

Welcome to the  
1995 ZJ Jeep Grand Cherokee  
Electronic Service Manual

**DaimlerChrysler Corporation**

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METRIC CONVERSION

in-lbs to N•m

N•m to in-lbs

in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m
2	.2260	42	4.7453	82	9.2646	122	13.7839	162	18.3032	.2	1.7702	4.2	37.1747	8.2	72.5792	12.2	107.9837	16.2	143.3882	
4	.4519	44	4.9713	84	9.4906	124	14.0099	164	18.5292	.4	3.5404	4.4	38.9449	8.4	74.3494	12.4	109.7539	16.4	145.1584	
6	.6779	46	5.1972	86	9.7165	126	14.2359	166	18.7552	.6	5.3107	4.6	40.7152	8.6	76.1197	12.6	111.5242	16.6	146.9287	
8	.9039	48	5.4232	88	9.9425	128	14.4618	168	18.9811	.8	7.0809	4.8	42.4854	8.8	77.8899	12.8	113.2944	16.8	148.6989	
10	1.1298	50	5.6492	90	10.1685	130	14.6878	170	19.2071	1	8.8511	5	44.2556	9	79.6601	13	115.0646	17	150.4691	
12	1.3558	52	5.8751	92	10.3944	132	14.9138	172	19.4331	1.2	10.6213	5.2	46.0258	9.2	81.4303	13.2	116.8348	17.2	152.2393	
14	1.5818	54	6.1011	94	10.6204	134	15.1397	174	19.6590	1.4	12.3916	5.4	47.7961	9.4	83.2006	13.4	118.6051	17.4	154.0096	
16	1.8077	56	6.3270	96	10.8464	136	15.3657	176	19.8850	1.6	14.1618	5.6	49.5663	9.6	84.9708	13.6	120.3753	17.6	155.7798	
18	2.0337	58	6.5530	98	11.0723	138	15.5917	178	20.1110	1.8	15.9320	5.8	51.3365	9.8	86.7410	13.8	122.1455	17.8	157.5500	
20	2.2597	60	6.7790	100	11.2983	140	15.8176	180	20.3369	2	17.7022	6	53.1067	10	88.5112	14	123.9157	18	159.3202	
22	2.4856	62	7.0049	102	11.5243	142	16.0436	182	20.5629	2.2	19.4725	6.2	54.8770	10.2	90.2815	14.2	125.6860	18.5	163.7458	
24	2.7116	64	7.2309	104	11.7502	144	16.2696	184	20.7889	2.4	21.2427	6.4	56.6472	10.4	92.0517	14.4	127.4562	19	168.1714	
26	2.9376	66	7.4569	106	11.9762	146	16.4955	186	21.0148	2.6	23.0129	6.6	58.4174	10.6	93.8219	14.6	129.2264	19.5	172.5970	
28	3.1635	68	7.6828	108	12.2022	148	16.7215	188	21.2408	2.8	24.7831	6.8	60.1876	10.8	95.5921	14.8	130.9966	20	177.0225	
30	3.3895	70	7.9088	110	12.4281	150	16.9475	190	21.4668	3	26.5534	7	61.9579	11	97.3624	15	132.7669	20.5	181.4480	
32	3.6155	72	8.1348	112	12.6541	152	17.1734	192	21.6927	3.2	28.3236	7.2	63.7281	11.2	99.1326	15.2	134.5371	21	185.8736	
34	3.8414	74	8.3607	114	12.8801	154	17.3994	194	21.9187	3.4	30.0938	7.4	65.4983	11.4	100.9028	15.4	136.3073	22	194.7247	
36	4.0674	76	8.5867	116	13.1060	156	17.6253	196	22.1447	3.6	31.8640	7.6	67.2685	11.6	102.6730	15.6	138.0775	23	203.5759	
38	4.2934	78	8.8127	118	13.3320	158	17.8513	198	22.3706	3.8	33.6342	7.8	69.0388	11.8	104.4433	15.8	139.8478	24	212.4270	
40	4.5193	80	9.0386	120	13.5580	160	18.0773	200	22.5966	4	35.4045	8	70.8090	12	106.2135	16	141.6180	25	221.2781	

ft-lbs to N•m

N•m to ft-lbs

ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m
1	1.3558	21	28.4722	41	55.5885	61	82.7049	81	109.8212	1	.7376	21	15.9888	41	30.2400	61	44.9913	81	59.7425	
2	2.7116	22	29.8280	42	56.9444	62	84.0607	82	111.1770	2	1.4751	22	16.2264	42	30.9776	62	45.7289	82	60.4801	
3	4.0675	23	31.1838	43	58.3002	63	85.4165	83	112.5328	3	2.2127	23	16.9639	43	31.7152	63	46.4664	83	61.2177	
4	5.4233	24	32.5396	44	59.6560	64	86.7723	84	113.8888	4	2.9502	24	17.7015	44	32.4527	64	47.2040	84	61.9552	
5	6.7791	25	33.8954	45	61.0118	65	88.1281	85	115.2446	5	3.6878	25	18.4391	45	33.1903	65	47.9415	85	62.6928	
6	8.1349	26	35.2513	46	62.3676	66	89.4840	86	116.6004	6	4.4254	26	19.1766	46	33.9279	66	48.6791	86	63.4303	
7	9.4907	27	36.6071	47	63.7234	67	90.8398	87	117.9562	7	5.1629	27	19.9142	47	34.6654	67	49.4167	87	64.1679	
8	10.8465	28	37.9629	48	65.0793	68	92.1956	88	119.3120	8	5.9005	28	20.6517	48	35.4030	68	50.1542	88	64.9545	
9	12.2024	29	39.3187	49	66.4351	69	93.5514	89	120.6678	9	6.6381	29	21.3893	49	36.1405	69	50.8918	89	65.6430	
10	13.5582	30	40.6745	50	67.7909	70	94.9073	90	122.0236	10	7.3756	30	22.1269	50	36.8781	70	51.6293	90	66.3806	
11	14.9140	31	42.0304	51	69.1467	71	96.2631	91	123.3794	11	8.1132	31	22.8644	51	37.6157	71	52.3669	91	67.1181	
12	16.2698	32	43.3862	52	70.5025	72	97.6189	92	124.7352	12	8.8507	32	23.6020	52	38.3532	72	53.1045	92	67.8557	
13	17.6256	33	44.7420	53	71.8583	73	98.9747	93	126.0910	13	9.5883	33	24.3395	53	39.0908	73	53.8420	93	68.5933	
14	18.9815	34	46.0978	54	73.2142	74	100.3316	94	127.4468	14	10.3259	34	25.0771	54	39.8284	74	54.5720	94	69.3308	
15	20.3373	35	47.4536	55	74.5700	75	101.6862	95	128.8026	15	11.0634	35	25.8147	55	40.5659	75	55.3172	95	70.0684	
16	21.6931	36	48.8094	56	75.9258	76	103.0422	96	130.1586	16	11.8010	36	26.5522	56	41.3035	76	56.0547	96	70.8060	
17	23.0489	37	50.1653	57	77.2816	77	104.3980	97	131.5144	17	12.5386	37	27.2898	57	42.0410	77	56.7923	97	71.5435	
18	24.4047	38	51.5211	58	78.6374	78	105.7538	98	132.8702	18	13.2761	38	28.0274	58	42.7786	78	57.5298	98	72.2811	
19	25.7605	39	52.8769	59	79.9933	79	107.1096	99	134.2260	19	14.0137	39	28.7649	59	43.5162	79	58.2674	99	73.0187	
20	27.1164	40	54.2327	60	81.3491	80	108.4654	100	135.5820	20	14.7512	40	29.5025	60	44.2537	80	59.0050	100	73.7562	

in. to mm

mm to in.

in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
.01	.254	.21	5.334	.41	10.414	.61	15.494	.81	20.574	.01	.00039	.21	.00827	.41	.01614	.61	.02402	.81	.03189		
.02	.508	.22	5.588	.42	10.668	.62	15.748	.82	20.828	.02	.00079	.22	.00866	.42	.01654	.62	.02441	.82	.03228		
.03	.762	.23	5.842	.43	10.922	.63	16.002	.83	21.082	.03	.00118	.23	.00906	.43	.01693	.63	.02480	.83	.03268		
.04	1.016	.24	6.096	.44	11.176	.64	16.256	.84	21.336	.04	.00157	.24	.00945	.44	.01732	.64	.02520	.84	.03307		
.05	1.270	.25	6.350	.45	11.430	.65	16.510	.85	21.590	.05	.00197	.25	.00984	.45	.01772	.65	.02559	.85	.03346		
.06	1.524	.26	6.604	.46	11.684	.66	16.764	.86	21.844	.06	.00236	.26	.01024	.46	.01811	.66	.02598	.86	.03386		
.07	1.778	.27	6.858	.47	11.938	.67	17.018	.87	22.098	.07	.00276	.27	.01063	.47	.01850	.67	.02638	.87	.03425		
.08	2.032	.28	7.112	.48	12.192	.68	17.272	.88	22.352	.08	.00315	.28	.01102	.48	.01890	.68	.02677	.88	.03465		
.09	2.286	.29	7.366	.49	12.446	.69	17.526	.89	22.606	.09	.00354	.29	.01142	.49	.01929	.69	.02717	.89	.03504		
.10	2.540	.30	7.620	.50	12.700	.70	17.780	.90	22.860	.10	.00394	.30	.01181	.50	.01969	.70	.02756	.90	.03543		
.11	2.794	.31	7.874	.51	12.954	.71	18.034	.91	23.114	.11	.00433	.31	.01220	.51	.02008	.71	.02795	.91	.03583		
.12	3.048	.32	8.128	.52	13.208	.72	18.288	.92	23.368	.12	.00472	.32	.01260	.52	.02047	.72	.02835	.92	.03622		
.13	3.302	.33	8.382	.53	13.462	.73	18.542	.93	23.622	.13	.00512	.33	.01299	.53	.02087	.73	.02874	.93	.03661		
.14	3.556	.34	8.636	.54	13.716	.74	18.796	.94	23.876	.14	.00551	.34	.01339	.54	.02126	.74	.02913	.94	.03701		
.15	3.810	.35	8.890	.55	13.970	.75	19.050	.95	24.130	.15	.00591	.35	.01378	.55	.02165	.75	.02953	.95	.03740		
.16	4.064	.36	9.144	.56	14.224	.76	19.304	.96	24.384	.16	.00630	.36	.01417	.56	.02205	.76	.02992	.96	.03780		
.17	4.318	.37	9.398	.57	14.478	.77	19.558	.97	24.638	.17	.00669	.37	.01457	.57	.02244	.77	.03032	.97	.03819		
.18	4.572	.38	9.652	.58	14.732	.78	19.812	.98	24.892	.18	.00709	.38	.01496	.58	.02283	.78	.03071	.98	.03858		
.19	4.826	.39	9.906	.59	14.986	.79	20.066	.99	25.146	.19	.00748	.39	.01535	.59	.02323	.79	.03110	.99	.03898		
.20	5.080	.40	10.160	.60	15.240	.80	20.320	1.00													

## WHEEL ALIGNMENT

## GENERAL INFORMATION

Four wheel alignment involves the correct positioning of the wheels in relation to the vehicle. The positioning is accomplished through suspension and steering linkage adjustments. An alignment is considered essential for efficient steering, good directional stability and to minimize tire wear. The most important measurements of an alignment are caster, camber toe and thrust angle.

**Routine inspection of the front suspension and steering components is a good preventative maintenance practice. Inspection also helps to ensure safe operation of the vehicle.**

- **CASTER** is the forward or rearward tilt of the steering knuckle from vertical. Tilting the top of the knuckle forward provides negative caster. Tilting the top of the knuckle rearward provides positive caster. Positive caster promotes directional stability. This angle enables the front wheels to return to a straight ahead position after turns (Fig. 1).

- **CAMBER** is the inward or outward tilt of the wheel relative to the center of the vehicle. Tilting the top of the wheel inward provides negative camber. Tilting the top of the wheel outward provides positive

camber. Incorrect camber will cause wear on the inside or outside edge of the tire (Fig. 1).

- **TOE** is the difference between the leading inside edges and trailing inside edges of the front tires (Fig. 1). Uneven wheel toe position cause's unstable steering, uneven tire wear and steering wheel off-center. The wheel toe position is the **final** front wheel alignment adjustment.

- **THRUST ANGLE** is the angle of the rear axle relative to the vehicle center line. If this angle is off the vehicle may drift or wander.

- **STEERING AXIS INCLINATION ANGLE** is measured in degrees. It is the angle that the steering knuckles are tilted (Fig. 1). The inclination angle has a fixed relationship with the camber angle. It will not change except when a spindle or ball stud is damaged or bent. The angle is not adjustable and the damaged component(s) must be replaced to correct mis-alignment.

**CAUTION: Do not attempt to modify any suspension or steering component by heating and bending.**

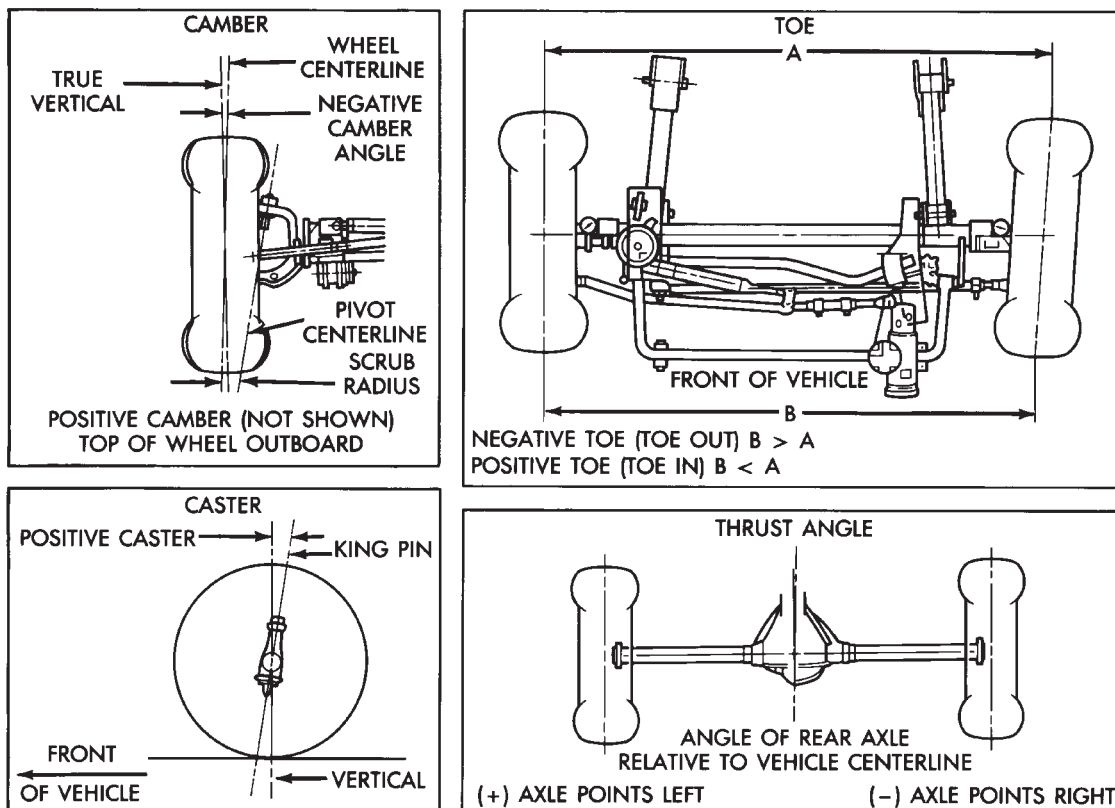


Fig. 1 Wheel Alignment Angles

**INSTALLATION**

(1) Thoroughly clean the axle shaft and apply a thin film of Mopar Wheel Bearing Grease to the shaft splines, seal contact surface, hub bore.

(2) On 4WD vehicles, install the axle shaft into the housing and differential side gears. Avoid damaging the axle shaft oil seals in the differential.

(3) Install the hub bearing and brake dust shield to the knuckle.

(4) Install the hub to knuckle bolts and tighten to 102 N·m (75 ft. lbs.) torque.

(5) Install the hub washer and nut. Tighten the hub nut to 237 N·m (175 ft. lbs.) torque. Install the nut retainer and a new cotter pin (Fig. 7).

(6) Install the brake components, refer to Group 5, Brakes.

(7) Install the wheel and tire assembly.

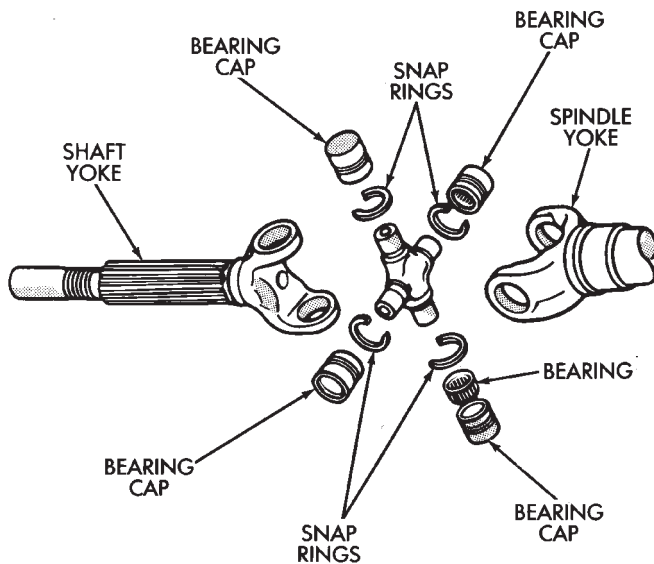
(8) Lower the vehicle.

**AXLE SHAFT— CARDAN U-JOINT****DISASSEMBLY**

Single cardan U-joints are not serviceable. If defective, they must be replaced as a unit. If the bearings, seals, spider or bearing caps are damaged or worn, replace the complete U-joint.

**CAUTION:** Clamp only the forged portion of the yoke in the vise. Also, to avoid distorting the yoke, do not over tighten the vise jaws.

(1) Remove the bearing cap retaining snap rings (Fig. 8).

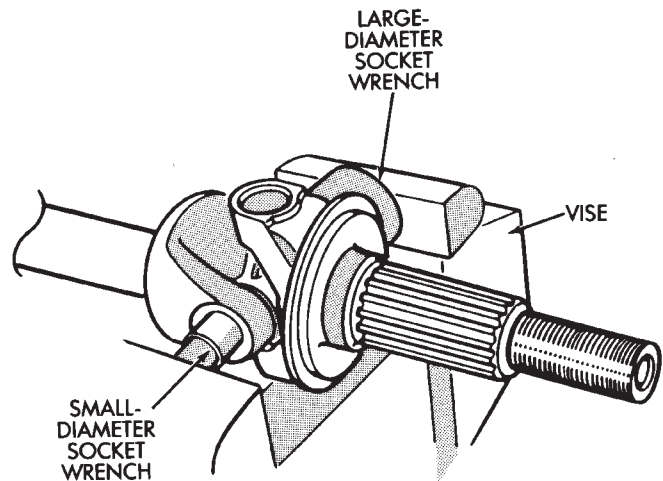


J8902-15

**Fig. 8 Axle Shaft Outer U-Joint**

**It can be helpful to saturate the bearing caps with penetrating oil prior to removal.**

(2) Locate a socket that is larger in diameter than the bearing cap. Place the socket (receiver) against the yoke and around the perimeter of the bearing cap to be removed. Locate a socket that is smaller in diameter than the bearing cap. Place the socket (driver) against the opposite bearing cap. Position the yoke with the sockets in a vise (Fig. 9).



J8902-16

**Fig. 9 Yoke Bearing Cap Removal**

(3) Compress the vise jaws to force the bearing cap into the larger socket (receiver).

(4) Release the vise jaws. Remove the sockets and bearing cap that was partially forced out of the yoke.

(5) Repeat the above procedure for the remaining bearing cap.

(6) Remove the remaining bearing cap, bearings, seals and spider from the propeller shaft yoke.

**CLEANING AND INSPECTION**

(1) Clean all the U-joint yoke bores with cleaning solvent and a wire brush. Ensure that all the rust and foreign matter are removed from the bores.

(2) Inspect the yokes for distortion, cracks and worn bearing cap bores.

(3) Replace the complete U-joint if any of the components are defective.

**ASSEMBLY**

(1) Pack the bearing caps 1/3 full of wheel bearing lubricant. Apply extreme pressure (EP), lithium-base lubricant to aid in installation.

(2) Position the spider in the yoke. Insert the seals and bearings. Tap the bearing caps into the yoke bores far enough to hold the spider in position.

(3) Place the socket (driver) against one bearing cap. Position the yoke with the socket wrench in a vise.

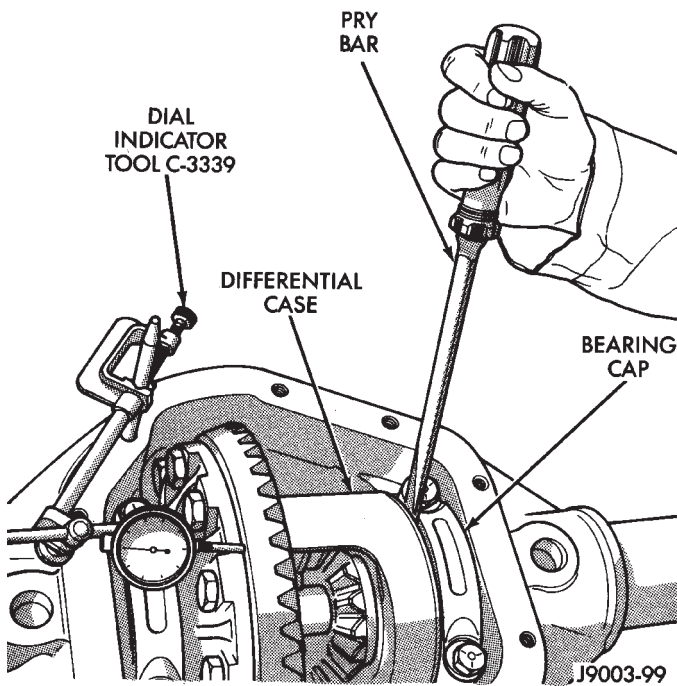


Fig. 59 Shim Pack Measurement

shim thickness (Fig. 60). The shims must be placed at the ring gear side between the case and bearing.

For Example:

Indicator Reading	LESS PINION	0.085 in.	total
Indicator Reading	WITH PINION	0.055 in.	total
-----			
BALANCE OF SHIM PACK		0.030 in.	total
Place BALANCE of shims at opposite side of ring gear			
ADD an additional 0.015 in. shim to opposite side of ring gear for bearing preload			
Ring Gear Side (Flange Side)		0.055 in.	←
Opposite Side		0.030 in.	←
Opposite Side Preload		0.015 in.	
Total Opposite Side		0.045 in.	J9302-65

Fig. 60 Shim Pack Calculations

- (6) Remove indicator and pilot stud.
- (7) Remove the differential case from housing.
- (8) Remove the master bearing tools from the differential case hubs.
- (9) Position the backlash shims (with determined thickness) on case hub (ring gear side). Install bear-

ing on the hub with Bearing Installer C-3716A and Driver Handle C-4171 (Fig. 61).

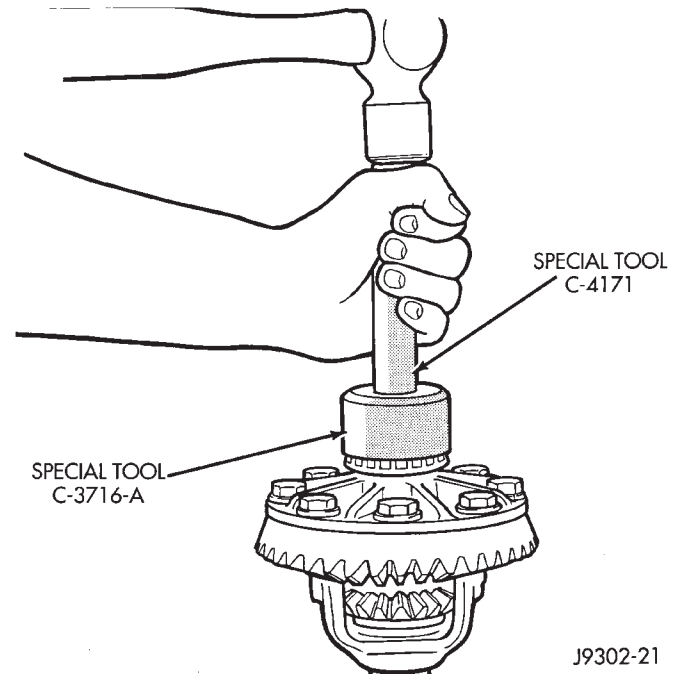


Fig. 61 Differential Bearing Installation

(10) Position the remaining zero end-play shims on hub at opposite side of case. Include an additional 0.015 in. (0.38 mm) thick shim on this hub. This will provide the required differential bearing preload.

(11) Install bearings on hubs with Installer C-3716A and Handle C-4171 (Fig. 61).

(12) Match each bearing cup with bearing (original). Install the cups on the bearings.

**DIFFERENTIAL INSTALLATION**

(1) Position Spreader W-129B with the tool dowel pins seated in the locating holes (Fig. 62). Install the holddown clamps and tighten the tool turnbuckle finger-tight.

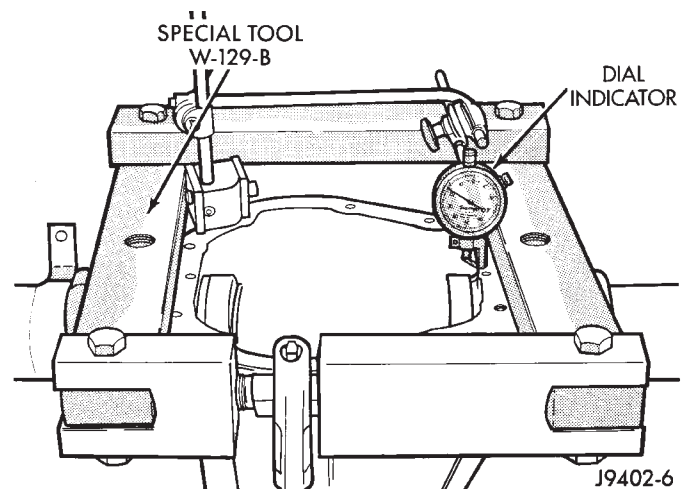
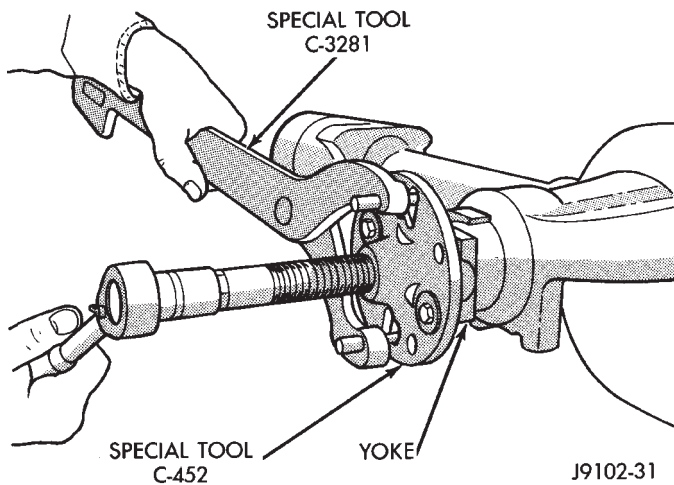
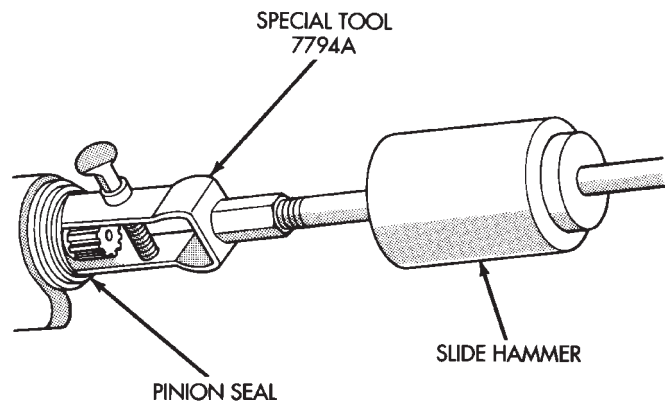


Fig. 62 Spread Differential Housing



**Fig. 2 Pinion Yoke Removal**

(9) Use Remover 7794A and slide hammer to remove the pinion gear seal (Fig. 3).



**Fig. 3 Seal Removal**

#### INSTALLATION

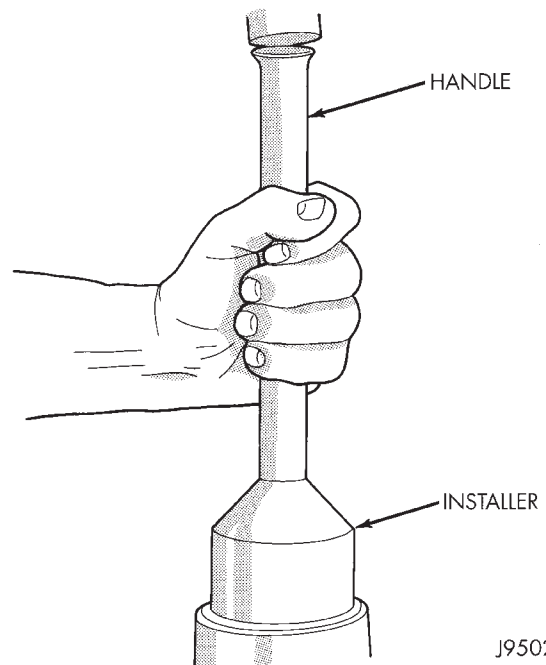
(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer D-163 and Handle C-4171 (Fig. 4).

(2) Align the installation reference marks and install yoke on the pinion gear with Installer W-162D.

(3) Install a new nut on the pinion gear. **Tighten the nut only enough to remove the shaft end play.**

**CAUTION:** Exercise care during bearing preload torque adjustment. Do not overtighten, or loosen and then re-tighten the nut. Do not exceed the bearing preload torque. The collapsible preload spacer on the pinion shaft will have to be replaced. The bearing preload torque will be re-adjusted afterward.

(4) Install a socket and inch pound torque wrench on the pinion nut.

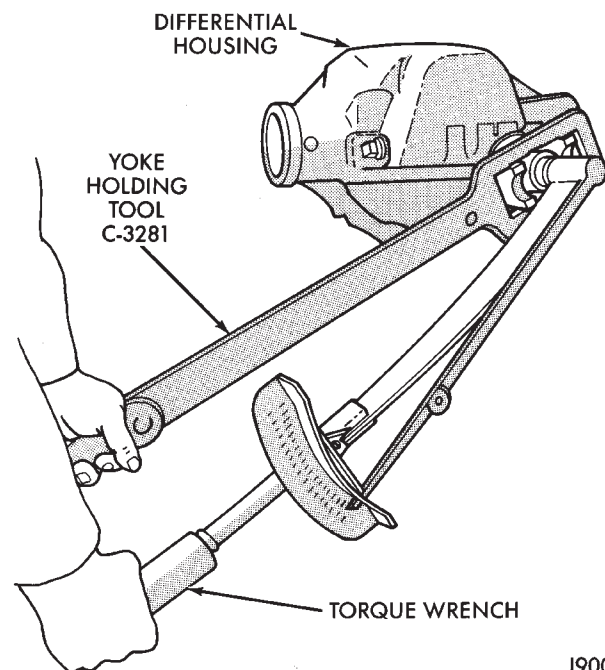


**Fig. 4 Pinion Seal Installation**

(5) Rotate the shaft with the torque wrench and note the torque.

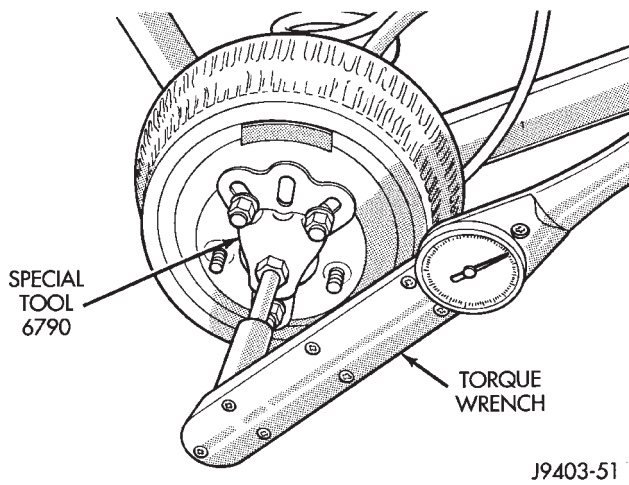
**The required preload is equal to the amount at removal plus 0.56 N·m (5 in. lbs.).**

(6) Use Flange Wrench C-3281 to retain the yoke and shaft (Fig. 5). Tighten the shaft nut in very small increments.



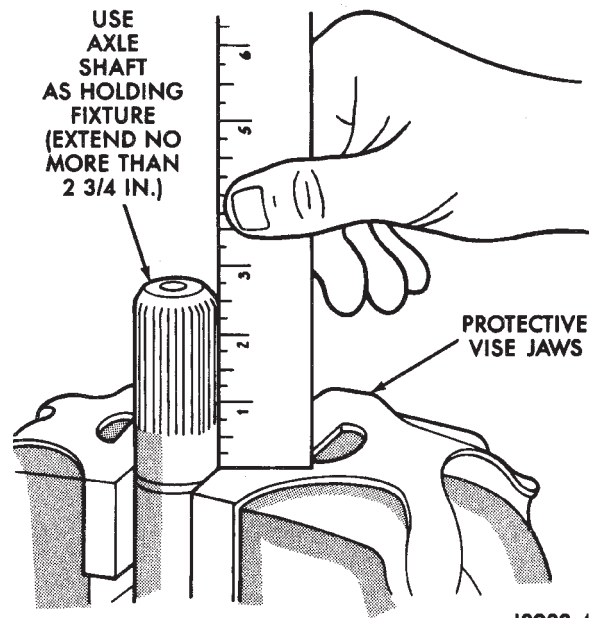
**Fig. 5 Tightening Pinion Shaft Nut**

(7) Continue tightening the shaft nut in small increments until the correct bearing preload torque is attained.



J9403-51

**Fig. 2 Trac-Loc Test**



J8903-42

**Fig. 4 Axle Shaft As Holding Fixture**

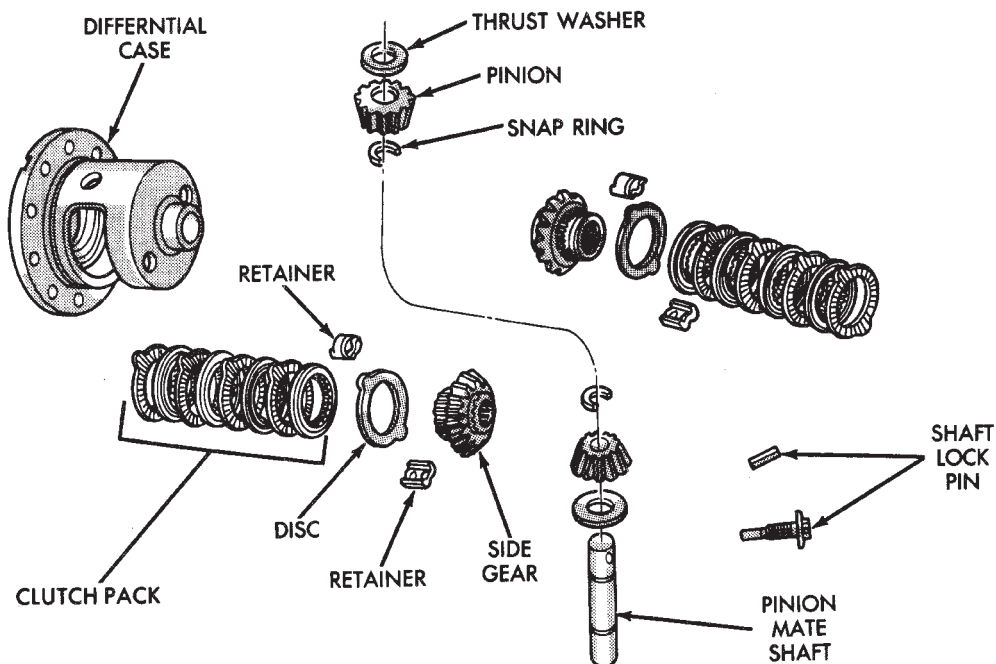
**DIFFERENTIAL OVERHAUL**

The **Trac-Lok** (limited-slip) differential components are illustrated in (Fig. 3). Refer to this illustration during repair service.

**DISASSEMBLY**

Service to the Trac-Lok differential requires the use of Tool Set C-4487 (J-23781). Refer to Model 35 Axle section in this Group for Differential Removal and Installation.

(1) Clamp one axle shaft in a vise equipped with soft jaws (Fig. 4).



J9203-13

**Fig. 3 Trac-Lok Differential Components**

tilock ECU at all times. The switch reference signal is utilized by the ECU when all wheels are decelerating at the same rate.

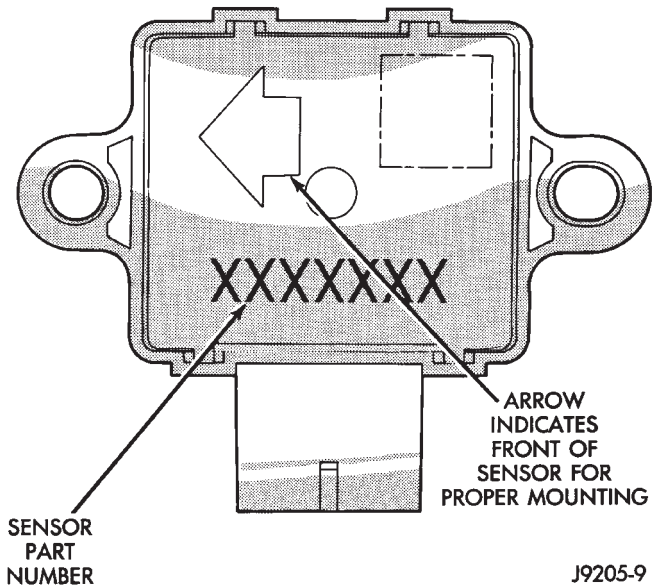


Fig. 5 Acceleration Switch

### SYSTEM RELAYS

The ABS system has two relays, which are the main and motor pump relays. The motor pump relay is used for the motor pump only. The main relay is used for the solenoid valves. The main relay is connected to the ECU at the power control relay terminal. The pump motor relay starts/stops the pump motor when signaled by the ECU.

### IGNITION SWITCH

The antilock ECU and warning light are in standby mode with the ignition switch in Off or Accessory position. No operating voltage is supplied to the system components.

A 12 volt power feed is supplied to the ECU and warning light when the ignition switch is in the Run position.

### SYSTEM WARNING LIGHT

The amber ABS warning light is in circuit with the ECU and operates independently of the red brake warning light.

The ABS light indicates antilock system condition. The light illuminates for 1-2 seconds at start-up as part of a bulb check routine. The light goes out when the self test program determines system operation is normal.

### COMBINATION VALVE

A combination valve is used with the ABS system. The valve contains a front/rear brake pressure differential valve and switch and a rear brake proportioning valve.

### ABS SYSTEM POWER-UP AND INITIALIZATION

battery voltage is supplied to the ECU ignition terminal when the ignition switch is turned to Run position. The ECU performs a system initialization procedure at this point. Initialization consists of a static and dynamic self check of system electrical components.

The static check occurs immediately after the ignition switch is turned in Run position. The dynamic check occurs when vehicle road speed reaches approximately 10 kph (6 mph). During the dynamic check, the ECU briefly cycles the pump to verify operation and the HCU solenoids are checked.

If an ABS component exhibits a fault during initialization, the ECU illuminates the amber warning light and registers a fault code in the microprocessor memory.

### ABS OPERATION IN NORMAL BRAKING MODE

The ECU monitors wheel speed sensor inputs continuously while the vehicle is in motion. However, the ECU will not activate any ABS components as long as sensor inputs and the acceleration switch indicate normal braking.

During normal braking, the master cylinder, power booster and wheel brake units all function as they would in a vehicle without ABS. The HCU pump and solenoids are not activated.

### ABS OPERATION IN ANTILOCK BRAKING MODE

The purpose of the antilock system is to prevent wheel lockup during periods of high wheel slip. Preventing lockup helps maintain vehicle braking action and steering control.

The antilock ECU activates the system whenever sensor signals indicate periods of high wheel slip. High wheel slip can be described as the point where wheel rotation begins approaching zero (or lockup) during braking. Periods of high wheel slip may occur when brake stops involve high rates of vehicle deceleration.

The antilock system prevents lockup during high slip conditions by modulating fluid apply pressure to the wheel brake units.

Brake fluid apply pressure is modulated according to wheel speed, degree of slip and rate of deceleration. A sensor at each wheel converts wheel speed into electrical signals. These signals are transmitted to the ECU for processing and determination of wheel slip and deceleration rate.

The ABS system has three fluid pressure control channels. The front brakes are controlled separately and the rear brakes in tandem (Fig. 1). A speed sensor input signal indicating high slip conditions activates the ECU antilock program.

Two solenoid valves are used in each antilock control channel. The valves are all located within the

(2) Wipe booster mounting surface of dash panel clean with shop towel.

(3) Align and position booster on engine compartment side of dash panel.

(4) Inside passenger compartment:

(a) Lubricate pedal pin and bushing with Mopar multi-mileage grease.

(b) Install booster attaching nuts on studs. Tighten attaching nuts to 41 N·m (30 ft. lbs.) torque.

(c) Slide booster push rod on pedal pin. Then secure rod to pin with retainer clip.

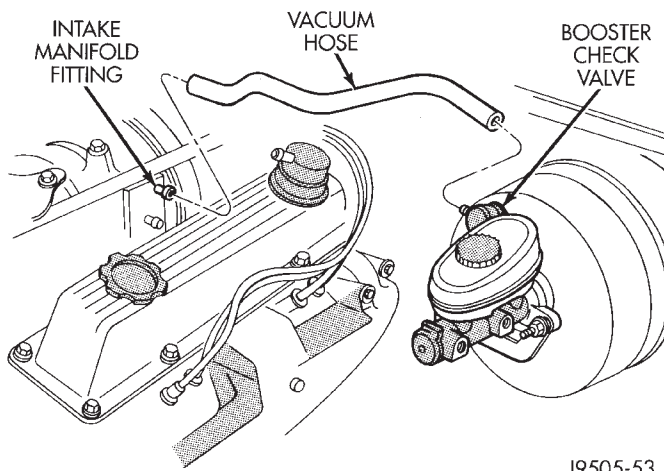
(5) In engine compartment, attach vacuum hose to booster check valve (Figs. 36 and 37).

(6) Install master cylinder, combination valve, and HCU. Refer to procedures in this section.

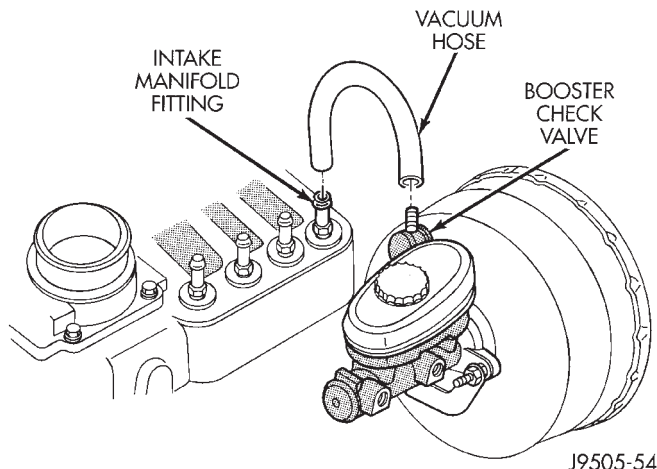
(7) Bleed brakes. Refer to section covering brake bleeding.

(8) Install engine air cleaner and hoses.

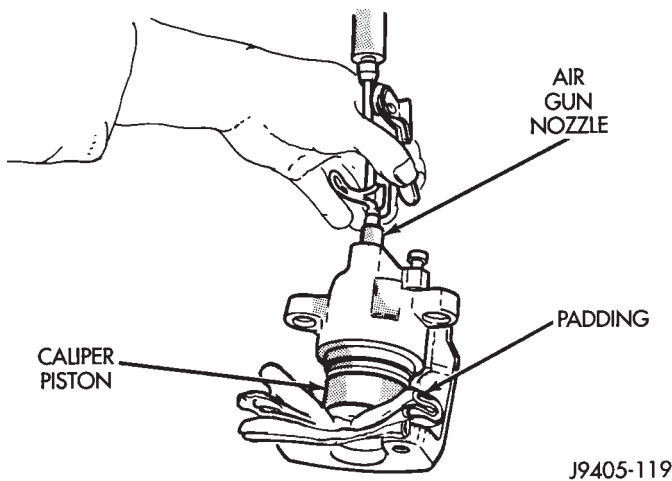
(9) Install windshield washer reservoir.



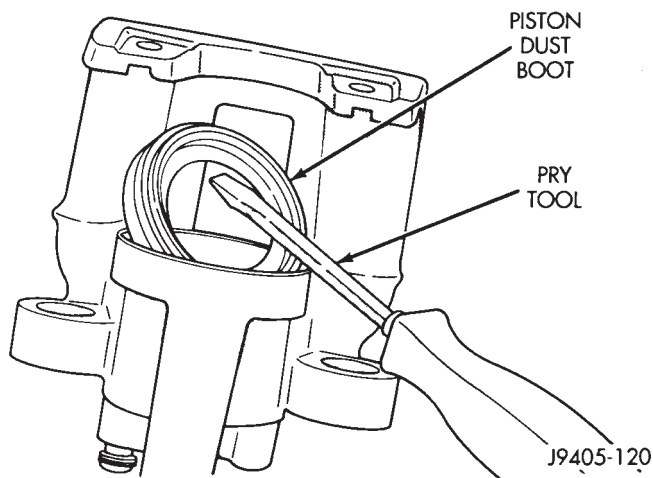
**Fig. 36 Vacuum Hose Connection (5.2L)**



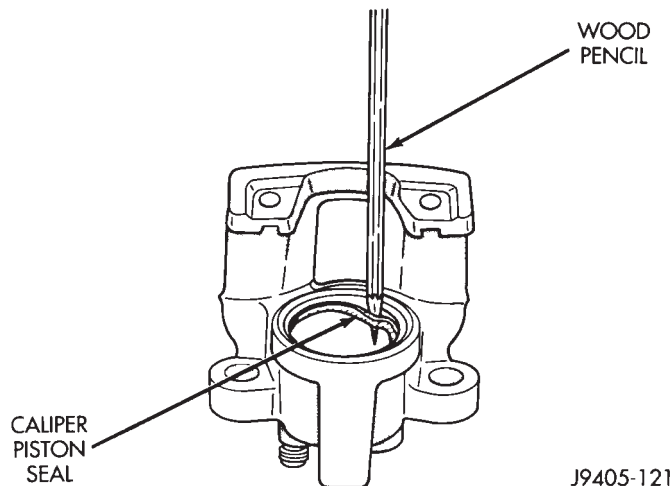
**Fig. 37 Vacuum Hose Connection (4.0L)**



**Fig. 13 Caliper Piston Removal**



**Fig. 14 Removing Caliper Piston Dust Boot**



**Fig. 15 Removing Caliper Piston Seal**

oline, kerosene, thinner, or similar fluids. These products may leave a residue that could damage the piston and seal.

Wipe the caliper and piston dry with lint free towels or use low pressure compressed air.

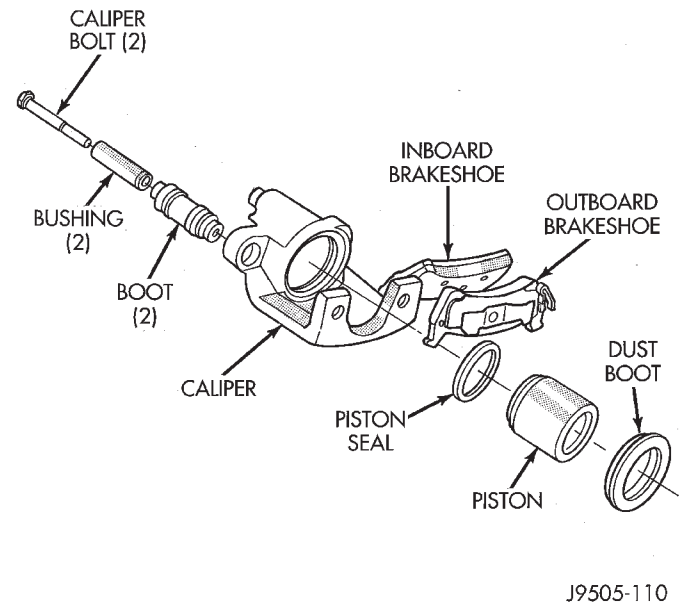
Inspect the piston and piston bore. Replace the cal-

iper if the bore is corroded, rusted, or scored. Do not hone the caliper piston bore. Replace the caliper if the bore is damaged.

Inspect the caliper piston (Fig. 16). The piston is made from a phenolic resin and should be smooth and clean. Although surface discoloration is normal, replace the piston if cracked, chipped, or scored. Do not attempt to restore a scored piston surface by sanding or polishing.

**CAUTION:** Never interchange phenolic resin and steel caliper pistons. The seals, seal grooves, caliper bores and piston tolerances are different for resin and steel pistons. Do not intermix these components.

Inspect the caliper bushings and boots (Fig. 16). Replace the boots if cut or torn. Clean and lubricate the bushings with GE 661 or Dow 111 silicone grease if necessary. Replace the bolts if worn, or the threads are damaged.



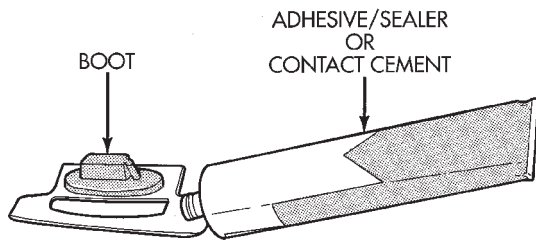
**Fig. 16 Rear Caliper Components**

### REAR CALIPER ASSEMBLY

(1) Lubricate caliper piston bore and new piston seal with clean brake fluid.

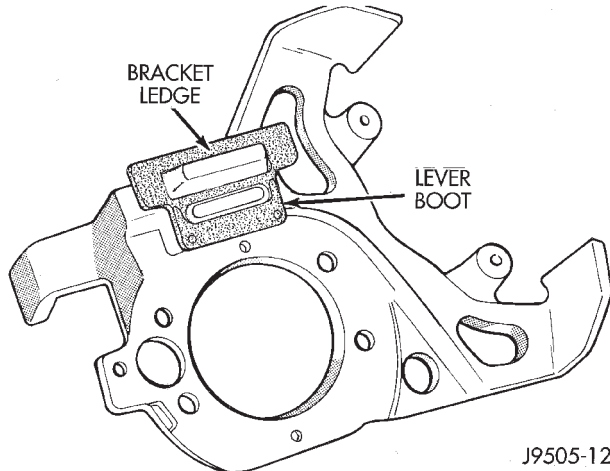
(2) Install new piston seal in groove machined in piston bore. Be sure seal is fully seated and is not twisted. Press seal into place with fingertips.

(3) Lubricate caliper piston with clean brake fluid and start piston into bore and seal by hand. Use a twisting, rocking motion to start piston into seal. **Keep piston level while starting it in seal otherwise seal can be folded over.**



J9505-124

**Fig. 24 Applying Adhesive To Parking Brake Lever Boot**



J9505-128

**Fig. 25 Lever Boot Installation**

**CAUTION:** Be sure the parking brake lever boot is not displaced when the shield/assembly is installed. If the boot becomes mispositioned, it will prevent the shield from seating squarely on the bracket. This will cock the shield causing it to rub against the rotor after installation. Inspect the boot and reposition it if necessary.

