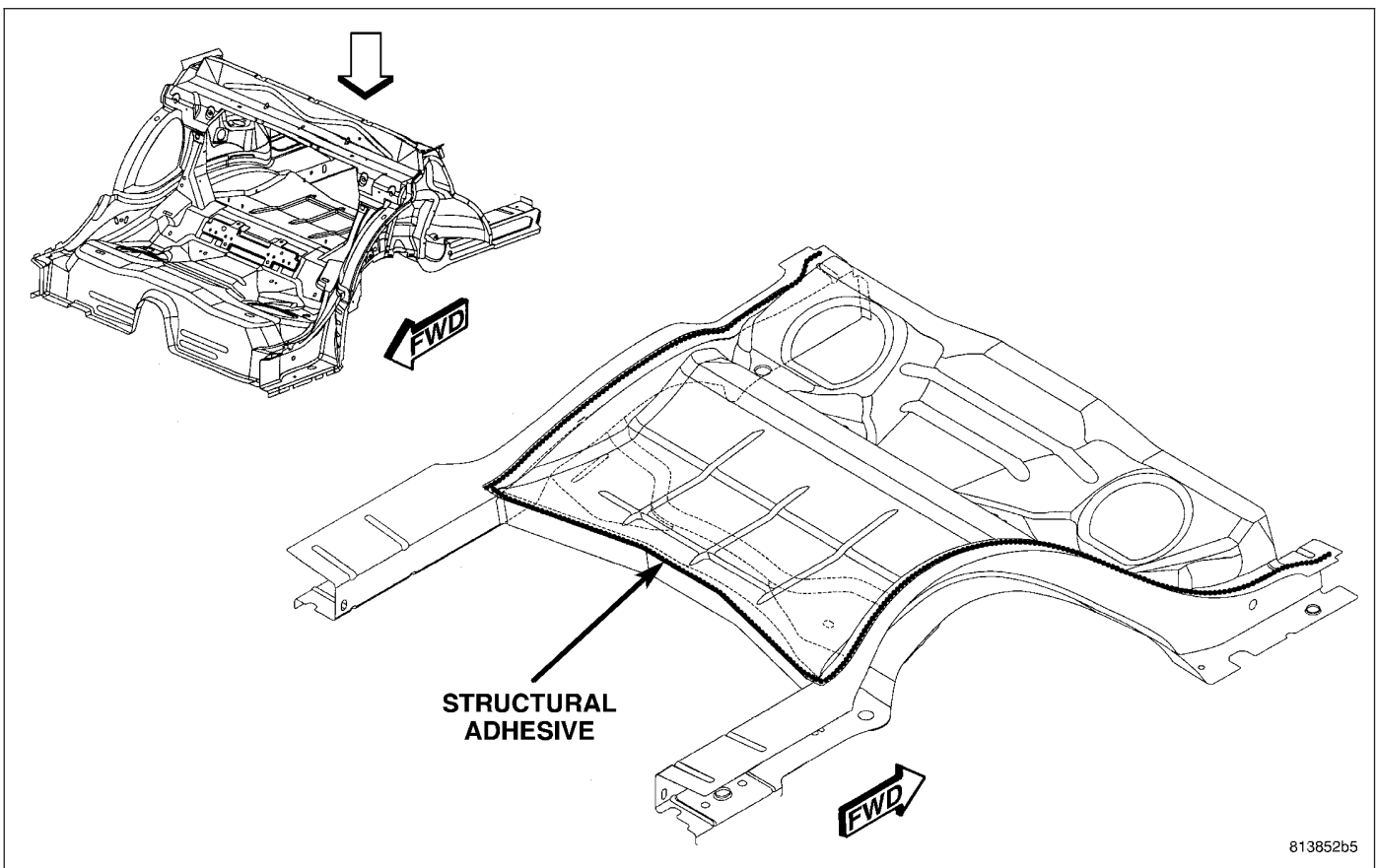
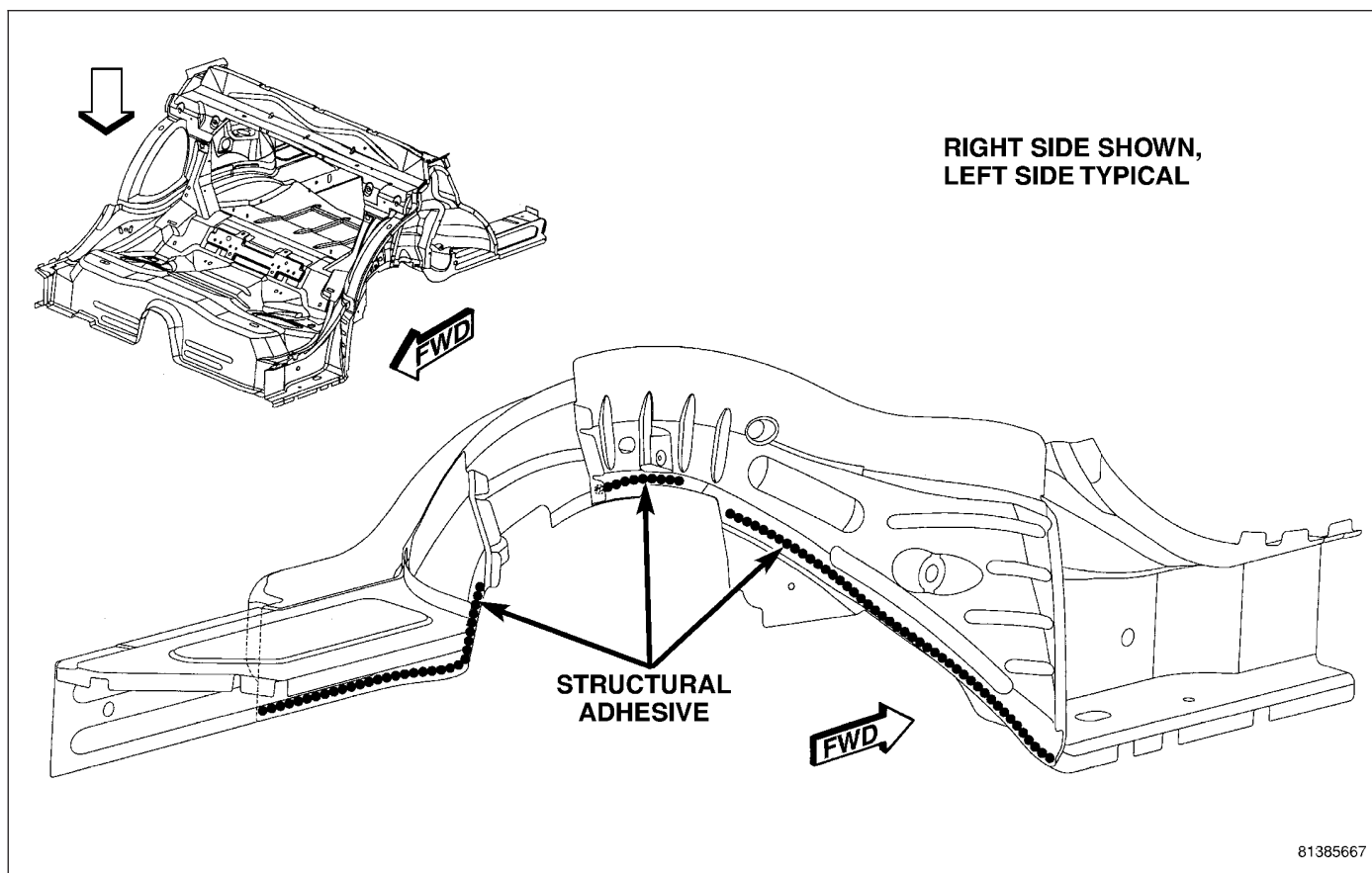
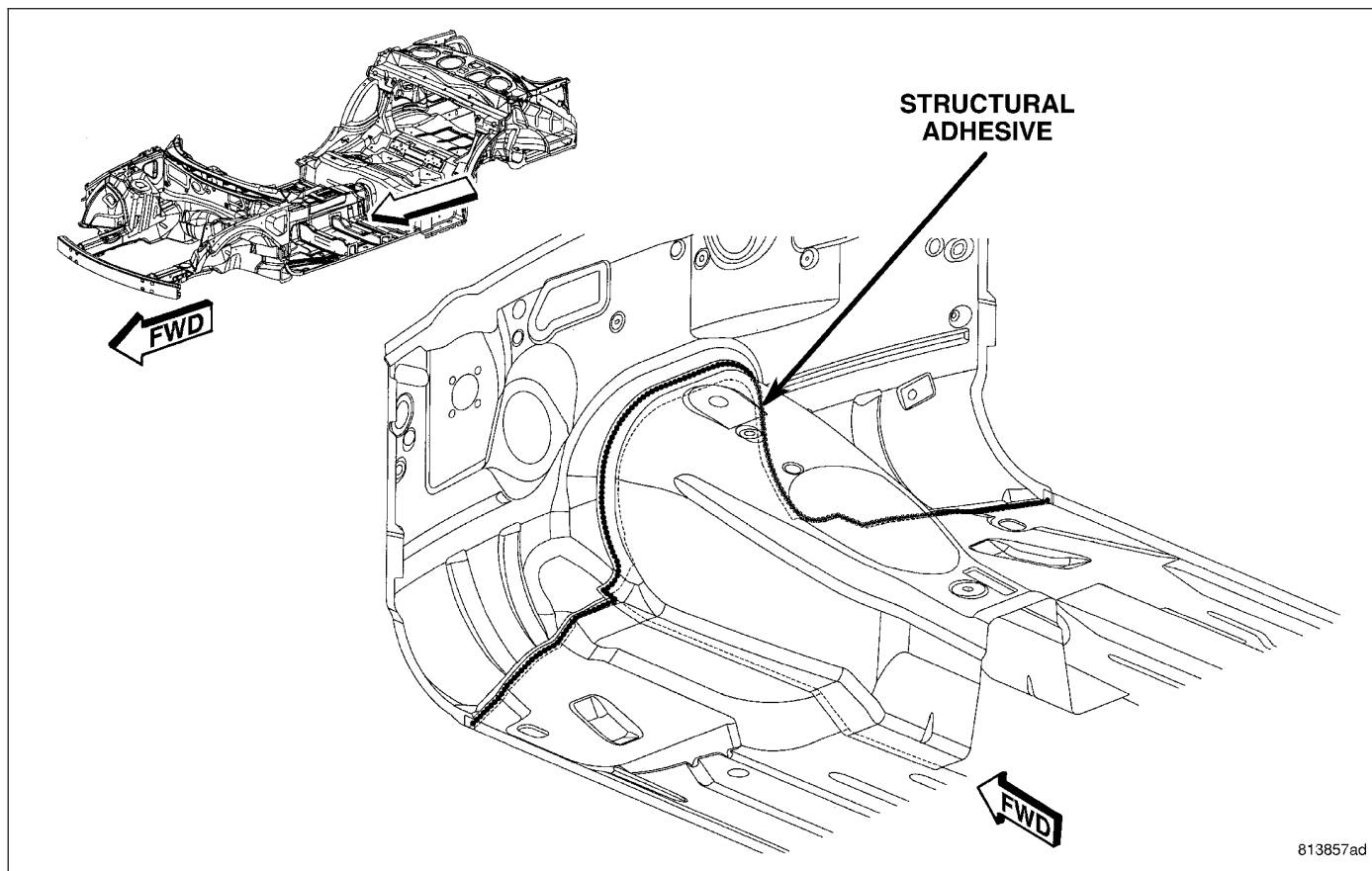


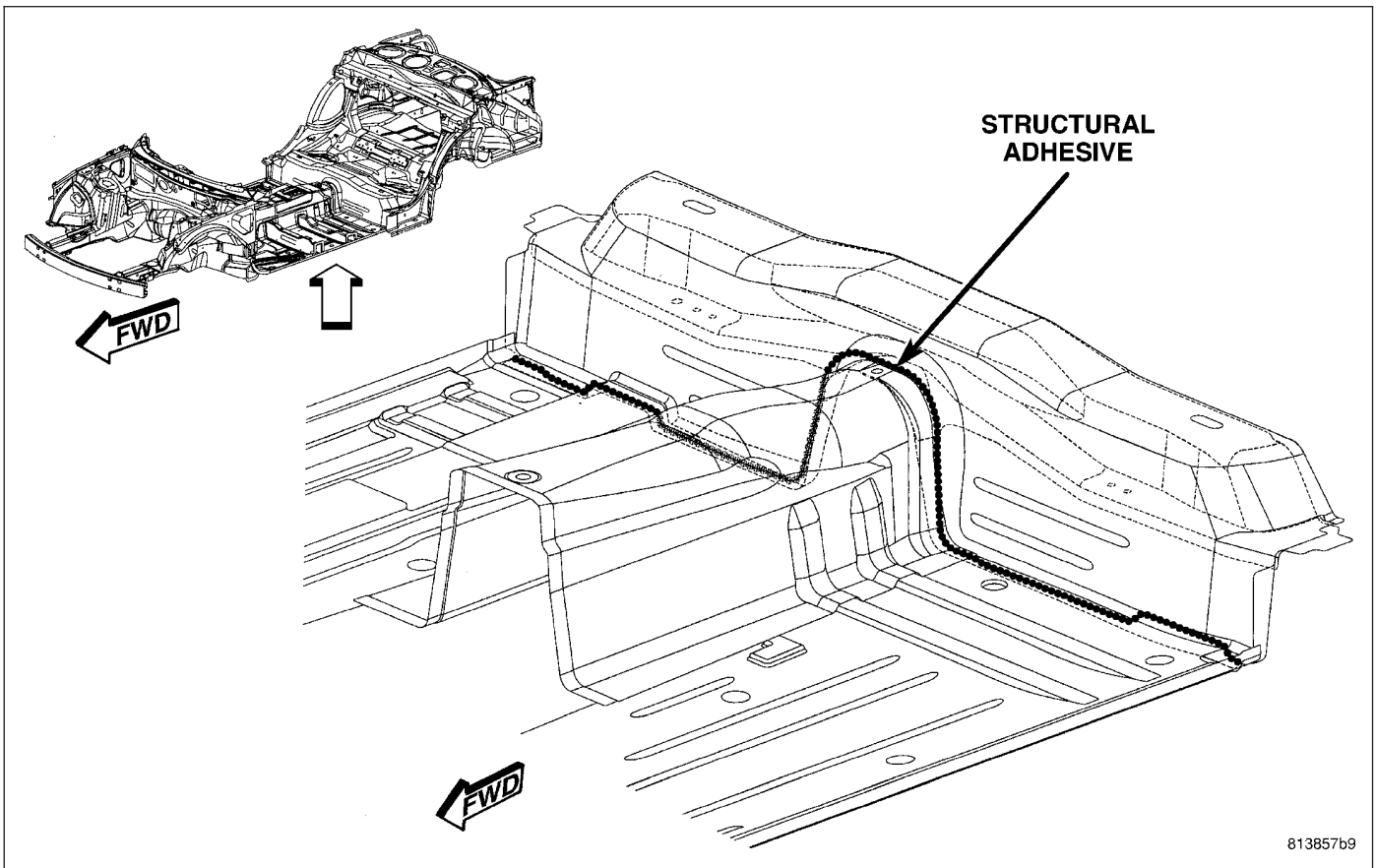
Fig. 47 REAR LADDER AND FLOOR (3 OF 4)



*Fig. 48 REAR LADDER AND FLOOR (4 OF 4)*



*Fig. 49 UNDERBODY FRAMING (1 OF 2)*



**Fig. 50 UNDERBODY FRAMING (2 OF 2)**

## WELD LOCATIONS

### SPECIFICATIONS

### WELD LOCATIONS

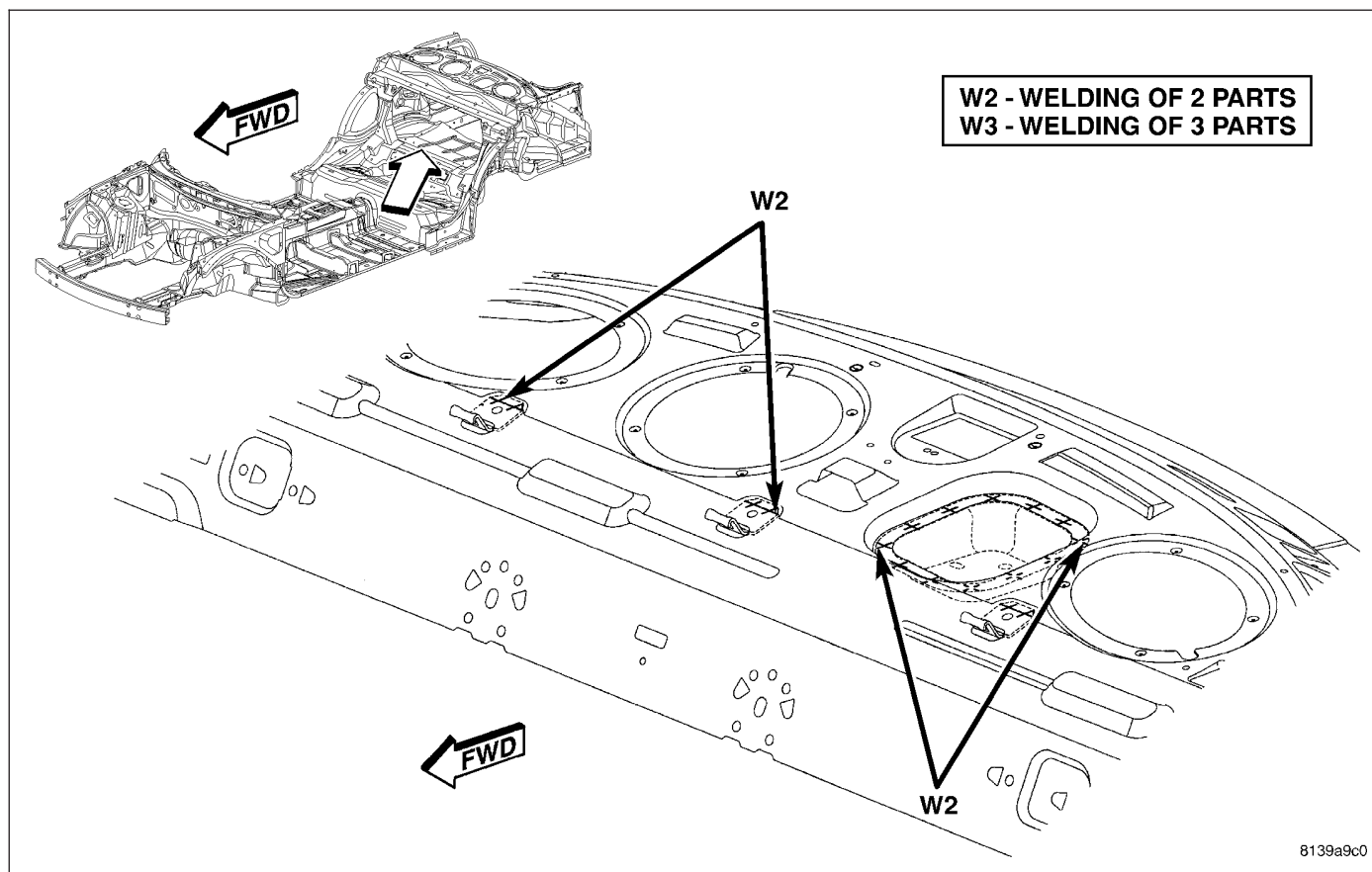
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**Sedan Only****Fig. 51 UNDERBODY (1 OF 4)**



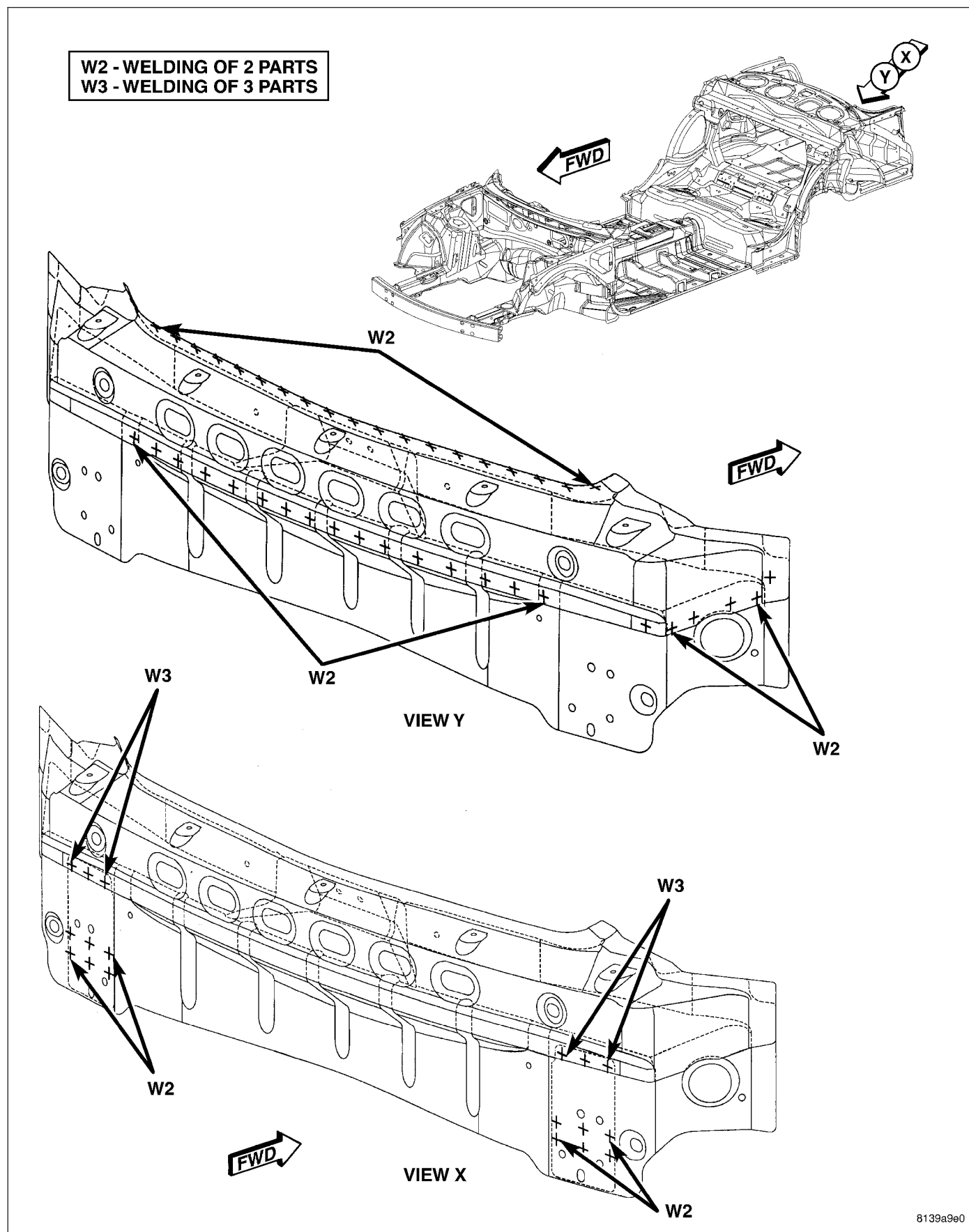
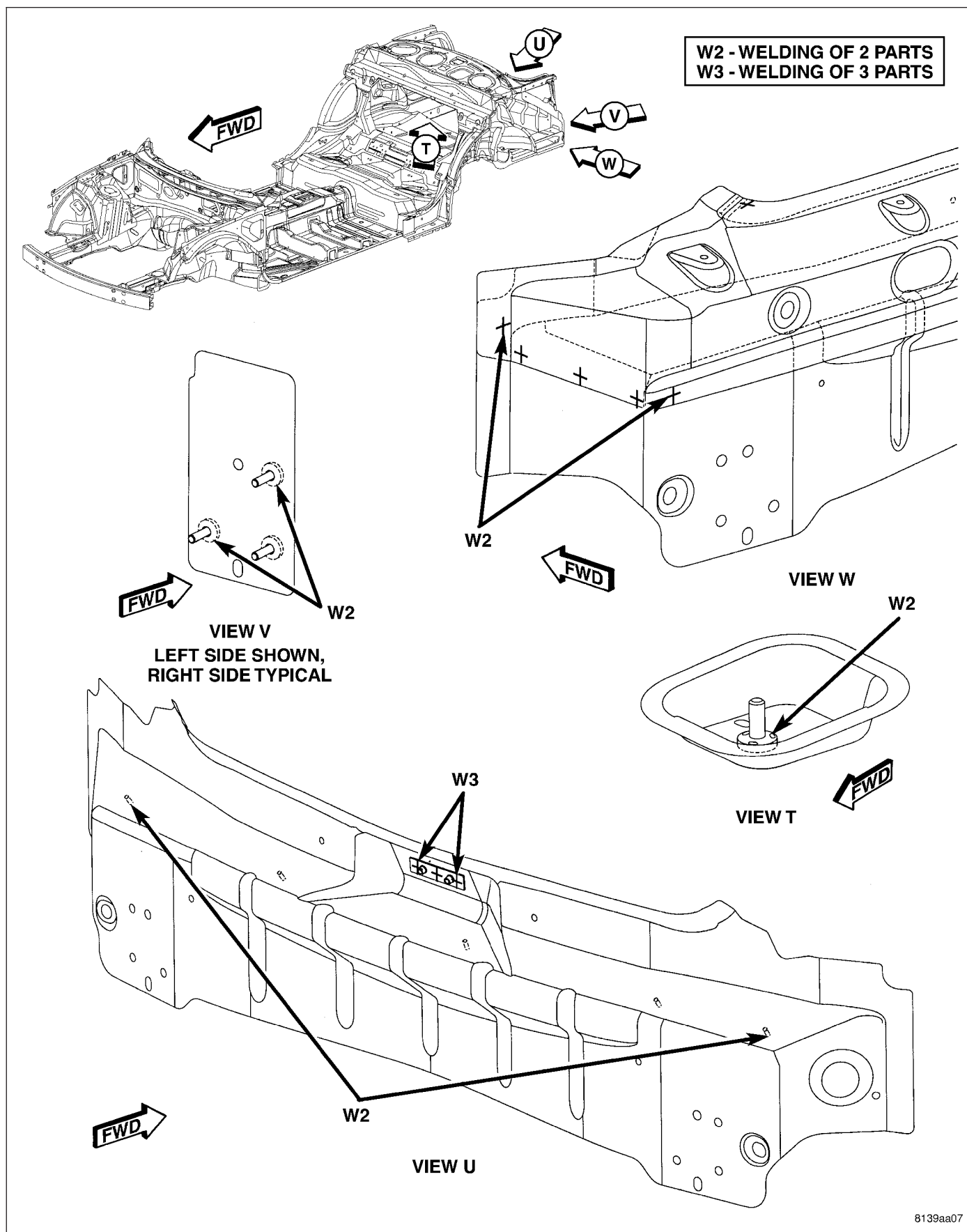


Fig. 52 UNDERBODY (2 OF 4)



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Fig. 53 UNDERBODY (3 OF 4)

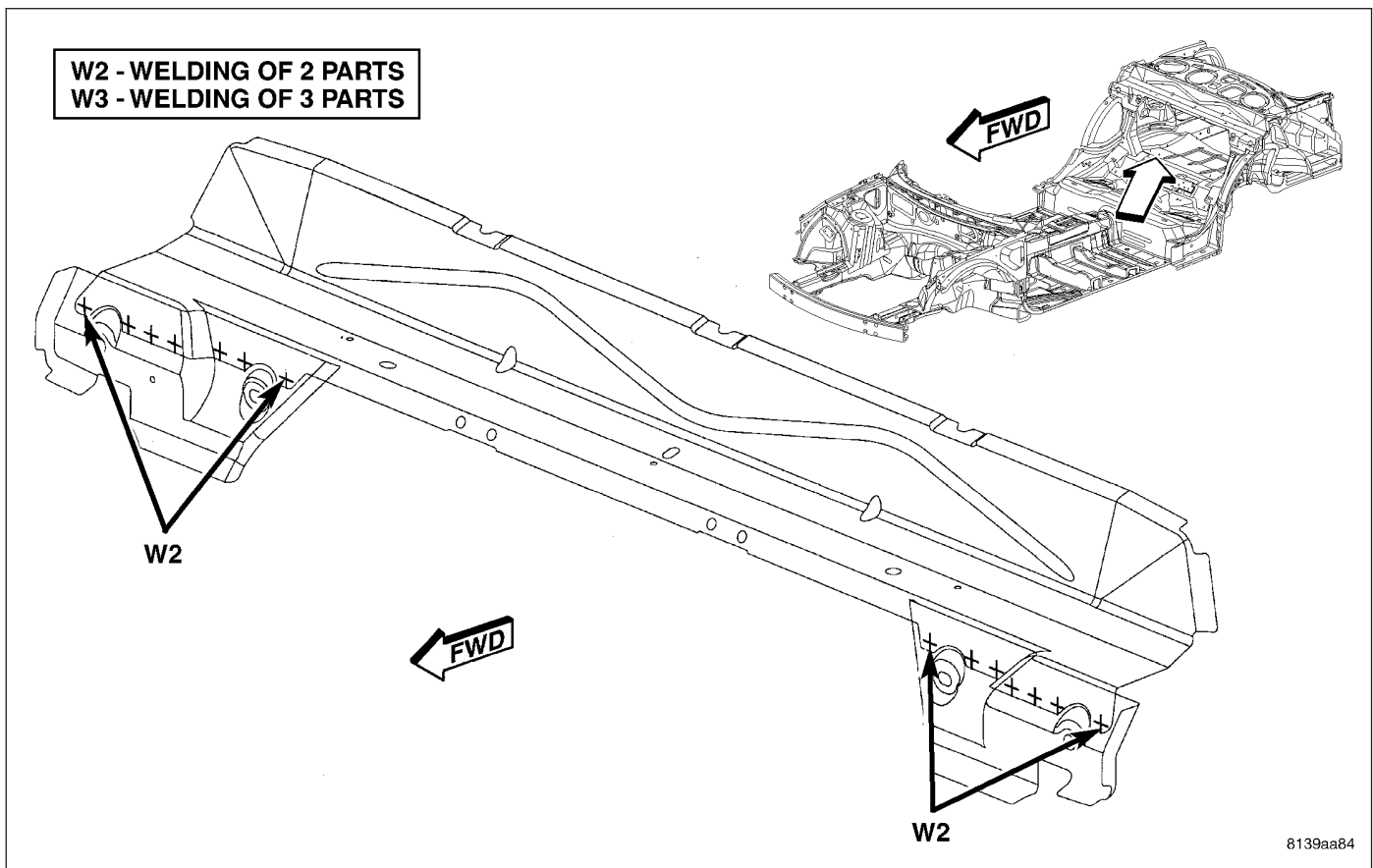


Fig. 54 UNDERBODY (4 OF 4)

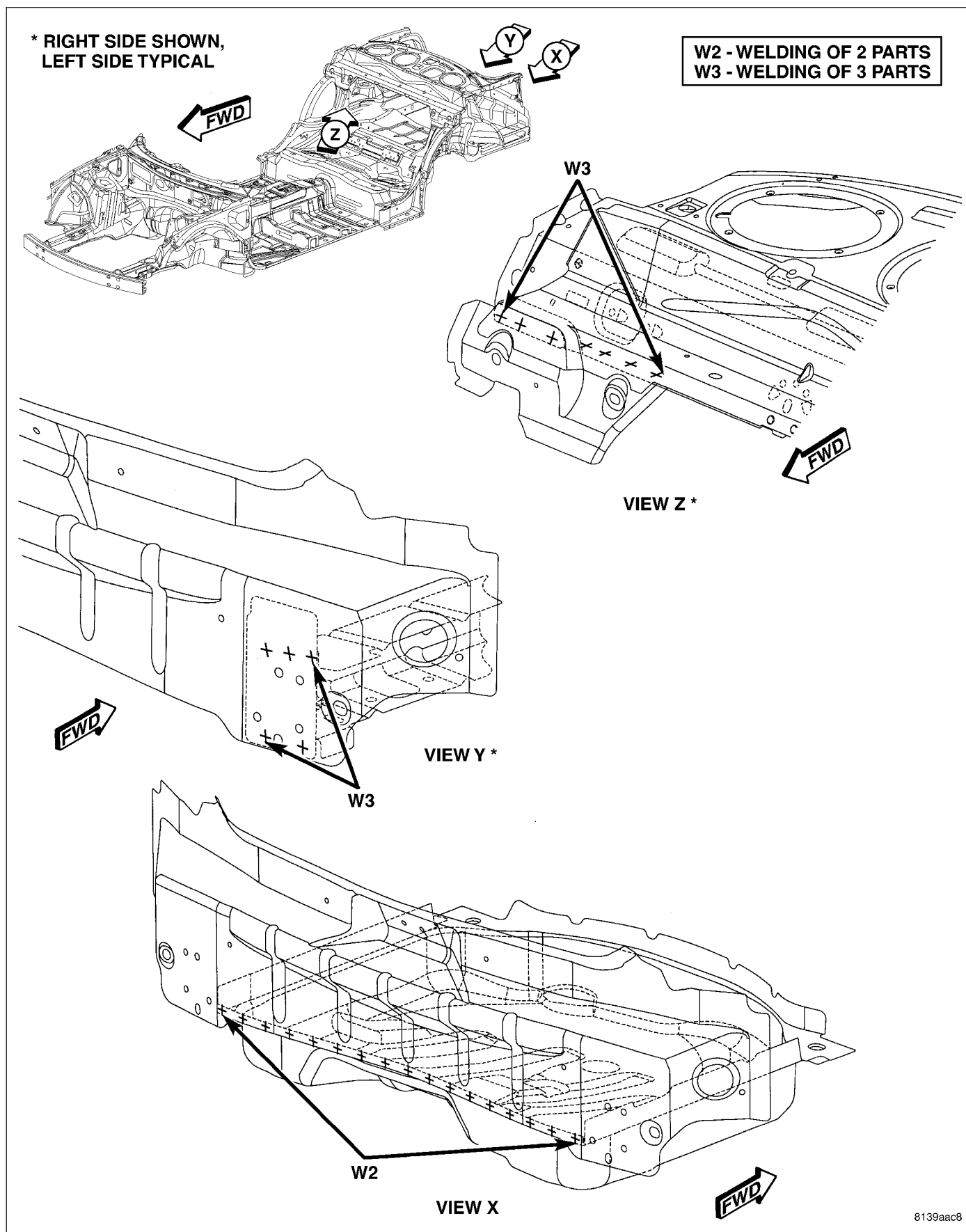
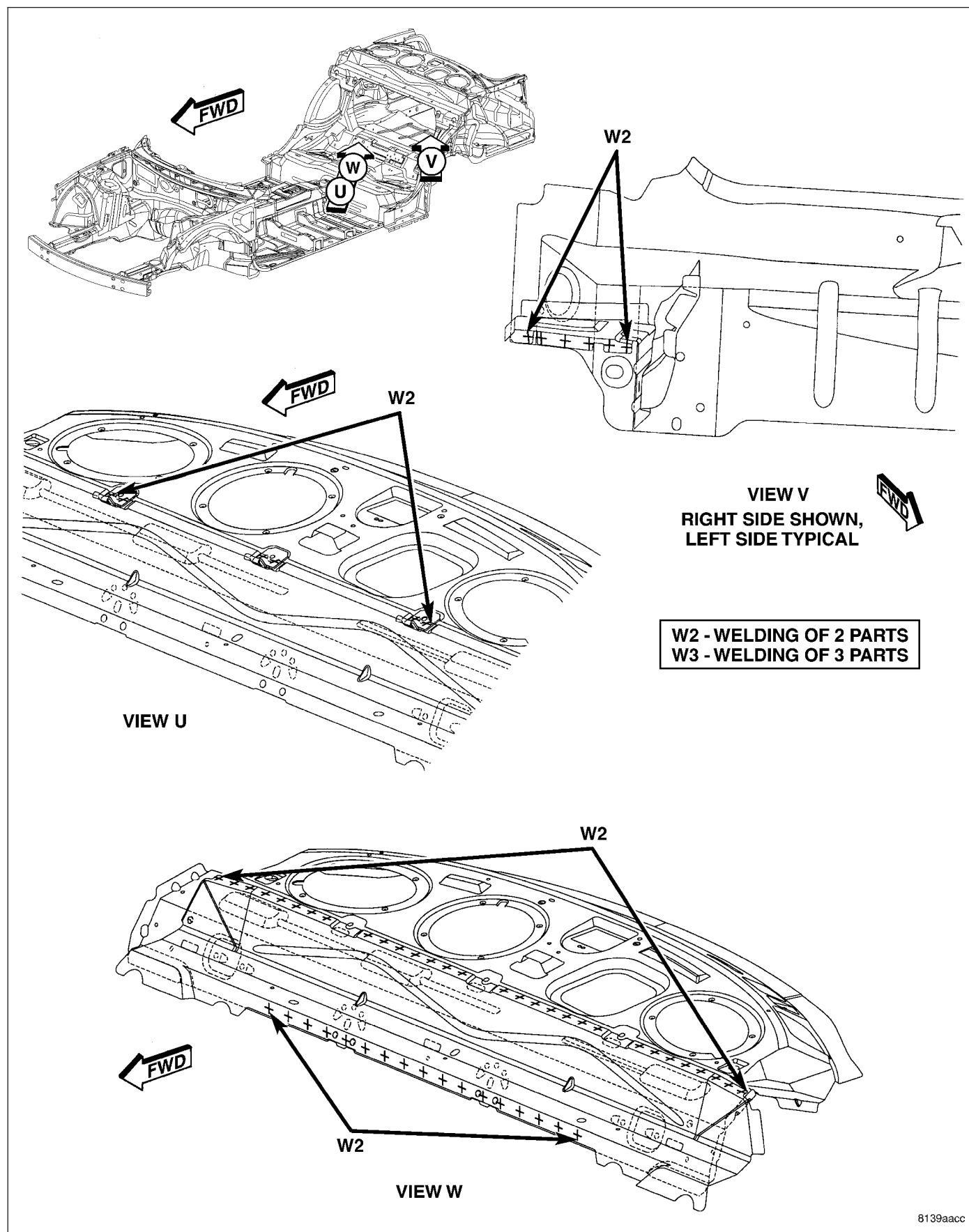
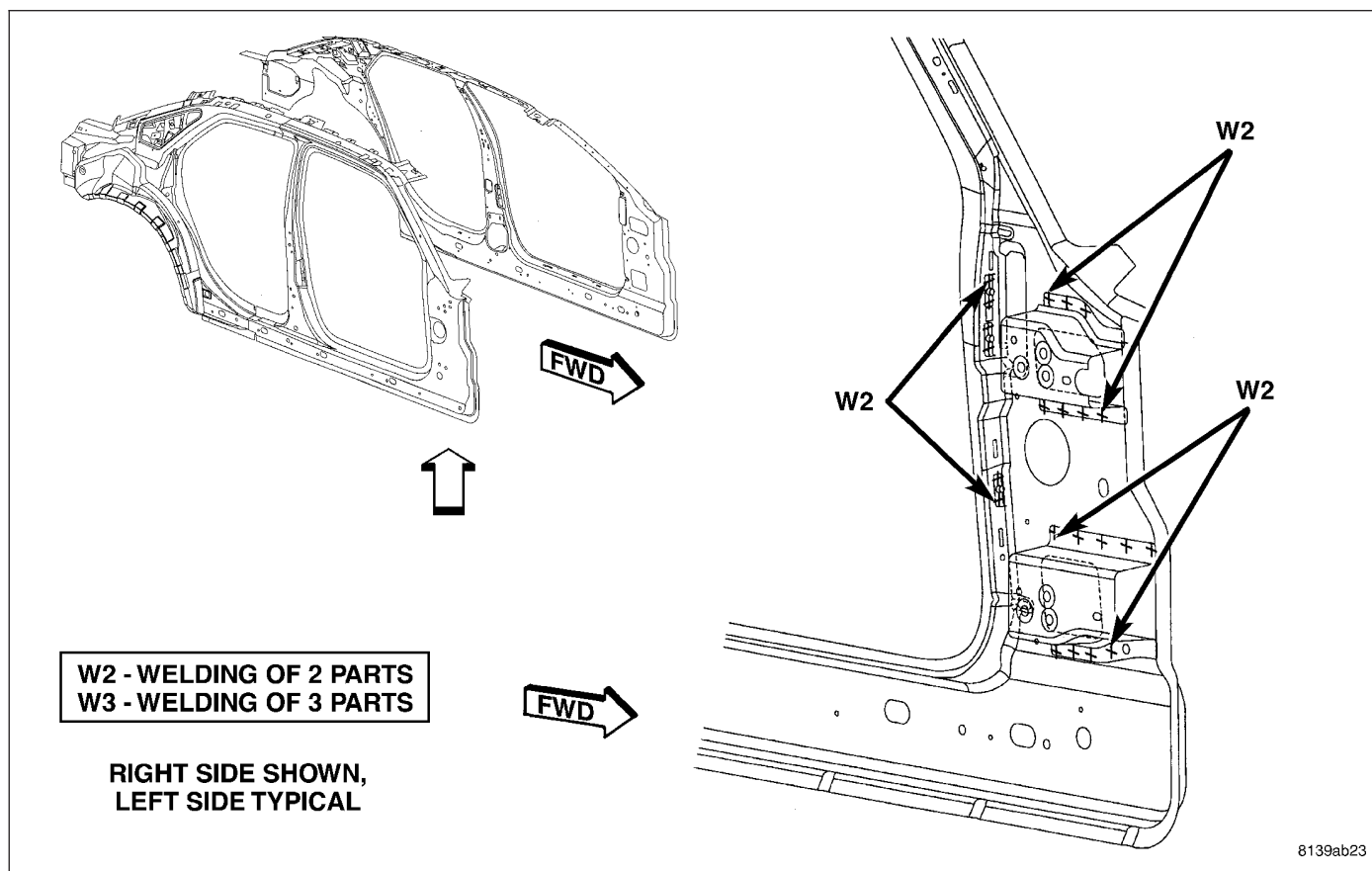


Fig. 55 UNDERBODY COMPLETE (1 OF 2)

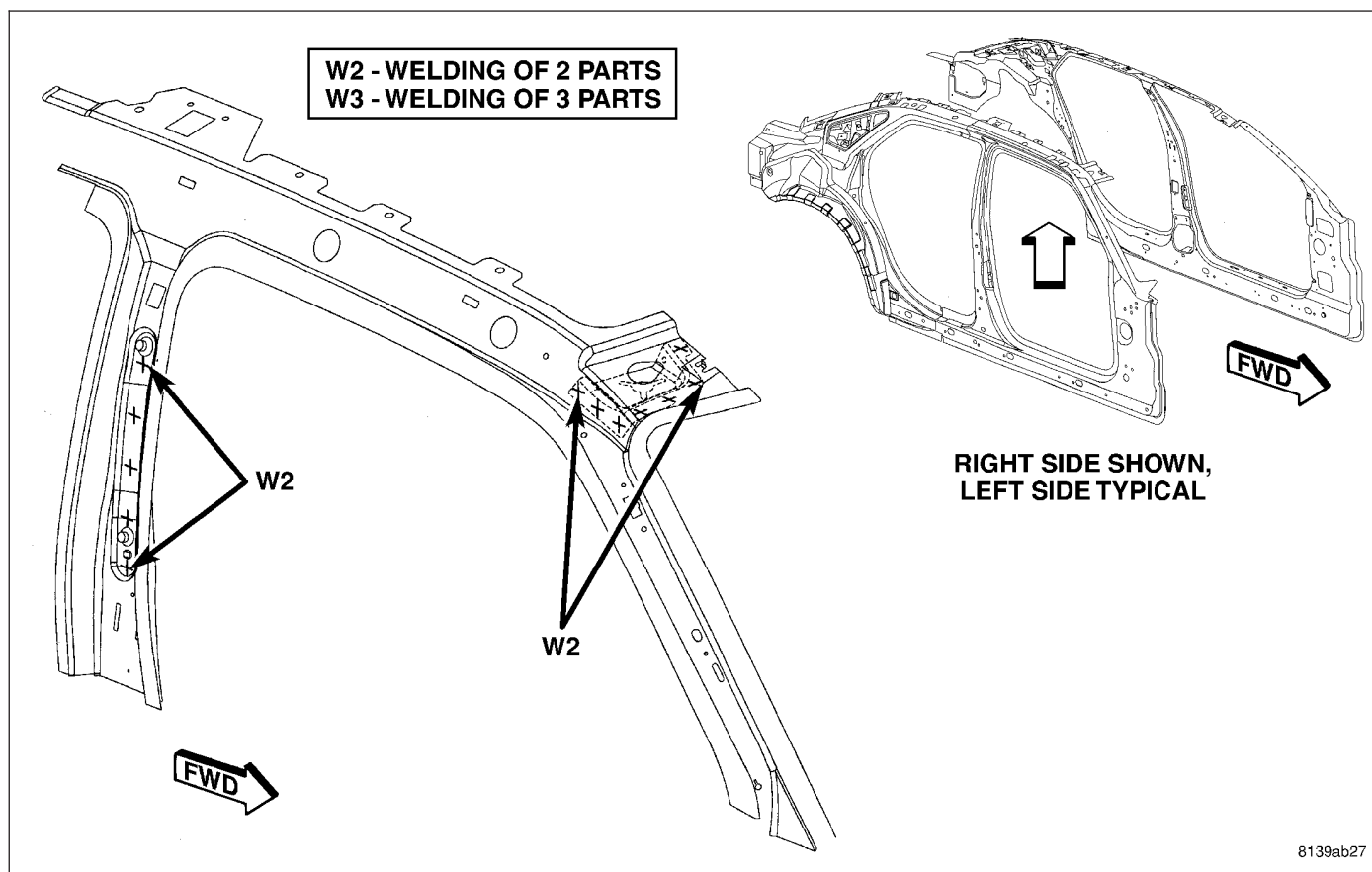


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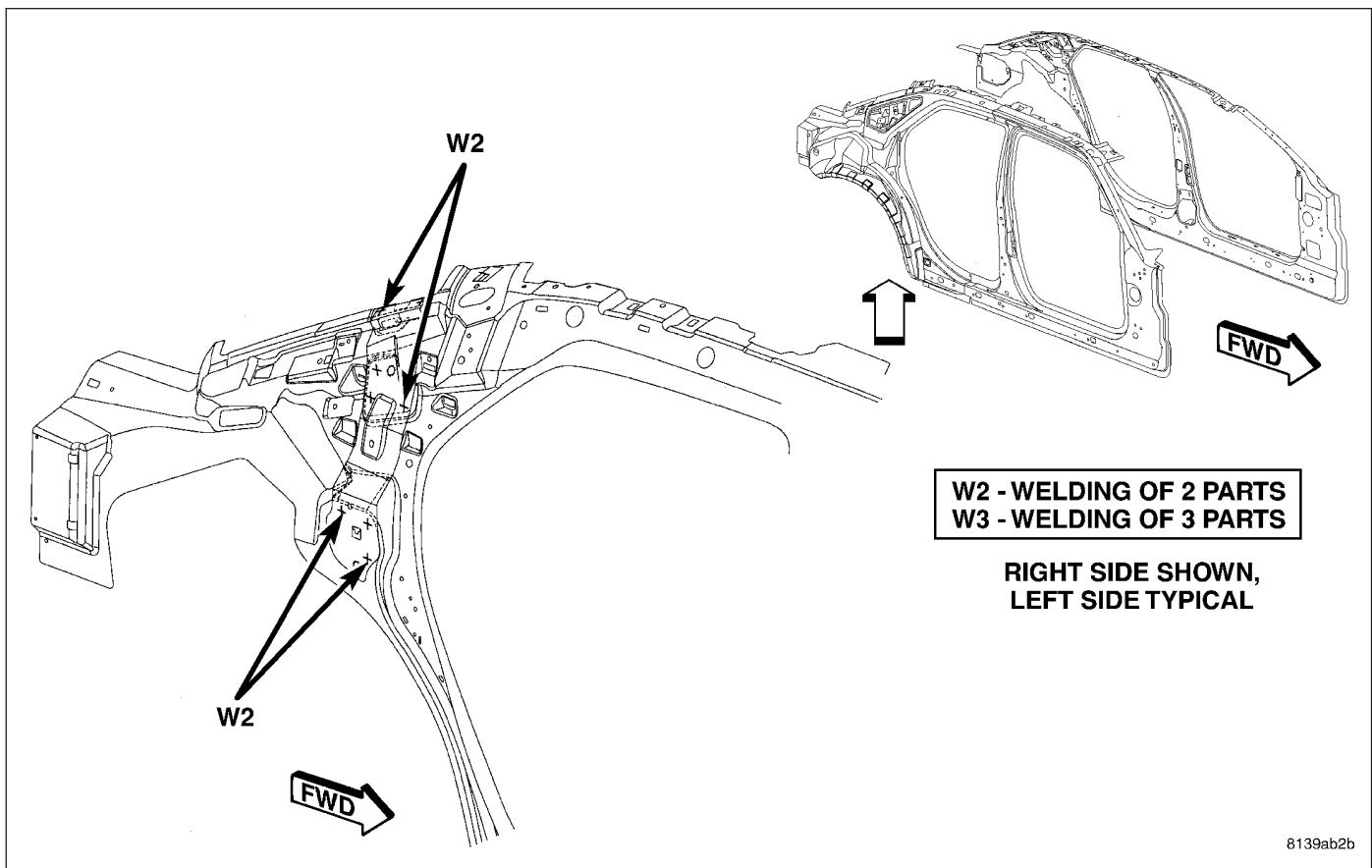
Fig. 56 UNDERBODY COMPLETE (2 OF 2)



*Fig. 57 INNER BODY SIDE APERTURE (1 OF 7)*

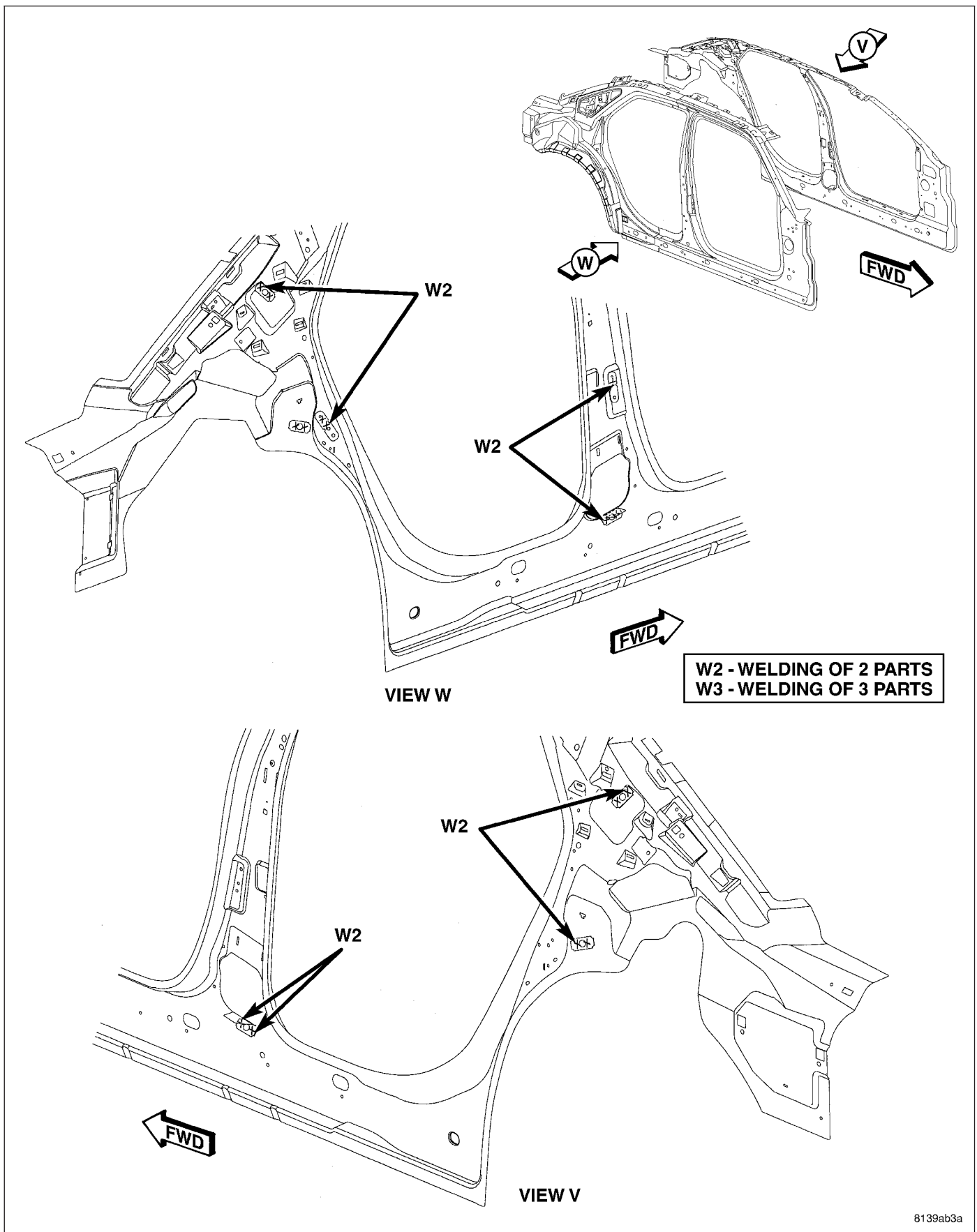


*Fig. 58 INNER BODY SIDE APERTURE (2 OF 7)*



*Fig. 59 INNER BODY SIDE APERTURE (3 OF 7)*





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Fig. 60 INNER BODY SIDE APERTURE (4 OF 7)



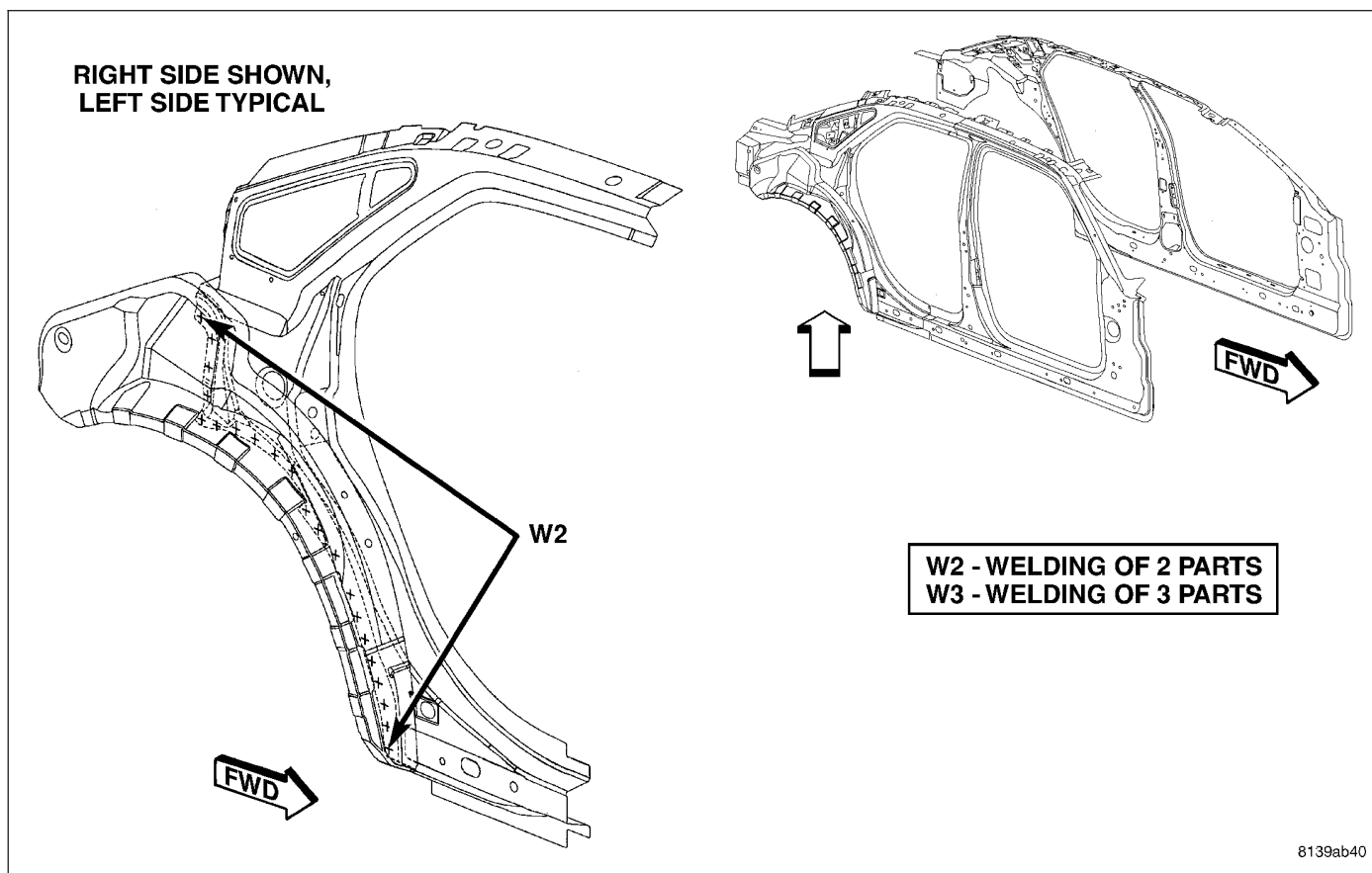


Fig. 61 INNER BODY SIDE APERTURE (5 OF 7)

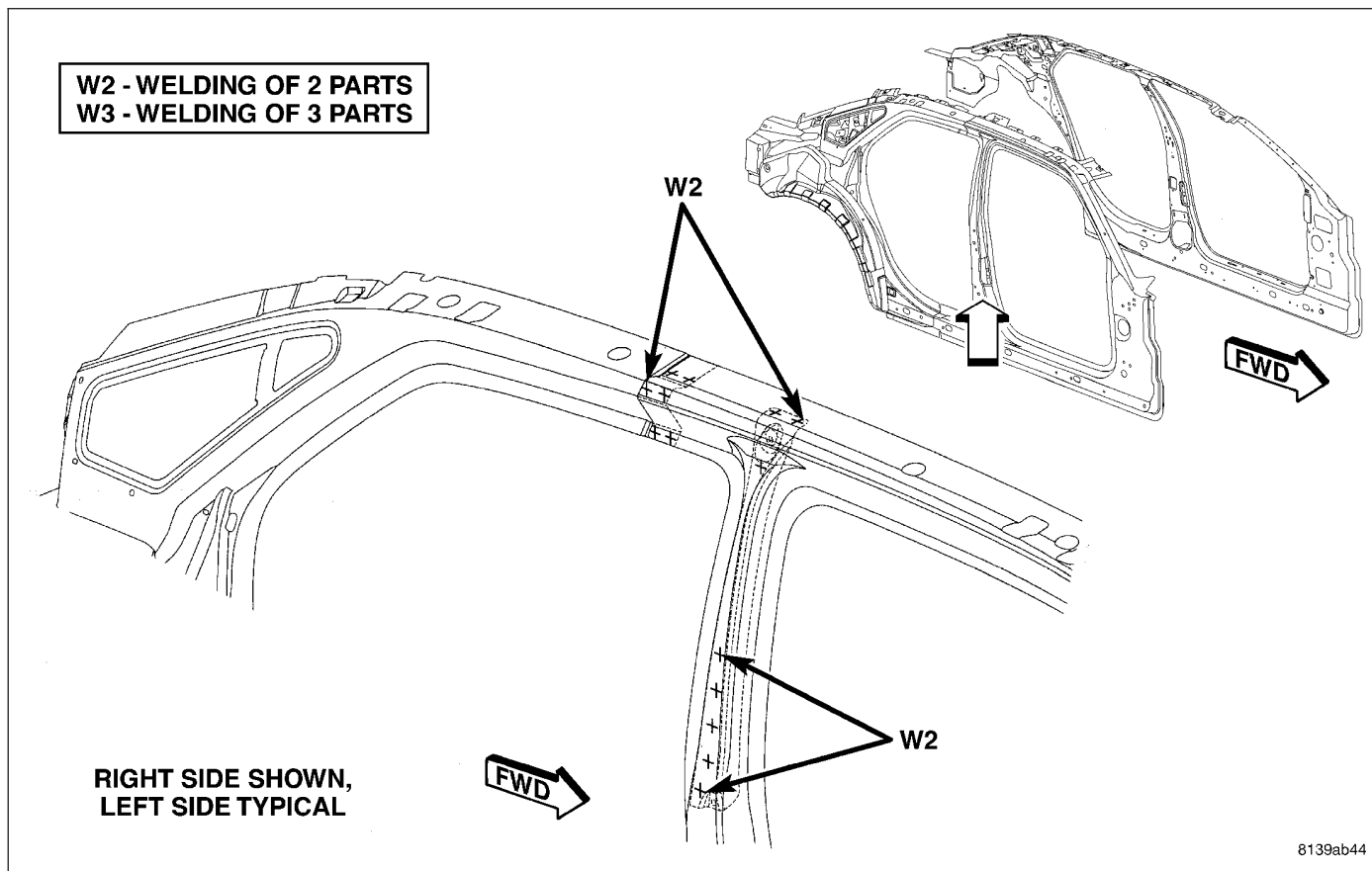
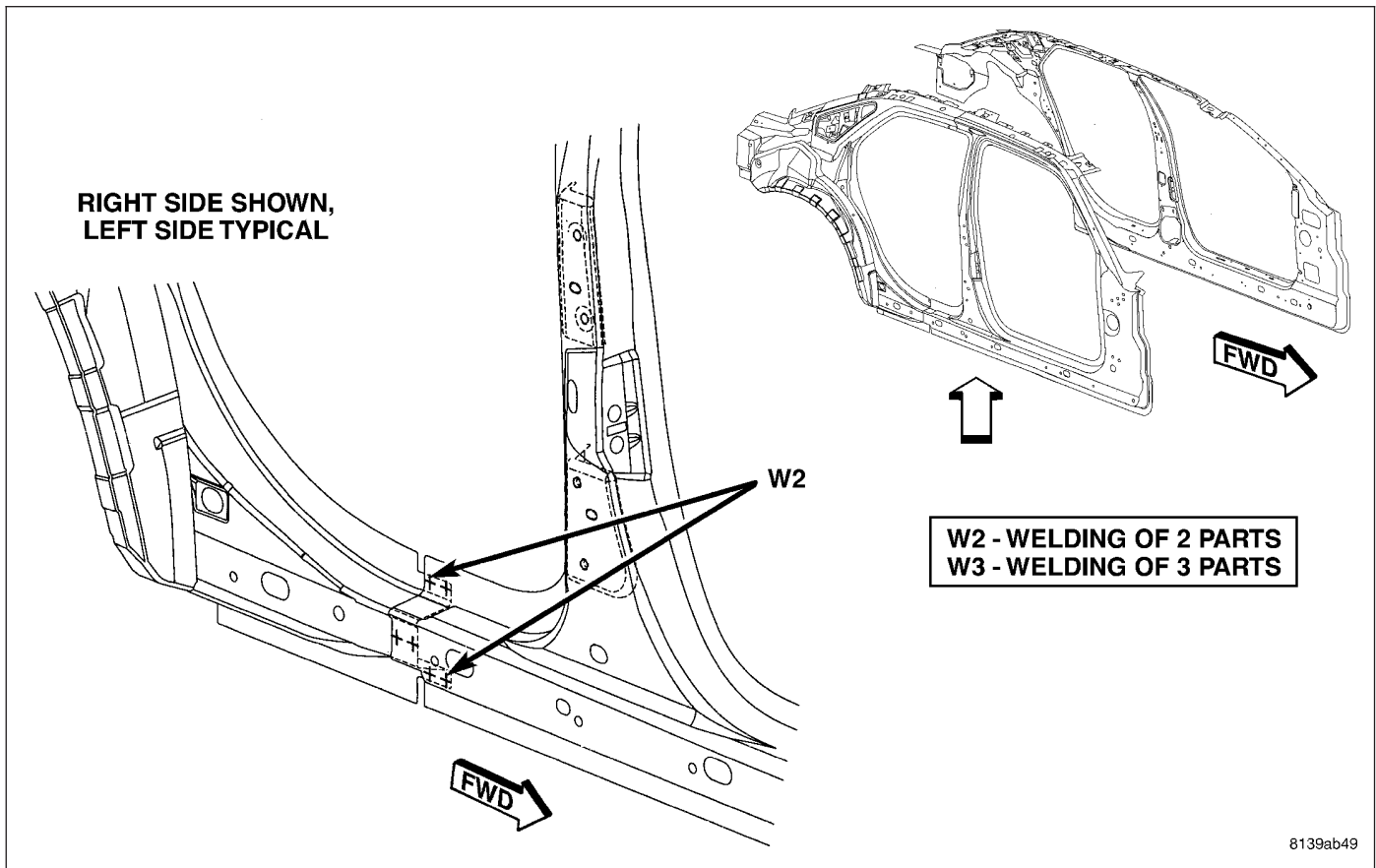


Fig. 62 INNER BODY SIDE APERTURE (6 OF 7)



**Fig. 63 INNER BODY SIDE APERTURE (7 OF 7)**

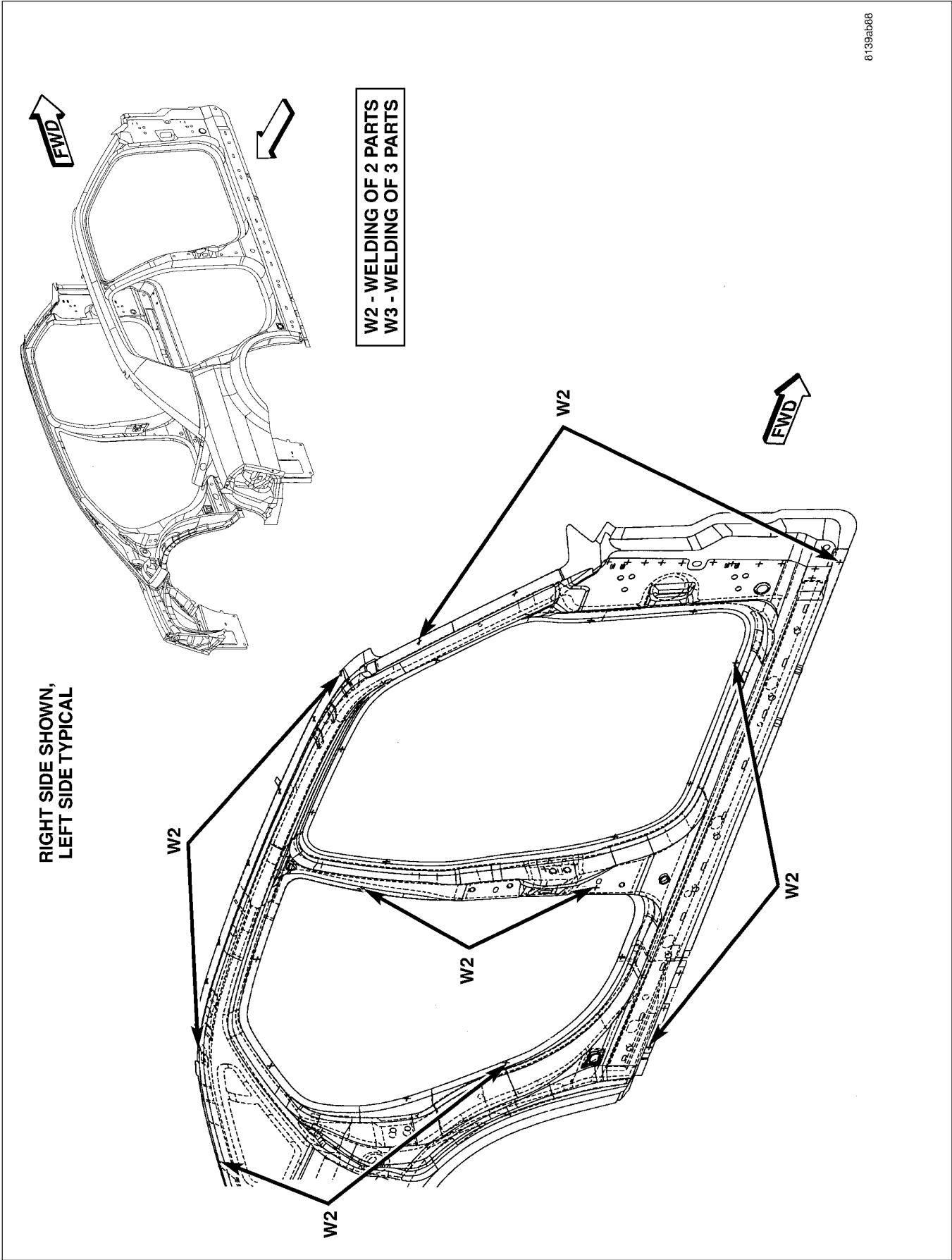


Fig. 64 OUTER BODY SIDE APERTURE (1 OF 5)

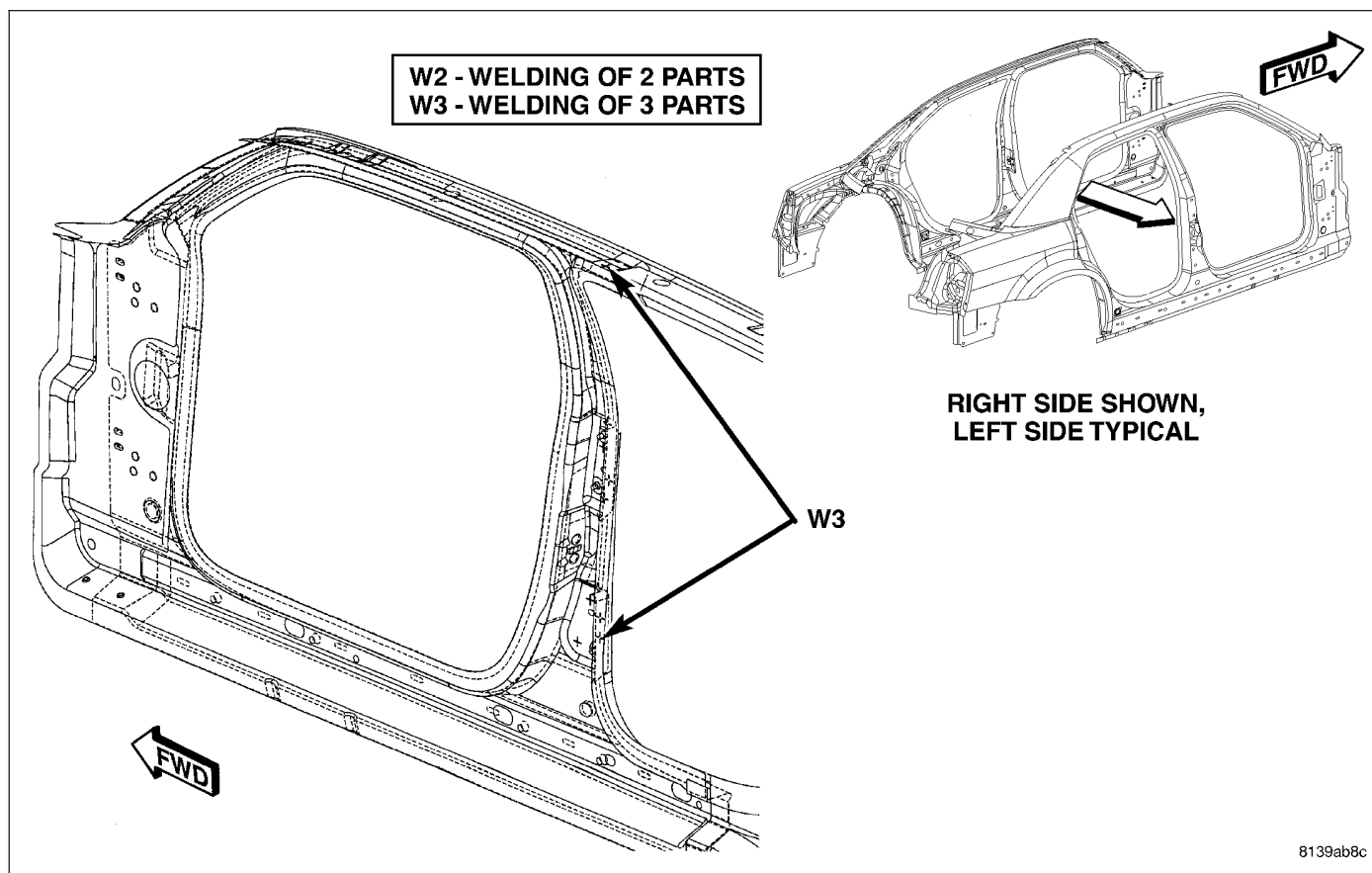


Fig. 65 OUTER BODY SIDE APERTURE (2 OF 5)

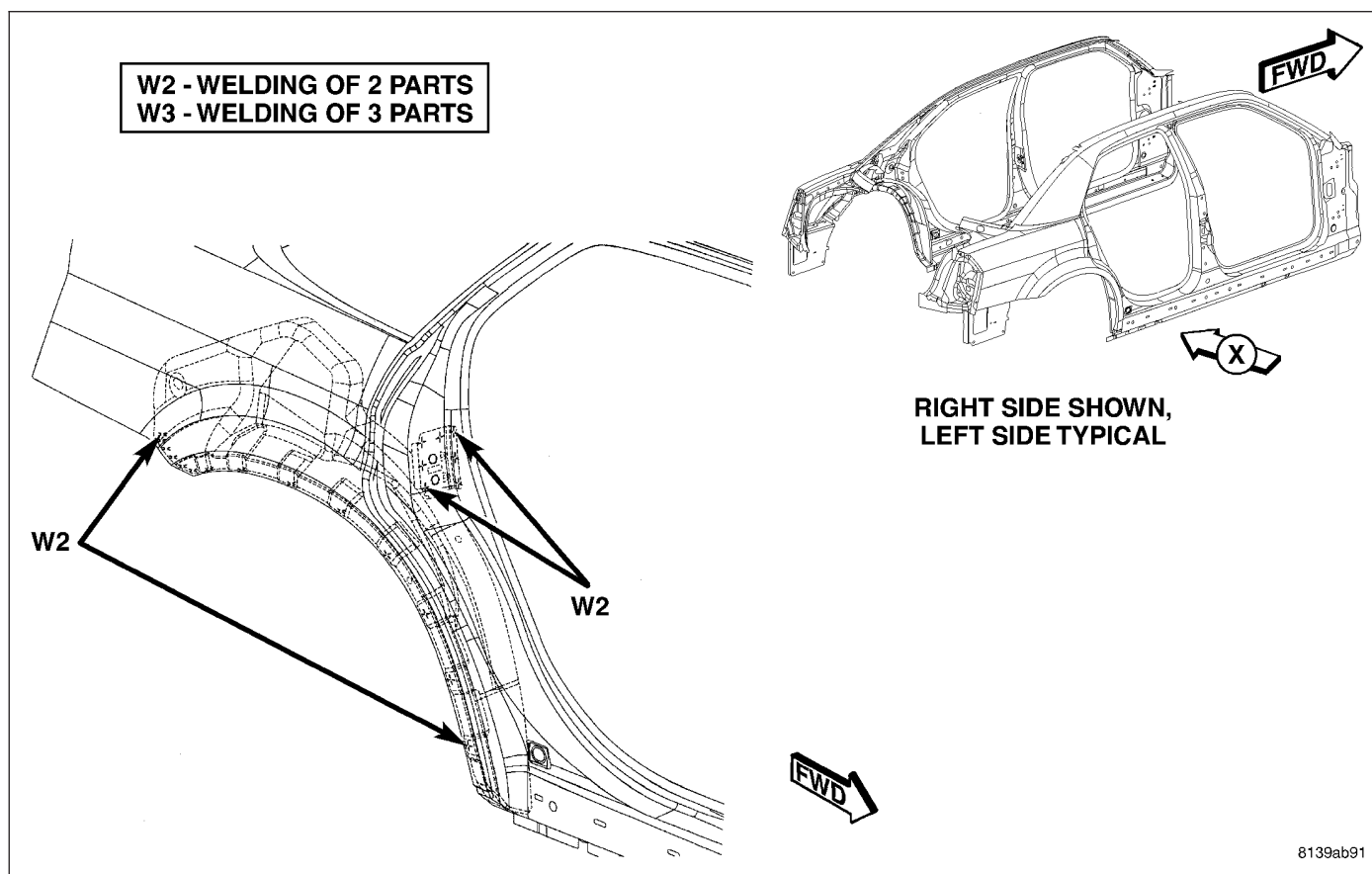
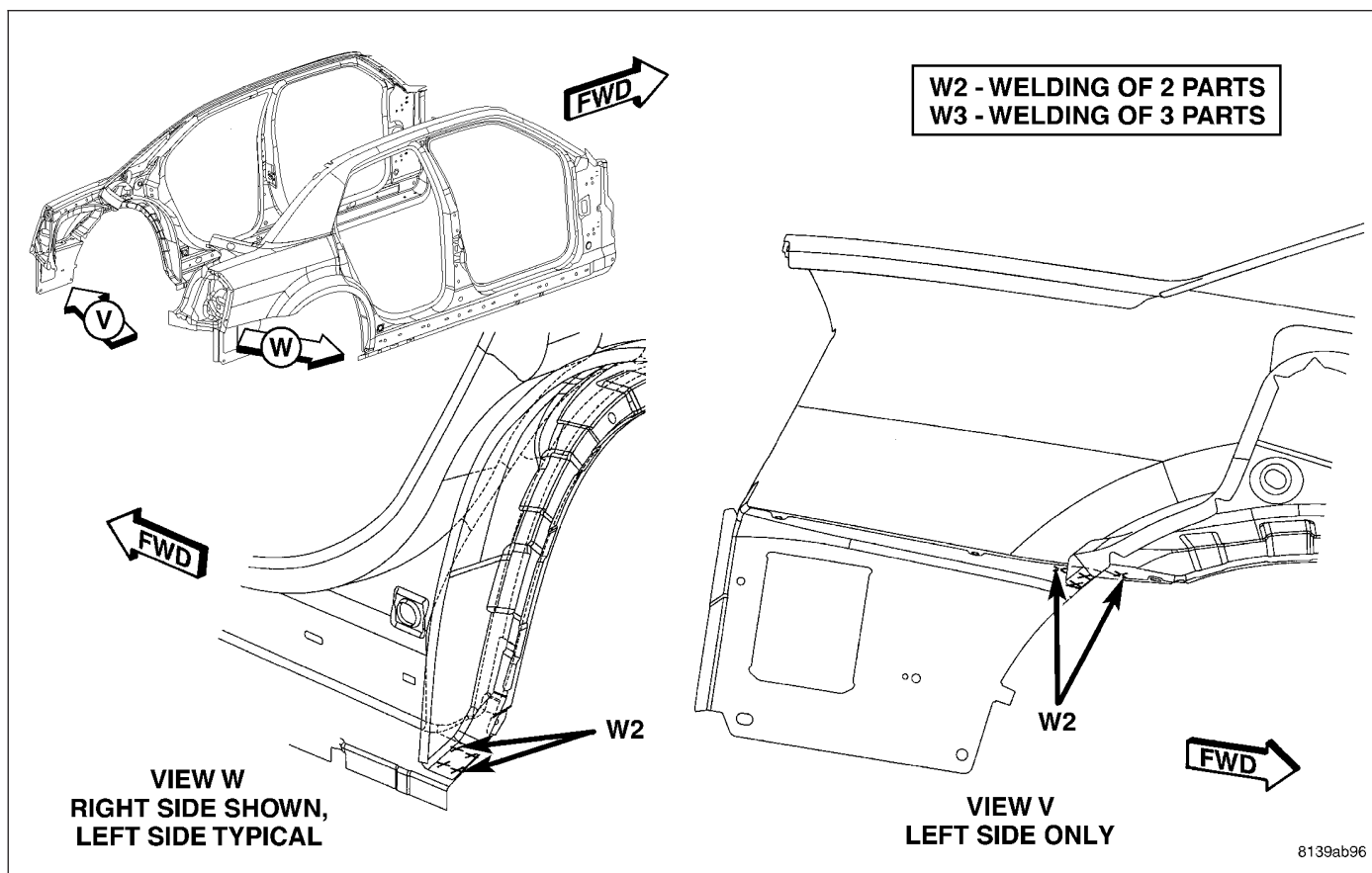
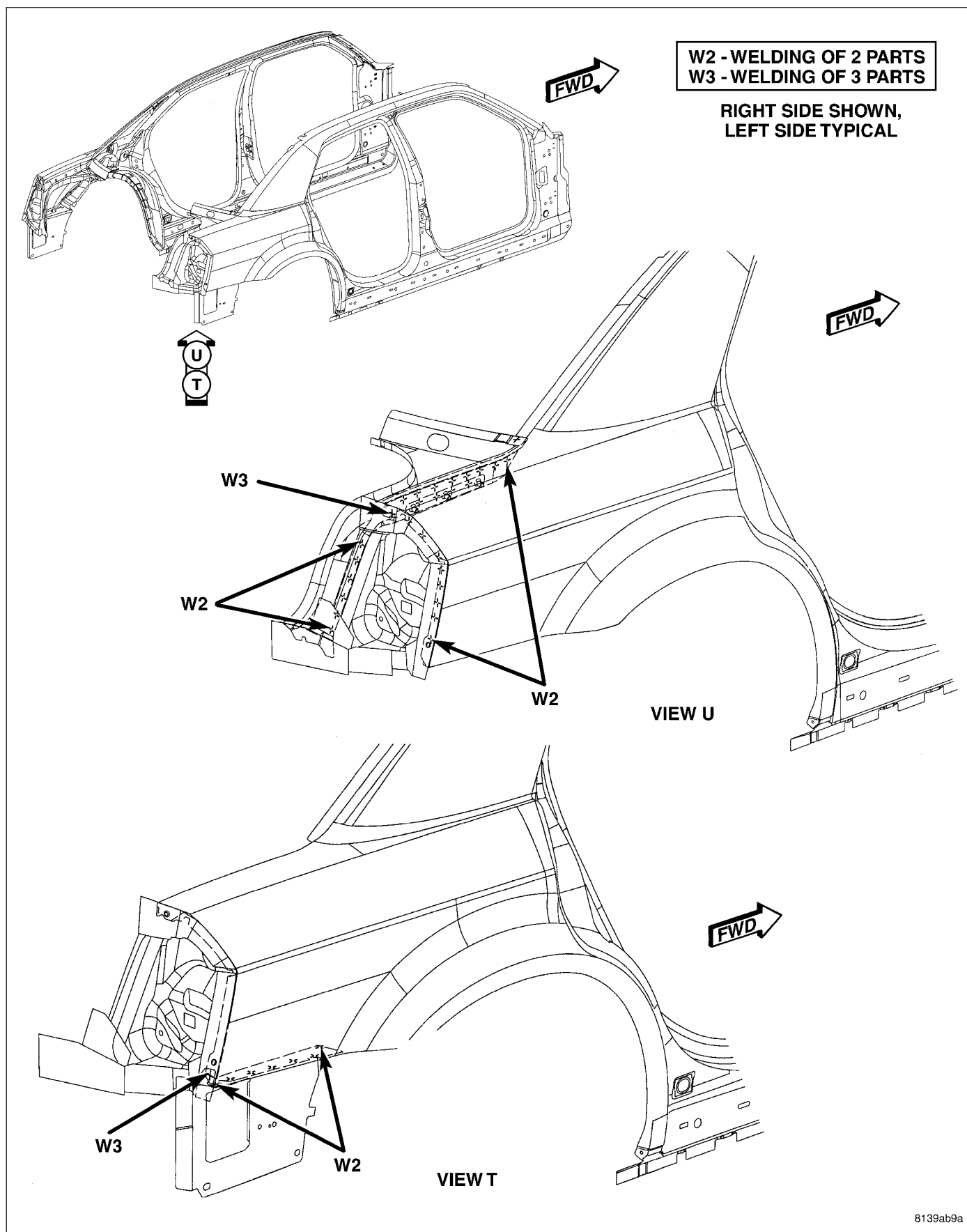


Fig. 66 OUTER BODY SIDE APERTURE (3 OF 5)



*Fig. 67 OUTER BODY SIDE APERTURE (4 OF 5)*



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**Fig. 68 OUTER BODY SIDE APERTURE (5 OF 5)**

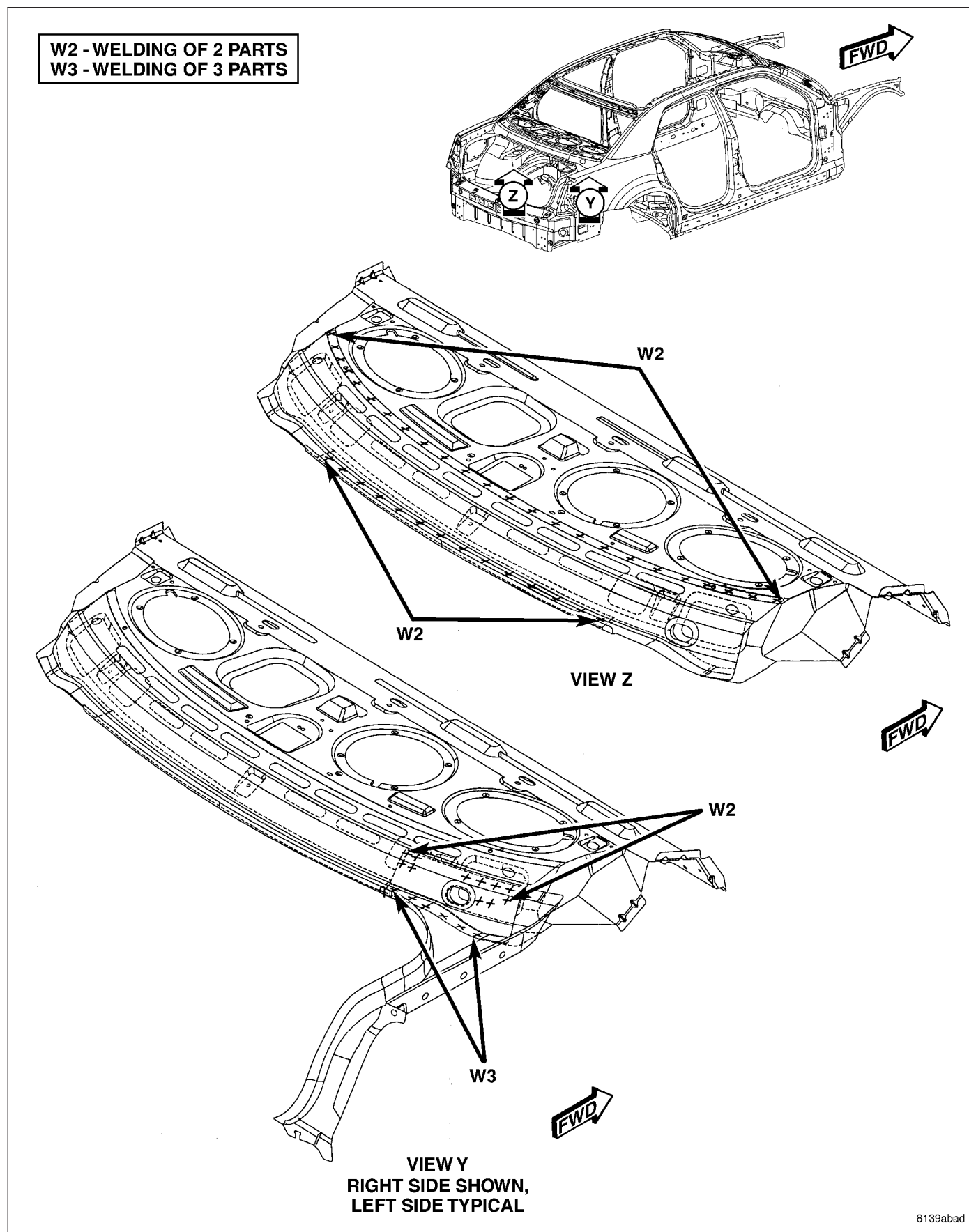
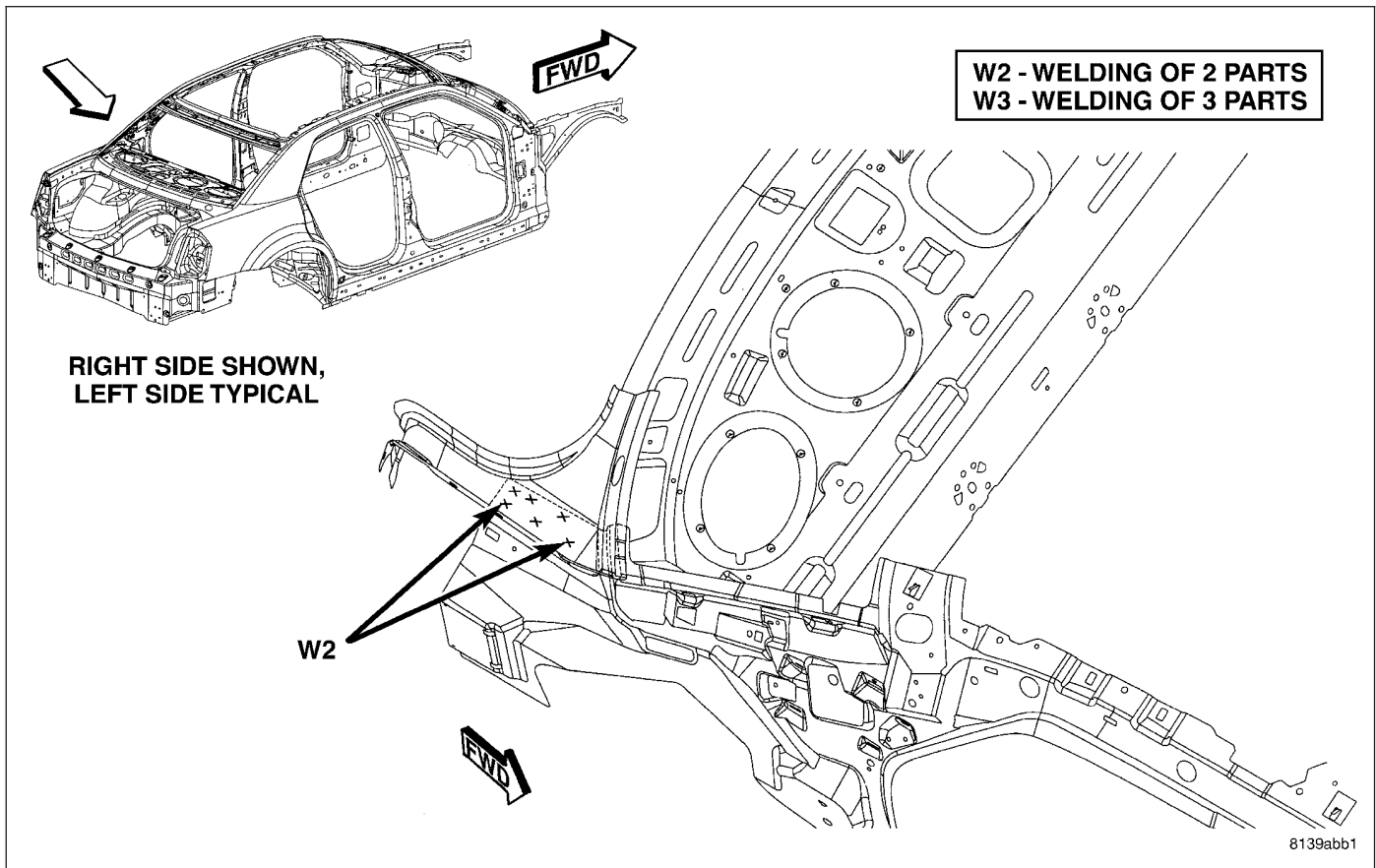


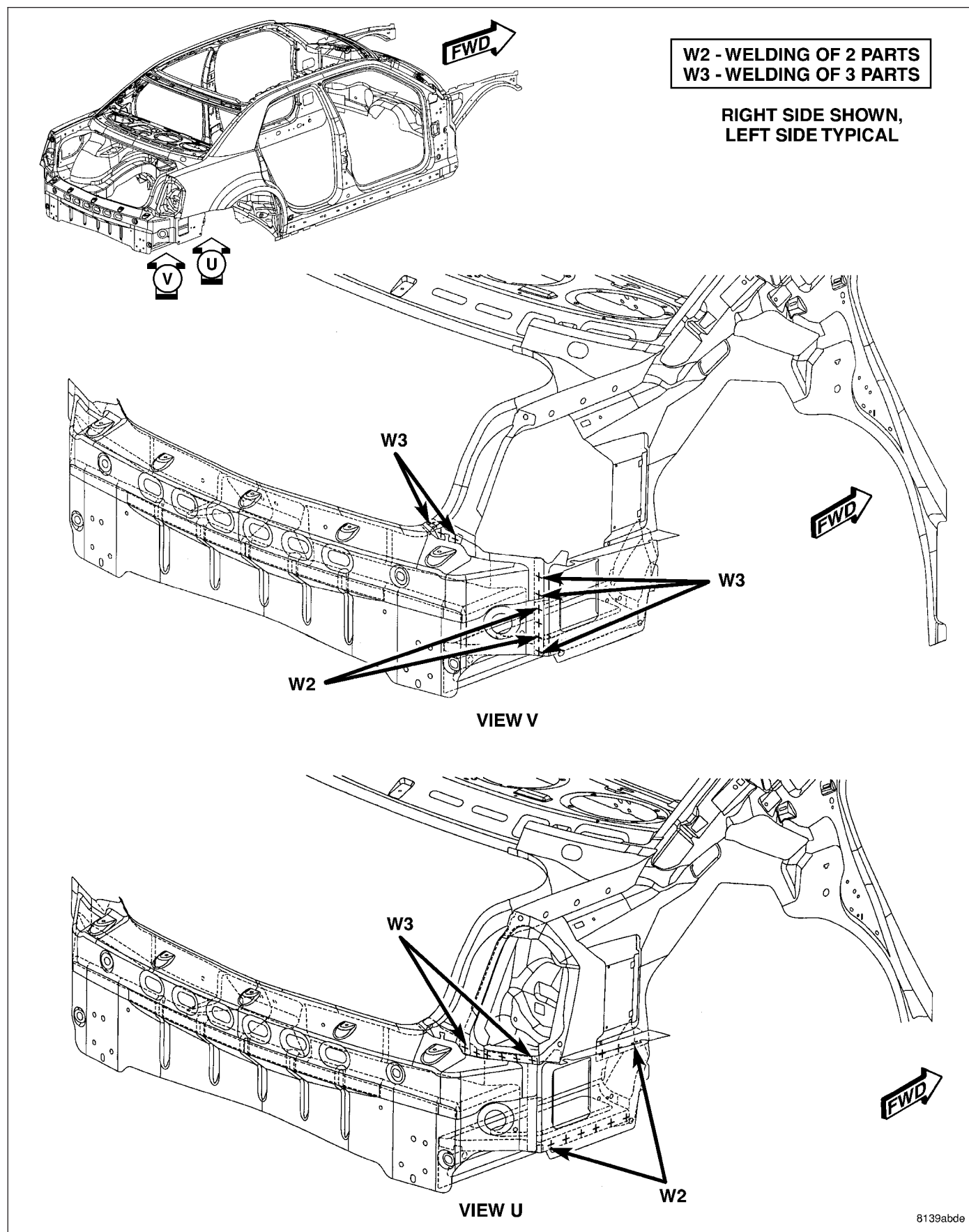
Fig. 69 FRAMED BODY IN WHITE (1 OF 12)



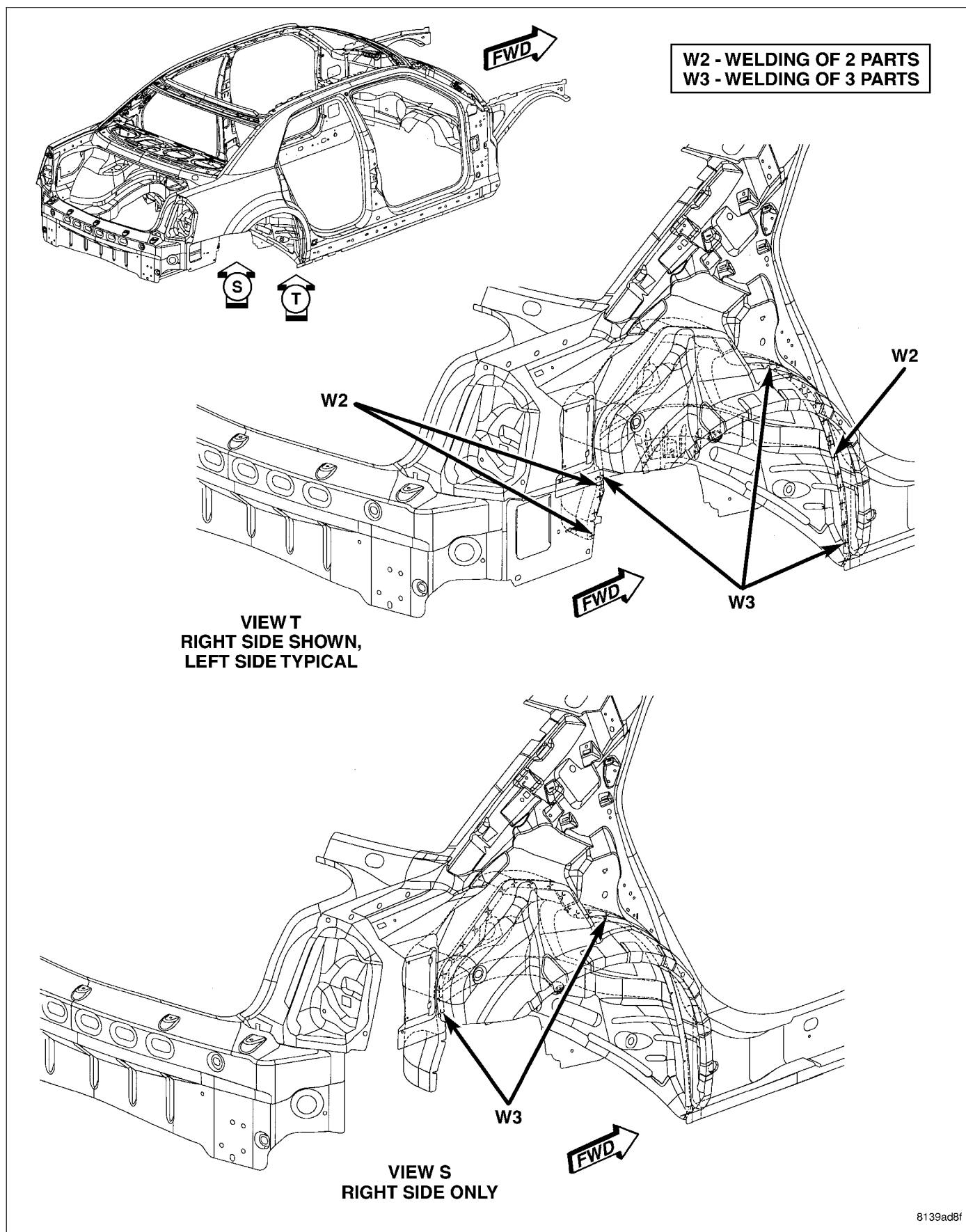


**Fig. 70 FRAMED BODY IN WHITE (2 OF 12)**



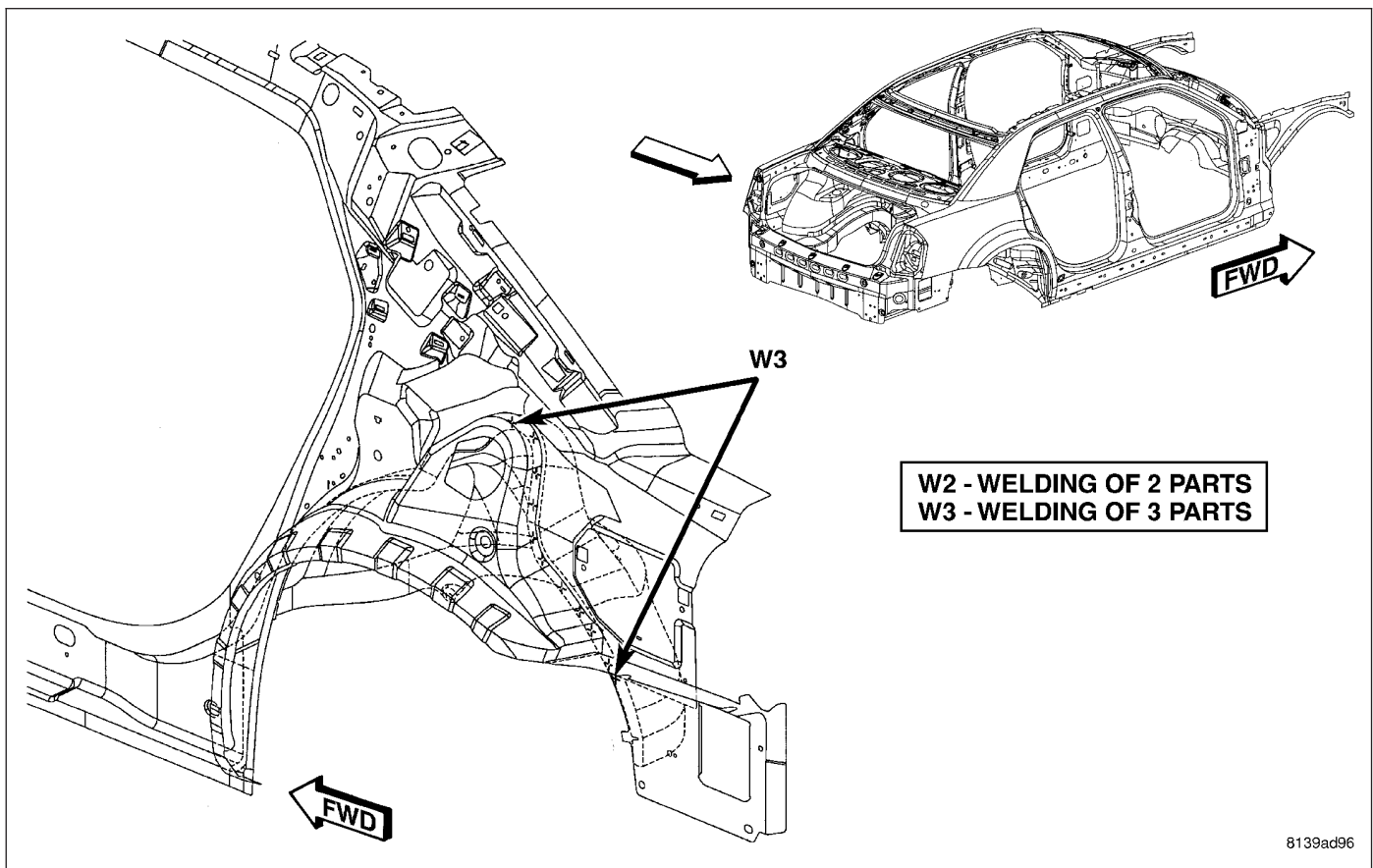


**Fig. 71 FRAMED BODY IN WHITE (3 OF 12)**



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Fig. 72 FRAMED BODY IN WHITE (4 OF 12)



**Fig. 73 FRAMED BODY IN WHITE (5 OF 12)**

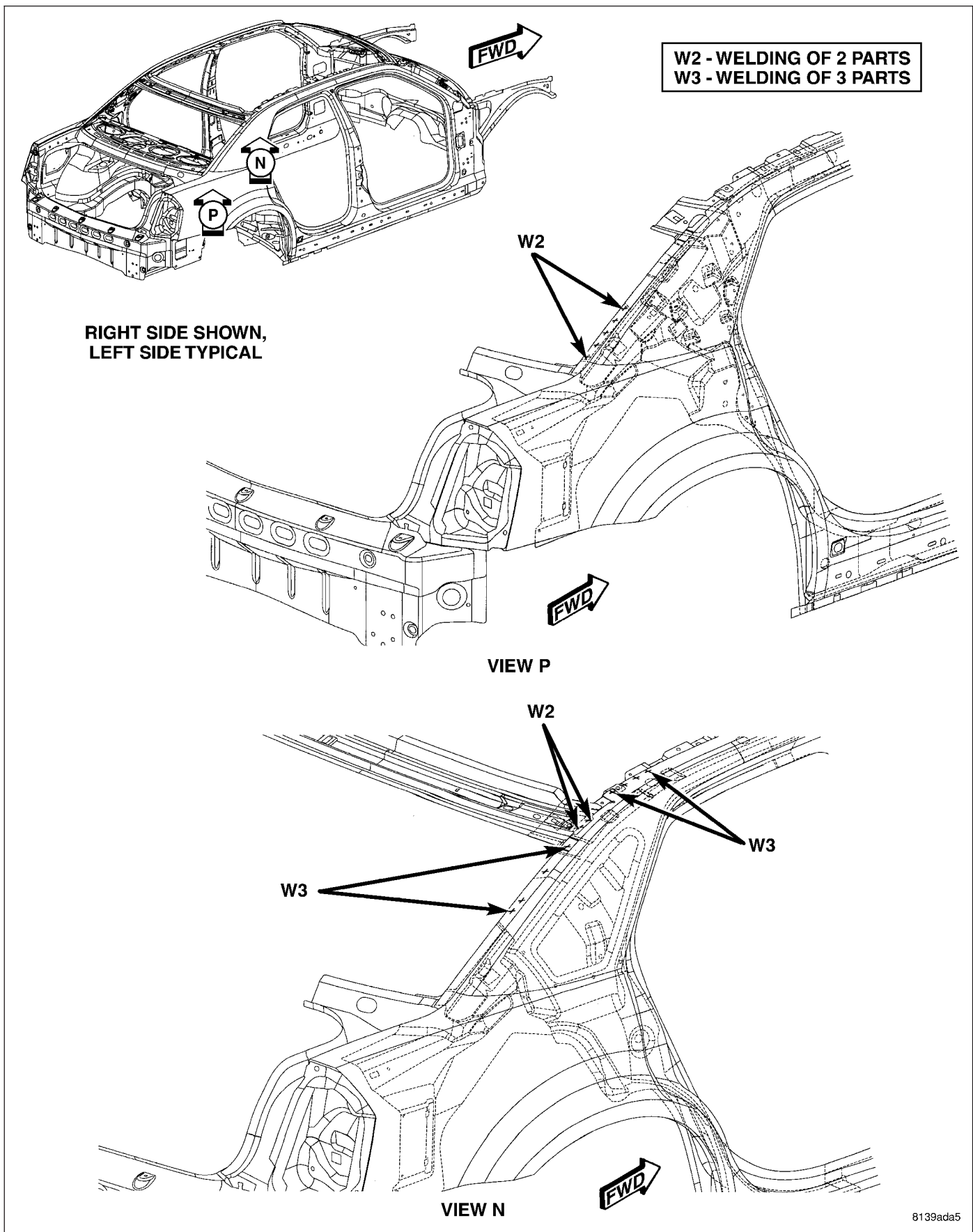


Fig. 74 FRAMED BODY IN WHITE (6 OF 12)

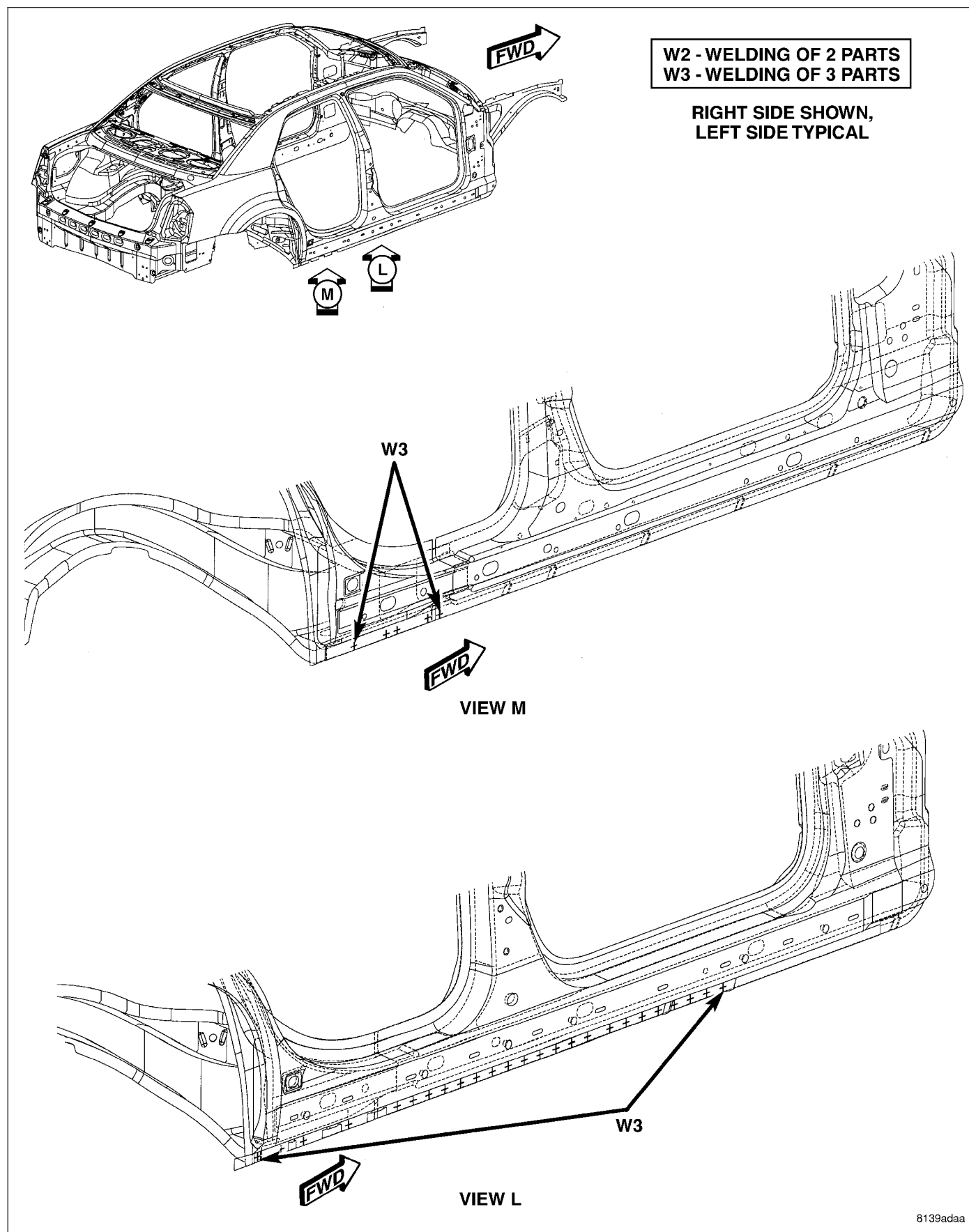


Fig. 75 FRAMED BODY IN WHITE (7 OF 12)



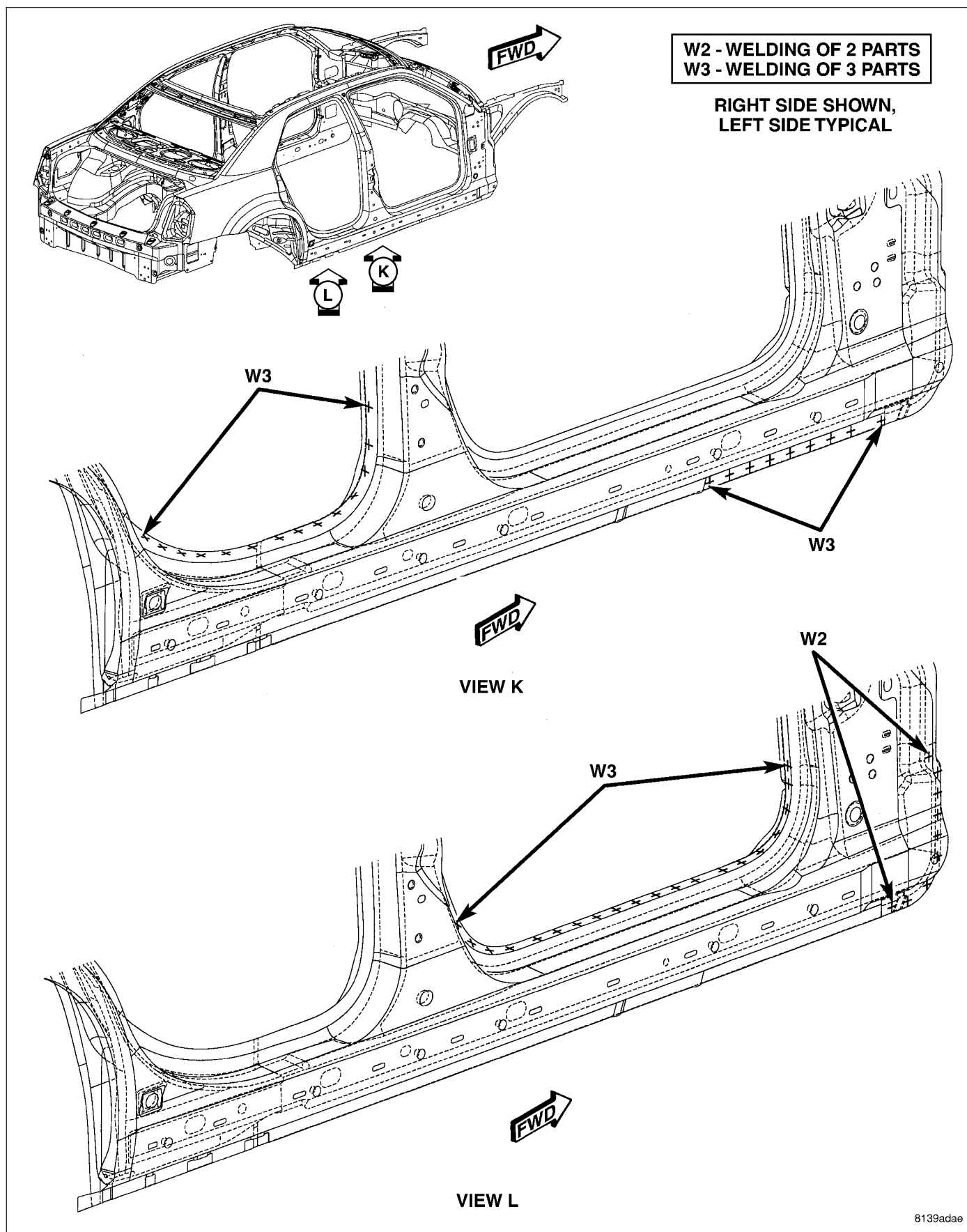


Fig. 76 FRAMED BODY IN WHITE (8 OF 12)

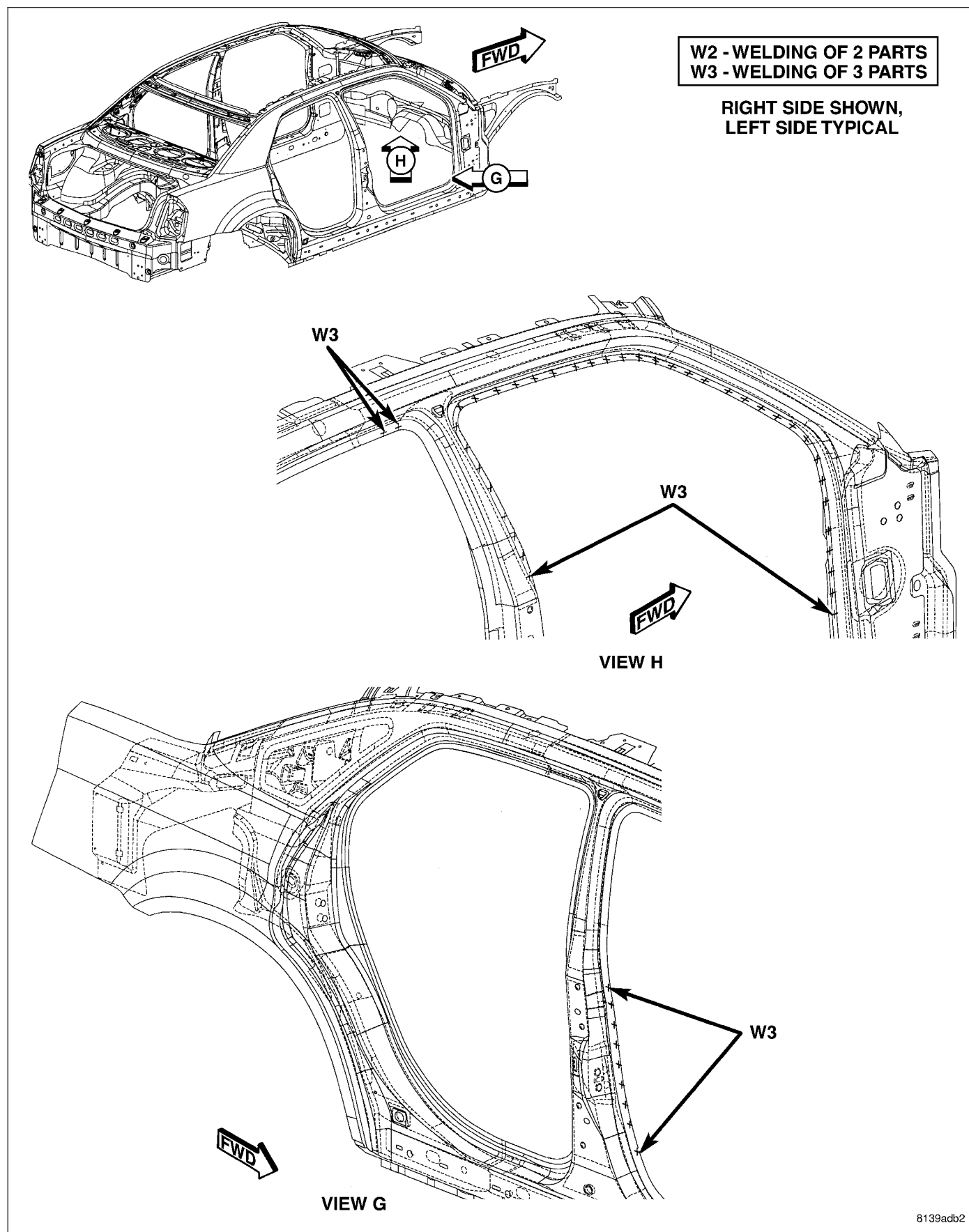
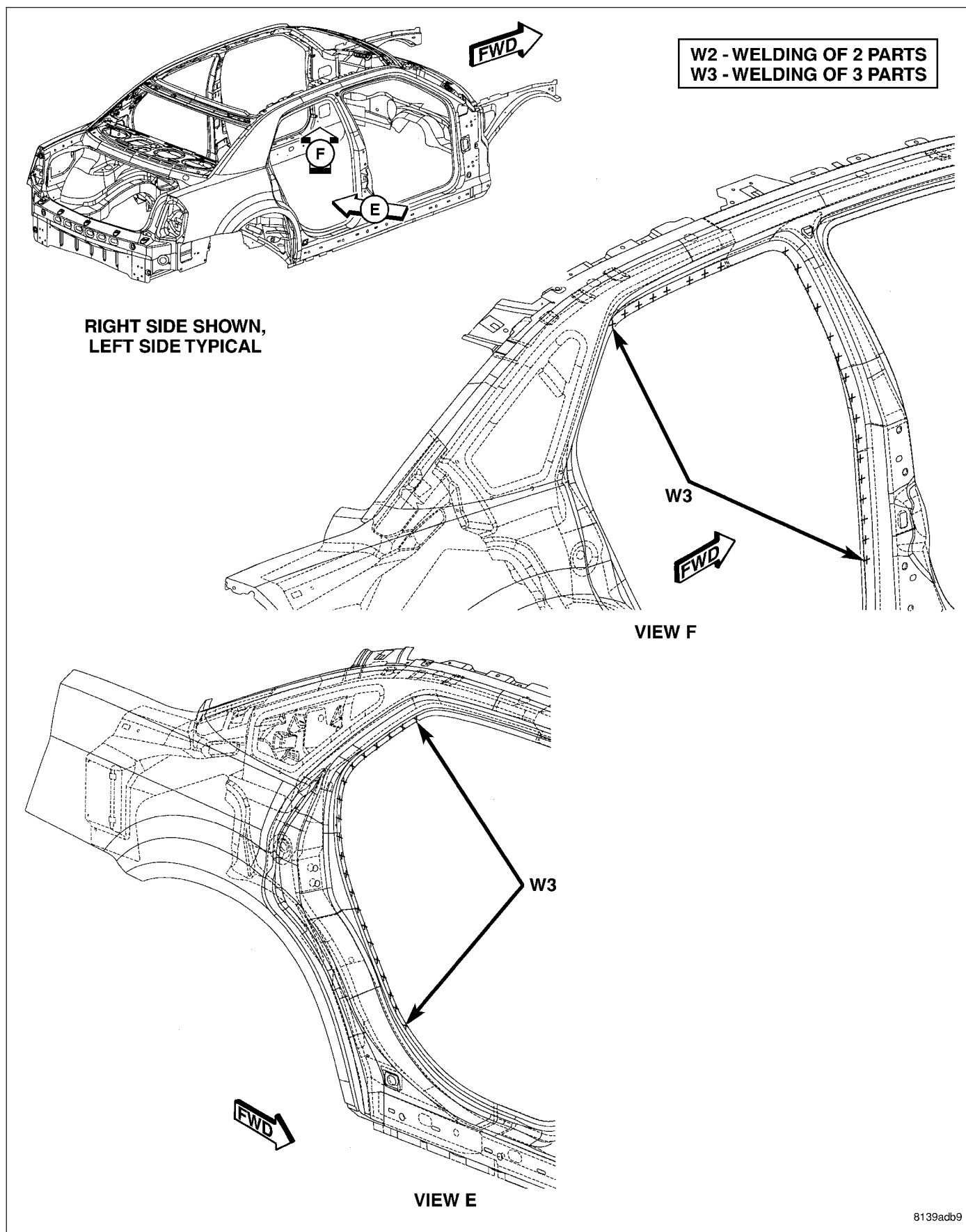


Fig. 77 FRAMED BODY IN WHITE (9 OF 12)



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Fig. 78 FRAMED BODY IN WHITE (10 OF 12)

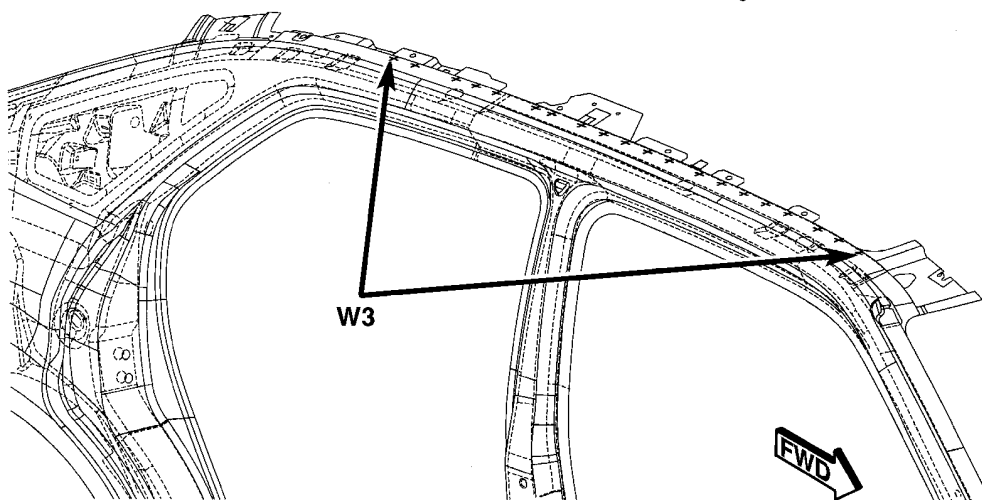
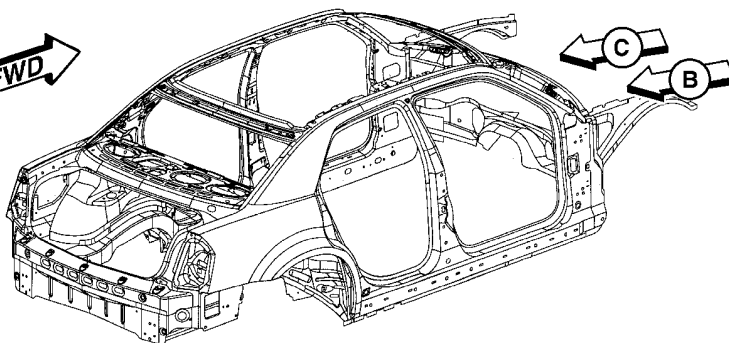


W2 - WELDING OF 2 PARTS  
W3 - WELDING OF 3 PARTS

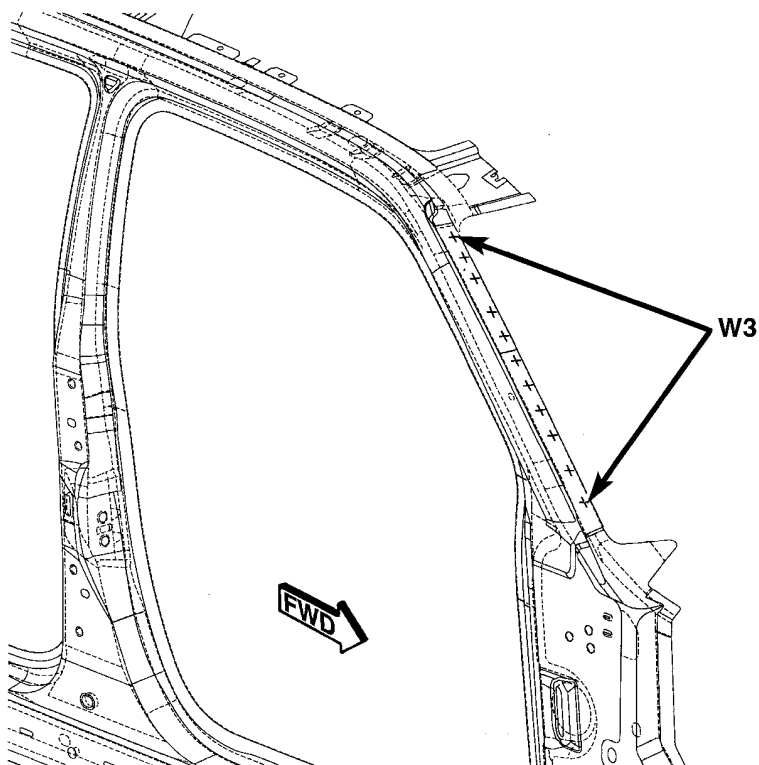
RIGHT SIDE SHOWN,  
LEFT SIDE TYPICAL

FWD

C B



VIEW C



VIEW B

8139adbd

Fig. 79 FRAMED BODY IN WHITE (11 OF 12)

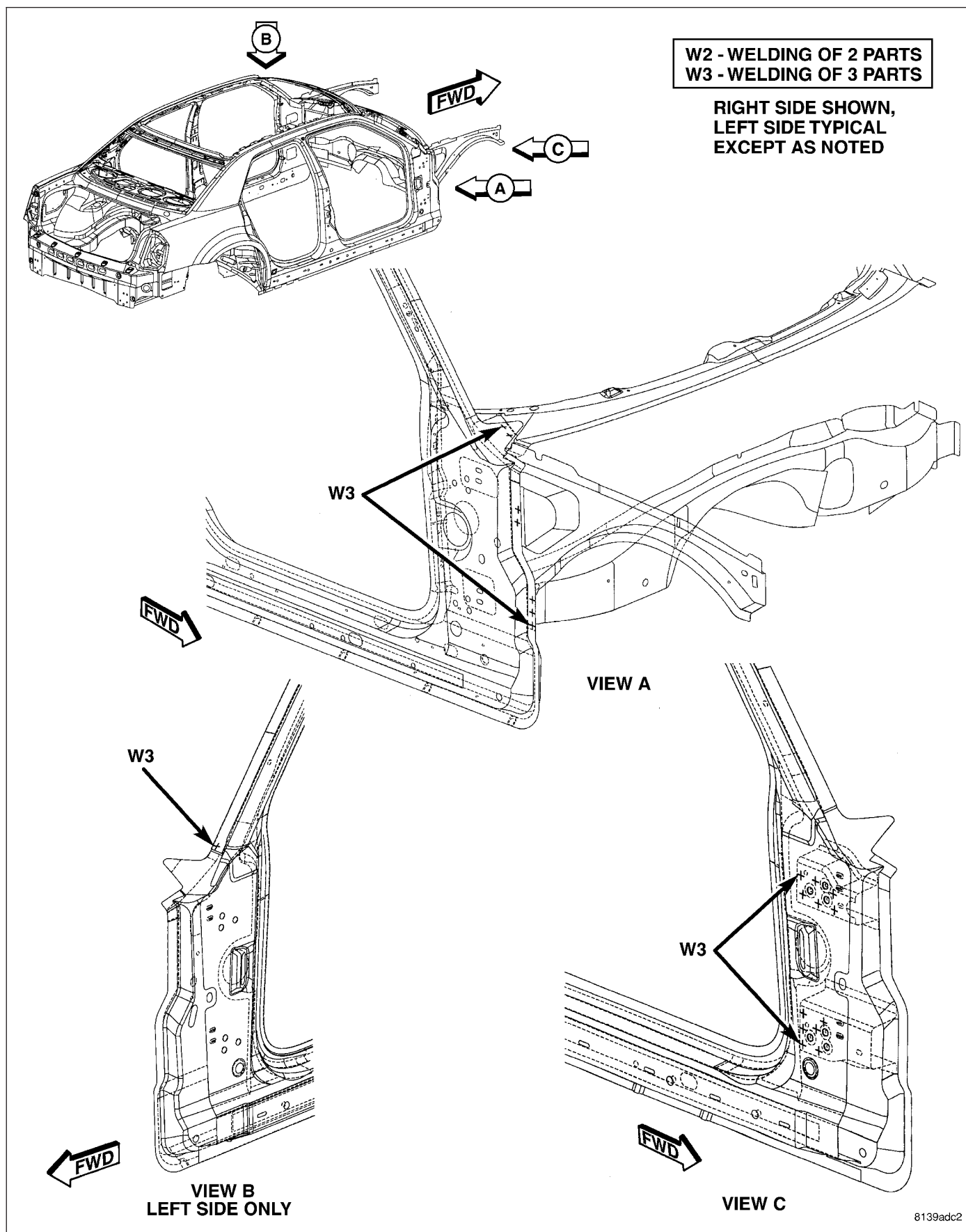
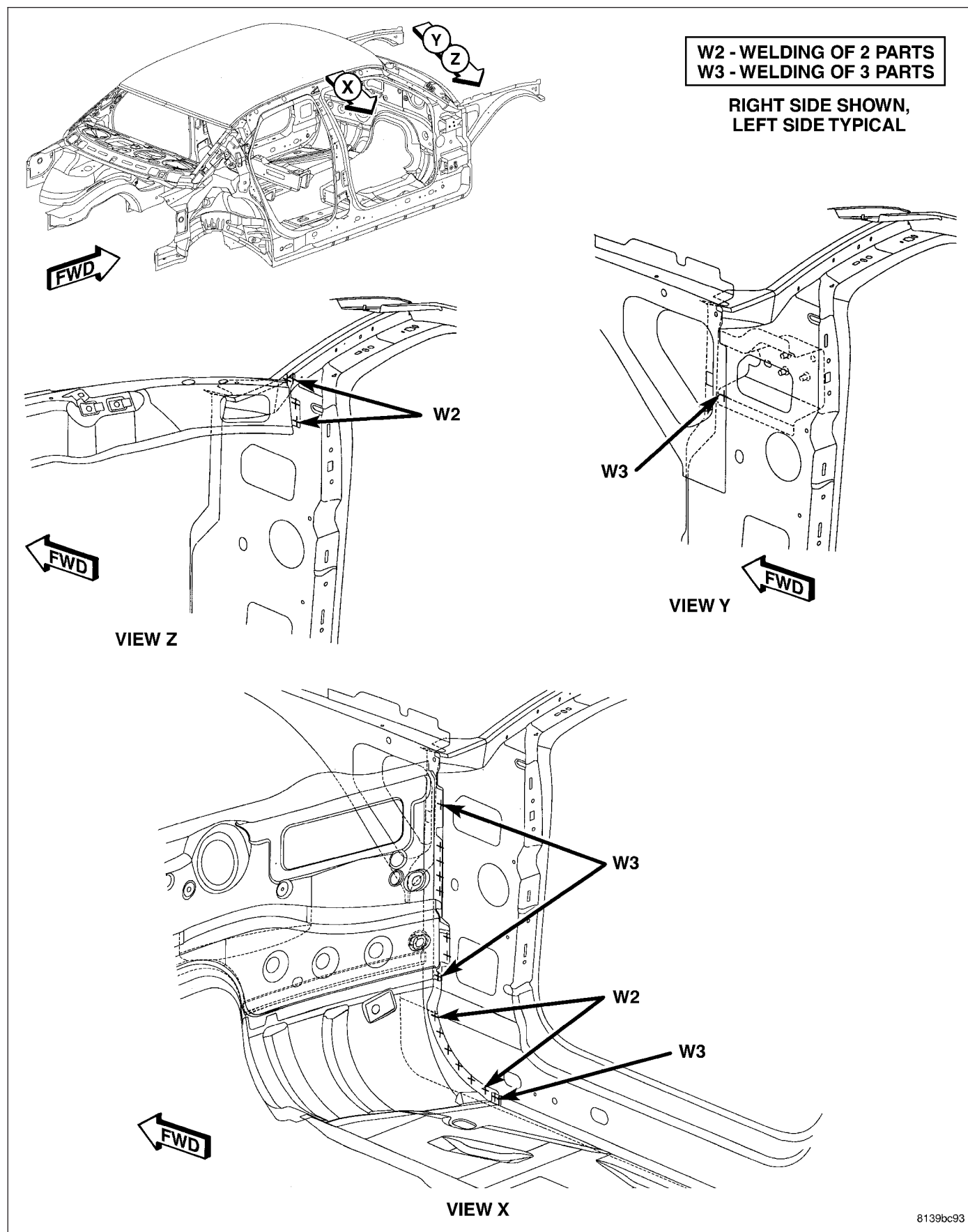
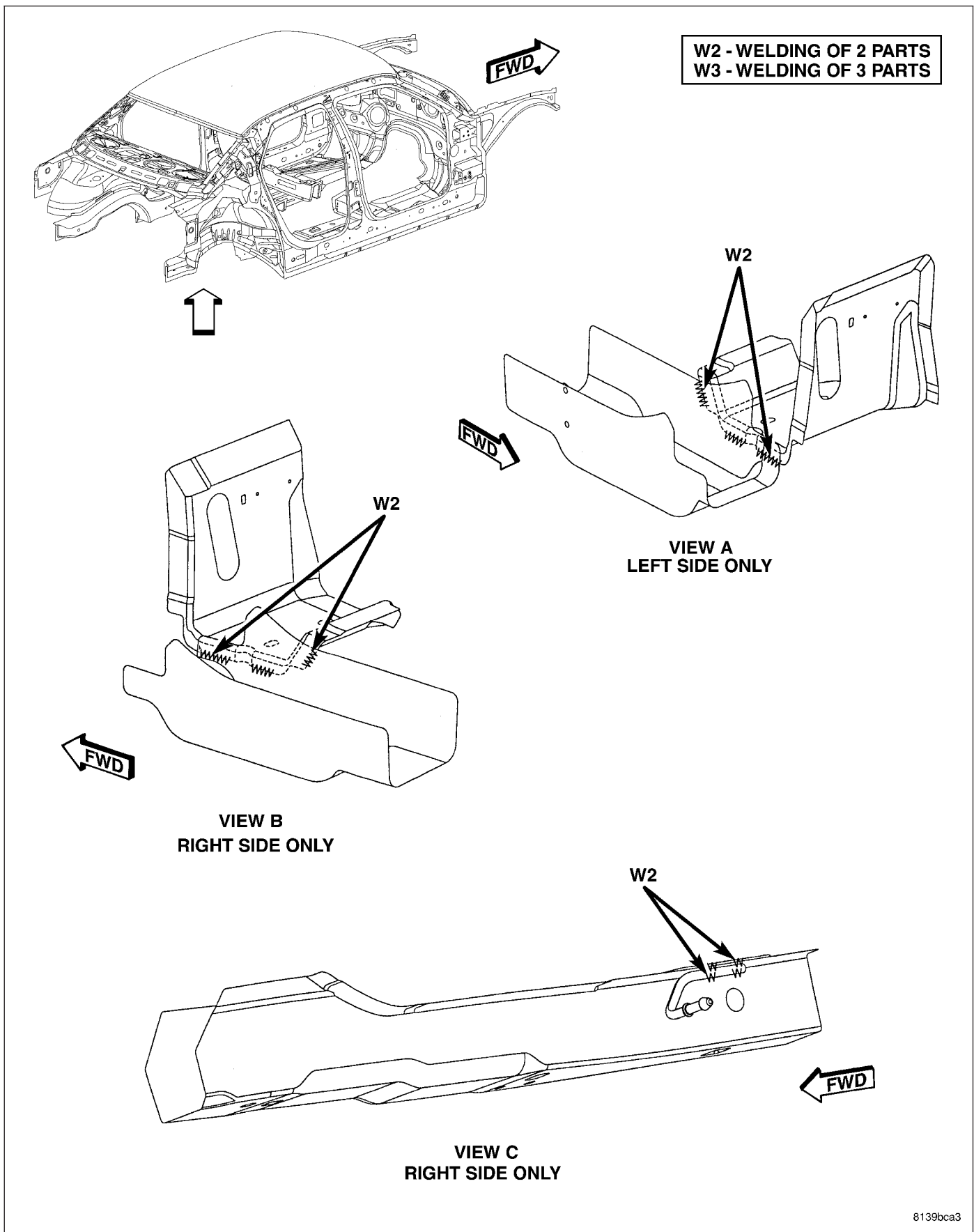


Fig. 80 FRAMED BODY IN WHITE (12 OF 12)

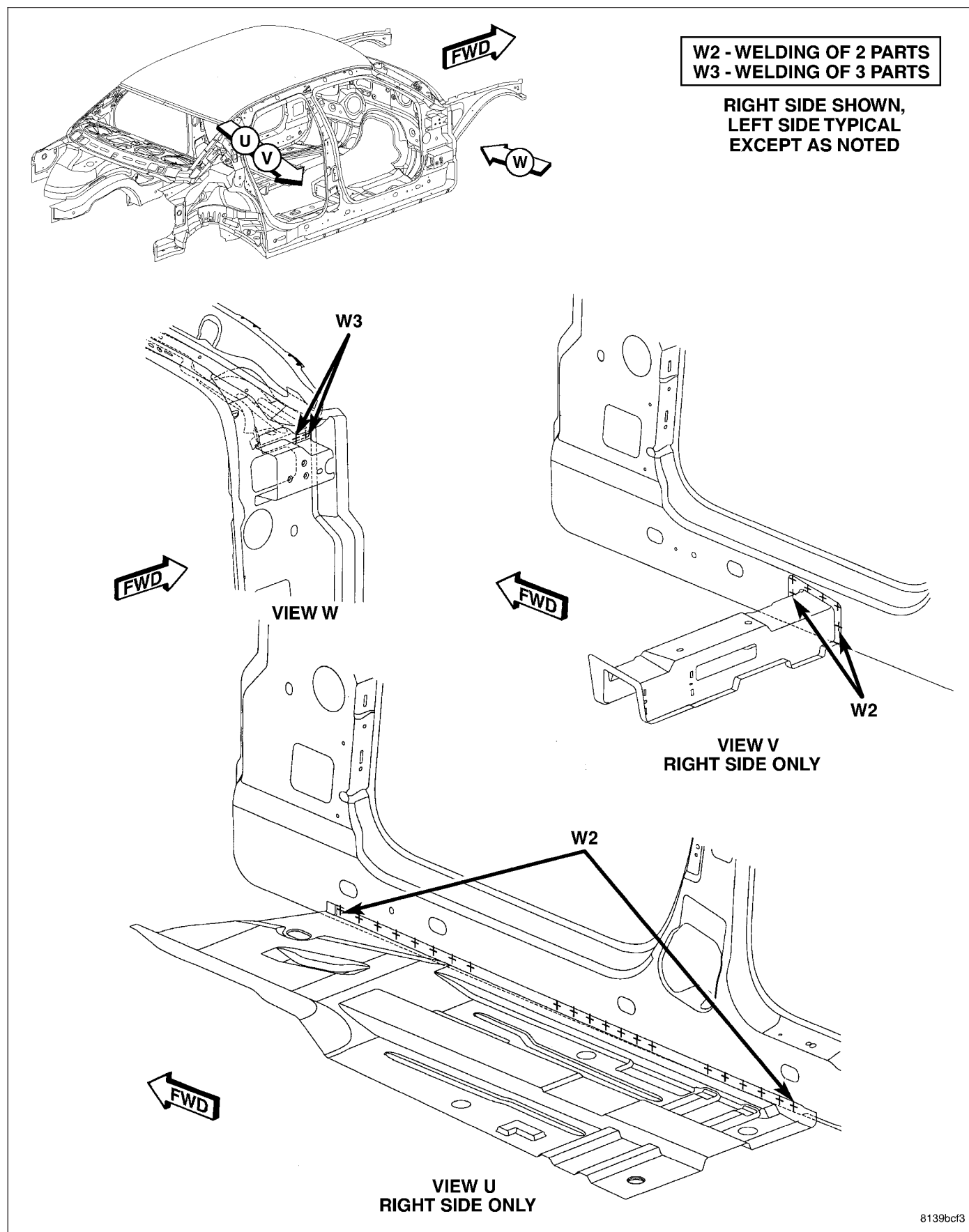


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Fig. 81 FRAMED FULL BODY IN WHITE (1 OF 9)



**Fig. 82 FRAMED FULL BODY IN WHITE (2 OF 9)**



**Fig. 83 FRAMED FULL BODY IN WHITE (3 OF 9)**

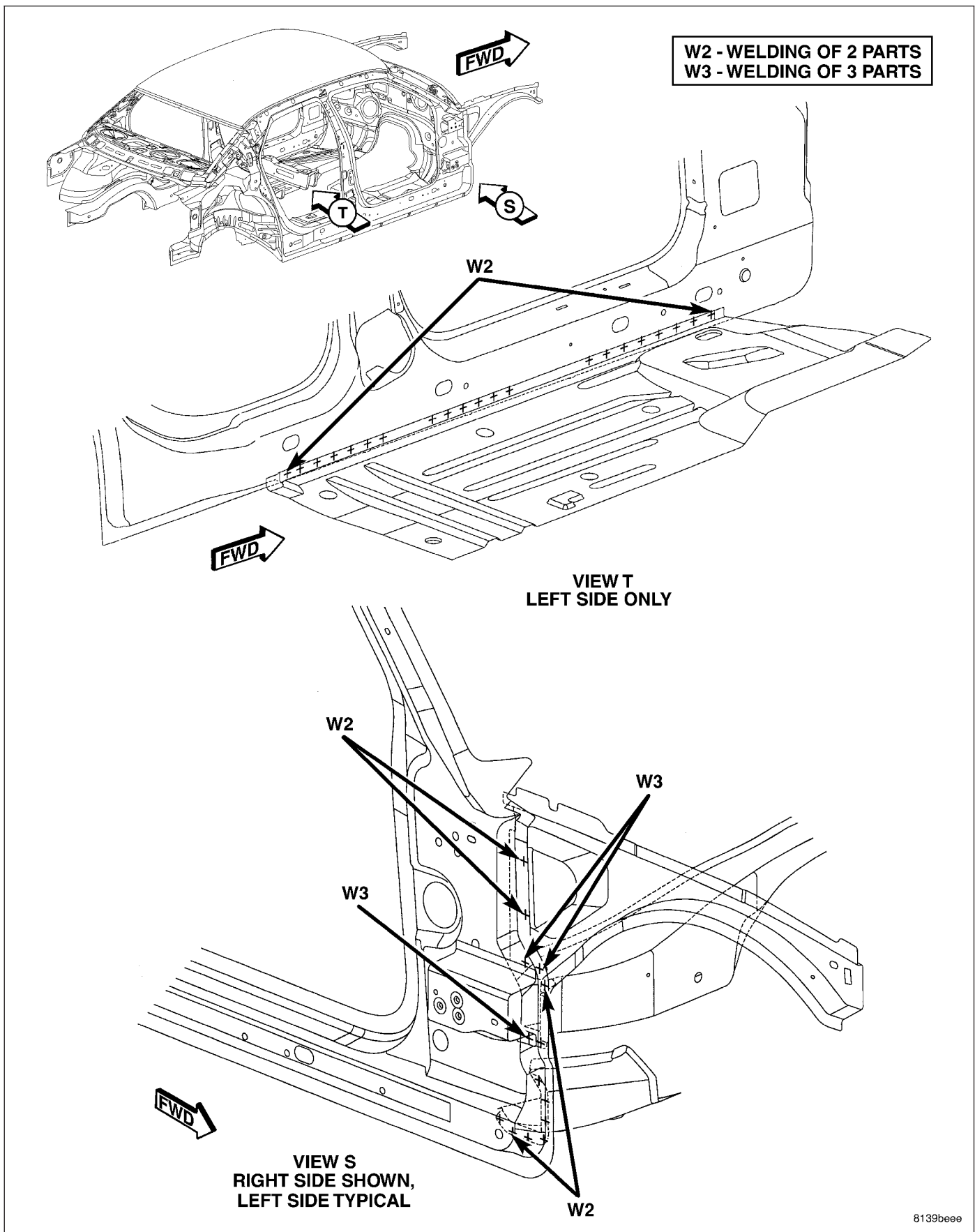
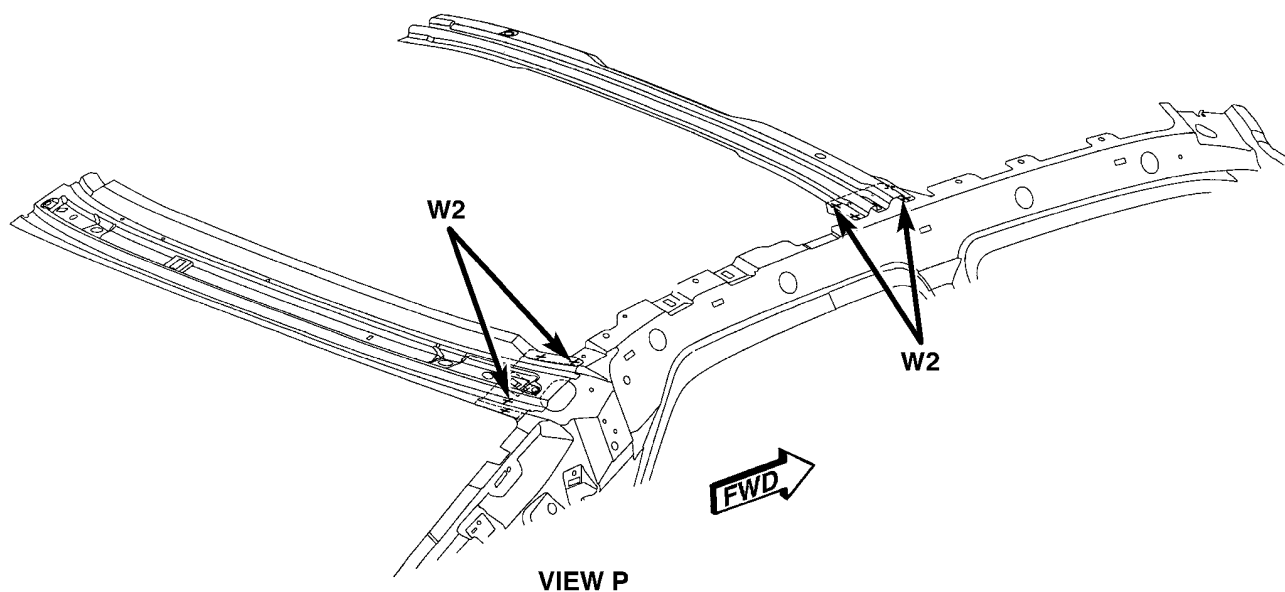
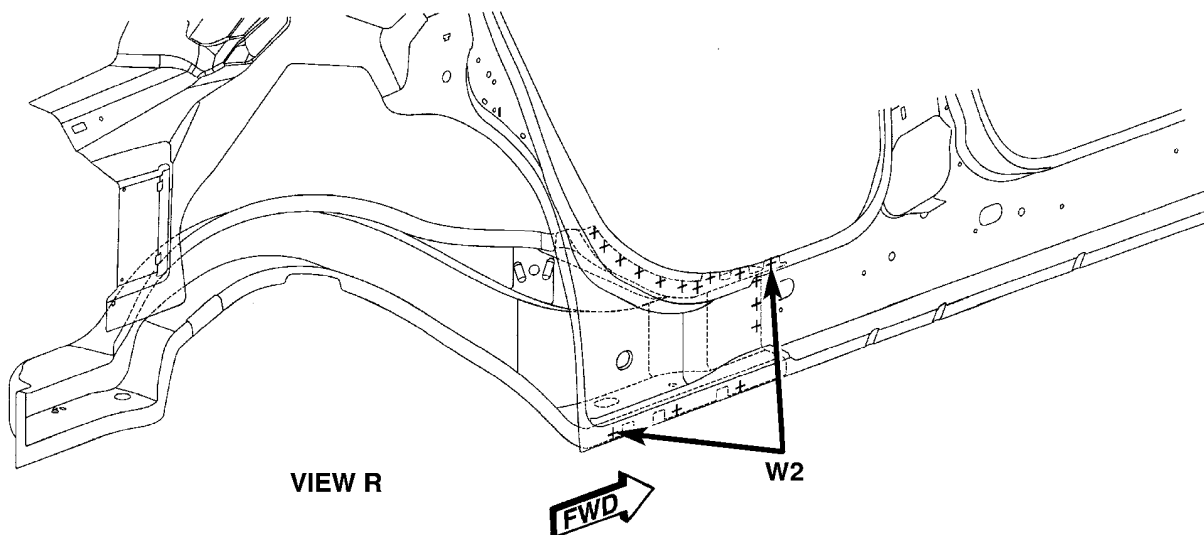
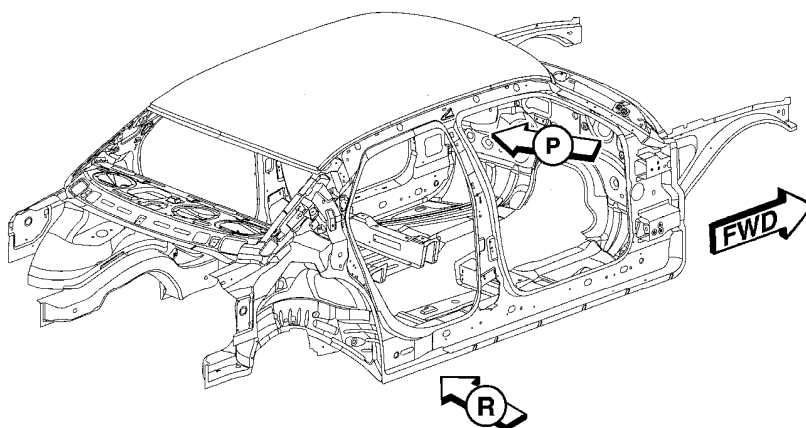


Fig. 84 FRAMED FULL BODY IN WHITE (4 OF 9)



W2 - WELDING OF 2 PARTS  
W3 - WELDING OF 3 PARTS

RIGHT SIDE SHOWN,  
LEFT SIDE TYPICAL



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Fig. 85 FRAMED FULL BODY IN WHITE (5 OF 9)

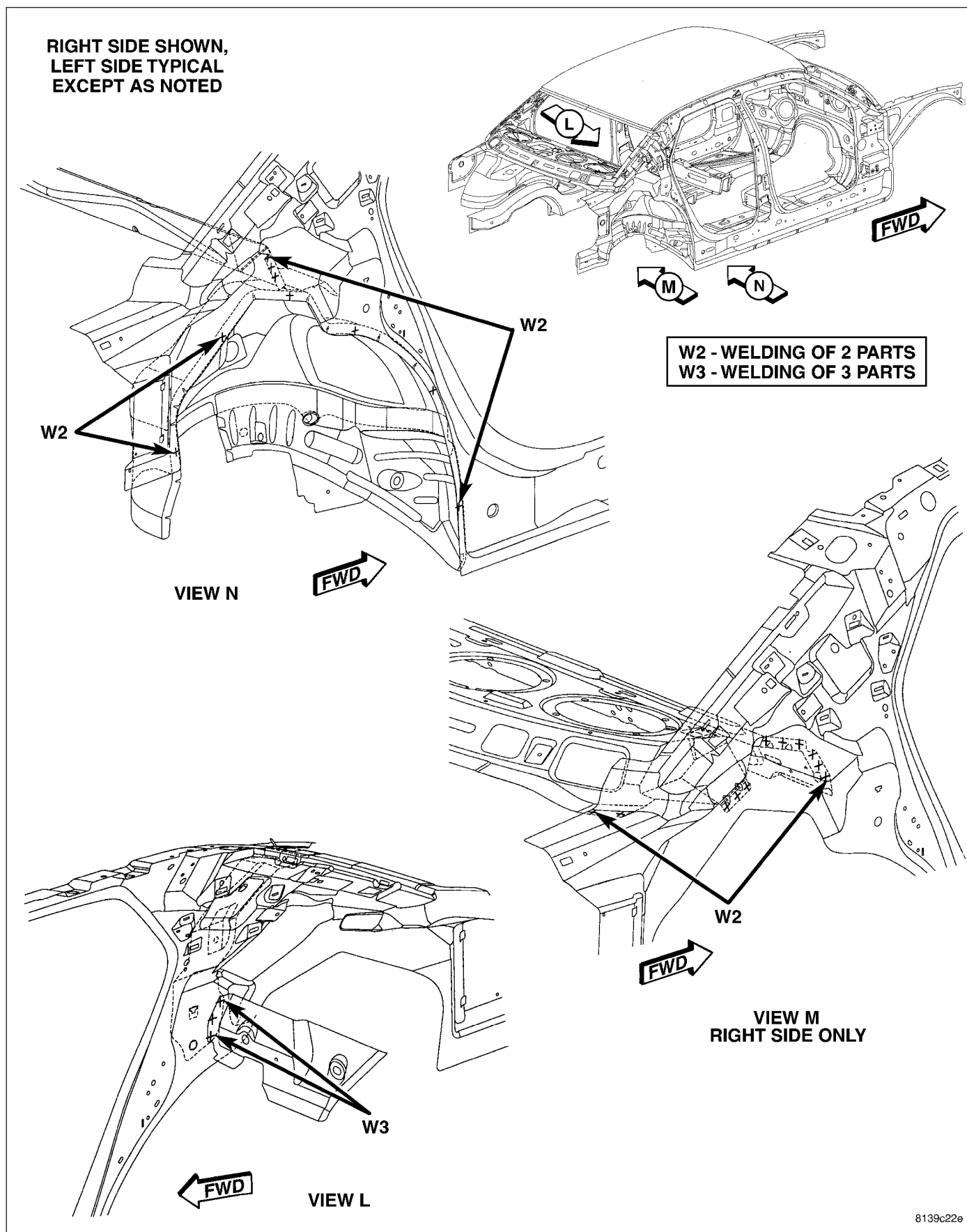
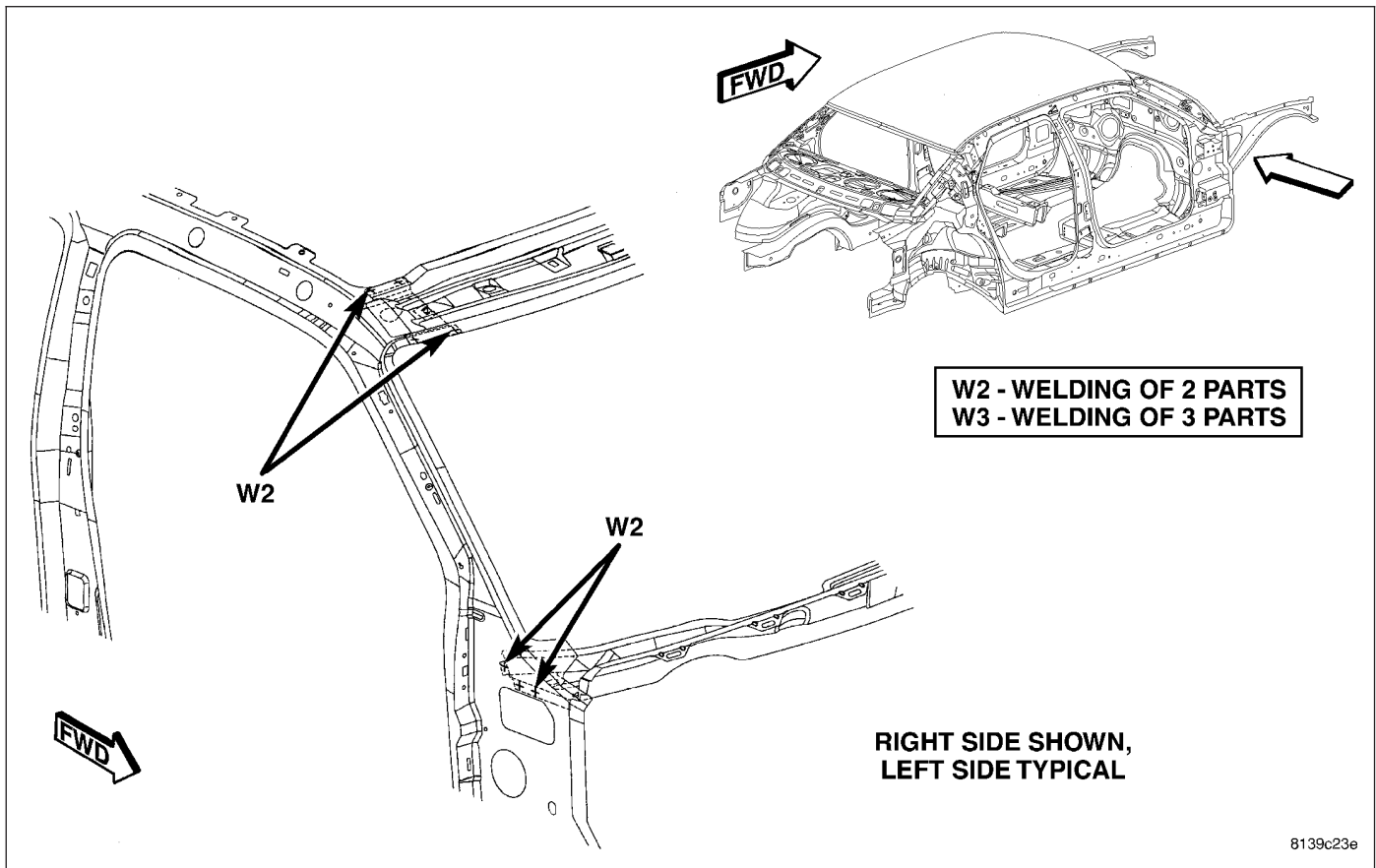


Fig. 86 FRAMED FULL BODY IN WHITE (6 OF 9)





**Fig. 87 FRAMED FULL BODY IN WHITE (7 OF 9)**

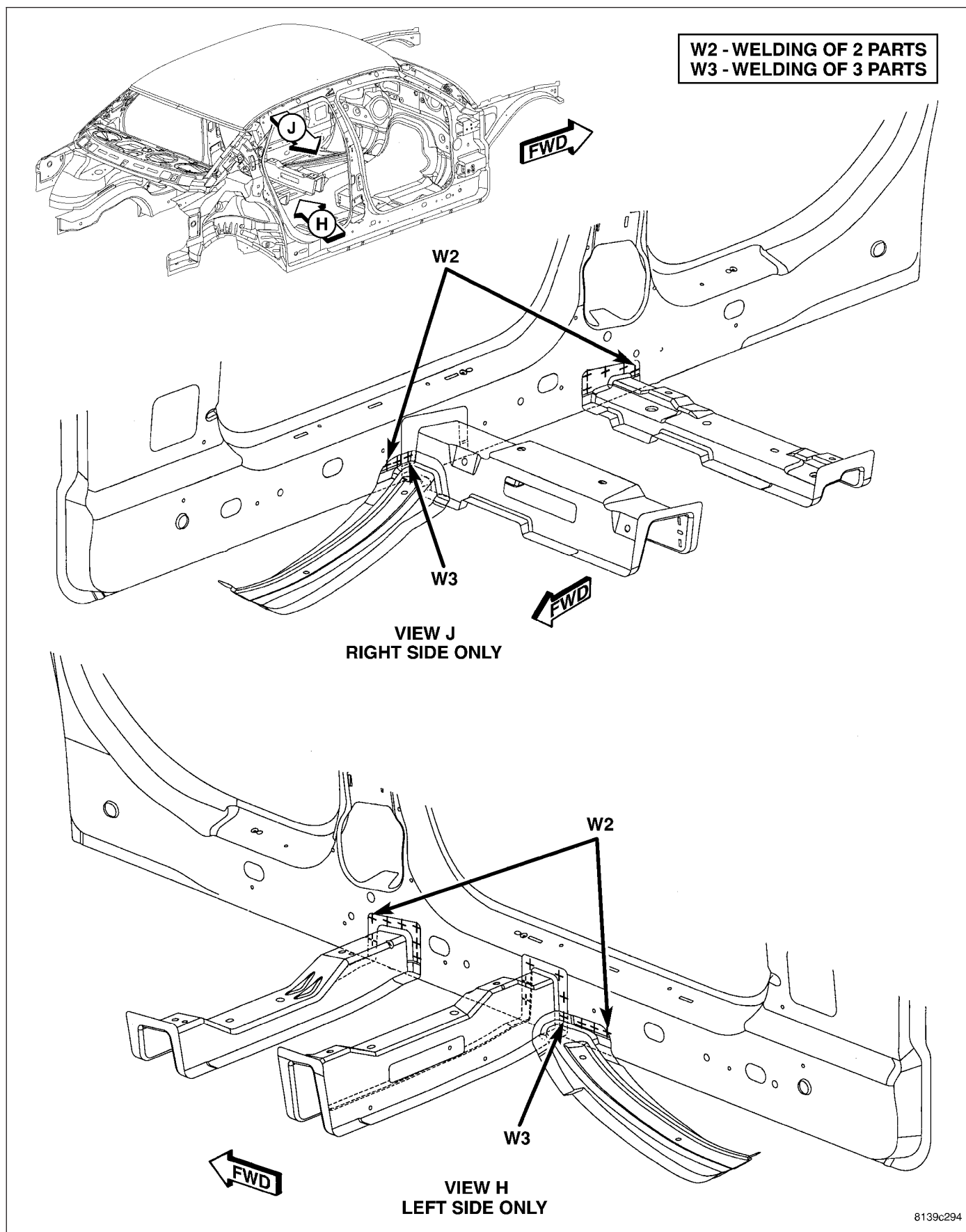


Fig. 88 FRAMED FULL BODY IN WHITE (8 OF 9)

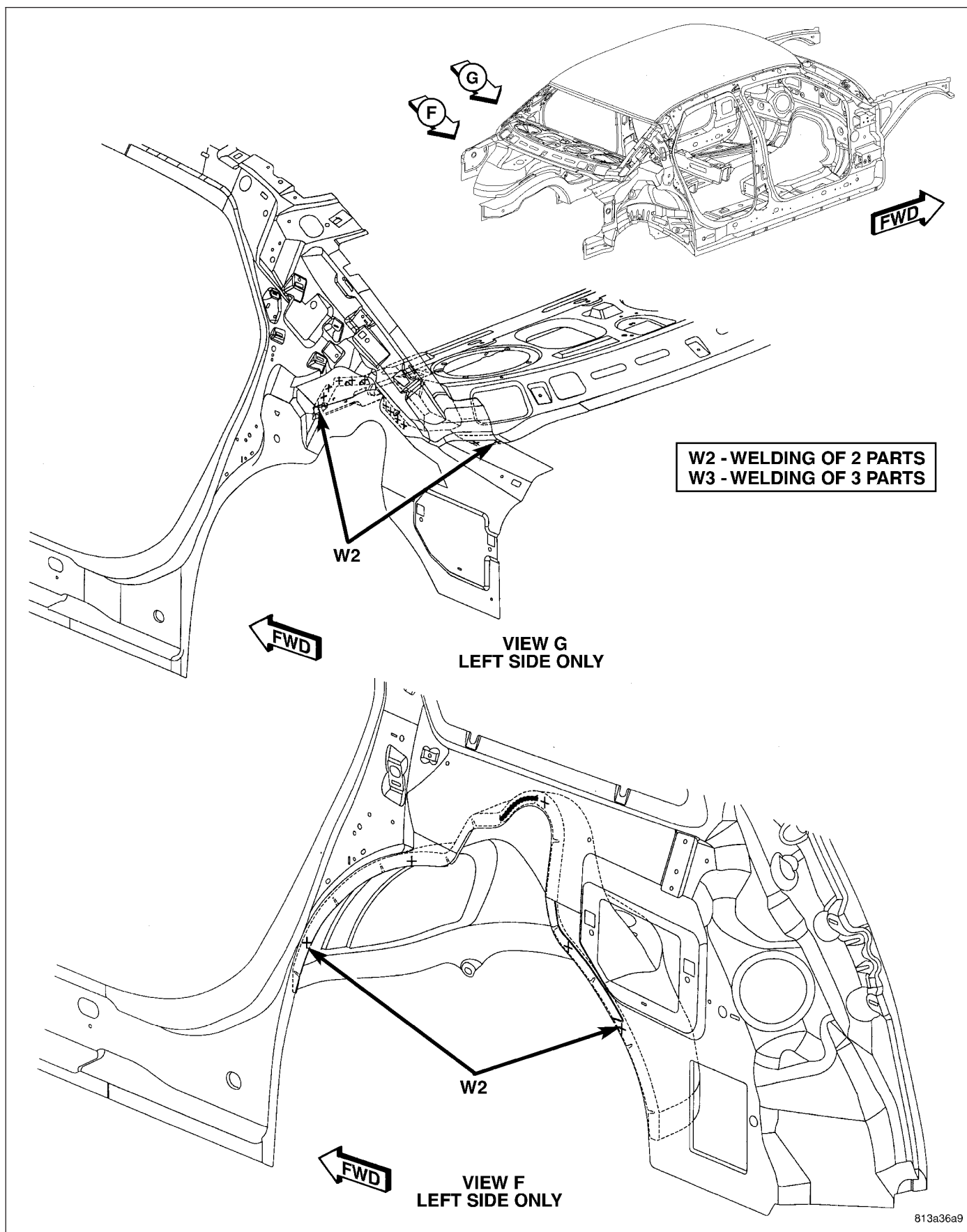


Fig. 89 FRAMED FULL BODY IN WHITE (9 OF 9)

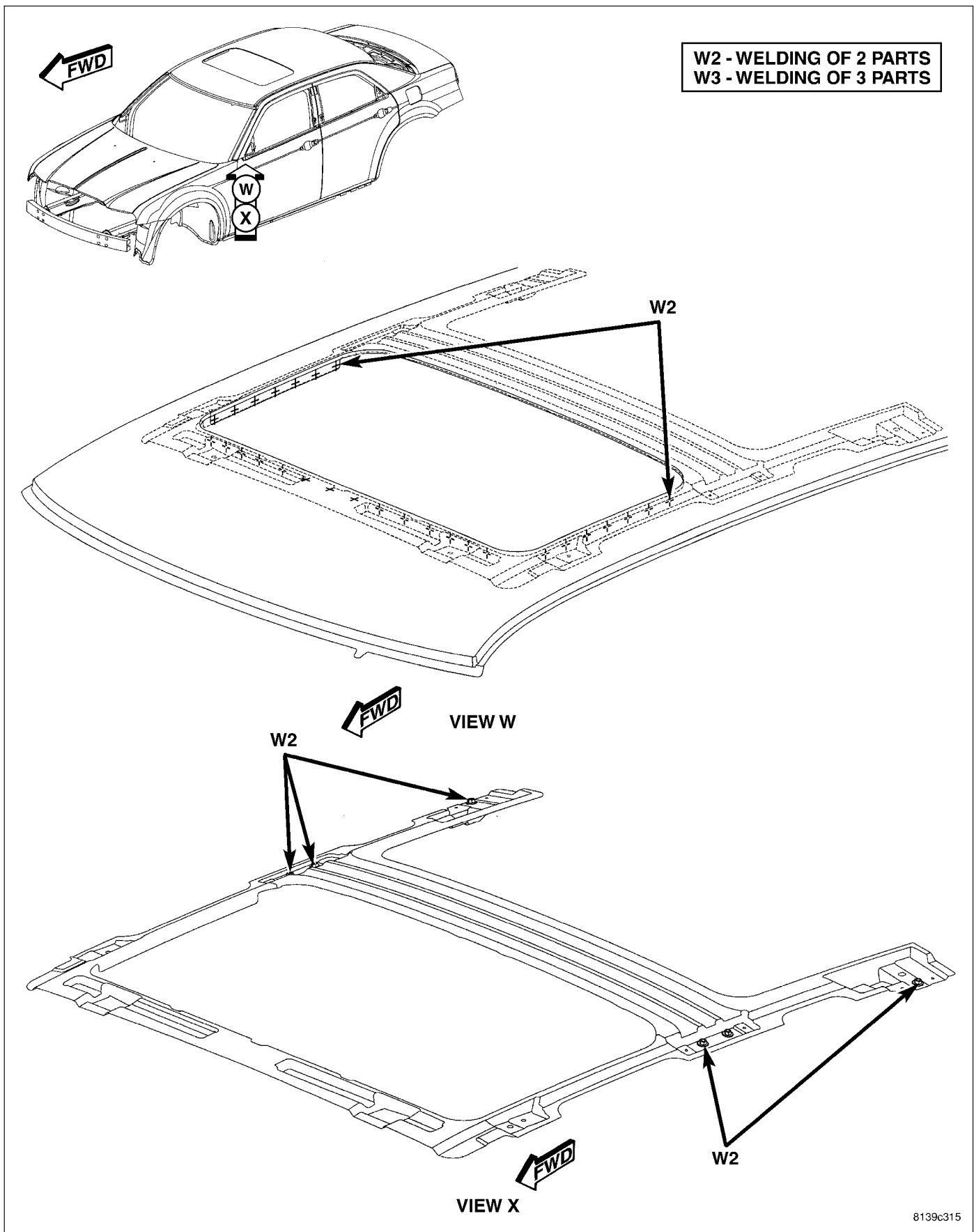


Fig. 90 ROOF (1 OF 3)

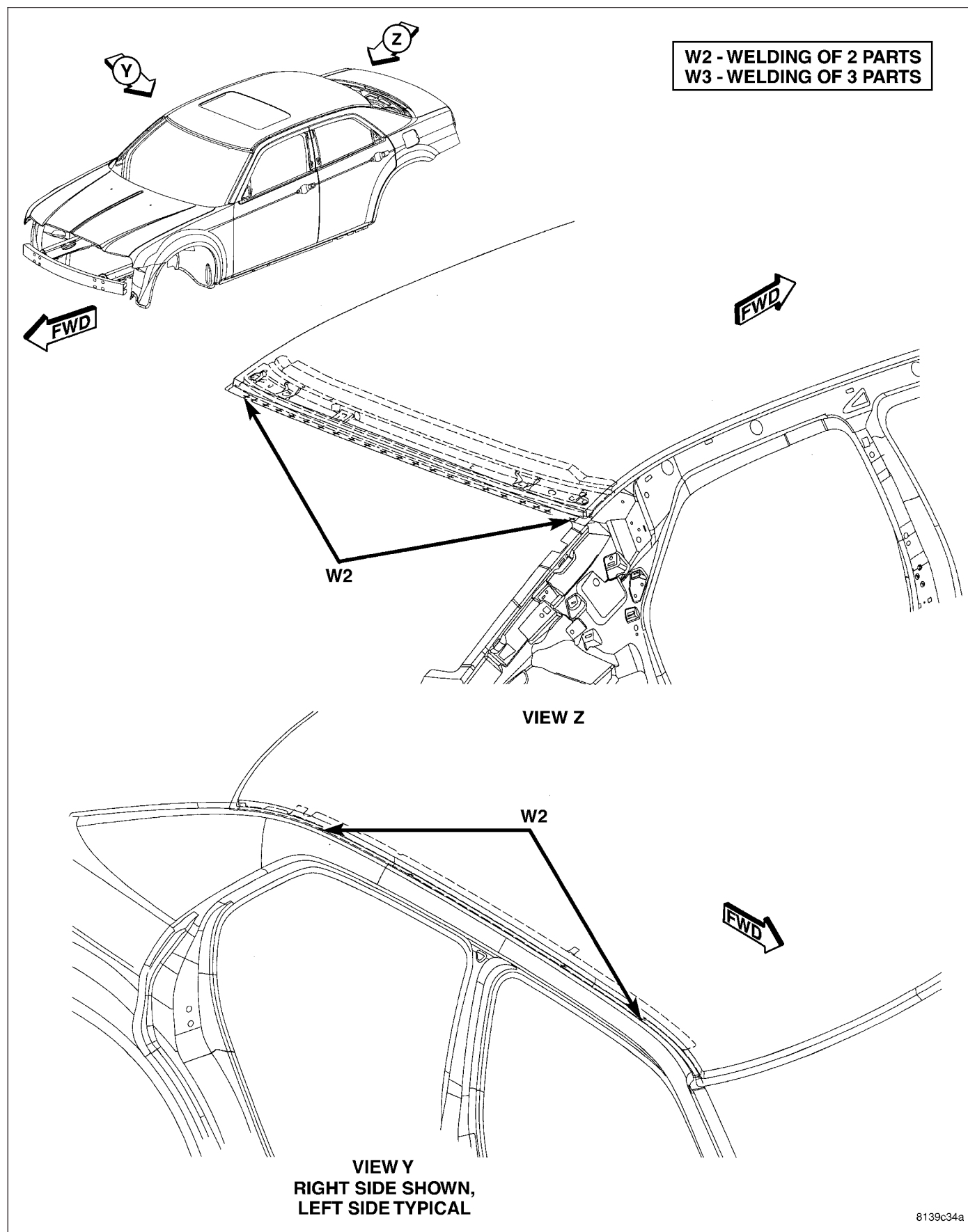


Fig. 91 ROOF (2 OF 3)