(16) Apply Mopar Lock N' Seal (or Loctite 242), to axle tube stud nuts. Then install and tighten nuts to 43-61 N·m (32-45 ft. lbs.) torque.

(17) Assemble and install cam and lever. Push lever through boot and seat cam between lip on shield and ledge on bracket (Fig. 26). Then engage lever in cable eyelet. Be sure cable notch in lever is facing rearward. Remove and reposition cam and lever if necessary.

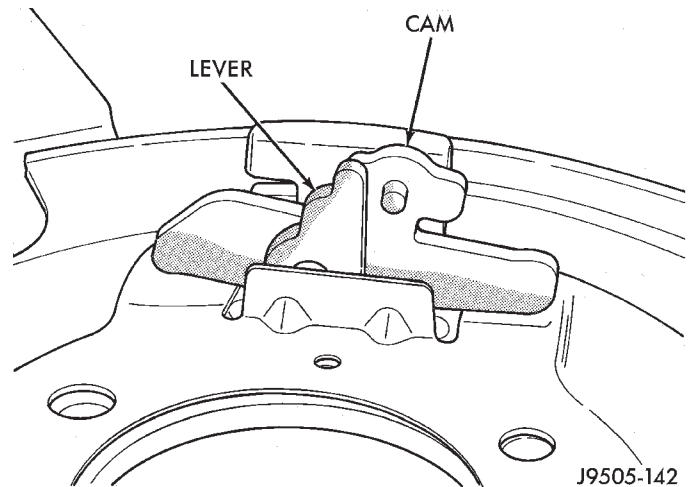
(18) Install parking brakeshoes on splash shield. Verify positioning of cam and lever, shoes, springs and holddown clips and pins (Fig. 27).

(19) Verify correct positioning of caliper bracket and shield (Fig. 28). Caliper opening and ledges should be to rear as shown.

(20) Install axle shaft, shaft retainer clips and housing cover. Check lube level and add lubricant if needed.

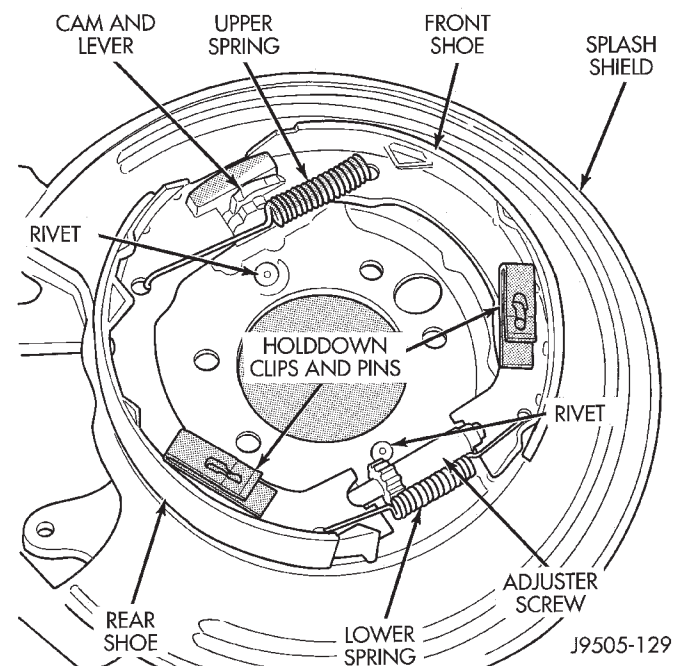
(21) Install rotor, caliper, and wheel and tire assembly. Then adjust parking brakeshoes.

(22) Lower vehicle and verify correct service and parking brake operation.



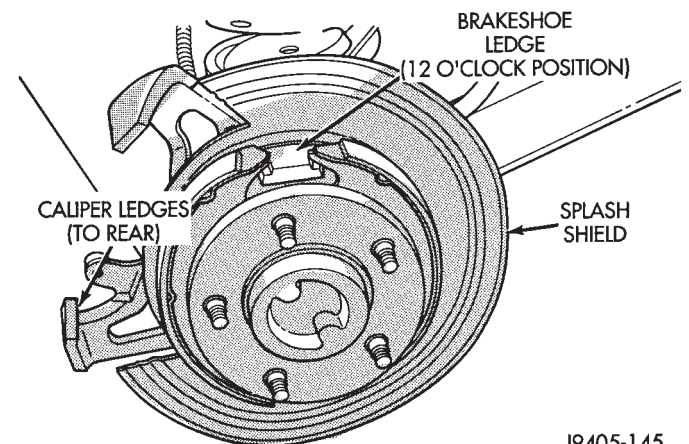
J9505-142

**Fig. 26 Cam And Lever Installation**



J9505-129

**Fig. 27 Parking Brakeshoes Mounted On Shield**



J9405-145

**Fig. 28 Checking Caliper Bracket And Shield Position**

- transmission bearing retainer slide surface
- release lever
- release lever pivot stud

(6) Install release lever and new release bearing. Be sure lever and bearing are properly secured.

(7) Install transmission and clutch housing as assembly.

### PILOT BEARING REPLACEMENT

(1) Remove transmission and clutch housing.

(2) Remove clutch cover and disc.

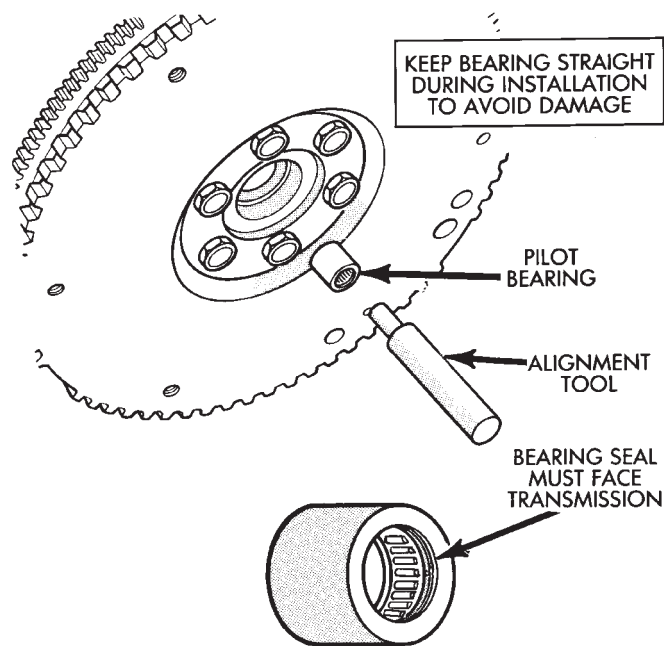
(3) Remove pilot bearing. Use blind hole puller tools such as those included in Snap-On set CG40CB to remove bearing.

(4) Clean bearing bore with solvent and wipe dry with shop towel.

(5) Lubricate new pilot bearing with Mopar high temperature grease.

(6) Position and start new bearing in bearing bore by hand. **Note that pilot bearing has seal at one end. Install bearing so seal is facing out and toward transmission.**

(7) Seat pilot bearing with clutch alignment tool (Fig. 6). **Keep bearing straight during installation. Do not allow bearing to become cocked. Tap bearing into place until flush with edge of bearing bore. Do not recess bearing.**



J9206-8

**Fig. 6 Pilot Bearing Installation**

(8) Install clutch cover and disc.

(9) Install clutch housing and transmission as assembly.

(10) Install transfer case, propeller shafts, wire harnesses, vacuum hoses, crossmembers, shift linkage and remaining components removed during service.

### CLUTCH HYDRAULIC LINKAGE REMOVAL

**The clutch master cylinder and pedal position switch, remote reservoir, slave cylinder, and connecting lines are only available as a complete assembly. The linkage components cannot be overhauled or serviced separately. The cylinders and connecting lines are sealed units.**

(1) Raise vehicle.

(2) Remove nuts attaching slave cylinder to clutch housing.

(3) Remove slave cylinder and clip from housing.

(4) Disengage hydraulic fluid line from body clips.

(5) Lower vehicle.

(6) Remove retaining ring, flat washer and wave washer that attach clutch master cylinder push rod to clutch pedal (Fig. 7).

(7) Disconnect clutch pedal position switch wires. Then slide clutch master cylinder piston rod off clutch pedal pin.

(8) Inspect condition of bushing on clutch pedal pin. Remove and replace bushing if worn or damaged.

(9) Verify that cap on clutch master cylinder reservoir is tight. This is necessary to avoid undue spillage during removal.

(10) Remove screws attaching clutch fluid reservoir to dash panel.

(11) Remove nuts attaching clutch master cylinder to stud nuts (Fig. 7).

(12) Remove both clutch cylinders, reservoir and connecting line from vehicle.

### CLUTCH HYDRAULIC LINKAGE INSTALLATION

(1) Tighten cap on clutch fluid reservoir to avoid spillage during installation.

(2) Position cylinders, connecting lines and reservoir in vehicle.

(3) Install clutch master cylinder on mounting studs extending through dash panel (Fig. 7). Tighten attaching nuts to 23-34 N·m (200-300 in. lbs.) torque.

(4) Position reservoir on dash panel and install reservoir screws. Tighten screws to 5 N·m (40 in. lbs.) torque.

(5) Install replacement bushing on clutch pedal pin if necessary.

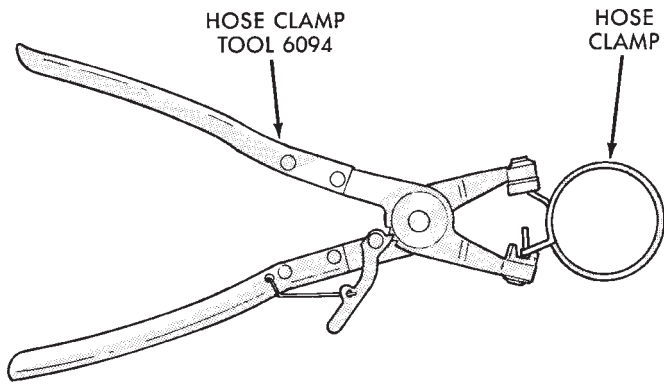
(6) Install clutch master cylinder push rod on clutch pedal pin. Secure rod with wave washer, flat washer and retainer ring.

(7) Connect clutch pedal position switch wires.

(8) Raise vehicle.

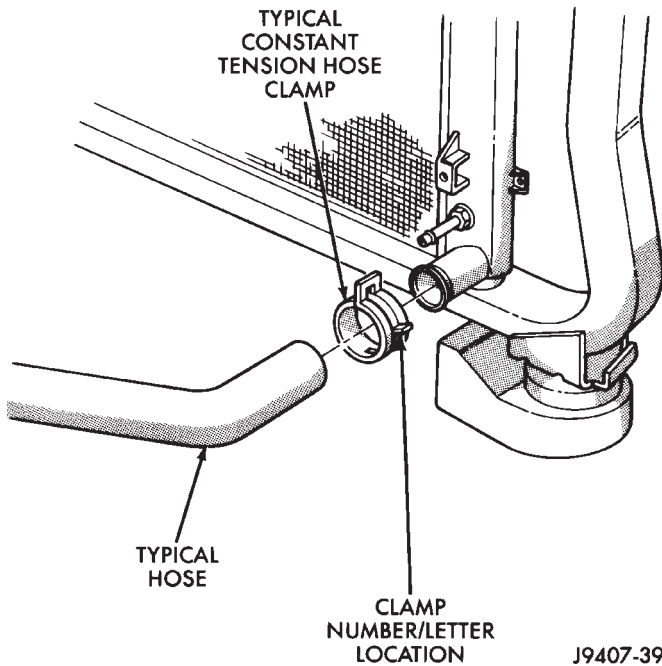
(9) Insert slave cylinder push rod through clutch housing opening and into release lever. Be sure cap on end of rod is securely engaged in lever. Check this before installing cylinder attaching nuts.

(10) Install and tighten slave cylinder attaching nuts to 23-34 N·m (200-300 in. lbs.) torque.



J9207-36

**Fig. 7 Hose Clamp Tool—Typical**



J9407-39

**Fig. 8 Clamp Number/Letter Location**

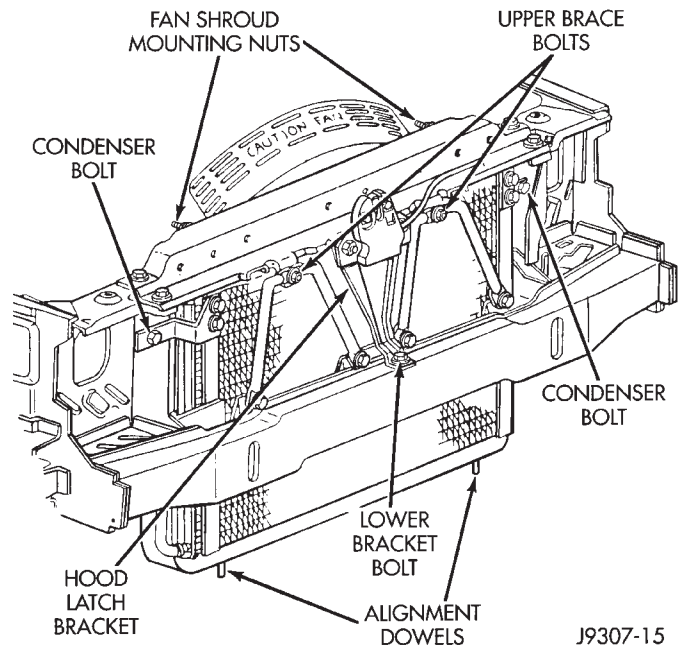
(16) Remove the four pump mounting bolts (Fig. 10) and remove pump from vehicle. Discard old gasket. Note that one of the four bolts is longer than the other bolts.

(17) If pump is to be replaced, the heater hose fitting must be removed. Note position of fitting before removal.

**INSTALLATION—4.0L 6-CYL. ENGINE**

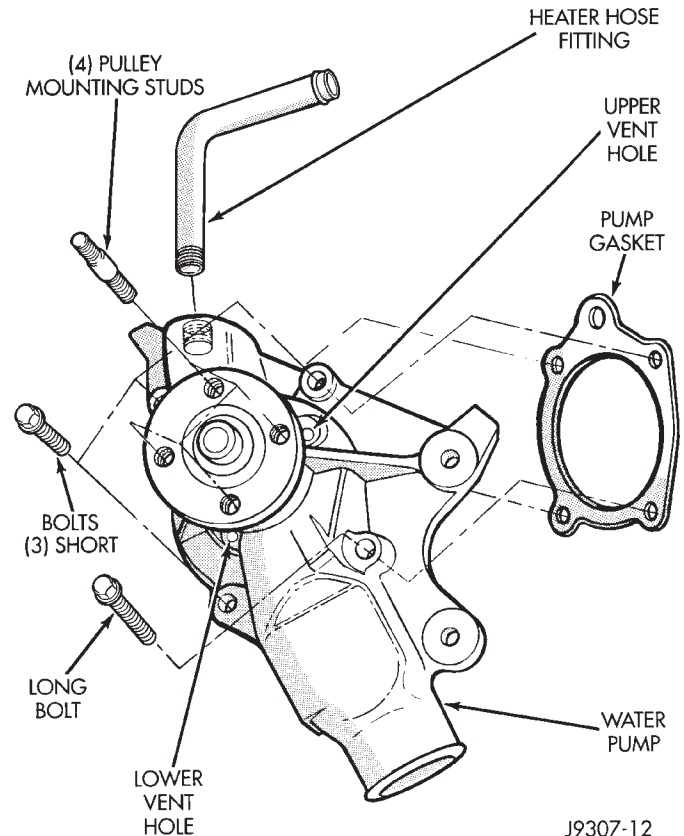
(1) If pump is being replaced, install the heater hose fitting to the pump. Use a sealant on the fitting such as Mopar™ Thread Sealant With Teflon. Refer to the directions on the package.

(2) Clean the gasket mating surfaces. If the original pump is used, remove any deposits or other for-



J9307-15

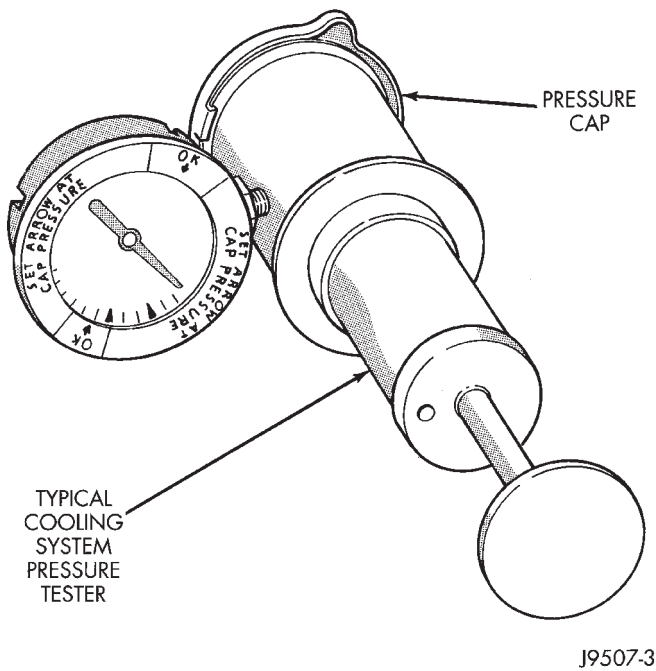
**Fig. 9 Fan Shroud Mounting**



J9307-12

**Fig. 10 Water Pump Remove/Install—4.0L 6-Cylinder Engine**

eign material. Inspect the cylinder block and water pump mating surfaces for erosion or damage from cavitation.



J9507-3

**Fig. 38 Pressure Testing Radiator Pressure Cap—Typical**

worn. Inspect the area around radiator filler neck for white deposits that indicate a leaking cap.

## RADIATOR

### GENERAL INFORMATION

All vehicles are equipped with a cross flow type radiator with plastic side tanks.

Plastic tanks, while stronger than brass, are subject to damage by impact, such as from tools or wrenches. Handle radiator with care.

### RADIATOR COOLANT FLOW CHECK

The following procedure will determine if coolant is flowing through the cooling system.

If engine is cold, idle engine until normal operating temperature is reached. Then feel the upper radiator hose. If hose is hot, the thermostat is open and water is circulating through cooling system.

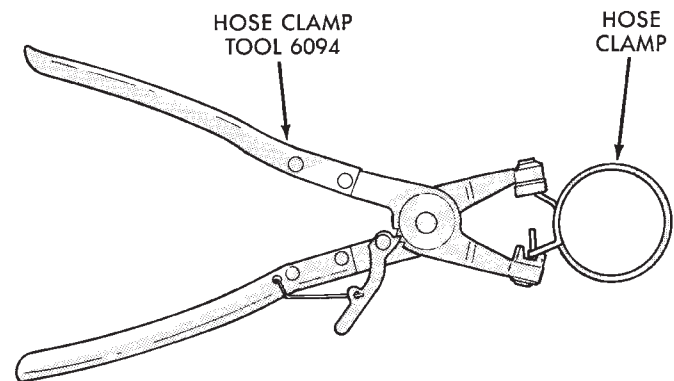
### RADIATOR REMOVAL

**WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR. REFER TO COOLING SYSTEM DRAINING IN THIS GROUP.**

Do not waste reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

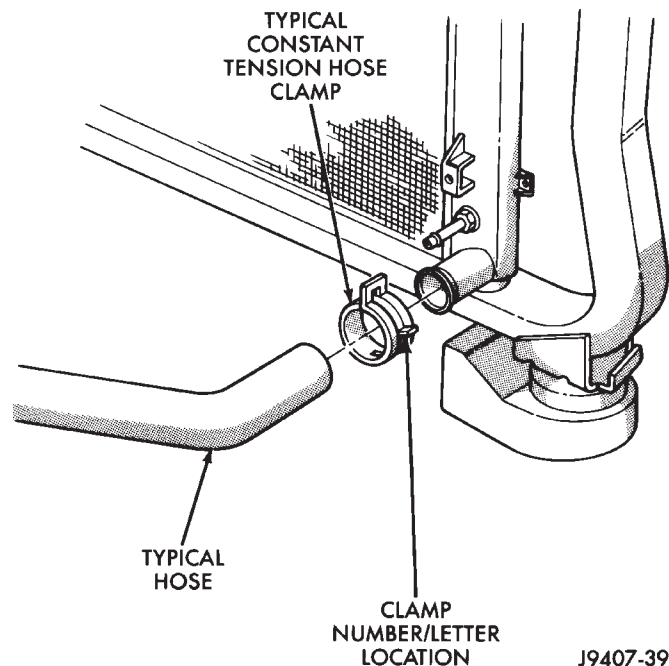
**WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (FIG. 39). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.**

**CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 40). If replacement is necessary, use only an original equipment clamp with matching number or letter.**



J9207-36

**Fig. 39 Hose Clamp Tool—Typical**



J9407-39

**Fig. 40 Clamp Number/Letter Location**

## INSTALLATION

**CAUTION:** When installing serpentine accessory drive belt, belt must be routed correctly. If not, engine may overheat due to water pump rotating in wrong direction. Refer to (Fig. 4) for correct 5.2L V-8 engine belt routing. Or, refer to the Belt Routing Label located in the vehicle engine compartment. The correct belt with correct length must be used.

(1) Position drive belt over all pulleys **except** idler pulley. This pulley is located between generator and A/C compressor.

(2) Attach a socket/wrench to pulley mounting bolt of automatic belt tensioner (Fig. 7).

(3) Rotate socket/wrench clockwise. Place belt over idler pulley. Let tensioner rotate back into place. Remove wrench. Be sure belt is properly seated on all pulleys.

(4) Check belt indexing marks. Refer to the preceding Automatic Belt Tensioner—5.2L Engine for more belt information.

## AUTOMATIC BELT TENSIONER—5.2L ENGINE

Drive belts on the 5.2L engine are equipped with a spring loaded automatic belt tensioner (Figs. 7 and 8). This belt tensioner will be used with all belt configurations. Such as with or without power steering or air conditioning.

The tensioner is equipped with an indexing arrow (Fig. 8) on back of tensioner and an indexing mark on tensioner housing. If a new belt is being installed, arrow must be within approximately 3 mm (1/8 in.) of indexing mark (Point B—figure 8). Belt is considered new if it has been used 15 minutes or less. If this specification cannot be met, check for:

- The wrong belt being installed (incorrect length/width)
- Worn bearings on an engine accessory (A/C compressor, power steering pump, water pump, idler pulley or generator)
- A pulley on an engine accessory being loose
- Misalignment of an engine accessory
- Belt incorrectly routed. Refer to (Fig. 4)

A used belt should be replaced if tensioner indexing arrow has moved beyond point A—figure 8.

## REMOVAL

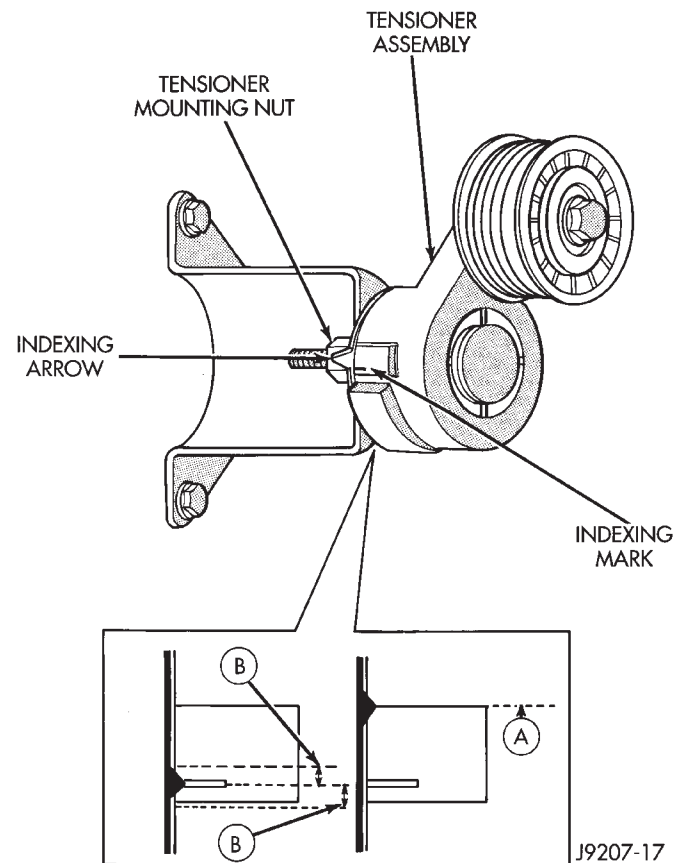
(1) Attach a socket/wrench to mounting bolt of automatic belt tensioner pulley bolt (Fig. 7).

(2) Rotate tensioner assembly clockwise (as viewed from front) until tension has been relieved from belt.

(3) Remove belt from idler pulley first.

(4) Remove belt from other pulleys.

(5) Disconnect wiring and secondary cable from ignition coil.



**Fig. 8 Belt Tensioner/Pulley Assembly—5.2L V-8 Engine**

(6) Remove ignition coil from coil mounting bracket (two bolts). Do not remove coil mounting bracket from cylinder head.

(7) Remove tensioner assembly from mounting bracket (one nut) (Fig. 8).

**WARNING: BECAUSE OF HIGH SPRING PRESSURE, DO NOT ATTEMPT TO DISASSEMBLE AUTOMATIC BELT TENSIONER. UNIT IS SERVICED AS AN ASSEMBLY (EXCEPT FOR PULLEY).**

(8) Remove pulley bolt. Remove pulley from tensioner.

## INSTALLATION

(1) Install pulley and pulley bolt to tensioner. Tighten bolt to 61 N·m (45 ft. lbs.) torque.

(2) Install tensioner assembly to mounting bracket. An indexing tab is located on back of tensioner. Align this tab to slot in mounting bracket. Tighten nut to 67 N·m (50 ft. lbs.) torque.

(3) Connect all wiring to ignition coil.

(4) Install coil to coil bracket. If nuts and bolts are used to secure coil to coil bracket, tighten to 11 N·m (100 in. lbs.) torque. If coil mounting bracket has been tapped for coil mounting bolts, tighten bolts to 5 N·m (50 in. lbs.) torque.

**WIRING INSPECTION**

Inspect wiring for damage. Inspect all connections at:

- starter solenoid
- park/neutral position switch (automatic transmission)
- clutch pedal position switch (manual transmission)
- ignition switch
- starter relay
- battery (including all ground connections).

Clean, tighten and repair all connections as required.

**SOLENOID, RELAY AND SWITCH INSPECTIONS**

Inspect the solenoid, relay and ignition switch to determine their condition. Also, if equipped with automatic transmission, inspect condition of the park/neutral position switch. If equipped with manual transmission, inspect condition of the clutch pedal position switch. Testing information can be found in the following pages.

## GENERATOR

## GENERAL INFORMATION

This section covers generator service procedures only. For generator or charging system diagnosis, refer to Group 8A - Battery/Starting/Charging Systems Diagnostics.

The generator is belt-driven by the engine. All engines use serpentine drive. The generator is serviced only as a complete assembly. If the generator fails for any reason, the entire assembly must be replaced.

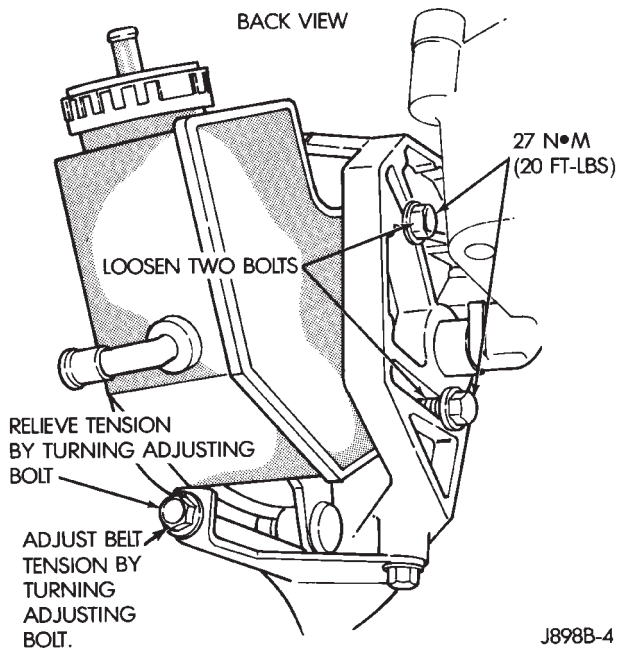
Be certain that the replacement generator has the same output rating as the original unit. Refer to Group 8A - Battery/Starting/Charging Systems Diagnostics and see Specifications.

The generator field control (voltage regulator) circuitry is internal to the Powertrain Control Module (PCM). If faulty, the entire PCM must be replaced. Refer to Group 14 - Fuel System for PCM service procedure.

## GENERATOR REMOVE/INSTALL - 4.0L

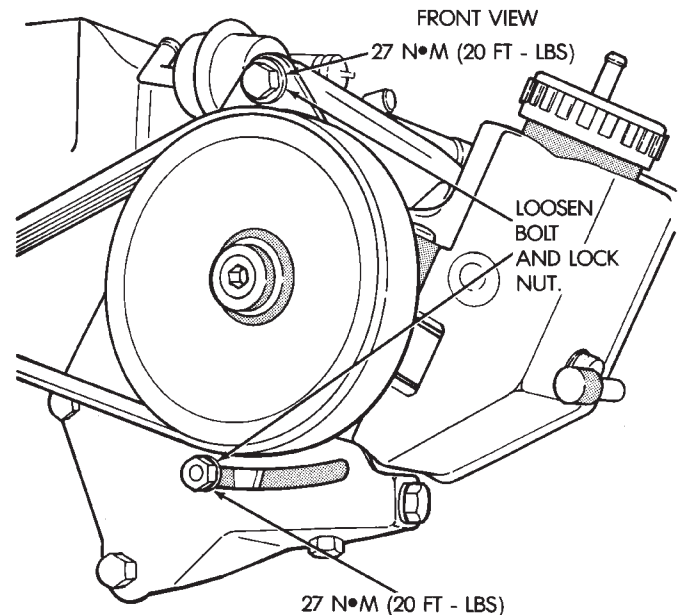
**WARNING: DISCONNECT NEGATIVE CABLE FROM BATTERY BEFORE REMOVING BATTERY OUTPUT WIRE FROM GENERATOR. FAILURE TO DO SO CAN RESULT IN INJURY.**

- (1) Disconnect battery negative cable.
- (2) Loosen rear mounting bolts (Fig. 14).



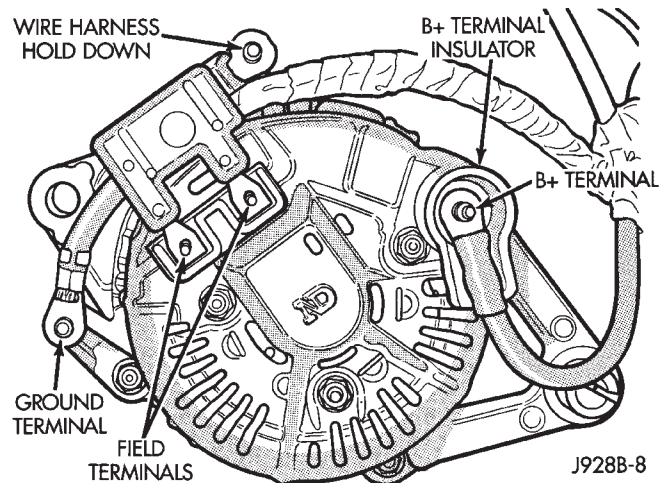
**Fig. 14 Power Steering Pump Rear Mounting Bolts**

- (3) Loosen power steering pump pivot bolt and lock nut (Fig. 15).
- (4) Loosen adjusting bolt to remove belt.
- (5) Raise and support vehicle.



**Fig. 15 Power Steering Pump Front Mounting Bolts**

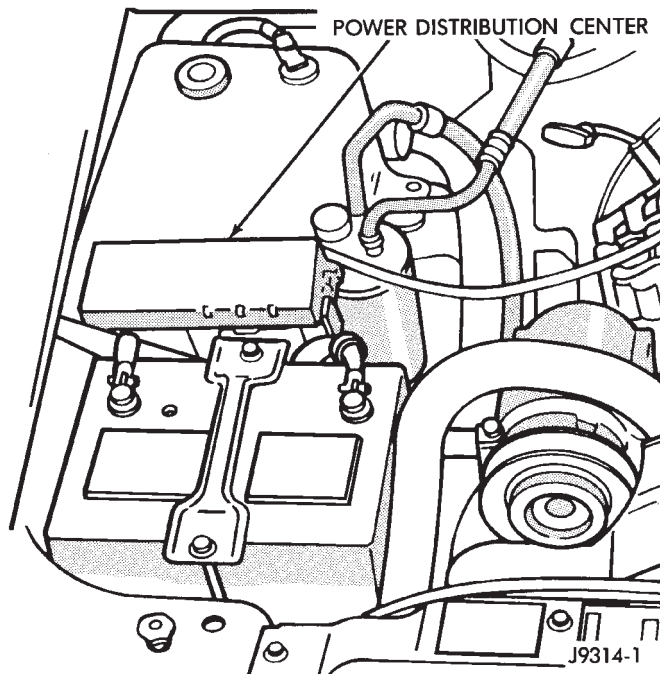
- (6) Remove generator B+ terminal nut, 2 field terminal nuts, ground and harness holddown nuts (Fig. 16). Remove wire connector assembly.



**Fig. 16 Connector Remove/Install**

- (7) Remove 2 generator mounting bolts and remove generator from vehicle.
- (8) Install generator with two mounting bolts. Torque bolts to 55 N·m (41 ft. lbs.).
- (9) Attach generator wires.

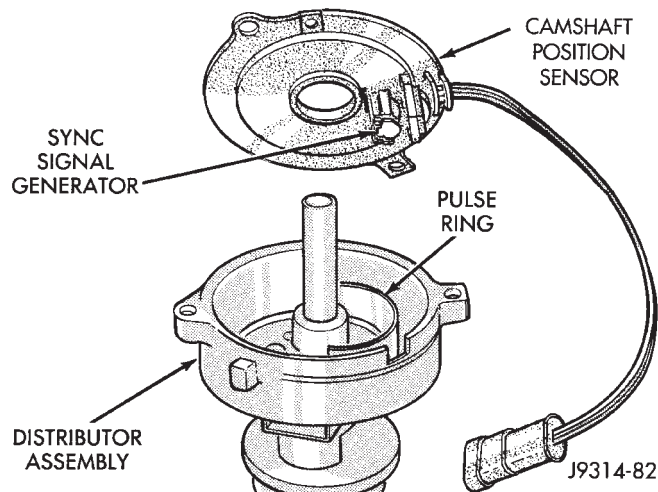
**CAUTION: Never force a belt over a pulley rim using a screwdriver as the synthetic fiber may be damaged.**



**Fig. 1 Power Distribution Center**

### CAMSHAFT POSITION SENSOR

The camshaft position sensor is located in the distributor (Fig. 2) on all engines. This sensor is similar on both the 4.0L and 5.2L engines for the 1995 model year.



**Fig. 2 Camshaft Position Sensor—Typical**

The camshaft position sensor contains a hall effect device called a sync signal generator to generate a fuel sync signal. This sync signal generator (Fig. 2) detects a rotating pulse ring (shutter) on the distributor shaft. The pulse ring rotates 180 degrees through the sync signal generator. Its signal is used in conjunction with the crankshaft position sensor to differentiate between fuel injection and spark events. It is also used to synchronize the fuel injectors with their respective cylinders.

When the leading edge of the pulse ring (shutter) enters the sync signal generator, the following occurs: The interruption of magnetic field causes the voltage to switch high resulting in a sync signal of approximately 5 volts.

When the trailing edge of the pulse ring (shutter) leaves the sync signal generator, the following occurs: The change of the magnetic field causes the sync signal voltage to switch low to 0 volts.

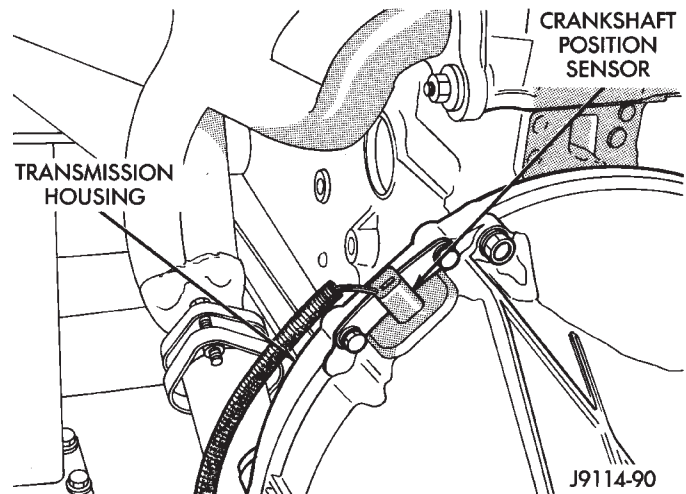
For component testing, refer to the Diagnostics/Service Procedures section of this group.

For removal and installation of this component, refer to the Component Removal/Installation section of this group.

### CRANKSHAFT POSITION SENSOR

#### 4.0L 6-CYLINDER ENGINES WITH MANUAL TRANSMISSION:

The crankshaft position sensor is mounted to the transmission bellhousing with two bolts at the left/rear side of the engine block (Fig. 3).



**Fig. 3 Crankshaft Position Sensor—4.0L Engine With Manual Transmission**

#### 4.0L 6-CYLINDER ENGINES WITH AUTOMATIC TRANSMISSION

The crankshaft position sensor is mounted to the transmission bellhousing with one bolt at the left/rear side of the engine block (Fig. 4).

#### 5.2L V-8 ENGINE

On 5.2L engines, the sensor is bolted to the top of cylinder block near the rear of the right cylinder head (Fig. 5).

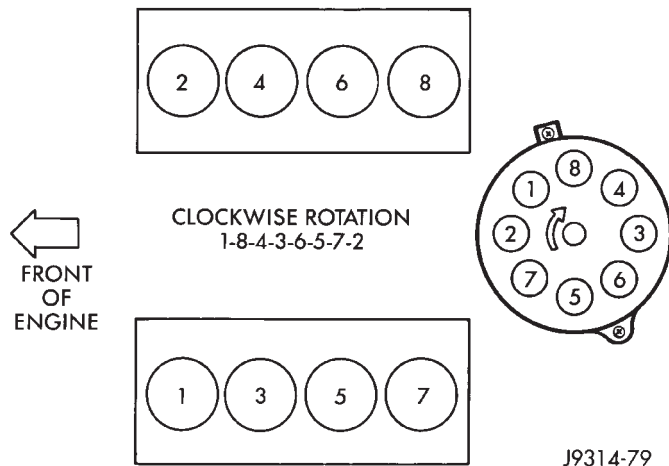
Engine speed and crankshaft position are provided through the crankshaft position sensor. The sensor generates pulses that are the input sent to the powertrain control module (PCM). The PCM interprets the sensor input to determine the crankshaft posi-

- (2) Connect wiring harness.
- (3) Install rotor.
- (4) Install distributor cap. Tighten mounting screws.
- (5) Connect negative battery cable at battery.

#### REMOVAL—5.2L V-8 ENGINE

Distributor removal is not necessary to remove camshaft position sensor.

- (1) Disconnect negative battery cable at battery.
- (2) Remove coil high-tension cable and all spark plug cables at distributor cap. Note and mark position of cables (Fig. 3) before removal.



**Fig. 3 Engine Firing Order—5.2L V-8 Engine**

- (3) Remove distributor cap from distributor (two screws).
- (4) Disconnect camshaft position sensor wiring harness from main engine wiring harness.
- (5) Remove distributor rotor from distributor shaft.
- (6) Lift the camshaft position sensor assembly from the distributor housing (Fig. 2).

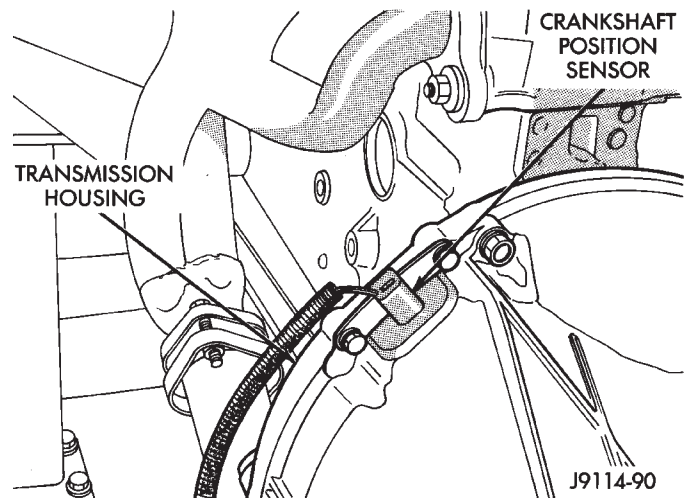
#### INSTALLATION

- (1) Install camshaft position sensor to distributor. Align sensor into notch on distributor housing.
- (2) Connect wiring harness.
- (3) Install rotor.
- (4) Install distributor cap. Tighten mounting screws.
- (5) Install spark plug cables in correct firing order (Fig. 3) to distributor cap. Be sure all spark plug cables are firmly connected into distributor cap towers.
- (6) Connect negative battery cable at battery.

### CRANKSHAFT POSITION SENSOR

#### REMOVAL—4.0L 6-CYLINDER ENGINE WITH MANUAL TRANSMISSION

The crankshaft position sensor is mounted to the transmission bellhousing with two bolts at the left/rear side of the engine block (Fig. 4).



**Fig. 4 Crankshaft Position Sensor—4.0L Engine With Manual Transmission**

- (1) Near the rear of the intake manifold, disconnect the pigtail harness on the sensor from the main electrical harness.
- (2) Raise and support the vehicle.
- (3) Remove the two sensor mounting bolts (Fig. 4).
- (4) Remove the sensor.
- (5) Remove clip from sensor wire harness.

#### INSTALLATION

- (1) Install the sensor flush against the opening in the transmission housing.
- (2) Install and tighten the two sensor mounting bolts to 19 N·m (14 ft. lbs.) torque.

**CAUTION:** The two bolts used to secure the sensor to the transmission are specially machined to correctly space the unit to the flywheel. Do not attempt to install any other bolts.

- (3) Lower the vehicle.
- (4) Connect the electrical connector to the sensor.
- (5) Install clip on sensor wire harness.

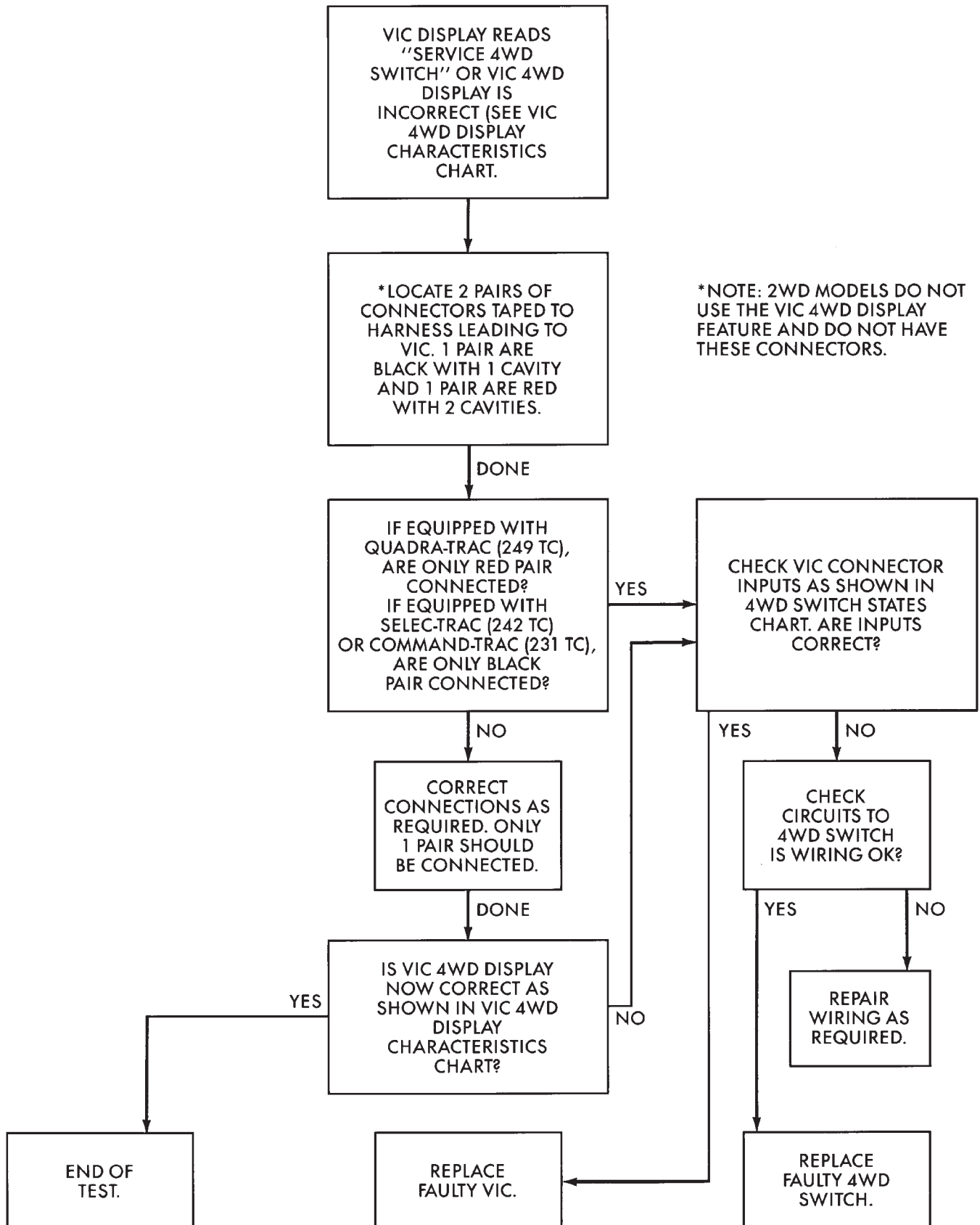
#### REMOVAL—4.0L ENGINE WITH AUTOMATIC TRANSMISSION

The crankshaft position sensor is mounted to the transmission bellhousing with a single bolt. It is located at the left/rear side of the engine block (Fig. 5). The slotted adjustment hole is not used for the 1995 model year.

- (1) Near the rear of the intake manifold, disconnect the pigtail harness (on the sensor) from the main electrical harness.
- (2) Remove the nut holding sensor wire clip to fuel rail mounting stud.
- (3) Remove the one sensor mounting bolt.
- (4) Remove the sensor.
- (5) Remove clip from sensor wire harness.



VIC 4WD DISPLAY FAULT DIAGNOSIS



## RADIO NOISE SUPPRESSION

Radio Frequency Interference (RFI) and Electro-Magnetic Interference (EMI) noise suppression is accomplished primarily through circuitry internal to the radio receivers. These internal suppression devices are only serviced as a part of the radio receiver.

External suppression devices that are serviceable and should be checked in the case of RFI or EMI noise complaints include the following:

- radio antenna base ground
- engine-to-body ground strap
- resistor-type spark plugs
- radio suppression-type secondary ignition wiring.

In addition, if the source of RFI or EMI noise is identified as a component on the vehicle (i.e.:generator, blower motor, etc.), the ground path for that com-

ponent should be checked. If excessive resistance is found in that circuit, repair as required before considering any component replacement.

Fleet vehicles are available with an extra-cost RFI-suppressed Powertrain Control Module (PCM). This unit reduces interference generated by the PCM on some radio frequencies used in two-way radio communications. However, this unit will not resolve complaints of RFI in the commercial AM or FM radio frequency ranges.

## ON-BOARD DIAGNOSTIC SYSTEM

The DRB scan tool may be used to test the audio system. Refer to the appropriate Diagnostic Procedures manual for more information.

ground at relay cavity 85 with the horn switch depressed. If no continuity is found with horn switch depressed or, if continuity is found with horn switch released, repair horn switch or wiring as required. See Horn Switch Remove/Install in this group for service procedures.

If all relay connections check OK, proceed to next step.

(3) With the horn relay still removed, check the horn relay by performing the following tests.

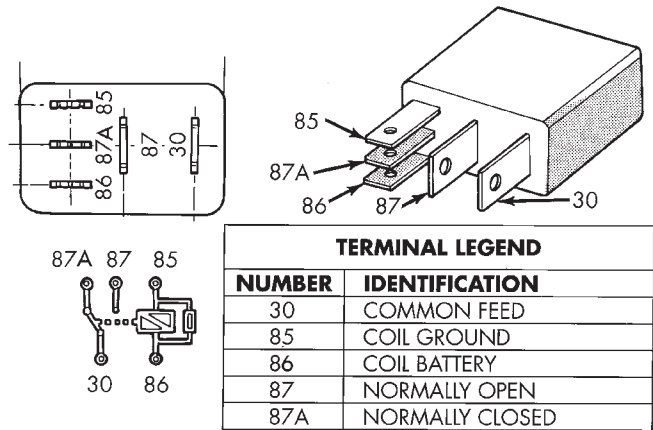
- A relay in the de-energized position should have continuity between terminal 87A and terminal 30, and no continuity between terminal 87 and terminal 30.

- Resistance value between terminals 85 and 86 (electromagnet) is  $75 \pm 5$  ohms.

- Connect a battery to terminals 85 and 86. There should now be continuity between terminal 87 and terminal 30.

If relay fails any of the above tests, replace faulty relay. If relay checks OK, reinstall and proceed to next step.

(4) Disconnect wiring at horn terminal. Depress horn switch. There should be battery voltage at the horn wiring connector. If not, repair wiring to relay. If OK, proceed to next step.



9514-16

**Fig. 1 Horn Relay Connections**

(5) Measure the resistance between the horn bracket and a good chassis ground. The meter should read zero ohms. If not, clean and tighten ground connection between horn mounting screw and bracket. If OK, replace faulty horn(s).

## SERVICE PROCEDURES

### HORN SWITCH REMOVE/INSTALL

**WARNING: BEFORE BEGINNING ANY AIRBAG SYSTEM COMPONENT REMOVAL OR INSTALLATION, REMOVE AND ISOLATE THE NEGATIVE (-) CABLE FROM THE BATTERY. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO DO THIS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE INJURY. WAIT 2 MINUTES FOR THE RESERVE CAPACITOR TO DISCHARGE BEFORE REMOVING OR WORKING ON ANY AIRBAG SYSTEM COMPONENTS.**

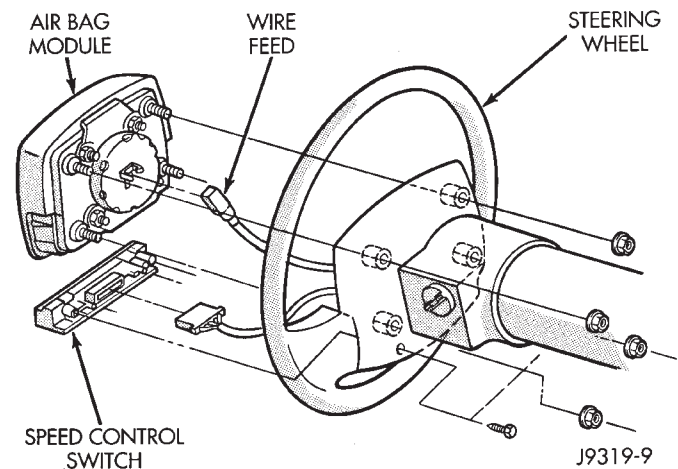
(1) Disconnect and isolate the battery negative cable.

(2) Remove 4 retaining nuts from back of steering wheel (Fig. 2). Remove air bag module.

(3) Disconnect wire from rear of air bag module.

(4) Place air bag module on a clean level surface with pad facing upward.