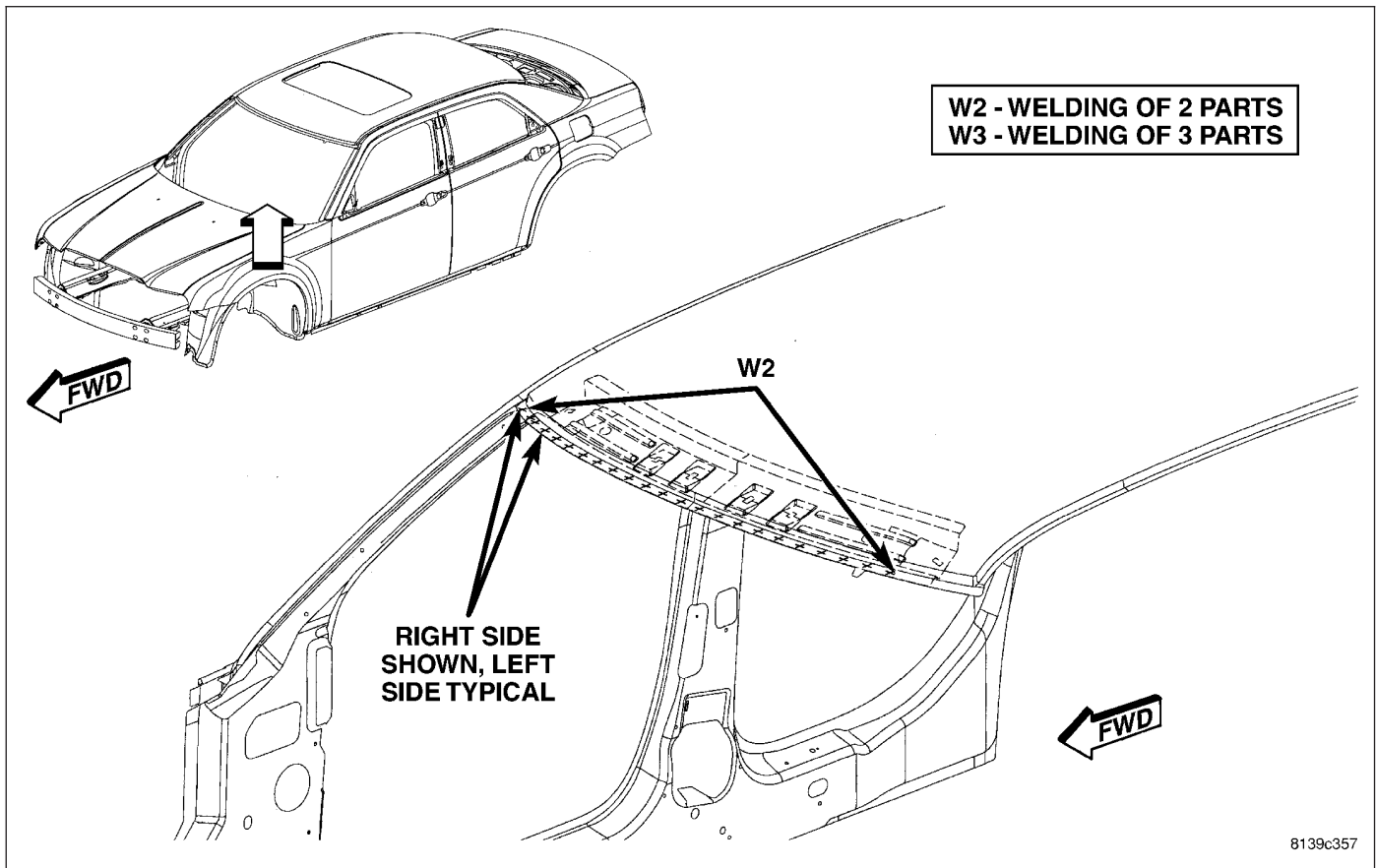


Fig. 92 ROOF (3 OF 3)

## Wagon Only

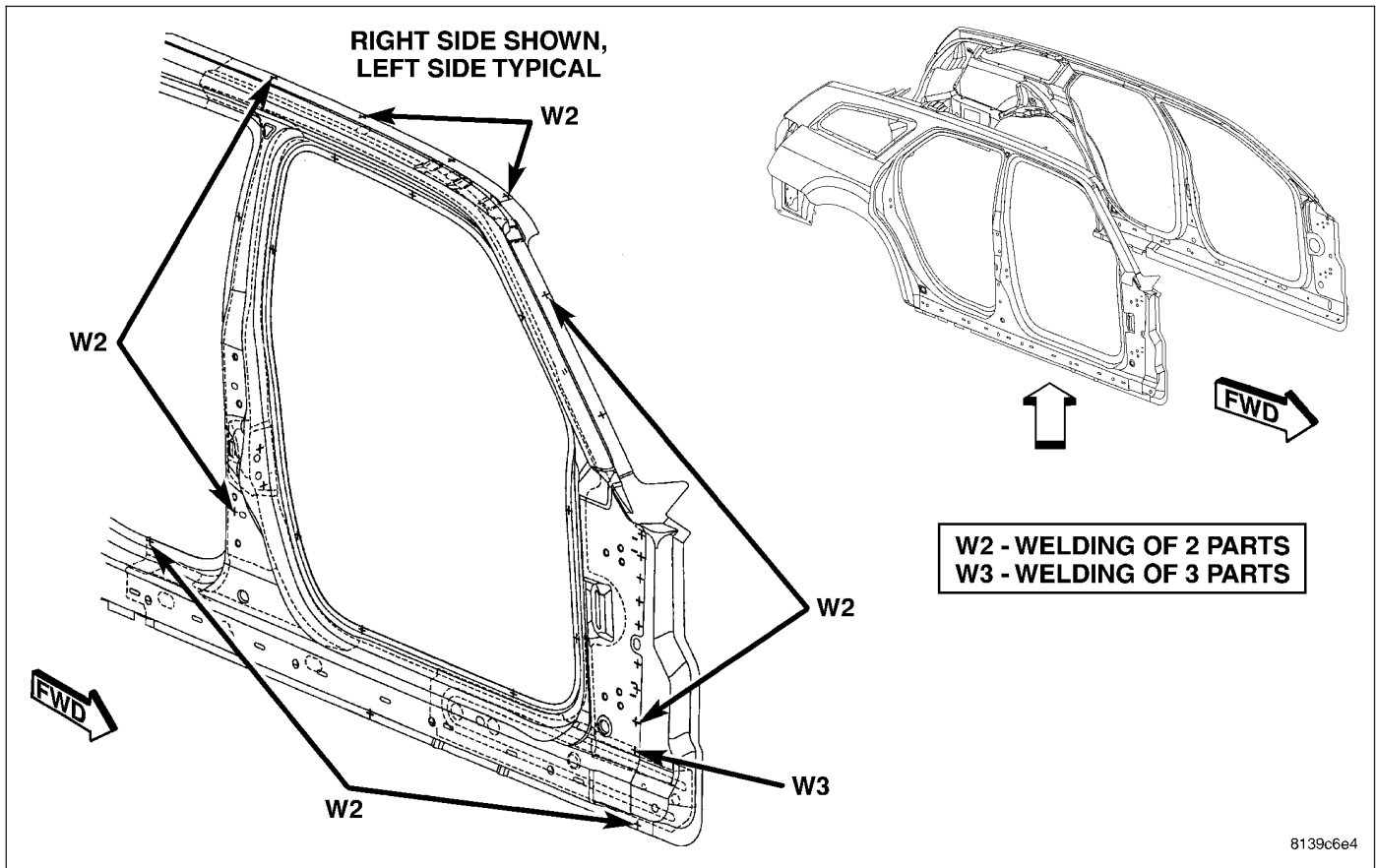
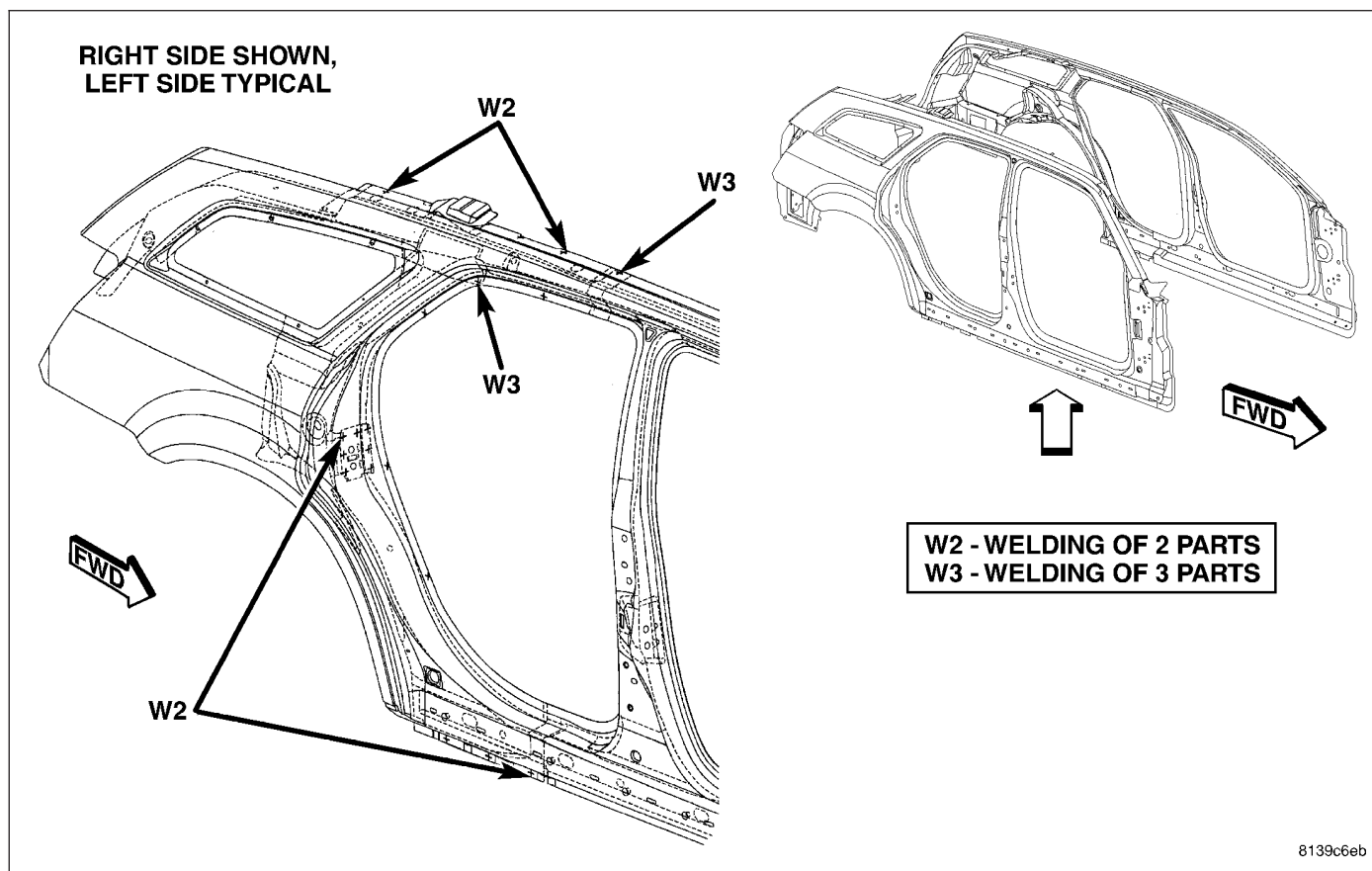
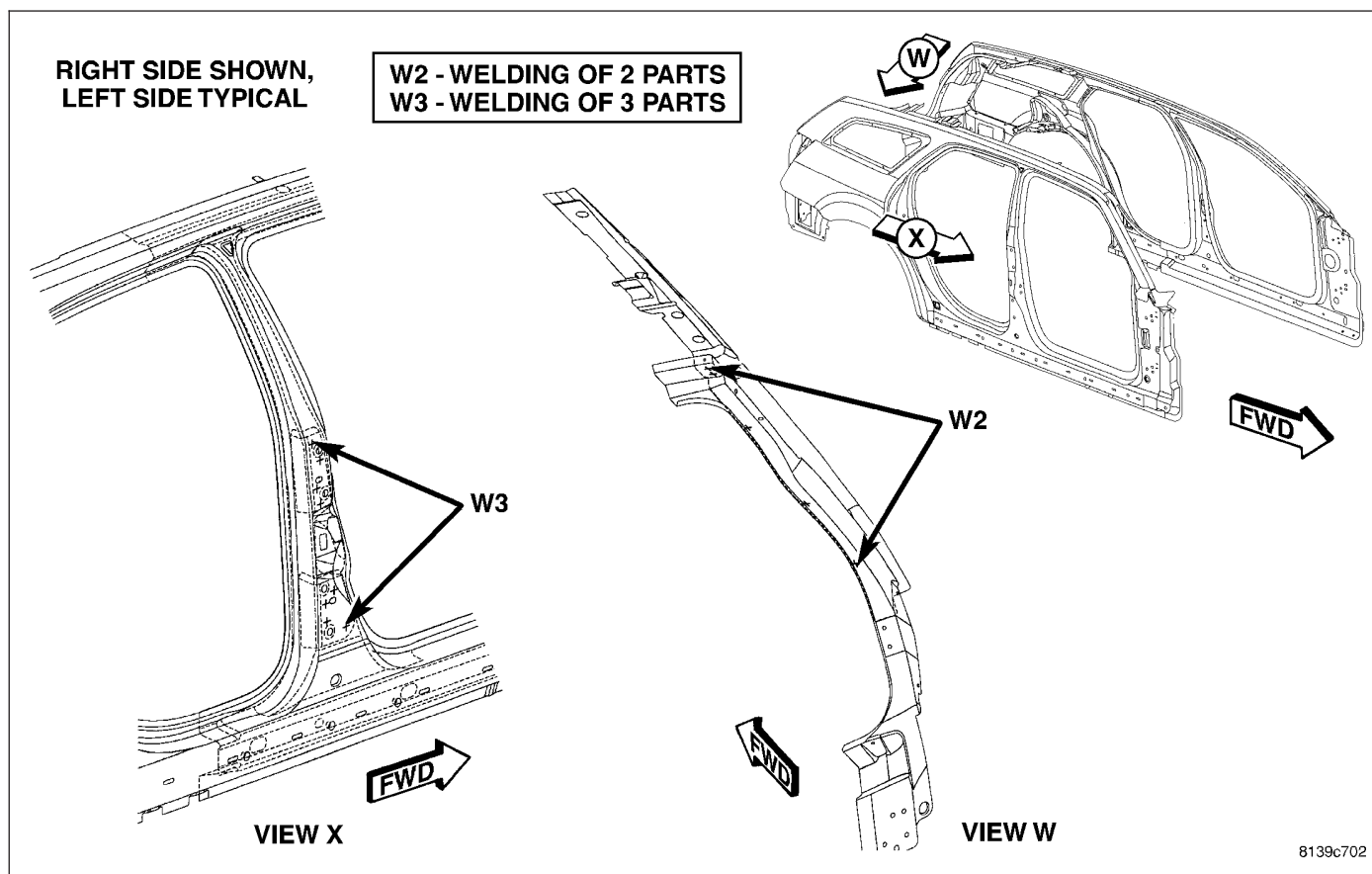


Fig. 93 OUTER BODY SIDE APERTURE (1 OF 5)

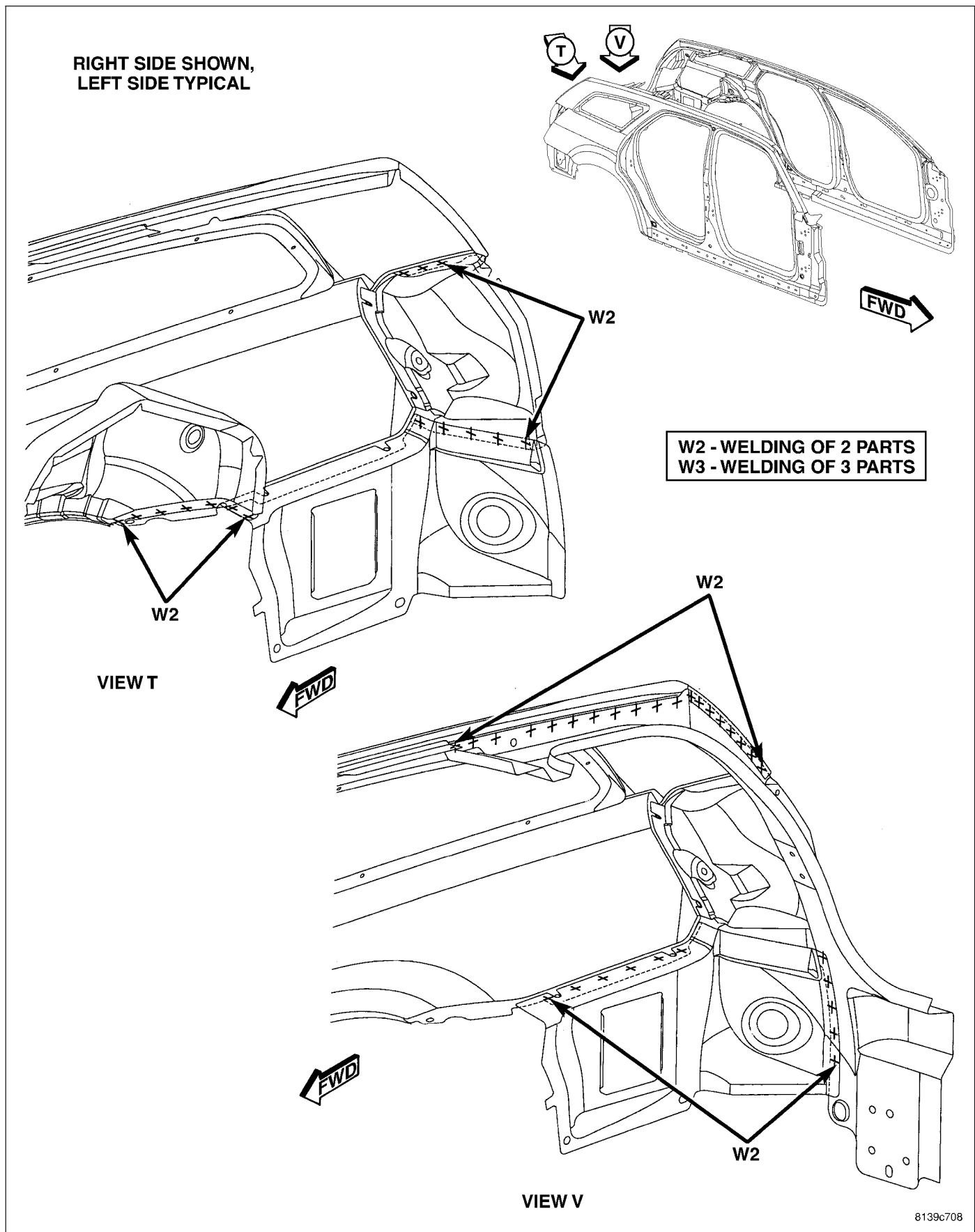


*Fig. 94 OUTER BODY SIDE APERTURE (2 OF 5)*



*Fig. 95 OUTER BODY SIDE APERTURE (3 OF 5)*

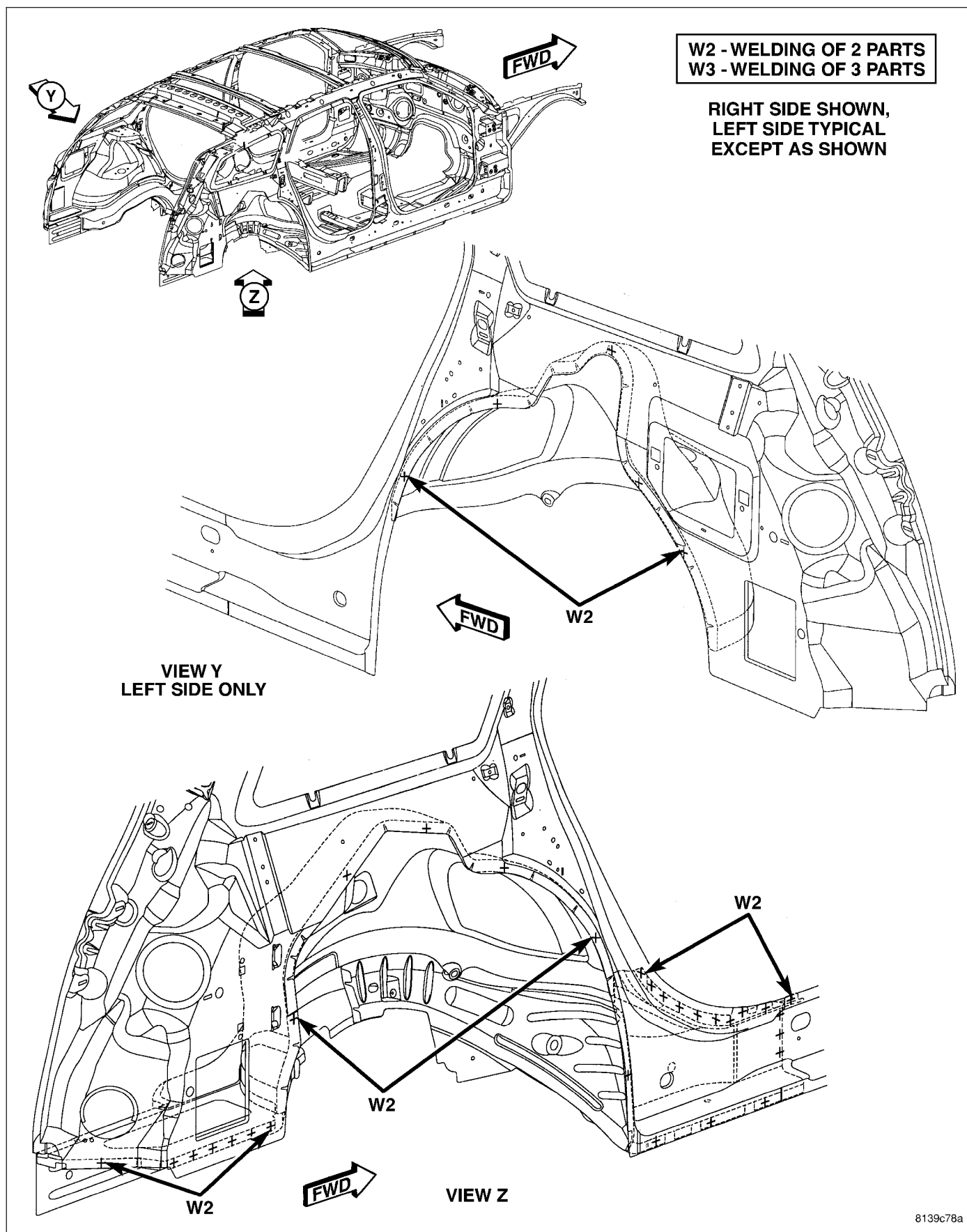




**Fig. 96 OUTER BODY SIDE APERTURE (4 OF 5)**







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**Fig. 99 FRAMED FULL BODY IN WHITE (1 OF 8)**

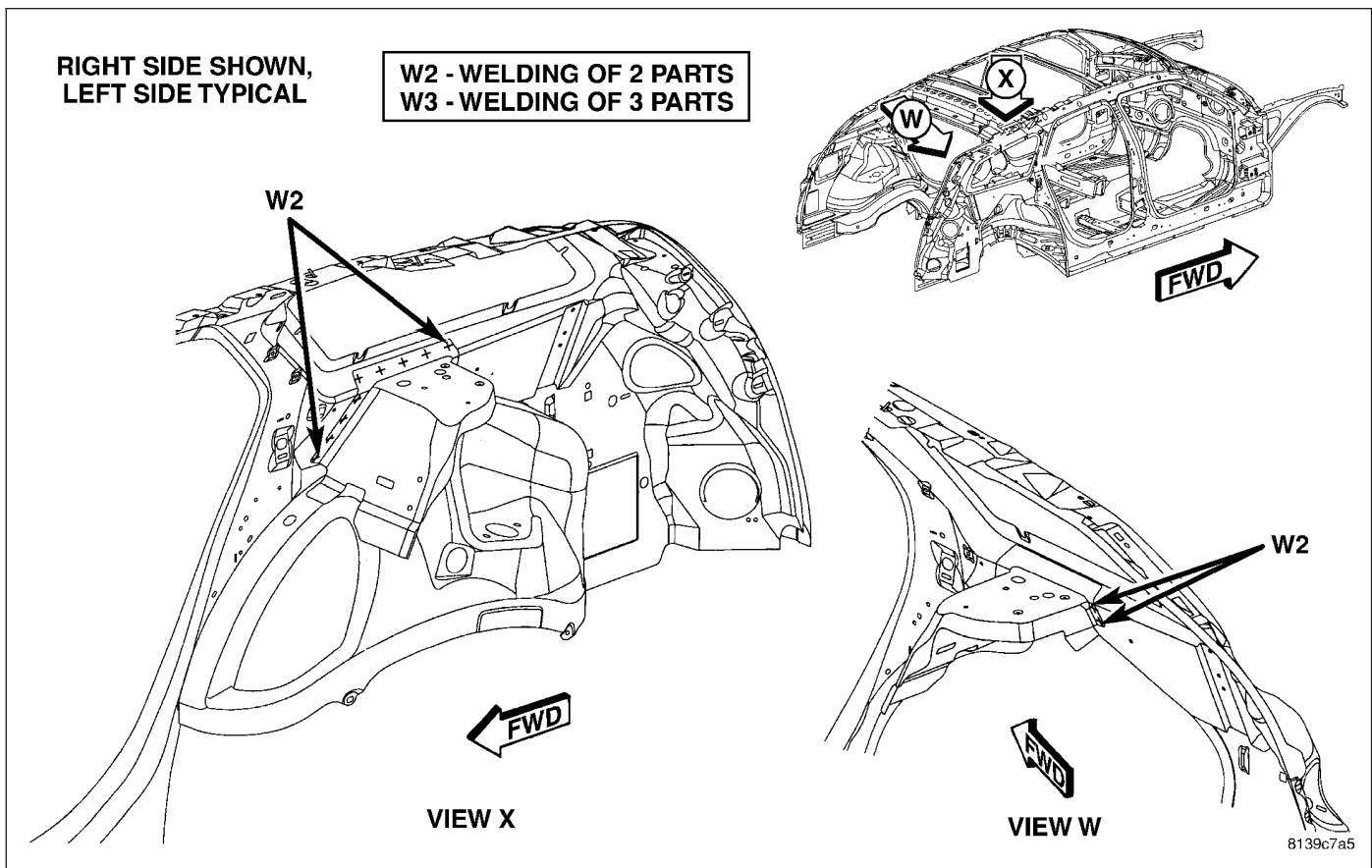


Fig. 100 FRAMED FULL BODY IN WHITE (2 OF 8)

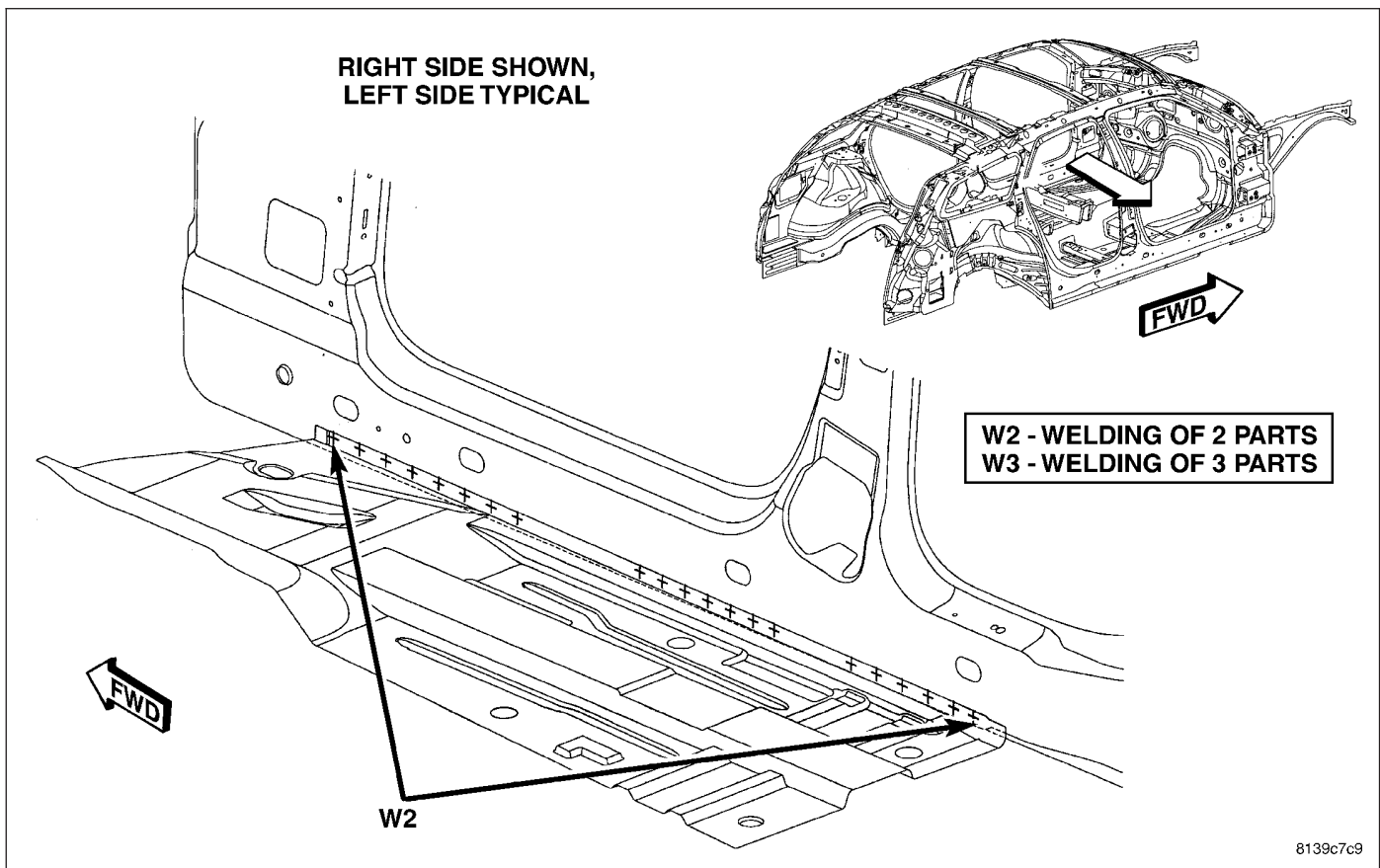


Fig. 101 FRAMED FULL BODY IN WHITE (3 OF 8)

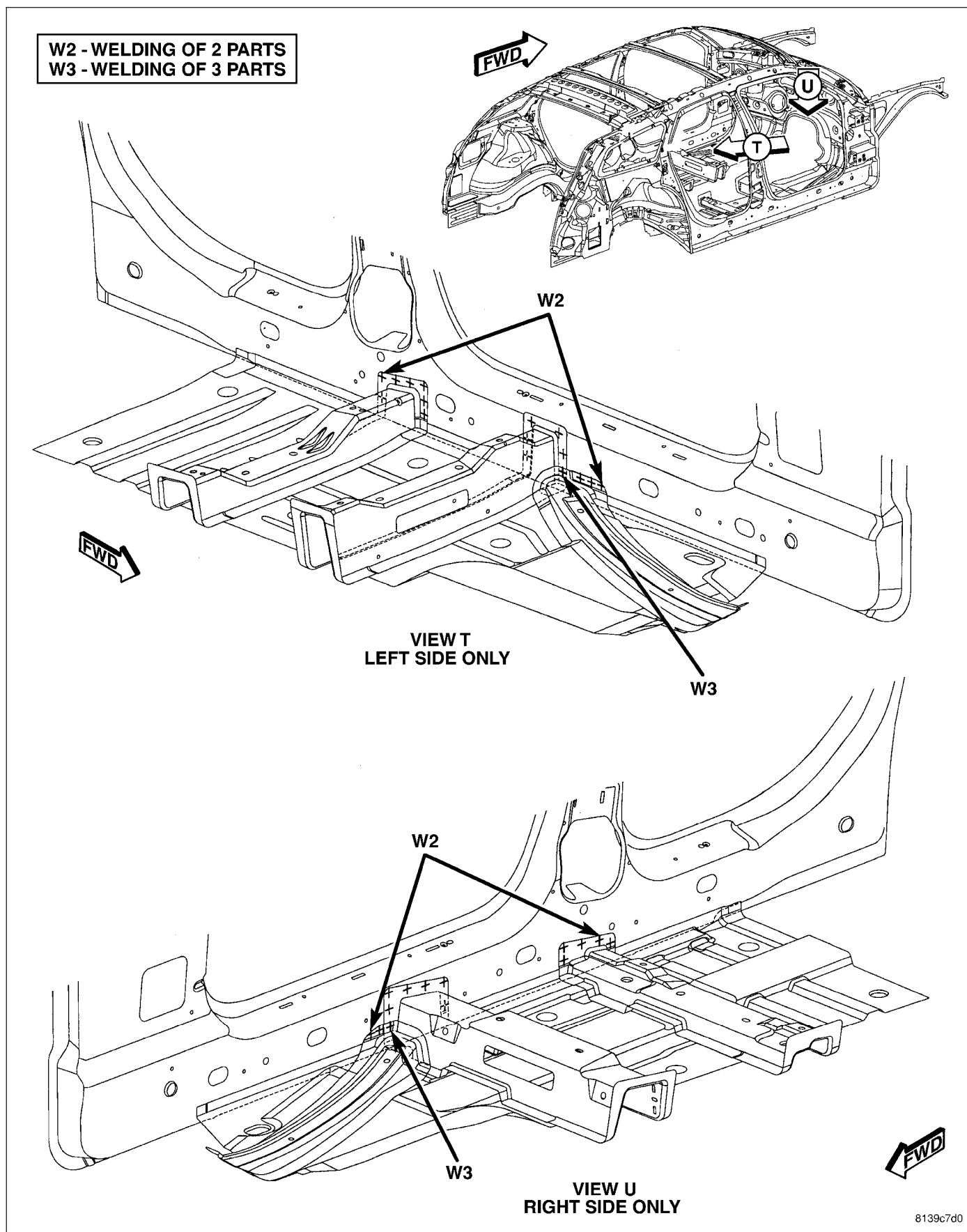


Fig. 102 FRAMED FULL BODY IN WHITE (4 OF 8)



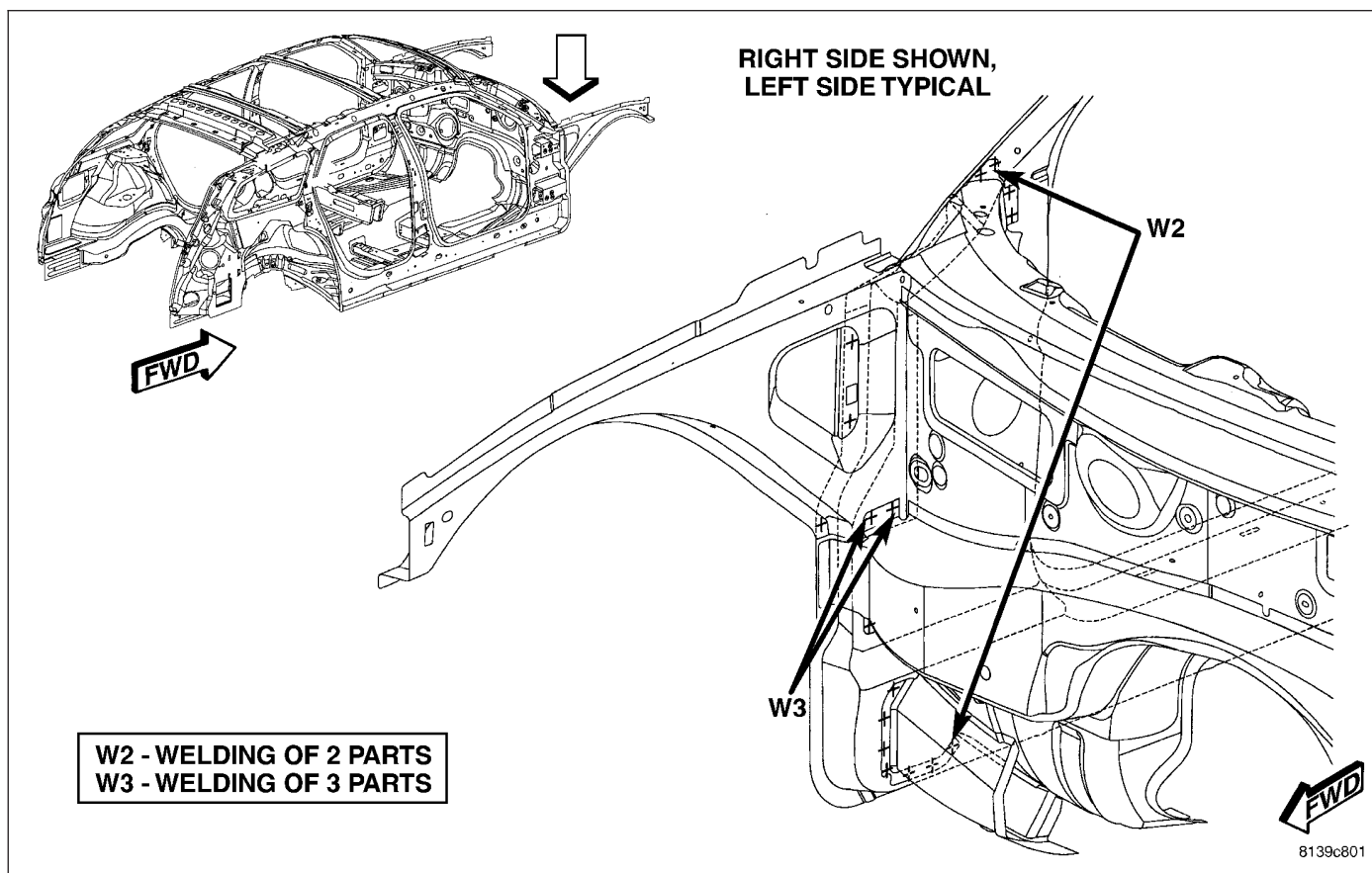


Fig. 103 FRAMED FULL BODY IN WHITE (5 OF 8)

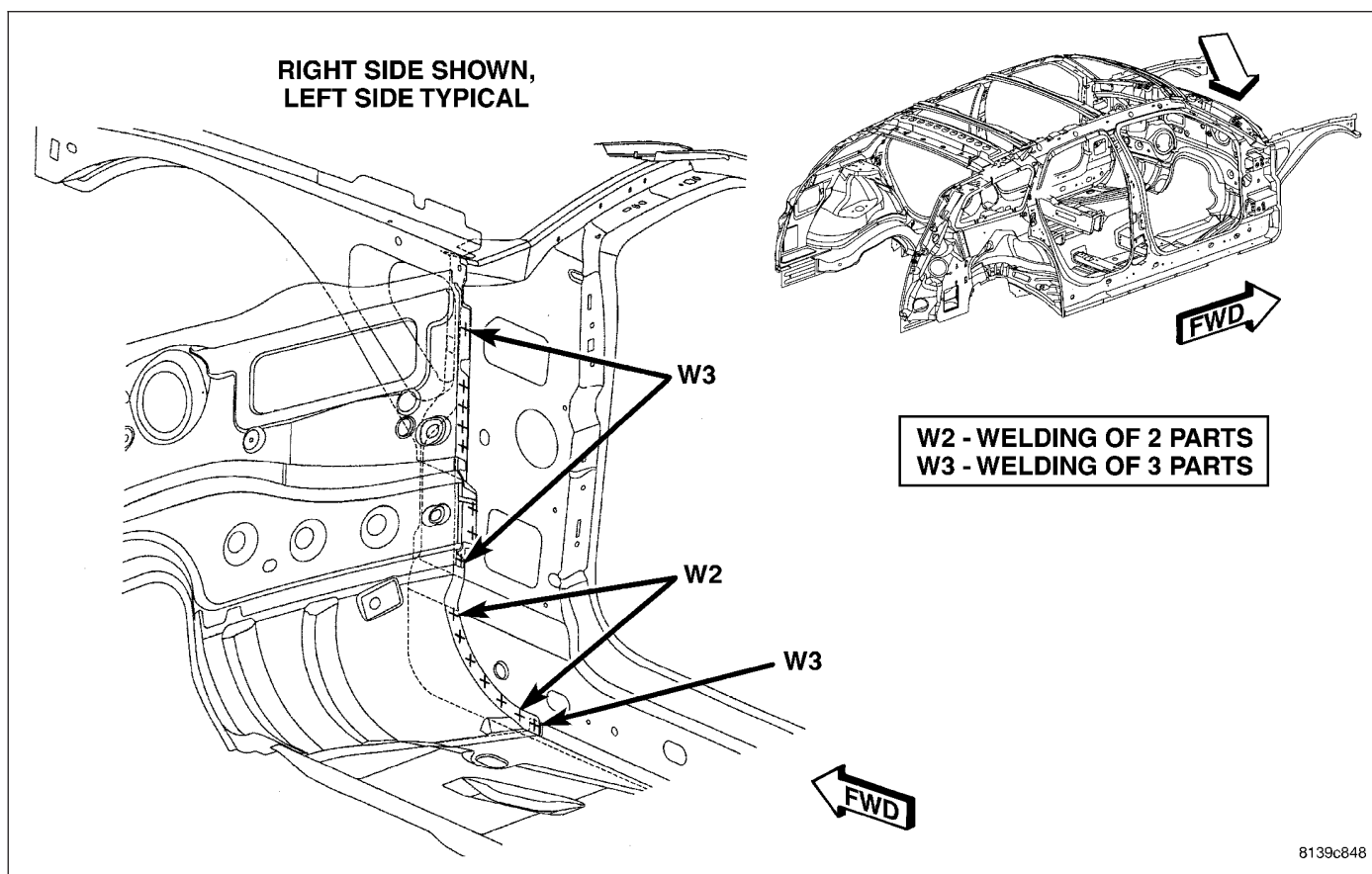
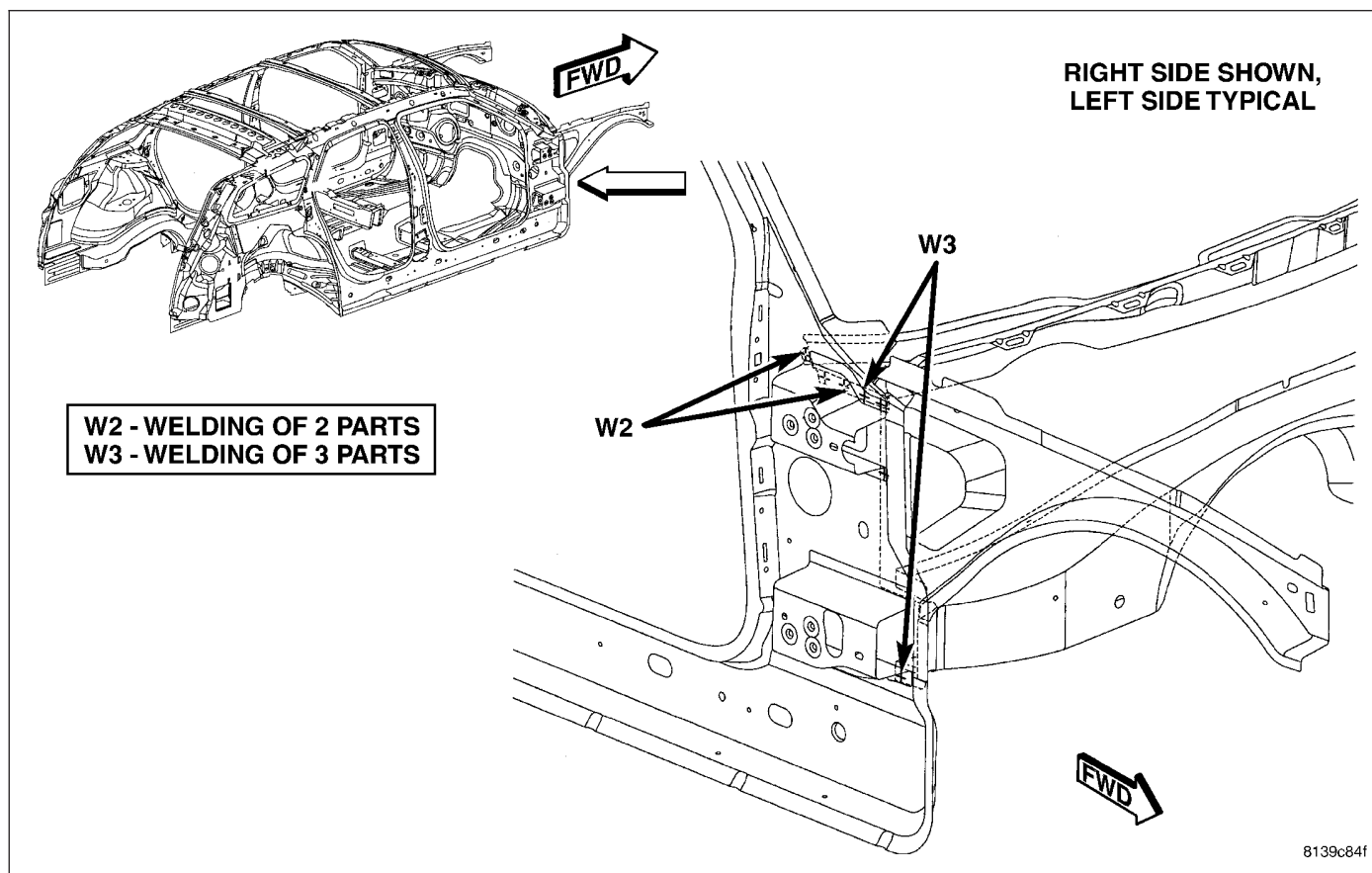
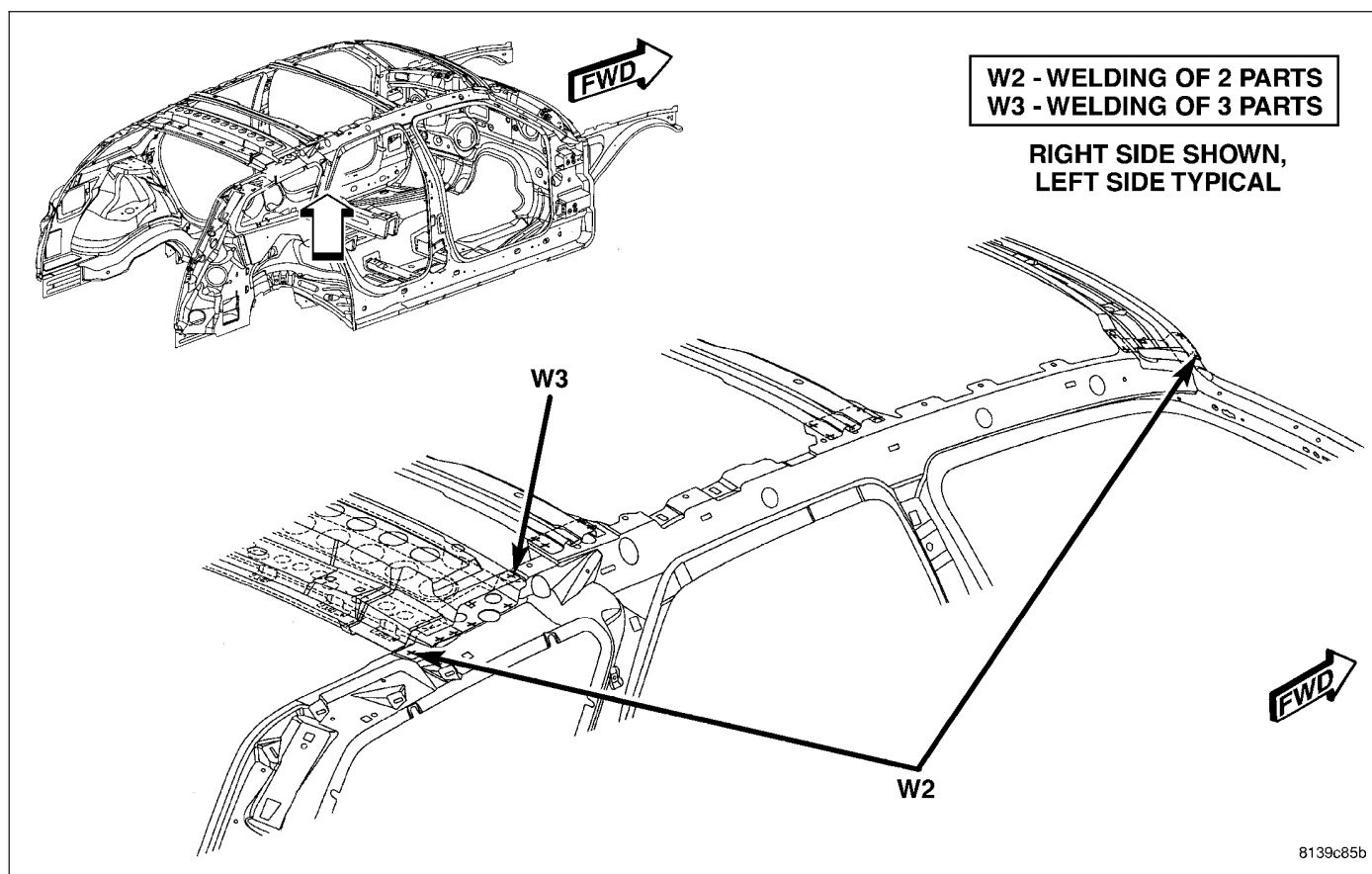


Fig. 104 FRAMED FULL BODY IN WHITE (6 OF 8)



**Fig. 105 FRAMED FULL BODY IN WHITE (7 OF 8)**

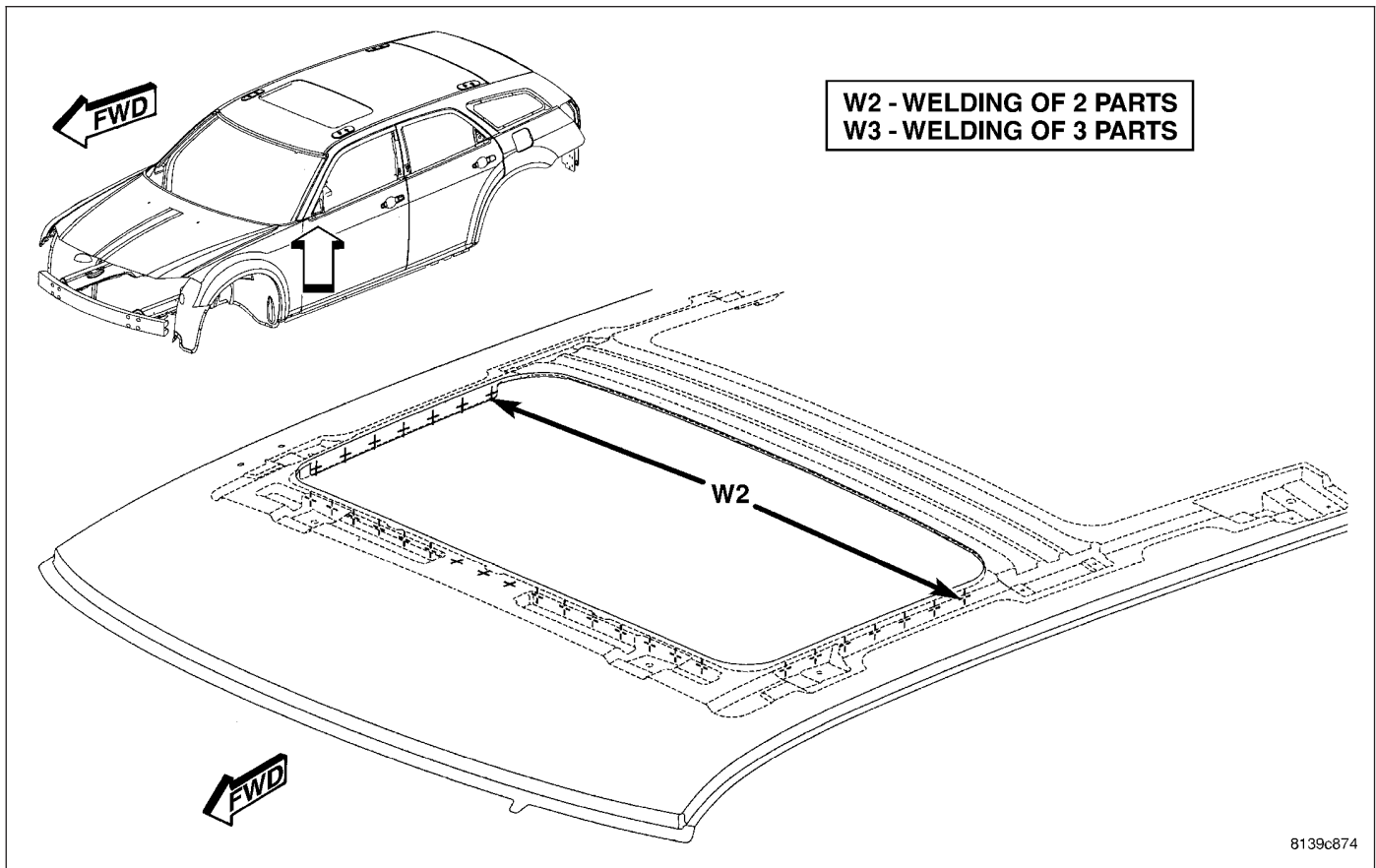


**Fig. 106 FRAMED FULL BODY IN WHITE (8 OF 8)**

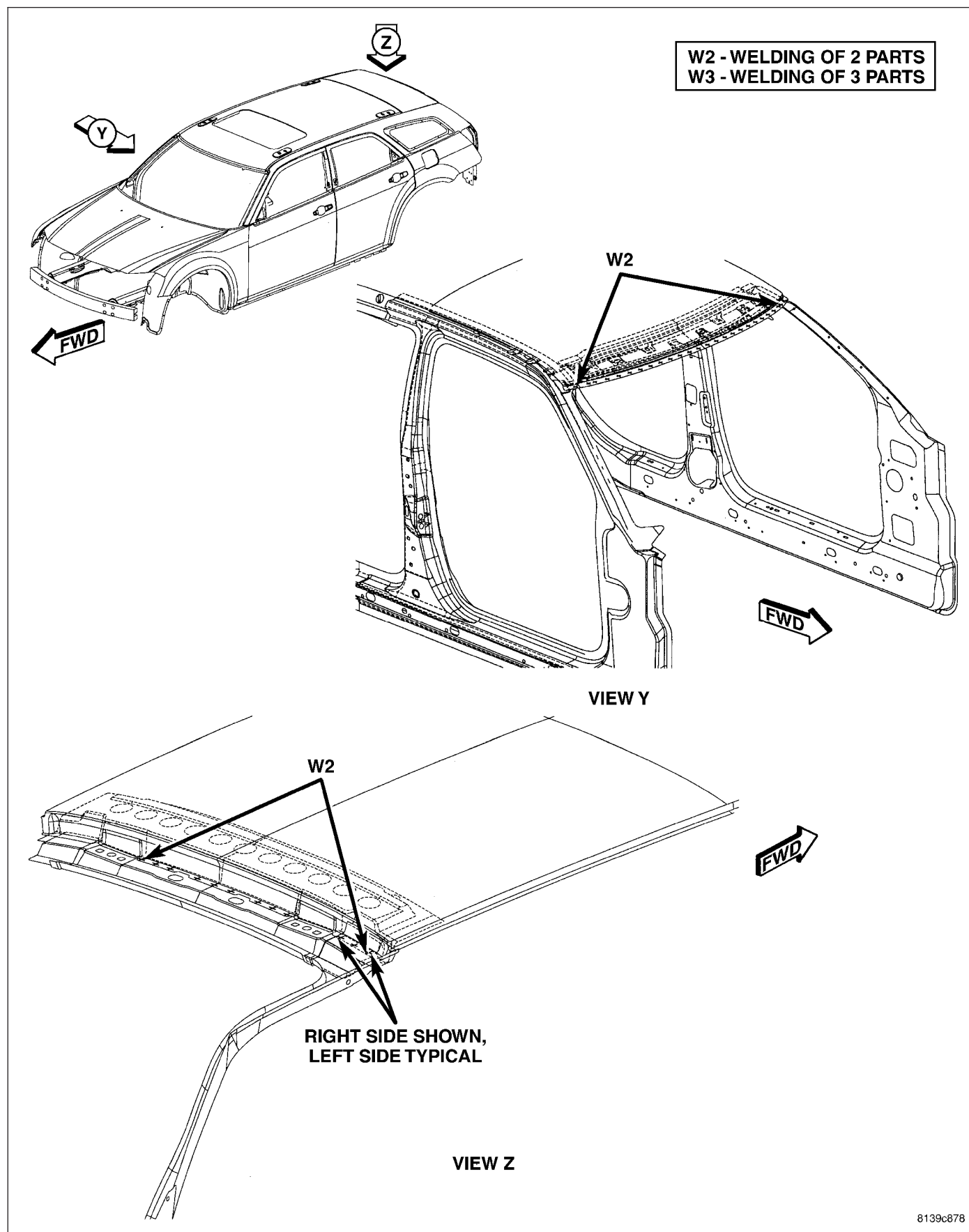




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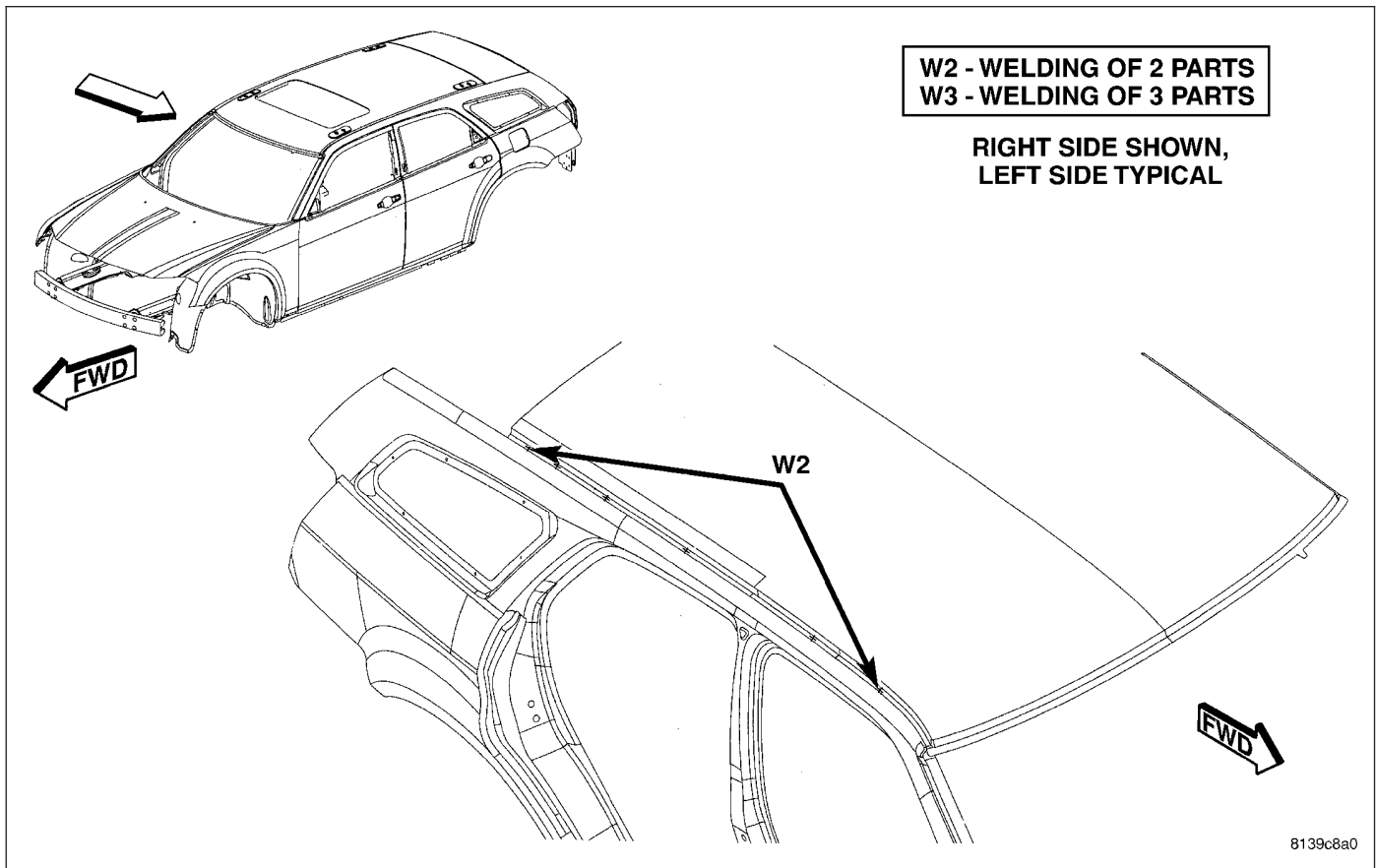


**Fig. 108 ROOF (2 OF 4)**



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Fig. 109 ROOF (3 OF 4)



**Fig. 110 ROOF (4 OF 4)**

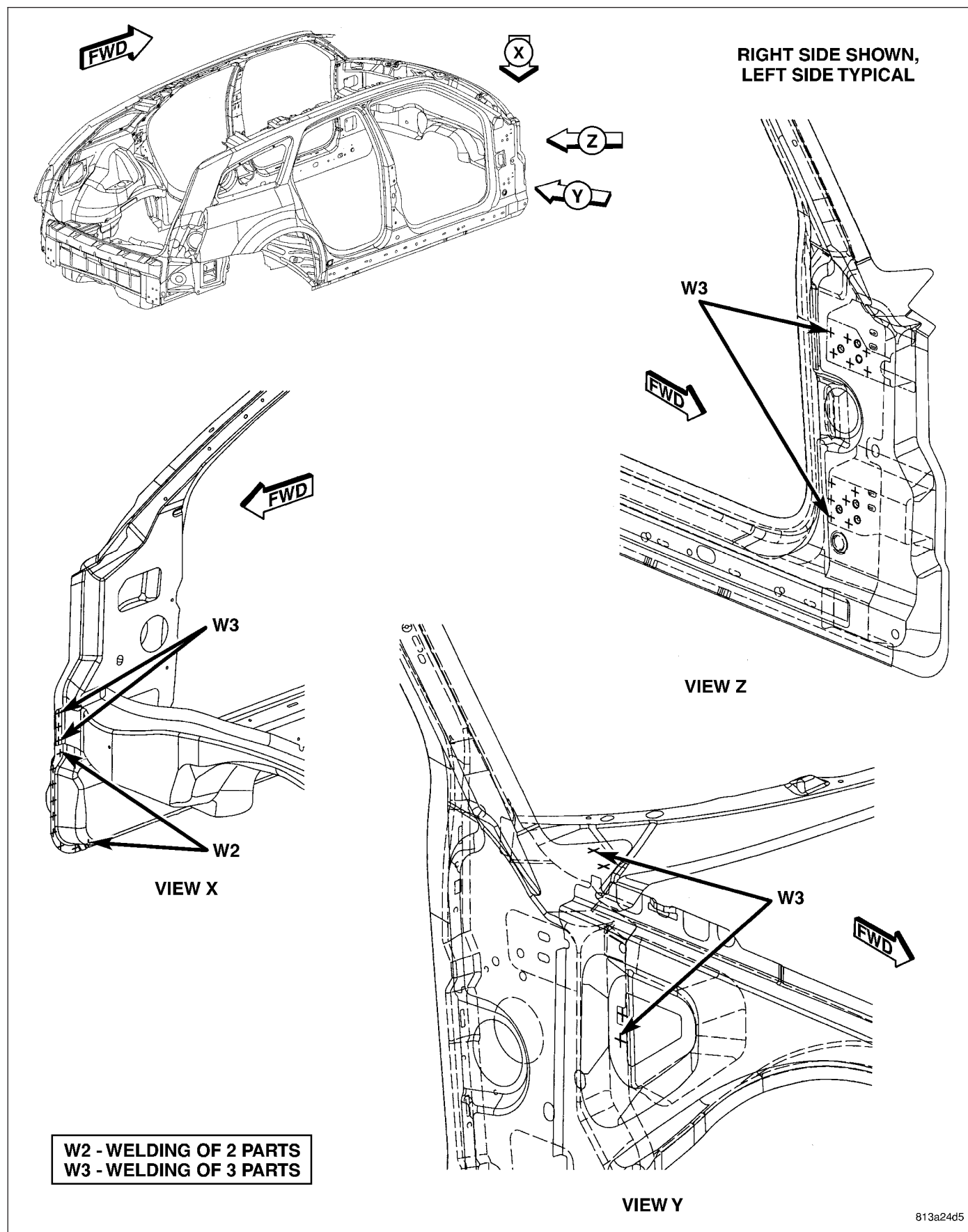


Fig. 111 FRAMED BODY IN WHITE (1 OF 12)

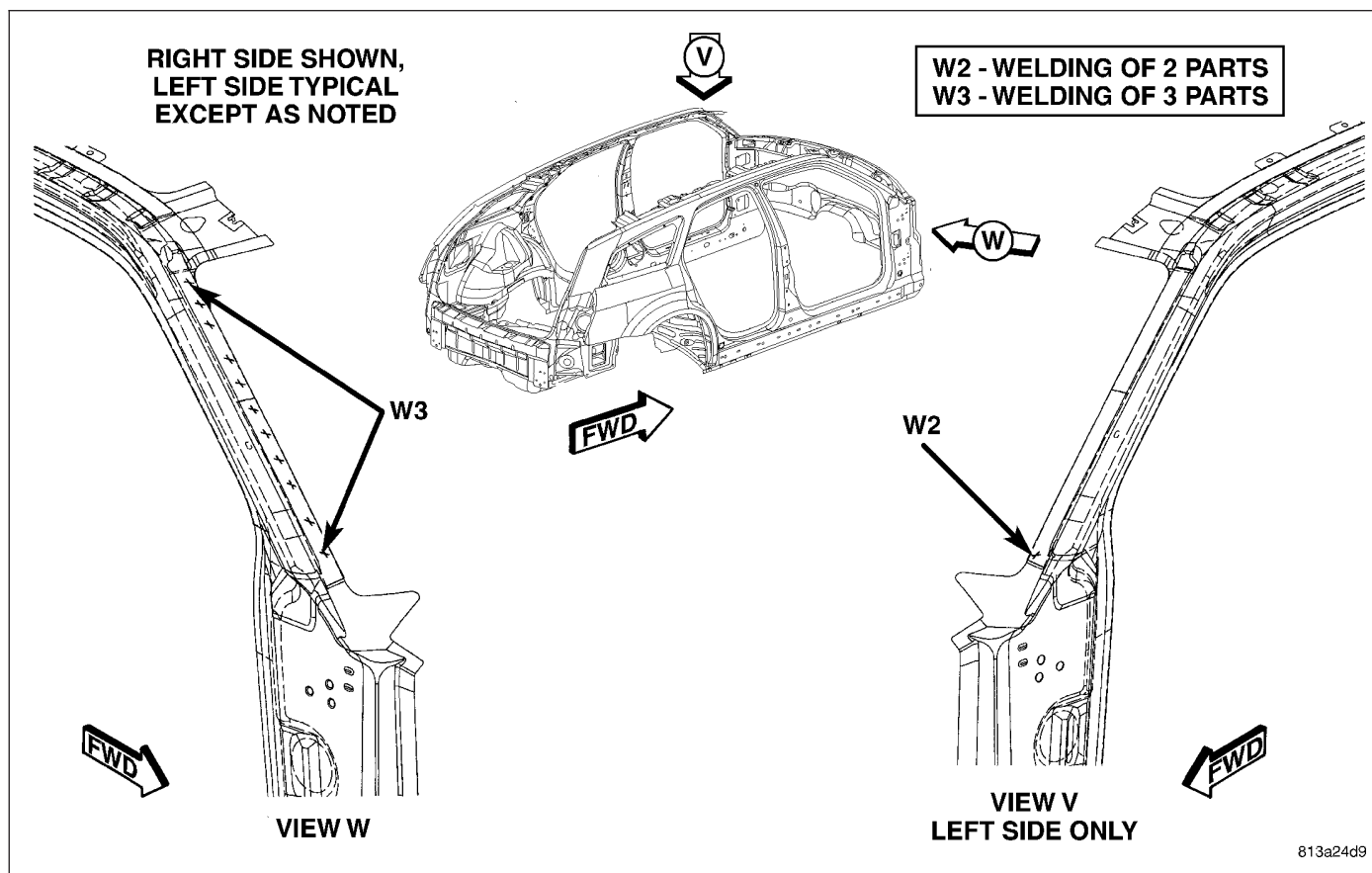


Fig. 112 FRAMED BODY IN WHITE (2 OF 12)

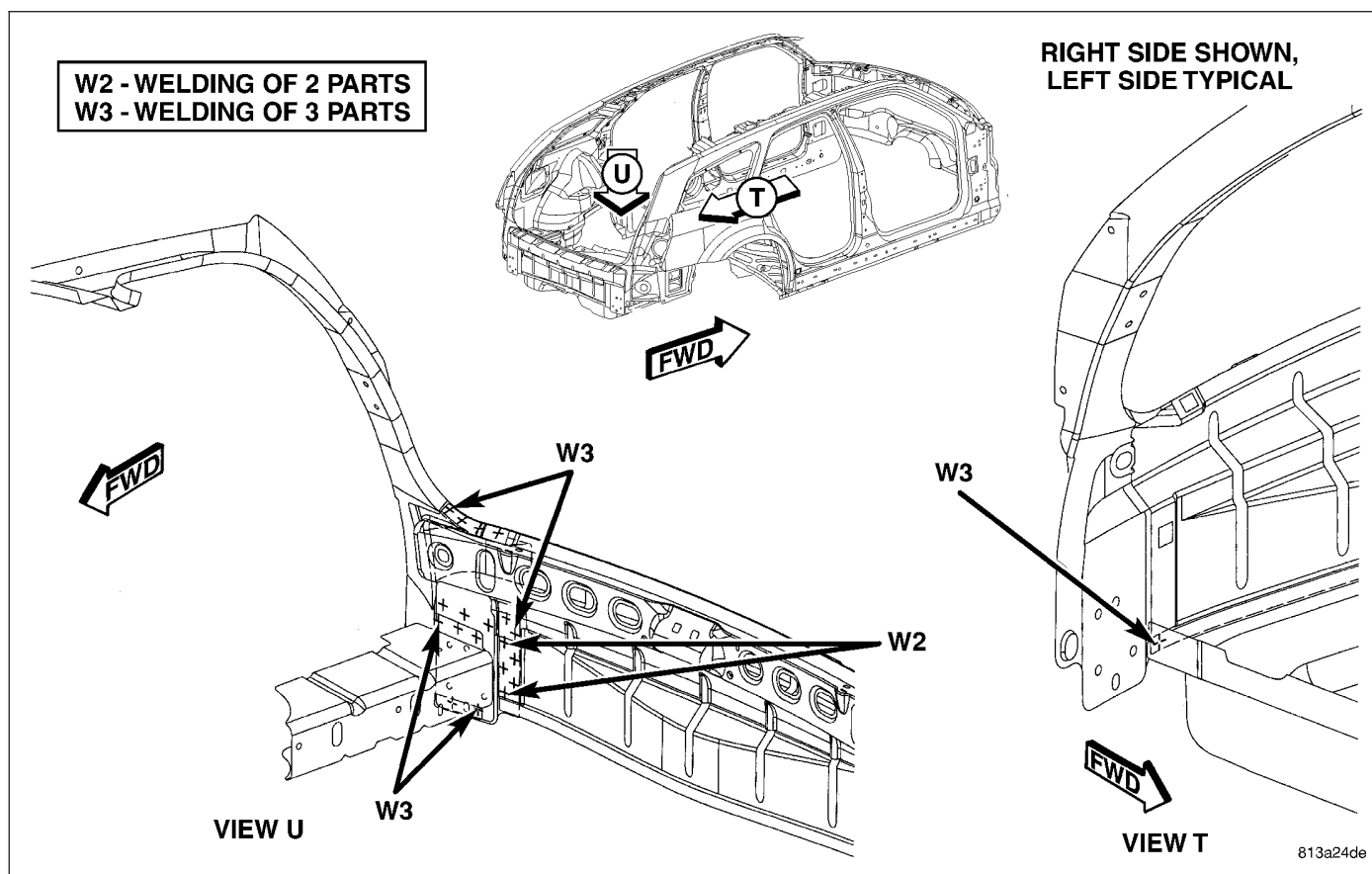


Fig. 113 FRAMED BODY IN WHITE (3 OF 12)

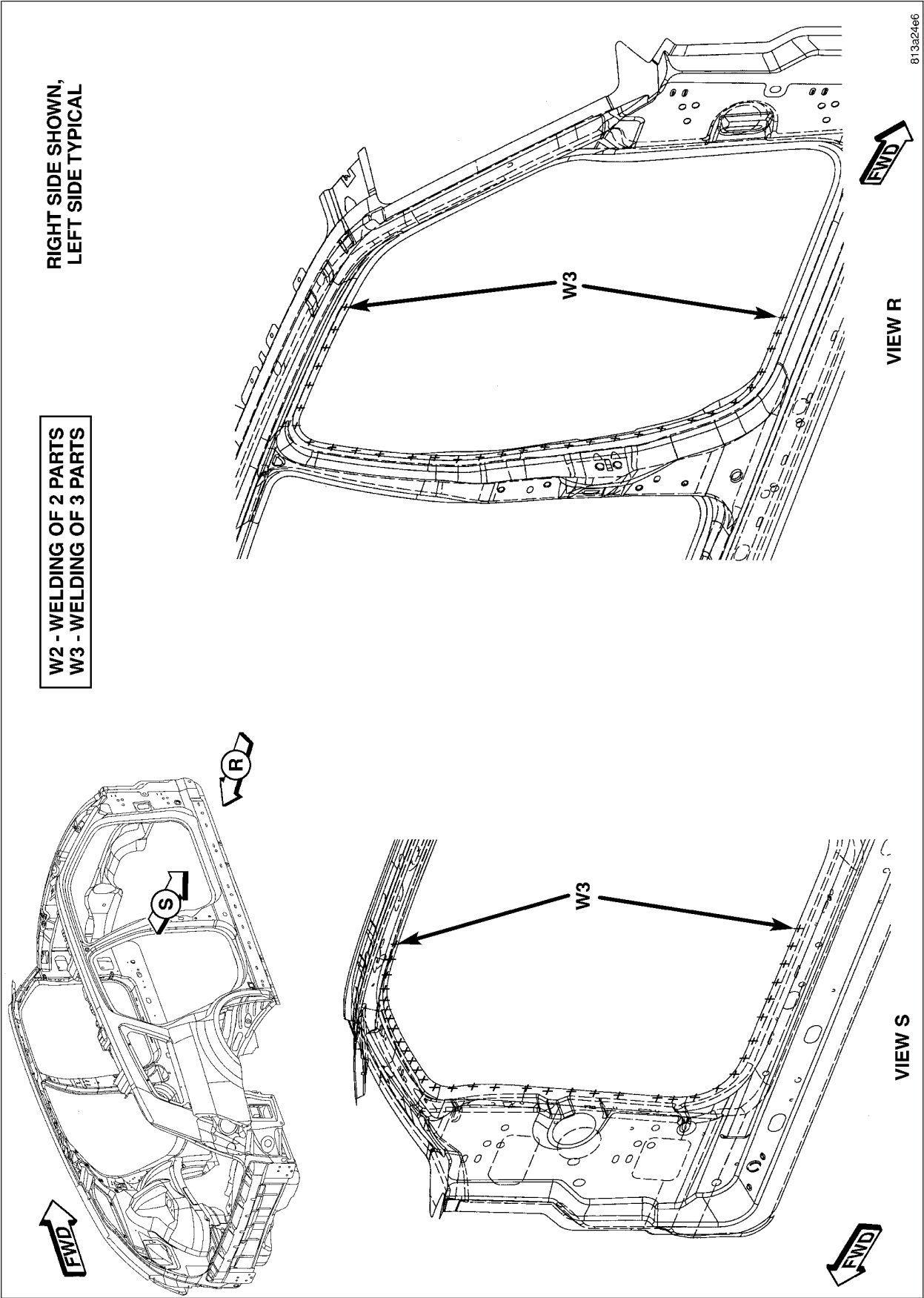


Fig. 114 FRAMED BODY IN WHITE (4 OF 12)



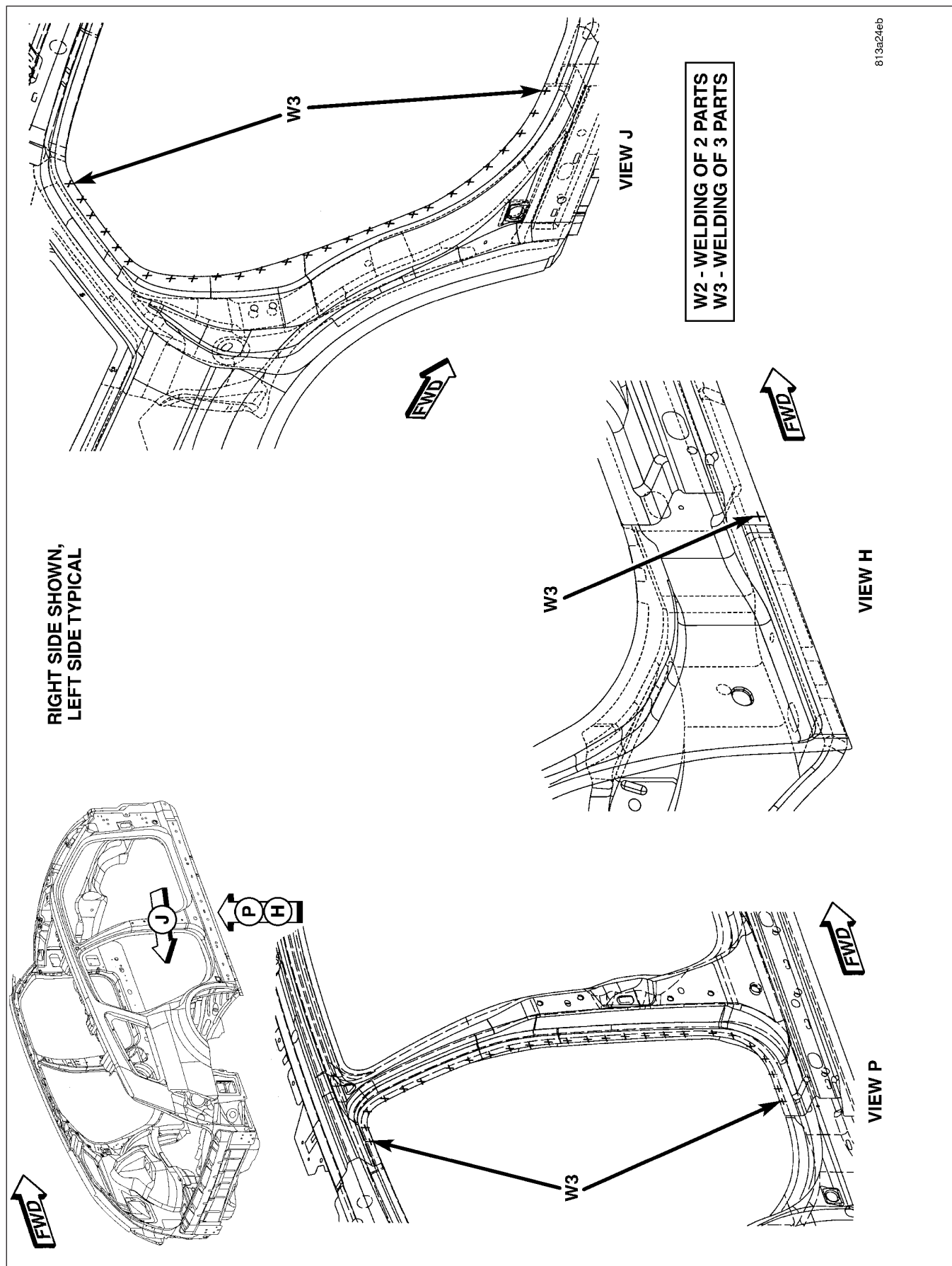


Fig. 115 FRAMED BODY IN WHITE (5 OF 12)



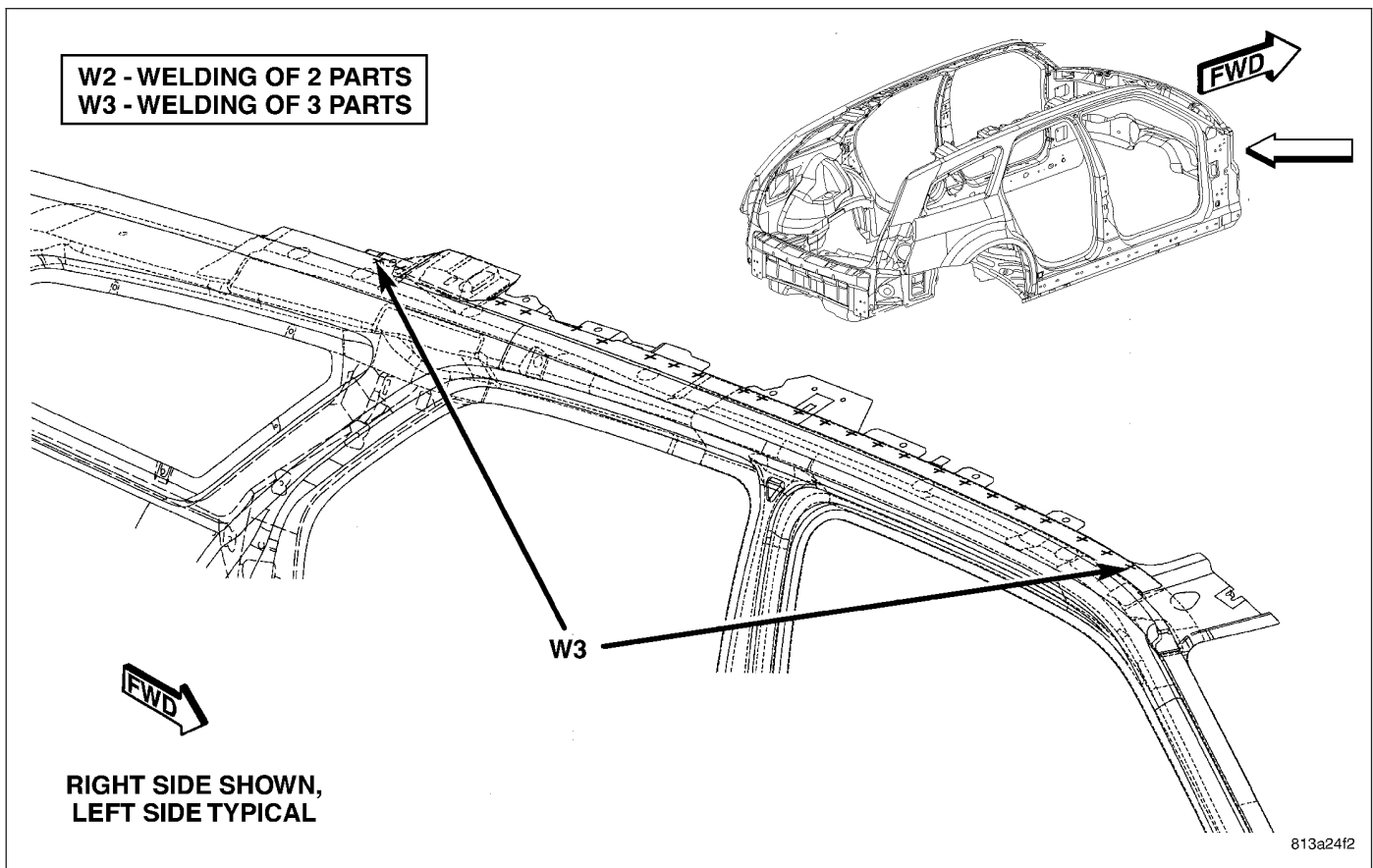


Fig. 116 FRAMED BODY IN WHITE (6 OF 12)

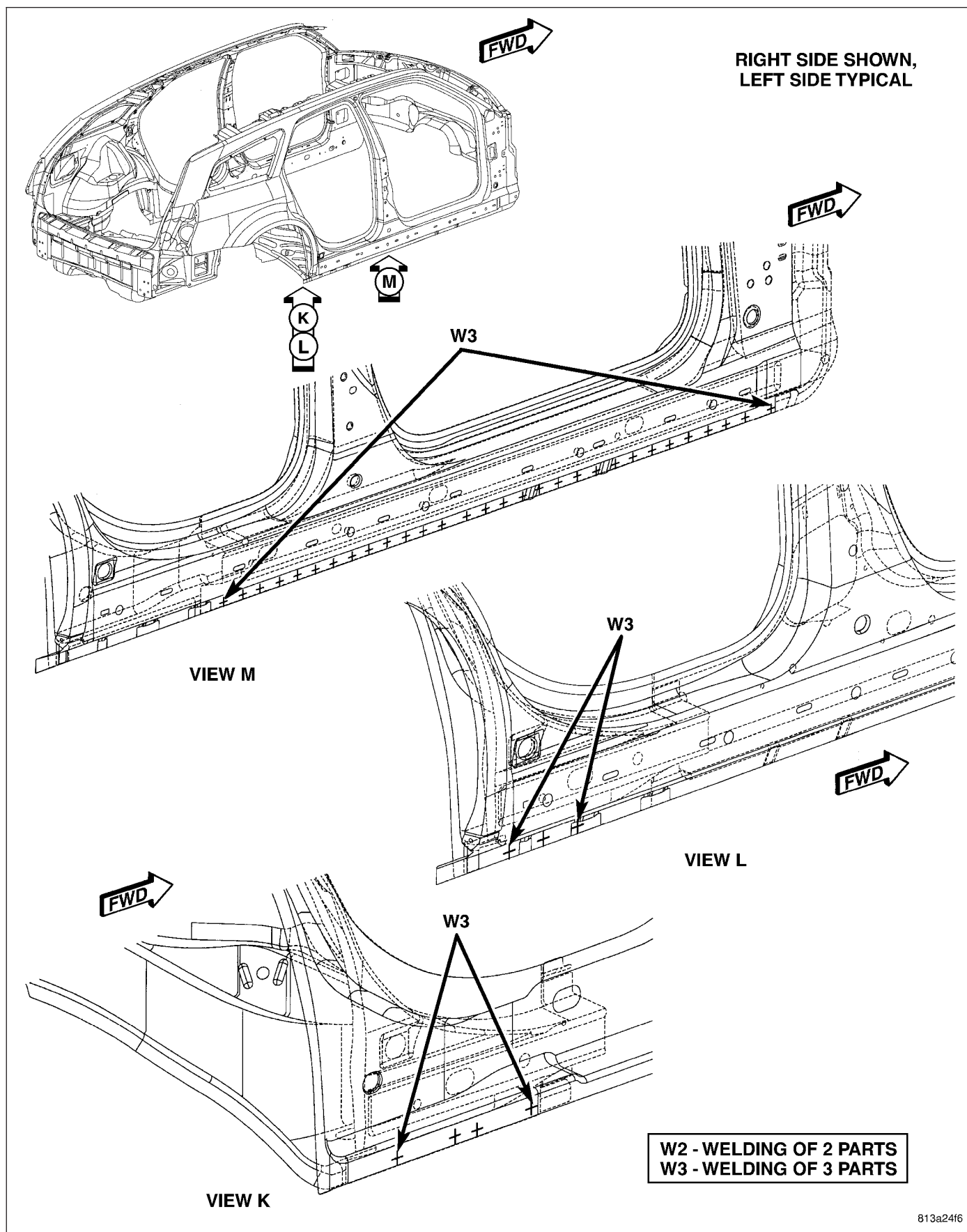
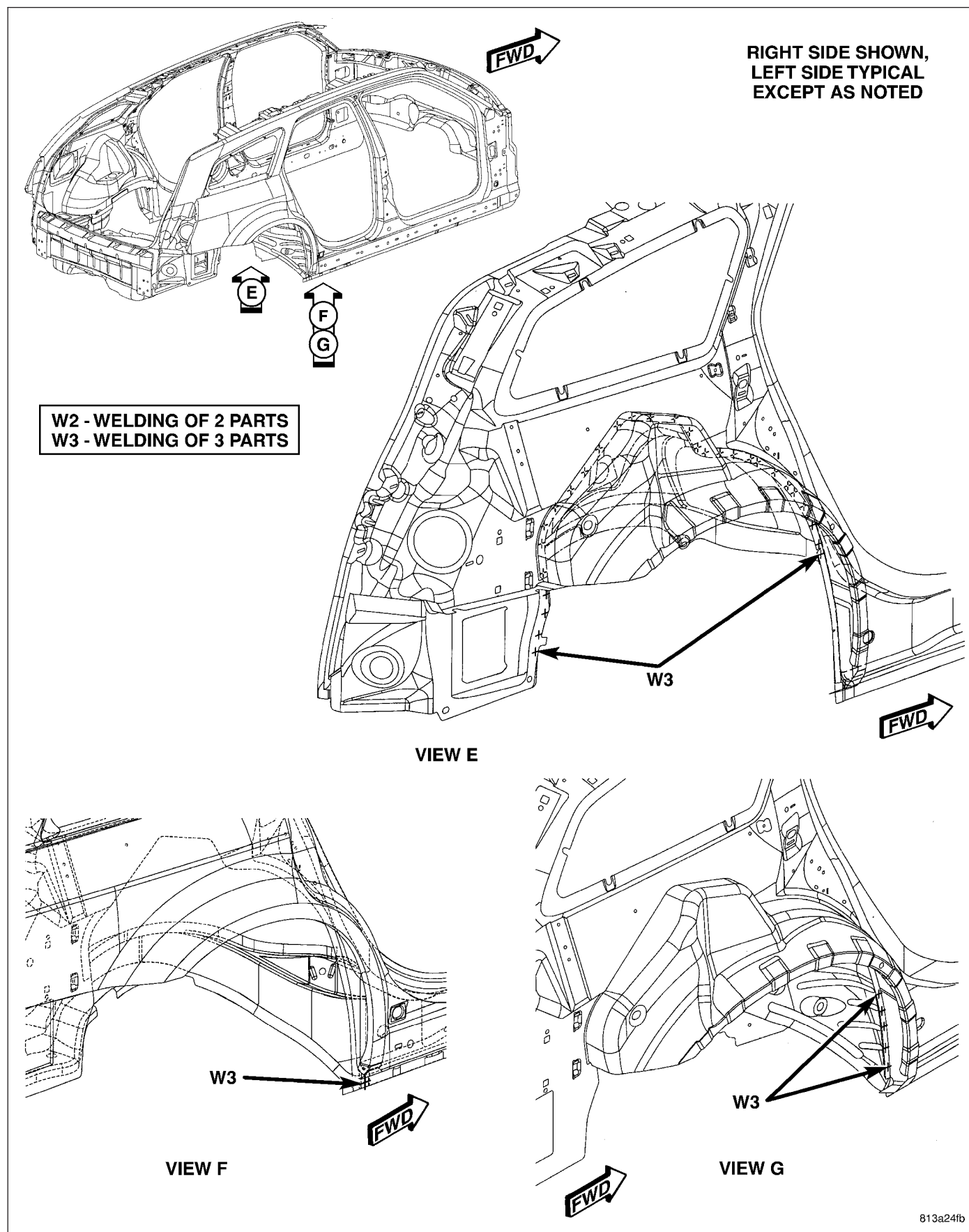


Fig. 117 FRAMED BODY IN WHITE (7 OF 12)



**Fig. 118 FRAMED BODY IN WHITE (8 OF 12)**

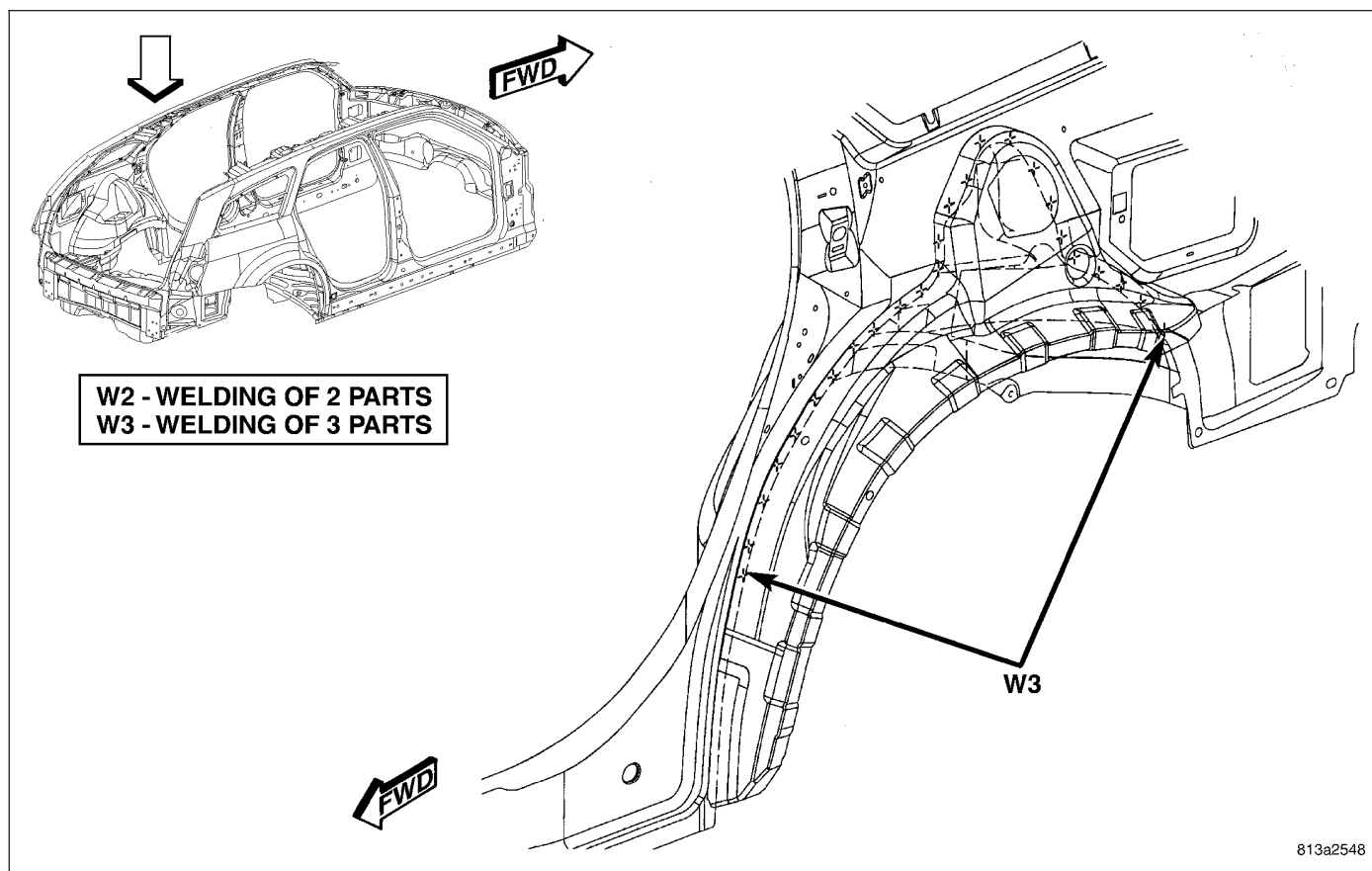


Fig. 119 FRAMED BODY IN WHITE (9 OF 12)

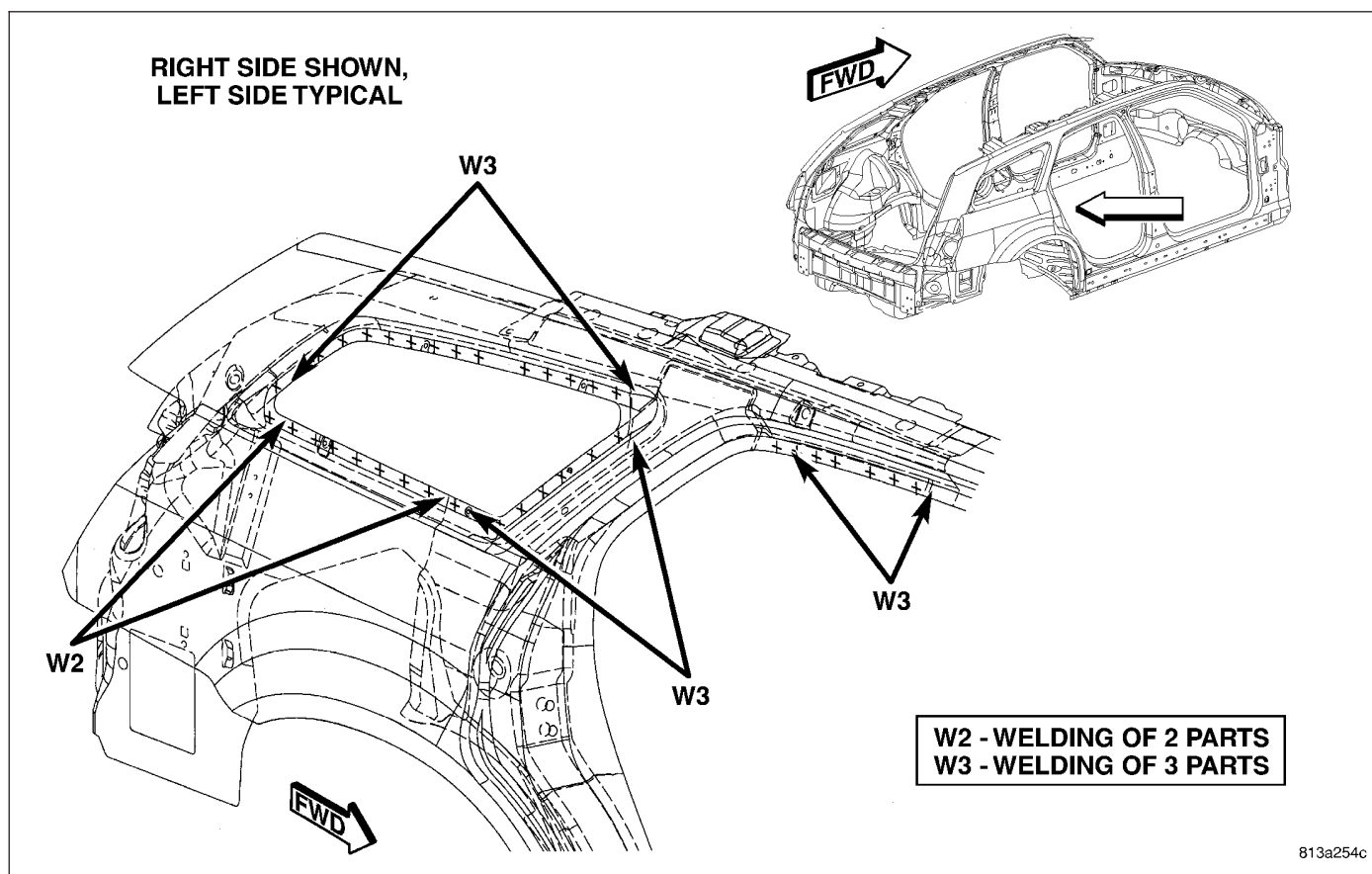


Fig. 120 FRAMED BODY IN WHITE (10 OF 12)

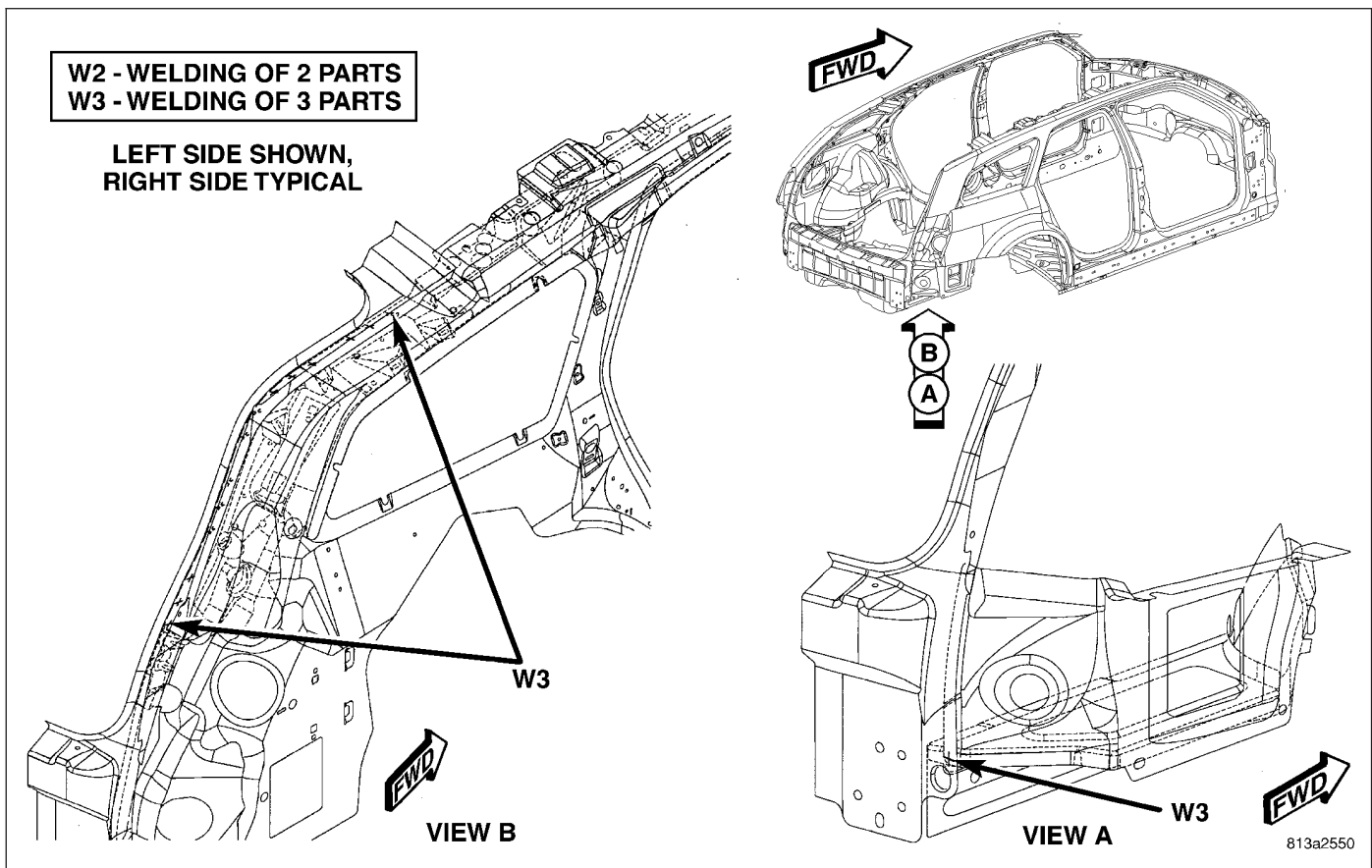


Fig. 121 FRAMED BODY IN WHITE (11 OF 12)

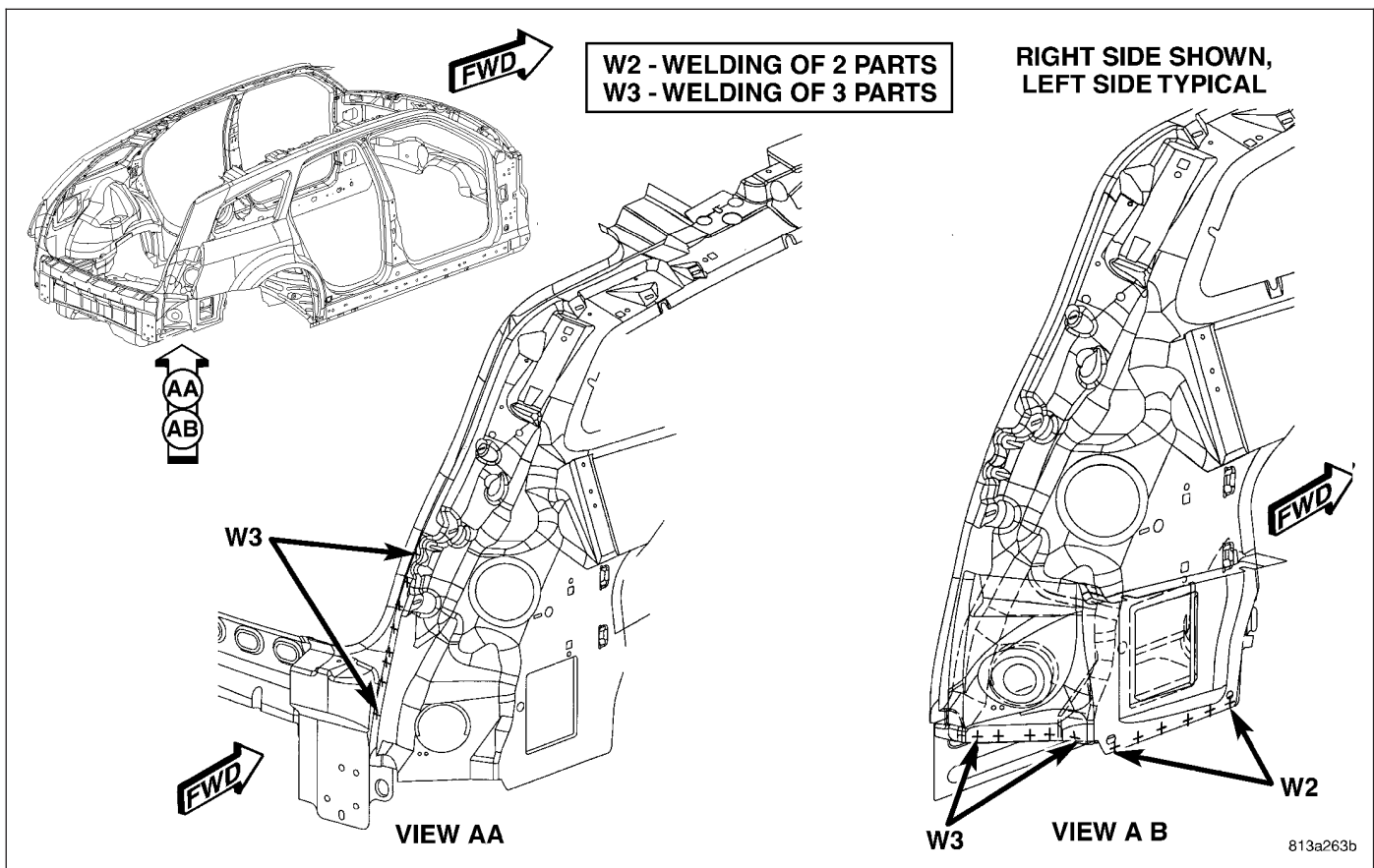
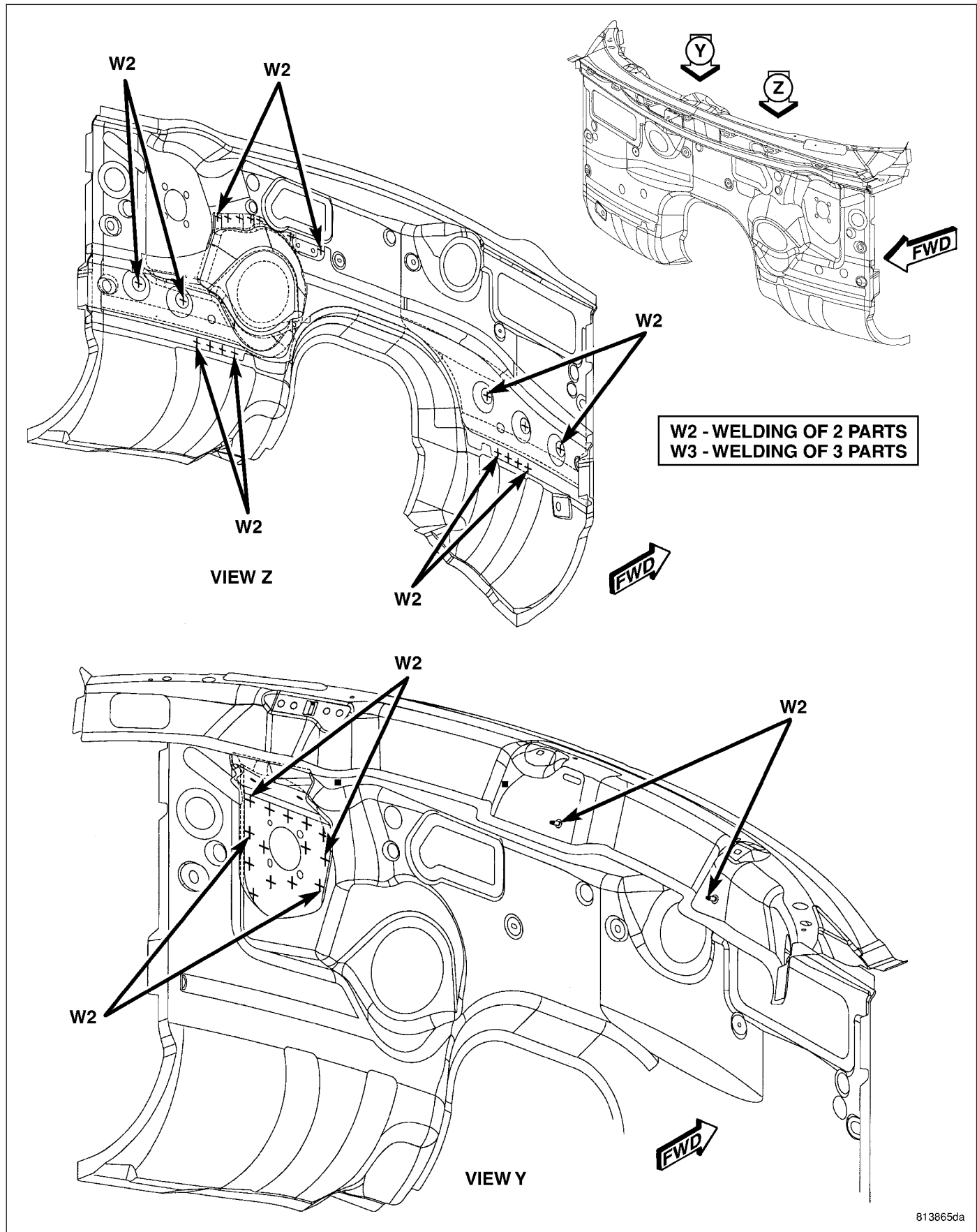


Fig. 122 FRAMED BODY IN WHITE (12 OF 12)



## Sedan & Wagon



**Fig. 123 DASH/COWL (1 OF 4)**

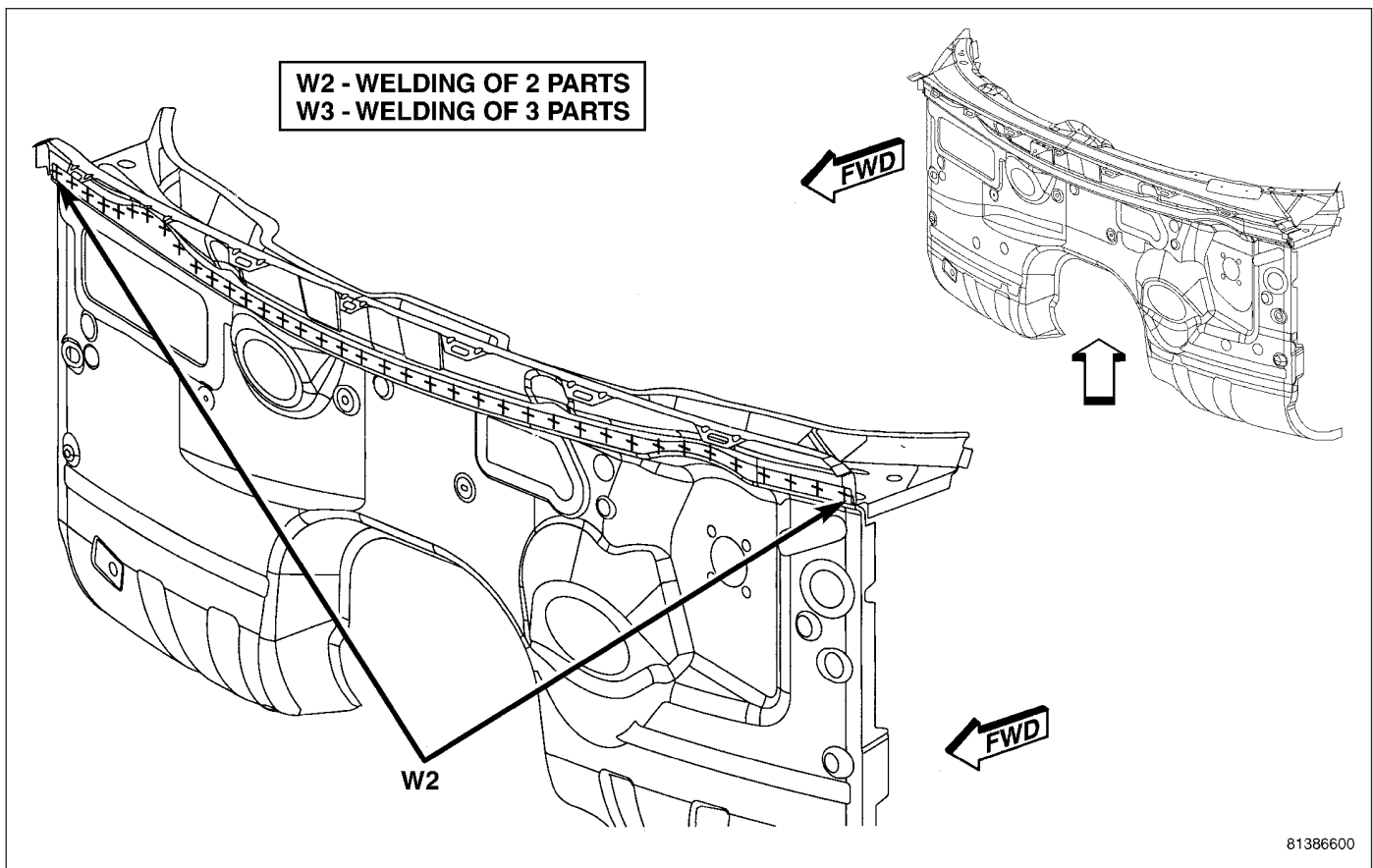


Fig. 124 DASH/COWL (2 OF 4)

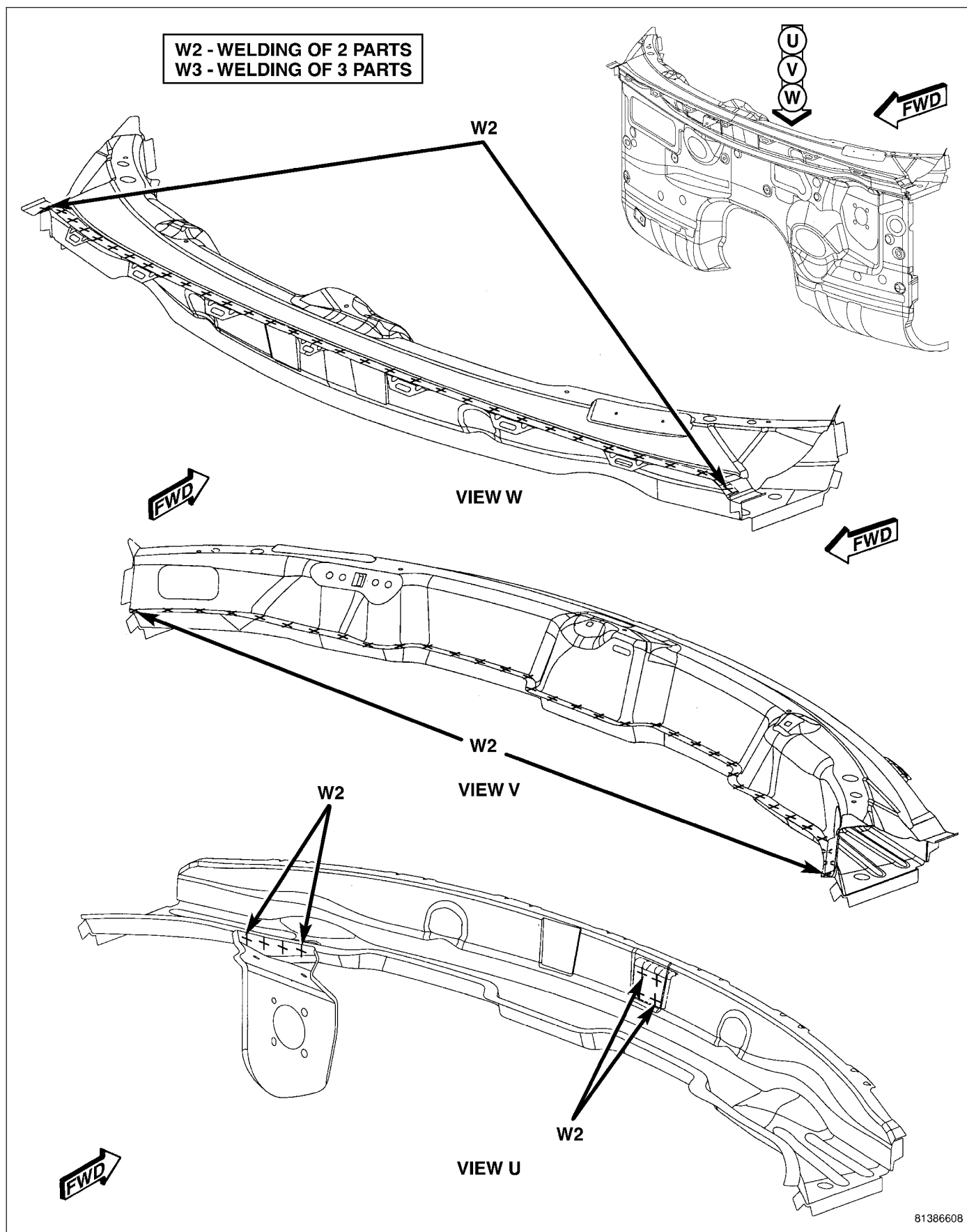


Fig. 125 DASH/COWL (3 OF 4)



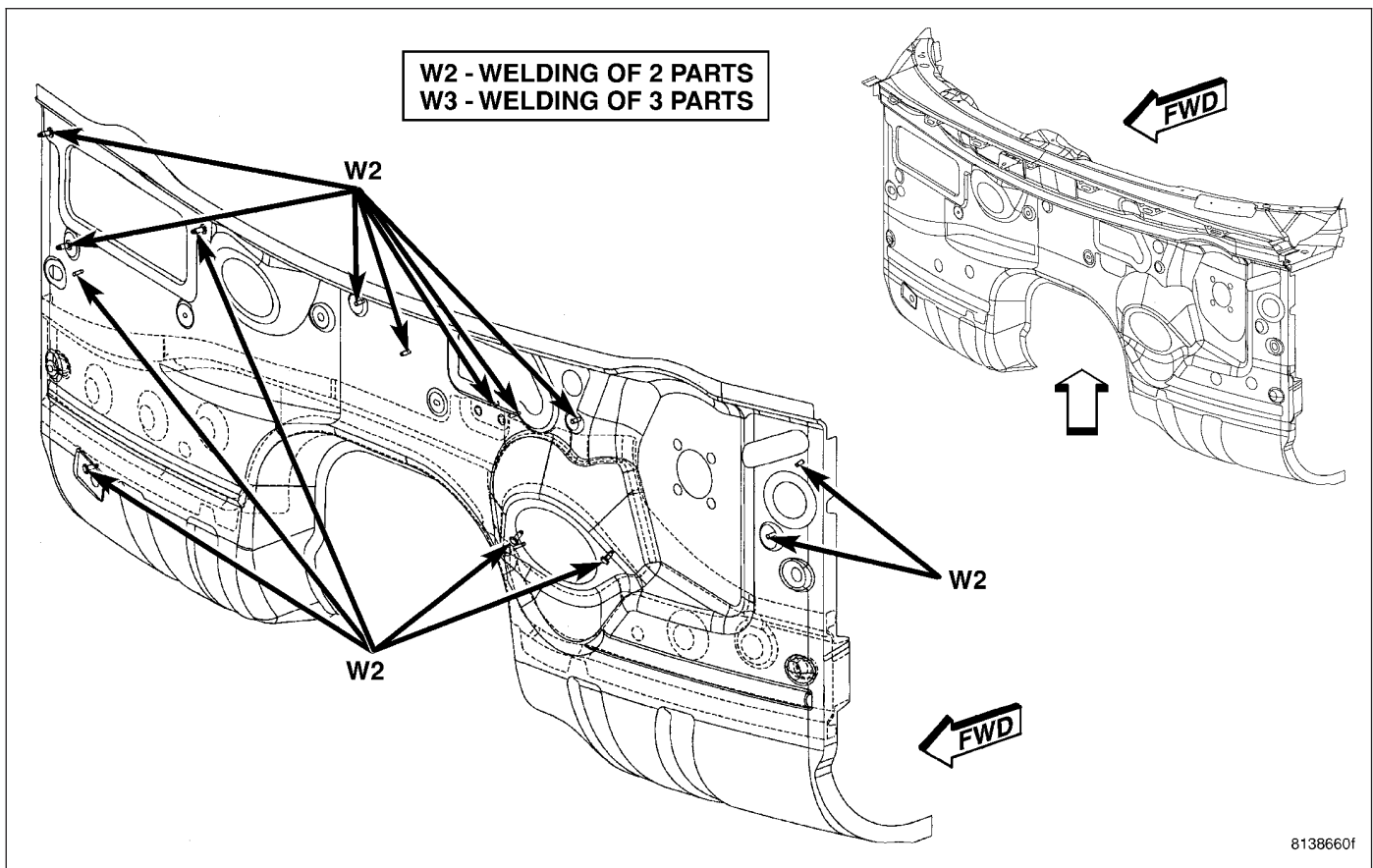


Fig. 126 DASH/COWL (4 OF 4)

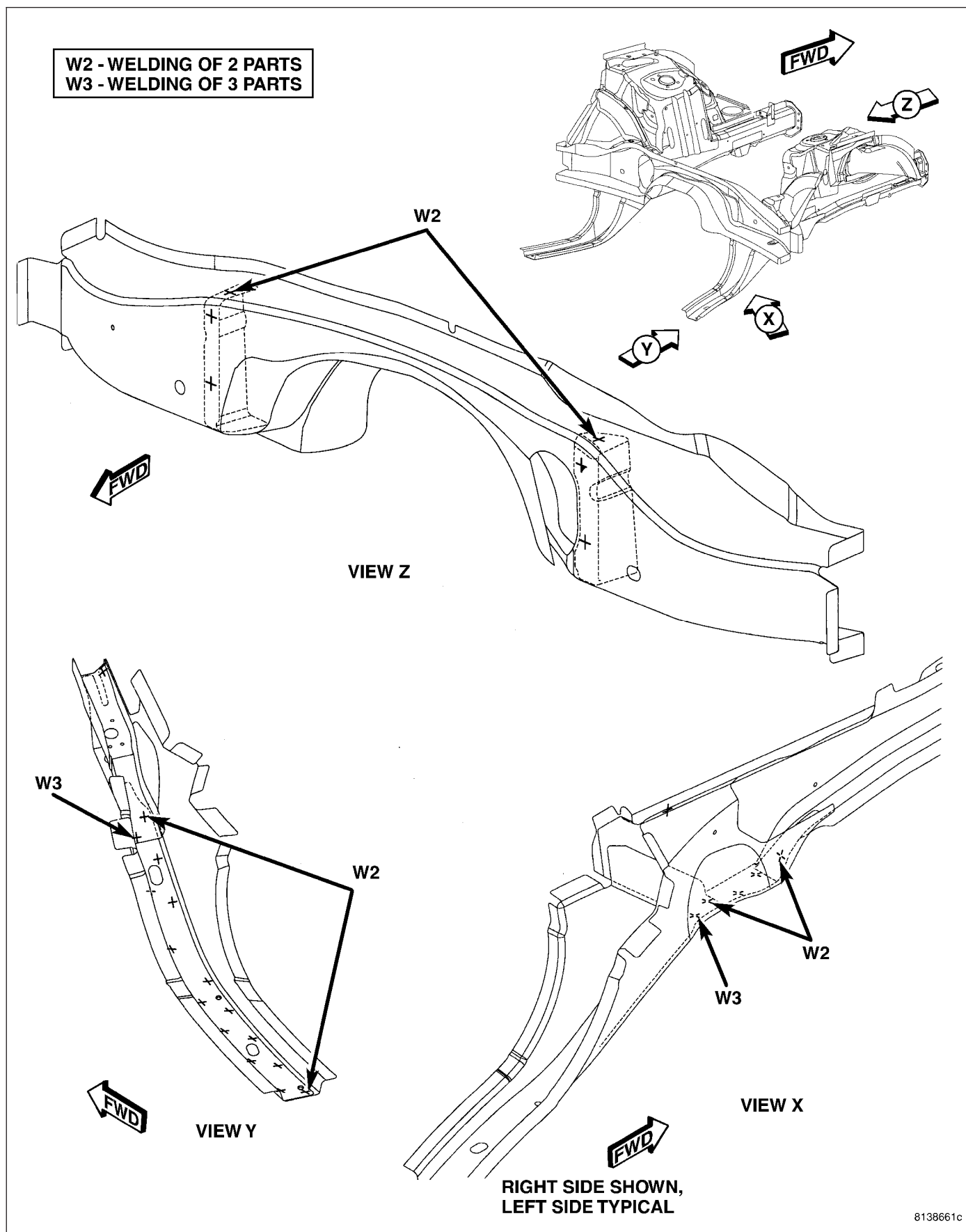


Fig. 127 FRONT LADDER (1 OF 7)

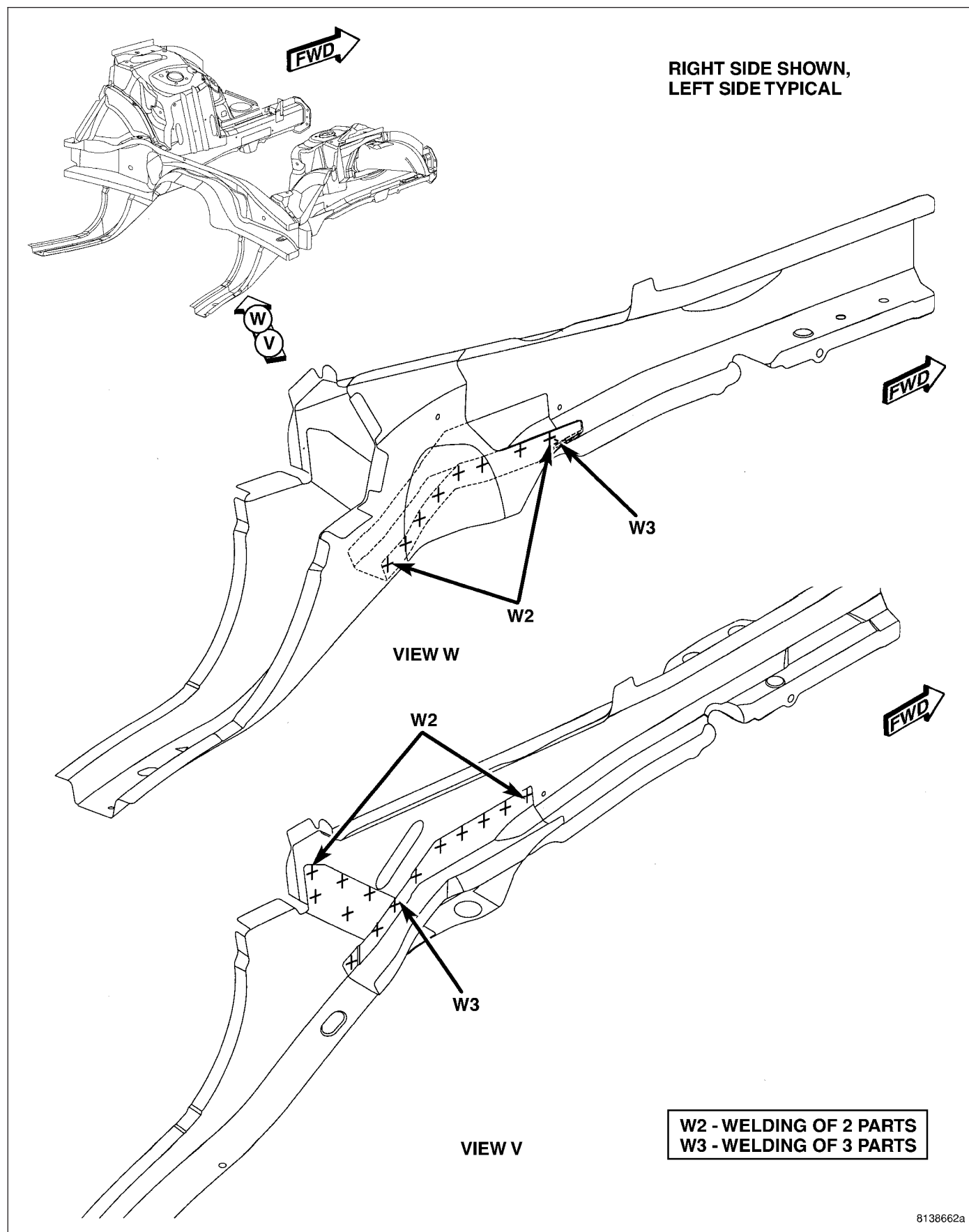


Fig. 128 FRONT LADDER (2 OF 7)



**Fig. 129 FRONT LADDER (3 OF 7)**

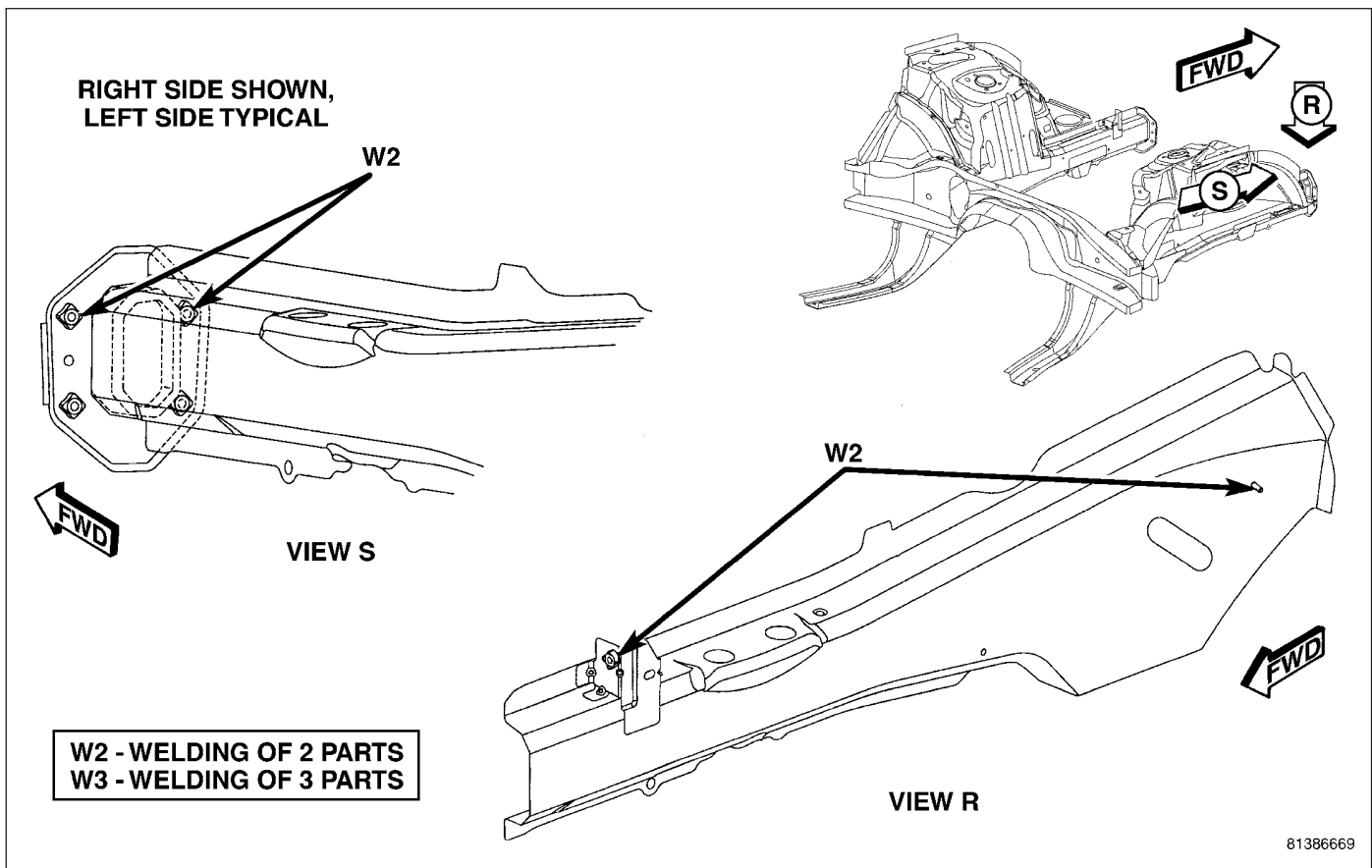


Fig. 130 FRONT LADDER (4 OF 7)

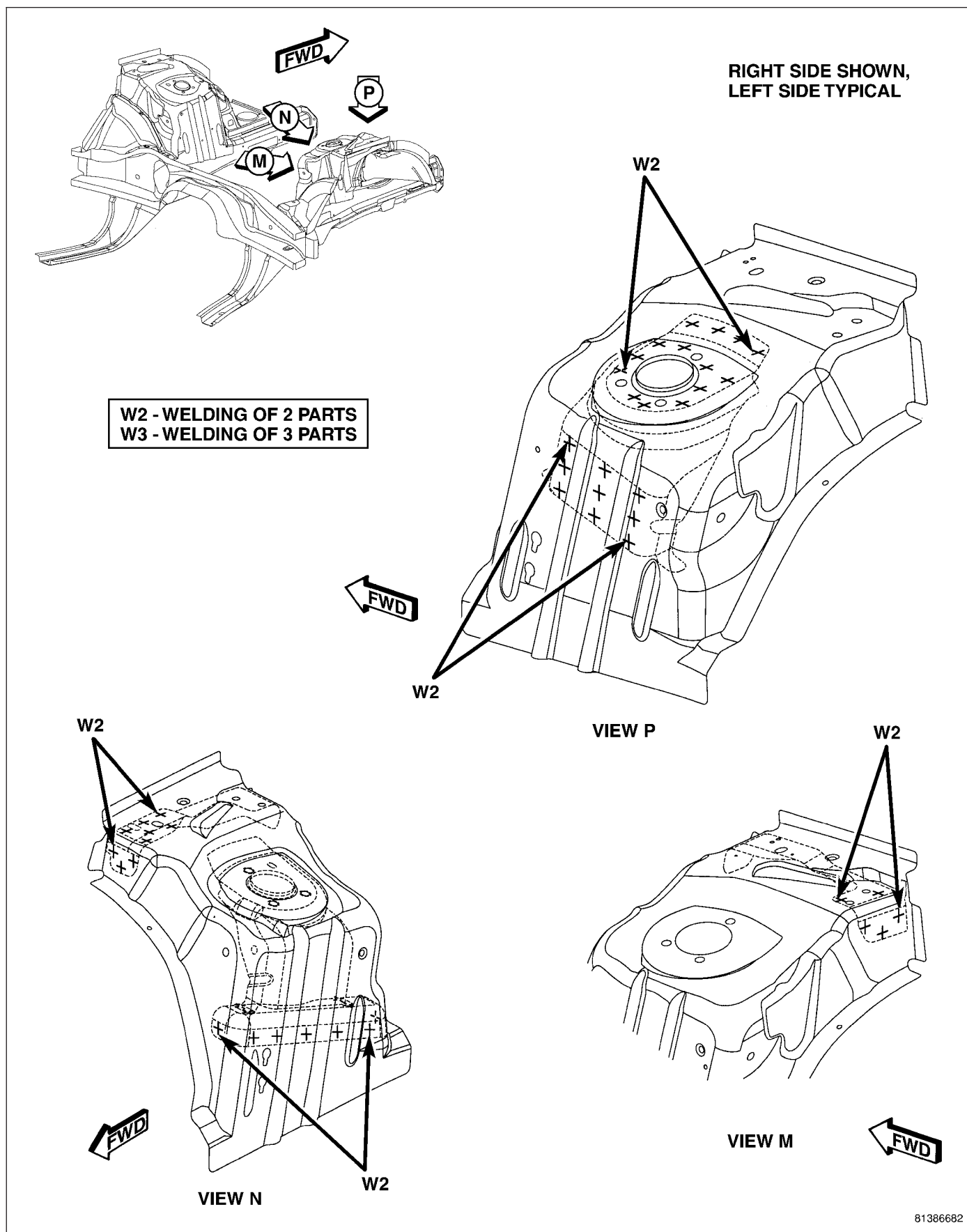


Fig. 131 FRONT LADDER (5 OF 7)

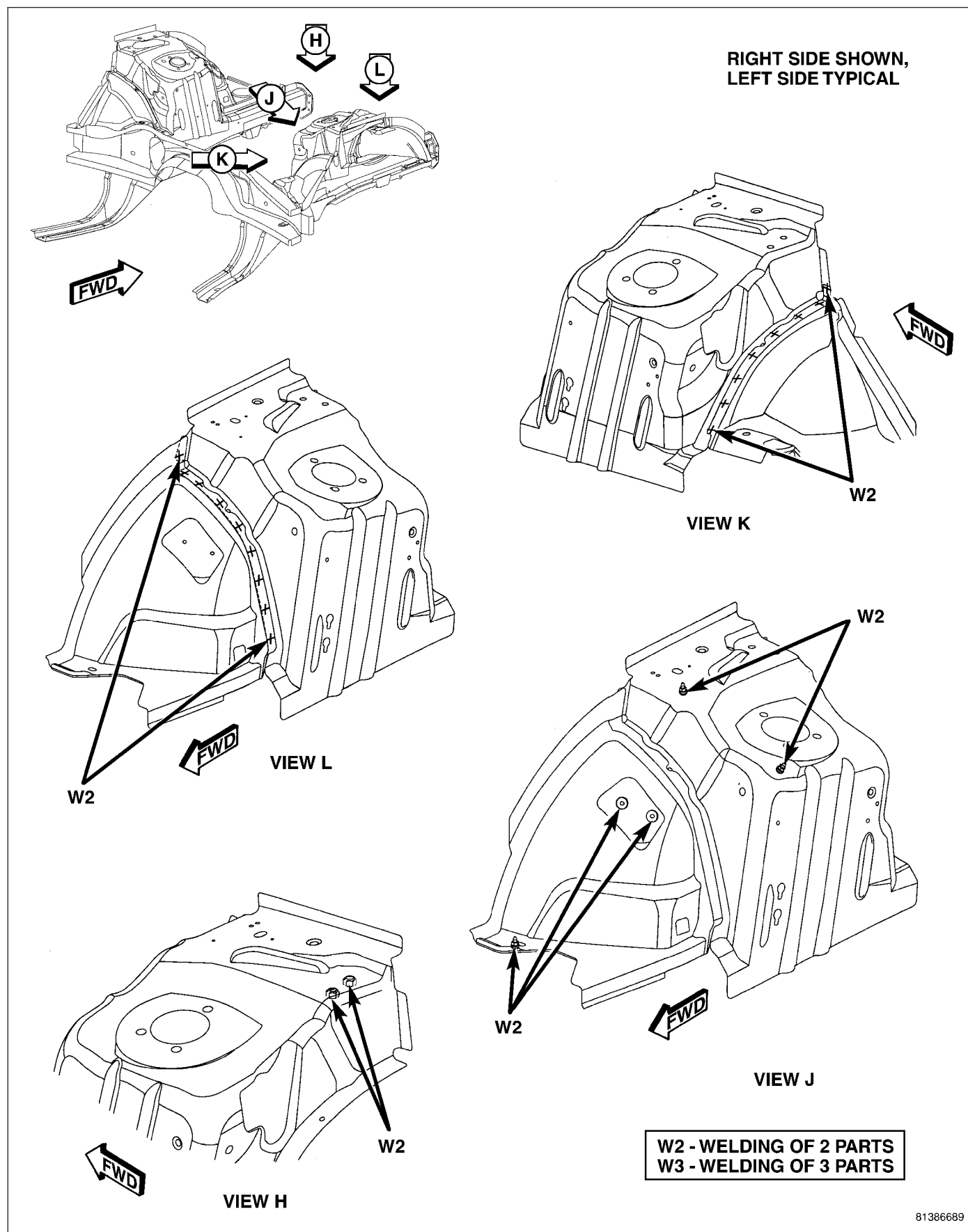
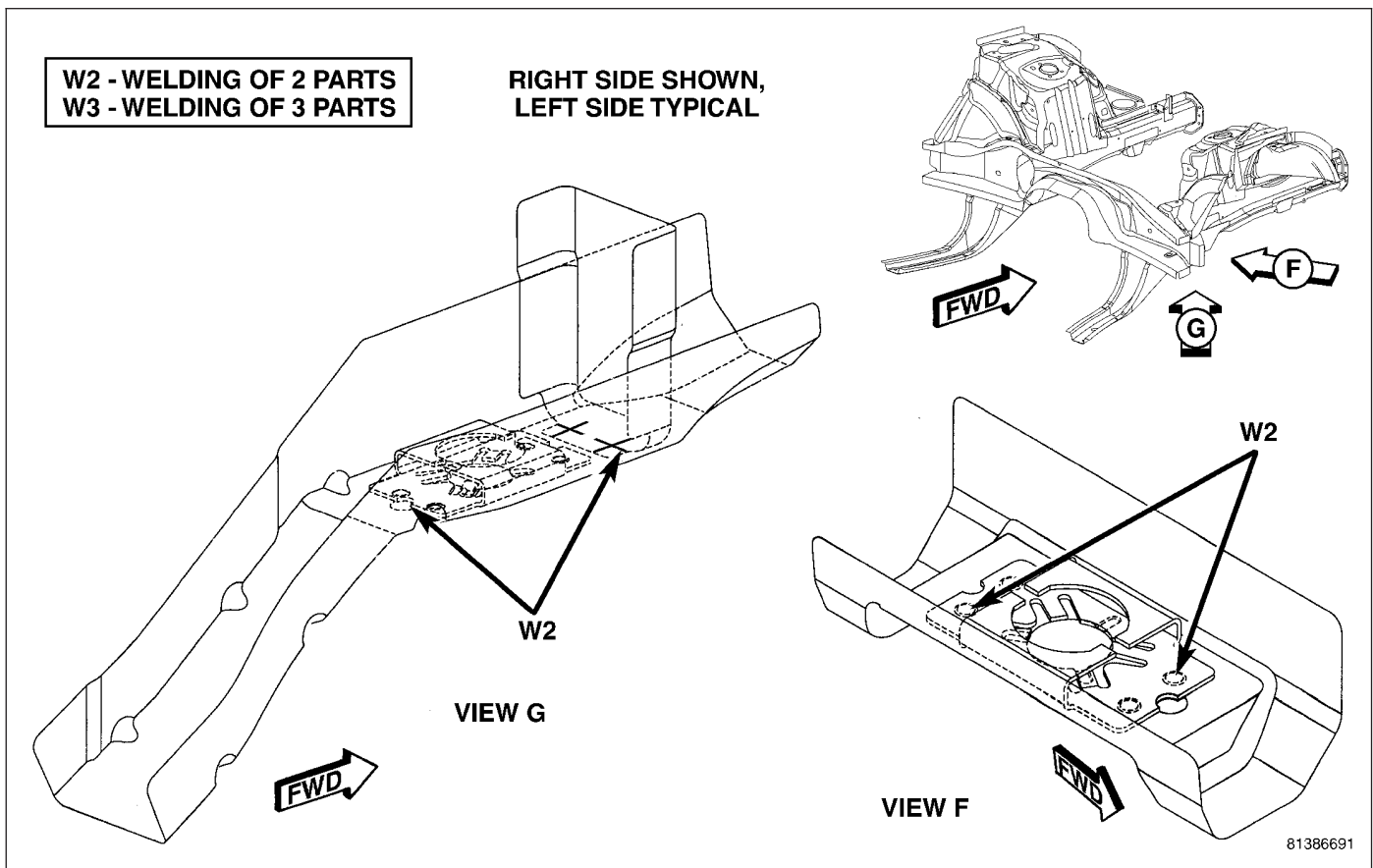


Fig. 132 FRONT LADDER (6 OF 7)



**Fig. 133 FRONT LADDER (7 OF 7)**



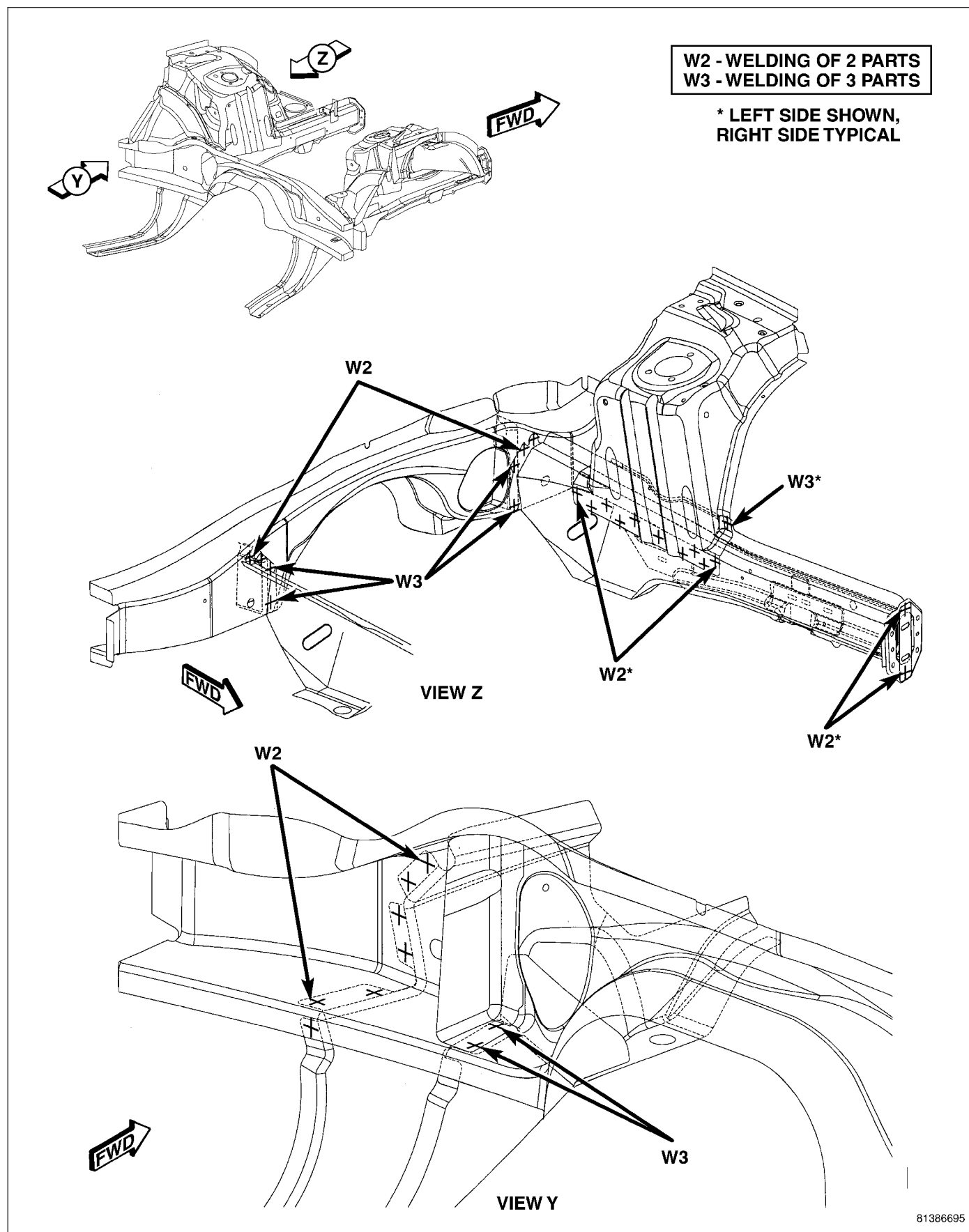
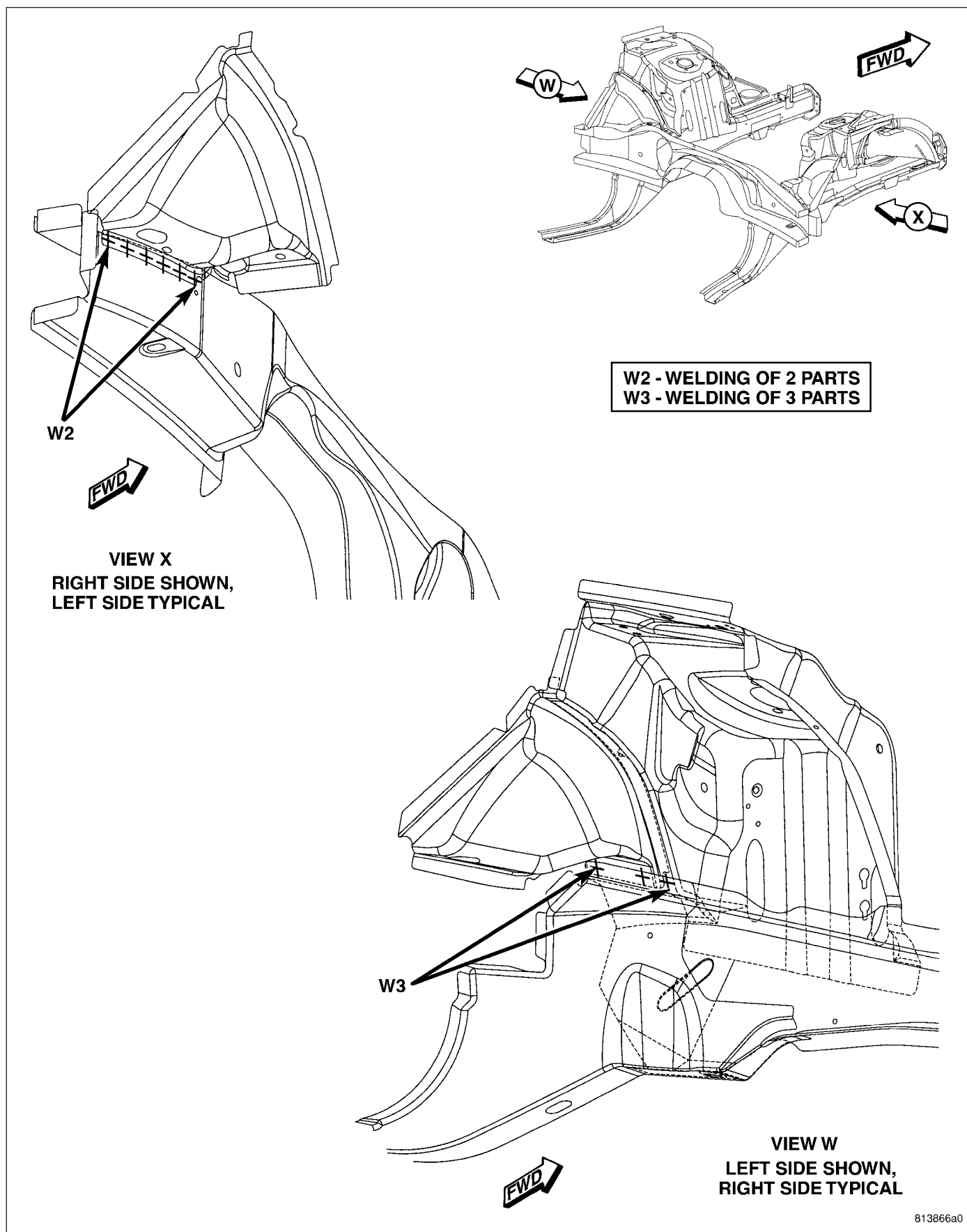


Fig. 134 FRONT LADDER, RAILS AND WHEELHOUSE (1 OF 3)



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Fig. 135 FRONT LADDER, RAILS AND WHEELHOUSE (2 OF 3)



**Fig. 136 FRONT LADDER, RAILS AND WHEELHOUSE (3 OF 3)**

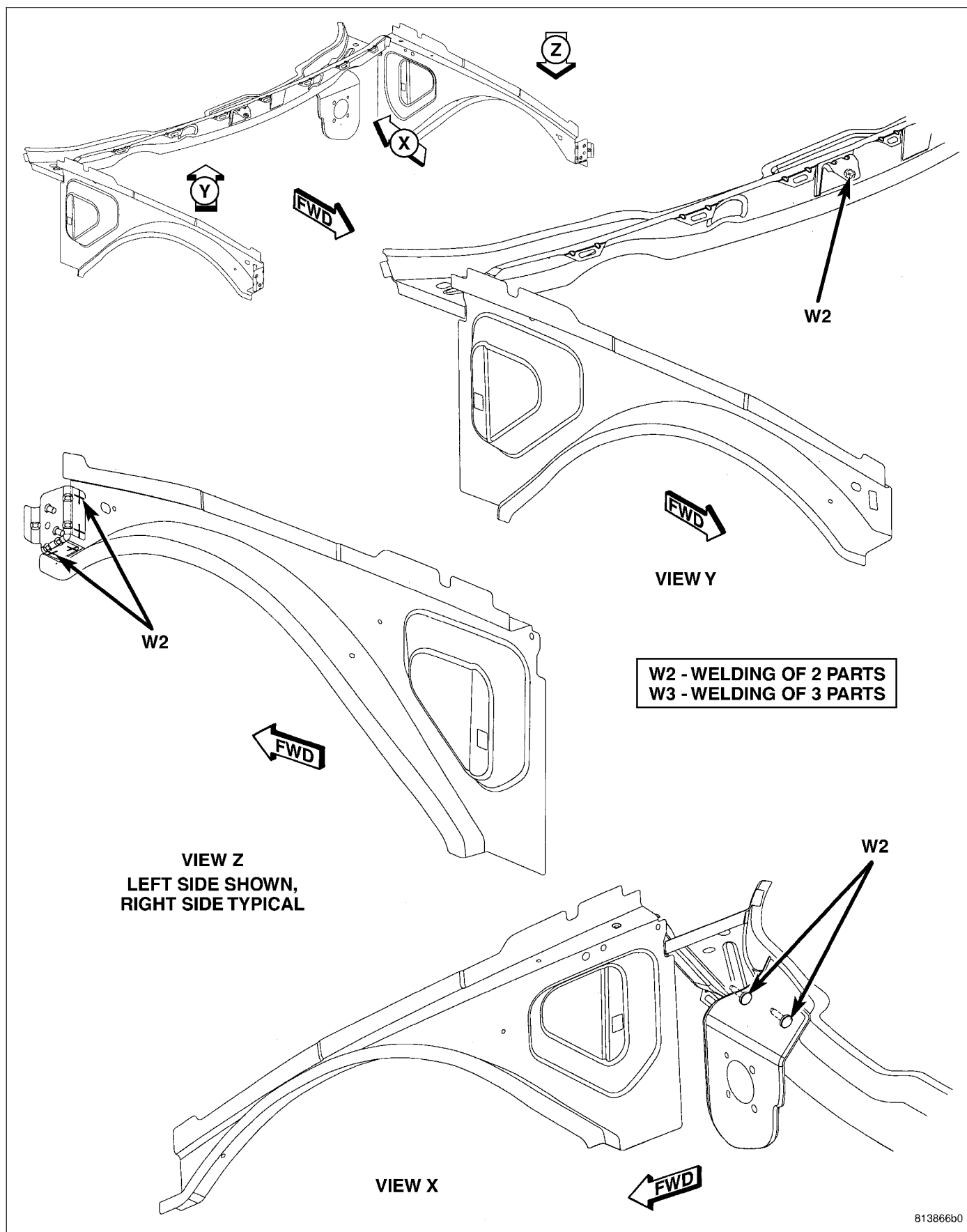


Fig. 137 ENGINE BOX (1 OF 6)

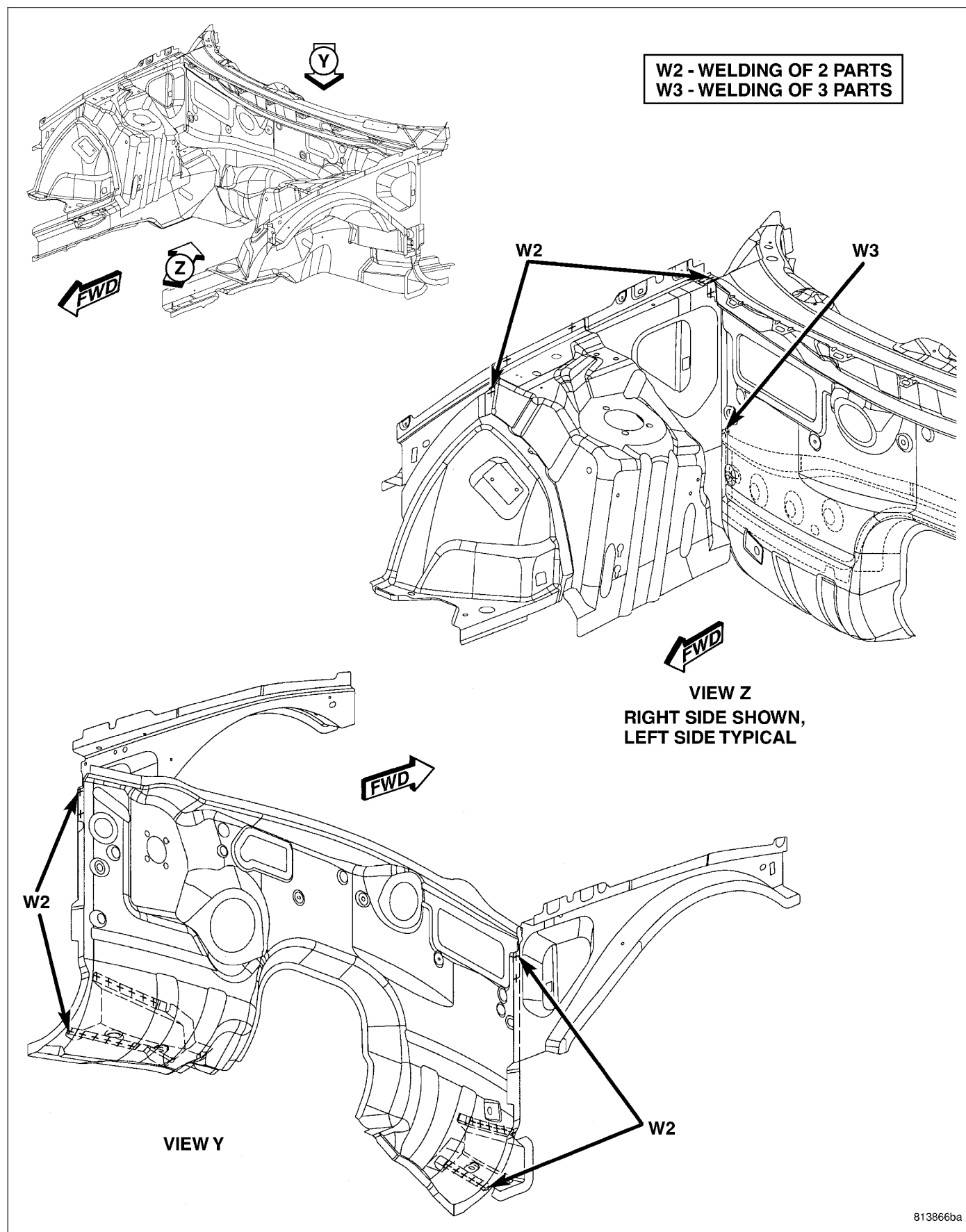
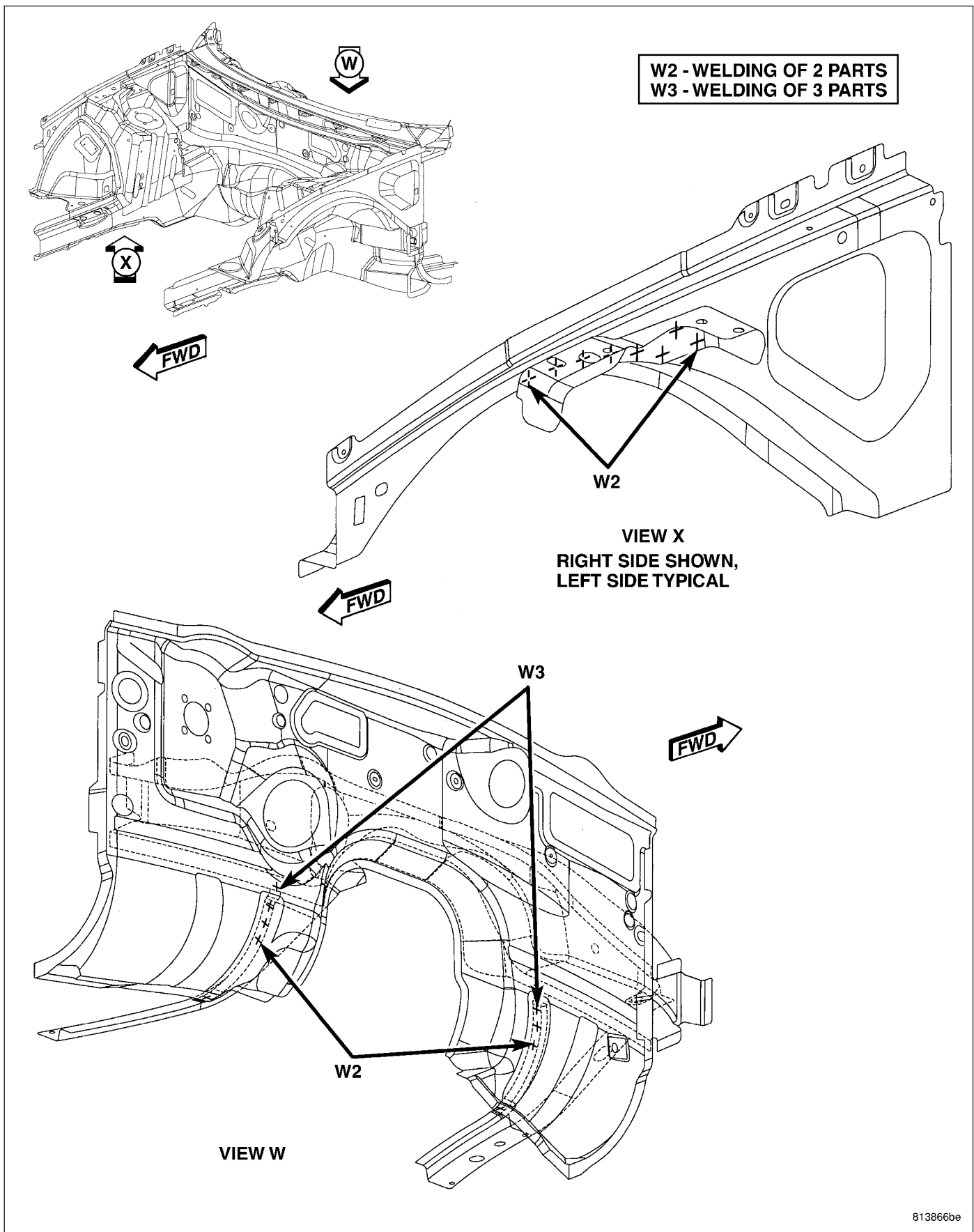


Fig. 138 ENGINE BOX (2 OF 6)



813866be

Fig. 139 ENGINE BOX (3 OF 6)



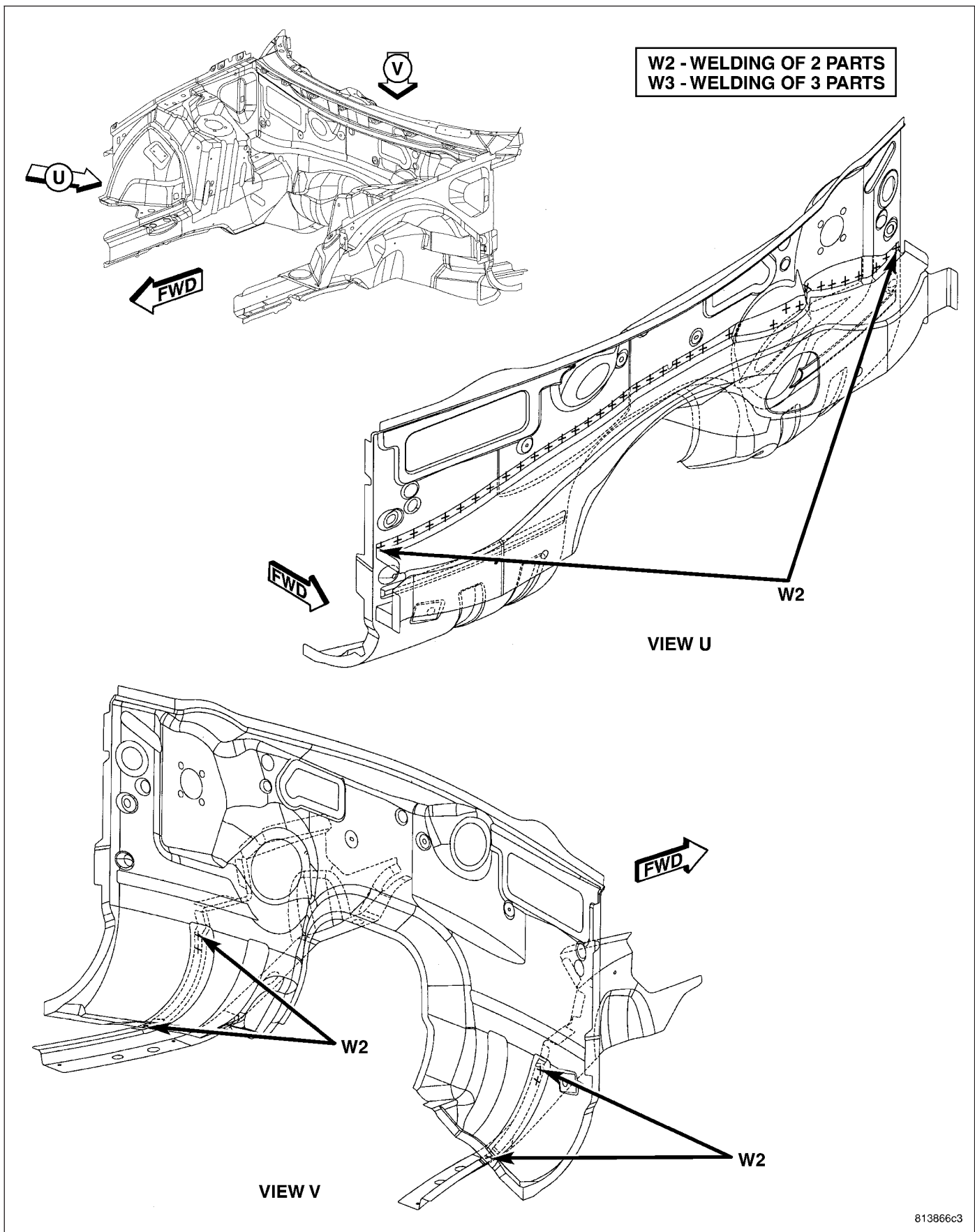


Fig. 140 ENGINE BOX (4 OF 6)

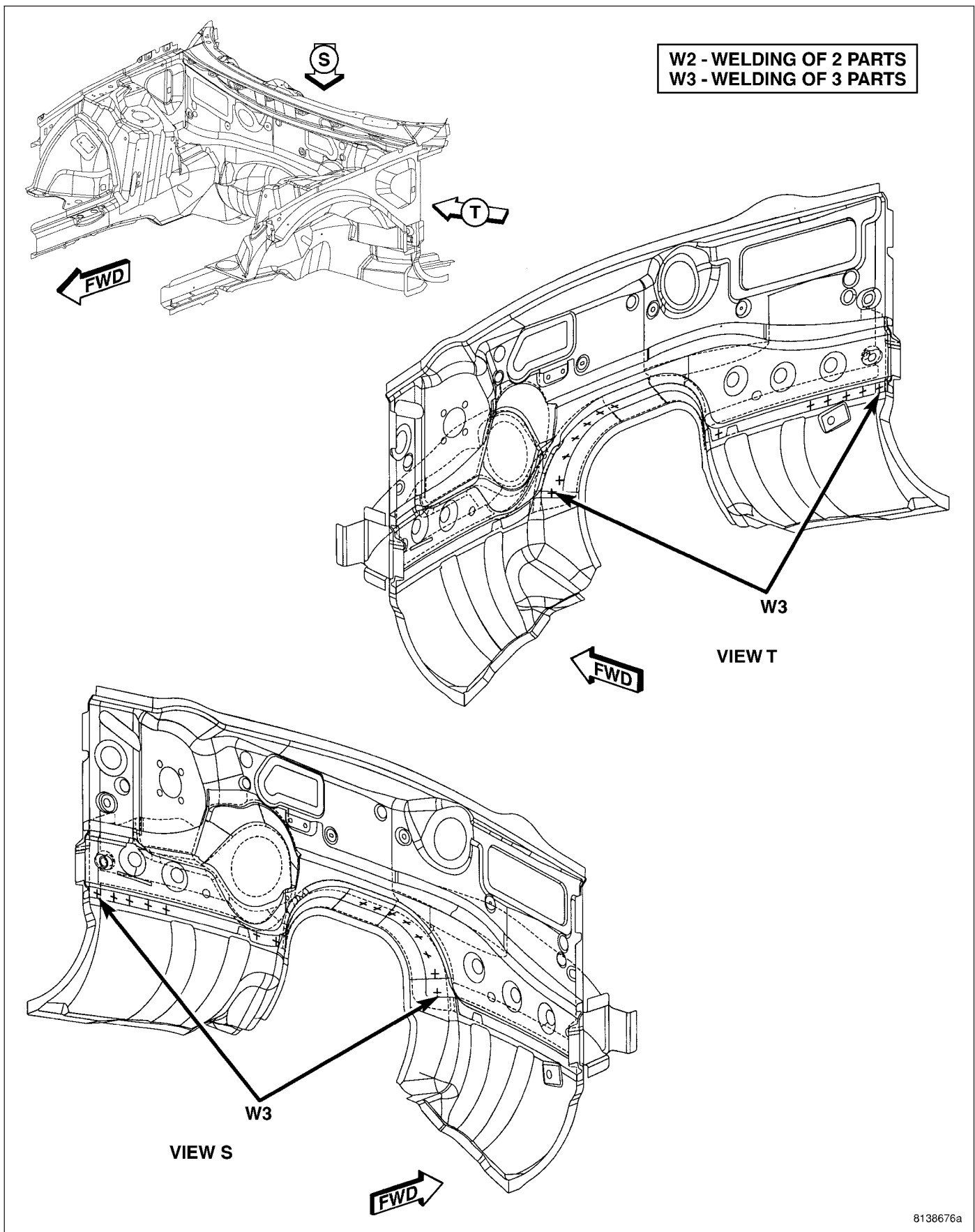


Fig. 141 ENGINE BOX (5 OF 6)



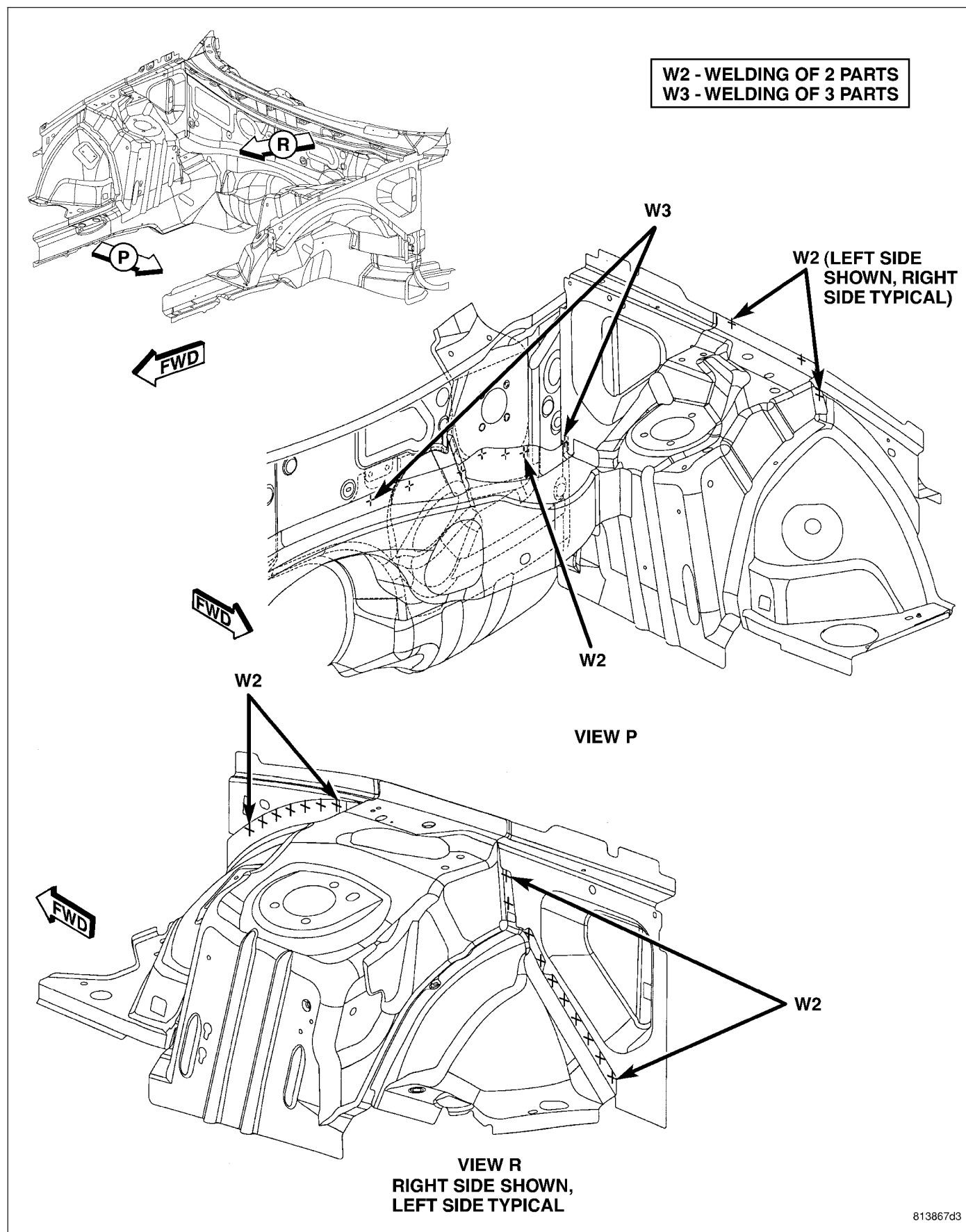
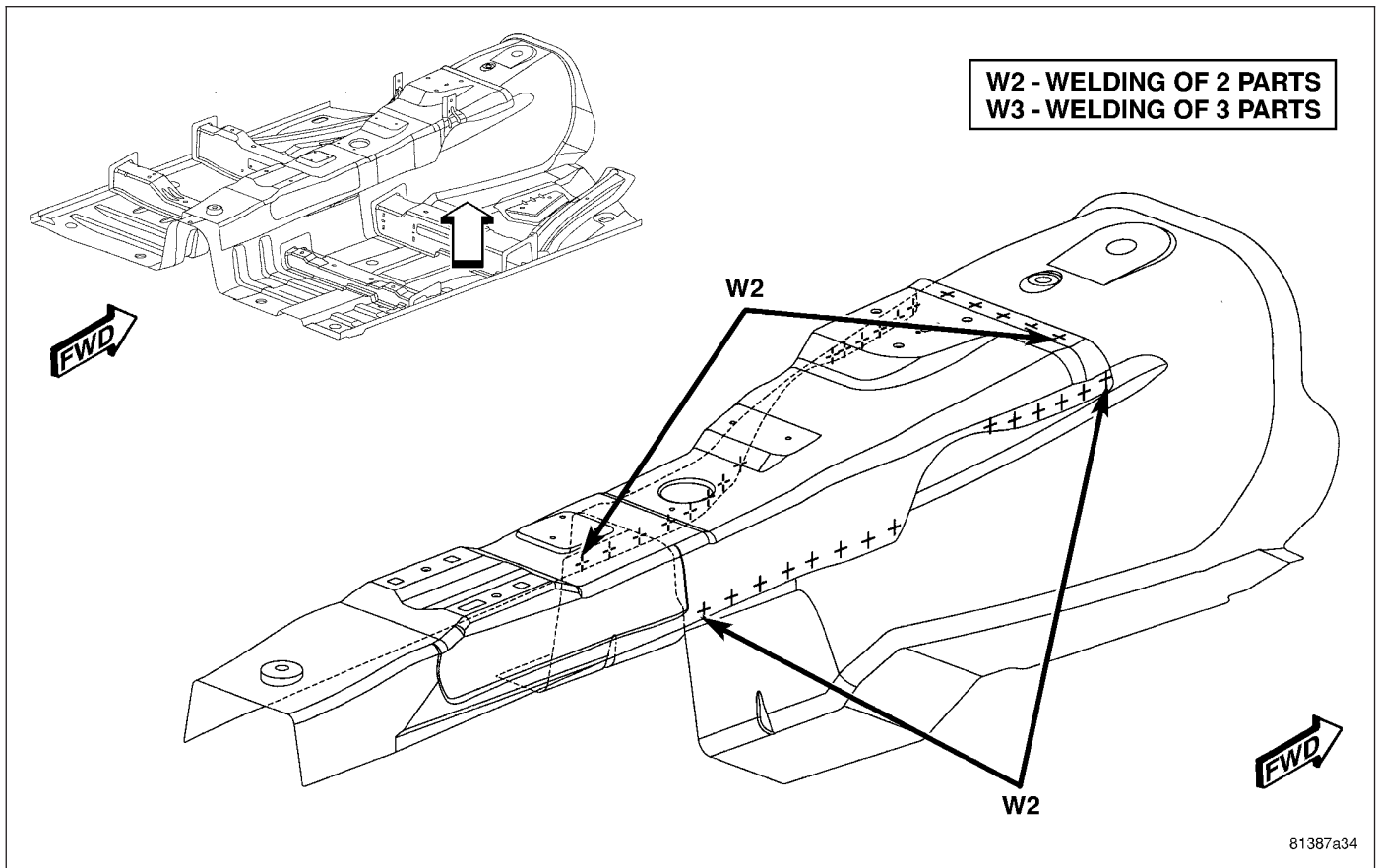


Fig. 142 ENGINE BOX (6 OF 6)



**Fig. 143 FRONT FLOOR PAN (1 OF 12)**

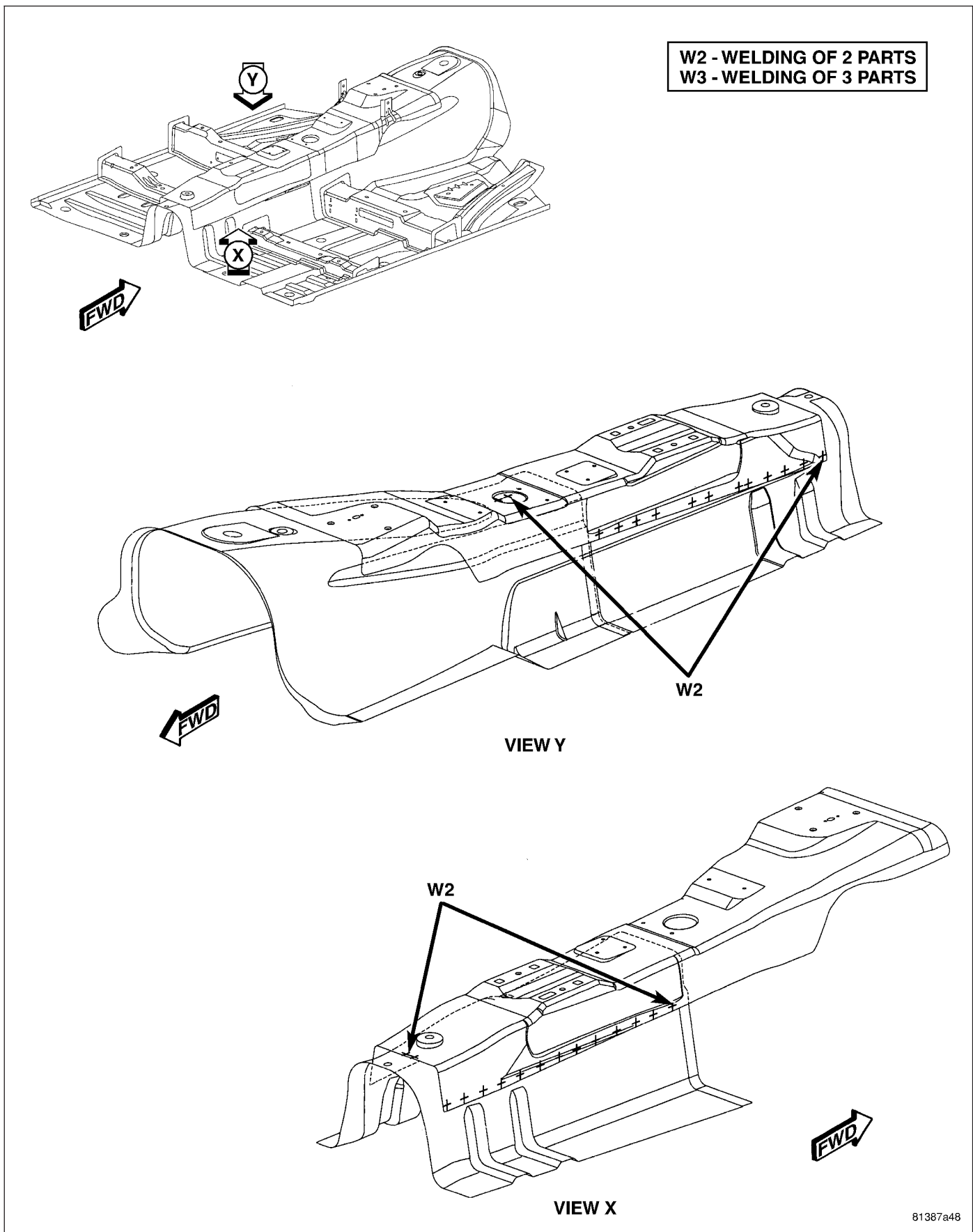
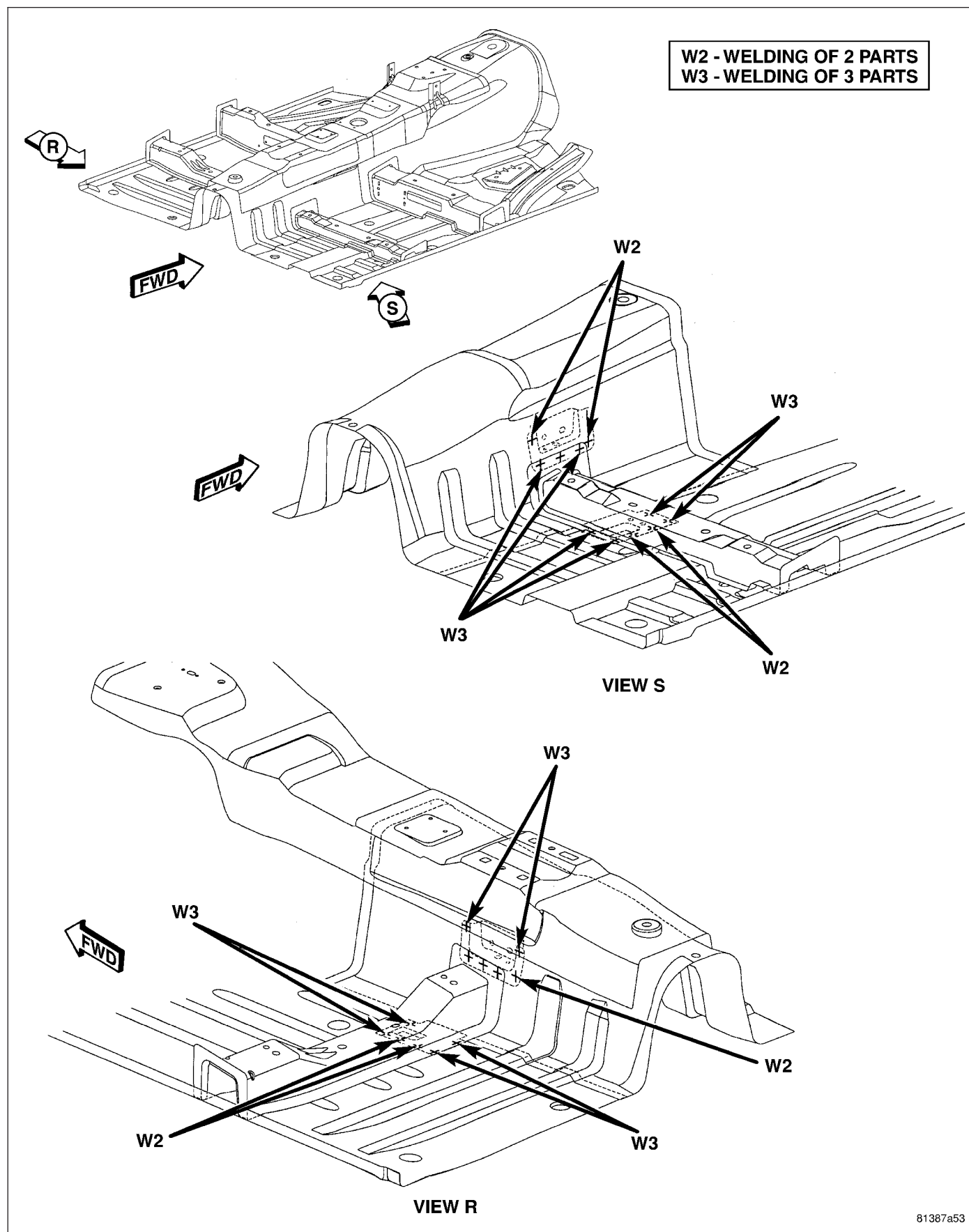


Fig. 144 FRONT FLOOR PAN (2 OF 12)



81387a4f



81387a53

Fig. 146 FRONT FLOOR PAN (4 OF 12)

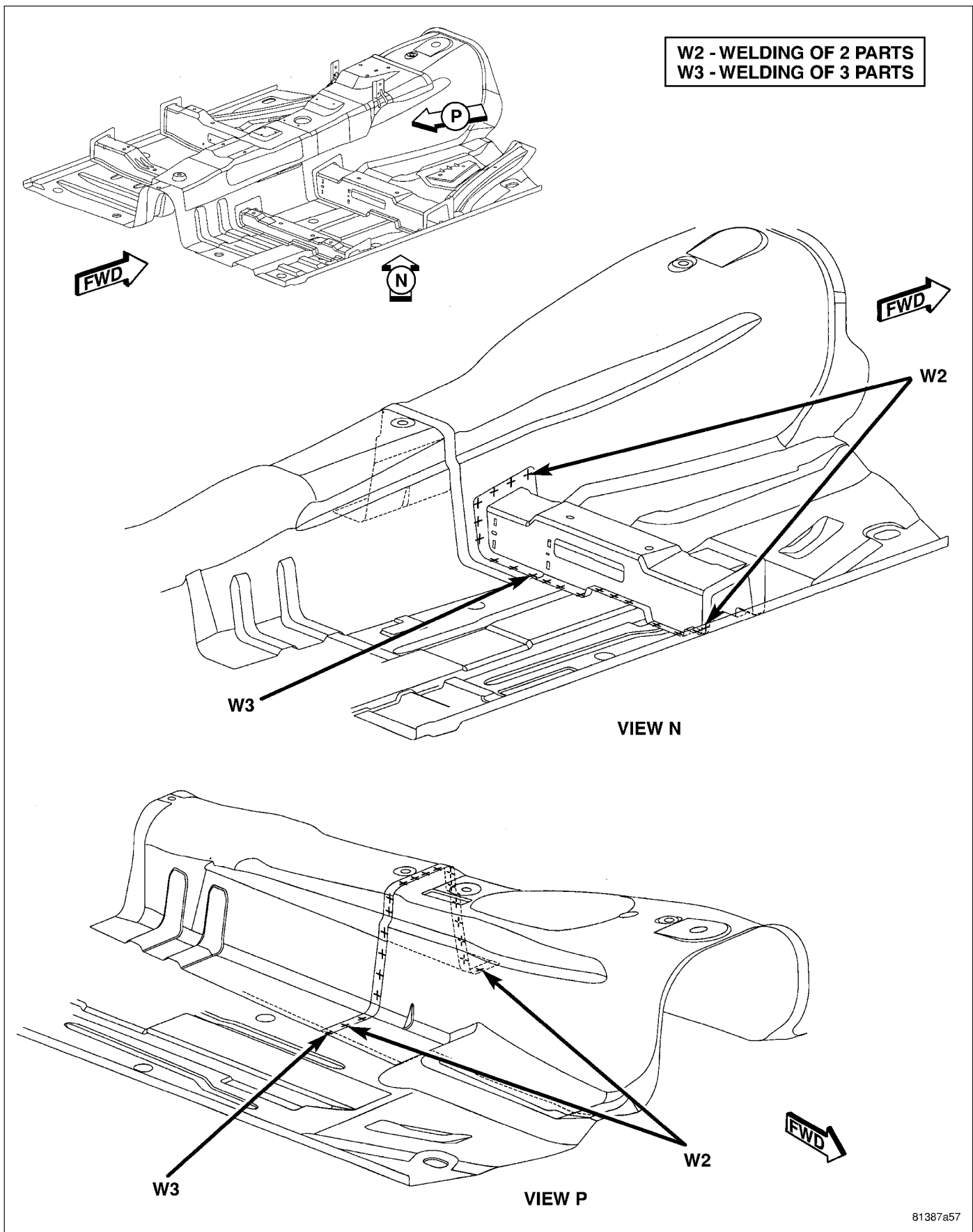


Fig. 147 FRONT FLOOR PAN (5 OF 12)

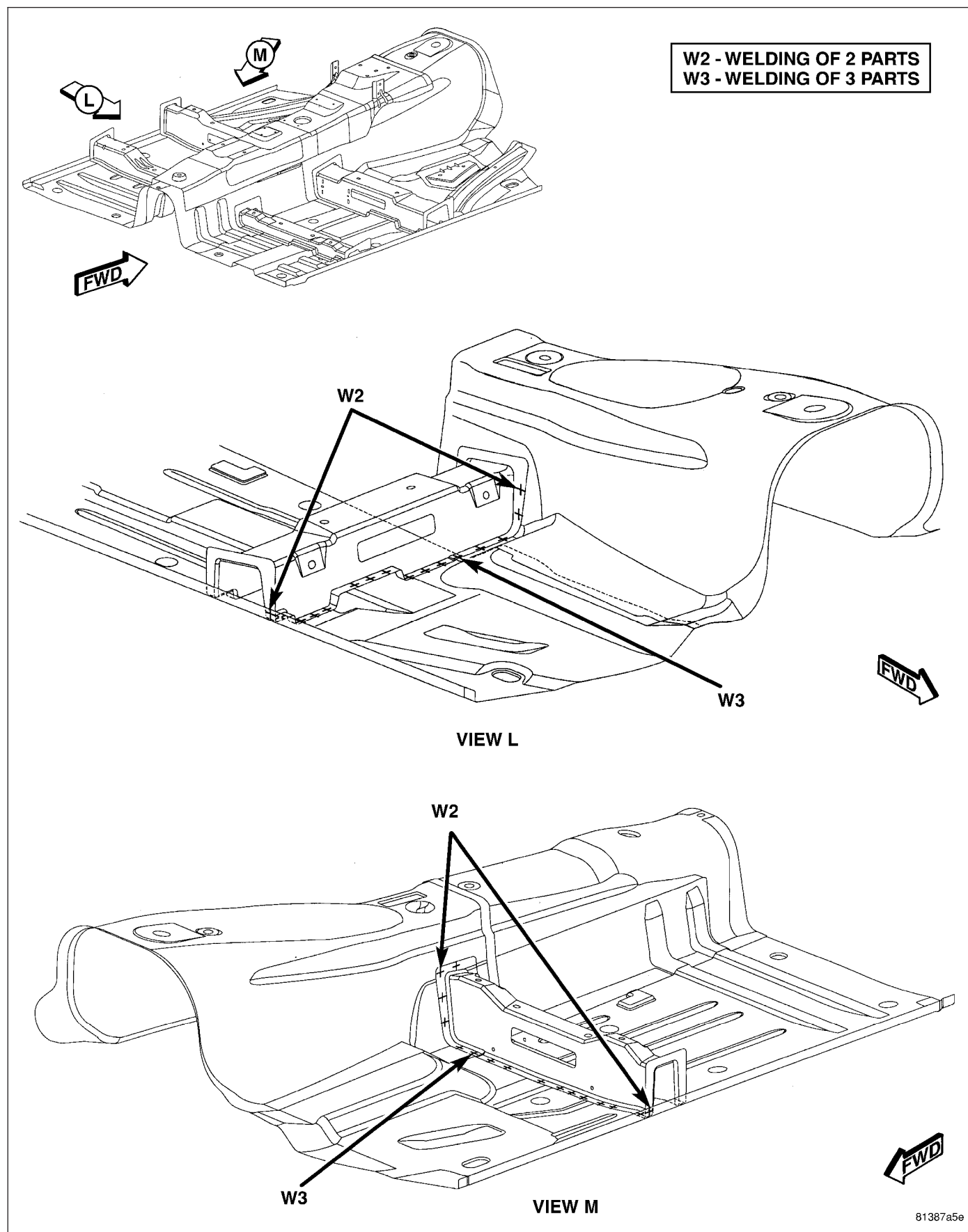


Fig. 148 FRONT FLOOR PAN (6 OF 12)



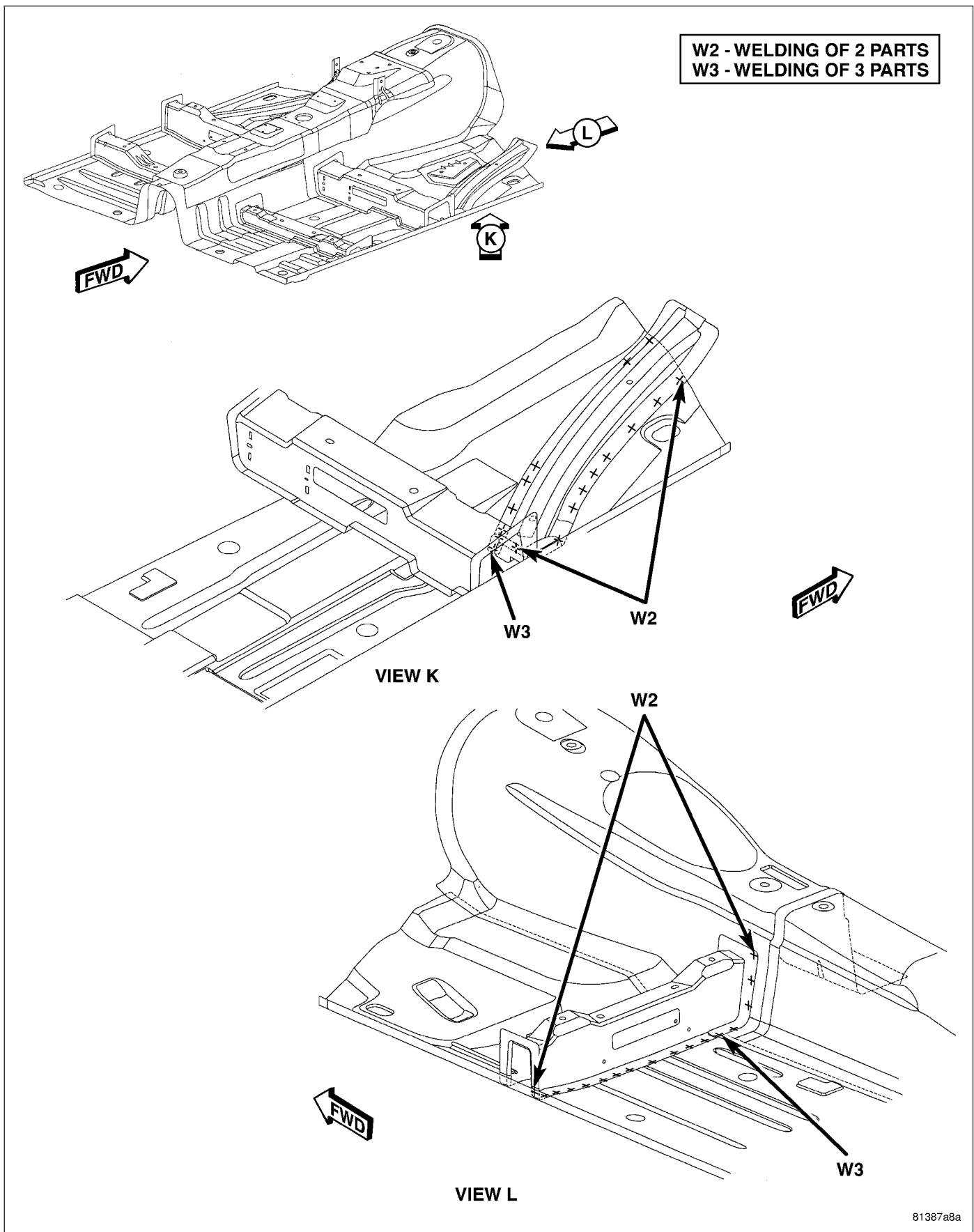
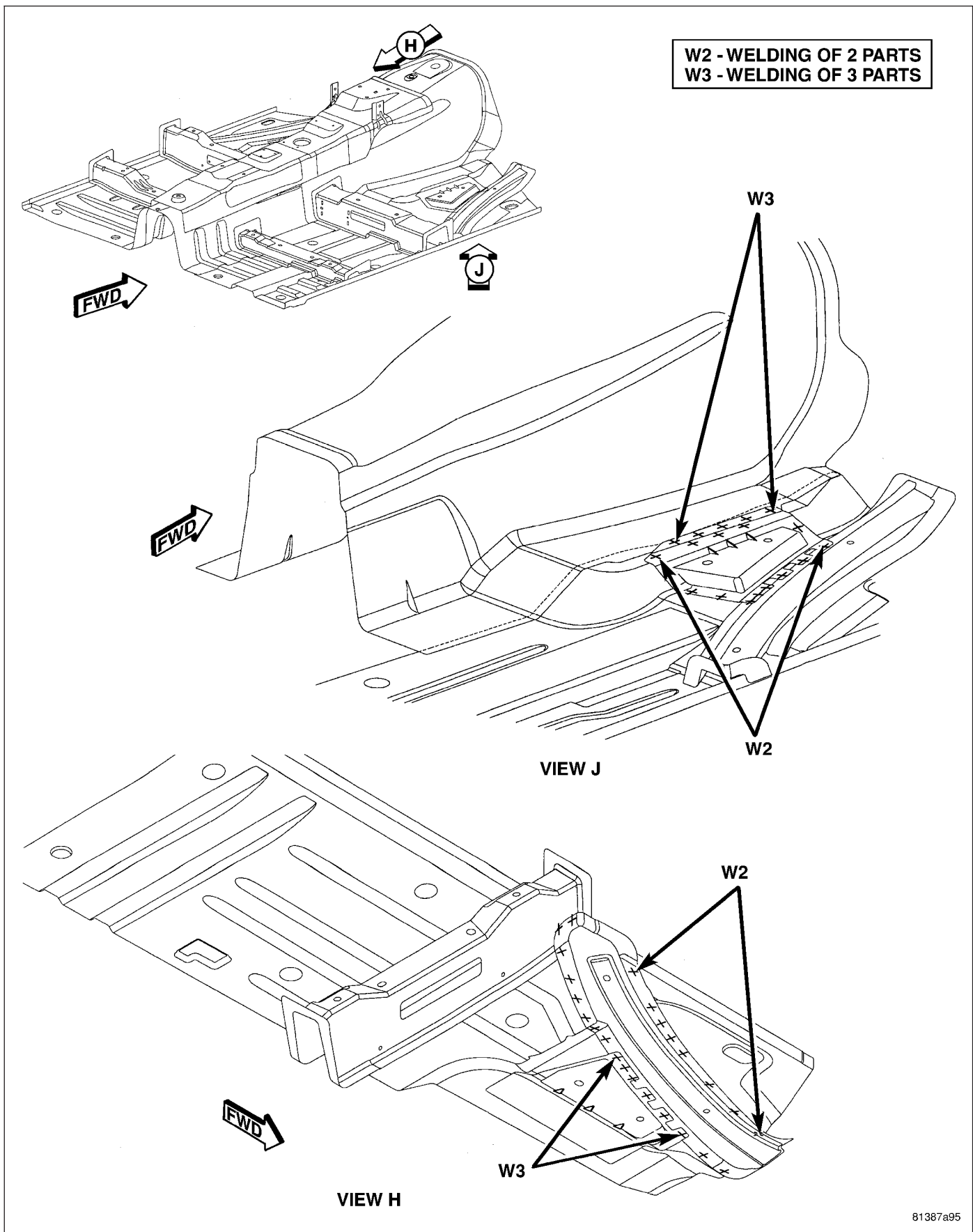


Fig. 149 FRONT FLOOR PAN (7 OF 12)





81387a95

Fig. 150 FRONT FLOOR PAN (8 OF 12)

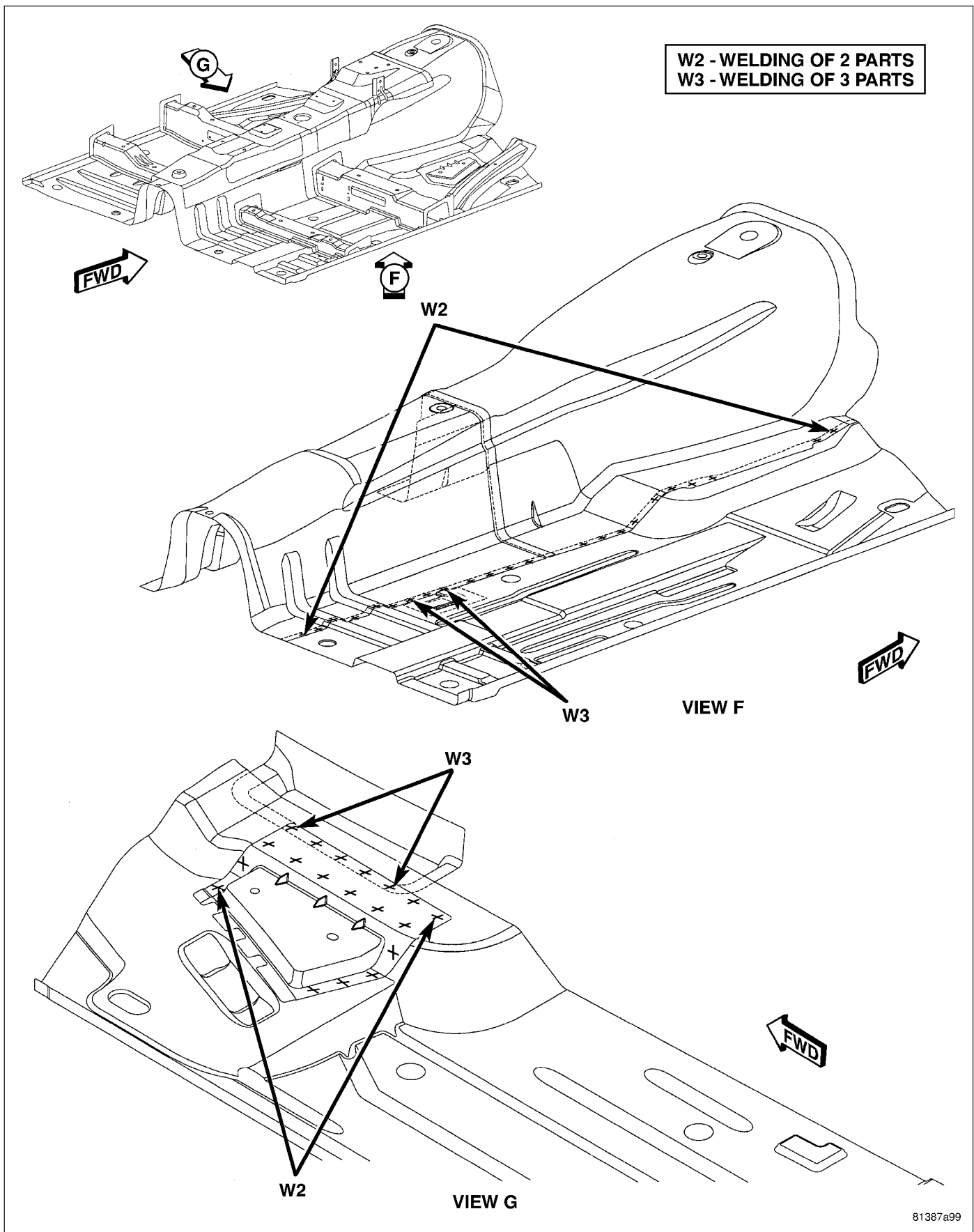
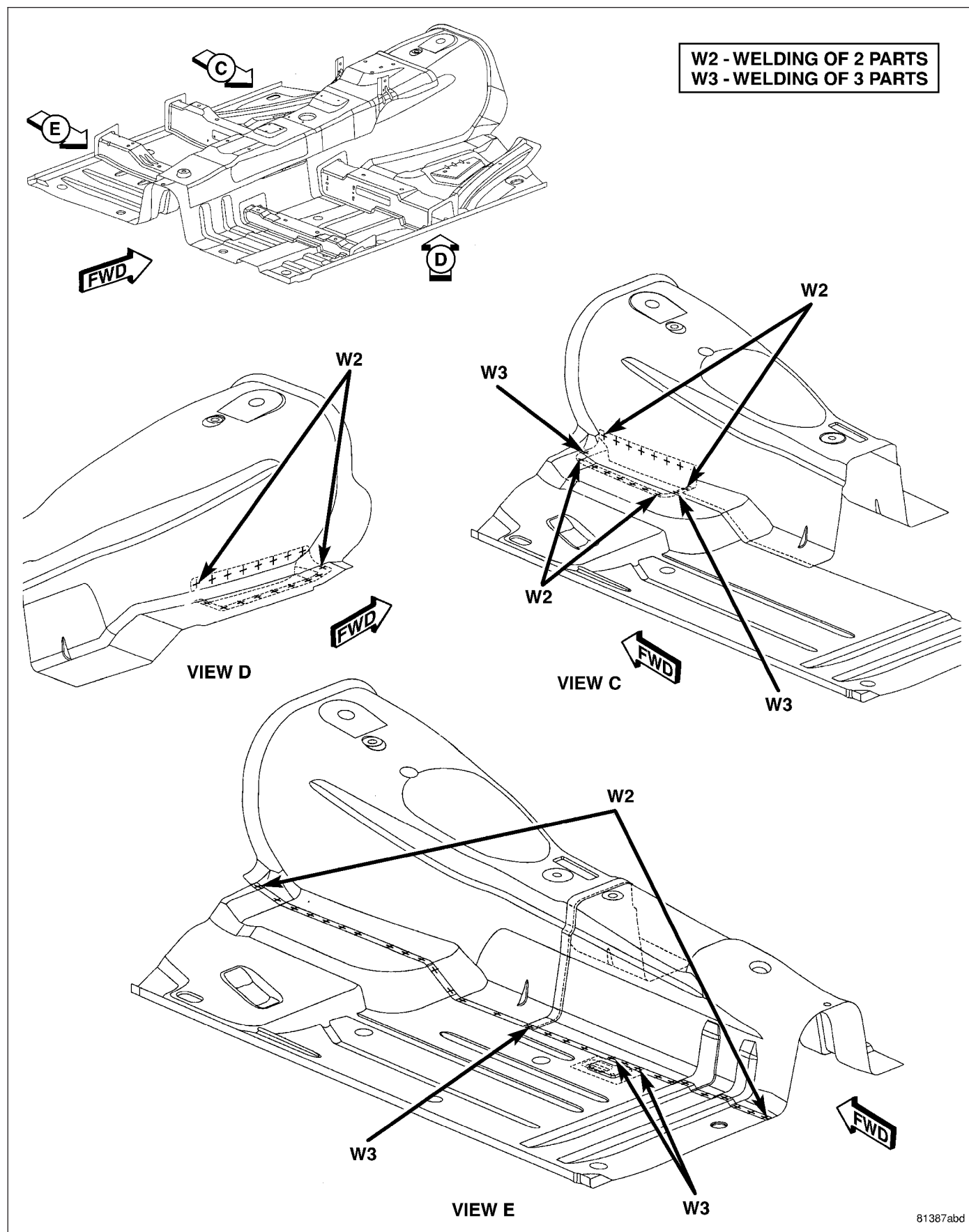
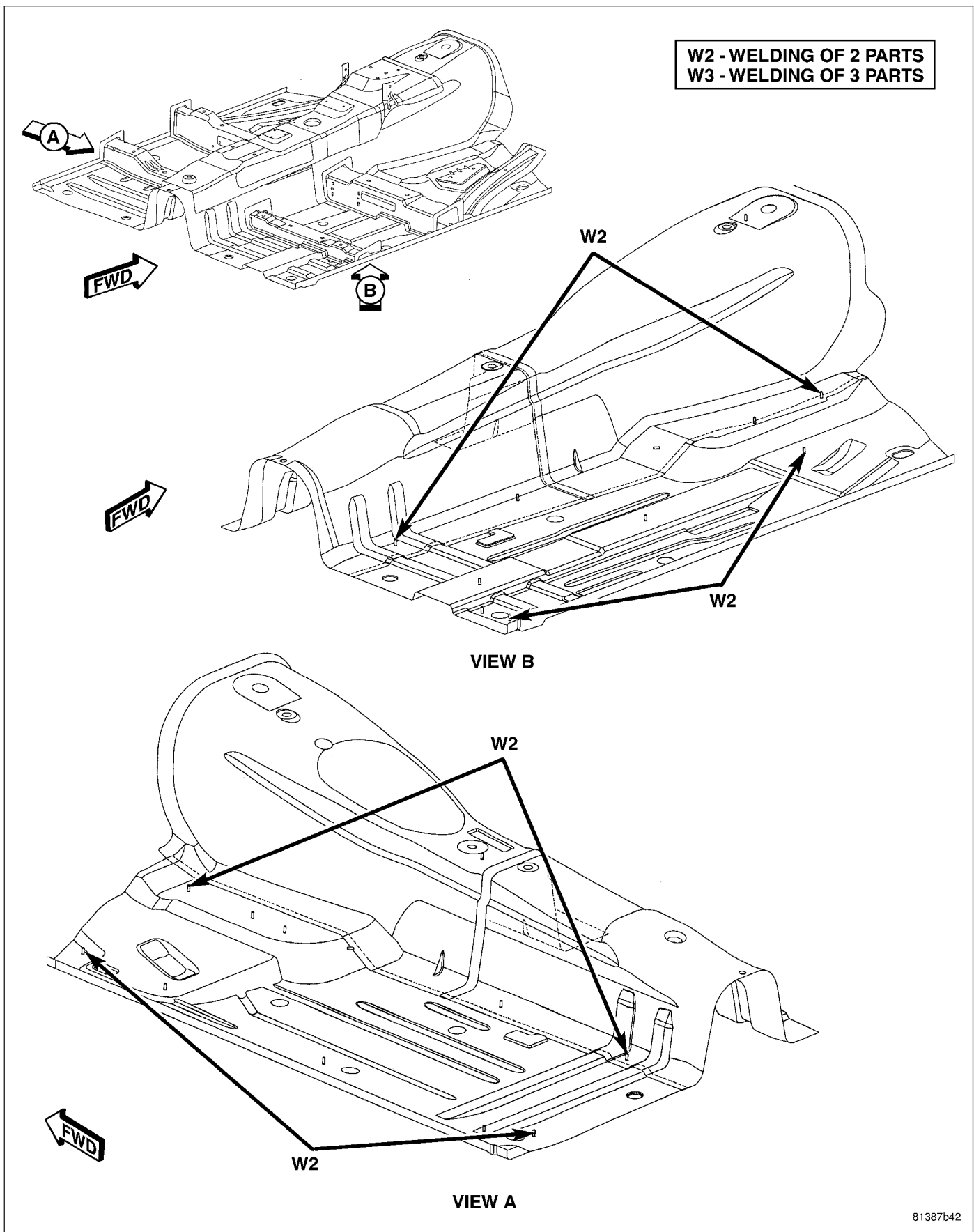


Fig. 151 FRONT FLOOR PAN (9 OF 12)



81387abd

Fig. 152 FRONT FLOOR PAN (10 OF 12)



81387b42

Fig. 153 FRONT FLOOR PAN (11 OF 12)

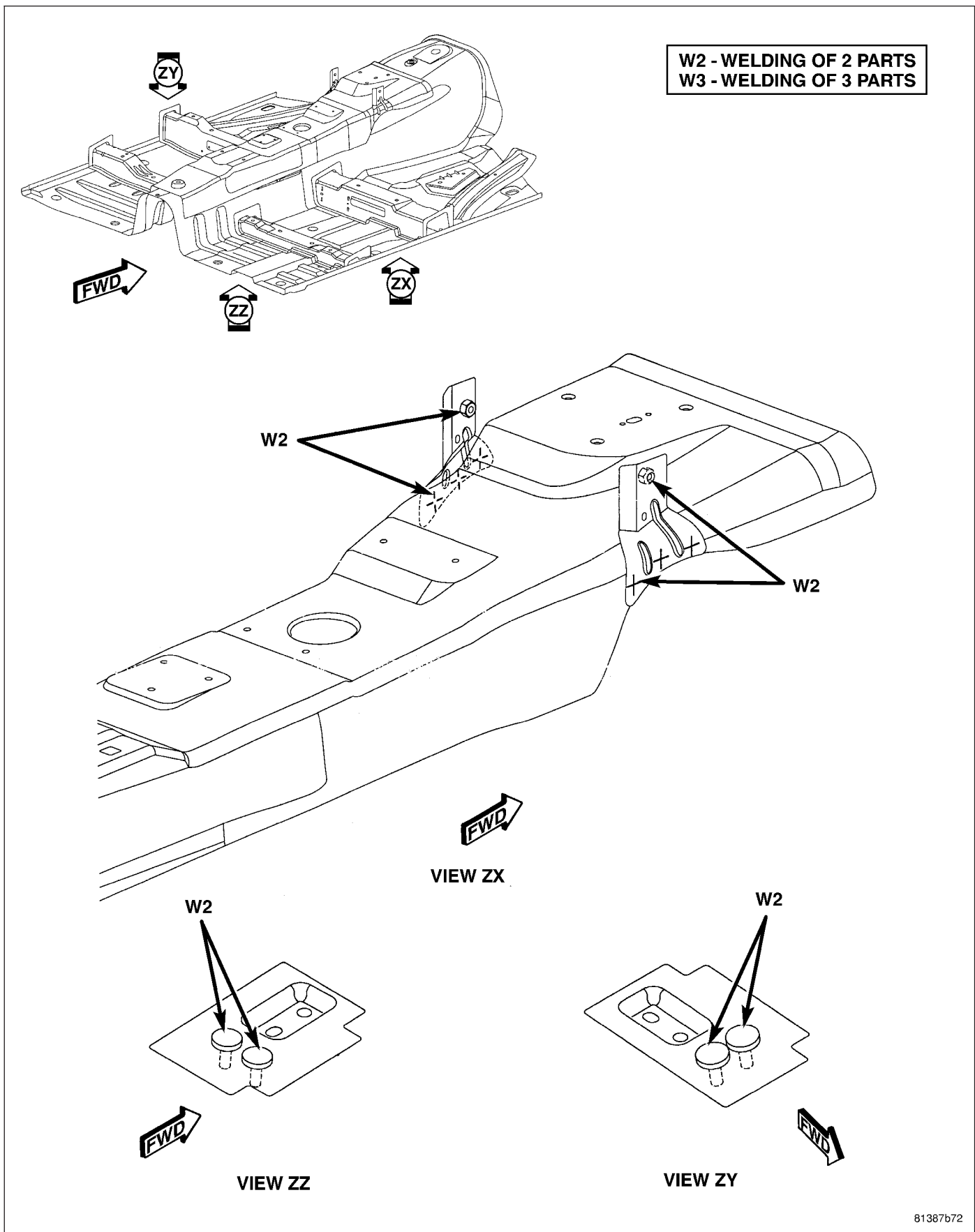
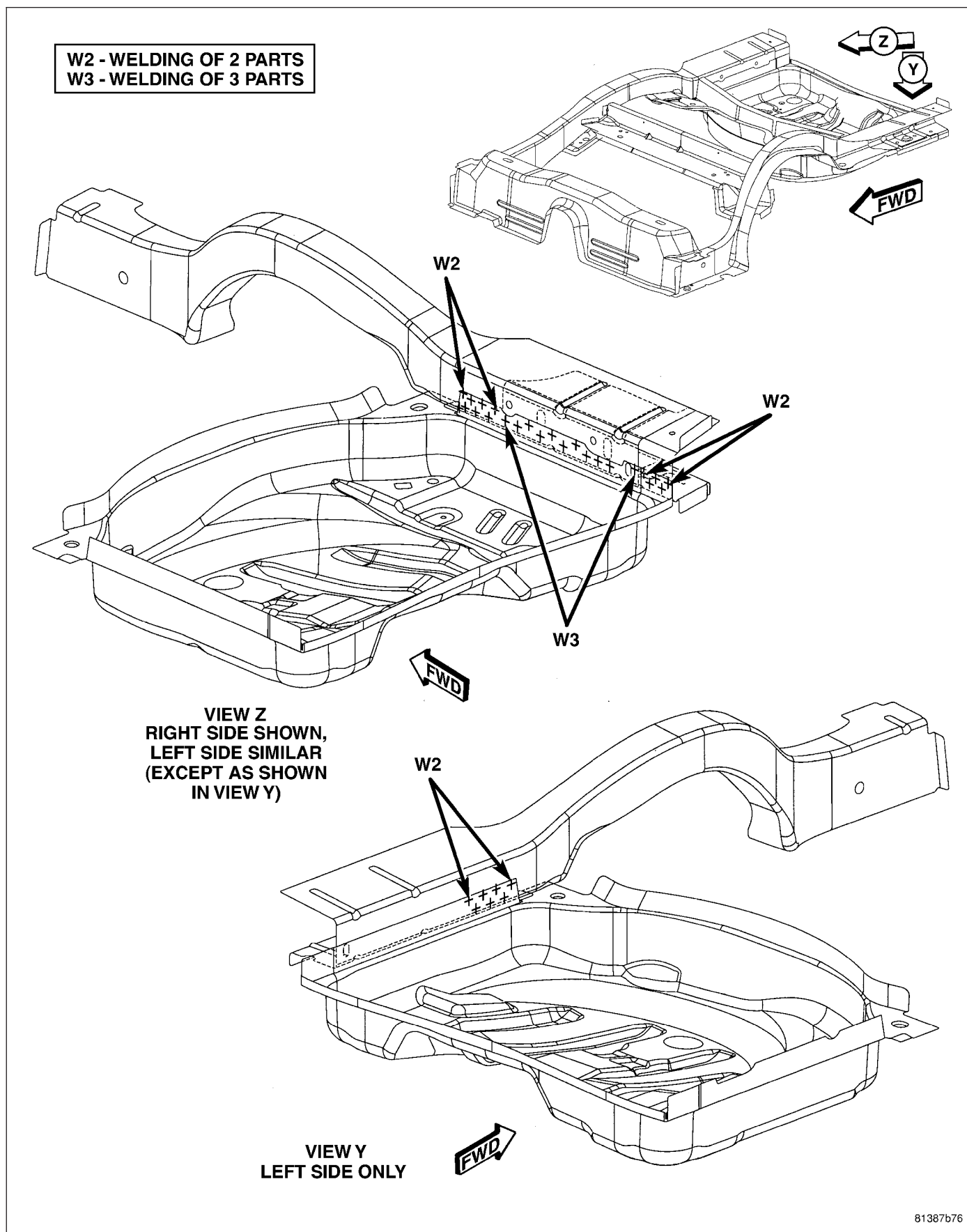
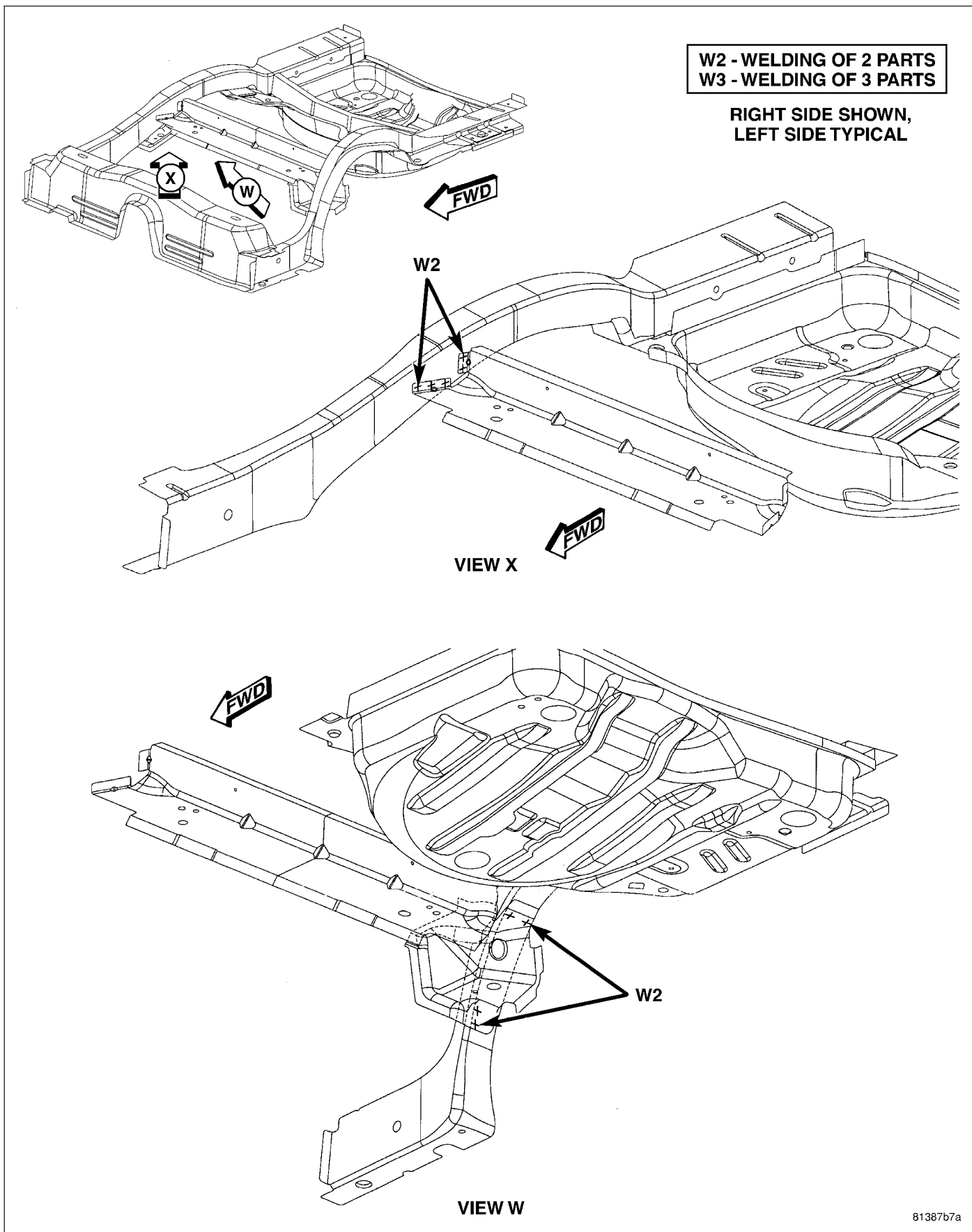


Fig. 154 FRONT FLOOR PAN (12 OF 12)



**Fig. 155 REAR LADDER (1 OF 5)**

**Fig. 156 REAR LADDER (2 OF 5)**



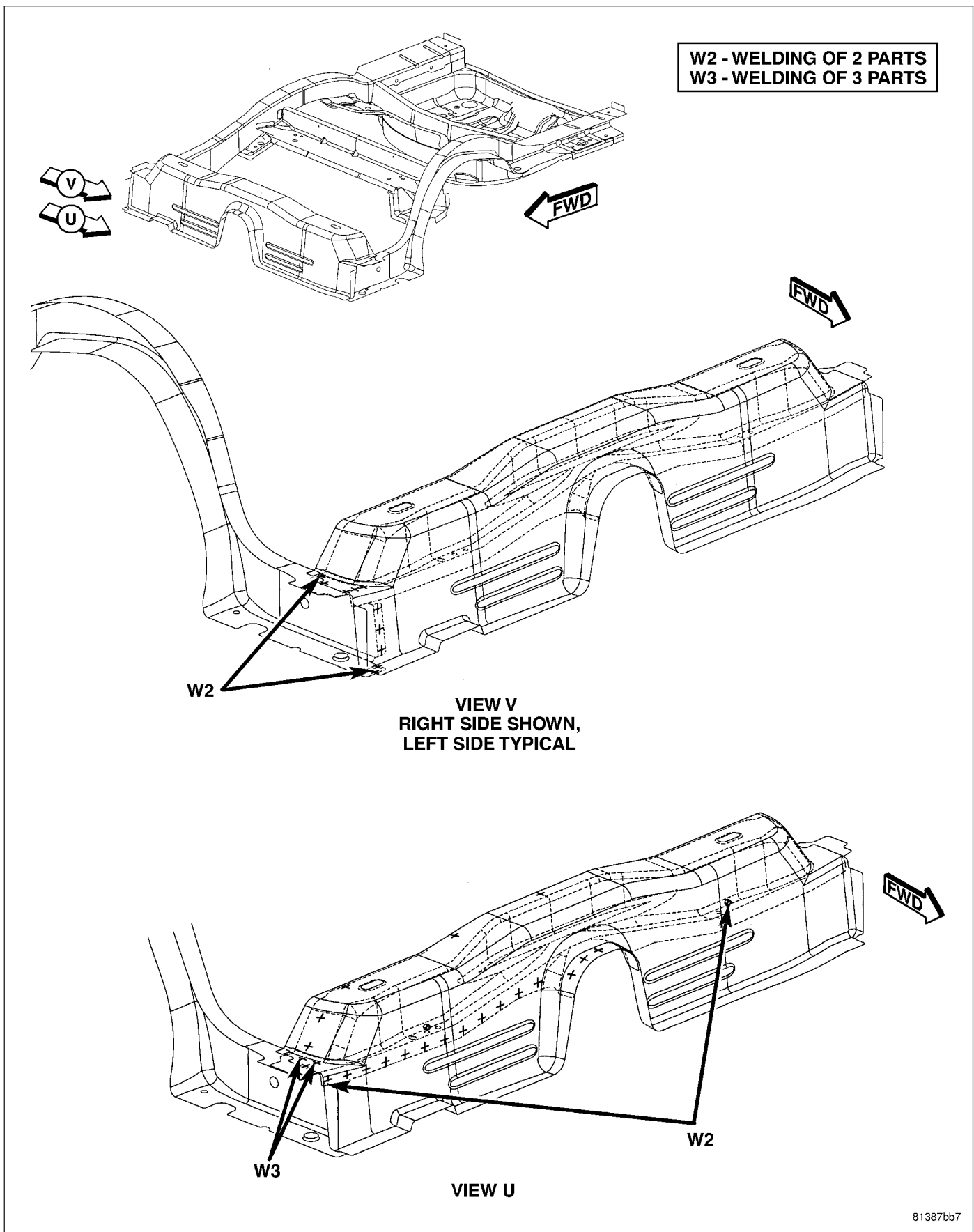
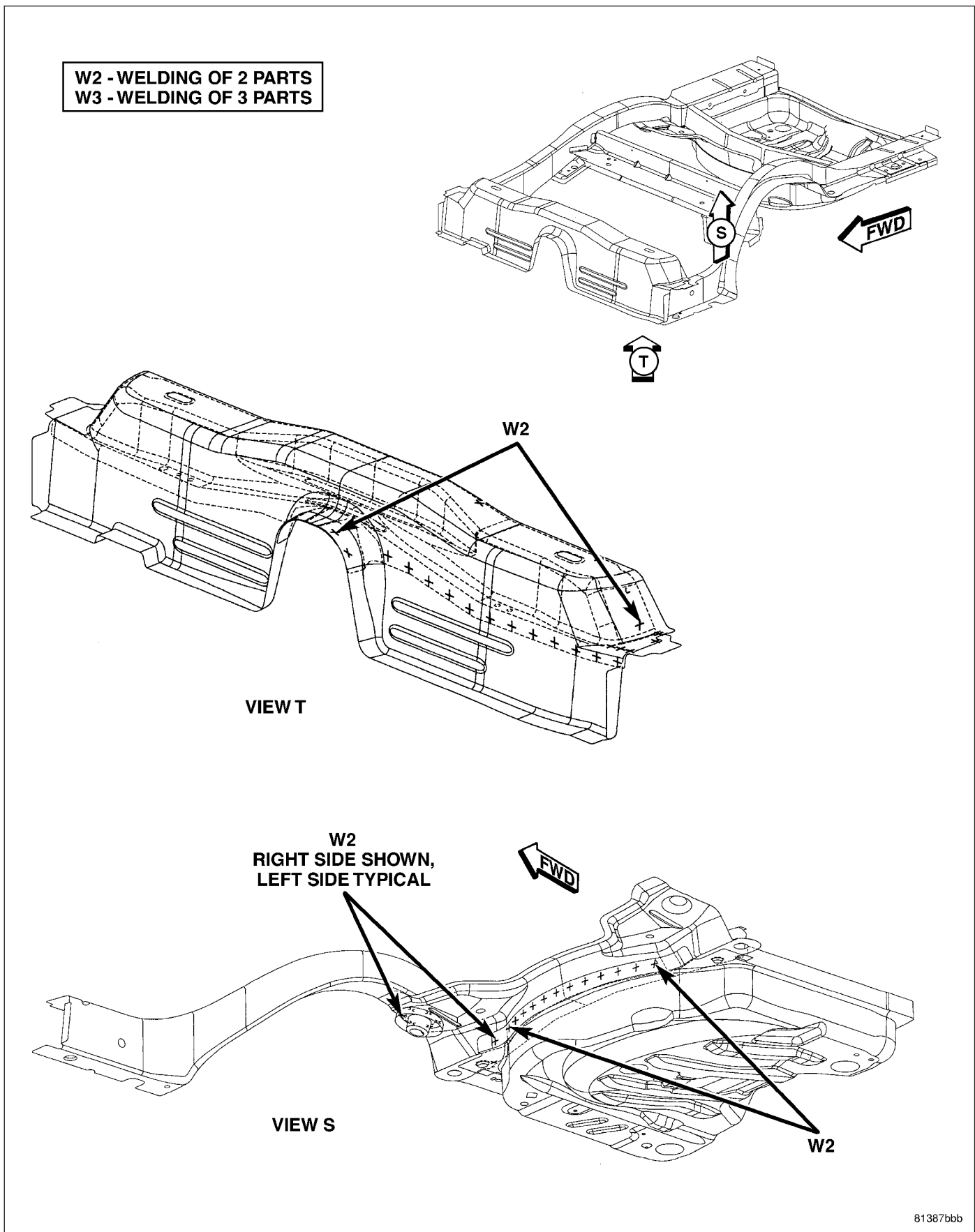


Fig. 157 REAR LADDER (3 OF 5)



*Fig. 158 REAR LADDER (4 OF 5)*

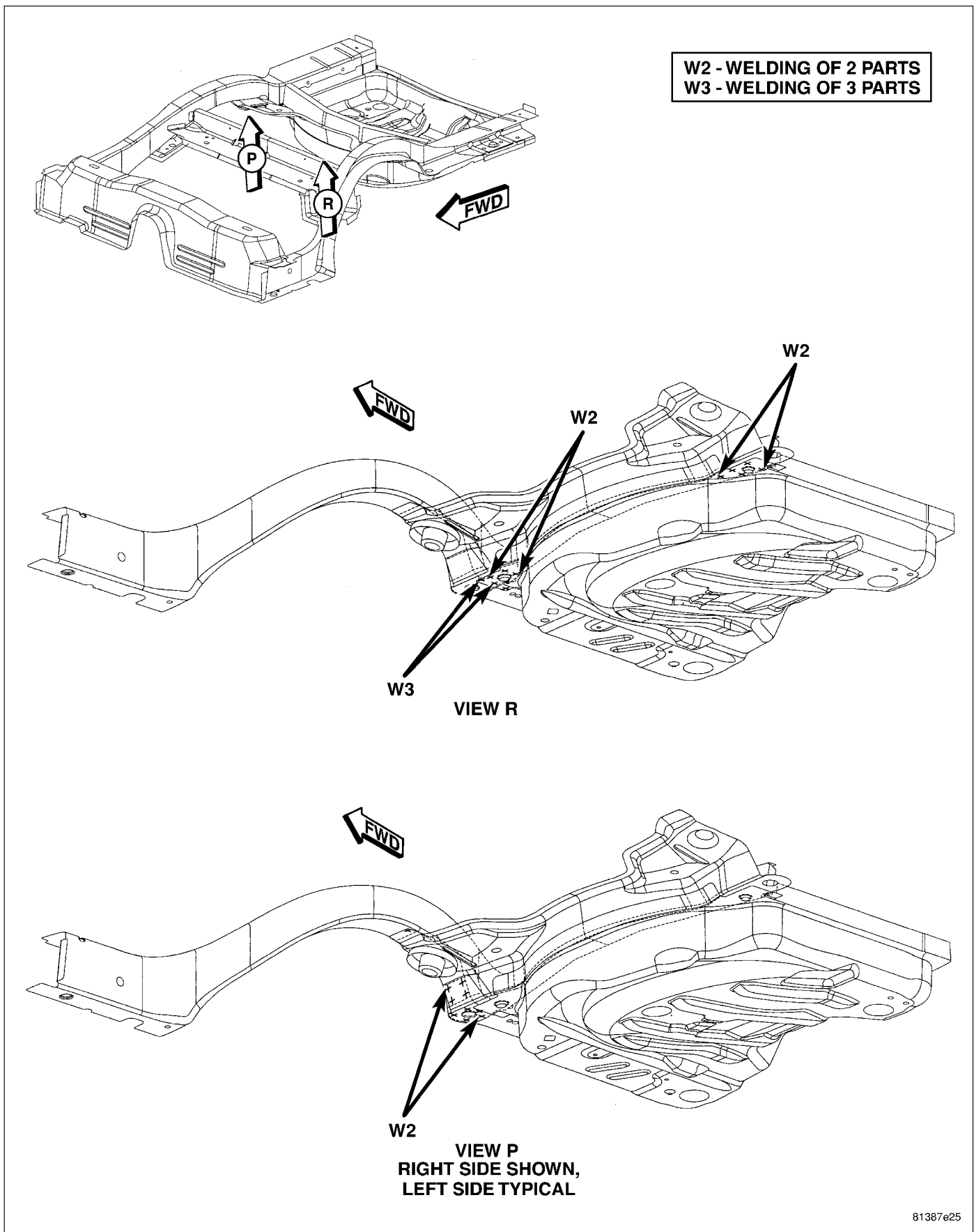
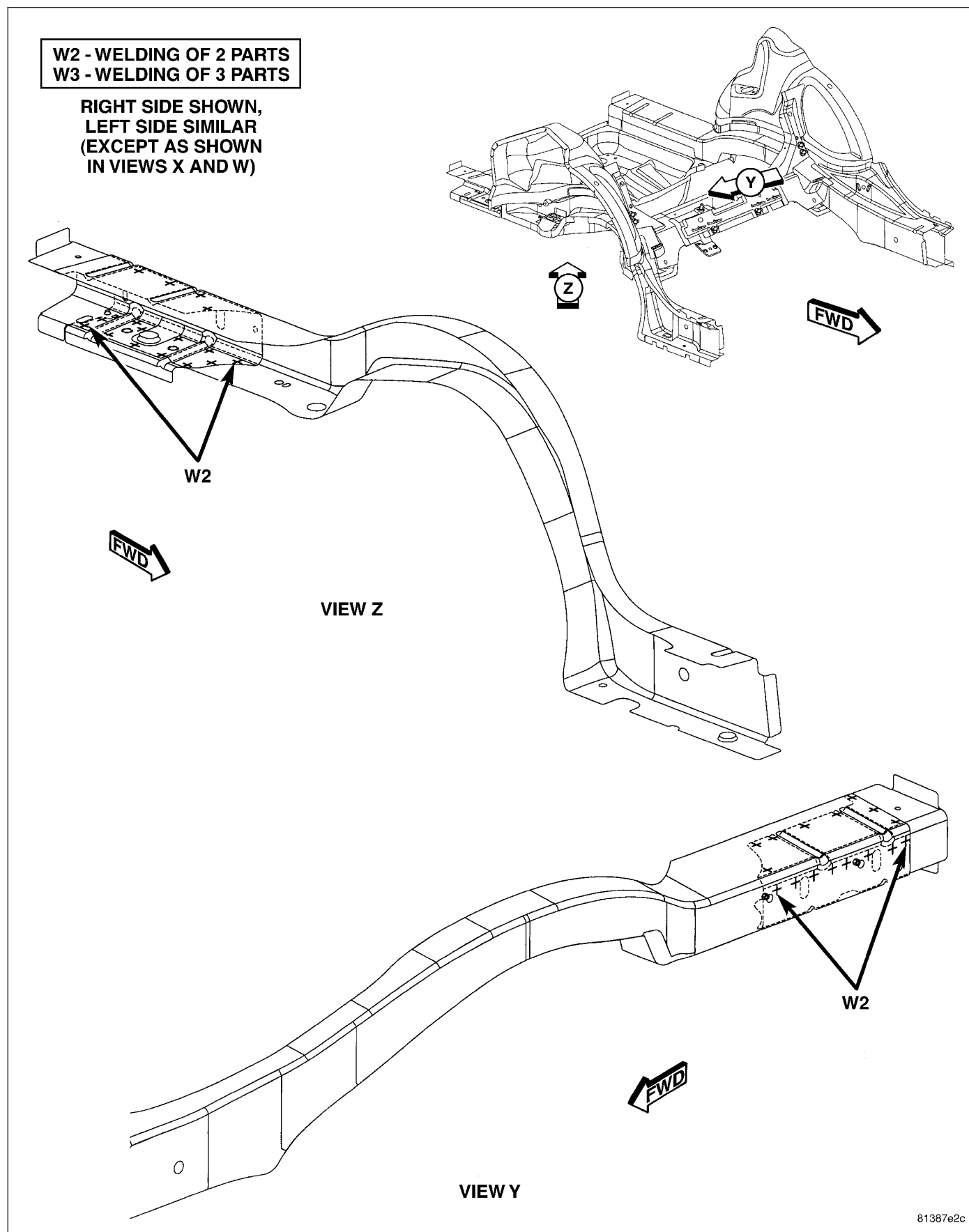
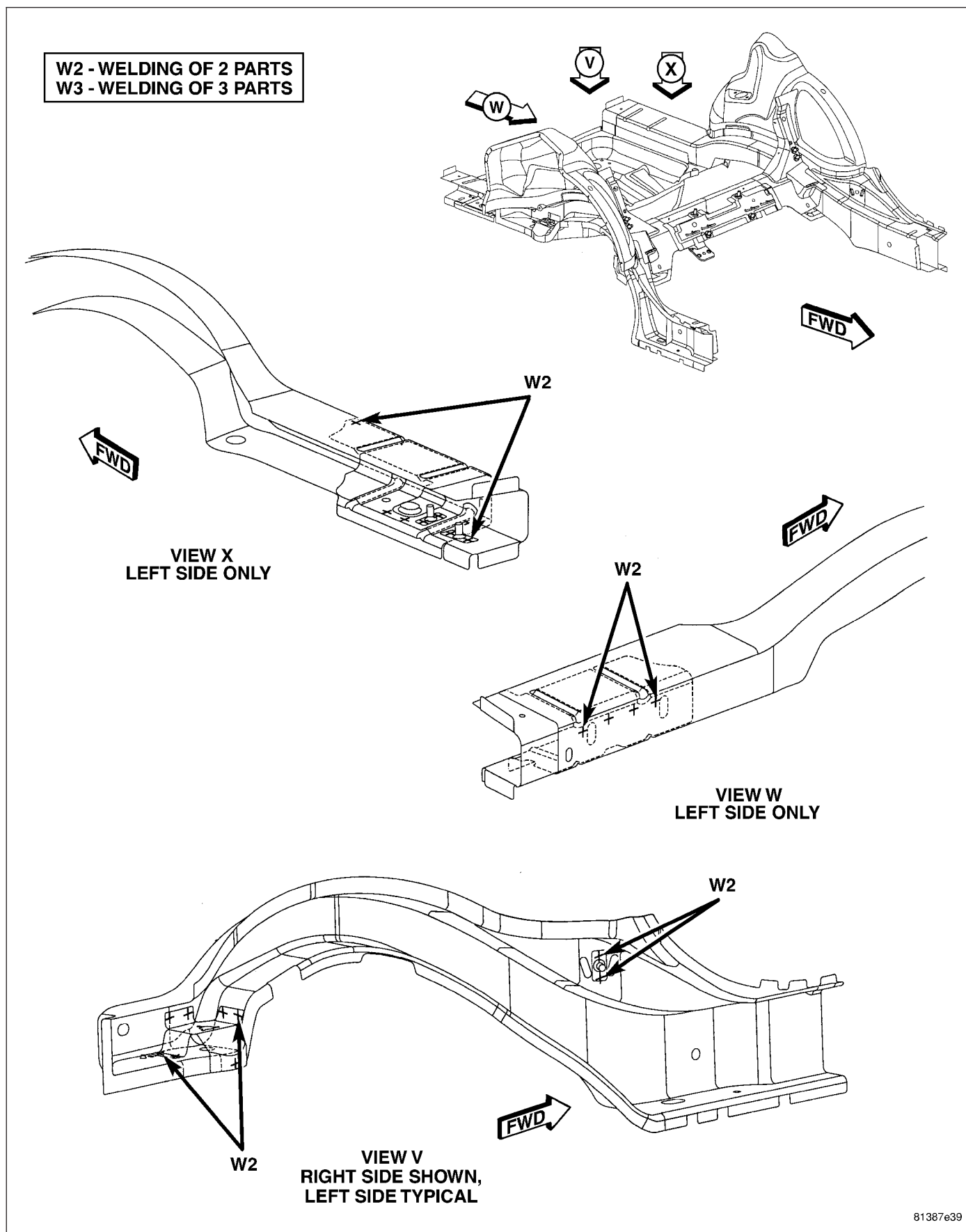


Fig. 159 REAR LADDER (5 OF 5)



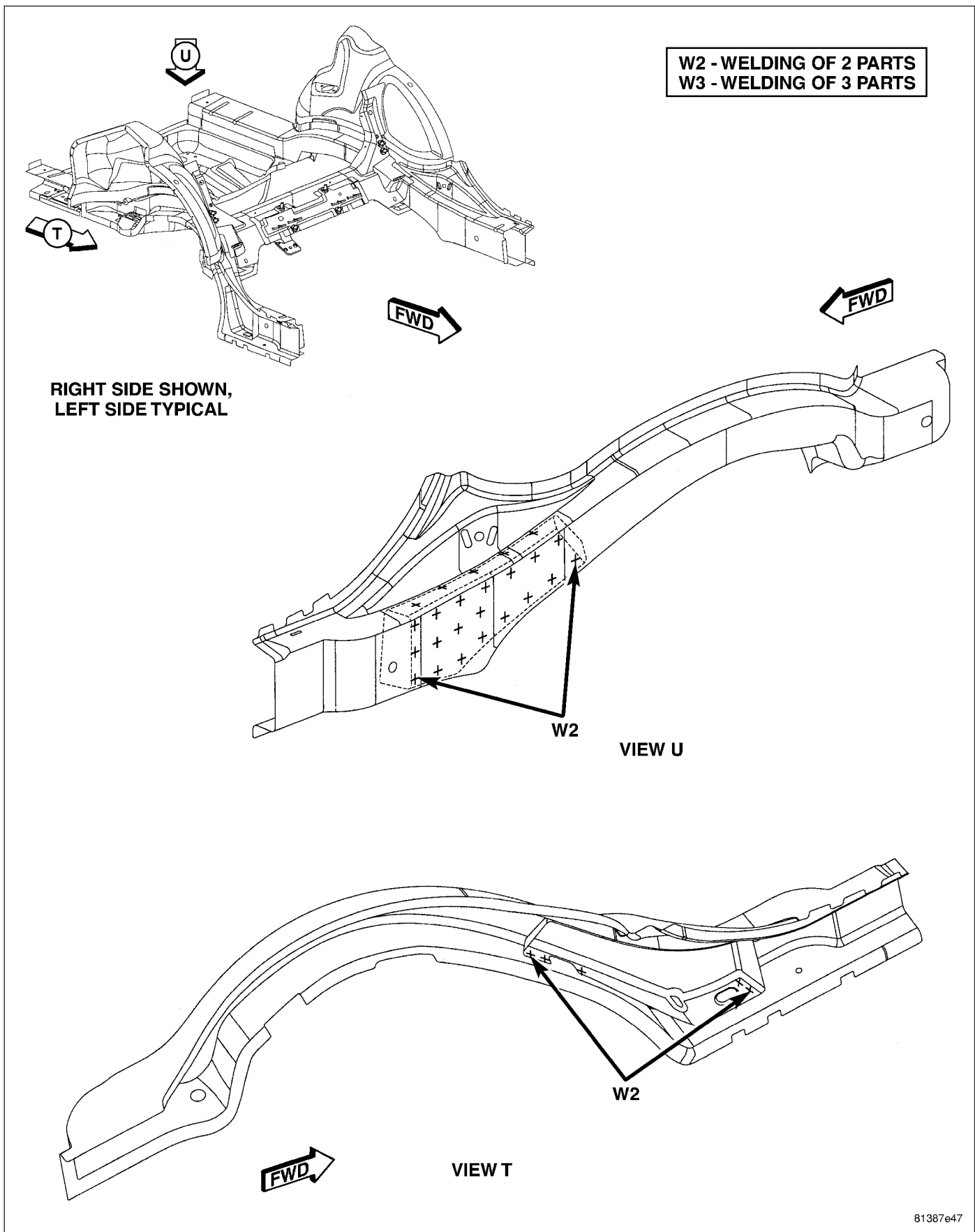
81387e2c

**Fig. 160 REAR FLOOR/LADDER (1 OF 6)**

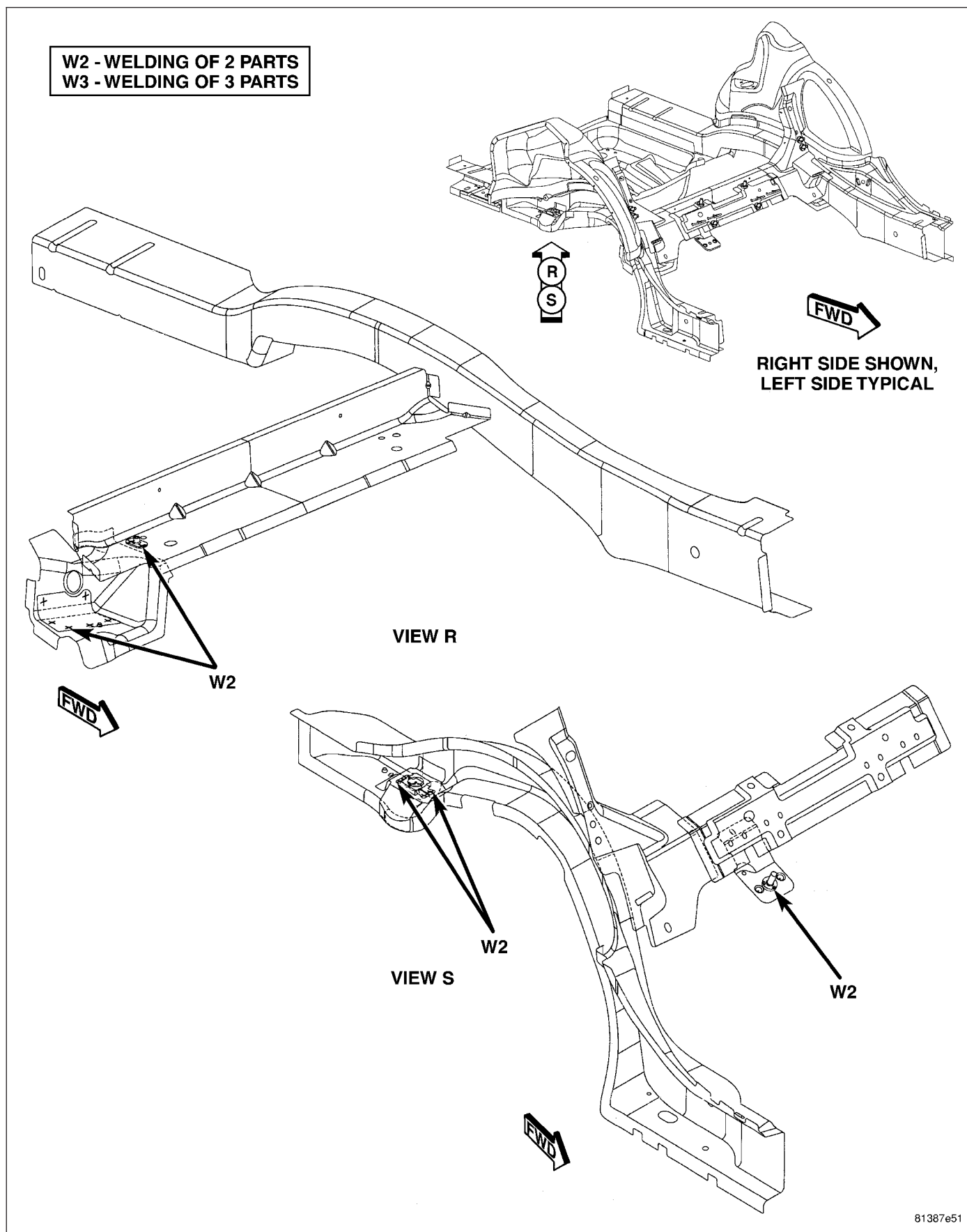


81387e39

**Fig. 161 REAR FLOOR/LADDER (2 OF 6)**

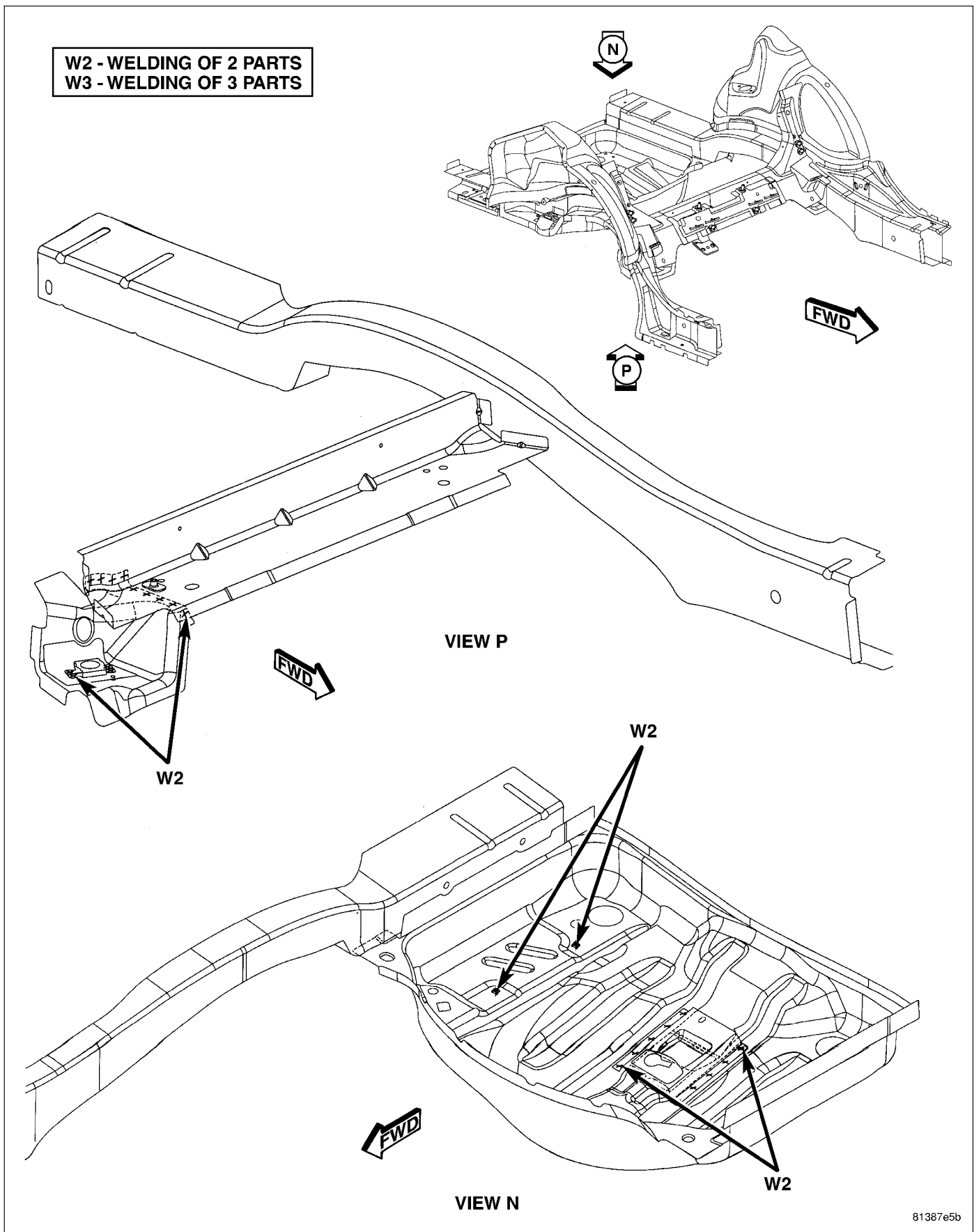


**Fig. 162 REAR FLOOR/LADDER (3 OF 6)**

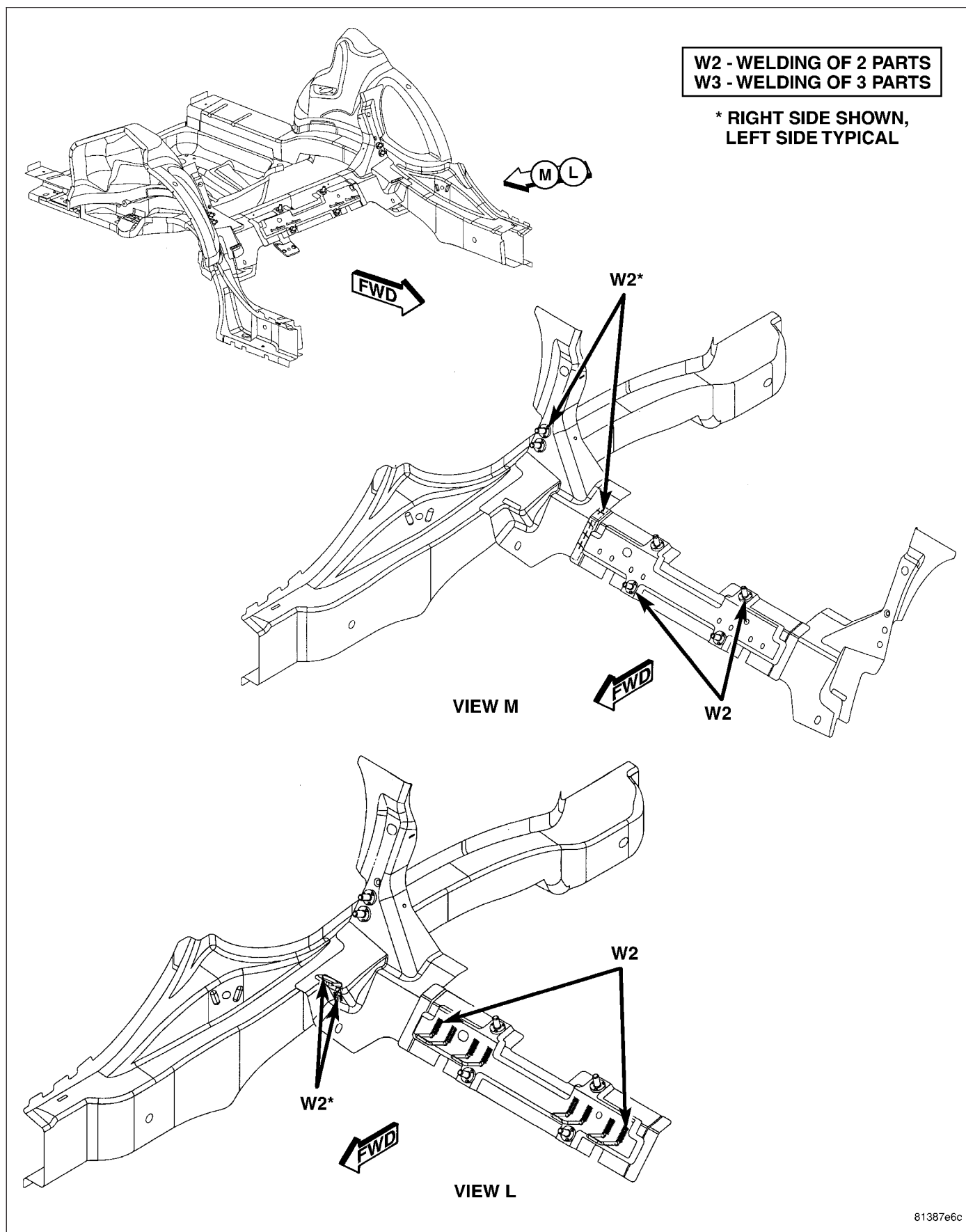


81387e51

**Fig. 163 REAR FLOOR/LADDER (4 OF 6)**



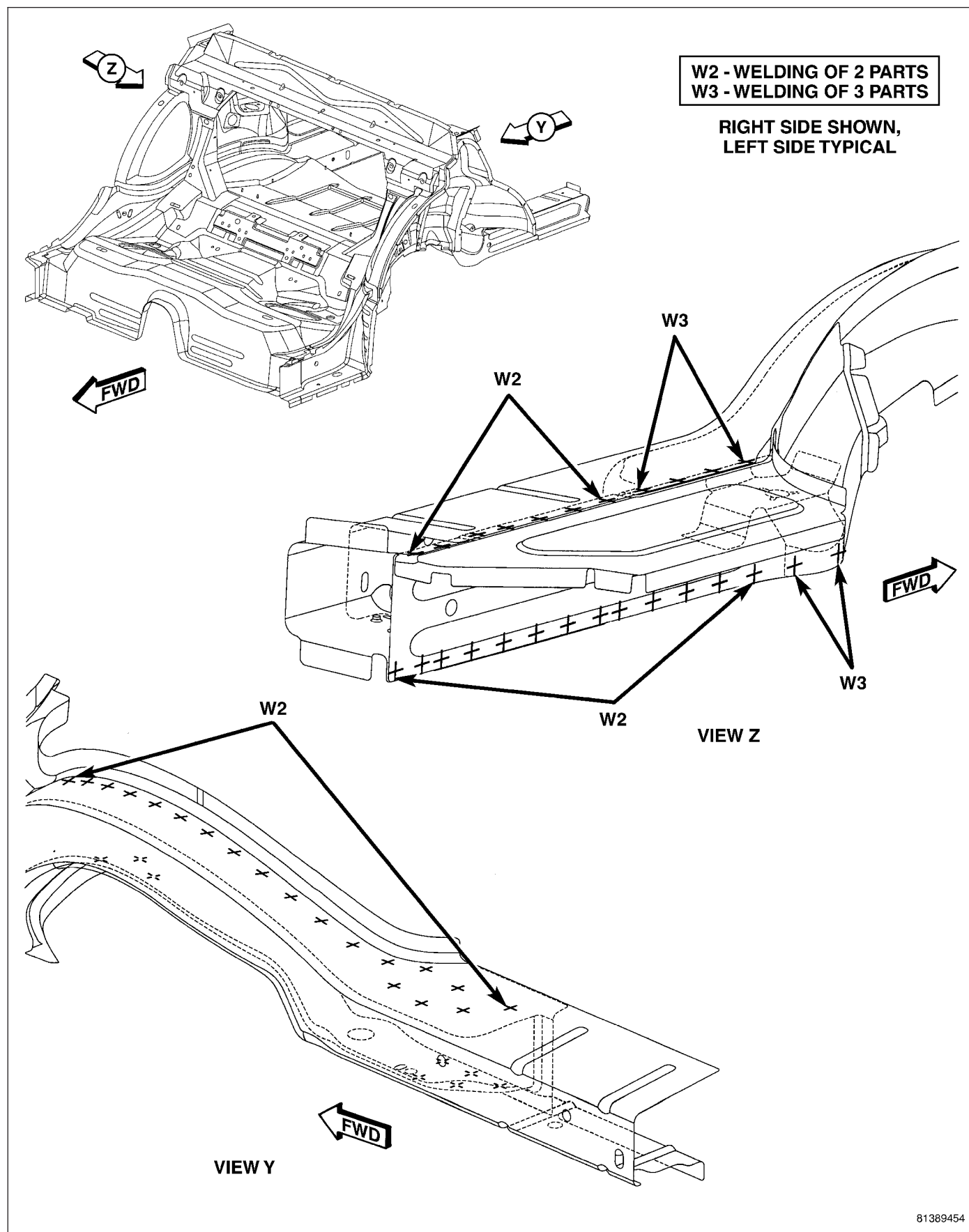
**Fig. 164 REAR FLOOR/LADDER (5 OF 6)**



81387e6c

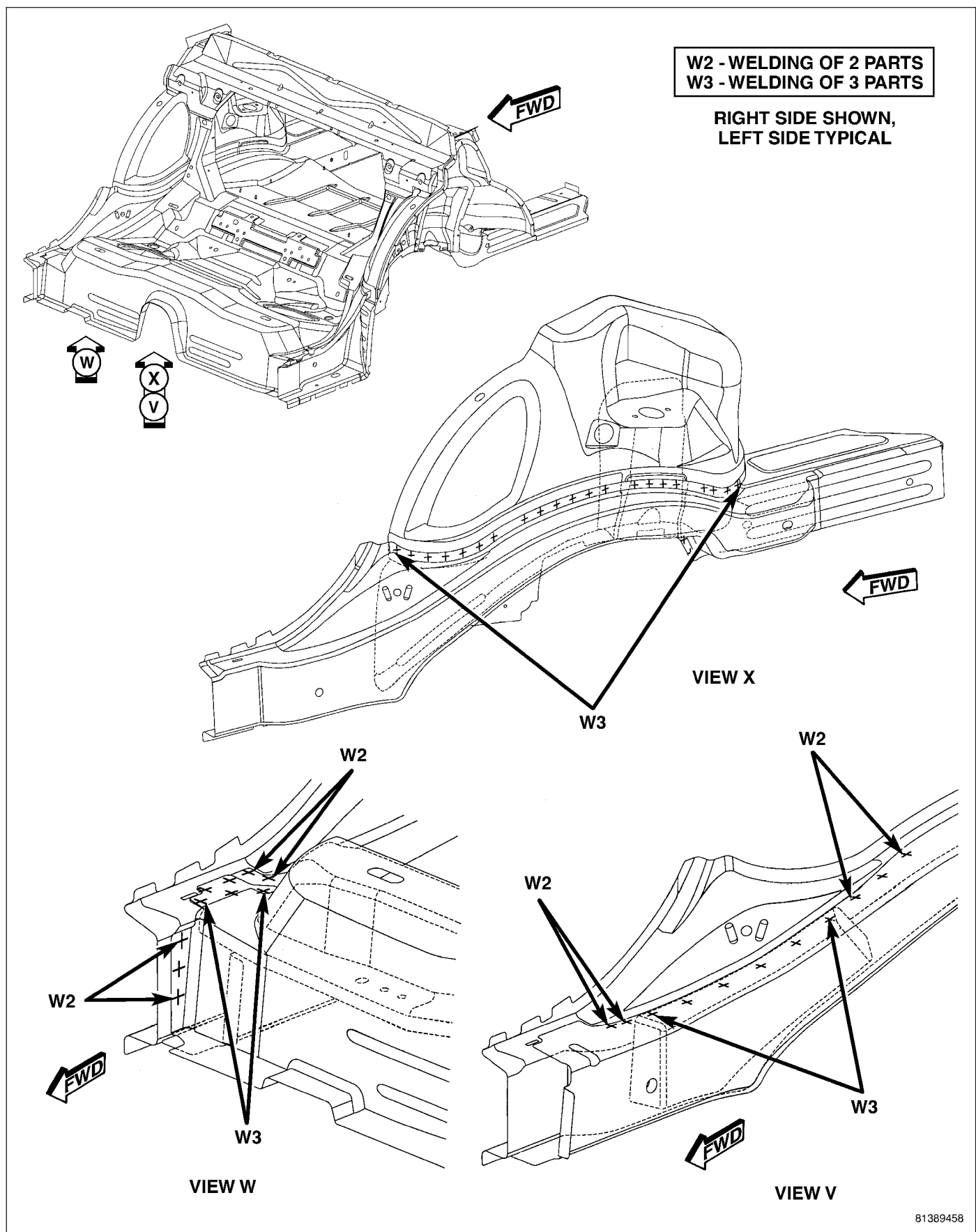
**Fig. 165 REAR FLOOR/LADDER (6 OF 6)**





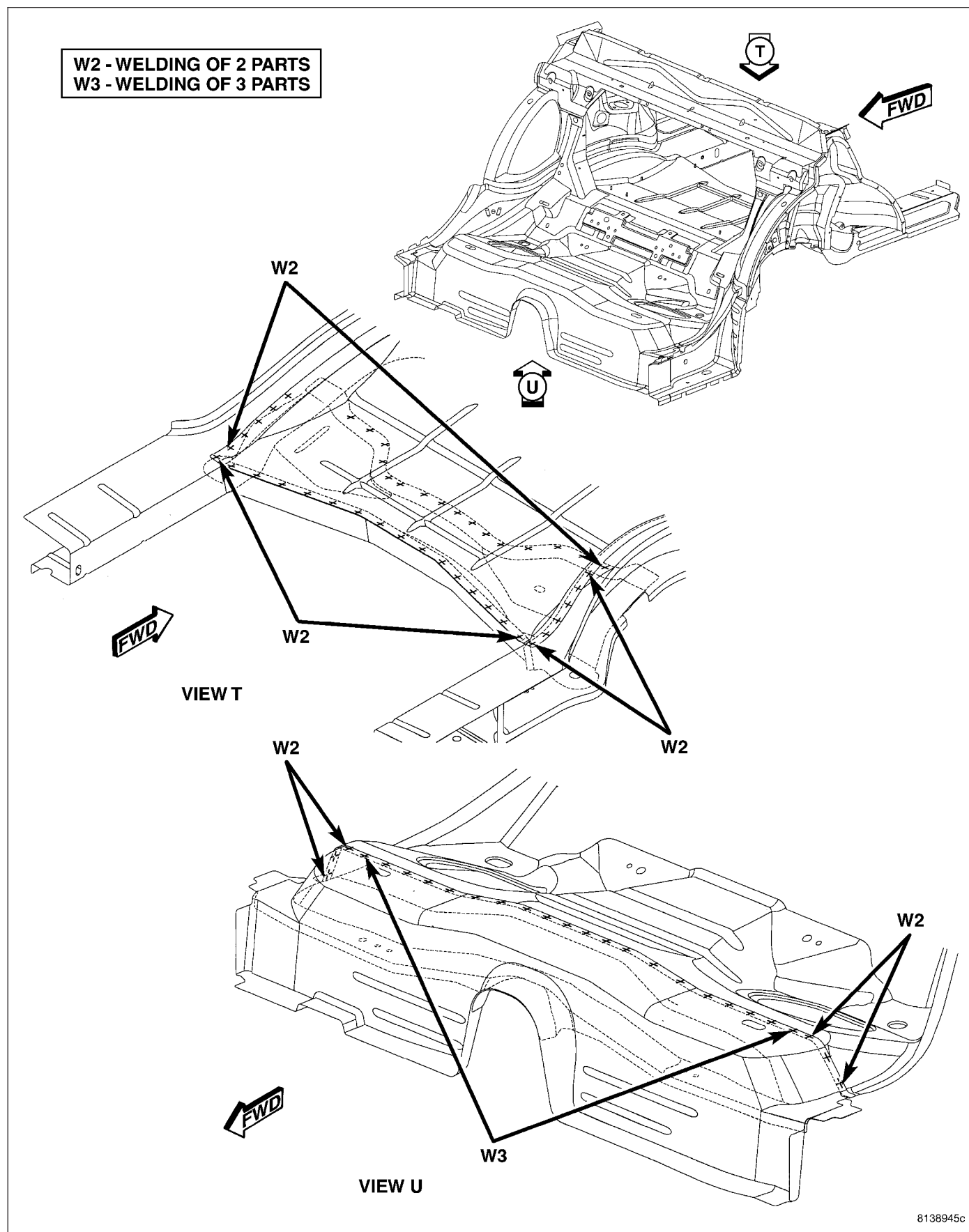
81389454

Fig. 166 REAR FLOOR/LADDER COMPLETE (1 OF 8)

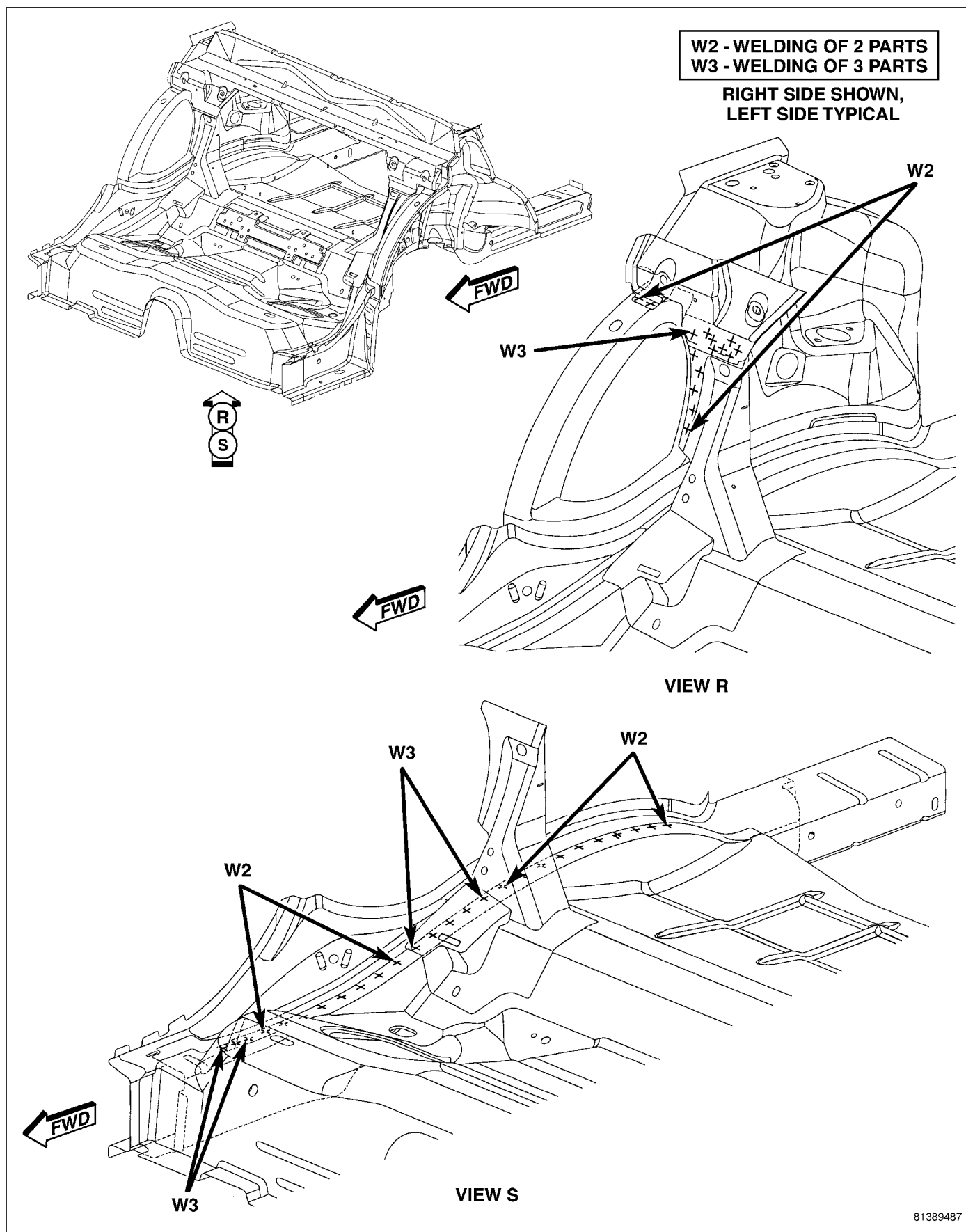


81389458

**Fig. 167 REAR FLOOR/LADDER COMPLETE (2 OF 8)**

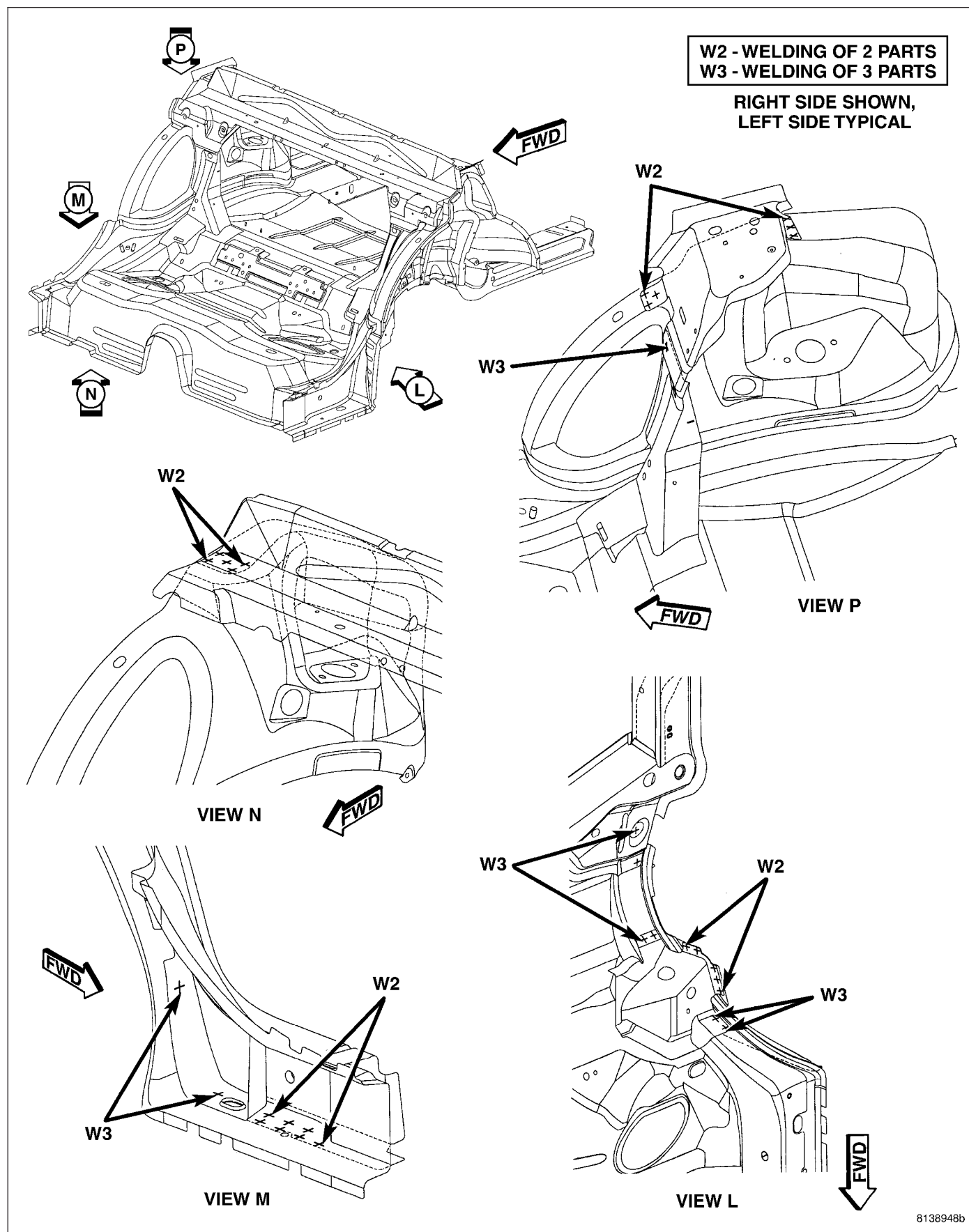


**Fig. 168 REAR FLOOR/LADDER COMPLETE (3 OF 8)**



81389487

**Fig. 169 REAR FLOOR/LADDER COMPLETE (4 OF 8)**

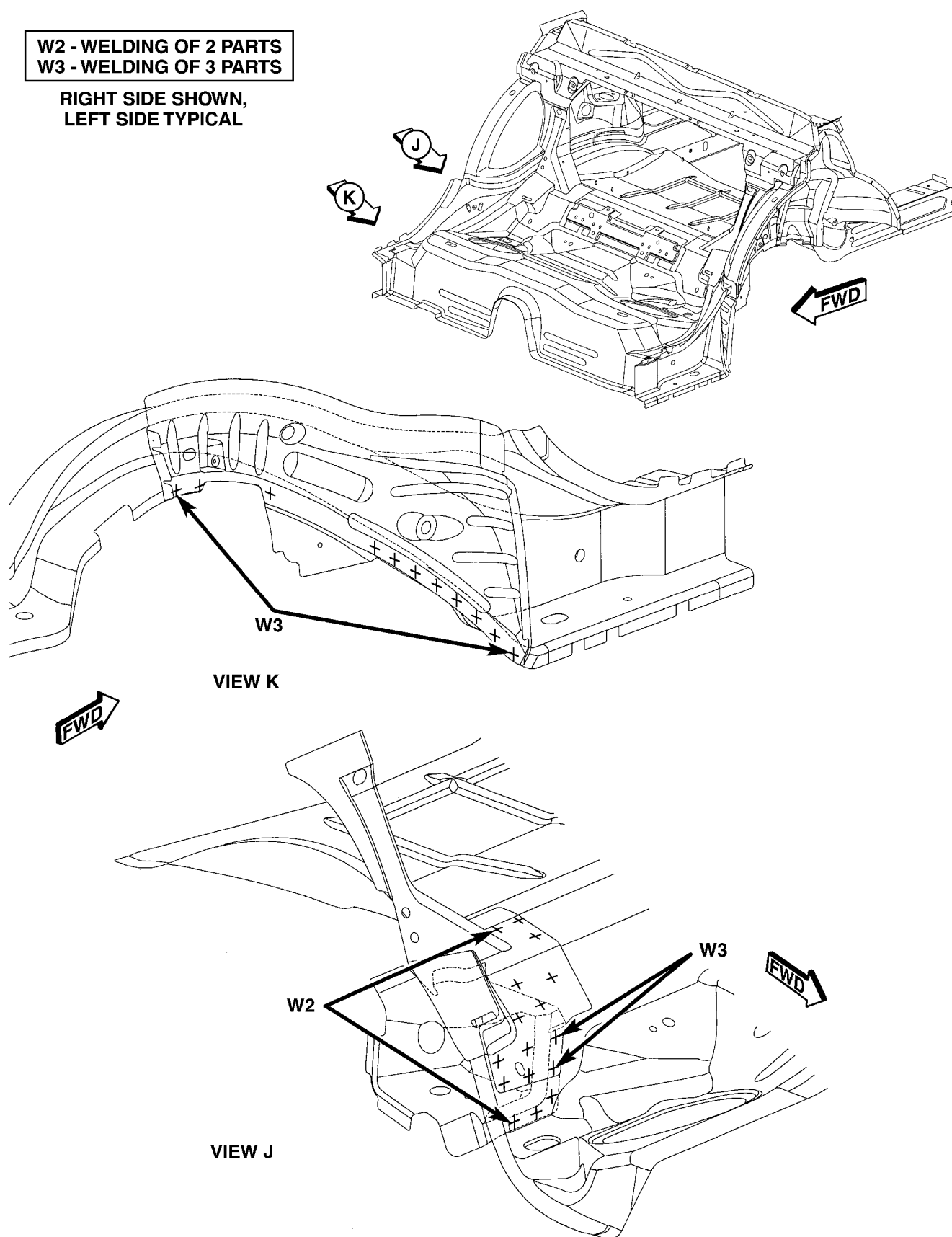


8138948b

Fig. 170 REAR FLOOR/LADDER COMPLETE (5 OF 8)

W2 - WELDING OF 2 PARTS  
W3 - WELDING OF 3 PARTS

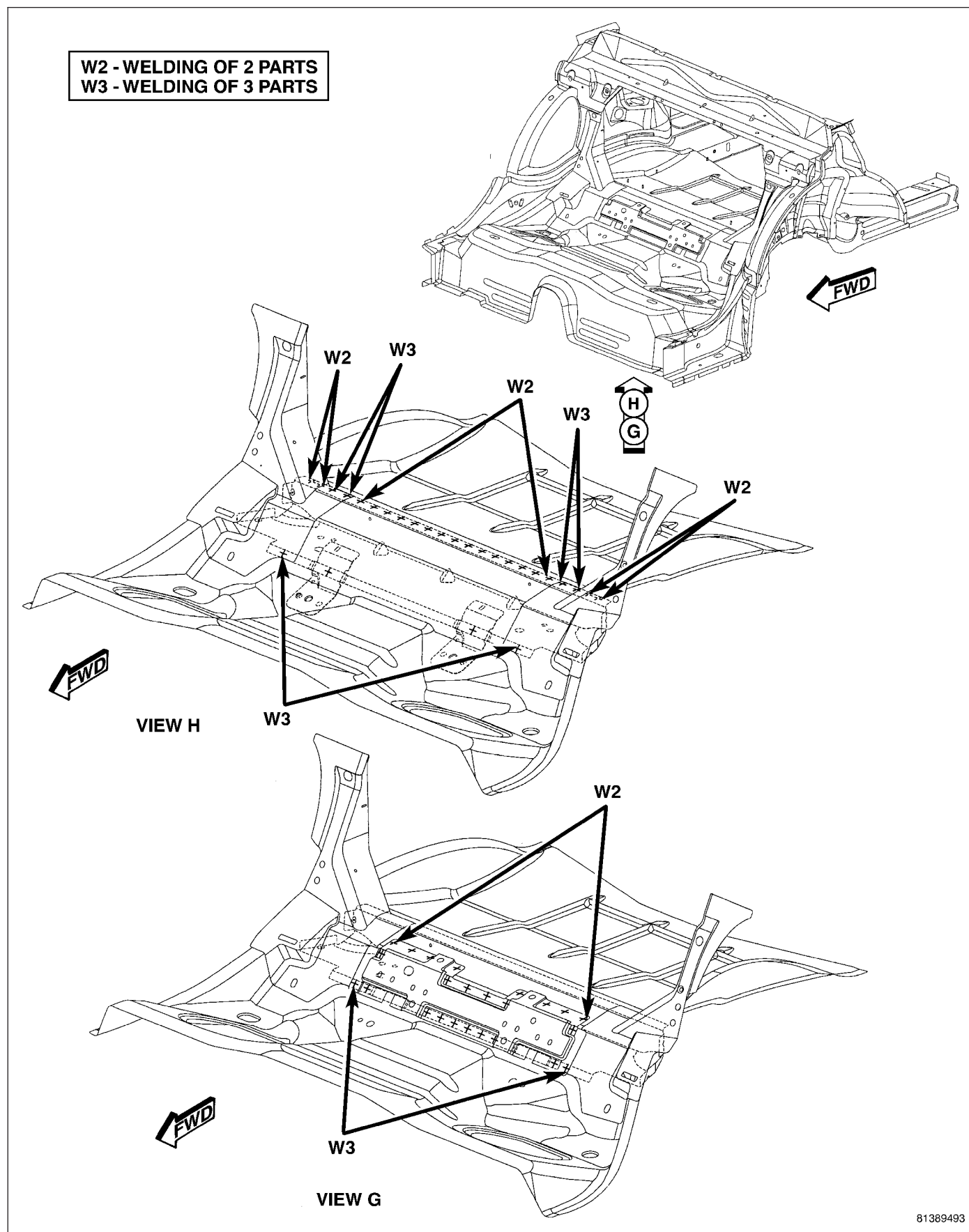
RIGHT SIDE SHOWN,  
LEFT SIDE TYPICAL



8138948f

Fig. 171 REAR FLOOR/LADDER COMPLETE (6 OF 8)





**Fig. 172 REAR FLOOR/LADDER COMPLETE (7 OF 8)**





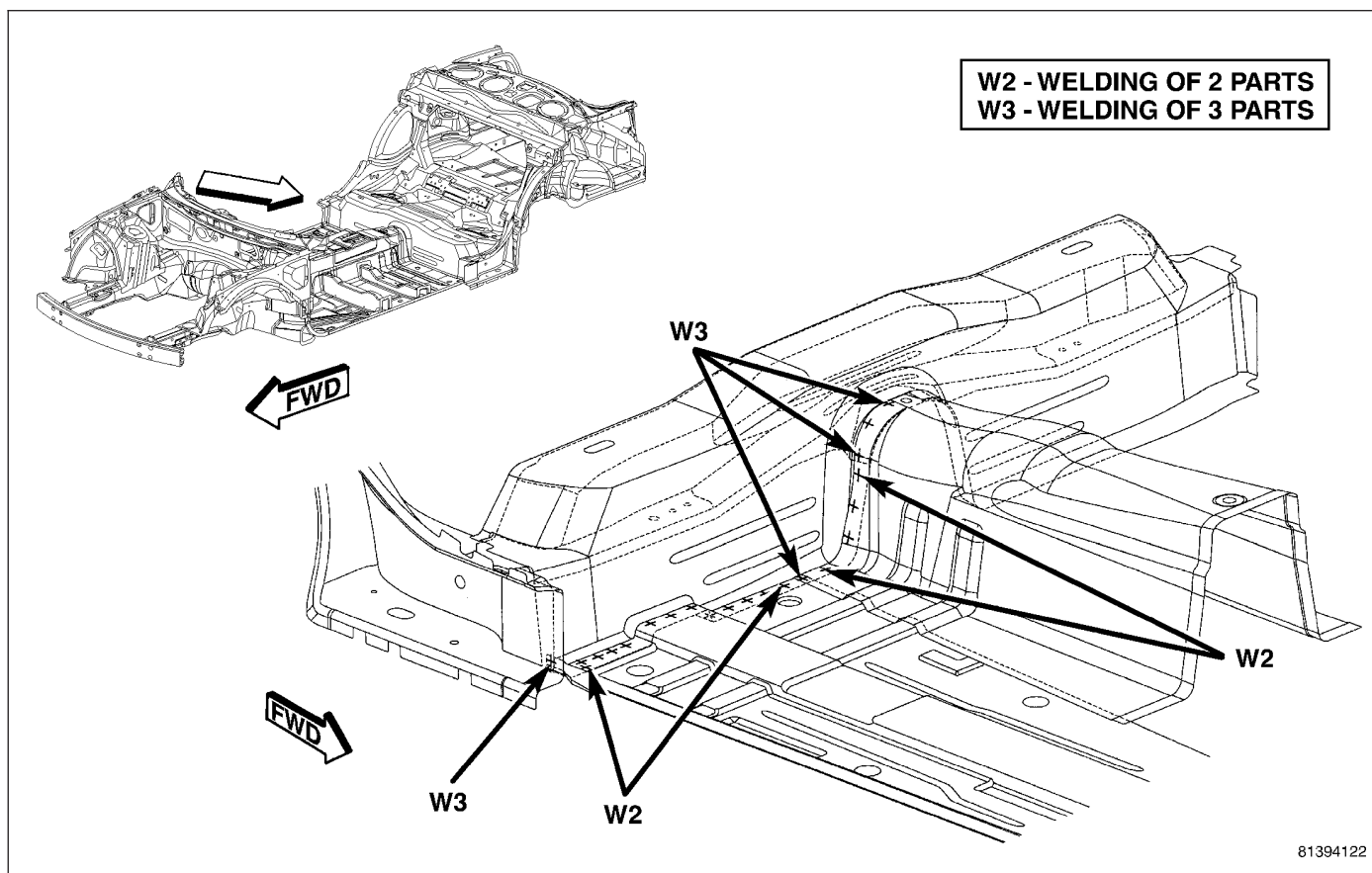


Fig. 175 UNDERBODY FRAMING (2 OF 5)

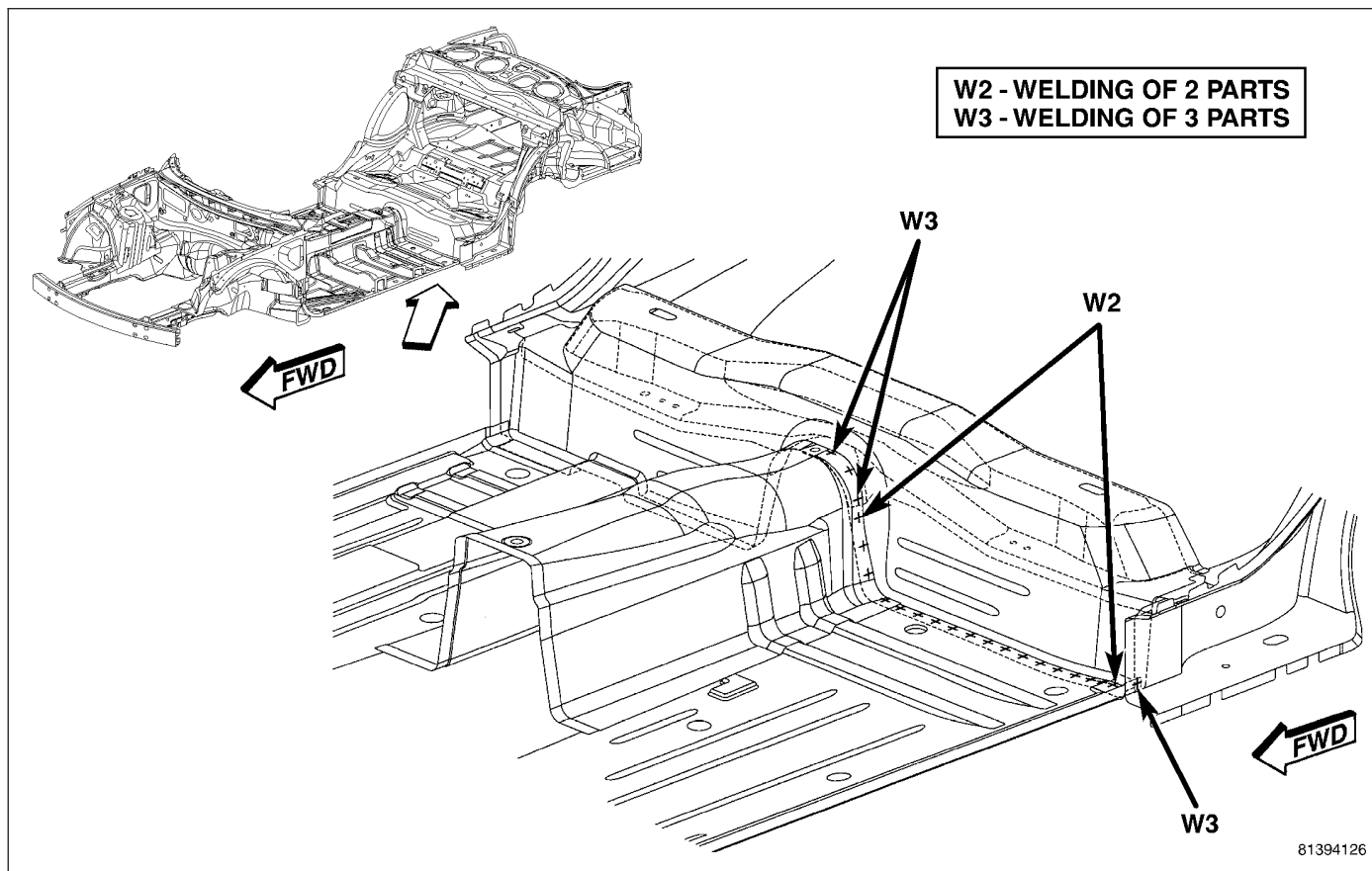
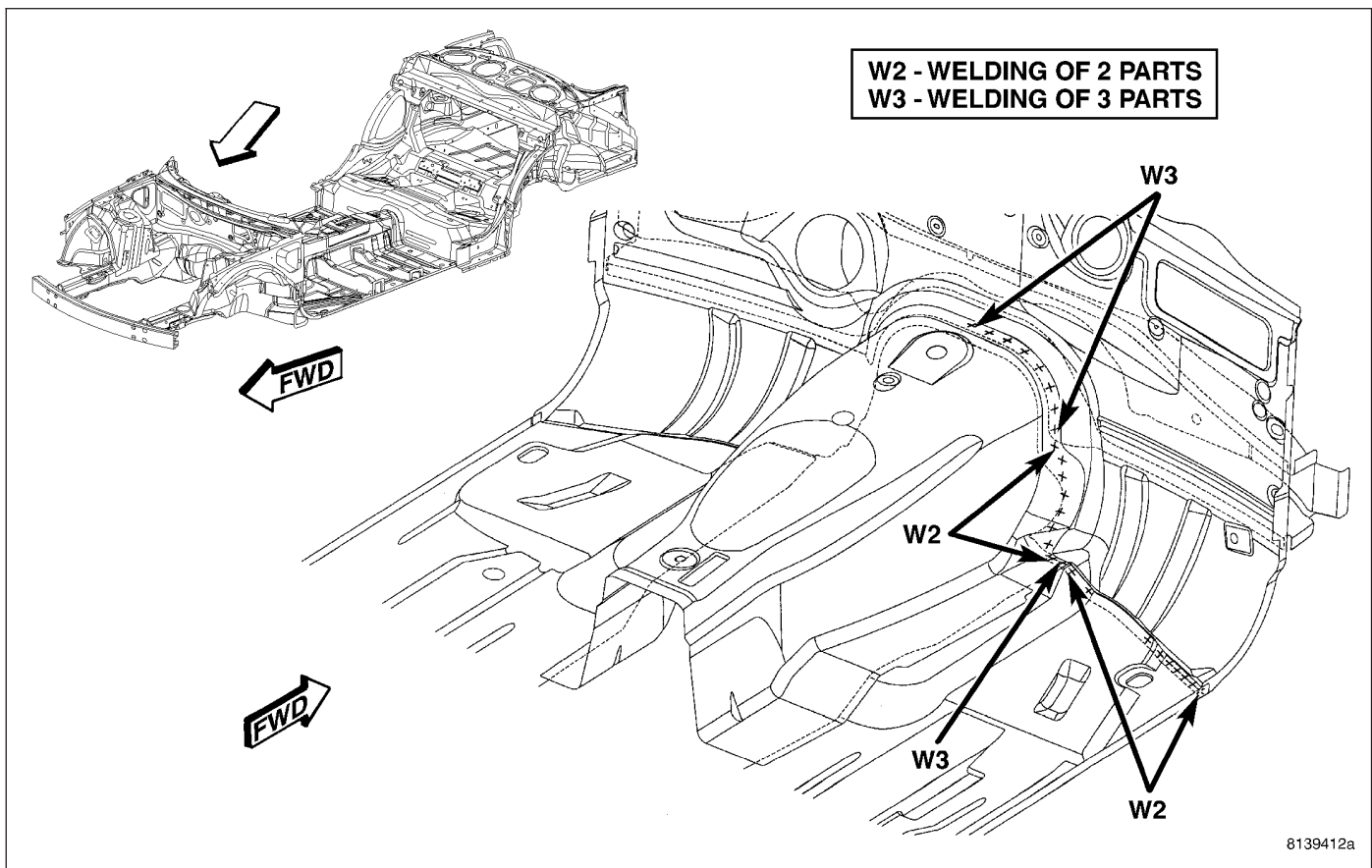
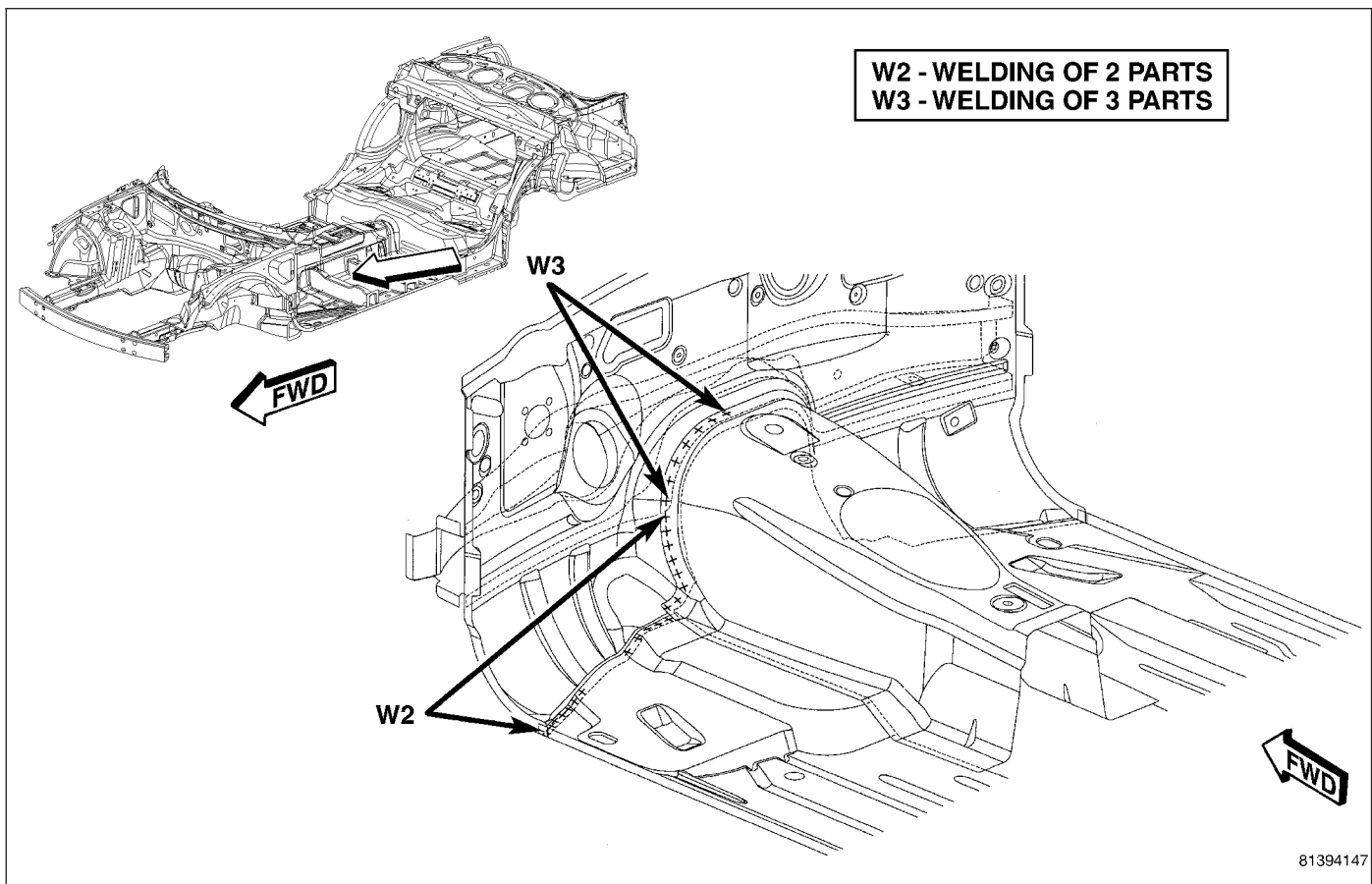


Fig. 176 UNDERBODY FRAMING (3 OF 5)



**Fig. 177 UNDERBODY FRAMING (4 OF 5)**



**Fig. 178 UNDERBODY FRAMING (5 OF 5)**



# HEATING & AIR CONDITIONING

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## HVAC - ELECTRICAL DIAGNOSTICS

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## HVAC - ELECTRICAL DIAGNOSTICS

### DIAGNOSIS AND TESTING

## 11–MODE POT OPEN (MTC)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the mode pot fails the internal self test.

Possible Causes
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

### Diagnostic Test

#### 1. REPLACE THE A/C HEATER CONTROL

#### Repair

Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

12-MODE POT SHORTED (MTC)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the mode pot fails the internal self test.

Possible Causes
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. REPLACE THE A/C HEATER CONTROL

Repair

Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

## 13–TEMP POT OPEN (MTC)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the temp pot fails the internal self test.

Possible Causes
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

## Diagnostic Test

### 1. REPLACE THE A/C HEATER CONTROL

#### Repair

Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---



14–TEMP POT SHORTED (MTC)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the temp pot fails the internal self test.

Possible Causes
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

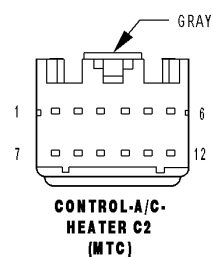
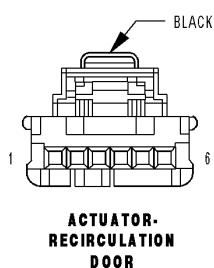
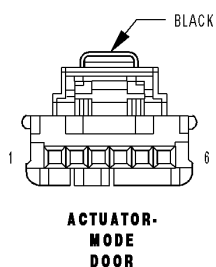
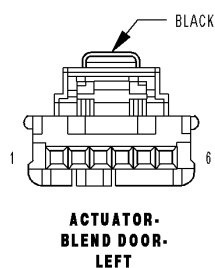
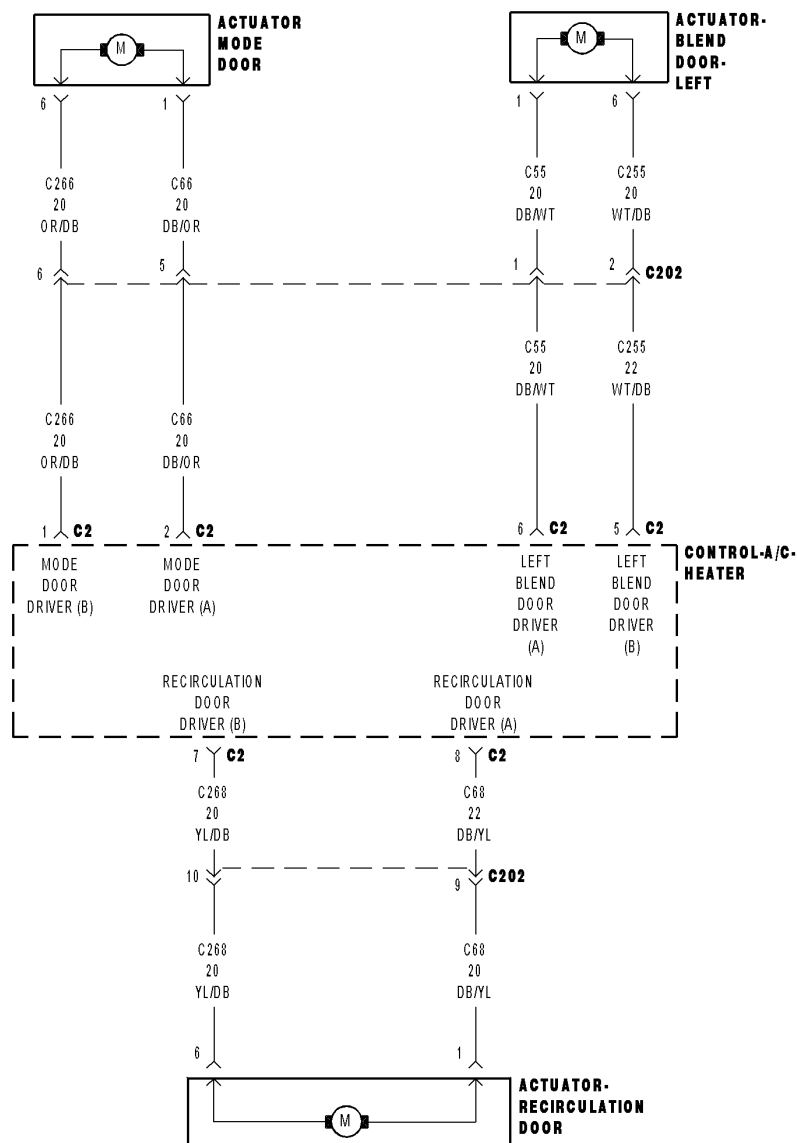
Diagnostic Test

1. REPLACE THE A/C HEATER CONTROL

Repair

Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

# 15-MODE NOT RESPONDING/STALLED (MTC)



**15-MODE NOT RESPONDING/STALLED (MTC) (CONTINUED)**

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When driving the Mode Door Actuator.
- **Set Condition:**  
If the A/C Heater Control fails to detect commutator pulses.

Possible Causes
MODE DOOR SEIZED, BINDING, OBSTRUCTED (C66) MODE DOOR DRIVER (A) CIRCUIT SHORTED TO VOLTAGE (C266) MODE DOOR DRIVER (B) CIRCUIT SHORTED TO VOLTAGE (C66) MODE DOOR DRIVER (A) CIRCUIT SHORTED TO GROUND (C266) MODE DOOR DRIVER (B) CIRCUIT SHORTED TO GROUND (C66) MODE DOOR DRIVER (A) CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S) (C266) MODE DOOR DRIVER (B) CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S) (C66) MODE DOOR DRIVER (A) CIRCUIT SHORTED TO (C266) MODE DOOR DRIVER (B) CIRCUIT (C66) MODE DOOR DRIVER (A) CIRCUIT OPEN (C266) MODE DOOR DRIVER (B) CIRCUIT OPEN MODE DOOR ACTUATOR A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

**Diagnostic Test****1. RUN THE ACTUATOR CALIBRATION FUNCTION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Actuate the Actuator Calibration function by performing the following:

- Turn the ignition on.
- Turn the blower control to off.
- Press the EBL mode switch down for 5 seconds and then release it.
- Wait approximately 90 seconds for the calibration process to run to completion before proceeding.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Actuate the Display DTC function by performing the following:

- Turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.

**Note:** The A/C status indicator displays active DTCs when the EBL status indicator is not illuminated and stored DTCs when the EBL status indicator is illuminated.

Read DTCs from the flashing A/C status indicator.

**Does the A/C status indicator flash DTC 22?**

- Yes** >> Diagnose and Repair the DTC. Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Go To 2

**15-MODE NOT RESPONDING/STALLED (MTC) (CONTINUED)****2. CHECK (C66) MODE DOOR DRIVER (A) CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the A/C Heater Control C2 harness connector.

Turn the ignition on.

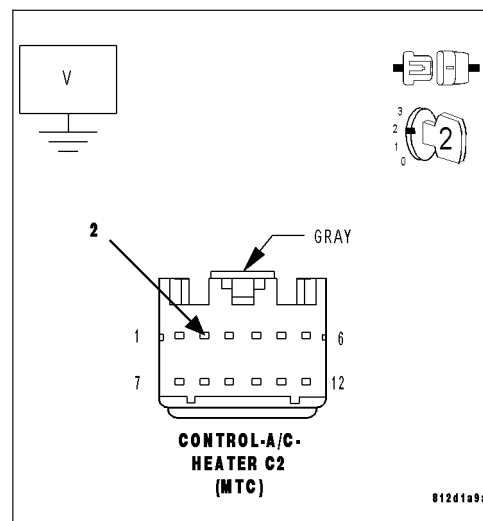
Measure the voltage of the (C66) Mode Door Driver (A) circuit.

**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (C66) Mode Door Driver (A) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 3

**3. CHECK (C266) MODE DOOR DRIVER (B) CIRCUIT FOR A SHORT TO VOLTAGE**

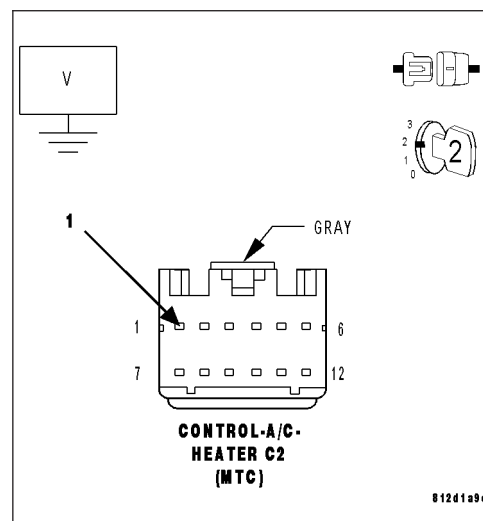
Measure the voltage of the (C266) Mode Door Driver (B) circuit.

**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (C266) Mode Door Driver (B) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 4



**15-MODE NOT RESPONDING/STALLED (MTC) (CONTINUED)****4. CHECK (C66) MODE DOOR DRIVER (A) CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

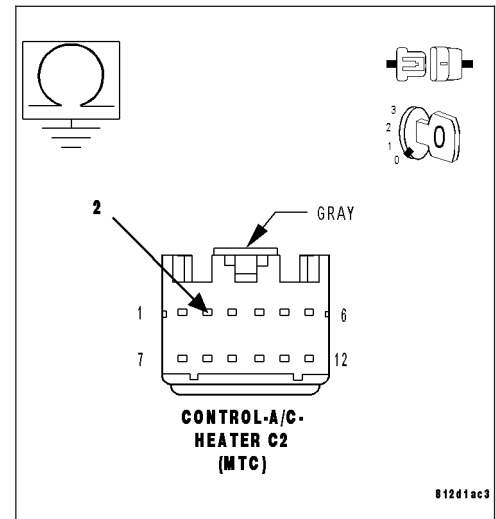
Measure the resistance of the (C66) Mode Door Driver (A) circuit between ground and the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C66) Mode Door Driver (A) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 5

**5. CHECK (C266) MODE DOOR DRIVER (B) CIRCUIT FOR A SHORT TO GROUND**

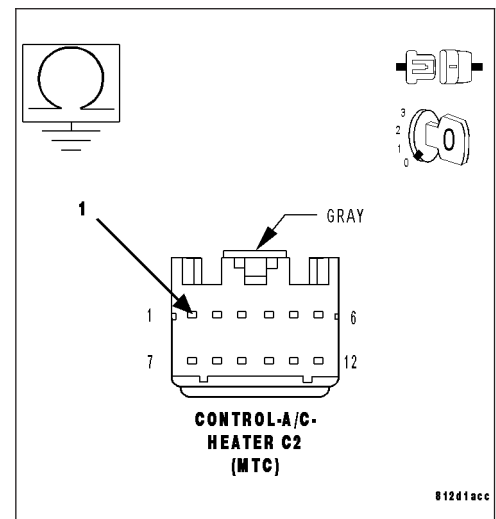
Measure the resistance of the (C266) Mode Door Driver (B) circuit between ground and the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C266) Mode Door Driver (B) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 6





**15-MODE NOT RESPONDING/STALLED (MTC) (CONTINUED)****8. CHECK MODE DOOR ACTUATOR CIRCUIT RESISTANCE**

Measure the resistance between the (C66) Mode Door Driver (A) circuit and the (C266) Mode Door Driver (B) circuit in the A/C Heater Control C2 harness connector.

**What is the resistance?**

**Below 30 Ohms**

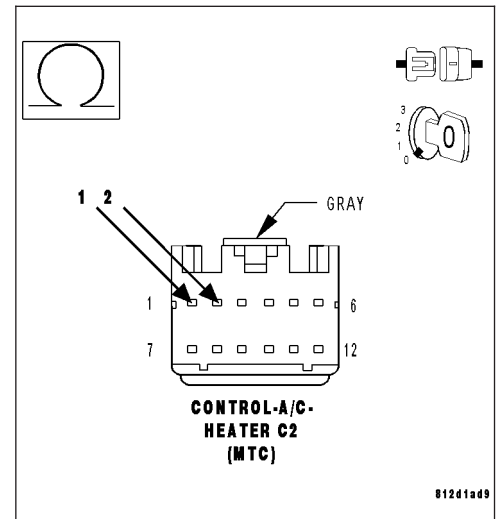
Go To 9

**Above 70 Ohms**

Go To 10

**30 to 70 Ohms**

Go To 12

**9. CHECK (C66) MODE DOOR DRIVER (A) CIRCUIT FOR A SHORT TO (C266) MODE DOOR DRIVER (B) CIRCUIT**

Disconnect the Mode Door Actuator harness connector.

Measure the resistance between the (C66) Mode Door Driver (A) circuit and the (C266) Mode Door Driver (B) circuit in the A/C Heater Control C2 harness connector.

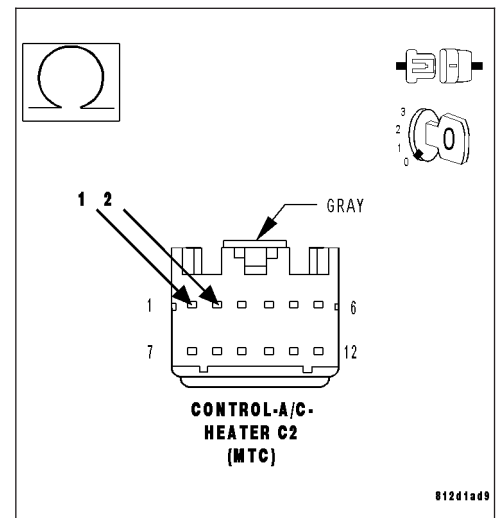
**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C66) Mode Door Driver (A) circuit for a short to the (C266) Mode Door Driver (B) circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Replace the Mode Door Actuator in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



## 15-MODE NOT RESPONDING/STALLED (MTC) (CONTINUED)

### 10. CHECK (C66) MODE DOOR DRIVER (A) CIRCUIT FOR AN OPEN

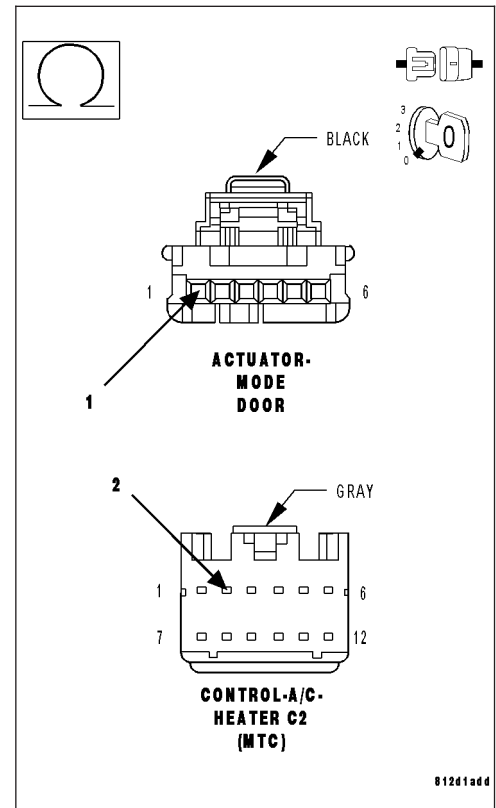
Disconnect the Mode Door Actuator harness connector.

Measure the resistance of the (C66) Mode Door Driver (A) circuit between the A/C Heater Control C2 harness connector and the Mode Door Actuator harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 11

**No** >> Repair the (C66) Mode Door Driver (A) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



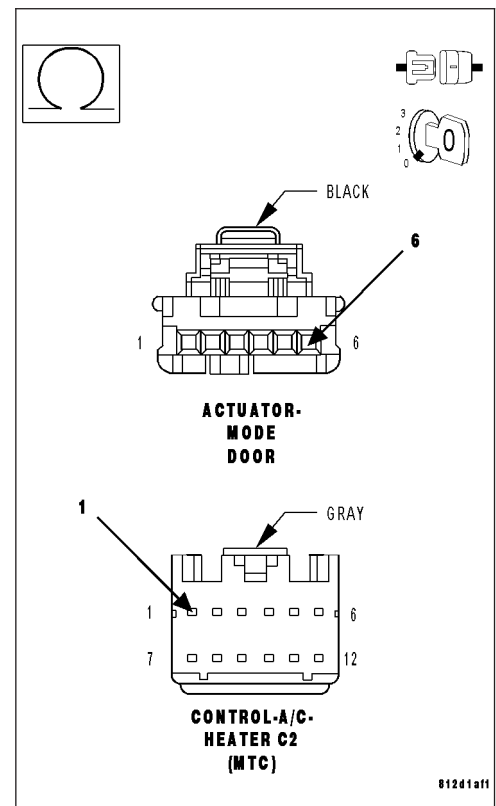
### 11. CHECK (C266) MODE DOOR DRIVER (B) CIRCUIT FOR AN OPEN

Measure the resistance of the (C266) Mode Door Driver (B) circuit between the A/C Heater Control C2 harness connector and the Mode Door Actuator harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Mode Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair the (C266) Mode Door Driver (B) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).





**15-MODE NOT RESPONDING/STALLED (MTC) (CONTINUED)****12. RUN THE ACTUATOR CALIBRATION FUNCTION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Reconnect the A/C Heater Control C2 harness connector.

Actuate the Actuator Calibration function by performing the following:

- Turn the ignition on.
- Turn the blower control to off.
- Press the EBL mode switch down for 5 seconds and then release it.
- Wait approximately 90 seconds for the calibration process to run to completion before proceeding.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Actuate the Display DTC function by performing the following:

- Turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.

**Note: The A/C status indicator displays active DTCs when the EBL status indicator is not illuminated and stored DTCs when the EBL status indicator is illuminated.**

Read DTCs from the flashing A/C status indicator.

**Does the A/C status indicator flash DTC 15?**

**Yes** >> Replace the A/C Heater Control in accordance with the Service Information.

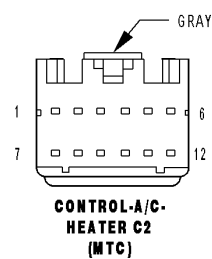
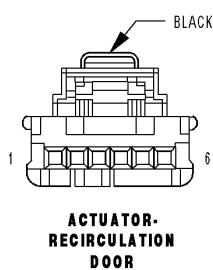
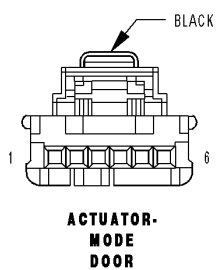
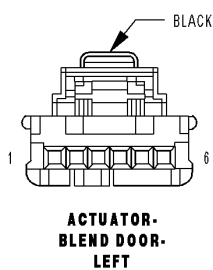
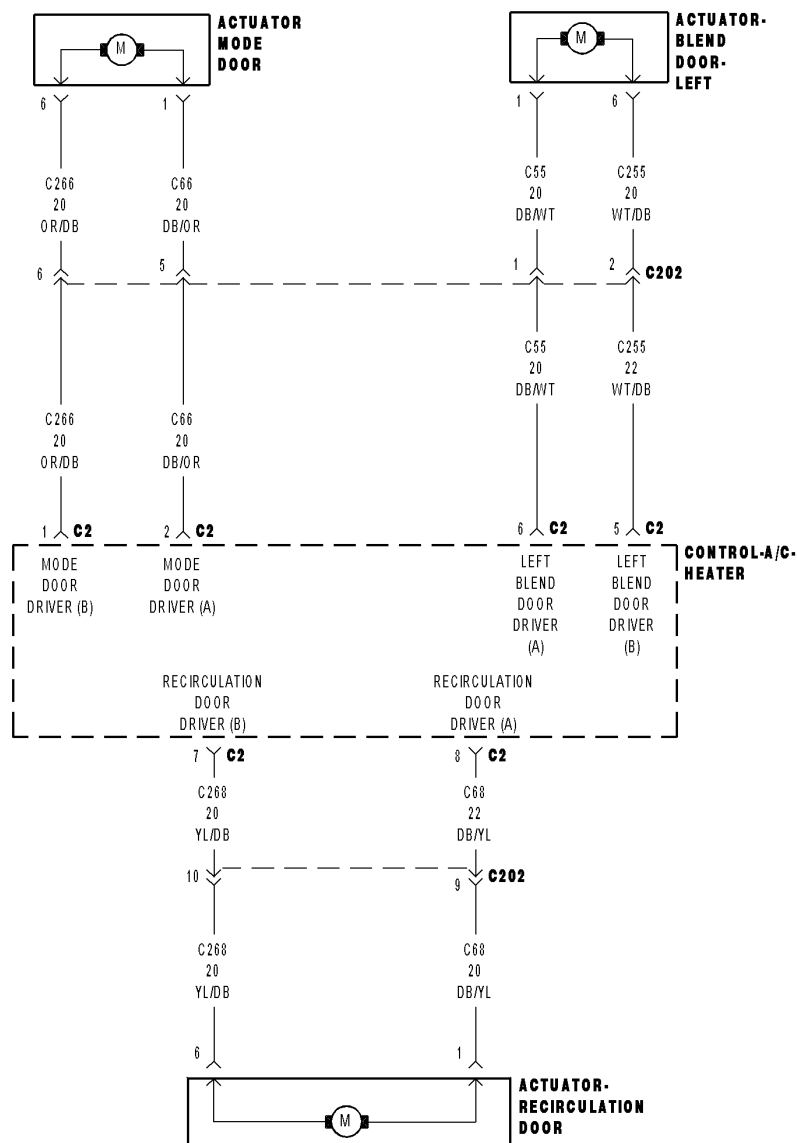
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Using the wiring diagram as a guide inspect the wiring and connectors for a condition causing an intermittent loss of commutator pulses from the Mode Door Actuator.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

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## 17-BLEND NOT RESPONDING/STALLED (MTC)



**17-BLEND NOT RESPONDING/STALLED (MTC) (CONTINUED)**

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When driving the Blend Door Actuator.
- **Set Condition:**  
If the A/C Heater Control fails to detect commutator pulses.

Possible Causes
BLEND DOOR SEIZED, BINDING, OBSTRUCTED (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT SHORTED TO VOLTAGE (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT SHORTED TO VOLTAGE (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT SHORTED TO GROUND (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT SHORTED TO GROUND (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S) (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S) (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT SHORTED TO (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT OPEN (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT OPEN BLEND DOOR ACTUATOR A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

**Diagnostic Test****1. RUN THE ACTUATOR CALIBRATION FUNCTION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Actuate the Actuator Calibration function by performing the following:

- Turn the ignition on.
- Turn the blower control to off.
- Press the EBL mode switch down for 5 seconds and then release it.
- Wait approximately 90 seconds for the calibration process to run to completion before proceeding.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Actuate the Display DTC function by performing the following:

- Turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.

**Note:** The A/C status indicator displays active DTCs when the EBL status indicator is not illuminated and stored DTCs when the EBL status indicator is illuminated.

Read DTCs from the flashing A/C status indicator.

**Does the A/C status indicator flash DTC 18?**

**Yes** >> Diagnose and Repair the DTC. Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 2

**17-BLEND NOT RESPONDING/STALLED (MTC) (CONTINUED)****2. CHECK (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the A/C Heater Control C2 harness connector.

Turn the ignition on.

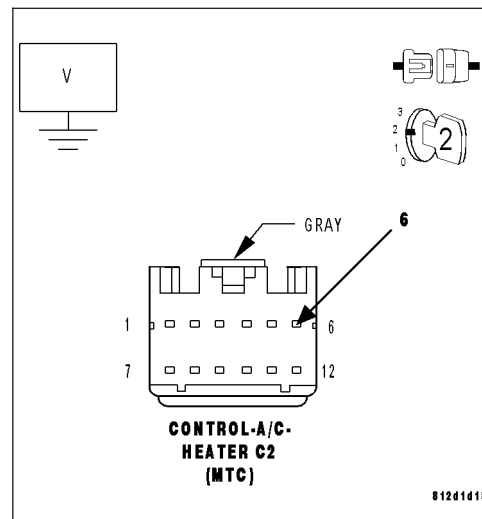
Measure the voltage of the (C55) Left Blend Door Driver (A) circuit.

**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (C55) Left Blend Door Driver (A) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 3

**3. CHECK (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT FOR A SHORT TO VOLTAGE**

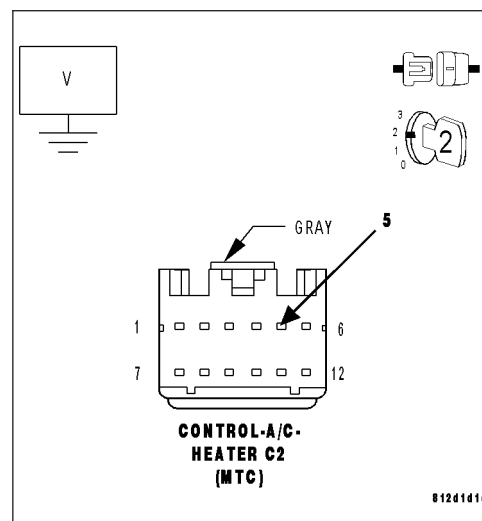
Measure the voltage of the (C255) Left Blend Door Driver (B) circuit.

**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (C255) Left Blend Door Driver (B) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 4



**17-BLEND NOT RESPONDING/STALLED (MTC) (CONTINUED)****4. CHECK (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

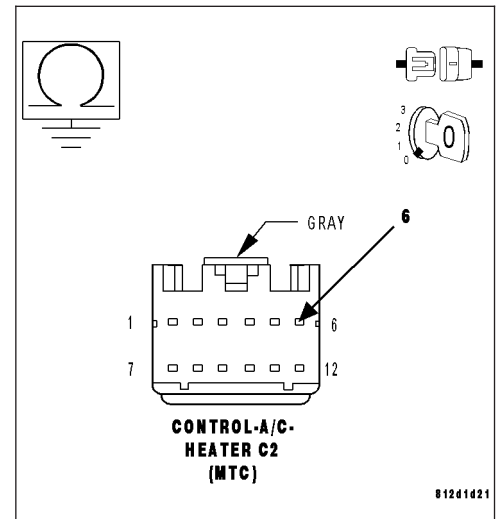
Measure the resistance of the (C55) Left Blend Door Driver (A) circuit between ground and the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C55) Left Blend Door Driver (A) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 5

**5. CHECK (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT FOR A SHORT TO GROUND**

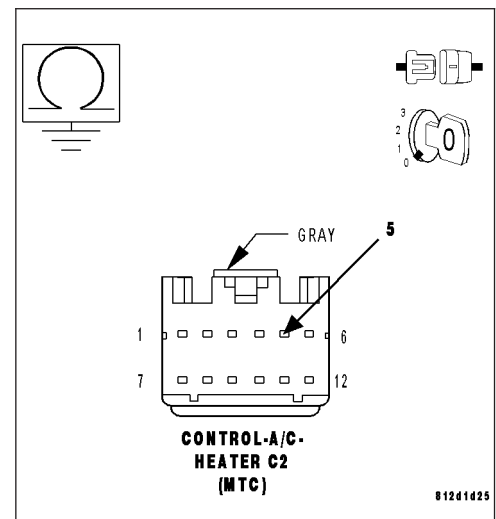
Measure the resistance of the (C255) Left Blend Door Driver (B) circuit between ground and the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C255) Left Blend Door Driver (B) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 6



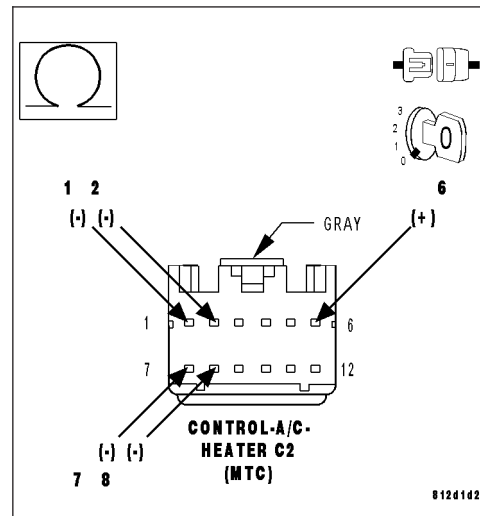
**17-BLEND NOT RESPONDING/STALLED (MTC) (CONTINUED)****6. CHECK (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)**

Measure the resistance between the (C55) Left Blend Door Driver (A) circuit and the (C266) Mode Door Driver (B) circuit, the (C66) Mode Door Driver (A) circuit, the (C268) Recirculation Door Driver (B) circuit, and the (C68) Recirculation Door Driver (A) circuit in the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms between the (C55) Left Blend Door Driver (A) circuit and any of the other door driver circuits?**

**Yes** >> Repair the circuits with a resistance below 10k ohms for a short to the (C55) Left Blend Door Driver (A) circuit.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 7

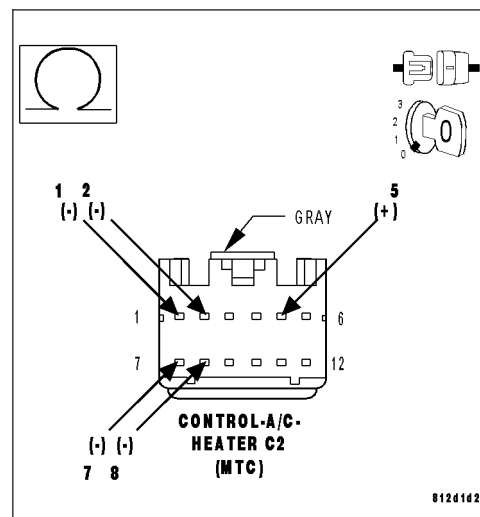
**7. CHECK (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)**

Measure the resistance between the (C255) Left Blend Door Driver (B) circuit and the (C266) Mode Door Driver (B) circuit, the (C66) Mode Door Driver (A) circuit, the (C268) Recirculation Door Driver (B) circuit, and the (C68) Recirculation Door Driver (A) circuit in the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms between the (C255) Left Blend Door Driver (B) circuit and any of the other door driver circuits?**

**Yes** >> Repair the circuits with a resistance below 10k ohms for a short to the (C255) Left Blend Door Driver (B) circuit.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 8



**17-BLEND NOT RESPONDING/STALLED (MTC) (CONTINUED)****8. CHECK BLEND DOOR ACTUATOR CIRCUIT RESISTANCE**

Measure the resistance between the (C55) Left Blend Door Driver (A) circuit and the (C255) Left Blend Door Driver (B) circuit in the A/C Heater Control C2 harness connector.

**What is the resistance?**

**Below 30 Ohms**

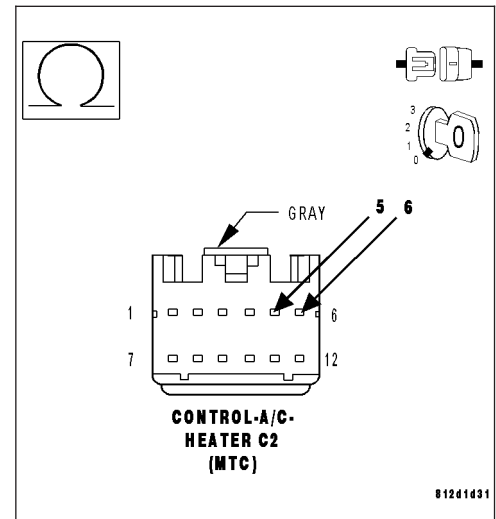
Go To 9

**Above 70 Ohms**

Go To 10

**30 to 70 Ohms**

Go To 12

**9. CHECK (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT FOR A SHORT TO (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT**

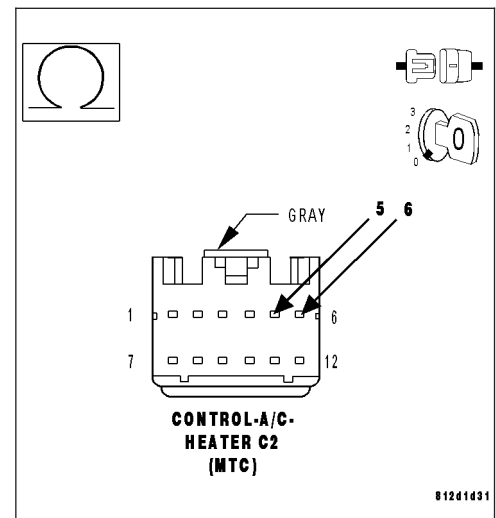
Disconnect the Blend Door Actuator harness connector.

Measure the resistance between the (C55) Left Blend Door Driver (A) circuit and the (C255) Left Blend Door Driver (B) circuit in the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C55) Left Blend Door Driver (A) circuit for a short to the (C255) Left Blend Door Driver (B) circuit.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Replace the Blend Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**17-BLEND NOT RESPONDING/STALLED (MTC) (CONTINUED)****10. CHECK (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT FOR AN OPEN**

Disconnect the Blend Door Actuator harness connector.

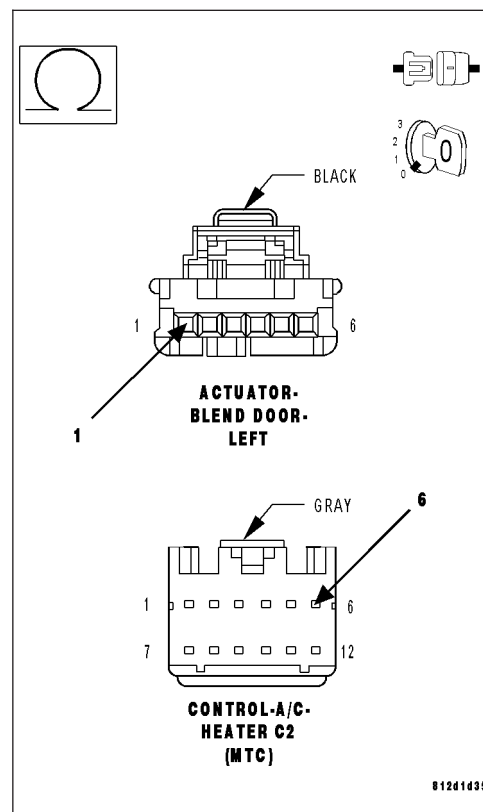
Measure the resistance of the (C55) Left Blend Door Driver (A) circuit between the A/C Heater Control C2 harness connector and the Blend Door Actuator harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 11

**No** >> Repair the (C55) Left Blend Door Driver (A) circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1)..

**11. CHECK (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT FOR AN OPEN**

Measure the resistance of the (C255) Left Blend Door Driver (B) circuit between the A/C Heater Control C2 harness connector and the Blend Door Actuator harness connector.

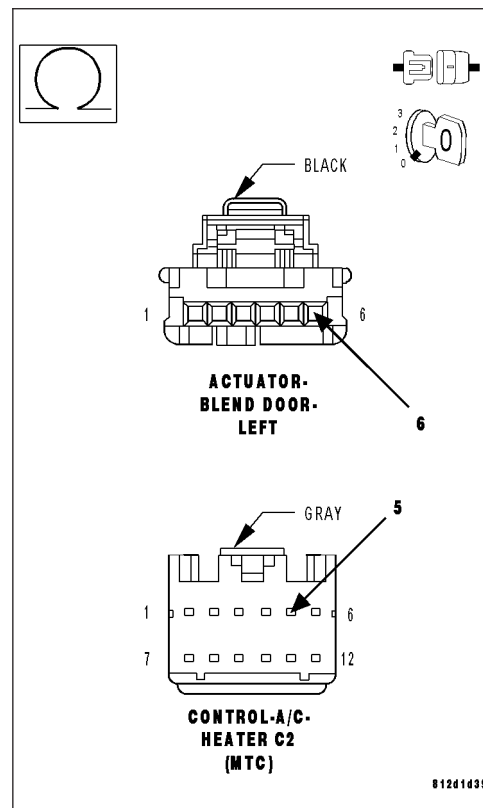
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Blend Door Actuator in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair the (C255) Left Blend Door Driver (B) circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).





**17-BLEND NOT RESPONDING/STALLED (MTC) (CONTINUED)****12. RUN THE ACTUATOR CALIBRATION FUNCTION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Reconnect the A/C Heater Control C2 harness connector.

Actuate the Actuator Calibration function by performing the following:

- Turn the ignition on.
- Turn the blower control to off.
- Press the EBL mode switch down for 5 seconds and then release it.
- Wait approximately 90 seconds for the calibration process to run to completion before proceeding.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Actuate the Display DTC function by performing the following:

- Turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.

**Note: The A/C status indicator displays active DTCs when the EBL status indicator is not illuminated and stored DTCs when the EBL status indicator is illuminated.**

Read DTCs from the flashing A/C status indicator.

**Does the A/C status indicator flash DTC 17?**

**Yes** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Using the wiring diagram as a guide, inspect the wiring and connectors for a condition causing an intermittent loss of commutator pulses from the Blend Door Actuator.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

## 18-BLEND RANGE TOO SMALL (MTC)

For a complete wiring diagram **Refer to Section 8W.**

### Theory of Operation

The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is less than the expected range for this actuator, this DTC will set. Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING for additional information.

- **When Monitored:**  
During actuator calibration.
- **Set Condition:**  
If the total span of the Blend Door is less than the low range limit.

Possible Causes
BLEND DOOR SEIZED, BINDING, OBSTRUCTED
BLEND DOOR ACTUATOR
A/C HEATER CONTROL

### Diagnostic Test

#### 1. INSPECT ACTUATOR & HOUSING ASSEMBLY FOR A CONDITION CAUSING THE DOOR TO SEIZE OR BIND

Turn the ignition off.

Inspect the actuator, linkage, and housing assembly for a condition causing the door to seize or bind.

**Are there any physical or mechanical problems with the door, housing, linkage, or actuator?**

- Yes** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Go To 2

#### 2. CHECK BLEND DOOR TRAVEL

Remove the Blend Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the door in both directions. The door should operate smoothly in both directions over approximately 190 degrees of travel.

**Does the door operate smoothly in both directions over approximately 190 degrees of travel?**

- Yes** >> Replace the Blend Door Actuator in accordance with the Service Information. Then, Go To 3.
- No** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**18-BLEND RANGE TOO SMALL (MTC) (CONTINUED)****3. RUN THE ACTUATOR CALIBRATION FUNCTION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Actuate the Actuator Calibration function by performing the following:

- Turn the ignition on.
- Turn the blower control to off.
- Press the EBL mode switch down for 5 seconds and then release it.
- Wait approximately 90 seconds for the calibration process to run to completion before proceeding.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Actuate the Display DTC function by performing the following:

- Turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.

**Note: The A/C status indicator displays active DTCs when the EBL status indicator is not illuminated and stored DTCs when the EBL status indicator is illuminated.**

Read DTCs from the flashing A/C status indicator.

**Does the A/C status indicator flash DTC 18?**

**Yes** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

## 21-BLEND RANGE TOO LARGE (MTC)

For a complete wiring diagram **Refer to Section 8W.**

### Theory of Operation

The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is greater than the expected range for this actuator, this DTC will set. Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING for additional information.

- **When Monitored:**  
During actuator calibration.
- **Set Condition:**  
If the total span of the Blend Door exceeds the high range limit.

Possible Causes
BLEND DOOR OR A/C HEATER HOUSING COMPONENTS WARPED, WORN, DAMAGED, MISSING, BROKEN
BLEND DOOR ACTUATOR
A/C HEATER CONTROL

### Diagnostic Test

#### 1. CHECK FOR A BROKEN BLEND DOOR ACTUATOR

Turn the ignition off.

Remove the Blend Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the actuator in both directions.

**Does the actuator turn in either direction?**

- Yes** >> Replace the Blend Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Go To 2

#### 2. CHECK BLEND DOOR & A/C HEATER HOUSING FOR WARPED, WORN, DAMAGED, MISSING, & BROKEN COMPONENTS

Inspect for excessively worn, disconnected, missing, or broken door linkage. Inspect for a damaged or broken A/C Heater Housing Assembly. Inspect for a warped or broken door, and missing door seals. Rotate the door from stop to stop. The door should rotate approximately 190 degrees.

**Are there any physical or mechanical problems with the door or housing?**

- Yes** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Replace the Blend Door Actuator in accordance with the Service Information. Then, Go To 3.

**21-BLEND RANGE TOO LARGE (MTC) (CONTINUED)****3. RUN THE ACTUATOR CALIBRATION FUNCTION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Actuate the Actuator Calibration function by performing the following:

- Turn the ignition on.
- Turn the blower control to off.
- Press the EBL mode switch down for 5 seconds and then release it.
- Wait approximately 90 seconds for the calibration process to run to completion before proceeding.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Actuate the Display DTC function by performing the following:

- Turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.

**Note: The A/C status indicator displays active DTCs when the EBL status indicator is not illuminated and stored DTCs when the EBL status indicator is illuminated.**

Read DTCs from the flashing A/C status indicator.

**Does the A/C status indicator flash DTC 21?**

**Yes** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

## 22–MODE RANGE TOO SMALL (MTC)

For a complete wiring diagram **Refer to Section 8W.**

### Theory of Operation

The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is less than the expected range for this actuator, this DTC will set. Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING for additional information.

- **When Monitored:**  
During actuator calibration.
- **Set Condition:**  
If the total span of the Mode Door is less than the low range limit.

Possible Causes
MODE DOOR SEIZED, BINDING, OBSTRUCTED
MODE DOOR ACTUATOR
A/C HEATER CONTROL

### Diagnostic Test

#### 1. INSPECT ACTUATOR & HOUSING ASSEMBLY FOR A CONDITION CAUSING THE DOOR TO SEIZE OR BIND

Turn the ignition off.

Inspect the actuator, linkage, and housing assembly for a condition causing the door to seize or bind.

**Are there any physical or mechanical problems with the door, housing, linkage, or actuator?**

- Yes** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Go To 2

#### 2. CHECK MODE DOOR TRAVEL

Remove the Mode Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the door in both directions. The door should operate smoothly in both directions over approximately 240 degrees of travel.

**Does the door operate smoothly in both directions over approximately 240 degrees of travel?**

- Yes** >> Replace the Mode Door Actuator in accordance with the Service Information. Then, Go To 3.
- No** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**22-MODE RANGE TOO SMALL (MTC) (CONTINUED)****3. RUN THE ACTUATOR CALIBRATION FUNCTION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Actuate the Actuator Calibration function by performing the following:

- Turn the ignition on.
- Turn the blower control to off.
- Press the EBL mode switch down for 5 seconds and then release it.
- Wait approximately 90 seconds for the calibration process to run to completion before proceeding.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Actuate the Display DTC function by performing the following:

- Turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.

**Note: The A/C status indicator displays active DTCs when the EBL status indicator is not illuminated and stored DTCs when the EBL status indicator is illuminated.**

Read DTCs from the flashing A/C status indicator.

**Does the A/C status indicator flash DTC 22?**

**Yes** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

## 23—MODE RANGE TOO LARGE (MTC)

For a complete wiring diagram **Refer to Section 8W.**

### Theory of Operation

The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is greater than the expected range for this actuator, this DTC will set. Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING for additional information.

- **When Monitored:**  
During actuator calibration.
- **Set Condition:**  
If the total span of the Mode Door exceeds the high range limit.

Possible Causes
MODE DOOR OR A/C HEATER HOUSING COMPONENTS WARPED, WORN, DAMAGED, MISSING, BROKEN
MODE DOOR ACTUATOR
A/C HEATER CONTROL

### Diagnostic Test

#### 1. CHECK FOR A BROKEN MODE DOOR ACTUATOR

Turn the ignition off.

Remove the Mode Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the actuator in both directions.

**Does the actuator turn in either direction?**

- Yes** >> Replace the Mode Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Go To 2

#### 2. CHECK MODE DOOR & A/C HEATER HOUSING FOR WARPED, WORN, DAMAGED, MISSING, & BROKEN COMPONENTS

Inspect for excessively worn, disconnected, missing, or broken door linkage. Inspect for a damaged or broken A/C Heater Housing Assembly. Inspect for a warped or broken door, and missing door seals. Rotate the door from stop to stop. The door should rotate approximately 240 degrees.

**Are there any physical or mechanical problems with the door or housing?**

- Yes** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Replace the Mode Door Actuator in accordance with the Service Information. Then, Go To 3.



**23-MODE RANGE TOO LARGE (MTC) (CONTINUED)****3. RUN THE ACTUATOR CALIBRATION FUNCTION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Actuate the Door Calibration function by performing the following:

- Turn the ignition on.
- Turn the blower control to off.
- Press the EBL mode switch down for 5 seconds and then release it.
- Wait approximately 90 seconds for the calibration process to run to completion before proceeding.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Actuate the Display DTC function by performing the following:

- Turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.

**Note: The A/C status indicator displays active DTCs when the EBL status indicator is not illuminated and stored DTCs when the EBL status indicator is illuminated.**

Read DTCs from the flashing A/C status indicator.

**Does the A/C status indicator flash DTC 23?**

**Yes** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

26–MODE ACTUATOR ACCUMULATED ERROR TOO LARGE (MTC)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
When driving the Mode Door Actuator.
- **Set Condition:**  
If the A/C Heater Control detects an excessive loss or gain of commutator pulses.

Possible Causes
MODE DOOR ACTUATOR

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. REPLACE THE MODE DOOR ACTUATOR

Repair

Replace the Mode Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

28–BLEND ACTUATOR ACCUMULATED ERROR TOO LARGE (MTC)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
When driving the Blend Door Actuator.
- **Set Condition:**  
If the A/C Heater Control detects an excessive loss or gain of commutator pulses.

Possible Causes
BLEND DOOR ACTUATOR

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

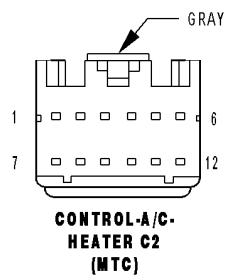
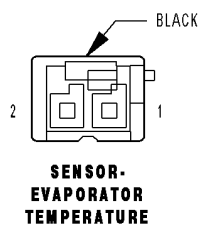
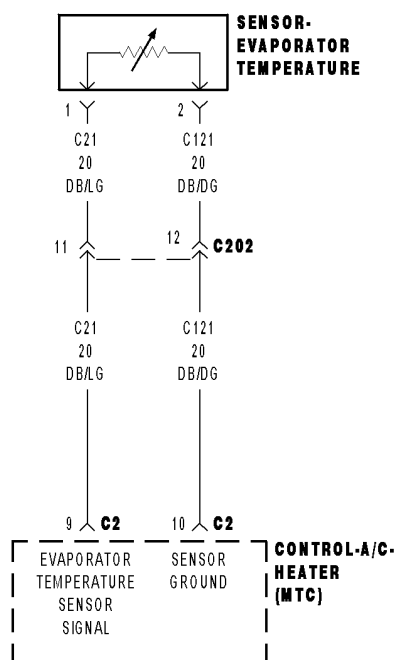
Diagnostic Test

1. REPLACE THE BLEND DOOR ACTUATOR

Repair

Replace the Blend Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

### 31-EVAPORATOR SENSOR OPEN (MTC)



31-EVAPORATOR SENSOR OPEN (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
  - **Set Condition:**  
If the Evaporator Temperature Sensor input is out of range toward the high voltage threshold.

Possible Causes
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN (C121) SENSOR GROUND CIRCUIT OPEN EVAPORATOR TEMPERATURE SENSOR A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

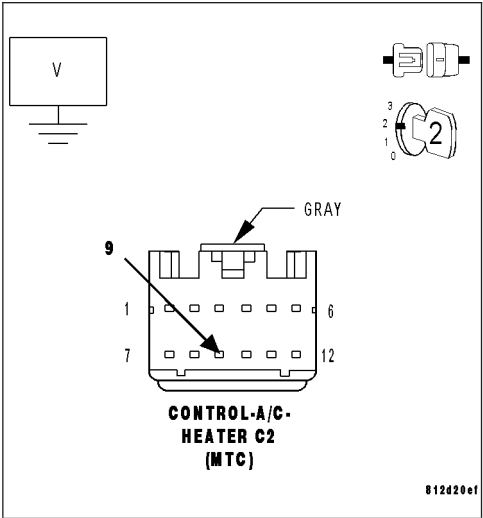
1. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.  
Disconnect the A/C Heater Control C2 harness connector.  
Turn the ignition on.  
Measure the voltage of the (C21) Evaporator Temperature Sensor Signal circuit.

- Is the voltage above 0.2 volts?**

**Yes**    >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to voltage.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No**      >> Go To 2



**31-EVAPORATOR SENSOR OPEN (MTC) (CONTINUED)****2. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT, (C121) SENSOR GROUND CIRCUIT, & EVAPORATOR TEMPERATURE SENSOR**

Turn the ignition off.