(5) To remove horn switch assembly from steering, pry out 2 trim cover buttons on back of steering wheel to access retaining screws for the horn switch.



**Fig. 2 Horn Switch Remove/Install**

(6) Remove 2 screws and disconnect horn wires located in the lower portion of steering wheel. Push wires through the access holes and remove horn switch.

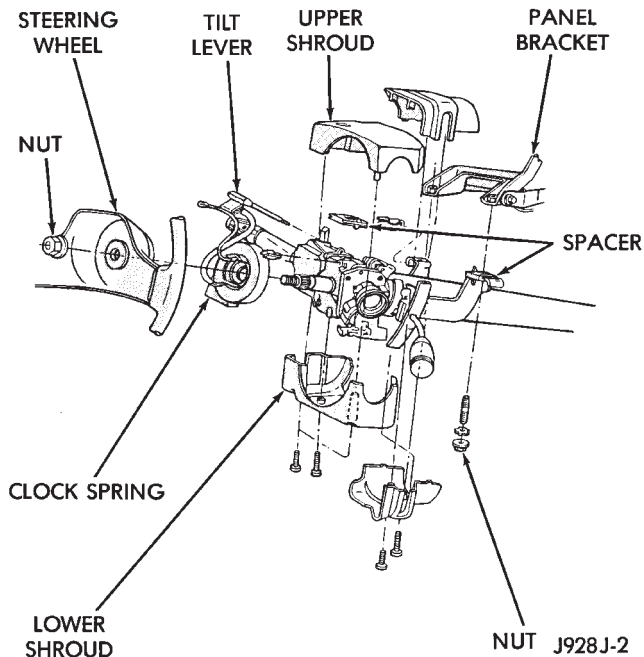
(7) Reverse removal procedures to install. Use caution not to pinch wires. Tighten airbag module mounting nuts to 1.5 N·m (15 in. lbs.) torque.

## SERVICE PROCEDURES

**WARNING: ON VEHICLES EQUIPPED WITH AN AIRBAG, REFER TO GROUP 8M - RESTRAINT SYSTEMS BEFORE ATTEMPTING STEERING WHEEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.**

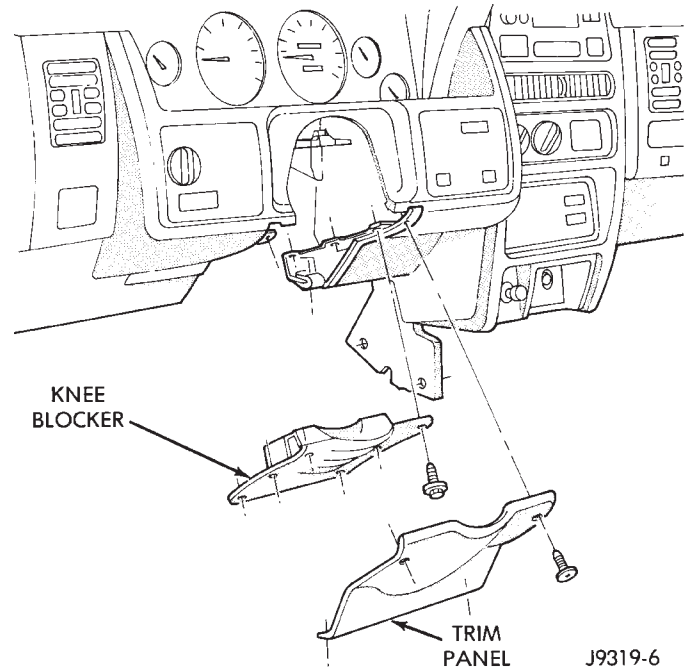
**MULTI-FUNCTION SWITCH REMOVE/INSTALL**

- (1) Disconnect battery negative cable.
- (2) Remove tilt lever (if equipped).
- (3) Remove both upper and lower shrouds from column (Fig. 4). Requires removal of 3 screws (Torx T-20).



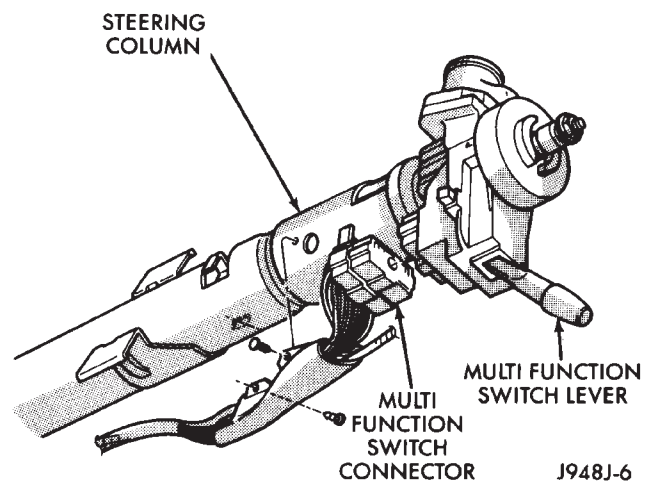
**Fig. 4 Steering Column Shrouds Remove/Install**

- (4) Remove 4 screws holding steering column trim panel (Fig. 5).



**Fig. 5 Steering Column Trim and Knee Blocker**

- (5) Remove 6 screws holding knee blocker.
- (6) Remove steering column retaining nuts.
- (7) Lower steering column.
- (8) Remove multi-function switch tamper proof mounting screws (tamper proof Torx bit Snap-On TTXR20B2 or equivalent required).
- (9) Gently pull switch away from column. Loosen connector screw. The screw will remain in the connector (Figs. 6 and 7).



**Fig. 6 Multi-Function Switch Connector**



EXTERIOR LAMP SYSTEMS

INDEX

	page		page
Auto Headlamps .....	16	Lamp Outage Module .....	22
Daytime Running Light Module .....	16		

**DAYTIME RUNNING LIGHT MODULE**

The headlamps on vehicles sold in Canada, will go ON when the ignition is turned ON. This provides a constant Lights On condition while the ignition switch is in the run position and the park brake is NOT engaged. The lamps illuminate at less than 50% of normal intensity.

The Daytime Running Light Module (DRL) is located on a bracket, to the left of the steering column, on the underside of the instrument panel.

- (1) Remove screws holding module and bracket to vehicle (Fig. 1).
  - (2) Disconnect electrical connector.
- To install module, reverse the removal procedures.

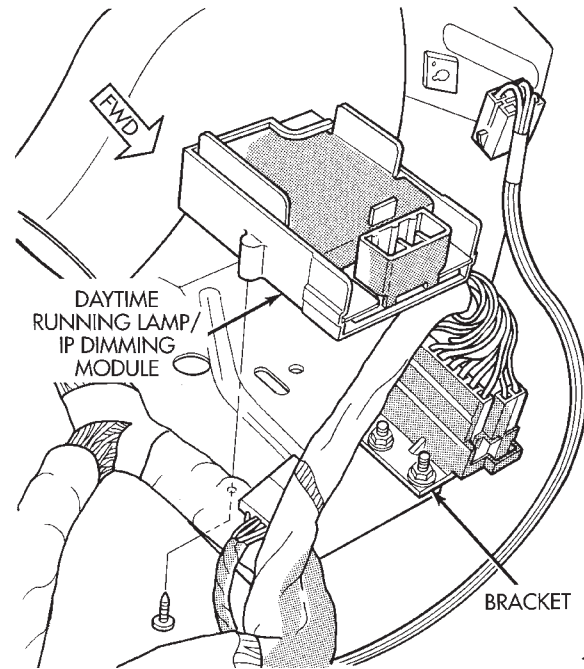
**AUTO HEADLAMPS**

This system automatically turns the lamps on and off according to light conditions. The system also keeps the lights on for a selected amount of time after driver has parked and left vehicle. The system can be turned off to give driver manual control of headlamps.

*AUTO HEADLAMP SYSTEM DIAGNOSIS*

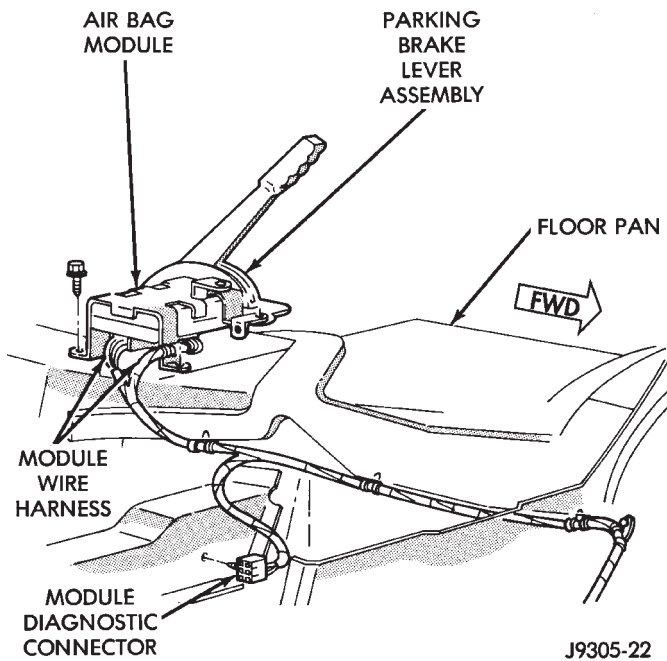
Perform the system check in the order shown. When a fault is found, refer to Diagnosis chart and/or Group 8W, Wiring Diagrams for circuit information. If a normal result is found at each and every step of the System Check, the fault may be intermittent.

To find an intermittent fault, check the mating ter-



**Fig. 1 Daytime Running Light Module**

minals at each component and connector for a poor connection. Also check that each terminal of mating connectors is properly seated. If the connections appear to be reliable, try the System Check again while moving the wire harness from side to side at each component. Once a fault has been corrected, perform the System Check to verify the diagnosis.



**Fig. 14 Airbag Control Module**

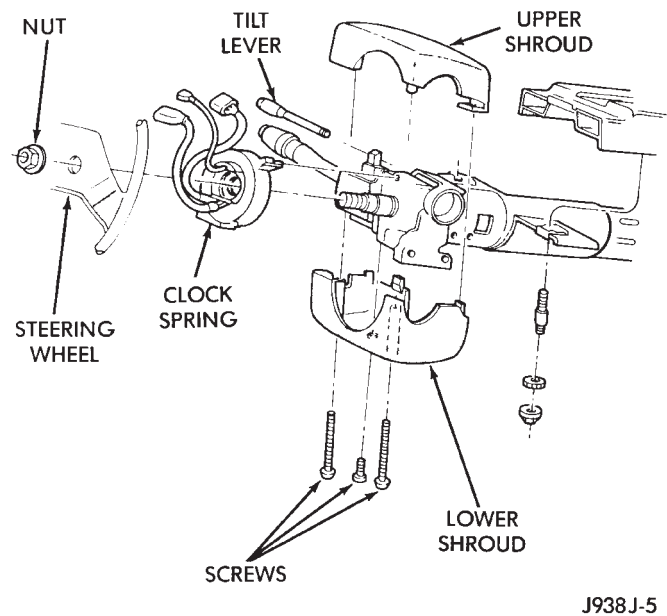
(3) Remove the airbag module. See Airbag Module Remove/Install.

(4) Remove speed control switch and connector, if equipped.

(5) Remove the steering wheel with steering wheel puller tool (C-3428B).

(6) Unplug wiring connectors from horn switches.

(7) Remove upper and lower steering column shrouds to gain access to clockspring wiring (Fig. 15).



**Fig. 15 Steering Column Shrouds Remove/Install**

(8) Disconnect the 2-way connector between the clockspring and the instrument panel wiring harness at the base of the steering column.

(9) To remove, pull clockspring assembly from steering column by lifting locating fingers as necessary. The clockspring cannot be repaired. It must be replaced if faulty, or if airbag has been deployed.

(10) When installing, snap clockspring onto the steering column. If the clockspring is not properly positioned, see Clockspring Centering before installing steering wheel.

(11) Connect the clockspring assembly to the instrument panel wiring harness. Make sure wiring locator clips are properly seated on the outside of the wiring trough and locking tabs are engaged.

(12) Reinstall steering column shrouds. Be sure airbag wire is inside the shrouds.

(13) Front wheels should still be in the straight-ahead position. Install steering wheel making sure to fit the flats on the hub of the steering wheel with the formations on the inside of clockspring. Pull the horn wiring through the upper, smaller hole in steering wheel hub. Pull the airbag and speed control wiring through the bottom, larger hole in the steering wheel hub. Make sure not to pinch wiring between the steering wheel and nut.

(14) Connect the horn switch wire, then the airbag wire to the airbag module. To assure complete connection, latching arms must be visibly on top of connector housing.

(15) Install the airbag module, and torque nuts to 9 to 11 N·m (80 to 100 in. lb.).

(16) Do not connect negative battery cable at this time. See Airbag System Check for proper procedure.

### CLOCKSPRING CENTERING

If the rotating tape within the clockspring is not positioned properly in relation to the steering wheel and the front wheels, the clockspring may fail during use. The clockspring **MUST BE CENTERED**, if it is not known to be properly positioned, or if the front wheels were moved from the straight-ahead position.

(1) Place front wheels in the straight-ahead position.

(2) Disconnect battery negative cable and isolate. If airbag is undeployed, wait 2 minutes for system capacitor to discharge before further service.

(3) Remove airbag module. Remove steering wheel with steering wheel puller tool (C-3428B).

(4) Depress the two plastic auto-locking tabs (Fig. 16).

(5) Keeping locking mechanism disengaged, rotate the clockspring rotor **CLOCKWISE** to the end of its travel. Do not apply excessive torque.

(14) Reverse remaining removal procedures to complete installation.

REAR DOORS

(1) Remove screw and door handle cover (Fig. 9).

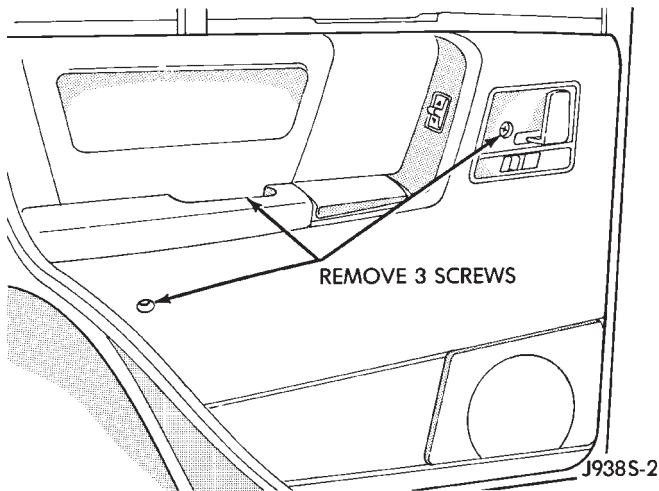


Fig. 9 Rear Door Trim Panel Attachment

(2) Remove screw from under armrest.

(3) Remove screw from bottom of hand hold in armrest.

**CAUTION:** The wiring harness to the door switches is just long enough to allow installation. If trim panel is pulled off by hand the switch may be pulled apart. Use a door clip tool to prevent damaging the switches.

(4) Remove the trim panel with a wide, flat-bladed tool (Fig. 5).

**To aid in removal of the trim panel, start at the bottom of the panel.**

(5) Remove 1 bolt holding bottom of window track to door (Fig. 10).

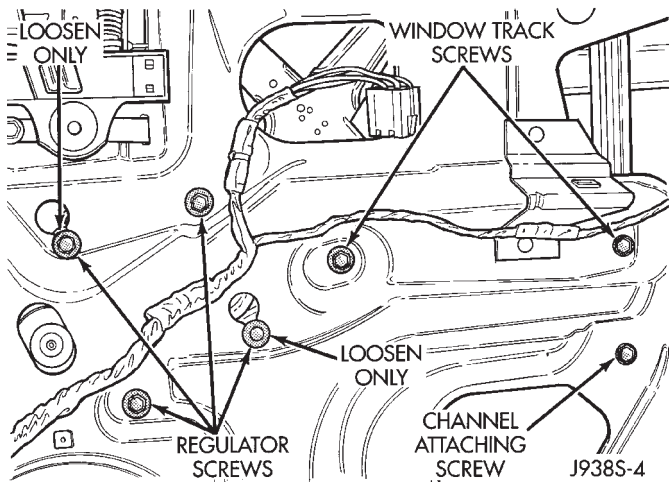


Fig. 10 Window Track Attaching Bolts - Rear Door

(6) Disconnect 4 linkage rods from their clips (Fig. 11).

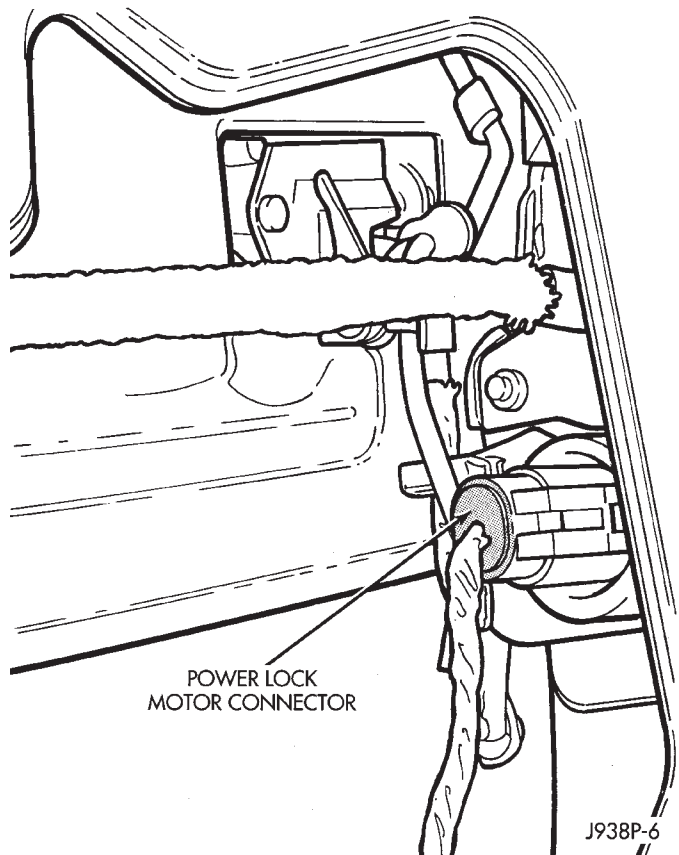


Fig. 11 Lock Actuator Motor - Rear Door

(7) Unplug wire harness connector from lock actuator motor.

(8) Remove 3 torx head screws retaining the latch (Fig. 12).

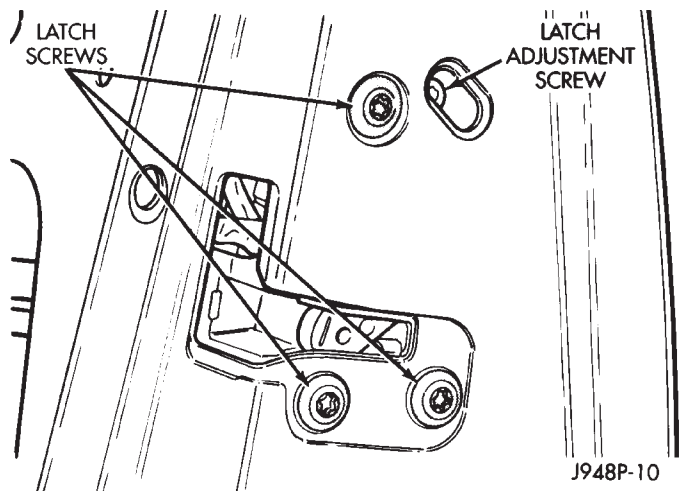
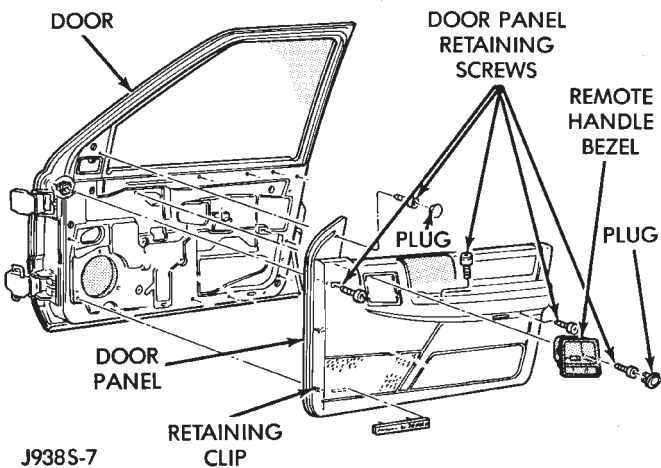


Fig. 12 Latch Remove/Install - Typical

(9) Place the lock actuator motor, latch and remote control rods in the door.

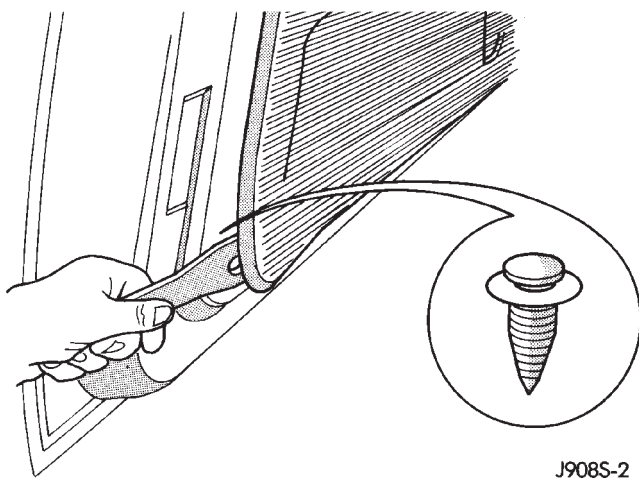




**Fig. 13 Door Trim Panel Remove**

(6) Remove the door trim panel with a wide, flat-bladed tool (Fig. 14).

**To aid in removal of the trim panel, start at the bottom of the panel.**

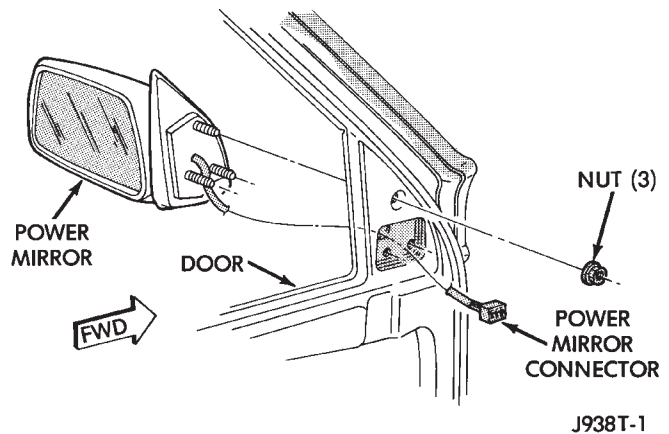


**Fig. 14 Door Trim Panel Remove**

(7) Unplug mirror wiring from door harness at connector (Fig. 15).

(8) Remove 3 nuts holding mirror to door panel and remove mirror.

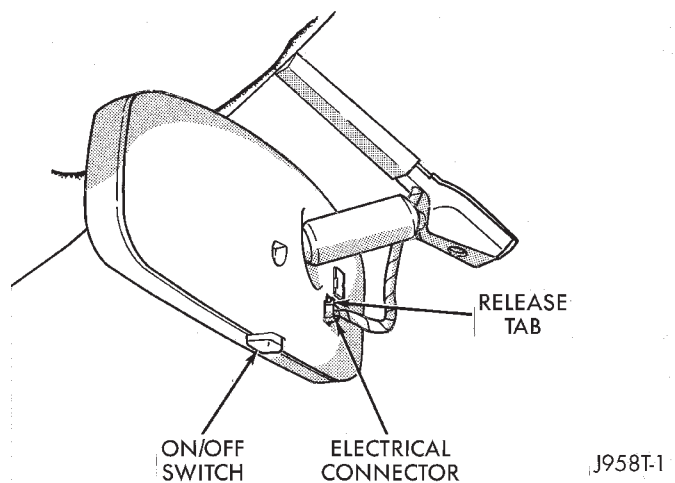
(9) Reverse removal procedures to install.



**Fig. 15 Power Mirror Remove/Install**

**AUTOMATIC DAY/NIGHT MIRROR REMOVE/INSTALL**

(1) Remove wire cover by grasping lower portion of wire cover and sliding into upper portion and off of mirror base (Fig. 16).



**Fig. 16 Automatic Rear View Mirror Remove/Install**

- (2) Unplug connector behind mirror.
- (3) Remove screw holding mirror to windshield.
- (4) Push mirror up far enough to clear the support and remove mirror.
- (5) Reverse removal procedures to install.

- (11) Twist the wires together (Fig. 11 example 3).
- (12) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**
- (13) Center the heat shrink tubing over the joint and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant comes out of both ends of the tubing.
- (14) Repeat steps 8 through 13 for each wire.
- (15) Re-tape the wire harness starting 1-1/2 inches behind the connector and 2 inches past the repair.
- (16) Re-connect the repaired connector.
- (17) Connect the battery, and test all affected systems.

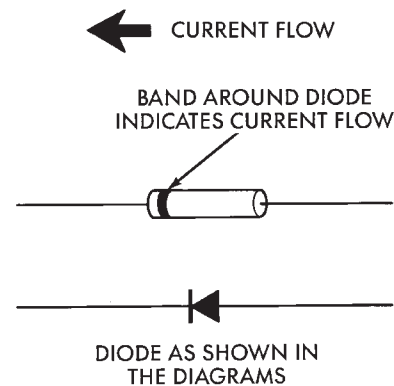
### TERMINAL REPLACEMENT

- (1) Disconnect battery.
- (2) Disconnect the connector being repaired from its mating half.
- (3) Remove connector locking wedge, if required (Fig. 14).
- (4) Position the connector locking finger away from the terminal using the proper pick from special tool kit 6680. Pull on the wire to remove the terminal from the connector (Figs. 15 and 16).
- (5) Cut the wire 6 inches from the back of the connector.
- (6) Remove 1 inch of insulation from the wire on the harness side.
- (7) Select a wire from the terminal repair assembly that best matches the color wire being repaired.
- (8) Cut the repair wire to the proper length and remove 1 inch of insulation.
- (9) Place a piece of heat shrink tubing over one side of the wire. Make sure the tubing will be long enough to cover and seal the entire repair area.
- (10) Spread the strands of the wire apart on each part of the exposed wires (Fig. 11 example 1).
- (11) Push the two ends of wire together until the strands of wire are close to the insulation (Fig. 11 example 2).
- (12) Twist the wires together (Fig. 11 example 3).
- (13) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**
- (14) Center the heat shrink tubing over the joint and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant comes out of both ends of the tubing.

- (15) Insert the repaired wire into the connector.
- (16) Install the connector locking wedge, if required, and reconnect the connector to its mating half/component.
- (17) Re-tape the wire harness starting 1-1/2 inches behind the connector and 2 inches past the repair.
- (18) Connect the battery, and test all affected systems.

### DIODE REPLACEMENT

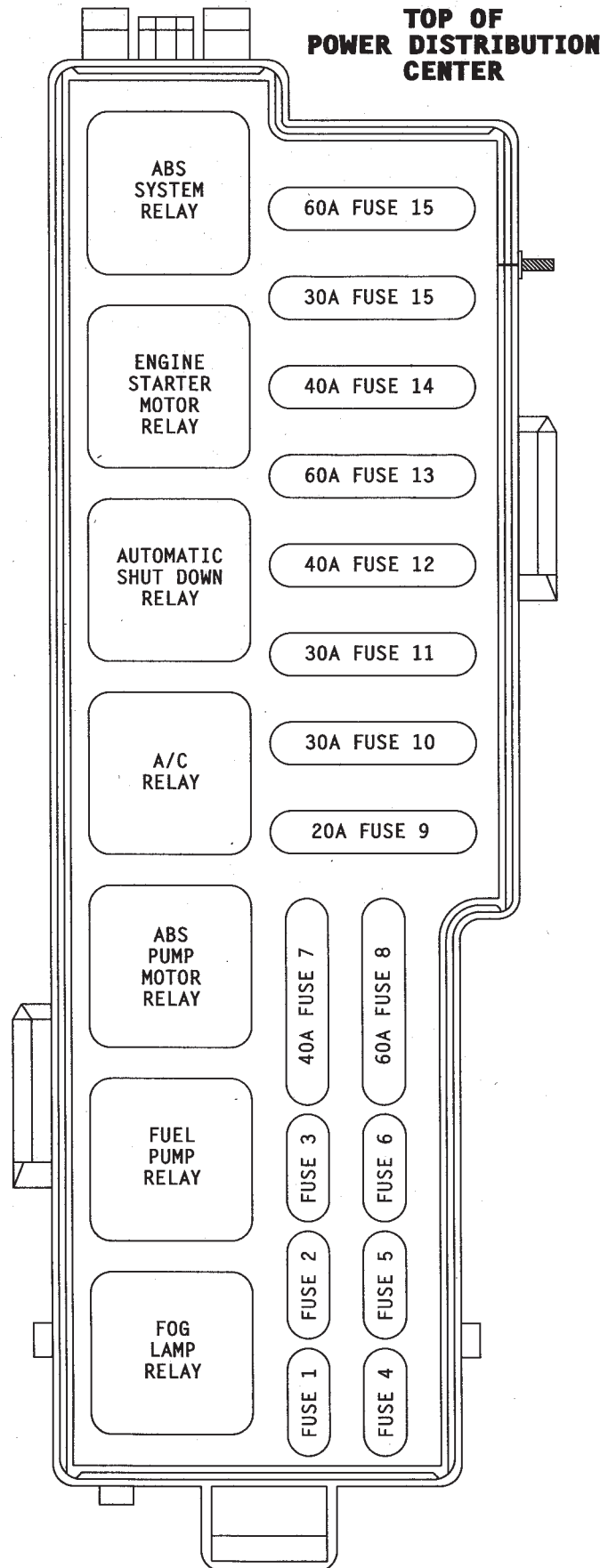
- (1) Disconnect the battery.
- (2) Locate the diode in the harness, and remove the protective covering.
- (3) Remove the diode from the harness, pay attention to the current flow direction (Fig. 18).



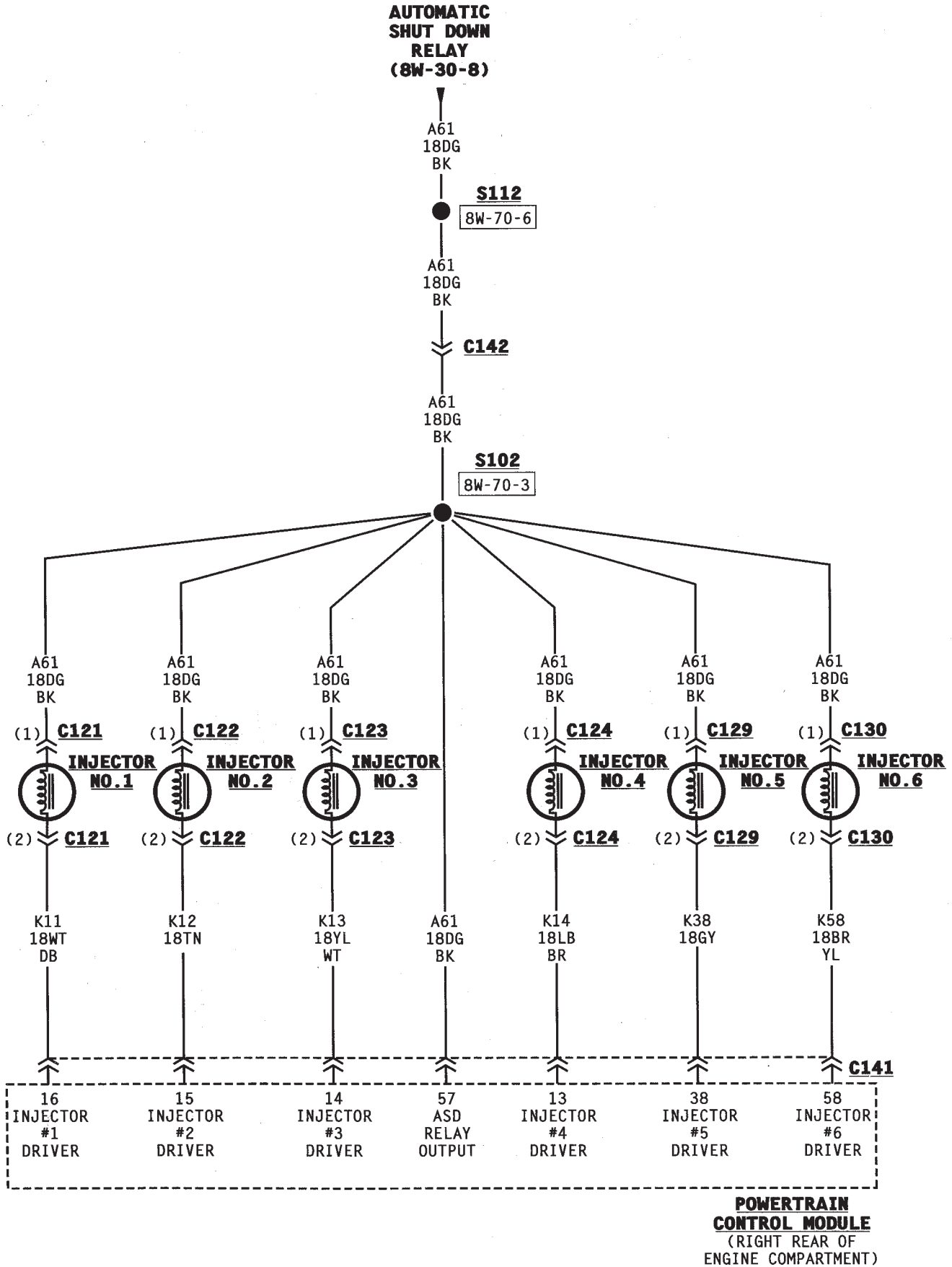
948W-197

**Fig. 18 Diode Identification**

- (4) Remove the insulation from the wires in the harness. Only remove enough insulation to solder in the new diode.
- (5) Install the new diode in the harness, making sure current flow is correct. If necessary, refer to the appropriate wiring diagram for current flow.
- (6) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**
- (7) Tape the diode to the harness using electrical tape. Make sure the diode is completely sealed from the elements.
- (8) Re-connect the battery, and test affected systems.

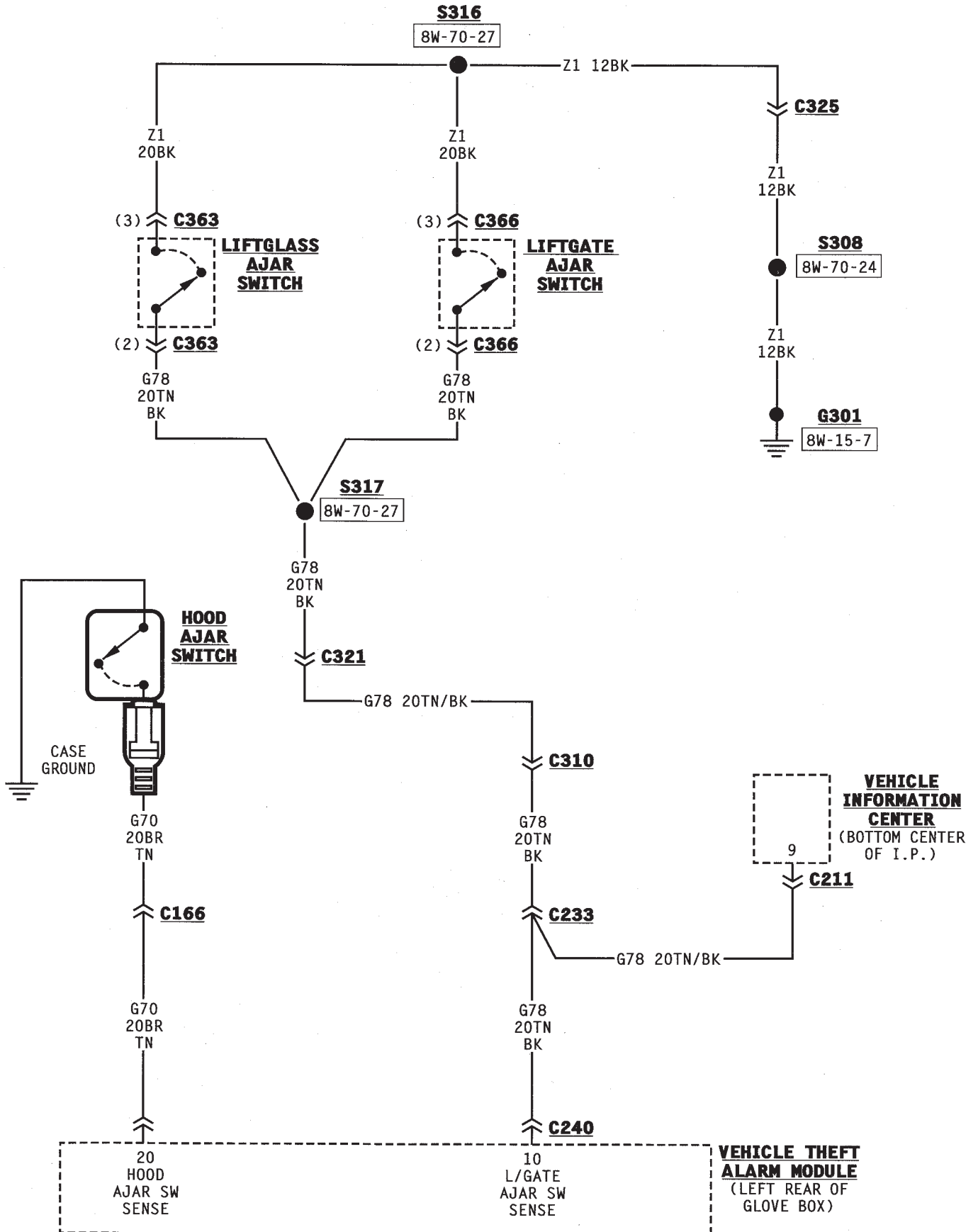


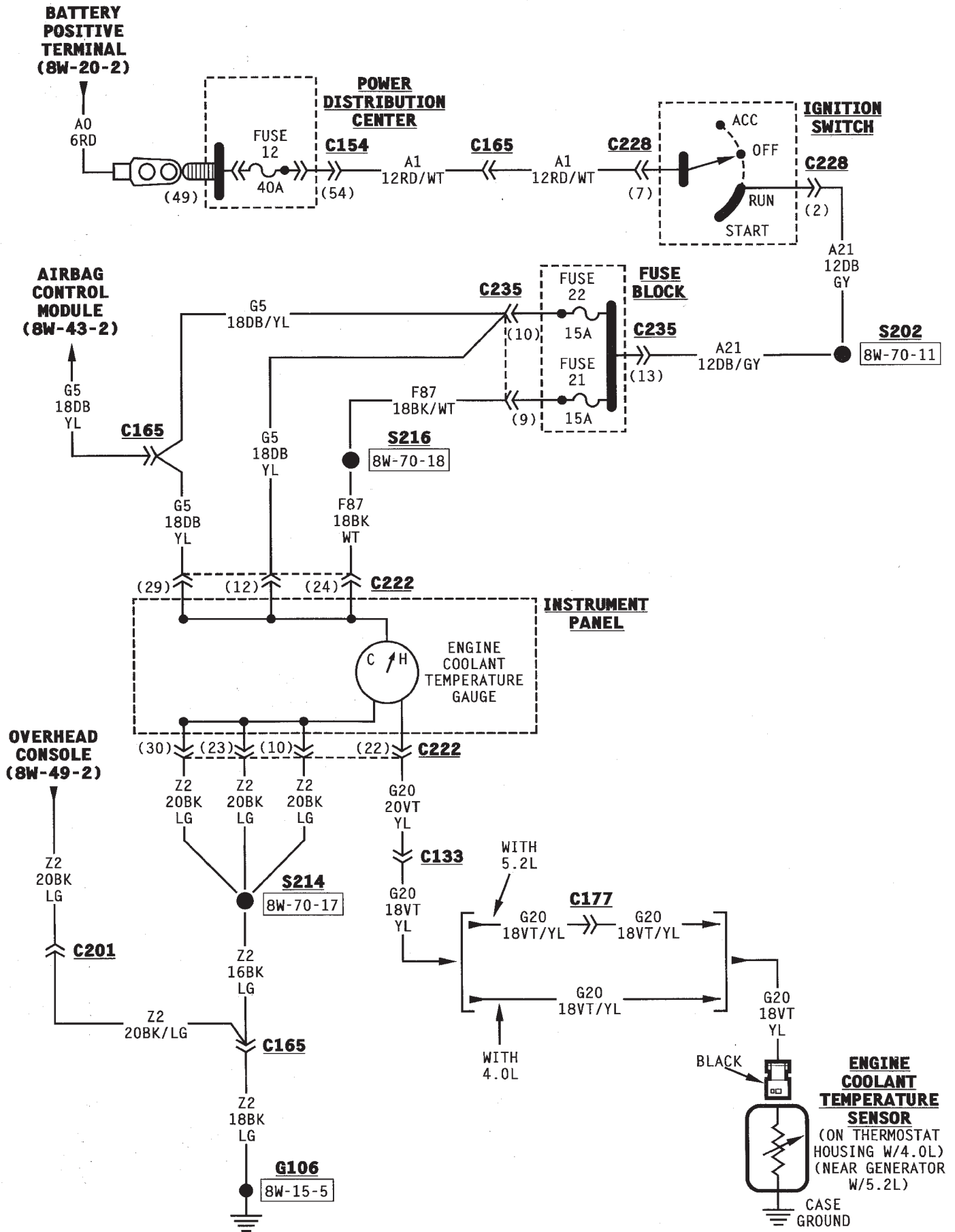


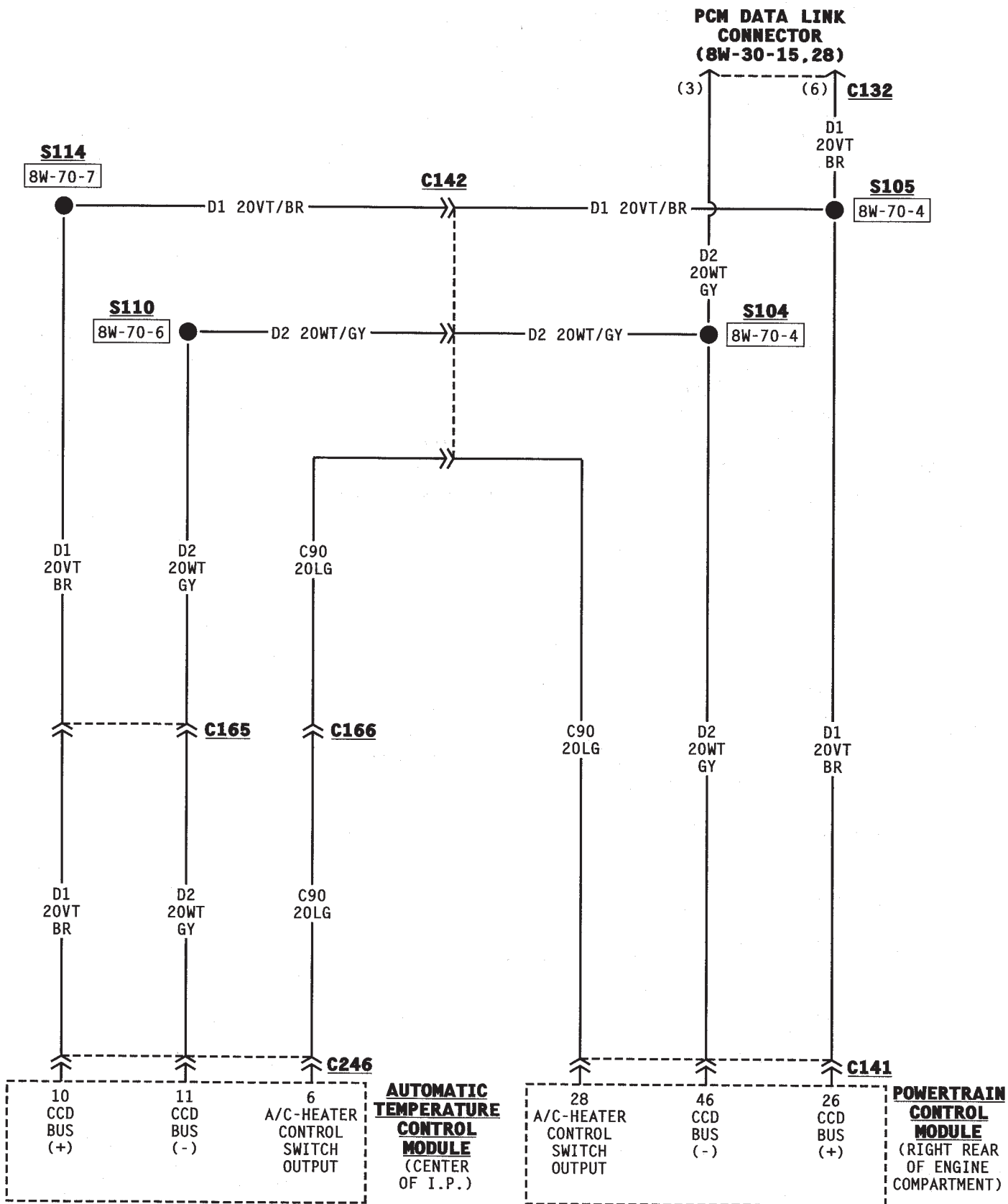


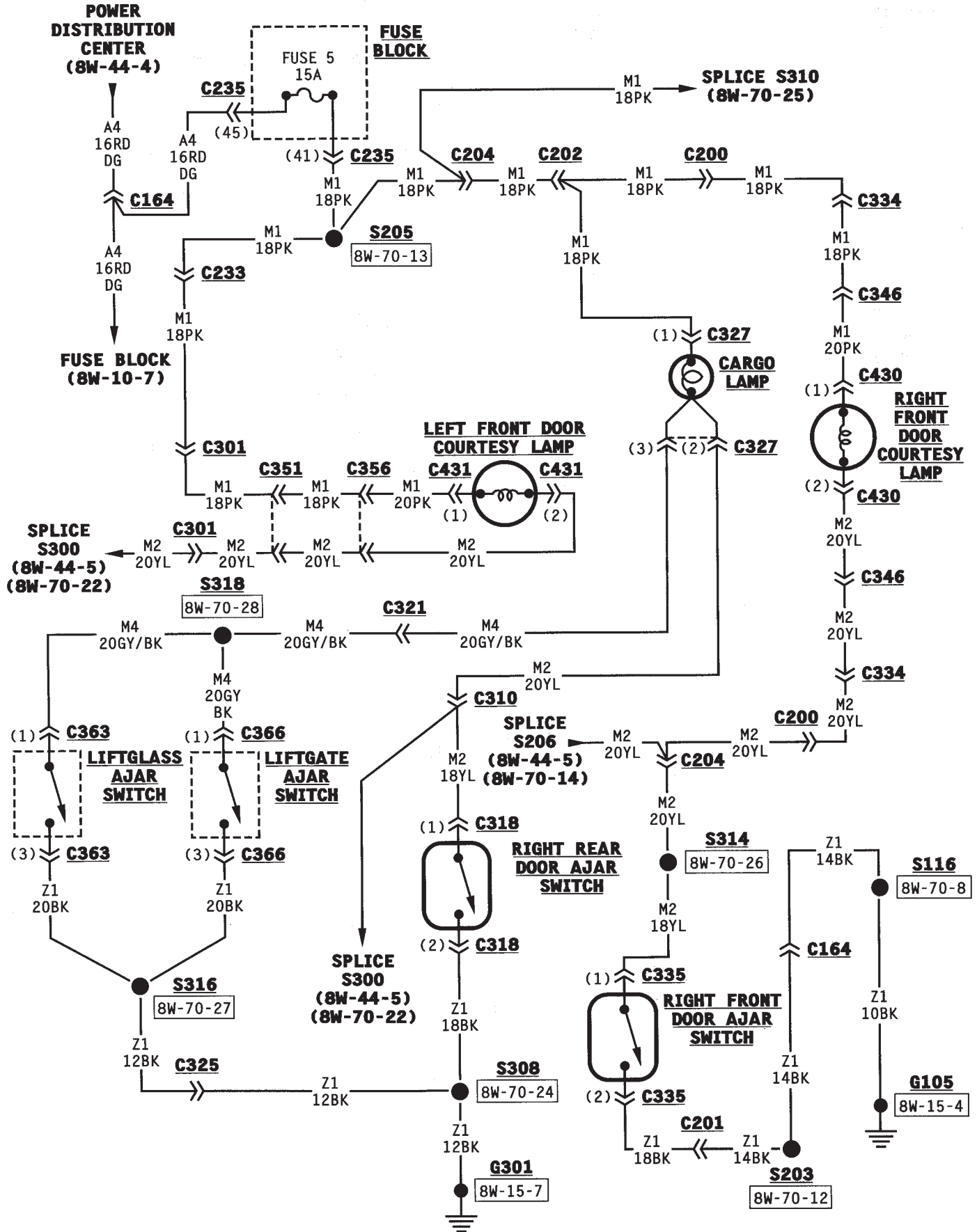






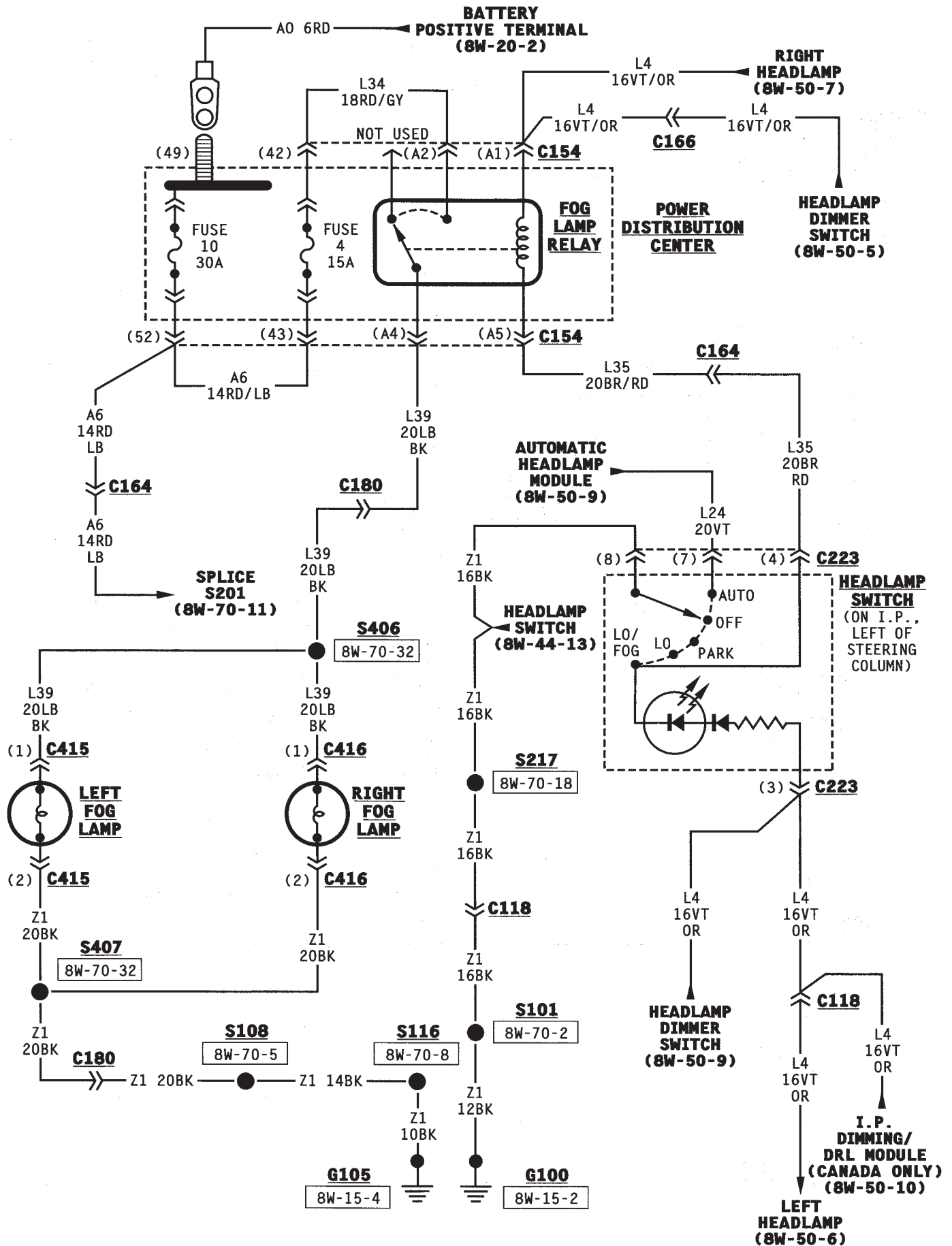












**ELECTRONIC  
FLASHER  
RELAY  
(8W-52-2)**

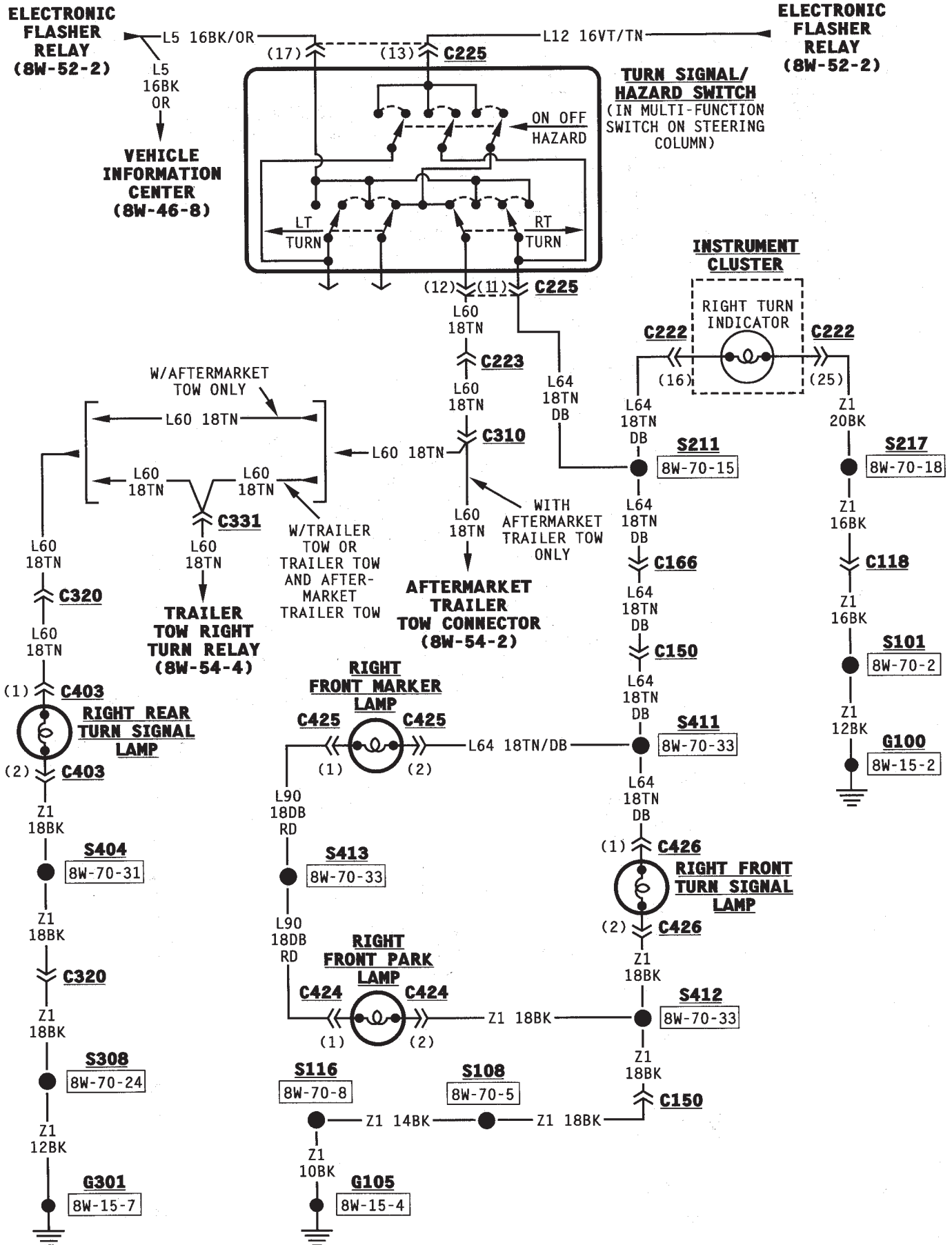
**ELECTRONIC  
FLASHER  
RELAY  
(8W-52-2)**

**VEHICLE  
INFORMATION  
CENTER  
(8W-46-8)**

**TURN SIGNAL/  
HAZARD SWITCH  
(IN MULTI-FUNCTION  
SWITCH ON STEERING  
COLUMN)**

**INSTRUMENT  
CLUSTER**

**RIGHT TURN  
INDICATOR**





to the switch. A ground BUS bar internal to the switch then connects to the Z1 circuit.