Measure the resistance between the (C21) Evaporator Temperature Sensor Signal circuit and the (C121) Sensor Ground circuit in the A/C Heater Control C2 harness connector. The approximate circuit resistance should be as follows:

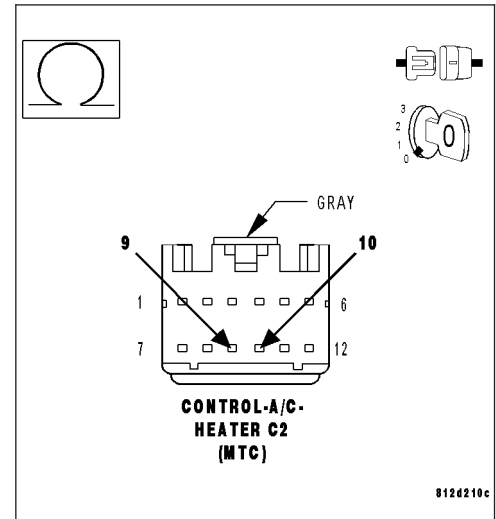
- 2925 ohms @ 38°C (100°F)
- 4050 ohms @ 30°C (86°F)
- 4985 ohms @ 25°C (77°F)
- 6498 ohms @ 19°C (66°F)
- 8989 ohms @ 12°C (54°F)
- 13307 ohms @ 4°C (39°F)
- 14860 ohms @ 2°C (36°F)

**Is the resistance within the specifications?**

**Yes** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 3

**3. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN**

Disconnect the Evaporator Temperature Sensor harness connector.

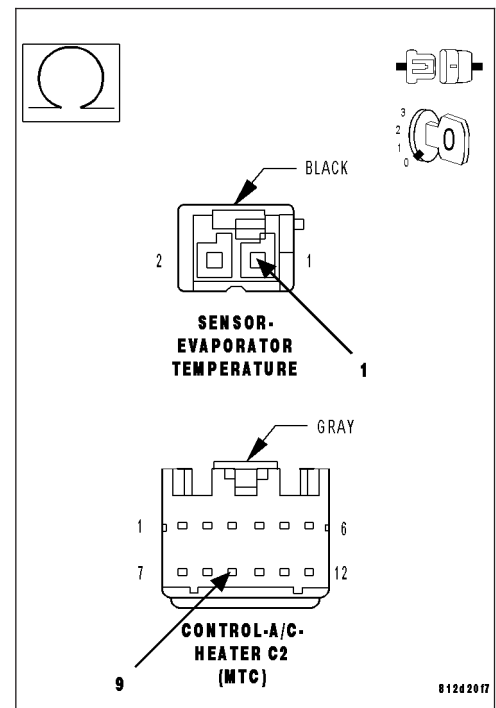
Measure the resistance of the (C21) Evaporator Temperature Sensor Signal circuit between the Evaporator Temperature Sensor harness connector and the A/C Heater Control C2 harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

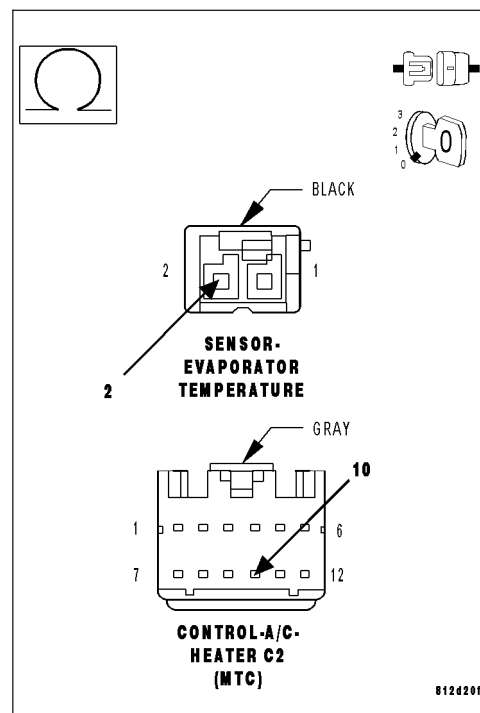


**31-EVAPORATOR SENSOR OPEN (MTC) (CONTINUED)****4. CHECK (C121) SENSOR GROUND CIRCUIT FOR AN OPEN**

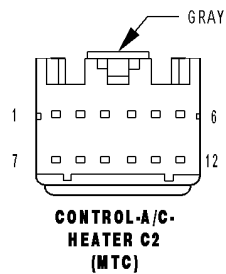
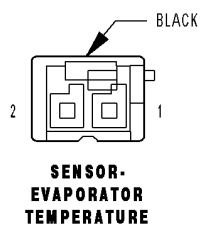
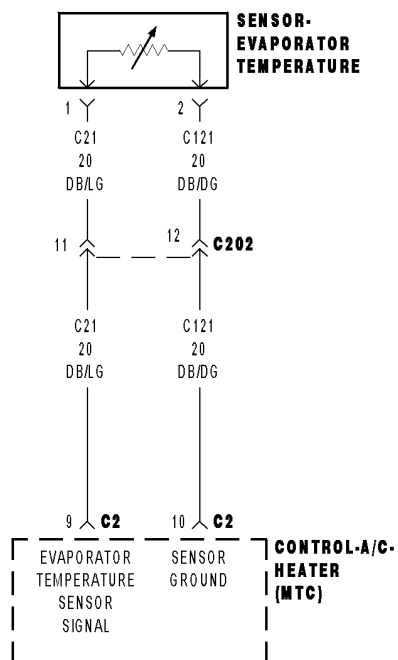
Measure the resistance of the (C121) Sensor Ground circuit between the Evaporator Temperature Sensor harness connector and the A/C Heater Control C2 harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Evaporator Temperature Sensor in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Repair the (C121) Sensor Ground circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



## 32-EVAPORATOR SENSOR SHORTED (MTC)





32-EVAPORATOR SENSOR SHORTED (MTC) (CONTINUED)

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
  - **Set Condition:**  
If the Evaporator Temperature Sensor input is out of range toward the low voltage threshold.

Possible Causes
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO (C121) SENSOR GROUND CIRCUIT EVAPORATOR TEMPERATURE SENSOR A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

Diagnostic Test

1. CHECK FOR DTC 32-EVAPORATOR SENSOR SHORTED WITH EVAPORATOR TEMPERATURE SENSOR HARNESS CONNECTOR DISCONNECTED

Turn the ignition off.

Disconnect the Evaporator Temperature Sensor harness connector.

Actuate the Clear DTC function by performing the following:

- Turn the ignition on.
  - Turn the blower control on.
  - Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.
  - When the A/C status indicator begins flashing DTCs, press the A/C mode switch down for 3 seconds and then release the switch.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Actuate the Display DTC function by performing the following:

- Turn the blower control on.
  - Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.

**Note:** The A/C status indicator displays active DTCs when the EBL status indictor is not illuminated and stored DTCs when the EBL status indicator is illuminated.

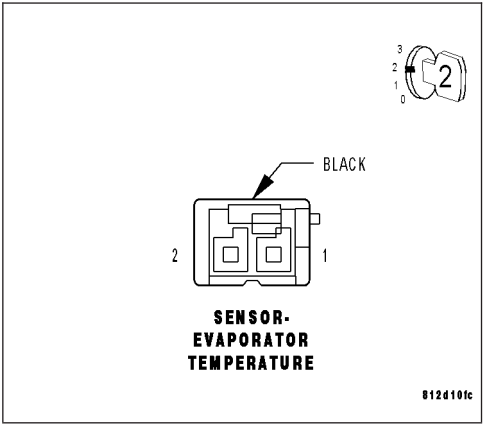
Read DTCs from the flashing A/C status indictor.

Does the A/C status indicator flash DTC 32?

- Yes

>> Go To 2
- No

>> Replace the Evaporator Temperature Sensor in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**32-EVAPORATOR SENSOR SHORTED (MTC) (CONTINUED)****2. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the A/C Heater Control C2 harness connector.

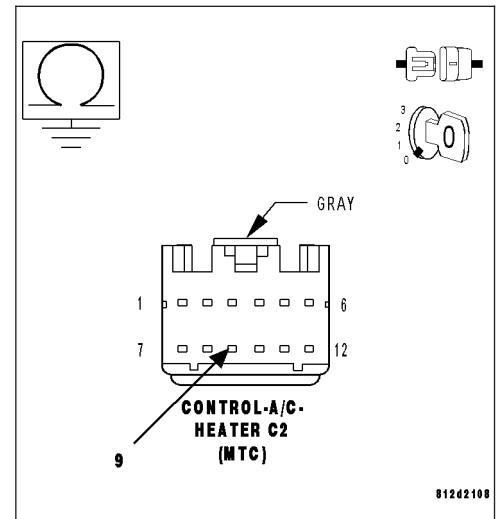
Measure the resistance of the (C21) Evaporator Temperature Sensor Signal circuit between ground and the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 3

**3. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO (C121) SENSOR GROUND CIRCUIT**

Measure the resistance between the (C21) Evaporator Temperature Sensor Signal circuit and the (C121) Sensor Ground circuit in the A/C Heater Control C2 harness connector.

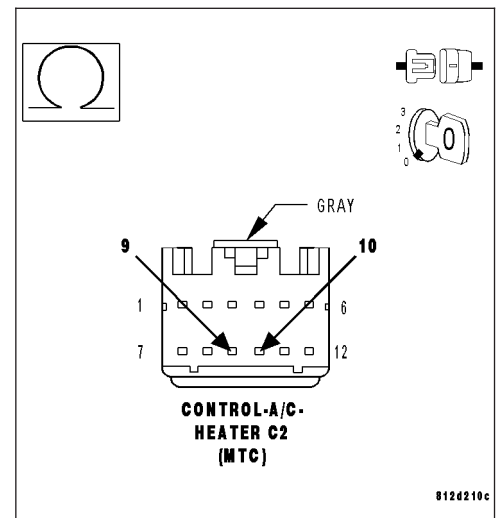
**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to the (C121) Sensor Ground circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



### 33–A/C MODE SWITCH STUCK (MTC)

For a complete wiring diagram **Refer to Section 8W.**

#### Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the A/C mode switch is stuck in a pushed position.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

#### Diagnostic Test

##### 1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION & THEN VERIFY DTC IS STILL ACTIVE

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object. Actuate the Clear DTC function by performing the following:

- Turn the ignition on.
- Turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.
- When the A/C status indicator begins flashing DTCs, press the A/C mode switch down for 3 seconds and then release the switch.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Actuate the Display DTC function by performing the following:

- Turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.

**Note:** The A/C status indicator displays active DTCs when the EBL status indicator is not illuminated and stored DTCs when the EBL status indicator is illuminated.

Read DTCs from the flashing A/C status indicator.

##### Does the A/C status indicator flash DTC 33?

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

### 34–EBL MODE SWITCH STUCK (MTC)

For a complete wiring diagram **Refer to Section 8W.**

#### Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the Rear Defrost mode switch is stuck in a pushed position.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

#### Diagnostic Test

##### 1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION & THEN VERIFY DTC IS STILL ACTIVE

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object. Actuate the Clear DTC function by performing the following:

- Turn the ignition on.
- Turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.
- When the A/C status indicator begins flashing DTCs, press the A/C mode switch down for 3 seconds and then release the switch.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Actuate the Display DTC function by performing the following:

- Turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.

**Note:** The A/C status indicator displays active DTCs when the EBL status indicator is not illuminated and stored DTCs when the EBL status indicator is illuminated.

Read DTCs from the flashing A/C status indicator.

##### Does the A/C status indicator flash DTC 34?

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

## 35-FAILED COOL DOWN (MTC)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When the Cooldown Test is executed.
- **Set Condition:**  
If the A/C system is unable to lower the evaporator temperature 11.11°C (20°F).

Possible Causes
PREREQUISITES NOT MET BEFORE RUNNING THE TEST ANOTHER RELATED SYSTEM NOT FUNCTIONING CORRECTLY POWERTRAIN SYSTEM FAULTS PRESENT

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

## Diagnostic Test

### 1. VERIFY THAT ALL OF THE PREREQUISITES WERE MET

Review the list of test prerequisites.

- DTCs 11, 12, 13, 14, 15, 17, 18, 21, 22, 23, 31 or 32 must not be active.
- The blower motor must operate correctly in all speeds.
- The work area ambient temperature must be above 18.3°C (65°F).
- The evaporator temperature must be above 18.3°C (65°F).
- The A/C compressor must be turned off.
- The refrigerant system must be adequately charged.

**Were all of the prerequisites met before running the Cooldown Test?**

**Yes** >> Go To 2

**No** >> Rerun the Cooldown Test after all of the prerequisites are met. Then, if DTC 35 is still active, Go To 2. Otherwise, perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

### 2. CHECK FOR DTCs IN THE PCM

With the scan tool, select PCM.

**Are any DTCs present in the PCM?**

**Yes** >> Diagnose and repair the DTC(s). (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) for PCM DTCs. Rerun the Cooldown Test after the repair is complete.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Refer to the Service Information for additional Cooldown Test related diagnostic information and testing procedures. Rerun the Cooldown Test after the repair is complete.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

### 36-EEPROM CHECKSUM ERROR (MTC)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
If the calculated checksum does not match the stored value.

Possible Causes
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

### Diagnostic Test

#### 1. REPLACE THE A/C HEATER CONTROL

#### Repair

Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

### 37–ROM CHECKSUM ERROR (MTC)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
If the calculated checksum does not match the stored value.

Possible Causes
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (MTC) for stored DTC test procedures.

### Diagnostic Test

1. REPLACE THE A/C HEATER CONTROL

### Repair

Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

## B10AD–RIGHT BLEND DOOR TRAVEL TOO SMALL (ATC)

For a complete wiring diagram **Refer to Section 8W.**

### Theory of Operation

The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is less than the expected range for this actuator, this DTC will set. Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING for additional information.

- **When Monitored:**  
During actuator calibration.
- **Set Condition:**  
If the total span of the Right Blend Door is less than the low range limit.

Possible Causes
RIGHT BLEND DOOR SEIZED, BINDING, OBSTRUCTED
RIGHT BLEND DOOR ACTUATOR
A/C HEATER CONTROL

### Diagnostic Test

#### 1. INSPECT ACTUATOR & HOUSING ASSEMBLY FOR A CONDITION CAUSING THE DOOR TO SEIZE OR BIND

Turn the ignition off.

Inspect the actuator, linkage, and housing assembly for a condition causing the door to seize or bind.

**Are there any physical or mechanical problems with the door, housing, linkage, or actuator?**

- Yes** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Go To 2

#### 2. CHECK RIGHT BLEND DOOR TRAVEL

Remove the Right Blend Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the door in both directions. The door should operate smoothly in both directions over approximately 190 degrees of travel.

**Does the door operate smoothly in both directions over approximately 190 degrees of travel?**

- Yes** >> Replace the Right Blend Door Actuator in accordance with the Service Information. Then, Go To 3.
- No** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

#### 3. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display: B10AD–RIGHT BLEND DOOR TRAVEL TOO SMALL?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



## B10AE–RIGHT BLEND DOOR TRAVEL TOO LARGE (ATC)

For a complete wiring diagram **Refer to Section 8W.**

### Theory of Operation

The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is greater than the expected range for this actuator, this DTC will set. Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING for additional information.

- **When Monitored:**  
During actuator calibration.
- **Set Condition:**  
If the total span of the Right Blend Door exceeds the high range limit.

Possible Causes
RIGHT BLEND DOOR OR A/C HEATER HOUSING COMPONENTS WARPED, WORN, DAMAGED, MISSING, BROKEN
RIGHT BLEND DOOR ACTUATOR
A/C HEATER CONTROL

### Diagnostic Test

#### 1. CHECK FOR A BROKEN RIGHT BLEND DOOR ACTUATOR

Turn the ignition off.

Remove the Right Blend Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the actuator in both directions.

**Does the actuator turn in either direction?**

- Yes**    >> Replace the Right Blend Door Actuator in accordance with the Service Information.  
            Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No**      >> Go To 2

---

#### 2. CHECK RIGHT BLEND DOOR & A/C HEATER HOUSING FOR WARPED, WORN, DAMAGED, MISSING, & BROKEN COMPONENTS

Inspect for excessively worn, disconnected, missing, or broken door linkage. Inspect for a damaged or broken A/C Heater Housing Assembly. Inspect for a warped or broken door, and missing door seals. Rotate the door from stop to stop. The door should rotate approximately 190 degrees.

**Are there any physical or mechanical problems with the door or housing?**

- Yes**    >> Repair as necessary in accordance with the Service Information.  
            Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No**      >> Replace the Right Blend Door Actuator in accordance with the Service Information. Then, Go To 3.
-

**B10AE–RIGHT BLEND DOOR TRAVEL TOO LARGE (ATC) (CONTINUED)****3. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display: B10AE–RIGHT BLEND DOOR TRAVEL TOO LARGE?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
-

**B10AF–RIGHT BLEND DOOR ACTUATOR PERFORMANCE (ATC)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When driving the Right Blend Door Actuator.
- **Set Condition:**  
If the A/C Heater Control detects an excessive loss or gain of commutator pulses.

Possible Causes
RIGHT BLEND DOOR ACTUATOR

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

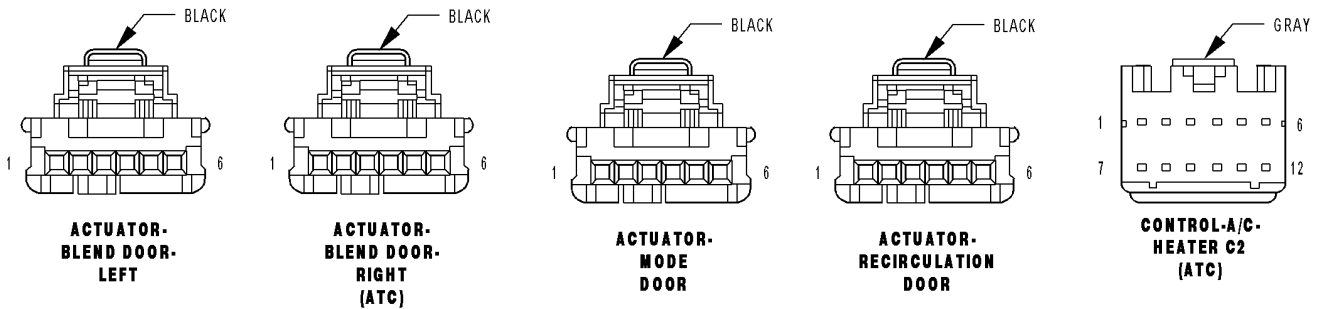
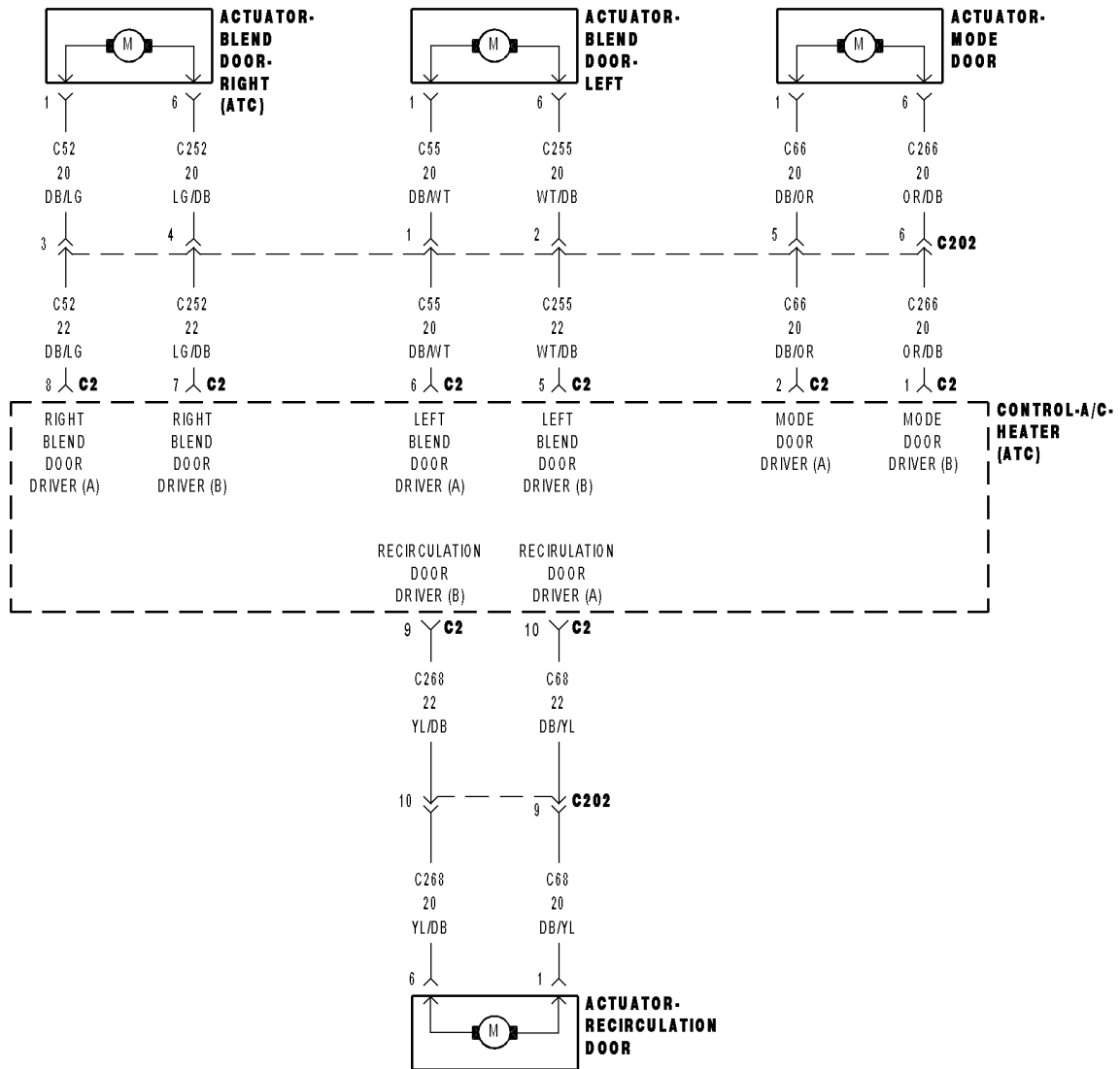
**Diagnostic Test**

1. REPLACE THE RIGHT BLEND DOOR ACTUATOR

**Repair**

Replace the Right Blend Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

# B10A2-LEFT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC)



**B10A2–LEFT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When driving the Left Blend Door Actuator.
- **Set Condition:**  
If the A/C Heater Control fails to detect commutator pulses.

Possible Causes
LEFT BLEND DOOR SEIZED, BINDING, OBSTRUCTED
(C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT SHORTED TO VOLTAGE
(C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT SHORTED TO VOLTAGE
(C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT SHORTED TO GROUND
(C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT SHORTED TO GROUND
(C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
(C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
(C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT SHORTED TO (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT
(C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT OPEN
(C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT OPEN
LEFT BLEND DOOR ACTUATOR
A/C HEATER CONTROL

**Diagnostic Test**

**1. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Turn the ignition on.  
With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

- Does the scan tool display: B10A6 LEFT BLEND DOOR TRAVEL TOO SMALL?**
- Yes**    >> Diagnose and Repair the DTC. Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms.  
            Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No**      >> Go To 2

**B10A2-LEFT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****2. CHECK (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the A/C Heater Control C2 harness connector.

Turn the ignition on.

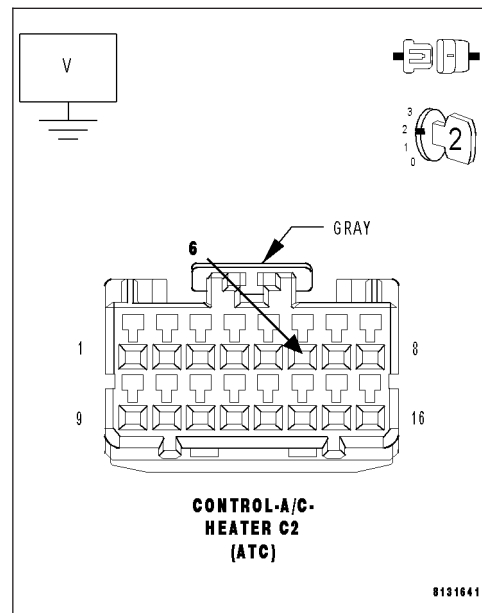
Measure the voltage of the (C55) Left Blend Door Driver (A) circuit.

**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (C55) Left Blend Door Driver (A) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 3

**3. CHECK (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT FOR A SHORT TO VOLTAGE**

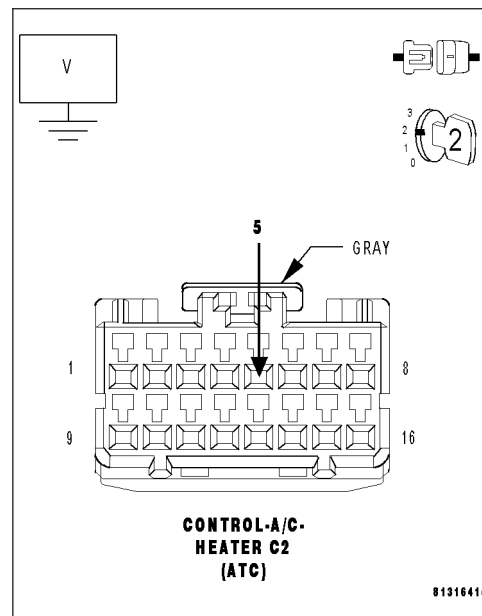
Measure the voltage of the (C255) Left Blend Door Driver (B) circuit.

**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (C255) Left Blend Door Driver (B) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 4



**B10A2-LEFT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****4. CHECK (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

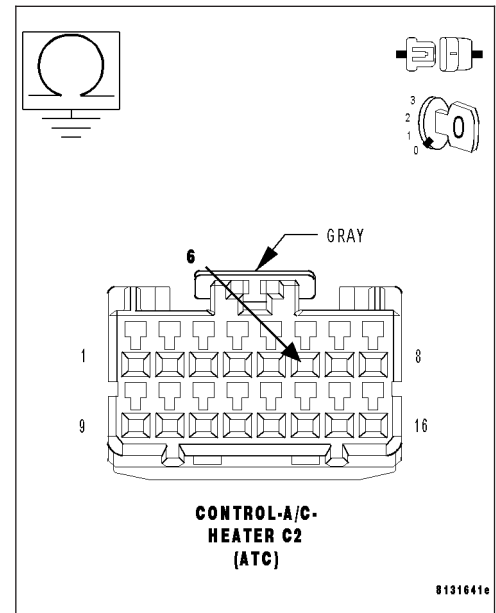
Measure the resistance of the (C55) Left Blend Door Driver (A) circuit between ground and the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C55) Left Blend Door Driver (A) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 5

**5. CHECK (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT FOR A SHORT TO GROUND**

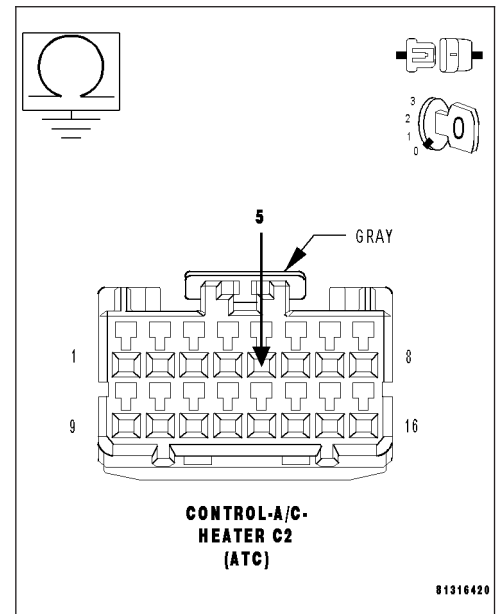
Measure the resistance of the (C255) Left Blend Door Driver (B) circuit between ground and the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C255) Left Blend Door Driver (B) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 6



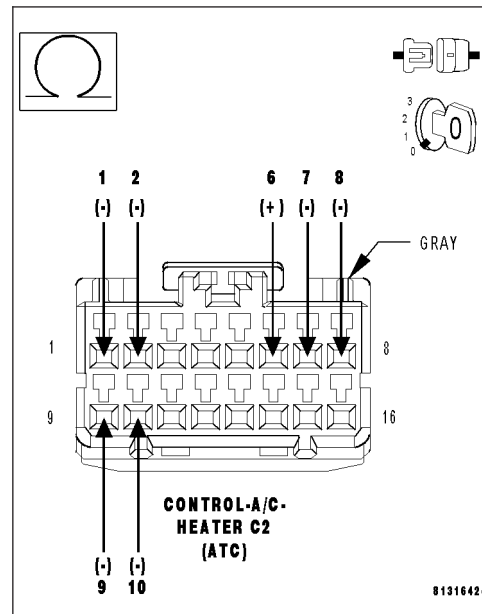
**B10A2-LEFT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****6. CHECK (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)**

Measure the resistance between the (C55) Left Blend Door Driver (A) circuit and the (C266) Mode Door Driver (B) circuit, the (C66) Mode Door Driver (A) circuit, the (C252) Right Blend Door Driver (B) circuit, the (C52) Right Blend Door Driver (A) circuit, the (C268) Recirculation Door Driver (B) circuit, and the (C68) Recirculation Door Driver (A) circuit in the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms between the (C55) Left Blend Door Driver (A) circuit and any of the other door driver circuits?**

**Yes** >> Repair the circuits with a resistance below 10k ohms for a short to the (C55) Left Blend Door Driver (A) circuit.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 7

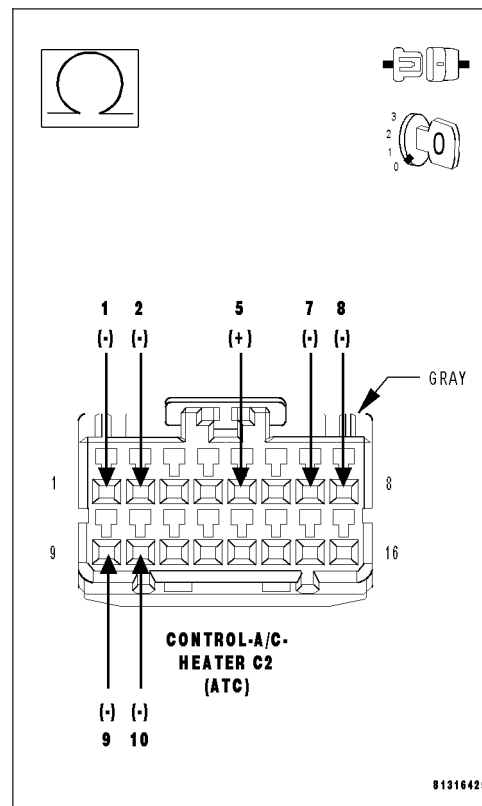
**7. CHECK (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)**

Measure the resistance between the (C255) Left Blend Door Driver (B) circuit and the (C266) Mode Door Driver (B) circuit, the (C66) Mode Door Driver (A) circuit, the (C252) Right Blend Door Driver (B) circuit, the (C52) Right Blend Door Driver (A) circuit, the (C268) Recirculation Door Driver (B) circuit, and the (C68) Recirculation Door Driver (A) circuit in the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms between the (C255) Left Blend Door Driver (B) circuit and any of the other door driver circuits?**

**Yes** >> Repair the circuits with a resistance below 10k ohms for a short to the (C255) Left Blend Door Driver (B) circuit.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 8





**B10A2-LEFT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****8. CHECK LEFT BLEND DOOR ACTUATOR CIRCUIT RESISTANCE**

Measure the resistance between the (C55) Left Blend Door Driver (A) circuit and the (C255) Left Blend Door Driver (B) circuit in the A/C Heater Control C2 harness connector.

**What is the resistance?**

**Below 30 Ohms**

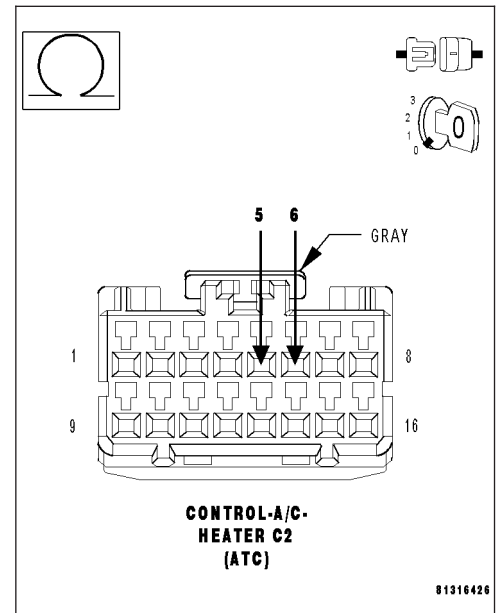
Go To 9

**Above 70 Ohms**

Go To 10

**30 to 70 Ohms**

Go To 12

**9. CHECK (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT FOR A SHORT TO (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT**

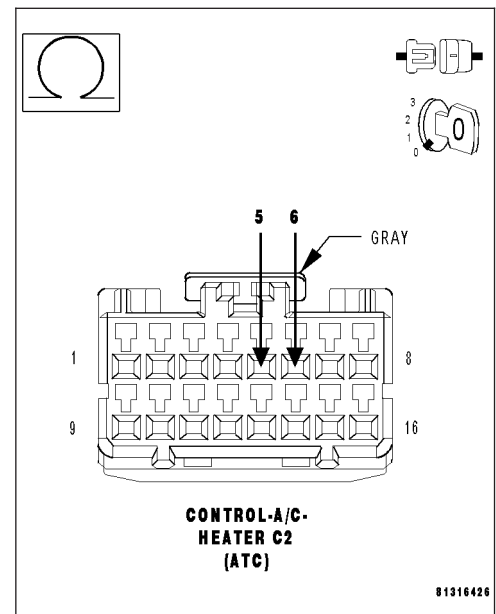
Disconnect the Left Blend Door Actuator harness connector.

Measure the resistance between the (C55) Left Blend Door Driver (A) circuit and the (C255) Left Blend Door Driver (B) circuit in the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C55) Left Blend Door Driver (A) circuit for a short to the (C255) Left Blend Door Driver (B) circuit. Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Replace the Left Blend Door Actuator in accordance with the Service Information. Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**B10A2-LEFT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****10. CHECK (C55) LEFT BLEND DOOR DRIVER (A) CIRCUIT FOR AN OPEN**

Disconnect the Left Blend Door Actuator harness connector.

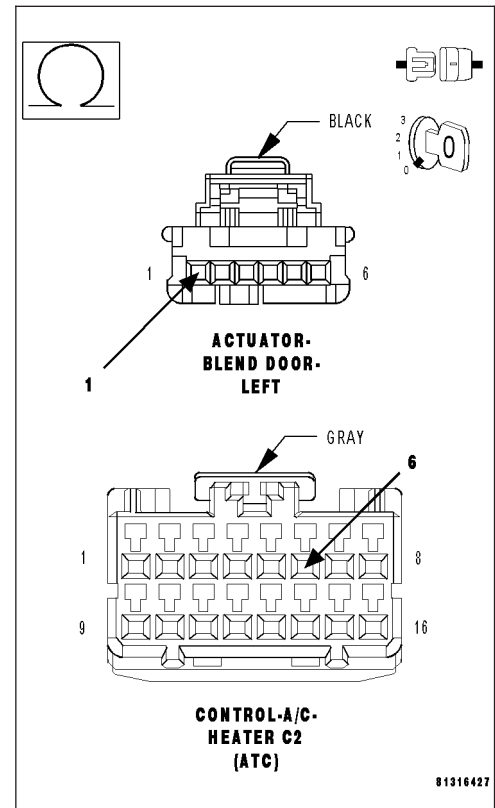
Measure the resistance of the (C55) Left Blend Door Driver (A) circuit between the A/C Heater Control C2 harness connector and the Left Blend Door Actuator harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 11

**No** >> Repair the (C55) Left Blend Door Driver (A) circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1)..

**11. CHECK (C255) LEFT BLEND DOOR DRIVER (B) CIRCUIT FOR AN OPEN**

Measure the resistance of the (C255) Left Blend Door Driver (B) circuit between the A/C Heater Control C2 harness connector and the Left Blend Door Actuator harness connector.

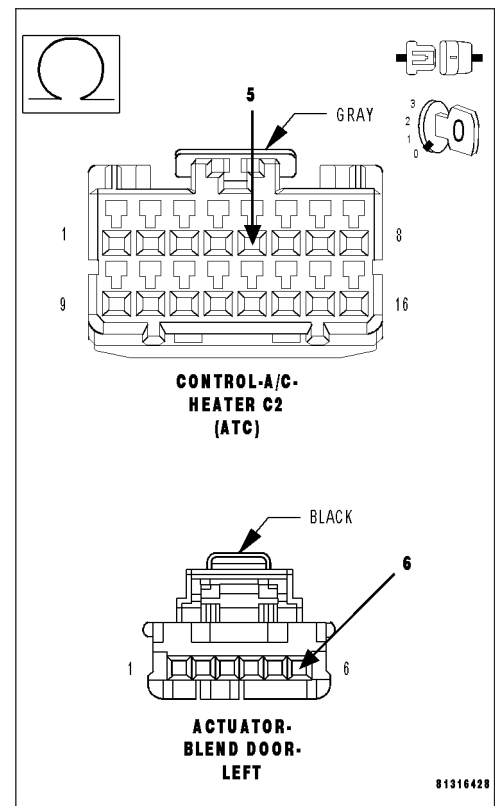
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Left Blend Door Actuator in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair the (C255) Left Blend Door Driver (B) circuit for an open.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**B10A2–LEFT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****12. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Reconnect the A/C Heater Control C2 harness connector.

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display: B10A2–LEFT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Using the wiring diagram as a guide, inspect the wiring and connectors for a condition causing an intermittent loss of commutator pulses from the Left Blend Door Actuator.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
-

## B10A6–LEFT BLEND DOOR TRAVEL TOO SMALL (ATC)

For a complete wiring diagram **Refer to Section 8W.**

### Theory of Operation

The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is less than the expected range for this actuator, this DTC will set. Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING for additional information.

- **When Monitored:**  
During actuator calibration.
- **Set Condition:**  
If the total span of the Left Blend Door is less than the low range limit.

Possible Causes
LEFT BLEND DOOR SEIZED, BINDING, OBSTRUCTED
LEFT BLEND DOOR ACTUATOR
A/C HEATER CONTROL

### Diagnostic Test

#### 1. INSPECT ACTUATOR & HOUSING ASSEMBLY FOR A CONDITION CAUSING THE DOOR TO SEIZE OR BIND

Turn the ignition off.

Inspect the actuator, linkage, and housing assembly for a condition causing the door to seize or bind.

**Are there any physical or mechanical problems with the door, housing, linkage, or actuator?**

- Yes** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Go To 2

#### 2. CHECK LEFT BLEND DOOR TRAVEL

Remove the Left Blend Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the door in both directions. The door should operate smoothly in both directions over approximately 190 degrees of travel.

**Does the door operate smoothly in both directions over approximately 190 degrees of travel?**

- Yes** >> Replace the Left Blend Door Actuator in accordance with the Service Information. Then, Go To 3.
- No** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

#### 3. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display: B10A6–LEFT BLEND DOOR TRAVEL TOO SMALL?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

## B10A7–LEFT BLEND DOOR TRAVEL TOO LARGE (ATC)

For a complete wiring diagram **Refer to Section 8W.**

### Theory of Operation

The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is greater than the expected range for this actuator, this DTC will set. Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING for additional information.

- **When Monitored:**  
During actuator calibration.
- **Set Condition:**  
If the total span of the Left Blend Door exceeds the high range limit.

Possible Causes
LEFT BLEND DOOR OR A/C HEATER HOUSING COMPONENTS WARPED, WORN, DAMAGED, MISSING, BROKEN
LEFT BLEND DOOR ACTUATOR
A/C HEATER CONTROL

### Diagnostic Test

#### 1. CHECK FOR A BROKEN LEFT BLEND DOOR ACTUATOR

Turn the ignition off.

Remove the Left Blend Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the actuator in both directions.

**Does the actuator turn in either direction?**

- Yes**    >> Replace the Left Blend Door Actuator in accordance with the Service Information.  
            Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No**      >> Go To 2

---

#### 2. CHECK LEFT BLEND DOOR & A/C HEATER HOUSING FOR WARPED, WORN, DAMAGED, MISSING, & BROKEN COMPONENTS

Inspect for excessively worn, disconnected, missing, or broken door linkage. Inspect for a damaged or broken A/C Heater Housing Assembly. Inspect for a warped or broken door, and missing door seals. Rotate the door from stop to stop. The door should rotate approximately 190 degrees.

**Are there any physical or mechanical problems with the door or housing?**

- Yes**    >> Repair as necessary in accordance with the Service Information.  
            Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No**      >> Replace the Left Blend Door Actuator in accordance with the Service Information. Then, Go To 3.
-

**B10A7–LEFT BLEND DOOR TRAVEL TOO LARGE (ATC) (CONTINUED)****3. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display: B10A7–LEFT BLEND DOOR TRAVEL TOO LARGE?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
-

**B10A8–LEFT BLEND DOOR ACTUATOR PERFORMANCE (ATC)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When driving the Left Blend Door Actuator.
- **Set Condition:**  
If the A/C Heater Control detects an excessive loss or gain of commutator pulses.

Possible Causes
LEFT BLEND DOOR ACTUATOR

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

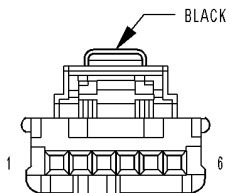
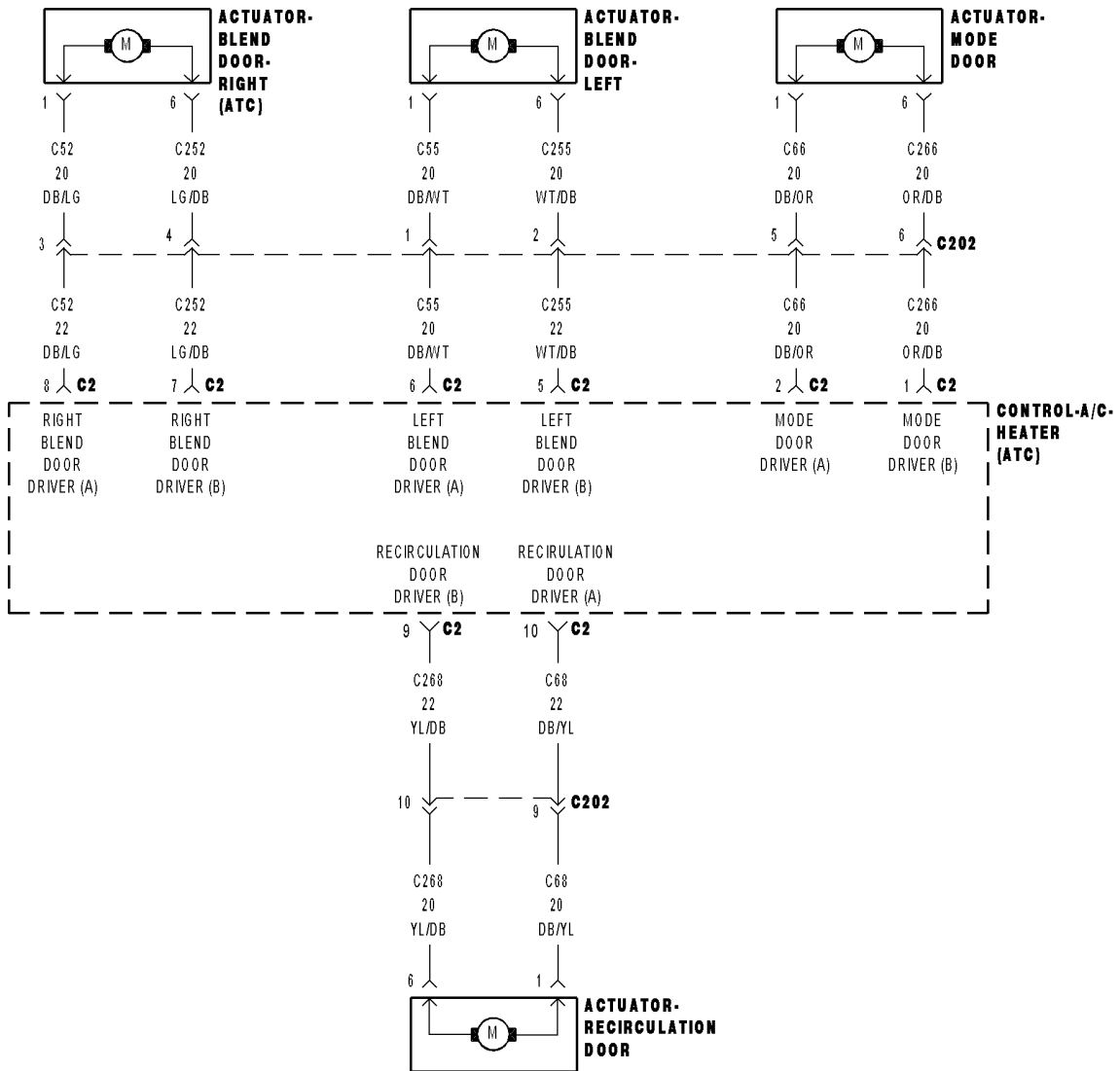
**Diagnostic Test**

1. REPLACE THE LEFT BLEND DOOR ACTUATOR

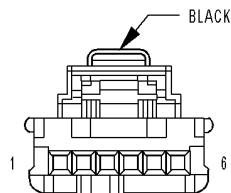
**Repair**

Replace the Left Blend Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

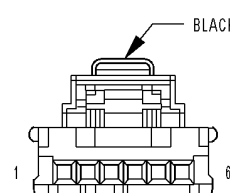
## B10A9—RIGHT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC)



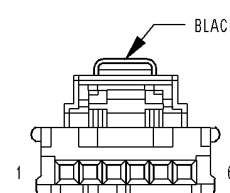
**ACTUATOR-BLEND DOOR-LEFT**



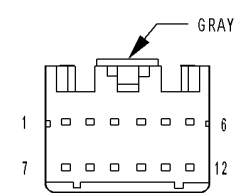
**ACTUATOR-BLEND DOOR-RIGHT (ATC)**



**ACTUATOR-MODE DOOR**



**ACTUATOR-RECIRCULATION DOOR**



**CONTROL-A/C-HEATER C2 (ATC)**



**B10A9–RIGHT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When driving the Right Blend Door Actuator.
- **Set Condition:**  
If the A/C Heater Control fails to detect commutator pulses.

Possible Causes
RIGHT BLEND DOOR SEIZED, BINDING, OBSTRUCTED
(C52) RIGHT BLEND DOOR DRIVER (A) CIRCUIT SHORTED TO VOLTAGE
(C252) RIGHT BLEND DOOR DRIVER (B) CIRCUIT SHORTED TO VOLTAGE
(C52) RIGHT BLEND DOOR DRIVER (A) CIRCUIT SHORTED TO GROUND
(C252) RIGHT BLEND DOOR DRIVER (B) CIRCUIT SHORTED TO GROUND
(C52) RIGHT BLEND DOOR DRIVER (A) CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
(C252) RIGHT BLEND DOOR DRIVER (B) CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
(C52) RIGHT BLEND DOOR DRIVER (A) CIRCUIT SHORTED TO (C252) RIGHT BLEND DOOR DRIVER (B) CIRCUIT
(C52) RIGHT BLEND DOOR DRIVER (A) CIRCUIT OPEN
(C252) RIGHT BLEND DOOR DRIVER (B) CIRCUIT OPEN
RIGHT BLEND DOOR ACTUATOR
A/C HEATER CONTROL

**Diagnostic Test**

**1. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Turn the ignition on.  
With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

- Does the scan tool display: B10AD RIGHT BLEND DOOR TRAVEL TOO SMALL?**
- Yes**    >> Diagnose and Repair the DTC. Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms.  
            Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No**      >> Go To 2

**B10A9–RIGHT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****2. CHECK (C52) RIGHT BLEND DOOR DRIVER (A) CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the A/C Heater Control C2 harness connector.

Turn the ignition on.

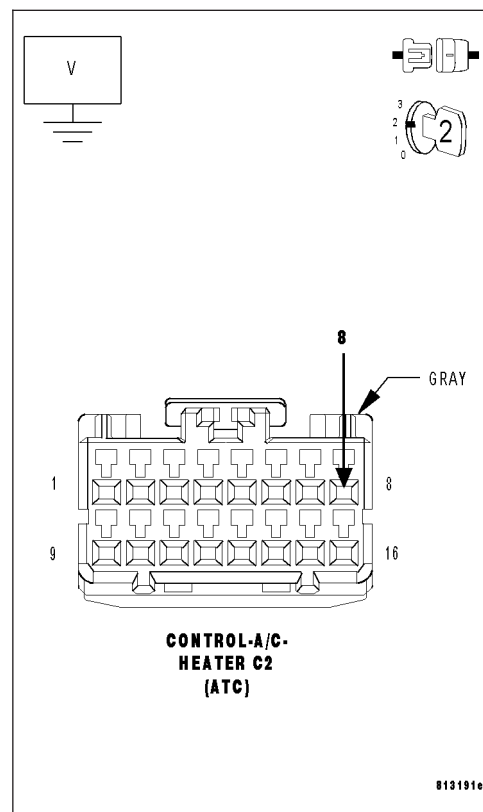
Measure the voltage of the (C52) Right Blend Door Driver (A) circuit.

**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (C52) Right Blend Door Driver (A) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 3

**3. CHECK (C252) RIGHT BLEND DOOR DRIVER (B) CIRCUIT FOR A SHORT TO VOLTAGE**

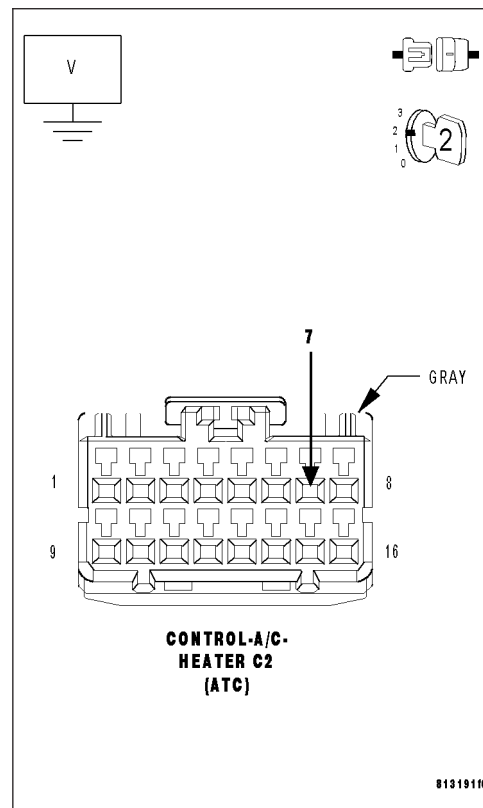
Measure the voltage of the (C252) Right Blend Door Driver (B) circuit.

**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (C252) Right Blend Door Driver (B) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 4



**B10A9–RIGHT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****4. CHECK (C52) RIGHT BLEND DOOR DRIVER (A) CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

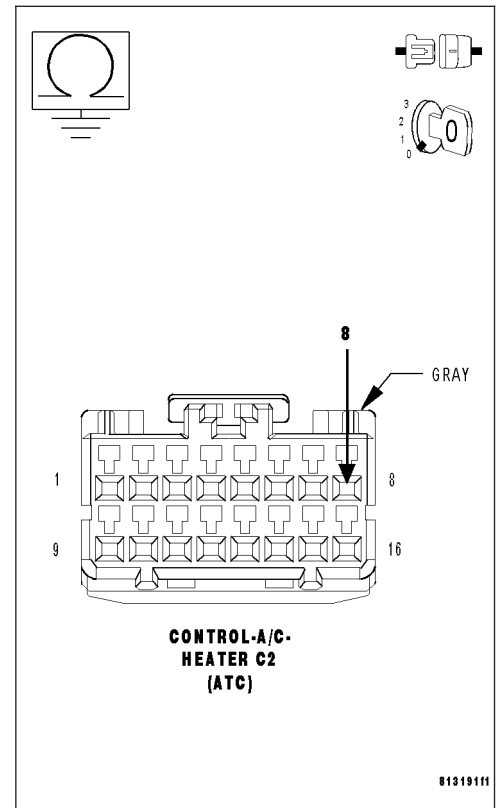
Measure the resistance of the (C52) Right Blend Door Driver (A) circuit between ground and the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C52) Right Blend Door Driver (A) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 5

**5. CHECK (C252) RIGHT BLEND DOOR DRIVER (B) CIRCUIT FOR A SHORT TO GROUND**

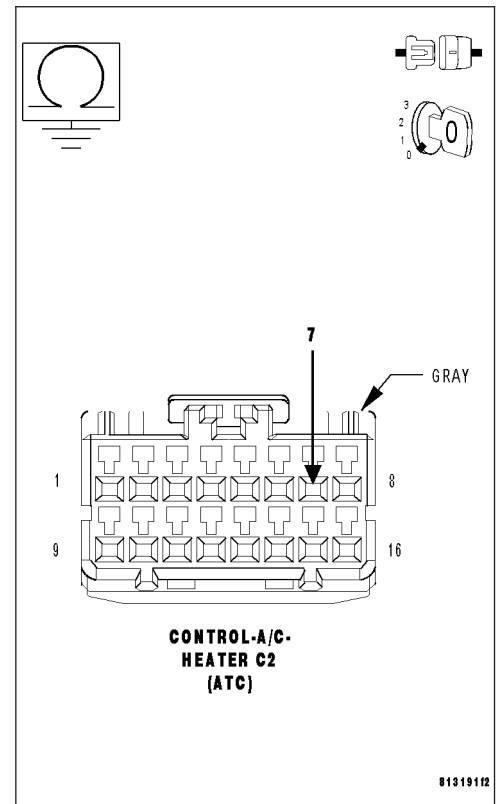
Measure the resistance of the (C252) Right Blend Door Driver (B) circuit between ground and the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C252) Right Blend Door Driver (B) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 6



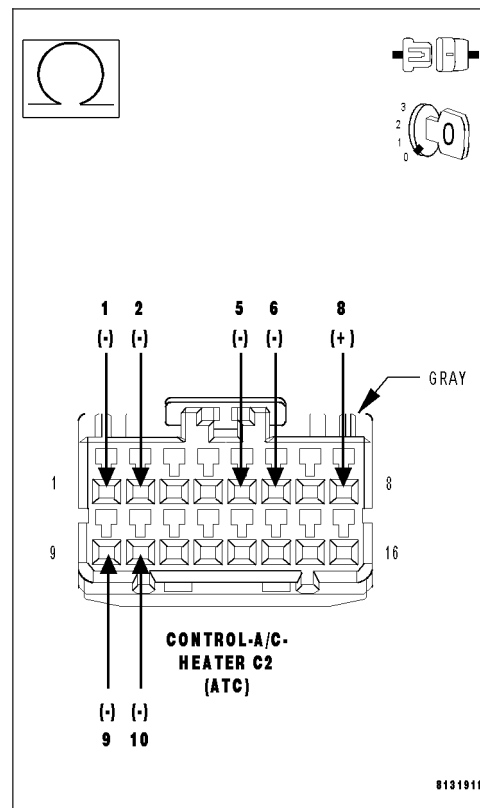
**B10A9–RIGHT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****6. CHECK (C52) RIGHT BLEND DOOR DRIVER (A) CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)**

Measure the resistance between the (C52) Right Blend Door Driver (A) circuit and the (C266) Mode Door Driver (B) circuit, the (C66) Mode Door Driver (A) circuit, the (C255) Left Blend Door Driver (B) circuit, the (C55) Left Blend Door Driver (A) circuit, the (C268) Recirculation Door Driver (B) circuit, and the (C68) Recirculation Door Driver (A) circuit in the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms between the (C52) Right Blend Door Driver (A) circuit and any of the other door driver circuits?**

**Yes** >> Repair the circuits with a resistance below 10k ohms for a short to the (C52) Right Blend Door Driver (A) circuit.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 7



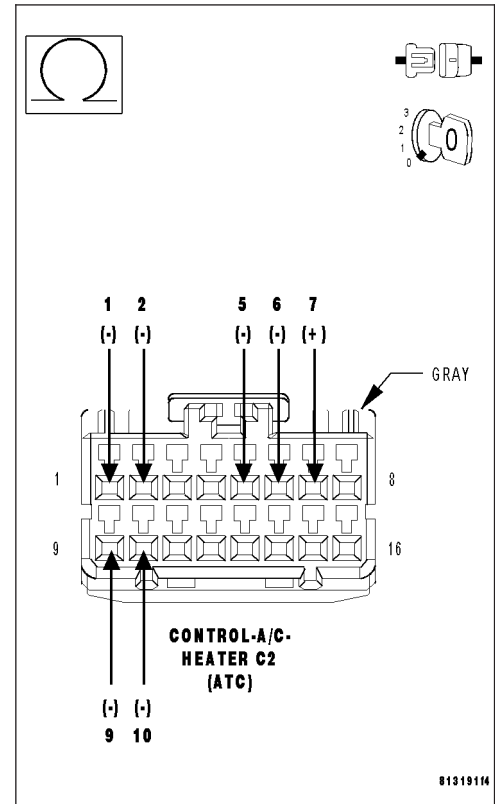
**B10A9-RIGHT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****7. CHECK (C252) RIGHT BLEND DOOR DRIVER (B) CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)**

Measure the resistance between the (C252) Right Blend Door Driver (B) circuit and the (C266) Mode Door Driver (B) circuit, the (C66) Mode Door Driver (A) circuit, the (C255) Left Blend Door Driver (B) circuit, the (C55) Left Blend Door Driver (A) circuit, the (C268) Recirculation Door Driver (B) circuit, and the (C68) Recirculation Door Driver (A) circuit in the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms between the (C252) Right Blend Door Driver (B) circuit and any of the other door driver circuits?**

**Yes** >> Repair the circuits with a resistance below 10k ohms for a short to the (C252) Right Blend Door Driver (B) circuit.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 8

**8. CHECK RIGHT BLEND DOOR ACTUATOR CIRCUIT RESISTANCE**

Measure the resistance between the (C52) Right Blend Door Driver (A) circuit and the (C252) Right Blend Door Driver (B) circuit in the A/C Heater Control C2 harness connector.

**What is the resistance?**

**Below 30 Ohms**

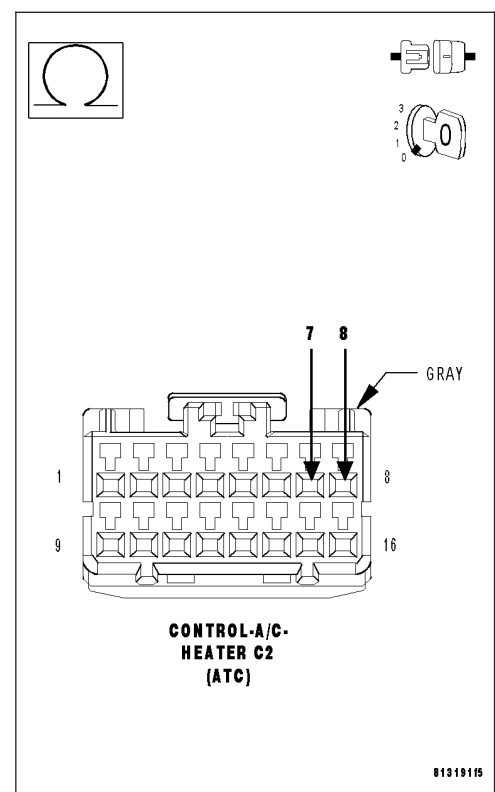
Go To 9

**Above 70 Ohms**

Go To 10

**30 to 70 Ohms**

Go To 12



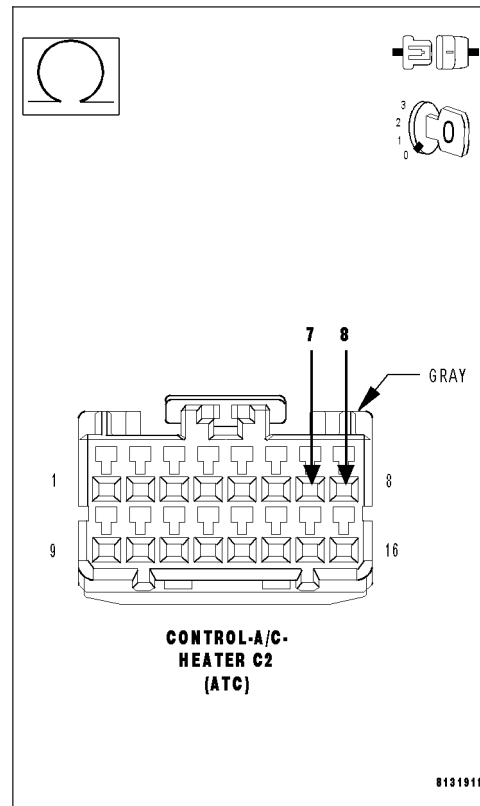
**B10A9–RIGHT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****9. CHECK (C52) RIGHT BLEND DOOR DRIVER (A) CIRCUIT FOR A SHORT TO (C252) RIGHT BLEND DOOR DRIVER (B) CIRCUIT**

Disconnect the Right Blend Door Actuator harness connector.

Measure the resistance between the (C52) Right Blend Door Driver (A) circuit and the (C252) Right Blend Door Driver (B) circuit in the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

- Yes** >> Repair the (C52) Right Blend Door Driver (A) circuit for a short to the (C252) Right Blend Door Driver (B) circuit.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Replace the Right Blend Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

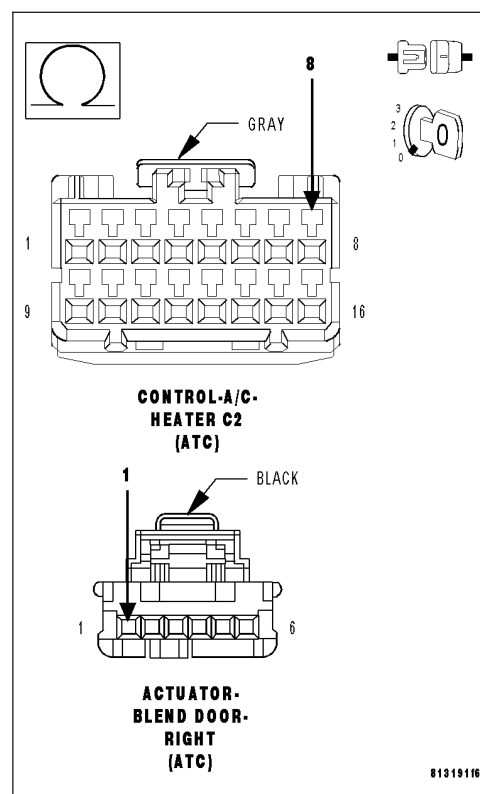
**10. CHECK (C52) RIGHT BLEND DOOR DRIVER (A) CIRCUIT FOR AN OPEN**

Disconnect the Right Blend Door Actuator harness connector.

Measure the resistance of the (C52) Right Blend Door Driver (A) circuit between the A/C Heater Control C2 harness connector and the Right Blend Door Actuator harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Go To 11
- No** >> Repair the (C52) Right Blend Door Driver (A) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1)..

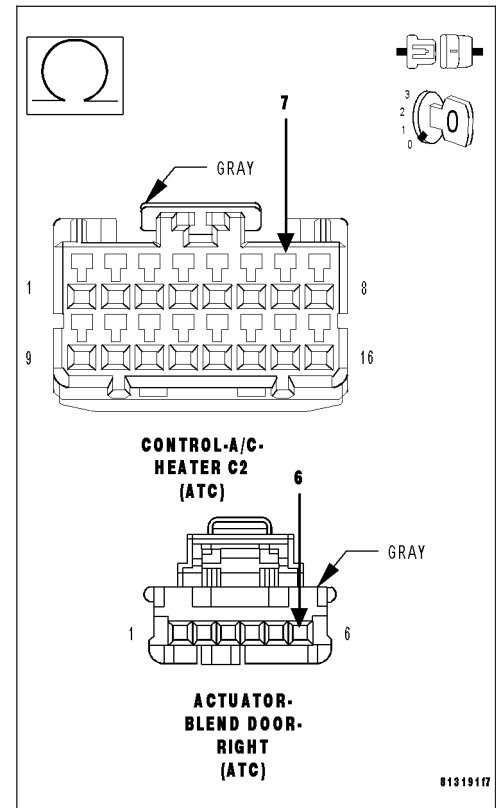


**B10A9–RIGHT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****11. CHECK (C252) RIGHT BLEND DOOR DRIVER (B) CIRCUIT FOR AN OPEN**

Measure the resistance of the (C252) Right Blend Door Driver (B) circuit between the A/C Heater Control C2 harness connector and the Right Blend Door Actuator harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Right Blend Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Repair the (C252) Right Blend Door Driver (B) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**12. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Reconnect the A/C Heater Control C2 harness connector.

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display: B10A9–RIGHT BLEND DOOR CONTROL CIRCUIT/PERFORMANCE?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Using the wiring diagram as a guide, inspect the wiring and connectors for a condition causing an intermittent loss of commutator pulses from the Right Blend Door Actuator.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**B10B0–INFRARED SENSOR THERMISTOR CIRCUIT LOW (ATC)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the IR Sensor fails the internal self test.

Possible Causes
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

**Diagnostic Test****1. REPLACE THE A/C HEATER CONTROL****Repair**

Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---



**B10B1–INFRARED SENSOR THERMISTOR CIRCUIT HIGH (ATC)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the IR Sensor fails the internal self test.

Possible Causes
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

**Diagnostic Test**

1. REPLACE THE A/C HEATER CONTROL

**Repair**

Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

## B10B2–A/C COOL DOWN TEST PERFORMANCE (ATC)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When the Cooldown Test is executed.
- **Set Condition:**  
If the A/C system is unable to lower the evaporator temperature 11.11°C (20°F) within two minutes.

Possible Causes
PREREQUISITES NOT MET BEFORE RUNNING THE TEST
ANOTHER RELATED SYSTEM NOT FUNCTIONING CORRECTLY
POWERTRAIN SYSTEM FAULTS PRESENT

## Diagnostic Test

### 1. VERIFY THAT ALL OF THE PREREQUISITES WERE MET

Review the list of test prerequisites.

- DTCs B1031, B1032, B1040, B1044, B1045, B1058, B105C, B105D, B1099, B109A, B10A2, B10A6, B10A7, B10A8, B10A9, B10AD, B10AE, B10AF, B222A, B2214, and U0141 must not be active.
- The refrigerant system must be adequately charged.
- The blower motor must operate correctly in all speeds.
- The work area ambient temperature must be above 18.3°C (65°F).
- The evaporator temperature must be above 18.3°C (65°F).
- The A/C compressor must be turned off.

**Were all of the prerequisites met before running the Cooldown Test?**

**Yes** >> Go To 2

**No** >> Rerun the Cooldown Test after all of the prerequisites are met. Then, if DTC B10B2 is still active, Go To 2. Otherwise, Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

### 2. CHECK FOR DTCs IN THE PCM

With the scan tool, select PCM.

**Are any DTCs present in the PCM?**

- Yes** >> Diagnose and repair the DTC(s). (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) for PCM DTCs. Rerun the Cooldown Test after the repair is complete.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Refer to the Service Information for additional Cooldown Test related diagnostic information and testing procedures. Rerun the Cooldown Test after the repair is complete.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

## B100A–RECIRCULATION SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W.**

### Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the Recirculation mode switch is stuck in a pushed position for more than two minutes.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

### Diagnostic Test

#### 1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION & THEN VERIFY DTC IS STILL ACTIVE

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object. Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Wait two minutes, then with the scan tool, read HVAC DTCs.

**Does the scan tool display active: B100A–RECIRCULATION SWITCH REQUEST INPUT CIRCUIT LOW?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

## B105C–RECIRCULATION DOOR TRAVEL RANGE TOO SMALL (ATC)

For a complete wiring diagram **Refer to Section 8W.**

### Theory of Operation

The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is less than the expected range for this actuator, this DTC will set. Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING for additional information.

- **When Monitored:**  
During actuator calibration.
- **Set Condition:**  
If the total span of the Recirculation Door is less than the low range limit.

Possible Causes
RECIRCULATION DOOR SEIZED, BINDING, OBSTRUCTED
RECIRCULATION DOOR ACTUATOR
A/C HEATER CONTROL

### Diagnostic Test

#### 1. INSPECT ACTUATOR & HOUSING ASSEMBLY FOR A CONDITION CAUSING THE DOOR TO SEIZE OR BIND

Turn the ignition off.

Inspect the actuator, linkage, and housing assembly for a condition causing the door to seize or bind.

**Are there any physical or mechanical problems with the door, housing, linkage, or actuator?**

- Yes** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Go To 2

#### 2. CHECK RECIRCULATION DOOR TRAVEL

Remove the Recirculation Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the door in both directions. The door should operate smoothly in both directions over approximately 100 degrees of travel.

**Does the door operate smoothly in both directions over approximately 100 degrees of travel?**

- Yes** >> Replace the Recirculation Door Actuator in accordance with the Service Information. Then, Go To 3.
- No** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

#### 3. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display: B105C–RECIRCULATION DOOR TRAVEL RANGE TOO SMALL?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

## B105D–RECIRCULATION DOOR TRAVEL RANGE TOO LARGE (ATC)

For a complete wiring diagram **Refer to Section 8W.**

### Theory of Operation

The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is greater than the expected range for this actuator, this DTC will set. Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING for additional information.

- **When Monitored:**  
During actuator calibration.
- **Set Condition:**  
If the total span of the Recirculation Door exceeds the high range limit.

Possible Causes
RECIRCULATION DOOR OR A/C HEATER HOUSING COMPONENTS WARPED, WORN, DAMAGED, MISSING, BROKEN
RECIRCULATION DOOR ACTUATOR
A/C HEATER CONTROL

### Diagnostic Test

#### 1. CHECK FOR A BROKEN RECIRCULATION DOOR ACTUATOR

Turn the ignition off.

Remove the Recirculation Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the actuator in both directions.

**Does the actuator turn in either direction?**

- Yes** >> Replace the Recirculation Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Go To 2

---

#### 2. CHECK RECIRCULATION DOOR & A/C HEATER HOUSING FOR WARPED, WORN, DAMAGED, MISSING, & BROKEN COMPONENTS

Inspect for excessively worn, disconnected, missing, or broken door linkage. Inspect for a damaged or broken A/C Heater Housing Assembly. Inspect for a warped or broken door, and missing door seals. Rotate the door from stop to stop. The door should rotate approximately 100 degrees.

**Are there any physical or mechanical problems with the door or housing?**

- Yes** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Replace the Recirculation Door Actuator in accordance with the Service Information. Then, Go To 3.
-

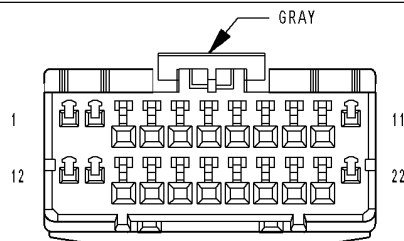
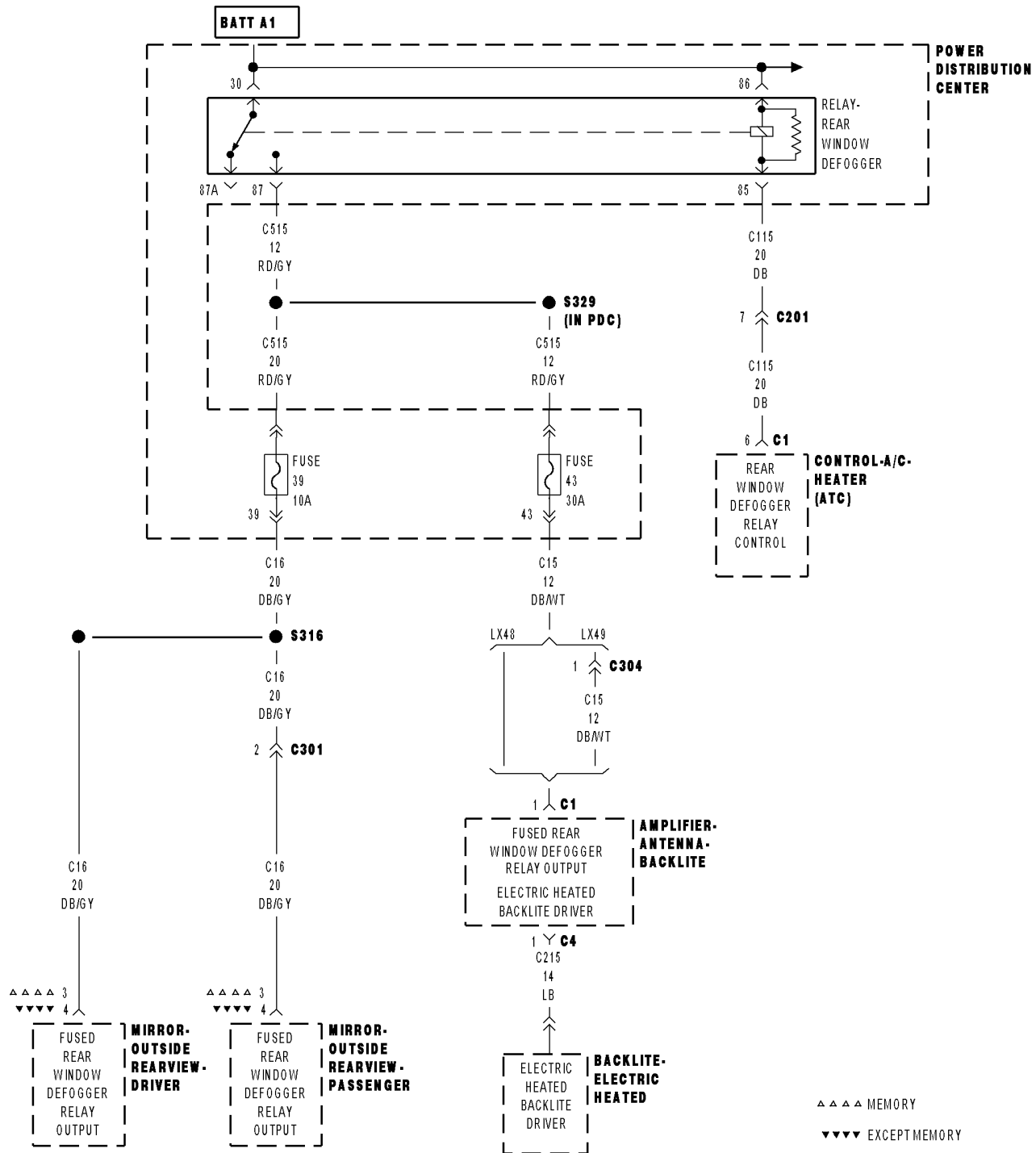
**B105D–RECIRCULATION DOOR TRAVEL RANGE TOO LARGE (ATC) (CONTINUED)****3. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display: B105D–RECIRCULATION DOOR TRAVEL RANGE TOO LARGE?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
-

**B106B-REAR DEFROST CONTROL CIRCUIT LOW (ATC)****CONTROL-A/C-HEATER C1 (ATC)**

**B106B–REAR DEFROST CONTROL CIRCUIT LOW (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Following the Start Up Wait Time after ignition on with the EBL output turned off.

- **Set Condition:**

If the (C115) Rear Window Defogger Relay Control circuit is shorted to ground.

Possible Causes
(C115) REAR WINDOW DEFOGGER RELAY CONTROL CIRCUIT SHORTED TO GROUND
(C115) REAR WINDOW DEFOGGER RELAY CONTROL CIRCUIT OPEN
REAR WINDOW DEFOGGER RELAY
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

**Diagnostic Test****1. INSTALL A SUBSTITUTE REAR WINDOW DEFOGGER RELAY & THEN CHECK FOR DTC B106B–REAR DEFROST CONTROL CIRCUIT LOW**

Turn the ignition on.

Verify that the EBL mode switch is off.

Turn the ignition off.

Install a substitute Rear Window Defogger Relay.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

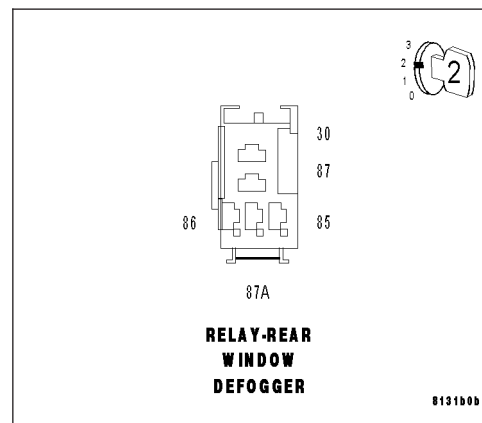
With the scan tool, read HVAC DTCs.

**Does the scan tool display: B106B–REAR DEFROST CONTROL CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> Replace the original Rear Window Defogger Relay in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).





**B106B-REAR DEFROST CONTROL CIRCUIT LOW (ATC) (CONTINUED)****2. CHECK (C115) REAR WINDOW DEFOGGER RELAY CONTROL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Remove the substitute Rear Window Defogger Relay.

Disconnect the A/C Heater Control C1 harness connector.

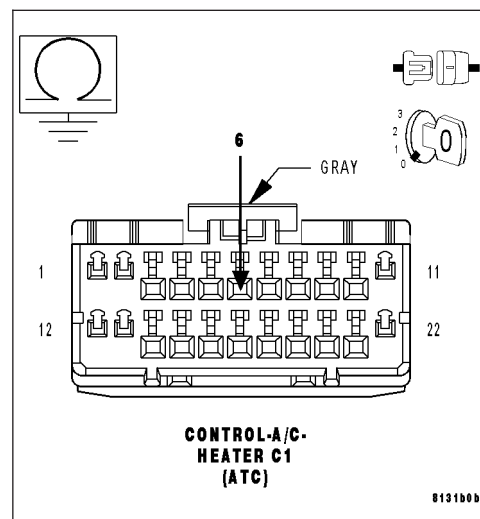
Measure the resistance of the (C115) Rear Window Defogger Relay Control circuit between ground and the A/C Heater Control C1 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C115) Rear Window Defogger Relay Control circuit for a short to ground. Reinstall the original Rear Window Defogger Relay.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 3

**3. CHECK (C115) REAR WINDOW DEFOGGER RELAY CONTROL CIRCUIT FOR AN OPEN**

Measure the resistance of the (C115) Rear Window Defogger Relay Control circuit between the Rear Window Defogger Relay connector terminal 85 in the PDC and the A/C Heater Control C1 harness connector.

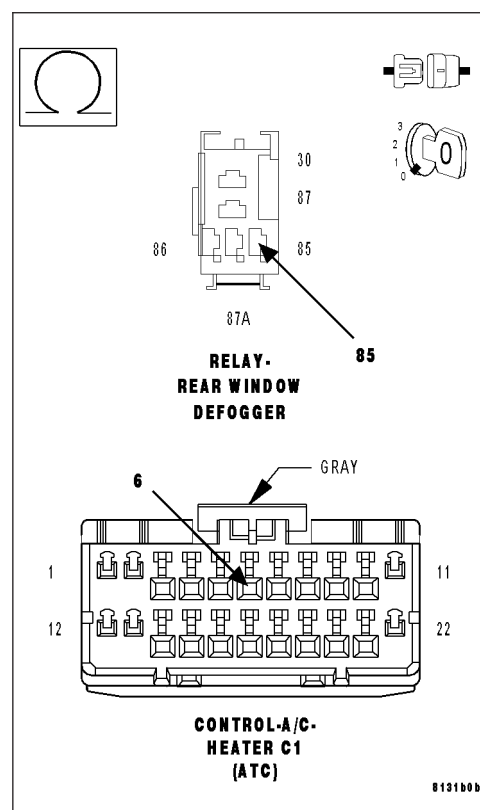
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the A/C Heater Control in accordance with the Service Information. Reinstall the original Rear Window Defogger Relay.

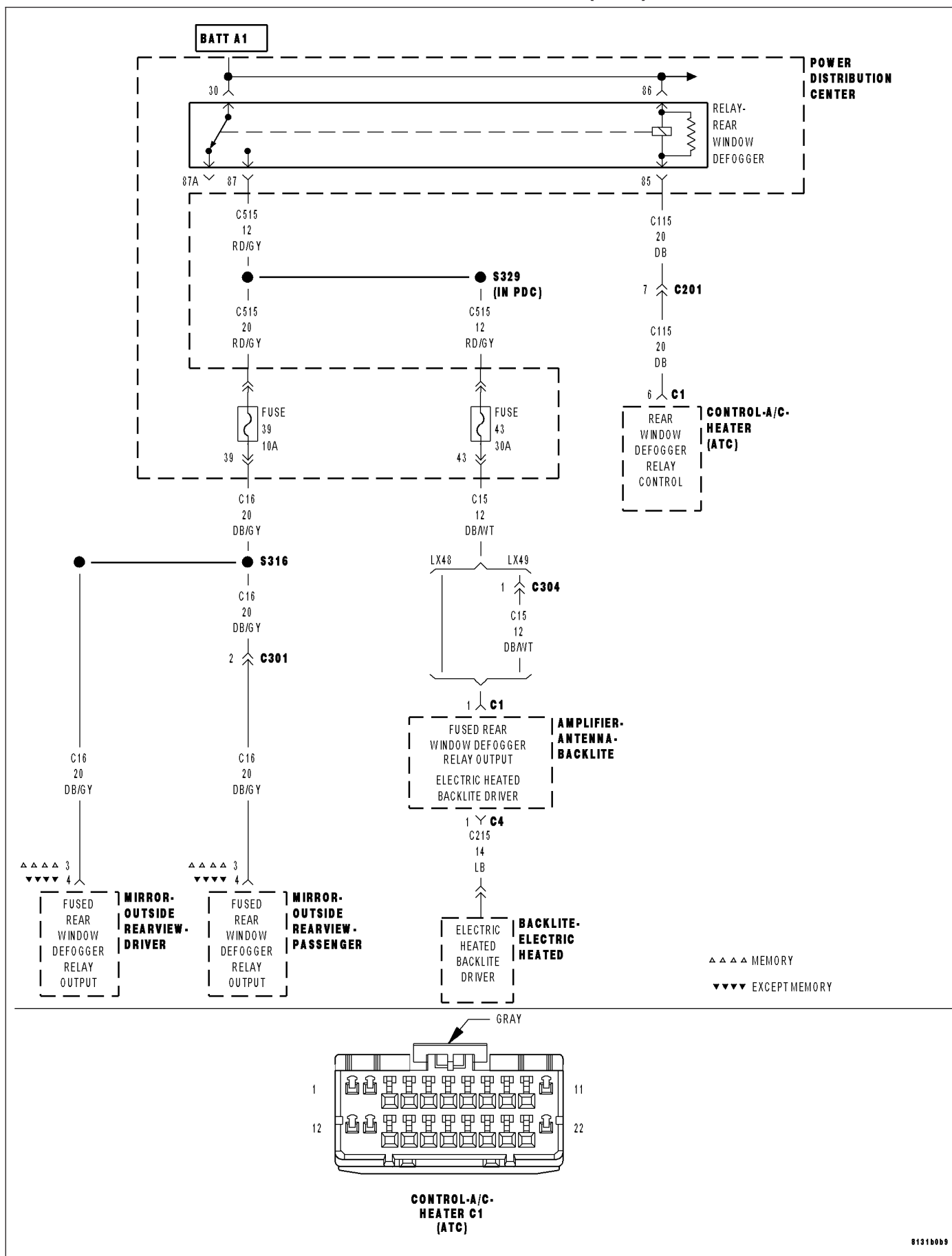
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Repair the (C115) Rear Window Defogger Relay Control circuit for an open. Reinstall the original Rear Window Defogger Relay.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



# B106C-REAR DEFROST CONTROL CIRCUIT HIGH (ATC)



**B106C–REAR DEFROST CONTROL CIRCUIT HIGH (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the EBL output is turned on and the (C115) Rear Window Defogger Relay Control circuit is either shorted to voltage or open.

Possible Causes
(C115) REAR WINDOW DEFOGGER RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
(C115) REAR WINDOW DEFOGGER RELAY CONTROL CIRCUIT OPEN
REAR WINDOW DEFOGGER RELAY
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

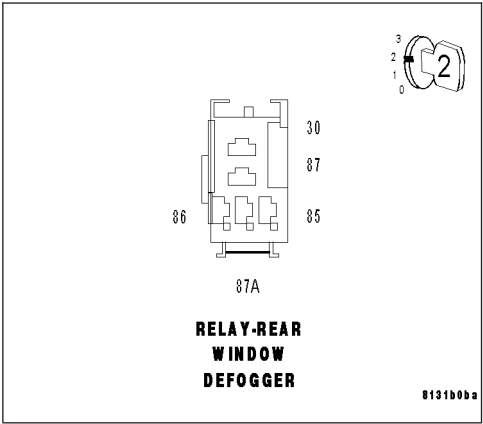
**Diagnostic Test**

**1. INSTALL A SUBSTITUTE REAR WINDOW DEFOGGER RELAY & THEN CHECK FOR DTC B106C–REAR DEFROST CONTROL CIRCUIT HIGH**

- Turn the ignition on.
- Verify that the EBL mode switch is off.
- Turn the ignition off.
- Install a substitute Rear Window Defogger Relay.
- Turn the ignition on.
- With the scan tool, erase HVAC DTCs.
- Turn the ignition off, wait 10 seconds, and turn the ignition on.
- Press the EBL mode switch is on.
- With the scan tool, read HVAC DTCs.

**Does the scan tool display: B106C–REAR DEFROST CONTROL CIRCUIT HIGH?**

- Yes** >> Go To 2
- No** >> Replace the original Rear Window Defogger Relay in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B106C-REAR DEFROST CONTROL CIRCUIT HIGH (ATC) (CONTINUED)****2. CHECK (C115) REAR WINDOW DEFOGGER RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition on.

Verify that the EBL mode switch is off.

Turn the ignition off.

Remove the substitute Rear Window Defogger Relay.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

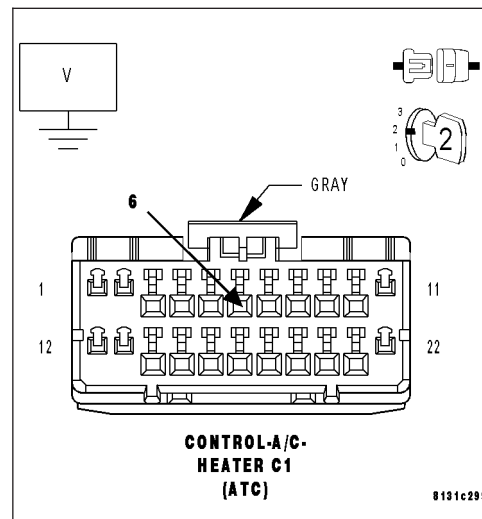
Measure the voltage of the (C115) Rear Window Defogger Relay Control circuit.

**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (C115) Rear Window Defogger Relay Control circuit for a short to voltage. Reinstall the original Rear Window Defogger Relay.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 3

**3. CHECK (C115) REAR WINDOW DEFOGGER RELAY CONTROL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Measure the resistance of the (C115) Rear Window Defogger Relay Control circuit between the Rear Window Defogger Relay connector terminal 85 in the PDC and the A/C Heater Control C1 harness connector.

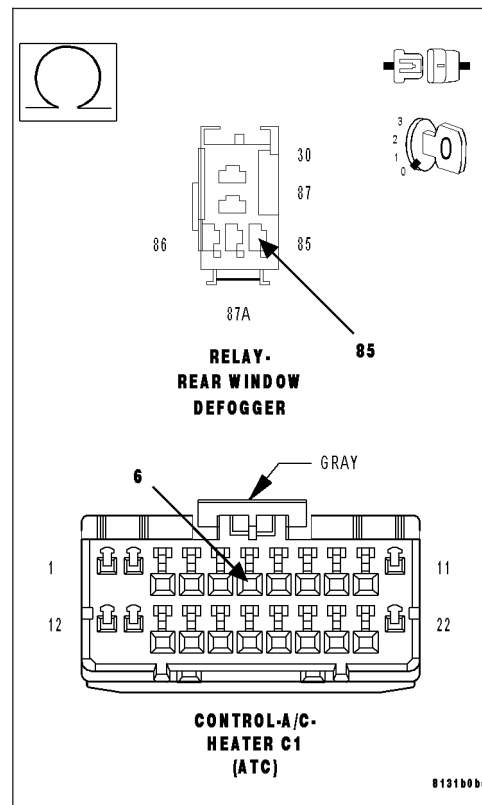
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the A/C Heater Control in accordance with the Service Information. Reinstall the original Rear Window Defogger Relay.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Repair the (C115) Rear Window Defogger Relay Control circuit for an open. Reinstall the original Rear Window Defogger Relay.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B109A–PANEL MODE DOOR 1 ACTUATOR PERFORMANCE (ATC)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When driving the Mode Door Actuator.
- **Set Condition:**  
If the A/C Heater Control detects an excessive loss or gain of commutator pulses.

Possible Causes
MODE DOOR ACTUATOR

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

**Diagnostic Test**

1. REPLACE THE MODE DOOR ACTUATOR

**Repair**

Replace the Mode Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

## B1001–A/C SWITCH REQUEST INPUT CIRCUIT LOW (ATC)

For a complete wiring diagram **Refer to Section 8W.**

### Theory of Operation

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the A/C mode switch is stuck in a pushed position for more than two minutes.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

### Diagnostic Test

#### 1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION & THEN VERIFY DTC IS STILL ACTIVE

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object. Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Wait two minutes, then with the scan tool, read HVAC DTCs.

#### Does the scan tool display active: B1001–A/C SWITCH REQUEST INPUT CIRCUIT LOW?

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
-

**B1016–REAR DEFROST SWITCH REQUEST INPUT CIRCUIT LOW (ATC)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The switch input changes when the switch is pushed down. An active DTC indicates that the switch is stuck in a pushed position. A stored DTC indicates that the switch was stuck in a pushed position for more than two minutes, but has since returned to its normal state.

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the Rear Defrost mode switch is stuck in a pushed position for more than two minutes.

Possible Causes
OBJECT HOLDING SWITCH IN A PUSHED POSITION
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

**Diagnostic Test****1. INSPECT FOR OBJECT HOLDING SWITCH IN A PUSHED POSITION & THEN VERIFY DTC IS STILL ACTIVE**

Inspect the A/C Heater Control for an object holding the switch in a pushed position. If present, remove the object. Turn the ignition on.

With the scan tool, erase HVAC DTCs.

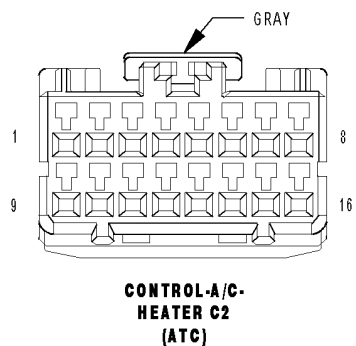
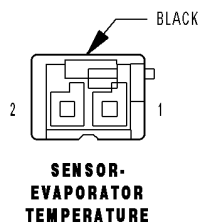
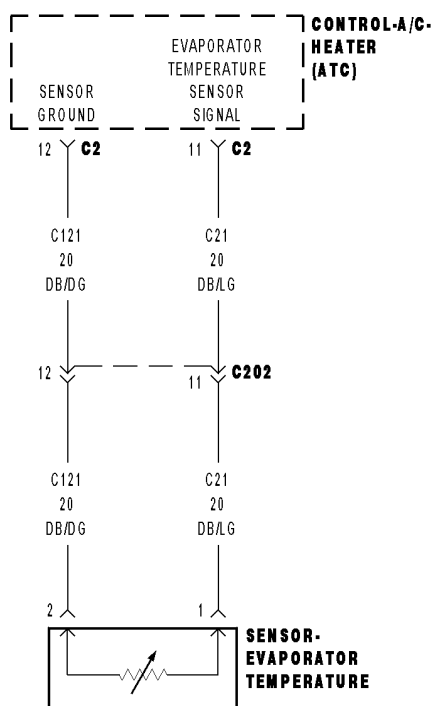
Turn the ignition off, wait 10 seconds, and then turn the ignition on.

Wait two minutes, then with the scan tool, read HVAC DTCs.

**Does the scan tool display active: B1016–REAR DEFROST SWITCH REQUEST INPUT CIRCUIT LOW?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
-

# B1031-EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW (ATC)





**B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the Evaporator Temperature Sensor input is out of range toward the low voltage threshold.

Possible Causes
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO (C121) SENSOR GROUND CIRCUIT EVAPORATOR TEMPERATURE SENSOR A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

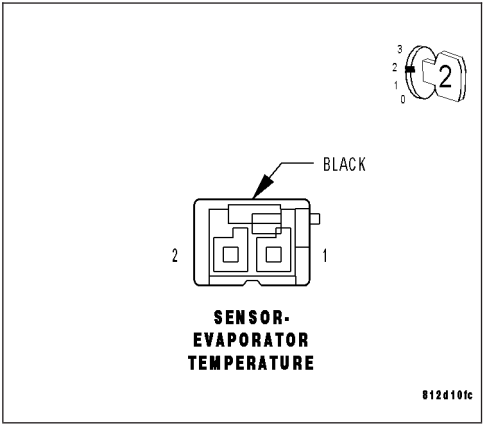
**Diagnostic Test**

**1. CHECK FOR DTC B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW WITH EVAPORATOR TEMPERATURE SENSOR HARNESS CONNECTOR DISCONNECTED**

Turn the ignition off.  
Disconnect the Evaporator Temperature Sensor harness connector.  
Turn the ignition on.  
With the scan tool, erase HVAC DTCs.  
Turn the ignition off, wait 10 seconds, and turn the ignition on.  
With the scan tool, read HVAC DTCs.

**Does the scan tool display: B1031–EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW?**

- Yes**    >> Go To 2
- No**    >> Replace the Evaporator Temperature Sensor in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1031-EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT LOW (ATC) (CONTINUED)****2. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the A/C Heater Control C2 harness connector.

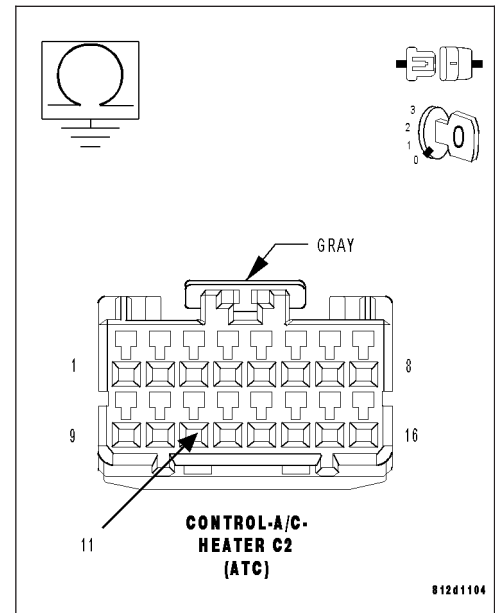
Measure the resistance of the (C21) Evaporator Temperature Sensor Signal circuit between ground and the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 3

**3. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO (C121) SENSOR GROUND CIRCUIT**

Measure the resistance between the (C21) Evaporator Temperature Sensor Signal circuit and the (C121) Sensor Ground circuit in the A/C Heater Control C2 harness connector.

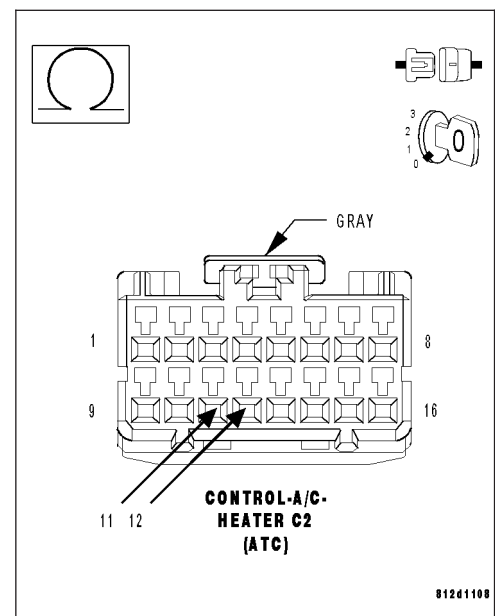
**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to the (C121) Sensor Ground circuit.

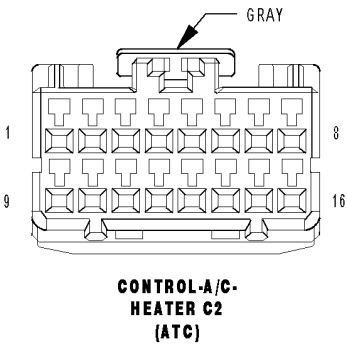
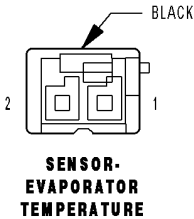
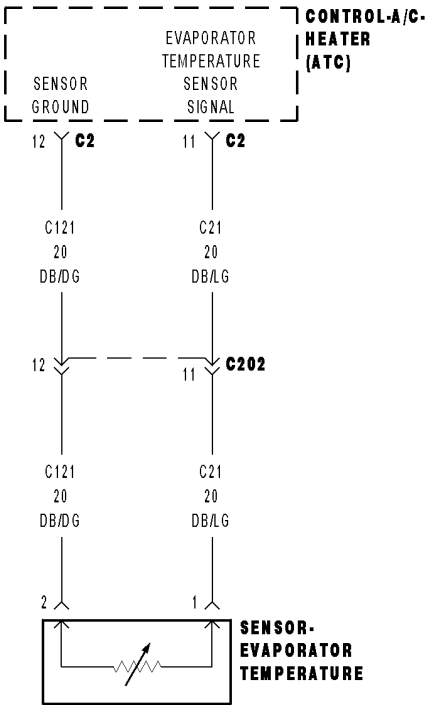
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



B1032-EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT HIGH (ATC)



**B1032-EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT HIGH (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Following the Start Up Wait Time after ignition on.

- **Set Condition:**

If the Evaporator Temperature Sensor input is out of range toward the high voltage threshold.

Possible Causes
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
(C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN
(C121) SENSOR GROUND CIRCUIT OPEN
EVAPORATOR TEMPERATURE SENSOR
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

## Diagnostic Test

### 1. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the A/C Heater Control C2 harness connector.

Turn the ignition on.

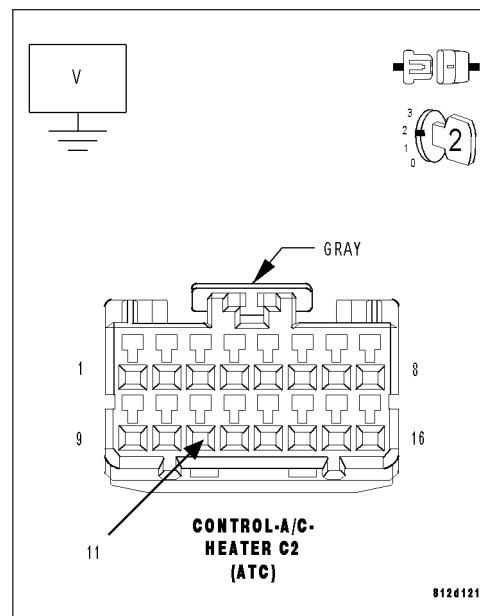
Measure the voltage of the (C21) Evaporator Temperature Sensor Signal circuit.

**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 2



**B1032-EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT HIGH (ATC) (CONTINUED)****2. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT, (C121) SENSOR GROUND CIRCUIT, & EVAPORATOR TEMPERATURE SENSOR**

Turn the ignition off.

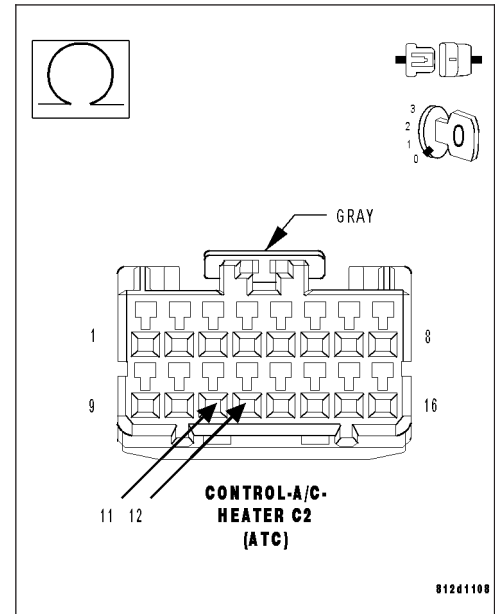
Measure the resistance between the (C21) Evaporator Temperature Sensor Signal circuit and the (C121) Sensor Ground circuit in the A/C Heater Control C2 harness connector. The approximate circuit resistance should be as follows:

- 2925 ohms @ 38°C (100°F)
- 4050 ohms @ 30°C (86°F)
- 4985 ohms @ 25°C (77°F)
- 6498 ohms @ 19°C (66°F)
- 8989 ohms @ 12°C (54°F)
- 13307 ohms @ 4°C (39°F)
- 14860 ohms @ 2°C (36°F)

**Is the resistance within the specifications?**

**Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 3

**3. CHECK (C21) EVAPORATOR TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN**

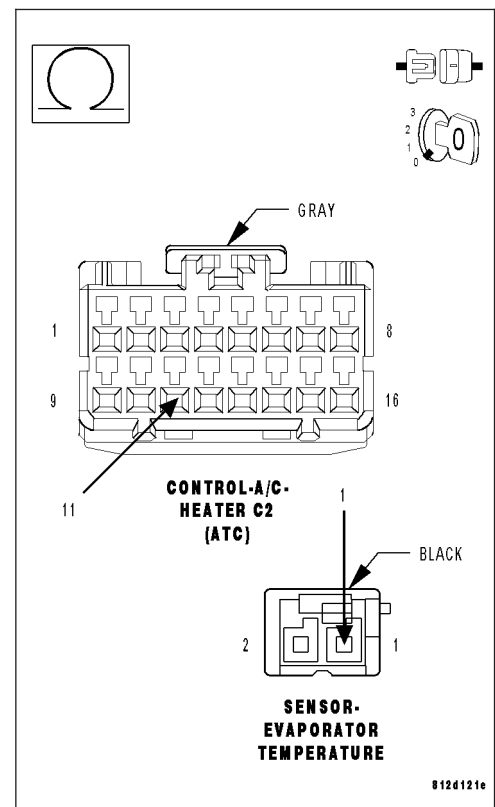
Disconnect the Evaporator Temperature Sensor harness connector.

Measure the resistance of the (C21) Evaporator Temperature Sensor Signal circuit between the A/C Heater Control C2 harness connector and the Evaporator Temperature Sensor harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (C21) Evaporator Temperature Sensor Signal circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

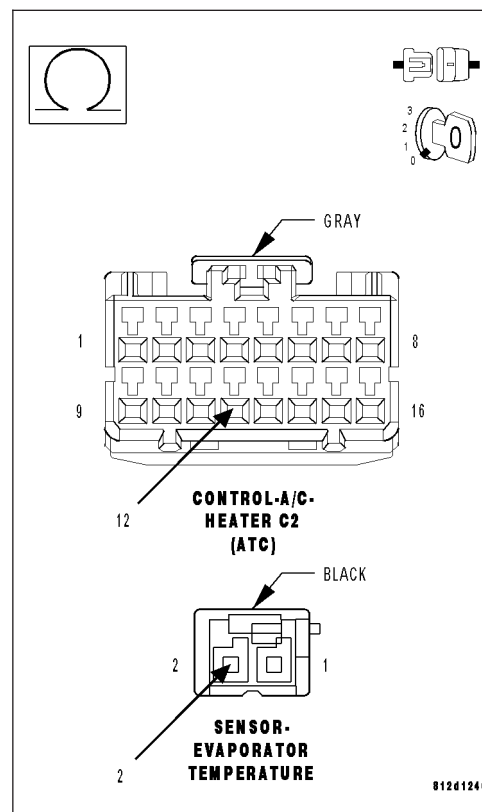


**B1032-EVAPORATOR FIN TEMPERATURE SENSOR CIRCUIT HIGH (ATC) (CONTINUED)****4. CHECK (C121) SENSOR GROUND CIRCUIT FOR AN OPEN**

Measure the resistance of the (C121) Sensor Ground circuit between the A/C Heater Control C2 harness connector and the Evaporator Temperature Sensor harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Evaporator Temperature Sensor in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Repair the (C121) Sensor Ground circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1034–INFRARED TEMPERATURE SENSOR INPUT CIRCUIT LOW (ATC)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the IR Sensor fails the internal self test.

Possible Causes
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

**Diagnostic Test**

1. REPLACE THE A/C HEATER CONTROL

**Repair**

Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**B1035—INFRARED TEMPERATURE SENSOR INPUT CIRCUIT HIGH (ATC)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the IR Sensor fails the internal self test.

Possible Causes
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

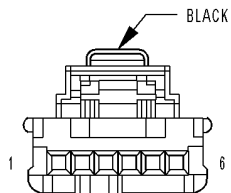
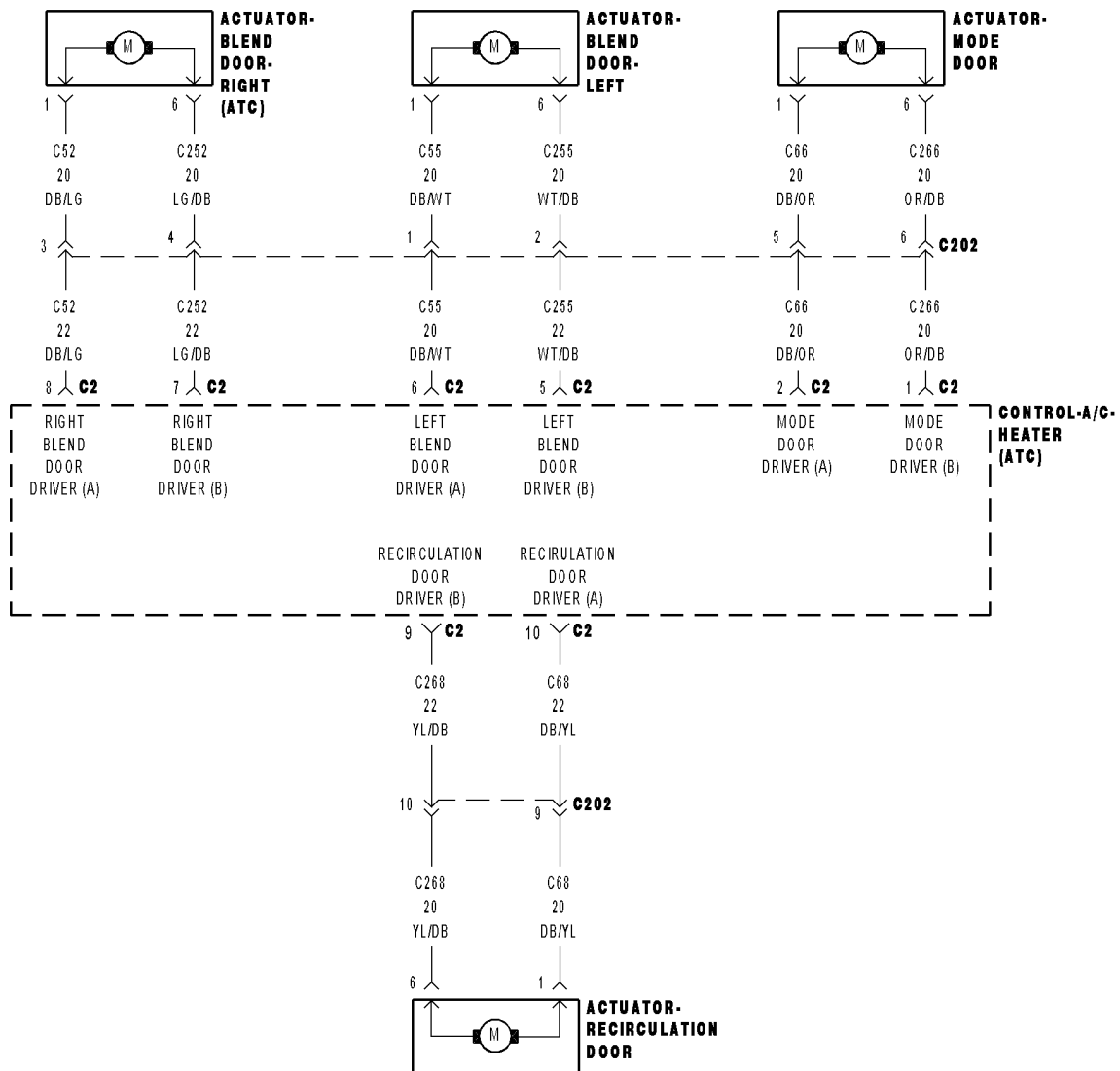
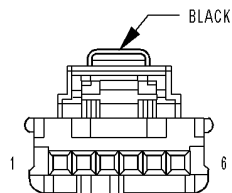
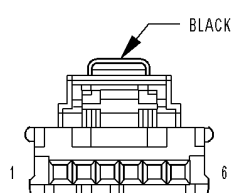
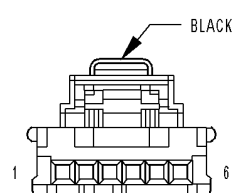
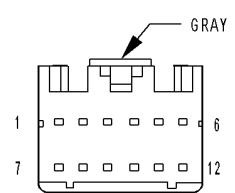
**Diagnostic Test****1. REPLACE THE A/C HEATER CONTROL****Repair**

Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

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**B1040—PANEL MODE DOOR 1 CONTROL CIRCUIT/PERFORMANCE (ATC)****ACTUATOR-BLEND DOOR-LEFT****ACTUATOR-BLEND DOOR-RIGHT (ATC)****ACTUATOR-MODE DOOR****ACTUATOR-RECIRCULATION DOOR****CONTROL-A/C-HEATER C2 (ATC)**

**B1040–PANEL MODE DOOR 1 CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When driving the Mode Door Actuator.
- **Set Condition:**  
If the A/C Heater Control fails to detect commutator pulses.

Possible Causes
MODE DOOR SEIZED, BINDING, OBSTRUCTED
(C66) MODE DOOR DRIVER (A) CIRCUIT SHORTED TO VOLTAGE
(C266) MODE DOOR DRIVER (B) CIRCUIT SHORTED TO VOLTAGE
(C66) MODE DOOR DRIVER (A) CIRCUIT SHORTED TO GROUND
(C266) MODE DOOR DRIVER (B) CIRCUIT SHORTED TO GROUND
(C66) MODE DOOR DRIVER (A) CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
(C266) MODE DOOR DRIVER (B) CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S)
(C66) MODE DOOR DRIVER (A) CIRCUIT SHORTED TO (C266) MODE DOOR DRIVER (B) CIRCUIT
(C66) MODE DOOR DRIVER (A) CIRCUIT OPEN
(C266) MODE DOOR DRIVER (B) CIRCUIT OPEN
MODE DOOR ACTUATOR
A/C HEATER CONTROL

**Diagnostic Test****1. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display: B1044 PANEL MODE DOOR 1 TRAVEL RANGE TOO SMALL?**

**Yes** >> Diagnose and Repair the DTC. Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 2

**B1040-PANEL MODE DOOR 1 CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****2. CHECK (C66) MODE DOOR DRIVER (A) CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the A/C Heater Control C2 harness connector.

Turn the ignition on.

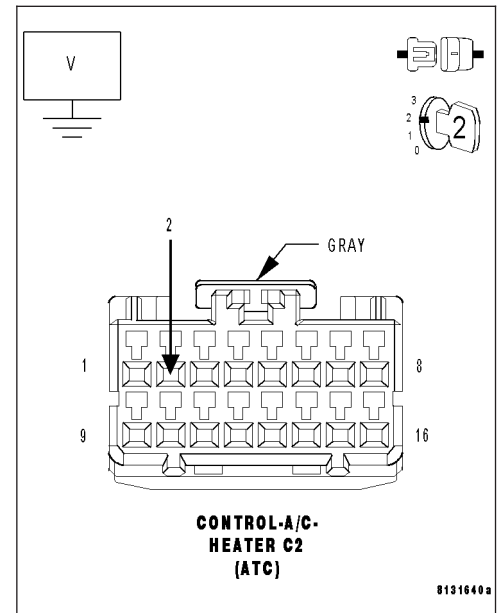
Measure the voltage of the (C66) Mode Door Driver (A) circuit.

**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (C66) Mode Door Driver (A) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 3

**3. CHECK (C266) MODE DOOR DRIVER (B) CIRCUIT FOR A SHORT TO VOLTAGE**

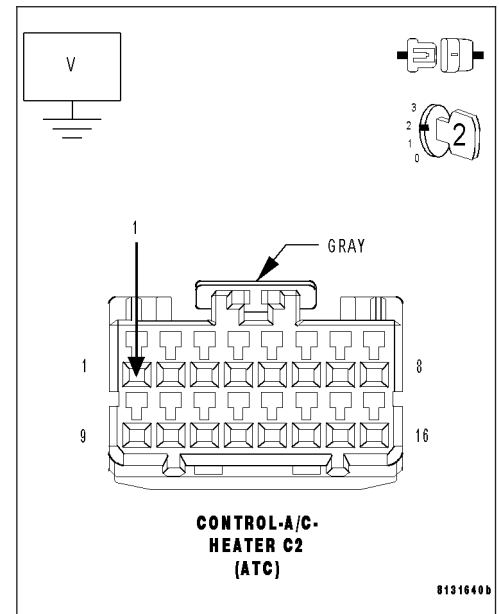
Measure the voltage of the (C266) Mode Door Driver (B) circuit.

**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (C266) Mode Door Driver (B) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 4



**B1040-PANEL MODE DOOR 1 CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****4. CHECK (C66) MODE DOOR DRIVER (A) CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

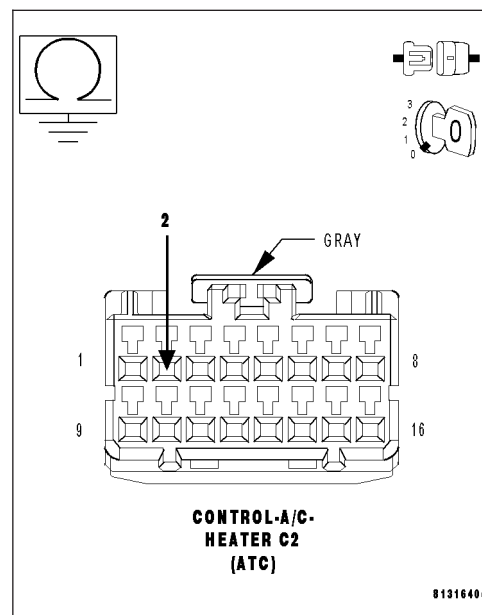
Measure the resistance of the (C66) Mode Door Driver (A) circuit between ground and the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C66) Mode Door Driver (A) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 5

**5. CHECK (C266) MODE DOOR DRIVER (B) CIRCUIT FOR A SHORT TO GROUND**

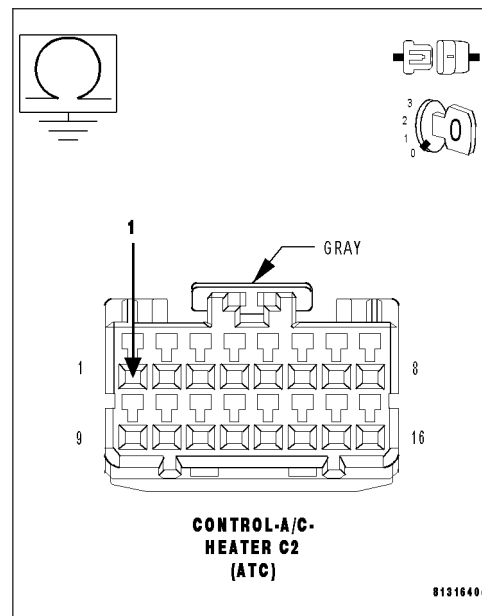
Measure the resistance of the (C266) Mode Door Driver (B) circuit between ground and the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C266) Mode Door Driver (B) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 6



**B1040-PANEL MODE DOOR 1 CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****6. CHECK (C66) MODE DOOR DRIVER (A) CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)**

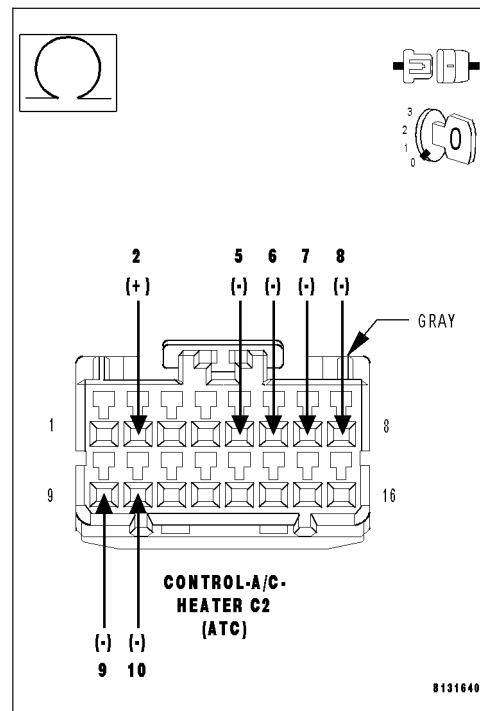
Measure the resistance between the (C66) Mode Door Driver (A) circuit and the (C255) Left Blend Door Driver (B) circuit, the (C55) Left Blend Door Driver (A) circuit, the (C252) Right Blend Door Driver (B) circuit, the (C52) Right Blend Door Driver (A) circuit, the (C268) Recirculation Door Driver (B) circuit, and the (C68) Recirculation Door Driver (A) circuit in the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms between the (C66) Mode Door Driver (A) circuit and any of the other door driver circuits?**

**Yes** >> Repair the circuits with a resistance below 10k ohms for a short to the (C66) Mode Door Driver (A) circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 7

**7. CHECK (C266) MODE DOOR DRIVER (B) CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)**

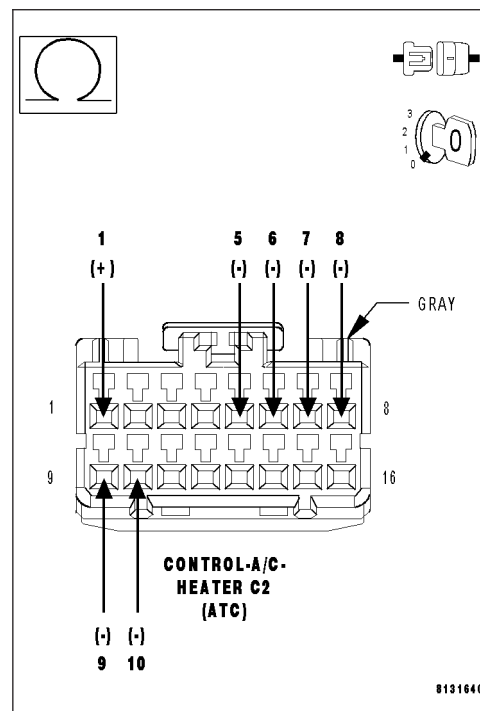
Measure the resistance between the (C266) Mode Door Driver (B) circuit and the (C255) Left Blend Door Driver (B) circuit, the (C55) Left Blend Door Driver (A) circuit, the (C252) Right Blend Door Driver (B) circuit, the (C52) Right Blend Door Driver (A) circuit, the (C268) Recirculation Door Driver (B) circuit, and the (C68) Recirculation Door Driver (A) circuit in the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms between the (C266) Mode Door Driver (B) circuit and any of the other door driver circuits?**

**Yes** >> Repair the circuits with a resistance below 10k ohms for a short to the (C266) Mode Door Driver (B) circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 8



**B1040-PANEL MODE DOOR 1 CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****8. CHECK MODE DOOR ACTUATOR CIRCUIT RESISTANCE**

Measure the resistance between the (C66) Mode Door Driver (A) circuit and the (C266) Mode Door Driver (B) circuit in the A/C Heater Control C2 harness connector.

**What is the resistance?**

**Below 30 Ohms**

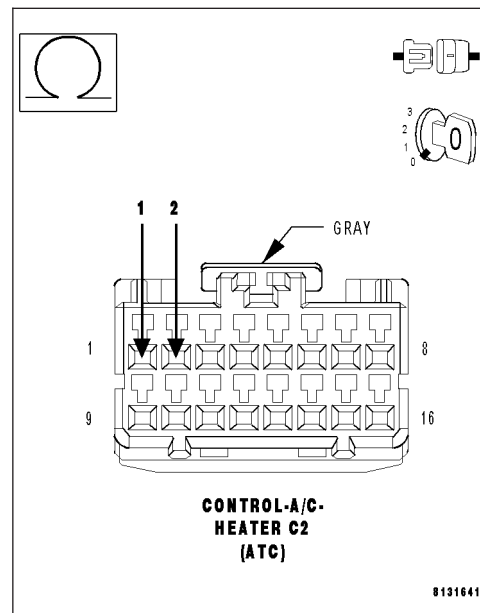
Go To 9

**Above 70 Ohms**

Go To 10

**30 to 70 Ohms**

Go To 12

**9. CHECK (C66) MODE DOOR DRIVER (A) CIRCUIT FOR A SHORT TO (C266) MODE DOOR DRIVER (B) CIRCUIT**

Disconnect the Mode Door Actuator harness connector.

Measure the resistance between the (C66) Mode Door Driver (A) circuit and the (C266) Mode Door Driver (B) circuit in the A/C Heater Control C2 harness connector.

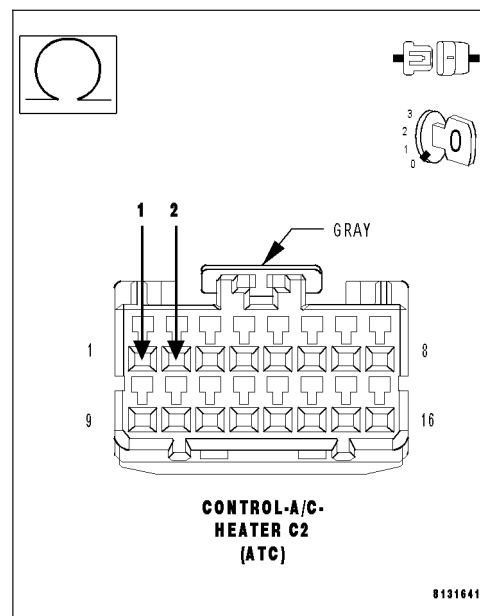
**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C66) Mode Door Driver (A) circuit for a short to the (C266) Mode Door Driver (B) circuit.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Replace the Mode Door Actuator in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**B1040-PANEL MODE DOOR 1 CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****10. CHECK (C66) MODE DOOR DRIVER (A) CIRCUIT FOR AN OPEN**

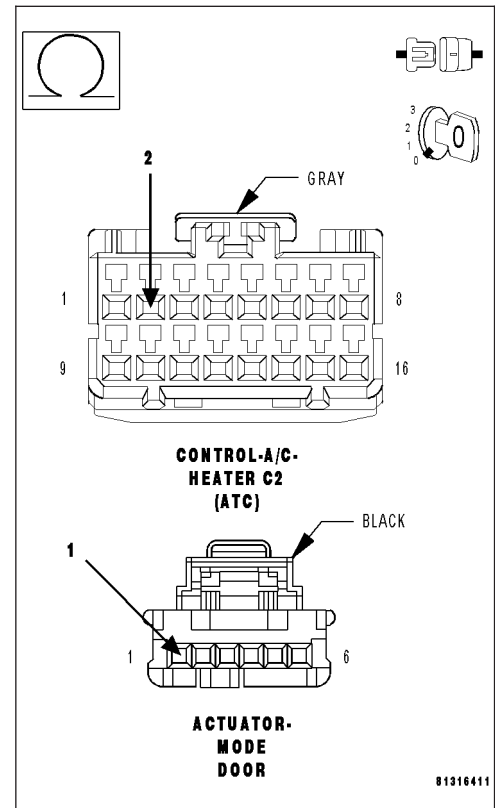
Disconnect the Mode Door Actuator harness connector.

Measure the resistance of the (C66) Mode Door Driver (A) circuit between the A/C Heater Control C2 harness connector and the Mode Door Actuator harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Go To 11

**No** >> Repair the (C66) Mode Door Driver (A) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

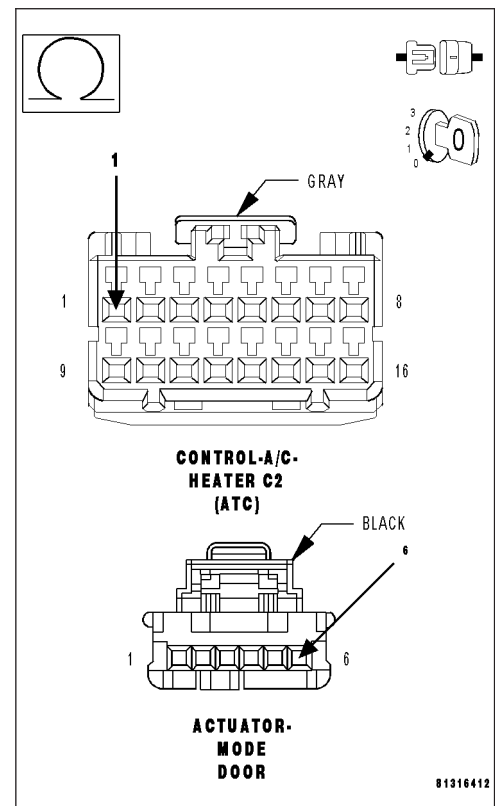
**11. CHECK (C266) MODE DOOR DRIVER (B) CIRCUIT FOR AN OPEN**

Measure the resistance of the (C266) Mode Door Driver (B) circuit between the A/C Heater Control C2 harness connector and the Mode Door Actuator harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the Mode Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Repair the (C266) Mode Door Driver (B) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).



**B1040–PANEL MODE DOOR 1 CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****12. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Reconnect the A/C Heater Control C2 harness connector.

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display: B1040–PANEL MODE DOOR 1 CONTROL CIRCUIT/PERFORMANCE?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Using the wiring diagram as a guide inspect the wiring and connectors for a condition causing an intermittent loss of commutator pulses from the Mode Door Actuator.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
-



**B1044–PANEL MODE DOOR 1 TRAVEL RANGE TOO SMALL (ATC)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is less than the expected range for this actuator, this DTC will set. Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING for additional information.

- **When Monitored:**  
During actuator calibration.
- **Set Condition:**  
If the total span of the Mode Door is less than the low range limit.

Possible Causes
MODE DOOR SEIZED, BINDING, OBSTRUCTED
MODE DOOR ACTUATOR
A/C HEATER CONTROL

**Diagnostic Test****1. INSPECT ACTUATOR & HOUSING ASSEMBLY FOR A CONDITION CAUSING THE DOOR TO SEIZE OR BIND**

Turn the ignition off.

Inspect the actuator, linkage, and housing assembly for a condition causing the door to seize or bind.

**Are there any physical or mechanical problems with the door, housing, linkage, or actuator?**

**Yes** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 2

**2. CHECK MODE DOOR TRAVEL**

Remove the Mode Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the door in both directions. The door should operate smoothly in both directions over approximately 240 degrees of travel.

**Does the door operate smoothly in both directions over approximately 240 degrees of travel?**

**Yes** >> Replace the Mode Door Actuator in accordance with the Service Information. Then, Go To 3.

**No** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**3. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display: B1044 PANEL MODE DOOR 1 TRAVEL RANGE TOO SMALL?**

**Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**B1045–PANEL MODE DOOR 1 TRAVEL RANGE TOO LARGE (ATC)**

For a complete wiring diagram **Refer to Section 8W.**

**Theory of Operation**

The purpose of actuator calibration is to determine the total span of door travel between physical stops. To calibrate the actuator, the A/C Heater Control first moves the door to its soft stop, and then counts the number of pulses it takes to move the door to its other stop. An expected range of span is stored in the control's memory. If the measured calibration value is greater than the expected range for this actuator, this DTC will set. Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING for additional information.

- **When Monitored:**  
During actuator calibration.
- **Set Condition:**  
If the total span of the Mode Door exceeds the high range limit.

Possible Causes
MODE DOOR OR A/C HEATER HOUSING COMPONENTS WARPED, WORN, DAMAGED, MISSING, BROKEN
MODE DOOR ACTUATOR
A/C HEATER CONTROL

**Diagnostic Test****1. CHECK FOR A BROKEN MODE DOOR ACTUATOR**

Turn the ignition off.

Remove the Mode Door Actuator from the A/C Heater Housing Assembly.

By hand, attempt to rotate the actuator in both directions.

**Does the actuator turn in either direction?**

- Yes** >> Replace the Mode Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Go To 2

**2. CHECK MODE DOOR & A/C HEATER HOUSING FOR WARPED, WORN, DAMAGED, MISSING, & BROKEN COMPONENTS**

Inspect for excessively worn, disconnected, missing, or broken door linkage. Inspect for a damaged or broken A/C Heater Housing Assembly. Inspect for a warped or broken door, and missing door seals. Rotate the door from stop to stop. The door should rotate approximately 240 degrees.

**Are there any physical or mechanical problems with the door or housing?**

- Yes** >> Repair as necessary in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Replace the Mode Door Actuator in accordance with the Service Information. Then, Go To 3.

**3. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display: B1045–PANEL MODE DOOR 1 TRAVEL RANGE TOO LARGE?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**Wiring Diagram for 81316409 Actuator Assembly**

The diagram illustrates the electrical connections for the actuator assembly, which includes the following components:

- ACTUATOR-BLEND DOOR-RIGHT (ATC)**: Motor (M) connected to terminals 1 and 6.
- ACTUATOR-BLEND DOOR-LEFT**: Motor (M) connected to terminals 1 and 6.
- ACTUATOR-MODE DOOR**: Motor (M) connected to terminals 1 and 6.
- ACTUATOR-RECIRCULATION DOOR**: Motor (M) connected to terminals 1 and 6.
- CONTROL-A/C-HEATER (ATC) C2**: Control unit with terminals 1 through 12.

**Wiring Connections:**

- Right Blend Door (ATC)**:
  - Terminal 1: C52 20 DB/LG
  - Terminal 6: C252 20 LG/DB
- Left Blend Door**:
  - Terminal 1: C55 20 DB/NT
  - Terminal 6: C255 20 WT/DB
- Mode Door**:
  - Terminal 1: C66 20 DB/OR
  - Terminal 6: C266 20 OR/DB
- Recirculation Door**:
  - Terminal 1: C68 20 DB/YL
  - Terminal 6: C268 20 YL/DB
- Control-A/C-Heater (ATC) C2**:
  - Terminal 1: C2 1 MODE DOOR DRIVER (B)
  - Terminal 2: C2 2 MODE DOOR DRIVER (A)
  - Terminal 5: C2 5 LEFT BLEND DOOR DRIVER (B)
  - Terminal 6: C2 6 LEFT BLEND DOOR DRIVER (A)
  - Terminal 7: C2 7 RIGHT BLEND DOOR DRIVER (B)
  - Terminal 8: C2 8 RIGHT BLEND DOOR DRIVER (A)
  - Terminal 9: C2 9 RECIRCULATION DOOR DRIVER (B)
  - Terminal 10: C2 10 RECIRCULATION DOOR DRIVER (A)

**Physical Assembly Details:**

- ACTUATOR-BLEND DOOR-LEFT**: BLACK
- ACTUATOR-BLEND DOOR-RIGHT (ATC)**: BLACK
- ACTUATOR-MODE DOOR**: BLACK
- ACTUATOR-RECIRCULATION DOOR**: BLACK
- CONTROL-A/C-HEATER C2 (ATC)**: GRAY

**B1058–RECIRCULATION DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When driving the Recirculation Door Actuator.
- **Set Condition:**  
If the A/C Heater Control fails to detect commutator pulses.

Possible Causes
RECIRCULATION DOOR SEIZED, BINDING, OBSTRUCTED (C68) RECIRCULATION DOOR DRIVER (A) CIRCUIT SHORTED TO VOLTAGE (C268) RECIRCULATION DOOR DRIVER (B) CIRCUIT SHORTED TO VOLTAGE (C68) RECIRCULATION DOOR DRIVER (A) CIRCUIT SHORTED TO GROUND (C268) RECIRCULATION DOOR DRIVER (B) CIRCUIT SHORTED TO GROUND (C68) RECIRCULATION DOOR DRIVER (A) CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S) (C268) RECIRCULATION DOOR DRIVER (B) CIRCUIT SHORTED TO OTHER DOOR DRIVER CIRCUIT(S) (C68) RECIRCULATION DOOR DRIVER (A) CIRCUIT SHORTED TO (C268) RECIRCULATION DOOR DRIVER (B) CIRCUIT (C68) RECIRCULATION DOOR DRIVER (A) CIRCUIT OPEN (C268) RECIRCULATION DOOR DRIVER (B) CIRCUIT OPEN RECIRCULATION DOOR ACTUATOR A/C HEATER CONTROL

**Diagnostic Test****1. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display: B105C RECIRCULATION DOOR TRAVEL RANGE TOO SMALL?**

**Yes** >> Diagnose and Repair the DTC. Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 2

**B1058-RECIRCULATION DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****2. CHECK (C68) RECIRCULATION DOOR DRIVER (A) CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the A/C Heater Control C2 harness connector.

Turn the ignition on.

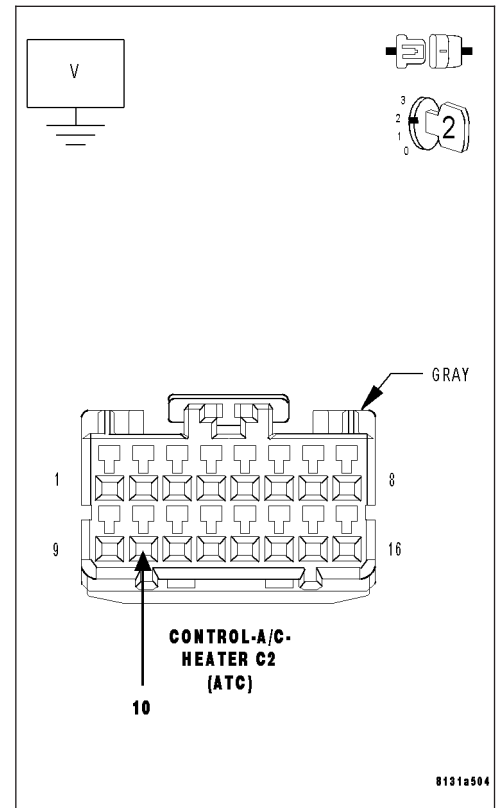
Measure the voltage of the (C68) Recirculation Door Driver (A) circuit.

**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (C68) Recirculation Door Driver (A) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 3

**3. CHECK (C268) RECIRCULATION DOOR DRIVER (B) CIRCUIT FOR A SHORT TO VOLTAGE**

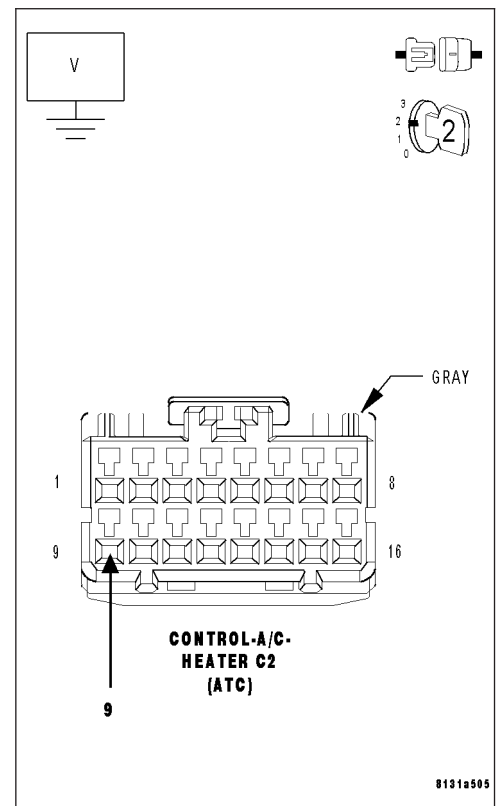
Measure the voltage of the (C268) Recirculation Door Driver (B) circuit.

**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (C268) Recirculation Door Driver (B) circuit for a short to voltage.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 4



**B1058-RECIRCULATION DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****4. CHECK (C68) RECIRCULATION DOOR DRIVER (A) CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

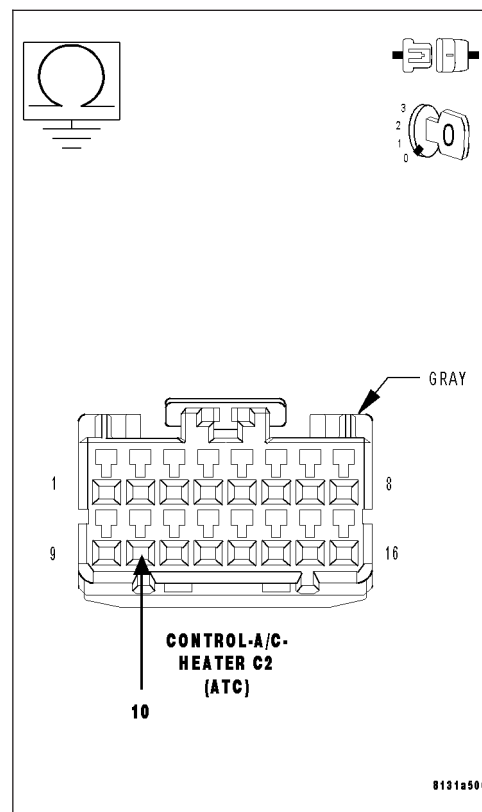
Measure the resistance of the (C68) Recirculation Door Driver (A) circuit between ground and the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C68) Recirculation Door Driver (A) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 5

**5. CHECK (C268) RECIRCULATION DOOR DRIVER (B) CIRCUIT FOR A SHORT TO GROUND**

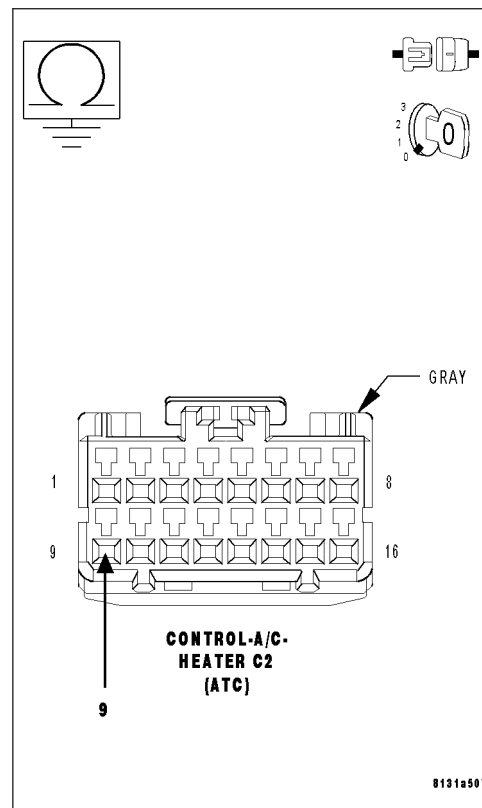
Measure the resistance of the (C268) Recirculation Door Driver (B) circuit between ground and the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C268) Recirculation Door Driver (B) circuit for a short to ground.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 6



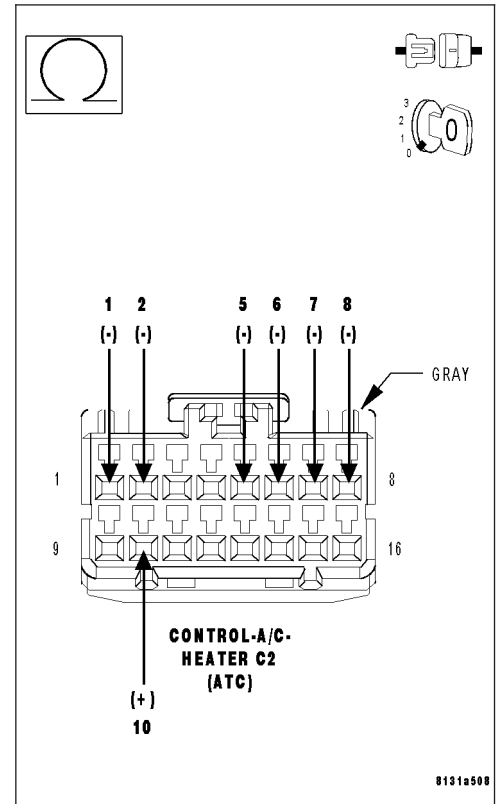
**B1058-RECIRCULATION DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****6. CHECK (C68) RECIRCULATION DOOR DRIVER (A) CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)**

Measure the resistance between the (C68) Recirculation Door Driver (A) circuit and the (C266) Mode Door Driver (B) circuit, the (C66) Mode Door Driver (A) circuit, the (C255) Left Blend Door Driver (B) circuit, the (C55) Left Blend Door Driver (A) circuit, the (C252) Right Blend Door Driver (B) circuit, and the (C52) Right Blend Door Driver (A) circuit in the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms between the (C68) Recirculation Door Driver (A) circuit and any of the other door driver circuits?**

**Yes** >> Repair the circuits with a resistance below 10k ohms for a short to the (C68) Recirculation Door Driver (A) circuit.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 7



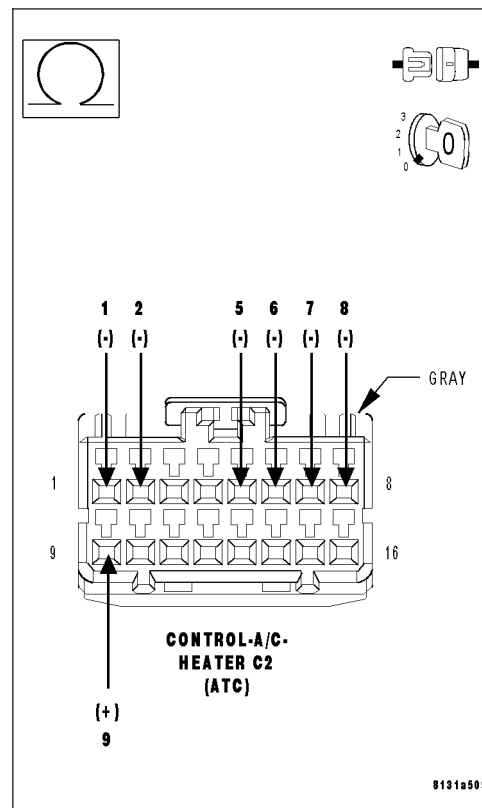
**B1058-RECIRCULATION DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****7. CHECK (C268) RECIRCULATION DOOR DRIVER (B) CIRCUIT FOR A SHORT TO OTHER DOOR DRIVER CIRCUIT(S)**

Measure the resistance between the (C268) Recirculation Door Driver (B) circuit and the (C266) Mode Door Driver (B) circuit, the (C66) Mode Door Driver (A) circuit, the (C255) Left Blend Door Driver (B) circuit, the (C55) Left Blend Door Driver (A) circuit, the (C252) Right Blend Door Driver (B) circuit, and the (C52) Right Blend Door Driver (A) circuit in the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms between the (C268) Recirculation Door Driver (B) circuit and any of the other door driver circuits?**

**Yes** >> Repair the circuits with a resistance below 10k ohms for a short to the (C268) Recirculation Door Driver (B) circuit.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**No** >> Go To 8

**8. CHECK RECIRCULATION DOOR ACTUATOR CIRCUIT RESISTANCE**

Measure the resistance between the (C68) Recirculation Door Driver (A) circuit and the (C268) Recirculation Door Driver (B) circuit in the A/C Heater Control C2 harness connector.

**What is the resistance?**

**Below 30 Ohms**

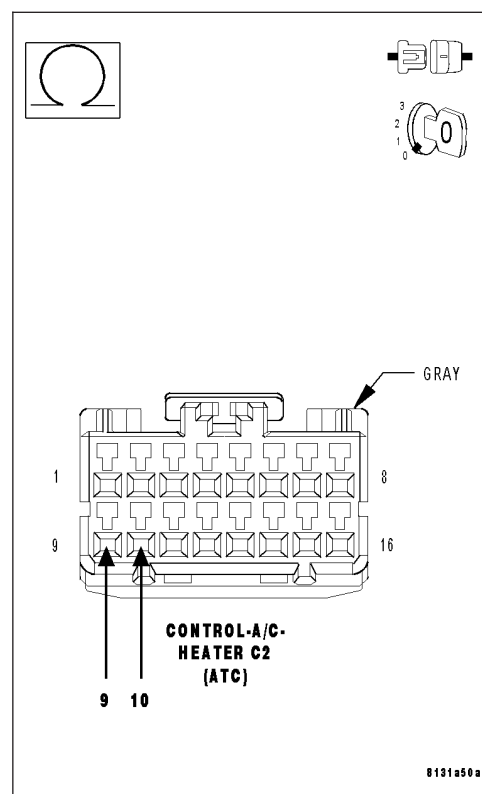
Go To 9

**Above 70 Ohms**

Go To 10

**30 to 70 Ohms**

Go To 12





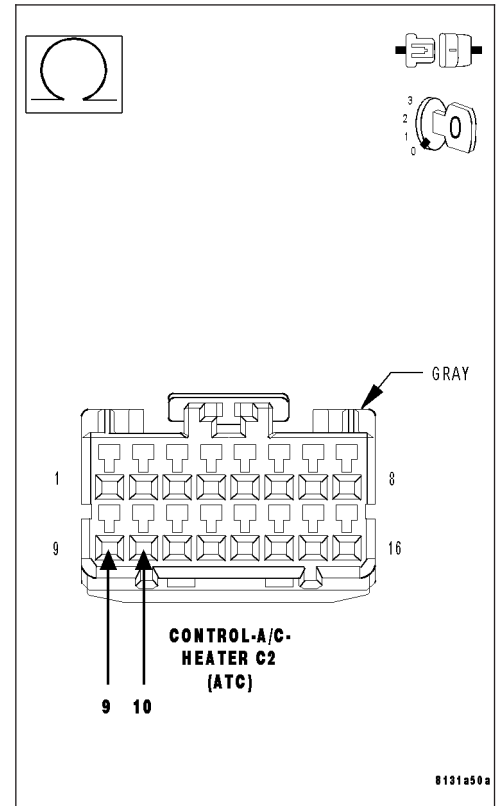
**B1058-RECIRCULATION DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****9. CHECK (C68) RECIRCULATION DOOR DRIVER (A) CIRCUIT FOR A SHORT TO (C268) RECIRCULATION DOOR DRIVER (B) CIRCUIT**

Disconnect the Recirculation Door Actuator harness connector.

Measure the resistance between the (C68) Recirculation Door Driver (A) circuit and the (C268) Recirculation Door Driver (B) circuit in the A/C Heater Control C2 harness connector.

**Is the resistance below 10k ohms?**

- Yes** >> Repair the (C68) Recirculation Door Driver (A) circuit for a short to the (C268) Recirculation Door Driver (B) circuit. Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Replace the Recirculation Door Actuator in accordance with the Service Information. Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

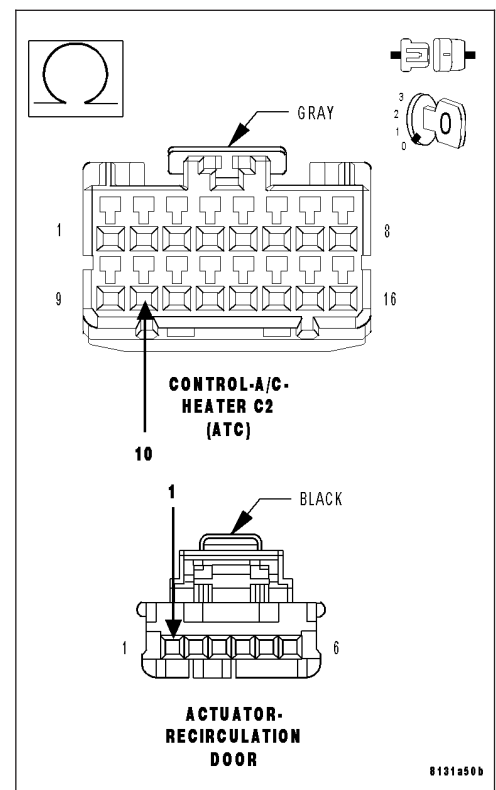
**10. CHECK (C68) RECIRCULATION DOOR DRIVER (A) CIRCUIT FOR AN OPEN**

Disconnect the Recirculation Door Actuator harness connector.

Measure the resistance of the (C68) Recirculation Door Driver (A) circuit between the A/C Heater Control C2 harness connector and the Recirculation Door Actuator harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Go To 11
- No** >> Repair the (C68) Recirculation Door Driver (A) circuit for an open. Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

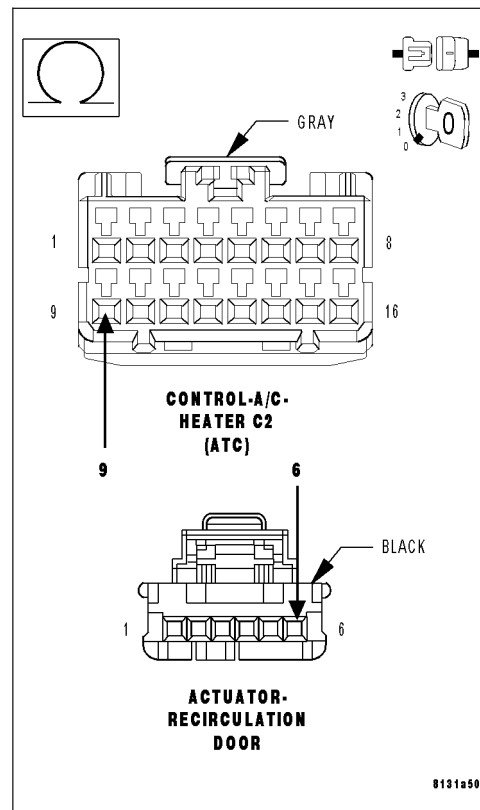


**B1058-RECIRCULATION DOOR CONTROL CIRCUIT/PERFORMANCE (ATC) (CONTINUED)****11. CHECK (C268) RECIRCULATION DOOR DRIVER (B) CIRCUIT FOR AN OPEN**

Measure the resistance of the (C268) Recirculation Door Driver (B) circuit between the A/C Heater Control C2 harness connector and the Recirculation Door Actuator harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Recirculation Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Repair the (C268) Recirculation Door Driver (B) circuit for an open.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**12. RUN ACTUATOR CALIBRATION & THEN CHECK FOR DTCS IN THE A/C HEATER CONTROL**

Reconnect the A/C Heater Control C2 harness connector.

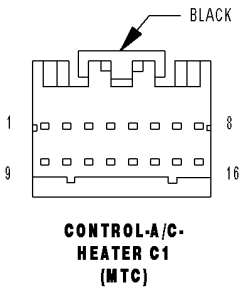
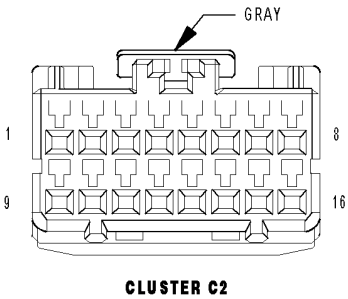
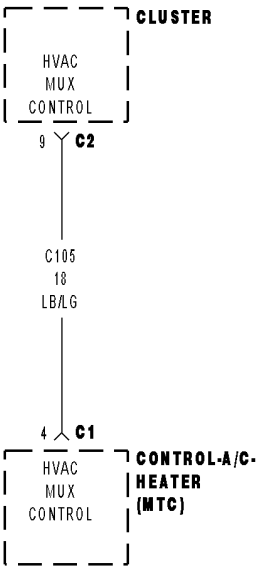
Turn the ignition on.

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display: B1058-RECIRCULATION DOOR CONTROL CIRCUIT/PERFORMANCE?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- No** >> Using the wiring diagram as a guide inspect the wiring and connectors for a condition causing an intermittent loss of commutator pulses from the Recirculation Door Actuator.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

B1082–HVAC MUX CIRCUIT LOW



**B1082–HVAC MUX CIRCUIT LOW (CONTINUED)**

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the Instrument Cluster (CCN) detects voltage below 0.55 volts for 10 seconds on the (C105) HVAC MUX Control circuit.

Possible Causes
(C105) HVAC MUX CONTROL CIRCUIT SHORTED TO GROUND
INSTRUMENT CLUSTER (CCN)
A/C HEATER CONTROL

**Diagnostic Test****1. VERIFY DTC B1082–HVAC MUX CIRCUIT LOW IS ACTIVE**

Turn the ignition on.

With the scan tool, erase CCN DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

With the scan tool, read CCN DTCs.

**Does the scan tool display active: B1082–HVAC MUX CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**2. CHECK FOR DTC B1082–HVAC MUX CIRCUIT LOW WITH A/C HEATER CONTROL C1 HARNESS CONNECTOR DISCONNECTED**

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

With the scan tool, erase CCN DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

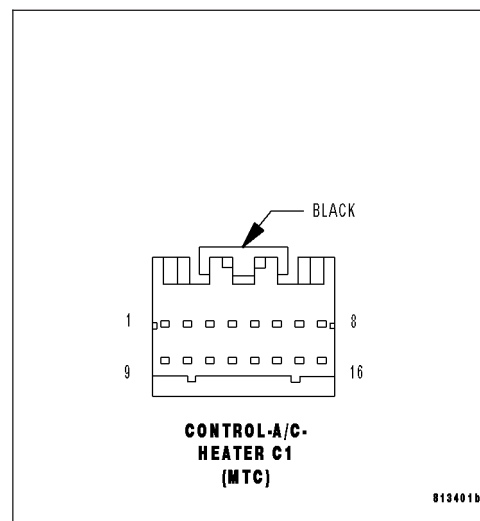
With the scan tool, read CCN DTCs.

**Does the scan tool display: B1082–HVAC MUX CIRCUIT LOW?**

**Yes** >> Go To 3

**No** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1082-HVAC MUX CIRCUIT LOW (CONTINUED)****3. CHECK (C105) HVAC MUX CONTROL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the Instrument Cluster C2 harness connector.

Measure the resistance of the (C105) HVAC MUX Control circuit between ground and the A/C Heater Control C1 harness connector.

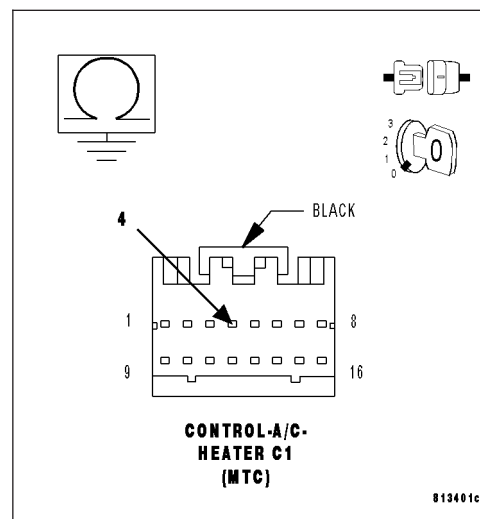
**Is the resistance below 10k ohms?**

**Yes** >> Repair the (C105) HVAC MUX Control circuit for a short to ground.

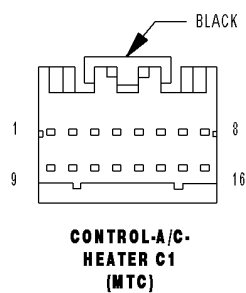
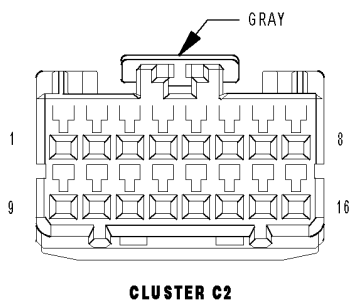
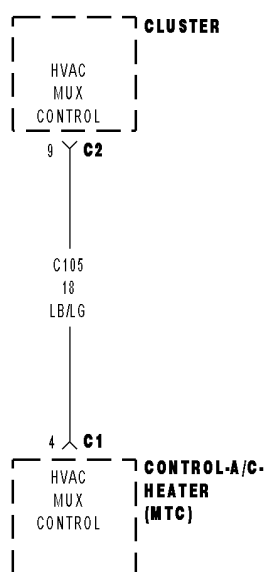
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the Instrument Cluster (CCN) in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



# B1083-HVAC MUX CIRCUIT HIGH



**B1083–HVAC MUX CIRCUIT HIGH (CONTINUED)**

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
If the Instrument Cluster (CCN) detects voltage above 4.5 volts for 10 seconds on the (C105) HVAC MUX Control circuit.

Possible Causes
(C105) HVAC MUX CONTROL CIRCUIT SHORTED TO VOLTAGE
(C105) HVAC MUX CONTROL CIRCUIT OPEN
INSTRUMENT CLUSTER (CCN)
A/C HEATER CONTROL

**Diagnostic Test**

**1. VERIFY DTC B1083–HVAC MUX CIRCUIT HIGH IS ACTIVE**

Turn the ignition on.  
With the scan tool, erase CCN DTCs.  
Turn the ignition off, wait 10 seconds, and turn the ignition on.  
With the scan tool, read CCN DTCs.

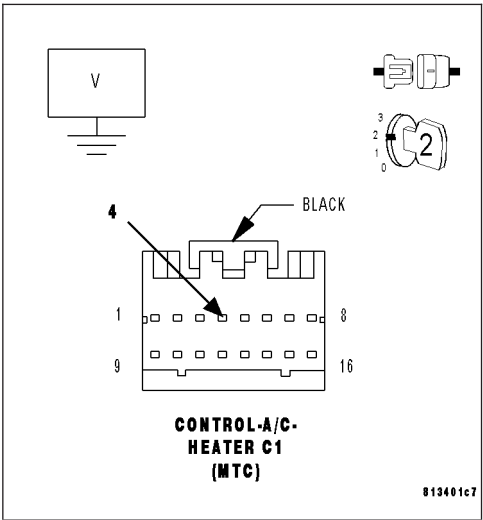
**Does the scan tool display active: B1083–HVAC MUX CIRCUIT HIGH?**

- Yes**    >> Go To 2
- No**    >> Check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**2. CHECK (C105) HVAC MUX CONTROL CIRCUIT VOLTAGE AT A/C HEATER CONTROL C1 HARNESS CONNECTOR**

Turn the ignition off.  
Disconnect the A/C Heater Control C1 harness connector.  
Turn the ignition on.  
Measure the voltage of the (C105) HVAC MUX Control circuit.

- What is the voltage?**
- Below 4.8 Volts**  
Go To 3
- 4.8 to 5.2 Volts**  
Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- Above 5.2 Volts**  
Go To 4



**B1083–HVAC MUX CIRCUIT HIGH (CONTINUED)****3. CHECK (C105) HVAC MUX CONTROL CIRCUIT FOR AN OPEN**

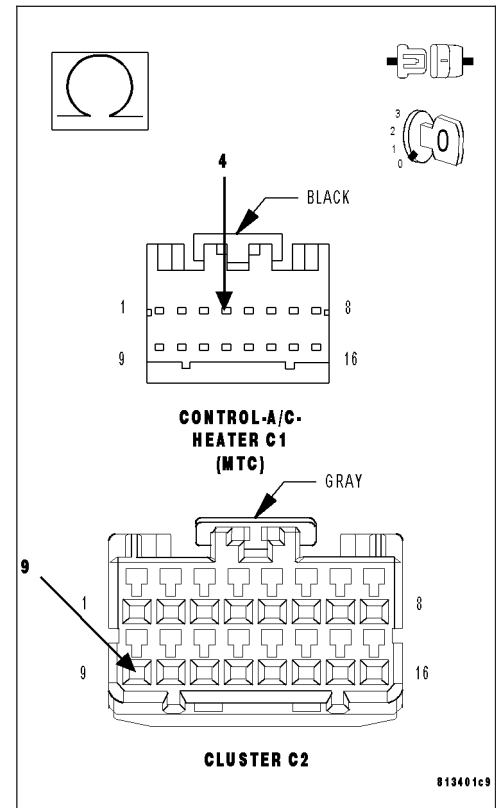
Turn the ignition off.

Disconnect the Instrument Cluster C2 harness connector.

Measure the resistance of the (C105) HVAC MUX Control circuit between the A/C Heater Control C1 harness connector and the Instrument Cluster C2 harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the Instrument Cluster (CCN) in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Repair the (C105) HVAC MUX Control circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**4. CHECK (C105) HVAC MUX CONTROL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

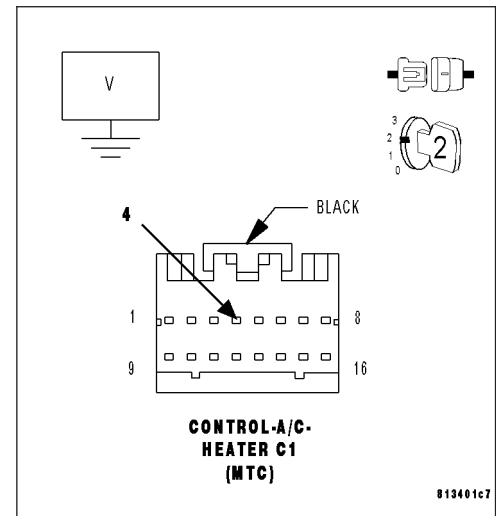
Disconnect the Instrument Cluster C2 harness connector.

Turn the ignition on.

Measure the voltage of the (C105) HVAC MUX Control circuit.

**Is the voltage above 0.2 volts?**

- Yes** >> Repair the (C105) HVAC MUX Control circuit for a short to voltage.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Replace the Instrument Cluster (CCN) in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).





**B1099–RECIRCULATION DOOR ACTUATOR PERFORMANCE (ATC)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
When driving the Recirculation Door Actuator.
- **Set Condition:**  
If the A/C Heater Control detects an excessive loss or gain of commutator pulses.

Possible Causes
RECIRCULATION DOOR ACTUATOR

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

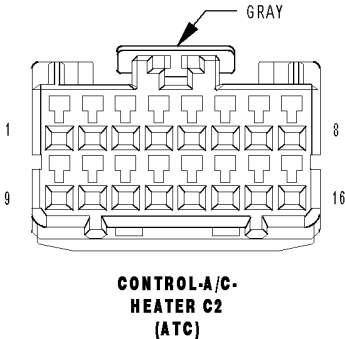
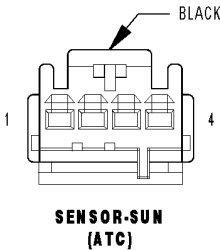
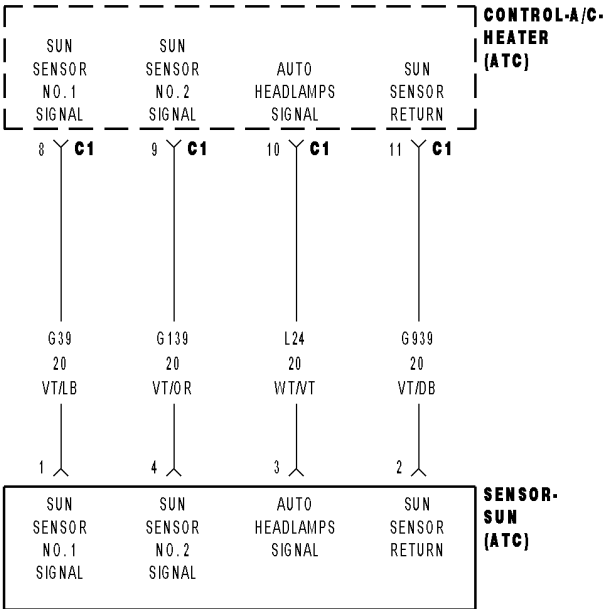
**Diagnostic Test**

1. REPLACE THE RECIRCULATION DOOR ACTUATOR

**Repair**

Replace the Recirculation Door Actuator in accordance with the Service Information.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

B1601-LEFT SOLAR SENSOR CIRCUIT LOW (ATC)



**B1601–LEFT SOLAR SENSOR CIRCUIT LOW (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the Left Sunload Sensor input is out of range toward the low voltage threshold.

Possible Causes
(G39) SUN SENSOR NO. 1 SIGNAL CIRCUIT SHORTED TO GROUND
(G39) SUN SENSOR NO. 1 SIGNAL CIRCUIT SHORTED TO (G939) SUN SENSOR RETURN CIRCUIT
SUN SENSOR
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

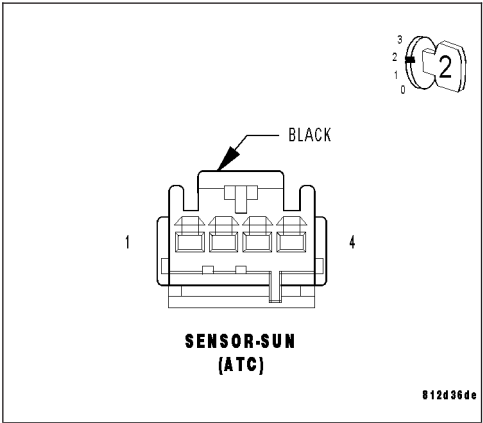
**Diagnostic Test**

**1. CHECK FOR DTC B1601–LEFT SOLAR SENSOR CIRCUIT LOW WITH SUN SENSOR HARNESS CONNECTOR DISCONNECTED**

- Turn the ignition off.
- Disconnect the Sun Sensor harness connector.
- Turn the ignition on.
- With the scan tool, erase HVAC DTCs.
- Turn the ignition off, wait 10 seconds, and turn the ignition on.
- With the scan tool, read HVAC DTCs.

**Does the scan tool display: B1601–LEFT SOLAR SENSOR CIRCUIT LOW?**

- Yes** >> Go To 2
- No** >> Replace the Sun Sensor in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1601-LEFT SOLAR SENSOR CIRCUIT LOW (ATC) (CONTINUED)****2. CHECK (G39) SUN SENSOR NO. 1 SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

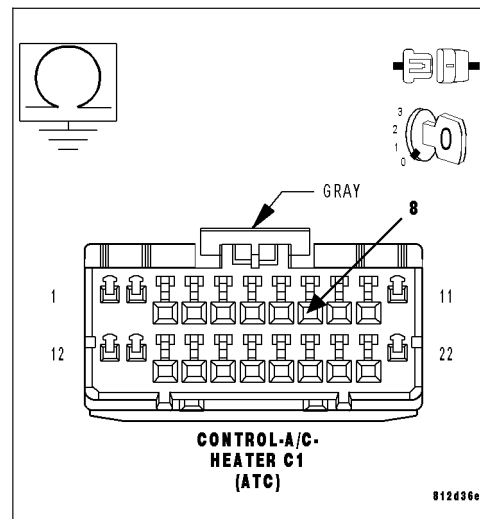
Measure the resistance of the (G39) Sun Sensor No. 1 Signal circuit between ground and the A/C Heater Control C1 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (G39) Sun Sensor No. 1 Signal circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 3

**3. CHECK (G39) SUN SENSOR NO. 1 SIGNAL CIRCUIT FOR A SHORT TO (G939) SUN SENSOR RETURN CIRCUIT**

Measure the resistance between the (G39) Sun Sensor No. 1 Signal circuit and the (G939) Sun Sensor Return circuit in the A/C Heater Control C1 harness connector.

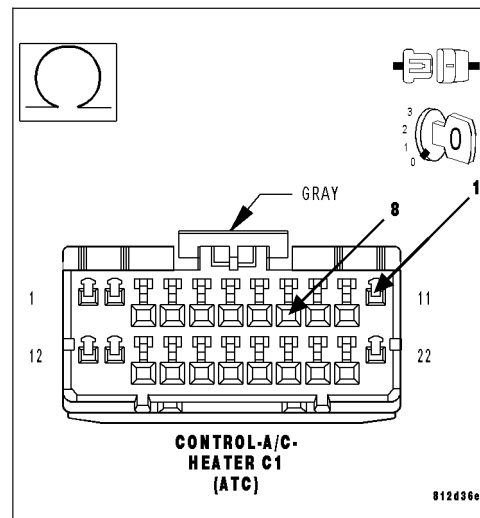
**Is the resistance below 10k ohms?**

**Yes** >> Repair the (G39) Sun Sensor No. 1 Signal circuit for a short to the (G939) Sun Sensor Return circuit.

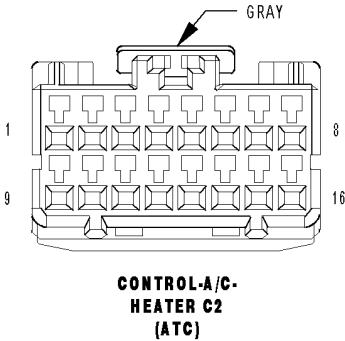
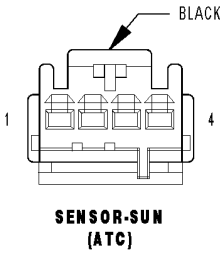
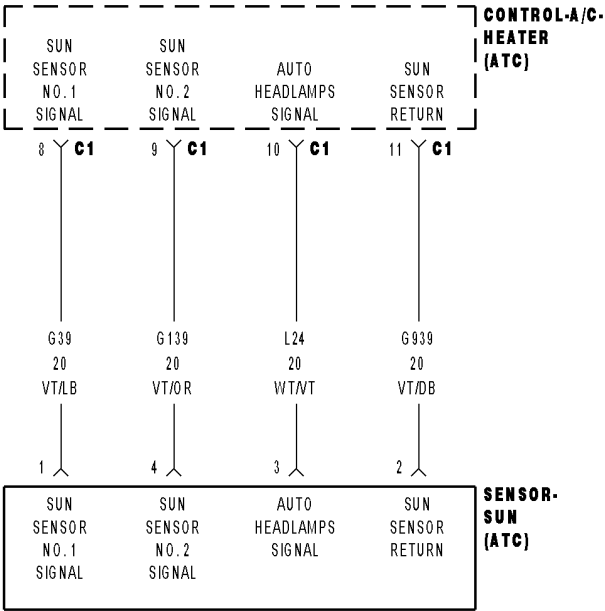
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



B1602-LEFT SOLAR SENSOR CIRCUIT HIGH (ATC)



**B1602–LEFT SOLAR SENSOR CIRCUIT HIGH (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the Left Sunload Sensor input is out of range toward the high voltage threshold.

Possible Causes
(G39) SUN SENSOR NO. 1 SIGNAL CIRCUIT OPEN
(G39) SUN SENSOR NO. 1 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(G939) SUN SENSOR RETURN CIRCUIT OPEN
SUN SENSOR
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

**Diagnostic Test****1. CHECK (G39) SUN SENSOR NO. 1 SIGNAL CIRCUIT VOLTAGE**

Turn the ignition off.

Disconnect the Sun Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (G39) Sun Sensor No. 1 Signal circuit.

**What voltage is present?**

**Above 5.2 Volts**

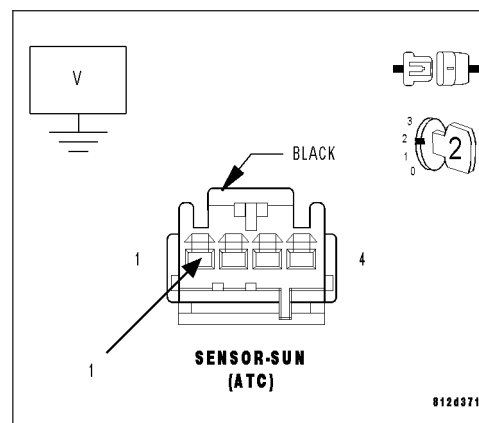
Go To 2

**4.8 Volts to 5.2 Volts**

Go To 3

**Below 4.8 Volts**

Go To 5

**2. CHECK (G39) SUN SENSOR NO. 1 SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (G39) Sun Sensor No. 1 Signal circuit.

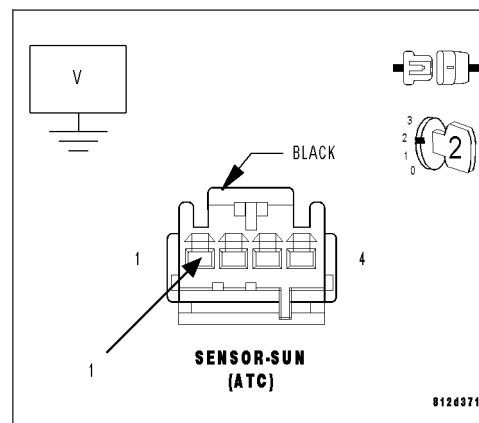
**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (G39) Sun Sensor No. 1 Signal circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1602-LEFT SOLAR SENSOR CIRCUIT HIGH (ATC) (CONTINUED)****3. CHECK (G939) SUN SENSOR RETURN CIRCUIT FUNCTION**

Turn the ignition off.

Connect a jumper wire between the (G39) Sun Sensor No. 1 Signal circuit and the (G939) Sun Sensor Return circuit in the Sun Sensor harness connector.

Turn the ignition on.

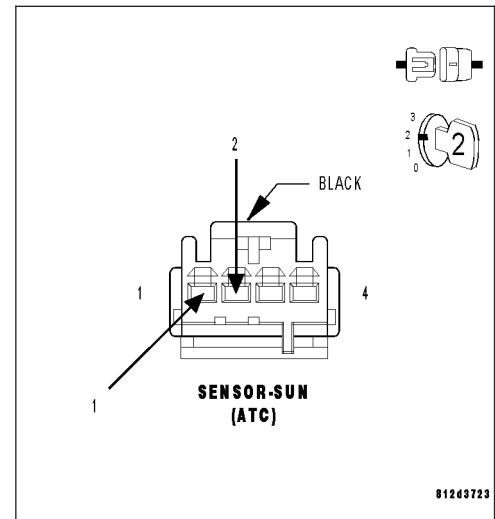
With the scan tool in HVAC, select Data Display and read the Left Solar Sensor voltage.

**Is the voltage below 0.2 volts?**

**Yes** >> Replace the Sun Sensor in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4

**4. CHECK (G939) SUN SENSOR RETURN CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

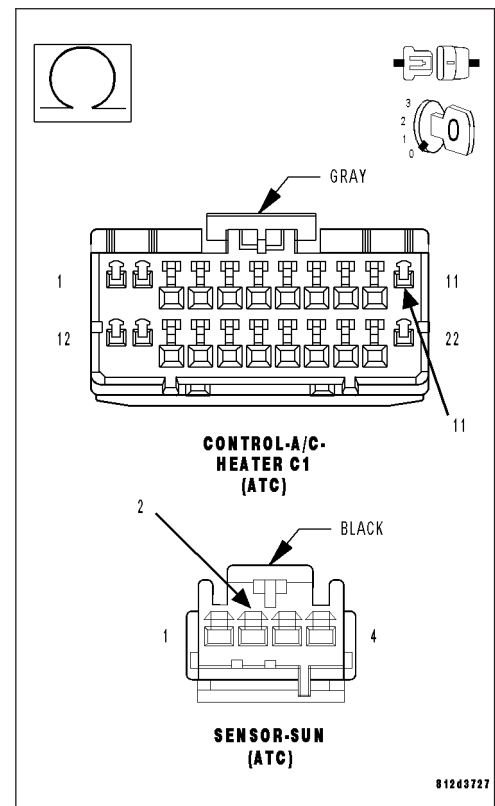
Measure the resistance of the (G939) Sun Sensor Return circuit between the Sun Sensor harness connector and the A/C Heater Control C1 harness connector.

**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Repair the (G939) Sun Sensor Return circuit for an open. Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1602-LEFT SOLAR SENSOR CIRCUIT HIGH (ATC) (CONTINUED)****5. CHECK (G39) SUN SENSOR NO. 1 SIGNAL CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (G39) Sun Sensor No. 1 Signal circuit between the Sun Sensor harness connector and the A/C Heater Control C1 harness connector.

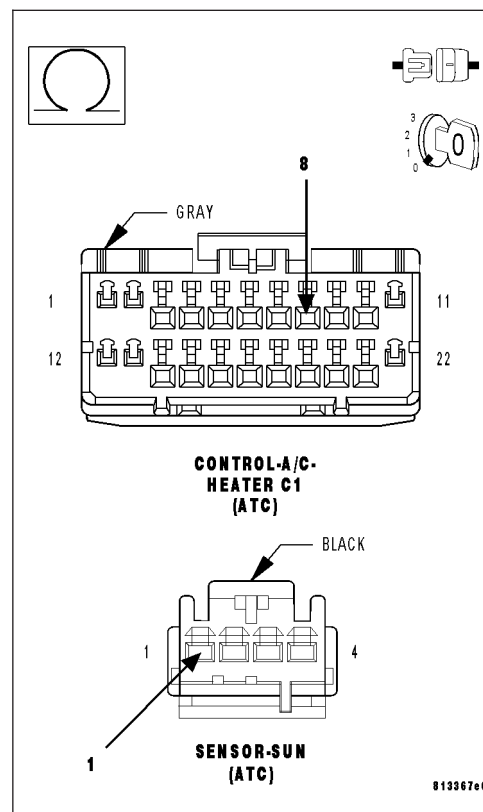
**Is the resistance below 5.0 ohms?**

**Yes** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

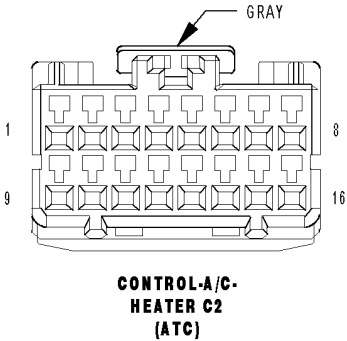
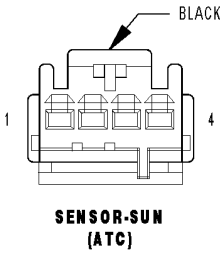
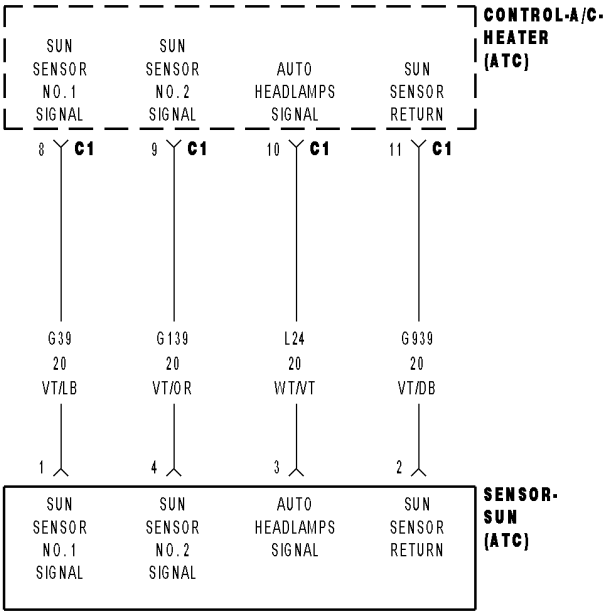
**No** >> Repair the (G39) Sun Sensor No. 1 Signal circuit for an open.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).





B1604–RIGHT SOLAR SENSOR CIRCUIT LOW (ATC)



**B1604–RIGHT SOLAR SENSOR CIRCUIT LOW (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the Right Sunload Sensor input is out of range toward the low voltage threshold.

Possible Causes
(G139) SUN SENSOR NO. 2 SIGNAL CIRCUIT SHORTED TO GROUND
(G139) SUN SENSOR NO. 2 SIGNAL CIRCUIT SHORTED TO (G939) SUN SENSOR RETURN CIRCUIT
SUN SENSOR
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

**Diagnostic Test****1. CHECK FOR DTC B1604–RIGHT SOLAR SENSOR CIRCUIT LOW WITH SUN SENSOR HARNESS CONNECTOR DISCONNECTED**

Turn the ignition off.

Disconnect the Sun Sensor harness connector.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

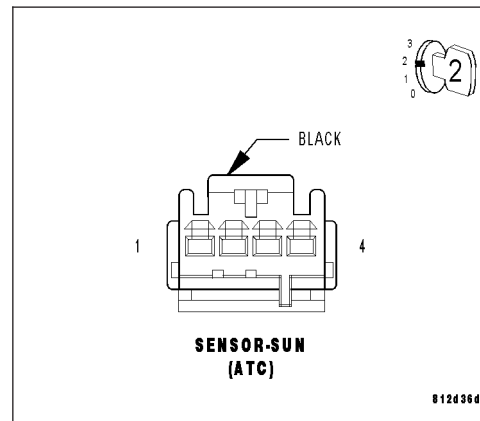
With the scan tool, read HVAC DTCs.

**Does the scan tool display: B1604–RIGHT SOLAR SENSOR CIRCUIT LOW?**

**Yes** >> Go To 2

**No** >> Replace the Sun Sensor in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1604-RIGHT SOLAR SENSOR CIRCUIT LOW (ATC) (CONTINUED)****2. CHECK (G139) SUN SENSOR NO. 2 SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

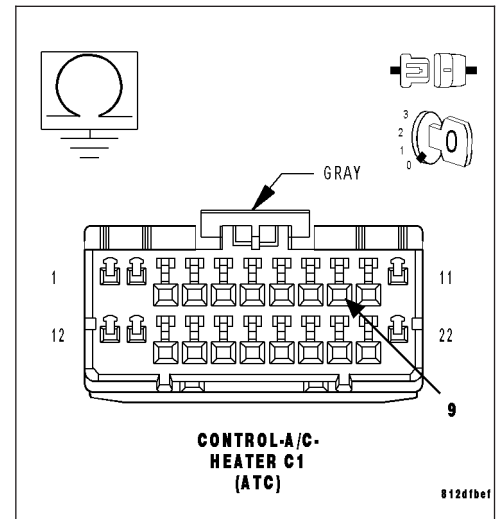
Measure the resistance of the (G139) Sun Sensor No. 2 Signal circuit between ground and the A/C Heater Control C1 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (G139) Sun Sensor No. 2 Signal circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 3

**3. CHECK (G139) SUN SENSOR NO. 2 SIGNAL CIRCUIT FOR A SHORT TO (G939) SUN SENSOR RETURN CIRCUIT**

Measure the resistance between the (G139) Sun Sensor No. 2 Signal circuit and the (G939) Sun Sensor Return circuit in the A/C Heater Control C1 harness connector.

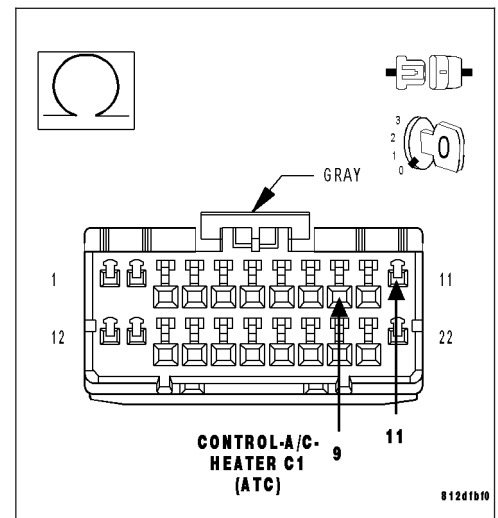
**Is the resistance below 10k ohms?**

**Yes** >> Repair the (G139) Sun Sensor No. 2 Signal circuit for a short to the (G939) Sun Sensor Return circuit.

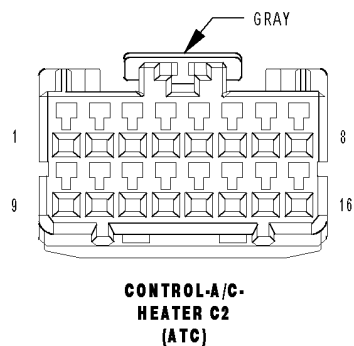
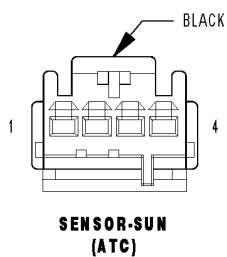
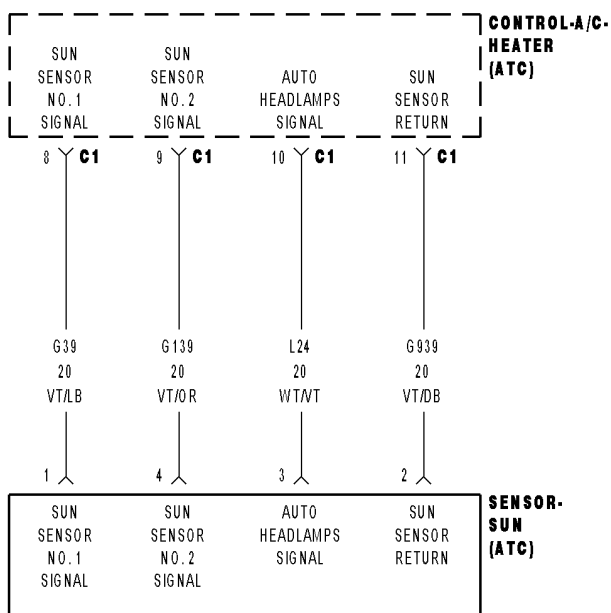
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



## B1605—RIGHT SOLAR SENSOR CIRCUIT HIGH (ATC)



**B1605–RIGHT SOLAR SENSOR CIRCUIT HIGH (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the Right Sunload Sensor input is out of range toward the high voltage threshold.

Possible Causes
(G139) SUN SENSOR NO. 2 SIGNAL CIRCUIT OPEN
(G139) SUN SENSOR NO. 2 SIGNAL CIRCUIT SHORTED TO VOLTAGE
(G939) SUN SENSOR RETURN CIRCUIT OPEN
SUN SENSOR
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK (G139) SUN SENSOR NO. 2 SIGNAL CIRCUIT VOLTAGE

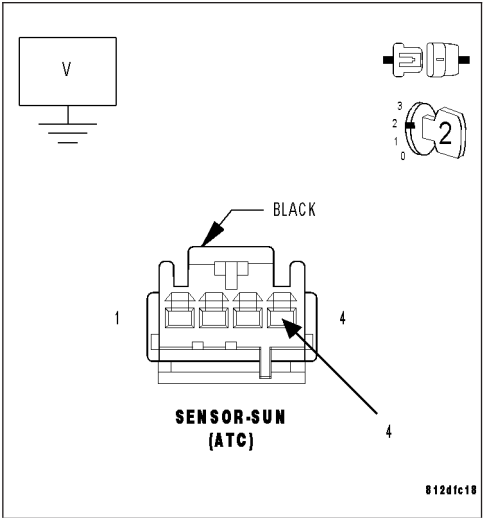
Turn the ignition off.

Disconnect the Sun Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (G139) Sun Sensor No. 2 Signal circuit.

- What voltage is present?**
- Above 5.2 Volts**  
Go To 2
- 4.8 Volts to 5.2 Volts**  
Go To 3
- Below 4.8 Volts**  
Go To 5



**B1605–RIGHT SOLAR SENSOR CIRCUIT HIGH (ATC) (CONTINUED)****2. CHECK (G139) SUN SENSOR NO. 2 SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (G139) Sun Sensor No. 2 Signal circuit.

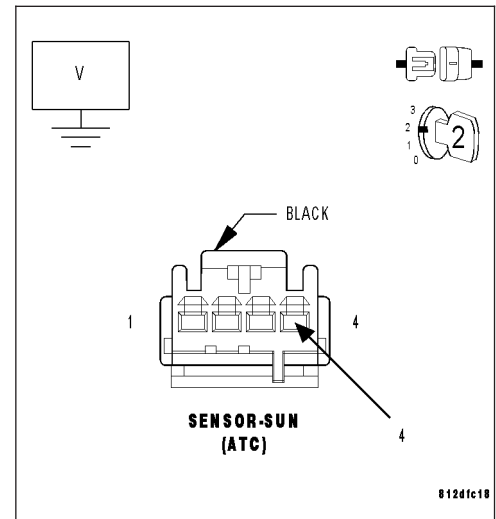
**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (G139) Sun Sensor No. 2 Signal circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**3. CHECK (G939) SUN SENSOR RETURN CIRCUIT FUNCTION**

Turn the ignition off.

Connect a jumper wire between the (G139) Sun Sensor No. 2 Signal circuit and the (G939) Sun Sensor Return circuit in the Sun Sensor harness connector.

Turn the ignition on.

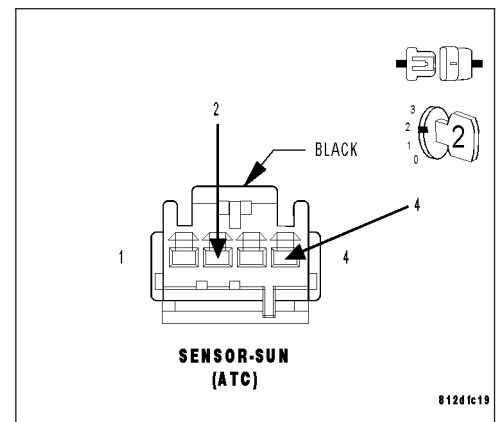
With the scan tool in HVAC, select Data Display and read the Right Solar Sensor voltage.

**Is the voltage below 0.2 volts?**

**Yes** >> Replace the Sun Sensor in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4



**B1605-RIGHT SOLAR SENSOR CIRCUIT HIGH (ATC) (CONTINUED)****4. CHECK (G939) SUN SENSOR RETURN CIRCUIT FOR AN OPEN**

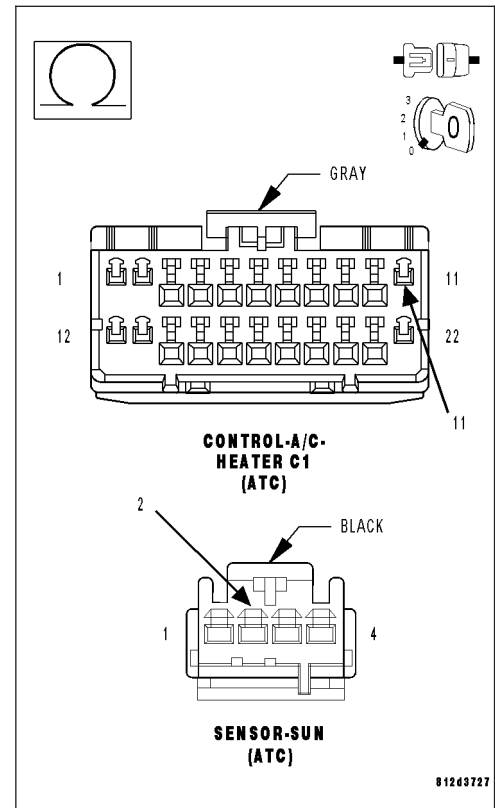
Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (G939) Sun Sensor Return circuit between the Sun Sensor harness connector and the A/C Heater Control C1 harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Repair the (G939) Sun Sensor Return circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**5. CHECK (G139) SUN SENSOR NO. 2 SIGNAL CIRCUIT FOR AN OPEN**

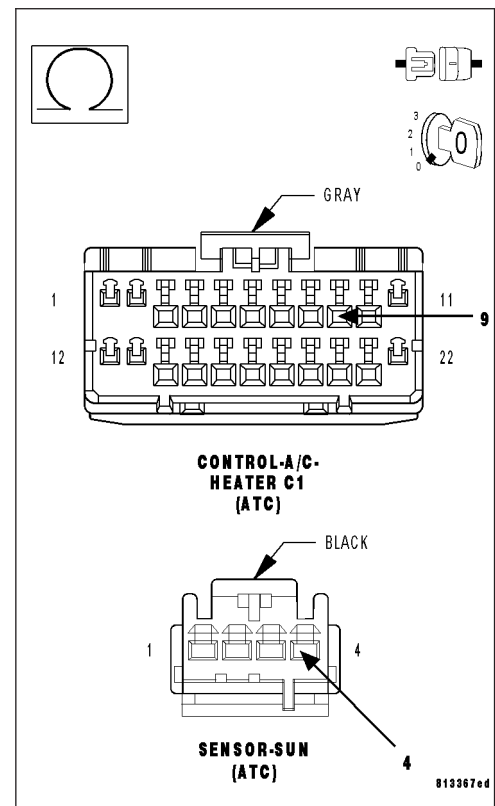
Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

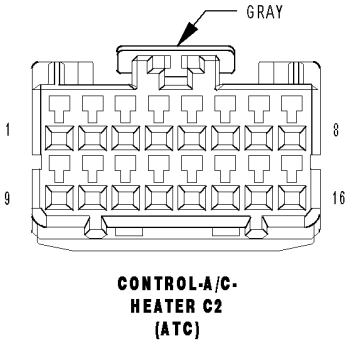
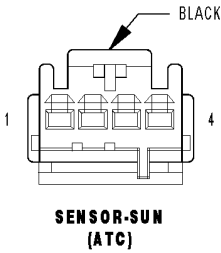
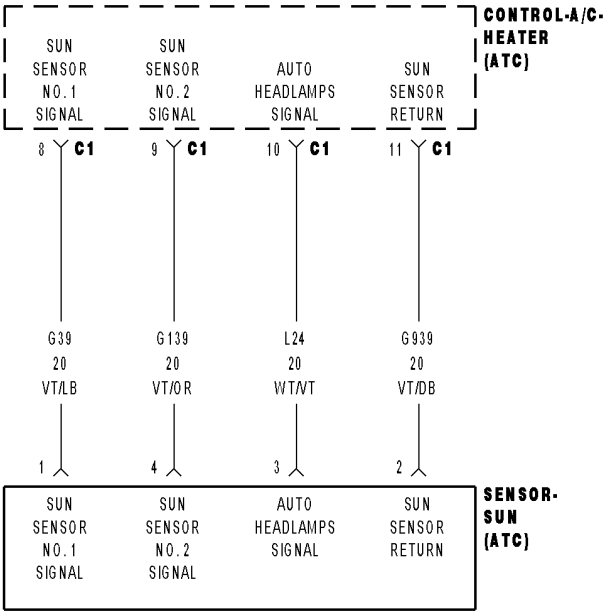
Measure the resistance of the (G139) Sun Sensor No. 2 Signal circuit between the Sun Sensor harness connector and the A/C Heater Control C1 harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Repair the (G139) Sun Sensor No. 2 Signal circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



B1610–AMBIENT LIGHT SENSOR INPUT CIRCUIT LOW (ATC)





**B1610–AMBIENT LIGHT SENSOR INPUT CIRCUIT LOW (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the Ambient Light Sensor input is out of range toward the low voltage threshold.

Possible Causes
(L24) AUTO HEADLAMPS SIGNAL CIRCUIT SHORTED TO GROUND
(L24) AUTO HEADLAMPS SIGNAL CIRCUIT SHORTED TO (G939) SUN SENSOR RETURN CIRCUIT
SUN SENSOR
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

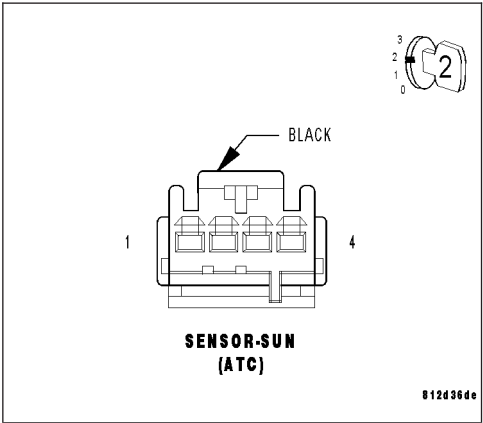
**Diagnostic Test**

**1. CHECK FOR DTC B1610–AMBIENT LIGHT SENSOR INPUT CIRCUIT LOW WITH SUN SENSOR HARNESS CONNECTOR DISCONNECTED**

- Turn the ignition off.
- Disconnect the Sun Sensor harness connector.
- Turn the ignition on.
- With the scan tool, erase HVAC DTCs.
- Turn the ignition off, wait 10 seconds, and turn the ignition on.
- With the scan tool, read HVAC DTCs.

**Does the scan tool display: B1610–AMBIENT LIGHT SENSOR INPUT CIRCUIT LOW?**

- Yes** >> Go To 2
- No** >> Replace the Sun Sensor in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



**B1610–AMBIENT LIGHT SENSOR INPUT CIRCUIT LOW (ATC) (CONTINUED)****2. CHECK (L24) AUTO HEADLAMPS SIGNAL CIRCUIT FOR A SHORT TO GROUND**

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

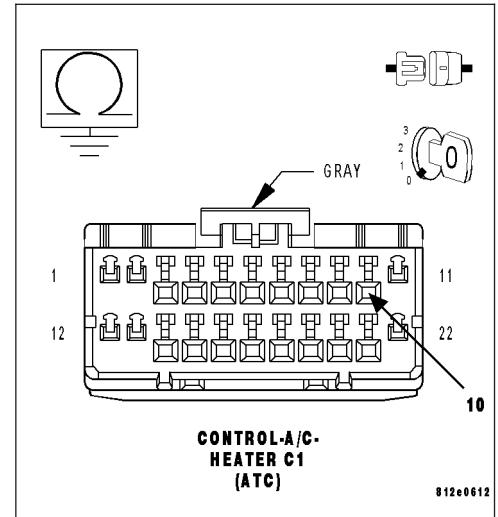
Measure the resistance of the (L24) Auto Headlamps Signal circuit between ground and the A/C Heater Control C1 harness connector.

**Is the resistance below 10k ohms?**

**Yes** >> Repair the (L24) Auto Headlamps Signal circuit for a short to ground.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 3

**3. CHECK (L24) AUTO HEADLAMPS SIGNAL CIRCUIT FOR A SHORT TO (G939) SUN SENSOR RETURN CIRCUIT**

Measure the resistance between the (L24) Auto Headlamps Signal circuit and the (G939) Sun Sensor Return circuit in the A/C Heater Control C1 harness connector.

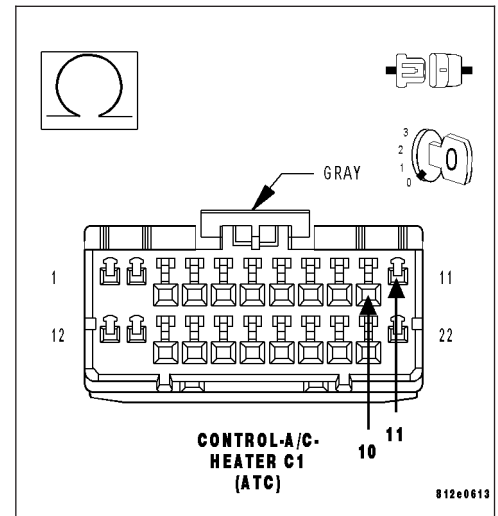
**Is the resistance below 10k ohms?**

**Yes** >> Repair the (L24) Auto Headlamps Signal circuit for a short to the (G939) Sun Sensor Return circuit.

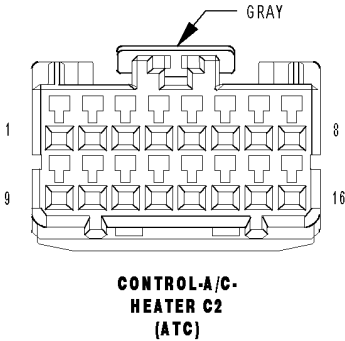
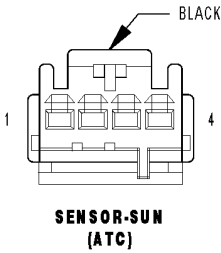
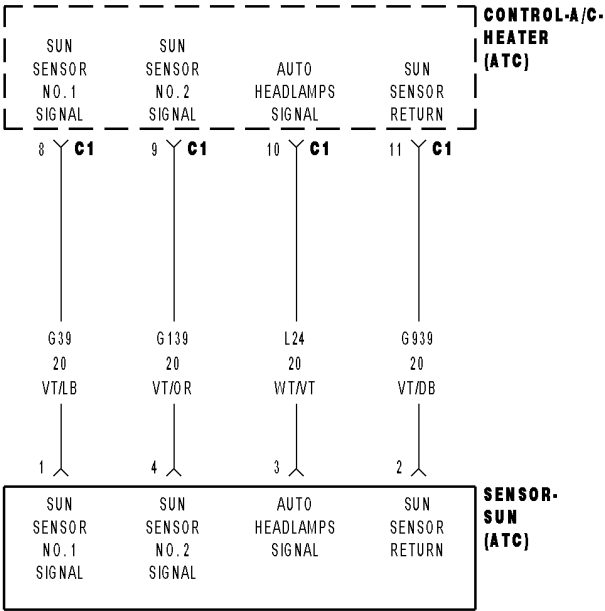
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



B1611–AMBIENT LIGHT SENSOR INPUT CIRCUIT HIGH (ATC)



**B1611-AMBIENT LIGHT SENSOR INPUT CIRCUIT HIGH (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If the Ambient Light Sensor input is out of range toward the high voltage threshold.

Possible Causes
(L24) AUTO HEADLAMPS SIGNAL CIRCUIT OPEN
(L24) AUTO HEADLAMPS SIGNAL CIRCUIT SHORTED TO VOLTAGE
(G939) SUN SENSOR RETURN CIRCUIT OPEN
SUN SENSOR
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

**Diagnostic Test****1. CHECK (L24) AUTO HEADLAMPS SIGNAL CIRCUIT VOLTAGE**

Turn the ignition off.

Disconnect the Sun Sensor harness connector.

Turn the ignition on.

Measure the voltage of the (L24) Auto Headlamps Signal circuit.

**What voltage is present?**

**Above 5.2 Volts**

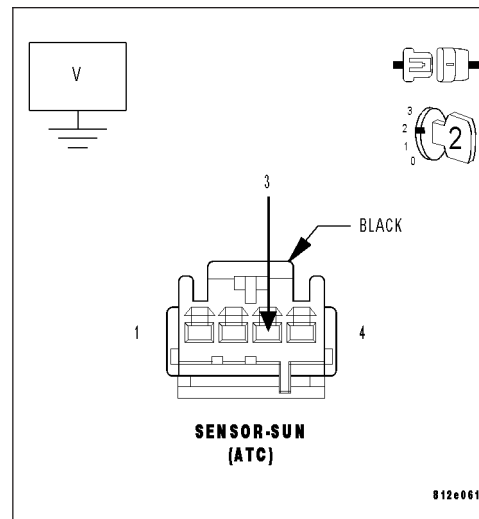
Go To 2

**4.8 Volts to 5.2 Volts**

Go To 3

**Below 4.8 Volts**

Go To 5



**B1611-AMBIENT LIGHT SENSOR INPUT CIRCUIT HIGH (ATC) (CONTINUED)****2. CHECK (L24) AUTO HEADLAMPS SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE**

Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Turn the ignition on.

Measure the voltage of the (L24) Auto Headlamps Signal circuit.

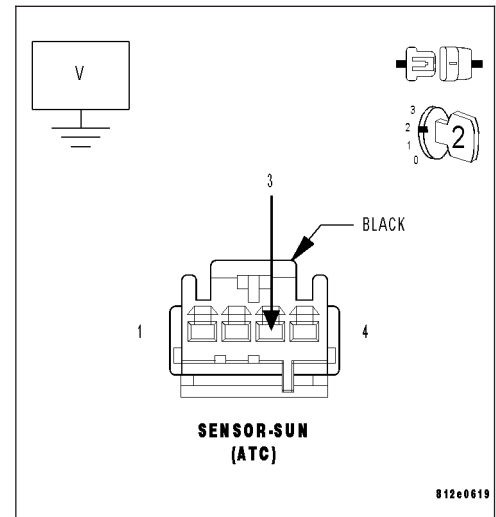
**Is the voltage above 0.2 volts?**

**Yes** >> Repair the (L24) Auto Headlamps Signal circuit for a short to voltage.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**3. CHECK (G939) SUN SENSOR RETURN CIRCUIT FUNCTION**

Turn the ignition off.

Connect a jumper wire between the (L24) Auto Headlamps Signal circuit and the (G939) Sun Sensor Return circuit in the Sun Sensor harness connector.

Turn the ignition on.

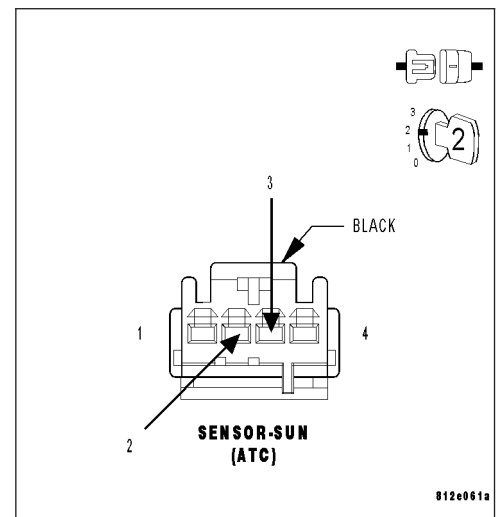
With the scan tool in HVAC, select Data Display and read the Ambient Light Sensor voltage.

**Is the voltage below 0.2 volts?**

**Yes** >> Replace the Sun Sensor in accordance with the Service Information.

Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Go To 4



**B1611-AMBIENT LIGHT SENSOR INPUT CIRCUIT HIGH (ATC) (CONTINUED)****4. CHECK (G939) SUN SENSOR RETURN CIRCUIT FOR AN OPEN**

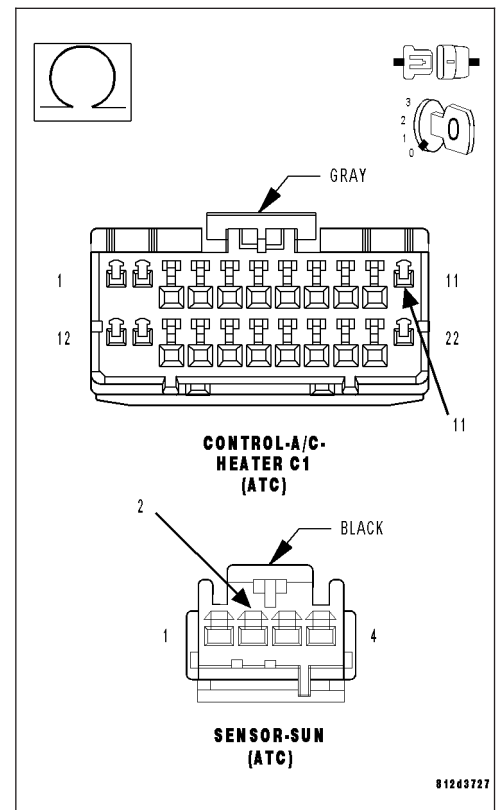
Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (G939) Sun Sensor Return circuit between the Sun Sensor harness connector and the A/C Heater Control C1 harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Repair the (G939) Sun Sensor Return circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**5. CHECK (L24) AUTO HEADLAMPS SIGNAL CIRCUIT FOR AN OPEN**

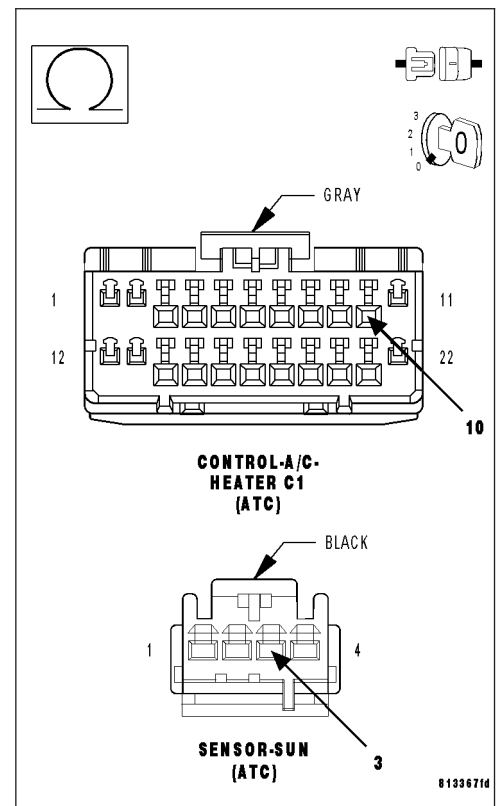
Turn the ignition off.

Disconnect the A/C Heater Control C1 harness connector.

Measure the resistance of the (L24) Auto Headlamps Signal circuit between the Sun Sensor harness connector and the A/C Heater Control C1 harness connector.

**Is the resistance below 5.0 ohms?**

- Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- No** >> Repair the (L24) Auto Headlamps Signal circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



B222A–VEHICLE LINE MISMATCH (ATC)

For a complete wiring diagram Refer to Section 8W.

Theory of Operation

The EBL and AC status indicators will flash when this DTC is active. The status indicators will continue to flash across ignition cycles and battery disconnects. The vehicle line and country code data transmitted on the CAN B Bus must correspond with data stored in the A/C Heater Control to stop the status indicators from flashing.

- **When Monitored:**  
Following the Start Up Wait Time after ignition on.
- **Set Condition:**  
If vehicle line and country code data transmitted on the CAN B Bus doesn't correspond with data stored in the A/C Heater Control.

Possible Causes
INCORRECT PCM
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

Diagnostic Test

1. CHECK VEHICLE LINE IN PCM

With the scan tool compare the vehicle line that is programmed into the PCM to the vehicle line of the vehicle.

- Does the vehicle line programmed into the PCM match the vehicle?**
- Yes**    >> Replace the A/C Heater Control in accordance with the service information.  
            Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).
- No**      >> Replace and program the Powertrain Control Module in accordance with the service information. Ensure the PCM is replaced with the correct vehicle line PCM.  
            Perform (NGC) POWERTRAIN VERIFICATION TEST VER - 5. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)

**B2214--(HVAC) CLIMATE CONTROL INTERNAL (ATC)**

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
With the ignition on.
- **Set Condition:**  
If the A/C Heater Control has an internal fault.

Possible Causes
A/C HEATER CONTROL

**Note:** This DTC must be active for the results of this test to be valid. Do not perform this test if this DTC is stored. Refer to HVAC System Test (ATC) for stored DTC test procedures.

**Diagnostic Test****1. REPLACE THE A/C HEATER CONTROL****Repair**

Replace the A/C Heater Control in accordance with the Service Information.

Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---



The diagram illustrates the wiring for the Control-A/C-Heater C1 (ATC) module. It shows two main sections: the **MODULE FRONT CONTROL** at the top and the **CONTROL-A/C-HEATER (ATC)** at the bottom.

**MODULE FRONT CONTROL:**

- Top Left:** CAN B BUS (-) connected to pin 3 of connector C1.
- Top Right:** CAN B BUS (+) connected to pin 2 of connector C1.
- Middle Left:** Pin 4 of connector C102 is connected to pin 4 of connector C1 via a 20-pin D54 connector (WT).
- Middle Right:** Pin 5 of connector C102 is connected to pin 5 of connector C1 via a 20-pin D55 connector (WT/OR).
- Bottom Left:** Pin 4 of connector C1 is connected to a sensor S218 via a 20-pin D54 connector (WT).
- Bottom Right:** Pin 5 of connector C1 is connected to a sensor S219 via a 20-pin D55 connector (WT/OR).

**CONTROL-A/C-HEATER (ATC):**

- Top Left:** CAN B BUS (-) connected to pin 4 of connector C1.
- Top Right:** CAN B BUS (+) connected to pin 5 of connector C1.

**Connector Views:**

- CONTROL-A/C-HEATER C1 (ATC):** A 24-pin connector with a GRAY tab. Pins are numbered 1, 11, 12, and 22.
- MODULE-FRONT CONTROL C1:** A 24-pin connector with a BLACK tab. Pins are numbered 1, 13, 12, and 24.

**U0019–CAN B BUS (ATC) (CONTINUED)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**  
Continuously
- **Set Condition:**  
If the CAN B Bus (+) or CAN B Bus (-) circuit is open, shorted to voltage, or shorted to ground.

Possible Causes
ACTIVE U0019 CAN B BUS DTC IN FRONT CONTROL MODULE (D55) CAN B BUS (+) CIRCUIT OPEN (D54) CAN B BUS (-) CIRCUIT OPEN A/C HEATER CONTROL

**Diagnostic Test****1. VERIFY DTC U0019–CAN B BUS IS ACTIVE**

Turn the ignition on.

With the scan tool, read HVAC DTCs.

**Does the scan tool display active: U0019–CAN B BUS?**

**Yes** >> Go To 2

**No** >> If the DTC is stored, check for an intermittent condition by inspecting the related wiring harness for chaffed, pierced, pinched, and partially broken wires. Also, inspect the related connectors for broken, bent, pushed out, spread, corroded, or contaminated terminals.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

**2. CHECK FOR ACTIVE CAN B BUS RELATED DTCs IN THE FRONT CONTROL MODULE (FCM)**

With the scan tool, read Front Control Module (FCM) DTCs

**Does the scan tool display any active CAN B BUS related DTCs?**

**Yes** >> Diagnose and repair the DTC(s). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING).

**No** >> Go To 3

**U0019-CAN B BUS (ATC) (CONTINUED)****3. CHECK (D55) CAN B BUS (+) CIRCUIT FOR AN OPEN**

Turn the ignition off.

Disconnect the negative battery cable.

Disconnect the A/C Heater Control C1 harness connector.

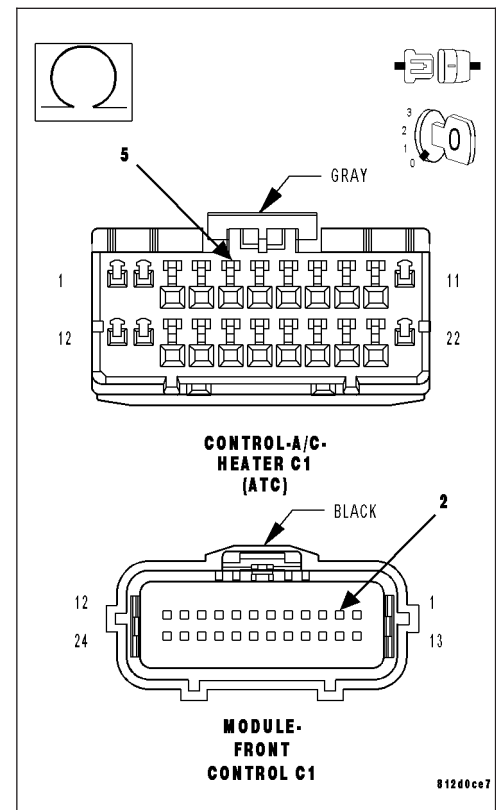
Disconnect the Front Control Module (FCM) C1 harness connector.

Measure the resistance of the (D55) CAN B Bus (+) circuit between the Front Control Module C1 harness connector and the A/C Heater Control C1 harness connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Go To 4

**No** >> Repair the (D55) CAN B Bus (+) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

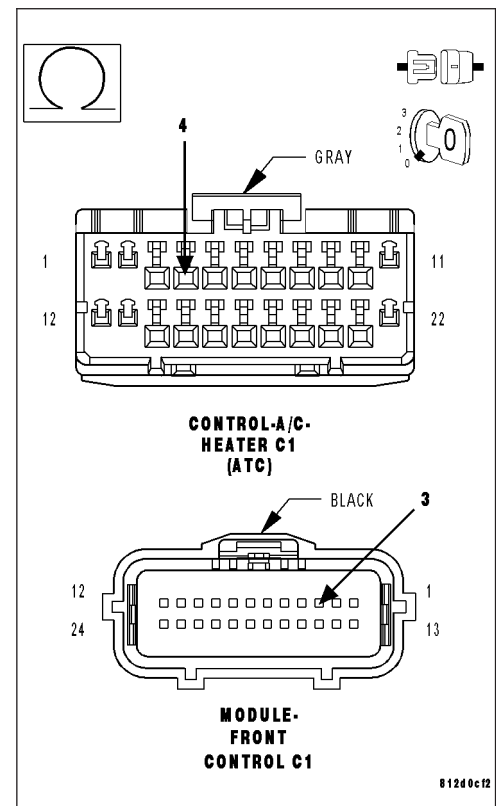
**4. CHECK (D54) CAN B BUS (-) CIRCUIT FOR AN OPEN**

Measure the resistance of the (D54) CAN B Bus (-) circuit between the Front Control Module C1 connector and the A/C Heater Control C1 harness connector.

**Is the resistance below 2.0 ohms?**

**Yes** >> Replace the A/C Heater Control in accordance with the Service Information.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).

**No** >> Repair the (D54) CAN B Bus (-) circuit for an open.  
Perform BODY VERIFICATION TEST - VER 1. (Refer to BODY VERIFICATION TEST - VER 1).



## **U0141—LOST COMMUNICATION WITH FRONT CONTROL MODULE (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Front Control Module (FCM).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0151—LOST COMMUNICATION WITH OCCUPANT RESTRAINT CONTROLLER (ORC) (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Occupant Restraint Controller (ORC).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0154—LOST COMMUNICATION WITH OCCUPANT CLASSIFICATION MODULE (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Occupant Classification Module (OCM).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## U0155—LOST COMMUNICATION WITH CLUSTER/CCN (ATC)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Cluster (CCN).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## U0156—LOST COMMUNICATION WITH EOM (ATC)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Compass Temperature Module (EOM).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## U0159—LOST COMMUNICATION WITH PARKING ASSIST CONTROL MODULE (ATC)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Parktronic (PTS).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## U0168—LOST COMMUNICATION WITH VEHICLE SECURITY CONTROL MODULE (SKREEM/WCM) (ATC)

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Vehicle Security Control Module (SKREEM/WCM).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0169—LOST COMMUNICATION WITH SUNROOF CONTROL MODULE (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Sunroof Control Module (SCM).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0181—LOST COMMUNICATION WITH HEADLAMP LEVELING TRANSLATOR (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Headlamp Leveling Translator.

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0184—LOST COMMUNICATION WITH RADIO (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Radio.

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0186—LOST COMMUNICATION WITH AUDIO AMPLIFIER (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Amplifier (AMP).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0195—LOST COMMUNICATION WITH SDARS (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Satellite Audio Receiver (SDARS).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0197—LOST COMMUNICATION WITH HANDS FREE PHONE MODULE (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Hands Free Phone Module (HFM).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0199—LOST COMMUNICATION WITH DRIVER DOOR MODULE (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Driver Door Module (DDM).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

## **U0200—LOST COMMUNICATION WITH PASSENGER DOOR MODULE (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Passenger Door Module (PDM).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0208—LOST COMMUNICATION WITH HEATED SEAT CONTROL MODULE (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Heated Seat Module (HSM).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0209—LOST COMMUNICATION WITH MEMORY SEAT CONTROL MODULE (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Memory Seat Module (MSM).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0212—LOST COMMUNICATION WITH SCCM - CAN-B (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Steering Column Control Module (SCCM).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.

**U0231—LOST COMMUNICATION WITH RAIN SENSING MODULE (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

With the ignition on.

- **Set Condition:**

If the A/C Heater Control loses communication with the Rain Sensing Module (RSM).

**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - DIAGNOSIS AND TESTING)** for the diagnostic test procedure.



## **\*HVAC SYSTEM TEST (ATC)**

For the Automatic Temperature Control (ATC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

### **Diagnostic Test**

#### **1. HVAC SYSTEM TEST**

**Note:** The HVAC System Test consists of three tests. Test 2 tests A/C system performance, Test 3 tests for mode switch and door actuator circuit faults, Test 4 tests for door actuator calibration faults. Either perform all three tests for a complete system test or perform an individual test if diagnosing a specific symptom.

**Note:** Active DTCs must be resolved before diagnosing stored DTCs.

Turn the ignition on.

With the scan tool, erase HVAC DTCs.

**Choose a diagnostic test to perform.**

**Complete HVAC System Test**

Go To 2

**A/C System Performance Test**

Go To 2

**Mode Switch & Door Actuator Ckt Test**

Go To 3

**Actuator Calibration Test**

Go To 4

---

**\*HVAC SYSTEM TEST (ATC) (CONTINUED)****2. A/C SYSTEM PERFORMANCE TEST**

**Note:** The following are prerequisites of the Cooldown Test. Verify each of the following before running the test:

- The test will not start if DTC B1031, B1032, B1040, B1044, B1045, B1058, B105C, B105D, B1099, B109A, B10A2, B10A6, B10A7, B10A8, B10A9, B10AD, B10AE, B10AF, B222A, or U0141 is active. If active, diagnose and repair the DTCs before proceeding. Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms.
- The Cooldown test will not start if the refrigerant pressure is not within specifications. Check and repair as necessary before proceeding.
- Verify that the blower motor operates correctly in all speeds. Diagnose and repair all blower related faults before proceeding.
- Verify that the work area ambient temperature is above 18.3°C (65°F) before proceeding. Move the vehicle to a warmer work area if necessary.
- Verify that the evaporator temperature is above 18.3°C (65°F) before proceeding.
- Verify that the A/C compressor is not running. If the compressor is running, turn the A/C off and allow the evaporator to warm up before proceeding.

Once all of the prerequisites have been met, actuate the Cooldown Test by performing the following:

Start the engine.

With the scan tool in HVAC, select System Tests and then select Cooldown test.

**Note:** The Cooldown Test can take up to two minutes to run. The test will stop running if any of the following occurs:

- The ignition is turned off.
- The compressor is requested off.
- The blower control is moved to the off position, unless the control was in the off position when the test was started. In this case, moving the blower control out of the off position and then returning it to the off position will stop the test
- DTC B1031 or B1032 sets during the test.
- the control receives a bus message to stop the test.

**Note:** Running the test will cause the EBL status indicator to flash. If the test passes, the EBL status indicator will stop flashing. If the test fails, both the EBL and A/C status indicators will flash alternately.

Allow the test to run to completion before proceeding.

With the scan tool, select View DTCs.

**Does the scan tool display any DTCs?**

- Yes** >> Diagnose and Repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms. Rerun the Cooldown Test after the repair is complete.
- No** >> As necessary, either Go To 3 or 4, or Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
-

**\*HVAC SYSTEM TEST (ATC) (CONTINUED)****3. MODE SWITCH & DOOR ACTUATOR CIRCUIT TEST**

**Note:** If at anytime a DTC becomes active during this test, proceed to the conclusion question.

**Note:** If multiple DTCs become active, diagnose those that relate to a short circuit first.

If not done so previously, start the engine.

Turn the blower control to manual low.

Turn the Left and Right Blend controls to full cold.

Turn the Mode control to panel.

Monitor the scan tool for active HVAC DTCs while performing the following test steps.

Press the A/C mode switch on, wait 30 seconds, press it off, and then proceed to the next step.

Press the Rear Defrost mode switch on, wait 30 seconds, press it off, and then proceed to the next step.

Press the Recirculation mode switch on, wait 30 seconds, press it off, and then proceed to the next step.

Turn the Left Blend control to full hot, wait 30 seconds, turn it to full cold, and then proceed to the next step.

Turn the Right Blend control to full hot, wait 30 seconds, turn it to full cold, and then proceed to the next step.

Turn the Mode control to every door position. Leave it in each position for 30 seconds.

**Does the scan tool display any active DTCs?**

- Yes** >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms.
- No** >> As necessary, either Go To 4 or Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
- 

**4. ACTUATOR CALIBRATION TEST**

With the scan tool, select System Tests and then select Actuator Calibration Test. When the test is complete, select View DTCs.

**Does the scan tool display any DTCs?**

- Yes** >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.
- No** >> No problem found.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
-

**\*HVAC SYSTEM TEST (MTC)**

For the Manual Temperature Control (MTC) circuit diagram (Refer to 24 - HEATING & AIR CONDITIONING - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

**Diagnostic Test****1. HVAC SYSTEM TEST**

**Note:** The HVAC System Test consists of three tests. Test 2 tests A/C system performance, Test 3 tests for mode switch, mode and temp pot, and door actuator circuit faults, Test 4 tests for door actuator calibration faults. Either perform all three tests for a complete system test or perform an individual test if diagnosing a specific symptom.

**Note:** Active DTCs must be resolved before diagnosing stored DTCs.

Choose a diagnostic test to perform.

**Complete HVAC System Test**

Go To 2

**A/C System Performance Test**

Go To 2

**Mode Switch, Mode & Temp Pot, & Door Actuator Ckt Test**

Go To 3

**Actuator Calibration Test**

Go To 4

---

**\*HVAC SYSTEM TEST (MTC) (CONTINUED)****2. A/C SYSTEM PERFORMANCE TEST**

**Note:** The following are prerequisites of the Cooldown Test. Verify each of the following before running the test:

- The test will not start if DTC 31 or 32 is active. If active, diagnose and repair the DTCs before proceeding. Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms.
- Verify that the blower motor operates correctly in all speeds. Diagnose and repair all blower related faults before proceeding.
- Verify that the work area ambient temperature is above 18.3°C (65°F) before proceeding. Move the vehicle to a warmer work area if necessary.
- Verify that the evaporator temperature is above 18.3°C (65°F) before proceeding.
- Verify that the A/C compressor is not running. If the compressor is running, turn the A/C off and allow the evaporator to warm up before proceeding.

Once all of the prerequisites have been met, actuate the Cooldown Test by performing the following:

- Turn the ignition off.
- Turn the blower control to off.
- Start the engine.
- Press the A/C mode switch down, turn the blower control to high speed, wait 3 seconds and then release the A/C mode switch.

•

**Note:** The Cooldown Test can take up to two minutes to run. The test will stop running if either the ignition or the blower is turned off or if DTC 31 or 32 sets during the test.

•

**Note:** Running the test will cause the EBL status indicator to flash. If the test passes, the EBL status indicator will stop flashing. If the test fails, both the EBL and A/C status indicators will flash alternately.

- Allow the test to run to completion before proceeding.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Actuate the Display DTC function by performing the following:

- Turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.

**Note:** The A/C status indicator displays active DTCs when the EBL status indicator is not illuminated and stored DTCs when the EBL status indicator is illuminated.

**Is the A/C status indicator flashing DTCs?**

- Yes** >> Diagnose and Repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms. Rerun the Cooldown Test after the repair is complete.
- No** >> As necessary, either Go To 3 or 4, or Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).
-

**\*HVAC SYSTEM TEST (MTC) (CONTINUED)****3. MODE SWITCH, MODE & TEMP POT, & DOOR ACTUATOR CIRCUIT TEST**

If not done so previously, start the engine.

Turn the blower control on.

Turn the Blend control to full cold.

Turn the Mode control to panel.

Press the A/C mode switch on, wait 30 seconds, press it off, and then proceed to the next step.

Press the Rear Defrost mode switch on, wait 30 seconds, press it off, and then proceed to the next step.

Turn the Blend control to full hot, wait 30 seconds, turn it to full cold, and then proceed to the next step.

Turn the Mode control to every door position. Leave it in each position for 30 seconds. When complete, proceed to the next step.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Actuate the Display DTC function by performing the following:

- If not done so previously, turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.

**Note: The A/C status indicator displays active DTCs when the EBL status indicator is not illuminated and stored DTCs when the EBL status indicator is illuminated.**

**Note: If multiple DTCs are active, diagnose those that relate to a short circuit first.**

**Is the A/C status indicator flashing DTCs?**

**Yes** >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of HVAC related symptoms.

**No** >> As necessary, either Go To 4 or Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

---

**4. ACTUATOR CALIBRATION TEST**

Actuate the Actuator Calibration function by performing the following:

- If not done so previously, turn the ignition on.
- Turn the blower control to off.
- Press the EBL mode switch down for 5 seconds and then release it.
- Wait approximately 90 seconds for the calibration process to run to completion before proceeding.

Turn the ignition off, wait 10 seconds, and turn the ignition on.

Actuate the Display DTC function by performing the following:

- Turn the blower control on.
- Press the A/C mode switch down, turn the blower control to off, wait 3 seconds and then release the A/C mode switch.

**Note: The A/C status indicator displays active DTCs when the EBL status indicator is not illuminated and stored DTCs when the EBL status indicator is illuminated.**

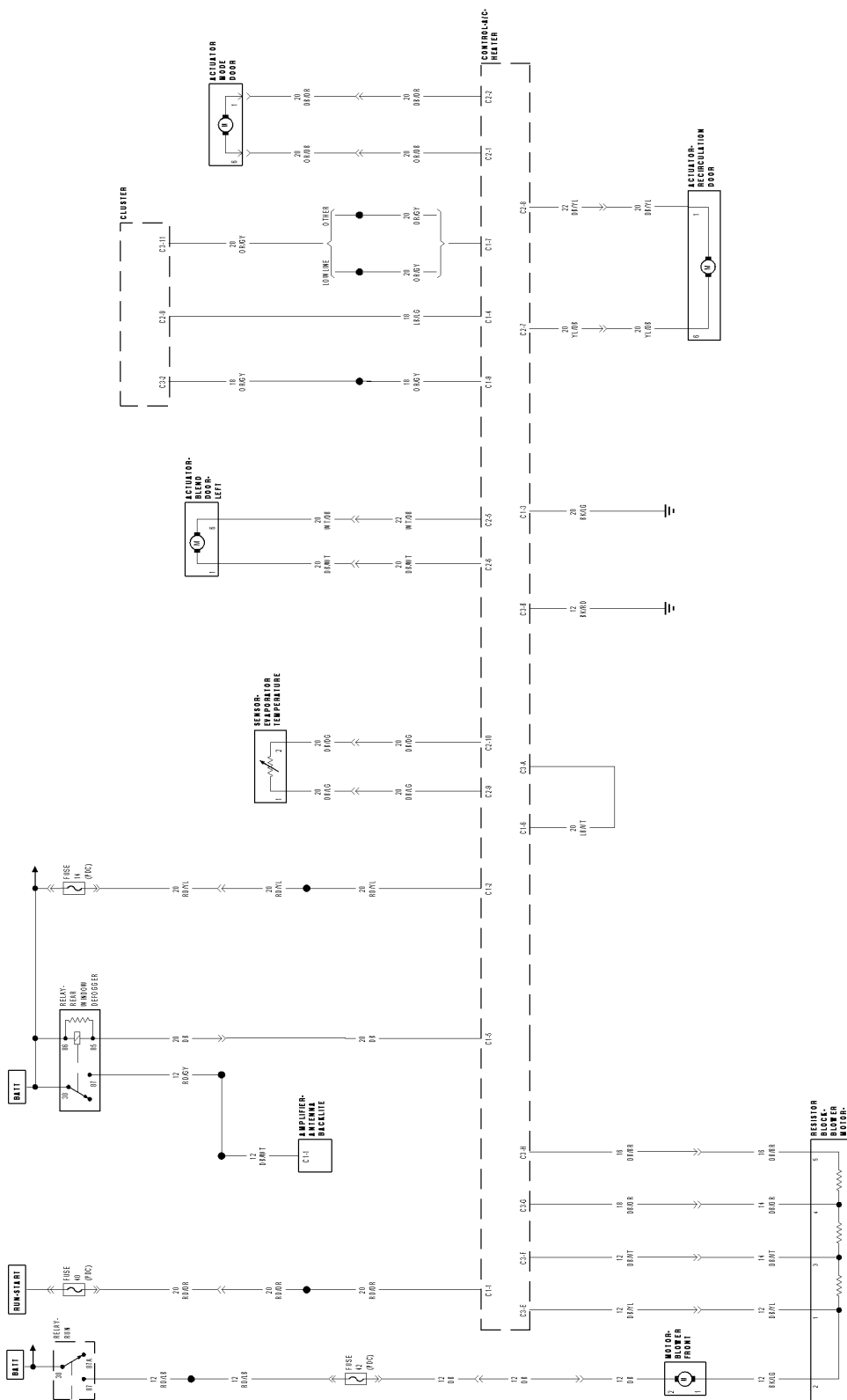
**Is the A/C status indicator flashing DTCs?**

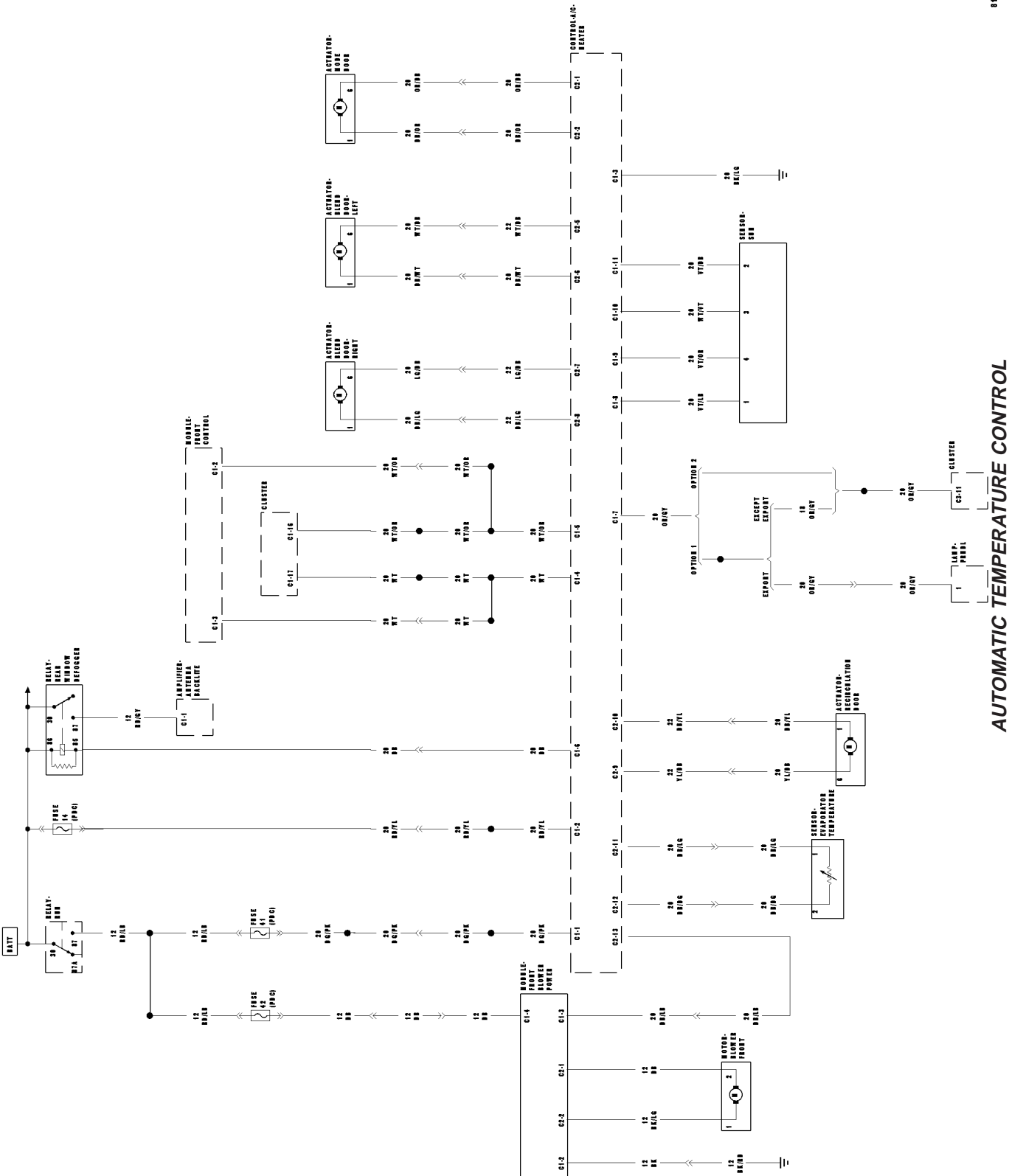
**Yes** >> Diagnose and repair the DTC(s). Refer to the Table of Contents in this Section for a complete list of all HVAC related symptoms.

**No** >> No problem found.  
Perform BODY VERIFICATION TEST – VER 1. (Refer to BODY VERIFICATION TEST – VER 1).

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## SCHEMATICS AND DIAGRAMS





8124102

AUTOMATIC TEMPERATURE CONTROL



HVAC - SERVICE INFORMATION

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HVAC - SERVICE INFORMATION

DESCRIPTION

HEATING AND AIR CONDITIONING SYSTEMS

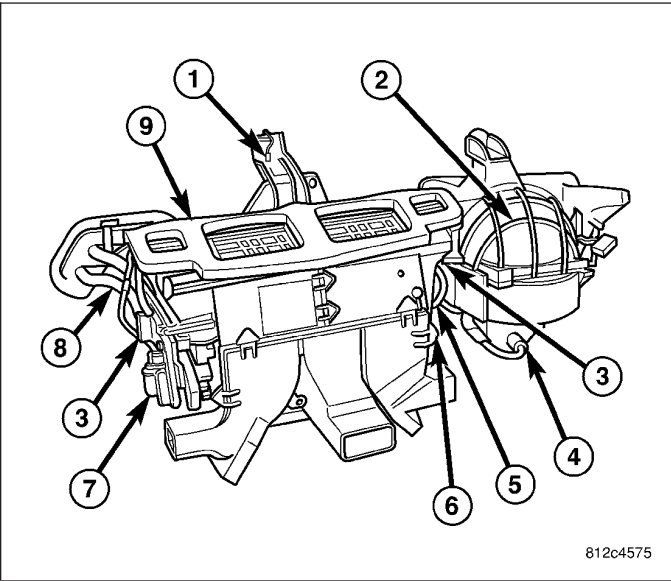
A manual temperature control (MTC) single zone type heating-A/C system or a fully adjustable automatic temperature control (ATC) dual zone type heating-A/C system is available on this vehicle.

To maintain the performance level of the heating, ventilation and air conditioning (HVAC) system, the engine cooling system must be properly maintained. The use of a bug screen is not recommended. Any obstructions in front of the radiator or A/C condenser will reduce the performance of the A/C and engine cooling systems.

The engine cooling system includes the radiator, thermostat, radiator hoses and the engine coolant pump. Refer to 7 - Cooling for more information before opening or attempting any service to the engine cooling system.

All vehicles are equipped with a common heater, ventilation and air conditioning (HVAC) housing (1). The heating-A/C system combines A/C, heating, and ventilating capabilities in a single HVAC housing mounted within the passenger compartment beneath the instrument panel. The HVAC housing includes:

- Recirculation-air door and actuator (2)
- Blend-air door(s) and actuator(s) (3)
- Blower motor (4)
- Blower motor resistor (MTC) or blower motor power module (ATC) (5)
- Evaporator temperature sensor (6)
- Mode-air doors and actuator (7)
- Heater core (8)
- A/C evaporator (9)



Based upon the system and selected mode, conditioned air can exit the HVAC housing through one or a combination of the three main housing outlets: defrost, panel or floor. The defrost and panel outlets are located on the top of the HVAC housing and the floor outlets are located on the bottom of the HVAC housing. Once the conditioned air exits the HVAC housing, it is further directed through molded plastic ducts to the outlets within the vehicle interior. These outlets and their locations are as follows:

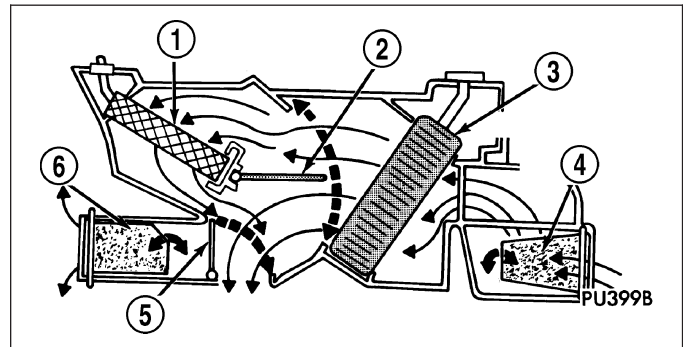
- **Defroster Outlets** - Two large defroster outlets are located near the center of the instrument panel top cover, near the base of the windshield.

- **Side Window Demister Outlets** - There are two side window demister outlets, one is located at each outboard end of the instrument panel top cover, near the belt line at the A-pillars.
- **Panel Outlets** - There are four panel outlets in the instrument panel, one located near each outboard end of the instrument panel facing the rear of the vehicle and one located on each side of the instrument panel center bezel.
- **Floor Outlets** - There is one floor outlet located above each side of the floor panel center tunnel near the dash panel. There is also one outlet located under each front seat.
- **Console Outlets** - There are two console outlets located at the back of the center floor console facing the rear of the vehicle.

## OPERATION

Both the manual temperature control (MTC) and the automatic temperature control (ATC) heating-A/C system are blend-air type systems. In a blend-air system, a blend-air door controls the amount of conditioned air that is allowed to flow through, or around, the heater core. In the available dual zone system, two blend-air doors are used to provide completely independent side-to-side temperature control of the discharge air. The temperature control(s) determines the discharge air temperature(s) by operating the blend door actuator(s), which move the blend-air door(s). This design allows almost immediate control of output air temperature(s).

The heating-A/C system pulls outside (ambient) air through the cowl opening at the base of the windshield, then into the air inlet housing and through the A/C evaporator (3). Air flow can be directed either through or around the heater core (1). This is done by adjusting the blend-air door(s) (2) with the temperature control(s) located on the A/C-heater control in the instrument panel. The air flow can then be directed from the panel, floor and defrost outlets in various combinations using the mode control located on the A/C-heater control. Air flow velocity can be adjusted with the blower speed control located on the A/C-heater control.



The outside (fresh) air intake can be shut off by selecting the Recirculation Mode with the mode control. This will operate an electrically actuated recirculation-air door (4) that closes off the fresh air intake and recirculates the air that is already inside the vehicle.

The A/C compressor can be engaged in any mode by pressing the snowflake, A/C on/off button. It can also be engaged by placing the mode control in the mix to defrost positions. This will remove heat and humidity from the air before it is directed through or around the heater core. The mode control on the A/C-heater control is used to also direct the conditioned air to the selected system outlets. The mode control uses an electric actuator to control the mode-air doors (5 and 6).

The two slot-type defroster outlets receive airflow from the HVAC housing through the molded plastic defroster ducts, which connect to the HVAC housing defroster outlets. The airflow from the defroster outlets is directed by fixed vanes in the defroster outlet grilles and cannot be adjusted. The defroster outlet grilles are integral to the instrument panel top cover.

The side window demister outlets receive airflow from the HVAC housing through the molded plastic demister ducts. The demisters direct air from the HVAC housing through the outlets located on the top corners of the instrument panel. The airflow from the side window demister outlets is directed by fixed vanes in the demister outlet grilles and cannot be adjusted. The side window demister outlet grilles are serviceable from the instrument panel. The demisters operate when the controls are set in Heat, Bi-level, Mix and Defrost modes.

The four instrument panel outlets receive airflow from the HVAC housing through two molded plastic main panel ducts. One duct directs air flow out of the right side instrument panel outlets, while the other duct delivers air flow to the left side outlets. Each of these outlets can be individually adjusted to direct the flow of air.

The floor outlets receive airflow from the HVAC housing through the floor distribution ducts which are integral to the rear cover of the HVAC air distribution housing. Two plastic rear distribution ducts and one center console duct attach to the rear cover and provide conditioned air to the rear seating positions. The two console outlets can be individually adjusted to direct the flow of air, but the floor outlets cannot be adjusted.

**Note:** It is important to keep the HVAC air intake opening clear of debris. Leaf particles and other debris that is small enough to pass through the cowl opening screen can accumulate within the HVAC housing. The closed, warm, damp and dark environment created within the housing is ideal for the growth of certain molds, mildews and other fungi. Any accumulation of decaying plant matter provides an additional food source for fungal spores, which enter the housing with the fresh intake-air. Excess debris, as well as objectionable odors created by decaying plant matter and growing fungi can be discharged into the passenger compartment during heater-A/C operation if the air intake opening is not kept clear of debris.

The A/C system is designed for the use of non-CFC, R-134a refrigerant and uses an A/C expansion valve to meter the flow of refrigerant to the A/C evaporator. The A/C evaporator cools and dehumidifies the incoming air prior to blending it with the heated air. To maintain minimum evaporator temperatures and prevent evaporator freezing, an evaporator temperature sensor is used. The sensor is located downstream of the evaporator and supplies an evaporator temperature signal to the A/C-heater control. For the ATC system, the A/C-heater control broadcasts the A/C request on the controller area network (CAN) B bus, where it is read and processed by the front control module (FCM), which in turn broadcasts it on the CAN C bus, where it is read and processed by the powertrain control module (PCM). For the MTC system, the A/C-heater control sends the request for A/C to the CCN via a dedicated mux circuit. The CCN then broadcasts the A/C request on the CAN B bus, where it is read and processed by the FCM, which in turn broadcasts it on the CAN C bus, where it is read and processed by the PCM.

## DIAGNOSIS AND TESTING

### HEATING AND A/C SYSTEMS

#### SETTING FAULTS - MTC AND ATC SYSTEMS

Both the automatic temperature control (ATC) and the manual temperature control (MTC) systems are controlled by the A/C-heater control located on the center bezel of the instrument panel. The ATC system communicates on the controller area network (CAN) B bus and is fully addressable with a scan tool. The MTC system is NOT connected to the CAN bus and is NOT addressable with a scan tool. The A/C-heater control for both heating-A/C systems continuously monitors various internal parameters during normal system operation. If the control detects a fault, both an active and a stored diagnostic trouble code (DTC) will set for that parameter. When the offending parameter returns to an acceptable value, the control automatically clears the active DTC. However, the stored DTC remains until cleared (either manually or automatically). Note that DTCs will not set or clear if supply voltage is low.

The setting and resetting of some active DTCs requires a wait time. Both the MTC and the ATC A/C-heater controls use two independent wait times for setting faults and one for resetting faults. The three different wait times are as follows:

- **Start Up Wait Time** - This is only used immediately after an ignition transition from low to high. It defines how long the system waits after the ignition line has gone high before setting any active DTCs. The duration of the Start Up Wait Time is 1.0 second.
- **Set Wait Time** - This is used at the conclusion of the Start Up Wait Time. It defines the duration a monitored parameter must remain continuously outside of the acceptable range before an active DTC will set. The duration of the Set Wait Time is 1.5 seconds.
- **Reset Wait Time** - It defines the duration a monitored parameter must remain continuously within the acceptable range before an active DTC resets. The duration of the Reset Wait Time is 1.5 seconds.

#### STORING FAULTS - MTC AND ATC SYSTEMS

The A/C-heater control for both the MTC and ATC systems stores the most recent fault by code number in data record number 1. For each new fault, the data records push up one level. After recording eight faults, the system deletes the oldest from the stack. If a fault clears in the middle of the stack due to key cycles, all of the faults below move up one level. To prevent a single fault from filling up the record, the system will only capture an active fault once upon its first detection. However, the system will record an active fault again if it clears and then reoccurs, such as in the case of an intermittent failure condition.

#### DISPLAYING FAULTS AND READING FAULTS - ATC SYSTEM

Use a scan tool to display DTCs stored in the A/C-heater control of the ATC system (Refer to 24 - HVAC - Electrical Diagnostics for more information).

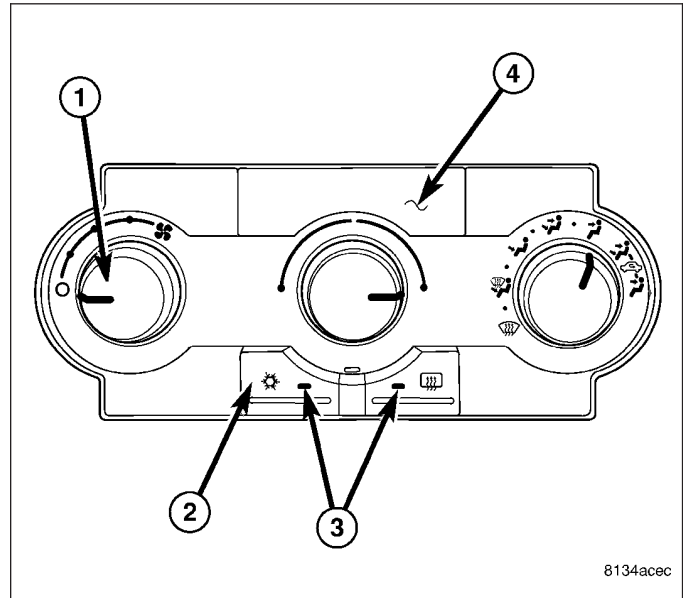
## DISPLAYING FAULTS AND READING FAULTS - MTC SYSTEM

Use the A/C-heater control to display DTCs stored in the A/C-heater control of the MTC system. Begin testing the MTC system with the Lamp Test Mode, which checks for failed LED circuits that could prevent the system from correctly displaying DTCs. Once the Lamp Test Mode is completed and the LEDs of the MTC A/C-heater control illuminate correctly, enter the Display DTC Mode.

### ENTERING LAMP TEST MODE - MTC SYSTEM

To enter the MTC system's Lamp Test Mode, perform the following:

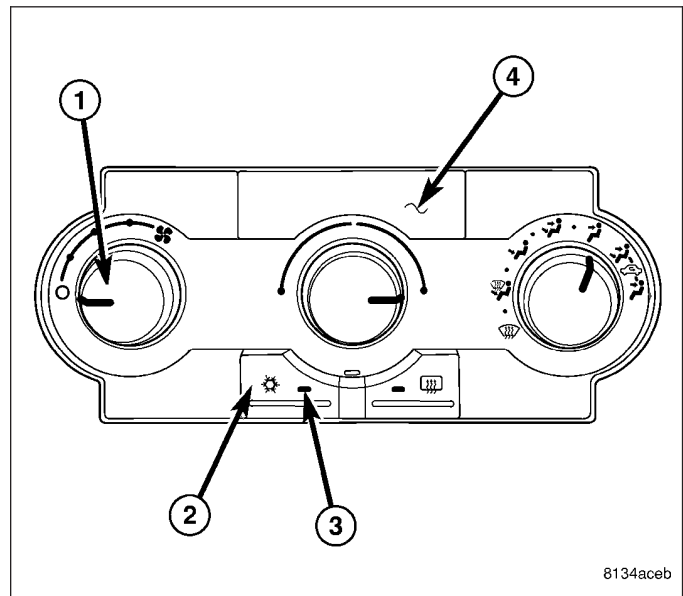
1. Turn the ignition to the On position.
2. Turn the blower motor control (1) to the On position.
3. Press the A/C mode switch (2) down and turn the blower motor control to the Off position. Do not release the A/C mode switch until all of the LEDs (3) illuminate. If all LED indicators do not illuminate, repeat the entire procedure a second time to confirm indicator operation. If any LED fails to function as specified, replace the A/C-heater control (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - REMOVAL).
4. To exit Lamp Test Mode, release the A/C mode switch.



### ENTERING DISPLAY DTC MODE - MTC SYSTEM

To enter the MTC system's Display DTC Mode, perform the following:

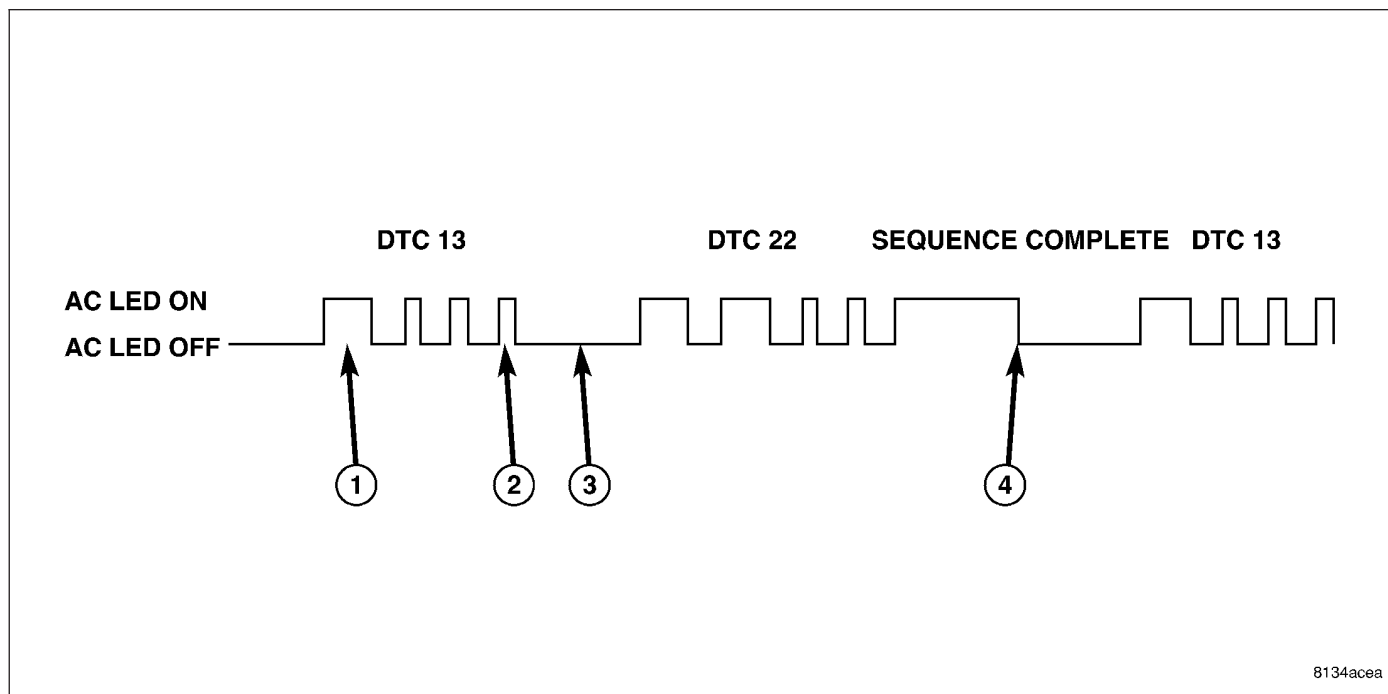
1. Turn the ignition to the On position.
2. Turn the blower motor control (1) to the On position.
3. Press the A/C mode switch (2) down, turn the blower motor control to the Off position, wait three seconds and then release the A/C switch. The MTC system automatically switches from Lamp Test Mode to Display DTC Mode. If there are active or stored DTCs to display, the A/C status indicator (3) will begin to flash. If there are no active or stored DTCs to display, the LEDs on the A/C-heater control (4) will turn off and the system will automatically exit the mode of operation.
4. To manually exit Display DTC Mode, either turn the blower motor control to any speed setting, or turn the ignition off, or disconnect the negative battery cable from the battery.



### DISPLAY SEQUENCING - MTC SYSTEM

MTC system DTCs will display in ascending numerical order but not in chronological order. Active DTCs will display before stored DTCs. If there are active and stored DTCs for the same parameter, the A/C-heater control will NOT display the stored DTC for that parameter. The EBL status indicator will illuminate and remain illuminated while the A/C-heater control is displaying stored DTCs. After displaying all active and stored DTCs the A/C-heater control restarts at the beginning, displaying all DTCs again. To restart the sequence from the beginning while the A/C-heater control is displaying DTCs, press the EBL mode switch down, and then release it. This will cause the A/C-heater control to quit displaying the present code, turn off all LEDs for 2.0 seconds, and then it will begin flashing all DTCs again from the beginning.

### READING DIAGNOSTIC TROUBLE CODES - MTC SYSTEM



All active and stored DTCs for the MTC system have an assigned code number. The A/C status indicator flashes in a series of pulses to display the code numbers. The tens unit value (which is indicated with a long pulse) (1) is flashed first followed by the ones unit value (which is indicated with a short pulse) (2). The long pulse has an indicator on time of 0.80 seconds and the short pulse has an indicator on time of 0.2 seconds, with a 0.5 second indicator off-time between long and short pulses. When displaying multiple DTCs, the A/C status indicator will go off for two seconds (3) before displaying the next DTC. To indicate that the A/C-heater control has completed displaying all DTCs, the A/C status indicator will illuminate for two seconds and then go off for two seconds (4) before beginning to flash the DTCs over again.

### ACTIVE DTCs - MTC AND ATC SYSTEMS

Refer to 24 - HVAC - Electrical Diagnostics to diagnose HVAC system DTCs.

### STORED DTCs - MTC AND ATC SYSTEMS

The HVAC System Test, found in 24 - HVAC - Electrical Diagnostics, provides a means for diagnosing stored DTCs. The HVAC System Test consists of three diagnostic procedures:

- A/C System Performance
- System Controls
- Air-door Functionality

Either perform all three diagnostic procedures for a complete system test or perform an individual procedure if diagnosing a specific symptom.



## ACTUATOR CALIBRATION - MTC AND ATC SYSTEMS

The Actuator Calibration function homes and repositions the air-door actuators, removes accumulated positioning errors, and checks for air-door span faults. The Actuator Calibration function will either run automatically 10 minutes after turning the ignition off after a specified number of ignition cycles or upon turning the ignition on after reconnecting the battery or it can be actuated manually. Once actuated, the calibration function will run to completion for both systems, even if the ignition is turned off. The entire process takes approximately 90 seconds. Upon completion, all air-door actuators should return to the position that the system is currently requesting. Running the Actuator Calibration function is the only way to detect air-door travel too large and air-door travel too small faults. Always check for DTCs in the A/C-heater control after performing an Actuator Calibration.

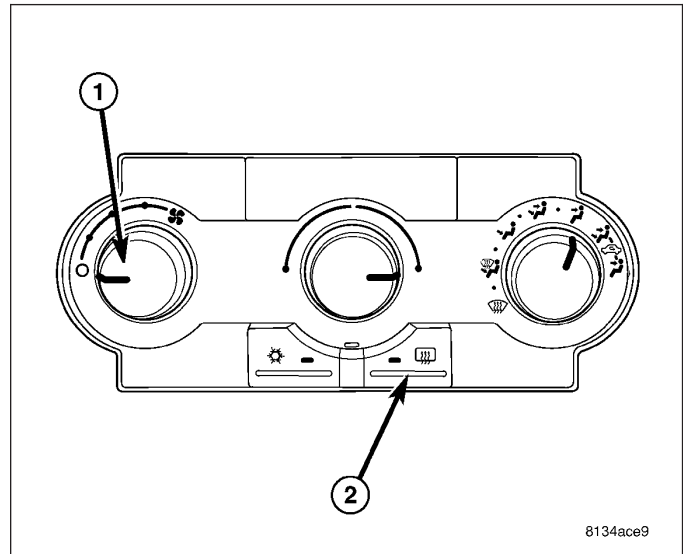
### STARTING ACTUATOR CALIBRATION - ATC SYSTEM

Use a scan tool to start the Actuator Calibration function for the ATC system.

### STARTING ACTUATOR CALIBRATION - MTC SYSTEM

To start the Actuator Calibration function for the MTC system, perform the following:

1. Turn the ignition to the On position.
2. Turn the blower motor control (1) to the Off position.
3. Press the EBL mode switch (2) down for five seconds and release it.



## COOLDOWN TEST PREREQUISITES - MTC AND ATC SYSTEMS

The Cooldown Test checks A/C system performance by measuring the system's ability to lower the evaporator temperature 11.11° C (20° F) as measured by the evaporator temperature sensor. The following are prerequisites of the Cooldown Test. Verify each of the following before running the Cooldown Test:

- For the ATC system, the Cooldown Test will NOT start if DTC B1031, B1032, B1040, B1044, B1045, B1058, B105C, B105D, B1099, B109A, B10A2, B10A6, B10A7, B10A8, B10A9, B10AD, B10AE, B10AF, B222A, B2214, or U0141 is active. If active, diagnose and repair the DTC(s) before proceeding (Refer to 24 - HVAC - Electrical Diagnostics for a complete list of HVAC related symptoms).
- For the MTC system, the Cooldown Test will NOT start if DTC 31 or 32 is active. In addition, DTC 11, 12, 13, 14, 15, 17, 18, 21, 22, or 23 should not be active. If active, diagnose and repair the DTC(s) before proceeding (Refer to 24 - HVAC - Electrical Diagnostics for a complete list of HVAC related symptoms).
- For either system, verify that the refrigerant system has an adequate charge. Check and repair as necessary before proceeding (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - DIAGNOSIS AND TESTING - REFRIGERANT SYSTEM LEAKS).
- For either system, verify that the blower motor operates correctly in all speeds. Diagnose and repair all blower motor related faults before proceeding.
- For either system, verify that the ambient temperature of the work area is above 18.3° C (65° F) before proceeding. Move the vehicle to a warmer work area if necessary.
- For either system, verify that the evaporator temperature is above 18.3° C (65° F) before proceeding.

- For either system, verify that the A/C compressor is NOT running. If the A/C compressor is running, turn the A/C off and allow the evaporator to warm up before proceeding.

### COOLDOWN TEST - ATC SYSTEM

Once all of the prerequisites have been met, the Cooldown Test for the ATC system can be actuated by sending a command with a scan tool. Once started, the ATC A/C-heater control automatically sets the blower speed and positions the air-doors for optimal A/C performance. It also sends a request for A/C operation on the CAN B bus. The Cooldown Test can take up to two minutes to run and, will stop running if any of the following occurs:

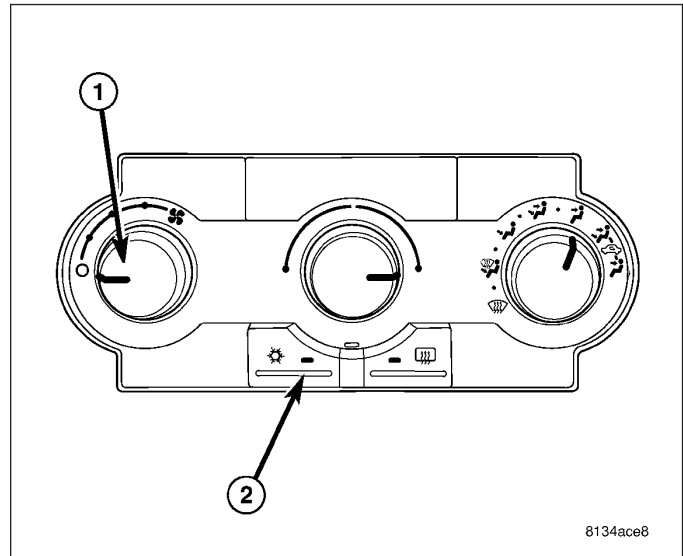
- The ignition is turned off.
- The A/C compressor is requested off.
- The blower motor control is moved to the Off position, unless the control was in the Off position when the Cooldown Test was started. In this case, moving the blower motor control out of the Off position and then returning it to the Off position will stop the test.
- DTC B1031 or B1032 sets during the Cooldown Test.
- The A/C-heater control receives a bus message to stop the Cooldown Test.

While the Cooldown Test is running, the EBL status indicator will flash. During this time the A/C-heater control will ignore most of its inputs. If the ATC system passes the test, the EBL status indicator will stop flashing. However, if the ATC system fails the test, both the A/C and EBL status indicators will flash alternately and an active DTC B10B2 will set. The status indicators will continue to flash until either a successful Cooldown Test is executed or until the vehicle is driven a specified number of miles. In addition, DTC B10B2 will remain active until a successful Cooldown Test is executed. Always check for DTCs in the A/C-heater control after running the Cooldown Test.

### COOLDOWN TEST - MTC SYSTEM

Once all of the prerequisites have been met, the Cooldown Test for the MTC system can be actuated by performing the following:

1. Verify that the ignition is in the Off position.
2. Turn the blower motor control (1) to the Off position.
3. Start the engine.
4. Press the A/C mode switch (2) down and turn the blower motor control to the highest speed. Wait three seconds and then release the A/C mode switch.



Once actuated, the MTC A/C-heater control automatically positions the air-doors for optimal A/C performance and sends a request for A/C operation to the cluster (CCN) via hardwired circuits. The Cooldown Test can take up to two minutes to run. The test will stop running if any of the following occurs:

- The ignition is turned to the Off position.
- The blower motor control is turned to the Off position.
- DTC 31 or 32 sets during the Cooldown Test.

While the Cooldown Test is running, the EBL status indicator will flash. During this time the A/C-heater control will ignore most of its inputs. If the MTC system passes the test, the EBL status indicator will stop flashing. However, if the MTC system fails the test, both the A/C and EBL status indicators will flash alternately and an active DTC 35 will set. The status indicators will continue to flash until either a successful Cooldown Test is executed or until the vehi-

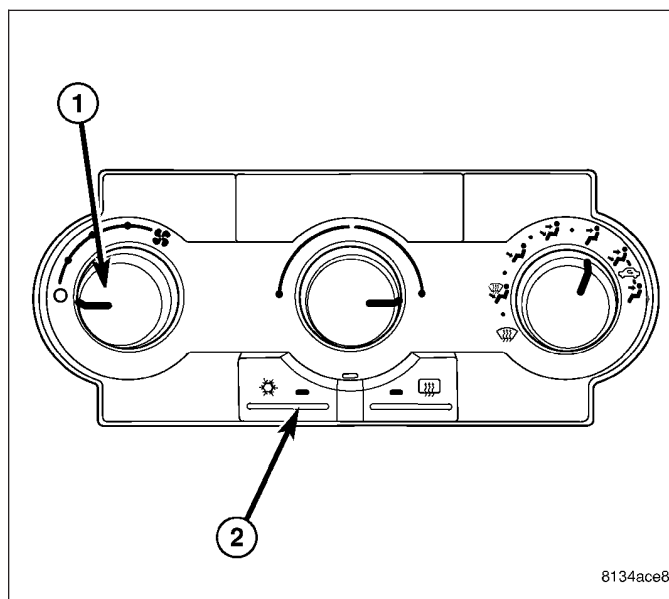
cle's ignition on time has exceeded a specified value. In addition, DTC 35 will remain active until a successful Cooldown Test is executed. Always check for and diagnose DTCs present in the A/C-heater control after running the Cooldown Test. If the Cooldown Test fails, service the heating-A/C system as required.

### CLEARING FAULTS - MTC AND ATC SYSTEMS

For every fault that sets, the A/C-heater control maintains an independent count of the number of key cycles since the active DTC cleared, the odometer reading when the DTC set (ATC system), and the elapsed ignition on time that the DTC was active. When the number of key cycles (by parameter) reaches a global number, the system automatically clears all of the information associated with that DTC. A loss of battery voltage will also clear all active DTCs and associated data from memory. However, upon reconnecting the battery and activating the A/C-heater control ("Ignition" line going "HIGH"), the system will again evaluate all parameters and will set active DTCs for parameters outside of acceptable limits.

DTCs can also be cleared manually from the A/C-heater control (which also resets key cycle counters). Use a scan tool to clear DTCs stored in the A/C-heater control of the ATC system (Refer to 24 - HVAC - Electrical Diagnostics for more information). To clear DTCs stored in the A/C-heater control of the MTC system, perform the following:

1. Turn the ignition to the On position.
2. Turn the blower motor control (1) to the lowest speed setting.
3. Press the A/C mode switch (2) down and turn the blower motor control to the Off position. Wait three seconds and then release the A/C switch.
4. When the A/C status indicator begins flashing DTCs, press the A/C mode switch down for three seconds and then release the A/C switch to clear the faults.



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### A/C PERFORMANCE

The A/C system is designed to provide the passenger compartment with low temperature and low humidity air. The A/C evaporator, located in the HVAC housing is cooled to temperatures near the freezing point. As warm damp air passes over the fins of the A/C evaporator, the air transfers its heat to the refrigerant in the evaporator coils and the moisture in the air condenses on the evaporator fins. During periods of high heat and humidity, an A/C system will be more effective in the Recirculation mode (max-A/C). With the system in the Recirculation mode, only air from the passenger compartment passes through the A/C evaporator. As the passenger compartment air dehumidifies, the A/C system performance levels rise.

Humidity has an important bearing on the temperature of the air delivered to the interior of the vehicle. It is important to understand the effect that humidity has on the performance of the A/C system. When humidity is high, the A/C evaporator has to perform a double duty. It must lower the air temperature, and it must lower the temperature of the moisture in the air that condenses on the evaporator fins. Condensing the moisture in the air transfers heat energy into the evaporator fins and coils. This reduces the amount of heat the A/C evaporator can absorb from the air. High humidity greatly reduces the ability of the A/C evaporator to lower the temperature of the air.

However, evaporator capacity used to reduce the amount of moisture in the air is not wasted. Wringing some of the moisture out of the air entering the vehicle adds to the comfort of the passengers. Although, an owner may expect too much from their A/C system on humid days. A performance test is the best way to determine whether the system is performing up to design standards. This test also provides valuable clues as to the possible cause of trouble with the A/C system. The ambient air temperature in the location where the vehicle will be tested must be a minimum of 21° C (70° F) for this test.



## A/C PERFORMANCE TEST

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING - A/C PLUMBING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - A/C PLUMBING). Failure to follow the warnings and cautions could result in possible personal injury or death.

**Note:** When connecting the service equipment coupling to the line fitting, verify that the valve of the coupling is fully closed. This will reduce the amount of effort required to make the connection.

1. Perform the A/C System Performance Test found within the HVAC System Test (refer to 24 - HVAC Electrical Diagnostics). If no diagnostic trouble codes (DTCs) are found in the A/C-heater control or the powertrain control module (PCM), go to Step 2. If any DTCs are found, repair as required, then proceed to Step 2.
2. Connect a tachometer and a manifold gauge set.
3. Set the A/C-heater control to the Recirculation mode (max-A/C) position, the temperature control to the full cool position, and the blower motor control to the highest speed position.
4. Start the engine and hold the idle at 1,000 rpm with the compressor clutch engaged. If the A/C compressor does not engage, see the A/C Diagnosis chart.
5. The engine should be at operating temperature, the doors should be closed and the windows opened.
6. Insert a thermometer in the driver side center panel outlet. Operate the A/C system until it stabilizes.
7. With the A/C compressor clutch engaged, compare the air temperature at the center panel outlet and the A/C compressor discharge pressure (high side) to the A/C Performance and Pressure chart. The compressor clutch may cycle, depending upon the ambient temperature and humidity. If the clutch cycles, use the readings obtained before the clutch disengaged.

### A/C PERFORMANCE TEMPERATURE AND PRESSURE

Ambient Air Temperature	21°C (70°F)	27°C (80°F)	32°C (90°F)	38°C (100°F)	43°C (110°F)
Maximum Allowable Air Temperature at Center Panel Outlet	9°C (48°F)	9°C (48°F)	12°C (54°F)	15°C (59°F)	18°C (65°F)
Suction Pressure at Service Port (Low Side)	138 to 207 kPa (20 to 30 psi)	138 to 207 kPa (20 to 30 psi)	207 to 276 kPa (30 to 40 psi)	207 to 276 kPa (30 to 40 psi)	241 to 310 kPa (35 to 45 psi)
Discharge Pressure at Service Port (High Side)	1034 to 1724 kPa (150 to 250 psi)	1379 to 2068 kPa (200 to 300 psi)	1551 to 2241 kPa (225 to 325 psi)	1724 to 2413 kPa (250 to 350 psi)	2068 to 2758 kPa (300 to 400 psi)

8. If the air outlet temperature fails to meet the specifications in the A/C Performance Temperature and Pressure chart, or if the A/C compressor discharge pressure is high, refer to the A/C Pressure Diagnosis chart.

## A/C PRESSURE DIAGNOSIS

Condition	Possible Causes	Correction
Rapid A/C compressor clutch cycling (ten or more cycles per minute).	Low refrigerant system charge.	See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
Equal pressures, but the compressor clutch does not engage.	1. No refrigerant in the refrigerant system.	1. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	2. Faulty fuse.	2. Check the fuses in the Integrated Power Module. Repair the shorted circuit or component and replace the fuses, if required. Refer to Group 8.
	3. Faulty A/C compressor clutch coil.	3. See A/C Compressor Clutch Coil in this group. Test the compressor clutch coil and replace, if required.
	4. Faulty A/C compressor clutch relay.	4. See A/C Compressor Clutch Relay in this group. Test the compressor clutch relay and relay circuits. Repair the circuits or replace the relay, if required.
	5. Improperly installed or faulty evaporator temperature sensor.	5. See Evaporator Temperature Sensor in this group. Test the sensor and replace, if required.
	6. Faulty A/C pressure transducer.	6. See A/C Pressure Transducer in this group. Test the sensor and replace, if required.
	7. Faulty Powertrain Control Module (PCM).	7. Refer to Group 9 - Engine Electrical Diagnostics for testing of the PCM. Test the PCM and replace, if required.
Normal pressures, but A/C Performance Test air temperatures at center panel outlet are too high.	1. Excessive refrigerant oil in system.	1. See Refrigerant Oil Level in this group. Recover the refrigerant from the refrigerant system and inspect the refrigerant oil content. Restore the refrigerant oil to the proper level, if required.
	2. Blend door actuator (s) improperly installed or faulty.	2. See Blend Door Actuator in this group. Inspect the actuator(s) for proper operation and replace, if required.
	3. Blend-air door(s) inoperative or sealing improperly.	3. See HVAC Housing in this group. Inspect the blend-air door(s) for proper operation and sealing. Repair if required.
The low side pressure is normal or slightly low, and the high side pressure is too low.	1. Low refrigerant system charge.	1. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	2. Refrigerant flow through the A/C evaporator is restricted.	2. See A/C Evaporator in this group. Replace the restricted A/C evaporator, if required.
	3. Faulty A/C compressor.	3. See A/C Compressor in this group. Replace the A/C compressor, if required.

Condition	Possible Causes	Correction
The low side pressure is normal or slightly high, and the high side pressure is too high.	1. A/C condenser air flow restricted.	1. Check the A/C condenser for damaged fins, foreign objects obstructing air flow through the condenser fins, and missing or improperly installed air seals. Clean, repair, or replace components as required.
	2. Refrigerant flow through the receiver/drier is restricted.	2. See Receiver/Drier in this group. Replace the restricted receiver/drier, if required.
	3. Inoperative radiator cooling fan.	3. Test the radiator cooling fan and replace, if required. Refer to Group 7 - Cooling.
	4. Refrigerant system overcharged.	4. See Refrigerant System Charge in this group. Recover the refrigerant from the refrigerant system. Charge the refrigerant system to the proper level, if required.
	5. Air in the refrigerant system.	5. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	6. Engine overheating.	6. Test the engine cooling system and repair, if required. Refer to Group 7 - Cooling.
The low side pressure is too high, and the high side pressure is too low.	1. Accessory drive belt slipping.	1. Inspect the accessory drive belt condition and tension. Repair as required. Refer to Group 7 - Cooling.
	2. Faulty A/C orifice valve.	2. See A/C Orifice Valve in this group. Replace the valve, if required.
	3. Faulty A/C compressor.	3. See A/C Compressor in this group. Replace the A/C compressor, if required.
The low side pressure is too low, and the high side pressure is too high.	1. Restricted refrigerant flow through the refrigerant lines.	1. See Liquid Line, Suction Line and Discharge Line in this group. Inspect the refrigerant lines for kinks, tight bends or improper routing. Correct the routing or replace the refrigerant line, if required.
	2. Restricted refrigerant flow through the A/C orifice valve.	2. See A/C Orifice Valve in this group. Replace the valve, if required.
	3. Restricted refrigerant flow through the A/C condenser.	3. See A/C Condenser in this group. Replace the restricted A/C condenser, if required.

## HEATER PERFORMANCE

Before performing the following tests, refer to Group 7 - Cooling for the procedures to check the engine coolant level and flow, engine coolant reserve/recovery system operation, accessory drive belt condition and tension, radiator air flow and the fan drive operation. Perform the A/C System Performance Test, which is found within the HVAC System Test (refer to 24 - HVAC Electrical Diagnostics). If any diagnostic trouble codes (DTCs) are found in the A/C-heater control or the powertrain control module (PCM), repair as necessary.

## MAXIMUM HEATER OUTPUT

Engine coolant is delivered to the heater core through two heater hoses. With the engine idling at normal operating temperature, set the temperature control to the full hot position, the mode control to the floor position, and the blower motor control to the highest speed position. Using a test thermometer, check the temperature of the air being discharged at the front floor outlets. Compare the test thermometer reading to the Heater Temperature Reference chart.

**HEATER TEMPERATURE REFERENCE**

<b>Ambient Air Temperature</b>	15.5° C (60° F)	21.1° C (70° F)	26.6° C (80° F)	32.2° C (90° F)
<b>Minimum Heater System Air Outlet Temperature</b>	52.2° C (126° F)	56.1° C (133° F)	59.4° C (139° F)	62.2° C (144° F)

If the heater outlet air temperature is below the minimum specification, refer to Group 7 - Cooling. Both of the heater hoses should be hot to the touch. The coolant return heater hose should be slightly cooler than the coolant supply heater hose. If the return hose is much cooler than the supply hose, locate and repair the engine coolant flow obstruction in the cooling system. Refer to Group 7 - Cooling for more information.

**OBSTRUCTED COOLANT FLOW**

Possible locations or causes of obstructed coolant flow are as follows:

- Faulty water pump.
- Faulty thermostat.
- Pinched or kinked heater hoses.
- Improper heater hose routing.
- Plugged heater hoses or supply and return ports at the cooling system connections.
- Plugged heater core.

If proper coolant flow through the cooling system is verified, and heater outlet air temperature is low, a mechanical problem may exist.

**MECHANICAL PROBLEMS**

Possible locations or causes of insufficient heat due to mechanical problems are as follows:

- Obstructed cowl air intake.
- Obstructed heater system outlets.
- Blend-air door(s) or actuator(s) not functioning properly.
- Faulty blower motor system
- Faulty A/C-heater control

**TEMPERATURE CONTROL**

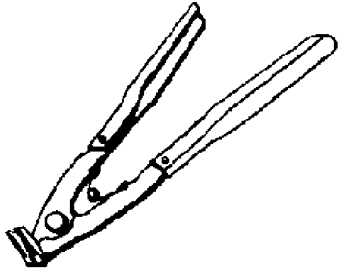
If the heater outlet air temperature cannot be adjusted with the temperature control on the A/C-heater control, the following could require service:

- Faulty A/C-heater control.
- Faulty blend door actuator(s).
- Faulty, obstructed or improperly installed blend-air door.
- Faulty related wiring harness or connectors.
- Improper engine coolant temperature.

## SPECIFICATIONS

### A/C SYSTEM

Item	Description	Notes
A/C Compressor	Denso 10S17	ND-8 PAG oil
Freeze-up Control	Evaporator Temperature Sensor	HVAC housing mounted
Low psi Control	A/C Pressure Transducer	Liquid line mounted - opens below 110 kPa (16 psi), closes above 220 kPa (32 psi)
High psi Control	A/C Pressure Transducer	Liquid line mounted - opens above 3219 kPa (476 psi), closed below 2937 kPa (426 psi)
Refrigerant Type	R-134a	
Refrigerant Capacity	Refer to the A/C Underhood Specification Label located in the engine compartment	
Compressor Clutch Coil Draw	3.3 amps	@ 12V $\pm$ 0.5V @ 21° C (70° F)
Compressor Clutch Coil Resistance	3.6 ohms	When measured across coil lead connector
Compressor Clutch Air Gap	0.35 - 0.60 mm (0.014 - 0.024 in.)	

**SPECIAL TOOLS****HEATING-A/C SYSTEM**

Snap Ring Pliers C-4574 is required to service the A/C clutch and field coil.

## CONTROLS

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## ACTUATOR-BLEND DOOR

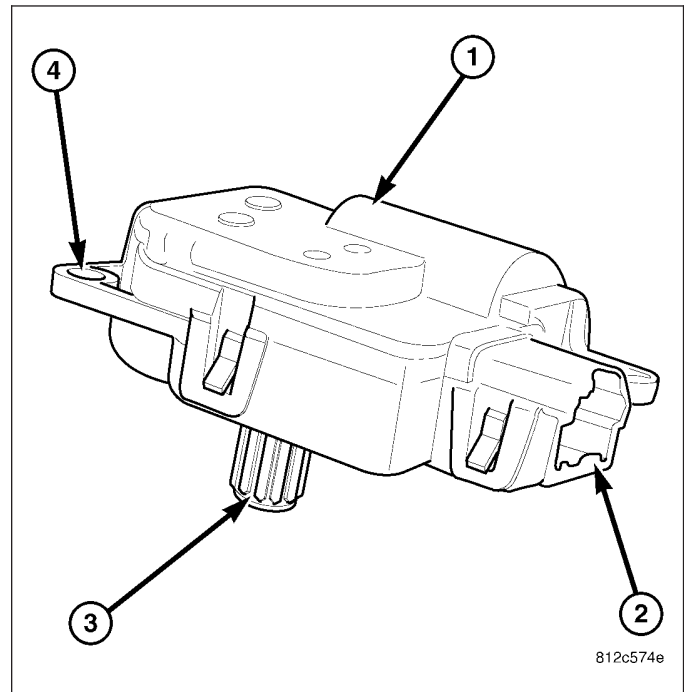
### DESCRIPTION

The blend door actuators (1) are reversible, 12 volt direct current (DC), servo motors. Models equipped with the MTC single zone heating-A/C system have a single blend-air door, which is controlled by a single blend door actuator. Models with the ATC dual zone heating-A/C system have two blend-air doors, which are controlled by two blend door actuators.

The blend door actuator for the single zone heating-A/C system is located on the driver side end of the HVAC air distribution housing, close to the dash panel.

For the dual zone heating-A/C system, the same blend door actuator used for the single zone system becomes the driver side blend door actuator, which is mechanically connected to only the driver side blend-air door. A second separate blend door actuator is also located on the passenger side of the HVAC air distribution housing which is mechanically connected to only the passenger side blend-air door.

The blend door actuators are interchangeable with each other, as well as with the actuators for the mode-air door and the recirculation-air door. Each actuator is contained within an identical black molded plastic housing with an integral wire connector receptacle (2). Each actuator also has an identical output shaft with splines (3) that connects it to its respective door linkage and three integral mounting tabs (4) that allow the actuator to be secured to the HVAC housing. The blend door actuators do not require mechanical indexing to the blend-air doors, as they are electronically calibrated by the A/C-heater control.



### OPERATION

The blend door actuators are connected to the A/C-heater control through the vehicle electrical system by a dedicated two-wire lead and connector of the HVAC wire harness. The blend door actuator(s) can move the blend-air door(s) in two directions. When the A/C-heater control pulls the voltage on one side of the motor connection high and the other connection low, the blend-air door will move in one direction. When the A/C-heater control reverses the polarity of the voltage to the motor, the blend-air door moves in the opposite direction.

When the A/C-heater control makes the voltage to both connections high or both connections low, the blend-air door(s) stops and will not move.

On ATC equipped vehicles, the A/C-heater control uses a pulse-count positioning system to monitor the operation and relative position of the blend door actuators and the blend-air doors. The A/C-heater control learns the blend-air doors stop positions during the calibration procedure and will store a diagnostic trouble code (DTC) for any problems it detects in the blend door actuator circuits.

On MTC equipped vehicles, the A/C-heater control uses a timer-type calibration procedure to check relative position of the blend door actuator and the blend-air door. The A/C-heater control learns the blend-air door stop positions during the calibration procedure and will store a diagnostic trouble code (DTC) for any problems it detects in the blend door actuator circuits.

The blend door actuator(s) are diagnosed using a scan tool (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING and to 24 - HVAC Electrical Diagnostics for more information).

The blend door actuator(s) cannot be adjusted or repaired and, if faulty or damaged, they must be replaced.



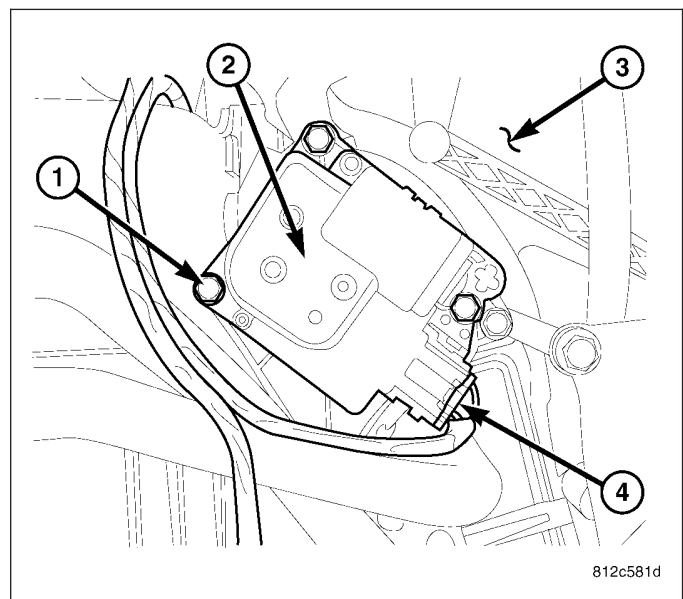
## REMOVAL

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

**Note:** The single zone heater-A/C system is equipped with a single blend door actuator. The dual zone system has two blend door actuators, one for the driver side blend-air door and one for the passenger side blend-air door.

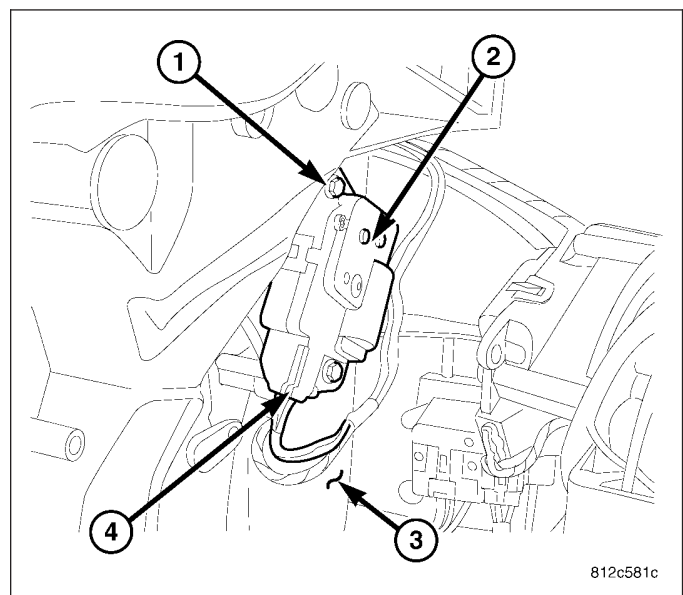
### SINGLE ZONE/DUAL ZONE DRIVER SIDE

1. Disconnect and isolate the negative battery cable.
2. Remove the instrument panel silencer from the driver side of the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL SILENCER - REMOVAL).
3. Remove the three screws (1) that secure the blend door actuator (2) to the driver side of the HVAC air distribution housing (3).
4. Remove the blend door actuator from the air distribution housing and disconnect the HVAC wire harness connector (4) from the actuator.
5. Remove the blend door actuator from the vehicle.



### DUAL ZONE PASSENGER SIDE

1. Disconnect and isolate the negative battery cable.
2. Remove the glove box from the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - REMOVAL).
3. Remove the three screws (1) that secure the blend door actuator (2) to the passenger side of the HVAC air distribution housing (3).
4. Remove the blend door actuator from the air distribution housing and disconnect the HVAC wire harness connector (4) from the actuator.
5. Remove the blend door actuator from the vehicle.

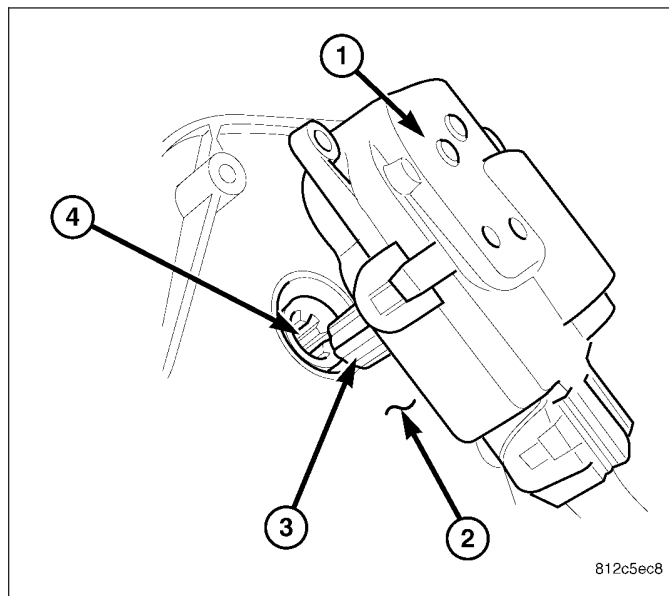


## INSTALLATION

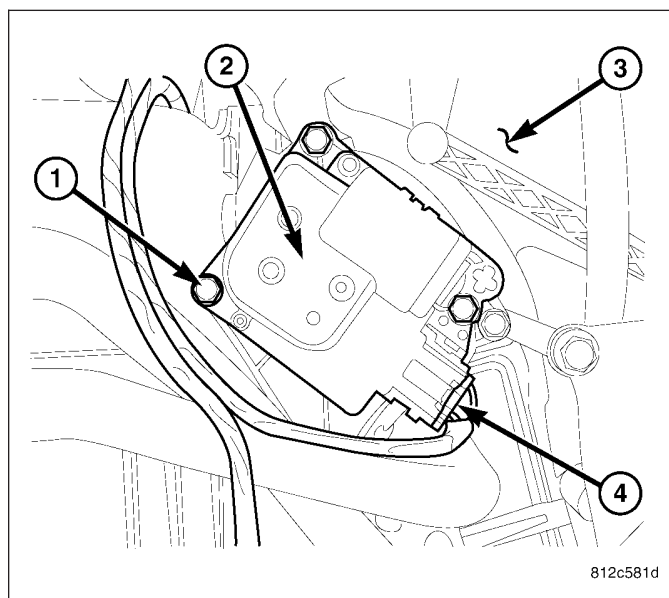
**Note:** The single zone heater-A/C system is equipped with a single blend door actuator. The dual zone system has two blend door actuators, one for the driver side blend-air door and one for the passenger side blend-air door.

### SINGLE ZONE/DUAL ZONE DRIVER SIDE

1. Position the blend door actuator (1) into the vehicle.
2. Install the blend door actuator onto the driver side of the HVAC air distribution housing (2). If necessary, rotate the actuator slightly to align the splines on the actuator output shaft (3) with those on the blend door cam (4).

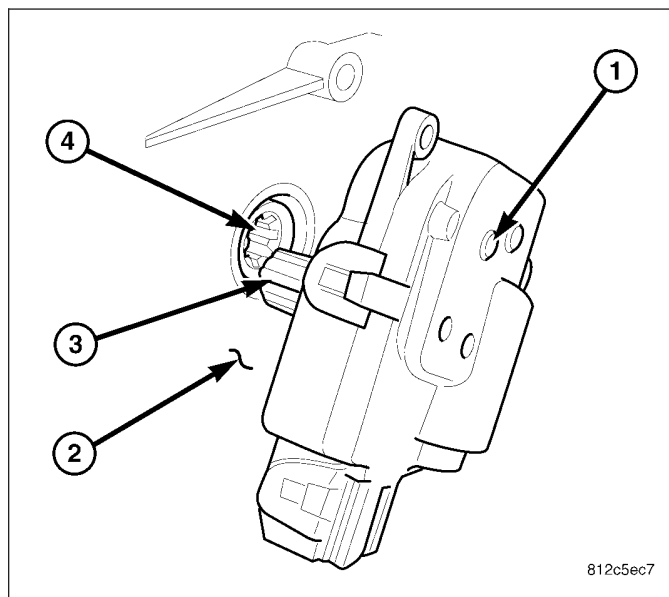


3. Install the screws (1) that secure the blend door actuator (2) to the driver side of the air distribution housing (3). Tighten the screws to 2 N·m (17 in. lbs.).
4. Connect the HVAC wire harness connector (4) to the blend door actuator.
5. Install the instrument panel silencer onto the driver side of the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL SILENCER - INSTALLATION).
6. Reconnect the negative battery cable.

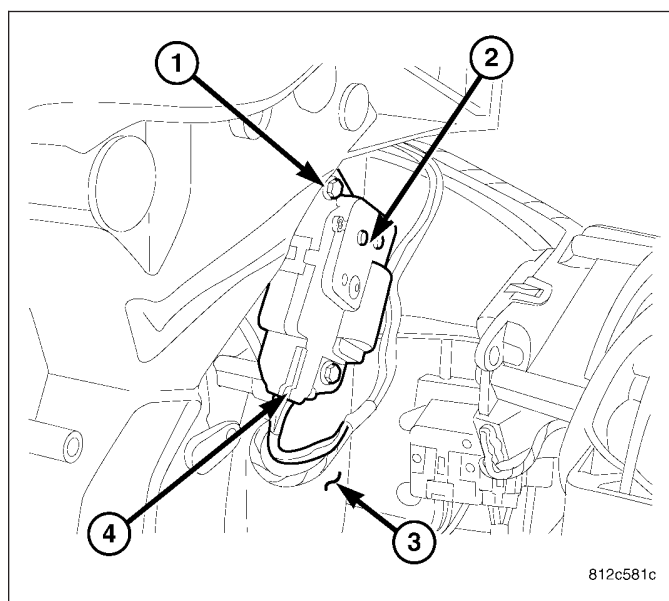


**DUAL ZONE PASSENGER SIDE**

1. Position the blend door actuator (1) into the vehicle.
2. Install the blend door actuator onto the passenger side of the HVAC air distribution housing (2). If necessary, rotate the actuator slightly to align the splines on the actuator output shaft (3) with those on the blend door cam (4).



3. Install the screws (1) that secure the blend door actuator (2) to the passenger side of the air distribution housing (3). Tighten the screws to 2 N·m (17 in. lbs.).
4. Connect the HVAC wire harness connector (4) to the blend door actuator.
5. Install the glove box into the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - INSTALLATION).
6. Reconnect the negative battery cable.

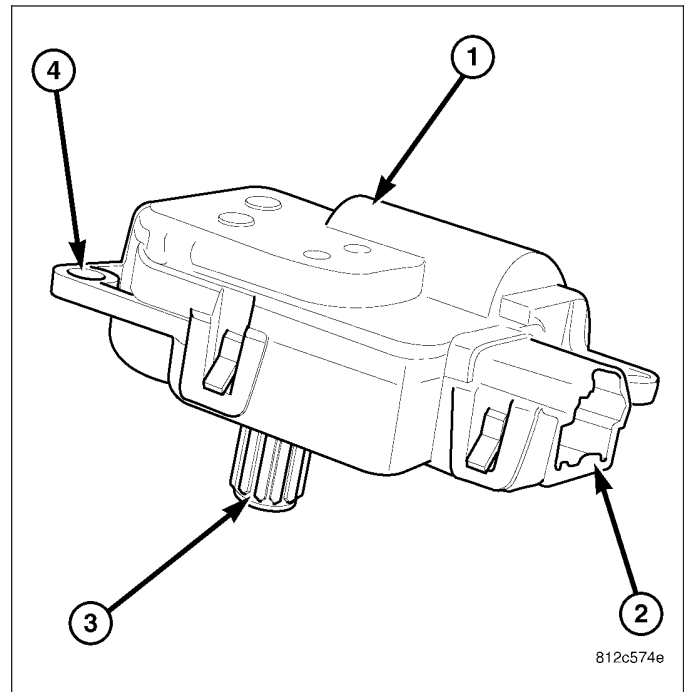


## ACTUATOR-MODE DOOR

### DESCRIPTION

The mode door actuator (1) is a reversible, 12-volt direct current (DC), servo motor. The mode door actuator is located on the driver side end of the HVAC air distribution housing, close to the instrument panel. The mode door actuator is mechanically connected to the floor, defrost/demist and the panel-air doors.

The mode door actuator is interchangeable with the actuators for the blend-air door(s) and the recirculation-air door. Each actuator is contained within an identical black molded plastic housing with an integral wire connector receptacle (2). Each actuator also has an identical output shaft with splines (3) that connects it to its door linkage and three integral mounting tabs (4) that allow the actuator to be secured to the HVAC housing. The mode door actuator does not require mechanical indexing to the mode-air doors, as it is electronically calibrated by the A/C-heater control.



### OPERATION

The mode door actuator is connected to the A/C-heater control through the vehicle electrical system by a dedicated two-wire lead and connector of the HVAC wire harness. The mode door actuator can move the floor, defrost/demist and the panel-air doors in two directions. When the A/C-heater control pulls the voltage on one side of the motor connection high and the other connection low, the mode-air doors will move in one direction. When the A/C-heater control reverses the polarity of the voltage to the motor, the mode-air doors moves in the opposite direction.

When the A/C-heater control makes the voltage to both connections high or both connections low, the mode-air doors stop and will not move. The A/C-heater control uses a pulse-count positioning system to monitor the operation and relative position of the mode door actuator and the mode-air doors. The A/C-heater control learns the mode-air doors stop position during the calibration procedure and will store a diagnostic trouble code (DTC) for any problems it detects in the mode door actuator circuits.

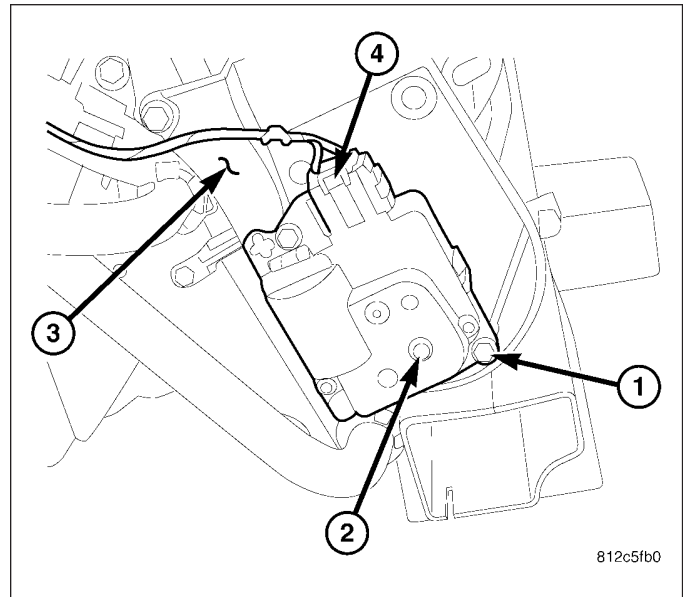
The mode door actuator is diagnosed using a scan tool (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING and to 24 - HVAC Electrical Diagnostics for more information).

The mode door actuator cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

### REMOVAL

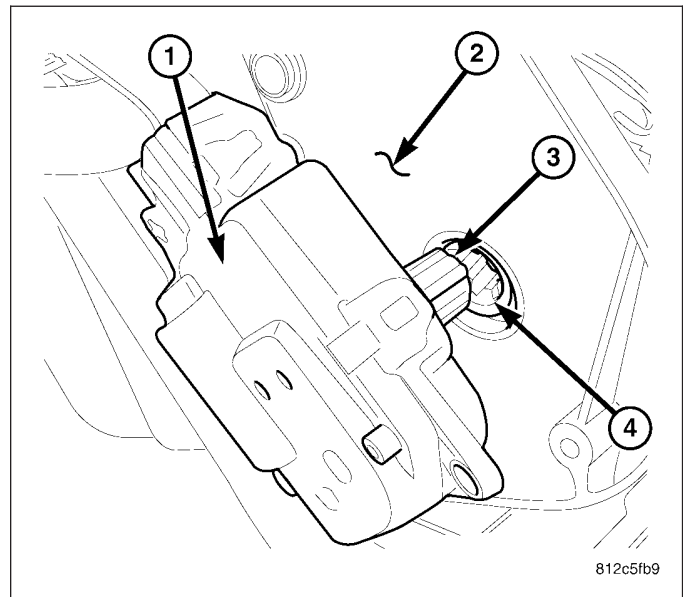
**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

1. Disconnect and isolate the negative battery cable.
2. Remove the instrument panel silencer from the driver side of the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL SILENCER - REMOVAL).
3. Remove the screws (1) that secure the mode door actuator (2) to the driver side of the HVAC air distribution housing (3).
4. Remove the mode door actuator from the air distribution housing and disconnect the HVAC wire harness connector (4) from the actuator.
5. Remove the mode door actuator from the vehicle.

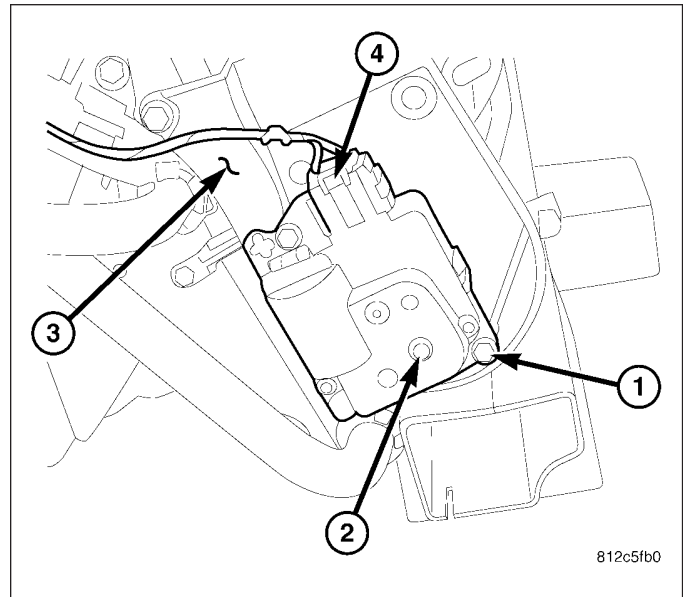


## INSTALLATION

1. Position the mode door actuator (1) into the vehicle.
2. Install the mode door actuator onto the driver side of the HVAC air distribution housing (2). If necessary, rotate the actuator slightly to align the splines on the actuator output shaft (3) with those on the mode door cam (4).



3. Install the screws (1) that secure the mode door actuator (2) to the driver side of the air distribution housing (3). Tighten the screws to 2 N·m (17 in. lbs.).
4. Connect the HVAC wire harness connector (4) to the mode door actuator.
5. Install the instrument panel silencer onto the driver side of the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL SILENCER - INSTALLATION).
6. Reconnect the negative battery cable.

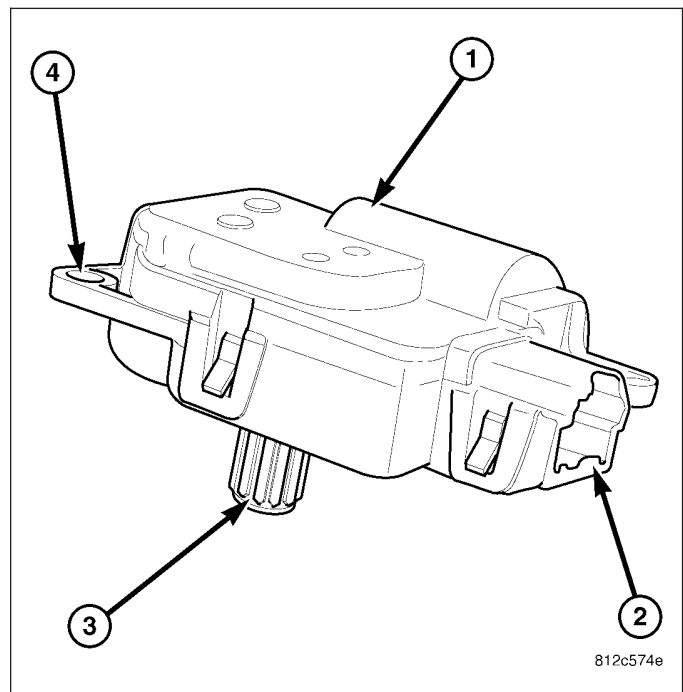


## ACTUATOR-RECIRCULATION DOOR

### DESCRIPTION

The recirculation door actuator (1) is a reversible, 12 volt direct current (DC), servo motor. The recirculation door actuator is located on the left side of the HVAC air inlet housing and is directly connected to the pivot shaft of the recirculation-air door.

The recirculation door actuator is interchangeable with the actuators for the blend-air door(s) and the mode-air doors. Each actuator is contained within an identical black molded plastic housing with an integral wire connector receptacle (2). Each actuator also has an identical output shaft with splines (3) that connects it to its door linkage and three integral mounting tabs (4) that allow the actuator to be secured to the air inlet housing. The recirculation door actuator does not require mechanical indexing to the recirculation-air door, as it is electronically calibrated by the A/C-heater control.



### OPERATION

The recirculation door actuator is connected to the A/C-heater control through the vehicle electrical system by a dedicated two-wire lead and connector of the HVAC wire harness. The recirculation door actuator can move the recirculation-air door in two directions. When the A/C-heater control pulls the voltage on one side of the motor connection high and the other connection low, the recirculation-air door will move in one direction. When the A/C-heater control reverses the polarity of the voltage to the motor, the recirculation-air door moves in the opposite direction.

When the A/C-heater control makes the voltage to both connections high or both connections low, the recirculation-air door stops and will not move.

On ATC equipped vehicles, the A/C-heater control uses a pulse-count positioning system to monitor the operation and relative position of the recirculation door actuator and the recirculation-air door. The A/C-heater control learns the recirculation-air door stop positions during the calibration procedure and will store a diagnostic trouble code (DTC) for any problems it detects in the recirculation door actuator circuits.

On MTC equipped vehicles, the A/C-heater control uses a timer-type calibration procedure to check relative position of the recirculation door actuator and the recirculation-air door. The A/C-heater control learns the recirculation-air door stop positions during the calibration procedure and will store a diagnostic trouble code (DTC) for any problems it detects in the recirculation door actuator circuits.

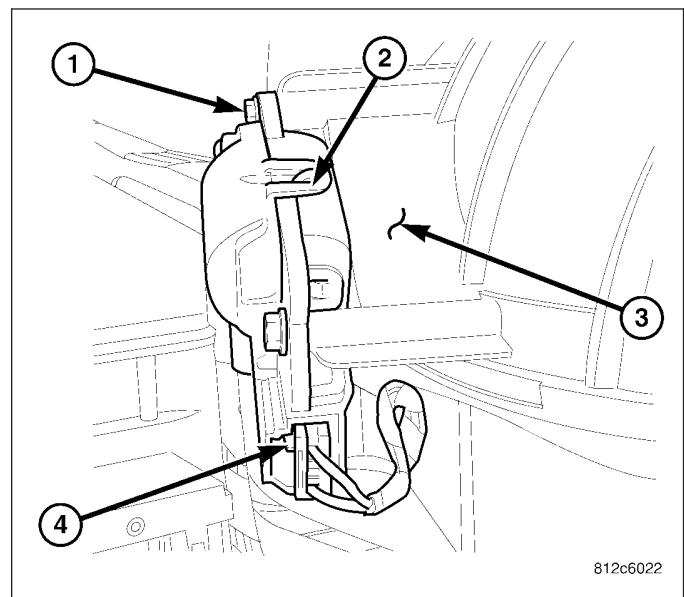
The recirculation door actuator is diagnosed using a scan tool (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING and to 24 - HVAC Electrical Diagnostics for more information).

The recirculation door actuator cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

## REMOVAL

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

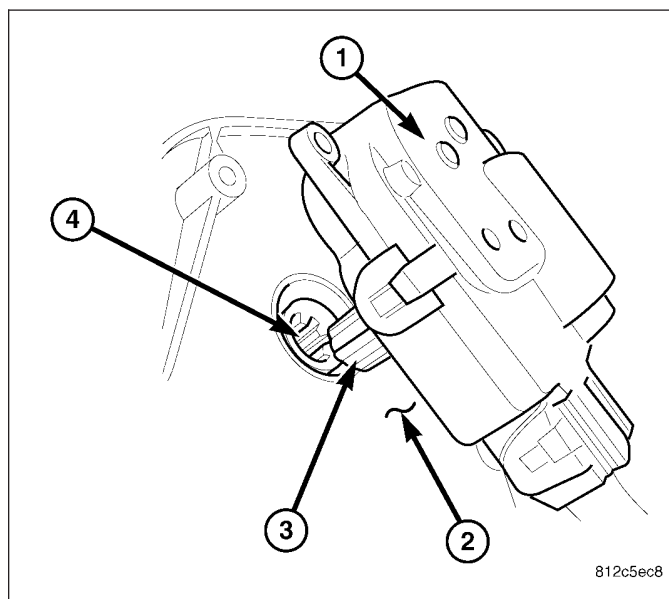
1. Disconnect and isolate the negative battery cable.
2. Remove the glove box from the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - REMOVAL).
3. Remove the three screws (1) that secure the recirculation door actuator (2) to the left side of the HVAC air inlet housing (3).
4. Remove the recirculation door actuator from the air inlet housing and disconnect the HVAC wire harness connector (4) from the actuator.
5. Remove the recirculation door actuator from the vehicle.



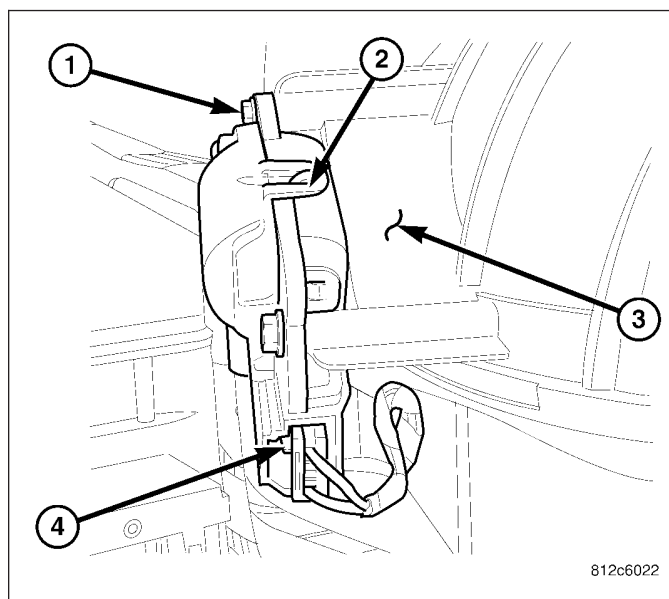


## INSTALLATION

1. Position the recirculation door actuator (1) into the vehicle.
2. Install the recirculation door actuator onto the left side of the HVAC air inlet housing (2). If necessary, rotate the actuator slightly to align the splines on the actuator output shaft (3) with those on the recirculation door pivot shaft (4).



3. Install the three screws (1) that secure the recirculation door actuator (2) to the left side of the HVAC air inlet housing (3). Tighten the screws to 2 N·m (17 in. lbs.).
4. Connect the HVAC wire harness connector (4) to the recirculation door actuator.
5. Install the glove box into the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - INSTALLATION).
6. Reconnect the negative battery cable.



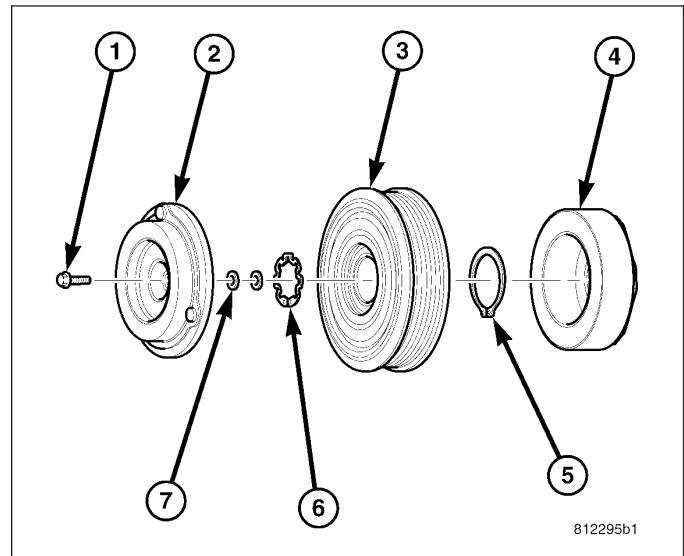


## CLUTCH-A/C COMPRESSOR

### DESCRIPTION

The A/C compressor clutch assembly consists of a stationary electromagnetic A/C clutch field coil (4), pulley bearing and pulley assembly (3), clutch plate (2) and shims (7). These components provide the means to engage and disengage the A/C compressor from the engine accessory drive belt.

The A/C clutch field coil and the pulley bearing and pulley assembly are both retained on the nose of the A/C compressor with snap rings (5 and 6). The clutch plate is splined to the compressor shaft and secured with a bolt (1).



### OPERATION

The A/C compressor clutch components provide the means to engage and disengage the A/C compressor from the engine accessory drive belt. When the electromagnetic A/C clutch field coil is energized, it magnetically draws the clutch plate into contact with the clutch pulley and drives the compressor shaft. When the coil is not energized, the pulley freewheels on the clutch hub bearing, which is part of the pulley.

A/C compressor clutch engagement is controlled by the powertrain control module (PCM) in the engine compartment.

The A/C compressor clutch components cannot be repaired and, if faulty or damaged, they must be replaced.

### DIAGNOSIS AND TESTING

#### A/C COMPRESSOR CLUTCH COIL

The A/C compressor clutch coil electrical circuit is controlled by the powertrain control module (PCM) through the A/C clutch relay. The A/C clutch coil can be tested by either measuring clutch field coil resistance or by measuring current draw. Begin testing of a suspected compressor clutch coil problem by performing the preliminary checks.

#### PRELIMINARY CHECKS

1. If the A/C compressor clutch will not engage, refer to 24 - HVAC Electrical Diagnostics to perform the A/C System Performance Test, which is found within the HVAC System Test. If no diagnostic trouble codes (DTCs) are found in the A/C-heater control or the powertrain control module (PCM), go to Step 2. If any DTCs are found, repair as required.
2. If the A/C compressor clutch still will not engage, verify the refrigerant charge level (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - DIAGNOSIS AND TESTING - REFRIGERANT SYSTEM LEAKS). If the refrigerant charge level is OK, go to COIL RESISTANCE TEST and/or COIL CURRENT DRAW TEST. If the refrigerant charge level is not OK, adjust the refrigerant charge as required.

#### COIL RESISTANCE TEST

1. Disconnect and isolate the negative battery cable.
2. Disconnect the wire harness connector from the A/C clutch field coil lead connector.
3. Use an ohm meter and measure the resistance of the clutch coil at the coil lead connector terminals.

4. Refer to the A/C Clutch Coil Specifications chart for the acceptable A/C clutch coil resistance. Specifications apply for a work area temperature of 21° C (70° F).
  - a. If the A/C clutch coil reading is below specifications, the coil is shorted and must be replaced.
  - b. If the A/C clutch coil reading is above specifications, the coil is open and must be replaced.

### COIL CURRENT DRAW TEST

1. Verify the battery state of charge (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - DIAGNOSIS AND TESTING).
2. Connect an ammeter (0 to 10 ampere scale selected) in series with the clutch coil feed terminal. Connect a voltmeter (0 to 20 volt scale selected) to measure voltage across the battery and the clutch coil.
3. With the A/C-heater control in the A/C mode and the blower motor at low speed, start the engine and allow it to run at a normal idle speed.
4. The A/C compressor clutch should engage immediately, and the clutch coil supply voltage should be within two volts of the battery voltage. If the coil supply voltage is OK, go to Step 5. If the coil supply voltage is not within two volts of battery voltage, test the clutch coil feed circuit for excessive voltage drop and repair as necessary.
5. Refer to the A/C Clutch Coil Specifications chart for the acceptable A/C clutch coil current draw. Specifications apply for a work area temperature of 21° C (70° F). If voltage is more than 12.5 volts, add electrical loads by turning on electrical accessories until voltage reads below 12.5 volts.
  - a. If the A/C clutch coil current reading is zero, the coil is open and must be replaced.
  - b. If the A/C clutch coil current reading is above specifications, the coil is shorted and must be replaced.

### A/C CLUTCH COIL SPECIFICATIONS

Compressor	Current Draw	Coil Resistance
Denso 10S17	3.3 amps @ 11.5 - 12.5 volts	3.6 ohms

## STANDARD PROCEDURE

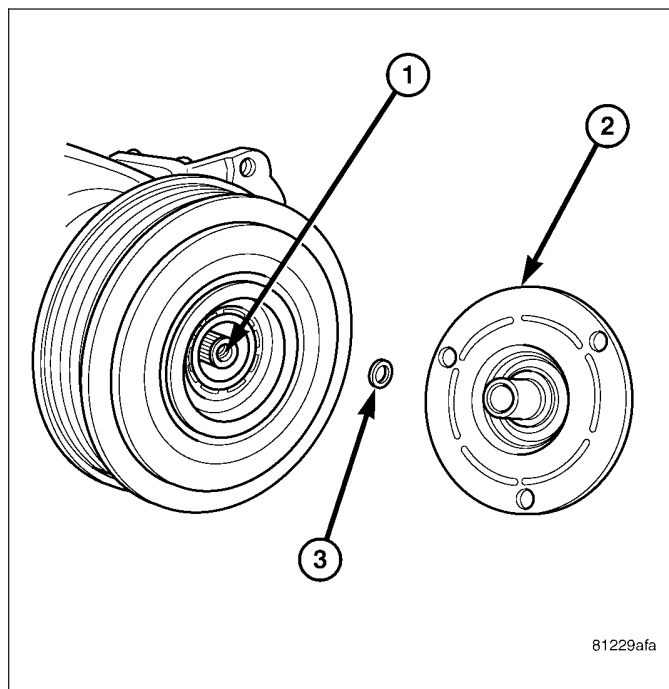
### A/C CLUTCH PLATE INSPECTION

**Note:** The compressor clutch can be serviced in the vehicle. The refrigerant system can remain fully-charged during compressor clutch, pulley and bearing assembly, or coil replacement.

Examine the friction surfaces of the pulley and the clutch plate (2) for wear. The pulley and clutch plate should be replaced if there is excessive wear or scoring.

If the friction surfaces are oily, inspect the shaft and nose area of the A/C compressor (1) for refrigerant oil. If refrigerant oil is found, the compressor shaft seal is leaking and the A/C compressor must be replaced.

Check the pulley bearing for roughness or excessive leakage of grease. Replace the pulley and bearing assembly, if required.



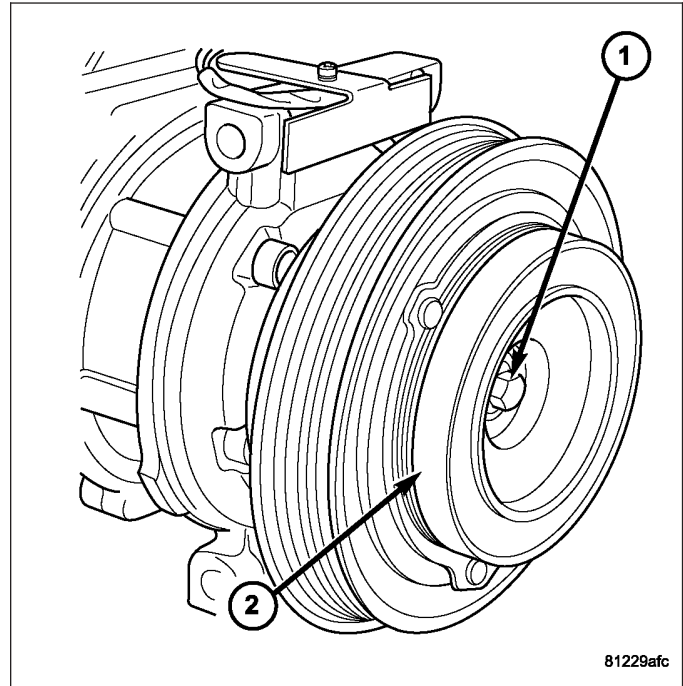
## A/C CLUTCH BREAK-IN

After a new A/C compressor clutch has been installed, cycle the compressor clutch approximately twenty times (five seconds on, then five seconds off). During this procedure, set the A/C-heater controls to the A/C Recirculation Mode, the blower motor in the highest speed position, and the engine speed at 1500 to 2000 rpm. This procedure (burnishing) will seat the opposing friction surfaces and provide a higher compressor clutch torque capability.

## REMOVAL

**Note:** The A/C compressor clutch can be serviced in the vehicle. The refrigerant system can remain fully-charged during compressor clutch, pulley and bearing assembly, or coil replacement.

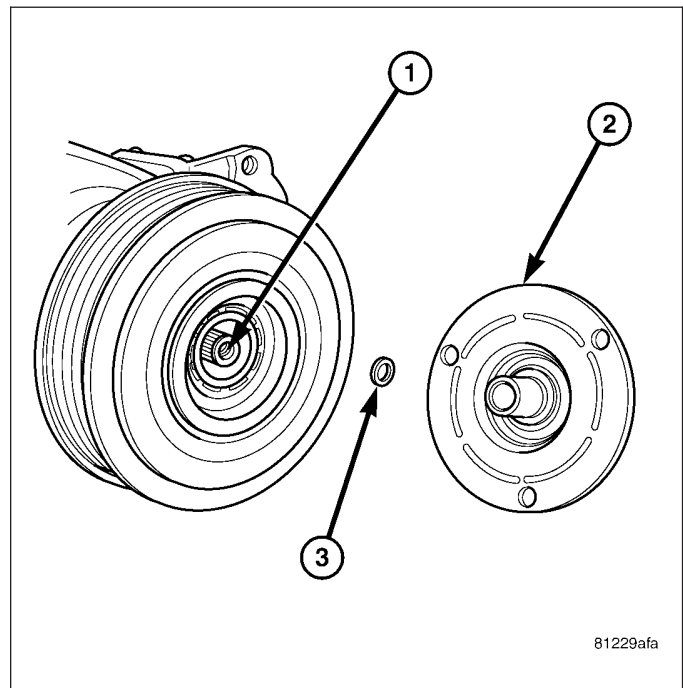
1. Disconnect and isolate the negative battery cable.
2. Remove the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/BELTS-DRIVE - REMOVAL).
3. Disconnect the engine wire harness connector for the A/C compressor clutch coil from the clutch field coil wire harness connector on the top of the A/C compressor.
4. Remove the bolts that secure the A/C compressor to the engine and support the A/C compressor.
5. Remove the compressor shaft bolt (1). A band-type oil filter wrench or a strap wrench may be used to secure the clutch plate (2) during bolt removal.



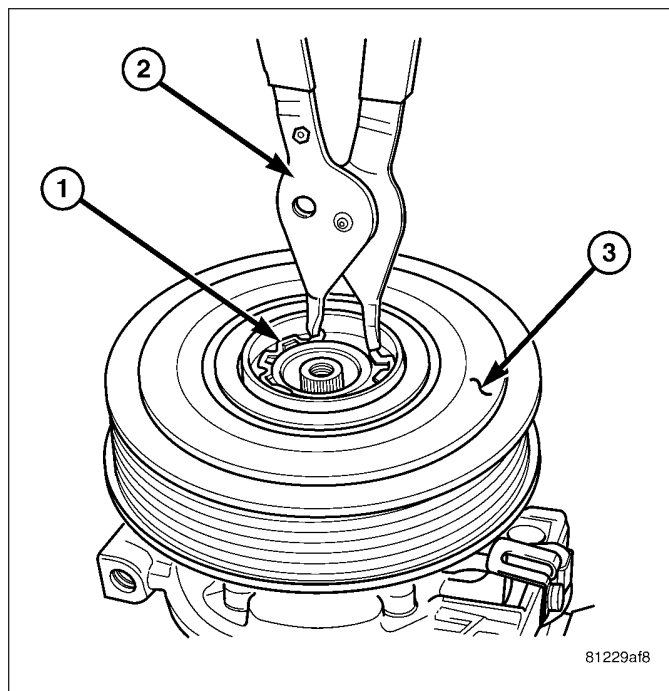
**CAUTION:** Do not pry between the clutch plate and the pulley and bearing assembly to remove the clutch plate from the compressor shaft as this may damage the clutch plate.

**Note:** Use care not to lose any clutch shim(s) during removal of the clutch plate, as they may be reused during the clutch plate installation process.

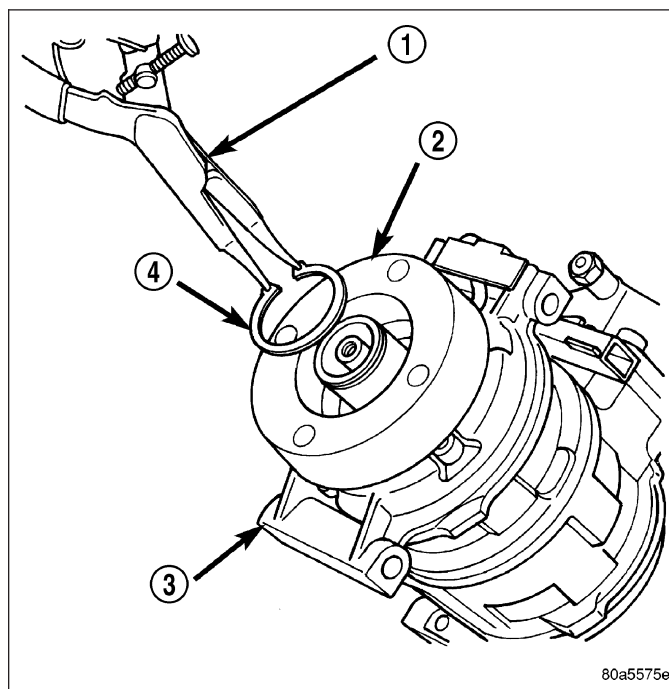
6. Tap the clutch plate (2) lightly with a plastic mallet to release it from the splines on the compressor shaft (1). Remove the clutch plate and shim(s) (3) from the compressor shaft.



7. Using snap ring pliers (Special Tool C-4574 or equivalent) (2), remove the external snap ring (1) that secures the pulley and bearing assembly (3) to the front cover of the A/C compressor, then slide the pulley and bearing assembly off of the A/C compressor.



8. Remove the screw that secures the clutch coil pigtail wire connector bracket and ground clip to the top of the compressor housing (3).
9. Using snap ring pliers (Special Tool C-4574 or equivalent) (1), remove the external snap ring (4) that secures the clutch field coil (2) to the front cover of the compressor housing, then slide the clutch field coil off of the A/C compressor.



## INSTALLATION

1. Align the dowel pin on the back of the clutch field coil (2) with the hole in the compressor front cover (3) and position the clutch field coil onto the A/C compressor. Be certain that the clutch coil wire harness is properly oriented and routed so that it is not pinched between the compressor front cover and the clutch field coil.

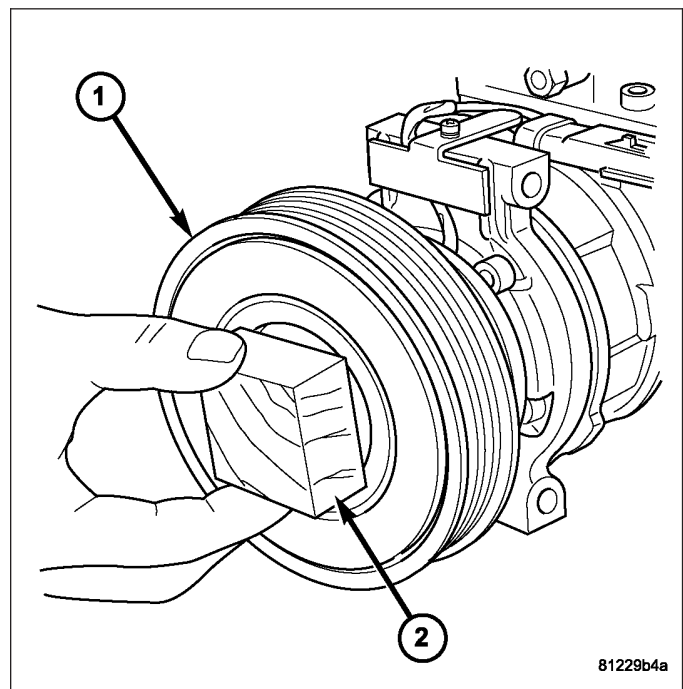
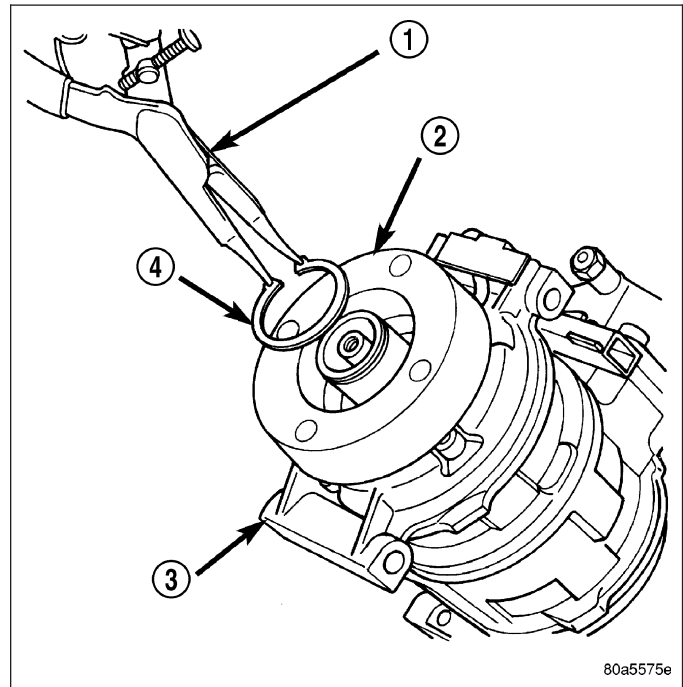
**CAUTION:** The snap ring must be fully and properly seated in the groove or it will vibrate out, resulting in a clutch failure and severe damage to the A/C compressor.

**Note:** A new snap ring must be used to secure the clutch field coil to the A/C compressor. The bevel side of the snap ring must face outward and both snap ring eyelets must be oriented to the right or to the left of the clutch field coil dowel pin location on the A/C compressor.

2. Using snap ring pliers (Special Tool C-4574 or equivalent) (1), install the external snap ring (4) that secures the clutch field coil to the front cover of the A/C compressor. Be certain that the snap ring is fully and properly seated in the groove and oriented correctly.
3. Install the screw that secures the clutch field coil wire harness connector bracket and ground clip to the top of the compressor housing. Tighten the screw securely.

**CAUTION:** When installing the pulley and bearing assembly, **DO NOT** mar the friction surfaces of the pulley or premature failure of the clutch will result.

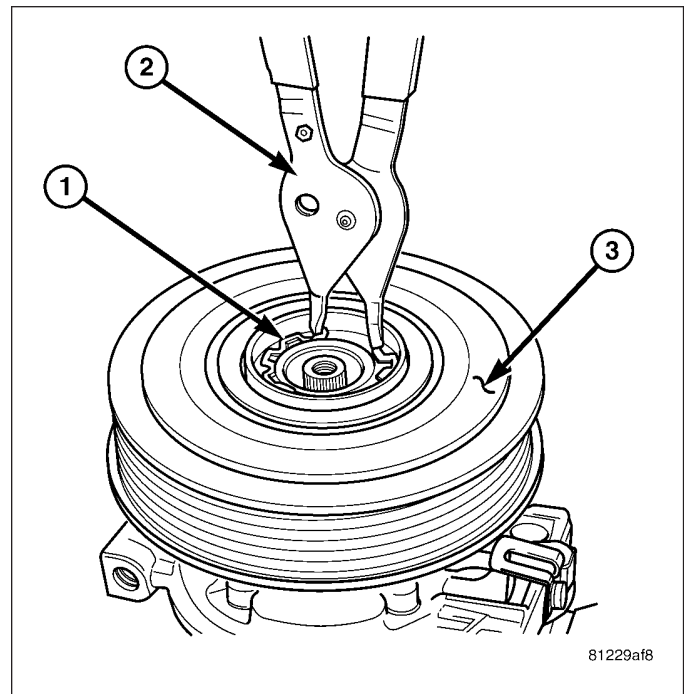
4. Install the pulley and bearing assembly (1) onto the front cover of the A/C compressor. If necessary, tap the pulley gently with a block of wood (2) placed on the pulley friction surface.



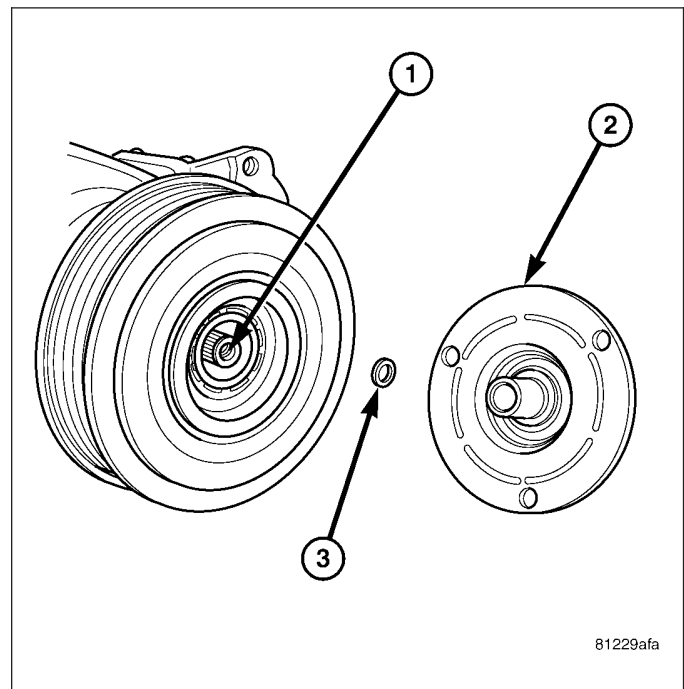
**CAUTION:** The snap ring must be fully and properly seated in the groove or it will vibrate out, resulting in a clutch failure and severe damage to the A/C compressor.

**Note:** A new snap ring must be used to secure the pulley and bearing assembly to the A/C compressor. The bevel side of the snap ring must face outward.

5. Using snap ring pliers (Special Tool C-4574 or equivalent) (2), install the external snap ring (1) that secures the pulley and bearing assembly (3) to the front cover of the A/C compressor. Be certain that the snap ring is fully and properly seated in the groove.



6. If the original clutch plate (2) and pulley and bearing assembly are to be reused, reinstall the original shim(s) (3) on the compressor shaft (1) against the shoulder. If a new clutch plate and/or pulley and bearing assembly are being used, install a trial stack of shims 2.54 mm (0.010 in.) thick on the compressor shaft against the shoulder.



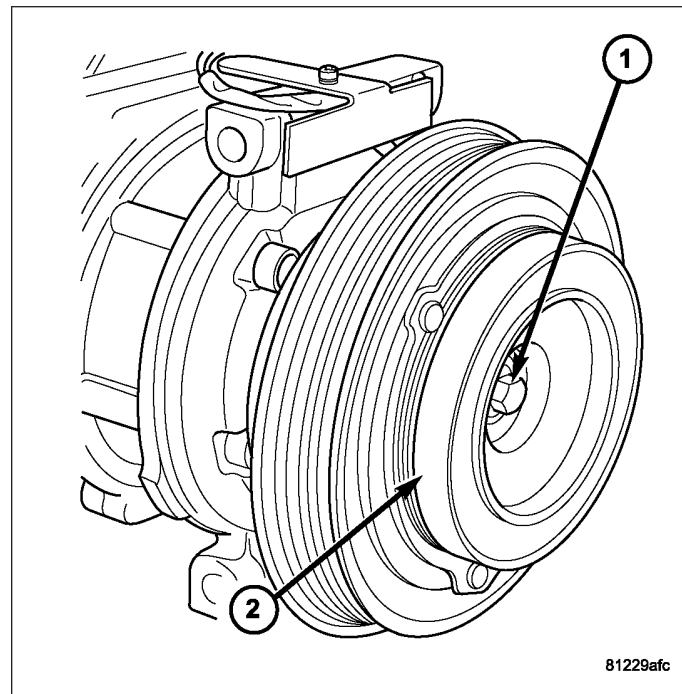


7. Install the clutch plate (2) onto the compressor shaft.
8. Install the compressor shaft bolt (1). Tighten the bolt to 17.5 N·m (155 in. lbs.).

**Note:** The shims may compress after tightening the shaft bolt. Check the air gap in four or more places to verify the air gap is correct. Spin the pulley before performing a final check of the air gap.

9. With the clutch plate assembled tight against the shim(s), measure the air gap between the clutch plate and the pulley and bearing assembly faces with a feeler gauge. The air gap should be between specifications (Refer to 24 - HEATING & AIR CONDITIONING - SPECIFICATIONS). If the proper air gap is not obtained, add or subtract shims as needed until the desired air gap is obtained.
10. Install the bolts that secure the A/C compressor to the engine (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/COMPRESSOR-A/C - INSTALLATION).

11. Connect the engine wire harness connector to the A/C compressor clutch coil.
12. Install the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/BELTS-DRIVE - INSTALLATION).
13. Reconnect the negative battery cable.



## CONTROL-A/C HEATER

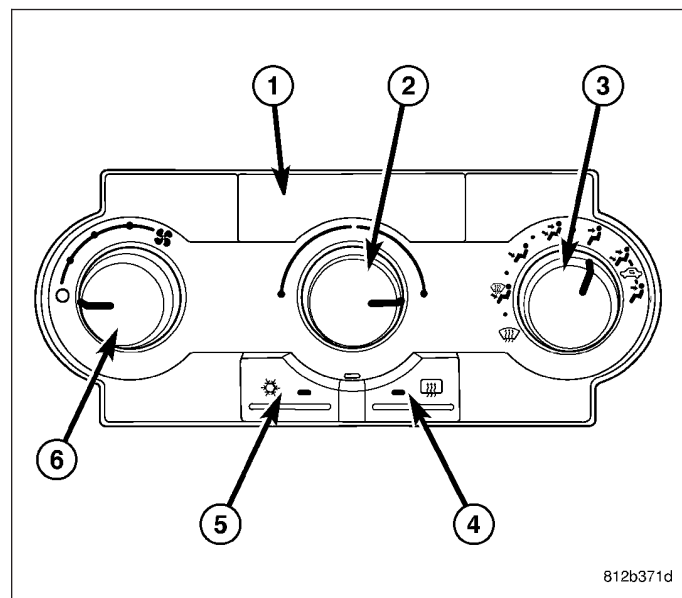
### DESCRIPTION

#### MANUAL SINGLE ZONE

The A/C-heater control (1) for the manual temperature control (MTC) single zone heating-A/C system allows one temperature setting for the entire vehicle. All controls are identified by ISO graphic symbols.

The A/C-heater control and integral computer is located in the instrument panel and contains:

- a rotary control knob for temperature control of the discharged air (2).
- a rotary control knob for recirculation and mode control of the discharged air (3).
- a push button rear window defogger on/off control (4). The defogger button contains an LED that illuminates when the rear window defogger system is in operation.
- a push button A/C on/off control (5). The Snowflake button contains an LED that illuminates when the A/C system is in operation.
- a rotary control knob for fan speed selection and turning the heating-A/C system off (6).



Prior to replacing an A/C-heater control, run the calibration procedure to verify that the concern is not a system issue. Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING and to 24 - HVAC Electrical Diagnostics for more information.

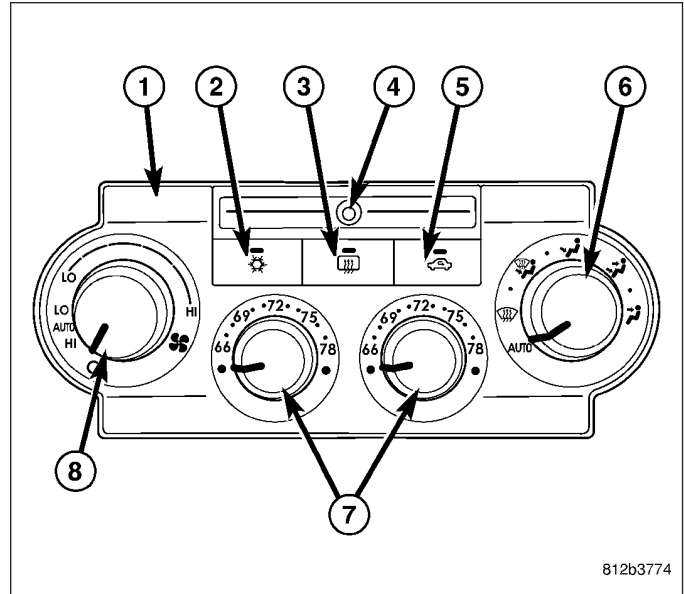
The A/C-heater control cannot be repaired and, if faulty or damaged, it must be replaced.

## AUTOMATIC DUAL ZONE

The A/C-heater control (1) for the automatic temperature control (ATC) dual zone heating-A/C system allows both the driver and the front seat passenger the ability to individually regulate air temperature for their side of the vehicle. All controls are identified by ISO graphic symbols.

The ATC A/C-heater control and integral computer is located in the instrument panel and contains:

- a push button A/C on/off control (2). The Snowflake button contains an LED that illuminates when the A/C system is in operation.
- a push button rear window defogger on/off control (3). The defogger button contains an LED that illuminates when the rear window defogger system is in operation.
- an infrared sensor (4) that detects thermal radiation emitted by the front seat occupants and their surroundings
- a push button air recirculation control (5). The Recirculation button contains an LED that illuminates when the recirculation function is manually activated.
- a rotary control knob for mode control of the discharged air (6).
- two rotary control knobs for individual driver and front seat passenger temperature control of the discharged air (7).
- a rotary control knob for manual and automatic fan speed selection and turning the heating-A/C system off (8).
- Auto mode provides variable air recirculation under high temperature and humidity conditions. Because recirculation is generally accompanied by increased fan noise, the proportion of recirculated to outside air gradually approaches full recirculation over a broad temperature range.



The A/C-heater control for the ATC dual zone heating-A/C system is diagnosed using a scan tool. Prior to replacing an A/C-heater control, run the calibration procedure to verify that the concern is not a system issue. (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING and to 24 - HVAC Electrical Diagnostics for more information).

The A/C-heater control cannot be repaired and, if faulty or damaged, it must be replaced.

The A/C-heater control utilizes integrated circuitry and information carried on the controller area network (CAN) B bus to monitor many sensors and switch inputs throughout the vehicle. In response to those inputs, the internal circuitry and programming of the A/C-heater control allows it to control electronic functions and features of the ATC heating-A/C system.

Some of the inputs received by the A/C-heater control of the ATC heating-A/C system on the CAN B bus are as follows:

- Dimming
- Refrigerant Pressure
- A/C Clutch Engage
- Vehicle Identification Number
- Vehicle Odometer
- Engine Coolant Temperature
- Ambient Air Temperature
- System Voltage
- Vehicle Speed
- Engine Speed



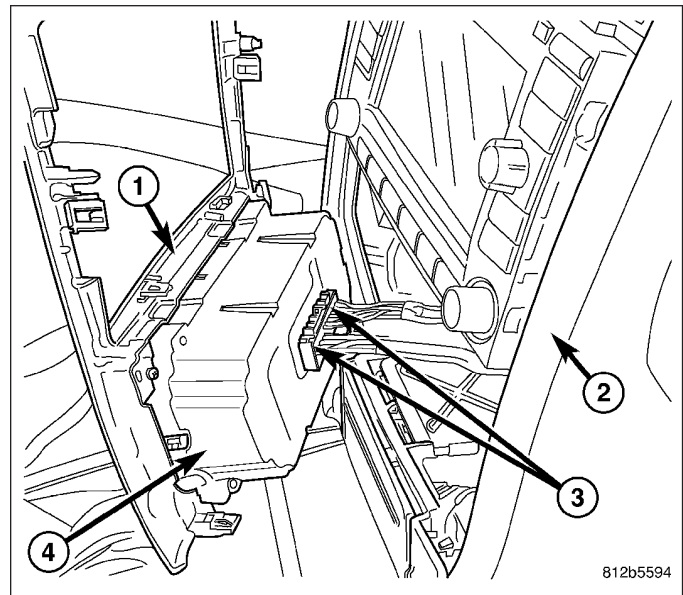
Some of the messages broadcasted by the A/C-heater control of the ATC heating-A/C system on the CAN B bus are as follows:

- A/C Request
- A/C Select
- EBL Status
- Auto Headlamp Signal

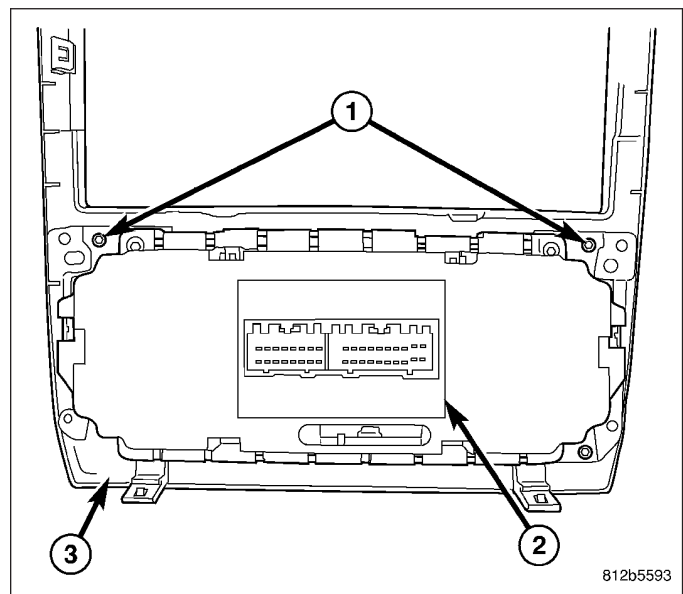
## REMOVAL

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

1. Disconnect and isolate the negative battery cable.
2. Remove the center bezel (1) from the instrument panel (2), disconnect the wire harness connector(s) (3) from the A/C-heater control (4) and place the center bezel on a workbench (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL).

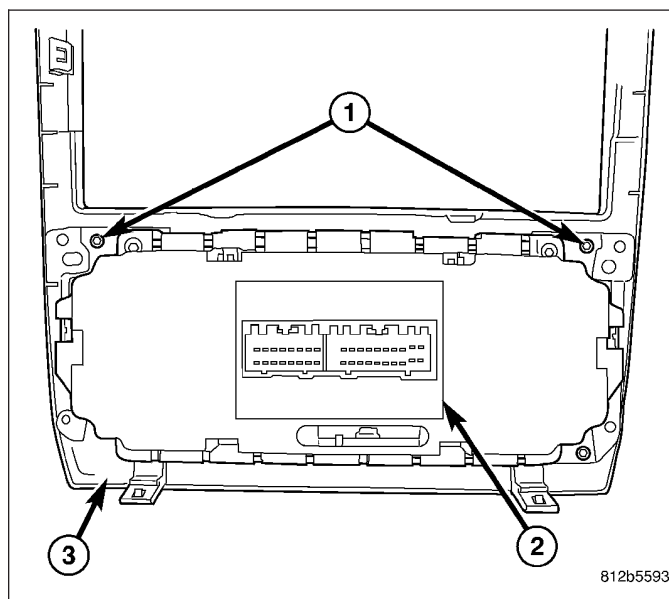


3. Remove the four screws (1) that secure the A/C-heater control (2) to the instrument panel center bezel (3).
4. Remove the A/C-heater control from the instrument panel center bezel.

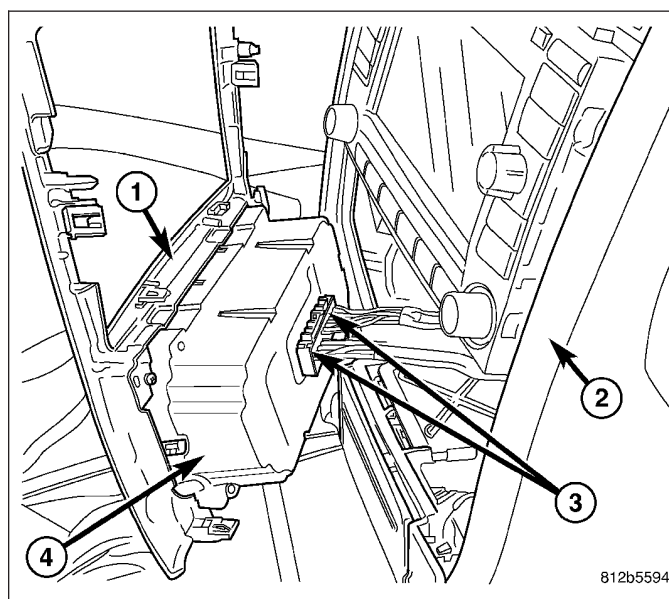


## INSTALLATION

1. Position the A/C-heater control (2) into the instrument panel center bezel (3).
2. Install the four screws (1) that secure the A/C-heater control to the instrument panel center bezel. Tighten the screws to 2 N·m (17 in. lbs.).



3. Connect the wire harness connector(s) (3) to the A/C-heater control (4) and install the instrument panel center bezel (1) to the instrument panel (2) (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - INSTALLATION).
4. Reconnect the negative battery cable.

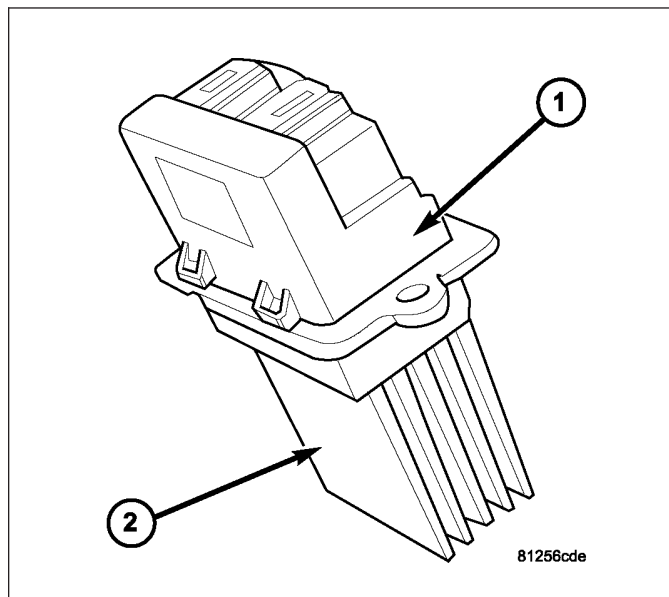


## MODULE-POWER-BLOWER MOTOR

### DESCRIPTION

A blower motor power module is used on this model when it is equipped with the automatic temperature control (ATC) heating-A/C system. Models equipped with the manual temperature control (MTC) heating-A/C system use a blower motor resistor, instead of the blower motor power module (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - FRONT/RESISTOR-BLOWER MOTOR - DESCRIPTION).