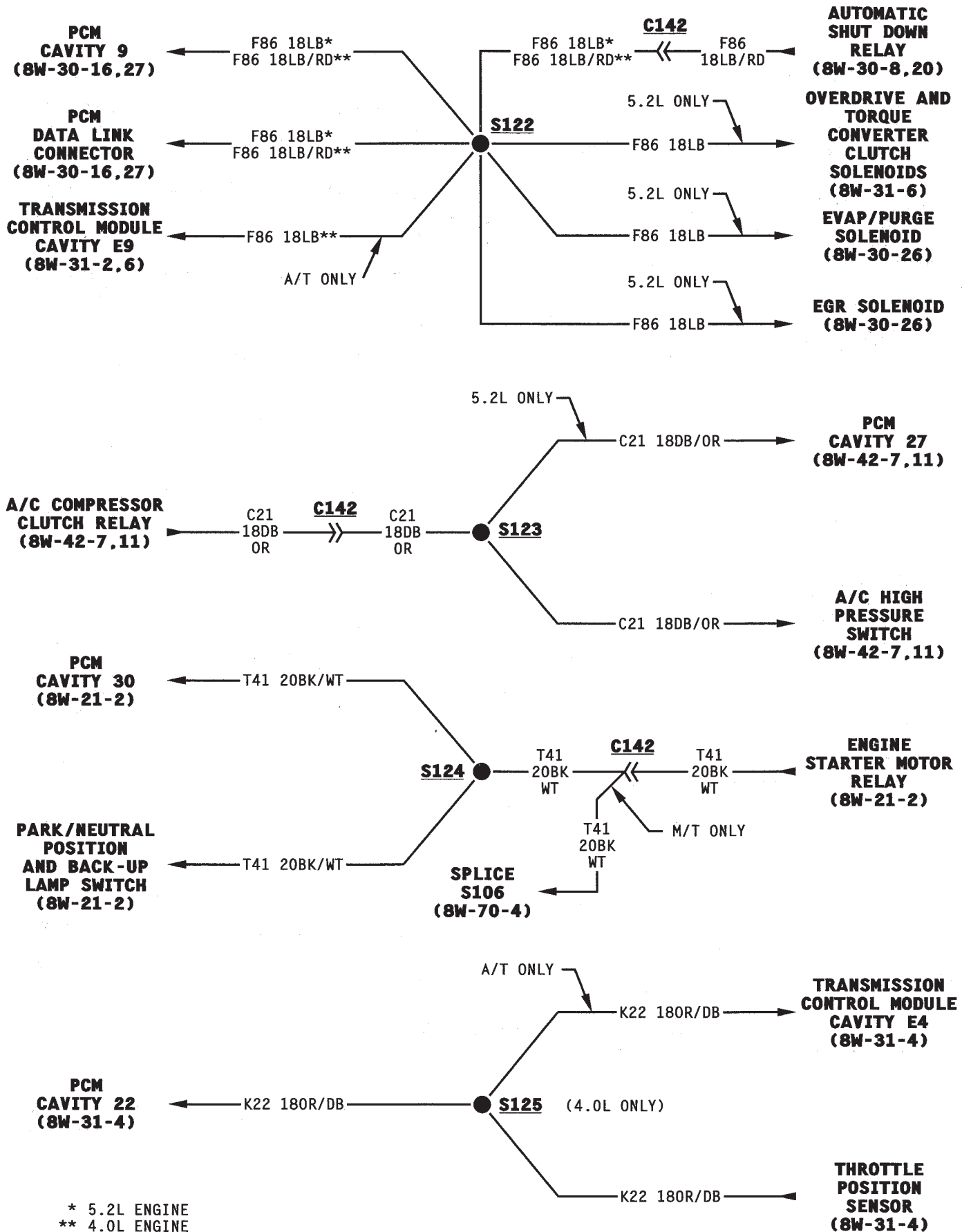
For SEAT DOWN function the circuits are reversed. P12 and P20 circuits are the feeds and P10 and P18 are the grounds.

#### HELPFUL INFORMATION

- Check the 25 amp circuit breaker in located in cavity 25 of the fuse block
- Check the 40 amp fuse located in cavity 14 of the PDC

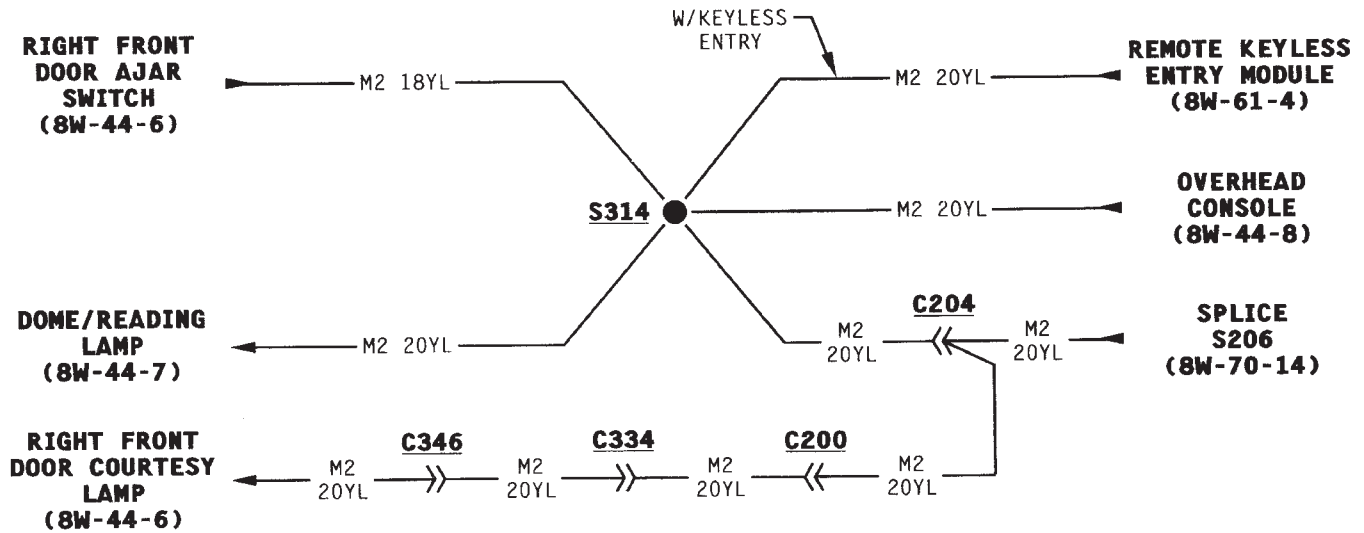
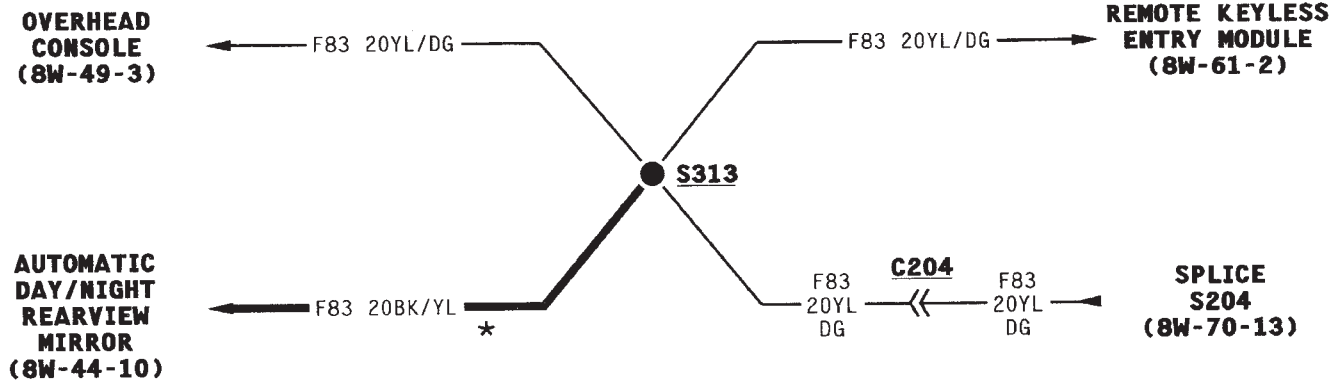
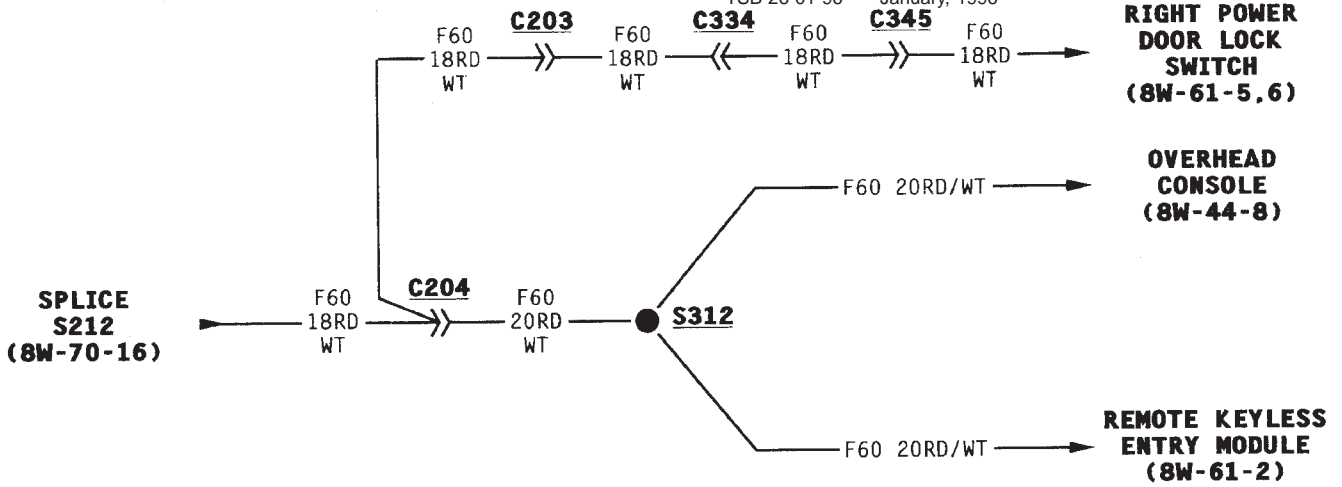
## DIAGRAM INDEX

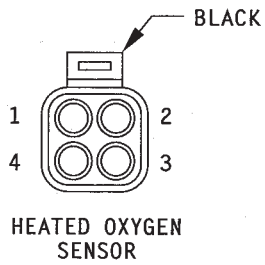
<u>Component</u>	<u>Page</u>
Circuit Breaker (Fuse Block Cavity 25) . . . . .	.8W-63-3, 4
Drivers Power Seat Motors . . . . .	.8W-63-3
Drivers Power Seat Switch . . . . .	.8W-63-3
Fuse 1 (PDC) . . . . .	.8W-63-3, 4
Fuse 14 (PDC) . . . . .	.8W-63-3, 4
Passengers Power Seat Motors . . . . .	.8W-63-3
Passengers Power Seat Switch . . . . .	.8W-63-3



\* 5.2L ENGINE  
 \*\* 4.0L ENGINE

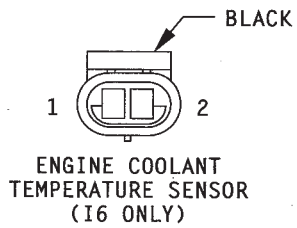
1995 Grand Cherokee  
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TSB 26-01-96 January, 1996





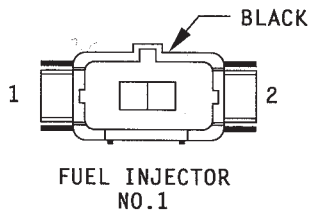
**C119**

CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K41 18BK/OR	OXYGEN SENSOR SIGNAL
3	Z12 18BK/TN	GROUND
4	A64 140R/DB	FUEL PUMP RELAY OUTPUT



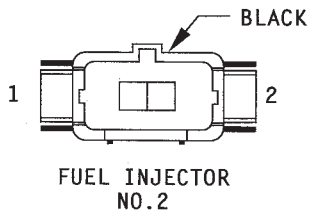
**C120**

CAV	CIRCUIT	FUNCTION
1	K2 16TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
2	K4 16BK/TN	SENSOR GROUND



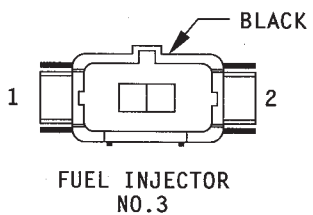
**C121**

CAV	CIRCUIT	FUNCTION
1	A61 18DG/BK	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K11 18WT/DB	INJECTOR #1 DRIVER



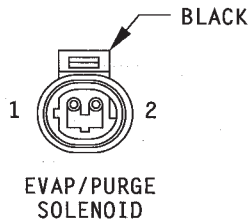
**C122**

CAV	CIRCUIT	FUNCTION
1	A61 18DG/BK	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K12 18TN	INJECTOR #2 DRIVER



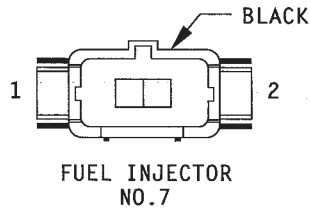
**C123**

CAV	CIRCUIT	FUNCTION
1	A61 18DG/BK	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K13 18YL/WT	INJECTOR #3 DRIVER



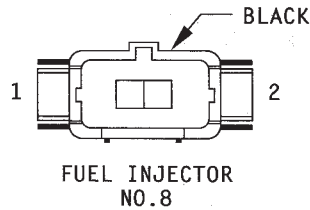
**C174**

CAV	CIRCUIT	FUNCTION
1	F86 18LB	FUSED IGNITION SWITCH OUTPUT (RUN/START)
2	K52 18PK/BK	EVAP/PURGE SOLENOID SIGNAL



**C175**

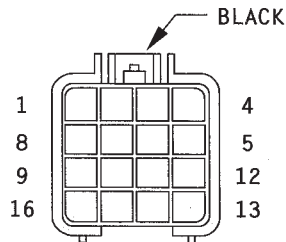
CAV	CIRCUIT	FUNCTION
1	A61 18DG/BK	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K17 18DB/WT	INJECTOR #7 DRIVER



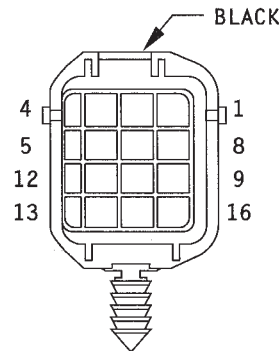
**C176**

CAV	CIRCUIT	FUNCTION
1	A61 18DG/BK	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K18 18DB/YL	INJECTOR #8 DRIVER

**C177**



CAV	CIRCUIT
1	Z12 20BK/TN
2	D1 20VT/BR
3	D2 20WT/GY
4	A14 16RD/WT
5	V31 20BR/RD
6	V32 20YL/RD
7	-
8	G21 20GY/LB
9	G68 20PK/OR
10	G3 20BK/PK
11	G20 18VT/YL
12	G6 20GY/WT
13	T9 20OR/BK
14	-
15	D83 20BK/YL
16	D84 20BK



CAV	CIRCUIT
1	Z12 20BK/TN
2	D1 20VT/BR
3	D2 20WT/GY
4	A14 18RD/WT
5	V31 20BR/RD
6	V32 20YL/RD
7	-
8	G21 20GY/LB
9	G68 20PK/OR
10	G3 20BK/PK
11	G20 20VT/YL
12	G6 20GY/WT
13	T9 20OR/BK
14	-
15	D83 20BK/YL
16	D84 20BK

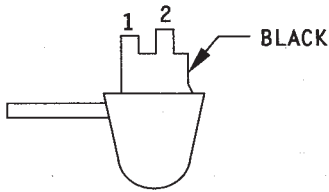
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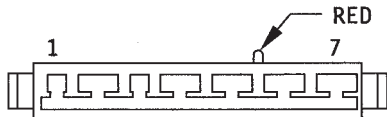


LEFT COURTESY LAMP

**C227**

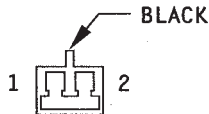
CAV	CIRCUIT	FUNCTION
1	M1 18PK	FUSED B(+)
2	M2 20YL	DOOR LATCH SWITCH SENSE

**C228**



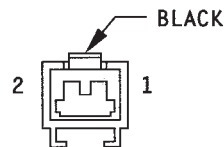
IGNITION SWITCH

CAV	CIRCUIT	FUNCTION
1	A41 16YL/DB	IGNITION SWITCH OUTPUT (START)
2	A21 12DB/GY	IGNITION SWITCH OUTPUT (RUN/START)
3	G9 20GY/BK	RED BRAKE WARNING LAMP DRIVER
4	A2 10PK/BK	FUSED B(+)
5	A22 12OR/BK	IGNITION SWITCH OUTPUT (RUN)
6	A31 12BK/WT	IGNITION SWITCH OUTPUT (ACC/RUN)
7	A1 12RD/WT	FUSED B(+)

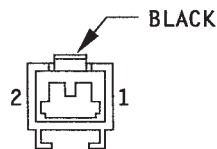


**C229 (WITH AUTOMATIC TRANSMISSION)**

CAV	CIRCUIT
1	A41 16YL/DB
2	A41 16YL



CAV	CIRCUIT
1	A41 16YL
2	A41 16YL

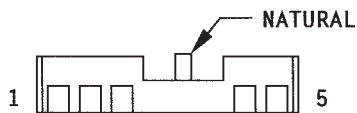


CLUTCH PEDAL POSITION SWITCH (MANUAL TRANSMISSION)

**C229 (WITH MANUAL TRANSMISSION)**

CAV	CIRCUIT	FUNCTION
1	A41 16YL/DB	CLUTCH PEDAL POSITION SWITCH SENSE
2	A41 16YL	CLUTCH PEDAL POSITION SWITCH SENSE

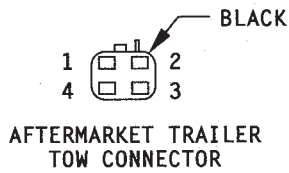
**C230**



VEHICLE SPEED CONTROL AND HORN SWITCH

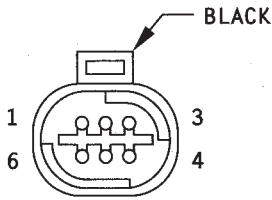
CAV	CIRCUIT	FUNCTION
1	X4 20GY/OR	HORN SWITCH OUTPUT
2	V33 20WT/LG	SPEED CONTROL RESUME SWITCH SENSE
3	V34 20WT/RD	FUSED IGNITION SWITCH OUTPUT
4	V31 20BR/RD	SPEED CONTROL COAST/SET SWITCH SENSE
5	V32 20YL/RD	SPEED CONTROL ON/OFF SWITCH SENSE

**C319**

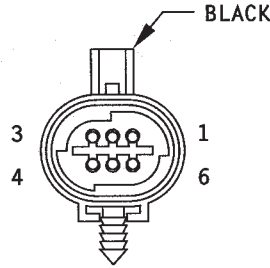


CAV	CIRCUIT	FUNCTION
1	L61 18LG	LEFT TURN SIGNAL
2	L90 18DB/RD	PARK LAMP SWITCH OUTPUT
3	L50 18WT/TN	STOP LAMP SWITCH OUTPUT
4	A18 18RD/BK	FUSED B(+)

**C320**

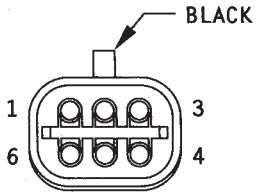


CAV	CIRCUIT
1	L73 18PK/WT
2	L22 18LB
3	L10 18BR/LG
4	-
5	L60 18TN
6	Z1 18BK

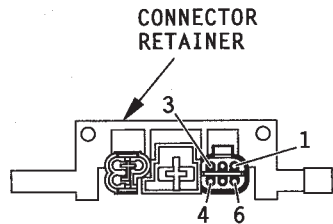


CAV	CIRCUIT
1	L73 18PK/WT
2	L22 18LB
3	L10 18BR/LG
4	-
5	L60 18TN
6	Z1 18BK

**C321**

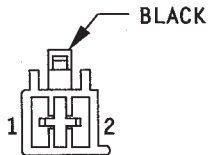


CAV	CIRCUIT
1	L90 18DB/RD
2	-
3	G78 20TN/BK
4	-
5	M4 20GY/BK
6	G71 20VT/YL

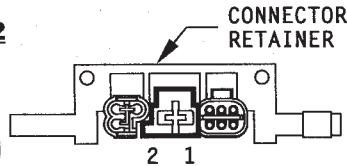


CAV	CIRCUIT
1	L90 18DB/RD
2	-
3	G78 20TN/BK
4	-
5	M4 20GY/BK
6	G71 20VT/YL

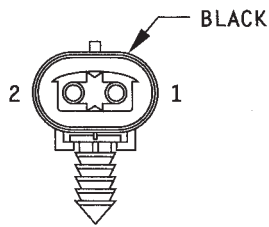
**C322**



CAV	CIRCUIT
1	C15 12BK/LB
2	-



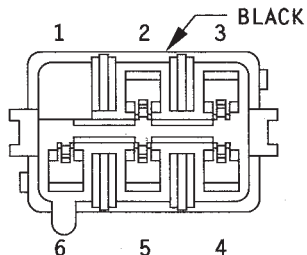
CAV	CIRCUIT
1	C15 12BK/LB
2	-



LEFT REAR POWER WINDOW MOTOR

**C379**

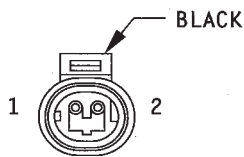
CAV	CIRCUIT	FUNCTION
1	Q22 14VT	LEFT REAR WINDOW DOWN CONTROL
2	Q12 14BR	LEFT REAR WINDOW UP CONTROL



LEFT REAR POWER WINDOW SWITCH

**C380**

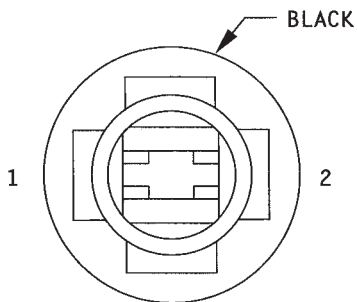
CAV	CIRCUIT	FUNCTION
1	-	-
2	Q28 14DG/WT	LEFT REAR WINDOW DOWN CONTROL
3	Q22 14VT	LEFT REAR WINDOW DOWN CONTROL
4	Q18 14GY/BK	LEFT REAR WINDOW UP CONTROL
5	Q12 14BR	LEFT REAR WINDOW UP CONTROL
6	Q1 14YL/GY	LEFT FRONT POWER WINDOW SWITCH OUTPUT



LEFT REAR DOOR LOCK MOTOR

**C381**

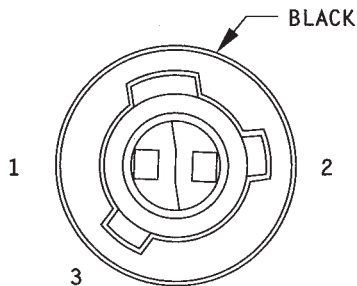
CAV	CIRCUIT	FUNCTION
1	P2 18BK/WT	DOOR LOCK RELAY OUTPUT
2	P34 18PK/BK	DOOR UNLOCK RELAY OUTPUT



RIGHT SIDE MARKER LAMP

**C400**

CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L22 18LB	PARK LAMP SWITCH OUTPUT



RIGHT TAIL/STOP LAMP

**C401**

CAV	CIRCUIT	FUNCTION
1	L73 18PK/WT	STOP LAMP SWITCH OUTPUT
2	L22 18LB	PARK LAMP SWITCH OUTPUT
3	Z1 18BK	GROUND

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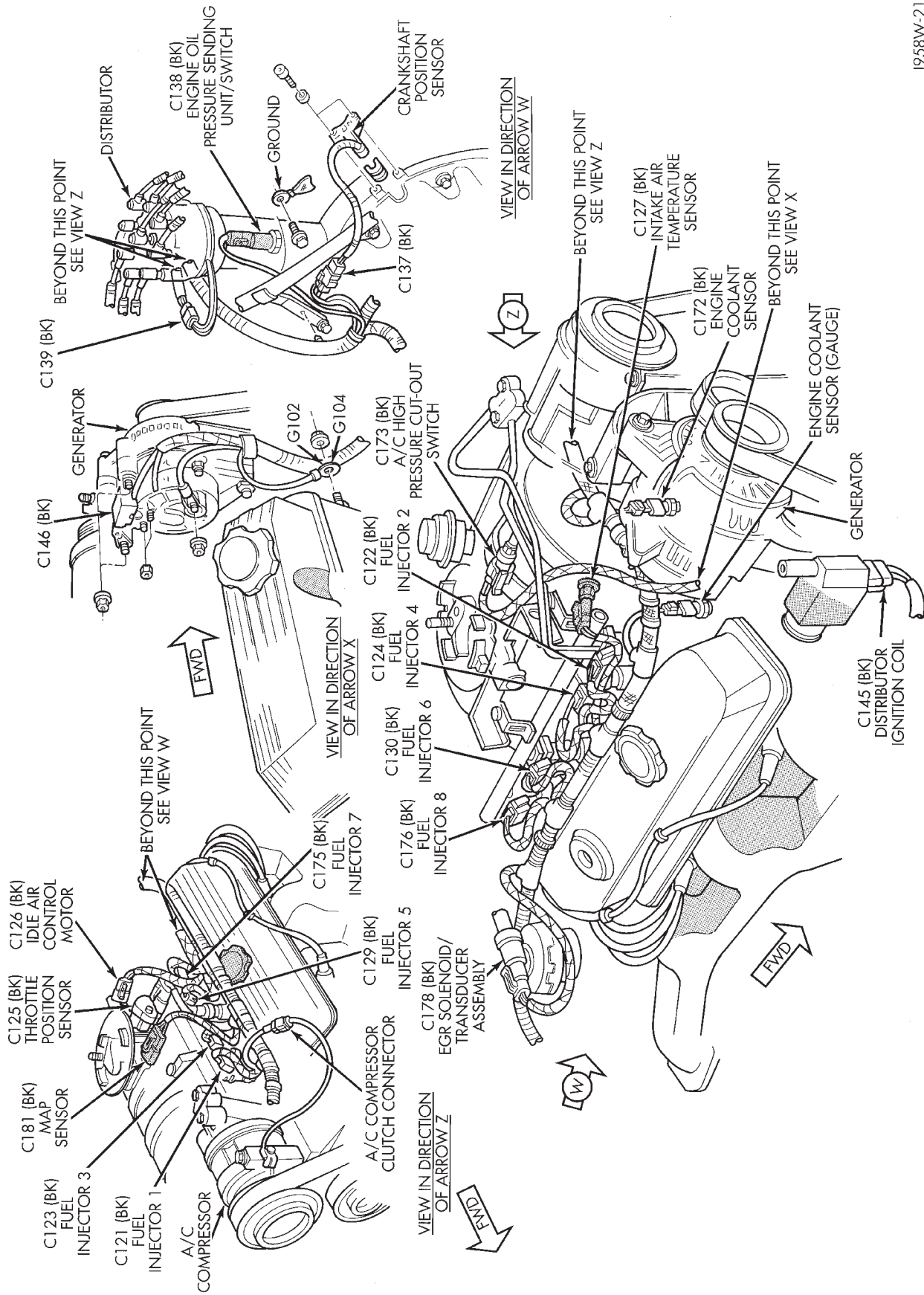


Fig. 5 Engine Wiring Connectors—5.2L

Splice Number	Locations	Fig.
S406	Center of Grille Opening	.4
S407	Center of Grille Opening	.4
S408	Near Left Headlamp Connector	.4
S409	Near Left Headlamp Connector	.4

Splice Number	Locations	Fig.
S410	Near Left Headlamp Connector	.4
S411	Near Right Headlamp Connector	.4
S412	Near Right Headlamp Connector	.4
S413	Near Right Headlamp Connector	.4

## ENGINE DIAGNOSIS

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine tune-ups.

These malfunctions may be classified as either performance (engine idles rough and stalls) or mechanical (a strange noise).

Refer to the Service Diagnosis—Performance chart and the Service Diagnosis—Mechanical chart for possible causes and corrections of malfunctions. Refer to Group 14, Fuel System for the fuel system diagnosis.

### GENERAL INFORMATION

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that can not be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following diagnosis:

- Cylinder Compression Pressure Test.
- Cylinder Combustion Pressure Leakage Test.
- Engine Cylinder Head Gasket Failure Diagnosis.
- Intake Manifold Leakage Diagnosis.

### INTAKE MANIFOLD LEAKAGE DIAGNOSIS

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

**WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.**

- (1) Start the engine.
- (2) Spray a small stream of water at the suspected leak area.
- (3) If a change in RPM'S, the area of the suspected leak has been found.
- (4) Repair as required.

### CYLINDER COMPRESSION PRESSURE TEST

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

- (1) Clean the spark plug recesses with compressed air.
- (2) Remove the spark plugs.
- (3) Secure the throttle in the wide-open position.
- (4) Disconnect the ignition coil.

(5) Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.

(6) Record the compression pressure on the 3rd revolution. Continue the test for the remaining cylinders.

Refer to Engine Specifications for the correct engine compression pressures.

### ENGINE CYLINDER HEAD GASKET FAILURE DIAGNOSIS

A leaking engine cylinder head gasket usually results in loss of power, loss of coolant and engine misfiring.

An engine cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

- An engine cylinder head gasket leaking between adjacent cylinders is indicated by a loss of power or engine misfire.
- An engine cylinder head gasket leaking between a cylinder and an adjacent water jacket is indicated by coolant foaming or overheating and loss of coolant.

#### CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders; follow the procedures outlined in Cylinder Compression Pressure Test. An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50-70% reduction in compression pressure.

#### CYLINDER-TO-WATER JACKET LEAKAGE TEST

**WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.**

Remove the radiator cap.

Start the engine and allow it to warm up until the engine thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

If bubbles are not visible, install a radiator pressure tester and pressurize the coolant system.

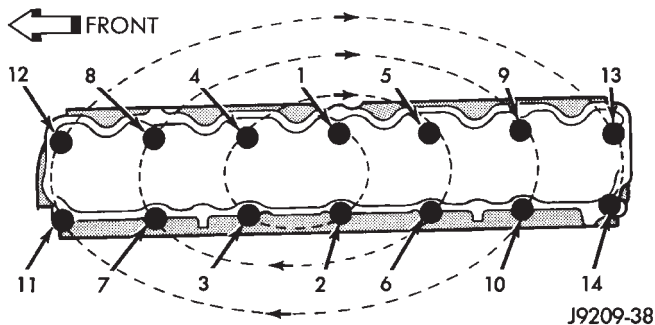
If a cylinder is leaking combustion pressure into the water jacket, the tester pointer will pulsate with every combustion stroke of the cylinder.

- Bolts 1 through 10 to 149 N·m (110 ft. lbs.) torque.
- Bolt 11 to 136 N·m (100 ft. lbs.) torque.
- Bolts 12 through 14 to 149 N·m (110 ft. lbs.) torque.

**CAUTION:** During the final tightening sequence, bolt No.11 will be tightened to a lower torque than the rest of the bolts. DO NOT overtighten bolt No.11.

(e) Check all bolts in sequence to verify the correct torque.

(f) If not already done, clean and mark each bolt with a dab of paint after tightening. Should you encounter bolts which were painted in an earlier service operation, replace them.



**Fig. 7 Engine Cylinder Head Bolt Tightening Sequence**

- (6) Install the ignition coil and bracket assembly.
- (7) Connect the temperature sending unit wire connector.
- (8) Install the spark plugs and tighten to 37 N·m (27 ft. lbs.) torque. Connect the ignition wires.
- (9) Install the intake and engine exhaust manifolds (refer to Group 11, Exhaust System and Intake Manifold for the proper procedures).
- (10) Install the fuel lines and the vacuum advance hose.
- (11) If equipped, attach the power steering pump and bracket.
- (12) Install the push rods, rocker arms, pivots and bridges in the order they were removed.
- (13) Install the engine cylinder head cover.
- (14) Attach the air conditioner compressor mounting bracket to the engine cylinder head and block. Tighten the bolts to 40 N·m (30 ft. lbs.) torque.
- (15) Attach the air conditioning compressor to the bracket. Tighten the bolts to 27 N·m (20 ft. lbs.) torque.

**CAUTION:** The serpentine drive belt must be routed correctly. Incorrect routing can cause the water pump to turn in the opposite direction causing the engine to overheat.

(16) Install the serpentine drive belt and correctly tension the belt (refer to Group 7, Cooling System for the proper procedure).

(17) Install the air cleaner and ducting.

(18) Install the engine cylinder head cover.

(19) Connect the hoses to the engine thermostat housing and fill the cooling system to the specified level (refer to Group 7, Cooling Systems for the proper procedure).

(20) The automatic transmission throttle linkage and cable must be adjusted after completing the engine cylinder head installation (refer to Group 21, Transmissions for the proper procedures).

(21) Install the temperature sending unit and connect the wire connector.

(22) Connect the fuel pipe and vacuum advance hose.

(23) Connect negative cable to battery.

(24) Connect the upper radiator hose and heater hose at the engine thermostat housing.

(25) Fill the cooling system. Check for leaks.

**WARNING:** USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN DIRECT LINE WITH THE FAN. DO NOT PUT HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(26) Operate the engine with the radiator cap off. Inspect for leaks and continue operating the engine until the engine thermostat opens. Add coolant, if required.

## VALVES AND VALVE SPRINGS

This procedure is done with the engine cylinder head removed from the block.

### REMOVAL

- (1) Remove the engine cylinder head from the cylinder block.
- (2) Use Valve Spring Compressor Tool MD-998772A and compress each valve spring.
- (3) Remove the valve locks, retainers, springs and valve stem oil seals. Discard the oil seals.
- (4) Use an Arkansas smooth stone or a jewelers file to remove any burrs on the top of the valve stem, especially around the groove for the locks.
- (5) Remove the valves, and place them in a rack in the same order as removed.

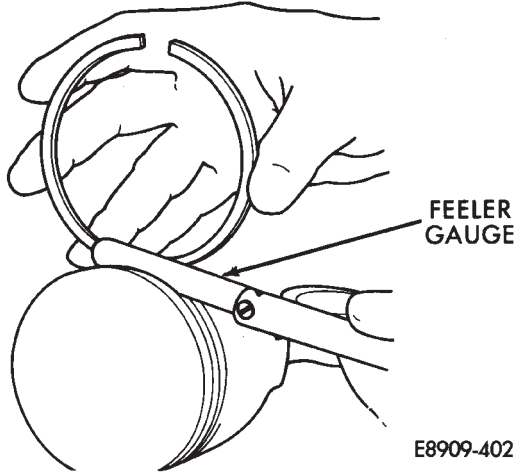
### VALVE CLEANING

Clean all carbon deposits from the combustion chambers, valve ports, valve stems, valve stem guides and head.

Clean all grime and gasket material from the engine cylinder head machined gasket surface.

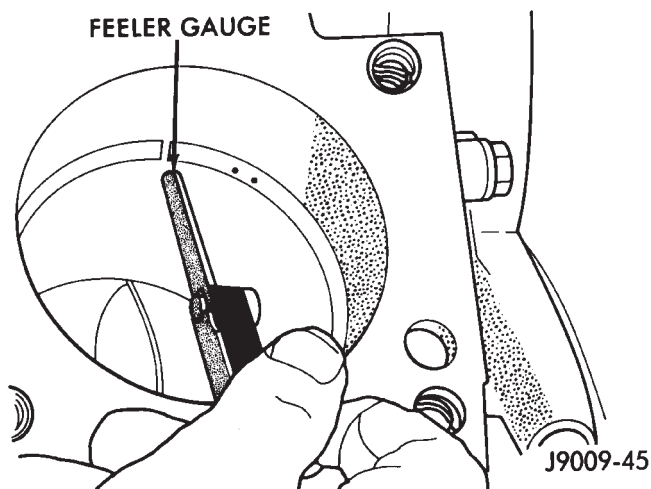
(3) Measure the ring side clearance with a feeler gauge fitted snugly between the ring land and ring (Fig. 11). Rotate the ring in the groove. It must move freely around circumference of the groove.

	<u>Millimeters</u>	<u>Inches</u>
No. 1 Compression	0.025-0.081 (0.043 Preferred)	0.001-0.0032 (0.0017 Preferred)
No. 2 Compression	0.025-0.081 (0.043 Preferred)	0.001-0.0032 (0.0017 Preferred)
Oil Control	0.025-0.241 (0.08 Preferred)	0.001-0.0095 (0.003 Preferred)



**Fig. 11 Ring Side Clearance Measurement**

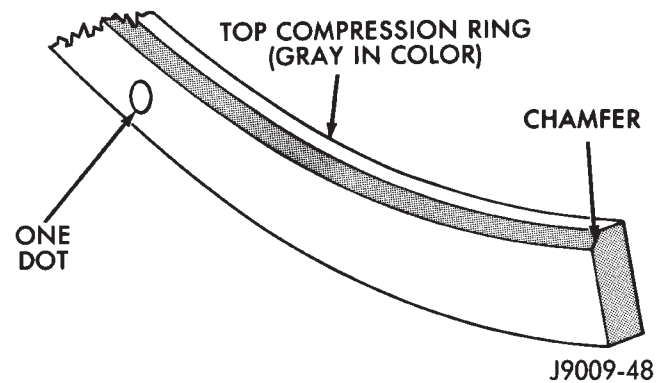
(4) Place ring in the cylinder bore and push down with inverted piston to position near lower end of the ring travel. Measure ring gap with a feeler gauge fitting snugly between ring ends (Fig. 12). The correct compression ring end gap is 0.25-0.51 mm (0.010-0.020 inch). The correct oil control ring end gap is 0.381-1.397 mm (0.015-0.055 inch).



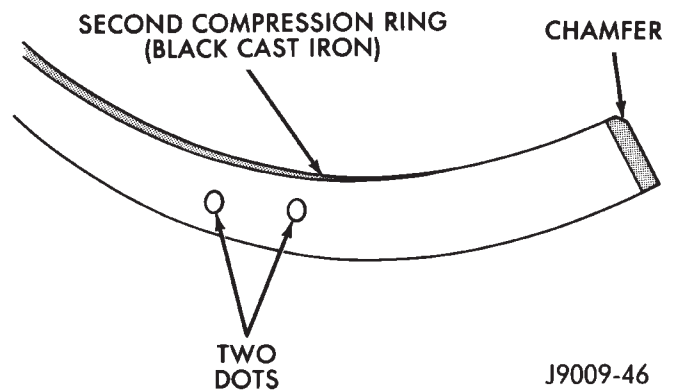
**Fig. 12 Ring Gap Measurement**

(5) Install the oil control rings according to instructions in the package. It is not necessary to use a tool to install the upper and lower rails. Insert oil rail spacer first, then side rails.

(6) The two compression rings are different and cannot be interchanged. The top ring (Fig. 13) is a moly ring (the scraping edge is gray in color). The second ring (Fig. 14) is a black cast iron ring (the scraping edge is black in color when new). The compression rings may also be identified by 1 or 2 dots on the top surface of the ring (Figs. 13 and 14).

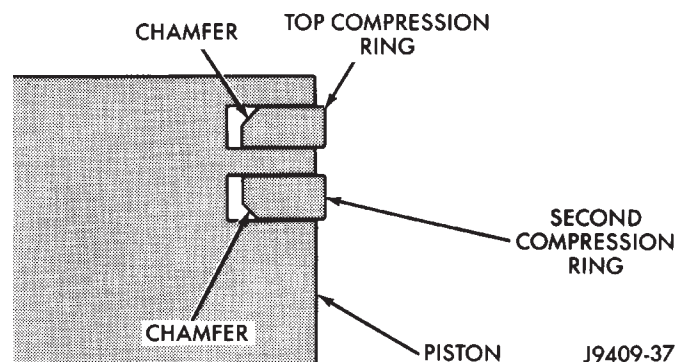


**Fig. 13 Top Compression Ring Identification**



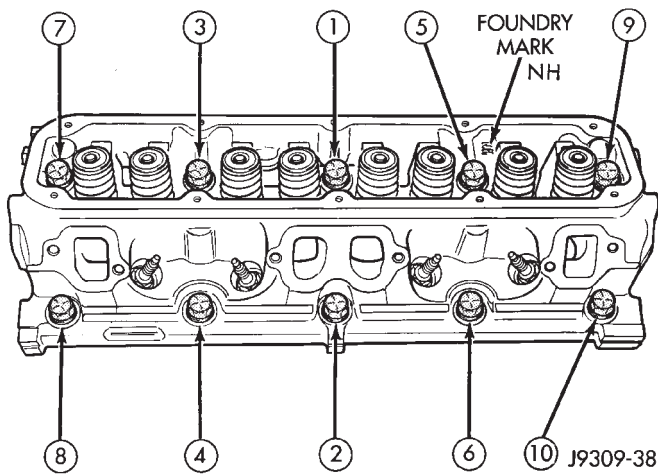
**Fig. 14 Second Compression Ring Identification**

(7) The second compression ring (black cast iron) has a chamfer on the BOTTOM of the inside edge (Fig. 15). This ring may also have 2 dots located on the top surface.



**Fig. 15 Compression Ring Chamfer Location**

(8) Using a ring installer, install the second compression ring with the chamfer facing down (Fig. 15). The 2 dots will be facing up.



**Fig. 4 Cylinder Head Bolt Tightening Sequence**

**CAUTION:** When tightening the rocker arm bolts, make sure the piston in that cylinder is **NOT** at TDC. Contact between the valves and piston could occur.

(4) Install push rods and rocker arm assemblies in their original position. Tighten the bolts to 28 N·m (21 ft. lbs.) torque.

(5) Install the intake manifold and throttle body assembly (refer to Group 11, Exhaust System and Intake Manifold).

(6) Install exhaust manifolds. Tighten the bolts and nuts to 34 N·m (25 ft. lbs.) torque.

(7) Adjust spark plugs to specifications (refer to Group 8D, Ignition System). Install the plugs and tighten to 41 N·m (30 ft. lbs.) torque.

(8) Install coil wires.

(9) Connect heat indicator sending unit wire.

(10) Connect the heater hoses and bypass hose.

(11) Install distributor cap and wires.

(12) Hook up the return spring.

(13) Connect the accelerator linkage and if so equipped, the speed control and transmission kick-down cables.

(14) Install the fuel lines.

(15) Install the generator and drive belt. Tighten generator mounting bolt to 41 N·m (30 ft. lbs.) torque. Tighten the adjusting strap bolt to 23 N·m (200 in. lbs.) torque. Refer to Group 7, Cooling System for adjusting the belt tension.

(16) Install the intake manifold-to-generator bracket support rod. Tighten the bolts.

(17) Place the cylinder head cover gaskets in position and install cylinder head covers. Tighten the bolts to 11 N·m (95 in. lbs.) torque.

(18) Install closed crankcase ventilation system.

(19) Connect the evaporation control system.

(20) Install the air cleaner.

(21) Fill cooling system (refer to Group 7, Cooling System for proper procedure).

(22) Connect the negative cable to the battery.

## VALVES AND VALVE SPRINGS

The valves are arranged in-line and inclined 18°. The rocker pivot support and the valve guides are cast integral with the heads.

This procedure requires the removal of the cylinder head.

### REMOVAL

(1) Remove the cylinder head.

(2) Compress valve springs using Valve Spring Compressor Tool MD-998772A.

(3) Remove valve retaining locks, valve spring retainers, valve stem seals and valve springs.

(4) Before removing valves, remove any burrs from valve stem lock grooves to prevent damage to the valve guides. Identify valves to ensure installation in original location.

### VALVE CLEANING

Clean valves thoroughly. Discard burned, warped and cracked valves.

Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.

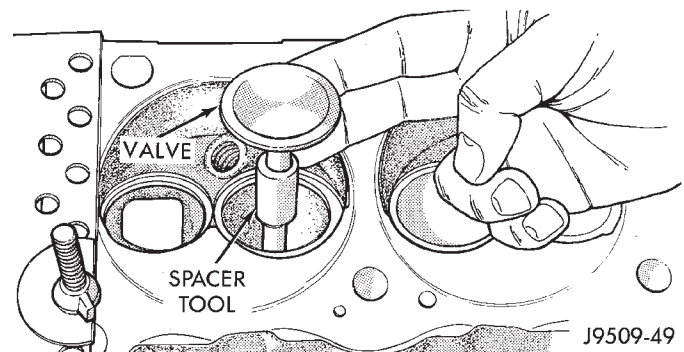
### VALVE INSPECTION

Measure valve stems for wear. If wear exceeds 0.051 mm (0.002 inch), replace the valve.

### VALVE GUIDES

Measure valve stem guide clearance as follows:

(a) Install Valve Guide Sleeve Tool C-3973 over valve stem and install valve (Fig. 5). The special sleeve places the valve at the correct height for checking with a dial indicator.

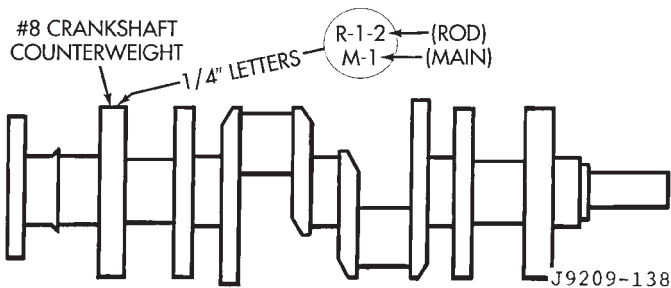


**Fig. 5 Positioning Valve with Tool C-3973**

(b) Attach Dial Indicator Tool C-3339 to cylinder head and set it at right angle of valve stem being measured (Fig. 6).

(c) Move valve to and from the indicator. The total dial indicator reading should not exceed 0.432 mm (0.017 inch). Ream the guides for valves with oversize stems if dial indicator reading is excessive or if the stems are scuffed or scored.

Undersize Journal	Identification Stamp
0.025 mm (0.001 in.) (Rod)	R1-R2-R3 or R4
0.025 mm (0.001 in.) (Main)	M1-M2-M3-M4 or M5



**Fig. 4 Location of Crankshaft Identification**

When a crankshaft is replaced, all main and connecting rod bearings should be replaced with new bearings. Therefore, selective fitting of the bearings is not required when a crankshaft and bearings are replaced.

#### REMOVAL

- (1) Remove the oil pan.
- (2) Remove the oil pump from the rear main bearing cap.
- (3) Identify bearing caps before removal. Remove bearing caps and bearings one at a time.
- (4) Lift the crankshaft out of the block.
- (5) Remove and discard the crankshaft rear oil seals.
- (6) Remove and discard the front crankshaft oil seal.

#### INSPECTION OF JOURNALS

The crankshaft connecting rod and main journals should be checked for excessive wear, taper and scoring. The maximum taper or out-of-round on any crankshaft journal is 0.025 mm (0.001 inch).

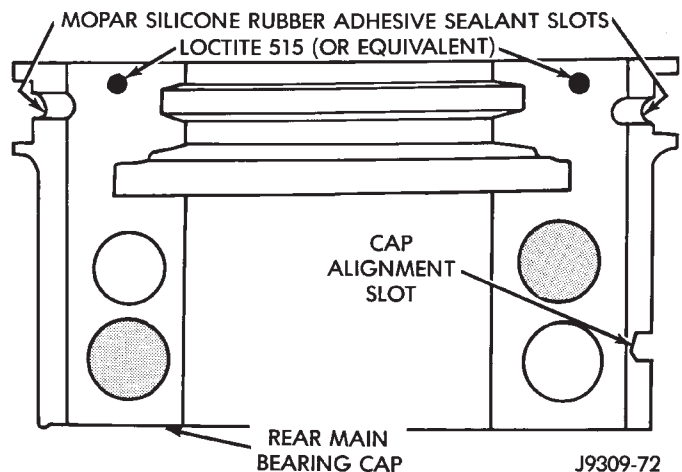
Journal grinding should not exceed 0.305 mm (0.012 inch) under the standard journal diameter. DO NOT grind thrust faces of No.3 main bearing. DO NOT nick crank pin or bearing fillets. After grinding, remove rough edges from crankshaft oil holes and clean out all oil passages.

**CAUTION:** After any journal grind, it is important that the final paper or cloth polish be in the same direction as the engine rotates.

Clean Loctite 515 residue and sealant from the cylinder block and rear cap mating surface. Do this before applying the Loctite drop and the installation of rear cap.

#### INSTALLATION

- (1) Lightly oil the new upper seal lips with engine oil.
- (2) Install the new upper rear bearing oil seal with the white paint facing towards the rear of the engine.
- (3) Position the crankshaft into the cylinder block.
- (4) Lightly oil the new lower seal lips with engine oil.
- (5) Install the new lower rear bearing oil seal into the bearing cap with the white paint facing towards the rear of the engine.
- (6) Apply 5 mm (0.20 in) drop of Loctite 515, or equivalent, on each side of the rear main bearing cap (Fig. 5). DO NOT over apply sealant or allow the sealant to contact the rubber seal. Assemble bearing cap to cylinder block immediately after sealant application.



**Fig. 5 Sealant Application to Bearing Cap**

- (7) To align the bearing cap, use cap slot, alignment dowel and cap bolts. DO NOT remove excess material after assembly. DO NOT strike rear cap more than 2 times for proper engagement.

- (8) Clean and oil all cap bolts. Install all main bearing caps. Install all cap bolts and alternately tighten to 115 N·m (85 ft. lbs.) torque.

- (9) Install oil pump.
- (10) Install the timing chain cover.
- (11) Install the vibration damper.
- (12) Apply Mopar® Silicone Rubber Adhesive Sealant, or equivalent, at bearing cap to block joint to provide cap to block and oil pan sealing (Fig. 6). Apply enough sealant until a small amount is squeezed out. Withdraw nozzle and wipe excess sealant off the oil pan seal groove.

- (13) Install new front crankshaft oil seal.

- (14) Immediately install the oil pan.

#### CRANKSHAFT MAIN BEARINGS

Bearing caps are not interchangeable and should be marked at removal to ensure correct assembly.

**INSPECTION**

Inspect manifold for cracks.

Inspect mating surfaces of manifold for flatness with a straightedge.

**INSTALLATION**

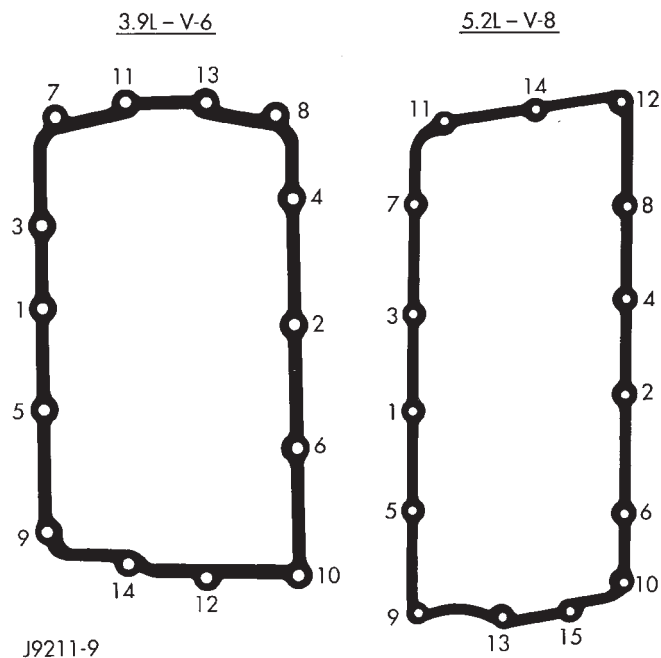
(1) Install the plenum pan, if removed, as follows:

(a) Turn the intake manifold upside down. Support the manifold.

(b) Place a new plenum pan gasket onto the seal rail of the intake manifold. Position the pan over the gasket. Align all the gasket and pan holes with the intake manifold.

(c) Hand start all bolts.

(d) Tighten the bolts, in sequence (Fig. 8), as follows:



**Fig. 8 Plenum Pan Bolt Tightening Sequence**

- Step 1—Tighten bolts to 2.7 N·m (24 in. lbs.) torque.
- Step 2—Tighten bolts to 5.4 N·m (48 in. lbs.) torque.
- Step 3—Tighten bolts to 9.5 N·m (84 in. lbs.) torque.
- Step 4—Check that all bolts are tighten to 9.5 N·m (84 in. lbs.) torque.

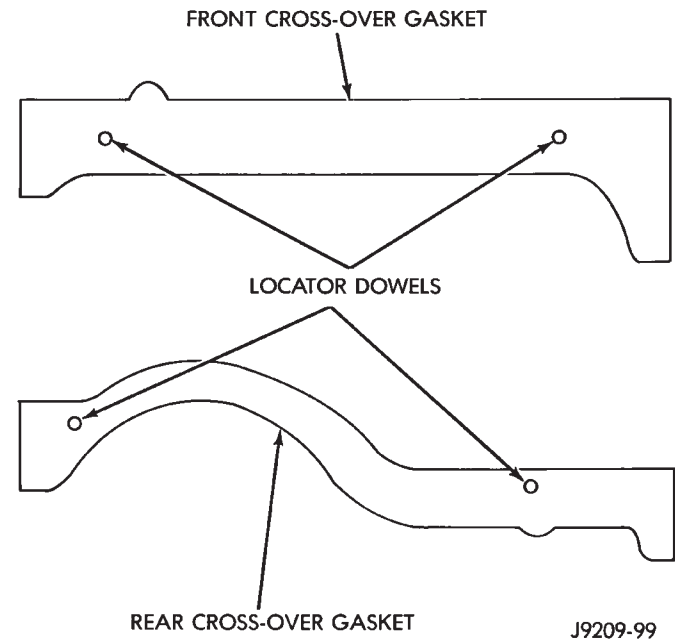
(2) Using a new gasket, install the throttle body onto the intake manifold. Tighten the bolts to 23 N·m (200 in. lbs.) torque.

(3) Place the 4 plastic locator dowels into the holes in the block Fig. 9).

(4) Apply Mopar® Silicone Rubber Adhesive Sealant, or equivalent, to the four corner joints. An excessive amount of sealant is not required to ensure a leak proof seal. However, an excessive amount of sealant may reduce the effectiveness of the flange

gasket. The sealant should be slightly higher than the cross-over gaskets, approx. 5 mm (0.2 in).

(5) Install the front and rear cross-over gaskets onto the dowels (Fig. 9).



**Fig. 9 Cross-Over Gaskets and Locator Dowels**

(6) Install the flange gaskets. Ensure that the vertical port alignment tab is resting on the deck face of the block. Also the horizontal alignment tabs must be in position with the mating cylinder head gasket tabs (Fig. 10). The words MANIFOLD SIDE should be visible on the center of each flange gasket.

(7) Carefully lower intake manifold into position on the cylinder block and cylinder heads. Use the alignment dowels in the cross-over gaskets to position the intake manifold. After intake manifold is in place, inspect to make sure seals are in place.

(8) The following torque sequence duplicates the expected results of the automated assembly system (Fig. 11).

- Step 1—Tighten bolts 1 through 4, in sequence, to 8 N·m (72 in. lbs.) torque. Tighten in alternating steps 1.4 N·m (12 in. lbs.) torque at a time.
- Step 2—Tighten bolts 5 through 12, in sequence, to 8 N·m (72 in. lbs.) torque.
- Step 3—Check that all bolts are tighten to 8 N·m (72 in. lbs.) torque.
- Step 4—Tighten all bolts, in sequence, to 16 N·m (12 ft. lbs.) torque.
- Step 5—Check that all bolts are tighten to 16 N·m (12 ft. lbs.) torque.

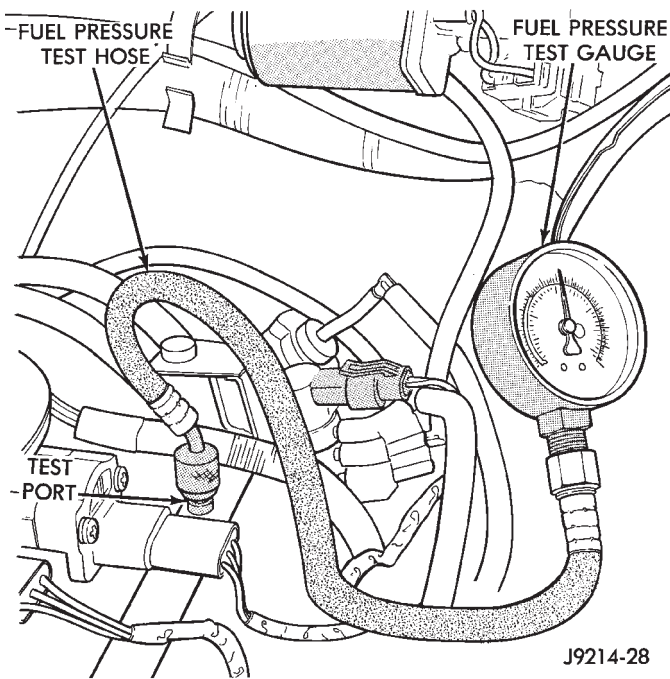
(9) Install closed crankcase ventilation and evaporation control systems.

(10) Install the coil wires.

(11) Connect the heat indicator sending unit wire.

(12) Connect the heater hoses and bypass hose.

(13) Install distributor cap and wires.



**Fig. 8 Typical Fuel Pressure Test Connection**

(1) Release the fuel system pressure from fuel system. Refer to the previous Fuel System Pressure Release Procedure in this group.

(2) Disconnect the fuel supply line at the fuel rail. Refer to Fuel Tubes/Lines/Hoses and Clamps in this section of the group for procedures.

(3) Connect Fuel Line Pressure Test Adapter Tool number 6631 (3/8 in.) into the disconnected fuel supply line. Insert the other end of tool 6631 into an approved gasoline container.

(4) To activate the fuel pump and pressurize the system, obtain the DRB scan tool. Refer to the appropriate Powertrain Diagnostic Procedures service manual for DRB operation.

(5) A good fuel pump will deliver at least 1 liter of fuel per minute.

## FUEL PRESSURE LEAK DOWN TEST

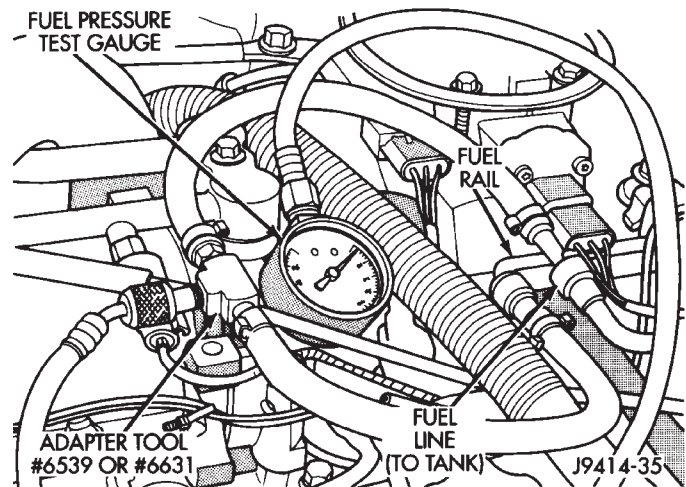
### ENGINE OFF

Abnormally long periods of cranking to restart a hot engine that has been shut down for a short period of time may be caused by:

- Fuel pressure bleeding past a fuel injector(s).
- Fuel pressure bleeding past the check valve in the fuel pump module.

(1) Disconnect the fuel inlet line at fuel rail. Refer to Fuel Tubes/Lines/Hoses and Clamps in this section of the group for procedures.

(2) Connect Fuel Line Pressure Test Adapter Tool number 6539 (5/16 in.), or Adapter Tool number 6631 (3/8 in.) between the disconnected fuel line and fuel rail (Fig. 9).



**Fig. 9 Connecting Adapter Tool—Typical**

(3) Connect the 0-414 kPa (0-60 psi) fuel pressure test gauge (from Gauge Set 5069) to the test port on either tool 6631 or 6539. **The fittings on both tools must be in good condition and free from any small leaks before performing the proceeding test.**

(4) Start engine and bring to normal operating temperature.

(5) Observe test gauge. Normal operating pressure at the fuel rail test port should be 255-283 kPa (39 psi  $\pm$  2 psi).

(6) Shut engine off.

(7) Pressure should not fall below 24 psi for five minutes.

(8) If pressure falls below 24 psi, it must determined if a fuel injector, the fuel module mounted fuel pressure regulator or a fuel tube/line is leaking.

(9) Again, start engine and bring to normal operating temperature.

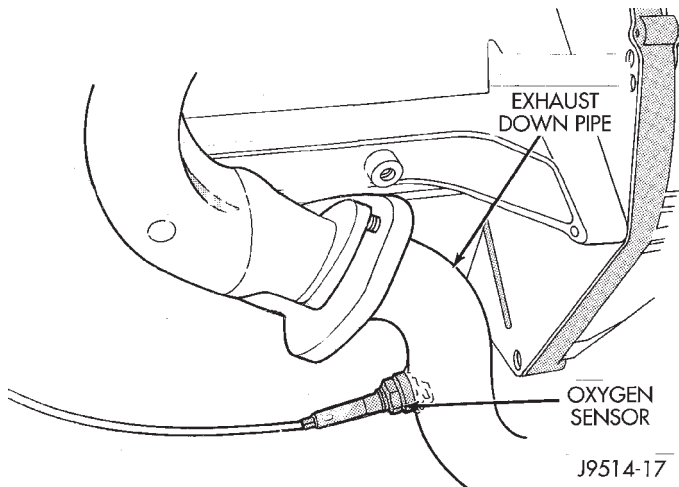
(10) Shut engine off.

(11) **Checking for fuel injector leakage:** Clamp off the rubber hose portion of either tool 6539 or 6631 between the disconnected fuel tube (line) and test port inlet. If pressure now holds at or above 24 psi, a fuel injector or the fuel rail is leaking.

**Checking for fuel pump module or fuel tube leakage:** Clamp off the rubber hose portion of either tool 6539 or 6631 between the fuel rail and test port inlet. If pressure now holds at or above 24 psi, a leak can be found at a fuel tube/line. If no leaks are found at fuel tubes or lines, replace the fuel pump module.

### MECHANICAL MALFUNCTIONS

Mechanical malfunctions are more difficult to diagnose with this system. The powertrain control module (PCM) has been programmed to compensate for some mechanical malfunctions such as incorrect cam timing, vacuum leaks, etc. If engine performance problems are encountered and diagnostic trouble



**Fig. 9 Heated Oxygen Sensor Location**

### POWER GROUND

The power ground is used to control ground circuits for the following powertrain control module (PCM) loads:

- Generator Field Winding
- 8 volt (PCM) power supply
- Fuel Injectors
- Ignition Coil

### SCI RECEIVE—PCM INPUT

SCI Receive is the serial data communication receive circuit for the DRB scan tool. The powertrain control module (PCM) receives data from the DRB through the SCI Receive circuit.

### SPEED CONTROL—PCM INPUT

The speed control system provides three separate inputs to the powertrain control module (PCM); On/Off, Set and Resume. The On/Off input informs the PCM that the speed control system has been activated. The Set input informs the PCM that a fixed vehicle speed has been selected. The Resume input indicates to the PCM that the previous fixed speed is requested.

The speed control operating range is from 50 km/h to 142 km/h (35 to 85 mph). Inputs that effect speed control operation are:

- Brake switch position
- Park/neutral switch
- Vehicle speed sensor
- Throttle position sensor

Refer to Group 8H for further speed control information.

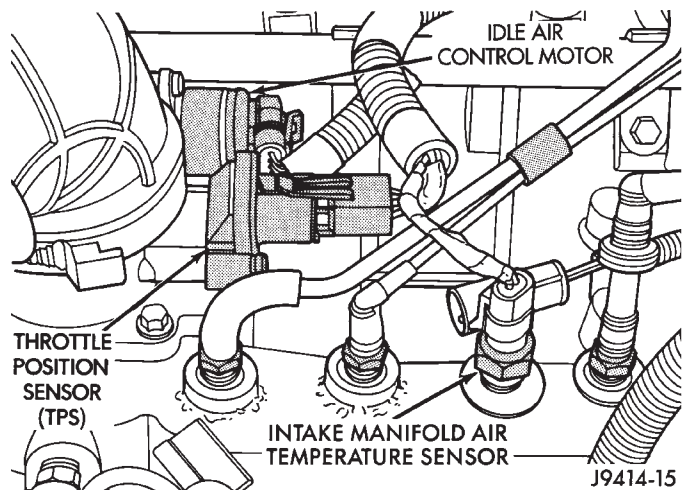
### SENSOR RETURN—PCM INPUT

Sensor Return provides a low noise ground reference for all system sensors.

### THROTTLE POSITION SENSOR (TPS)—PCM INPUT

The throttle position sensor (TPS) is mounted on the throttle body (Fig. 10). The TPS is a variable resistor that provides the powertrain control module (PCM) with an input signal (voltage) that represents throttle blade position. The sensor is connected to the throttle blade shaft. As the position of the throttle blade changes, the resistance of the TPS changes.

The PCM supplies approximately 5 volts to the TPS. The TPS output voltage (input signal to the PCM) represents the throttle blade position. The PCM receives an input signal voltage from the TPS. This will vary in an approximate range of from 1 volt at minimum throttle opening (idle), to 4 volts at wide open throttle. Along with inputs from other sensors, the PCM uses the TPS input to determine current engine operating conditions. In response to engine operating conditions, the PCM will adjust fuel injector pulse width and ignition timing.



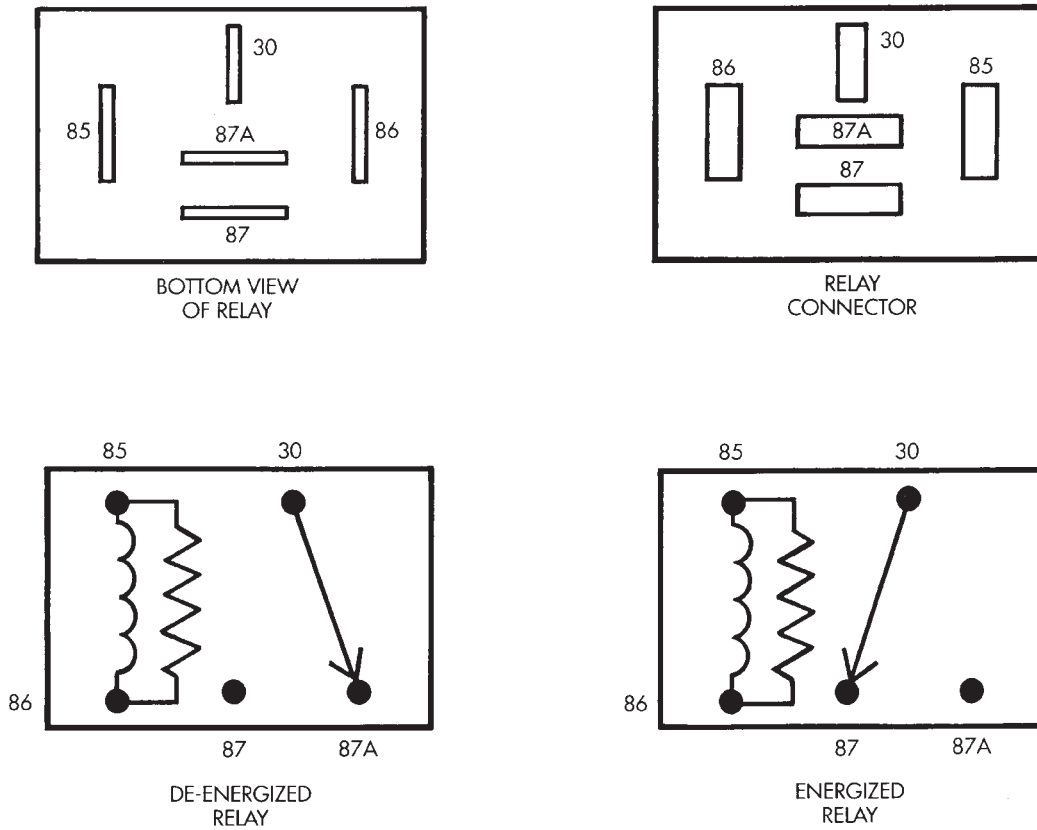
**Fig. 10 Throttle Position Sensor and IAC Motor**

### VEHICLE SPEED SENSOR—PCM INPUT

The speed sensor (Fig. 11) is located in the extension housing of the transmission (2WD) or on the transfer case extension housing (4WD). The sensor input is used by the powertrain control module (PCM) to determine vehicle speed and distance traveled.

The speed sensor generates 8 pulses per sensor revolution. These signals, in conjunction with a closed throttle signal from the throttle position sensor, indicate a closed throttle deceleration to the PCM. When the vehicle is stopped at idle, a closed throttle signal is received by the PCM (but a speed sensor signal is not received).

Under deceleration conditions, the PCM adjusts the idle air control (IAC) motor to maintain a desired MAP value. Under idle conditions, the PCM adjusts the IAC motor to maintain a desired engine speed.



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**Fig. 24 Relay Terminals**

ate Powertrain Diagnostics Procedures manual. To test the injector only, refer to the following:

Disconnect the injector wire connector from the injector. Place an ohmmeter on the injector terminals. Resistance reading should be approximately 14.5 ohms  $\pm$  1.2 ohms at 20°C (68°F). Proceed to following Injector Diagnosis chart. **When performing the following tests from the chart, do not leave electrical current applied to the injector for longer than five seconds. Damage to injector coil or internal injector seals could result.**

**FUEL SYSTEM PRESSURE TEST**

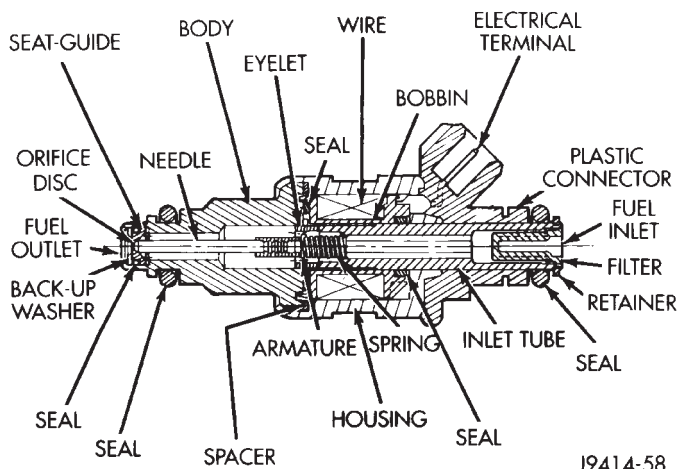
Refer to the Fuel Delivery System section of this group.

**ON-BOARD DIAGNOSTICS (OBD)**

The powertrain control module (PCM) has been programmed to monitor many different circuits of the fuel injection system. If a problem is sensed in a monitored circuit often enough to indicate an actual problem, a Diagnostic Trouble Code (DTC) is stored. The DTC will be stored in the PCM memory for eventual display to the service technician. If the problem is repaired or ceases to exist, the PCM cancels the DTC after 51 engine starts.

Certain criteria must be met for a diagnostic trouble code (DTC) to be entered into PCM memory. The criteria may be a specific range of engine rpm, engine temperature and/or input voltage to the PCM.

It is possible that a DTC for a monitored circuit may not be entered into memory even though a malfunction has occurred. This may happen because one of the DTC criteria for the circuit has not been met. Example: assume that one of the criteria for the MAP sensor circuit is that the engine must be operating between 750 and 2000 rpm to be monitored for a DTC. If the MAP sensor output circuit shorts to ground when the engine rpm is above 2400 rpm, a 0 volt input will be seen by the PCM. A DTC will not



J9414-58

**Fig. 25 Fuel Injector Internal Components—Typical**

charges when the PCM supplies a ground. By switching the ground path on and off, the PCM regulates ignition timing.

The sensors and switches that provide inputs to the powertrain control module (PCM) comprise the Engine Control System. It is also comprised of the PCM Outputs (engine control devices that are operated by the PCM).

#### SYSTEM DIAGNOSIS

The powertrain control module (PCM) tests many of its own input and output circuits. If a Diagnostic Trouble Code (DTC) is found in a major system, this information is stored in the PCM memory. Refer to On-Board Diagnostics in the Multi-Port Fuel Injection—General Diagnosis—5.2L Engine section of this group for DTC information.

#### POWERTRAIN CONTROL MODULE (PCM)

The powertrain control module (PCM) (Fig. 1) operates the fuel system. The PCM was formerly referred to as the SBEC or engine controller. The PCM is a pre-programmed, dual microprocessor digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, speed control, air conditioning compressor clutch engagement and idle speed. The PCM can adapt its programming to meet changing operating conditions.

The PCM receives input signals from various switches and sensors. Based on these inputs, the PCM regulates various engine and vehicle operations through different system components. These components are referred to as Powertrain Control Module (PCM) Outputs. The sensors and switches that provide inputs to the PCM are considered Powertrain Control Module (PCM) Inputs.

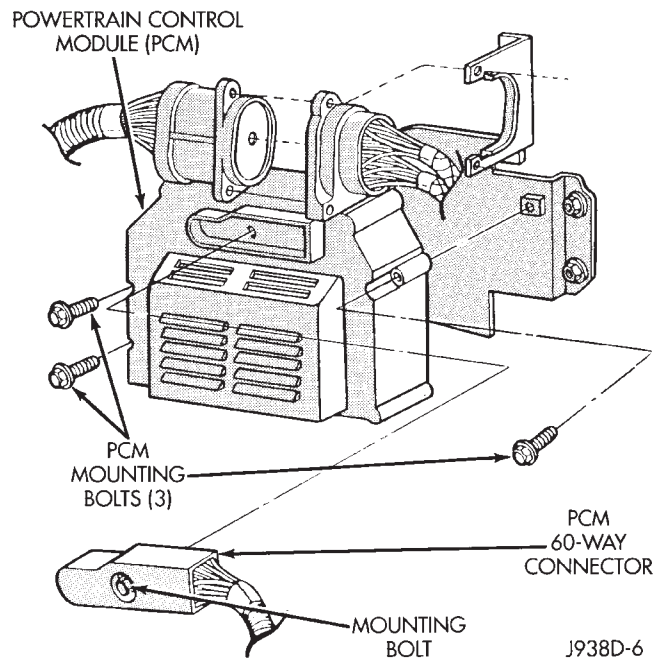
The PCM adjusts ignition timing based upon inputs it receives from sensors that react to: engine rpm, manifold absolute pressure, engine coolant temperature, throttle position, transmission gear selection (automatic transmission), vehicle speed and the brake switch.

The PCM adjusts idle speed based on inputs it receives from sensors that react to: throttle position, vehicle speed, transmission gear selection, engine coolant temperature and from inputs it receives from the air conditioning clutch switch and brake switch.

Based on inputs that it receives, the PCM adjusts ignition coil dwell. The PCM also adjusts the generator charge rate through control of the generator field and provides speed control operation.

##### Powertrain Control Module (PCM) Inputs:

- Generator output
- A/C request (if equipped with factory A/C)
- A/C select (if equipped with factory A/C)
- Auto shutdown (ASD) sense
- Intake manifold air temperature sensor
- Battery voltage

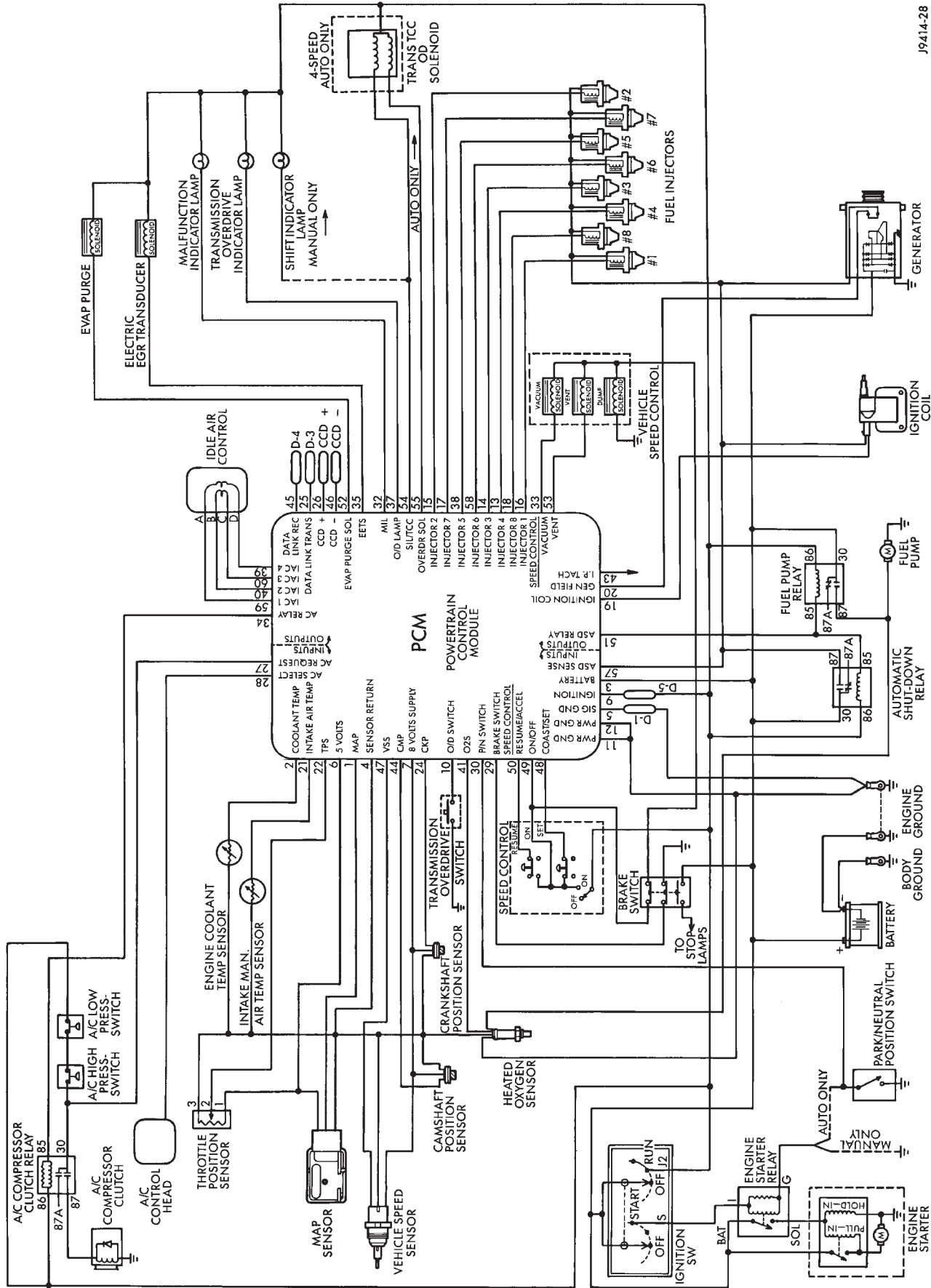


**Fig. 1 Powertrain Control Module (PCM) Location**

- Brake switch
- Engine coolant temperature sensor
- Crankshaft position sensor
- Ignition circuit sense (ignition switch in run position)
- Manifold absolute pressure sensor
- Overdrive/override switch
- Oxygen sensor
- Park/neutral switch (auto. trans. only)
- SCI receive (DRB scan tool connection)
- Speed control resume switch
- Speed control set switch
- Speed control on/off switch
- Camshaft position sensor signal
- Throttle position sensor
- Vehicle speed sensor
- Sensor return
- Power ground
- Signal ground

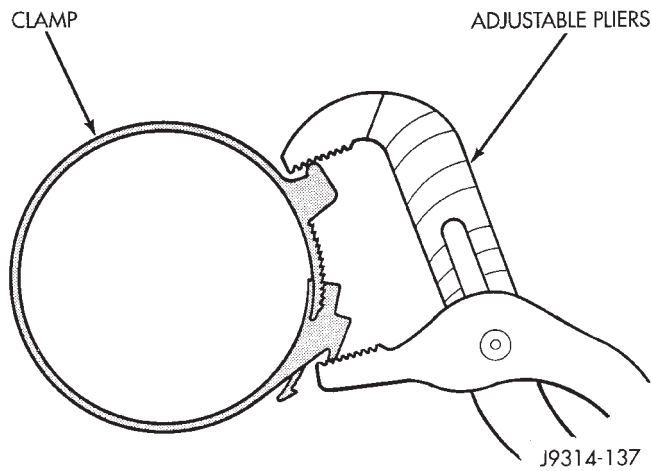
##### Powertrain Control Module (PCM) Outputs:

- A/C clutch relay
- Idle air control (IAC) motor
- Auto shutdown (ASD) relay
- Generator field
- Malfunction indicator lamp (Check engine lamp)
- EGR valve control solenoid
- Fuel injectors
- Fuel pump relay
- Ignition coil
- EVAP canister purge solenoid
- SCI transmit (DRB scan tool connection)
- Shift indicator lamp (manual transmission only)
- Speed control vacuum solenoid
- Speed control vent solenoid

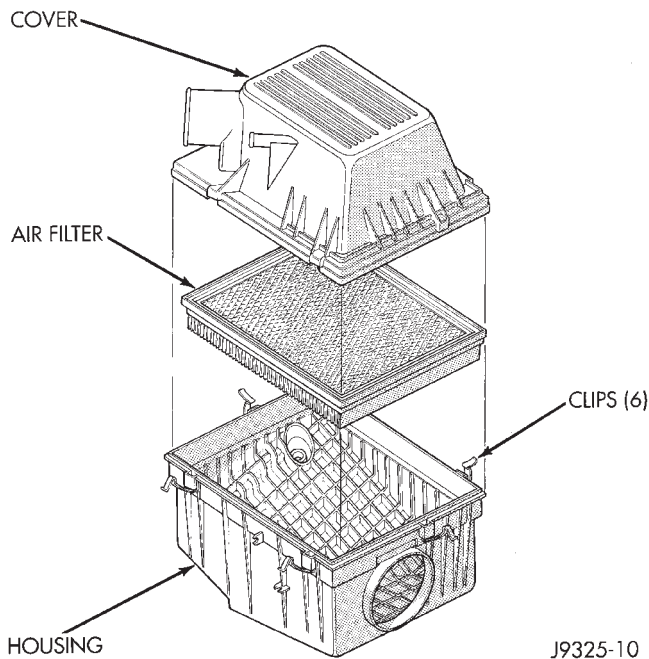


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Fig. 11 System Schematic—5.2L Engine



**Fig. 3 Clamp Installation**



**Fig. 4 Typical Air Cleaner Element Removal/Installation**

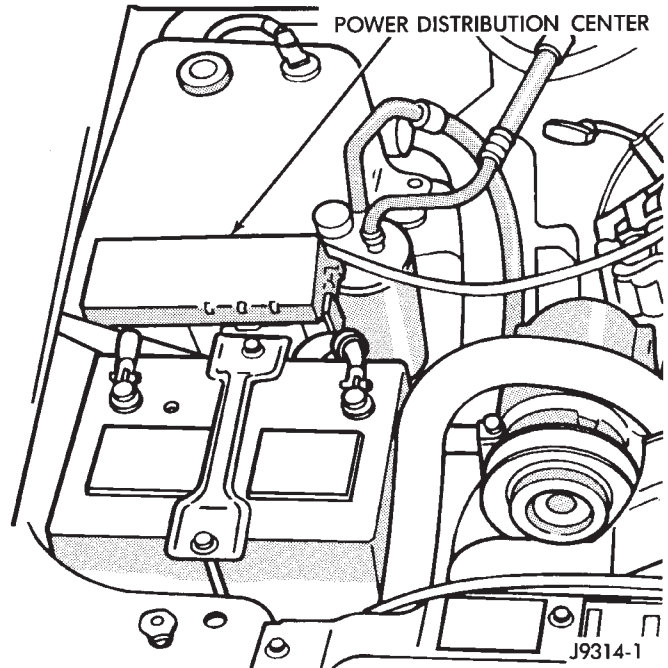
- (2) Lift the cover up and position to the side.
- (3) Remove air cleaner element.
- (4) Clean the inside of air cleaner housing before installing new element.
- (5) Reverse the preceding operation for installation. Be sure the air cleaner cover is properly seated to air cleaner housing.

**ACCELERATOR PEDAL AND THROTTLE CABLE**

Refer to the Accelerator Pedal and Throttle Cable section of this group for removal/installation procedures.

**AIR CONDITIONING (A/C) CLUTCH RELAY**

The A/C clutch relay is located in the power distribution center (PDC) (Fig. 5). For location of this relay within the PDC, refer to label attached to bottom of PDC cover.



**Fig. 5 Power Distribution Center (PDC)**

**AUTOMATIC SHUTDOWN (ASD) RELAY**

The ASD relay is located in the power distribution center (Fig. 5) (PDC). For location of this relay within the PDC, refer to label attached to bottom of PDC cover.

**BRAKE SWITCH**

Refer to Group 5, Brakes for removal/installation procedures.

**CAMSHAFT POSITION SENSOR**

For removal/installation procedures, refer to Group 8D, Ignition System. See Camshaft Position Sensor.

**INTAKE MANIFOLD AIR TEMPERATURE SENSOR**

The intake manifold air temperature sensor is located in the front/side of the intake manifold (Fig. 6).

**REMOVAL**

- (1) Remove air cleaner assembly.
- (2) Disconnect electrical connector at sensor (Fig. 6).
- (3) Remove sensor from intake manifold.

**INSTALLATION**

- (1) Install sensor to intake manifold. Tighten to 28 N·m (20 ft. lbs.) torque.
- (2) Install electrical connector.
- (3) Install air cleaner.

Ideally the driveline system should have:

- **Angles that are equal or opposite within 1 degree of each other**
- **Have a 3 degree maximum operating angle**
- **Have at least a 1/2 degree continuous operating (propeller shaft) angle**

Engine speed (R.P.M.) is the main factor in determining maximum allowable operating angles. As a guide to maximum normal operating angles refer to the chart listed (Fig. 4).

PROPELLER SHAFT R.P.M.	MAX. NORMAL OPERATING ANGLES
5000	3°
4500	3°
4000	4°
3500	5°
3000	5°
2500	7°
2000	8°
1500	11°

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**Fig. 4 Maximum Angles and R.P.M.**

#### INSPECTION

**Before measuring universal joint angles, the following must be done.**

- Inflate all tires to correct pressure.
- **Check angles in the same loaded or unloaded condition as when the vibration occurred. Prop shaft angles will change according to the amount of load in the vehicle. Always check angles in loaded and unloaded conditions.**
- Check the condition of all suspension springs and verify all fasteners are torqued to specifications.
- Check the condition of the engine and transmission mounts. Verify all fasteners are torqued to specifications.

#### MEASUREMENT

To accurately check driveline alignment, raise and support the vehicle at the axles as level as possible. Allow the wheels and propeller shaft to turn. Remove snap rings from universal joint so Inclinometer 7663 (J-23498A) base sits flat on cap.

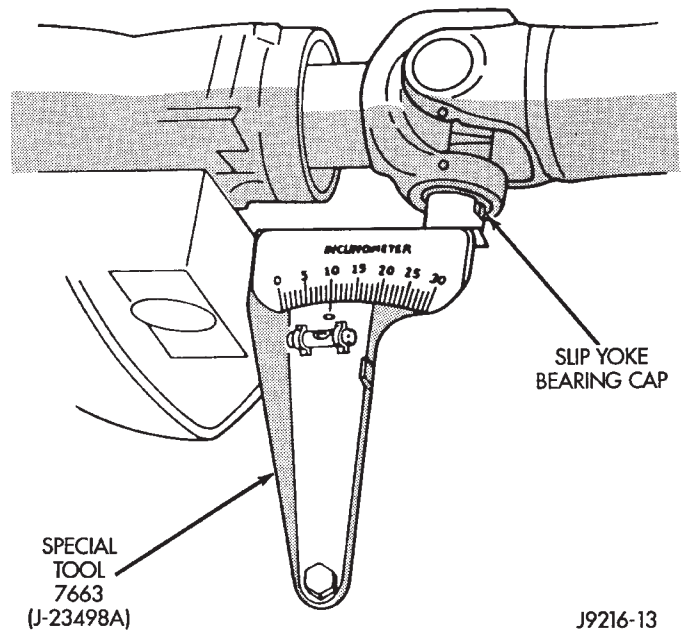
(1) Rotate the shaft until transmission/transmission case output yoke bearing is facing downward.

**Always make measurements from front to rear.**

(2) Place Inclinometer on yoke bearing (A) parallel to the shaft (Fig. 5). Center bubble in sight glass and record measurement.

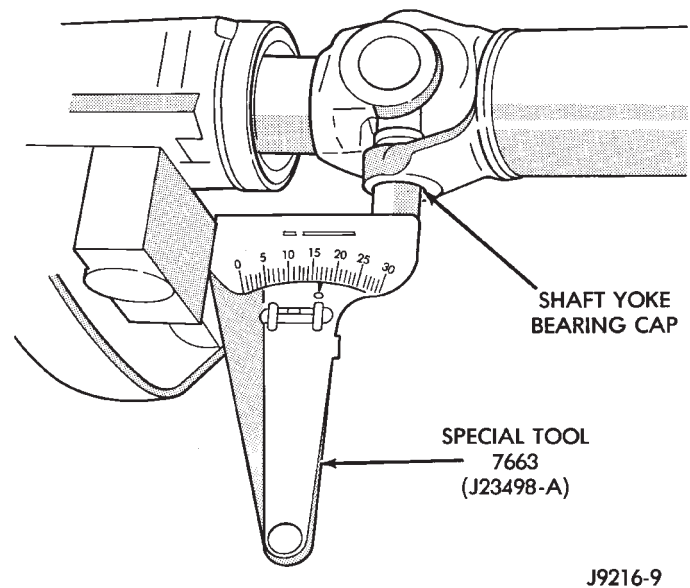
This measurement will give you the transmission or OUTPUT YOKE ANGLE (A).

(3) Rotate propeller shaft 90 degrees. Place Inclinometer on yoke bearing parallel to the shaft (Fig. 6). Center bubble in sight glass and record measurement.



**Fig. 5 Front (Output) Angle Measurement (A)**

This measurement will give you the PROPELLER SHAFT ANGLE (C).



**Fig. 6 Propeller Shaft Angle Measurement (C)**

(4) Subtract smaller figure from larger (C minus A) to obtain transmission OUTPUT OPERATING ANGLE.

(5) Rotate propeller shaft 90 degrees and place Inclinometer on pinion yoke bearing parallel to the shaft (Fig. 7). Center bubble in sight glass and record measurement.

This measurement will give you the pinion shaft or INPUT YOKE ANGLE (B).

(6) Subtract smaller figure from larger (C minus B) to obtain axle INPUT OPERATING ANGLE.

## POWER STEERING SYSTEM DIAGNOSIS

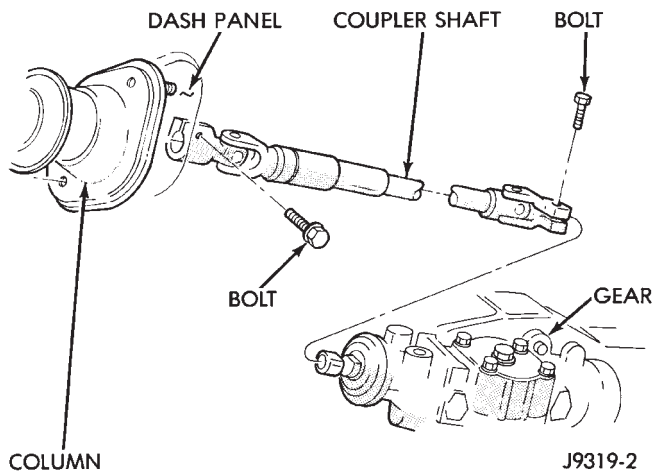
**BINDS STICKS SEIZED**

CONDITION	POSSIBLE CAUSES	CORRECTION
CATCHES, STICKS IN CERTAIN POSITIONS OR DIFFICULT TO TURN	<ol style="list-style-type: none"> <li>1. Low fluid level.</li> <li>2. Tires not properly inflated.</li> <li>3. Lack of lube in ball joints.</li> <li>4. Lack of lube in outer tie rod ends.</li> <li>5. Loose pump belt.</li> <li>6. Faulty pump flow control (Verify cause using Pump Test Procedure).</li> <li>7. Excessive friction in steering column or intermediate shaft.</li> <li>8. Steering column coupling binding.</li> <li>9. Binding upper strut bearing.</li> <li>10. Excessive friction in steering gear.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill to proper level and perform leakage diagnosis.</li> <li>2. Inflate tires to proper pressure.</li> <li>3. Lubricate where possible.</li> <li>4. Lubricate where possible.</li> <li>5. Tighten or replace belt.</li> <li>6. Replace pump.</li> <li>7. Correct condition. (See Steering Column Service Procedure.)</li> <li>8. Realign as necessary.</li> <li>9. Correct binding condition.</li> <li>10. Replace steering gear.</li> </ol>

**SHAKE SHUDDER VIBRATION**

CONDITION	POSSIBLE CAUSES	CORRECTION
VIBRATION OF THE STEERING WHEEL AND/OR DASH DURING DRY PARK OR LOW SPEED STEERING MANEUVERS	<ol style="list-style-type: none"> <li>1. Air in the power steering system.</li> <li>2. Tires not properly inflated.</li> <li>3. Excessive engine vibration.</li> <li>4. Loose tie rod end.</li> <li>5. Overcharged air conditioning system.</li> </ol>	<ol style="list-style-type: none"> <li>1. Steering shudder can be expected in new vehicles and vehicles with recent steering system repairs. Shudder should improve after the vehicle has been driven several weeks.</li> <li>2. Inflate tires to proper pressure.</li> <li>3. Make sure that engine is running properly.</li> <li>4. Check inner and outer tie rod and jam nut for excessive free play.</li> <li>5. Check air conditioning pump head pressure. (See Air Conditioning Refrigerant System Diagnosis).</li> </ol>

(3) Remove the shaft pinch bolt at the steering gear and column (Fig. 5). Unbolt steering gear from frame rail to remove shaft. Refer to Steering Gear Replacement in this section.



**Fig. 5 Coupling Shaft**

#### INSTALLATION

- (1) Align the intermediate (coupling) shaft to the steering gear and column.
- (2) Position the steering gear on the frame. Refer to Steering Gear Replacement in this section.
- (3) Install and tighten the pinch bolts to 45 N·m (33 ft. lbs.) torque.
- (4) Install the intermediate (coupling) shaft stone shield.

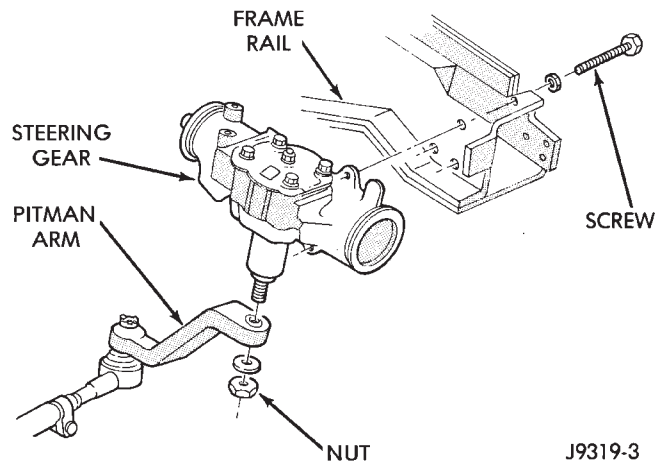
#### STEERING GEAR REPLACEMENT

##### REMOVAL

- (1) Place the front wheels in the straight ahead position with the steering wheel centered.
- (2) Disconnect and cap the fluid hoses from steering gear. Refer to Pressure and Return Hose Replacement in this group.
- (3) Remove the column coupler shaft from the gear. Refer to the removal procedures in this section.
- (4) Remove pitman arm from gear. Refer to Pitman Arm Removal in the Steering Linkage section.
- (5) Remove the steering gear retaining bolts and nuts. Remove the steering gear from the vehicle (Fig. 6).

##### INSTALLATION

- (1) Align the column coupler shaft to steering gear. Refer to Column Coupler installation in this section.
- (2) Position the steering gear on the frame rail and install the bolts. Tighten the bolts to 88 N·m (65 ft. lbs.) torque.
- (3) Align and install the pitman arm. Refer to Pitman Arm Installation in the Steering Linkage section.
- (4) Connect fluid hoses to steering gear. Refer to Pressure and Return Hose Replacement in this group.



**Fig. 6 Steering Gear Mounting**

#### STEERING GEAR ADJUSTMENTS

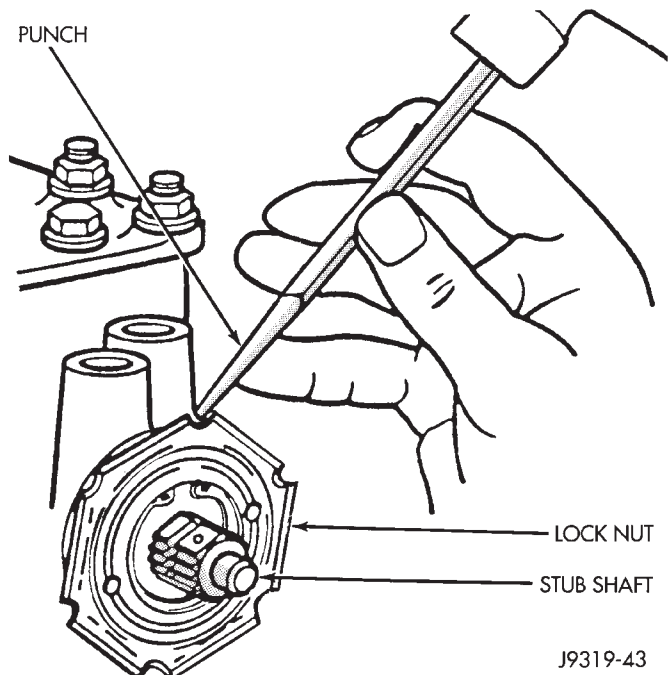
##### SERVICE INFORMATION

Adjusting the steering gear in the vehicle is **NOT** recommended. Remove the gear from the vehicle and mount in a vise. Drain the power steering fluid and make the following adjustments in this order:

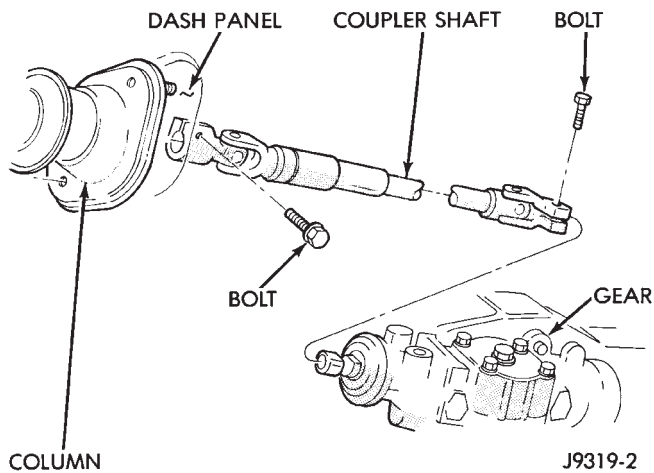
- FIRST - worm thrust bearing preload
- SECOND - over-center preload adjustment

##### WORM THRUST BEARING PRELOAD ADJUSTMENT

- (1) Remove adjuster plug locknut (Fig. 7).