The blower motor power module is mounted to the rear of the HVAC housing, directly behind the glove box. The blower motor power module consists of a molded plastic mounting plate with two integral connector receptacles (1). Concealed behind the mounting plate is the power module electronic circuitry and a large finned heat sink (2). The blower motor power module is accessed for service by removing the glove box.



### OPERATION

The blower motor power module is connected to the vehicle electrical system through a dedicated lead and connector of the HVAC wire harness. A second connector receptacle receives the wire harness connector from the blower motor. The blower motor power module allows the microprocessor-based automatic temperature control (ATC) A/C-heater control to calculate and provide infinitely variable blower motor speeds based upon either manual blower switch input or the ATC programming using a pulse width modulated (PWM) circuit strategy.

The PWM voltage is applied to a comparator circuit which compares the PWM signal voltage to the blower motor feedback voltage. The resulting output drives the power module circuitry, which provides a linear output voltage to change or maintain the desired blower speed.

The blower motor power module is diagnosed using a scan tool. Refer to 24 - HVAC Electrical Diagnostics for more information.

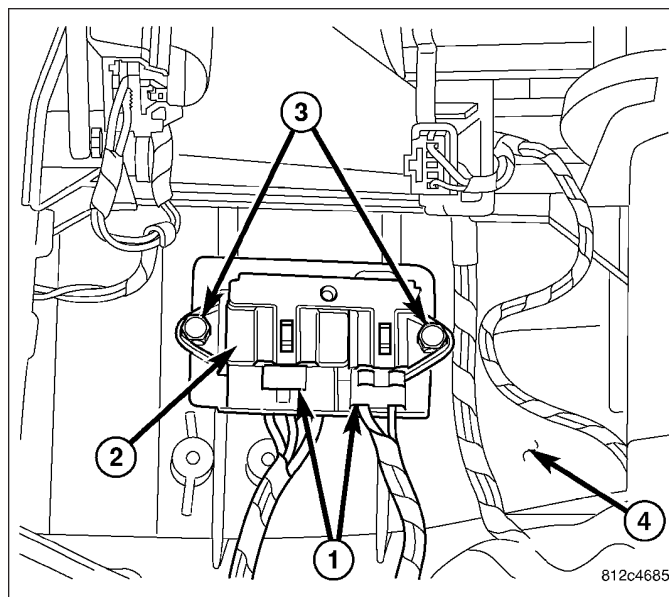
The blower motor power module cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

### REMOVAL

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

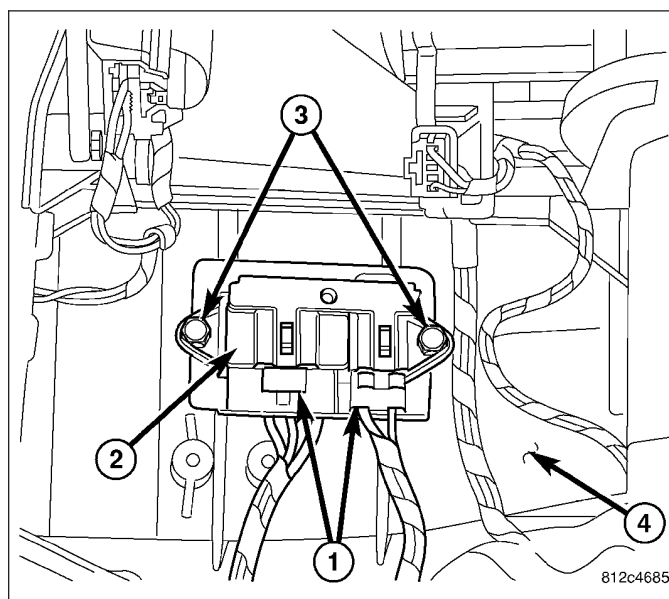
**WARNING:** The heat sink for the blower motor power module may get very hot during normal operation. If the blower motor was turned on prior to servicing the blower motor power module, wait five minutes to allow the heat sink to cool before performing diagnosis or service. Failure to take this precaution can result in possible personal injury.

1. Disconnect and isolate the negative battery cable.
2. Remove the glove box from the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - REMOVAL).
3. Disconnect the two wire harness connectors (1) from the blower motor power module (2).
4. Remove the two screws (3) that secure the blower motor power module to the HVAC housing (4).
5. Remove the blower motor power module from the HVAC housing.



## INSTALLATION

1. Position the blower motor power module (2) into the HVAC housing (4).
2. Install the two screws (3) that secure the blower motor power module to the HVAC housing. Tighten the screws to 2 N·m (17 in. lbs.).
3. Connect the two wire harness connectors (1) to the blower motor power module.
4. Install the glove box into the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - INSTALLATION).
5. Reconnect the negative battery cable.

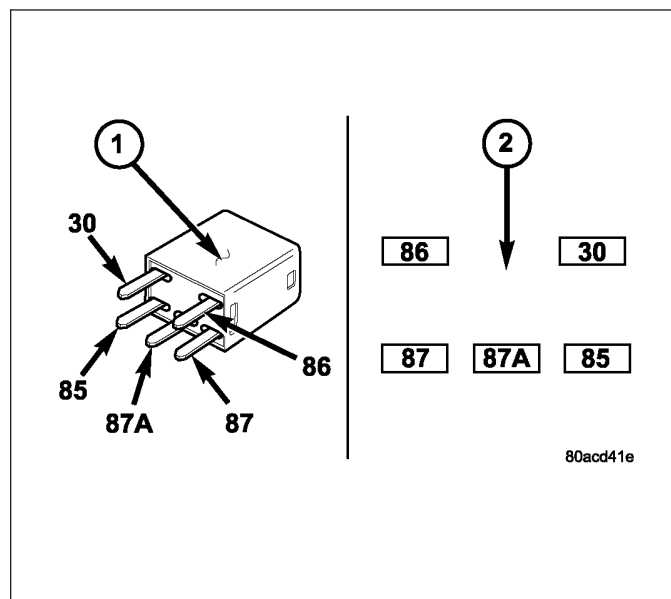


## RELAY-A/C CLUTCH

### DESCRIPTION

The A/C clutch relay (1) is a International Standards Organization (ISO) micro-relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal functions and patterns (2). The ISO micro-relay terminal functions are the same as a conventional ISO relay. However, the ISO micro-relay terminal pattern (or footprint) is different, the current capacity is lower, and the physical dimensions are smaller than those of the conventional ISO relay.

The A/C clutch relay is located in the integrated power module (IPM) in the engine compartment.



### OPERATION

The A/C clutch relay is an electromechanical switch that uses a low current input controlled by the powertrain control module (PCM) to control the high current output to the A/C clutch electromagnetic field coil. The movable common feed relay contact is held against the normally closed contact point by spring pressure. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact away from the normally closed contact point, and holds it against the normally open contact point. When the relay coil is de-energized, spring pressure returns the movable relay contact back against the normally closed contact point. The resistor or diode is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

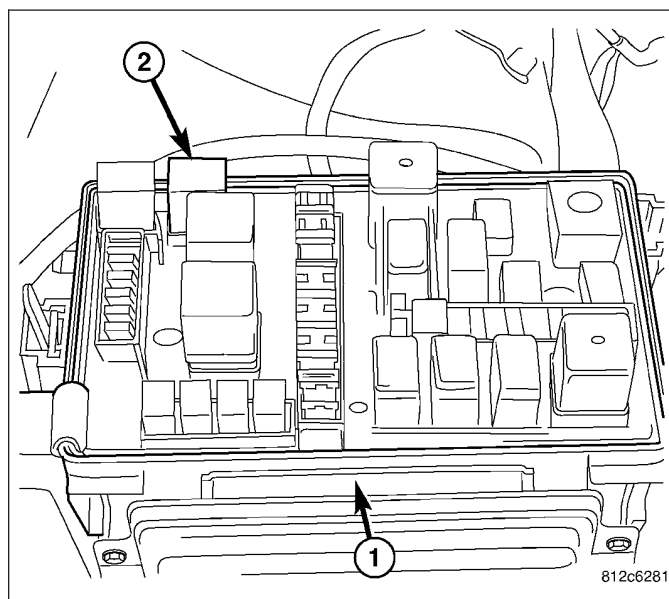
The A/C clutch relay terminals are connected to the vehicle electrical system through a receptacle in the integrated power module (IPM). The inputs and outputs of the A/C clutch relay include:

- The common feed terminal (30) receives battery current through a fused B(+) circuit at all times.
- The coil ground terminal (85) receives a ground through the A/C clutch relay control circuit only when the PCM electronically pulls the circuit to ground.
- The coil battery terminal (86) receives battery current from the IPM through a fused ignition switch output (run-start) circuit only when the ignition switch is in the On or Start positions.
- The normally open terminal (87) provides battery current to the A/C clutch coil through the A/C clutch relay output circuit only when the A/C clutch relay coil is energized.
- The normally closed terminal (87A) is not connected to any circuit in this application, but provides a battery current output only when the A/C clutch relay coil is de-energized.

The A/C clutch relay cannot be repaired and, if faulty or damaged, it must be replaced. Refer to the appropriate wiring information for diagnosis and testing of the micro-relay and for complete HVAC wiring diagrams.

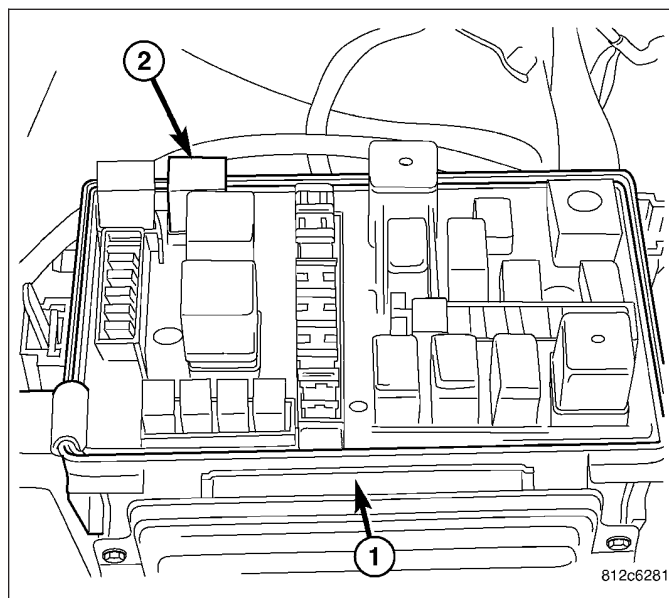
## REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Open the cover of the integrated power module (IPM) (1) located in the engine compartment.
3. Remove the A/C clutch relay (2) from the IPM.



## INSTALLATION

1. Position the A/C clutch relay (2) into the receptacle of the integrated power module (IPM) (1).
2. Align the A/C clutch relay terminals with the terminal cavities in the IPM receptacle and push down firmly on the relay until the terminals are fully seated.
3. Close the cover of the IPM.
4. Reconnect the negative battery cable.

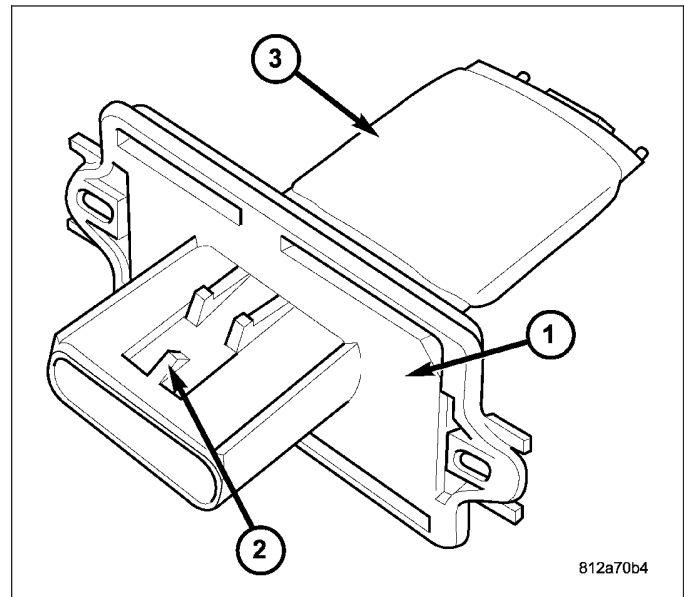


## RESISTOR-BLOWER MOTOR

### DESCRIPTION

A blower motor resistor is used on vehicles equipped with the manual temperature control (MTC) heating-A/C system. Vehicles equipped with the automatic temperature control (ATC) heating-A/C system use a blower motor power module, instead of the blower motor resistor (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/POWER MODULE - DESCRIPTION).

The blower motor resistor is mounted to the rear of the HVAC housing, directly behind the glove box. The blower motor resistor consists of a molded plastic mounting plate (1) with an integral wire connector receptacle (2). Concealed behind the mounting plate are coiled resistor wires contained within a ceramic heat sink (3). The blower motor resistor is accessed for service by removing the glove box.



### OPERATION

The blower motor resistor is connected to the vehicle electrical system through a dedicated wire lead and connector of the HVAC wire harness. The blower motor resistor has multiple resistor wires, each of which will reduce the current flow through the blower motor to change the blower motor speed.

The blower motor switch in the MTC heating-A/C system directs the ground path for the blower motor through the correct resistor wire to obtain the selected speed. With the blower motor control in the lowest speed position, the ground path for the blower motor is applied through all of the resistor wires. Each higher speed selected with the blower motor control applies the blower motor ground path through fewer of the resistor wires, increasing the blower motor speed.

The blower motor resistor cannot be adjusted or repaired and, if faulty or damaged (such as a cracked ceramic heat sink), it must be replaced.

### DIAGNOSIS AND TESTING

#### BLOWER MOTOR RESISTOR

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.



For circuit descriptions and diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

1. Disconnect and isolate the negative battery cable.
2. Disconnect the wire harness connector from the blower motor resistor (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS -FRONT/RESISTOR-BLOWER MOTOR - REMOVAL).
3. Check for continuity between each of the blower motor switch input terminals of the blower motor resistor and the resistor output terminal. In each case there should be continuity. If OK, repair the wire harness circuits between the blower motor switch and the blower motor resistor or blower motor as required. If not OK, replace the faulty blower motor resistor.

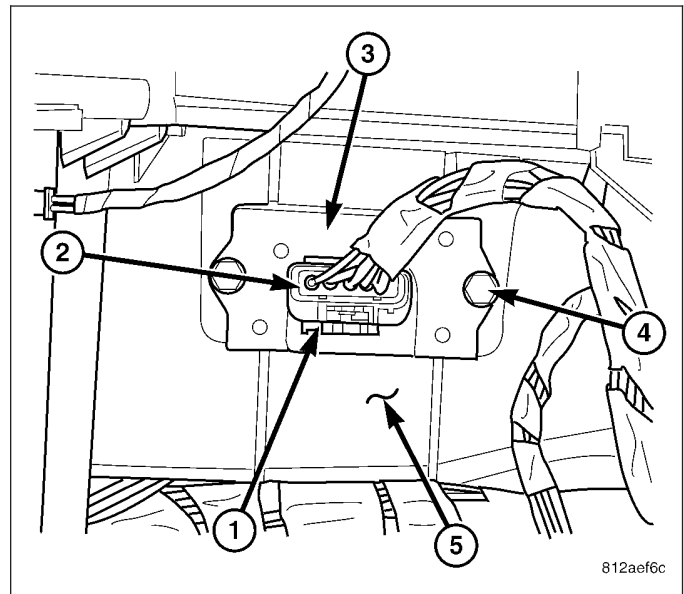
## REMOVAL

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

**WARNING:** The blower motor resistor may get very hot during normal operation. If the blower motor was turned on prior to servicing the blower motor resistor, wait five minutes to allow the blower motor resistors to cool before performing diagnosis or service. Failure to take this precaution can result in possible personal injury.

**CAUTION:** Do not operate the blower motor with the blower motor resistor removed from the circuit. Failure to take this precaution can result in vehicle damage.

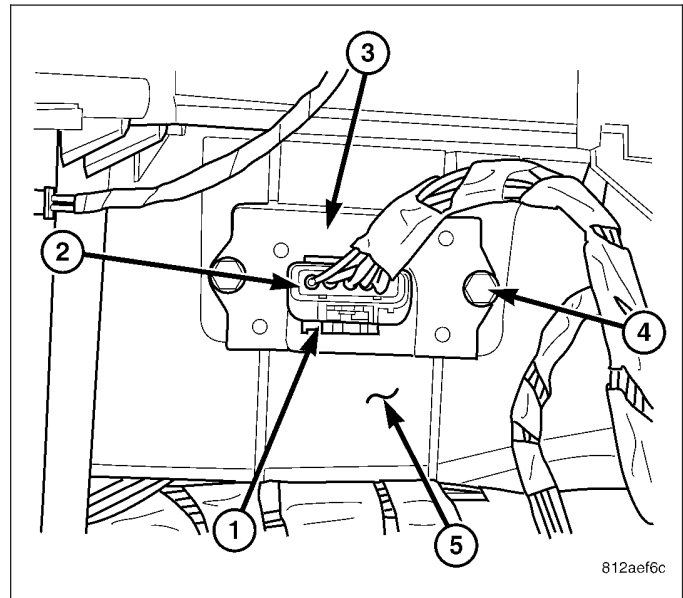
1. Disconnect and isolate the negative battery cable.
2. Remove the glove box from the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - REMOVAL).
3. Disengage the wire harness connector locking tab (1) and disconnect the wire harness connector (2) from the blower motor resistor (3).
4. Remove the two screws (4) that secure the blower motor resistor to the HVAC housing (5).
5. Remove the blower motor resistor from the HVAC housing.





## INSTALLATION

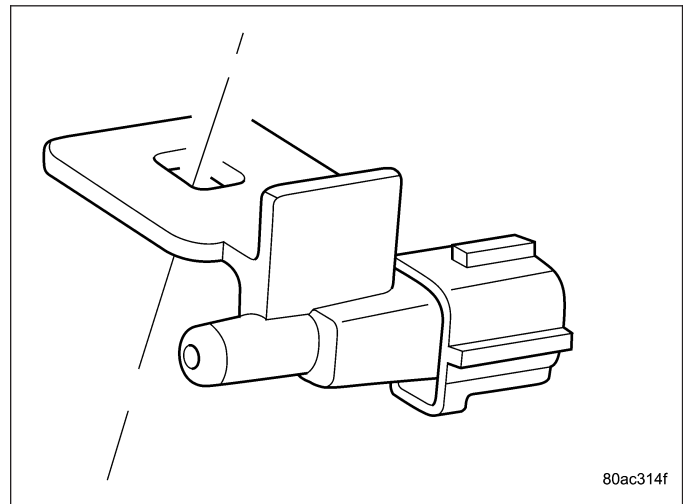
1. Position the blower motor resistor (3) into the HVAC housing (5).
2. Install the two screws (4) that secure the blower motor resistor to the HVAC housing. Tighten the screws to 2 N·m (17 in. lbs.).
3. Connect the wire harness connector (2) to the blower motor resistor and engage the wire harness connector locking tab (1).
4. Install the glove box into the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - INSTALLATION).
5. Reconnect the negative battery cable.



## SENSOR-AMBIENT AIR TEMPERATURE

### DESCRIPTION

The ambient air temperature sensor is a variable resistor that monitors the air temperature outside of the vehicle. The ATC system uses the sensor data to maintain optimum cabin temperature levels. The ambient air temperature sensor is mounted onto the bottom of the front bumper beam.



### OPERATION

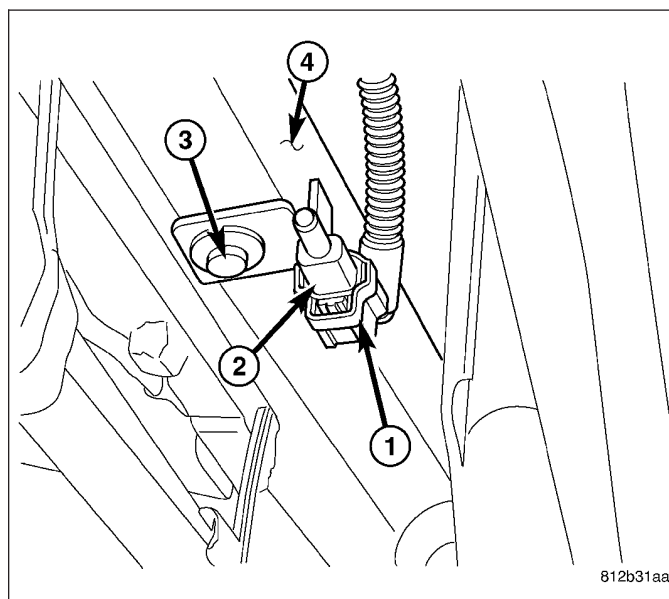
The ambient air temperature sensor is a variable resistor that operates on a 5-volt reference signal sent by the front control module (FCM). The ambient air temperature sensor is connected to the FCM through a two-wire lead and connector of the vehicle wire harness. The ambient air temperature sensor changes its internal resistance in response to changes in the outside air temperature, which either increases or decreases the reference signal voltage read by the FCM. The FCM converts and broadcasts the sensor data over the controller area network (CAN) B bus, where it is read by the ATC A/C-heater control and other vehicle control modules.

The ambient air temperature sensor is diagnosed using the scan tool. Refer to 9 - Engine Electrical Diagnostics for more information.

The ambient air temperature sensor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

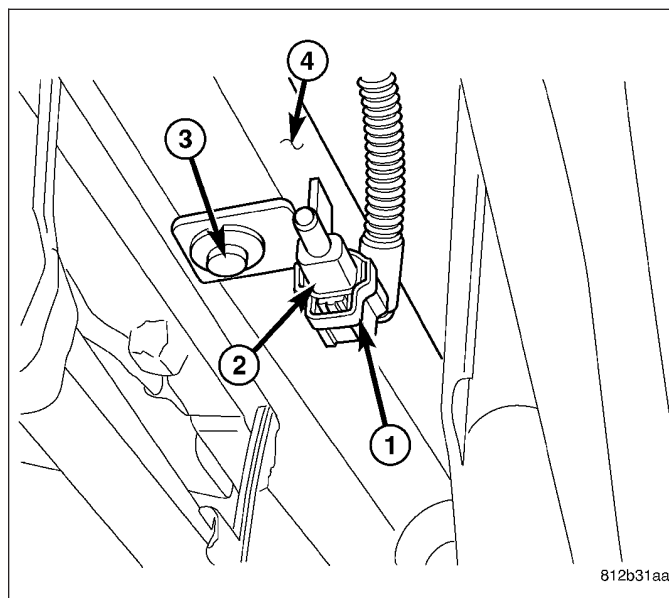
## REMOVAL

1. Disconnect and isolate the negative battery cable.
2. Raise and support the vehicle.
3. Remove the front end splash shields (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - REMOVAL).
4. Disconnect the wire harness connector (1) from the ambient air temperature sensor (2).
5. Remove the push pin (3) that secures the ambient air temperature sensor to the bottom of the front bumper beam (4).
6. Remove the ambient air temperature sensor from the front bumper beam.



## INSTALLATION

1. Position the ambient air temperature sensor (2) onto the bottom of the front bumper beam (4).
2. Install the push pin (3) that secures the ambient air temperature sensor to the front bumper beam.
3. Connect the wire harness connector (1) to the ambient air temperature sensor.
4. Install the front end splash shields (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - INSTALLATION).
5. Lower the vehicle.
6. Reconnect the negative battery cable.

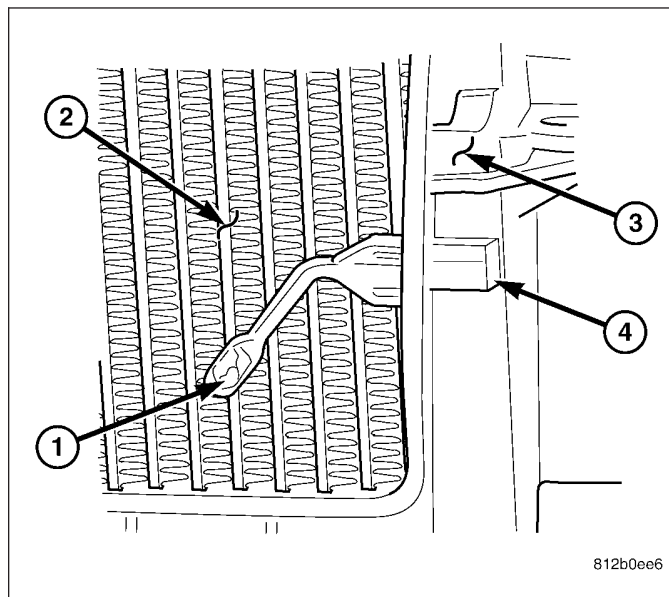


## SENSOR-EVAPORATOR TEMPERATURE

### DESCRIPTION

The evaporator temperature sensor (1) measures the temperature of the conditioned air downstream of the A/C evaporator (2). The evaporator temperature sensor is an electrical thermistor within a molded plastic case that is inserted into the HVAC housing (3) near the coldest point of the A/C evaporator. Two terminals within the connector receptacle (4) connect the sensor to the vehicle electrical system through a wire lead and connector of the HVAC wire harness.

The external location of the evaporator temperature sensor allows the sensor to be removed or installed without disturbing the refrigerant in the A/C system.



### OPERATION

The evaporator temperature sensor is a thermistor that operates on a 5-volt reference signal sent out by the A/C-heater control. The sensor connects to the A/C-heater control through a two-wire lead and connector of the HVAC wire harness. The sensor monitors the temperature of the conditioned air downstream of the A/C evaporator and changes its internal resistance in response to changes in the air temperature. As the temperature increases, the sensor's resistance decreases which increases the reference signal voltage read by the A/C-heater control. As the temperature decreases, the sensor's resistance increases which decreases the reference signal voltage read by the A/C-heater control.

The A/C-heater control also uses the reference signal voltage as an indication that conditions are correct to request A/C operation, should the operator (manually) or the A/C-heater control (automatically) so desire this function. For the ATC system, the A/C-heater control broadcasts the A/C request on the controller area network (CAN) B bus, where it is read and processed by the front control module (FCM), which in turn broadcasts it on the CAN C bus, where it is read and processed by the powertrain control module (PCM). For the MTC system, the A/C-heater control sends the request for A/C to the CCN via a dedicated mux circuit. The CCN then broadcasts the A/C request on the CAN B bus, where it is read and processed by the FCM, which in turn broadcasts it on the CAN C bus, where it is read and processed by the PCM.

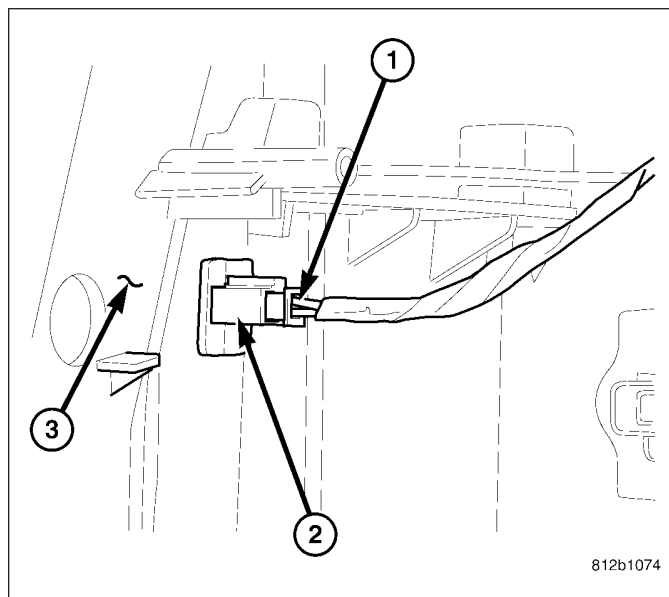
The evaporator temperature sensor is diagnosed using a scan tool (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING and to 24 - HVAC Electrical Diagnostics for more information).

The evaporator temperature sensor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

### REMOVAL

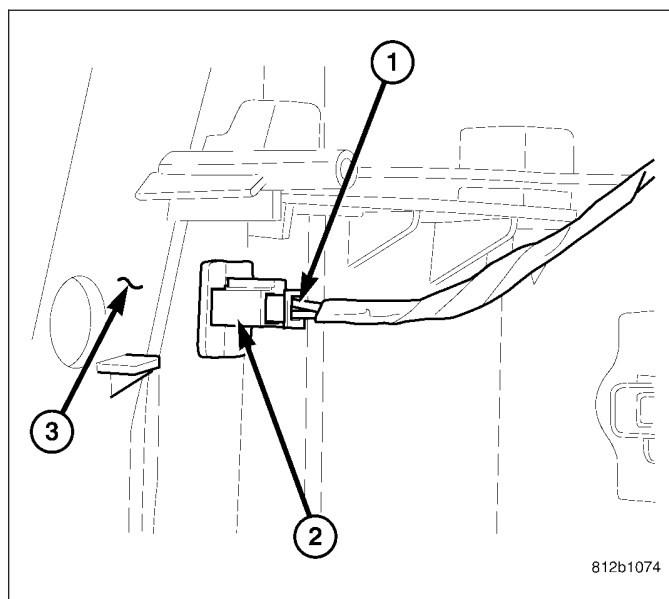
**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

1. Disconnect and isolate the negative battery cable.
2. Remove the glove box from the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - REMOVAL).
3. Disconnect the HVAC wire harness connector (1) from the evaporator temperature sensor (2) located on the HVAC housing (3).
4. Remove the evaporator temperature sensor from the HVAC housing.



## INSTALLATION

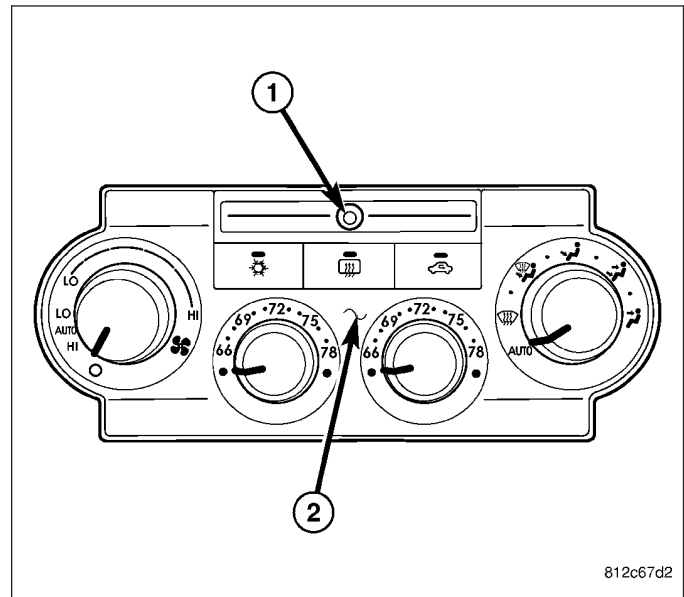
1. Install the evaporator temperature sensor (2) into HVAC housing (3).
2. Connect the HVAC wire harness connector (1) to the evaporator temperature sensor.
3. Install the glove box into the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - INSTALLATION).
4. Reconnect the negative battery cable.



## SENSOR-INFRARED

### DESCRIPTION

The infrared sensor is used only on models equipped with the automatic temperature control (ATC) heating-A/C system. The infrared temperature sensor consists of an infrared transducer concealed behind a clear lens (1) located within the instrument panel mounted A/C-heater control (2).



### OPERATION

The infrared sensor detects thermal radiation emitted by the driver and front passenger seat occupants and their surroundings and converts its data into a linear pulse width modulated (PWM) output signal which is read by the automatic temperature control (ATC) A/C-heater control. The ATC A/C-heater control uses the infrared sensor data as one of the inputs necessary to automatically control the interior cabin temperature level. By using thermal radiation (surface temperature) measurement, rather than an air temperature measurement, the ATC heating-A/C system is able to adjust itself to the comfort level as perceived by the occupant. This allows the ATC system to compensate for other ambient conditions affecting comfort levels, such as solar heat gain or evaporative heat loss.

The ATC system logic responds to the infrared sensor message by calculating and adjusting the air flow temperature and air flow rate needed to properly obtain and maintain the selected comfort level temperature of the occupants. The A/C-heater control continually monitors the infrared sensor circuits, and will store diagnostic trouble codes (DTCs) for any problem it detects.

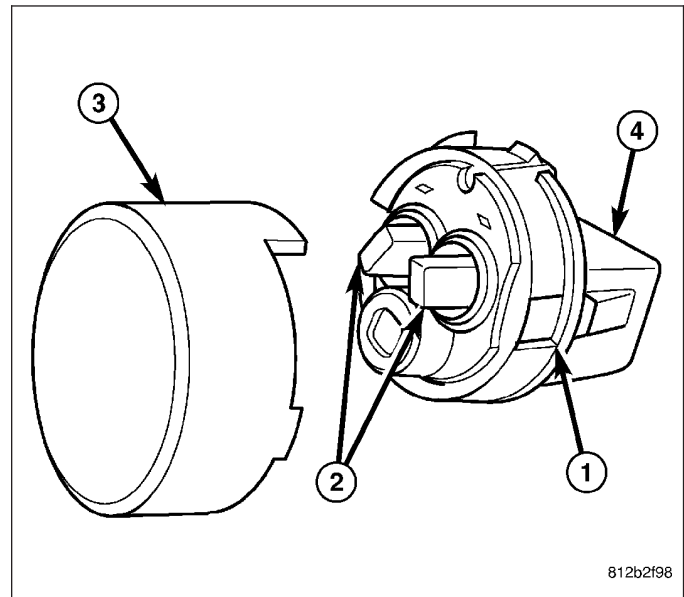
The infrared sensor is diagnosed using a scan tool (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING and to 24 - HVAC Electrical Diagnostics for more information).

The infrared sensor cannot be adjusted or repaired and, if faulty or damaged, the entire ATC A/C-heater control must be replaced.

## SENSOR-SUN

### DESCRIPTION

The automatic temperature control (ATC) heating-A/C system uses a sun sensor assembly (1) to measure sun light intensity. The sun sensor assembly incorporates two sun sensors (2) within a molded plastic case which is mounted to the instrument panel and a clear lens (3) that protrudes through the defroster grille. The wire harness receptacle (4) connects the sun sensors to the vehicle electrical system through a wire lead and connector of the instrument panel wire harness.



### OPERATION

The ATC heating-A/C system uses two sun sensors to balance the system in response to side-to-side variations in sun light intensity. Passengers in sun and shadow require different functional settings because they experience very different temperatures. The sun sensor assembly provides data to the A/C heater control to help determine proper mode and blend-air door positions and blower motor speeds. The sun sensors are not thermistor type sensors, but rather photo diodes. For this reason the sun sensors responds to sun light intensity rather than temperature. The sun sensor assembly is also used to sense day and night conditions for automatic headlight control, if equipped.

The sun sensor is diagnosed using a scan tool (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING and to 24 - HVAC Electrical Diagnostics for more information).

The sun sensor assembly cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

### DIAGNOSIS AND TESTING

#### SUN SENSOR

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in an accidental airbag deployment and possible personal injury or death.

The sun sensor assembly is located so that the sun rays will hit the sensors in the same way that it will hit the driver and the passenger. It is important that the area in front of the sun sensor assembly be unobstructed. Check for the following:

- Windshield wipers are properly adjusted.
- Defroster grille or sun sensor is properly installed. The sun sensor lens should protrude above the defroster grille.
- Any stickers on the windshield are not directly in front of the sun sensor.
- Any items laying on top of the instrument panel are not covering the sun sensor.

If the vehicle exhibits a lack of passenger comfort in sunny weather such as in the early afternoon, inspect the position of the sun sensor assembly. The sun sensor lens should protrude above the defroster grille to insure proper operation. If the sun sensor is not properly positioned, perform the following procedure:

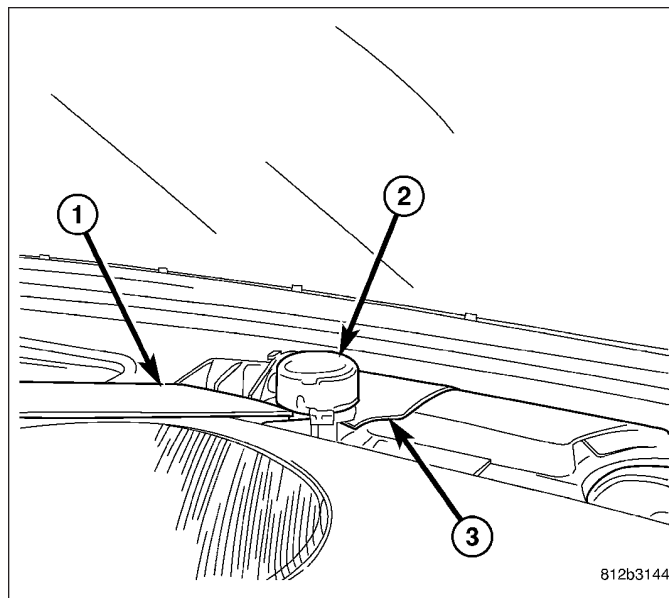
1. Confirm that the defroster grille is properly installed. If not, repair as required.
2. Remove the defroster grille (Refer to 23 - BODY/INSTRUMENT PANEL/DEFROSTER GRILLE - REMOVAL).
3. Verify that the sun sensor is properly installed to the instrument panel (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/SENSOR-SUN - INSTALLATION).
4. Install the defroster grille (Refer to 23 - BODY/INSTRUMENT PANEL/DEFROSTER GRILLE - INSTALLATION).

The sun sensor can be tested in the vehicle with a scan tool (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING and to 24 - HVAC Electrical Diagnostics for more information).

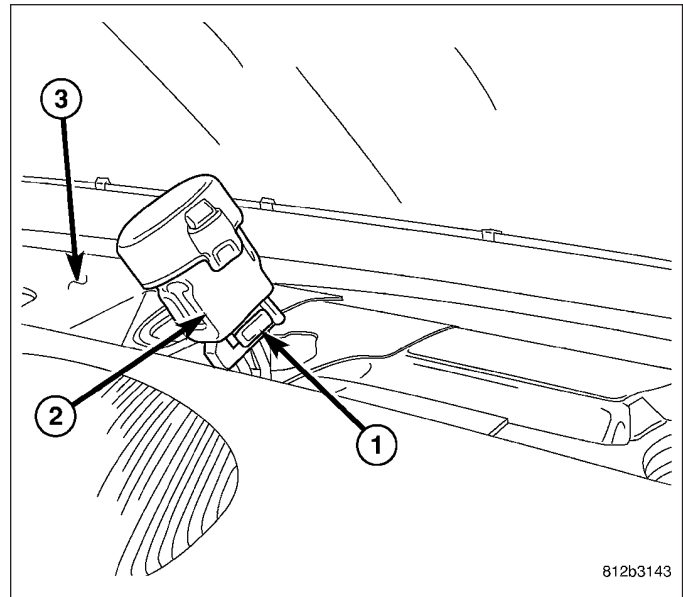
## REMOVAL

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in an accidental airbag deployment and possible personal injury or death.

1. Disconnect and isolate the negative battery cable.
2. Remove the defroster grille (Refer to 23 - BODY/INSTRUMENT PANEL/DEFROSTER GRILLE - REMOVAL).
3. Using a trim stick or another suitable wide flat-blade tool (1), gently pry between both sides of the sun sensor assembly (2) and the instrument panel (3) to release the snap clip retainers that secure the sun sensor.

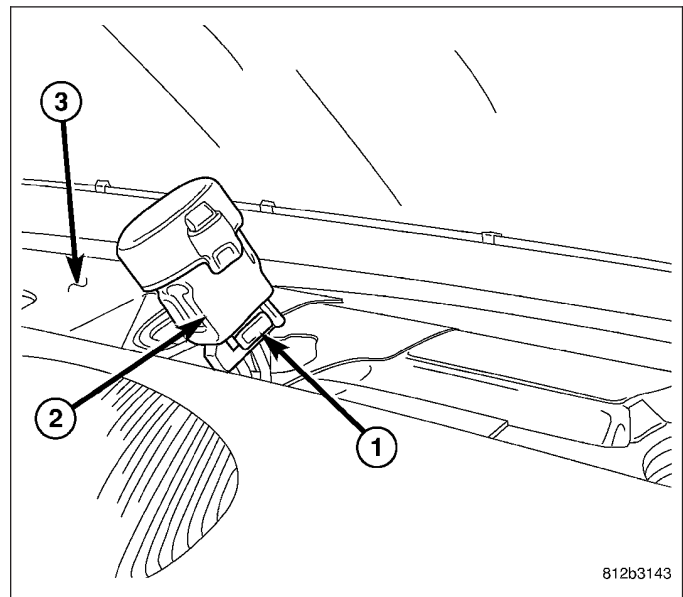


4. Disconnect the wire harness connector (1) from the sun sensor assembly (2).
5. Remove the sun sensor assembly from the instrument panel (3).



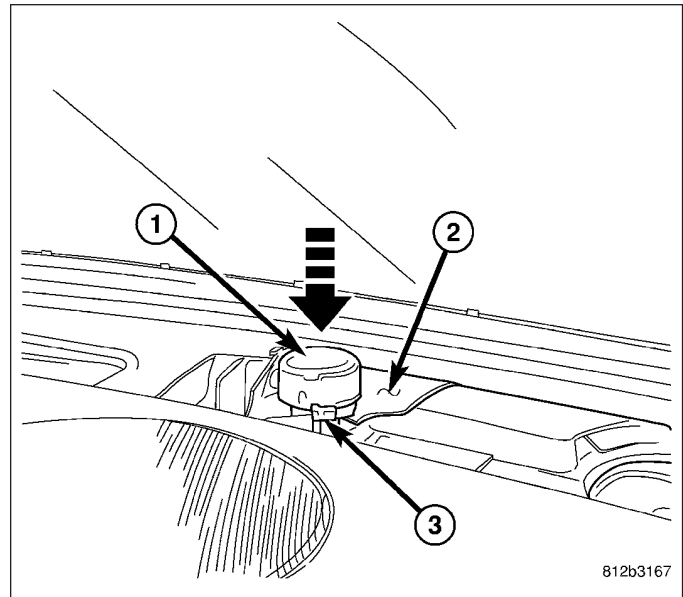
## INSTALLATION

1. Position the sun sensor assembly (2) near the instrument panel (3).
2. Connect the wiring harness connector (1) to the sun sensor assembly (2).





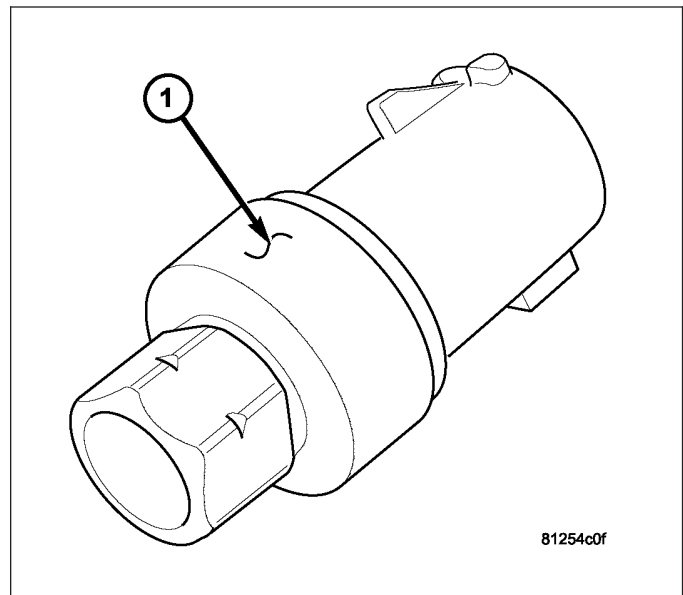
3. Align the tab on the sun sensor assembly (1) with the opening in the instrument panel (2).
4. Gently push the sun sensor assembly into the instrument panel until the sensor snap clip retainers (3) are securely engaged.
5. Install the defroster grille (Refer to 23 - BODY/INSTRUMENT PANEL/DEFROSTER GRILLE - INSTALLATION).
6. Reconnect the negative battery cable.



## TRANSDUCER-A/C PRESSURE

### DESCRIPTION

The A/C pressure transducer (1) is a switch that is installed on a fitting located on the A/C liquid line. An internally threaded fitting on the A/C pressure transducer connects it to the externally threaded Schrader-type fitting on the A/C liquid line. A rubber O-ring seals the connection between the A/C pressure transducer and the liquid line fitting. The A/C pressure transducer is connected to the vehicle electrical system by a molded plastic connector with three terminals.



### OPERATION

The A/C pressure transducer monitors the pressures in the high side of the refrigerant system through its connection to a fitting on the A/C liquid line. The A/C pressure transducer will change its internal resistance in response to the pressures it monitors. A Schrader-type valve in the liquid line fitting permits the A/C pressure transducer to be removed or installed without disturbing the refrigerant in the A/C system.

The powertrain control module (PCM) provides a five volt reference signal and a sensor ground to the A/C pressure transducer, then monitors the output voltage of the A/C pressure transducer on a sensor return circuit to determine refrigerant pressure. The PCM is programmed to respond to the A/C pressure transducer and other sensor inputs by controlling the operation of the A/C compressor clutch and the radiator cooling fan to help optimize A/C system performance and to protect the system components from damage. The PCM will disengage the A/C compressor clutch when high side pressure rises above 3082 kPa (447 psi) and re-engage the clutch when high side pressure drops below 2937 kPa (426 psi). The A/C pressure transducer will also disengage the A/C compressor clutch if the high side pressure drops below 110 kPa (16 psi) and will re-engage the clutch when the high side pressure rises above 221 kPa (32 psi). If the refrigerant pressure rises above 1655 kPa (240 psi), the PCM will actuate the cooling fan. The A/C pressure transducer input to the PCM will also prevent the A/C compressor clutch from engaging when ambient temperatures are below about 4.5° C (40° F) due to the pressure/temperature relationship of the refrigerant.

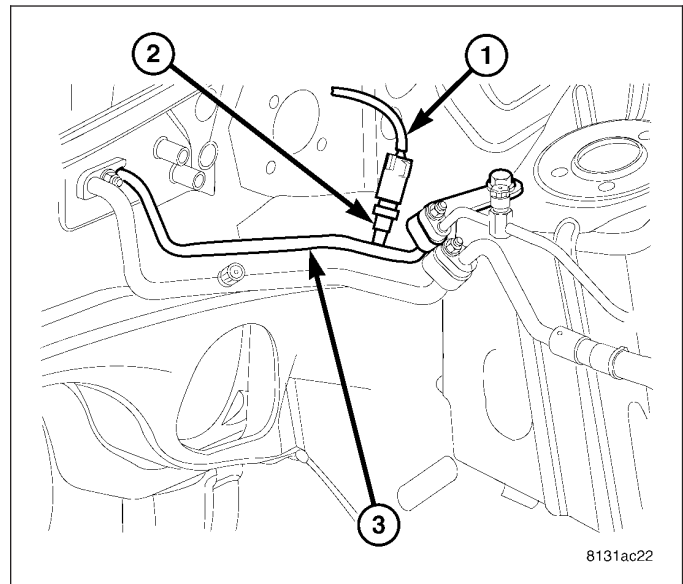
The A/C pressure transducer cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

The A/C pressure transducer is diagnosed using a scan tool. Refer to 9 - Engine Electrical Diagnostics for more information.

## REMOVAL

**Note: It is not necessary to discharge the refrigerant system to replace the A/C pressure transducer.**

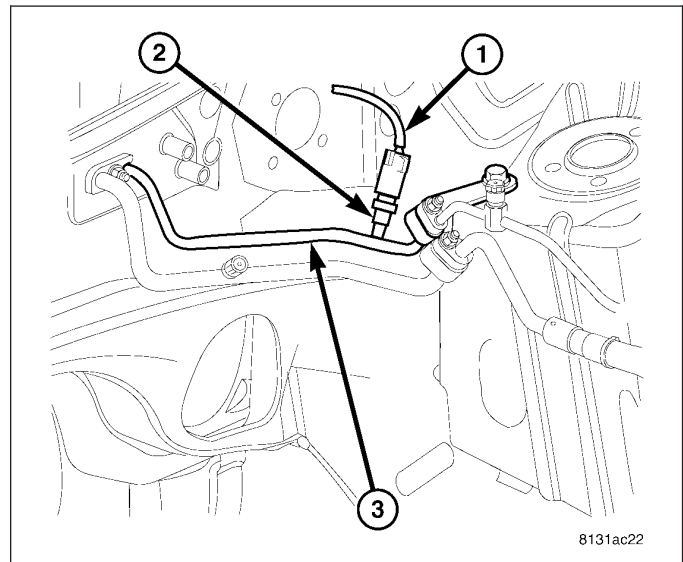
1. Disconnect and isolate the negative battery cable.
2. Disconnect the wire harness connector (1) from the A/C pressure transducer (2).
3. Remove the A/C pressure transducer from the A/C liquid line (3).
4. Remove the O-ring seal from the liquid line fitting and discard.



## INSTALLATION

**Note: Use only the specified O-ring as it is made of special material for R-134a. Use only refrigerant oil of the type required for the A/C compressor.**

1. Lubricate a new rubber O-ring seal with clean refrigerant oil and install it onto the liquid line fitting.
2. Install the A/C pressure transducer (2) onto the A/C liquid line (3). Tighten the A/C pressure transducer securely.
3. Connect the wire harness connector (1) to the A/C pressure transducer.
4. Reconnect the negative battery cable.



## DISTRIBUTION

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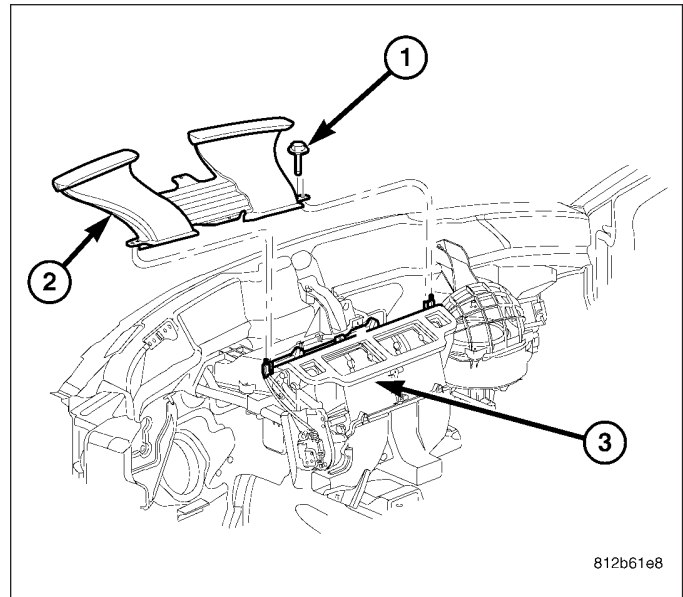
## DUCT-DEFROSTER

## REMOVAL

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

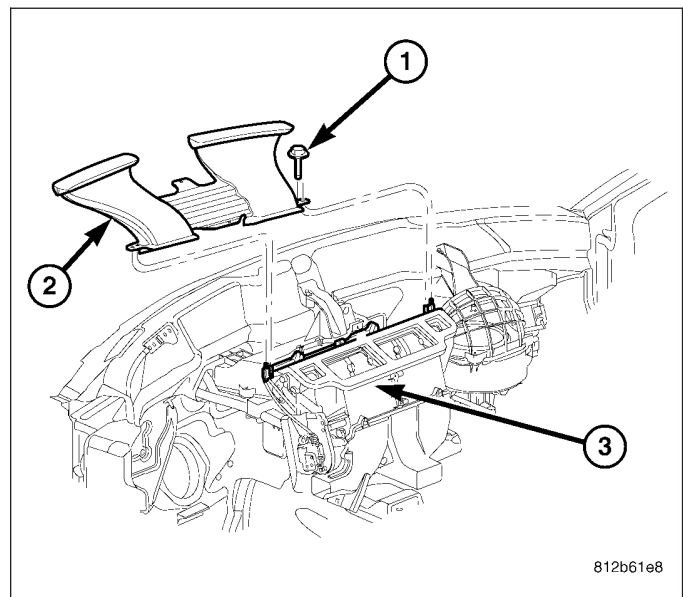
**Note:** Take the proper precautions to protect the front face of the instrument panel from cosmetic damage.

1. Remove the instrument panel and place it on a workbench (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).
2. Remove the four screws (1) that secure the defroster duct (2) to the top of the HVAC air distribution housing (3).
3. Remove the defroster duct from the top of the air distribution housing.



## INSTALLATION

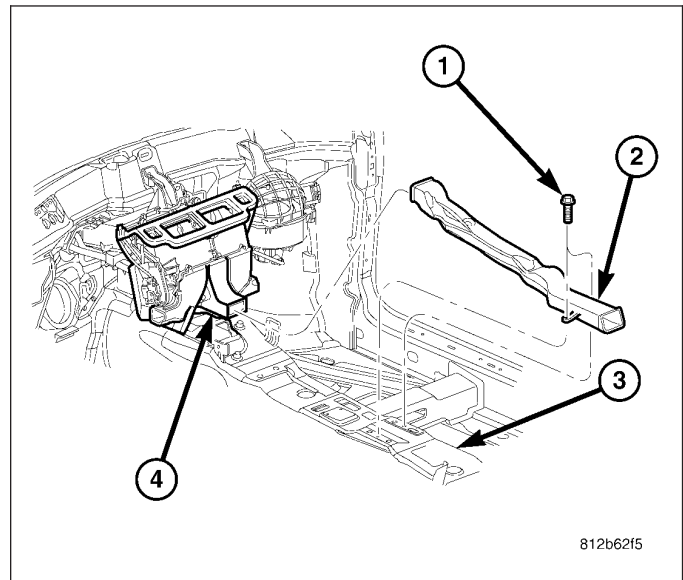
1. Position the defroster duct (2) onto the top of the HVAC air distribution housing (3).
2. Install the four screws (1) that secure the defroster duct to the air distribution housing. Tighten the screws to 2 N·m (17 in. lbs.).
3. Install the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).



## DUCT-FLOOR CONSOLE

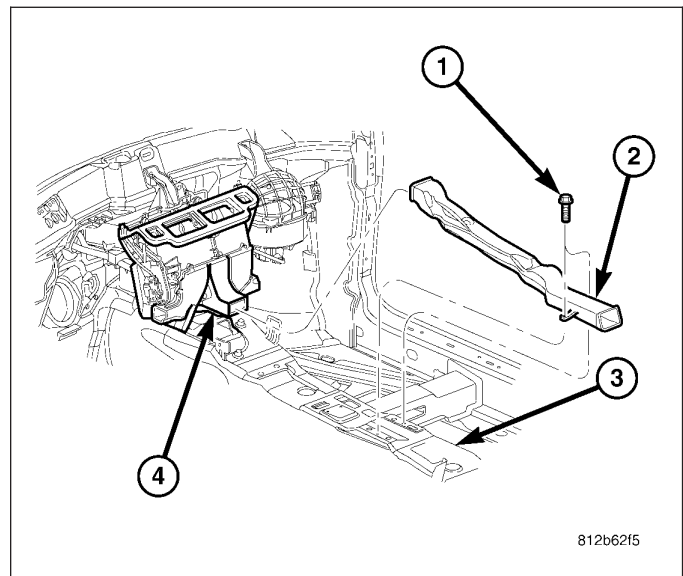
### REMOVAL

1. Remove the center floor console (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - REMOVAL).
2. Remove the two screws (1) that secure the floor console duct (2) to the center floor panel (3).
3. Disconnect the floor console duct from the floor distribution duct (4) and remove the floor console duct from the vehicle.



### INSTALLATION

1. Position the floor console duct (2) into the vehicle.
2. Connect the floor console duct to the floor distribution duct (4).
3. Install the two screws (1) that secure the floor console duct to the center floor panel (3). Tighten the screws to 2.2 N·m (20 in. lbs.).
4. Install the center floor console (Refer to 23 - BODY/INTERIOR/CENTER CONSOLE - INSTALLATION).



## DUCT-FLOOR DISTRIBUTION

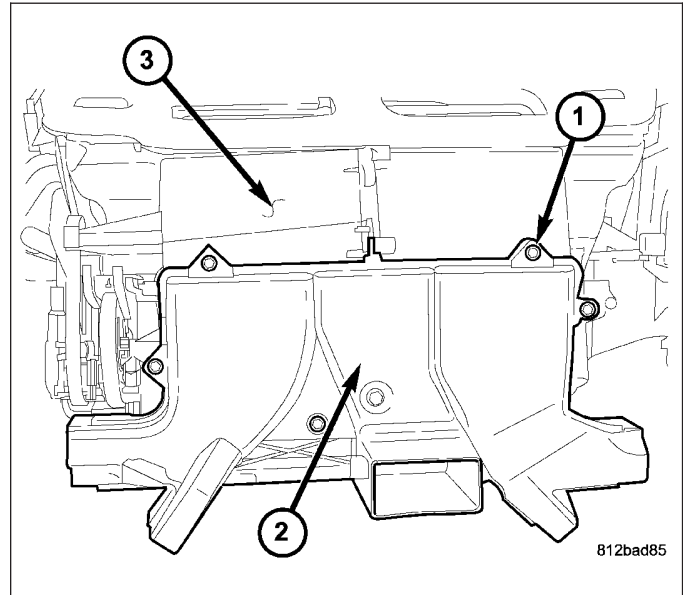
### REMOVAL

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

**Note:** Take the proper precautions to protect the front face of the instrument panel from cosmetic damage.

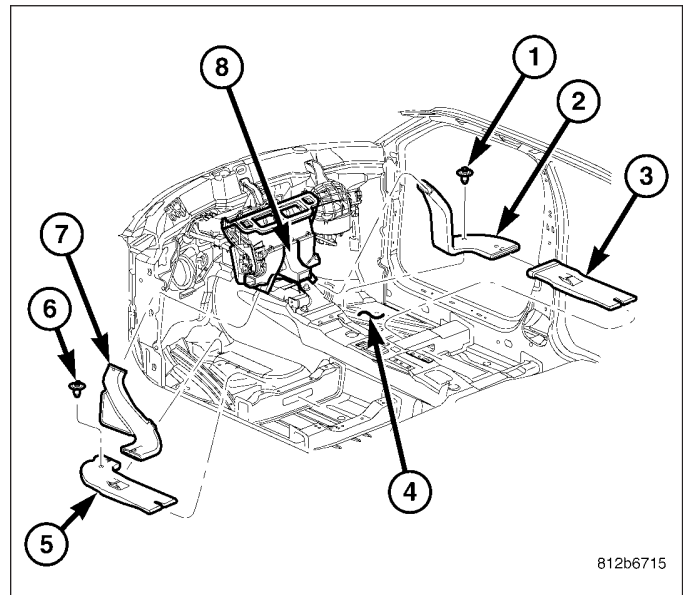
### FRONT FLOOR DISTRIBUTION DUCT

1. Remove the HVAC air distribution housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - REMOVAL).
2. Remove the six screws (1) that secure the front floor distribution duct (2) to the bottom of the air distribution housing (3).
3. Remove the front floor distribution duct from the air distribution housing.



### INTERMEDIATE FLOOR DISTRIBUTION DUCTS

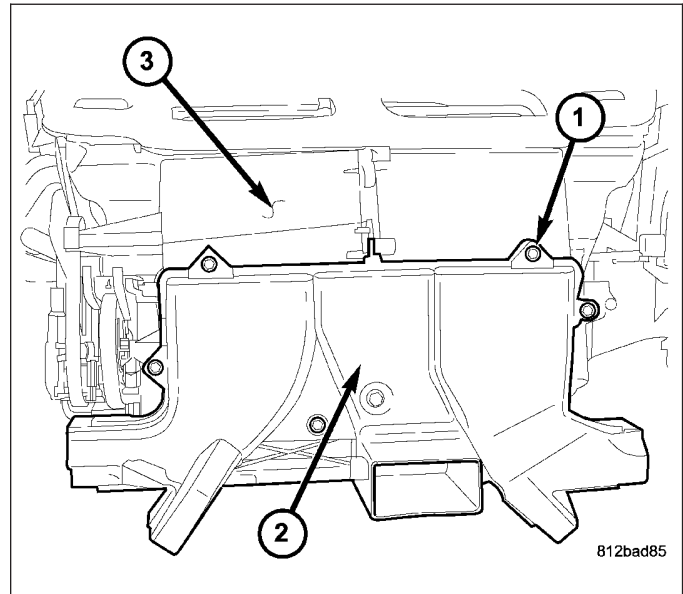
1. Remove the center floor console (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).
2. Remove the front seats (Refer to 23 - BODY/SEATS/SEAT - REMOVAL).
3. Roll back the front floor carpet from under the instrument panel toward the rear of the vehicle (Refer to 23 - BODY/INTERIOR/CARPETS AND FLOOR MATS - REMOVAL).
4. Remove the push pin fastener (1) that secures the right front intermediate floor distribution duct (2) to the floor support (4).
5. Disconnect the right front intermediate floor distribution duct from the front floor distribution duct (8).
6. Disconnect the right front intermediate floor distribution duct from the right rear intermediate floor distribution duct (3).
7. Remove the right rear intermediate floor distribution duct from the floor support.
8. Remove the push pin fastener (6) that secures the left rear intermediate floor distribution duct (5) to the floor support.
9. Disconnect the left front intermediate floor distribution duct (7) from the front floor distribution duct.
10. Disconnect the left front intermediate floor distribution duct from the left rear intermediate floor distribution duct.
11. Remove the left rear intermediate floor distribution duct from the floor support.



## INSTALLATION

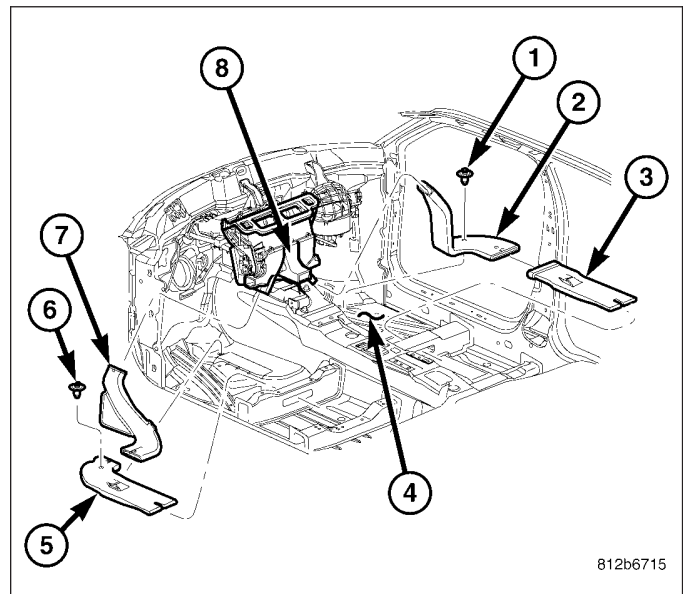
### FRONT FLOOR DISTRIBUTION DUCT

1. Position the front floor distribution duct (2) to the bottom of the HVAC air distribution housing (3).
2. Install the six screws (1) that secure the front floor distribution duct to the air distribution housing. Tighten the screws to 2 N·m (17 in. lbs.).
3. Install the air distribution housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION).



### INTERMEDIATE FLOOR DISTRIBUTION DUCTS

1. Install the left rear intermediate floor distribution duct (5) and the right rear intermediate floor distribution duct (3) into the slots in the floor support (4).
2. Connect the left front intermediate floor distribution duct (7) to the left rear intermediate floor distribution duct.
3. Connect the left front intermediate floor distribution duct to the front floor distribution duct (8).
4. Install the push-pin fastener (6) that secures the left rear intermediate floor distribution duct to the floor support.
5. Connect the right front intermediate floor distribution duct (2) to the right rear intermediate floor distribution duct.
6. Connect the right front intermediate floor distribution duct to the front floor distribution duct.
7. Install the push-pin fastener (1) that secures the right front intermediate floor distribution duct to the floor support.
8. Install the carpet onto the front floor panel and under the instrument panel (Refer to 23 - BODY/INTERIOR/CARPETS AND FLOOR MATS - INSTALLATION).
9. Install the front seats (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION).
10. Install the center floor console (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).





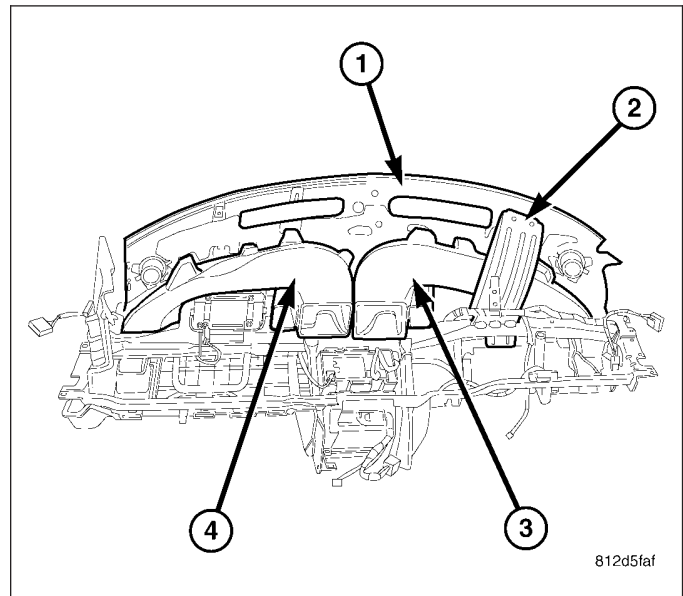
## DUCT-INSTRUMENT PANEL

### REMOVAL

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

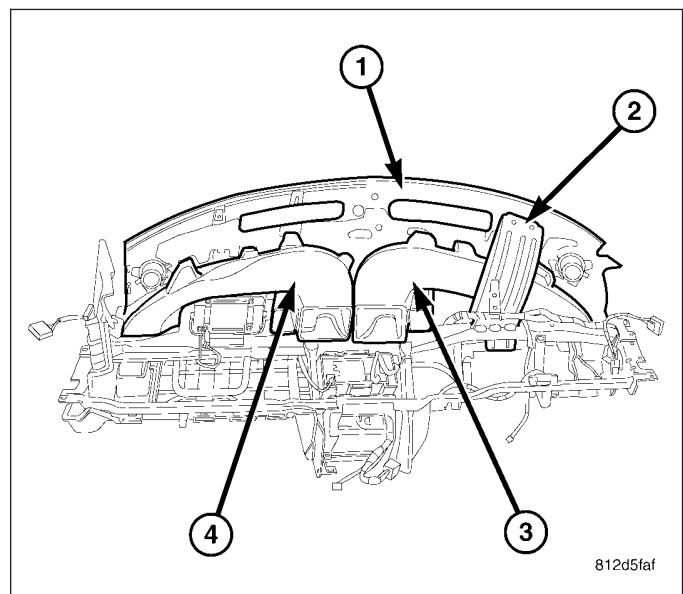
**Note:** Take the proper precautions to protect the front face of the instrument panel from cosmetic damage.

1. Remove the instrument panel and place it on a workbench (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).
2. Remove the screw that secures the instrument panel top pad (1) to the reinforcement bracket (2).
3. Remove the four screws that secure the driver side instrument panel duct and demister duct assembly (3) to the instrument panel and remove the duct assembly.
4. Remove the four screws that secure the passenger side instrument panel duct and demister duct assembly (4) to the instrument panel and remove the duct assembly.



### INSTALLATION

1. Position the passenger side instrument panel duct and demister duct assembly (4) into the instrument panel.
2. Install the passenger side instrument panel duct and demister duct assembly onto the outlets of the instrument panel. Make sure that the ducts are correctly installed over the instrument panel and demister outlet seals.
3. Install the four screws that secure the passenger side instrument panel duct and demister duct assembly to the instrument panel. Tighten the screws to 2.2 N·m (20 in. lbs.).
4. Position the driver side instrument panel duct and demister duct assembly (3) into the instrument panel.
5. Install the driver side instrument panel duct and demister duct assembly onto the outlets of the instrument panel. Make sure that the ducts are correctly installed over the instrument panel and demister outlet seals.





6. Install the four screws that secure the driver side instrument panel duct and demister duct assembly to the instrument panel. Tighten the screws to 2.2 N·m (20 in. lbs.).
7. Install the screw that secures the instrument panel top pad (1) to the reinforcement bracket (2). Tighten the screw to 2.2 N·m (20 in. lbs.).
8. Install the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

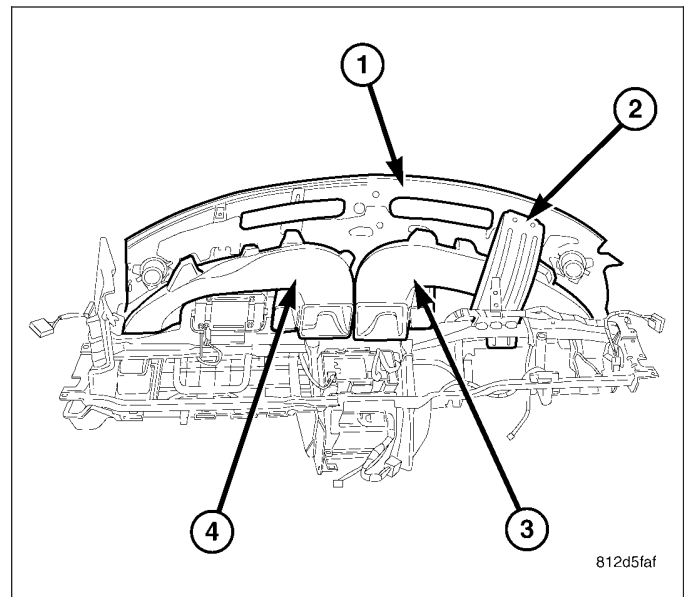
## DUCT-INSTRUMENT PANEL DEMISTER

### REMOVAL

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the battery negative (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

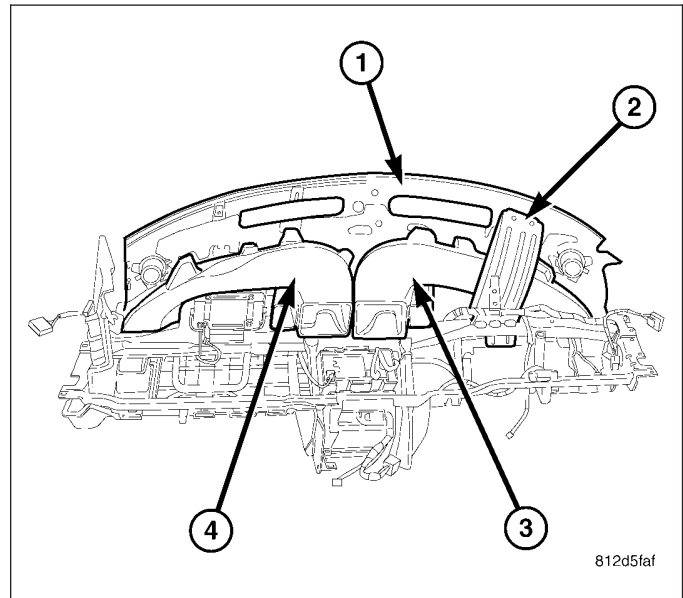
**Note:** Take the proper precautions to protect the front face of the instrument panel from cosmetic damage.

1. Remove the instrument panel and place it on a workbench (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).
2. Remove the screw that secures the instrument panel top pad (1) to the reinforcement bracket (2).
3. Remove the four screws that secure the driver side instrument panel duct and demister duct assembly (3) to the instrument panel and remove the duct assembly.
4. Remove the four screws that secure the passenger side instrument panel duct and demister duct assembly (4) to the instrument panel and remove the duct assembly.



## INSTALLATION

1. Position the passenger side instrument panel duct and demister duct assembly (4) into the instrument panel.
2. Install the passenger side instrument panel duct and demister duct assembly onto the outlets of the instrument panel. Make sure that the ducts are correctly installed over the instrument panel and demister outlet seals.
3. Install the four screws that secure the passenger side instrument panel duct and demister duct assembly to the instrument panel. Tighten the screws to 2.2 N·m (20 in. lbs.).
4. Position the driver side instrument panel duct and demister duct assembly (3) into the instrument panel.
5. Install the driver side instrument panel duct and demister duct assembly onto the outlets of the instrument panel. Make sure that the ducts are correctly installed over the instrument panel and demister outlet seals.
6. Install the four screws that secure the driver side instrument panel duct and demister duct assembly to the instrument panel. Tighten the screws to 2.2 N·m (20 in. lbs.).
7. Install the screw that secures the instrument panel top pad (1) to the reinforcement bracket (2). Tighten the screw to 2.2 N·m (20 in. lbs.).
8. Install the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

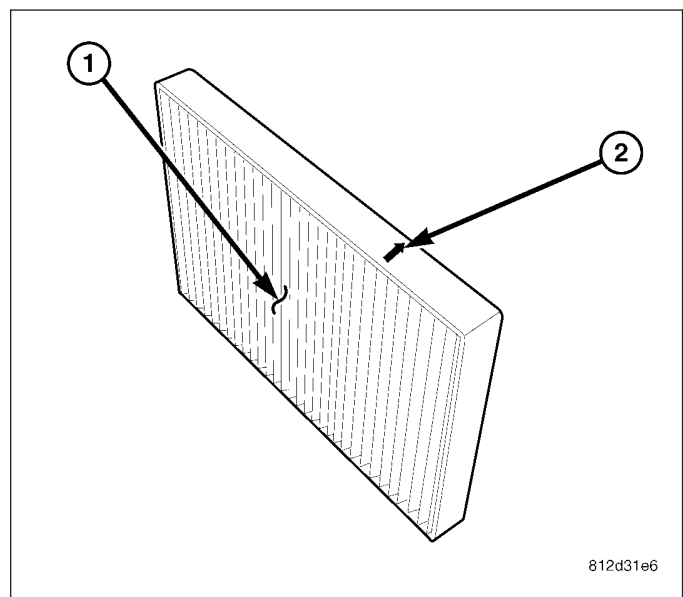


## FILTER-PARTICULATE AIR

### DESCRIPTION

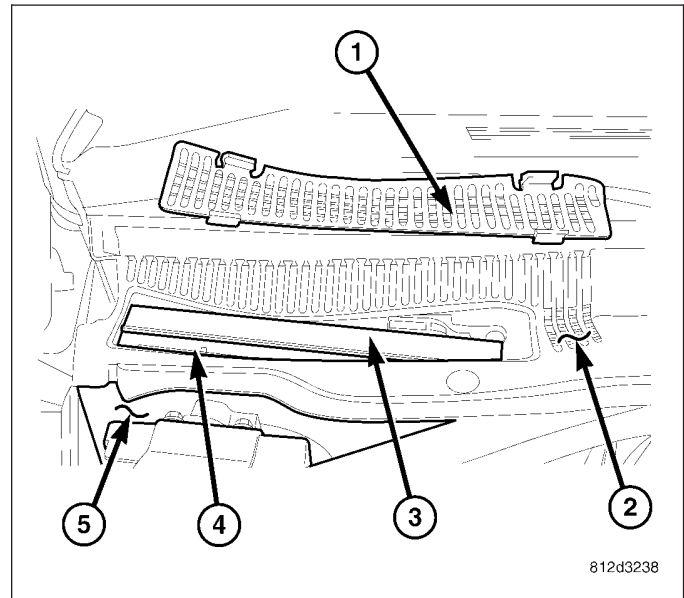
Some models are equipped with a particulate air filter (1) that helps purify the outside air entering the HVAC housing. The filter is mounted in the engine compartment, inside of the fresh air inlet housing of the heating-A/C system.

The filter should be checked and replaced at least once every 24,000 km (15,000 miles) and checked if heating-A/C system performance seems lower than expected. The particulate air filter is labeled with "REAR OF VEHICLE" and an arrow (2) to indicate air flow direction through the filter.



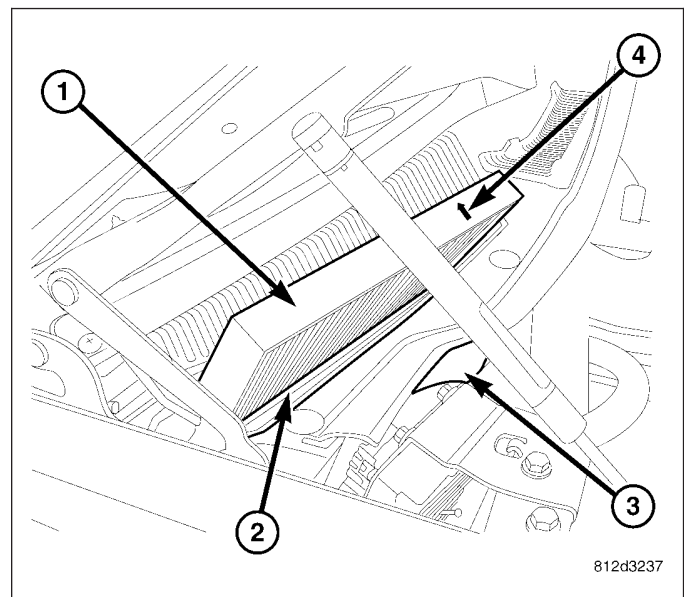
## REMOVAL

1. Remove the air inlet grille (1) from the wiper module screen (2) located near the dash panel in the engine compartment.
2. Open the filter door (3) on the top of the particulate air filter housing (4) located inside of the dash panel plenum (5).



**Note:** To aid in reinstallation, note the installed position of the particulate air filter prior to removal of the filter.

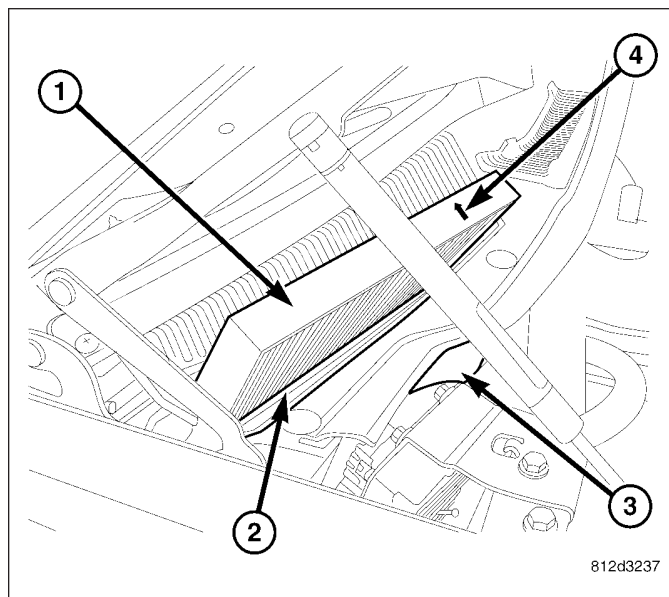
3. Remove the particulate air filter (1) from the particulate air filter housing (2) located inside of the dash panel plenum (3). Note the direction of air flow indicated by an arrow (4) on the filter.



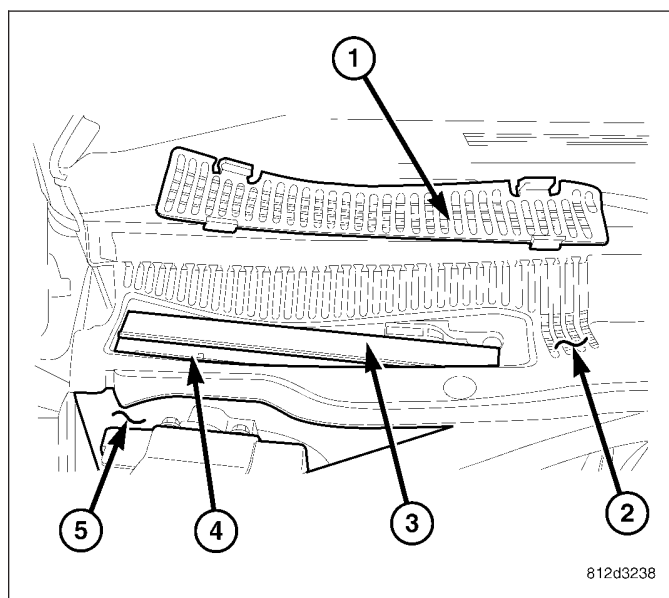
## INSTALLATION

**Note:** The particulate air filter is labeled with “REAR OF VEHICLE” and an arrow to indicate air flow direction through the filter. Make sure to properly install the particulate air filter. Failure to properly install the filter will result in the need to replace the filter sooner than required by design.

1. Install the particulate air filter (1) into the particulate air filter housing (2) located inside of the dash panel plenum (3). Insert the particulate air filter down directly into the filter housing with the arrow (4) on the filter pointing to the rear of the vehicle. The particulate air filter is held in place by friction between the filter element and the filter housing, so no fasteners are required.



2. Close the filter door (3) on the top of the particulate air filter housing (4) located inside of the dash panel plenum (5).
3. Install the air inlet grille (1) onto the wiper module screen (2).

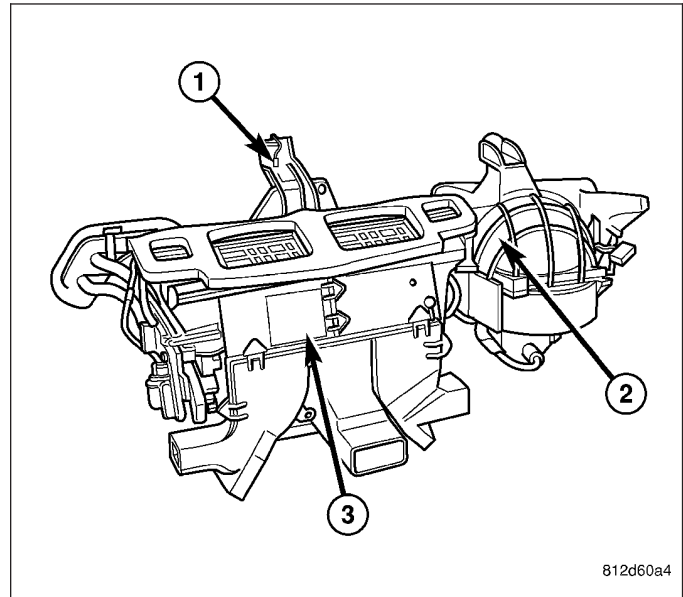


## HOUSING-HVAC

### DESCRIPTION

All models are equipped with a common HVAC housing assembly that combines A/C and heating capabilities into a single unit mounted within the passenger compartment. The HVAC housing assembly consists of three separate housings:

- **HVAC housing** — The HVAC housing (1) is mounted to the dash panel behind the instrument panel and contains the evaporator core and the blower motor resistor block or power model, depending on application. The HVAC housing consists of an upper and a lower housing that are attached together and has mounting provisions for the air inlet housing, blower motor, air distribution housing and the HVAC wire harness.
- **Air inlet housing** — The air inlet housing (2) is mounted to the right end of the HVAC housing and contains the recirculation-air door and actuator.
- **Air distribution housing** — The air distribution housing (3) is mounted to the rear of the HVAC housing and contains the heater core, blend-air door(s) and actuator(s), mode-air doors and actuator and door linkage.



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The heating-A/C system is a blend-air type system. The blend-air doors control the amount of conditioned air that is allowed to flow through, or around, the heater core. The dual zone heating A/C system uses two blend door actuators while the single zone system uses only one blend door actuator.

The A/C system is designed for the use of a non-CFC, R-134a refrigerant and uses an A/C evaporator to cool and dehumidify the incoming air prior to blending it with the heated air. A temperature control determines the discharge air temperature by operating the blend door actuator(s), which moves the blend-air door(s). This allows an almost immediate control of the output air temperature of the system. The mode door actuator operates the mode-air doors which direct the flow of the conditioned air out the various air outlets, depending on the mode selected. The recirculation door actuator operates the recirculation-air door which closes off the fresh air intake and recirculates the air already inside the vehicle. The electric door actuators are connected to the vehicle electrical system by the HVAC wire harness. The blower motor controls the velocity of air flowing through the HVAC housing assembly by spinning the blower wheel within the HVAC housings at the selected speed by use of the blower motor resistor block or power model, depending on application.

The air distribution housing must be removed from the HVAC housing and disassembled for service of the mode-air and blend-air doors. The air inlet housing must be removed from HVAC housing and disassembled for service of the recirculation-air door. The HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator.

### REMOVAL

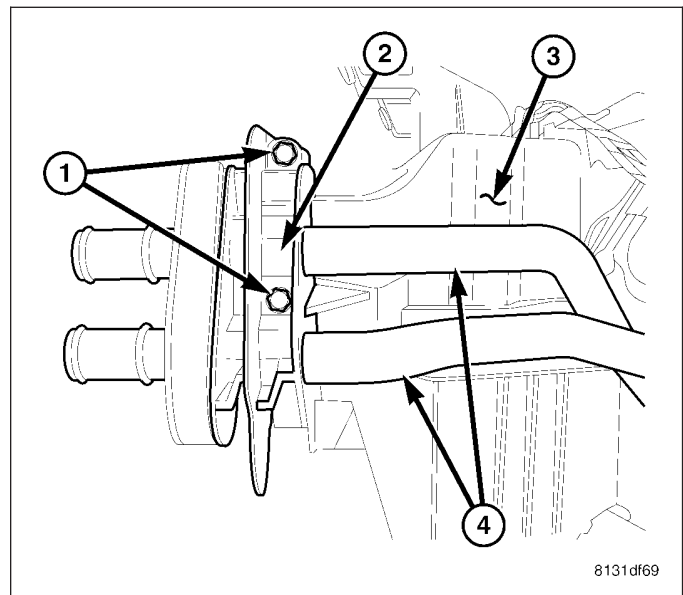
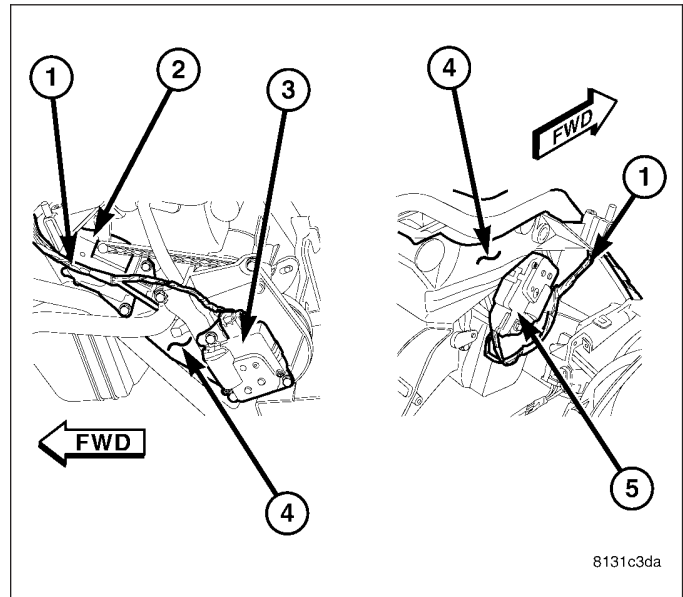
#### AIR DISTRIBUTION HOUSING

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

**Note:** The air distribution housing must be removed from the HVAC housing and disassembled for service of the mode-air and blend-air doors.

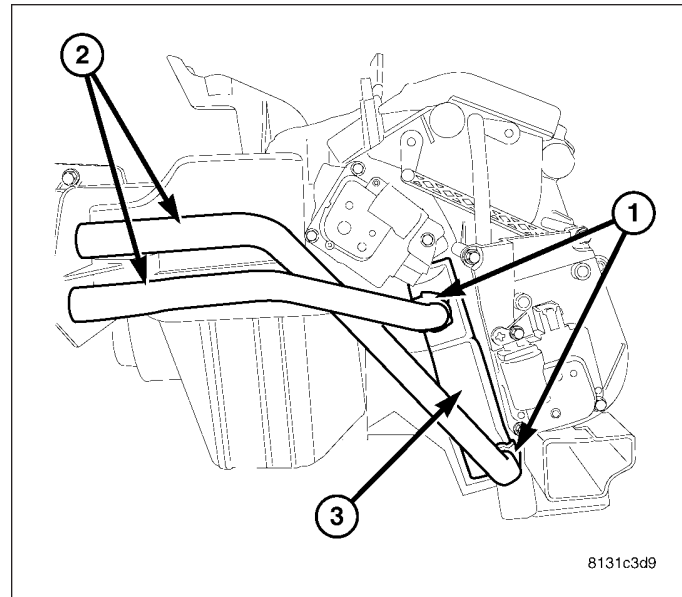
1. Drain the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM DRAIN).
2. Disconnect and isolate the negative battery cable.
3. Remove the instrument panel from the passenger compartment (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).
4. Remove the defroster ducts (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/DUCTS-DEFROSTER - REMOVAL).
5. Remove the floor console duct (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/DUCT-FLOOR CONSOLE - REMOVAL).
6. Disconnect the HVAC wire harness (1) from the mode door actuator (2) and the blend door actuator (3) located on the driver side of the air distribution housing (4).
7. If equipped with dual zone heating-A/C, disconnect the HVAC wire harness from the blend door actuator (5) located on the passenger side of the air distribution housing.
8. Remove the two screws (1) that secure the flange (2) to the front of the HVAC housing (3).
9. Remove the flange and the heater core tubes (4) from the HVAC housing.



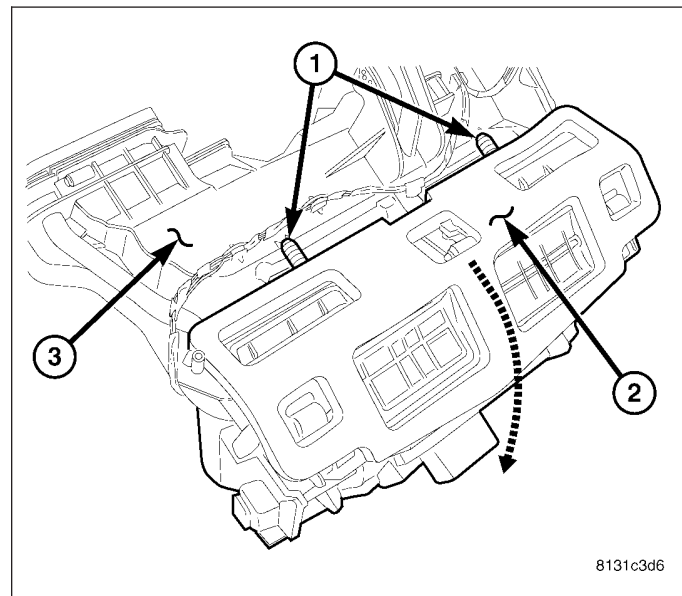


**Note:** Take proper precautions to protect the carpeting from spilled engine coolant. Have absorbent toweling readily available to clean up any spills.

10. Remove the two retaining clamps (1) that secure the heater core tubes (2) to the heater core (3).
11. Disconnect the heater core tubes from the heater core and remove and discard the O-ring seals.
12. Install plugs in, or tape over the opened heater core tubes and heater core ports.



13. Remove the two screws (1) that secure the air distribution housing (2) to the rear of the HVAC housing (3).
14. Tilt the top of the air distribution housing rearward to disconnect the distribution housing from the tab-and-slot type retainers located at the bottom of the housing.
15. Disconnect the air distribution housing from rear floor distribution ducts.
16. Remove the air distribution housing from the vehicle.
17. If required, disassemble the air distribution housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC ASSEMBLY - DISASSEMBLY).



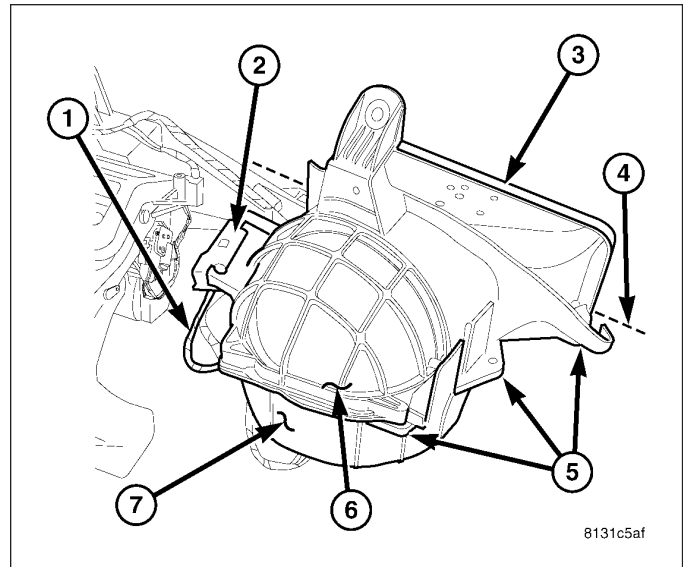
## AIR INLET HOUSING

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

**Note:** The air inlet housing must be removed from HVAC housing and disassembled for service of the recirculation-air door.

1. Disconnect and isolate the negative battery cable.
2. Remove the HVAC housing assembly (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC ASSEMBLY - REMOVAL).
3. Disconnect the HVAC wire harness (1) from the recirculation door actuator (2).
4. Carefully cut the foam seal (3) along the parting line (4) of the air inlet housing (6). If the seal is deformed or damaged, it must be replaced.
5. Remove the five screws (5) that secure the air inlet housing to HVAC housing (7).
6. Remove the air inlet housing from the HVAC housing.
7. If required, disassemble the air inlet housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC ASSEMBLY - DISASSEMBLY).



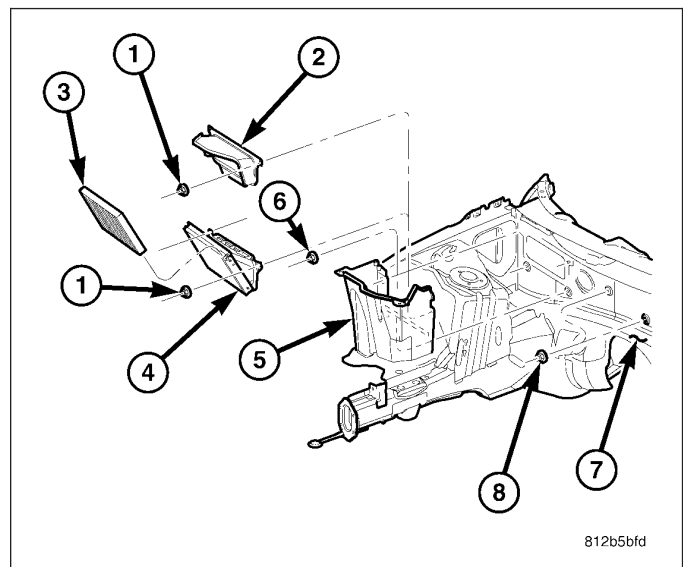
## HVAC HOUSING ASSEMBLY

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

**Note:** The HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator.

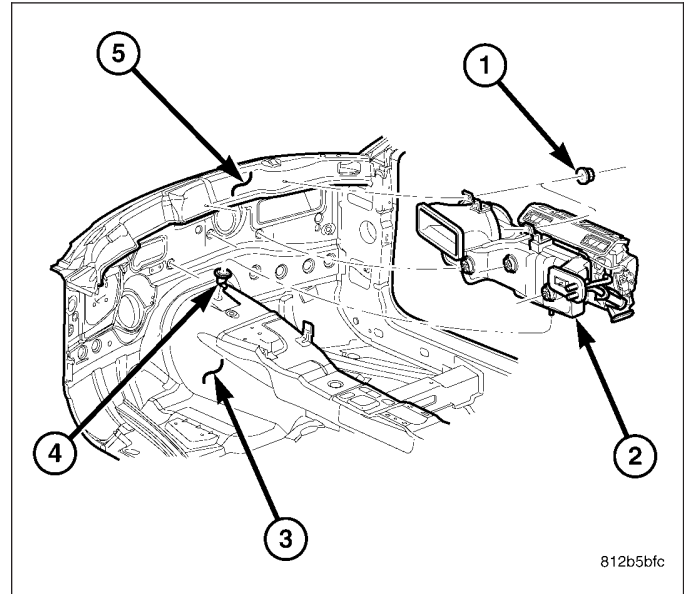
1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Drain the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM DRAIN).
3. Disconnect and isolate the negative battery cable.
4. Remove the wiper module assembly from the dash panel (7) (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/MODULE-WIPER - REMOVAL).
5. Disconnect the A/C liquid line and the A/C suction line from the A/C evaporator (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/LINE-A/C LIQUID - REMOVAL).
6. Disconnect the heater hoses from the heater core tubes.



7. Remove the two nuts (1) that secure the air inlet water separator (2) or particulate air filter (3) and housing (4) to the dash panel (depending on application).



8. Remove the fresh air inlet water separator or particulate air filter housing from the fresh air inlet housing (5) (depending on application).
9. Reach into the fresh air inlet housing and remove the nut (6) that secures the HVAC housing to the engine compartment side of the dash panel.
10. Remove the two nuts (8) that secure the HVAC housing to the engine compartment side of the dash panel.
11. Remove the instrument panel from the passenger compartment (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - REMOVAL).
12. Disconnect the floor console duct (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/ DUCT-FLOOR CONSOLE - REMOVAL).
13. Disconnect the rear floor distribution ducts (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/DUCTS-FLOOR DISTRIBUTION - REMOVAL).
14. Remove the defroster ducts (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/ DUCTS-DEFROSTER - REMOVAL).
15. Remove the two nuts (1) that secure the HVAC housing (2) to the passenger compartment side of the dash panel (5).
16. Pull the HVAC housing assembly rearward so that the mounting studs clear the dash panel.
17. Lift the HVAC housing assembly upwards so that the condensate drain tube clears the grommet (4) in the floor panel (3) and remove the HVAC housing assembly from the passenger compartment.
18. If required, disassemble the HVAC housing assembly (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC ASSEMBLY - DISASSEMBLY).

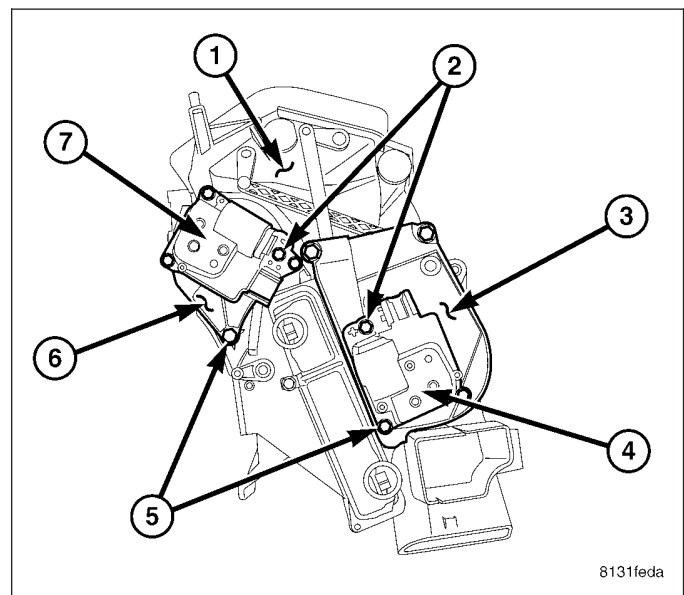


## DISASSEMBLY

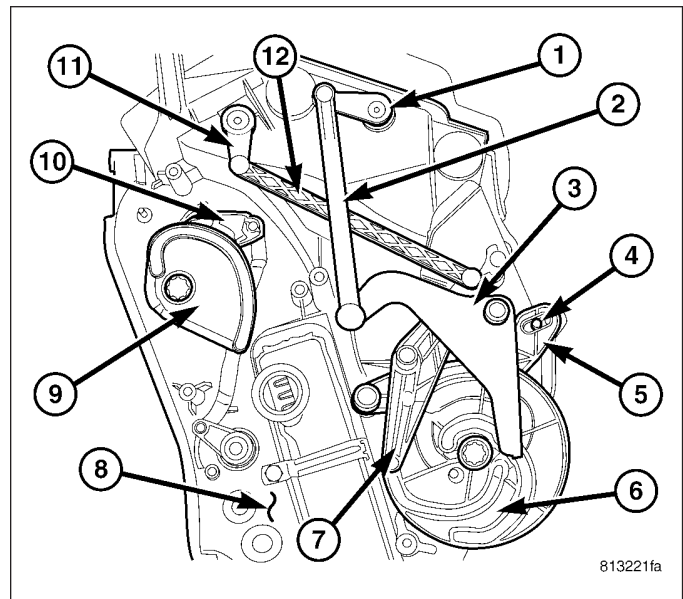
### AIR DISTRIBUTION HOUSING

**Note:** The air distribution housing must be removed from the HVAC housing and disassembled for service of the mode-air and blend-air doors.

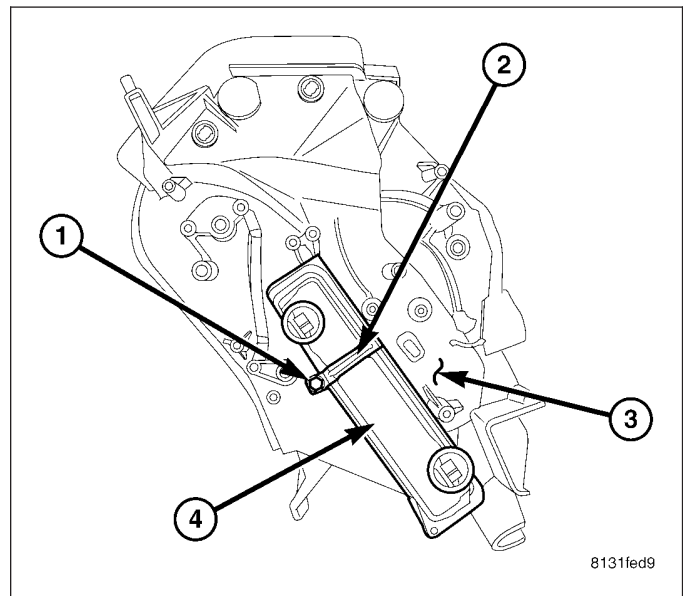
1. Remove the air distribution housing (1) from the HVAC housing and place it on a workbench (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - AIR DISTRIBUTION HOUSING - REMOVAL).
2. Remove the screws (2) that secure the mode door actuator (4) and the blend door actuator (7) to the driver side of the air distribution housing and remove the actuators.
3. Remove the screws (5) that secure the blend door actuator mounting bracket (6) and the mode door actuator mounting bracket (3) to the driver side of the air distribution housing and remove the mounting brackets.



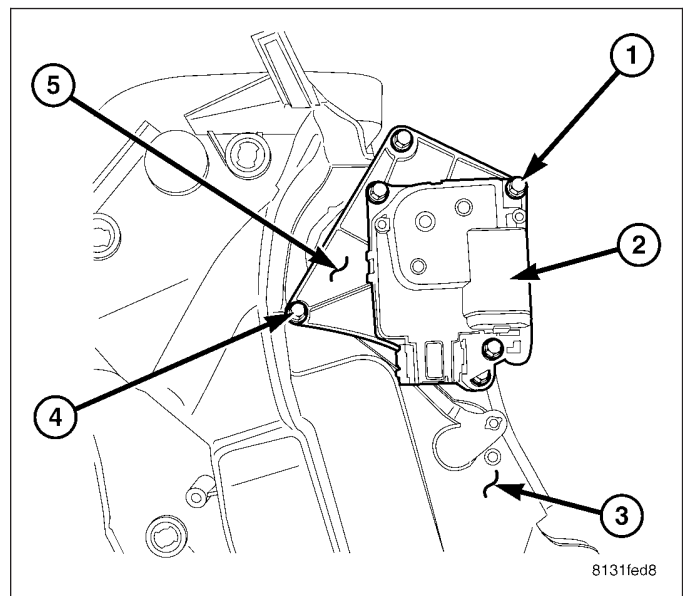
4. Remove the instrument panel door linkage (3) from the pivot shaft located on the driver side of the air distribution housing (8) and carefully disconnect the linkage rod (2) from the instrument panel door lever (1).
5. Remove the defrost/demister door linkage (7) from the pivot shaft on the air distribution housing and carefully disconnect the linkage rod (12) from the defrost/demister door lever (11).
6. Remove the mode door cam (6) from the air distribution housing.
7. Remove the floor door linkage (5) from the floor door lever (4) and the air distribution housing.
8. Remove the blend door cam (9) from the blend door lever (10) and the air distribution housing.



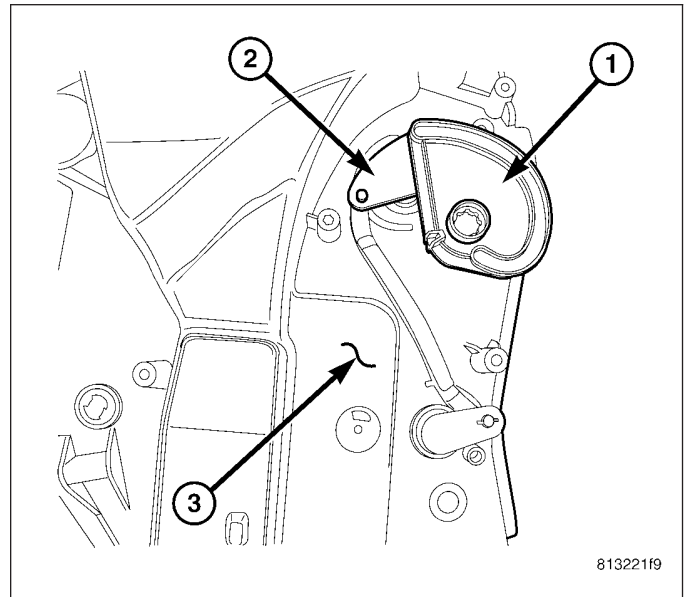
9. Remove the screw (1) that secures the heater core retaining bracket (2) to the driver side of the air distribution housing (3) and remove the bracket.
10. Carefully pull the heater core (4) out of the air distribution housing.



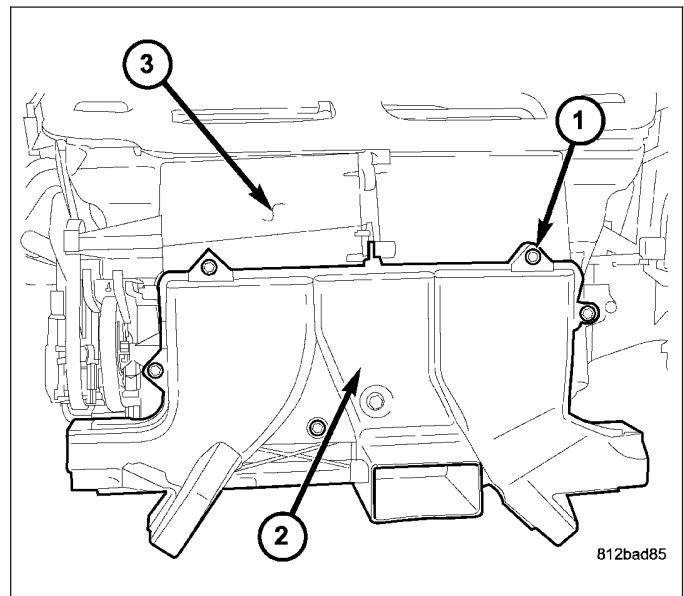
11. If equipped with dual zone heating-A/C, remove the screws (1) that secure the blend door actuator (2) to the passenger side of the air distribution housing (3) and remove the actuator.
12. Remove the screws (4) that secure the blend door actuator mounting bracket (5) to the passenger side of the air distribution housing and remove the mounting bracket.



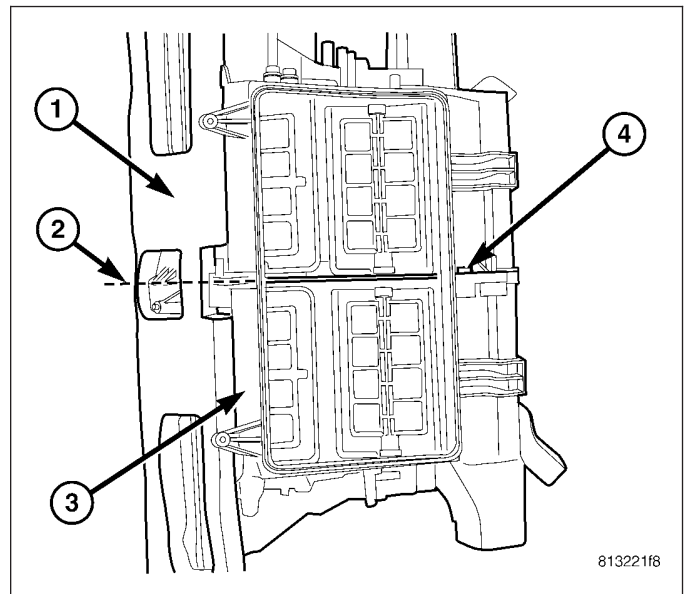
13. If equipped with dual zone heating-A/C, remove the blend door cam (1) from blend door lever (2) and the pivot shaft located on the passenger side of the air distribution housing (3).



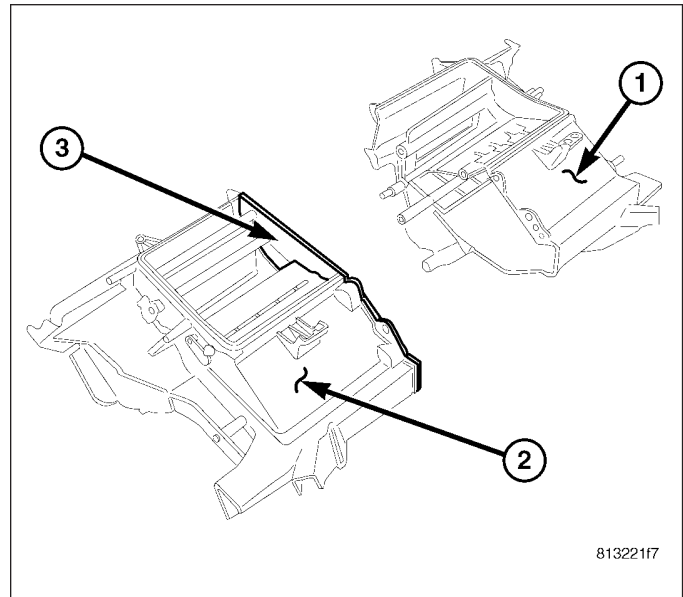
14. Remove the six screws (1) that secure the front floor distribution duct (2) to the bottom of the air distribution housing (3) and remove the duct.



15. Carefully cut the foam seal (1) along the parting line (2) of the two halves of the air distribution housing (3). If the seal is deformed or damaged, it must be replaced.
16. Remove the screws (4) that secure the two halves of the air distribution housing together.



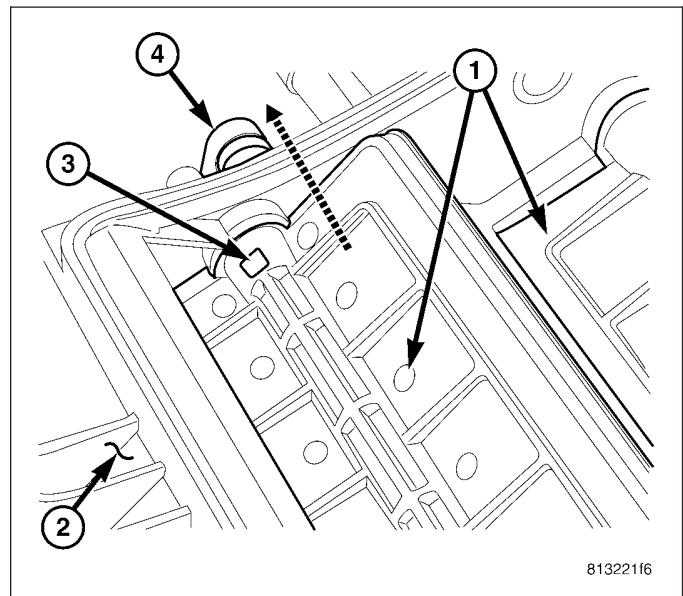
17. Carefully separate the left half of the air distribution housing (1) from the right half of the housing (2).
18. Remove the center partition (3).



19. To remove the air doors (1) from the air distribution housing (2), first carefully push down on the tab (3) of the air door lever (4) located in the pivot shaft of the air door being removed.

**Note: If the seal on the air door is deformed or damaged, the air door must be replaced.**

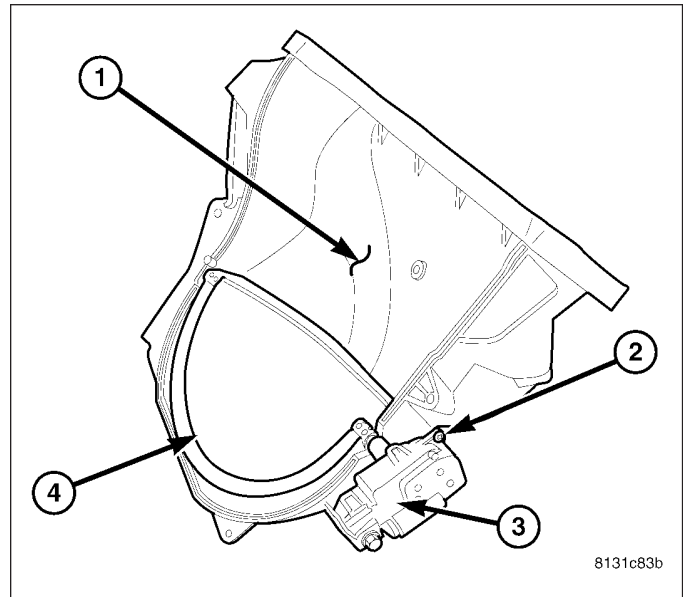
20. Gently pull the air door lever out of the pivot shaft and remove the air door(s) from the air distribution housing as required.



## AIR INLET HOUSING

**Note: The air inlet housing must be removed from HVAC housing and disassembled for service of the recirculation-air door.**

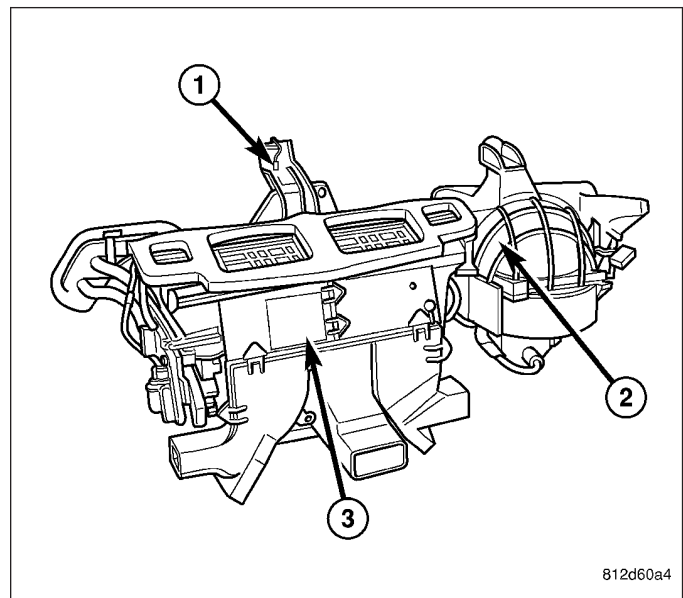
1. Remove the air inlet housing (1) from the HVAC housing and place it on a workbench (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - AIR INLET HOUSING - REMOVAL)
2. Remove the three screws (2) that secure the recirculation door actuator (3) to the left side of the air inlet housing and remove the actuator.
3. Remove the recirculation-air door (4) from the air inlet housing.



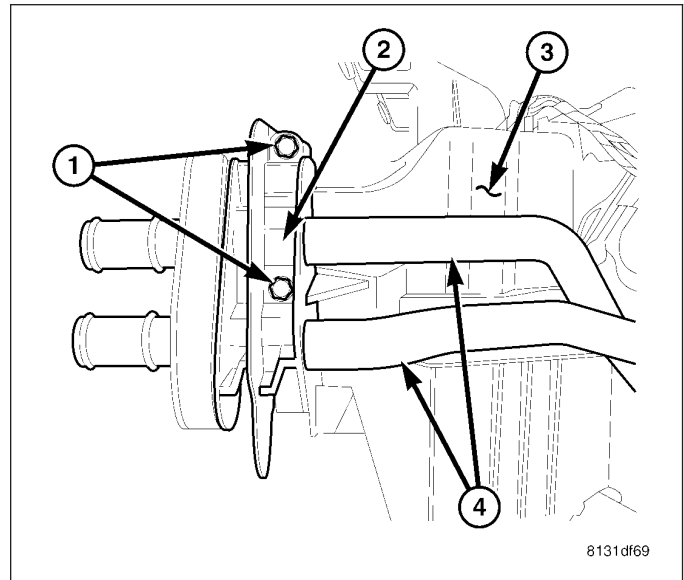
## HVAC HOUSING

**Note:** The HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator.

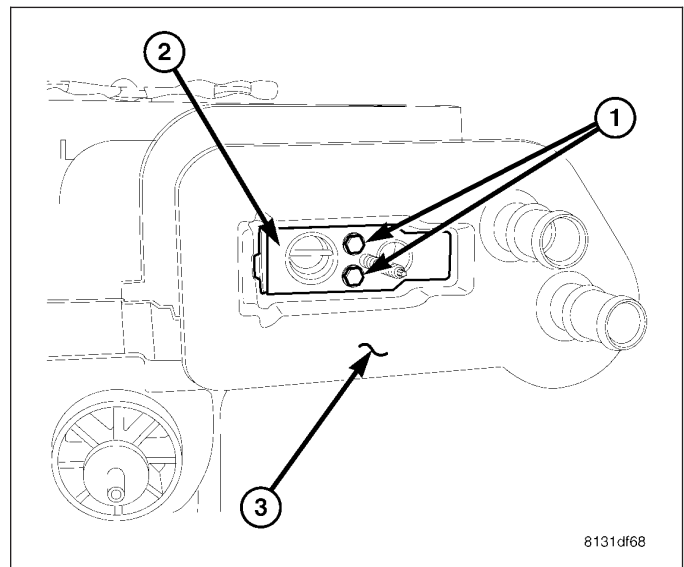
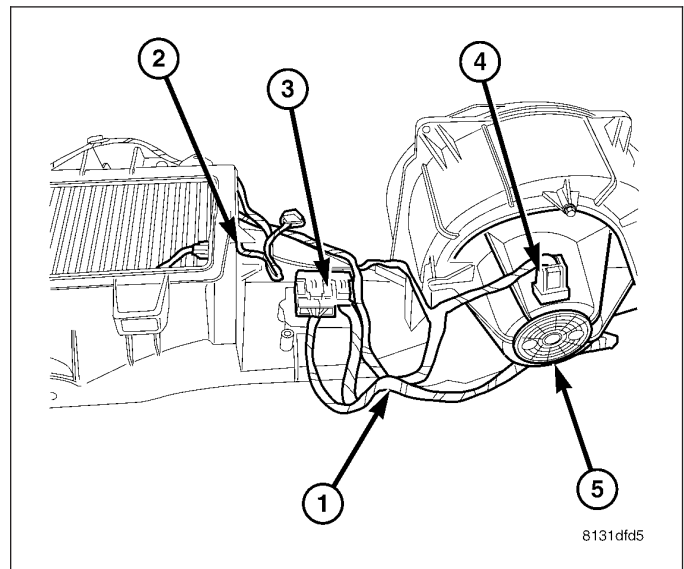
1. Remove the HVAC housing assembly and place it on a workbench (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION /HOUSING-HVAC - HVAC HOUSING ASSEMBLY - REMOVAL).
2. Remove the air distribution housing (3) from the HVAC housing (1) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - AIR DISTRIBUTION HOUSING - REMOVAL).
3. Remove the air inlet housing (2) from the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - AIR INLET HOUSING - REMOVAL).



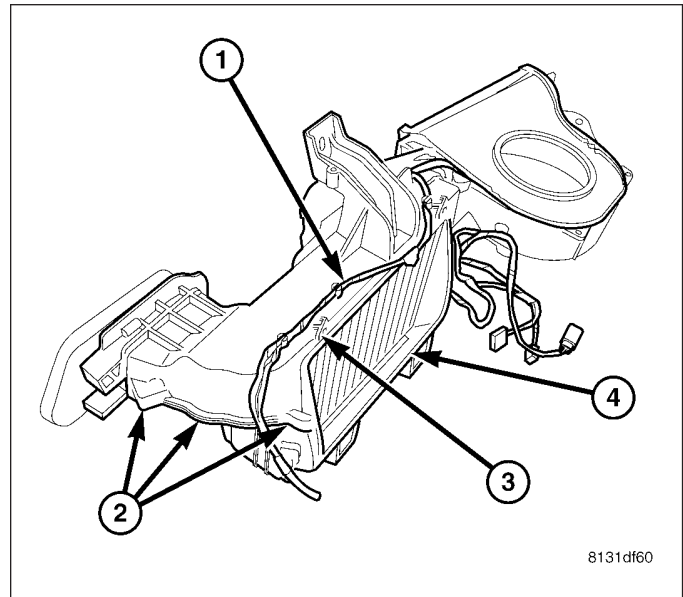
4. Remove the two screws (1) that secure the flange (2) to the front of the HVAC housing (3).
5. Remove the flange and the heater core tubes (4) from the HVAC housing.



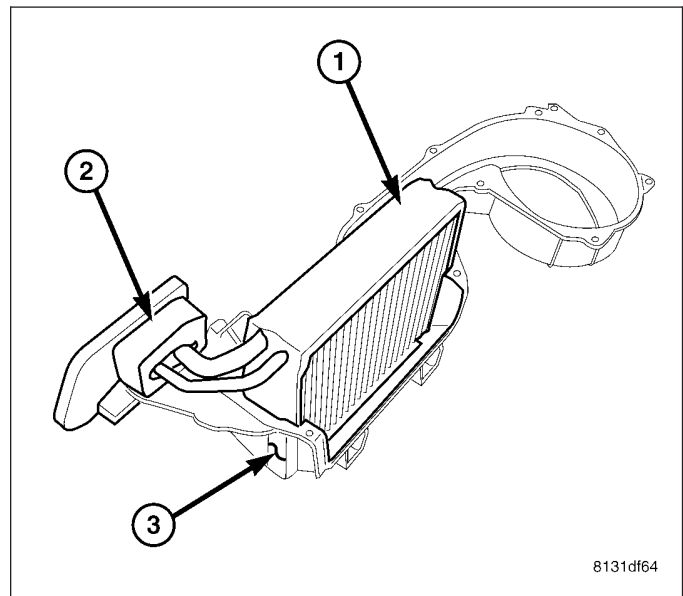
6. Disconnect the HVAC wiring harness (1) from the evaporator temperature sensor (2), blower motor resistor or power module (3) (depending on application) and the blower motor (4).
7. Disengage the two HVAC wire harness retainers (5) from the blower motor and remove the blower motor from the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/MOTOR-BLOWER - REMOVAL).
8. Remove the blower motor resistor or power module, depending on application (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/RESISTOR-BLOWER MOTOR - REMOVAL) or (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/MODULE-POWER-BLOWER MOTOR - REMOVAL).
9. Remove the evaporator temperature sensor (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/SENSOR-EVAPORATOR TEMPERATURE - REMOVAL).
10. Remove the two bolts (1) that secure the A/C expansion valve (2) to the evaporator tube tapping block located within the foam seal (3).
11. Remove the A/C expansion valve from the evaporator tube tapping block and foam seal.
12. Remove the O-ring seals from the evaporator tube fittings and discard.
13. Install plugs in, or tape over the opened evaporator tube fittings and all expansion valve ports.



14. Remove the HVAC wiring harness (1).
15. Remove the ten screws (2) that secure the upper half of the HVAC housing (3) to the lower half of the HVAC housing (4).
16. Separate the two halves of the HVAC housing.



17. Carefully lift the A/C evaporator (1) and foam seal (2) out of the lower half of the HVAC housing (3).
18. If required, remove the foam seal from the tapping block of the A/C evaporator. If the seal is deformed or damaged, it must be replaced.



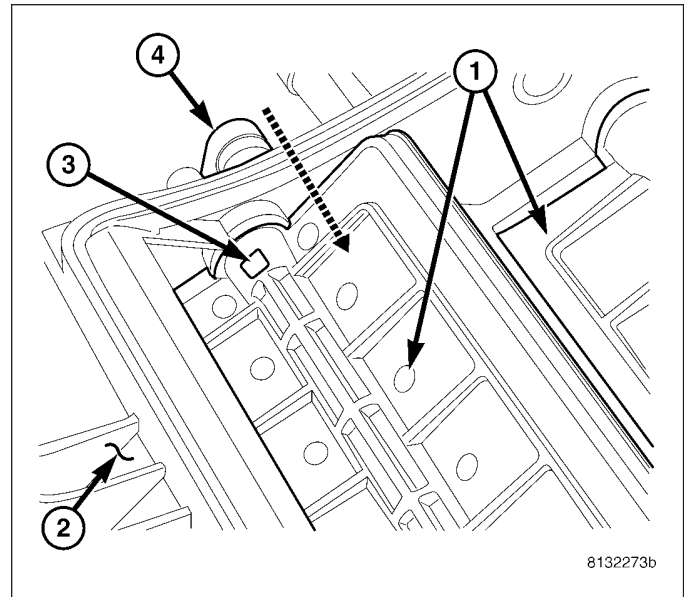
## ASSEMBLY

### AIR DISTRIBUTION HOUSING

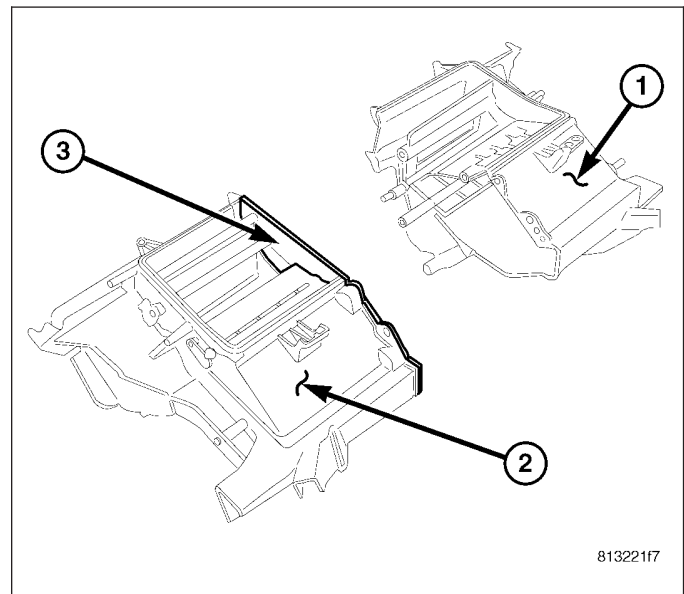
**Note:** The air distribution housing must be removed from the HVAC housing and disassembled for service of the mode-air and blend-air doors.



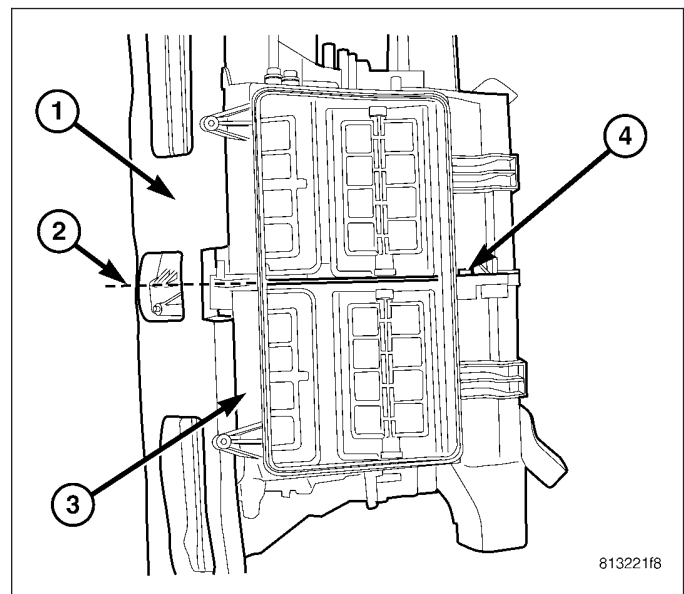
1. Install the air door(s) (1) into the air distribution housing (2) as required. Align the air door with the pivot shaft hole in the housing.
2. Align and install the air door lever (4) into the pivot shaft of the air door. Make sure that the tab (3) on the door lever is securely engaged to the pivot shaft.



3. Align the air door pivot shafts with the pivot holes in the center partition (3) and install the partition onto the left half of the air distribution housing (1).
4. Align the air door pivot shafts to each other and carefully install the left half of the air distribution housing to the right half of the housing (2).

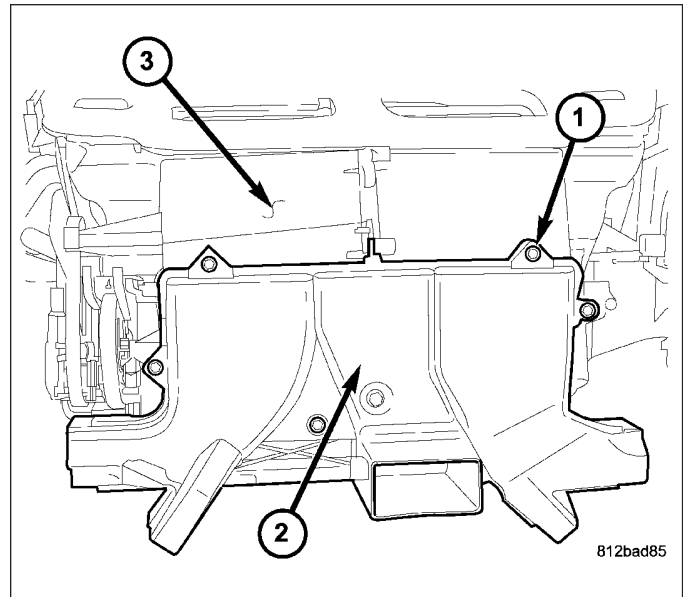


5. Install the screws (4) that secure the two halves of the air distribution housing (3) together. Tighten the screws to 2.2 N·m (20 in. lbs.).
6. Inspect the foam seal (1), especially at the parting line (2). If the seal is deformed or damaged, it must be replaced.

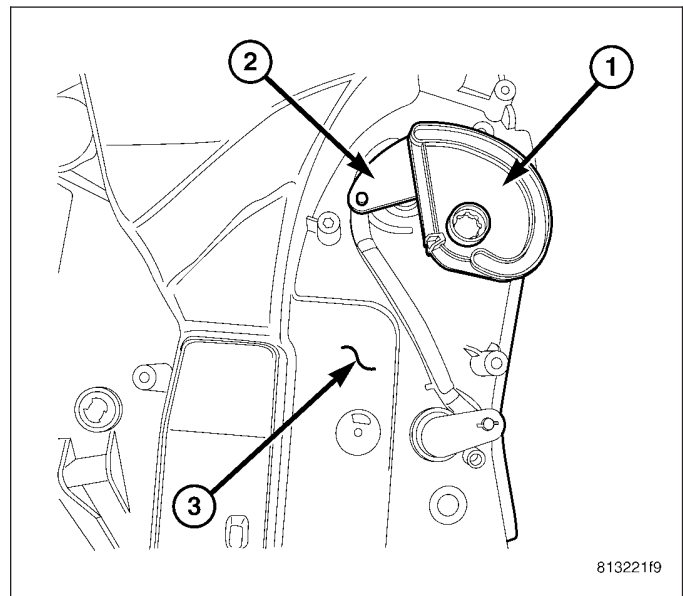




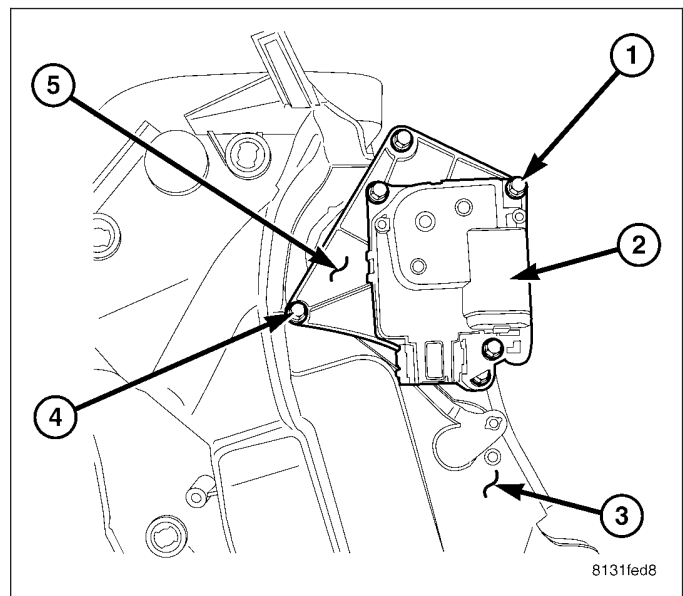
7. Position the front floor distribution duct (2) onto the air distribution housing (3).
8. Install the six screws (1) that secure the front floor distribution duct to the air distribution housing. Tighten the screws to 2 N·m (17 in. lbs.).



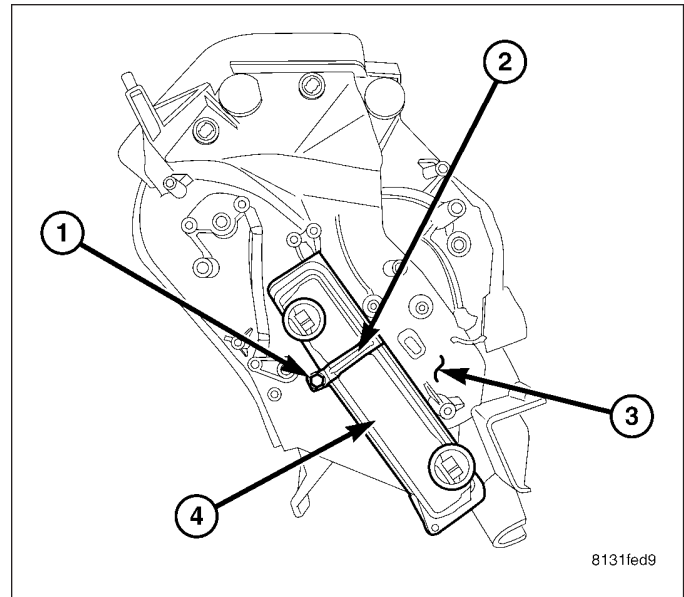
9. If equipped with dual zone heating-A/C, install the blend door cam (1) onto the blend door lever (2) and the pivot shaft located on the passenger side of the air distribution housing (3).



10. If equipped with dual zone heating-A/C, position the blend door actuator mounting bracket (5) onto the passenger side of the air distribution housing (3).
11. Install the screws (4) that secure the blend door actuator mounting bracket to the air distribution housing. Tighten the screws to 2 N·m (17 in. lbs.).
12. Position the blend door actuator (2) onto the air distribution housing. If necessary, rotate the actuator slightly to align the splines on the actuator output shaft with those on the blend door cam (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/ACTUATOR-BLEND DOOR - INSTALLATION).
13. Install the screws (1) that secure the blend door actuator to the air distribution housing. Tighten the screws to 2 N·m (17 in. lbs.).



14. Carefully install the heater core (4) into the driver side of the HVAC air distribution housing (3).
15. Install heater core retaining bracket (2) onto the air distribution housing.
16. Install the screw (1) that secures the heater core retaining bracket onto the air distribution housing. Tighten the screw to 2.2 N·m (20 in. lbs.).

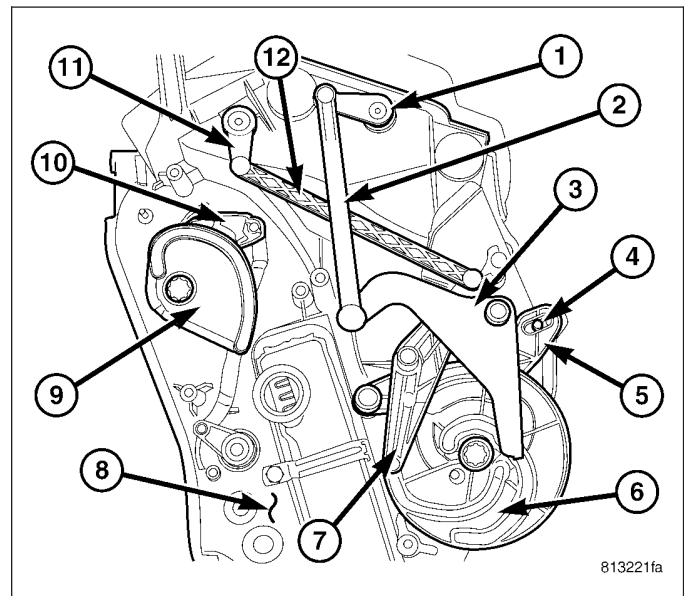


17. Install the blend door cam (9) onto the blend door lever (10) and the pivot shaft located on the driver side of the air distribution housing (8).
18. Install the floor door linkage (5) onto the floor door lever (4) and the pivot shaft on air distribution housing.

**Note:** Align the guide pin on the floor door linkage with the guides on the mode door cam during installation of the floor door linkage.

19. Install the mode door cam (6) onto the pivot shaft on air distribution housing.
20. Connect the defrost/demister door linkage rod (12) onto the defrost/demister door lever (11).

**Note:** Align the guide pin on the defrost/demister linkage with the guides on the mode door cam during installation of the defrost/demister linkage.

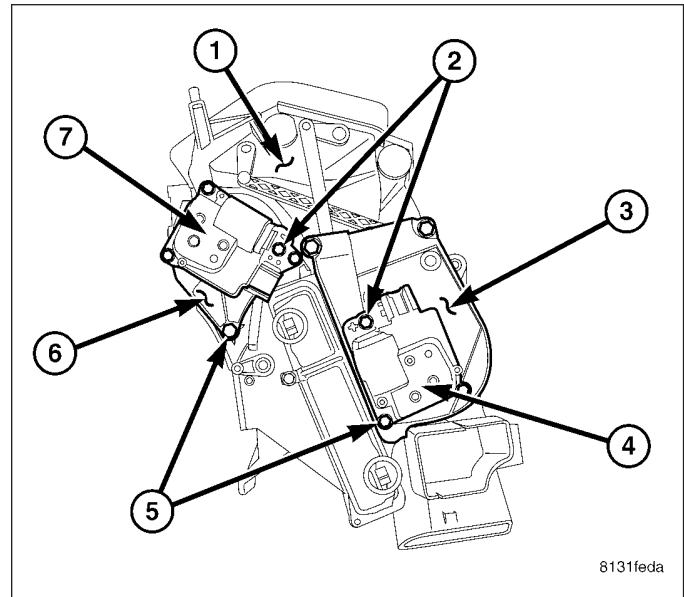


21. Install the defrost/demister linkage (7) onto the pivot shaft on air distribution housing.
22. Connect the instrument panel door linkage rod (2) onto the instrument panel door lever (1).

**Note:** Align the guide pin on the instrument panel linkage with the guides on the mode door cam during installation of the instrument panel linkage.

23. Install the instrument panel linkage (3) onto the pivot shaft on air distribution housing.

24. Position the blend door actuator mounting bracket (6) and the mode door actuator mounting bracket (3) onto the driver side of the air distribution housing (1).
25. Install the screws (5) that secure the mounting brackets to the air distribution housing. Tighten the screws to 2 N·m (17 in. lbs.).
26. Position the blend door actuator (7) onto the air distribution housing. If necessary, rotate the actuator slightly to align the splines on the actuator output shaft with those on the blend door cam (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/ACTUATOR-BLEND DOOR - INSTALLATION).
27. Position the mode door actuator (4) onto the air distribution housing. If necessary, rotate the actuator slightly to align the splines on the actuator output shaft with those on the mode door cam (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/ACTUATOR-MODE DOOR - INSTALLATION).
28. Install the screws (2) that secure the blend door actuator to the air distribution housing. Tighten the screws to 2 N·m (17 in. lbs.).
29. Position the mode door actuator mounting bracket (6) onto the driver side of the air distribution housing (1).
30. Install the screws that secure the blend door actuator mounting bracket to the air distribution housing. Tighten the screws to 2 N·m (17 in. lbs.).
31. Position the blend door actuator (7) onto the air distribution housing. If necessary, rotate the actuator slightly to align the splines on the actuator output shaft with those on the blend-air door linkage (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/ACTUATOR-BLEND DOOR - INSTALLATION).
32. Install the screws (2) that secure the blend door and mode door actuators to the air distribution housing. Tighten the screws to 2 N·m (17 in. lbs.).
33. Install the air distribution housing onto the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - AIR DISTRIBUTION HOUSING - INSTALLATION).



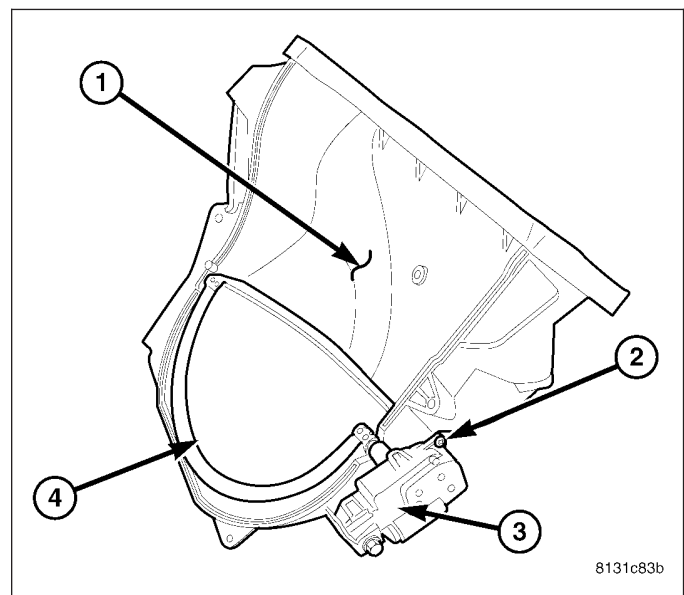
## AIR INLET HOUSING

**Note:** The air inlet housing must be removed from HVAC housing and disassembled for service of the recirculation-air door.

1. Position the recirculation-air door (4) into the air inlet housing (1).

**CAUTION:** Make sure that the recirculation-air door pivot shaft is properly seated in the pivot seats located on the air inlet housing.

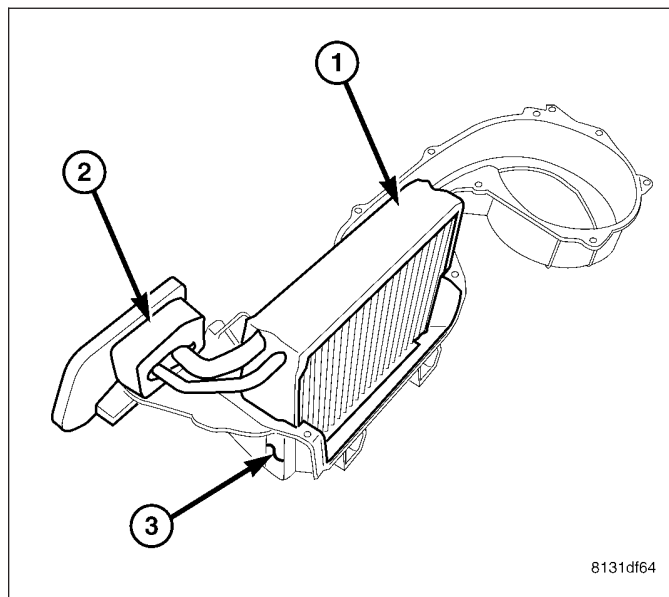
2. Install the recirculation door actuator (3) onto the air inlet housing. If necessary, rotate the actuator slightly to align the splines on the actuator output shaft with those on the recirculation door pivot shaft (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/ACTUATOR-RECIRCULATION DOOR - INSTALLATION).
3. Install the three screws (2) that secure the recirculation door actuator to the air inlet housing. Tighten the screws to 2 N·m (17 in. lbs.).



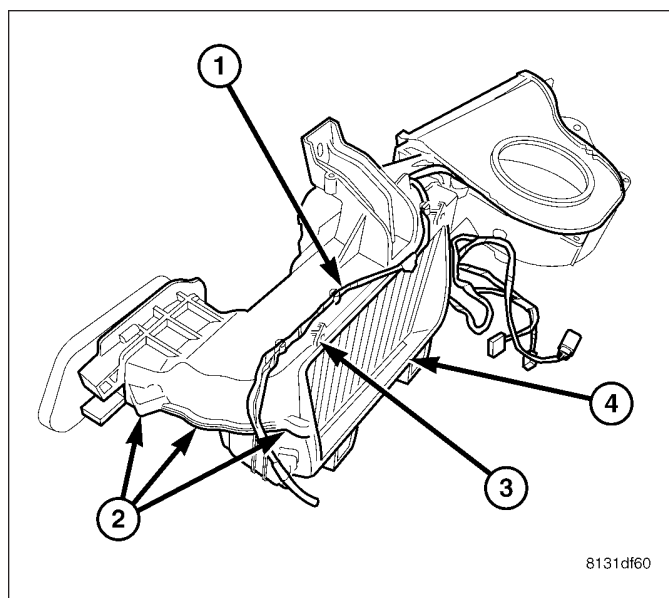
4. Install the air inlet housing onto the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION).

## HVAC HOUSING

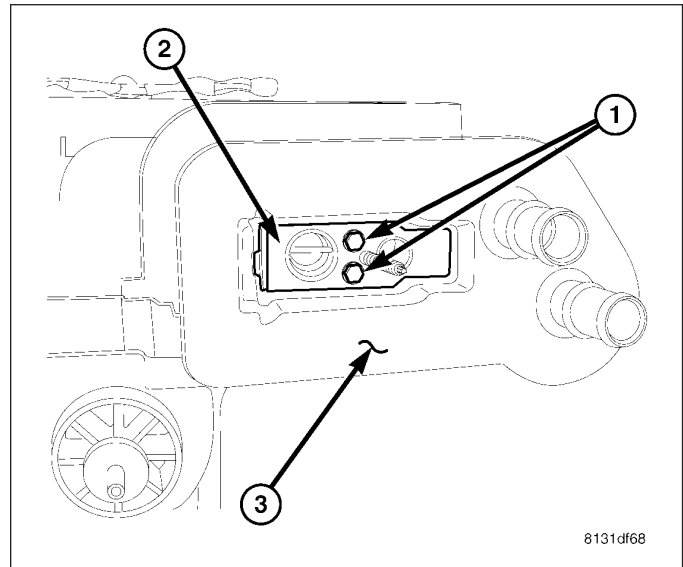
1. If removed, install the foam seal (2) over the tapping block of the A/C evaporator (1). If the seal is deformed or damaged, it must be replaced.
2. Install the A/C evaporator into the lower half of the HVAC housing (3). Make sure that the evaporator drain within the HVAC housing is clean and unrestricted and that the insulator around the A/C evaporator is properly installed.



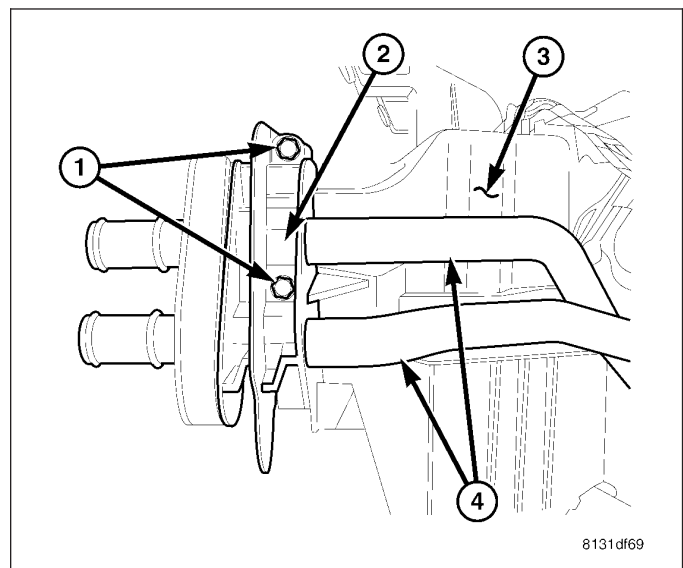
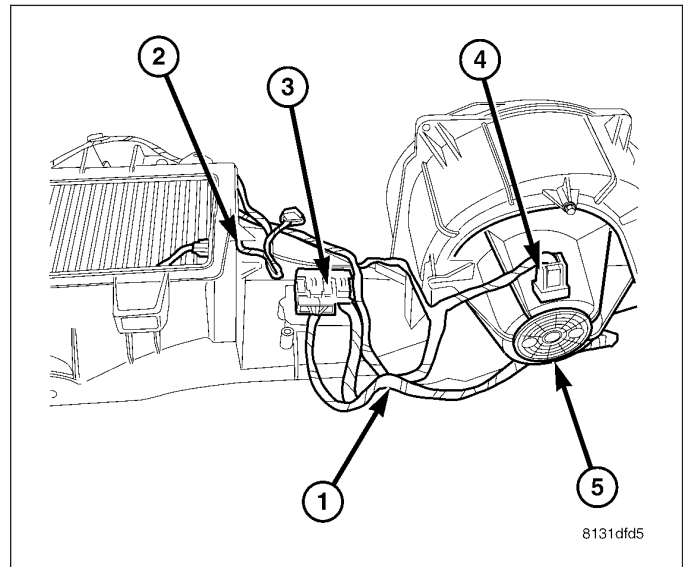
3. Install the upper half of the HVAC housing (3) onto the lower half of the HVAC housing (4).
4. Install the screws (2) that secure the two halves of the HVAC housing together. Tighten the screws to 2.2 N·m (20 in lbs.).
5. Install the HVAC wiring harness (1). Make sure the harness is routed through all wiring retainers.



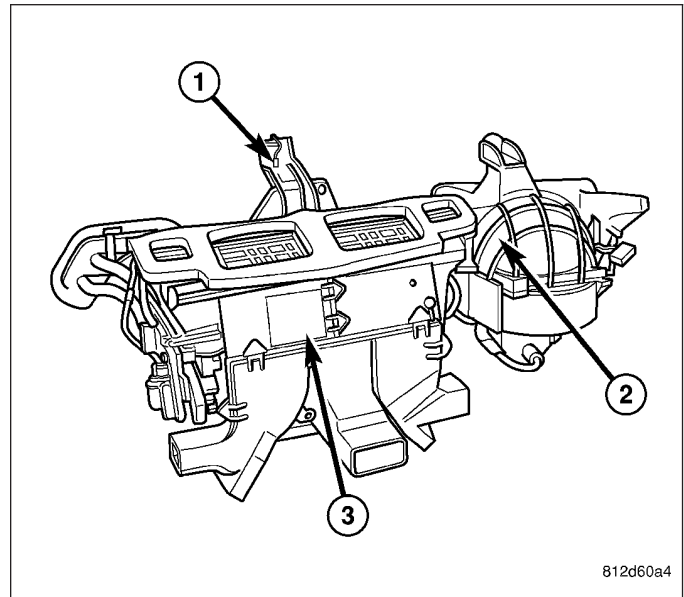
6. Remove the tape or plugs from the evaporator tube fittings and all of the expansion valve ports.
7. Lubricate new rubber O-ring seals with clean refrigerant oil and install them on the evaporator tube fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
8. Install the A/C expansion valve (2) onto the evaporator tube tapping block located within the foam seal (3).
9. Install the two bolts (1) that secure the A/C expansion valve to the evaporator tube tapping block. Tighten the bolts to 11 N·m (97 in. lbs.).



10. Install the evaporator temperature sensor (2) (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS - FRONT/EVAPORATOR TEMPERATURE SENSOR - INSTALLATION).
11. Install the blower motor resistor or power module (3), depending on application (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/RESISTOR-BLOWER MOTOR - INSTALLATION) or (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/MODULE-POWER-BLOWER MOTOR - INSTALLATION).
12. Install the blower motor (4) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/MOTOR-BLOWER - INSTALLATION).
13. Connect the HVAC wire harness (1) to the evaporator temperature sensor, blower motor resistor or power module (depending on application) and the blower motor.
14. Install the two HVAC wire harness retainers (5) onto the blower motor.
15. Install the heater core tubes (4) and the flange (2) to the front of the HVAC housing (3).
16. Install the two screws (1) that secure the flange to the HVAC housing. Tighten the screws to 2.2 N·m (20 in. lbs.).



17. Install the air inlet housing (2) onto the HVAC housing (1) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - AIR INLET HOUSING - INSTALLATION).
18. Install the air distribution housing (3) onto the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - AIR DISTRIBUTION HOUSING - INSTALLATION).
19. Install the HVAC housing assembly (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - HVAC HOUSING ASSEMBLY - INSTALLATION).

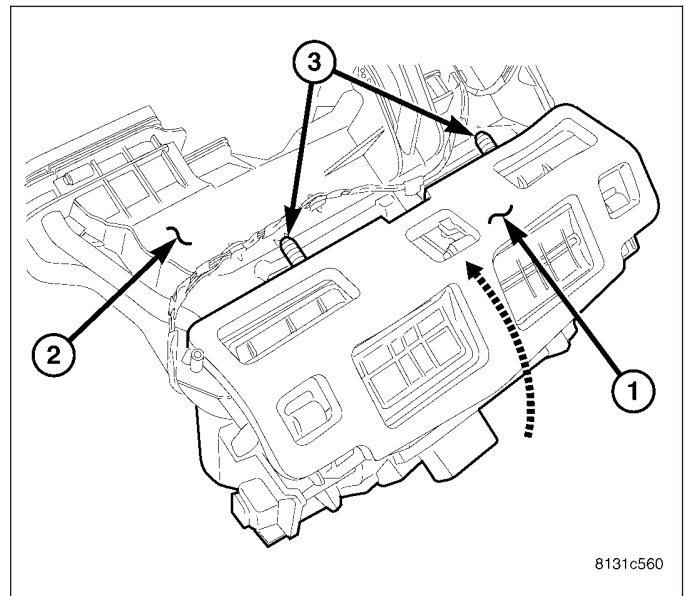


## INSTALLATION

### AIR DISTRIBUTION HOUSING

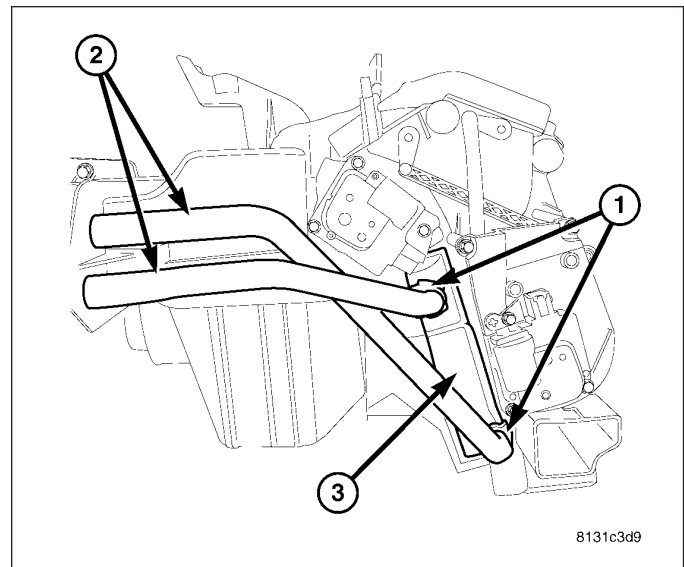
**Note:** The air distribution housing must be removed from the HVAC housing and disassembled for service of the mode-air and blend-air doors.

1. Position the air distribution housing (1) into the vehicle.
2. Install the air distribution housing onto the rear of the HVAC housing (2) by inserting the tabs on the bottom of the distribution housing into the slots located on the bottom of the HVAC housing and tipping the distribution housing forward until it is properly aligned with the HVAC housing.
3. Connect the floor distribution ducts to the air distribution housing.
4. Install the screws (3) that secure the air distribution housing to the HVAC housing. Tighten the screws to 2.2 N·m (20 in. lbs.).

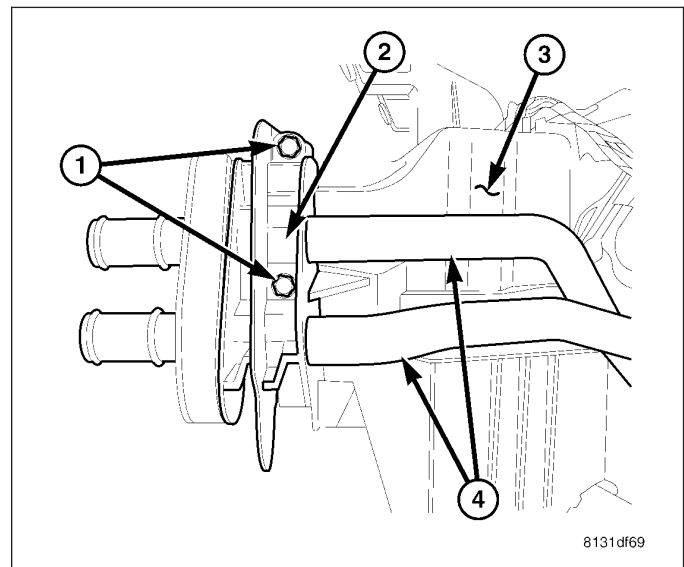




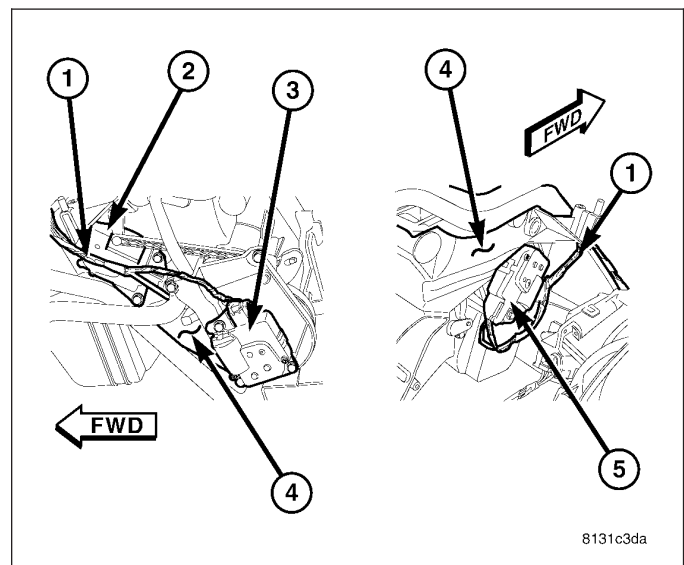
5. Remove the tape or plugs from the heater core tubes and heater core ports.
6. Lubricate new rubber O-ring seals with clean engine coolant and install them onto the heater core tube fittings. Use only the specified O-ring as they are made of a special material for the engine cooling system.
7. Install the heater core tubes (2) onto the heater core (3).
8. Install the two retaining clamps (1) that secure the heater core tubes to the heater core. Make sure that the clamps are installed correctly and securely.



9. Install the heater core tubes (4) and the flange (2) to the front of the HVAC housing (3).
10. Install the two screws (1) that secure the flange to the HVAC housing. Tighten the screws to 2.2 N-m (20 in. lbs.).



11. Connect the HVAC wire harness (1) to the mode door actuator (2) and the blend door actuator (3) located on the driver side of the air distribution housing (4).
12. If equipped with dual zone heating-A/C, connect the HVAC wire harness to the blend door actuator (5) located on the passenger side of the air distribution housing.
13. Install the floor console duct (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/DUCTS-FLOOR CONSOLE - INSTALLATION).
14. Install the defroster ducts (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/DUCTS-DEFROSTER - INSTALLATION).
15. Install the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).
16. Reconnect the negative battery cable.



17. Refill the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM REFILL).

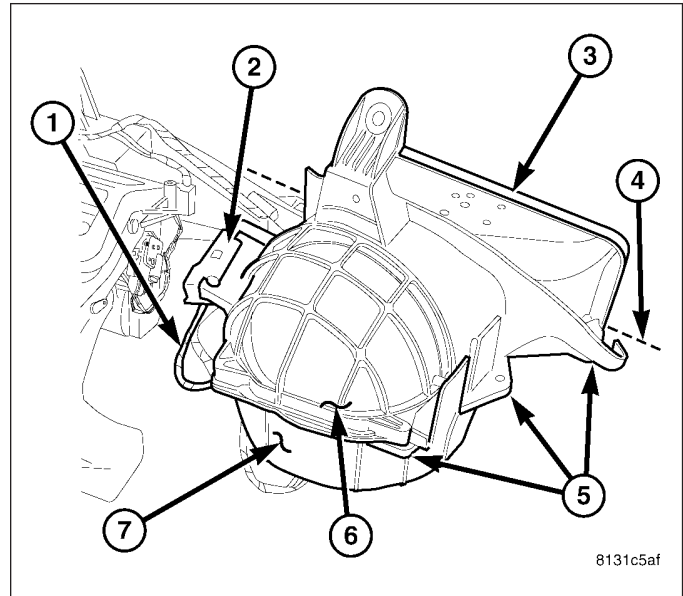
## AIR INLET HOUSING

**Note:** The air inlet housing must be removed from HVAC housing and disassembled for service of the recirculation-air door.

1. Position the air inlet housing (6) onto the HVAC housing (7).

**CAUTION:** Make sure that the recirculation-air door pivot shaft is properly seated in the pivot seats located on the top of the HVAC housing.

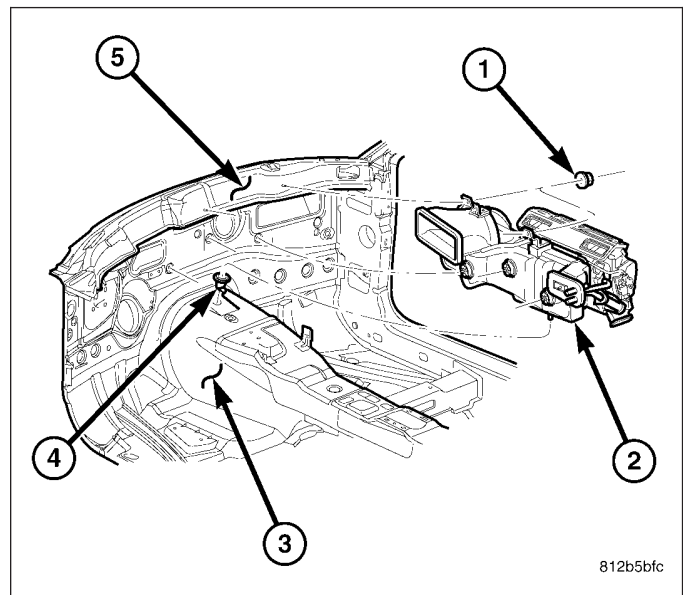
2. Install the five screws (5) that secure the air inlet housing to the HVAC housing. Tighten the screws to 2.2 N·m (20 in. lbs.).
3. Inspect the foam seal (3). If the seal is deformed or damaged, it must be replaced.
4. Connect the HVAC wire harness (1) to the recirculation door actuator (2).
5. Install the HVAC housing assembly (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC ASSEMBLY - INSTALLATION)
6. Reconnect the negative battery cable.



## HVAC HOUSING ASSEMBLY

**Note:** The HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator.

1. Position the HVAC housing assembly (2) into the passenger compartment with the mounting studs in their proper locations in the dash panel (5) and the condensate drain tube into the grommet (4) on the floor panel (3).
2. Install the two nuts (1) that secure the HVAC housing to the passenger compartment side of the dash panel. Tighten the nuts to 3 N·m (26 in. lbs.).
3. Install the defroster ducts (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/DUCTS-DEFROSTER - INSTALLATION).
4. Connect the floor distribution ducts (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION - FRONT/DUCTS-FLOOR DISTRIBUTION - INSTALLATION).
5. Connect the floor console duct (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/FLOOR CONSOLE DUCTS - INSTALLATION).
6. Install the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL ASSEMBLY - INSTALLATION).

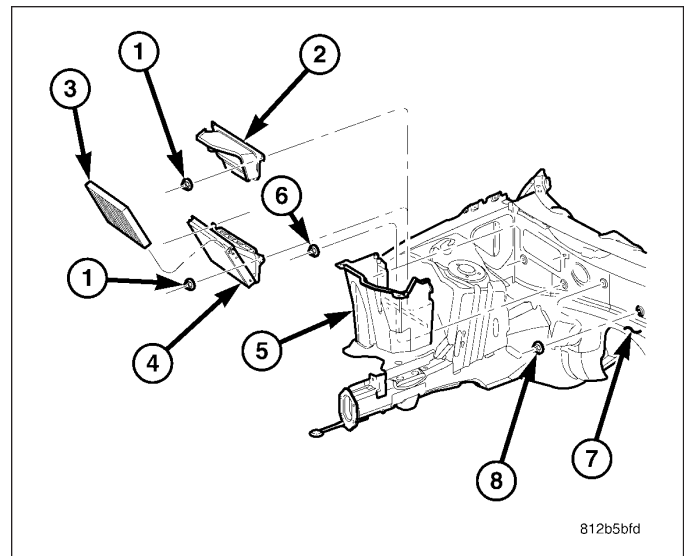




7. Install the two nuts (8) that secure the HVAC housing to the engine compartment side of the dash panel (7). Tighten the nuts to 7 N·m (62 in. lbs.).
8. Reach into the fresh air inlet housing (5) and install the nut (6) that secures the HVAC housing to the engine compartment side of the dash panel. Tighten the nut to 7 N·m (62 in. lbs.).

**Note:** Make sure to install the lead-in on the bottom edge of the water separator or the filter housing (depending on application) into the slot located at the bottom of the fresh air inlet housing.

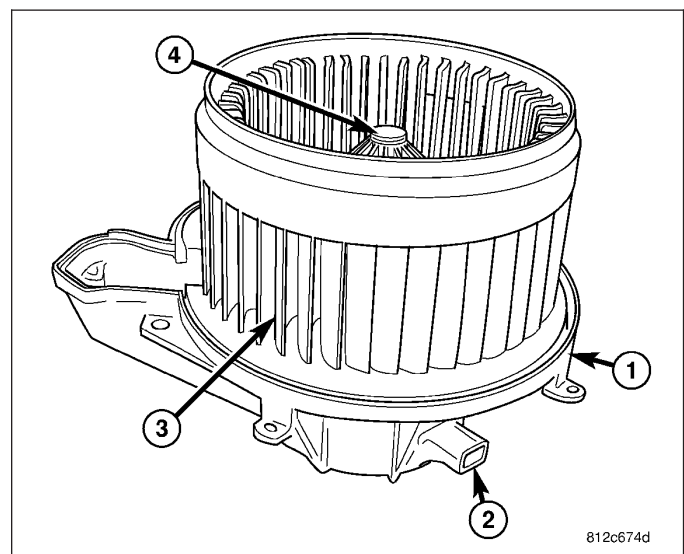
9. Install the fresh air inlet water separator (2) or particulate air filter housing (4) and filter (3) (depending on application) into the fresh air inlet housing.
10. Install the two nuts (1) that secure the fresh air inlet water separator or particulate air filter housing to the dash panel (depending on application). Tighten the nuts to 7 N·m (62 in. lbs.).
11. Connect the heater hoses to the heater core tubes.
12. Connect the A/C suction line and A/C liquid line to the A/C evaporator (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING /LINE-A/C LIQUID - INSTALLATION).
13. Install the wiper module assembly onto the dash panel (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - INSTALLATION).
14. Reconnect the negative battery cable.
15. Refill the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM REFILL).
16. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
17. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).



## MOTOR-BLOWER

### DESCRIPTION

The blower motor (1) is a 12-volt, direct current (DC) motor mounted within a plastic housing with an integral wire harness connector (2) and squirrel cage-type blower wheel (3) that is secured to the blower motor shaft (4). The blower motor wheel is located in the HVAC air inlet housing which is mounted to the passenger side end of the HVAC housing. The blower motor can be accessed for service from underneath the instrument panel.



## OPERATION

The blower motor is used to control the velocity of air moving through the HVAC housing by spinning the blower wheel within the HVAC air inlet housing at the selected speed or, in the ATC system, at the selected or programmed speed.

On models equipped with the manual temperature control (MTC) heating-A/C system, the blower motor will operate whenever the ignition switch is in the On position and the blower motor control in any position except Off. On models equipped with the automatic temperature control (ATC) system, the blower motor will operate whenever the ignition switch is in the On position and the A/C-heater control power is turned on.

Blower motor speed for the MTC system is controlled by regulating the path to ground through the blower motor resistor and through the blower motor control located within the A/C-heater control.

For the ATC system, blower motor speed is controlled by the blower motor power module which provides the blower motor with power and a path to ground. The blower motor power module also sends a blower control signal to the A/C-heater control. Using input from the blower motor control (manual mode ) or sensor data (automatic mode), the A/C-heater control processes the blower control signal from the power module and sets the speed at which the blower motor will run.

The blower motor and blower motor wheel are factory balanced and cannot be adjusted or repaired. If faulty or damaged, the blower motor and blower wheel must be replaced as an assembly.

## DIAGNOSIS AND TESTING

### MOTOR-BLOWER

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

**Note:** For circuit descriptions and diagrams, refer to Air Conditioning/Heater in Group 8W - Wiring Diagrams.

### OPERATION

Possible causes of an inoperative blower motor include:

- Faulty fuse
- Faulty blower motor resistor or power module (depending on application)
- Faulty blower motor switch
- Faulty mode control switch
- Faulty blower motor
- Faulty blower motor circuit wiring or wire harness connectors

Possible causes of the blower motor not operating in all speeds include:

- Faulty fuse
- Faulty blower motor resistor or power module (depending on application)
- Faulty blower motor switch
- Faulty blower motor
- Faulty blower motor circuit wiring or wire harness connectors

### VIBRATION

Possible causes of blower motor vibration include:

- Improper blower motor mounting
- Improper blower wheel mounting
- Deformed blower wheel

- Out of balance blower wheel due to foreign material in the wheel
- Faulty blower motor

## NOISE

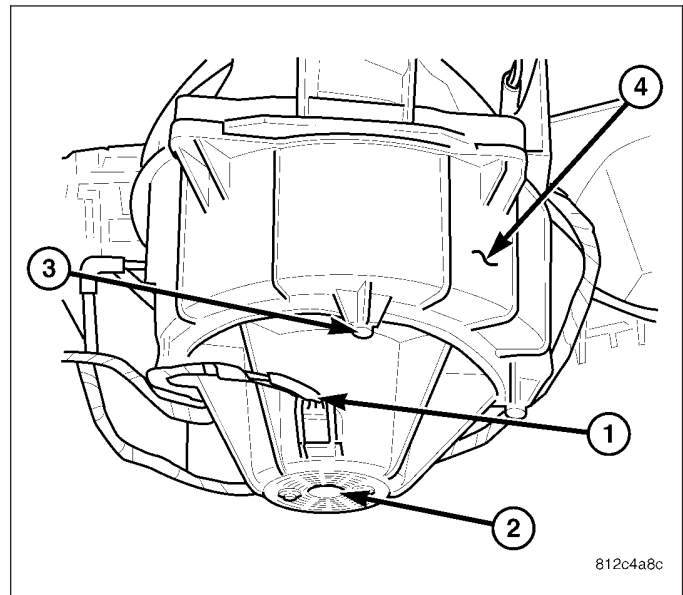
To determine if the blower motor is the source of the noise, simply switch the blower motor from Off to On. To verify that the blower motor is the source of the noise, unplug the blower motor wire harness connector and operate the heater-A/C system. If the noise goes away, possible causes include:

- Foreign material in the HVAC air inlet housing
- Improper blower motor mounting
- Improper blower wheel mounting
- Faulty blower motor

## REMOVAL

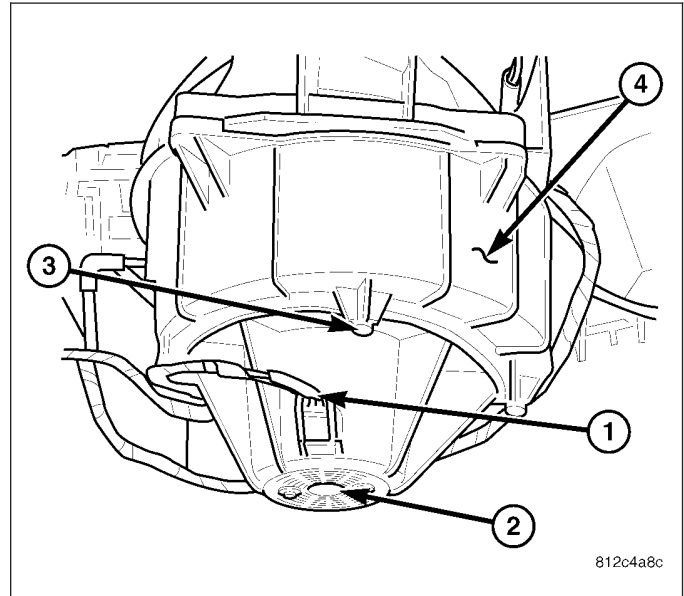
**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

1. Disconnect and isolate the negative battery cable.
2. Remove the instrument panel silencer from the passenger side of the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL SILENCER - REMOVAL)
3. Disengage the wire harness connector locking tab and disconnect the wire harness connector (1) and wire harness retainers from the blower motor (2).
4. Remove the four screws (3) that secure the blower motor to the HVAC housing (4).
5. Remove the blower motor from the HVAC housing.



## INSTALLATION

1. Position the blower motor (2) into the HVAC housing (4).
2. Install the four screws (3) that secure the blower motor to the HVAC housing. Tighten the screws to 2.2 N·m (20 in. lbs.).
3. Connect the wire harness connector (1) to the blower motor and engage the wire harness connector locking tab.
4. Install the HVAC wire harness retainers onto the blower motor.
5. Install the instrument panel silencer onto the passenger side of the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL SILENCER - INSTALLATION)
6. Reconnect the negative battery cable.



## OUTLETS-AIR

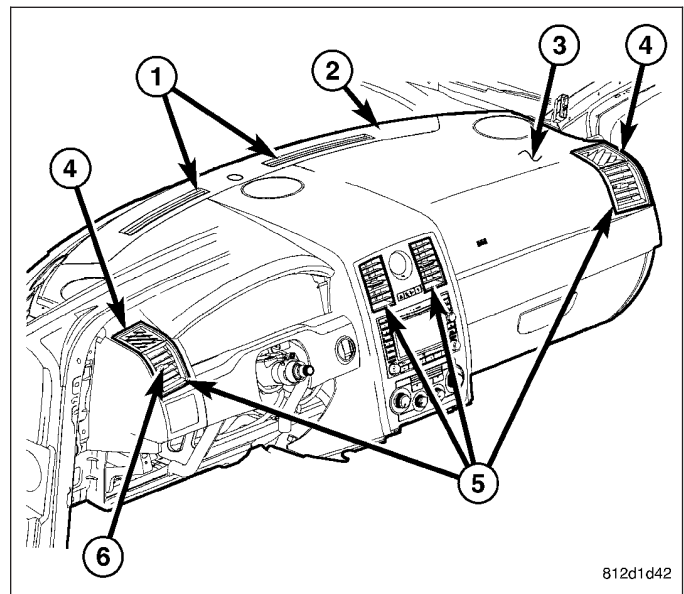
### DESCRIPTION

#### CHRYSLER

There are two defroster air outlets (1) in the defroster grille (2) located on the top of the instrument panel (3). The airflow from the defroster outlets is directed by fixed vanes in the defroster grille and cannot be adjusted. The defroster air outlets are not serviceable from the defroster grille (Refer to 23 - BODY/INSTRUMENT PANEL/DEFROSTER GRILLE - REMOVAL).