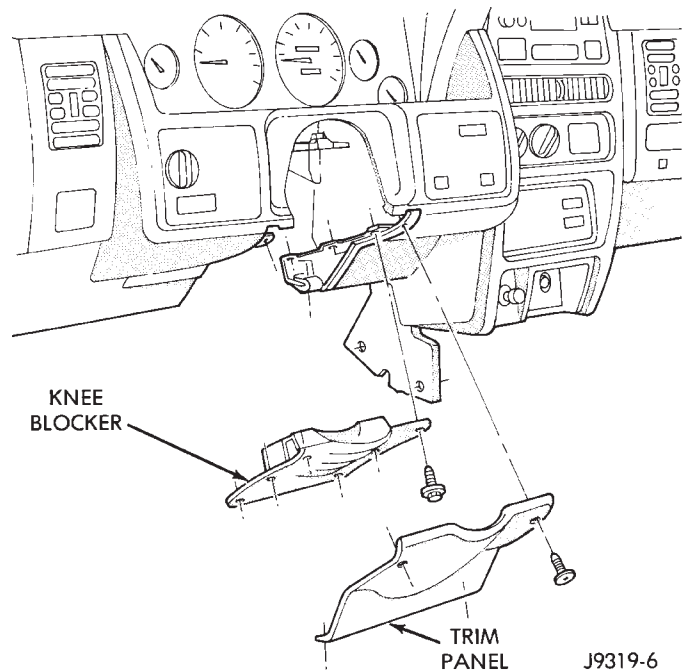


**Fig. 7 Loosening the Adjuster Plug Locknut**



**Fig. 5 Column Coupler Shaft**

- (7) Remove the upper and lower lock housing shrouds (Fig. 1).
- (8) Remove the heater cross over tube from under the column.
- (9) Loosen the panel bracket nuts/studs to allow the column to drop.
- (10) Remove the wiring harness from steering column (Fig. 7).
- (11) Remove the Interlock cable from the steering column. Refer to Automatic Transmission Shifter/Ignition Interlock in this group.
- (12) Remove the toe plate to dash panel nuts (Fig. 1).
- (13) Remove the panel bracket nuts/studs and remove the column. Use care to avoid damaging the paint or trim.

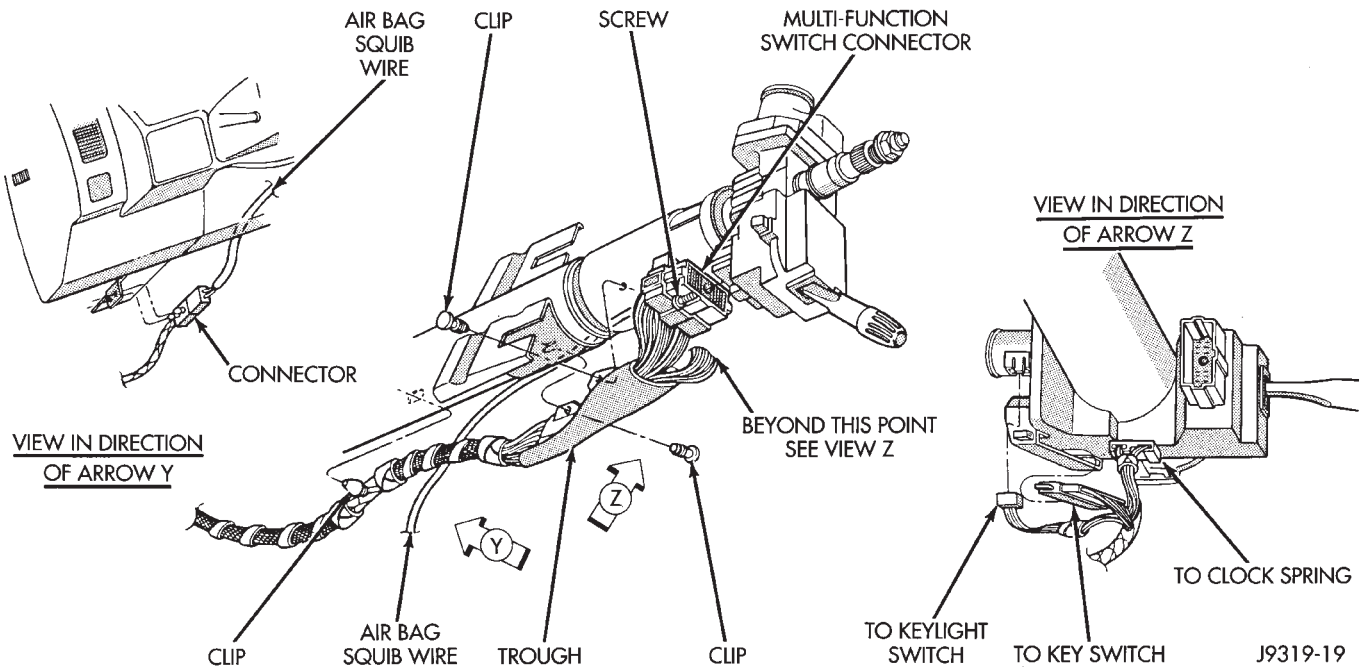


**Fig. 6 Trim Panel Column Cover**

**INSTALLATION**

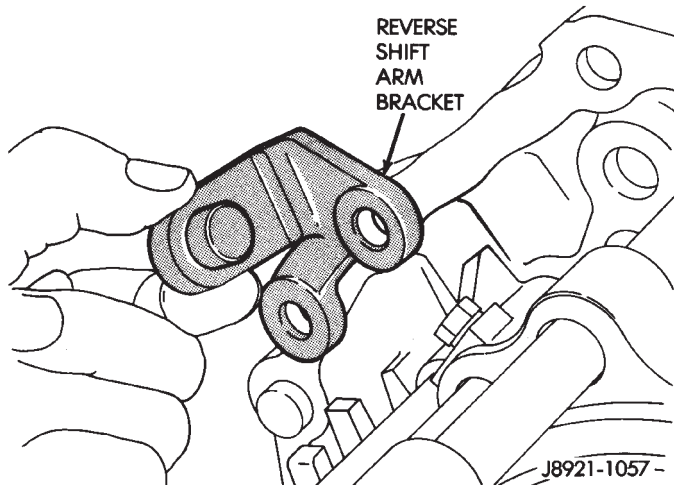
**CAUTION:** Bumping, jolting and hammering on the steering column shaft and gear shift tube must be avoided during all service procedures.

- (1) With the front wheels in the straight ahead position. Align and install the column to coupler. **Do not apply force at the top of the steering column shaft.**



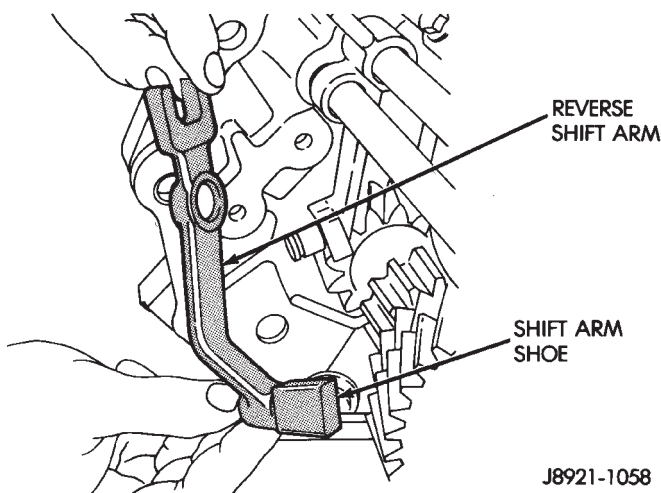
**Fig. 7 Steering Column Wiring Harness**

(6) Remove bolts attaching reverse shift arm bracket to intermediate plate. Then remove bracket (Fig. 27).



**Fig. 27 Reverse Shift Arm Bracket Removal**

(7) Remove reverse shift arm and shoe (Fig. 28).



**Fig. 28 Reverse Shift Arm And Shoe Removal**

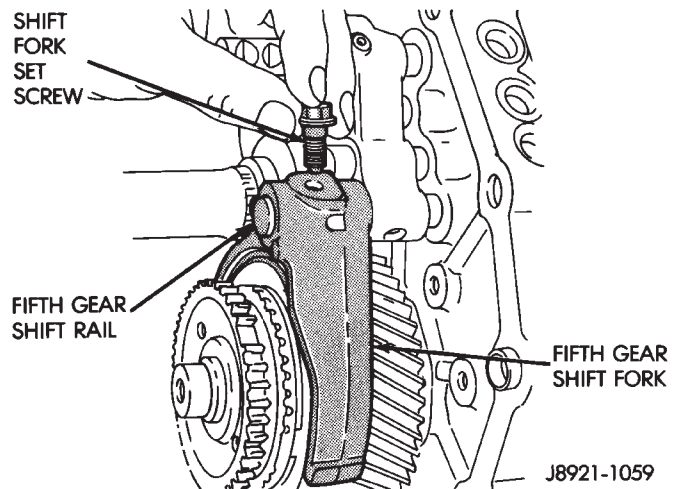
(8) Remove fifth gear shift fork set screw (Fig. 29).

(9) Move fifth gear shift rail forward until it clears shift fork.

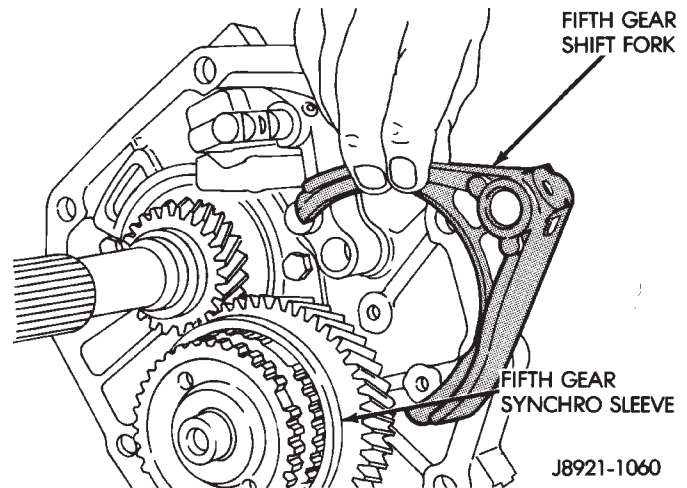
(10) Remove fifth gear shift fork from synchro sleeve (Fig. 30).

(11) Remove reverse shift rail and reverse shift head as assembly (Fig. 31).

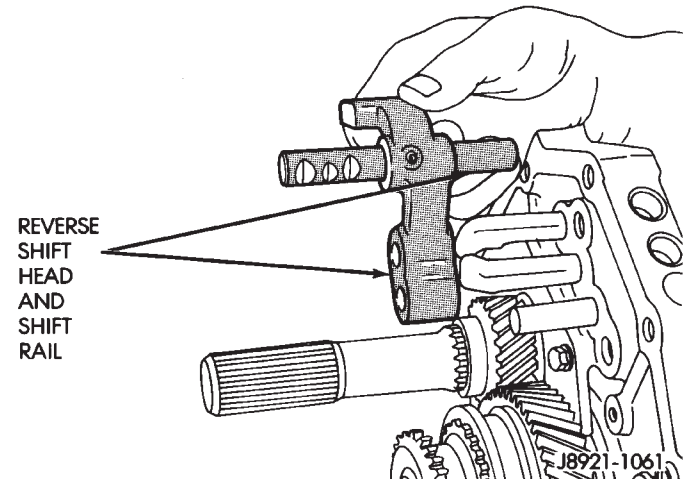
(12) Measure thrust clearance between counter fifth gear and thrust ring with feeler gauge. Clearance should be 0.10 to 0.40 mm (0.003 to 0.019 in.). If clearance exceeds limits, gear and/or ring will have to be replaced.



**Fig. 29 Fifth Gear Fork Set Screw Removal**



**Fig. 30 Fifth Gear Shift Fork Removal**



**Fig. 31 Reverse Shift Head And Rail Removal**

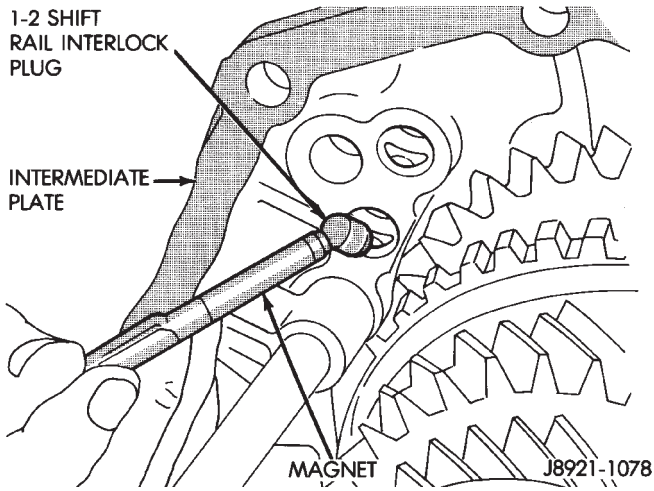


Fig. 90 Installing 1-2 Shift Rail Interlock Plug

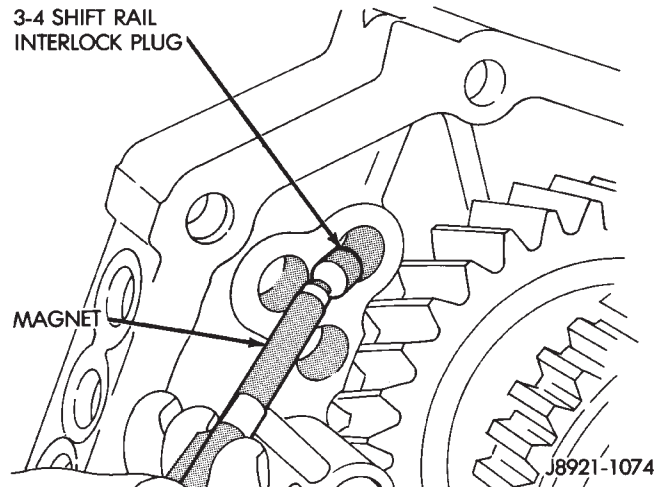


Fig. 93 Installing 3-4 Shift Rail Interlock Plug

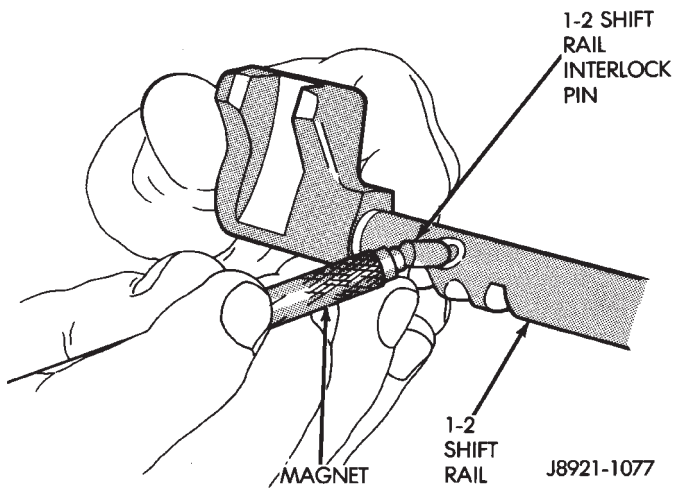


Fig. 91 Installing 1-2 Shift Rail Interlock Pin

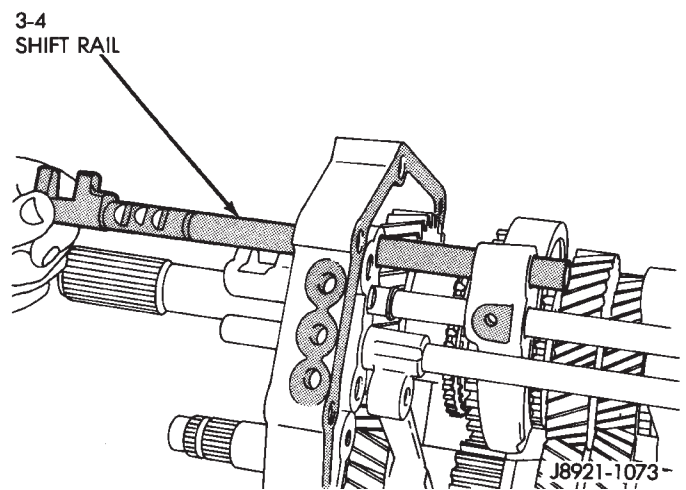


Fig. 94 Installing 3-4 Shift Rail

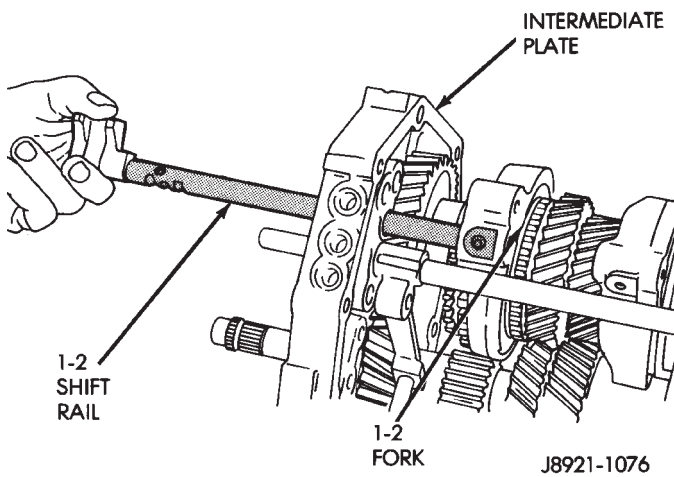


Fig. 92 Installing 1-2 Shift Rail

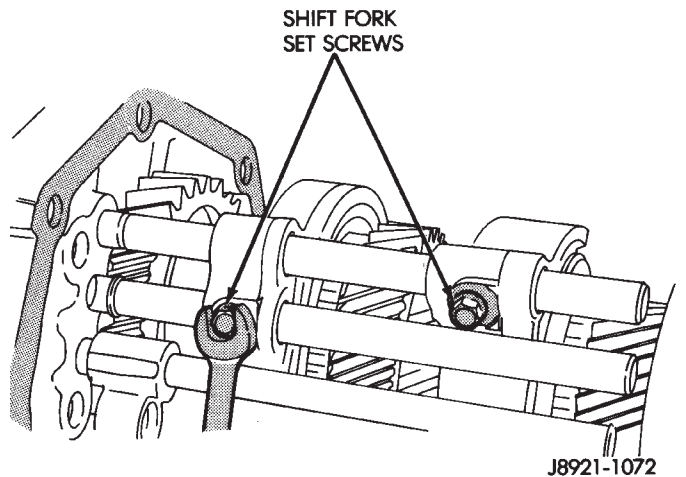


Fig. 95 Installing Shift Fork Set Screws

Switch and solenoid continuity should be checked whenever the transmission fails to shift into fourth gear range.

### DIAGNOSTIC TROUBLE FLASH CODES

Diagnostic trouble flash codes are provided for diagnosis purposes. The lamp in the overdrive off switch is used to signal the various flash codes.

The flash codes and type of fault indicated are outlined in the Flash Code Chart (Fig. 1).

To view flash codes, proceed as follows:

(a) Turn ignition key on and off three times. Then leave overdrive off switch in normal overdrive (on) position.

(b) Immediately begin counting number of flashes displayed by overdrive off switch indicator lamp.

(c) Flash codes will correspond to powertrain control module in duration and spacing.

(d) A code 55 identifies end of flash code transmission

FAULT CODE	FAULT DESCRIPTION
11	Engine RPM input
12	Output shaft sensor input
13	Vehicle speed input
14	Governor pressure sensor input
15	Throttle position sensor input
16	Transmission fluid temperature input
17	Overdrive override (control) switch input
18	System voltage
19	Internal fault in module
21	Governor pressure solenoid output
22	Overdrive solenoid output
23	Converter clutch solenoid output
24	Overdrive override (control switch) lamp output
25	Internal fault in module
26	Governor pressure sensor offset drift
55	End of code transmission

J9321-347

**Fig. 1 42RE DIAGNOSTIC TROUBLE FLASH CODE CHART**

### TRANSMISSION THROTTLE VALVE AND SHIFT CABLES

Transmission throttle cable adjustment is important to proper operation. This adjustment positions

the valve body throttle valve which controls shift speed, quality and part throttle downshift sensitivity.

If cable setting is too short, early shifts and slippage between shifts may occur. If the setting is too long, shifts may be delayed and part throttle downshifts may be very sensitive. Refer to the In-Vehicle Service section for adjustment procedure.

Shift cable adjustment is important because it positions the valve body manual valve. Incorrect adjustment will cause creep in Neutral, premature clutch wear, delayed engagement in all gear ranges, or a no-start in Park or Neutral.

Proper operation of the park/neutral position switch will provide a quick check of linkage adjustment. Refer to the In-Vehicle Service section for linkage adjustment procedure.

### ROAD TESTING

Before road testing, be sure the fluid level and all cable adjustments have been checked and reset if necessary. Observe engine performance during the road test. A poorly tuned engine will not allow an accurate analysis of transmission operation.

Operate the transmission in all gear ranges. Check for shift variations and engine flare, which indicates slippage. Note if shifts are harsh, spongy, delayed, early, or if part throttle downshifts are sensitive.

Slippage indicated by engine flare, usually means clutch, band or overrunning clutch problems. If the condition is advanced, an overhaul may be necessary to restore normal operation.

A slipping clutch or band can often be determined by comparing which internal units are applied in the various gear ranges. The Clutch and Band Application chart (Fig. 2) provides a basis for analyzing road test results.

### ANALYZING THE ROAD TEST

Refer to the Clutch and Band Application chart (Fig. 2) and note which elements are in use in the various gear ranges.

Note that the rear clutch is applied in all forward ranges (D, 2, 1). The transmission overrunning clutch is applied in first gear (D, 2 and 1 ranges) only. The rear band is applied in 1 and R range only.

Note that the overdrive clutch is applied only in fourth gear and the overdrive direct clutch and overrunning clutch are applied in all ranges except fourth gear.





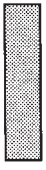
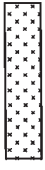

For example: If slippage occurs in first gear in D and 2 range but not in 1 range, the transmission overrunning clutch is faulty. Similarly, if slippage occurs in any two forward gears, the rear clutch is slipping.

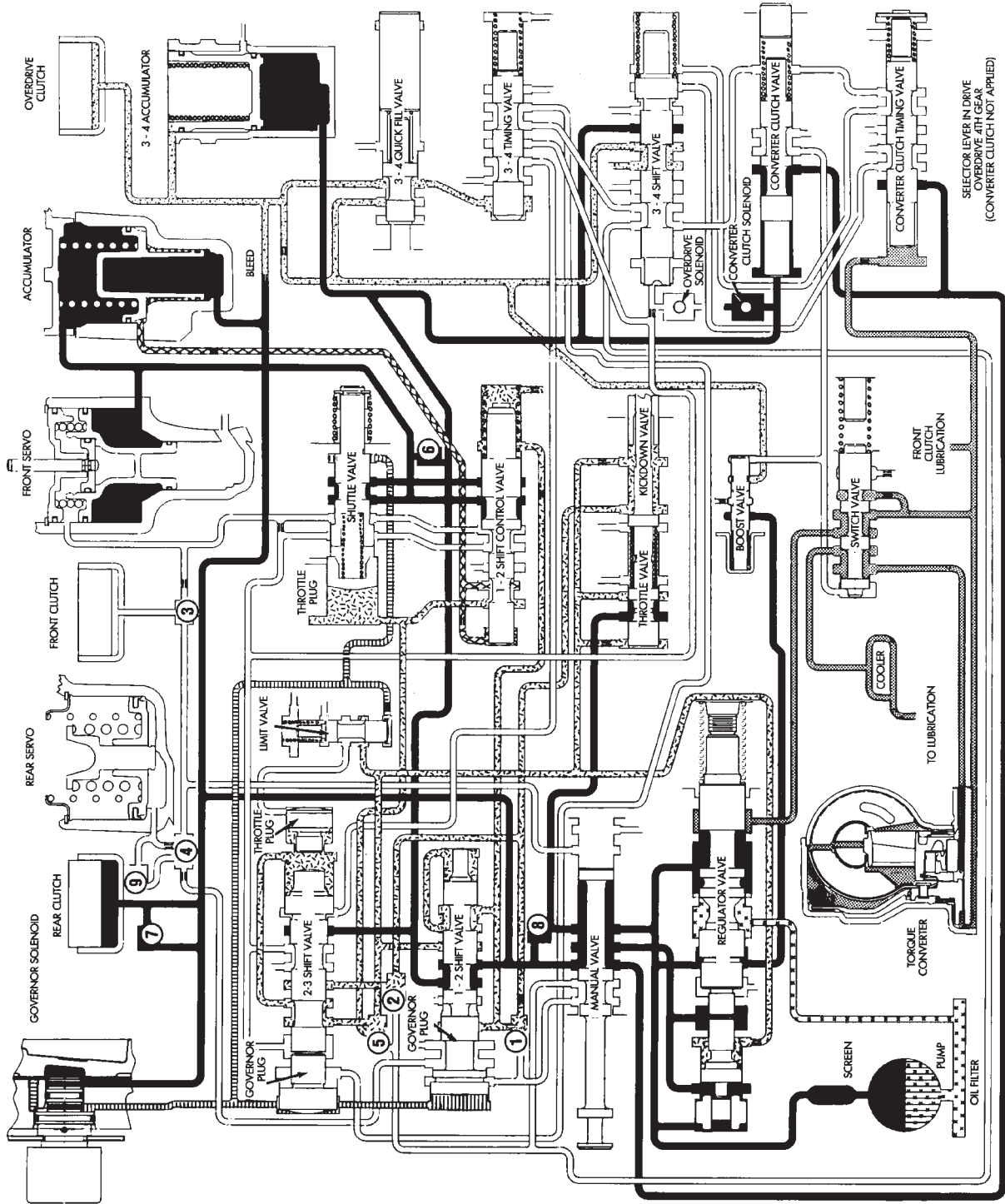
Applying the same method of analysis, note that the front and rear clutches are applied simultaneously only in D range third and fourth gear. If the

## OVERDRIVE DIAGNOSIS

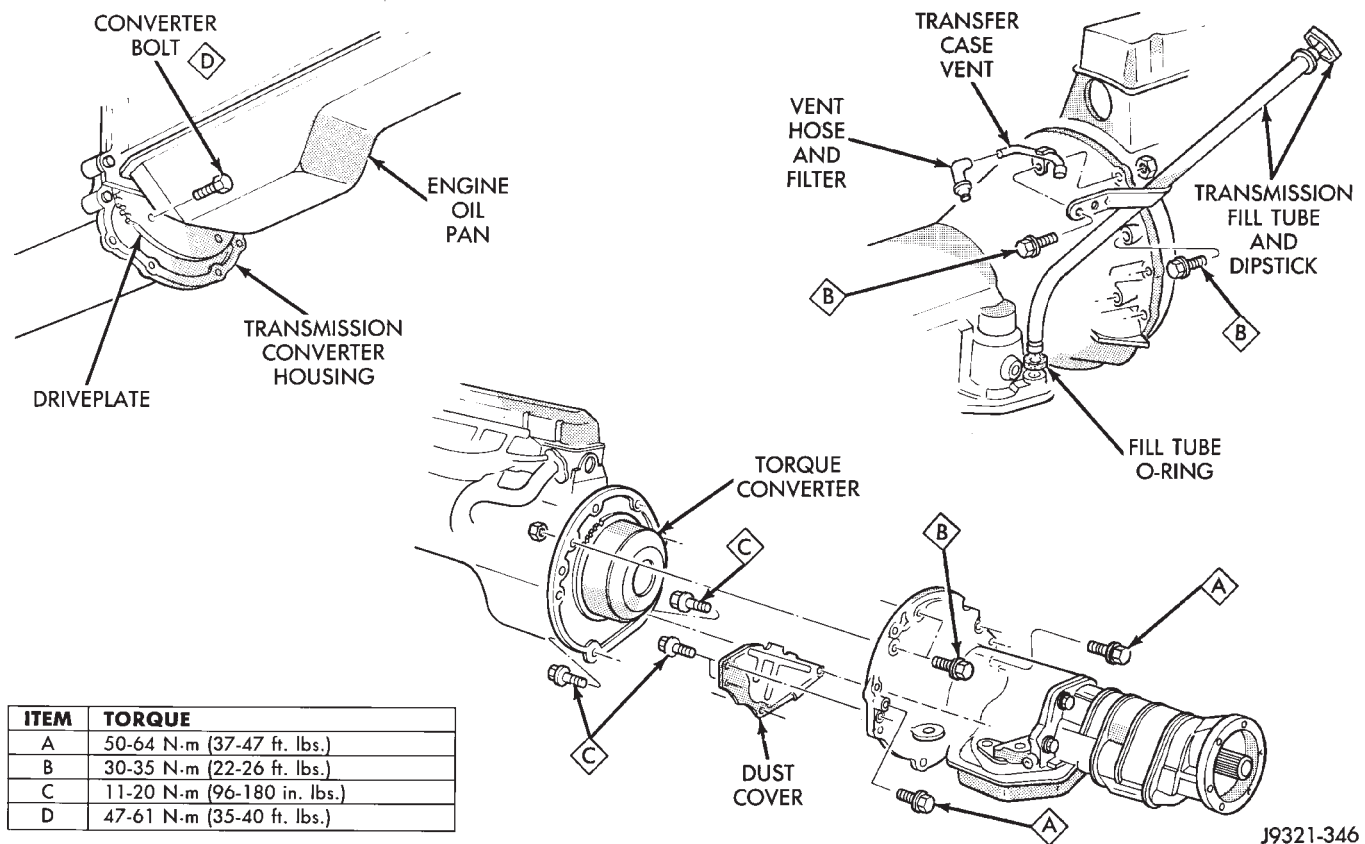
CONDITION	POSSIBLE CAUSES	CORRECTION
NO 3-4 UPSHIFT	<ol style="list-style-type: none"> <li>1. Fourth gear overdrive switch (on dash) in OFF position.</li> <li>2. Overdrive circuit fuse blown.</li> <li>3. Fourth gear overdrive switch shorted, open, wires loose.</li> <li>4. Overdrive solenoid or circuit wire loose, shorted, open.</li> <li>5. Solenoid feed orifice in valve body is blocked.</li> <li>6. Fourth gear overdrive solenoid failure.</li> <li>7. Sensor failure (distance sensor or coolant sensor).</li> <li>8. Neutral switch open or shorted or switch wire to PCM is damaged (loss of park/neutral input to PCM).</li> <li>9. PCM faulty.</li> <li>10. Overdrive piston seal failure.</li> <li>11. Wrong overdrive piston spacer.</li> <li>12. Low hydraulic pressure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Turn control switch to ON position.</li> <li>2. Replace fuse; determine why fuse failed and repair as necessary (i.e., shorts, grounds in circuit).</li> <li>3. Replace switch if shorted or open and repair loose or damaged wires.</li> <li>4. Check wires/connections with 12V test lamp and voltmeter; repair damaged or loose wires/connections as necessary.</li> <li>5. Remove, disassemble, clean valve body thoroughly.</li> <li>6. Verify solenoid failure with test lamp and replace solenoid.</li> <li>7. Test both sensors with test lamp or volt/ohmmeter and replace faulty sensor.</li> <li>8. Test switch as described in service section and replace if necessary.</li> <li>9. Check with tester and replace if necessary.</li> <li>10. Replace both seals.</li> <li>11. Remove unit, check end play, and install correct spacer.</li> <li>12. Pressure test transmission to determine cause.</li> </ol>
SLIPS IN OVERDRIVE FOURTH GEAR	<ol style="list-style-type: none"> <li>1. Low fluid level.</li> <li>2. Overdrive piston or seal malfunction.</li> <li>3. Overdrive clutch pack worn.</li> <li>4. 3-4 shift valve, timing valve, or accumulator malfunction.</li> <li>5. Overdrive piston retainer bleed orifice blown out.</li> <li>6. Overdrive unit thrust bearing failure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Add fluid and check for leaks.</li> <li>2. Remove overdrive unit; replace piston seals if worn; replace piston if damaged; if piston retainer is damaged, it will be necessary to remove and disassemble the transmission.</li> <li>3. Remove overdrive unit and rebuild clutch pack.</li> <li>4. Remove and overhaul valve body. Replace accumulator seals. Make sure all valves operate freely in bores and do not bind or stick. Make sure valve body screws are correctly tightened and separator plates are properly positioned.</li> <li>5. Disassemble transmission, remove retainer, and replace orifice.</li> <li>6. Disassemble overdrive unit and replace thrust bearing (No. 1 thrust bearing is between overdrive piston and clutch hub; No. 2 thrust bearing is between the planetary gear and the direct clutch spring plate; No. 3 thrust bearing is between overrunning clutch hub and output shaft).</li> </ol>

HYDRAULIC FLOW DURING FULL THROTTLE 3-2 DOWNSHIFT

	<b>LINE PRESSURE</b> (57-94 psi)		<b>THROTTLE PRESSURE</b> (0-94 psi)		<b>1-2 SHIFT CONTROL</b> (25-70 psi)		<b>GOVERNOR PRESSURE</b> (0-57 psi)		<b>CONVERTER/LUBE PRESSURE</b> (5-57 psi)		<b>PUMP SUCTION</b>		<b>OVERDRIVE PRE-FILL PRESSURE</b> (0-5 psi)
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SELECTOR LEVER IN DRIVE  
OVERDRIVE 4TH GEAR  
(CONVERTER CLUTCH NOT APPLIED)



J9321-346

**Fig. 5 Transmission And Fill Tube Mounting**

**CAUTION:** It is essential that correct length bolts be used to attach the converter to the driveplate. Bolts that are too long will damage the modulated clutch surfaces in the converter. If new bolts are required, use the bolts specified in the parts catalogue only.

(12) Verify converter bolt length. Bolt measurement is from bottom (underside) of bolt head to end of bolt threads. On 9.5 in. 3-lug converter bolts should be 11.7 mm (0.46 in.). On 10.75 in. 4-lug converter bolts should be 11.2 mm (0.44 in.).

(13) Install torque converter bolts. Tighten bolts to following torques: 54 N·m (40 ft. lbs.) with 9.5 in. 3-lug converter, or 31 N·m (270 in. lbs.) with 10.75 in 4-lug converter

(14) Install and tighten remaining transmission attaching bolts (Fig. 6).

(15) Connect crankshaft position sensor.

(16) Install dust cover on transmission converter housing. Two small vise grip pliers can be used to hold and align cover during installation.

(17) Install and connect starter motor.

(18) Connect transmission shift and throttle valve cables to valve body manual shaft and transmission brackets.

(19) Fasten wire harnesses in clips on transmission case.

(20) Connect wires to solenoids, park/neutral position switch, transmission speed sensor and vehicle speed sensor.

(21) Install transmission fill tube and O-ring.

(22) Install rear crossmember and attach rear insulator to transmission and crossmember.

(23) Connect cooler lines to fittings. Pull lines outward to verify that they are securely seated and retained in fittings.

(24) Align and install propeller shaft. **Clean and lubricate slip yoke before installation.**

(25) Install exhaust system components.

(26) Lower vehicle.

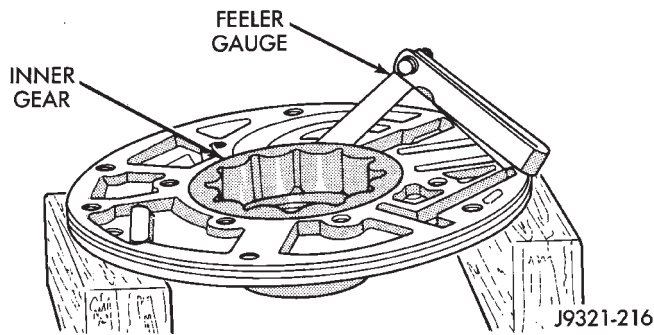
(27) Connect battery negative cable.

(28) Fill or top off transmission fluid level with Mopar ATF Plus, type 7176.

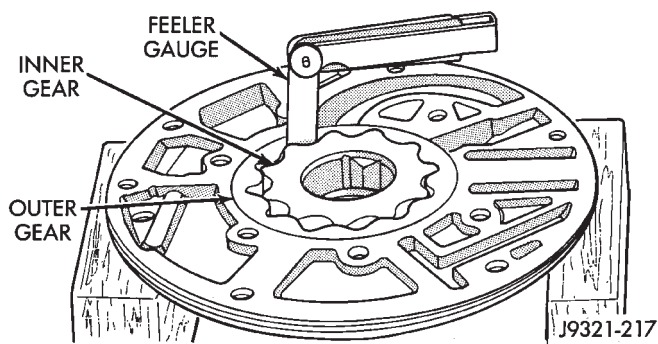
(29) Check transmission control cable adjustments. Readjust cables if necessary.

Measure clearance between the outer gear and the pump body (Fig. 42). Clearance should be 0.08 - 0.19 mm (0.0035 - 0.0075 in.).

Measure gear tooth clearance with a feeler gauge. Align one tooth of the outer gear in inner gear and measure clearance (Fig. 43). Clearance should be 0.08 - 0.19 mm (0.0035 - 0.0075 in.).



**Fig. 42 Measuring Pump Housing-To-Inner Gear Clearances**



**Fig. 43 Measuring Pump Gear Tooth Clearance**

#### REPLACING OIL PUMP BUSHING

(1) Remove pump bushing with Tool Handle C-4171 and Bushing Remover SP-3551 (Fig. 44).

(2) Install new pump bushing with Tool Handle C-4171 and Bushing Installer SP-5117 (Fig. 44). Bushing should be flush with pump housing bore.

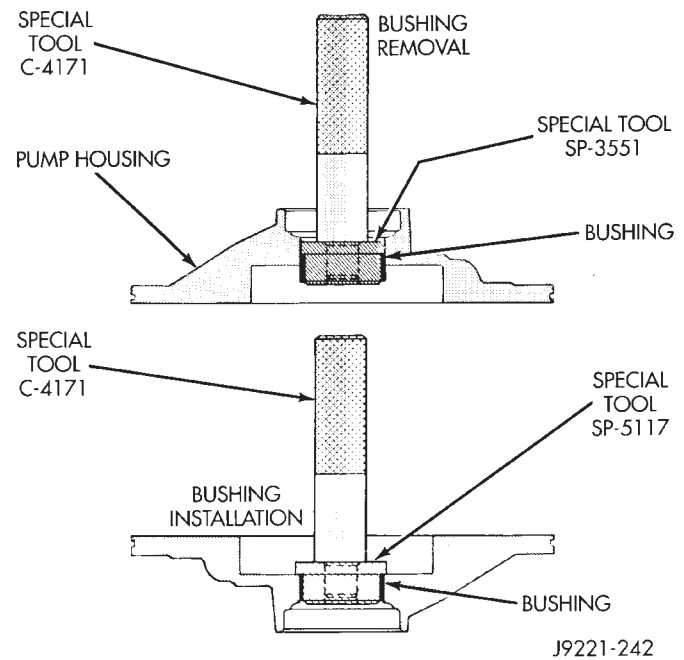
(3) Stake new pump bushing in two places with blunt punch (Fig. 45). Remove burrs from stake points with knife blade afterward.

#### REPLACING REACTION SHAFT SUPPORT BUSHING

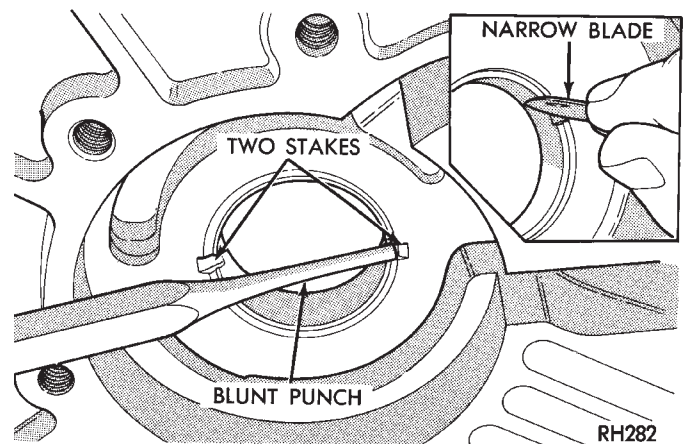
(1) Assemble Bushing Remover Tools SP-1191, 3633 and 5324 (Fig. 46). **Do not clamp any part of reaction shaft or support in vise.**

(2) Hold Cup Tool SP-3633 firmly against reaction shaft and thread remover SP-5324 into bushing as far as possible by hand. Then thread remover tool 3-4 additional turns into bushing with a wrench.

(3) Turn remover tool hex nut down against remover cup to pull bushing from shaft. Clean all chips from shaft after bushing removal.



**Fig. 44 Removing Oil Pump Bushing**



**Fig. 45 Staking Oil Pump Bushing**

(4) Lightly grip old bushing in vise or with pliers and back remover tool out of bushing.

(5) Assemble Bushing Installer Tools C-4171 and SP-5325 (Fig. 46).

(6) Slide new bushing onto Installer Tool SP-5325.

(7) Position reaction shaft support upright on a clean smooth surface.

(8) Align bushing in bore. Then tap bushing into place until Bushing Installer SP-5325 bottoms.

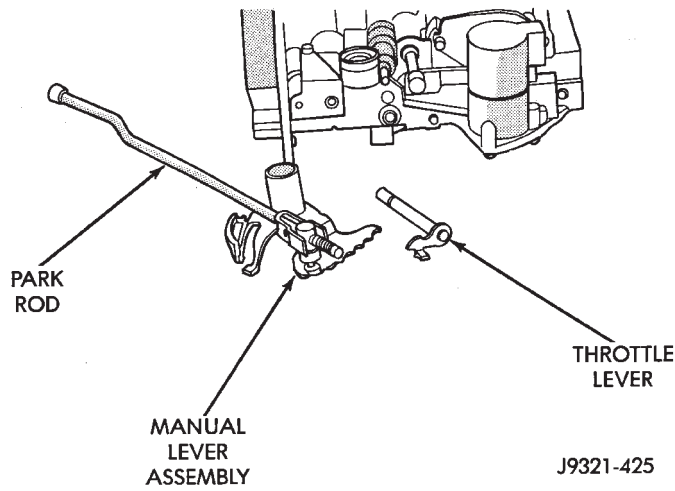
(9) Clean reaction shaft support thoroughly after installing bushing.

#### ASSEMBLING OIL PUMP AND REACTION SHAFT SUPPORT

(1) Lubricate gear bore in pump housing with transmission fluid.

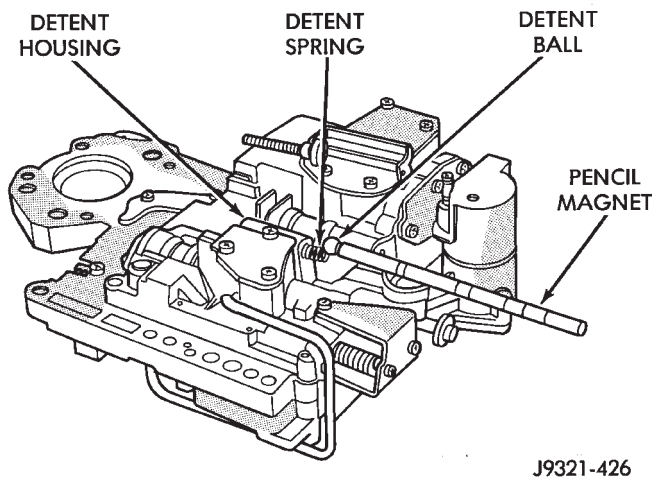
(2) Lubricate pump gears with transmission fluid.

(15) Remove manual lever and throttle lever (Fig. 103). Rotate and lift manual lever off valve body and throttle lever shaft. Then slide throttle lever out of valve body.



**Fig. 103 Manual And Throttle Lever Removal**

(16) Position pencil magnet next to detent housing to catch detent ball and spring. Then carefully remove Retainer Tool 6583 and remove detent ball and spring (Fig. 104).

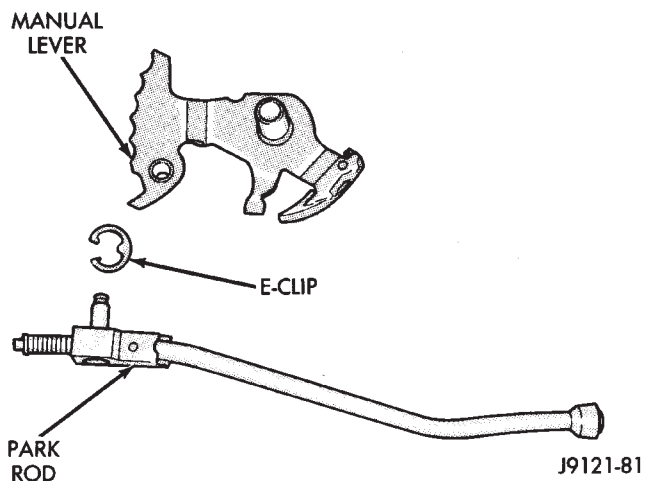


**Fig. 104 Detent Ball And Spring Removal**

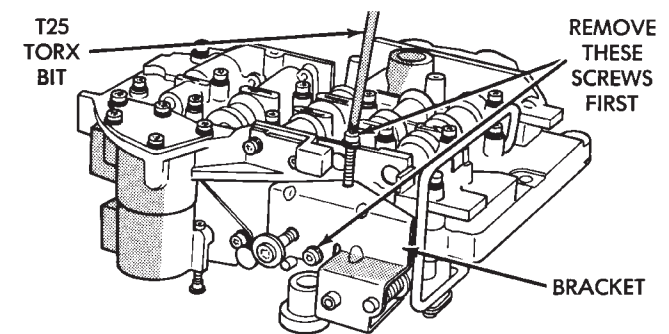
(17) Remove park rod E-clip and separate rod from manual lever (Fig. 105).

(18) Remove screws attaching pressure adjusting screw bracket to valve body and transfer plate (Fig. 106). Hold bracket firmly against spring tension while removing last screw.

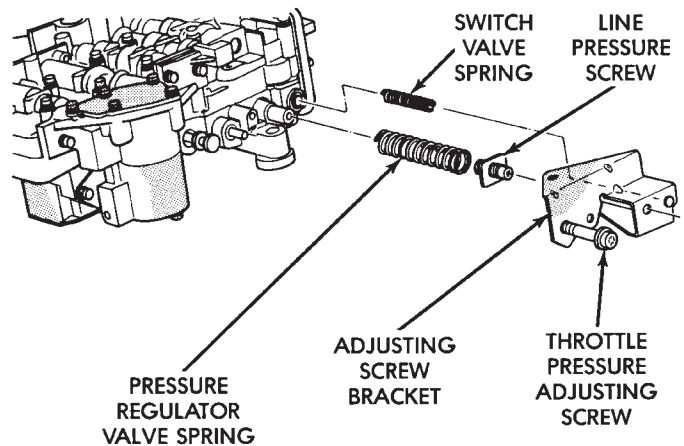
(19) Remove adjusting screw bracket, line pressure adjusting screw, pressure regulator valve spring and switch valve spring (Fig. 107). **Do not remove throttle pressure adjusting screw from bracket and do not disturb setting of either adjusting screw during removal.**



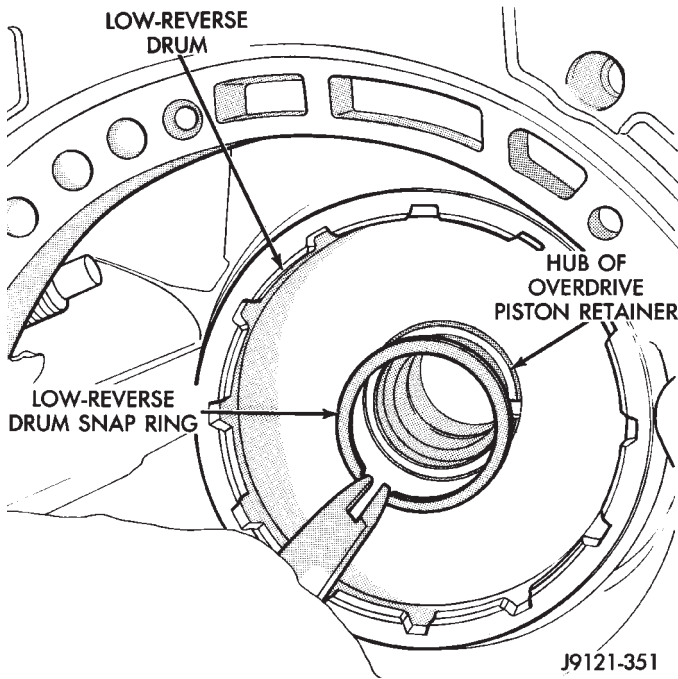
**Fig. 105 Park Rod Removal**



**Fig. 106 Adjusting Screw Bracket Fastener Removal/Installation**

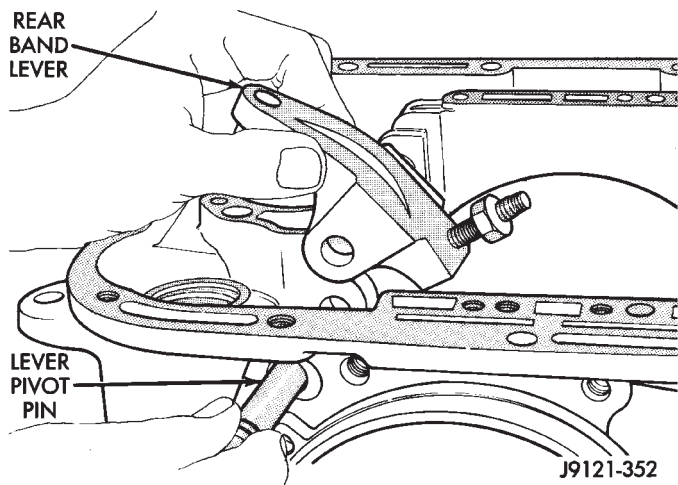


**Fig. 107 Adjusting Screw Bracket And Spring Removal**



J9121-351

**Fig. 151 Installing Low-Reverse Drum Retaining Snap Ring**



J9121-352

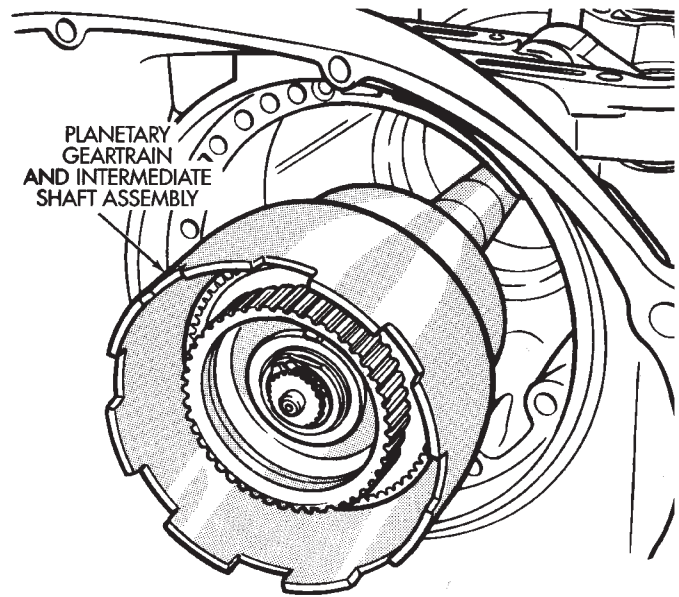
**Fig. 152 Rear Band Lever And Pivot Pin Installation**

(18) Install thrust plate on intermediate shaft hub (Fig. 154). Use petroleum jelly to hold thrust plate in place.

(19) Check seal ring on rear clutch retainer hub (Fig. 49) and seal rings on input shaft (Fig. 155). Verify that diagonal-cut ends of teflon seal rings are properly joined and ends of metal ring are correctly hooked together. Also verify that shaft seal rings are installed in sequence shown.

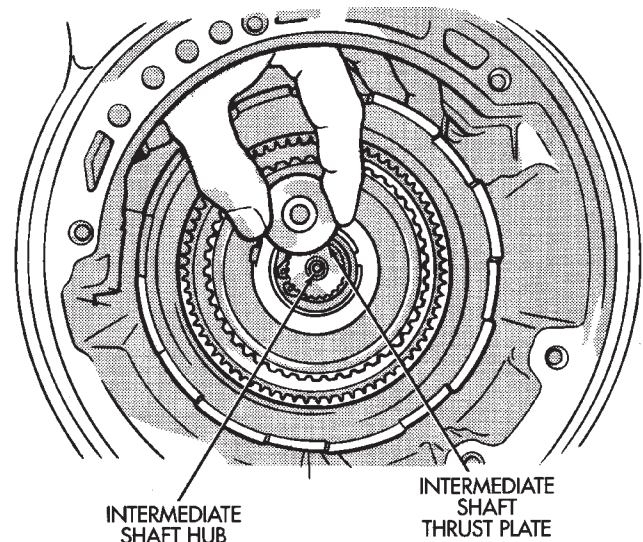
(20) Check rear clutch thrust washer (Fig. 156). Use additional petroleum jelly to hold washer in place if necessary.

(21) Align clutch discs in front clutch and install front clutch on rear clutch (Fig. 157). Rotate front clutch retainer back and forth until completely seated on rear clutch.



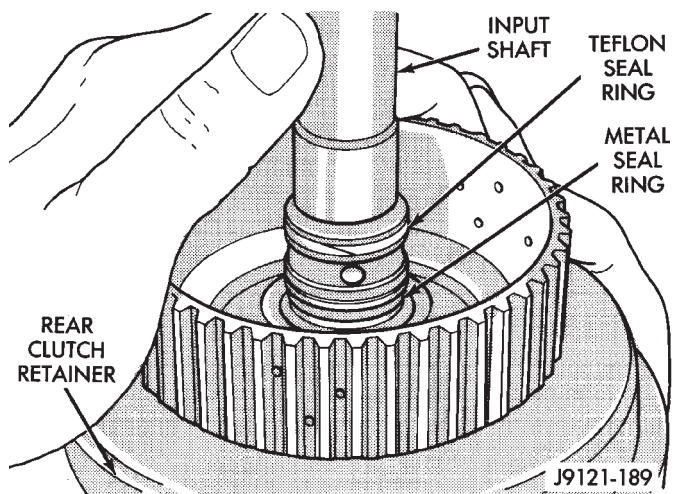
J9121-217

**Fig. 153 Installing Planetary Geartrain**



J9121-215

**Fig. 154 Installing Intermediate Shaft Thrust Plate**



J9121-189

**Fig. 155 Input Shaft Seal Ring Location**

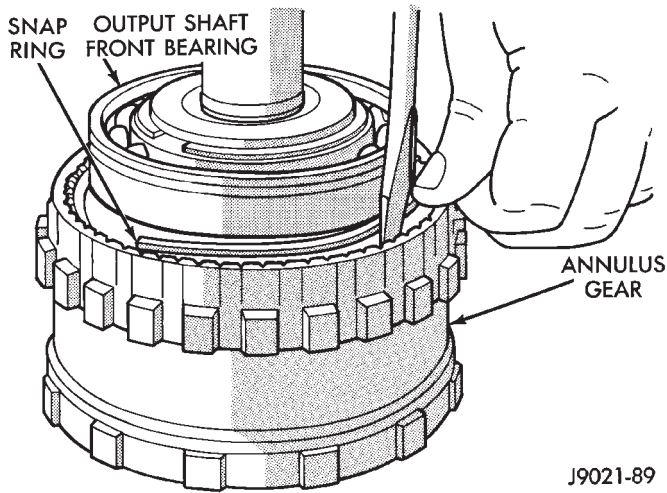


Fig. 36 Annulus Gear Installation

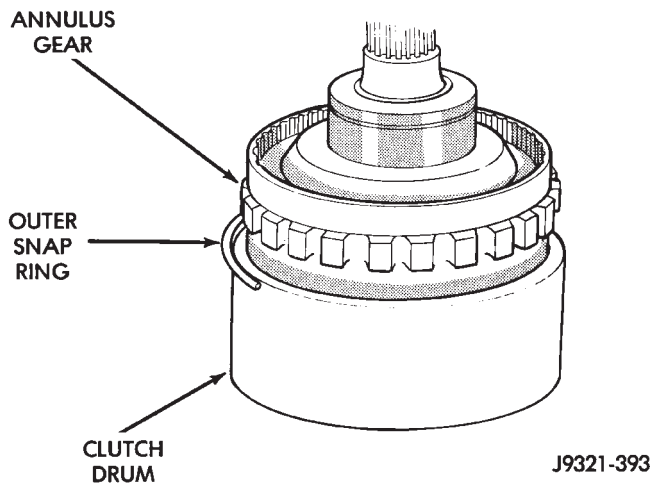


Fig. 37 Clutch Drum And Outer Retaining Ring Installation

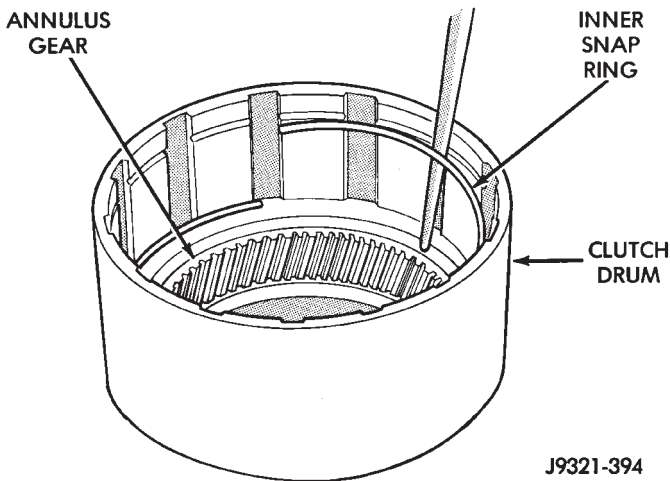


Fig. 38 Clutch Drum Inner Retaining Ring Installation

(7) Install rear bearing and snap ring on output shaft (Fig. 39). Be sure locating ring groove in bearing is toward rear.

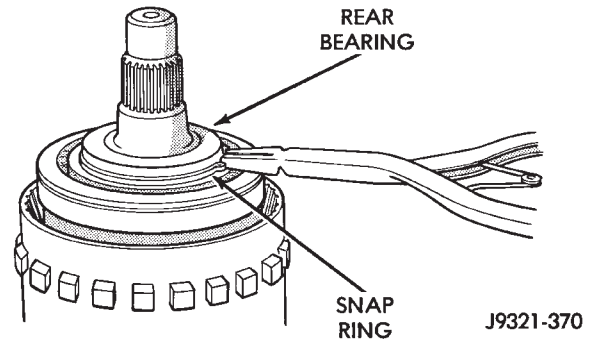


Fig. 39 Rear Bearing And Snap Ring Installation

(8) Install overrunning clutch on hub (Fig. 40). **Note that clutch only fits one way. Shoulder on clutch should seat in small recess at edge of hub.**

(9) Install thrust bearing on overrunning clutch hub (Fig. 41). Use generous amount of petroleum jelly to hold bearing in place for installation. **Bearing fits one way only. Be sure bearing is seated squarely against hub. Reinstall bearing if it does not seat squarely.**

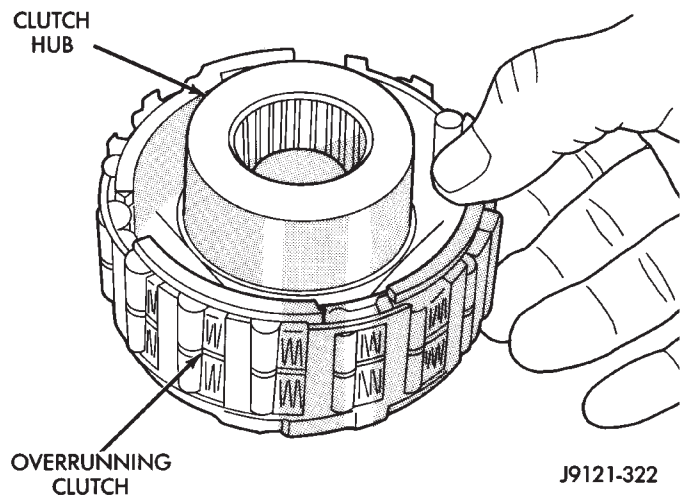


Fig. 40 Assembling Overrunning Clutch And Hub

(10) Install overrunning clutch in output shaft (Fig. 42). Insert snap ring pliers in hub splines. Expand pliers to grip hub. Then install assembly with counterclockwise, twisting motion.

(11) Install planetary gear in annulus gear (Fig. 43). **Be sure planetary pinions are fully seated in annulus gear before proceeding.**

Switch and solenoid continuity should be checked whenever the transmission fails to shift into fourth gear range.

### TRANSMISSION CONTROL CABLE ADJUSTMENTS

Transmission throttle valve cable adjustment is extremely important to proper operation. This adjustment positions the throttle valve which controls shift speed, quality and part throttle downshift sensitivity.

If cable setting is too short, early shifts and slippage between shifts may occur. If the setting is too long, shifts may be delayed and part throttle downshifts may be very sensitive. Refer to the In Vehicle Service section for adjustment procedure.

Shift cable adjustment is important because it positions the valve body manual valve. Incorrect adjustment will cause creeping in Neutral, premature clutch wear, delayed engagement in any gear, or a no-start in Park or Neutral position.

Proper operation of the park/neutral position switch will provide a quick check of cable adjustment. Refer to the In-Vehicle Service section for linkage adjustment procedure.

### ROAD TESTING

Before road testing, be sure the fluid level and all linkage adjustments have been checked and adjusted if necessary. Observe engine performance during the road test. A poorly tuned engine will not allow an accurate analysis of transmission operation.

Operate the transmission in all gear ranges. Check for shift variations and engine flare, which indicates slippage. Note if shifts are harsh, spongy, delayed, early, or if part throttle downshifts are sensitive.

Slippage indicated by engine flare, usually means clutch, band or overrunning clutch problems. If the condition is advanced, an overhaul may be necessary to restore normal operation.

A slipping clutch or band can often be determined by comparing which internal units are applied in the various gear ranges. The Clutch and Band Application chart (Fig. 4) provides a basis for analyzing road test results.

### ANALYZING THE ROAD TEST

Refer to the Clutch and Band Application chart (Fig. 1) and note which elements are in use in the various gear ranges.

Note that the rear clutch is applied in all forward ranges (D, 2, 1). The transmission overrunning clutch is applied in first gear (D, 2 and 1 ranges) only. The rear band is applied in 1 and R range only.

Note that the overdrive clutch is applied only in fourth gear and the overdrive direct clutch and overrunning clutch are applied in all ranges except fourth gear.

For example: If slippage occurs in first gear in D and 2 range but not in 1 range, the transmission overrunning clutch is faulty. Similarly, if slippage occurs in any two forward gears, the rear clutch is slipping.

Applying the same method of analysis, note that the front and rear clutches are applied simultaneously only in D range third and fourth gear. If the transmission slips in third gear, either the front clutch or the rear clutch is slipping.

If the transmission slips in fourth gear but not in third gear, the overdrive clutch is slipping. By selecting another gear which does not use these clutches, the slipping unit can be determined. For example, if the transmission also slips in Reverse, the front clutch is slipping. If the transmission does not slip in Reverse, the rear clutch is slipping.

If slippage occurs during the 3-4 shift or only in fourth gear, the overdrive clutch is slipping. Similarly, if the direct clutch were to fail, the transmission would lose both reverse gear and overrun braking in 2 position (manual second gear). If the transmission slips in any other two forward gears, the transmission rear clutch is probably slipping.

If the transmission will not shift to fourth gear, the control switch, overdrive solenoid or related wiring may also be the problem cause.

This process of elimination can be used to identify a slipping unit and check operation. Proper use of the Clutch and Band Application Chart is the key.

Although road test analysis will help determine the slipping unit, the actual cause of a malfunction usually cannot be determined until hydraulic and air pressure tests are performed. Practically any condition can be caused by leaking hydraulic circuits or sticking valves.

**Unless a malfunction is obvious, such as no drive in D range first gear, do not disassemble the transmission. Perform the hydraulic and air pressure tests to help pinpoint the problem cause.**

### HYDRAULIC PRESSURE TEST

Hydraulic test pressures range from a low of one psi (6.895 kPa) governor pressure, to 300 psi (2068 kPa) at the rear servo pressure port in reverse.

An accurate tachometer and two test gauges are required for the pressure test. Test Gauge C-3292 has a 100 psi range and is used at the accumulator, governor, and front servo pressure ports. Test Gauge C-3293 has a 300 psi range and is used at the rear servo port and overdrive test ports where pressures are higher. In cases where two test gauges are required, the 300 psi gauge can be used at any of the other test ports.

## OVERDRIVE DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
NO 3-4 UPSHIFT	<ol style="list-style-type: none"> <li>1. Fourth gear overdrive switch (on dash) in OFF position.</li> <li>2. Overdrive circuit fuse blown.</li> <li>3. Fourth gear overdrive switch shorted, open, wires loose.</li> <li>4. Overdrive solenoid or circuit wire loose, shorted, open.</li> <li>5. Solenoid feed orifice in valve body is blocked.</li> <li>6. Fourth gear overdrive solenoid failure.</li> <li>7. Sensor failure (distance sensor or coolant sensor).</li> <li>8. Neutral switch open or shorted or switch wire to PCM is damaged (loss of park/neutral input to PCM).</li> <li>9. PCM faulty.</li> <li>10. Overdrive piston seal failure.</li> <li>11. Wrong overdrive piston spacer.</li> <li>12. Low hydraulic pressure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Turn control switch to ON position.</li> <li>2. Replace fuse; determine why fuse failed and repair as necessary (i.e., shorts, grounds in circuit).</li> <li>3. Replace switch if shorted or open and repair loose or damaged wires.</li> <li>4. Check wires/connections with 12V test lamp and voltmeter; repair damaged or loose wires/connections as necessary.</li> <li>5. Remove, disassemble, clean valve body thoroughly.</li> <li>6. Verify solenoid failure with test lamp and replace solenoid.</li> <li>7. Test both sensors with test lamp or volt/ohmmeter and replace faulty sensor.</li> <li>8. Test switch as described in service section and replace if necessary.</li> <li>9. Check with tester and replace if necessary.</li> <li>10. Replace both seals.</li> <li>11. Remove unit, check end play, and install correct spacer.</li> <li>12. Pressure test transmission to determine cause.</li> </ol>
SLIPS IN OVERDRIVE FOURTH GEAR	<ol style="list-style-type: none"> <li>1. Low fluid level.</li> <li>2. Overdrive piston or seal malfunction.</li> <li>3. Overdrive clutch pack worn.</li> <li>4. 3-4 shift valve, timing valve, or accumulator malfunction.</li> <li>5. Overdrive piston retainer bleed orifice blown out.</li> <li>6. Overdrive unit thrust bearing failure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Add fluid and check for leaks.</li> <li>2. Remove overdrive unit; replace piston seals if worn; replace piston if damaged; if piston retainer is damaged, it will be necessary to remove and disassemble the transmission.</li> <li>3. Remove overdrive unit and rebuild clutch pack.</li> <li>4. Remove and overhaul valve body. Replace accumulator seals. Make sure all valves operate freely in bores and do not bind or stick. Make sure valve body screws are correctly tightened and separator plates are properly positioned.</li> <li>5. Disassemble transmission, remove retainer, and replace orifice.</li> <li>6. Disassemble overdrive unit and replace thrust bearing (No. 1 thrust bearing is between overdrive piston and clutch hub; No. 2 thrust bearing is between the planetary gear and the direct clutch spring plate; No. 3 thrust bearing is between overrunning clutch hub and output shaft).</li> </ol>

46RH IN-VEHICLE SERVICE

INDEX

	page	page	
Aluminum Thread Repair .....	215	Recommended Fluid .....	204
Converter Drainback Check Valve Service .....	213	Refilling After Overhaul or Fluid/Filter Change .....	205
Fluid and Filter Replacement .....	205	Slip Yoke Seal Replacement—2-Wheel Drive Models .....	209
Fluid Level Check .....	204	Speedometer Service .....	208
Front Band Adjustment .....	207	Transmission Cooler Flow Testing .....	213
Gearshift Cable Adjustment .....	206	Transmission Cooler Line and Fitting Service .....	211
Governor and Park Lock Service .....	204	Transmission Cooler Replacement .....	214
Oil Pump Seal .....	204	Transmission Cooler Reverse Flushing .....	214
Park Interlock Cable Adjustment .....	207	Transmission Throttle Valve Cable Adjustment .....	205
Park/Neutral Position Switch .....	209	Valve Body Service .....	210
Rear Band Adjustment .....	207		

**GOVERNOR AND PARK LOCK SERVICE**

The governor and park lock components are located within the overdrive unit and cannot be serviced in the vehicle. The overdrive unit must be removed and disassembled for access to the governor and park lock components.

Refer to the sections dealing with overdrive removal, installation and disassembly for repair procedures.

**OIL PUMP SEAL**

The transmission and torque converter must be removed for access to the oil pump seal. Oil pump seal replacement procedures are described in the Transmission/Converter Removal And Installation section.

**RECOMMENDED FLUID**

The recommended and preferred fluid for 46RH transmissions is Mopar ATF Plus, type 7176.

Mopar Dexron II is not really recommended and should only be used when ATF Plus is not available.

**FLUID LEVEL CHECK**

Transmission fluid level should be checked monthly under normal operation. If the vehicle is used for trailer towing or similar heavy load hauling, check fluid level and condition weekly.

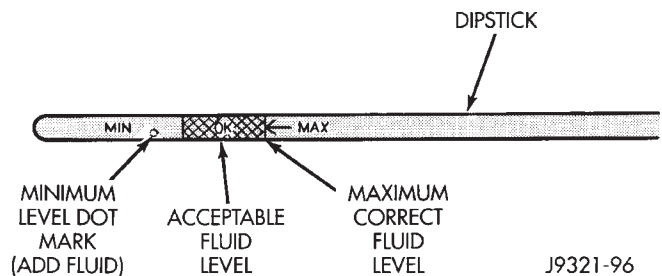
Fluid level is checked with the engine running at curb idle speed, the transmission in Neutral, parking brakes applied, and the transmission fluid at normal operating temperature.

**FLUID LEVEL CHECK PROCEDURE**

- (1) Transmission fluid must be at normal operating temperature for accurate fluid level check. Drive vehicle if necessary to bring fluid temperature up to normal hot operating temperature of 82°C (180°F).
- (2) Position vehicle on level surface. This is extremely important for accurate fluid level check.
- (3) Start and run engine at curb idle speed.

- (4) Apply parking brakes.
- (5) Shift transmission momentarily into all gear ranges. Then shift transmission back to Neutral.
- (6) Clean top of filler tube and dipstick to keep dirt from entering tube.
- (7) Remove dipstick and check fluid level as follows:
  - (a) Dipstick has three fluid level indicator levels (Fig. 1) which are a MIN dot, an OK crosshatch area, and a MAX fill arrow.
  - (b) Correct maximum level is to MAX arrow mark. Correct acceptable level is to OK mark in crosshatch area. Incorrect level is at or below MIN dot.
  - (c) If fluid is low, add only enough Mopar ATF Plus to restore correct level. Do not overfill.

**CAUTION: Do not overfill the transmission. Overfilling may cause leakage out the pump vent which can be mistaken for a pump seal leak. Overfilling will also cause fluid aeration and foaming as the excess fluid is picked up and churned by the gear train. This will significantly reduce fluid life.**



**Fig. 1 Fluid Level Marks On Dipstick**

**CAUTION:** Be sure the cooler lines are fully secured by the fitting retainers. Otherwise, normal fluid pressure will force the cooler line out of the fitting causing fluid loss and transmission damage.

(33) Connect vehicle speed sensor wires. If vehicle is also equipped with speedometer cable, connect cable to sensor.

(34) Align and install remaining exhaust components. Tighten all clamp and bracket bolts and nuts securely. Be sure exhaust components are clear of all chassis and driveline components.

(35) Align and install propeller shaft(s). Tighten U-joint clamp bolts to 19 N·m (170 in. lbs.) torque.

(36) Verify that all linkage components, hoses and electrical wires have been connected.

(37) Check transfer case fluid level. Add Mopar Dexron II, or ATF Plus if necessary. Correct level is to edge of fill plug hole. Be sure transfer case is level before checking or adding fluid.

(38) Install transfer case skid plate, if equipped.

(39) Lower vehicle.

(40) Refill transmission with Mopar ATF Plus, type 7176 fluid.

(41) Check and adjust transmission and transfer case shift linkage if necessary.

(42) Check and adjust transmission throttle valve cable if necessary.

## OVERDRIVE UNIT REMOVAL

(1) Disconnect battery negative cable.

(2) Raise vehicle on hoist.

(3) Remove transfer case skid plate, if equipped.

(4) Mark front and rear propeller shafts and U-joints for alignment reference (Fig. 9).

(5) Disconnect and remove both propeller shafts.

(6) Disconnect vehicle speed sensor wires.

(7) Disconnect vacuum switch hoses at transfer case, if equipped.

(8) Disconnect transfer case shift linkage at transfer case range lever. Then remove linkage bracket bolts and remove linkage and bracket from transfer case. Move linkage aside for clearance.

(9) Remove nuts attaching transfer case to overdrive unit.

(10) Remove transfer case. Support transfer case with transmission jack (secure transfer case to jack with safety chains). Then move transfer case rearward and off overdrive case.

(11) Remove transfer case from jack and position it on bench.

(12) Support transmission with adjustable jack stand. Position wood block between jack and transmission case.

(13) Remove nuts and bolts attaching transmission mount to center crossmember.

(14) Remove nuts and bolts attaching crossmember to frame rails.

(15) Rotate crossmember diagonally to clear frame rails and remove crossmember.

(16) Support overdrive unit with transmission jack.

(17) Remove bolts attaching overdrive unit to transmission (Fig. 9).

**CAUTION:** The overdrive unit must be fully supported during removal. This is necessary to prevent damaging the intermediate shaft. Do not allow the shaft to support the entire weight of the overdrive unit.

(18) Carefully slide overdrive unit off intermediate shaft. Do not tilt overdrive unit during removal. Keep it as level as possible.

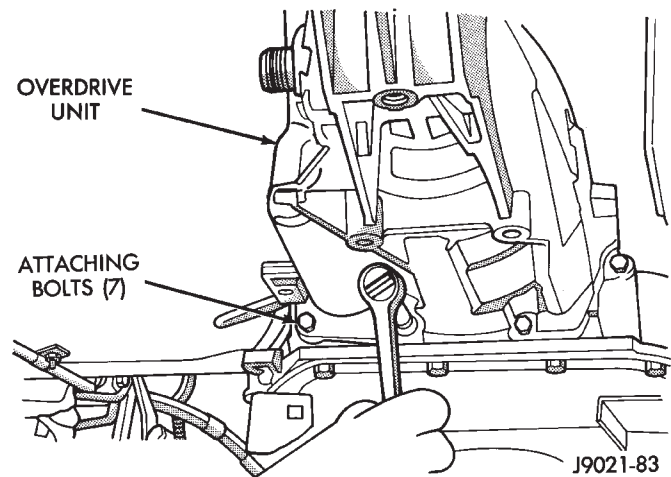
(a) If overdrive unit does not require service, **immediately insert Alignment Tool 6227-2 in splines of planetary gear and overrunning clutch (Fig. 10). If misalignment occurs, overdrive unit will have to be disassembled in order to realign splines.**

(b) If overdrive unit requires service, refer to Overdrive Unit Overhaul procedures.

(19) Remove and retain bearing and select fit spacer. These parts may remain on overdrive piston, rear of transmission case, sliding hub, or intermediate shaft during removal.

(20) Place several clean shop towels on a bench. Then position unit on towels to absorb spilled fluid.

(21) Position overdrive unit over drain pan and tilt unit to drain residual fluid from case. Examine fluid for clutch material or metal fragments. If fluid contains these items, overhaul will be necessary.



**Fig. 9 Removing/Installing Overdrive Unit Attaching Bolts**

## OVERDRIVE UNIT INSTALLATION

(1) Be sure Alignment Tool 6227-2 is still fully seated in splines of overdrive planetary gear and

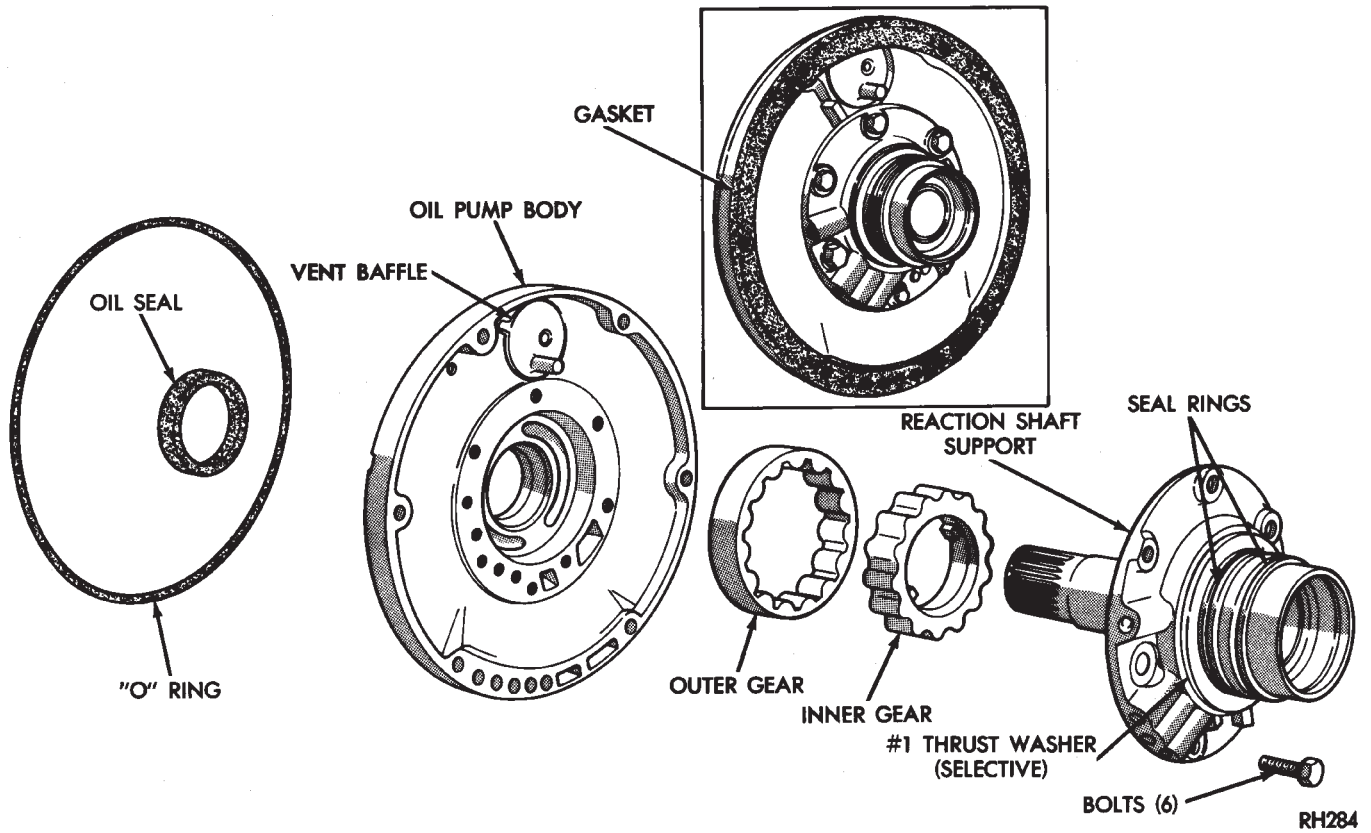


Fig. 53 Oil Pump And Reaction Shaft Components

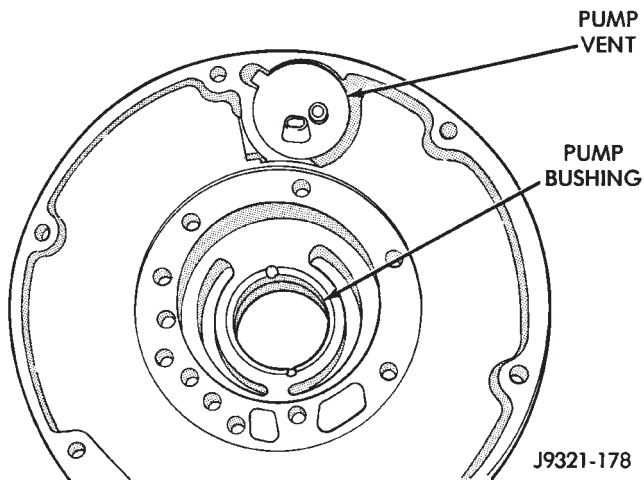
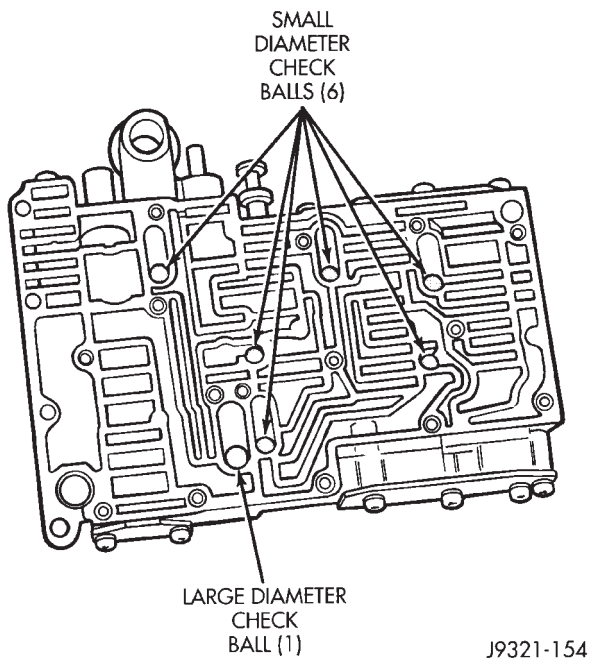
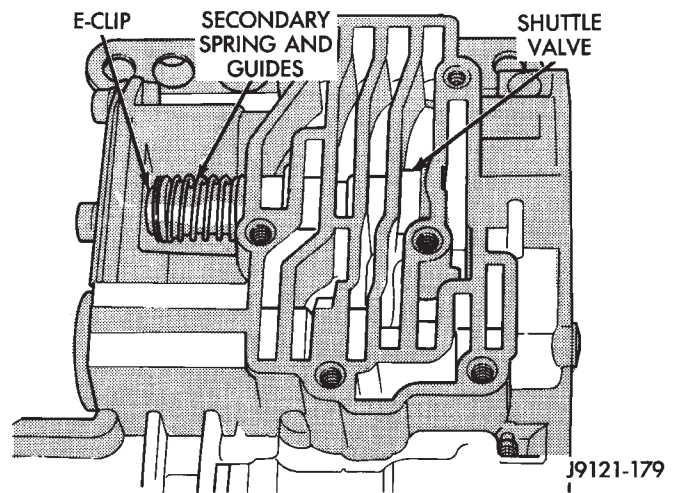


Fig. 54 Pump Vent And Bushing Location



**Fig. 111 Upper Housing Check Ball Locations**

(7) Remove kickdown detent, kickdown valve, and throttle valve and spring (Fig. 114).

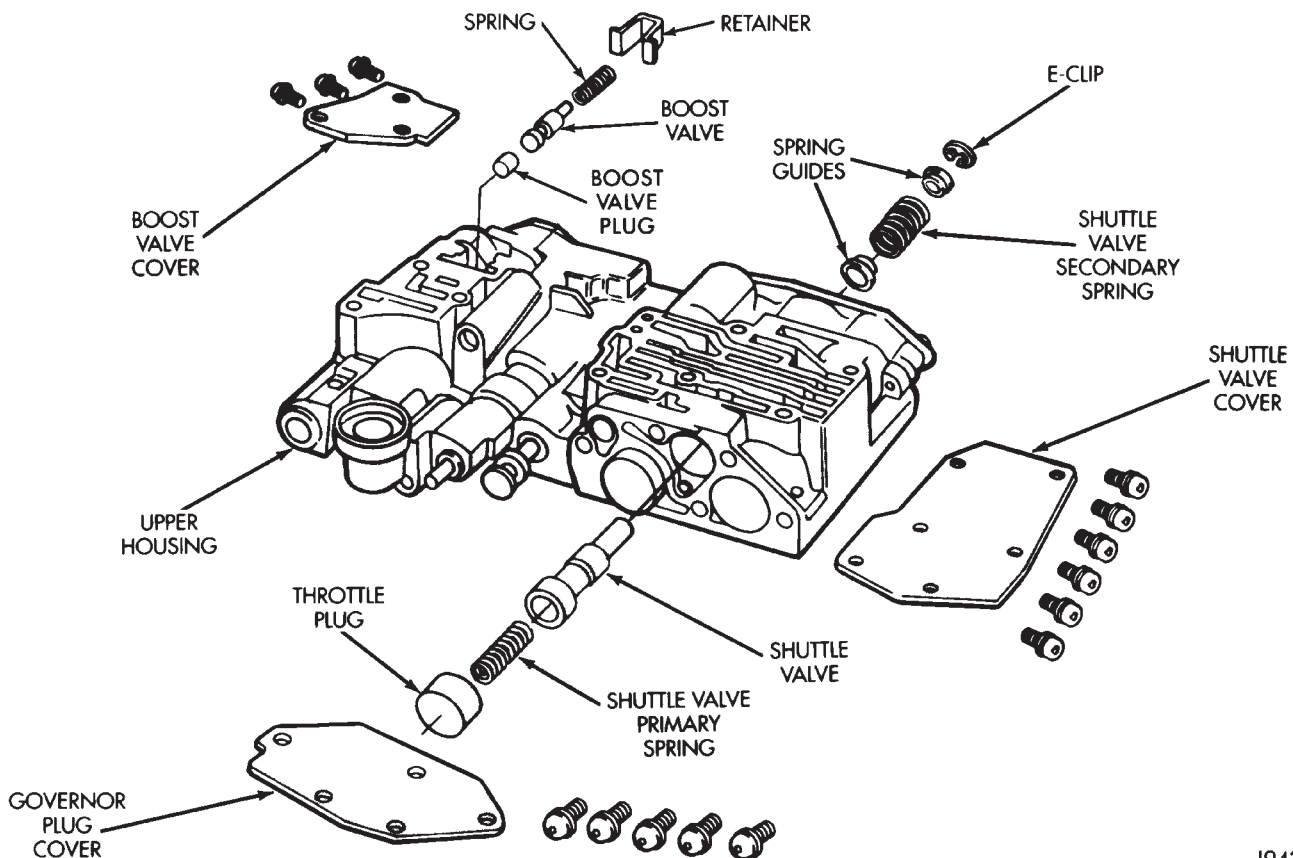


**Fig. 112 Shuttle Valve E-Clip And Secondary Spring Location**

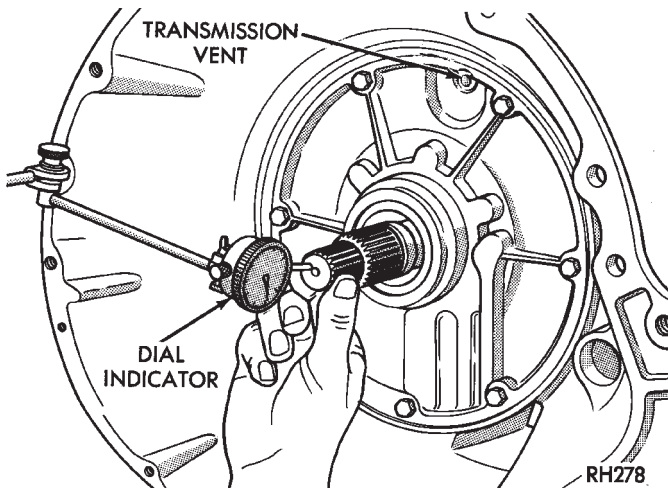
(8) Remove throttle plug and 1-2 and 2-3 governor plugs (Fig. 114). Also remove shuttle valve primary spring if not removed in prior step.

(9) Turn upper housing around and remove limit valve and shift valve covers (Fig. 115).

(10) Remove limit valve housing. Then remove retainer, spring, limit valve, and 2-3 throttle plug from limit valve housing (Fig. 115).



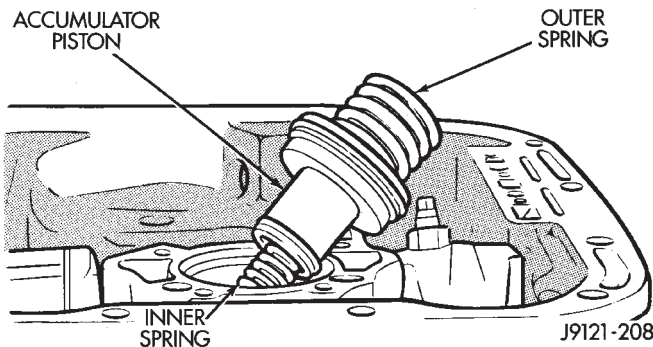
**Fig. 113 Shuttle And Boost Valve Components**



**Fig. 156 Checking Input Shaft End Play**

**BAND ADJUSTMENTS AND INSTALLATION OF ACCUMULATOR, VALVE BODY, OIL PAN, AND TORQUE CONVERTER**

(1) Install accumulator inner spring, piston and outer spring (Fig. 157).



**Fig. 157 Installing Accumulator Piston And Springs**

(2) Verify that park/neutral position switch has **not** been installed in case. Valve body can not be installed if switch is in position.

(3) Install valve body as follows:

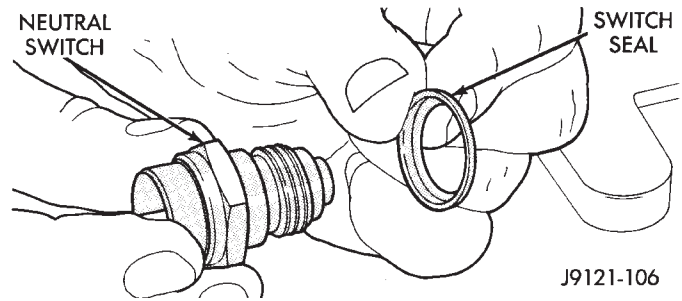
(a) Start park rod into park pawl. If rod will not slide past park pawl, pawl is engaged in park gear. Rotate overdrive output shaft with suitable size 12 point socket; this will free pawl and allow rod to engage.

(b) Align and seat valve body on case. Be sure manual lever shaft and overdrive connector are fully seated in case.

(c) Install and start all valve body attaching bolts by hand. Then tighten bolts evenly, in a diagonal pattern to 12 N·m (105 in. lbs.) torque. **Do not overtighten valve body bolts. This could result in distortion and cross leakage after installation..**

(4) Install new filter on valve body. Tighten filter screws to 4 N·m (35 in. lbs.).

(5) Install seal on park/neutral position switch (Fig. 158). Then install and tighten switch to 34 N·m (25 ft. lbs.).



**Fig. 158 Park/Neutral Position Switch Seal Position**

(6) Adjust front and rear bands as follows:

(a) Loosen locknut on each band adjusting screw 4-5 turns.

(b) Tighten both adjusting screws to 8 N·m (72 in. lbs.).

(c) Back off front band adjusting screw 2-7/8 turns.

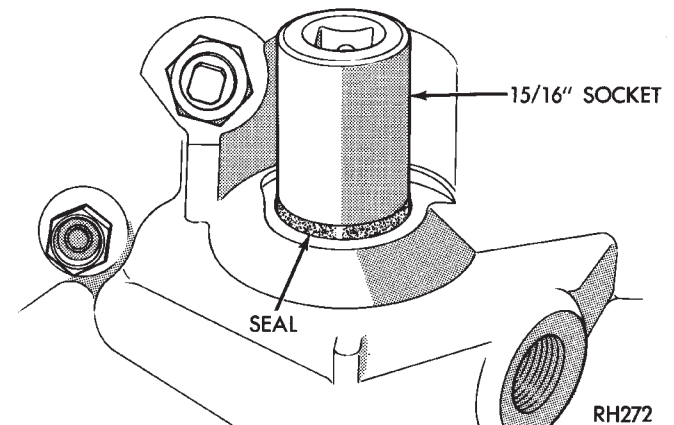
(d) Back off rear band adjusting screw 2 turns.

(e) Hold each adjusting screw in position and tighten locknut to 34 N·m (25 ft. lbs.) torque.

(7) Install magnet in oil pan. Magnet seats on small protrusion at corner of pan.

(8) Position new oil pan gasket on case and install oil pan. Tighten pan bolts to 17 N·m (13 ft. lbs.).

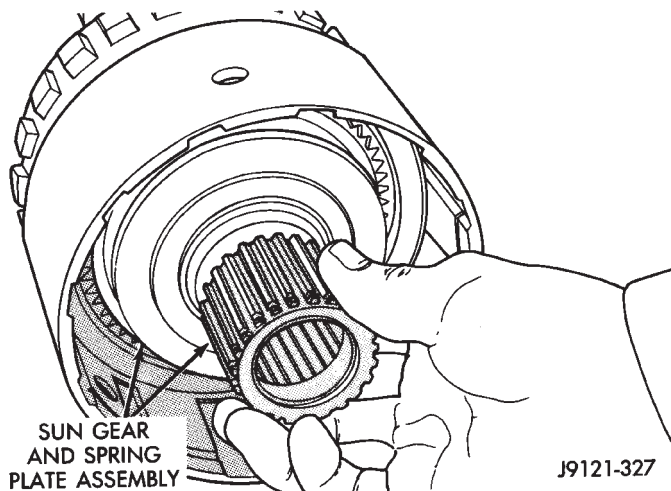
(9) Install new valve body manual shaft seal in case (Fig. 159). Lubricate seal lip and manual shaft with petroleum jelly. Start seal over shaft and into case. Seat seal with 15/16 inch, deep well socket.



**Fig. 159 Manual Lever Shaft Seal Installation**

(10) Install throttle valve and shift selector levers on valve body manual lever shaft.

(11) Cap or cover transmission openings (cooler line fittings, filler tube bore, etc.) to prevent dirt entry.



**Fig. 54 Sun Gear Installation**

(19) Assemble direct clutch pack for installation on hub (Fig. 56).

(20) Install direct clutch reaction plate on clutch hub. **Note that one side of reaction plate is counterbored. Be sure this side faces rearward. Splines at rear of hub are raised slightly and counterbore in plate fits over these splines. Plate should be flush with this end of hub (Fig. 57).**

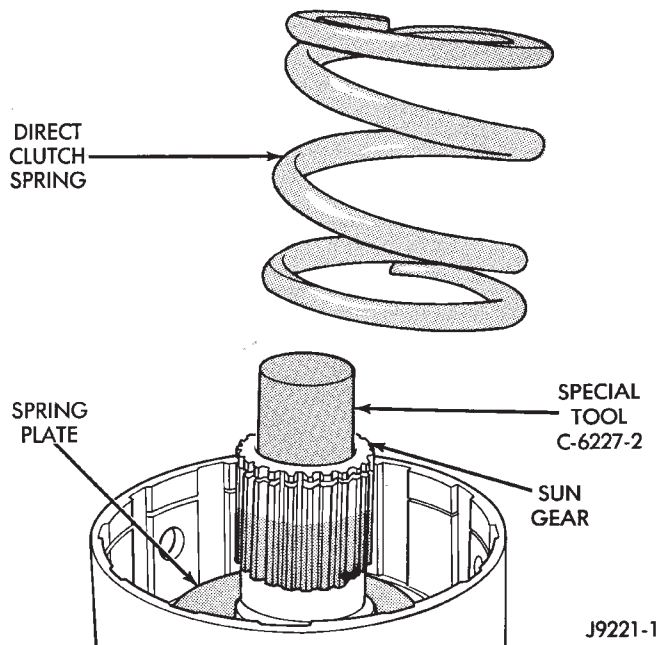
(21) Install remainder of direct clutch components as follows:

(a) Install first clutch disc on reaction plate followed by a steel plate.

(b) Alternately install remaining clutch discs and steel plates until required number of discs and plates are installed. **46RH requires 8 discs and 7 steel plates (Fig. 56).**

(c) Last clutch pack item installed is clutch pressure plate. Be sure plate is installed with shoulder side of plate facing upward (Fig. 58).

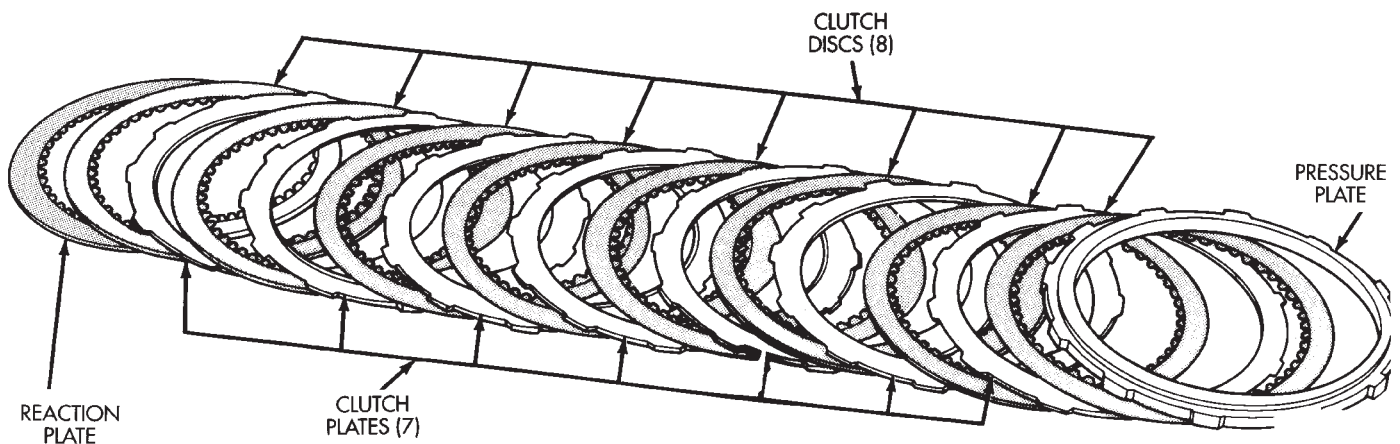
(22) Install clutch hub and clutch pack on direct clutch spring (Fig. 59).



**Fig. 55 Direct Clutch Spring Installation**

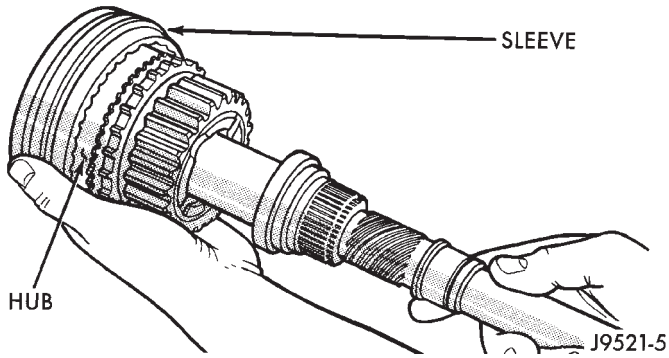
(23) Mount geartrain assembly in shop press (Fig. 60)

**WARNING: THE NEXT STEP IN GEARTRAIN ASSEMBLY INVOLVES COMPRESSING THE DIRECT CLUTCH HUB AND SPRING. IT IS EXTREMELY IMPORTANT THAT PROPER EQUIPMENT BE USED TO COMPRESS THE SPRING AS SPRING FORCE IS APPROXIMATELY 800 POUNDS. USE SPRING COMPRESSOR TOOL C-6227-1 AND A HYDRAULIC-TYPE SHOP PRESS WITH A MINIMUM RAM TRAVEL OF 5-6 INCHES. THE PRESS MUST ALSO HAVE A BED THAT CAN BE ADJUSTED UP OR DOWN AS REQUIRED. RELEASE CLUTCH SPRING TENSION SLOWLY AND COMPLETELY TO AVOID PERSONAL INJURY.**



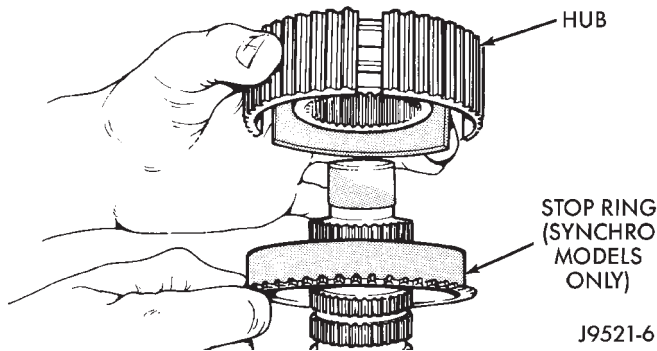
**Fig. 56 Direct Clutch Pack Components**

(23) Remove sleeve from hub (Fig. 14).



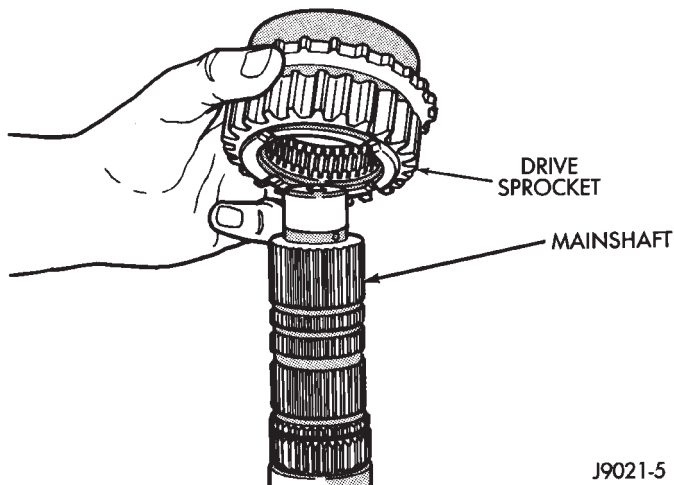
**Fig. 14 Removing Sleeve From Hub**

(24) Remove hub from mainshaft. On synchro models, also remove synchro stop ring (Fig. 15).