There are two side window demister air outlets (4). One located on each end of the instrument panel top cover. The airflow from the side window demister air outlets is directed by fixed vanes in the outlets and cannot be adjusted. The side window demister air outlets are only serviced with the outboard instrument panel air outlets.

There are four instrument panel air outlets (5). One air outlet is located near each outboard end of the instrument panel facing the rear of the vehicle and two air outlets are located at the top of the instrument panel center bezel. Each of the instrument panel air outlets contain a non-serviceable grille with movable vanes (6) that are used to direct or shut off the flow of the conditioned air leaving the instrument panel outlets. Only the outboard instrument panel air outlets can be serviced separately. For service of the other instrument panel air outlets, refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL.

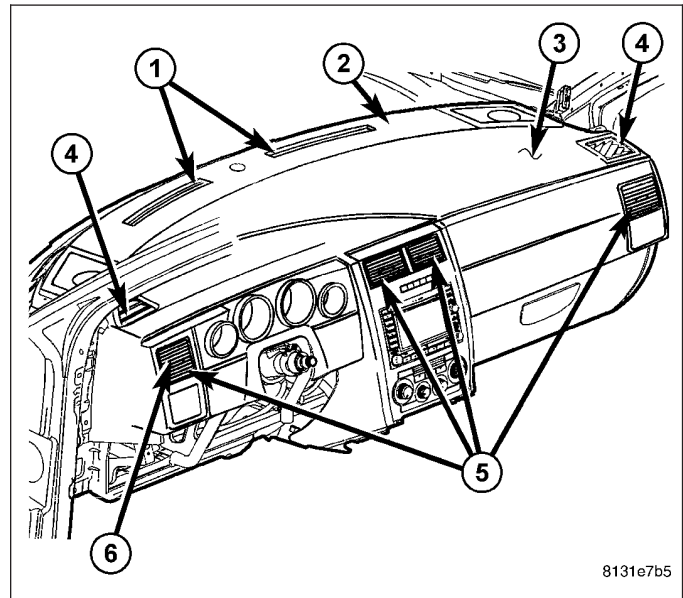


## DODGE

There are two defroster air outlets (1) in the defroster grille (2) located on the top of the instrument panel (3). The airflow from the defroster outlets is directed by fixed vanes in the defroster grille and cannot be adjusted. The defroster air outlets are not serviceable from the defroster grille (Refer to 23 - BODY/INSTRUMENT PANEL/DEFROSTER GRILLE - REMOVAL).

There are two side window demister air outlets (4). One located on each end of the instrument panel top cover. The airflow from the side window demister air outlets is directed by fixed vanes in the outlets and cannot be adjusted. The side window demister air outlets are not serviceable from the instrument panel top pad (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP PAD - REMOVAL).

There are four instrument panel air outlets (5). One air outlet is located near each outboard end of the instrument panel facing the rear of the vehicle and two air outlets are located at the top of the instrument panel center bezel. Each of the instrument panel air outlets contain a replaceable grille with movable vanes (6) that are used to direct or shut off the flow of the conditioned air leaving the instrument panel outlets. Only the passenger side outboard instrument panel air outlet can be serviced separately. For service of the other instrument panel air outlets, refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL and 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL.

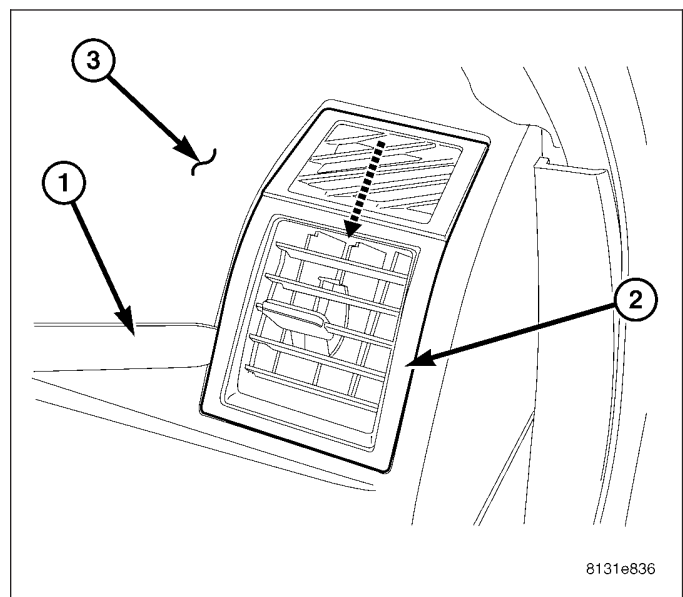


## REMOVAL

### AIR OUTLET - CHRYSLER

**Note:** Only the outboard instrument panel air outlets can be serviced separately. For service of the other instrument panel air outlets refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL.

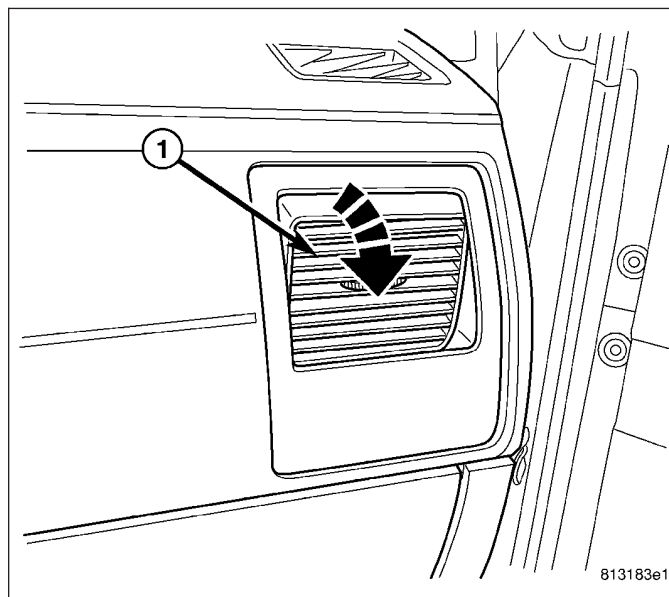
1. Using a trim stick or another suitable wide flat-bladed tool (1), gently pry on both sides of the outboard instrument panel air outlet(s) (2) until the air outlet snap clip retainers are released from the face of the instrument panel (3).
2. Gently slide the air outlet(s) rearward to release the top of the outlet (demister outlet) from the instrument panel.



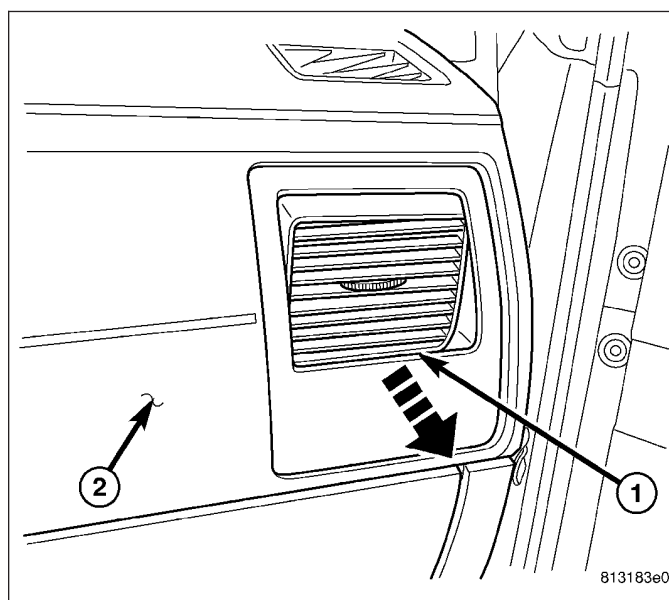
## AIR OUTLET - DODGE

**Note:** Only the outboard passenger side instrument panel air outlet can be serviced separately. For service of the other instrument panel air outlets refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL and to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL CENTER BEZEL - REMOVAL.

1. Rotate the top of the outboard passenger side air outlet barrel (1) downwards.



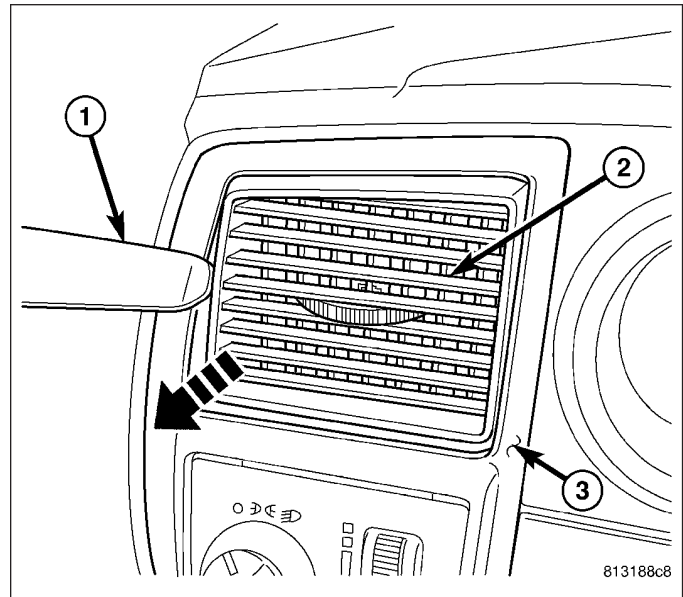
2. Gently pull out on the bottom edge of the air outlet (1) to release the snap clip retainers that secure the outlet to the instrument panel (2).
3. Remove the air outlet from the instrument panel.



## AIR OUTLET BARRELS - DODGE

**Note:** The instrument panel air outlet barrels are retained to the pivots within the air outlets by a snap fit.

1. Using a trim stick or another suitable wide flat-bladed tool (1), gently pry the air outlet barrel(s) (2) out of the instrument panel air outlet(s) (3) as required.



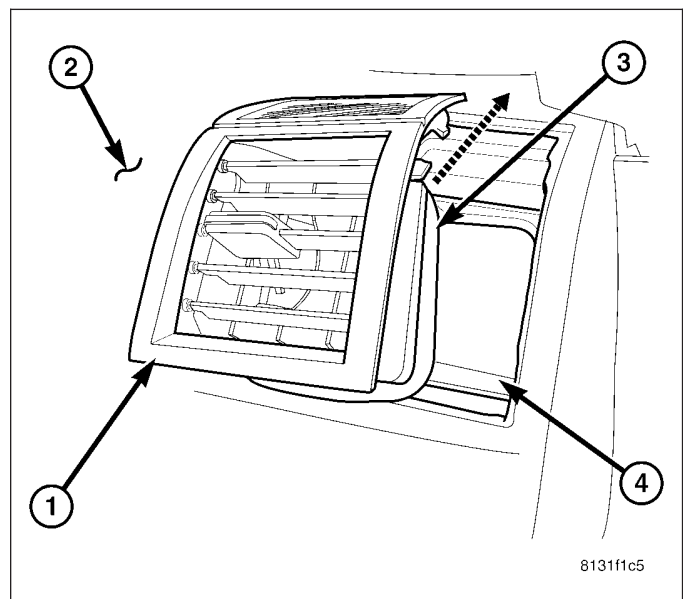
## INSTALLATION

### AIR OUTLET - CHRYSLER

1. Position the outboard air outlet (1) into its location on the instrument panel (2).

**Note:** Make sure that the air outlet is properly aligned to the duct within the instrument panel opening and that the foam seal on the outlet is properly installed.

2. Align the air outlet foam seal (3) with the duct in the instrument panel (4) and slide the top portion of the air outlet into the instrument panel top pad. Gently push on the sides of the air outlet until the snap clip retainers on the outlet are fully engaged to the instrument panel.



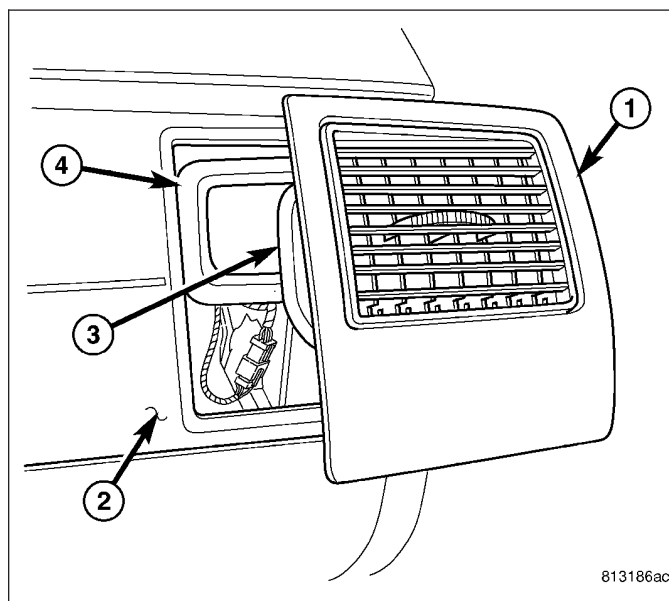


## AIR OUTLET - DODGE

1. Position the air outlet (1) into it's location on the outboard passenger side of the instrument panel (2).

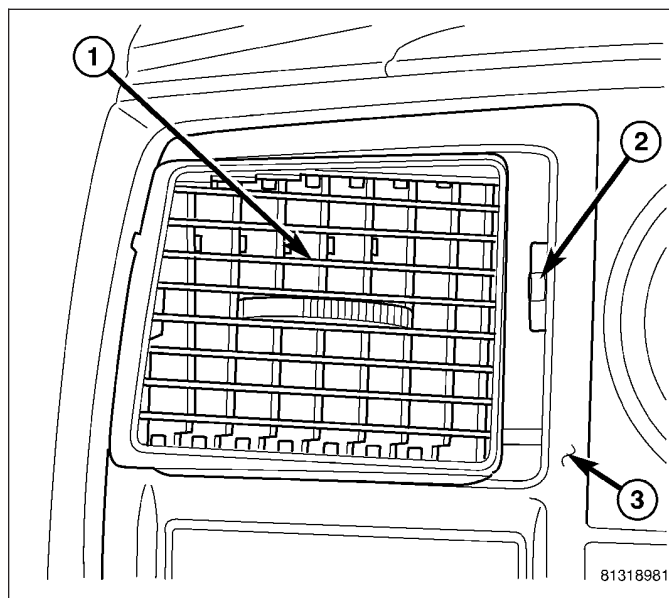
**Note:** Make sure that the air outlet is properly aligned to the duct within the instrument panel opening and that the foam seal on the outlet is properly installed.

2. Align the air outlet foam seal (3) with the duct in the instrument panel (4) and gently push on the air outlet until the snap clip retainers on the outlet are fully engaged to the instrument panel.



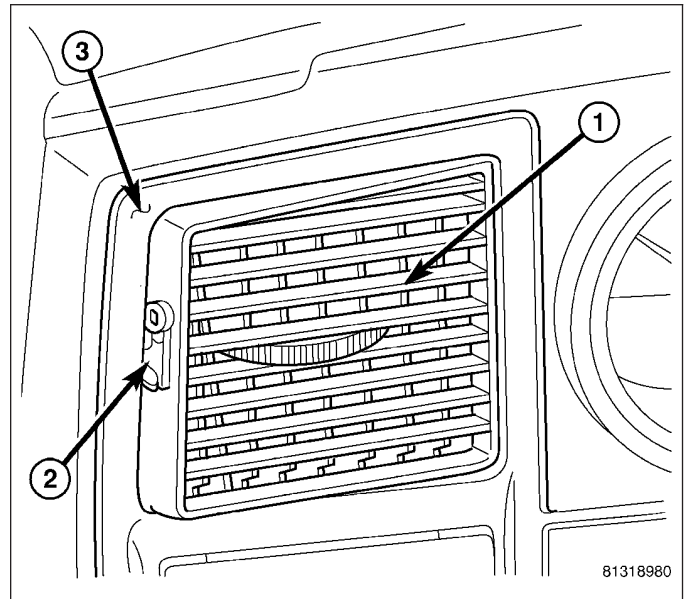
## AIR OUTLET BARRELS - DODGE

1. Install the air outlet barrel (1) onto the pivot shaft (2) on the right side of the instrument panel air outlet (3).





2. Gently push the air outlet barrel (1) onto the pivot shaft (2) on the left side of the instrument panel air outlet (3).



## PLUMBING

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## PLUMBING

### DESCRIPTION

**CAUTION:** The system must be completely empty before opening any fitting or connection in the refrigeration system. Open fittings with caution even after the system has been emptied. If any pressure is noticed as a fitting is loosened, retighten fitting and evacuate the system again.

The use of correct wrenches when making connections is very important. Improper wrenches or improper use of wrenches can damage the fittings.

The internal parts of the A/C system will remain stable as long as moisture-free refrigerant and refrigerant oil is used. Abnormal amounts of dirt, moisture or air can upset the chemical stability. This may cause operational troubles or even serious damage if present in more than very small quantities. Before disconnecting a refrigerant line or hose, clean the outside of the fittings thoroughly to prevent contamination from entering the refrigerant system.

When opening a refrigeration system, have everything you will need to repair the system ready to minimize the amount of time the system is opened. Cap or plug all refrigerant line fittings as soon as they are opened. This will help prevent the entrance of dirt and moisture. All new lines and components should be capped or sealed until they are ready to be used. Before connecting a refrigerant line or hose, clean the outside of the fittings thoroughly to prevent contamination from entering the refrigerant system.

All tools, including the refrigerant dispensing manifold, manifold gauge set and test hoses should be kept clean and dry.

The A/C refrigerant lines and hoses are used to carry the refrigerant between the various A/C system components. The refrigerant lines and hoses for the R-134a system on this vehicle consist of a barrier-hose design with a nylon tube sandwiched between rubber layers. The nylon tube helps to contain the R-134a refrigerant, which has a smaller molecular structure than R-12 refrigerant. The ends of the refrigerant lines are made from lightweight aluminum or steel, and commonly use braze-less fittings.

Any kinks or sharp bends in the refrigerant lines and hoses will reduce the capacity of the entire A/C system and can reduce the flow of refrigerant in the system. The radius of all bends in the flexible hose refrigerant lines should be at least ten times the diameter of the hose and the refrigerant lines should be routed so they are at least 80 millimeters (3 inches) away from the exhaust manifold(s) and exhaust pipe(s).

### OPERATION

High pressures are produced in the refrigerant system when the A/C compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

The refrigerant lines and hoses are coupled to other A/C system components with block-type fittings. A flat steel gasket with an integral O-ring (dual plane seal) is used to mate the refrigerant line fittings with A/C system components to ensure the integrity of the refrigerant system.

The refrigerant lines and hoses cannot be repaired and, if faulty or damaged, they must be replaced.

## WARNING

### ENGINE COOLING SYSTEM

**WARNING:** The engine cooling system is designed to develop internal pressures of 97 to 123 kilopascals (14 to 18 pounds per square inch). Do not remove or loosen the coolant pressure cap, cylinder block drain plugs, radiator drain, radiator hoses, heater hoses, or hose clamps while the engine cooling system is hot and under pressure. Allow the vehicle to cool for a minimum of 15 minutes before opening the cooling system for service. Failure to observe this warning can result in serious burns from the heated engine coolant.

### A/C SYSTEM

**WARNING:** The A/C system contains refrigerant under high pressure. Repairs should only be performed by qualified service personnel. Severe personal injury or death may result from improper service procedures. Avoid breathing the refrigerant and refrigerant oil vapor or mist. Exposure may irritate the eyes, nose, and/or throat. Wear eye protection when servicing the air conditioning refrigerant system. Serious eye injury can result from direct contact with the refrigerant. If eye contact occurs, seek medical attention immediately. Do not expose the refrigerant to open flame. Poisonous gas is created when refrigerant is burned. An electronic leak detector is recommended.

If accidental system discharge occurs, ventilate the work area before resuming service. Large amounts of refrigerant released in a closed work area will displace the oxygen and cause suffocation and death.

The evaporation rate of R-134a refrigerant at average temperature and altitude is extremely high. As a result, anything that comes in contact with the refrigerant will freeze. Always protect the skin or delicate objects from direct contact with the refrigerant.

The R-134a service equipment or the vehicle refrigerant system should not be pressure tested or leak tested with compressed air. Some mixtures of air and R-134a have been shown to be combustible at elevated pressures. These mixtures are potentially dangerous, and may result in fire or explosion causing property damage, personal injury or death.

### CAUTION - A/C SYSTEM

**CAUTION:** Liquid refrigerant is corrosive to metal surfaces. Follow the operating instructions supplied with the service equipment being used.

Never add R-12 to a refrigerant system designed to use R-134a and do not use R-12 equipment or parts on the R-134a system. Damage to the system will result.

R-12 refrigerant oil must not be mixed with R-134a refrigerant oil. They are not compatible and damage to the system will result.

Do not overcharge the refrigerant system. Overcharging will cause excessive compressor head pressure and can cause noise and system failure.

Recover the refrigerant before opening any fitting or connection. Open the fittings with caution, even after the system has been discharged. Never open or loosen a connection before recovering the refrigerant.

If equipped, do not remove the secondary retention clip from any spring-lock coupler connection while the refrigerant system is under pressure. Recover the refrigerant before removing the secondary retention clip. Open the fittings with caution, even after the system has been discharged. Never open or loosen a connection before recovering the refrigerant.

Do not open the refrigerant system or uncap a replacement component until you are ready to service the system. This will prevent contamination in the system. Before disconnecting a component, clean the outside of the fittings thoroughly to prevent contamination from entering the refrigerant system. Immediately after disconnecting a component from the refrigerant system, seal the open fittings with a cap or plug.

Refrigerant oil will absorb moisture from the atmosphere if left uncapped. Do not open a container of refrigerant oil until you are ready to use it. Replace the cap on the oil container immediately after using. Store refrigerant oil only in a clean, airtight, and moisture-free container.

Keep service tools and the work area clean. Contamination of the refrigerant system must be avoided.

**CAUTION:** The use of A/C system sealers may result in damage to A/C refrigerant recovery/evacuation/re-charging equipment and/or A/C systems.

Many federal, state/provincial and local regulations prohibit the recharge of A/C systems with known leaks. DaimlerChrysler recommends the detection of A/C system leaks through the use of approved leak detectors and fluorescent leak detection dyes.

Vehicles found with A/C system sealers should be treated as contaminated and replacement of the entire A/C refrigerant system is recommended. A/C systems found to be contaminated with A/C system sealers, A/C stop-leak products or seal conditioners voids the warranty for the A/C system.

## DIAGNOSIS AND TESTING

### REFRIGERANT SYSTEM LEAKS

**WARNING:** R-134a service equipment or vehicle A/C system should not be pressure tested or leak tested with compressed air. Mixture of air and R-134a can be combustible at elevated pressures. These mixtures are potentially dangerous and may result in fire or explosion causing property damage, personal injury or death.

Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. Use only approved service equipment meeting SAE requirements to discharge R-134a system. If accidental system discharge occurs, ventilate work area before resuming service.

If the A/C system is not cooling properly, determine if the refrigerant system is fully charged with R-134a. This is accomplished by performing a system Charge Level-Check or Fill. If while performing this test A/C liquid line pressure is less than 345 kPa (50 psi) proceed to System Empty procedure. If liquid line pressure is greater than 345 kPa (50 psi) proceed to System Low procedure. If the refrigerant system is empty or low in refrigerant charge, a leak at any line fitting or component seal is likely. A review of the fittings, lines and components for oily residue is an indication of the leak location. To detect a leak in the refrigerant system, perform one of the following procedures as indicated by the symptoms.

#### SYSTEM EMPTY

1. Evacuate the refrigerant system to the lowest degree of vacuum possible (approximately 28 in Hg.). Determine if the system holds a vacuum for 15 minutes. If vacuum is held, a leak is probably not present. If system will not maintain vacuum level, proceed to Step 2.
2. Prepare a 0.284 Kg. (10 oz.) refrigerant charge to be injected into the refrigerant system.
3. Connect and dispense 0.284 Kg. (10 oz.) of refrigerant into the evacuated refrigerant system.
4. Proceed to Step 2 of System Low procedure.

#### SYSTEM LOW

1. Determine if there is any R-134a refrigerant in the system.
2. Position the vehicle in a wind free work area. This will aid in detecting small leaks.
3. Bring the refrigerant system up to operating temperature and pressure. This is done by allowing the engine to run for five minutes with the A/C system set to the following:
  - Transmission in Park or Neutral with parking brake set
  - Engine idling
  - Mode control set to the outside air position
  - Blower control set to the high speed position
  - A/C set to the ON position
  - All windows open

**CAUTION:** A leak detector only designed for R-12 refrigerant will not detect leaks in a R-134a refrigerant system.

4. Shut the vehicle Off and wait 2-7 minutes. Then use an electronic leak detector that is designed to detect R-134a refrigerant and search for leaks. Fittings, lines or components that appear to be oily usually indicate a refrigerant leak. To inspect the A/C evaporator for leaks, insert the leak detector probe into the drain tube opening or an air outlet. A dye for R-134a is available to aid in leak detection. Use only DaimlerChrysler approved refrigerant dye.

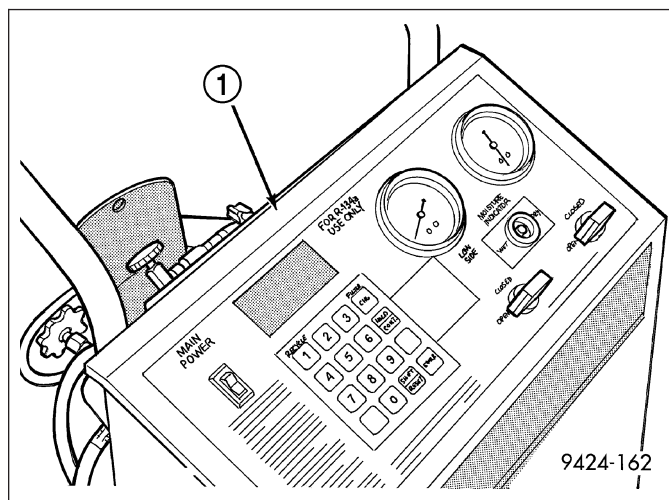
## STANDARD PROCEDURE

### REFRIGERANT SYSTEM SERVICE EQUIPMENT

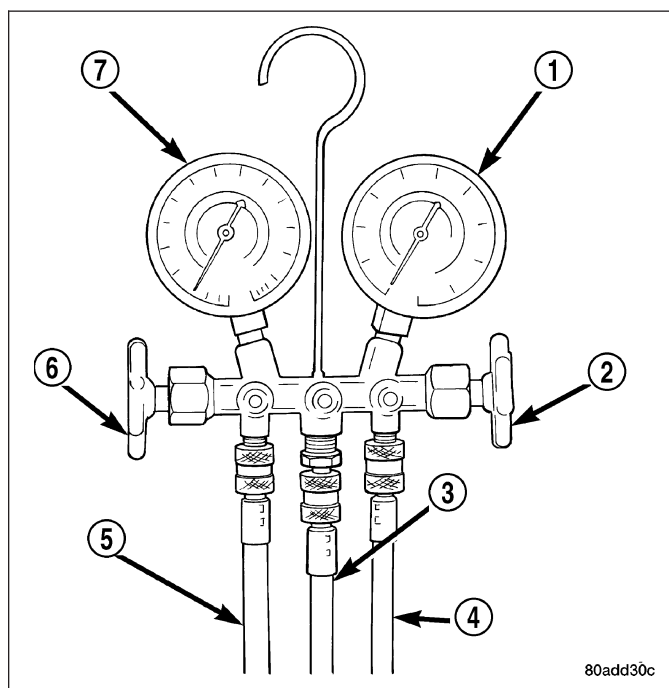
**WARNING:** Eye protection must be worn when servicing an A/C refrigerant system. Turn all valves off (rotate clockwise) on the equipment being used before connecting or disconnecting service equipment from the refrigerant system. Failure to observe these warnings may result in personal injury or death.

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING - A/C PLUMBING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - A/C PLUMBING). Failure to follow the warnings and cautions could result in possible personal injury or death.

When servicing the A/C system, a R-134a refrigerant recovery/recycling/charging station that meets SAE standard J2210 must be used (1). Contact an automotive service equipment supplier for refrigerant recovery/recycling/charging equipment. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.



A manifold gauge set (1) may be needed with some recovery/recycling/charging equipment. The manifold gauge set should have manual shut-off valves (2 and 6), or automatic back-flow valves located at the service port connector end of the manifold gauge set hoses (4 and 5). This will prevent refrigerant from being released into the atmosphere.



### MANIFOLD GAUGE SET CONNECTIONS

**CAUTION:** Do not use an R-12 manifold gauge set on an R-134a system. The refrigerants are not compatible and system damage will result.



**RECOVERY/RECYCLING/EVACUATION/CHARGING HOSE** – The center manifold hose (Yellow, or White, with Black stripe) (3) is used to recover, evacuate, and charge the refrigerant system. When the low or high pressure valves on the manifold gauge set are opened, the refrigerant in the system will escape through this hose.

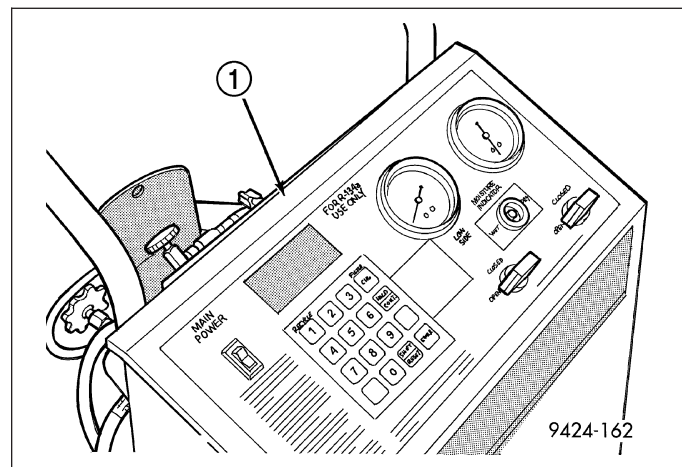
**HIGH PRESSURE GAUGE HOSE** – The high pressure hose (Red with Black stripe) (4) attaches to the high side service port. This service port is located on the A/C liquid line next to the left shock tower. On this model, an A/C pressure transducer is also installed on the liquid line. A/C high-side pressures can be read using a scan tool. Refer to 9 - Engine Electrical Diagnostics for more information.

**LOW PRESSURE GAUGE HOSE** – The low pressure hose (Blue with Black stripe) (5) attaches to the low side service port. This service port is located on the A/C suction line behind the left shock tower.

## REFRIGERANT SYSTEM RECOVERY

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION). Failure to follow the warnings and cautions could result in possible personal injury or death.

An R-134a refrigerant recovery/recycling/charging station (1) that meets SAE standard J2210 must be used to recover the refrigerant from the R-134a refrigerant system. Refer to the operating instructions supplied by the equipment manufacturer for the proper care and use of this equipment.



## REFRIGERANT SYSTEM EVACUATE

**Note:** Special effort must be used to prevent moisture from entering the A/C system oil. Moisture in the oil is very difficult to remove and will cause a reliability problem with the compressor.

If an A/C compressor designed to use R-134a refrigerant is left open to the atmosphere for an extended period of time. It is recommended that the refrigerant oil be drained and replaced with new oil or a new A/C compressor be used. This will eliminate the possibility of contaminating the refrigerant system.

If the refrigerant system has been open to the atmosphere, it must be evacuated before the system can be filled. Moisture and air mixed with the refrigerant will raise the compressor head pressure above acceptable operating levels. This will reduce the performance of the A/C system and damage the A/C compressor. Moisture will boil at near room temperature when exposed to vacuum. To evacuate the refrigerant system:

**Note:** When connecting the service equipment coupling to the line fitting, verify that the valve of the coupling is fully closed. This will reduce the amount of effort required to make the connection.

1. Recover the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Connect a suitable charging station, refrigerant recovery machine or a manifold gauge set with vacuum pump and refrigerant recovery equipment (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM SERVICE EQUIPMENT).
3. Open the suction and discharge valves and start the vacuum pump. The vacuum pump should run a minimum of 45 minutes prior to charge to eliminate all moisture in system. When the suction gauge reads -88 kPa (- 26 in. Hg) vacuum or greater for 30 minutes, close all valves and turn off vacuum pump. If the system fails to reach

specified vacuum, the refrigerant system likely has a leak that must be corrected. If the refrigerant system maintains specified vacuum for at least 30 minutes, start the vacuum pump, open the suction and discharge valves. Then allow the system to evacuate an additional 10 minutes.

4. Close all valves. Turn off and disconnect the vacuum pump.
5. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

## REFRIGERANT SYSTEM CHARGE

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING - A/C PLUMBING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - A/C PLUMBING). Failure to follow the warnings and cautions could result in possible personal injury or death.

**Note:** Always refer to the underhood HVAC Specification Label for the refrigerant fill specification of the vehicle being serviced.

After all refrigerant system leaks have been repaired and the refrigerant system has been evacuated, a refrigerant charge can be injected into the system. For the proper amount of the refrigerant charge, refer to the underhood HVAC Specification Label.

A R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used to charge the refrigerant system with R-134a refrigerant. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

## CHARGING PROCEDURE

**CAUTION:** A small amount of refrigerant oil is removed from the A/C system each time the refrigerant system is recovered and evacuated. Before charging the A/C system, you **MUST** replenish any oil lost during the recovery process. Refer the equipment manufacturer instructions for more information.

1. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
2. A manifold gauge set and an R-134a refrigerant recovery/recycling/charging station that meets SAE standard J2210 should be connected to the refrigerant system.
3. Measure the proper amount of refrigerant and heat it to 52° C (125° F) with the charging station. See the operating instructions supplied by the equipment manufacturer for proper use of this equipment.
4. Open both the suction and discharge valves, then open the charge valve to allow the heated refrigerant to flow into the system.
5. When the transfer of refrigerant has stopped, close both the suction and discharge valves.
6. If all of the refrigerant charge did not transfer from the dispensing device, open all of the windows in the vehicle and set the heating-A/C system controls so that the A/C compressor is engaged and the blower motor is operating at its lowest speed setting. Run the engine at a steady high idle (about 1400 rpm). If the A/C compressor does not engage, test the compressor clutch control circuit and repair as required.
7. Open the low-side valve to allow the remaining refrigerant to transfer to the refrigerant system.

**WARNING:** Take care not to open the discharge (high pressure) valve at this time. Failure to follow this warning could result in possible personal injury or death.

8. Disconnect the charging station and manifold gauge set from the refrigerant system service ports.
9. Reinstall the caps onto the refrigerant system service ports.



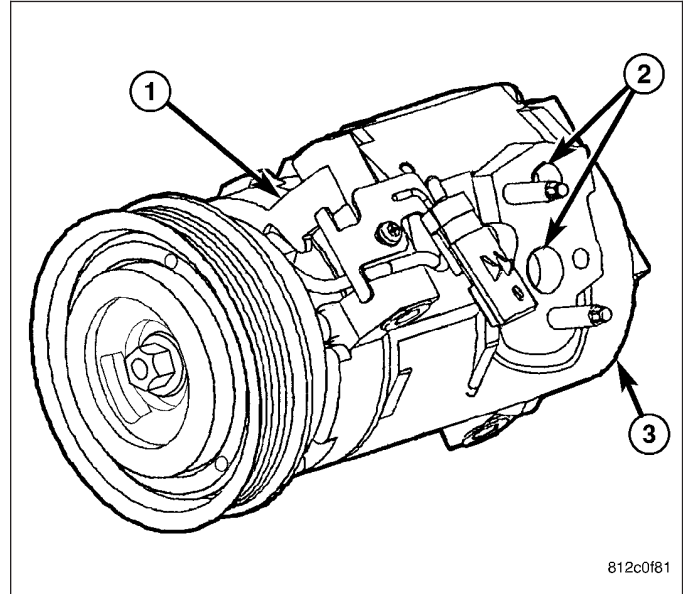
## COMPRESSOR-A/C

### DESCRIPTION

#### A/C COMPRESSOR

The A/C system uses a Denso 10S17C ten cylinder, double-acting swash plate-type A/C compressor (1). This A/C compressor has a fixed displacement of 170 cubic centimeters (10.374 cubic inches), and has both the suction and discharge ports (2) located on the cylinder head (3) at the rear of the compressor.

A label identifying the use of R-134a refrigerant is located on the A/C compressor.



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#### HIGH PRESSURE RELIEF VALVE

A high pressure relief valve is located on the compressor cylinder head, which is at the rear of the A/C compressor. This mechanical valve is designed to vent refrigerant from the A/C system to protect against damage to the A/C compressor and other A/C system components, caused by condenser air flow restriction or an overcharge of refrigerant.

### OPERATION

#### A/C COMPRESSOR

The A/C compressor is driven by the engine through an electric clutch, drive pulley and belt arrangement. The A/C compressor is lubricated by refrigerant oil that is circulated throughout the refrigerant system with the refrigerant.

The A/C compressor draws in low-pressure refrigerant vapor from the A/C evaporator through its suction port. It then compresses the refrigerant into a high-pressure, high-temperature refrigerant vapor, which is then pumped to the A/C condenser through the compressor discharge port.

The A/C compressor cannot be repaired. If faulty or damaged, the A/C compressor assembly must be replaced. The compressor clutch, pulley and bearing assembly, and clutch field coil are available for service.

#### HIGH PRESSURE RELIEF VALVE

The high pressure relief valve vents refrigerant from the A/C system when a discharge pressure of 3445 to 4135 kPa (500 to 600 psi) or above is reached. The high pressure relief valve closes with a minimum discharge pressure of 2756 kPa (400 psi) is reached.

The high pressure relief valve vents only enough refrigerant to reduce the A/C system pressure, and then re-seats itself. The majority of the refrigerant is conserved in the A/C system. If the high pressure relief valve vents refrigerant, it does not mean the valve is faulty.

The high pressure relief valve is factory-calibrated and cannot be adjusted or repaired, and must not be removed or otherwise disturbed. The valve is only serviced as a part of the A/C compressor.

## DIAGNOSIS AND TESTING

### A/C COMPRESSOR

When investigating an A/C system related noise, you must first know the conditions under which the noise occurs. These conditions include: weather, vehicle speed, transmission in gear or neutral, engine speed, engine temperature, and any other special conditions. Noises that develop during A/C operation can often be misleading. For example: What sounds like a failed front engine bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets or a loose compressor clutch assembly.

Drive belts are speed sensitive. At different engine speeds and depending upon drive belt tension, drive belts can develop noises that are mistaken for an A/C compressor noise. Improper drive belt tension can cause a misleading noise when the compressor clutch is engaged, which may not occur when the compressor clutch is disengaged. Check the accessory drive belt condition and tension as described in Cooling before beginning this procedure.

1. Select a quiet area for testing. Duplicate the complaint conditions as much as possible. Turn the A/C compressor On and Off several times to clearly identify the compressor noise. Listen to the A/C compressor while the clutch is engaged and disengaged. Probe the A/C compressor with an engine stethoscope or a long screwdriver with the handle held to your ear to better localize the source of the noise.
2. Loosen all of the compressor mounting hardware and retighten. Check the compressor clutch retainer. Be certain that the clutch field coil is mounted securely to the A/C compressor, and that the clutch plate and pulley are properly aligned and have the correct air gap (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/CLUTCH-A/C COMPRESSOR - INSTALLATION).
3. To duplicate a high-ambient temperature conditions (high head pressure), restrict the air flow through the A/C condenser. Install a manifold gauge set or a scan tool to be certain that the discharge pressure does not exceed 2760 kPa (400 psi).
4. Check the refrigerant system plumbing for incorrect routing, rubbing or interference, which can cause unusual noises. Also check the refrigerant lines and hoses for kinks or sharp bends that will restrict refrigerant flow, which can cause noises (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - DESCRIPTION - REFRIGERANT LINES)
5. If the noise is from opening and closing of the high pressure relief valve, recover, evacuate and recharge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY), (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE). If the high pressure relief valve still does not seat properly, replace the A/C compressor (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/COMPRESSOR-A/C - REMOVAL).

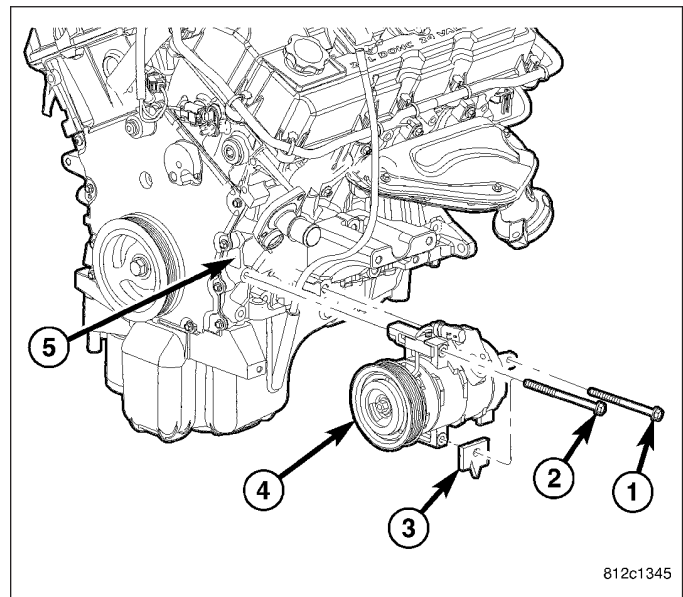
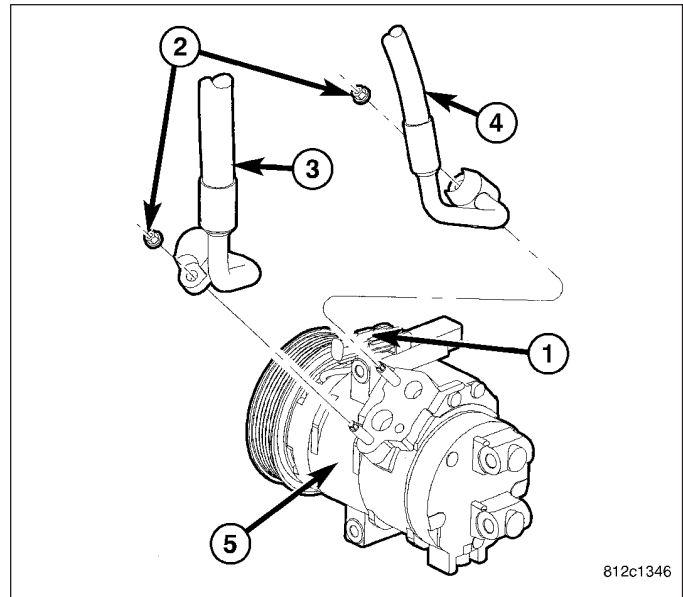
## REMOVAL

### 2.7L ENGINE

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING - A/C PLUMBING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - A/C PLUMBING). Failure to follow the warnings and cautions could result in possible personal injury or death.

**Note:** The A/C compressor may be removed and repositioned without disconnecting the refrigerant lines or discharging the refrigerant system. Discharging is not necessary if servicing the compressor clutch, clutch coil, engine, engine cylinder head or the generator.

1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
4. Remove the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/BELTS-DRIVE - REMOVAL).
5. Disconnect the wire harness connector from the A/C compressor clutch coil connector (1).
6. Remove the nuts (2) that secure the A/C suction line (3) and A/C discharge line (4) to the A/C compressor (5).
7. Disconnect the suction and discharge lines from the A/C compressor and remove and discard the dual plane seals.
8. Install plugs in, or tape over all of the opened refrigerant line fittings and the compressor ports.
9. Raise and support the vehicle.
10. Remove the front end splash shield (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - REMOVAL).
11. Remove the bolts (1 and 2) that secure the automatic transmission cooler line bracket (3) and the A/C compressor (4) to the cylinder block (5).
12. Position the cooler lines out of the way and remove the A/C compressor from the engine compartment.

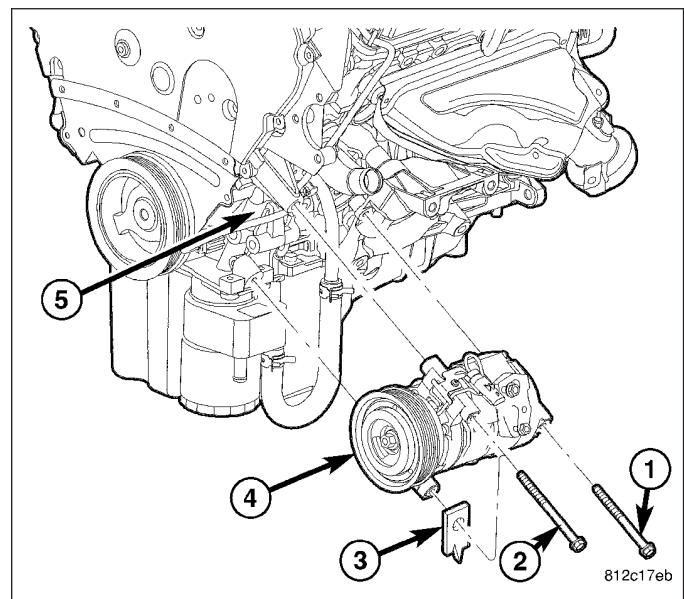
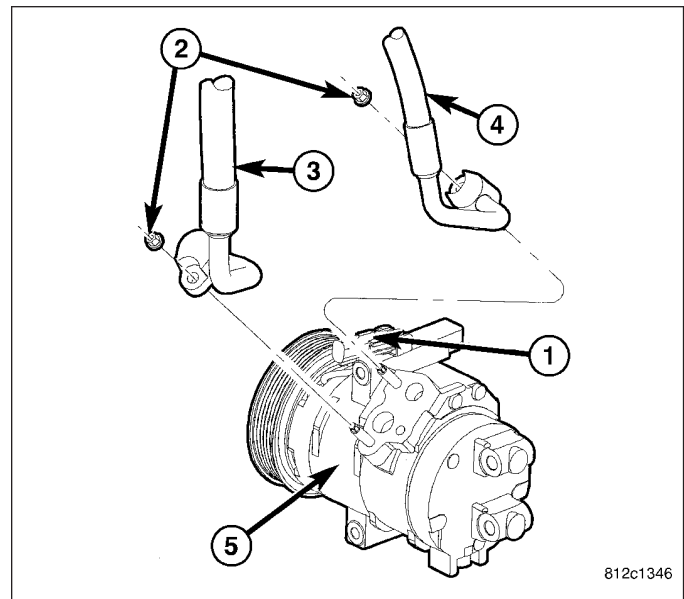


### 3.5L ENGINE

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING - A/C PLUMBING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - A/C PLUMBING). Failure to follow the warnings and cautions could result in possible personal injury or death.

**Note:** The A/C compressor may be removed and repositioned without disconnecting the refrigerant lines or discharging the refrigerant system. Discharging is not necessary if servicing the compressor clutch, clutch coil, engine, engine cylinder head or the generator.

1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
4. Remove the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/BELTS-DRIVE - REMOVAL).
5. Disconnect the wire harness connector from the A/C compressor clutch coil connector (1).
6. Remove the nuts (2) that secure the A/C suction line (3) and A/C discharge line (4) to the A/C compressor (5).
7. Disconnect the suction and discharge lines from the A/C compressor and remove and discard the dual plane seals.
8. Install plugs in, or tape over all of the opened refrigerant line fittings and the compressor ports.
9. Raise and support the vehicle.
10. Remove the front end splash shield (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - REMOVAL).
11. Remove the bolts (1 and 2) that secure the automatic transmission cooler line bracket (3) and the A/C compressor (4) to the cylinder block (5).
12. Position the cooler lines out of the way and remove the A/C compressor from the engine compartment.

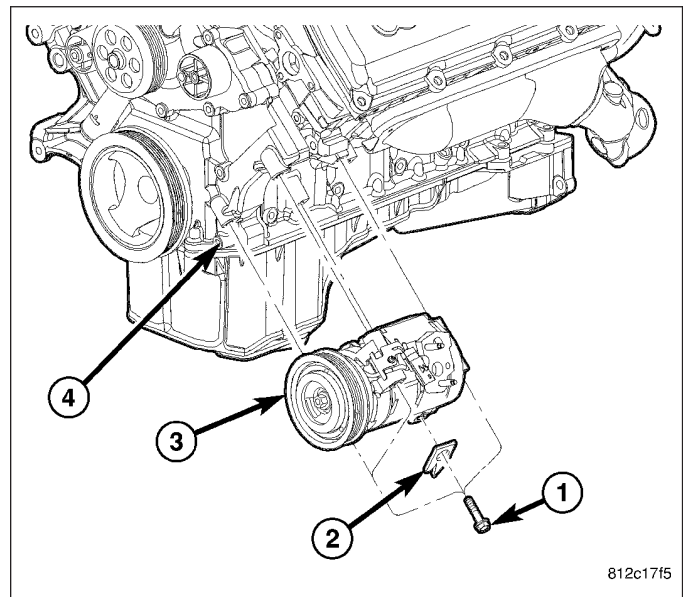
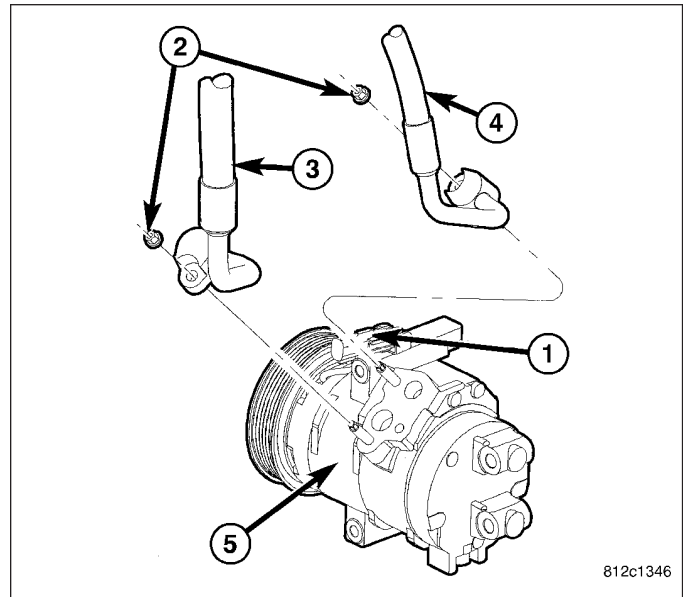


## 5.7L ENGINE

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING - A/C PLUMBING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - A/C PLUMBING). Failure to follow the warnings and cautions could result in possible personal injury or death.

**Note:** The A/C compressor may be removed and repositioned without disconnecting the refrigerant lines or discharging the refrigerant system. Discharging is not necessary if servicing the compressor clutch, clutch coil, engine, engine cylinder head or the generator.

1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
4. Remove the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/BELTS-DRIVE - REMOVAL).
5. Disconnect the wire harness connector from the A/C compressor clutch coil connector (1).
6. Remove the nuts (2) that secure the A/C suction line (3) and A/C discharge line (4) to the A/C compressor (5).
7. Disconnect the suction and discharge lines from the A/C compressor and remove and discard the dual plane seals.
8. Install plugs in, or tape over all of the opened refrigerant line fittings and the compressor ports.
9. Raise and support the vehicle.
10. Remove the front end splash shield (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - REMOVAL).
11. Remove the bolts (1) that secure the automatic transmission cooler line bracket (2) and the A/C compressor (3) to the cylinder block (4).
12. Position the cooler lines out of the way and remove the A/C compressor from the engine compartment.



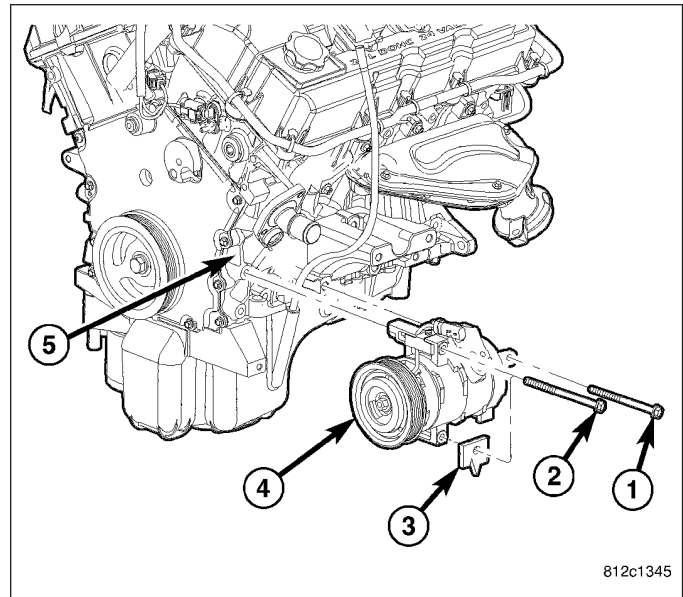
## INSTALLATION

### 2.7L ENGINE

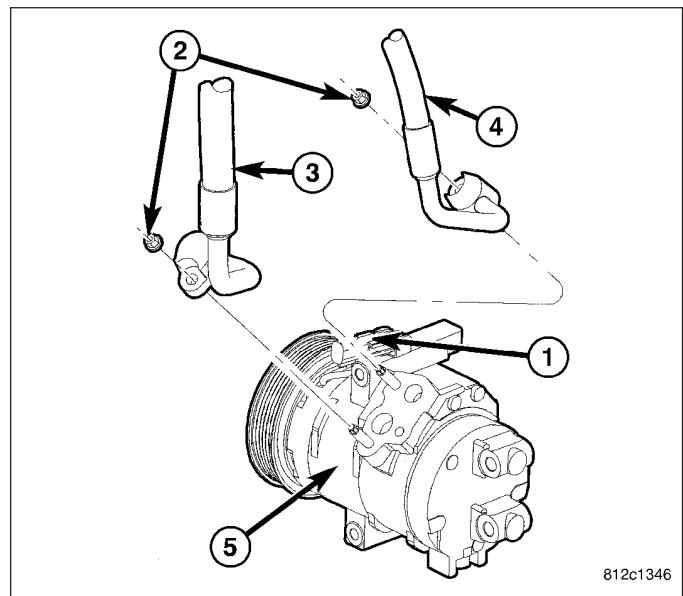
**Note:** Be certain to check the refrigerant oil level if the A/C compressor is being replaced. See Refrigerant Oil Level in this group for the procedures. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.



1. Position the A/C compressor (4) into the engine compartment.
2. Install the bolts (1 and 2) that secure the A/C compressor and the automatic transmission cooler line bracket (3) to the cylinder block (5). Tighten the bolts to 55 N·m (41 ft. lbs.).
3. Install the front end splash shields (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - INSTALLATION).
4. Lower the vehicle.



5. Remove the tape or plugs from the opened fittings on the A/C suction line (3) and the A/C discharge line (4) and the compressor ports.
6. Lubricate the new dual plane seals with clean refrigerant oil and install them onto the suction and the discharge line fittings. Use only the specified seals as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
7. Install the suction and discharge lines onto the A/C compressor (5).
8. Install the nuts (2) that secure the suction and discharge lines to the A/C compressor. Tighten the nuts to 23 N·m (17 ft. lbs.).
9. Connect the wire harness connector to the A/C compressor clutch coil connector (1).
10. Install the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/BELTS-DRIVE - INSTALLATION).

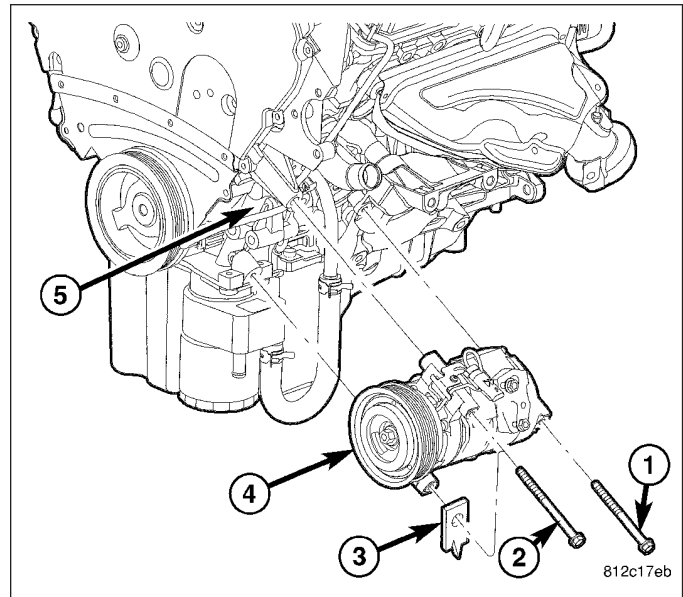


11. Install the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
12. Reconnect the negative battery cable.
13. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
14. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

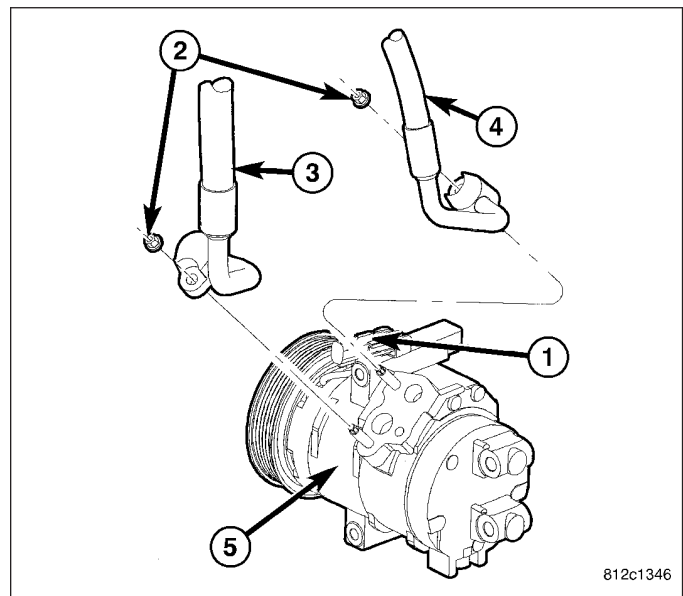
### 3.5L ENGINE

**Note:** Be certain to check the refrigerant oil level if the A/C compressor is being replaced. See Refrigerant Oil Level in this group for the procedures. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

1. Position the A/C compressor (4) into the engine compartment.
2. Install the bolts (1 and 2) that secure the A/C compressor and the automatic transmission cooler line bracket (3) to the cylinder block (5). Tighten the bolts to 55 N·m (41 ft. lbs.).
3. Install the front end splash shields (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - INSTALLATION).
4. Lower the vehicle.



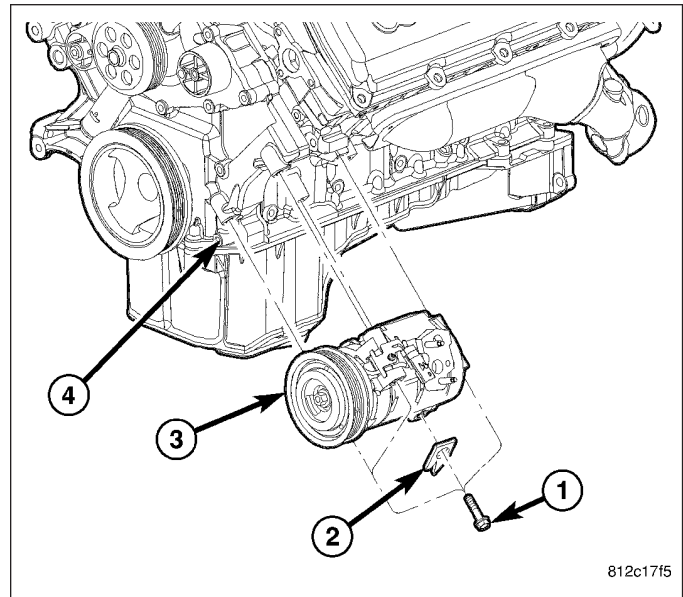
5. Remove the tape or plugs from the opened fittings on the A/C suction line (3) and the A/C discharge line (4) and the compressor ports.
6. Lubricate new dual plane seals with clean refrigerant oil and install them onto the suction and the discharge line fittings. Use only the specified seals as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
7. Install the suction and discharge lines onto the A/C compressor (5).
8. Install the nuts (2) that secure the suction and discharge lines to the A/C compressor. Tighten the nuts to 23 N·m (17 ft. lbs.).
9. Connect the wire harness connector to the A/C compressor clutch coil connector (1).
10. Install the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/BELTS-DRIVE - INSTALLATION).
11. Install the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
12. Reconnect the negative battery cable.
13. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
14. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).



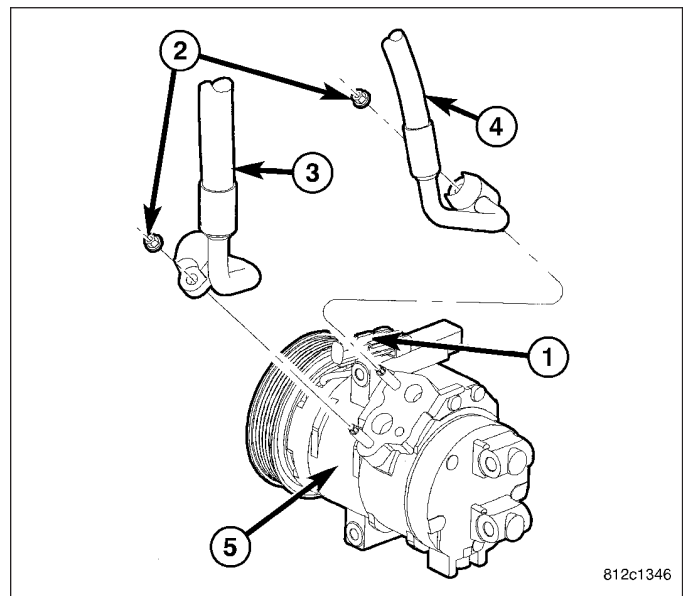
## 5.7L ENGINE

**Note:** Be certain to check the refrigerant oil level if the A/C compressor is being replaced. See Refrigerant Oil Level in this group for the procedures. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

1. Position the A/C compressor (3) into the engine compartment.
2. Install the bolts (1) that secure the A/C compressor and the automatic transmission cooler line bracket (2) to the cylinder block (4). Tighten the bolts to 55 N·m (41 ft. lbs.).
3. Install the front end splash shields (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - INSTALLATION).
4. Lower the vehicle.



5. Remove the tape or plugs from the opened fittings on the A/C suction line (3) and the A/C discharge line (4) and the compressor ports.
6. Lubricate new dual plane seals with clean refrigerant oil and install them onto the suction and the discharge line fittings. Use only the specified seals as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
7. Install the suction and discharge lines onto the A/C compressor (5).
8. Install the nuts (2) that secure the suction and discharge lines to the A/C compressor. Tighten the nuts to 23 N·m (17 ft. lbs.).
9. Connect the wire harness connector to the A/C compressor clutch coil connector (1).
10. Install the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/BELTS-DRIVE - INSTALLATION).



11. Install the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
12. Reconnect the negative battery cable.
13. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
14. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

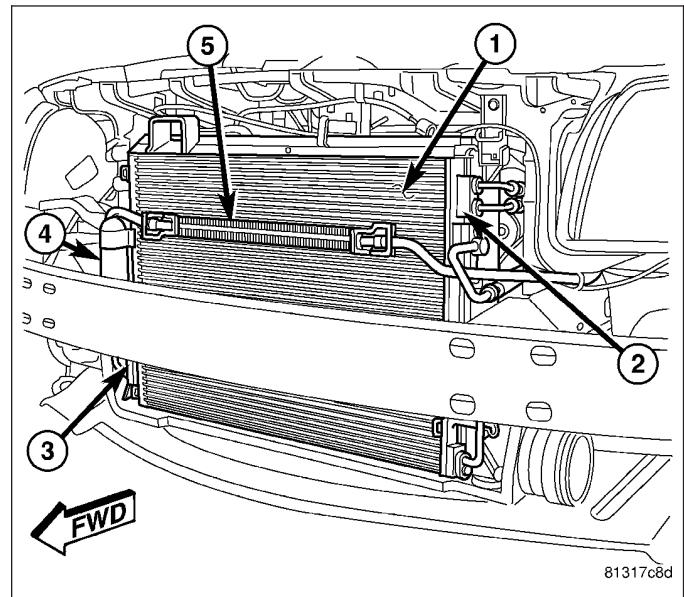


## CONDENSER-A/C

### DESCRIPTION

The A/C condenser (1) is located in the front of the engine compartment behind the front fascia. The A/C condenser is a heat exchanger that allows the high-pressure refrigerant gas being discharged by the A/C compressor to give up its heat to the air passing over the condenser fins, which causes the refrigerant to cool and change to a liquid state.

The A/C condenser is equipped with an integral automatic transmission cooler (2), a tapping block (3) for the receiver/drier (4) and mounting provisions for the power steering cooler (5).



### OPERATION

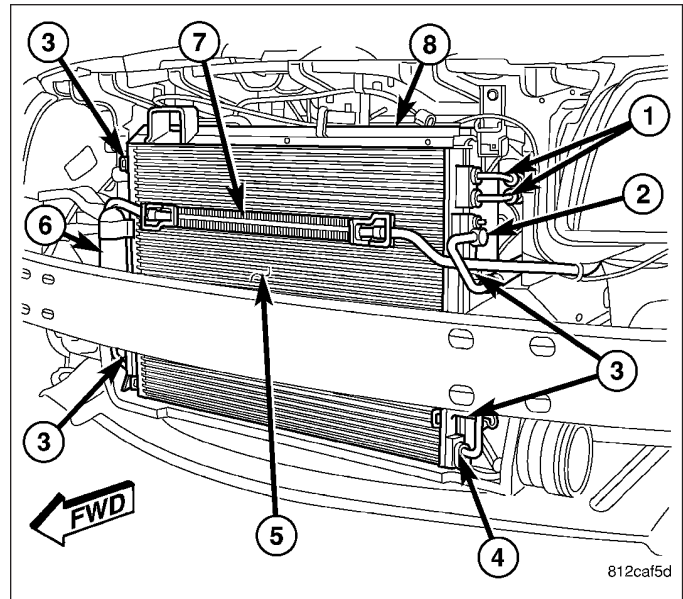
When air passes through the fins of the A/C condenser, the high-pressure refrigerant gas within the A/C condenser gives up its heat. The refrigerant then condenses as it leaves the A/C condenser and becomes a high-pressure liquid. The volume of air flowing over the condenser fins is critical to the proper cooling performance of the A/C system. Therefore, it is important that there are no objects placed in front of the radiator grille openings at the front of the vehicle or foreign material on the condenser fins that might obstruct proper air flow. Also, any factory-installed air seals or shrouds must be properly reinstalled following radiator or A/C condenser service.

The A/C condenser cannot be repaired and, if faulty or damaged, it must be replaced.

### REMOVAL

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING - A/C PLUMBING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - A/C PLUMBING). Failure to follow the warnings and cautions could result in possible personal injury or death.

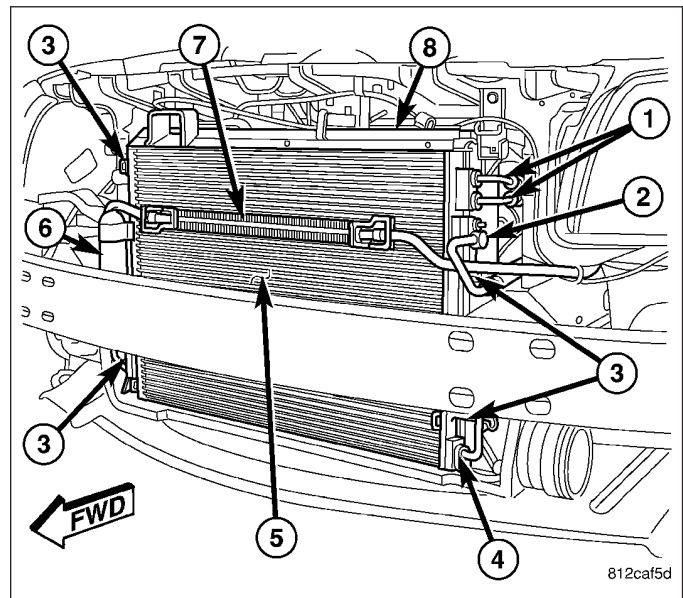
1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the front fascia (Refer to 23 - BODY/EXTERIOR/FRONT FASCIA - REMOVAL).
4. Disconnect the automatic transmission cooler lines (1) from the left end of the A/C condenser (5) (Refer to 7 - COOLING/TRANSMISSION - STANDARD PROCEDURE - TRANSMISSION COOLER LINE QUICK CONNECT FITTING).
5. Install plugs in, or tape over the automatic transmission cooler line fittings and the cooler ports.
6. Disconnect the A/C discharge line (2) and the A/C liquid line (4) from A/C condenser (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/LINE-A/C LIQUID - REMOVAL) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/LINE-A/C DISCHARGE - REMOVAL).
7. Position the power steering fluid cooler (7) out of the way (Refer to 19 - STEERING/PUMP/FLUID COOLER - REMOVAL).
8. Remove the receiver/drier (6) from the A/C condenser (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/RECEIVER/DRIER - REMOVAL).
9. Remove the four bolts (3) that secure A/C condenser to the radiator (8).
10. Carefully tilt the bottom of the A/C condenser forward and lower the condenser out of the vehicle.
11. If required, place the A/C condenser onto a workbench and remove the power steering cooler brackets.



## INSTALLATION

**Note:** If the A/C condenser is being replaced, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

1. If required, install the power steering cooler brackets onto the A/C condenser.
2. Carefully position the A/C condenser (5) onto the radiator (8).
3. Install the four bolts (3) that secure the A/C condenser to the radiator. Tighten the bolts to 5 N·m (45 in. lbs.).
4. Install the receiver/drier (6) onto the A/C condenser (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/RECEIVER / DRIER - INSTALLATION).
5. Install the power steering fluid cooler (7) onto the A/C condenser (Refer to 19 - STEERING/PUMP/FLUID COOLER - INSTALLATION).
6. Connect the A/C discharge line (2) and the A/C liquid line (4) onto the A/C condenser (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/LINE-A/C DISCHARGE - INSTALLATION) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/LINE-A/C LIQUID - INSTALLATION).
7. Remove the tape or plugs from the automatic transmission cooler lines (1) and the cooler ports.



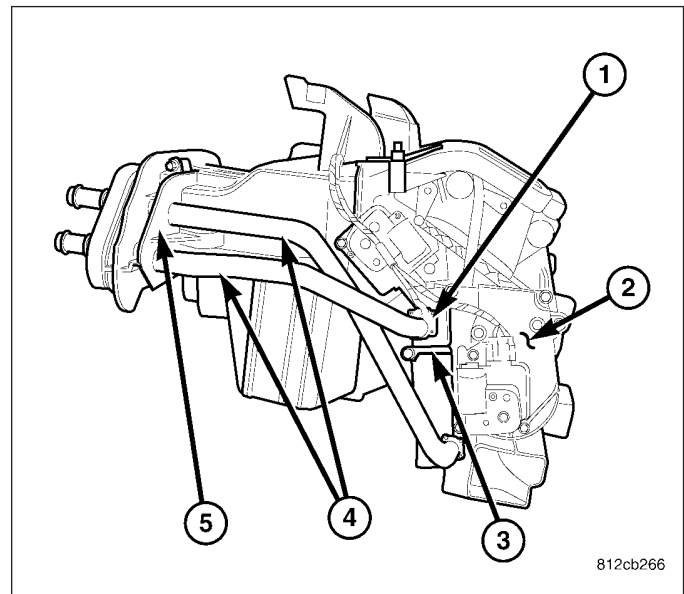
8. Connect the automatic transmission cooler lines to the cooler ports at the top of the A/C condenser (Refer to 7 - COOLING/TRANSMISSION - STANDARD PROCEDURE - TRANSMISSION COOLER LINE QUICK CONNECT FITTING).
9. Install the front fascia (Refer to 23 - BODY/EXTERIOR/FRONT FASCIA - INSTALLATION).
10. Reconnect the negative battery cable.
11. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
12. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).
13. Check the automatic transmission fluid level (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC/FLUID AND FILTER - STANDARD PROCEDURE - CHECK OIL LEVEL). Fill as required (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC /FLUID AND FILTER - STANDARD PROCEDURE - TRANSMISSION FILL).

## CORE-HEATER

### DESCRIPTION

The heater core (1) is mounted into the driver side of HVAC air distribution housing (2), located behind the instrument panel. The heater core is a heat exchanger made of rows of tubes and fins and is secured to the air distribution housing by a plastic retaining bracket (3). The heater core tubes (4) are attached to the side of the heater core and are secured to the HVAC housing by a removable flange (5).

The heater core can be serviced in the vehicle without removing the HVAC housing assembly.



### OPERATION

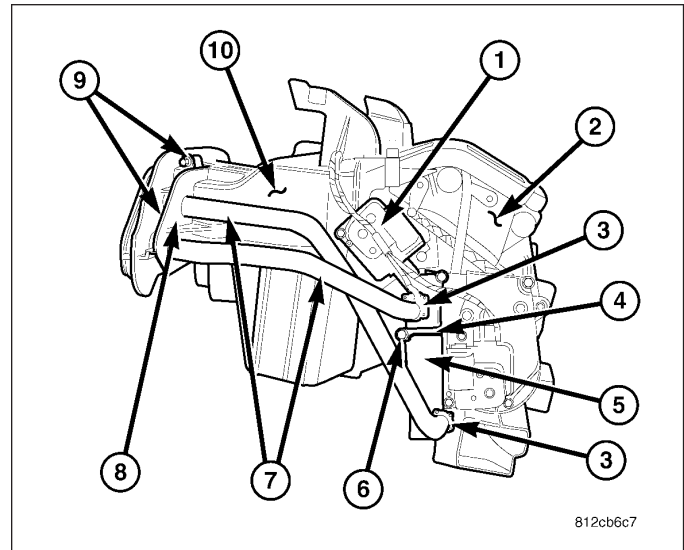
Engine coolant is circulated through the heater hoses to the heater core at all times. As the coolant flows through the heater core, heat is removed from the engine and is transferred to the heater core tubes and fins. Air directed through the heater core picks up the heat from the heater core fins. The blend-air door(s) allows control of the heater output air temperature by regulating the amount of air flowing through the heater core. The blower motor speed controls the volume of air flowing through the HVAC housing.

The heater core cannot be repaired and, if faulty or damaged, it must be replaced.

### REMOVAL

**WARNING:** On vehicles equipped with airbags, disable the airbag system before attempting any steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to take the proper precautions could result in accidental airbag deployment and possible personal injury or death.

1. Drain the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM DRAIN).
2. Disconnect and isolate the negative battery cable.
3. Carefully disconnect the heater hoses from the heater core tubes (7).
4. Remove the instrument panel silencer from the driver side of the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL SILENCER - REMOVAL).
5. Remove the blend door actuator (1) from the driver side of the HVAC air distribution housing (2) (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/ACTUATOR-BLEND DOOR - REMOVAL).
6. Remove the two screws (9) that secure the flange (8) to the front of the HVAC housing (10) near the dash panel.
7. Remove the flange from the HVAC housing.



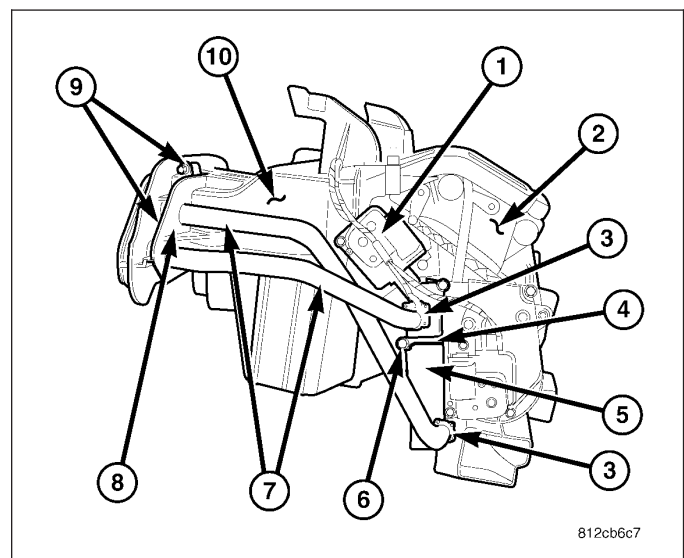
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**Note:** Take proper precautions to protect the carpeting from spilled engine coolant. Have absorbent towel- ing readily available to clean up any spills.

8. Remove the retaining clamps (3) that secure the heater core tubes to the heater core (5).
9. Disconnect the heater core tubes from the heater core and remove and discard the O-ring seals.
10. Carefully pull the heater core tubes through the dash panel.
11. Install plugs in, or tape over the opened heater core ports.
12. Remove the screw (6) that secures the heater core retaining bracket (4) to the driver side of the HVAC air distribution housing (2).
13. Remove the heater core retaining bracket from the air distribution housing.
14. Carefully pull the heater core out of the air distribution housing.

## INSTALLATION

1. Carefully install the heater core (5) into the driver side of the HVAC air distribution housing (2).
2. Install heater core retaining bracket (4) onto the air distribution housing.
3. Install the screw (6) that secures the heater core retaining bracket onto the air distribution housing. Tighten the screw to 2.2 N·m (20 in. lbs.).
4. Remove the tape or plugs from the heater core ports.
5. Lubricate new rubber O-ring seals with clean engine coolant and install them onto the heater core tube fittings. Use only the specified O-ring as they are made of a special material for the engine cooling system.
6. Install the heater core tubes (7) through the dash panel and onto the heater core.
7. Install the two retaining clamps (3) that secure the heater core tubes to the heater core. Make sure that the clamps are installed correctly and securely.
8. Install the flange (8) over the heater core tubes and onto the HVAC housing (10) near the dash panel.
9. Install the two screws (9) that secure the flange to the HVAC housing. Tighten the screws to 2.2 N·m (20 in. lbs.).



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10. Install the blend door actuator (1) to the driver side of the air distribution housing (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/ACTUATOR-BLEND DOOR - INSTALLATION).
11. Install the instrument panel silencer onto the driver side of the instrument panel (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL SILENCER - INSTALLATION).
12. Connect the heater hoses to the heater core tubes.
13. Connect the negative battery cable.
14. Refill the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM REFILL).

## CORE-VALVE-SERVICE PORT

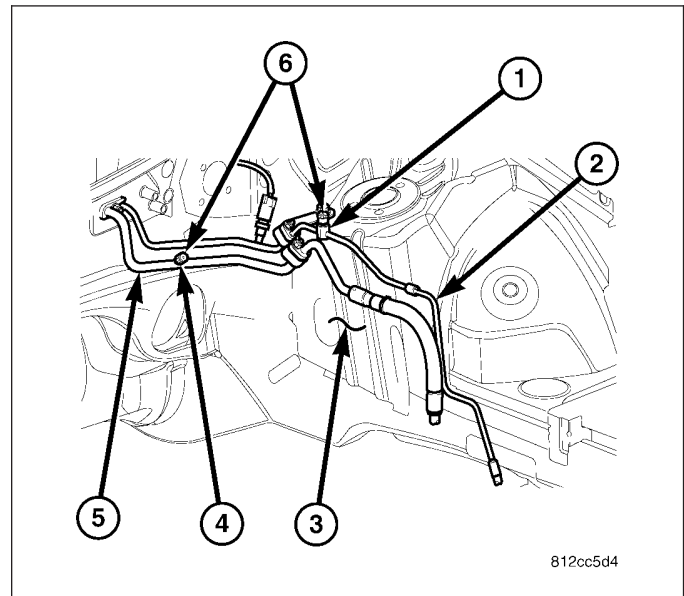
### DESCRIPTION

Refrigerant system service ports are used to recover, recycle, evacuate, charge and test the A/C refrigerant system. Unique sizes are used on the two service ports for the R-134a refrigerant system to ensure the system is not accidentally contaminated with R-12 refrigerant or by service equipment used for R-12 refrigerant.

The high side service port (1) is located on the liquid line (2) near the left shock tower (3). The low side service port (4) is located on the suction line (5) near the left shock tower. Both the high side and low side A/C service port valve cores are serviceable.

**Note:** The protective cap aids in service port sealing and helps protect the refrigerant system from contamination. Remember to always reinstall the protective cap onto the service port when refrigerant system service is complete.

Each of the service ports has a threaded plastic protective cap (6) installed over it from the factory. The service port caps are serviceable items.



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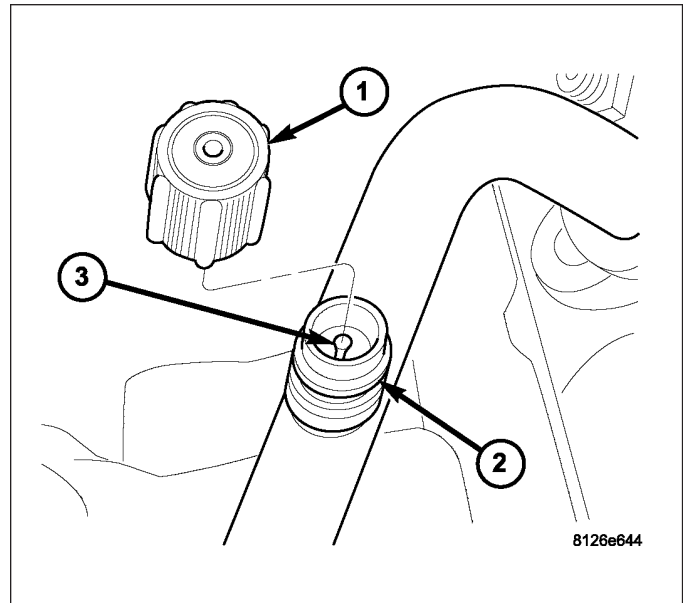
### REMOVAL

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING - A/C PLUMBING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - A/C PLUMBING). Failure to follow the warnings and cautions could result in possible personal injury or death.



**Note: Typical A/C service port shown.**

1. Remove the protective cap (1) from the service port (2).
2. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
3. Using a Schrader-type valve core tool, remove the valve core (3) from the service port.
4. Install a plug in or tape over the opened service port(s).



## INSTALLATION

**Note: Typical A/C service port shown.**

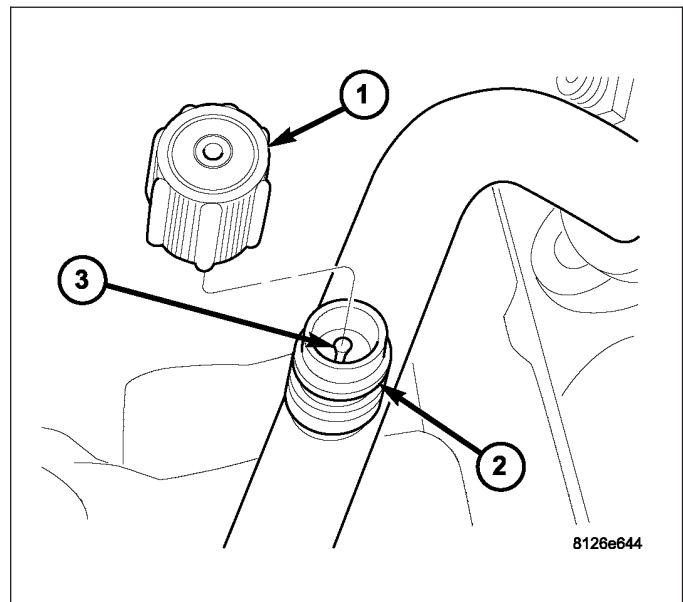
1. Lubricate the valve core (3) with clean refrigerant oil prior to installation. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
2. Remove the tape or plug from the service port (2).

**CAUTION: A valve core that is not fully seated in the A/C service port can result in damage to the valve during refrigerant system evacuation and charge. Such damage may result in a loss of system refrigerant while uncoupling the charge adaptors.**

3. Using a Schrader-type valve core tool, install and tighten the valve core into the service port(s).
4. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
5. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

**Note: The protective cap helps aid in service port sealing and helps protects the refrigerant system from contamination. Remember to always reinstall the protective cap onto the service port when refrigerant system service is complete.**

6. Install the protective cap (1) onto the service port.



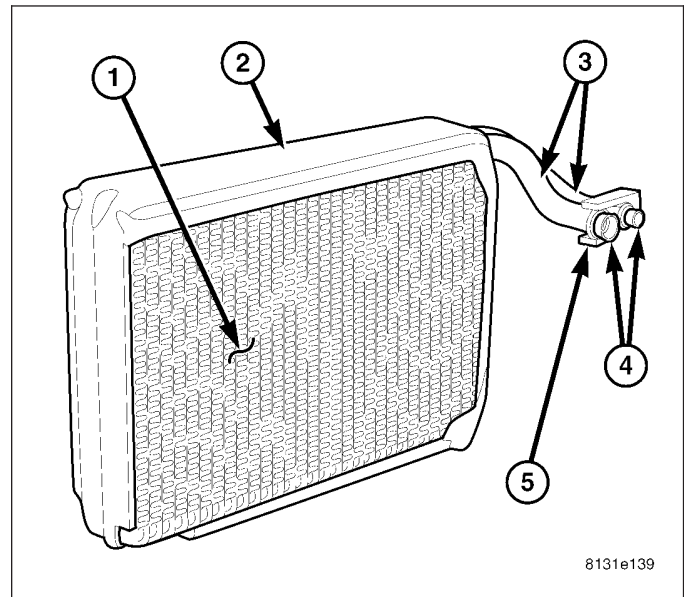
## EVAPORATOR-A/C

### DESCRIPTION

The A/C evaporator (1) for the heating-A/C system is located within the HVAC housing, behind the instrument panel. The A/C evaporator and its insulator (2) are positioned in the HVAC housing so that all air entering the housing must pass over the evaporator fins before it is distributed through the heating-A/C system ducts and outlets. However, air passing over the evaporator fins will only be conditioned when the A/C compressor is engaged and circulating refrigerant through the A/C evaporator.

The A/C evaporator tubes (3) are connected and sealed to the A/C expansion valve by use of rubber O-rings (4) a tapping block (5).

The A/C evaporator can only be serviced by removing and disassembling the HVAC housing assembly.



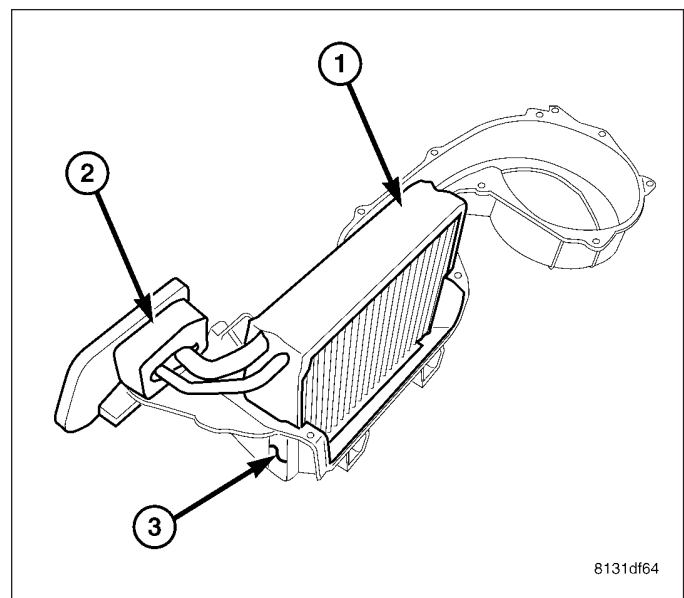
### OPERATION

Refrigerant enters the A/C evaporator from the A/C expansion valve as a low-temperature, low-pressure mixture of liquid and gas. As air flows over the fins of the A/C evaporator, the humidity in the air condenses on the fins, and the heat from the air is absorbed by the refrigerant. Heat absorption causes the refrigerant to boil and vaporize. The refrigerant becomes a low-pressure gas when it leaves the A/C evaporator.

The A/C evaporator cannot be repaired and, if faulty or damaged, it must be replaced.

### REMOVAL

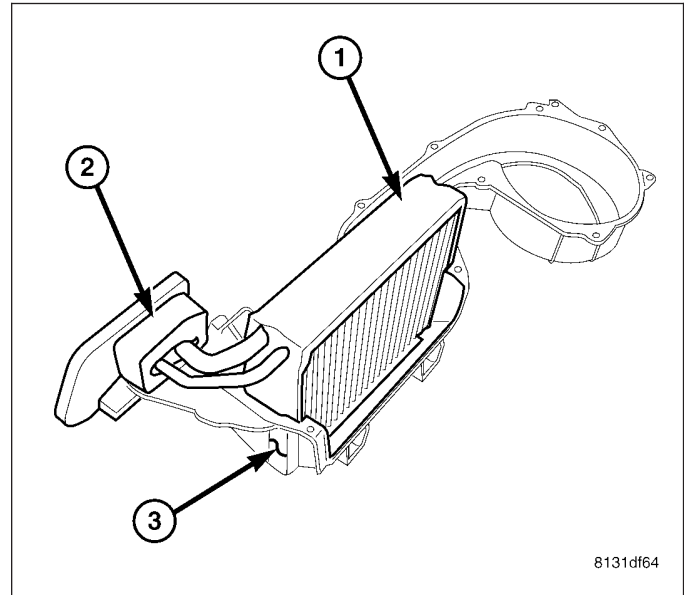
1. Remove the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - REMOVAL).
2. Disassemble the HVAC housing as necessary to access the A/C evaporator (1) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - DISASSEMBLY).
3. Carefully lift the A/C evaporator and the foam seal (2) out of the lower half of the HVAC housing (3).
4. If required, remove the foam seal from the tapping block of the A/C evaporator. If the seal is deformed or damaged, it must be replaced.



## INSTALLATION

**Note:** If the front A/C evaporator is being replaced, add 60 milliliters (2 fluid ounces) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

1. If removed, install the foam seal (2) over the tapping block of the A/C evaporator (1). If the seal is deformed or damaged, it must be replaced.
2. Install the A/C evaporator into the lower half of the HVAC housing (3). Make sure that the evaporator drain within the HVAC housing is clean and unrestricted and that the insulator around the A/C evaporator is properly installed.
3. Assemble the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - ASSEMBLY).
4. Install the HVAC housing (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HOUSING-HVAC - INSTALLATION).



## LINE-A/C DISCHARGE

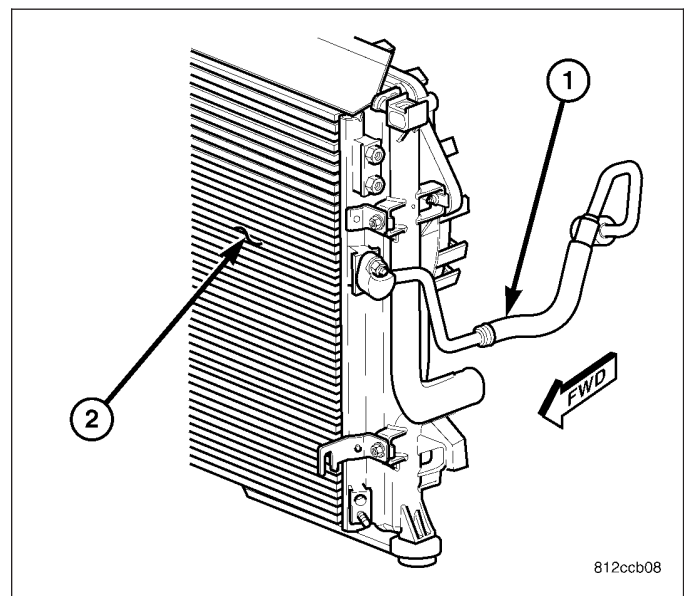
### DESCRIPTION

The A/C discharge line (1) is the refrigerant line that carries refrigerant from the A/C compressor to the A/C condenser (2).

**CAUTION:** Use only seals specified for the vehicle. Failure to use the correct seals will cause the refrigerant system connections to leak.

The A/C discharge line has no serviceable parts except for the dual plane seals. The seals used on the connections are made from a special type of rubber not affected by R-134a refrigerant. The seals must be replaced whenever the A/C discharge line is removed and installed.

If the A/C discharge line is found to be leaking or is damaged, it must be replaced.

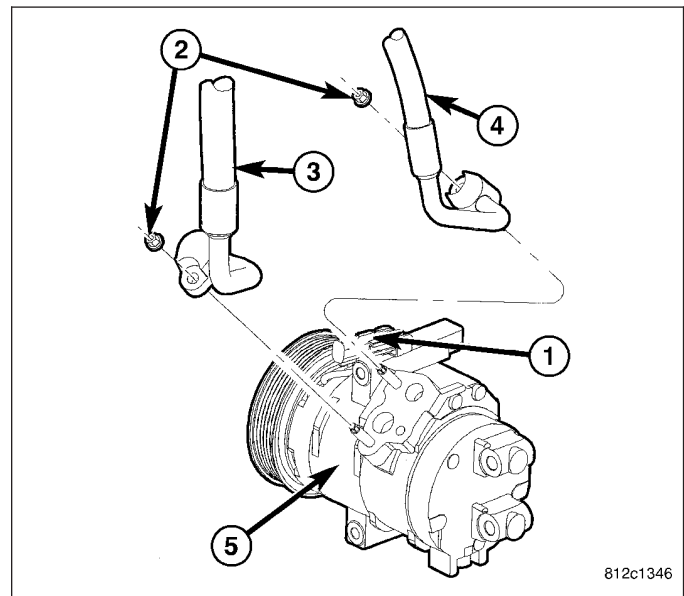
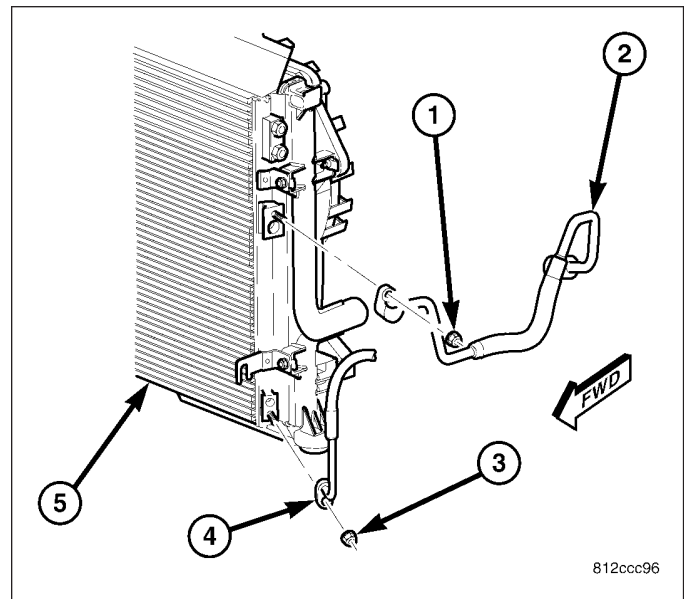


## REMOVAL

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING - A/C PLUMBING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - A/C PLUMBING). Failure to follow the warnings and cautions could result in possible personal injury or death.

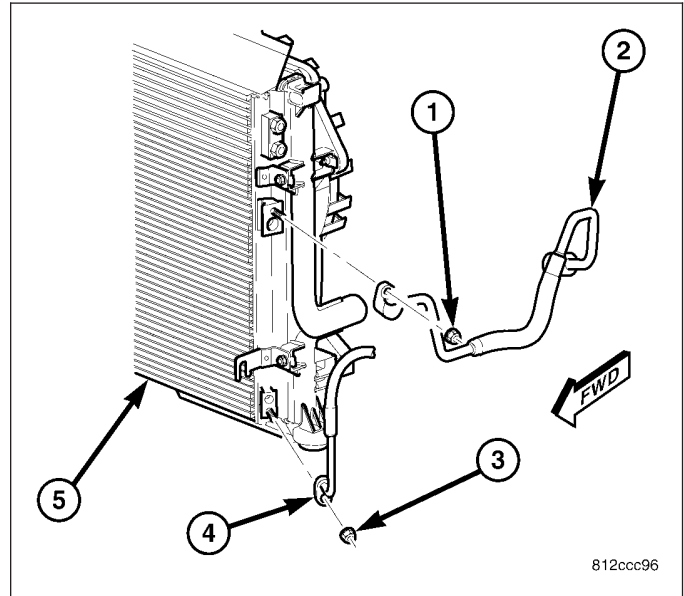


1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
4. Reach through the headlamp opening in the upper radiator support and remove the nut (1) that secures the A/C discharge line (2) to the A/C condenser (5).
5. Disconnect the A/C discharge line from the A/C condenser and remove and discard the dual plane seal.
6. Install plugs in, or tape over the discharge line fitting and condenser inlet port.
7. Remove the nut (2) that secures the A/C discharge line (4) to the A/C compressor (5).
8. Disconnect the A/C discharge line from the A/C compressor and remove and discard the dual plane seal.
9. Install plugs in, or tape over the opened refrigerant line fitting and the compressor port.
10. Remove the A/C discharge line from the engine compartment.

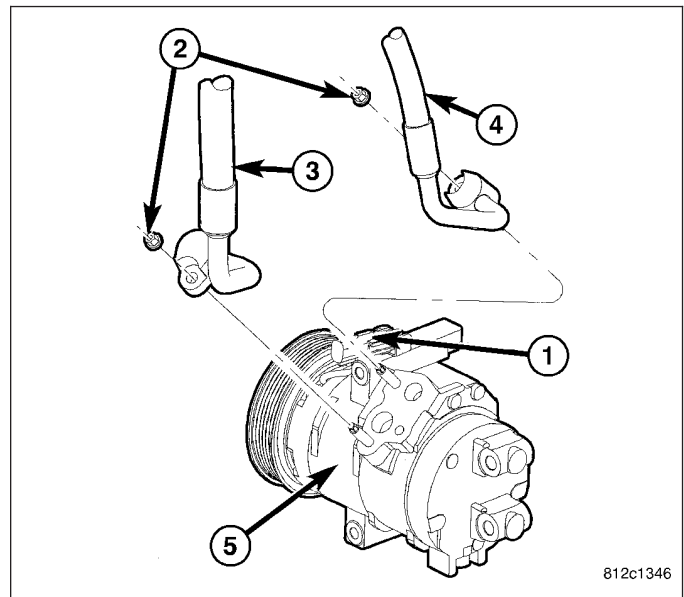


## INSTALLATION

1. Position the A/C discharge line (2) into the engine compartment.
2. Remove the tape or plugs from the opened discharge line fitting and the inlet port on the A/C condenser (5).
3. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the discharge line fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Install the A/C discharge line onto the A/C condenser.
5. Reach through the headlamp opening in the upper radiator support and install the nut (1) that secures the A/C discharge line to the A/C condenser. Tighten the nut to 22 N·m (16 ft. lbs.).



6. Remove the tape or plugs from the opened fitting on the A/C discharge line (4) and the outlet port on the A/C compressor (5).
7. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the discharge line fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
8. Install the A/C discharge line onto the A/C compressor.
9. Install the nut (2) that secures the A/C discharge line to the A/C compressor. Tighten the nut to 23 N·m (17 ft. lbs.).



10. Install the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
11. Reconnect the negative battery cable.
12. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
13. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

## LINE-A/C LIQUID

### DESCRIPTION

The A/C liquid line is the refrigerant line that carries refrigerant from the A/C condenser to the A/C evaporator. The A/C liquid line is serviced in two sections. The front section of the liquid line (1) connects to the rear section of the liquid line (5) with a nut (2) and includes the high side service port (8). The rear section of the A/C liquid line includes the fitting for the A/C pressure transducer (6) and a mounting bracket (7) and is secured to the A/C expansion valve by a tapping plate (4). The rear section of the A/C liquid line is serviced as an assembly with the rear section of the A/C suction line (3).

**CAUTION:** Use only seals specified for the vehicle. Failure to use the correct seals will cause the refrigerant system connections to leak.

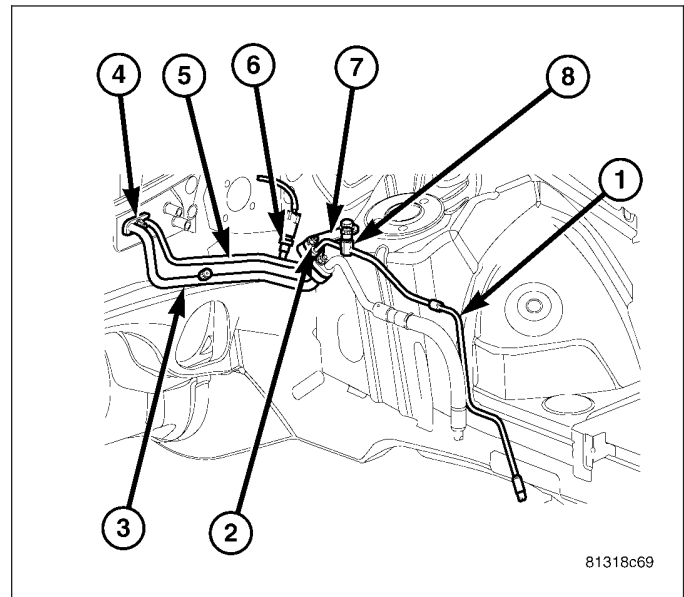
The A/C liquid line has no serviceable parts except for the dual plane seals, high-side service port valve and its protective cap. The seals used on the connections are made from a special type of rubber not affected by R-134a refrigerant. The seals must be replaced whenever the A/C liquid line is removed and installed.

If either section of the A/C liquid line is found to be leaking or damaged, it must be replaced.

### REMOVAL

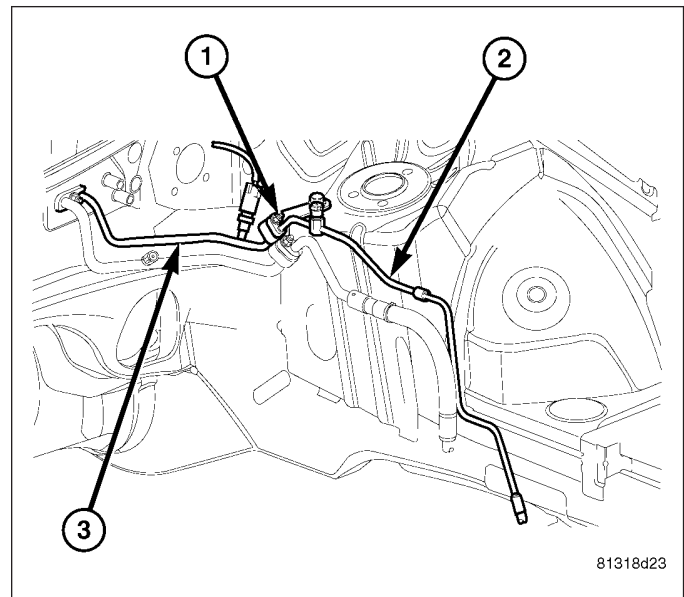
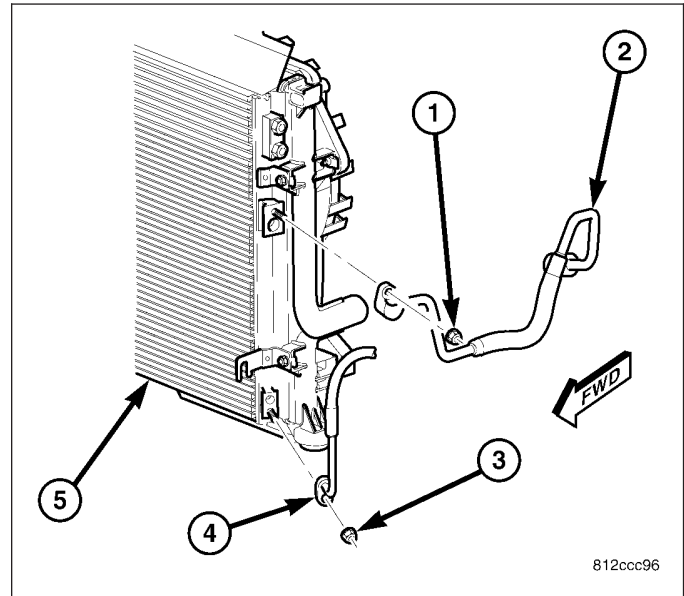
**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING - A/C PLUMBING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - A/C PLUMBING). Failure to follow the warnings and cautions could result in possible personal injury or death.

**Note:** The A/C liquid line is serviced in two sections. The rear section of the liquid line is serviced as an assembly with the rear section of the A/C suction line.



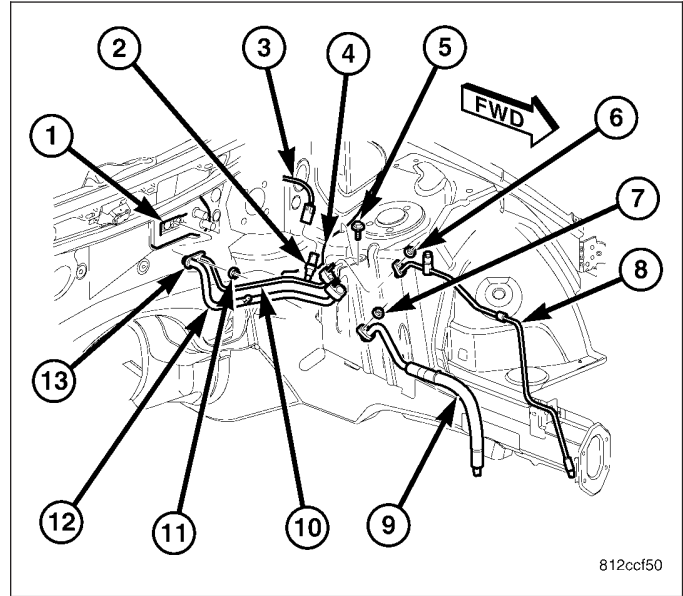
## FRONT SECTION

1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
4. Raise and support the vehicle.
5. Remove the front end splash shields (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - REMOVAL).
6. Remove the nut (3) that secures the front section of the A/C liquid line (4) to the A/C condenser (5).
7. Disconnect the A/C liquid line from the A/C condenser and remove and discard the dual plane seal.
8. Install plugs in, or tape over the opened liquid line fitting and condenser outlet port.
9. Lower the vehicle.
10. Remove the nut (1) that secures the front section of the A/C liquid line (2) to the rear section of the liquid line (3).
11. Disconnect the front section of the A/C liquid line from the rear section of the liquid line and remove and discard the dual plane seal.
12. Install plugs in, or tape over the opened liquid line fittings.
13. Remove the front section of the A/C liquid line from the engine compartment.



## REAR SECTION

1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
4. Remove the nut (6) that secures the front section of the A/C liquid line (8) to the rear section of the liquid line (10).
5. Disconnect the front section of the A/C liquid line from the rear section of the liquid line and remove and discard the dual plane seal.
6. Install plugs in, or tape over the opened liquid line fittings.
7. Remove the nut (7) that secures the front section of the A/C suction line (9) to the rear section of the suction line (12).
8. Disconnect the front section of the A/C suction line from the rear section of the suction line and remove and discard the dual plane seal.
9. Install plugs in, or tape over the opened suction line fittings.
10. Disconnect the wire harness (3) from the A/C pressure transducer (2).
11. Remove the bolt (5) that secures the refrigerant line mounting bracket to the left front shock tower (4).
12. Remove the nut (11) that secures the liquid and suction line tapping block (13) to the A/C expansion valve (1).
13. Disconnect the rear section of the A/C liquid and suction lines from the A/C expansion valve.
14. Remove the dual plane seal from the suction and liquid line fittings and discard.
15. Install plugs in, or tape over the opened suction and liquid line fittings and the expansion valve ports.
16. Remove the rear section of the A/C liquid and suction lines as an assembly from the engine compartment.
17. If required, remove the A/C pressure transducer from the rear section of the A/C liquid line (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/TRANSDUCER-A/C PRESSURE - REMOVAL).

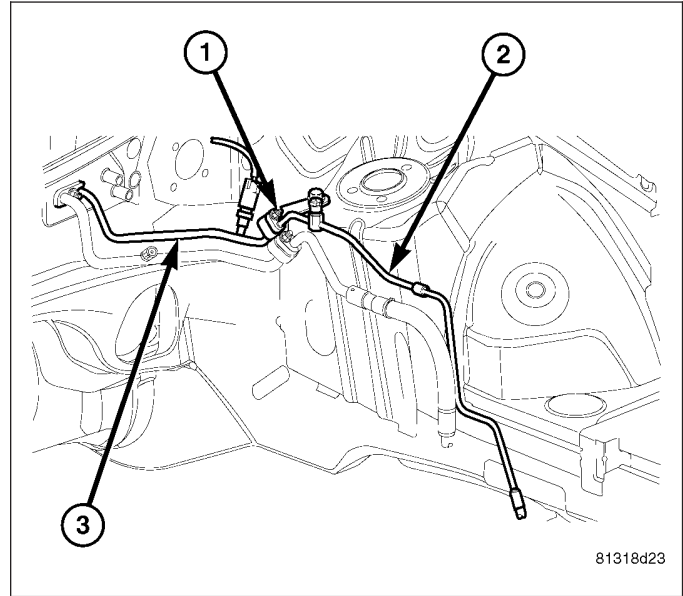


## INSTALLATION

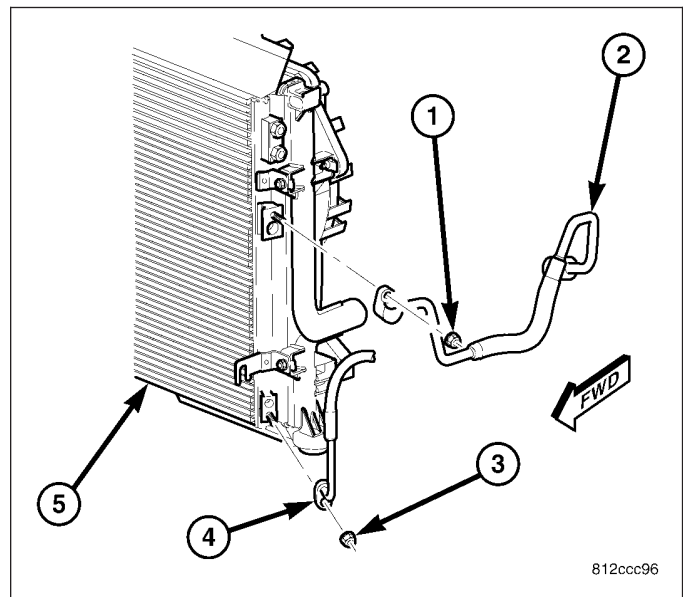
**Note:** The A/C liquid line is serviced in two sections. The rear section of the liquid line is serviced as an assembly with the rear section of the A/C suction line.

**FRONT SECTION**

1. Position the front section of the liquid line (2) into the engine compartment.
2. Remove the tape or plugs from the fittings that connect the front section of the A/C liquid line to the rear section of the A/C liquid line (3).
3. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the liquid line fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Connect the front section of the A/C liquid line to the rear section of the A/C liquid line.
5. Install the nut (1) that secures the front section of the A/C liquid line to the rear section of the A/C liquid line. Tighten the nut to 22 N·m (16 ft. lbs.).



6. Raise and support the vehicle.
7. Remove the tape or plugs from the fitting on the front section of the A/C liquid line (4) and the outlet port of the A/C condenser (5).
8. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the liquid line fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
9. Connect the A/C liquid line to the A/C condenser.
10. Install the nut (3) that secures the front section of the A/C liquid line to the A/C condenser. Tighten the nut to 22 N·m (16 ft. lbs.).
11. Install the front end splash shields (Refer to 23 - BODY/EXTERIOR/FRONT END SPLASH SHIELDS - INSTALLATION).

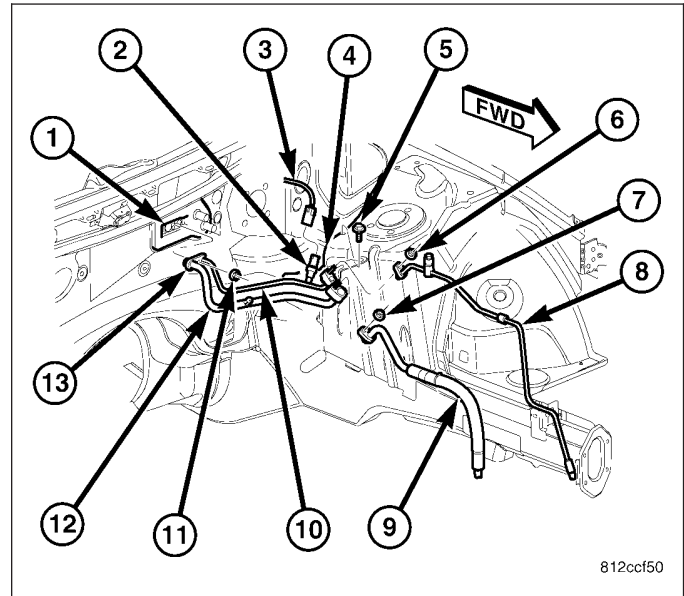


12. Lower the vehicle.
13. Install the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
14. Reconnect the negative battery cable.
15. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
16. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).



**REAR SECTION**

1. If removed, install the A/C pressure transducer (2) onto the A/C liquid line (10) (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C PRESSURE TRANSDUCER - INSTALLATION).
2. Position the rear section of the A/C liquid line (10) and the rear section of the A/C suction line (12) as an assembly into the engine compartment.
3. Remove the tape or plugs from the suction and liquid line fittings and the ports in the A/C expansion valve (1).
4. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the suction and liquid line fittings. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
5. Connect the rear section of the A/C liquid and suction lines to the A/C expansion valve.
6. Install the nut (11) that secures the liquid and suction line tapping block (13) to the A/C expansion valve. Tighten the nut to 23 N·m (17 ft. lbs.).
7. Install the bolt (5) that secures the refrigerant line mounting bracket to the left front shock tower (4). Tighten the bolt to 11 N·m (100 in. lbs.).
8. Connect the wire harness (3) to the A/C pressure transducer.
9. Remove the tape or plugs from the fittings that connect the front section of the A/C liquid line (8) to the rear section of the A/C liquid line.
10. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the liquid line fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
11. Connect the front section of the A/C liquid line to the rear section of the A/C liquid line.
12. Install the nut (6) that secures the front section of the A/C liquid line to the rear section of the A/C liquid line. Tighten the nut to 22 N·m (16 ft. lbs.).
13. Remove the tape or plugs from the fittings that connect the front section of the A/C suction line (9) to the rear section of the A/C suction line.
14. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the suction line fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
15. Connect the front section of the A/C suction line to the rear section of the A/C suction line.
16. Install the nut (7) that secures the front section of the A/C suction line to the rear section of the A/C suction line. Tighten the nut to 22 N·m (16 ft. lbs.).
17. Install the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
18. Reconnect the negative battery cable.
19. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
20. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).



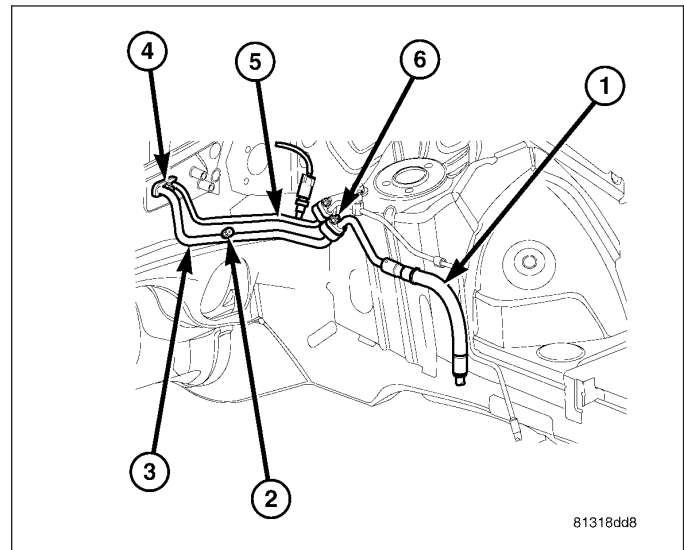
## LINE-A/C SUCTION

### DESCRIPTION

The A/C suction line is the refrigerant line that carries refrigerant from the A/C evaporator to the A/C compressor. The A/C suction line is serviced in two sections. The front section of the suction line (1) connects to the rear section of the suction line (3) with a nut (6). The rear section of the A/C suction line includes the low side service port (2) and is secured to the A/C expansion valve by a tapping plate (4). The rear section of the A/C suction line is serviced as an assembly with the rear section of the A/C liquid line (5).

**CAUTION:** Use only seals specified for the vehicle. Failure to use the correct seals will cause the refrigerant system connections to leak.

The A/C suction line has no serviceable parts except for the dual plane seals, low-side service port valve and it's protective cap. The seals used on the connections are made from a special type of rubber not affected by R-134a refrigerant. The seals must be replaced whenever the A/C suction line is removed and installed. If either section of the A/C suction line is found to be leaking or damaged, it must be replaced.



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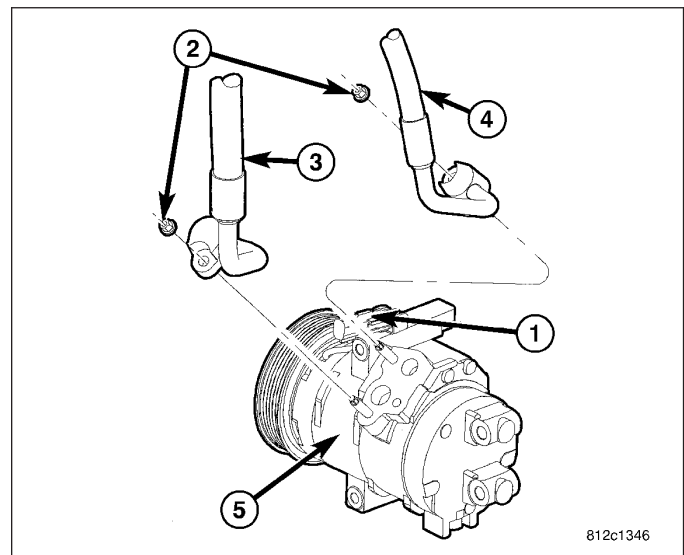
### REMOVAL

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING - A/C PLUMBING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - A/C PLUMBING). Failure to follow the warnings and cautions could result in possible personal injury or death.

**Note:** The A/C suction line is serviced in two sections. The rear section of the suction line is serviced as an assembly with the rear section of the A/C liquid line.

### FRONT SECTION

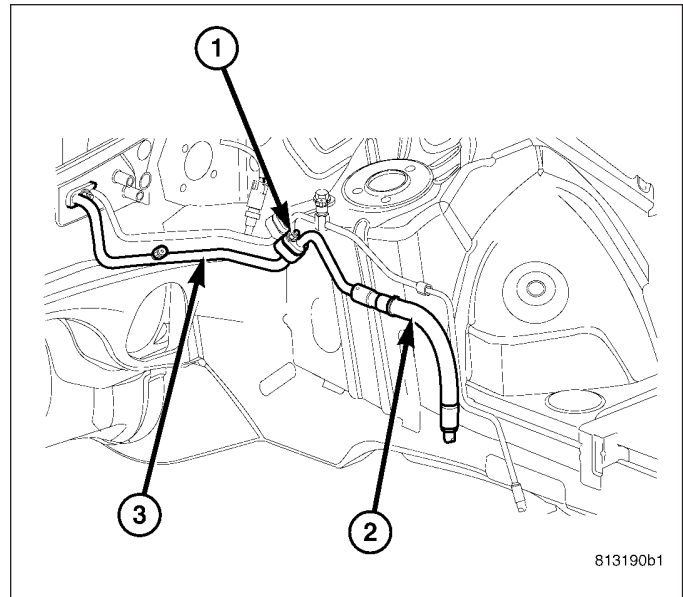
1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
4. Remove the nut (2) that secures the front section of the A/C suction line (3) to the A/C compressor (5).
5. Disconnect the A/C suction line from the A/C compressor and remove and discard the dual plane seal.
6. Install plugs in, or tape over the opened suction line fitting and compressor inlet port.



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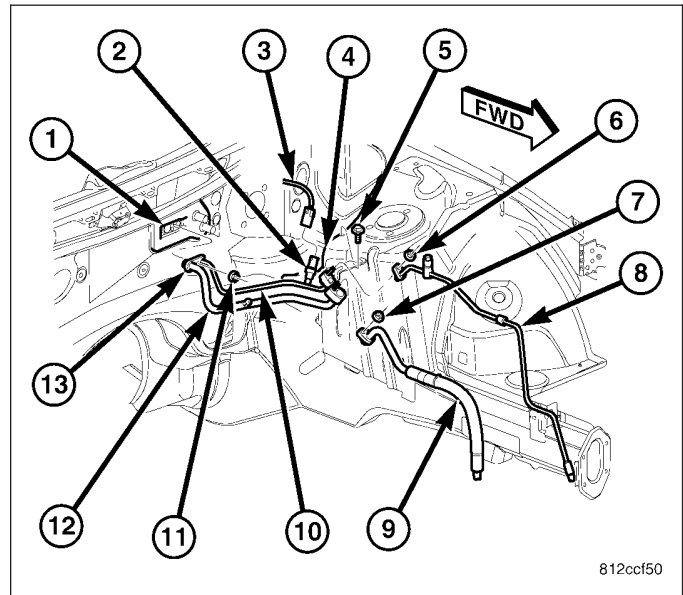


7. Remove the nut (1) that secures the front section of the A/C suction line (2) to the rear section of the suction line (3).
8. Disconnect the front section of the A/C suction line from the rear section of the suction line and remove and discard the dual plane seal.
9. Install plugs in, or tape over the opened suction line fittings.
10. Remove the front section of the A/C suction line from the engine compartment.



## REAR SECTION

1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
4. Remove the nut (7) that secures the front section of the A/C suction line (9) to the rear section of the suction line (12).
5. Disconnect the front section of the A/C suction line from the rear section of the suction line and remove and discard the dual plane seal.
6. Install plugs in, or tape over the opened suction line fittings.
7. Remove the nut (6) that secures the front section of the A/C liquid line (8) to the rear section of the liquid line (10).
8. Disconnect the front section of the A/C liquid line from the rear section of the liquid line and remove and discard the dual plane seal.
9. Install plugs in, or tape over the opened liquid line fittings.
10. Disconnect the wire harness (3) from the A/C pressure transducer (2).
11. Remove the bolt (5) that secures the refrigerant line mounting bracket to the left front shock tower (4).
12. Remove the nut (11) that secures the liquid and suction line tapping block (13) to the A/C expansion valve (1).
13. Disconnect the rear section of the A/C suction and liquid lines from the A/C expansion valve.
14. Remove the dual plane seal from the suction and liquid line fittings and discard.
15. Install plugs in, or tape over the opened suction and liquid line fittings and the expansion valve ports.
16. Remove the rear section of the A/C suction and liquid lines as an assembly from the engine compartment.
17. If required, remove the A/C pressure transducer from the rear section of the A/C liquid line (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/TRANSDUCER-A/C PRESSURE - REMOVAL).

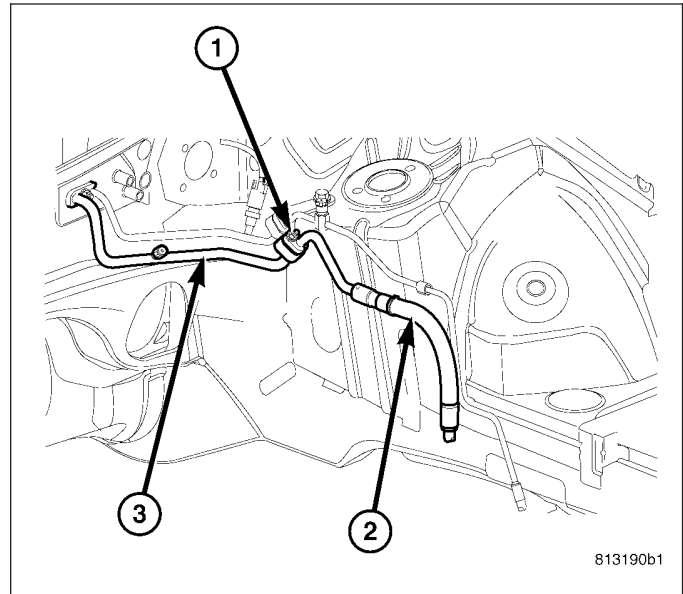


## INSTALLATION

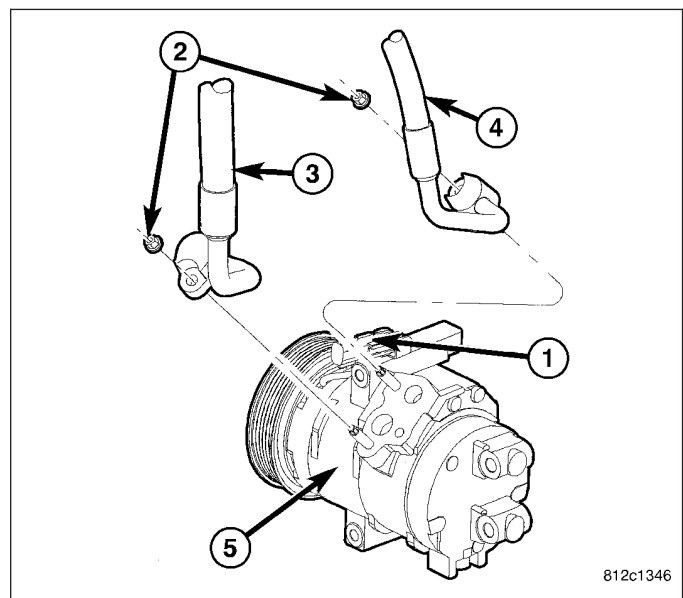
**Note:** The A/C suction line is serviced in two sections. The rear section of the suction line is serviced as an assembly with the rear section of the A/C liquid line.

### FRONT SECTION

1. Position the front section of the A/C suction line (2) into the engine compartment.
2. Remove the tape or plugs from the fittings that connect the front section of the A/C suction line to the rear section of the A/C suction line (3).
3. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the suction line fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Connect the front section of the A/C suction line to the rear section of the A/C suction line.
5. Install the nut (1) that secures the front section of the A/C suction line to the rear section of the A/C suction line. Tighten the nut to 22 N·m (16 ft. lbs.).



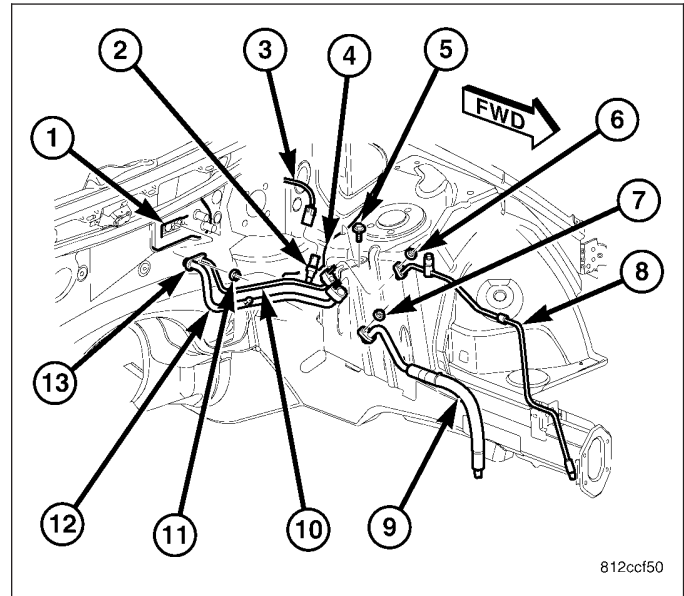
6. Remove the tape or plugs from the fitting on the front section of the A/C suction line (3) and the inlet port of the A/C compressor (5).
7. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the suction line fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
8. Connect the A/C suction line to the A/C compressor.
9. Install the nut (2) that secures the front section of the A/C suction line to the A/C compressor. Tighten the nut to 22 N·m (16 ft. lbs.).



10. Install the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
11. Reconnect the negative battery cable.
12. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
13. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

**REAR SECTION**

1. If removed, install the A/C pressure transducer (2) onto the A/C liquid line (10) (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C PRESSURE TRANSDUCER - INSTALLATION).
2. Position the rear section of the A/C suction line (12) and the rear section of the A/C liquid line (10) as an assembly into the engine compartment.
3. Remove the tape or plugs from the suction and liquid line fittings and the ports in the A/C expansion valve (1).
4. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the suction and liquid line fittings. Use only the specified seal as it made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
5. Connect the rear section of the A/C liquid and suction lines to the A/C expansion valve.
6. Install the nut (11) that secures the liquid and suction line tapping block (13) to the A/C expansion valve. Tighten the nut to 23 N·m (17 ft. lbs.).
7. Install the bolt (5) that secures the refrigerant line mounting bracket to the left front shock tower (4). Tighten the bolt to 11 N·m (100 in. lbs.).
8. Connect the wire harness (3) to the A/C pressure transducer.
9. Remove the tape or plugs from the fittings that connect the front section of the A/C liquid line (8) to the rear section of the A/C liquid line.
10. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the liquid line fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
11. Connect the front section of the A/C liquid line to the rear section of the A/C liquid line.
12. Install the nut (6) that secures the front section of the A/C liquid line to the rear section of the A/C liquid line. Tighten the nut to 22 N·m (16 ft. lbs.).
13. Remove the tape or plugs from the fittings that connect the front section of the A/C suction line (9) to the rear section of the A/C suction line.
14. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the suction line fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
15. Connect the front section of the A/C suction line to the rear section of the A/C suction line.
16. Install the nut (7) that secures the front section of the A/C suction line to the rear section of the A/C suction line. Tighten the nut to 22 N·m (16 ft. lbs.).
17. Install the air cleaner housing (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
18. Reconnect the negative battery cable.
19. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
20. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).



## OIL-A/C REFRIGERANT

### DESCRIPTION

The refrigerant oil used in R-134a refrigerant systems is a synthetic-based, polyalkylene glycol (PAG), wax-free lubricant. Mineral-based R-12 refrigerant oils are not compatible with PAG oils, and should never be introduced to an R-134a refrigerant system.

There are different PAG oils available, and each contains a different additive package. The Denso 10S17 A/C compressor used in this vehicle is designed to use ND-8 PAG refrigerant oil. Use only this type of refrigerant oil the refrigerant system.

### OPERATION

After performing any refrigerant recovery or recycling operation, always replenish the refrigerant system with the same amount of the recommended refrigerant oil as was removed. Too little refrigerant oil can cause A/C compressor damage, and too much can reduce A/C system performance.

PAG refrigerant oil is more hygroscopic than mineral oil, and will absorb any moisture it comes into contact with, even moisture in the air. The PAG oil container should always be kept tightly capped until it is ready to be used. After use, recap the oil container immediately to prevent moisture contamination.

### STANDARD PROCEDURE

#### REFRIGERANT OIL LEVEL

When an A/C system is assembled at the factory, all components except the A/C compressor are refrigerant oil free. After the refrigerant system has been charged and operated, the refrigerant oil in the A/C compressor is dispersed throughout the refrigerant system. The receiver/drier, A/C evaporator, A/C condenser and the A/C compressor will each retain a significant amount of the needed refrigerant oil.

It is important to have the correct amount of refrigerant oil in the A/C system. This ensures proper lubrication of the A/C compressor. Too little oil will result in damage to the A/C compressor, while too much oil will reduce the cooling capacity of the A/C system and consequently result in higher discharge air temperatures.

**Note: The oil used in the Denso 10S17 A/C compressor is ND-8 PAG R-134a refrigerant oil. Only refrigerant oil of the same type should be used to service the A/C system. Do not use any other refrigerant oil. The oil container should be kept tightly capped until it is ready for use and then tightly capped after use to prevent contamination from dirt and moisture. Refrigerant oil will quickly absorb any moisture it comes in contact with, therefore, special effort must be used to keep all R-134a system components moisture-free. Moisture in the refrigerant oil is very difficult to remove and will cause a reliability problem with the A/C compressor.**

It will not be necessary to check the oil level in the A/C compressor or to add oil, unless there has been an oil loss. An oil loss may occur due to a rupture or leak from a refrigerant line, a connector fitting, a component, or a component seal. If a leak occurs, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system after the repair has been made. Refrigerant oil loss will be evident at the leak point by the presence of a wet, shiny surface around the leak.

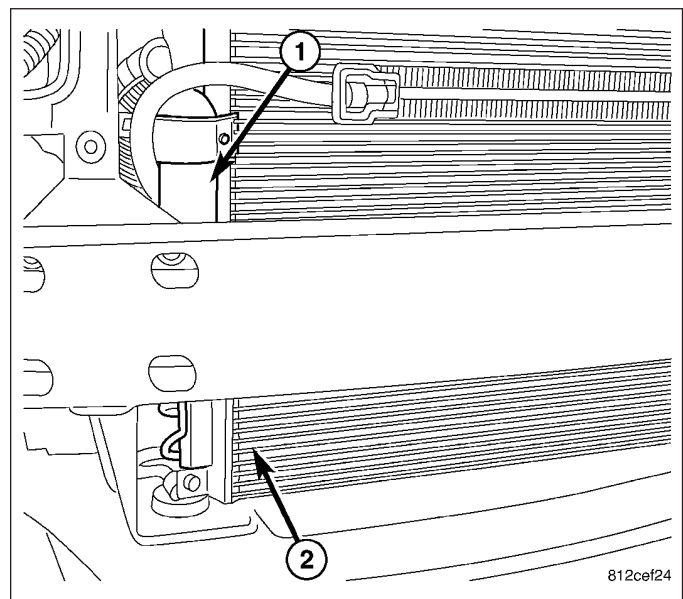
Refrigerant oil must be added when a receiver/drier, A/C evaporator or A/C condenser is replaced. See the Refrigerant Oil Capacities chart. When an A/C compressor is replaced, the refrigerant oil must be drained from the old compressor and measured. Drain all of the refrigerant oil from the new A/C compressor, then fill the new compressor with the same amount of refrigerant oil that was drained out of the old compressor.

**REFRIGERANT OIL CAPACITIES**

COMPONENT NAME	ml.	oz.
Total System Fill	180 ml.	6.1 oz.
A/C Condenser	30 ml.	1.0 oz.
A/C Evaporator	60 ml.	2.0 oz.
Receiver/drier	30 ml.	1.0 oz.
A/C Compressor	Drain and measure the oil from the old compressor. See text.	

**RECEIVER/DRIER-A/C****DESCRIPTION**

The receiver/drier (1) stores unnecessary refrigerant, filters the refrigerant, helps remove moisture from the refrigerant and retains any refrigerant vapor that may leave the A/C condenser (2) until it becomes a liquid. The receiver/drier is installed on the high-side of the A/C system and is connected directly to the right end of the A/C condenser. The receiver/drier can be easily serviced by removing the front fascia.

**OPERATION**

The receiver/drier performs a filtering action to prevent foreign material in the refrigerant from contaminating the A/C expansion valve. Refrigerant enters the receiver/drier as a high-pressure, low temperature liquid. Desiccant inside the receiver/drier absorbs any moisture which may have entered and become trapped within the refrigerant system. In addition, during periods of high demand operation of the A/C system, the receiver/drier acts as a reservoir to store surplus refrigerant.

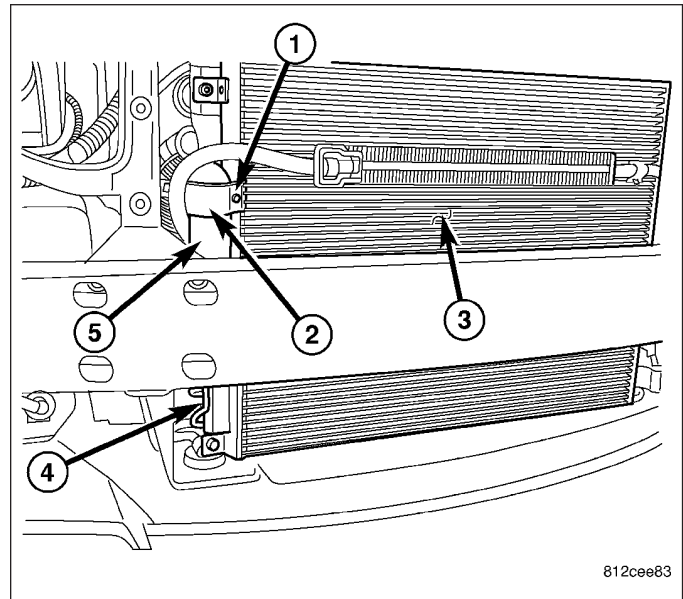
The receiver/drier cannot be repaired. If the receiver/drier is faulty or damaged, or if the refrigerant system has been contaminated or left open to the atmosphere for an indeterminable period or if the A/C compressor has failed, it must be replaced.

**REMOVAL**

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING - A/C PLUMBING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - A/C PLUMBING). Failure to follow the warnings and cautions could result in possible personal injury or death.



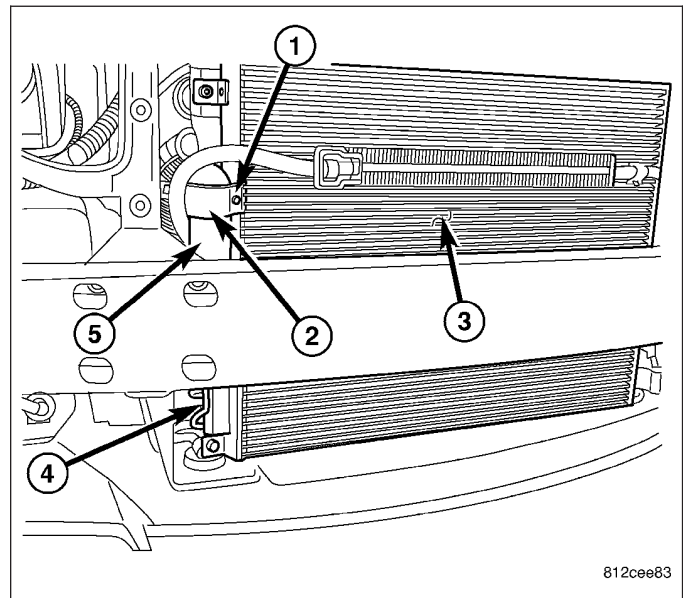
1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the front fascia (Refer to 23 - BODY/EXTERIOR/FRONT FASCIA - REMOVAL).
4. Remove the screw (1) that secures the receiver/drier mounting bracket (2) to the right end of the A/C condenser (3).
5. Remove the bolt (4) that secures the receiver/drier (5) to the A/C condenser.
6. Disconnect the receiver/drier from the A/C condenser and remove and discard the dual-plane seal.
7. Install plugs in, or tape over the opened receiver/drier fitting and the condenser ports.



## INSTALLATION

**Note:** If the receiver/drier is being replaced, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system. Use only the refrigerant oil of the type recommended for the A/C compressor in the vehicle.

1. Position the receiver/drier (5) into the engine compartment.
2. Remove the tape or plugs from the receiver/drier fitting and the ports of the A/C condenser (3).
3. Lubricate a new dual-plane seal with clean refrigerant oil and install it onto the receiver/drier fitting. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
4. Connect the receiver/drier to the right end of the A/C condenser.
5. Install the bolt (4) that secures the receiver/drier to the A/C condenser. Tighten the bolt to 22 N·m (16 ft. lbs.).
6. Install the receiver/drier mounting bracket (2) onto the A/C condenser.
7. Install the screw (1) that secures the receiver/drier mounting bracket onto the A/C condenser. Tighten the screw to 5 N·m (44 in. lbs.).
8. Install the front fascia (Refer to 23 - BODY/EXTERIOR/FRONT FASCIA - INSTALLATION).
9. Reconnect the negative battery cable.
10. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
11. Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).



## REFRIGERANT-A/C

### DESCRIPTION

The refrigerant used in this air conditioning system is a HydroFluoroCarbon (HFC), type R-134a. Unlike R-12, which is a ChloroFluoroCarbon (CFC), R-134a refrigerant does not contain ozone-depleting chlorine. R-134a refrigerant is a non-toxic, non-flammable, clear, and colorless liquefied gas.

Even though R-134a does not contain chlorine, it must be reclaimed and recycled just like CFC-type refrigerants. This is because R-134a is a greenhouse gas and can contribute to global warming.

### OPERATION

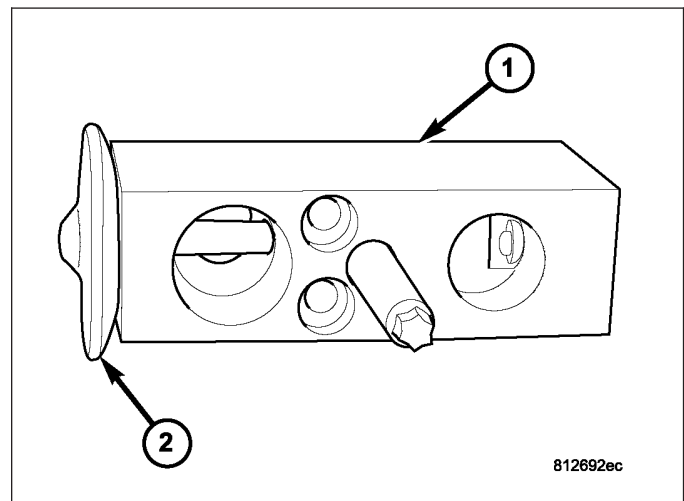
R-134a refrigerant is not compatible with R-12 refrigerant in an A/C system. Even a small amount of R-12 refrigerant added to an R-134a refrigerant system will cause A/C compressor failure, refrigerant oil sludge or poor A/C system performance. In addition, the polyalkylene glycol (PAG) synthetic refrigerant oils used in an R-134a refrigerant system are not compatible with the mineral-based refrigerant oils used in an R-12 refrigerant system.

R-134a refrigerant system service ports, service tool couplers and refrigerant dispensing bottles have all been designed with unique fittings to ensure that an R-134a refrigerant system is not accidentally contaminated with the wrong refrigerant (R-12). There are also labels posted in the engine compartment of the vehicle and on the A/C compressor to identify that the A/C system is equipped with R-134a refrigerant.

## VALVE-A/C EXPANSION

### DESCRIPTION

The A/C expansion valve controls the amount of refrigerant entering the A/C evaporator and is of a thermostatic expansion valve (TXV) design. The A/C expansion valve consists of an aluminum H-valve type body (1) with an integral thermal sensor (2) and is located at the dash panel between the A/C refrigerant lines and the A/C evaporator.



### OPERATION

The A/C expansion valve controls the high-pressure, low temperature liquid refrigerant from the liquid line and converts it into a low-pressure, low-temperature mixture of liquid and gas before it enters the A/C evaporator. A mechanical sensor in the A/C expansion valve monitors the temperature and pressure of the refrigerant leaving the A/C evaporator through the suction line, and adjusts the orifice size at the liquid line port to let the proper amount of refrigerant into the A/C evaporator to meet the vehicle A/C cooling requirements. Controlling the refrigerant flow through the A/C evaporator ensures that none of the refrigerant leaving the A/C evaporator is still in a liquid state, which could damage the A/C compressor.

The A/C expansion valve is factory calibrated and cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

## DIAGNOSIS AND TESTING

### VALVE-A/C EXPANSION

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - WARNING - A/C PLUMBING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - FRONT - CAUTION - A/C PLUMBING). Failure to follow the warnings and cautions could result in possible personal injury or death.

**Note:** The A/C expansion valve should only be tested following testing of the A/C compressor.

**Note:** Liquid CO<sup>2</sup> is required to test the A/C expansion valve. This material is available from most welding supply facilities. Liquid CO<sup>2</sup> is also available from companies which service and sell fire extinguishers.

When testing the A/C expansion valve, the work area and the vehicle temperature must be 21° to 27° C (70° to 85° F). To test the expansion valve:

1. Connect a charging station or manifold gauge set to the refrigerant system service ports. Verify the refrigerant charge level.
2. Close all doors, windows and vents to the passenger compartment.
3. Set the A/C-heater controls so that the A/C compressor is operating, the temperature control is in the highest temperature position, the mode-air doors is directing air output to the floor and the blower motor operating is operating at the highest speed.
4. Start the engine and allow it to idle. After the engine has reached normal operating temperature, allow the passenger compartment to heat up. This will create the need for maximum refrigerant flow into the A/C evaporator.
5. If the refrigerant charge is sufficient, the discharge (high pressure) gauge should read 827 kPa to 1655 kPa (120 psi to 240 psi). The suction (low pressure) gauge should read 207 kPa to 345 kPa (30 psi to 50 psi). If OK, go to Step 6. If not OK, replace the faulty A/C expansion valve.

**WARNING:**

**Protect the skin and eyes from exposure to liquid CO<sup>2</sup> or personal injury can result.**

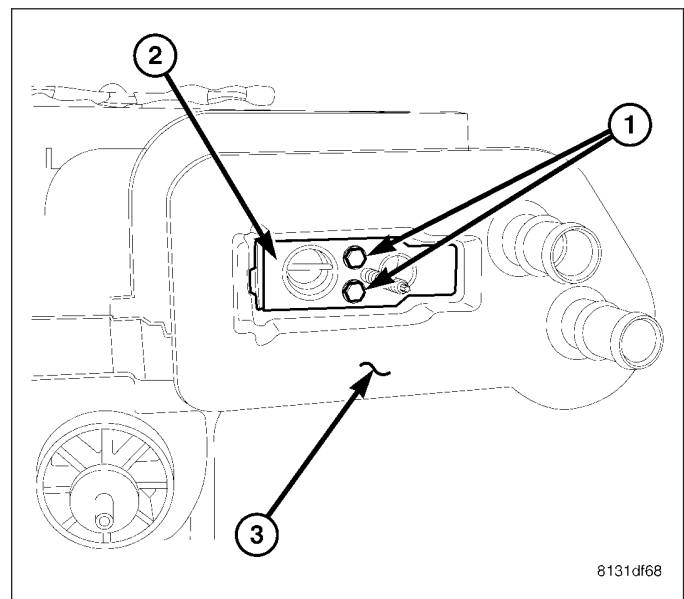
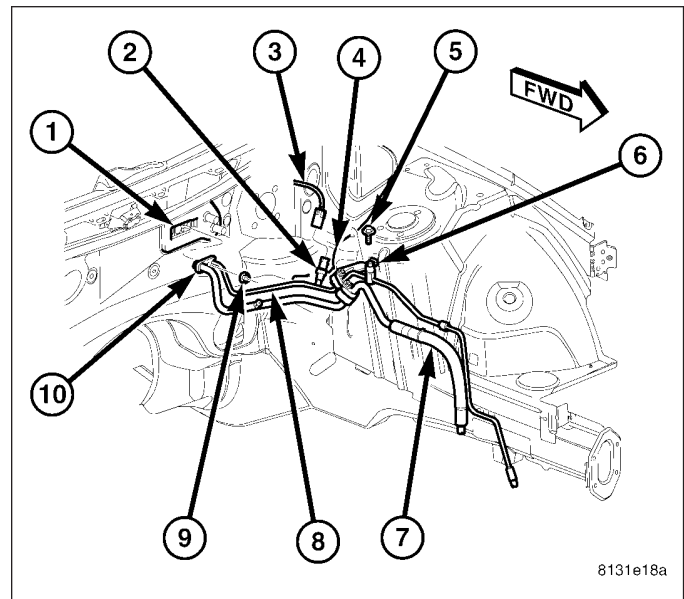
6. If the suction (low pressure) gauge reads within the specified range, freeze the A/C expansion valve for 30 seconds using liquid CO<sup>2</sup> or another suitable super-cold material. **Do not spray R-134a or R-12 refrigerant on the A/C expansion valve for this test.** The suction (low pressure) gauge reading should drop by 69 kPa (10 psi). If OK, go to Step 7. If not OK, replace the faulty A/C expansion valve.
7. Allow the expansion valve control head to thaw. The suction (low pressure) gauge reading should stabilize at 207 kPa to 345 kPa (30 psi to 50 psi). If not OK, replace the faulty A/C expansion valve.
8. When expansion valve testing is complete, test the overall A/C system performance (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING - A/C PERFORMANCE TEST).

### REMOVAL

**WARNING:** Refer to the applicable warnings and cautions for this system before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING - A/C PLUMBING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - A/C PLUMBING). Failure to follow the warnings and cautions could result in possible personal injury or death.

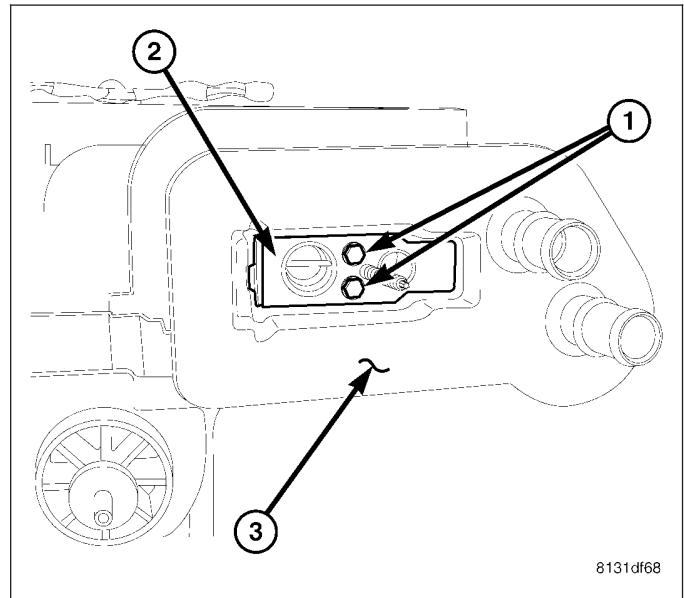


1. Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).
2. Disconnect and isolate the negative battery cable.
3. Remove the bolt (5) that secures the refrigerant line mounting bracket (6) to the left front shock tower (4).
4. Remove the nut (9) that secures the refrigerant line tapping block (10) to the A/C expansion valve (1).
5. Disconnect the wire harness (3) from the A/C pressure transducer (2) to help allow access to the A/C expansion valve.
6. Disconnect the A/C suction line (7) and the A/C liquid line (8) from the A/C expansion valve and position the refrigerant lines out of the way.
7. Remove the dual plane seal from the suction and liquid line fittings and discard.
8. Install plugs in, or tape over the opened suction and liquid line fittings.
9. Remove the two bolts (1) that secure the A/C expansion valve (2) to the evaporator tube tapping block located within the foam seal (3).
10. Remove the A/C expansion valve from the evaporator tube tapping block and foam seal.
11. Remove the dual plane seal from the evaporator tube fittings and discard.
12. Install plugs in, or tape over the opened evaporator tube fittings and all expansion valve ports.

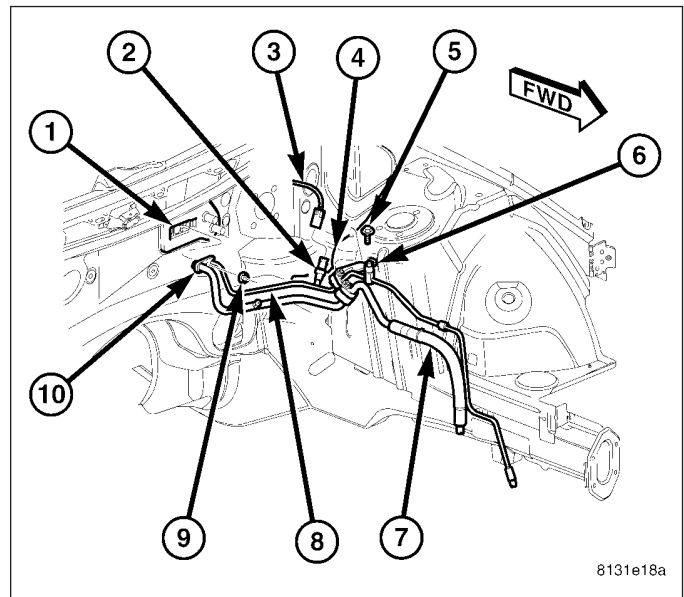


## INSTALLATION

1. Remove the tape or plugs from the evaporator tube fittings and all of the expansion valve ports.
2. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the evaporator tube fittings. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
3. Install the A/C expansion valve (2) onto the evaporator tube tapping block located within the foam seal (3).
4. Install the two bolts (1) that secure the A/C expansion valve to the evaporator tube tapping block. Tighten the bolts to 11 N·m (97 in. lbs.).



5. Remove the tape or plugs from the suction and liquid line fittings.
6. Lubricate a new dual plane seal with clean refrigerant oil and install it onto the suction and liquid line fittings. Use only the specified seal as it is made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
7. Connect the A/C suction line (7) and the A/C liquid line (8) to the A/C expansion valve (1).
8. Install the nut (9) that secures the refrigerant line tapping block (10) to the A/C expansion valve. Tighten the nut to 23 N·m (17 ft. lbs.).
9. Install the bolt (5) that secures the refrigerant line mounting bracket (6) to the left front shock tower (4). Tighten the bolt to 11 N·m (100 in. lbs.).
10. Connect the wire harness (3) to the A/C pressure transducer (2).



11. Reconnect the negative battery cable.
12. Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE).
13. Recharge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).



# EMISSIONS CONTROL

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## EMISSIONS CONTROL

### DESCRIPTION

#### MONITORED COMPONENT

There are several components that will affect vehicle emissions if they malfunction. If one of these components malfunctions the Malfunction Indicator Lamp (Check Engine) will illuminate.

Some of the component monitors are checking for proper operation of the part. Electrically operated components now have input (rationality) and output (functionality) checks as well as continuity tests (opens/shorts). Previously, a component like the Throttle Position sensor (TPS) was checked by the PCM for an open or shorted circuit. If one of these conditions occurred, a DTC was set. Now there is a check to ensure that the component is working. This is done by watching for a TPS indication of a greater or lesser throttle opening than MAP and engine rpm indicate. In the case of the TPS, if engine vacuum is high and engine rpm is 1600 or greater and the TPS indicates a large throttle opening, a DTC will be set. The same applies to low vacuum and 1600 rpm.

Any component that has an associated limp in will set a fault after 1 trip with the malfunction present.

Refer to the Diagnostic Trouble Codes Description Charts in this section and the appropriate Powertrain Diagnostic Procedure Manual for diagnostic procedures.

The following is a list of the monitored components:

- Catalyst Monitor
- Comprehensive Components
- EGR (if equipped)
- Fuel Control (rich/lean)
- Oxygen Sensor Monitor
- Oxygen Sensor Heater Monitor
- Purge
- Misfire
- Natural Vacuum Leak Detection (NVLD)

#### COMPREHENSIVE COMPONENTS

Along with the major monitors, OBD II requires that the diagnostic system monitor any component that could affect emissions levels. In many cases, these components were being tested under OBD I. The OBD I requirements focused mainly on testing emissions-related components for electrical opens and shorts.

However, OBD II also requires that inputs from powertrain components to the PCM be tested for **rationality**, and that outputs to powertrain components from the PCM be tested for **functionality**. Methods for monitoring the various Comprehensive Component monitoring include:

1. Circuit Continuity
  - Open
  - Shorted high
  - Shorted to ground
2. Rationality or Proper Functioning
  - Inputs tested for rationality
  - Outputs tested for functionality

**Note: Comprehensive component monitors are continuous. Therefore, enabling conditions do not apply. All will set a DTC and illuminate the MIL in 1- trip.**

**Input Rationality**—While input signals to the PCM are constantly being monitored for electrical opens and shorts, they are also tested for rationality. This means that the input signal is compared against other inputs and information to see if it makes sense under the current conditions.

PCM sensor inputs that are checked for rationality include:

- Manifold Absolute Pressure (MAP) Sensor
- Oxygen Sensor (O2S) (slow response)
- Engine Coolant Temperature (ECT) Sensor
- Camshaft Position (CMP) Sensor
- Vehicle Speed Sensor
- Crankshaft Position (CKP) Sensor
- Intake Air Temperature (IAT) Sensor
- Throttle Position (TPS) Sensor
- Ambient/Battery Temperature Sensors
- Power Steering Switch
- Oxygen Sensor Heater
- Engine Controller
- Brake Switch
- Natural Vacuum Leak Detection (NVLD)
- P/N Switch
- Trans Controls

**Output Functionality**—PCM outputs are tested for functionality in addition to testing for opens and shorts. When the PCM provides a voltage to an output component, it can verify that the command was carried out by monitoring specific input signals for expected changes. For example, when the PCM commands the Idle Air Control (IAC) Motor to a specific position under certain operating conditions, it expects to see a specific (target) idle speed (RPM). If it does not, it stores a DTC.

PCM outputs monitored for functionality include:

- Fuel Injectors
- Ignition Coils
- Torque Converter Clutch Solenoid
- Idle Air Control
- Purge Solenoid
- EGR Solenoid
- Radiator Fan Control
- Trans Controls

## OXYGEN SENSOR (O2S) MONITOR

**DESCRIPTION**—Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperature 300° to 350°C (572° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. When there is a large amount of oxygen in the exhaust caused by a lean

condition, misfire or exhaust leak, the sensor produces a low voltage, below 450 mV. When the oxygen content is lower, caused by a rich condition, the sensor produces a higher voltage, above 450mV.

The information obtained by the sensor is used to calculate the fuel injector pulse width. The PCM is programmed to maintain the optimum air/fuel ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrous oxide (NOx) from the exhaust.

The O2S is also the main sensing element for the EGR, Catalyst and Fuel Monitors, and purge.

The O2S may fail in any or all of the following manners:

- Slow response rate (Big Slope)
- Reduced output voltage (Half Cycle)
- Heater Performance

**Slow Response Rate (Big Slope)**—Response rate is the time required for the sensor to switch from lean to rich signal output once it is exposed to a richer than optimum A/F mixture or vice versa. As the PCM adjusts the air/fuel ratio, the sensor must be able to rapidly detect the change. As the sensor ages, it could take longer to detect the changes in the oxygen content of the exhaust gas. The rate of change that an oxygen sensor experiences is called 'Big Slope'. The PCM checks the oxygen sensor voltage in increments of a few milliseconds.

**Reduced Output Voltage (Half Cycle)**—The output voltage of the O2S ranges from 2.5 to 5 volt. A good sensor can easily generate any output voltage in this range as it is exposed to different concentrations of oxygen. To detect a shift in the A/F mixture (lean or rich), the output voltage has to change beyond a threshold value. A malfunctioning sensor could have difficulty changing beyond the threshold value. Many times the condition is only temporey and the sensor will recover. Under normal conditions the voltage signal surpasses the threshold, and a counter is incremented by one. This is called the Half Cycle Counter.

**Heater Performance**—The heater is tested by a separate monitor. Refer to the Oxygen Sensor Heater Monitor.

**OPERATION**—As the Oxygen Sensor signal switches, the PCM monitors the half cycle and big slope signals from the oxygen sensor. If during the test neither counter reaches a predetermined value, a malfunction is entered and a Freeze Frame is stored. Only one counter reaching its predetermined value is needed for the monitor to pass.

The Oxygen Sensor Signal Monitor is a two trip monitor that is tested only once per trip. When the Oxygen Sensor fails the test in two consecutive trips, the MIL is illuminated and a DTC is set. The MIL is extinguished when the Oxygen Sensor monitor passes in three consecutive trips. The DTC is erased from memory after 40 consecutive warm-up cycles without test failure.

**Enabling Conditions**—The following conditions must typically be met for the PCM to run the oxygen sensor monitor:

- Battery voltage
- Engine temperature
- Engine run time
- Engine run time at a predetermined speed
- Engine run time at a predetermined speed and throttle opening
- Transmission in gear (automatic only)
- Fuel system in Closed Loop
- Long Term Adaptive (within parameters)
- Power Steering Switch in low PSI (no load)
- Engine at idle
- Fuel level above 15%
- Ambient air temperature
- Barometric pressure
- Engine RPM within acceptable range of desired idle
- Closed throttle speed

**Pending Conditions**—The Task Manager typically does not run the Oxygen Sensor Signal Monitor if overlapping monitors are running or the MIL is illuminated for any of the following:

- Misfire Monitor
- Front Oxygen Sensor and Heater Monitor
- MAP Sensor
- Vehicle Speed Sensor

- Engine Coolant Temperature Sensor
- Throttle Position Sensor
- Engine Controller Self Test Faults
- Cam or Crank Sensor
- Injector and Coil
- Idle Air Control Motor
- EVAP Electrical
- EGR Solenoid Electrical
- Intake Air Temperature
- 5 Volt Feed

**Conflict**—The Task Manager does not run the Oxygen Sensor Monitor if any of the following conditions are present:

- A/C ON (A/C clutch cycling temporarily suspends monitor)
- Purge flow in progress
- Ethanol content learn is taking place and the ethanol used once flag is set

**Suspend**—The Task Manager suspends maturing a fault for the Oxygen Sensor Monitor if any of the following are present:

- Oxygen Sensor Heater Monitor, Priority 1
- Misfire Monitor, Priority 2

### OXYGEN SENSOR HEATER MONITOR (NGC)

**DESCRIPTION**—If the Oxygen sensor (O2S) DTC as well as a O2S heater DTC is present, the O2S Heater DTC MUST be repaired first. After the O2S Heater is repaired, verify that the sensor circuit is operating correctly.

The voltage reading taken from the O2S are very temperature sensitive. The readings taken from the O2S are not accurate below 300 degrees C. Heating the O2S is done to allow the engine controller to shift to closed loop control as soon as possible. The heating element used to heat the O2S must be tested to ensure that it is heating the sensor properly. Starting with the introduction on the NGC module the strategy for checking the heater circuit has changed. The heater resistance is checked by the NGC almost immediately after the engine is started. The same O2S heater return pin used to read the heater resistance is capable of detecting an open circuit, a shorted high or shorted low condition.

### CATALYST MONITOR

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide.

Normal vehicle miles or engine misfire can cause a catalyst to decay. A meltdown of the ceramic core can cause a reduction of the exhaust passage. This can increase vehicle emissions and deteriorate engine performance, driveability and fuel economy.

The catalyst monitor uses dual oxygen sensors (O2S's) to monitor the efficiency of the converter. The dual O2S strategy is based on the fact that as a catalyst deteriorates, its oxygen storage capacity and its efficiency are both reduced. By monitoring the oxygen storage capacity of a catalyst, its efficiency can be indirectly calculated. The upstream O2S is used to detect the amount of oxygen in the exhaust gas before the gas enters the catalytic converter. The PCM calculates the A/F mixture from the output of the O2S. A low voltage indicates high oxygen content (lean mixture). A high voltage indicates a low content of oxygen (rich mixture).

When the upstream O2S detects a high oxygen condition, there is an abundance of oxygen in the exhaust gas. A functioning converter would store this oxygen so it can use it for the oxidation of HC and CO. As the converter absorbs the oxygen, there will be a lack of oxygen downstream of the converter. The output of the downstream O2S will indicate limited activity in this condition.

As the converter loses the ability to store oxygen, the condition can be detected from the behavior of the downstream O2S. When the efficiency drops, no chemical reaction takes place. This means the concentration of oxygen will be the same downstream as upstream. The output voltage of the downstream O2S copies the voltage of the upstream sensor. The only difference is a time lag (seen by the PCM) between the switching of the O2S's.

To monitor the system, the number of lean-to-rich switches of upstream and downstream O2S's is counted. The ratio of downstream switches to upstream switches is used to determine whether the catalyst is operating properly.



An effective catalyst will have fewer downstream switches than it has upstream switches i.e., a ratio closer to zero. For a totally ineffective catalyst, this ratio will be one-to-one, indicating that no oxidation occurs in the device.

The system must be monitored so that when catalyst efficiency deteriorates and exhaust emissions increase to over the legal limit, the MIL (check engine lamp) will be illuminated.

**Monitor Operation**—To monitor catalyst efficiency, the PCM expands the rich and lean switch points of the heated oxygen sensor. With extended switch points, the air/fuel mixture runs richer and leaner to overburden the catalytic converter. Once the test is started, the air/fuel mixture runs rich and lean and the O<sub>2</sub> switches are counted. A switch is counted when an oxygen sensor signal goes from below the lean threshold to above the rich threshold. The number of Rear O<sub>2</sub> sensor switches is divided by the number of Front O<sub>2</sub> sensor switches to determine the switching ratio.

The test runs for 20 seconds. As catalyst efficiency deteriorated over the life of the vehicle, the switch rate at the downstream sensor approaches that of the upstream sensor. If at any point during the test period the switch ratio reaches a predetermined value, a counter is incremented by one. The monitor is enabled to run another test during that trip. When the test fails three times, the counter increments to three, a malfunction is entered, and a Freeze Frame is stored. When the counter increments to three during the next trip, the code is matured and the MIL is illuminated. If the test passes the first, no further testing is conducted during that trip.

The MIL is extinguished after three consecutive good trips. The good trip criteria for the catalyst monitor is more stringent than the failure criteria. In order to pass the test and increment one good trip, the downstream sensor switch rate must be less than 80% of the upstream rate (60% for manual transmissions). The failure percentages are 90% and 70% respectively.

**Enabling Conditions**—The following conditions must typically be met before the PCM runs the catalyst monitor. Specific times for each parameter may be different from engine to engine.

- Accumulated drive time
- Enable time
- Ambient air temperature
- Barometric pressure
- Catalyst warm-up counter
- Engine coolant temperature
- Accumulated throttle position sensor
- Vehicle speed
- MAP
- RPM
- Engine in closed loop
- Fuel level

**Pending Conditions**—

- Misfire DTC
- Front Oxygen Sensor Response
- Front Oxygen Sensor Heater Monitor
- Front Oxygen Sensor Electrical
- Rear Oxygen Sensor Rationality (middle check)
- Rear Oxygen Sensor Heater Monitor
- Rear Oxygen Sensor Electrical
- Fuel System Monitor
- All TPS faults
- All MAP faults
- All ECT sensor faults
- Purge flow solenoid functionality
- Purge flow solenoid electrical
- All PCM self test faults
- All CMP and CKP sensor faults
- All injector and ignition electrical faults
- Idle Air Control (IAC) motor functionality



- Vehicle Speed Sensor
- Brake switch
- Intake air temperature

**Conflict**—The catalyst monitor does not run if any of the following conditions are present:

- EGR Monitor in progress
- Fuel system rich intrusive test in progress
- EVAP Monitor in progress
- Time since start is less than 60 seconds
- Low fuel level
- Low ambient air temperature
- Ethanol content learn is taking place and the ethanol used once flag is set

**Suspend**—The Task Manager does not mature a catalyst fault if any of the following are present:

- Oxygen Sensor Monitor, Priority 1
- Upstream Oxygen Sensor Heater, Priority 1
- EGR Monitor, Priority 1
- EVAP Monitor, Priority 1
- Fuel System Monitor, Priority 2
- Misfire Monitor, Priority 2

## VEHICLE EMISSION CONTROL INFORMATION LABEL

All models have a Vehicle Emission Control Information (VECI) Label. Chrysler permanently attaches the label in the engine compartment. It cannot be removed without defacing information and destroying the label.

The label contains the vehicle's emission specifications and vacuum hose routings. All hoses must be connected and routed according to the label.

## TRIP DEFINITION

A "Trip" means vehicle operation (following an engine-off period) of duration and driving mode such that all components and systems are monitored at least once by the diagnostic system. The monitors must successfully pass before the PCM can verify that a previously malfunctioning component is meeting the normal operating conditions of that component. For misfire or fuel system malfunction, the MIL may be extinguished if the fault does not recur when monitored during three subsequent sequential driving cycles in which conditions are similar to those under which the malfunction was first determined.

Anytime the MIL is illuminated, a DTC is stored. The DTC can self erase only after the MIL has been extinguished. Once the MIL is extinguished, the PCM must pass the diagnostic test for the most recent DTC for 40 warm-up cycles (80 warm-up cycles for the Fuel System Monitor and the Misfire Monitor). A warm-up cycle can best be described by the following:

- The engine must be running
- A rise of 40°F in engine temperature must occur from the time when the engine was started
- Engine coolant temperature must crossover 160°F
- A "driving cycle" that consists of engine start up and engine shut off.

Once the above conditions occur, the PCM is considered to have passed a warm-up cycle. Due to the conditions required to extinguish the MIL and erase the DTC, it is most important that after a repair has been made, all DTC's be erased and the repair verified by running 1—good trip.

## NON-MONITORED CIRCUITS

The PCM does not monitor all circuits, systems and conditions that could have malfunctions causing driveability problems. However, problems with these systems may cause the PCM to store diagnostic trouble codes for other systems or components. For example, a fuel pressure problem will not register a fault directly, but could cause a rich/lean condition or misfire. This could cause the PCM to store an oxygen sensor or misfire diagnostic trouble code.

The major non-monitored circuits are listed below along with examples of failure modes that do not directly cause the PCM to set a DTC, but for a system that is monitored.

## **FUEL PRESSURE**

The fuel pressure regulator controls fuel system pressure. The PCM cannot detect a clogged fuel pump inlet filter, clogged in-line fuel filter, or a pinched fuel supply or return line. However, these could result in a rich or lean condition causing the PCM to store an oxygen sensor, fuel system, or misfire diagnostic trouble code.

## **SECONDARY IGNITION CIRCUIT**

The PCM cannot detect an inoperative ignition coil, fouled or worn spark plugs, ignition cross firing, or open spark plug cables. The misfire will however, increase the oxygen content in the exhaust, deceiving the PCM in to thinking the fuel system is too lean. Also see misfire detection. There are DTC's that can detect misfire and Ionization shorts in the secondary ignition circuit, refer to the Powertrain Diagnostic manual for more information

## **CYLINDER COMPRESSION**

The PCM cannot detect uneven, low, or high engine cylinder compression. Low compression lowers O2 content in the exhaust. Leading to fuel system, oxygen sensor, or misfire detection fault.

## **EXHAUST SYSTEM**

The PCM cannot detect a plugged, restricted or leaking exhaust system. It may set a EGR (if equipped) or Fuel system or O2S fault.

## **FUEL INJECTOR MECHANICAL MALFUNCTIONS**

The PCM cannot determine if a fuel injector is clogged, the needle is sticking or if the wrong injector is installed. However, these could result in a rich or lean condition causing the PCM to store a diagnostic trouble code for either misfire, an oxygen sensor, or the fuel system.

## **EXCESSIVE OIL CONSUMPTION**

Although the PCM monitors engine exhaust oxygen content when the system is in closed loop, it cannot determine excessive oil consumption.

## **THROTTLE BODY AIR FLOW**

The PCM cannot detect a clogged or restricted air cleaner inlet or filter element.

## **VACUUM ASSIST**

The PCM cannot detect leaks or restrictions in the vacuum circuits of vacuum assisted engine control system devices. However, these could cause the PCM to store a MAP sensor diagnostic trouble code and cause a high idle condition.

## **PCM SYSTEM GROUND**

The PCM cannot determine a poor system ground. However, one or more diagnostic trouble codes may be generated as a result of this condition. The module should be mounted to the body at all times, including when diagnostics are performed.

## **PCM CONNECTOR ENGAGEMENT**

The PCM may not be able to determine spread or damaged connector pins. However, it might store diagnostic trouble codes as a result of spread connector pins.

## **DESCRIPTION - MONITORED SYSTEMS**

There are new electronic circuit monitors that check fuel, emission, engine and ignition performance. These monitors use information from various sensor circuits to indicate the overall operation of the fuel, engine, ignition and emission systems and thus the emissions performance of the vehicle.

The fuel, engine, ignition and emission systems monitors do not indicate a specific component problem. They do indicate that there is an implied problem within one of the systems and that a specific problem must be diagnosed.

If any of these monitors detect a problem affecting vehicle emissions, the Malfunction Indicator (Check Engine) Lamp will be illuminated. These monitors generate Diagnostic Trouble Codes that can be displayed with the a scan tool.

The following is a list of the system monitors:

- EGR Monitor (if equipped)
- Misfire Monitor
- Fuel System Monitor
- Oxygen Sensor Monitor
- Oxygen Sensor Heater Monitor
- Catalyst Monitor
- Evaporative System Leak Detection Monitor (if equipped)

Following is a description of each system monitor, and its DTC.

**Refer to the appropriate Powertrain Diagnostics Procedures manual for diagnostic procedures.**

### **OXYGEN SENSOR (O2S) MONITOR**

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperatures of 300° to 350°C (572° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. The information obtained by the sensor is used to calculate the fuel injector pulse width. The PCM is programmed to maintain the optimum air/fuel ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrous oxide (NOx) from the exhaust.

The O2S is also the main sensing element for the EGR (if equipped), Catalyst and Fuel Monitors.

The O2S may fail in any or all of the following manners:

- Slow response rate
- Reduced output voltage
- Dynamic shift
- Shorted or open circuits

Response rate is the time required for the sensor to switch from lean to rich once it is exposed to a richer than optimum A/F mixture or vice versa. As the sensor starts malfunctioning, it could take longer to detect the changes in the oxygen content of the exhaust gas.

The output voltage of the O2S ranges from 0 to 1 volt (voltages are offset by 2.5 volts on NGC vehicles). A good sensor can easily generate any output voltage in this range as it is exposed to different concentrations of oxygen. To detect a shift in the A/F mixture (lean or rich), the output voltage has to change beyond a threshold value. A malfunctioning sensor could have difficulty changing beyond the threshold value.

### **OXYGEN SENSOR HEATER MONITOR**

If there is an oxygen sensor (O2S) DTC as well as a O2S heater DTC, the O2S heater fault **MUST** be repaired first. After the O2S fault is repaired, verify that the heater circuit is operating correctly.

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperatures of 300° to 350°C (572 ° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. The information obtained by the sensor is used to calculate the fuel injector pulse width. This maintains a 14.7 to 1 Air Fuel (A/F) ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxide (NOx) from the exhaust.

The voltage readings taken from the O2S are very temperature sensitive. The readings are not accurate below 300°C. Heating of the O2S is done to allow the engine controller to shift to closed loop control as soon as possible. The heating element used to heat the O2S must be tested to ensure that it is heating the sensor properly.

The O2S circuit is monitored for a drop in voltage. The sensor output is used to test the heater by isolating the effect of the heater element on the O2S output voltage from the other effects.

### **EGR MONITOR (if equipped)**

The Powertrain Control Module (PCM) performs an on-board diagnostic check of the EGR system.

The EGR monitor is used to test whether the EGR system is operating within specifications. The diagnostic check activates only during selected engine/driving conditions. When the conditions are met, the EGR is turned off (solenoid energized) and the O2S compensation control is monitored. Turning off the EGR shifts the air fuel (A/F) ratio in the lean direction. The O2S data should indicate an increase in the O2 concentration in the combustion chamber when the exhaust gases are no longer recirculated. While this test does not directly measure the operation of the EGR system, it can be inferred from the shift in the O2S data whether the EGR system is operating correctly. Because the O2S is being used, the O2S test must pass its test before the EGR test. Also looks at EGR linear potentiometer for feedback.