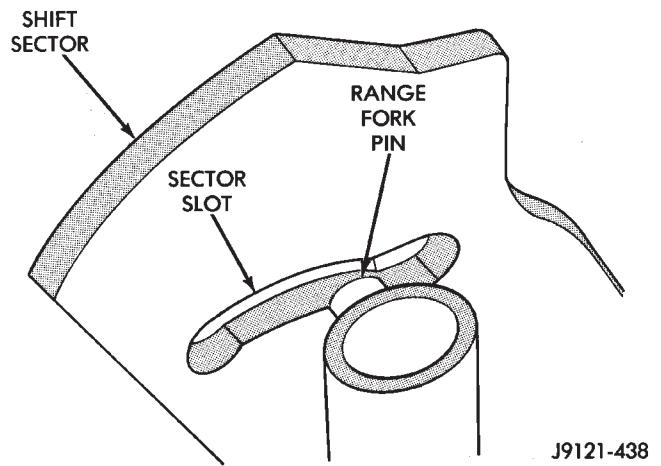
**Fig. 15 Hub And Stop Ring Removal**

(25) Remove drive sprocket (Fig. 16).

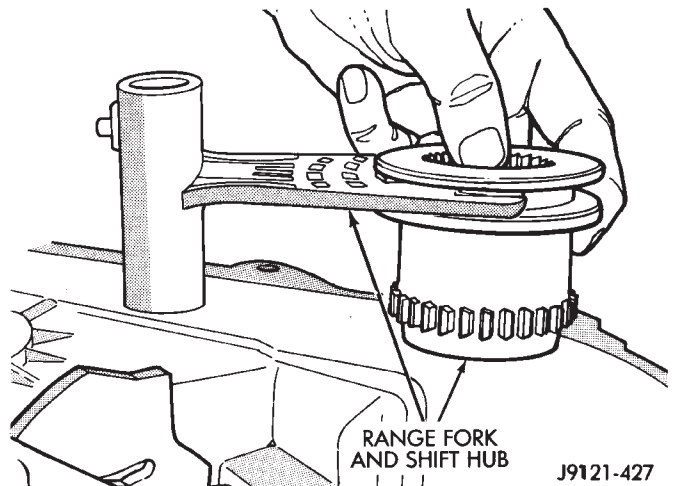


**Fig. 16 Drive Sprocket Removal/Installation**

(26) Slide range fork pin out of shift sector (Fig. 17).



**Fig. 17 Disengaging Range Fork**

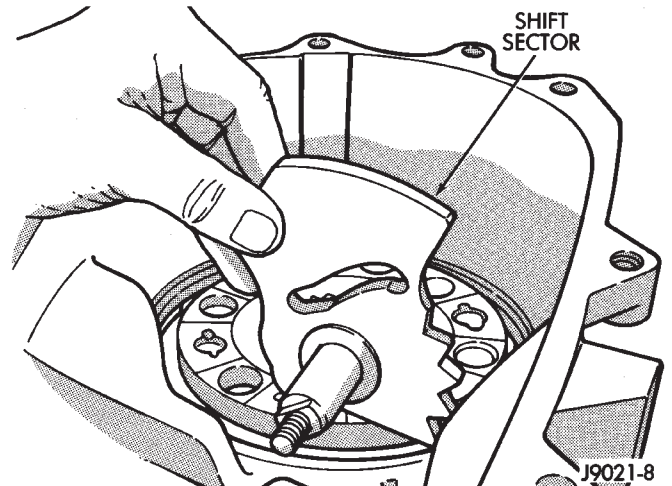


**Fig. 18 Range Fork And Hub Removal/Installation**

(27) Remove range fork and shift hub (Fig. 18).

(28) Remove range lever from sector shaft.

(29) Remove shift sector (Fig. 19).



**Fig. 19 Shift Sector Removal/Installation**

**TRANSFER CASE CHANGES**

The only service change for 1995 involves the front output seal which is new. The new seal does not have the flange used on prior seals and affects seal installation. The new seal must be seated below the edge of the seal bore in the front case. Refer to the overhaul procedures for seal installation.

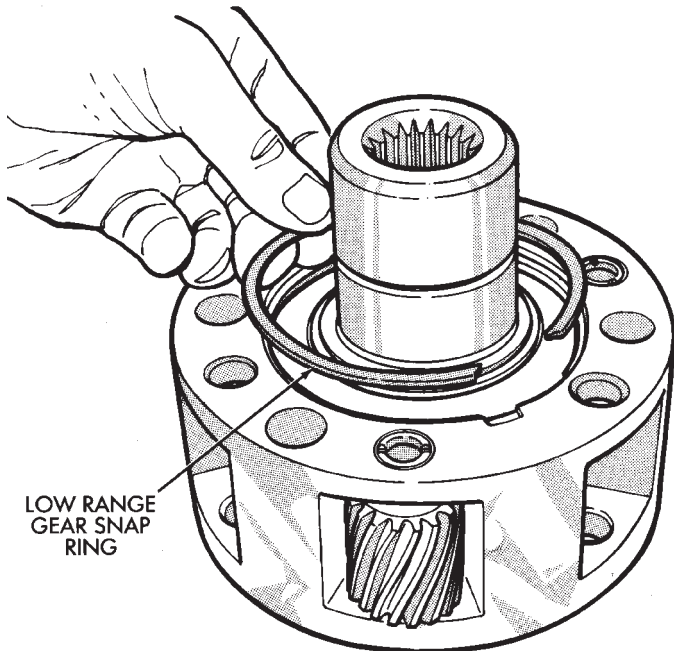
**TRANSFER CASE LUBRICANT**

Mopar Dexron II is the recommended lubricant for the NP242 transfer case. Lubricant capacity is approximately 1.4 liters (1.45 qts.).

**TRANSFER CASE FILL LEVEL**

Correct fill level for the NP242 transfer case is to the bottom edge of the fill plug hole.

(12) Install low range gear snap ring (Fig. 45).



J8921-269

**Fig. 45 Install Low Range Gear Snap Ring**

(13) Lubricate input gear and low range gears with automatic transmission fluid.

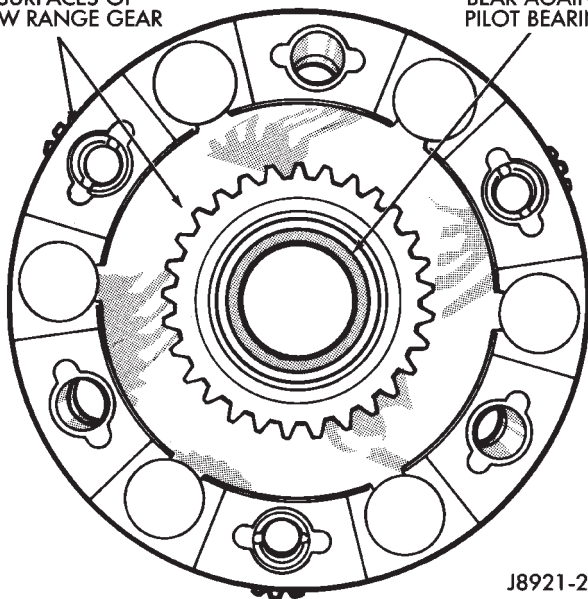
(14) Start input gear shaft into front case bearing.

(15) Press input gear shaft into front bearing.

**CAUTION:** Be sure the input gear installer tool is the proper size. The wrong size tool could push the input gear pilot bearing too far into the gear bore (Fig. 46). Also, do not press against the end surfaces of the low range gear. The gear case and thrust washers could be damaged.

DO NOT PRESS AGAINST THESE SURFACES OF LOW RANGE GEAR

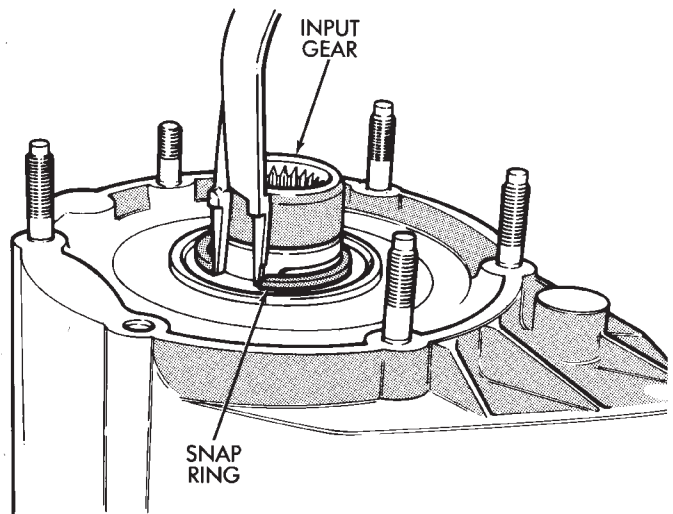
DO NOT ALLOW PRESS TOOL TO BEAR AGAINST PILOT BEARING



J8921-222

**Fig. 46 Input Gear Installation**

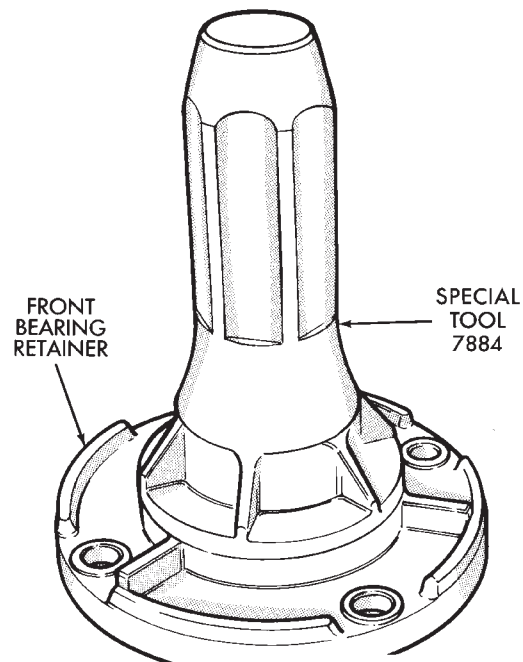
(16) Install new input gear snap ring (Fig. 47).



J8921-267

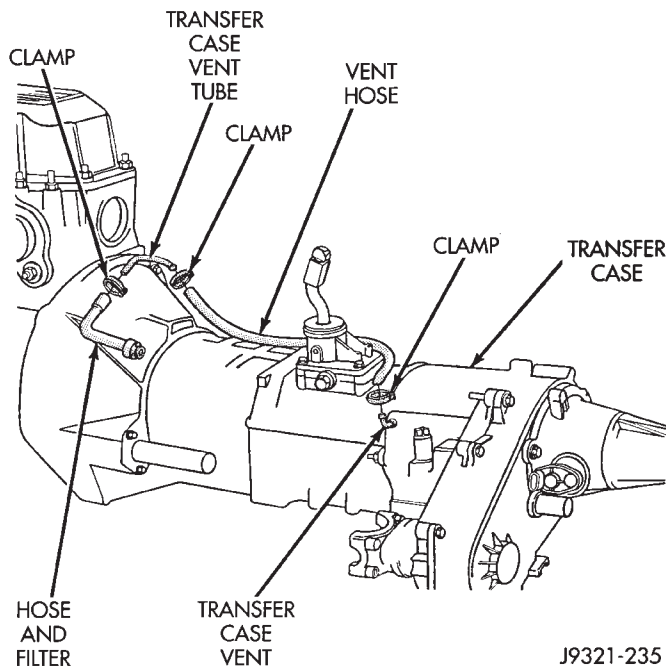
**Fig. 47 Input Gear Snap Ring Installation**

(17) Install new seal in front bearing retainer with Tool Handle C-4171 and Installer 7884 (Fig. 48).



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**Fig. 48 Front Bearing Retainer Seal Installation**



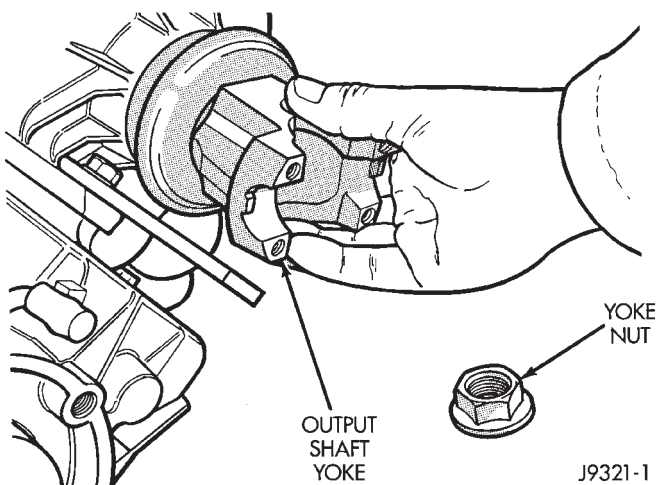
**Fig. 9 Transfer Case Vent Hose Routing**

- (8) Align and connect propeller shafts. Tighten shaft attaching bolts to 19 N·m (170 in. lbs.) torque.
- (9) Fill transfer case with Dexron II. Correct level is to bottom edge of fill plug hole.
- (10) Install rear crossmember if removed. Tighten crossmember bolts to 41 N·m (30 ft. lbs.) torque.
- (11) Remove transmission jack and transmission support stand.
- (12) Connect transfer case shift lever to shift lever rod.
- (13) Check and adjust transfer case shift linkage if necessary.
- (14) Lower vehicle.

**TRANSFER CASE DISASSEMBLY AND OVERHAUL**

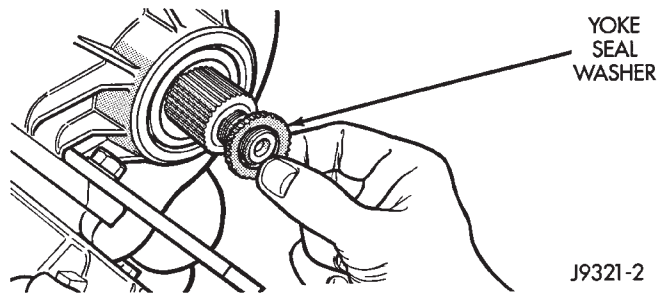
*TRANSFER CASE DISASSEMBLY*

- (1) Position transfer case on shallow drain pan. Remove drain plug and drain any lubricant remaining in case.
- (2) Remove front yoke nut and remove yoke (Fig. 1).



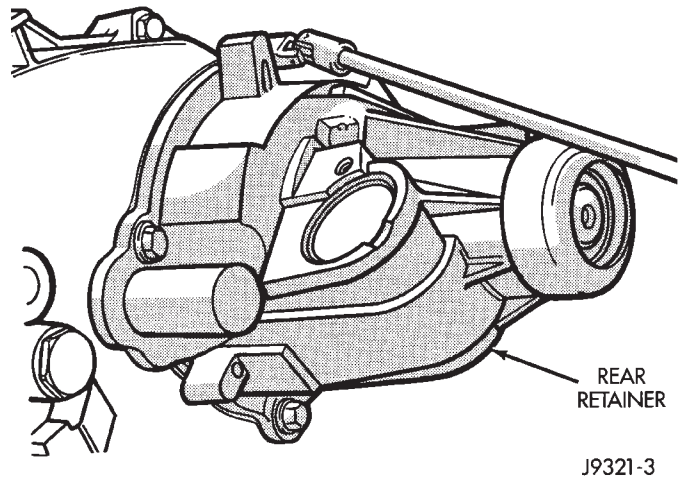
**Fig. 1 Front Yoke Removal**

- (3) Remove yoke seal washer from front output shaft (Fig. 2).



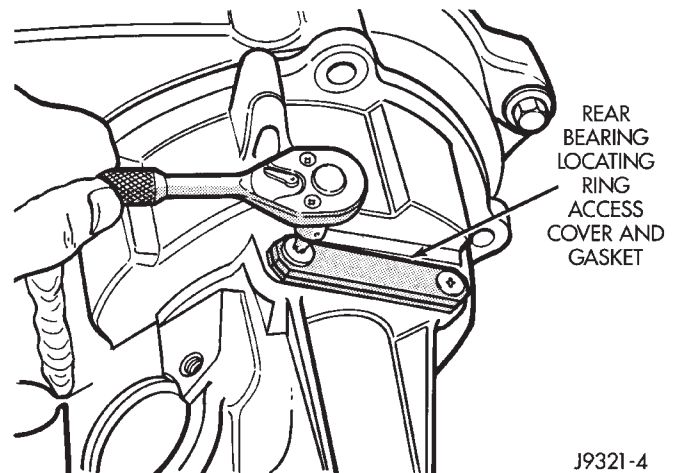
**Fig. 2 Yoke Seal Washer Removal**

- (4) Remove rear retainer bolts (Fig. 3).



**Fig. 3 Rear Retainer Bolt Removal**

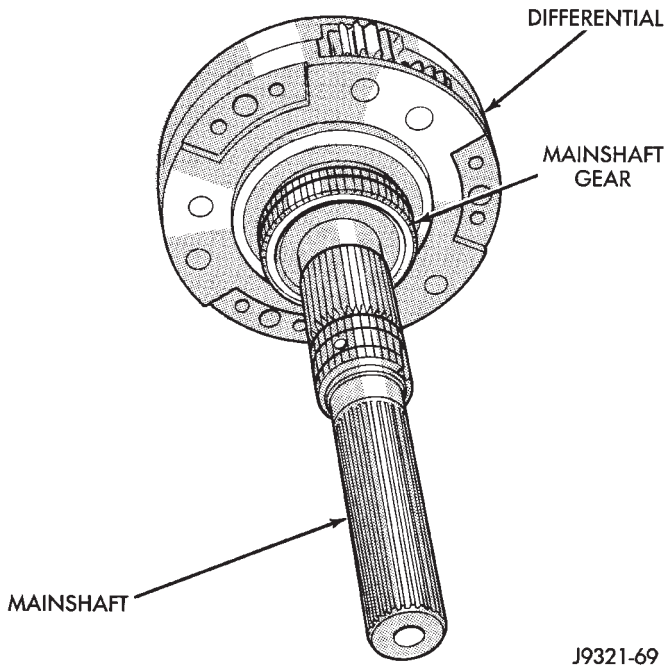
- (5) Remove rear bearing locating ring access cover screws, cover and gasket (Fig. 4).



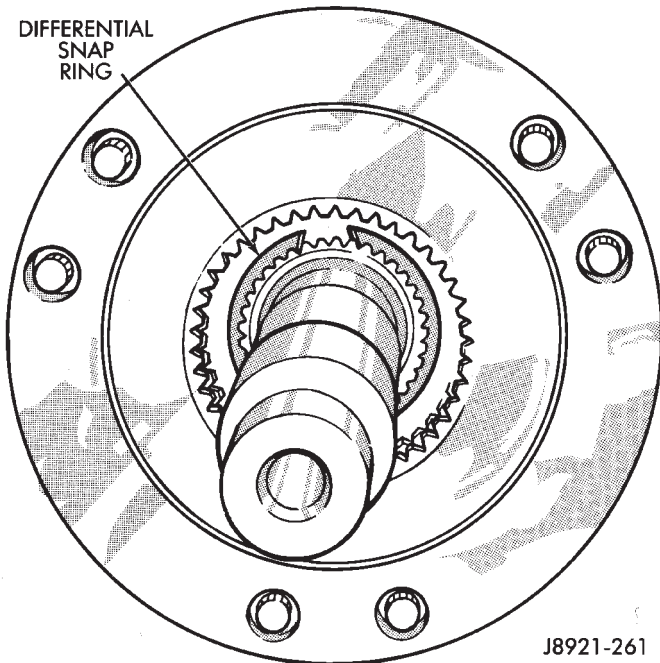
**Fig. 4 Locating Ring Access Cover And Gasket Removal**

(13) Install mainshaft in differential (Fig. 76). Rotate shaft to verify that bearings were not displaced during assembly. Also be sure that shaft is fully seated in differential.

(14) Install mainshaft snap ring (Fig. 77).



**Fig. 76 Installing Mainshaft In Differential**



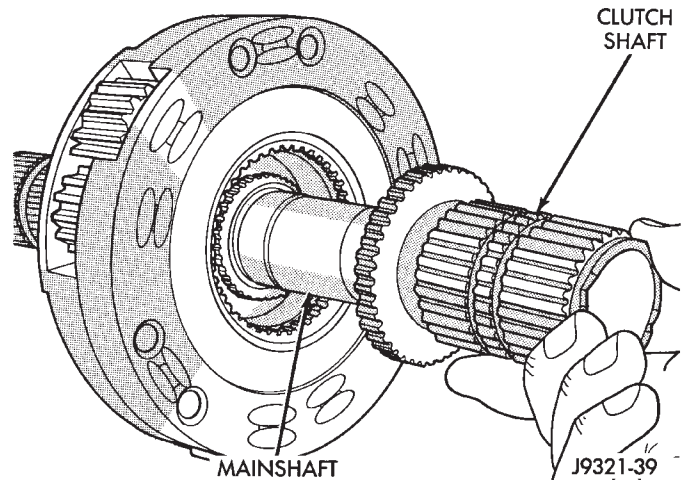
**Fig. 77 Differential Snap Ring Installation**

(15) Install clutch shaft (Fig. 78).

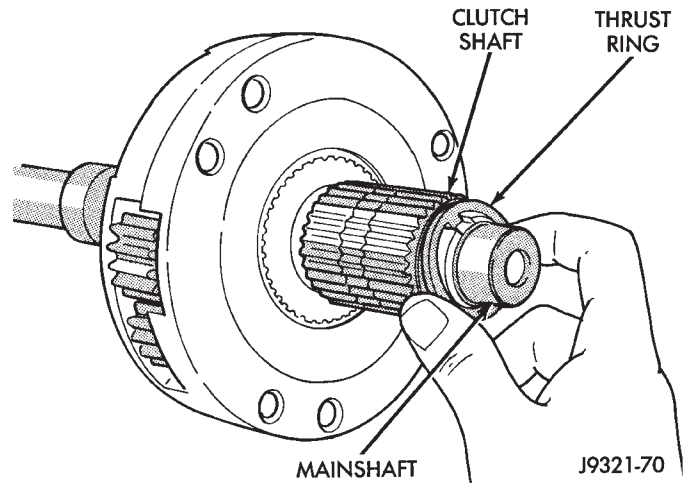
(16) Install thrust ring on end of mainshaft (Fig. 79). Be sure notch on ring seats in notch in shaft.

(17) Install clutch shaft snap ring (Fig. 80). Be sure snap ring is fully seated in ring groove.

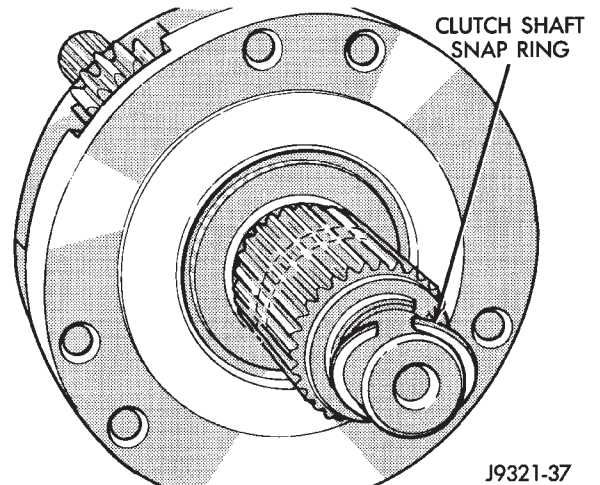
(18) Install assembled mainshaft and differential in low range gear and clutch gears (Fig. 81).





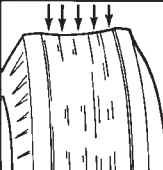

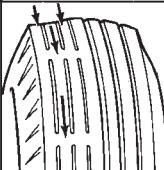
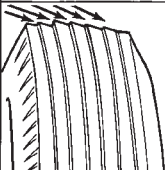
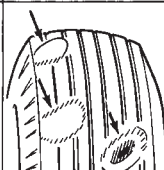
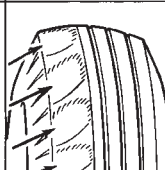
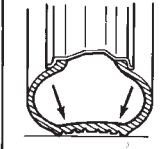
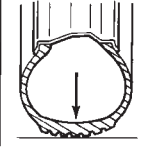
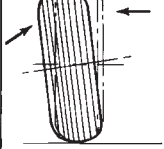
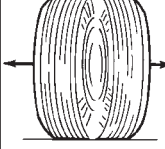
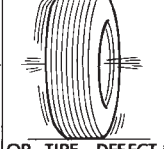
**Fig. 78 Clutch Shaft Installation**



**Fig. 79 Clutch Shaft Thrust Ring Installation**



**Fig. 80 Clutch Shaft Snap Ring Installation**

CONDITION	RAPID WEAR AT SHOULDERS	RAPID WEAR AT CENTER	CRACKED TREADS	WEAR ON ONE SIDE	FEATHERED EDGE	BALD SPOTS	SCALLOPED WEAR
EFFECT	 						
CAUSE	UNDER-INFLATION OR LACK OF ROTATION	OVER-INFLATION OR LACK OF ROTATION	UNDER-INFLATION OR EXCESSIVE SPEED*	EXCESSIVE CAMBER	INCORRECT TOE	UNBALANCED WHEEL	LACK OF ROTATION OF TIRES OR WORN OR OUT-OF-ALIGNMENT SUSPENSION.
							
CORRECTION	ADJUST PRESSURE TO SPECIFICATIONS WHEN TIRES ARE COOL ROTATE TIRES			ADJUST CAMBER TO SPECIFICATIONS	ADJUST TOE-IN TO SPECIFICATIONS	DYNAMIC OR STATIC BALANCE WHEELS	ROTATE TIRES AND INSPECT SUSPENSION SEE GROUP 2

\*HAVE TIRE INSPECTED FOR FURTHER USE.

RN797

**Fig. 7 Abnormal Tire Tread Wear Patterns**

**TIRE NOISE OR VIBRATION**

The radial-ply tire on your vehicle is more sensitive to improper mounting, or imbalance.

To determine if tires are the cause of vibration, drive the vehicle over a smooth road at different speeds. Note the effect of acceleration and deceleration on noise level. Differential and exhaust noise will change in intensity as speed varies. Tire noise will usually remain constant.

**TIRE WEAR PATTERNS**

Under inflation will increase wear on the shoulders of the tire. Over inflation will increase wear at the center of the tread.

Excessive camber causes the tire to run at an angle to the road. One side of tread is worn more than the other.

Excessive toe-in or toe-out causes wear on tread edges. There is a feathered effect across the tread (Fig. 7).

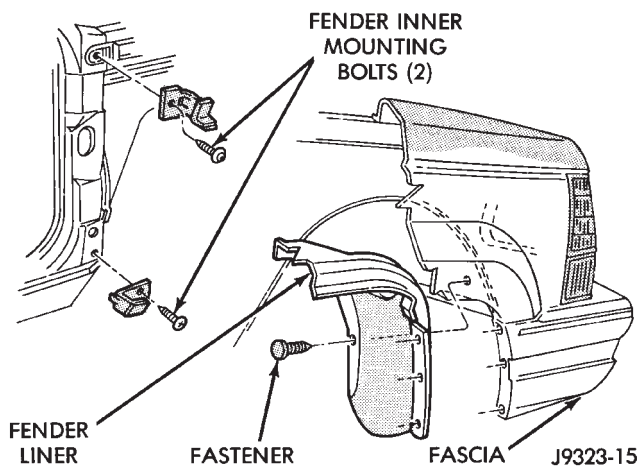


Fig. 23 Inner Fender Mounting

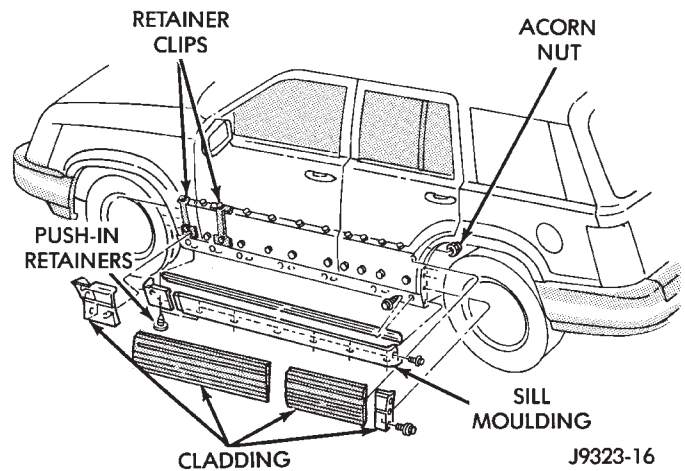


Fig. 25 Body Side Cladding

- (4) Install acorn nut onto retainer.

REMOVAL/FENDER-QUARTER PANEL

- (1) Remove 3 screws at wheel opening.
- (2) Using a trim stick, Gently pry upward from bottom of cladding.
- (3) Unsnap cladding from retainers.

INSTALLATION/FENDER-QUARTER PANEL

- (1) Install molding over top of retainer clips.
- (2) Snap molding down over retaining clips.
- (3) Install screws into wheel opening.

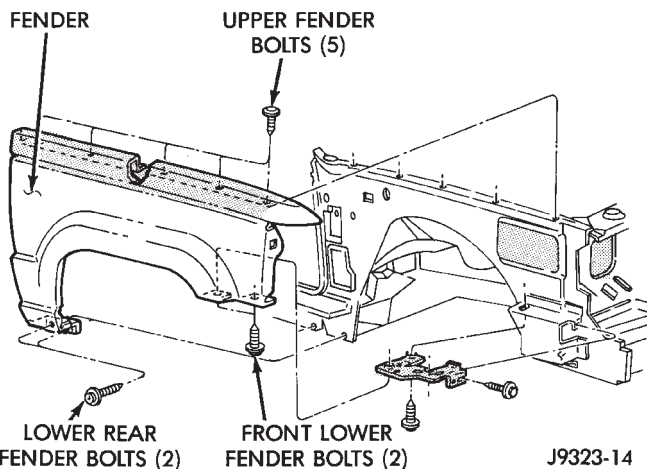


Fig. 24 Fender Mounting

BODY STRIPES/DECALS

GENERAL INFORMATION

Body stripes are durable, weather-resistant tape stripes with pressure-sensitive backing. The tape stripe is protected by a carrier until installed on a body panel. Carrier also is an installation alignment aid (Fig. 1).

BODY SIDE CLADDING

REMOVAL/FRONT DOOR

- (1) Using a trim stick, gently lift up from bottom of cladding. Unsnap molding from retaining clips (Fig. 25).
- (2) Lift upward and remove molding.

INSTALLATION/FRONT DOOR

- (1) Install molding over top of retaining clips.
- (2) Align molding to door edges.
- (3) Snap molding down over retaining clips.

REMOVAL/REAR DOOR

- (1) Open rear door.
- (2) Remove acorn nut at rear dogleg (Fig. 25).
- (3) Using a trim stick, gently lift up from bottom of cladding. Unsnap molding from retaining clips.

INSTALLATION/REAR DOOR

- (1) Install molding retainer into hole at dogleg.
- (2) Install molding over top of retaining clips.
- (3) Snap molding down over top of retaining clips.

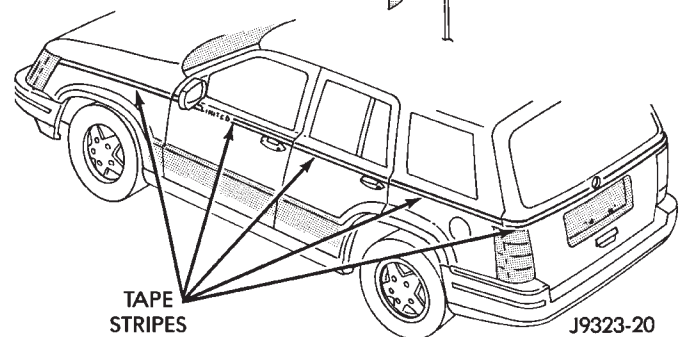
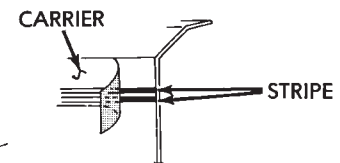
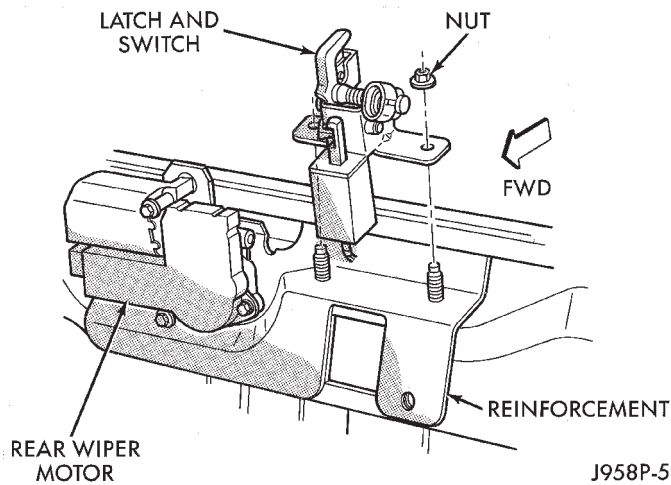


Fig. 1 Tape Stripes



**Fig. 13 Flip-Up Glass Latch/Lock Component**

- (3) Disconnect switch connector.
- (4) Remove latch from liftgate.

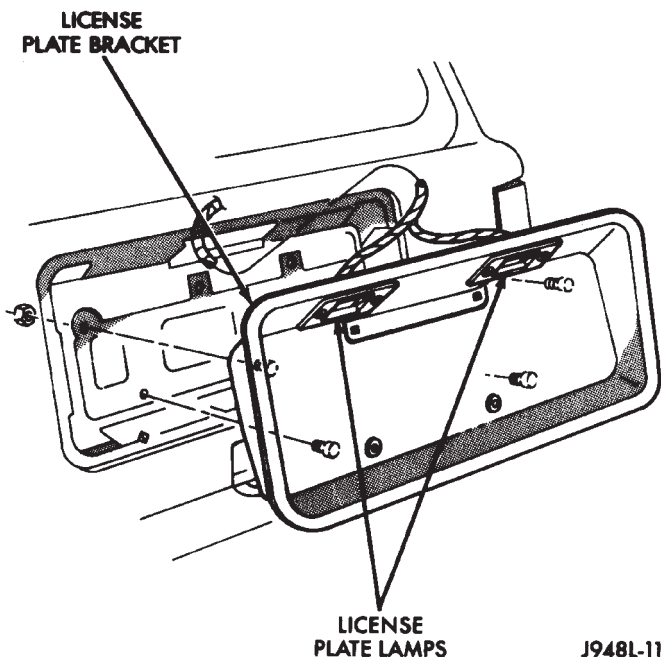
#### INSTALLATION

- (1) Position latch on vehicle, 2.5 mm forward of seal.
- (2) Connect switch connector.
- (3) Install latch nuts. Tighten to 11 N·m (100 in. lbs.).
- (4) Close flip-up glass panel and verify proper operation.
- (5) Install liftgate trim panel.

#### FLIP-UP GLASS SWITCH

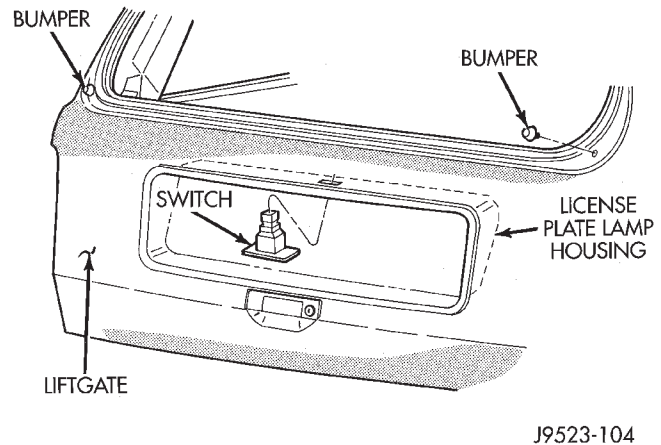
##### REMOVAL

- (1) Remove liftgate trim panel.
- (2) Remove license plate lamp housing nuts from liftgate (Fig. 14).



**Fig. 14 License Plate Lamp Housing**

- (3) Squeeze switch locking tabs inward to release switch from license plate lamp housing.
- (4) Disconnect switch harness connector.
- (5) Separate switch from housing (Fig. 15).



**Fig. 15 Switch Removal**

##### INSTALLATION

- (1) Position switch into license plate lamp housing and connect switch harness connector.
- (2) Snap switch into place.
- (3) Install license plate lamp housing.
- (4) Install liftgate trim panel.

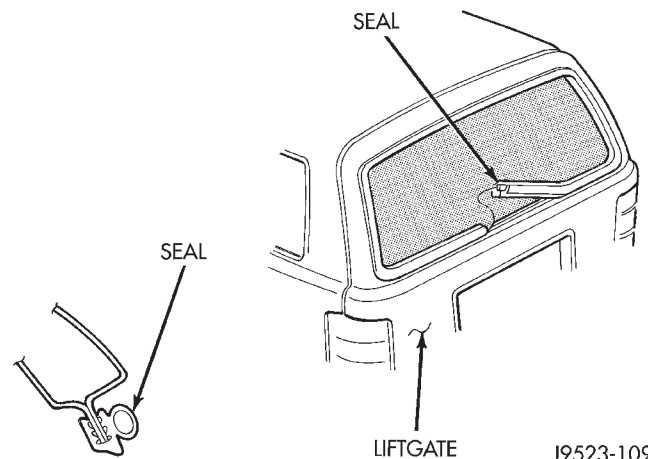
#### LIFTGATE FLIP-UP GLASS WEATHERSTRIP SEAL

##### REMOVAL

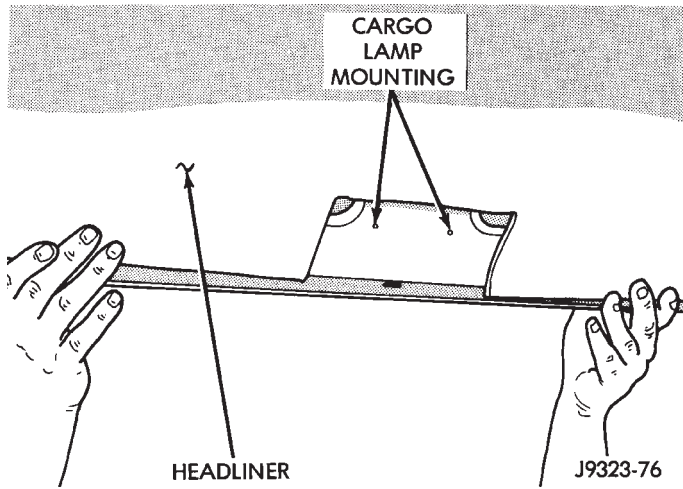
- (1) Slowly pull seal away from flange around edge of glass opening. Remove it from vehicle.
- (2) Clean seal flange as necessary.

##### INSTALLATION

- (1) Position weatherstrip seal with paint dots aligned with window opening corners.
- (2) Seat seal firmly around entire liftgate (Fig. 16).
- (3) Butt seal ends together and smooth out any remaining length.



**Fig. 16 Liftgate Seal**



**Fig. 9 Headliner Positioning/Rear**

- (3) Remove sunvisor from vehicle.
- (4) Remove retaining screw and support bracket (Fig. 3).

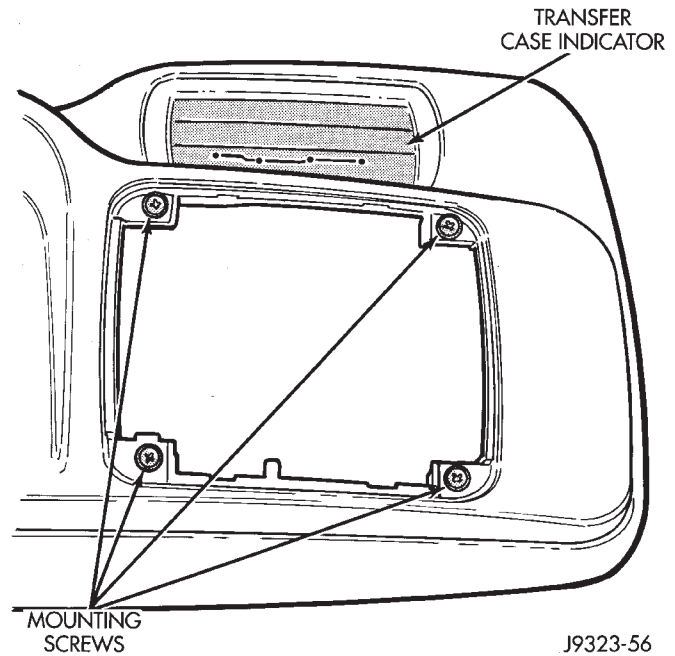
For installation, reverse removal procedure.

**FULL FLOOR CONSOLE**

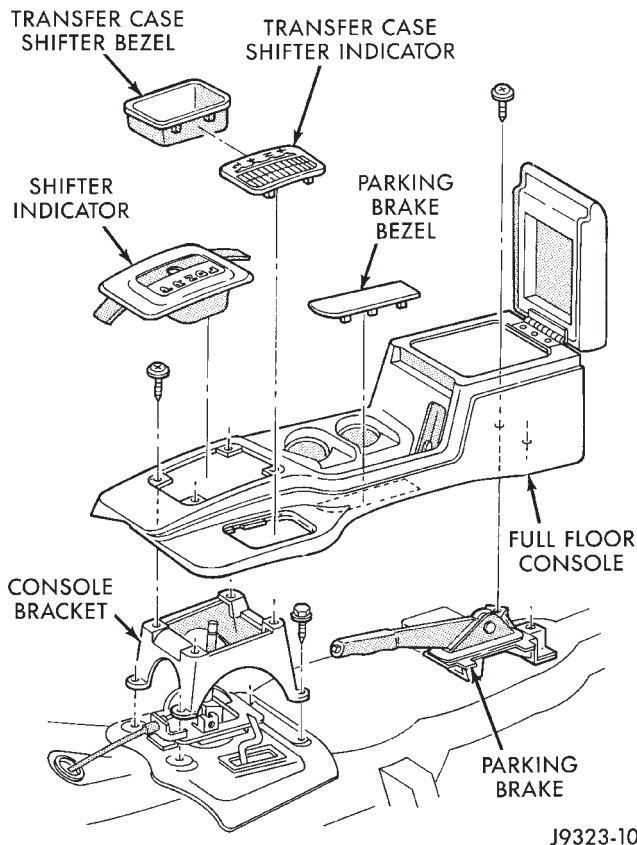
**REMOVAL**

- (1) Pull transmission shift lever handle straight up and remove handle.

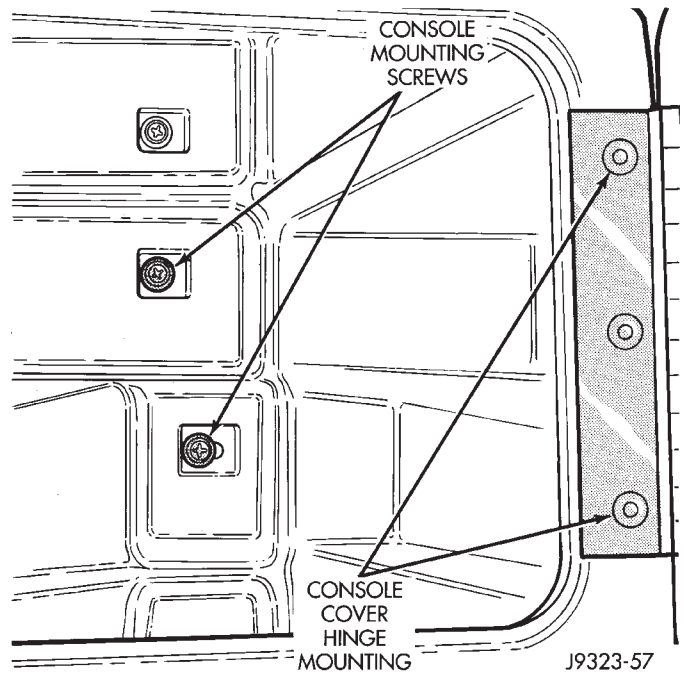
- (2) Remove transmission and transfer case shift indicator bezels by prying upward to release them. Position flat screwdriver between bezel and console to remove indicator bezel (Fig. 1).
- (3) Disconnect lamp sockets from bezels (Fig. 1).
- (4) Remove console retaining screws (Fig. 2 and 3).
- (5) Remove console from floor (Fig. 4).



**Fig. 2 Console Mounting/Front**



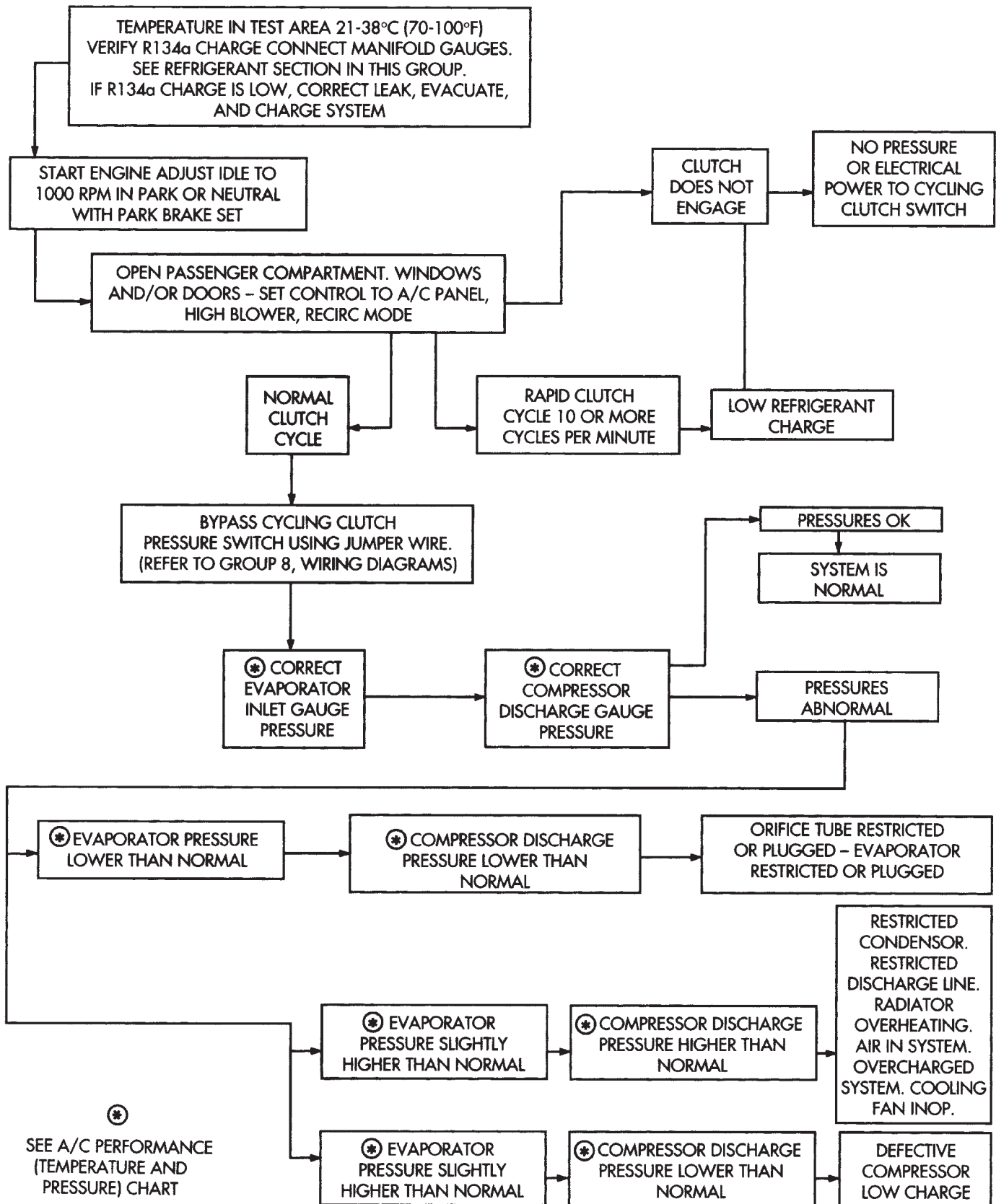
**Fig. 1 Full Console Components**



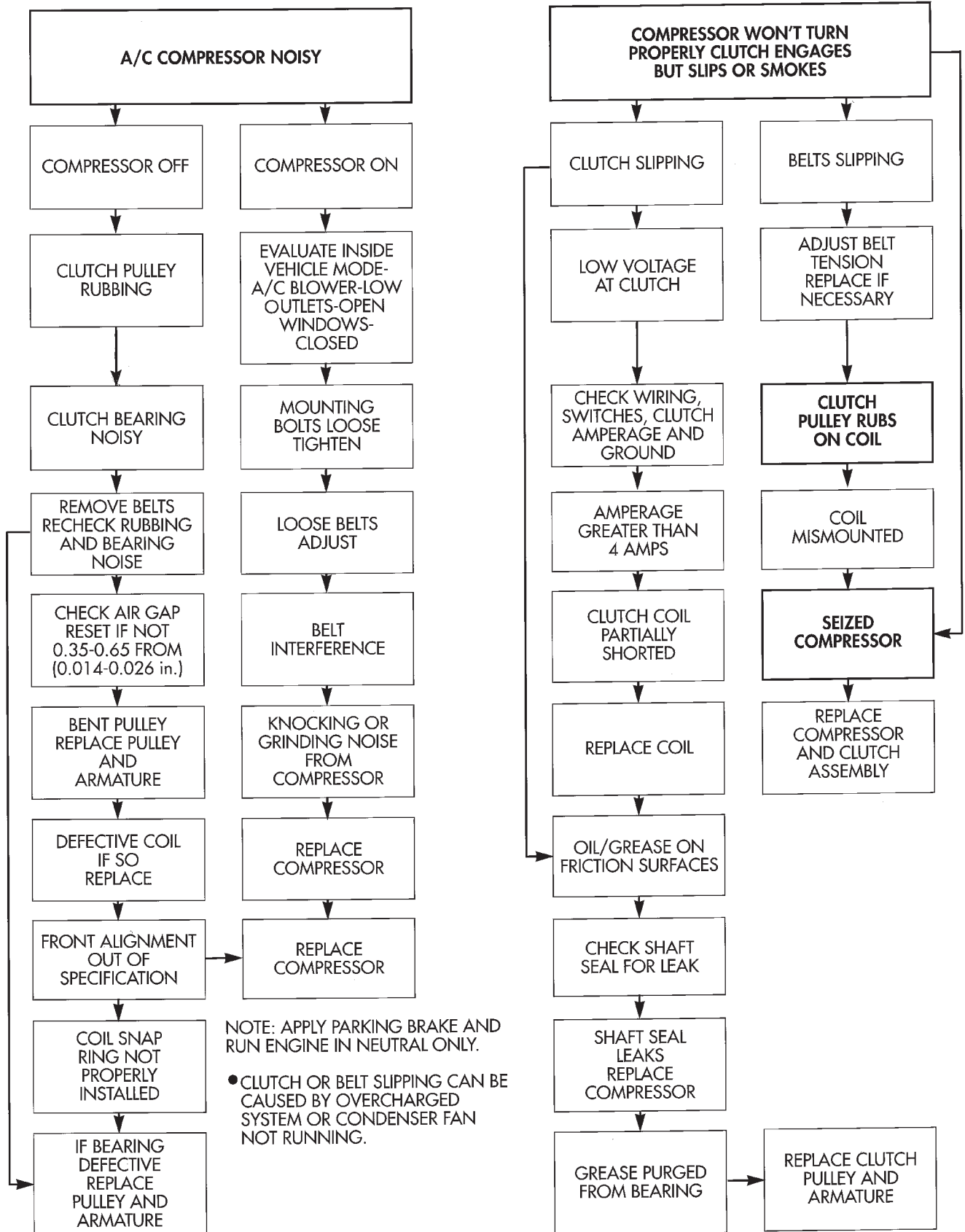
**Fig. 3 Console Mounting/Rear**

For installation, reverse removal procedure.

REFRIGERANT SYSTEM DIAGNOSIS



COMPRESSOR AND CLUTCH DIAGNOSIS



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