### **MISFIRE MONITOR**

Excessive engine misfire results in increased catalyst temperature and causes an increase in HC emissions. Severe misfires could cause catalyst damage. To prevent catalytic converter damage, the PCM monitors engine misfire.

The Powertrain Control Module (PCM) monitors for misfire during most engine operating conditions (positive torque) by looking at changes in the crankshaft speed. If a misfire occurs the speed of the crankshaft will vary more than normal.

The PCM can detect and compensate for variances in the engine and its components. To learn these variations, the PCM uses the input of the actual crankshaft rotation pattern and ideal crankshaft rotation pattern that has been calibrated into the PCM. The PCM then compares the two patterns. The variation between the two values is the Adaptive Numerator. If the Adaptive Numerator is not learned by the PCM, the misfire monitor will not run and the Multi-Cylinder Displacement System (MDS) will not operate. Without MDS operation, the customer will experience decreased fuel economy. If the customer experiences decrease fuel economy, use the scan tool to ensure that the Adaptive Numerator is learned.

### **FUEL SYSTEM MONITOR**

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide. The catalyst works best when the air fuel (A/F) ratio is at or near the optimum of 14.7 to 1.

The PCM is programmed to maintain the optimum air/fuel ratio. This is done by making short term corrections in the fuel injector pulse width based on the O2S output. The programmed memory acts as a self calibration tool that the engine controller uses to compensate for variations in engine specifications, sensor tolerances and engine fatigue over the life span of the engine. By monitoring the actual air-fuel ratio with the O2S (short term) and multiplying that with the program long-term (adaptive) memory and comparing that to the limit, it can be determined whether it will pass an emissions test. If a malfunction occurs such that the PCM cannot maintain the optimum A/F ratio, then the MIL will be illuminated.

### **CATALYST MONITOR**

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide.

Normal vehicle miles or engine misfire can cause a catalyst to decay. A meltdown of the ceramic core can cause a reduction of the exhaust passage. This can increase vehicle emissions and deteriorate engine performance, driveability and fuel economy.

The catalyst monitor uses dual oxygen sensors (O2S's) to monitor the efficiency of the converter. The dual O2S's strategy is based on the fact that as a catalyst deteriorates, its oxygen storage capacity and its efficiency are both reduced. By monitoring the oxygen storage capacity of a catalyst, its efficiency can be indirectly calculated. The upstream O2S is used to detect the amount of oxygen in the exhaust gas before the gas enters the catalytic converter. The PCM calculates the A/F mixture from the output of the O2S. A low voltage indicates high oxygen content (lean mixture). A high voltage indicates a low content of oxygen (rich mixture).

When the upstream O2S detects a lean condition, there is an abundance of oxygen in the exhaust gas. A functioning converter would store this oxygen so it can use it for the oxidation of HC and CO. As the converter absorbs the oxygen, there will be a lack of oxygen downstream of the converter. The output of the downstream O2S will indicate limited activity in this condition.

As the converter loses the ability to store oxygen, the condition can be detected from the behavior of the downstream O2S. When the efficiency drops, no chemical reaction takes place. This means the concentration of oxygen will be the same downstream as upstream. The output voltage of the downstream O2S copies the voltage of the upstream sensor. The only difference is a time lag (seen by the PCM) between the switching of the O2S's.

To monitor the system, the number of lean-to-rich switches of upstream and downstream O<sub>2</sub>S's is counted. The ratio of downstream switches to upstream switches is used to determine whether the catalyst is operating properly. An effective catalyst will have fewer downstream switches than it has upstream switches i.e., a ratio closer to zero. For a totally ineffective catalyst, this ratio will be one-to-one, indicating that no oxidation occurs in the device.

The system must be monitored so that when catalyst efficiency deteriorates and exhaust emissions increase to over the legal limit, the MIL (Check Engine lamp) will be illuminated.

### **NATURAL VACUUM LEAK DETECTION (NVLD) (if equipped)**

The Natural Vacuum Leak Detection (NVLD) system is the next generation evaporative leak detection system that will first be used on vehicles equipped with the Next Generation Controller (NGC). This new system replaces the leak detection pump as the method of evaporative system leak detection. This is to detect a leak equivalent to a 0.020" (0.5 mm) hole. This system has the capability to detect holes of this size very dependably.

The basic leak detection theory employed with NVLD is the "Gas Law". This is to say that the pressure in a sealed vessel will change if the temperature of the gas in the vessel changes. The vessel will only see this effect if it is indeed sealed. Even small leaks will allow the pressure in the vessel to come to equilibrium with the ambient pressure. In addition to the detection of very small leaks, this system has the capability of detecting medium as well as large evaporative system leaks.

The NVLD seals the canister vent during engine off conditions. If the EVAP system has a leak of less than the failure threshold, the evaporative system will be pulled into a vacuum, either due to the cool down from operating temperature or diurnal ambient temperature cycling. The diurnal effect is considered one of the primary contributors to the leak determination by this diagnostic. When the vacuum in the system exceeds about 1" H<sub>2</sub>O (0.25 KPA), a vacuum switch closes. The switch closure sends a signal to the NGC. The NGC, via appropriate logic strategies (described below), utilizes the switch signal, or lack thereof, to make a determination of whether a leak is present.

The NVLD device is designed with a normally open vacuum switch, a normally closed solenoid, and a seal, which is actuated by both the solenoid and a diaphragm. The NVLD is located on the atmospheric vent side of the canister. The NVLD assembly may be mounted on top of the canister outlet, or in-line between the canister and atmospheric vent filter. The normally open vacuum switch will close with about 1" H<sub>2</sub>O (0.25 KPA) vacuum in the evaporative system. The diaphragm actuates the switch. This is above the opening point of the fuel inlet check valve in the fill tube so cap off leaks can be detected. Submerged fill systems must have recirculation lines that do not have the in-line normally closed check valve that protects the system from failed nozzle liquid ingestion, in order to detect cap off conditions.

The normally closed valve in the NVLD is intended to maintain the seal on the evaporative system during the engine off condition. If vacuum in the evaporative system exceeds 3" to 6" H<sub>2</sub>O (0.75 to 1.5 KPA), the valve will be pulled off the seat, opening the seal. This will protect the system from excessive vacuum as well as allowing sufficient purge flow in the event that the solenoid was to become inoperative.

The solenoid actuates the valve to unseal the canister vent while the engine is running. It also will be used to close the vent during the medium and large leak tests and during the purge flow check. This solenoid requires initial 1.5 amps of current to pull the valve open but after 100 ms. will be duty cycled down to an average of about 150 mA for the remainder of the drive cycle.

Another feature in the device is a diaphragm that will open the seal in the NVLD with pressure in the evaporative system. The device will "blow off" at about 0.5" H<sub>2</sub>O (0.12 KPA) pressure to permit the venting of vapors during refueling. An added benefit to this is that it will also allow the tank to "breathe" during increasing temperatures, thus limiting the pressure in the tank to this low level. This is beneficial because the induced vacuum during a subsequent declining temperature will achieve the switch closed (pass threshold) sooner than if the tank had to decay from a built up pressure.

The device itself has 3 wires: Switch sense, solenoid driver and ground. It also includes a resistor to protect the switch from a short to battery or a short to ground. The NGC utilizes a high-side driver to energize and duty-cycle the solenoid.

### **HIGH AND LOW LIMITS**

The PCM compares input signal voltages from each input device with established high and low limits for the device. If the input voltage is not within limits and other criteria are met, the PCM stores a diagnostic trouble code in memory. Other diagnostic trouble code criteria might include engine RPM limits or input voltages from other sensors or switches that must be present before verifying a diagnostic trouble code condition.



## OPERATION

### SYSTEM

The Powertrain Control Module (PCM) monitors many different circuits in the fuel injection, ignition, emission and engine systems. If the PCM senses a problem with a monitored circuit often enough to indicate an actual problem, it stores a Diagnostic Trouble Code (DTC) in the PCM's memory. If the code applies to a non-emissions related component or system, and the problem is repaired or ceases to exist, the PCM cancels the code after 40 warmup cycles. Diagnostic trouble codes that affect vehicle emissions illuminate the Malfunction Indicator Lamp (MIL). Refer to Malfunction Indicator Lamp in this section.

Certain criteria must be met before the PCM stores a DTC in memory. The criteria may be a specific range of engine RPM, engine temperature, and/or input voltage to the PCM.

The PCM might not store a DTC for a monitored circuit even though a malfunction has occurred. This may happen because one of the DTC criteria for the circuit has not been met. **For example**, assume the diagnostic trouble code criteria requires the PCM to monitor the circuit only when the engine operates between 750 and 2000 RPM. Suppose the sensor's output circuit shorts to ground when engine operates above 2400 RPM (resulting in 0 volt input to the PCM). Because the condition happens at an engine speed above the maximum threshold (2000 rpm), the PCM will not store a DTC.

There are several operating conditions for which the PCM monitors and sets DTC's. Refer to Monitored Systems, Components, and Non-Monitored Circuits in this section.

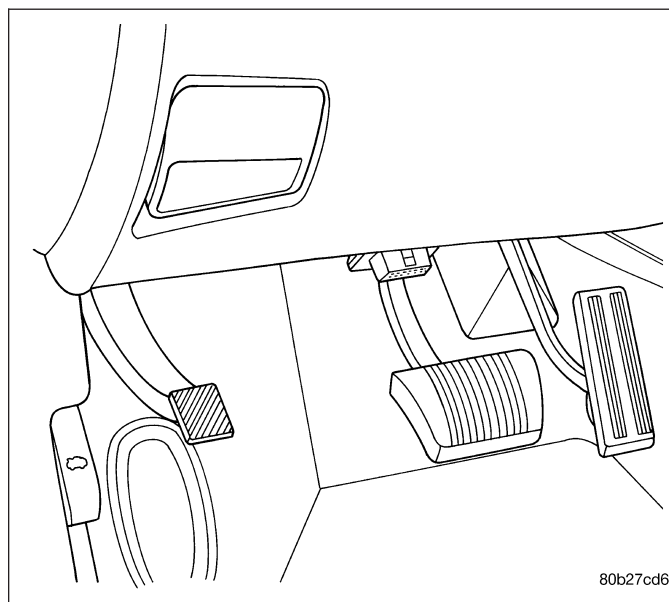
**Note:** Various diagnostic procedures may actually cause a diagnostic monitor to set a DTC. For instance, pulling a spark plug wire to perform a spark test may set the misfire code. When a repair is completed and verified, use the scan tool to erase all DTC's and extinguish the MIL.

Technicians can display stored DTC's. For obtaining the DTC information, use the Data Link Connector with the scan tool.

### DRB III® STATE DISPLAY TEST MODE

#### OPERATION

The switch inputs to the Powertrain Control Module (PCM) have two recognized states; HIGH and LOW. For this reason, the PCM cannot recognize the difference between a selected switch position versus an open circuit, a short circuit, or a defective switch. If the State Display screen shows the change from HIGH to LOW or LOW to HIGH, assume the entire switch circuit to the PCM functions properly. From the state display screen, access either State Display Inputs and Outputs or State Display Sensors.



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# EVAPORATIVE EMISSIONS

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## EVAPORATIVE EMISSIONS

### DESCRIPTION

#### MONITORED COMPONENT

There are several components that will affect vehicle emissions if they malfunction. If one of these components malfunctions the Malfunction Indicator Lamp (Check Engine) will illuminate.

Some of the component monitors are checking for proper operation of the part. Electrically operated components now have input (rationality) and output (functionality) checks as well as continuity tests (opens/shorts). Previously, a component like the Throttle Position sensor (TPS) was checked by the PCM for an open or shorted circuit. If one of these conditions occurred, a DTC was set. Now there is a check to ensure that the component is working. This is done by watching for a TPS indication of a greater or lesser throttle opening than MAP and engine rpm indicate. In the case of the TPS, if engine vacuum is high and engine rpm is 1600 or greater and the TPS indicates a large throttle opening, a DTC will be set. The same applies to low vacuum and 1600 rpm.

Any component that has an associated limp in will set a fault after 1 trip with the malfunction present.

Refer to the Diagnostic Trouble Codes Description Charts in this section and the appropriate Powertrain Diagnostic Procedure Manual for diagnostic procedures.

The following is a list of the monitored components:

- Catalyst Monitor
- Comprehensive Components
- EGR (if equipped)
- Fuel Control (rich/lean)
- Oxygen Sensor Monitor
- Oxygen Sensor Heater Monitor
- Purge
- Misfire
- Natural Vacuum Leak Detection (NVLD)

## COMPREHENSIVE COMPONENTS

Along with the major monitors, OBD II requires that the diagnostic system monitor any component that could affect emissions levels. In many cases, these components were being tested under OBD I. The OBD I requirements focused mainly on testing emissions-related components for electrical opens and shorts.

However, OBD II also requires that inputs from powertrain components to the PCM be tested for **rationality**, and that outputs to powertrain components from the PCM be tested for **functionality**. Methods for monitoring the various Comprehensive Component monitoring include:

1. Circuit Continuity
  - Open
  - Shorted high
  - Shorted to ground
2. Rationality or Proper Functioning
  - Inputs tested for rationality
  - Outputs tested for functionality

**Note: Comprehensive component monitors are continuous. Therefore, enabling conditions do not apply. All will set a DTC and illuminate the MIL in 1- trip.**

**Input Rationality**—While input signals to the PCM are constantly being monitored for electrical opens and shorts, they are also tested for rationality. This means that the input signal is compared against other inputs and information to see if it makes sense under the current conditions.

PCM sensor inputs that are checked for rationality include:

- Manifold Absolute Pressure (MAP) Sensor
- Oxygen Sensor (O2S) (slow response)
- Engine Coolant Temperature (ECT) Sensor
- Camshaft Position (CMP) Sensor
- Vehicle Speed Sensor
- Crankshaft Position (CKP) Sensor
- Intake Air Temperature (IAT) Sensor
- Throttle Position (TPS) Sensor
- Ambient/Battery Temperature Sensors
- Power Steering Switch
- Oxygen Sensor Heater
- Engine Controller
- Brake Switch
- Natural Vacuum Leak Detection (NVLD)
- P/N Switch
- Trans Controls

**Output Functionality**—PCM outputs are tested for functionality in addition to testing for opens and shorts. When the PCM provides a voltage to an output component, it can verify that the command was carried out by monitoring specific input signals for expected changes. For example, when the PCM commands the Idle Air Control (IAC) Motor to a specific position under certain operating conditions, it expects to see a specific (target) idle speed (RPM). If it does not, it stores a DTC.

PCM outputs monitored for functionality include:

- Fuel Injectors
- Ignition Coils
- Torque Converter Clutch Solenoid
- Idle Air Control
- Purge Solenoid
- EGR Solenoid
- Radiator Fan Control
- Trans Controls



## OXYGEN SENSOR (O2S) MONITOR

**DESCRIPTION**—Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperature 300° to 350°C (572° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. When there is a large amount of oxygen in the exhaust caused by a lean condition, misfire or exhaust leak, the sensor produces a low voltage, below 450 mV. When the oxygen content is lower, caused by a rich condition, the sensor produces a higher voltage, above 450mV.

The information obtained by the sensor is used to calculate the fuel injector pulse width. The PCM is programmed to maintain the optimum air/fuel ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrous oxide (NOx) from the exhaust.

The O2S is also the main sensing element for the EGR, Catalyst and Fuel Monitors, and purge.

The O2S may fail in any or all of the following manners:

- Slow response rate (Big Slope)
- Reduced output voltage (Half Cycle)
- Heater Performance

**Slow Response Rate (Big Slope)**—Response rate is the time required for the sensor to switch from lean to rich signal output once it is exposed to a richer than optimum A/F mixture or vice versa. As the PCM adjusts the air/fuel ratio, the sensor must be able to rapidly detect the change. As the sensor ages, it could take longer to detect the changes in the oxygen content of the exhaust gas. The rate of change that an oxygen sensor experiences is called 'Big Slope'. The PCM checks the oxygen sensor voltage in increments of a few milliseconds.

**Reduced Output Voltage (Half Cycle)**—The output voltage of the O2S ranges from 2.5 to 5 volt. A good sensor can easily generate any output voltage in this range as it is exposed to different concentrations of oxygen. To detect a shift in the A/F mixture (lean or rich), the output voltage has to change beyond a threshold value. A malfunctioning sensor could have difficulty changing beyond the threshold value. Many times the condition is only temporey and the sensor will recover. Under normal conditions the voltage signal surpasses the threshold, and a counter is incremented by one. This is called the Half Cycle Counter.

**Heater Performance**—The heater is tested by a separate monitor. Refer to the Oxygen Sensor Heater Monitor.

**OPERATION**—As the Oxygen Sensor signal switches, the PCM monitors the half cycle and big slope signals from the oxygen sensor. If during the test neither counter reaches a predetermined value, a malfunction is entered and a Freeze Frame is stored. Only one counter reaching its predetermined value is needed for the monitor to pass.

The Oxygen Sensor Signal Monitor is a two trip monitor that is tested only once per trip. When the Oxygen Sensor fails the test in two consecutive trips, the MIL is illuminated and a DTC is set. The MIL is extinguished when the Oxygen Sensor monitor passes in three consecutive trips. The DTC is erased from memory after 40 consecutive warm-up cycles without test failure.

**Enabling Conditions**—The following conditions must typically be met for the PCM to run the oxygen sensor monitor:

- Battery voltage
- Engine temperature
- Engine run time
- Engine run time at a predetermined speed
- Engine run time at a predetermined speed and throttle opening
- Transmission in gear (automatic only)
- Fuel system in Closed Loop
- Long Term Adaptive (within parameters)
- Power Steering Switch in low PSI (no load)
- Engine at idle
- Fuel level above 15%
- Ambient air temperature
- Barometric pressure
- Engine RPM within acceptable range of desired idle
- Closed throttle speed

**Pending Conditions**—The Task Manager typically does not run the Oxygen Sensor Signal Monitor if overlapping monitors are running or the MIL is illuminated for any of the following:

- Misfire Monitor
- Front Oxygen Sensor and Heater Monitor
- MAP Sensor
- Vehicle Speed Sensor
- Engine Coolant Temperature Sensor
- Throttle Position Sensor
- Engine Controller Self Test Faults
- Cam or Crank Sensor
- Injector and Coil
- Idle Air Control Motor
- EVAP Electrical
- EGR Solenoid Electrical
- Intake Air Temperature
- 5 Volt Feed

**Conflict**—The Task Manager does not run the Oxygen Sensor Monitor if any of the following conditions are present:

- A/C ON (A/C clutch cycling temporarily suspends monitor)
- Purge flow in progress
- Ethanol content learn is taking place and the ethanol used once flag is set

**Suspend**—The Task Manager suspends maturing a fault for the Oxygen Sensor Monitor if any of the following are present:

- Oxygen Sensor Heater Monitor, Priority 1
- Misfire Monitor, Priority 2

## OXYGEN SENSOR HEATER MONITOR (NGC)

**DESCRIPTION**—If the Oxygen sensor (O2S) DTC as well as a O2S heater DTC is present, the O2S Heater DTC MUST be repaired first. After the O2S Heater is repaired, verify that the sensor circuit is operating correctly.

The voltage reading taken from the O2S are very temperature sensitive. The readings taken from the O2S are not accurate below 300 degrees C. Heating the O2S is done to allow the engine controller to shift to closed loop control as soon as possible. The heating element used to heat the O2S must be tested to ensure that it is heating the sensor properly. Starting with the introduction on the NGC module the strategy for checking the heater circuit has changed. The heater resistance is checked by the NGC almost immediately after the engine is started. The same O2S heater return pin used to read the heater resistance is capable of detecting an open circuit, a shorted high or shorted low condition.

## CATALYST MONITOR

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide.

Normal vehicle miles or engine misfire can cause a catalyst to decay. A meltdown of the ceramic core can cause a reduction of the exhaust passage. This can increase vehicle emissions and deteriorate engine performance, driveability and fuel economy.

The catalyst monitor uses dual oxygen sensors (O2S's) to monitor the efficiency of the converter. The dual O2S strategy is based on the fact that as a catalyst deteriorates, its oxygen storage capacity and its efficiency are both reduced. By monitoring the oxygen storage capacity of a catalyst, its efficiency can be indirectly calculated. The upstream O2S is used to detect the amount of oxygen in the exhaust gas before the gas enters the catalytic converter. The PCM calculates the A/F mixture from the output of the O2S. A low voltage indicates high oxygen content (lean mixture). A high voltage indicates a low content of oxygen (rich mixture).

When the upstream O2S detects a high oxygen condition, there is an abundance of oxygen in the exhaust gas. A functioning converter would store this oxygen so it can use it for the oxidation of HC and CO. As the converter absorbs the oxygen, there will be a lack of oxygen downstream of the converter. The output of the downstream O2S will indicate limited activity in this condition.

As the converter loses the ability to store oxygen, the condition can be detected from the behavior of the downstream O<sub>2</sub>S. When the efficiency drops, no chemical reaction takes place. This means the concentration of oxygen will be the same downstream as upstream. The output voltage of the downstream O<sub>2</sub>S copies the voltage of the upstream sensor. The only difference is a time lag (seen by the PCM) between the switching of the O<sub>2</sub>S's.

To monitor the system, the number of lean-to-rich switches of upstream and downstream O<sub>2</sub>S's is counted. The ratio of downstream switches to upstream switches is used to determine whether the catalyst is operating properly. An effective catalyst will have fewer downstream switches than it has upstream switches i.e., a ratio closer to zero. For a totally ineffective catalyst, this ratio will be one-to-one, indicating that no oxidation occurs in the device.

The system must be monitored so that when catalyst efficiency deteriorates and exhaust emissions increase to over the legal limit, the MIL (check engine lamp) will be illuminated.

**Monitor Operation**—To monitor catalyst efficiency, the PCM expands the rich and lean switch points of the heated oxygen sensor. With extended switch points, the air/fuel mixture runs richer and leaner to overburden the catalytic converter. Once the test is started, the air/fuel mixture runs rich and lean and the O<sub>2</sub> switches are counted. A switch is counted when an oxygen sensor signal goes from below the lean threshold to above the rich threshold. The number of Rear O<sub>2</sub> sensor switches is divided by the number of Front O<sub>2</sub> sensor switches to determine the switching ratio.

The test runs for 20 seconds. As catalyst efficiency deteriorated over the life of the vehicle, the switch rate at the downstream sensor approaches that of the upstream sensor. If at any point during the test period the switch ratio reaches a predetermined value, a counter is incremented by one. The monitor is enabled to run another test during that trip. When the test fails three times, the counter increments to three, a malfunction is entered, and a Freeze Frame is stored. When the counter increments to three during the next trip, the code is matured and the MIL is illuminated. If the test passes the first, no further testing is conducted during that trip.

The MIL is extinguished after three consecutive good trips. The good trip criteria for the catalyst monitor is more stringent than the failure criteria. In order to pass the test and increment one good trip, the downstream sensor switch rate must be less than 80% of the upstream rate (60% for manual transmissions). The failure percentages are 90% and 70% respectively.

**Enabling Conditions**—The following conditions must typically be met before the PCM runs the catalyst monitor. Specific times for each parameter may be different from engine to engine.

- Accumulated drive time
- Enable time
- Ambient air temperature
- Barometric pressure
- Catalyst warm-up counter
- Engine coolant temperature
- Accumulated throttle position sensor
- Vehicle speed
- MAP
- RPM
- Engine in closed loop
- Fuel level

**Pending Conditions**—

- Misfire DTC
- Front Oxygen Sensor Response
- Front Oxygen Sensor Heater Monitor
- Front Oxygen Sensor Electrical
- Rear Oxygen Sensor Rationality (middle check)
- Rear Oxygen Sensor Heater Monitor
- Rear Oxygen Sensor Electrical
- Fuel System Monitor
- All TPS faults
- All MAP faults
- All ECT sensor faults
- Purge flow solenoid functionality

- Purge flow solenoid electrical
- All PCM self test faults
- All CMP and CKP sensor faults
- All injector and ignition electrical faults
- Idle Air Control (IAC) motor functionality
- Vehicle Speed Sensor
- Brake switch
- Intake air temperature

**Conflict**—The catalyst monitor does not run if any of the following conditions are present:

- EGR Monitor in progress
- Fuel system rich intrusive test in progress
- EVAP Monitor in progress
- Time since start is less than 60 seconds
- Low fuel level
- Low ambient air temperature
- Ethanol content learn is taking place and the ethanol used once flag is set

**Suspend**—The Task Manager does not mature a catalyst fault if any of the following are present:

- Oxygen Sensor Monitor, Priority 1
- Upstream Oxygen Sensor Heater, Priority 1
- EGR Monitor, Priority 1
- EVAP Monitor, Priority 1
- Fuel System Monitor, Priority 2
- Misfire Monitor, Priority 2

## VEHICLE EMISSION CONTROL INFORMATION LABEL

All models have a Vehicle Emission Control Information (VECI) Label. Chrysler permanently attaches the label in the engine compartment. It cannot be removed without defacing information and destroying the label.

The label contains the vehicle's emission specifications and vacuum hose routings. All hoses must be connected and routed according to the label.

## TRIP DEFINITION

A "Trip" means vehicle operation (following an engine-off period) of duration and driving mode such that all components and systems are monitored at least once by the diagnostic system. The monitors must successfully pass before the PCM can verify that a previously malfunctioning component is meeting the normal operating conditions of that component. For misfire or fuel system malfunction, the MIL may be extinguished if the fault does not recur when monitored during three subsequent sequential driving cycles in which conditions are similar to those under which the malfunction was first determined.

Anytime the MIL is illuminated, a DTC is stored. The DTC can self erase only after the MIL has been extinguished. Once the MIL is extinguished, the PCM must pass the diagnostic test for the most recent DTC for 40 warm-up cycles (80 warm-up cycles for the Fuel System Monitor and the Misfire Monitor). A warm-up cycle can best be described by the following:

- The engine must be running
- A rise of 40°F in engine temperature must occur from the time when the engine was started
- Engine coolant temperature must crossover 160°F
- A "driving cycle" that consists of engine start up and engine shut off.

Once the above conditions occur, the PCM is considered to have passed a warm-up cycle. Due to the conditions required to extinguish the MIL and erase the DTC, it is most important that after a repair has been made, all DTC's be erased and the repair verified by running 1-good trip.

## NON-MONITORED CIRCUITS

The PCM does not monitor all circuits, systems and conditions that could have malfunctions causing driveability problems. However, problems with these systems may cause the PCM to store diagnostic trouble codes for other

systems or components. For example, a fuel pressure problem will not register a fault directly, but could cause a rich/lean condition or misfire. This could cause the PCM to store an oxygen sensor or misfire diagnostic trouble code.

The major non-monitored circuits are listed below along with examples of failures modes that do not directly cause the PCM to set a DTC, but for a system that is monitored.

### **FUEL PRESSURE**

The fuel pressure regulator controls fuel system pressure. The PCM cannot detect a clogged fuel pump inlet filter, clogged in-line fuel filter, or a pinched fuel supply or return line. However, these could result in a rich or lean condition causing the PCM to store an oxygen sensor, fuel system, or misfire diagnostic trouble code.

### **SECONDARY IGNITION CIRCUIT**

The PCM cannot detect an inoperative ignition coil, fouled or worn spark plugs, ignition cross firing, or open spark plug cables. The misfire will however, increase the oxygen content in the exhaust, deceiving the PCM in to thinking the fuel system is too lean. Also see misfire detection. There are DTC's that can detect misfire and Ionization shorts in the secondary ignition circuit, refer to the Powertrain Diagnostic manual for more information

### **CYLINDER COMPRESSION**

The PCM cannot detect uneven, low, or high engine cylinder compression. Low compression lowers O2 content in the exhaust. Leading to fuel system, oxygen sensor, or misfire detection fault.

### **EXHAUST SYSTEM**

The PCM cannot detect a plugged, restricted or leaking exhaust system. It may set a EGR (if equipped) or Fuel system or O2S fault.

### **FUEL INJECTOR MECHANICAL MALFUNCTIONS**

The PCM cannot determine if a fuel injector is clogged, the needle is sticking or if the wrong injector is installed. However, these could result in a rich or lean condition causing the PCM to store a diagnostic trouble code for either misfire, an oxygen sensor, or the fuel system.

### **EXCESSIVE OIL CONSUMPTION**

Although the PCM monitors engine exhaust oxygen content when the system is in closed loop, it cannot determine excessive oil consumption.

### **THROTTLE BODY AIR FLOW**

The PCM cannot detect a clogged or restricted air cleaner inlet or filter element.

### **VACUUM ASSIST**

The PCM cannot detect leaks or restrictions in the vacuum circuits of vacuum assisted engine control system devices. However, these could cause the PCM to store a MAP sensor diagnostic trouble code and cause a high idle condition.

### **PCM SYSTEM GROUND**

The PCM cannot determine a poor system ground. However, one or more diagnostic trouble codes may be generated as a result of this condition. The module should be mounted to the body at all times, including when diagnostics are performed.

### **PCM CONNECTOR ENGAGEMENT**

The PCM may not be able to determine spread or damaged connector pins. However, it might store diagnostic trouble codes as a result of spread connector pins.

## DESCRIPTION - MONITORED SYSTEMS

There are new electronic circuit monitors that check fuel, emission, engine and ignition performance. These monitors use information from various sensor circuits to indicate the overall operation of the fuel, engine, ignition and emission systems and thus the emissions performance of the vehicle.

The fuel, engine, ignition and emission systems monitors do not indicate a specific component problem. They do indicate that there is an implied problem within one of the systems and that a specific problem must be diagnosed.

If any of these monitors detect a problem affecting vehicle emissions, the Malfunction Indicator (Check Engine) Lamp will be illuminated. These monitors generate Diagnostic Trouble Codes that can be displayed with the a scan tool.

The following is a list of the system monitors:

- EGR Monitor (if equipped)
- Misfire Monitor
- Fuel System Monitor
- Oxygen Sensor Monitor
- Oxygen Sensor Heater Monitor
- Catalyst Monitor
- Evaporative System Leak Detection Monitor (if equipped)

Following is a description of each system monitor, and its DTC.

**Refer to the appropriate Powertrain Diagnostics Procedures manual for diagnostic procedures.**

### OXYGEN SENSOR (O2S) MONITOR

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperatures of 300° to 350°C (572° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. The information obtained by the sensor is used to calculate the fuel injector pulse width. The PCM is programmed to maintain the optimum air/fuel ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrous oxide (NOx) from the exhaust.

The O2S is also the main sensing element for the EGR (if equipped), Catalyst and Fuel Monitors.

The O2S may fail in any or all of the following manners:

- Slow response rate
- Reduced output voltage
- Dynamic shift
- Shorted or open circuits

Response rate is the time required for the sensor to switch from lean to rich once it is exposed to a richer than optimum A/F mixture or vice versa. As the sensor starts malfunctioning, it could take longer to detect the changes in the oxygen content of the exhaust gas.

The output voltage of the O2S ranges from 0 to 1 volt (voltages are offset by 2.5 volts on NGC vehicles). A good sensor can easily generate any output voltage in this range as it is exposed to different concentrations of oxygen. To detect a shift in the A/F mixture (lean or rich), the output voltage has to change beyond a threshold value. A malfunctioning sensor could have difficulty changing beyond the threshold value.

### OXYGEN SENSOR HEATER MONITOR

If there is an oxygen sensor (O2S) DTC as well as a O2S heater DTC, the O2S heater fault **MUST** be repaired first. After the O2S fault is repaired, verify that the heater circuit is operating correctly.

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperatures of 300° to 350°C (572 ° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. The information obtained by the sensor is used to calculate the fuel injector pulse width. This maintains a 14.7 to 1 Air Fuel (A/F) ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxide (NOx) from the exhaust.



The voltage readings taken from the O<sub>2</sub>S are very temperature sensitive. The readings are not accurate below 300°C. Heating of the O<sub>2</sub>S is done to allow the engine controller to shift to closed loop control as soon as possible. The heating element used to heat the O<sub>2</sub>S must be tested to ensure that it is heating the sensor properly.

The O<sub>2</sub>S circuit is monitored for a drop in voltage. The sensor output is used to test the heater by isolating the effect of the heater element on the O<sub>2</sub>S output voltage from the other effects.

### **EGR MONITOR (if equipped)**

The Powertrain Control Module (PCM) performs an on-board diagnostic check of the EGR system.

The EGR monitor is used to test whether the EGR system is operating within specifications. The diagnostic check activates only during selected engine/driving conditions. When the conditions are met, the EGR is turned off (solenoid energized) and the O<sub>2</sub>S compensation control is monitored. Turning off the EGR shifts the air fuel (A/F) ratio in the lean direction. The O<sub>2</sub>S data should indicate an increase in the O<sub>2</sub> concentration in the combustion chamber when the exhaust gases are no longer recirculated. While this test does not directly measure the operation of the EGR system, it can be inferred from the shift in the O<sub>2</sub>S data whether the EGR system is operating correctly. Because the O<sub>2</sub>S is being used, the O<sub>2</sub>S test must pass its test before the EGR test. Also looks at EGR linear potentiometer for feedback.

### **MISFIRE MONITOR**

Excessive engine misfire results in increased catalyst temperature and causes an increase in HC emissions. Severe misfires could cause catalyst damage. To prevent catalytic converter damage, the PCM monitors engine misfire.

The Powertrain Control Module (PCM) monitors for misfire during most engine operating conditions (positive torque) by looking at changes in the crankshaft speed. If a misfire occurs the speed of the crankshaft will vary more than normal.

The PCM can detect and compensate for variances in the engine and its components. To learn these variations, the PCM uses the input of the actual crankshaft rotation pattern and ideal crankshaft rotation pattern that has been calibrated into the PCM. The PCM then compares the two patterns. The variation between the two values is the Adaptive Numerator. If the Adaptive Numerator is not learned by the PCM, the misfire monitor will not run and the Multi-Cylinder Displacement System (MDS) will not operate. Without MDS operation, the customer will experience decreased fuel economy. If the customer experiences decrease fuel economy, use the scan tool to ensure that the Adaptive Numerator is learned.

### **FUEL SYSTEM MONITOR**

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide. The catalyst works best when the air fuel (A/F) ratio is at or near the optimum of 14.7 to 1.

The PCM is programmed to maintain the optimum air/fuel ratio. This is done by making short term corrections in the fuel injector pulse width based on the O<sub>2</sub>S output. The programmed memory acts as a self calibration tool that the engine controller uses to compensate for variations in engine specifications, sensor tolerances and engine fatigue over the life span of the engine. By monitoring the actual air-fuel ratio with the O<sub>2</sub>S (short term) and multiplying that with the program long-term (adaptive) memory and comparing that to the limit, it can be determined whether it will pass an emissions test. If a malfunction occurs such that the PCM cannot maintain the optimum A/F ratio, then the MIL will be illuminated.

### **CATALYST MONITOR**

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide.

Normal vehicle miles or engine misfire can cause a catalyst to decay. A meltdown of the ceramic core can cause a reduction of the exhaust passage. This can increase vehicle emissions and deteriorate engine performance, driveability and fuel economy.

The catalyst monitor uses dual oxygen sensors (O<sub>2</sub>S's) to monitor the efficiency of the converter. The dual O<sub>2</sub>S's strategy is based on the fact that as a catalyst deteriorates, its oxygen storage capacity and its efficiency are both reduced. By monitoring the oxygen storage capacity of a catalyst, its efficiency can be indirectly calculated. The upstream O<sub>2</sub>S is used to detect the amount of oxygen in the exhaust gas before the gas enters the catalytic con-

verter. The PCM calculates the A/F mixture from the output of the O2S. A low voltage indicates high oxygen content (lean mixture). A high voltage indicates a low content of oxygen (rich mixture).

When the upstream O2S detects a lean condition, there is an abundance of oxygen in the exhaust gas. A functioning converter would store this oxygen so it can use it for the oxidation of HC and CO. As the converter absorbs the oxygen, there will be a lack of oxygen downstream of the converter. The output of the downstream O2S will indicate limited activity in this condition.

As the converter loses the ability to store oxygen, the condition can be detected from the behavior of the downstream O2S. When the efficiency drops, no chemical reaction takes place. This means the concentration of oxygen will be the same downstream as upstream. The output voltage of the downstream O2S copies the voltage of the upstream sensor. The only difference is a time lag (seen by the PCM) between the switching of the O2S's.

To monitor the system, the number of lean-to-rich switches of upstream and downstream O2S's is counted. The ratio of downstream switches to upstream switches is used to determine whether the catalyst is operating properly. An effective catalyst will have fewer downstream switches than it has upstream switches i.e., a ratio closer to zero. For a totally ineffective catalyst, this ratio will be one-to-one, indicating that no oxidation occurs in the device.

The system must be monitored so that when catalyst efficiency deteriorates and exhaust emissions increase to over the legal limit, the MIL (Check Engine lamp) will be illuminated.

### **NATURAL VACUUM LEAK DETECTION (NVLD) (if equipped)**

The Natural Vacuum Leak Detection (NVLD) system is the next generation evaporative leak detection system that will first be used on vehicles equipped with the Next Generation Controller (NGC). This new system replaces the leak detection pump as the method of evaporative system leak detection. This is to detect a leak equivalent to a 0.020" (0.5 mm) hole. This system has the capability to detect holes of this size very dependably.

The basic leak detection theory employed with NVLD is the "Gas Law". This is to say that the pressure in a sealed vessel will change if the temperature of the gas in the vessel changes. The vessel will only see this effect if it is indeed sealed. Even small leaks will allow the pressure in the vessel to come to equilibrium with the ambient pressure. In addition to the detection of very small leaks, this system has the capability of detecting medium as well as large evaporative system leaks.

The NVLD seals the canister vent during engine off conditions. If the EVAP system has a leak of less than the failure threshold, the evaporative system will be pulled into a vacuum, either due to the cool down from operating temperature or diurnal ambient temperature cycling. The diurnal effect is considered one of the primary contributors to the leak determination by this diagnostic. When the vacuum in the system exceeds about 1" H2O (0.25 KPA), a vacuum switch closes. The switch closure sends a signal to the NGC. The NGC, via appropriate logic strategies (described below), utilizes the switch signal, or lack thereof, to make a determination of whether a leak is present.

The NVLD device is designed with a normally open vacuum switch, a normally closed solenoid, and a seal, which is actuated by both the solenoid and a diaphragm. The NVLD is located on the atmospheric vent side of the canister. The NVLD assembly may be mounted on top of the canister outlet, or in-line between the canister and atmospheric vent filter. The normally open vacuum switch will close with about 1" H2O (0.25 KPA) vacuum in the evaporative system. The diaphragm actuates the switch. This is above the opening point of the fuel inlet check valve in the fill tube so cap off leaks can be detected. Submerged fill systems must have recirculation lines that do not have the in-line normally closed check valve that protects the system from failed nozzle liquid ingestion, in order to detect cap off conditions.

The normally closed valve in the NVLD is intended to maintain the seal on the evaporative system during the engine off condition. If vacuum in the evaporative system exceeds 3" to 6" H2O (0.75 to 1.5 KPA), the valve will be pulled off the seat, opening the seal. This will protect the system from excessive vacuum as well as allowing sufficient purge flow in the event that the solenoid was to become inoperative.

The solenoid actuates the valve to unseal the canister vent while the engine is running. It also will be used to close the vent during the medium and large leak tests and during the purge flow check. This solenoid requires initial 1.5 amps of current to pull the valve open but after 100 ms. will be duty cycled down to an average of about 150 mA for the remainder of the drive cycle.

Another feature in the device is a diaphragm that will open the seal in the NVLD with pressure in the evaporative system. The device will "blow off" at about 0.5" H2O (0.12 KPA) pressure to permit the venting of vapors during refueling. An added benefit to this is that it will also allow the tank to "breathe" during increasing temperatures, thus limiting the pressure in the tank to this low level. This is beneficial because the induced vacuum during a subsequent declining temperature will achieve the switch closed (pass threshold) sooner than if the tank had to decay from a built up pressure.



The device itself has 3 wires: Switch sense, solenoid driver and ground. It also includes a resistor to protect the switch from a short to battery or a short to ground. The NGC utilizes a high-side driver to energize and duty-cycle the solenoid.

## HIGH AND LOW LIMITS

The PCM compares input signal voltages from each input device with established high and low limits for the device. If the input voltage is not within limits and other criteria are met, the PCM stores a diagnostic trouble code in memory. Other diagnostic trouble code criteria might include engine RPM limits or input voltages from other sensors or switches that must be present before verifying a diagnostic trouble code condition.

## OPERATION

### SYSTEM

The Powertrain Control Module (PCM) monitors many different circuits in the fuel injection, ignition, emission and engine systems. If the PCM senses a problem with a monitored circuit often enough to indicate an actual problem, it stores a Diagnostic Trouble Code (DTC) in the PCM's memory. If the code applies to a non-emissions related component or system, and the problem is repaired or ceases to exist, the PCM cancels the code after 40 warmup cycles. Diagnostic trouble codes that affect vehicle emissions illuminate the Malfunction Indicator Lamp (MIL). Refer to Malfunction Indicator Lamp in this section.

Certain criteria must be met before the PCM stores a DTC in memory. The criteria may be a specific range of engine RPM, engine temperature, and/or input voltage to the PCM.

The PCM might not store a DTC for a monitored circuit even though a malfunction has occurred. This may happen because one of the DTC criteria for the circuit has not been met. **For example**, assume the diagnostic trouble code criteria requires the PCM to monitor the circuit only when the engine operates between 750 and 2000 RPM. Suppose the sensor's output circuit shorts to ground when engine operates above 2400 RPM (resulting in 0 volt input to the PCM). Because the condition happens at an engine speed above the maximum threshold (2000 rpm), the PCM will not store a DTC.

There are several operating conditions for which the PCM monitors and sets DTC's. Refer to Monitored Systems, Components, and Non-Monitored Circuits in this section.

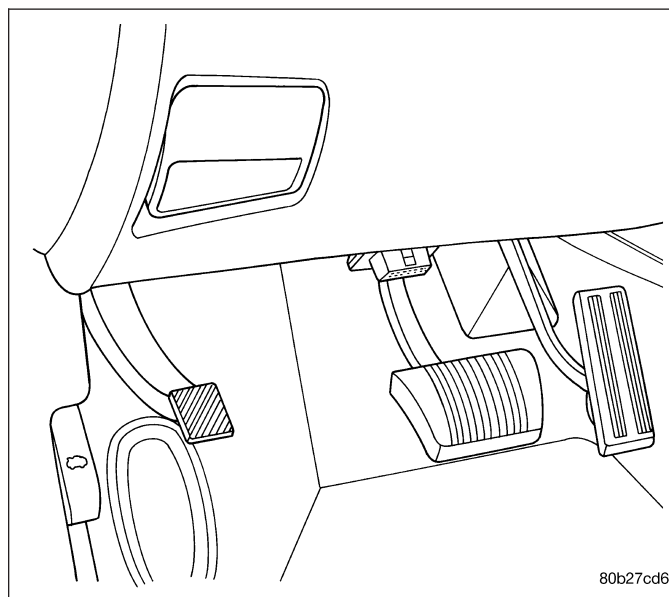
**Note: Various diagnostic procedures may actually cause a diagnostic monitor to set a DTC. For instance, pulling a spark plug wire to perform a spark test may set the misfire code. When a repair is completed and verified, use the scan tool to erase all DTC's and extinguish the MIL.**

Technicians can display stored DTC's. For obtaining the DTC information, use the Data Link Connector with the scan tool.

## DRB III® STATE DISPLAY TEST MODE

### OPERATION

The switch inputs to the Powertrain Control Module (PCM) have two recognized states; HIGH and LOW. For this reason, the PCM cannot recognize the difference between a selected switch position versus an open circuit, a short circuit, or a defective switch. If the State Display screen shows the change from HIGH to LOW or LOW to HIGH, assume the entire switch circuit to the PCM functions properly. From the state display screen, access either State Display Inputs and Outputs or State Display Sensors.



## DIAGNOSIS AND TESTING

### OBD II Monitor Information

Comprehensive Components Monitor (Includes All Engine Hardware Sensor, Switches, Solenoids, etc.)	Major Monitors Non Fuel Control & Non Misfire (Monitors Entire Emission System)	Major Monitors Fuel Control & misfire (Monitors Entire System)
Most are one trip Faults	Most are Two Trips Faults	Two Trip Faults
Usually Turns on The Mil and Sets DTC After One Failure	Turns On The Mil and Sets DTC after Two Consecutive Failure	The Mil and Sets DTC After Two Consecutive Failure
<b>Priority 3</b>	<b>Priority 1 or 3</b>	<b>Priority 2 or 4</b>
All Checked For Continuity	Done Stop Test = Yes	<b>Fuel Control Monitor</b>
Open	Oxygen Sensor Heater	Monitors Fuel Control System For:  Fuel System Lean  Fuel System Rich
Short To Ground	Oxygen Sensor Response	
Short To Voltage	Catalytic Converter	Requires 3 Consecutive Fuel System Good Trips to Extinguish the MIL
Inputs Checked For Rationality	Efficiency Except EWMA	
Outputs Checked For Functionality	up to 6 test per trip and a one trip fault (SBEC) and two trip fault on (JTEC)	
	<b>EGR System</b>	<b>Misfire Monitor</b>
	Evaporative Emission System (purge and leak)  Non-LDP  LDP	Monitors for Engine Misfire At:  4 X 1000 RPM Counter (4000 Revs) (Type B)  **200 X 3 (600) RPM counter (Type A)
Requires 3 Consecutive Global Good Trips to Extinguish the MIL*	Requires 3 Consecutive Global Good Trips to Extinguish the MIL*	Requires 3 Consecutive Global Good Trips to Extinguish the MIL
*40 Warm Up Cycles are required to erase DTCs after the MIL has been extinguished		** Type A misfire is a one trip failure on pre-1999, 2 trip failure on 1999 and later. The MIL will illuminate at the first or second failure, based on MY.

### OBD II MONITOR RUN PROCESS

The following procedure has been established to assist Chrysler Dealer Technicians in the field with enabling and running OBD II Monitors. The order listed in the following procedure is intended to allow the technician to effectively complete each monitor and to set the CARB Readiness Status in the least time possible.

**Note: A. Once the monitor run process has begun, do not turn off the ignition. By turning the ignition key off, monitor enabling conditions will be lost. NVLD Monitor runs after key off. B. By performing a Battery Disconnect, or Selecting Erase DTCs, the CARB Readiness and all additional OBD II information will be cleared.**

### Monitor Preliminary Checks:

1. Plug a SCAN TOOL into the vehicle's Data Link Connector (DLC).
2. Turn the ignition, KEY ON - ENGINE OFF. Watch for MIL lamp illumination during the bulb check. MIL lamp must have illuminated, if not, repair MIL lamp.
3. On the SCAN TOOL Select #1 Stand-alone.
4. Select #1 1998-2004 Diagnostics.
5. Select #1 Engine.
6. Select #2 DTCs and Related Functions.
7. Select #1 Read DTCs.
  - Verify that No Emissions Related DTCs are Present.
  - \* If an Emissions DTC is Present, the OBD II Monitors may not run and the CARB Readiness will not update.
  - The Emissions related DTC, will need to be repaired, then cleared. By clearing DTCs, the OBD Monitors will need to be run and completed to set the CARB Readiness Status.
8. Return to Engine Select Function Menu and Select #9, OBD II Monitors.
9. Select #3 CARB Readiness Status.

Do all the CARB Readiness Status Locations read YES?.

- \*YES, then all monitors have been completed and this vehicle is ready to be I/M or Emission Tested.
- \*NO, then the following procedure needs to be followed to run/complete all available monitors.

**Note: A. Only the monitors, which are not YES in the CARB Readiness Status, need to be completed. B. Specific criteria need to be met for each monitor. Each monitor has a Pre-Test screen to assist in running the monitor. For additional information, refer to the DaimlerChrysler Corporation Technical Training Workbook titled On Board Diagnostics: OBD II/EOBD, part number 81-699-01050. C. The most efficient order to run the monitors has been outlined below, including suggestions to aid the process.**

### Natural Vacuum Leak Detection with Purge Monitor

This monitor requires a cool down cycle, usually an overnight soak for at least 8 hours without the engine running. The ambient temperature must decrease overnight - parking the vehicle outside is advised. To run this test the fuel level must be between 15-85% full. For the monitor run conditions select the EVAP MON PRE-TEST in the SCAN TOOL, OBD II Monitors Menu. The Purge monitor will run if the small leak test reports a pass. Criteria for NVLD monitor:

- Engine off time greater than @ one hour.
- Fuel Level between 15% and 85 %.
- Start Up ECT and IAT within 10 C (18 F).
- Vehicle started and run until Purge Monitor reports a result.

**Note: If the vehicle does not report a result and the conditions where correct. It may take up to two weeks to fail the small leak monitor. DO NOT use this test to attempt to determine a fault. Use the appropriate service information procedure for finding a small leak. If there are no faults and the conditions are correct this test will run and report a pass. Note the Small leak test can find leaks less than 10 thousands of an inch. If a small leak is present it takes approximately one week of normal driving to report a failure.**

### Catalyst / O2 Monitor

With NGC, Catalyst and O2 Monitor information are acquired and processed at the same time. Most vehicles will need to be driven at highway speed (< 50 mph) for a few minutes. Some trucks run the monitor at idle in drive. If the vehicle is equipped with a manual transmission, using 4th gear may assist in meeting the monitor running criteria. For the monitor run conditions, select the BANK 1 CAT MON PRE-TEST in the SCAN TOOL, OBD II Monitors Menu.

### EGR Monitor

The EGR monitor now runs in a closed throttle decel or at idle on a warm vehicle. However, it is necessary to maintain the TPS, Map and RPM ranges to allow the monitor to complete itself. For the monitor run conditions, select the EGR PRE-TEST in the SCAN TOOL, OBD II Monitors Menu.

## O2 Sensor Heater Monitor

This monitor is now continuously running once the heaters are energized. Pass information will be processed at power down. For the monitor run conditions, select the O2S HEATER MON PRE-TEST in the SCAN TOOL, OBD II Monitors Menu.

## SOLENOID-PROPORTIONAL PURGE

### REMOVAL

The solenoid attaches to a bracket near the right rear of the engine. The solenoid will not operate unless it is installed correctly.

1. Location for 5.7L engine.

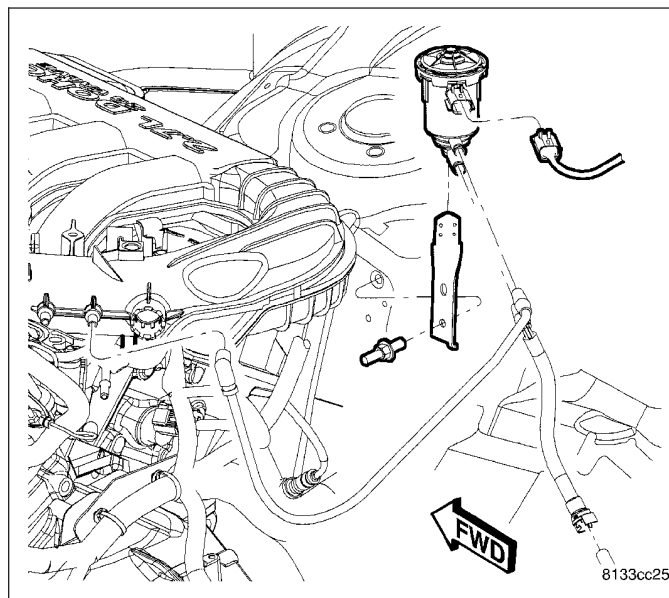


2. Location for 2.7 and 3.5L engine.

3. Disconnect electrical connector from solenoid.

4. Disconnect vacuum tubes from solenoid.

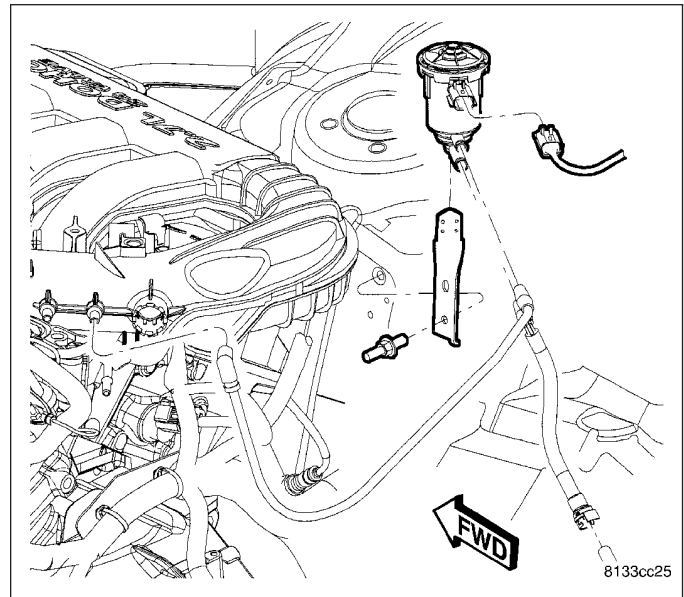
5. Remove solenoid from bracket.



### INSTALLATION

The solenoid attaches to a bracket near the air cleaner. The solenoid will not operate unless it is installed correctly. The top of the solenoid has TOP printed on it. The solenoid will not operate unless it is installed correctly.

1. Location for 2.7 and 3.5L engines.



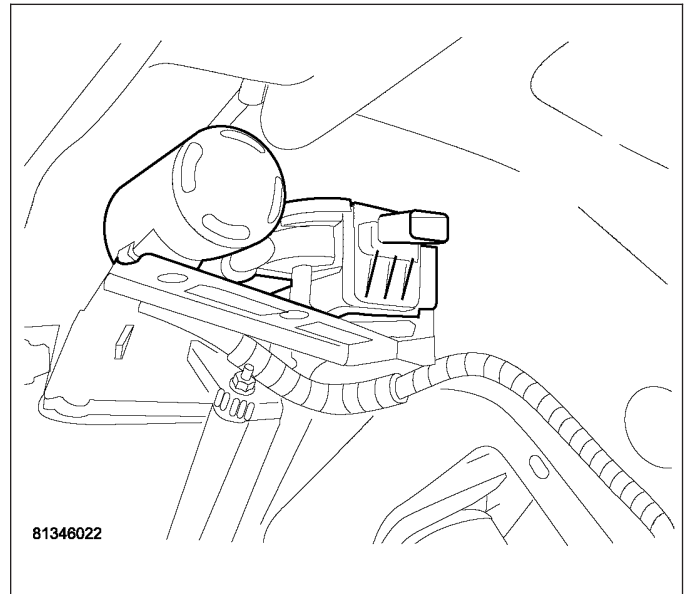
2. Location for 5.7L engine.
3. Install solenoid on bracket.
4. Connect vacuum tube to solenoid.
5. Connect electrical connector to solenoid.



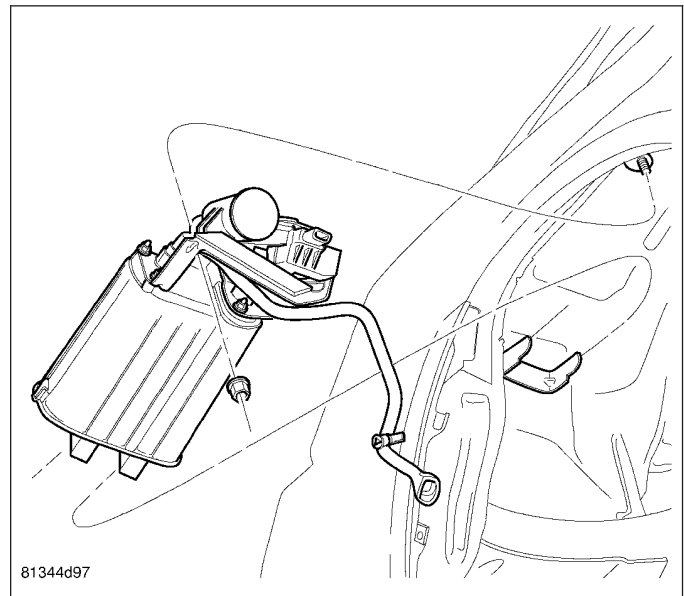
## ASSEMBLY-NATURAL VAC LEAK DETECTION

### REMOVAL

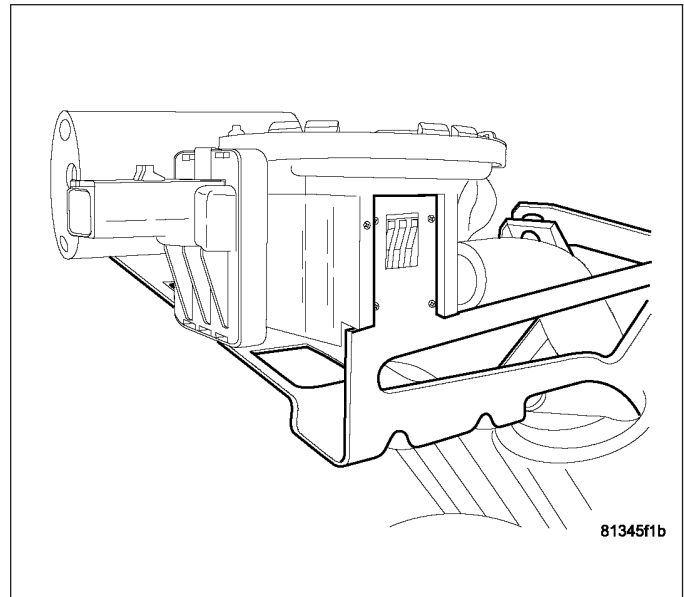
1. Disconnect negative battery cable.
2. Raise and support vehicle.
3. Remove the right rear tire.
4. Remove the inner splash shield.
5. Natural Vacuum Leak Detection Pump (NVLD) location.



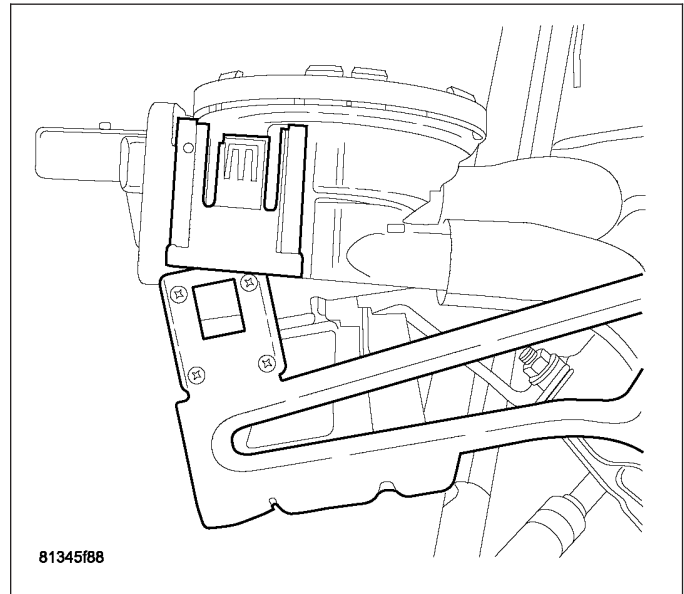
6. Remove vapor canister and NVLD pump assembly from vehicle.



7. Squeeze tab and pull pump from bracket.

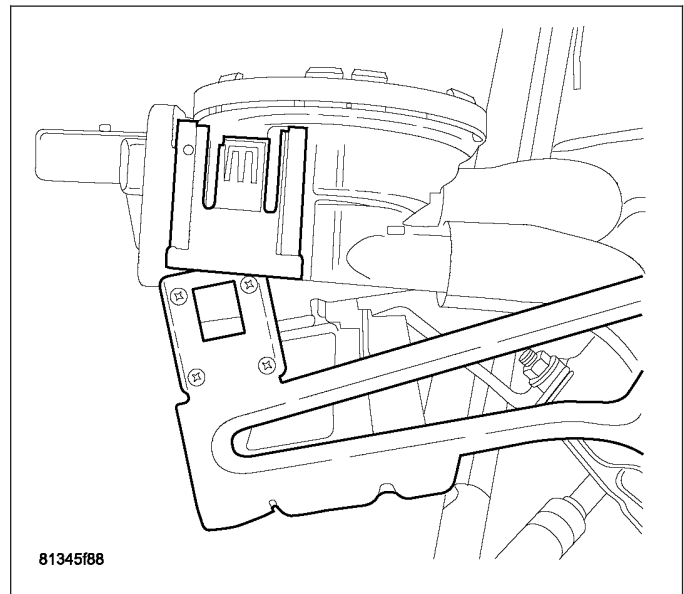


8. Remove hoses from pump assembly and remove pump.



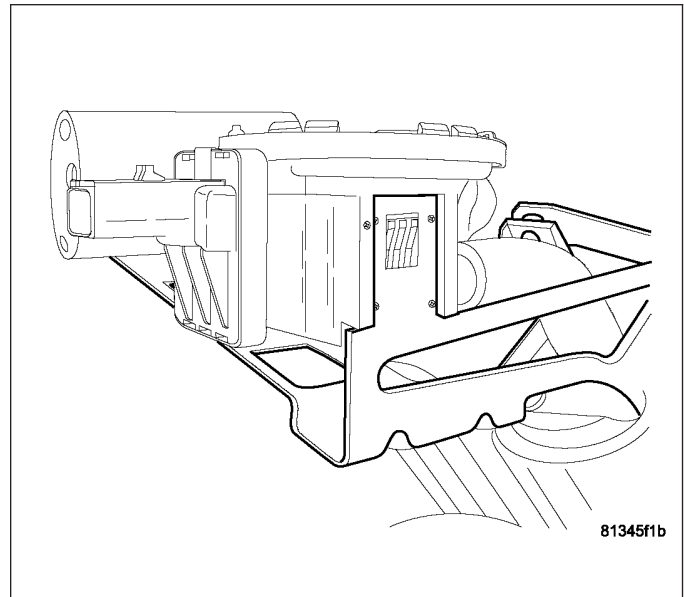
## INSTALLATION

1. Install pump assembly to hoses.

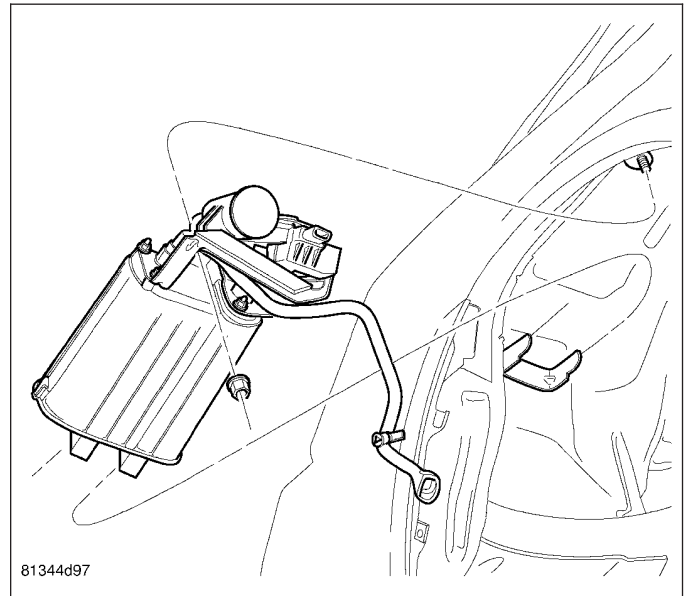




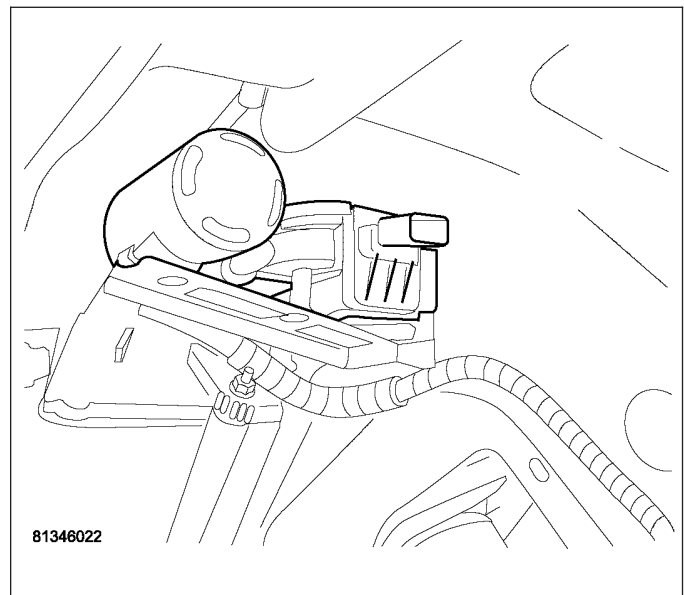
2. Install pump assembly to bracket.



3. Install vapor canister and pump assembly to vehicle.



4. Install inner splash shield.
5. Install right rear tire.
6. Lower vehicle.
7. Connect negative battery cable.



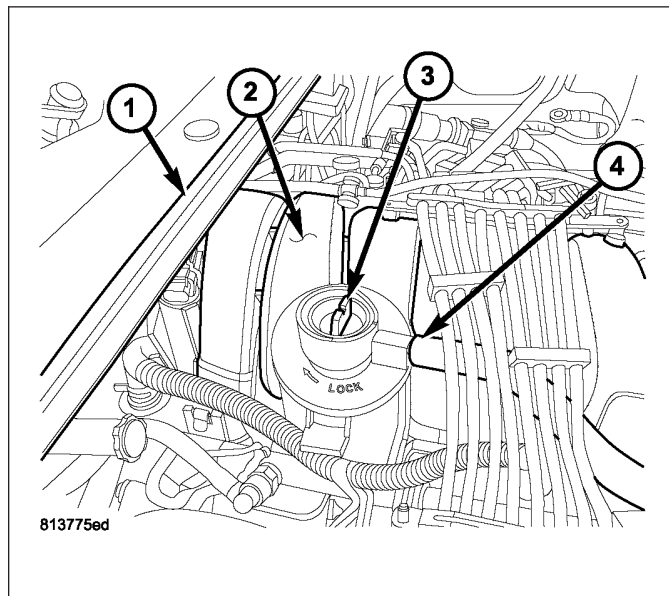


## PCV VALVE

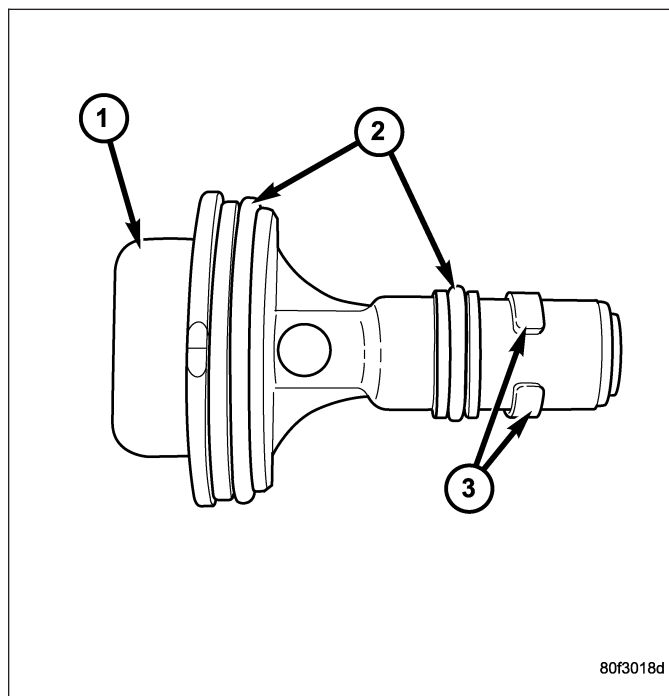
### REMOVAL

#### 5.7L

The PCV valve (3) is mounted into the top/right side of the intake manifold (2).



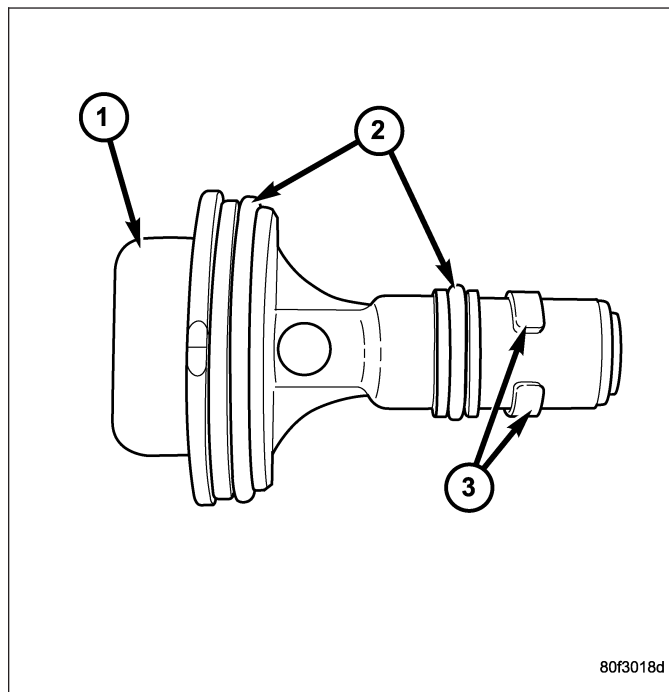
1. The PCV valve (1) is sealed to the intake manifold with two O-rings (2).
2. Remove PCV valve by rotating counter-clockwise 90 degrees until locating tabs (3) have been freed. After tabs have cleared, pull valve straight up from intake manifold.
3. After valve is removed, check condition of two valve O-rings (2).



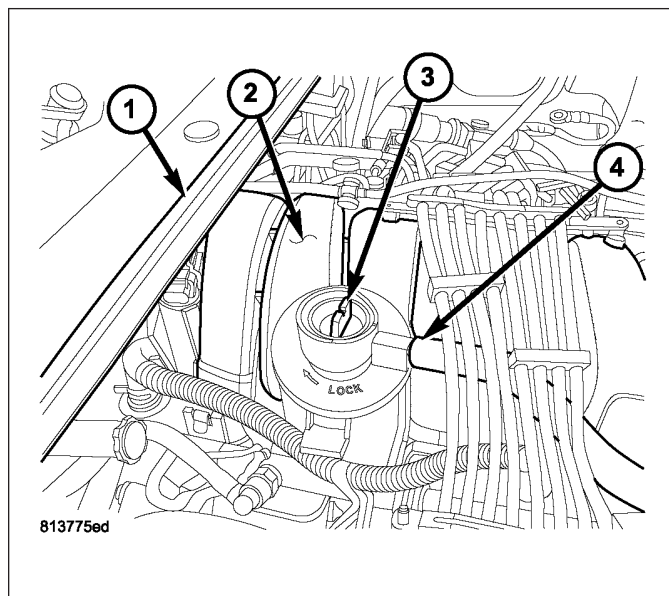
## INSTALLATION

### 5.7L

1. Clean out intake manifold opening.
2. Check condition of two O-rings (2) on PCV valve (1).
3. Apply engine oil to two O-rings.



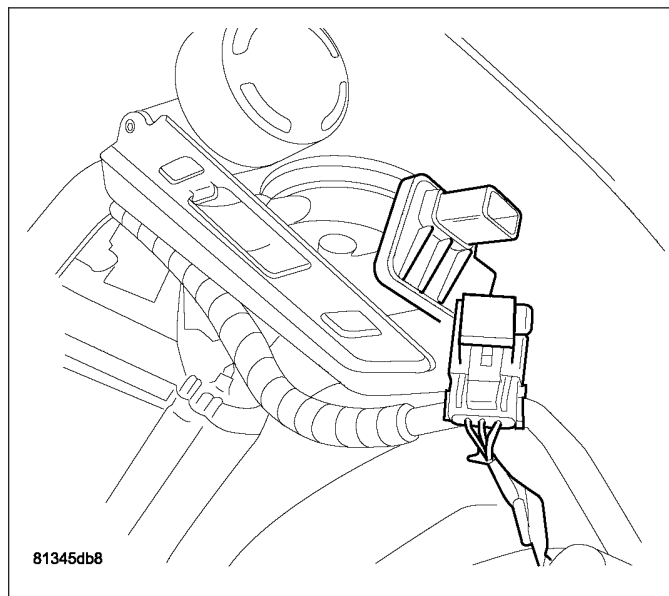
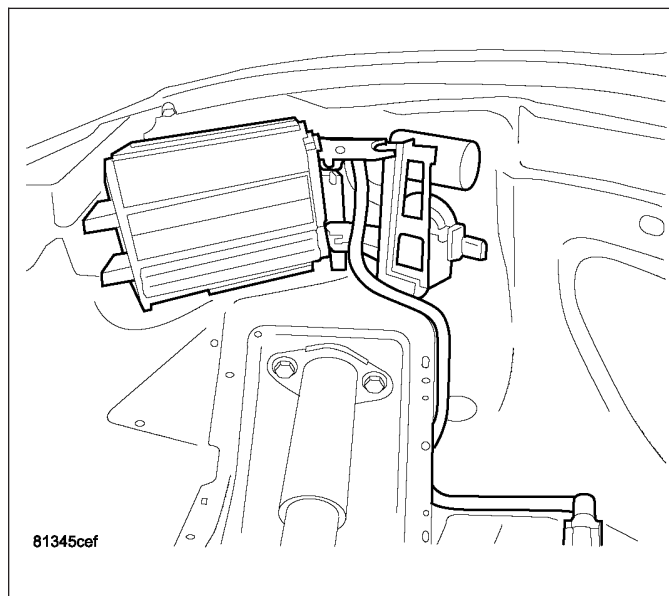
4. Place PCV valve (3) into intake manifold and rotate 90 degrees clockwise for installation.



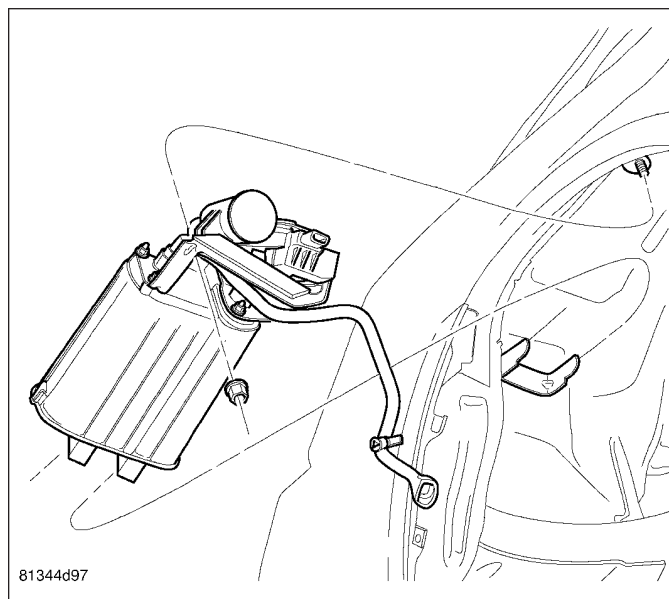
## CANISTER-VAPOR

### REMOVAL

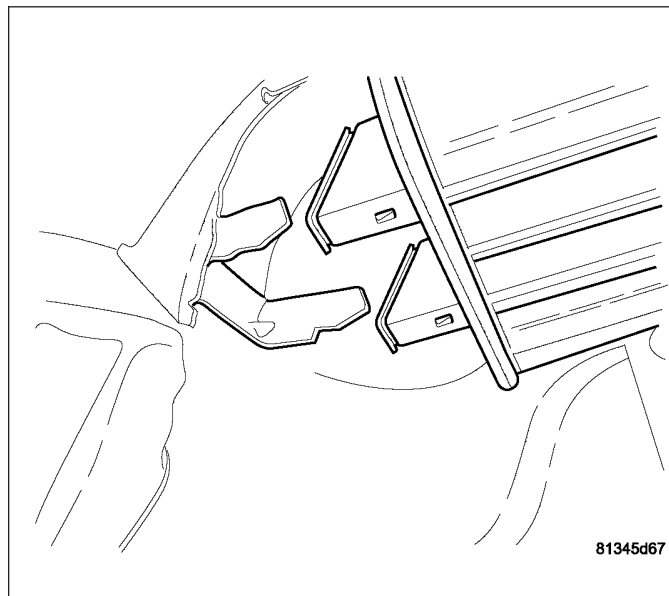
1. Disconnect negative battery cable.
  2. Raise vehicle and support.
  3. Remove the right rear tire.
  4. Remove the inner splash shield.
- 
5. Disconnect the EVAP line.
  6. Unlock and disconnect electrical connector from pump.



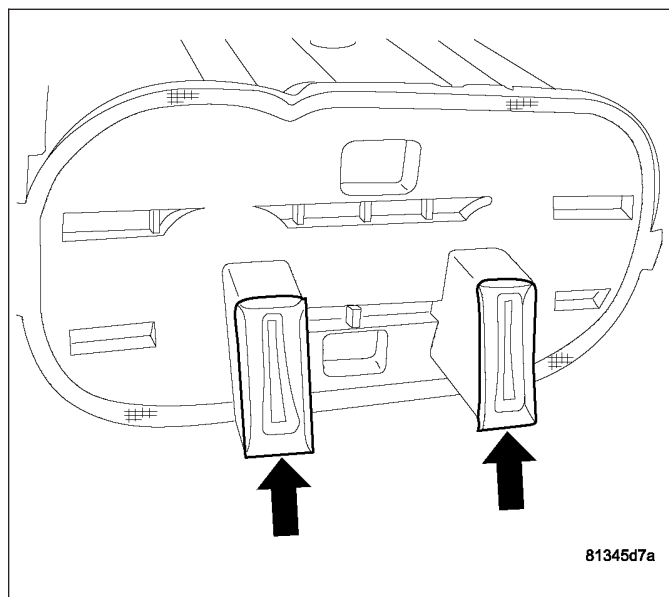
7. Remove mounting nut.



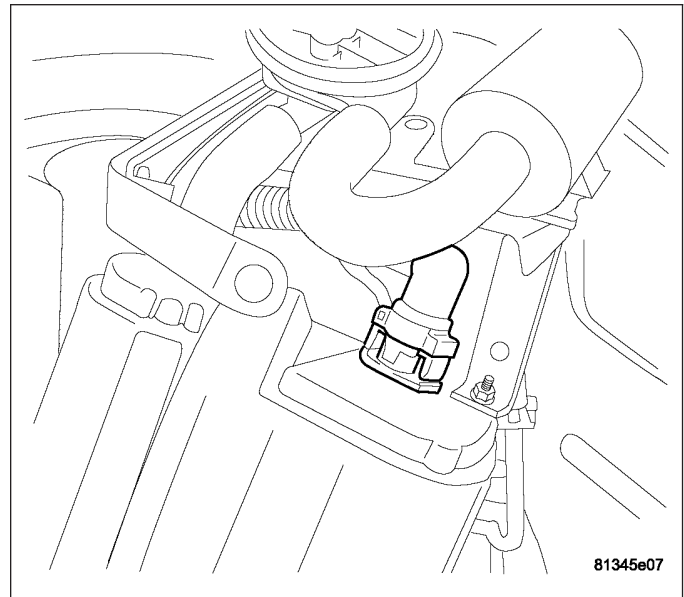
8. Slide assembly forward off of rear mounting brackets.



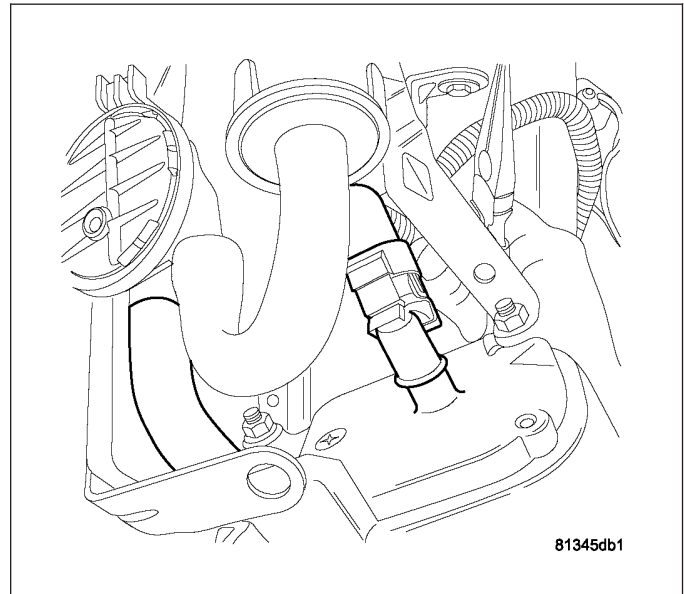
9. Make sure that you do not lose the rubber mounts in canister brackets.



10. Disconnect vapor lines from EVAP canister.

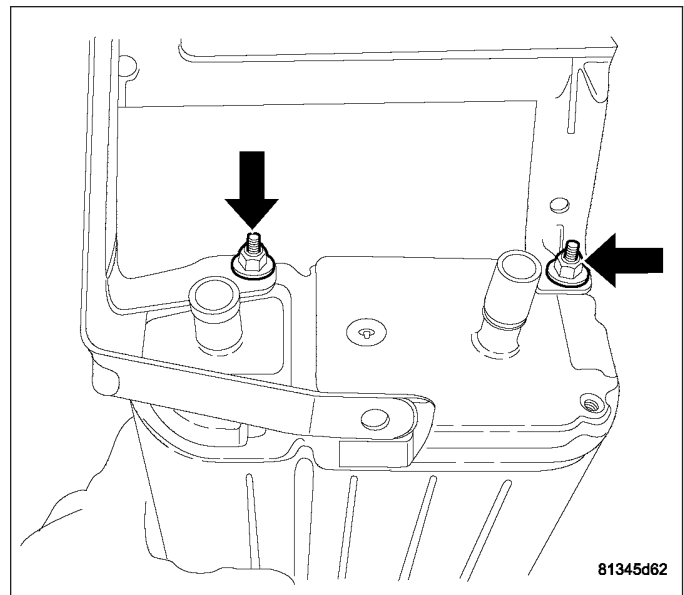


11. Squeeze connector and pull.



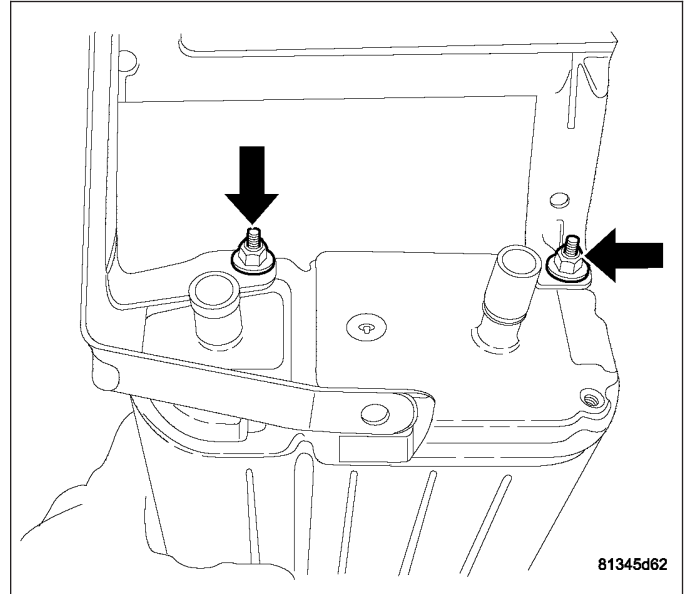
12. Remove mounting nuts from canister.

13. Remove vapor canister from bracket.

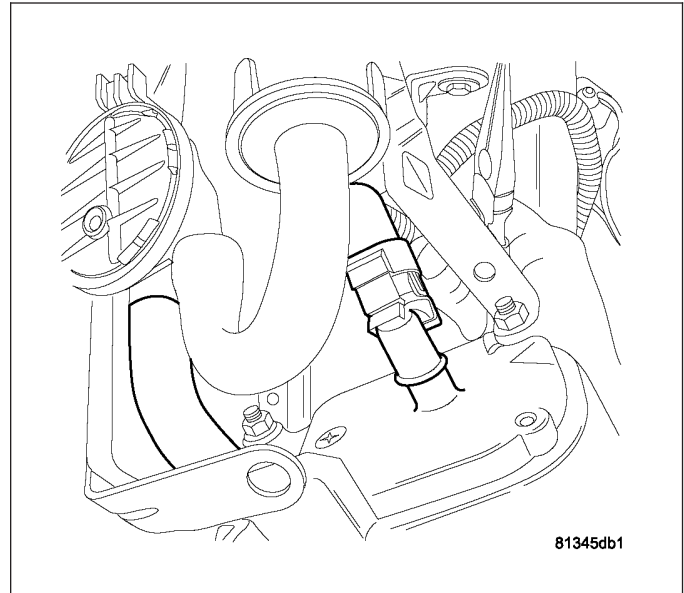


## INSTALLATION

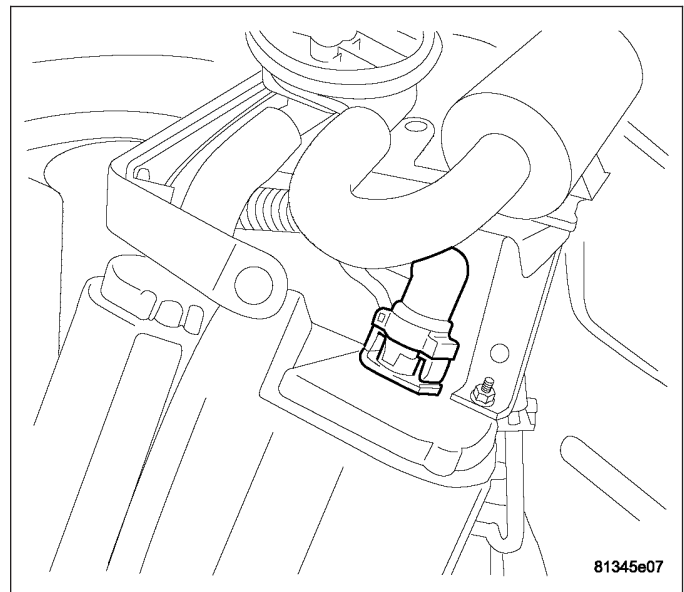
1. Install canister to bracket and tighten nuts.



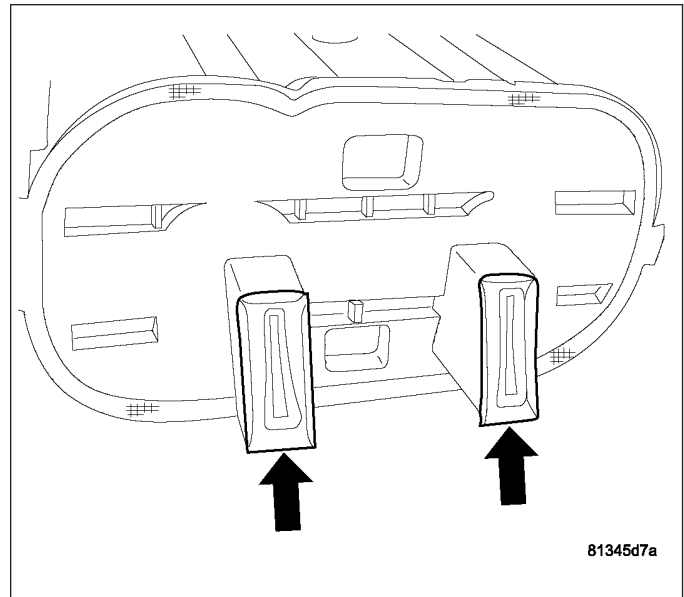
2. Connect hoses to vapor canister.



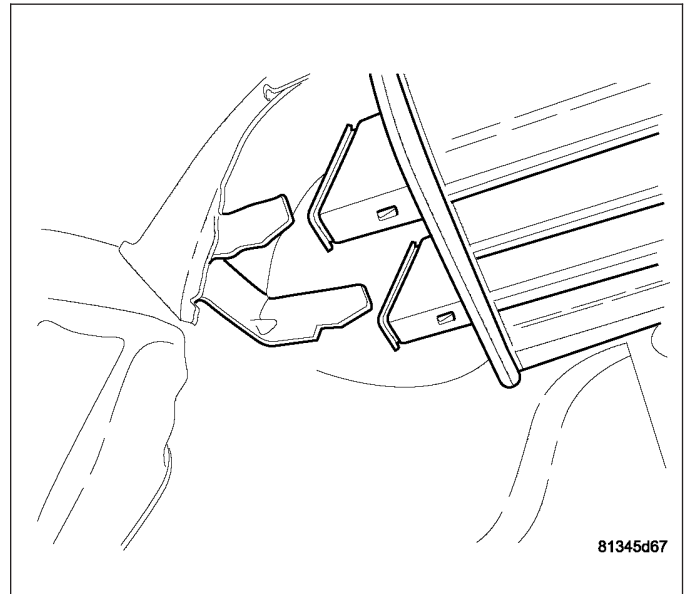
3. Hose connected.



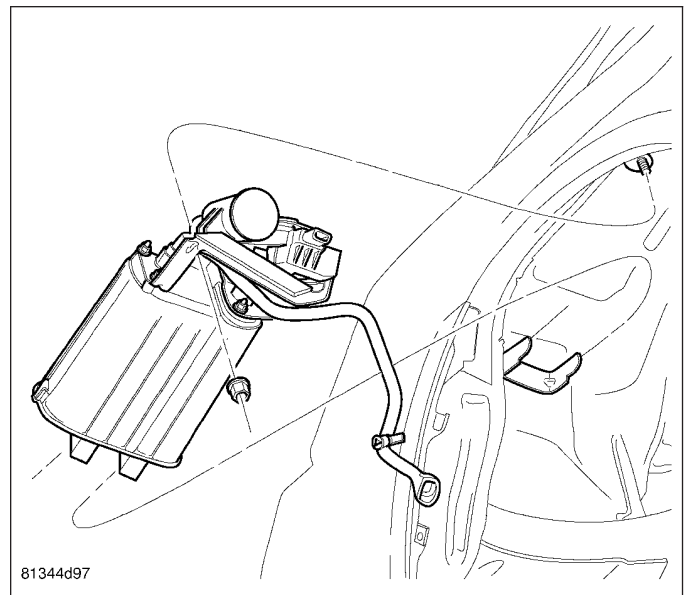
4. Install rubber isolator in canister brackets.



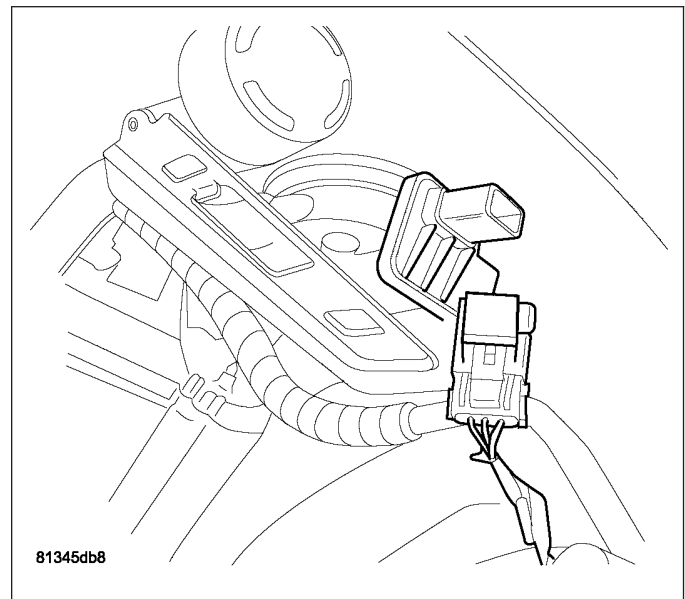
5. Slide canister brackets with rubber isolators onto mounting brackets.



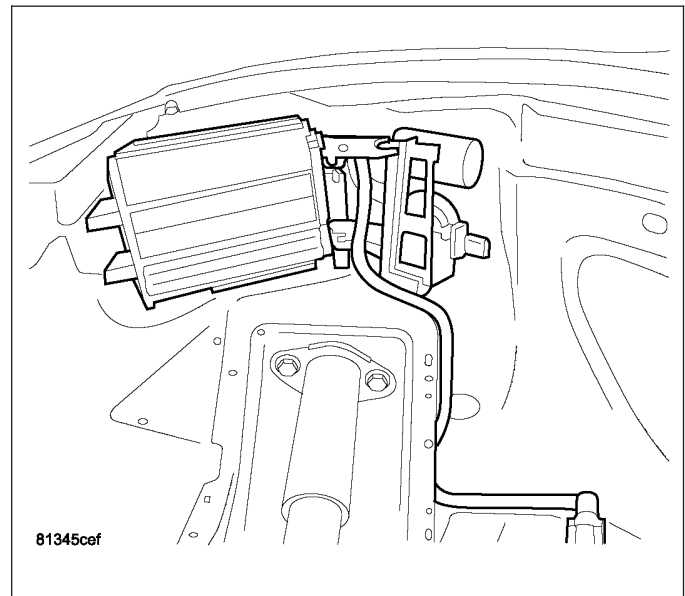
6. Install assembly mounting nut.



7. Connect electrical connector to pump and lock.



- 8. Connect the EVAP line.
- 9. Install the inner splash shield.
- 10. Install tire.
- 11. Lower vehicle.
- 12. Connect negative battery cable.





EXHAUST GAS RECIRCULATION

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EXHAUST GAS RECIRCULATION

SPECIFICATIONS

TORQUE

SPECIFICATIONS

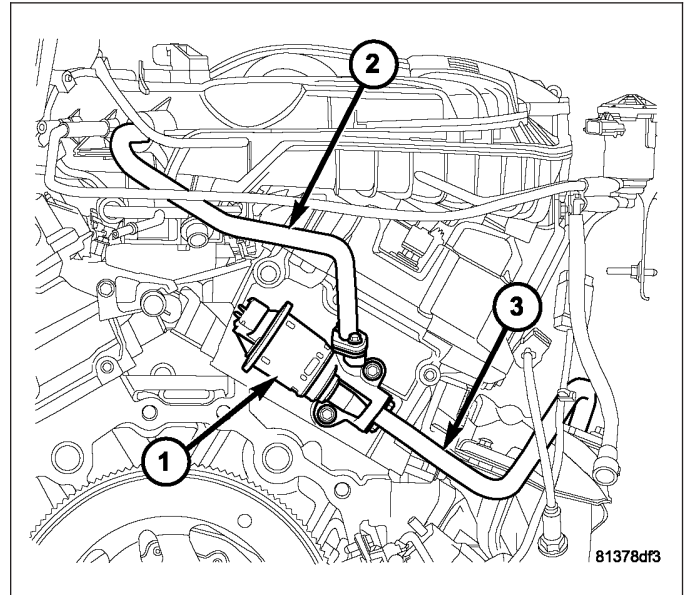
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Tube to Exhaust Manifold Bolts	31	23	275
Tube to EGR valve Bolts	11	-	95
EGR Valve to Cyl. Head Bolts	31	23	275

## TUBE-EXHAUST GAS RECIRCULATION

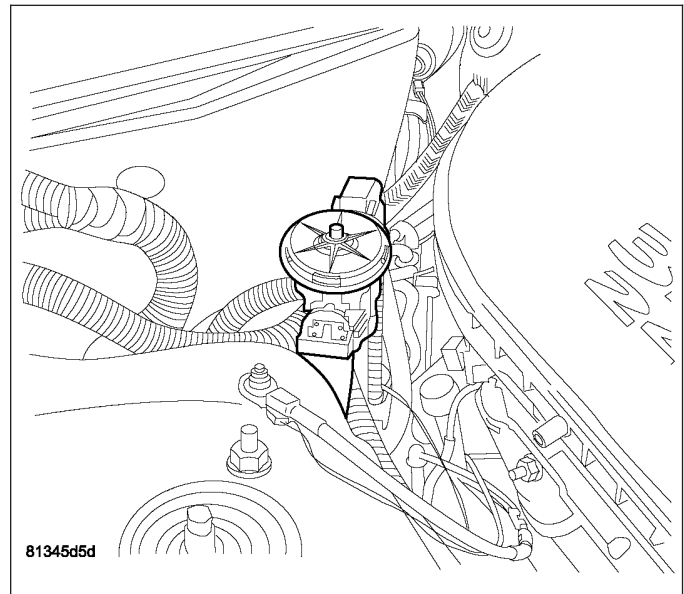
### REMOVAL

#### 2.7L - LOWER TUBE

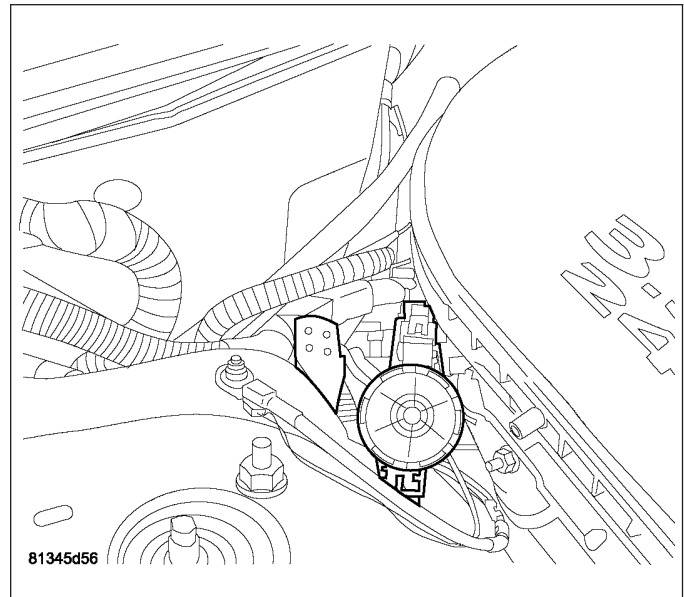
1. Disconnect negative battery cable.



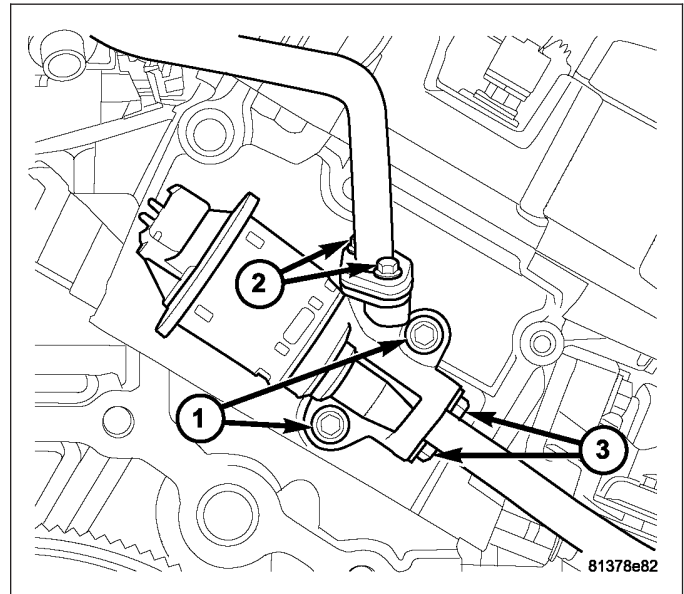
2. Remove purge solenoid from bracket.



3. Relocate the purge solenoid.
4. Unlock and disconnect the electrical connector from EGR valve.

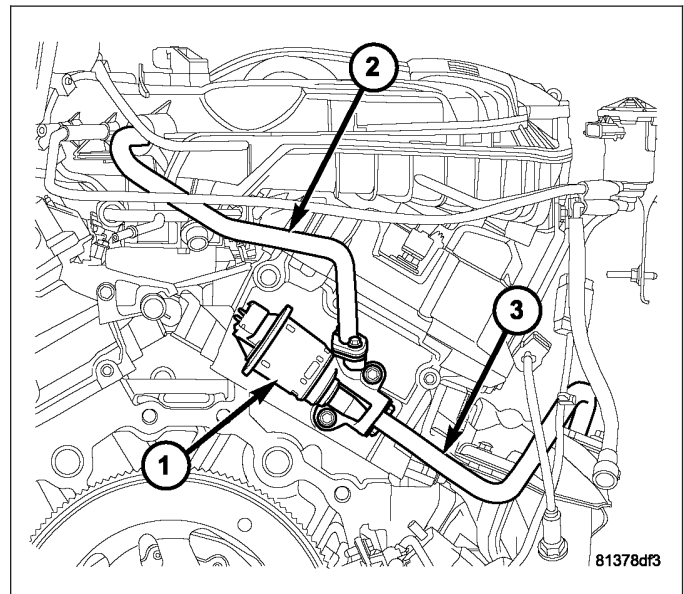


5. Remove the bolts from the lower tube to exhaust manifold.
6. Remove the lower tube bolts to EGR valve.
7. Remove lower tube from vehicle.
8. When removing EGR upper tube assembly being careful not to drop the silicone rubber seals in the intake manifold. Clean gasket surfaces on the EGR valve. Note that any loose dirt can lodge between the pintle and the seat and cause valve leakage that will give a rough idle and depressed manifold vacuum.
9. Clean mounting surface.

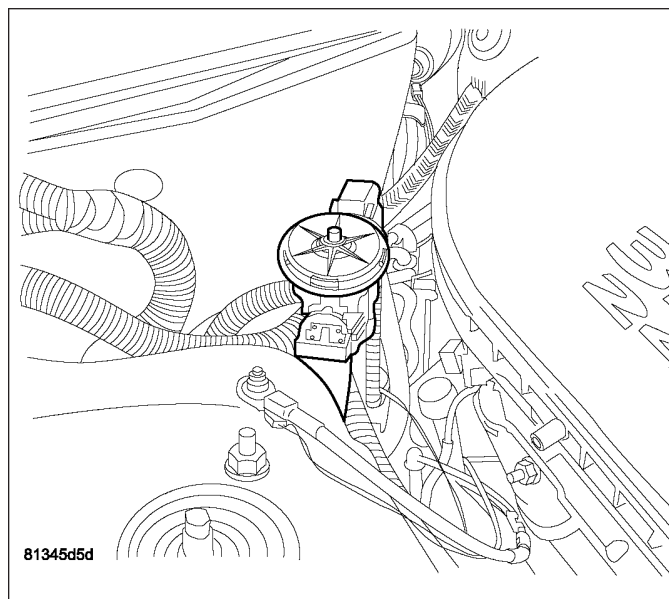


## 2.7L - UPPER TUBE

1. EGR system components and location. Upper tube (2), EGR valve (1), and Lower tube (3).
2. Disconnect negative battery cable.

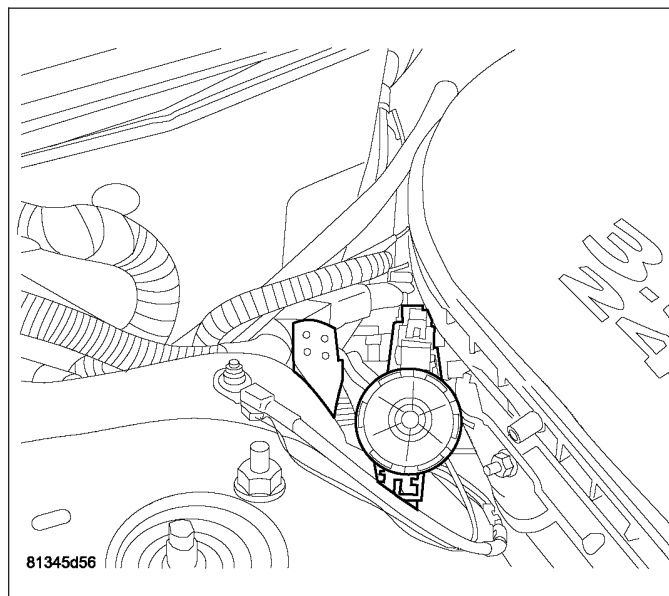


3. Remove purge solenoid from bracket.



4. Relocate the purge solenoid.

5. Unlock and disconnect the electrical connector from EGR valve.

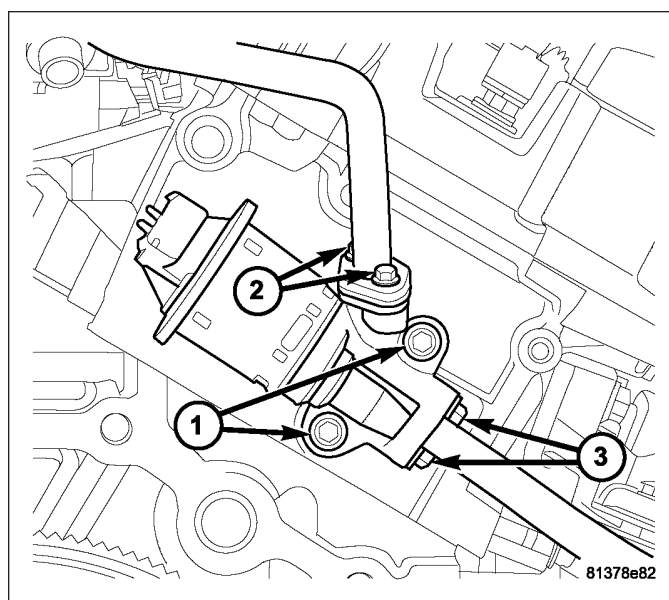


6. Remove upper tube bolts to EGR valve (2).

7. Remove upper tube from intake manifold.

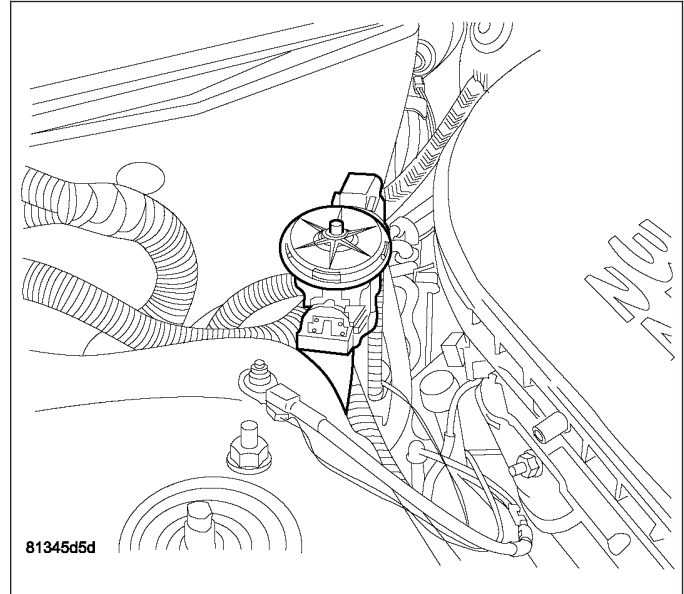
8. When removing EGR upper tube assembly being careful not to drop the silicone rubber seals in the intake manifold. Clean gasket surfaces on the EGR valve. Note that any loose dirt can lodge between the pintle and the seat and cause valve leakage that will give a rough idle and depressed manifold vacuum.

9. Clean mounting surface.

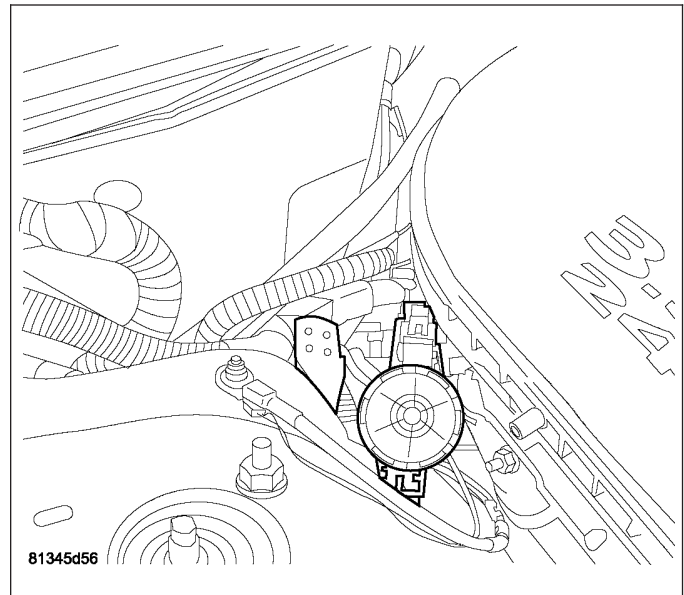


**3.5L**

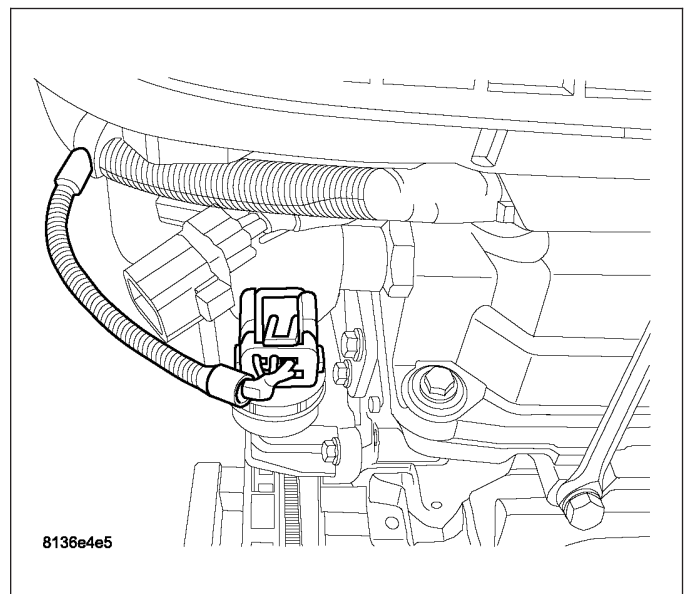
1. Disconnect negative battery cable.
2. Remove purge solenoid from bracket.



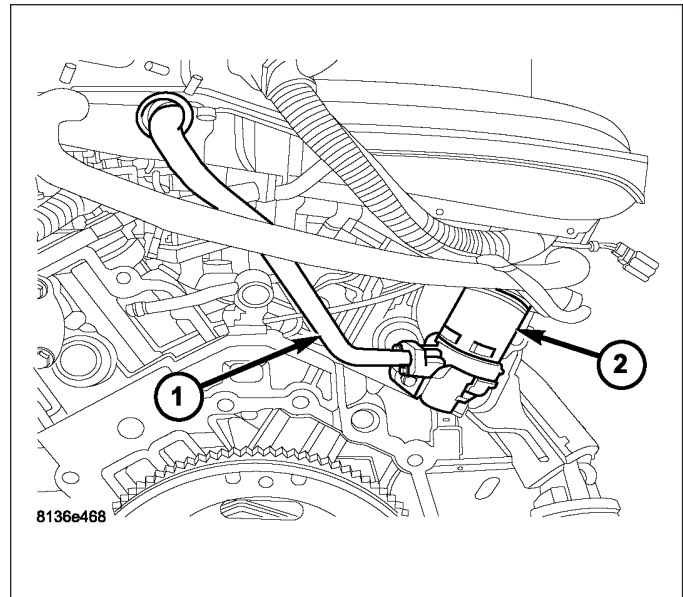
3. Relocate the purge solenoid.



4. Unlock and disconnect the electrical connector from EGR valve.
5. Remove the wiper module, (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - REMOVAL).
6. Remove shock tower brace and relocate.
7. Remove the upper intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).



8. EGR valve (2) and tube (1).

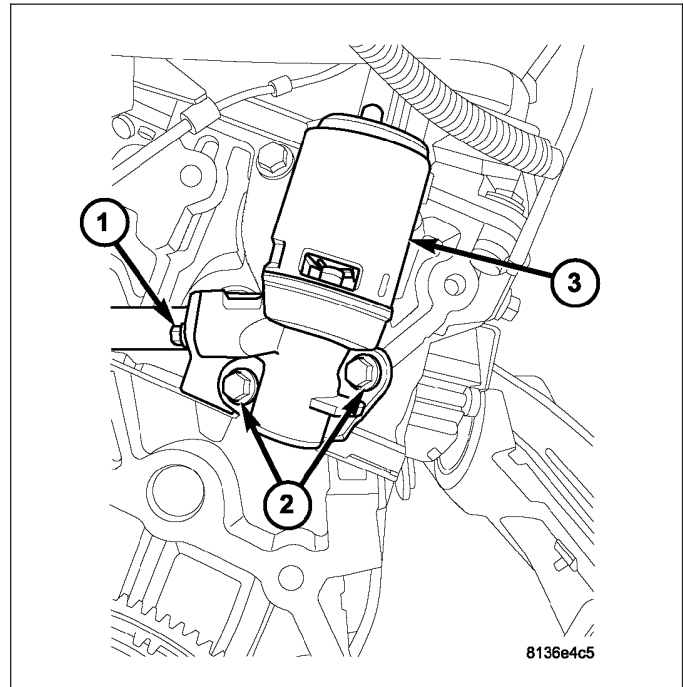


9. Remove tube bolts (1) to EGR valve (2).

10. Remove tube (1) from intake manifold.

11. When removing EGR upper tube assembly being careful not to drop the silicone rubber seals in the intake manifold. Clean gasket surfaces on the EGR valve. Note that any loose dirt can lodge between the pintle and the seat and cause valve leakage that will give a rough idle and depressed manifold vacuum.

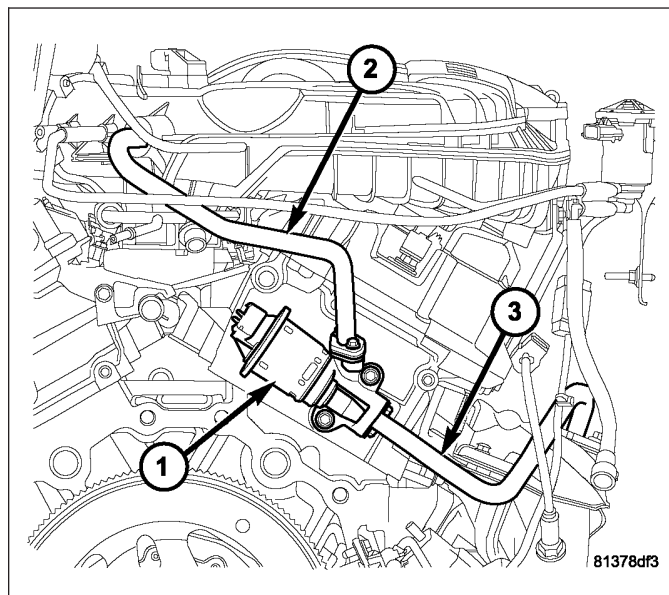
12. Clean mounting surface.



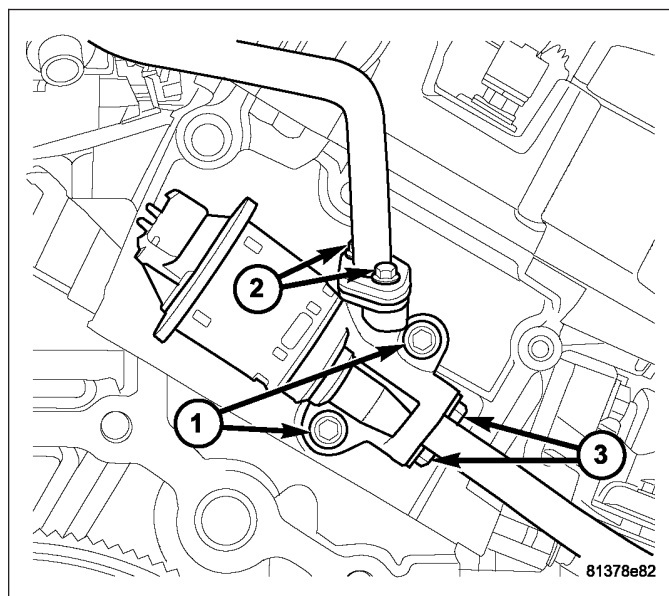
## INSTALLATION

### 2.7L - LOWER TUBE

1. Clean mounting surface.

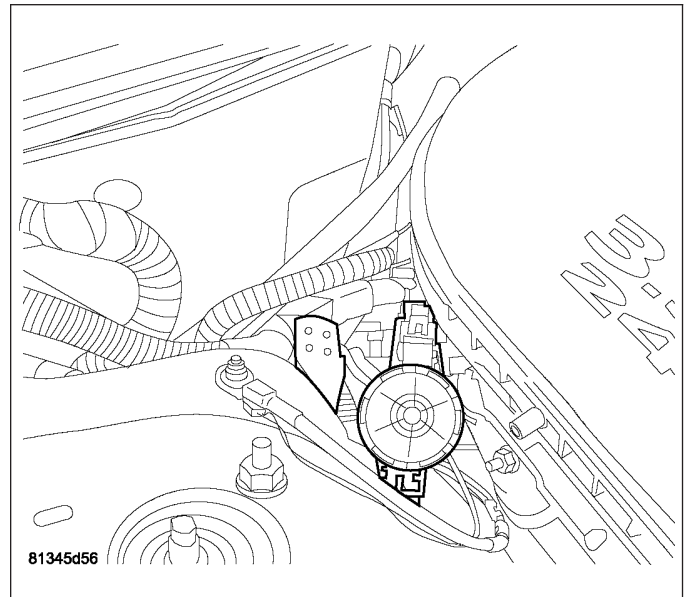


2. Install the lower tube to vehicle.
3. Install the lower tube bolts to EGR valve.
4. Install the lower tube bolts to exhaust manifold.
5. Tighten the lower tube to EGR valve bolts to 11 N·m (95 in. lbs.) torque.
6. Tighten the lower tube to exhaust manifold bolts to 31 N·m (275 in. lbs.) torque.



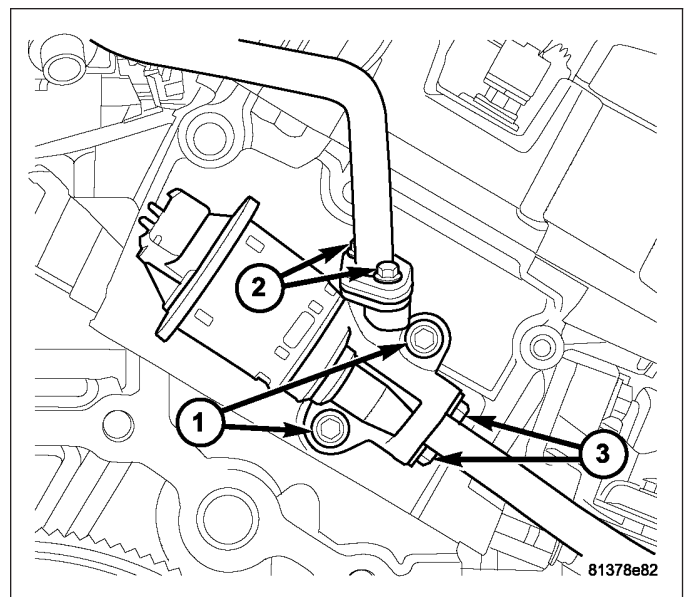
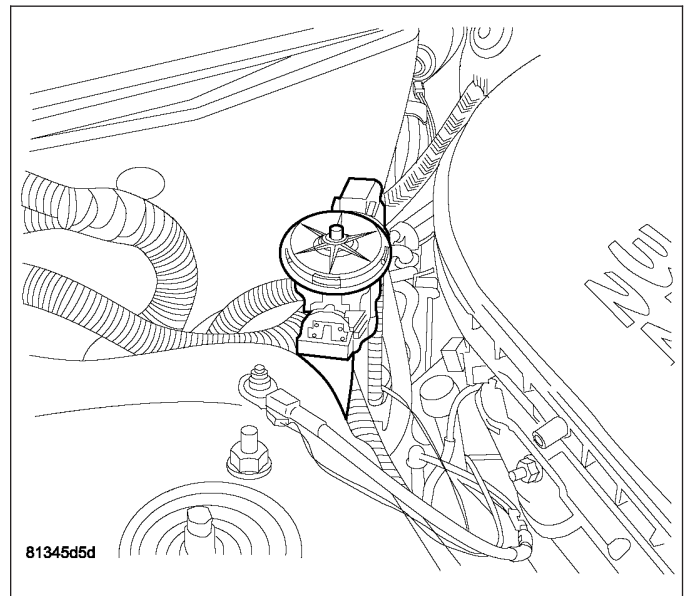


7. Connect the electrical connector to EGR valve and lock.
8. Relocate the purge solenoid.
9. Install purge solenoid to bracket.
10. Connect negative battery cable.



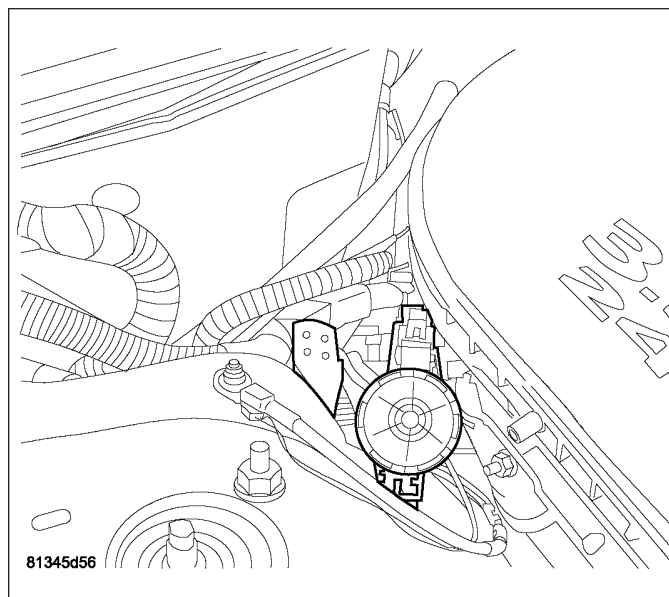
## 2.7L - UPPER TUBE

1. Clean mounting surface.
2. Inspect rubber silicone seals on intake manifold end of EGR tube.
3. Install upper tube into the intake manifold, being careful that the silicone rubber seals are correctly installed and undamaged..
4. Install new gasket between the EGR valve and tube and install bolts (2).
5. Tighten the upper tube to EGR valve bolts to 11 N·m (95 in. lbs.) torque.

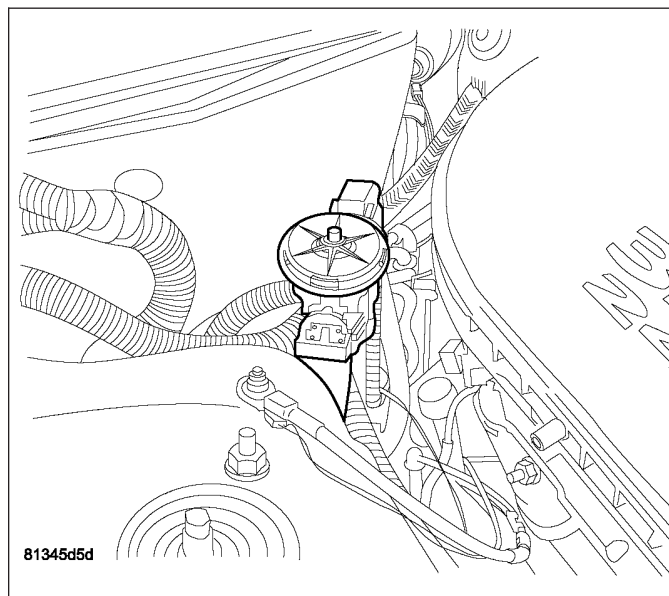




6. Connect the electrical connector to EGR valve and lock.
7. Relocate the purge solenoid.

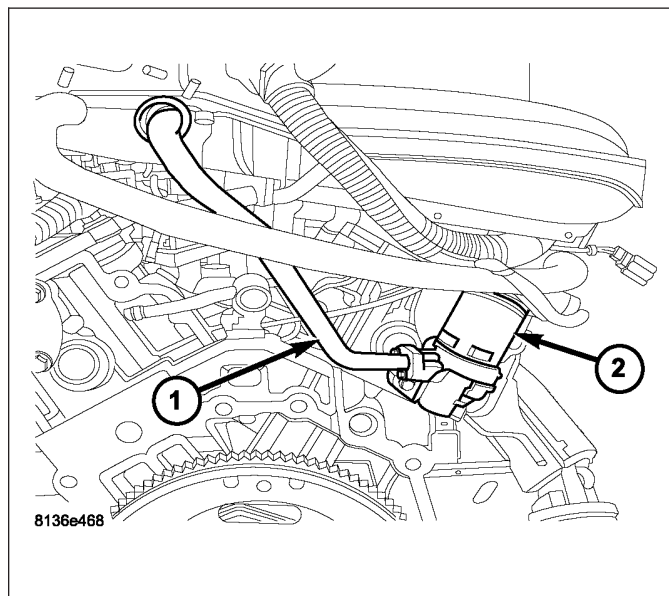


8. Install purge solenoid to bracket.
9. Connect negative battery cable.

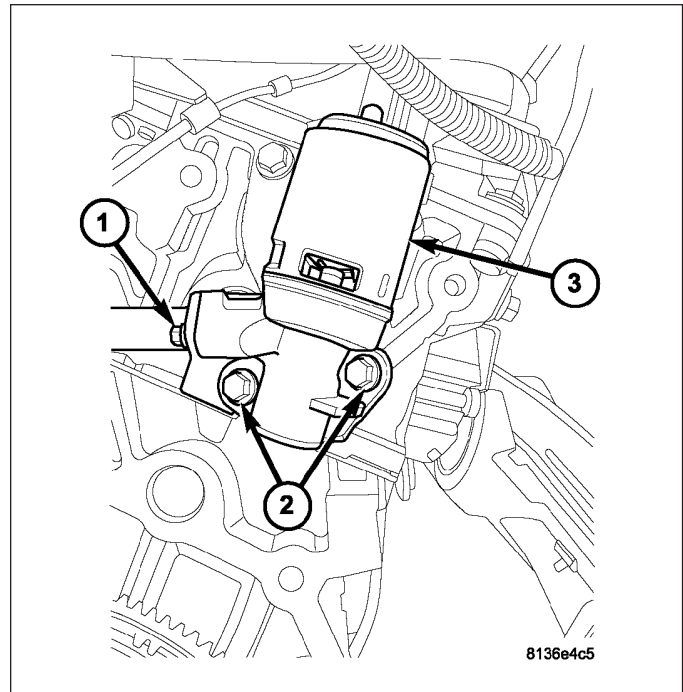


### 3.5L

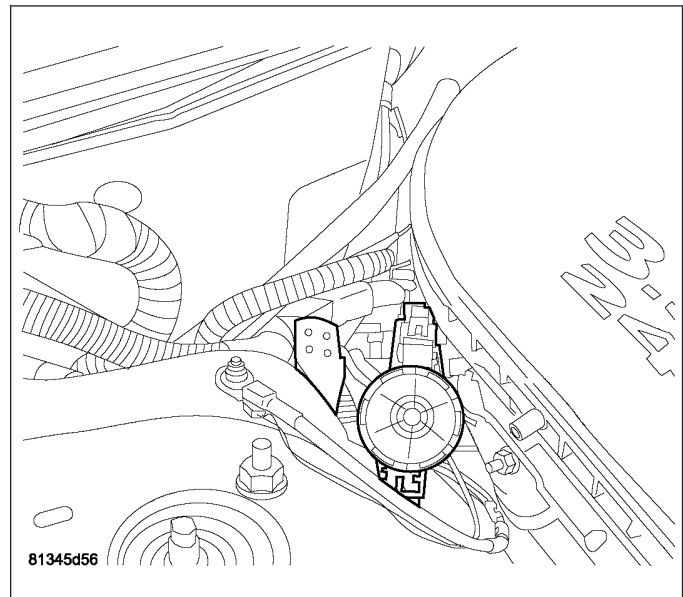
1. Clean mounting surface.
2. Inspect rubber silicone seals on intake manifold end of EGR tube.
3. Install tube into the intake manifold being careful that the silicone rubber seals are correctly installed and undamaged.



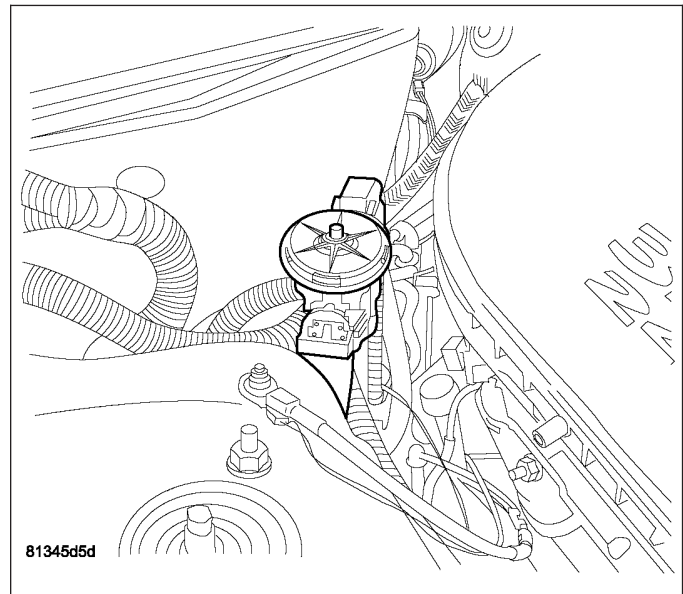
4. Install the tube bolts to EGR valve.
5. Tighten the EGR tube to EGR valve bolts to 11 N·m (95 in. lbs.) torque.



6. Connect the electrical connector to EGR valve and lock.
7. Install upper intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
8. Install the shock tower brace.
9. Install the wiper module, (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - INSTALLATION).
10. Relocate the purge solenoid.



11. Install purge solenoid to bracket.
12. Connect negative battery cable.



## ASSEMBLY-EXHAUST GAS RECIRCULATION VALVE

### DESCRIPTION

The EGR valve consists of three major components. First there is the pintle, valve seat, and housing which contains and regulates the gas flow. Second there is the armature, return spring, and solenoid coil to provide the operating force to regulate the flow by changing the pintle position. The solenoid coil assembly is in parallel with a diode and connects to the two connectors in the connector assembly. The third major component which senses pintle position and is connected to the three connectors in the electrical connector.

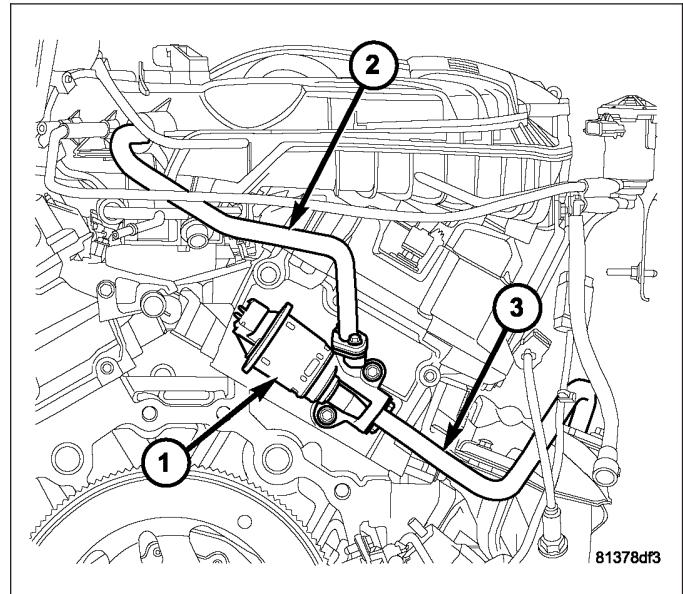
### OPERATION

The exhaust gas recirculation flow is determined by the engine controller. For a given set of conditions, the engine controller knows the ideal exhaust gas recirculation flow to optimize NOx and fuel economy as a function of the pintle position. Pintle position is obtained from the position sensor. The engine controller adjusts the duty cycle of 128 Hz power supplied to the solenoid coil to obtain the correct position.

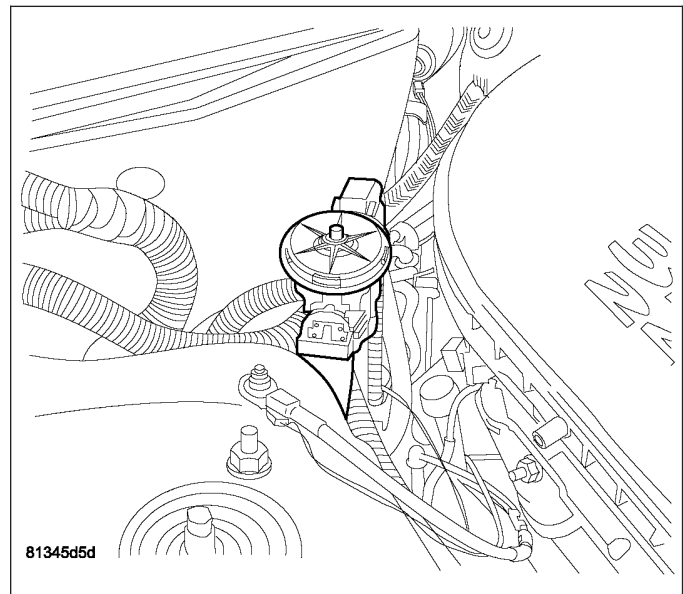
### REMOVAL

#### 2.7L

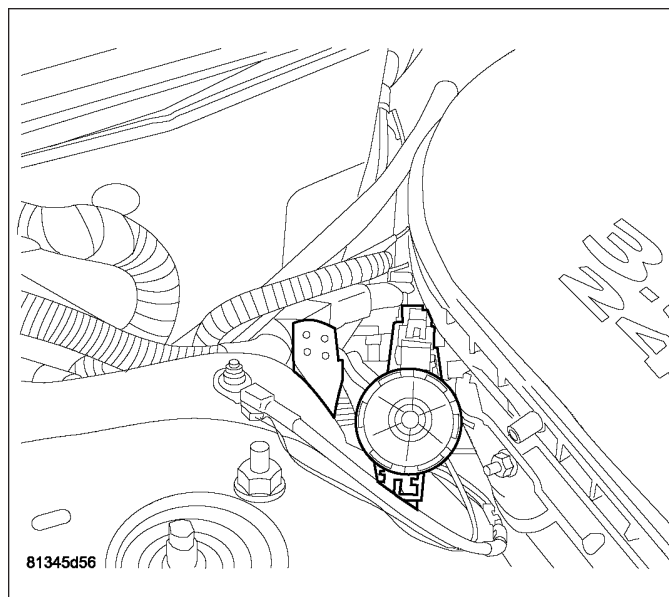
1. EGR system components and location. Upper tube (2), EGR valve (1), and Lower tube (3).
2. Disconnect negative battery cable.



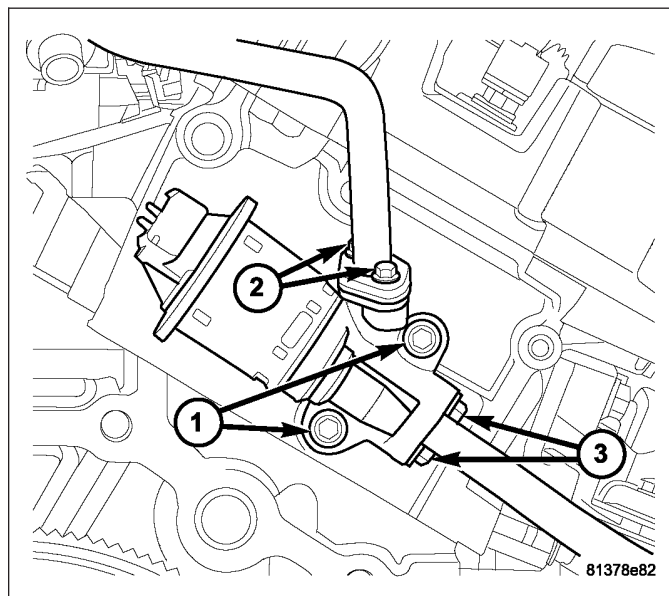
3. Remove purge solenoid from bracket.



4. Relocate the purge solenoid.
5. Unlock and disconnect the electrical connector from EGR valve.

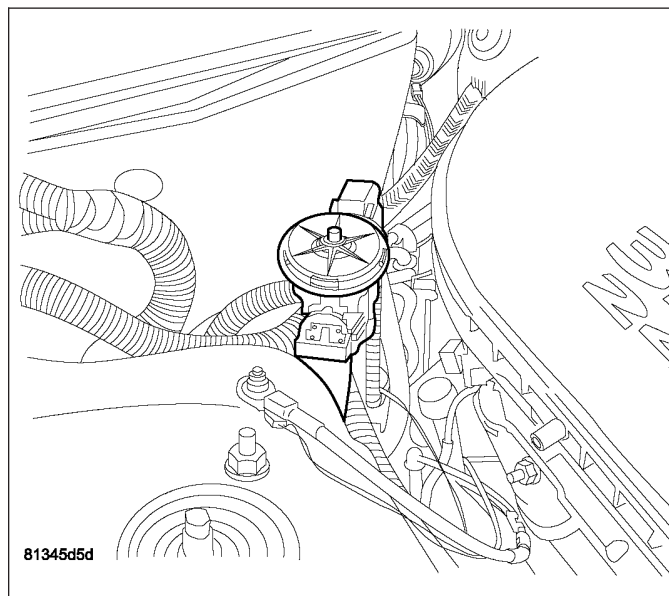


6. Remove the bolts from the EGR tube to exhaust manifold.
7. Remove the lower tube bolts to EGR valve and remove tube(3).
8. Remove upper tube bolts to EGR valve (2).
9. Remove the EGR valve mounting bolts (1).
10. Remove valve from vehicle.
11. Clean mounting surface.

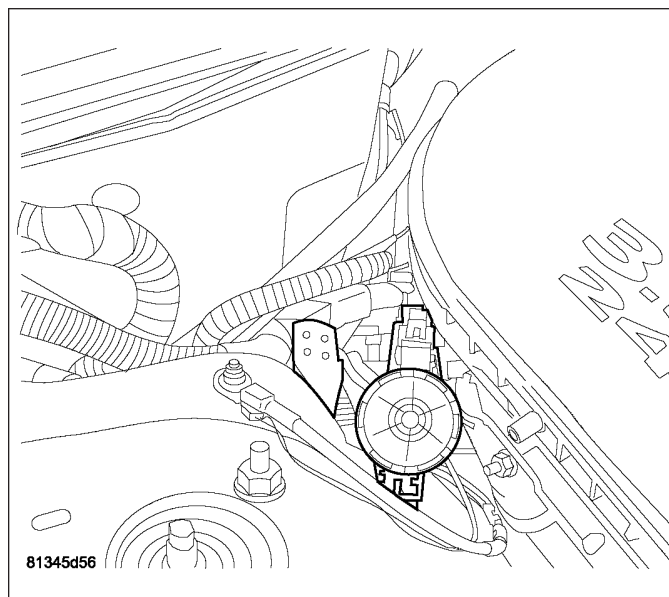


### 3.5L

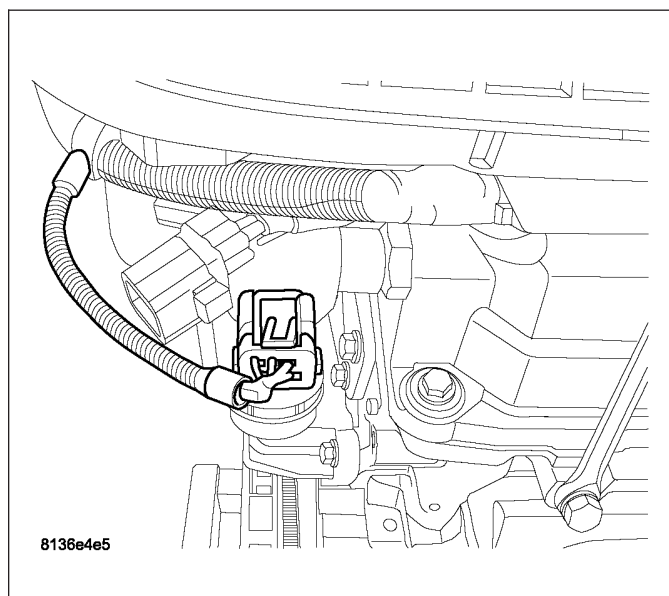
1. Disconnect negative battery cable.
2. Remove purge solenoid from bracket.



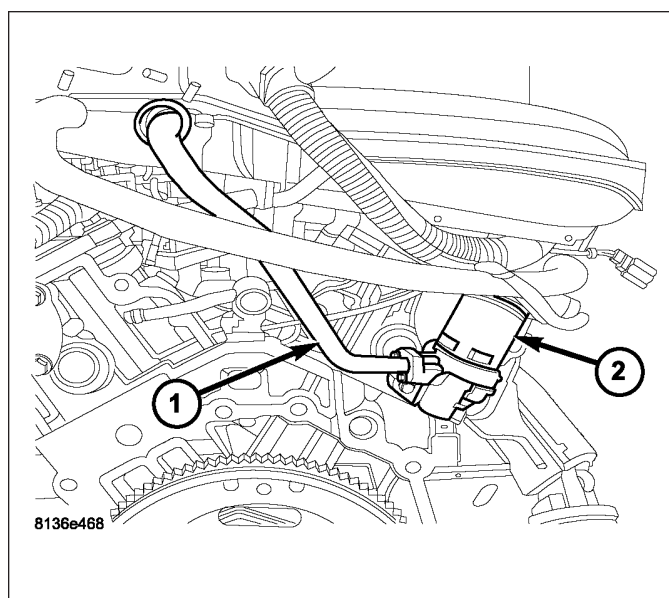
3. Relocate the purge solenoid.



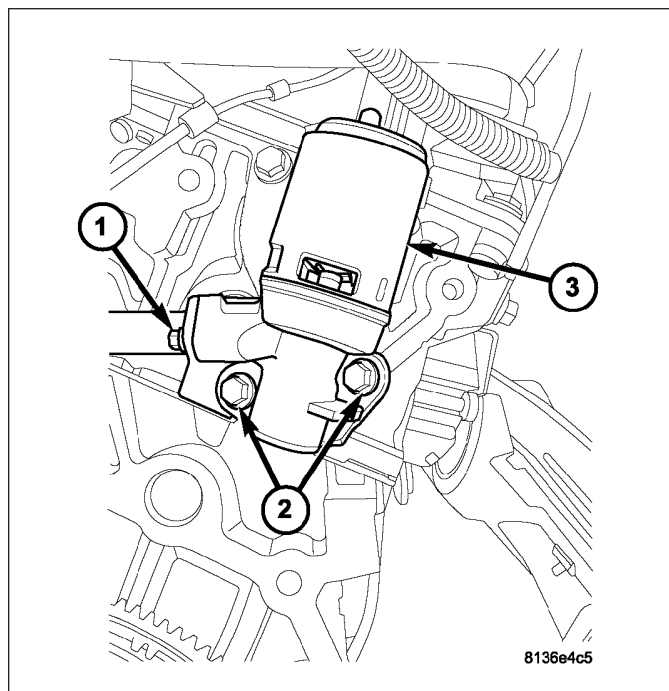
4. Unlock and disconnect the electrical connector from EGR valve.
5. Remove the wiper module, (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - REMOVAL).
6. Remove shock tower brace and relocate.
7. Remove the upper intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).



8. EGR valve (2) and tube (1).

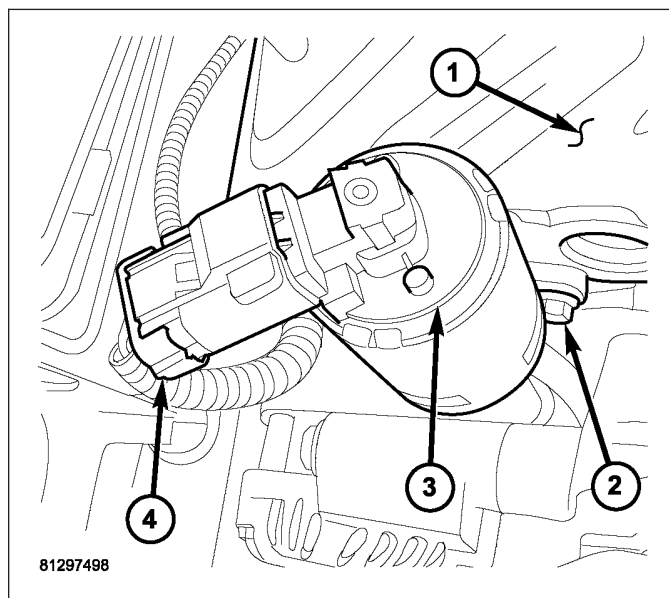


9. Remove tube bolts (1) to EGR valve (3).
10. Remove tube (1) from intake manifold.
11. When removing EGR upper tube assembly being careful not to drop the silicone rubber seals in the intake manifold. Clean gasket surfaces on the EGR valve. Note that any loose dirt can lodge between the pintle and the seat and cause valve leakage that will give a rough idle and depressed manifold vacuum.
12. Remove EGR valve mounting bolts (2).
13. Remove EGR valve from vehicle.
14. Clean mounting surface.



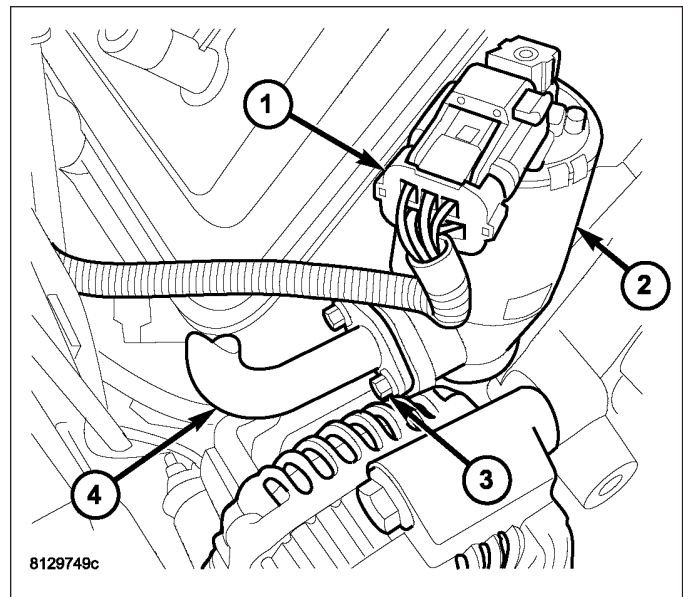
## 5.7L

The electronic EGR valve and solenoid assembly (3) is attached to the front of the right cylinder head (1). An exhaust gas routing tube connects the EGR valve to the intake manifold.

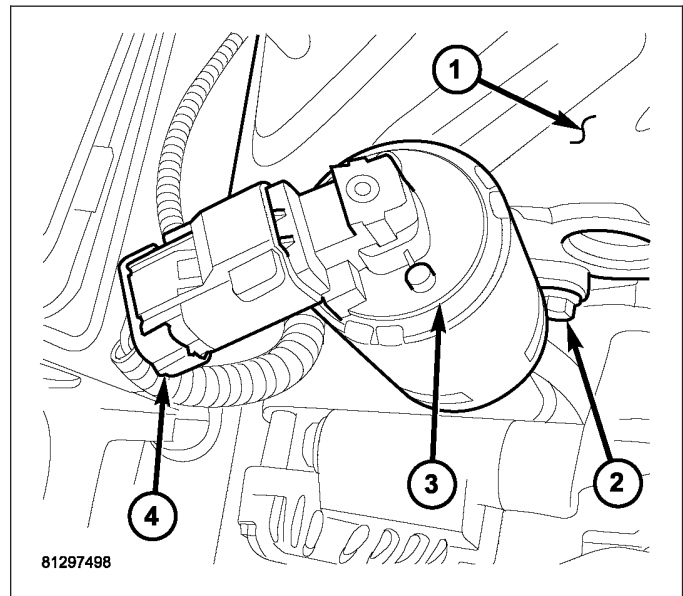




1. Disconnect electrical connector (1) from EGR solenoid (2).
2. Remove two bolts (3) connecting EGR tube (4) to valve assembly.
3. Remove gasket located between EGR tube flange and EGR valve assembly.



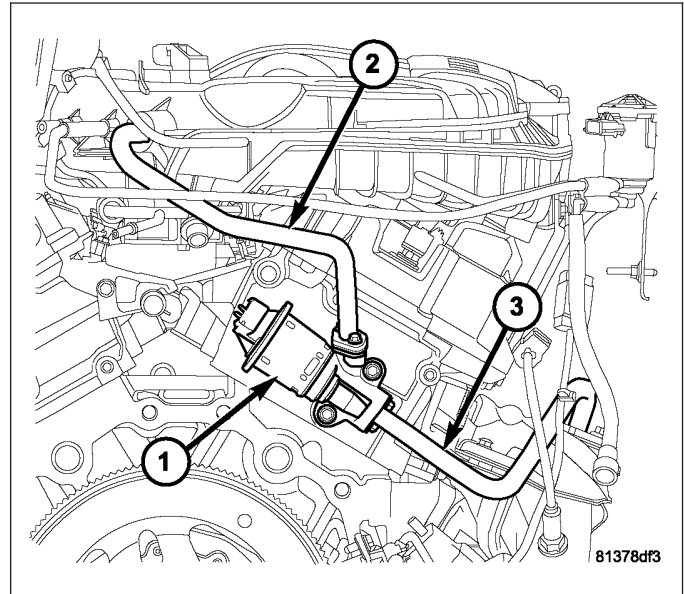
4. Remove two mounting bolts (2).
5. Separate valve assembly (3) from cylinder head (1).
6. Remove and discard metal gasket located between cylinder head and valve assembly.



## INSTALLATION

### 2.7L

1. Clean mounting surface.



2. Install EGR valve.

3. Install the EGR valve mounting bolts (1).

4. Inspect rubber silicone seals on intake manifold end of EGR tube.

5. Install upper tube into the intake manifold, being careful that the silicone rubber seals are correctly installed and undamaged..

6. Install new gasket between the EGR valve and upper tube and install bolts (2).

7. Install the lower tube to exhaust manifold.

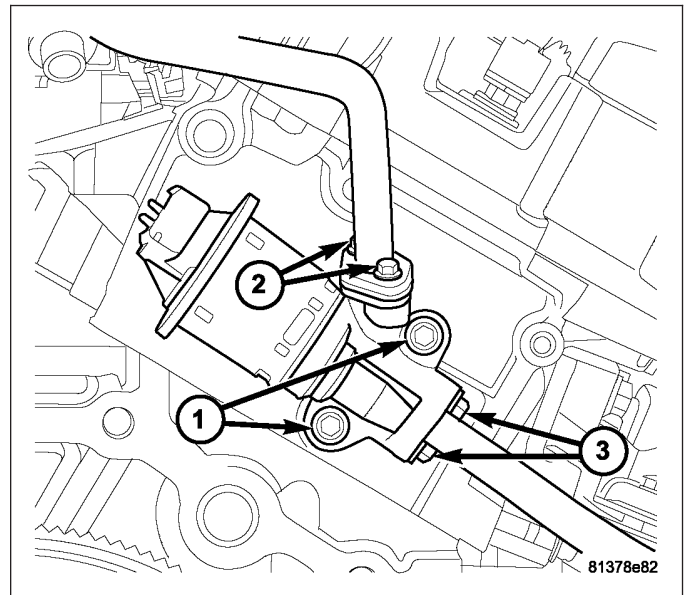
8. Install new gasket between the EGR valve and lower tube and install bolts (3).

9. Tighten the lower tube to EGR valve bolts (3) to 11 N·m (95 in. lbs.) torque.

10. Tighten the lower tube to exhaust manifold bolts to 31 N·m (275 in. lbs.) torque.

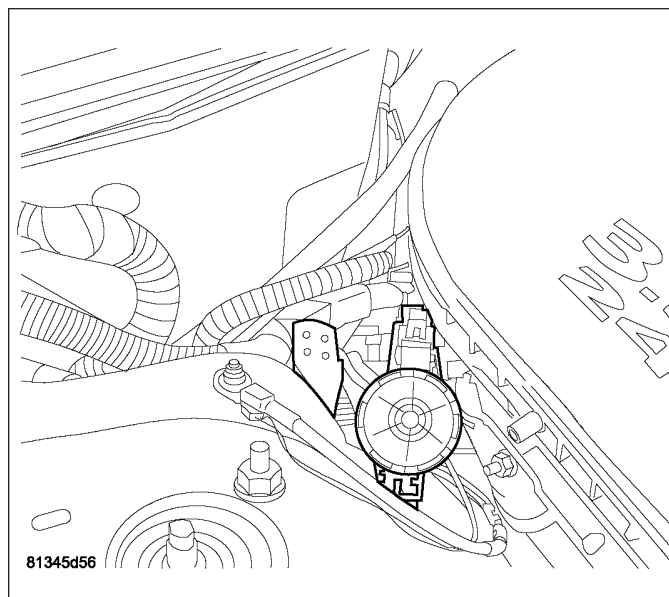
11. Tighten the upper tube to EGR valve bolts (2) to 11 N·m (95 in. lbs.) torque.

12. Tighten EGR valve to cylinder head bolts (1) to 31 N·m (275 in. lbs.) torque.

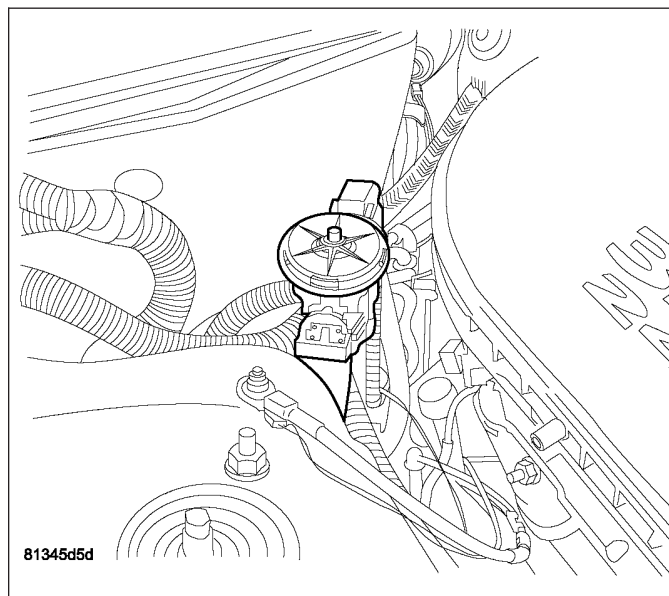




13. Connect the electrical connector to EGR valve and lock.
14. Relocate the purge solenoid.

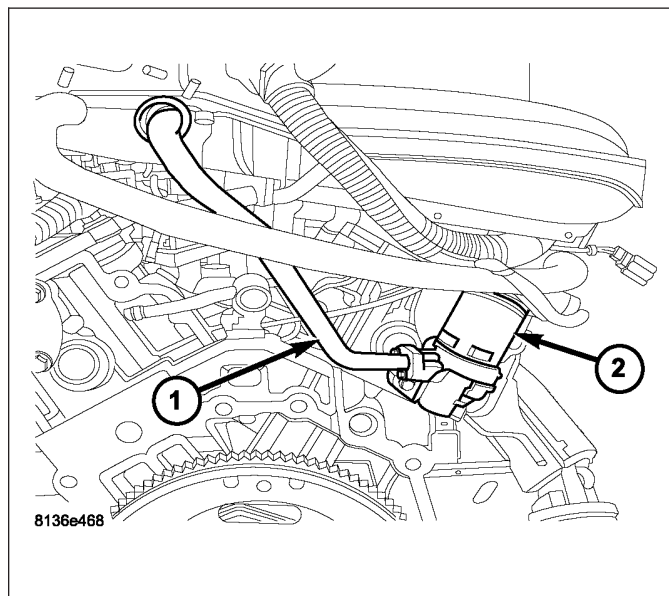


15. Install purge solenoid to bracket.
16. Connect negative battery cable.

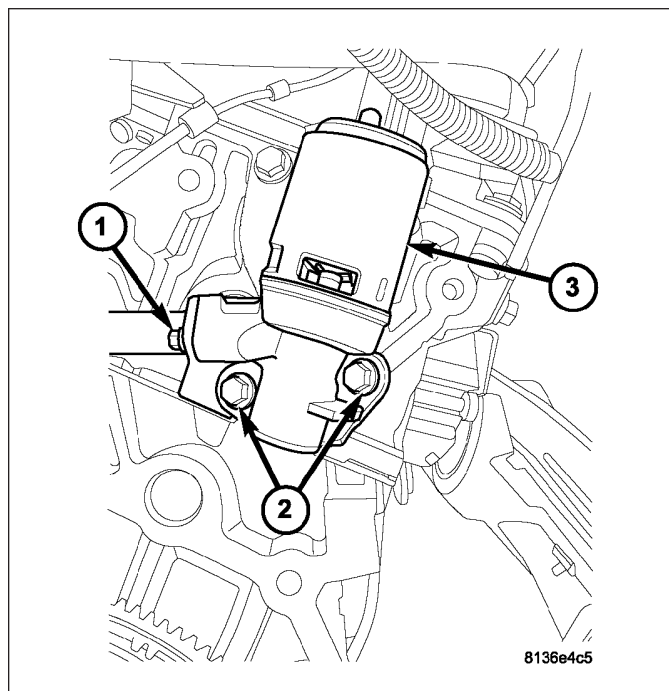


### 3.5L

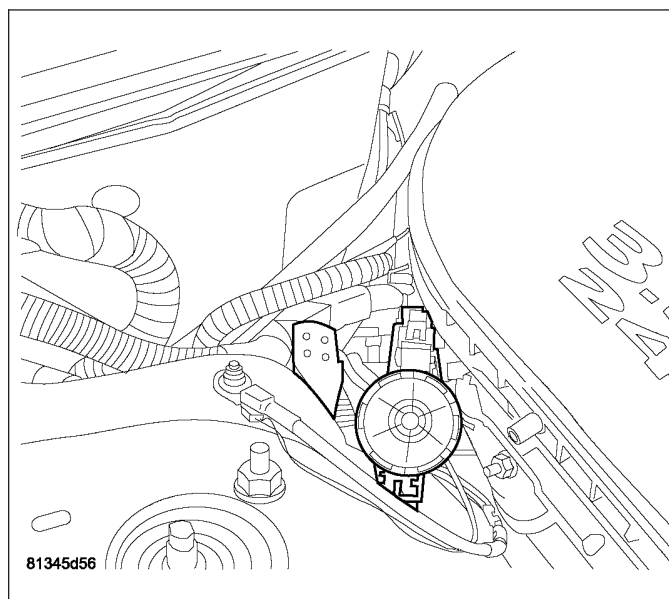
1. Clean mounting surface.
2. Inspect rubber silicone seals on intake manifold end of EGR tube.
3. Install tube into the intake manifold being careful that the silicone rubber seals are correctly installed and undamaged.



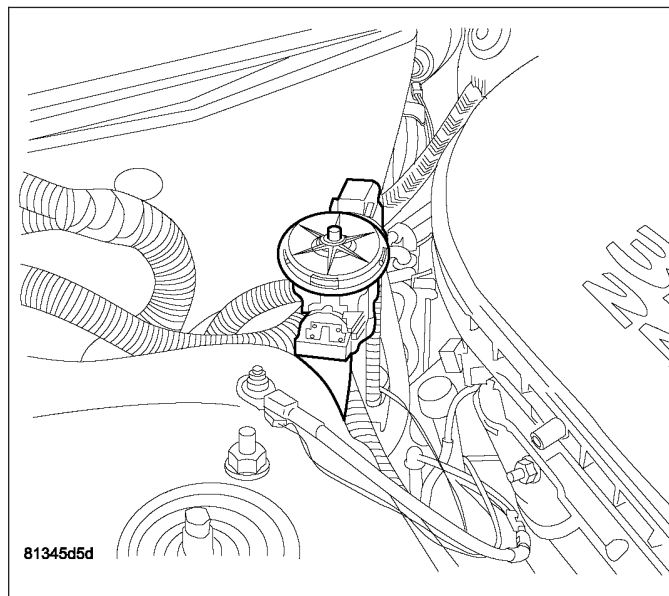
4. Install new gasket between the EGR valve (3) and tube and install bolts (1).
5. Tighten the EGR tube to EGR valve bolts to 11 N·m (95 in. lbs.) torque.



6. Connect the electrical connector to EGR valve and lock.
7. Install upper intake manifold, (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
8. Install the shock tower brace.
9. Install the wiper module, (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - INSTALLATION).
10. Relocate the purge solenoid.

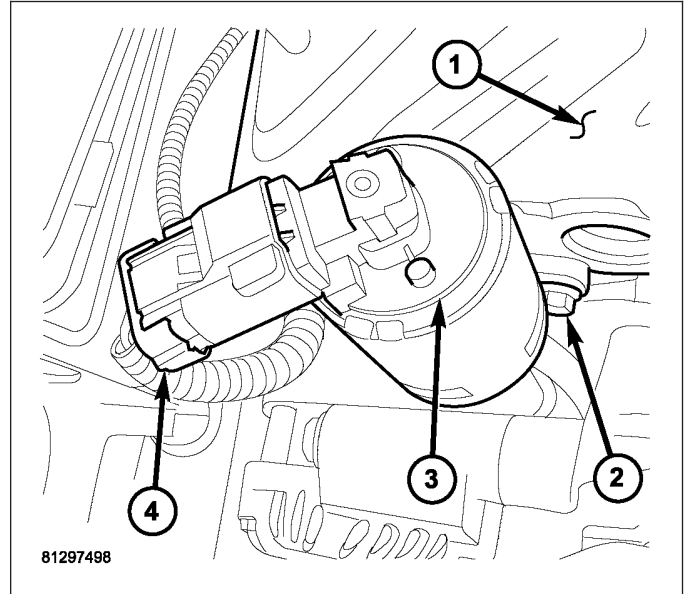


11. Install purge solenoid to bracket.
12. Connect negative battery cable.

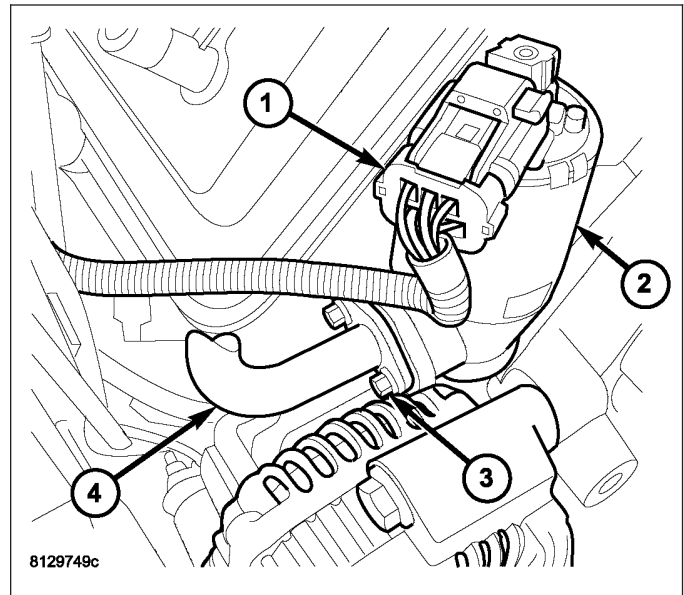


**5.7L**

1. Position a new metal gasket between cylinder head (1) and valve assembly (3).
2. Install two mounting bolts (2) and tighten. Refer to Torque Specifications.



3. Clean EGR tube where it joins EGR valve.
4. Position new gasket between EGR tube flange and EGR valve assembly.
5. Install two bolts (3) connecting EGR tube (4) to valve assembly (2). Tighten bolts. Refer to Torque Specifications.
6. Connect electrical connector (1) to EGR solenoid (2).



# ON-BOARD DIAGNOSTICS

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## TASK MANAGER

### DESCRIPTION

The PCM is responsible for efficiently coordinating the operation of all the emissions-related components. The PCM is also responsible for determining if the diagnostic systems are operating properly. The software designed to carry out these responsibilities is called the "Task Manager".

### OPERATION

The Task Manager determines when tests happen and when functions occur. Many of the diagnostic steps required by OBD II must be performed under specific operating conditions. The Task Manager software organizes and prioritizes the diagnostic procedures. The job of the Task Manager is to determine if conditions are appropriate for tests to be run, monitor the parameters for a trip for each test, and record the results of the test. Following are the responsibilities of the Task Manager software:

- Test Sequence
- MIL Illumination
- Diagnostic Trouble Codes (DTCs)
- Trip Indicator
- Freeze Frame Data Storage
- Similar Conditions Window

### Test Sequence

In many instances, emissions systems must fail diagnostic tests more than once before the PCM illuminates the MIL. These tests are known as 'two trip monitors.' Other tests that turn the MIL lamp on after a single failure are known as 'one trip monitors.' A trip is defined as 'start the vehicle and operate it to meet the criteria necessary to run the given monitor.'

Many of the diagnostic tests must be performed under certain operating conditions. However, there are times when tests cannot be run because another test is in progress (conflict), another test has failed (pending) or the Task Manager has set a fault that may cause a failure of the test (suspend).

- **Pending**

Under some situations the Task Manager will not run a monitor if the MIL is illuminated and a fault is stored from another monitor. In these situations, the Task Manager postpones monitors **pending** resolution of the original fault. The Task Manager does not run the test until the problem is remedied.

For example, when the MIL is illuminated for an Oxygen Sensor fault, the Task Manager does not run the Catalyst Monitor until the Oxygen Sensor fault is remedied. Since the Catalyst Monitor is based on signals from the Oxygen Sensor, running the test would produce inaccurate results.

- **Conflict**

There are situations when the Task Manager does not run a test if another monitor is in progress. In these situations, the effects of another monitor running could result in an erroneous failure. If this **conflict** is present, the monitor is not run until the conflicting condition passes. Most likely the monitor will run later after the conflicting monitor has passed.

For example, if the Fuel System Monitor is in progress, the Task Manager does not run the catalyst Monitor. Since both tests monitor changes in air/fuel ratio and adaptive fuel compensation, the monitors will conflict with each other.

- **Suspend**

Occasionally the Task Manager may not allow a two trip fault to mature. The Task Manager will **suspend** the maturing of a fault if a condition exists that may induce an erroneous failure. This prevents illuminating the MIL for the wrong fault and allows more precise diagnosis.

For example, if the PCM is storing a one trip fault for the Oxygen Sensor and the catalyst monitor, the Task Manager may still run the catalyst Monitor but will suspend the results until the Oxygen Sensor Monitor either passes or fails. At that point the Task Manager can determine if the catalyst system is actually failing or if an Oxygen Sensor is failing.

### **MIL Illumination**

The PCM Task Manager carries out the illumination of the MIL. The Task Manager triggers MIL illumination upon test failure, depending on monitor failure criteria.

The Task Manager Screen shows both a Requested MIL state and an Actual MIL state. When the MIL is illuminated upon completion of a test for a good trip, the Requested MIL state changes to OFF. However, the MIL remains illuminated until the next key cycle. (On some vehicles, the MIL will actually turn OFF during the third good trip) During the key cycle for the third good trip, the Requested MIL state is OFF, while the Actual MIL state is ON. After the next key cycle, the MIL is not illuminated and both MIL states read OFF.

### **Diagnostic Trouble Codes (DTCs)**

With OBD II, different DTC faults have different priorities according to regulations. As a result, the priorities determine MIL illumination and DTC erasure. DTCs are entered according to individual priority. DTCs with a higher priority overwrite lower priority DTCs.

#### **Priorities**

- Priority 1 One-Trip Failure of Non-Fuel or Non-Mis-Fire Fault (e.g., Cat Mon Failure)
- Priority 3 Matured Fault (either One-Trip or Two-Trip) Non-Fuel & Non-Mis-Fire
- Priority 4 One-Trip Failure of Fuel System or Mis-Fire Fault
- Priority 6 Matured Fault for Fuel System or Mis-Fire (either One-Trip or Two-Trip)

Non-emissions related failures have no priority. One trip failures of two trip faults have low priority. Two trip failures or matured faults have higher priority. One and two trip failures of fuel system and misfire monitor take precedence over non-fuel system and non-misfire failures.

### **DTC Self Erasure**

With one trip components or systems, the MIL is illuminated upon test failure and DTCs are stored.

Two trip monitors are components requiring failure in two consecutive trips for MIL illumination. Upon failure of the first test, the Task Manager enters a maturing code. If the component fails the test for a second time the code matures and a DTC is set.

After three good trips the MIL is extinguished and the Task Manager automatically switches the trip counter to a warm-up cycle counter. DTCs are automatically erased following 40 warm-up cycles if the component does not fail again.

For misfire and fuel system monitors, the component must pass the test under a Similar Conditions Window in order to record a good trip. A Similar Conditions Window is when engine RPM is within  $\pm 375$  RPM and load is within  $\pm 20\%$  of when the fault occurred.

**Note: It is important to understand that a component does not have to fail under a similar window of operation to mature. It must pass the test under a Similar Conditions Window when it failed to record a Good Trip for DTC erasure for misfire and fuel system monitors.**

DTCs can be erased anytime with a scan tool. Erasing the DTC with the scan tool erases all OBD II information. The scan tool automatically displays a warning that erasing the DTC will also erase all OBD II monitor data. This includes all counter information for warm-up cycles, trips and Freeze Frame.

### **Trip Indicator**

The **Trip** is essential for running monitors and extinguishing the MIL. In OBD II terms, a trip is a set of vehicle operating conditions that must be met for a specific monitor to run. All trips begin with a key cycle.

## Good Trip

The Good Trip counters are as follows:

- Global Good Trip
- Fuel System Good Trip
- Misfire Good Trip
- Alternate Good Trip (appears as a Global Good Trip on scan tool)
  - Comprehensive Components
  - Major Monitor
- Warm-Up Cycles

### Global Good Trip

To increment a Global Good Trip, the Oxygen sensor and Catalyst efficiency monitors must have run and passed, and 2 minutes of engine run time.

### Fuel System Good Trip

To count a good trip (three required) and turn off the MIL, the following conditions must occur:

- Engine in closed loop
- Operating in Similar Conditions Window
- Short Term multiplied by Long Term less than threshold
- Less than threshold for a predetermined time

If all of the previous criteria are met, the PCM will count a good trip (three required) and turn off the MIL.

### Misfire Good Trip

If the following conditions are met the PCM will count one good trip (three required) in order to turn off the MIL:

- Operating in Similar Condition Window
- 1000 engine revolutions with no misfire

### Alternate Good Trip

Alternate Good Trips are used in place of Global Good Trips for Comprehensive Components and Major Monitors. If the Task Manager cannot run a Global Good Trip because a component fault is stopping the monitor from running, it will attempt to count an Alternate Good Trip.

The Task Manager counts an Alternate Good Trip for Comprehensive components when the following conditions are met:

- Two minutes of engine run time, idle or driving
- No other faults occur

The Task Manager counts an Alternate Good Trip for a Major Monitor when the monitor runs and passes. Only the Major Monitor that failed needs to pass to count an Alternate Good Trip.

### Warm-Up Cycles

Once the MIL has been extinguished by the Good Trip Counter, the PCM automatically switches to a Warm-Up Cycle Counter that can be viewed on the scan tool. Warm-Up Cycles are used to erase DTCs and Freeze Frames. Forty Warm-Up cycles must occur in order for the PCM to self-erase a DTC and Freeze Frame. A Warm-Up Cycle is defined as follows:

- Engine coolant temperature must start below and rise above 160° F
- Engine coolant temperature must rise by 40° F
- No further faults occur

### Freeze Frame Data Storage

Once a failure occurs, the Task Manager records several engine operating conditions and stores it in a Freeze Frame. The Freeze Frame is considered one frame of information taken by an on-board data recorder. When a fault occurs, the PCM stores the input data from various sensors so that technicians can determine under what vehicle operating conditions the failure occurred.

The data stored in Freeze Frame is usually recorded when a system fails the first time for two trip faults. Freeze Frame data will only be overwritten by a different fault with a higher priority.



**CAUTION:** Erasing DTCs, either with the scan tool; or by disconnecting the battery, also clears all Freeze Frame data.

### Similar Conditions Window

The Similar Conditions Window displays information about engine operation during a monitor. Absolute MAP (engine load) and Engine RPM are stored in this window when a failure occurs. There are two different Similar conditions Windows: Fuel System and Misfire.

#### FUEL SYSTEM

- **Fuel System Similar Conditions Window** — An indicator that 'Absolute MAP When Fuel Sys Fail' and 'RPM When Fuel Sys Failed' are all in the same range when the failure occurred. Indicated by switching from 'NO' to 'YES'.
- **Absolute MAP When Fuel Sys Fail** — The stored MAP reading at the time of failure. Informs the user at what engine load the failure occurred.
- **Absolute MAP** — A live reading of engine load to aid the user in accessing the Similar Conditions Window.
- **RPM When Fuel Sys Fail** — The stored RPM reading at the time of failure. Informs the user at what engine RPM the failure occurred.
- **Engine RPM** — A live reading of engine RPM to aid the user in accessing the Similar Conditions Window.
- **Adaptive Memory Factor** — The PCM utilizes both Short Term Compensation and Long Term Adaptive to calculate the Adaptive Memory Factor for total fuel correction.
- **Upstream O2S Volts** — A live reading of the Oxygen Sensor to indicate its performance. For example, stuck lean, stuck rich, etc.
- **SCW Time in Window (Similar Conditions Window Time in Window)** — A timer used by the PCM that indicates that, after all Similar Conditions have been met, if there has been enough good engine running time in the SCW without failure detected. This timer is used to increment a Good Trip.
- **Fuel System Good Trip Counter** — A Trip Counter used to turn OFF the MIL for Fuel System DTCs. To increment a Fuel System Good Trip, the engine must be in the Similar Conditions Window, Adaptive Memory Factor must be less than calibrated threshold and the Adaptive Memory Factor must stay below that threshold for a calibrated amount of time.
- **Test Done This Trip** — Indicates that the monitor has already been run and completed during the current trip.

#### MISFIRE

- **Same Misfire Warm-Up State** — Indicates if the misfire occurred when the engine was warmed up (above 160° F).
- **In Similar Misfire Window** — An indicator that 'Absolute MAP When Misfire Occurred' and 'RPM When Misfire Occurred' are all in the same range when the failure occurred. Indicated by switching from 'NO' to 'YES'.
- **Absolute MAP When Misfire Occurred** — The stored MAP reading at the time of failure. Informs the user at what engine load the failure occurred.
- **Absolute MAP** — A live reading of engine load to aid the user in accessing the Similar Conditions Window.
- **RPM When Misfire Occurred** — The stored RPM reading at the time of failure. Informs the user at what engine RPM the failure occurred.
- **Engine RPM** — A live reading of engine RPM to aid the user in accessing the Similar Conditions Window.
- **Adaptive Memory Factor** — The PCM utilizes both Short Term Compensation and Long Term Adaptive to calculate the Adaptive Memory Factor for total fuel correction.
- **200 Rev Counter** — Counts 0–100 720 degree cycles.
- **SCW Cat 200 Rev Counter** — Counts when in similar conditions.
- **SCW FTP 1000 Rev Counter** — Counts 0–4 when in similar conditions.
- **Misfire Good Trip Counter** — Counts up to three to turn OFF the MIL.

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# SERVICE MANUAL COMMENTS

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